

**EUROKODEKS 2: BETOONKONSTRUKTSIOONIDE
PROJEKTEERIMINE. OSA 1-1: ÜLDREEGLID JA REEGLID
HOONETELE**

**Eurocode 2: Design of concrete structures - Part 1-1:
General rules and rules for buildings**

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

<p>See Eesti standard EVS-EN 1992-1-1:2005+A1:2015+NA:2015 sisaldab Euroopa standardi EN 1992-1-1:2004, selle muudatuse A1:2015 ja paranduse AC:2010 ning rahvusliku lisa NA:2015 ja selle paranduse AC:2021 ingliskeelset teksti.</p>	<p>This Estonian standard EVS-EN 1992-1-1:2005+A1:2015+NA:2015 consists of the English text of the European standard EN 1992-1-1:2004, its amendment A1:2015, its corrigendum AC:2010 and national annex NA:2015 and its corrigendum AC:2021.</p>
<p>Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.</p> <p>Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 15.12.2004, muudatus A1 17.12.2015.</p>	<p>This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.</p> <p>Date of Availability of the European standard is 15.12.2004, for A1 17.12.2014.</p>
<p>Muudatusega A1 lisatud või muudetud teksti algus ja lõpp on tekstis tähistatud sümbolitega [A1] [A1].</p> <p>Parandusega AC:2010 lisatud või muudetud teksti algus ja lõpp on tekstis tähistatud sümbolitega [AC] [AC].</p> <p>Rahvusliku lisa parandusega AC:2021 lisatud või muudetud teksti algus ja lõpp on tekstis tähistatud sümbolitega [AC2] [AC2].</p> <p>Standard on kättesaadav Eesti Standardimis- ja Akrediteerimiskeskusest.</p>	<p>The start and finish of text introduced or altered by amendment A1 is indicated in the text by tags [A1] [A1].</p> <p>The start and finish of text introduced or altered by corrigendum AC:2010 is indicated in the text by tags [AC] [AC].</p> <p>The start and finish of text introduced or altered by corrigendum AC:2021 of national annex is indicated in the text by tags [AC2] [AC2].</p> <p>The standard is available from the Estonian Centre for Standardisation and Accreditation.</p>

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English version

Eurocode 2: Design of concrete structures - Part 1-1: General rules and rules for buildings

Eurocode 2: Calcul des structures en béton - Partie 1-1 :
Règles générales et règles pour les bâtiments

Eurocode 2: Bemessung und konstruktion von Stahlbeton-
und Spannbetontragwerken - Teil 1-1: Allgemeine
Bemessungsregeln und Regeln für den Hochbau

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CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard and its amendment 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 Central Secretariat or to any CEN member.

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CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This European Standard EN 1992, Eurocode 2: Design of concrete structures: General rules and rules for buildings, has been prepared by Technical Committee CEN/TC250 « Structural Eurocodes », the Secretariat of which is held by BSI. CEN/TC250 is responsible for all Structural Eurocodes.

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 June 2005, and conflicting National Standards shall be withdrawn at latest by March 2010.

This Eurocode supersedes ENV 1992-1-1, 1992-1-3, 1992-1-4, 1992-1-5, 1992-1-6 and 1992-3.

According to the CEN-CENELEC Internal Regulations, the National Standard Organisations of the following countries are bound to implement these European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary,

Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Background to 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 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).

The Structural Eurocode programme comprises the following standards generally consisting of a number of Parts:

EN 1990	Eurocode 0:	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

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).

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 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.

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.

It may 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 should clearly mention which Nationally Determined Parameters have been taken into account.

Additional information specific to EN 1992-1-1

EN 1992-1-1 describes the principles and requirements for safety, serviceability and durability of concrete structures, together with specific provisions for buildings. It is based on the limit state concept used in conjunction with a partial factor method.

For the design of new structures, EN 1992-1-1 is intended to be used, for direct application, together with other parts of EN 1992, Eurocodes EN 1990, 1991, 1997 and 1998.

EN 1992-1-1 also serves as a reference document for other CEN TCs concerning structural matters.

EN 1992-1-1 is intended for use by:

- committees drafting other 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.

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 1992-1-1 is used as a base document by other CEN/TCs the same values need to be taken.

National annex for EN 1992-1-1

This standard gives values with notes indicating where national choices may have to be made. Therefore the National Standard implementing EN 1992-1-1 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 1992-1-1 through the following clauses:

2.3.3 (3)	5.10.3 (2)	9.2.2 (7)
2.4.2.1 (1)	5.10.8 (2)	9.2.2 (8)
2.4.2.2 (1)	5.10.8 (3)	9.3.1.1(3)
2.4.2.2 (2)	5.10.9 (1)P	9.5.2 (1)

⁴ 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.

2.4.2.2 (3)	6.2.2 (1)	9.5.2 (2)
2.4.2.3 (1)	6.2.2 (6)	9.5.2 (3)
2.4.2.4 (1)	6.2.3 (2)	9.5.3 (3)
2.4.2.4 (2)	6.2.3 (3)	9.6.2 (1)
2.4.2.5 (2)	6.2.4 (4)	9.6.3 (1)
3.1.2 (2)P	6.2.4 (6)	9.7 (1)
3.1.2 (4)	6.4.3 (6)	9.8.1 (3)
3.1.6 (1)P	6.4.4 (1)	9.8.2.1 (1)
3.1.6 (2)P	AC 6.4.5 (1) AC	9.8.3 (1)
3.2.2 (3)P	6.4.5 (3)	9.8.3 (2)
3.2.7 (2)	6.4.5 (4)	9.8.4 (1)
3.3.4 (5)	6.5.2 (2)	9.8.5 (3)
3.3.6 (7)	6.5.4 (4)	9.10.2.2 (2)
4.4.1.2 (3)	6.5.4 (6)	9.10.2.3 (3)
4.4.1.2 (5)	6.8.4 (1)	9.10.2.3 (4)
4.4.1.2 (6)	6.8.4 (5)	9.10.2.4 (2)
4.4.1.2 (7)	6.8.6 (1)	11.3.5 (1)P
4.4.1.2 (8)	AC 6.8.6 (3) AC	11.3.5 (2)P
4.4.1.2 (13)	6.8.7 (1)	11.3.7 (1)
4.4.1.3 (1)P	7.2 (2)	11.6.1 (1)
4.4.1.3 (3)	7.2 (3)	11.6.1 (2)
4.4.1.3 (4)	7.2 (5)	11.6.2 (1)
5.1.3 (1)P	7.3.1 (5)	11.6.4.1 (1)
5.2 (5)	7.3.2 (4)	12.3.1 (1)
5.5 (4)	7.3.4 (3)	12.6.3 (2)
5.6.3 (4)	7.4.2 (2)	A.2.1 (1)
5.8.3.1 (1)	8.2 (2)	A.2.1 (2)
5.8.3.3 (1)	8.3 (2)	A.2.2 (1)
5.8.3.3 (2)	8.6 (2)	A.2.2 (2)
5.8.5 (1)	8.8 (1)	A.2.3 (1)
5.8.6 (3)	9.2.1.1 (1)	C.1 (1)
5.10.1 (6)	9.2.1.1 (3)	C.1 (3)
5.10.2.1 (1)P	9.2.1.2 (1)	E.1 (2)
5.10.2.1 (2)	9.2.1.4 (1)	AC J.1 (2) AC
5.10.2.2 (4)	9.2.2 (4)	J.2.2 (2)
5.10.2.2 (5)	9.2.2 (5)	J.3 (2)
	9.2.2 (6)	J.3 (3)

A1 Amendment A1 foreword

This document (EN 1992-1-1:2004/A1:2014) has been prepared by Technical Committee CEN/TC 250 “Structural Eurocodes”, the secretariat of which is held by BSI.

This Amendment to the European Standard EN 1992-1-1:2004 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2015, and conflicting national standards shall be withdrawn at the latest by December 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom. **A1**

SECTION 1 GENERAL

1.1 Scope

1.1.1 Scope of Eurocode 2

(1)P Eurocode 2 applies to the design of buildings and civil engineering works in plain, reinforced and prestressed concrete. It complies with the principles and requirements for the safety and serviceability of structures, the basis of their design and verification that are given in EN 1990: Basis of structural design.

(2)P Eurocode 2 is only concerned with the requirements for resistance, serviceability, durability and fire resistance of concrete structures. Other requirements, e.g. concerning thermal or sound insulation, are not considered.

(3)P Eurocode 2 is intended to be used in conjunction with:

EN 1990: Basis of structural design

EN 1991: Actions on structures

hEN's: Construction products relevant for concrete structures

ENV 13670: Execution of concrete structures

EN 1997: Geotechnical design

EN 1998: Design of structures for earthquake resistance, when concrete structures are built in seismic regions.

(4)P Eurocode 2 is subdivided into the following parts:

Part 1.1: General rules and rules for buildings

Part 1.2: Structural fire design

Part 2: Reinforced and prestressed concrete bridges

Part 3: Liquid retaining and containing structures

1.1.2 Scope of Part 1-1 of Eurocode 2

(1)P Part 1-1 of Eurocode 2 gives a general basis for the design of structures in plain, reinforced and prestressed concrete made with normal and light weight aggregates together with specific rules for buildings.

(2)P The following subjects are dealt with in Part 1-1.

Section 1: General

Section 2: Basis of design

Section 3: Materials

Section 4: Durability and cover to reinforcement

Section 5: Structural analysis

Section 6: Ultimate limit states

Section 7: Serviceability limit states

Section 8: Detailing of reinforcement and prestressing tendons - General

Section 9: Detailing of members and particular rules

Section 10: Additional rules for precast concrete elements and structures

Section 11: Lightweight aggregate concrete structures

Section 12: Plain and lightly reinforced concrete structures

(3)P Sections 1 and 2 provide additional clauses to those given in EN 1990 "Basis of structural design".

(4)P This Part 1-1 does not cover:

- the use of plain reinforcement
- resistance to fire;
- particular aspects of special types of building (such as tall buildings);
- particular aspects of special types of civil engineering works (such as viaducts, bridges, dams, pressure vessels, offshore platforms or liquid-retaining structures);
- no-fines concrete and aerated concrete components, and those made with heavy aggregate or containing structural steel sections (see Eurocode 4 for composite steel- concrete structures).

1.2 Normative references

(1)P The following normative documents contain provisions which, through references in this text, constitutive provisions of this European standard. For dated references, subsequent amendments to or revisions of any of these publications do not apply. However, parties to agreements based on this European standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references the latest edition of the normative document referred to applies.

1.2.1 General reference standards

- EN 1990: Basis of structural design
 EN 1991-1-5: Actions on structures: Thermal actions
 EN 1991-1-6: Actions on structures: Actions during execution

1.2.2 Other reference standards

- EN1997: Geotechnical design
 EN 197-1: Cement: Composition, specification and conformity criteria for common cements
 EN 206-1: Concrete: Specification, performance, production and conformity
 EN 12390: Testing hardened concrete
 EN 10080: Steel for the reinforcement of concrete
 EN 10138: Prestressing steels
 EN ISO 17660 (all parts): Welding – Welding of reinforcing steel 
 ENV 13670: Execution of concrete structures
 EN 13791: Testing concrete
 EN ISO 15630 Steel for the reinforcement and prestressing of concrete: Test methods

1.2 Assumptions

(1)P In addition to the general assumptions of EN 1990 the following assumptions apply: