



**BSI Standards Publication**

## **Eurocode 2 — Design of concrete structures**

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Part 1-1: General rules and rules for buildings,  
bridges and civil engineering structures

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## National foreword

This British Standard is the UK implementation of EN 1992-1-1:2023. It supersedes BS EN 1992-1-1:2004+A1:2014, BS EN 1992-2:2005 and BS EN 1992-3:2006, which will be withdrawn on 30 March 2028.

The UK participation in its preparation was entrusted to Technical Committee B/525/2, Structural use of concrete.

A list of organizations represented on this committee can be obtained on request to its committee manager.

National choice is allowed in this standard where explicitly stated within notes. The National Annex to this standard contains the national choices to be used for buildings and civil engineering works constructed in the UK.

The first generation of EN Eurocodes was published between 2002 and 2007, with conflicting British Standards withdrawn in 2010. This document forms part of the second generation of EN Eurocodes.

The second generation of EN Eurocodes is expected to be published between 2023 and 2026. These documents are being published as soon as they are available. This is being done to enable users to prepare for the transition from the first generation to second generation of EN Eurocodes.

UK adoptions of the first generation of EN Eurocodes will be withdrawn by BSI on 30 March 2028. Until that date, the first generation documents should be considered as the applicable standards for buildings and civil engineering works constructed in the UK unless otherwise specified by the relevant authority or in the specification for a particular project.

This standard is intended to be used with its National Annex and other referenced documents, including other second generation Eurocodes, as an interdependent suite of documents.

While the use of provisions in this standard in conjunction with first generation Eurocodes is not precluded, it should be undertaken with care and should only be done when users are satisfied that it will not result in a lower level of reliability than the minimum level set in the first generation Eurocodes and associated UK National Annexes.

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## EUROPÄISCHE NORM

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## Eurocode 2 - Design of concrete structures - Part 1-1: General rules and rules for buildings, bridges and civil engineering structures

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: Règles générales - Règles pour les bâtiments, les ponts  
et les ouvrages de génie civil

Eurocode 2 - Bemessung und Konstruktion von  
Stahlbeton- und Spannbetontragwerken - Teil 1-1:  
Allgemeine Regeln und Regeln für Hochbauten,  
Brücken und Ingenieurbauwerke

This European Standard was approved by CEN on 23 July 2023.

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 CEN-CENELEC Management Centre or to any CEN member.

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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**

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## European foreword

This document (EN 1992-1-1:2023) 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 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 September 2027 and conflicting national standards shall be withdrawn at the latest by March 2028.

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

This document supersedes EN 1992-1-1:2004, EN 1992-2:2005 and EN 1992-3:2006 and their amendments and corrigenda.

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.

The main changes compared to the previous edition are listed below:

- the scope of EN 1992-1-1 was extended to higher material strengths - for concrete up to class C100, for reinforcing steel to B700, for prestressing steel strand to Y2060 – and covering stainless steel;
- a new performance-based method for durability design of concrete structures was introduced;
- ULS design models were updated for confined concrete, shear and punching shear without and with shear reinforcement, strut-and-tie modelling, and size effect considered where relevant;
- provisions for anchorage and laps of reinforcing steel were updated to consider non-linear bond characteristics and size effect, and new anchorage methods for U-bar loops, headed bars and post-installed bars were integrated;
- an informative annex provides statistical data of material and dimensional properties as basis for the partial factors;
- creep and shrinkage models were updated and unified for normal strength and high strength — concretes;
- assumed material characteristics not directly used in design are listed in Annex C as basis for specifications and interface to product standards;
- a new informative annex gives provisions for early-age thermo-mechanical design;
- a new informative annex gives requirements for use of non-linear finite element methods;

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- informative annexes provide guidance for the assessment of existing structures, for strengthening with FRP materials, for steel fibre reinforced concrete structures, for recycled aggregates concrete structures, for embedded FRP reinforcement, and for minimum reinforcement for crack control and simplified control of cracking.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

## 0 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 1992 (all parts)

(1) EN 1992 applies to the design of buildings, bridges and civil engineering structures 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 and geotechnical design*.

(2) EN 1992 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) EN 1992 is subdivided into various parts:

- EN 1992-1-1, Design of concrete structures — Part 1-1: General rules and rules for buildings, bridges and civil engineering structures,
- EN 1992-1-2, Design of concrete structures — Part 1-2: Structural fire design,
- EN 1992-4, Design of concrete structures — Part 4: Design of fastenings for use in concrete.

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### 0.3 Introduction to EN 1992-1-1

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

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

(3) 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.

### 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 1992-1-1

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

The national standard implementing EN 1992-1-1 can have a National Annex containing all national choices to be used for the design of buildings, bridges and civil engineering works to be constructed in the relevant country.

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

When no national choice is made and no default is given in this document, 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 1992-1-1 through notes to the following:

4.2.1.5(3)	4.3.1(1)	4.3.2(1)	4.3.2(2)
4.3.3(1)	4.3.3(4)	5.1.3(3)	5.1.4(2)
5.1.5(4)	5.1.6(1)	5.1.6(2)	5.2.1(5)
5.2.2(1)	5.3.1(3)	5.3.2(1)	5.4.1(1)
6.3(3)	6.3(5)	6.4(1)	6.5.2.1(2)
6.5.2.2(1)	6.5.2.2(2)	6.5.2.2(3)	6.5.2.2(4)
6.5.2.2(5)	6.5.2.2(6)	6.5.2.2(9)	6.5.3(1)
7.3.2(5)	8.2.1(3)	8.2.2(5)	8.4.2(1)
8.4.4(4)	8.4.4(5)	8.4.4(6)	9.2.1(6)

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9.2.3(2)	11.4.2(2)	11.4.2(3)	11.5.2(2)
11.6.3(2)	12.3.1(1)	12.4.1(1)	12.6(1)
12.7(2)	12.9.3(1)	14.2(1)	14.4.5.2(1)
A.3(1)	A.3(3)	A.3(6)	B.3(1)
B.6(1)	C.6(1)	C.7(1)	C.8(2)
E.4.2(1)	F.5.2(1)	F.7(2)	F.7(8)
H.4.2(4)	I.4.2.1(2)	I.5.2.1(3)	I.5.2.2(1)
I.8.3.1(1)	I.9.1(2)	J.4(1)	J.5.1(2)
K.5(2)	K.6(2)	K.6(3)	K.6(4)
K.7(2)	K.7(3)	K.8(2)	K.8(3)
K.8(4)	K.8(5)	K.8(6)	K.9(2)
K.9(3)	K.10.1(2)	K.11(2)	K.11(3)
K.11(4)	K.11(5)	K.12.2(1)	K.13(2)
K.13(4)	K.15(1)	L.4(1)	L.5.1(1)
L.5.5.2(1)	L.6(4)	L.7(1)	L.11.2(1)
L.12.3.1(2)	Q.3(1)	Q.4(2)	R.4(1)
R.5.1(2)			

National choice is allowed in FprEN 1992-1-1 on the application of the following informative annexes:

Annex A	Annex D	Annex F	Annex H
Annex I	Annex J	Annex L	Annex N
Annex O	Annex P	Annex R	Annex S

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.

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## 1 Scope

### 1.1 Scope of EN 1992-1-1

(1) This document gives the general basis for the design of structures in plain, reinforced and prestressed concrete made with normal weight, lightweight and heavyweight aggregates. It gives specific rules for buildings, bridges and civil engineering structures, including temporary structures; additional requirements specific to bridges are given in Annex K. The rules are valid under temperature conditions between  $-40\text{ °C}$  and  $+100\text{ °C}$  generally. This document complies with the principles and requirements for the safety, serviceability, durability and robustness of structures, the basis of their design and verification that are given in EN 1990.

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

(3) This document does not cover:

- resistance to fire (see EN 1992-1-2);
- fastenings in concrete (see EN 1992-4);
- seismic design (see EN 1998 (all parts));
- particular aspects of special types of civil engineering works (such as dams, pressure vessels);
- structures made with no-fines concrete, aerated or cellular concrete, lightweight aggregate concrete with open structure components;
- structures containing steel sections considered in design (see EN 1994 (all parts)) for composite steel and concrete structures;
- structural parts made of concrete with a smallest value of the upper sieve aggregate size  $D_{\text{lower}} < 8\text{ mm}$  (or if known  $D_{\text{max}} < 8\text{ mm}$ ) unless otherwise stated in this Eurocode.

### 1.2 Assumptions

(1) The assumptions of EN 1990 apply to EN 1992-1-1.

(2) It is assumed that the requirements for execution and workmanship given in EN 13670 are complied with.

## 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.

EN 197-1, *Cement — Part 1: Composition, specifications and conformity criteria for common cements*

EN 206, *Concrete — Specification, performance, production and conformity*