



EN 1996-1-1:2022

Replaces SN EN 1996-1-1+A1:2012 and SN EN 1996-1-1+A1/NA:2014

Eurocode 6 - Bemessung und Konstruktion von Mauerwerksbauten - Teil 1-1: Allgemeine Regeln für bewehrtes und unbewehrtes Mauerwerk

Eurocode 6 - Calcul des ouvrages en maçonnerie - Partie 1-1: Règles générales pour ouvrages en maçonnerie armée et non

Eurocode 6 - Design of masonry structures - Part 1-1: General rules for reinforced and unreinforced masonry structures

Reference number SN EN 1996-1-1:2022 en

Valid from: 2027-10-01

Editor Swiss Society of Engineers and Architects P.O. Box, CH-8027 Zürich

Number of pages: 2 (national) + 137 (EN) Copyright © 2024 by SIA Zurich

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 2022

EN 1996-1-1

ICS 91.010.30; 91.080.30

Supersedes EN 1996-1-1:2005+A1:2012

English Version

Eurocode 6 - Design of masonry structures - Part 1-1: General rules for reinforced and unreinforced masonry structures

Eurocode 6 : Calcul des ouvrages en maçonnerie -Partie 1-1: Règles générales pour ouvrages en maçonnerie armée et non armée Eurocode 6 - Bemessung und Konstruktion von Mauerwerksbauten - Teil 1-1: Allgemeine Regeln für bewehrtes und unbewehrtes Mauerwerk

This European Standard was approved by CEN on 3 January 2022.

This European Standard was corrected and reissued by the CEN-CENELEC Management Centre on 20 April 2022.

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.

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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION COMITÉ EUROPÉEN DE NORMALISATION EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents		
Euro	pean foreword	5
Introduction		6
1	Scope	8
2	Normative references	
3		
3.1	Terms, definitions and symbols Terms and definitions	
3.2	Symbols	
4	Basis of design	
4 4.1	General rules	
4.2	Principles of limit state design	
4.3	Basic variables	
4.4	Verification by the partial factor method	
4.5	Design assisted by testing	25
5	Materials	25
5.1	Masonry units	
5.2	Mortar	
5.3	Concrete infill	
5.4	Steel reinforcement	28
5.5	Prestressing systems	28
5.6	Ancillary components	29
5.7	Mechanical properties of masonry	29
5.8	Deformation properties of masonry	38
6	Durability	41
6.1	General	
6.2	Classification of environmental conditions	
6.3	Durability of masonry	
6.4	Masonry below ground	44
7	Structural analysis	44
7.1	General	
7.2	Structural behaviour in accidental situations (other than fire)	
7.3	Imperfections	
7.4	Second order effects	
7.5	Analysis of structural members	46
8	Ultimate limit states	58
8.1	General	
8.2	Verification of unreinforced masonry walls subjected to mainly vertical loading	58
8.3	Verification of unreinforced masonry walls subjected to combined vertical and	
0.4	horizontal loading in the plane of the wall	
8.4 8.5	Verification of unreinforced masonry walls subjected to mainly lateral loading Verification of unreinforced masonry walls subjected to combined vertical and	65
0.3	lateral loading	68
8.6	Ties	
8.7	Verification of reinforced masonry members subjected to bending, bending and	
	axial loading, or axial loading	70

8.8	Verification of reinforced masonry members subjected to shear loading	79
8.9	Prestressed masonry	82
8.10	Confined masonry	83
9	Serviceability limit states	86
9.1	General	86
9.2	Unreinforced masonry walls	86
9.3	Reinforced masonry members	
9.4	Prestressed masonry members	
9.5	Confined masonry members	
9.6	Walls subjected to concentrated loads	87
10	Detailing	88
10.1	Masonry details	88
10.2	Reinforcement details	89
10.3	Prestressing details	95
10.4	Confined masonry details	
10.5	Connection of walls	
10.6	Chases and recesses on walls	
10.7	Damp proof courses	
10.8	Thermal and long term movement	99
11	Execution	99
11.1	General	99
11.2	Design of structural members	99
11.3	Loading of masonry	99
Anne	x A (informative) Consideration of partial factor for materials relating to execution	. 100
A.1	Use of this Informative Annex	. 100
A.2	Scope and field of application	. 100
A.3	General	. 100
Anne	x B (informative) Method for calculating the second order effect	. 102
B.1	Use of this Informative Annex	. 102
B.2	Scope and field of application	. 102
B.3	Total moment including second order effects	. 102
Anne	x C (informative) Simplified methods for calculating the out-of-plane eccentricity of loading on walls	. 104
C.1	Use of this Informative Annex	
C.2	Scope and field of application	. 104
C.3	Eccentricity with reinforced concrete floors	. 104
C.4	Eccentricity with timber floors	
Anne	x D (informative) Bending moment coefficients, α_2 , in single leaf laterally loaded wall	
	panels	. 111
D.1	Use of this Informative Annex	
D.2	Scope and field of application	

Anne	ex E (informative) Limiting height and length to thickness ratios for unreinforced walls and walls with only bed joint reinforcement under the serviceability limit state	.118
E.1	Use of this Informative Annex	.118
E.2	Scope and field of application	.118
E.3	Limiting height and length to thickness ratios	.118
Anne	ex F (informative) Capacity reduction factor for slenderness and eccentricity	.121
F.1	Use of this Informative Annex	.121
F.2	Scope and field of application	.121
F.3	Reduction factor $\Phi_{ m m}$ for masonry walls subjected to mainly vertical loading (expressed as a function of eccentricity)	.121
F.4	Reduction factor Φ_{M} for masonry walls subjected to combined vertical and lateral loading (expressed as a function of normal load ratio)	.122
Anne	ex G (informative) Adjustment of lateral load for walls supported on three or four edges subjected to out-of-plane horizontal loading and vertical loading	.125
G.1	Use of this Informative Annex	.125
G.2	Scope and field of application	.125
G.3	Calculation of the reduction factor for the lateral load	.125
Anne	ex H (informative) Reinforced masonry members subjected to shear loading: enhancement of the design shear strength of masonry, $f_{ m vd}$.126
H.1	Use of this Informative Annex	.126
H.2	Scope and field of application	.126
Н.3	Calculation of the design shear strength of masonry, $f_{ m vd}$.126
Anne	ex I (informative) A design method for complex shaped members subjected to mainly vertical loading	.127
I.1	Use of this Informative Annex	
I.2	Scope and field of application	.127
I.3	Design of complex shaped members	.128
Anne	ex J (informative) Method for walls under combined lateral and vertical loading taking buckling due to vertical loading and flexural strength into account	.133
J.1	Use of this Informative Annex	
J.2	Scope and field of application	.133
J.3	Verifications	
Anne	ex K (informative) Mean material properties	.134
K.1	Use of this Informative Annex	.134
K.2	Scope and field of application	.134
K.3	Mechanical properties of masonry	
K.4	Deformation properties of masonry	
Bibli	ography	

European foreword

This document (EN 1996-1-1:2022) 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 1996-1-1:2005+A1:2012.

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 a Mandate M/515 given 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 main changes compared to the previous edition are listed below:

- improvement of the verification of combined loading;
- improvement of the capacity reduction factor for slenderness and eccentricity;
- addition of the out-of-plane shear friction coefficient;
- addition of rules for confined masonry;
- addition of informative annexes for complex shapes and mean material properties.

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.

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 organisations 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, Turkey and the United Kingdom.