SLOVENSKI STANDARD

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Evrokod 6: Projektiranje zidanih konstrukcij - 3. del: Poenostavljene raļ unske metode za nearmirane zidane konstrukcije

Eurocode 6 - Design of masonry structures - Part 3: Simplified calculation methods for unreinforced masonry structures

Eurocode 6 - Bemessung und Konstruktion von Mauerwerksbauten - Teil 3: Vereinfachte Berechnungsmethoden für unbewehrte Mauerwerksbauten

Eurocode 6 - Calcul des ouvrages en maçonnerie - Partie 3: Méthodes de calcul simplifiées pour les ouvrages en maçonnerie non armée

Ta slovenski standard je istoveten z: **EN 1996-3:2006**

ICS:

91.010.30	Tehniļ ni vidiki	Technical aspects
91.080.30	Zidane konstrukcije	Masonry

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EUROPEAN STANDARD

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English Version

Eurocode 6 - Design of masonry structures - Part 3: Simplified calculation methods for unreinforced masonry structures

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This European Standard was approved by CEN on 24 November 2005.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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Contents

Foreword

This European Standard EN 1996-3 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 July 2006, and conflicting national standards shall be withdrawn at the latest by March 2010.

CEN/TC 250 is responsible for all Structural Eurocodes.

This document supersedes ENV 1996-3:1999

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this 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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and 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 1980s.

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 the 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:

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[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).

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

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[2] According to Article 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 Article 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.;

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 (informative).

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

and 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.

This European Standard is part of EN 1996 which comprises the following parts:

Part 1-1: General *rules for reinforced and unreinforced masonry.*

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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.

[4] See Article 3.3 and Article 12 of the CPD, as well as clauses 4.2**,** 4.3.1, 4.3.2 and 5.2 of ID 1.

Part 1-2: General rules - *Structural fire design*.

Part 2: *Design considerations, selection of materials and execution of masonry.*

Part 3: *Simplified calculation methods for unreinforced masonry structures*.

EN 1996-1-1 describes the principles and requirements for safety, serviceability and durability of masonry structures. It is based on the limit state concept used in conjunction with a partial factor method. This EN 1996-3 describes simplified calculation methods to facilitate the design of unreinforced masonry walls based on the principles from EN 1996-1-1.

For the design of new structures, EN 1996 is intended to be used, for direct application, together with ENs 1990, 1991, 1992, 1993, 1994, 1995, 1997, 1998 and 1999.

EN 1996-3 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 contractors;

— relevant authorities.

National Annex for EN 1996-3

This standard gives some symbols for which a National value needs to be given, with notes indicating where national choices may have to be made. Therefore the National Standard implementing EN 1996-3 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 1996-3 through clauses:

— 2.3 (2)P Verification by the partial factor method

— 4.1 (P) Verification of the overall stability of a building

— 4.2.1.1 (1)PGeneral conditions

— 4.2.2.3 (1) Capacity reduction factor

— D.1 (1) Characteristic compressive strength

— D.2 (1) Characteristic flexural strength

— D.3 (1) Characteristic initial shear strength.

1 General

1.1 Scope Part 3 of Eurocode 6

(1)P The scope of Eurocode 6 for Masonry Structures as given in 1.1.1 of EN 1996-1-1:2005 applies also to this EN 1996-3.

NOTE: Eurocode 6 deals only with the requirements for resistance, serviceability and durability of structures. Other requirements are not considered. Eurocode 6 does not cover the special requirements of seismic design.

(2)P EN 1996-3 provides simplified calculation methods to facilitate the design of the following unreinforced masonry walls, subject to certain conditions of application:

— walls subjected to vertical loading and wind loading;

— walls subjected to concentrated loads;

— shear walls;

— basement walls subjected to lateral earth pressure and vertical loads;

— walls subjected to lateral loads but not subjected to vertical loads.

(3)P The rules given in EN 1996-3 are consistent with those given in EN 1996-1-1, but are more conservative in respect of the conditions and limitations of their use.

(4) For those types of masonry structure or parts of structures not covered by (1), the design shall be based on EN 1996-1-1.

(5) This EN 1996-3 applies only to those masonry structures, or parts thereof, that are described in EN 1996-1-1 and EN 1996-2.

(6) The simplified calculation methods given in this EN 1996-3 do not cover the design for accidental situations.

1.2 Normative references

(1)P The references in 1.2 of EN 1996-1-1:2005 apply to this EN 1996-3.

1.3 Assumptions

(1)P The assumptions given in 1.3 of EN 1990:2002 apply to this EN 1996-3.

1.4 Distinction between Principles and Application Rules

(1)P The rules of 1.4 of EN 1990:2002 apply to this EN 1996-3.

1.5 Definitions

1.5.1 General

(1) The terms and definitions given in 1.5 of EN 1990:2002 apply to this EN 1996-3.

(2) The terms and definitions in 1.5 of EN 1996-1-1:2005 apply to this EN 1996-3.

(3) Additional terms and definitions used in this EN 1996-2 are given the meanings contained in clause 1.5.2.

1.5.2 Masonry

1.5.2.1

basement wall

a retaining wall constructed partly or fully below ground level.

1.6 Symbols

(1)P Material-independent symbols are given in 1.6 of EN 1990.

(2)P For the purpose of this standard the symbols given in EN 1996-1-1 apply.

(3)P Other symbols used in this EN 1996-3 are:

b_c is the distance apart of cross walls or other buttressing elements;

c is a constant;

$f_{k,s}$ is the characteristic compressive strength of masonry, determined from a simplified method;

f_{vdo} is the design value of the initial shear strength;

f_{vdu} is the design value of the limit to the shear strength;

h_a is the average height of the building;

h_e is the height of the wall under ground level

h_m is the maximum height of a building allowed with the simplified calculation method;

k_G is a constant;

l is the length of a wall in the horizontal direction;

l_{bx} is the plan dimension of a building in the x-direction;

l_{by} is the plan dimension of a building in the y-direction;

l_f is the span of a floor;

$l_{f,ef}$ is the effective span of a floor;

l_{sx} is the length of a shear wall orientated in the x-direction;

l_{sy} is the length of a shear wall orientated in the y-direction;

$N_{Ed,max}$ is the design value of the maximum vertical load

$N_{Ed,min}$ is the design value of the minimum vertical load

q_{Ewd} is the design wind load per unit area;

w_{Ek} is the characteristic wind load per unit area;

α is the loading ratio;

β is a constant;

ρ_e is the weight per volume of the soil;

Φ_s is the capacity reduction factor.

2 Basis of design

2.1 General

(1)P The design of masonry buildings shall be in accordance with the general rules given in EN 1990.

(2)P Specific provisions for masonry structures are given in section 2 of EN 1996-1-1:2005 and shall be applied.

2.2 Basic variables

(1)P Actions shall be obtained from the relevant parts of EN 1991.

(2)P Partial factors for load shall be obtained from EN 1990.

(3)P Properties for materials and construction products and geometrical data to be used for design shall be those specified in EN 1996-1-1, or other relevant hENs of ETAs, unless otherwise indicated in this EN 1996-3.

2.3 Verification by the partial factor method

(1)P The verification by the partial factor method shall be done according to clause 2.4 of EN 1996-1-1:2005.

NOTE: The notes to 2.4.2 of EN 1996-1-1:2005 also apply.

(2)P The relevant values of the partial factor for materials γ_M shall be used for the ultimate limit state for ordinary situations.

NOTE: The numerical values to be ascribed to the symbol γ_M may be found in the National Annex. Recommended values are those as given in clause 2.4.3 of EN 1996-1-1:2005. The recommended values for masonry are repeated in the table below.

Material	γ_M				
	Class				
Masonry made with	1	2	3	4	5
Units of Category I, designed mortar	1,5	1,7	2,0	2,2	2,5
Units of Category I, prescribed mortar	1,7	2,0	2,2	2,5	2,7
Units of Category II	2,0	2,2	2,5	2,7	3,0

END of NOTE

3 Materials

3.1 General

(1)P The materials used in the masonry walls referred to in this EN 1996-3 shall be in accordance with Section 3 of EN 1996-1-1:2005.

(2) Masonry units should be grouped as Group 1, Group 2, Group 3 or Group 4 according to clause 3.1.1 of EN 1996-1-1:2005.

NOTE: Normally the manufacturer will state the grouping of his units in his product declaration.

3.2 Characteristic compressive strength of masonry

(1)The characteristic compressive strength of masonry should be determined according to 3.6.1 of EN 1996-1-1:2005.

(2) A simplified method to determine the characteristic compressive strength of masonry for use in this document is provided in Annex D.

3.3 Characteristic flexural strength of masonry

(1) The characteristic flexural strength of masonry should be determined according to 3.6.3 of EN 1996-1-1:2005.

(2) A simplified method to determine the characteristic flexural strengths of masonry for use in this document is provided in Annex D.

3.4 Characteristic initial shear strength of masonry

(1) The characteristic initial shear strength of masonry, f_{vko}, should be determined according to 3.6.2 of EN 1996-1-1:2005.