

Eurocode 6: Design of masonry structures —

**Part 3: Simplified calculation methods
and simple rules for masonry**

**(together with United Kingdom
National Application Document)**

ICS 91.010.30; 91.080.30

Committees responsible for this Draft for Development

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Association of Consulting Engineers
Autoclaved Aerated Concrete Products Association
Brick Development Association
British Ceramic Research Ltd.
British Masonry Society
British Precast Concrete Federation Ltd.
Construction Federation
Concrete Block Association
Department of the Environment, Transport and the Regions —
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Department of the Environment, Transport and the Regions —
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Institution of Structural Engineers
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National foreword

This Draft for Development was prepared by Subcommittee B/525/6, and is the English language version of ENV 1996-3:1999, *Eurocode 6: Design of masonry structures — Part 3: Simplified calculation methods and simple rules for masonry*, published by the European Committee for Standardization (CEN). This Draft for Development also includes the United Kingdom (UK) National Application Document (NAD) to be used with the ENV for the design of masonry structures to be constructed in the UK.

ENV 1996-3:1999 results from a programme of work sponsored by the European Commission to make available a common set of rules for the design of building and civil engineering works.

This publication is not to be regarded as a British Standard.

An ENV is made available for provisional application during a trial period of use of three years, but does not have the status of a European Standard. The aim is to use the experience gained period to modify the ENV so that it can be adopted as a European Standard. The publication of this ENV and its NAD should be considered to supersede any reference to a British Standard in previous DD ENV Eurocodes concerning the subject covered by these documents.

The values for certain parameters in the ENV Eurocodes may be set by individual CEN Members so as to meet the requirements of national regulations. These parameters are designated by □(boxed values in the ENV).

During the ENV period of validity, reference should be made to the supporting documents listed in the NAD. The purpose of the NAD is to provide essential information, particularly in relation to safety, to enable the ENV to be used for masonry structures constructed in the UK and the NAD takes precedence over corresponding provisions in the ENV.

Approved Document A to The Building Regulations 1991 [1], draws designers' attention to the potential use of ENV Eurocodes as an alternative approach to Building Regulation compliance. ENV 1996-3 has been thoroughly examined over a period of several years and is considered to offer such an alternative approach, when used in conjunction with this NAD.

Compliance with ENV 1996-3:1999 and this NAD does not in itself confer immunity from legal obligations.

Users of this document are invited to comment on its technical content, ease of use and any ambiguities or anomalies. These comments will be taken into account when preparing the UK national response to CEN to the question of whether the ENV can be converted to an EN.

Comments should be sent in writing to BSI, British Standards House, 389 Chiswick High Road, London W4 4AL, quoting the document reference, the relevant clause and, where possible, a proposed revision.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to vi, the ENV title page, pages 2 to 39 and a back cover.

The BSI copyright notice displayed in this document indicates when the document was last issued.

National Application Document

**for use in the UK with
ENV 1996-3:1999**

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Introduction

This National Application Document (NAD) has been prepared by Subcommittee B/525/6, Use of masonry. It has been developed from a textual examination of ENV 1996-3:1999.

It is anticipated that ENV 1996-3:1999 will have little general application in the UK. It is not a substitute for Approved Document A to the Building Regulations, and produces load bearing designs which are more conservative than either ENV 1996-1-1:1996 or BS 5628-1:1992. However, the simple rules for unreinforced basement walls and non-load bearing internal walls may be useful.

It should be noted that this NAD, in common with ENV 1996-3 and supporting European Standards, uses a comma (,) where a decimal point (.) would be traditionally used in the UK.

1 Scope

This NAD provides information required to enable ENV 1996-3:1999 to be used for the design of buildings to be constructed in the UK.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this NAD. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

BS 648, *Schedule of weights of building materials*.

BS 6399-1, *Loading for buildings — Part 1: Code of practice for dead and imposed loads*.

DD ENV 1996-1-1:1996, *Eurocode 6 — Design of masonry structures — Part 1-1: General rules for buildings — Rules for reinforced and unreinforced masonry (together with United Kingdom National Application Document)*.

3 Boxed values

In general, the boxed values in ENV 1996-3:1999 should be used, but the boxed value of 50 mm, in C.1 (2) should be taken to be 75 mm in the UK.

4 Loading codes

The loading codes given in BS 648 and BS 6399-1 should be used.

5 Reference standards

The supporting standards to be used, including materials specifications and standards for construction should be those given in Table 4 of the NAD to ENV 1996-1-1:1996.

6 Additional recommendations

In determining the vertical loading category from Table B.1 of ENV 1996-3:1999, the floor and roof elements included are assumed to be of concrete construction. Timber floors and roofs should be disregarded when using Table B.1 of ENV 1996-3:1999 in the UK.

Bibliography

Standards publication

BS 5628-1:1992, *Code of practice for use of masonry — Structural use of unreinforced masonry*.

Other document

[1] GREAT BRITAIN. The Building Regulations 1991. SI 1991 No. 2768. London, HMSO.

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Descriptors: buildings, construction, masonry work, structures, computation

English version

Eurocode 6: Design of masonry structures - Part 3: Simplified calculation methods and simple rules for masonry structures

Eurocode 6: Calcul des structures en maçonnerie - Partie
3: Méthodes de calcul simplifiées

Eurocode 6: Berechnung und Ausführung von Mauerwerk -
Teil 3: Vereinfachte Berechnungsmethoden und einfache
Regeln für Mauerwerk

This European Prestandard (ENV) was approved by CEN on 27 March 1998 as a prospective standard for provisional application.

The period of validity of this ENV is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the ENV can be converted into a European Standard.

CEN members are required to announce the existence of this ENV in the same way as for an EN and to make the ENV available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the ENV) until the final decision about the possible conversion of the ENV into an EN is reached.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

Objectives and programme of the Eurocodes

- (1) The structural Eurocodes comprise a group of standards for the structural and geotechnical design of buildings and civil engineering works.
- (2) They cover execution and control only to the extent that it is necessary to indicate the quality of the construction products, and the standard of workmanship needed on and off site to comply with the assumptions of the design rules.
- (3) Until the necessary set of harmonized technical specifications for products and the methods for testing their performance is available, some of the Structural Eurocodes will cover some of these aspects in informative annexes.

Background of the Eurocode programme

- (4) The Commission of the European Communities (CEC) initiated the work of establishing a set of harmonized technical rules for the design of building and civil engineering works which would initially serve as an alternative to the different rules in force in the various member states and would ultimately replace them. These technical rules became known as the Structural Eurocodes.
- (5) In 1990, after consulting their respective Members States, the CEC transferred the work of further development, issue and updating of the Structural Eurocodes to CEN, and the EFTA secretariat agreed to support the CEN work.
- (6) CEN Technical Committee CEN/TC 250 is responsible for all Structural Eurocodes.

Eurocode programme

- (7) Work is in hand on the following Structural Eurocodes, each generally consisting of a number of parts :

- EN 1991 Eurocode 1 : Basis of design and 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 alloy structures.

- (8) Separate sub-committees have been formed by CEN/TC 250 for the various Eurocodes listed above.

- (9) This ENV 1996-3 is being published as a European Prestandard (ENV) with an initial life of three years.
- (10) This prestandard is intended for experimental application and for the submission of comments.
- (11) After approximately two years, CEN members will be invited to submit formal comments to be taken into account in determining future actions.
- (12) Meanwhile feedback and comments on this prestandard should be sent to the Secretariat of CEN/TC 250/SC6 at the following address :

DIN
Burggrafenstrasse 6
10772 Berlin
Germany

or to your national standards organization.

National Application Documents (NADs)

- (13) In view of the responsibilities of authorities in member countries for safety, health and other matters covered by the essential requirements of the Construction Products Directive (CPD), certain safety elements in this ENV have been assigned indicative values which are identified by ☐ ("boxed values"). The authorities in each member country are expected to review the "boxed values" and may substitute alternative definitive values for these safety elements for use in national application.
- (14) Some of the supporting European or International standards may not be available by the time this prestandard is issued. It is therefore anticipated that a National Application Document (NAD) giving any substitute definitive values for safety elements, referencing compatible supporting standards and providing guidance on the national application of this prestandard, will be issued by each member country or its standards organisation.
- (15) It is intended that this prestandard is used in conjunction with the NAD valid in the country where the building and civil engineering work is located.

Matters specific to this prestandard

- (16) The scope of Eurocode 6 is defined in clause 1.1.1 of ENV 1996-1-1 and the scope of this ENV 1996-3 is defined in clause 1.1 of this Part 3. Additional parts of Eurocode 6 which are planned are indicated in clause 1.1.3 of ENV 1996-1-1.
- (17) Section 4.5 of this ENV 1996-3, relating to unreinforced basement walls, replaces normative Annex E of ENV 1996-1-1.

1 General

1.1 Scope

- (1)P This ENV 1996-3 provides either simplified calculation methods or simple rules to facilitate the design of the following unreinforced masonry walls, subject to certain conditions of application.

Simplified calculation methods are given for :

- walls subjected to vertical loading, including wind loading ;
- walls subjected to concentrated loads ;
- shear walls ;
- basement walls subjected to lateral earth pressure and vertical loads ;
- walls subjected to vertical loading where the height of the building does not exceed 3 storeys above ground level ;
- shear walls where the height of the building does not exceed 3 storeys above ground level.

Simple rules are given for :

- basement walls subjected to lateral earth pressure and vertical loads where the height of the building does not exceed 4 storeys above ground level ;
- non loadbearing internal walls.

(2) This ENV 1996-3 gives Principles and Application Rules for designing structures for specified requirements in respect of the aforementioned functions.

NOTE : The rules given in this ENV 1996-3 are consistent with those given in ENV 1996-1-1, but are more conservative in respect of the conditions and limitations of their use.

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

(4) The simplified calculation methods given in this ENV 1996-3 are not applicable to the design for accidental situations.

1.2 Distinction between Principles and Application Rules

(1)P Depending on the character of the individual clauses, a distinction is made in this ENV 1996-3 between principles and application rules.

(2)P The principles comprise :

- general statements and definitions for which there is no alternative ;
- requirements and analytical models for which no alternative is permitted unless specifically stated.

(3)P The principles are defined by the letter P, following the clause number, for example, (1)P.

(4)P The application rules are generally recognised rules which follow the principles and satisfy their requirements. Alternative rules different from the application rules given in this ENV 1996-3 may be used provided that it is shown that the alternative rule accords to the relevant principles and has at least the same reliability.

(5)P The application rules are all clauses not indicated as being principles.

1.3 Assumptions

(1)P The assumptions stated in clause 1.3 of ENV 1996-1-1 also apply to this ENV 1996-3.

1.4 Definitions

1.4.1 General

(1)P Unless otherwise stated in the following, the terminology given in clause 1.4 of ENV 1996-1-1 and clause 1.5 of ENV 1996-2, shall apply to this Part.

1.4.2 Special terms used

(1)P Basement wall - A wall constructed partly or fully below ground level.

1.5 S.I. units

(1)P S.I. units in accordance with ISO 1000 shall be used.

1.6 Symbols

(1)P The symbols given in clause 1.6 of ENV 1996-1-1 also apply to this ENV 1996-3.
 q_d is the design wind load on the wall per unit area of the wall.

2 Basis of design

2.1 General

(1)P The basis of design shall be in accordance with the principles given in Section 2 of ENV 1996-1-1 and this section 2.

2.2 Combination of actions

(1) The design value of a combination of actions for fundamental design situations shall be the larger value determined from the following expressions :

- considering only the most unfavourable variable action :

$$\Sigma \gamma_{G,j} G_{k,j} + 1,5 Q_{k,1} \quad (2.1)$$

- considering all unfavourable variable actions

$$\Sigma \gamma_{G,j} G_{k,j} + 1,35 \Sigma Q_{k,i} \quad (2.2)$$