

Specification for masonry units —

Part 3: Aggregate concrete masonry units (dense and light-weight aggregates)

The European Standard EN 771-3:2003, with the incorporation of amendment A1:2005, has the status of a British Standard

ICS 91.100.30

National foreword

This British Standard is the official English language version of EN 771-3:2003, including amendment A1:2005.

The start and finish of text introduced or altered by CEN amendment is indicated in the text by tags **A1** **A1**. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by **A1** **A1**.

EN 771-3 is a candidate “harmonized” European Standard and fully takes into account the requirements of the European Commission mandate M116, Masonry and related products, given under the EU Construction Products Directive (89/106/EEC), and is intended to lead to CE marking. The date of applicability of EN 771-3 as a “harmonized” European Standard, i.e. the date after which this standard may be used for CE marking purposes, is subject to an announcement in the *Official Journal of the European Communities*.

The Commission in consultation with Member States has agreed a transition period for the co-existence of “harmonized” European Standards and their corresponding national standard(s). It is intended that this period will comprise a period, usually nine months, after the date of availability of the European Standard, during which any required changes to national regulations are to be made, followed by a further period, usually of 12 months, for the implementation of CE marking. At the end of this co-existence period, the national standard(s) will be withdrawn.

EN 771-3:2003 is the subject of transitional arrangements agreed under the Commission mandate. In the UK, the corresponding national standard is:

— BS 6073-1:1981, *Precast concrete masonry units — Part 1: Specification for precast concrete masonry units*;

and based on this transition period of twenty-one months, the above mentioned national standard will be withdrawn in April 2006.

NOTE This date is approximate. Users of this standard should contact BSI Customer Services for confirmation of withdrawal.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 17 March 2004

© BSI 9 February 2006

ISBN 0 580 43559 8

Amendments issued since publication

Amd. No.	Date	Comments
16001	9 February 2006	Incorporation of CEN amendment A1:2005 and revision of national Annex NA and national foreword

The UK participation in its preparation was entrusted by Technical Committee B/519, Masonry and associated testing, to B/519/1, Masonry units, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

EN 771-3 specifies the characteristics and performance requirements for aggregate concrete masonry units available throughout the CEN member countries. It aims to do so in product performance terms, avoiding as far as possible prescriptive requirements and all the traditional designations of aggregate concrete units available throughout Europe. Current products, however, will continue to be manufactured, traded and used, even though they are not referred to by name in this European Standard. The concept of the declared value has been introduced. This is the value for the various properties referred to in this standard that the manufacturer claims for the product. There are other notable differences to which the national annex will refer, in particular the supporting test methods are different and in respect of compressive strength, manufactured aggregate concrete masonry units are designated either Category I or Category II.

The UK National Annex NA attached to this standard provides an informative commentary on the differences between EN 771-3 and BS 6073-1. Nothing in this annex should be construed as specifying requirements other than those contained in the normative parts of this European Standard.

If CE marking is performed, the procedures in Annex ZA will apply. The significance of the CE marking is that the product manufacturer claims compliance with the “harmonized” requirements given in the normative text of the product standard. These relate to the essential requirements of the EU Construction Products Directive. Not all product characteristics need necessarily be given on the CE marking, but those product characteristics covered by regulations in force in each EU Member State, where the manufacturer intends that the product will be used, do need to be stated.

This standard has been written as a performance standard, unlike BS 6073-1, which was a combination of performance and recipe, leading to the following changes.

- There are no standard product sizes given and the distinction between brick and block has been removed. These names have been replaced by the term “masonry units”.
- The order in which the dimensions of blocks are specified has been changed from “length, height and thickness” to “length, width (previously called thickness) and height”.
- Tolerance categories on the manufacturer’s declared dimensions are specified.
- The limit on shell thickness for blocks and the limits on void percentages for bricks have been removed but the manufacturer is required to declare one of the groups defined in EN 1996-1-1 and/or the configuration in 5.3.1 of this standard.
- The manufacturer is required to declare the gross dry density of a unit and, when appropriate, the net dry density of the concrete. The tolerance on these declared values is given.
- The limit on minimum strength has been removed but the manufacturer has to declare the strength together with the category of unit.

- The limit on drying shrinkage has been removed and replaced by a requirement for manufacturers to declare the moisture movement value when units are marketed for structural purposes.
- When relevant the manufacturer has to declare the thermal properties, freeze/thaw durability, water absorption by capillarity and water vapour permeability of units.
- The manufacturer has to declare the units reaction to fire class, and when intended to be used in structural masonry, its bond strength.
- A requirement for flexural bond strength of masonry units in combination with mortar has been included and is applicable only when required by national provisions valid in the intended place of use and relevant to the application.
- A requirement for the manufacturer to establish product conformity with its declared properties is included in this standard. This requires both initial type testing and the operation of continuing factory production control procedures that have to be fully documented. An outline for this is included in 8.3.
- An informative annex, Annex ZA, is included which indicates those clauses in this “harmonized” Standard and the procedures to be followed in order to CE mark a product.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 36, an inside back cover and a back cover.

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

English version

**Specification for masonry units - Part 3: Aggregate concrete
masonry units (Dense and light-weight aggregates)**

(includes amendment A1:2005)

Spécifications pour éléments de maçonnerie - Partie 3:
Blocs en béton de granulats (granulats courants et légers)
(inclut l'amendement A1:2005)

Festlegungen für Mauersteine - Teil 3: Mauersteine aus
Beton (mit dichten und porigen Zuschlägen)
(enthält Änderung A1:2005)

This European Standard was approved by CEN on 9 April 2003; amendment A1:2005 was approved by CEN on 29 December 2004.

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 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 Management Centre 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, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



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

Management Centre: rue de Stassart, 36 B-1050 Brussels

Contents

Foreword	3
Foreword to amendment A1	3
1 Scope	4
2 Normative references	4
3 Definitions, terms and symbols	5
3.1 Terms and definitions	5
3.2 Symbols	7
4 Materials	7
4.1 General	7
5 Requirements for aggregate concrete masonry units	7
5.1 General	7
5.2 Dimensions and tolerances	8
5.3 Configuration and appearance	9
5.4 Density	11
5.5 Mechanical strength	11
5.6 Thermal properties	12
5.7 Durability	12
5.8 Water absorption by capillarity	13
5.9 Moisture movement	13
5.10 Water vapour permeability	13
5.11 Reaction to fire	13
5.12 Shear bond strength	13
5.13 Flexural bond strength	14
6 Description, designation and classification of concrete masonry units	14
6.1 Description and designation of units	14
6.2 Classification	15
7 Marking	15
8 Evaluation of conformity	15
8.1 General	15
8.2 Initial type tests	15
8.3 Factory production control	16
Annex A (normative) Sampling for initial type testing and for independent testing of consignments	18
Annex B (normative) Compliance criteria for initial type testing and for independent testing of consignments	21
Annex C (informative) Examples of different shapes of concrete masonry units	25
Annex ZA (informative) Clauses of this European Standard addressing the provisions of the EU Construction Products Directive	26

Foreword

This document (EN 771-3:2003) has been prepared by Technical Committee CEN/TC 125 'Masonry', 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 January 2004, and conflicting national standards shall be withdrawn at the latest by April 2005.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports the essential requirements of the EU Construction Products Directive (89/106/EEC).

For relationship with EU Directives, see informative Annex ZA which is an integral part of this document.

It also takes into account the general rules for reinforced and unreinforced masonry in Eurocode 6.

The Annexes A and B of this European Standard are normative, Annex C is informative.

EN 771 *Specification for masonry units* consists of:

- *Part 1: Clay masonry units.*
- *Part 2: Calcium silicate masonry units.*
- *Part 3: Aggregates concrete masonry units (Dense and light-weight aggregates).*
- *Part 4: Autoclaved aerated concrete masonry units.*
- *Part 5: Manufactured stone masonry units.*
- *Part 6: Natural stone masonry units.*

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

Foreword to amendment A1

This document (EN 771-3 :2003/A1 :2005) has been prepared by Technical Committee CEN/TC 'Masonry', the Secretariat of which is held by BSI.

This Amendment to the European Standard EN 771-3:2003 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2005, and conflicting national standards shall be withdrawn at the latest by August 2005.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see modifications to informative Annex ZA, which is an integral part of this document.

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, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This European Standard specifies the characteristics and performance requirements of aggregate concrete masonry units made from dense and lightweight aggregates or a combination of both for which the main intended uses are common, facing or exposed masonry in load bearing or non load bearing building and civil engineering applications. The units are suitable for all forms of walling, including single leaf, external leaf to chimneys, cavity wall, partitions, retaining, and basement. They can provide fire protection, thermal insulation, sound insulation and sound absorption.

This European Standard includes concrete masonry units of an overall non rectangular parallelepiped shape, especially shaped and accessory units.

It defines the performance related to e.g. strength, density, dimensional accuracy, and provides for the evaluation of conformity of the product to this European Standard. The marking requirements for products covered by this European Standard is also included.

This European Standard does not specify standard sizes for aggregate concrete masonry units, nor standard work dimensions and angles of specially shaped aggregate concrete masonry units. It does not cover storey height panels, chimney flue linings nor units intended for use as a damp proof course. It does not cover units with an incorporated thermal insulation material bonded to the faces of the unit susceptible to be exposed to fire.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 772-1, *Methods of test for masonry units — Part 1: Determination of compressive strength*

EN 772-2, *Methods of test for masonry units — Part 2: Determination of percentage area of voids in masonry units (by paper indentation)*

EN 772-6, *Methods of test for masonry units — Part 6: Determination of bending tensile strength of aggregate concrete masonry units*

EN 772-11, *Methods of test for masonry units — Part 11: Determination of water absorption of aggregate concrete, manufactured stone and natural stone masonry units due to capillary action in the initial rate of water absorption of clay masonry units*

EN 772-13, *Methods of test for masonry units — Part 13: Determination of net and gross dry density of masonry units (except for natural stone)*

EN 772-14, *Methods of test for masonry units — Part 14: Determination of moisture movement of aggregate concrete and manufactured stone masonry units*

EN 772-16, *Methods of test for masonry units — Part 16: Determination of dimensions*

EN 772-20, *Methods of test for masonry units — Part 20: Determination of flatness of faces of masonry units*

EN 998-2, *Specification for mortar for masonry — Part 2 : Masonry mortar*

EN 1052-3, *Methods of test for masonry — Part 3 : Determination of initial shear strength*

EN 1745, *Masonry and masonry products — Methods for determining declared and design thermal values*

EN 13501-1, *Fire classification of construction products and building elements — Part 1: Classification using test data from reaction to fire tests*

EN ISO 12572, *Hygrothermal performance of building materials and products — Determination of water vapour transmission properties (ISO 12572:2001)*

EN 1996-1-1, *Eurocode 6: Design of masonry structures — Part 1-1: Common rules for reinforced and unreinforced masonry structures* 

3 Definitions, terms and symbols

3.1 Terms and definitions

For the purposes of this European Standard the following terms and definitions apply.

3.1.1

masonry unit

preformed component intended for use in masonry construction

3.1.2

common masonry unit

masonry unit normally intended for use with no faces left visible

3.1.3

facing masonry unit

masonry unit intended for use with one or more faces left visible and which may or may not be exposed to external climatic conditions

3.1.4

exposed masonry unit

facing masonry unit exposed to external climatic conditions without render or other equivalent protection

3.1.5

aggregate concrete masonry unit

masonry unit manufactured from, cementitious binder, aggregates and water and which may contain admixtures and additions and colouring pigments and other materials incorporated or applied during or subsequent to unit manufacture

3.1.6

co-ordinating size

size of a co-ordinating space allocated to a masonry unit including allowances for joints

3.1.7

work size

size of a unit specified for its manufacture, to which the actual size conforms within permissible deviations

3.1.8

actual size

size of a unit as measured

3.1.9

regular shaped masonry unit

masonry unit with an overall rectangular parallelepiped shape

NOTE Examples of different shapes of concrete masonry units are shown in Annex C.

3.1.10

specially shaped masonry unit

masonry unit which is not a rectangular parallelepiped

3.1.11

accessory unit

unit which is shaped to provide a particular function, e.g. to complete the geometry of the masonry

3.1.12

interlocking features

shaped matched projections and indentations on masonry units, e.g. tongue and groove systems

3.1.13

hole

formed void which may or may not pass completely through a masonry unit

3.1.14

frog

depression formed in one or both of the bed faces of a unit, the total volume of all such depressions which does not exceed a certain limit of the overall volume of the unit, i.e. length $\times$ width $\times$ height

3.1.15

recess

depression or indentation in one or more surfaces of a masonry unit (e.g. mortar pocket, rendering keyway, grooves to provide a discontinuity in the mortar joint, grip hole)

3.1.16

shell

peripheral solid material between the hole(s) and the face or the header of a unit

A1 3.1.17

web

solid material between the formed voids in a masonry unit

3.1.18

declared value

value that a manufacturer is confident of achieving, bearing in mind the precision of the test and the variability of the manufacturing process

3.1.19

Category I masonry units

units with a declared compressive strength with a probability of failure to reach it not exceeding 5 %. This may be determined via the mean or characteristic value

3.1.20

Category II masonry units

units not intended to comply with the level of confidence of Category I units

3.1.21

normalized compressive strength of masonry units

compressive strength of masonry units converted to the air dry compressive strength of an equivalent 100 mm wide $\times$ 100 mm high masonry unit

NOTE See the procedure given in Annex A of EN 772-1:2000 **A1**

3.1.22**mean compressive strength of masonry units**

arithmetic mean of the compressive strengths of masonry units

3.1.23**characteristic compressive strength of masonry units**

compressive strength corresponding to a 5 % lower fractile of the compressive strength of masonry units

3.1.24**combined thickness of webs and shells**

sum of the thicknesses of the shells and webs from one face or header of a masonry unit to the opposite face or header respectively along whichever path, via the formed voids, gives the smallest value, expressed as a percentage of the unit width or length respectively 

3.2 Symbols

l length, in mm;

l_d length of the diagonal, in mm;

w width, in mm;

h height, in mm;

f_b normalized compressive strength, in N/mm²;

f_c characteristic compressive strength in N/mm²;

f_m mean compressive strength in N/mm²;

f_{bi} individual result compressive strength, in N/mm²;

4 Materials**4.1 General**

The specifications of the materials to be used shall be included in the production control documentation (see 8.3). If appropriate European Standards are available, they shall be used except that aggregates need not comply with grading requirements. If not available, the manufacturer shall specify the materials and have data on their suitability.

5 Requirements for aggregate concrete masonry units**5.1 General**

The requirements and properties specified in this European Standard shall be defined in terms of the test methods and other procedures referred to in this European Standard.

NOTE A declared value may be chosen from the classification system, if any, of the place of manufacture/use of the units.

It should be noted that the standard test methods are not always applicable to specially shaped and accessory units as defined in 3.1.10 and 3.1.11.

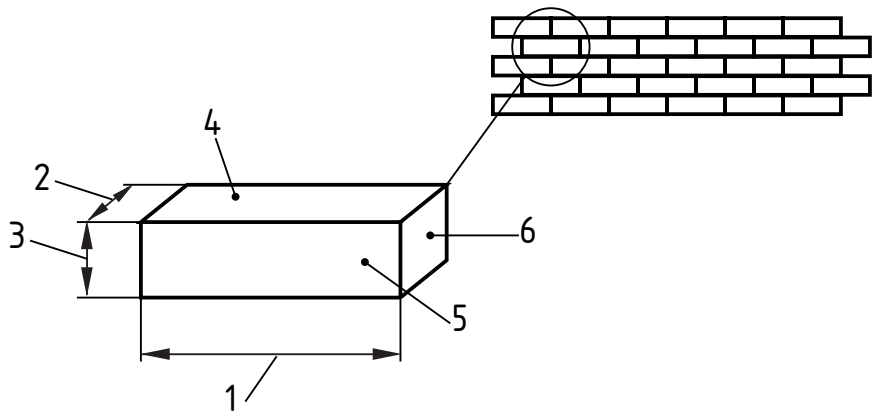
The conformity criteria given in the following sub-clauses relates to initial type testing (see 8.2) and, when relevant, to consignment testing (see Annex A). For the compressive strength of Category I units use a 50 % fractile ($p = 0,50$) for mean values or 5 % fractile ($p = 0,05$) for characteristic values and a confidence level of 95 %.

For production evaluation the manufacturer shall define the conformity criteria in the factory production control documentation (see 8.3).

5.2 Dimensions and tolerances

5.2.1 **Dimensions** The manufacturer shall declare the dimensions of the concrete masonry units in mm for *length*, *width* and *height*, in that order (see Figure 1). They shall be given in terms of work size.

NOTE 1 In addition the co-ordinating size may be given



Key

- | | | |
|----------|---------|----------|
| 1 Length | 2 Width | 3 Height |
| 4 Bed | 5 Face | 6 Header |

NOTE 2 This relates to the normal use of the masonry unit in the wall.

Figure 1 — Dimensions and surfaces

5.2.2 Dimensional tolerances

5.2.2.1 **Tolerances**

The tolerances on declared work sizes of individual regular shaped units shall conform to Table 1. Closer tolerances may be declared for one or more dimensions. The manufacturer shall declare the tolerance category of the units.

Table 1 — Limit deviations in millimetres

Tolerance category	D1	D2	D3	D4
length	+ 3 – 5	+ 1 – 3	+ 1 – 3	+ 1 – 3
Width	+ 3 – 5	+ 1 – 3	+ 1 – 3	+ 1 – 3
height	+ 3 – 5	± 2	± 1,5	± 1,0

Tolerances for non-regular shaped and accessory units shall be as given in Table 1 or as declared by the manufacturer.

These tolerances shall not apply to the dimensions between the surfaces of units which are manufactured to be non planar.

If sampled in accordance with clause A.2 and tested in accordance with EN 772-16: 2000 (method A) the results evaluated in accordance with clause B.1 shall conform to the declared tolerance category.

5.2.2.2 Flatness of bed faces

When aggregate concrete masonry units are declared as tolerance category D4 for use with thin layer mortar, the manufacturer shall also declare the maximum deviation from flatness of the bed faces.

If sampled in accordance with Clause A.2 and tested in accordance with EN 772-20, the deviation from flatness of the bed faces shall not exceed the declared value.

5.2.2.3 Plane parallelism of bed faces

When aggregate concrete masonry units are declared as tolerance category D4 for use with thin layer mortar, the manufacturer shall also declare the maximum deviation from plane parallelism of the bed faces.

If sampled in accordance with Clause A.2 and tested in accordance with EN 772-16 method d), the deviation from plane parallelism of the bed faces shall not exceed the declared value.

5.3 Configuration and appearance

5.3.1 Configuration

When relevant to the uses for which aggregate concrete masonry units are put on the market, the configuration shall be declared. The declaration may be made by reference to one or another of the groups defined in EN 1996-1-1 and/or it may include one or more items such as those in the following list, as relevant:

- shape and features, including the direction of any formed voids (by means of a drawing or illustration, when relevant);