BS EN 771-2:2011+A1:2015

BSI Standards Publication

Specification for masonry units

Part 2: Calcium silicate masonry units

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of EN 771-2:2011+A1:2015. It supersedes BS EN 771-2:2011, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. 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 771-2 is a "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 Regulation (Regulation (EU) No 305/2011).

EN 771-2 was the subject of transitional arrangements agreed under the Commission mandate. In the UK, the corresponding national standards were:

— BS 187:1978, *Specification for calcium silicate (sandlime and flintlime) bricks*;

— BS 6649:1985, *Specification for clay and calcium silicate modular bricks*;

which were withdrawn in 2007.

The UK participation in its preparation was entrusted by Technical Committee B/519, Masonry and associated testing, to Subcommittee B/519/1, Masonry units.

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

EN 771-2 specifies the characteristics and performance requirements for calcium silicate masonry units available throughout the CEN member countries. It aims to do so in product performance terms, avoiding as far as possible prescriptive requirements but permitting all the traditional designations of calcium silicate units available throughout Europe. 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, calcium silicate masonry units are designated either Category I or Category II.

One particular variety of calcium silicate brick available in the UK is the Class 3: Special Purpose (or SP3), whose characteristics are described later in the National Annex.

The UK National Annex NA attached to this standard provides an informative commentary on the differences between EN 771-2 and BS 187. Nothing in this annex should be construed as specifying requirements other than those contained in the normative parts of this European Standard.

Masonry units conforming to this standard need to be CE marked in accordance with the procedures in Annex ZA. 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 Regulation. 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.

It cannot be assumed that the declared value of a performance characteristic given for a masonry unit conforming to one part of EN 771 can be directly compared with the same performance characteristic for a masonry unit conforming to another part of EN 771.

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

Published by BSI Standards Limited 2016

ISBN 978 0 580 79490 2

ICS 91.100.25

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 November 2011.

Amendments/corrigenda issued since publication

Date	Text affected
31 March 2016	Implementation of CEN amendment A1:2015. National Foreword and National Annex NA also updated

This page deliberately left blank

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 771-2:2011+A1

August 2015

ICS 91.100.25

Supersedes EN 771-2:2011

English Version

Specification for masonry units - Part 2: Calcium silicate masonry units

Spécifications pour éléments de maçonnerie - Partie 2: Eléments de maçonnerie en silico-calcaire

Festlegungen für Mauersteine - Teil 2: Kalksandsteine

This European Standard was approved by CEN on 10 March 2011 and includes Amendment 1 approved by CEN on 11 January 2015.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, 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: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 771-2:2011+A1:2015 E

Contents

Page

European foreword

This document (EN 771-2:2011+A1:2015) 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 February 2016, and conflicting national standards shall be withdrawn at the latest by May 2017.

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

This document supersedes [A1] EN 771-2:2011 [A1].

This document includes Amendment 1 approved by CEN on 2015-01-11.

The start and finish of text introduced or altered by amendment is indicated in the text by tags [A1] [A1].

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports [A1] the basic requirements for construction works of the EU Construction Products Regulation (Regulation (EU) No 305/2011) [A1].

[A1] For relationship with EU Regulation/Directive(s), see informative Annex ZA, which is an integral part of this document. [A1]

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

EN 771, *Specification for masonry units* consists of:

— *Part 1: Clay masonry units*

— *Part 2: Calcium silicate masonry units*

— *Part 3: Aggregate 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, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies the characteristics and performance requirements of calcium silicate masonry units for which the main intended uses are inner walls, outer walls, cellars, foundations and external chimney masonry.

This European Standard is intended to apply to all calcium silicate masonry units, including those of an overall nonrectangular parallelepiped shape, specially shaped and accessory units.

It defines the performance related to e.g. strength, density and dimensional accuracy, measured according to the corresponding test methods contained in separate European Standards.

It provides for the ▌A1⟩ assessment and verification of constancy of performance (AVCP) ⟨A1▐ of the product to this European Standard. The marking requirement for products covered by this document is also included.

This European Standard does not specify standard sizes for calcium silicate masonry units, nor standard work dimensions and angles of specially shaped and accessory units.

It does not cover units with more than 60 % volume of voids, nor products made from shale as a major raw material.

It does not cover storey height panels.

It does not cover units intended for use as a damp proof course, nor units with an incorporated thermal insulation material bonded to the faces of the unit susceptible to be exposed to fire, nor chimney flue units.

2 Normative references

The following referenced documents are indispensable for the application 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.

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 aggregate concrete masonry units (by paper indentation)*

EN 772-9, *Methods of test for masonry units — Part 9: Determination of volume and percentage of voids and net volume of clay and calcium silicate masonry units by sand filling*

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 772-16:2011, *Methods of test for masonry units — Part 16: Determination of dimensions*

EN 772-18:2011, *Methods of test for masonry units — Part 18: Determination of freeze-thaw resistance of calcium silicate masonry units*

EN 772-20, *Methods of test for masonry units — Part 20: Determination of flatness of faces of aggregate concrete, manufactured stone and natural stone masonry units*

EN 772-21, *Methods of test for masonry units — Part 21: Determination of water absorption of clay and calcium silicate masonry units by cold water absorption*

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

EN 1745, *Masonry and masonry products — Methods for determining thermal properties*

EN 13501-1, *Fire classification of construction products and building elements — Part 1: Classification using 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)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
masonry unit
preformed component intended for use in masonry construction

3.2
calcium silicate masonry unit
masonry unit made predominantly from lime and siliceous materials, hardened by high pressure steam

3.3
shale
fine grained sedimentary rock, finely laminated and consisting of mainly quartz and clay minerals

3.4
co-ordinating size
size of the co-ordinating space allocated to a masonry unit including allowances for joints and tolerances

3.5
work size
size of a masonry unit specified for its manufacture, to which the actual size conforms within permissible deviations

3.6
actual size
size of a masonry unit as measured

3.7
regular shaped masonry unit
masonry unit with an overall rectangular parallelepiped shape

3.8
specially shaped masonry unit
masonry unit which is not a rectangular parallelepiped

3.9
accessory unit
masonry unit which is shaped to provide a particular function, e.g. to complete the geometry of the masonry

NOTE It may be obtained by cutting a large unit.

3.10
interlocking feature
shaped matched projections and indentations on masonry units

EXAMPLE Tongue and groove systems.

3.11
hole
formed void which may or may not pass completely through a masonry unit

3.12
perforation
formed void which passes completely through a masonry unit

3.13
cell
formed void which does not pass through a masonry unit

3.14
frog
depression formed in one or both 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 × width × height

3.15
recess
depression or indentation in one or more surfaces of a masonry unit

EXAMPLE Mortar pocket, rendering keyway.

3.16
shell
peripheral material between the hole(s) and the outer surfaces of a masonry unit

3.17
web
solid material between the holes in a masonry unit

3.18
normalized compressive strength of masonry units
compressive strength of masonry units converted to the air dry compressive strength of an equivalent 100 mm wide and 100 mm high masonry unit

NOTE See procedure given in EN 772-1.

3.19
mean compressive strength of masonry units
arithmetic mean of the compressive strengths of masonry units

3.20
characteristic compressive strength of masonry units
compressive strength corresponding to the 5 % fractile of the compressive strength of masonry units

3.21
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

3.22
Category I masonry units
units with a declared compressive strength with a probability of failure to reach it not exceeding 5 %

NOTE This may be determined via the mean or characteristic value.

3.23
Category II masonry units
units not intended to comply with the level of confidence of Category I units

3.24
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

3.25
grip hole
hole in a masonry unit to enable it to be more readily grasped and lifted by hand or machine

3.26
product group
products from one manufacturer having common values for one or more characteristics

3.27
consignment
shipment from the supplier

〈A1〉

3.28
protected masonry
masonry (walls, columns or partitions) which is protected against water penetration and is not in contact with soil and ground water

Note 1 to entry: It can either be masonry in external walls which is protected, (e.g. by a layer of suitable render or by cladding), or it can be the inner leaf of a cavity wall or it can be an internal wall. It may or may not be loadbearing.

3.29
unprotected masonry
masonry (walls, columns or partitions) which may be exposed to rain, freeze/thaw and/or may be in contact with soil and ground water without a suitable protection

Note 1 to entry: It can either be masonry in external walls which is fully unprotected, or which is intended to be provided by a limited protection (e.g. by a thin layer of render). It may or may not be loadbearing. 〈A1〉

4 Materials and manufacture

Calcium silicate masonry units are produced predominantly from a mixture of lime and natural siliceous materials (sand, crushed or uncrushed siliceous gravel or rock or a mixture thereof), hardened by high pressure steam.

Calcium silicate masonry units produced with a majority of other siliceous materials are permitted if these materials have no deleterious effect on the properties of the product. The presence of such a material shall be declared.

5 Requirements for calcium silicate 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.

It should be noted that the test methods are not always applicable to specially shaped and accessory units as defined in 3.8. and 3.9.

The conformity criteria given in the following subclauses relate to ▌A1⟩ product type determination ⟨A1▌ (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 and a confidence level of 95 %.

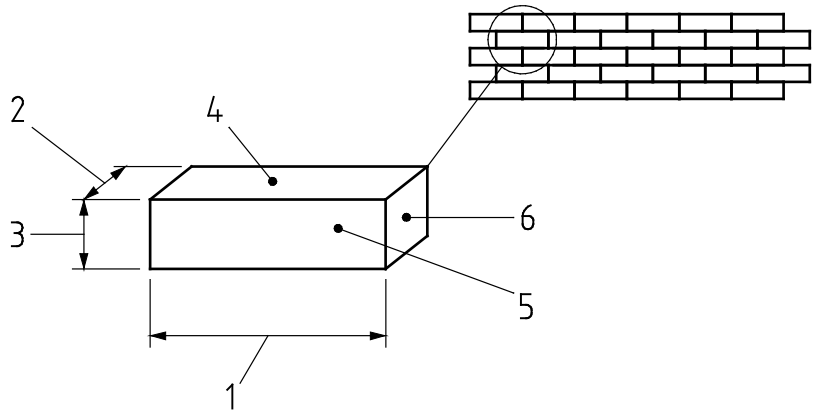
For production evaluation, the manufacturer shall define the conformity criteria in the factory production control documentation (see 8.3).

5.2 Dimensions and tolerances

5.2.1 Dimensions

The dimensions of a calcium silicate masonry unit shall be declared in mm for length, width and height, in that order. They shall be given in terms of work size.

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



Key

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

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

Figure 1 — Dimensions and surfaces

When a specified number of calcium silicate masonry units is sampled from a consignment in accordance with Annex A and tested in accordance with EN 772-16, the tolerances shall be indicated as in 5.2.2.1. The determination of length, width and height shall be by one measurement taken approximately in the centre of each specimen (EN 772-16:2011, 7.1, procedure d)). When there is a need to exclude irregular surfaces (tongues and grooves, grip holes, etc.) in providing the dimension, EN 772-16:2011 procedure e) shall be used.

Dimensions and tolerances of accessory units need only be declared by the manufacturer, if the accessory units are placed on the market as individual products and do not form part of a customised consignment. When a specified number of accessory units is sampled from a consignment in accordance with Annex A, dimensions and tolerances shall be as given in Annex C.

5.2.2 Dimensional tolerances

5.2.2.1 Tolerances

The dimensional tolerance category shall be declared in accordance with Table 1. The actual deviations for the mean length, width and height and the actual deviations for individual length, width and height shall not be greater than the permissible deviations as specified in Table 1 for the declared dimensional tolerance category.

Actual deviations for the mean are differences between declared work sizes and the mean measured values. Actual deviations for individual values are differences between the mean measured values and the measured individual values.

These dimensional tolerances shall not apply to the direction perpendicular to a treated face of a sliced, fractured or structured unit.

Table 1 — Dimensional tolerance categories and tolerances for calcium silicate masonry units (in millimetres)

Dimensions	Dimensional tolerance categories for calcium silicate masonry units			
	T1	T2	T3	Tm
Mean height of sample	work size height ± 2	work size height ± 1	—	[A1] a deviation in mm declared by the manufacturer (may be closer or wider than the other categories) [A1]
Mean length of sample	work size length ± 2	work size length ± 2	work size length ± 2	
Mean width of sample	work size width ± 2	work size width ± 2	work size width ± 2	
Individual height	mean height of sample ± 2	mean height of sample ± 1,0	work size height ± 1,0	
Individual length	mean length of sample ± 2	mean length of sample ± 2	work size length ± 3	
Individual width	mean width of sample ± 2	mean width of sample ± 2	work size width ± 3	
Flatness of bed faces	—	—	1,0	
Plane parallelism of bed faces	—	—	1,0	

5.2.2.2 Flatness of bed faces

When calcium silicate masonry units are sampled from a consignment in accordance with Annex A 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 calcium silicate masonry units are sampled from a consignment in accordance with Annex A and tested in accordance with EN 772-16:2011 by procedure d), the deviation from plane parallelism shall not exceed the declared value.

5.3 Configuration

When relevant to the uses, for which calcium silicate 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 or EN 1996-1-2 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 perforations (by means of a drawing or illustration, when relevant);

— volume of all formed voids as a percentage of the length × width × height of the unit;

— volume of the largest of any formed voids as a percentage of the length × width × height of the unit;

— volume of grip holes as a percentage of the length × width × height of the unit;

— thickness of webs;

— thickness of shells;

— combined thickness of webs and shells from face to face;

— combined thickness of webs and shells from header to header;

— area of voids on a bed face as a percentage of the length × width of the unit.

The total volume of frogs shall not exceed 20 % of the overall volume of the unit, i.e. length × width × height.

Each declared value shall be stated as either an upper limit or a lower limit or as a range of values. When calcium silicate masonry units are sampled from a consignment in accordance with Annex A and tested in accordance with EN 772-16, EN 772-9 and EN 772-2, the mean value derived from measurements of the test sample shall be within the range or limit declared.

5.4 Dry density

5.4.1 Gross dry density

The manufacturer shall declare a minimum and a maximum value for the gross dry density. The manufacturer may declare the gross dry density class according to D.2.

When a specified number of calcium silicate masonry units is sampled from a consignment in accordance with Annex A and tested and in accordance with EN 772-13, the mean gross density shall comply with this declared values or declared density class.

Individual values of the sample shall not be out of the declared range of the declared values or the corresponding range of the declared density class by more than 100 kg/m^3 for units with a declared gross dry density greater than 900 kg/m^3 or by more than 50 kg/m^3 for units with a declared gross dry density less than or equal to 900 kg/m^3.

5.4.2 Net dry density

If necessary for the intended use the manufacturer shall declare a minimum and a maximum value for the net dry density. When a specified number of calcium silicate masonry units is sampled from a consignment in accordance with Annex A and tested in accordance with EN 772-13, the mean net dry density shall comply with this declared values.

In addition, the manufacturer may declare the minimum and maximum individual values of net dry density.

5.5 Compressive strength

The mean compressive strength and the normalised compressive strength shall be declared by the manufacturer, e.g. by reference to a class according to D.1.

In addition the manufacturer shall declare whether the calcium silicate masonry unit is Category I or Category II.

NOTE More information is given in ZA.2 〚A1〛 *deleted text* 〚A1〛.

The declaration shall indicate the orientation(s) of the calcium silicate masonry units and the type of specimen (whole unit or cut prism) as tested, the method(s) of bedding the calcium silicate masonry units and whether voids present are intended to be fully filled with mortar. The declared value shall be not less than 5 N/mm^2.

When a specified number of calcium silicate masonry units is sampled from a consignment in accordance with Annex A and tested in accordance with EN 772-1, the mean normalised compressive strength shall not be less than the declared value.

When a strength class is declared, the mean normalised compressive strength shall be not less than the value for the strength class declared.

Individual values of compressive strength as determined in accordance with EN 772-1 shall be not less than 80 % of the declared value.

For calcium silicate masonry units with lengths ≥ 500 mm and/or heights ≥ 300 mm representative portions may be cut for determination of compressive strength as specified in Annex B. In all other cases, whole calcium silicate masonry units shall be tested.

The mean value of the compressive strength of three pieces cut according to Annex B from any calcium silicate masonry unit in a sample shall be not less than 90 % of the declared value.

5.6 Thermal properties

When relevant to the uses for which the units are placed on the market and in all cases for masonry units intended to be used in elements subject to thermal insulation requirements, the manufacturer shall provide the mean $\lambda_{10,dry,unit}$-value and the determination model as prescribed in EN 1745 or alternatively give the gross dry density or net dry density and configuration.

Additionally another fractile may be provided. In such cases both the additional fractile and the corresponding $\lambda_{10,dry,unit}$-value shall be given.

When the calcium silicate masonry units are sampled in accordance with Annex A and tested in accordance with EN 1745 following the model provided, then the obtained λ-value of the specified number of calcium silicate masonry units shall be not greater than the provided λ-value.

When relevant to the use for which the units are placed on the market, the value of specific heat capacity given in EN 1745 may be provided.

5.7 Durability

〚A1〛 For calcium silicate masonry units intended to be used where there is a risk of freezing and thawing while in a wet condition, the manufacturer shall declare the freeze/thaw resistance category according to Table 2. 〚A1〛

Table 2 — Freeze/thaw categories for calcium silicate masonry units

Criteria	F1	F2
Freeze/thaw cycles N	≥ 25	≥ 50
Significant visual damages according to one of the categories in EN 772-18:2011, Clause 7	none	none
Reduction of compressive strength R_c according to EN 772-18	≤ 20 %	≤ 20 %

When a specified number of calcium silicate masonry units is sampled from a consignment in accordance with Annex A and tested in accordance with EN 772-18, the freeze/thaw resistance shall be confirmed.

For calcium silicate masonry units with lengths ≥ 500 mm and/or heights ≥ 300 mm representative portions shall be cut for determination of freeze/thaw resistance as specified in Annex B. In all other cases whole calcium silicate masonry units shall be tested.

5.8 Water vapour permeability

When relevant to the uses for which the calcium silicate masonry unit is placed on the market, the manufacturer shall provide information on the water vapour permeability through the water vapour diffusion coefficient tabulated values given in EN 1745 or determined in accordance with EN ISO 12572.

5.9 Reaction to fire

For units intended to be used in elements subject to fire requirements, the manufacturer shall declare the reaction to fire classification of the masonry unit.

For masonry units containing ≤ 1,0 % by mass or volume (whichever is the most onerous) of homogeneously distributed organic materials the declaration may be fire Class A1 without the need to test.

Masonry units containing > 1,0 % by mass or volume (whichever is the most onerous) of homogeneously distributed organic materials shall be classified in accordance with EN 13501-1 and the appropriate reaction to fire class declared.

NOTE Attention is drawn to the Commission Decision 96/603/EC, as amended by Commission Decision 2000/605/EC, in which non-combustible masonry units containing not more than 1,0 % (by mass or volume whichever is more onerous) of homogeneously distributed organic materials are classified as reaction to fire Class A1 without testing.

5.10 Water absorption

When relevant to the uses for which the calcium silicate masonry units are placed on the market, the manufacturer shall declare the water absorption of the masonry units. When sampled in accordance with Annex A and tested in accordance with EN 772-21, the mean value of the water absorption shall not be greater than the declared water absorption.

5.11 Moisture movement

When required, moisture movement shall be declared by reference to national provisions in place of the use of the product.

5.12 Bond strength

5.12.1 General

For calcium silicate masonry units intended to be used in elements subjected to structural requirements the bond strength of the unit in combination with mortar shall be declared in terms of the characteristic initial shear strength in accordance with EN 1052-3. The declaration may be made either on the basis of fixed values as in 5.12.2 or tests as in 5.12.3. The manufacturer shall declare whether the value of bond strength has been obtained from the fixed values or from test.

NOTE In most cases it is expected that the use of fixed values will be sufficient.

5.12.2 Declaration based on fixed values

When no declaration is made under 5.12.3, the characteristic initial shear strength of the unit in combination with mortar may be declared by reference to EN 998-2:2010, Annex C.

5.12.3 Declaration based on tests

The characteristic initial shear strength of the unit in combination with one or more specific mortars in accordance with EN 998-2 may be declared based on tests on masonry units sampled from a consignment in accordance with Annex A and tested in accordance with EN 1052-3. The characteristic initial shear strength shall not be less than the declared value.

NOTE Bond strength depends on the mortar, the masonry unit and the workmanship.

〚A1〛

5.13 Dangerous substances

National regulations on dangerous substances may require verification and declaration on release, and sometimes content, when construction products covered by this standard are placed on those markets.

In the absence of European harmonized test methods, verification and declaration on release/content should be done taking into account national provisions in the place of use.

NOTE An informative database covering European and national provisions on dangerous substances is available at the Construction web site on EUROPA accessed through: http://ec.europa.eu/enterprise/construction/cpd-ds/. 〚A1〛

6 〚A1〛 Description, designation, designation code and classification of calcium silicate masonry units 〚A1〛

6.1 Description and designation

The description and designation of a calcium silicate masonry unit shall comprise at least the following:

a) number and date of issue of this European Standard;

b) work size dimensions (see 5.2.1); for non-rectangular units the slanting angle may be declared;

c) dimensional tolerance category (see 5.2.2);

d) compressive strength (see 5.5);

e) gross dry density (see 5.4.1);

f) configuration (see 5.3).

When relevant to the uses for which the unit is put on the market the description and designation shall include:

g) net dry density (see 5.4.2);

h) volume of voids intended to be fully filled with mortar, in mm^3 (if applicable);

i) thermal properties (see 5.6);

j) durability (see 5.7);

k) water absorption (see 5.10).

〈A1〉

6.2 Designation codes

A designation code may be used as part of the designation as shown in Table 3.

Table 3 — Definition of the designation code

Clause in the standard	Characteristic	Position in the designation code	Unit	Code
	unit type	1	–	CS
	intended use	2	–	P or U P: intended to be used for protected masonry U: intended to be used for unprotected masonry
3.22 Category I masonry units 3.22 Category II masonry units	category	3	–	I or II
5.5 Compressive strength	mean compressive strength[a]	4	N/mm^2	**,*/**,* or **,*p**,*
	type of specimen (/ = whole unit or p = cut prism)		–	
	normalized compressive strength[a]		N/mm^2	
5.4.1 Gross dry density	min. and max. gross dry density (given as range)	5	kg/m^3	xxxx − yyyy
5.2.1 Dimensions	l × w × t	6	mm	lll × www × ttt
5.2.2 Dimensional tolerances	dimensional tolerance category	no fixed position	–	T1, T2 or T3[b]

Clause in the standard	Characteristic	Position in the designation code	Unit	Code
5.3 Configuration	illustration or group[c]	no fixed position	–	G1, G1S or G2
5.7 Durability	freeze/thaw category	no fixed position	–	F1 or F2
5.9 Reaction to fire	class	no fixed position	–	A1
5.12 Bond strength	initial shear strength for general purpose (GPM) and/or thin layer mortar (TLM)	no fixed position	N/mm^2 or "-"	B**,*/- (GPM only), B-/**,* (TLM only) or B**,*/**,* (both)
5.10 Water absorption	W_s	no fixed position	%	W**
5.8 Water vapour permeability	water vapour diffusion coefficient	no fixed position	–	V*/**
5.6 Thermal properties	thermal conductivity $\lambda_{10,dry,unit}$	no fixed position	W/mK	Lx,xx

a by default the direction of load is perpendicular to bed faces, for other directions the designation code is not applicable

b designation code is not applicable in case of category Tm

c by reference to EN 1996-1-1 resp. EN 1996-1-2

The characteristics shall be given in the given order (fixed positions) except for those characteristics with no fixed position. "NPD" is expressed by omitting the respective characteristic.

NOTE 1 NPD means 'No Performance Determined. For the use of NPD option see annex ZA.

NOTE 2 A designation code for a calcium silicate masonry unit (CS) where the following characteristics are declared:

Intended use:	P
Category	I
Mean compressive strength	25,0 N/mm^2
Type of specimen	cut prism
Normalized compressive strength	20,0 N/mm^2
Gross dry density range	2010 kg/m^3 – 2200 kg/m^3
Dimensions (length × width × height)	998 mm × 175 mm × 623 mm
Dimensional tolerance category	T3
Unit Group	G1
Reaction to fire	A1
Bond strength (initial shear strength)	GPM: 0,15 N/mm^2
	TLM: 0,35 N/mm^2

will be the following one

CS P I 25,0p20,0 2010-2200 998x175x623 T3 G1 A1 B0,15/0,35

〈A1

6.3 Classification

Specification of the properties of calcium silicate masonry units may be given by reference to classification systems included in this standard.

This does not remove the requirement that all manufacturers claiming compliance with this standard shall state declared values of the properties of their products, when required.

7 Marking

The following particulars shall be clearly marked on one of the following: the units, the packaging, the delivery note or any certificate supplied with the calcium silicate masonry units:

a) name, trademark or other means of identification of the manufacturer;

b) means of identifying the calcium silicate masonry units and relating them to their description and designation.

NOTE For CE-marking and labelling, see Annex ZA. Where ZA.3 requires the CE marking to be accompanied by the same information as required by Clause 7 a) and b), the requirement of these clauses can be considered to have been met.

8 [A1] Assessment and verification of constancy of performance (AVCP) [A1]

8.1 General

The manufacturer shall demonstrate compliance for his product with the requirements of this European Standard and with the declared [A1] performance [A1] for the product properties by carrying out both:

— [A1] product type determination [A1] (see 8.2), which can be physical testing, calculation, reference to tabulated values or combinations of these methods;

— factory production control (see 8.3).

[A1] Alternative methods of test to the reference methods specified in this European Standard may be adopted except for the product type determination tests and in case of dispute, provided that these alternative methods satisfy the following: [A1]

a) a correlation can be shown to exist between the results from the reference method and those from the alternative method; or

b) a safe relationship can be demonstrated when using the alternative method compared to the reference methods; and

c) the information on which the relationship is based is available.

[A1]

8.2 Product type determination

After completion of the development of a new product type and before placing on the market, appropriate product type determination shall be carried out to confirm that the properties predicted from the development meet the requirements of this standard and the performance of the characteristics to be declared for the product.

Whenever a major change in the source, blend, or nature of raw materials occurs, or when there is a change in processing conditions, leading to what the manufacturer considers will constitute a new product type being produced, the appropriate product type determination shall be repeated.

The manufacturer may define product groups. The product group may differ according to the characteristics in question.

In the product type determination process a manufacturer may take in consideration already existing results.

A manufacturer may use the product type determination results determined by someone else (e.g. another manufacturer or a Research, Technology & Development service provider) to justify his own declaration of performance regarding a product that is manufactured according to the same design and with raw materials, constituents and manufacturing methods of the same kind, provided that permission is given by the owner of the results, and the results are valid for both products.

The tests to be conducted shall be the tests or calculations as described in Table A.1 for the properties selected from the following list relevant to the manufacturer's declaration for the product type's intended use:

— dimensions and dimensional tolerances;

— configuration;

— gross dry density;

— net dry density;

— compressive strength;

— thermal properties;

— durability;

— water vapour permeability;

— water absorption;

— bond strength

Sampling for product type determination shall be in accordance with Annex A.

The results of type tests shall be recorded.

NOTE For the performance characteristics to be determined in order to address the Declaration of Performance and CE marking provisions, see Table ZA.1.1 and Table ZA.1.2. 〈A1〉

8.3 Factory production control

8.3.1 General

The manufacturer shall establish, document and maintain a factory production control system to enable continuing conformity with this European Standard and the declared 〈A1〉 performance of the characteristics 〈A1〉 of the products placed on the market.

The factory production control system may consist of procedures related to the process only (full process control and consequently no finished product testing, i.e. 8.3.6 does not apply), to finished products only (consequently no process control, i.e. 8.3.5 does not apply) or any combination of both. Consequently conformity criteria depend on the individual factory production procedures.

As appropriate, the responsibility, authority and interrelation of all personnel who manage, perform and verify work affecting the quality of masonry unit products shall be established.

The factory production control system shall describe the control procedure of production, the regular checks by the manufacturer and his testing, depending on the combination of the procedures related to process control and/or finished product testing. Controls and tests may include the characteristics of raw materials and finished products, the procedure of production, the production equipment or the production machines, the test equipment or the testing instruments and the marking of the product.

The test results shall be recorded.

Actions to be taken when the control test values or criteria do not meet those specified should be documented by the manufacturer.

For Category I masonry units the factory production control system shall be designed so that the probability of failure to reach the declared compressive strength is not exceeding 5 % corresponding to 95 % confidence level.

8.3.2 Testing and measuring equipment

All relevant weighing, measuring and testing equipment, that has an influence on the declared values, shall be verified and regularly inspected.

8.3.3 Production Equipment

When the factory production control system includes process control procedures all production equipment, that forms part of these procedures and has an influence on the declared values, shall be regularly inspected.

8.3.4 Raw materials

As appropriate, the manufacturer shall define the acceptance criteria of raw materials and the procedures operated to ensure that these are met.

8.3.5 Production process

As appropriate, the relevant features of the production processes shall be defined giving the frequency of the manufacturer’s checks together with the required criteria. Actions to be taken when the criteria are not achieved shall be specified by the manufacturer.

8.3.6 Finished product testing

As appropriate, the factory production control system shall incorporate a sampling plan and the frequency of testing of the finished product. The results of sampling and testing shall be recorded.

The sample shall be representative of the production.

Guidance on testing frequencies for the characteristics of the finished products is given in Table E.1. The guidance should only be used if no better information is available.

Depending on the corrective measure nonconformities may result in higher frequencies of testing than the ones used.

8.3.7 Statistical techniques

When reasonably practicable and applicable, the results of checks and testing shall be interpreted by means of statistical techniques, by attributes or by variables, to verify the product characteristics and to determine if the production conforms to the compliance criteria and the product conforms to the declared values.

NOTE One method of satisfying this conformity criterion is to use the approach given in ISO 12491.

8.3.8 Marking and stock control of products

The marking and stock control shall be documented. Individual products or/and a defined quantity of products (e.g. a consignment of products) should be identifiable and traceable.

8.3.9 Traceability

As appropriate, systems of traceability shall be given in the factory production control system.

8.3.10 Nonconforming products

[A1] The procedure for dealing with nonconforming products shall be documented. Products that do not conform with the requirements or the performances of the product type shall be segregated and marked accordingly. However, these products may be reassessed by the manufacturer and assigned to a different product type. [A1]

The manufacturer shall take action to avoid a reoccurrence of the nonconformity.

Annex A
(normative)

[A1] Sampling for product type determination tests and for independent testing of consignments [A1]

A.1 General

[A1] This sampling procedure shall apply for product type determination tests and in the event that there is a requirement for an assessment of product compliance.

Only those characteristics declared by the manufacturer shall be assessed by this procedure.

The number of calcium silicate masonry units required to determine compliance with the specification shall be sampled from a consignment no greater than 20 m^3 (see Table A.1). [A1]

A.2 Sampling procedure

A.2.1 General

NOTE The choice of the method of sampling will normally be dictated by the physical form of the consignment in question.

A.2.2 Random sampling

Whenever possible, the random sampling method shall be used, in which every masonry unit in the consignment has an equal chance of being selected for the sample. The appropriate number of masonry units shall be selected at random from positions throughout the consignment without any consideration being given to the quality of those selected except that units damaged in transit shall not be selected.

NOTE In practice, random sampling is normally only convenient either when the calcium silicate masonry units forming the consignment are being moved in a loose (unpacked) form from one place to another or when they have been split into a large number of small stacks, e.g. on scaffolding awaiting laying.

A.2.3 Representative sampling

A.2.3.1 General

When random sampling is impracticable or not convenient, e.g. when the calcium silicate masonry units form a large stack or stacks with ready access to only a limited number, a representative sampling procedure shall be used.

A.2.3.2 Sampling from a stack

The consignment shall be divided into at least six real or imaginary sections, each of a similar size. An equal number of masonry units shall be selected at random from within each section in order to give the required number without any consideration being given to the quality of those selected except that units damaged in transit shall not be selected.

NOTE It will be necessary to remove some sections of the stack or stacks in order to gain access to masonry units within the body of such stacks when taking samples.

A.2.3.3 Sampling from a consignment formed of banded packs

At least six packs shall be selected at random from the consignment. The packaging shall be removed and an equal number of calcium silicate masonry units shall be sampled at random from within each of the opened packs in order to give the required number without any consideration being given to the quality of those selected except that units damaged in transit shall not be selected.

A.2.4 Dividing the sample

When the sample is to provide calcium silicate masonry units for more than one test, the total number shall be collected together and then divided by taking masonry units at random from within the total sample to form each successive sub-sample.

A1

A.2.5 Number of masonry units required for testing

The sample size for each test shall be in accordance with Table A.1.

Table A.1 — Number of units required for tests

Property	Clause No.	Test method	Remarks		
			Number of units required for sample. If Annex B is applicable, the number of units in brackets is to be used.		
Dimensions	5.2	EN 772-16	6		For accessory units no minimum requirement
Configuration	5.3	EN 772-2, EN 772-9, EN 772-16			–
Flatness of bed faces	5.2.2.2	EN 772-20	3		–
Plane parallelism of bed faces	5.2.2.3	EN 772-16	3		–
Dry density	5.4	EN 772-9 EN 772-13	6 (3)		–
Compressive strength	5.5	EN 772-1	6 (3)	10 (5)	If the coefficient of variation is known to be greater than 15 %, the number of units shall be 10.
Thermal properties	5.6	EN 1745	3		–
Durability against freeze/thaw	5.7	EN 772-18	12 (6)		Only half of the sample will be tested. The other half of the sample is for eventual testing of loss of compressive strength (see EN 772-18)
Water absorption	5.10	EN 772-21	6 (3)		–
Moisture movement	5.11	National provision in place of use of unit	–		–

Property	Clause No.	Test method	Remarks		
Bond strength	5.12	EN 1052-3	Type I specimen	Type II specimen	–
		Procedure A	27	18	
		Procedure B	18	12	
Dangerous substances	5.13	National provision in place of use of unit	National provisions		–
NOTE Additional units should be taken to allow for any damage that may occur in transit to the testing laboratory. If appropriate, e.g. when the units are not affected by a test procedure, the same units may be used for different tests.					

〈A1

Annex B
(normative)

Cutting schemes

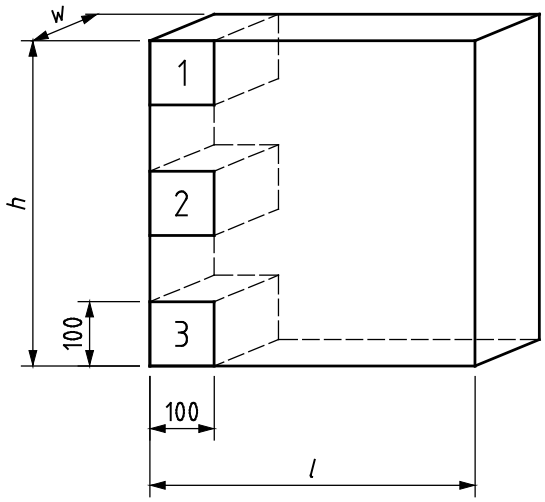
B.1 General

For calcium silicate masonry units with lengths ≥ 500 mm and/or heights ≥ 300 mm representative portions shall be cut for determination of compressive strength and/or freeze/thaw resistance.

B.2 Representative portions for compressive strength determination

In the case of calcium silicate masonry units with lengths ≥ 500 mm and/or heights ≥ 300 mm the compressive strength of a whole unit shall be determined on three specimens taken from the unit. The cutting scheme is given in Figure B.1. Cutting of specimens is done so that grooves and tongues will be removed. Specimens obtained by this cutting may be used for net dry density determinations if EN 772-13:2000, 7.1.2, is followed.

Dimensions in millimetres



Key

h height

l length

w width

Figure B.1 — Cutting scheme for compressive strength

The specimen shall have the dimensions 100 mm × 100 mm × width of unit.

The vertical direction should be marked on the specimen.

After cutting the specimen shall be conditioned according to the applicable test method.

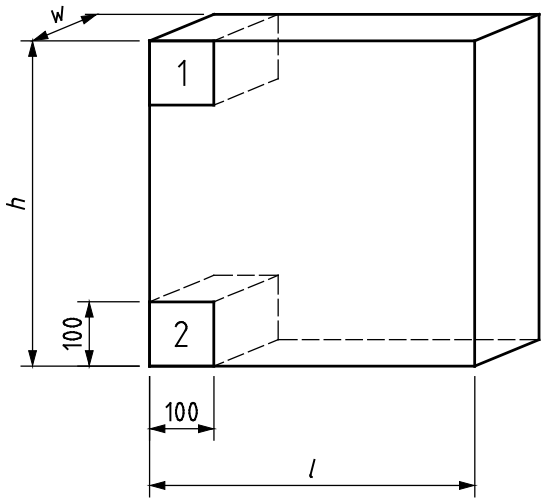
The compressive strength of the entire unit is obtained by taking the mean value of the compressive strength of the three specimens. The normalised compressive strength is obtained by making correction for the moisture condition during testing (see EN 772-1).

B.3 Representative portions for determination of freeze-thaw resistance

In the case of calcium silicate masonry units with lengths ≥ 500 mm and/or heights ≥ 300 mm the freeze/thaw resistance shall be determined on two specimens taken from the unit. Smaller units may be cut as well, according to the same principle. The test specimen should be completely solid.

The cutting scheme is given in Figure B.2.

Dimensions in millimetres



Key

h height

l length

w width

Figure B.2 — Cutting scheme for freeze-thaw resistance testing

The vertical direction should be marked on the specimen.

The dimensions of each specimen will be 100 mm × 100 mm × width of large units.

Annex C
(normative)

Tolerances on accessory units

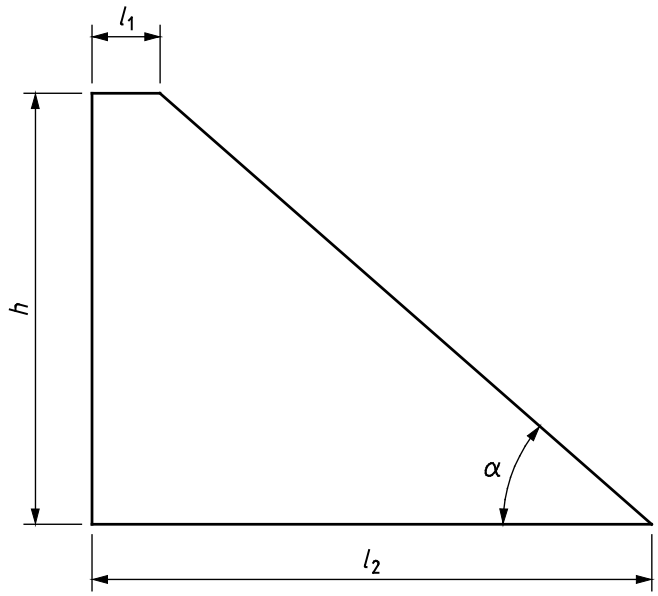
C.1 Dimensions of rectangular and non-rectangular accessory calcium silicate masonry units

Dimensions of accessory units which are placed on the market as individual products and do not form part of a customised consignment shall be tested in accordance with EN 772-16. For dimensions between parallel faces one measurement over the centre of the shortest face is taken. For dimensions between non-parallel faces a calliper is used.

Measurement errors shall be less than 0,2 mm for dimensions with a tolerance of 1 mm, and less than 0,5 mm for all other tolerances.

The dimensions of accessory units obtained by cutting large units, shall be stated in mm for length, width and height in that order. If the unit is not rectangular parallelepiped it may be required to state two length and/or two height values. For all units that are not rectangular parallelepiped the slanting angle (α) should be declared or calculated in degrees.

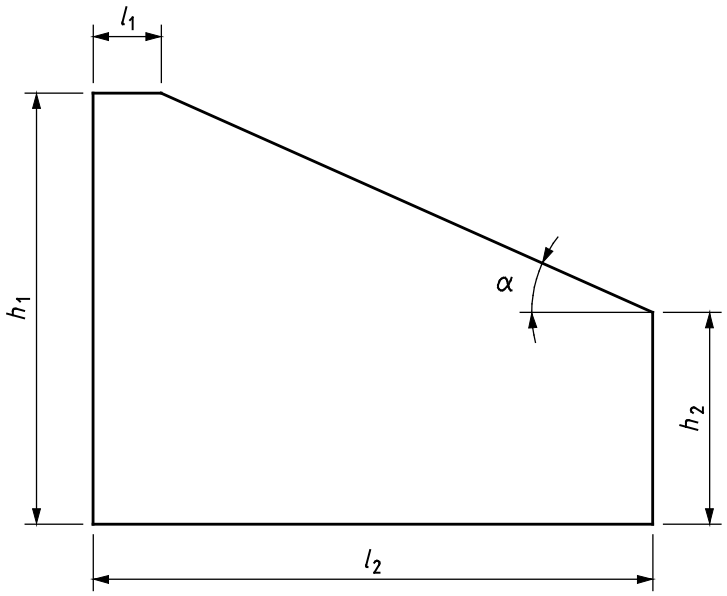
Depending on the shape the following dimensions should be stated:



Key

h height l_1 and l_2 lengths

Figure C.1

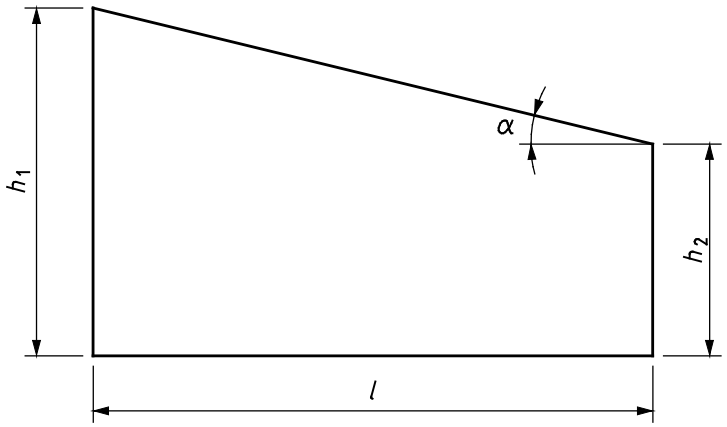


Key

h_1 and h_2 height

l_1 and l_2 lengths

Figure C.2

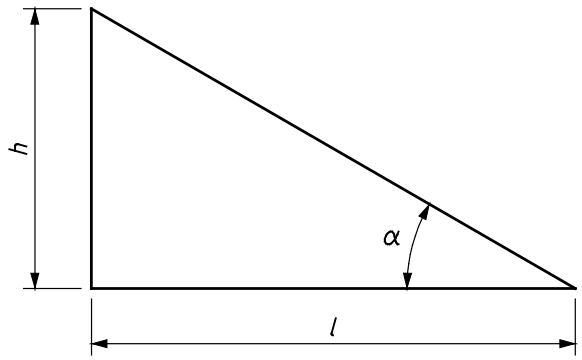


Key

h_1 and h_2 heights

l length

Figure C.3



Key

h height

l length

Figure C.4

C.2 Tolerances for accessory calcium silicate masonry units

The permissible deviations shall be as given in Table C.1. These tolerances apply to all individual dimensions of each individual accessory unit.

For dimensions unaltered by cutting the same tolerances apply as for the declared dimensional tolerance category in Table 1.

Table C.1 — Dimensional tolerances for accessory units

Dimensions	Figure	Height(s)	Width(s)	Length(s)
Rectangular accessory units		work size height −4 mm to work size height +2 mm	not applicable	work size length −4 mm to work size length +2 mm
Non-rectangular units	Figure C.1	−4 mm to +2 mm	not applicable	l_1 and l_2 $\frac{-4}{\sin\alpha}$ mm to $\frac{+2}{\sin\alpha}$ mm
	Figure C.2	h_1 −4 mm to +2 mm h_2 $\frac{-4}{\cos\alpha}$ mm to $\frac{+2}{\cos\alpha}$ mm	not applicable	l_1 $\frac{-6}{\sin\alpha}$ mm to $\frac{+3}{\sin\alpha}$ mm l_2 −4 mm to +2 mm
	Figure C.3	h_1 and h_2 $\frac{-4}{\cos\alpha}$ mm to $\frac{+2}{\cos\alpha}$ mm	not applicable	l −4 mm to +2 mm

Dimensions	Figure	Height(s)	Width(s)	Length(s)
	Figure C.4	h $\frac{-4}{\cos\alpha}$ mm to $\frac{+2}{\cos\alpha}$ mm	not applicable	l $\frac{-4}{\sin\alpha}$ mm to $\frac{+2}{\sin\alpha}$ mm

Annex D
(informative)

Classification systems

D.1 Classification based on compressive strength

Calcium silicate masonry units may be classified in accordance with the normalised compressive strength classes given in Table D.1.

Table D.1 — Classification of calcium silicate masonry units based on normalised compressive strength

Compressive strength class	Normalized compressive strength N/mm^2
5	5,0
7,5	7,5
10	10,0
15	15,0
20	20,0
25	25,0
30	30,0
35	35,0
40	40,0
45	45,0
50	50,0
60	60,0
75	75,0
NOTE When a strength class is declared, the mean normalised compressive strength shall not be less than the value for the strength class as defined in this table,	

D.2 Classification based on gross dry density

Calcium silicate masonry units may be classified in accordance with the gross dry density classes given in Table D.2.

Table D.2 — Classification of calcium silicate masonry units based on gross dry density

Gross dry density class	Density range kg/m^3
3,0	> 2 800
2,8	2 610 – 2 800
2,6	2 410 – 2 600
2,4	2 210 – 2 400
2,2	2 010 – 2 200
2,0	1 810 – 2 000
1,8	1 610 – 1 800
1,6	1 410 – 1 600
1,4	1 210 – 1 400
1,2	1 010 – 1 200
1,0	905 – 1 000
0,9	805 – 900
0,8	705 – 800
0,7	605 – 700
0,6	505 – 600
0,5	≤ 500

Annex E
(informative)

Guidance for test frequencies for designing a FPC system to demonstrate conformity of finished products with the requirements of the standard and the declaration of the manufacturer

Table E.1 — Checking of finished products

Subject	Purpose of checking	Reference method [a]	Frequency of checking by the manufacturer for product range
Dimensions	Conformity with the declared dimensions and the permissible dimensional deviations determined by EN 771-2	EN 772-16	— Weekly of 6 units and — At least each 1 000 m^3 (for units smaller than 500 mm × 300 mm) or 5 000 m^3 (larger units) or — As given in the FPC documentation
Flatness of bed faces[b]	Conformity with the declared value and the deviation determined by EN 771-2	EN 772-20	— Once a year or — As given in the FPC documentation
Plane parallelism of bed faces[b]	Conformity with the declared value and the deviation determined by EN 771-2	EN 772-16	— Once a year or — As given in the FPC documentation
Gross dry density	Conformity with the declared gross dry density (value or class)	EN 772-13	— Weekly of 6 units and — At least each 1 000 m^3 (for units smaller than 500 mm × 300 mm) or 5 000 m^3 (larger units) or — As given in the FPC documentation
Compressive strength	Conformity with the declared compressive strength and determined by EN 771-2	EN 772-1	— Weekly of 6 units and — At least each 1 000 m^3 (for units smaller than 500 mm × 300 mm) or 5 000 m^3 (larger units) or — As given in the FPC documentation
Freeze/thaw resistance[c]	Conformity with the declared freeze/thaw resistance according to EN 771-2	EN 772-18	— Once a year or — As given in the FPC documentation
Water absorption[c]	Conformity with declared value	EN 772-21	— Once a year or — As given in the FPC documentation
Thermal conductivity[c]	Conformity with declared value	EN 1745	— Once a year or — As given in the FPC documentation
Water vapour permeability[c]	Conformity with declared value	EN ISO 12572	— Once a year or — As given in the FPC documentation
Moisture movement[c]	Conformity with declared value	National test methods	— Once a year or — As given in the FPC documentation
Bond strength[c]	Conformity with declared value	EN 1052-3	— Once a year or — As given in the FPC documentation

Subject	Purpose of checking	Reference method [a]	Frequency of checking by the manufacturer for product range
Reaction to fire[c]	Conformity with declared value	EN 13501-1	— Every five years or — As given in the FPC documentation
The manufacturer does not necessarily have to declare a value against every property and some may be on the basis of, for example, tabulated values. Where the declared value is from a tabulated value no testing is required. In these cases certification can be based on evidence that the tables are being used correctly.			
[a] The tests should be carried out in accordance with the reference methods mentioned in the standard or by applying alternative test methods with a proven correlation or a safe relationship to the reference methods. [b] Applies only where units of tolerance category T3 are used. [c] Only when declared by the manufacturer based on testing.			

Annex ZA
(informative)

[A1] Clauses of this European Standard addressing the provisions of the EU Construction Products Regulation [A1]

ZA.1 Scope and relevant characteristics

This European Standard has been prepared under Mandate M/116 (as amended) "Masonry and related products" given to CEN by the European Commission and the European Free Trade Association.

If this European standard is cited in the Official Journal of the European Union (OJEU), the clauses of this standard, shown in this annex, are considered to meet the provisions of the relevant mandate, under the Regulation (EU) No. 305/2011.

This annex deals with the CE marking of the calcium silicate masonry units intended for the uses indicated in Table ZA.1.1 and Table ZA.1.2 and shows the relevant clauses applicable.

This annex has the same scope as in Clause 1 of this standard related to the aspects covered by the mandate and is defined by Table ZA.1.1 and Table ZA.1.2.

Table ZA.1.1 — Relevant clauses for calcium silicate masonry units in protected masonry walls, columns and partitions

Product:	Calcium silicate masonry units			
Intended use:	In protected masonry walls, columns and partitions			
Essential Characteristics	**Clauses in this European Standard related to essential characteristics**		**Regulatory levels and/or classes**	**Notes**
Dimensions and dimensional tolerances (for units intended to be used in elements subject to structural requirements)	5.2.1 5.2.2	Dimensions Dimensional tolerances	None	Declared values, in mm, and tolerance category
Configuration (for units intended to be used in elements subject to structural requirements)	5.3	Configuration	None	Declared configuration as illustrated or described
Compressive strength (for units intended to be used in elements subject to structural requirements)	5.5	Compressive strength	None	Declared value, in N/mm^2 or class [a] (with indication of direction of load and unit category)
Bond strength (for units intended to be used in elements subject to structural requirements)	5.12	Bond strength	None	Fixed value or declared value of initial shear strength, in N/mm^2
Reaction to fire (for units intended to be used in elements subject to fire requirements)	5.9	Reaction to fire	Euroclass A1 to F	Declared reaction to fire Class A1 to F
Water absorption (for units intended to be used in damp proof courses or in external elements with exposed face)	5.10	Water absorption	None	Declared value, in %

Product:	Calcium silicate masonry units			
Intended use:	In protected masonry walls, columns and partitions			
Essential Characteristics	**Clauses in this European Standard related to essential characteristics**		**Regulatory levels and/or classes**	**Notes**
Water vapour permeability (for units intended to be used in external elements)	5.8	Water vapour permeability	None	Declared value (Tabulated water vapour diffusion coefficient)
Direct airborne sound insulation (in end conditions)/ [Density and configuration] (for units to be used in elements subject to acoustic requirements)	5.4.1	Gross dry density	None	Declared value of gross dry density in kg/m^3 or density class [a]
	5.3	Configuration		Declared configuration as illustrated or described
	5.2	Dimensions and tolerances		
Thermal resistance/[Density and configuration] (for units intended to be used in elements subject to thermal insulation requirements)	5.4.1	Gross dry density	None	Declared value of thermal conductivity in W/mK and the means of evaluation
	5.3	Configuration		
	5.6	Thermal properties		
[a] To be considered technical classes and not regulatory classes.				

Table ZA.1.2 — Relevant clauses for calcium silicate masonry units in unprotected masonry walls, columns and partitions

Product:	Calcium silicate masonry units			
Intended use:	In unprotected masonry walls, columns and partitions			
Essential Characteristics	**Clauses in this European Standard related to essential characteristics**		**Regulatory levels and/or classes**	**Notes**
Dimensions and dimensional tolerances (for units intended to be used in elements subject to structural requirements)	5.2.1	Dimensions	None	Declared values, in mm, and tolerance category
	5.2.2	Dimensional tolerances		
Configuration (for units intended to be used in elements subject to structural requirements)	5.3	Configuration	None	Declared configuration as illustrated or described
Compressive strength (for units intended to be used in elements subject to structural requirements)	5.5	Compressive strength	None	Declared value, in N/mm^2 or class [a] (with indication of direction of load and unit category)
Bond strength (for units intended to be used in elements subject to structural requirements)	5.12	Bond strength	None	Fixed value or declared value of initial shear strength, in N/mm^2
Reaction to fire (for units intended to be used in elements subject to fire requirements)	5.9	Reaction to fire	Euroclass A1 to F	Declared reaction to fire Class A1 to F
Water absorption (for units intended to be used in damp proof courses or in external elements with exposed face)	5.10	Water absorption	None	Declared value, in %
Water vapour permeability (for units intended to be used in external elements)	5.8	Water vapour permeability	None	Declared value (Tabulated water vapour diffusion coefficient)

Product:	Calcium silicate masonry units			
Intended use:	In unprotected masonry walls, columns and partitions			
Essential Characteristics	**Clauses in this European Standard related to essential characteristics**		**Regulatory levels and/or classes**	**Notes**
Direct airborne sound insulation (in end conditions)/ [Density and configuration] (for units to be used in elements subject to acoustic requirements)	5.4.1	Gross dry density	None	Declared value of gross dry density in kg/m^3 or density class [a]
	5.3	Configuration		Declared configuration as illustrated or described
	5.2	Dimensions and tolerances		
Thermal resistance/[Density and configuration] (for units intended to be used in elements subject to thermal insulation requirements)	5.4.1	Gross dry density	None	Declared value of thermal conductivity in W/mK and the means of evaluation
	5.3	Configuration		
	5.6	Thermal properties		
Durability against freeze/thaw	5.7	Durability	None	Declared freeze/thaw category
Dangerous substances	5.13	Dangerous Substances	None	
[a] To be considered technical classes and not regulatory classes.				

The declaration of the product performance related to certain essential characteristics is not required in those Member States (MS) where there are no regulatory requirements on these essential characteristics for the intended use of the product.

In this case, manufacturers placing their products on the market of these MS are not obliged to determine nor declare the performance of their products with regard to these essential characteristics and the option “No performance determined” (NPD) in the information accompanying the CE marking and in the declaration of performance (see ZA.3) may be used for those essential characteristics.

ZA.2 Procedure for AVCP of calcium silicate masonry units

ZA.2.1 System(s) of AVCP

The AVCP system(s) of calcium silicate masonry units indicated in Table ZA.1.1 to Table ZA.1.2, established by EC Decision 97/740/EC of 14.10.1997 (OJ L 299 of 4.11.1997) as amended by the Commission Decision 2001/596/EC of 8 January 2001 published in the OJEU as L209 (page 33) of 2.8.2001 is shown in Table ZA.2 for the indicated intended use(s) and relevant level(s) or class(es) of performance.

Table ZA.2 — System(s) of AVCP

Product(s)	Intended use(s)	Regulatory levels and/or classes	AVCP system(s)
Masonry Units. Category I [a]	In walls, columns and partitions	—	2+
Masonry Units. Category II	In walls, columns and partitions	—	4
System 2+: See Regulation (EU) No. 305/2011 (CPR) Annex V, 1.3 including certification of the factory production control by a notified production control certification body on the basis of initial inspection of the manufacturing plant and of factory production control as well as of continuous surveillance, assessment and evaluation of factory production control. System 4: See Regulation (EU) No. 305/2011 (CPR) Annex V, 1.5 amended by the Regulation (EU) No 568/2014.			
[a] Units with a specified mean compressive strength with a probability of failure to reach it not exceeding 5 %.			

The AVCP of the calcium silicate masonry units in Table ZA.1.1 and Table ZA.1.2 shall be according to the AVCP procedures indicated in Table ZA.3.1 and Table ZA.3.2 resulting from application of the clauses of this or other European Standard indicated therein. The content of tasks of the notified body shall be limited to those essential characteristics as provided for, if any, in Annex III of the relevant mandate and to those that the manufacturer intends to declare.

Table ZA.3.1 — Assignment of AVCP tasks for Category I of calcium silicate masonry units masonry units under system 2+

Tasks		Content of the task	AVCP clauses to apply
Tasks for the manufacturer	Factory production control (FPC)	Parameters related to essential characteristics of the relevant Table ZA.1.1 or ZA.1.2 relevant for the declared intended use	8.3
	Determination of the product-type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product	Parameters related to essential characteristics of the relevant Table ZA.1.1 or ZA.1.2 relevant for the declared intended use	8.2
	Further testing of samples taken at factory according to the prescribed test plan	Essential characteristics of the relevant Table ZA.1.1 or ZA.1.2 relevant for the declared intended use	8.3
Tasks for the notified production control certification body	Initial inspection of the manufacturing plant and of FPC	Parameters related to essential characteristics of the relevant Table ZA.1.1 or ZA.1.2, relevant for the declared intended use. Documentation of the FPC.	8.3
	Continuous surveillance, assessment and evaluation of FPC	Parameters related to essential characteristics of the relevant Table ZA.1.1 or ZA.1.2, relevant for the declared intended use, namely Compressive strength Bond strength Documentation of the FPC.	8.3

Table ZA.3.2 — Assignment of AVCP tasks for Category II of calcium silicate masonry units masonry units under system 4

Tasks		Content of the task	AVCP clauses to apply
Tasks for the manufacturer	Factory production control (FPC)	Parameters related to essential characteristics of the relevant Table ZA.1.1 or ZA.1.2 relevant for the declared intended use	8.3
	Determination of the product-type on the basis of type testing, type calculation, tabulated values or descriptive documentation of the product	Essential characteristics of the relevant Table ZA.1.1 or ZA.1.2 relevant for the declared intended use	8.2

ZA.2.2 Declaration of performance (DoP)

ZA.2.2.1 General

The manufacturer draws up the DoP and affixes the CE marking on the basis of the different AVCP systems set out in Annex V of the Regulation (EU) No 305/2011 amended by the Regulation (EU) No 568/2014:

In case of products under system 2+

— the determination of the product-type on the basis of type testing (including sampling), type calculation, tabulated values or descriptive documentation of the product; the factory production control and the testing of samples taken at the factory according to the prescribed test plan, carried out by the manufacturer; and

— the certificate of conformity of the factory production control, issued by the notified production control certification body on the basis of:

  — initial inspection of the manufacturing plant and of factory production control and

  — continuous surveillance, assessment and evaluation of factory production control.

In case of products under system 4

— the factory production control carried out by the manufacturer;

— the determination by the manufacturer of the product-type on the basis of type testing, type calculation, tabulated values or descriptive documentation of the product.

ZA.2.2.2 Content

The model of the DoP is provided in Annex III of the Regulation (EU) No 305/2011 amended by the Regulation (EU) No 574/2014.

According to this Regulation, the DoP shall contain, in particular, the following information:

— the reference of the product-type for which the declaration of performance has been drawn up;

— the AVCP system or systems of the construction product, as set out in Annex V of the CPR amended by the Regulation (EU) No 568/2014;

— the reference number and date of issue of the harmonized standard which has been used for the assessment of each essential characteristic;

— where applicable, the reference number of the Specific Technical Documentation used and the requirements with which the manufacturer claims the product complies.

The DoP shall in addition contain:

(a) the intended use or uses for the construction product, in accordance with the applicable harmonized technical specification;

(b) the list of essential characteristics, as determined in the harmonized technical specification for the declared intended use or uses;

(c) the performance of at least one of the essential characteristics of the construction product, relevant for the declared intended use or uses;

(d) where applicable, the performance of the construction product, by levels or classes, or in a description, if necessary based on a calculation in relation to its essential characteristics determined in accordance with the Commission determination regarding those essential characteristics for which the manufacturer shall declare the performance of the product when it is placed on the market or the Commission determination regarding threshold levels for the performance in relation to the essential characteristics to be declared.

(e) the performance of those essential characteristics of the construction product which are related to the intended use or uses, taking into consideration the provisions in relation to the intended use or uses where the manufacturer intends the product to be made available on the market;

(f) for the listed essential characteristics for which no performance is declared, the letters “NPD” (No Performance Determined);

Regarding the supply of the DoP, Article 7 of the Regulation (EU) No 305/2011 applies.

The information referred to in Article 31 or, as the case may be, in Article 33 of Regulation (EC) No 1907/2006, (REACH) shall be provided together with the DoP.

ZA.2.2.3 Examples of DoP

ZA.2.2.3.1 General

The following are examples of completed DoPs for calcium silicate masonry units

ZA.2.2.3.2 Example A

Declaration of Performance (DoP) – Example

No. 12345

1. Unique identification code of the product-type

ABCDEFGH

2. Intended use/es

Unprotected masonry walls, columns or partitions

3. Manufacturer:

Any Company Ltd, Production Plant A

Any Street 1, PPCC Anywhere, Country

4. System/s of AVCP

2+

5. Harmonized standard:

EN 771-2:2011+A1:2015

Notified body/ies

NB 9999

Master Inspection Ltd, Someplace

6. Declared performance/s

Essential characteristics		**Performance**
Dimensions	length, width, height	*998 mm × 175 mm × 623 mm*
Dimensional tolerances		*T3*
Configuration	group according to Eurocode 6	*1*
Compressive strength	unit category	*I*
	mean compressive strength	*≥ 25,0 N/mm^2*
	type of specimen	*cut prism*
	normalized compressive strength	*≥ 20,0 N/mm^2*
	direction of load	*perpendicular to bed faces*
Bond strength		*GPM: 0,15 N/mm^2* *TLM: 0,3 N/mm^2*
Reaction to fire		*A1*
Water absorption		*NPD*
Water vapour permeability		*NPD*
Gross dry density	min	*≥ 2 010 kg/m^3*
	max	*≤ 2 200 kg/m^3*
Thermal properties		*NPD*
Durability against freeze-thaw		*F2*
Dangerous substances		*NPD*

The performance of the product identified above is in conformity with the set of declared performance/s. This declaration of performance is issued, in accordance with Regulation (EU) No 305/2011, under the sole responsibility of the manufacturer identified above.

Signed for and on behalf of the manufacturer by:

Anywhere 14.05.2014 **(place and date of issue)** John Q. Public (manager) **(name, function)**

ZA.2.2.3.3 Example B

Declaration of Performance (DoP) – Example

No. 12345a

1. Unique identification code of the product-type

same as DoP No

2. Intended use/es

Unprotected masonry walls, columns or partitions

3. Manufacturer:

Any Company Ltd, Production Plant A

Any Street 1, PPCC Anywhere, Country

4. System of assessment and verification of constancy of performance

4

5. Harmonized standard:

EN 771-2:2011+A1:2015

6. Declared performance/s

Essential characteristics		**Performance**
Dimensions	length, width, height	*998 mm × 175 mm × 623 mm*
Dimensional tolerances		*T3*
Configuration	group according to Eurocode 6	*1*
Compressive strength	unit category	*II*
	mean compressive strength	*≥ 25,0 N/mm^2*
	type of specimen	*cut prism*
	normalized compressive strength	*≥ 20,0 N/mm^2*
	direction of load	*perpendicular to bed faces*
Bond strength		*GPM: 0,15 N/mm^2* *TLM: 0,3 N/mm^2*
Reaction to fire		*A1*
Water absorption		*NPD*
Water vapour permeability		*NPD*
Gross dry density	min	*≥ 2 010 kg/m^3*
	max	*≤ 2 200 kg/m^3*
Thermal properties		*NPD*
Durability against freeze-thaw		*F2*

Essential characteristics	Performance
Dangerous substances	*NPD*

The performance of the product identified above is in conformity with the set of declared performance/s. This declaration of performance is issued, in accordance with Regulation (EU) No 305/2011, under the sole responsibility of the manufacturer identified above.

Signed for and on behalf of the manufacturer by:

Anywhere 14.05.2014 **(place and date of issue)** John Q. Public (manager) **(name, function)**

ZA.3 CE marking and labelling

The CE marking symbol shall be in accordance with the general principles set out in Article 30 of Regulation (EC) No 765/2008 and shall be affixed visibly, legibly and indelibly:

— to the calcium silicate masonry units

or

— to a label attached to it.

Where this is not possible or not warranted on account of the nature of the product, it shall be affixed:

— to the packaging

or

— to the accompanying documents.

The CE marking shall be followed by:

— the last two digits of the year in which it was first affixed,

— the name and the registered address of the manufacturer, or the identifying mark allowing identification of the name and address of the manufacturer easily and without any ambiguity,

— the unique identification code of the product-type,

— the reference number of the declaration of performance [see example of DoP],

— the level or class of the performance declared,

— the reference to the harmonized technical specification applied,

— the identification number of the notified body, [only for products under system 2+],

— the intended use as laid down in the harmonized technical specification applied.

The CE marking shall be affixed before the construction product is placed on the market. It may be followed by a pictogram or any other mark notably indicating a special risk or use.

Figure ZA.1 and Figure ZA.2 give examples of CE marking for calcium silicate masonry units:

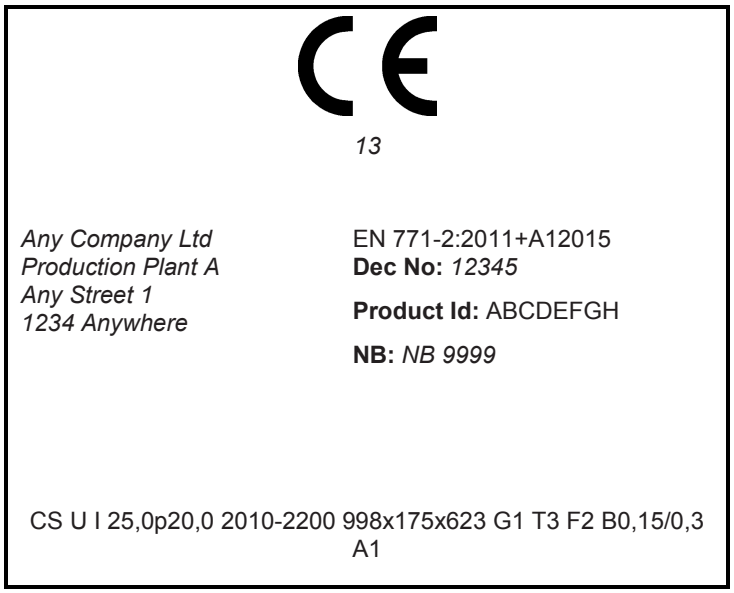


Figure ZA.1 — Example CE marking information of products under AVCP system 2+ corresponding to the DoP example A (using the designation code defined in clause 6.2)

CE

13

Any Company Ltd
Production Plant A
Any Street 1
1234 Anywhere

EN 771-2

Dec No / Product Id: *12345*

NB: *NB 9999*

Intended use: For un*protected* masonry in walls, columns or partitions

Length	*998 mm*
Width	*175 mm*
Height	*623 mm*
Dimensional tolerances	*T3*
Group according to EC 6	*1*
Unit category	*I*
Mean compressive strength	*≥ 25,0 N/mm^2*
Type of specimen	*cut prism*
Normalized compressive strength	*≥ 20,0 N/mm^2*
Direction of load	*perpendicular to bed faces*
Bond strength (initial shear strength)	*GPM: 0,15N/mm^2* *TLM 0,3 N/mm^2*
Reaction to fire	*A1*
Min. gross dry density	*≥ 2 010 kg/m^3*
Max. gross dry density	*≤ 2 200 kg/m^3*
Durability against freeze-thaw	*F2*

CE marking, consisting of the "CE"-symbol

Last two digits of the year in which the marking was first affixed

Name and the registered address of the manufacturer, or identifying mark

No. of European Standard applied, as referenced in OJEU
Reference number of the DoP
Unique identification code of the product type
Identification number of the notified production control certification body

Intended use of the product as laid down in the European standard applied

Level or class of performance declared

Figure ZA.2 — Example CE marking information of products under AVCP system 2+ corresponding to DoP example A (except for the Unique Identification Code of the Product Type (Product Id)) A1

Bibliography

[1] EN 998-2:2010, *Specification for mortar for masonry — Part 2: Masonry mortar*

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

[3] EN 1996-1-2, *Eurocode 6 — Design of masonry structures — Part 1-2: General rules - Structural fire design*

[4] ISO 12491, *Statistical methods for quality control of building materials and components*

[5] 96/603/EC: Commission Decision of 4 October 1996 establishing the list of products belonging to Classes A 'No contribution to fire' provided for in Decision 94/611/EC implementing Article 20 of Council Directive 89/106/EEC on construction products, OJ L 267, 19.10.1996, p. 23-26

[6] 2000/605/EC: Commission Decision of 26 September 2000 amending Decision 96/603/EC establishing the list of products belonging to Classes A 'No contribution to fire' provided for in Decision 94/611/EC implementing Article 20 of Council Directive 89/106/EEC on construction products (notified under document number C(2000) 2640), OJ L 258, 12.10.2000, p. 36-37

National Annex (informative)

Commentary on the differences between EN 771-2:2011+A1:2015 and BS 187:1978

NA.1 General

This National Annex provides an informative commentary on the differences between EN 771-2 and BS 187 and should not be construed as specifying requirements other than those given in the normative parts of EN 771-2.

Changes made to this National Annex are indicated in the text by [A1] ⟨A1⟩. Minor editorial changes are not tagged.

NA.2 Size

The sizes of calcium silicate masonry units have not been standardized on a European level, and EN 771-2 has been prepared to encompass all the sizes of calcium bricks and blocks available throughout Europe. However, the sizes and tolerances given in BS 187:1978 (as amended 1987) only applied to the format given in Table NA.1.

Table NA.1 **Sizes**

Coordinating size mm			Work size mm		
Length	**Width**	**Height**	**Length**	**Width**	**Height**
225	112,5	75	215	102,5	65

NOTE 1 The work sizes are derived from the corresponding co-ordinating sizes by the subtraction of 10 mm for the mortar joint.

NOTE 2 The sizes and shapes of other bricks (both rectangular parallelepiped and special shapes) are given in terms of their work sizes and angles in BS 4729:2005.

NA.3 Requirements for calcium silicate masonry units (see EN 771-2:2011+A1:2015, Clause 5)

NA.3.1 Dimensions and tolerances (see EN 771-2:2011+A1:2015, 5.2)

BS 187:1978 (as amended 1987) specified minimum and maximum limits for the 215 mm × 102,5 mm × 65 mm work size format in absolute terms. EN 771-2 specifies the dimensional tolerances of the mean length, width and height of a sample relative to the declared value of each dimension, and tolerances for individual units relative to the mean. It introduces a lower tolerance on the height of calcium silicate masonry units used with thin layer mortars. This caters for the wide range of sizes of calcium silicate bricks and blocks available throughout Europe, and recognizes their manufacturing characteristics.

NA.3.2 Configuration (see EN 771-2:2011+A1:2015, 5.3)

BS EN 771-2 requires the manufacturer to declare the configuration of the calcium silicate masonry units, whereas BS 187:1978 (as amended 1987) defines solid and frogged bricks only and required the manufacturer to indicate the presence or not of a frog in the marking.

The limit on the frog volume of 20 % in BS 187:1987 (as amended 1987) was derived from the presumption that for those bricks with a frog volume of 20 % or less, the performance can be determined using the same design rules in as for solid bricks. In EN 1996-1-1, design rules are given for brickwork made with units containing frogs.

[A1] *Text deleted* [A1]

NA.3.3 **Density** (see EN 771-2:2011+A1:2015, 5.4)

BS 187:1978 (as amended 1987) did not specify any requirements for the 215 mm × 102,5 mm × 65 mm work size format for gross or net density. Where needed, values supplied voluntarily by manufacturers were used instead. However, gross or net dry density can be important for relatively lightweight, perforated calcium silicate units when considering their thermal performance. Density can also be important, expressed as mass per unit area of a wall, in respect of sound reduction through the wall. EN 771-2 requires a maximum and/or minimum gross and net dry density to be declared, with the actual value obtained by a test to be within a specified tolerance. The gross and net dry density is the same for solid calcium silicate units (units with no formed voids, depressions or indentations).

NA.3.4 **Compressive strength** (see EN 771-2:2011+A1:2015, 5.5)

The manufacturer was required to declare the compressive strength of calcium silicate masonry units in accordance with BS 187:1978, Appendix B (as amended 1987). The compressive strength of calcium silicate bricks was determined on prepared specimens tested wet between plywood packing. In contrast, in accordance with BS EN 772-1, calcium silicate masonry units are tested dry with their bed faces ground if necessary to achieve specified levels of flatness and parallelism without the use of any form of packing. As might be expected, testing calcium silicate masonry units dry generally gives higher compressive strengths than when testing wet. However, the apparent strength enhancement is not readily predictable, and the manufacturer will have to declare a minimum value based on the new test procedure.

If sampled and tested, the compressive strength of the calcium silicate masonry units shall exceed the declared value, and the lowest individual value shall exceed 80 % of the declared value. The manufacturer is also required to declare the normalized compressive strength, which is the measured strength adjusted to an air dry condition and multiplied by a shape factor. The value is needed for structural design, and the required shape factors are given in BS EN 772-1.

NA.3.5 **Freeze/thaw resistance** (see EN 771-2:2011+A1:2015, 5.7)

BS 187:1978 (as amended 1987) did not specify any requirements for the 215 mm × 102,5 mm × 65 mm work size format for freeze/thaw resistance. This is because calcium silicate bricks with a minimum compressive strength of 20,5 N/mm^2 are regarded in the UK as inherently frost-resistant, confirmed by extensive laboratory testing and monitoring of the use of the bricks in practice for over 60 years. However, experience in some countries differed and EN 771-2 requires the freeze/thaw resistance to be declared for structural use and visual aspects, or for structural use only. This declaration may be confirmed by testing in accordance with BS EN 772-18.

NA.3.6 **Bond strength** (see EN 771-2:2011+A1:2015, 5.12)

Bond strength is not a characteristic that has been referenced in UK masonry product standards such as BS 187. Its introduction into this Standard will allow the manufacturer to declare the bond strength between calcium silicate masonry units and the mortar when the units are intended for the construction of masonry wall subjected to structural requirements.

The declaration of shear bond strength shall be made in terms of the initial shear strength and based on fixed tabulated values or values determined for tests.

NA.3.7 **Factory production control** (see EN 771-2:2011+A1:2015, 8.3)

BS 187:1978, Appendix C (as amended 1987) specified optional suggested levels of manufacturing control relating to the compressive strength including a "special category" of control where the manufacturer operated a quality control scheme with demonstrable results. EN 771-2 introduces a requirement for the manufacturer to have a documented factory production control system covering the regular inspection, checking and testing of raw materials, the production process, and the finished products.

NA.3.8 **Class 3: Special Purpose (SP3) bricks**

Class 3 bricks were defined in BS 187:1978 (as amended 1987) as calcium silicate bricks of 215 mm × 102,5 mm × 65 mm work size format and a minimum compressive strength of 20,5 N/mm2. The Special Purpose or SP3 designation refers to Class 3 bricks intended for non-fairfaced work such as foundations or walls to be rendered, plastered or printed. The frost resistance, sulfate resistance, negligible soluble salts, and accurate dimensions of these bricks make them ideal for this purpose.

Bibliography

BS 187:1978, *Specification for calcium silicate (sandlime and flintlime) bricks.*

[A1] *Text deleted* [A1]

BS 6649:1985, *Specification for clay and calcium silicate modular bricks*.

BS EN 771-2:2001, *Specification for masonry units — Part 2: Calcium silicate masonry units.*

BS EN 772-18:2011, *Methods of test for masonry units — Part 18: Determination of freeze-thaw resistance of calcium silicate masonry units.*

EN 1996-1-1:2005, *Eurocode 6. Design of masonry structures — Part 1: General rules for reinforced and unreinforced masonry structures* (together with the United Kingdom National Application Document).

PD 6697: 2010, *Recommendations for the design of masonry structures to BS EN 1996-1-1 and BS EN 1996-2.*

This page deliberately left blank

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.