BS EN 413-1:2011

BSI Standards Publication

Masonry cement

Part 1: Composition, specifications and conformity criteria

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National foreword

This British Standard is the UK implementation of EN 413-1:2011. It supersedes BS EN 413-1:2004, which is withdrawn.

The UK participation in the preparation of EN 413-1:2011 was entrusted by Technical Committee B/516, Cement and lime, to Subcommittee B/516/10, Masonry cement.

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

When the reference to this European Standard has been published in the Official Journal of the European Communities (OJ), compliance with it will confer a presumption of conformity with the essential requirements covered by the Standard in respect of the Construction Products Directive.

Additional information

It should be noted that the masonry cement traditionally used in the UK falls into the type MC 12,5 (MC 12,5 includes an air entraining agent) as specified in this British Standard. There has been no body of experience in the UK of types MC 5, MC 22,5, MC 12,5 X and MC 22,5 X.

Attention is drawn to National annex NA (informative), which details the exchange of additional information that should be made between the manufacturer and user of the masonry cement, in special cases, in accordance with the note to Clause **1**.

Attention is drawn to National annex NB (informative), which gives recommendations for sampling and testing for acceptance inspection at delivery.

Attention is drawn to National annex NC (informative), which gives additional information on workability.

Attention is drawn to National annex ND (informative), which provides guidance on the general use of masonry cement, including health and safety aspects.

Attention is drawn to National annex NE (informative), which provides a bibliography of the publications referred to in the national annexes.

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 cannot confer immunity from legal obligations.

Attention is drawn to the following statutory regulations:

The Manual Handling Operations Regulations 1992 (as amended).

The Control of Substances Hazardous to Health Regulations 2002 (COSHH) (as amended).

The Chemicals (Hazard Information and Packaging for Supply) Regulations 2009 (CHIP 4).

Regulation (EC) No. 1907/2006 of the European Parliament and Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No. 793/93 and Commission Regulation (EC) No. 1488/94 as well

as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC. Brussels: OJEU L 136.

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Supersedes EN 413-1:2004

English Version

Masonry cement - Part 1: Composition, specifications and conformity criteria

Putz- und Mauerbinder - Teil 1: Zusammensetzung, Anforderungen und Konformitätskriterien

This European Standard was approved by CEN on 10 March 2011.

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.

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Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (EN 413-1:2011) has been prepared by Technical Committee CEN/TC 51 "Cement and building limes", the secretariat of which is held by NBN.

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 October 2011, and conflicting national standards shall be withdrawn at the latest by October 2011.

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 EN 413-1:2004.

The European Standard, EN 413, “Masonry cement”, consists of the following parts:

Part 1: Composition, specifications and conformity criteria;

Part 2: Test methods.

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 informative Annex ZA, which is an integral part of this document.

EN 413-1 has been prepared to provide a range of materials from which users of EN 998-1, EN 998-2 and EN 1996-1-1 (Eurocode 6) can select with confidence to achieve the level of strength and durability required of masonry and rendering.

The main changes from EN 413-1:2004 are as follows:

- introduction of a class MC 22,5 (air-entrained) cement;
- removal of references to EN 459-2 for compressive strength testing;
- the upper limit for SO_3 content is increased.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

Masonry cement should be defined and specified precisely with sufficiently stringent requirements to satisfy those who are responsible for the design and construction of buildings and other structures for maximum safety and durability.

This European Standard is a carefully balanced document that has been thoroughly discussed, taking into account the need to provide clear definitions and specifications and to arrive at a usable standard.

The requirements of this European Standard are, where appropriate, based on the results from tests on masonry cement in accordance with EN 196 'Methods of testing cement'. Strength is measured on a standard mortar prepared in accordance with EN 196-1 with a fixed water/cement ratio and compacted using the equipment described in EN 196-1. However, some additional tests have been found necessary and these tests are described in EN 413-2.

CEN/TC 51 recognises the importance of workability (cohesivity at standard consistence) of mortars prepared from masonry cements. A test method is available in CR 13933, and in which results of a test programme are also given. This test method was not found valid for standard requirement purposes due to its lack of reproducibility, however it provides valuable information for the manufacturers and users on the property in use of masonry cements.

The properties of bond and durability (resistance to frost and/or chemical attack) of mortars are very important and appropriate mortar tests are being developed by CEN/TC 125, Masonry. In many applications, particularly in severe environmental conditions, the choice of the type/class of masonry cement from EN 413-1 can influence the durability of mortar, e.g. in respect of frost and chemical resistance.

1 Scope

This European Standard specifies the definition and composition of masonry cements as commonly used in Europe for the production of mortar for bricklaying and blocklaying and for rendering and plastering. It includes physical, mechanical and chemical requirements and defines strength classes. EN 413-1 also states the conformity criteria and the related rules. Necessary durability requirements are also given.

NOTE For normal applications the information given in EN 413-1, in EN 998-1 and in EN 998-2 is generally sufficient. However, in special cases, an exchange of additional information between the masonry cement producer and user can be helpful. The details of such an exchange are not within the scope of EN 413-1 but should be dealt with in accordance with national standards or other regulations or can be agreed between the parties concerned.

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 196-1, *Methods of testing cement — Part 1: Determination of strength*

EN 196-2, *Methods of testing cement — Part 2: Chemical analysis of cement*

EN 196-3, *Methods of testing cement — Part 3: Determination of setting time and soundness*

EN 196-6, *Methods of testing cement — Part 6: Determination of fineness*

EN 196-7, *Methods of testing cement — Part 7: Methods of taking and preparing samples of cement*

EN 197-1, *Cement — Part 1: Composition, specifications and conformity criteria for common cements*

EN 413-2, *Masonry cement — Part 2: Test methods*

EN 459-1, *Building lime - Part 1: Definitions, specifications and conformity criteria*

EN 12878, *Pigments for the colouring of building materials based on cement and/or lime - Specifications and methods of test*

3 Terms and definitions

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

3.1
masonry cement
factory made finely powdered hydraulic binder which relies essentially upon the presence of Portland cement clinker to develop strength. When mixed with sand and water only and without the addition of further materials it produces a workable mortar suitable for use in rendering, plastering and masonry work

3.2
additives
constituents which are added to improve the manufacture or the properties of the masonry cement, e.g. grinding aids, air-entraining agents

3.3
autocontrol testing
continual testing by the manufacturer, of masonry cement spot samples taken at the point(s) of release from the factory/depot

3.4
control period
period of production and despatch identified for the evaluation of the autocontrol test results

3.5
characteristic value
value of a required property outside of which lies a specified percentage, the percentile P_k, of all the values of the population

3.6
specified characteristic value
characteristic value of a mechanical, physical or chemical property which in the case of an upper limit is not to be exceeded or, in the case of a lower limit is, as a minimum, to be reached

3.7
single result limit value
value of a mechanical, physical or chemical property which, for any single test result as in the case of an upper limit is not to be exceeded or, in the case of a lower limit is, as a minimum, to be reached

3.8
allowable probability of acceptance CR
for a given sampling plan, the allowed probability of acceptance of masonry cement with a characteristic value outside the specified characteristic value

3.9
sampling plan
specific plan which states the (statistical) sample size(s) to be used, the percentile P_k and the allowable probability of acceptance CR

3.10
spot sample
sample taken at the same time and from one and the same place, relating to the intended tests. It can be obtained by combining one or more immediately consecutive increments (see EN 196-7)

4 Notation

Masonry cement is designated by the term 'MC'.

There are three strength classes of masonry cement, 5, 12,5 and 22,5.

The term 'X' designates masonry cements in which an air entraining agent is not incorporated.

5 Requirements

5.1 General

The physical, mechanical and chemical properties of masonry cements shall be measured by the test methods described in EN 413-2 and in the relevant parts of EN 196. These European Standards give alternative test methods for some properties but in the event of a dispute only the reference methods shall be used. Where allowed in the relevant part of EN 196, different methods may be used provided they give correlated and equivalent values to those obtained using the reference method.

The CEN Standard sand (see EN 196-1) used to make the mortars for the tests required by 5.3.5 and 5.3.6 shall have a silica content (as quartz) of not less than 93 %.

NOTE EN 196-1 permits the use of CEN Standard sands that have been assessed against the CEN Reference sand in respect of their strength characteristics. According to this standard the CEN Standard sand is used in mortar for tests other than that for strength. These tests have only been evaluated using CEN Standard sand based essentially on silica.

All requirements are specified as characteristic values. They serve to define the performance level and classification of the masonry cements.

5.2 Constituents and composition

Masonry cement shall comprise Portland cement clinker, inorganic constituents and where appropriate additive(s) as given in Table 1. Calcium sulfate is added in small quantities to the other constituents of masonry cement during its manufacture to control setting.

The inorganic constituents of masonry cements conforming to EN 413-1 shall be materials selected from:

— natural mineral materials;

— mineral materials used for or derived from the clinker production process;

— hydrated and/or hydraulic building limes conforming to EN 459-1;

— constituents specified in EN 197-1;

— inorganic pigments (except those containing carbon black) conforming to EN 12878.

NOTE Carbon black has a detrimental effect upon the air entrainment.

Additives shall not promote corrosion of embedded metal such as reinforcement and wall ties or impair the properties, including behaviour in fire, of the mortar made from the masonry cement. Organic pigments are not permitted.

Table 1 — Composition of masonry cements

Type	Content % by mass	
	Portland cement clinker	Additives
MC 5	≥ 25	≤ 1 [a]
MC 12,5; MC 12,5 X MC 22,5; MC 22,5 X	≥ 40	
[a] The quantity of organic additives on a dry basis shall not exceed 0,5 % by mass of the masonry cement.		

The manufacturing process and its control shall ensure that the composition of masonry cement is kept within the limits fixed in EN 413-1. Masonry cements consist ultimately of individual small grains of different materials and are statistically homogeneous in composition resulting from quality assured production and material handling processes.

A high degree of uniformity in all masonry cement properties shall be obtained through mass production processes, in particular, adequate grinding and homogenization. Qualified and skilled personnel and the facilities to test, evaluate and adjust product quality are indispensable for producing masonry cement in accordance with this European Standard.

5.3 Physical and mechanical requirements

5.3.1 Fineness (sieve residue)

The residue on a 90 μm sieve shall be not more than 15 % by mass when determined in accordance with EN 196-6.

5.3.2 Initial setting time

The initial setting time shall be not less than 60 min when determined in accordance with EN 413-2.

5.3.3 Final setting time

Where the initial setting time is less than 6 h, there is no requirement for final setting time. Where the initial setting time is 6 h or more, the final setting time shall be not more than 15 h when determined in accordance with EN 413-2.

5.3.4 Soundness

The expansion shall be not more than 10 mm when determined in accordance with EN 196-3.

5.3.5 Fresh mortar requirements

The properties of air content and water retention of fresh mortar shall be measured in accordance with EN 413-2, on a mortar of standard consistence that shall have a value of penetration of (35 ± 3) mm using the plunger apparatus as the reference method. The flow table test is the alternative method. The test results shall meet the requirements given in Table 2.

Table 2 — Fresh mortar requirements given as characteristic values

Type	Air content % by volume	Water retention % by mass
MC 5 MC 12,5 MC 22,5	≥ 8 and ≤ 22	≥ 80
MC 12,5 X MC 22,5 X	≤ 6 [a]	≥ 75
[a] The control of the masonry cement manufacturing process ensures that this upper limit is not exceeded.		

NOTE An air-entraining agent is incorporated into masonry cements to improve their workability and durability. An upper limit is set for air content to maintain good bond strength to masonry units. The water retention limits are specified for all classes of masonry cement to provide a performance suitable for use with high suction masonry units.

5.3.6 Compressive strength

The compressive strength when determined in accordance with EN 196-1, at the fixed water/masonry cement ratio of 0,50 shall have the values given in Table 3.

Table 3 — Compressive strength requirements given as characteristic values

Type	7 day (early) strength MPa	28 day (standard) strength MPa	
MC 5	-	≥ 5 [a)]	≤ 15 [a]
MC 12,5 MC 12,5 X	≥ 7	≥ 12,5	≤ 32,5
MC 22,5	≥ 10	≥ 22,5	≤ 42,5
MC 22,5 X			
[a] A loading rate of (400 ± 40) N/s shall be used when testing specimens of type MC 5.			

Should it not be possible to remove the prisms from the moulds after 24 h, it is permitted to remove them at 48 h. Where the prisms are demoulded at 48 h this shall be recorded.

EN 196-1 gives repeatability and reproducibility values for 28 day strength. On account of their lower strengths, values of 4 % and 8 % respectively are appropriate for masonry cements conforming to this European Standard.

5.4 Chemical requirements

The properties of the masonry cement shall conform to the requirements given in Table 4 when determined by the method indicated in this table.

NOTE The REACH Regulation 1907/2006 sets limits on water-soluble hexavalent chromium determined in accordance with EN 196-10.

Table 4 — Chemical requirements given as characteristic values

Property	Reference test method	Type	Value
Sulfate content (as SO_3)	EN 196-2	MC 5	≤ 2,5
		MC 12,5 MC 12,5 X MC 22,5 MC 22,5 X	≤ 3,5
Chloride content (as Cl)	EN 196-2	MC 5	No requirement
		MC 12,5 MC 12,5 X MC 22,5 MC 22,5 X	≤ 0,10

5.5 Durability requirements

To ensure durability, the requirements of 5.2 shall be met.

In many applications, particularly in severe environmental conditions, the choice of masonry cement type from this standard has an influence on the durability of mortar. The choice of masonry cement type for different applications and exposure classes shall follow the appropriate standards and/or regulations valid in the place of use of the mortar.

6 Standard designation

Masonry cement conforming to this European Standard shall be identified using the notation in Clause 4, i.e. the symbol 'MC', followed by the strength class and when relevant, by the letter 'X'.

EXAMPLE Masonry cement EN 413-1 MC 12,5 X.

7 Conformity criteria

7.1 General requirements

Conformity of masonry cement to this European Standard shall be continuously evaluated on the basis of testing spot samples. The properties, test methods and the minimum testing frequencies for the autocontrol testing by the manufacturer are specified in Table 5. Concerning testing frequencies for masonry cement not being despatched continuously and other details, see EN 197-2.

For certification of conformity by an approved certification body, conformity of masonry cement to this European Standard shall be evaluated in accordance with Annex ZA of this standard.

NOTE This European Standard does not deal with acceptance inspection at delivery.

7.2 Conformity criteria for physical, mechanical and chemical properties and evaluation procedure

7.2.1 General

Conformity of masonry cement with physical, mechanical and chemical requirements in EN 413-1 is assumed if the conformity criteria specified in 7.2.2 and 7.2.3 are met.

Conformity shall be evaluated on the basis of continual sampling using spot samples taken at the point of release and on the basis of the test results obtained on all autocontrol samples taken during the control period.

7.2.2 Statistical conformity criteria

7.2.2.1 General

Conformity shall be formulated in terms of a statistical criterion based on:

— the required characteristic values for physical, mechanical and chemical properties as specified in 5.3 and 5.4;

— the percentile P_k on which the specified characteristic value is based, as specified in Table 6;

— the allowable probability of acceptance CR as specified in Table 6.

Table 5 — Properties, test methods and minimum testing frequencies for the autocontrol testing by the manufacturer, and the statistical assessment procedure

Property	Masonry cements to be tested	Test method [a, b]	Autocontrol testing			
			Minimum testing frequency		Statistical assessment procedure	
			Routine situation	Initial period for a new type of masonry cement	Inspection by	
					Variables [d]	Attributes [f]
1	2	3	4	5	6	7
Strength - 7 days - 28 days	all except MC 5 all	EN 196-1 [e]	1 every 2 weeks	2/week		X
Initial setting time	all	EN 413-2	1 every 2 weeks	2/week		X
Final setting time	as appropriate	EN 413-2				X
Soundness (expansion)	all	EN 196-3	1/month	1/week		X
Sieve residue	all	EN 196-6	1/month	1/week		X
Air content	MC 5, MC 12,5 MC 22,5	EN 413-2	1/week	4/week		X
Water retention	all	EN 413-2	1/month	1/week		X
Sulfate content	all	EN 196-2	1 every 2 weeks	2/week		X
Chloride content	all except MC 5	EN 196-2	1/month	1/week		X
Composition	all	- [c]	1/month	1/week		

[a] Where allowed in the relevant part of EN 196, other methods than those indicated may be used provided they give results correlated and equivalent to those obtained with the reference method (except initial type testing).

[b] The methods used to take and prepare samples shall be in accordance with the requirements of EN 196-7.

[c] Appropriate method chosen by the manufacturer and for which a correlation with the method(s) used for initial type testing can be established.

[d] If the data are not normally distributed, then the method of assessment may be decided on a case by case basis.

[e] See 5.3.6.

[f] If the number of samples is at least 1 each week during the control period, the assessment may be made by variables.

Table 6 — Required values of P_k and CR

	Air content (upper limit) 28 day strength (lower limit)	All other requirements
The percentile P_k on which the characteristic value is based	5 %	10 %
Allowable probability of acceptance CR	5 %	

NOTE Conformity evaluation by a procedure based on a finite number of test results can only produce an approximate value for the proportion of results outside the specified characteristic value in a population. The larger the sample size (number of test results), the better the approximation. The selected probability of acceptance CR controls the degree of approximation by the sampling plan.

Conformity with the requirements of this European Standard shall be verified either by variables or by attributes, as described in 7.2.2.2 and 7.2.2.3 as specified in Table 5.

The control period shall be 24 months.

7.2.2.2 Inspection by variables

For this inspection, the test results are assumed to be normally distributed.

Conformity is verified when Equations (1) and (2), as relevant, are satisfied.

$$\bar{x} - k_A s \geq L \quad (1)$$

and

$$\bar{x} + k_A s \leq U \quad (2)$$

where

$\bar{x}$ is the arithmetic mean of the totality of the autocontrol test results in the control period;

s is the standard deviation of the totality of the autocontrol test results in the control period;

k_A is the acceptability constant;

L is the specified lower limit given in Tables 2 and 3;

U is the specified upper limit given in Tables 2, 3 and 4.

The acceptability constant k_A depends on the percentile P_K on which the characteristic value is based, on the allowable probability of acceptance CR and on the number n of the test results. Values of k_A are listed in Table 7.

Table 7 — Acceptability constant

Number of test results *n*	k_A [a]	
	for P_k = 5 % [b]	for P_k = 10 % [c]
20 to 21	2,40	1,93
22 to 23	2,35	1,89
24 to 25	2,31	1,85
26 to 27	2,27	1,82
28 to 29	2,24	1,80
30 to 34	2,22	1,78
35 to 39	2,17	1,73
40 to 44	2,13	1,70
45 to 49	2,09	1,67
50 to 59	2,07	1,65
60 to 69	2,02	1,61
70 to 79	1,99	1,58
80 to 89	1,97	1,56
90 to 99	1,94	1,54
100 to 149	1,93	1,53
150 to 199	1,87	1,48
200 to 299	1,84	1,45
300 to 399	1,80	1,42
> 400	1,78	1,40
NOTE Values given in this table are valid for CR = 5 %.		
[a] The value of k_A valid for each intermediate value on *n* may be used instead.		
[b] For air content (upper limit) and 28 days strength (lower limit).		
[c] For all other strength, physical and chemical requirements.		

7.2.2.3 Inspection by attributes

The number c_D of test results outside the characteristic value shall be counted and compared with an acceptable number c_A calculated from the number *n* of autocontrol test results and the percentile P_k as specified in Table 8.

Conformity is verified when the following Equation (3) is satisfied:

$$c_D \leq c_A \quad (3)$$

The value of c_A depends on the percentile P_k on which the characteristic value is based, on the allowable probability of acceptance CR and on a number *n* of the test results. Values of c_A are listed in Table 8.

Table 8 — Values of c_A

Number of test results n [a] P_k = 10 %	c_A	Number of test results n [a] P_k = 5 %
20 to 39	0	20 to 79
40 to 54	1	80 to 109
55 to 69	2	110 to 139
70 to 84	3	140 to 169
85 to 99	4	170 to 199
100 to 109	5	200 to 219
110 to 123	6	220 to 247
124 to 136	7	248 to 273
NOTE Values given in this table are valid for CR = 5 %.		
[a] If the number of test results is $n < 20$ a statistically based conformity criterion is not possible. Despite this, a criterion of $c_A = 0$ shall be used in case where $n < 20$.		

7.2.3 Single result conformity criteria

In addition to the statistical conformity criteria, conformity of test results with the requirements of this European Standard requires that it shall be verified that each test result remains within the single result limit values specified in Table 9.

Table 9 — Limit values for single results

Property	Limit values for single results				
	MC 5	**MC 12,5**	**MC 22,5**	**MC 12,5 X**	**MC 22,5 X**
Strength (MPa) lower limit value 7 day 28 day	 - 4	 6 10,5	 9 20,5	 6 10,5	 9 20,5
Strength (MPa) upper limit value 28 day	 17,5	 37,5	 47,5	 37,5	 47,5
Initial setting time (min) lower limit value	45				
Final setting time (h) upper limit value	17[a]				
Soundness (expansion in mm) upper limit	10				
Sulfate content (as % SO_3) upper limit value	3,0	4,0	4,0	4,0	4,0
Chloride content (%) upper limit value	-	0,10	0,10	0,10	0,10
Water retention (%) lower limit value	75			70	
Air content (%) lower limit value upper limit value	 6 25	 6 25	 6 25	 - -	 - -

[a] Where appropriate (see 5.3.3).

7.3 Conformity criteria for masonry cement composition

At least once per month the composition of the masonry cement shall be checked by the manufacturer, using as a rule a spot sample taken at a point of release. The masonry cement composition shall meet the requirements specified in 5.2. The limiting quantities of the Portland cement clinker specified in Table 1 are reference values to be met by the average composition calculated from the spot samples taken in the control period. For single results, maximum deviations of -2 from the reference value are allowed. Suitable procedures during production and appropriate verification methods to ensure conformity to this requirement shall be applied and documented.

Annex A
(informative)
Water-soluble hexavalent chromium

It should be noted that the REACH Regulation 1907/2006 sets limits on water-soluble hexavalent chromium determined in accordance with EN 196-10.

Annex ZA
(informative)

Clauses of this European Standard addressing the provisions of the EU Construction Products Directive

ZA.1 Scope and relevant characteristics

EN 413-1 and this Annex ZA have been prepared under a Mandate[1)] given to CEN by the European Commission and the European Free Trade Association.

The clauses of this European Standard, shown in Table ZA.1, meet the requirements of this Mandate given under the EU Construction Products Directive (89/106/EEC).

Compliance with these clauses confers a presumption of fitness of the masonry cements covered by this annex for the intended use indicated herein; reference shall be made to the information accompanying the CE marking.

WARNING – Other requirements and other EU Directives, not affecting the fitness for intended use(s), can be applicable to a construction product falling within the scope of this European Standard.

NOTE 1 In addition to any specific clauses relating to dangerous substances contained in this standard, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply.

NOTE 2 An informative database of European and national provisions on dangerous substances is available at the Construction website on EUROPA (accessed through http://ec.europa.eu/enterprise/construction/cpd-ds)

This annex establishes the conditions for the CE marking of masonry cement intended for the uses indicated in Table ZA.1 and shows the relevant clauses applicable.

This annex has the same scope as Clause 1 of this standard and is defined by Table ZA.1.

[1)] M/114 Cement, building limes and other hydraulic binders.

Table ZA.1— Harmonised clauses

Construction Products: Masonry cement as covered under the scope of this standard **Intended use(s):** **Preparation of mortar for bricklaying and blocklaying and for rendering and plastering**				
Requirements/performance characteristics	**Harmonised clauses [a] in this European Standard**		**CPD Article 3.2 level(s) and/or class(es)**	**Notes**
Composition and durability	5.2 5.5		None	Selection of masonry cement by the member states in technical regulations for particular intended uses shall be possible, based on the different masonry cement products and strength classes. Durability relates to mortar for bricklaying, blocklaying and mortar for rendering and plastering made from masonry cement according to the application rules valid in the place of use.
Compressive strength (early and standard)	5.3.6	Compressive strength requirements expressed in terms of strength classes and limits.[b]	None	
Setting time	5.3.2 5.3.3		None	
Fineness (sieve residue)	5.3.1		None	
Soundness (expansion and SO_3 content)	5.3.4 5.4		None	
Air content of fresh mortar	5.3.5		None	MC 5; MC 12,5 and MC 22,5
Water retention of fresh mortar	5.3.5	Requirements expressed in terms of lower limits. [b]	None	
Chloride content	5.4		None	

a The requirements in these clauses, including the entire contents and tables of the clauses listed, are fully integrated parts of this harmonised European Cement Standard

b These limits are part of the definition of the products covered by this cement standard.

The requirement on a certain characteristic is not applicable in those member states (MSs) where there are no regulatory requirements on that characteristic for the intended use of the product. In this case, manufacturers placing their products on the market of these MSs are not obliged to determine nor declare the performance of their products with regard to this characteristic and the option “No performance determined” (NPD) in the information accompanying the CE marking (see ZA.3) may be used. The NPD option may not be used, however, where the characteristic is subject to a threshold level.

ZA.2 Procedure for the attestation of conformity of masonry cement

ZA.2.1 System of attestation of conformity

The system of attestation of conformity for the masonry cement indicated in Table ZA.1 is shown in Table ZA.2 for the indicated intended use(s), in accordance with the Commission Decision of 14 July 1997 (97/555/EC) published in the Official Journal of the European Communities and given in annex 3 of the Mandate for the product family “Cements”.

Table ZA.2— System of attestation of conformity

Product(s)	Intended use(s)	Level(s) or class(es)	Attestation of conformity systems
Masonry cements	Preparation of mortar for bricklaying and blocklaying and rendering and plastering	.....	1+
System 1+: See annex III Section 2 point (i) of Directive 89/106/EEC, with audit-testing of samples taken at the factory.			

The attestation of conformity of the masonry cement in Table ZA.1 shall be based on the evaluation of conformity procedures indicated in Table ZA.3 resulting from application of the clauses of this European Standard indicated therein. Clause 6 of EN 197-2:2000 gives rules relating to actions in the event of non-conformity.

Clause 9 of EN 197-2:2000, giving rules relating to Dispatching Centres, is not part of the procedure of attestation of conformity for the affixing of the CE marking under the CPD. However, Member States, within their market surveillance obligations, must ensure that CE marking is correctly used (Article 15.1 of the CPD). Clause 9 of EN 197-2:2000 should be used for the corresponding national provisions concerning Dispatching Centres.

Table ZA.3— Assignment of evaluation of conformity tasks for masonry cement under system 1+

Tasks		Content of the task	Evaluation of conformity clauses to apply
Tasks under the responsibility of the manufacturer	Factory production control (FPC)	Parameters related to all characteristics of Table ZA.1 relevant for the intended use	Clause 7 of this standard and EN 197-2:2000, Clause 4
	Further testing of samples taken at factory	All characteristics of Table ZA.1 relevant for the intended use	
Tasks under the responsibility of the product certification body	Initial type testing	All relevant characteristics in Table ZA.1 [a]	Clause 7 of this standard and EN 197-2:2000, Clauses 5 and 7
	Initial inspection of factory and of FPC	Parameters related to all relevant characteristics in Table ZA.1[a]	
	Continuous surveillance, assessment and approval of FPC	Parameters related to all relevant characteristics in Table ZA.1[a]	
	Audit testing of samples taken at factory	All relevant characteristics in Table ZA.1 [a]	
[a] except durability			

ZA.2.2 EC certificate of conformity

When compliance with the conditions of this annex is achieved, the certification body shall draw up a certificate of conformity (EC Certificate of conformity), which entitles the manufacturer to affix the CE marking. The certificate shall include:

— Name, address and identification number of the certification body;

— Name and address of the manufacturer, or his authorised representative established in the EEA, and place of production;

NOTE 1 The manufacturer may also be the person responsible for placing the product onto the EEA market, if he takes responsibility for CE Marking.

— Description of the product (type, identification, use, ...);

— Provisions to which the product conforms (e.g. Annex ZA of this EN);

— Particular conditions applicable to the use of the product (e.g. provisions for use under certain conditions, etc.);

— The number of the certificate;

— Conditions and period of validity of the certificate, where applicable;

— Name of, and position held by, the person empowered to sign the certificate.

The above mentioned certificate shall be presented in the official language or languages of the Member State in which the product is to be used.

ZA.3 CE marking and labelling

The manufacturer or his authorised representative established within the EEA is responsible for the affixing of the CE marking. The CE marking symbol to affix shall be in accordance with Directive 93/68/EEC and shall be shown on the bag of masonry cement (or when not possible it may be on the accompanying label, the packaging or on the accompanying commercial documents e.g. a delivery note). The following information shall accompany the CE marking symbol:

— Identification number of the certification body;

— Name or identifying mark and registered address of the producer;

— The last two digits of the year in which the marking is affixed;

— Number of the EC Certificate of conformity or factory production control certificate;

— Reference to this European Standard;

— Description of the product: generic name, … and intended use;

— Information on those relevant essential characteristics listed in Table ZA.1 which are to be declared presented as:

  — declared values and, where relevant, level or class (including “pass” for pass/fail requirements, where necessary) to declare for each essential characteristic as indicated in "Notes" in Table ZA.1;

  — as an alternative, a standard designation as defined in clause 6, alone or in combination with declared values as above, and;

— “No performance determined” for characteristics where this is relevant.

The “No performance determined” (NPD) option may not be used where the characteristic is subject to a threshold level. Otherwise, the NPD option may be used when and where the characteristic, for a given intended use, is not subject to regulatory requirements in the Member State of destination.

Figure ZA.1 gives an example of the information to be given on the product, label, packaging and/or commercial documents.

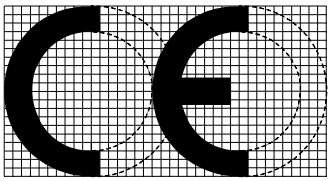
For reasons of practicality, selections from the following alternative arrangements for bagged cement concerning the presentation of the accompanying information may be used:

a) When the CE marking is given on the bag (this is the normal situation and is preferred) the elements shown on Figure ZA.1 shall be given.

b) Where the last two digits of the year in which the CE marking is affixed is pre-printed on the bag, the year so printed should relate to the date of affixing with an accuracy of within plus or minus 3 months.

c) Where the last two digits of the year in which the marking is affixed is to be presented but not pre-printed on the bag, it may be applied by means of date-stamping in any easily visible position. This position should be indicated in the information accompanying the CE marking.

In the case of bulk masonry cement, the CE conformity marking, the identification number of the certification body and the accompanying information as listed for bagged masonry cement should be affixed in some suitable practical form on the accompanying commercial documents.

	*CE conformity marking, consisting of the "CE"-symbol given in Directive 93/68/EEC.*
0123	*Identification number of the certification body*
Any Company The registered address	*Name or identifying mark and registered address of the producer*
Any factory [a] 09 [b] (or position of date stamping)	*Registered address of the producer* *Name or identifying mark of the factory where the cement was produced* [a] *Last two digits of the year in which the marking was affixed* [b]
0123-CPD-00234	*Number of the EC certificate of conformity*
EN 413–1:2011	*Number of European Standard with the version date*
Type : MC12,5 X	*Example of standard designation, indicating the cement product and the strength class*
Masonry cement, intended to be used for preparation of mortar	*Intended use*

[a] Considered necessary for the requirements of EN 197-2 but not compulsory.

[b] The year of marking should relate to either the time of packing into bags or the time of dispatch from the factory or depot.

Figure ZA.1 — Example of CE marking information

In addition to any specific information relating to dangerous substances shown above, the product should be accompanied, when and where required and in the appropriate form, by documentation listing any legislation on dangerous substances for which compliance is claimed, together with any information required by that legislation.

NOTE 1 European legislation without national derogations need not be mentioned.

NOTE 2 Affixing the CE marking symbol means, if a product is subject to more than one directive, that it complies with all applicable directives.

Bibliography

[1] EN 196-10, *Methods of testing cement — Part 10: Determination of the water-soluble chromium (VI) content of cement*

[2] EN 197-2:2000, *Cement — Part 2: Conformity evaluation*

National annex NA (informative)
Additional information to be provided in special cases

NA.1 General

In accordance with the note to Clause **1**, "… in special cases, an exchange of additional information between the masonry cement producer [1)] and the user can be helpful." The details "… should be dealt with in accordance with national standards or other regulations or can be agreed between the parties concerned", are outlined in, but not limited to, this annex.

NA.2 Marking

The bag containing the masonry cement, or its accompanying delivery note, should be identified with the following particulars (most of which are already stated in **ZA.3**, but which are repeated here for ease of reference for the user of this standard):

a) the name, trade mark or other means of identification of the manufacturer to facilitate traceability to the works in which the masonry cement was manufactured;

b) the name, and strength class of the cement;

   e.g. masonry cement, type MC 12,5;

c) the number and date of this British Standard, i.e. BS EN 413-1:2011;

d) the CE marking plus associated information.

NA.3 Test report

If a test report is requested from the manufacturer, it should include results of the following tests on samples of masonry cement relating to the material delivered:

a) compressive strength at 7 days, if appropriate, and also at 28 days (see **5.3.6**);

b) initial setting time (see **5.3.2**);

c) soundness (see **5.3.4**);

d) sulfate content (see **5.4**);

e) chloride content (see **5.4**);

f) air content (see **5.3.5**);

g) water retention (see **5.3.5**).

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1) In the rest of this annex, the term "producer" is substituted by the term "manufacturer".

National annex NB (informative)
Sampling and testing for acceptance inspection at delivery

NB.1 For acceptance at delivery, when requested, a spot sample of the masonry cement should be taken in accordance with the relevant clauses of BS EN 196-7 either before, or at the time of delivery. A laboratory sample should be prepared from the spot sample and packed in accordance with BS EN 196-7. A sampling report should be completed at the time of sampling and should be attached to the laboratory sample in accordance with BS EN 196-7.

NOTE 1 Testing may be delayed for up to three months from the time of sampling, provided that there is confirmation that the sample has been stored continuously in the manner described in BS EN 196-7.

NB.2 When the masonry cement is tested for compressive strength (see **5.3.6**), it is recommended that the source from which the CEN Standard sand (see BS EN 196-1) is obtained and the compaction procedure used should be the same as those in use by the manufacturer at the time the cement was originally tested.

NOTE It should be noted that the source of CEN Standard sands and the compaction procedure can, within permitted limits (see BS EN 196-1:2005, **11.2.3.3** and **11.3.2.3**), influence the strength achieved.

NB.3 When the masonry cement is tested for chemical properties (see **5.4**), the sample should be prepared by the method described in BS EN 196-2.

NB.4 The testing of properties of the laboratory sample should be carried out in accordance with the relevant methods in BS EN 413-2 or the BS EN 196 series of standards.

NB.5 The limiting values applicable to acceptance inspection of masonry cement should be those given in Table NB.1.

Table NB.1 **Acceptance inspection limiting values**

Property		Type				
		MC 5	MC 12,5	MC 22,5	MC 12,5 X	MC 22,5 X
Compressive strength (MPa)						
lower limit value	7 day	–	6	9	6	9
	28 day	4	10,5	20.5	10,5	20,5
Compressive strength (MPa)						
upper limit value	28 day	17,5	37,5	47,5	37,5	47,5
Setting times						
Initial – lower limit (min)		45	45	45	45	45
Final – upper limit (h)		17	17	17	17	17
Soundness						
maximum (mm)		10	10	10	10	10
Sulfate content (as % SO_3)						
maximum (% by mass)		2,5	3,5 [1)]	3,5 [1)]	3,5 [1)]	3,5 [1)]
Chloride content						
maximum (% by mass)		–	0,10	0,10	0,10	0,10
Water retention						
lower limit (% by mass)		75	75	75	70	70
Air content						
upper limit (% by volume)		25	25	25	–	–
lower limit (% by volume)		6	6	6	–	–

[1)] 4,0 % by mass if the Portland cement clinker content can be shown to be not less than 55 %.

National annex NC (informative)
Workability

Technical Committee CEN/TC 51 (as stated in the Foreword) and BSI Subcommittee B/516/10 recognize the importance of workability (cohesivity at standard consistence) of mortars prepared from masonry cements. A test method is available in the published document PD CR 13933, within which, results of a test programme are also given. This test method was found not to be valid for standard requirement purposes due to its poor reproducibility; however, it provides valuable information for the manufacturers and users on the property in use of masonry cements.

National annex ND (informative)
Guidance on use of the product

ND.1 General

Guidance on the use of masonry cement in mortars can be found in the National Annex to BS EN 1996-1-1, as well as BS EN 998-1, BS EN 998-2, BS EN 13914-1, BS EN 13914-2, BS 8000-3 and PD 6678.

ND.2 Safety

ND.2.1 Manual handling of bags

Manual handling activities are subject to the Manual Handling Operations Regulations 1992 (as amended) [1]. Where manual handling operations cannot be avoided, the Regulations require that the risks be assessed and reduced so far as is reasonably practicable. Guidance on how to assess and reduce risk, is given by the Health and Safety Executive (HSE), the UK's regulatory authority, in its booklet, Manual Handling [Manual Handling Operations Regulations 1992 (as amended)] [2], Guidance and Regulations L23 (HMSO). In addition, the HSE in its Construction Information Sheet No. 26 (revision 2) [3], recommends that cement should be supplied in 25 kg bags or ordered in bulk supply, in order to reduce the risk of injury.

ND.2.2 Safety in use

ND.2.2.1 Regulations

Work with cement is subject to the Control of Substances Hazardous to Health Regulations (COSHH) 2002 (as amended) [4]. Further, cements based on Portland cement clinker have been classified as irritant under The Chemicals [Hazard Information & Packaging for Supply] Regulations (CHIP 4) 2009 [5]. In addition, requirements to limit the water-soluble chromium (VI) content to no more than 2ppm (0,0002%) by total dry weight of cement and the provision of Safety Data Sheets (SDS), are both covered by the REACH Regulation [6].

ND.2.2.2 Hazards

When masonry cement is mixed with water, for example when making mortar, or when cement becomes damp, a concentrated alkaline solution is produced. Where this comes into contact with the eyes or skin, it may cause serious burns and ulceration. The eyes are particularly vulnerable and injury will increase with contact time.

Concentrated alkaline solutions in contact with skin tend to damage the nerve endings first before damaging the skin. Chemical burns can develop without pain being felt at the time.

In addition, cement-mortar and other wet cement-based mixes may, until they have set, cause both irritant and allergic contact dermatitis:

a) Irritant contact dermatitis results from a combination of the moisture content, alkalinity and abrasiveness of the construction materials.

b) Allergic contact dermatitis is mainly a consequence of the sensitivity of an individual's skin to hexavalent chromium salts in solution.

High repeated exposures to airborne cement in excess of the Occupational Exposure Standard (OES) [7] have been linked with rhinitis and coughing.

ND.2.2.3 First aid measures

a) In the event that eyes come into contact with masonry cement, wash eyes immediately with copious amounts of clean water for a period of at least 15 minutes and seek medical advice without delay.

b) In the event that skin comes into contact with masonry cement, wash the affected area thoroughly with soap and water before continuing the activity. If irritation, pain or skin trouble occurs, seek medical advice.

Clothing or footwear contaminated by wet cement, or cement-mortar should be removed and washed immediately and thoroughly before being reused.

ND.2.2.4 Use of personal protective equipment (PPE)

a) Where the risk of cement becoming airborne can be neither prevented nor completely controlled, attention is drawn to The Control of Substances Hazardous to Health Regulations 2002 (COSHH) (as amended) which specify a regulatory exposure limit ["Occupational Exposure Standard" ("OES")] and the use of appropriate respiratory protective equipment to ensure that exposure is less than the OES, and users' obligations thereunder. In addition, dustproof goggles should be worn in order to protect the eyes.

b) Where the risks from contact with wet cement or wet mortar can be neither prevented nor completely controlled, appropriate protective equipment should be worn as follows.

   1) Waterproof protective clothing should be worn in order that cement, or any cement and water mixture, e.g. mortar, does not come into contact with the skin. Should wet mortar enter waterproof footwear, waterproof gloves or other waterproof protective clothing, then the item(s) of clothing should be removed immediately and the skin thoroughly washed with soap and water. Items of waterproof protective clothing that have been worn should be washed before reuse.

   2) Where this appropriate protective equipment takes the form of eye protection, wherever there is a risk of cement, or any wet cement mixture entering the eye, dustproof goggles should be worn.

ND.3 Storage

To protect masonry cement from premature hydration after delivery and to optimize the activity of any reducing agent added to the cement to reduce the water-soluble chromium (VI) content to no more than 2ppm (0,0002%), bulk silos should be waterproof and internal condensation should be minimized. Where reducing agents are used, manufacturers are required, under Annex 17 of the REACH Regulation [6] to mark delivery documents with the despatch date and the storage period appropriate to maintaining the activity of the reducing agent required to keep the content of soluble chromium (VI) below the regulatory limit.

Masonry cement in paper bags should be stored unopened, clear of the ground, not more than eight bags high, in cool, dry conditions protected from excessive draught and additionally protected by a waterproof structure where storage is external to buildings. As significant strength losses begin after four to six weeks of storage in paper bags in normal conditions, and considerably sooner under adverse weather conditions or high humidity, deliveries should be controlled and used in order of receipt. Where reducing agents are used, manufacturers are required, under the REACH Regulation to legibly and indelibly mark bags with information on the packing date and the storage period appropriate to maintaining the activity of the reducing agent required to keep the content of soluble chromium (VI) below the regulatory limit.

ND.4 Use of masonry cement in mortar

In the UK, the only type of masonry cement that has established its suitability for use in mortar, is the air entrained type MC 12,5. As stated in the National Foreword, there is no body of experience in the UK of types MC 5, MC 22,5, MC 12,5 X and MC 22,5 X.

The mix proportions (by volume) required to produce any given type of prescribed mortar will vary depending on the composition and bulk density of the masonry cement. Manufacturers' advice should be followed to achieve the required type.

The compositional possibilities covered in this British Standard permit the use of masonry cements that contain lower clinker contents than the type MC 12,5 established in the UK. Although information can be obtained about the working properties, such as workability (see National annex NC), of these other masonry cements specified in this Standard, there is as yet no information available on the durability of these other masonry cements when they are subjected to UK climatic conditions. In particular, type MC 5 may be considered to be unsuitable for external masonry in the UK and non air entrained types MC 12,5 X and MC 22,5 X may be considered to be more susceptible to the action of freezing and thawing.

National annex NE (informative)
National Bibliography

NE.1 Standards publications

BS 8000-3, *Workmanship on building sites — Part 3: Code of practice for masonry*

PD 6678, *Guide to the specification of masonry mortar*

BS EN 196 (all parts), *Methods of testing cement*

BS EN 413-2, *Masonry cement — Part 2: Test methods*

BS EN 998-1, *Specification for mortar for masonry. Rendering and plastering mortar*

BS EN 998-2, *Specification for mortar for masonry. Masonry mortar*

BS EN 1996-1-1, *Eurocode 6. Design of masonry structures. General rules for reinforced and unreinforced masonry structures*

BS EN 13914-1, *Design, preparation and application of external rendering and internal plastering. External rendering*

BS EN 13914-2, *Design, preparation and application of external rendering and internal plastering. Design considerations and essential principles for internal plastering*

PD CR 13933, *Masonry cement — Testing for workability (cohesivity)*

NE.2 Other publications

[1] GREAT BRITAIN. Manual Handling Operations Regulations 1992 (as amended). London: The Stationery Office.

[2] GREAT BRITAIN. Manual Handling Operations Regulations 1992 (as amended), Guidance and Regulations booklet L23. London: The Stationery Office.

[3] Health and Safety Executive (HSE) – *Health and Safety Executive Construction information sheet No. 26*, (revision 2). London: HSE books, 2002.

[4] GREAT BRITAIN. Control of Substances Hazardous to Health Regulations (COSHH) 2002 (as amended). London: The Stationery Office.

[5] GREAT BRITAIN. The Chemicals [Hazard Information and Packaging for Supply] Regulations (CHIP 4) 2009. London: The Stationery Office.

[6] EUROPE. Regulation (EC) No. 1907/2006 of the European Parliament and Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No. 793/93 and Commission Regulation (EC) No. 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC. Brussels: OJEU L 136

[7] FAIRHURST, S., *et al. – Portland Cement Dust Criteria document, for an occupational exposure limit*, (HSE EH65/12). London: HSE books, 1994.

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