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BSI Standards Publication

Specification for mortar for masonry

Part 2: Masonry mortar

bsi.

National foreword

This British Standard is the UK implementation of EN 998-2:2016. It supersedes BS EN 998-2:2010 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/519/2, Mortar.

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

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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European foreword

This document (EN 998-2:2016) has been prepared by Technical Committee CEN/TC 125 “Masonry”, the secretariat of which is held by BSI.

This document supersedes EN 998-2:2010.

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of an identical text or by endorsement, at the latest by May 2017, and conflicting national standards shall be withdrawn at the latest by August 2018.

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

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

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

The most significant changes compared to the previous edition include:

a) implementation of new regulatory (CPR) terminology where relevant;

b) new subclause 5.4.2.2 on Flexural bond strength (deriving from Finnish legal query);

c) revised clauses on Assessment and verification of constancy of performance (AVCP);

d) new explanatory note added to tabulated values in Annex C;

e) new annex with indicative frequencies on testing for factory production control (informative);

f) revised Annex ZA (informative);

g) some minor editorial changes.

No changes to existing technical classes and/or threshold levels have been made.

EN 998, *Specification for mortar for masonry* consists of:

— *Part 1: Rendering and plastering mortar;*

— *Part 2: Masonry mortar.*

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.

According to the CEN/CENELEC Internal Regulations, the national standards organisations 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.

Introduction

The characteristics required of a mortar are related to its use.

They are considered in two groups, namely those relating to the fresh, unhardened mortar and those to the hardened mortar.

1 Scope

This European Standard specifies requirements for factory-made masonry mortars (bedding, jointing and pointing) for use in masonry walls, columns and partitions (e.g. facing and rendered masonry, load bearing or non-load bearing masonry structures for buildings and civil engineering works).

This European Standard defines for fresh mortar the performance related to workable life, chloride content, air content, density and correction time (for thin-layer mortar only). For hardened mortar it defines, e.g. performance related to compressive strength, bond strength, density measured according to the corresponding test methods contained in separate European Standards.

This European Standard provides for the assessment and verification of constancy of performance (AVCP) of the product to this European Standard. The marking requirement for products covered by this European Standard is included.

This European Standard covers masonry mortars defined in Clause 3 with the exception of site made mortar. However, this European Standard or part of this European Standard may be used in conjunction with codes of application and national specifications covering site made mortar.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 771 (all parts), *Specification for masonry units*

EN 1015-1, *Methods of test for mortar for masonry - Part 1: Determination of particle size distribution (by sieve analysis)*

EN 1015-2, *Methods of test for mortar for masonry - Part 2: Bulk sampling of mortars and preparation of test mortars*

EN 1015-7, *Methods of test for mortar for masonry - Part 7: Determination of air content of fresh mortar*

EN 1015-9, *Methods of test for mortar for masonry - Part 9: Determination of workable life and correction time of fresh mortar*

EN 1015-10, *Methods of test for mortar for masonry - Part 10: Determination of dry bulk density of hardened mortar*

EN 1015-11, *Methods of test for mortar for masonary - Part 11: Determination of flexural and compressive strength of hardened mortar*

EN 1015-17, *Methods of test for mortar for masonry - Part 17: Determination of water-soluble chloride content of fresh mortars*

EN 1015-18, *Methods of test for mortar for masonry - Part 18: Determination of water absorption coefficient due to capillary action of hardened mortar*

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

EN 1052-5, *Methods of test for masonry - Part 5: Determination of bond strength by the bond wrench method*

EN 1745:2012, *Masonry and masonry products - Methods for determining thermal properties*

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

3 Terms and definitions

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

3.1
masonry mortar
mix of one or more inorganic binders, aggregates, water, and sometimes additions and/or admixtures for bedding, jointing and pointing of masonry

3.2
fresh masonry mortar
mortar completely mixed and ready for use

3.3
Type of masonry mortar, defined according to concept

3.3.1
designed masonry mortar
mortar whose composition and manufacturing method is chosen by the producer in order to achieve specified properties (performance concept)

3.3.2
prescribed masonry mortar
mortar made in predetermined proportions, the properties of which are assumed from the stated proportion of the constituents (recipe concept)

3.4
Type of masonry mortar, defined according to properties and/or use

3.4.1
general purpose masonry mortar (G)
masonry mortar without special characteristics

3.4.2
thin layer masonry mortar (T)
designed masonry mortar with a maximum aggregate size less than or equal to a prescribed figure (see 5.5.2)

3.4.3
lightweight masonry mortar (L)
designed masonry mortar with a dry hardened density below a prescribed figure (see 5.4.5)

3.5
Type of masonry mortar, defined according to the mode of manufacture

3.5.1
factory-made masonry mortar
mortar batched and mixed in a factory

Note 1 to entry: It can be "dry mortar" which is ready-mixed, only requiring the addition of water or "wet mortar" which is supplied ready for use.

3.5.2
semi-finished factory made masonry mortar
mortar described in either 3.5.2.1 or 3.5.2.2

3.5.2.1
pre-batched masonry mortar
mortar whose constituents are wholly batched in a factory, supplied to the building site and mixed there according to the manufacturer's specification and conditions

3.5.2.2
premixed lime-sand- masonry mortar
mortar whose constituents are wholly batched and mixed in a factory, supplied to the building site where further constituents specified or provided by the factory are added (e.g. cement)

3.5.3
site-made masonry mortar
mortar composed of individual constituents batched and mixed on the building site

3.6
binder
material used to hold solid particles together in a coherent mass, e.g. cement, building lime

3.7
aggregate
granular material that does not contribute to the hardening reaction of the mortar

3.8
admixture
material added in small quantities to produce specified modifications to the properties

3.9
addition
finely divided inorganic material (which is not an aggregate or binder) that can be added to mortar in order to improve or achieve special properties

3.10
bond strength
adhesion between the masonry mortar and the masonry unit

Note 1 to entry: The bond strength can either be determined as shear bond strength or as flexural bond strength.

3.11
declared value
value that a manufacturer is confident in achieving, taking into account the precision of test method, the variability of the production process(es) and the product performance

Note 1 to entry: Characteristic strength values may be determined in accordance with the relevant test methods.

3.12
masonry subjected to severe exposure
masonry or elements of masonry which are subjected to saturation with water (driving rain, ground water) combined with frequent freeze/thaw-cycling due to climatic conditions, and absence of protective features

3.13
masonry subjected to moderate exposure
masonry or elements of masonry which are exposed to moisture and freeze/thaw-cycling, excluding constructions subjected to severe exposure

3.14
masonry subjected to passive exposure
masonry or elements of masonry which are not intended to be exposed to moisture and freezing conditions

3.15
product-type
set of representative performance levels or classes of a construction product, in relation to its essential characteristics, produced using a given combination of raw materials or other elements in a specific production process

Note 1 to entry: The definition is taken from Regulation (EU) No. 305/2011.

4 Materials

Raw materials shall have characteristics permitting the finished product to conform to the requirements of this European Standard. The manufacturer shall keep records of how suitability of materials is established.

5 Product characteristics

5.1 General

The requirements on characteristics for fresh and hardened mortar specified in this European Standard shall be defined in terms of the test methods and other procedures referred to in this European Standard. The conformity criteria given in the following subclauses relate to product-type determination (see 8.2) and consignments testing (in accordance with Annex A). For production evaluation, the manufacturer shall define the conformity criteria in the factory production control documentation (see 8.3).

NOTE The characteristics of mortar are specified under laboratory conditions and cannot always be directly compared with the characteristics obtained under site conditions.

5.2 Characteristics of fresh mortar

5.2.1 Workable life

The workable life shall be declared by the manufacturer. When the masonry mortar is sampled in accordance with EN 1015-2 and tested in accordance with EN 1015-9, the workable life shall not be less than the declared value.

5.2.2 Chloride content

When relevant, the chloride content of the mortar as delivered shall be declared by the manufacturer. When sampled in accordance with EN 1015-2 and either tested in accordance with EN 1015-17 using the procedure for determining water soluble chloride content or using a calculation based on measured chloride ion content of the constituents of the mortar, the chloride content shall not be higher than the declared value.

The chloride content should not exceed 0,1 % Cl of the mortar by dry mass.

5.2.3 Air content

When relevant for the use for which the masonry mortar is placed on the market the range in which the air content will fall shall be declared by the manufacturer. When sampled in accordance with EN 1015-2 and tested in accordance with EN 1015-7 the air content shall fall within the declared range.

For masonry mortar where porous aggregates are used the air content may alternatively be determined by testing the fresh mortar density according to EN 1015-6.

5.3 Proportion of constituents

For prescribed mortars, the mix proportions by volume or by weight of all the constituents shall be declared by the manufacturer. In addition, the compressive strength shall be declared using publicly available references establishing relationship between same mix proportions of the same constituents and compressive strength.

5.4 Characteristics of hardened mortar

5.4.1 Compressive strength

For designed mortars, the compressive strength of masonry mortar shall be declared by the manufacturer. The manufacturer may declare, alternatively or as supplement, the compressive strength class in accordance with Table 1, where the compressive strength is designated by an 'M' followed by the compressive strength class in N/mm^2, which it exceeds.

Table 1 — Mortar classes

Class	M 1	M 2,5	M 5	M 10	M 15	M 20	M d
Compressive strength N/mm^2	1	2,5	5	10	15	20	d
d is a compressive strength greater than 20 N/mm^2 as a multiple of 5 declared by the manufacturer.							

When the masonry mortar is sampled in accordance with EN 1015-2 and tested in accordance with EN 1015-11, the compressive strength shall not be less than the declared compressive strength or the declared compressive strength class. The declaration shall be followed by information on the test sample preparation used (with or without absorbent filter paper).

5.4.2 Bond strength

5.4.2.1 Shear bond strength

For designed masonry, mortars intended to be used in elements subjected to structural requirements the shear bond strength of the mortar in combination with a masonry unit shall be declared in terms of the characteristic initial shear strength. The declaration may be made either on the basis of tests as a) below or tabulated values as b) below. The manufacturer shall declare the basis for his declaration.

a) Declaration based on tests

The characteristic initial shear strength of the mortar in combination with a specific type of unit in accordance with EN 771 may be based on tests on mortar sampled in accordance with EN 1015-2 and tested with the relevant unit in accordance with EN 1052-3. The characteristic initial shear strength shall not be less than the declared value.

b) Declaration based on tabulated values

When no declaration is made under a) the characteristic initial shear strength of the mortar in combination with a range of unit types shall be declared by reference to Annex C.

NOTE Shear bond strength depends on the mortar, the masonry unit, its moisture content and the workmanship.

5.4.2.2 Flexural bond strength

For designed masonry mortars intended to be used in elements subjected to structural requirements and when relevant for the intended place of use, the flexural bond strength of the mortar in combination with a masonry unit shall be declared either in terms of the characteristic flexural bond strength, as a) below, or in terms of the characteristic flexural strength of the masonry, as b) below. The manufacturer shall declare the basis for his declaration.

a) Declaration based on flexural bond strength tests

The characteristic flexural bond strength of the mortar in combination with a specific type of unit in accordance with EN 771 may be based on tests on mortar sampled in accordance with EN 1015-2 and tested with the relevant unit in accordance with EN 1052-5. The characteristic flexural bond strength shall not be less than the declared value.

b) Declaration based on direct flexural strength (masonry) tests

The characteristic flexural strength of the mortar in combination with a specific type of unit in accordance with EN 771 may be based on tests on mortar sampled in accordance with EN 1015-2 and tested with the relevant unit in accordance with EN 1052-2 either in the plane of failure parallel or perpendicular to the bed joints, or both. The characteristic flexural strength shall not be less than the declared value.

NOTE 1 Flexural bond strength depends on the mortar, the masonry unit, its moisture content and the workmanship.

NOTE 2 In accordance with EN 1996-1-1, the declared flexural bond strength can be used in publicly available references to obtain the characteristic flexural strength of masonry from the same combinations of mortars and units.

5.4.3 Water absorption

For masonry mortar intended to be used in external elements and exposed directly to the weather, the water absorption shall be declared by the manufacturer. When sampled in accordance with EN 1015-2 and tested in accordance with EN 1015-18, the water absorption shall not be higher than the declared value.

5.4.4 Water vapour permeability

For masonry mortar intended to be used in external elements, the water vapour permeability shall be declared by the manufacturer by reference to EN 1745:2012, Table A.12 giving tabulated values for water vapour diffusion coefficient for mortar.

5.4.5 Density (dry hardened mortar)

When relevant for the use for which the masonry mortar is placed on the market the range in which the density of dry hardened mortar will fall shall be declared by the manufacturer. When the masonry mortar is sampled in accordance with EN 1015-2 and tested in accordance with EN 1015-10 the density shall fall within the declared range.

For lightweight masonry mortar, the density shall be equal to or less than 1 300 kg/m^3.

5.4.6 Thermal conductivity

For masonry mortar intended to be used in elements subject to thermal requirements the manufacturer shall give the mean $\lambda_{10,dry,mat}$ -value for the thermal conductivity of the masonry mortar by reference to EN 1745:2012, Table A.12. Especially for lightweight masonry mortar, measured values according to EN 1745:2012, 4.2.2 may alternatively be declared. The manufacturer shall declare the basis for his declaration. In addition, another fractile may be used. If so, the used fractile shall be provided together with the additional provided $\lambda_{10,dry,mat}$ –value.

When the masonry mortar is sampled in accordance with EN 1015-2 and tested in accordance with EN 1745, the thermal conductivity shall be not greater than the declared value.

5.4.7 Durability

Until a European test method is available, the freeze/thaw resistance shall be evaluated and declared to the provisions valid in the intended place of use of the mortar.

5.4.8 Reaction to fire

The manufacturer shall declare the reaction to fire classification of the masonry mortar.

Masonry mortars containing a mass or volume fraction of ≤ 1,0 % (whichever is the most onerous) of homogeneously distributed organic materials are classified as reaction to fire Class A1 without the need to test.

Masonry mortars containing a mass or volume fraction of > 1,0 % (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, in which non-combustible masonry mortars containing not more than a mass or volume fraction of 1,0 % (whichever is the more onerous) of homogeneously distributed organic materials are classified as reaction to fire Class A1 without testing.

5.4.9 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 Growth web site on EUROPA accessed through:

http://ec.europa.eu/growth/tools-databases/cp-ds/index_en.htm

5.5 Additional requirements for thin layer mortars

5.5.1 General

Thin layer mortars shall comply with the requirements described in 5.2 and 5.4 and with the following additional requirements.

NOTE Other requirements could be necessary if the thin layer mortar is intended to be used for joint thicknesses less than 1 mm.

5.5.2 Aggregates

The aggregate size shall be not greater than 2 mm when the masonry mortar is in accordance with EN 1015-2 and tested in accordance with EN 1015-1. The manufacturer shall declare the maximum grain size.

5.5.3 Correction time

The correction time shall be declared. When the masonry mortar is sampled in accordance with EN 1015-2 and tested according to EN 1015-9, the correction time shall be greater than the declared value.

5.6 Mixing of mortar on site

If certain types of mortar need specific site mixing equipment procedures or times, these shall be specified by the manufacturer. Mixing time is measured from the time when all constituents have been added.

6 Designation of masonry mortar

The designation shall include the following, as relevant:

— number of this European Standard;

— name of manufacturer;

— a code for or the date of production;

— type of mortar (3.2, 3.3 and 3.4);

— workable life (5.2.1);

— chloride content (5.2.2);

— air content (5.2.3);

— proportion of constituents (for prescribed mortars) and relationship to compressive strength or compressive strength class (5.3);

— compressive strength, and/or compressive strength class (for designed mortars) (5.4.1);

— bond strength (5.4.2);

— water absorption (5.4.3);

— water vapour permeability (5.4.4);

— density (5.4.5);

— thermal conductivity (5.4.6);

— durability (5.4.7);

— maximum aggregate grain size (5.5.2);

— correction time (5.5.3);

— reaction to fire (5.4.8).

In the designation for a product, information about special qualities should be included when the mortar is intended for use in special construction.

7 Marking and labelling

The designation (see Clause 6) or code identifying the designation shall be marked on the packaging, the delivery ticket or the manufacturer's data sheet or other information accompanying the product.

8 Assessment and verification of constancy of performance (AVCP)

8.1 General

Conformity assessment is needed to demonstrate, by product-type determination (see 8.2), that the product complies with the requirements of this European Standard and that the performance declarations represent the true behaviour of the product and, by Factory Production Control, FPC (see 8.3), that the performance declarations based on product-type determination results remain valid for subsequent products.

The manufacturer (or his agent) shall demonstrate the compliance for his product with the requirements of this European Standard by carrying out both product-type determination and FPC and is responsible for the product being in compliance with all the provisions.

8.2 Product-type determination

8.2.1 General

After completion of the development of a new product-type and before the commencement of the manufacture and the offering for sale, appropriate product-type determination shall be carried out that the properties predicted during the development meet the requirements of this European Standard and the values to be declared for the product.

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

For the verification of product characteristics requiring testing which is needed to be performed only during product-type determination, an individual manufacturer may use the product-type determination results obtained by someone else (another manufacturer) or carried out by industry to justify his own declaration of conformity 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 of the data owner is given, and the test is valid for both products.

Where a manufacturer produces the same product on more than one production line or unit, or in more than one factory, there may be no need to repeat product-type determination for these different production lines or units (the manufacturer takes responsibility for ensuring that the products are indeed the same).

8.2.2 Sampling

Sampling shall be carried out in accordance with Annex A.

8.2.3 Reference test

The tests to be conducted shall be reference tests as described in this European Standard for properly dried and hardened product characteristics according to Clause 5, consistent with the intended use(s) of the product-type.

8.2.4 Repeating of product-type determination

Product-type determination shall also be carried out on existing products when a change in the basic materials or manufacturing processes requires the consideration by the manufacturer if leading to a change in the declared performance of the product or the intended use(s) of the product. In these cases, the appropriate product-type determinations to be carried out are for those characteristics, which are affected or need confirming and any new characteristics introduced by a change of intended use(s).

8.2.5 Recording

The results of the product-type determinations shall be recorded.

8.2.6 Application of test methods

When declaration is based on tabulated values as defined in relevant clauses, testing is not required.

NOTE For CE marking, where some characteristics are not subject to regulations, it might be possible using the NPD option.

8.3 Factory Production Control, FPC

8.3.1 General

The manufacturer shall establish, document and maintain an FPC-system to enable continuing conformity with the standard and the declared values of the product placed on the market.

The FPC-system shall consist of procedures for process control (incoming raw material and production process), finished products (tests on finished products and test equipment), and traceability treatment of non-conforming products.

Any FPC system complying with EN ISO 9001 and made specific to the requirements of this European Standard is deemed to satisfy the requirement of FPC.

8.3.2 Process control

8.3.2.1 Incoming raw materials

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

8.3.2.2 Production process

The relevant features of the production processes shall be defined giving the frequency of the manufacturer's inspection checks, together with the required criteria and the required in-progress product characteristics. Actions to be taken, when the criteria or the product characteristics are not achieved, shall be specified by the manufacturer within the FPC documentation.

All production equipment that has an influence on the declared values shall be controlled and regularly inspected according to the documented procedures, frequencies and criteria.

8.3.3 Finished product conformity

8.3.3.1 Tests on the finished product

The FPC system shall incorporate a sampling plan containing the frequencies of testing of the products. The results of testing shall be recorded.

NOTE Examples for test frequencies are given in Annex D.

For production evaluation, the manufacturer shall define the conformity criteria in the FPC documentation.

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

a) a correlation can be demonstrated between the results from the reference test and those from the alternative test; and

b) the information is available on which the correlation is based on.

The sampling shall be representative for the production.

The results of testing shall meet the specified compliance criteria and shall be recorded.

8.3.3.2 Test equipment

All weighing, measuring and testing equipment which has an influence on the declared values shall be calibrated and regularly inspected in accordance with the documented procedures and frequencies, as stated in the FPC manual.

8.3.4 Statistical techniques

Where and when possible and applicable, the results of inspections 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 Guidance is given in FprCEN/TR 16886.

8.3.5 Traceability – marking and stock control of products

The marking and stock control shall be documented. Products shall be identifiable and traceable with regard to their production origin.

8.3.6 Non-conforming products

The procedure for dealing with non-conforming products shall be documented. Products that do not conform to the requirements shall be segregated and marked accordingly. However, these may be reclassified by the manufacturer and given different declared values. The manufacturer shall take action to avoid recurrence of the non-conformity.

Annex A
(normative)

Sampling for product-type determination and independent testing of consignments

A.1 General

This sampling procedure shall apply for product-type determination and in the event that there is a requirement for an assessment of product compliance. For independent testing where only those properties declared by the manufacturer shall be assessed, representatives of all parties shall have the opportunity to be present at the time of sampling.

The required amount of masonry mortar for one sample shall be sampled from a lot of masonry mortar of not more than 10 m^3.

A.2 Sampling procedure

The sampling shall follow one of the procedures as specified in EN 1015-2.

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

Annex B
(informative)

Use of masonry units and masonry mortar

European codes of practice have not yet been prepared dealing with architectural design and workmanship, encompassing the specification and use of units and masonry mortar to ensure that satisfactory durability in service is achieved in the finished masonry.

Until such time, as these codes become available, this annex entitled "Use of masonry units and masonry mortar" has been attached, relating the masonry mortar grades specified for such properties as frost resistance and soluble salts content to service conditions, including the degree of exposure and risk of saturation.

Before choosing the mortar, the degree of exposure should be considered. This will include protection against saturation.

"Severe", "moderate", and "passive" environment are expressions for the degree of risk of having masonry exposed to a high water content coincident with the risk of a high frequency of freezing-thawing cycles due to local climatic conditions and/or to the design of the construction.

The factors forming part of the environmental evaluation are temperature and moisture conditions as well as the occurrence of any aggressive substances. In the evaluation, it is necessary to use local or traditional experience.

The influence of possible surface coatings (e.g. painting) should be evaluated.

The examples given in the following should only be regarded as such.

a) Constructions subjected to severe exposure

   The following examples are given for masonry or masonry elements subjected to severe exposure:

   1) masonry near to external ground level (two courses above and below) where there is a high risk of saturation with freezing;

   2) unrendered parapets where there is a high risk of saturation with freezing, e.g. where the parapet is not provided with an effective coping;

   3) unrendered chimneys where there is a high risk of saturation with freezing;

   4) cappings, copings and sills in areas where freezing conditions may occur;

   5) free-standing boundary and screen walls where there is a high risk of saturation with freezing, for example if the wall is not provided with an effective coping;

   6) earth retaining walls where there is a high risk of saturation with freezing for example where the wall has not been provided with an effective coping or a water proofing treatment on the retaining face;

b) Constructions subjected to moderate exposure

   The following suitable measures to prevent saturation of the masonry are given:

   1) protection to wall heads by roof overhangs or copings;

2) projecting throated sills;

3) damp-proof courses at the top and base of walls;

c) Constructions subjected to passive exposure

The following examples are given for masonry or masonry elements subjected to passive exposure:

1) masonry in external walls, if provided with suitable protection, the extent of which depends on climatic conditions. In some parts of Europe, local experience shows that a thick layer of render provides such protection.

Annex C
(normative)

Characteristic initial shear strength of designed masonry mortars

The characteristic initial shear strength of designed masonry mortars in combination with masonry units according to EN 771 shall be as follows:

— 0,15 N/mm^2 for general purpose and lightweight mortar;

— 0,3 N/mm^2 for thin layer mortar.

NOTE Declarations based on these tabulated values remain the responsibility of the manufacturer using them and are to be supported by Appropriate Technical Documentation.

Annex D
(informative)

Indicative test frequencies for Factory Production Control (FPC)

Table D.1 — Testing of masonry mortars

Subject	Purpose of testing	Reference method [a]	Indicative frequency of testing by the manufacturer for a product-type
Compressive strength (for designed masonry mortars)	Conformity with the declared value or class	EN 1015-11	— At each change in production process and — 6 samples per 5 000 m^3 or 8 000 t/machine or — As given in the FPC documentation
Proportion of constituents (for prescribed masonry mortars)	Conformity with the declared proportion of constituents	-	— At each change in production process and — 6 samples per 5 000 m^3 or 8 000 t /machine or — As given in the FPC documentation
Shear bond strength (for designed masonry mortars intended to be used in elements subject to structural requirements) [b]	Conformity with the declared value	EN 1052-3	— Once a year or — As given in the FPC documentation
Flexural bond strength (for designed masonry mortars intended to be used in elements subject to structural requirements) [b]	Conformity with the declared value	EN 1052-2 (e.g. with blocks) EN 1052-5 (e.g. with bricks)	— Every 5 years or — As given in the FPC documentation
Content of chlorides (for masonry mortars intended for reinforced masonry) [b]	Conformity with the declared value	EN 1015-17	— Every 5 years or — As given in the FPC documentation

Subject	Purpose of testing	Reference method [a]	Indicative frequency of testing by the manufacturer for a product-type
Reaction to fire (for masonry mortars intended to be used in elements subject to fire requirements) [b]	Conformity with the declared class	EN 13501-1	— Every 5 years or — As given in the FPC documentation
Water absorption (for masonry mortars intended to be used in external elements) [b]	Conformity with the declared water absorption coefficient according to EN 998-2	EN 1015-18	— Once a year or — As given in the FPC documentation
Water vapour permeability (for masonry mortars intended to be used in external elements)	Conformity with the declared water vapour permeability coefficient according to EN 998-2	Tabulated value from EN 1745	— No need for testing
Thermal conductivity/Density (for masonry mortars intended to be used in elements subject to thermal insulation requirements) [b]	Conformity with declared value	EN 1745	— Every 5 years or — As given in the FPC documentation
Freeze-thaw resistance [b]	Conformity with declared value	National test method valid in the intended use	— As given in the national provisions or — As given in the FPC documentation
Dangerous substances [b]	Conformity with declared value	National test method valid in the intended use	— As given in the national provisions or — As given in the FPC documentation

[a] The tests should be carried out in accordance with the reference methods given in the standard or by applying alternative test methods with a proven correlation or a safe relationship to the reference methods.

[b] Only when declared by the manufacturer based on testing. 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 taken from a table (tabulated value) no FPC testing is required.

Annex ZA
(informative)

Relationship of this European Standard with Regulation (EU) No.305/2011

(When applying this standard as a harmonized standard under Regulation (EU) No. 305/2011, the manufacturers and Member States are obliged by this regulation to use this Annex)

ZA.1 Scope and relevant characteristics

This European Standard has been prepared under standardization request M 116 'Masonry and related products' (as amended) given to CEN and CENELEC by the European Commission (EC) and the European Free Trade Association (EFTA).

When this European Standard is cited in the Official Journal of the European Union (OJEU), under Regulation (EU) No 305/2011, it shall be possible to use it as a basis for the establishment of the Declaration of Performance (DoP) and the CE marking from the date of the beginning of the co-existence period as specified in the OJEU.

Regulation (EU) No 305/2011, as amended, contains provisions for the DoP and the CE marking.

Table ZA.1 — Relevant clauses for masonry mortars and intended use(s)

<table>
<tr><td colspan="4">Product: Factory-made masonry mortars, comprising the following types:
• General purpose mortar;
• Thin layer mortar;
• Lightweight mortar.
Intended use: In masonry walls, columns and partitions</td></tr>
<tr><th colspan="2">Essential characteristics</th><th>Clauses of this European Standard(s) related to essential characteristics</th><th>Classes and/or threshold levels</th><th>Notes</th></tr>
<tr><td colspan="2">Compressive strength
(for designed masonry mortars)</td><td>5.4.1</td><td>Classes</td><td>Declared value and/or category (N/mm^2)</td></tr>
<tr><td colspan="2">Proportion of constituents
(for prescribed masonry mortars)</td><td>5.3</td><td>None</td><td>Mix proportions by volume or weight</td></tr>
<tr><td rowspan="2">Bond strength
(for designed masonry mortars intended to be used in elements subject to structural requirements)</td><td>Shear bond strength</td><td>5.4.2.1</td><td>None</td><td>Declared tabulated or measured value (N/mm^2)</td></tr>
<tr><td>Flexural bond strength</td><td>5.4.2.2</td><td>None</td><td>Declared value (N/mm^2)</td></tr>
<tr><td colspan="2">Contents of chlorides
(for mortars intended for reinforced masonry)</td><td>5.2.2</td><td>None</td><td>Declared value (as a mass fraction in %)</td></tr>
</table>

Essential characteristics	Clauses of this European Standard(s) related to essential characteristics	Classes and/or threshold levels	Notes
Reaction to fire *(for masonry mortars intended to be used in elements subject to fire requirements)*	5.4.8	Euroclasses A1 to F	Declared Euroclass
Water absorption *(for masonry mortars intended to be used in external elements)*	5.4.3	None	Declared value [$kg/(m^2 \cdot min^{0,5})$]
Water vapour permeability *(for masonry mortars intended to be used in external elements)*	5.4.4	None	Declared tabulated water vapour diffusion coefficient μ
Thermal conductivity/Density *(for masonry mortars intended to be used in elements subject to thermal insulation requirements)*	5.4.6	None	Declared tabulated or measured mean value [W/(m·K)]
Durability	5.4.7	None	Declared value or description, as relevant
Dangerous substances	5.4.9	None	Declaration as per 5.4.9

ZA.2 System of Assessment and Verification of Constancy of Performance (AVCP)

The AVCP systems of masonry mortars indicated in Table ZA.1 can be found in the EC legal acts adopted by the EC: Commission Decision 97/740/EC of 14.10.1997 (OJEU L299 of 4.11.1997, p. 42) as amended by the Commission Decision 2001/596/EC of 8 January 2001 (OJEU L209 of 2.8.2001, p. 33).

ZA.3 Assignment of AVCP tasks

The AVCP of masonry mortars as provided in Table ZA.1 is defined in Tables ZA.3.1 to ZA.3.2 resulting from application of the clauses of this or other European Standard indicated therein. The content of the tasks assigned to the notified body shall be limited to those essential characteristics, if any, as provided for in Annex III of the relevant standardization request and to those that the manufacturer intends to declare.

Taking into account the AVCP systems defined for the products and the intended uses the following tasks are to be undertaken by the manufacturer and the notified body respectively for the assessment and verification of the constancy of performance of the product.

Table ZA.3.1— Assignment of AVCP tasks for factory-made designed masonry mortars under system 2+

Tasks		Content of the task	AVCP clauses to apply
Tasks for the manufacturer	An assessment of the performance of the construction product carried out on the basis of testing (including sampling), calculation, tabulated values or descriptive documentation of the product	Essential characteristics of Table ZA.1 relevant for the intended use(s) which are declared	8.2
	Factory production control (FPC)	Parameters related to essential characteristics of Table ZA.1 relevant for the intended use(s) which are declared	8.3
	Further testing of samples taken at the manufacturing plant by the manufacturer in accordance with the prescribed test plan.	Essential characteristics of Table ZA.1 relevant for the intended use(s) which are declared	8.3.3.1
Tasks for the notified production control certification body	Initial inspection of the manufacturing plant and of FPC	Parameters related to essential characteristics of Table ZA.1 relevant for the intended use(s), *which* are declared. Documentation of the FPC.	8.3
	Continuous surveillance, assessment and evaluation of FPC	Parameters related to essential characteristics of Table ZA.1 relevant for the intended use(s), *which* are declared. Documentation of the FPC.	8.3

Table ZA.3.2 — Assignment of AVCP tasks for factory-made prescribed masonry mortars under system 4

Tasks		Content of the task	AVCP clauses to apply
Tasks for the manufacturer	An assessment of the performance of the construction product on the basis of testing, calculation, tabulated values or descriptive documentation of that product	Essential characteristics of Table ZA.1 relevant for the intended use(s) which are declared	8.2
	Factory production control (FPC)	Parameters related to essential characteristics of Table ZA.1 relevant for the intended use(s) which are declared	8.3

Bibliography

[1] EN 1015-6, *Methods of test for mortar for masonry - Part 6: Determination of bulk density of fresh mortar*

[2] EN 1052-2, *Methods of test for masonry - Part 2: Determination of flexural strength*

[3] CEN/TR 15225, *Guidance on Factory Production Control for the CE Marking (Attestation of Conformity 2+) of designed masonry mortars*

[4] FprCEN/TR 16886, Guidance on the application of statistical methods for determining the properties of masonry products

[5] 2003/424/EC, *Commission Decision of 6 June 2003 amending Commission Decision 96/603/EC of 4 October 1996 establishing the list of products belonging to Classes A "No contribution to fire" provided for in Commission Decision 94/611/EC implementing Article 20 of Council Directive 89/106/EEC on construction products (Text with EEA relevance) (notified under document number C(2003) 1673)*

[6] EN ISO 9001, *Quality management systems - Requirements (ISO 9001)*

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

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