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Metode preskušanja zidarske malte - 11. del: Določevanje upogibne in tlačne trdnosti strjene malte

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

Prüfverfahren für Mörtel für Mauerwerk - Teil 11: Bestimmung der Biegezug- und Druckfestigkeit von Festmörtel

Methodes d'essai des mortiers pour maçonnerie - Détermination de la résistance a la flexion et a la compression du mortier durci

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Annex A (normative) Description of metal moulds for specimen preparation. 11

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 125 "Masonry", the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2000, and conflicting national standards shall be withdrawn at the latest by December 2001.

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

1 Scope

This European Standard specifies a method for determining the flexural and compressive strength of moulded mortar specimens.

2 Normative references

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

prEN 998-1	Specification for mortar for masonry - Part 1: Rendering and plastering mortar with inorganic binding agents
prEN 998-2	Specification for mortar for masonry - Part 2: Masonry mortar
EN 1015-2	Methods of test for mortar for masonry - Part 2 : Bulk sampling of mortars and preparation of test mortars
EN 1015-3	Methods of test for mortar for masonry - Part 3 : Determination of consistence of fresh mortar (by flow table)
ISO 468	Surface roughness - Parameters, their values and general rules for specifying requirements
EN ISO 6507-1	Metallic materials - Vickers hardness test - Part 1 : Test method

3 Principle

The flexural strength of mortar is determined by three point loading of hardened moulded mortar prism specimens to failure. The compressive strength of the mortar is determined on the two parts resulting from the flexural strength test. Where the flexural strength is not required, the parts for compressive strength testing can be produced from the prisms in any way which does not lead to these parts being damaged.

4 Definitions and symbols

4.1 Definitions

air-lime[1] : limes mainly consisting of calcium oxide or hydroxide which slowly harden in air by reacting with atmospheric carbon dioxide. Generally they do not harden under water as they have no hydraulic properties.

4.2 Symbols

F is the maximum load applied to the specimen, in Newtons (N).

l is the distance between the axes of the support rollers, in millimetres (mm).

b is the width of specimen in millimetres (mm).

d is the depth of the specimen in millimetres (mm).

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[1] An English translation of a term used in most European countries.

5 Apparatus

5.1. Metal moulds consisting of an open frame of removable walls forming three compartments when assembled (see figure 1 for typical design and Annex A for a detailed description).

5.2. A **tamper** consisting of a rigid, non-absorptive rod of square cross-section, each side of which is 12 mm ± 1 mm. The tamping face is flat and at right angles to the length of the tamper. The mass of the tamper is 50 g ± 1 g.

5.3. Storage chambers capable of maintaining a temperature of 20 °C ± 2 °C and a relative humidity of 95 % ± 5 % or 65 % ± 5 %.

5.4. A **clamp** enabling the assembled mould frame to be kept together at right angles.

5.5. White cotton gauze, four sheets each with a size of approximately 150 mm x 175 mm.

5.6. Absorbent filter paper with a specific mass of 200 g/m^2 ± 20 g/m^2 and water absorption capacity of
160 g/m^2 ± 20 g/m^2; twelve sheets each with a size of approximately 150 mm x 175 mm.

5.7. Polyethylene bags capable of containing the steel moulds.

5.8. Two glass plates of sufficient area to cover the steel mould.

5.9. A **palette knife**

5.10. A **grid** with webs of triangular section providing point contact support for storing and curing the specimens.

5.11. A **trowel**

Additional apparatus are described in 8.1 and 9.1.

6 Sampling

The fresh mortar for this test shall have a minimum volume of 1,5 1 or at least 1,5 times the quantity needed to perform the test, whichever is the greater, and shall be obtained either by reduction of the bulk test sample (see EN 1015-2) using a sample divider or by quartering, or by preparation from dry constituents and water in the laboratory. The flow value of the mortar in the bulk test sample shall be determined in accordance with EN 1015-3 and reported.

Laboratory mixed samples shall be before testing be brought to a defined flow value as specified in EN 1015-2.

Ready to use mortars (factory-made wet mortars which are retarded), and pre-batched air-lime/sand wet mortars when not gauged with hydraulic binders, shall be tested within their specified workable life.

The length of mixing period shall be measured from the moment all constituents are introduced into the mixer.

Before testing, the batch shall be gently stirred by hand using a trowel or palette knife in 5 s to 10 s to counteract any false setting etc., but without any additional mixing of the batch.

Any deviation from the mixing procedure shall be noted.

7 Preparation and storage of test specimens

7.1 General

The test specimens shall be prisms 160 mm x 40 mm x 40 mm. Three specimens shall be provided. For the compressive strength test, break the prisms into two halves to provide six half prisms.

7.2 Preparation

7.2.1 General

Prepare mortars based on hydraulic binders (retarded or not retarded), and air-lime/cement mortars with mass of air-lime not exceeding 50% of the total binder mass, in accordance with 7.2.2.

Prepare mortars based on air-lime, and air-lime/cement mortars with cement mass not exceeding 50% of the total binder mass, in accordance with 7.2.3.

Preparation and storage conditions are given in table 1.

Prepare three specimens for testing at an age of 28 days, or more if retarding agents are incorporated in the mortar, unless otherwise specified.

Clean the moulds and lubricate the internal faces of the assembled moulds with a thin layer of mineral oil to prevent adhesion of the mortar.

7.2.2 Mortars with hydraulic binders, and air-lime/cement mortars with mass of air-lime not exceeding 50% of the total binder mass.

Fill the mould with mortar in two approximately equal layers, each layer being compacted by 25 strokes of the tamper.

Skim off the excess mortar with a palette knife, leaving the mortar surface plane and level with the top of the mould. Then store the mould as described in 7.3.

7.2.3 Mortars based on air-lime, and air-lime/cement mortars with cement mass not exceeding 50% of the total binder mass.

Place the assembled mould frame, clamped together at right angles, on a glass plate on which two layers of dry white cotton gauze have been placed. Fill the mould with mortar in two approximately equal layers, each layer being compacted by 25 strokes of the tamper.

Skim off the excess mortar with a palette knife leaving the mortar surface plane and level with the top of the mould.

Place two layers of white cotton gauze tightly on the mortar surface. Place six layers of absorbent filter paper on top of the gauze.

Cover the absorbent filter paper with a glass plate and turn the mould upside down keeping the glass plates at the bottom and top firmly attached to the mould.

Carefully remove the glass plate from the top of the inverted mould, place six layers of absorbent filter paper on the exposed gauze and re-cover with the glass plate on top.

Re-invert the mould back to its upright position and place it on a fixed table and load with mass of approximately 5 kg.

After 3 h remove the load and the glass plate. Discard the absorbent filter paper and the gauze on top of the mould, and re-cover with the glass plate on top. Invert the mould, keeping the glass plates at the bottom and the top firmly attached to the mould. Remove the glass plate from the top of the inverted mould and discard the absorbent filter paper and the gauze. Then store the mould as described in 7.3.

7.3 Storage and curing conditions

Place the mould in a humidity chamber or in sealed polyethylene bags . Then after the period given in table 1 remove the specimens from the mould and subsequently store them on the grid with triangular section webs under the conditions also described in table 1

Table 1: Preparation and conditions of storing specimens

Type of mortar	Preparation	Storage time at a temperature of 20 °C ± 2 °C in days		
		Relative humidity		
		95 % ± 5 % or in polyethylene bag		65 % ± 5 %
		in the mould	with the mould removed	with the mould removed
Air-lime mortars	7.2.3	5	2	21
Air-lime/cement mortars with cement mass not exceeding 50 % of the total binder mass	7.2.3	5	2	21
Cement and air-lime/cement mortars with mass of air-lime not exceeding 50 % of the total binder mass	7.2.2	2	5	21
Mortars with other hydraulic binders	7.2.2	2	5	21
Retarded mortars	7.2.2	5	2	21

8 Determination of flexural strength

8.1 Apparatus

A testing machine capable of applying the load at a rate specified in 8.2. The machine shall comply with the requirements in table 2. The machine shall have two steel supporting rollers of length between 45 mm and 50 mm and 10 mm ± 0,5 mm diameter, spaced 100,0 mm ± 0,5 mm apart, and a third steel roller of the same length and diameter located centrally between the support rollers (see figure 2). The three vertical planes through the axes of the three rollers shall be parallel and remain parallel, equidistant and normal to the direction of the prism under test. One of the supporting rollers and the loading roller shall be capable of tilting slightly to allow a uniform distribution of the load over the width of the prism without subjecting it to any torsional stresses.