SLOVENSKI STANDARD
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Zidarski cement - 2. del: Preskusne metode

Masonry cement - Part 2: Test methods

Putz- und Mauerbinder - Teil 2: Prüfverfahren

Ciment à maçonner - Partie 2 : Méthodes d'essai

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Masonry cement - Part 2: Test methods

Ciment à maçonner - Partie 2 : Méthodes d'essai

Putz- und Mauerbinder - Teil 2: Prüfverfahren

This European Standard was approved by CEN on 18 June 2016.

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COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 413-2:2016) 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of an identical text or by endorsement, at the latest by February 2017, and conflicting national standards shall be withdrawn at the latest by February 2017.

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

This document supersedes EN 413-2:2005.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

EN 413, Masonry cement, consists of the following parts:

— Part 1: Composition, specifications and conformity criteria;

— Part 2: Test methods.

The main differences between this document and EN 413-2:2005 are:

— updating of normative references;

— revised guidance on the properties of gauzes used in the water retention test;

— revised repeatability and reproducibility limits for setting time(Method B), water retention and air content (these revisions are based on a round-robin test programme instituted following the introduction of a new class of Masonry cement MC 22,5 into EN 413-1).

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

This European Standard includes additional test methods to those described in the EN 196 series, *Methods of testing cement*, that enable the performance of masonry cement to be assessed when used in mortar for bedding masonry units and for rendering and plastering.

1 Scope

This European Standard describes reference and alternative test methods to be used when testing masonry cements to assess their conformity to EN 413-1. It gives the tests on fresh mortar for consistence, water retention and air content.

In the event of a dispute, only the reference methods are used.

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

EN 196-3:2005+A1:2008, *Methods of testing cement - Part 3: Determination of setting times and soundness*

EN 459-2:2010, *Building lime - Part 2: Test methods*

3 General requirements for testing

3.1 Laboratory

Unless specifically stated to the contrary, all the tests described in this document shall be carried out in a laboratory where the air temperature is maintained at (20 ± 2) °C and the relative humidity at not less than 50 %.

3.2 Manufacturing tolerances for test equipment

3.2.1 Dimensions

Figures indicating the specified requirements for apparatus used in the tests described in this document shall include essential dimensions for which manufacturing tolerances are given.

Unless otherwise stated, tolerance class m according to EN 22768-1 should be applied.

NOTE Other dimensions are given for guidance.

3.2.2 Mass

Specified masses shall have manufacturing tolerances within ± 1 % of the mass unless otherwise stated.

3.3 Tolerances for test equipment in use

Tolerances applying to apparatus, which has been subjected to wear in use shall not exceed twice the corresponding manufacturing tolerance unless alternative requirements are specified.

3.4 Number of tests

Where the test is one of a series subject to statistical control, determination of each property by a single test shall be the minimum required.

Where the test is not part of a series subject to statistical control, two tests shall be performed to determine each property.

4 Determination of setting time

4.1 General

The setting time is determined by observing the penetration of a needle into a cement paste of standard consistence until it reaches a specified value.

The setting time is determined in accordance with either method A (4.2) or method B (4.3).

Method B is the reference method.

4.2 Method A

The setting time is determined in accordance with EN 196-3.

NOTE Experience has shown that the method specified in EN 196–3, in which the specimens are tested under water, is not suitable for some masonry cements which have low clinker contents.

4.3 Method B

4.3.1 Test principle

The equipment used and the specimen preparation procedures are as described in EN 196-3 but with the additional requirement for a room or a humidity cabinet of adequate size and maintained at (20 ± 1) °C and not less than 90 % relative humidity.

4.3.2 Initial setting time procedure

Calibrate the Vicat apparatus with the needle, attached in advance of the test, by lowering the needle to rest on the base-plate to be used and adjusting the pointer to read zero on the scale. Raise the needle to the stand-by position. Fill a Vicat mould in accordance with EN 196-3:2005+A1:2008, 5.2.2 with paste of standard consistence mixed in accordance with EN 196-3:2005+A1:2008, 5.2.1

Place the filled mould and base-plate in the room or humidity cabinet and after a suitable time, position the mould and base-plate under the needle of the Vicat apparatus. Lower the needle gently until it is in contact with the paste. Pause in that position for between 1 s and 2 s in order to avoid initial velocity or forced acceleration of the moving parts. Then release the moving parts quickly and allow the needle to penetrate vertically into the paste. Read the scale when penetration has ceased, or 30 s after the release of the needle, whichever is the earlier.

Record the scale reading, which indicates the distance between the end of the needle and the base-plate, together with the time from zero. Repeat the penetration on the same specimen at conveniently spaced positions, not less than 8 mm from the rim of the mould or 5mm from each other and at least 10 mm from the last penetration position, at conveniently spaced intervals of time, e.g. at 10 min intervals. Between penetrations keep the specimen in a room or humidity cabinet. Clean the Vicat needle immediately after each penetration. Retain the specimen if determination of the final setting time is to be made.

4.3.3 Report – initial setting time

Report the elapsed time measured from zero to the time at which the distance between the needle and the base-plate is (6 ± 3) mm as the initial setting time of the cement to the nearest 5 min.

If the initial setting time exceeds 6h determine the final setting time.

4.3.4 Final setting time procedure

Invert the filled mould and follow the procedure described in EN 196-3:2005+A1:2008, 6.3 with the specimen held in the room or humidity cabinet at controlled humidity rather than under water.

4.3.5 Report – final setting time

Report the elapsed time measured from zero to that at which the needle first penetrates only 0,5 mm into the specimen as the final setting time of the cement, to the nearest 15 min.

4.3.6 Repeatability and reproducibility

The standard deviation of repeatability is 4 min for initial setting time and 7 min for final setting time.

The standard deviation of reproducibility is 20 min for initial setting time and 24 min for final setting time.

These precision data take into account uncertainty of measurement.

5 Preparation of standard mortar

5.1 Principle

The properties of fresh mortar made with masonry cement are assessed on standard mortar prepared in accordance with EN 196-1, but with the water content necessary for the standard consistence.

The consistence is measured using the plunger apparatus (see 5.2) as the reference method to achieve the required value of penetration.

A flow table test (see 5.3) is allowed as an alternative to the plunger test but it is important that the flow table spread equivalent to the required value of penetration is established, using the same type of masonry cement as that which shall be tested.

5.2 Consistence of fresh mortar by plunger apparatus (reference method)

5.2.1 Apparatus

The mixer and ancillary equipment shall be as described in EN 196-1.

The plunger apparatus shown in Figure 1 shall conform to the dimensions specified.

The shape of the baseplate (1) shall enable the mortar container (8) to be placed centrally below the plunger (7). The plunger shall have a hemispherical lower end, be resistant to corrosion and not attacked by mortar. The total mass of the rod (6) and plunger (7) shall be (90 ± 2) g. A release mechanism (5) holds the measuring rod in its initial position so that the lower end of the plunger is (100 ± 0,5) mm above the mortar surface prior to commencing the test (the initial position in 5.2.2).

The tamper (see Figure 2) shall consist of a round rod made of impermeable material with sheet metal protection and shall weigh (250 ± 15) g.

5.2.2 Procedure

Prepare the mortar according to the procedure described in EN 196-1 except that the water content shall be that determined to give the consistence required.

Before the start of each test wipe the plunger with a damp cloth.

Fill the container in two layers immediately after completing the mixing procedure. Compact each layer with 10 light strokes of the tamper.

Strike off the excess mortar, within 1 min of completion of mixing, by a gentle sawing action using the straightedge held at an angle of about 45 degrees. Then at a slightly flatter angle smooth the surface in a single direction in the reverse direction. After placing the container on the base-plate, release the plunger from its initial position (150 ± 15) s after the completion of mixing and determine the value of penetration into the mortar by reading the scale.

A value of penetration of (35 ± 3) mm is required for the mortar to be of standard consistence. If the mortar does not achieve the standard consistence required then mix a new batch of mortar using a different quantity of water. Repeat the test on new batches of mortar until the value of penetration of (35 ± 3) mm is obtained in two consecutive tests.

Record the mass of water required in grams to obtain standard consistence and the value of penetration in millimetres.

5.2.3 Reproducibility

The reproducibility which can be expected, expressed as the standard deviation of the results of the penetration test obtained by different, well-experienced, laboratories is 3,0 mm.

5.3 Consistence of fresh mortar by flow table (alternative method)

5.3.1 Method

NOTE The flow table method has been retained as an alternative to the plunger method (reference method) as it is still widely used.

5.3.2 Apparatus

5.3.2.1 Flow table, as described in EN 459-2:2010, 6.8.2.1.2.

5.3.3 Calibration

Calibrate the flow table, using the same type of masonry cement as that to be tested, against the plunger used for the consistence test described in 5.2. Carry out a minimum of three pairs of tests at different water contents in order to establish the spread range on the flow table which is equivalent to a (35 ± 3) mm value of penetration using the plunger apparatus. Then adopt this spread in order to achieve the defined level of consistence required. The relationship between the values using the flow table and the plunger apparatus shall be established for all products and updated at least once every 12 months.

It is recommended to establish a relationship between flow and penetration over the range 30mm to 40mm penetration.