BRITISH STANDARD

BS EN
480-2:2006

Admixtures for concrete, mortar and grout — Test methods —

Part 2: Determination of setting time

The European Standard EN 480-2:2006 has the status of a British Standard

ICS 91.100.30

BSI
British Standards

National foreword

This British Standard was published by BSI. It is the UK implementation of EN 480-2:2006. It supersedes BS EN 480-2:1997 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee B/517, Concrete, to Subcommittee B/517/3, Admixtures.

A list of organizations represented on B/517/3 can be obtained on request to its secretary.

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.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 29 September 2006

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English Version

Admixtures for concrete, mortar and grout - Test methods - Part 2: Determination of setting time

Adjuvants pour béton, mortier et coulis - Méthodes d'essai - Partie 2: Détermination du temps de prise

Zusatzmittel für Beton, Mörtel und Einpressmörtel - Prüfverfahren - Teil 2: Bestimmung der Erstarrungszeit

This European Standard was approved by CEN on 19 June 2006.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

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Foreword

This document (EN 480-2:2006) has been prepared by Technical Committee CEN/TC 104 “Concrete and related products”, the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by February 2007, and conflicting national standards shall be withdrawn at the latest by February 2007.

This document supersedes EN 480-2:1996.

This draft European Standard is part of the series EN 480 *Admixtures for concrete, mortar and grout – Test methods* which comprises the following:

Part 1 *Reference concrete and reference mortar for testing*

Part 2 *Determination of setting time*

Part 4 *Determination of bleeding of concrete*

Part 5 *Determination of capillary absorption*

Part 6 *Infrared analysis*

Part 8 *Determination of the conventional dry material content*

Part 10 *Determination of water soluble chloride content*

Part 11 *Determination of air void characteristics in hardened concrete*

Part 12 *Determination of the alkali content of admixtures*

Part 13 *Reference masonry mortar for testing mortar admixtures*

Part 14 *Determination of the effect on corrosion susceptibility of reinforcing steel by potentiostatic electro-chemical test*[1)]

This standard is applicable together with the other standards of the series EN 934 *Admixtures for concrete, mortar and grout*.

Notification of revisions:

The previous edition EN 480-2:1996 has been revised as follows:

- provision for using a manual Vicat;

- general editorial revision.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic,

1) This part is under preparation.

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.

1 Scope

This European Standard describes a method for determining setting time of mortar with and without admixtures. It is an adaptation of the setting time test described in EN 196-3.

This European Standard describes the reference method; it allows the use of alternative apparatus as indicated in notes provided that they do not affect the results.

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

EN 480-1, *Admixtures for concrete, mortar and grout — Test methods — Part 1: Reference concrete and reference mortar for testing*

EN 1008, *Mixing water for concrete — Specification for sampling, testing and assessing the suitability of water, including water recovered from processes in the concrete industry, as mixing water for concrete*

3 Test principle

The setting time is determined by observing the penetration of a needle into a reference mortar until it reaches a specified value.

The reference mortar with admixture (test mix) shall have the same consistence as the reference mortar without admixture (control mix) that conforms to EN 480-1.

For this purpose the mixing water required shall be determined in advance according to EN 413-2.

4 General requirements for testing

4.1 Laboratory

The laboratory in which specimens are prepared and tested shall be maintained at a temperature of (20 ± 2) °C and a relative humidity no less than 65 %.

After preparation and between tests, the specimen shall be stored in a room or cabinet having a relative humidity of no less than 90 % and a temperature of (5 ± 1) °C or (20 ± 2) °C as appropriate to the test requirements.

4.2 Apparatus

a) balance, accurate to 1 g;

b) graduated cylinder or burette, accurate to 1 % of the volume measured;

c) mixer, complying with EN 196-1.

4.3 Materials

Mortar shall be prepared by using the standard sand described in EN 196-1.

Water according to EN 1008 shall be used as mixing water[2)].

Cement, sand, water, admixture and apparatus used to make the specimens shall be stored at a temperature selected for the test (5 ± 1) °C or (20 ± 2) °C for at least 12 h before the mortar is prepared.

5 Setting time test

5.1 Apparatus

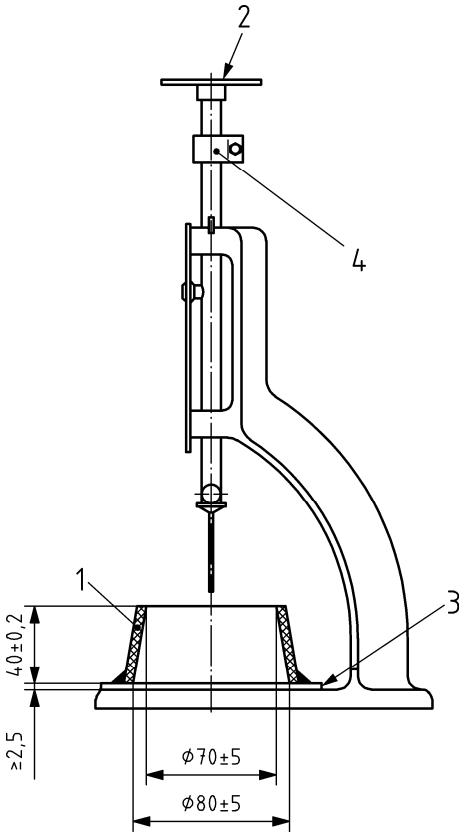
Vicat apparatus as shown in Figure 1 a) with a needle as shown in Figure 1 b). The needle (Figure 1 b)) shall be of non-corrodible metal with an effective height of (50 ± 1) mm and a diameter of (1,13 ± 0,05) mm.

To prevent the needle of the Vicat apparatus striking the base plate of the mould, a stopping device (Figure 1 c) is recommended. A suitable device fixed to the central plunger of the apparatus such that the needle can be stopped at approximately 2 mm from the bottom of the mould is shown in Figure 1 a). This device takes the form of a split clamp which can be fixed in any position to suit the apparatus, and when loosened should not impart any friction to the plunger.

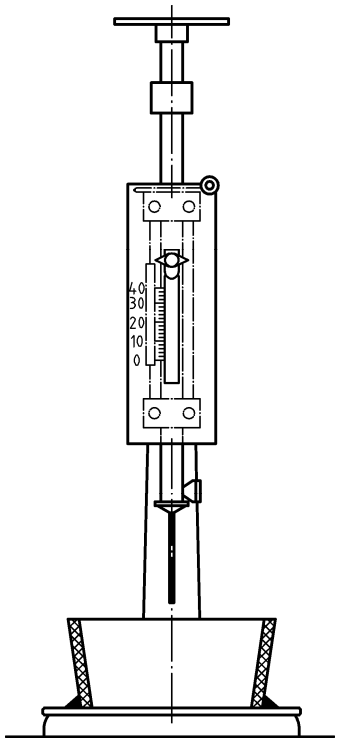
The total mass of the moving parts, including the stopping device, shall be (1 000 ± 2) g. Their movement shall be truly vertical and without appreciable friction, and their axes shall coincide with that of the needle.

NOTE 1 Devices for automatic determination of the setting time are commercially available and may be used provided that they can be shown to give the same test results to those obtained with the specified apparatus and procedure.

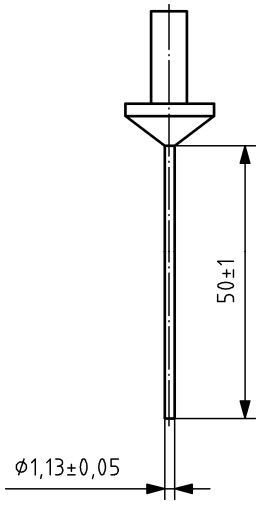
Dimensions in millimetres



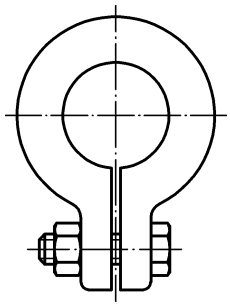
a) Side view with mould in upright position for initial setting time determination



b) Front view with mould inverted for the determination of final setting time



c) Needle



d) Example of a stopping device

Key
1 hard rubber mould
2 platform for correcting weights
3 glass plate
4 stopping device

Figure 1 — Vicat apparatus for determining the setting time of mortar

The Vicat mould (see Figure 1 a)) to contain the mortar under test shall be of hard rubber. It shall be of truncated conical form (40,0 ± 0,2) mm deep and shall have internal diameters at top and bottom of (70 ± 5) mm and (80 ± 5) mm respectively. It shall be adequately rigid and shall be provided with a plane glass or hard rubber base plate larger than the mould and at least 2,5 mm thick.

NOTE 2 Moulds may be of metal or plastics and of cylindrical shape provided that they are of the specified depth and that they can be shown to give the same test results as the specified hard rubber mould of truncated conical form.

5.2 Preparation of the mortar

The mortar shall be prepared in accordance with EN 480-1.

5.3 Filling the mould

Place the mortar in the mould (previously placed on a flat, lightly greased base plate) immediately after mixing. Seal the joint between the mould and the base plate to prevent bleeding. Fill the mould completely without undue segregation or vibration. Remove the excess mortar by a careful back and forth movement with a tool having a straight edge so as to leave the mortar filling the mould with its top surface as flat as possible.

Transfer this specimen immediately to the storage conditions as described in 4.1.

5.4 Test procedure

5.4.1 Determination of initial setting time

First, set the Vicat apparatus by lowering the needle onto the base plate to adjust the zero reference of the scale.

Keep the filled mould and its base plate in the room or humidity cabinet specified in 4.1 and after a suitable period of time align them beneath the needle of the Vicat apparatus. Lower the needle carefully until it comes into contact with the mortar. Wait for 1 to 2 s in this position so as to avoid any initial velocity or forced acceleration of the plunger. Then release the plunger rapidly. The needle should penetrate the mortar vertically. Read the scale when penetration is complete or 30 s after the plunger has been released whichever of these two time limits is the earlier. Record the reading, which indicates the distance between the end of the needle and the base plate together with the time, which has elapsed since completion of mixing. Repeat the penetration test on the same specimen at suitably spaced positions more than 10 mm from the edge of the mould or each other and at suitable time intervals, for example at intervals of 10 min.

Keep the specimen in a room or humidity cabinet in accordance with 4.1 between penetration tests. If using an automatic setting time meter determine the initial setting time by drawing the characteristic line.

The time measured from completion of mixing until the time at which the distance between the needle and the base plate is 4,0 mm is the initial setting time for the mortar. For manual and automatic methods select time intervals between penetrations so that the initial setting time can be determined within ca. 5 % of the measured value.

Results may be interpolated to determine the exact initial setting time.

NOTE The presence of sand will cause a greater spread in the penetration depth results than when using cement paste.

5.4.2 Determination of final setting time

Turn over the filled mould used in 5.4.1 onto the base plate of the Vicat apparatus (see figure 1b) so that final setting time tests can be carried out on the face of the specimen, which was originally in contact with the base plate.

If using an automatic setting time meter continue taking measurements without turning the mould over, taking care to prevent the needle from penetrating the marks of previous measurements.

The setting time measured from completion of mixing until the time after which the needle no longer penetrates 2,5 mm into the specimen is the final setting time for the mortar. This is determined as described in 5.4.1.

5.4.3 Manual Vicat

Where a manual Vicat is being used for testing, the setting time may be interpolated to cover overnight periods by giving setting between time limits e.g. > x hours, < y hours. This interpolative method is not permitted where comparative results are required or where the expected setting time is less than 8 h.

6 Test report

The following items shall be reported:

— type of test equipment;

— temperature to the nearest 1 °C at which the test is carried out;

— initial and final setting times expressed in minutes.

Bibliography

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

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BSI — British Standards Institution

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