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BSI Standards Publication

Admixtures for concrete, mortar and grout — Test methods

Part 15: Reference concrete and method for
testing viscosity modifying admixtures

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National foreword

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

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English Version

Admixtures for concrete, mortar and grout - Test methods - Part 15: Reference concrete and method for testing viscosity modifying admixtures

Adjuvant pour béton, mortier et coulis - Méthodes d'essai -
Partie 15: Béton de référence et méthode d'essai des
adjuvants modificateurs de viscosité

Zusatzmittel für Beton, Mörtel und Einpressmörtel -
Prüfverfahren - Teil 15: Referenzbeton und Prüfverfahren
zur Prüfung von viskositätsmodifizierenden Zusatzmitteln

This European Standard was approved by CEN on 19 January 2013.

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Foreword

This document (EN 480-15:2013) 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of an identical text or by endorsement, at the latest by September 2013, and conflicting national standards shall be withdrawn at the latest by September 2013.

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 has been drafted by Subcommittee 3 (SC 3) of CEN/TC 104 “Admixtures for concrete, mortar and grout”.

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

- *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*
- *Part 15: Reference concrete and method for testing viscosity modifying admixtures (the present document)*

This European Standard is applicable together with the other standards of the EN 480 series and for testing admixtures in accordance with the EN 934 series of standards.

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, 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.

1 Scope

This European Standard specifies the constituent materials, the composition and the mix procedure to produce a reference concrete with a prescribed consistency and segregated portion for testing viscosity modifying admixtures as defined in EN 934-2. It also describes how to determine the requirements for the test mix in comparison with the control mix.

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

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

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

EN 934-2, *Admixtures for concrete, mortar and grout — Part 2: Concrete admixtures — Definitions, requirements, conformity, marking and labelling*

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*

EN 12350-7, *Testing fresh concrete — Part 7: Air content — Pressure methods*

EN 12350-8, *Testing fresh concrete — Part 8: Self-compacting concrete — Slump-flow test*

EN 12350-11, *Testing fresh concrete — Part 11: Self-compacting concrete — Sieve segregation test*

EN 12390-1, *Testing hardened concrete — Part 1: Shape, dimensions and other requirements for specimens and moulds*

EN 12390-2, *Testing hardened concrete — Part 2: Making and curing specimens for strength tests*

EN 12620, *Aggregates for concrete*

3 Constituent materials

3.1 Cement

The reference concrete shall be made with a CEM I cement of strength class 42,5 or 52,5 conforming to EN 197-1.

The cement used shall have a C₃A content of 7 % to 11 % by mass calculated from chemical analysis according to EN 196-2 and a specific surface of 3 200 cm²/g to 4 600 cm²/g determined according to EN 196-6.

3.2 Aggregate

A natural normal weight aggregate conforming to EN 12620 with low water absorption (≤ 2 % by mass) shall be used. The grading shall conform to Table 1.

Table 1 — Aggregate for reference concrete

Aperture size - mm	Percentage by mass passing the test sieve
16	95 to 100
12	85 to 100
8	62 to 74
4	42 to 52
2	28 to 38
1	19 to 29
0,500	11 to 21
0,250	4 to 14
0,125	2 to 6
0,063	0 to 2

3.3 Mixing water

Water according to EN 1008, or distilled or de-ionised water shall be used as mixing water.

Wash water from concrete production shall not be used.

4 Reference concrete

Unless otherwise specified, tests on the reference concrete are performed as comparative tests. That is, the performance of the admixtures is determined by comparing the reference concrete containing the viscosity modifying admixture (test mix) with the reference concrete made without the viscosity modifying admixture (control mix) but otherwise with the same aggregate/cement ratio and constituents from the same delivery.

The requirements for the reference concrete are given in Table 2. The fresh concrete shall be fully compacted. The air content of the control mix shall not exceed 2 % by volume.

Table 2 — Requirements for reference concrete

Constituent / test	Requirement
Reference Cement	(400 ± 10) kg/m ³
Aggregate	According to 3.2. The aggregate: cement ratio shall be recorded
Superplasticizer to EN 934-2	Within manufacturers normal range
Water	≤ 230 kg/m ³
Slump flow (SF) to EN 12350-8	Control mix 660 mm to 750 mm Test mix ≥ control mix
Sieve segregation (SR) to EN 12350-11	Control mix 15 % ≤ SR ≤ 30 %
Air content to EN 12350-7	Control mix ≤ 2 %

5 Preparation of reference concrete

5.1 Mix proportions

The mix proportions shall be in accordance with Table 2.

The aggregate shall be used in an oven dry condition (≥ 105 °C) to remove doubts on moisture content variation. If the aggregate is not oven dry, its moisture content shall be determined and the aggregate and water content shall be corrected accordingly. In the case of dispute, oven dry aggregates shall be used.

The dosage of the superplasticizer and the quantity of water in the control mix shall be such as to obtain an initial slump flow (SF) and sieve segregation (SR) in accordance with Table 2.

The test mix containing the viscosity modifying admixture shall have the same water content, cement content and the same aggregate: cement ratio as the control mix but the dosage of superplasticizer shall be adjusted if necessary to give a consistence not less than that of the control mix.

5.2 Mixing and testing

Prior to mixing, each of the constituents shall be conditioned to a temperature of (20 ± 2) °C.

The following mixing technique shall be adopted to ensure repeatability of results and eliminate initial moisture absorption effects on consistence.

- Use a forced action pan mixer to a minimum of 50 % and a maximum 90 % of capacity.
- Wipe the inside with a damp cloth if dry.
- Add all the aggregates to the pan mixer with half the mixing water. Mix for 2 min then stand for 2 min. Cover the pan mixer during the standing period to minimise evaporation effects.
- Restart the mixer for 30 s after or while adding the cement. Over the next 30 s, add the remaining water and admixtures as appropriate to the mix (noting any manufacturer's recommendations with respect to the order and timing). Mix for a further 2 min.
- Determine the slump flow (SF) and start the sieve segregation test (SR) within 10 min of completion of mixing.

- If the slump flow and sieve segregation of the control mix are outside the limits in Table 2, discard the mix and repeat at a revised water or superplasticiser content. If the slump flow of the test mix is not equal to or greater than the slump flow of the control mix, discard the mix and repeat at a revised superplasticiser content.
- Determine the fresh density and air content within 30 min from completion of mixing (if necessary the concrete may be remixed for 10 s).
- If the air content and/or cement content of the control mix calculated from the fresh density are outside the limits in Table 2, discard the mix and test a new mix.
- Take three specimens from each mix for compressive strength testing. The control mix should be held for 60 min to 90 min then remixed for 1 min before taking the specimens to prevent segregation in the cube or cylinder mould. The test mix specimens should not be remixed but be made within 60 min from completion of initial mixing. Prepare and cure the specimens in accordance with EN 12390-2 using moulds conforming to EN 12390-1. If the compressive strength of one of the specimens varies from the average of the set by more than 10 % it shall be discarded and the average recalculated from the remaining two specimens.

6 Test report

The test report shall include the following information for the control and test mixes:

- a) A reference to this standard.
- b) Aggregate:
 - 1) source and type;
 - 2) crushed / uncrushed;
 - 3) grading;
 - 4) moisture content if not oven dry.
- c) Cement:
 - 1) source;
 - 2) notation to EN 197-1 including strength class;
 - 3) C₃A content;
 - 4) specific surface.
- d) Concrete:
 - 1) aggregate: cement ratio of control and test mixes;
 - 2) admixture dose in the control and test mixes (superplasticizer and the viscosity modifying admixture);
 - 3) consistence, slump flow (SF);
 - 4) sieve segregation, segregated portion (SR);
 - 5) air content;
 - 6) fresh bulk density;
 - 7) compressive strength individual and average results.

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