DRAFT FOR DEVELOPMENT

DD CEN/TS
14754-1:2007

Curing compounds — Test methods —

Part 1: Determination of water retention efficiency of common curing compounds

ICS 91.100.30

BSI
British Standards

National foreword

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Comments arising from the use of this Draft for Development are requested so that UK experience can be reported to the European organization responsible for its conversion to a European standard. A review of this publication will be initiated not later than 3 years after its publication by the European organization so that a decision can be taken on its status. Notification of the start of the review period will be made in an announcement in the appropriate issue of *Update Standards*.

According to the replies received by the end of the review period, the responsible BSI Committee will decide whether to support the conversion into a European Standard, to extend the life of the Technical Specification or to withdraw it. Comments should be sent to the Secretary of the responsible BSI Technical Committee at British Standards House, 389 Chiswick High Road, London W4 4AL.

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 this committee 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.

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Produits de cure - Méthodes d'essai - Partie 1 : Détermination de l'efficacité de protection des produits de cure courants

Nachbehandlungsmittel - Prüfverfahren - Teil 1: Bestimmung der Wasserrückhaltefähigkeit von üblichen Nachbehandlungsmitteln

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Foreword

This document (CEN/TS 14754-1:2007) has been prepared by Technical Committee CEN/TC 104 “Concrete and related products”, the secretariat of which is held by DIN.

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1 Scope

This Technical Specification describes a procedure for determining the ability of a curing compound to prevent the evaporation of water from young concrete when applied immediately after the bleed water has evaporated.

NOTE The procedure involves application to a horizontal surface; it may not be applicable for use on vertical or sloping surfaces.

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

EN 206-1, *Concrete — Part 1: Specification, performance, production and conformity.*

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.*

EN 12350-2, *Testing fresh concrete - Part 2: Slump test.*

EN 12350-6, *Testing fresh concrete – Part 6: Density.*

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

EN 12620, *Aggregates for concrete.*

3 Terms and definitions

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

3.1
curing compound
liquid applied to the surface of concrete which prevents the evaporation of water after casting and/or during the hardening phase at early days

3.2
water retention efficiency index
the reduction in evaporation of water from the test specimen treated with a curing compound compared to an untreated specimen expressed as a percentage of the evaporation from the untreated specimen

4 Principle

The test consists of:

— measuring the quantity of water which evaporates, under specified conditions, from test specimens of concrete with and without the application of a curing compound,

— calculating the curing efficiency index.

5 Apparatus

a) non-absorbent watertight moulds of (50 000 ± 5 000) mm^2 surface area and inside depth of (50 ± 2) mm for the preparation of specimens made of concrete;

b) vibrating table with a frequency of about 50 Hz and an amplitude of about 0.5 mm;

c) scoop;

d) steel float;

e) non absorbent plates (e.g. glass, metal) of the same surface area as in a);

f) Spray gun with a max. nozzle of 2 mm and a pressure of 1.0 MPa;

g) balance of sufficient capacity to weigh the test specimens with an accuracy of 0.1 g;

h) mask to ensure only the specified surface is treated;

i) controlled room at (35 ± 2) °C and (40 ± 3) % relative humidity with no air circulation on the top of the specimens or ventilated room at (40 ± 2) °C

NOTE Special arrangement to protect the specimens from air circulation is recommended.

6 Reference concrete

6.1 Constituent materials

6.1.1 Cement

For the reference concrete use a CEM I - R cement conforming to EN 197-1.

6.1.2 Aggregate

A natural normal weight aggregate conforming to EN 12620 with a water absorption ≤ 2 % by mass. Maximum nominal upper aggregate size 8 mm as defined in EN 206-1.

6.1.3 Additions

To fulfil the requirements on bleeding or mat dry surface, additions according to the definitions in EN 206-1 may be used.

6.1.4 Mixing water

Water conforming to EN 1008.

6.2 Test concrete

6.2.1 Mix design

Tests on reference concrete are performed as comparative tests. That is, the performance of curing agents is determined by comparing the treated concrete specimens with the untreated concrete specimens. All concrete specimens have the same mix design and constituent materials from the same delivery.

Mix design by mass

Cement:	1,0
Aggregates and additions:	3,0
Water:	0,42

6.2.2 Concrete properties

The concrete shall be as dry as possible (slump class S1 when measured in accordance with EN 12350-2) but compactable and able to be finished to a perfectly closed and smooth surface. When tested in accordance with the procedure described in clause 6.3.2 and 7.3 there shall be no bleeding after compaction and the surface shall be mat dry within the time given in clause 7.3. The air content of the fresh concrete shall not exceed 3 % by volume when measured in accordance with EN 12350-7.

6.3 Production of reference concrete

6.3.1 Mix preparation

Mix design shall be in accordance with clause 6.2.

Aggregate is used in the oven dry condition to remove doubts on the moisture content variation. If the aggregate is not oven dry, the moisture content shall be determined and the specific gravity corrected accordingly. In case of dispute, oven dry aggregate shall be used.

6.3.2 Mixing procedure

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

Mix the concrete in accordance with EN 480-1, except for the requirement for consistence, to ensure repeatability of results and eliminate the effect of initial absorption on consistence.

Measure the air content in accordance with EN 12350-7 and the fresh concrete density in accordance with EN 12350-6 and make specimens after completion of mixing.

7 Water retention efficiency test

7.1 Number of specimens

For the test 3, concrete specimens are treated with curing compound, 3 concrete specimens are left untreated and 3 non-absorbent plates are treated with curing compound.

7.2 Determination of loss of solvent

To determine the loss of solvent from the curing compound:

Weigh the non-absorbent plate.

Spray apply the curing compound at the manufacturers recommended rate.

Immediately, reweigh the plate.

Place the plate in the controlled room (5i) and reweigh at 6 h, 24 h and 72 h (± 15 min).

A total of 3 tests on different plates are carried out.

Determine the coverage rate of the curing compound in g/m² and the cumulative loss of solvent at each time interval. Individual and mean values are reported.

7.3 Procedure

Fill the moulds with concrete in one layer and compact on the vibrating table for a maximum of 20 seconds.

After compaction, finish the surface with a steel float, making the minimum number of passes and working along the length of the mould in both directions, to produce a uniform, flat, smooth and closed surface, free from undulations and surface defects.

After the second water addition to the mix, complete the compaction and finishing of the specimens within 45 minutes and record the time taken. After finishing the surface, store the specimens in the controlled room until the surface loses its wet sheen and record the time taken. If the time exceeds 30 min repeat the specimen preparation using a revised test mix.

As soon as the surface has lost its sheen, remove all 6 specimens from the controlled room.

Weigh one specimen, cover with the mask, uniformly spray apply the curing membrane and check by intermediate weighing to obtain the manufacturer's recommended rate of application. Reweigh the specimen to determine the applied weight of curing compound and the initial weight at t_o for water loss determinations.

Take a second specimen, leave untreated and weigh it to determine the initial weight at t_o for water loss determinations.

Return these two specimens to the controlled room and record the zero water loss time for this pair. Repeat this procedure for the remaining 4 specimens. Working in pairs, one test and one control specimen. All three pairs should be returned to the controlled room within 30 minutes.

NOTE It can be an advantage to seal the seam between concrete and mould with a strip of elastic material. Determine the difference of the weight before sealing and after sealing of protected and unprotected specimens to correct the weight.

Keep the specimens, treated and untreated, in the controlled room for 72 h.

In addition to determining the initial weight, reweigh the specimens after 6 h, 24 h and 72 h.

8 Calculations

The water retention efficiency is expressed by the curing efficiency index I_t. Calculate the curing efficiency index of the curing compound at the time t as a percentage from the equation:

$$I_t = \frac{M_{Rt} - M_{Ct}}{M_{Rt}} \times 100 \quad (1)$$

where:

I_t is the curing efficiency index at time "t"

t is the time at which the weight of the specimens is determined (t = 0 h, 6 h, 24 h and 72 h)

M_{Rt} is the average of mass loss from the untreated specimens at time "t" (specimens without curing compound)

M_{Ct} is the average of mass loss from the treated specimens at time "t", reduced with the average of mass loss of the curing compound (solvent loss) at time "t"

$$M_{Rt} = \frac{\sum_{i=1}^{3}(m_{Ri0} - m_{Rit})}{3} \quad (2)$$

$$M_{Ct} = \frac{\sum_{i=1}^{3}(m_{Ci0} - m_{Cit}) - \sum_{i=1}^{3}(m_{Si0} - m_{Sit})}{3} \quad (3)$$

Where m is the mass of specimens according to the following table:

Table 1 — Mass of specimens

Measurements at time t = 6 h, 24 h and/or 72 h						
Specimens:	Specimen 1		Specimen 2		Specimen 3	
Curing compound (Solvent loss)	m_{S10}	m_{S1t}	m_{S20}	m_{S2t}	m_{S30}	m_{S3t}
Untreated specimens	m_{R10}	m_{R1t}	m_{R20}	m_{R2t}	m_{R30}	m_{R3t}
Treated specimens	m_{C10}	m_{C1t}	m_{C20}	m_{C2t}	m_{C30}	m_{C3t}

9 Test report

The test report shall include the following information about the test results and about the test concrete:

— source, notation and class of cement in accordance with EN 197-1;

— source, type and grading of aggregate;

— type and source of additions (if any);

— consistence of concrete;

— fresh bulk density;

— air content of fresh concrete;

— name or code of curing compound tested (with information relating to its marking);

— individual test results relating to Table 1;

— mean curing efficiency index at 6 h, 24 h and 72 h;

— time of application of curing compound expressed in minutes after second addition of water to the concrete mix;

— amount of curing compound applied in g/m^2;

— surface area in mm^2 of specimens.

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