BRITISH STANDARD

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Products and systems for the protection and repair of concrete structures — Test methods — Determination of watertightness of injected cracks without movement in concrete

The European Standard EN 14068:2003 has the status of a British Standard

ICS 91.080.40; 91.100.30

National foreword

This British Standard is the official English language version of EN 14068:2003.

The UK participation in its preparation was entrusted by Technical Committee B/517, Concrete, to Subcommittee B/517/8, Protection and repair of concrete structures, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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

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EN 14068

December 2003

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English version

Products and systems for the protection and repair of concrete structures - Test methods - Determination of watertightness of injected cracks without movement in concrete

Produits et systèmes pour la protection et la réparation des structures en béton - Méthodes d'essai - Détermination de l'étanchéité à l'eau des fissures injectées sans mouvement dans le béton

Produkte und Systeme für den Schutz und die Instandsetzung von Betontragwerken - Prüfverfahren - Bestimmung der Wasserdichtheit von injizierten Rissen ohne Bewegung in Beton

This European Standard was approved by CEN on 1 September 2003.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document EN 14068:2003 has been prepared by Technical Committee CEN/TC 104 “Concrete and related products”, the secretariat of which is held by DIN.

It has been prepared by Sub-Committee 8 "Products and systems for the protection and repair of concrete structures" (Secretariat AFNOR).

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 June 2004, and conflicting national standards shall be withdrawn at the latest by June 2004.

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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard describes a test method to determine the watertightness of injected cracks in concrete, with defined crack width.

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 (including amendments).

EN 1504-1, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 1: Definitions.*

prEN 1504-5:2001, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 5: Concrete injection.*

EN 1766, *Products and systems for the protection and repair of concrete structures — Test methods — Reference concretes for testing.*

EN 12390-6, *Testing hardened concrete — Part 6: Tensile splitting strength of test specimens.*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 1504-1 and prEN 1504-5:2001 apply.

4 Test principle

The injection product is injected into a crack of 1 mm width, the moisture condition of which is controlled (dry, damp, wet or with water counter pressure).

After hardening, the watertightness of the injected crack is tested by applying a hydraulic direct pressure, which is increased in a specified number of steps.

NOTE For specific applications, the use of test parameters different from those specified in prEN 1504-5:2001 can be appropriate.

5 Apparatus

5.1 Apparatus which allows the application of water under pressure to one surface of the test piece whilst allowing observation of the opposite face, as shown in Figure 1.

It consists basically of:

¾ a cylindrical chamber 170 mm in diameter to enclose the test specimen;

¾ a bottom plate with a vent and a water inlet;

¾ polymeric e.g. polypropylene spacers between the specimen's lower surface and the bottom plate;

The spacers are:

¾ a disc 170 mm in diameter and 10 mm thickness;

¾ two segments 170 mm in diameter, 70 mm in height and 10 mm thickness.

¾ a bar 10 mm thickness to hold the specimen in place;

¾ an elastic packer, shore - A hardness 40° between the upper surface of the specimen and the bar.

5.2 Supply of adjustable pressure tap water, with pressure measuring device, capable of being maintained to within 10 % of the specified value.

5.3 Diamond saw to cut specimens.

5.4 Compression cylinders testing machine, for splitting concrete.

5.5 Injection equipment, including mixer, pressure pot or injection pump, injection nipples or packers.

5.6 Caulking or sealing compound to seal the crack along the height and across the base of the cylindrical test samples, according to the instructions of the manufacturer.

5.7 Elastomeric bitumen or other suitable material, to provide sealing of the test sample in the apparatus for applying water pressure.

6 Specimen preparation

The test shall be performed on three specimens, prepared as follows:

6.1 The concrete specimen shall be cylindrical with a diameter of (150 2) mm and (100 2) mm in height and cut by sawing from concrete cylinders 150 mm in diameter cast from a reference concrete type MC (0.45) as defined in EN 1766.

6.2 The concrete specimen shall be split along the axis, according to EN 12390-6.

6.3 The two pieces shall be held together in such a way that a crack width of (1 0,2) mm is obtained by using inert flexible plastic spacers; the crack openings along the height shall be entirely sealed by using caulking or sealing compound (5.6). The caulking compound shall not penetrate into the crack by more than 5 mm.

6.4 The concrete specimen shall be inserted into the apparatus described in 5.1 on the polymeric disc.

6.5 Hot elastomeric bitumen (5.7) or other suitable material is poured between the mould and the concrete specimen, taking care not to contaminate the upper circular surface.

7 Injection

7.1 Test conditions

The standard climate conditions during the test shall be (21 2) °C and (60 10) % relative humidity, for conditioning before injection, injection process, specimen curing and pressure test.

The assembly shall be stored at these conditions for (48 4) h prior to testing.

7.2 Crack conditioning

The bottom plate and the polypropylene disc (5.1) shall be removed. If it is not required to inject against a head of water (see below), the crack at the lower side shall be sealed by using caulking compound (5.6). The caulking compound shall cover the crack and an area immediately adjacent to the crack to a width less than 15 mm to either side of the crack.

Two polymeric segments (5.1) shall be put on the lower side of the specimen, on each size of the caulking compound strip, and the bottom plate shall be fixed again.

If testing for injection against a head of water is required, the lower side of the crack shall not be sealed. Two polymeric segments (5.1) shall be put on the lower side of the specimen so that the crack is not covered. Connection to a water supply at the agreed water pressure shall be made via the water inlet.

Depending upon the classification of humidity specified by the manufacturer of the injection material, the specimen shall be conditioned as follows:

- for injection into a dry crack: no further conditioning required;
- for injection into a damp crack: the crack shall be kept filled with tap water at (21 2) °C for 30 min, then emptied and allowed to drain for 30 min before proceeding with injection;
- for injection into a wet crack: soak crack as above, but proceed with injection immediately after emptying without any period of draining;
- for injection into a water filled crack: fill the crack with water at (21 2) °C for 30 min as above. Then proceed with injection without emptying the water;
- if testing for injection against a head of water is required, the lower side of the crack shall not be sealed and connection to a water supply at the agreed water pressure shall be made via the water inlet.

7.3 Injection

- The crack opening on the upper surface of the specimen shall be prepared for injection according to the manufacturer's recommended procedure appropriate for the selected crack condition (7.2). This may include the fitting of injection nipples or packers and vents as inlet and outlet ports;
- The components of the injection product shall be mixed in accordance with the manufacturer's instructions and then introduced into the crack in accordance with the method described by the manufacturer. The injection is complete when unadulterated injection product is seen to emerge from the outlet port.

7.4 Curing

The test specimens shall be cured for 7 days at (21 2) °C and (60 10) % relative humidity.

8 Procedure

8.1 Cleaning of the surfaces of the test specimen

After curing, the bottom plate and the segments (5.1) shall be removed. The caulking compound, if used, and any injection product lying on the surface shall be completely removed, according to the instructions of the manufacturer, so that the crack becomes visible at the upper and lower side (bottom) of the specimen.

The segments (5.1) shall then be replaced on the underside, so that the crack is not covered, i.e. with the chords of the segments running parallel to the crack. The bottom plate shall then be replaced.

At the upper end, the sample shall be held in place by the bar and the elastic packer which will be positioned so that their longitudinal axes are about normal to the line of the crack.

8.2 Application of water pressure

Water pressure shall be applied from the lower face as follows:

¾ 25 % of the maximum target pressure for 7 days;

¾ 50 % of the maximum target pressure for 7 days;

¾ 75 % of the maximum target pressure for 7 days;

¾ 100 % of the maximum target pressure for 7 days.

NOTE See prEN 1504-5:2001 for requirements on target pressures and note in clause 4.

8.3 Observations

During the application of water pressure, the specimens shall be examined for water leakage.

Temporary leakages, which may occur during pressure changes or shortly afterwards, shall be ignored.

9 Expression of results

The observations made during each pressure increment shall be documented.

If the sample leaks at 25 % or 50 % of the target pressure, the injection material is deemed to have failed the test. The test may be repeated reiteratively using different target pressures in order to determine the correct pressure interval for the material.

10 Test report

The test report shall contain the following information:

a) a reference to this test method standard;

b) name and address of the test laboratory;

c) identification number and date of the test report;

d) name and address of the manufacturer or supplier of the product;

e) name and identification marks or batch number of the product;

f) date of supply of the product;

g) date of preparation of the test specimens and any deviation from the prescribed method of preparation; description of injection procedure and conditions of injection including the moisture condition of the crack, the water pressure (if any) during injection;

h) conditions of storage of prepared specimens prior to test;

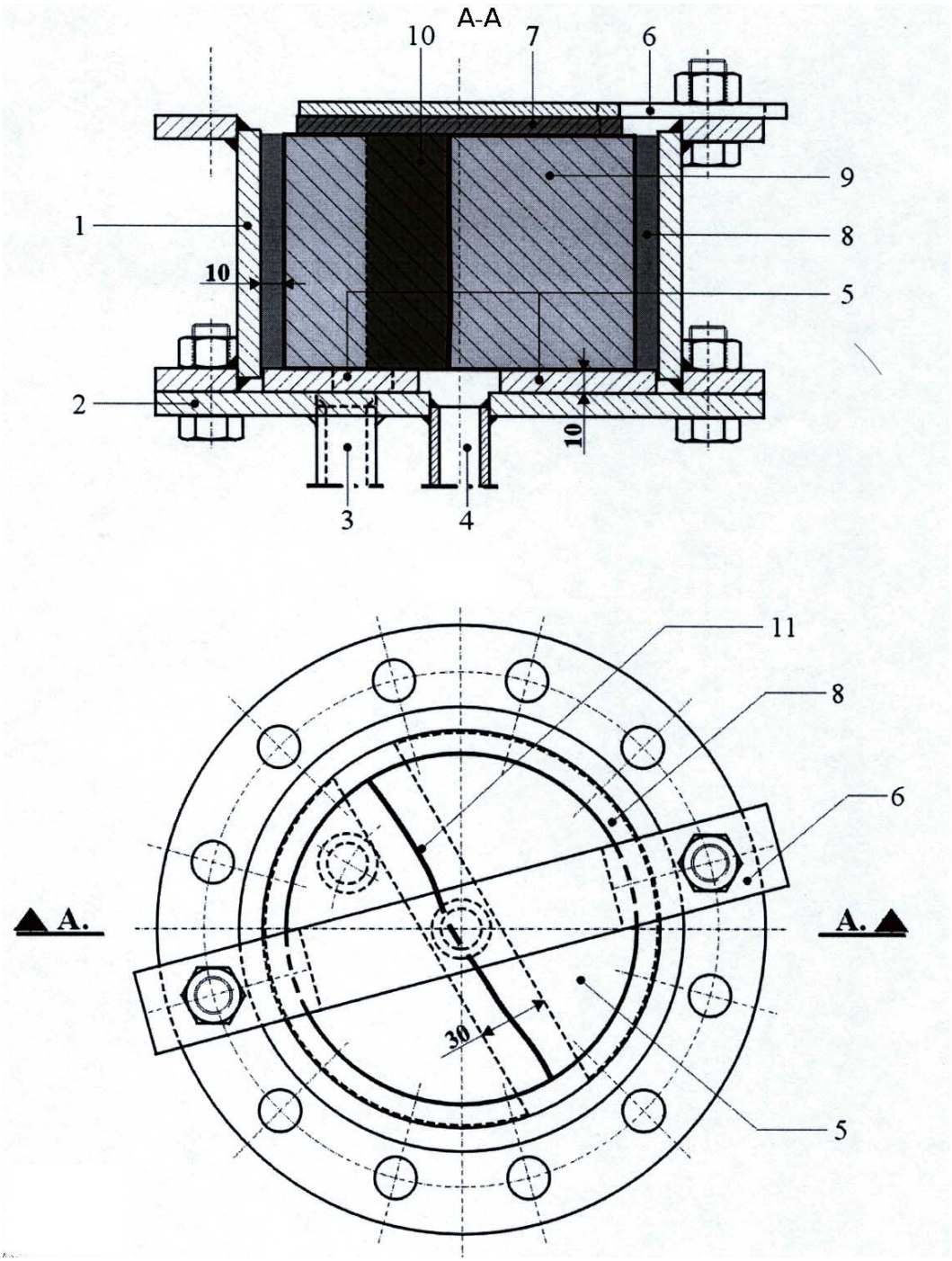
i) date of test and details of the test equipment used, including the make, type and capacity and the calibrations details or the identification number of the apparatus;

j) test results: observations related to each pressure, nature of any leakage pressure at which the crack is watertight;

k) precision data;

l) date of test report and signature.

Dimensions in millimetres



Key

1 Mould
2 Bottom plate
3 Vent
4 Pressurised water supply
5 Polymeric segments or disc
6 Bar
7 Elastic packer
8 Elastomeric bitumen
9 Concrete specimen (Ø150; height:100)
10 Injected area
11 Injected crack

Figure 1 — Test arrangement to apply water pressure

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