BRITISH STANDARD

BS EN
12189:1999

Products and systems for the protection and repair of concrete structures — Test methods — Determination of open time

The European Standard EN 12189:1999 has the status of a British Standard

ICS 91.080.040

National foreword

This British Standard is the English language version of EN 12189:1999.

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

— aid enquirers to understand the text;

— present to the responsible 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.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 7 and a back cover.

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This British Standard, having been prepared under the direction of the Sector Committee for Building and Civil Engineering, was published under the authority of the Standards Committee and comes into effect on 15 September 1999

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EUROPEAN STANDARD **EN 12189**
NORME EUROPÉENNE
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ICS 91.080.40; 91.100.30

English version

Products and systems for the protection and repair of concrete structures — Test methods — Determination of open time

Produits et systèmes pour la protection et la réparation des structures en béton — Détermination du temps ouvert

Produkte und Systeme für den Schutz und die Instandsetzung von Betontragwerken — Prüfverfahren — Bestimmung der Offenzeit

This European Standard was approved by CEN on 16 April 1999.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

 Ref. No. EN 12189:1999 E

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 104, Concrete (performance, production, placing and compliance criteria), 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 November 1999, and conflicting national standards shall be withdrawn at the latest by November 1999.

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

It has been prepared by Subcommittee 8, Products and systems for the protection and repair of concrete structures (Secretariat AFNOR).

NOTE This standard should be read together with EN 1504–1 and prEN 1504–4.

Contents

1 Scope

This European Standard describes a method for the measurement of the open time of structural bonding agents by use of bonded concrete prisms tested in flexure.

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.

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

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

3 Test method

The open time is defined as the period that elapses between the completion of mixing of the bonding agent and the longest time to closing of the joint which results in a failure plane within the concrete.

The open time is measured using the results from tensile bending tests performed on a series of concrete test prisms which have been bonded using the same mix of bonding agent but with the pairs of prisms being brought together at predetermined intervals after application of the bonding agent.

For those test prisms bonded within the open time the tensile bending test should result in fracture in the concrete. When fracture occurs within the bond line it is considered that the test prisms concerned were bonded outside the open time.

4 Equipment

4.1 *Steel moulds*, for producing concrete test pieces of size 40 mm × 40 mm × 80 mm.

4.2 *Concrete mixer*, as in EN 480-1.

4.3 Grit blasting equipment.

4.4 *A stop clock*, calibrated in minutes to a maximum of 120 min.

4.5 *Clamping frames*, as shown in Figure 1, capable of applying a compressional longitudinal force of 320 N and maintaining this force on the bonded concrete prisms during the tensile bending test.

4.6 *Testing machine*, capable applying a force at a rate of (50 ± 10) N/s up to 20 kN during the tensile bending test.

4.7 *Steel support frame*, support rollers, loading rollers and spreader beam as shown in Figure 2 for four point bending test on bonded concrete prisms.

4.8 *Thermometer*.

4.9 *Relative humidity equipment.*

5 Test procedure

5.1 Sampling material

The bonding agent to be tested shall be taken from one production batch.

5.2 Number of test specimens

Flexural tests shall be carried out on six bonded concrete prisms. The concrete prisms shall be bonded at different time intervals after application of the bonding agent (see **5.5**).

5.3 Concrete prisms

Concrete test prisms, measuring 40 mm × 40 mm × 80 mm and using reference concrete Type MC (0,40) shall be manufactured and cured for at least 21 days in accordance with prEN 1766. One end face of each prism shall then be grit blasted in accordance with prEN 1766.

5.4 Conditioning

The concrete test prisms and the resin and hardener component of the bonding agent shall be conditioned at the test temperature, which is at the upper limit of the specified application temperature range of the particular formulation under test.

NOTE The most demanding conditions have been selected for the test, i.e. high strength concrete and the upper limit of the specified application temperature.

5.5 Procedure

The components of the bonding agent shall be mixed at the test temperature in accordance with the manufacturer's instructions. Immediately on completion of mixing the stop clock shall be started and after 10 min have elapsed the bonding agent shall be applied in a layer about 2 mm thick to the prepared end face of one concrete prism in each pair. Appropriate spacers shall be used to control the thickness of the bonding agent.

At intervals, for example at 30 min, 45 min, 60 min, 75 min, 90 min and 105 min after application of the bonding agent, the corresponding face of the other concrete prism in each pair shall be placed against the coated face and the two prisms shall be clamped together in the frame shown in Figure 1 with a clamping force normal to the bonded interface of (320 ± 20) N. This generates a compressive stress of 0,20 N/mm^2 in the bond plane. The complete assemblies shall then be cured at the test temperature for 7 days or such other time that may be agreed between interested parties.

At the end of the specified curing period the assembly shall be mounted in the support frame as shown in Figure 2 and positioned within the testing machine. The load shall be applied vertically by means of the spreader beam and it shall be increased uniformly at a rate of (50 ± 10) N/s until fracture.

Record the position of the failure plane for each pair of prisms.

6 Report

The report shall include the following information:

a) name and address of the testing laboratory, and the place at which the tests were performed if different from the laboratory address;

b) date and identification number of the test report;

c) name and address of the client;

d) identification of the product;

e) purpose of the test;

f) date of receipt and complete identification of the samples of bonding agents to be tested;

g) description and marking of the specimens;

h) description of the preparation of the specimens, including full details of any priming system used and thickness (or mass) of primer or bonding agent applied;

i) date of the test performance;

j) any deviations from or additions to the test method, and any omissions, together with other information of importance for the interpretation of the observation and the evaluation of the test result;

k) the conditioning, curing and test temperature;

l) curing period in days between bonding and testing;

m) for each specimen:

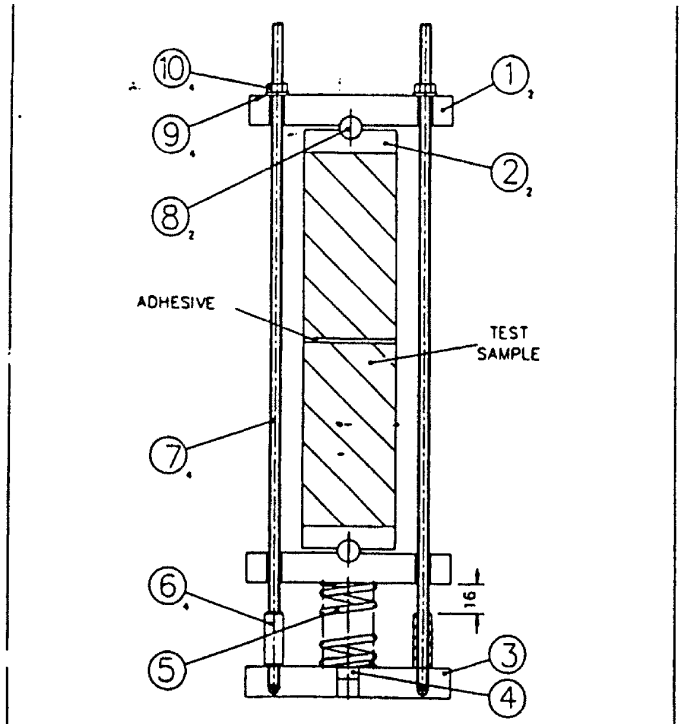
1) the elapsed time interval between application of the bonding agent and closing of the joint;

2) the failure load recorded in the tensile bending test;

3) the position of the failure plane;

n) the open time of the structural bonding agent, taken as the longest time interval between application of the bonding agent and closing of the joint which results in a failure plane within the concrete;

o) reference to this European Standard.



ITEM	TITLE	NO. OFF	REMARKS
1	CLAMPING PLATE	2	
2	SUPPORT PLATE	2	
3	BASE PLATE	1	
4	SPRING LOCATION PEG	1	
5	SPRING (COMPRESSION)	1	
6	SPACING BUSH	4	
7	M6 STUDDING 315 LG	4	STANDARD PARTS
8	BALL BEARING ø12	2	" "
9	M6 STEEL WASHER	4	" "
10	M6 STEEL NUT	4	" "

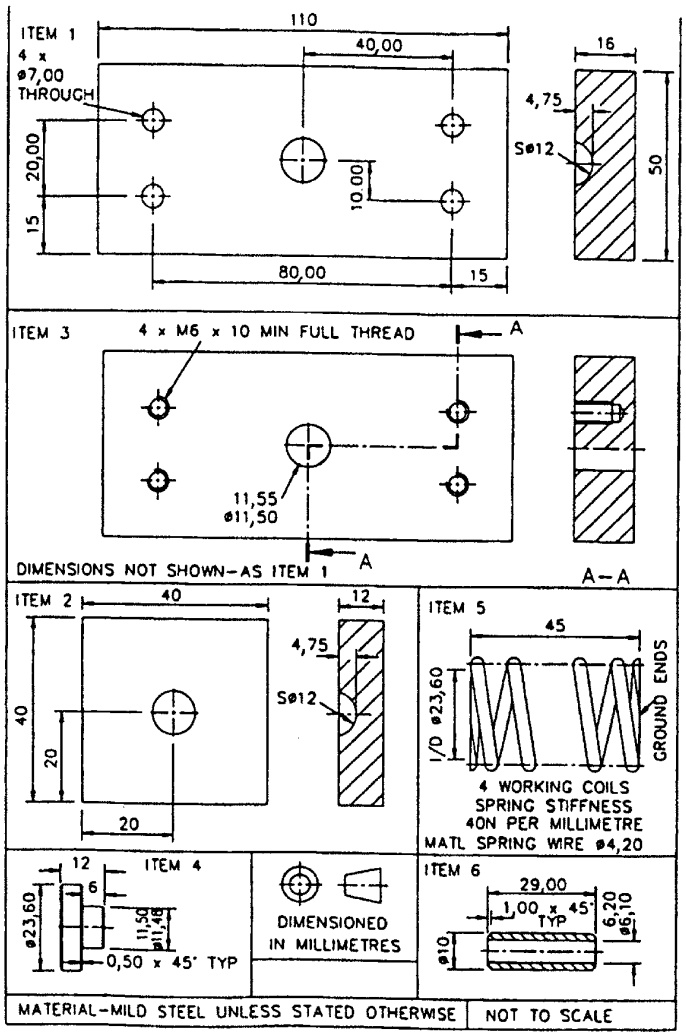
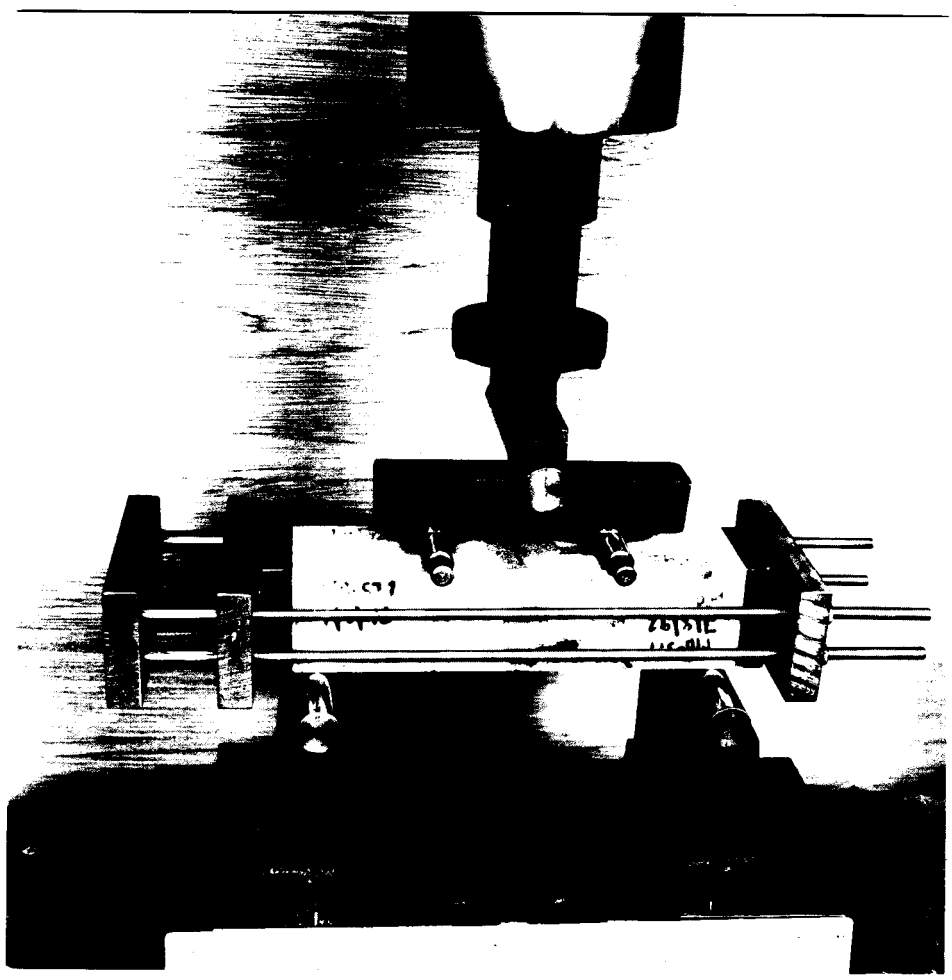


Figure 1 —Clamping frame



Key

Span between support rollers = 150 mm
Span of spreader beam = 50 mm

Figure 2 — Four point bend test

Annex A (informative)
Bibliography

[1] FIP/9/2, *Proposal for a standard for acceptance tests and verification of epoxy bonding agents for segmental construction*. Fédération Internationale de la Précontrainte, March 1978.

[2] EN 1504–1, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 1: General scope and definitions*.

[3] prEN 1504–4, *Products and systems for the protection and repair of concrete structures — Definitions, requirements, quality control and evaluation of conformity — Part 4: Structural bonding.*

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