BRITISH STANDARD

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Hot applied joint sealants —

Part 10: Test method for the determination of adhesion and cohesion following continuous extension and compression

The European Standard EN 13880-10:2003 has the status of a British Standard

ICS 93.080.20

BSI
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National foreword

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The UK participation in its preparation was entrusted by Technical Committee B/510, Roads materials, to Subcommittee B/510/3, Materials for concrete roads, which has the responsibility to:

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Hot applied joint sealants - Part 10: Test method for the determination of adhesion and cohesion following continuous extension and compression

Produits de scellement de joints appliqués à chaud - Partie 10: Méthode d'essai pour la détermination de l'adhésion et de la cohésion après traction et compression répétée

Heiß verarbeitbare Fugenmassen - Teil 10: Prüfverfahren zur Bestimmung des Dehn- und Haftvermögens bei kontinuierlicher Dehnung und Stauchung

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Contents

page

Foreword

This document EN 13880-10:2003 has been prepared by Technical Committee CEN/TC 227 “Road materials”, 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of an identical text or by endorsement, at the latest by February 2004, and conflicting national standards shall be withdrawn at the latest by March 2005.

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.

This European Standard is one of a series of standards as listed below:

EN 13880-1, *Hot applied joint sealants — Part 1: Test method for the determination of density at 25 °C.*

EN 13880-2, *Hot applied joint sealants — Part 2: Test method for the determination of cone penetration at 25 °C.*

EN 13880-3, *Hot applied joint sealants — Part 3: Test method for the determination of penetration and recovery (resilience).*

EN 13880-4, *Hot applied joint selants — Part 4: Test method for the determination of heat resistance — Change in penetration value.*

EN 13880-5, *Hot applied joint sealants — Part 5: Test method for the determination of flow resistance.*

prEN 13880-6, *Hot applied joint sealants — Part 6: Test method for the preparation of samples for testing.*

EN 13880-7, *Hot applied joint sealants — Part 7: Function testing of joint sealants.*

EN 13880-8, *Hot applied joint sealants — Part 8: Test method for the determination of the change in weight of fuel resistance joint sealants after fuel immersion.*

EN 13880-9, *Hot applied joint sealants — Part 9: Test method for the determination of compatibility with asphalt pavements.*

EN 13880-10, *Hot applied joint sealants — Part 10: Test method for the determination of adhesion and cohesion following continuous extension and compression.*

EN 13880-11, *Hot applied joint sealants — Part 11: Test method for the preparation of asphalt test blocks used in the function test and for the determination of compatibility with asphalt pavements.*

EN 13880-12, *Hot applied joint sealants — Part 12: Test method for the manufacture of concrete test blocks for bond "testing (recipe methods).*

EN 13880-13, *Hot applied joint sealants — Part 13: Test method for the determination of the discontinuous extension (adherence test).*

Annexe A is informative.

1 Scope

This European Standard describes a method for determining the adhesion and cohesion characteristics of hot applied joint sealant specimens following continuous extension and compression bond testing.

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 13880-2, *Hot applied joint sealants — Part 2: Test method for the determination of cone penetration at 25 °C.*

prEN 13880-6, *Hot applied joint sealants — Part 6: Test method for the preparation of samples for testing.*

EN 13880-12, *Hot applied joint sealants — Part 12: Test method for the manufacture of concrete test blocks for bond testing (recipe methods).*

prEN 14188-1:2001, *Joint fillers and sealants — Part 1: Specifications for hot applied sealants.*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in prEN 14188-1:2001 and the following apply.

3.1
adhesion failures
surface area of the concrete test blocks from which the sealant is completely separated are to be evaluated for adhesive failure, calculated to the nearest 10 mm^2

3.2
cohesion failures
cohesion failure is the sum of the superficial areas of any ruptures on the faces of the material to the nearest 5 mm^2 and any cavity exceeding 3 mm in depth, measured normal to the face of the test specimen

4 Principle

The cohesive properties of a sealant are examined to verify its ability to adhere to concrete (primed if the manufacturer of the sealant so recommends) when subjected to cycles of extension and compression at the appropriate test temperature according to prEN 14188-1.

5 Apparatus

5.1 Jig for pouring and handling of test specimen

Suitable jig to place two concrete test blocks exactly opposite each other for a joint width of (24,0 ± 0,5) mm and joint length and height of (50,0 ± 0,5) mm and handling the test specimen until testing without disturbing the test specimens before, during and after the removal of the jig.

5.2 Tensile rig

Bond testing tensile rig, which allows the specimens to be inserted:

- motor driven through positive drives without slip or significant backlash, so the cycles of extension and compression are carried out steadily and automatically;
- capable of moving blocks smoothly and linearly, so that their alignment is maintained at all times and the test specimens are not subjected to torsion, bending, shocks or significant vibration;
- capable of exerting on each test specimen a tensile force of up to 2 500 N and subject to such a force being sufficient, extending each test specimen uniformly under all conditions by (18,00 ± 0,25) mm at a rate of (6,00 ± 0,25) mm/h;
- capable of exerting on each extended test specimen a compressive force of 2 500 N in order to compress each test specimen uniformly under all conditions to its original length;
- if the apparatus is capable of testing a number of test specimens simultaneously, it shall not be significantly affected by the premature failure of one or more test specimens.

5.3 Cooling chamber

Capable of reducing the temperature of a full compliment of test specimens to the appropriate test temperature in not more than 4 h and holding the test specimens at this temperature for at least 36 h. The test temperature is according to prEN 14188-1.

The chamber shall be fitted with a calibrated temperature indicator accurate to (±1,0 °C) with its bulb or sensor at the point where the temperature fluctuation is known to be greatest. Alternatively the temperature indicator may be placed in the centre of the horizontal plane above the top of the specimens.

5.4 Measurement of forces

Device for measurement of forces, fitted to the outside of the cooling chamber, capable of measuring with an accuracy of ±1 N up to 100 N and with an accuracy of ±1 % thereafter, the maximum tensile forces applied to each test specimen.

6 Preparation and conditioning of test specimens

6.1 Prepare the test sample according to prEN 13880-6.

6.2 Concrete test blocks in accordance with EN 13880-12 shall be used. The concrete test blocks shall be (125 ± 1) mm in length, (50,0 ± 0,5) mm in width and (50,0 ± 0,5) mm in height and shall have a moisture content of (5,0 ± 0,5) %.

6.3 Use a suitable jig to place two test blocks exactly opposite each other for a joint width of (24,0 ± 0,5) mm and a joint length and height of (50,0 ± 0,5) mm.

6.4 If a primer is used, apply it to the sawn test faces of the concrete test blocks in accordance with the manufacturer's instructions.

6.5 Place a top-mask on the jig so that the joint can be overfilled when the hot applied joint sealant in poured into it.

6.6 Any adhering of the poured hot applied joint sealant to the borders of the joint shall be avoided.

6.7 Allow the test specimens to cool at laboratory temperature for 2 h after which remove the excess hot applied joint sealant using a heated knife so that the test specimens are flush with the surface of the concrete test blocks.

6.8 Three test specimens shall be prepared for each test.

7 Procedure

7.1 Leave the assembled test specimen in the jig and firmly fix it in the clamps of the extension apparatus. Remove the jig. Arrange the apparatus so that the jigged test specimens can be inserted into the clamps conveniently and without disturbing the test specimens before, during and after the removal of the jig.

7.2 Reduce the temperature of the atmosphere surrounding the test specimen and maintain for a period of 6 h and during the test.

NOTE The relevant testing temperatures for hot applied joint sealants are in accordance with prEN 14188-1.

7.3 The test specimens are subjected to three cycles of extension and compression as follows:

— Extend the joint 18 mm at a uniform rate of (6,00 ± 0,25) mm/h and immediately compress the test specimen at the same uniform rate and at the same temperature to its original dimension without removal from the test rig.

7.4 The force and extension shall be recorded during the entire test procedure.

7.5 Record the maximum force reached for each test specimen.

7.6 Examine all three test specimens at the end of the third cycle for adhesion and cohesion failures.

8 Calculation and expression of results

8.1 General

The maximum tension σ shall be calculated by the following formula:

$$\max\sigma = \frac{\max F}{A} \quad (1)$$

where

$\max\sigma$ is the maximum tension, in newton per square millimetres (N/mm^2);

$\max F$ is the maximum force, in newton (N);

A is the joint area [(50,0 ± 0,5) mm × (50,00 ± 0,5) mm], in square millimetres (mm).

Report the maximum tension as the average of the three test specimens, rounded to the nearest 0,1 N/mm^2.

8.2 Failures

Report adhesive failures, calculated to the nearest 10 mm^2.

Report cohesive failures, calculated to the nearest 5 mm^2, and any cavity exceeding 3 mm in depth.

9 Precision

Estimates of the repeatability and reproducibility of this test method and of the variability due to sampling are not yet available but will be included by amendment when known.

10 Test report

The test report shall confirm that the test was carried out in accordance with this European Standard and shall include the following information:

a) name of sample and related primers if used;

b) source of sample, batch number and date of manufacture where appropriate or expiry date;

c) date of testing, name of analyst and test laboratory;

d) force/time- and extension/time-diagram for each test specimen;

e) results obtained.

Annex A
(informative)

Bond testing after fuel immersion

A.1 Principle

The adhesive and cohesive properties of fuel-resistant type sealants are verified to determine that they do not deteriorate to an unacceptable degree as a result of contact with spilt fuel or oil.

NOTE 1 Provision is made for the test to be carried out with different fluids if the standard fuel is not representative of a particular spillage. Standard fuel for full immersion test see EN 13880-2.

NOTE 2 Attention is drawn to the European Health Safety Regulations.

A.2 Apparatus

A.2.1 Large container, 460 mm × 310 mm × 150 mm made from 2 mm sheet metal with a close fitting lid which can be sealed.

A.2.2 Standard fuel, being a mixture of 70 % iso-octane (V/V) having the properties given in Table B.1, with a 30 % (V/V) industrial grade toluene.

Table A.1 — Properties of iso-octane

Octane number	100,0 ± 0,1
Density at 20 °C	(0,69193± 0,00015) g/ml
Refractive index, N_D	(1,39145 ± 0,00015) N
Freezing point	–107,442 °C
Distillation: 50 % recovery	(99,238 ± 0,025) °C
Increase from 20 % and 80 % recovery, °C	maximum 0,020
NOTE Alternatively, if agreed between the purchaser and the supplier, a special fluid may be substituted, but the other conditions of the test should not be varied.	

A.2.3 Adhesive tape.

A.3 Preparation and conditioning of test specimens

Prepare the test specimens in accordance with clause 6.

A.4 Procedure

Place the test specimen in the small container and pour in standard fuel to a depth of 100 mm. Seal the lid with adhesive tape.

Maintain the container at a temperature of (23 ± 2) °C for a period of (24± 1) h.

After removal from the fuel, dry the test specimen in airflow with a mean flow velocity between 90 m/min and 150 m/min, for a period of 1 h.

Carry out the test in accordance with clause 7.

A.5 Test report

A test report shall be completed in accordance with clause 10.

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