SLOVENSKI STANDARD
SIST EN 12697-44:2019

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Nadomešča:
SIST EN 12697-44:2010

Bitumenske zmesi - Preskusne metode - 44. del: Širjenje razpoke s polkrožnim upogibnim preskusom

Bituminous mixtures - Test methods - Part 44: Crack propagation by semi-circular bending test

Asphalt - Prüfverfahren - Teil 44: Bestimmung der Rissausbreitung mittels Halbzylinder-Biegeversuch

Mélanges bitumineux - Méthodes d'essai - Partie 44 : Propagation de fissure par essai de flexion d'un bloc semi-circulaire

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93.080.20	Materiali za gradnjo cest	Road construction materials

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EUROPEAN STANDARD

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Bituminous mixtures - Test methods - Part 44: Crack propagation by semi-circular bending test

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 12697-44:2019) has been prepared by Technical Committee CEN/TC 227 “Road materials”, the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by September 2019, and conflicting national standards shall be withdrawn at the latest by September 2019.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 12697-44:2010.

The following is a list of significant technical changes since the previous edition:

— The series title no longer makes the method exclusively for hot mix asphalt;

— [6.10] Tolerance for notch width amended to (0,40 ± 0,20) mm;

— [7.1.2]; [7.1.3]; [7.1.4] Addition of tolerance for height of specimen: (74 ± 1) mm;

— [7.1.6] Tolerance for notch width amended to (0,40 ± 0,20) mm in accordance with 6.10;

— [9.4] Formulae (2) to (4) amended. Formula (5) deleted and (6) renumbered to (5).

A list of all parts in the EN 12697 series can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations 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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This document specifies the Semi-Circular Bending (SCB) test method to determine the tensile strength or fracture toughness of an asphalt mixture for the assessment of the potential for crack propagation. The results of the test can be used to calculate:

— the maximum load that the material containing a notch (crack) can resist before failure;

— when the presence of a notch is critical.

It should be noted that the test only describes a method to determine the resistance to crack propagation of an asphalt mixture. The crack propagation phase describes the second part of failure mechanism during dynamic loading. The first phase, which is the crack initiation phase, is mainly covered by the fatigue test (EN 12697-24).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 12697-27, *Bituminous mixtures — Test methods — Part 27: Sampling*

EN 12697-31, *Bituminous mixtures — Test methods — Part 31: Specimen preparation by gyratory compactor*

EN 12697-33, *Bituminous mixtures — Test methods — Part 33: Specimen prepared by roller compactor*

EN 12697-35, *Bituminous mixtures — Test methods — Part 35: Laboratory mixing*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia. available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
test piece
sample obtained by sawing an asphalt cylinder through a diameter

3.2
strain
relative deformation of the test piece

3.3
stress
force per unit area

3.4
horizontal stress
tensile stress prevailing at the base of the test piece

3.5
tensile strength
strength of the material under tensile loading

3.6
fracture toughness
resistance to failure of the test piece by breaking

4 Symbols

For the purposes of this document, the following symbols apply.

a	notch depth in millimetres (mm)
D	diameter in millimetres (mm)
$f(a/W)$	geometric factor
F	force in newtons (N)
F_{max}	maximum force in newtons (N)
K_{Ic}	fracture toughness in newtons per millimetre to the power of 1,5 ($N/mm^{1,5}$)
t	thickness in millimetres (mm)
ΔW	vertical displacement at maximum force in millimetres (mm)
ε_{max}	strain at maximum force in percent (%)
σ	stress in newtons per square millimetre (N/mm^2)
σ_{hor}	horizontal stress in newtons per square millimetre (N/mm^2)
σ_{max}	maximum stress at failure in newtons per square millimetre (N/mm^2)

5 Principle

A half cylinder test piece with a centre crack is loaded in three-point bending in such a way that the middle of the base of the test piece is subjected to a tensile stress. During the test, the deformation increases at a constant rate of 5 mm/min. The corresponding load increases to a maximum value, F_{max}, that is directly related to the fracture toughness of the test sample. In Figure 1 an example of the test frame and specimen is given.

Dimensions in millimetres

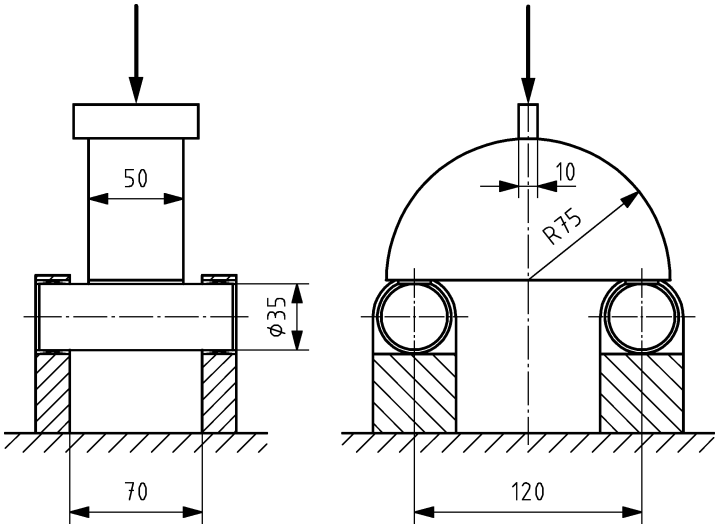


Figure 1 — Example of the test frame and specimen for the SCB-test

6 Apparatus

6.1 Test machine.

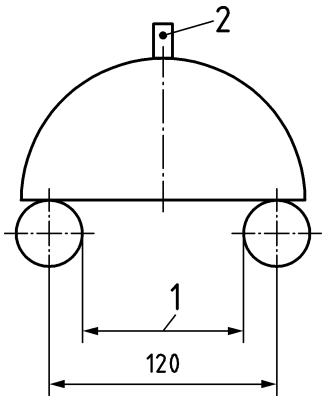
The machine should have a range of at least 50 kN and have a drive with which a constant deformation rate of (5,0 ± 0,2) mm/min is maintained during the test.

6.2 Load cell or other force-measuring gauge, capable of measuring the load with an accuracy of ± 0,2 kN.

6.3 Deformation gauge, capable of measuring the deformation to an accuracy of ± 0,01 mm.

6.4 Roller bearings, capable of rotating on its axis with a support length (centre to centre) of (120,0 ± 0,5) mm and a diameter of (35,0 ± 0,5) mm, as shown in Figure 2.

Dimensions in millimetres



Key

1 roller bearings

2 loading strip

Figure 2 — Schematic of semi-circular bend test

6.5 Specimen bearing strips.

Between specimen and roller bearing, a metal specimen bearing strip (two per specimen) of dimensions (52 ± 1) mm by (20 ± 1) mm by (1,0 ± 0,2) mm ($L \times W \times H$) shall be placed. The centre of each bearing strip shall be directly above the centre of the each roller bearing.

6.6 Metal loading strip, with a length of at least the thickness of the specimen, a width of (10,0 ± 0,2) mm and a height of (20,0 ± 0,5) mm, as shown in Figure 1.

6.7 Monitoring equipment, capable of continuously logging the loading and the vertical deformation of the test piece.

6.8 Sliding callipers, capable of measuring the dimensions of the specimens with an accuracy of ± 0,1 mm.

6.9 Climatic chamber, capable to maintain the test temperature in the vicinity of the specimen to ± 1 °C.

6.10 Cutting machine, capable to cut a notch in the specimen with a width of (0,40 ± 0,20) mm and a depth of (10,0 ± 1,0) mm.

NOTE The dimensions of the notch can be checked using high accurate metal strips with various thicknesses and lengths.

7 Sample preparation

7.1 Manufacture

7.1.1 Prepare asphalt cylinders in accordance with either 7.1.2, 7.1.3 or 7.1.4.

NOTE If the cylinders are cored, it is important that they are drilled as near perpendicular to the surface of the asphalt as practicable.