PD CEN/TS 12697-50:2018

BSI Standards Publication

Bituminous mixtures - Test methods

Part 50: Resistance to scuffing

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National foreword

This Published Document is the UK implementation of CEN/TS 12697-50:2018. It supersedes PD CEN/TS 12697-50:2016, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/510/1, Asphalt products.

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

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Asphalt - Prüfverfahren - Teil 50: Widerstand gegen Oberflächenverschleiß

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European foreword

This document (CEN/TS 12697-50:2018) has been prepared by Technical Committee CEN/TC 227 "Road materials", the secretariat of which is held by DIN.

This document supersedes CEN/TS 12697-50:2016.

In comparison with the previous edition, the following modifications have been made:

— General: Several editorial changes has been performed for clarity and increased consistency of used terms, definitions, symbols, abbreviations and units. NOTES are amended to normal text were appropriate;

— The clause numbers for Terms, definitions, symbols and abbreviations [3], [3.1], [3.2] and Principle [4] has been altered to be in line with current template for standards;

— [3.2] Completion of symbol, D and definition for the diameter of the tested core specimen, in 0,1 mm;

— [3.2] Amended definitions for the following symbols: T, A, M_0, M_1, V_0, V_1, ΔV were "slab" has been altered to "specimen" since mass and volume parameters are also valid for core specimen;

— [3.2] Amended definition from "loss of volume" to "increase of texture" for the symbol ΔV to be in line with Clause 7;

— [5.3] Standard dimensions for slabs deleted and transferred to A.1.1 (only valid for ARTe). Completion with reference to Annexes A to D;

— [5.3] Text describing the variation of thickness of specimen transferred to A.1.1. NOTE describing preparation of slabs deleted.

— [5.4] NOTE (describing ageing procedures) completed with reference to CEN/TS 12697-52;

— [6] Abbreviations for the listed devices are completed with the full title for clarification;

— [7] Conformity of definition for ΔV to read "increase of texture" for consistency;

— [8] The word "slab" amended to "specimen" were appropriate for consistency;

— [8] bullet f). Completed with alternative report of diameter and thickness of the tested cores;

— [Annexes A to D] Titles completed with respective full title for clarification;

— [Annexes A and B] Amended from (Normative) to (Informative) for consistency. All annexes are only referred to informatively;

— [A.1.3] Requirement for two smooth unprofiled PIARC tires is replaced by a general requirement of two smooth profiled 165/75 R14C radial 97/95 tires. NOTE deleted;

— [A.1.3] Tyre pressure corrected from (200 ± 10) kPa to (230 ± 10) kPa;

— [C.2.10] Tolerance for dimension of cores amended from (150 ± 1 mm) to (150 ± 2 mm) for consistency;

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— [C.3.3] New clause (Specimen preparation) introduced for clarity and readbility;

— [C.3.4] New clause (Performance of the test) introduced for clarity and readbility;

— [C.3.4] 2nd indent: Thickness of rubber mat changed from (5 ± 1) mm to (3 ± 1) mm;

— [D.1.2] Reference to DIN 53516 deleted. Replaced with clarification that the abrasion resistance for the tyre is expressed as relative volume loss, in accordance with Method A of ISO 4649 where the standard reference compound Nr.One is used;

— [D.2.3.1] Bullet a) Incorrect reference to (EN 12697-1). Replaced by (EN 13036-1).

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

This Technical Specification was prepared with the aim of having a 3-year lifetime.

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Introduction

The European Committee for Standardization (CEN) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning a load applicator given in subclause D.1.2.

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1 Scope

This European Technical Specification specifies a test method for determining the resistance to scuffing of asphalt mixtures which are used in surface layers and are loaded with high shear stresses in road or airfield pavement. These shear stresses occur in the contact area between tyre and pavement surface and can be caused by cornering of the vehicle. Due to these shear stresses, material loss will occur at the surface of these layers. The test is normally performed on asphalt layers with a high amount of air voids (e.g. porous asphalt), but can also be applied on other asphaltic mixtures. Test specimens are used either produced in a laboratory or cut from the pavement.

NOTE The test is developed to determine the resistance to scuffing for noise reducing surface layers where raveling is the normative damage criterion. The test can also be performed on other surface mixtures with a high resistance to permanent deformation. In case a mixture has a low resistance to permanent deformation, rutting can occur during the test. This can influence the test results.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 12697-6, *Bituminous mixtures - Test methods for hot mix asphalt - Part 6: Determination of bulk density of bituminous specimens*

EN 12697-29, *Bituminous mixtures - Test method for hot mix asphalt - Part 29: Determination of the dimensions of a bituminous specimen*

EN 12697-33, *Bituminous mixtures - Test methods for hot mix asphalt - Part 33: Specimen prepared by roller compactor*

3 Terms, definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following term and definition applies.

3.1.1
material loss
amount of material that has been lost from the surface of the slab due to the test

Note 1 to entry: The amount of material loss can be determined in 3 different ways:

— visually and/or by taking pictures;

— by weighing the mass of the slab before and after the test: the difference in mass per area is a measure for the resistance to scuffing of the tested asphalt mixture;

— by scanning the surface of the slab before and after the test. The scans provide a 3D picture from the surface of the slab. After subtracting mathematically the 3D picture after the test from the one before the test, an accurate 3D overview of the material loss can be generated. The calculated volume of this 3D overview of the material loss is an accurate value for the resistance to scuffing of the tested asphalt mixture.

Note 2 to entry: If permanent deformation occurs during the test, the results of the surface scan will be compensated for this phenomenon.

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3.2 Symbols and abbreviations

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

T is the thickness of the specimen, in 0,1 mm;

W is the width of the slab, in 0,1 mm;

L is the length of the slab, in 0,1 mm;

D is the diameter of the tested core specimen, in 0,1 mm;

A is the surface of the tested specimen, in 0,01 mm^2;

M_0 is the mass of the specimen before performing the test, in 1 g;

M_1 is the mass of the specimen after performing the test, in 1 g;

ΔM is the loss of mass due to performing the test, in 1 g;

V_0 is the volume of the texture of the specimen before performing the test, in 0,1 mm^3;

V_1 is the volume of the texture of the specimen after performing the test, in 0,1 mm^3;

ΔV is the increase in the volume of the texture of the specimen due to performing the test, in 0,1 mm^3.

4 Principle

Laboratory compacted asphalt slabs or asphalt cores cut from a pavement are fixed in a test facility. In this facility, the asphalt specimen is loaded simultaneously with both normal and shear stresses. Due to these stresses, material loss will occur from the surface of the specimens. This material loss depends on the resistance to scuffing of the tested asphalt mixture: the higher the resistance, the less material will be removed.

To determine the resistance to scuffing, two slabs or (set of) cores shall be tested. The average of both test results is reported as the resistance to scuffing.

In this Technical Specification, four different kinds of loading facilities are described:

— the Aachener Raveling Tester (ARTe);

— the Darmstadt Scuffing Device (DSD);

— the Rotating Surface Abrasion Test (RSAT); and

— the Triboroute Device (TRD).

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5 Preparation of test specimens

5.1 General

To determine the resistance to scuffing of an asphalt mixture, 2 slabs or 2 (sets of) cores of that material shall be tested. The average of both test results shall be considered to determine the resistance to scuffing.

5.2 Compaction of the slabs

In the scuffing device, asphalt slabs or (sets of) cores shall be tested. These slabs or (sets of) cores shall be prepared according to EN 12697-33 or can be cut from pavements.

5.3 Dimensions of the specimens

The test can be performed on specimens with various dimensions defined in Annex A to D. Cores shall have a standard diameter of (150 ± 2) mm.

5.4 Age of the specimens

Prior to the start of testing, the specimen shall be stored on a flat surface at a temperature of not more than 20 °C for between 14 days and 42 days from the time of their manufacture. In the case of samples requiring cutting, the cutting shall be performed no more than 8 days after compaction of the asphalt. The time of manufacture for these samples is the time when they are cut.

NOTE Not only fresh asphalt mixtures can be tested, also aged specimens can be examined in the scuffing test. In literature several aging procedures can be found. The choice of a proper aging procedure depends on the characteristics of the tested material. Guidance for different aging procedures can be found in the technical specification CEN/TS 12697-52.

5.5 Dimensions and bulk density of the specimens

The dimensions of the slab shall be determined according to EN 12697-29. The length, *L*, and width, *W*, of the slab are measured at four positions of the slab, equally divided over the area. The accuracy of the measurements shall be 0,1 mm. The average of the four individual measurements are respective the length, *L*, and width, *W*, of the slab.

The thickness, *T*, of the slab shall be determined at eight points. Each point shall be taken 100 mm from the edge of the slab using a vernier calliper. All eight point shall be equally divided over the surface of the slab. The accuracy of each measurement shall be 0,1 mm. The maximum difference between the eight individual measurements shall be 2,5 mm. If not, the specimen shall not be tested. The average of the eight measurements is the thickness, *T*, of the slab.

If cores are tested, the diameter and thickness of each core shall be determined according to EN 12697-29 using a vernier calliper. The diameter, *D*, and the thickness, *T*, are measured at four positions of the slab, equally divided over the area. The accuracy of the measurements shall be 0,1 mm. The average of the four individual measurements shall be deemed to be the diameter of the core.

The bulk density of the slab or the core shall be determined according to EN 12697-6 using the bulk density by dimensions procedure. Before measuring the mass, M_0, of the slab, the specimen shall be dried to constant mass in air at a relative air humidity of less than 80 % at a temperature not more than 20 °C. A test specimen shall be considered to be dry after at least 8 h drying time and when two weighings performed minimum 4 h apart differ by less than 0,1 %.

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6 Loading devices

The resistance to scuffing can be determined using one of the following test devices:

— the Aachener Raveling Tester (ARTe), see Annex A;

— the Darmstadt Scuffing Device (DSD), see Annex B;

— the Rotating Surface Abrasion Test (RSAT), see Annex C; and

— the Triboroute Device (TRD), see Annex D.

7 Test results

The results of the tests shall be reported using the results of the visual inspection and/or pictures before and after the test and the material loss per covered area (= *MLpA*). Alternatively, the increase in texture per covered area, ΔV, can be used. The following formulae shall be used:

— Material loss per covered area *MLpA* when slabs are tested determine by:

$$MLpA_{\mathrm{i}} = \frac{M_{0,\mathrm{i}} - M_{1,\mathrm{i}}}{W_{\mathrm{i}} L_{\mathrm{i}}} = \frac{\Delta M_{\mathrm{i}}}{W_{\mathrm{i}} L_{\mathrm{i}}} \text{ with i = 1,2} \tag{1}$$

$$MLpA = \frac{\sum_{i=1}^{2} MLpA_{\mathrm{i}}}{2} \tag{2}$$

where

$M_{0,\mathrm{i}}$ is the mass of the slab i (i = 1,2) before performing the test, in 1 g;

$M_{1,\mathrm{i}}$ is the mass of the slab i (i = 1,2) after performing the test, in 1 g;

W_{i} is the width of the slab i (i = 1,2) in 0,1 mm;

L_{i} is the length of the slab i (i = 1,2) in 0,1 mm.

— Material loss per covered area *MLpA* when a (set of) cores are tested determine:

$$MLpA_{\mathrm{i}} = \frac{M_{0,\mathrm{i}} - M_{1,\mathrm{i}}}{\frac{1}{4}\pi D_{\mathrm{i}}^2} = \frac{\Delta M_{\mathrm{i}}}{\frac{1}{4}\pi D_{\mathrm{i}}^2} \text{ with i = 1,2} \tag{3}$$

$$MLpA = \frac{\sum_{i=1}^{2} MLpA_{\mathrm{i}}}{2} \tag{4}$$

where

$M_{0,\mathrm{i}}$ is the mass of the (set of) core i (i = 1,2) before performing the test, in 1 g;

$M_{1,\mathrm{i}}$ is the mass of the (set of) core i (i = 1,2) after performing the test, in 1 g;

D_{i} is the diameter of the (set of) core i (i = 1,2) in 0,1 mm.

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