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Bituminous mixtures - Test methods - Part 22: Wheel tracking

Asphalt - Prüfverfahren - Teil 22: Spurbildungstest

Mélanges bitumineux - Méthodes d'essai - Partie 22 : Essai d'orniérage

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Bituminous mixtures - Test methods - Part 22: Wheel tracking

Mélanges bitumineux - Méthodes d'essai - Partie 22 : Essai d'orniérage

Asphalt - Prüfverfahren - Teil 22: Spurbildungstest

This European Standard was approved by CEN on 18 November 2019 and includes Amendment approved by CEN on 20 November 2023.

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Contents

Page

European foreword ... 3

1 Scope ... 5

2 Normative references ... 5

3 Terms and definitions ... 5

4 Symbols and abbreviated terms ... 6

5 Principle ... 7

6 Apparatus ... 8
6.1 Large size devices ... 8
6.2 ▌A1⟩ Extra-large ⟨A1▐ devices ... 9
6.3 Small size devices for use with rectangular plates ... 10
6.4 Small-size devices for use with cores ... 11

7 Sampling and sample preparation ... 12
7.1 Test portion ... 12
7.2 Sampling and manufacture ... 12
7.3 Thickness and surface regularity ... 14
7.4 Transport and storage of unmounted specimens ... 14
7.5 Sample preparation ... 14
7.6 Storage ... 15
7.7 Temperature probes ... 15

8 Procedure for carrying out a single measurement ... 15
8.1 Large size devices ... 15
8.2 Extra-large size device ... 16
8.3 Small size devices ... 17

9 Calculation and expression of results ... 18
9.1 Large size devices ... 18
9.2 Extra-large size device ... 18
9.3 Small size devices ... 19

10 Test report ... 22
10.1 Obligatory information ... 22
10.2 Complementary information ... 24

11 Precision ... 24
11.1 General ... 24
11.2 Laboratory prepared samples, proportional rut depth, large size devices ... 24
11.3 Samples cored from a pavement and laboratory prepared samples, wheel-tracking rate, small-size devices, conditioning in air ... 24
11.4 Samples cored from a pavement and laboratory prepared samples, wheel-tracking rate, small-size devices, conditioning in air, procedure B ... 25

Bibliography ... 29

European foreword

This document (EN 12697-22:2020+A1:2023) 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 June 2024, and conflicting national standards shall be withdrawn at the latest by June 2024.

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 ▌A1⟩ EN 12697-22:2020 ⟨A1▌.

This document includes Amendment 1 approved by CEN on 20 November 2023.

The start and finish of text introduced or altered by amendment is indicated in the text by tags ▌A1⟩ ⟨A1▌.

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

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

— [Clause 2] ISO 48, Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD), replaced by: ISO 48-2, Rubber, vulcanized or thermoplastic — Determination of hardness — Part 2: Hardness between 10 IRHD and 100 IRHD; ISO 7619, Rubber, vulcanized or thermoplastic — Determination of indentation hardness, replaced by: ISO 48-5, Rubber, vulcanized or thermoplastic — Determination of hardness — Part 5: Indentation hardness by IRHD pocket meter method;

— [3.5] Table 1 deleted;

— [Clause 4] symbols for properties in the different methods made more consistent and corrected through the whole document. Table 2 replaced by new Table 1;

— [Clause 6] moulds added to the list of equipment. Modifications for clarity;

— [6.3.1.2] ISO 7619 and ISO 48 replaced by: ISO 48-5 and 48-2;

— [7.1] new clause added and the order of clauses changed;

— [7.2.1.1] vibratory compactor excluded as a method of sample preparation;

— [7.2.1.2] thickness for mixtures with upper sieve size larger than 22 changed to 80 mm;

— [7.5.1] the text has been modified for clarity. “Plaster of Paris” amended to holding medium;

— [7.6] storage time amended to max 42 days and requirement added for storing samples on a flat surface;

— [8.1.7] deleted;

— [9.2.1] Formula (2) corrected;

— [9.3.1.2] Formula (7) corrected;

— [9.3.2.2] required rounding of WTS_{AIR} values specified;

— [9.3.3.2] required rounding of WTS_{W} values specified;

— [10.1.2] type of roller compactor required to be reported;

— [11.4] precision data for small device, procedure B (air) added;

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

〚A1〉 Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website. 〈A1〛

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

1 Scope

This document describes test methods for determining the susceptibility of bituminous materials to deform under load. The test is applicable to mixtures with upper sieve size less than or equal to 32 mm.

The tests are applicable to specimens prepared from asphalt mixtures that have either been manufactured in a laboratory or cut from a pavement; test specimens are held in a mould with their surface flush with the upper edge of the mould.

〈A1〉 The susceptibility of bituminous materials to deform is assessed by the rut formed by repeated passes of a loaded wheel at constant temperature. Three alternative types of devices can be used according to this document: large size devices, extra-large size devices and small size devices. With large size devices and extra-large size devices, the specimens are conditioned in air during testing. With small size devices, specimens are conditioned, in either air or water.

NOTE Large size and extra-large size devices are not suitable for use with cylindrical cores. 〈A1〉

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 12697-6, *Bituminous mixtures — Test methods — Part 6: Determination of bulk density of bituminous specimens*

EN 12697-7, *Bituminous mixtures — Test methods for hot mix asphalt — Part 7: Determination of bulk density of bituminous specimens by gamma rays*

EN 12697-27, *Bituminous mixtures — Test methods — Part 27: Sampling*

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

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

ISO 48-2, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 2: Hardness between 10 IRHD and 100 IRHD*

ISO 48-5, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 5: Indentation hardness by IRHD pocket meter method*

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 https://www.iso.org/obp

3.1
nominal thickness
for laboratory prepared specimens, the target thickness, in millimetres, to which the specimens are to be prepared

Note 1 to entry: The target thickness is the required thickness that is targeted when making the specimen.

3.2
rut depth
reduction in the thickness of a test specimen, in millimetres, caused by repeated passes of a loaded wheel

3.3
test surface
surface of the test specimen on which the loaded wheel runs

3.4
single test result
value obtained by applying this document, once, to a single test portion

3.5
test portion
number of samples that are required to be tested for a single test result

3.6
tyre track
impression of the tyre on a flat surface when a vertical load is applied

3.7
load cycle
two passes (outward and return) of the loaded wheel

〚A1〛 *deleted text* 〚A1〛

4 Symbols and abbreviated terms

For the purposes of this document, the symbols and abbreviations given in Table 1 apply.

〚A1〛

Table 1 — Symbols and abbreviated terms

Symbol	Definition	Unit
d_{ij}	local distance between the reference plane and the j predetermined location on the test surface at the i-th measurement with multiple measurement points for large size device. NOTE j varies between 1 and 15	mm
d_{0j}	local distance between a reference plane and the j predetermined location on the test surface before the start of the test (i=0) for large size device	mm
d_i	is the vertical displacement at the i-th measurement for small size device, procedure A	mm
$d_{i,\,s}$	is the measured rut depth in the measured cross-section, at the i-th measurement for extra-large device;	mm
d_n	is the vertical displacement after n load cycles for small size device, procedure B	mm
d_0	is the vertical displacement initially after 0 load cycles for small size device	mm
h	specimen thickness equal to the thickness of the course or courses of the test piece in which a rut can form	mm
L	load applied	N

Symbol	Definition	Unit
n	number of cycles	—
n_{15}	number of load cycles for rut depth to reach 15 mm using small size device, procedure A	—
N	Total number of readings taken at 100 load cycle intervals for small size device, procedure A	—
P_i	measured proportional rut depth calculated as the average depth of a rut at the i-th measurement for one specimen for large size and extra-large size devices	%
$P_{i\mathrm{LD}}$	mean value of P_i obtained on two or more specimens using large size device	%
$P_{i\mathrm{XL}}$	mean value of P_i obtained on two or more specimens using extra-large size device	%
PRD_{AIR}	mean proportional rut depth for the material using a small size device, procedure B in air	%
PRD_{W}	mean proportional rut depth for the material using a small size device, procedure B in water	%
RD	the rut depth of the specimen i using a small size device, procedure B	mm
RD_{AIR}	mean rut depth for the material using a small size device, procedure B in air	mm
RD_{W}	mean rut depth for the material using a small size device, procedure B in water	mm
r_{i}	mean rut depth at the i-th measurement for large size and extra-large size devices	mm
s	number of measured cross-sections for extra-large device	—
TR	mean rate of increase of track depth for one specimen using small size device, procedure A	µm/cycle
TR_{m}	mean value of the determinations of TR for small size device, procedure A	µm/cycle
w	width of the tyre applying the load	mm
WTR	wheel-tracking rate calculated as the mean rate at which the rut depth increases with time under repeated passes of a loaded wheel for small size device, procedure A	µm/cycle
WTS_{W}	wheel-tracking slope, calculated as the mean rate at which the rut depth increases with repeated passes of a loaded wheel for small size device, procedure B in water	mm/1 000 load cycles
WTS_{AIR}	wheel-tracking slope, calculated as the mean rate at which the rut depth increases with repeated passes of a loaded wheel for small size device, procedure B in air	mm/1 000 load cycles

A1

5 Principle

The susceptibility of a bituminous material to deform is assessed by measuring the rut depth formed by repeated passes of a loaded wheel at a fixed temperature.

6 Apparatus

6.1 Large size devices

6.1.1 Device simulating a rolling load which shall include

6.1.1.1 Wheel fitted with a 400 × 8 pneumatic tyre without tread pattern and having a track width of (80 ± 5) mm. The pneumatic tyre pressure shall be (600 ± 30) kPa.

NOTE The Trelleborg T522 BV Extra or Special 6-ply type pneumatic tyre is suitable for this test.

6.1.1.2 The travel of pneumatic tyre relative to the specimen shall be (410 ± 5) mm.

6.1.1.3 The frequency of travel (outward and return) shall be (1,0 ± 0,1) Hz.

6.1.1.4 The rolling load applied to the test specimen shall be (5 000 ± 50) N at the centre of the test specimen, measured at least when the device is static.

6.1.1.5 The centre line of the tyre track shall be not more than 5 mm from the theoretical centre of the test specimen.

6.1.1.6 The angle of skew of the wheel shall be (0,0 ± 0,5)°.

6.1.2 Mould(s)

Mould(s) of internal dimensions (500 × 180 × 50) mm or (500 × 180 × 100) mm, all dimensions ± 2 mm, capable of withstanding the test conditions without distortion.

6.1.3 Depth gauge

Depth gauge to measure local distance from the reference plane, d_{ij}, to within ± 0,2 mm and with a square, rectangle or circular measurement area of between 5 mm^2 and 10 mm^2. A contact-free sensor can be used if it leads to the same result.

6.1.4 Ventilated enclosure

Ventilated enclosure with a set temperature that is regulated by a probe installed within the test specimen such that the temperature within the specimen is maintained at the set temperature ± 2 °C (see Figure 1)

6.1.5 Temperature sensors

Temperature sensor(s) suitable for installation within a compacted bituminous test specimen and for the measurement of air temperature.

6.1.6 Temperature monitoring indicator

Temperature monitoring indicator to record the temperature within the test specimen, as shown in Figure 1.

6.1.7 Steel supporting plate

Steel supporting plate with a surface unevenness of less than 1 mm when checked with a steel rule across the diagonals and of a thickness such that the deflection under test conditions of this document shall not exceed 0,5 mm.

6.1.8 Non-stick chemical

Non-stick chemical, such as glycerized sodium oleate.

6.2 〚A1〛 Extra-large 〚A1〛 devices

6.2.1 Device simulating a rolling load which shall include

6.2.1.1 General

Wheel fitted with a 6.00-R9 pneumatic tyre without tread pattern and having a track width of (110 ± 5) mm.

6.2.1.2 The travel of pneumatic tyre relative to the specimen shall be (700 ± 5) mm.

6.2.1.3 The time of travel (outward and return) shall be (2,5 ± 0,5) s.

6.2.1.4 The rolling load applied to the test specimen shall be (10 000 ± 100) N at the centre of the test specimen, measured at least when the device is static.

6.2.1.5 The centre line of the tyre track shall be not more than 20 mm from the theoretical centre of the test specimen.

6.2.1.6 The angle of skew of the wheel shall be (0,0 ± 0,5)°.

6.2.2 Moulds

Mould(s) of internal dimensions (700 × 500) mm, all dimensions ± 5 mm, capable of withstanding the test conditions without distortion. The height of the mould corresponds to the nominal thickness of the test specimen at the ends. The height of the side edges correspond to the nominal thickness of the specimen or exceed it by a maximum of 20 mm.

6.2.3 Depth gauge

Laser sensors to measure local deformation within ± 0,2 mm. Laser sensors shall be capable to measure rut depth with interval maximum 2 mm at least in 3 cross-sections as indicated in Figure 2.

6.2.4 Ventilated enclosure

Ventilated enclosure with a set temperature that is regulated by a probe installed within the test specimen such that the temperature within the specimen is maintained at ± 3 °C of the test temperature (see Figure 2).

6.2.5 Temperature sensors

Temperature sensor(s) suitable for installation within a compacted bituminous test specimen and for the measurement of air temperature.

6.2.6 Temperature monitoring indicator

Temperature monitoring indicator to record the temperature within the test specimen, as shown in Figure 2.