



BSI Standards Publication

Bituminous mixtures — Test methods

Part 22: Wheel tracking

National foreword

This British Standard is the UK implementation of EN 12697-22:2020+A1:2023. It supersedes BS EN 12697-22:2020, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by A1 A1.

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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of an identical text or by endorsement, at the latest by June 2024, and conflicting national standards shall be withdrawn at the latest by June 2024.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  EN 12697-22:2020 .

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  .

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]**

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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_{iLD}	mean value of P_i obtained on two or more specimens using large size device	%
P_{iXL}	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	$\mu\text{m}/\text{cycle}$
TR_m	mean value of the determinations of TR for small size device, procedure A	$\mu\text{m}/\text{cycle}$
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	$\mu\text{m}/\text{cycle}$
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 $(1,0 \pm 0,1)$ Hz.

6.1.1.4 The rolling load applied to the test specimen shall be $(5\,000 \pm 50)$ 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 $(0,0 \pm 0,5)^\circ$.

6.1.2 Mould(s)

Mould(s) of internal dimensions $(500 \times 180 \times 50)$ mm or $(500 \times 180 \times 100)$ 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 $\pm 0,2$ 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 $\pm 2\text{ }^\circ\text{C}$ (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.