SLOVENSKI STANDARD

SIST EN 12697-22:2004

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Bitumenske zmesi ï Preskusne metode za vroļ e asfaltne zmesi ï 22. del: Preskus nastajanja kolesnic

Bituminous mixtures - Test methods for hot mix asphalt - Part 22: Wheel tracking

Asphalt - Prüfverfahren für Heißasphalt - Teil 22: Spurbildungstest

Mélanges bitumineux - Méthodes d'essai pour mélange hydrocarboné a chaud - Partie 22: Essai d'orniérage

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93.080.20 Materiali za gradnjo cest Road construction materials

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Bituminous mixtures - Test methods for hot mix asphalt - Part 22: Wheel tracking

Mélanges bitumineux - Méthodes d'essai pour mélange hydrocarboné à chaud - Partie 22: Essai d'orniérage

Asphalt - Prüfverfahren für Heißasphalt - Teil 22: Spurbildungstest

This European Standard was approved by CEN on 21 November 2003.

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

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Foreword

This document (EN 12697-22:2003) 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of an identical text or by endorsement, at the latest by June 2004, and conflicting national standards shall be withdrawn at the latest by August 2005.

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

EN 12697-1, *Bituminous mixtures — Test methods for hot mix asphalt — Part 1: Soluble binder content.*

EN 12697-2, *Bituminous mixtures — Test methods for hot mix asphalt — Part 2: Determination of particle size distribution.*

EN 12697-3, *Bituminous mixtures — Test methods for hot mix asphalt — Part 3: Bitumen recovery: Rotary evaporator.*

EN 12697-4, *Bituminous mixtures — Test methods for hot mix asphalt — Part 4: Bitumen recovery: Fractionating column.*

EN 12697-5, *Bituminous mixtures — Test methods for hot mix asphalt — Part 5: Determination of the maximum density.*

EN 12697-6, *Bituminous mixtures — Test methods for hot mix asphalt — 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 12697-8, *Bituminous mixtures — Test methods for hot mix asphalt — Part 8: Determination of void characteristics of bituminous specimens.*

EN 12697-9, *Bituminous mixtures — Test methods for hot mix asphalt — Part 9: Determination of the reference density.*

EN 12697-10, *Bituminous mixtures — Test methods for hot mix asphalt — Part 10: Compactibility.*

EN 12697-11, *Bituminous mixtures — Test methods for hot mix asphalt — Part 11: Determination of the affinity between aggregates and bitumen.*

EN 12697-12, *Bituminous mixtures — Test methods for hot mix asphalt — Part 12: Determination of the water sensitivity of bituminous specimens.*

EN 12697-13, *Bituminous mixtures — Test methods for hot mix asphalt — Part 13: Temperature measurement.*

EN 12697-14, *Bituminous mixtures — Test methods for hot mix asphalt — Part 14: Water content.*

EN 12697-15, *Bituminous mixtures — Test methods for hot mix asphalt — Part 15: Determination of the segregation sensitivity*

prEN 12697-16, *Bituminous mixtures — Test methods for hot mix asphalt — Part 16: Abrasion by studded tyres.*

prEN 12697-17, *Bituminous mixtures — Test methods for hot mix asphalt — Part 17: Particle loss of porous asphalt specimen.*

prEN 12697-18, *Bituminous mixtures — Test methods for hot mix asphalt — Part 18: Binder drainage from porous asphalt.*

prEN 12697-19, *Bituminous mixtures — Test methods for hot mix asphalt — Part 19: Permeability of specimen.*

EN 12697-20, *Bituminous mixtures — Test methods for hot mix asphalt — Part 20: Indentation using cube or Marshall specimen.*

EN 12697-21, *Bituminous mixtures — Test methods for hot mix asphalt — Part 21: Indentation using plate specimens.*

EN 12697-22, *Bituminous mixtures — Test methods for hot mix asphalt — Part 22: Wheel tracking.*

EN 12697-23, *Bituminous mixtures — Test methods for hot mix asphalt — Part 23: Determination of the indirect tensile strength of bituminous specimens.*

prEN 12697-24, *Bituminous mixtures — Test methods for hot mix asphalt — Part 24: Resistance to fatigue.*

prEN 12697-25, *Bituminous mixtures — Test methods for hot mix asphalt — Part 25: Cyclic compression test*

prEN 12697-26, *Bituminous mixtures — Test methods for hot mix asphalt — Part 26: Stiffness.*

EN 12697-27, *Bituminous mixtures — Test methods for hot mix asphalt — Part 27: Sampling.*

EN 12697-28, *Bituminous mixtures — Test methods for hot mix asphalt — Part 28: Preparation of samples for determining binder content, water content and grading.*

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

prEN 12697-30, *Bituminous mixtures — Test methods for hot mix asphalt — Part 30: Specimen preparation, impact compactor.*

prEN 12697-31, *Bituminous mixtures — Test methods for hot mix asphalt — Part 31: Specimen preparation, gyratory compactor.*

EN 12697-32, *Bituminous mixtures — Test methods for hot mix asphalt — Part 32: Laboratory compaction of bituminous mixtures by vibratory compactor.*

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

prEN 12697-34, *Bituminous mixtures — Test methods for hot mix asphalt — Part 34: Marshall test.*

prEN 12697-35, *Bituminous mixtures — Test methods for hot mix asphalt — Part 35: Laboratory mixing.*

EN 12697-36, *Bituminous mixtures — Test methods for hot mix asphalt — Part 36: Determination of the thickness of a bituminous pavement*

EN 12697-37, *Bituminous mixtures — Test methods for hot mix asphalt — Part 37: Hot sand test for the adhesivity of binder on pre-coated chippings for HRA.*

prEN 12697-38, *Bituminous mixtures — Test methods for hot mix asphalt — Part 38: Test equipment and calibration.*

prEN 12697-39, *Bituminous mixtures — Test methods for hot mix asphalt — Part 39: Binder content by ignition.*

prEN 12697-40, *Bituminous mixtures — Requirements - Void content, compaction and hydraulic conductivity of material in the layer*

prEN 12697-41, *Bituminous mixtures — Test methods for hot mix asphalt — Part 41: Resistance to de-icing fluids.*

prEN 12697-42, *Bituminous mixtures — Test methods for hot mix asphalt — Part 42: Amount of foreign matter in reclaimed asphalt.*

prEN 12697-45, *Bituminous mixtures - Test methods for hot mix asphalt - Part 45: Binder drainage - Schellenberg method*

No existing European Standard is superseded.

For the small-size device, the use of a wheel fitted with a solid rubber tyre is specified. Depending on the result of on-going research, the use of a steel wheel may be accepted.

This document includes a bibliography.

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.

1 Scope

This European Standard 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 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.

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 device can be used according to this standard: 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.

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 12697-6, *Bituminous mixtures — Test methods for hot mix asphalt — 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 for hot mix asphalt — Part 27: Sampling.*

EN 12697-32, *Bituminous mixtures — Test methods for hot mix asphalt — Part 32: Laboratory compaction of bituminous mixtures by vibratory compactor.*

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

prEN 12697-35, *Bituminous mixtures — Test methods for hot mix asphalt — Part 35: Laboratory mixing.*

ISO 48, *Rubber, vulcanised or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD).*

ISO 7619, *Rubber — Determination of indentation hardness by means of pocket hardness meters.*

3 Terms and definitions

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

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

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 European Standard, once, to a single test portion

3.5
test portion
for this test, a test portion to represent one material shall consist of a set of:

Table 1 — Minimum set of specimen

Device	Minimum set of test specimen
Large or extra-large size device	2
Small size model A testing in air	6
Small size model B testing in air	2
Small size model B testing in water	2

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

4 Symbols and abbreviated terms

Table 2 — Symbols and abbreviated terms

Symbol	Definition	Unit
m_{ij}	local distance between a reference plane and the j specified location of the upper face of the test piece at the time of the i measurement sequence (large device) NOTE j varies between 1 and 15.	mm
m_{0j}	initial measurement at the j location	—
P_i	measured proportional rut depth calculated as the average depth of a rut at the i measurement sequence measured at predetermined points or the average of predetermined stretch (large size device) or the average of predetermined cross-sections (extra-large device) as a proportion of the thickness of the test specimen	%
h	specimen thickness equal to the thickness of the course or courses of the test piece in which a rut can form	mm
WTR	wheel-tracking rate calculated as the average rate at which the rut depth increases with time under repeated passes of a loaded wheel of a small size device model A in air	mm/h
WTS_W	wheel-tracking slope, calculated as the average rate at which the rut depth increases with repeated passes of a loaded wheel of a small size device model B in water	mm/10^3 load cycles
WTS_{AIR}	wheel-tracking slope, calculated as the average rate at which the rut depth increases with repeated passes of a loaded wheel of a small size device model B in air	mm/10^3 load cycles
w	width of the tyre applying the load	mm
N	number of cycles	—
P	average value of P_i obtained on two or more specimens	—
P_{LD}	average value of P_i obtained on two or more specimens using large size device	%
P_{XL}	average value of P_i obtained on two or more specimens using extra-large size device	%
TR	mean rate of increase of track depth	mm/h
TR_m	mean value of the determinations of TR	mm/h
PRD_W	proportional rut depth for the material under test at N cycles using a small size device in water	%
RD_W	rut depth for the material under test at N cycles using a small size device in water	mm
PRD_{AIR}	proportional rut depth for the material under test at N cycles using a small size device in air	%
RD_{AIR}	rut depth for the material under test at N cycles using a small size device in air	mm
L	load applied	N
t_{15}	time for rut depth to reach 15 mm	min

Table 2 *(continued)*

Symbol	Definition	Unit
r_i	change in vertical displacement from the initial value, r_0, to the i relevant reading	mm
n	total number of readings taken at 5 min., excluding the initial reading.	—
$d_{5\,000}$, $d_{10\,000}$	rut depth after 5 000 load cycles and 10 000 load cycles. respectively	mm

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* 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 deformation, m_{ij}, to within ±0,2 mm and with a square 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 ±2 °C of that set (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 European Standard shall not exceed 0,5 mm.

6.1.8 Non-stick chemical

Non-stick chemical, such as glycerized sodium oleate.

6.2 Extra large 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* 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 mould corresponds to the nominal thickness of the test specimen at the ends. The height of side edges correspond to the nominal thickness or exceed it by a maximum of 20 mm.

6.2.3 Depth gauge

Laser sensors to measure local deformation to 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 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 that set (see Figure 2).