



SLOVENSKI STANDARD SIST EN 12697-45:2020

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Nadomešča:
SIST EN 12697-45:2012

Bitumenske zmesi - Preskusne metode - 45. del: Preskus staranja na zasičenih asfaltnih preskušancih (preskus SATS)

Bituminous mixtures - Test methods - Part 45: Saturation Ageing Tensile Stiffness (SATS) conditioning test

Asphalt - Prüfverfahren - Teil 45: Alterungsprüfung an gesättigten Asphalt-Probekörpern (SATS-Prüfung)

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Mélanges bitumineux - Méthodes d'essai - Partie 45: Saturation vieillissant l'essai de tension de la rigidité (SATS)

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ICS:

93.080.20 Materiali za gradnjo cest Road construction materials

SIST EN 12697-45:2020

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EUROPEAN STANDARD

EN 12697-45

NORME EUROPÉENNE

EUROPÄISCHE NORM

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ICS 93.080.20

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English Version

Bituminous mixtures - Test methods - Part 45: Saturation Ageing Tensile Stiffness (SATS) conditioning test

Mélanges bitumineux - Méthodes d'essai - Partie 45 :
Essai de module en traction après saturation
conditionnée (SATS)

Asphalt - Prüfverfahren - Teil 45: Alterungsprüfung an
gesättigten Asphalt-Probekörpern (SATS-Prüfung)

This European Standard was approved by CEN on 18 November 2019.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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European foreword

This document (EN 12697-45:2020) 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of an identical text or by endorsement, at the latest by August 2020, and conflicting national standards shall be withdrawn at the latest by August 2020.

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 12697-45:2012.

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;
- [ge] editorial update according to current standard template;
- [ge] dated references for test methods deleted in relevant places;
- [ge] NOTES modified and adjusted to normal text and vice versa where appropriate according to ISO/IEC Directives – Part 2:2016, 24.5;
- [Clause 1] irrelevant NOTE deleted, indicating a future development of alternative conditions not covered by this document;
- [Clause 2] titles for test methods EN 12697-serie adjusted;
- [Bibliography] test methods referred to in normal text moved to Clause 2 Normative references.

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, 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, Turkey and the United Kingdom.

EN 12697-45:2020 (E)**1 Scope**

This document specifies a test method to assess the durability of adhesion in base and binder course asphalt mixtures. The Saturation Ageing Tensile Stiffness (SATS) conditioning regime is used to age the specimens in the presence of water. A comparative test for assessing their performance before and after conditioning is also conducted.

The applicability of this test method is limited to bituminous specimens with consistent air voids contents and hard binder, in particular, to asphalt concrete mixtures with a binder content between 3,5 % and 5,5 %, air voids contents between 6 % and 10 % and 10/20 pen hard paving grade bitumen.

The test is intended to be used as a screening test for the assessment of a combination of aggregate, filler and additives with respect to the retained adhesion properties after simulated ageing in a moist atmosphere for lean/stiff base and binder course mixtures.

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 12697-5, *Bituminous mixtures — Test methods — Part 5: Determination of the maximum density*

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

EN 12697-8, *Bituminous mixtures — Test methods — Part 8: Determination of void characteristics of bituminous specimens*

EN 12697-26:2018, *Bituminous mixtures — Test methods — Part 26: Stiffness*

EN 12697-30, *Bituminous mixtures — Test methods — Part 30: Specimen preparation by impact compactor*

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

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12697-5, EN 12697-6 and the following 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/ui>

3.1 saturation before conditioning

saturation of the mixture, determined as the calculated proportion of air voids filled with water after partial vacuum saturation, prior to conditioning by storage under increased pressure and elevated temperature, in percent

3.2**unconditioned stiffness**

stiffness modulus of the mixture as determined in accordance with EN 12697-26:2018, Annex C, prior to conditioning by storage under increased pressure and elevated temperature

Note 1 to entry: Alternative comparative tests can be used (see 9.2).

3.3**conditioned stiffness**

stiffness modulus of the mixture as determined in accordance with EN 12697-26:2018, Annex C, after conditioning by storage under increased pressure and elevated temperature

3.4**stiffness ratio**

ratio of the conditioned stiffness to the unconditioned stiffness

3.5**saturation after conditioning**

saturation of the mixture, determined as the calculated proportion of air voids filled with water after conditioning by storage under increased pressure and elevated temperature, in percent

4 Principle

Nominally identical test specimens are subjected to moisture saturation by a vacuum system. They are then transferred into a pressurized vessel partially filled with water where they are subjected to a conditioning procedure by storage at 85 °C temperature and 2,1 MPa pressure for 65 h. The ratios of the stiffness, measured by indirect tension on cylindrical specimens, before and after conditioning by storage under increased pressure and elevated temperature on the individual specimens situated above the water are averaged to determine the sensitivity of the material to ageing and moisture. The whole process is referred to as the Saturation Ageing Tensile Stiffness (SATS) conditioning test. The average ratio is the SATS durability index of the mixture components when the comparative test is the indirect tensile stiffness modulus.

NOTE Tests other than stiffness by indirect tension on cylindrical specimens can be used as the comparative test (see 9.2).

5 Apparatus**5.1 Sample manufacture****5.1.1 Asphalt mixer.****5.1.2 Coring equipment.****5.1.3 Saw for cutting asphalt.****5.2 Conditioning regime**

5.2.1 Vacuum desiccator and vacuum pump, including manometer or calibrated vacuum gauge in accordance with EN 12697-5.

5.2.2 Balance with a capacity greater than the mass of a sample that is accurate to 0,1 g.

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5.2.3 Pressure/temperature vessel designed to operate at $(2,1 \pm 0,1)$ MPa between 80 °C and 115 °C and which shall be made from stainless steel, having internal dimensions adequate to contain the specimen tray (see 5.2.7) and an integral temperature control system that is capable of:

- a) bringing the loaded pressurized vessel to the desired conditioning temperature $\pm 0,5$ °C, as recorded by a suitable thermometer inside the vessel, within 2 h;
- b) maintaining the temperature at all points within the vessel at the ageing temperature $\pm 0,5$ °C.

SAFETY PRECAUTIONS — The pressure ageing vessel operates at high temperatures and high pressures. All safety guidelines issued by equipment manufacturers shall be adhered to.

5.2.4 Pressure controlling devices

5.2.4.1 Pressure release valve, which prevents pressure in the vessel from exceeding 2,5 MPa during the ageing procedure.

5.2.4.2 Pressure regulator, capable of controlling the pressure within the vessel to $\pm 0,1$ MPa and with a capacity sufficient to reduce the pressure from the source of compressed air so that the pressure within the vessel is maintained at the operating pressure of $(2,1 \pm 0,1)$ MPa.

5.2.4.3 Slow release bleed valve, which allows the pressure in the vessel at the completion of the test to be reduced from the 2,1 MPa operating pressure, to atmospheric pressure within 20 min to 30 min.

5.2.4.4 Pressure gauge, capable of measuring the pressure within the vessel to within 0,3 MPa during the test. The pressure gauge shall be calibrated to an accuracy of $\pm 0,1$ MPa at appropriate intervals.

5.2.4.5 Porous disc, 5 mm thick by 100 mm diameter, with a permeability substantially greater than that of the asphalt and the capability withstand the maximum vertical pressure likely to be imposed. The discs shall be checked before each use to ensure that they are not clogged by particles. They shall be boiled for at least 10 min in distilled water before use and kept immersed in de-aerated water until required.

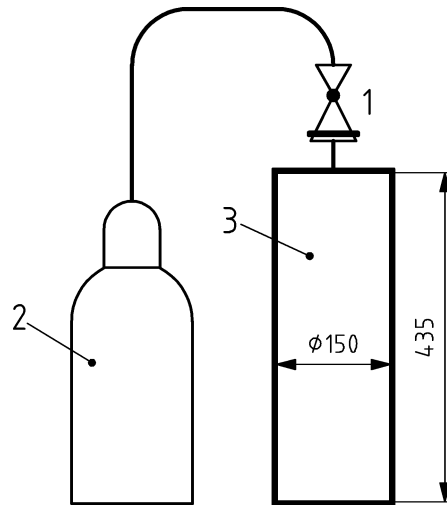
5.2.5 Thermometer, accurate to 0,1 °C, for measuring the temperature inside the pressure vessel.

NOTE A resistance thermal detector (RTD) has been found to be suitable.

5.2.6 Temperature recording device, data acquisition system capable of recording the temperature throughout the test to 0,1 °C.

NOTE The current method of monitoring temperature is via a computerized log of time and temperature. It is assumed the temperature recorded is that which is to be found within every point within the ageing vessel.

Dimensions in millimetres

**Key**

- 1 pressure regulator
- 2 compressed air cylinder
- 3 pressure vessel

Figure 1 — Schematic diagram and dimensions of typical pressure vessel

5.2.7 Specimen tray, having the form and dimensions specified in Figure 2, to accommodate five test specimens for a full test. The tray shall sit in the pressure vessel on top of a porous disc, as shown in Figure 3.

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The fifth sample is placed so that, unlike the other samples, it is submerged during the test. As such, it is not included in the averaging to produce the overall result. The ratio for this fifth sample can be used to provide additional information on the properties of the mixture.

NOTE The form and dimensions of the pressure vessel and specimen tray shown in Figures 1 and 2 have been found to be practicable in the SATS test when used with different aggregate types. Other forms of pressure vessel and specimen tray can also be suitable, but have not yet been specifically investigated. However, early work carried out in a standard binder pressure ageing vessel in EN 14769 yielded similar results to those generated using the apparatus described in this document.