

SLOVENSKI STANDARD

SIST EN 12697-12:2018

01-september-2018

Nadomešča:

SIST EN 12697-12:2009

Bitumenske zmesi - Preskusne metode - 12. del: Ugotavljanje občutljivosti bitumenskih preskušancev za vodo

Bituminous mixtures - Test methods - Part 12: Determination of the water sensitivity of bituminous specimens

Asphalt - Prüfverfahren - Teil 12: Bestimmung der Wasserempfindlichkeit von Asphalt-Probekörpern

Mélanges bitumineux - Méthodes d'essai - Partie 12: Détermination de la sensibilité à l'eau des éprouvettes bitumineuses

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Ta slovenski standard je istoveten z: **EN 12697-12:2018**

ICS:

93.080.20 Materiali za gradnjo cest Road construction materials

SIST EN 12697-12:2018

en,fr,de

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 12697-12

June 2018

ICS 93.080.20

Supersedes EN 12697-12:2008

English Version

**Bituminous mixtures - Test methods - Part 12:
Determination of the water sensitivity of bituminous
specimens**

Mélanges bitumineux - Méthodes d'essai - Partie 12:
Détermination de la sensibilité à l'eau des éprouvettes
bitumineuses

Asphalt - Prüfverfahren - Teil 12: Bestimmung der
Wasserempfindlichkeit von Asphalt-Probekörpern

This European Standard was approved by CEN on 26 February 2018.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (EN 12697-12:2018) 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of an identical text or by endorsement, at the latest by December 2018, and conflicting national standards shall be withdrawn at the latest by December 2018.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN not be held responsible for identifying any or all such patent rights.

This document supersedes EN 12697-12:2008.

Compared with EN 12697-12:2008, the following changes have been made:

- the series title no longer makes the method exclusively for hot mix asphalt [Title];
- the structure of the standard has been altered, describing each method separately;
- description of Method A and Method B giving the same result deleted [1];
- restriction for slenderness, less than 0,5, of specimen for Method B deleted [1]. Added in 6.2.5 as requirement;
- EN 12697-5 and EN 12697-7 added. EN 1246 and EN 13108-1 deleted [2];
- introduction of option for compaction with EN 12697-30 (2x50 blows) [5.2.3 b];
- tolerance changed for conditioning at 40 °C from ± 1 °C to ± 2 °C [5.3.2 b)];
- description added of procedure for determining specimen volume, used for calculation of degree of swelling [5.3.2 e];
- changed conditioning temperature for soft grade bitumen [5.3.2 f];
- introduction of table with recommended test temperatures for Method A, depending on binder grade [5.4, Table 1];
- description and requirements for compression testing machine and measuring device added for [6.1];
- modification of tolerance for the constant load. Introduction of Table 2 with Static compaction parameters [6.2.3].

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

EN 12697-12:2018 (E)

1 Scope

This European Standard specifies three test methods for determining the effect of saturation and accelerated water conditioning:

- method A uses the indirect tensile strength of cylindrical specimens of bituminous mixtures;
- method B uses the compression strength of cylindrical specimens of bituminous mixtures;
- method C defines the bonding value for a bituminous mixture 1 h after mixing, where the bonding of bitumen and aggregate can be equated to a bonding value.

Method C is suitable for soft asphalt with bitumen of kinematic viscosity at 60 °C of 4 000 mm²/s or less.

These methods can be used to evaluate the effect of water on asphalt mixtures with or without anti-stripping additives including liquids, such as amines; and fillers, such as hydrated lime or cement.

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 12697-5, *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 12697-23, *Bituminous mixtures — Test methods for hot mix asphalt — Part 23: Determination of the indirect tensile strength of bituminous specimens*

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

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

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

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

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

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

3 Terms and definitions

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

3.1

slenderness

height of a specimen divided by its diameter

3.2

indirect tensile strength *ITS*

maximum tensile stress according to EN 12697-23, calculated from the peak load applied to a cylindrical specimen loaded diametrically until break at specified test conditions

3.3

indirect tensile strength ratio *ITSR*

ratio of the indirect tensile strength of wet (water conditioned) specimens to that of dry specimens, expressed in percent

3.4

compressive strength ratio *i/C*

ratio of the strength of a specimen loaded in compression at the specified test temperature and speed of displacement of the press, of wet (water conditioned) specimens to that of dry specimens expressed in percent

3.5

water sensitivity in accordance with method A

ITSR value obtained on compacted specimens of a bituminous mixture

3.6

water sensitivity in accordance with method B

i/C value obtained on compacted specimens of a bituminous mixture

3.7

bonding value

amount of aggregate fines and bitumen which comes loose from 1 000 g sample of bituminous mixture when mixed with 1 500 ml of water in a graduated glass beaker

4 Principle

Method A: Method A uses the indirect tensile strength of cylindrical specimens of bituminous mixtures. A set of cylindrical test specimens is divided into two equally sized subsets and conditioned. One subset is maintained dry at room temperature while the other subset is saturated and stored in water at elevated conditioning temperature. After conditioning, the indirect tensile strength of each of the two subsets is determined at a defined test temperature, depending on the grade of bitumen. The ratio of the indirect tensile strength of the water conditioned subset compared to that of the dry subset is determined and expressed in percent.

Method B: Method B uses the compression strength of cylindrical specimens of bituminous mixtures. A set of cylindrical test specimens is divided into two equally sized subsets and conditioned. One subset is maintained at 50 % humidity while the other subset is saturated and stored in water. After conditioning, the compression strength of each of the two subsets is determined at 18 °C. The ratio of the compression strength of the water conditioned subset compared to that of the dry subset is determined and expressed in percent.

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Method C: A sample of bituminous mixture and water is mixed. The amount of material that comes loose is measured by filtering. The bonding value is the amount of dried aggregate fines and bitumen left on the filtering paper measured in grams.

5 Method A**5.1 Apparatus****5.1.1 Compression testing machine**

Compression testing machine and testing head with loading strips, according to EN 12697-23.

5.1.2 Vacuum system

Vacuum system (pump, gauge etc.), capable of obtaining a residual pressure of $(6,7 \pm 0,3)$ kPa within (10 ± 1) min and able of maintaining the vacuum for (30 ± 5) min.

5.1.3 Vacuum container

Vacuum container, with a perforated shelf, placed above the bottom.

5.1.4 Water bath

Thermostatically controlled water bath(s), capable of maintaining the prescribed conditioning temperature according to 5.3.2 and test temperature according to 5.4 in the vicinity of the specimens. Both temperatures depend on the grade of bitumen of the specimens being tested. The bath shall be equipped with a perforated shelf, placed on spacers above the bottom. The capacity of the bath shall be sufficient to ensure that the test specimens can be stored with upper surfaces more than 20 mm below the water surface.

5.1.5 Air chamber

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Thermostatically controlled air chamber (optional), capable of maintaining the prescribed test temperature according to 5.4 in the vicinity of the specimens.

5.1.6 Other material

Soft plastic bags or other suitable watertight protection (optional), for water bath test temperature conditioning.

5.2 Specimen preparation**5.2.1 Number of specimens**

At least six cylindrical test specimens shall be prepared for each sample to be tested. All specimens shall be of the same age (prepared the same day).

5.2.2 Dimensions of specimens

The cylindrical test specimens shall have a diameter of (80 ± 2) mm, (100 ± 3) mm, (120 ± 3) mm, (150 ± 3) mm or (160 ± 3) mm.

For 80 mm nominal diameter specimens, the maximum aggregate size of the bituminous mixture shall not exceed 11 mm. For 100 mm nominal diameter specimens, the maximum aggregate size shall not exceed 22 mm. For 120 mm nominal diameter specimens the maximum aggregate size shall not exceed 31,5 mm. For 150 mm and 160 mm nominal diameter specimens, the maximum aggregate size shall not exceed 40 mm. The specimens shall be cylindrical moulded specimens, laboratory-produced in accordance with EN 12697-30, EN 12697-31 or EN 12697-32, or cores taken from a slab produced in accordance with EN 12697-33, or cores taken from a bituminous layer according to EN 12697-27.

5.2.3 Method of compaction

The test specimens shall be compacted:

- a) either to yield a sample with an air void content greater than or equal to the highest required value for local application. The air void content is determined according to EN 12697-8, based on densities determined according to EN 12697-5 and EN 12697-6 or EN 12697-7.
- b) or by using the following energy levels:
 - impact compaction (EN 12697-30): 2×25 , 2×35 or 2×50 blows,
 - gyratory compaction (EN 12697-31): 25 or 50 gyrations,
 - vibratory compaction (EN 12697-32): (80 ± 5) s,
 - roller compactor (EN 12697-33): 24 passes (pneumatic tyre compaction procedure).

5.2.4 Visual examination

The specimens shall visually be symmetrical with the curved side even and circular.

5.2.5 Measurement of dimensions

The dimensions of each of the test specimens shall be determined in accordance with EN 12697-29. The measuring points shall be marked to allow measurements of the dimensions to be repeated between the same points for wet specimens (5.3.2).

Calculate the volume according to 8.1, Formula (1).

5.2.6 Determination of bulk density

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The bulk density shall be determined according to EN 12697-6 or EN 12697-7.

5.2.7 Division into subsets

The test specimens shall be divided into two subsets having approximately the same average height and average bulk density. The difference of the average heights shall not exceed 5 mm. The difference of the average bulk densities shall not exceed $0,015 \text{ Mg/m}^3$.

5.2.8 Curing of specimens

Store the specimens upright on a flat surface at a temperature of $(20 \pm 5) ^\circ\text{C}$, for a time between 16 h to 24 h from the time of compaction.

5.3 Conditioning

5.3.1 Dry specimens

Store the dry subset of specimens upright on a flat surface at a temperature of $(20 \pm 5) ^\circ\text{C}$.

5.3.2 Wet specimens

- a) Place the wet subset of specimens on the perforated shelf in the vacuum container filled with water at $(20 \pm 5) ^\circ\text{C}$. The water level shall be at least 20 mm above the upper surface of the test specimens.