



SLOVENSKI STANDARD

oSIST prEN 12697-8:2014

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Bitumenske zmesi - Preskusne metode - 8. del: Ugotavljanje značilnosti votlin v bitumenskih preskušancih

Bituminous mixtures - Test methods - Part 8: Determination of void characteristics of bituminous specimens

Asphalt - Prüfverfahren - Teil 8: Bestimmung von volumetrischen Charakteristiken von Asphalt-Probekörpern

Mélanges bitumineux - Méthodes d'essai - Partie 8: Détermination des pourcentages de vides caractéristiques des éprouvettes bitumineuses

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ICS:

93.080.20 Materiali za gradnjo cest Road construction materials

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EUROPEAN STANDARD
NORME EUROPÉENNE
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prEN 12697-8

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ICS 93.080.20

Will supersede EN 12697-8:2003

English Version

Bituminous mixtures - Test methods - Part 8: Determination of void characteristics of bituminous specimens

Matériaux enrobés - Méthodes d'essai - Partie 8:
Détermination de la teneur en poches d'air des matériaux
bitumineux

Asphalt - Prüfverfahren - Teil 8: Bestimmung von
volumetrischen Charakteristiken von Asphalt-Probekörpern

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 227.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

This draft European Standard was established by CEN 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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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (prEN 12697-8:2014) has been prepared by Technical Committee CEN/TC 227 "Road materials", the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 12697-8:2003.

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

- Title changed to allow application to warm mix, half-warm mix and cold mix asphalts;
- alternative procedures and calculations added for mixtures including additives;
- clarification added when densities need to be of dry mixture;
- clarification that specimens cut from the pavement can be by either coring or sawing;
- dimension of specimen (if measured) added to results;
- "v/v" and "m/m" replaced by "by volume" and "by mass" for clarity.

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: Binder recovery: Rotary evaporator*

EN 12697-4, *Bituminous mixtures — Test methods for hot mix asphalt — Part 4: Binder 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 specimen*

EN 12697-7, *Bituminous mixtures — Test methods for hot mix asphalt — Part 7: Determination of the 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 12697-10, *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 compatability between aggregate and bitumen*

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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*

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

EN 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*

EN 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 cylindrical specimen (CY)*

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*

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

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

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

EN 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 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 for hot mix asphalt — Part 32: Laboratory compaction of bituminous specimen by vibratory compactor*

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

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

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- EN 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: Method for the 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 precoated chippings for HRA*
- EN 12697-38, *Bituminous mixtures — Test methods for hot mix asphalt — Part 38: Common equipment and calibration*
- EN 12697-39, *Bituminous mixtures — Test methods for hot mix asphalt — Part 39: Binder content by ignition*
- EN 12697-40, *Bituminous mixtures — Test methods for hot mix asphalt — Part 40: In situ drainability*
- EN 12697-41, *Bituminous mixtures — Test methods for hot mix asphalt — Part 41: Resistance to de-icing fluids*
- EN 12697-42, *Bituminous mixtures — Test methods for hot mix asphalt — Part 42: Amount of foreign matters in reclaimed asphalt*
- EN 12697-43, *Bituminous mixtures — Test methods for hot mix asphalt — Part 43: Resistance to fuel*
- EN 12697-44, *Bituminous mixtures — Test methods for hot mix asphalt — Part 44: Crack propagation by semi-circular bending test*
- EN 12697-45, *Bituminous mixtures — Test methods for hot mix asphalt — Part 45: Saturation ageing tensile stiffness (SATS) conditioning test* (standards.iteh.ai)
- EN 12697-46, *Bituminous mixtures — Test methods for hot mix asphalt — Part 46: Low temperature cracking and properties by uniaxial tension tests*
- EN 12697-47, *Bituminous mixtures — Test methods for hot mix asphalt — Part 47: Determination of the ash content of natural asphalts*
- prEN 12697-48, *Bituminous mixtures — Test methods for hot mix asphalt — Part 48: Interlayer bonding¹⁾*
- EN 12697-49, *Bituminous mixtures — Test methods for hot mix asphalt — Part 49: Determination of friction after polishing*
- prCEN/TS 12697-50, *Bituminous mixtures — Test methods — Part 50: Resistance to scuffing¹⁾*
- prEN 12697-51, *Bituminous mixtures — Test methods — Part 51: Surface shear strength test¹⁾*
- prCEN/TS 12697-52, *Bituminous mixtures — Test methods — Part 52: Conditioning to address oxidative ageing¹⁾*
- prEN 12697-53, *Bituminous mixtures — Test methods — Part 53: Cohesion increase by spreadability-meter method¹⁾*

1) In preparation

1 Scope

This European Standard describes a procedure for calculating volumetric characteristics of a compacted bituminous specimen: the air voids content (V_m) and the voids content in the mineral aggregate filled with binder (VFB) and the voids content in the mineral aggregate filled with binder and additives (VFB_{ad}) for the case of mixtures containing additives in their composition.

NOTE For mixtures with water in their composition (e.g. mixtures produced with bituminous emulsion or foamed bitumen) the volumetric characteristics determined according to the present standard refers to “dry” bituminous specimens (i.e. compacted mixtures whose voids are exclusively filled with air).

The method is suitable for specimens which are laboratory compacted or specimens cut from the pavement after placement and compacting, either by coring or sawing.

These volumetric characteristics can be used as mix design criteria or as parameters for evaluating the mixture after placing and compacting in the road.

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 by hydro-static method*

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3 Terms and definitions

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

NOTE All the terms and definitions refer to dry bituminous specimens (i.e. compacted mixtures whose voids are exclusively filled with air).

3.1
air void
pocket of air between the bitumen-coated aggregate particles (including any existing additives) in a compacted bituminous specimen

3.2
air voids content
(V_m)
volume of the air voids in a bituminous specimen, expressed as a percentage of the total volume of that specimen

3.3
maximum density
mass per unit volume without air voids of a bituminous material

3.4
bulk density
mass per unit volume, including the air voids, of a specimen

3.5**void in the mineral aggregate**

(VMA or VMAad)

volume of inter-granular void space between the aggregate particles of a compacted bituminous mixture that includes the air voids, the volume of the bituminous binder and the volume of additives, if any, in the specimen, expressed as a percentage of the total volume of the specimen

Note 1 to entry: An allowance should be made for the absorbency of binder by the aggregate, which can otherwise lead to an over estimation of the air voids content. The level of absorbency depends on the porosity of the aggregate.

3.6**voids filled with binder**

(VFB)

percentage of the voids in the mineral aggregate filled with binder (for mixtures not containing additives)

3.7**voids filled with binder and with additives**

(VFBad)

percentage of the voids in the mineral aggregate filled with binder and additives (for mixtures with additives in their composition)

4 Determination of the air voids content (V_m)**4.1 Principle**

The air voids content of a bituminous specimen is calculated using the maximum density of the mixture and the bulk density of the specimen.

NOTE For mixtures with water in their composition (e.g. mixtures produced with bituminous emulsion or foamed bitumen), the bulk density of the specimen refers to its "dry" bulk density.

4.2 Calculation

The air voids content shall be calculated to the nearest 0,1 % (by volume) as follows:

$$V_m = \frac{\rho_m - \rho_b}{\rho_m} \times 100 \text{ \% (by volume)} \quad (1)$$

where

V_m is the air voids content of the mixture, in 0,1 percent (by volume);

ρ_m is the maximum density of the mixture, in megagrams per cubic metre (Mg/m³);

ρ_b is the bulk density of the specimen, in megagrams per cubic metre (Mg/m³).

4.3 Precision

The precision of this test method can be calculated from the precision of the test methods for maximum density and bulk density according to the following formula:

$$\sigma_{x/y} = \sqrt{\frac{\bar{y}^2 \sigma_x^2 + \bar{x}^2 \sigma_y^2}{\bar{y}^4}} \quad (2)$$

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where

$\sigma_{x/y}$ is the standard deviation for determining the precision limits of a new standard based on the air voids content of the present mixture;

σ_x is the standard deviation from the precision statement EN 12697-5;

σ_y is the standard deviation from the precision statement EN 12697-6;

\bar{x} is the mean or average value of the bulk density of the present mixture;

\bar{y} is the mean or average value of the maximum density of the present mixture.

From the average values of σ_r and σ_R as obtained in tests EN 12697-5 and EN 12697-6 this results in the following values for the air voids content calculation:

Repeatability r :

Standard deviation: $\sigma_r = 0,4$ % (by volume);

Repeatability: $r = 2,77 \times \sigma_r = 1,1$ % (by volume)

Reproducibility R :

Standard deviation: $\sigma_R = 0,8$ % (by volume);

Reproducibility: $R = 2,77 \times \sigma_R = 2,2$ % (by volume).

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4.4 Test report

With reference to this European Standard the test report for the determination of the air voids content (V_m) shall include the following information:

origin of the specimen;

type of mixture and identification of additives, if any;

dimensions of the specimen in millimetres (when measured);

methods used to determine maximum density and bulk density;

maximum density and bulk density, in megagrams per cubic metre;

air voids content in percent to 0,1 % (by volume);

5 Determination of the percentage of the voids in the mineral aggregate filled with binder and with additives, if any (V_{FB})**5.1 Principle**

The percentage of the voids in the mineral aggregate of a bituminous specimen (without additives) filled with binder is calculated from the binder content, the voids in the mineral aggregate, the bulk density of the specimen and the density of the binder.