SLOVENSKI STANDARD
SIST EN 12697-31:2007

01-junij-2007

Nadomeġļa:
SIST EN 12697-31:2004

Bitumenske zmesi ï Preskusne metode za vroļe asfaltne zmesi ï 31. del: Priprava preskuġancev z vrtljivim zgoġļevalnikom

Bituminous mixtures - Test methods for hot mix asphalt - Part 31: Specimen preparation by gyratory compactor

Asphalt - Prüfverfahren für Heißasphalt - Teil 31: Herstellung von Probekörpern mit dem Gyrator-Verdichter

Mélanges bitumineux - Méthodes d'essai pour mélange hydrocarboné a chaud - Partie 31 : Confection d'éprouvettes a la presse a compactage giratoire

Ta slovenski standard je istoveten z: **EN 12697-31:2007**

ICS:

93.080.20 Materiali za gradnjo cest Road construction materials

SIST EN 12697-31:2007 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12697-31

April 2007

ICS 93.080.20

Supersedes EN 12697-31:2004

English Version

Bituminous mixtures - Test methods for hot mix asphalt - Part 31: Specimen preparation by gyratory compactor

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This European Standard was approved by CEN on 4 February 2007.

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Ref. No. EN 12697-31:2007: E

Contents

Foreword

This document (EN 12697-31:2007) 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of an identical text or by endorsement, at the latest by October 2007, and conflicting national standards shall be withdrawn at the latest by January 2008.

This document supersedes EN 12697-31:2004.

This document 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 aggregate 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.*

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.*

EN 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 Marshall specimens.*

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.*

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 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 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.*

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

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: 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 coarse foreign matter in reclaimed asphalt.*

EN 12697-43, *Bituminous mixtures — Test methods for hot mix asphalt — Part 43: Resistance to fuel.*

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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

1 Scope

This European Standard specifies the method for compaction of cylindrical specimens of bituminous mixtures using a gyratory compactor. Such compaction is achieved by combining a rotary shearing action and a vertical resultant force applied by a mechanical head.

The method is used for:

a) determination of the air voids content of a mixture for a given number of gyrations or derivation of a curve density (or void content) versus number of gyrations;

b) preparation of specimens of given height and/or at a predetermined density, for subsequent testing of their mechanical properties.

The equipment used for the method needs to comply with Annex A, Annex B or Annex C.

NOTE Annex A is especially suitable for void content evaluation and compaction research and Annex B and Annex C for the preparation of specimens for mechanical testing.

This European Standard applies to bituminous mixtures (both those made up in laboratory and those resulting from work site sampling), with an upper aggregate size not larger than 31,5 mm.

2 Normative references

The following referenced documents are indispensable for the application 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 — Tests 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 12697-8, *Bituminous mixtures — Test methods for hot mix asphalt — Part 8: Determination of void characteristics of bituminous specimens*

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

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

EN 13108-1; *Bituminous mixtures — Material specifications — Part 1: Asphalt concrete*

EN ISO 4287, *Geometrical product specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters (ISO 4287:1997)*

EN ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T) (ISO 6508-1:2005)*

3 Terms, definitions and symbols

3.1 Terms and definitions

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

3.1.1
gyratory compactor type
representative model of a given production compactor

3.1.2
force-angle calibration chain
force F and the angle ϕ determined for a type of gyratory compactor in order to comply with the central reference material requirements in Table A.1

NOTE Production gyratory compactors of the same type are adjusted using the determined values of F and ϕ. The conformity of a production gyratory compactor to a type can be verified by doing a comparative test on a bituminous mixture or by checking the variations of the internal angle as described in A.3.3.

3.1.3
central reference material
two bituminous mixtures, produced under defined conditions from constituents stored at a given site, of which the compositions are not specified but the air voids content (the constancy of which is traceable) at fixed numbers of gyrations complies respectively

NOTE The characteristics of the central reference material are specified in Table A.1.

3.1.4
internal angle
angle between the internal mould cross-sectional plane and the metallic insert as a mould is gyrated in a gyratory compactor

3.1.5
internal top angle
angle between the internal mould cross-sectional plane and the upper metallic insert as a mould is gyrated in a gyratory compactor

3.1.6
internal bottom angle
angle between the internal mould cross-sectional plane and the lower metallic insert as a mould is gyrated in a gyratory compactor

3.1.7
internal effective angle
average of the internal top angle and the internal bottom angle

3.1.8
eccentricity
distance, *e*, away from the axis of gyration at which a force, F, is acting at one end of a gyratory compactor mould

NOTE The eccentricity is explained in Figure C.1.

3.1.9
tilting moment
product of the eccentricity, e, and the force, F, acting at one end of a gyratory compactor mould in a direction parallel to the axis of gyration

NOTE The tilting moment is explained in Figure C.1.

3.2 Symbols

For the purposes of this document, the following symbols apply.

α is the internal angle, in degrees (°);

ϕ is the angle of incline of axis of test piece, in degrees (°);

F is the axial resultant force applicable to the ends of the test pieces, in newton (N);

ω is the speed of rotation of the axis of symmetry of revolution of the test piece, in revolutions per minute (rev/min);

D is the internal diameter of the mould, in millimetres (mm);

M is the mass of the mixture to be introduced in the mould, in kilograms (kg);

ρ_M is the maximum density of the mixture, in kilograms per cubic metre (kg/m^3);

h_{min} is the minimum height of compacted specimen, corresponding to a zero percentage of voids, in millimetres (mm);

$h(n_g)$ is the height of specimen after a number of gyrations n_g, in millimetres (mm);

$\rho_{(ng)}$ is the bulk density of specimen after a number of gyrations n_g, in kilograms per cubic metre (kg/m^3);

P is the preload, initial value of F, in newton (N);

$v_{\%}$ is the void content, in percent (%);

e is the eccentricity, in millimetres (mm);

$ITa_{1...4}$ is the measured internal top angle (4 individual measurements);

ITa_{min} is the minimum measured internal top angle (of 4 measurements);

ITa_{max} is the maximum measured internal top angle (of 4 measurements);

ITA is the internal top angle (average of 4 measurements)

ITA_{240} is the internal top angle at 240 Nm tilting moment;

$IBa_{1...4}$ is the measured internal bottom angle (4 individual measurements);

IBa_{min} is the minimum measured internal bottom angle (of 4 measurements);

IBa_{max} is the maximum measured internal bottom angle (of 4 measurements);

IBA is the internal bottom angle (average of 4 measurements)

IBA_{240} is the internal bottom angle at 240 Nm tilting moment;

IEA is the internal effective angle (average of *ITA* and *IBA*);

IEA_{240} is the internal effective angle at 240 Nm tilting moment;

IEA_{425} is the internal effective angle at 425 Nm tilting moment;

$\delta_{TB(240)}$ is the difference between *ITA* and *IBA* at 240 Nm;

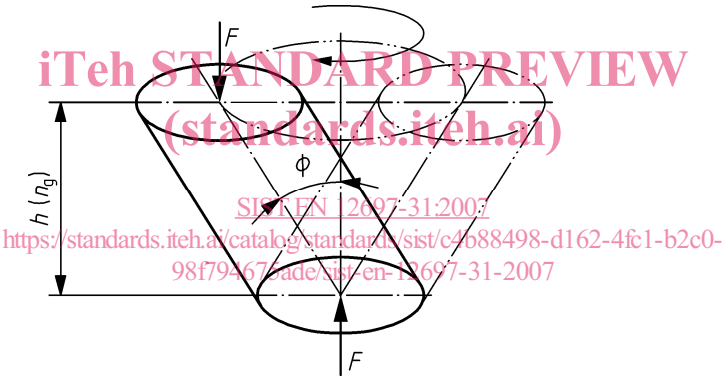
$\delta_{TB(425)}$ is the difference between *ITA* and *IBA* at 425 Nm;

δ_{LH} is the difference between IEA_{240} and IEA_{425}.

4 Principle

The bituminous mixture is contained within a cylindrical mould limited by inserts and kept at a constant temperature within specified tolerances throughout the whole duration of the test.

Compaction is achieved by the simultaneous action of a low static compression, and of the shearing action resulting from the motion of the axis of the mould which generates a conical surface of revolution, of apex O and of 2 ϕ angle at the apex, while the ends of the test piece should ideally remain perpendicular to the axis of the conical surface (see Figure 1).



Key

F axial resultant force

$h\ (n_g)$ height of specimen after a number of gyrations

ϕ angle

Figure 1 — Test piece motion diagram

NOTE When the specimen is taken out of the equipment for use in other mechanical tests, the temperature and pressure will change and can affect the measured density. The density should then be measured in accordance with the relevant part of EN 12697-6.

5 Apparatus

5.1 Test device

Test device:

– capable of compacting the test specimen according to the principle described in Clause 4 and in accordance with the requirements of Clause 7, concerning the angle and the force;