SLOVENSKI STANDARD
SIST EN 12697-31:2019

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Bitumenske zmesi - Preskusne metode - 31. del: Priprava preskušancev z vrtljivim zgoščevalnikom

Bituminous mixtures - Test methods - Part 31: Specimen preparation by gyratory compactor

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

Mélanges bitumineux - Méthodes d'essai - Partie 31 : Confection d'éprouvettes à la presse à compactage giratoire

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93.080.20	Materiali za gradnjo cest	Road construction materials

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EUROPEAN STANDARD

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English Version

Bituminous mixtures - Test methods - Part 31: Specimen preparation by gyratory compactor

Mélanges bitumineux - Méthodes d'essai - Partie 31 : Confection d'éprouvettes à la presse à compactage giratoire

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

This European Standard was approved by CEN on 19 November 2018.

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

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European foreword

This document (EN 12697-31:2019) 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of an identical text or by endorsement, at the latest by September 2019, and conflicting national standards shall be withdrawn at the latest by September 2019.

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 12697-31:2007.

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

— The series title no longer makes the method exclusively for hot mix asphalt;

— Definition of force-angle calibration chain and internal angle deleted;

— [Clause 1] Advice on use of alternative calibration Annexes revised and changed from Note to normative;

— [3.2] A number of symbols added and the symbol for water content amended to “*w*” throughout the standard;

— [5.1] System to collect excess moisture added to requirements for test device;

— [5.6] Ventilated oven, balance and thermometer added to list of equipment;

— [6.1.2] Existing preparation of specimens made for dry mixtures and separate method for wet mixtures added;

— New subclause [6.1.2.1] calculation of mass of dry mixture modified;

— New subclause [6.1.2.2] calculation of mass of wet mixture added;

— [6.2] Preparation of mixtures revised;

— [7.1.1] and [7.2.3] Value of force replaced by stress;

— [7.1.3] NOTE to setting angle of inclination deleted and extra line added;

— [7.2.1] Start of compaction revised;

— [7.2.2] Number of gyrations at which measurements made clarified;

— [Clause 8] Additional precision data given.

— [Clause 9] Water content added as optional in test reports;

— [A.3.1] Modified to delete reference materials and to specify calibration stress;

- [A.3.1] Value of force replaced by stress;
- Annex B deleted and Annex C has become new Annex B;
- [New Annex B] Compliance requirements clarified;
- [Annex A] and [New Annex B] Same Internal Effective Angle for both Annexes (0,82 ± 0,02)°.
- [New Annex B] Precision statement updated;

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, 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.

1 Scope

This document specifies the method for compaction of cylindrical specimens of bituminous mixtures using a gyratory compactor.

The method is used for:

— 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;

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

Annex A and Annex B describe method of complying for the equipment.

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

EN 12697-35, *Bituminous mixtures — Test methods — Part 35: Laboratory mixing*

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

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

EN ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method (ISO 6508-1)*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions 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 http://www.iso.org/obp

3.1.1
gyratory compactor type
representative model of a given production compactor

3.1.3
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

3.1.4
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

3.1.5
internal effective angle
average of the internal top angle and the internal bottom angle

3.1.6
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 1 to entry: The eccentricity is explained in Figure B.1.

3.1.7
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 1 to entry: The tilting moment is explained in Figure B.1.

3.1.8
cold mixture
asphalt produced at ambient temperature in which the binder is added in the form of a bituminous emulsion

3.2 Symbols

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

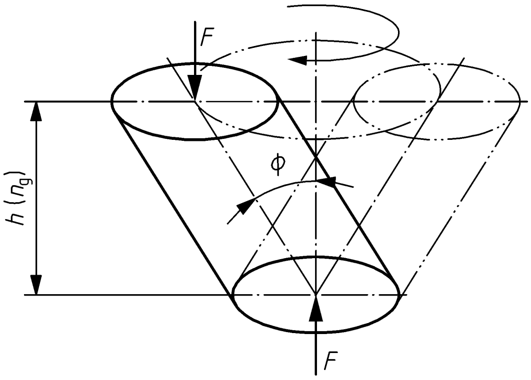
ϕ	is the angle of incline of axis of test piece, in degrees (°);
F	is the axial resultant force applicable to the ends of the test pieces, in newton (N);
D	is the internal diameter of the mould, in millimetres (mm);
M	is the mass of a dry mixture to be introduced in the mould, in grams (g);
M_w	is the mass of a wet mixture to be introduced in the mould, in grams (g);
ρ_M	is the maximum density of the mixture, in Megagrams per cubic metre (Mg/m^3);
h_{min}	is the minimum height of compacted specimen, corresponding to zero percent of voids, in millimetres (mm);
$h(n_g)$	is the height of specimen after a number of gyrations n_g, in millimetres (mm);

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_{m1}	is the internal top angle at tilting moment m_1 (m_1 between 180 Nm and 240 Nm tilting moment);
ITA_{m2}	is the internal top angle at tilting moment m_2 (m_2 between 250 Nm and 425 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 n measurements);
IBA_{m1}	is the internal bottom angle at tilting moment m_1 (m_1 between 180 Nm and 240 Nm tilting moment);
IBA_{m2}	is the internal bottom angle at tilting moment m_2 (m_2 between 250 Nm and 425 Nm tilting moment;
IEA	is the internal effective angle (average of *ITA* and *IBA*);
IEA_{m1}	is the internal effective angle at tilting moment m_1 (m_1 between 180 Nm and 240 Nm tilting moment);
IEA_{m2}	is the internal effective angle at tilting moment m_2 (m_2 between 250 Nm and 425 Nm tilting moment);
IEA_{240}	is the internal effective angle at 240 Nm tilting moment;
IEA_{425}	is the internal effective angle at 425 Nm tilting moment;
$\delta_{TB(m1)}$	is the difference between *ITA* and *IBA* at m_1;
$\delta_{TB(m2)}$	is the difference between *ITA* and *IBA* at m_2;
$\delta_{TB(240)}$	is the difference between *ITA* and *IBA* at 240 Nm;
$\delta_{TB(425)}$	is the difference between *ITA* and *IBA* at 425 Nm;
cs	is the variation coefficient of the angle measurement between tilting moment m_1 and m_2;
δ_{LH}	is the difference between IEA_{240} and IEA_{425};
w	is the water content (if present) in percent of the mass of the dry mixture;
SMA	Stone Mastic Asphalt;
AC	Asphalt concrete.

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 sample 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

When the specimen is taken out of the equipment for use in other mechanical tests, the temperature and stress 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 stress;

— capable of maintaining at least one point in the vicinity of the mid-plane, located between 30 mm and 45 mm from the mould axis, at within ± 10 °C of the prescribed temperature during the test;

— capable of maintaining the speed of rotation constant during the test to ± 10 % at a speed lower or equal to 32 rev/min.

When testing mixtures with a high moisture content, the test device shall be equipped with a system able to collect the excess of moisture draining from the mix during compaction.

The stress shall conform to the provisions of Annex A or Annex B.