SLOVENSKI STANDARD
SIST EN 12697-9:2004

01-junij-2004

Bitumenske zmesi ï Preskusne metode za vroļ e asfaltne zmesi ï 9. del: Ugotavljanje referenļ ne gostote

Bituminous mixtures - Test methods for hot mix asphalt - Part 9: Determination of the reference density

Asphalt - Prüfverfahren für Heißasphalt - Teil 9: Bestimmung der Bezugsraumdichte, Gyrator-Verdichter

Mélanges bitumineux - Méthodes d'essai pour mélange hydrocarboné a chaud - Partie 9: Détermination de la masse volumique de référence

Ta slovenski standard je istoveten z: **EN 12697-9:2002**

ICS:

93.080.20	Materiali za gradnjo cest	Road construction materials

SIST EN 12697-9:2004 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12697-9

November 2002

ICS 93.080.20

English version

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This European Standard was approved by CEN on 8 September 2002.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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Ref. No. EN 12697-9:2002 E

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Foreword

This document (EN 12697:2002) 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of an identical text or by endorsement, at the latest by May 2003, and conflicting national standards shall be withdrawn at the latest by April 2005.

This European Standard is one of a series of standards as follows:

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*

prEN 12697-6, *Bituminous mixtures — Test methods for hot mix asphalt — Part 6: Determination of bulk density of bituminous specimen by hydro-static method*

EN 12697-7, *Bituminous mixtures — Test methods for hot mix asphalt — Part 7: Determination of bulk density of bituminous specimens by gamma rays*

prEN 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*

prEN 12697-11, *Bituminous mixtures — Test methods for hot mix asphalt — Part 11: Determination of the compatibility between aggregate and bitumen*

prEN 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*

prEN 12697-15, *Bituminous mixtures — Test methods for hot mix asphalt — Part 15: Determination of the segregation sensitivity*

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

prEN 12697-17, *Bituminous mixtures — Test methods for hot mix asphalt — Part 17: Partial loss of porous asphalt specimen*

prEN 12697-18, *Bituminous mixtures — Test methods for hot mix asphalt — Part 18: Binder drainage from porous asphalt*

prEN 12697-19, *Bituminous mixtures — Test methods for hot mix asphalt — Part 19: Permeability of specimen*

prEN 12697-20, *Bituminous mixtures — Test methods for hot mix asphalt — Part 20: Indentation using cube or marshall specimen*

prEN 12697-21, *Bituminous mixtures — Test methods for hot mix asphalt — Part 21: Indentation using plate specimens*

prEN 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*

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

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

prEN 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*

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

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

prEN 12697-32, *Bituminous mixtures — Test methods for hot mix asphalt — Part 32: Laboratory compaction of bituminous mixtures by a vibratory compactor*

prEN 12697-33, *Bituminous mixtures — Test methods for hot mix asphalt — Part 33: Specimen preparation, slab compactor*

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

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

prEN 12697-36, *Bituminous mixtures — Test methods for hot mix asphalt — Part 36: Determination of the thickness of a bituminous pavement*

prEN 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*

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

prEN 12697-39, *Bituminous mixtures – Test methods for hot mix asphalt – Part 39: Soluble binder content of mixtures by ignition method*

prEN 12697-40, *Bituminous mixtures – Test methods for hot mix asphalt – Part 40: Void content, compaction and hydraulic conductivity of material in the layer*

prEN 12697-41, *Bituminous mixtures – Test methods for hot mix asphalt – Part 41: Resistance to deicing fluid*

prEN 12697-42, *Bituminous mixtures – Test methods for hot mix asphalt – Part 42: Content of foreign matters in reclaimed asphalt*

prEN 12697-43, *Bituminous mixtures – Test methods for hot mix asphalt – Part 43: Resistance to fuel*

prEN 12697-44, *Bituminous mixtures – Test methods for hot mix asphalt – Part 44: Binder content of mixtures with modified binders*

prEN 12697-45, *Bituminous mixtures — Test methods for hot mix asphalt — Part 45: Binder drainage – Schellenberg method*

The applicability of this European Standard is described in the product standards for bituminous mixtures.

No existing European Standard is superseded.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard describes a test method for the determination of reference densities of bituminous mixtures. These densities are obtained on specimens compacted by three alternative compactors at specified compaction energies in accordance with prEN 12697-30, prEN 12697-31 and prEN 12697-32 for the impact, gyratory and vibratory compactors respectively.

This European Standard is applicable to bituminous mixtures made up in the laboratory and those resulting from work site operations, with *D* dependent upon the compaction method and not >31,5 mm.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

prEN 12697-6, *Bituminous mixtures — Test methods for hot mix asphalt — Part 6: Determination of bulk density of bituminous specimen by hydro-static method.*

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

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

prEN 12697-32, *Bituminous mixtures — Test methods for hot mix asphalt — Part 32: Laboratory compaction of bituminous mixtures by a vibratory compactor.*

prEN 12697-33, *Bituminous mixtures — Test methods for hot mix asphalt — Part 33: Specimen preparation, slab compactor.*

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

3 Terms and definitions

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

3.1
conventional reference density
value expressed as mass per unit volume that is used as a reference for the density of specimens for the determination of compaction degree, results of type testing, etc.

NOTE For a given bituminous mixture, the conventional reference density determined by the procedure using the gyratory compactor, generally varies according to the nominal thickness of the layer in which it is intended to be used.

3.2
conventional refusal density
value expressed as mass per unit volume of the specimen compacted to a very high compaction energy or refusal in accordance with prEN 12697-31 and prEN 12697-32 with the gyratory and vibratory compactor respectively and determined in accordance with prEN 12697-6

NOTE The conventional refusal density is independent of the thickness of the layer.

3.3
compaction degree
ratio of the bulk density of the specimen determined in accordance with prEN 12697-6 (dried bulk density if applicable to a core) to the conventional reference density for the corresponding thickness of layer expressed as a percentage

3.4
percentage refusal density (PRD)
ratio of the initial dried bulk density of the specimen determined in accordance with prEN 12697-6 to the conventional refusal density expressed as a percentage

4 Principle

4.1 The **conventional reference density** is determined in one of the following two ways:

a) by compacting by impact compactor specimens obtained from laboratory or plant mixtures with a predetermined number of hammer blows on each side of the specimens;

NOTE 1 The number of blows is dependent upon the product type and traffic category.

b) by compacting by gyratory compactor specimens obtained from laboratory or plant mixtures at a prescribed number of gyrations which varies according to the nominal thickness of the layer in which it will be used.

NOTE 2 The number of gyrations is stated in the product standard.

4.2 The **conventional refusal density** is determined in one of the following two ways:

a) by compacting by gyratory compactor specimens obtained from laboratory or plant mixtures for 200 gyrations;

b) by compacting by vibratory compactor a heated core sample to refusal.

NOTE 3 Until such time as relevant data is obtained from the use of the procedure with a vibrating hammer for other product types, this European Standard only applies to asphalt concrete base and binder course mixtures.

The initial dried bulk density of a core specimen of a dense bituminous mixture is measured.

The compaction degree is calculated as the ratio between that density and the conventional reference density or the percentage refusal density is calculated as the ratio between that density and the conventional refusal density.

NOTE 4 The conventional reference or refusal density can be measured on the core specimen after its initial dried bulk density.

The uses of compaction methods are summarized in Table 1.

Table 1

Parameter	Compaction Method		
	Impact compactor	Gyratory compactor	Vibratory compactor
Conventional reference density	Yes	Yes	Not normally
Conventional refusal density	No	Yes (at 200 gyrations)	Yes
Compaction degree	Yes	Yes	Not normally
Percentage refusal density (PRD)	No	Yes (at 200 gyrations)	Yes