SLOVENSKI STANDARD
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Bitumenske zmesi - Preskusne metode za vroče asfaltne zmesi - 39. del: Ugotavljanje deleža veziva z žigom

Bituminous mixtures - Test methods for hot mix asphalt - Part 39: Binder content by ignition

Asphalt - Prüfverfahren für Heißasphalt - Teil 39: Bindemittelgehalt durch Thermoanalyse

Mélanges bitumineux - Méthodes d'essai pour mélange hydrocarboné à chaud - Partie 39: Détermination de la teneur en liant par calcination

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EUROPEAN STANDARD

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Bituminous mixtures - Test methods for hot mix asphalt - Part 39: Binder content by ignition

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Foreword

This document (EN 12697-39:2012) 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of an identical text or by endorsement, at the latest by December 2012, and conflicting national standards shall be withdrawn at the latest by December 2012.

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

This document supersedes EN 12697-39:2004.

The significant technical changes made to EN 12697-39:2004 include the following:

a) The need for calibration of a mixture is clarified in the scope;

b) The definitions for precision concepts are removed;

c) Minor clarifications in the principle;

d) The nesting of baskets is clarified in the equipment;

e) The tolerance on the temperature of the oven is widened;

f) The maximum weight requirements of the external balance are corrected;

g) The note that the calibration value based on dry analysis of constituent aggregate can only be regarded as an estimate is deleted;

h) The catch pan to be placed in the furnace with the sample baskets is added;

i) Note added that the mass of the sample baskets and catch pan need not be measured if the binder content is to be calculated using the mass loss directly;

j) In Annex A, the total binder load is limited to 150 g;

k) Precision added to Annex B.

This European Standard is one of a series of standards for Bituminous mixtures 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 12697-10, *Bituminous mixtures — Test methods for hot mix asphalt — Part 10: Compactability*

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 cylindrical specimens (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*

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 methods 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*

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*

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 bonding*[1)]

prEN 12697-49, *Bituminous mixtures — Test methods for hot mix asphalt — Part 49: Determination of friction after polishing*[1)]

prEN 12697-50, *Bituminous mixtures — Test methods for hot mix asphalt — Part 50: Scuffing resistance of surface course*[1)]

WARNING — The temperature of the oven and the different accessories is extremely high during the ignition method. Special care shall be taken when handling the equipment and the samples baskets etc. should be placed, shielded and marked in a way that helps ensure any unpremeditated contact is avoided.

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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1) In preparation.

1 Scope

This document describes a test method for the determination of the binder content of samples of bituminous mixtures by ignition. As such, it is an alternative to the more traditional method of extracting the binder using solvents. The method can be used for evaluation of mixture composition because the remaining aggregate can be used for determining aggregate gradation and density, provided excessive breakdown of the aggregate particles does not occur at the temperature reached. The results can be used for process control or checks on the compliance of mixtures. However, the need for calibration of a mixture, either on the complete mixture or on each of its component materials separately, before an analysis can be carried out makes this method easier to use with regularly used mixtures rather than with an extensive range of different mixtures from different aggregate sources. The test method is equally suitable for the analysis of mixtures containing unmodified or modified binders because the method has to be calibrated for each mixture being checked when calibration on mixtures is used. In case of doubt/dispute, the determination of the calibration value based on laboratory-prepared bituminous mixtures (see A.1 and A.2) is the reference method.

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 12597, *Bitumen and bituminous binders — Terminology*

EN 12697-1, *Bituminous mixtures — Test methods for hot mix asphalt — Part 1: Soluble binder content*

EN 12697-14, *Bituminous mixtures — Test methods for hot mix asphalt — Part 14: Water content*

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*

3 Terms and definitions

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

3.1
binder
covers both bitumen and bituminous binder as described in EN 12597

3.2
corrected binder content
calculated binder content after correction by the calibration value in order to compensate for components in the asphalt material itself that, due to the high temperatures during ignition, could give rise to misinterpretations

3.3
calibration value
mean difference between the actual and measured binder contents for a particular bituminous mixture, in per cent, as measured from three samples

Note 1 to entry: The calibration value is a specific, material-dependent value that normally results from a loss of mass during the ignition from constituents in the mixture other than the binder. The principle of the binder content by ignition is based upon a pre-determination of the corrections for the constituents used in the mixture, primarily the aggregate.

Note 2 to entry: Mineral aggregates will show varying losses of mass during the test depending on their origin (petrographic composition). Examples of components that give rise to high corrections are limestone, hydrated lime and cellulose fibres.

Note 3 to entry: Methods for determining the calibration values are given in Annex A (normative).

3.4
target temperature
temperature to which the furnace would raise the sample in the test without the rise in temperature due to the exothermic reaction of burning the binder

Note 1 to entry: The target temperature (usually 540 °C) is determined during the calibration.

3.5
test completion time
time from when the temperature in the furnace returns to the target temperature, after the initial rise above that temperature, to when the test is completed with the sample having nominally reached constant mass

Note 1 to entry: If a furnace with an internal balance is used, the completion time is when the loss of mass between individual readings taken at 1 min intervals for three consecutive minutes is less than a constant mass limit. If a furnace without an internal balance is used, the completion time is when the change in the mass of the sample after further ignition for 15 min is less than a constant mass limit.

4 Principle

The test method determines the binder content of bituminous mixtures by ignition of the mixture in a furnace.

The corrected binder content is obtained by a calculation that includes a calibration term. Calibration terms are determined for particular asphalt mixtures or aggregates. Two test methods are described: Method A utilises a furnace with an internal balance; Method B permits the use of a furnace and external balance. Re-determination (re-calibration or re-calculation depending on the calibration method chosen from Annex A) shall be undertaken for each significant change in the mixture, including changes in the constituent materials or their proportions.

NOTE 1 The ignition process should have a controlled rise in temperature in order to avoid excessive heating of the mineral aggregate which can break down the aggregate particles depending on the petrographic composition.

NOTE 2 The calculation of the calibration value based on parallel analysis with extraction methods (A.1 and A.3) is appropriate for mixtures for which the intended proportions of the constituent materials are not known.

5 Apparatus

5.1 Furnace.

5.1.1 Furnace, capable of burning all the binder with the features detailed in 5.1.2 to 5.1.6 for Method A and 5.1.2 to 5.1.4 for Method B.

NOTE 1 The temperature required to burn all the binder will depend on the technology used and is determined as part of the calibration procedure (see Annex A).

NOTE 2 The furnace should not have to operate at its maximum capacity in order to allow flexibility and to ensure long service.

5.1.2 Sample chamber, having an internal capacity capable of taking the sample without touching the sides and with the maximum dimensions not greater than twice the minimum dimensions.

NOTE Larger chamber sizes may expedite testing by allowing larger sample basket(s) (and thus the material to be tested can be placed in thinner layers).

5.1.3 Automatic lock, that shall not allow the door to be opened until the completion of the test procedure, and a warning system to indicate the end of the pre-programmed temperature cycle.

5.1.4 System for reducing furnace emissions, by which the furnace shall be vented into a hood or to the outside and which, when properly set up, shall permit no noticeable odours escaping into the laboratory.

The furnace shall have a fan with the capability to pull sufficient air through the furnace to expedite the test and to reduce the escape of smoke into the laboratory.

NOTE 1 The method for reducing furnace emissions can comprise a filter and a post combustion chamber that is designed to eliminate the toxic residues produced by burning the binder.

NOTE 2 If mechanical ventilation is used, the air flow should be adjusted so as not to affect the operation of the equipment (e.g. a forced air extraction system may result in a loss of fines and the generation of fumes from the furnace).

5.1.5 Internal balance, capable of detecting mass variations of ± 0,1 g in the sample within the baskets.

The balance shall be thermally isolated from the furnace chamber.

5.1.6 Data collection system and a warning system, which shall be capable of being set to a value such that the loss in mass between individual readings taken at 1 min intervals for three consecutive minutes at end of the pre-programmed temperature cycle is not higher than the values stated in Table 1.

5.2 Metal baskets, manufactured from perforated sheet of tempered stainless steel or other suitable material that permits adequate air flow through the sample and retains the majority of the sample throughout the test.

The dimensions shall be specified by the furnace manufacturer to provide the maximum surface area for the sample while still providing sufficient room to safely load and unload the sample. The baskets shall be capable of being nested.

5.3 Catch pan, made of stainless steel with dimensions sized to accommodate the metal baskets specified in 5.2.

5.4 Oven, with convection or forced draft, capable of maintaining a temperature of (110 ± 5) °C in the vicinity of the samples.

5.5 External balance, capable of weighing the mass of trays plus the catch pan and the test sample according to Table 1 to ± 0,1 g.

5.6 Safety equipment, including safety glasses or face shield, high temperature gloves, and long sleeved jacket.

5.7 Heat-resistant surface, capable of withstanding 650 °C and able to act as a heat sink that can speed the cooling of the sample baskets, and protective cage, capable of completely surrounding the sample baskets and preventing accidental physical contact with them.

NOTE An appropriate sign warning of the danger of 'Very Hot Surfaces' should be attached to the protective cage.

5.8 Pan, larger than the sample basket(s), for transferring samples after ignition.

5.9 Spatulas.

5.10 Bowls.

5.11 Wire brushes.