SLOVENSKI STANDARD
SIST EN 12697-25:2016

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Nadomešča:
SIST EN 12697-25:2005

Bitumenske zmesi - Preskusne metode - 25. del: Ciklični tlačni preskus

Bituminous mixtures - Test methods - Part 25: Cyclic compression test

Asphalt - Prüfverfahren - Teil 25: Druckschwellversuch

Mélanges bitumineux - Méthodes d'essai - Partie 25 : Essai de compression cyclique

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93.080.20 Materiali za gradnjo cest Road construction materials

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EUROPEAN STANDARD

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EN 12697-25

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ICS 93.080.20

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English Version

Bituminous mixtures - Test methods - Part 25: Cyclic compression test

Mélanges bitumineux - Méthodes d'essai - Partie 25 : Essai de compression cyclique

Asphalt - Prüfverfahren - Teil 25: Druckschwellversuch

This European Standard was approved by CEN on 19 May 2016.

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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 CEN-CENELEC Management Centre has the same status as the official versions.

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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 12697-25:2016) has been prepared by Technical Committee CEN/TC 227 “Road materials”, the secretariat of which is held by DIN.

This document supersedes EN 12697-25:2005.

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of an identical text or by endorsement, at the latest by January 2017, and conflicting national standards shall be withdrawn at the latest by January 2017.

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.

Compared with EN 12697-25:2005 the following changes have been made:

a) addition of uniaxial compression test with confinement for mastic asphalt;

b) precision of friction-reducing system for loading surfaces;

c) definition of loading signal for triaxial tests by identifying loading time and rest time, to be considered in EN 13108-20;

d) implementation of digit numbers for test results;

e) clarification of formulae and definitions.

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 — 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 — 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 — 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 — 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 — Part 25: Cyclic compression test (this document)*

— 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 specimens 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 — 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 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*

— 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 — Part 48: Interlayer bonding*[1)]

— EN 12697-49, *Bituminous mixtures — Test methods for hot mix asphalt — Part 49: Determination of friction after polishing*

— CEN/TS 12697-50, *Bituminous mixtures — Test methods — Part 50: Resistance to scuffing*

— FprCEN/TS 12697-51, *Bituminous mixtures — Test methods — Part 51: Surface shear strength test*[2)]

— prCEN/TS 12697-52, *Bituminous mixtures — Test methods — Part 52: Conditioning to address oxidative ageing*[3)]

— prEN 12697-53, *Bituminous mixtures — Test methods — Part 53: Cohesion increase by spreadability-meter method*[1)]

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, Former Yugoslav Republic of Macedonia, 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) Currently at Enquiry stage.

2) In preparation.

3) In preparation for CEN/TS or EN.

1 Scope

This European Standard specifies three test methods (A1, A2 and B) for determining the resistance of bituminous mixtures to permanent deformation by cyclic compression tests with confinement. The tests make it possible to rank various mixtures or to check on the acceptability of a given mixture. They do not allow making a quantitative prediction of rutting in the field to be made.

Test methods A1 and A2 describe methods for determining the creep characteristics of bituminous mixtures by means of a uniaxial cyclic compression test with some confinement present. In this test a cylindrical test specimen is subjected to a cyclic axial stress. Method A2 is preferred for mastic asphalt and Method A1 for other asphalt mixtures. To achieve a certain confinement, the diameter of the loading platen is taken smaller than that of the test specimen. In test method A1, the test specimen is loaded by block-pulses whereas in method A2 haversine loading with rest time is applied.

Test method B describes the method for determining the creep characteristics of bituminous mixtures by means of the triaxial cyclic compression test. In this test a cylindrical test specimen is subjected to a defined confining stress and a cyclic axial stress. This test is most often used for the purpose of evaluation and development of new types of mixtures.

This European Standard applies to test specimens prepared in the laboratory or cored from the road. The maximum size of the aggregates is 32 mm.

NOTE 1 Confinement of the test specimen is necessary to simulate realistic rutting behaviour, especially for gap-graded mixtures with a large stone fraction.

NOTE 2 For the purpose of Type Testing, the test conditions are given in EN 13108–20.

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 12697-6, *Bituminous mixtures - Test methods for hot mix asphalt - Part 6: Determination of bulk density of bituminous specimens*

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

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

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

EN 13108-20, *Bituminous mixtures - Material specifications - Part 20: Type Testing*

3 Terms and definitions

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

3.1
contact area
portion of the pressure platen that is in contact with the test specimen

3.2
creep curve
display of the cumulative axial strain, expressed in %, of the test specimen as a function of the number of loading cycles

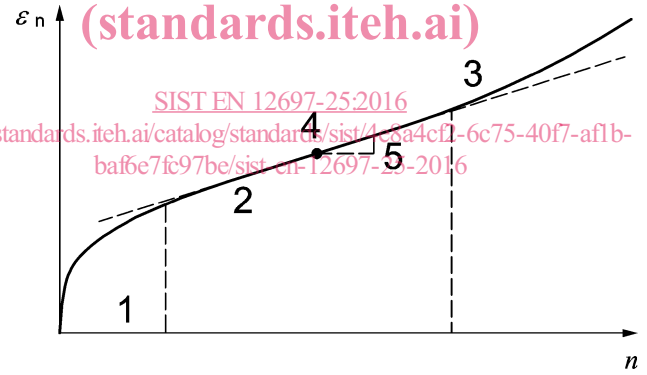
Note 1 to entry: Generally the following stages can be distinguished (see Figure 1):

— stage 1: the (initial) part of the creep curve, where the slope of the curve decreases with increasing number of loading cycles;

— stage 2: the (middle) part of the creep curve, where the slope of the curve is quasi constant and can be expressed by the creep rate f_c (See key 5 of Figure 1). The exact turning point of the creep curve lies within this stage;

— stage 3: the (last) part of the creep curve, where the slope increases with increasing number of loading cycles.

Depending on the testing conditions and on the mixture, one or more stages may be absent.



Key

ε_n cumulative axial strain
n number of loading cycles
1 stage 1
2 stage 2
3 stage 3
4 turning point
5 creep rate f_c

Figure 1 — Example of creep curve

3.3
Creep rate
slope of axial strain of the test specimen after a given number of loading cycles

3.4
permanent deformation
cumulative axial deformation of the test specimen after a given number of loading cycles

4 Principle

This test method determines the resistance to permanent deformation of a cylindrical test specimen of bituminous mixture by repeated load. The test specimens may be either prepared in the laboratory or be cored from a pavement.

During the test, the change in height of the test specimen is measured at specified numbers of loading cycles. From this, the cumulative axial strain ε_n of the test specimen is determined as a function of the number of loading cycles. The results are represented in a creep curve as given in Figure 1. From this, the creep characteristics of the test specimen are computed.

5 Equipment

5.1 Control and loading system

PC and software for controlling, reading and collecting necessary data. The control system shall guarantee that during the test the physical parameter to be controlled (force) shows no over-modulation. The load cell shall have a capacity of at least 5000 N with a precision of ± 10 N. All components shall be constructed out of hardened corrosion-resistant steel. The load cell should be able to generate a block or haversine loading pulse with or without rest periods. Resonance frequencies of the load cell, as mounted, shall be at least 10 times higher as the test frequency. Test frequencies in the range of 0,5 Hz to 5 Hz are most often applied.

It is recommended that the control system should include a programmable function generator and a control circuit with which the desired loading signal can be generated.

5.2 Displacement transducers

The deformation measurement system shall include two displacement transducers for measuring and recording the cumulative axial deformation to the test specimen, by measuring the change of the upper loading plate position during the test. The transducers shall have a tolerance of not more than 2 % for the measuring range of 5 mm.

NOTE Another number of suitable displacement transducers is possible, if proven, that inhomogeneous test specimen deformation is levelled during the test.

5.3 Data registration equipment

A data-acquisition system shall be provided for controlling and collecting the signals from the load and displacement transducers.

A system for graphical follow-up of the creep curve during testing is recommended.

5.4 Thermostatic chamber

A thermostatic chamber to maintain the temperature in the vicinity of the test specimen constant with a tolerance of ± 0,5 °C .

It is recommended that a sufficiently large thermostatic chamber should be chosen, so that during the test additional test specimens can be acclimatised inside the thermostatic chamber