



NSAI
Standards

Irish Standard
I.S. EN 12697-34:2012

Bituminous mixtures - Test methods for hot mix asphalt - Part 34: Marshall test

I.S. EN 12697-34:2012

Incorporating amendments/corrigenda/National Annexes issued since publication:

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English Version

Bituminous mixtures - Test methods for hot mix asphalt - Part 34: Marshall test

Mélanges bitumineux - Méthodes d'essai pour mélange
hydrocarboné à chaud - Partie 34 : Essai Marshall

Asphalt - Prüfverfahren für Heißasphalt - Teil 34: Marshall-
Prüfung

This European Standard was approved by CEN on 30 March 2012.

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Contents		Page
Foreword		3
1	Scope	7
2	Normative references	7
3	Terms and definitions	7
4	Principle	8
5	Apparatus	8
6	Procedure	8
6.1	Specimen preparation	8
6.2	Test procedure	9
7	Expression of results	9
8	Test report	10
9	Precision	10
Annex A (normative) Marshall stability and flow values		11
Annex B (normative) Testing head		12
Bibliography		13

Foreword

This document (EN 12697-34:2012) 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of an identical text or by endorsement, at the latest by May 2012, and conflicting national standards shall be withdrawn at the latest by May 2012.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 12697-34:2004+A1:2007.

The significant changes with respect to the previous edition are:

- a) definition of stability revised;
- b) definition of total flow added;
- c) note added on need for graphical plotter;
- d) note added allowing alternative number of votes;
- e) staking of specimens not permitted;
- f) note added about rapid cooling of rolled asphalt specimens;
- g) requirements for measurement of flow revised;
- h) equation for calculating the corrected stability revised with units in cubic millimetres rather than millilitres;
- i) calculation of flow clarified;
- j) Annex A revised.

Annexes A and B are normative.

This document is one of a series of European Standards which specify various test methods for bituminous mixtures. It includes the following parts:

- EN 12697-1, *Bituminous mixtures — Test methods for hot mix asphalt — Part 1: Soluble binder content*
- EN 12697-2, *Bituminous mixtures — Test method 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 12697-34:2012 (E)

- 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*
- 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 bond strength¹⁾*

1) In preparation.

I.S. EN 12697-34:2012

EN 12697-34:2012 (E)

- prEN 12697-49, *Bituminous mixtures — Test methods for hot mix asphalt — Part 49: Skid resistance of asphalt in the laboratory*¹⁾
- prEN 12697-50, *Bituminous mixtures — Test methods for hot mix asphalt — Part 50: Scuffing resistance of surface course asphalt*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, 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 Scope

This European Standard specifies a test method for determining the stability, flow and the Marshall Quotient values of specimens of bituminous mixtures mixed according to EN 12697-35 and prepared using the impact compactor method of test EN 12697-30. It is limited to dense graded asphalt concrete and hot rolled asphalt.

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 12697-29, *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 ISO 7500-1:2004, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Verification and calibration of the force-measuring system (ISO 7500-1:2004)*

3 Terms and definitions

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

3.1

stability

S

maximum load, in kilonewtons (kN), of a moulded asphalt specimen

3.2

flow

F

deformation of the moulded specimen in millimetres (mm) at maximum load less the nominal deformation obtained by extrapolation of the tangent of the graph of load against deformation back to zero load (A to M' in Figure A.1)

3.3

tangential flow

F_t

nominal deformation of the moulded specimen, in millimetres (mm) obtained by extrapolation of the tangent of the graph of load against deformation forward to the stability load less the nominal deformation obtained by extrapolation of the tangent back to zero load (A to B' in Figure A.1)

3.4

total flow

F_T

deformation of the moulded specimen in millimetres (mm) at maximum load (0 to M' in Figure A.1)

3.5

Marshall quotient

ratio of the stability, S , to the flow, F , S/F

Note 1 to entry: See Annex A.

4 Principle

Marshall specimens are compacted in accordance with EN 12697-30. The Marshall stability, flow and quotient are subsequently determined on these specimens using defined procedures and reported along with the bulk density of the specimen.

5 Apparatus

5.1 Compression testing machine of Class 2 or better according to EN ISO 7500-1:2004, clause 7, having a recommended minimum capacity of 28 kN and capable of applying loads to test specimens at a constant rate of deformation of (50 ± 2) mm/min after a transitory period less than 20 % of the loading time.

The rate of deformation is to be maintained.

5.2 Flow measuring device, capable of determining deformation to an accuracy of $\pm 0,1$ mm.

5.3 Graphical plotter, for evaluating the curve of force versus deformation, e.g. graphical plotter, strip recorder or software program.

NOTE A graphical plotter is required to obtain a test result by this test method. If dial gauges are used, they should be checked and zeroed prior to each measurement. In these cases, only the total flow can be recorded.

5.4 Testing head, comprised of upper and lower breaking heads with the dimensions given in Figure B.1.

5.5 Water bath, at least 150 mm deep and capable of thermostatically maintaining the water at a temperature of (60 ± 1) °C.

This bath shall have a perforated false bottom or shelf that can suspend the test specimens at least 25 mm above the bottom of the bath, and allow at least 25 mm depth of water above the specimens. The size of the bath shall allow specimens to be placed face down and not in contact with one another. A device to ensure continuous circulation of water shall also be fitted.

5.6 Thermometer, capable of measuring a temperature of 60 °C accurate to 0,5 °C.

5.7 Oven, capable of maintaining temperatures of (110 ± 5) °C.

6 Procedure

6.1 Specimen preparation

6.1.1 Specimens shall be compacted in accordance with EN 12697-30, ensuring that 50 blows are applied to each side within the acceptable temperature range given.

NOTE A different number of blows may be selected; for example, 35 blows for light traffic and 75 blows for heavy duty pavements.

6.1.2 The compacted specimens shall be de-moulded, ensuring that they are cooled in air to avoid any danger of deformation and then tested in accordance with 6.1.1 and 6.1.3. After de-moulding, wait at least 4 h before further testing begins. All tests shall be completed within 32 h of de-moulding. Specimens shall not be stacked prior to testing.

NOTE Specimens of rolled asphalt may be left in the moulds and immersed in cold water to facilitate rapid cooling. The cooled specimens should be extruded from their moulds with the minimum of force and using an extractor of suitable design so that they are ejected without distortion or shock.

The bulk density of each specimen shall be determined in accordance with EN 12697-6.

6.1.3 The height of each specimen shall be measured in accordance with EN 12697-29; or the volume shall be calculated from the bulk density measurement.

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