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Bitumenske zmesi - Preskusne metode - 53. del: Povečanje kohezije z metodo merjenja razširjanja

Bituminous mixtures - Test methods - Part 53: Cohesion increase by spreadability-meter method

Asphalt - Prüfverfahren - Teil 53: Beurteilung der Kohäsionszunahme durch Messung der Konsistenz

Mélanges bitumineux - Méthodes d'essai - Partie 53: Montée en cohésion par la méthode du maniabilimètre

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Bituminous mixtures - Test methods - Part 53: Cohesion increase by spreadability-meter method

Mélanges bitumineux - Méthodes d'essai - Partie 53:
Montée en cohésion par la méthode du maniabilimètre

Asphalt - Prüfverfahren - Teil 53: Beurteilung der
Kohäsionszunahme durch Messung der Konsistenz

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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European foreword

This document (prEN 12697-53:2018) has been prepared by Technical Committee CEN/TC 227 “Road materials”, the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

A list of all parts in the EN 12697 series can be found on the CEN website.

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1 Scope

The aim of the test is to determine the cohesion increase of a bituminous mixture in fixed temperature and hygrometry conditions, using a spreadability-meter.

This European Standard specifies a method to measure the spreadability characteristics of asphalt which are able to vary with time. It may be used for the determination of the delay between manufacturing and laying. It is intended to be assistance for mixture design rather than a type test.

This European Standard 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. It is not applicable to mastic asphalt.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

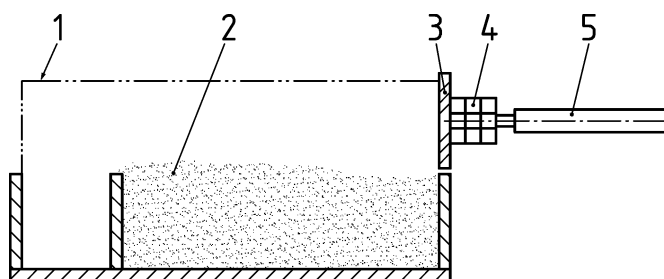
No terms and definitions are listed in this document.

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>

4 Principle

The cohesion increase test consists of measuring of the resistance against the shear due to the progress of a piston in a mould filled with the bituminous mixture to be tested (Figure 1). The cohesion of the mixture increases as the shear force increases.



Key

- 1 mould
- 2 asphalt mixture
- 3 stainless steel plate
- 4 sensor
- 5 piston

Figure 1 — Flow diagram of workability-meter

5 Apparatus

5.1 Moulds

5.1.1 General

Depending on the application, the equipment may comprise large size and or small size moulds, as mentioned in Figure 2 using the following symbols:

L is the dimension of the mould according to the piston axle, in millimetre (mm);

W is the horizontal dimension of the mould perpendicular to the piston axle, millimetre (mm);

H is the height of the mould, millimetre (mm).

5.1.2 Large size moulds

— $L = (220 \pm 2)$ mm,

— $W = (300 \pm 2)$ mm,

— $H = (100 \pm 2)$ mm.

5.1.3 Small size moulds

— $L = (220 \pm 2)$ mm,

— $W = (150 \pm 2)$ mm,

— $H = (100 \pm 2)$ mm.

5.2 Spreadability-meter

An example of a spreadability-meter is shown on Figure 2. It comprises following elements:

- Metallic chassis, equipped with a piston which moves with a speed of $(10,0 \pm 0,5)$ mm/s on a minimal length of 130 mm and able to transmit a horizontal movement to the stainless steel plate.
- Sensor, fixed on the piston and linked to a steel plate, able to measure the force to ± 1 N up to 100 N and to ± 1 % above 100 N.
- Stainless steel plate, linked to the force measurement : length (230 ± 2) mm for large size moulds, length (115 ± 2) mm for small size moulds, width (80 ± 1) mm, and thickness $(4,0 \pm 0,5)$ mm. As the initial position, it is set on the wall with a vertical gap of $(3 \pm 0,5)$ mm and it is vertically aligned with the inside edge of the mould.

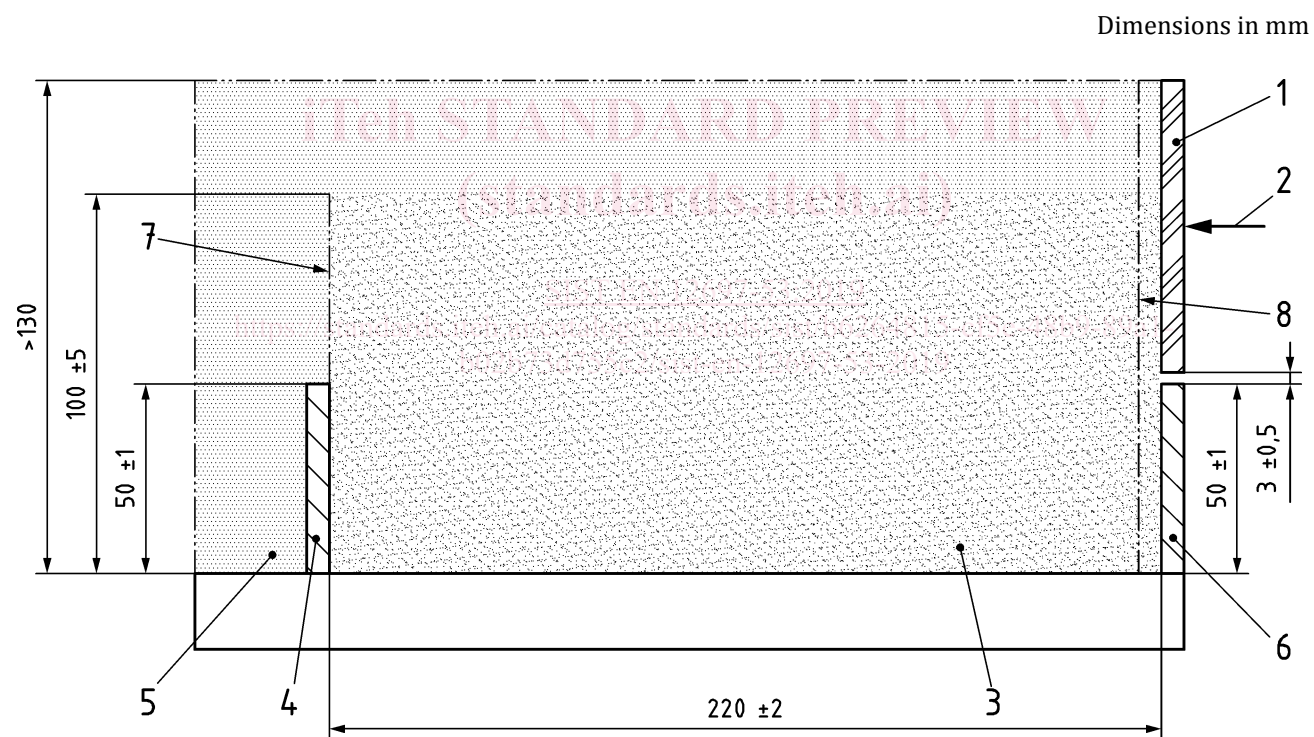


Key

- 1 stainless steel plate in initial position
- 2 chassis

Figure 2 — Example of workability-meter

The workability-meter equipped with a mould is shown on Figure 3.



Key

- 1 stainless steel plate in initial position
- 2 piston
- 3 mixture to be tested after striking
- 4 partition wall
- 5 mixture pouring out
- 6 pressure wall
- 7 detachable rear wall
- 8 detachable front wall

Figure 3 — Schema of spreadability-meter equipped with a mould

The bottom of the mould may comprise 15 holes with a diameter of $(3,0 \pm 0,1)$ mm, uniformly distributed to allow the drainage, if the drainage should be taken into account during the curing of the mixture.

The mould comprises detachable rear and front walls to allow filling with the mixture. They are placed respectively on the pressure wall and on the partition wall. They shall be removed after filling the mould and after the striking of the mixture and before the start of the test.

5.3 Filling shoot

Parallelepiped filling shoot, of which dimensions are suitable for filling the mould equipped with a discharge box comprising a retractable trap door. The height of discharge between the door and the bottom of the mould shall be $(1\ 000 \pm 50)$ mm. The discharge box shall be able to contain (11 ± 1) kg of mixture and the trap door shall be able to dump all the material when open.



Figure 4 — Example of filling shoot

5.4 Steel straightedge for striking off

Suitable dimension to be able to strike off the mixture in the mould at a height of (100 ± 2) mm in order to obtain a constant volume of material to be tested.

5.5 Climatic chamber or oven

Climatic chamber or oven able to maintain the mixture in the vicinity of the samples a fixed temperature to ± 1 °C for storage temperature less or equal to 25 °C and to ± 5 °C for storage temperature greater and a fixed hygrometry to ± 10 % for mixtures with a water content greater than 1 %.

6 Procedure

6.1 Number of samples to be tested

To determine the cohesion increase kinetic, many filled moulds should be prepared and conditioned, if necessary, at the fixed temperature and hygrometry in order to test the mixture at different curing times. At each curing time at least 2 individual tests shall be carried out.

Curing time and curing temperature depend on the aim of the test and on the nature of the mixture.

6.2 Filling the mould and curing

6.2.1 General

For some applications the mould may be filled without the use of the filling shoot.

6.2.2 Direct filling

Set the mould equipped with the detachable walls on a flat surface.

Fill the mould in one batch larger than the mould capacity.

6.2.3 Filling using a filling shoot and a discharge box

Set either a large size mould or two small size mould equipped with the detachable walls on a flat surface.

NOTE The mass of tested asphalt may be determined by the difference between the weight of the equipment after striking of the mixture and the empty one.

Set the filling shoot and the discharge box vertically on the mould.

Fill the discharge box with $(11,0 \pm 0,1)$ kg of bituminous mixture.

Set the discharge box on the top of the filling shoot. Open the trap door in order the mixture falls in the mould.

6.2.4 Striking off and curing the mixture

Strike off the mixture of the mould using the straightedge in order to obtain a thickness of (100 ± 2) mm. Care shall be taken to avoid compaction when the mould is filled, because any compaction influences the result.

Set the filled mould in the climatic chamber or in the oven. For the curing time $t = 0$, the moulds are not set in the climatic chamber or in oven but directly tested.

The time between the filling of the discharge box and the conditioning in the oven or in the climatic chamber shall not exceed 3 min.

Except for $t = 0$, the moulds are conditioned in the oven or in the climatic chamber during the time t , in hours (h).

6.3 Shear force measurement

Check that the stainless steel plate is fixed vertically on the piston of the spreadability-meter.

For the mixtures with a curing time of i , take the mould out of the oven or climatic chamber, set it in the workability-meter according to Figure 2, remove the detachable rear and front walls.

Start the test with the displacement of the piston and continue until the end of the piston travel.