SLOVENSKI STANDARD
SIST EN 12697-19:2020

01-maj-2020

Nadomešča:
SIST EN 12697-19:2012

Bitumenske zmesi - Preskusne metode - 19. del: Prepustnost preskušancev

Bituminous mixtures - Test methods - Part 19: Permeability of specimen

Asphalt - Prüfverfahren - Teil 19: Durchlässigkeit der Probekörper

Mélanges bitumineux - Méthodes d'essai - Partie 19: Perméabilité des éprouvettes

Ta slovenski standard je istoveten z: **EN 12697-19:2020**

ICS:

93.080.20 Materiali za gradnjo cest Road construction materials

SIST EN 12697-19:2020 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12697-19

February 2020

ICS 93.080.20

Supersedes EN 12697-19:2012

English Version

Bituminous mixtures - Test methods - Part 19: Permeability of specimen

Mélanges bitumineux - Méthodes d'essai - Partie 19 : Perméabilité des éprouvettes

Asphalt - Prüfverfahren - Teil 19: Durchlässigkeit der Probekörper

This European Standard was approved by CEN on 18 November 2019.

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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 12697-19:2020) has been prepared by Technical Committee CEN/TC 227 “Road materials”, the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by August 2020, and conflicting national standards shall be withdrawn at the latest by August 2020.

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.

This document supersedes EN 12697-19:2012.

The following is a list of significant technical changes since the previous edition:

— the title no longer makes the method exclusively for hot mix asphalt;

— [ge] editorial update according to current standard template;

— [Clause 3, new clause: 3 Terms and definitions introduced. Following clauses renumbered accordingly;

— [5.2.2] accuracy of balance of ± 0,5 g introduced. (4.2.2 in previous version);

— [5.4.1] Formula (1): rounding rules for calculation introduced. (4.4.1 in previous version);

— [5.4.2] Formula (2) corrected. (4.4.2 in previous version);

— [6.2.4] accuracy of balance of ± 0,5 g introduced. (5.2.4 in previous version);

— [6.4.1] Formula (3): rounding rules for calculation introduced. (5.4.1 in previous version);

— [6.4.2] Formula (4), key for K_h: unit for the horizontal permeability corrected to (m/s). (5.4.2 in previous version);

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

According to the CEN-CENELEC Internal Regulations, the national standards organisations 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, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This document specifies a method for determining the vertical and horizontal permeability of cylindrical specimens of bituminous mixtures with interconnecting voids. The document applies to specimens cored out of the road, specimens from laboratory made slabs or laboratory specimens prepared with a compaction device provided the thickness of the specimen is not less than twice the nominal maximum particle size of the aggregate in the mixture. The nominal diameter of specimens should be either 100 mm or 150 mm unless the nominal maximum particle size of the aggregate size exceeds 22 mm, when the nominal diameter is 150 mm.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 12697-29, *Bituminous mixtures — Test methods — Part 29: Determination of the dimensions of a bituminous specimen*

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 https://www.iso.org/obp/ui

4 Principle

A column of water with a constant height is applied to a cylindrical specimen and is allowed to permeate through the specimen for a controlled time in either a vertical or horizontal direction depending upon the parameter being measured. The resultant flow rate of the water Q_v or Q_h is a calculated measure of the permeability value K_v or K_h. The test is carried out at ambient temperature.

NOTE When the void content of the same specimen is determined, the relationship between permeability and void content can be established.

5 Vertical permeability

5.1 General

In this method, only the water flow in a vertical direction through the specimen is measured.

5.2 Apparatus for vertical permeability

5.2.1 Apparatus as shown in Figure 1. The dimensions shall be such to ensure the water column height is (300 ± 1) mm. The external diameter of the tube and any fittings shall be such that no water can flow between the wall of the tube and the specimen when in place; the thickness of the tube shall be sufficient to ensure it retains its shape but shall not be more than 5 mm.

The external diameter of the tube should generally be greater than the diameter of the specimen by up to 5 mm.

NOTE A suitable rubber cuff that fits snugly around the tube and sample is one method to ensure that no water can flow between the two. Another approach that could be used is to attach the plastic tube with duct tape to the specimen.

5.2.2 A balance with suitable capacity and capable of weighing with an accuracy of ± 0,5 g.

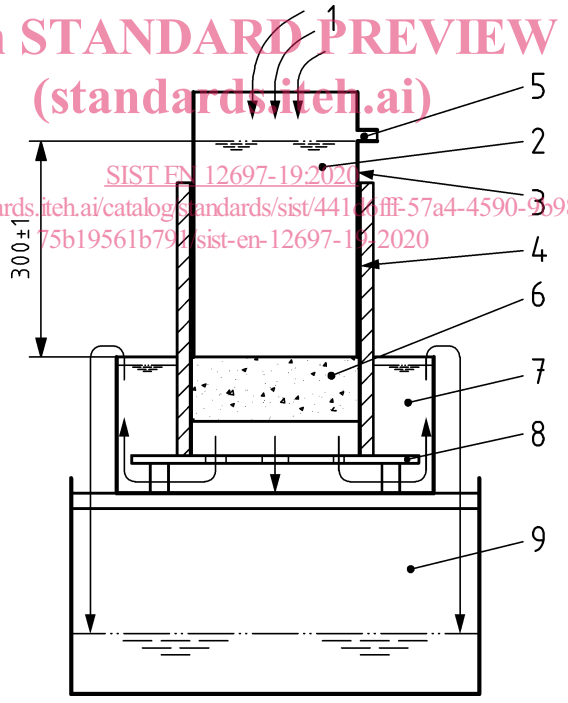
5.3 Procedure

5.3.1 Determine the dimensions of the specimen, to the nearest millimetre, according to EN 12697-29. The thickness shall be greater than 25 % of the diameter and greater than twice the nominal maximum aggregate size of the mixture.

5.3.2 If the specimen is trimmed by saw cutting, it shall be cleaned prior to testing, to prevent restriction of the water flow.

5.3.3 The test shall be carried out at ambient temperature within the ranges of 15 °C to 25 °C and shall be monitored and recorded. Place the specimen in a rubber cuff. Insert a plastic tube in the cuff and place it on top of the specimen. Carefully inflate the rubber cuff with air to at least 50 kPa, so that it presses firmly around the wall of the specimen to prevent leakage of water along the wall. A seal needs to be ensured between the cuff and the tube.

Dimensions in millimetres



Key

1 water supply
2 water column
3 plastic tube
4 rubber cuff (optional)
5 outlet to maintain water column height
6 specimen
7 water bath
8 perforated plate
9 collecting reservoir

Figure 1 — Apparatus for vertical permeability

5.3.4 Place the cuff with the specimen on a perforated plate and place it in a container that is filled with water to the maximum level. Adjust the feet of the perforated plate in such a way that the upper side of the specimen is at the same level as the water in the bath. Allow the water to flow into the specimen for approximately 10 min. After this time, it is assumed that the specimen is saturated with water and all enclosed air is removed.

5.3.5 Fill the plastic tube with water. There is an outlet in the plastic tube, so that a water column height of (300 ± 1) mm is always maintained.

5.3.6 Allow the water to flow through the specimen into a container. The container shall be located above a second container of mass m_1 into which the water passing through the sample can overflow to the level of the top of the sample. After approx. 1 min, empty the second container and collect the water that flows through into the weighed second container for a certain time t, minimum 60 s. After the time t weigh the second container together with the collected water m_2.

At a voids content of about 20 %, the vertical flow of water is about 3 l/min to 10 l/min. It should be noted, however, that when the test is carried out on a core taken from the road surface, the surface can be somewhat clogged and although still retaining 20 % voids may not have a flow in this range.

The measuring time can be decreased from 60 s if the amount of water exceeds 8 l. The decreased measuring time should then be reported in the test report.

5.3.7 Repeat the test on the same specimen.

5.4 Calculation

5.4.1 Determine the vertical flow of water through the specimen Q_v according to Formula (1).

$$Q_v = \frac{(m_2 - m_1)}{t} \times 10^{-6} \quad (1)$$

where

Q_v is the vertical flow, through the specimen, in cubic metres per second (m^3/s), to the nearest 1×10^{-6} m^3/s;

m_1 is the mass of the empty second container, in gram (g), to the nearest 0,5 g;

m_2 is the mass of the filled second container, in gram (g), to the nearest 0,5 g;

t is the time of collecting the water, in seconds (s), to the nearest 1 s;

The water density is assumed to 1 g/cm^3.

5.4.2 Calculate the vertical permeability K_v according to Formula (2):

$$K_v = \frac{4 \times Q_v \times l}{h \times \pi \times D^2} \quad (2)$$

where

K_v is the vertical permeability, in metres per second (m/s);

Q_v is the vertical flow through the specimen, in cubic metres per second (m^3/s);

l is the thickness of the specimen, in metres (m);

h is the actual height of water column, in metres (m);

D is the diameter of the specimen, in metres (m).

NOTE Usually the permeability is between $0,5 \times 10^{-3}$ m/s and $3,5 \times 10^{-3}$ m/s, when testing porous asphalt.

6 Horizontal permeability

6.1 General

In this test method, the water flows partially in a horizontal direction through the specimen. The result of the test is a combination of vertical and horizontal permeability.

6.2 Apparatus for horizontal permeability

6.2.1 Apparatus as shown in Figure 2. The external diameter of the upper and lower tubes and any fittings shall be such that no water can flow between the wall of the upper and lower tubes nor between the lower tube and the specimen when in place; the thickness of the tubes shall be sufficient to ensure it retains its shape but shall not be more than 5 mm.

The external diameter of the upper tube should generally be greater than the diameter of the specimen by up to 5 mm.

NOTE A suitable rubber cuff that fits snugly around the tubes is one method to ensure that no water can flow between the two. Another approach that could be used is to attach the two plastic tubes with duct tape.

6.2.2 The tray in which the specimen sits shall be held in place by adjustable feet or other suitable means so that the upper face of the specimen is horizontal and the height of the top of the upper tube shall be capable of being adjusted to attain the required distance above the upper face of the specimen.

A tray capacity of 5 l to 7 l is recommended.

6.2.3 Collecting reservoir of suitable size.

A capacity of 15 l is recommended.

6.2.4 A balance with suitable capacity and capable of weighing with an accuracy of ± 0,5 g.