SLOVENSKI STANDARD
SIST EN 13588:2018

01-januar-2018

Nadomešča:
SIST EN 13588:2008

Bitumen in bitumenska veziva - Določanje kohezijskih lastnosti bitumenskih veziv s preskusom z nihalom

Bitumen and bituminous binders - Determination of cohesion of bituminous binders with pendulum test

Bitumen und bitumenhaltige Bindemittel - Bestimmung der Kohäsion von bitumenhaltigen Bindemitteln mit der Pendelprüfung

Bitumes et liants bitumineux - Détermination de la cohésion des liants bitumineux par la méthode du mouton-pendule

Ta slovenski standard je istoveten z: **EN 13588:2017**

ICS:

75.140	Voski, bitumni in drugi naftni proizvodi	Waxes, bituminous materials and other petroleum products
91.100.50	Veziva. Tesnilni materiali	Binders. Sealing materials

SIST EN 13588:2018 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13588

November 2017

ICS 91.100.50; 93.080.20

Supersedes EN 13588:2008

English Version

Bitumen and bituminous binders - Determination of cohesion of bituminous binders with pendulum test

Bitumes et liants bitumineux - Détermination de la cohésion des liants bitumineux par la méthode du mouton-pendule

Bitumen und bitumenhaltige Bindemittel - Bestimmung der Kohäsion von bitumenhaltigen Bindemitteln mit der Pendelprüfung

This European Standard was approved by CEN on 7 August 2017.

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Ref. No. EN 13588:2017 E

Contents

Page

European foreword ... 3
Introduction ... 5
1 Scope ... 6
2 Normative references ... 6
3 Terms and definitions ... 6
4 Symbols ... 6
5 Principle ... 7
6 Apparatus ... 8
7 Procedure ... 12
7.1 Preparation of cubes and supports ... 12
7.2 Preparation of the binder for test ... 12
7.3 Preparation of the test assemblies ... 12
7.4 Storage of the assemblies ... 13
7.5 Adjustment of the pendulum ... 13
7.6 Measurement ... 13
7.6.1 General ... 13
7.6.2 Number of test repetitions at a given temperature ... 14
7.6.3 Determination of an average value for α' ... 14
7.6.4 Special precautions ... 14
7.7 Selection of test temperatures ... 15
7.7.1 Initial selection ... 15
7.7.2 Determination of the maximum cohesion and associated temperature ... 15
7.7.3 Determination of a full cohesion curve down to a limit cohesion value C_L ... 15
8 Expression of results ... 15
8.1 General ... 15
8.2 Determination of the maximum cohesion and associated temperature ... 16
8.3 Determination of the low and high temperature values corresponding to a given cohesion limit C_L ... 16
9 Precision ... 17
9.1 General ... 17
9.2 Unmodified bitumen ... 17
9.3 Polymer modified bitumen ... 17
10 Test report ... 18
Annex A (informative) Example system for keeping the cubes in place ... 19
Figure A.1 — Use of a magnet to keep the cubes correctly positioned ... 19
Annex B (informative) Example work sheet ... 20
Annex C (normative) Drawing details ... 21
Bibliography ... 22

European foreword

This document (EN 13588:2017) has been prepared by Technical Committee CEN/TC 336 "Bituminous binders", the secretariat of which is held by AFNOR.

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 2018, and conflicting national standards shall be withdrawn at the latest by May 2018.

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 13588:2008.

This document contains the following main changes compared to EN 13588-2008:

— More extensive description of the types of binders to which the test is applicable and reduction of the scope in terms of temperature range (Clause 1);

— Normative references are updated (Clause 2 and Bibliography);

— More precise description on how to determine peak cohesion and its associated temperature. More precise description on how to determine the end points of a full cohesion curve (value C_L of cohesion) and the associated temperatures (T_{low} and T_{high}). This leads to modifications in Clause 4, Clause 5 (Figure 1) and Clause 10 as well as in Clause 7 (selection of test temperatures) and Clause 8 (introduction of Figures 6 and 7);

— Dials graduated in grades and equipment with digital display are allowed (6.1.3);

— Clarification on the estimated number of needed test assemblies (6.1.4);

A NOTE is introduced under Clause 6.3 to recommend the use of stainless steel cubes and cube supports and warn against the risk of adhesive failure when water baths are used. Storage times in liquid or air baths are revised (7.4);

— 6.4 (thermometer) is discarded since this clause is not called by the test procedure and temperature control requirements are already covered by 6.3;

— Greater emphasis is given to the control and reporting of the thermal history of the test sample (7.2.3 and 10);

— More detailed instructions on how to prepare (7.3) and store (7.4) the test assemblies. Introduction of a new informative Annex describing a possible feature for maintaining cubes in place;

— Clarification on the number of test assemblies to be tested and the definition of a valid result (7.6.1, 7.6.2 and 8.1);

— Possibility is given for a simplified determination of an average value for α' (7.6.3);

— Improved explanations on special precautions which may have to be taken (7.6.4);

— Figures 3, 4 and 5 are corrected so as to be in agreement with 6.1.4 and 7.5;

— Worksheet in Annex B is no longer mandatory and required in the test report (Clause 10) but is given as an example.

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

Introduction

The cohesion is one of the measures of the performance of a bituminous binder. It is important to use binders which have a sufficient level of cohesion according to the level of traffic to be supported. Cohesion test with the pendulum has originally been developed for surface dressing however it can be used for any type of binder which is to be used in different types of road applications. Knowledge of cohesion enables the choice of binder type for given traffic and site conditions.

This European Standard describes the method for determining the cohesion of a bituminous binder with a pendulum and how to draw the cohesion curve as a function of temperature.

1 Scope

This European Standard specifies a method for measuring the cohesion of bituminous binders at temperatures in the range of (+ 10 °C) to (+ 70 °C) and for expressing the relationship between cohesion and temperature.

In the case of cut-back and fluxed bituminous binders and for bituminous emulsions, the tested binder may be the result of a specific distillation, recovery and/or stabilization procedure.

The method may also be applied to binders which have undergone a specific ageing procedure.

WARNING — The use of this European Standard may involve hazardous materials, operations and equipment. This European Standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this European Standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

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 58, *Bitumen and bituminous binders - Sampling bituminous binders*

EN 1427, *Bitumen and bituminous binders - Determination of the softening point - Ring and Ball method*

EN 12594, *Bitumen and bituminous binders - Preparation of test samples*

3 Terms and definitions

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

3.1
cohesion
energy per unit area required to fully detach a cube from the support, with the previously-bonded faces of cube and support remaining fully covered by binder

Note 1 to entry: If the cube remains attached to the support after the test, the value measured by the test is always less than the actual cohesion value. In such case, the test result can however be used to establish that the binder has more than a specified minimum value of cohesion.

4 Symbols

For the purposes of this European Standard, the following symbols apply.

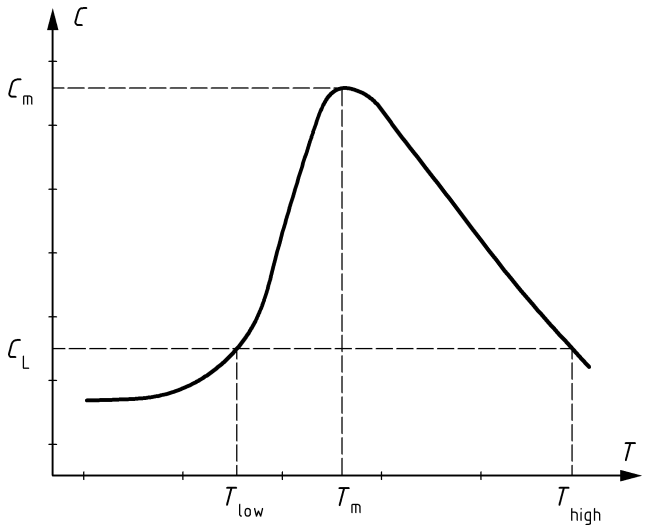
α	angle indicated by the device after launching the pendulum and impacting a cube placed on and adhered to the support by binder
α'	angle indicated by the device after launching the pendulum and impacting a cube with binder, placed on but not adhered to the clean support
C	cohesion of the binder determined for a specified temperature
C_L	limit value of cohesion at the low and high temperature end-points of the cohesion curve
C_m	maximum value of cohesion at the top of the curve

E	energy required to remove a cube placed on and adhered to the support by binder
E'	energy required to remove a cube with binder, placed on but not adhered to the clean support
g	acceleration due to gravity
M_X (T_X, C_X)	measurement point at a temperature T_X giving a cohesion C_X
m	mass of pendulum
T_{low}	temperature of the test associated to the limit value of cohesion at the low temperature end of the cohesion curve
T_{high}	temperature of the test associated to the limit value of cohesion at the high temperature end of the cohesion curve
T_m	temperature of the test associated to the maximum value of cohesion
r	radius at the centre of gravity of the pendulum
s	breaking area

5 Principle

A 10 mm side steel cube is fixed to a steel support by a film of binder of 1 mm thickness.

The assembly is brought to the test temperature and the cube is dislodged by the impact of a swinging pendulum. The energy absorbed by rupture of the binder is calculated from the angle (α) of swing of the pendulum. The determination is performed over a range of temperatures allowing the determination of the cohesion peak of the binder (C_m, T_m) and, optionally, the description of a full cohesion curve between two limiting temperatures (T_{low} and T_{high}) corresponding to a limit value (C_L) of cohesion (see Figure 1).



Key

C cohesion, J/cm²

T temperature, °C

Figure 1 — Cohesion versus temperature

6 Apparatus

6.1 Cohesion tester, comprising the elements specified in 6.1.1 to 6.1.4.

6.1.1 Base, set in a horizontal position by means of height adjustment screws and a spirit level, and carrying:

— an adjustable quick-release clamping device to hold the test assembly firmly to the base;

— two vertical supports carrying the pendulum, attached to the base;

— a locking system holding the pendulum in a parked position of (4,0 ± 1,0)° or (4,0 ± 1,0) grade angle with the vertical;

— a removable protective cage constructed to allow the pendulum to swing without impediment whilst retaining dislodged cubes.

NOTE In some cases, when performing the test, the cube may not be removed entirely by the pendulum and become the cause for damage when struck by the returning pendulum. To avoid this, it is advised to equip the tester with a pendulum-catching device able to stop the pendulum after it has reached its point of return.

6.1.2 A pendulum, having the form and dimensions specified in Figure 2 capable of rotating freely on a horizontal shaft held in ball bearings in the supports. The mounting for the bearings are adjustable so that the impact edge of the pendulum can be closely adjusted for freedom of swing and height with respect to the test specimen.

a) Pendulum mass: (1 925 ± 95) g;

The mass of the pendulum shall be noted and declared in the report of results.

b) Height from shaft axis to the point of impact: (500 ± 1) mm;

c) Radius at the pendulum centre of gravity to the shaft: (295 ± 2) mm.

6.1.3 A device allowing to record the maximum swing position of the pendulum.

This can be a pointer on the pendulum support shaft driven forward by the pendulum but held by an adjustable friction device at the point of maximum swing until manually reset. The end point position of the pointer (angle α) is read on a dial graduated in at least 0,5° or 0,5 grade intervals, with zero in the lower balance position of the pendulum.

If a dial graduated in grades is used, all the specific angle values referred to in degrees by this standard need to be converted into their equivalent in grades.

The maximum swing position of the pendulum may also be recorded through a digital device allowing a resolution of at least 0,5° or 0,5 grade.

6.1.4 Cubes and cube supports, steel, to the forms and dimensions shown in Figure 3 and Figure 4, serrated on the faces to be coated with binder. Figure 5 shows typical serrations and angles for the cubes and cube supports.

The mass of any cube is (9,0 ± 0,5) g.

The precise details for the serrations are not mandatory and alternative configurations may be used provided they do not result in adhesion failure between binder and cube or support during testing.

A minimum of six test assemblies, consisting of a cube attached by a film of binder to the cube support, are required for each test temperature (7.6.2). The number of test temperatures will depend on the information

to be generated. For cohesion peak only, it is safe to foresee at least 5 × 6 = 30 assemblies (i.e. cubes and cube supports) whereas for the optional determination of a full cohesion curve this number may have to be extended to at least 9 × 6 = 54 assemblies.

6.2 Oven, capable of maintaining a set temperature of from 60 °C up to a temperature equal to 90 °C above the ring and ball softening point (EN 1427) of the respective binder under test with an accuracy of ± 5 °C.

6.3 Thermostatically controlled enclosure(s), incubator air bath(s) or liquid bath(s), capable of maintaining the set temperature within ± 1,0 °C over the range (+ 10 °C) to (+ 70 °C).

NOTE The use of a liquid bath requires the use of stainless-steel cubes and cube-supports and may create unwanted adhesion failures.

6.4 Other apparatus including a brush, spatula and knife blade.

Dimensions in millimetres
Unless otherwise is indicated, tolerances are ± 1 mm
Height from shaft axis to the point of impact: (500 ± 1) mm

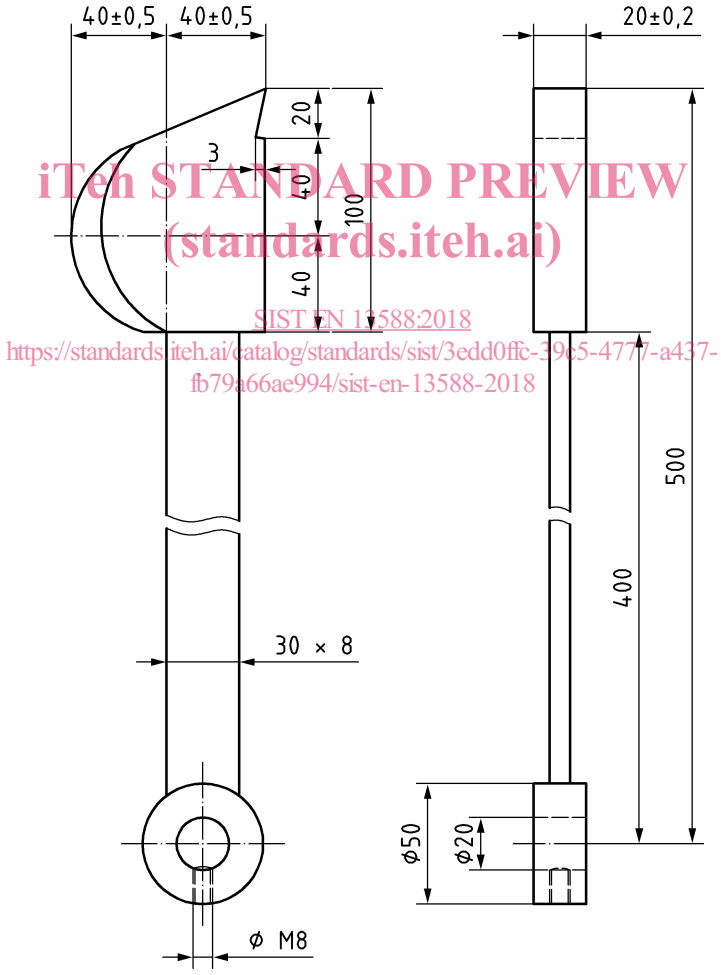


Figure 2 — Ram pendulum