SLOVENSKI STANDARD
SIST EN 13588:2008

01-september-2008

Nadomešča:
SIST EN 13588:2004

Bitumen in bitumenska veziva - Določevanje kohezijskih lastnosti bitumenskih veziv - Preskus 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 13588:2008**

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 13588:2008 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13588

March 2008

ICS 91.100.50; 93.080.20

Supersedes EN 13588:2004

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 21 January 2008.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, 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 and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Contents

page

Foreword

This document (EN 13588:2008) 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 September 2008, and conflicting national standards shall be withdrawn at the latest by September 2008.

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 13588:2004.

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, 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 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 has originally been developed for surface dressing however it can be used for any type of binder (pure, modified or fluxed) 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 a method for determining the cohesion of a binder 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 (+ 80 °C) and for expressing the relationship between cohesion and temperature.

This method is applicable for pure bitumen, modified bitumen and fluxed bitumen; in the case of fluxed bitumen, the test can be performed on the binder containing fluxant or on binder from which the solvent has been removed. For bitumen emulsions, the test is carried out on the residual binder obtained after recovery and the method used to recover the binder should be reported.

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 referenced documents are indispensable for the application 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 58, *Bitumen and bituminous binders - Sampling bituminous binders*

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 Where the cube remains attached to the support after elastic displacement, the energy value measured by the test is always less than the true cohesion value, so the test result can be used to establish that the binder has more than a specified minimum value of cohesion.

4 Symbols and abbreviations

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

α
angle indicated by the pointer after launching the pendulum and impacting a cube placed on and adhered to the support by binder

α'
angle indicated by the pointer after launching the pendulum and impacting a cube with binder, placed on but not adhered to the clean support

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

C_m
maximum value of cohesion at the top of the curve

T_m
temperature of the test giving the maximum value of cohesion

m
mass of pendulum

g
acceleration due to gravity

r
radius at the centre of gravity of the pendulum

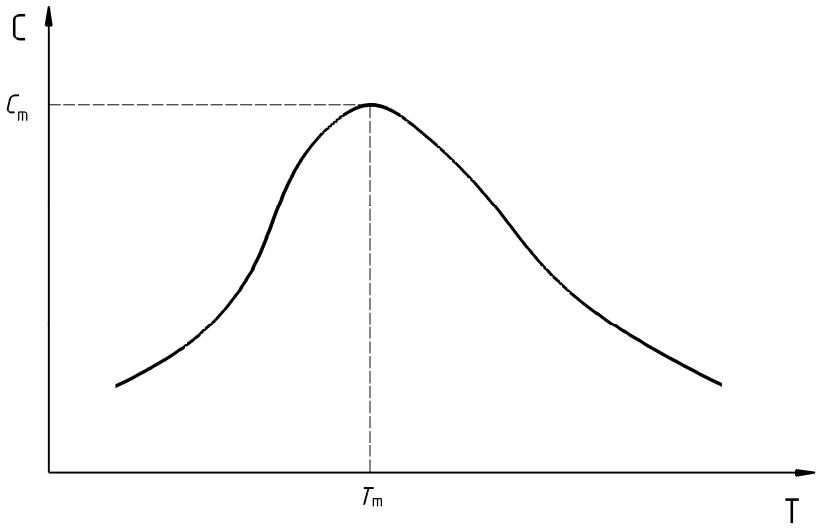
s
breaking area

C
cohesion of the binder determined for a specified temperature

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 at least six temperatures covering the cohesion peak of the binder (see Figure 1).



Key
1 Cohesion, J/cm^2
2 Temperature, °C

Figure 1 — Cohesion versus temperature

6 Apparatus

6.1 Cohesion tester, comprising of 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)° angle with the vertical;

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

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;

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

b) Radius at point of impact: (500 ± 1) mm;

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

6.1.3 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.

A 360° dial graduated in 0,5° interval, with zero in the lower balance position of the pendulum.

NOTE Some dials are graduated in grades from 0 to 400 grades, with 0,5 grade intervals.

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

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.

NOTE A minimum of six test assemblies, consisting of a cube attached by a film of binder to the cube support, are suggested for each temperature, and typically a minimum of three different temperatures are needed to show the relationship between cohesion and temperature. It is therefore useful to have 18 assemblies (i.e. cubes and cube supports).

6.2 Oven, capable of maintaining a set temperature of from 60 ºC up to a temperature equal to 85 °C above the ring and ball softening point of the respective binder under test with an accuracy of 5 ºC

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 (+ 80 °C).

6.4 Temperature reading device, capable of measuring the temperature of the thermostatically controlled enclosure, readable and calibrated to 0,2 °C or less.

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

7 Procedure

NOTE Sufficient cube and support assemblies for not less than eight different test temperatures should be prepared.

7.1 Preparation of cubes and supports

Ensure that the cubes and supports are clean by washing in a suitable solvent and by checking afterwards. If necessary, use a small brush (6.5) to remove contamination from the serrations.

Rinse with water containing ethanol, and dry the cubes and supports in an oven and examine to ensure that they are undamaged.

Pre-heat cubes and supports for each temperature in the oven at (60 ± 5) °C for at least 60 min. If the cubes and supports are heated to a higher temperature (see 8.3.2 Note), record the temperature used.

If the binder is fluxed, the cube and support can be heated for 30 min. If the binder has a softening point above 60 °C accordingly to EN 1427 [1], the cube support shall be heated to the softening point with an accuracy of 5 °C.

7.2 Preparation of the binder for test

7.2.1 Ensure that the laboratory sample is homogeneous and the test sample is representative of the laboratory sample from which it is taken in accordance with EN 58.

7.2.2 Prepare the sample in accordance with EN 12594.

7.2.3 Bring the binder to a temperature at which it can be spread on the serrated faces of the pre-heated cube and support (see NOTES 1 and 2). Observe any limitations set by the binder suppliers on heating times and temperatures. If no limitations are available do not heat the binder to a temperature greater than 90 °C above its ring and ball softening point. Record the temperature and duration of heating.

It is essential that the binder is heated no more than is necessary and that the binders are treated the same each time this test is carried out. Inconsistent results will be obtained if this precaution is not followed, particularly for polymer modified binders.

NOTE 1 For cut-back bitumens, this is usually possible without heating the binder. Highly modified bitumens require heating to a temperature at which their flow behaviour becomes predominantly viscous. A temperature range from 40 °C to 50 °C above the R&B is generally appropriate to spread the binder. It is also convenient to heat the cubes and the cube supports in the same oven as the binder.

NOTE 2 The thermal history of a binder can affect the results of this test method

7.3 Preparation of the test assemblies

7.3.1 Prepare sufficient test assemblies for each temperature.

7.3.2 Perform the following procedure in less than 10 min:

Take one pre-heated cube and one pre-heated support (6.1.4). Using a small spatula (6.5), apply pre-heated binder to both serrated faces. The total amount of binder applied shall be in excess of that needed to fill the gap between support and cube in the assembly (> 0,2 ml). As quickly as possible, place the cube on the support with the serrations facing each other and the ridges on the cube parallel to the edge of the support, which will be parallel to the plane of movement of the pendulum when the assembly is inserted in the clamping device of the tester.

Apply pressure to the cube and support so that excess binder is squeezed out and the ridges of the cube are in contact with the support.

NOTE Some binders show elastic behaviour which can lead to stress being retained in the binder film and poor repeatability between tests. In extreme cases the cube may lift from the support before testing commences. To avoid this problem the cube, support and sample should be pre-heated to a higher temperature. A mass of approximately 500 g may be put on top of the cube.

7.3.3 Repeat 8.3.2 for each test assembly.

7.3.4 Remove the excess binder from the cube faces of the test assemblies by scraping with a knife blade (6.5), which may be heated. If necessary, clean the cube face which will be struck by the pendulum using absorbent paper with a little solvent. Ensure that the solvent does not contaminate the exposed edge of the film of binder.

7.4 Storage of the assemblies

Place the set of test assemblies in a thermostatically controlled enclosure maintained at the required test temperature for 90 min to 4 h if a liquid bath is used, or 3 h to 15 h if an air bath is used.

7.5 Adjustment of the pendulum

Place the cohesion tester on a rigid, stable support and ensure that it is level. Check that the impact edge of the pendulum is undamaged and straight. Set the pendulum hanging freely in the down position and ensure that the scale reading is (0 ± 0,5)° by adjusting the scale dial, if necessary. Adjust the position of the clamping device so that a test assembly is held in a position such that the impact edge of the pendulum is parallel to the bottom edge of the cube and just in contact with the cube over its full length, at a height of (2,0 ± 0,2) mm above the top of the serrations of the cube support (see Annex B).

Set the pendulum in the “up” position.

Set the pointer in contact with the pendulum in this “up” position.

Release the pendulum repeatedly with no test assembly in position until the swing-through angle of the pendulum is constant to ± 0,5° and a minimum of 155,0° for six successive swings is achieved. If necessary, adjust the friction device of the pointer to achieve this.