



SLOVENSKI STANDARD

SIST EN 14769:2005

01-december-2005

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Bitumen and bituminous binders - Accelerated long-term ageing conditioning by a Pressure Ageing Vessel (PAV)

Bitumen und bitumenhaltige Bindemittel - Beschleunigte Langzeit-Alterung mit einem Druckalterungsbehälter (PAV)

Bitumes et liants bitumineux - Vieillissement long-terme accéléré réalisé dans un récipient de vieillissement sous pression (PAV)

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Ta slovenski standard je istoveten z: EN 14769:2005

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 |

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en

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EUROPEAN STANDARD
NORME EUROPÉENNE
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English Version

Bitumen and bituminous binders - Accelerated long-term ageing conditioning by a Pressure Ageing Vessel (PAV)

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This European Standard was approved by CEN on 26 August 2005.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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Foreword

This European Standard (EN 14769:2005) 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 April 2006, and conflicting national standards shall be withdrawn at the latest by April 2006.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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EN 14769:2005 (E)**1 Scope**

This European Standard specifies an accelerated ageing/conditioning procedure for bituminous binders. The procedure involves ageing trays of binder at elevated temperatures under pressurised conditions in a pressure ageing vessel (PAV).

NOTE For binders to be used in hot asphalt applications the pre-conditioning of the sample would typically be by one of the methods in EN 12607. For binders to be used in bituminous emulsion and cut-back or fluxed applications the stabilising of the sample should be such that there are no volatiles remaining.

WARNING — The use of this standard can involve hazardous materials, operations and equipment, in particular, the use of a high pressure ageing vessel. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate health and safety practices and determine the applicability of regulatory limitations prior to use.

If there is the likelihood of volatile components being present in a binder, this procedure shall not be used.

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 12607-1, *Bitumen and bituminous binders – Determination of the resistance to hardening under the influence of heat and air – Part 1: RTFOT method.* [SIST EN 14769:2005](https://standards.iteh.ai/catalog/standards/sist/326b749-9fee-471e-836a-2492176c46/sist-en-14769-2005)

EN 12607-2:1999, *Bitumen and bituminous binders – Determination of the resistance to hardening under the influence of heat and air – Part 2: TFOT method.* <https://standards.iteh.ai/catalog/standards/sist/326b749-9fee-471e-836a-2492176c46/sist-en-14769-2005>

EN 12607-3, *Bitumen and bituminous binders – Determination of the resistance to hardening under the influence of heat and air – Part 3: RFT method.*

3 Terms and definitions

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

3.1**short-term ageing/conditioning**

conditioning that the binder goes through during the method described in EN 12607 (parts 1, 2 & 3)

3.2**stabilisation**

conditioning of the binders from bituminous emulsions, cutbacks or fluxed bitumens to produce residual binders for further determination of their characteristics, eg the procedure described in prEN 14895

3.3**long-term ageing**

ageing that the binder goes through during its service life

3.4**accelerated long-term ageing conditioning**

simulated long-term ageing that the binder goes through during the accelerated pressure ageing procedure. In the case of hot mix asphalt binders the long-term ageing is carried out on binders that have already been conditioned through short-term ageing/conditioning. In the case of bituminous emulsion and cut-back, the long term ageing is carried out on binders after a stabilisation procedure.

4 Principle

A static film of binder is heated to a specified temperature, under a specified air pressure for a given period of time. This is to simulate the changes occurring to the binder within the pavement during use.

The effects of this ageing procedure are evaluated on the residual binder after the test.

NOTE The ageing of binders during service is affected by ambient temperature and air pressure as well as by mixture associated variables such as volumetric mixture proportions, mixture permeability, aggregate properties and other factors. This test is intended to provide an evaluation of the relative ageing behaviour of binders under specified conditions, but cannot account entirely for bituminous application variables or provide relative resistance to ageing at in-service conditions.

5 Apparatus

Usual laboratory apparatus and glassware, together with the following:

5.1 Pressure/temperature vessel designed to operate at $2,1 \text{ MPa} \pm 0,1 \text{ MPa}$ between $80 \text{ }^\circ\text{C}$ and $115 \text{ }^\circ\text{C}$. Either 5.1.1 and 5.1.2 or 5.1.3 applies (see Figure 1)

5.1.1 Pressure vessel, which shall be made from stainless steel and shall have internal dimensions adequate to contain a pan holder capable of holding a number of containers (as per requirements and dimensions given in EN 12607-2). The bottom of the pressure vessel shall be such that the containers are held in a horizontal position with the binder film thickness evenly distributed across the diameter of the container. A schematic showing a possible configuration of the vessel pan holder and containers and specifying dimensional requirements is shown in Figure 2.

NOTE 1 Most pan holder assemblies hold up to 10 containers.

NOTE 2 Other pressure vessels of different internal dimensions may be used provided that the operating conditions can be satisfied. In such cases the containers used may differ from the standard dimensions given in EN 12607-2.

5.1.2 Forced-draft oven, to be used with 5.1.1, capable of:

- a) bringing the loaded pressurised vessel to the desired conditioning temperature $\pm 0,5 \text{ }^\circ\text{C}$, as recorded by a suitable thermometer inside the vessel, within two hours after loading the pressure vessel into the oven,
- b) maintaining the temperature at all points within the vessel at the ageing temperature $\pm 0,5 \text{ }^\circ\text{C}$.

The oven shall have sufficiently large interior dimensions to allow forced air to freely circulate within the oven and around the pressure vessel. The oven shall contain a stand or a shelf, which supports the loaded pressure vessel in a level position above the lower surface of the oven.

5.1.3 Pressure vessel, having the same dimensions described in 5.2.1, with an integral temperature control system that is capable of:

- a) bringing the loaded pressure vessel to the desired conditioning temperature $\pm 0,5 \text{ }^\circ\text{C}$, as recorded by the thermometer inside the vessel, within two hours,

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b) maintaining the temperature at all points within the vessel at the ageing temperature $\pm 0,5$ °C.

The vessel may be a separate unit to be placed in a forced draft oven or an integral part of a temperature control system.

SAFETY PRECAUTIONS — The pressure ageing vessel operates at high temperatures and high pressures. All safety guidelines issued by equipment manufacturers must be adhered to.

5.2 Pressure controlling devices

5.2.1 Pressure release valve, which prevents pressure in the vessel from exceeding 2,5 MPa during the ageing procedure.

5.2.2 Pressure regulator, capable of controlling the pressure within the vessel to $\pm 0,1$ MPa and with a capacity sufficient to reduce the pressure from the source of compressed air so that the pressure within the vessel is maintained at the operating pressure of 2,1 MPa $\pm 0,1$ MPa.

5.2.3 Slow release bleed valve, which allows the pressure in the vessel at the completion of the test to be reduced from 2,1 MPa, the operating pressure, to atmospheric pressure within 8 min to 15 min.

5.2.4 Pressure gauge, capable of measuring the pressure within the vessel to within 0,1 MPa during the test. The pressure gauge shall be calibrated to an accuracy of $\pm 0,1$ MPa at appropriate intervals.

5.3 Thermometer, accurate to 0,1 °C for measuring the temperature inside the pressure vessel.

NOTE A resistance thermal detector (RTD) has been found to be suitable.

5.4 Temperature recording device, data acquisition system capable of recording the temperature throughout the test to 0,1 °C.

NOTE The current method of monitoring temperature is via a computerised log of time and temperature. It is assumed the temperature recorded is that within every point within the ageing vessel.

5.5 Metal containers

The standard container is defined in EN 12607-2:1999 sub clause 4.3 and has a diameter of 140 mm ± 1 mm. Similar containers with other diameters can be used if their diameters are determined with the same tolerance and the amount of binder is adjusted as given in Equation (1).

Weighing

Weigh 50,0 $\pm 0,5$ g in the container (nominal diameter 140 mm \varnothing).

If a container with another diameter is used weigh the amount given in Equation (1):

d_1 is the normal container diameter (140 mm ± 1 mm),

d_2 is the actual container diameter (tolerance ± 1 mm), and

M is the mass of binder at ambient temperature for the actual container.

$$M = 50,0 \times (d_2 \times d_2) / (d_1 \times d_1) \text{ g } \pm 0,5 \text{ g} \quad (1)$$

5.6 Balance

The balance shall be capable of weighing to an accuracy of $\pm 0,1$ g.

5.7 Vacuum oven (optional)

The vacuum oven shall be capable of maintaining a temperature up to 180 °C with an accuracy of ± 5 °C. The vacuum system shall be capable of maintaining pressures below 15,0 kPa ($\pm 2,5$ kPa) absolute. Alternatively, the pressure vessel itself may be used in lieu of the vacuum oven if it is capable of maintaining a temperature of 180 °C and a vacuum of 15,0 kPa ($\pm 2,5$ kPa).

5.8 Commercial bottled air

A sufficient supply of pressurized air should be available to carry out the test, commercially available bottled air is suitable for this.

6 Procedure

SAFETY PRECAUTIONS — Use laboratory safety procedures in handling the hot bituminous binders when preparing the specimens and removing the residue from the pressure vessel. Take particular care when lifting the lid of the pressure vessel.

Pre-heat the PAV vessel or forced draft oven to the ageing temperature. The binder is firstly pre-conditioned as necessary prior to the long term ageing procedure. The procedure used shall be stated in the report.

If it is necessary to prepare more than one set of samples in the short-term ageing/conditioning procedure (either EN 12607 or by a stabilisation procedure) in order to obtain sufficient quantity for this procedure, sub-samples shall be combined and homogenised before the test. The stabilisation procedure shall be stated in the report.

NOTE 1 The hot residue may be poured immediately into the container or allowed to cool for PAV ageing later. If allowed to cool, the container with the binder should be covered and stored at ambient temperature. When it is to be used, the sample should be re-heated in accordance with EN 12594 for the minimum possible time and stirred prior to pouring into the container.

NOTE 2 Pre-heating the vessel up to 15 °C above the conditioning temperature may be used to reduce the drop in PAV temperature during the loading process and minimise the time required for stabilisation of the set temperature after loading. However, pressurising the vessel causes an increase in temperature and the vessel may cool slowly, making it difficult to achieve the specified temperature at the start of the test.

Pre-heat the container to the PAV conditioning temperature. Place the heated container on a balance and pour 50,0 g \pm 0,5 g into the container. Ensure that the binder is distributed over the entire base of the container by tilting the filled container if necessary.

NOTE 3 The binder film thickness will be about 3,2 mm. The number of containers per binder will depend on the amount of binder required for subsequent testing. The heating of the container should be sufficient to enable flow of the binder.

NOTE 4 50,0 g \pm 0,5 g refers to containers conforming to EN 12607-2. When using containers of a different diameter, the requirement is that sufficient binder shall be poured such that the film thickness will be about 3,2 mm (see 5.6).

Place the pan holder inside the heated pressure vessel and set the ageing temperature to the specified temperature.

NOTE 5 Typical conditioning temperatures used are 85 °C, 90 °C, 100 °C and 110 °C. The higher temperatures may make this ageing procedure unsuitable for evaluation of binders containing some polymers as they could exhibit separation and/or degradation in a way that does not occur during natural ageing.

NOTE 6 Several temperatures are currently used for the accelerated long-term ageing method. No correlation of a particular temperature with performance is established at this time.