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ILNAS-EN 14769:2023

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

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

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

07/2023



National Foreword

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This European Standard was approved by CEN on 28 May 2023.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 14769:2023) 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of an identical text or by endorsement, at the latest by January 2024, and conflicting national standards shall be withdrawn at the latest by January 2024.

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 14769:2012.

In comparison with the previous edition, the main technical changes are:

- a) Scope updated;
- b) 3.1 aligned with other standards;
- c) Terms and definitions: update of 3.2, 3.3 and addition of 3.4;
- d) Clause 4 updated editorially;
- e) Clause 5: “accuracy” replaced by “maximum permissible measurement error”;
- f) Apparatus: 5.1.1 updated editorially and reference to (new) 5.1.2 added; 5.1.3 and 5.1.1 merged; 5.3 updated; 5.9 and 5.10 added;
- g) Clause 5.5: calculation of binder mass for other containers moved to 6.4 and cross-references;
- h) Procedure: updated in order to ease understanding, duplications removed;
- i) Clause 6.4: Note 3 changed into standard text and warning removed;
- j) Report updated;
- k) Figure 1: key updated;
- l) Figure 2 editorially updated (layout of key) and renamed into “drawing”;
- m) Bibliography updated.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies 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, Türkiye and the United Kingdom.

1 Scope

This document specifies an accelerated long-term ageing/conditioning procedure for bituminous binders. The procedure involves ageing trays of binder at elevated temperatures under pressurized conditions in a pressure ageing vessel (PAV).

NOTE For binders to be used in hot and warm asphalt applications, the pre-conditioning of the sample can be performed using one of the methods in the EN 12607 series. For binders to be used in bituminous emulsion and cut-back or fluxed applications, the stabilization of the sample is such that there are no volatiles remaining.

WARNING — The use of this document can involve hazardous materials, operations and equipment, in particular, the use of a high pressure ageing vessel. This document does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this document 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 is not used.

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

EN 12607-1, *Bitumen and bituminous binders - Determination of the resistance to hardening under influence of heat and air - Part 1: RTFOT method*

EN 12607-2:2014, *Bitumen and bituminous binders - Determination of the resistance to hardening under influence of heat and air - Part 2: TFOT method*

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

EN 13074-2, *Bitumen and bituminous binders - Recovery of binder from bituminous emulsion or cut-back or fluxed bituminous binders - Part 2: Stabilization after recovery by evaporation*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

short-term ageing

ageing that the binder experiences during the production of asphalt mixtures

3.2

long-term ageing

ageing that the binder experiences during its service life in asphalt pavements

3.3**stabilisation**

conditioning of the binders from bituminous emulsions, cut-back or fluxed bitumens to produce residual binders for further determination of their characteristics

Note 1 to entry: The conditioning procedure is described in EN 13074-2.

3.4**short-term ageing conditioning**

conditioning that the binder experiences during the method according to EN 12607-1, EN 12607-2 or EN 12607-3

3.5**accelerated long-term ageing conditioning**

simulated long-term ageing that the binder experiences during the ageing procedure described in this document

Note 1 to entry: This procedure is called “accelerated” because the ageing of the binder during long-term service life is speeded up for laboratory purposes by use of high pressure and high temperature.

Note 2 to entry: In the case of hot mix asphalt binders, the long-term ageing conditioning is carried out on binders that have already been conditioned through short-term ageing conditioning procedures (3.4).

Note 3 to entry: In the case of bituminous emulsion, cut-back and fluxed bitumens, the long-term ageing conditioning is carried out on binders after a stabilization procedure (3.3).

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 done in order to simulate the changes occurring to the binder within the pavement during service life.

The effects of this ageing procedure are evaluated on the conditioned binders after PAV.

NOTE The ageing of binders during service life can be affected by ambient temperature and air pressure as well as by a combination of 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 it 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 PAV equipment, designed to operate with an air supply at $(2,1 \pm 0,1)$ MPa between 80 °C and 115 °C. Either 5.1.1 or 5.1.2 are applicable as individual parts or as an integrated system (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 (according to requirements and dimensions given in EN 12607-2:2014, 4.3).

The bottom of the pressure vessel shall be such that the containers are held in a horizontal position with the binder evenly distributed across the diameter of the container in equal binder film thickness. A drawing showing a possible configuration of the vessel pan holder and containers and specifying dimensional requirements is shown in Figure 2.

Other pressure vessels of different internal dimensions can 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.

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

The PAV equipment shall have an integrated, built-in temperature control system that is capable of meeting the conditions given in 5.1.2 a) and b).

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

5.1.2 Forced draft oven, to be used with 5.1.1 and which is capable of:

- a) bringing the loaded pressure vessel to the desired conditioning temperature $\pm 1,0$ °C, as recorded by a suitable temperature measuring device inside the vessel, within two hours after loading the pressure vessel into the oven;
- b) maintaining the conditioning temperature at $\pm 1,0$ °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.

5.2 Pressure controlling devices, which include the following:

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 $(2,1 \pm 0,1)$ 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 $\pm 0,1$ MPa during the test with a maximum permissible error of $\pm 0,02$ MPa.

5.3 Temperature measuring device, with a maximum permissible measurement error 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, which is a data acquisition system capable of recording the temperature throughout the test to 0,1 °C.

NOTE The current method of monitoring temperature consists of a computerized log of time and temperature. It is assumed that the temperature recorded is the temperature at every area within the ageing vessel.

5.5 Metal containers (or pans), with diameters of (140 ± 1) mm, the standard which is specified in EN 12607-2:2014, 4.3.

Similar containers with other diameters may be used if their diameters are determined with the same tolerance and the amount of binder is adjusted (see 6.4).