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**Bitumen in bitumenska veziva - Okvirna specifikacija za posebne cestogradbene bitumne - 2. del: "Multigrade" cestogradbeni bitumni**

Bitumen and bituminous binders - Specification framework for special paving grade bitumen - Part 2: Multigrade paving grade bitumens

Bitumen und bitumenhaltige Bindemittel - Anforderungsrahmenwerk für spezielle Straßenbaubitumen - Teil 2: Multigrade Straßenbaubitumen

Bitumes et liants bitumineux - Cadre de spécifications pour les bitumes routiers spéciaux - Partie 2: Bitumes routiers multigrades

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**ICS:**

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| 91.100.50 | Veziva. Tesnilni materiali               | Binders. Sealing materials                               |

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## Bitumen and bituminous binders - Specification framework for special paving grade bitumen - Part 2: Multigrade paving grade bitumens

Bitumes et liants bitumineux - Cadre de spécifications pour les bitumes routiers spéciaux - Partie 2: Bitumes routiers multigrades

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This European Standard was approved by CEN on 4 February 2014.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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## Foreword

This document (EN 13924-2:2014) has been prepared by Technical Committee CEN/TC 336 "Bituminous binders", the secretariat of which is held by AFNOR.

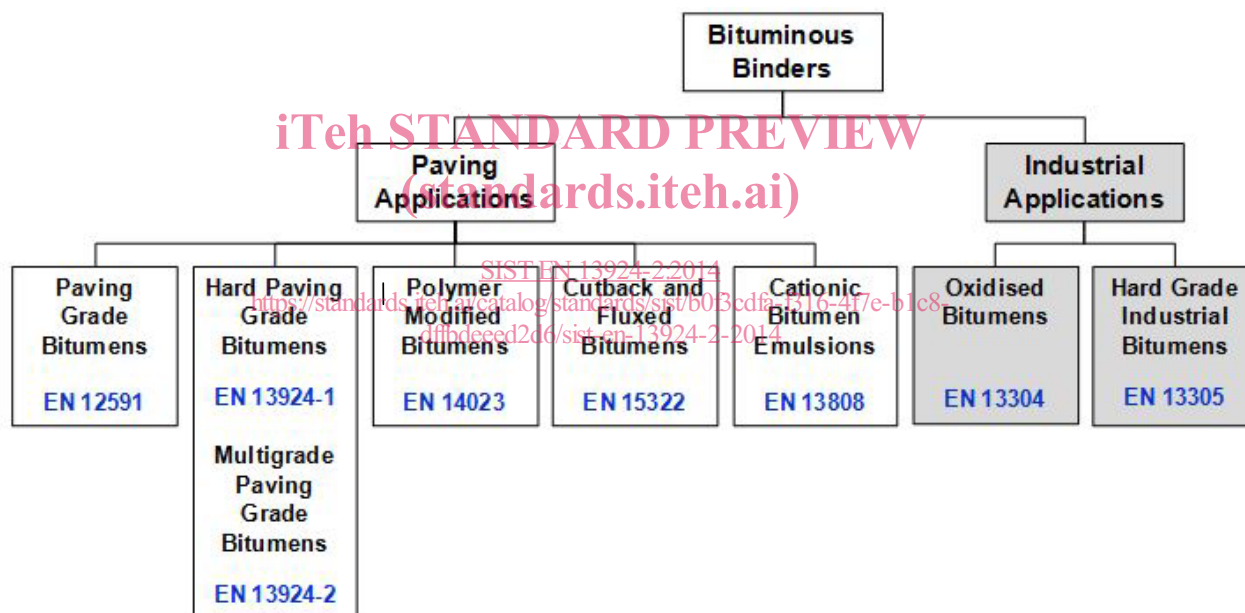
This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2014 and conflicting national standards shall be withdrawn at the latest by December 2015.

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 has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA which is an integral part of this document.

This European Standard is part of a family of European Standards for bitumen as follows:



NOTE Industrial applications are not covered by mandate M/124.

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, 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, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

**EN 13924-2:2014 (E)****Introduction**

This document is closely related to EN 12591. This introduction gives information on the basis for selection of the grades defined in this document, the status of certain of the properties and test methods, and proposed development of this document.

The general principle adopted in the development of EN 12591 was to provide a range of grades suitable for the manufacture of the materials for road construction and maintenance used, and the climatic and traffic conditions encountered, in all the Member States. This document extends the range of grades specified in EN 12591, following the wider use of materials for road construction and maintenance.

This document has been based on the regional requirements identified when the process started. It is a first step in harmonising the so-called "empirical" specifications and it is intended to evaluate alternative properties and test methods to develop new specifications that are more directly performance-related. To this end, work programmes are being undertaken and the results will be considered for a future revision of this document. The progress of those work programmes are reported in CEN/TR 15352 [1], and the results will be considered for future revisions of this European Standard.

For multigrade paving grade bitumens (MG), the testing of the five essential characteristics, according to the mandate M/124, also gives an indication that its intrinsic cohesive properties are adequate for its normal use. The properties of "adhesion" and "setting ability" are indicated by tests used on the finished asphalt mixtures, EN 12697-1, EN 12697-11, EN 12697-12, EN 12697-26 (respectively [2] to [5]), rather than tests on the bitumen itself.

In certain acid modified binders the structure may change when mixed with aggregate.

Table B.1 lists informative properties which suppliers of multigrade bitumens are encouraged to produce as "Supplier Declared Values". It is hoped that the data so provided will form the basis for developing performance-related specifications in the future.

## 1 Scope

This document provides a framework for specifying the properties and relevant test methods for multigrade paving grade bitumens which are suitable for use in the construction and maintenance of roads, airfields and other paved areas, together with information for attestation and verification of constancy of performance. Multigrade paving grade bitumens are designated in EN 12597:2000 as special bitumens for road applications having a positive penetration index ( $I_p$ ).

This document does not directly address cohesion, adhesion and settling ability, (see Clause Introduction).

## 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 1426, *Bitumen and bituminous binders - Determination of needle penetration*

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

EN 12592, *Bitumen and bituminous binders - Determination of solubility*

EN 12593, *Bitumen and bituminous binders - Determination of the Fraass breaking point*

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

EN 12595, *Bitumen and bituminous binders - Determination of kinematic viscosity*

EN 12596, *Bitumen and bituminous binders - Determination of dynamic viscosity by vacuum capillary*

EN 12597:2000, *Bitumen and bituminous binders - Terminology*

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

EN 15326 *Bitumen and bituminous binders – Measurement of density and specific gravity – Capillary-stoppered pycnometer method*

EN ISO 2592, *Determination of flash and fire points - Cleveland open cup method (ISO 2592:2000)*

EN ISO 4259, *Petroleum products - Determination and application of precision data in relation to methods of test (ISO 4259)*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12597:2000 apply.

### 3.1

#### **multigrade paving grade bitumens**

multigrade paving grade bitumens are designated by stating MG and the nominal penetration range at 25 °C, followed by the softening point range (see Table 1), e.g. "MG 20/30-64/74"

**EN 13924-2:2014 (E)****4 Sampling**

Samples of bulk products shall be taken as described in EN 58. Test samples shall be taken from the laboratory samples, and prepared for testing, as described in EN 12594.

**5 Requirements and test methods****5.1 General**

The requirements for the properties for a specific grade shall be selected from the classes given in Tables 1 and 2. The properties in Table 1 shall be specified for all multigrade paving grade bitumens. They are associated with regulatory or Health Safety and Environmental requirements. The properties in Table 2 are required to meet specific regional conditions. They are associated with regulatory or other regional requirements.

When tested by the methods given in the tables, the various multigrade paving grade bitumens shall conform to the limits specified by classes in these tables.

NOTE The TBR class has been included to facilitate selection in countries which merely wish to record a supplier's range for a particular requirement. It should not be considered as a "Class" for the purpose of regulatory marking. These values can be used as a basis for the development of future technical specifications.

The selection of classes should be made from past experience to avoid unworkable combinations.

**5.2 Properties and related test methods****5.2.1 General**

For specifying multigrade paving grade bitumens the appropriate class for each technical requirement is selected in turn. Different classes may be selected for different properties.

**5.2.2 Consistency at intermediate service temperature**

Consistency at intermediate service temperature for these multigrade paving grade bitumens shall comply with the requirements for penetration at 25 °C in Table 1.

**5.2.3 Consistency at elevated service temperature**

Consistency at elevated service temperature for these multigrade paving grade bitumens shall comply with the requirements for softening point Ring and Ball in Table 1.

**5.2.4 Temperature dependence of consistency**

Temperature dependence of consistency shall comply with the requirements for penetration index ( $I_p$ ) in Table 1. Where required, multigrade paving grade bitumens shall comply also with the requirement for dynamic viscosity in Table 2.

The penetration index shall be calculated in accordance with Annex A.

**5.2.5 Brittleness at low service temperature**

Brittleness at low service temperature may be required to meet specific regional conditions. Where required, multigrade paving grade bitumens shall conform to the requirements for Fraass breaking point in Table 2.



### 5.2.6 Durability – Resistance to hardening

Durability shall be demonstrated by compliance with the required surrogate characteristics “Resistance to hardening“ of Table 1.

Resistance to hardening shall be tested after running the Rolling Thin Film Oven Test (RTFOT), EN 12607-1.

NOTE Appropriate tests and classes, for measurements on material after the hardening procedure, are given in Table 1. The choice of class may depend upon the intended use of the product.

### 5.2.7 Temperature dependency of mixing

Where required, multigrade paving grade bitumens shall comply also with the requirement for kinematic viscosity in Table 2.

### 5.2.8 Other properties

#### 5.2.8.1 Flash point

Flash point shall be determined by the Cleveland open cup method in EN ISO 2592.

NOTE The Pensky-Martens closed cup method (see EN ISO 2719 [8]) can be used to investigate possible contamination, but is likely to give lower values.

#### 5.2.8.2 Density

If the supplier wishes to declare the density of multigrade paving grade bitumens, it shall be determined in accordance with EN 15326.

#### 5.2.8.3 Solubility

Solubility shall be determined on the fresh multigrade paving grade bitumens in accordance with EN 12592.

### 5.2.9 Informative properties

The specifications include a table of informative properties (Annex B) based on new test methods. Suppliers of multigrade paving grade bitumens are invited to supply data from these measurements to the client on a voluntary basis. It is hoped that the data so gathered will be of assistance in developing performance-related specifications in the future.

## 5.3 Release of regulated dangerous substances

When required, products covered by this standard shall comply with relevant regulations on dangerous substances in force in the intended place of use. In the absence of International or European test methods, manufacturers shall verify and declare the release of dangerous substances in accordance with provisions applicable in the intended place of use of the product.

NOTE An informative database covering European and national provisions on dangerous substances is available at the Construction web site on Europa accessed through <http://ec.europa.eu/enterprise/construction/cpd-ds/>.

## 5.4 Precision

The test methods referred to in this document include a precision statement where available. In cases of uncertainty, the procedures described in EN ISO 4259 for interpretation of the results based on test method precision shall be used.

## EN 13924-2:2014 (E)

**Table 1 — Specifications for multigrade paving grade bitumens: properties applying to all multigrade paving grade bitumens<sup>a</sup>**

| Property                          | Test method | Unit   | Class            |              |              |          |
|-----------------------------------|-------------|--------|------------------|--------------|--------------|----------|
|                                   |             |        | 1                | 2            | 3            | 4        |
| Penetration at 25 °C              | EN 1426     | 0,1 mm | DV <sup>b</sup>  | 20 to 30     | 35 to 50     | 50 to 70 |
| Softening point                   | EN 1427     | °C     | DV <sup>b</sup>  | 54 to 64     | 59 to 69     | 64 to 74 |
| Resistance to hardening at 163 °C | EN 12607-1  |        |                  |              |              |          |
| Retained penetration              | EN 1426     | %      | DV <sup>b</sup>  | ≥ 50         | ≥ 60         |          |
| Increase in softening point       | EN 1427     | °C     | DV <sup>b</sup>  | ≤ 8          | ≤ 10         | ≤ 12     |
| Change in mass                    |             | %      | ≤ 0,5            |              |              |          |
| Penetration Index $I_p$           | Annex A     | °C     | DV <sup>b</sup>  | +0,1 to +1,5 | +0,3 to +2,0 |          |
| Flash point                       | EN ISO 2592 | °C     |                  | ≥ 220        | ≥ 235        | ≥ 250    |
| Solubility                        | EN 12592    | %      | TBR <sup>c</sup> | ≥ 99,0       |              |          |

<sup>a</sup> Grades are designated by MG with the nominal penetration range followed by softening point range, e.g. MG 20/30-64/74.

<sup>b</sup> DV: Declared Value shall mean that the manufacturer is required to provide a range of values, or limiting value(s) as part of a regulatory declaration and subsequent regulatory requirement.

<sup>c</sup> TBR: To Be Reported may be used when there are no regulations or other regional requirements for the property in the territory of intended use, but the property has been found useful to describe multigrade paving grade bitumens.

**Table 2 — Specifications for multigrade paving grade bitumens: properties associated with specific regional requirements**

| Property                      | Test method           | Unit               | Class           |                  |       |        |        |         |
|-------------------------------|-----------------------|--------------------|-----------------|------------------|-------|--------|--------|---------|
|                               |                       |                    | 0               | 1                | 2     | 3      | 4      | 5       |
| Fraass breaking point         | EN 12593              | °C                 | NR <sup>a</sup> | TBR <sup>b</sup> | ≤ - 8 | ≤ - 12 | ≤ - 15 | ≤ - 17  |
| Dynamic viscosity at 60 °C    | EN 12596 <sup>c</sup> | Pa.s               | NR <sup>a</sup> | TBR <sup>b</sup> | ≥ 300 | ≥ 600  | ≥ 900  | ≥ 1 500 |
| Kinematic viscosity at 135 °C | EN 12595              | mm <sup>2</sup> /s | NR <sup>a</sup> | TBR <sup>b</sup> | ≥ 200 | ≥ 300  | ≥ 700  | ≥ 1 200 |

<sup>a</sup> NR, No Requirement may be used when there are no regulations or other regional requirements for the property in the territory of intended use.

<sup>b</sup> TBR, To Be Reported may be used when there are no regulations or other regional requirements for the property in the territory of intended use, but the property has been found useful to describe multigrade bitumens.

<sup>c</sup> EN 13302 using a rotating spindle apparatus is an alternative test method. The reference method is EN 12596.

## 6 Assessment and verification of constancy of performance - AVCP

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### 6.1 General

The compliance of multigrade paving grade bitumens with the requirements of this standard and with the performance declared by the manufacturer in the declaration of performance (DoP) shall be demonstrated by:

- Determination of the product type;
- Factory Production Control (FPC) by the manufacturer, including product assessment.

The manufacturer shall always retain the overall control and shall have the necessary means to take responsibility for the conformity of the product with its declared performance(s)

NOTE The information from AVCP can be available for audit as detailed in a manufacturer's quality plan.

### 6.2 Type testing

#### 6.2.1 General

All performances related to characteristics included in this standard shall be determined when the manufacturer intends to declare the respective performances unless the standard gives provisions for declaring them without performing tests. (e.g. use of previously existing data, classified without further testing (CWFT) and conventionally accepted performance).

Assessment previously performed in accordance with the provisions of this standard, may be taken into account provided that they were made to the same or a more rigorous test method, under the same AVCP system on the same product or products of similar design, construction and functionality, such that the results are applicable to the product in question.

For the purposes of assessment, the manufacturer's products may be grouped into families, where it is considered that the results for one or more characteristics from any one product within the family are representative for the same characteristics for all products within that same family

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Products may be grouped in different families for different characteristics.

With reference to the assessment method, standards should be made to allow the selection of a suitable representative sample.

In addition, the determination of the product type shall be performed for all characteristics included in the standard for which the manufacturer declares the performance:

- at the beginning of the production of a new or modified multigrade paving grade bitumen (unless a member of the same product range), or
- at the beginning of a new or modified method of production (where this may affect the stated properties); or they shall be repeated for the appropriate characteristic(s), whenever a change occurs in the multigrade paving grade bitumen design, in the raw material or in the supplier of the components, or in the method of production (subject to the definition of a family), which would affect significantly one or more of the characteristics.

Where components are used whose characteristics have already been determined, by the component manufacturer, on the basis of assessment methods of other product standards, these characteristics need not be re-assessed. The specifications of these components shall be documented.

Products bearing regulatory marking in accordance with appropriate harmonized European specifications may be presumed to have the performances declared in the declaration of performance (DoP), although this does not replace the responsibility on the multigrade paving grade bitumen manufacturer to ensure that the multigrade paving grade bitumen as a whole is correctly manufactured and its component products have the declared performance values.

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**6.2.2 Test samples, testing and compliance criteria**

Sampling shall be carried out in accordance with [SIST EN 13924-2:2014](https://standards.iteh.ai/catalog/standards/sist/b0f3cdfa-b16-4f7e-b1c8-dffbdeeed2d6/sist-en-13924-2-2014) Clause 4.

The results of all type tests shall be recorded, held by the manufacturer at least ten years from the date of the test or until the type test is no longer valid (whichever is the longer) and be available for inspection.

**6.2.3 Test reports**

The results of the determination of the product type shall be documented in test reports. All test reports shall be retained by the manufacturer for at least 10 years after the last date of production of the multigrade paving grade bitumen to which they relate.

**6.2.4 Shared other party results**

A manufacturer may use the results of the product type determination obtained by someone else (e.g. by another manufacturer, as a common service to manufacturers, or by a product developer), to justify his own declaration of performance regarding a product that is manufactured according to the same design (e.g. dimensions) and with raw materials, constituents and manufacturing methods of the same kind, provided that:

- the results are known to be valid for products with the same essential characteristics relevant for the product performance;
- in addition to any information essential for confirming that the product has such same performances related to specific essential characteristics, the other party who has carried out the determination of the product type concerned or has had it carried out, has expressly accepted to transmit to the manufacturer the results and the test report to be used for the latter's product type determination, as well as information regarding production facilities and the production control process that can be taken into account for FPC;