
Bitumen in bitumenska veziva – Specifikacije za cestogradbene bitumne

Bitumen and bituminous binders - Specifications for paving grade bitumens

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English Version

Bitumen and bituminous binders - Specifications for paving grade bitumens

Bitumes et liants bitumineux - Spécifications des bitumes
routiers

Bitumen und bitumenhaltige Bindemittel - Anforderungen
an Straßenbaubitumen

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 336.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (prEN 12591:2005) has been prepared by Technical Committee CEN/TC 336 "Bitumen and bituminous binders", the secretariat of which is held by AFNOR.

This document is currently submitted to the CEN Enquiry.

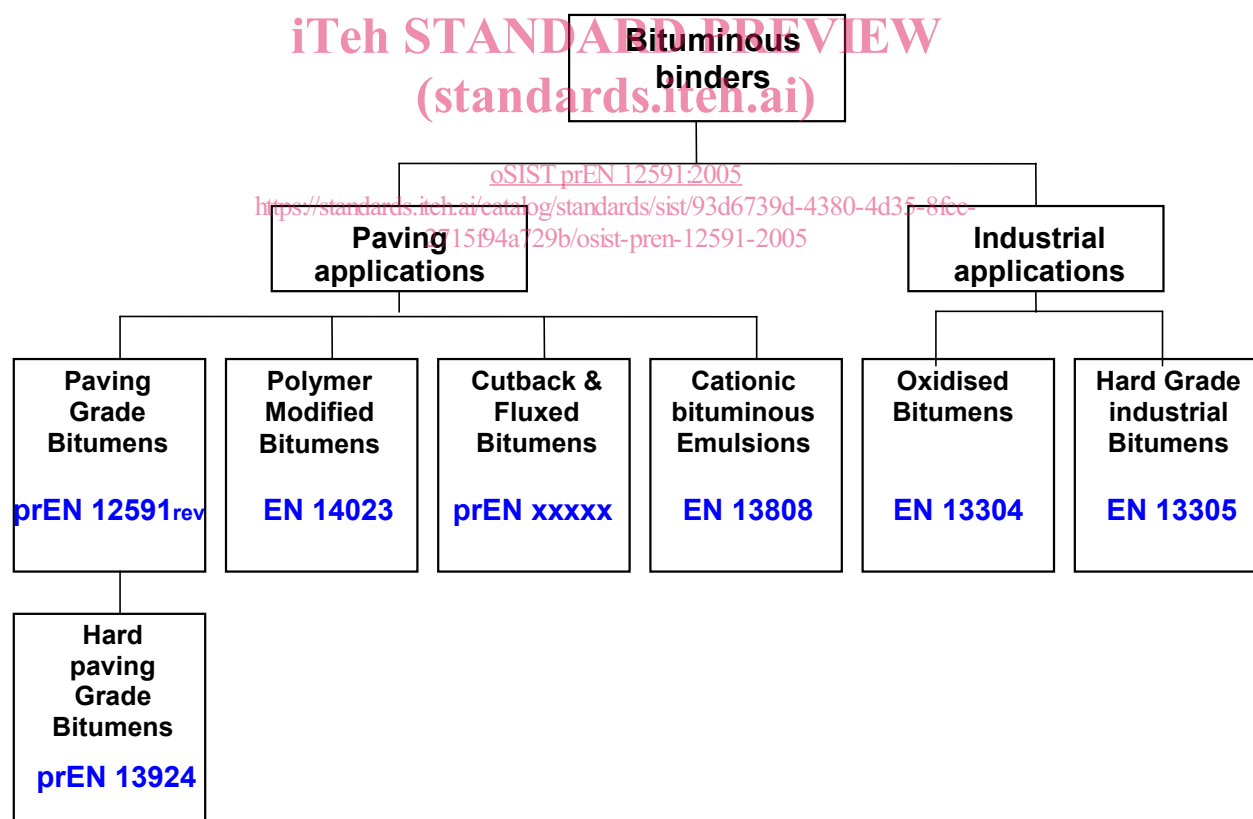
This document will supersede EN 12591:1999.

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 Construction Product Directive (89/106/EEC).

For relationship with EU Construction Product Directive, see informative Annex ZA, which is an integral part of this document.

In this European standard, Annex A is normative, Annex B is informative.

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



Introduction

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 considering the climatic and traffic conditions encountered in all the Member States. It is compulsory for the full specification to be published in all EU and EFTA countries. This European Standard has been revised to make it more harmonised than the previous version, however it is permitted for each country to determine which of two severity levels to use and which of the optional additional properties to adopt. The decision should be based on demands of the current market and take into account the relevant informative notes.

This standard still consists of the so-called "empirical" specifications. Work programmes are being undertaken to evaluate alternative properties and test methods in order to develop new specifications that are more directly performance-related. The progress of those work programmes are reported in CEN/TR XXX 2005, and the results will be considered for future revisions of this European Standard.

1 Scope

This European Standard provides a framework for specifying the properties and relevant test methods for paving grade bitumens which are suitable for use in the construction and maintenance of roads, airfields and other paved areas.

This framework covers three essential requirements according to the mandate M/124: EU Construction Products Directive 89/106/EEC.

— "Consistency at intermediate service temperature";

— "Consistency at elevated service temperature";

— "Durability" of consistency

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For paving grade bitumen the testing of the above three essential characteristics also gives an indication that its intrinsic cohesive properties that 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, rather than tests on the bitumen itself.

2 Normative references

The following referenced documents are indispensable for the application of this European standard. 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 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, *Bitumen and bituminous binders – Terminology*

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, *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 13108-1, *Bituminous mixtures. Material specifications. Part 1: Asphalt concrete.*

EN 13108-2, *Bituminous mixtures. Material specifications. Part 2: Asphalt concrete for very thin layers.*

EN 13108-3, *Bituminous mixtures. Material specifications. Part 3: Soft asphalt.*

EN 13108-4, *Bituminous mixtures. Material specifications. Part 4: Hot rolled asphalt.*

EN 13108-5, *Bituminous mixtures. Material specification. Part 5: Stone mastic asphalt.*

EN 13108-6, *Bituminous mixtures. Material specifications. Part 6: Mastic asphalt.*

EN 13108-7, *Bituminous mixtures. Material specifications. Part 7: Porous asphalt (PA).*

EN ISO 2592, *Petroleum products – Determination of flash and fire points – Cleveland open cup method.*

EN 12597, *Bitumen and bituminous binders – Terminology*

prEN15326, *Bitumen and bituminous binders – Measurement of density and specific gravity – Capillary stoppered pycnometer method.*

EN ISO 3838, *Crude petroleum and liquid or solid petroleum products – Determination of density or relative density – Capillary stoppered pycnometer and graduated bicapillary pycnometer methods.*

EN ISO 4259, *Petroleum products – Determination and application of precision data in relation to methods of test.*

EN ISO 9001, *Quality management systems. Requirements.*

3 Terms and definitions

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

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

The bitumens covered by this European Standard represent one of the constituents in asphalt materials covered by the European Standards prEN 13108-1 to 13108-7. As the European product standards cover a large variety of asphalt materials for different applications, traffic loads and climatic conditions, EN 12591 must also cover a large range of bitumens to facilitate the production and application of these materials. The variation in the prEN13108 series makes it necessary and practical to split the bitumens - mainly due to the application – which is the reasons for grouping the grades into three separate tables.

The requirements for the properties for a specific grade must be selected from the three Tables 1, 2 and 3 **by choosing a column** representing the specified values or ranges.

Two severity levels for resistance to hardening are stated as alternatives because under specific conditions a larger increase in softening point ring and ball after RTFOT can be allowed without detrimental effect if this increase is associated with requirements for either breaking point Fraass or penetration index (Ip).

Due to the Construction Product Directive (CPD) there is a subdivision of characteristics in three groups horizontally in the tables.

- 1) First characteristic group is the mandatory requirements (essential requirements) associated with CPD.
- 2) Second characteristic group is not mandatory properties but indicates properties which shall be included in all specifications for other reasons (e.g. health, safety, environment, transport, ...).
- 3) Third characteristic group is optional properties that can be considered as useful information or linked to climatic or other regional considerations.

5.1 Properties and related test methods

The properties of and related test methods for paving grade bitumens shall be in accordance with Tables 1, 2 or 3. When tested by the methods given in the tables, the various paving grades shall conform to the limits specified.

5.1.1 Consistency at intermediate service temperatures

Consistency at intermediate service temperature for paving grade bitumens shall comply with the requirements for penetration value in Table 1 and 2, or kinematic viscosity at 60 °C in Table 3. The grades are designated by the nominal penetration or viscosity ranges as appropriate.

5.1.2 Consistency at elevated service temperatures

Consistency at elevated service temperature for penetration graded paving grade bitumens shall comply with the requirements for softening point or kinematic viscosity at 60 °C.

5.1.3 Durability – Resistance to hardening

Durability shall be demonstrated by compliance with the required surrogate characteristics of Tables 1, 2 or 3.

Resistance to hardening shall be tested according to the Rolling Thin Film Oven Test (RTFOT) (EN 12607-1) for binders from Tables 1 and 2. For a transitional period of three years from the date of availability of this standard, resistance to hardening may also be tested using the Rotating Flask Test (RFT) (EN 12607-3).

NOTE The transitional period is intended to provide new users with the opportunity to gather empirical data and experience of the RTFOT.

Resistance to hardening shall be tested according to the Thin Film Oven Test (TFOT) (EN 12607-2) for binders from Table 3.

5.1.4 Other properties

5.1.4.1 Flash point

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

NOTE The Pensky-Martens closed cup method (see EN ISO 2719 [7]) can be used to investigate possible contamination but is likely to give lower values.

5.1.4.2 Density

Although requirements for the density of paving grade bitumens are not given in this European Standard, density shall be determined, when necessary, in accordance with prEN 15326.

5.1.4.3 Fraass Breaking Point

This test method is included despite shortcomings in accuracy and precision (see Table 1, Note 2). However, it is expected that a more appropriate method will be included in a later, performance related standard if a link to performance is proven.

5.1.4.4 Solubility

Determination of solubility: the current method EN 12592:1999 is being revised due to practical problems.

5.2 Precision and dispute

The test methods referred to in this European Standard include precision statements when available. In cases of dispute, the procedures described in EN ISO 4259 for resolving the dispute, and interpretation of the results based on test method precision shall be used.

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Table 1 — Paving grade bitumen specifications for grades from 20 x 0,1mm to 220 x 0,1mm penetration

Characteristics	Unit	Test method	Class 0 ^a	20/30	30/45	35/50	40/60	50/70	70/100	100/150	160/220
Penetration at 25 °C	0,1 mm	EN 1426	/	20 – 30	30 – 45	35 – 50	40 – 60	50 – 70	70 – 100	100 – 150	160 – 220
Softening point	°C	EN 1427	/	55 – 63	52 – 60	50 – 58	48 – 56	46 – 54	43 – 51	39 – 47	35 – 43
Resistance to hardening at 163°C		EN 12607-1	/								
Retained penetration	%		/	≥ 55	≥ 53	≥ 53	≥ 50	≥ 50	≥ 46	≥ 43	≥ 37
Increase in softening point, max - <i>Severity 1</i> or Increase in softening point, max - <i>Severity 2^b</i>	°C		/	≤ 8 or ≤ 10	≤ 8 or ≤ 11	≤ 8 or ≤ 11	≤ 9 or ≤ 11	≤ 9 or ≤ 11	≤ 9 or ≤ 11	≤ 10 or ≤ 12	≤ 11 or ≤ 12
Flash point ^b	°C	EN ISO 2592	/	≥ 240	≥ 240	≥ 240	≥ 230	≥ 230	≥ 230	≥ 230	≥ 220
Solubility ^b	%	EN 12592	/	≥ 99,0	≥ 99,0	≥ 99,0	≥ 99,0	≥ 99,0	≥ 99,0	≥ 99,0	≥ 99,0
Change of mass after RTFOT ^b	%	EN 12607-1	/	≤ 0,5	≤ 0,5	≤ 0,5	≤ 0,5	≤ 0,5	≤ 0,8	≤ 0,8	≤ 1,0
Penetration index		Annex A ^c	NR ^d	-1,5 to +0,7	-1,5 to +0,7	-1,5 to +0,7	-1,5 to +0,7	-1,5 to +0,7	-1,5 to +0,7	-1,5 to +0,7	-1,5 to +0,7
Kinematic viscosity at 135 °C	mm ² /s	EN 12595	NR ^d	≥ 530	≥ 400	≥ 370	≥ 325	≥ 295	≥ 230	≥ 175	≥ 135
Dynamic viscosity at 60 °C	Pa.s	EN 12596	NR ^d	≥ 440	≥ 260	≥ 225	≥ 175	≥ 145	≥ 90	≥ 55	≥ 30
Fraass breaking point	°C	EN 12593	NR ^d	-	≤ -5	≤ -5	≤ -7	≤ -8	≤ -10	≤ -12	≤ -15

^a Class 0 can only selected for non-mandated properties. These properties are optional. The decision to apply or not to apply a property is taken by the National Standardisation Body (NSB). If chosen it becomes "required", if not, class 0 is to be selected.

^b When Severity 2 is selected, it shall be associated with Fraass breaking point and/or penetration index.

^c Reference to normative Annex A in the present document, dealing with calculation of the penetration index, Ip.

^d NR: "Not Required", this class is used when there is no mandated requirement for a property.

Table 2 — Paving grade bitumen specifications for grades from 250 x 0,1mm to 900 x 0,1mm penetration

	Unit	Test method	250/330	330/430	500/650	650/900
Penetration at 25 °C <i>or</i>	0,1 mm	EN 1426	250 – 330	-	-	-
Penetration at 15 °C	0,1 mm	EN 1426	-	90 – 170	140 – 260	180 – 360
Dynamic viscosity at 60 °C <i>or</i>	Pa.s	EN 12596	≥ 18	≥ 12	≥ 7,0	≥ 4,5
Softening point	°C	EN 1427	30 – 38	28 – 36	-	-
Resistance to hardening at 163 °C		EN 12607-1				
Viscosity ratio at 60 °C <i>or</i>			≤ 4,0	≤ 4,0	≤ 4,0	≤ 4,0
Increase in softening point	°C		≤ 11	≤ 11	-	-
Kinematic viscosity at 135 °C	mm ² /s	EN 12595	≥ 100	≥ 85	≥ 65	≥ 50
Flash point	°C	EN 2719	≥ 180	≥ 180	≥ 180	≥ 180
Solubility	% mass fraction	EN 12592	≥ 99,0	≥ 99,0	≥ 99,0	≥ 99,0
Resistance to hardening at 163 °C		EN 12607-1				
Change of mass	%		≤ 1,0	≤ 1,0	≤ 1,5	≤ 1,5
Fraass breaking point	°C	EN 12593	≤ -16	≤ -18	≤ -20	≤ -20

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