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IS 73 (2006): Paving bitumen [PCD 6: Bitumen Tar and their Products]



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“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक
खड़जा डालने के लिए डामर — विशिष्टि
(तीसरा पुनरीक्षण)

Indian Standard
PAVING BITUMEN — SPECIFICATION
(*Third Revision*)

ICS 93.080.20

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BHADUR SHAH ZAFAR MARG
NEW DELHI 110002

FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Bitumen, Tar and Their Products Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

This standard was first published in 1950 as 'Specification for asphaltic bitumen and fluxed native asphalt for road making purpose' which was revised in 1961 to change the grades of material and incorporate the methods of test as per IS 1201 to IS 1220 : 1958 'Methods for testing tar and bitumen'. In the first revision, the grades of fluxed native asphalt were deleted and essentially the paving grades were included.

Based on the revised methods of test in IS 1201 to IS 1220 : 1978 'Methods for testing tar and bituminous materials (*first revision*)' and the additional data that had become available, second revision was prepared in 1992. Bituminous mixes prepared with binders having high wax content have tendencies to become brittle in cold weather and to bleed in hot weather. In the second revision, separate tables of requirements of paving grade bitumen derived from waxy crude and non-waxy crude have been prepared. Requirements of performance tests like penetration ratio, paraffin wax content, and viscosity at 60°C and 135°C and retained penetration after thin film oven test have been incorporated. Besides, six grades of bitumen derived from waxy crude have been unified into four grades and in the case of bitumen from non-waxy crude, an additional grade of 50/60 penetration has been introduced on the basis of the data made available from a study carried out jointly by the Central Road Research Institute and the Indian Oil Corporation (R & D) Centre, Faridabad.

In this third revision grading of bitumens is changed from penetration grade to viscosity grade. The variability in performance at high temperatures can be addressed by adopting a viscosity-graded bitumen specification (based on viscosity at 60°C) *in lieu* of the current penetration-graded specification (based on penetration at 25°C). Tender asphalt mixtures, which push and shove under the roller wheels presenting problems during compaction, have also been encountered in the recent past. Since the viscosity-graded bitumen specification has a requirement of minimum viscosity at 135°C, it will also be helpful in minimizing the tender mix problems in the field.

Adoption of viscosity-graded paving bitumen specification will also reduce the number of total tests to 7, which will reduce the cost of testing bitumen. This will result from eliminating empirical tests/parameters such as penetration ratio, paraffin wax content, and Fraass breaking point without compromising the quality of bitumen. Also, no new tests need to be introduced in implementing this specification. Since high penetration values are desirable for pavement durability, requirement for a minimum penetration value is adequate and has been retained in the viscosity-graded specification. Specifying a maximum value for penetration is undesirable and will reject some good quality bitumens unreasonably.

This standard is one of the series of standards on bitumen. Other specifications so far published in this series are:

<i>IS No.</i>	<i>Title</i>
217 : 1988	Specification for cutback bitumen (<i>second revision</i>)
454 : 1994	Cutback bitumen from waxy crude — Specification (<i>second revision</i>)
702 : 1988	Specification for industrial bitumen (<i>second revision</i>)

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

PAVING BITUMEN — SPECIFICATION

(Third Revision)

1 SCOPE

This standard covers the requirement for physico-chemical properties of various grades of paving grade bitumen for use as binders in the construction of pavements related to highways, expressways, air fields, rural roads and other allied construction and maintenance works.

2 REFERENCES

The following standards contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
334 : 2002	Glossary of terms relating to bitumen and tar (<i>third revision</i>)
1201 : 1978	Methods for testing tar and bituminous materials: Sampling (<i>first revision</i>)
1203 : 1978	Methods of testing tar and bituminous materials: Determination of penetration (<i>first revision</i>)
1205 : 1978	Methods for testing tar and bituminous materials: Determination of softening point (<i>first revision</i>)
1206	Methods of testing tar and bituminous materials: Determination of viscosity:
(Part 2) : 1978	Absolute viscosity
(Part 3) : 1978	Kinematic viscosity
1208 : 1978	Methods for testing tar and bituminous materials: Determination of ductility (<i>first revision</i>)
1209 : 1978	Methods for testing tar and bituminous materials: Determination of flash point and fire point (<i>first revision</i>)
1216 : 1978	Methods for testing tar and bituminous materials: Determination of solubility in carbon disulphide or trichloroethylene (<i>first revision</i>)

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 334 shall apply.

4 DESCRIPTION

Bitumens shall be prepared by the refining of crude petroleum by suitable methods using appropriate crude or by blending different crudes or different short residue to achieve desired properties of paving grade bitumen conforming to specifications.

5 GRADES

Bitumens shall be classified into four types, based on viscosity, as given below:

- a) VG-10
- b) VG-20
- c) VG-30
- d) VG-40

6 REQUIREMENTS

6.1 The paving bitumen binder shall be homogeneous and shall not foam when heated to 175°C.

6.2 The various grades of bitumen shall conform to the requirements prescribed in Table 1.

7 SAMPLING AND CRITERIA FOR CONFORMITY

7.1 Lot

In any consignment, all the containers of paving grade bitumen binders of same category and grade from the same batch of manufacture shall be grouped to constitute a lot.

7.2 The number of containers to be selected at random from the lot shall depend upon the size of the lot given in Table 2

7.3 From each of the containers selected as in 7.2 an average sample representative of the material in the container shall be drawn in accordance with the methods prescribed in IS 1201, taking all the precautions mentioned therein. All these samples from individual containers shall be stored separately.

Table 1 Requirements for Paving Bitumen
(Clause 6.2)

Sl No.	Characteristics	Paving Grades				Methods of Test, Ref to IS No.
		VG 10 (3)	VG 20 (4)	VG 30 (5)	VG 40 (6)	
(1)	(2)					(7)
i)	Absolute viscosity at 60°C, Poises, <i>Min</i>	800	1 600	2 400	3 200	IS 1206 (Part 2)
ii)	Kinematic viscosity at 135°C, cSt, <i>Min</i>	250	300	350	400	IS 1206 (Part 3)
iii)	Flash point, (Cleveland open cup), °C, <i>Min</i>	220	220	220	220	IS 1209
iv)	Solubility in trichloroethylene, percent, <i>Min</i>	99.0	99.0	99.0	99.0	IS 1216
v)	Penetration at 25°C, 100 g, 5 s, 0.1 mm	80-100	60-80	50-70	40-60	IS 1203
vi)	Softening point (R&B), °C, <i>Min</i>	40	45	47	50	IS 1205
vii)	Tests on residue from thin-film oven tests/RTFOT					
	1) Viscosity ratio at 60°C, <i>Max</i>	4.0	4.0	4.0	4.0	IS 1206 (Part 2)
	2) Ductility at 25°C, cm, <i>Min</i> , after thin-film oven test	75	50	40	25	IS 1208

Table 2 Scale of Sampling
(Clause 7.2)

Sl No.	Lot Size	No. of Containers to be Selected
(1)	(2)	(3)
i)	Up to 50	3
ii)	5-150	5
iii)	151-500	7
iv)	501 and above	10

7.4 Number of Tests

7.4.1 All the individual samples shall be tested for absolute viscosity at 60°C, penetration and softening point tests.

7.4.2 For the remaining characteristics, a composite sample prepared by mixing together equal quantities of paving grade bitumen, sampled, as the case may be, from all individual samples taken from each sample container, shall be tested.

7.5 Criteria for Conformity

7.5.1 The lot shall be considered as conforming to the requirements of this standard, if the conditions mentioned under 7.5.2 and 7.5.3 are satisfied.

7.5.2 From the test results of absolute viscosity at 60°C, penetration and softening point, the mean (\bar{X}) and the range (R) shall be calculated. The following conditions shall be satisfied:

- $[\bar{X} - 0.6R]$ shall be greater than or equal to the minimum specification limit specified in Table 1, and
- $[\bar{X} + 0.6R]$ shall be less than or equal to the maximum specification limit specified in Table 1.

7.5.3 The composite sample when tested for the characteristics mentioned in 7.4.2 shall satisfy the corresponding requirements of the characteristics given in Table 1.

8 PACKING AND MARKING

8.1 Packing

Penetration grade bitumen of all types shall be suitably packed in a container as agreed to between the purchaser and the supplier.

8.2 Marking

Each container of penetration grade bitumen shall be legibly and indelibly marked with the following:

- a) Manufacturer's name or trade-mark, if any;
- b) Month and year of manufacture;
- c) Type of the material and Grade; and
- d) Batch number.

8.3 BIS Certification Marking

The container may also be marked with the Standard Mark.

8.3.1 The use of Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of the Standard Mark may be granted to manufactures or producers may be obtained from the Bureau of Indian Standards.

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This Indian Standard has been developed from Doc : No. PCD 6 (2335).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters :

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110 002
Telephones : 2323 01 31, 2323 33 75, 2323 94 02

Telegrams : Manaksanstha
(Common to all offices)

Regional Offices :

	Telephone
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110 002	{ 2323 76 17 2323 38 41
Eastern : 1/14 C.I.T. Scheme VII M, V. I. P. Road, Kankurgachi KOLKATA 700 054	{ 2337 84 99, 2337 85 61 2337 86 26, 2337 91 20
Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160 022	{ 260 38 43 260 92 85
Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600 113	{ 2254 12 16, 2254 14 42 2254 25 19, 2254 23 15
Western : Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400 093	{ 2832 92 95, 2832 78 58 2832 78 91, 2832 78 92

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