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Edition 3.3
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भारतीय मानक

खडंजा डालने के लिए डामर — विशिष्टि

(दूसरा पुनरीक्षण)

Indian Standard

PAVING BITUMEN — SPECIFICATION

(Second Revision)

(Incorporating Amendment Nos. 1, 2 & 3)

UDC 665.775.625.856.06

BUREAU OF INDIAN STANDARDS
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Price Group 2

FOREWORD

This Indian Standard (Second 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 this 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, a revision was undertaken. 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 present revision, separate tables of requirements of paving grade bitumens derived from waxy crude and non-waxy crude have been prepared. Requirements of performance tests like penetration ratio, paraffin wax content, 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.

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

IS 217 : 1989 Cut back bitumen (*second revision*)

IS 454 : 1961 Digboi type cut back bitumen (*under revision*)

IS 702 : 1988 Industrial bitumen (*second revision*)

This edition 3.3 incorporates Amendment No. 2 (May 2002) and Amendment No. 3 (October 2002). Side bar indicates modification of the text as the result of incorporation of the amendments. Amendment No. 1 had been incorporated earlier.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the results 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 values should be the same as that of the specified value of this standard.

Indian Standard

PAVING BITUMEN — SPECIFICATION

(Second Revision)

1 SCOPE

This standard covers physical and chemical requirements of paving bitumens for use in roadways, runways and allied constructions.

2 REFERENCES

The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 334 : 1982 shall apply.

4 TYPES AND GRADES

4.1 Paving bitumen shall be of the following two types:

Type 1 Paving bitumen from non-waxy crude; and

Type 2 Paving bitumen from waxy crude.

4.1.1 Paving bitumen Type 1 shall be classified into six grades according to their penetration and each grade shall be given a designation as given in Table 1 with letter 'S' denoting the type and a numeral representing the mean of the limits of the penetration specified for the grade.

4.1.2 Paving bitumen Type 2 shall be classified into four grades according to their penetration and each grade shall be given a designation as given in Table 2 with letter 'A' denoting the type and a numeral representing the mean of the limits of the penetration specified for the grade.

NOTE — For example, A 35 means that paving bitumen corresponding to this grade has high wax content and has approximately a penetration value in the range of 30 to 40. S 35 means that paving bitumen corresponding to this grade has low wax content and has approximately a penetration value in the range of 30 to 40.

4.2 Intermediate grades shall be subject to mutual agreement between the purchaser and the supplier.

5 MANUFACTURE AND SOURCE

5.1 The material shall be prepared by the distillation of suitable crude petroleum oil with or without subsequent blending with other grades and/or air blowing.

5.2 The source of the material shall be stated by the manufacturer.

6 REQUIREMENTS

6.1 The material shall be homogeneous and shall not foam when heated to 175°C.

6.2 Paving bitumen Type 1 shall satisfy the requirements given in Table 1 and paving bitumen Type 2 shall satisfy the requirements given in Table 2.

6.2.1 For a given lot under each type the softening point for samples taken from different parts of the lot shall not vary by more than 8°C from maximum to minimum and shall not fall outside the range of the test limits specified in Tables 1 and 2.

7 TESTS

7.1 Tests shall be carried out as described by methods referred in col 9 of Table 1 and col 7 of Table 2, for paving bitumen Type 1 and Type 2 respectively.

8 PACKING AND MARKING

8.1 Packing

The material may be supplied in drums of Type A or Type B as per IS 3575 : 1989 or as agreed to between the purchaser and the supplier.

8.2 Marking

Each container of paving bitumen shall be legibly marked with the following:

a) Indication of source of manufacture,

b) Month and year of manufacture,

c) Type and Grade, and

d) Batch number.

8.2.1 Each container may also be marked with the Standard Mark.

9 SAMPLING AND CRITERIA FOR CONFORMITY

Representative samples of the material shall be drawn and their conformity to the requirements of this standard be judged as prescribed in Annex B.

Table 1 Requirements for Paving Bitumen Type 1

(*Clause* 6.2)

Sl No.	Characteristics	Requirements for Grades						Methods of Test, Ref to
		S 35	S 45	S 55	S 65	S 90	S 200	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	Specific gravity at 27°C, *Min*	0.99	0.99	0.99	0.99	0.99	0.99	IS 1202 : 1978
ii)	Water, percent by mass, *Max*	0.2	0.2	0.2	0.2	0.2	0.2	IS 1211 : 1978
iii)	Flash point, Cleveland open cup, °C, *Min*	175	175	175	175	175	175	IS 1448 (P:69) : 1969
iv)	Softening point °C	55-65	50-60	50-60	45-55	40-55	30-45	IS 1205 : 1978
v)	Penetration at 25°C, 100 g, 5 Sec., 1/10 mm	30 to 40	40 to 50	50 to 60	60 to 70	80 to 100	175 to 225	IS 1203 : 1978
vi)	Penetration ratio[1], *Min*	42	40	40	35	30	20	—
vii)	Ductility at 27°C, cm, *Min*	50	75	75	75	75	—	IS 1208 : 1978
viii)	Paraffin wax content, percent by mass, *Max*	4.5	4.5	4.5	4.5	4.5	4.5	IS 10512 : 1983
ix)	Frass breaking point[2], °C, *Max*	–4	–4	–6	–6	–8	–10	IS 9381 : 1979
x)	Loss on heating, thin film oven test, percent by mass, *Max*	1	1	1	1	1	2	IS 1212 : 1978
xi)	Retained penetration after thin film oven test, 25°C, 100 g, 5 Sec., 1/10 mm, percent of original, *Min*	55	55	52	52	47	42	IS 9382 : 1979
xii)	Matter soluble in trichloroethylene, percent by mass, *Min*	99	99	99	99	99	99	IS 1216 : 1978
xiii)	Viscosity at :							
	a) 60°C, Poises	5 000± 1 000	4 000± 800	3 000± 600	2 000± 500	1 000± 250	250± 50	IS 1206 (Part 2) : 1978
	b) 135°C, cst, *Min*	500	400	350	300	250	125	IS 1206 (Part 3) : 1978

[1] Penetration ratio = $\frac{\text{Penetration at 4°C, 200 g, 60 s}}{\text{Penetration at 25°C, 100 g, 5 s}} \times 100$

[2] This characteristic is subject to the agreement between the supplier and the purchaser.

Table 2 Requirements for Paving Bitumen Type 2

(*Clause* 6.2)

Sl No.	Characteristics	Requirements for Grades				Methods of Test, Ref to
		A 35	A 55	A 65	A 90	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Specific gravity at 27°C, *Min*	0.99	0.99	0.99	0.98	IS 1202 : 1978
ii)	Water, percent by mass, *Max*	0.2	0.2	0.2	0.2	IS 1211 : 1978
iii)	Flash point, Cleveland open cup °C, *Min*	175	175	175	175	IS 1448 (P:69) : 1969
iv)	Softening point, °C	55 to 70	45 to 60	45 to 60	35 to 50	IS 1205 : 1978
v)	Penetration at 25°C, 100 g, 5 Sec., 1/10 mm	30 to 40	50 to 60	60 to 70	80 to 100	IS 1203 : 1978
vi)	Penetration ratio[1], *Min*	25	25	25	25	—
vii)	Ductility at 27°C, cm, *Min*	10	15	15	15	IS 1208 : 1978
viii)	Paraffin wax content, percent by mass, *Max*	10	10	10	10	IS 10512 : 1983
ix)	Frass breaking point °C, *Min*	–4	–6	–8	–10	IS 9381 : 1979
x)	Loss on heating in thin film oven test, percent by mass, *Max*	1	1	1	1	IS 1212 : 1978
xi)	Retained penetration after thin film oven test at 25°C, 100 g, 5 Sec., 1/10 mm percent of original, *Min*	57	57	47	42	IS 9382 : 1979
xii)	Matter soluble in trichloroethylene, percent by mass, *Min*	99	99	99	99	IS 1216 : 1978
xiii)	Viscosity at : (a) 60°C, Poises	1000±300	400±300	300±10	200±50	IS 1206 (Part 2) : 1978
	(b) 135°C, cst, *Min*	250	100	70	50	IS 1206 (Part 3) : 1978

[1] Penetration ratio = $\frac{\text{Penetration at 4°C, 200 g, 60 s}}{\text{Penetration at 25°C, 100 g, 5 s}} \times 100$

ANNEX A

(*Item* 2)

LIST OF INDIAN STANDARDS

IS No.	*Title*	*IS No.*	*Title*
334 : 1982	Glossary of terms relating to bitumen and tar (*second revision*)	1205 : 1978	Methods for testing tar and bituminous materials : Determination of softening point (*first revision*)
1201 : 1978	Methods of testing tar and bituminous materials — Sampling (*first revision*)	1206 (Part 2) : 1978	Methods for testing tar and bituminous materials : Determination of viscosity — Absolute viscosity (*first revision*)
1202 : 1978	Methods for testing tar and bituminous materials : Determination of specific gravity (*first revision*)	1206 (Part 3) : 1978	Determination of viscosity — Kinematic viscosity (*first revision*)
1203 : 1978	Methods of testing tar and bituminous materials : Determination of penetration (*first revision*)	1208 : 1978	Methods for testing tar and bituminous materials : Determination of ductility (*first revision*)

IS No.	*Title*
1448 (P: 69) : 1969	Methods of test for petroleum and its product (P: 69) Flash and fire point by cleveland (open) cup
1211 : 1978	Methods for testing tar and bituminous materials : Determination of water content (Dean and Stark Method) (*first revision*)
1212 : 1978	Method for testing tar and bituminous materials : Determination of loss on heating (*first revision*)
1216 : 1978	Methods for testing tar and bituminous materials : Determination of solubility in carbon disulphide or trichloroethylene (*first revision*)
3575 : 1989	Specification of bitumen drums (*first revision*)
4905 : 1968	Methods for random sampling
9381 : 1979	Methods for testing tar and bituminous materials : Determination of Frass breaking point of bitumen
9382 : 1979	Methods for testing tar and bituminous materials : Determination of effect of heat and air by thin film oven tests
10512 : 1983	Methods for determination of wax content in bitumen

ANNEX B

(*Clause* 9)

SAMPLING AND CRITERIA FOR CONFORMITY

B-1 SCALE OF SAMPLING

B-1.1 Lot

In any consignment, all the containers of same type, same grade and belonging to the same batch of manufacture shall be grouped together to constitute a lot.

B-1.2 The number of containers to be selected from the lot shall depend upon the size of the lot and shall be in accordance with Table 3.

Table 3 Scale of Sampling

Lot size	No. of Containers to be Selected
(1)	(2)
Up to 50	3
51 to 150	5
151 to 500	7
501 and above	10

B-1.3 These containers shall be selected at random from the lot. In order to ensure the randomness of selection, procedure given in IS 4905 : 1968 may be followed.

B-2 PREPARATION OF TEST SAMPLES

From each of the containers selected according to **B-1.2** and **B-1.3**, a sample representative of material in the container shall be drawn in accordance with the methods prescribed in IS 1201 : 1978 taking all the precautions mentioned therein. All these samples from individual containers shall be stored separately.

B-3 NUMBER OF TESTS

B-3.1 All the individual samples shall be tested for softening point, penetration and ductility.

B-3.2 For the remaining characteristics given in **6.1** and **6.2** of the specification, a composite sample prepared by mixing together approximately equal quantities of bitumen from all individual samples shall be tested.

B-4 CRITERIA FOR CONFORMITY

B-4.1 The lot shall be declared as conforming to the requirements of this specification if **B-4.1.1** and **B-4.1.2** are satisfied.

B-4.1.1 From the test results of each of the characteristics given in **B-3.1**, the mean ($\bar{X}$) and the range (R) shall be calculated as below:

$$\text{mean } (\bar{X}) = \frac{\text{Sum of the test results}}{\text{Number of test results}}$$

Range (R) = Difference in the largest and the smallest of the test results

If the expression ($\bar{X} - 0.6\,R$) is greater than or equal to the minimum specification limit, the expression ($\bar{X} + 0.6\,R$) is less than or equal to the maximum specification limit and both the conditions are satisfied in case of two-sided specification limits, the lot shall be considered to have met these requirements.

B-4.1.2 The composite sample when tested for the characteristics mentioned in **B-3.2** shall satisfy the corresponding specification requirements.

Bureau of Indian Standards

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc : No. PCD 6 (783).

Amendments Issued Since Publication

Amend No.	Date of Issue
Amd. No. 1	Incorporated earlier
Amd. No. 2	May 2002
Amd. No. 3	October 2002

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