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Indian Standard

SPECIFICATION FOR BITUMEN MASTIC FOR USE IN WATER PROOFING OF ROOFS

(First Revision)

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(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 4 July 1986, after the draft finalized by the Waterproofing and Damp-proofing Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 A number of materials for waterproofing of roofs are available. Bitumen mastic is one of them and this standard is intended to provide the required guidance in the proportioning of bitumen and aggregates to get bitumen mastic suitable for waterproofing purposes. The choice of materials and proportioning aims at obtaining (a) the densest mix to ensure imperviousness, (b) the required flexibility of the mastic layer after it is laid, and (c) sufficient workability to ensure ease of application. This mastic is intended for hot application. For flat surface, both airblown and steam refined grades of bitumen are used within the limits specified. For steeply inclined and vertical surfaces, however, airblown bitumen within the limits specified may prove more suitable.

0.3 This standard was first published in 1965. The present revision incorporates the changes necessary due to developments and revision of other standards referred to in the standard. In this revision, the requirement of solubility of bitumen in carbon tetrachloride and trichloroethylene has been added in the physical properties of bitumen.

0.4 In the formulation of this standard, due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

0.5 This standard is one of a series of Indian Standard specifications on materials for use in waterproofing and damp-proofing of buildings. Other specifications published so far in the series are:

IS : 1322-1982 Bitumen felts for waterproofing and damp-proofing (*third revision*)

IS : 1580-1969 Bituminous compounds for waterproofing and caulking purposes (*first revision*)

0.6 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*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the requirements for bitumen mastic suitable for waterproofing of roofs.

1.2 This bitumen mastic is not intended to be used as a paving material or to withstand exceptional conditions, such as acid or alkali actions.

2. TERMINOLOGY

2.1 For the purpose of this standard, definitions given in IS : 334-1982† and IS : 4911-1968‡ shall apply.

3. GENERAL CHARACTERISTICS

3.1 The bitumen mastic shall consist of a mixture of bitumen, aggregates and mineral filler in such suitable proportions as to give it a semi-fluid consistency when heated to about 180°C. The mastic at this temperature shall be easily compressible by trowels into a compact and uniform layer, not less than 10 mm in thickness.

4. MATERIALS

4.1 Bitumen — The physical properties of bitumen used shall conform to those specified in Table 1 when tested in accordance with the methods of tests specified therein.

4.2 Aggregates — Aggregates suitable for bitumen mastic for waterproofing purposes are crushed rock or gravel of silicious, granite or limestone origin with mineral fillers, such as limestone dust or cement. Aggregates used shall be clean and free of all foreign matter. The aggregates shall conform to gradings given in Table 2.

*Rules for rounding off numerical values (*revised*).

†Glossary of terms relating to bitumen and tar (*second revision*).

‡Glossary of terms relating to bituminous waterproofing and damp-proofing of buildings.

TABLE 1 PHYSICAL PROPERTIES OF BITUMEN

(*Clause* 4.1)

Sl No.	Characteristic	Requirement	Method of Test, Ref to IS
(1)	(2)	(3)	(4)
i)	Softening point (R & D)	55 to 90°C	IS : 1205-1978*
ii)	Penetration	10 to 30	IS : 1203-1978†
iii)	Ductility	3 to 30	IS : 1208-1978‡
iv)	Loss on heating, percent, *Max*	2·0	IS : 1212-1978§
v)	Solubility in carbon disulphide, carbon tetrachloride or trichloroethylene, *Min*	99%	IS : 1216-1978‖

*Methods for testing tar and bitumen: Determination of softening point (*first revision*).

†Methods for testing tar and bitumen: Determination of penetration (*first revision*).

‡Methods for testing tar and bitumen: Determination of ductility (*first revision*).

§Methods for testing tar and bitumen: Determination of loss on heating (*first revision*).

‖Methods for testing tar and bitumen: Determination of solubility in carbon disulphide carbon tetrachloride or trichloroethylene (*first revision*).

TABLE 2 GRADING OF AGGREGATES

(*Clause* 4.2)

Type of Sieve Used [*see* IS : 460 (Part 1)-1985*]	Percentage by Weight
Passing 75-micron IS Sieve	40 to 45
Retain on 75-micron IS Sieve and passing 2·00-mm IS Sieve	15 " 20
Retained on 425-micron IS Sieve and passing 2·00-mm IS Sieve	15 " 20
Retained on 2·00-mm IS Sieve and passing 4·75-mm IS Sieve	20 " 30
Retained on 10-mm IS Sieve	Nil

*Specification for test sieves: Part 1 Wire cloth test sieves (*third revision*).

5. MANUFACTURE AND COMPOSITION

5.1 The filler and fine aggregate shall be mixed together and heated to a temperature of 170 to 205°C. The required quantity of bitumen shall be separately heated to 170 to 180°C and added to the aggregate. These shall be mixed and cooked in a mechanically agitated mixer, called mastic cooker, until the materials are thoroughly mixed. During mixing, care shall be taken to ensure that the contents in the cooker are at no time heated to a temperature exceeding 205°C. Mechanical cooker should be such that it can discharge whole of the mix in about 30 minutes time.

5.2 If the mastic has to be pre-manufactured in the factory and cast into blocks and has then to be taken to site, the mastic shall be prepared as given in **5.2.1.**

5.2.1 The filler and fine aggregates shall be properly mixed and heated to a temperature of 170 to 205°C. The required quantity of bitumen shall be separately heated to 170 to 180°C and added to the aggregate. These shall be mixed and cooked in a mastic cooker until the materials are thoroughly mixed. The mastic shall then be cast into blocks weighing about 25 kg.

5.2.2 When required, the bitumen mastic blocks shall be broken into convenient sizes and remelted and mixed in the mastic cooker at the site of work.

5.3 Composition — The composition of the bitumen mastic when determined in the manner specified in Appendix C of IS : 1195-1978* shall conform to the requirements given in Table 3.

TABLE 3 COMPOSITION OF BITUMEN MASTIC BY ANALYSIS

Sl No.	Requirement	Percentage by Weight of Total Mastic
(1)	(2)	(3)
i)	Bitumen	15 to 20
	Aggregate passing [*see* IS : 460 (Part 1)-1985*]:	
ii)	4·75-mm IS Sieve and retained on 2·00-mm IS Sieve	18 to 20
iii)	2·00-mm IS Sieve and retained on 425-micron IS Sieve	12 to 18
iv)	425-micron IS Sieve and retained on 75-micron IS Sieve	12 to 18
v)	75-micron IS Sieve (mineral filler)	35 to 40

*Specification for test sieves: Part 1 Wire cloth test sieves (*third revision*).

*Specification for bitumen mastic for flooring (*second revision*).

6. HARDNESS NUMBER

6.1 The hardness number of the bitumen mastic at the time of laying shall be between 2 to 8 at 25°C, and 10 to 65 at 45°C when determined in the manner described in Appendix D of IS : 1195-1978*.

7. SAMPLING AND CRITERIA FOR CONFORMITY

7.1 During Discharge from Mixer — Three or more separate portions of not less than 5 kg each of bitumen mastic shall be taken at intervals during the discharge of the mixer. The specimen shall include portions taken at beginning or at the end of the discharge except in cases where the practice of returning to the mixer the first and last portions discharged is followed. The portions shall then be thoroughly mixed at a temperature range of 150 to 205°C. The mixture shall be floated out on an iron plate with the aid of a wooden float to a thickness not less than 25 mm. While still warm, the specimen shall be loosened from the plate, and a representative portion weighing not less than 5 kg, shall be forwarded to the laboratory for examination.

7.2 Blocks — Material in block form shall be sampled by taking approximately equal amounts, in pieces, from not less than 6 blocks taken at random. The total specimen of not less than 5 kg, shall be forwarded to the laboratory for examination.

7.3 Criteria for Conformity — The bitumen mastic shall be considered as conforming to this specification if the requirements given in **5.3** and **6.1** are satisfied.

8. MARKING

8.1 If cast into blocks for storage, the date and name of the manufacturer shall be indicated suitably.

8.2 They may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

*Specification for bitumen mastic for flooring (*second revision*).

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	Unit	Symbol	Definition
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

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