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SPECIFICATION FOR BITUMEN MASTIC, ANTI-STATIC AND ELECTRICALLY CONDUCTING GRADE

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SPECIFICATION FOR BITUMEN MASTIC, ANTI-STATIC AND ELECTRICALLY CONDUCTING GRADE

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 28 February 1977, after the draft finalized by the Flooring and Plastering Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 In locations where it is necessary to take precautionary measures against the accumulation of static electricity, the flooring forms an important link in providing a safe path for the discharge of electricity from objects. Flooring intended to be used for this purpose should have uniform electrical conductance to a degree which will always ensure that under the fastest rate of generation of any charge that can possibly occur in practice, a dangerous potential cannot exist.

0.2.1 Bitumen suitably incorporated with certain material can be made to acquire electrical conductive and anti-static properties. One of the material commonly used for incorporation in bitumen mastic is carbon black of conductive grade like graphite.

0.3 Experience has shown that for anti-static purposes the discharge path through a product should normally have an electrical resistance of less than 10^8 ohms at any time throughout its useful life. A value of 5×10^4 ohms for anti-static products is suggested as the lowest limit of resistance to give adequate protection against fire and dangerous electric shock in the event of any apparatus becoming defective when operating at voltages up to 250.

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. This has been met by deriving assistance from BS 2050 : 1961 'Specification for electrical resistance of conductive and anti-static products made from flexible polymeric material', issued by the British Standards Institution.

0.5 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*. 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 specifies requirements of bitumen mastic for anti-static and electrically conducting grade.

2. TERMINOLOGY

2.0 For the purpose of this standard, the definitions given in IS : 334-1965† and those given below shall apply.

2.1 Electrically Conducting — Having an upper limit of resistance of 5×10^1 ohms.

2.2 Anti-Static — Having a resistance of over 5×10^4 ohms and less than 10^8 ohms.

3. MATERIALS

3.1 Bitumen — Requirements shall conform to as specified in Table 1.

TABLE 1 PHYSICAL PROPERTIES OF BITUMEN

Sl No.	Characteristic	Requirement	Method of Test, Ref to
(1)	(2)	(3)	(4)
i)	Softening point (ring and ball method)	65 to 100°C	IS : 1205-1958*
ii)	Penetration at 25°C in 1/100 cm	5 to 20	IS : 1203-1958†
iii)	Ductility at 27°C, *Min* in cm	2	IS : 1208-1958‡
iv)	Loss on heating, percent, *Max*	0·3	IS : 1212-1958§
v)	Solubility in CS_2, percent, *Min*	99	IS : 1216-1958‖

NOTE — Industrial bitumen of the grades 90/15 and 75/15 conforming to IS : 702-1961 ' Specification for industrial bitumen (*revised*) ', are two typical examples of binder which will satisfy the requirements of this table.

*Methods for testing tar and bitumen. Determination of softening point.
†Methods for testing tar and bitumen. Determination of penetration.
‡Methods for testing tar and bitumen. Determination of ductility.
§Methods for testing tar and bitumen. Determination of loss on heating.
‖Methods for testing tar and bitumen. Determination of solubility in carbon disulphide.

*Rules for rounding off numerical values (*revised*).
†Glossary of terms relating to bitumen and tar (*revised*).

3.2 Aggregates and Fillers — The aggregates and fillers used in preparing bitumen mastic should be of inert nature and should have the gradings as specified in Table 2.

TABLE 2 GRADING OF AGGREGATES AND FILLERS

Sieve Designation		Percentage by Mass
Passing IS Sieve	Retained on IS Sieve	
(1)	(2)	(3)
75 micron	—	45 to 55 (filler)
212 micron	75 micron	10 to 30
600 micron	212 micron	10 to 30
2·36 mm	600 micron	5 to 20
—	2·36 mm	Nil

4. COMPOSITION

4.1 Bitumen mastic composition for electrical conducting and anti-static grade are made by incorporating bitumen in conjunction with other suitable materials like carbon black of the conductive grade like graphite.

4.1.1 The bitumen content shall be between 13 to 18 percent by mass of the total mastic.

4.2 Preparation of Bitumen Mastic

4.2.1 The aggregates shall be heated to a temperature of 170 to 205°C and then the required amount of bitumen heated to 170 to 180°C shall be added to it. They shall be mixed and cooked in a mechanically agitated mixer called mastic cooker for about 3 hours 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. Where the material is not required for immediate use, it shall be cast into blocks weighing about 25 kg.

4.2.2 *Remelting at Site* — The blocks shall be broken to convenient size not exceeding 150 mm cube and loaded into the mastic cooker at the site of work. The material shall then be carefully remelted. At no stage during the remelting and mixing process shall the temperature exceed 205°C.

5. PROPERTIES

5.1 Unless otherwise agreed to between the purchaser and the vendor, the hardness number of bitumen mastic as laid when tested in accordance with the method specified in Appendix A shall be 4 to 12 at 35°C.

5.2 The resistance of products after being manufactured according to **4** and when tested in accordance with **6** shall have electrical conductance between 5×10^4 ohms and 2×10^6 ohms.

6. TEST PROCEDURE FOR MEASURING ELECTRICAL CONDUCTANCE

6.1 Preparation of the Surface — The surface to be used in test shall be cleaned by rubbing with dry Fullers' earth using a clear pad of cotton wool, care being taken to avoid straining the material.

6.1.1 After all traces of the powder have been cleaned away, the surfaces shall be wiped over with a pad moistened with distilled water and rubbed dry with a clean cloth.

6.2 Test Procedure — Immediately after the preparation of the surface, liquid electrodes and metal contacts as specified in Appendix B shall be applied as specified in Appendix C. It shall then be kept at a temperature of 27 ± 2°C at a relative humidity of less than 70 percent, and the resistance test as specified in Appendix C shall be carried out after a period of not less than 15 minutes or more than two hours. As some materials are sensitive to moisture, great care shall be taken to avoid breathing on the samples prior to and during the resistance test.

7. SAMPLING AND CRITERIA FOR CONFORMITY

7.1 Lot — The entire quantity of bitumen mastic prepared in a single charge of the mastic cooker shall constitute a lot. In cases where the practice of returning the first and the last portions to the cooker is followed, portions thus returned should be excluded from the lot.

7.2 Sampling from Mastic Cooker — When bitumen mastic is to be used directly from the cooker, a sample composed of five increments taken at equal intervals shall be withdrawn from each lot during discharge from the mastic cooker. The increments shall be taken at the beginning, the end, and soon after discharge of one quarter, half, and three quarters of the bitumen mastic. Each increment shall be at least 2 kg in mass.

7.2.1 All the five increments from a lot shall be thoroughly mixed together at a temperature 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 10 kg shall be forwarded to the laboratory for examination with full particulars as given in **7.5**.

7.3 Sampling from Blocks — From each lot cast in blocks, five blocks shall be picked up at random. Each block shall be broken and a number of pieces weighing about 2 kg shall be taken from different positions in the block so as to represent the block adequately. 10 kg of material thus collected from all the five blocks shall constitute the laboratory sample and shall be sent to the laboratory with full particulars as given in **7.5**.

7.4 Criteria for Conformity — The laboratory sample representing the lot shall be tested for all requirements. The lot shall be considered to conform to the requirements of this specification if the laboratory sample passes tests for all the requirements.

7.5 Labelling — The specimen shall be adequately identified, and the identification shall provide for reference to a schedule which shall be sent, giving the appropriate items from the following:

a) Name and address of authority giving instructions for the examination to be carried out,
b) Sample number;
c) Type of material;
d) Type of binder;
e) Type of aggregate;
f) Specification with which the material is intended to comply;
g) Name and location of mixing plant;
h) Sample taken before or after laying;
j) Date of mixing, if known;
k) Date of laying, if known;
m) Date of sampling;
n) Site where laid;
p) Position from which sample was taken;
q) Number and nominal thickness of courses;
r) Nature of foundation;
s) Nature of surface treatment (if any); and
t) Tests to be made, or information sought.

To facilitate the testing procedure and the interpretation of test results it is essential that as much information as possible should be given to the laboratory.

8. MARKING

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

8.2 BIS Certification Marking

The product may also be marked with Standard Mark.

8.2.1 The use of the 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 Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

APPENDIX A

(*Clause* 5.1)

METHOD FOR DETERMINING HARDNESS NUMBER

A-1. DEFINITION OF HARDNESS NUMBER

A-1.1 The hardness number is the figure denoting the depth, in hundredths of a centimetre, to which a flat-ended indentation pin in the form of a steel rod 6·35 mm in diameter will penetrate the mastic under a load of 31·7 kg, applied for 1 minute, the temperature being maintained at 35°±0·5°C. This load is equivalent to 100 kg/cm^2 and is conveniently applied by means of a lever giving a suitable mechanical advantage.

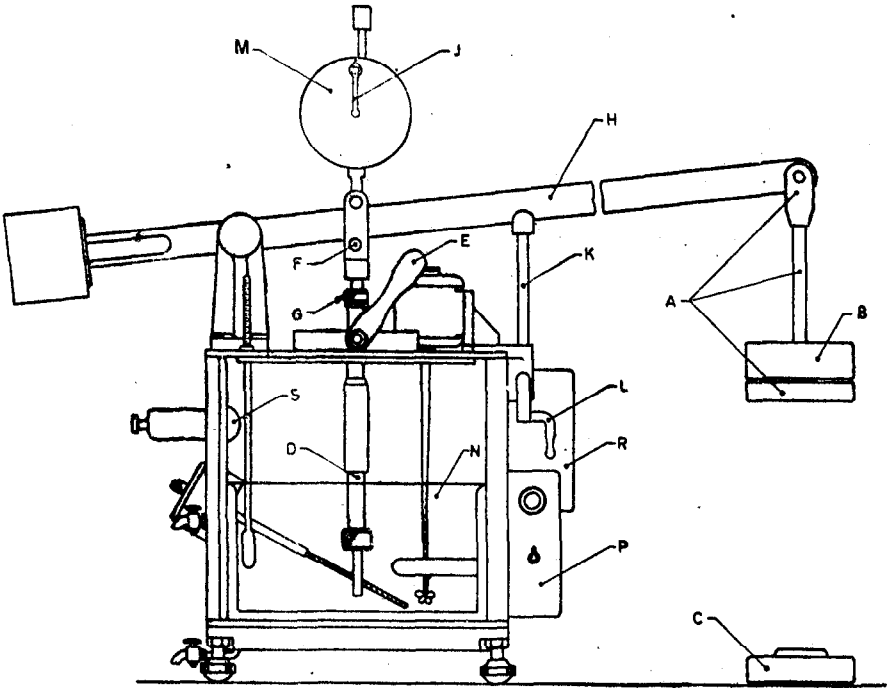
A-2. APPARATUS

A-2.1 The apparatus employed should be capable of fulfilling the above requirements accurately. One convenient form of apparatus is shown in Fig. 1.

A-3. METHOD

A-3.1 In order to ensure that the test results are reproducible, particular attention is called to the points given in **A-3.1.1** to **A-3.1.5**.

A-3.1.1 *Samples* — In preparing samples for test, the mastic as laid shall be filled directly from the mixer at the time of laying, into moulds which are not less than 100 mm in diameter or 100 mm^2, and float finished. The samples, which shall be taken in duplicate, shall be moulded to a thickness of 25 mm. Where it is necessary to make a test on samples cut from the floor, special precautions should be taken to ensure that the sample is of uniform thickness and that the base is level. The samples should not be remelted.



A — Yoke, stalk and tray
B — Weight (central hole)
C — Weight (slotted)
D — Indentor pin spindle
E — Lock lever
F — Spindle head
G — Adjusting nut
H — Beam
J — Indicating needle
K — Beam support yoke
L — Support bracket
M — Calibrated dial
N — Water bath
P — Controls for water stirrer
R — Controls for heater blade and thermostat
S — Bath illuminator

FIG. 1 A TYPE OF APPARATUS FOR HARDNESS TESTING

A-3.1.2 *Test Temperature* — For the purpose of this standard, the sample shall be cooled for not less than three hours in air or not less than one hour in cold running water. It shall then be immersed in water at a temperature of 35 ± 0·5°C for at least one hour immediately prior to testing and shall be maintained at that temperature during the test.

A-3.1.3 *Adjustment of Pin* — Before the load is applied, the indentation pin shall be adjusted lightly but firmly in contact with the surface. The pressure should be not greater than is necessary to prevent lateral movement of the specimen.

A-3.1.4 *Testing* — The requisite load shall then be applied for exactly 1 minute and the depth of indentation recorded in hundredths of a centimetre.

A-3.1.5 *Test Results* — Test points shall be not less than 25 mm apart and not less than 25 mm from the edge. At least five readings shall be taken and the results averaged. If any result differs from the mean by more than two hardness number units, it shall be rejected and the average of the remainder determined, except that if there are fewer than four results to be averaged the sample shall be discarded and the test made on another sample.

APPENDIX B

(*Clause* 6.2)

LIQUID ELECTRODES AND CONTACTS AND TESTING INSTRUMENTS

B-1. LIQUID ELECTRODES

B-1.1 Liquid electrodes shall be formed on the surface by means of a conducting liquid.

B-1.1.1 This shall consist of:

Anhydrous polyethylene glycol of mol wt 600	800 parts
Water	200 parts
Soft soap	1 part
Potassium chloride	10 parts

B-1.1.2 The electrode area shall be completely wetted and remain so until the end of the test.

B-1.1.3 Clean metal contacts shall be applied to the wetted areas so that the contact area is approximately the same size as but not greater than the wetted area.

B-1.1.4 The surface of the product shall not be deformed either during the application of the contacts or during the test.

B-2. TESTING INSTRUMENTS

B-2.1 The test shall be carried out with an insulation tester having a nominal open circuit voltage of 500 V dc or with any suitable instrument known to give comparable results. For values of resistance above 10^6 ohms, an instrument with a nominal open circuit voltage of 1 000 V dc may be used.

The instrument shall be sufficiently accurate to determine the resistance within 5 percent and shall not dissipate more than 3 W in the specimen. The voltage shall be applied for no longer than is necessary to carry out the test in order to reduce the risk of overheating the test piece.

APPENDIX C

(*Clause* 6.2)

TESTS FOR ELECTRICAL CONDUCTANCE FOR FLOOR COVERING MATERIAL

C-1. The test is performed on one surface. Apply liquid electrodes to two areas, each approximately 25 mm^2, located on the same surface to be tested and situated so that the dry distance between the facing edges is 50 ± 6 mm. Apply the metal contacts to the wetted areas and measure the resistance.

BUREAU OF INDIAN STANDARDS

Headquarters:
Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002
Telephones: 323 0131, 323 8375, 323 9402
Fax : 91 11 3234062, 91 11 3239399

Telegrams : Manaksanstha
(Common to all Offices)

	Telephone
Central Laboratory:	
Plot No. 20/9, Site IV, Sahibabad Industrial Area, Sahibabad 201010	8-77 00 32
Regional Offices:	
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*Eastern : 1/14 CIT Scheme VII M, V.I.P. Road, Maniktola, CALCUTTA 700054	337 86 62
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