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मानक

IS 7193 (2013): glass fibre base bitumen felts [CED 41: Civil Engineering]





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Indian Standard GLASS FIBRE BASE BITUMEN FELTS — SPECIFICATION

(Second Revision)

ICS 91.100.10

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BUREAU OF INDIAN STANDARDS MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG NEW DELHI 110002 Water Proofing and Damp-Proofing Sectional Committee, CED 41

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Water Proofing and Damp-Proofing Sectional Committee had been approved by the Civil Engineering Division Council.

Glass fibre bitumen felts are suitable for use for water proofing and damp-proofing in buildings and other situations where penetration of moisture is to be stopped. This standard specifies the requirements for glass fibre base bitumen felts. It is an adjunct to IS 1322 : 1993 'Specification for bitumen felts for water-proofing and damp-proofing (*fourth revision*)'.

This standard was first published in 1973 and revised in 1994.

The significant modifications in this revision include:

- a) Incorporation of Amendment No. 1.
- b) The requirement of glass fibre mat has been modified.
- c) The requirement of glass fibre felt has been further elaborated and two new properties, namely tear strength and pliability have been added, that is which are important in the durability point of view.

This revision of the standard also brings it in line with the technical developments in the field apart from the incorporation of the existing amendment. All references have been updated to take care of latest revision of the referred standards.

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.

The composition of the Committee responsible for the formulation of this standard is given in Annex C.

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 GLASS FIBRE BASE BITUMEN FELTS — SPECIFICATION

(Second Revision)

1 SCOPE

This standard covers the requirements of self finished glass fibre base bitumen felts for use in water-proofing and damp-proofing.

2 REFERENCES

The standards listed in Annex A 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 agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 TERMINOLOGY

For the purpose of this standard the definitions given in IS 4911 shall apply.

4 CLASSIFICATION

Glass fibre base felts shall be classified depending upon their use as follows:

- a) *Grade 1* Glass fibre base bitumen felts for use in water-proofing.
- b) *Grade* 2— Glass fibre base bitumen felts for use in damp-proofing.

5 MATERIALS

5.1 Base Membrane

Fibre glass mat is used as the base membrane and shall be a thin flexible uniformly reinforced bonded mat, composed of chemically resistant borosilicate staple glass fibres, distributed in a random open porous structure, bonded together with a thermosetting resin (Phenolic type). The physical properties of the mat shall be as given in Table 1.

5.2 Bitumen

The bitumen serves as the coatant and shall have a softening point of not less than 105°C when tested in accordance with IS 1205 and penetration of not less than 7 at 25°C when tested in accordance with IS 1203.

5.3 Mineral Filler

The coatant may also consist of finely divided inert filler. The proportion of mineral inert filler shall depend upon the type and the weight of felt manufactured; but shall not exceed 40 percent by weight of the coating material. The filler shall be insoluble in water and should pass through 75 microns IS Sieve [*see* IS 460 (Part 1)].

5.4 Mineral Powder for Surfacing

5.4.1 Any of the following mineral powder shall be used for surfacing. Powdered mineral matter such as talc or mica passing through 600 microns IS Sieve [*see* IS 460 (Part 1)] or fine sand passing through 250 microns IS Sieve [*see* IS 460 (Part 1)] may be used.

5.4.2 The permitted quantity of the surfacing material 10 m^2 of the finished bitumen felt shall be 1.2 to 2.0 kg for mica, 1.5 to 2.25 kg for talc powder and 3 to 5 kg for fine sand.

Table 1 Requirements of Reinforced Glass Fibre Mat (Base Membrane) (Clause 5.1)

| Sl No. | Characteristic | Requirement | Method of Test, Ref to |
|-------------------|---|---|------------------------------|
| (1) | (2) | (3) | (4) |
| i) ii) iii) | Weight, gm/m ² , <i>Min</i> Nominal thickness, mm Breaking load, N/cm, <i>Min</i> : | 40 0.50 <u>+</u> 0.1 | B-1 B-2 |
| iv) | Longitudinal direction Tear strength (warp/ weft way), N, <i>Min</i> | 22.80 100 | B-3 B-4 |
| v) | Porosity (at an air velocity of 1 m/s), mm | 0.6-1.9 | B-5 |
| vi) | Temperature resistance | Shall be unaffected under load in hot bitumen at 285 ± 5 °C for 1 min | B-6 |
| vii) | Pliability | No cracking when bend over a 3 mm radius after immersing in water at 23 ± 1 °C for 10 min through a 90° arc | B-7 |

6 MANUFACTURE

The bitumen glass fibre base felt consists of a

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continuous mat of resin bonded glass fibres treated with bitumen. The coatant shall be uniformly applied. The resultant coated felt shall be given a superficial application of mineral powder to prevent the layer of the coated felt sticking together in the roll.

7 PHYSICAL REQUIREMENTS

7.1 Dimensions

Unless otherwise specified, glass fibre base bitumen felt shall be supplied in widths of 1 m and generally in lengths of 1 m, 10 m or 20 m.

7.2 Weight

The weight of the constituents used in the manufacture of glass fibre base bitumen felts for 10 m^2 shall not be less than those specified in Table 2.

Table 2 Minimum Weight (in kg) of ConstituentsGlass Fibre Base Bitumen Felts for 10 m2

| Sl No. | Type of Felt | Untreated Base Membrane | Coatant | Bitumen | Total Weight of the Finished Felt in Dry Condition (Including Surfacing Materials) |
|-----------|--------------------|-------------------------------|--------------|--------------|--|
| (1) | (2) | (3) | (4) | (5) | (6) |
| i) ii) | Grade 1 Grade 2 | 0.4 0.4 | 15.3 22.0 | 14.3 21.0 | 18.0 25.0 |

7.2.1 Method

For determining the weight, select at random the number of glass fibre felt rolls as indicated in col 2 of Table 4. The randomness of selection is ensured by following the procedure as specified in IS 4905. The average weights of the rolls selected above shall then be taken to represent the weight of the rolls in the consignment and the weight for 10 m^2 computed from this weight.

8 OTHER REQUIREMENTS OF GLASS FIBRE FELTS

Bitumen felts when tested in accordance with the appropriate tests shall conform to the requirements given in Table 3.

9 SAMPLING AND CRITERIA FOR CONFORMINTY

9.1 Sampling

9.1.1 Lot

All the rolls of the same grade and from the same batch of manufacture, in one consignment shall constitute a lot.

9.1.1.1 The conformity of the lot to the requirements of this standard shall be determined on the basis of the inspection and tests carried out on the samples selected from the lot.

9.1.2 The number of rolls to be selected from a lot shall depend upon the size of the lot and shall be in accordance with col 1 of Table 4.

9.1.2.1 These rolls shall be selected at random from the lot, and in order to ensure randomness of selection, procedures given in IS 4905 may be followed.

9.1.3 Test Samples and Number of Tests

9.1.3.1 All the rolls of selection in **9.1.2** shall be inspected for width, length and visible external defects.

Table 3 Requirements of Glass Fibre Felts

(Clause 8)

| Sl No. | Characteristic | Requirement | Method of Test, Ref to |
|-----------|----------------------------------|--|------------------------|
| i) | Breaking load, kg, Min | a) Warp 50 | IS 13826 (Part1) |
| | | b) Weft 30 | IS 13826 (Part1) |
| ii) | Pliability at 23 <u>+</u> 1 °C | a) Roll shall not show cracks on unrolling | IS 13826 (Part 2) |
| | | b) Consider any surface rupture exceeding 3 mm in length as failure | IS 13826 (Part 2) |
| iii) | Storage sticking | The test pieces shall be examined after cooling. After release of load, the layers of felt be capable of being separated without damaging. | IS 13826 (Part 3) |
| iv) | Pressure head | The test pieces shall show no sign of leakage. | IS 13826 (Part 4) |
| v) | Heat resistance at 68 ± 2 °C | The test pieces shall show no sign of melting of bitumen compound | IS 13826 (Part 5) |
| vi) | Water absorption, percent, Max | 2.0 | IS 13826 (Part 6) |

| Table 4 Sample Size and | Criterion for Conformity |
|-------------------------|---------------------------------|
| [Clauses 7.2.1, 9.1.2, | 9.1.3.2 and 9.1.4 (a)] |

| No. of the Roll in the Lot (1) | No. of Rolls to be Selected in the Sample (2) | Permissible No. of Defective Rolls (3) | Sub-sample Size No. of Rolls to be Selected (4) |
|--------------------------------------|---|--|---|
| Up to 100 | 5 | 0 | 2 |
| 101-150 | 8 | 0 | 3 |
| 151-300 | 13 | 0 | 4 |
| 301-500 | 20 | 1 | 5 |
| 501-1 000 | 32 | 2 | 6 |
| 1 001-3 000 | 50 | 3 | 8 |
| 3 001 and above | 80 | 5 | 10 |

9.1.3.2 The number of rolls to be tested for breaking strength, pliability, storage sticking, heat resistance, water absorption and pressure head, shall be in accordance with col 4 of Table 4. These rolls shall be taken at random from those inspected under **9.1.3.1** and satisfactory for dimensions. From each of these rolls, one test sample of 3 m long and the full width of the felt shall be cut out for preparing test specimens. Test samples shall not be taken from damaged portion of the roll, if any. The required number of test specimens shall be taken from each of the test sample and subjected to the corresponding tests.

9.1.4 Criteria of Conformity

The lot shall be considered to be in conformity with the requirements of the standard, if the following conditions are satisfied:

- a) The number of rolls found defective with respect to any characteristic mentioned in **9.1.3.1** does not exceed the corresponding number given in col 3 of Table 4.
- b) From the observed values of the breaking strength, the average (\bar{x}) and the range (R)are calculated for each direction (that is, warpway and weftway) separately, and the value of the expression \bar{x} -0.6 *R* is found to be greater than or equal to the applicable specified value.

NOTES

1 Average (\overline{x}) is the value obtained by dividing the

sum of the observed values by the number of observed values.

2 Range *R* is the difference between the maximum and minimum in a set of observed values.

- c) All the sample rolls tested for water absorption shall satisfy the condition of water absorption given in Table 3 individually.
- d) For all the other characteristics mentioned in **9.1.3.2** (except breaking strength and water absorption), all the test pieces shall satisfy all the requirements of the characteristics individually.

10 PACKING

Unless otherwise specified, glass fibre base bitumen felts shall be securely packed in rolls. The bitumen felts need not be wound on core but shall be securely wrapped in a craft paper of the same width as the fabric. The wrapper shall completely encircle the roll and shall be pasted at the overlap in a manner that will prevent it from opening out. The ends of the roll need not be covered.

11 MARKING

11.1 Each package shall be legibly and indelibly marked with the following:

- a) Identification of the source of manufacture;
- b) The country of manufacture;
- c) Grade of the glass fibre base bitumen felts;
- d) Length, width and weight of the roll; and
- e) Batch number in code and date of manufacture.

11.2 BIS Certification Marking

Each package may also be marked with the Standard Mark.

11.2.1 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.

ANNEX A

(Clause 2)

LIST OF REFERRED INDIAN STANDARDS

| IS No. | Title | IS No. | Title |
|----------------|--|-----------------------|------------------------------------|
| 460 (Part 1) : | Specifications for test sieves: Part 1 | 13826 | Methods of tests for bitumen based |
| 1985 | Wire cloth test sieve (third revision) | | felt: |
| 1203 : 1978 | Methods for testing tar and bitumen: | (Part 1): 1993 | Breaking strength test |
| | Determination of penetration | (Part 2): 1993 | Pliability test |
| 1205 : 1978 | Methods for testing tar and bitumen: | (Part 3) : 1993 | Storage sticking test |
| 1005 1000 | Determination of softening point | $(Part 4) \cdot 1993$ | Pressure head test |
| 4905 : 1968 | Methods for random sampling | (1 uit 1): 1))) | i lessure neue test |
| 4911 : 1986 | Glossary of terms relating to | (Part 5) : 1993 | Heat resistance test |
| | bituminous water proofing and damp- | (Part 6) : 1993 | Water absorption test |
| | proofing of ounding materials | | |

ANNEX B

(Table 1)

TEST METHODS FOR PROPERTIES OF GLASS FIBRE MAT

B-1 METHOD OF TEST FOR DETERMINATION OF WEIGHT OF GLASS FIBRE MAT

B-1.1 Test Piece

Cut out approximately about 2 m from the roll. Measure and cut a sample exactly 1 000 mm \times 1 000 mm.

B-1.2 Procedure

Weigh the sample in a balance having an accuracy of 0.5g and record the results.

NOTE — For easier weighing, the piece of $1\ 000\ \text{mm} \times 1\ 000\ \text{mm}$ may be cut in smaller sizes and weighed together.

B-2 METHOD OF TEST FOR DETERMINATION OF MAT THICKNESS

B-2.1 Principles

The thickness of glass fibre mat is determined by placing sample on a glass plate, and a metallic cylinder of foot and anvil area both 6.45 cm² exerting a pressure of 35 g/cm² and measuring the deflection in dial gauge having a least count of 0.01 mm (*see* Fig. 1).



FIG. 1 Arrangement for Measurement of Thickness

B-2.2 Equipment

- a) Stand with glass plate;
- b) Lifting mechanism;
- c) Metallic cylinder, weighing 227g; and
- d) Dial gauge with clamp.

B-2.3 Method

B-2.3.1 Place the cylinder on glass plate and set the gauge on the cylinder to read zero.

B-2.3.2 Cut approximately 1 000 mm \times 1 000 mm across the width.

B-2.3.3 Press the clamp to lift the metallic cylinder to allow for insertion of the sample and gently lower the cylinder to rest on the sample.

B-2.3.4 Measure the thickness at 12 equally spaced areas through a dial gauge having a least count of 0.01 mm. The loading given shall be 35 g/cm².

B-2.3.5 The average of 12 readings are taken as the mean thickness and recorded to the accuracy of 0.01 mm.

B-2.4 Calculation

Average the total number of readings and record to an accuracy of 0.01 mm.

B-3 METHOD OF TEST FOR TESTING BREAKING LOAD OF GLASS FIBRE MAT

B-3.1 Breaking Load

The breaking load is measured along the length of the reinforcement.

B-3.2 Test Pieces

Using a template cut 6 specimen of size $50.0 \text{ cm} \times 10.0 \text{ cm}$ from the mat with reinforcement along the longer side (*see* Fig. 2).

B-3.3 Procedure

B-3.3.1 For each of the samples cut two lengths of adhesive tape measuring approximately $30 \text{ cm} \times 5 \text{ cm}$.

Take sample No.1, wrap and stick each length of adhesive tape over the 10 cm wide ends. This is a precaution taken for the testing of a membrane material like RP tissue. The tape enables better gripping of the sample in the breaking machine gripping jaws.

B-3.3.2 Apply load along the length of the sample by moving the lower jaws of the testing machine away from the upper jaws at about 250 mm/min.

B-3.3.3 Note the breaking load as P1.

B-3.3.4 Repeat B-3.3.1 to B-3.3.3 for the other 5



FIG. 2 TEST SAMPLE FOR BREAKING LOAD

samples, and record it as P2, P3, P4, P5 and P6.

B-3.3.5 Average breaking load shall be calculated as follows:

$$P = \frac{P1 + P2 + P3 + P4 + P5 + P6}{6}$$

B-4 METHOD OF TEST FOR TESTING TEAR STRENGTH OF GLASS FIBRE MAT

B-4.1 Apparatus

Elmendorf type tearing tester as shown in Fig. 3. The machine is provided with two clamps; one fixed and the other movable which is carried on a sector shaped pendulum, suspended from a column by means of a frictionless bearing located near the apex of the sector. A means is provided to hold the pendulum in the raised position and a lever to release the pendulum instantaneously. On releasing the pendulum, the centre tongue of the specimen is subjected to the load of pendulum recorded through a spring loaded friction pointer on the circumferential scale marked on the pendulum.

B-4.2 Test Procedures

B-4.2.1 With a template, cut 10 specimens of size



FIG. 3 GENERAL VIEW OF ELEMENDORF TYPE TEARING STRENGTH TESTER

53 mm long and 63.0 ± 0.15 mm wide, taking all the plies to be torn together from a single sheet.

B-4.2.2 Raise the pendulum sector to its initial position and set the point against its stop. Centre the specimen in the clamps with the bottom edge carefully set against the stops. Make the initial slit. Depress the pendulum stop quickly as far as it will go to release the pendulum. Hold down the stop until after the tear is completed and catch the pendulum on the return swing without disturbing the position of the pointer.

B-4.2.3 Make only one test per specimen, each specimen consisting same number of plies. Record the scale readings to the nearest half division, also record the number of plies used in the specimen.

B-4.2.4 Calculate the average tearing force in gramforce to tear a single ply as follows:

If the standard 1 600 kgf instrument with 0 - 100 scale is used, then

Average Tearing Force (GF) = $\frac{16 \times \text{Avg scale reading}}{\text{Number of plies}}$

B-4.2.5 Report results with tear parallel with the machine direction and tear perpendicular to machine direction.

B-5 METHOD OF TEST FOR TESTING POROSITY OF GLASS FIBRE MAT

B-5.1 Test Piece

Five specimens, in the size of the 250 mm \times 250 mm representative of the glass fibre mat shall be taken.

B-5.2 Apparatus

The apparatus shall consist essentially of a suction fan for drawing air through a known area of glass fibre mat, a circular orifice over which the mat to be tested can be clamped. A means of measuring the pressure drop across the mat, and means of measuring the volume of air flowing through the mat.

The clamp shall effectively eliminate edge leakage.

B-5.3 Procedure

Mount the test specimen between the clamp and the circular orifice with sufficient tension to draw the unsaturated glass fibre mat smooth. It shall not be distorted in its own plane. Draw conditioned air through the known area of the mat and through the calibrated flow meter at the rate of 1 m/s and record the pressure drop across the mat of water, in mm. Report the average of the test results for five test specimens.

B-6 METHOD OF TEST FOR TESTING TEMPERATURE RESISTANCE OF GLASS FIBRE MAT

B-6.1 Test Pieces

Three test specimens of dimension $300 \text{ mm} \times 75 \text{ mm}$ with reinforcement along the longer sides shall be taken.

B-6.2 Apparatus

The apparatus required consists of a dish A and a loading frame B. This carries clamps C and D attached to a cord which over pulley P, carries a mass M (200 g). Two cross bars E of stainless steel of 10 mm outside diameter are so positioned that they are 10 mm above base levels (*see* Fig. 4).

B-6.3 Procedure

Fill the dish A with hot bitumen having approximate temperature of $285 \pm 5^{\circ}$ C to a level of 20 mm. Clamp 5 mm of one end of the specimen in clamp C and the other end in clamp D. Attach mass into the free end of cord. Ensure that specimen lies at right angle to cross bars E. Place the frame B in dish A. Visually observe it for 1 min for any cracks and breaks.

B-7 METHOD OF TEST FOR TESTING PLIABILITY OF GLASS FIBRE MAT

B-7.1 Test Piece

5 pieces of size 25 mm \times 203 mm with a long dimension parallel to the length of roll.

B-7.2 Procedure

Immerse the test piece in water at $23 \pm 1^{\circ}$ C for 10 min. Remove each specimen individually and bend over a 3.0 mm rod/tube through a 90° arc. Examine each specimen for cracks and breaks.



FIG. 4 TEMPERATURE RESISTANCE TESTING ASSEMBLY

ANNEX C

(Foreword)

COMMITTEE COMPOSITION

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VISAKHAPATNAM.

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