



CORPORATE PURCHASE SPECIFICATION

AA 222 16

Rev. No. 03

PREFACE SHEET

PHENOLIC LAMINATED COTTON FABRIC SHEET GRADE- F4

FOR INTERNAL USE ONLY
REMOVE THIS PREFACE BEFORE ISSUE TO SUPPLIERS

Comparable Standards:

1. Indian : IS: 2036 - 1995 , Grade F 4 (Reaffirmed - 2000)

Suggested/Probable suppliers and grades:

1. Bekalite Hylam	Hyderabad
2. Formica India	Pune
3. Permal Wallace	Bhopal

User Plant References:

1. BHOPAL	: PS 2216-A & MCR 6101
2. HEER, HARDWAR	: 0503-402
3. HYDERABAD	: LAM 2048

Revisions :

Cl: 32.2.2 & 32.4.36 of MOM of MRC-E

APPROVED :

INTERPLANT MATERIAL
RATIONALISATION COMMITTEE -MRC (E)

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BHOPAL

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October, 1978



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PHENOLIC LAMINATED COTTON FABRIC SHEET GRADE- F4

1.0 GENERAL:

This specification governs the quality requirements of laminated sheet made from layers of cotton fabric using thermosetting phenolic resin as the bonding medium. The material has temperature index of at least 105.

2.0 APPLICATION:

Suitable for components used in indoor type electrical apparatus where in addition to mechanical properties, good electrical properties are also required.

3.0 COMPLIANCE WITH NATIONAL STANDARDS:

The material shall comply, in general, with the following standard and also meet the requirements of this specification.

IS: 2036 - 1995, (Reaffirmed 2000) : "Phenolic Laminated Sheets"
Grade: F 4

4.0 DIMENSIONS AND TOLERANCES:

4.1 Sizes:

Nominal thickness, width and length shall be stated on BHEL order.

4.2 Nominal Thickness, mm:

As given in table below:

However, other thicknesses are can also be ordered.

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**4.3 Tolerance on Thickness:**

Nominal Thickness, mm	Tolerance (\pm) mm	Nominal Thickness, mm	Tolerance (\pm) mm
-	-	12.0	0.76
-	0.18	14.0	0.84
0.8	0.19	16.0	0.91
1.0	0.20	20.0	1.06
1.2	0.21	25.0	1.24
1.6	0.24	30.0	1.41
2.0	0.27	35.0	1.56
2.5	0.31	40.0	1.71
3.0	0.34	50.0	1.87
4.0	0.40	60.0	2.42
5.0	0.45	70.0	2.80
6.0	0.50	80.0	3.20
8.0	0.59	90.0	3.60
10.0	0.68	100.0	4.00

4.4 Tolerance on Width and Length:**Width or Length, mm****Tolerance, mm**

Below 1000

 ± 35

Above 1000

 ± 50 **4.5 Flatness:**

This is applicable to sheets of thickness 3mm above. The flatness of sheets shall be such that when a sheet is placed without restraint on a flat surface, concave side, if present up, departure at any point of the surface from a light straight edge laid in any direction upon it shall not exceed the following:

- 0.50 mm under a 300 mm straight edge.
- 3.00 mm under a 360 mm straight edge.
- 6.00 mm under a 1000 mm straight edge.

5.0 FINISH:

The surface of the sheets be even, smooth, free from visible defects like blisters, loose fibres, resin concentration, delamination, wrinkles, local deformation and dents. The material shall be supplied with trimmed edges and the colour shall be preferably natural tan or natural brown.

**6.0 TEST METHODS:**

Unless other wise specified, the tests shall be conducted in accordance with the relevant methods specified in BHEL standard AA 085 17 01.

7.0 TEST SAMPLES:

Three sheets of ordered thickness and size 300 X 300 mm, prepared from the same batch shall be supplied for testing.

8.0 PHYSICAL PROPERTIES:**8.1 Water Absorption:**

Maximum permissible water absorption after immersion in water 20⁰C for 24 hours shall be as follows:

Nominal thickness, mm	Mg., max	Nominal thickness, mm	Mg., max
0.8	133	6.0	183
1.0	136	8.0	194
1.2	139	10.0	204
1.6	145	12.0	214
2.0	151	14.0	224
2.5	157	16.0	234
3.0	162	20.0	253
4.0	169	25.0	277
5.0	176	* Above 25	277

* Thickness above 25mm shall be machined down to 25±2.5mm keeping one side intact.

8.2 Resistance to Hot Oil:

When a specimen is immersed in hot oil at 110±2⁰C for 24 ± 1 hours, it shall not show any sign of splitting, blistering, disintegration or appreciable warping.

8.3 Heat Ageing:

When a test piece of 100 x 100mm of ordered thickness is kept at 125±2⁰C for 24 ± 1 hours and then cooled, it shall not show any sign of crumbling, cracking or blistering.

**9.0 MECHANICAL PROPERTIES:****9.1 Cross Breaking Strength:**

For sheets 1.5mm thickness and above: 100 N/mm², min.

9.2 Shear Strength, Flatwise:

For sheets 1.5mm thickness and above: 65 N/mm², min.

9.3 Impact Strength Charpy Edgewise:

For sheets above 5mm thickness: 7.0 kgcm/cm², min.

9.4 Splitting Load Edgewise:

For sheets 10mm thickness and above: 3.0 kN, min.

9.5 Punching:

This is applicable for sheets below 2.5mm thickness. When the sheet under test is pierced in a single operation with a pattern given in IS:1998, there shall be no excessive lifting or cracking around the holes.

9.6 Machinability:

This test shall be applicable for sheets of thickness 3mm and above. The sheet shall be capable of being sawn, milled, drilled and tapped with a M3.5mm tap and shall be capable of being shapped in a shaping machine without showing any signs of splitting, cracking or chipping.

10.0 ELECTRICAL PROPERTIES:**10.1 Insulation Resistance:**

Insulation resistance of sheets below 25mm thickness, after immersion in water at 20⁰C for 24 hours shall be 150 Megohms, min.

10.2 Proof Voltage in Oil at 90±2⁰C:**10.2.1 Flatwise:**

For sheets upto 3.0mm thickness:

Thickness, mm	Proof voltage, KV/mm
0.8	7.0
1.0	6.3
1.2	5.8
1.6	5.1
2.0	4.6
2.5	4.2
3.0	4.0



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10.2.2 Edgewise:

For sheets above 3mm thickness: 15 KV.

11.0 TEST CERTIFICATES:

Unless otherwise specified, three copies of test certificates shall be supplied alongwith each consignment .

In addition, the supplier shall ensure to enclose one copy of the test certificate along with their despatch documents to facilitate quick clearance of the material.

The test certificate shall bear the following information:

AA 22216 (Rev.No 03): Phenolic Laminated Cotton Fabric Sheet Grade F4

BHEL order No.

Batch/Lot No.

Test Values obtained and certificate for compliance with clauses 8 to 10.

12.0 PACKING AND MARKING:

Identification slips shall be pasted suitably on all corners of each board/sheet giving the size of the board and manufacturers code number. The boards shall be sealed in a polythene sheet which shall then be covered all round with water proof bituminised brown paper and packed in wooden crate.

AA 22216: Phenolic Laminated Cotton Fabric Sheet Grade F4

BHEL order No.

Manufacturer's / Supplier's Name

Grade/Trade mark, if any

Batch/Lot No.

Thickness, Width & Length

No. of sheets

Net weight and Gross weight

13.0 REFERRED STANDARDS (Latest Publications Including Amendments) :

1) IS:1998

2) IS:2036

3) AA 085 17 01