

**KRAFT INSULATING PAPER - MEDIUM AIR PERMEABILITY****1.0 GENERAL:**

This specification governs the quality requirements of kraft Insulating Paper for electrical purposes made entirely from soft-wood pulp manufactured by the sulphate process. The paper shall be manufactured in natural colour (undyed) and shall be free from metallic particles. The material in insulating oil shall have a temperature index of at least 105.

2.0 APPLICATION:

Used in power and instrument transformer windings, oil impregnated paper bushings and as a base paper for low phenolic coated hard kraft paper to AA 22112 and crepe kraft paper to AA 21117 and BP 21179.

3.0 COMPLIANCE WITH NATIONAL STANDARDS:

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

IS: 9335 (Part 3/Sec.5)-1985 | Cellulosic paper for electrical purposes. Part3: Spec.
Gr.: 5B2-2M3 | for individual materials. Sec.5: Special papers.

IEC 60554-3-5 - 1984 | Cellulosic paper for electrical purposes. Part3: Spec.
Gr.: 5B2-2M3 | for individual materials. Sec.5: Special papers.

4.0 DIMENSIONS AND TOLERANCES:**4.1 Sizes:**

Thickness and width shall be as stated on BHEL order.

4.2 Thickness And Tolerances:

Nominal Thickness and Tolerances shall be in accordance with IEC 60554-3-5, as shown below:

<u>Nominal Thickness, micron</u>		Tolerance, ±%
Over	Upto & Includ.	
-	75	10
75	105	7
105	125	6
125	-	4

Revisions :

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INTERPLANT MATERIAL
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4.3 Width:

915, 1525, 1780, 2030, 2285, 2540, 2795, 3050, 4050 mm with a tolerance of ± 5 mm.
However any other width can also be ordered.

5.0 FINISH:

The paper shall have smooth but unglazed surface.

6.0 TEST METHODS:

Unless other wise specified, the tests shall be conducted in accordance with the relevant methods of IEC 60554-2/IS:9335 Part 2.

7.0 SAMPLE FOR TEST:

20 sheets of size 300 X 300 mm of ordered thickness suitably packed shall be supplied for testing and approval purposes. Machine direction shall be marked clearly on all the sheets.

8.0 PHYSICAL PROPERTIES:

8.1 Substance (grammage):

Nominal Thickness (μm)	Substance (g/m^2)	Tolerance ($\pm\%$)
25	20	10
50	40	10
65	52	5
75	60	5
90	72	5
125	100	5
180	144	5
190	152	5

Note: Substance for intermediate thickness shall be 0.8 times of the thickness, in micron.

8.2	Apparent Density	:	$0.80 \pm 0.05 \text{ g/cm}^3$
8.3	Moisture Content	:	8%, max.
8.4	Water absorption	:	10 mm, min.
8.5	Air permeability	:	0.2 to 0.5 $\mu\text{m/Pa.S}$



9.0 MECHANICAL PROPERTIES:

9.1 Tensile Strength (Expressed as tensile index):

Machine Direction (MD)	:	93 Nm/g, min.
Cross Direction (XD)	:	35 Nm/g, min.

9.2 Heat Stability (Type Test):

Paper shall be heated in air at $120^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 168 hours and following requirements shall be met.

- Increase in Conductivity of aqueous extract shall not be more than 23 ms/m.

9.3 Tear Index:

The material when tested shall show a minimum Internal Tearing Resistance as shown below, expressed as Tear Index.

Weight, g/m^2		Machine Direction, $\text{m N m}^2 / \text{g}$, min	Cross Direction, $\text{m N m}^2 / \text{g}$, min
Above	Upto & Includ.		
30	80	5.0	6.0
80	120	6.0	7.0
120	-	8.0	9.0

10.0 ELECTRICAL PROPERTIES:

10.1 Electric strength in air:

Thickness, micron		BDV, (kV/mm), min.
Above	Upto & Includ.	
-	90	7.5
90	125	7.0
125	-	6.5

Electric Strength shall be determined at room temperature after drying the paper for 1 to 2 hours at $105^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and then tested within 2 minutes of removal from the oven.

11.0 CHEMICAL PROPERTIES:

11.1	Ash Content	:	1%, max.
11.2	Conductivity of 5% aqueous extract	:	10 mS/m, max.
11.3	pH of 5% aqueous extract	:	6 to 8



12.0 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 21110 (Rev.No 06): Kraft Insulating Paper - Medium Air Permeability.

BHEL order No.

Manufacturer's/Supplier's Name.

Batch/Lot No.

Thickness & Width.

Net weight/No. of rolls.

Test values obtained and certificate for Physical, Mechanical, Electrical and Chemical Properties called for in this specification.

13.0 PACKING AND MARKING:

The paper shall be supplied in rolls tightly wound on suitable single piece hollow formers of strong straw board with 90 mm inside diameter. The rolls shall be adequately wrapped with suitable sea-worthy packing for transit through tropics so as to prevent any moisture ingress or damage to the roll. The ends of the rolls shall be protected during packing to avoid any radial or telescopic deformation. The paper shall normally be supplied in one continuous length and in no case the number of lengths shall exceed two. In such a case the number of lengths shall be indicated by a tag projecting from one end of the roll. For 190 μ m thick paper, the outside dia of the roll shall be between 500-610 mm and for other thickness the outside dia and the weight for the roll shall be as stated on the order.

Each roll shall be clearly and indelibly marked with the following information:

AA 21110: Kraft insulating Paper-Medium Air permeability.

BHEL order No.

Manufacturer's / Supplier's Name

Batch/Lot No.

Thickness, Width and outside diameter.

Net weight.

14.0 REFERRED STANDARDS (Latest Publications Including Amendments) :

- 1) IS:9335, Part 2 &3
- 2) IEC 60554-3-5 and IEC 60554-2
- 3) AA 21112
- 4) AA 21117