	CORPORATE PURCHASING SPECIFICATIONS	AA 22001 Rev. No.02 PREFACE SHEET

UNIMPREGNATED DENSIFIED LAMINATED WOOD-LOW DENSITY

FOR INTERNAL USE ONLY

REMOVE THIS PREFACE SHEET BEFORE ISSUE TO SUPPLIERS

Equivalent Standards :

Suggested/Probable Suppliers and Grades:

1.0 M/s.Permali Wallace, Bhopal - Pernawood Lv/67/60
2.0 M/s. western India Plywood, Kerala - wiplam WI (LD) 2

User plants & Replaced Plant Specifications / References:

BHOPAL	PS 22001 B
JHANSI	PS 22001 B

Revisions: Ref: C 1.34.1.25 of MOM of MRC (E)			**APPROVED:** INTERPLANT MATERIAL RATIONALISATION COMMITTEE – MRC(E)		
Rev. No.02	Amd. No.	Reaffirmed	Prepared	Issued	Dt. of 1st Issue
Dt:01-01-1998	Dt:	Year: 2007	HEP, Bhopal	Corp. R&D	01.05.1980

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UNIMPREGNATED DENSIFIED LAMINATED WOOD-LOW DENSITY

1.0 GENERAL:

This specification governs the quality requirements of an unimpregnated densified laminated wood of low density, consisting of layers or cross laminated 2 mm thick wood veneers, bonded and densified under heat and pressure. The material in insulating oil has temperature index of at least 105.

2.0 APPLICATION:

Used for coil support ring, winding support flange, supporting cleates etc. in Transformers

3.0 COMPLAINCE WITH NATIONAIL STANDARDS:

There is no Indian Standard covering this type of material.

4.0 TEST METHODS:

Unless otherwise specified, the tests shall be conducted in accordance with the relevant methods of AA 085 17 01.

5.0 SAMPLE FOR TEST:

Two sheets of ordered thickness and size 500 x 500 mm prepared from the same batch, shall be supplied for testing and approval.

6.0 DIMENSIONS AND TOLERANCES:

Thickness, width, length of the laminated wood shall be stated on the order.

6.1 Preferred Thickens (mm):

10, 12, 14, 16, 20, 25, 30, 40, 45, 50, 60, 70, 75, 80, 90 and 100.

6.2 Tolerance on Nominal Thickness:

Nominal thickness (mm)	Above Up to & Including	Tolerance (±)(mm)
10	25	0.8
25	40	1.0
40	50	1.25
50	-	1.5

6.3 Tolerance on width Length:

± 3.5 mm.

7.0 PHYSICAL PROPERTIES:

7.1 Density, as received condition (IS : 1708):

0.90 – 1.09 g/cm^3

7.2 Moisture & Volatile Content:

7% Max.

Test Specimen (40 x 12mm x thickness of board) shall be dried at 145 ± 2ºC till the weight is constant. Thickness above 12 mm shall be machined down to 12 mm, keeping one surface intact.

7.3 Oil Absorption:

9%, Min.

Test specimen (100 x 100 mm x thickness of board) shall be dried at 105 ± 2ºC for 72 hours and then impregnated with insulating oil (IS: 335) at 90 ± 2ºC for 72 hours. Thickness above 12 mm shall be machined down to 12 mm, keeping one surface intact.

8.0 EFFECT OF OIL ON WOOD (TYPE TEST):

8.1 Sludge and Oil Acidity (Appendix – 1):

8.1.1 Increase in acidity: 0.1 mg KOH/g, Max.

8.1.2 Increase in Sludge content: 0.05% Max.

9.0 ELECTRICAL PROPERTIES;

9.1 Electric Strength (Proof) in Oil at 90 ± 2ºC:

Three test specimens shall be dried at 105 ± 2°C for 72 hours and, impregnated with insulating oil (IS: 335) at 90 ± 2°C 72 hours.

9.1.1 Flatwise:

4 k v/mm

Sample size shall be at least 150 x 150 mm x thickness of board. However thickness above 12 mm shall be machined down to 12mm keeping one surface intact.

9.1.2 Edgewise:

60 kV

10.0 MECHANICAL PROPERTIES:

10.1 Tensile strength:

Along the grain 70 MPa, Min.

10.2 Cross Breaking Strength:

Along the grain : 90 MPa, Min.

Across the grain: 67 MPa Min.

10.3 Compressive Strength:

Flatwise: 160 MPa, Min.

The test shall be carried out on 20 x 20 mm x thickness of board. However thickness above 20 mm shall be machined down to 20 mm keeping one side intact.

11.0 TEST CERTIFICATES:

Unless otherwise stated, three copies of test certificates shall be sent along with each consignment.

In addition, the supplier shall ensure to send one copy of test certificates along with the dispatch documents to facilitate quick clearance of the material.

The test certificates shall bear the following Information:

AA 22001 : Unimpregnated Densified Laminated Wood -
(Rev.No.02) Low Density
BHEL order No.
Batch/LOt NO.
Thickness, Width & length
Net weight/No of boards
Test values obtained and certificate tor compliance with clauses 4, 7 to 10.

12.0 PACKING AND MARKING:

The laminated wood shall be suitably packed to prevent any damage during transit, Each package shall bear the following information:

AA 22001: Unimpregnated Densified Laminated wood – Low Density
BHEL Order No.

Manufacturer's Name & Grade.
Thickness, width & Length,
No, of boards/Components,
Net weight & Gross Weight.

13.0 REFERRED STANDARDS (Latest publications Including Amendments):

1. IS: 335 2. IS: 1708 3. AA 085 17 01

Appendix – I

Slug and Oil Acidity:

1. **Conditioning:** Condition the test piece for 168 hours in controlled atmosphere of 65 ± 5% RH and 27 ± 2ºC.

2. **Test Specimen:** Cut the specimen to dimension of 75mm x 12.5mm x Thickness.

NOTE: Thickness above 9 mm shall be machined to 9 mm.Both the surfaces shall be machined evenly to achieve thickness of 9 mm.

3. **Procedure:** Into a 150 mm x 25 mm test tube weigh 25 g of, transformer oil. Transformer oil complying with the requirements of IS 335 is suitable. Prepare the test specimen, weigh it to the nearest 0.01 g and introduce it into the oil. Lightly plug
the Mouth of the tube with cotton wool and place it in a constant temperature bath maintained at 100 ± 0.5º c for 164±1 hour.

Place a similar quantity of the same oil in a second tube and maintain this under the same conditions as a 'blank' sample.
At the end of the specified heating period, remove the tubes from the bath and allow them to cool to room temperature. If it can be seen that del agination has occurred, the specimen has failed. If there is no visible-n delaminating, determine the sludge content of the oil in which the pressboard has been impressed as follows.

Pour the oil into a 600 ml beaker and wash the test tube and pressboard sample with n-heptanes until oil-free, adding the washings to the oil in the beaker. Make the contents of the beaker up to approximately 300 ml with n-heptanes. cover the beaker with a watch glass and allow to stand in the dark for 24 hrs. At room temperature.

Filter the solution through a tared, dried, sintered glass filter, of no. 4 filter transferring all the sediment to the filter with the aid of n-heptane from a wash-bottle. Dry the filter at 105 ± 2ºC to constant mass. Express the amount of sediment as a percentage of the original sample mass.
Make the filtrate up to 500 ml in a measuring cylinder with n-heptane. Make the 'blank' sample up to 500 ml in a second cylinder- Determine the acid values of the heptane solutions as follows.

Place 60ml toluene and 40ml industrial methylated spirits(66 overproof) in a 600 ml conical flask.Add 2ml to 3 ml Alkali blue indicator solution(2% by mass in industrial methylated spirits and one drop of 0,1N hydrochloric acid),Neutralize this mixture, with 0.1N alcoholic hydrochloric potassium hydroxide '(KOH),to give a red colour which persists for 15 s .Add 100ml of the above filtrate to the neutralized solvents and titrate to the same and point with the 0.1N alcoholic KOH.Repeat the titration on 100 ml of the' blank' solution.

Results: Calculated the increases in the acid value of the oil per gram of pressboard in mg KOH//g from the expression.

$$\text{Increase in acid value} = \frac{(t_2 - t_1) \times 5.61 \times 5}{W}$$

Where

T_1 is the number of millitres of 0.1n KOH required to neutralize 100 ml n-heptane in blank solution.

T_2 is the number of millitres of 0.1n KOH required to neutralize 100 ml of filtrate: and

W is the sample mass of laminated pressboard (grams).

Report the acid value of the 'blank' oil together with the increase in acid value due to the sample as calculated from the above equation. Report also the percentage sludge produced by the sample.