

**FIBRE GLASS EPOXY MOULDINGS****1.0 GENERAL:**

This specification governs the quality requirements of Glass Fibre Reinforced High Pressure and High Temperature Epoxy Mouldings.

The epoxy mouldings shall have a very good resistance to oil, petrol and acids and the water extract of the material shall be neutral. The material shall have a temperature index of at least 155.

2.0 APPLICATION:

Used as lead insulation of a bar type windings (caps) etc., for Hydro - generators.

3.0 COMPLIANCE WITH NATIONAL STANDARDS:

There is no Indian standard covering this material.

4.0 DIMENSIONS AND TOLERANCES:

Shall be as stated on the order or the drawing accompanying BHEL order.

5.0 COMPOSITION:**5.1 Glass Chopped Strand Mat:**

The epoxy mouldings shall be based on chopped strand glass fibre type E-silane finished and treated with epoxy resin using hardener, additives like curing agents, lubricants, plasticizers etc., added in suitable proportions keeping in view the required properties and moulding conditions. However these additives should not have any detrimental effect on the properties and performance of mouldings.

Glass fibre shall be thoroughly dried before use to remove moisture.

5.2 Resin :

Bisphenol A based liquid epoxy resin having epoxy equivalent of 180 to 200, with appropriate hardener for temperature index 155.

or

Novalak epoxy resin of low molecular weight having epoxy equivalent of 175 to 200, with appropriate hardener for temperature index 155.

Revisions :

Cl: 32.4.45 of MOM of MRC-E

APPROVED :

INTERPLANT MATERIAL
RATIONALISATION COMMITTEE-MRC (E)

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**5.3 Diluents and Viscosity Reducers:**

Not to be used.

6.0 MOULDING CONDITIONS:

Moulding temperature : $155 \pm 5^{\circ}\text{C}$
 Specified mould pressure : $3.0 \pm 0.5 \text{ N/mm}^2$
 Moulding time : 15 minutes, approx.
 Post curing of components/sheets : 6 to 8 hours at 140° to 150°C

Note: However, supplier may furnish recommended moulding schedule.

7.0 FINISH:

Shall be pure, smooth, compact, bright surface and shall be free from cracks, blisters, gas pockets, foreign inclusions etc., and with bond uniformly distributed.

8.0 TEST SAMPLES:**8.1 Tests On Moulded Sheets:**

Three moulded sheets of size $3 \pm 0.25 \times 300 \times 300 \text{ mm}$ and one sheet of $10 \pm 0.5 \text{ mm}$ thick and size 300×300 prepared from the same batch shall be supplied for testing and approval purposes.

8.2 Tests On Components:

Number of test samples and tests to be conducted shall be as mutually agreed upon between BHEL and supplier.

9.0 PROPERTIES:

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

9.1 Physical:

9.1.1 Specific Gravity : 1.8 ± 0.1

9.1.2 Water absorption : 0.2%, max.

9.1.3 Bond Content : $40 \pm 4\%$

Shall be determined by burning the bond at 600°C for sufficient time.

9.1.4 Marten's Heat Distortion Temperature:

155°C minimum.

**9.2 MECHANICAL:**

- 9.2.1 Tensile Strength** : 80 N/mm² minimum
- 9.2.2 Cross Breaking Strength** : 120 N/mm² min.
- 9.2.3 Compression Strength** : 130 N/mm² minimum
- 9.2.4 Impact Strength - Charpy - Flatwise** : 30 kJ/m² minimum

9.3 ELECTRICAL:**9.3.1 Electric Strength (Proof) In Oil At 90⁰C - Flatwise:**

This test shall be carried out on 3 mm thick sheet.

As received : 10kV/mm

At 90⁰ after ageing at 155⁰±2C in air for 100 hrs : 10 kV/mm

9.3.2 Volume Resistivity 'As Received':

10¹² ohm - cm minimum

9.3.3 Surface Resistivity:

10¹² ohm - minimum

10.0 Shrinkage (For information only):

0.15% maximum.

Components shall be placed in an oven after measuring dimensions and temperature increased to 155⁰C as rapidly as possible. The temperature shall be maintained for a period of 16 hours. Then the components shall be cooled rapidly to room temperature and then subjected to relative humidity of 95 to 100% at room temperature. Components shall be maintained under this condition for 6 hours.

Components shall be subjected to six cycles as stated above. The dimensions shall be measured after this and percentage shrinkage shall be computed.

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 224 21

Rev. No. 03

PAGE 4 OF 4

CORPORATE PURCHASING SPECIFICATION



AA 22421 (Rev.No 03): Fibre glass epoxy mouldings.
BHEL Order No.
Manufacturer's name and Trade mark
Batch/Lot
Quantity supplied
Test results of clauses 4.0, 5.0, 6.0, 9.0 and 10.0.

11.0 PACKING AND MARKING:

The mouldings shall be suitably packed to avoid contamination and damage during transit transit and storage. Packings shall be labeled with the following information:

AA 22421: Fibre glass epoxy mouldings.

BHEL order No.
Manufacturer's / Supplier's Name
Trade mark, if any
Drawing and Item Nos.
Quantity supplied
Batch/Lot No.
Net weight and Gross weigh.

12.0 REFERRED STANDARDS (Latest Publications Including Amendments) :

1) AA 085 17 01