



CORPORATE PURCHASING SPECIFICATION

AA 224 21

Rev. No. 03

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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)

Rev. No. 03

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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.



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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 90°C - Flatwise:

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

As received : 10kV/mm

At 90° after ageing at 155° ±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 155°C 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 along with 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:

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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



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1.0 MATERIALS

The materials of below mentioned vendors shall only be used for making components :

1.1 Resins and Hardeners

- M/s Atul Ltd., Ahmedabad
- M/s Huntsman International (India) Pvt. Ltd., Mumbai
- M/s Hexion B.V. Netherland
- M/s Resinova Chemie Ltd., Kanpur
- M/s Hindusthan Speciality Chemicals Ltd., Mumbai
- M/s Grasim Industries Ltd.(Aditya Birla Group)
- M/s Fine finish Organics, Mumbai
- M/s KUKDO, Korea

1.2 Glass material and Glass cloth

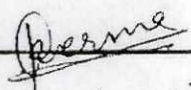
- M/s Binani
- M/s Owens
- M/s Fibre Glass Insulation, Bhopal
- M/s Glass Fibre Textiles, Bhopal

1.3 Epoxy Glass Fibre Laminate Sheets

- M/s Permalli Wallace, Bhopal
- M/s Surendra Composites Pvt. Ltd., Mandideep
- M/s D.K.Insulation, Bhopal
- M/s Fibre Polyglass, Karnataka
- M/s Micaply, Mandideep
- M/s Glass Fibre & Allied Industries, Mumbai
- M/s Texplas (India) Pvt. Ltd.
- M/s Lamtuf Plastics Ltd., Hyderabad
- M/s Sahney Kirkwood (P) Ltd., Nasik

2.0 IMPORTANT NOTES FOR SUPPLIER

- Supplier to confirm meeting drawing requirements i.e. dimensions, technical requirements, tolerance etc. Any deviations shall be clearly broughtout in the offer.
- Supplier to confirm meeting specification requirements of AA 22414 /AA 22415 /AA 22417 /AA 22421/ BP 22484/ BP22495 as applicable.
- Supplier to confirm meeting inspection requirements as per QSP/HG/102 ,QSP/HG/103, QSP/HG/112 whichever is applicable as per enquiry/P.O.


(P.K. Verma)



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3.0 CRITERIA FOR ACCEPTANCE

- Compliance certificate furnished by the supplier for drawing, specifications and QSP as applicable.
- Internal test certificates furnished by the supplier.
- BHEL / Third party inspection report.
- Test reports for any of the tests as per specification carried out at BHEL TSD.
- Type test certificate as applicable from NABL approved laboratory not prior than 2 years from P.O. date.

4.0 REJECTION

- Material is liable for rejection in part or full of the supplies which could not be tested due to random sampling and found defective or contains hidden defects which are noticed at the time of processing / assembly or during operation of the machine.

5.0 GUARANTEE

- The items shall be guaranteed for a period of 24 months from the date of dispatch or 12 months from the date of its actual use whichever is later against any material or manufacturing defects.

HYDROGENERATOR ENGINEERING DIVISION, BHEL BHOPAL

Revisions	Prepared by	Checked by	Approved by	Date of issue
Rev-02	P.K.Verma (P.K.Verma)	Gopal M (Gopal M)	A. Dixit (A. Dixit)	04.11.2016
Rev-01	Y.D.Yadav	Y.D.Yadav	J.K.Bhati	16.10.2006
Rev-00	Y.D.Yadav	K.V.Ajane	J.K.Bhati	19.09.2005



Q A PLAN FOR- INSULATION CAP P.I. No.- SHEET 2 OF 1

Q A PLAN NO.- QSG/HG /103 DT. 13/10/93 REV. 00 Dt. 13/10/93

QGX-9

SL NO	COMPONENT/ASSY. / OPERATION	CHARACTERISTICS	CLASS TYPE	QUANTUM	REF. DOC.	RECORD AGENCY	REMARKS
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Certification : Supplier shall furnish number of copies of test certificates as called in P.O. duly countersigned by BHEL or its authorised representative incorporating the following before despatched.

- Lot/Batch Identification.
- Result of test for physical, chemical, electrical, propf test.
- Dimensional record, postcuring record sheets.

Abbreviation : Maj - Major, V - Visual, D - Dimension, Cri - Critical, TC - Test Certificate
Supp - Supplier, Mech - Mechanical, Elect - Electrical, QC - Quality Control.

only/-

/rev/

PREPARED BY

CHECKED BY

APPROVED BY

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RPES

Dr. 13/10/22

REMARKS:

contd. 2/-

А. А. АРПРОД

(4) (b) (5) (A) (i) (3)

NUMBER

Handwritten: $X \sim O(1)$ with prob.

ANANDI BHOPAL,

