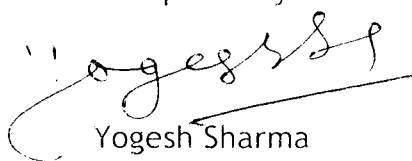


Purchase Specification for Fiber Reinforced Plastic Tubes

Spec. No : BHEL/DPD/CI/ERP III- 001- 2010
REV : 00
DATE : 30/06/2010
PAGE : 1 of 2

	Specification	Requirement	
1	Purpose	To manufacture Polymer composite insulators by Injection molding technique for products such as Composite Hollow Insulators up to 800kV for circuit breaker, CT, VT , Capacitor Housings, Power Transformers etc for Standard and polluted zones using catalyst based Liquid Silicone rubber compound (two part A & B system) and FRP tubes.	
2	Scope of Supply	Fully finished FRP (Fiber Reinforces Plastics) Tubes made by filament winding technique using uncut fibers, meeting the technical requirements as per Sl. No 3 of the Specification and mentioned in the concern drawings. The tubes should be post cured. Internal diameter side Polyester coating should be done if mentioned in the drawing.	
3	Technical requirements		
Sl. No.	Parameter	Reference Standard	Specified value
I.	Visual Examination	---	Tubes should be free from any defects like voids inconsistency of the material, deformation, crack etc.
II.	Dimensions	As per drawing	As per drawing
III.	Dye Penetration Test	IEC 61462 & IEC 61109	No Dye Penetration for 15 Minutes (minimum)
IV.	Flammability Test	IEC 60707	FV0
V.	Water absorption	DIN 53475	0.3 % Maximum
VI.	Water absorption, 100 ⁰ C	DIN 53479	0.3 % Maximum
VII.	Water diffusion test	IEC 61462	Leakage Current should not exceed 1mA and no puncture and surface flashover after applying 12 kV for one minute.
VIII.	Specific Gravity		1.3 ± 0.05
IX.	Tg Temperature	ASTM D 3418	120 ⁰ C
X.	Chemical Resistance		FRP Rod material should not react with Solvents (Not Phenole and Ketone), Mineral Oils and diluted acid, SF6 Gas
XI.	Tensile E-Modules Axial	ASTM D3039	52000 MPa
XII.	Tensile Strength Axial	ASTM D3039 / DIN 53453	1050 MPa
XIII.	Shear Strength	ASTM D 3846	15 MPa

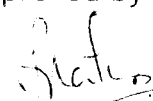
Prepared by



Yogesh Sharma
Manager

Composite Insulator

Approved by



S. Ravikumar
AGM

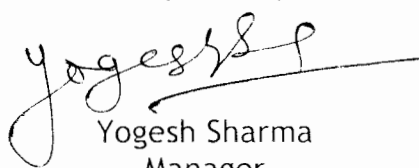
Quality, CI & NP

Purchase Specification for Fiber Reinforced Plastic Tubes

Spec. No : BHELEPD: C/FRP III: 001: 2010
REV : 00
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PAGE : 2 of 2

XIV.	Impulse Di-electrical Strength	DIN 53481	16 to 18 kV / mm
XV.	Di-electrical Strength Axial 50 Hz, 12.7mm ring section	DIN 53481	8 to 10 kV / mm
XVI.	Di-electrical Strength Transverse 50 Hz, 3 mm	DIN 53481	16 to 18 kV / mm
XVII.	Di-electrical Loss factor (Tg δ)	DIN 53483	0.30 TO 0.50 %
XVIII.	Relative Permittivity	DIN 53483	3.4 TO 3.6
XIX.	Mechanical test requirement of the FRP Tubes	As per Drawing	As per Drawing
4	Packing	Each FRP tube should be wrapped using Polythene sheet to avoid foreign material (like dust etc) deposition. Packing of the FRP Tube should be such that no damage (like scratch, dent, Bend, crack etc) should take place during transportation/transit.	
5.	Marking	Each tube should be marked with 1. Manufacturer's Name 2. Serial Number 3. Date of manufacture 4. Place of Manufacturing	

Prepared by


Yogesh Sharma
Manager

Composite Insulator

Approved by


S. Ravikumar
AGM

Quality, CI & NP

REV 00
3 987 14 50111
DRG No.

4028±0.5

123

123

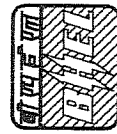
ø486
ø508.5
+0.1
-0.1
ø510

R5

NOTES:

1. MATERIAL SHOULD COMPLY WITH MATERIAL BHELPD:CIFRPHI:001:2010 LATEST REVISION IN GENERAL.
2. FRP TUBE TO BE FREE FROM SURFACE SCRATCHES,BENDS,FLAWS AND DENTS.
3. SHARP CORNERS TO BE ROUNDED OFF TO RADIUS R1.
4. PACKING: a) EACH FRP TUBE SHOULD BE WRAPPED WITH 5 mm THICK EXPANDED POLYSTYRENE SHEET FOR EXTRA CUSHIONING.
b) ALL INDIVIDUALLY WRAPPED TUBE SHOULD BE PACKED IN A WELL SEASONED WOOD FABRICATED CRATE OR CORRUGATED BOX ENSURING NO DAMAGES TO RODS.
5. ALL RELEVANT MARKINGS SHOULD BE LABELED OR PRINTED ON THE CRATE/BOX.
6. THE FRP TUBE SHALL HAVE MIRROR FINISH ON THE ID SURFACE.
7. INNER SURFACE OF THE FRP TUBE SHOULD BE COATED SUCH THAT NO REACTION TAKES PLACE BETWEEN FRP TUBE TO SF6 GAS OR OIL.

FERROUS PARTS ARE HOT-DIP GALVANIZED (EXCEPT FEMALE THREADS) AS PER IS:2829 & TESTS CONFORM TO IS:2633/IEC-383



BHARAT HEAVY ELECTRICALS LTD;
ELECTROPORCELAINS DIVISION
BANGALORE 560 012

DRN	N.CHIKKANNA	SIGN	DATE
CHD	S S P		29.06.10
APPD	S S P		29.06.10

DEPT	GRADE OF TOL DIM C/M/F	SCALE	WEIGHT (kg)	REF TO ASSY.DRG	ITEM No.	No.OF ITEMS
CODE		N T S	159 (Approx)			

TITLE	CARD CODE	DRAWING No.	REV.
FRP TUBE FOR COMPOSITE HOLLOW INSULATOR FOR 400 kV		3 987 14 50111	00

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REF. DRG. No.

SIGN AND DATE

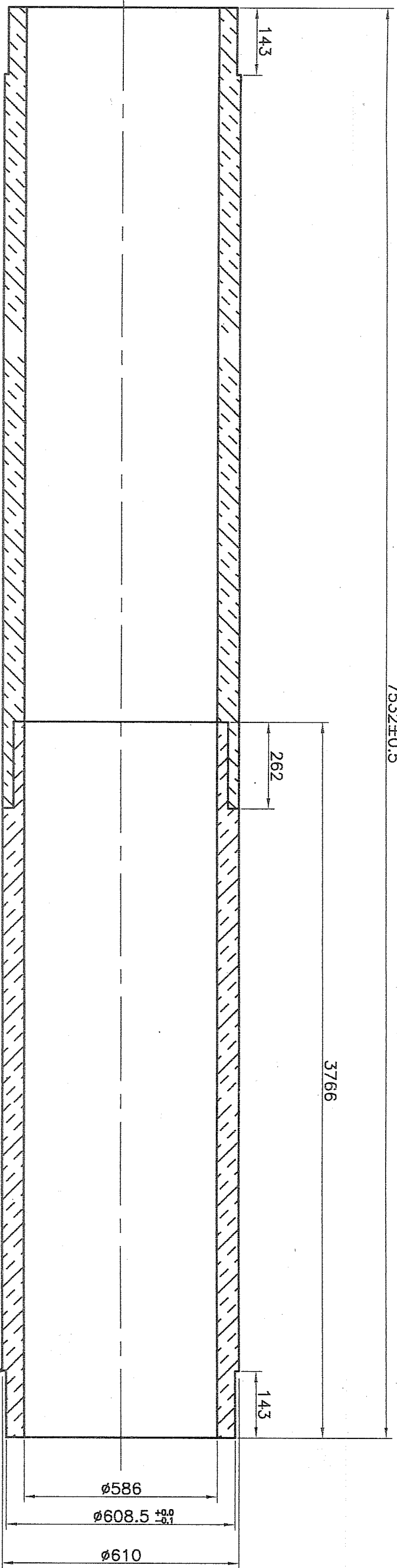
INVENTORY No.

No.OF SHEETS

SUPERSEDES DRG. No.

SHT.24 SIZE A3 420 x 297

REV 00
11105 81 2863
DRG



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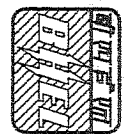
REF. DRG. No.

SIGN AND DATE

INVENTORY No.

- NOTES:
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 - c) ALL RELEVANT MARKINGS SHOULD BE LABELED OR PRINTED ON THE CRATE/BOX.
 5. THE FRP TUBE SHALL HAVE MIRROR FINISH ON THE ID SURFACE.
 6. INNER SURFACE OF THE FRP TUBE SHOULD BE COATED SUCH THAT NO REACTION TAKES PLACE BETWEEN FRP TUBE TO SF6 GAS OR OIL.
 7. SINGLE PIECE FRP TUBE PREFERRED OVER THE JOINTS ON FRP.

FERROUS PARTS ARE HOT-DIP GALVANIZED (EXCEPT FEMALE THREADS) AS PER IS:2629 & TESTS CONFORM TO IS:2633/IEC-383



BHARAT HEAVY ELECTRICALS LTD.
ELECTROPORCELAINS DIVISION
BANGALORE 560 012

DRN	NAME	SIGN	DATE
NCHIKKANNA			29.06.10
CHD	S S P		29.06.10
APPD	S S P		29.06.10

DEPT	GRADE OF TOL DIM	SCALE	WEIGHT (kg)	REF TO ASSY.DRG	ITEM No.	No.OF ITEMS
C/M/F		N T S	357 (Approx)			

TITLE	CARD CODE	DRAWING No.	REV.
FRP TUBE FOR COMPOSITE HOLLOW INSULATOR FOR 800 KV		3 987 18 50111	00

SUPERSEDES DRG. No.

SHT.24 SIZE A3 420 x 297

No.OF SHEETS

00

6592 SK 2659

DRG No.

800±0.5

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SIGN AND DATE

INVENTORY No.

REV	DATE	ALTERED CHECKED	REV	DATE	ALTERED CHECKED	REV	DATE	ALTERED CHECKED

ALTERED
CHECKED

REV
DATE

ALTERED
CHECKED

REV
DATE

ALTERED
CHECKED

FERROUS PARTS ARE HOT-DIP GALVANIZED (EXCEPT FEMALE THREADS) AS PER IS:2829 & TESTS CONFORM TO IS:2833/IEC-383



BHARAT HEAVY ELECTRICALS LTD;
ELECTROPORCELAINS DIVISION
BANGALORE 560 012



GRADE OF
TOL DIM
C/M/F

SCALE
N T S

WEIGHT (kg)
31.5
(Approx)

REF TO ASSY.DRG

ITEM No.
No. OF ITEMS

TITLE
SHORT SAMPLE FRP TUBE FOR
COMPOSITE HOLLOW INSULATOR

CARD CODE

DRAWING No.

3 SK 2659

REV.
00

No.

No. OF SHEETS

NOTES:

1. MATERIAL SHOULD COMPLY WITH MATERIAL BHELEPD:C:FRP:HI:001-2010 LATEST REVISION IN GENERAL.
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R5

