

ITEM: SUPPLY OF FRP TUBE AS PER ANNEXURE No. A/12303246/25.01.2023

TECHNICAL PQR, DRAWING, SPECIFICATION, QAP: AS ATTACHED

QUANTITY: As per AS ATTACHED BOQ

BILL OF MATERIAL (BOM):

Sr. No.	BHEL Item Code	Description of Item/Specification	Quantity	UOM	Technical Specification/Drg.
1	180114	FRP TUBE 482x510x4012 39871450111/04	57	EA	AS ATTACHED

- Bidder to provide signed & Sealed GEM BID, drawings, QAP & Annexure No. A/12303246/25.01.2023 with their offer.
- To get MSE preference, bidder to choose MSE purchase preference on GEM portal otherwise purchase preference shall not be applicable.
- To get MII preference, bidder to choose MII purchase preference on gem portal and bidder to submit signed local content declaration otherwise purchase preference shall not be applicable.
- Item shall be manufactured as per attached drawing.
- Delivery Schedule: Material shall be supplied to BHEL SBD MP Stores, Bangalore within 30 days from the date of PO.
- Delivery location: BHEL SBD MP Stores Bangalore-560012 as per GeM consignee.
- Price basis: **Price shall be firm till completion of the contract. No PVC is applicable.**
- Payment terms: Hundred Percent (100%) of basic price of the material supplied as per PO, along with 100% taxes & duties (as applicable) shall be payable on pro-rata as per following manner
 - 45 days for Micro & Small Enterprises (MSEs)
 - 60 days for Medium Enterprises
 - 90 days for Non-MSME
 from the date of receipt of goods at BHEL SBD and receipt of complete documents at BHEL SBD as specified in Clause No. 9 below subject to acceptance of materials. [i.e. date of acceptance of material or date of submission of complete set of documents (whichever is later) shall be considered for reckoning the due date of payment.]
- Documents to be Submitted by Vendor for payment:
 - Original GST compliant invoice. (Original for Buyer copy)
 - Copy of LR/ Delivery Challan for local supplier in place of LR
- Invoice to be made as per the prevailing GST format only. TDS Deductions applicable as per GST Law & TDS certificate shall be issued by BHEL in line with the latest amendment in GST Law.
- Technical PQR- requirement i.e. Years of Past Experience required is 02 year and Past Experience shall be supply of 10% of bid quantity.
- Minimum Average Annual Turnover of the Bidders shall be 20 lakhs for last three FY.
- Inspection and Quality Clearance: As per attached QAP

BOQ FOR 12303246							
Item Number	Item Code	Item Description	Quantity	UOM	Unit Price (Inclusive of TAX) [QUOTED/NOT QUOTED]	Applicable GST %	HSN Code
1	180114	FRP TUBE 482x510x4012 39871450111/04	57.00	EA			

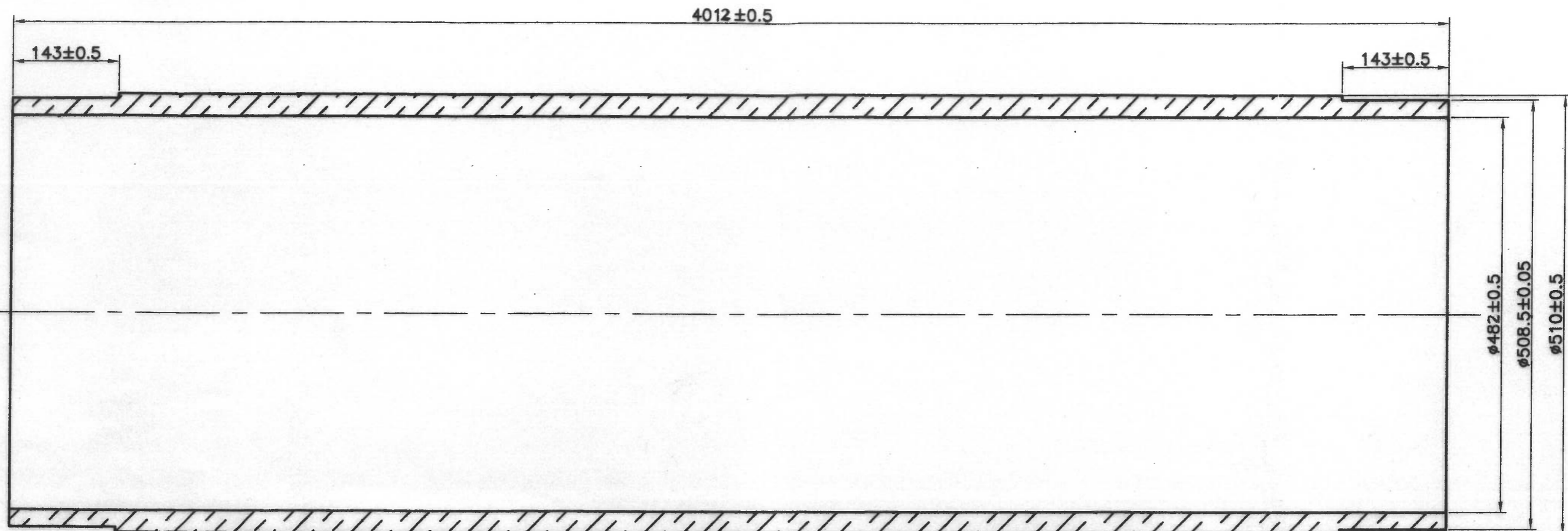
FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN mm.

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SIGN AND DATE
REF. DRG. No.

INVENTORY No.

REV 04
DRG No. 3 987 14 50111

NOTES:

1. MATERIAL SHOULD COMPLY WITH MATERIAL SPECIFICATION OF BHEL EPD: CIFRPHI:001:2010 LATEST REVISION AND IEC: 61462-1998 IN GENERAL.
2. WINDING ANGLE: PRESSURE & BENDING FILAMENT WINDING ANGLE AT 25° & 54°
3. FRP TUBE TO BE FREE FROM SURFACE SCRACHES, BENDS, FLAWS, VOIDS AND DENTS ETC.
4. SHARP CORNERS TO BE ROUNDED OFF TO RADIUS R2.
5. PACKING: a) EACH FRP TUBE SHOULD BE WRAPPED WITH 10 mm THICK EXPANDED POLYSTYRENE SHEET FOR EXTRA CUSHIONING.
b) ALL INDIVIDUALLY WRAPPED TUBE SHOULD BE PACKED IN A WELL SEASONED WOOD FABRICATED CRATE OR STRONG CORRUGATED BOX ENSURING NO DAMAGES TO TUBES.
c) 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 WITH NON GLASS FIBER EPOXY SUCH THAT NO REACTION TAKEN PLACE BETWEEN FRP TUBE TO SF6 GAS OR TRANSFORMER OIL.

CONTROLLED COPY

BHARAT HEAVY ELECTRICALS LTD;
ELECTROPORCELAINS DIVISION
BANGALORE 560 012

NAME	SIGN	DATE
DRN N.CHIKKANNA		09.02.12
CHD S S P		9/2/12
APPD S S P		9/2/12

REV	DATE	ALTERED	REV	DATE	ALTERED	REV	DATE	ALTERED
04	25.07.19	CHECKED 12	03	17.4.12	CHECKED Am.	02	09.02.12	CHECKED NY
1. DIM. $\phi 482 \pm 0.5$ WAS $\phi 486 \pm 0.5$			DIM 4012 ± 0.5 WAS 4018 ± 0.5			DIM. $\phi 508.5 \pm 0.05$ WAS $\phi 508.45 \pm 0.05$		
2. TOTAL WEIGHT ALTERED								
3. DRAWING REVISED								
REF. PH. NO. 5992			REF. PH. No. 5507			REF. PH. No. 5493		


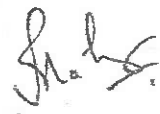
DEPT	GRADE OF TOL DIM C/M/F	SCALE	WEIGHT (kg)	REF TO ASSY.DRG	ITEM No.	No. OF ITEMS
		NTS	175 (Approx)			
TITLE FRP TUBE 400KV COMPOSITE HOLLOW INSULATOR				CARD CODE	DRAWING No. 3 987 14 50111	REV. 04
				No. OF SHEETS		



Purchase Specification for Fiber Reinforced Plastic Tubes

Spec. No : BHELEPD:CI:FRP:HI:001
REV : 01
DATE : 24/03/2012
PAGE : 1 of 2

I No	Specification	Requirement	
1	Purpose	To manufacture Polymer composite Hollow 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 Reinforced Plastic) Tubes made by wet filament winding technique using uncut fibers, meeting the technical requirements as per Sl. No 3 of this Specification and mentioned in the concerned 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	0.1 % Maximum
VI.	Water absorption, 100°C	DIN 53479	0.1 % Maximum
VII.	Water diffusion test	IEC 61462	Leakage Current should not exceed 1mA and no puncture and surface flash over after applying 12 kV for one minute.
VIII.	Specific Gravity		2.0 ± 0.1
IX.	Tg Temperature	ASTM D 3418	125 °C
X.	Chemical Resistance		FRP Rod material should not react with Solvents (Not Phenole and Ketone), Mineral Oils and dilute acid.
XI.	Tensile E-Modules Axial	ASTM D3039	52000 MPa 520000 kg/cm²
XII.	Tensile Strength Axial	ASTM D3039 / DIN 53453	1050 MPa 10,500 kg/cm²
XIII.	Shear Strength	ASTM D 3846	15 MPa 150 kg/cm²

Prepared by  Yogesh Sharma Manager Composite Insulator	Approved by  S. Ravikumar AGM IO & CPBG
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TECHNICAL PRE-QUALIFICATION REQUIREMENT (TECHNICAL PQR)

ITEM DESCRIPTION: FRP TUBE

NB:- Technical PQR not applicable for PMD enlisted vendor of BHEL,SBD

Sl. No.	Details of Requirement	Supporting Documents to be submitted by the Bidder	Bidder Confirmation
1.	Vendor should have supplied at least 5 FRP tubes for similar application in last 2 years.	PO and supply details of FRP tubes	
2.	Vendor should be a manufacturer or manufacturer authorized agent	Business license or authorization from OEM	

Prepared By	Approved by
JAGANNATH MAJI Digitally signed by JAGANNATH MAJI DN: cn=JAGANNATH MAJI, o=BHEL, ou=SBD, email=jagannath@bhel.in, c=IN Date: 2022.11.19 11:25:31 +05'30' Adobe Acrobat Reader version: 2022.003.20282	PRATAP MUKHERJEE Digitally signed by PRATAP MUKHERJEE DN: c=IN, o=BHARAT HEAVY ELECTRICALS LIMITED, ou=BHEL SBD BANGALORE, postalCode=560012, st=KARNATAKA, 2.5.4.20=f181c7a6157fb821eebaca0d8f10951d8e3323a0a352aa37a716eb9f8e9dd4f, pseudonym=AB2B7B3910B99B3240FE1DD115F10C8D2976A955, serialNumber=85268162EFB465D4B9BF34F27049FEA0688952E8E6F2A91E4717DC65206E7DCF, cn=PRATAP MUKHERJEE Date: 2022.11.19 16:27:15 +05'30'

 BHEL-SBD		BHARAT HEAVY ELECTRICALS LIMITED SOLAR BUSINESS DIVISION PROF.C.N.R RAO CIRCLE, IISc POST MALLESHWARAM, BENGALURU-560012			STANDARD QUALITY ASSURANCE PLAN			QP NO.: EPD_QP_CI_2021-22_0006				
					ITEM: FRP TUBE			REV. NO.: 00 DATE: 06.08.2021 PAGE 1 OF 2				
SL. NO	ITEM/COMPO-NENT	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY		REMARKS
1.	2.	3.	4.	5.	6.	7.	8.	9.	D*	**	B	11.
A INSPECTION BY SUPPLIER AT THEIR WORKS												
A.1	FRP Tube Specimen	Chemical Resistance	Major	Chemical	Sample test	BHEL Drg /BHEL Spec	BHEL Drg /BHEL Spec	Supplier TC/Third Party Test Report	✓	P	V	Once In Every Five Years
A.2	FRP Tube	Visual	Major	Physical	100%	BHEL Drg /BHEL Spec	BHEL Drg /BHEL Spec	Supplier TC	✓	P	V	
A.3		Dimension, Winding angle & Marking	Major	Physical	100%	BHEL Drg /BHEL Spec	BHEL Drg /BHEL Spec	Supplier TC	✓	P	V	
A.4		Specific Gravity	Major	Physical	10 nos/lot	BHEL Spec/ ASTM D792	1.9-2.1	Supplier TC	✓	P	V	
A.5		Dye Penetration Test	Major	Chemical	10 nos/lot	BHEL Spec/IEC 61109	No dye shall raise through the specimen before 15 minutes	Supplier TC	✓	P	V	
A.6		Water Absorption Test	Major	Chemical	5 nos/lot	BHEL Spec/ DIN 53745/DIN 53749	≤ 0.1%	Supplier TC	✓	P	V	
A.7		Percentage of Glass Content	Major	Physical	3 nos/lot	BHEL Spec/ ASTM D2584	≥ 70%	Supplier TC	✓	P	V	
A.8		Water Diffusion Test	Major	Electrical	6 nos/lot	BHEL Spec/ IEC 61109	BHEL Spec/ IEC 61109	Supplier TC	✓	P	V	
A.9		Glass Transition Temperature (TG)	Major	Thermal	1 nos/lot	ASTM D3418	≥ 125 °C	Supplier TC	✓	P	V	
A.10	Packing	Major	Physical	100%	BHEL Drg /BHEL Spec	BHEL Drg /BHEL Spec	--	-	P	-		
B PRE DISPATCH INSPECTION /INSPECTION AT BHEL WORKS												
B.1	FRP Tube	Visual	Major	Physical	100%	BHEL Drg /BHEL Spec	BHEL Drg /BHEL Spec	Inspection Report	✓	P	V	
B.2		Dimension & Marking	Major	Physical	10%	BHEL Drg /BHEL Spec	BHEL Drg /BHEL Spec		✓	P	V	
B.3		Specific Gravity	Major	Physical	10 nos/lot	BHEL Spec/ ASTM D792	1.9-2.1		✓	P	V	

LEGEND: *D: RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY VENDOR IN QA DOCUMENTATION.

** M: MANUFACTURER/SUB-VENDOR, B: BHEL/BHEL NOMINATED INSPECTION AGENCY

P: PERFORM W: WITNESS AND V: VERIFICATION.


FOR BHEL USE

PREPARED BY: DHANANJAYA R

APPROVED BY: KUMAR MOURYA

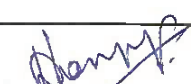

ADITYA

QUALITY ASSURANCE

 BHEL-SBD		BHARAT HEAVY ELECTRICALS LIMITED SOLAR BUSINESS DIVISION PROF.C.N.R RAO CIRCLE, IISc POST MALLESHWARAM, BENGALURU-560012		STANDARD QUALITY ASSURANCE PLAN				QP NO.: EPD_QP_CI_2021-22_0006 REV. NO.: 00 DATE: 06.08.2021 PAGE 2 OF 2				
				ITEM: FRP TUBE								
SL. NO	ITEM/COMPO-NENT	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY		REMARKS
1.	2.	3.	4.	5.	6.	7.	8.	9.	D*	**	10.	11.
B.4		Dye Penetration Test	Major	Chemical	10 nos/lot	BHEL Spec/IEC 61109	No dye shall raise through the specimen before 15 minutes		✓	P	V	
B.5		Water Absorption Test	Major	Chemical	5 nos/lot	BHEL Spec/DIN 53745/DIN 53749	≤ 0.1%		✓	P	V	
B.6		Percentage of Glass Content	Major	Physical	3 nos/lot	BHEL Spec/ ASTM D2584	≥ 70%		✓	P	V	
B.7		Water Diffusion Test	Major	Electrical	6 nos/lot	BHEL Spec/ IEC 61109	BHEL Spec/ IEC 61109		✓	P	V	

Notes:

- For first time supply of any new item by the vendor, vendor should take sample approval before bulk manufacturing from Quality/Engineering.
- The SQAP shall be read in conjunction with BHEL Specification mentioned in Purchase Order.
- Material supplied shall be in line with BHEL Purchase Order, Technical Specification, Approved Drawings, applicable Standard References, or any other document/references.
- In case of any contradiction between this SQAP, BHEL Specifications the following precedence shall be followed:
 - 1st: This STANDARD QUALITY ASSURANCE PLAN & Applicable standard;
 - 2nd: BHEL Purchase Order Specification;
 - 3rd: Manufacturers plant standards
- Packing shall be as per BHEL purchase order.
- BHEL reserves the right for pre-dispatch inspection at vendor works by BHEL or BHEL nominated agency.
- In case of pre-dispatch inspection, Supplier shall raise the inspection call in the CQIR with inspection agency as BHEL SBD URL: www.cqir.bhel.in and shall upload Test Certificates, Internal Tests Report as per this SQAP in CQIR Portal. TC to be verified w.r.t to inspected item during inspection and to be signed by the inspector.
- Original Test Certificates, Internal Tests Report (Duly Sealed & signed), test bar per batch per lot as per this SQAP shall be sent along with lot for review.
- BHEL may carry out all the tests at his premises or at any third party lab, in-case of any non-conformance material will be rejected.

LEGEND: *D: RECORDS, IDENTIFIED WITH "TICK" (✓) SHALL BE ESSENTIALLY INCLUDED BY VENDOR IN QA DOCUMENTATION. ** M: MANUFACTURER/SUB-VENDOR, B: BHEL/BHEL NOMINATED INSPECTION AGENCY P: PERFORM W: WITNESS AND V: VERIFICATION.	FOR BHEL USE			
	 PREPARED BY: DHANANJAYA R		 APPROVED BY: ADITYA	
	KUMAR MOURYA		QUALITY ASSURANCE	

Purchase Specification for Fiber Reinforced Plastic Tubes

Spec. No : BHELEPD:CI:FRP:HI:001
REV : 01
DATE : 24/03/2012
PAGE : 2 of 2

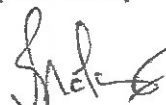
XIV.	Impulse Di-electrical Strength	DIN 53481	16 to 18 kV / mm
XV.	Di-electrical Strength Axial 50 Hz, 12.7mm ring section	DIN 53481	8 to 10 kV / mm
XVI.	Di-electrical Strength Transverse 50 Hz, 3 mm	DIN 53481	16 to 18 kV / mm
XVII.	Di-electrical Loss factor (T_g δ)	DIN 53483	0.30 TO 0.50 %
XVIII.	Relative Permittivity	DIN 53483	3.4 TO 3.6
XIX.	Mechanical test requirement of the FRP Tubes	As per Drawing	As per Drawing
4.	Winding Angle	25 DEG & 54 DEG	
5.	Packing	Each FRP tube should be wrapped using 10 mm thick expanded polystyrene Sheet to avoid foreign material (like dust etc) deposition. To be packed in a well seasoned wood crate or strong corrugated box, such that no damage (like scratch, dent, Bend, crack etc) should take place during transportation/transit. Relevant marking to be labelled or printed on the crate / box.	
6.	Marking	Each tube should be marked 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
IO & CPBG