

SPECIFICATION FOR POLYMER POST INSULATOR

Scope:

This specification cover the design, manufacturing, testing at manufacturers works, transport to site, insurance, unloading & storage of 11 KV & 33 KV Polymer Post Insulator suitable for use in 11 KV & 33 KV Overhead Lines situated in any part of West Bengal under the jurisdiction of WBSEDCL.

General Requirements:

The post insulator is extensively used in different applications because of its excellent electrical and mechanical properties.

1. The Composite insulators will be used as **Pedestal Insulator for 11kV, 200 & 400Amp. T.P.G.O. Isolator and 33kV T.P.G.O.(Rocking) Isolator & Double Break C.R. type Isolator**. The insulators should withstand the Cantilever Load along with other Mechanical load related with Operation of Gang / Central Rotating Isolator and suitable for replacement of existing 11kV and 33kV Porcelain Post insulator.
2. Insulator shall be suitable for 3 Phase, 50 Hz effectively earthed 11KV Overhead Lines and 33 KV Impedance Grounded distribution systems in a moderately/heavily polluted atmosphere.
3. Bidder must be an indigenous manufacturer and supplier of composite insulators of rating 11KV or above or must have developed proven in house technology and manufacturing process for composite insulators of above rating. The Bidder shall furnish necessary evidence in support of the above **along with the bid**, which can be in the form of certification from the utilities concerned, or any other documents to the satisfaction of the owner/purchaser.
4. Insulator shall be suitable for the long Rod Type.
5. Insulators shall have sheds with good self-cleaning properties. Insulator shed profile, spacing, projection etc. and selection in respect of polluted conditions shall be generally in accordance with the commendation of IEC- 60815/ IS: 13134.
6. **Dimensional Tolerance of Composite Insulators**
The tolerances on all dimensions e.g. diameter shall be allowed as follows in line with-IEC 62231:
 $\pm (0.04d + 1.5)$ mm when $d \leq 300$ mm
 $\pm (0.025d+6)$ mm when $d > 300$ mm
Where, d is being the dimensions in millimetres for diameter.
7. **Inter-changeability**
The composite insulators including the end fitting connection shall be standard design suitable for use with the hardware fittings of any make conforming to relevant IEC/IS standards.
8. **Corona and RI performance**
All surfaces shall be clean, smooth, without cuts, abrasions or projections. No part shall be subjected to excessive localized pressure. The insulator and metal parts shall be so designed and manufactured that it shall avoid local corona formation and not generate any radio interference beyond specified limit under the operating conditions.
9. **Maintenance**
The composite insulators offered shall be suitable for use of hot line maintenance technique so that usual hot line operation can be carried out with ease, speed and safety.

Service condition:

The insulators to be supplied against this specification shall be suitable for satisfactory continuous operation under the following topical condition :

A. Max. ambient temperature of the air	: 50 ° C
B. Min. ambient temperature of the air	: -5 ° C
C. Relative humidity	: 10 % to 100 %
D. Average number of rainy days	: 100 / annum.
E. Max. Annual Rainfall	: 1500 mm

F. Max. Wind Pressure	: 150 Kg/ sq. Meter
G. Max. Wind Velocity	: 50 Km/ hour
H. Max. Altitude above MSL	: 1000 Meter.
I. Seismic level	: 0.3 g (Horizontal acceleration)
J. Average Thunder storm	: 45 Days per annum.
K. Climatic condition	: Moderately hot and humid tropical climate, conductive to rust and fungus growth. Pollution level is high. Some area with seashores having saline atmosphere.

System Parameters:

a) Nominal system voltage	: 11 KV & 33 KV.
b) Highest system voltage	: 12 KV & 36 KV.
c) Power frequency	: 50 Hz.
d) Number of Phases	: Three.
e) System earthing	: 11 KV Solidly earthed, 33 KV Impedance earth.

Standard :

The following Indian / International Standards with latest revisions and amendments shall be referred while accessing conformity of insulators with this specification.

<u>Sl. No.</u>	<u>Indian Standard</u>	<u>Title</u>	<u>International Standard</u>
1.		Composite station post insulators for substations with a.c. voltages greater than 1 000 V up to 245 kV –Definitions, test methods and acceptance criteria	IEC : 62231
2.	IS : 5350 PART III	Dimensions of indoor and outdoor porcelain post insulators and post insulator units for systems with nominal voltages greater than 1000Volts Part III for Pedestal Type Post Insulator	
3.	IS : 731	Porcelain insulators for overhead power lines with a nominal voltage greater than 1000V	IEC : 60383
4.	IS : 2071	Methods of High Voltage Testing	IEC : 60060-1
5.	IS : 2486	Specification for insulator fittings for overhead power lines with a nominal voltage greater than 1000V General Requirements and Tests Dimensional Requirements Locking Devices	IEC : 60120 IEC : 60372
6.		Thermal Mechanical Performance test and mechanical performance test on string insulator units	IEC : 60575
7.	IS : 13134	Guide for the selection of insulators in respect of polluted conditions	IEC : 60815
8.		Characteristics of string insulator units of the long rod type	IEC : 60433
9.		Hydrophobicity classification guide	STRI guide 1.92/1
10.		Radio interference characteristics of overhead power lines and high-voltage equipment	CISPR:18-2 part2

11.	IS : 8263	Methods of RI Test of HV Insulators	IEC : 60437
12.		Standard for insulators – 'Composite- Distribution Dead-end type	ANSI C29 13-2000
13.	IS : 4759	Hot dip zinc coatings on structural steel & other allied products	ISO : 1459 ISO : 1461
14.	IS : 2629	Recommended Practice for Hot, Dip Galvanization for iron and steel	ISO-1461 (E)
15.	IS : 6745	Determination of weight of zinc coating on zinc coated iron and steel articles	ISO : 1460
16.	IS : 3203	Methods of testing of local thickness of electroplated coatings	ISO : 2178
17.	IS : 2633	Testing of Uniformity of coating of zinc coated articles	
18.		Standard specification for glass fiber strands	ASTMD 578-05
19.		Standard test method for compositional analysis by Thermo-gravimetric	ASTM E 1131-03
20.	IS : 4699	Specification for refined secondary zinc	

Technical Requirement:

Composite Insulators shall be designed to meet the light quality, safety and reliability and are capable of withstanding a wide range of environmental conditions.

- (a) **Core** : The internal insulating part
- (b) **Housing** : The external insulating part.
- (c) **Metal end fittings**: For attaching to hardware to support conductor.

Core:

It shall be a glass-fibber reinforced epoxy resin rod of high strength (FRP rod). Glass fibbers and resin shall be optimized in the FRP rod. Glass fibbers shall be Boron free electrically corrosion resistant (ECR) glass fibber or Boron free E-Glass and shall exhibit both high electrical integrity and high resistance to acid corrosion. The matrix of the FRP rod shall be Hydrolysis resistant. The FRP shall be manufactured through Pultrusion process. The FRP rod shall be void free.

Housing (Sheath):

The FRP rod shall be covered by a seamless sheath of a silicone elastometric compound of a thickness of 3 mm minimum. It shall be one-piece housing using injection Moulding Principle to cover the core. The elastomer housing shall be designed to provide the necessary creepage distance and protection against environmental influences, external pollution and humidity. Housing shall conform to the requirement of IEC 61109/92-93 with latest amendments.

It shall be extruded or directly moulded on core and shall have chemical bonding with the FRP rod. The strength of the bond shall be greater than the tearing strength of the polymer. Sheath material in the bulk as well as in the sealing / bonding area shall be free from voids.

Manufacturer should furnish a description of its quality assurance programme including fabrication; testing and inspection for any material (i.e rubber), Components (i.e rod) or hardware (i.e. end fittings). The manufacturer has had fabricated by others should also be included. **Manufacturing methods and material composition documentation will be a part of Technical Bid to be submitted along with offer.**

WEATHERSHEDS:

The composite polymer Weather sheds made of silicone elastometric compound shall be firmly bonded to the sheath, vulcanized to the sheath or moulded as part of the sheath and

shall be free from imperfections. The weathersheds should have silicon content of minimum 30% by weight. The strength of the weathershed to sheath interface shall be greater than the tearing strength of the polymer. The interface, if any, between sheds and sheath (housing) shall be free from voids.

METAL END FITTINGS:

End fittings transmit the mechanical load to the core. The material used in fittings shall be corrosion resistant.

They shall be made of malleable cast iron as first choice if not possible than spheroidal graphite cast iron. They shall be connected to the rod by means of a controlled compression technique. As the main duty of the end fitting is the transfer of mechanical load to the core, the fittings should be properly attached to the core by a coaxial or hexagonal compression process and should not damage the individual fibres or crack the core. The gap between fitting and sheath shall be sealed by a flexible silicone electrometric compound or silicone alloy compound sealant. System of attachment of end fitting to the rod shall provide superior sealing performance between housing, i.e. seamless sheath and metal connection. The sealing must be moisture proof.

The dimensions of end fittings of Insulators shall be in accordance with the standard dimensions stated in IS: 2486/IEC60120.

The finished surface shall be smooth and shall have a good performance. The surface shall not crack or get chipped due to ageing effect under normal and abnormal service conditions or while handling during transit or erection.

The design of the fittings and the insulators shall be such that there is no local corona formation or discharges likely to cause the interference to either sound or vision transmission.

The post type insulators shall be suitable for outdoor use where top and base shall have plain machined faces with easy & perfect assembly. Regarding Test for Mechanical strength for post Insulators, all the necessary tests are as per IEC: 62231 with latest amendments are to be carried out at the manufacturer's premises. The Cap & Pedestal of Post Insulators shall be of malleable cast iron(MCI) as first choice, if not possible than spheroidal graphite cast iron (SGCI).

Workmanship :

- All the materials shall be of latest design and conform to the best engineering practices adopted in the high voltage field. Bidders shall offer only such insulators as are guaranteed by them to be satisfactory and suitable for continued good service in power transmission lines.
- The design, manufacturing process and material control at various stages shall be such as to give maximum working load, highest mobility, best resistance to corrosion, good finish and elimination of sharp edges and corners.
- The design of the insulators shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration.
- The core shall be sound and free of cracks and voids that may adversely affect the insulators.
- Weather sheds shall be uniform in quality. They shall be clean, sound and smooth and shall be free from defects and excessive flashing at parting lines.
- End fittings shall be free from cracks, seams, shrinks, air holes and rough edges. End fittings should be effectively sealed to prevent moisture ingress. Effectiveness of sealing system must be supported by test documents. All surfaces of the metal parts shall be perfectly smooth without projecting points or irregularities, which may cause corona. All load bearing surfaces shall be smooth and uniform so as to distribute the loading stresses uniformly.

- g) All ferrous parts shall be hot dip galvanized to give a minimum average coating of zinc equivalent to 610 gm/sq.m. or 87µm thickness and shall be in accordance with the requirement of IS:4579. The zinc used for galvanizing shall be of purity 99.5% as per IS : 4699. The zinc coating shall be uniform, adherent, smooth, reasonably bright continuous and free from imperfections such as flux, ash rust stains, bulky white deposits and blisters. The galvanized metal parts shall be guaranteed to withstand at least four successive dips each lasting for one (1) minute duration under the standard preece test. The galvanizing shall be carried out only after any machining.

Drawing :

The bidder shall furnish along with the bid the outline drawing of each insulator unit including a cross sectional view of the long rod insulator unit. The drawing shall include but not be limited to the following information:

- (a) Long rod diameter with manufacturing tolerances
- (b) Minimum Creepage distance with positive tolerance
- (c) Protected creepage distance
- (d) Eccentricity of the long rod unit
 - (i) Axial run out
 - (ii) Radial run out
- (e) Unit mechanical and electrical characteristics
- (f) Weight of composite long rod units
- (g) Identification mark
- (h) Manufacturer's catalogue number

Marking:

Each insulator shall be legibly and indelibly marked (embossing/engraved/laser printed) to show the following:

- a) Name or Trade mark of the manufacturer
- b) Month & Year of manufacturing
- c) Voltage & Type
- d) Minimum Failing Load (in KN)
- e) "WBSDECL" marking

N.B. Marking with sticker/written by Ink is not acceptable.

TESTS AND STANDARDS:

Insulators offered shall be manufactured with the same configuration & raw materials as used in the Insulators for which design & type test reports are submitted. The manufacturer shall submit a **certificate** for the same.

The Bidder should submit **with the bid**, the complete **Type/Design Test Reports** as stipulated in latest relevant IS/IEC with complete Identification, Date & Sl. No., carried out **at CPRI/ERDA /NABL accredited/Govt. recognized Test House or Laboratory** on the Tendered items ,**within 5 (Five) years from Due Date of Tender.**

Design Test:

Manufacturer should submit test report for design test as per IEC- 62231 and IEC-62217 with its latest amendments along with the bid.

1. Assembled core load tests:

- a) Test for the verification of the maximum design cantilever load (MDCL)
- b) Test for the verification of the maximum design torsion load (MDToL)
- c) Verification of the specified tension load (STL)

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2. Tests on shed and housing material:

- (a) Hardness test
- (b) Accelerated weathering test
- (c) Tracking and erosion test
- (d) Flammability test
- (e) Chemical composition test (as per ANNEXURE: A of specification)

3. Tests on the core material:

- (a) Dye penetration test
- (b) Water diffusion test

Type Test:

The Tenderer shall furnish detailed Type Test report of the offered composite insulators as per IEC 62231 with latest amendments from NABL approved lab to prove that the composite insulators offered meet the requirements of the specifications. These Type tests should have been carried out within 5 (Five) years from Due Date of Tender.

The following Type tests shall be conducted on a suitable number of individual insulator units, components, materials or complete strings. The Type test contains the following test reports should be invariably submitted along with the bid or otherwise the offers will be rejected.

1. Electrical tests

a) Dry lightning impulse voltage test:

- i) Withstand voltage test using the withstand voltage procedure
- ii) Voltage test using the 50 % flashover voltage procedure

- b) Wet power frequency voltage withstand test
- c) Wet power frequency voltage flashover test
- d) Dry power frequency voltage withstand test
- e) Dry power frequency voltage flashover test
- f) Visible Discharge Voltage (PF) test

2. Mechanical tests

- a) Cantilever failing load test
- b) Specified tension load test
- c) Compression and buckling withstand load test

3. Recovery of hydrophobicity test (as per ANNEXURE: A of specification)

4. Radio interference test (as per ANNEXURE: A of specification)

5. Brittle fracture resistance test (as per ANNEXURE: A of specification)

The Manufacturer shall submit type test reports as per IEC 62231. Additional type tests required if any shall be carried out by the manufacturer, after award of contract for which no additional charges shall be payable. In case, the tests have already been carried out, the manufacturer shall submit reports for the same.

All the Type Tests noted above in addition to routine & acceptance test shall be carried out on insulator along with hardware fittings wherever required.

Routine Test :

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- a) All insulators shall be packed in strong **corrugated box of min. 7 ply duly palette or wooden crates**. The gross weight of the crates along with the material shall not normally exceed 100 Kg to avoid handling problem. The crates shall be suitable for outdoor storage under wet climate during rainy season.
- b) The packing shall be of sufficient strength to withstand rough handling during transit, storage at site and subsequent handling in the field.
- c) Suitable cushioning, protective padding or spacers shall be provided to prevent damage or deformation during transit and handling.
- d) Each wooden case / crate / corrugated box shall have all the markings stencilled on it in indelible ink.
- e) The bidder shall provide instructions regarding handling and storage precautions to be taken at site.

Guarantee:

In the event of any defect in the equipment / materials arising out of faulty design, materials, workmanship within a period of 12 (twelve) months of commissioning or 18 (eighteen) months from the date of last despatch of any integral part of the equipment / materials whichever is earlier the supplier shall guarantee to replace or repair the same to the satisfaction of the purchaser.

If the supplier fail to do so within a reasonable time, WBSEDCL reserves the right to effect repair or replacement by any other agency and recover charges for repair or replacement from the supplier.

Quality Assurance Plan:

1. The successful bidder shall submit following information along with the bid.
2. Test certificates of the raw materials and bought out accessories.
3. Statement giving list of important raw material, their grades along with names of sub-suppliers for raw materials, list of standards according to which the raw materials are tested. List of tests normally carried out on raw materials in presence of bidder's representative.
4. List of manufacturing facilities available.
5. Level of automation achieved and lists of areas where manual processing exists.
6. List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.
7. List of testing equipments available with the bidder for final testing equipment along with valid calibration reports.
8. The manufacturer shall submit Manufacturing Quality Assurance Plan (QAP) for approval & the same shall be followed during manufacture and testing.
9. The successful bidder shall submit the routine test certificates of bought out raw materials/accessories and central excise passes for raw material at the time of inspection.
10. The Owner's/Purchaser's representative shall at all times be entitled to have access to the works and all places of manufacture, where insulator, and its component parts shall be manufactured and the representatives shall have full facilities for unrestricted inspection of the Supplier's and sub-Supplier's works, raw materials, manufacture of the material and for conducting necessary test as detailed herein.
11. **The material for final inspection shall be offered by the Supplier only under packed condition.** The owner/Purchaser shall select samples at random from the packed lot for carrying out acceptance tests. The lot offered for inspection shall be homogeneous and shall contain insulators manufactured in 3-4 consecutive weeks.
12. The Supplier shall keep the Owner/Purchaser informed in advance of the time of starting and the progress of manufacture of material i/n their various stages so that arrangements could be made for inspection.
13. No material shall be dispatched from its point of manufacture before it has been satisfactorily inspected and tested unless the owner/Purchaser in writing waives off the inspection. In the later case also the material shall be dispatched only after satisfactory testing specified herein has been completed.
14. The acceptance of any quantity of material shall in no way relieve the Supplier of his responsibility for meeting all the requirements of the specification and shall not prevent subsequent rejection, if such materials are later found to be defective.

ANNEXURE: A

Test on Insulator units

1. **RIV Test (Dry):** The insulator string along with complete hardware fittings shall have a radio interference voltage level below 100 micro volts at one MHz when subjected to 50 Hz voltage of 10 kV & 30 kV for 11 kV & 33 kV class insulators respectively under dry condition. The test procedure shall be in accordance with IS: 8263/IEC: 437/CISPR 18-2.
2. **Brittle Fracture Resistance Test:** Brittle fracture test shall be carried out on naked rod along with end fittings by applying "1N HNO₃ acid" (63 g conc. HNO₃ added to 937 g water) to the rod. The rod should be held at **80% of SML** for the duration of the test. The rod should not fail within the 96 Hour test duration. Test arrangement should ensure continuous wetting of the rod with Nitric acid.
3. **Recovery of Hydrophobicity & Corona Test:**
 - i. The surface of selected samples shall be cleaned with isopropyl alcohol. Allow the surface to dry and spray with water. Record the Hydrophobicity classification in line with STRI guide for Hydrophobicity classification (Extract enclosed at Annexure-D). Dry the sample surface.
 - ii. The sample shall be subjected to mechanical stress by bending the Sample over a ground electrode. Corona is continuously generated by applying 12 kV to a needle like electrode placed 1 mm above the sample surface. Tentative arrangement shall be as shown in Annexure-E. The test shall be done for 100 hrs.
 - iii. Immediately after the corona treatment, spray the surface with Water and record the HC classification. Dry the surface and repeat the corona treatment as at Clause-2 above. Note HC classification. Repeat the cycle for 1000 Hrs. or until an HC of 6 or 7 is obtained. Dry the sample surface.
 - iv. Allow the sample to recover and repeat hydrophobicity Measurement at several time intervals. **Silicone rubber should recover to HC 1 – HC 2 within 24 to 48 hours**, depending on the Material and the intensity of the corona treatment.
4. **Chemical composition test for Silicon content:**

The content of silicon in the composite polymer shall be evaluated by EDX (Energy Dispersion X-ray) Analysis or Thermo-gravimetric analysis. The test may be carried out at **CPRI / ERDA / NABL Accredited / Govt. Recognized Test House or Laboratory.**

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MANDATORY PARTICULARS FOR 11 KV & 33 KV POST INSULATOR

Sl. No.	Description	11 KV Post Insulator	33 KV Post Insulator
1.	Type of insulator	Polymeric composite Post Insulator	Polymeric composite Post Insulator
2.	Reference Standard	IEC 62231	IEC 62231
3.	Material of FRP Rod	Boron free ECR	Boron free ECR
4.	Material of sheds	Silicon Rubber	Silicon Rubber
5.	Minimum silicon content in weather sheds	30% by weight	30% by weight
6.	Method of fixing of metal end fittings to rod	Controlled compression technique	Controlled compression technique
7.	Material of Top End Fittings	SGCI /MCI	SGCI /MCI
8.	Material of Bottom End Fittings	SGCI /MCI	SGCI /MCI
9.	Material of sealing compound	RTV Silicon	RTV Silicon
10.	Colour of sheds	Grey	Grey
11.	Rated voltage	11 KV	33 KV
12.	Highest voltage	12 KV	36 KV
13.	Visible Discharge Voltage (PF)	9KV	27KV
14.	Dry Power Frequency Withstand voltage	60 KV	95 KV
15.	Wet Power Frequency Withstand voltage	35 KV	75 KV
16.	Dry Power Frequency Flashover Voltage	75 KV	130 KV
17.	Wet Power Frequency Flashover Voltage	45 KV	90 KV
18.	Dry Lightning Impulse withstand voltage	Positive : 75 KV Negative : 80 KV	Positive : 170 KV Negative : 180 KV
19.	Dry Lightning Impulse Flashover voltage	Positive : 95 KV Negative : 100 KV	Positive : 210 KV Negative : 230 KV
20.	RIV at 1 MHz when energised at 10 KV / 30 KV (rms) under dry condition	< 100 microvolt	< 100 microvolt
21.	Creepage distance (min.)	320 mm	900 mm
22.	Mechanical Characteristic		
a)	Cantilever strength upright	5KN	10KN
b)	Cantilever strength under hung	3KN	6.8KN
c)	Torsional Strength	200Nm	680Nm
d)	Tensile Strength	15KN	30KN
e)	Compression Strength	30KN	40KN
23.	Diameter of FRP Rod (min.)	24 mm	33.5 mm
24.	Length of FRP Rod (min.)	165 mm	300 mm
25.	Minimum thickness of housing	3 mm	3 mm
26.	Minimum dry arc distance	150 mm	300 mm
27.	Method of fixing sheds to housing	Injection moulding	Injection moulding
28.	No of weather sheds (min.)	Three	Eight
29.	Type of sheds	Aerodynamic	Aerodynamic
30.	Pitch Circle Dia of Top and Bottom metal fittings	57 mm	76 mm
	No. of Holes	4Nos	4Nos
	Dia of holes at Top Plain	12mm	15mm
	Dia of holes at Bottom Plain	12mm	15 mm
	HEIGHT	254mm	508 mm
31.	Type of packing	Wooden / Corrugated box	Wooden / Corrugated box
32.	Marking		
33.	Guarantee	12 months from commissioning or 18 months from the date of last despatch.	12 months from commissioning or 18 months from the date of last despatch.

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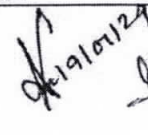
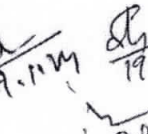
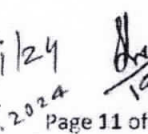
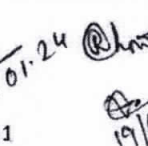
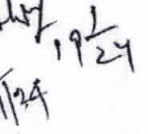
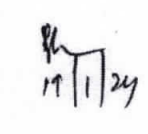

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ANNEXURE B
G T P TO BE FILLED UP BY THE BIDDER

Name of the manufacturer:

Address of works:

Sl. No.	Description	11 KV Post Insulator	33 KV Post Insulator
1.	Type of insulator		
2.	Reference Standard		
3.	Material of FRP Rod		
4.	Material of sheds		
5.	Minimum silicon content in weather sheds		
6.	Method of fixing of metal end fittings to rod		
7.	Material of Top End Fittings		
8.	Material of Bottom End Fittings		
9.	Material of sealing compound		
10.	Colour of sheds		
11.	Rated voltage		
12.	Highest voltage		
13.	Visible Discharge Voltage (PF)		
14.	Dry Power Frequency Withstand voltage		
15.	Wet Power Frequency Withstand voltage		
16.	Dry PF Flashover Voltage		
17.	Wet PF Flashover Voltage		
18.	Dry Lightning Impulse withstand voltage		
	Positive		
	Negative		
19.	Dry Lightning Impulse Flashover voltage		
	Positive		
	Negative		
20.	RIV at 1 MHz when energised at 10 KV / 30 KV (rms) under dry condition		
21.	Creepage distance (min.)		
22.	Minimum Failing load		
a)	Cantilever strength upright		
b)	Cantilever strength under hung		
c)	Torsional Strength		
d)	Tensile Strength		
e)	Compression Strength		
23.	Diameter of FRP Rod		
24.	Length of FRP Rod		
25.	Thickness of housing		
26.	Dry arc distance		
27.	Method of fixing sheds to housing		
28.	No of weather sheds		
29.	Type of sheds		
30.	Pitch Circle Dia of Top metal fittings		
	Pitch Circle Dia of Bottom metal fittings		
	No. of Holes		
	Dia of holes at Top Plain		
	Dia of holes at Bottom Plain		
	Height		
31.	Weight of composite insulator		
32.	Type of packing		
33.	No. of insulators in each pack		
34.	Gross weight of package		
35.	Marking		
36.	Guarantee		

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