Maharashtra State Electricity Distribution Co. Ltd.

SPECIFICATION NO. MSEDCL/ DIST: MM-III/01/2007/R1

TECHNICAL SPECIFICATIONS

FOR

11/22/33 KV

H.T. PIN INSULATORS

TECHNICAL SPECIFICATIONS FOR HT PIN INSULATORS

SPECIFICATION NO.MM-III/HT Pin Ins: 01/2007/R1

INDEX

TECHNICAL SPECIFICATION FOR 11/22/33 KV H.T. PIN INSULATORS
SPECIFICATION NO.MM-III/HT PIN INS: 01/2007/R1

1. SCOPE:

This specification covers the manufacture, testing and works supply and delivery of 11 kV, 22 kV & 33 kV Pin insulators. The Insulators shall be porcelain/composite type pin insulators.

1.1 Bidder must be an indigenous manufacturer and supplier of porcelain/composite type insulators of ratings 33 kV or above OR must have developed proven in house technology and manufacturing process for porcelain/composite type insulators of above rating OR possess technical collaboration/association with a manufacturer of porcelain type insulators of ratings 33 kV or above. 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 purchaser.

2. SERVICE CONDITIONS:

The insulators to be supplied against this specification shall be suitable for satisfactory continuous operation under the following tropical conditions.

2.1.1	Maximum ambient temperature (Degree C)	…	50
2.1.2	Minimum ambient temperature (Degree C)	…	3.5
2.1.3	Relative Humidity (%)	…	10 to 100
2.1.4	Maximum Annual Rainfall (mm)	…	1450
2.1.5.	Maximum Wind pressure (kg/m.sq.)	…	150
2.1.6	Maximum wind velocity (km/hour)	…	45
2.1.7	Maximum altitude above mean sea level (meter)	…	1000
2.1.8	Isoceraunic level (days/year)	…	50
2.1.9	Seismic level (Horizontal acceleration)	…	0.3 g
2.1.10	Moderately hot and humid tropical climate conductive to rust and fungus growth		

3. SYSTEM PARTICULARS:

a) Nominal System Voltage	11 kV, 22 kV, 33 kV
b) Corresponding highest system Voltage	12 kV, 24 kV, 36 kV
c) Frequency	50 Hz with 3% tolerance
d) Number of phase	---------- 3 ----------
e) Neutral earthing	effectively grounded.
f) Min. Impulse withstand voltage	75 kV, 125 kV, 170 kV

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4. STANDARDS:

Unless otherwise specified elsewhere in the specifications insulators shall confirm to IS: 731/1971/ IEC: 61109 / 92-93 with the latest revisions at the time of placement of the order. The standards are listed in Annexure 'D'.

5.0 GENERAL TECHNICAL REQUIREMENTS:

The porcelain insulators shall generally conform to IS: 731/1971 and any amendments up to date to the same. The insulators shall confirm to type 'B'of IS: 731/1971.

5.1 Conductors:

The pin insulators will be used on lines on which the conductors will be A.A.A. Conductor size up to 200 sq.mm. and ACSR of any size up to Panther (0.2 sq. inch copper equivalent). The insulators should withstand the conductor tension, the reversible wind load as well as the high frequency vibrations set up to due to wind.

5.2 Design Specification:

5.2.1 The Porcelain Pin Insulators shall conform to the provisions of IS: 731-1971 or its latest version in all respects. The pin insulators shall be suitable for the spindle detailed below:

Pin Insulator	Suitable for head	Shank dia	Remarks
11 kV	Small head as per Fig.I A of IS-2486 (II)/1989 or latest version.	20 mm	Lead thimbles suitable for the pin heads shall be provided
22 & 33 kV	Large head as per Fig.I B of IS-2486 (II)/1989 or latest version.	24 mm	Lead thimbles suitable for the pin heads shall be provided

For H. T. Pin Insulators, the top and neck of the Insulators should have dimensions as shown in the indicative Drg.No. CE (Dist)/MM-III/ Pin. Ins./1, which is enclosed herewith.

5.3 Strength :

For pin insulators of 11 kV the minimum failing load shall be 5 kN and for 22 kV and 33 kV the minimum failing load shall be 10 kN.

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5.4 Creepage Distance :

The minimum creepage distance shall be those given below :

Insulators	Creepage distance
11 kV Pin Insulator	320 mm
22 kV Pin Insulator	560 mm
33 kV Pin Insulators	840 mm

5.5 <u>Material Quality and Workmanship</u>

The quality of porcelain/composite material and hardware and all workmanship should be of the highest grade and such as is suitable and customary for extra high tension lines and shall conform to current IS or IEC. (Only in absence of the relevant I.S.S.).

The porcelain shall be sound, free from defect, thoroughly vitrified and smoothly glazed and brown in colour.

Unless otherwise specified the glaze shall cover all exposed porcelain parts of the insulator.

Glazing shall be uniform and free from defects. Small and isolated defects in the insulator glaze of a total surface less than 0.5 sq.cm. will however be ignored. Deviation on this account may be supported by relevant IS.

5.6 <u>Mechanical Design</u>:

The design shall be such that stresses due to expansion and contraction in any part of insulator shall not lead to deterioration. Cement used in manufacture of insulator shall not cause fracture due to expansion or loosening due to contraction.

5.7 Design and construction for composite insulators.

The composite insulator shall have a core, housing & weathershed of insulating material and steel/aluminum hardware components for attaching it to the support/conductor.

5.7.1 Core

It shall be a glass-fiber reinforced epoxy resin rod of high strength (FRP rod). Glass fibers and resin shall be optimized in the FRP rod. Glass fibers shall be Boron free electrically corrosion resistant (ECR) glass fiber or boron free E-Glass and shall

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exhibit both high electrical integrity and high resistance to acid corrosion. The matrix of the FRP rod shall be Hydrolysis resistant. The FRP rod shall be manufactured through Pultrusion process. The FRP rod shall be void free.

5.7.2 Housing (Sheath)

The FRP rod shall be covered by a seamless sheath of a silicone elastometric compound or silicone alloy compound of a thickness of 3 mm minimum.

It should protect the FRP rod against environmental influences, external pollution and humidity. It shall be extruded or directly molded on the 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.

5.7.3 Weather sheds

The composite polymer weather sheds made of silicone elastometic compound or silicon alloy shall be firmly bonded to the sheath, vulcanized to the sheath or molded as part of the sheath and shall be free from imperfections. The weather sheds should have silicon content of minimum 30% by weight. The strength of the weather sheds 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.

5.7.4 Metal End Fitting:

End fitting transmit the mechanical load to the core. They shall be made of forged steel. G. I. pin shall be connected to the rod by means of a controlled compression technique. G. I. pins shall be of respective specified mechanical load and shall be hot dip galvanized after, all fittings have been completed. The material used in fittings shall be corrosion resistant. As the main duty of the end fittings is the transfer of mechanical loads to the core the fittings should be properly attached to the core by a coaxial or hexagonal compression process & should not damage the individual fibers or crack the core. The gap between fitting and sheath shall be sealed by a flexible silicone elastomeric 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 IEC: 60120/IS: 2486 - Part-II /1989.

5.7.5 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.

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6.0 TESTS:

6.1 Testing Facilities:

The tenderer must clearly indicate what testing facilities are available in the works of the manufacturer and whether facilities are adequate to carry out all Routine & acceptance Tests. These facilities should be available to MSEDCL's Engineers if deputed or carry out or witness the tests in the manufacturer works. If any test cannot be carried out at the manufacturer's work, the reasons should be clearly stated in the tender. The insulators shall be tested in accordance with the procedure detailed in IS-731/1971 or IEC 61109 / 92-93 with latest amendments.

6.2 Design Tests:

For composite insulators it is essential to carry out design test as per clause 4.1 of IEC 61109 / 92-93 with latest amendments. The design tests are intended to verify the suitability of the design, materials and method of manufacture (technology). When a composite insulator is submitted to the design tests, the result shall be considered valid for the whole class of insulators, which are represented by the one tested and having the following characteristics:

- Same materials for the core, and sheds and same manufacturing method;
- Same material of the fittings, the same design, the same method of attachment;
- Same or greater layer thickness of the shed material over the core (including a sheath where used);
- Same or smaller ratio of the highest system voltage to insulation length;
- Same or smaller ratio of all mechanical loads to the smallest core diameter between fittings
- Same or greater diameter of the core.

The tested composite insulators shall be identified by a drawing giving all the dimensions with the manufacturing tolerances.

Manufacturer should submit test reports for Design Tests as per IEC – 61109 (clause – 5) along with the bid. Additionally following tests shall be carried out or reports for the tests shall be submitted after award of contract:

UV test: the test shall be carried out in line with clause 7.2 of ANSI C29.13.

6.3 Type Test :

6.3.1 The type tests mentioned below should be carried out on porcelain type of Insulator offered by the tenderer and the test shall conform to requirements as per Table IA & as per clause 10.1.1 of IS 731/1971 (latest version).

1. Visual Examination.
2. Verification of dimensions.
3. Visible Discharge Test

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4. Impulse Voltage Withstand Test.
5 Wet Power Frequency Voltage Withstand Test
6. Temperature Cycle Test.
7. Electro-Mechanical failing load test.
8. Power frequency puncture withstand test.
9. Porosity test.

Following Type test shall be conducted on a suitable number of composite insulator as per: IEC 61109

Sr. No.	Description of type test	Test procedure / standard
1	Dry lightning impulse withstand voltage test	As per IEC 61109(Clause 6.1)
2	Wet power frequency test	As per IEC 61109(Clause 6.2)
3	Mechanical load-time test	As per IEC 61109(Clause 6.4)
4	Radio interference test	As per IEC 61109(Clause 6.5) revised
5	Recovery of Hydrophobicity test	Annexure – B This test may be repeated every 3yrs by the manufacturer
6	Chemical composition test for silicon content	Annexure – B or any other test method acceptable to the owner
7	Brittle fracture resistance test	Annexure – B

The bidder shall submit type test reports as per IEC 61109 along with the bid. 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.

6.3.2 Acceptance Tests

The Test samples after having withstood the routine test, porcelain type insulators shall be subject to the following acceptance tests in order indicted below as per clause 10.1.2 of IS-731/1971

1. Verification of dimensions.
2. Temperature Cycle Test.
3. Porosity Test.

The test samples after having withstood the routine test, composite insulators shall be subject to the following acceptance tests in order indicated below:

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(a)	Verification of dimensions	: Clause 7.2 IEC: 61109,
(b)	Verification of the locking system (if applicable)	: Clause 7.3 IEC: 61109,
(c)	Verification of tightness of the interface Between end fittings & Insulator housing	: Clause 7.4 IEC: 61109 amendment 1of 1995
(d)	Verification of the specified mechanical load	: Clause 7.4 IEC: 61109, amendment 1of 1995
(e)	Galvanizing test	: IS:2633/IS:6745

6.3.3 Routine Test :

Routine test shall be made on every porcelain insulators as specified in clause 10.1.3 of IS-731/1971 or latest version. However for the guidance of the tenderer the routine tests are mentioned below :

1) Visual Examination.
2) Electrical Routine Test.

Routine test shall be made on every composite insulators as specified in IEC 61109 .

Sr.No.	Description	Standard
1	Identification of marking	As per IEC: 61109 Clause 8.1
2	Visual Inspection	As per IEC: 61109 Clause 8.2
3	Mechanical routine test	As per IEC: 61109 Clause 8.3

Every composite insulator shall withstand mechanical routine test at ambient temperature tensile load at RTL corresponding to at least 50 % of the SML for at least 10 sec.

7.0 <u>TEST CERTIFICATE</u>:

The tenderer shall furnish detailed type test reports of the offered porcelain/ composite Insulators as per clause of the Technical Specifications at the NABL approved laboratories to prove that the Insulators offered meet the requirements of the specification. These Type tests should have been carried out within five years prior to the date of opening of this tender. However, the tenderers who have supplied the porcelain/composite Insulators to M.S.E.D.C.L./ erstwhile M.S.E.B. against purchase order shall be exempted from submission of type test reports against this tender provided.

i) The offered Insulators are already fully type tested at Laboratories accredited by the National Accreditation Board of Testing and Calibration Laboratories (NABL) within five years prior to the date of opening of the tender.

ii) There is no change in the design of type-tested porcelain/composite Insulators and those offers against this tender.

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(iii) Such tenderers complying (i) and (ii) above shall furnish an undertaking in the format scheduled 'F' enclosed herewith.

The detailed Type tests along with the relevant certified drawings etc. or undertaking in the format schedule "F" seeking exemption from their submission of the type test reports are to be submitted along with the offer.

The purchaser reserves right to demand repetition of some or all the Type Test in presence of purchaser's representative at purchaser's cost. For this purpose, the tenderer shall quote unit rates for carrying out each Type Test. However, such unit rates will not be considered for evaluation of the offer. In case the unit fails in the Type Tests, the complete supply shall be rejected.

The successful tenderer shall take approval / waival of Type Test from C.E. (Dist.), M.S.E.D.C.L., Prakashgad, Bandra(E), Mumbai prior to the commencement of supply.

8.0 DRAWINGS:

The tender shall be accompanied with the detailed drawings with dimensions for each ratings of pin insulators i.e.11,22 & 33 KV. The Bidder shall furnish full description and illustration of the material offered.

8.1 The Bidder shall furnish along with the bid the outline drawing (3 copies) 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) Minimum Creepage distance with positive tolerance
(b) Protected creepage distance
(c) Unit mechanical and electrical characteristics
(d) Size and weight of ball and socket/tongue & clevis
(e) Weight of composite long rod units
(f) Materials
    (i) Identification mark
    (ii) Manufacturer's catalogue number

9. Retest and Rejection:

9.1 **C-2.1** Sample Procedure for testing of porcelain insulators shall be as per Appendix 'C' of IS- 731/1971 for Acceptance & Routine Tests.
All the insulators selected at random according to col. 1 & 2 of Table 5 of IS-731/1971 shall be subjected to dimensions and temperature cycle tests. The insulators failing to satisfy either of requirements shall be termed as defectives. The lot shall be considered as confirming to these requirements if the number of defectives found in the sample is less than or equal to corresponding acceptance number given in col. 4 of Table 5. The lot shall be rejected if the number of defectives in the same lot is greater than or equal to the first rejection number (r_1) given in col. 5. If the number of

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defectives is between the acceptance number and the first rejection number, a second sample of the same size (see col. 3 of Table 5) shall be selected from the lot at random and subjected to these tests. The number of defectives in the first sample and second sample shall be combined. If the combined number of defectives is less than the second rejection number ($r_{2)}$ given in col. 6 of Table 5, the lot shall be considered as confirming to these requirements. Otherwise the lot shall be rejected without further testing.

C-2.2 The lot which has been found as confirming to the above requirements shall then be divided into two parts, as shown in col 7 and 9 of Table 5. The number of insulators to be tested for mechanical, electromechanical and porosity tests shall be in accordance with col 7 of Table 5. The lot shall be considered as confirming to these requirements if no defective is found in the sample and shall be rejected if there are two or more defectives. If there is one defective, a second sample of the same size (see col 8 of Table 5) shall be selected at random and subjected to the tests. The lot shall be considered as confirming to these requirements if no defective is found in the second sample; otherwise the lot shall be rejected without further testing.

C-2.3 The lot which has been found as confirming to the above requirements of C-2.1 shall then be tested for galvanizing test and puncture test. For this purpose, the sample size is given in col. 9 of Table 5. The lot shall be considered as confirming to these requirements if no defective is found in the sample and shall be rejected if two or more defectives are found in the sample. If there is one defective, a second sample of the same size (see col. 10 of Table 5) shall be selected at random and subjected to the tests. The lot shall be considered as confirming to these requirements if no defective is found in the second sample; otherwise the lot shall be rejected without further testing.

The lot shall be considered as conforming to the requirements of acceptance tests if conditions in C-2.1, C-2.2 and C-2.3 are satisfied.

9.2 Sample Procedure for testing of composite insulators shall be as per clause 7.1 to 7.6 of IEC 61109 for Acceptance & Routine Tests.

For the sampling tests, two samples are used, E1and E2. The sizes of these samples are indicated in the table below.

Lot Size (N)	Sample Size	
	E1	E2
N < 300	Subject to agreement	
300 < N < 2000	4	3
2000 < N < 5000	8	4
5000 < N < 10000	12	6

If more than 10000 insulators are concerned, they shall be divided into an optimum number of lots comprising between 2000 and 10000 insulators. The results of the tests shall be evaluated separately for each lot.

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The purchaser's representative shall select the composite insulators from the lot at random.

The samples shall be subjected to the applicable sampling tests.

The sampling tests are:

Verification of dimensions	-	(E1 + E2)
Verification of the locking system	-	(E2)
Verification of tightness of the interface between end fittings & Insulator housing	-	(E2)
Verification of the specified mechanical load SML	-	(E1)
Galvanizing test	-	(E2)

9.2.1 In the event of a failure of the sample to satisfy a test, the retesting procedure for composite insulators shall be as per IEC Standard.:

10.0. Markings:

10.1.1 Each insulator shall be legibly and indelibly marked to show the following:

a) Name or trademark of the manufacturer.
b) Highest system Voltage
c) Month and year of manufacturing.
d) Min. failing load in 'KN'.
e) Tender Reference Number

10.2 Marking on porcelain shall be printed and applied before firing.

11. Packing :

All insulators shall be packed in crates or boxes suitable for rough handling. Packing shall be marked with the strength and KV rating.

12. Guaranteed Technical Particulars :

The tenderer shall furnish in the attached form (Schedule 'A') all the guaranteed technical particulars.

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Schedule A-1

GUARANTEED TECHNICAL PARTICULARS

FOR 11 KV PIN. INSULATOR UNIT.

Sr. No.	Parameter Name	Parameter type 11 KV
1.	Name of Manufacturer.	Text
2.	Type of Insulator	Text
3.	Standard according to which the insulators manufactured & tested.	
4.	Name of material used in manufacture of the insulator with class / grade	Text
4(a)	Material of housing & weather sheds (Silicon content by weight)	Text
5.	Diameter of first outer shell	Numeric
6.	Diameter of second middle shell	Numeric
7.	Diameter of third lower shell in mm (min.)	Numeric
8.	Height of Insulator in mm	Numeric
9.	Minimum failing load in KN (5)	Text
10.	Min. creepage distance in mm. (320)	Numeric
11.	Suitable for shank diameter in mm (20)	Numeric
12.	Net weight of single Pin. Ins.	Text
13.	Nominal System Voltage in kV.	Text
14.	Highest System Voltage in kV (rms).(12)	Text
15.	Dry 1 min. power frequency withstand Voltage kV (rms)	Text
16.	Wet 1 min. power frequency withstands Voltage. KV (rms)	Text
17.	Dry flashover voltage. kV (rms)	Text
18.	Wet flashover voltage. KV (rms)	Text
19.	Dry lighting Impulse Withstand Voltage (Positive) kV (Peak)	Text
20.	Dry lighting Impulse Withstand Voltage test (Negative) kV (Peak)	Text
21.	Dry lighting Impulse flashover Voltage (Positive) kV (Peak)	Text
22.	Dry lighting Impulse flashover Voltage test (Negative) kV (Peak)	Text
23.	Method of fixing of sheds to housing (Specify):Single mould or Modular construction (Injection molding/Compression molding)	Text
24.	Any other particulars which the bidder may like to give	File
25.	Type test reports as per specification are submitted	Boolean
26.	Type test reports	File

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Schedule A-2

GUARANTEED TECHNICAL PARTICULARS

FOR 22 KV PIN. INSULATOR UNIT.

Sr. No.	Parameter Name	Parameter type 22 KV
1.	Name of Manufacturer.	Text
2.	Type of Insulator	Text
3.	Standard according to which the insulators manufactured & tested.	
4.	Name of material used in manufacture of the insulator with class / grade	Text
4(a)	Material of housing & weather sheds (Silicon content by weight)	Text
5.	Diameter of first outer shell	Numeric
6.	Diameter of second middle shell	Numeric
7.	Diameter of third lower shell in mm (min.)	Numeric
8.	Height of Insulator in mm	Numeric
9.	Minimum failing load in KN (10)	Text
10.	Min. creepage distance in mm.(560)	Numeric
11.	Suitable for shank diameter in mm (24)	Numeric
12.	Net weight of single Pin. Ins.	Text
13.	Nominal System Voltage in kV.	Text
14.	Highest System Voltage in kV (rms). (24)	Text
15.	Dry 1 min. power frequency withstand Voltage kV (rms)	Text
16.	Wet 1 min. power frequency withstands Voltage. KV (rms)	Text
17.	Dry flashover voltage. KV (rms)	Text
18.	Wet flashover voltage. KV (rms)	Text
19.	Dry lighting Impulse Withstand Voltage (Positive) kV (Peak)	Text
20.	Dry lighting Impulse Withstand Voltage test (Negative) kV (Peak)	Text
21.	Dry lighting Impulse flashover Voltage (Positive) kV (Peak)	Text
22.	Dry lighting Impulse flashover Voltage test (Negative) kV (Peak)	Text
23.	Method of fixing of sheds to housing (Specify):Single mould or Modular construction (Injection molding/Compression molding)	Text
24.	Any other particulars which the bidder may like to give	File
25.	Type test reports as per specification are submitted	Boolean
26.	Type test reports	File

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Schedule A-3

GUARANTEED TECHNICAL PARTICULARS

FOR 33 KV PIN. INSULATOR UNIT.

Sr. No.	Parameter Name	Parameter type 33 KV
1.	Name of Manufacturer.	Text
2.	Type of Insulator	Text
3.	Standard according to which the insulators manufactured & tested.	
4.	Name of material used in manufacture of the insulator with class / grade	Text
4(a)	Material of housing & weather sheds (Silicon content by weight)	Text
5.	Diameter of first outer shell	Numeric
6.	Diameter of second middle shell	Numeric
7.	Diameter of third lower shell in mm (min.)	Numeric
8.	Height of Insulator in mm	Numeric
9.	Minimum failing load in KN (10)	Text
10.	Min. creepage distance in mm.(900)	Numeric
11.	Suitable for shank diameter in mm (24)	Numeric
12.	Net weight of single Pin. Ins.	Text
13.	Nominal System Voltage in kV.	Text
14.	Highest System Voltage in kV (rms).(36)	Text
15.	Dry 1 min. power frequency withstand Voltage kV (rms)	Text
16.	Wet 1 min. power frequency withstands Voltage. KV (rms)	Text
17.	Dry flashover voltage. kV (rms)	Text
18.	Wet flashover voltage. KV (rms)	Text
19.	Dry lighting Impulse Withstand Voltage (Positive) kV (Peak)	Text
20.	Dry lighting Impulse Withstand Voltage test (Negative) kV (Peak)	Text
21.	Dry lighting Impulse flashover Voltage (Positive) kV (Peak)	Text
22.	Dry lighting Impulse flashover Voltage test (Negative) kV (Peak)	Text
23.	Method of fixing of sheds to housing (Specify):Single mould or Modular construction (Injection molding/Compression molding)	Text
24.	Any other particulars which the bidder may like to give	File
25.	Type test reports as per specification are submitted	Boolean
26.	Type test reports	File

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Annexure – 'D'

List of Standards applicable

Sr. No.	Particulars	Specified Standards with latest amendments
1.	Specifications for Porcelain insulators for overhead lines with nominal voltage greater than 1000V	IS- 731/1971
2.	Specifications for Composite insulators for A.C. overhead lines with nominal voltage greater than 1000V	IEC: 61109 / 92-93
2.	Metal fittings of insulators for overhead lines.	IS: 2486 part-1 / 1993
3.	Dimensional Requirements for Insulators fittings	IS: 2486 part-2 / 1989
4.	Methods of Random Samplings	IEC: 61109 / 92-93 IS- 731/1971
5.	Methods of High Voltage Testing	IS: 2071

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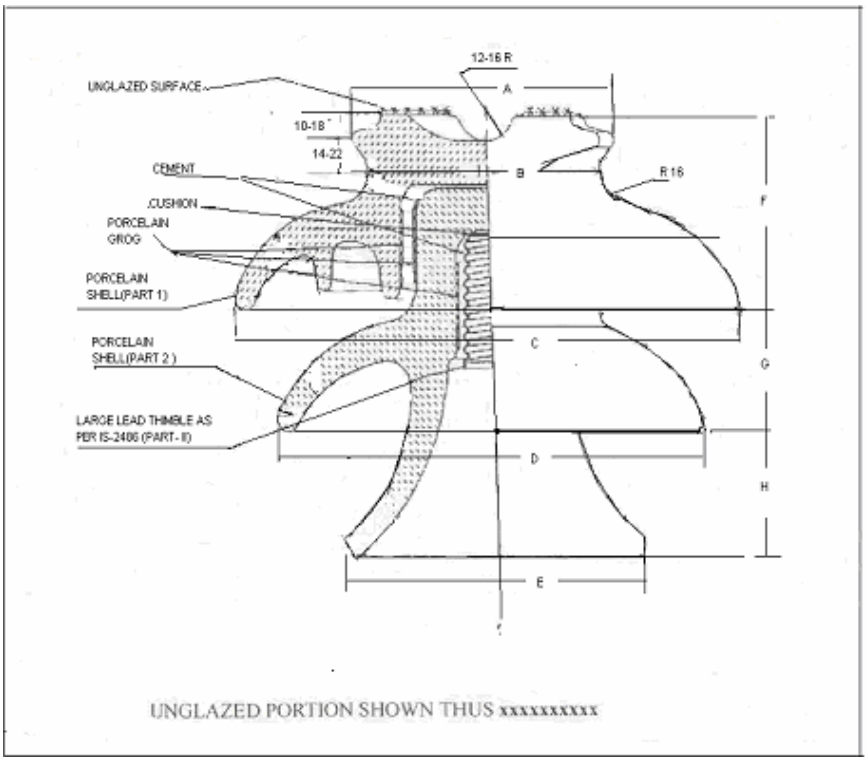

Sr. No.	DIMENSIONS	PIN INSULATORS (All Dimensions in mm)		
		11KV min. Creepage 320mm	22KV min Creepage 560mm	33KV min Creepage 840mm
1.	A			
2.	B			
3.	C			
4.	D			
5.	E			
6.	F			
7.	G			
8.	H			

Note: Dimensions A to H to be specified by the bidder along with the offer.

Sr. No.	Type of composite insulators	Nominal System voltage kV (rms)	Highest System voltage kV(rms)	Visible discharge test voltage kV(rms)	Wet Power Frequency Withstand voltage kV(rms)	Impulse Withstand voltage kV(rms)	Minimum Creepage Distance (mm)	Min. failing load kN
1.	Post/Pin Insulator	11	12	9	35	75	320	5
		22	24	18	55	125	560	10
		33	36	27	75	170	840	10

MAHARASTRA STATE ELECTRICITY DISTRIBUTION CO.LTD.			
DRAWN BY	DY.EE (MM-III)	SCALE: (NTS)	DISTRIBUTION SECTION M. M. CELL
CHECKED BY	EE (MM-III)		GENERAL ARRANGEMENT DRAWING FOR **11/22/33 KV** PIN INSULATORS
RECOMMENDED BY	SE (MM)	RIVISION (IF ANY)	
APPROVED BY	C. E.(DIST)		DRG. NO.: CE(DIST)/ MM-III / PIN INS/ DT 20 -05-2007