GUJARAT ENERGY TRANSMISSION CORPORATION LTD.
Sardar Patel Vidyut Bhavan, Race Course,
Vadodara: 390 007

TECHNICAL SPECIFICATION
OF
LONG ROD PORCELAIN INSULATORS
FOR
TRANSMISSION LINES

SPECIAL INSTRUCTIONS TO BIDDER

Please read following instructions carefully before submitting your bid.

1. All the drawings, i.e. elevation, side view, plan, cross sectional view etc., in AutoCAD format and manuals in PDF format, for offered item shall be submitted. Also the hard copies as per specification shall be submitted.

2. The bidder shall submit Quality Assurance Plan for manufacturing process and Field Quality Plan with the technical bid.

3. The bidder shall have to submit all the required type test reports for the offered item. In absence of this, the evaluation shall be carried out accordingly as non-submission of type test reports.

4. The bidder must fill up all the point of GTP for offered item/s. Instead of indicating “refer drawing, or as per IS/IEC”, the exact value/s must be filled in.

5. All the points other than GTP, which are asked to confirm in technical specifications must be submitted separately with the bid.

6. The bidder is required to impart training in view of manufacture, assembly, erection, operation and maintenance for offered item, at his works, to the person/s identified by GETCO, in the event of an order, free of cost. The cost of logistics will be borned by GETCO.

7. Please note that the evaluation will be carried out on the strength of content of bid only. No further correspondence will be made.

8. The bidder shall bring out all the technical deviation/s only at the specified annexure.

9. The bidder should indicate manufacturing capacity by submitting latest updated certificate of a Chartered Engineer (CE).
QUALIFYING REQUIREMENT DATA  
(For Supply)

Bidder to satisfy all the following requirements.

1) The bidder shall be Original Equipment Manufacturer (OEM). The offered equipment have to be designed, manufactured and tested as per relevant IS/IEC with latest amendments.

2) The minimum requirement of manufacturing capacity of offered type, size and rating of equipment shall be 7 times tender / bid quantity. The bidder should indicate manufacturing capacity by submitting latest updated certificate of a Chartered Engineer (CE).

3) Equipment proposed shall be of similar or higher rating and in service for a minimum period of THREE (3) years and satisfactory performance certificate in respect of this is to be available and submitted.

4) The bidder should clearly indicate the quantity and Single Value Contract executed during last FIVE (5) years, for the offered equipment. Bidder should have executed one single contract during last five years for the quantity equivalent to tender / bid. The details are to be submitted in following format,

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>ITEMS SUPPLIED TO</th>
<th>ORDER REFERENC E No. &amp; DATE</th>
<th>ITEM S</th>
<th>QUANTI TY</th>
<th>ORDER FULLY EXECUTE D. YES/NO</th>
<th>STATUS, IF ORDER UNDER EXECUTI ON</th>
<th>REMARK</th>
</tr>
</thead>
</table>

5) Equipment offered shall have Type Test Certificates from accredited laboratory (accredited based on ISO/IEC Guide 25 / 17025 or EN 45001 by the National accreditation body of the country where laboratory is located), as per IEC / IS / technical specification, valid for a period of FIVE years from the date of opening of technical bid.
1.0 **SCOPE**

1.1 This specification provides for design, manufacture, testing, inspection, packing and despatch, to destination of Long Rod porcelain insulators, specified herein for their satisfactory operation in various transmission lines and substations of the State.

1.2 These Insulators are to be used as insulating part on single circuit and / or double circuit 220 / 132 / 66 KV transmission lines and / or sub-stations of the purchaser.

2.0 **STANDARDS**

2.1 The Long Rod Insulators shall conform to the following Indian / International Standards, which shall mean latest revisions, amendments / changes adopted and / or published as on the date of opening of the Tender.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Indian Standards</th>
<th>Title</th>
<th>International Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IS : 731 1971</td>
<td>Specification For Porcelain Insulators.</td>
<td>--</td>
</tr>
<tr>
<td>2</td>
<td>--</td>
<td>Characteristics of String Insulator units of the long rod type</td>
<td>IEC Publication 433</td>
</tr>
<tr>
<td>3</td>
<td>--</td>
<td>Test Methods for Electrical Power Insulators</td>
<td>ANSI C 29.1</td>
</tr>
<tr>
<td>4</td>
<td>--</td>
<td>Insulators for Overhead lines of &gt;1KV, tests methods</td>
<td>IEC : 383 &amp; ANSI : C 29.11</td>
</tr>
<tr>
<td>5</td>
<td>--</td>
<td>Wet Process Porcelain and Toughened Glass Insulators Suspension Type</td>
<td>ANSI C29.2</td>
</tr>
<tr>
<td>6</td>
<td>IS : 2486 (Part-IV) 1974</td>
<td>Mechanical Performance Test</td>
<td>IEC : 575</td>
</tr>
<tr>
<td>7</td>
<td>IS : 2629</td>
<td>Recommended practice for Hot dip galvanizing of Iron and Steel.</td>
<td>ASTM A153</td>
</tr>
<tr>
<td>8</td>
<td>IS : 2633</td>
<td>Method of Testing uniformity of coating of</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Standard No.</td>
<td>Description</td>
<td></td>
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<tr>
<td>9</td>
<td>IS : 4826</td>
<td>Galvanized coating on round steel wire.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>IS : 6745</td>
<td>Methods of determination of weight of zinc coating of zinc coated iron and steel articles.</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>IS : 2071 (Part I,II&amp;III) BS : 443</td>
<td>Method of high voltage testing. For tests on insulators of Ceramics material for overhead Lines with a nominal voltage Greater than 1000 Volts.</td>
<td></td>
</tr>
</tbody>
</table>

3.2 However, in an event where the supplier offers Insulators conforming to standards other than the above, then the salient points of comparison between the standards adopted and the standards quoted herein shall be detailed in relevant schedule with an authenticated English version of such standards referred to.

3.0 CLIMATIC CONDITIONS

i) Location : In the State of Gujarat As per Annexure-I.

ii) Maximum Ambient Air Temperature. °C : 50

iii) Minimum Ambient Air Temperature. °C : 0

iv) Average daily ambient Air Temperature °C : 35

v) Maximum relative humidity. - % : 95

vi) Average rainfall per annum.(mm) : 1150

vii) Maximum altitude above mean sea level – Mtrs : 1000
viii) Iso-Ceraunic level i.e. Average number of Thunder storm - Days/annum : 30

ix) Maximum wind pressure.(kg/Sq. meters) : 200

x) Seismic level i.e. Earthquake Acceleration
   a) Horizontal Seismic Co-efficient (acceleration) – g (Zone – 5) : 0.08
   b) Vertical Seismic Co-efficient (acceleration) – g (Zone – 5) : 0.84

5.0 GENERAL TECHNICAL REQUIREMENT

5.1 The insulators shall be suitable for being installed directly in air supported on suspension insulator hardware or anchored through tension insulator hardware at the power cross arms of single circuit, double circuit or multi circuit transmission line towers.

5.2 The insulator shall therefore be suitable for satisfactory operation under the tropical climatic conditions listed in the relevant clause. The applicable design particulars of the insulator to be used on these lines is furnished in "System Particulars".

5.3 The design of the insulator Long Rods shall be such that all the stresses due to expansion or contraction in any part of the insulator under rapid temperature fluctuation, which may be created due to variation in the loads or fault of any nature, while in service shall not lead to any type of deterioration. Flat surface and corners shall not be allowed and shall be completely rounded off.

5.4 The porcelain shall not engage directly with the hard metal and all metal in contact with the cement shall be coated with the layer of chemically neutral and suitably yielding material or paint which shall act as a cushion and lubricant for the slight relative expansion and contraction of the parts.

5.5 The Long Rod shall be cap and pin type with the ball and socket coupling. The caps and pins of the Long Rod insulators shall be heavily galvanised and mechanically strong. The pin balls shall move freely in the cap sockets but shall be so designed that they do not get disengaged while in service under various operating and atmospheric conditions.

5.6 The caps shall be made of heat treated malleable cast iron (MCI) / SGI. These shall be free from cracks, shrinks, air holes, burrs and rough
edges, etc. The caps shall be circular with the inner and outer surfaces concentric and of such design that they will not yield or distort under stresses to the porcelains shells. The pins shall be of single piece made of high tensile forged steel hardened and tempered and shall be free from laps, folds, burrs, and rough edges. All bearing surfaces shall be smooth and uniform so as to distribute the loading stresses evenly. The pins shall be of such a design that they will not yield or distort under loaded condition. No joints in the pins shall be allowed, what so ever the joint type may be.

5.7 Nominal dimensions of the pin, ball and socket interior shall be in accordance with the IS indicated above. The mechanical strength rating of the pin ball shank shall not be less than the electromechanical strength of the insulator Long Rods as specified in this Specification.

5.8 The finished porcelain shall be glazed to a chocolate brown colour. The glaze shall cover all the exposed porcelain parts of the insulators and shall have a bright luster smooth surface and shall have a good performance under extreme weather conditions of tropical climate and heavily polluted atmosphere. The glaze shall not crack or get chipped due to ageing effect under normal and abnormal service conditions or while handling during transit or erection. The glaze shall have the same co-efficient of expansion as of porcelain body through out the working range of the temperature.

5.9 An additional quantity of clips to the extent of 1.5 % shall be supplied with the insulators free cost.

5.10 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.

5.11 The bidder shall be responsible for satisfying himself that all the insulators including fittings in a string are suitable for the tower structures and conductors specified in this specification.

5.12 The insulators shall be of standard design and made to gauge or a jig and the same shall be interchangeable, in all respect with the similar items.

6.0 MATERIALS

6.1 The insulators shall be manufactured from good quality porcelain insulating material as per approved design. The materials supplied shall be free from blow-holes, flaws, cracks, or other defects and shall be smooth, close – grained and of true forms and approved dimensions. All machined surfaces
shall be true, smooth, and well finished. The materials used shall comply with all the relevant ISS, BSS, or other standards to be specified along with the due justifications.

6.2 The porcelain shall be Ivory white, non-porous, of high dielectric, mechanical and thermal strength. The materials shall be free from internal stresses, blisters, laminations, voids, foreign matters / particles, imperfection of other defects which might in way render it unsuitable as insulator shells. Porcelain shall be unaffected by climatic conditions, ozone, acids, alkalies, zinc, dust etc.

6.2.1 The porcelain shells shall be made by wet process. They shall be clean, dense, homogeneous, and shall be fired to a complete and uniform vitrification so that glaze is not depended upon for insulation. The glaze shall be smooth, uniform and of Brown shade and shall cover completely all exposed porcelain in parts of the insulator. The shells shall posses the qualities best adopted to insulators for service at extra and ultra high voltages.

6.2.2 Metal fittings of drop forged steel or heat treated melliable cast iron for insulators are required to have excellent mechanical properties such as strength, toughness, high corrosion resistance, free from corona effects, etc.

6.2.3 Cement used in the construction of insulators, particularly for joining the metal parts with the porcelain insulator, shall not cause fracture by expansion or loosening by contraction and must have high compression and shearing strengths and be free from change in volume due to ageing and temperature changes. The thickness of the cement shall be kept as less as possible, however without affecting the strength of the joint, and proper care shall be taken to correctly fix the individual parts. The cement shall not give rise to chemical reaction with the metal fittings and/or thermal instability or chemical changes either in the porcelain insulator or the metal parts themselves.

6.2.4 Galvanised steel parts shall be made from high quality steel produced by either acidic or basic open hearth process, electric furnace process or basic oxygen process. All the properties of the steel castings and hard drawn shall conform to the relevant standards.

6.2.5 The zinc used for galvanising shall be electrolytic high grade Zinc, Zn-98, not less than 98 percent purity. It shall conform to and satisfy all the requirements of relevant ISS, BSS or other Standards to be specified with
the due justification. Galvanising has to be done hot dip galvanising process.

6.2.6 The bidder should specify the source of raw materials along with the proof of last purchases made. The Purchaser may reject the tender of the Bidders whose raw material suppliers are found to be supplying any poor quality or non standard materials, to the purchaser of this Specification or any other purchaser.

7.0 FREEDOM FROM DEFECTS

7.1 The products shall be smooth and free from all imperfections such as spills, splits, slag inclusion, die marks, scratches, fittings, blow-holes, projections, looseness, overlapping of layers, chipping of porcelain layers, cracks, shrinks, sand, etc. and all such other defects which may hamper the mechanical & electrical properties of the insulator as also the installation of the same at the site etc. Special care should be taken to keep away dirt, grit etc. during manufacturing.

8.0 SIZES

8.1 Nominal Size And Tolerances

The porcelain and galvanised steel parts for the complete insulator covered by this standard shall have dimensions specified in this Specification and shall be within the tolerances indicated therein. The dimensions of the steel galvanised parts shall be measured over the zinc coating.

Tolerance for length shall be allowed as follows

\[ \pm (0.04d + 1.5) \text{mm when } d \leq 300 \text{ mm.} \]

\[ \pm (0.025d + 6) \text{mm when } d > 300 \text{ mm.} \]

No negative tolerance for creepage distance is allowed.

9.0 JOINTS IN INSULATOR & PARTS

9.1 Porcelain Parts

9.1.1 No joints shall be permitted in the porcelain parts in the insulators, in addition to those made in the base materials before final production.

9.2 Galvanised Steel Parts
9.2.1 There shall be no joints in steel parts forming the fixing parts (core for mechanical strength) of the insulator.

9.2.2 The steel used in the construction of galvanised steel insulator parts before and after putting in position shall satisfy all the relevant requirements as per the standards indicated or any other standards with due justification.

9.2.3 The zinc used for galvanising shall be electrolytic high grade Zinc. It shall conform to and satisfy all the requirements of relevant standards indicated or any other standards with due justification. Galvanising shall be done by hot dip galvanising process.

9.3 The insulators offered shall be suitable for employing Hot Line Maintenance Techniques with the required speed, ease, and safety.

10.0 MARKING

10.1 Each insulators shall be legibly and indelibly mark with the trade mark of manufacturer, the batch and year of manufacture, guaranteed Electrical & Mechanical strength and the country of manufacture. Such marking on the porcelain shall be printed not embossed and shall be applied before firing. The unit of E&M strength viz. ‘Kg.’ should be given to facilitate easy identification and to ensure correct use.

11.0 STANDARD PACKING

11.1 All insulator Long Rods shall be packed in strong wooden crates and boxes of approved design with steel hoop and bends for strength and durability to withstand rough handling during transport and storage.

11.2 All crates shall have a tin label which shall indicate all the details like batch number, make, date of manufacture, consignee, destination, quantity, serial numbers etc.

12.0 TESTS:

12.1 The type, acceptance, routine tests, any tests specifically demanded by the Purchaser and tests during manufacture shall be carried out on the conductor free of cost.

12.2 Type tests shall mean those tests, which are to be carried out to prove the process of manufacture and general conformity of the material
to this specification. These tests shall be carried out on samples prior to commencement of commercial production against the order. The Bidder shall indicate his schedule for carrying out these tests in the activity schedule. These tests shall have to be carried out at the Government Approved Testing Laboratory only in presence of the Purchaser’s representative. Purchaser reserves the right to specify the name of the laboratory also, if so felt.

12.3 Acceptance Tests shall mean those tests, which are to be carried out on samples taken from each lot offered for pre-despatch inspection, for the purposes of acceptance of that lot. These tests shall be carried out at the manufacturers works in presence of Purchaser’s representative before the despatch of the materials to the site.

12.4 Routine Tests shall mean those tests which are to be carried out on each of the insulator to check requirements which are likely to vary during production. These tests shall be carried out by the manufacturer on each insulator and shall have to furnish these reports to the Purchaser’s representative during his visit for acceptance tests.

12.5 Tests during manufacture shall mean those tests, which are to be carried out during the process of manufacture and end inspection by the supplier to ensure the desired quality of the end product to be supplied by him, including all Quality Control checks and Raw Materials testing.

12.6 The standards to which these tests will be carried out are listed against them. Where a particular test is a specific requirement of this specification, the norms and procedures of the test shall be as specified in specification or as mutually agreed between the Bidder and the purchaser in the Quality Assurance Programme.

12.8 For all type and acceptance tests, the acceptance values shall be the values guaranteed by the Bidder in the "Guaranteed Technical Particulars", of his proposal or the acceptance value specified in this specification, whichever is more stringent for that particular test.

12.9 **Type Tests**

12.9.1 The following necessary type test will have to be carried on before submission of tender & to be submitted along with the technical bid. The type test which are older than 5 (Five) years will not be considered.
The tests should be carried out on Two (2) samples in the order mentioned below.

**On Both Insulators**

a) Visual Examination :

b) Verification Of Dimensions

c) Visible discharge test

d) Impulse voltage Withstand Test For Positive And Negative Wave

e) Dry And Wet Power Frequency Voltage Withstand test For One Minute

f) Temperature Cycle Test

**On First Insulator**

g) Mechanical Performance Test

h) Electro Mechanical Failing Load Test

i) Porosity Test

**On Second Insulator**

a) Galvanising Test

12.9.2 All the above Electrical and Mechanical tests shall have to be carried out on minimum three samples of each size and capacity of the insulators from the first lot offered at the third party Government Approved testing laboratory as per clause no 12.9.1.

12.10 **Acceptance Tests**
The following Acceptance tests shall be performed on samples selected in accordance with IS:731.

a) Visual and dimensional check

b) Temperature Cycle Test

c) Mechanical Performance Test

d) Electro Mechanical Failing Load Test

e) Porosity Test

g) Galvanising Test
12.11 Routine tests

a) Check that there are no cuts, fins etc. on the insulators.
b) Check that crates are as per specification.
c) Visual Examination
d) Mechanical Routine Tests
e) Electrical Routine Tests

12.12 Test During Manufacture

<table>
<thead>
<tr>
<th></th>
<th>Chemical analysis of zinc used for galvanising</th>
<th>As Per Relevant IS with latest Amendment.</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>Chemical analysis Porcelain</td>
<td>- D O -</td>
</tr>
<tr>
<td>c)</td>
<td>Chemical analysis of steel used</td>
<td>- D O -</td>
</tr>
</tbody>
</table>

12.13 Testing Charges

12.13.1 The testing charges for the type tests specified and as per relevant IS shall be borne by the bidder. All the bidders irrespective of quantity allotted to them, and time when they have earlier carried out the Type Test, will have to carry out the Type Tests at their own cost and the Purchaser will not have any financial or technical implication on this account. The tests shall be as per clause no. 12.9.1.

12.13.2 In case of failure in any of the type test/s, the supplier is either required to modify the design of the material or repeat the particular type test three times successfully at his own expenses. The decision of the owner in this regard shall be final and binding. The Purchaser at its own desecration may also cancel the order at the risk and cost of the contractor, if the material fails twice successfully in the Type Test.

12.13.3 Bidder shall indicate the laboratories in which they proposed to conduct the type tests. They shall ensure that the tests can be completed in these laboratories within the time schedule guaranteed by them in the appropriate schedule. The Purchaser reserves the right to specify the name of the laboratory also, if so felt.
12.13.4 The entire cost of testing for the type, acceptance routine tests and tests during manufacture specified herein shall be treated as included in the quoted unit price of insulator.

12.14 Additional Tests

12.14.1 The Purchaser reserves the right of getting done any other test(s) of reasonable nature carried out at Purchaser's premises, at site, or in any other place in addition to the aforesaid type, acceptance and routine tests to satisfy himself that the material comply with the specifications. In such case all the expenses will be to Suppliers account.

12.15 Sample Batch For Type Testing

12.15.1 The Bidder shall offer at least 10% of the ordered quantity or 300 nos. whichever is higher, for selection of samples required for conducting all the type tests.

12.15.2 The Bidder is required to carry out all the acceptance tests successfully in the presence of Purchaser's representative before despatch of the selected sample to the testing laboratory for type test.

13.0 TEST REPORTS

13.1 Copies of type test reports shall be furnished in at least two(2) copies along with one original. One copy shall be returned duly certified by the Purchaser only after which the material already inspected i.e. the materials manufactured for selection of sample for type test, shall be dispatched on receipt of Despatch Instructions from the Chief Engineer (Project).

13.2 Record of routine test reports shall be maintained by the Bidder at his works for periodic inspection by the purchaser’s representative.

13.3 Test Certificates of test during manufacture shall be maintained by the Bidder. These shall be produced for verification as and when desired by the Purchaser.

14.0 TEST FACILITIES

14.1 The following additional facilities shall be available at Supplier's works:-
a) Calibration Reports from Government approved testing laboratory of various testing and measuring equipment including tensile testing machine, resistance measurement facilities, burette, thermometer, barometer etc.

b) Finished insulator shall be checked for dimension verification and surface finish separately.

c) The bidder should have all the routine and acceptance testing facilities, in house in accordance with related standards. Manufacturers of foreign origin shall, in addition to the above, also have arrangements in India, either at works of their authorized representative/licenses or in the NABL lab. like CPRI, IISC, ERDA etc. for conducting sampling test in accordance with related standards.

15.0 INSPECTION

15.1 Supplier will have to offer inspection of insulators batch wise indicating quantity of each batch. Each batch will be considered as individual lot and the samples for inspection will be selected accordingly. However the number of insulators actually selected for testing will be considering the lots individually or single which ever is higher. The Purchaser's representative shall at all times during the pendency of the contract be entitled to have access to the works and all places of manufacture where insulators are being manufactured and the representative shall have full facilities for unrestricted inspection of the Suppliers works raw materials and process of manufacture and conducting necessary tests as may be deemed fit, for certifying the quality of product.

15.2 The Supplier shall keep the Purchaser informed in advance of the time of starting and of the progress of manufacture of insulator in its various stages so that arrangements can be made for inspection.

15.3 No material shall be despatched from its point of manufacture before it has been satisfactorily inspected, tested, and necessary despatch instructions are issued in writing, except for the cases where waiver of inspection is granted by competent authority of the Purchaser, and even in this case also written dispatch instructions will be issued. Any dispatches
before the issue of Dispatch Instructions in writing will be liable for rejection and non acceptance of the materials by the consignee.

15.4 The acceptance of any quantity of material shall in no way relieve the Bidder of any of his responsibilities for meeting all requirements of the specification, and shall not prevent subsequent rejection if such material is later found to be defective.

15.5 The sample taken from any numbers of crates for carrying out any type of tests will be to the suppliers account.

16.0 QUALITY ASSURANCE PLAN

16.1 The bidder shall invariably furnish following information along with his offer, failing which his offer shall be rejected.

i) Statement giving list of important raw materials, proposed to be used in the manufacture of the insulator against this Specification, names of sub suppliers for the 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 as routine and / or acceptance during production and on finished goods, copies of test certificates.

ii) Information and copies of test certificates as in (i) above in respect of bought out accessories.

iii) List of manufacturing facilities available.

iv) Level of automation achieved and list of areas where manual processing exists.

v) List of areas in manufacturing process, where stage inspections are normally carried out for quality control and details of such tests and inspections.

vi) List of testing equipment available with the Bidder for final testing of Insulator specified. In the case if the Bidder does not possess all the Routine and Acceptance testing facilities the tender will be rejected.

vii) The Purchaser reserves the right for factory inspection to verify the facts quoted in the offer. If any of the facts are found to be
misleading or incorrect the offer of that Bidder will be out rightly rejected and he may be black listed.

ix) Special features provided to make it maintenance free.

16.2 The bidder shall also submit following information to the purchaser along with the technical Bid.

i) List of raw materials as well as bought out accessories, and the name of suppliers of raw materials as well as bought out accessories.

ii) Type test certificates of the raw material and bought out accessories.

iii) Quality assurance plan (QAP) with hold points for purchaser's inspection.

16.3 The Bidders shall submit the routine test certificates of all the bought out items, accessories etc.

17.0 DOCUMENTATION

17.1 Two sets of type test reports, duly approved by the Purchaser shall be submitted by the Bidder, before commencement of supply. A copy of acceptance and routine test certificates, duly approved by the purchaser shall accompany the despatch consignment.

17.2 The manufacturing of the insulator shall be strictly in accordance with the approved drawings and no deviation shall be permitted without the written approval of the Purchaser. All manufacturing and fabrication work in connection with the insulator prior to the approval of the drawing shall be at supplier's risk.

17.3 Approval of drawing etc. by the purchaser shall not relieve the Bidder of his responsibility and liability for ensuring correctness and correct interpretation of the latest revision of applicable standards, rules and codes of practices. The insulator shall conform in all respects to high standards of engineering, design, workmanship and latest revisions of relevant standards in vogue on the day of opening of the Technical Bid and purchaser shall have the power to reject any work or material which in his judgment is not in full accordance therewith.
18.0 PACKING & FORWARDING

18.1 The insulator shall be supplied in non-returnable strong wooden crates provided with lagging of adequate strength, and displacement during transit, storage and subsequent handling and stringing operations in the field. The crates shall generally conform to relevant IS except otherwise specified hereinafter.

18.2 The bidder should submit the proposed crate drawing along with the bid. However, the same shall be in line with the requirements as stated herein. After placement of the Letter of Award, the Bidder shall submit four copies of fully dimensioned drawing of the crate, for Purchaser's approval before taking up manufacturing of Insulator and or crates. After getting approval from the Purchaser, Bidder shall submit 6 more copies of the approved drawing to Purchaser for further distribution and field use at Purchaser's end.

18.3 All wooden components shall be manufactured out of seasoned soft wood free from defects that may materially weaken the component parts of the crate. Preservative treatment for anti-termite/anti-fungus (Aldrime / Aldruse) etc. shall be applied to the entire crate with preservatives of a quality which is not harmful to the insulator nor to the persons using or storing the same.

18.4 The complete crate including inner cheek of the flanges and crate barrel surface shall be painted with a bitumen based paint.

18.5 A minimum space of 125 mm shall be provided between the inner surface of the insulator and outer surface of the crate.

18.6 Each batten shall be securely nailed across grains as far as possible to the flange edges with at least 2 nails per end. The length of the nails shall not be less than twice the thickness of the battens. The nail shall not protrude above the general surface and shall not have exposed sharp edges or allow the battens to be released due to corrosion.

18.7 Outside the protective layer, there shall be minimum of two binder consisting of hoop iron/galvanised steel wire. Each protective layer shall have two recess to accommodate the binders.
18.8 If any bidder wishes to supply the insulator in the steel crates the same will be acceptable, however free of cost.

19.0 **Marking**

19.1 Each drum shall have the following information stenciled on it in indelible ink along with other essential data:

- a) Contract/Award letter / order number
- b) Name and address of consignee
- c) Manufacturer's name and address
- d) Crate Number
- e) Size of insulator
- f) E&M strength of Insulator
- g) Gross weight of crate with insulator
- h) Weight of empty crate with lagging

20.0 **DRAWINGS**

20.1 All the bidders have to submit the drawings for Long Rod insulator along with the crates to be utilised for packing of the insulator, for the numbers specified in this Tender Specification along with the offer. In the event of an order the successful bidder shall submit the drawings stated above in triplicate for approval during the commencement period to CE(Project)GETCO Corporate Office Vadodara.

21.0 **DEVIATIONS**

21.1 Any deviation to this tender Specification will be out rightly rejected. All the Bidders have to submit this specification duly authenticated without any alterations, additions etc. on each page along with the Technical Bid. Any offer without this will be out rightly rejected.
SPECIFIC TECHNICAL REQUIREMENTS

2.0 SCOPE

2.1 This section covers the specific technical particular requirements the Long Rod insulators shall be offered. The Long Rod insulators offered shall also confirm to the General Technical requirements covered in this Specification.

2.2 The Specific Technical particulars of the Power System, as also for the Suspension and Tension Insulators are given as under.

SYSTEM PARTICULARS

<table>
<thead>
<tr>
<th>A)</th>
<th>Electrical System Data :</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>System Voltage (KV rms)</td>
</tr>
<tr>
<td>b)</td>
<td>Max. Voltage KV rms)</td>
</tr>
<tr>
<td>c)</td>
<td>Lightning impulse withstand voltage (dry &amp; wet) (KVP)</td>
</tr>
<tr>
<td>d)</td>
<td>Power Frequency withstand voltage (wet) (KV rms)</td>
</tr>
<tr>
<td>e)</td>
<td>Short circuit level (KA)</td>
</tr>
<tr>
<td>f)</td>
<td>Switching Surge withstand voltage (wet) KVP</td>
</tr>
<tr>
<td>g)</td>
<td>Frequency – Hz</td>
</tr>
<tr>
<td>I)</td>
<td>Normal</td>
</tr>
<tr>
<td>II)</td>
<td>Maximum</td>
</tr>
<tr>
<td>III)</td>
<td>Minimum</td>
</tr>
<tr>
<td>h)</td>
<td>Number Of Circuits Single / Double</td>
</tr>
<tr>
<td>i)</td>
<td>Normal Span – m</td>
</tr>
<tr>
<td>j)</td>
<td>Wind Span – m</td>
</tr>
<tr>
<td>k)</td>
<td>Weight Span – m</td>
</tr>
</tbody>
</table>

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a) System Voltage (KV rms)</td>
<td>400</td>
<td>220/132/66</td>
</tr>
<tr>
<td>b) Max. Voltage KV rms)</td>
<td>420</td>
<td>245/145/72.5</td>
</tr>
<tr>
<td>c) Lightning impulse withstand voltage (dry &amp; wet) (KVP)</td>
<td>1425</td>
<td>1050/650/350</td>
</tr>
<tr>
<td>d) Power Frequency withstand voltage (wet) (KV rms)</td>
<td>630</td>
<td>460/275/140</td>
</tr>
<tr>
<td>e) Short circuit level (KA)</td>
<td>40</td>
<td>40/40/31.5</td>
</tr>
<tr>
<td>f) Switching Surge withstand voltage (wet) KVP</td>
<td>1050</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>g) Frequency – Hz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I) Normal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II) Maximum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III) Minimum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>h) Number Of Circuits Single / Double</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Normal Span – m</td>
<td>400</td>
<td>350/350/260</td>
</tr>
<tr>
<td>j) Wind Span – m</td>
<td>440</td>
<td>385/385/300</td>
</tr>
<tr>
<td>k) Weight Span – m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13 Maximum</td>
<td>800</td>
<td>525/525/360</td>
</tr>
<tr>
<td>14 Minimum</td>
<td>-200</td>
<td>-100/-100/-50</td>
</tr>
<tr>
<td>l) Factor Of Safety (At Every Day Temp. &amp; No Wind)</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>m) Neutral Grounding</td>
<td>Effectively Earthed</td>
<td></td>
</tr>
<tr>
<td>n) Ball Socket dia in mm Suspension/Tension</td>
<td>16/20</td>
<td></td>
</tr>
<tr>
<td>o) Length of AF insulator string (in mm) 400/220/132/66 KV for suspension location</td>
<td>3335/2030/1305/725</td>
<td></td>
</tr>
<tr>
<td>p) Length of insulator string (in mm) 400/220/132/66 KV for Tension location</td>
<td>4080/2175/1450/870</td>
<td></td>
</tr>
<tr>
<td>r) Minimum failing load (KN) For 400KV For 220/132 KV For 66 KV</td>
<td>120/160 90/120 90/90 or 120</td>
<td></td>
</tr>
<tr>
<td>s) Minimum creapage distance in mm 400KV 220KV 132KV 66KV</td>
<td>10500 6125 3625 1815</td>
<td></td>
</tr>
</tbody>
</table>

**DETAILS OF CONDUCTORS**

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Details</th>
<th>Moose – 400KV</th>
<th>Zebra – 220KV</th>
<th>Panther – 132KV</th>
<th>Dog – 66KV</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Number Of Strands a) Aluminium b) Steel</td>
<td>54 7</td>
<td>54 7</td>
<td>30 3</td>
<td>6 7</td>
</tr>
<tr>
<td>2</td>
<td>Wire Diameter – mm a) Aluminium b) Steel</td>
<td>3.53 3.53</td>
<td>3.18 3.18</td>
<td>3 3</td>
<td>4.72 1.57</td>
</tr>
<tr>
<td>3</td>
<td>Approximate Weight – Kg / Km.</td>
<td>1998 1621</td>
<td>1974 394</td>
<td>974</td>
<td>394</td>
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<tr>
<td>4</td>
<td>Overall Diameter - mm</td>
<td>31.77 28.62</td>
<td>21 14.15</td>
<td>21</td>
<td>14.15</td>
</tr>
<tr>
<td>5</td>
<td>Ultimate Tensile</td>
<td>16275 13289</td>
<td>9144 3305</td>
<td>9144</td>
<td>3305</td>
</tr>
<tr>
<td>Strength - Kg</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
GUARANTEED TECHNICAL PARTICULARS

FOR

LONG ROD PORCELAIN INSULATORS
### GURANTEED TECHNICAL PARTICULARS OF LONG ROD PORCELAIN INSULATORS

*(To be furnished by the bidder and submitted with the offer. Entering Duplicate/overwritten data may lead to rejection of offer.)*

<table>
<thead>
<tr>
<th>A</th>
<th>GENERAL</th>
<th>SUSPENSION TYPE</th>
<th>TENSION TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1)</td>
<td>Voltage level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2)</td>
<td>Type (Ball &amp; Socket)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3)</td>
<td>Material of Disc</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4)</td>
<td>Color</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5)</td>
<td>Surface</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6)</td>
<td>Type of Locking device and its material (Clip of ss/phos.Bronze or better)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7)</td>
<td>Size</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8)</td>
<td>Ball/Socket dia (in mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9)</td>
<td>No. of units per single string</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Length of insulator string (in mm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Total length with hardware (in mm)</td>
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<td></td>
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<tr>
<td>12</td>
<td>Guaranteed mechanical failing load (in KN)</td>
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<td></td>
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</tbody>
</table>

### B ELECTRICAL

<table>
<thead>
<tr>
<th>1)</th>
<th>Total Min. creep age distance (in mm)</th>
<th>SUSPENSION TYPE</th>
<th>TENSION TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2)</td>
<td>Power frequency withstand voltage - dry KV(peak)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3)</td>
<td>Power frequency withstand voltage – wet KV(peak)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4)</td>
<td>Impulse withstand voltage (+/-)1.2x50 micro-second ,KV (peak)</td>
<td></td>
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</tr>
<tr>
<td>10</td>
<td>Visible discharge Voltage KV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Standard Applicable</td>
<td>IS:731 &amp; IEC:383</td>
<td></td>
</tr>
</tbody>
</table>

Signature of the Bidder : __________
Name : _______________________
Designation : ___________________

Date : ________________ Authorised common rubber
Stamp / seal of the bidder :__________