GUJARAT ENERGY TRANSMISSION CORPORATION LTD.

Sardar Patel Vidyut Bhavan, Race Course,

Vadodara: 390 007

TECHNICAL SPECIFICATIONS

OF

MAINTENANCE FREE TREATED EARTHPIT

SIGNATURE AND
SEAL OF THE BIDDER

MAINTENANCE FREE TREATED EARTHPIT

The bidder shall have to do the entire work of earth pits required for equipment earthing and for the pits at the corners of earth mat.

STANDARDS

The product and the equipment covered by this specification shall, unless otherwise specified be in line with the requirement of any of the latest applicable standards and will apply in order of priority as listed below:-

a) Indian Standards
b) IEEE 80
c) ANSI (American National Standards)
d) BS (British Standards)

EARTH PITS

All the Earth Pit shall be with special Ground electrodes supplied by Reputed Manufacturer. These special electrodes are provided with Ground enhancement material.

A. EARTHING PRODUCT COMPONENT SPECS

- The Earthing System should be based on use of Copper Bonded Earth Rods / Cu coated Pipe electrode / Cu coated PIP electrode (for corrosion resistance) and Ground Enhancement Material (to reduce Soil Resistivity).
- It should be capable of providing any ohmic value as specified by the client, by inter-connection of ground rods to form a Grid.
- The system shall be totally maintenance free and require no periodic or scheduled maintenance for a period of at least 30 years.
- There shall be no requirement to add water or any other chemical any time after initial installation.
- The system shall provide constant low ohmic value for entire life cycle without any consideration for moisture or temperature conditions.
- The manufacturer shall be a company of international repute engaged in the field of Facility Electrical Protection work.

B. ELECTRODE:

(1) COPPER BONDED EARTH RODS

- **For 66 KV Substations:**
  The Earth Rods shall have a nominal (actual) dia of 24mm (Min.) and length of 3 M (Min.).It shall be capable of handling 25 KA 1-Sec Short time current.

- **For 132KV, 220KV & 400 KV Substations:**
  The Earth Rods shall have a nominal (actual) dia of 38mm (Min.) and length of 3 M (Min.). It shall be capable of handling 40 KA 1-Sec Short time current.
- The Rods shall have a steel core with molecular bonding of 250 micron of copper as per international standards.

- A nickel layer is applied to steel core (and subsequently copper) by an electrolytic process forming a metallurgical bond between the three.
- The copper used shall be type DHP alloy No. 122 CDA and rated at 99.95% copper. The thickness of copper layer shall be uniform 250 micron.
- The Rods should be manufactured by a company of high repute to ensure quality of Copper Bonding.
- Type test report (tested at NABL accredited laboratory) shall be submitted satisfying minimum STC of 25 KA-1Sec for 66 KV S/S and for above class, STC shall be 40 KA-1 Sec.
- Test report (tested at NABL accredited laboratory) of cu-coating shall be submitted satisfying our requirement of 250 micron coating.

(2) PIPE or PIP (Pipe-In-Pipe) or Flat-In-Pipe ELECTRODE

For 66 KV Substations:

- The Pipe or Pipe-In-Pipe or Flat-In-Pipe electrode shall have a nominal (actual) outer dia of *50 mm & 2.5 mm thickness* (Min.) and length of 3 M (Min.). It shall be capable of handling 25 KA 1-Sec Short time current and shall have a molecular bonding of 250 micron of copper as per international standards.

- **For 132KV, 220KV & 400 KV Substations:**
  The Pipe or Pipe-In-Pipe or Flat-In-Pipe electrode shall have a nominal (actual) outer dia of *75.5 mm & 3 mm thickness* (Min.) and length of 3 M (Min.). It shall be capable of handling 40 KA 1-Sec Short time current shall have a molecular bonding of 250 micron of copper as per international standards.

- In case of P-I-P and Flat-In-Pipe, the portion between pipes shall be filled with the conductive material.

- Type test report (tested at NABL accredited laboratory) shall be submitted satisfying minimum STC of 25 KA-1Sec for 66 KV S/S and for above class, STC shall be 40 KA-1 Sec.

- Test report (tested at NABL accredited laboratory) of cu-coating shall be submitted satisfying our requirement of 250 micron coating.

C. GROUND ENHANCEMENT MATERIAL / BACK FILL / GROUNDING COMPOUND

- Ground Enhancement Material/ Backfill / Grounding compound shall be permanent and maintenance free. (No re- charging with salts or any other chemicals) and shall maintain its earth resistance with time.
- Ground Enhancement Material/ Backfill / Grounding compound shall confirm IEEE 80-2000 Clause No.14.5 (d). Ground Enhancement Material/ Backfill / Grounding compound in its set form shall have a resistivity of not more than 0.12 ohm-m.
- Ground Enhancement Material / Backfill / Grounding compound shall comply the requirements and all applicable tests as per part-7 of IEC

62561. The same shall be tested at NABL accredited laboratory and reports are to be verified at site.

-- Resistivity test using soil box
-- Leaching test
-- Sulfur determination
-- Corrosion test

- It must set up firmly and not dissolve or decompose or otherwise pollute the soil or the local water table.
- It shall be suitable for use in dry form or slurry form.
- The Ground Enhancement Material/ Backfill / Grounding compound shall not depend on the continuous presence of water to maintain its conductivity.
- The material shall be carbon based conductive concrete and shall not contain bentonite in any form.
- Same shall be applicable **for conductive material** used for filling in case of P-I-P and Flat-In-Pipe type earth electrodes.

D. CLAMP

- Each Earth Rod/Pipe/PIP must be provided with a suitable Cu plated clamp OR exothermic welding of Cu plated plate to facilitate Inter-connection of rods and connection to Equipment Earth Bar using appropriate copper coated MS strip.

GUARANTEE

The product shall be guaranteed for trouble free operation for a period of 30 years from date of commission or arrival at site whichever is later. Any defect discovered during this period shall be rectified free of charge.

The pits shall be drawn with the help of a boring machine, an auger or any other means as required by site conditions and nature of ground strata which shall be in the scope of supplier.

VERIFICATIONS & TESTS TO BE CARRIED OUT AT SITE:

Following verifications and tests shall be carried out by respective E.E.(Construction) while execution of work of maintenance free treated earth electrodes.

(I) Electrode:

1. Type test report shall be verified satisfying minimum requirement of STC of 25 KA-1Sec for 66 KV S/S and for above class (i.e. 132 KV, 220KV, & 400 KV Substations), STC shall be 40 KA-1 Sec.

2. Test report of cu-coating shall be verified for 250 micron coating.

(II) Ground enhancement material/ Back fill /Grounding material:

(A) Sampling of bag shall be 1 bag per lot of 50 bags received at site.

As per part-7 of IEC 62561, resistivity test using soil box shall be carried out and value of the same shall be below 0.12 Ohm-m.

(B) As per part-7 of IEC 62561, following test certificates shall be verified at site for

-- Leaching test
-- Sulfur determination
-- Corrosion test

Important Notes:

For Normal soil, drawing no.: GETCO/E/STD/P-021(1of 2), R2 Dtd.04.06.2015 shall be used for execution purpose and supersedes earlier released drawings dated 30.07.14 & 08.10.14.

For Rocky soil, drawing no.: GETCO/E/STD/P-021(2 of 2), R2 Dtd.04.06.2015 for execution purpose and supersedes earlier released drawings dated 30.07.14 & 08.10.14.

In Earthing Philosophy, terms **"CI Pipe Electrode"** and **"Treated Electrode"** shall be read as **"Maintenance free Treated Earth pit"** wherever indicated. It shall also be applicable for various equipment earthing drawings.

SIGNATURE AND
SEAL OF THE BIDDER