

**SPECIFICATION FOR 9.0 M LONG PCC POLES OF 400 KG. W/L**

**1. SCOPE:**

This specification covers the design and manufacture of 9 Meter long, rectangular shaped, solid prestressed cement concrete poles as per the reference at clause No. 2 required for creation of 11/33 KV urban distribution system.

**2. STANDARD:**

The poles shall conform in all respect IS as detailed below. Poles meeting any other authoritative standard which ensure an equal or better quality than the standard mentioned below will also be acceptable. In such cases the copy of standards (English version) adopted should be enclosed with the tender.

- |      |                                   |   |
|------|-----------------------------------|---|
| i)   | IS: 1678/1998<br>(Latest amended) | Specification for prestressed concrete poles for overhead power traction and telecommunication lines.                   |
| ii)  | IS: 2905/1989<br>(Latest amended) | Method of test for concrete poles for overhead power and telecommunication lines.                                       |
| iii) | IS: 7321/1974<br>(Latest amended) | Code of practice for selection, handling and erection of concrete poles for overhead power and telecommunication lines. |

**3. CLIMATIC CONDITIONS:**

- |       |  |              |
|-------|--|--------------|
| i)    | Peak ambient temperature in Shade.                               | 50 Degree C. |
| ii)   | Maximum average ambient temperature in 24 hours period in shade. | 40 Degree C. |
| iii)  | Maximum temperature attainable By an object exposed to sun.      | 60 Degree C. |
| iv)   | Maximum relative humidity  | 100%         |
| v)    | Average number of thunder storm days per annum                   | 40           |
| vi)   | Average number of rainy days per annum                           | 70           |
| vii)  | Average annual rainfall  | 10-100 cm    |
| viii) | No. of months of tropical monsoon                                | 4 months     |

Conditions.

- xi) Maximum wind pressure 100 kg/ m<sup>2</sup>.
- x) Altitudes not exceeding 1000 Mtrs.

#### **4.0 MATERIALS:**

The following quality of material should be used for manufacturing of PCC poles.

#### **4.1 CEMENT:**

The cement used in manufacture of prestressed concrete poles shall be 43 grade ordinary Portland cement conforming to IS: 8112/1976 or IS: 8041- 1978 (Specification for rapid hardening Portland cement) or Portland slag cement conforming to IS: 455 but with not more than 50% slag cement or 53 grade ordinary Portland Cement conforming to IS 12269.

#### **4.2 AGGREGATES:**

Aggregates used for the manufacture of prestressed concrete poles shall conform to IS 383/1970 (specification for coarse and fine aggregates from natural sources for concrete). The nominal maximum size of coarse aggregates shall not exceed 12 mm. Only coarse sand of FM not less than 2.5 is permissible.

#### **4.3 WATER:**

Water should be free from chlorides other salts and organic matter. Potable water is generally suitable.

#### **4.4 ADMIXTURES:**

These admixtures should not contain calcium chloride or other chlorides and salts which are to likely to promote corrosion of prestressing steel. The admixtures shall conform to IS 9103

#### **4.5 PRESTRESSING STEEL:**

The pre stressing steel wires including those used as un-tensioned wires should conform to IS: 1785 (Part. I) 1983 (Specification for plain hard drawn steel wire) or IS: “6003/1983 (Specification for indented wire for pre stressed concrete)”. The type design for Indented wires of 4 mm diameter are with a guaranteed ultimate Tensile strength of 175 kg. / sq. mm.

#### **4.6 CONCRETE MIX:**

The concrete mix. M45 grade shall be designed to the requirements laid down for controlled concrete (also called design concrete requirement laid down / mix concrete) in IS: 1343/1980 (Code of practice for pre stressed concrete) and IS: 456/2000 (code of practice for plain and reinforced concrete) subject to the following special conditions:

- a) Min. working cube strength at 28 days should be at least 450 kg./Sq. cm.
- b) The mix. Should contain at least 380 kg. cement per cubic meter of concrete.
- c) The concrete strength at transfer should be at least 245 kg. /Sq. cm.

- d) The mix. Should contain as low water content as is consistent with adequate workability. If it becomes necessary to add water to increase the workability the cement content should also be raised in such a way that the original value of water cement ratio is maintained.
- e) Weigh Batchers should be used for mixing aggregates and coarse sand by weight.

## **5.0 TECHNICAL REQUIREMENTS:**

### **5.1 DESIGN REQUIREMENTS:**

The poles shall be designed for the following requirements.

- 5.1 The poles shall be planted directly in the ground with a planting depth of 1.52 meters.
- 5.2 The working load on the poles shall be 400 kg. applied at 0.6 M from top.
- 5.3 The factor of safety shall not be less than 2.
- 5.4 The average permanent load should be 40% of the working load.
- 5.5 The factor of safety against first crack load shall be 1.0.
- 5.6 At the design value of first crack load the modulus of rupture shall not exceed 53 kg. / cm<sup>2</sup>.
- 5.7 The ultimate moment capacity in the longitudinal direction should be at least one fourth of that in the transverse direction.
- 5.8 The max. compressive stress in concrete at the time of transfer of prestress should not exceed 0.8 times the cube strength.
- 5.9 The concrete strength at transfer shall not be less than half of the 28 days strength ensured in the design.
- 5.10 Clear concrete cover shall not be less than 30 mm.

### **6.0 OTHER TECHNICAL REQUIREMENTS:**

- A** **EARTHING:** Earthing shall be provided, by having continuous length of 4 mm dia G.I. wire left projected from the transverse face of the poles to a length of 100 mm at 250 mm from top and 150 mm below ground level (Planting depth to be 1.52 M). The tolerance of 25 mm shall be allowed in position of earth wire. The earth wire shall not be allowed to entangle with prestressing wires. G.I. wire coatings should be heavy as per IS 4826: 1979

**MARKING:** The poles shall be clearly marked by engraving during manufacture, the following particulars at a height of 3 meters from the bottom end which should be clearly visible/readable/legible.

- (i) Name of firm, LOI/ PO no. at position (i) 400 mm, below top (ii) 3.0 meters from the bottom.
- (ii) P.V.V.N.L., Date, month and year of casting at a place in between name of firm as given in (i).

### **7.0 GUARANTEED TECHNICAL PARTICULARS/Drawing/Proven Design:**

The tenderer must furnish the guaranteed technical particulars of the PCC poles as required in the Volume-2 (B) by mentioning specific figures therein. Any item of the GTP left unfilled or simply written as per ISS etc. shall be considered as incomplete GTP and such tender is liable to be rejected. Complete drawing of PCC poles should also be furnished showing HT wire configuration along with proven design.

## **8.0 SUPPLY OF RAW MATERIAL:**

No assistance shall be provided by the purchaser for arranging, procuring the part / full required quantity of any raw materials like cement, aggregates. HT steel wires, MS rounds, etc. While quoting the delivery viz. commencement time and monthly rate of supplies, this point should be kept in view.

## **7 INSPECTION:**

Inspection shall comprise of:

- a) Visual inspection for shape, workmanship and finish of the PCC poles.
- b) Checking of dimensions/quantity as per the GTP.
- c) Witness of tests:
  - i) On PCC poles for its transverse load strength, and
  - ii) Testing arrangement shall be preferably as specified in the relevant specification i.e. IS: 1678/1998 and IS: 2905/ 1989 (both latest amended). As per provision of clause No. 6.2.3 of IS: 2905/ 1989, the load shall be applied at a point stipulated in the relevant IS by means of a suitable device such as a wire rope and which placed in a direction normal to the relevant IS by means of a suitable device such as a wire rope and which placed in a direction normal to the direction of the length of the pole so that the minimum length of the pole under pull is not less than the length of the pole.

As per provision of clause No. 6.2.5 of IS-2905/1989 (latest amended)” load measurement”, the dynamometer or any other satisfactory method of load measurement shall be calibrated at regular intervals and capable of measuring load to the accuracy of 50 N may be adopted.

The supplier should have transverse load testing arrangements of its own.

## **d) TOLERANCE:**

The following tolerances shall be allowed.

- |       |  |          |
|-------|--|----------|
| i)    | Over all length of PCC poles.  | ± 15 mm  |
| ii)   | Top and bottom dimension.  | ± 5 mm   |
| iii)  | Clear concrete cover over HT steel Wires (Average of measurements at three Sections) | ± 1 mm   |
| iv)   | Uprightness of the PCC poles.  | 0.5%     |
| v)    | Diameter of HT wires as per IS: 6003/1983  | ± 0.05mm |
| vi)   | Diameter of GI wires as per IS: 280/1978   | ± 2.5%   |
| vii)  | Diameter of M.S. Rod for Eye hook as per IS: 1786/1966                               | ± 4%.    |
| viii) | In position of GI wire   | ± 15 mm  |

The material used with negative tolerance more than above tolerance in the pole will not be acceptable.

All the tests (as mentioned above) and Inspection shall be made at the place of manufacture unless otherwise especially agreed upon by the bidder and purchaser at the time of purchase. The bidder shall afford the inspection officer (s) representing the purchaser all reasonable facilities without charges, to satisfy him that the material is being furnished in accordance with this

specification. The purchaser has the right to have the tests carried out at this own cost by an independent agency whenever there is a dispute regarding the quality of supply.

The Inspection may be carried out by the purchaser at any stage of manufacture/ before dispatch as per relevant standard.

Inspection and acceptance of any material under the specification by the purchaser, shall not relieve the bidder of his obligation of furnishing material in accordance with the specification and shall not prevent subsequent rejection if the material is found to be substandard. The Bidder shall keep the purchaser informed in advance, about manufacturing programme so that arrangements can be made for inspection.

The purchaser reserves the right to insist for witnessing the acceptance/ routine testing of the bought out items.

The bidder shall give 15 days (for local supplies) /30 days (in case of foreign bidder) advance intimation to enable the purchaser to depute his representative for witnessing the acceptance and routine tests. The inspection charges (inspectors traveling, boarding/ lodging) would be to the purchaser's account.

#### NOTE FOR FOREIGN BIDDER:

The Bidder shall indicate the name(s) of reputed inspection agencies and their inspection charges clearly for each lot. The Inspection charges will be borne by the purchaser. However, the purchaser reserves the right to appoint at its cost any inspection agency to carry out the inspection.

### 8 **SAMPLING:**

- a) Randomness is the pre requisite for sample checking and testing. Starting from any random serial number of PCC poles in the offered lot (arranged serial number wise and sub-divided sub-lots each not exceeding 200 Nos. of poles) every pole shall be included in the sample "r" being the next higher integral part of  $N/n$  where N is the size of the lot or sub-lot and "n" is the sample size as per the table below: -

#### **Sample size and criterion for conformity:**

Size of lot or sub-lot (N)	Dimensional requirement		No of sample poles for transverse strength test (r) (Till breakage)
	Sample size (n)	Permissible No. of defective samples	
Upto 100	10	1	1
101 to 200	15	1	3
201 to 300	20	2	4
301 to 500	30	3	5

The maximum size of lot which can be offered for inspection at site is 200 Nos. except in case of last lot which will be balance quantity left. Lots size once offered for inspection cannot be reduced subsequently under the re-inspection if required unless re inspection charges for each sub lots out of the original lot are deposited.

- b) Deviation in selection of samples may be effected by the inspecting officer only if he thinks that the purpose of checking/testing will be better served by such deviation.
- c) The number of poles, in every lot/sub lot, which does not satisfy, the requirement of overall length, cross section and uprightness shall not exceed the corresponding number given in col.3 of the above Table. If the number of such poles exceeds the corresponding number, supplier shall segregate the pole not conforming to the requirement of specification and shall submit the remaining poles for checking. Fresh poles as per sample size indicating in col.2 will be drawn from the remaining poles also exceeds the permissible number indicated in Col.3 then the subject lot or sub lot under inspection will be rejected without further checking. Result of all such checking shall be recorded.
- d) PCC poles, in every lot/sub lot sampled for transverse load strength test shall satisfy the requirement of the test. If one or more poles fail, twice the number of poles originally tested shall be selected as before and subjected to the test. If there is no failure among these poles the lot or sub lot under inspection shall be considered to have satisfied the requirements of this test. All result shall be recorded.

All of the poles subjected to transverse load strength test shall be reserved for at least 7 days from the date of inspection for any subsequent checking by any other representative of the purchaser, if required. These poles shall not be dispatched/supplied to the purchaser.

- e) The pole out of these already subjected to transverse load strength test, from every lot/sub lot, shall be destructed to:
  - i) Measure clear thickness of concrete cover at three points one within 1 metre from the button end of the pole, the second within 0.6 metre from the top end of the pole and the third at an intermediate point and the mean value compared with the specified value.
  - ii) Check size, quantity and configuration of steel reinforcement and GI earth wire.
  - iii) The destructed poles shall also be preserved for at least seven days from the date of inspection for subsequent checking by any other representative of the purchaser if required. In case of foreign bidders, this period shall be fifteen days.

## **9 QUALITY ASSURANCE PLAN:**

The tenderer shall invariably furnish the following information along with his offer, failing which his offer shall be liable for rejection. Information shall be separately given for individual type of equipment offered.

- i) Statement giving list of important raw materials, name 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 tenderer's representative, copies of tests certificates.
- ii) Information and copies of test certification as in (i) above in respect of bought out accessories.
- iii) List of manufacturing facilities available/capacity 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) Special features provided in the equipments to make it maintenance free.
- vii) List of testing equipments and apparatus along with their date of calibration, available with the tenderer for testing of pole specified and test plant limitation, if any, vis-à-vis the type, special acceptance and routine tests as specified in the

relevant standards. These limitations shall be very clearly brought out in schedule of deviations from specified tests requirements.

9.1 The successful tenderer shall within 30 days of placement of order, submit following information to the purchaser.

- i) List of raw material as well as bought out accessories and the name of sub-suppliers selected from those furnished along with offer.
- ii) Quality assurance plan (QAP) with hold points for purchaser's inspection. The quality assurance plan and purchasers hold points shall be discussed between the purchaser and the supplier, before the QAP is finalized.

9.2 The successful tenderers shall submit the routine tests certificates of bought out accessories and central excise passes for raw materials at the time of routine test.

#### 10.0 **DOCUMENTATION**

All drawings shall be in ink and suitable for microfilming. All dimensions and data shall be in SI units.

##### 10.1 LIST OF DRAWINGS AND DOCUMENTS:

- a) Detailed dimensional drawing of pole
- b) Sectional view showing –
  - i) Configuration of HT wires (Tensioned & Un tensioned) size and No. of HT wires eye hooks positions and projection of earth wire marking and reinforcement.
  - ii) Test reports, literature, pamphlets of the bought out items, and raw material.
  - iii) Proven design.

10.2 The successful tenderer shall, within two weeks of placement of order, submit three sets of final versions of all the above said drawings for purchaser's approval.

10.3 The manufacturing of the poles shall be strictly in accordance with the approved drawing and no deviation shall be permitted without the written approval of the purchaser. All manufacturing and fabrication in connection with the pole prior to the approval of the drawing shall be at the suppliers risk.

#### 11 **SPECIAL AND IMPORTANT CONDITIONS OF THE TENDER:**

- 1. The Price of 9.0 M Long PCC Pole are **FIRM** in all respect and the tenderer must quote accordingly.
- 2- TENDERER MUST QUOTE FOR A MINIMUM OF 100% QUANTITY 9.0 M LONG PCC POLES, OTHERWISE THEIR TENDER SHALL NOT BE CONSIDERED.
- 3. FOR LOADING/UNLOADING /TRANSPORT AND INSURANCE AGAINST ALL RISKS INCLUDING INSURANCE CHARGES FOR 30 DAYS STORAGE AFTER RECEIPT OF POLES AT DESTINATION STORES /SUBSTATION HAS TO BE QUOTED IN THE FOLLOWING SLABS (I) 0-25 KM. (II) 26-50 KM. (III) 51-75 KM. (IV) 76-100 KM. (V) 101-150 KM (VI) 151-200 KM (VII) 201-250 KM (VIII) 251-300 (IX) 301-350 KM PER KM./POLE RATE HAS TO BE QUOTED.

**NOTES:** Firm situated outside PVVNL Area shall transport the PCC Poles from their works to the nearest PVVNL Area border free of cost. This can be further understood as if the nearest PVVNL Area border from the firms works is 'X' Km. & the poles have been transported for total 'Y' Km. Distance then the firm shall be given transportation charges/ Corresponding to (Y-X) Km. Only.

Incase of any ambiguity in quoting the above rates, the tender is liable to be rejected.

4. 'Proven design' as mentioned in clause No.1.2.6 of Instruction to Tenderers implies that the drawing & design calculation of 9.0 M Long PCC Pole should be got approved by a approved Institution.
5. Data of R/R shall be deemed to be date of delivery for dispatch by rail, the data of receipt of material in purchaser's store shall be deemed to be the date of delivery for dispatch by Road.
6. No payment shall be made for broken pole during inspection/testing out of the lot offered for inspection.
7. THE BIDDER SHOULD SIGN AND STAMP EACH PAGE OF THE BIDS ITS ANNEXURE/DOCUMENTS NECESSARILY.
8. Incase of any Inconsistency the provisions contained above shall prevail.
9. The tender part II (price part) of bidders who quote poles of cross-sections different form that mentioned in the tender specification shall not be opened.