CONTENTS

1. SCOPE:

This specification covers technical requirements for manufacturing, performance & testing at manufacturer's place, packing, supply and unloading at stores/site, PSC poles for use in overhead 11 KV and L.T. power lines and double pole structures complete for efficient and trouble free operation at the site.

2.APPLICABLE STANDARD:

The Poles shall comply with latest standards as under:

The PSC poles shall conform to the requirements stated in latest editions of relevant applicable standards as follows:

a) IS 1678 Specification for Pre Stressed Concrete Poles for Overhead Power Lines.
b) IS2905MethodsofTestforConcretePolesforOverheadPower Lines.
c) IS 6003 for Indented Wire for Pre Stressed Concrete.
d) IS 8112 For 43 Grade Ordinary Port Land Cement.
e) IS 12269 For 53 Grade Ordinary Port Land Cement.
f) IS 8041 For Rapid Hardening Portland Cement
g) IS 383 Specifications for Coarse And Fine Aggregate from Natural Sources for Concrete.
h) IS 9103 Concrete Admixtures.
i) IS 456 Plain And Reinforced Concrete-Code Of Practice.
j) IS 1343 for Pre-Stressed Concrete
k) REC Manual 13/1977: Manual for Solid PCC Pole.
l) IE Rules and Electricity Act, 2003.

REC Specification No. 15/1979, REC Specification No. 24/1983, IS 1678, IS 2905, IS 7321.

3.CLIMATIC CONDITIONS OF THE INSTALLATION :

a) Maximum altitude above sea level 1,000m

b) Maximum ambient air temperature 50°C

c) Maximum daily average ambient air temperature 35°C

d) Minimum ambient air temperature 0°C

e) Maximum relative humidity 95%

f) Average number of thunderstorm days per annum (isokeraunic level) 70

g) Average number of rainy days per annum 120

h) Average annual rainfall 150cm

i) Earthquakes of an intensity in horizontal direction - equivalent to seismic acceleration of 0.3g

j) Earthquakes of an intensity in vertical direction - equivalent to seismic acceleration of 0.15g (g being acceleration due to gravity)

k) Wind velocity of 300 km/hr, 200 km/hr and 160 km/hr

l) Wind Pressure of 126kg/sq m up to an elevation of10 mtrs

Environmentally, some of the regions, where the work will take place includes coastal areas, subject to high relative humidity, which can give rise to condensation. Onshore winds will frequently be salt laden. On occasions, the combination of salt and condensation may create pollution conditions for outdoor insulators. Some places are in heavily industrial polluted areas. Therefore, Outdoor material and equipment shall be designed and protected for use in exposed, heavily polluted, salty, corrosive and humid coastal atmosphere. The design of equipment and accessories shall be suitable to withstand seismic forces corresponding to an acceleration of 0.1 g.

4.GENERAL TECHNICAL REQUIREMENTS & CONSTRUCTIONS :

Material

Cement to be used in the manufacture of pre-stressed concrete poles shall be ordinary for rapid hardening Portland cement confirming to IS: 269-1976 (Specification for ordinary and low heat Portland cement) or IS: 8041 E-1978 (Specification for rapid hardening Portland cement).

Aggregates

Aggregates to be used for the manufacture of pre-stressed concrete poles shall confirm to IS: 383 (Specification for coarse and fine aggregates from natural sources for concrete) .The nominal maximum sizes of aggregates shall in no case exceed 12 mm for 8mtr pole and 10mm for 9mtr pole.

Water

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

Admixture

Admixture should not contain Calcium Chloride or other chlorides and salts which are likely to promote corrosion of pre-stressing steel. The admixture shall conform to IS: 9103.

Pres-Stressing Steel

Pre-stressing steel wires including those used as un tensioned wires should conform to IS:1785 (Part-I) (Specification for plain hard-drawn steel wire for pre-stressed concrete, Part-I cold drawn stress relieved wire).IS:1785 (Part-II)(Specification for plain hard-drawn steel wire) or IS:6003 (Specification for indented wire for pre-stressed concrete).The type design given in the annexure are for plain wires of 4 mm diameter with a guaranteed ultimate strength of 175kg/mm². All pre-stressing steel shall be free from splits, harmful scratches, surface flaw, rough, aged and imperfect edges and other defects likely to impair its use in pre-stressed concrete.

Concrete Mix

Concrete mix shall be designed to the requirements laid down for controlled concrete (also called design mix concrete) in IS: 1343-1980 (Code of practice for pre-stressed concrete) and IS: 456 – 1978 (Code of practice for plain and reinforced concrete) subject to the following special conditions:

Minimum works cube strength at 28 days should be at least 420Kg/cm² for 8mtr pole. The concrete strength at transfer should be at least 210 Kg/cm² for 8mtr pole.

The mix should contain at least 380 Kg of cement per cubic meter of concrete.

The mix should contain as low water content as is consistent with adequate workability. It becomes necessary to add water to increase the workability the cement content also should be raised in such a way that the original value of water cement ratio is maintained.

Design Requirements

The poles shall be designed for the following requirements:

The poles shall be planted directly in the ground with a planting depth as per IS: 1678. Wherever, planting depth is required to be increased beyond the specified limits or alternative arrangements are required to be made on account of ground conditions e.g. water logging etc., the same shall be in the scope of the bidder at no extra cost to owner. The bidder shall furnish necessary design calculations/details of alternative arrangements in this regard.

The working load on the poles should correspond to those that are likely to come on the pole during their service life.

The factor of safety for 8.0 M poles shall not be less than 2.5. The average permanent load shall be 40% of the working load. The F.O.S. against first load shall be 1.0. At average permanent load, permissible tensile stress in concrete shall be 30 kg/cm². At the design value of first crack load, the modulus of rupture shall not exceed 55.2Kg/cm² for M-420 Concrete of 8mtr pole.

The ultimate moment capacity in the longitudinal direction should be at least one fourth of that in the transverse direction.

The maximum compressive stress in concrete at the time of transfer of pre-stress should not exceed 0.8 times the cube strength.

The concrete strength at transfer shall not be less than half, the 28 days strength ensured in the design, i.e. 420x0.5=210kg/cm² for 8mtr pole. For model check calculations on the design of poles, referred to in the annexure, a reference may be made to the REC “Manual on Manufacturing of solid PCC poles, Part-I-Design Aspects”.

Dimensions and Reinforcement

The cross-sectional dimensions and the details of pre-stressing wires should conform to the particulars given as per TPSODL specification and drawing.The provisions of holes for fixing cross-arms and other fixtures should conform to TPSODL specification and drawing.

All pre-stressing wires and reinforcements shall be accurately fixed as shown in drawings and maintained in position during manufacture. The un-tensioned reinforcement as indicated in the drawings should be held in position by the use of stirrups which should go round all the wires.

All wires shall be accurately stretched with uniform pre-stressed in each wire. Each wire or group of wires shall be anchored positively during casing. Care should be taken to see that the anchorages do not yield before the concrete attains the necessary strength.

Cover

The cover of concrete measured from the outside of pre-stressing tendon shall be normally 20 mm.

Welding and Lapping of Steel

The high tensile steel wire shall be continuous over the entire length of the tendon. Welding shall not be allowed in any case. However, joining or coupling may be permitted provided the strength of the joint or coupling is not less than the strength of each individual wire.

Compacting

Concrete shall be compacted by spinning, vibrating, shocking or other suitable mechanical means. Hand compacting shall not be permitted.

Curing

The concrete shall be covered with a layer of sacking, canvass, Hessian or similar absorbent material and kept constantly wet up to the time when the strength of concrete is at least equal to the minimum strength of concrete at transfer of pre-stress. Thereafter, the pole may be removed from the mould and watered at intervals to prevent surface cracking of the unit the interval should depend on the atmospheric humidity and temperature. The pre-stressing wires shall be de-tensioned only after the concrete has attained the specified strength at transfer (i.e. 200 or 210 kg/cm² as applicable).The cubes cast for the purpose of determining the strength at transfer should be coursed, a sear as possible, under condition similar to those under which the poles are cured. The transfer stage shall be determined based on the daily tests carried out on concrete cubes till the specified strength indicated above is reached. Thereafter the test on concrete shall be carried out as detailed in IS: 1343(code of practice for pre-stressed concrete). The manufacture shall supply, when required by the owner or his

representative, result of compressive test conducted in accordance with IS: 456 (Code of practice for plain and reinforced concrete) on concrete cubes made from the concrete used for the poles. If the manufacture so desired, the manufacture shall supply cubes for test purpose and such cubes shall be tested in accordance with IS: 456 (Code of practice for plain and reinforced concrete).

Lifting Eye-Hooks or Holes

Separate eye-hooks or hoes shall be provided for handling the transport, one each at a distance of 0.15 times the overall length, from either end of the pole. Eye-hooks, if provided, should be properly anchored and should be on the face that has the shorter dimension of the cross-section. Holes, if provided for lifting purpose, should be perpendicular to the broad face of the pole.

Holes for Cross Arms etc

Sufficient number of holes shall be provided in the poles for attachment of cross arms and other equipments.

Stacking & Transportation

Stacking should be done in such a manner that the broad side of the pole is vertical. Each tier in the stack should be supported on timber sleeper located as 0.15 times the overall length, measured from the end. The timber supported in the stack should be aligned in vertical line.

Earthing

(a) Earthing shall be provided by having length of 6 SWG GI wire embedded in Concrete during manufacture and the ends of the wires left projecting from the pole to a length of 50mm at 250 mm from top and 150 mm below ground level for 8mtr pole. Similarly, the end of the wires left projecting from the pole to a length of 100mm at 250mm from top and 150 mm below ground level for 9mtr pole.

(b) Earth wire shall not be allowed to come in contract with the pre-stressing wires

5.APPROVED MAKES

Cement - Grasim, Ultratech, Vikram, Birla Uttam, Binani, Gujrat Ambuja, ACC, Shree. 4MM Dia. Steel tendons – TATA, Ushamartin, Bajrang.

6.MARKING

Every pole shall be embossed/engraved/painted with “Property of TPSODL, Berhampur”,

material code and P.O. No. with date along with the following details.

i) Manufacturer's name.
ii) Month and Year of manufacture.
iii) Serial number of the pole
iv) Position of Centre
v) Planting Depth

A strip 20-25mm wide shall be painted with two or more coats to give an even shade of synthetic enamel paint in red colour on one major face at planting depth.

Another strip 20-25mm wide shall be painted to mark the position of Centre of pole.

7.QUALITY ASSURANCE AND CONTROL:

The bidder shall have adequate in-house testing facilities for carrying out all tests as per approved TPSODL Inspection and Testing Plan. All inspections and testing shall be carried out in accordance with relevant IS Codes in the bidder's testing facility. The bidder shall replace the materials / reject the work if test reports are not acceptable to TPSODL without any extra claim on this account. TPSODL's engineer-in-charge shall have free access to the bidder's manufacturing facility.

8.ACCEPTANCE TESTS:

The bidder shall perform all tests as per enclosed ITP for acceptance of material. The transverse strength test on poles shall be conducted in accordance with IS 2905. A pre-stressed concrete pole shall be deemed not to have passed the test if cracks wider than 0.1 mm appear at a stage prior to the application of the design transverse load at first crack and the observed ultimate transverse load is less than the design ultimate transverse load.

9.PRE-DISPATCH INSPECTION :

Material shall be subject to inspection by a duly authorized representative of TPSODL. Inspection may be made at any stage of manufacture at the discretion of the TPSODL and the material, if found unsatisfactory as to workmanship or material, is liable to rejection. The bidder shall grant free access to the places of manufacture to TPSODL's representatives at the times when the work is in progress. Inspection by TPSODL or its authorized representatives shall not relieve the bidder of his obligation of furnishing material in accordance with the specifications. Material shall be dispatched after specific MDCC (Material Dispatch Clearance Certificate) is issued by the TPSODL.

Following documents shall be sent along with material:

a) Test reports
b) MDCC issued by TPSODL
c) Invoice in duplicate
d) Packing list
e) Delivery Challan
f) Other Documents (as applicable)

10.INSPECTION AFTER RECEIPT AT STORES

The material received at the TPSODL store will be inspected for acceptance and shall be liable for rejection if found different from the reports of the pre-dispatch inspection and one copy of report shall be sent to Project Engineering department.

11.GUARANTEE:

The bidder shall stand guarantee towards materials, workmanship & quality of process/manufacturing of items under this contract for due and intended performance of the same, as an integrated product delivered under this contract. In the event any defect is found by the company up to a period of 12 months from the date of supply, the bidder shall be liable to undertake to replace/rectify such defects at its own costs, within 45 days' time frame, and to the entire satisfaction of TPSODL, failing which TPSODL will be at liberty to get it replaced/rectified at the bidder's risks and costs and recover all such expenses plus the Company's own charges (@ 20% of total expenses incurred), from the bidder or from the "Security cum Performance Deposit" as the case may be.

12.PACKING:

The bidder shall ensure that all material covered under this specification shall be prepared for rail/road transport in a manner so as to protect the material from damage in transit.

13.MANUFACTURING ACTIVITIES :

The bidder shall submit Pole Casting Schedule clearly elaborating various manufacturing activities with quantities. This Schedule should be in line with the Inspection & Testing Plan. The schedule shall be submitted within 15 days from the release of the order.

14.DRAWINGS:

The bidder shall provide drawings of PSC pole for approval.

15.SCHEDULE OF DEVIATIONS:

The bidders shall set out all deviations from this specification, Clause by Clause in this schedule. Unless **specifically** mentioned in this schedule, the tender shall be deemed to confirm the TPSODL's specifications.

SCHEDULE OF DEVIATIONS:

(TO BE ENCLOSED WITH BID)

All deviations from this specification shall be set out by the bidders, clause by clause in this schedule. Unless specifically mentioned in this schedule, the tender shall be deemed to confirm TPSODL's specifications.

S.No	Clause No.	Details of deviation with justifications

We confirm that there are no deviations apart from those detailed above.

Seal of the Purchaser: Designation:

Signature:

16.GTP:

NAME OF MATERIAL		**8 Mtr. Long 200 kg PSC Poles**	
GTP of 8 Mtr long 200 Kg. PSC Pole			
NAME OF THE BIDDER			
Sl No.	**Description**	**Unit**	Bidder's offer
1	Type of pole		
2	Factor of Safety		
3	Overall Length of Pole Meters	meters	
4	Working Load Kg	Kg	
5	Overall Dimensions		
A	Bottom Depth	mm	
B	Top Depth	mm	
C	Breadth	mm	
D	Planting Depth	mm	
6	Reinforcement Detail:		
7	Diameter of prestressing wire	mm	
8	No. of Tensioned wires		
9	No. of Untensioned wire		
10	Length of each untensioned wire	mtr.	
11	Concrete Detail		
A	Cement Type		
B	Grade		
C	Type		
D	Quantity	Cubic meter/pole	
E	Standard confirming to:		
12	Steel Quality	Kg/Pole	
A	Ultimate Tensile Strength (UTS)	Kg/Cm^2	
B	Weight	Kg/Pole	