TECHNICAL SPECIFICATION OF MATERIALS USED FOR CIVIL WORKS

1. M-1. Water

i. Water shall not be salty brackish and shall be clean, reasonably clear and free objectionable quantities of silt and traces of oil bad injurious alkalis, salts, organic matter and other deleterious material which will either weaken the mortar of concrete or cause efflorescence or attack the steel in R.C.C. Container for transport, storage and handling of water shall be clean. Water shall conform to the standard specified in I.S.456-1978.

ii. If required by the Engineer-in-Charge it shall be tested by comparison with distilled water. Comparison shall be made by means of standard cement tests for soundness time of setting and mortar strength as specified in I.S. 269-1976 Any indication of unsoundness, charge in time of setting by 30 minutes or more or decrease of more than 10 per cent in strength, of mortar prepared with water sample when compared with the results obtained with mortar prepared with distilled water shall be sufficient cause for rejection of water under test.

iii. Water for curing mortar, concrete or masonry should not be too acidic or too alkaline. It shall be free of elements which significantly affect the hydration reaction or otherwise interfere with the hardening of mortar or concrete during curing or those which produce objectionable stains or other unsightly deposits on concrete or mortar surfaces

iv. Hard and bitter water shall not be used for curing.

v. Potable water will generally found suitable for curing mortar or concrete.

2. M-2 Cement

Cement shall be ordinary Portland cement as per I.S. 12269: 2013.

3. M-3 Sand

i. Sand shall be natural sand, clean, well graded, hard strong, durable and gritty particles free from injurious amounts of dust, clay kankar nodules, soft or flaky particles shale, alkali salts organic matter, loam, mica or other deleterious substances and shall be got approved from the Engineer-in-Charge. The sand shall not contain more contain more than 8 percent of silt as determined by field test. If necessary, the sand shall be washed to make it clean.

ii. Coarse Sand: The fineness modulus of coarse sand shall not be less than 2.5-and shall not exceed 3.0, The sieve analysis of coarse shall be as under:

I.S Designation	Sieve Passing sieve	Percentage by weight Designation	I.S. Sieve percentage weight passing sieve
4.75mm	100	600 Micron	30-100
2.36mm	90 to 100	300 Micron	5-70
1.18mm	70-100	150 Micron	0-50

iii. Fine Sand:

The fineness modulus shall not exceed 1.0. The sieve analysis of fine sand shall be as under:

I.S Designation	Sieve Passing sieve	Percentage by weight Designation	I.S. Sieve percentage by weight passing sieve
4.75mm	100	600 Micron	40-85
2.36mm	100	300 Micron	5-50
1.18mm	75-100	150 Micron	0-10

4. M-4. Stone Grit

i. Grit shall consist of crushed or broken stone and be hard, strong, dense, durable, clean of proper gradation and free from skin or coating likely to prevent proper adhesion of mortar. Grit shall generally be cubical in shape and as far as possible flakey elongated pieces shall be avoided. It shall generally comply whit the provisions of I.S. 383-1970. Unless special stone of particular quarries is mentioned grit shall be obtained from the best black trap or equivalent hard stone as approved by the Engineer-in-Charge. The grit shall have no deleterious with cement.

ii. The grit shall conform to the following gradation as per sieve analysis:

I.S Designation	Sieve Passing sieve	Percentage by weight Designation	I.S. Sieve percentage by weight passing sieve
1250mm	100 %	4.75mm	0-20 %
10.00mm	85-100 %	2.36mm	0-25%

iii. The crushing strength of grit will be such as to allow the concrete in which it used to build-up the specified strength of concrete

iv. The necessary tests for grit shall be carried out as per the requirements of I.S.2386- (parts-l of VIII) 1963, as per instructions of the Engineer-in-Charge. The necessity of test will be decided by the. Engineer-in-Charge.

5. M-5 Cement Mortar

i. Water shall conform to specification M-1 Cement: Cement shall conform to specifications M-3 Sand: Sand shall conform to M-6

ii. **Proportion of Mix**

Cement and sand shall be mixed to specified proportion, sand being measured by measuring boxes, the proportion of cement will be by volume on the basis of 50 Kg/Bag of cement being equal to 0.0342 Cu.m. The mortar may be hand mixed of machine mixed as directed.

iii. **Proportion of Mortar:**

In hand mixed mortar, cement and sand in the specified proportions shall be thoroughly mixed dry on a clean impervious platform by turning over at least 3 times or more till a homogeneous mixture of uniform colour is obtained. Mixing platform shall be so arranged, that no deleterious extraneous material shall get mixed with mortar or mortar shall flow out. While mixing, the water shall be gradually added and thoroughly mixed to from a stiff plastic mass

of uniform colour so that each particle of sand shall be completely covered with a film of wet cement. The water cement ratio shall be adopted as directed.

The mortar so prepared shall be used within 30 minutes of adding water. Only such quantity of mortar shall be prepared as can be used within 30 minutes.

6. M-6 Stone Coarse Aggregate for Nominal Mix Concrete

i. coarse aggregate shall be of machine crushed stone of black trap or equivalent and be hard, strong, dense, durable, clean and free from skin and coating likely to prevent proper adhesion of mortar.

ii. The aggregate shall generally be cubical in shape. Unless special stones of particular quarries are mentioned aggregates shall be machine crushed from the best black trap or equivalent hard stone as approved. Aggregate shall Have no deleterious reaction with cement. The size of the coarse aggregate for plain cement and ordinary reinforced cement concrete shall generally be as per the table given below However, in case of reinforced cement concrete the maximum limit may be restricted to 6 mm less than the minimum lateral clear distance between bars or 6 mm. less than the cover whichever is smaller

TABLE

IS. Sieve	Percentage passing for single	IS. Sieve	Percentage passing for single
Designation	Sized aggregates of Nominal size 40mm 20mm 16mm	Designation	Sized aggregates of Nominal size 40mm 20mm 16mm
80mm	-	12.5mm	0.5 0.20
63mm	100	10 mm	0.5 0.5
40mm	85-100 100	4.75mm	
20mm	0.2 85-100 100	2.35 mm	
16mm	85-100		

Note: This percentage may be varied somewhat by the Engineer-in-Charge when considered necessary for obtaining better density and strength of concrete.

iii. The grading test shall be taken in the beginning and at the change of source of materials. The necessary tests Indicated in IS 383-1970 and 456-1978 shall have to be carried out to ensure the acceptability. The aggregates shall be stored separately and handled in such a manner as to prevent the mixing of different aggregates. If she aggregates are covered with dust, they shall be washed with water to make them clean.

7. M-7 Black Trap or Equivalent Hard Stone Coarse

i. Aggregate for Design Mix Concrete Coarse aggregate shall be of machine crushed stone of black trap or equivalent hard stone and be hard, strong, dense, durable, clean and free from skin and coating likely to prevent proper adhesion of mortar,

ii. The aggregates shall generally-be cubical in shape. Unless special stones of particular quarries are mentioned, aggregates shall be machine crushed from the best, black trap or equivalent hard stones as approved, Aggregate shall have no deleterious with cement.

iii. The necessary tests indicated in IS. 383-1970 and IS.456-1978 shall have to be carried out to ensure the acceptability of the material. If aggregate is covered with dust it shall be washed with water to make it clean.

8. M-8 Brick

i. The brick shall be shall be machine moulded and made from suitable fly ash, cement, lime, gypsum, etc. They shall be free from cracks and nodules of free lime. They shall have smooth rectangular faces with sharp corners and shall be of uniform colour. The bricks shall be moulded with the frog of 100mm x 40 mm and 10mm to 20mm deep on one of its flat sides. The bricks shall not break when thrown on the ground from a height of 600mm.

ii. The size of the modular bricks shall be 190 x 90 x 90 mm.

iii. The size of the conventional bricks shall be 225 x 110 x 75mm.

iv. Only bricks of one standard size shall be used on one work. The following tolerance shall be permitted in the conventional size adopted in a particular work. Length +3.0mm, Width + 1.50mm, Height +1.50mm.

v. The crushing strength of the brick shall not be less than 35.0 Kg / Sq cm. The average water absorption shall not be less than 20 per cent by weight. Necessary test for crushing strength and water absorption shall be carried out as per IS 3495: (Part I to Part IV) 1976.

9. M-9 Mild Steel Binding Wire

i. The mild steel wire shall be of 1.63 mm. or 1.22 mm. (16 to 18 gauge) diameter and shall conform to l.S. 280-1972.

ii. The use of black wire will be permitted for binding reinforcement bars. It shall be free from rust, oil paint, grease, loose mill scale or any other undesirable coating which may prevent adhesion of cement mortar.

10. M-10 Structural Steel

All structural Steel shall conform to I.S. 226-1985. The steel shall be free from the defects mentioned in I.S. 226-1975 and shall have a smooth finish. The material shall be free from loose mill scale, rust pits or other defects affecting the strength and durability. River bars shall conform to I.S. 1148-1973. When the steel is supplied by the Contractor test certificate of the manufacturers shall be obtained according to I.S. 226-1975 and other relevant Indian. Standards.

11. M-11 Shuttering

i. The shuttering shall be either of ply wood planking of appropriate thickness with or without steel lining or of steel plates stiffened by steel angles. The shuttering shall be supported on battens and beams and props of vertical ballies properly cross braced together so as to make the centering rigid. In places of bulli props, brick pillar of adequate section built in mud mortar may be used.

ii. The form work shall be sufficiently strong and shall have camber, so that it assumes correct shape after deposition of the concrete and shall be able to resist forces caused by vibration of live load of men working over it and other incidental loads associated with it. The shuttering shall have smooth and even surface and its joints shall permit leakage of cement grout.

iii. If at any stage of work during or after placing concrete in the structure, the form work sags or bulges out beyond the required shape of the structure, the concrete shall be removed and work redone with fresh concrete and adequately rigid form work. The complete formwork shall be got inspected by and got approved from the Engineer-in-Charge, before the reinforcement bars are placed in position

iv. The props shall consist to bullies having 100 mm. minimum diameters measured at mid length and 80mm. at thin end shall be placed as per design requirement. These shall rest squarely on wooden sole plates 40 mm. thick and minimum bearing area of 0-10 sq m. laid on sufficiently hard base.

v. Double wedges shall further be provided between the sole plate and the wooden props so as to facilitate tightening and easing of shuttering without jerking the concrete.

vi. The wood used in shuttering shall not be so dry as to absorb water from concrete and swell or bulge nor so green or wet as to shrink after erection. The timber shall be properly sawn and planed on the sides and the surface coming in contact with concrete, Wooden form work with metal sheet lining or steel plates stiffened by steel angles shall be permitted,

vii. As far as practicable, clamps shall be used to hold the forms together and use of nails and spikes avoided.

viii. The surface of timber shuttering that would come in contact with concrete shall be well wetted and coated with soap solution before the concreting is done. Alternatively coat of raw linseed oil or oil of approved manufacture may be applied in place of soap solution. In case of steel shuttering either soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface. Under no circumstances black or burnt oil shall be permitted.

ix. The shuttering for beams and slabs shall have camber of 4 mm. per meter.

x. (1in250) or as directed by the Engineer-in-Charge so as to offset the subsequent deflection. For cantilevers, the camber at free end shall be 1/50 of the projected length or as directed by the Engineer-in-Charge.

PSC Poles of 8 meter long and 200Kgs TECHNICAL TERMS AND CONDITIONS

1 SCOPE OF WORK:

The scope of the work covers fabrication and supply PSC Poles of 8 meter long and 200Kgs. working (transverse) load in accordance with the technical terms and drawing of this specification. Alternate design / specifications shall not be considered which may be noted.

2 DIMENSIONS AND TOLERANCES:

SR NO	DESCRIPTION	STANDARD IN MM	MAXIMUM IN MM	MINIMUM IN MM
1	LENGTH	8000	8015	7985
2	WIDTH - TOP - BOTTOM	 114.3 336.55	 117.3 339.55	 111.3 333.55
3	THICKNESS	139.7	142.7	136.7
4	UP RIGHTNESS	1 TO 72	0.5 %	0.5 %
5	PLANTING DEPTH	1381	-	-

NOTE: All dimensions are in mm.

3 WORKMANSHIP:

The contractor will be responsible for the general soundness as well as good finish of each pole. The workmanship should be of high degree and poles having flaws and defects will be rejected.

4 STANDARDS:

The poles shall comply with the relevant provisions made in the following Indian standard specifications with latest amendment.

IS: 1678/1998: Specification for Prestressed concrete poles for overhead Power traction and telecommunication lines.
IS: 2905/1989: Method of test for concrete poles for Overhead Power and Telecommunication lines.
IS:1343 & IS: 456:Code of practice for Prestressed and plain/reinforced concrete.

5 MATERIALS:

The materials shall conform to this specification and be in accordance with the guaranteed particulars given.

The Consumption of materials per PSC Pole with minimum limit indicated below:

1. Cement 53 grade/43 grade 1.45/1.61 Bags. For concrete mix
2. 4mm H.T. Steel wire 12 nos. - For tension wire.

	3. 4mm H.T. Steel wire 24 Nos. Rings. The consumption indicated above shall be inclusive of variations inclusive rolling margin. The consumption of cement shall be inclusive of quantity required in finishing work. PSC Pole under destruction test shall be to the Supplier's account. The quality of materials to be used for manufacturing of PSC poles shall be as under. **[A]CEMENT:** The Ordinary Portland Cement used in manufacture of Prestressed concrete poles shall be relevant to IS: 8112/1989 of 43-Grade / 53- Grade to get 28 days strength of 450 Kg/ cm2. **[B] STEEL:** The 4mm H.T. Steel wire used in manufacture of Prestressed concrete poles shall be conforming to IS 6003/1983 of latest amendment thereof respectively. **[C] AGGREGATE:** Aggregate used for the manufacturing of Prestressed concrete poles shall conform to IS: 383-1963. Aggregate shall consist of naturally occurring crushed black metal. They shall be hard, strong, dense, durable, clear and free from veins and adherent coating, and free from injurious amount of disintegrated pieces, alkali, vegetable material, and other deterious substances. As far as possible flaky and Elongated pieces should be avoided. It should not contain organic or other admixture that may cause corrosion of the reinforcement or impair the strength or durability of the concrete. The coarse aggregate shall consist of trap (preferably black) metal and in no case exceed 20 mm size. The fine aggregate shall be sharp, free from impurities and required fineness modules as specified. The sand shall be washed before use by installing a sand washing machine in the factory and the same shall not contain silt and deterious materials. The grading of fine aggregate shall be in accordance with IS: 2386 - 1963 with latest amendment. [D] WATER: Water to be used for process of manufacturing PSC poles like concrete mix and curing should be free from chlorides, other salts and organic materials and it should be got tested in Govt. Laboratory at least once in a year by the party. Potable water is preferable.
5	**STORAGE OF MATERIALS** The cement shall be stored at the work side in such a manner as to prevent deterioration due to moisture or intrusion of foreign matter. Steel reinforcement shall ordinary be staggered in such a way so as to avoid distortion and to prevent deterioration and corrosion, it is good practice to coat reinforcement with cement wash before stacking to prevent scale and rust. The aggregates shall be stored in such a way as to prevent mixing of foreign materials. The heaps of fine and coarse aggregates shall be kept separately. When different sizes of fine

	or coarse aggregate are procured separately, they shall be stored in separate stockpiles, to prevent the material at the edges of the piles from getting intermixed. Any material, which has deteriorated or has been damaged or is otherwise considered defective, shall not be used for the concrete.
6	**TESTING OF MATERIALS:** The Supplier shall arrange for the necessary testing of the material like Metal, Sand, Water etc. and see that the materials to be used in the manufacturing confirm to relevant IS.
7	**METHOD OF MANUFACTURING OF PSC POLES:** The Prestressed concrete poles are generally manufactured by long line multiple bed method for mass production. **(A) BED AND MOULD:** The length and number of rows of concrete casting bed shall be according to the production capacity of pole factory. Preferably one pole bed separately should be provided to minimise wastage of H.T.Steel wire. The Prestressed poles are to be cast in a steel mould having accurately machined bottom bed and side faces. The steel mould should be strong enough to resist distortion. The bed should be absolutely horizontally levelled and free from any undulation. The mould should be capable of being opened in such a way that edges of the poles are not damaged. At both the ends of row of concrete casting bed, the anchor blocks are provided for fixing and stretching of H.T.Steel Wire. **(B) STIRRUPS:** The stirrups shall be prepared as per the design / drawing of the MGVCL from 4 MM dia H.T. Steel. The stirrups shall be placed in position as per approved drawing. Stirrups shall have standard lap lengths and be welded to ensure maintaining proper shape and position. **(C) PREPARATION OF REINFORCEMENT:** All the reinforcement and window boxes shall be accurately placed and maintained in position during the fabrication. As per the Design / Drawing all the stirrups made out of H.T.steel, H.T.Steel wire shall be placed in respective position of the mould and thereafter continuous H.T.Steel wires are arranged through holes and plates of the mould. The welded joints in H.T. Steel wire will not be permitted. The H.T.Steel wires are stretched up to the required tension 10% of UTS as specified in relevant I.S. code with the help of Jacks and anchor blocks. All the wires shall be accurately stretched with uniform prestressing in each wire. Each wire shall be anchored positively during the casting. The tension applied shall be checked with the help of suitable Gauge/Meter. **(D) CONCRETE MIX:** The concrete mix to be used for manufacturing of PSC Poles shall be prepared by weight batching only in such a manner and proportion so as to achieve the compressive strength of the concrete mix as per IS: 456 and none of the test specimen shall have strength less

than 225 and 450 KG/CM2 after 3 and 28 days respectively. The cement concrete shall be mixed only in electrically / mechanically operated concrete mixer machine. Gradation of the aggregate used in concrete mix shall adhere to the appropriate Mix Design and proportions be checked in regular interval. Water in concrete shall be added with proper measurement to maintain required water cement ratio. The hand broken metal shall not be permitted.

(E) PLACING OF CONCRETE MIX:

The mould should be free from Dust, Dirt and other organic materials and oil is to be applied before placing the concrete mix. The machine mixed concrete is, thereafter poured in the mould and shall be compacted by spinning, vibrating, shocking or other suitable mechanical means. Over-vibration or under-vibration or vibration of very wet mix is harmful and should be avoided. The Hand compaction shall not be permitted.

On application of vibrator the concrete Mix will compact & get to 2 to 3 mm below form/mould level. This gap shall also be filled up with prepared concrete Mix only & re vibrated. The mixture of cement & sand for filling up the gap as well as finishing work will not be permitted. Finishing work shall be done only with cement slurry.

Care should be taken to see that anchorages do not yield before concrete attains necessary strength. Proper cover for concrete should be maintained throughout process of pouring, compacting etc. of concrete mix.

On achieving setting time, the side faces of the mould shall be removed from the bed and watered at intervals to prevent the surface cracking of the pole. The concrete shall be covered with a layer of sacking, canvas, Hessian or similar absorbent materials and kept constantly wet up to the time when the strength of the concrete reaches to the minimum strength of the concrete at transfer of prestress i.e. for about 72 hours.

The Steam curing may be permitted in exigency or emergency cases with the approval of the competent authority only.

(F) DETENSIONING, CUTTING OF WIRE AND REMOVING OF POLES FROM THE BED:

After ascertaining that concrete has attained required strength of min. 225 KG/CM2 by checking the cube strength stretched wires are released from the anchor blocks and cut with the help of welding machine. The cutting shall be started only from the centre of the bed length. The pole is then removed from the bed by lifting at 2 points using gantry and moved to the Curing Pond.

(G) CURING:

The curing of the pole shall commence after setting of the concrete. Continuous curing on bed should be done till it is shifted to curing pond, The curing pond shall be full of water and each pole must be immersed in the water for a period of at least 28 days. If required, water sprinkling shall be done at intervals to keep the poles constantly wet as per I.S.No.1678-1998.

(H) STORING OF POLES READY FOR INSPECTION:

The poles prepared vide method stated above shall be stacked in chronological method and indication of the date of manufacturing and number of poles be put before with particular lot so as to identify the lot by inspecting officer.

8 **MARKING:**

The poles shall be clearly and indelibly marked with the following particulars during manufacture, at a position between 5th (W5) and 6th (W6) window indicated in the drawing so as to easily read after erection in position. The mark shall be done by pressing embossed figures / letters of 50 mm height and 20 mm width with gap of 5 mm between two figures. The sample drawing is attached with the tender.

(e) Date, month & year of manufacture, (On front face)
(f) Serial number of pole, and (On front face)
(g) Maker's serial number or mark (On front faces)
(h) MGVCL (in words) (above planting depth)

The pole shall also be suitably marked for the planting depth i.e. 1381 mm from bottom. On both the end of pole the anti-corrosive paint i.e. epoxy based bituminous paints two coats are to be applied. One before putting in curing pond and second after removing from the pond.

9 **CUBE TESTING:**

Total 6 Nos. Cubes of 100mm X 100mm X 100mm size concrete shall be cast daily and tested at release, i.e. after approx. 72 Hours of cast as well as after 28 days, in accordance with Indian Standard specification at Supplier's own expense. The mix for concrete adopted shall be such as to give cube strength not less than 225Kg/cm2 at release (after 3 days) and 450 Kg/cm2 after 28 days.

Cube testing machine shall always be kept in the working condition and regular cube tests shall be taken and results be recorded in the registers duly signed by engineer-in -charge and representative of the Supplier.

10 SAMPLING AND CONFORMITY

1] LOT:

A. In any batch, all poles of the same class and same dimensions shall be grouped together to constitute a LOT.

B. If the number of poles in a lot exceeds 500 then the lot shall be divided into suitable number of SUB-LOTS such that the number of poles i.e. any sub-lot shall not exceed 500. The acceptance or otherwise of a sub lot shall be determined on the basis of the performance of sample selected from it.

2] Scale of Sampling: The number of poles to be selected from a lot or a sub-lot shall depend upon its size and shall be in accordance with col.1&2 of the table given below.

SAMPLE SIZE AND CRITERIA OF CONFORMITY

DIMENSIONAL REQUIREMENTS.

Size of lot Or Sub-Lot	Sample size	Permissible No. of Defective samples.	NO. Of sample Poles (Out of Col.2) for Transverse Strength test
(1)	(2)	(3)	(4)

	Up to 100	10	1	2	
	101 to 200	15	1	3	
	201 to 300	20	2	4	
	301 to 500	30	3	5	

3] Number of Tests: All the poles as selected as above shall be tested for overall length, cross-section and uprightness. The number of poles to be tested for transverse strength test shall be in accordance with col 4 of table. These poles may be selected from those already tested.

4] Criteria of conformity: A lot or sub-lot shall be considered as conforming to the specification if the conditions under are satisfied.

The numbers of poles which do not satisfy the requirements of overall length; cross-section and uprightness shall not exceed the corresponding number given in col.3 of Table. If the number of such poles exceeds the corresponding number, all poles in the lot or sub-lot shall be tested for these requirements, and those not satisfying the requirements shall be rejected.

All the poles tested for transverse strength test shall satisfy the requirements of the test. If one or more poles fail, twice the number of poles originally tested shall be selected from those already selected, and subjected to the test. If there is no failure among these poles, the lot or the sub-lot shall be considered to have satisfied the requirements of this test. If one or more poles of the second samples fail, the lot or the sub-lot represented by the corresponding samples shall be considered not to have passed the test.

11 METHOD OF INSPECTION AND TESTING GENERAL:

The tests on poles shall not be carried out earlier than 28 days from date of manufactured for poles manufactured from ordinary Portland cement. If a chloride free ad mixture is used or rapid hardening Cement of Grade 43 / 53 is used than pole can be tested at 14 days of age. The specimens shall be inspected and any specimen with visible flaws shall be discarded. If any test specimen fails because of mechanical reasons, such as failure of testing equipment of improper specimen preparation, it shall be discarded and another specimen shall be taken.

INSPECTION:

The Tenderer shall offer Ready Made PSC Poles lot for inspection and relevant tests.

(01) DIMENSIONS:

All the Poles shall be manufactured in accordance with the detailed dimensional drawing.

The tolerance on dimension shall be limited to...

(i)	For length	-	± 15 mm.
(ii)	For Web thickness	-	± 5 mm.
(iii)	Uprightness	-	0.5 % (i.e. 72 to 1.005 / 0.995)

(02) METHOD OF TESTING:
The pole shall be tested only in the horizontal position or as specified in I.S. 1678 / latest amendment & I.S. 2905 /1989 latest amendment .While testing in the horizontal position, provision shall be made by suitable supports to compensate for the overhanging weight of the pole; for this purpose the overhanging portion of the pole may be supported on a movable trolley or similar device. The frictional resistance of the supporting devices should be separately determined and deducted from the total final load applied on the pole.
Theoretically the permanent deflection should be as per IS 2905 / 1966 and latest amendment thereof. The recovery of deformations should not be less than 90%.

A] Testing Arrangement -
The pole shall be fixed in the crib longitudinally from butt to its ground line and then it shall be secured firmly in place. Wooden saddles with concave surfaces and other packing shall be placed around the pole to prevent injury to the butt section as specified in IS: 2905/1966 – latest amendment.

To minimize vertical movement at the point of load application and to reduce the stresses due to dead weight of the pole, a rail support shall be provided near the point of load application, or alternately a number of frictionless supports in the form of trolleys may be provided near the end or throughout the length of the pole. The rail support or other forms of support shall be such that any friction associated with the deflection of the pole under load shall not be a significant portion of the measured load on the pole.
B] Loading: The load shall be applied at a point 600 mm from the top of the pole by means of a suitable device, such as a wire rope and winch placed in a direction normal to the direction of the length of the pole, so that the minimum length of the straight rope under pull (excluding the curved portion near the transmitting devices) is not less than two times the length of the pole. If the loading device is set sufficiently far away from the pole to make the angle between the initial and final positions of pulling line small, the error in assuming that the pull is always perpendicular to the original direction of the pole axis will be negligible. The pulling line shall be kept level between the winch position and the point where load is applied to the pole. The load shall be applied at a constant rate of 4 percent of the specified test load per minute and in accordance with procedure.

C] Pulling Line: The pulling line shall be secured around the pole at the load point. Load measuring device shall be placed in a way so as to accurately measure in the tension in the pulling line. The other end of which is attached to the loading equipment (winch).

D] Load Measurement: Load Cell with accuracy of 5 Kg. for measurement may be adopted. Load cell shall be calibrated before every test. The load measuring device shall be supported in such a way that the force required to pull it shall not add to the

	measured load on the pole and that no damage is cause to the instrument if the pole suddenly breaks under test. No pullies or any other device in between load application point and load cell will be allowed. E] Deflections - The deflection of the pole and the load applied shall be measured simultaneously at different stages of loading to provide at least five sets of readings or as specified in I.S.2905 & latest amendment thereof. The measurement of the deflection of the load point shall be made in a direction perpendicular to the unloaded position of the pole axis. The measurement shall be made correct to the nearest 1 mm by use of datum board. A second datum line shall also be established from which the movement of the ground line if any, shall be measured. F] PROCEDURE: Load shall be applied at a point 600 mm from the top of the pole and shall be steadily and gradually increased to 250 kg. till formation of 1st crack recording deflection at each increment. The load shall be then reduced to zero and then increased gradually in 50 Kg. increments up to 400Kg load. Then Each load increment be successively increased by 25Kg. up to design ultimate transverse load (i.e. 500 Kgs.). The load shall be increased in steps of 25 Kgs. to measure ultimate transverse load, until failure occurs. Each time the load is applied same shall be held for 2 minutes. The load applied to Prestressed concrete poles at the point of failure shall be measured to the nearest five kilograms. G] RECORDING OF DATA AND MEASUREMENTS: (i) Any hair cracks appearing at a stage prior to the application of the design transverse load at first crack shall be measured using feeler gauges & shall be recorded. It should also be recorded, whether the hair cracks, if any, produced on application of the 60 percent of the minimum ultimate transverse load close up on the removal or reduction of the test load. (ii) The load applied to the pole at the time of failure shall be measured to the nearest 5Kg. iii) A Prestressed concrete pole shall be deemed not to have passed the test if crack wider than 0.1mm appears at a stage prior to the application of the design transverse load at first crack (200 Kgs.) (iv) The definition of failure of PSC Pole in test will be (i) permanent set more than 2.5 Cm. at load of 500 Kgs. Or (ii) Deflection of more than 25 Cms at load of 500 Kgs. H] ULTIMATE FAILURE: The conditions existing when the pole ceases to sustain a load increment owing to either crushing of concrete or snapping of the Prestressing tension or permanent stretching of the steel in any part of the pole. In order to access ultimate load carrying capacity of the pole, MGVCL reserves the right to test 1 (One) no. of pole up to destruction test out of total 1000 no. of poles. This one no. of pole shall not form part of quantity to be supplied by the Supplier.

	At least one pole shall be subjected to destruction test in the contract in presence of representative from MGVCL, Rajkot.
12	TECHNICAL DATA OF PSC POLES The Guaranteed Particulars of PSC Poles 8 Mtr. 200 Kg. 01. Working load : 200 Kg. 02. Factor of safety : 2.5 03. Ultimate Load : 500 Kgs. 04. Dimensions (a) Bottom Cross-Section : 336.55 x 139.7 mm. (b) Top Cross-Section : 114.3 x 139.7 mm. (c) Total height : 8,000 mm. (d) Web thickness. : 57.15 mm (2.25 inch) (e) Planting Depth : 1381 mm. 06. No. of 20mm dia. holes. On Front face : 02 nos. (100 mm apart). On side face : 06 nos. (300 mm apart). 07. Minimum requirement: (a) Cube Test (Each Specimen) : 450 Kg/Cm2 (28 days). : 225Kg/Cm2 (3 days)- at release of Prestress. (b) Initial tension in HT Steel Wire/Pole. : 70% of 175.00 Kg/mm2 as specified in related I.S. Code