3.01 Scope of work:

The work to be performed by the contractor covers manufacture, testing, supply and ex-works delivery of 8m and 9m P.C.C. poles in accordance with the enclosed drawing bearing no. PLN(D)/SS/123 and PLN(D)/SS/124 dt.09.03.2018 respectively and approved modifications as may be found required subsequently.

3.02 Work to be provided for by the contractor:

The work to be provided for by the contractor, unless otherwise specified, shall include but not be limited to the following:

- Furnish all labour, supervision, services, materials, forms, templates, supports, scaffolds, approaches, aids, construction equipment, testing equipment, tools & plants, transportation, handling, incidental construction like different sheds, casting bed, curing vats etc. as required for due fulfillment of the contract.
- Furnish samples and submit results of tests of various ingredients and / or finished jobs for approval, if asked for.
- Provide all incidental items not shown or specified in particular but reasonably implied as necessary for successful completion in accordance with the drawings, specification, and schedule and as per direction of the Engineer-in-charge.
- For supply of certain materials normally manufactured by specialist Firms, the contractor may have to produce, if directed by the Engineer-in-charge, a guarantee for satisfactory performance of the material binding both the manufacturer and the contractor jointly and severally for due performance of the above items, the cost element may be considered as included in the rates.

3.03 Codes and standards:

All items of work under this contract shall, unless otherwise specified elsewhere in the contract, conform to the latest revision up to the date of bid submission and / or replacements of relevant Indian Standard specification and code of practices. The work under the contract shall comply with the relevant provisions made in the following Indian Standards or the latest versions thereof.

- IS: 1678-1998: Pre - stressed concrete poles for overhead Power traction and telecommunication Lines – specification.
- IS: 2905-1989: Concrete poles for overhead power and telecommunication lines - Methods of test.
- IS: 7321-1974: Code of practice for selection, handling and erection of concrete poles for overhead power and telecommunication lines

However, if the specifications, provisions and other requirements set out by WBSEDCL differ from that of the IS codes, then those of WBSEDCL will prevail and shall be binding on the contractor. In case any particular item is not specifically covered by Indian Standard practice & usage that should be carried out as per direction of the Engineer-in-charge.

3.04 Forms and Moulds:

Form work shall include all temporary or permanent forms or moulds of Mild Steel required for forming the concrete with all temporary / permanent constructions and installations for their support. Form work shall be of rigid construction (strong enough

to withstand the concrete and other incidental loads imposed upon it during and after casting of concrete) true to shape and dimensions to produce poles strictly as per drawing having a smooth surface. The form boxes/mould (including forms for block-outs or pockets, if any) shall be fabricated in such a way that the same may be easily dismantled/taken out in sections or as required without causing any damage to the poles. It shall be made sufficiently rigid by using adequate number of ties, bracings and, if required, by providing wedges to make up any deformation before and during placement of concrete. Provision shall also be there for strictly maintaining dimensions of the poles. It shall be of sufficient number to maintain the ordered rate of supply of poles, without any interruption. Provisions shall also be there to accommodate increased/decreased production of poles if found necessary and intimated to the contractor.

Before use, all the moulds shall be thoroughly cleaned from grit or other foreign materials and individual moulds shall be fitted rigidly using suitable devices. The moulds shall be oiled properly with waste transformer oil or waste oil from vehicles or mixture of light diesel oil/crude oil and grease (by melting) in the ratio 10 litres to 500 grams of grease. The moulds shall not be oiled excessively and all care shall always be taken that wires do not come in contact with oil.

Before concreting the alignment and level of pedestal foundations and moulds shall be checked and set right, if not in order. Deformity in moulds, if any, shall also be set right before using the same for manufacture of poles. All components of individual moulds should be assembled, tightened and brought to true alignment to have correct shape. The assembled moulds shall be free from leakage of water or cement slurry.

3.05 Aggregate (coarse or fine):

Aggregate (coarse or fine) as to be used in manufacture of PCC poles should conform to IS: 383-1970. They shall be hard, strong, dense, durable, clear and free from veins and adhering coating and free from injurious amount of disintegrated pieces, alkali, vegetable matters and other deleterious substances.

As far as possible flaky, scoriaceous and elongated pieces should be avoided. All aggregates (coarse or fine) shall be within the grading limits as per relevant clauses of IS: 383-1970.

The grading of fine aggregates shall be determined as described in IS: 2386-1963 and shall be within the limit as described in IS: 383-1970. However, the grade-II fine aggregate as in IS: 383-1970 is always preferred.

All aggregates (both course and fine) shall be of tested quality as per relevant IS Codes. All aggregates shall be stored in such a way as to prevent the admixture of foreign materials. The heaps of fine aggregate and coarse aggregates shall be kept separate. When different sizes of fine and coarse aggregates are procured separately, they shall be stored in separate stock-piles, sufficiently removed from each other to prevent the materials at the edge of the stock-piles from getting intermixed.

3.06 Cement:

The cement used in the manufacture of Pre-stressed Cement Concrete Poles shall be Ordinary Portland Cement conforming to IS: 8112 or IS: 12269.

Cement shall be stored at site in well covered sheds in such a manner as to prevent deterioration due to moisture or due to intrusion of foreign matters.

3.07 H.T. Wire:

H.T. wire of diameter 4 mm. having a minimum tensile strength of 1715 N/mm^2 shall be used as per approved drawing for manufacture of the PCC poles. Test certificate for each lot of H.T. wires shall be submitted by the contractor at his own cost if desired by the Engineer-in-charge. The H.T. wire shall be continuous over the entire length of the

Tendon. It shall be free from rust, loose scales and/or other deleterious materials/coating liable to effect adversely on proper tensioning of H.T. wire or its proper bonding with concrete. The H.T. wire shall conform to IS: 6003-2010(Indented wire for Prestressed concrete — specification). H.T. wire shall ordinarily be stored in such a way so as to avoid distortion and to prevent deterioration and corrosion.

3.08 Water:

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

3.09 Admixtures:

Admixture, if used, should not contain calcium chloride or other chlorides and salts which are likely to promote corrosion of pre-stressing steel. However, if any admixture is used, the same should be brought to the notice of WBSEDCL.

3.10 Reinforcement and Tensioning:

Pre-stressing wires come in coils of large diameters. The same may be unwound for use and slight bends or kinks, if any, may be straightened by using a hammer. Heating of pre-stressing wire shall be avoided. The required length from Bulk Head at one end to the other in a single length after adding approximately 2 metre extra for jacking operation may be cut by using a bar cropper. The pre-stressing wires may be placed through the holes at cross beam at one of the bulk heads and drawn through the holes at the end plates of successive moulds and finally through the holes at the cross beam at the opposite bulk head. The wire should project for distances beyond the bulk heads to facilitate stretching by jacks. Initial sag in the wires shall be eliminated by stretching the same manually. The cover of the reinforcements be checked and set right, if not in order. All pre-stressing wire/reinforcements be placed in position as shown in the drawing and accurately fixed. Un-tensioned wires/reinforcement, if any as indicated in the drawings be held in position by the use of stirrups which should go round all the wires. All the wires to be pre-tensioned be accurately stretched with uniform pre-stress in each wire, individually or in a group according to convenience by the power / labour operated tensioning devices with the help of a dynamometer. The stretch in the wire shall be checked with the help of the dynamometer and from time to time tensioning may be stopped at the required stretch and be checked with the help of stress-strain chart as supplied by the wire manufacturer. All care shall be there to avoid over tensioning i.e. to avoid tensioning more than 80% of the ultimate tensile strength of the particular type of H.T. wire. The cover to the pre-stressed wires should be checked again and set right if not in order.

Failure to observe this precaution may cause eccentricity of the pre-stressed wires which in turn cause bending of poles.

After applying the required pre-stress the pressure be released slightly and the wires be anchored permanently by tapping the wedges through the slits in the nose cone of the jack. The jack be then released and the operation is carried out in other wires or group of wires.

All precautions should be there to arrest any accident.

3.11 Designing, mixing, placing and compacting concrete:

The design of concrete Mix shall conform to the requirements laid down for controlled concrete (also called design mix concrete) in IS: 1343-1980 and IS: 456- 2000 subject to the condition that minimum works cube strength at 28 days should be at least 42 N/mm^2 and the concrete strength at transfer should be at least 21 N/mm^2. The mix should contain as low a water content as is consistent with adequate workability. A cube testing register should be maintained at site.

Placing and compacting concrete shall be commenced and continued as per relevant IS Code. Concreting shall be commenced only after checking forms, Tensioned wires, covers (20 mm.) etc. and if found to be in order. All care shall be there that none of above is disturbed in any way during laying and compacting concrete.

In all cases segregation of the ingredients of concrete shall be avoided and if any segregated mass is observed the same shall be rejected and removed at the cost of the contractor. Low water cement ratio for obtaining high strength concrete requires mechanical aid for compaction since the workability of the mix is poor. Electrical vibrators having flat bottom surface are preferred for vibrating the concrete placed in the mould. It may be ensured that at least two vibrators are fixed at a time for each mould and concrete shall be poured in the mould only when the vibrator is fixed properly and switched on. No cement mix/slurry be allowed to leak/fall during the process of pouring concrete and / or compacting. Immediately after completion of pouring concrete, the top surface of the concrete shall be finished to have a smooth surface.

During the cold weather, below 4.5°C temperature, concreting shall not be done.

During hot weather, precaution shall be taken to see that temperature of wet concrete does not exceed 38°C.

3.12 Curing of Poles:

Curing of poles shall be commenced after setting of the concrete. The poles shall be covered with well burlaps, gunny bags and kept continuously moist, until transfer of pre-stress (de-tensioning). After this the curing shall be continued by immersion of the poles in the curing vat. If steam curing is used, it must be done under careful control and special precaution.

3.13 De-tensioning and cutting of wires:

The pre-stressing wires shall be de-tensioned only after the concrete has attained the specific strength at transfer i.e. 21 N/mm^2 to grip the wires and retain pre-stress. Normally good quality concrete should develop the required strength after 72 hours of casting. The cubes of concrete taken for the purpose, from each day's concrete (working mix) be cured as far as possible, under conditions similar to those under which the poles are cured. The transfer stage shall be determined based on daily tests carried out on the above concrete cubes till the specified strength indicated above is reached. It is to be ensured that the wires are de-tensioned by a de-tensioning device before they are cut by releasing the wires slowly without imparting any shock or sudden load to the poles with control by any suitable means either mechanical (screw type) or hydraulic. The poles shall not be de-tensioned or released by cutting the pre-stressing wires using flames or bar croppers while the same are under tension. After de-tensioning, the wires be cut with the help of wire cutters or welding transformers. To start with cutting be done at the centre portion of the bed length and then other tendons are cut.

3.14 Curing of poles in vats, handling and stacking:

After de-tensioning, cutting wires & removing the moulds, the poles preferably be taken to curing vats carefully (so that no pole is damaged) for continuous curing under cold water for 25 days or so to achieve the desired strength. Separate eye- hooks shall be provided for handling, lifting and transport, one each at a distance of 0.15 time the overall length from either end of the pole. Eye-hooks shall be properly anchored and should be on the face that has the shorter dimension of the cross section. While handling the poles after taking the poles from curing vats to the stack yard or for other purposes all care shall be taken that the poles are lifted and carried with their broad faces placed vertically and in such a manner that shocks are avoided. Stacking of poles

be done in a manner that the broad sides of the poles are vertical. Each tier in the stack should be supported on timber sleepers located at 0.15 times the overall length measured from the end. The timber supports in the stack should be aligned in a vertical line.

3.15 Calibration:

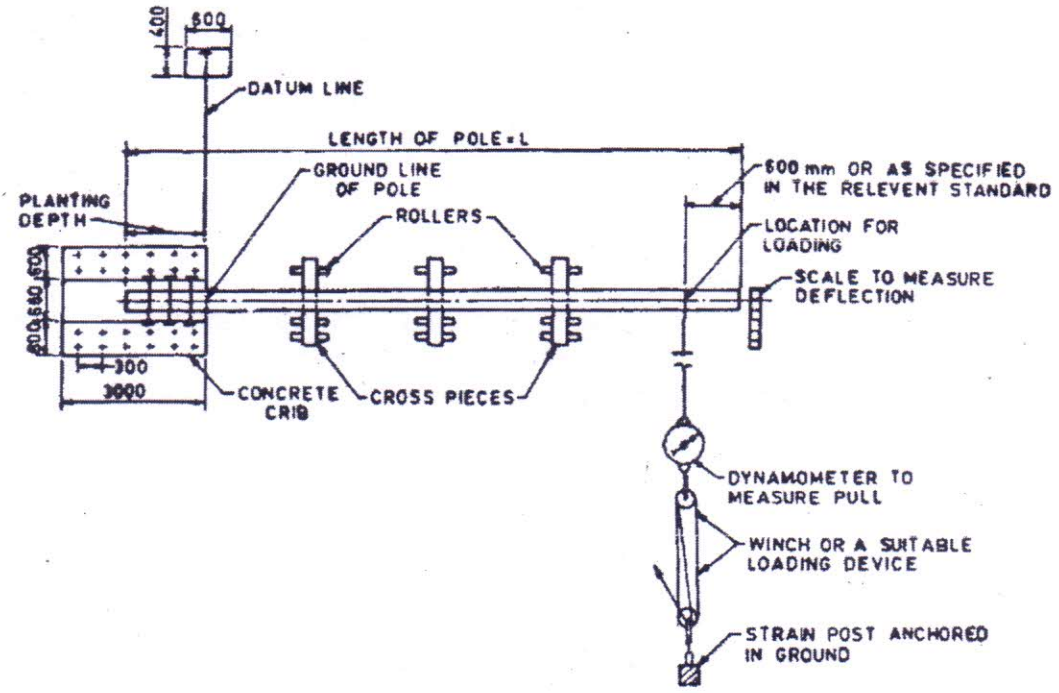
The instruments/equipment required for Testing shall have valid calibration certificate issued by National Test House or equivalent Government Laboratory.
Before testing, the supplier shall produce the calibration certificate.

3.16 Sampling and Inspection:

All poles of the same class and same dimensions shall be grouped together to constitute a lot. If the number of poles in a lot exceeds 100, the lots shall be divided into a suitable number of sub lots such that the number of poles in a sub lot does not exceed 100. The acceptance of a sub lot/lot shall be determined on the basis of the performance of samples selected from it. The number of poles to be selected from a lot or a sub lot shall depend upon and shall be guided by relevant clause of IS: 1678- 1998.
All such selected poles shall be tested for overall length, cross section and uprightness. The tolerance shall be for overall length (±) 15 mm. cross-sectional dimensions (±) 3 mm. and uprightness 0.5 percent. The number of poles, which does not satisfy the requirements of overall length cross-section and uprightness, shall not exceed 1(one) in each lot/sub lot of 100 poles. If the number of such poles exceeds the corresponding number, all the poles in the lot or sub lot shall be tested for these requirements and those not satisfying the requirement shall be rejected.

3.17 Transverse Strength Test:

After deciding acceptance of lots/sub lots as per clause 3.16, one pole from each lot/sub lot of 100 poles shall be subjected to Transverse Strength Test as per relevant clauses of IS: 1678-1998 and IS: 2905-1989 or its latest version. Unless otherwise specified this test on pole shall not be carried out earlier than 28 days after the date of manufacture of poles manufactured with Ordinary Portland Cement. The test specimens shall not have been exposed to a temperature below 4°C for 24 hours immediately preceding the test and the same shall be free from all visible moisture. The specimen shall be inspected and any specimen with visible flaws shall be discarded. If any specimen fails because of the mechanical reasons, such as failure of testing equipment or improper specimen preparation, it should be discarded and another specimen be taken.
The pole may be tested in either horizontal or vertical position. If tested in horizontal position, provisions shall be made to compensate for the overhanging weight of the pole. For this purpose, the overhanging portion of the pole may be supported on a moveable trolley or similar device. The test loads shall be applied at a point 600 mm. from the top of the pole by means of a suitable device, such as 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 five times the length of the pole. The pulling line shall be kept level between the winch position and the point where load is applied to the pole. 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 the tension in the pulling line the other end of which is attached to the loading equipment. To minimize a vertical movement at the point of load application and to reduce the stress due to dead weight of the pole, a rail support be provided near the point of load application or alternatively a number of frictionless supports in the form of trolleys



All dimensions in millimetres.

FIG. 1 TYPICAL ARRANGEMENT FOR TESTING OF CONCRETE POLES

may be provided conveniently as per direction of the testing Engineer. The pole shall be fixed in the crib longitudinally from butt to its ground line i.e. for the depth of planting and then it shall be secured firmly in place up to the satisfaction of the testing Engineer (Ref.: Fig.1). The crib shall check all longitudinal and rotational motions of the clamped portion of the pole.

The test load shall then be applied and increased steadily and gradually to the value of the transverse load at first crack. The load shall then be reduced to zero and increased gradually to a load equal to the first crack load plus 10% of the minimum ultimate transverse strength as per drawing/order and again reduced to zero. This procedure shall be repeated until the load reaches the value of 80 percent of the minimum ultimate transverse strength and thereafter increased by 5% of the minimum ultimate transverse strength until failure occurs. Each time the load is applied, it shall be held for two minutes. The load applied to the pole at the point of failure shall be measured to the nearest five kilograms. The deflection of the pole at each stage of loading and the same after reduction of the load to zero at each stage shall be measured simultaneously and recorded. Number and extent of cracks appearing at each stage of loading and the same disappearing/remaining after reduction of the load to zero at each stage be noted and recorded. The test pole may be considered to have passed the test if no visible crack appears prior to application of the design transverse load at first crack (i.e. the working load of the pole) and also if no failure of the pole occurs prior to application of the design ultimate transverse load. The lot/sub lot of pole be considered to have passed the testing and may be certified to be acceptable by the testing Engineer if the test sample passed the testing as above. The pole shall be deemed not to have passed the test if visible cracks appear at a stage prior to the application of the design transverse load at first crack or if the observed ultimate transverse load at failure is less than the design ultimate transverse load. In that case another two samples of the same lot/sub lot of 100 poles are to be taken and subjected to testing following the same procedure as above. The lot/sub lot of poles may be certified by the testing Engineer to be accepted. If one or more samples in retesting (2nd specimen or 3rd specimen) fail, the

lot/sub lot represented by the corresponding samples shall be considered not to have passed the test.

3.18 The failed lot:

The failed lot pole shall be marked as "R" by red paint and removed from factory premises.

3.19 Checking of cover:

After completion of transverse strength test, the sample pole shall be taken and checked for cover. The cover of the pole shall be measured at three points, one within 1.8 metre from the butt end of the pole, the second within 0.6 metre from the top of the pole and the third at any intermediate point and the mean value compared with the specified value. The mean value of the measured cover should not differ by more than 1 mm. from the specified cover, the individual values however should not differ by more than + 3 mm. from the specified value. If these requirements are not met, the workmanship with reference to pre-stressing wires and assembly of mould should be improved to get approved by the Engineer-in-charge.

3.20 End Capping:

End capping at both ends of each pole shall be done by applying three coats of approved quality anticorrosive bituminous paint as per direction of the Engineer-in-charge.

3.21 Marking of Poles:

Each pole shall be clearly marked by engraving for proper identification with the following:

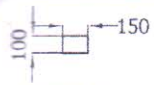
- Date, Month & Year of manufacture
- Maker's Serial Number and Mark.
- WBSEDCL or any other mark as prescribed in the tender.

Technical Particulars for 8m/200kg Pre-stressed Cement Concrete Poles

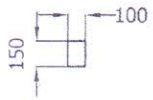
Sl no.	Parameters	Unit	8m PCC pole	Remarks
1	Overall length of pole	m	8	**Any other detail are available in the drawing bearing no.** PLN(D)/SS/123 dt.09.03.2018
2	Working load	Kg.	200	
3	Bottom depth	mm	280	
4	Top depth	mm	150	
5	Breadth	mm	100	
6	Depth of planting	m	1.5	
7	Factor of safety	-	2.5	
8	Dia. of HT Pre-stressing wire	mm	4	
9	Minimum tensile strength of HT pre-stressing wire	N/mm^2	1715	
10	Number of HT wire	Nos.	15	
11	Concrete grade	-	M42	
12	Ultimate load	Kg	500	

Technical Particulars for 9m/400kg Pre-stressed Cement Concrete Poles

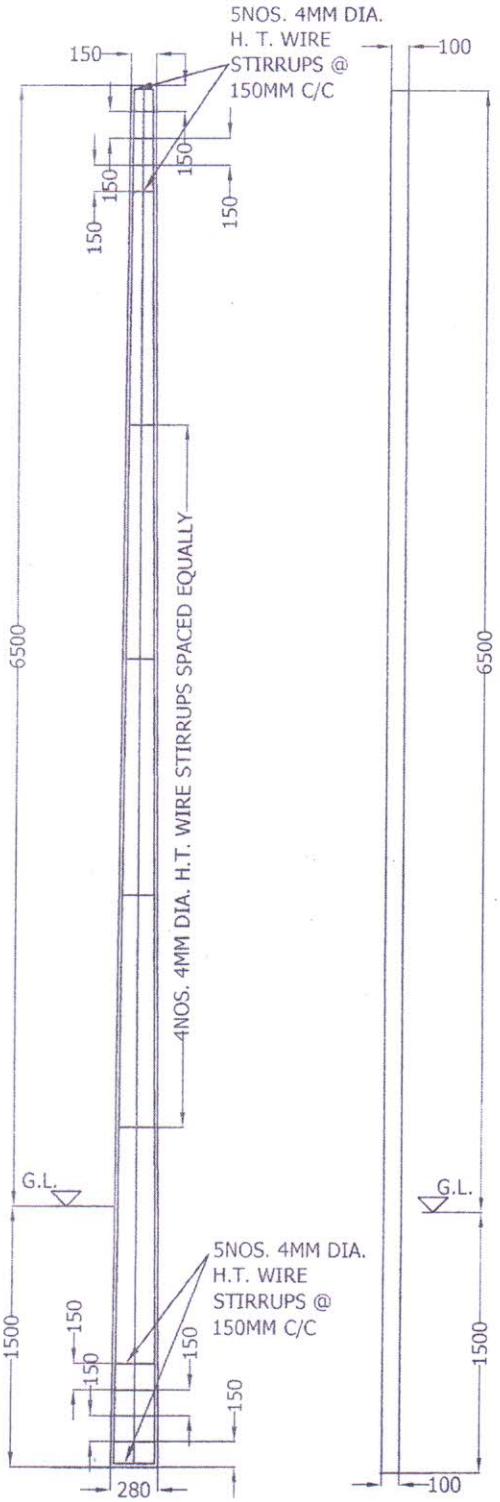
Sl no.	Parameters	Unit	9m PCC pole	Remarks
1	Overall length of pole	m	9	**Any other detail are available in the drawing bearing no.** PLN(D)/SS/124 dt.09.03.2018
2	Working load	Kg.	400	
3	Bottom depth	mm	410	
4	Top depth	mm	230	
5	Breadth	mm	100	
6	Depth of planting	m	1.5	
7	Factor of safety	-	2	
8	Dia. of HT Pre-stressing wire	mm	4	
9	Minimum tensile strength of HT pre-stressing wire	N/mm^2	1715	
10	Number of HT wire	Nos.	20	
11	Concrete grade	-	M42	
12	Ultimate load	Kg	800	



TOP PLAN
(MAJOR AXIS)
SCALE-N.T.S

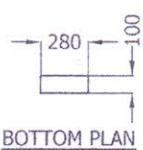


TOP PLAN
(MINOR AXIS)
SCALE-N.T.S

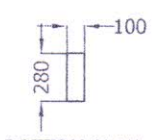


SECTION
(MAJOR AXIS)
SCALE-N.T.S

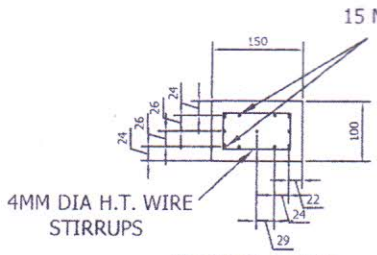
SIDE ELEVATION
SCALE-N.T.S



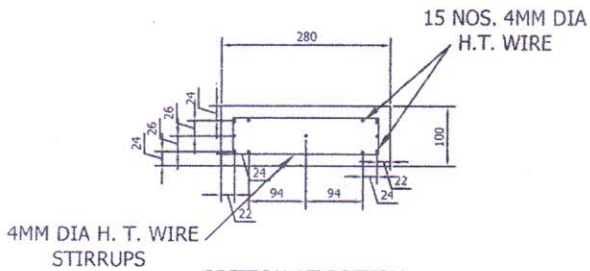
BOTTOM PLAN
(MAJOR AXIS)
SCALE-N.T.S



BOTTOM PLAN
(MINOR AXIS)
SCALE-N.T.S



SECTION AT TOP
SCALE-N.T.S

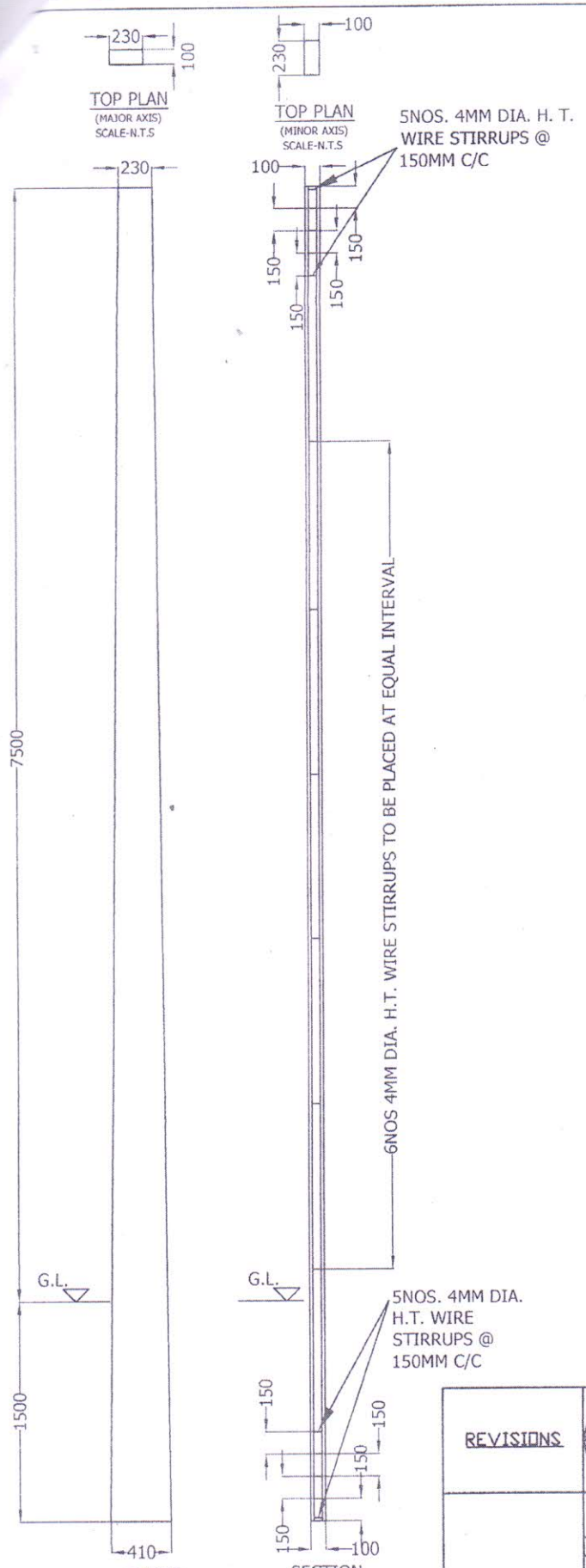


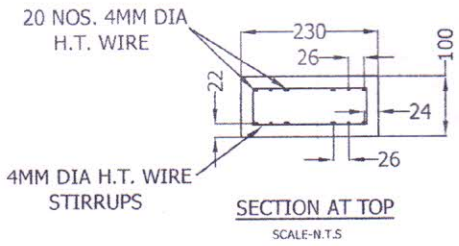
SECTION AT BOTTOM
SCALE-N.T.S

NOTE:

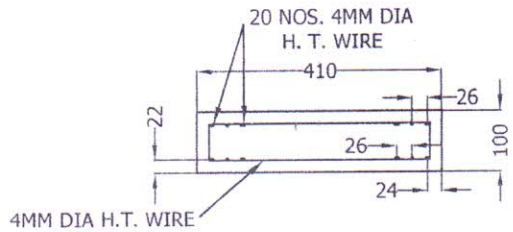
1. WORKING LOAD 200KG ACTING AT 600MM BELOW THE TOP OF THE POLE.
2. FACTOR OF SAFETY = 2.5
3. DEPTH OF PLANTING BELOW G.L. =1500MM.
4. H.T. WIRE USED 15 NOS. 4MM DIA. HAVING A MINIMUM. TENSILE STRENGTH OF 1715 N/SQ.MM AS PER IS 6003.
5. PRETENSION TO BE APPLIED/4MM Ø H.T. WIRE EQUAL TO 1758 KG.
6. 20MM THICK CAPPING WITH 1:2 CEMENT MORTAR OR 3 COAT BLACK ANTI CORROSIVE BITUMINOUS PAINT TO BE PROVIDED AT THE ENDS OF THE POLE.
7. 4MM DIA. H.T. WIRE STIRRUPS ARE TO BE PLACED @ 150MM C/C FOR THE DISTANCE OF 600MM FROM THE TOP & BOTTOM. IN REMAINING CENTRAL POSITION ANOTHER 4NOS. STIRRUPS SHALL BE PLACED IN EQUAL SPACING. TOTAL STIRRUPS EQUAL TO 14NOS.
8. GRADE OF CONCRETE IS M42.
9. ALL DIMENSIONS ARE IN MM.
10. THIS HAS REFERENCE TO THE RESOLUTION OF STANDARDIZATION COMMITTEE MEETING HELD ON 27.02.2018

REVISIONS	WBSEDCL	DISTRIBUTION HQ.
		PLANNING AND ENGINEERING DEPARTMENT
	DETAILS OF 8MTR. X 200KG SOLID P.C.C. POLE	
	DRAWN BY : 09.03.18 A.E.(C)	
	DESIGNED BY: 09.03.18 A.E.(C)	
	CHECKED BY: 09.03.18 D.E.(C)	DRAWING NO. PLN(D)/SS/123
	RECOMMENDED BY: 09.05.18 ADDL. C.E.-II (P & E - Dist.)	SCALE : N.T.S / SHEET NO. 1 OF 1
	APPROVED BY: 09/3/18 C.E. (P & E - Dist.)	DATE: 09.03.2018 / REV NO. 0





SECTION AT TOP
SCALE-N.T.S



SECTION AT BOTTOM
SCALE-N.T.S

NOTE:

1. WORKING LOAD 400KG ACTING AT 600MM BELOW THE TOP OF THE POLE.
2. FACTOR OF SAFETY = 2.0.
3. DEPTH OF PLANTING BELOW G.L. = 1500MM.
4. H.T. WIRE USED 20 NOS. 4MM DIA. HAVING A MINIMUM. TENSILE STRENGTH OF 1715 N/SQ.MM AS PER IS 6003.
5. PRETENSION TO BE APPLIED 4MM ϕ H.T. WIRE EQUAL TO 1758 KG.
6. 20MM THICK CAPPING WITH 1:2 CEMENT MORTER OR 3 COAT BLACK ANTI CORROSIVE BITUMINOUS PAINT TO BE PROVIDED AT THE ENDS OF THE POLE.
7. 4MM DIA. H.T. WIRE STIRRUPS ARE TO BE PLACED @ 150MM C/C FOR THE DISTANCE OF 600MM FROM THE TOP & BOTTOM. IN REMAINING CENTRAL POSITION ANOTHER 6NOS. STIRRUPS SHALL BE PLACED IN EQUAL SPACING. TOTAL STIRRUPS EQUAL TO 16NOS.
8. GRADE OF CONCRETE IS M42.
9. ALL DIMENSIONS ARE IN MM.
10. THIS HAS REFERENCE TO THE RESOLUTION OF STANDARDIZATION COMMITTEE MEETING HELD ON 27.02.2018

REVISIONS	WBSEDCL	DISTRIBUTION HQ.
		PLANNING AND ENGINEERING DEPARTMENT
	DETAILS OF 9MTR. X 400KG SOLID P.C.C. POLE	
	DRAWN BY : 09.03.18 A.E.(C)	
	DESIGNED BY: 09.03.18 A.E.(C)	
	CHECKED BY: 09.03.18 D.E.(C)	DRAWING NO. PLN(D)/SS/124
	RECOMMENDED BY: 09.03.18 ADDL. C.E.-II (P & E - Dist.)	SCALE : N.T.S — SHEET NO. 1 OF 1
	APPROVED BY: 9/3/18 C.E. (P & E - Dist.)	DATE: 09.03.2018 — REV NO. 0