044 - 1: 1996

CEB
STANDARD

REINFORCED CONCRETE POLES

CEYLON ELECTRICITY BOARD
SRI LANKA

Specification

for

REINFORCED CONCRETE POLES

CEB Standard 044 - 1: 1996

CEYLON ELECTRICITY BOARD

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Amendment Slip "General Amendments to CEB Specification"
Effective from 05-10-2005

REVISED TEXT

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1. Tender form, Schedule of Prices, Letter of Authorization, Power of Attorney documents shall be signed in Blue Ink. Name of the persons signing shall be clearly indicated and their official stamp has to be put in.

2. Bidders shall include with their offer the Type Tests Report/Certificates in accordance with the Standard specified, obtained from an accredited independent test laboratory acceptable to the CEB.

   Proof of accreditation by a national/international authority shall also be forwarded with the offer.

   Test Reports shall be complete including all the pages as issued by the Testing Authority. Parts of the Test Report shall not be acceptable.

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SPECIFICATION FOR REINFORCED CONCRETE POLES

1. GENERAL

This Specification covers the manufacture, testing and delivery to the site of Reinforced Concrete Poles, for Low Voltage & Medium Voltage distribution lines.

2. DESIGN LOADINGS

Each pole shall be able to withstand 2.5 times the design working load in the transverse direction, as indicated in the corresponding drawing.

Each Pole shall be able to withstand an independent load in the longitudinal direction of at least 25% of the transverse loading described above.

The ultimate design load used for designing each type of pole shall be that calculated by applying a point load of 2.5 (factor of safety) times the appropriate standard design working load when the pole is held in the test frame specified in the Clause 10.

3. STANDARDS AND CODES OF PRACTICE

Unless otherwise specified, the materials and workmanship specified under this contract shall conform to the latest version of the appropriate British Standards. In particular to:

BS8110		1985	Structural use of Concrete
BS 12		1991	Specification for ordinary Portland Cement
BS 4449		1988	Specification for carbon steel bars for the reinforcement of concrete
BS 4482		1985	Cold reduced steel wire for the reinforcement of concrete
BS 882		1992	Specification for aggregates from natural sources for concrete
BS 1881		1993	
	Part	101	Sampling of fresh concrete
		102	Determination of slump
		108	Method of making test cubes from fresh concrete
		110	Method of making test cylinders from fresh concrete

		111		Method of normal curing of test specimens
		116		Method for determination of compressive strength of concrete cubes
BS 812	Part	101	1984	Testing aggregates
BS 5328	Part	1	1991	Guide to specifying concrete
	Part	2	1991	Methods for specifying concrete mixes
	Part 4		1990	Specification for the procedures to be used in sampling, testing and assessing compliance of concrete.

4. STANDARDIZED TYPES/SIZES OF REINFORCED CONCRETE POLES

HEIGHT OF POLE (m)	BURIED LENGTH (m)	WORKING LOAD (kg)	PURPOSE	CEB DRAWING NO. *
6.0	1.4	50	Insulated Wire Service Connection	DS&S/98/7710
8.3	1.40	100	LV Lines (without street lamp wire)	DS&S/2002/7709
8.3	1.40	500	LV Lines (self supporting pole)	DS&S/2002/7720
9.0	1.5	115	LV Lines (with street lamp wire)	DS&S/99/7707
10.0	1.7	300	i.Only MV Line ii.Combined Run MV & LV on same Pole	DS&S/98/7705

*Reduced size drawings of each type of pole are annexed to this Specification. Detailed drawings could be obtained from the respective Branch of the CEB.

5. MATERIALS

5.1 General

All materials shall conform to the relevant standard specifications referred to in this specification. However, the Inspection Officer representing the CEB (herein after called the "Engineer") reserves the right, where necessary, to inspect/test samples of raw materials stockpiled for use, in any of the contractors work sites. Cost of such tests will be borne by CEB. In the event of such samples not confirming to the standards given herein, the Engineer may inform such to the Contractor in writing on the receipt of which, the contractor shall make immediate arrangements to remove such unsuitable materials completely from the work site, and replace them with materials conforming to the standards, at the contractors own expense.

Manufacturer's test certificates for all reinforcing steel shall be supplied to the Engineer in accordance with the said standards in Clause 3. These test certificates shall show compliance with the relevant standard specifications in all respects and shall be issued by an independent testing laboratory acceptable to the Engineer. If the manufacturer's test certificates are not available and if the Engineer requires it then it shall be the Contractor's responsibility for arranging all testing requested by the Engineer, before using such materials.

The test information so obtained must be sufficient to satisfy the Engineer that the item being tested conforms to the relevant standard specification. The Contractor shall bear the cost of these testing work.

5.2 Reinforcing Steel

Steel reinforcement shall be one of the following :

a) Hot rolled mild steel round bars complying with BS 4449.

b) High tensile steel either (i) cold worked deformed bars or (ii) hot rolled bars

The contractor shall supply the Engineer with a certificate for each consignment from the steel manufacturers showing that the steel meets the requirements of the specification. If required, the Engineer may carry out one tension test and one bond test for each lot of 50 tonnes or part thereof.

Steel reinforcing bars shall be kept clean and shall be free from pitting, loose rust, mill scale, oil, grease, mortar, earth, paint or any harmful material.

5.3 Cement

Cement shall be Ordinary Portland Cement complying with BS 12.

Insoluble matter in the cement used shall be less than 3 percent, and magnesium compounds shall be less than 5 percent.

All cement necessarily complying with BS 12 shall be obtained from the manufacturer or from his authorized distributors acceptable to the Engineer.

Test Certificates for cement satisfying the relevant standards shall be provided by the contractor when requested by the Engineer where necessary before use is made of a particular brand of cement.

5.4 Aggregates

Both the fine and coarse aggregates shall comply with BS 882 - 1992. Fine aggregate (sand) shall consist of clean sands and coarse aggregate shall consist of clean crushed stone. The nominal maximum size of the coarse aggregates shall be 20 mm.

Aggregates shall be free from clay, earth, loom or other organic or similar material. Aggregates which in the opinion of the Engineer is not clean, shall be thoroughly washed in clean water before use.

Prohibited Aggregates :

- coming from feldspathic or schistous rock
- containing charcoal or their residues such as coke, ashes, clinkers etc.

Sulphate and Sulphide must be in such quantities that the whole proportion, in Sulphur Trioxide, be less than one percent (1%) of the mass.

5.5 Water

All water used for the mixing of concrete shall be clean and free of any dissolved or undissolved impurities likely to be harmful to the cement, aggregates or the steel reinforcement.

The use of sea water is prohibited.

The water shall contain less than 700 parts per million (ppm) of dissolved solids.

The water should comply with the requirements of BS 3148.

5.6 Admixtures

No admixtures shall be added to the concrete mix unless the prior approval of the Engineer has been obtained in writing.

All admixtures shall comply with BS 5075. Approval by the Engineer of the use of any admixtures shall in no way relieve the Contractor and his supplier of their responsibility in regard to maintaining the quality or durability of the concrete used in the manufacture of poles.

Under no circumstances shall calcium chloride or any admixtures containing calcium chloride be permitted in the concrete used to manufacture the poles.

6. STORAGE AND PROTECTION OF MATERIALS

6.1 Cement

Cement shall be stored in a suitable weather-tight enclosure on a broad platform raised off the ground. The enclosure should be such that free circulation of air around the bags of cement is kept to a minimum.

Any cement that has become damp, caked or lumpy shall not be used. Concrete batching operations shall be organised so that cement that has been longest at the place of manufacture of the poles is used first.

If the Engineer has any doubts with regard to the quality of a certain batch of cement at site, samples of that should be retested for fineness, setting time, strength and soundness in the presence of the Engineer and in the event it fails the tests such cement should be removed from site immediately.

6.2 Aggregates

Both fine and coarse aggregates shall be separately stored so that they are kept clean and free from contamination and are not subjected to intermingling. Where a clean hard surface is not available for the stockpiles the bottom 150 mm of the aggregate piles which are in contact with the ground shall not be used.

Heaps of fine aggregate shall be capable of draining freely. Wet fine aggregate shall not be used until, in the opinion of the Engineer, has drained sufficiently to ensure proper control of the water/cement ratio.

6.3 Reinforcing Steel

All reinforcing steel shall be stored clear off the ground on sufficient supports to prevent distortion of bars and in a clean dry place. Grease, oil, paint or any other substance that will affect the bond of the reinforcement shall not be allowed to come in contact with it. If it does then all such substances shall be cleaned off the reinforcement before it is placed in the pole moulds.

Mild steel and high tensile steel shall be stored separately.

7. INSTALLATION OF REINFORCEMENT STEEL

7.1 Covers

The **minimum cover** from the outermost reinforcing steel to the nearest permanent surface of the concrete member shall be 25mm. All steel shall be accurately placed and shall be held in position during manufacture.

7.2 Spacing

The clear spacing between two parallel reinforcing bars shall not be less than the greatest of the nominal bar diameter or 1.33 times the maximum nominal size of the aggregate or 25 mm.

7.3 Stirrups and Ties

Bends in stirrups and ties shall have a diameter on the inside of the bar not less than the diameter of enclosed bar or two times the diameter of the stirrup or tie, whichever is the greater as per the corresponding drawing.

The ends of the stirrups and ties shall be anchored with a minimum of 90º bend plus a straight extension of 8 bar diameters but not less that 65 mm. They shall be firmly attached to the supporting tendons/reinforcement using soft wire ties.

7.4 Welding

Any form of welding or tack-welding of reinforcement will not be permitted.

8. MIXING, PLACING AND CURING CONCRETE

8.1 Mix Design

Concrete used for casting of poles throughout this contract shall be of grade 25 which should possess the following minimum qualities (as per BS 5328).

i) Minimum Cement content	-	275kg/m^3
ii) Maximum free water-cement ratio	-	0.65
iii) Minimum strength at an age of 28 days	-	25N/mm^2
iv) Nominal maximum aggregate size	-	20 mm

The ratio of the weight of the fine aggregates (sand) to the total weight of aggregates shall be between 0.35 and 0.50. As a guide, a mixing ratio of 1:1½:3 (cement:sand:metal) is suggested.

However it is the full responsibility of the contractor to ensure that the design strength of the concrete and the concrete mix is not varied unless by agreement with the Engineer.

8.2 Concrete Mixing

All concrete except where specifically permitted by the Engineer in writing shall be mixed in mixing machines.

The dry concrete ingredients shall be mixed until a uniform colour is obtained. After the addition of the water the concrete shall be mixed for a further 2 minutes or until a uniform colour is achieved. The total water in the mix shall not exceed the amount specified in the Clause 8.1 above.

In computing the quantity of water to be added, due account must be taken of the water contained in the aggregates. The amount of water shall be sufficient to ensure thorough hydration, good workability and high strength.

8.3 Workability

The concrete shall be of such consistency that it can be readily worked into the corners and angles of the formwork and around reinforcement without segregation of the materials or bleeding of free water at the surface. On striking the formwork it shall present a face which is smooth & uniform, free from honeycombing, or excessive dusting. Water should be added with great care, without letting the total water content to be excessive.

8.4 Transportation

The concrete shall be discharged from the mixer and transported to the Works by means that shall be approved by the Engineer and which shall prevent adulteration, segregation or loss of ingredients, and ensure that the concrete is of the required workability at the point and time of placing.

8.5 Placing and Compaction

Placement of concrete shall be at such a rate that the concrete is at all times plastic and flows readily into the space between the reinforcement. No concrete that has partially hardened or been contaminated by foreign materials shall be deposited in the moulds, nor shall re-tempered concrete or concrete that has been re-used after initial set be used.

The placement of concrete in the moulds shall be completed within half hour after the introduction of mixing water to the cement and aggregate in the concrete mixer. Each mould shall be filled with concrete as a continuous operation. Construction joints will not be permitted in the poles. Should there be an interruption during the placement of concrete into the mould such that initial set occurs to the deposited concrete then that pole shall be discarded.

All concrete shall be consolidated in the moulds using **high frequency vibrators**. The vibration applied shall be uniform along the length of the mould and shall be carefully controlled so that adequate consolidation is achieved without segregation of the mixed ingredients by over vibration.

8.6 Protection and Curing of Concrete

During the initial stages of hardening, the concrete shall be protected from direct rays of the sun and from drying winds. The moulds containing the hardened concrete shall not be disturbed or shifted unless it can be shown that such movements will not impart any damaging stress to the hardening concrete.

9. CONCRETE SAMPLING AND TESTING

9.1.1 General

A random sampling procedure, to obtain the samples for compression strength tests of concrete has to be adopted, and the maximum frequency of sampling of the concrete shall be (01) one sample per (50) fifty poles, but not less than one sample per day, whichever gives the higher number of samples. "Sample" is described in Cl. 9.1.2. Contractor shall make arrangements to carry out the compression strength test as per BS 1881, for each of above samples, at an independent testing laboratory approved by the Engineer, and the results of these tests shall be brought to the notice of the Engineer within 10 working days from each test. The acceptance of concrete will be decided by the Engineer, as described in Clause 9.3.

9.1.2 Casting of Samples

Samples for compression strength tests shall be moulded in either 150mm or 100mm cubes. The date of casting of the sample shall be clearly and indelibly marked on the fresh concrete. Subsequent marking on freshly applied grout layer is not allowed.

A sample shall consist of 4 cubes made concurrently from the same batch of concrete. Two (2) of the cubes shall be used to establish the 28 day compression strength and two (2) of the cubes shall be used to establish the 07 day compression.

All samples shall be moulded and cured in accordance with the procedures in BS 1881.

9.2 Compression Strength Tests

Testing of the compression strength samples shall be carried out in accordance with the procedures in BS 1881.

The minimum required 28 day compression strength of all concrete used to manufacture concrete poles shall be 25 N/mm^2

9.3 Acceptance Criteria for Compression strength

The concrete shall be considered acceptable when tested and found satisfactory according to stipulations in B.S. 5328 Part 4.

9.4 Pole Moulds and Surface Finishes

Moulds shall be designed, constructed and finished to ensure they can be removed without damaging the hardened concrete, and they shall be securely braced and supported to prevent sagging and bulging during the deposition of the concrete. Joints in the materials used to manufacture the moulds shall be tight and shall not permit any leakage of cement paste from the concrete mix. Holes in the walls of the moulds used for retaining pins which form bolt holes in the finished pole shall be provided with flexible seals or some similar means to prevent the loss of any cement paste from the concrete mix.

All poles shall have a surface finish that is smooth, hard, uniform in colour and appearance and free from any honeycombing and air pockets exceeding 4mm in diameter. All fins and other projections shall be rubbed down or ground flush with the general surface of the pole.

Repair of defective concrete will **not be permitted** and any pole containing defective concrete will be **rejected** by the Engineer.

9.5 Dimensional Tolerances

The permitted variation from a stated dimension or cross sectional shape of the finished pole shall be as follows. Any pole having dimensional tolerances above the figures given below will be rejected by the Engineer.

Length	± 15 mm
Cross Section	Overall dimensions and dimensions of parts such as webs etc. + 4mm, - 2mm
Straightness	Deviation from a straight line joining the top end and the widest dimensions at the butt end ± 15 mm
Holes	Size - 0, + 2 mm relative position ± 5 mm
Location of Reinforcement	±3mm, but specified covers shall not be reduced

Notwithstanding all of the above, any apparent waviness or serious local variation of flatness of the pole surfaces may lead to its rejection by the Engineer.

9.6 Marking of Poles

Following data of the pole shall be clearly and indelibly marked at a position approximately 1.5m above the ground level, by **embossing** the marks on **fresh** concrete, just after the casting of pole. Subsequent marking on cement mortar/grout applied **later** into the pole is **not** allowed.

a) Letters "CEB", size and working load, date of casting, serial no. and name/identification no. of manufacturer, of the pole. No two poles belonging to the same manufacturer could bear the same serial number. (A pre-formed template shall be used for this purpose).

b) A line indicating the theoretical point of fixity as given in the corresponding drawings (for purpose of testing).

9.7 Lifting, Handling and Shifting

Poles shall not be lifted or handled until the concrete has attained sufficient strength.

While lifting, the pole shall be held from at least two points.

10. INSPECTION AND TESTING OF POLES

10.1 General

The CEB shall reserve the right to inspect the Plant and Machinery and raw materials used for the manufacture of poles, manufacturing facilities, methods and systems, testing equipment and the final inspection of manufactured poles. The contractor shall provide access to the Plant at any reasonable time to the Engineer and shall provide such facilities as necessary, free of charge, for carrying out tests and inspection and provide labour, gauges, tools, materials and testing equipment/apparatus for such tests and inspection.

In case of manufactured Poles the Engineer shall have the right to reject any pole/poles with the surface finish/dimensions/markings not in accordance with Clauses 9.4, 9.5 and 9.6 respectively.

10.2 Testing of Poles

Pole shall be tested as per the CEB Standards 044-3:96. One in hundred numbers of each type of poles selected at random by the Engineer will be tested in the following manner.

A pole shall be tested in the horizontal position. It shall be held rigidly at the butt end in accordance with the supported lengths on 1/9th of the total length of each pole. (Testing line is as indicated in the corresponding pole drawing).

In horizontal testing, provision shall be made with suitable supports to neutralise the bending moment as indicated in the Drawing No. DS&S/2000/44-3.

Test load shall be applied at a point 0.60m from the top of the pole and raised in increments of 10% of the ultimate load. Measurements shall be taken for deflection after each increment of 10% of the ultimate load.

Load shall be reduced to zero at 40% and at 60% of ultimate load and permanent set shall be measured. Load shall be increased in steps of 10% of the ultimate load until failure occurs by maintaining each load above 60% of the ultimate load for at least two minutes (failure load is the load at which the dynamometer indicates no further increase in load).

After the failure has occurred, the Pole shall be removed from the test bed, and concrete shall be broken sufficiently from any place/places as required by the Engineer, until the reinforcements and stirrups are exposed. The reinforcement should be carefully examined and verified whether the following factors are meeting the requirements of relevant drawing/specification.

i) Type, diameter, length number of bars and positioning of the main reinforcement.

ii) Type, diameter, shape and spacing of stirrups.

iii) Length and correct positioning (staggered) of lap joints.

The whole batch of 100 would be acceptable to the CEB, if the tested pole passes the criteria given in (a), (b), (c), (d) and (e) below:

a) During the application of load upto 40% of the ultimate load, the pole shall **not** have developed any hair cracks.

b) The permanent set recorded, after removal of a test load of 60% of ultimate load shall **not** exceed 10% of the deflection recorded for same test load.

c) The hair cracks produced while loading upto 60% of the ultimate load, shall clearly **close up** on removal of the above test load.

d) The test load at failure shall **exceed** the ultimate load.

e) On breaking the concrete after failure it shall be established that the following requirements are in accordance with the corresponding drawing/specification of Pole.

i) Type, diameter, length number of bars and positioning of the main reinforcement.

ii) Type, diameter, shape and spacing of stirrups.

iii) Length and correct positioning (staggered) of lap joints.

10.3 Failure to Satisfy Acceptance Criteria

In the event that a pole does not satisfy any one of the above acceptance criteria, one more pole selected randomly from the same batch shall be tested for all the five acceptance criteria. If this additional pole tested fails to satisfy any one of acceptance criteria then the entire batch shall be rejected. All the poles rejected shall be marked with a permanent ink, and removed from the site immediately.

10.4 The cost of all the above pole testing shall be borne by the Contractor. This includes the cost of poles used for testing.

11. TRANSPORTATION & HANDLING

11.1 Transport to Site

Pole shall be stored, transported, and handled at all times with its longer axis in vertical position to ensure that the resulting forces are always resisted by the poles stronger direction.

The pole shall be transported on a suitable vehicle supported full length or with limited overhang.

11.2 Lifting and Storage

While lifting, the pole shall be held from at least two points and when stacked at the manufacturing plant or at the point of delivery the poles shall be separated by timber bearers placed between each unit. Timber bearers shall be placed only on lines vertically above each other.

Transporting of poles is deemed to be completed only when the contractor hands over the poles to places nominated in the schedule of this contract.

If any damage or cracking occurs to any of the poles before they are handed over to the Engineer such poles shall be rejected. All rejected poles shall be marked with a permanent ink and removed from the site immediately.

12. ANNEXURES

A - 6.0m 50kg RC Pole -Dr. No. DS&S/98/7710

B - 8.3m 100kg RC Pole -Dr. No. DS&S/2002/7709

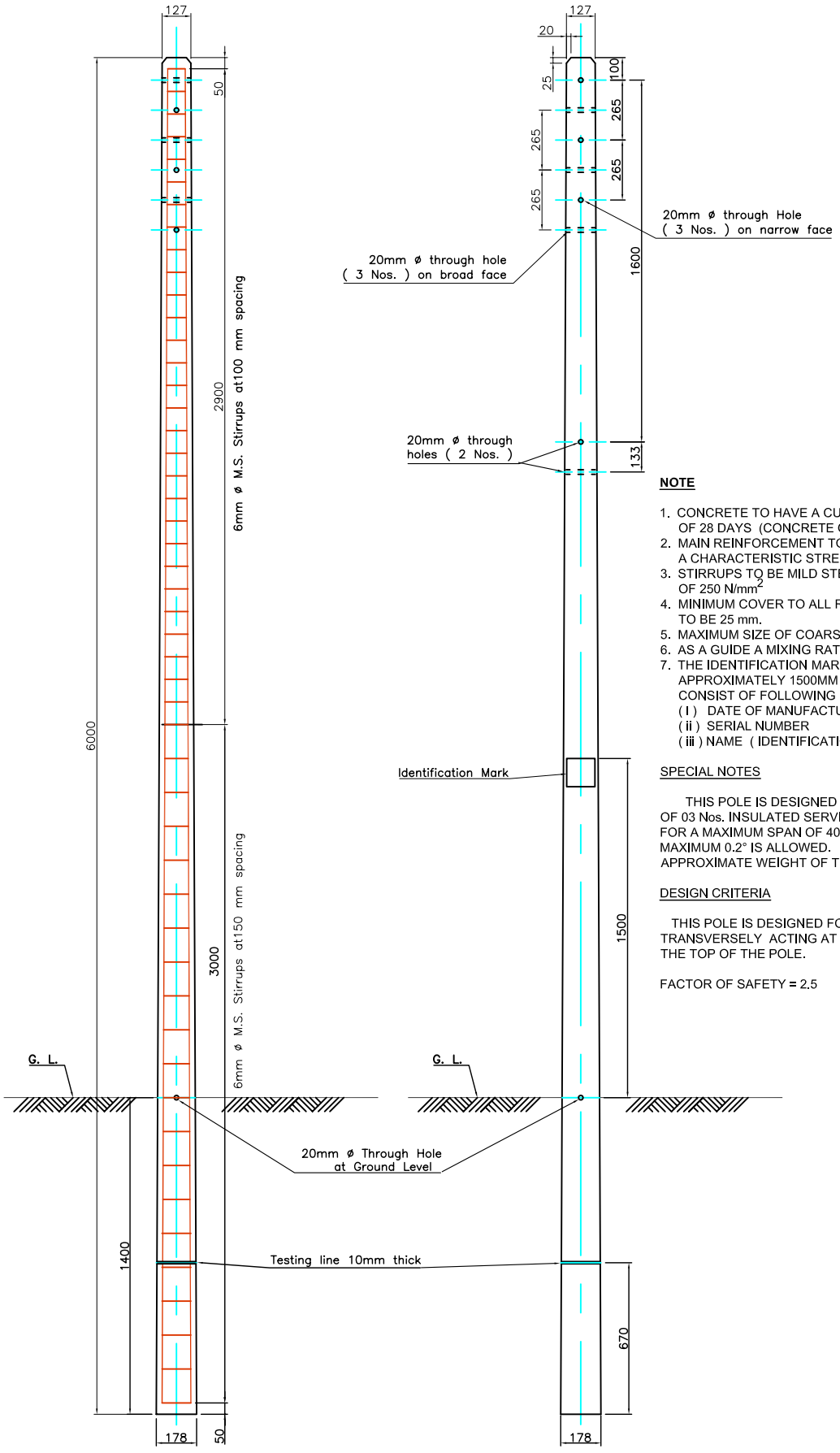
C - 8.3m 500kg RC Pole -Dr. No. DS&S/2002/7720

D - 9.0m 115kg RC Pole -Dr. No. DS&S/99/7707

E - 10.0m 300kg RC Pole -Dr. No. DS&S/98/7705

F - Horizontal arrangements for pole testing - Dr. No. DS&S/2000/44-3

G - Pole Test Report



NOTE

1. CONCRETE TO HAVE A CUBE STRENGTH OF 25 N/mm^2 AT AN AGE OF 28 DAYS (CONCRETE GRADE 25)
2. MAIN REINFORCEMENT TO BE DEFORMED HIGH YIELD STEEL HAVING A CHARACTERISTIC STRENGTH OF 450 N/mm^2
3. STIRRUPS TO BE MILD STEEL HAVING A CHARACTERISTIC STRENGTH OF 250 N/mm^2
4. MINIMUM COVER TO ALL REINFORCEMENT (INCLUDING STIRRUPS) TO BE 25 mm.
5. MAXIMUM SIZE OF COARSE AGGREGATE TO BE 20 mm.
6. AS A GUIDE A MIXING RATIO OF 1:1 1/2:3 IS SUGGESTED.
7. THE IDENTIFICATION MARK SHALL BE LOCATED AT APPROXIMATELY 1500MM ABOVE GROUND LEVEL ,AND CONSIST OF FOLLOWING IMFORMATION.
   (i) DATE OF MANUFACTURE
   (ii) SERIAL NUMBER
   (iii) NAME (IDENTIFICATION) OF MANUFECTUER

SPECIAL NOTES

THIS POLE IS DESIGNED TO CARRY A SERVICE CONNECTION OF 03 Nos. INSULATED SERVICE WIRES (WITHOUT EARTH WIRE) FOR A MAXIMUM SPAN OF 40M AN OUT OF ALIGNMENT OF MAXIMUM 0.2° IS ALLOWED.
APPROXIMATE WEIGHT OF THE POLE IS 345 Kg.

DESIGN CRITERIA

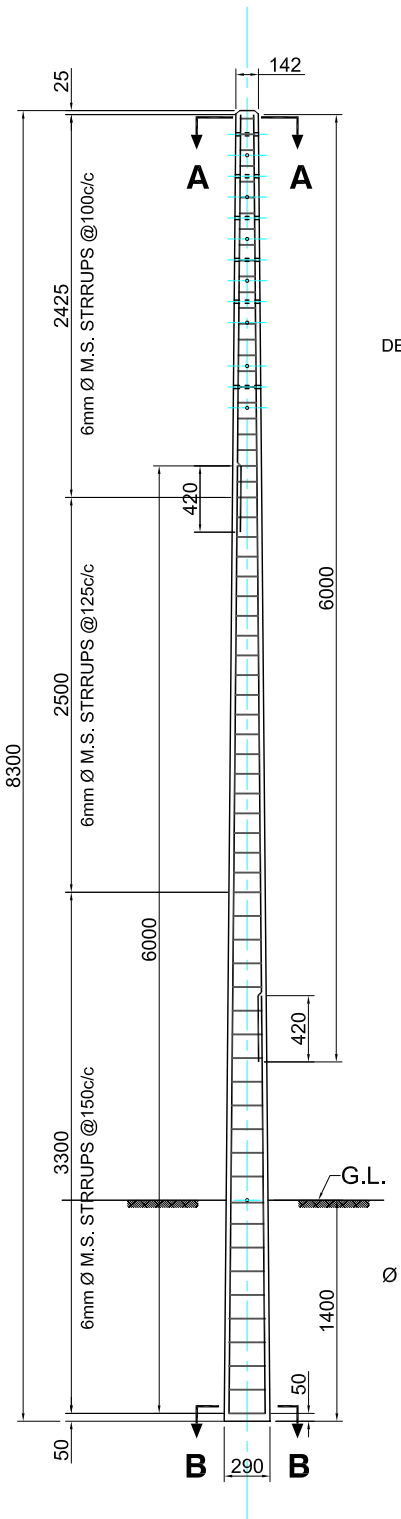
THIS POLE IS DESIGNED FOR WORKING LOAD OF 50 KG. TRANSVERSELY ACTING AT A DISTANCE OF 0.6 M BELOW THE TOP OF THE POLE.

FACTOR OF SAFETY = 2.5

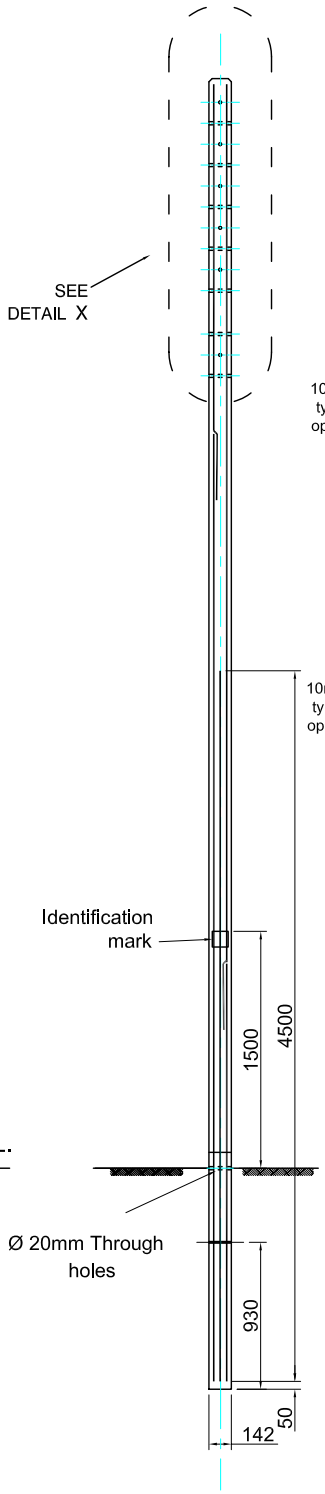
ALL DIMENSIONS ARE IN mm.

CEYLON ELECTRICITY BOARD	DISTRIBUTION STANDARDS & SPECIFICATION	SCALE : NOT TO SCALE
	6 METER / 50 kg RC POLE	DRAWN : LALANI
	CHECKED BY / APPROVED BY	DATE : NOV. 1998
		DRG. NO : DS&S/98/7710
DIST. PLANNING BRANCH	CHIEF ENGINEER (DS & S) / CHAIRMAN, SPECIFICATION COMMITTEE	CAD NO :

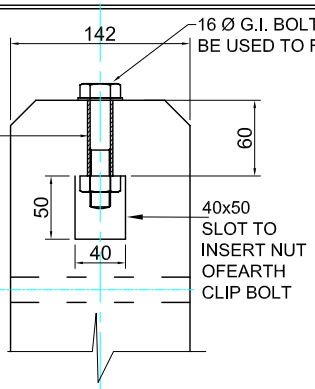
8.3M /100 KG REINFORCED CONCRETE POLE



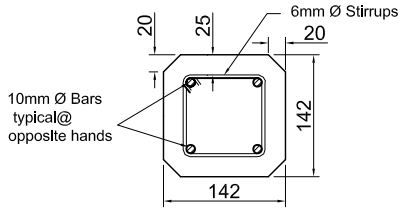
SECTIONAL ELEVATION OF BROAD FACE



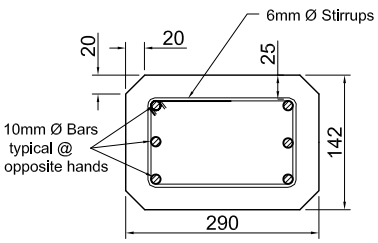
SECTIONAL ELEVATION OF NARROW FACE



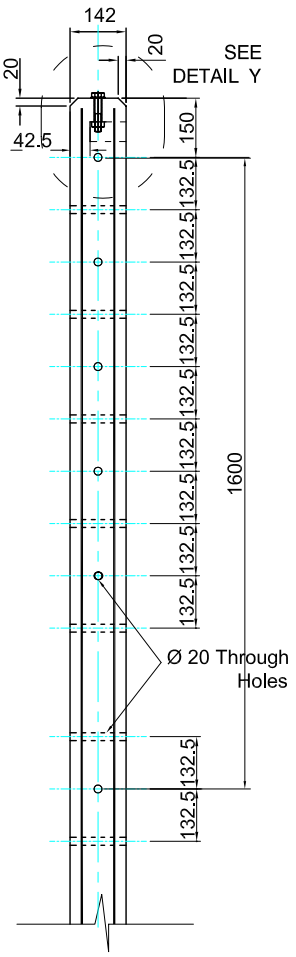
DETAIL Y



SECTION A-A



SECTION B-B



DETAIL X

NOTE

1. CONCRETE TO HAVE A CUBE STRENGTH OF 25 N/mm^2 AT AN AGE OF 28 DAYS (CONCRETE GRADE 25)
2. MAIN REINFORCEMENT TO BE DEFORMED HIGH YIELD STEEL HAVING A CHARACTERISTIC STRENGTH OF 450 N/mm^2
3. STIRRUPS TO BE MILD STEEL HAVING A CHARACTERISTIC STRENGTH OF 250 N/mm^2
4. MINIMUM LAP LENGTH OF 10MM ØHIGH YIELD STEEL BARS TO BE 41x DIA.
5. MINIMUM COVER TO ANY REINFORCEMENT TO BE 20 mm.
6. MAXIMUM SIZE OF COARSE AGGREGATE TO BE 20 mm.
7. LAPS FORMED IN THE ADJACENT BARS IN THE SAME FACE OF THE POLE MUST BE STAGGERED.
8. AS A GUIDE A MIXING RATIO OF 1:1 1/2:3 IS SUGGESTED.
9. THE IDENTIFICATION MARK SHALL BE LOCATED AT APPROXIMATELY 1500MM ABOVE GROUND LEVEL ,AND CONSIST OF FOLLOWING IMFORMATION.
   (i) DATE OF MANUFACTURE
   (ii) SERIAL NUMBER
   (III) NAME (IDENTIFICATION) OF MANUFECTUER

SPECIAL NOTES

THIS POLE IS DESIGNED TO CARRY A L.T. LINE CONSISTING AT 04 Nos. FLY CONDUCTORS WITH A SINGLE EARTH WIRE, FOR A MAXIMUM SPAN OF 45M. AN OUT OF ALIGNMENT OF MAXIMUM 0.2° IS ALLOWED. THE POLE SHALL BE CASTED SO THAT THE NARROW FACE IS RESTING ON THE BASE PLATE, AND SHALL BE TRANSPORTED RESTING ON THE NARROW FACE WHILE FULL LENGTH OF THE POLE BEING SUPPORTED.

APPROXIMATE WEIGHT OF THE POLE IS 610 Kg.

DESIGN CRITERIA

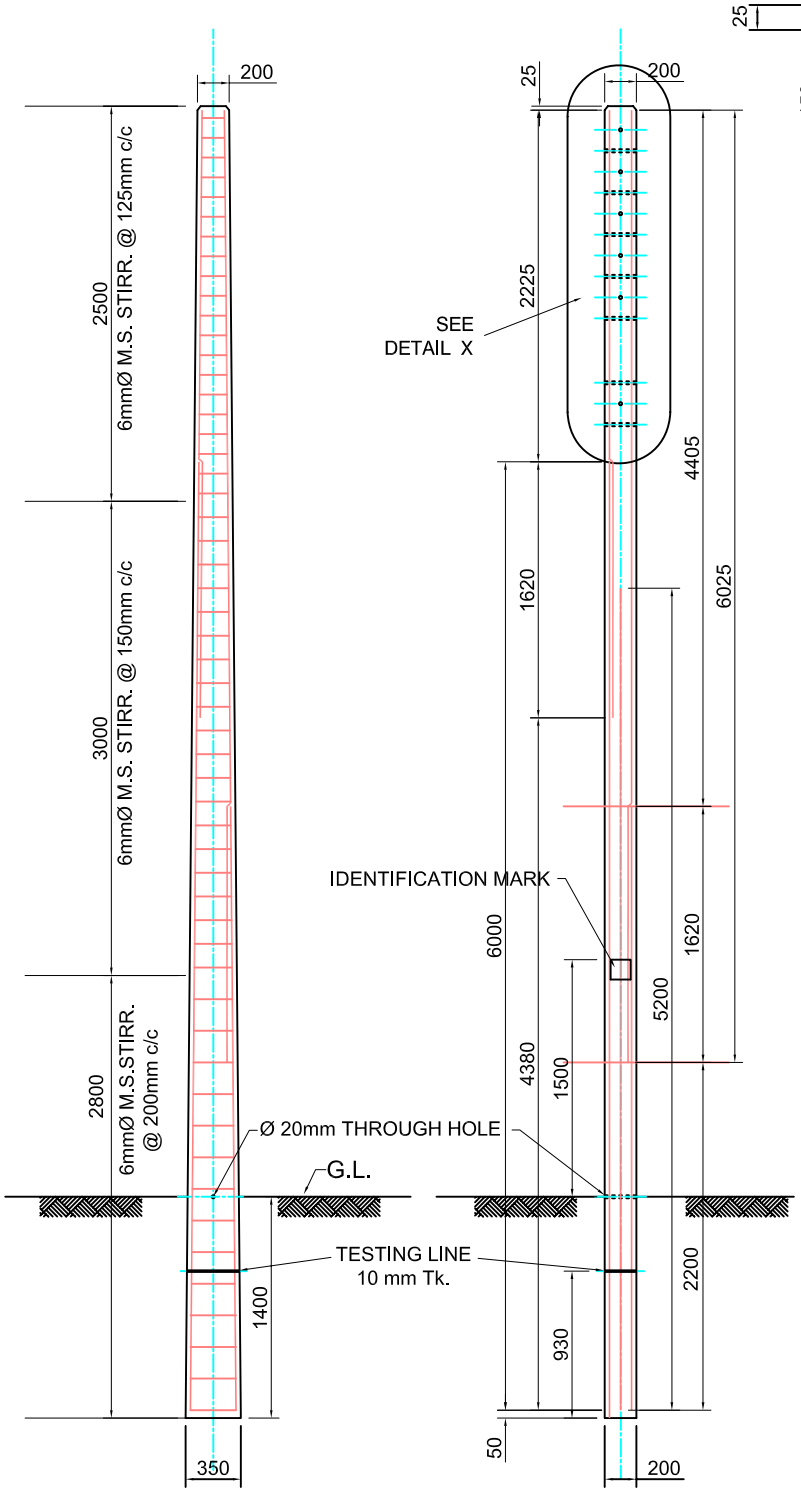
THIS POLE IS DESIGNED FOR WORKING LOAD OF 100KG. TRANSVERSELY & 25Kg LONGITUDINALY ACTING AT A DISTANCE OF 0.6 M BELOW THE TOP OF THE POLE.

FACTOR OF SAFETY = 2.5

ALL DIMENSIONS ARE IN mm.

CEYLON ELECTRICITY BOARD	DISTRIBUTION STANDARDS & SPECIFICATION	SCALE : NOT TO SCALE
	8.3 M / 100 kg REINFORCED CONCRETE POLE	DRAWN : LALANI
	DESIGNED BY / APPROVED BY	DATE : Feb., 2002
		DRG. NO : DS&S/2002/7709
DIST. PLANNING BRANCH	E.E. (DS & S) / CHAIRMAN, SPECIFICATION COMMITTEE	CAD NO :

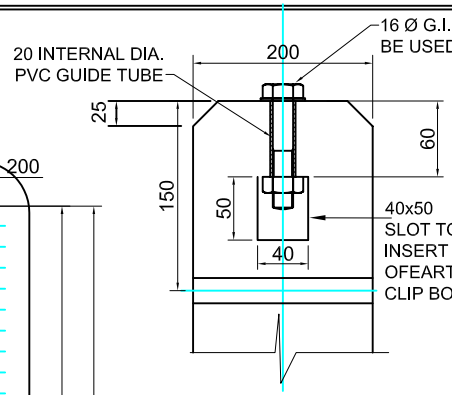
8.3M /500 KG REINFORCED CONCRETE POLE



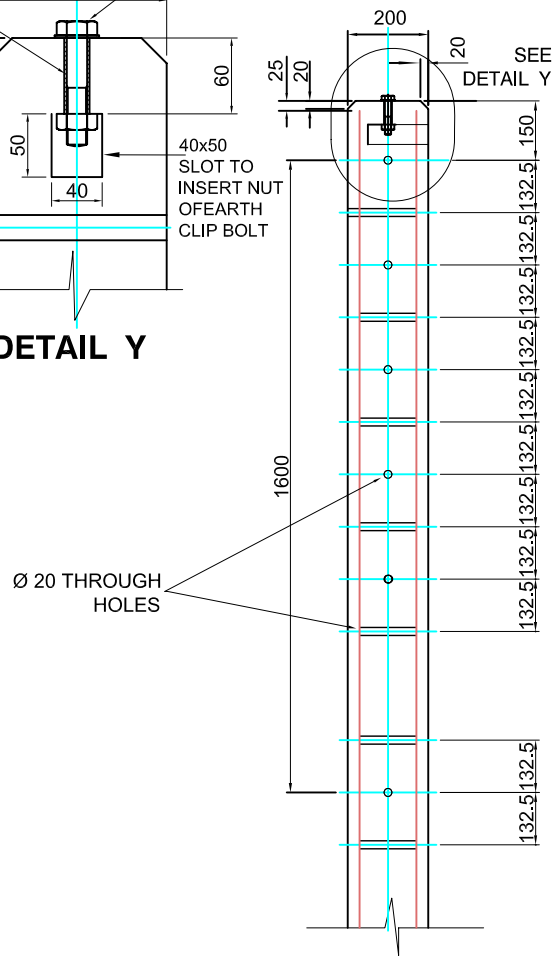
SECTIONAL ELEVATION OF BROAD FACE

SECTIONAL ELEVATION OF NARROW FACE

ALL DIMENSIONS ARE IN mm.



DETAIL Y



DETAIL X

NOTE

1. CONCRETE TO HAVE A CUBE STRENGTH OF 25 N/mm^2 AT AN AGE OF 28 DAYS (CONCRETE GRADE 25)
2. MAIN REINFORCEMENT TO BE DEFORMED HIGH YIELD STEEL HAVING A CHARACTERISTIC STRENGTH OF 460 N/mm^2
3. STIRRUPS TO BE MILD STEEL HAVING A CHARACTERISTIC STRENGTH OF 250 N/mm^2
4. MINIMUM LAP LENGTH OF MAIN REINFORCEMENT BARS TO BE 81x DIA.
5. MINIMUM COVER TO ANY REINFORCEMENT TO BE 25 mm.
6. MAXIMUM SIZE OF COARSE AGGREGATE TO BE 20 mm.
7. LAPS FORMED IN THE ADJACENT BARS IN THE SAME FACE OF THE POLE MUST BE STAGGERED.
8. AS A GUIDE A MIXING RATIO OF 1:1 1/2:3 IS SUGGESTED.
9. THE IDENTIFICATION MARK SHALL BE LOCATED AT APPROXIMATELY 1500MM ABOVE GROUND LEVEL, AND CONSIST OF FOLLOWING IMFORMATION.
   (i) DATE OF MANUFACTURE
   (ii) SERIAL NUMBER
   (iii) NAME (IDENTIFICATION) OF MANUFECTUER

SPECIAL NOTES

THIS POLE IS DESIGNED TO CARRY A L.T. LINE CONSISTING AT 04 Nos. FLY CONDUCTORS WITH A SINGLE EARTH WIRE. THIS POLE CAN WITHSTAND A MAXIMUM INCLUDED ANGLE OF 15°, TOGETHER WITH A MAXIMUM SPAN OF 45M, **WITHOUT A STAY OR GUY**.
THESE POLES SHOULD BE TRANSPORTED RESTING ON THE NARROW FACE WHILE FULL LENGTH OF THE POLE BEING SUPPORTED.

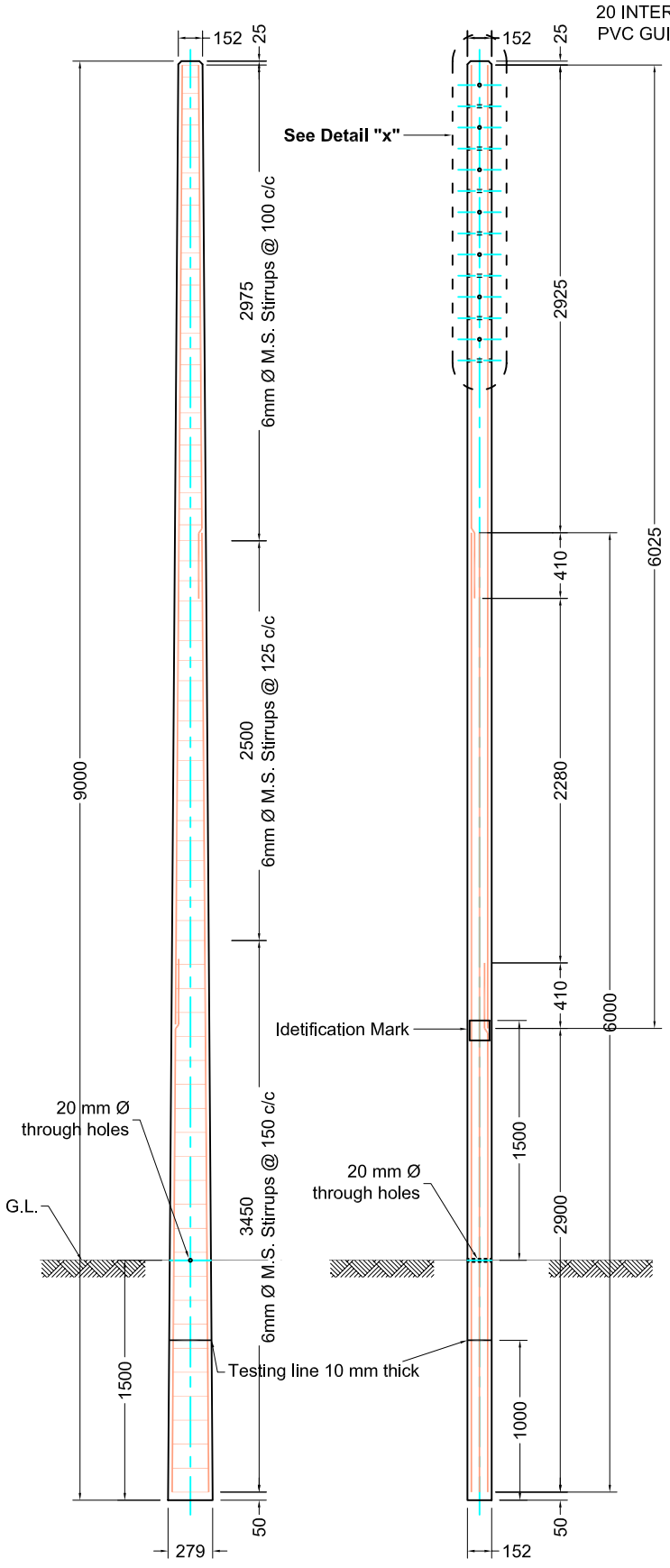
APPROXIMATE WEIGHT OF THE POLE IS 1100 Kg.

DESIGN CRITERIA

THIS POLE IS DESIGNED FOR WORKING LOAD OF 500KG. TRANSVERSELY & 125Kg LONGITUDINALY ACTING AT A DISTANCE OF 0.6 M BELOW THE TOP OF THE POLE.

FACTOR OF SAFETY = 2.5

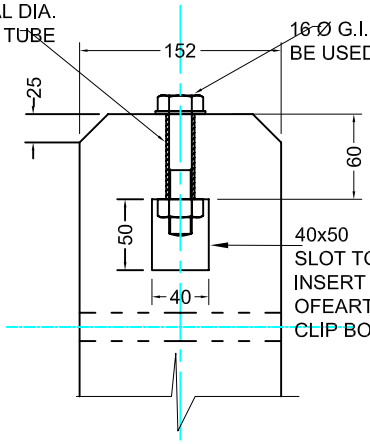
CEYLON ELECTRICITY BOARD	DISTRIBUTION STANDARDS & SPECIFICATION	SCALE : NOT TO SCALE
	8.3 M / 500 kg REINFORCED CONCRETE POLE (UNGUYED ANGLEM POLE)	DRAWN : LALANI
		DATE : Feb., 2002
	DESIGNED BY / APPROVED BY	DRG. NO : DS&S/2002/7720
DIST. PLANNING BRANCH	E.E. (DS & S) / CHAIRMAN, SPECIFICATION COMMITTEE	CAD NO :



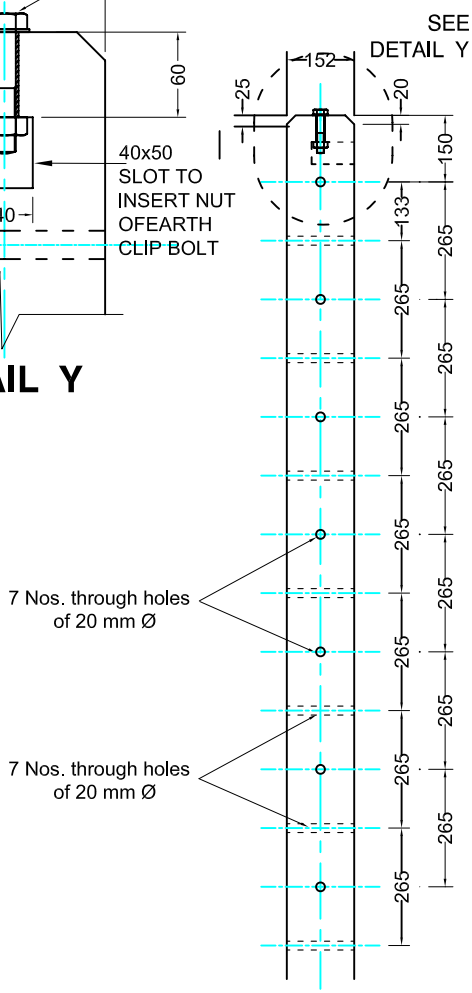
SECTIONAL ELEVATION OF BROAD FACE

ELEVATION OF NARROW FACE

ALL DIMENSIONS ARE IN mm.



DETAIL Y



DETAIL X

SPECIAL NOTES

This pole is designed to carry a L. T. Line consisting at 4 (four) Nos. Fly conductors (with Earth wire) & a street lamp wire consisting of 1 (one) Fly conductor for a maximum span of 45 m.
An out of alignment of maximum 0.2° is allowed.
These poles should be transported resting on the narrow face while full length of the pole being supported. Approximate weight of the Pole is 710 kg.

DESIGNED CRITERIA

This pole is Designed for working load of 115 kg. Transversely & 28 kg. Longitudinaly acting at a distance of 0.6 m below the top of the pole.

Factor of Safty 2.5

NOTES

1. Concrete to have a Cube strength of 25 N/mm^2 at an age of 28 days (concrete grade 25 - As a Guide a Mixing Ratio of 1 : 1 1/2 : 3 is suggested.)
2. Main Reinforcement to be deformed High Yield Steel having a characteristic strength of 450 N/mm^2
3. Stirrups to be Mild steel having a characteristic strength of 250 N/mm^2
4. Minimum lap length of 10 mm. Ø High Yield Steel bars to be 41 x dia.
5. Minimum cover to any Reinforcement to be 20 mm.
6. Maximum Size of coarse aggregate to be 20 mm.
7. Laps formed in the adjacent bars on the same face **must be staggered.**
8. Approximate weight of the pole is 710 kg.

CEYLON ELECTRICITY BOARD

DIST. PLANNING BRANCH

DISTRIBUTION STANDARDS & SPECIFICATION

9.0 M / 115 kg. REINFORCED CONCRETE POLE

CHECKED BY — CHIEF ENGINEER (DS & S)

APPROVED BY — CHAIRMAN, SPECIFICATION COMMITTEE

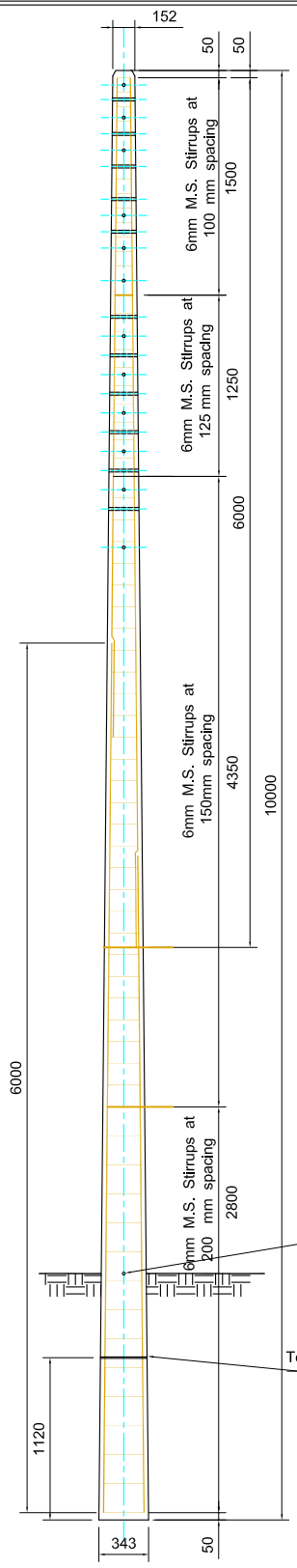
SCALE : NOT TO SCALE

DRAWN : LALANI

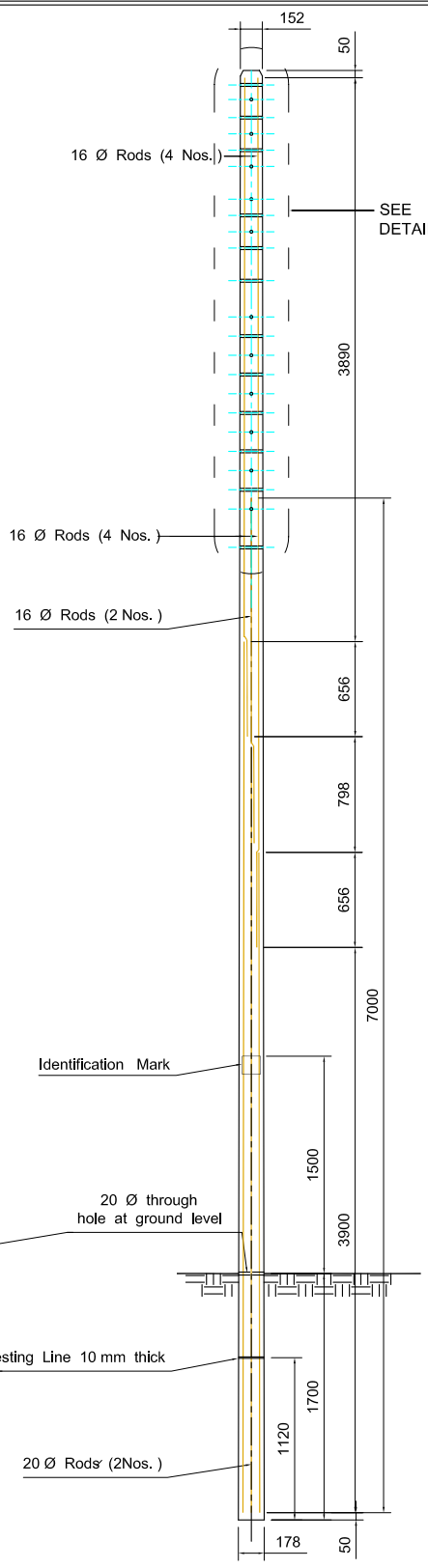
DATE : March, 1999

DRG. NO : DS&S/99/7707

CAD NO :

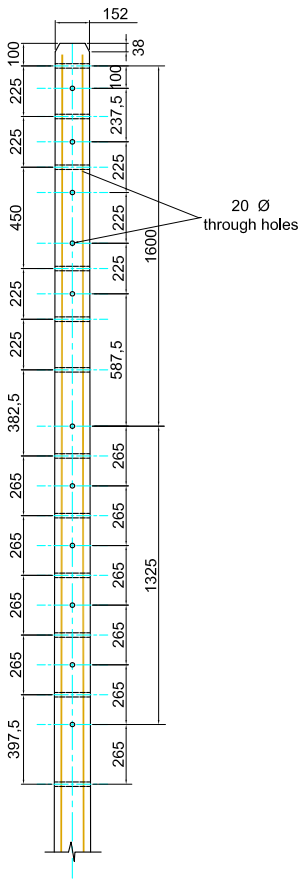


SECTIONAL ELEVATION OF BROAD FACE



SECTIONAL ELEVATION OF NARROW FACE

ELEVATION



DETAIL - X

NOTES :

1. Concrete to have a Cube Strength of 25.0 N/mm^2 at an age of 28 Days. (Concrete Grade 25)
2. Main Reinforcement to be Deformed High Yield Steel having a Characteristic Strength of 450 N/mm^2
3. Stirrups to be Mild Steel having a Characteristic Strength of 250 N/mm^2
4. MInImum Lap Length of HIgh YIeld Steel bars to be 41 x dIa.
5. Minimum Cover to all Reinforcement (including Stirrups) to be 25 mm
6. Maximum Size of Coarse aggregate to be 20 mm.
7. Laps Formed in the Adjacent Bars in the same face of the Pole must be Staggered.
8. As a Gulde a MIxIng Rate of 1:1 1/2 :3 Is Suggested.

SPECIAL NOTES

This Pole is designed carry either of

1. a. H. T. Line consisting of Three (3) Nos. Raccon conductors & a single earth wIre, wIth a maxImum span of 80 M.
   b. H.T. Line of similar configuration together with a L.T. Line consisting of 04Nos. Fly conductors and a single earth wIre, wIth a maxImum span of 40m.
2. In both Cases an out of alignment of Max. 0.2° for a pole is allowed.
3. These poles should be transported face resting on the narrow face while full length of the pole being supported.
4. Approximate weight of the Pole is 1010 kg.

DESIGN CRITERIA

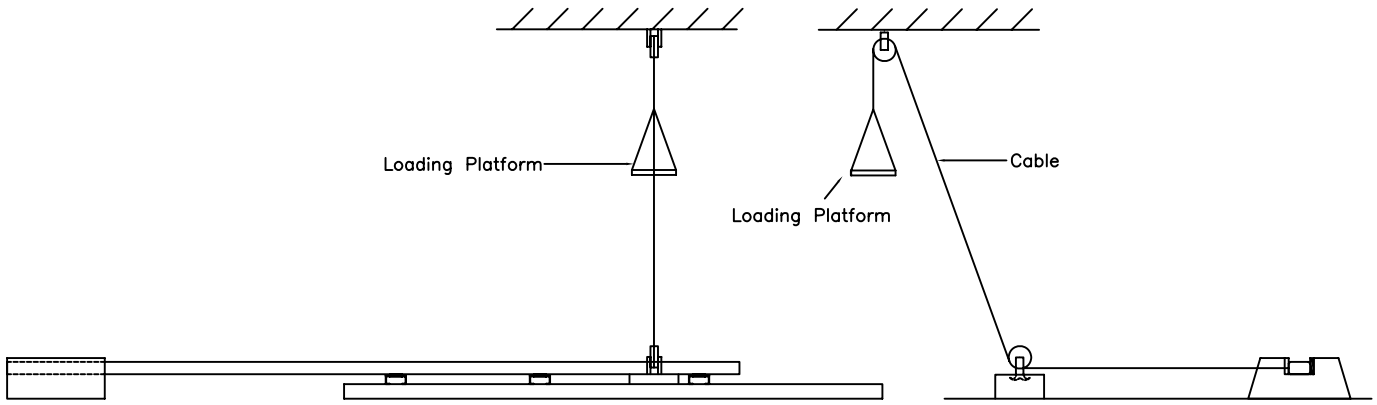
1. The pole is designed for working load of 300 kg. transversly and 75 kg. longitudinally acting at a distance of 0.6 M below the top of pole.

   Factor of Safty - 2.5

ALL DIMENSIONS ARE IN MM.

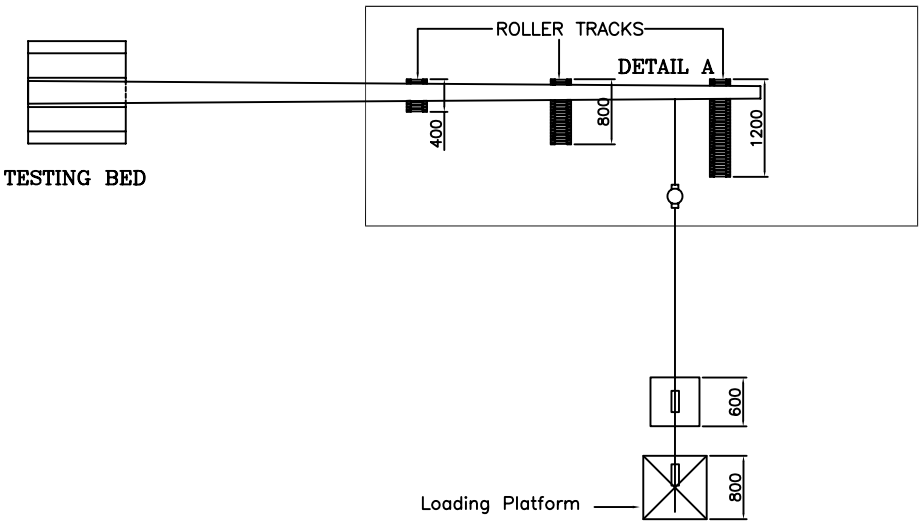
ALL DIMENSIONS ARE IN MILLIMETERS.

CEYLON ELECTRICITY BOARD	DISTRIBUTION STANDARDS & SPECIFICATION	SCALE : NOT TO SCALE
	10.0 METER 300 KG REINFORCED CONCRETE POLE	DRAWN : LALANI
	DESIGNED BY / APPROVED BY	DATE : SEP. 1998
DETAIL X		DRG. NO : DS&S/98/7705
DIST. PLANNING BRANCH	CHIEF ENGINEER (DS & S) / CHAIRMAN, SPECIFICATION COMMITTEE	CAD NO :

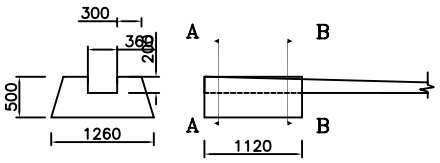


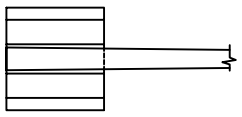
FRONT ELEVATION

SIDE ELEVATION

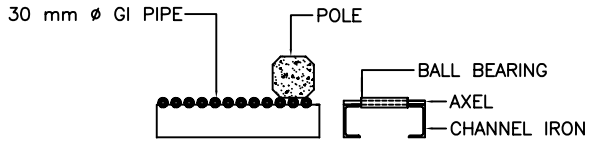


PLAN

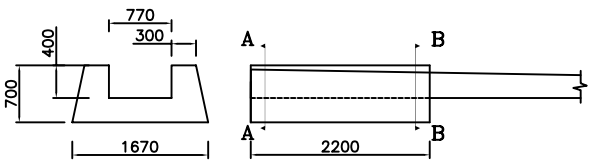


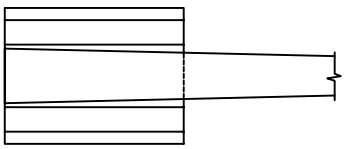


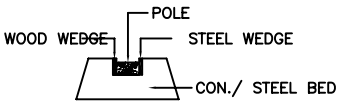
TESTING BED FOR
R.C. POLE



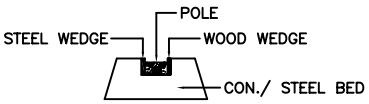
DETAIL A







VIEW B-B



VIEW A-A

TESTING BED FOR
PRE-STRESSED POLE

ALL DIEMENSIONS ARE IN mm.

CEYLON ELECTRICITY BOARD	DISTRIBUTION STANDARDS & SPECIFICATION	SCALE : NOT TO SCALE
	HORIZONTAL ARRANGEMENT FOR POLE TESTING	DRAWN : LALANI
		DATE : Feb. 2000
	DESIGNED BY / E.E. (DS & S) — APPROVED BY / CHAIRMAN, SPECIFICATION COMMITTEE	DRG. NO : DS&S/2000/044-3
DIST. PLANNING BRANCH		CAD NO :

Annex G

My No. ……

Branch ……

POLE TEST REPORT

NAME OF THE CONTRACTOR & PLACE OF SITE : ……

……

DATE OF TESTING : …….

TYPE OF POLE : ……..

WORKING LOAD : …….

FACTOR OF SAFETY : ……..

ULTIMATE LOAD : ……

PLACE OF TESTING : ……..

SERIAL NO. OF THE TEST POLE : ……..

SERIAL NOS. OF BATCH OF POLES FROM …….. TO …….

INSPECTION OF POLE BATCH :

(a) Whether all the poles satisfied the visual inspection criteria given in clause 3.2 ……..

If not,

(b) Following poles have been rejected due to non-conformity to aspects mentioned herein.

Serial No.	Pole Height	Cross Section	Hole Position	Hole Size	Straightness	Finishing	Pole Marking	Remarks

TEST POLE : a) SERIAL NO. : .....

b) DATE OF MANUFACTURE: .....

STAGE	LOAD APPLIED IN kg.	% OF ULTIMATE LAOD	DEFLECTION IN mm	REMARKS
1		0		
2		10		
3		20		
4		30		
5		40		
6		0		
7		10		
8		20		
9		30		
10		40		
11		50		
12		60		
13		0		
14		10		
15		20		
16		30		
17		40		
18		50		
19		60		
20		70		
21		80		
22		90		
23		100		
24		110		
25		120		
26		130		
27		140		
28		150		
29		160		
30		170		
31		180		
32		190		
33		200		

1. Whether any hair crack/cracks developed during the application of load upto 40% of the ultimate load : …….

2. Whether the hair cracks, produced while loading upto 60% of the ultimate load, have closed : ……..

3. Permanent set after 60% of the ultimate load : ……. Mm

4. Test load at the destruction of the pole : ……. Kg

5. Verification of reinforcement after breaking of the concrete of the tested pole

   a) Main Reinforcement

      (1) Type …….. (2) Diameter …….. (3) Lap length ……mm
      (4) Lap positioning

   b) Stirrups

      (1) Diameter ……. mm (2) Spacing …….. mm

Whether the tested pole satisfied the acceptance criteria : …….

If not what is the pole No. selected for second test : ……

In view of the above this batch of poles is accepted/rejected with the acceptance in the rejected pole/poles mentioned in page 01 of this report and the tested pole

Name and Designation of CEB
Testing Officer/Engineer : ……..

Signature : ……..

Tested in the presence of
(Name of Contractor or his Agent) : ……..

Signature : ……..

Date : …….