

Saudi Electricity Company



الشركة السعودية للكهرباء

SEC DISTRIBUTION MATERIALS SPECIFICATION

20-SDMS-03 Rev. 01

DATE: 14-10-2014G

**20-SDMS-03
REV. 01**

**SPECIFICATION
OF
PRESTRESSED SPUN CONCRETE POLE
FOR
DISTRIBUTION SYSTEM**

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subject to change or modification without any notice**



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1.0 SCOPE

This SEC Distribution Material Specification (SDMS) specifies the minimum technical requirements for design, engineering, manufacturing, inspection, testing and performance of Prestressed Spun Concrete Poles intended to be used in the medium and low voltage system (MV/LV) distribution system of Saudi Electricity Company (SEC).

2.0 CROSS REFERENCES

- 2.1 This SDMS shall always be read in conjunction with SEC General Specification No. 01-SDMS-01 (Latest Revision) titled General Requirements for all Equipment/Materials, which shall be considered as an integral part of this SDMS.
- 2.2 This SDMS shall also be read in conjunction with SEC Purchase Order or Contract Schedules and the Scope of Work and Technical Specifications for projects, as applicable.

3.0 APPLICATION CODES AND STANDARDS

The latest revision of the following codes and standards shall be applicable for the equipment/materials covered in this SDMS. In case of any deviation, the vendor/manufacturer may propose equipment/materials conforming to an alternate codes or standards.

However, the provisions of this specification shall supersede the provisions of these alternate standards in case of any difference.

| | |
|-------------|---|
| JIS R 5210 | Portland Cement |
| EN 12843 | Precast Concrete Products – Masts and Poles |
| EN 13369 | General Provisions for Precast Concrete Units |
| EN 50341 | Overhead Electrical Lines Exceeding AC 45kV |
| EN 1990 | Eurocode 0: Basis of Structural Design |
| EN 1991 | Eurocode 1: Actions on Structures |
| EN 1992-1-1 | Eurocode 2: Design of Concrete Structures |
| EN 206-1 | Concrete, Part-1: Provision, Characteristics, Production and Conformity |
| EN 12350 | Testing Fresh Concrete |
| EN 12390 | Testing Hardened Concrete |
| EN 196 | Methods of Testing Cement |
| EN 197 | Cement |
| EN 10138-3 | Prestressing Steels, Part-3: Strand |



| | |
|------------|---|
| EN 10080 | Steel for the Reinforcement of Concrete – Weld Able Reinforcing Steel: General |
| ISO 15630 | Steels for Reinforcement and Prestressing of Concrete |
| ISO 17760 | Welding – Welding of Reinforcing Steel |
| EN 12620 | Aggregates for Concrete |
| EN 933 | Testing for Geometrical Properties of Aggregates |
| EN 934 | Admixtures for Concrete, Mortar and Grout |
| EN 1008 | Mixing Water for Concrete |
| JIS A 5373 | Precast Prestressed Concrete Products |
| JIS A 1108 | Method of Test for Compressive Strength of Concrete |
| JIS A 1132 | Method of making and Curing Concrete Specimens |
| JIS A 1136 | Method of Test for Compressive Strength of Spun Concrete |
| JIS G 3101 | Rolled Steel for General Structure |
| JIS G 3109 | Steel Bar for Prestressed Concrete |
| JIS G 3112 | Steel Bar for Concrete Reinforcement |
| JIS G 3505 | Low Carbon Steel Wire Rods |
| JIS G 3506 | High Carbon Steel Wire Rods |
| JIS G 3521 | Hard Drawn Steel Wires |
| JIS G 3532 | Low Carbon Steel Wires |
| JIS G 3536 | Uncoated Stress-Relieved Steel Wire and Strand for Prestressed Concrete |
| JIS G 3538 | Hard Drawn Steel Wire for Prestressed Concrete |
| ASTM A123 | Standard Specification for Zinc (Hot-Dip Galvanized) Coatings of Iron and Steel products |
| ASTM A153 | Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware |
| ASTM A354 | Standard Specification for Structural Bolts, Steel, Heat-Treated Bolts, Studs and Other Externally Threaded Fasteners |
| ASTM A394 | Standard Specification for Carbon and Alloy Steel Nuts |

4.0 SERVICE CONDITIONS AND SYSTEM PARAMETERS

The poles shall be suitable for operation under the service conditions given in the latest revision of SEC General Specification No. 01-SDMS-01.



5.0 DESIGN, MATERIALS AND FABRICATION

5.1 General

Structural design of the prestressed concrete poles shall be the responsibility of the manufacture according to the data submitted by the user.

5.2 Design Criteria

5.2.1 General

Length of prestressed concrete poles:

The length of the pole is measured in meters between the two extremities.

Total length of the concrete poles are:

10, 13, 14, 15m and other lengths can be requested if needed.

5.2.2 Working, Design and Ultimate Load

5.2.2.1 The working load is the load that a pole will bear without any deterioration during normal operation.

5.2.2.2 The design load is the working load including factor of safety.

5.2.2.3 The ultimate load is the maximum load which can be sustained by the pole with a safety factor of not less than 2 times the design load.

5.2.3 Dimensions and Tolerances

Poles are designed to withstand the worst possible combination of simultaneous loading of lateral loads consisting of wind forces on conductors corresponding to wind spans, wind force on insulators, wind force on pole and maximum conductor tension as defined in this specification (design loads) taking into consideration the stated safety factors.

5.2.3.1 Tolerances

Poles shall be made to the following dimensional tolerances:

- | | |
|---------------------------|------------------|
| a) Pole length | $\pm 0.5\%$ |
| b) Pole straightness | 1.5mm/1000mm |
| c) Distance between holes | $\pm 5\text{mm}$ |



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- d) Center-to-center distance between holes $\pm 3\text{mm}$
 e) Uppermost hole from pole top $\pm 10\text{mm}$
 f) Bottom Diameter $+ 25\text{mm}$

5.2.3.2 Dimensions

The shapes and dimensions of the pole shall be as per SEC's requirement as shown in Table (1) and Table (2).

| Pole Type | Butt Diameter (mm) | Maximum Pole Weight (kg)* |
|-----------|--------------------|---------------------------|
| CP10 | 323 | 1100 |
| CP13S | 433 | 2000 |
| CP14S | 447 | 2800 |
| CP14D | 537 | 3300 |
| CP15S/D | 460 | 2900 |
| CP10SFS | 583 | 3090 |
| CP13SFS | 773 | 7100 |
| CP14SFS | 787 | 7740 |
| CP15SFS | 800 | 8390 |

Note (*) – maximum pole weight indicated is for estimation of lifting equipment.

Table (1)



| Types, Dimensions and Characteristics of Standard Prestressed Spun Concrete Poles | | | | | | | | |
|---|--|-------|--------|-------------|-------------|---------------|-----------------|---------------------------|
| Pole type | Brief description | Top Ø | Butt Ø | Pole weight | Design Load | Ultimate load | Embedded length | Color code (no. of Bands) |
| | | (mm) | (mm) | (kg) | (kg) | (kg) | (m) | |
| CP10 | 10m Concrete pole, Low voltage | 190 | 323 | 690 | 600 | 1,200 | 1.5 | White (1) |
| CP13S | 13m Concrete pole, Medium Voltage, Single Circuit | 260 | 433 | 1650 | 1,100 | 2,200 | 2.0 | Red (1) |
| CP14S | 14m Concrete pole, Medium Voltage, Single Circuit | 260 | 447 | 1800 | 1,100 | 2,200 | 2.0 | Yellow (1) |
| CP14D | 14m Concrete pole, Medium Voltage, Double Circuit | 350 | 537 | 2960 | 1,700 | 3,400 | 2.0 | Yellow (1) |
| CP15S/D | 15m Concrete pole, Medium Voltage, Single & Double Circuit | 260 | 460 | 1980 | 1,100 | 2,200 | 2.0 | Green (1) |
| CP10SFS | 10m Concrete pole, Self-Support, Single Circuit | 450 | 583 | 3090 | 3,500 | 7,000 | 1.5 | White (3) |
| CP13SFS | 13m Concrete pole, Self-Support, Single Circuit | 600 | 773 | 7100 | 6,000 | 12,000 | 2.0 | Red (3) |
| CP14SFS | 14m Concrete pole, Self-Support, Single Circuit | 600 | 787 | 7740 | 6,000 | 12,000 | 2.0 | Yellow (3) |
| CP15SFS | 15m Concrete pole, Self-Support, Single Circuit | 600 | 800 | 8390 | 6,000 | 12,000 | 2.0 | Green (3) |

Table (2)



| Applications of Standard Prestressed Spun Concrete Poles For Single Circuit Lines | | | | | |
|---|------------------|--------------------|--------------------------------|--------------|----------------------------|
| Pole type | Pole Structure | Angle of Deviation | No. of Stays/Location From Top | Buried Depth | Crossarm Location From Top |
| | | (degrees) | (mm) | (mm) | (mm) |
| CP10 | Intermediate, LV | 0-15 | N/A | 1500 | N/A |
| | Medium angle, LV | 16-60 | 1@150 | 1500 | N/A |
| | Heavy angle, LV | 61-90 | 1@150 | 1500 | N/A |
| | Terminal, LV | - | 1@150 | 1500 | N/A |
| CP13S CP14S CP15S/D | Intermediate, MV | 0-5 | N/A | 2000 | 50 |
| | Light angle, MV | 6-15 | 1@250 | 2000 | 50 |
| | Medium angle, MV | 16-60 | 1@250 & 1@350 | 2000 | 50 |
| | Heavy angle, MV | 61-90 | 1@250 & 1@350 | 2000 | 50 |
| | Section, MV | - | 2@250 along the line | 2000 | 50 |
| | Terminal, MV | - | 1@250 & 1@350 | 2000 | 50 |
| CP10SFS* | Self-Support, LV | 16-90 | N/A | 1500 | N/A |
| CP13SFS* | Self-Support, MV | 6-90 | N/A | 2000 | 50 |
| CP14SFS* | | | | | |
| CP15SFS* | | | | | |
| CP15SFS* | | | | | |

* For The installation of the above specified angles without guy support.

Table (3)



| Applications of Standard Prestressed Spun Concrete Poles For Double Circuit Lines | | | | | |
|---|------------------|--------------------|-----------------------------------|--------------|-----------------------------|
| Pole Type | Pole Structure | Angle of Deviation | No. of Stays/Location from Top | Buried Depth | Cross arm Location From Top |
| | | (Degrees) | (mm) | (mm) | (mm) |
| CP14D | Intermediate, MV | 0-5 | N/A | 2000 | 50, 1250 & 2450 |
| | Light Angle, MV | 6-15 | 1@250 & 1@350 | 2000 | 50, 1250 & 2450 |
| | Medium Angle, MV | 16-60 | 1@250 & 1@350, 1@2650 & 1@2750 | 2000 | 50, 1250 & 2450 |
| | Heavy Angle, MV | 61-90 | 1@250 & 1@350, 1@2650 & 1@2750 | 2000 | 50, 1250 & 2450 |
| | Section, MV | - | 2@250 & 2@2650 along the line | 2000 | 50, 1250 & 2450 |
| | Terminal, MV | - | 1@250, 1@350, 1@2650 & 1@2750 | 2000 | 50, 1250 & 2450 |
| CP15S/D | Intermediate, MV | 0 | N/A | 2000 | 50, 1250 & 2450 |
| | Light Angle, MV | 1-15 | 1@250 & 1@350 | 2000 | 50, 1250 & 2450 |
| | Medium Angle, MV | 16-60 | 1@250 & 1@350, 1@2650 & 1@2750 | 2000 | 50, 1250 & 2450 |
| | Heavy Angle, MV | 61-90 | 1@250 & 1@350, 1@2650 & 1@2750 | 2000 | 50, 1250 & 2450 |
| | Section, MV | - | 2@250 & 2@2650 along the line | 2000 | 50, 1250 & 2450 |
| | Terminal, MV | - | 1@250, 1@350, 1@2650 & 1@2750 | 2000 | 50, 1250 & 2450 |

Table (4)



Design Parameters for Single Circuit LV and MV (with Earth Wire) Line

| Description | | 10m | 13m, 14m and 15m |
|-----------------------------------|-------------------------------------|--|--|
| Span (m) | Basic | 50 | 100 |
| | Wind | 55 | 110 |
| | Weight | 75 | 150 |
| Wind pressure (N/m ²) | On pole | 1200 | 1200 |
| | On conductors at 10°C | 600 | 600 |
| Safety factor | Vertical loads | 1.5 | 1.5 |
| | Transverse loads | 1.5 | 1.5 |
| | Longitudinal loads | 1.5 | 1.5 |
| | Ultimate load | 2.0 | 2.0 |
| | Conductor minimum breaking strength | 3.0 | 3.0 |
| Planting depth (m) | | 1.5 | 2.0 |
| Types of structure | Unstayed | Intermediate (0-15°) | Intermediate (0-15°) |
| | stayed | - | Light angle (6-15°) |
| | stayed | Med. angle (16-60°) | Med. angle (16-60°) |
| | stayed | Heavy angle (60-90°) | Heavy angle (61-90°) |
| | stayed | - | Section |
| | stayed | Terminal | Terminal |
| | Unstayed | Self-support (90°) | Self-support (90°) |
| Allowable deflection at pole top | | 5% of expose length | 5% of expose length |
| Conductors | Phase | 120mm ² Quadruplex Cable (3-Insulated AAC for Phase & 1 – Bare ACSR/AW Messenger – Neutral) | 170mm ² ACSR/AW (Merlin) in horizontal configuration 70mm ² ACSR/AW (Quail) for Branch |
| | Earth wire | N/A | 70mm ² ACSR/AW (Quail) below crossarm |
| Stay wires | Minimum Breaking Load | 65kN | 101kN |
| | Max. Tension | 90% of min. breaking load | 90% of min. breaking load |
| | Min. angle to the pole | 37° | 37° |
| Temperature | Minimum/maximum | -2°C/+80°C | -2°C/+80°C |

Table (5)



Design Parameters for Double Circuit MV (with Earth Wire) Line

| Description | | 14m | 15m |
|-----------------------------------|----------------------------------|---|---|
| Span (m) | Basic | 100 | 100 |
| | Wind | 110 | 110 |
| | Weight | 150 | 150 |
| Wind pressure (N/m ²) | On pole | 1200 | 1200 |
| | On conductors at 10°C | 600 | 600 |
| Safety factor | Vertical loads | 1.5 | 1.5 |
| | Transverse loads | 1.5 | 1.5 |
| | Longitudinal loads | 1.5 | 1.5 |
| | Ultimate loads | 2.0 | 2.0 |
| | Conductor min. breaking strength | 3.0 | 3.0 |
| Planting depth (m) | | 2.0 | 2.0 |
| Type of structure | Unstayed | Intermediate (0-5°) | Intermediate (0-5°) |
| | Stayed | Light angle (6-15°) | Light angle (6-15°) |
| | Stayed | Med. angle (16-60°) | Med. angle (16-60°) |
| | Stayed | Heavy angle (61-90°) | Heavy angle (61-90°) |
| | Stayed | Section | Section |
| | Stayed | Terminal | Terminal |
| Allowable deflection at pole top | | 5° of exposed length | 5° of exposed length |
| Conductors | Phase | 170mm ² ACSR/AW (Merlin) in vertical configuration | 170mm ² ACSR/AW (Merlin) in vertical configuration |
| | Earth wire | 70mm ² ACSR/AW (Quail) below crossarm | 70mm ² ACSR/AW (Quail) below crossarm |
| Stay wires | Min braking load | 101kN | 101kN |
| | Max tension | 90% of min breaking load | 90% of min breaking load |
| | Min angle to the pole | 37° | 37° |
| Temperature | Min / max | -2°C / +80°C | -2°C / +80°C |

Table (6)



5.2.4 Holes

The poles shall be fabricated with hole sizes and location as shown on the attached drawings holes are realized during fabrication by insertion of pins.

5.2.5 Buried Section

The prestressed reinforced concrete pole can be stabilized with concrete foundation or directly set into ground and backfilled with adequate material.

5.3. Materials

5.3.1 Cement

5.3.1.1 Deteriorated cement shall not be used.

5.3.1.2 The cement shall conform to the standard of the Ordinary Portland Cement specified in JIS R 5210 or EN 197.

5.3.2 Aggregate

5.3.2.1 The aggregate shall be clean, hard and durable and shall not include any harmful extent such as dust, mud, organic substances, clay lumps, stone mica particles and salt.

5.3.2.2 The aggregate shall have a proper mix of small and large size.

5.3.3 Admixture

5.3.3.1 The admixture used shall not exert and adverse influence on the poles

5.3.4 Water

5.3.4.1 The used water shall not contain any organic or inorganic substances (salt, oil, chemicals, acid, and leach).

5.3.4.2 Water test results according to EN 1008 have to be submitted from approved test laboratories

5.3.5 Steel Materials

5.3.5.1 The prestressed steel wire shall conform to JIS G 3536 or EN 10138-3.



5.3.5.2 The reinforcement and spiral wire shall conform to JIS G 3532 or EN 10080.

5.3.6 Accessories socket for Through Hole

5.3.6.1 The socket shall be made of brass.

5.3.7 Ventilation Hole

5.3.7.1 Air ventilation hole will be used to ventilate the pole.

5.3.7.2 The shape, dimension and quality of ventilation arrangements are shown in the drawings as per Appendix A.

5.3.8 Earthing Arrangement

5.3.8.1 Galvanized steel, copper or copper coated steel lead wire or normal reinforcement steel (as per EN 50341) shall be provided inside the pole wall. It shall be pulled out through the earthing wire outlet at top middle and bottom of the pole. The ohmic resistance between any two points shall not exceed 1Ω .

5.3.8.2 The shape, dimensions and quality of the earthing arrangement are shown in the drawings as per Appendix B.

5.3.8.3 All earth plugs shall be equipped with stainless steel M12 screws.

5.3.9 Pole Embedded Length Marking

5.3.9.1 Level marking for pole embedded length shall be marked in black 20mm width.

6.0 MANUFACTURE

6.1 Prestressing Steel and Reinforcement

6.1.1 PC wires and reinforcement spiral wires shall be cut and arranged correctly to coincide the shapes and dimensions as specified in the attached drawing.

6.1.2 The PC wires and reinforcement wires shall be arranged so that they are as uniformly distributed as possible, in the cross-section of the concrete pole.



6.1.3 All steel reinforcement shall have a concrete cover of not less than 20mm without any adjustment of PC wire or reinforcement bar.

6.1.4 The PC Steel member shall not be joined by any method. Welding process is strictly prohibited onto prestressing steel.

6.2 Molding

6.2.1 Molds used shall be sufficiently rigid in order to withstand the prestressing forces. The PC wire shall be tensioned in advance, before the compaction (spinning/centrifugal) process.

6.3 Prestressing of Steel/Wires

6.3.1 The PC Steel shall be arranged at the proper position, stretched and firmly fixed at both ends so that the tension is not reduced until the concrete is sufficiently cured.

6.3.2 The prestressing process shall be introduced gradually.

6.3.3 The compressive strength of concrete at the time when prestressed is applied (i.e. when PC wires are cut) shall be more than 250kg/cm^2 . The test method is specified in JIS A 1136 and EN 1992-1-1.

6.4 Concrete

6.4.1 The concrete shall be thoroughly mixed in a concrete mixer and shall be used immediately after being mixed to prevent concrete hardening.

6.4.2 The quality of concrete to be used shall be such that the compressive strength of the concrete at 28 days in age is more than 500kg/cm^2 in accordance with the tests stipulated in JIS A 1132 and JIS A 1108 or EN 12390.

6.4.3 The quantitative measurement of the materials used for concrete shall be by mass. However, water and admixture may be measured by volume.

6.4.4 Three (3) samples of cylinder/cubes test for every lot of pole produced shall be provided for concrete test.



6.5 Spinning

6.5.1 Spinning process shall be done immediately after concreting.

6.5.2 The speed (rpm) and timing of spinning process shall be sufficient to form even distribution of concrete compactness through the whole length of pole.

6.6 Curing

6.6.1 The curing shall be made by means which will not adversely affect the quality of the pole.

6.6.2 The minimum time of curing for maturity is at least 10 days or achieves required concrete strength, whichever comes first, before the pole can be tested or delivered to site.

6.7 Top end of poles

The top end of poles should be flat and covered with an aluminum cap as shown in Appendix C. The aluminum cap shall have a thickness of at least 2mm. A cement cover is not allowed.

7.0 QUALITY AND TEST

7.1 Appearance

The concrete poles shall be dense in quality and free from harmful flaws and cracks.

7.2 Bending Strength Test

The test shall be carried out in accordance with JIS A 5373 or EN 12843. The test shall be carried out on a horizontal pole, rigidly embedded, resting on mobile supports that must avoid effects due to its weight and allow its free movement as shown in Figure 1. Loads shall be applied at $90^\circ (\pm 5^\circ)$ of the non-deformed central-axis of the pole extremity, i.e. on the arc of the deformed pole as shown in Figure 2. The loading speed applied under force control, shall be limited to 100 N/s without any shock or impact. An accuracy of $\pm 3\%$ is required on the applied test loads and on the measured deflections. Carry out load application as follows:

- Stage 0, stabilization stage.
Before measuring, a force F_0 to stabilize the embedment is applied in accordance to purchaser requirements or to complementary provisions.



- Stage 1, elastic stage.
Apply successively at least two other forces ($F_1 < F_2$) and release them. The deflection f shall be measured (at the nearest mm) in the same direction as the applied force, between zero position (after stage zero) and the position under F .

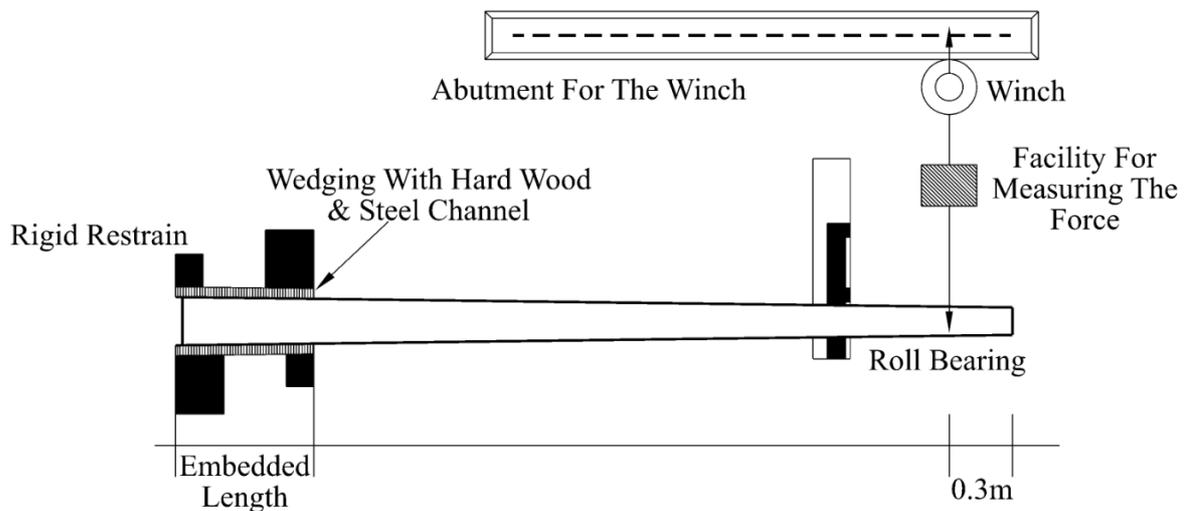


Figure (1) Method of Test

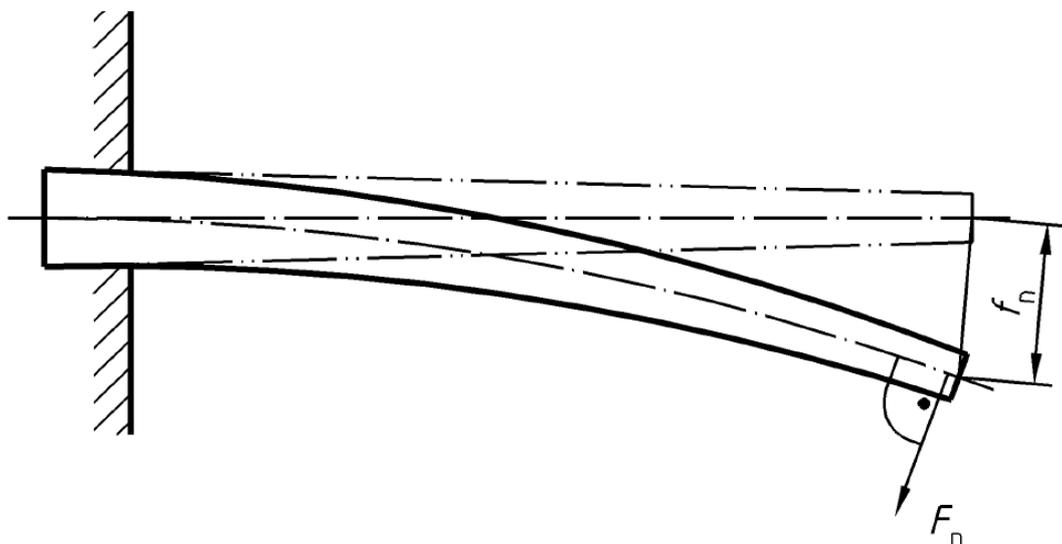


Figure (2) Bending Test



7.3 Breaking Test

7.3.1 This test shall be carried out in accordance to JIS A 5373 or EN 12384.

7.3.2 The test shall be carried out with the testing device as defined in 7.2. Before test, a force to stabilize the embedment is applied in accordance with complementary provisions. The force F shall be applied up to the ultimate force which is the maximum force measured by the testing device. The result shall be the force corresponding to the ultimate value in kN.

8.0 INSPECTION

8.1 Inspection Item

The inspection shall be conducted with respect to the following items:

- a. Appearance
- b. Shape
- c. Dimension
- d. Bending strength
- e. Marking
- f. Concrete cover

8.2 Quantity of poles to be inspected

8.2.1 Inspection of the appearance, shape and dimensions shall be performed on all poles.

8.2.2 Inspection of the concrete cover shall be performed on the poles that have been subjected to the breaking test.

8.2.3 The bending strength test shall be conducted on three poles sampled from a batch of 1000 poles or part thereof.

8.2.4 The breaking test shall be performed on one of three poles used in the bending strength test.

8.2.5 The whole batch of poles is accepted if all the requirements are fulfilled.

8.2.6 The whole batch of poles are to be rejected if any of the requirements is not fulfilled.



8.3 Determination of Acceptability

8.3.1 All poles shall comply with the specification with respect to appearance, shape and dimensions.

8.3.2 When all the three poles subjected to the bending strength test comply with the specification, then all the poles in the batch shall be accepted.

8.3.3 When one pole does not conform to the specification during the bending strength test, the test shall be repeated on one or two more sampled poles. When both poles conform to the specification, all poles in the batch shall be accepted except for the initially rejected pole.

8.3.4 When the breaking test pole does not comply with the specification, the test shall be repeated with two more sampled poles.

8.3.5 When both poles conform, all the poles in the batch shall be accepted except for the initially rejected pole.

9.0 TESTING PROCEDURE

9.1 All tests and inspection procedures shall be carried out at the works to check for compliance with this specification.

9.2 At least three weeks notice of test shall be given to the client. The client's representative may be present for testing verification.

9.3 Upon satisfactory completion of the tests, manufacturer shall furnish the client with test report before the tested poles can be delivered.

10.0 MARKING:

Each pole shall be provided with the following data marked clearly and indelibly on the pole at a location approximately 1.5m above the ground level as specified in applicable drawing. All markings shall be legible and so applied to remain legible under normal handling and installation practices. The marking shall include, but not limited to the following information:

- SEC Monogram
- Pole type, name
- Pole Ultimate load
- Pole dimension (top/bottom)
- Pole weight



- SEC Purchase Order Number
- SEC Stock Number
- Manufacturer's Name or trademark, place and year of manufacturing

11.0 PACKING AND SHIPMENT:

In addition to the packing and shipping requirements specified in 01-SDMS-01, the following shall be fulfilled:

- 11.1 The poles shall be stacked with wooden separators, spacers or blocks provided between the horizontal and vertical layers in order to avoid damages or scratches of the surface during the loading and transportation and to facilitate slinging.
- 11.2 Stacked poles shall be so arranged such that the earthing hardwares are not disturbed during normal handling.
- 11.3 Reasonable care shall be exercised in the handling and shipment of concrete poles. Any expense incurred due to the careless handling and shipment of concrete poles shall be considered as a legitimate back charge against the supplier/contractor.

12.0 GUARANTEE:

- 12.1 The manufacturer shall guarantee the concrete pole against all defects arising out of faulty design or workmanship during production or defective material for a period of one year from the date of installation or two years from date of delivery. SEC certificates for the date of commissioning shall be accepted.
- 12.2 If no exceptions to this specification are taken and no list of deviations is submitted, it shall be deemed that, in every respect, concrete pole offered shall conform to this specification. SEC interpretation of this specification shall be accepted.

13.0 SUBMITTALS:

- 13.1 In addition to documentations specified in 01-SDMS-01, the following shall be submitted by the vendor/manufacturer:
- a) Detailed drawings of concrete pole showing the complete dimensions, identification marks, number and location of pre-drilled bolt holes, details of pole top cap, earthing nut and marking plate.
 - b) Detailed drawing/procedure for bundling of poles.

**13.2 Submittals required following award of contract:**

- a) Drawings for final SEC approval shall be submitted prior to starting of manufacturing. Supplier shall furnish all final drawings in original or Mylar tracings as well as on digital format.
- b) Manufacturing schedule, progress report and test schedules.
- c) Test reports including, but not limited to, the following:
 - Certified mill test reports for all material.
 - Test reports on dimensional checks.
 - Report of all structure testing, when required, including photos, diagrams, loading trees, etc.

**14. TECHNICAL DATA SCHEDULE****PRESTRESSED SPUN CONCRETE POLES**

(Sheet 1 of 9)

| NO | DESCRIPTION | SEC REQUIREMENTS | BIDDER DATA |
|----|--|------------------|-------------|
| 1 | Pole type | CP10 | |
| 2 | Length, m | 10 | |
| 3 | Top diameter, mm | 190 | |
| 4 | Bottom diameter, mm | 323 | |
| 5 | Pole ultimate load, kg | 1200 | |
| 6 | Nominal weight, kg | 690 | |
| 7 | M12 x 30 mm bolt and washer for earthing nut | As Specified | |
| 8 | M12 x 30 mm bolt with washer for attaching top cap | As Specified | |
| 9 | Tolerances | As Specified | |
| 10 | Straightness of the pole | As Specified | |
| 11 | Name plate with complete information | As Specified | |
| 12 | Color Code (Number of bands) | White (1) | |
| 13 | Submittals as per this specification enclosed | As Specified | |

**14. TECHNICAL DATA SCHEDULE****PRESTRESSED SPUN CONCRETE POLES**

(Sheet 2 of 9)

| NO | DESCRIPTION | SEC REQUIREMENTS | BIDDER DATA |
|----|--|------------------|-------------|
| 1 | Pole type | CP13S | |
| 2 | Length, m | 13 | |
| 3 | Top diameter, mm | 260 | |
| 4 | Bottom diameter, mm | 433 | |
| 5 | Pole ultimate load, kg | 2200 | |
| 6 | Nominal weight, kg | 1650 | |
| 7 | M12 x 30 mm bolt and washer for earthing nut | As Specified | |
| 8 | M12 x 30 mm bolt with washer for attaching top cap | As Specified | |
| 9 | Tolerances | As Specified | |
| 10 | Straightness of the pole | As Specified | |
| 11 | Name plate with complete information | As Specified | |
| 12 | Color Code (Number of bands) | Red (1) | |
| 13 | Submittals as per this specification enclosed | As Specified | |

**14. TECHNICAL DATA SCHEDULE****PRESTRESSED SPUN CONCRETE POLES**

(Sheet 3 of 9)

| NO | DESCRIPTION | SEC REQUIREMENTS | BIDDER DATA |
|----|--|------------------|-------------|
| 1 | Pole type | CP14S | |
| 2 | Length, m | 14 | |
| 3 | Top diameter, mm | 260 | |
| 4 | Bottom diameter, mm | 447 | |
| 5 | Pole ultimate load, kg | 2200 | |
| 6 | Nominal weight, kg | 1800 | |
| 7 | M12 x 30 mm bolt and washer for earthing nut | As Specified | |
| 8 | M12 x 30 mm bolt with washer for attaching top cap | As Specified | |
| 9 | Tolerances | As Specified | |
| 10 | Straightness of the pole | As Specified | |
| 11 | Name plate with complete information | As Specified | |
| 12 | Color Code (Number of bands) | Yellow (1) | |
| 13 | Submittals as per this specification enclosed | As Specified | |

**14. TECHNICAL DATA SCHEDULE****PRESTRESSED SPUN CONCRETE POLES**

(Sheet 4 of 9)

| NO | DESCRIPTION | SEC REQUIREMENTS | BIDDER DATA |
|----|--|------------------|-------------|
| 1 | Pole type | CP14D | |
| 2 | Length, m | 14 | |
| 3 | Top diameter, mm | 350 | |
| 4 | Bottom diameter, mm | 537 | |
| 5 | Pole ultimate load, kg | 3400 | |
| 6 | Nominal weight, kg | 2960 | |
| 7 | M12 x 30 mm bolt and washer for earthing nut | As Specified | |
| 8 | M12 x 30 mm bolt with washer for attaching top cap | As Specified | |
| 9 | Tolerances | As Specified | |
| 10 | Straightness of the pole | As Specified | |
| 11 | Name plate with complete information | As Specified | |
| 12 | Color Code (Number of bands) | Yellow (1) | |
| 13 | Submittals as per this specification enclosed | As Specified | |

**14. TECHNICAL DATA SCHEDULE****PRESTRESSED SPUN CONCRETE POLES**

(Sheet 5 of 9)

| NO | DESCRIPTION | SEC REQUIREMENTS | BIDDER DATA |
|----|--|------------------|-------------|
| 1 | Pole type | CP15S/D | |
| 2 | Length, m | 15 | |
| 3 | Top diameter, mm | 260 | |
| 4 | Bottom diameter, mm | 460 | |
| 5 | Pole ultimate load, kg | 2200 | |
| 6 | Nominal weight, kg | 1980 | |
| 7 | M12 x 30 mm bolt and washer for earthing nut | As Specified | |
| 8 | M12 x 30 mm bolt with washer for attaching top cap | As Specified | |
| 9 | Tolerances | As Specified | |
| 10 | Straightness of the pole | As Specified | |
| 11 | Name plate with complete information | As Specified | |
| 12 | Color Code (Number of bands) | Green (1) | |
| 13 | Submittals as per this specification enclosed | As Specified | |

**14. TECHNICAL DATA SCHEDULE****PRESTRESSED SPUN CONCRETE POLES**

(Sheet 6 of 9)

| NO | DESCRIPTION | SEC REQUIREMENTS | BIDDER DATA |
|----|--|------------------|-------------|
| 1 | Pole type | CP10SfS | |
| 2 | Length, m | 10 | |
| 3 | Top diameter, mm | 450 | |
| 4 | Bottom diameter, mm | 583 | |
| 5 | Pole ultimate load, kg | 7000 | |
| 6 | Nominal weight, kg | 3090 | |
| 7 | M12 x 30 mm bolt and washer for earthing nut | As Specified | |
| 8 | M12 x 30 mm bolt with washer for attaching top cap | As Specified | |
| 9 | Tolerances | As Specified | |
| 10 | Straightness of the pole | As Specified | |
| 11 | Name plate with complete information | As Specified | |
| 12 | Color Code (Number of bands) | White (3) | |
| 13 | Submittals as per this specification enclosed | As Specified | |

**14. TECHNICAL DATA SCHEDULE****PRESTRESSED SPUN CONCRETE POLES**

(Sheet 7 of 9)

| NO | DESCRIPTION | SEC REQUIREMENTS | BIDDER DATA |
|----|--|------------------|-------------|
| 1 | Pole type | CP13SFS | |
| 2 | Length, m | 13 | |
| 3 | Top diameter, mm | 600 | |
| 4 | Bottom diameter, mm | 773 | |
| 5 | Pole ultimate load, kg | 12000 | |
| 6 | Nominal weight, kg | 7100 | |
| 7 | M12 x 30 mm bolt and washer for earthing nut | As Specified | |
| 8 | M12 x 30 mm bolt with washer for attaching top cap | As Specified | |
| 9 | Tolerances | As Specified | |
| 10 | Straightness of the pole | As Specified | |
| 11 | Name plate with complete information | As Specified | |
| 12 | Color Code (Number of bands) | Red (3) | |
| 13 | Submittals as per this specification enclosed | As Specified | |

**14. TECHNICAL DATA SCHEDULE****PRESTRESSED SPUN CONCRETE POLES**

(Sheet 8 of 9)

| NO | DESCRIPTION | SEC REQUIREMENTS | BIDDER DATA |
|-----------|--|-------------------------|--------------------|
| 1 | Pole type | CP14SFS | |
| 2 | Length, m | 14 | |
| 3 | Top diameter, mm | 600 | |
| 4 | Bottom diameter, mm | 787 | |
| 5 | Pole ultimate load, kg | 12000 | |
| 6 | Nominal weight, kg | 7740 | |
| 7 | M12 x 30 mm bolt and washer for earthing nut | As Specified | |
| 8 | M12 x 30 mm bolt with washer for attaching top cap | As Specified | |
| 9 | Tolerances | As Specified | |
| 10 | Straightness of the pole | As Specified | |
| 11 | Name plate with complete information | As Specified | |
| 12 | Color Code (Number of bands) | Yellow (3) | |
| 13 | Submittals as per this specification enclosed | As Specified | |

**14. TECHNICAL DATA SCHEDULE****PRESTRESSED SPUN CONCRETE POLES**

(Sheet 9 of 9)

| NO | DESCRIPTION | SEC REQUIREMENTS | BIDDER DATA |
|----|--|------------------|-------------|
| 1 | Pole type | CP15SFS | |
| 2 | Length, m | 15 | |
| 3 | Top diameter, mm | 600 | |
| 4 | Bottom diameter, mm | 800 | |
| 5 | Pole ultimate load, kg | 12000 | |
| 6 | Nominal weight, kg | 8390 | |
| 7 | M12 x 30 mm bolt and washer for earthing nut | As Specified | |
| 8 | M12 x 30 mm bolt with washer for attaching top cap | As Specified | |
| 9 | Tolerances | As Specified | |
| 10 | Straightness of the pole | As Specified | |
| 11 | Name plate with complete information | As Specified | |
| 12 | Color Code (Number of bands) | Green (3) | |
| 13 | Submittals as per this specification enclosed | As Specified | |



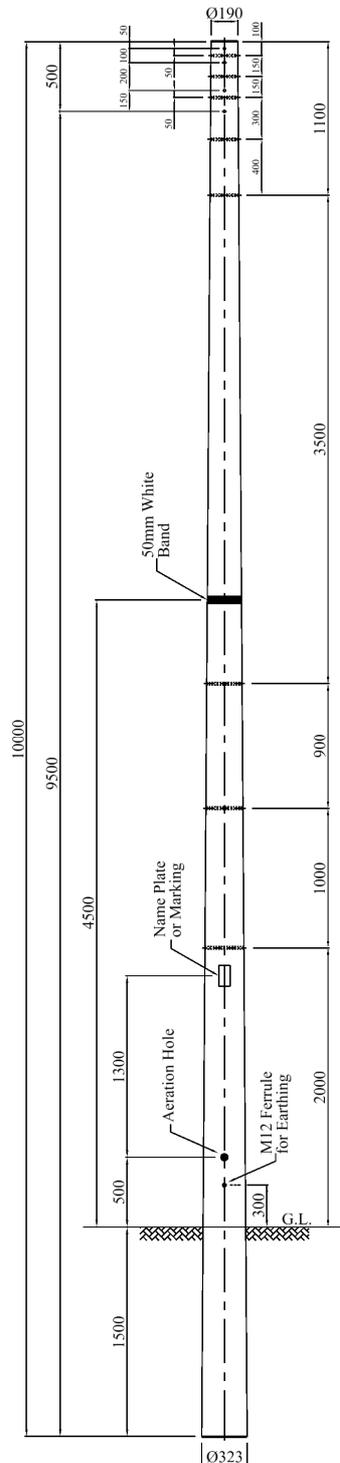
14. TECHNICAL DATA SCHEDULE

PRESTRESSED SPUN CONCRETE POLES

(Sheet 10 of 10)

- A. ADDITIONAL TECHNICAL INFORMATION OR FEATURES SPECIFIED BY SEC:
- B. ADDITIONAL SUPPLEMENTARY DATA OR FEATURES PROPOSED BY BIDDER/VENDOR/SUPPLIER:
- C. OTHER PARTICULARS TO BE FILLED UP BY BIDDER/VENDOR/ SUPPLIER:
- D. LIST OF DEVIATIONS & CLAUSES TO WHICH EXCEPTIONS ARE TAKEN BY THE BIDDER/VENDOR/SUPPLIER: (USE SEPARATE SHEET IF NECESSARY)

| | MANUFACTURER | VENDOR / SUPPLIER |
|---|--------------|-------------------|
| Name of Company | | |
| Location and Office | | |
| Address | | |
| Name and Signature of Authorized Representative | | |
| Official Seal / Stamp | | |



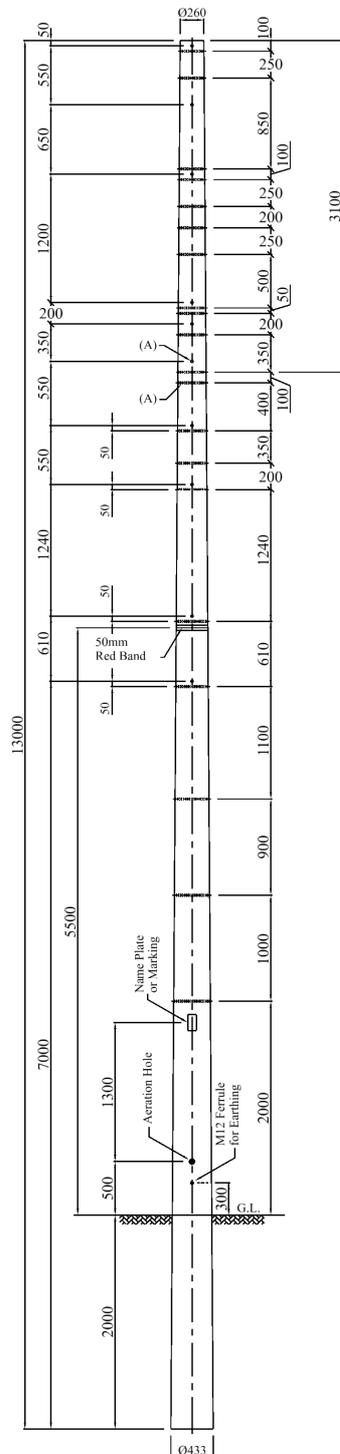
Note:

1. All dimensions are in mm.
2. All holes of prestressed spun concrete pole, CP10, 10 meters shall be of Ø18mm to suit Ø16mm bolts.
3. The prestressed spun concrete pole shall be in single piece.
4. All holes of prestressed spun concrete pole shall be protected by approved sockets.
5. All earthing wire inlets and outlets shall be protected by approved insulation tubes.
6. No modification of holes is allowed.

Pole Detail:

1. Pole Weight = 690 kg
2. Design Load = 600 kg
3. Ultimate Load = 1,200 kg

Figure CP01 – Spun Concrete Pole, 10M, Low Voltage (CP10)



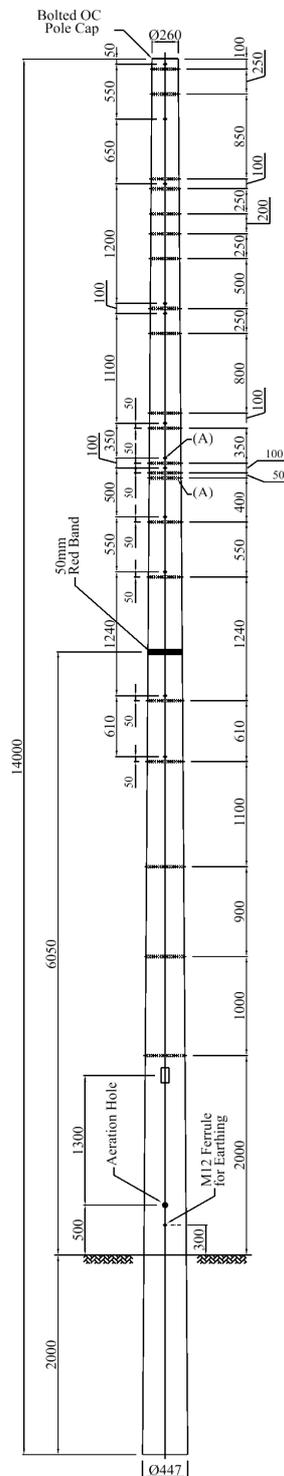
Note:

1. All dimensions are in mm.
2. All holes of prestressed spun concrete pole, CP13S, 13 meters shall be of Ø22mm to suit Ø20mm bolts except those indicated by "A".
3. Holes indicated by (A) are Ø18mm (2 nos. only)
4. The prestressed spun concrete pole shall be in single piece.
5. The holes at 3100mm from the pole top is designed for bracing of fuse cutout channel of single pole mounted transformer.
6. All holes of prestressed spun concrete pole shall be protected by approved sockets.
7. All earthing wire inlets and outlets shall be protected by approved insulation tubes.
8. No modification of holes is allowed.

Pole Detail:

1. Pole Weight = 1,650 kg
2. Design Load = 1,100 kg
3. Ultimate Load = 2,200 kg

Figure CP02 – Spun Concrete Pole, 13M, Medium Voltage S.C. (CP13S)



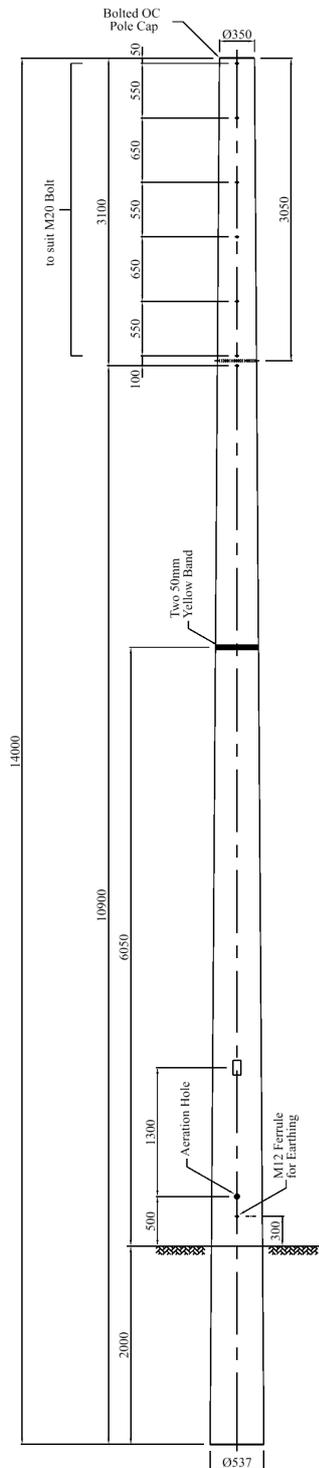
Note:

1. All dimensions are in mm.
2. All holes of prestressed spun concrete pole, CP14S, 14 meters shall be of Ø22mm to suit Ø20mm bolts except those indicated by "A".
3. Holes indicated by (A) are Ø18mm (2 nos. only)
4. The prestressed spun concrete pole shall be in single piece.
5. All holes of prestressed spun concrete pole shall be protected by approved sockets.
6. All earthing wire inlets and outlets shall be protected by approved insulation tubes.
7. No modification of holes is allowed.

Pole Detail:

1. Pole Weight = 1,800 kg
2. Design Load = 1,100 kg
3. Ultimate Load = 2,200 kg

Figure CP03 – Spun Concrete Pole, 14M, Medium Voltage S.C. (CP14S)



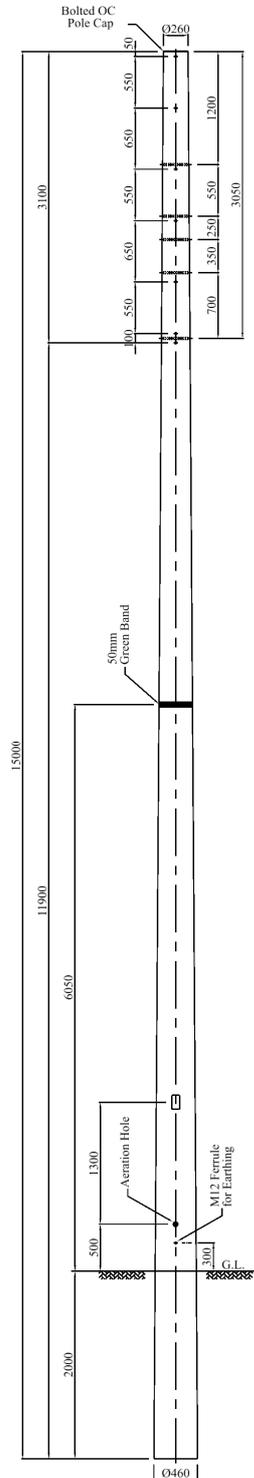
Note:

1. All dimensions are in mm.
2. All holes of prestressed spun concrete pole, CP14D, 14 meters shall be of Ø22mm to suit Ø20mm bolts.
3. The prestressed spun concrete pole shall be in single piece.
4. All holes of prestressed spun concrete pole shall be protected by approved sockets.
5. All earthing wire inlets and outlets shall be protected by approved insulation tubes.
6. No modification of holes is allowed.

Pole Detail:

1. Pole Weight = 2,960 kg
2. Design Load = 1,700 kg
3. Ultimate Load = 3,400 kg

Figure CP04 – Spun Concrete Pole, 14M, Medium Voltage D.C. (CP14D)



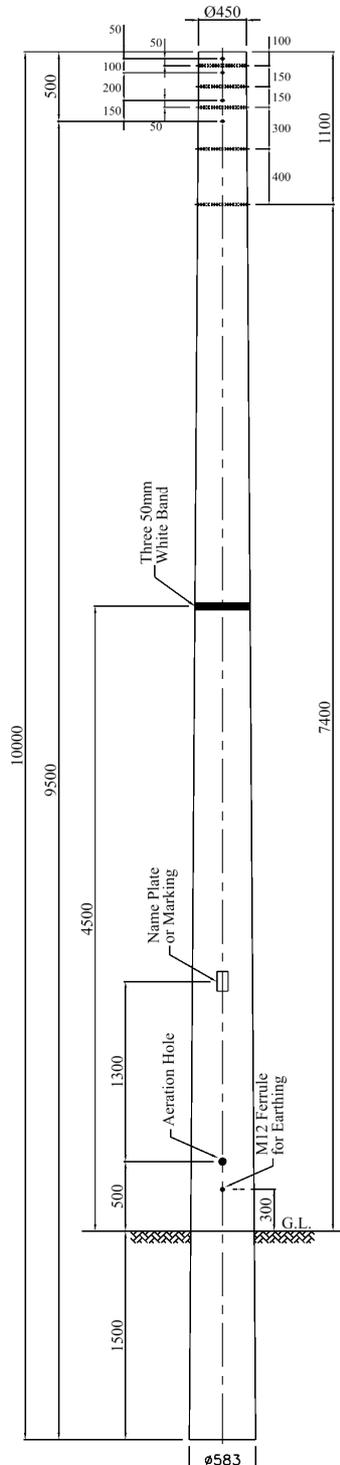
Note:

1. All dimensions are in mm.
2. All holes of prestressed spun concrete pole, CP15S/D, 15 meters shall be of Ø22mm to suit Ø20mm bolts.
3. The prestressed spun concrete pole shall be in single piece.
4. All holes of prestressed spun concrete pole shall be protected by approved sockets.
5. All earthing wire inlets and outlets shall be protected by approved insulation tubes.
6. No modification of holes is allowed.

Pole Detail:

1. Pole Weight = 1,980 kg
2. Design Load = 1,100 kg
3. Ultimate Load = 2,200 kg

Figure CP05 – Spun Concrete Pole, 15M, Medium Voltage S.C./D.C. (CP15S/D)



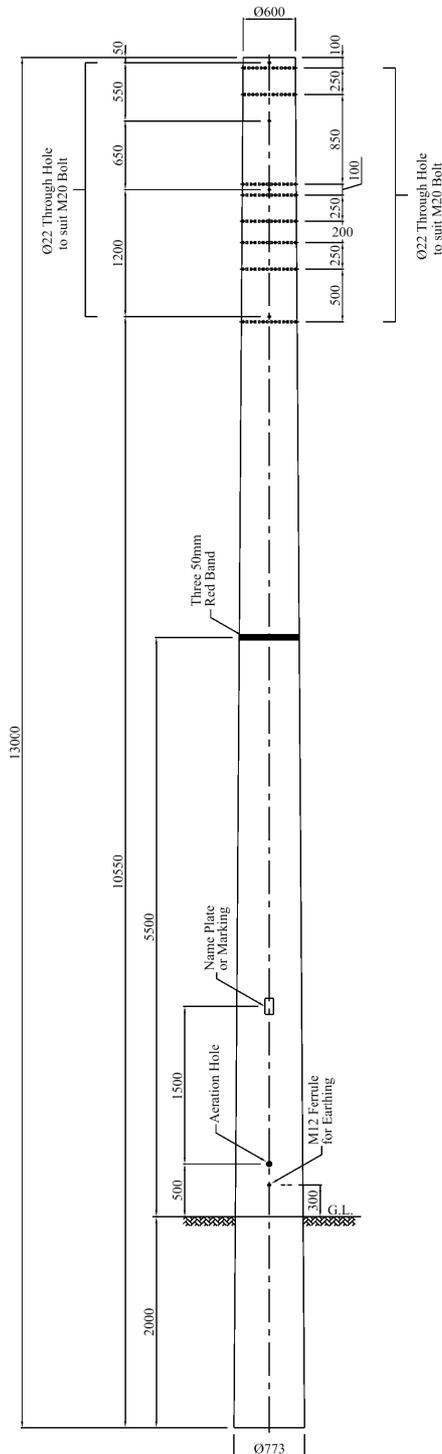
Note:

1. All dimensions are in mm.
2. All holes of prestressed spun concrete pole, CP10SFS, 10 meters shall be of Ø18mm to suit Ø16mm bolts.
3. The prestressed spun concrete pole shall be in single piece.
4. All holes of prestressed spun concrete pole shall be protected by approved sockets.
5. All earthing wire inlets and outlets shall be protected by approved insulation tubes.
6. No modification of holes is allowed.

Pole Detail:

1. Pole Weight = 3,090 kg
2. Design Load = 3,500 kg
3. Ultimate Load = 7,000 kg

Figure CP06 – Spun Concrete Pole, Self-Support, 10M, Low Voltage (CP10SFS)



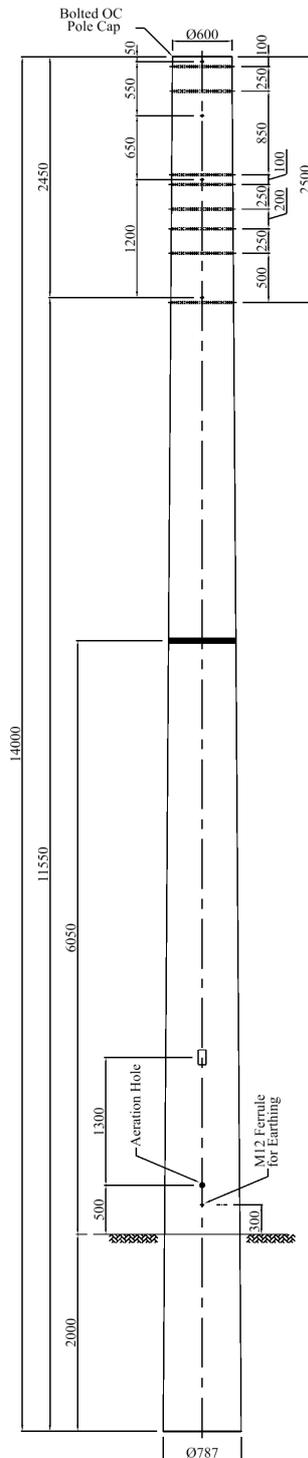
Note:

1. All dimensions are in mm.
2. All holes of prestressed spun concrete pole, CP13SFS, 13 meters shall be of Ø22mm to suit Ø20mm bolts.
3. The prestressed spun concrete pole shall be in single piece.
4. All holes of prestressed spun concrete pole shall be protected by approved sockets.
5. All earthing wire inlets and outlets shall be protected by approved insulation tubes.
6. No modification of holes is allowed.

Pole Detail:

1. Pole Weight = 7,100 kg
2. Design Load = 6,000 kg
3. Ultimate Load = 12,000 kg

Figure CP07 – Spun Concrete Pole, Self-Support, 13M, Medium Voltage S.C. (CP13SFS)



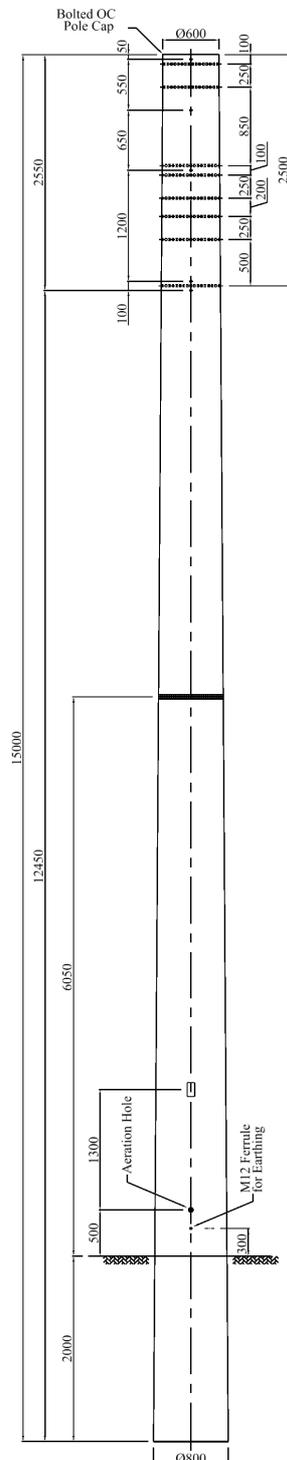
Note:

1. All dimensions are in mm.
2. All holes of prestressed spun concrete pole, CP14SFS, 14 meters shall be of Ø22mm to suit Ø20mm bolts.
3. The prestressed spun concrete pole shall be in single piece.
4. All holes of prestressed spun concrete pole shall be protected by approved sockets.
5. All earthing wire inlets and outlets shall be protected by approved insulation tubes.
6. No modification of holes is allowed.

Pole Detail:

1. Pole Weight = 7,750 kg
2. Design Load = 6,000 kg
3. Ultimate Load = 12,000 kg

Figure CP08 – Spun Concrete Pole, Self-Support, 14M, Medium Voltage S.C. (CP14SFS)



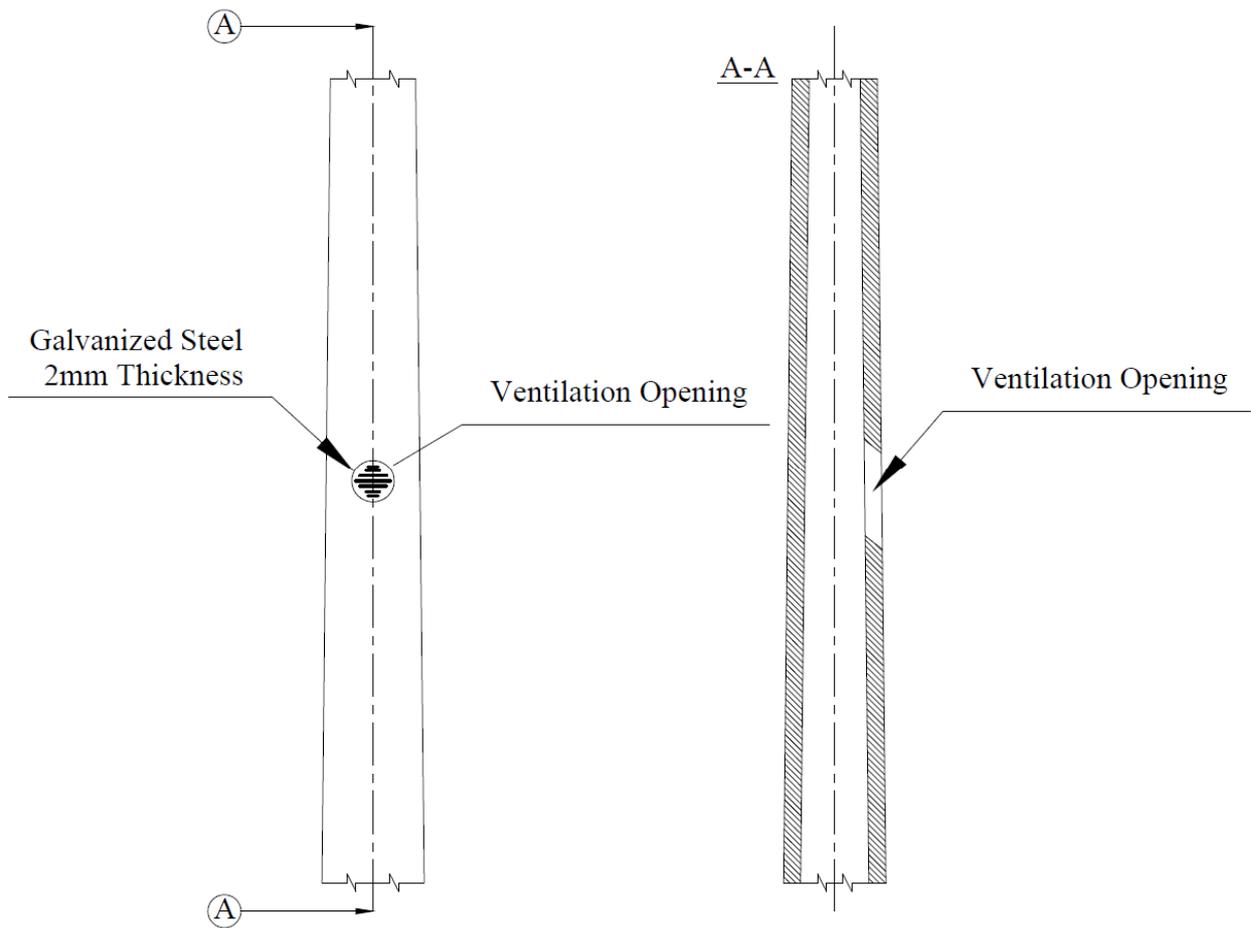
Note:

1. All dimensions are in mm.
2. All holes of prestressed spun concrete pole, CP15SFS, 15 meters shall be of Ø22mm to suit Ø20mm bolts.
3. The prestressed spun concrete pole shall be in single piece.
4. All holes of prestressed spun concrete pole shall be protected by approved sockets.
5. All earthing wire inlets and outlets shall be protected by approved insulation tubes.
6. No modification of holes is allowed.

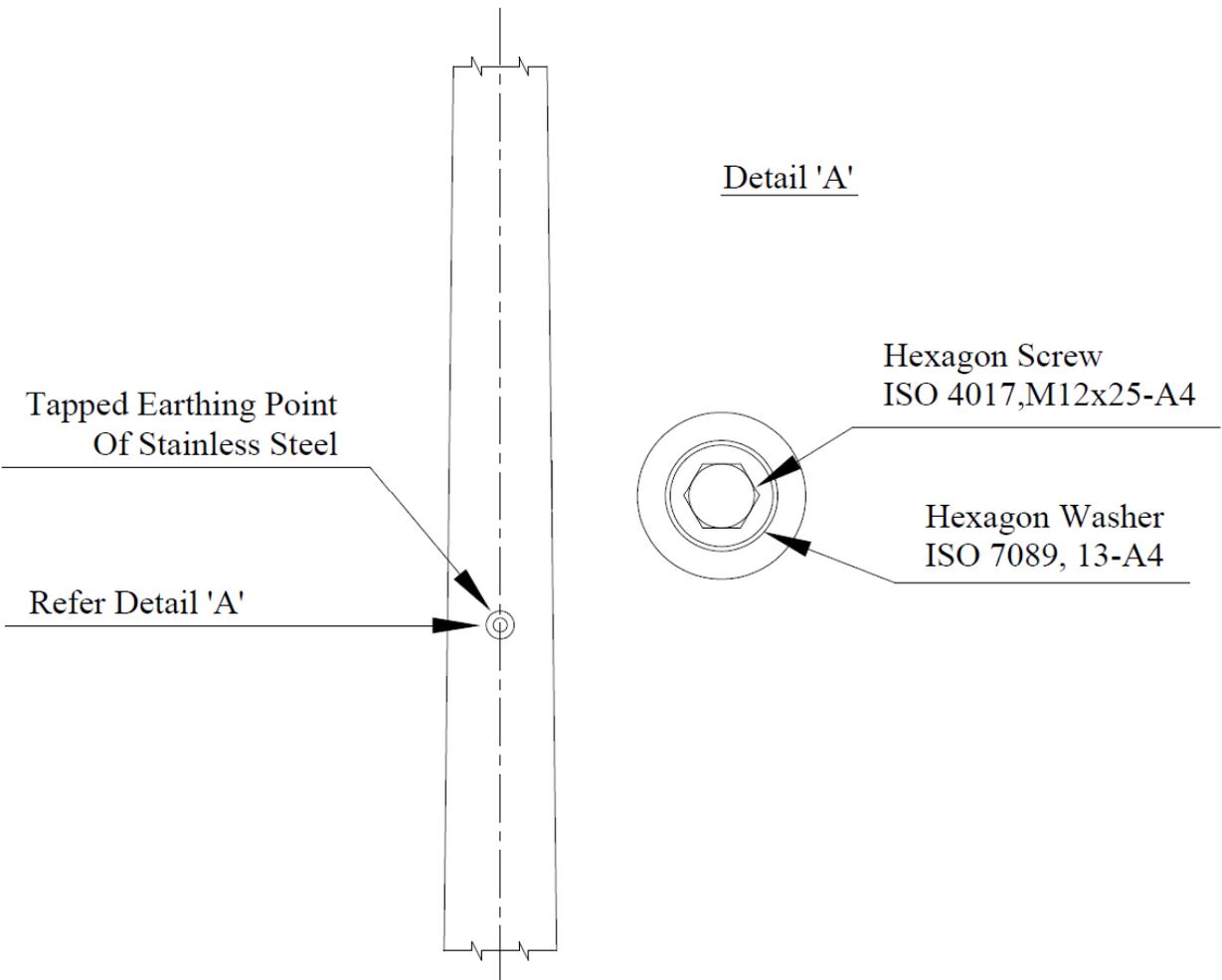
Pole Detail:

1. Pole Weight = 8,390 kg
2. Design Load = 6,000 kg
3. Ultimate Load = 12,000 kg

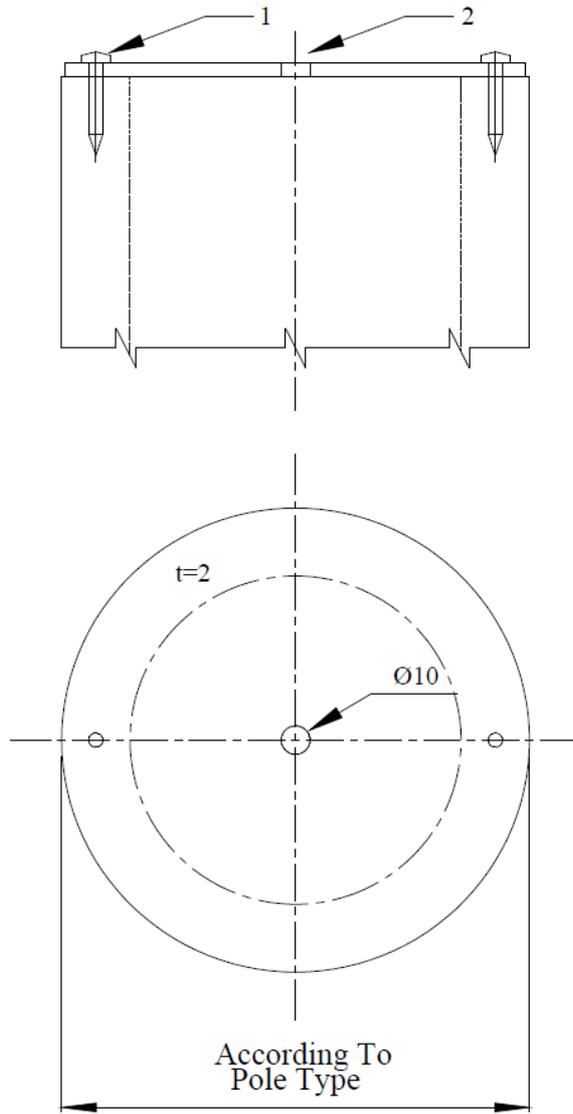
Figure CP09 – Spun Concrete Pole, Self-Support, 15M, Medium Voltage S.C. (CP15SFS)



Appendix A – Details for Spun Concrete Pole, Ventilation Hole



Appendix B – Details for Spun Concrete Pole, Earthing Arrangement



| No. | Description |
|-----|-----------------------------------|
| 1 | Head Screw, Stainless Steel, M8 |
| 2 | Cover Plate Aluminum Sheet, t=2mm |

Appendix C – Details for Spun Concrete Pole, Top End Cover