



TITLE:
**SPECIFICATION
FOR CONCRETE POLES:**
Part 3: Reinforced concrete
poles 18M and above

Doc. No.	KP1/3CB/TSP/03/005-3
Issue No.	1
Revision No.	0
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0.1 Circulation List

COPY NO.	COPY HOLDER
1	Research & Development Manager
2	Procurement Manager
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0.2 Amendment Record

Rev No.	Date (YYYY-MM-DD)	Description of Change	Prepared by (Name & Signature)	Approved by (Name & Signature)
Issue 1 Rev 0				

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FOREWORD

This specification has been prepared by the Research and Development Department of the Kenya Power and Lighting Company Limited (abbreviated as KPLC) and it lays down requirements for Reinforced Concrete Poles for use on overhead power lines. It is intended for use by the company in purchasing Concrete Poles.

1. SCOPE

- 1.1 This specification is for reinforced concrete poles for use on overhead power lines operating at voltages of up to 132kV 50Hz.
- 1.2 The specification covers poles for the following applications:
 - a) Overhead Lines
 - b) Line Switchgear and Equipment.
- 1.3 The specification covers jointed pole sizes 18m and above without holes
- 1.4 The specification also covers sampling, inspection and test of the concrete poles as well as schedule of Guaranteed Technical Particulars to be filled, signed by the manufacturer and submitted for tender evaluation.

The specification stipulates the minimum requirements for concrete poles acceptable for use in the company and it shall be the responsibility of the supplier to ensure adequacy of the design, adherence to the specification and applicable standards and regulations as well as ensuring good workmanship and good engineering practice in the manufacture of the concrete poles for The Kenya Power & Lighting Company.

The specification does not purport to include all the necessary provisions of a contract.

2. REFERENCES

The following standards contain provisions which, through reference in this text, constitute provisions of this specification. Unless otherwise stated, the latest edition of the referenced documents (including any amendments) applies.

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KS 1933: Kenya Standard- Concrete Poles for Telephone, Power and Lighting Purposes – Specification.

AS 4065-1992: Australian Standard-Concrete Poles for overhead lines and street lighting

3. TERMS AND DEFINITIONS

For the purpose of this specification, the definitions given in the reference standards shall apply.

4. REQUIREMENTS

4.1 Service Conditions

The concrete poles shall be suitable for continuous outdoor use in tropical areas with humidity of up to 90%, average ambient temperature of +30°C with a minimum of -1°C and maximum of +40°C and saline conditions with severe corrosive effects along the coast.

4.2 Design, Materials and Construction

4.2.1 The poles shall be round, reinforced concrete poles (RC) as per KS 1933.

4.2.2 The concrete poles shall be designed, manufactured and tested to KS 1933 and the requirements of this specification. The earthing details shall be as per this specification based on AS 4065-1992.

4.2.3 The complete pole shall consist of two units, the upper and lower unit.

4.2.4 The two units shall be joined together, on site and during testing, by bolting a suitably designed flange as shown on Drawing **TSP/03/005 c.**

4.2.5 The flange shall be of cast steel (30 -A2 no. 20) or stainless steel molded into the steel frame works of the individual units.

4.2.6 The flange bolts used for bolting together the flanges of the two units shall be of stainless steel and a minimum of M22x 50

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- 4.2.7 The correct torque to achieve the required jointing and earth continuity shall be stated by the manufacturer plus the recommended torque spanners.
- 4.2.8 The materials used shall be in conformity with the design standard (KS 1933) and shall be selected to suit intended application.
- 4.2.9 The pole shall be so designed that its strength in transverse direction shall be sufficient to take the load due to wind on conductors, fittings and the pole.
- 4.2.10 In accordance with Annex A of KS 1933, the aggregates used in the manufacture of the pole shall be free from veins and adherent coating and free from injurious amount of disintegrated pieces, alkali, vegetable matter and other deleterious substances. As far as possible, flaky, scoriaceous and elongated pieces shall be avoided.
- 4.2.11 The surface of all reinforcement shall be free from loose scale, oil, grease, clay or other material that may have deleterious effect on the bond between the reinforcement and concrete.
- 4.2.12 The mix design, mixing and compaction of the concrete shall be such that the necessary strength in the pole is obtained after curing in accordance with KS 1933.
- 4.2.13 Concrete shall be compacted by vibration, centrifugation or other efficient means. Hand compaction shall not be permitted.
- 4.2.14 The finished pole shall have a smooth external surface that is free from honeycombing, cracks and defects.
- 4.2.15 The individual portions of the concrete poles shall have an integral earthing provisions in accordance with Drawing no. TSP/03/005-3a. The jointing flanges shall form part of earthing continuity after bolting together the two portions. The positions of the earthing ferules are as shown on drawing no. TSP/03/005-3c.

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4.2.16 The value of resistance as measured between the two ferules of the completed pole shall be $0.27 \Omega/\text{km}$ running the length of the pole.

4.3 Sizes

4.3.1 The concrete poles shall conform to the standard sizes and characteristics given in Table 1 based on KS 1933:

Table 1: Standard Sizes and Characteristics

Pole Length M	Top Diameter mm	Ultimate Load KN	Strength Class	Clamping Length M
18	230	18	100 SC	2.4
21	300	21	100 SC	2.7
24	300	24	100 SC	3.0

4.3.2 Pole taper for each concrete pole shall be 13mm per meter.

4.3.3 The safety factor shall be 2.5.

4.3.4 Transportation and storage of the concrete poles shall be in accordance with KS 1933.

4.4 Color codes

Each pole shall be color coded to facilitate size identification during handling and storage. The paint used for color coding shall be indelible and in accordance with the color coding shown in table 2.

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Table 2: Color Coding

STANDARD POLE LENGTH (m)	COLOUR OF PAINT
18	ORANGE
21	BROWN
24	PURPLE

4.5 Quality Management System

4.5.1 The supplier shall submit a quality assurance plan (QAP) that will be used to ensure that the concrete poles materials, manufacture, workmanship, tests, service capability, maintenance and documentation, will fulfill the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfill the requirements of ISO 9001:2008 for imported poles and the Diamond Mark of Quality for locally produced poles.

4.5.2 The Manufacturer's Declaration of Conformity to reference standards and copies of quality management certifications including copy of valid and relevant ISO 9001: 2008 certificate (or for locally manufactured poles, the Diamond Mark of Quality from Kenya Bureau of Standards) shall be submitted with the tender for evaluation.

5. TESTS AND INSPECTION

5.1 The complete reinforced concrete poles shall be inspected and tested to the requirements of KS 1933 and this specification. It shall be the responsibility of the supplier to perform or to have performed all the tests specified.

5.2 Copies of previous Test Certificates and Test Reports issued by a third party testing laboratory that is accredited to ISO/IEC 17025 shall be submitted with the tender for the purpose of technical evaluation.

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5.2.1 The Test Reports to be submitted with the tender shall not be more than five years old.
5.2.2 The accreditation certificate for the third party testing laboratory shall also be submitted with the tender (all in English Language).

5.2.3 The Test Reports as per KS 1933 to be submitted with the tender shall include:

- a) Resistance to proof load;
- b) Verification of dimensions;
- c) Straightness;
- d) Ultimate load

5.3 After manufacture, Sampling, Inspection and Methods of Test shall be in accordance with KS 1933 and this specification. The tests shall be done at the manufacturer's works in the presence of KPLC Engineers and shall include:

- a) Visual inspection (for defects, finish etc);
- b) Resistance to proof load;
- c) Verification of dimensions;
- d) Straightness;
- e) Ultimate load;
- f) Verification of resistance between earthing ferrules.

Complete test reports for the poles shall be submitted to KPLC for approval before delivery.

5.4 Upon delivery of the concrete poles, KPLC will inspect them and may perform or have performed any of the relevant tests in order to verify compliance with the specification. The supplier shall replace/rectify without extra or additional charge to KPLC, concrete poles which upon examination, test or use fail to meet any of the requirements in the specification and reference standards.

5.5 Sampling

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- 5.5.1 Lot: In a consignment, 500 poles or a part thereof of the same overall length, same dimensions and belonging to the same batch of manufacture shall be grouped together to constitute a lot.
- 5.5.2 For ascertaining the conformity of the poles in the consignment to the requirements of this specification, samples shall be tested from each lot separately.
- 5.5.3 The number of poles to be selected from the lot shall depend on the size of the lot and shall be according to the sampling table below.
- 5.5.4 All the poles selected according to 5.5.3 shall be tested for defects, physical dimensions and straightness. A pole failing to satisfy one or more of these requirements shall be considered as defective. All the poles in the lot shall be considered as conforming to these requirements if the number of defective poles found in the sample is less than or equal to the corresponding acceptance number given in Column 3 of the sampling table.
- 5.5.5 The lot having been found satisfactory according to 5.5.4 shall be further tested for ultimate load of the poles. For this purpose, the number of poles given in column 4 of the sampling table shall be tested, these poles may be selected from those already tested according to 5.5.4 and found satisfactory. All these poles tested for ultimate load shall satisfy the corresponding specification requirements. If one or more poles fail, twice the number of poles required for ultimate load tests shall be selected from the lot again and subjected to this test. If there is no failure among these poles, the lot shall be considered to have satisfied the requirements of this test. If there is failure then the entire lot shall be rejected.

Sampling Table

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No. of poles in the lot	Sample size	Defects and Dimensional Requirements acceptance number	Ultimate load test
Up to 100	10	1	1
101 to 200	15	1	1
201 to 300	20	2	1
301 to 500	30	3	2

6. MARKING

6.1 Each concrete pole shall be marked permanently by embossing on a permanently secured corrosion resistant plate at a position 1.5m above the pole Ground line with the following details.

- Manufacturer's name
- Date of manufacture (mm/yy)
- Length of pole (meters) and Tip dimensions (mm)
- Ultimate/Working load/Strength Class
- Type of pole
- Weight of pole
- Standard to which the pole complies
- Unique traceability reference no.
- The words "PROPERTY OF KPLC"

Ground line reference mark as determined in 4.3.1 shall be conspicuous on the pole.

The plate used shall be made of stainless steel, securely affixed to the pole. In all cases the lettering shall be not less than 5mm high legibly impressed.

7. DOCUMENTATION

7.1 The bidder shall submit its tender complete with technical documents required by Annex A (Guaranteed Technical Particulars) for tender evaluation. The technical

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documents to be submitted (all in English language) for tender evaluation shall include the following:

- a) Guaranteed Technical Particulars;
- b) Copies of the Manufacturer's catalogues, brochures, drawings and technical data;
- c) Sales records for the last five years and at least four customer reference letters;
- d) Details of manufacturing capacity and the manufacturer's experience;
- e) Copies of required test reports by a third party testing laboratory accredited to ISO/IEC 17025. The test reports shall not be more than five years old and shall include:
 - i. Resistance to proof load;
 - ii. Verification of dimensions;
 - iii. Straightness;
 - iv. Ultimate load.
- f) Copy of accreditation certificate for the testing laboratory;
- g) Copy of the manufacturer's ISO 9001:2008 certificate or for local manufacturer's valid Diamond Mark of Quality Certificate issued by KEBS.

7.2 The successful bidder (supplier) shall submit the following documents/details to The Kenya Power & Lighting Company for approval before manufacture:

- a) Guaranteed Technical Particulars,
- b) Design Drawings with details of the concrete poles to be manufactured for KPLC,
- c) Quality assurance plan (QAP) that will be used to ensure that the design, materials, workmanship, tests, service capability, maintenance and documentation will fulfil the requirements stated in the contract documents, standards, specifications and regulations. The QAP shall be based on and include relevant parts to fulfill the requirements of ISO 9001:2008 and for local manufacturers the Diamond Mark of Quality (KEBS).
- d) Detailed test program to be used during factory testing,
- e) Marking details and method to be used in marking the concrete poles,

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- f) Manufacturer's undertaking to ensure adequacy of the design, good engineering practice, adherence to the specification and applicable standards and regulations as well as ensuring good workmanship in the manufacture of the concrete poles for The Kenya Power & Lighting Company.
- g) Packaging details (including packaging materials and their dimensions).

7.3 Installation and technical instructions for the concrete poles shall be supplied with the poles during delivery.

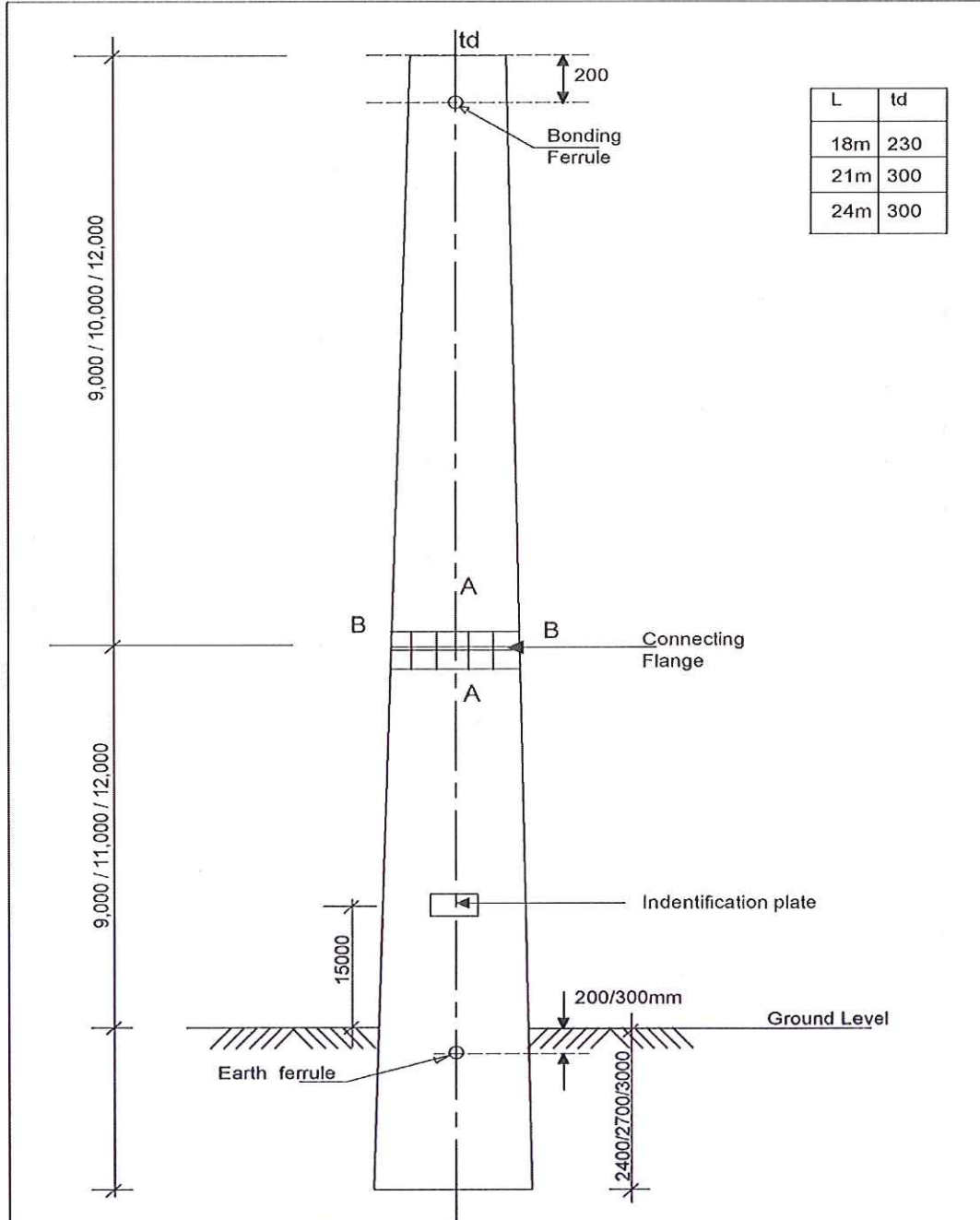
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REINFORCED CONCRETE POLE WITH JOINT
 FOR 18M , 21M & 24M CONCRETE POLES

DRG No.
TSP/03/005 - 3/C

Checked : **G. Gathige**

Drawn: **.J. Kahara**



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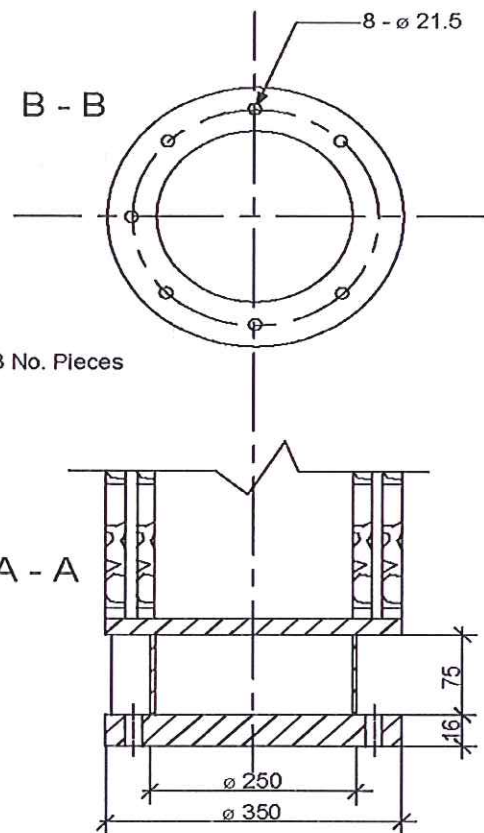
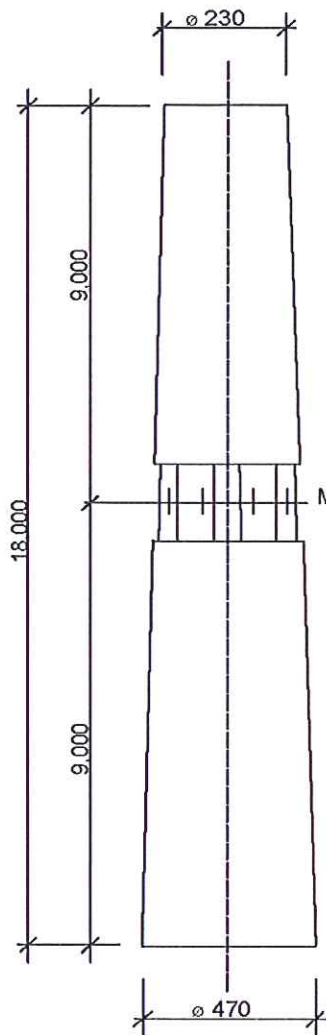
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CONNECTING FLANGE

Pole $\phi 230 \times 9 \text{m} \times 100 \text{SC} \times \text{RC}$



M20 Bolts, 8 No. Pieces

- Reference:
1. KS1933 Concrete poles Telephone, Power & Lighting purposes -- Specification;
 2. TSP/O3 /005-3 Specification for concrete poles.

JOINTS FOR REINFORCED CONCRETE POLE
FOR 18M CONCRETE POLES

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TSP/03/005 - 3/B
Checked : **G. Gathige**
Drawn : **J. Kahara**



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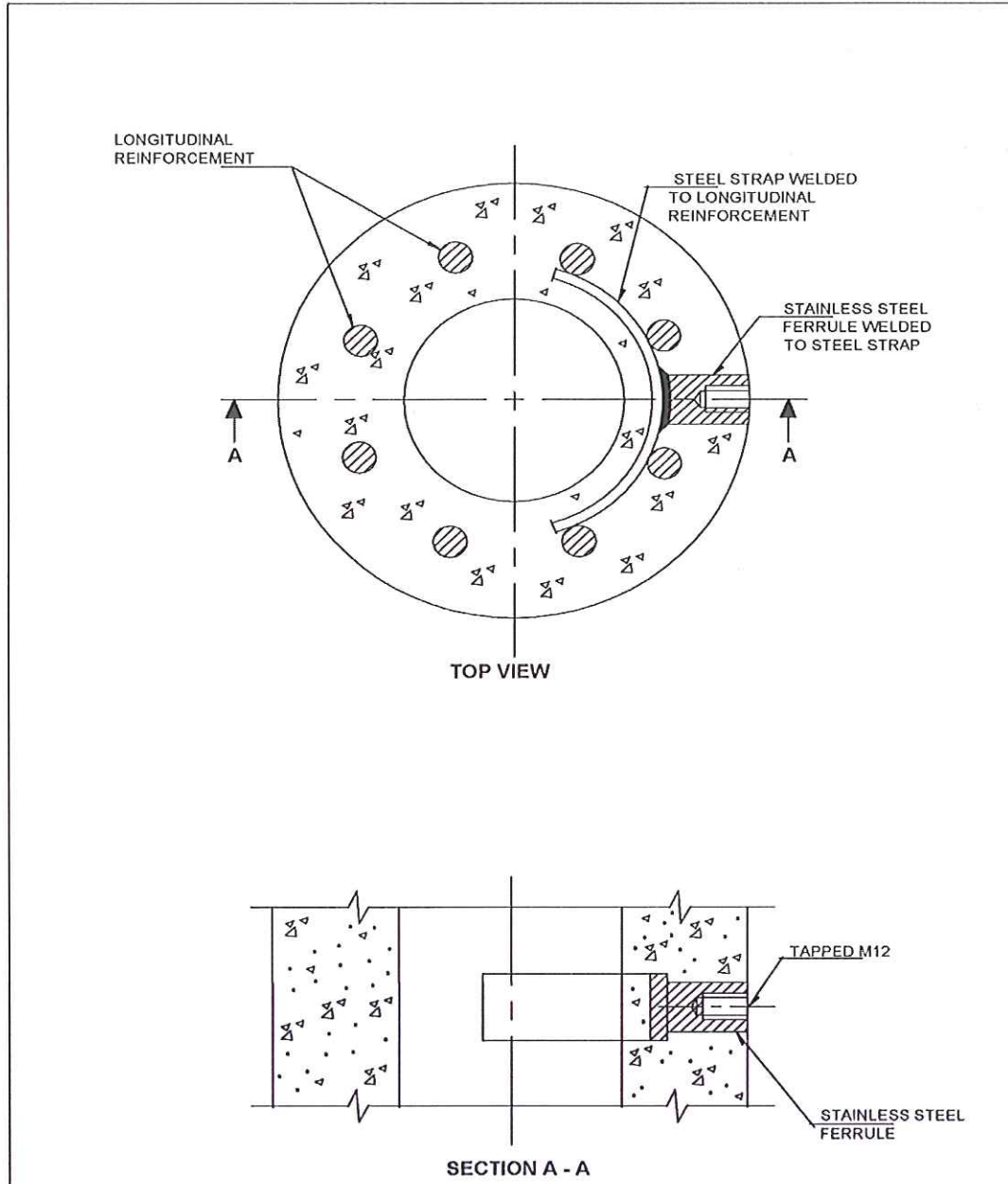
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NOTE: Steel spirals and longitudinal bars are not shown

REINFORCED CONCRETE POLE EARTHING DETAILS
 FOR 18M , 21M & 12M CONCRETE POLES

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ANNEX A: Guaranteed Technical Particulars (to be filled and signed by the Manufacturer and submitted together with relevant copies of the Manufacturer's catalogues, brochures, drawings, technical data, sales records, four customer reference letters, details of manufacturing capacity, the manufacturer's experience and copies of complete type test certificates and type test reports for tender evaluation, all in English Language)

Tender No.

Clause number	Bidder's offer (indicate full details of the offered equipment for each requirement of the specification)
Name of the Manufacturer, address and Country of manufacture	
Name & address of Bidder	
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1.2	
1.3	
1.4	
4. Requirements	
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4.2 Design Materials and Construction	
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	Ultimate load, kN	
	Strength class	
	Clamping length, m	
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.....
Manufacturer's Name, Signature, Stamp and Date

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