

**Ministry of Electricity
Power Distribution Office
Baghdad - Iraq**

Specification No.	D 22-
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**TECHNICAL SPECIFICATION
OF
TUBULAR STEEL POLES**

REVISION	YEAR 2001	YEAR 2009	YEAR 2012
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1- Scope of supply:

Suppliers are called upon to deliver tubular steel poles to MOE which are required for the installation of medium voltage (11 kV) and low voltage (0.4kv) Electricity Distribution Network.

The Japanese Industrial Standards (JIS) or British Standards (BS) are to be considered in the design, manufacture and testing have above mentioned materials. Similar or equivalent international standards such as A.P.I or DIN etc. Shall be likewise.

2- General Requirements:

The materials shall be of first class quality and designed for continuous satisfactory operation as continuity of supply is of prime importance and to operate satisfactorily under variation of load, voltage and short circuit or other conditions which may occur on the system provided that these variations are within the assigned rating of the apparatus. The materials used shall be suitable for the following climatic conditions.

2 1-A ambient temperature:

Highest maximum (in the shade) 55 °C for about 6 hours a day

Lowest minimum (-10) °C

Maximum yearly average (+30) °C

Maximum daily average (+40) °C

2-2 Sun Shine temperature:

Black objects under direct sunshine attain a temperature of 80 °C

2-3 Air humidity:

Maximum	92% at 40 °C
Minimum	12%
Yearly average	44%

2-4 Altitudes:

From sea level up to (1000m)

2-5 Sand storm:

The equipments shall be suitable for outdoor installations and subjected to frequent sand storms and heavily polluted atmosphere.

2-6 Wind Velocity:

Max velocity (for design purpose) (140 KM/ HR) or 39m/sec.

2-7 Composition of Soil:

The soil consists mainly of hard clay containing deposit gravel.

3- Technical Requirement:

3-1 System Data

a. 11 KV System	
Nominal voltage	11000 volts
Highest system voltage	12000 volts
System	3-phase, 3wire neutral earthed through resistance of 21.1 Ohm limiting the earth fault current to 300A
Short circuit breaking current	25 KA R.M.S at 11000 volts

b. 0.4 kV system	
Nominal voltage	400 Volts
System	3phases, 4 wires with neutral solidly grounded.
Frequency	50 Hz

4- materials and process:

The poles shall be made from longitudinally welded tube sections of hot rolled structural carbon steel in accordance with JIS-G-3444 or in accordance with BS-4360 or in accordance with any international equivalent standards like DIN 17100 with considering the design factor of safety for design of the poles shall be considered (2.0). Then the materials having the following properties.

Characteristics	Unit	type of steel standards			
		High tensile steel		Medium tensile steel	
		according to JIS-G-3444	according to BS-4360 DIN-17100	according to JIS-G-3444	according to BS-4360 DIN-17100
Tensile strength	Kg f/mm ² (min)	ST-51	ST-52	ST-41	ST-42
Yield strength	Kg f/mm ² (min)	36	36	24	24
Design bending stress	Kg f/mm ² (min)	25.5	26	20.5	21

Poles shall be delivered in a swaged or stepped form.

Swaged poles shall be manufactured from tubes brought together when hot. Stepped poles shall be made from one length of tube with its diameter being reduced in parallel steps by passing the tube through a series of dies. Stepped poles shall have the same wall thickness at any section of its whole length.

A swaged pole shall consist of three-tube section with diminishing diameters, the bottom Section being the biggest in size. See fig (1).

The length of the overlap shall be at least 3 times . The diameter of the smaller tube. The supplier should state the overlapping length in his offer. The upper edge of tube at the joint shall be chamfered off at an angle of 45°

The top end of all poles shall be rounded off and sealed completely. Welded type poles made out of three- sections similar to the design but jointed together via reducers welded to the pole section shall also be accepted subject that the mechanical characteristics and tests are the same as for swaged or stepped poles.

a. The pole design shall be in accordance with the following: -

Characteristics	Unit	9m poles (LV)	11m poles (MV)
Effective length of pole	m	9	11
Length of top section	m	2	2.5
Outside diameter of top section	mm	89	114
Length of middle section	m	2.3	3
Outside diameter of middle section	mm	114	139
Length of bottom section	m	4.7	5.5
Outside diameter of bottom section	mm	139	165
Planting depth	m	1.5	2
Working load	kgf	210	285
Point of application of load		60 cm below top	120 below top
Allowable bending stress For JIS-G-3444 ST-51 & DIN-17100 ST-52	kgf/mm ²	26	26
Wall thickness (t) of the poles must be for ST-51 or ST-52	mm	≥ 3.7	≥ 4.4
Allowable bending stress For ST-41 JIS - G - 34444 & ST 42 according to DIN - 17100 and any equivalent	kgf/mm ²	21	21
Wall thickness (t) of the poles must be for ST-41 or ST-42	mm	≥ 4.4	≥ 5.3

b. All (11 m) pole shall be fitted with (A) shaped clamped welded to the poles top and having an approximate height of (25 cm). The clamp which shall be fixing the upper (11 kv) pin insulator, is to be made of plate steel having of chemical and mechanical properties similar to that of the tubular poles.

The plate shall have a width of (75mm) and (6mm) thickness with two holes (25 mm) diameter of steel (ST-41) or (ST-42), each drilled at center coincident with the centerline of the pole.

The extra length of ((A)) clamp shall not be considered in the effective length of the (11 m) pole.

c. Five nos. (17.5mm) dia. Through holes shall be drilled at the top sections of poles for the purpose of fixing low tension shackle insulators. The upper-most hole shall be located (120 cm) below the top of the (11 m) pole, the rest spaced (30 cm) between centers vertically downwards.

The same number of holes shall be drilled through the (9 m) poles, but the upper-most hole shall be drilled (15 cm) below the top.

For earthing purposes a (20-mm) dia. Hole shall be drilled at the bottom of each pole at a distance of (15-cm) there from and a suitable length (M-18) galvanized bolt, nut & washer shall be supplied with each pole.

Tolerance in diameter and thickness of tube section shall be within the limits specified in (JIS-G-3444, or BS 4360, or DIN 17100) the complete pole shall be out of straightness more than (1/1000) of length of pole.

d. Loading process (type test):

The design of each pole shall has the acceptance criteria as follows when conducting loading tests:

Load	Measuring item	Acceptance criteria
Ps	Specified working load	Any defect should not be produced
O	-----	-----
Pp	1.5 load × Ps	Any defect should not be produced
O	-----	Permanent set shall not exceed (13 mm) from zero position
Pb	2.0 load × Ps	Destruction

Where: -

Ps = Specified working load.

Pp = Load for permanent set not exceeding (13 mm).

b = Breaking load.

5- Protection: -

The poles shall be hot-dip galvanized thoroughly internally and externally as per (BS 729) but zinc distribution shall not be less than (650 gr. /m).

6- Testing and inspection:

The poles are subject to inspection by (MOE) inspection authority during manufacture and before shipment to verify compliance of poles with our specifications. The fees shall be borne by (MOE) but the supplier shall submit all necessary facilities to our inspector to conduct such tests without-extra charge.

7- Specification For Cross-Arms & Clamps

Generally these cross-arms and clamps shall be used for (11 m) poles at the rate of one set of cross-arm and clamp per each pole shall be steel (St-41) or (St-42). The set shall be fastened at a distance of (0.9 m) below pole top (excluding A - clamp). Generally the design shall be complying fully with the attached drawings No.2 & No.3 . Every set shall include the followings: -

- a. One No. Channel steel (75x40x6 mm) length (1250 mm).
- b. One No. Clamp having cross-section (75x6 mm).
- c. Tow Nos. high stress ((M-16)) Hexagonal headed bolts, nuts, plain washer & spring washers, the length of bolt (excluding head shall be 60 mm, fully threaded 50 mm).With spare bolts, nuts. etc of 5% for the whole quantity required.

8. Protection:

- a. All channel steels and clamps shall be hot dip galvanized to (BS 729), with same zinc distribution as above.
- b. All bolts nuts and washers shall be electrically galvanized.

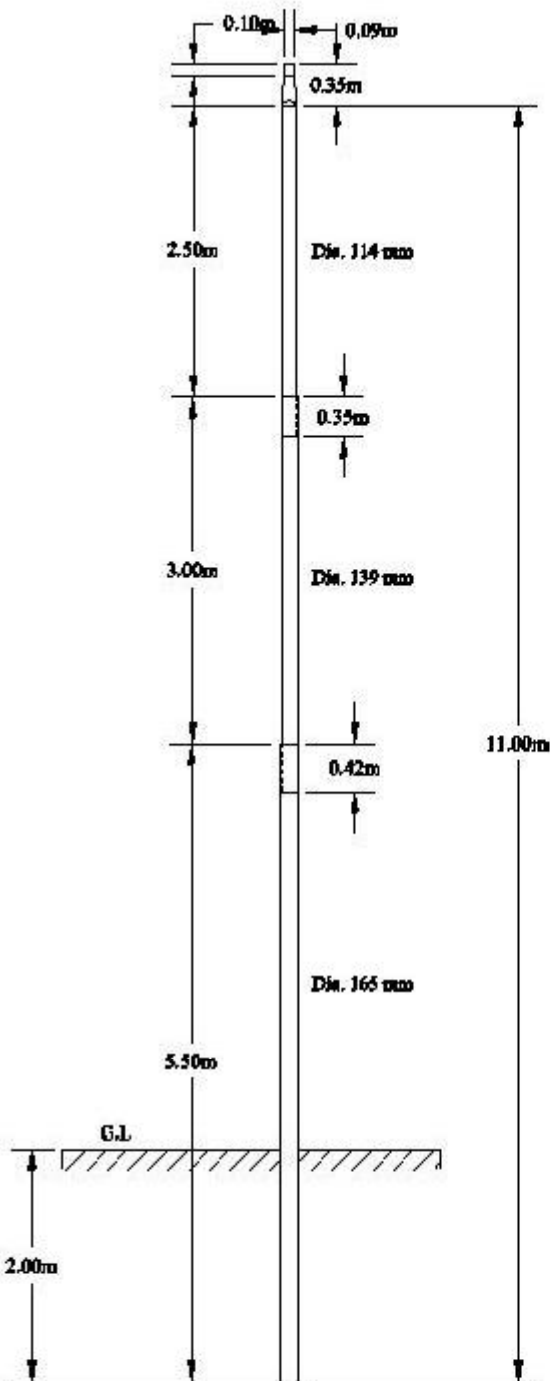
9. Packing:

- a. Channel steels and clamps in bundles.
 - b. Bolts nuts and washers in proper wooden or steel cases.
- Details shall be stated clearly in the offer.

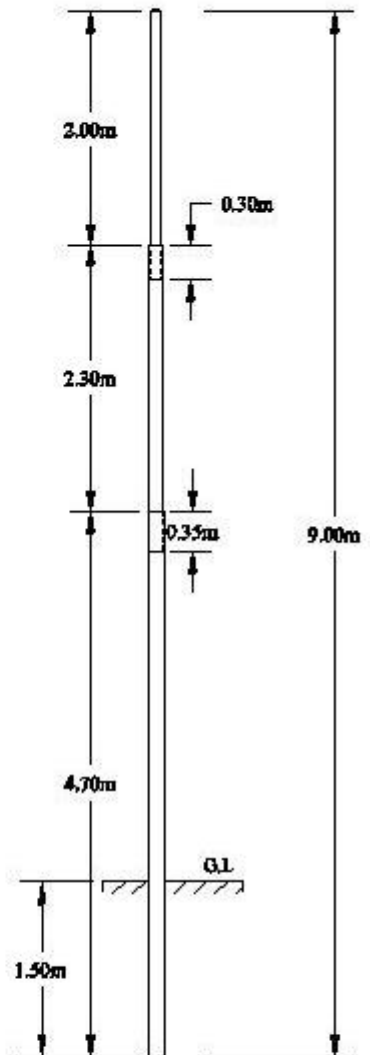
Note:

All drawings of the pole and its accessories subjected to our approval before start manufacturing.

11m poles

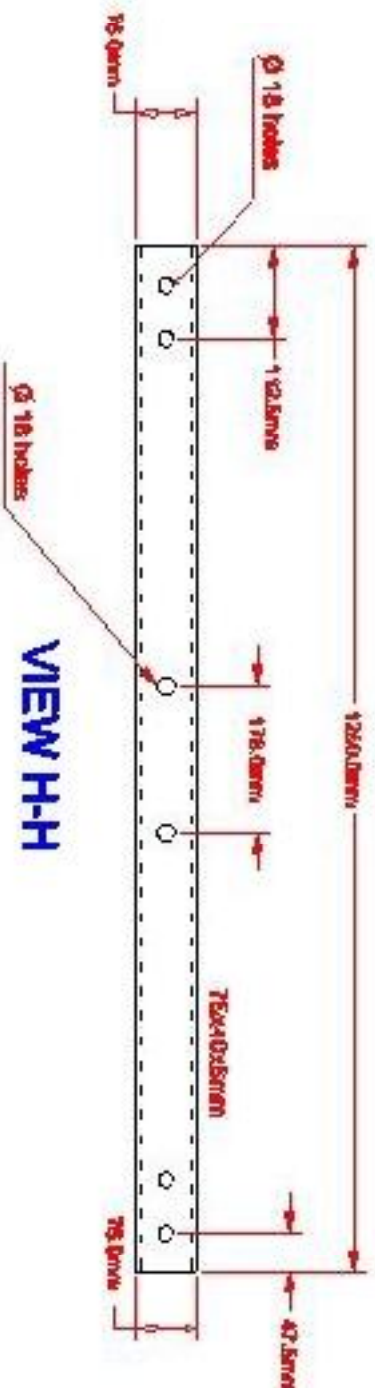
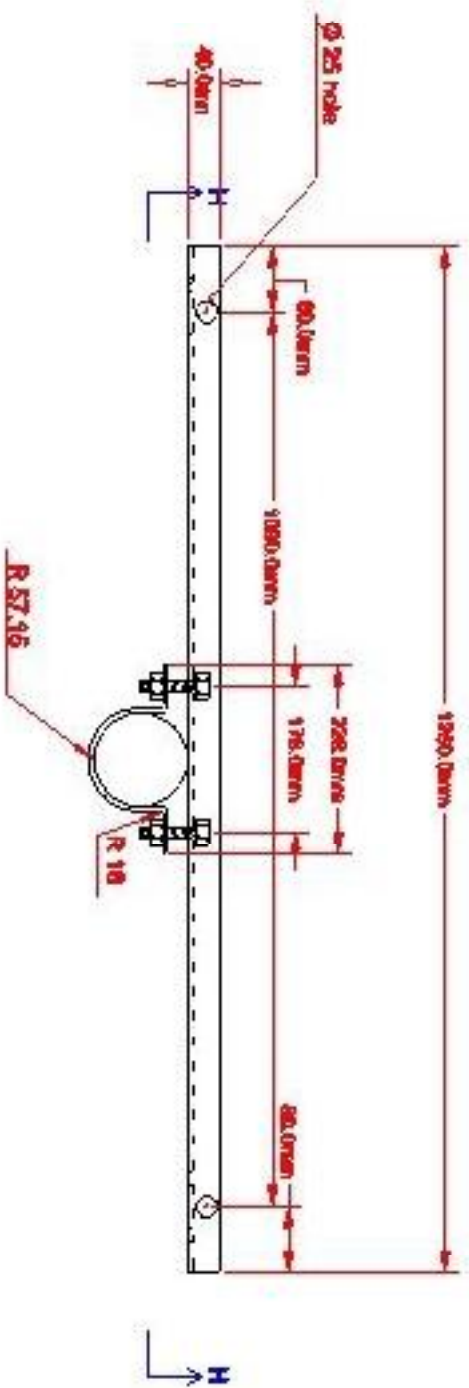


9m poles



Drawing no. (1)

11m & 9 m Tubular steel poles



All materials STK-41 or ST-42 or ST-44 Hot dip galvanization to B.S.729 for all steel works except bolts which should be electrically galvanized

Drawing no. (2)

CROSS ARM FOR 11m TUBULAR POLES