

**Ministry of Electricity
Planning and Studies Office
Baghdad – Iraq**

Specification No.

D-46

**TECHNICAL SPECIFICATION
OF
LATTICE STEEL POLES**

REVISION

YEAR 2001

YEAR 2009

1- Scope of supply: -

Suppliers are called upon to deliver lattice steel poles and cross-arm to MOE which required for the installation of medium voltage (11 kV), and low voltage (0.4 kV) Electricity Distribution Network usually our network using tubular steel poles but the lattice pole shall be used in – between for the following purposes: -

- a- Tensioning of the Network.
- b- At corners of Network.
- c- At end of Network.

The Japanese Industrial Standards (JIS) are to be considered in the design, manufacture and testing of the above mentioned materials. Similar or equivalent international standards such as BS or DIN shall be treated likewise. Specifications and quantities are stated in the following items.

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 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%

Max. wind velocity 125 km/hr

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 hot rolled I- joists and angle-steel sections with steel plates specified in JIS-G-3101 (STK-51) or in accordance with BS 4360 (Steel 52) or in accordance with any international equivalent standard having the following mechanical properties.

| Characteristics | Unit | Steel type | | |
|-----------------------|-----------------------------|------------|-----------------------|-------------------------|
| | | STK-51 | Steel 52 (to BS 4360) | Steel 52 (to DIN 17100) |
| Tensile strength | Kg f /mm ² (min) | 51 | 52 | 52 |
| Yield strength | Kg f /mm ² (min) | 36 | 36 | 34.5 |
| Design bending stress | Kg f /mm ² (min) | 20.4 | 20.8 | 20.8 |

Materials for A-clamps used at the top of (11 m lattice steel poles) and cross-arms shall be made of hot rolled structural carbon steel in accordance with the same specifications above but either STK-51, Steel-52 (to BS or DIN) having the following mechanical properties: -

5- Lattice-steel poles:

Each low voltage lattice steel pole shall be made out of two Nos. I-steel joists which are to be welded together and cross-braced with angle iron size (30×30×3) of steel (ST-41) or (ST-37) or any equiv. forming the shape of latter (A) as shown in drawings No. (2). I-steel sizes for low voltage is as follows: -

(120×58×5.1×7.7) ST-52 according to (11 meter) DIN-17100.

(125×75×5.5×9.5) STK-51 according to JIS-G-3101.

Any equivalent sections ST-52 according BS-4360.

And for medium voltage lattice steel pole is as follows: -

(140×66×5.7×8.6) ST-52 according to DIN-17100.

(150×75×5.5×9.5) STK-51 according to JIS-G-3101.

Any equivalent sections ST-51, ST-52 according BS-4360.

And any other size having the same modulus of section shall be acceptable.

a- Low-Voltage Lattice Poles:

The lattice pole which is shown in drawing No. (1) shall serve as a tension, angle and end-pole for low voltage network using straight-line tubular poles. The lattice pole should be capable of withstanding a working load of (700 Kgf) acting vertical to its plan in the transverse and longitudinal directions at the poles top. Planting depth shall be (1.5 m) for (9 m) poles. The rest of dimensions and parameters as per drawing No. (2) attached and also for locations of holes. Inspection shall takes into consideration (JIS-G-3101, G-3191 & G-3192) . The whole pole shall be hot-dip galvanized according to BS 729.

b- Medium Voltage Lattice Poles: -

This pole shall be used as a tension, angle (0-65⁰) and end-pole for (11 kV) power transmission lines together with straight line tubular poles. Referring to drawing No. (1) this pole has to withstand the max. working loads 1400 Kgf. Planting depth shall be (2m) for (11 m) poles. The rest of dimension, parameters, locations of hole shall be as per drawing no. (1) attached. (A-clamp) as per drawing no. (2) shall be welded to the top of each pole. Inspection shall takes into consideration (JIS-G-3101, G-3191 & G-3192). The whole pole shall be hot-dip galvanized according to BS 729.

c- Common Remarks For Lattice Poles: -

c-1 Each of the (9&11 m) lattice steel poles shall have an earthing hole (18 mm dia.) located at the center of the lower plate for earthing purposes.

c-2 Every steel lattice pole shall be supplied with (11 Nos.) electrically galvanized, high stress, hexagonal –headed (M-16) fully threaded bolt (35 mm) length of screw with nut, plain washer & spring washer as they are used as follows.

(10 Nos.) For the 2 rows of (5x18 mm) dia. holes of each pole. (1 No.) For the (18 mm) dia. earthing these bolts, nuts...etc shall be firmly tightened in their places on the poles at the manufacturing works to guarantee supplying each pole to our job-site complete. (5%) spare bolts, nuts...etc shall be supplied as a spare individually.

6- Testing

All materials under contract shall be tested at the manufacturing works to verify compliance to our specifications. The MOE shall appoint an inspector for this purpose and paid accordingly, but the manufacturer shall supply all equipment and facilities to our inspector necessary for conducting all such tests without extra charge, the tests shall include the followings: -

a- Mills certificate approved by the manufacturer for the materials like I-joist, angle-steel, steel plates, channel steel, bolts & nuts...etc.

Complying fully with the international specifications based upon.

b- Dimensional tests in quantities not less then (5%) of the quantity of each batch, taking into consideration that eccentricity between top and bottom part of the pole shell not exceed 1/1000.

c- Welding tests by x-ray at the rate of two tests per each 100 Nos. of lattice poles.

d- Loading Tests (type test):

The design of each pole shall have the acceptance arteries as follows when conducting loading tests.

| Load | Measuring item | Acceptance criteria |
|------|------------------------|---|
| Ps | Specified working load | Any defect should not be produced |
| O | ----- | ----- |
| Pp | Ps × 1.5 load | Any defect should not be produced |
| O | ----- | Permanent set shall not exceed (13 mm) from zero position |
| Pb | Ps × 2.5 load | Destruction |

Where: -

Ps = Specified working load.

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

Pb = Breaking load.

The loading test shall be carried out at rate of one test per each batch of 500 Nos. of lattice poles manufactured. The distracted pole shall not be considered from our poles. The manufacturer to replace the tested sample shall supply another.

e- Galvanizing:

Test shall be carried out on samples of the materials under contract as per BS 729.

7- Packing:

The manufacturer shall states clearly in his offer the proposed packing of the materials under contract mainly for the lattice poles and how many poles in each bundle. The cross arms and accessories shall be supplied in suitable bundles as well.

8- Alternative design:

The tendered may offer an alternative design for the lattice poles, but the new design shall take the following points into consideration.

- a- Same applied working load.
- b- Same total lengths of pole.
- c- Same locations of the medium voltage and low voltage conductor.
- d- Suitability of the cross-arms to the (11 m) lattice poles.

9- Specification For The Cross-Arms

The cross-arm shall be used to support insulators carrying bare copper or aluminum conductors on the medium voltage poles (11 m) they are to be made of section (channel steel) (ST-41), (ST-42) , (ST-44) or any equiv. Flat steel, bolts, nuts and washers according to (JIS-G-3101 and JIS-G-1186) or equivalent and as per drawing (No. 3) attached. All steel work shall be hot dip galvanized to BS 729 but bolts nuts; washers shall be electrically galvanized.

10. **Options:** as an option the poles could be painted type with two anti-oxide (red laite) paint layers with cross arms. According to the tender's request bolts and nuts to be electrically galvanized.

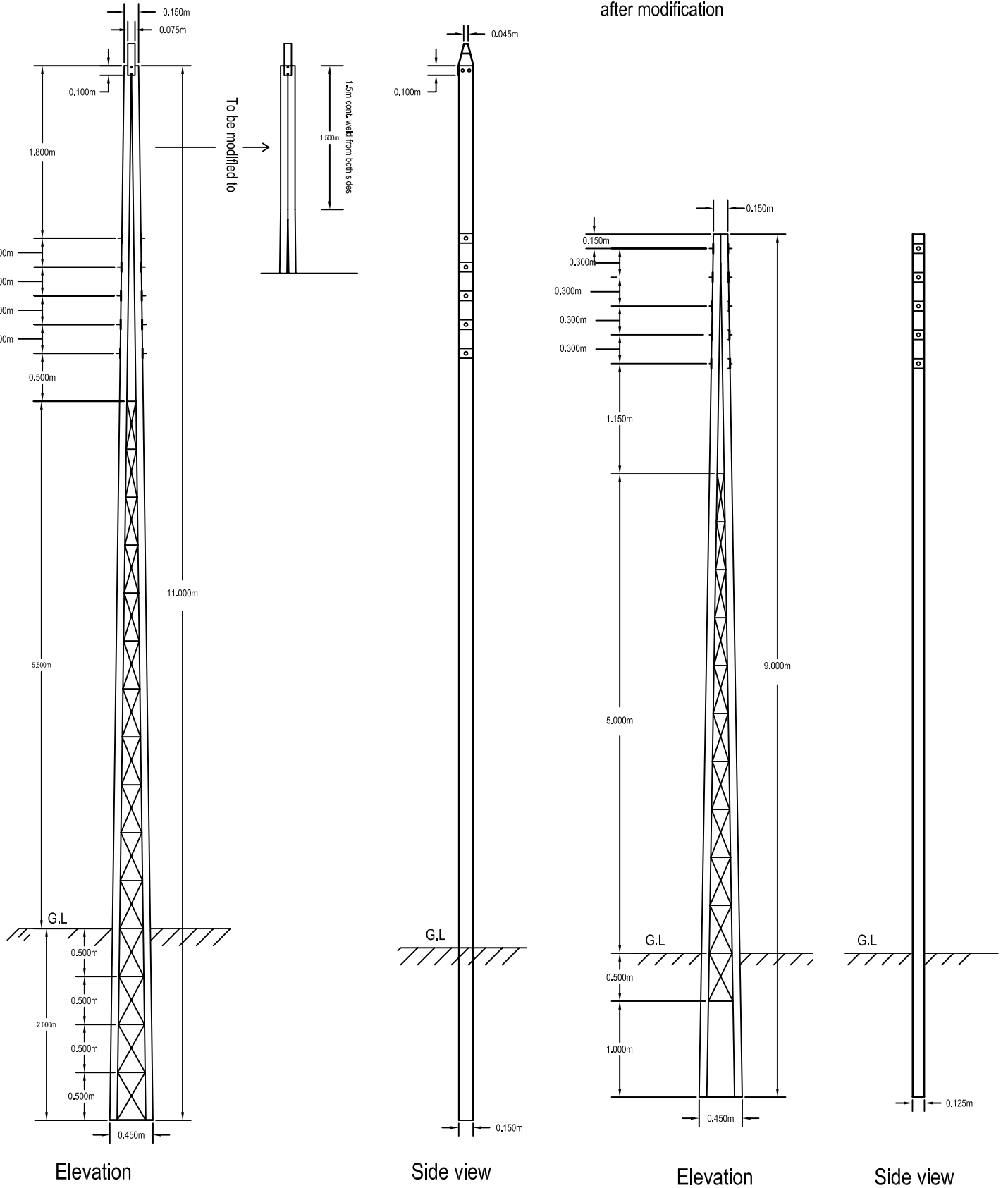
Note:

- a. All drawings of the pole and its accessories subjected to our approval before start manufacturing.
- b. The type of poles (galvanized or painted) will be fixed by the tendrer.

11. Schedule of materials:

| # | Item | Qty. | Total Price CIP |
|---|------------------------------------|------|--------------------|
| 1 | 9m lattice poles | | |
| 2 | 11 m lattice poles | | |
| 3 | cross arm 1410 mm with accessories | | |

Note: accessoiies on the top
of the pole are the same
after modification



Note:

Materials:

Steel pole: JIS G 3101 SS ST-51 or DIN 17100 (ST-52)

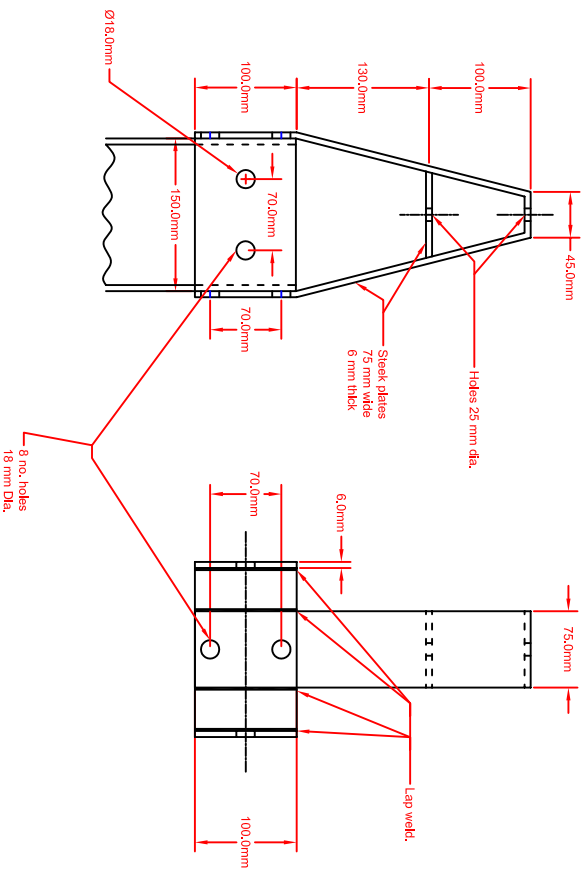
A clamp & cross arm: JIS G 3101 SSSS (ST-41)

Bolts: JIS B 1180 St

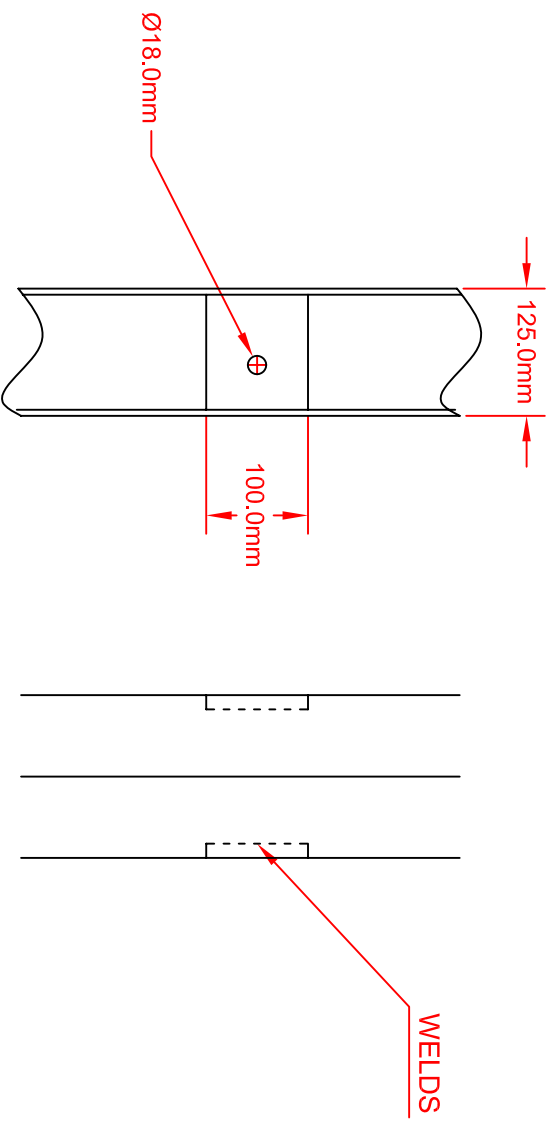
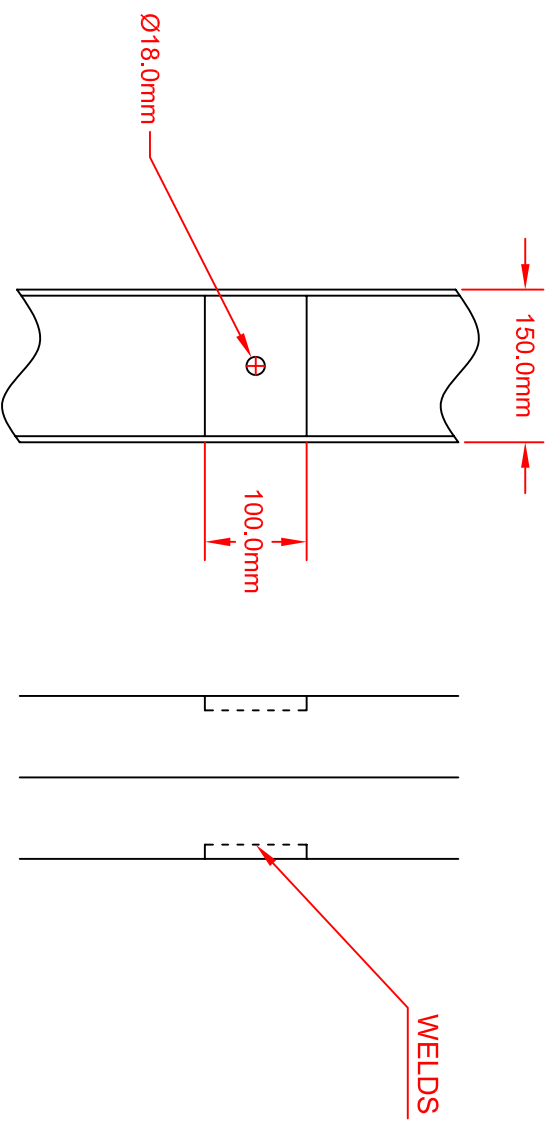
Galvanization: bolts, nuts electrogalvanized

All steel, Hot dip galvanized to BS 729

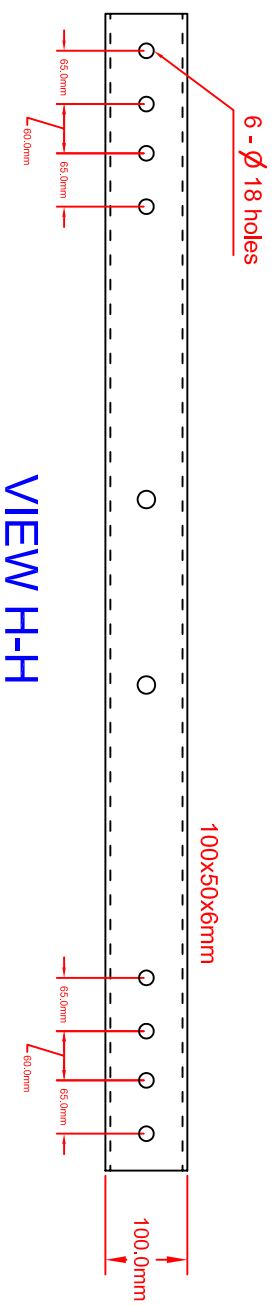
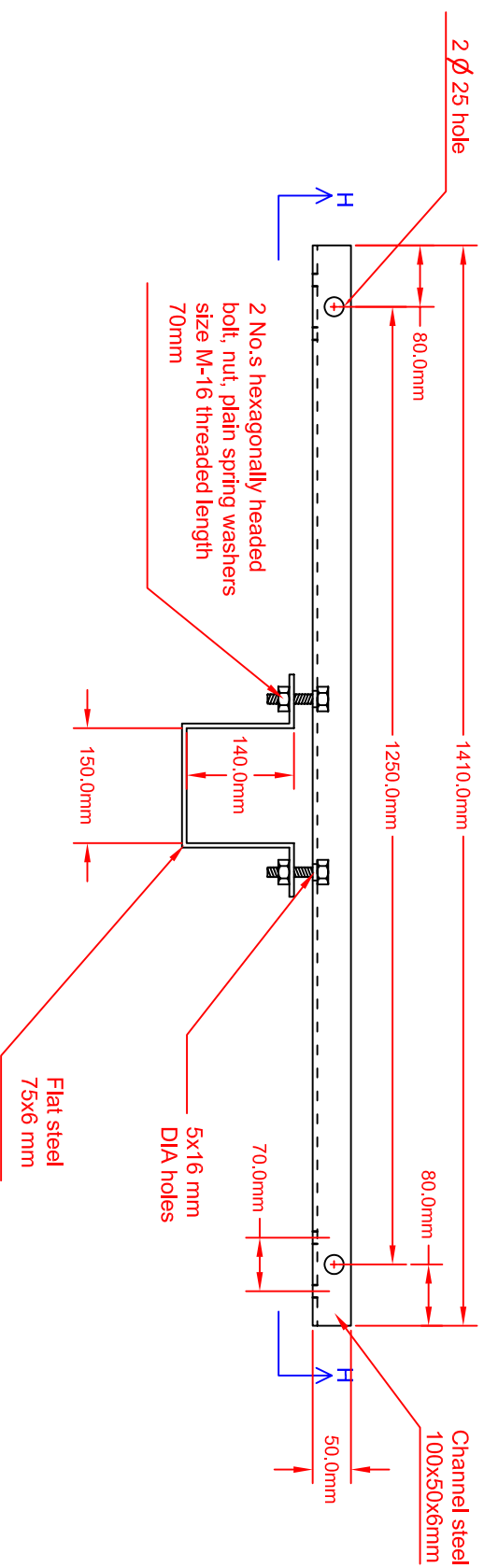
Drawing no. (1)



A Clamp for the pole
Material STK-51 or ST-52
Hot dip galvanized to B.S 729



Drawing no. (2)



All materials STK-51 or ST-52 Hot dip galvanization to B.S729 for all steel works except bolts which should be electrically galvanized

Drawing no. (3)

CROSS ARM FOR 11m LATTICE POLES