

SPECIFICATION FOR TUBULAR STEEL LIGHTING COLUMN

1. SCOPE

This specification covers the design, fabrication and testing of tubular section, galvanised steel friction fit jointed street light columns of the ground planted, flange mounted and frangible base type.

2. RELATED DOCUMENTS

Reference is made in this Specification to the following:

New Zealand Specifications

NZS 3404:1992 Steel structures standard.

NZS 4203:1992 General structural design and design loading for buildings.

NZS 4701:1981 Metal-arc welding of steel structures.

Australian Specifications

AS 1110:1984 ISO metric hexagon precision bolts and screws

AS 1111:1980 ISO metric hexagon commercial bolts and screws

AS 1112:1980 ISO metric hexagon nuts, including thin nuts, slotted nuts and castle nuts

AS 1214:1983 Hot-dip galvanised coatings on threaded fasteners (ISO metric coarse thread series)

AS 1538:1988 Cold-formed steel structures code

AS 1650:1989 Hot-dipped galvanised coatings on ferrous articles

AS 3678:1990 Hot-rolled structural steel plates, floor plates and slabs

3. INFORMATION TO BE SUPPLIED WITH QUOTATION

The following information shall be supplied with the quotation:

- (a) Fully detailed drawing showing a general arrangement, mounting height, outreach arm length and base plate details, together with welding and fixing details.
- (b) Method of assembly of the sections and base.
- (c) Installation procedure including torque setting for holding down bolts and the maximum and minimum torque tolerance applicable.

4. DIMENSIONS AND TOLERANCES

4.1 Mounting Height (H)

The mounting height dimension shall be the distance between the centreline of lantern mounting spigot, and the intended ground level for a ground planted column, or the bottom of the base plate for a column with base plate (see Figure 1).

4.2 Outreach Arm Length (W)

The outreach arm length shall be the horizontal distance from the point of entry to the lantern, to a vertical line passing through the centre of the column cross section at the ground level (see Figure 1).

4.3 Straightness

Columns, when in a vertical position with the outstretch arm supporting a 12.5 kg lantern in still air shall not deviate from straightness by more than 15 mm in any 3 metre length, or have a total deflection from true vertical greater than $H/200$ where H = mounting height.

5. CONSTRUCTION AND MATERIALS

Columns may be of one piece construction or be constructed with slip jointed sections, each section being not less than 2 m in length. Slip jointed sections shall be designed to give a lap length of approximately 1.5, but not less than 1.4, times the joint female diameter when assembled tight. The cross-sectional dimensions of the column shall not increase with increase in column height.

Both column and outreach arm shall be formed or rolled from steel sheet, not less than 2 mm in thickness.

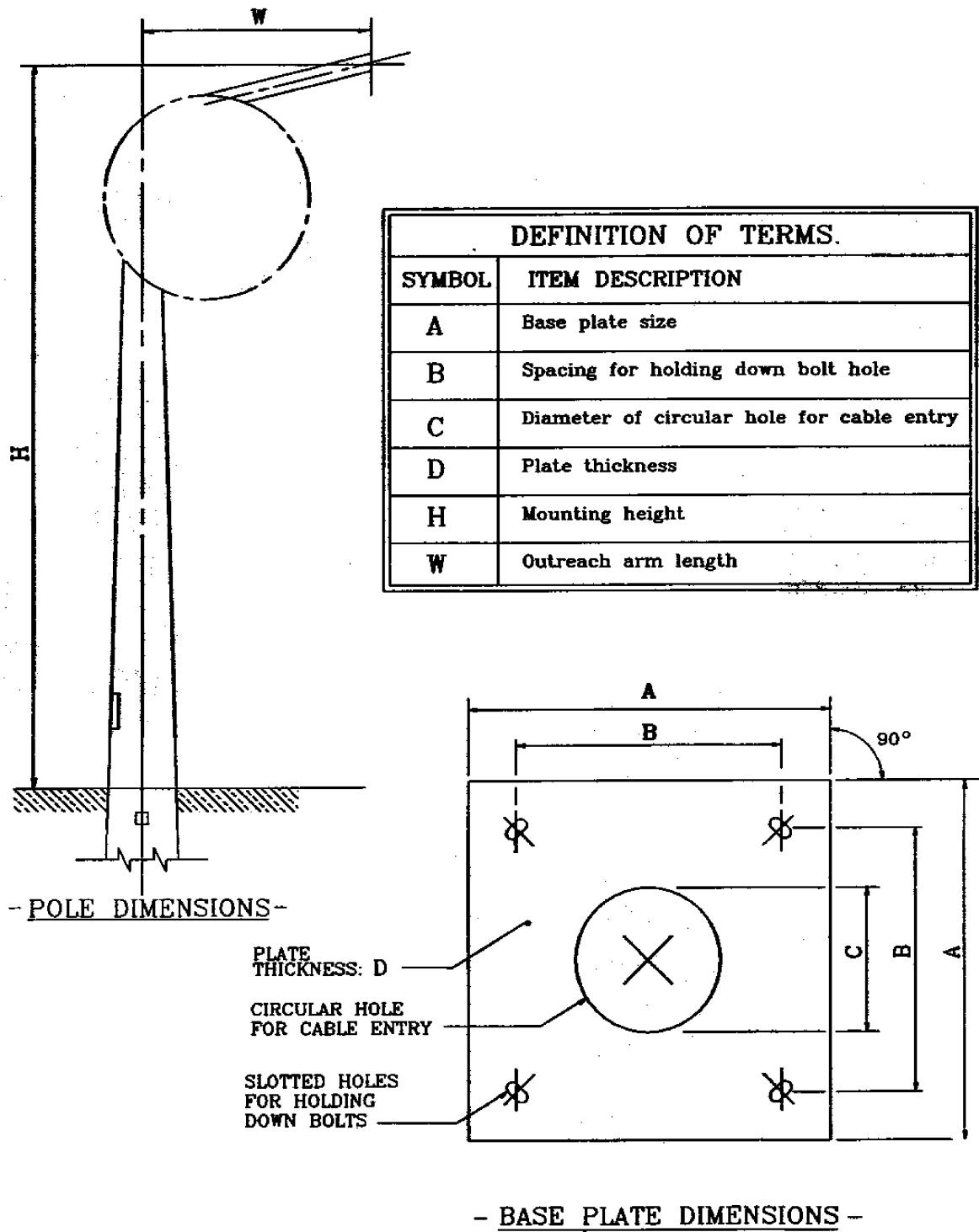


FIGURE 1

All fabrication shall be in accordance with section 14 of NZS 3404. Welders shall hold a current NZS 4711 certificate of competency for the processes, positions, or conditions used.

Sheet steel shall be Grade 200 or 250 of AS 3678 with a maximum silicon content of 0.03%.

Any bolts and nuts supplied shall be of minimum property class 4.6 and 5 respectively and comply with AS 1110, AS 1111 or AS 1112 as appropriate.

6. FINISH

All columns, outreach arms and fasteners shall be hot dipped galvanised in accordance with AS 1650 or AS 1214 as appropriate.

Ground planted columns shall be further protected to 100 mm above finished surface level (ground or concrete) and to a minimum of 400 mm below surface level with a continuous barrier coating (epoxy-mastic or similar) at least 150 microns thick. No other paint or surface coating shall be applied over the galvanising unless otherwise specified by the Engineer.

7. BASE COMPARTMENTS AND CABLE ENTRIES

When a base compartment is supplied, it shall include a weather resistant door, made to the same material specifications as the column, and shall be attached in such a manner as to resist unauthorised entry and damage by vandals.

Where a metal part is used, it shall be of corrosion resistant material or be protected against corrosion. When a baseboard is used, it shall be manufactured from material which is substantially non-hygroscopic and rot resistant.

Cable entries shall be smooth and free from obstruction and present no sharp edges or features which might cause damage to the cables.

8. MOUNTING DETAILS

Specific column designs are required for the following types:

- (a) a ground planted type.
- (b) a flange mounted type (for attachment to a concrete foundation or ground stub).
- (c) a frangible based type.

- 8.1** Ground planted columns shall be designed for planting in the ground a sufficient depth to resist overturning with a minimum factor of safety of 2, taking into consideration local soil conditions and expected maximum loading. Where not specifically designed, the minimum planting depth shall be one fifth of the mounting height.
- 8.2** Flange mounted columns shall be supplied with a galvanised steel base plate not less than 16 mm thick and of adequate strength to take full wind loading. The base plate shall be provided with a minimum of four holes at equally spaced centres for attachment of holding down bolts. A hole with minimum diameter of 100 mm shall be provided through the centre of the base plate for cable entry. Preferred dimensions for baseplates for different mounting heights are given in Table 1 below. (See also Figure 1.)

Dimensions (Note 1)					
Mounting Height [m]	Base Plate Size [mm] A	Hole Centres [mm] B	Internal Diameter [mm] C (Note 2)	HD Bolt	
				m Required	Metric Size Designation (Note 2)
up to 7.4	300 x 300	220	120	4	M16
7.4 to 11.6	375 x 375	260	190	4	M20
greater than 11.6 (Note 3)	450 x 450	320	190	4	M24
Note 1:	Dimensions are indicated in Figure 1.				
Note 2:	Default values listed only, values adopted in any application shall be justified by design or testing.				
Note 3:	Columns exceeding 16 m require specific consideration.				

TABLE 1: PREFERRED BASE PLATE DIMENSIONS

- 8.3** Frangible bases shall be designed to shear upon impact from a motor vehicle (see Clause 12.3). The holding down bolts, fittings and base shall also be designed to ensure that the column does not work loose from its seating during service. The top of the frangible base plate shall be installed to a level not exceeding 100 mm above the surrounding ground level. The installation instructions shall be provided to the Engineer.

9. LANTERN FIXING

A tubular spigot of hot-dip galvanised mild steel to suit the intended lantern, is to be fitted to and shall project 150 mm beyond the end of the outreach arm.

10. DESIGN LOADS

The columns shall be designed for loads which simulate the effect of distributed wind loads and dead loads on the column, outreach arm and lantern.

All wind loads shall be calculated in accordance with Part 5 of the NZS 4203 and design of columns shall comply with NZS 3404 and relevant clauses of AS 1538.

11. DEFLECTIONS

Both horizontal and vertical deflections specified in this clause shall be those measured at the spigot/lantern connection.

Criteria

Horizontal Deflection

The total horizontal deflection of each spigot under a service load of wind load plus 1.0 times the dead load, where wind load shall be calculated using $q = 500 \text{ Pa}$, shall not exceed:

$$0.04 \times (H + W), \text{ where}$$

H is the nominal column mounting height, and
W is the outreach arm length

Vertical Deflection

The vertical deflection of each spigot shall not exceed $0.025W$ when the intended lantern is fitted.

12. TESTING

Compliance with design and deflection requirements shall be demonstrated by structural calculations and testing, if requested by the Engineer.

12.1 Structural Calculations

The structural calculation shall demonstrate the design complies with this specification, and in particular shall take full consideration of:

- (a) the effects of local buckling in the column wall
- (b) the effects of openings made in the column wall
- (c) fatigue at welds and
- (d) P-delta effects (as defined in NZS 4203).

When compliance with the deflection criteria are demonstrated by calculation, the analysis may be performed with the assistance of a suitable computer programme.

12.2 Test Loading

Should test loading be required, the method of testing and loadings applied to a full sized column shall be approved by the Engineer.

12.3 Frangible Base Testing

Tenders for frangible bases will only be accepted from fabricators whose design has been approved by Transit New Zealand. Approval will be based on;

- (a) Submission of detailed drawings of the pole and base details together with the manufacturer's installation instructions including holding down bolt requirements, maximum and minimum torque settings, relevant tolerances to ensure function and
- (b) Results of performance testing of the poles under vehicle crash-testing using a saloon car of approximately one tonne travelling at 50 kph and also 80 kph.

In each case, the test pole is required to break away at the base and its collapse mechanism shall be such that it avoids endangering other road users or the potential occupant(s) of the impacting vehicle.