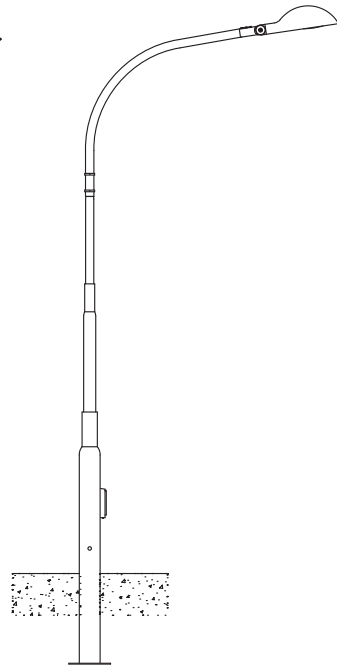
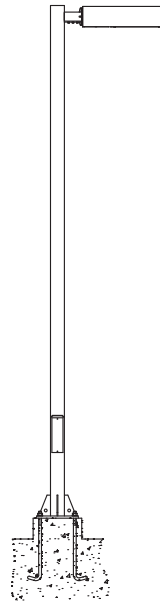


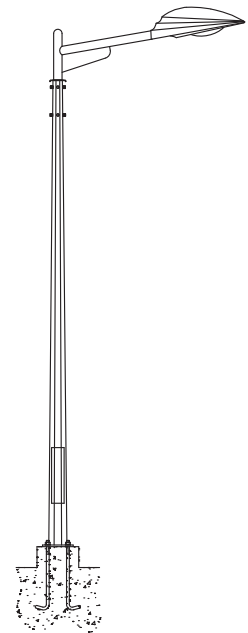
**SWAGED CIRCULAR POLE  
SURFACE MOUNTING**



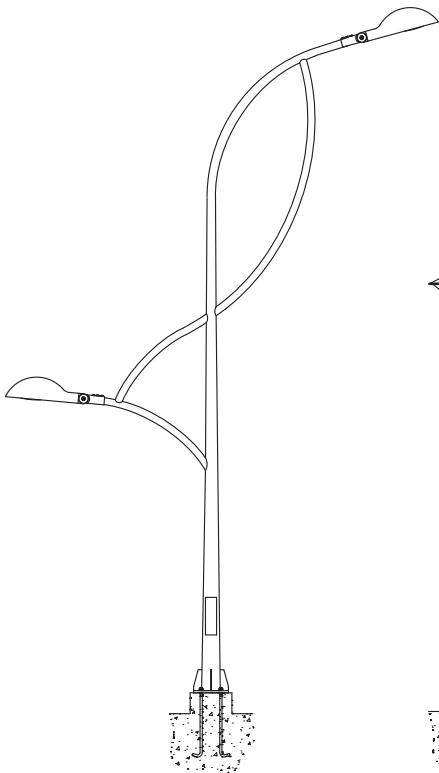
**SWAGED CIRCULAR POLE  
PLANTING**



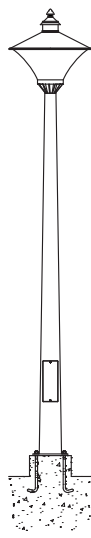
**SQUARE POLE**



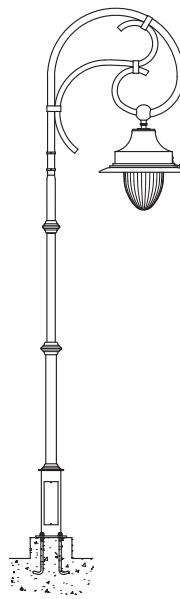
**CONTINUOUSLY TAPERED  
POLYGONAL ( OCTAGONAL ) POLE**



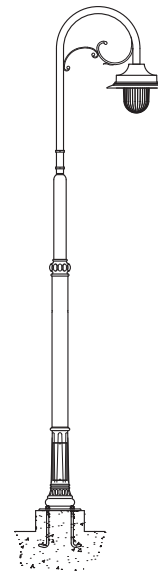
**CONTINUOUSLY TAPERED  
CIRCULAR POLE**



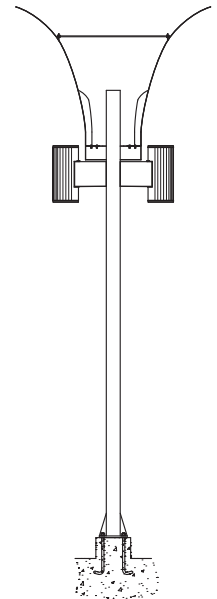
**CONTINUOUSLY TAPERED  
SQUARE POLE**



**POLE WITH DECORATIVE  
ELEMENTS**



**POLE WITH DECORATIVE  
CAST IRON EMBELLISHMENT**



**PREMIUM POLE**

# SALIENT ASPECTS OF POLES

## 1. GENERAL

**Metal Coats** design and manufacture poles with total commitment to consistent quality for lighting applications, besides those for signage, flag hoisting, etc. Bracket with required number of arms (single, dual, triple, etc.), meeting the requirements, arrived from lighting design form part of poles for lighting applications. Apart from meeting technical requirements, cast / fabricated / formed embellishments are added to enhance the aesthetic / decorative aspects to meet architectural requirements. Following are some of major proven strengths of **Metal Coats** -

- Cost effective optimum design, meeting the technical requirements, including those with challenging complications
- Manufacturing by processes and machines of State-of-the Art technology by trained personals
- Consistent quality
- Timely delivery.

Poles are classified as Swaged Circular, Octagonal, Conical, Square, Rectangular, etc. from the point of shape and as Surfaced and Planting types from the point of mounting. Some of our standard designs are pictorially represented on opposite page.

**Metal Coats** has also meeting clients' requirements in Design, Manufacture and Supply of custom built poles.

## 2. DESIGN

Poles are normally designed to withstand static and dynamic forces on shaft of the pole, bracket, over hang, luminaire, etc. due to mass of pole, overhanging mass, basic wind speed, as applicable to the location, wherein pole is installed, as referred to in IS : 875 - Part 3 (latest), Indian Standard for Code of Practice for Design Loads due to Wind.

Optimized design is adopted by selecting higher size at the bottom of the pole and diminishing either gradually or in steps. However, pole with same size from bottom to top is considered to meet specific requirements.

The length, inclination, etc., of the arm(s) forming part of the bracket are designed taking care of the photometric requirements, obtained from the lighting design and luminaire selection. Brackets for signage are designed depending on the sizes, technology for display, etc.

The baseplate, anchoring bolt size and numbers, etc., - in case of poles for surface mounting is designed to take care of static and dynamic forces experienced between the pole and base plate and those between baseplate and foundation. Gussets welded to disperse stress concentration between pole and base plate as well as to dampen oscillation.

The electrical junction / marshaling box, forming part of the pole is designed with one single pole MCB for protection and terminal blocks for incoming supply on loop - in and loop - out scheme, either for single phase two wire system or three phase four wire system. Threaded boss or stud is welded to pole for connection to earth continuity conductor ( by clients to their earthing sytem )

### 3. MATERIAL

#### 3.1 POLE AND BRACKET

Materials to the specification and grade indicated against each are used for poles and brackets :

(i) **Circular Tubes** : Steel tubes to grade either YSt 240 or YSt 310 to IS : 1161 (latest), Indian Standard Specification for Steel Tubes for Structural purposes, selected depending on the loading and required factor of safety.

Either in plain (un - galvanized) condition or in galvanized condition meeting the requirements of IS : 4736 (latest), Indian Standard Specification for Hot - dip Zinc Coating on Mild Steel Tubes.

(ii) **Square Hollow section** : Steel tubes to grade either YSt 240 or YSt 310 to IS: 4923 (latest), Indian Standard Specification for Hollow Steel Sections for Structural purposes, selected depending on the loading and required factor of safety.

(iii) **Polygonal and conical section** : Steel flat products to IS: 5986 (latest) Indian Standard Specification for Hot rolled Steel Flat Products for Structural Purposes.

(iv) **Base Plate** : Steel of grade Fe410 to IS : 2062 (latest), Indian Standard Specification for steel for general structural purposes.

(v) **Embellishments** : Cast iron / Cast Aluminium / MS formed.

### 4. CONSTRUCTION

#### 4.1 POLE

4.1.1 The swaged circular poles are made by joining tubes of different diameters, as arrived in the design (ie) with higher diameter at the bottom and reduced diameter in steps, thereafter. These sections are joined together by swaged joints ensuring rigidity, straightness, etc. meeting the requirements in clause 5.3, 5.3.1, 5.3.2, and 5.4 in IS: 2713 (Part I to III) - (latest).

The square poles are made by using hollow sections of required designation.

The octagonal and circular conical are made in one section generally upto 12M and in two sections thereafter. Each section is made by folding / forming trapezoidal steel sheets and by single longitudinal auto welding.

4.1.2. Following are the salient features of the process involved in case of swaged poles. Majority of the features are unique from ***Metal Coats***.

- The tubes are cut and square with the axis of tubes to required length.
- The cut edges are cleaned / dressed up.
- The tubes are swaged to the length specified in clause 5.4 of IS : 2713 (latest) or more in special purpose die swaging machines, achieving the required tolerance, for ensuring designed fit with total surface contact between tubes to be joined.

## SALIENT ASPECTS OF POLES

Length of swaged joints {clause 5.4 of IS : 2713 (latest)}

Outside Diameter of Smaller Tube in Joint mm	Length of Joint
76.1	200
88.9	230
114.3	300
139.7	350
165.1	400
193.7	450

- The swaged joints are made with hydraulic force.
- The tubes are circumferentially welded at the upper end of the joints at a slope of approximately 45°, using autoroto MIG welder by qualified operators under trained supervisors, even though the swaging is done by special purpose die swaging machines - a feature over and above that called for in IS : 2713 and the same is adopted for obtaining increased strength.
- Individual tube lengths of the poles (each section) are of single length (ie) tube with circumferential joint in a section is not used.

4.1.3. Special provision is incorporated to ensure high rigidity, wherever, circular tubes or hollow sections are joined without swaged joint.

### 4.1.4 ISS FOR DIMENSIONS OF SWAGED POLES

Indian Standard Specification No. IS : 2713 (Parts I to III) - 1980 furnishes dimensions and technical requirements of swaged poles (for overhead power lines). These details are made use of for swaged poles for application like lighting, signage, flag hoisting, etc. These details are furnished in annexure I and annexure II.

Annexure I (Page S13 - S15)

Dimensions and structural properties of swaged poles made from steel of YSt 240, UTS 410 Mpa (42 kgf / mm<sup>2</sup>)

Annexure II (Page S16 - S18)

Dimensions and structural properties of swaged poles made from steel of YSt 310, UTS 540 Mpa (55 kgf / mm<sup>2</sup>)

### 4.2. OCTAGONAL POLES

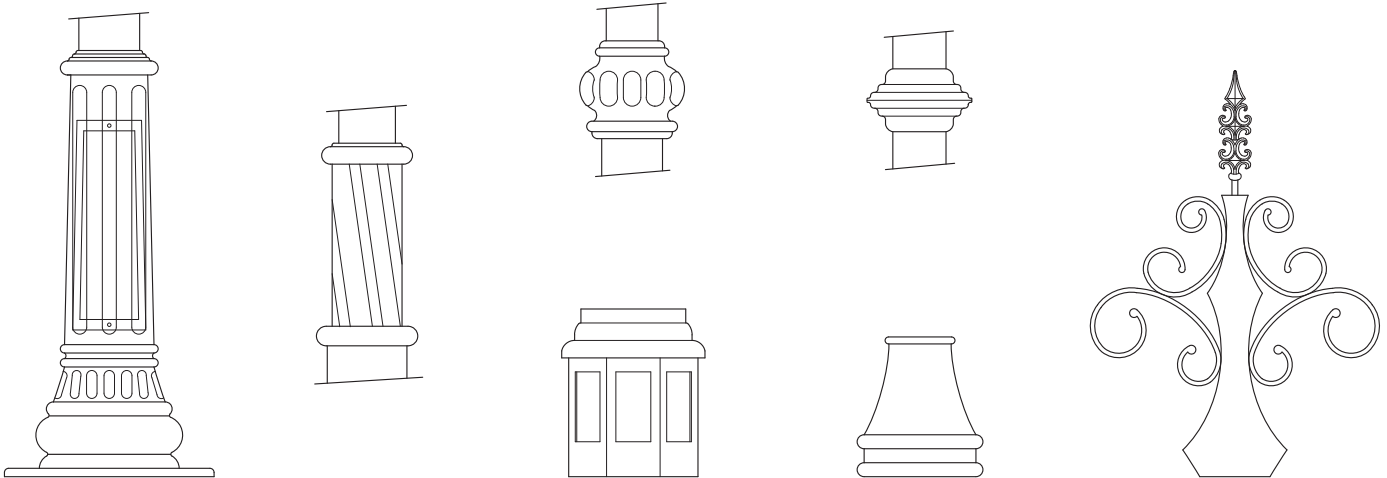
Octagonal poles are of continuously tapered with higher dimensions at the bottom and are manufactured from hot rolled steel by folding the trapezoidal sheet into octagonal shape and by single longitudinal submerged arc welding, Built-in junction is incorporated and base plate is welded by MIG processes.

### 4.3. CONICAL POLE

Conical poles are of continuously tapered with higher dimensions at the bottom and are manufactured from hot rolled steel by bending the trapezoidal sheet into circular shape and by single longitudinal submerged arc welding, Built-in junction is incorporated and base plate is welded by MIG processes.

### 4.4. DECORATIVE EMBELLISHMENTS

Special requirements for improving the aesthetic appearance are met by adding embellishments to the pole. A few of the embellishments are shown below.



### 4.5. BRACKET OF SPLIT CONSTRUCTION

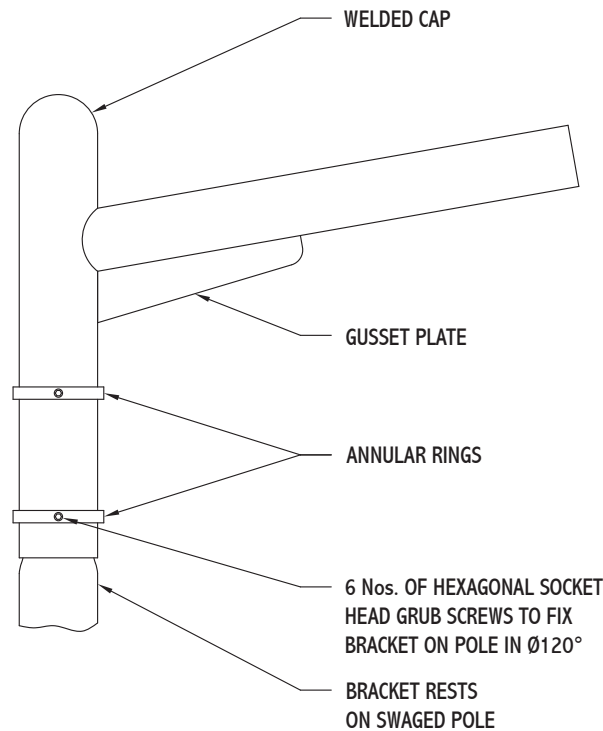
Bracket is an assembly with arm(s), attached to pole by Split Construction (ie) detachable part for mounting to the pole at site. This construction has the following advantages:

- Well suited for transportation of the pole.
- Permits orientation of the bracket / luminaire with reference to the road alignment for ensuring required optimum distribution of illumination;
- To take care of angular error in the alignment of foundation bolts, if any.

## SALIENT ASPECTS OF POLES

### 4.5.1 SPLIT CONSTRUCTION FOR SWAGED CIRCULAR POLE

The arrangement adopted for split construction for swaged poles is generally as shown in the sketch below



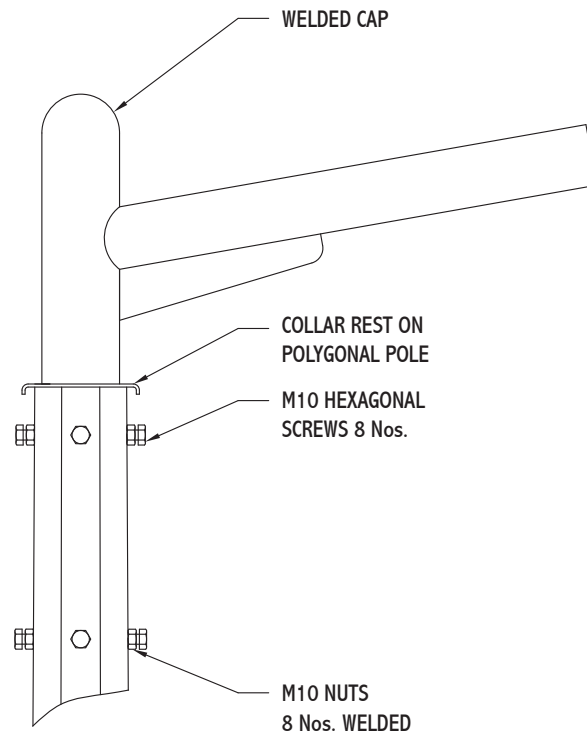
**SPLIT CONSTRUCTION FOR SWAGED CIRCULAR POLE**

This arrangement, in view of the following technical aspects, ensure very rigid and reliable joints:

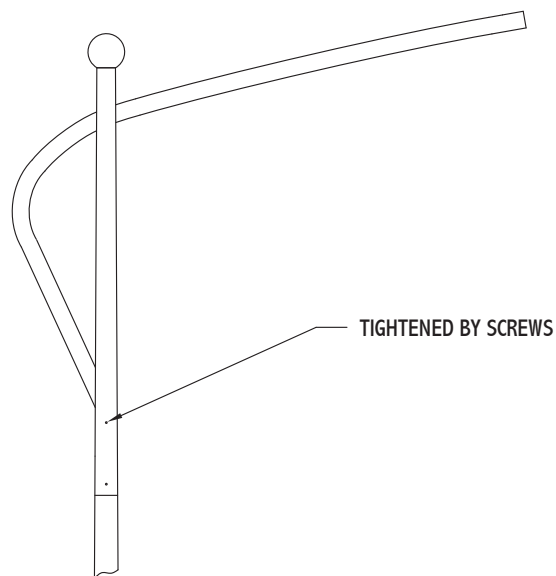
- Sliding fit with very close tolerance is maintained between the outer diameter of the pole and inner diameter of the mating pipe of the bracket
- The joint is tightened by six number of hexagon socket head grub screw - three numbers at 120° apart in each of the two annular rings
- These two annular rings have been welded to the pipe of the bracket to have increased depth of tapered holes for the hexagon socket head grub screws.
- These two rings are welded with wide spacing to ensure rigidity
- The depth of swaging is as per relevant standard
- The direction of insertion at the swaging has been so made that water does not enter inside the pole.

## 4.5.2. SPLIT CONSTRUCTION FOR OCTAGONAL AND CONICAL POLES

The arrangement is generally same as adopted for swaged circular pole, except, screwing pieces are provided on pole and hex head screws are tightened in these screwing pieces.



SPLIT CONSTRUCTION FOR OCTAGONAL POLE



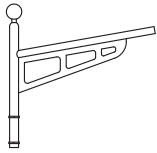
SPLIT CONSTRUCTION FOR CONICAL POLE

## SALIENT ASPECTS OF POLES

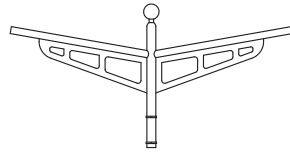
4.5.3. Brackets are supplied as separate sub assembly to facilitate economical and damage free transportation and installation at site with ease.

4.5.4. The outreach and angle of inclination of the arm forming part of the bracket are adopted to suit the individual application of the road lighting. A few members are added to the bracket to improve the rigidity, besides as needed by architectural and aesthetic considerations.

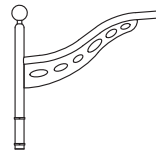
4.5.5. Some of the standard shaped brackets of **Metal Coats** are depicted below. However, changes If any required will be incorporated, subject to feasibility.



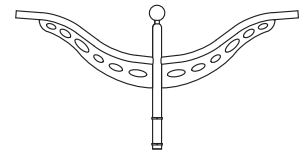
MODEL : FRANCO - SINGLE



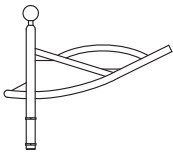
MODEL : FRANCO - DUAL



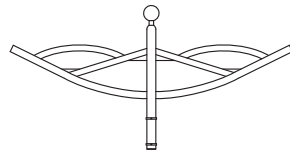
MODEL : CUCKOO - SINGLE



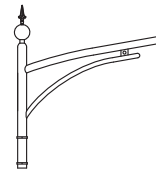
MODEL : CUCKOO - DUAL



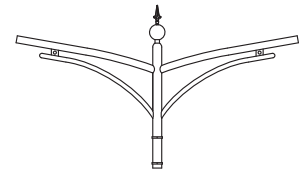
MODEL : KNOTTY - SINGLE



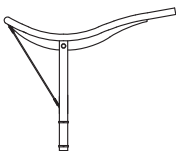
MODEL : KNOTTY - DUAL



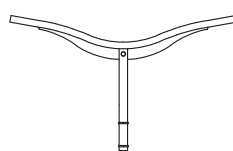
MODEL : AMERICAN - SINGLE



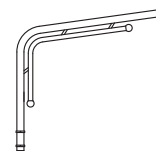
MODEL : AMERICAN - DUAL



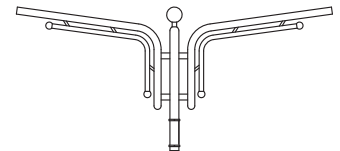
MODEL : NEERO - SINGLE



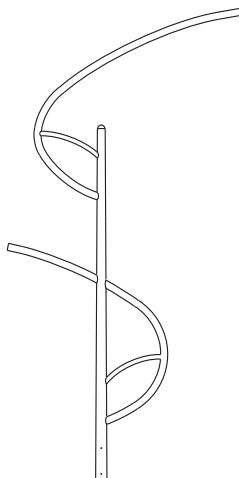
MODEL : NEERO - DUAL



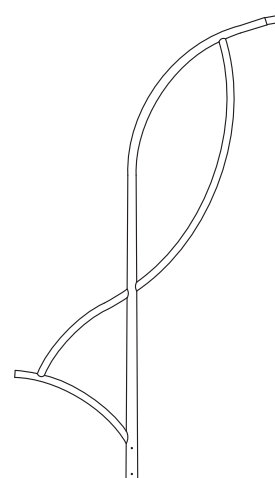
MODEL : PALIO - SINGLE



MODEL : PALIO - DUAL



MODEL : CONICAL NOSEE



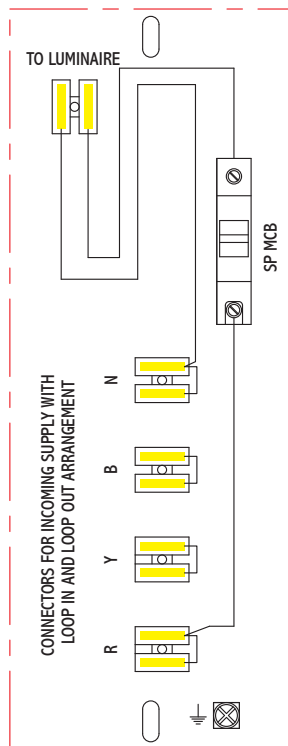
MODEL : CONICAL SNAKY

## 4.6 BASE PLATE

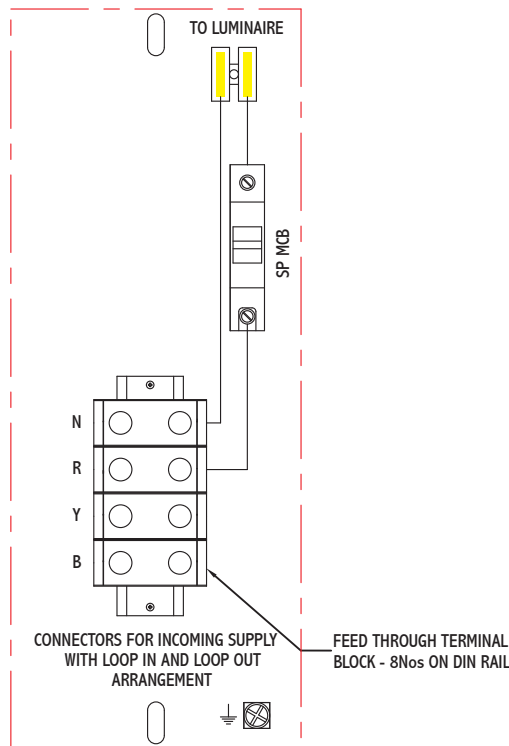
Surface mounted poles are welded to base plate for mounting on a foundation. Gussets are welded to disperse the stress concentrations and to dissipate / dampen the oscillations. Holes of required diameter and numbers are provided to suit the size of the foundation bolts. Required hole is provided in the gusset to attach the hook, during lifting the pole for installation. Base plate is welded to pole of planting type for improved anchoring.

## 4.7 ELECTRICAL JUNCTION / MARSHALLING BOX

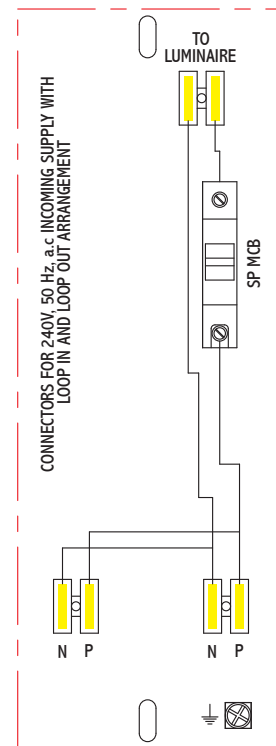
Electrical junction box is generally provided at the bottom section of pole, in case of surface mounted poles and in a separate enclosure, in case of planting type poles. Terminals / Connectors for incoming supply cables in loop-in and loop-out scheme, MCB of required rating, connector for terminating the cable from the luminaire are provided inside this junction box - either for 240V single phase distribution or for 416V three phase four wire distribution. Weather proof and vandal resistant door is provided.



**CIRCUIT DIAGRAM IN ELECTRICAL JUNCTION BOX FOR 416V, 50Hz, ac, THREE PHASE, FOUR WIRE SYSTEM WITH 10A PORCELIN B - CONNECTOR**



**CIRCUIT DIAGRAM IN ELECTRICAL JUNCTION BOX FOR 416V, 50Hz, ac, THREE PHASE, FOUR WIRE SYSTEM WITH FEED THROUGH TERMINAL ON DIN RAIL**



**CIRCUIT DIAGRAM IN ELECTRICAL JUNCTION BOX FOR 240V, 50Hz, ac, SINGLE PHASE SUPPLY WITH ABS B - CONNECTOR**

## SALIENT ASPECTS OF POLES

### 4.8 EARTHING

Standard earthing arrangements with a tapped boss is provided in each pole. Special earthing requirements if any, will be complied with.

### 5. TOLERANCE

The pole complete is manufactured within the tolerances furnished below :

Outside diameter	:	$\pm 1.0\%$
Thickness	:	-1.0%
Length	:	$\pm 25\text{mm}$ on overall length
Weight	:	-7.5%
Straightness	:	Less than 1/600 of the length

### 6. CORROSION PROTECTION

**Metal Coats** meets the requirements of corrosion protection and finish with different technologies. Some of them are -

- Hot - dip zinc coating (galvanizing) on plain surfaces,
- Usage of galvanised tubes,
- Aliphatic Polyurethane paint over compatible primer on plain surfaces,
- Aliphatic Polyurethane paint over penetrating primer on galvanised surfaces,
- Zinc chromate red oxide primer,
- Aluminium or any other paint over zinc chromate red oxide primer,
- Powder Coating can be done for poles with a height of 3.5 M (12') and below.

#### 6.1 HOT - DIP ZINC COATING (GALVANIZING)

Hot - dip zinc coating is done following the processes for degreasing, pickling, rinsing, fluxing and drying and the same has the following advantages:

- (i) Most efficient way of protection of steel against corrosion.
- (ii) Protection is offered both to internal and external surfaces.
- (iii) Longer life and does not need maintenance.

- (iv) Resistant to fading, chalking and environmental ageing.
- (v) Best suited for saline atmosphere and air borne pollutants like acid rains.
- (vi) Excellent adhesion offering increased protection against scratching, etc.,
- (vii) Not affected by Sun's UV radiation.
- (viii) Highly heat and fungus resistant as compared to paints

Circular tubes to IS : 1161 (latest) are Hot - dip zinc coated for minimum mass of 400 g / M2 to IS : 4736 (latest) Indian Standard Specification for Hot - dip Zinc Coatings on Mild Steel Tubes, .

Poles made of steel sheets to IS: 5986 (latest) are Hot - dip zinc coated for minimum mass of 460 g / M2 to IS : 4759 (latest) Indian Standard Specification for Hot - dip Zinc Coatings on structural steel.

### 6.2 USAGE OF GALVANISED TUBES

Alternative method for corrosion protection of circular poles is by making use of zinc coated tubes, as covered in clause 8.1 in IS : 4736 (latest). In this method, a special solution by name 'zinga' is applied on the zones where the zinc coating is affected by processing like cutting, welding, etc. Thereafter a coat of paint is applied over penetrating primer.

### 6.3 ALIPHATIC POLYURETHANE PAINT OVER EPOXY PRIMER

The poles, on completion of manufacturing processes are thoroughly cleaned by sand blasting / cylindrical grinding. Aliphatic based polyurethane (PU) paint on high performance epoxy primer made with anti corrosive pigment is applied, following the manufacturer's recommendations. PU paint offers the following salient advantages, which are essential for poles, used under outdoor application:

- Best against the effects of UV radiations, like chalking, fading, etc.,
- Very high gloss retention
- Best against salt spray corrosion (ie) more suitable for use in coastal atmosphere
- High flexibility
- High impact resistance
- High scratch resistance
- High mar resistance
- Excellent against sand abrasion.

## SALIENT ASPECTS OF POLES

### 6.4. ALIPHATIC POLYURETHANE PAINT OVER ANTI CORROSIVE ZINC PHOSPHATE PRIMER ON GALVANISED SURFACES

In case of need to meet very adverse atmospheric conditions as well as to meet the requirements from the point of aesthetic appearance, poles dealt in Para : 6.1 and 6.2 are coated by polyurethane paint over the high performance on anti corrosive primer.

### 6.5. ANTI CORROSIVE PRIMER

The high performance anti corrosive primer, is applied post completion of manufacturing processes and thorough cleaning by sand blasting / cylindrical grinding.

6.6 ANY OTHER PAINT INCLUDING ALUMINIUM PAINT CAN BE APPLIED ON ANTI CORROSIVE PRIMER, referred to in Para : 6.5, above.

### NOTE

1. ***Metal Coats*** generally adopt polyurethane painting process. Other protective processes are adopted in case of specific requirements by the client.
2. The standard choice of colours in enamel and polyurethane paints are Off white, Signal Red and Olive Green other shades including metallic are offered on request.

### 7. TESTS

The fully manufactured poles meet the requirements of the tests specified in IS : 2713 (latest), as applicable.

### 8. ACCESSORIES

- (i) Anchoring bolts, nuts, etc., for installing the pole on foundation, as called for in the respective foundation drawing can be supplied with the poles.
- (ii) Template can be supplied to facilitate positioning of the foundation bolts, ensuring correct pitch distance.