

Pole Foundation Design



Introduction

Pole installation is a common requirement of all the smart city development projects. Installation of WiFi Hotspots and access points, Smart lighting systems, CCTV surveillance camera and various types of sensors make use of poles for installations. To make the process of pole installation easy and optimized in terms of cost of installation and time taken for installation of the same, the white paper is written to give details of various options and the finalize the optimum design for smart city applications

Criteria for Pole Foundation Selection

This guide is prepared for conceptual purpose and preliminary estimating of foundation design for pole installation only. Determination of suitability should be based on actual conditions at site and final



designs for construction purposes must be validated by a certified professional engineer.

1. Wind Load Assumptions

Under certain circumstances, extra assumptions are necessary to prevent wind induced vibrations on poles. In steady low wind speed situations (70-90kmph) with poles 7 meter or higher have a higher probability of wind induced harmonic vibrations. This may cause poles to fall because of fracture between the weld and the base

plate. Geographical location may contribute to this type of vibration; furthermore open lands are most susceptible to harmonic vibration due to wind speed.

2. Cement Concrete Consideration

Typical poles have a setting depth based on a definite empirical formula which comes out to be approx. 21% of pole buried and rest aerial. Assuming Wind load that pole may be accustomed to additional support for grouting pole base by anchor fastener or HILTI may be provided for additional strengthening purpose based on actual site condition

Concrete Grade & Mix:

As per IS 456:2000, the code of practice for normal and reinforced concrete, Letter M represents mix (Concrete Mix) and number followed after M represents the compressive



strength to be attained in N/sq.mm at 28 days age when a standard cube of 150X 150 mm is subjected to standard compressive strength. Thus a concrete of M20 grade should attain a compressive strength of 20N/sq.mm at 28 days of age. Generally grades of concrete lower than M20 are not to be used for RCC work. Here N = Newton, mm = millimeter.

Concrete Grade:

General expression for the proportions of cement, sand and coarse aggregate is 1: n : 2n by volume.

M5 = 1:4:8 (1 portion of cement, 4 portion of sand and 8 portion of coarse aggregate)

M10 = 1:3:6 ; M15 = 1:2:4; M20 = 1:1.5:3; M25 = 1:1:2

to hold the base plate. Pole is later fastened to the base plate on the anchor bolts.

Precast Muff Design

Pre cast RCC Muff is fixed in the ground and the pole is mounted inside the Muff with PCC all around the pole inside the muff. This gives a faster and economical way to install the average sized poles upto a length of 6-12 m poles.

to the Cast in situ option, muff design is better as it involves lesser labor and time for installation. RCC takes a curing time 5-6 days before the pole can be installed whereas the muff design takes 2-3 days

2. Cost of Installation – Comparison is given below.

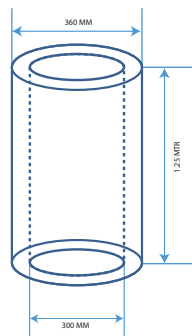


Table 1		
Contents Annexure	Muff Design	RCC structure (600 X 600 X 500)
Concrete Mix Cost M 25	300	1000
Material Cost	800	1500
Labor	1200	2000
Transportation	200	700
Approximate Installation Cost	2500	5200

3. Foundation designs and installation method

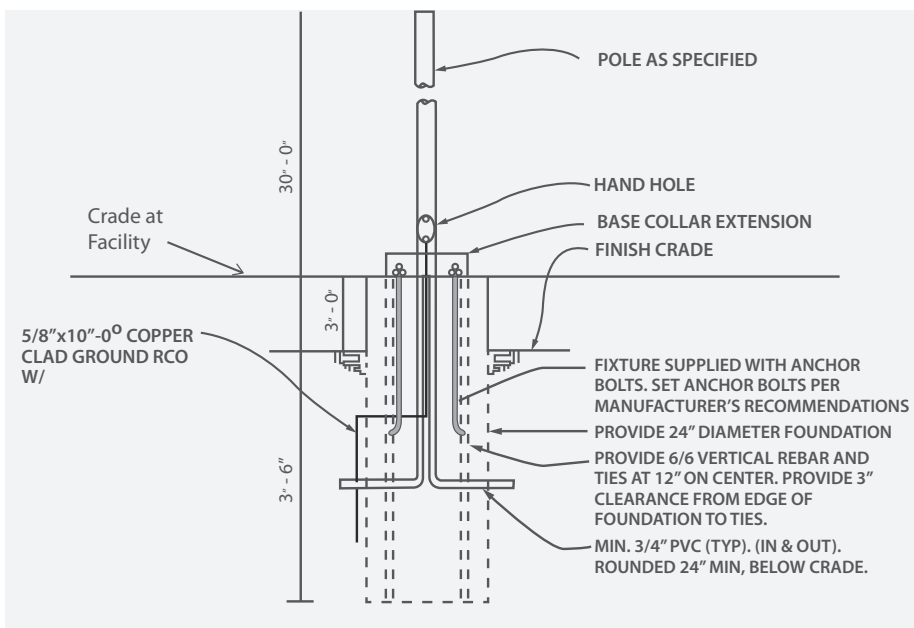
Cast in Situ foundation: Basis the selection of the concrete mix, pole foundation is cast with anchor bolts

4. Comparison between the above designs

1. Ease of installation- As compared

5. Recommended Pole Foundation:

Basis the above analysis and business requirements, we recommend to use the Muff design of pole foundation for all smart city applications in Smart lighting, CCTV Camera Installation, WiFi Hotspot and Access point Installation.



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