



**3.0 MT INTEGRATED STEEL PLANT OF N.M.D.C.  
AT NAGARNAR, DIST. - BASTAR, CHATTISHGARH  
COAL HANDLING PLANT ( PART AREA ONLY )  
GEOTECHNICAL RECOMMENDATION FOR TURNKEY PACKAGES  
( Document No. : MEC/11/11/Q6QZ/CHP/Part-A/GR, Rev 0 )**

**01 INTRODUCTION**

The Geotechnical recommendation furnished herein shall be considered by all turnkey bidders, for Civil foundation design, for part area of CHP, falling within earlier land boundary of NMDC & excluding CHP area falling within the newly acquired land of NMDC. If any deviation is found between any clause set out in this document & any earlier clarification, the clause set out in this document shall govern.

The stipulation furnished herein are binding for bidding, designing, engineering & execution of all civil foundations for aforesaid portion of CHP area.

**02 SUB-SURFACE**

The sub-surface generally consists of a top Fill layer (Stratum-I), if any, followed by varying thickness of residual virgin Soil deposit (Stratum-II), which is underlain by completely to highly weathered, disintegrated & decomposed rock layer (Stratum-III). Here, Fill layer (Stratum-I) indicates Fill, if any, mentioned in the attached borelogs, as well as, Fill required to be used for site terracing to reach to the final Terrace Level (TL). Stratum-I may be absent in some of the locations.

To get preliminary & indicative idea of sub-surface stratification, the attached borelogs (BH - 60, BH - 61, BH - 101 to 104, BH - 210, BH - 216 to 218, BH - 221 to 223, BH - 243 & BH - 246) may be studied. The successful bidder may like to conduct pilot boring, if felt necessary by him, to ascertain the depth & thickness of different strata, at specific locations, for their purpose of assessment of foundation (open &/or pile) depth only. The outcome of such pilot boring, if conducted by the successful bidder, shall neither have any implication on the maximum limit of Bearing Capacities of different strata, Pile Capacity &/or any other stipulation, specified in this document, nor have any commercial implication, whatsoever.

For Design purpose, Ground Water Table (GWT) shall be considered at TL.

**03 CHOICE OF FOUNDATION**

Open foundation, in Stratum-II or III shall be adopted for proposed structures, as per design requirement following the recommended maximum limit of Net Allowable Bearing capacity, stipulated herein, satisfying the relevant provisions of section 03.A of this document.

**03.A OPEN FOUNDATION :**

**03.A.01** Open foundation shall be placed at a depth, not less than 1.0 m below the bottom of any Fill layer (Stratum-I).

**03.A.02** Minimum Depth of Open foundation shall be 1.5 m from TL.

**03.A.03** In case any localized soft / loose spot is encountered at founding level, the same shall be replaced completely as stipulated below, before placing mud-mat for foundation,

- by PCC, wherever required Net Allowable Bearing Capacity is more than 10 ton/m<sup>2</sup>, or
- by compacted (not less than 70 % Relative Density) medium to coarse Sand, wherever required Net Allowable Bearing Capacity is less than 10 ton/m<sup>2</sup>.

**03.A.04 Open Foundation in Virgin Soil (Stratum-II)**

Design Bulk Density of Stratum-II shall be considered as 1.85 gm/cc.

In virgin soil layer, Net Allowable Bearing Capacities for Open foundation shall be limited to the following.

Depth from TL ( m )	Width, B ( m )	Net Allowable Bearing Capacity ( ton / m <sup>2</sup> )	
		L / B ≤ 2	L / B ≥ 10
1.5 m	≤ 2.0	14	13
	4.0	12	10
	6.0	10	9
	> 7.0 (Raft)	12	11
3.0 m	≤ 2.0	20	18
	4.0	17	14
	6.0	15	12
	> 7.0 (Raft)	16	15
6.0 m & below	≤ 3.0	25	23
	4.0	24	21
	6.0	22	20
	> 7.0 (Raft)	20	18

- Bearing capacity for intermediate size & depth can be evaluated by rectilinear interpolation.

### **03.A.05 Open Foundation in completely to highly weathered, disintegrated & decomposed Shale / Mudstone deposit (Stratum-III)**

In completely to highly weathered, disintegrated & decomposed rock layer (Stratum-III), Open foundation shall be placed with a minimum embedment of 1200 mm within such layer & maximum value of Net Safe Bearing Capacity shall be limited to **30 ton/m<sup>2</sup>** for any size of footing.

However, for an embedment of at least 3000 mm within Stratum-III, the maximum value of Net Safe Bearing Capacity shall be limited to **35 ton/m<sup>2</sup>** for any size of footing.

There will not be any increase in Net Safe Bearing Capacity with depth, apart from the above.

Design Bulk Density of Stratum-III shall be considered as 2.0 gm/cc.

Stratum-III materials shall be recognized at site by its identifiable colour & texture in foundation excavation, as well as SPT 'N' > 100.

### **03.B PILE FOUNDATION :**

In case, Pile foundation is adopted, then Bored Cast-in-situ RCC (M-25) Pile shall be used. The termination depth of such piles shall not be less than 25 m from TL. The capacities of such piles shall be limited to the following.

#### **03.B.01 Recommended maximum Vertical Capacities of single Pile ( Ton ) :**

Loading Pattern	Pile Diameter (mm)				
	500	550	600	750	1000
Compressive	85	105	125	190	345
Uplift	42	51	61	96	170

The Piling equipment shall be capable to penetrate upto the termination depth, through the completely to highly weathered, disintegrated & decomposed, greyish brown / brownish grey, Shale / Mudstone layer (Stratum-III) & its underlying highly to moderately weathered, whitish grey, Shale deposit (Stratum-IV), which may be encountered tentatively at 538 m RL or below. Rock socket length not less than 5D within Stratum-IV shall also to be ensured. Centre to centre distance for the above piles shall be at least 2.5 D, where 'D' is the diameter of pile.

### 03.B.02 Lateral Pile Capacity

Following stipulations shall be followed for Lateral Capacity of Piles.

**Recommended Lateral Capacities of single Pile ( Ton ) :** ( for fully Fixed Head condition )

Maximum value of Lateral Capacity shall be limited to the following.

Category	Parameter	Pile Diameter (mm)				
		500	550	600	750	1000
Piles passing through Fill	Lateral Capacity (ton)	3.5	4	4.5	5.5	7
	$L_f$ (m)	5.6	6.1	6.7	8.3	11.1
Piles passing through virgin Soil	Lateral Capacity (ton)	6.0	6.5	7.0	9.0	12.0
	$L_f$ (m)	4.3	4.7	5.2	6.5	8.6

For fully Free Head condition, the above capacities shall be reduced to one-third.

Maximum moment due to lateral load shall be evaluated as per Section C-2, Appendix C, Amendment No. 3, 1987 of IS : 2911 (Part-1/Sec 2) -1979. ' $L_f$ ' is the equivalent length of cantilever as defined in the above code.

### 03.B.03

In case, Pile foundation is adopted, the enclosed Piling TS No. MEC/11/11/Q6QZ/Pile/TS shall have to be followed for the same.