Design of Foundation:

* Combined Foundation of Foundation Slab + thickness of 200 mm

8 piles: $d = 0.91 \text{ m}$, length $L = 16 \text{ m}$

* 70% of load goes to piles, 30% of load taken by foundation slab.

* Number of heaviest loaded column = 3390 kN

* Load on pile = 2373 kN

* Ch. load on pile = $\frac{2373}{14} = 169.5 \text{ kN}$

* Load bearing capacity of pile: According to Foundation 1 class procedure

* Dp Soil Section consists of 3.0 m of soft clay & 4.0 m of stiff clay below with consistency index IC. Borehole supported by bentonite clay & the pile will be centered at the maximum with in 8 hours after boring.

* $E_c = 2360 \text{ MPa}$ * Pile: $d = 0.37 \text{ m}; L = 15 \text{ m}$

* Soil: $I_c = 0.3; C_{u} = 26.0 \text{ kPa}; \gamma_b = 20 \text{ kN/m}^3; z_b = 8.0 \text{ m}$ (Accretion Settling)

* Ch. Settlement
Shaft Resistance:

\[ R_{shk} = \frac{m}{3} \times C_p \times \sum_{i=1}^n \frac{D_i}{C_{ui}} \]

\[ H_s = 0.5 \text{ (bentonite sandy)} \]

\[ C_p = 21.7r = 21.7 \times 3.15 = 67.8 \text{ kN/m} \]

\[ D_p = 3m = 16.3 = 16.3 \text{ m} \]

\[ C_{ui} = 60 \text{ kPa} \]

\[ R_{shk} = 0.5 \times 2.83 \times 13 \times 60 = 1352 \text{ kN} \]

Pile Resistance At Fully Mobilized Skin Friction:

\[ R_y = \frac{R_{shk}}{1 - B} \]

\[ B = B_i \times C_{ui} \]

\[ B_i = \frac{Fy(D_i d)}{D_i} = \frac{13}{0.9} = 14.5 \]

\[ C_{ui} = F(D_p d; k) \]

\[ D_p = \frac{16}{0.9} = 17.8 \]

\[ K = \frac{E_c}{E_s} = \frac{2300}{8} = 287.5 \]

\[ \beta = 0.93 \times 0.93 = 0.86849 \]

\[ R_y = \frac{R_{shk}}{1 - B} = \frac{1352}{1 - 0.86849} = 840 \text{ kN} \]

Resistance of Pile Toe:

\[ R_{pil\text{toe}} = \frac{m \times A \times C_{ui} \times L_c}{u} = 0.7 \times 0.7 \times 549 \times 9 \times 60 = 266,884 \text{ kN} \]

\[ \mu_0 = 0.87 \]

\[ \theta = 2 \times 9 \times 0.9 = 28 \text{ (coning of C_{capacity})} \]

\[ A = \frac{P}{q} = \frac{0.7854}{q} = 0.7854 \text{ m}^2 \text{ (Area of toe contact with Subsoil)} \]

\[ C_{ui} = 60 \text{ kPa} \]
Total Resistance of the pile Under Compression:

\[ P_{el} = \frac{R_{bk}}{\gamma_b} + \frac{R_{sk}}{\gamma_s} \]

\[ \gamma_b = 3.25 \quad \gamma_s = 1.0 \]

\[ P_{ej} = \frac{266.9}{1.25} + \frac{1460}{1.0} = 1700\text{ KN} \quad > N = 1695\text{ KN} \]

The pile is calculated for settlement Maximum = 10 mm Under Characteristic Load.