



#### 4.2 BEARING CAPACITY OF FOUNDATION

For example, a concrete pile with the dimensions 0.4 x 0.4 x 22.0 m is taken, the calculation is as follows:

$$\begin{aligned} P &= 1.6 \text{ m} \\ A_s &= 0.16 \text{ m}^2 \end{aligned}$$

Applying formula

$$\begin{aligned} \text{and formula} \quad Q_{ult} &= C N_c s A_s + C_A 2 \pi R L \\ Q_{ult} &= q A_s + (K_H/2) \gamma_{sub} L^2 \tan \delta * P \\ \text{where } q &= \gamma_{sub} R N \gamma + K_B * \gamma_{sub} * L * N_q - \gamma_{sub} * L \end{aligned}$$

At the borehole UV-01, with following parameters:

- Layer 1 + layer 2 :

$$\begin{aligned} L &= 18.0 \text{ m.} \\ C &= 0.068 \text{ kg/cm}^2 = 0.680 \text{ T/m}^2 \\ C_A &= 0.680 \text{ T/m}^2 \\ \gamma_{sub} &= 0.462 \text{ T/m}^3 \end{aligned}$$

- Layer 3a :

$$\begin{aligned} L &= 4.0 \text{ m} \\ \phi &= 30^\circ \\ \phi' &= 35^\circ \\ \gamma_{sub} &= 0.976 \text{ T/m}^3 \\ K_H &= 0.5 \\ \tan \delta &= 0.25 \\ K_B &= 0.4 \\ N \gamma &= 40 \\ N_q &= 40 \\ \tan \delta &= 0.25 \end{aligned}$$

Because the pile gets through 3 layers so the total bearing capacity is the sum of skin friction through all layers (layer 1 + layer 2 and layer 3a) and bearing capacity of tip in layer 3a:

Calculation:

$$\begin{aligned} \text{Layer 1 + 2 : } Q_{1+2} &= C_A 2 \pi R L \\ &= 0.680 \text{ T/m}^2 \times 1.6 \text{ m} \times 18.0 \text{ m} = 19.584 \text{ T.} \end{aligned}$$

$$\begin{aligned} \text{Layer 3a : } Q_{3a} &= q A_s + P_o \times K_H \times \tan \delta \times L \times P \\ Q_{3a-1} &= P_o \times K_H \times \tan \delta \times L \times P \end{aligned}$$

$$P_o = 0.462 \times 18.0 + 0.976 \times 4.0/2 = 10.268 \text{ T/m}^2$$

$$Q_{3a-1} = 10.268 \times 0.5 \times 0.25 \times 4.0 \times 1.6 = 8.214 \text{ T}$$

$$Q_{3a-2} = q \times A_s$$

$$q = \gamma_{\text{sub}} R N_\gamma + K_B * \gamma_{\text{sub}} * L * N_q - \gamma_{\text{sub}} * L$$

$$q = 0.976 \times 0.2 \times 40 + 0.4 \times 0.976 \times 4.0 \times 40 - 0.976 \times 4.0 = 66.368 \text{ T}$$

$$Q_{4-2} = q \times A_s = 66.368 \times 0.16 = 10.612 \text{ T}$$

$$Q_{\text{total}} = Q_{1+2} + Q_{3a-1} + Q_{3a-2} =$$

$$Q_{\text{total}} = 19.584\text{T} + 8.214 \text{ T} + 10.612 = 38.410 \text{ T}$$

Choosing safety factor  $F_s = 3$  ,  $Q_{\text{ult}} = 12.803 \text{ T}$

### *Conclusion*

With the above mentions, some following remarks can be made :

- Up to 30.0 m deep, the foundation is constructed by Holocene and Pleistocene deposit layers. The Holocene deposits have low bearing capacity.
- According to load of construction, foundation can be put on the layer 2 after improving, may be to use cajepit pile foundation, sand pile foundation or draining plastic stripes (for small load construction) or use concrete pile foundation to transmit the construction load to Pleistocene deposit soil layers ( layer 3, layer 3a or layer 3b)

Calculation for a concrete pile at borehole UV-01 with section (0.4 x 0.4m) and length of 25.0m has following results :

$$Q_{\text{ult}} = 12.803 \text{ T} .$$

### 4.3 OBSTACLES DURING DRILLING.

During drilling at some the boreholes caught some rotten woods have not yet completely disintegrated when drill through layer 2 (Very soft, high plasticity blackish grey).