

ENCE 4340 Foundation Engineering Fall 2011 Homework # 5 (due: 11-30-2011)

Problem #1: Refer to Figure P12.1. Determine the net allowable point bearing capacity of the drilled shaft.

Given : $L_1 = 6m$; $L_2 = 3m$; $\gamma_c = 15.6 \text{ kN/m}^3$; $\gamma_s = 17.6 \text{ kN/m}^3$

$\phi' = 35^\circ$; $c_u = 35 \text{ kN/m}^2$; $D_s = 2m$; $D_b = 1.2m$, Factor of safety = 3

Use Equation 12.18

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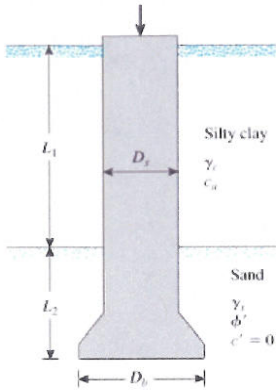


Figure P12.1

Eqn 12.18 $Q_{pNET} = A_p q' (\omega N_q^* - 1)$

$$q' = L_1 \gamma_c + L_2 \gamma_s = 6(15.6) + 3(17.6) = 146.4 \frac{\text{KN}}{\text{m}^2}$$

$$A_p = \frac{\pi}{4} D_b^2 = \frac{\pi}{4} (2)^2 = 3.14 \text{ m}^2$$

Eqn 12.19 $N_q^* = 0.21 e^{0.17 \phi'} = 0.21 e^{0.17(35)} = 80.6$

$$\frac{L}{D_b} = \frac{6+3}{2} = 4.5 \quad (\text{use } 5)$$

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From Fig. 12.10 (p651) $\omega = 0.82$

$$Q_{pNET} = 3.14 (146.4) (0.82 \times 80.6 - 1) = 29922 \text{ KN}$$

$$Q_{ALL} = \frac{Q_{pNET}}{FS} = \frac{29922}{3} = 9974 \text{ KN}$$



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Problem # 2 : A concrete pile 15 m long having a cross section of 0.38m x 0.38 m is fully embedded in a saturated clay layer.

For the clay, given : $\gamma_{sat} = 18\text{kN/m}^3$; $\phi = 0$; and $c_u = 80\text{kN/m}^2$.

Determine the allowable load that the pile can carry (FS = 3).

Use the λ method to estimate the skin resistance.

Fig. 11.9
(p 576)

$L = 15\text{ m}$ $\lambda = 0.2$

$$\bar{\sigma}_0' = \frac{(15 \times 18)}{2} = 135 \frac{\text{KN}}{\text{m}^2}$$

$$Q_s = pL f_{AV} = pL \lambda (\bar{\sigma}_0' + 2c_u) = (4 \times 0.38)(15)(0.2(135 + 2(80)))$$

$$Q_s = 1345.2 \text{ KN}$$

$$Q_{ALL} = \frac{Q_s}{FS} = 448.4 \text{ KN}$$

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$Q_{ALL} = 448.4 \text{ KN}$ ✓