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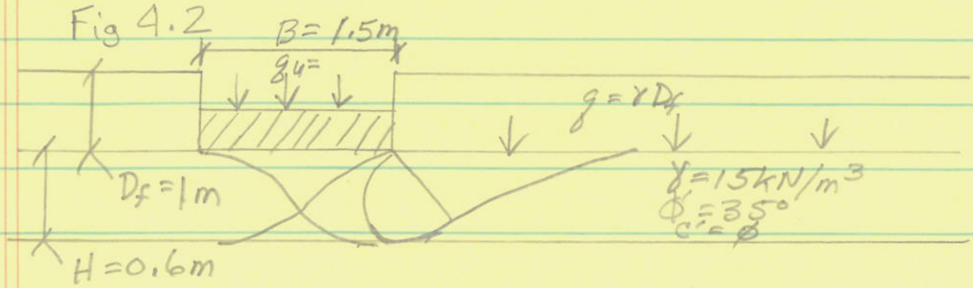
4.2 Square foundation, $B = 1.5m$, $L = 1.5m$, $D_f = 1m$,

Pg 220 $H = 0.6m$, $\phi' = 35°$, $c' = 0$ & $\gamma = 15\,kN/m^3$; Use FS=3

Fig 4.2



Determine gross allowable load. Use Eq [4.3]

$$\boxed{4.6} \quad q_u = q N_q^* F_{qs}^* + \frac{1}{2}\gamma B N_\gamma^* F_{\gamma s}^* \qquad H/B = \frac{0.6m}{1.5m} = 0.4$$

Fig 4.4 $N_q^* = 325.0$

Fig 4.5 $N_\gamma^* = 131.6$

Fig 4.6 $m_1 = 0.579$

$m_2 = 0.586$

$$\boxed{4.4} \quad F_{qs}^* = 1 - m_1\left(\frac{B}{L}\right) = 1 - 0.579\left(\frac{1.5}{1.5}\right) = 0.4214$$

$q = \gamma D_f = (15)(1) = 15\,kN/m^2$

$$\boxed{4.5} \quad F_{\gamma s}^* = 1 - m_2\left(\frac{B}{L}\right) = 1 - 0.586\left(\frac{1.5}{1.5}\right) = 0.414$$

$$\boxed{4.6} \quad q_u = (15\,kN/m^2)(325.0)(0.4214) + \frac{1}{2}(15)(1.5)(131.6)(0.414)$$

$q_u = 2667.25\,kN$

$$Q_{ALL} = \frac{q_u B^2}{FS} = \frac{(2667.25)(1.5)^2}{3} = \boxed{2{,}000.4\,kN}$$

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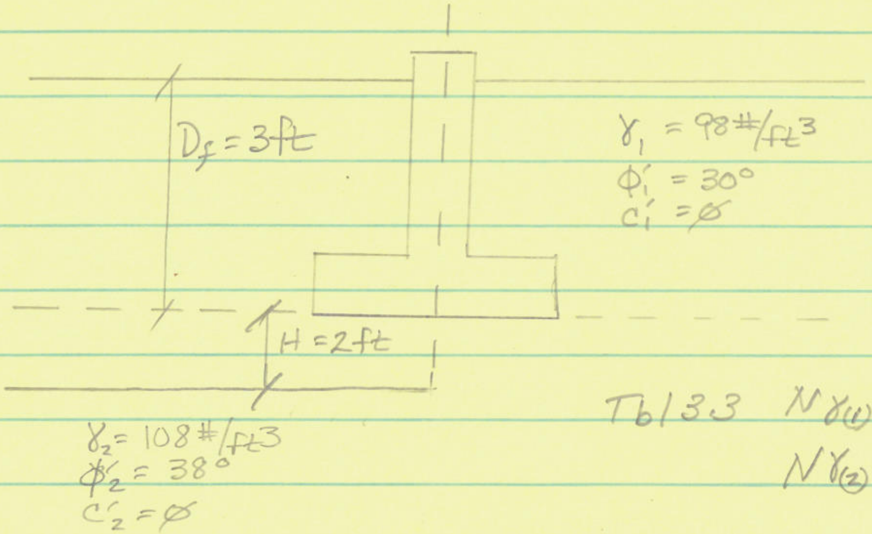
4.8 Using Fig 4-11. $B = 4ft, L = 6ft, H = 2ft, D_f = 3ft$

pg 220 $\gamma_1 = 98 \#/ft^3, \phi'_1 = 30°, c'_1 = 0$

$\gamma_2 = 108 \#/ft^3, \phi'_2 = 38°, c'_2 = 0$

USe FS = 4

Determine gross allowable load.



Tbl 3.3 $N_{\gamma(1)} = 22.4$ $N_{q(1)} = 18.40$

$N_{\gamma(2)} = 78.03$ $N_{q(2)} = 48.93$

[4.15] $q_1 = \underset{0}{c'_1} N_{c(1)} + \frac{1}{2}\gamma_1 B N_{\gamma(1)} = \frac{1}{2}(98)(4)(22.4) = 4390.4$

[4.16] $q_2 = \underset{0}{c'_2} N_{c(2)} + \frac{1}{2}\gamma_2 B N_{\gamma(2)} = \frac{1}{2}(108)(4)(78.03) = 16,854.48.$

$\frac{q_2}{q_1} = \frac{16,854.5}{4390.4} = 3.84 > 1$ so Eq [4.32] applies

Tbl 3.4 $F_{qs(1)} = 1 + \left(\frac{B}{L}\right)\tan\phi' = 1 + \left(\frac{4}{6}\right)\tan(30°) = 1.385$

$F_{qs(2)} = 1 + \left(\frac{B}{L}\right)\tan\phi' = 1 + \left(\frac{4}{6}\right)\tan(38°) = 1.521$

$F_{\gamma s1} = 1 - 0.4(B/L) = 1 - 0.4\left(\frac{4}{6}\right) = \boxed{0.733}$

[4.33] $q_t = \cancel{c_1 N_{c(1)} F_{cs(1)}} + \gamma_1 D_f N_{q(1)} F_{qs(1)} + \frac{1}{2}\gamma_1 B N_{\gamma(1)} F_{\gamma s(1)}$

$q_t = (98)(3)(18.4)(1.385) + \frac{1}{2}(98)(4)(22.4)(0.733) = \boxed{10,710.45}$

$q_b = (108)(3)(48.93)(1.521) + \frac{1}{2}(108)(4)(78.03)(0.733) = \boxed{36,462.23}$

$D \approx B$

[4.32] $q_u = q_t + (q_b - q_t)\left(\frac{H}{D}\right)^2 = 10,710 + (36,462 - 10,710)\left(\frac{2}{4}\right)^2 = \boxed{17,149 \#/ft^2}$

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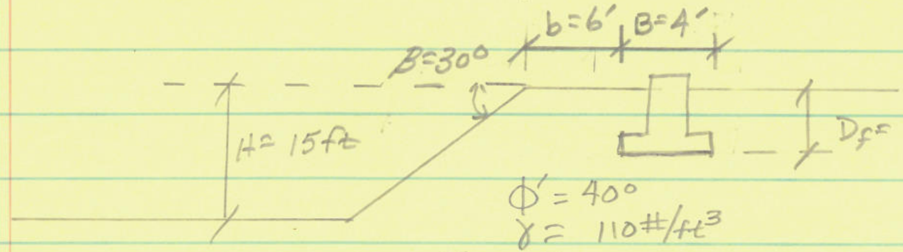
4.11 pg220 A continuous foundation near a slope of granular soil (Fig 4.14). $B = 4ft$, $b = 6ft$, $H = 15ft$, $D_f = 4ft$, $\beta = 30°$, $\phi' = 40°$ & $\gamma = 110 \#/ft^3$

Estimate ultimate bearing capacity with Meyerhof's



Granular Soil Eq [4.38] Applies $\underline{q_u = \frac{1}{2} \gamma B N_{\gamma q}}$ (pg 203)

Fig 4.15 $\frac{b}{B} = \frac{6}{4} = 1.5$ $\frac{D_f}{B} = \frac{4}{4} = 1$ $\therefore N_{\gamma q} = 53.57$

[4.38] $q_u = \frac{1}{2}(110)(4)(53.57) = \boxed{11{,}785.4 \#/ft^2}$