ID # 6954

Paper Foundation & Pavements.

Module :- 6th Semester , Date: 17-04-2020

Question:

Given data:

Dead load = 500 KN/m

Live load = 300 KN/m

Depth = 0.7 m

Shear Strength Parameters = $C = 0$

and $\phi = 40°$, $N_q = 81.3$, $N_\gamma = 100.4$

Factor of Safety = F.O.S = 3.0

Unit w.t of Sand above the W.T is

$= 17\ KN/m^3$

below the W.T the Saturated Unit

weight = 20 KN/m^3

Required data:

Width of the Footing = B = ?

Solution :-

1st find q_u from equation.

$$F.O.S = \frac{q_u}{q_{app}}$$

$$q_u = F.O.S \times q_{app}$$

$$q_{app} = \frac{500+300}{B}$$

Put the value

$$q_u = 3 \times \frac{800}{B} = \frac{2400}{B}$$

For $\phi = 40°$ the Terzaghi Bearing capacity

factor are $N_q = 81.3$ and $N_\gamma = 100.4$

$$q_u = cN_c + \gamma D N_q + \tfrac{1}{2}\gamma B N_\gamma$$

Use Bulk unit weight ($17\ KN/m^3$) in 2nd term and submerged unit weight ($\gamma = \gamma_{sat} - \gamma_w$) $= 20 - 9.8 = 10.2\ KN/m^3$ in 3rd term of Bc equation.

$$q_u = 0 + 17 \times 0.7 \times 81.3 + 0.5 \times 10.2 \times B \times 100.4$$

$$\frac{2400}{B} = 967.5 + 512B$$

Dividing "B" Both Side

$$B \times \frac{2400}{B} = (967.5 + 512B)B$$

$$2400 = 967.5B + 512B^2$$

Equation convert to Quadratic form in $= 512B^2 + 967.5 - 2400 = 0$ and apply Quardatic formula.

Which is $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$a = 512$, $B = 967.5$ and $c = -2400$

in equation $= x = \dfrac{-967.5 \pm \sqrt{(967.5)^2 - 4(512)(-2400)}}{2(512)}$

$$= \frac{-967.5 \pm \sqrt{936056.25 + 4915200}}{1024}$$

$$= \frac{-967.5 \pm \sqrt{5851256.25}}{1024}$$

$$= \frac{-967.5 \pm 2418.93}{1024}$$

$$x = \frac{-967.5 + 2418.93}{1024}$$

$$x = \frac{1451.43}{1024}$$

$$x = 1.42 \text{ m}$$

Ans ⇒ **B = 1.42 m**

OR Minus Use

$$x = \frac{-967.5 - 2418.93}{1024}$$

$$x = \frac{-3386.42}{1042}$$

$$x = -3.307 \text{ m}$$