

IQRA NATIONAL UNIVERSITY PESHAWER



Paper:

Foundation and pavement

B-tech(civil)

6th semester

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(1)

Given:-

$$\text{Dead load} = D.L = 500 \text{ kN/m}$$

$$\text{Live load} = L.L = 300 \text{ kN/m}$$

$$\text{depth} = \phi = 0.7 \text{ m}$$

$$\text{Cohesion} = c = 0$$

$$\text{Angles } \phi = 40^\circ$$

$$\text{factor of safety} = 3.0$$

$$\text{bulk unit weight} = \gamma = 17 \text{ kN/m}^3$$

$$\text{saturated unit weight} = \gamma_{\text{sat}} = 20 \text{ kN/m}^3$$

From Terzaghi's Bearing capacity factors from the for 40° are:

$$N_c = 95.7$$

$$N_q = 81.3$$

$$N_\gamma = 100.4$$

Required:-

"Design the a strip" footing.

①

Solution:-

ultimate Bearing Capacity:

We know that

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

$$\begin{aligned} \therefore Q_u &= 0.4 \times 4 \\ &= 500 + 300 \\ &= 800 \text{ kN/m}^2 \end{aligned}$$

$$q_u = FOS \times q_{app}$$

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

$$q_u = \frac{2400}{B}$$

Terzaghi Bearing Capacity equation.

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

Use the bulk unit weight in
1st term and submerged unit
weight in 2nd term in the
equation.

Submerged unit weight can be
find.

$$\gamma = \gamma_{sat} - \gamma_w$$

$$= 20 - 9.8$$

$$\gamma = 10.2 \text{ kN/m}^3$$

$$\therefore \gamma_w = 9.8 \text{ kN/m}^3$$

(5)

put all data in the equation

$$Q_u = 0(957) + (0.7 \times 81.3) + (0.5 \times 10^2 \times B)$$

$$Q_u = 0 + 967.5 + 512B$$

put $Q_u = \frac{2400}{B}$ 

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

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

$$512B^2 + 967.5B - 2400 = 0$$

divide both side by 512.

$$\frac{512B^2}{512} + \frac{967.5B}{512} - \frac{2400}{512} = \frac{0}{512}$$

$$B^2 + 1.89B - 4.68 = 0$$

Use Quadratic equation:

$$= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

where $a = 1$

$b = 1.89$

$c = -4.68$

(A)

$$= \frac{-(1.89) \pm \sqrt{(1.89)^2 - 4(1)(-4.68)}}{2(1)}$$

$$= \frac{-1.89 \pm \sqrt{3.57 + 18.6}}{2(1)}$$

$$= \frac{-1.89 \pm (4.71)}{2}$$

$$= \frac{-1.89 + 4.71}{2}, \quad \frac{-1.89 - 4.71}{2}$$

$$= \frac{2.81}{2}, \quad \frac{-6.50}{2}$$

$$B = 1.405m$$

So, the breadth (B) = 1.405m