Student I.D # 12196

Programe: B-Tech (Civil)

Subject: Foundation and Pavement

Exam: Mid Exam.

Question: A strip footing is to be design for Proposed 2 story building in Swat which support dead load of $500 \frac{KN}{m}$ and live load of $300 \frac{KN}{m}$ at depth of 0.7m and the soil is found gravelly Sand and characteristic values of the shear strength parameters are $C = 0$ and $\phi = 40^\circ$. Determine the Required width of the footing if the factor of safety 3.0 against shear failure of the soil is specified. Assuming that the WT may rise to foundation level. The unit weight of sand above WT is $17 \frac{KN}{m^3}$ and below the WT the Saturated unit weight is $20 \frac{KN}{m^3}$.

Problem:

Given Data:

Dead load = D.L = 500 $\frac{KN}{m}$

Live load = L.L = 300 $\frac{KN}{m}$

$D = 0.7m$

$C = 0$

$\phi = 40^{\circ}$

$N_q = 81.3$

$N_\gamma = 100.4$

$F.O.S = 3.0$

$\delta = 17 KN/m^3$

$\delta_{sat} = 20 KN/m^3$

SOLUTION:

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

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

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

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

For $\phi = 4^\circ$ The Terzaghi Bearing capacity factor are:

$N_q = 81.3$ $N_\gamma = 100.4$

$$q_u = CNC + \gamma DNq + \frac{1}{2}\gamma BN_\gamma$$

Use bulk unit weight $17 \frac{kN}{m^3}$ in second term and Submerged unit weight ($\gamma = \gamma_{sat} - \gamma_w$)

$= 20 - 9.8 = 10.2\ KN/m^3$ in third term of bearing capacity equation.

$$q_u = 0 + (17 \times 0.7 \times 81.3) + (0.5 \times 16.2 \times B \times 100.4)$$

$$q_u = 967.47 + 512B$$

$q_u =$ Put the value of $q_u = \frac{2400}{B}$

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

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

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

By using Quadratic formula.

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

Putting values.

Here $a = 512$

$b = 967.5$

$c = -2400$.

$$x = \frac{-967.5 \pm \sqrt{(967.5)^2 - 4(512)(-2400)}}{2(512)}.$$

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

$$x = \frac{-967.5 \pm 2148.93}{1024}.$$ Here are two values of x.

$$x = \frac{-967.5 + 2148.93}{1024}, \quad x = \frac{-967.5 - 214893}{1024}.$$

$$x = \frac{1415.43}{1024}, \quad x = \frac{-3386.43}{1024}$$

$$x = 1.42 \qquad x = -3.3$$

Here we take positive value that is 1.42 Ans.