David Dommon

ENCE 4340 Foundation Engineering Fall 2011 Homework # 2 (due: 9-26-2011)

Problem 1: Refer to Figure P5.5. Determine the average stress increase in the clay layer below the center of the foundation due to the net foundation load of 900 kN. **Use the 2:1 Method.** 45° ∠

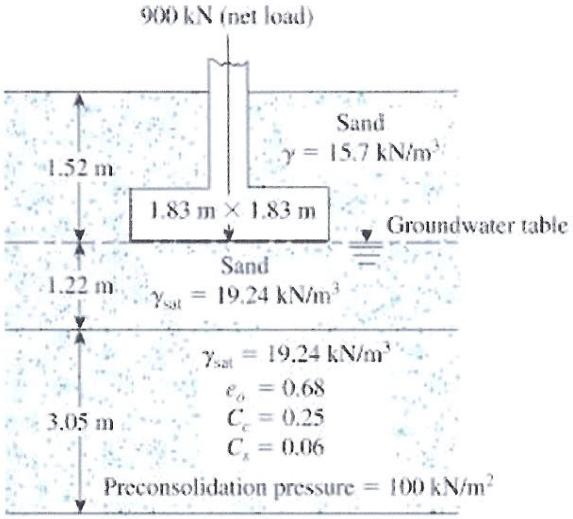

Figure P5.5

q_o is distributed

$\therefore q_o = \frac{Q}{B \times L} = \frac{900\ kN}{1.83m \times 1.83m}$

$q_o = 268.7$

[5.14] $\Delta\sigma = \frac{q_o \times B \times L}{(B+z)(L+z)}$

$= \frac{(268.7\ kN/m^2)(1.83m)(1.83m)}{(1.83+1.22m)(1.83m+1.22m)}$

$= 96.75\ kN/m^2$

$\Delta\sigma_{mid} = \frac{(268.7\ kN/m^2)(1.83m)(1.83m)}{(1.83m+1.22m+1.52m)(1.83m+1.22m+1.52m)}$

$= 43.0\ kN/m^2$

$\Delta\sigma_{bot} = \frac{(268.7\ kN/m^2)(1.83m)(1.83m)}{(1.83m+1.22m+3.05m)(1.83m+1.22m+3.05m)}$

$= 24.19\ kN/m^2$

$\Delta\sigma_{AVG} = \frac{1}{6}(96.75 + (4 \times 43.0) + 24.19)\ kN/m^2$

$= 48.82\ kN/m^2$

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Problem 2: Figure P5.7 shows an embankment load on a silty clay soil layer. Determine the stress increase at points A, B, and C, which are located at a depth of 5 m below the ground surface.

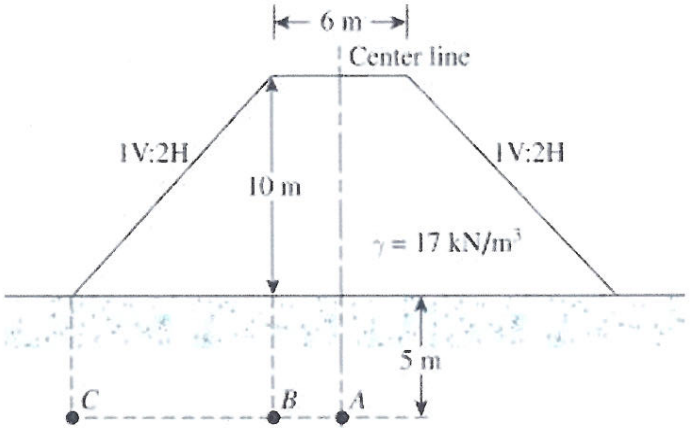
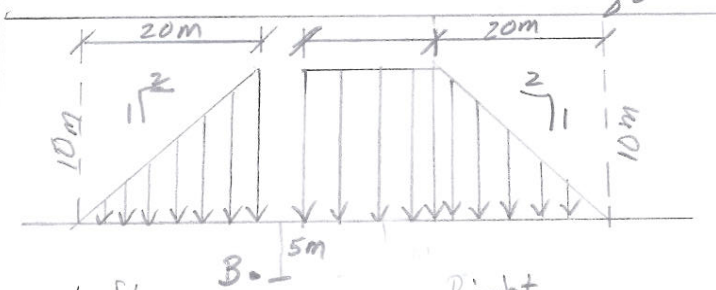


Figure P5.7

$q_0 = \gamma H = (17)(10) = 170\ kN/m^2$



Left

$\frac{B_1}{z} = \frac{0}{5m} = 0$

$\frac{B_2}{z} = \frac{20m}{5m} = 4$

$I' = 0.42$

Right

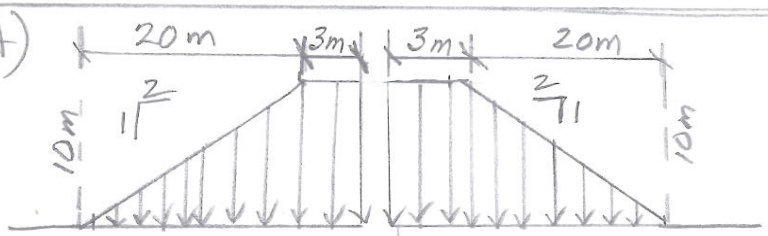
$\frac{B_1}{z} = \frac{6m}{5m} = 1.2$

$\frac{B_2}{z} = \frac{20m}{5m} = 4$

$I' = 0.49$ (Fig 5-11)

$\sigma_B = 170\ kN/m^2 (0.42 + 0.49) = \boxed{154.7\ kN/m^2}$

A)



Left:

$\frac{B_1}{z} = \frac{3m}{5m} = 0.6$

$\frac{B_2}{z} = \frac{20m}{5m} = 4$

$I' = 0.475$ (Fig 5.11)

Right

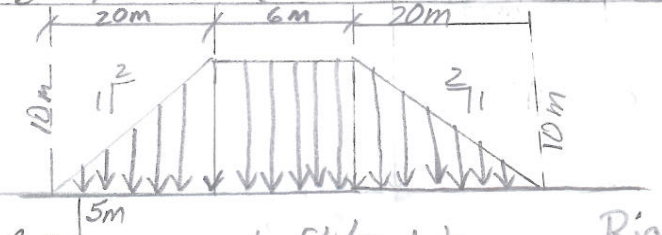
$\frac{B_1}{z} = \frac{3m}{5m} = 0.6$

$\frac{B_2}{z} = \frac{20m}{5m} = 4$

$I' = 0.475$

$\Delta\sigma_A = \Delta\sigma_{(1)} + \Delta\sigma_{(2)} = q_0 (I'_L + I'_R)$

$\Delta\sigma_A = 170\ kN/m^2 (0.475 + 0.475) = \boxed{161.5\ kN/m^2}$



Left

$\frac{B_1}{z} = \frac{0}{5m} = 0$

$\frac{B_2}{z} = \frac{0}{5} = 0$

$I' = 0$

Left/Right

$\frac{B_1}{z} = \frac{20}{5} = 4$

$\frac{B_2}{z} = \frac{26}{5} = 5.2$

$I' = 0.5$ (Fig 5.11)

Right/Right

$\frac{B_1}{z} = \frac{0}{5} = 0$

$\frac{B_2}{z} = \frac{20}{5} = 4$

$I' = 0.42$

$\Delta\sigma_C = 170\ kN/m^2 [0.5 - 0.42] = \boxed{13.6\ kN/m^2}$