Homework # 5
Shallow Foundations
Settlement

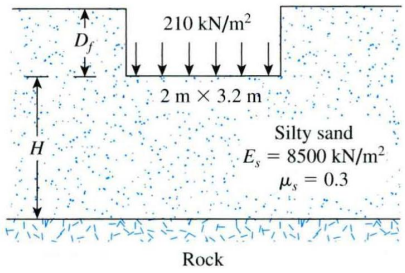

Figure P5.8

Solve the Following Problems:

5.8 A planned flexible load area (see Figure P5.8) is to be 2 m × 3.2 m and carries a uniformly distributed load of 210 kN/m^2. Estimate the elastic settlement below the center of the loaded area. Assume that $D_f = 1.6$ m and $H = \infty$. Use Eq. (5.33).

5.9 Redo Problem 5.8 assuming that $D_f = 1.2$ m and $H = 4$ m.

5.10 Consider a flexible foundation measuring 5 ft × 10 ft in a plan on a soft saturated clay ($\mu_s = 0.5$). The depth of the foundation is 4 ft below the ground surface. A rigid rock layer is located at 40 ft below the bottom of the foundation. Given: $q_o = 3000$ lb/ft^2 and, for the clay, $E_s = 1875$ lb/in^2. Determine the average elastic settlement of the foundation. Use Eq. (5.30).

5.11 Figure 5.16 shows a foundation of 10 ft × 6.25 ft resting on a sand deposit. The net load per unit area at the level of the foundation, q_o, is 3000 lb/ft^2. For the sand, $\mu_s = 0.3$, $E_s = 3200$ lb/in.^{2}, $D_f = 2.5$ ft and $H = 32$ ft. Assume that the foundation is rigid, and determine the elastic settlement the foundation would undergo. Use Eqs. (5.33) and (5.41).

5.13 For a shallow foundation supported by a silty clay, as shown in Figure 5.17, the following are given:

Length, $L = 2$ m
Width, $B = 1$ m
Depth of foundation, $D_f = 1$ m
Thickness of foundation, $t = 0.23$ m
Load per unit area, $q_o = 190$ kN/m^2
$E_f = 15 \times 10^6$ kN/m^2

The silty clay soil has the following properties:

$H = 2$ m
$\mu_s = 0.4$
$E_o = 9000$ kN/m^2
$k = 500$ kN/m^2/m

Using Eq. (5.46), estimate the elastic settlement of the foundation.

5.16 A continuous foundation on a deposit of sand layer is shown in Figure P5.16 along with the variation of the modulus of elasticity of the soil (E_s). Assuming $\gamma = 18\ kN/m^3$ and C_2 for 10 years, calculate the elastic settlement of the foundation using the strain influence factor method.

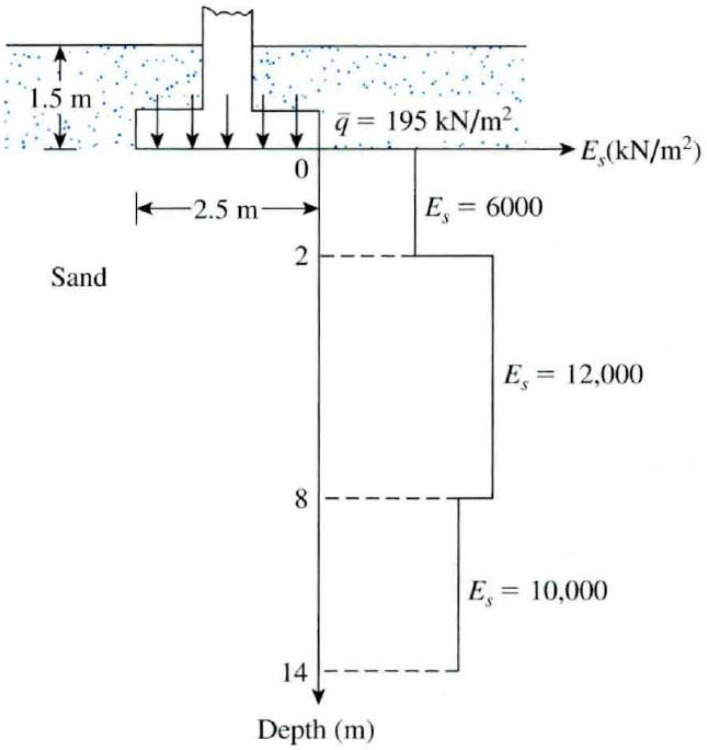

Figure P5.16

5.17 Following are the results of standard penetration tests in a granular soil deposit.

Depth (ft)	Standard penetration number, N_{60}
5	11
10	10
15	12
20	9
25	14

What will be the net allowable bearing capacity of a foundation planned to be 6 ft × 6 ft? Let $D_f = 3$ ft and the allowable settlement = 1 in., and use the relationships presented in Eq. (5.60).

5.20 Estimate the consolidation settlement of the clay layer shown in Figure P5.5 using the results of Problem 5.5.