Example

Example 9.7

A 3-m-thick layer (two-way drainage) of saturated clay under a surcharge loading underwent 90% primary consolidation in 75 days. Find the coefficient of consolidation of clay for the pressure range.

$$T_z = \frac{c_v t}{H_{dr}^2}$$

$$c_v = \frac{T_z H_{dr}^2}{t}$$

Example

Example 9.8

For a 30-mm-thick undisturbed clay specimen as described in Example 9.7, how long will it take to undergo 90% consolidation in the laboratory for similar consolidation pressure range? The laboratory test specimen will have two-way drainage.

$$T_z = \frac{c_v t}{H_{dr}^2}$$

$$t = \frac{T_z H_{dr}^2}{c_v}$$

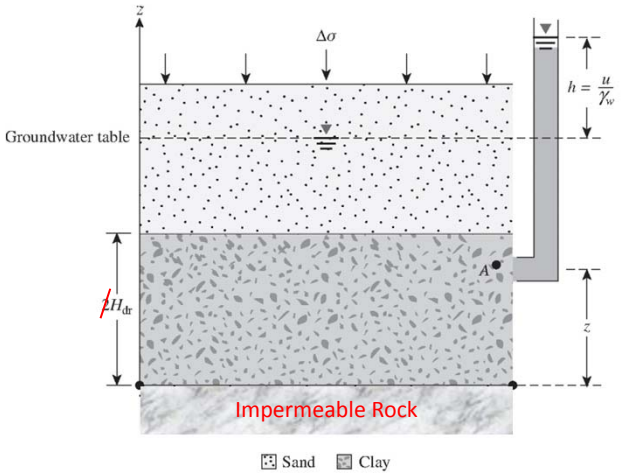
Example

$$c_v = \left(\frac{T_z H_{dr}^2}{t}\right)_{lab} = \left(\frac{T_z H_{dr}^2}{t}\right)_{field}$$

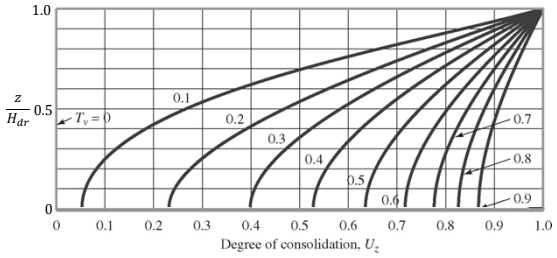
$$\left(\frac{H_{dr}^2}{t}\right)_{lab} = \left(\frac{H_{dr}^2}{t}\right)_{field}$$

$$t_{lab} = t_{field}\left(\frac{H_{lab}}{H_{field}}\right)^2$$

Singly-Drained Soil Profiles



Degree of Consolidation



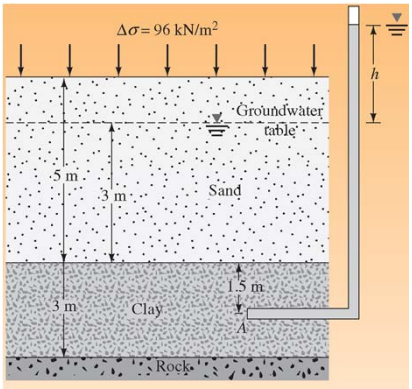
$$T_z = \frac{c_v t}{H_{dr}^2}$$

Example 9.5

A soil profile is shown in Figure 9.21. A surcharge load of 96 kN/m^2 is applied on the ground surface. Determine the following:

a. How high the water will rise in the piezometer immediately after the application of load.

b. After 104 days of the load application, $h = 4$ m. Determine the coefficient of consolidation (c_v) of the clay soil.



$$U_z = \frac{u_0 - u_z}{u_0} = 1 - \frac{u_z}{u_0}$$

Example

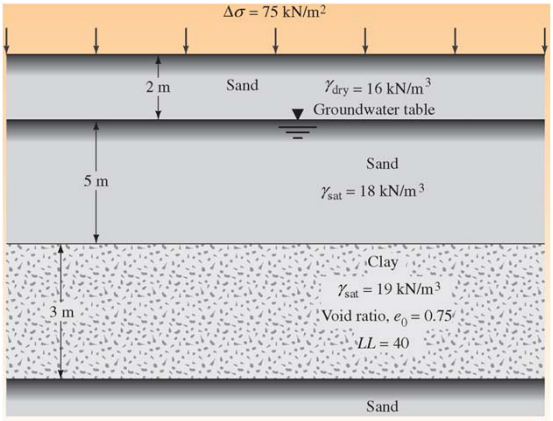
Example 9.6

For the problem in Example 9.2, answer the following:

a. What is the average degree of consolidation for the clay layer when the settlement is 15 mm?
b. If the average value of c_v for the pressure range is 0.003 cm^2/sec, how long will it take for 50% settlement to occur?
c. If the 3-m-thick clay layer is drained only at the top, how long will it take for 50% consolidation to occur?

Example 9.2

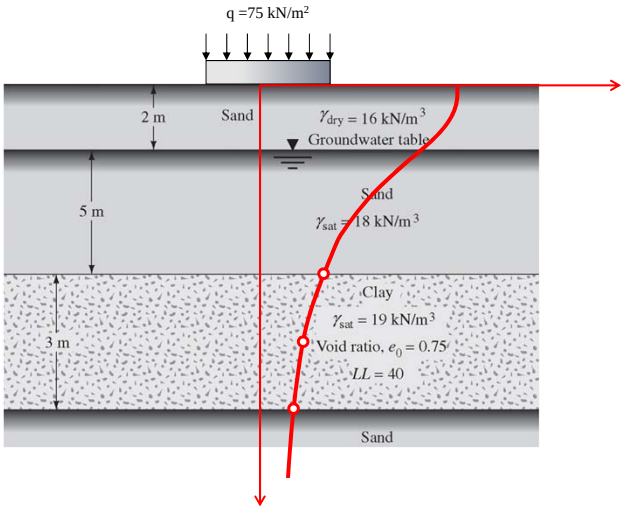
A soil profile is shown in Figure 9.14. If a uniformly distributed load $\Delta\sigma$ is applied at the ground surface, what will be the settlement of the clay layer caused by primary consolidation? We are given that σ'_c for the clay is 125 kN/m^2 and $C_s = \frac{1}{6}C_c$.



Settlement Under a Foundation

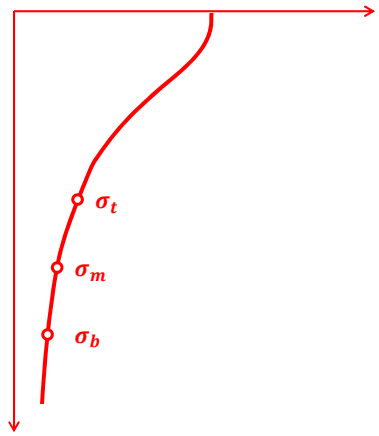
Chapter 9.12

Circular Foundation

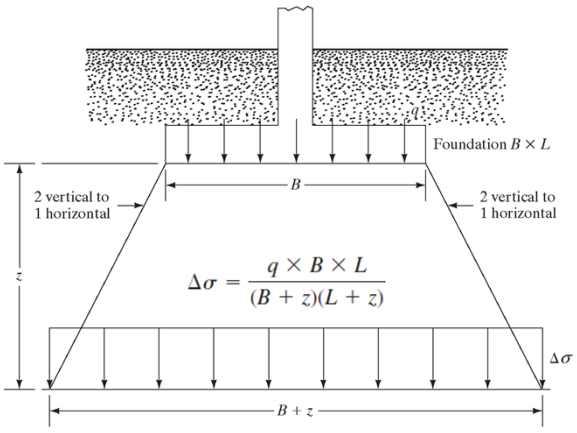


Simpson's Rule

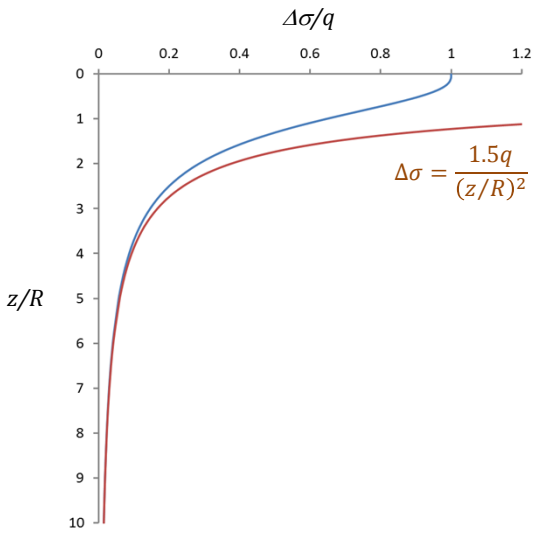
$$\Delta\sigma'_{av} = \frac{\Delta\sigma_t + 4\Delta\sigma_m + \Delta\sigma_b}{6}$$



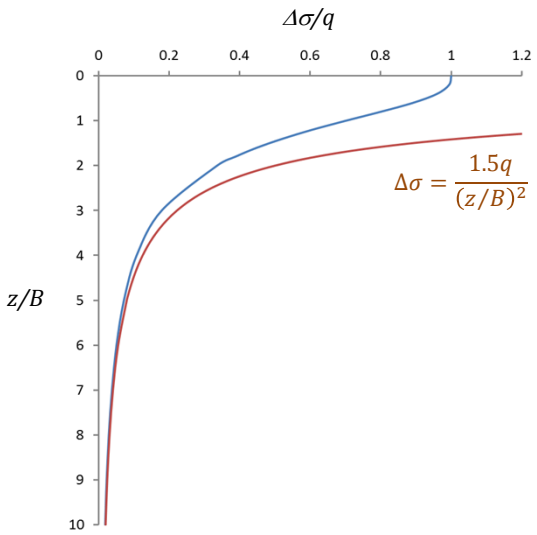
2:1 Method



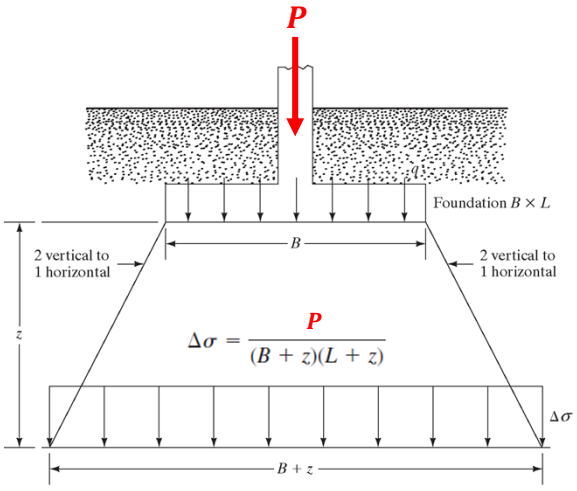
Circular Loaded Area



Square Loaded Area

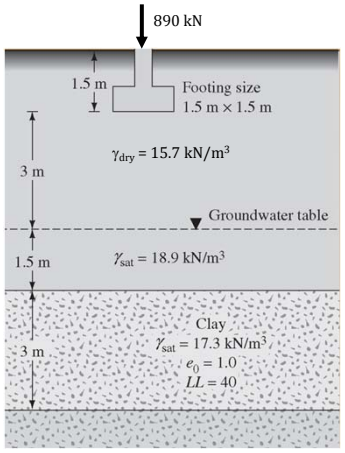


2:1 Method



Example 9.10

Calculate the primary consolidation settlement of the 3-m-thick clay layer (Figure 9.24) that will result from the load carried by a 1.5-m square footing. The clay is normally consolidated. Use *2 : 1 method* for calculation of $\Delta\sigma'$



Example 9.10

Calculate the primary consolidation settlement of the 3-m-thick clay layer (Figure 9.24) that will result from the load carried by a 1.5-m square footing. The clay is normally consolidated. Use ***Table 8.6*** for calculation of $\Delta\sigma'$