

Seepage and Effective Stress

Q1. Figure 1 shows three layers of soil in a tube that is 100mm x 100mm in cross section. Water is supplied to maintain a constant head difference of 300 mm across the sample. The coefficients of permeability, k , for the three soil layers in the direction of flow are given in the table below. Find the rate of water supply, q in cm^3/hr .

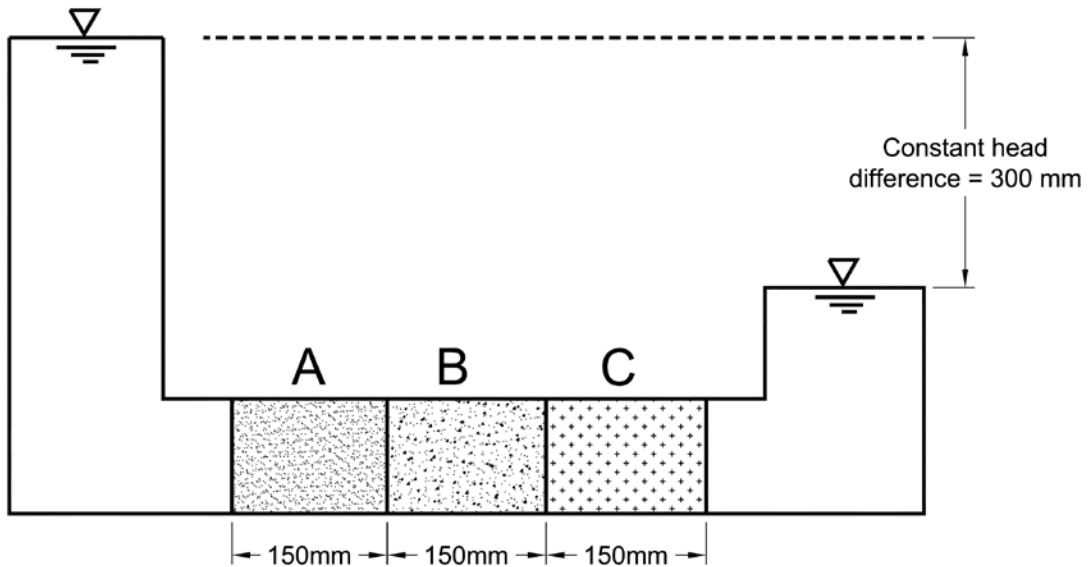


Figure 1

Soil	k (cm/sec)
A	2.0×10^{-2}
B	2.0×10^{-3}
C	8.0×10^{-5}

Q2. Draw the flow net for seepage under the structure detailed in Figure 2 (Use the figure on page 3 to draw flow net) and determine the quantity of seepage. The coefficient of permeability of the soil is 5×10^{-5} m/s. Plot the pore-water pressure distribution on the base of the structure and determine the uplift force per unit length?

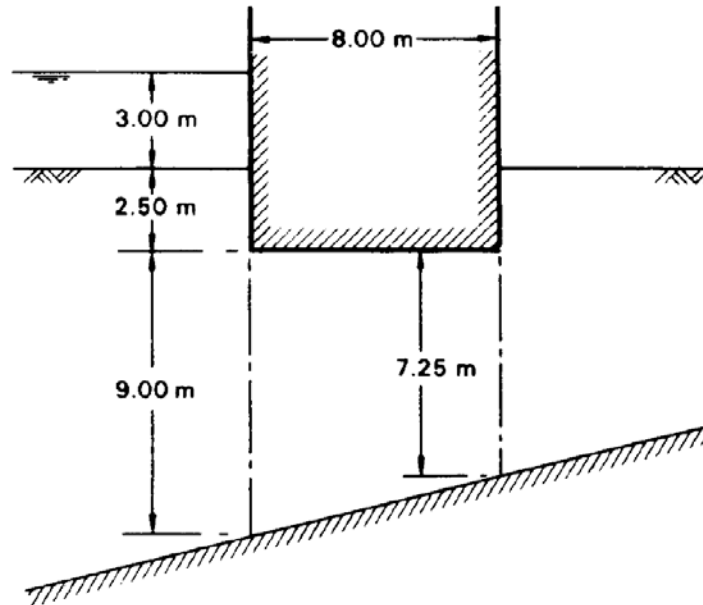
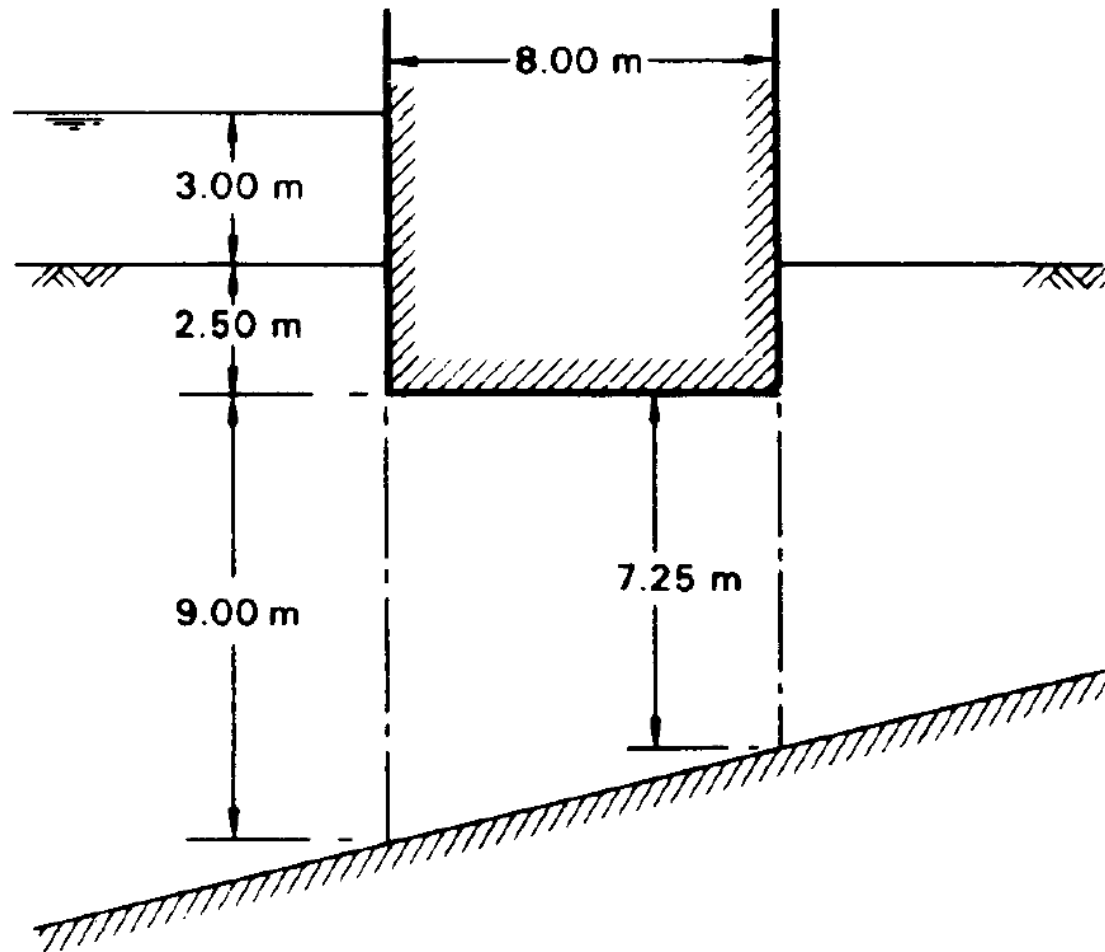


Figure 2



Q3. A 10-m-thick layer of stiff saturated clay is underlain by a layer of sand (Figure 3). The sand is under artesian pressure. If $H = 7.2\text{m}$, what would be the required height of water, h in the cut so that the stability of the saturated clay against heaving is not lost?

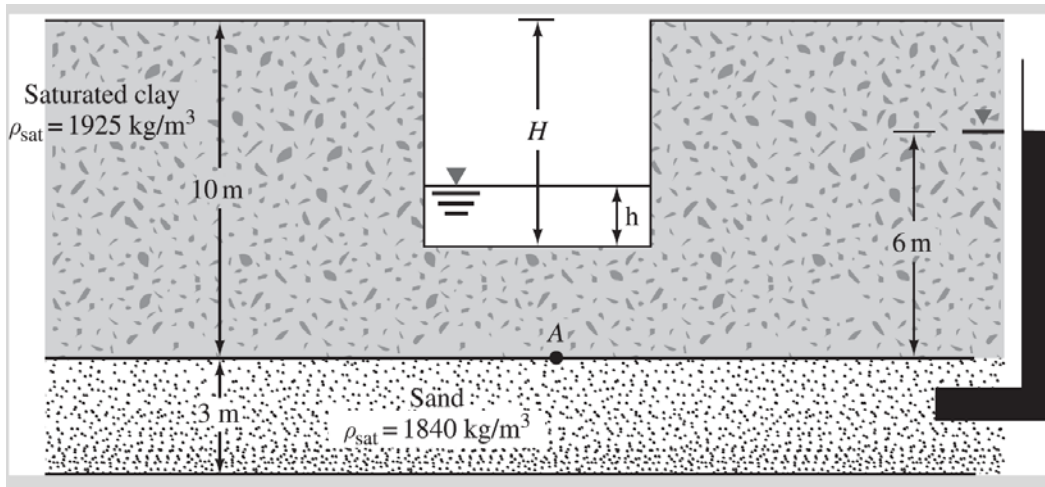
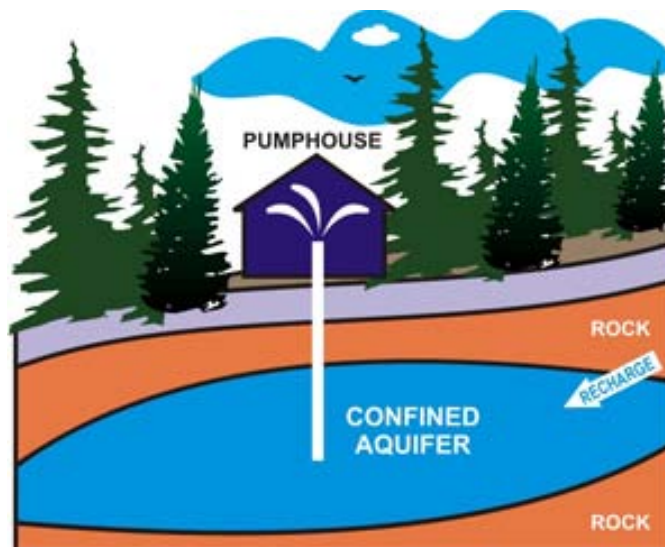


Figure 3

FYI: Artesian water is ground water confined under pressure between layers of relatively impermeable, underground rock-called a confined aquifer. Artesian water rises to the top of the aquifer and sometimes above land when a well taps the confined aquifer.



<http://www.nicoletwater.com/>

Q4. A borehole at a site reveals the soil profile shown in Figure 4. Plot the distribution of vertical total and effective stresses with depth. Assume $G_s=2.7$ for all layers.

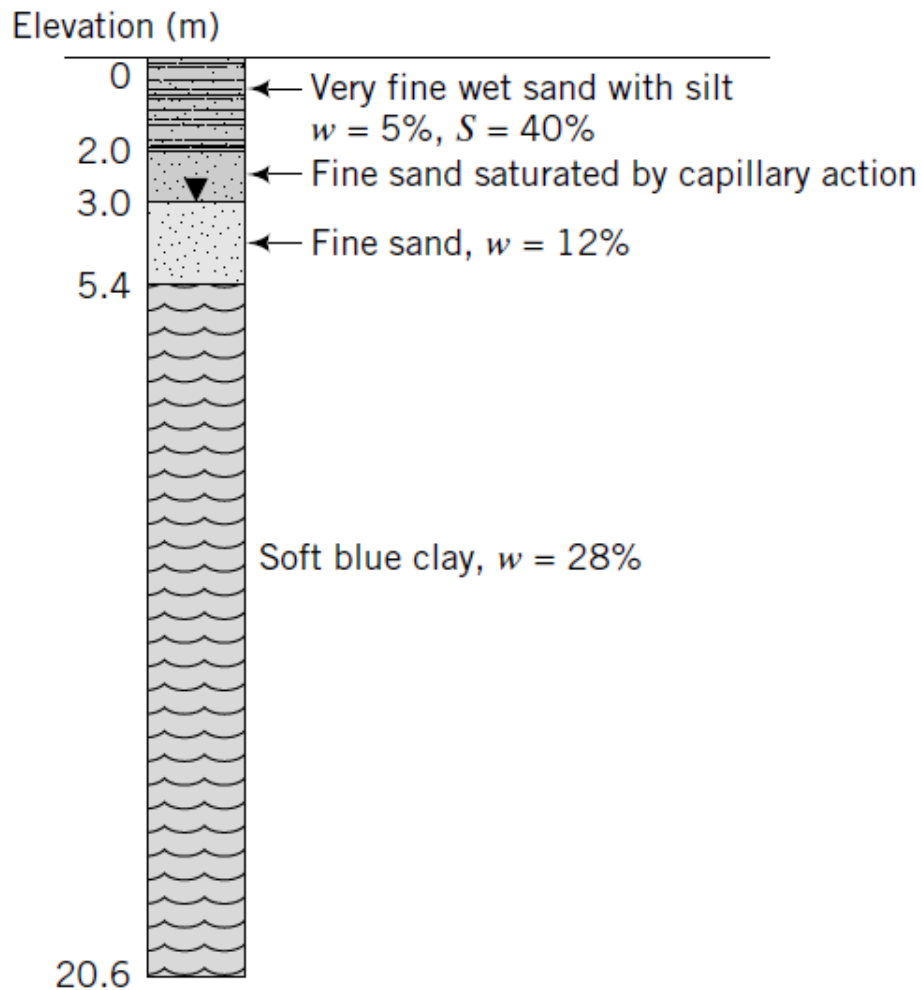


Figure 4