CIVE 353 - Geotechnical Engineering I
ASSIGNMENT 6

University of
Waterloo

**Department of
Civil Engineering**

Posted Date: Wednesday February 22, 2006
Due Date: Friday March 3, 2006 @ 4:30pm in soil lab

1. What head is required to produce quick conditions at the base of the column in Figure 1? The soil has Gs of 2.68 and water content of 14.9 percent.
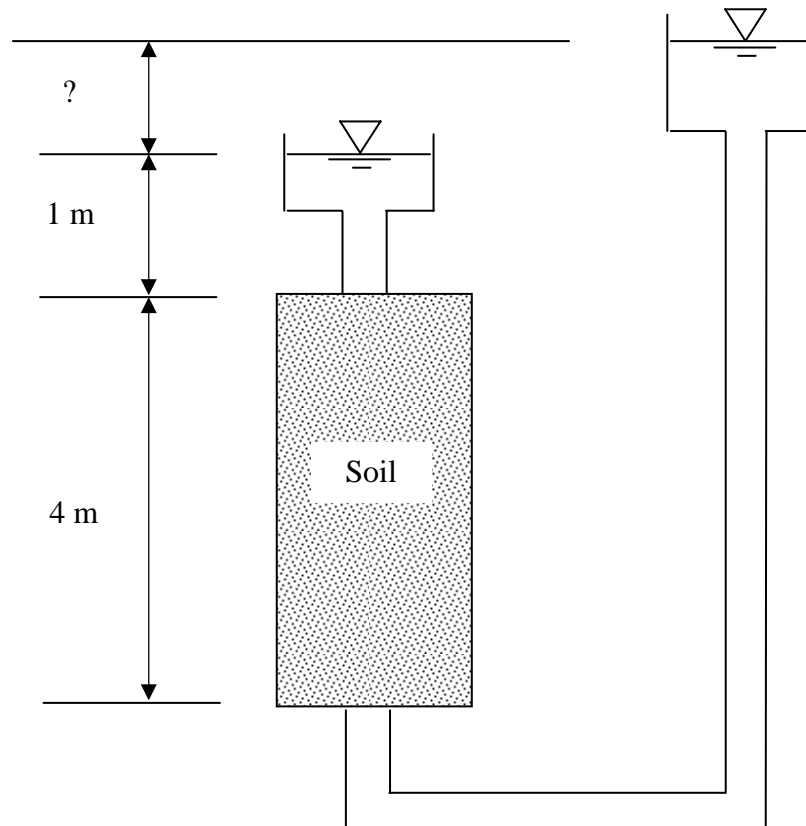

?

1 m

4 m

Soil

Figure 1

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2. Determine the factor of safety against quick condition for the sheet pile wall shown in Figure 2. Assume the soil has a saturated unit weight of 19.0 kN/m³.
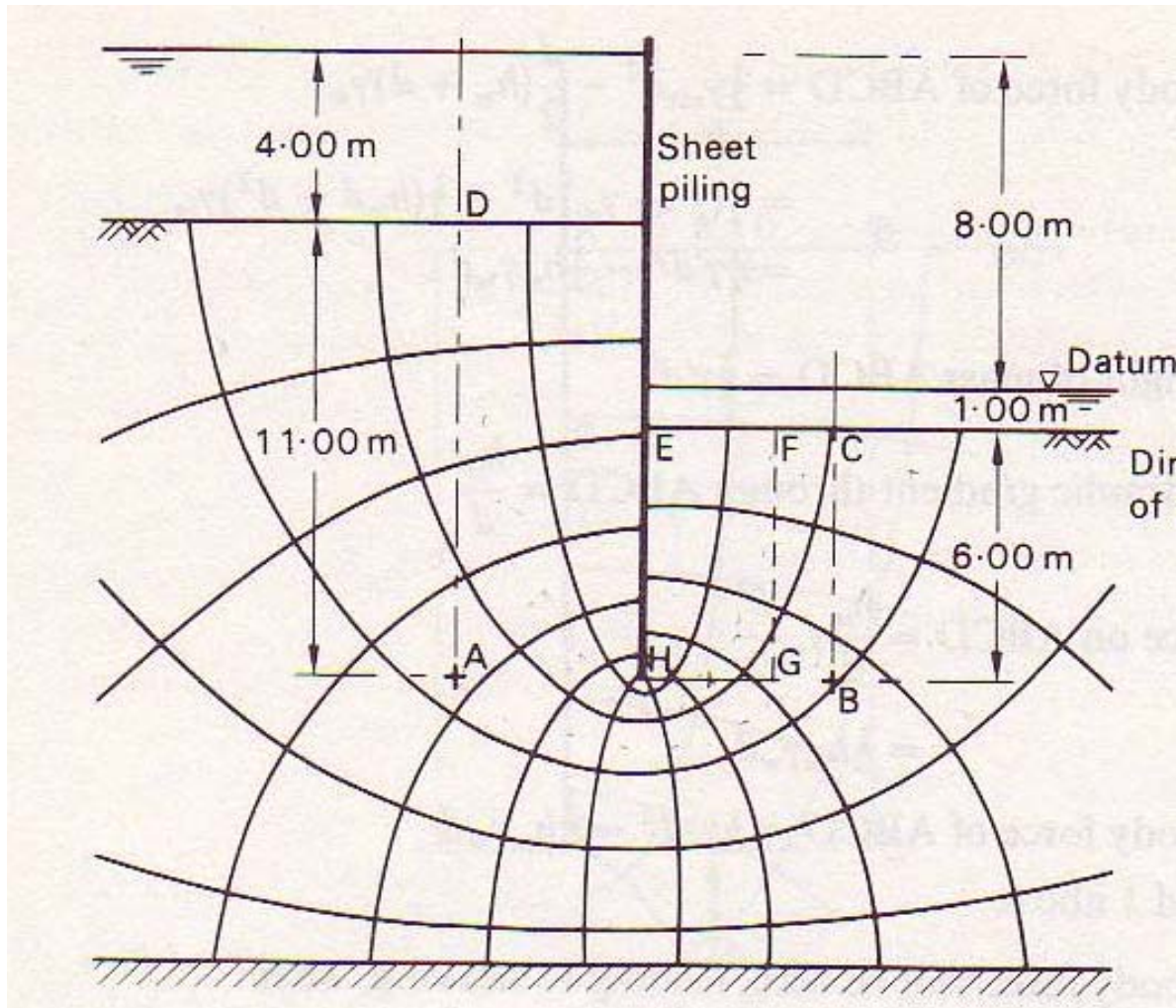

Figure 2

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3. A contractor plans to dig an excavation as shown in Figure 3. If the river level is at elevation +18 m a) what is the factor of safety against quick condition? b) What river water elevation will develop quick condition in the excavation?
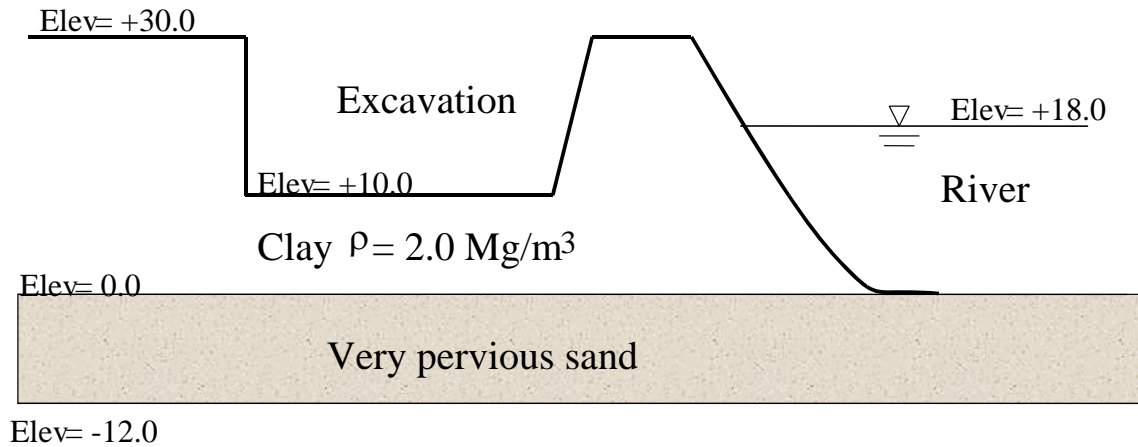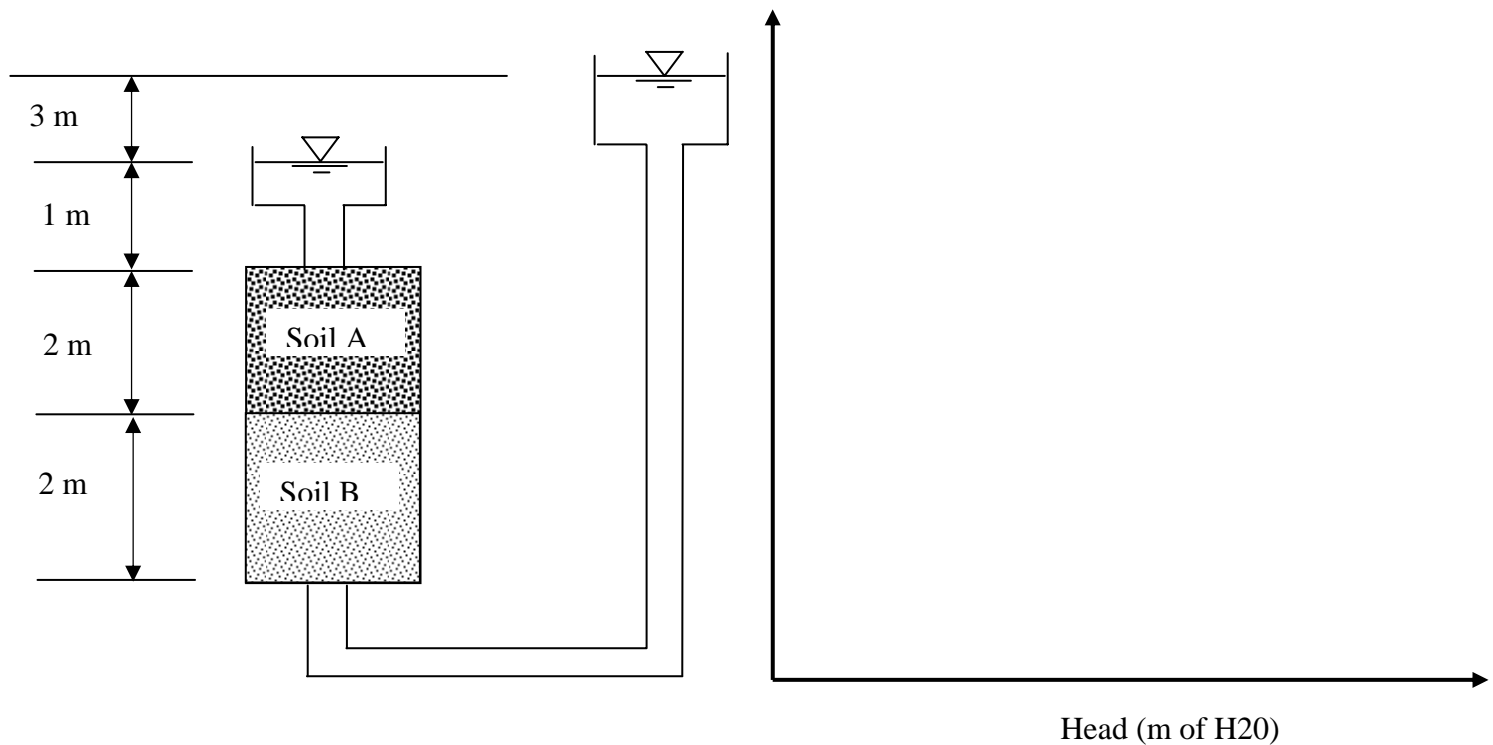
Elev= +30.0

Excavation

Elev= +18.0

Elev= +10.0

River

Clay $\rho = 2.0$ Mg/m³

Elev= 0.0

Very pervious sand

Elev= -12.0

Figure 3

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4. Determine the elevation, pressure and total head at the top, middle and bottom of the soil column. Using this data, plot the distribution of elevation, pressure and total head along the soil column. The hydraulic conductivity for soil A and B are 1×10^{-4} and 5×10^{-5} cm/s respectively. Hint flow thru soil A must equal flow thru soil B.

3 m

1 m

2 m

Soil A

2 m

Soil B

Head (m of H20)

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5. Consider the vertical column with:

Sand No. 1: $K = 5 \times 10^{-3}$ cm/s, porosity = 0.35
Sand No. 2: $K = ?$, porosity = 0.35
Total flow through the column = 1×10^{-1} cm^3/s
Column cross sectional area = 0.01 m^2

Assuming steady state through the column find:
a) Height of water in the piezometer.
b) Hydraulic conductivity of sand layer No. 2.
c) Seepage velocity in sand layer No. 1.