Pengukuran daya rembesan dalam tanah

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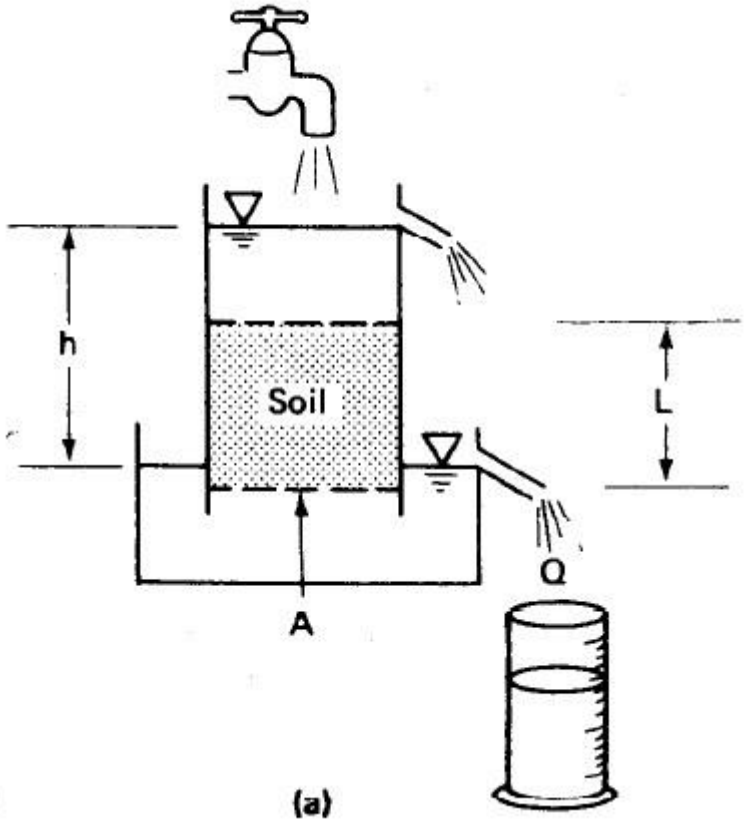
Pengukuran permeabilitas tanah (k)

– Constant head for coarse grained soil

$$k = \frac{QL}{Ah\Delta t}$$

$$k_{20^oC} = \frac{\mu_T}{\mu_{20^oC}} k_T$$



Pengukuran permeabilitas tanah (k)

Falling head for

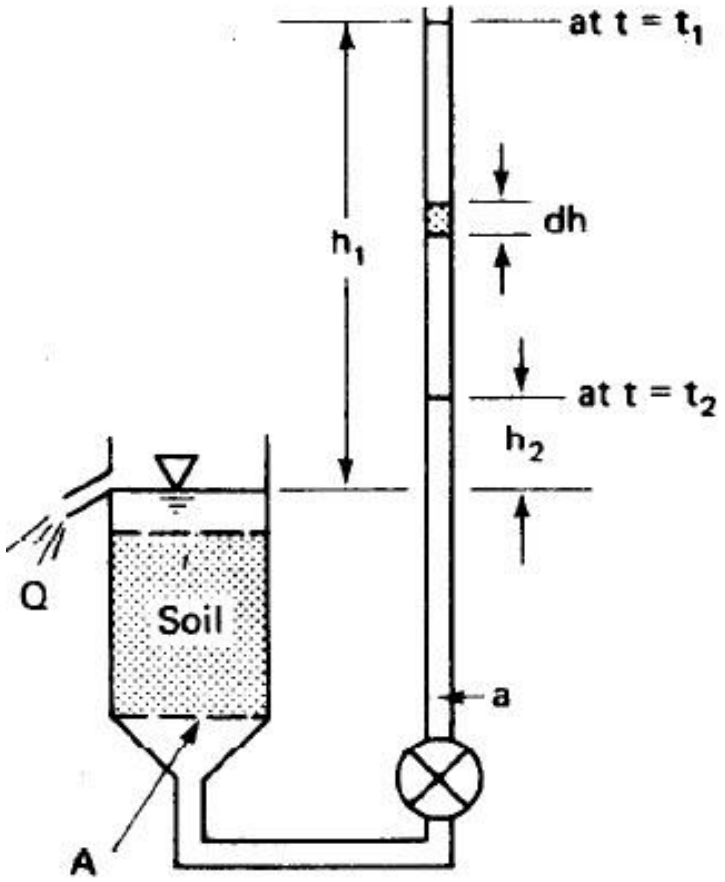
fine grained soil

$$-a\frac{dh}{dt} = A\,k\frac{h}{l}$$

$$-a\int_{h1}^{h2}\frac{dh}{h} = \frac{A\,k}{l}\int_{t1}^{t2}dt$$

$$k = \frac{al}{A\,\Delta t}\ln\frac{h_o}{h_1} = 2.3\frac{al}{A\,\Delta t}\log\frac{h_1}{h_2}$$

$$k_{20^oC} = \frac{\mu_T}{\mu_{20^oC}}k_T$$



Kecepatan aliran dalam tanah

- In small scale, water flow through inter-particle pores. However, in a larger scale, it could be assumed that the water flow through a straight line. The average velocity of water flow in soil is called seepage velocity (v):

$$v' = \frac{q}{A_v} \qquad A_v = n A$$

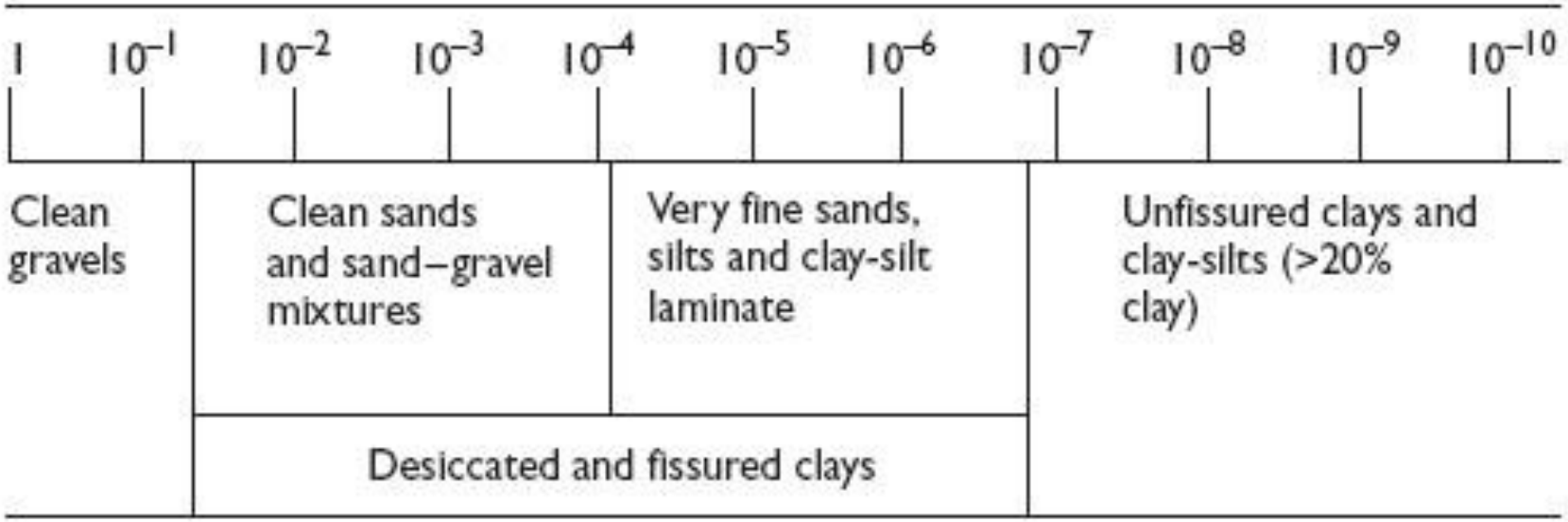
Assuming 2 D case

where n is porosity

$$v' = \frac{q}{n A} = \frac{v}{n}$$

Range of permeability

Table 2.1 Coefficient of permeability (m/s) (BS 8004: 1986)



Correlation for permeability

For coarse grained soil (Hazen, 1911):

$$k = C_1 D_{10}^2 \ (m/sec)$$

where C_1 = constant (=viaries from 0.4 10^{-2} – 1.2 10^{-2} with avarge of 1x10^{-2} for clean sand) and D_{10} is effective diameter in mm (D_{10} sizes between 0.1 to 3.0 mm). This equation is valid for k ≥ *10^{-5} m/sec.*

For clay (Taylor,1948)

$$\log k = \log k_o - \frac{e_o - e}{C_k}$$

where

C_k = permeability change index, while k_o, e_o = *in-situ* value.

Correlation for permeability

- The permeability of porous media is related to the size, shape, and distribution of their voids.

- For sands the relevant relationships was developed by Kozeny and Carman (Kozeny, 1927; and Carman, 1939) and is written in the form:

$$k = \frac{\gamma_w}{5 f \eta S^2} \frac{e^3}{1+e} \qquad (1.4)$$

where

e = void ratio, and

η = dynamic viscosity of water.

The coefficient f depends on pore shape: f = 1.1 for rounded grains, f = 1.25 for sub rounded grains and f = for angular grains (London, 1952).

- The specific surface area S:

$$S = \frac{6}{\sqrt{d_{\max} d_{\min}}} \left(mm^{-1}\right)$$

Thanks for your attention