Discharge Velocity

The v in equation below is known as the superficial or discharge velocity for the very good reason that it is not the actual velocity of flow of the water through the soil.

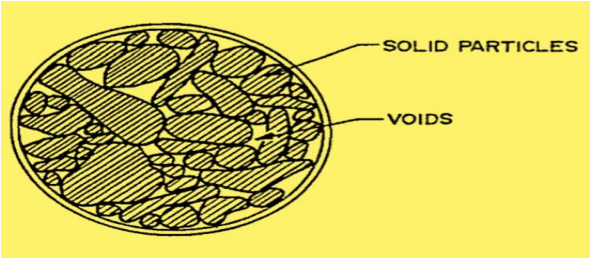
$$v = \frac{Q}{A} = k\ i$$

Consider a typical cross section through the soil in the pipe as illustrated in below figure. The hatched portion represents the soil mineral particles of soil with an average cross sectional are equal to As. The remaining cross sectional area in the pipe Av = Vv L

Where:

L is the length of pipe

Vv is the volume of voids, represents the void space through which the water flows. If A represents the total internal cross sectional area of the pipe, then clearly A = Av + As



TYPICAL CROSS-SECTION IN A SOIL FILLED PIPE

The rate of discharge of water Q is given by Q = v A

Therefore v = Q /A = k i

But the water is actually flowing through an area Av with a velocity which will be indicated by V_s.

The rate of discharge Q is Q = v_s A_v which also = v A

Therefore:

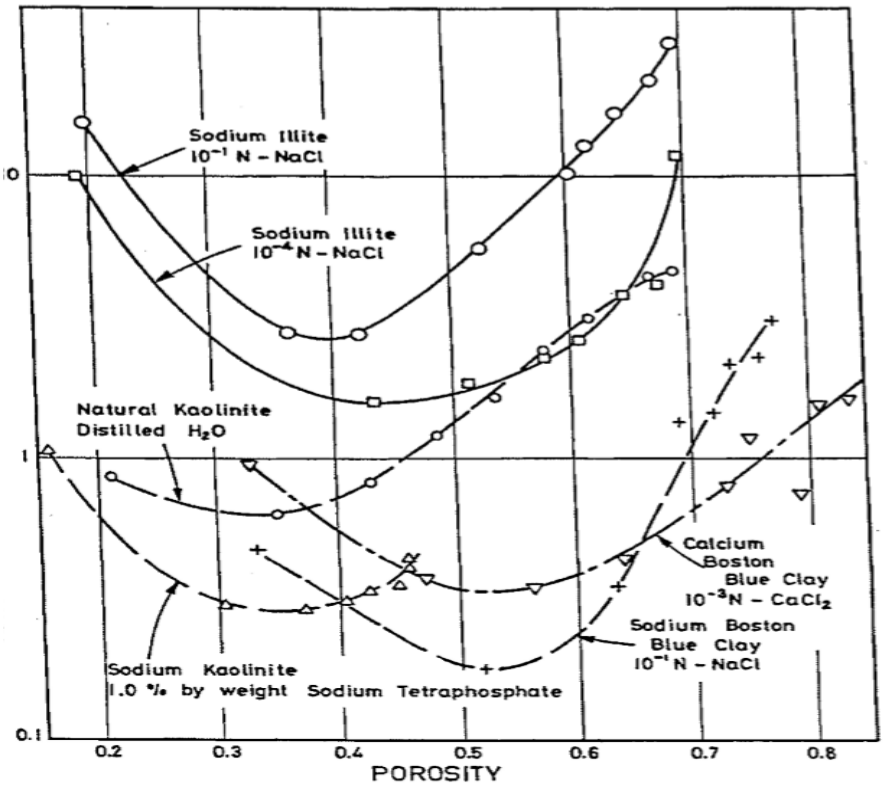
$$V_s = v\frac{A}{Av}$$

$$= V\frac{V}{Vv} \text{ where V is the total internal volume of the pipe}$$

$$= \frac{V}{n}$$

So v (superficial or discharge velocity) and the actual velocity of flow vs (effective or seepage velocity) are never equal.

Ratio of Measured to Predicted Flow Rates



Discrepancies between measured and predicted Flow Rates