Soil

By Rajat Singh

Day -02

Soil

Irrigation

By- Rajat Sir

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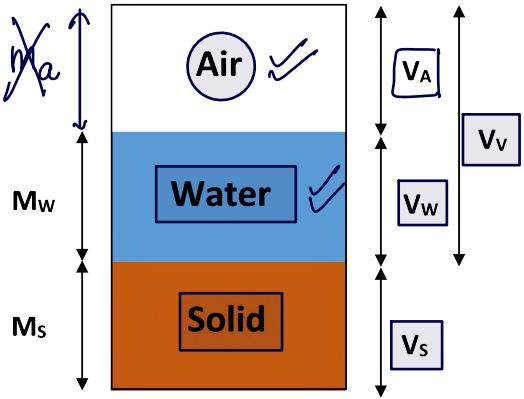
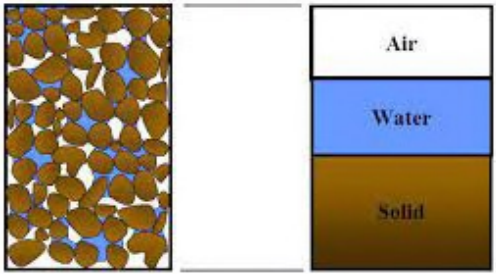
Three Phase Diagram





V_v = void volm = V_w + V_{air}

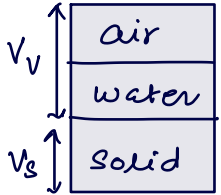
V_w ↓ water, V_{air} ↓ air

V = volm of soil = $V_v + V_s$

Weight of air ≃ 0

Terms and Definitions in Soil

e



Void Ratio

Void ratio is the volume of voids to the volume of solids.
It is denoted by 'e'.

$$e = \frac{V_V}{V_S}$$

$V_V \neq 0$

$e \neq 0$

$e > 0$

$e \in (0 - \infty)$

Porosity

It is defined as the ratio of volume of voids to the total volume. It is denoted by 'n'.

n=Vv/V

$$\eta = \frac{V_v}{V} \times 100$$

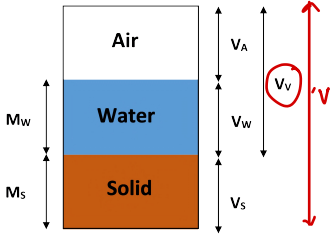
V = Total volume of soil

b/w

n (0 - 100%)

$\eta \neq 0\%$

$\eta \neq 100\%$



η e

$$\eta = \frac{V_r}{V} = \frac{V_v}{V_v + V_s}$$

$$= \frac{V_v/V_s}{V_v/V_s + 1}$$

$$\eta = \frac{e}{1+e} \quad (*)$$

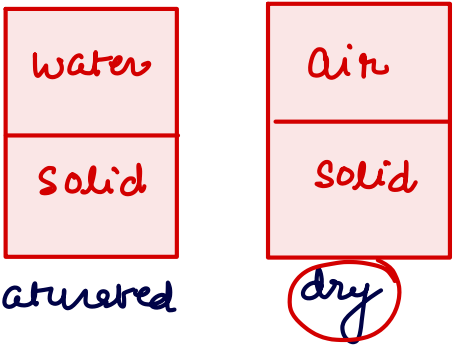
$$e = \frac{\eta}{1-\eta} \quad (*)$$

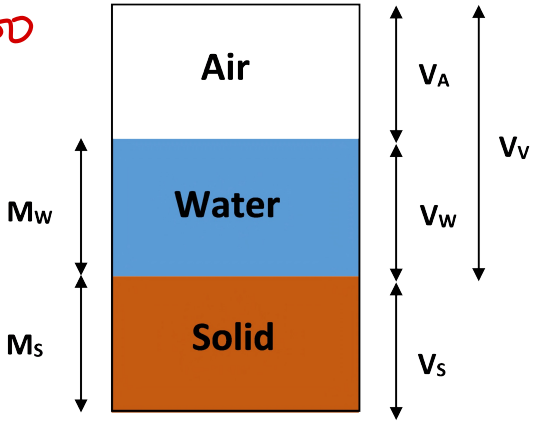
Water cont → w

$\rho_w = 1\ g/cc = 1000\ kg/m^3$

$w = \frac{w_w}{w_s} \times 100$

$w = 0$ $(0 - \infty)$

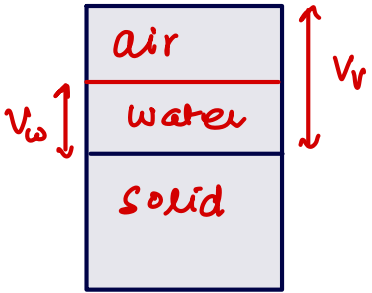




Degree of saturation

The degree of saturation is the ratio of the volume of water to the volume of voids. It is denoted by 'S'.

$$S = \frac{V_w}{V_v} \times 100$$



- S % = 0% dry soil
- S% = 100% Saturated soil

Percentage air voids

It is the ratio of volume of air to the total volume.

$$n_a = \frac{V_a}{V} \times 100$$

$n_a = 0\%$

$n_a < 100\%$

$$0 \leq n_a < 100\%$$

Air content a_c

Air content is defined as the ratio of the volume of air to the volume of voids

$$a_c = \frac{V_a}{V_v} \times 100$$

$$S = \frac{V_w}{V_v} \times 100$$

$$a_c + S = \frac{V_a}{V_v} + \frac{V_w}{V_v} = \frac{V_v}{V_v} = 1$$

$$\boxed{a_c + S = 1}^{*}$$