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Water Content and Volume of Solids in Soil Formulas

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List of 14 Water Content and Volume of Solids in Soil Formulas

Water Content and Volume of Solids in Soil 🔗

1) Degree of Saturation given Bulk Unit Weight and Degree of Saturation 🔗

Open Calculator 🔗

$$\textit{fx} \quad S = \frac{\gamma_{bulk} - \gamma_{dry}}{\gamma_{saturated} - \gamma_{dry}}$$

$$\textbf{ex} \quad 2.559792 = \frac{20.89 \text{kN/m}^3 - 6.12 \text{kN/m}^3}{11.89 \text{kN/m}^3 - 6.12 \text{kN/m}^3}$$

2) Degree of Saturation given Dry Unit Weight and Water Content 🔗

Open Calculator 🔗

$$\textit{fx} \quad S = \frac{w_s}{\left(G_s \cdot \frac{\gamma_{water}}{\gamma_{dry}} \right) - 1}$$

$$\textbf{ex} \quad 2.555581 = \frac{8.3}{\left(2.65 \cdot \frac{9.81 \text{kN/m}^3}{6.12 \text{kN/m}^3} \right) - 1}$$

3) Dry Mass given Water Content with respect to Mass of Water ⤴

fx $W_s = W_w \cdot \dfrac{100}{w_s}$

Open Calculator ⤴

ex $0.60241kg = 0.05kg \cdot \dfrac{100}{8.3}$

4) Mass of Water given Water Content with respect to Mass of Water ⤴

fx $W_w = w_s \cdot \dfrac{W_s}{100}$

Open Calculator ⤴

ex $0.049966kg = 8.3 \cdot \dfrac{0.602kg}{100}$

5) Percentage Air Voids given Porosity ⤴

fx $n_a = \eta \cdot a_c$

Open Calculator ⤴

ex $0.2 = 0.5 \cdot 0.4$

6) Total Mass of Soil ⤴

fx $\Sigma f_i = \left(w_s \cdot \dfrac{W_s}{100} \right) + W_s$

Open Calculator ⤴

ex $0.651966kg = \left(8.3 \cdot \dfrac{0.602kg}{100} \right) + 0.602kg$

7) Total Volume given Dry Unit Weight in Unit Weight of Solids ↗

fx $V = \gamma_{\text{soilds}} \cdot \dfrac{Vs}{\gamma_{\text{dry}}}$

ex $12.2549\text{m}^3 = 15\text{kN/m}^3 \cdot \dfrac{5.0\text{m}^3}{6.12\text{kN/m}^3}$

8) Volume of Solids given Density of Solids ↗

fx $v_{\text{so}} = \dfrac{W_s}{\rho_d}$

ex $12.28571\text{m}^3 = \dfrac{0.602\text{kg}}{0.049\text{kg/m}^3}$

9) Volume of Solids given Dry Unit Weight in Unit Weight of Solids ↗

fx $Vs = \gamma_{\text{dry}} \cdot \dfrac{V}{\gamma_{\text{soilds}}}$

ex $4.999632\text{m}^3 = 6.12\text{kN/m}^3 \cdot \dfrac{12.254\text{m}^3}{15\text{kN/m}^3}$

10) Water Content given Dry Unit Weight ↗

fx $$w_s = S \cdot \left(\left(G_s \cdot \frac{\gamma_{water}}{\gamma_{dry}} \right) - 1 \right)$$

Open Calculator ↗

ex $$8.314353 = 2.56 \cdot \left(\left(2.65 \cdot \frac{9.81 \text{kN/m}^3}{6.12 \text{kN/m}^3} \right) - 1 \right)$$

11) Water Content given Dry Unit Weight and Percentage of Air Voids ↗

fx $$\omega = \left((1 - n_a) \cdot G_s \cdot \frac{\gamma_{water}}{\gamma_{dry}} \right) - \frac{1}{G_s}$$

Open Calculator ↗

ex $$3.020877 = \left((1 - 0.2) \cdot 2.65 \cdot \frac{9.81 \text{kN/m}^3}{6.12 \text{kN/m}^3} \right) - \frac{1}{2.65}$$

12) Water Content given Dry Unit Weight at Full Saturation ↗

fx $$\omega = \frac{\left(G_s \cdot \frac{\gamma_{water}}{\gamma_{dry}} \right) - 1}{G_s}$$

Open Calculator ↗

ex $$1.225583 = \frac{\left(2.65 \cdot \frac{9.81 \text{kN/m}^3}{6.12 \text{kN/m}^3} \right) - 1}{2.65}$$

13) Water Content given Void Ratio in Specific Gravity ⌇

Open Calculator ⌇

fx $\omega = e \cdot \dfrac{S}{G_s}$

ex $1.159245 = 1.2 \cdot \dfrac{2.56}{2.65}$

14) Water Content given Void Ratio in Specific Gravity for Fully Saturated Soil ⌇

Open Calculator ⌇

fx $\omega = \dfrac{e}{G_s}$

ex $0.45283 = \dfrac{1.2}{2.65}$

Variables Used

- a_c Air Content
- e Void Ratio
- G_s Specific Gravity of Soil
- n_a Percentage of Air Voids
- S Degree of Saturation
- V Total Volume in Soil Mechanics *(Cubic Meter)*
- v_{so} Volume of Solids in Soil *(Cubic Meter)*
- Vs Volume of Solids *(Cubic Meter)*
- w_s Water Content of Soil from Pycnometer
- W_s Weight of Solids in Soil Mechanics *(Kilogram)*
- W_w Weight of Water in Soil Mechanics *(Kilogram)*
- γ_{bulk} Bulk Unit Weight *(Kilonewton per Cubic Meter)*
- γ_{dry} Dry Unit Weight *(Kilonewton per Cubic Meter)*
- $\gamma_{saturated}$ Saturated Unit Weight of Soil *(Kilonewton per Cubic Meter)*
- γ_{soilds} Unit Weight of Solids *(Kilonewton per Cubic Meter)*
- γ_{water} Unit Weight of Water *(Kilonewton per Cubic Meter)*
- η Porosity in Soil Mechanics
- ρ_d Dry Density *(Kilogram per Cubic Meter)*
- Σf_i Total Mass of Sand in Soil Mechanics *(Kilogram)*
- ω Water Content

Constants, Functions, Measurements used

- Measurement: **Weight** in Kilogram (kg)
  Weight Unit Conversion 🔗

- Measurement: **Volume** in Cubic Meter (m³)
  Volume Unit Conversion 🔗

- Measurement: **Density** in Kilogram per Cubic Meter (kg/m³)
  Density Unit Conversion 🔗

- Measurement: **Specific Weight** in Kilonewton per Cubic Meter (kN/m³)
  Specific Weight Unit Conversion 🔗

Check other formula lists

- **Density of Soil Formulas** ↗
- **Dry Unit Weight of Soil Formulas** ↗
- **Unit Weight of Soil Formulas** ↗
- **Water Content and Volume of Solids in Soil Formulas** ↗

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