Important Dry Unit Weight of Soil Formulas PDF

Formulas
Examples
with Units

List of 7
Important Dry Unit Weight of Soil Formulas

1) Dry Unit Weight given Bulk Unit Weight and Degree of Saturation Formula

Evaluate Formula

Formula

$$\gamma_{dry} = \frac{\gamma_{bulk} - \left(S \cdot \gamma_{saturated} \right)}{1 - S}$$

Example with Units

$$6.1208\,\text{kN/m}^3 = \frac{20.89\,\text{kN/m}^3 - \left(2.56 \cdot 11.89\,\text{kN/m}^3 \right)}{1 - 2.56}$$

2) Dry Unit Weight given Percentage of Air Voids Formula

Evaluate Formula

Formula

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

Example with Units

$$0.9044\,\text{kN/m}^3 = \left(1 - 0.2 \right) \cdot 2.65 \cdot \frac{9.81\,\text{kN/m}^3}{1 + 8.3 \cdot 2.65}$$

3) Dry Unit Weight given Submerged Unit Weight of Soil and Porosity Formula

Evaluate Formula

Formula

$$\gamma_{dry} = W_{su} + \left(1 - \eta \right) \cdot \gamma_{water}$$

Example with Units

$$16.705\,\text{kN/m}^3 = 11.8\,\text{kN} + \left(1 - 0.5 \right) \cdot 9.81\,\text{kN/m}^3$$

4) Dry Unit Weight given Unit Weight of Solids Formula

Evaluate Formula

Formula

$$\gamma_{dry} = \gamma_{soilds} \cdot \frac{Vs}{V}$$

Example with Units

$$6.1205\,\text{kN/m}^3 = 15\,\text{kN/m}^3 \cdot \frac{5.0\,\text{m}^3}{12.254\,\text{m}^3}$$

5) Dry Unit Weight given Water Content Formula

Evaluate Formula

Formula

$$\gamma_{dry} = G_s \cdot \frac{\gamma_{water}}{1 + \frac{w_s}{S}}$$

Example with Units

$$6.1281\,\text{kN/m}^3 = 2.65 \cdot \frac{9.81\,\text{kN/m}^3}{1 + \frac{8.3}{2.56}}$$

6) Dry Unit Weight given Water Content at Full Saturation Formula

Evaluate Formula

Formula

$$\gamma_{dry} = G_s \cdot \frac{\gamma_{water}}{1 + w_s \cdot G_s}$$

Example with Units

$$1.1305\,\text{kN/m}^3 = 2.65 \cdot \frac{9.81\,\text{kN/m}^3}{1 + 8.3 \cdot 2.65}$$

7) Dry Unit Weight of Soil when Saturation is 0 Percent Formula

Evaluate Formula

Formula

$$\gamma_{dry} = \left(\frac{G_s \cdot \gamma_{water}}{1 + e_s} \right)$$

Example with Units

$$7.8777\,\text{kN/m}^3 = \left(\frac{2.65 \cdot 9.81\,\text{kN/m}^3}{1 + 2.3} \right)$$

Variables used in list of Dry Unit Weight of Soil Formulas above

- e_s Void Ratio of Soil
- G_s Specific Gravity of Soil
- n_a Percentage of Air Voids
- **S** Degree of Saturation
- **V** Total Volume in Soil Mechanics *(Cubic Meter)*
- **Vs** Volume of Solids *(Cubic Meter)*
- w_s Water Content of Soil from Pycnometer
- W_{su} Submerged Weight of Soil *(Kilonewton)*
- 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

Constants, Functions, Measurements used in list of Dry Unit Weight of Soil Formulas above

- Measurement: **Volume** in Cubic Meter (m^3)
  Volume Unit Conversion
- Measurement: **Force** in Kilonewton (kN)
  Force Unit Conversion
- Measurement: **Specific Weight** in Kilonewton per Cubic Meter (kN/m^3)
  Specific Weight Unit Conversion

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