

Important Specific Gravity of Soil Formulas PDF



Formulas Examples with Units

List of 16 Important Specific Gravity of Soil Formulas

1) Bulk Specific Gravity Formula ↻

Formula

$$G_m = \frac{\gamma_{\text{bulk}}}{\gamma_{\text{water}}}$$

Example with Units

$$2.1529 = \frac{21.12 \text{ kN/m}^3}{9.81 \text{ kN/m}^3}$$

Evaluate Formula ↻

2) Bulk Unit Weight of Soil Given Bulk Specific Gravity Formula ↻

Formula

$$\gamma_{\text{bulk}} = G_m \cdot \gamma_{\text{water}}$$

Example with Units

$$21.582 \text{ kN/m}^3 = 2.2 \cdot 9.81 \text{ kN/m}^3$$

Evaluate Formula ↻

3) Specific Gravity given Dry density and Void ratio Formula ↻

Formula

$$G_s = \rho_d \cdot \frac{1 + e}{\gamma_{\text{water}}}$$

Example with Units

$$2.2426 = 10 \text{ kg/m}^3 \cdot \frac{1 + 1.2}{9.81 \text{ kN/m}^3}$$

Evaluate Formula ↻

4) Specific Gravity Given Dry Unit Weight and Water Content Formula ↻

Formula

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

Example with Units

$$1.0937 = 6.12 \text{ kN/m}^3 \cdot \frac{1 + \frac{0.61}{0.81}}{9.81 \text{ kN/m}^3}$$

Evaluate Formula ↻

5) Specific Gravity Given Dry Unit Weight and Water Content at Full Saturation Formula ↻

Formula

$$G_s = \frac{\gamma_{\text{dry}}}{\gamma_{\text{water}} - (w_s \cdot \gamma_{\text{dry}})}$$

Example with Units

$$1.0071 = \frac{6.12 \text{ kN/m}^3}{9.81 \text{ kN/m}^3 - (0.61 \cdot 6.12 \text{ kN/m}^3)}$$

Evaluate Formula ↻

6) Specific Gravity Given Dry Unit Weight in Porosity Formula ↻

Formula

$$G_s = \frac{\gamma_{\text{dry}}}{(1 - \eta) \cdot \gamma_{\text{water}}}$$

Example with Units

$$1.2477 = \frac{6.12 \text{ kN/m}^3}{(1 - 0.5) \cdot 9.81 \text{ kN/m}^3}$$

Evaluate Formula ↻



7) Specific Gravity Given Submerged Unit Weight in Void Ratio Formula

Formula

$$G = \left(\frac{\gamma_s \cdot (1 + e)}{\gamma_{\text{water}}} \right) + 1$$

Example with Units

$$2.1213 = \left(\frac{5.00 \text{ kN/m}^3 \cdot (1 + 1.2)}{9.81 \text{ kN/m}^3} \right) + 1$$

Evaluate Formula 

8) Specific Gravity given Void Ratio given Specific Gravity for Fully Saturated Soil Formula

Formula

$$G_s = \frac{e}{w_s}$$

Example

$$1.9672 = \frac{1.2}{0.61}$$

Evaluate Formula 

9) Specific Gravity given Void Ratio in Specific Gravity Formula

Formula

$$G_s = e \cdot \frac{S}{w_s}$$

Example

$$1.5934 = 1.2 \cdot \frac{0.81}{0.61}$$

Evaluate Formula 

10) Specific Gravity of Soil Formula

Formula

$$G_s = \frac{\gamma_s}{\gamma_{\text{water}}}$$

Example with Units

$$1.5291 = \frac{15 \text{ kN/m}^3}{9.81 \text{ kN/m}^3}$$

Evaluate Formula 

11) Specific Gravity of Soil Solids by Pycnometer Method Formula

Formula

$$G = \left(\frac{w_2 - w_1}{(w_4 - w_3) + (w_2 - w_1)} \right)$$

Example with Units

$$2.0769 = \left(\frac{800 \text{ g} - 125 \text{ g}}{(650 \text{ g} - 1000 \text{ g}) + (800 \text{ g} - 125 \text{ g})} \right)$$

Evaluate Formula 

12) Specific Gravity of Soil Solids given Dry Unit Weight Formula

Formula

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

Example with Units

$$1.3725 = \left(6.12 \text{ kN/m}^3 \cdot \frac{1 + 1.2}{9.81 \text{ kN/m}^3} \right)$$

Evaluate Formula 



13) Specific Gravity of Soil Solids given Saturated Unit Weight Formula

Formula

$$G_s = \frac{\gamma_{\text{saturated}} \cdot (1 + e)}{\gamma_{\text{water}} \cdot (1 + w_s)}$$

Example with Units

$$1.6562 = \frac{11.89 \text{ kN/m}^3 \cdot (1 + 1.2)}{9.81 \text{ kN/m}^3 \cdot (1 + 0.61)}$$

Evaluate Formula 

14) Unit Weight of Soil Solids Given Specific Gravity of Soil Formula

Formula

$$\gamma_s = G_s \cdot \gamma_{\text{water}}$$

Example with Units

$$25.9965 \text{ kN/m}^3 = 2.65 \cdot 9.81 \text{ kN/m}^3$$

Evaluate Formula 

15) Unit Weight of Water Given Bulk Specific Gravity of Soil Formula

Formula

$$\gamma_{\text{water}} = \frac{\gamma_{\text{bulk}}}{G_m}$$

Example with Units

$$9.6 \text{ kN/m}^3 = \frac{21.12 \text{ kN/m}^3}{2.2}$$

Evaluate Formula 

16) Unit Weight of Water Given Specific Gravity of Soil Formula

Formula

$$\gamma_{\text{water}} = \frac{\gamma_s}{G_s}$$

Example with Units

$$5.6604 \text{ kN/m}^3 = \frac{15 \text{ kN/m}^3}{2.65}$$

Evaluate Formula 



Variables used in list of Specific Gravity of Soil Formulas above

- **e** Void Ratio
- **G** Specific Gravity of Soil Solids
- **G_m** Bulk Specific Gravity
- **G_s** Specific Gravity of Soil
- **S** Degree of Saturation
- **W₁** Weight of Empty Pycnometer (*Gram*)
- **W₂** Weight of Empty Pycnometer and Moist Soil (*Gram*)
- **W₃** Weight of Empty Pycnometer, Soil and Water (*Gram*)
- **W₄** Weight of Empty Pycnometer and Water (*Gram*)
- **w_s** Water Content of Soil from Pycnometer
- **Y_S** Submerged Unit Weight in KN per Cubic Meter (*Kilonewton per Cubic Meter*)
- **Y_{bulk}** Bulk Unit Weight (*Kilonewton per Cubic Meter*)
- **Y_{dry}** Dry Unit Weight (*Kilonewton per Cubic Meter*)
- **Y_s** Unit Weight of Solids (*Kilonewton per Cubic Meter*)
- **Y_{saturated}** Saturated Unit Weight of Soil (*Kilonewton per Cubic Meter*)
- **Y_{water}** Unit Weight of Water (*Kilonewton per Cubic Meter*)
- **η** Porosity of Soil
- **ρ_d** Dry Density (*Kilogram per Cubic Meter*)

Constants, Functions, Measurements used in list of Specific Gravity of Soil Formulas above

- **Measurement: Weight** in Gram (g)
Weight 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 



- Important Bearing Capacity for Strip Footing for $C \ \Phi$ Soils Formulas 
- Important Bearing Capacity of Cohesive Soil Formulas 
- Important Bearing Capacity of Non cohesive Soil Formulas 
- Important Bearing Capacity of Soils Formulas 
- Important Bearing Capacity of Soils by Meyerhof's Analysis Formulas 
- Important Foundation Stability Analysis Formulas 
- Important Atterberg Limits Formulas 
- Important Bearing Capacity of Soil by Terzaghi's Analysis Formulas 
- Important Compaction of Soil Formulas 
- Important Earth Moving Formulas 
- Important Lateral Pressure for Cohesive and Non Cohesive Soil Formulas 
- Important Minimum Depth of Foundation by Rankine's Analysis Formulas 
- Important Pile Foundations Formulas 
- Important Porosity of Soil Sample Formulas 
- Important Scraper Production Formulas 
- Important Seepage Analysis Formulas 
- Important Slope Stability Analysis using Bishops Method Formulas 
- Important Slope Stability Analysis using Culman's Method Formulas 
- Important Soil Origin and Its Properties Formulas 
- Important Specific Gravity of Soil Formulas 
- Important Stability Analysis of Infinite Slopes Formulas 
- Important Stability Analysis of Infinite Slopes in Prism Formulas 
- Important Vibration Control in Blasting Formulas 
- Important Void Ratio of Soil Sample Formulas 
- Important Water Content of Soil and Related Formulas 

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