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Specific Gravity of Soil Formulas

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List of 16 Specific Gravity of Soil Formulas

Specific Gravity of Soil

1) Bulk Specific Gravity

$$fx \quad G_m = \frac{\gamma_{bulk}}{\gamma_{water}}$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b_img.jpg\)](#)

$$ex \quad 2.152905 = \frac{21.12kN/m^3}{9.81kN/m^3}$$

2) Bulk Unit Weight of Soil Given Bulk Specific Gravity

$$fx \quad \gamma_{bulk} = G_m \cdot \gamma_{water}$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d_img.jpg\)](#)

$$ex \quad 21.582kN/m^3 = 2.2 \cdot 9.81kN/m^3$$

3) Specific Gravity given Dry density and Void ratio

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

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d_img.jpg\)](#)

$$ex \quad 2.24261 = 10kg/m^3 \cdot \frac{1 + 1.2}{9.81kN/m^3}$$



4) Specific Gravity Given Dry Unit Weight and Water Content

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

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235_img.jpg\)](#)

$$ex \quad 1.093669 = 6.12\text{kN/m}^3 \cdot \frac{1 + \frac{0.61}{0.81}}{9.81\text{kN/m}^3}$$

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

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

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0_img.jpg\)](#)

$$ex \quad 1.007109 = \frac{6.12\text{kN/m}^3}{9.81\text{kN/m}^3 - (0.61 \cdot 6.12\text{kN/m}^3)}$$

6) Specific Gravity Given Dry Unit Weight in Porosity

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

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f_img.jpg\)](#)

$$ex \quad 1.247706 = \frac{6.12\text{kN/m}^3}{(1 - 0.5) \cdot 9.81\text{kN/m}^3}$$



7) Specific Gravity Given Submerged Unit Weight in Void Ratio

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

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95_img.jpg\)](#)

$$ex \quad 2.121305 = \left(\frac{5.00\text{kN/m}^3 \cdot (1 + 1.2)}{9.81\text{kN/m}^3} \right) + 1$$

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

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

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2_img.jpg\)](#)

$$ex \quad 1.967213 = \frac{1.2}{0.61}$$

9) Specific Gravity given Void Ratio in Specific Gravity

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

[Open Calculator !\[\]\(fe3aebe81acea8d45108cd2768939da7_img.jpg\)](#)

$$ex \quad 1.593443 = 1.2 \cdot \frac{0.81}{0.61}$$

10) Specific Gravity of Soil

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

[Open Calculator !\[\]\(899d8b7697d64725bf017d3296cfcf1b_img.jpg\)](#)

$$ex \quad 1.529052 = \frac{15\text{kN/m}^3}{9.81\text{kN/m}^3}$$



11) Specific Gravity of Soil Solids by Pycnometer Method

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

[Open Calculator !\[\]\(e2376d476d06eb31946dc01a69a4403a_img.jpg\)](#)

$$ex \quad 2.076923 = \left(\frac{800g - 125g}{(650g - 1000g) + (800g - 125g)} \right)$$

12) Specific Gravity of Soil Solids given Dry Unit Weight

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

[Open Calculator !\[\]\(0b5e7e25e8775f7e7e80906ada4f0021_img.jpg\)](#)

$$ex \quad 1.372477 = \left(6.12kN/m^3 \cdot \frac{1 + 1.2}{9.81kN/m^3} \right)$$

13) Specific Gravity of Soil Solids given Saturated Unit Weight

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

[Open Calculator !\[\]\(bd3b31712ad9bab5a241210fa6925cdd_img.jpg\)](#)

$$ex \quad 1.656188 = \frac{11.89kN/m^3 \cdot (1 + 1.2)}{9.81kN/m^3 \cdot (1 + 0.61)}$$


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

$$fx \quad \gamma_s = G_s \cdot \gamma_{water}$$

[Open Calculator !\[\]\(7bc43b319a082987e20f7bf78f4bab80_img.jpg\)](#)

$$ex \quad 25.9965kN/m^3 = 2.65 \cdot 9.81kN/m^3$$



15) Unit Weight of Water Given Bulk Specific Gravity of Soil [Open Calculator](#) 

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

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

16) Unit Weight of Water Given Specific Gravity of Soil [Open Calculator](#) 

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

$$\text{ex } 5.660377\text{kN/m}^3 = \frac{15\text{kN/m}^3}{2.65}$$



Variables Used

- **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

- **Measurement: Weight** in Gram (g)
Weight Unit Conversion 
- **Measurement: Density** in Kilogram per Cubic Meter (kg/m^3)
Density Unit Conversion 
- **Measurement: Specific Weight** in Kilonewton per Cubic Meter (kN/m^3)
Specific Weight Unit Conversion 



Check other formula lists

- [Bearing Capacity for Strip Footing for C- \$\Phi\$ Soils Formulas](#)
- [Bearing Capacity of Cohesive Soil Formulas](#)
- [Bearing Capacity of Non-cohesive Soil Formulas](#)
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