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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 ↗](#)

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

2) Bulk Unit Weight of Soil Given Bulk Specific Gravity ↗

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

[Open Calculator ↗](#)

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

3) Specific Gravity given Dry density and Void ratio ↗

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

[Open Calculator ↗](#)

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



4) Specific Gravity Given Dry Unit Weight and Water Content ↗

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

[Open Calculator ↗](#)

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

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

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

[Open Calculator ↗](#)

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

6) Specific Gravity Given Dry Unit Weight in Porosity ↗

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

[Open Calculator ↗](#)

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



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

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

[Open Calculator ↗](#)

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

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

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

[Open Calculator ↗](#)

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

9) Specific Gravity given Void Ratio in Specific Gravity ↗

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

[Open Calculator ↗](#)

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

10) Specific Gravity of Soil ↗

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

[Open Calculator ↗](#)

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



11) Specific Gravity of Soil Solids by Pycnometer Method

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

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

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

12) Specific Gravity of Soil Solids given Dry Unit Weight

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

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

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

13) Specific Gravity of Soil Solids given Saturated Unit Weight

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

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

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

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

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

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

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



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

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

[Open Calculator ↗](#)

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 ↗

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

[Open Calculator ↗](#)

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
- w_1 Weight of Empty Pycnometer (Gram)
- w_2 Weight of Empty Pycnometer and Moist Soil (Gram)
- w_3 Weight of Empty Pycnometer, Soil and Water (Gram)
- w_4 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*)
- γ_{bulk} Bulk Unit Weight (*Kilonewton per Cubic Meter*)
- γ_{dry} Dry Unit Weight (*Kilonewton per Cubic Meter*)
- γ_s Unit Weight of Solids (*Kilonewton per Cubic Meter*)
- $\gamma_{saturated}$ Saturated Unit Weight of Soil (*Kilonewton per Cubic Meter*)
- γ_{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/m³)
Density Unit Conversion ↗
- **Measurement:** **Specific Weight** in Kilonewton per Cubic Meter (kN/m³)
Specific Weight Unit Conversion ↗



Check other formula lists

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- Bearing Capacity of Cohesive Soil Formulas ↗
- Bearing Capacity of Non-cohesive Soil Formulas ↗
- Bearing Capacity of Soils: Meyerhof's Analysis Formulas ↗
- Foundation Stability Analysis Formulas ↗
- Atterberg Limits Formulas ↗
- Bearing Capacity of Soil: Terzaghi's Analysis Formulas ↗
- Compaction of Soil Formulas ↗
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