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Terzaghi's Analysis in Water Table is Below the Base of Footing Formulas

Calculators! Examples! Conversions!

List of 25 Terzaghi's Analysis in Water Table is Below the Base of Footing Formulas

Terzaghi's Analysis in Water Table is Below the Base of Footing

1) Cohesion of Soil given Depth and Width of Footing

Open Calculator

fx $$C = \frac{q_{fc} - \left(\left(\gamma \cdot D_{footing} \cdot N_q\right) + \left(0.5 \cdot \gamma \cdot B \cdot N_\gamma\right)\right)}{N_c}$$

ex $$0.7892\text{kPa} = \frac{127.8\text{kPa} - \left(\left(18\text{kN/m}^3 \cdot 2.54\text{m} \cdot 2.01\right) + \left(0.5 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6\right)\right)}{9}$$

2) Cohesion of Soil given Net Ultimate Bearing Capacity

Open Calculator

fx $$C_s = \frac{q_{nf} - \left(\left(\sigma_s \cdot \left(N_q - 1\right)\right) + \left(0.5 \cdot \gamma \cdot B \cdot N_\gamma\right)\right)}{N_c}$$

ex $$8.315667\text{kPa} = \frac{150\text{kN/m}^2 - \left(\left(45.9\text{kN/m}^2 \cdot (2.01 - 1)\right) + \left(0.5 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6\right)\right)}{9}$$

3) Cohesion of Soil given Safe Bearing Capacity

Open Calculator

fx $$C_s = \frac{\left(\left(q_{sa} \cdot f_s\right) - \left(f_s \cdot \sigma'\right)\right) - \left(\left(\sigma_s \cdot \left(N_q - 1\right)\right) + \left(0.5 \cdot \gamma \cdot B \cdot N_\gamma\right)\right)}{N_c}$$

ex $$13.42367\text{kPa} = \frac{\left(\left(70\text{kN/m}^2 \cdot 2.8\right) - \left(2.8 \cdot 10.0\text{Pa}\right)\right) - \left(\left(45.9\text{kN/m}^2 \cdot (2.01 - 1)\right) + \left(0.5 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6\right)\right)}{9}$$

4) Depth of Footing given Bearing Capacity Factor

Open Calculator

fx $$D_{footing} = \frac{q_{fc} - \left(\left(C \cdot N_c\right) + \left(0.5 \cdot \gamma \cdot B \cdot N_\gamma\right)\right)}{\gamma \cdot N_q}$$

ex $$2.420398\text{m} = \frac{127.8\text{kPa} - \left(\left(1.27\text{kPa} \cdot 9\right) + \left(0.5 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6\right)\right)}{18\text{kN/m}^3 \cdot 2.01}$$

5) Depth of Footing given Bearing Capacity Factor and Width of Footing

Open Calculator

fx $$D = \frac{q_{nf} - \left((C_s \cdot N_c) + (0.5 \cdot \gamma \cdot B \cdot N_\gamma) \right)}{\gamma \cdot (N_q - 1)}$$

ex $$4.191419\text{m} = \frac{150\text{kN/m}^2 - ((5.0\text{kPa} \cdot 9) + (0.5 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6))}{18\text{kN/m}^3 \cdot (2.01 - 1)}$$

6) Depth of Footing given Factor of Safety and Safe Bearing Capacity

Open Calculator

fx $$D = \frac{(q_{sa} \cdot f_s) - \left((C_s \cdot N_c) + (0.5 \cdot \gamma \cdot B \cdot N_\gamma) \right)}{\gamma \cdot N_q}$$

ex $$3.377557\text{m} = \frac{(70\text{kN/m}^2 \cdot 2.8) - ((5.0\text{kPa} \cdot 9) + (0.5 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6))}{18\text{kN/m}^3 \cdot 2.01}$$

7) Effective Surcharge given Bearing Capacity Factor

Open Calculator

fx $$\sigma_s = \frac{q_{nf} - \left((C_s \cdot N_c) + (0.5 \cdot \gamma \cdot B \cdot N_\gamma) \right)}{N_q - 1}$$

ex $$103.6808\text{kN/m}^2 = \frac{150\text{kN/m}^2 - ((5.0\text{kPa} \cdot 9) + (0.5 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6))}{2.01 - 1}$$

8) Effective Surcharge given Safe Bearing Capacity

Open Calculator

fx $$\sigma_s = \frac{(q_{sa} \cdot f_s) - \left((C_s \cdot N_c) + (0.5 \cdot \gamma \cdot B \cdot N_\gamma) \right)}{f_s + N_q - 1}$$

ex $$32.07349\text{kN/m}^2 = \frac{(70\text{kN/m}^2 \cdot 2.8) - ((5.0\text{kPa} \cdot 9) + (0.5 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6))}{2.8 + 2.01 - 1}$$

9) Factor of Safety given Bearing Capacity Factor

Open Calculator

fx $$f_s = \frac{(C_s \cdot N_c) + (\sigma_s \cdot (N_q - 1)) + (0.5 \cdot \gamma \cdot B \cdot N_\gamma)}{q_{sa} - \sigma_s}$$

ex $$4.985851 = \frac{(5.0\text{kPa} \cdot 9) + (45.9\text{kN/m}^2 \cdot (2.01 - 1)) + (0.5 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6)}{70\text{kN/m}^2 - 45.9\text{kN/m}^2}$$

10) Factor of Safety given Depth and Width of Footing

Open Calculator

fx $$f_s = \frac{(C_s \cdot N_c) + ((\gamma \cdot D) \cdot (N_q - 1)) + (0.5 \cdot \gamma \cdot B \cdot N_\gamma)}{q_{sa} - (\gamma \cdot D)}$$

ex $$1.778499 = \frac{(5.0\text{kPa} \cdot 9) + ((18\text{kN/m}^3 \cdot 1.01\text{m}) \cdot (2.01 - 1)) + (0.5 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6)}{70\text{kN/m}^2 - (18\text{kN/m}^3 \cdot 1.01\text{m})}$$

11) Net Ultimate Bearing Capacity given Bearing Capacity Factor

Open Calculator

fx $$q_{nf} = (C_s \cdot N_c) + (\sigma_s \cdot (N_q - 1)) + (0.5 \cdot \gamma \cdot B \cdot N_\gamma)$$

ex $$120.159\text{kN/m}^2 = (5.0\text{kPa} \cdot 9) + (45.9\text{kN/m}^2 \cdot (2.01 - 1)) + (0.5 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6)$$

12) Net Ultimate Bearing Capacity given Depth and Width of Footing

Open Calculator

fx $$q_{nf} = ((C_s \cdot N_c) + ((\gamma \cdot D) \cdot (N_q - 1)) + (0.5 \cdot \gamma \cdot B \cdot N_\gamma))$$

ex $$92.1618\text{kN/m}^2 = ((5.0\text{kPa} \cdot 9) + ((18\text{kN/m}^3 \cdot 1.01\text{m}) \cdot (2.01 - 1)) + (0.5 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6))$$

13) Safe Bearing Capacity given Bearing Capacity Factor

Open Calculator

fx $$q_{sa} = \left(\frac{(C_s \cdot N_c) + (\sigma_s \cdot (N_q - 1)) + (0.5 \cdot \gamma \cdot B \cdot N_\gamma)}{f_s}\right) + \sigma_s$$

ex $$88.81393\text{kN/m}^2 = \left(\frac{(5.0\text{kPa} \cdot 9) + (45.9\text{kN/m}^2 \cdot (2.01 - 1)) + (0.5 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6)}{2.8}\right) + 45.9\text{kN/m}^2$$

14) Safe Bearing Capacity given Depth and Width of Footing

Open Calculator

fx $$q_{sa} = \left(\frac{(C_s \cdot N_c) + ((\gamma \cdot D) \cdot (N_q - 1)) + (0.5 \cdot \gamma \cdot B \cdot N_\gamma)}{f_s}\right) + (\gamma \cdot D)$$

ex

$$51.09493\text{kN/m}^2 = \left(\frac{(5.0\text{kPa} \cdot 9) + ((18\text{kN/m}^3 \cdot 1.01\text{m}) \cdot (2.01 - 1)) + (0.5 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6)}{2.8}\right) + (18\text{kN/}$$

15) Ultimate Bearing Capacity given Bearing Capacity Factor

Open Calculator

fx $$q_f = (C_s \cdot N_c) + (\gamma \cdot D \cdot N_q) + (0.5 \cdot \gamma \cdot B \cdot N_\gamma)$$

ex $$110.3418\text{kPa} = (5.0\text{kPa} \cdot 9) + (18\text{kN/m}^3 \cdot 1.01\text{m} \cdot 2.01) + (0.5 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6)$$

16) Unit Weight of Soil given Bearing Capacity Factor, Depth and Width of Footing

Open Calculator

fx $$\gamma = \frac{q_{nf} - (C_s \cdot N_c)}{(0.5 \cdot B \cdot N_\gamma) + (D \cdot (N_q - 1))}$$

ex $$0.040075\text{kN/m}^3 = \frac{150\text{kN/m}^2 - (5.0\text{kPa} \cdot 9)}{(0.5 \cdot 2\text{m} \cdot 1.6) + (1.01\text{m} \cdot (2.01 - 1))}$$

17) Unit Weight of Soil given Depth and Width of Footing

Open Calculator

fx $$\gamma = \frac{q_f - (C_s \cdot N_c)}{(D \cdot N_q) + (0.5 \cdot B \cdot N_\gamma)}$$

ex $$4.132118\text{kN/m}^3 = \frac{60\text{kPa} - (5.0\text{kPa} \cdot 9)}{(1.01\text{m} \cdot 2.01) + (0.5 \cdot 2\text{m} \cdot 1.6)}$$

18) Unit Weight of Soil given Factor of Safety and Safe Bearing Capacity

Open Calculator

fx $$\gamma = \frac{(q_{sa} \cdot f_s) - ((C_s \cdot N_c))}{(N_q \cdot D) + (0.5 \cdot B \cdot N_\gamma)}$$

ex $$41.59665\text{kN/m}^3 = \frac{(70\text{kN/m}^2 \cdot 2.8) - ((5.0\text{kPa} \cdot 9))}{(2.01 \cdot 1.01\text{m}) + (0.5 \cdot 2\text{m} \cdot 1.6)}$$

19) Unit Weight of Soil given Net Ultimate Bearing Capacity

Open Calculator

fx $$\gamma = \frac{q_{nf} - ((C_s \cdot N_c) + (\sigma_s \cdot (N_q - 1)))}{0.5 \cdot B \cdot N_\gamma}$$

ex $$36.65062\text{kN/m}^3 = \frac{150\text{kN/m}^2 - ((5.0\text{kPa} \cdot 9) + (45.9\text{kN/m}^2 \cdot (2.01 - 1)))}{0.5 \cdot 2\text{m} \cdot 1.6}$$

20) Unit Weight of Soil given Safe Bearing Capacity

Open Calculator

fx $$\gamma = \frac{((q_{sa} \cdot f_s) - (f_s \cdot \sigma_s)) - ((C \cdot N_c) + (\sigma_s \cdot (N_q - 1)))}{0.5 \cdot B \cdot N_\gamma}$$

ex $$6.056875\text{kN/m}^3 = \frac{((70\text{kN/m}^2 \cdot 2.8) - (2.8 \cdot 45.9\text{kN/m}^2)) - ((1.27\text{kPa} \cdot 9) + (45.9\text{kN/m}^2 \cdot (2.01 - 1)))}{0.5 \cdot 2\text{m} \cdot 1.6}$$

21) Width of Footing given Bearing Capacity Factor and Depth of Footing

Open Calculator

fx $$B = \frac{q_{nf} - ((C_s \cdot N_c) + ((\gamma \cdot D) \cdot (N_q - 1)))}{0.5 \cdot \gamma \cdot N_\gamma}$$

ex $$6.016542\text{m} = \frac{150\text{kN/m}^2 - ((5.0\text{kPa} \cdot 9) + ((18\text{kN/m}^3 \cdot 1.01\text{m}) \cdot (2.01 - 1)))}{0.5 \cdot 18\text{kN/m}^3 \cdot 1.6}$$

22) Width of Footing given Effective Surcharge

Open Calculator

fx $$B = \frac{q_{nf} - ((C_s \cdot N_c) + (\sigma_s \cdot (N_q - 1)))}{0.5 \cdot \gamma \cdot N_\gamma}$$

ex $$4.072292\text{m} = \frac{150\text{kN/m}^2 - ((5.0\text{kPa} \cdot 9) + (45.9\text{kN/m}^2 \cdot (2.01 - 1)))}{0.5 \cdot 18\text{kN/m}^3 \cdot 1.6}$$

23) Width of Footing given Factor of Safety and Safe Bearing Capacity

Open Calculator

fx $$B = \frac{((q_{sa} \cdot f_s) - (f_s \cdot (\gamma \cdot D))) - ((C_s \cdot N_c) + ((\gamma \cdot D) \cdot (N_q - 1)))}{0.5 \cdot \gamma \cdot N_\gamma}$$

ex

$$5.675986\text{m} = \frac{((70\text{kN/m}^2 \cdot 2.8) - (2.8 \cdot (18\text{kN/m}^3 \cdot 1.01\text{m}))) - ((5.0\text{kPa} \cdot 9) + ((18\text{kN/m}^3 \cdot 1.01\text{m}) \cdot (2.01 -}{0.5 \cdot 18\text{kN/m}^3 \cdot 1.6}$$

24) Width of Footing given Safe Bearing Capacity

Open Calculator

fx $$B = \frac{((q_{sa} \cdot f_s) - (f_s \cdot \sigma_s)) - ((C \cdot N_c) + (\sigma_s \cdot (N_q - 1)))}{0.5 \cdot \gamma \cdot N_\gamma}$$

ex $$0.672986\text{m} = \frac{((70\text{kN/m}^2 \cdot 2.8) - (2.8 \cdot 45.9\text{kN/m}^2)) - ((1.27\text{kPa} \cdot 9) + (45.9\text{kN/m}^2 \cdot (2.01 - 1)))}{0.5 \cdot 18\text{kN/m}^3 \cdot 1.6}$$

25) Width of Footing given Ultimate Bearing Capacity

Open Calculator

fx $$B = \frac{q_{fc} - ((C \cdot N_c) + (\gamma \cdot D_{footing} \cdot N_q))}{0.5 \cdot \gamma \cdot N_\gamma}$$

ex $$1.6995\text{m} = \frac{127.8\text{kPa} - ((1.27\text{kPa} \cdot 9) + (18\text{kN/m}^3 \cdot 2.54\text{m} \cdot 2.01))}{0.5 \cdot 18\text{kN/m}^3 \cdot 1.6}$$

Variables Used

- **B** Width of Footing *(Meter)*
- **C** Cohesion in Soil as Kilopascal *(Kilopascal)*
- **C_s** Cohesion of Soil *(Kilopascal)*
- **D** Depth of Footing *(Meter)*
- **$D_{footing}$** Depth of Footing in Soil *(Meter)*
- **f_s** Factor of Safety
- **N_c** Bearing Capacity Factor dependent on Cohesion
- **N_q** Bearing Capacity Factor dependent on Surcharge
- **N_γ** Bearing Capacity Factor dependent on Unit Weight
- **q_f** Ultimate Bearing Capacity *(Kilopascal)*
- **q_{fc}** Ultimate Bearing Capacity in Soil *(Kilopascal)*
- **q_{nf}** Net Ultimate Bearing Capacity *(Kilonewton per Square Meter)*
- **q_{sa}** Safe Bearing Capacity *(Kilonewton per Square Meter)*
- **γ** Unit Weight of Soil *(Kilonewton per Cubic Meter)*
- **σ'** Effective Surcharge *(Pascal)*
- **σ_s** Effective Surcharge in KiloPascal *(Kilonewton per Square Meter)*

Constants, Functions, Measurements used

- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Pressure** in Kilopascal (kPa), Kilonewton per Square Meter (kN/m²), Pascal (Pa)
  Pressure Unit Conversion
- Measurement: **Specific Weight** in Kilonewton per Cubic Meter (kN/m³)
  Specific Weight Unit Conversion

Check other formula lists

- **Terzaghi's Analysis in Water Table is Below the Base of Footing Formulas**
- **Terzaghi's Analysis Purely Cohesive Soil Formulas**

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