Important Bearing Capacity of Soil by Terzaghi's Analysis Formulas PDF





| | Formula | | Example with Units |
|-----|---|-----------|---|
| B = | $\frac{W\cdot 4}{\tan\left(\frac{\phi\cdot\pi}{180}\right)\cdot\gamma}$ | 0.2974m = | $\frac{10.01{\rm kg}\cdot 4}{\tan\left(\frac{82.57^{\circ}\cdot 3.1416}{180}\right)\cdot 18{\rm kN/m^3}}$ |







Example with Units

$$14.723_{kPa} = \frac{60_{kPa} - ((10.0_{Pa} \cdot 2.01) + (0.5 \cdot 18_{kN/m^3} \cdot 2_m \cdot 1.6 \cdot 0.8))}{1.3 \cdot 1.93}$$



9.10) Cohesion of Soil given Strip Footing and Bearing Capacity Formula 🕝

Evaluate Formula

Evaluate Formula (

Evaluate Formula

$$C_{st} = \frac{q_{f} \cdot \left(\left(\sigma' \cdot N_{q} \right) + \left(0.5 \cdot \gamma \cdot B \cdot N_{\gamma} \cdot 1 \right) \right)}{1 \cdot N_{c}}$$

Example with Units

$$16.1554_{kPa} = \frac{60_{kPa} - ((10.0_{Pa} \cdot 2.01) + (0.5 \cdot 18_{kN/m^3} \cdot 2_m \cdot 1.6 \cdot 1))}{1 \cdot 1.93}$$

9.11) Effective Surcharge given Round Footing and Bearing Capacity Formula 🕝

$$\sigma_{\text{round}} = \frac{q_{\text{f}} \cdot \left(\left(1.3 \cdot \text{C} \cdot \text{N}_{\text{c}} \right) + \left(0.5 \cdot \gamma \cdot \text{B} \cdot \text{N}_{\gamma} \cdot 0.6 \right) \right)}{\text{N}_{\text{q}}}$$

$$15.9736 \text{ kN/m}^{2} = \frac{60 \text{ kPa} - ((1.3 \cdot 4.23 \text{ kPa} \cdot 1.93) + (0.5 \cdot 18 \text{ kN/m}^{3} \cdot 2\text{ m} \cdot 1.6 \cdot 0.6))}{2.01}$$

9.12) Effective Surcharge given Square Footing and Bearing Capacity Formula

Formula
 Evaluate Formula

$$\sigma_{square} = \frac{q_f - ((1.3 \cdot C \cdot N_c) + (0.5 \cdot \gamma \cdot B \cdot N_\gamma \cdot 0.8))}{N_q}$$
 Example with Units

$$13.1079_{kN/m^{2}} = \frac{60_{kPa} - ((1.3 \cdot 4.23_{kPa} \cdot 1.93) + (0.5 \cdot 18_{kN/m^{3}} \cdot 2_{m} \cdot 1.6 \cdot 0.8))}{2.01}$$

9.13) Effective Surcharge given Strip Footing and Bearing Capacity Formula

$$\sigma_{strip} = \frac{q_{f} \cdot \left(\left(1 \cdot C \cdot N_{c} \right) + \left(0.5 \cdot \gamma \cdot B \cdot N_{\gamma} \cdot 1 \right) \right)}{N_{q}}$$

Example with Units

$$11.4607 \text{ kN/m}^2 = \frac{60 \text{ kPa} \cdot ((1 \cdot 4.23 \text{ kPa} \cdot 1.93) + (0.5 \cdot 18 \text{ kN/m}^3 \cdot 2 \text{ m} \cdot 1.6 \cdot 1))}{2.01}$$





9.18) Unit Weight of Soil given Square Footing and Bearing Capacity Formula 🕝

$$\gamma = \frac{q_{s} \cdot \left(\left(1.3 \cdot C_{sq} \cdot N_{c} \right) + \left(\sigma_{square} \cdot N_{q} \right) \right)}{0.5 \cdot N_{\gamma} \cdot B_{square} \cdot 0.8}$$

Example with Units

$$17.3611 \text{ kN/m}^3 = \frac{110.819 \text{ kPa} - ((1.3 \cdot 14.72 \text{ kPa} \cdot 1.93) + (13.10 \text{ kN/m}^2 \cdot 2.01))}{0.5 \cdot 1.6 \cdot 4.28 \text{ m} \cdot 0.8}$$

9.19) Unit Weight of Soil given Strip Footing and Bearing Capacity Formula 🕝

$$\label{eq:gamma} \boxed{ \begin{array}{l} \gamma = \displaystyle \frac{{{q_s} \cdot \left({\left({1 \cdot {C_{{st}} \cdot {N_c}}} \right) + \left({{\sigma _{{strip}} \cdot {N_q}}} \right)} \right)}{{0.5 \cdot {N_\gamma } \cdot {B_{{strip}} \cdot 1}} \end{array} } }$$

$$19.7127 \text{ kN/m}^{3} = \frac{110.819 \text{ kPa} \cdot ((1 \cdot 16.15 \text{ kPa} \cdot 1.93) + (11.46 \text{ kN/m}^{2} \cdot 2.01))}{0.5 \cdot 1.6 \cdot 3.59 \text{ m} \cdot 1}$$

9.20) Width of Footing given Round Footing and Bearing Capacity Formula 🕝

$$B_{round} = \frac{q_{f} - \left(\left(1.3 \cdot C \cdot N_{c} \right) + \left(\sigma' \cdot N_{q} \right) \right)}{0.5 \cdot N_{\gamma} \cdot \gamma \cdot 0.6}$$

Example with Units

$$5.7138_{m} = \frac{60_{kPa} - ((1.3 \cdot 4.23_{kPa} \cdot 1.93) + (10.0_{Pa} \cdot 2.01))}{0.5 \cdot 1.6 \cdot 18_{kN/m^{3}} \cdot 0.6}$$

9.21) Width of Footing given Shape Factor Formula 🕝

Evaluate Formula 🕝

Evaluate Formula

Evaluate Formula (

Evaluate Formula

$$B = \frac{q_{f} \cdot \left(\left(s_{c} \cdot C \cdot N_{c}\right) + \left(\sigma' \cdot N_{q}\right)\right)}{0.5 \cdot N_{\gamma} \cdot \gamma \cdot s_{\gamma}}$$

Example with Units

$$2.0009_{m} = \frac{60_{kPa} \cdot ((1.7 \cdot 4.23_{kPa} \cdot 1.93) + (10.0_{Pa} \cdot 2.01))}{0.5 \cdot 1.6 \cdot 18_{kN/m^{3}} \cdot 1.60}$$



9.22) Width of Footing given Square Footing and Bearing Capacity Formula

Evaluate Formula

Evaluate Formula

$$B_{square} = \frac{q_{f} \cdot \left(\left(1.3 \cdot C \cdot N_{c} \right) + \left(\sigma' \cdot N_{q} \right) \right)}{0.5 \cdot N_{\gamma} \cdot \gamma \cdot 0.8}$$

$$\boxed{\begin{array}{l} \text{Example with Units} \\ 4.2853\,\text{m} \ = \ \frac{60\,\text{kPa} \ \cdot \ \left(\ \left(\ 1.3 \cdot 4.23\,\text{kPa} \ \cdot \ 1.93 \ \right) \ + \ \left(\ 10.0\,\text{Pa} \ \cdot \ 2.01 \ \right) \ \right)}{0.5 \cdot 1.6 \cdot 18\,\text{kN/m}^3 \cdot 0.8} \end{array}}$$

9.23) Width of Footing given Strip Footing and Bearing Capacity Formula 🕝

$$B_{strip} = \frac{q_{f} \cdot \left(\left(1 \cdot C \cdot N_{c} \right) + \left(\sigma' \cdot N_{q} \right) \right)}{0.5 \cdot N_{\gamma} \cdot \gamma \cdot 1}$$

| Example with Units | | | | | |
|--------------------|--|--|--|--|--|
| 3 5983 | $60{}_{kPa}\cdot\left(\left(1\cdot4.23{}_{kPa}\cdot1.93\right)+\left(10.0{}_{Pa}\cdot2.01\right)\right)$ | | | | |
| 5.5705111 - | $0.5\cdot1.6\cdot18\textrm{kN/m^3}\cdot1$ | | | | |



Variables used in list of Bearing Capacity of Soil by Terzaghi's Analysis Formulas above

- B Width of Footing (Meter)
- B_{round} Width of Footing for Round Footing (Meter)
- B_{square} Width of Footing for Square Footing (*Meter*)
- Bstrip Width of Footing for Strip Footing (Meter)
- C Cohesion (Kilopascal)
- C_r Cohesion of Soil given Round Footing (*Kilopascal*)
- C_{sq} Cohesion of Soil given Square Footing (Kilopascal)
- C_{st} Cohesion of Soil given Strip Footing (*Kilopascal*)
- N_c Bearing Capacity Factor dependent on Cohesion
- N_q Bearing Capacity Factor dependent on Surcharge
- N_Y Bearing Capacity Factor dependent on Unit Weight
- Pp Passive Earth Pressure (Kilopascal)
- q Load Intensity (Kilopascal)
- **q**_b Loading Intensity with Bearing Capacity Factors (*Kilopascal*)
- **q**f Ultimate Bearing Capacity (Kilopascal)
- **q**round Bearing Capacity for Round Footing (*Kilopascal*)
- **q**_s Bearing Capacity (Kilopascal)
- **q_{square}** Bearing Capacity for Square Footing (Kilopascal)
- **q**_{strip} Bearing Capacity for Strip Footing (*Kilopascal*)
- **R**_v Total Downward Force in Soil (*Kilonewton*)
- Sc Shape Factor dependent on Cohesion
- S_v Shape Factor Dependent on Unit Weight

Constants, Functions, Measurements used in list of Bearing Capacity of Soil by Terzaghi's Analysis Formulas above

- constant(s): pi,
 3.14159265358979323846264338327950288
 Archimedes' constant
- Functions: atan, atan(Number) Inverse tan is used to calculate the angle by applying the tangent ratio of the angle, which is the opposite side divided by the adjacent side of the right triangle.
- Functions: sqrt, sqrt(Number) A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Functions: tan, tan(Angle) The tangent of an angle is a trigonometric ratio of the length of the side opposite an angle to the length of the side adjacent to an angle in a right triangle.
- Measurement: Length in Meter (m)
 Length Unit Conversion
- Measurement: Weight in Kilogram (kg) Weight Unit Conversion
- Measurement: **Pressure** in Kilopascal (kPa), Kilonewton per Square Meter (kN/m²), Pascal (Pa)

Pressure Unit Conversion 🕝

- Measurement: Force in Kilonewton (kN)
 Force Unit Conversion
- Measurement: Angle in Degree (°)
 Angle Unit Conversion
- Measurement: Specific Weight in Kilonewton per Cubic Meter (kN/m³)
 Specific Weight Unit Conversion C



- W Weight of Wedge (Kilogram)
- Wwe Weight of Wedge in Kilonewton (Kilonewton)
- γ Unit Weight of Soil (Kilonewton per Cubic Meter)
- σ' Effective Surcharge (Pascal)
- σ_{round} Effective Surcharge given Round Footing (Kilonewton per Square Meter)
- σ_s Effective Surcharge (KN/m2) (Kilonewton per Square Meter)
- σ_{square} Effective Surcharge given Square Footing (Kilonewton per Square Meter)
- σ_{strip} Effective Surcharge given Strip Footing (Kilonewton per Square Meter)
- **•** Angle of Shearing Resistance (Degree)



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Proper fraction

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