Important Bearing Capacity for Strip Footing for C-Φ Soils Formulas PDF

Formulas
Examples
with Units

List of 16
Important Bearing Capacity for Strip Footing for C-Φ Soils Formulas

1) General Shear Failure Formulas

1.1) Bearing Capacity Factor Dependent on Cohesion for General Shear Failure Formula

Evaluate Formula

Formula

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

Example with Units

$$9.3236 = \frac{87\,\text{kN/m}^2 - \left(\left(45.9\,\text{kN/m}^2 \cdot \left(2.01 - 1 \right) \right) + \left(0.5 \cdot 2\,\text{m} \cdot 18\,\text{kN/m}^3 \cdot 1.6 \right) \right)}{1.27\,\text{kPa}}$$

1.2) Bearing Capacity Factor Dependent on Surcharge for General Shear Failure Formula

Evaluate Formula

Formula

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

Example with Units

$$2.2676 = \left(\frac{87\,\text{kN/m}^2 - \left(\left(2.05\,\text{Pa} \cdot 9 \right) + \left(0.5 \cdot 2\,\text{m} \cdot 18\,\text{kN/m}^3 \cdot 1.6 \right) \right)}{45.9\,\text{kN/m}^2} \right) + 1$$

1.3) Bearing Capacity Factor Dependent on Unit Weight for General Shear Failure Formula

Evaluate Formula

Formula

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

Example with Units

$$2.2568 = \frac{87\,\text{kN/m}^2 - \left(\left(2.05\,\text{Pa} \cdot 9 \right) + \left(45.9\,\text{kN/m}^2 \cdot \left(2.01 - 1 \right) \right) \right)}{0.5 \cdot 2\,\text{m} \cdot 18\,\text{kN/m}^3}$$

1.4) Cohesion of Soil given Net Ultimate Bearing Capacity for General Shear Failure Formula

Evaluate Formula

Formula

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

Example with Units

$$1.3157\,\text{kPa} = \frac{87\,\text{kN/m}^2 - \left(\left(45.9\,\text{kN/m}^2 \cdot \left(2.01 - 1 \right) \right) + \left(0.5 \cdot 2\,\text{m} \cdot 18\,\text{kN/m}^3 \cdot 1.6 \right) \right)}{9}$$

1.5) Effective Surcharge given Net Ultimate Bearing Capacity for General Shear Failure Formula

Evaluate Formula

Formula

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

Example with Units

$$46.3069\,\text{kN/m}^2 = \frac{87\,\text{kN/m}^2 - \left(\left(1.27\,\text{kPa} \cdot 9 \right) + \left(0.5 \cdot 2\,\text{m} \cdot 18\,\text{kN/m}^3 \cdot 1.6 \right) \right)}{2.01 - 1}$$

1.6) Net Ultimate Bearing Capacity for General Shear Failure Formula

Evaluate Formula

Formula

$$q_{nu} = \left(C \cdot N_c \right) + \left(\sigma_s \cdot \left(N_q - 1 \right) \right) + \left(0.5 \cdot B \cdot \gamma \cdot N_\gamma \right)$$

Example with Units

$$86.589\,\text{kN/m}^2 = \left(1.27\,\text{kPa} \cdot 9 \right) + \left(45.9\,\text{kN/m}^2 \cdot \left(2.01 - 1 \right) \right) + \left(0.5 \cdot 2\,\text{m} \cdot 18\,\text{kN/m}^3 \cdot 1.6 \right)$$

1.7) Unit Weight of Soil under Strip Footing for General Shear Failure Formula

Evaluate Formula

Formula

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

Example with Units

$$18.2569\,\text{kN/m}^3 = \frac{87\,\text{kN/m}^2 - \left(\left(1.27\,\text{kPa} \cdot 9 \right) + \left(45.9\,\text{kN/m}^2 \cdot \left(2.01 - 1 \right) \right) \right)}{0.5 \cdot 2\,\text{m} \cdot 1.6}$$

1.8) Width of Strip Footing given Net Ultimate Bearing Capacity Formula

Evaluate Formula

Formula

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

Example with Units

$$2.0285\,\text{m} = \frac{87\,\text{kN/m}^2 - \left(\left(1.27\,\text{kPa} \cdot 9 \right) + \left(45.9\,\text{kN/m}^2 \cdot \left(2.01 - 1 \right) \right) \right)}{0.5 \cdot 18\,\text{kN/m}^3 \cdot 1.6}$$

2) Local Shear Failure Formulas

2.1) Bearing Capacity Factor Dependent on Cohesion for Case of Local Shear Failure Formula

Evaluate Formula

Formula

$$N_c = \frac{q_{nu} - \left(\left(\sigma_s \cdot \left(N_q - 1 \right) \right) + \left(0.5 \cdot B \cdot \gamma \cdot N_\gamma \right) \right)}{\left(\frac{2}{3} \right) \cdot C}$$

Example with Units

$$13.9854 = \frac{87\,\text{kN/m}^2 - \left(\left(45.9\,\text{kN/m}^2 \cdot \left(2.01 - 1 \right) \right) + \left(0.5 \cdot 2\,\text{m} \cdot 18\,\text{kN/m}^3 \cdot 1.6 \right) \right)}{\left(\frac{2}{3} \right) \cdot 1.27\,\text{kPa}}$$

2.2) Bearing Capacity Factor Dependent on Surcharge for Case of Local Shear Failure Formula

Evaluate Formula

Formula

$$N_q = \left(\frac{q_{nu} - \left(\left(\left(\frac{2}{3} \right) \cdot C \cdot N_c \right) + \left(0.5 \cdot B \cdot \gamma \cdot N_\gamma \right) \right)}{\sigma_s} \right) + 1$$

Example with Units

$$2.102 = \left(\frac{87\,\text{kN/m}^2 - \left(\left(\left(\frac{2}{3} \right) \cdot 1.27\,\text{kPa} \cdot 9 \right) + \left(0.5 \cdot 2\,\text{m} \cdot 18\,\text{kN/m}^3 \cdot 1.6 \right) \right)}{45.9\,\text{kN/m}^2} \right) + 1$$

2.3) Bearing Capacity Factor Dependent on Unit Weight for Case of Local Shear Failure Formula

Evaluate Formula

Formula

$$N_\gamma = \frac{q_{nu} - \left(\left(\left(\frac{2}{3}\right) \cdot C \cdot N_c\right) + \left(\sigma_s \cdot \left(N_q - 1\right)\right)\right)}{0.5 \cdot B \cdot \gamma}$$

Example with Units

$$1.8345 = \frac{87\,\text{kN/m}^2 - \left(\left(\left(\frac{2}{3}\right) \cdot 1.27\,\text{kPa} \cdot 9\right) + \left(45.9\,\text{kN/m}^2 \cdot \left(2.01 - 1\right)\right)\right)}{0.5 \cdot 2\,\text{m} \cdot 18\,\text{kN/m}^3}$$

2.4) Cohesion of Soil given Net Ultimate Bearing Capacity for Local Shear Failure Formula

Evaluate Formula

Formula

$$C = \frac{q_{nu} - \left(\left(\sigma_s \cdot \left(N_q - 1\right)\right) + \left(0.5 \cdot B \cdot \gamma \cdot N_\gamma\right)\right)}{\left(\frac{2}{3}\right) \cdot N_c}$$

Example with Units

$$1.9735\,\text{kPa} = \frac{87\,\text{kN/m}^2 - \left(\left(45.9\,\text{kN/m}^2 \cdot \left(2.01 - 1\right)\right) + \left(0.5 \cdot 2\,\text{m} \cdot 18\,\text{kN/m}^3 \cdot 1.6\right)\right)}{\left(\frac{2}{3}\right) \cdot 9}$$

2.5) Effective Surcharge given Net Ultimate Bearing Capacity for Local Shear Failure Formula

Evaluate Formula

Formula

$$\sigma_s = \frac{q_{nu} - \left(\left(\left(\frac{2}{3}\right) \cdot C \cdot N_c\right) + \left(0.5 \cdot B \cdot \gamma \cdot N_\gamma\right)\right)}{N_q - 1}$$

Example with Units

$$50.0792\,\text{kN/m}^2 = \frac{87\,\text{kN/m}^2 - \left(\left(\left(\frac{2}{3}\right) \cdot 1.27\,\text{kPa} \cdot 9\right) + \left(0.5 \cdot 2\,\text{m} \cdot 18\,\text{kN/m}^3 \cdot 1.6\right)\right)}{2.01 - 1}$$

2.6) Net Ultimate Bearing Capacity for Local Shear Failure Formula

Evaluate Formula

Formula

$$q_{nu} = \left(\left(\frac{2}{3}\right) \cdot C \cdot N_c\right) + \left(\sigma_s \cdot \left(N_q - 1\right)\right) + \left(0.5 \cdot B \cdot \gamma \cdot N_\gamma\right)$$

Example with Units

$$82.779\,\text{kN/m}^2 = \left(\left(\frac{2}{3}\right) \cdot 1.27\,\text{kPa} \cdot 9\right) + \left(45.9\,\text{kN/m}^2 \cdot \left(2.01 - 1\right)\right) + \left(0.5 \cdot 2\,\text{m} \cdot 18\,\text{kN/m}^3 \cdot 1.6\right)$$

2.7) Unit Weight of Soil under Strip Footing for Case of Local Shear Failure Formula

Evaluate Formula

Formula

$$\gamma = \frac{q_{nu} - \left(\left(\left(\frac{2}{3}\right) \cdot C \cdot N_c\right) + \left(\sigma_s \cdot \left(N_q - 1\right)\right)\right)}{0.5 \cdot B \cdot N_\gamma}$$

Example with Units

$$20.6381\,\text{kN/m}^3 = \frac{87\,\text{kN/m}^2 - \left(\left(\left(\frac{2}{3}\right) \cdot 1.27\,\text{kPa} \cdot 9\right) + \left(45.9\,\text{kN/m}^2 \cdot \left(2.01 - 1\right)\right)\right)}{0.5 \cdot 2\,\text{m} \cdot 1.6}$$

2.8) Width of Footing given Net Ultimate Bearing Capacity for Local Shear Failure Formula

Evaluate Formula

Formula

$$B = \frac{q_{nu} - \left(\left(\left(\frac{2}{3}\right) \cdot C \cdot N_c\right) + \left(\sigma_s \cdot \left(N_q - 1\right)\right)\right)}{0.5 \cdot \gamma \cdot N_\gamma}$$

Example with Units

$$2.2931\,\text{m} = \frac{87\,\text{kN/m}^2 - \left(\left(\left(\frac{2}{3}\right) \cdot 1.27\,\text{kPa} \cdot 9\right) + \left(45.9\,\text{kN/m}^2 \cdot \left(2.01 - 1\right)\right)\right)}{0.5 \cdot 18\,\text{kN/m}^3 \cdot 1.6}$$

Variables used in list of Bearing Capacity for Strip Footing for C-Φ Soils Formulas above

- **B** Width of Footing *(Meter)*
- **c** Cohesion in Soil *(Pascal)*
- **C** Cohesion in Soil as Kilopascal *(Kilopascal)*
- 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_{nu} Net Ultimate BC *(Kilonewton per Square Meter)*
- **γ** Unit Weight of Soil *(Kilonewton per Cubic Meter)*
- σ_s Effective Surcharge in KiloPascal *(Kilonewton per Square Meter)*

Constants, Functions, Measurements used in list of Bearing Capacity for Strip Footing for C-Φ Soils Formulas above

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

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