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Bearing Capacity for Strip Footing for C-Φ Soils Formulas

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

Bearing Capacity for Strip Footing for C-Φ Soils

General Shear Failure

1) Bearing Capacity Factor Dependent on Cohesion for General Shear Failure

Open Calculator

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

$$9.685039 = \frac{87\text{kN/m}^2 - \left(\left(45.9\text{kN/m}^2 \cdot \left(2.0 - 1\right)\right) + \left(0.5 \cdot 2\text{m} \cdot 18\text{kN/m}^3 \cdot 1.6\right)\right)}{1.27\text{kPa}}$$

2) Bearing Capacity Factor Dependent on Surcharge for General Shear Failure

Open Calculator

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

$$2.267572 = \left(\frac{87\text{kN/m}^2 - \left(\left(2.05\text{Pa} \cdot 9\right) + \left(0.5 \cdot 2\text{m} \cdot 18\text{kN/m}^3 \cdot 1.6\right)\right)}{45.9\text{kN/m}^2}\right) + 1$$

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

Open Calculator

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

$$2.282308 = \frac{87\text{kN/m}^2 - \left(\left(2.05\text{Pa} \cdot 9\right) + \left(45.9\text{kN/m}^2 \cdot \left(2.0 - 1\right)\right)\right)}{0.5 \cdot 2\text{m} \cdot 18\text{kN/m}^3}$$

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

Open Calculator

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

$$1.366667\text{kPa} = \frac{87\text{kN/m}^2 - \left(\left(45.9\text{kN/m}^2 \cdot \left(2.0 - 1\right)\right) + \left(0.5 \cdot 2\text{m} \cdot 18\text{kN/m}^3 \cdot 1.6\right)\right)}{9}$$

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

Open Calculator

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

$$46.77\text{kN/m}^2 = \frac{87\text{kN/m}^2 - \left(\left(1.27\text{kPa} \cdot 9\right) + \left(0.5 \cdot 2\text{m} \cdot 18\text{kN/m}^3 \cdot 1.6\right)\right)}{2.0 - 1}$$

6) Net Ultimate Bearing Capacity for General Shear Failure

Open Calculator

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

$$86.13\text{kN/m}^2 = \left(1.27\text{kPa} \cdot 9\right) + \left(45.9\text{kN/m}^2 \cdot \left(2.0 - 1\right)\right) + \left(0.5 \cdot 2\text{m} \cdot 18\text{kN/m}^3 \cdot 1.6\right)$$

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

Open Calculator

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

$$18.54375\text{kN/m}^3 = \frac{87\text{kN/m}^2 - \left(\left(1.27\text{kPa} \cdot 9\right) + \left(45.9\text{kN/m}^2 \cdot \left(2.0 - 1\right)\right)\right)}{0.5 \cdot 2\text{m} \cdot 1.6}$$

8) Width of Strip Footing given Net Ultimate Bearing Capacity

Open Calculator

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

$$2.060417\text{m} = \frac{87\text{kN/m}^2 - \left(\left(1.27\text{kPa} \cdot 9\right) + \left(45.9\text{kN/m}^2 \cdot \left(2.0 - 1\right)\right)\right)}{0.5 \cdot 18\text{kN/m}^3 \cdot 1.6}$$

Local Shear Failure

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

Open Calculator

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

$$14.52756 = \frac{87\text{kN/m}^2 - \left(\left(45.9\text{kN/m}^2 \cdot \left(2.0 - 1\right)\right) + \left(0.5 \cdot 2\text{m} \cdot 18\text{kN/m}^3 \cdot 1.6\right)\right)}{\left(\frac{2}{3}\right) \cdot 1.27\text{kPa}}$$

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

Open Calculator

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

$$2.101961 = \left(\frac{87\text{kN/m}^2 - \left(\left(\left(\frac{2}{3}\right) \cdot 1.27\text{kPa} \cdot 9\right) + \left(0.5 \cdot 2\text{m} \cdot 18\text{kN/m}^3 \cdot 1.6\right)\right)}{45.9\text{kN/m}^2}\right) + 1$$

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

Open Calculator

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

$$1.86 = \frac{87\text{kN/m}^2 - \left(\left(\left(\frac{2}{3}\right) \cdot 1.27\text{kPa} \cdot 9\right) + \left(45.9\text{kN/m}^2 \cdot \left(2.0 - 1\right)\right)\right)}{0.5 \cdot 2\text{m} \cdot 18\text{kN/m}^3}$$

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

Open Calculator

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

$$2.05\text{kPa} = \frac{87\text{kN/m}^2 - \left(\left(45.9\text{kN/m}^2 \cdot \left(2.0 - 1\right)\right) + \left(0.5 \cdot 2\text{m} \cdot 18\text{kN/m}^3 \cdot 1.6\right)\right)}{\left(\frac{2}{3}\right) \cdot 9}$$

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

Open Calculator

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

ex $$50.58\text{kN/m}^2 = \frac{87\text{kN/m}^2 - \left(\left(\left(\frac{2}{3}\right) \cdot 1.27\text{kPa} \cdot 9\right) + \left(0.5 \cdot 2\text{m} \cdot 18\text{kN/m}^3 \cdot 1.6\right)\right)}{2.0 - 1}$$

14) Net Ultimate Bearing Capacity for Local Shear Failure

Open Calculator

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

ex $$82.32\text{kN/m}^2 = \left(\left(\frac{2}{3}\right) \cdot 1.27\text{kPa} \cdot 9\right) + \left(45.9\text{kN/m}^2 \cdot \left(2.0 - 1\right)\right) + \left(0.5 \cdot 2\text{m} \cdot 18\text{kN/m}^3 \cdot 1.6\right)$$

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

Open Calculator

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

ex $$20.925\text{kN/m}^3 = \frac{87\text{kN/m}^2 - \left(\left(\left(\frac{2}{3}\right) \cdot 1.27\text{kPa} \cdot 9\right) + \left(45.9\text{kN/m}^2 \cdot \left(2.0 - 1\right)\right)\right)}{0.5 \cdot 2\text{m} \cdot 1.6}$$

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

Open Calculator

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

ex $$2.325\text{m} = \frac{87\text{kN/m}^2 - \left(\left(\left(\frac{2}{3}\right) \cdot 1.27\text{kPa} \cdot 9\right) + \left(45.9\text{kN/m}^2 \cdot \left(2.0 - 1\right)\right)\right)}{0.5 \cdot 18\text{kN/m}^3 \cdot 1.6}$$

Variables Used

- **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

- 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

Check other formula lists

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