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Bearing Capacity of Cohesive Soil Formulas

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List of 28 Bearing Capacity of Cohesive Soil Formulas

Bearing Capacity of Cohesive Soil

1) Bearing Capacity Factor Dependent on Cohesion for Circular Footing

Open Calculator

fx $$N_c = \frac{q_f - \sigma_s}{1.3 \cdot C}$$

ex $$8.540279 = \frac{60\text{kPa} - 45.9\text{kN/m}^2}{1.3 \cdot 1.27\text{kPa}}$$

2) Bearing Capacity Factor Dependent on Cohesion for Square Footing

Open Calculator

fx $$N_c = \frac{q_f - \sigma_s}{(C) \cdot \left(1 + 0.3 \cdot \left(\frac{B}{L}\right)\right)}$$

ex $$9.654228 = \frac{60\text{kPa} - 45.9\text{kN/m}^2}{(1.27\text{kPa}) \cdot \left(1 + 0.3 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)}$$

3) Bearing Capacity for Circular Footing given Value of Bearing Capacity Factor

Open Calculator

fx $$q_f = (7.4 \cdot C) + \sigma_s$$

ex $$55.298\text{kPa} = (7.4 \cdot 1.27\text{kPa}) + 45.9\text{kN/m}^2$$

4) Bearing Capacity of Cohesive Soil for Circular Footing

Open Calculator

fx $$q_f = (1.3 \cdot C \cdot N_c) + \sigma_s$$

ex $$60.759\text{kPa} = (1.3 \cdot 1.27\text{kPa} \cdot 9) + 45.9\text{kN/m}^2$$

5) Bearing Capacity of Cohesive Soil for Square Footing

Open Calculator

fx $$q_f = \left((C \cdot N_c) \cdot \left(1 + 0.3 \cdot \left(\frac{B}{L}\right)\right)\right) + \sigma_s$$

ex $$59.0445\text{kPa} = \left((1.27\text{kPa} \cdot 9) \cdot \left(1 + 0.3 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)\right) + 45.9\text{kN/m}^2$$

6) Cohesion of Soil for Circular Footing given Value of Bearing Capacity Factor

Open Calculator

fx $$C = \frac{q_f - \sigma_s}{7.4}$$

ex $$1.905405\text{kPa} = \frac{60\text{kPa} - 45.9\text{kN/m}^2}{7.4}$$

7) Cohesion of Soil given Bearing Capacity for Circular Footing

Open Calculator

fx $$C = \frac{q_f - \sigma_s}{1.3 \cdot N_c}$$

ex $$1.205128\text{kPa} = \frac{60\text{kPa} - 45.9\text{kN/m}^2}{1.3 \cdot 9}$$

8) Cohesion of Soil given Bearing Capacity for Square Footing

Open Calculator

fx $$C = \frac{q_f - \sigma_s}{(N_c) \cdot \left(1 + 0.3 \cdot \left(\frac{B}{L}\right)\right)}$$

ex $$1.362319\text{kPa} = \frac{60\text{kPa} - 45.9\text{kN/m}^2}{(9) \cdot \left(1 + 0.3 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)}$$

9) Effective Surcharge for Circular Footing given Value of Bearing Capacity Factor

Open Calculator

fx $$\sigma_s = q_f - (7.4 \cdot C)$$

ex $$50.602\text{kN/m}^2 = 60\text{kPa} - (7.4 \cdot 1.27\text{kPa})$$

10) Effective Surcharge given Bearing Capacity for Circular Footing

Open Calculator

fx $$\sigma_s = (q_f - (1.3 \cdot C \cdot N_c))$$

ex $$45.141\text{kN/m}^2 = (60\text{kPa} - (1.3 \cdot 1.27\text{kPa} \cdot 9))$$

11) Effective Surcharge given Bearing Capacity for Square Footing

Open Calculator

fx $$\sigma_s = q_f - \left((C \cdot N_c) \cdot \left(1 + 0.3 \cdot \left(\frac{B}{L}\right)\right)\right)$$

ex $$46.8555\text{kN/m}^2 = 60\text{kPa} - \left((1.27\text{kPa} \cdot 9) \cdot \left(1 + 0.3 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)\right)$$

12) Length of Footing given Bearing Capacity for Square Footing

Open Calculator

$$L = \frac{0.3 \cdot B}{\left(\frac{q_f - \sigma_s}{C \cdot N_c}\right) - 1}$$

$$2.568539\text{m} = \frac{0.3 \cdot 2\text{m}}{\left(\frac{60\text{kPa} - 45.9\text{kN/m}^2}{1.27\text{kPa} \cdot 9}\right) - 1}$$

13) Width of Footing given Bearing Capacity for Square Footing

Open Calculator

$$B = \left(\left(\frac{q_f - \sigma_s}{C \cdot N_c}\right) - 1\right) \cdot \left(\frac{L}{0.3}\right)$$

$$3.114611\text{m} = \left(\left(\frac{60\text{kPa} - 45.9\text{kN/m}^2}{1.27\text{kPa} \cdot 9}\right) - 1\right) \cdot \left(\frac{4\text{m}}{0.3}\right)$$

Frictional Cohesive Soil

14) Bearing Capacity Factor Dependent on Cohesion for Rectangular Footing

Open Calculator

$$N_c = \frac{q_{fc} - \left((\sigma_s \cdot N_q) + \left(0.4 \cdot \gamma \cdot B \cdot N_\gamma\right)\right)}{(C) \cdot \left(1 + 0.3 \cdot \left(\frac{B}{L}\right)\right)}$$

$$8.873673 = \frac{127.8\text{kPa} - \left((45.9\text{kN/m}^2 \cdot 2.0) + (0.4 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6)\right)}{(1.27\text{kPa}) \cdot \left(1 + 0.3 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)}$$

15) Bearing Capacity Factor Dependent on Cohesion for Rectangular Footing given Shape Factor

Open Calculator

$$N_c = \frac{q_{fc} - \left((\sigma_s \cdot N_q) + \left(\left(0.5 \cdot \gamma \cdot B \cdot N_\gamma\right) \cdot \left(1 - 0.2 \cdot \left(\frac{B}{L}\right)\right)\right)\right)}{(C) \cdot \left(1 + 0.3 \cdot \left(\frac{B}{L}\right)\right)}$$

$$6.901746 = \frac{127.8\text{kPa} - \left((45.9\text{kN/m}^2 \cdot 2.0) + \left((0.5 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6) \cdot \left(1 - 0.2 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)\right)\right)}{(1.27\text{kPa}) \cdot \left(1 + 0.3 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)}$$

16) Bearing Capacity Factor Dependent on Surcharge for Rectangular Footing

Open Calculator

$$N_q = \frac{q_{fc} - \left(\left((C \cdot N_c) \cdot \left(1 + 0.3 \cdot \left(\frac{B}{L}\right)\right)\right) + \left(0.4 \cdot \gamma \cdot B \cdot N_\gamma\right)\right)}{\sigma_s}$$

$$1.99598 = \frac{127.8\text{kPa} - \left(\left((1.27\text{kPa} \cdot 9) \cdot \left(1 + 0.3 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)\right) + (0.4 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6)\right)}{45.9\text{kN/m}^2}$$

17) Bearing Capacity Factor Dependent on Surcharge for Rectangular Footing given Shape Factor

Open Calculator

fx
$$N_q = \frac{q_{fc} - \left(\left(\left(C \cdot N_c\right) \cdot \left(1 + 0.3 \cdot \left(\frac{B}{L}\right)\right)\right) + \left(\left(0.5 \cdot \gamma \cdot B \cdot N_\gamma\right) \cdot \left(1 - 0.2 \cdot \left(\frac{B}{L}\right)\right)\right)\right)}{\sigma_s}$$

ex
$$1.933235 = \frac{127.8\text{kPa} - \left(\left(\left(1.27\text{kPa} \cdot 9\right) \cdot \left(1 + 0.3 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)\right) + \left(\left(0.5 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6\right) \cdot \left(1 - 0.2 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)\right)\right)}{45.9\text{kN/m}^2}$$

18) Bearing Capacity Factor Dependent on Unit Weight for Rectangular Footing

Open Calculator

fx
$$N_\gamma = \frac{q_{fc} - \left(\left(\left(C \cdot N_c\right) \cdot \left(1 + 0.3 \cdot \left(\frac{B}{L}\right)\right)\right) + \left(\sigma_s \cdot N_q\right)\right)}{0.4 \cdot B \cdot \gamma}$$

ex
$$1.587188 = \frac{127.8\text{kPa} - \left(\left(\left(1.27\text{kPa} \cdot 9\right) \cdot \left(1 + 0.3 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)\right) + \left(45.9\text{kN/m}^2 \cdot 2.0\right)\right)}{0.4 \cdot 2\text{m} \cdot 18\text{kN/m}^3}$$

19) Bearing Capacity Factor Dependent on Weight for Rectangular Footing given Shape Factor

Open Calculator

fx
$$N_\gamma = \frac{q_{fc} - \left(\left(\left(C \cdot N_c\right) \cdot \left(1 + 0.3 \cdot \left(\frac{B}{L}\right)\right)\right) + \left(\sigma_s \cdot N_q\right)\right)}{\left(0.5 \cdot B \cdot \gamma\right) \cdot \left(1 - 0.2 \cdot \left(\frac{B}{L}\right)\right)}$$

ex
$$1.410833 = \frac{127.8\text{kPa} - \left(\left(\left(1.27\text{kPa} \cdot 9\right) \cdot \left(1 + 0.3 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)\right) + \left(45.9\text{kN/m}^2 \cdot 2.0\right)\right)}{\left(0.5 \cdot 2\text{m} \cdot 18\text{kN/m}^3\right) \cdot \left(1 - 0.2 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)}$$

20) Cohesion of Soil for Rectangular Footing given Shape Factor

Open Calculator

fx
$$C = \frac{q_{fc} - \left(\left(\sigma_s \cdot N_q\right) + \left(\left(0.5 \cdot \gamma \cdot B \cdot N_\gamma\right) \cdot \left(1 - 0.2 \cdot \left(\frac{B}{L}\right)\right)\right)\right)}{\left(N_c\right) \cdot \left(1 + 0.3 \cdot \left(\frac{B}{L}\right)\right)}$$

ex
$$0.973913\text{kPa} = \frac{127.8\text{kPa} - \left(\left(45.9\text{kN/m}^2 \cdot 2.0\right) + \left(\left(0.5 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6\right) \cdot \left(1 - 0.2 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)\right)\right)}{\left(9\right) \cdot \left(1 + 0.3 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)}$$

21) Cohesion of Soil given Ultimate Bearing Capacity for Rectangular Footing

Open Calculator

fx
$$C = \frac{q_{fc} - \left(\left(\sigma_s \cdot N_q\right) + \left(0.4 \cdot \gamma \cdot B \cdot N_\gamma\right)\right)}{\left(N_c\right) \cdot \left(1 + 0.3 \cdot \left(\frac{B}{L}\right)\right)}$$

ex
$$1.252174\text{kPa} = \frac{127.8\text{kPa} - \left(\left(45.9\text{kN/m}^2 \cdot 2.0\right) + \left(0.4 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6\right)\right)}{\left(9\right) \cdot \left(1 + 0.3 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)}$$

22) Effective Surcharge for Rectangular Footing

Open Calculator

$$\sigma_s = \frac{q_{fc} - \left(\left(\left(C \cdot N_c\right) \cdot \left(1 + 0.3 \cdot \left(\frac{B}{L}\right)\right)\right) + \left(0.4 \cdot \gamma \cdot B \cdot N_\gamma\right)\right)}{N_q}$$

$$45.80775\text{kN/m}^2 = \frac{127.8\text{kPa} - \left(\left(\left(1.27\text{kPa} \cdot 9\right) \cdot \left(1 + 0.3 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)\right) + \left(0.4 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6\right)\right)}{2.0}$$

23) Effective Surcharge for Rectangular Footing given Shape Factor

Open Calculator

$$\sigma_s = \frac{q_{fc} - \left(\left(\left(C \cdot N_c\right) \cdot \left(1 + 0.3 \cdot \left(\frac{B}{L}\right)\right)\right) + \left(\left(0.5 \cdot \gamma \cdot B \cdot N_\gamma\right) \cdot \left(1 - 0.2 \cdot \left(\frac{B}{L}\right)\right)\right)\right)}{N_q}$$

$$44.36775\text{kN/m}^2 = \frac{127.8\text{kPa} - \left(\left(\left(1.27\text{kPa} \cdot 9\right) \cdot \left(1 + 0.3 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)\right) + \left(\left(0.5 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6\right) \cdot \left(1 - 0.2 \cdot \left(-\right.\right.\right.\right.$$

24) Length of Rectangular Footing given Ultimate Bearing Capacity

Open Calculator

$$L = \frac{0.3 \cdot B}{\left(\frac{q_{fc} - \left(\left(\sigma_s \cdot N_q\right) + \left(0.4 \cdot \gamma \cdot B \cdot N_\gamma\right)\right)}{C \cdot N_c}\right) - 1}$$

$$4.482353\text{m} = \frac{0.3 \cdot 2\text{m}}{\left(\frac{127.8\text{kPa} - \left(\left(45.9\text{kN/m}^2 \cdot 2.0\right) + \left(0.4 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6\right)\right)}{1.27\text{kPa} \cdot 9}\right) - 1}$$

25) Ultimate Bearing Capacity for Rectangular Footing

Open Calculator

$$q_{fc} = \left(\left(C \cdot N_c\right) \cdot \left(1 + 0.3 \cdot \left(\frac{B}{L}\right)\right)\right) + \left(\sigma_s \cdot N_q\right) + \left(0.4 \cdot \gamma \cdot B \cdot N_\gamma\right)$$

$$127.9845\text{kPa} = \left(\left(1.27\text{kPa} \cdot 9\right) \cdot \left(1 + 0.3 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)\right) + \left(45.9\text{kN/m}^2 \cdot 2.0\right) + \left(0.4 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6\right)$$

26) Ultimate Bearing Capacity for Rectangular Footing given Shape Factor

Open Calculator

$$q_{fc} = \left(\left(C \cdot N_c\right) \cdot \left(1 + 0.3 \cdot \left(\frac{B}{L}\right)\right)\right) + \left(\sigma_s \cdot N_q\right) + \left(\left(0.5 \cdot \gamma \cdot B \cdot N_\gamma\right) \cdot \left(1 - 0.2 \cdot \left(\frac{B}{L}\right)\right)\right)$$

$$130.8645\text{kPa} = \left(\left(1.27\text{kPa} \cdot 9\right) \cdot \left(1 + 0.3 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)\right) + \left(45.9\text{kN/m}^2 \cdot 2.0\right) + \left(\left(0.5 \cdot 18\text{kN/m}^3 \cdot 2\text{m} \cdot 1.6\right) \cdot \left(1\right.\right.$$

27) Unit Weight of Soil for Rectangular Footing given Shape Factor

Open Calculator

fx $$\gamma = \frac{q_{fc} - \left(\left(\left(C \cdot N_c\right) \cdot \left(1 + 0.3 \cdot \left(\frac{B}{L}\right)\right)\right) + \left(\sigma_s \cdot N_q\right)\right)}{\left(0.5 \cdot B \cdot N_\gamma\right) \cdot \left(1 - 0.2 \cdot \left(\frac{B}{L}\right)\right)}$$

ex $$15.87187\text{kN/m}^3 = \frac{127.8\text{kPa} - \left(\left(\left(1.27\text{kPa} \cdot 9\right) \cdot \left(1 + 0.3 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)\right) + \left(45.9\text{kN/m}^2 \cdot 2.0\right)\right)}{\left(0.5 \cdot 2\text{m} \cdot 1.6\right) \cdot \left(1 - 0.2 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)}$$

28) Unit Weight of Soil given Ultimate Bearing Capacity for Rectangular Footing

Open Calculator

fx $$\gamma = \frac{q_{fc} - \left(\left(\left(C \cdot N_c\right) \cdot \left(1 + 0.3 \cdot \left(\frac{B}{L}\right)\right)\right) + \left(\sigma_s \cdot N_q\right)\right)}{0.4 \cdot B \cdot N_\gamma}$$

ex $$17.85586\text{kN/m}^3 = \frac{127.8\text{kPa} - \left(\left(\left(1.27\text{kPa} \cdot 9\right) \cdot \left(1 + 0.3 \cdot \left(\frac{2\text{m}}{4\text{m}}\right)\right)\right) + \left(45.9\text{kN/m}^2 \cdot 2.0\right)\right)}{0.4 \cdot 2\text{m} \cdot 1.6}$$

Variables Used

- **B** Width of Footing *(Meter)*
- **C** Cohesion in Soil as Kilopascal *(Kilopascal)*
- **L** Length of Footing *(Meter)*
- 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)*
- 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 Kilopascal (kPa), Kilonewton per Square Meter (kN/m²)
  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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