calculatoratoz.com

unitsconverters.com

Column Base Plate Design Formulas

Calculators! Examples! Conversions!

Bookmark **calculatoratoz.com**, **unitsconverters.com**

Widest Coverage of Calculators and Growing - **30,000+ Calculators!**
Calculate With a Different Unit for Each Variable - **In built Unit Conversion!**
Widest Collection of Measurements and Units - **250+ Measurements!**

Feel free to SHARE this document with your friends!

Please leave your feedback here...

List of 15 Column Base Plate Design Formulas

Column Base Plate Design

1) Area of Base Plate given Nominal Bearing Strength

Open Calculator

fx $$A_1 = \frac{A_2}{\left(\frac{f_p}{\left(f'c\right)\cdot 0.85}\right)^2}$$

ex $$700.017\text{mm}^2 = \frac{1400\text{mm}^2}{\left(\frac{132.6\text{Pa}}{110.31\text{Pa}\cdot 0.85}\right)^2}$$

2) Area of Supporting Concrete given Nominal Bearing Strength

Open Calculator

fx $$A_2 = A_1 \cdot \left(\left(\frac{f_p}{\left(f'c\right)\cdot 0.85}\right)^2\right)$$

ex $$1399.966\text{mm}^2 = 700\text{mm}^2 \cdot \left(\left(\frac{132.6\text{Pa}}{110.31\text{Pa}\cdot 0.85}\right)^2\right)$$

3) Base Plate Thickness given Projection of Base Plate beyond Flange and Parallel to Web

Open Calculator

fx $$t = m \cdot \sqrt{2 \cdot \frac{P_u}{0.9 \cdot F_y \cdot B \cdot N}}$$

ex $$34.23527\text{mm} = 75\text{mm} \cdot \sqrt{2 \cdot \frac{39381\text{kN}}{0.9 \cdot 350\text{kN} \cdot 40\text{mm} \cdot 30\text{mm}}}$$

4) Base Plate Thickness given Projection of Base Plate beyond Flange and Perpendicular to Web

Open Calculator

fx $$t = n \cdot \sqrt{2 \cdot \frac{P_u}{0.9 \cdot F_y \cdot B \cdot N}}$$

ex $$32.86586\text{mm} = 72\text{mm} \cdot \sqrt{2 \cdot \frac{39381\text{kN}}{0.9 \cdot 350\text{kN} \cdot 40\text{mm} \cdot 30\text{mm}}}$$

5) Factored Load given Base Plate Area

Open Calculator

fx $$P_u = A_1 \cdot 0.85 \cdot \phi_c \cdot \left(f'c\right)$$

ex $$39380.67\text{kN} = 700\text{mm}^2 \cdot 0.85 \cdot 0.6 \cdot 110.31\text{Pa}$$

6) Length Rectangular Base for Projection of Base Plate beyond Flange and Parallel to Web

Open Calculator

fx $$N = m^2 \cdot \left(2 \cdot \frac{P_u}{0.9 \cdot F_y \cdot B \cdot t^2}\right)$$

ex $$32.28798\text{mm} = (75\text{mm})^2 \cdot \left(2 \cdot \frac{39381\text{kN}}{0.9 \cdot 350\text{kN} \cdot 40\text{mm} \cdot (33\text{mm})^2}\right)$$

7) Length Rectangular Base for Projection of Base Plate beyond Flange and Perpendicular to Web

Open Calculator

fx $$N = n^2 \cdot \left(2 \cdot \frac{P_u}{0.9 \cdot F_y \cdot B \cdot t^2}\right)$$

ex $$29.7566\text{mm} = (72\text{mm})^2 \cdot \left(2 \cdot \frac{39381\text{kN}}{0.9 \cdot 350\text{kN} \cdot 40\text{mm} \cdot (33\text{mm})^2}\right)$$

8) Length Rectangular Base for Wide-Flange Column

Open Calculator

fx $$N = \frac{A_1}{B}$$

ex $$17.5\text{mm} = \frac{700\text{mm}^2}{40\text{mm}}$$

9) Nominal Bearing Strength of Concrete

Open Calculator

fx $$f_p = \left(f'c\right) \cdot 0.85 \cdot \sqrt{\frac{A_2}{A_1}}$$

ex $$132.6016\text{Pa} = 110.31\text{Pa} \cdot 0.85 \cdot \sqrt{\frac{1400\text{mm}^2}{700\text{mm}^2}}$$

10) Projection of Base Plate beyond Flange and Parallel to Web

Open Calculator

fx $$m = \frac{t}{\sqrt{2 \cdot \frac{P_u}{0.9 \cdot F_y \cdot B \cdot N}}}$$

ex $$72.29387\text{mm} = \frac{33\text{mm}}{\sqrt{2 \cdot \frac{39381\text{kN}}{0.9 \cdot 350\text{kN} \cdot 40\text{mm} \cdot 30\text{mm}}}}$$

11) Projection of Base Plate beyond Flange and Perpendicular to Web

Open Calculator

fx $$n = \frac{t}{\sqrt{2 \cdot \frac{P_u}{0.9 \cdot F_y \cdot B \cdot N}}}$$

ex $$72.29387\text{mm} = \frac{33\text{mm}}{\sqrt{2 \cdot \frac{39381\text{kN}}{0.9 \cdot 350\text{kN} \cdot 40\text{mm} \cdot 30\text{mm}}}}$$

12) Required Area of Base Plate for Factored Load

Open Calculator

$$A_1 = \frac{P_u}{0.85 \cdot \phi_c \cdot \left(f'c\right)}$$

$$700.0059\text{mm}^2 = \frac{39381\text{kN}}{0.85 \cdot 0.6 \cdot 110.31\text{Pa}}$$

13) Specified Compressive Strength of Concrete using Nominal Bearing Strength

Open Calculator

$$\left(f'c\right) = \left(\frac{f_p}{0.85}\right) \cdot \sqrt{\frac{A_1}{A_2}}$$

$$110.3087\text{Pa} = \left(\frac{132.6\text{Pa}}{0.85}\right) \cdot \sqrt{\frac{700\text{mm}^2}{1400\text{mm}^2}}$$

14) Width Parallel to Flanges

Open Calculator

$$B = \frac{A_1}{N}$$

$$23.33333\text{mm} = \frac{700\text{mm}^2}{30\text{mm}}$$

15) Yield Load for Projection of Base Plate beyond Flange and Parallel to Web

Open Calculator

fx $$F_y = m^2 \cdot \left(2 \cdot \frac{P_u}{0.9 \cdot N \cdot B \cdot t^2} \right)$$

ex $$376.6931\text{kN} = (75\text{mm})^2 \cdot \left(2 \cdot \frac{39381\text{kN}}{0.9 \cdot 30\text{mm} \cdot 40\text{mm} \cdot (33\text{mm})^2} \right)$$

Variables Used

- A_1 Area of Base Plate *(Square Millimeter)*
- A_2 Area of supporting Concrete *(Square Millimeter)*
- **B** Width *(Millimeter)*
- f_p Nominal Bearing Strength *(Pascal)*
- F_y Yield Load *(Kilonewton)*
- f'_c Specified Compressive Strength of Concrete *(Pascal)*
- **m** Projection of Base Plate Beyond Flange *(Millimeter)*
- **n** Projection of Base Plate Beyond Edge *(Millimeter)*
- **N** Length *(Millimeter)*
- P_u Factored Load *(Kilonewton)*
- **t** Thickness *(Millimeter)*
- ϕ_c Strength Reduction Factor

Constants, Functions, Measurements used

- Function: **sqrt**, sqrt(Number)
  Square root function
- Measurement: **Length** in Millimeter (mm)
  Length Unit Conversion
- Measurement: **Area** in Square Millimeter (mm²)
  Area Unit Conversion
- Measurement: **Force** in Kilonewton (kN)
  Force Unit Conversion
- Measurement: **Stress** in Pascal (Pa)
  Stress Unit Conversion

Check other formula lists

- **Allowable Design for Column Formulas**
- **Column Base Plate Design Formulas**
- **Columns of Special Materials Formulas**
- **Eccentric Loads on Columns Formulas**
- **Elastic Flexural Buckling of Columns Formulas**
- **Short Axially Loaded Columns with Helical Ties Formulas**
- **Ultimate Strength Design of Concrete Columns Formulas**

Feel free to SHARE this document with your friends!

PDF Available in

English Spanish French German Russian Italian Portuguese Polish Dutch

10/30/2023 | 8:51:40 PM UTC

Please leave your feedback here...