Column Base Plate: Bearing Pressure and Thickness (Cantilever)

Bearing pressure under a steel column base plate and the plate thickness for the projection as a cantilever, from the load, plate size and allowable bending stress.

Method: Elastic bending of a uniformly loaded cantilever strip (strength of materials)

Input parameters

Unit system: SI

Parameter	Value	Unit
Axial load (on the basis of your allowable stresses: service for allowable-stress design)	1,200.0	kN
Plate width	450.00	mm
Plate length	500.00	mm
Largest projection beyond the column (cantilever)	100.00	mm
Allowable bending stress of the plate From your design code for the plate steel.	185.00	MPa
Allowable bearing pressure on the concrete From your design code for the grout and concrete.	10.000	MPa

Calculated results

Parameter	Value	Unit
Bearing pressure P/(BN)	5.3333	MPa
Bearing utilisation	53.333	%
Plate thickness c√(3q/f_b)	29.409	mm

Notes for this case

- Elastic cantilever strip of unit width: M = qc²/2 and Z = t²/6. Design codes set the projection and stress rules; this shows the mechanics.

Formula and method

$$q = \frac{P}{BN}, \quad t = c\sqrt{\frac{3q}{f_b}}$$

Variables

P	Axial load (on the basis of your allowable stresses: service for allowable-stress design)	N
B	Plate width	m
N	Plate length	m
c	Largest projection beyond the column (cantilever)	m
f_b	Allowable bending stress of the plate	Pa
f_c	Allowable bearing pressure on the concrete	Pa
q	Bearing pressure P/(BN)	Pa
q/f_c	Bearing utilisation	-
t	Plate thickness c√(3q/f_b)	m

Method and standards

Cantilever plate strip.

Assumptions and limits

- Concentric load, uniform pressure.
- Allowable-stress basis with the elastic section modulus $t^2/6$; limit-state codes (IS 800, AISC LRFD) use factored loads and the plastic modulus $t^2/4$, giving a thinner plate.
- A bearing utilisation above 1 is flagged.

References

- Elastic bending of a uniformly loaded cantilever strip (strength of materials)

Report details

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Release checks	2 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/civil/steel/base-plate-thickness

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.