Biaxially Loaded Column: Bresler Reciprocal Load Method

Axial capacity of a reinforced concrete column bent about both axes by Bresler's reciprocal load formula, from the uniaxial capacities at the same eccentricities.

Method: Bresler reciprocal load formula

Input parameters

Unit system: SI

Parameter	Value	Unit
Axial capacity with no bending	4,500.0	kN
Capacity with the x eccentricity alone	2,600.0	kN
Capacity with the y eccentricity alone	2,200.0	kN
Strength reduction factor	65.000	%
Design axial load	1,000.0	kN

Calculated results

Parameter	Value	Unit
Nominal biaxial capacity	1,620.9	kN
Design biaxial capacity	1,053.6	kN
Utilisation	94.914	%

Notes for this case

• Bresler's reciprocal formula 1/P_n = 1/P_nx + 1/P_ny − 1/P_0 approximates the failure surface by a plane through the three points. It is accurate when the column is controlled by compression (P_n above about 0.1 f'_c A_g); for small axial loads use the load contour method instead. P_nx and P_ny come from the interaction diagram of each axis at the actual eccentricities.

Formula and method

$$\frac{1}{P_n} = \frac{1}{P_{nx}} + \frac{1}{P_{ny}} - \frac{1}{P_0}$$

Variables

P_0	Axial capacity with no bending	N
P_{nx}	Capacity with the x eccentricity alone	N
P_{ny}	Capacity with the y eccentricity alone	N
ϕ	Strength reduction factor	-
P_u	Design axial load	N
P_n	Nominal biaxial capacity	N
ϕP_n	Design biaxial capacity	N
$P_u/\phi P_n$	Utilisation	-

Method and standards

Bresler method.

Assumptions and limits

- Compression-controlled section.

References

Bresler reciprocal load formula

Report details

Report reference	FCC-X1WG-6BXF (the same inputs always give the same reference)
Generated	23 November 2026, 18:09 UTC
Calculator	Biaxially Loaded Column: Bresler Reciprocal Load Method
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
Release checks	3 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/concrete/biaxial-column-bresler

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Reopens the calculator with the inputs of this report.