Bolted Connection: Bolt Value from Shear and Bearing

Shear capacity of a bolt over its shear planes, bearing capacity on the thinnest plate, the governing bolt value and the number of bolts for a load.

Method: Bearing-type bolted joint (working stress)

Input parameters

Unit system: SI

Parameter	Value	Unit
Connection load	300.00	kN
Bolt diameter	20.000	mm
Bolt area in the shear plane (stress or shank area)	245.00	mm²
Shear planes per bolt	1.0000	
Allowable bolt shear stress	160.00	MPa
Thinnest plate thickness in bearing	10.000	mm
Allowable bearing stress	300.00	MPa

Calculated results

Parameter	Value	Unit
Shear value per bolt	39.200	kN
Bearing value per bolt	60.000	kN
Bolt value	39.200	kN
Bolts required	8.0000	
Bolt group utilisation	95.663	%

Notes for this case

• V_s = n_p·A_s·τ_a; V_b = d·t·σ_b on the thinnest plate (or the sum of plates bearing in one direction); bolt value = min. Use the stress area where threads cross the shear plane and the shank area where they do not. Long joints, large gaps or packing need reduction factors from the user's code; edge distance limits bearing too.

Formula and method

$$V_s = n_p A_s \tau_a, \quad V_b = dt\sigma_b, \quad n = \left\lceil \frac{P}{\min(V_s, V_b)} \right\rceil$$

Variables

P	Connection load	N
d	Bolt diameter	m
A_s	Bolt area in the shear plane (stress or shank area)	m²
n_p	Shear planes per bolt	-
τ_a	Allowable bolt shear stress	Pa
t	Thinnest plate thickness in bearing	m
σ_b	Allowable bearing stress	Pa
V_s	Shear value per bolt	N
V_b	Bearing value per bolt	N
V	Bolt value	N
n	Bolts required	-
η	Bolt group utilisation	-

Method and standards

Bolt value.

Assumptions and limits

- Concentric load shared equally; bearing-type joint.

References

Bearing-type bolted joint (working stress)

Report details

Report reference	FCC-PTAN-P46A (the same inputs always give the same reference)
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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/steel/bolt-shear-bearing-capacity

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.