Lifting Lug Load, Net Section, Tear-Out, Bearing and Weld Stresses

Load per lug from weight, number of lugs, sling angle and dynamic factor, and the tension, tear-out shear, pin bearing and weld shear stresses of a plate lug.

Method: Pin-connected plate lug checks

Input parameters

Unit system: SI

Parameter	Value	Unit
Weight lifted	20.000	t
Load-bearing lugs	2.0000	
Sling angle from vertical	30.000	°
Dynamic load factor	1.5000	
Lug width at the hole	160.00	mm
Lug thickness	25.000	mm
Hole diameter	52.000	mm
Hole centre to edge (in load direction)	80.000	mm
Pin (shackle) diameter	48.000	mm
Fillet weld leg	12.000	mm
Total weld length	600.00	mm

Calculated results

Parameter	Value	Unit
Load per lug (along the sling)	169.86	kN
Net-section tension	62.910	MPa
Tear-out shear	62.910	MPa
Pin bearing	141.55	MPa
Weld throat shear	33.368	MPa

Notes for this case

• F = Wgk_d/(n·cosθ). Net tension F/[(b − d_h)t]; tear-out F/[2(e − d_h/2)t] over two shear planes; pin bearing F/(d_pt); weld F/(0.707sL_w). Compare with the allowable stresses and load factors of the user's lifting standard; also check out-of-plane loads, the shell locally, and that the shackle fits.

Formula and method

$$F = \frac{W g k_d}{n \cos\theta}, \quad \sigma_t = \frac{F}{(b - d_h)t}, \quad \tau_{to} = \frac{F}{2(e - d_h/2)t}, \quad \sigma_b = \frac{F}{d_p t}$$

Variables

W	Weight lifted	kg
n	Load-bearing lugs	-
θ	Sling angle from vertical	rad
k_d	Dynamic load factor	-
b	Lug width at the hole	m
t	Lug thickness	m

d_h	Hole diameter	m
e	Hole centre to edge (in load direction)	m
d_p	Pin (shackle) diameter	m
s	Fillet weld leg	m
L_w	Total weld length	m
F	Load per lug (along the sling)	N
σ_t	Net-section tension	Pa
τ_{to}	Tear-out shear	Pa
σ_b	Pin bearing	Pa
τ_w	Weld throat shear	Pa

Method and standards

Lug checks.

Assumptions and limits

- In-plane load; pin close fit; uniform weld stress.

References

Pin-connected plate lug checks

Report details

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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/mechanical/vessels/lifting-lug-check

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.