



Strength and Stress Formulas

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List of 13 Strength and Stress Formulas

Strength and Stress &

1) Bending Stress in Cotter of Cotter Joint

$$\sigma_{b} = \left(3 \cdot rac{L}{t_{c} \cdot b^{2}}
ight) \cdot \left(rac{d_{2} + 2 \cdot d_{4}}{12}
ight)$$

Open Calculator

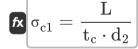
2) Compressive Stress in Socket of Cotter Joint given Diameter of Spigot and of Socket Collar

$$\sigma_{
m cso} = rac{
m L}{({
m d}_4 - {
m d}_2) \cdot {
m t}_c}$$

Open Calculator

$$ext{ex} \ 58.19909 ext{N/mm}^2 = rac{50000 ext{N}}{(80 ext{mm} - 40 ext{mm}) \cdot 21.478 ext{mm}}$$

3) Compressive Stress in Spigot of Cotter Joint Considering Crushing Failure



Open Calculator

$$ext{ex} \left[58.19909 ext{N/mm}^2 = rac{50000 ext{N}}{21.478 ext{mm} \cdot 40 ext{mm}}
ight]$$



4) Compressive Stress of Spigot

$$\sigma_{cp} = rac{L}{t_c \cdot D_s}$$

$$\boxed{ 46.55927 \text{N}/\text{mm}^2 = \frac{50000 \text{N}}{21.478 \text{mm} \cdot 50.0 \text{mm}} }$$

5) Permissible Shear Stress for Cotter

fx
$$au_{
m p} = rac{
m P}{2 \cdot {
m b} \cdot {
m t_c}}$$

$$ext{ex} \left[719988.7 ext{N/m}^2 = rac{1500 ext{N}}{2 \cdot 48.5 ext{mm} \cdot 21.478 ext{mm}}
ight]$$

6) Permissible Shear Stress for Spigot

fx
$$au_{
m p} = rac{
m P}{2 \cdot {
m a} \cdot {
m d}_{
m ex}}$$

$$oxed{ex} 957854.4 \mathrm{N/m^2} = rac{1500 \mathrm{N}}{2 \cdot 17.4 \mathrm{mm} \cdot 45 \mathrm{mm}}$$

7) Shear Stress in Cotter given Cotter Thickness and Width

$$au_{
m co} = rac{
m L}{2 \cdot
m t_c \cdot
m b}$$

$$\mathbf{ex} \ 23.99962 \mathrm{N/mm^2} = rac{50000 \mathrm{N}}{2 \cdot 21.478 \mathrm{mm} \cdot 48.5 \mathrm{mm}}$$



8) Shear Stress in Socket of Cotter Joint given Inner and Outer Diameter of Socket

of Silear Siless in Socket of Cotter Joint given inner and Outer Diameter of Socket

fx
$$au_{
m so} = rac{
m L}{2\cdot (
m d_4 -
m d_2)\cdot
m c}$$

Open Calculator 🚰

$$ext{ex} 25 ext{N/mm}^2 = rac{50000 ext{N}}{2 \cdot (80 ext{mm} - 40 ext{mm}) \cdot 25.0 ext{mm}}$$

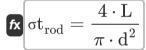
9) Shear Stress in Spigot of Cotter Joint given Diameter of Spigot and Load

$$au_{
m sp} = rac{
m L}{2 \cdot
m L_a \cdot
m d_2}$$

Open Calculator

$$ext{ex} \left[26.59574 ext{N/mm}^2 = rac{50000 ext{N}}{2 \cdot 23.5 ext{mm} \cdot 40 ext{mm}}
ight]$$

10) Tensile Stress in Rod of Cotter Joint 🗗



Open Calculator 🖸

ex
$$49.99939 \mathrm{N/mm^2} = \frac{4 \cdot 50000 \mathrm{N}}{\pi \cdot (35.6827 \mathrm{mm})^2}$$

11) Tensile Stress in Socket of Cotter Joint given Outer and Inner Diameter of Socket

$$ag{(\sigma_t so)} = rac{L}{rac{\pi}{4} \cdot \left(d_1^2 - d_2^2
ight) - t_c \cdot \left(d_1 - d_2
ight)}$$

Open Calculator 🗗

$$68.22288 \text{N/mm}^2 = \frac{50000 \text{N}}{\frac{\pi}{4} \cdot \left((54 \text{mm})^2 - (40 \text{mm})^2 \right) - 21.478 \text{mm} \cdot (54 \text{mm} - 40 \text{mm})}$$





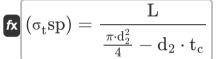
12) Tensile Stress in Spigot

 $\mathbf{x} \mathbf{\sigma}_{\mathrm{t}} = rac{\mathrm{P}}{\left(rac{\pi}{4} \cdot \mathrm{d}_{\mathrm{ex}}^{2}
ight) - \left(\mathrm{d}_{\mathrm{ex}} \cdot \mathrm{t}_{\mathrm{c}}
ight)}$

Open Calculator

 $= \frac{1500 \mathrm{N}}{\left(\frac{\pi}{4} \cdot (45 \mathrm{mm})^2\right) - (45 \mathrm{mm} \cdot 21.478 \mathrm{mm})}$

13) Tensile Stress in Spigot of Cotter Joint given Diameter of Spigot, Thickenss of Cotter and Load



Open Calculator

ex $125.7808 \mathrm{N/mm^2} = rac{50000 \mathrm{N}}{rac{\pi \cdot (40 \mathrm{mm})^2}{4} - 40 \mathrm{mm} \cdot 21.478 \mathrm{mm}}$



Variables Used

- a Spigot Distance (Millimeter)
- **b** Mean Width of Cotter (Millimeter)
- C Axial Distance From Slot to End of Socket Collar (Millimeter)
- **d** Diameter of Rod of Cotter Joint (Millimeter)
- **d**₁ Outside Diameter of Socket (Millimeter)
- d₂ Diameter of Spigot (Millimeter)
- d₄ Diameter of Socket Collar (Millimeter)
- d_{ex} External Diameter of Spigot (Millimeter)
- **D**_s Spigot Diameter (Millimeter)
- L Load on Cotter Joint (Newton)
- La Gap between End of Slot to End of Spigot (Millimeter)
- P Tensile Force on Rods (Newton)
- t_c Thickness of Cotter (Millimeter)
- σ_b Bending Stress in Cotter (Newton per Square Millimeter)
- σ_{c1} Compressive Stress in Spigot (Newton per Square Millimeter)
- σ_{cp} Stress in Spigot (Newton per Square Millimeter)
- σ_{cso} Compressive Stress In Socket (Newton per Square Millimeter)
- σ_t Tensile Stress (Newton per Square Millimeter)
- σ_tso Tensile Stress In Socket (Newton per Square Millimeter)
- σ_tsp Tensile Stress In Spigot (Newton per Square Millimeter)
- σt_{rod} Tensile Stress in Cotter Joint Rod (Newton per Square Millimeter)
- T_{CO} Shear Stress in Cotter (Newton per Square Millimeter)
- T_{SO} Shear Stress in Socket (Newton per Square Millimeter)
- T_{Sp} Shear Stress in Spigot (Newton per Square Millimeter)





• $au_{\mathbf{p}}$ Permissible Shear Stress (Newton per Square Meter)





Constants, Functions, Measurements used

- Constant: pi, 3.14159265358979323846264338327950288
 Archimedes' constant
- Measurement: Length in Millimeter (mm)
 Length Unit Conversion
- Measurement: Pressure in Newton per Square Meter (N/m²)

 Pressure Unit Conversion
- Measurement: Force in Newton (N)
 Force Unit Conversion
- Measurement: Stress in Newton per Square Millimeter (N/mm²)

 Stress Unit Conversion





Check other formula lists

- Forces and Loads on Joint Formulas
- Joint Geometry and Dimensions
 Formulas
- Strength and Stress Formulas

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