



# **Design of Cotter Joint Formulas**

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## List of 51 Design of Cotter Joint Formulas Design of Cotter Joint 🕝 Forces and Loads on Joint 1) Force on Cotter given Shear Stress in Cotter 🖸 Open Calculator fx $\mathrm{L}=2\cdot\mathrm{t_c}\cdot\mathrm{b}\cdot\mathrm{ au_{co}}$ ex $50000.78N = 2 \cdot 21.478mm \cdot 48.5mm \cdot 24N/mm^2$ 2) Load Taken by Cotter Joint Rod given Tensile Stress in Rod 🕑 Open Calculator $\mathbf{f_X} \mathrm{L} = rac{\pi \cdot \mathrm{d}^2 \cdot \mathrm{\sigma t_{rod}}}{4}$ ex 50000.61N = $\frac{\pi \cdot (35.6827 \text{mm})^2 \cdot 50 \text{N/mm}^2}{4}$ 3) Load Taken by Socket of Cotter Joint given Compressive Stress fx $L = \sigma_{cso} \cdot (d_4 - d_2) \cdot t_c$ Open Calculator ex 50000.78N = 58.20N/mm<sup>2</sup> · (80mm - 40mm) · 21.478mm 4) Load Taken by Socket of Cotter Joint given Shear Stress in Socket 🖌 Open Calculator fx $L = 2 \cdot (d_4 - d_2) \cdot c \cdot \tau_{so}$ ex $50000N = 2 \cdot (80mm - 40mm) \cdot 25.0mm \cdot 25N/mm^2$ 5) Load Taken by Socket of Cotter Joint given Tensile Stress in Socket 💪 Open Calculator $\mathbf{fx} = (\sigma_t so) \cdot \left( rac{\pi}{4} \cdot \left( d_1^2 - d_2^2 ight) - t_c \cdot (d_1 - d_2) ight)$ ex $50000.82 \mathrm{N} = 68.224 \mathrm{N/mm^2} \cdot \left( rac{\pi}{4} \cdot \left( (54 \mathrm{mm})^2 - (40 \mathrm{mm})^2 ight) - 21.478 \mathrm{mm} \cdot (54 \mathrm{mm} - 40 \mathrm{mm}) ight)$



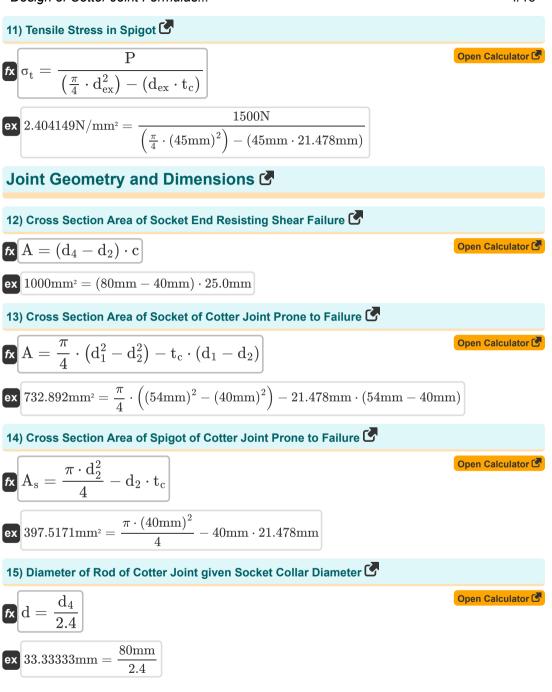


6) Load Taken by Spigot of Cotter Joint given Compressive Stress in Spigot Considering Crushing Failure

KL = t\_c · d\_2 · 
$$\sigma_{c1}$$
Open Catculator (\*)(\*)L = t\_c · d\_2 ·  $\sigma_{c1}$ Open Catculator (\*)(\*)L = 2 · L\_a · d\_2 ·  $\tau_{sp}$ Open Catculator (\*)(\*)L = 2 · L\_a · d\_2 ·  $\tau_{sp}$ Open Catculator (\*)(\*)L = 2 · L\_a · d\_2 ·  $\tau_{sp}$ Open Catculator (\*)(\*)S 50000.48N = 2 · 23.5mm · 40mm · 26.596N/mm²Open Catculator (\*)(\*)S 50000.48N = 2 · 23.5mm · 40mm · 26.596N/mm²Open Catculator (\*)(\*)L =  $\left(\frac{\pi}{4} \cdot d_2^2 - d_2 \cdot t_c\right) \cdot (\sigma_t sp)$ Open Catculator (\*)(\*)L =  $\left(\frac{\pi}{4} \cdot d_2^2 - d_2 \cdot t_c\right) \cdot (\sigma_t sp)$ Open Catculator (\*)(\*)S 50000.89N =  $\left(\frac{\pi}{4} \cdot (40mm)^2 - 40mm · 21.478mm\right) \cdot 125.783N/mm²$ Open Catculator (\*)(\*)T\_p =  $\frac{P}{2 \cdot b \cdot t_c}$ Open Catculator (\*)(\*)T\_p =  $\frac{1500N}{2 \cdot 48.5mm \cdot 21.478mm}$ Open Catculator (\*)(\*)T\_p =  $\frac{P}{2 \cdot a \cdot d_{ex}}$ Open Catculator (\*)(\*)T\_p =  $\frac{P}{2 \cdot a \cdot d_{ex}}$ Open Catculator (\*)(\*)T\_p =  $\frac{P}{2 \cdot a \cdot d_{ex}}$ Open Catculator (\*)(\*)S  $\tau_p = \frac{P}{2 \cdot a \cdot d_{ex}}$ Open Catculator (\*)(\*)S  $\tau_p = \frac{P}{2 \cdot a \cdot d_{ex}}$ Open Catculator (\*)(\*)S  $\tau_p = \frac{1500N}{2 \cdot 17.4mm \cdot 45mm}$ Open Catculator (\*)











#### 16) Diameter of Rod of Cotter Joint given Spigot Collar Diameter 🕑

$$d = \frac{d_3}{1.5}$$
(c) 
$$d = \frac{d_3}{1.5}$$
(c) 
$$d = \frac{48mm}{1.5}$$
(c) 
$$d = \frac{48mm}{1.5}$$
(c) 
$$d = \frac{t_c}{0.31}$$
(c) 
$$d = \frac{t_c}{0.31}$$
(c) 
$$d = \frac{t_c}{0.31}$$
(c) 
$$d = \frac{t_1}{0.31}$$
(c) 
$$d = \frac{t_1}{0.45}$$
(c)

fx 
$$d_4 = 2.4 \cdot d$$

ex 85.63848mm =  $2.4 \cdot 35.6827$ mm

#### 20) Diameter of Socket Collar of Cotter Joint given Bending Stress in Cotter 🚰

$$fx d_4 = \frac{4 \cdot b^2 \cdot \sigma_b \cdot \frac{t_c}{L} - d_2}{2}$$

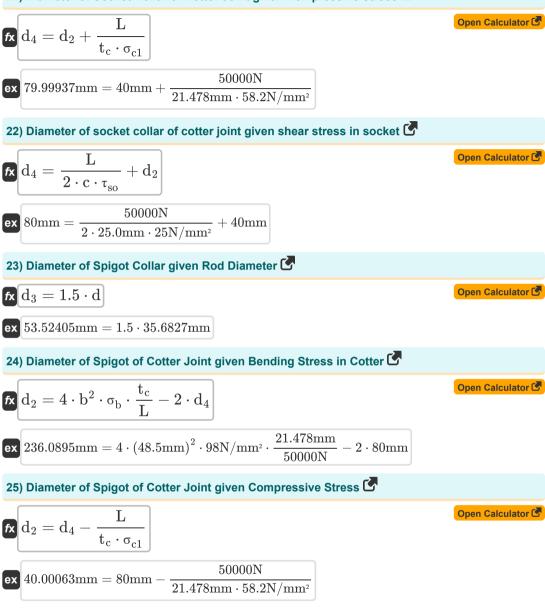
$$ex 178.0448 \text{mm} = \frac{4 \cdot (48.5 \text{mm})^2 \cdot 98 \text{N/mm}^2 \cdot \frac{21.478 \text{mm}}{50000 \text{N}} - 40 \text{mm}}{2}$$

$$Open Calculator Constraints of the second se$$



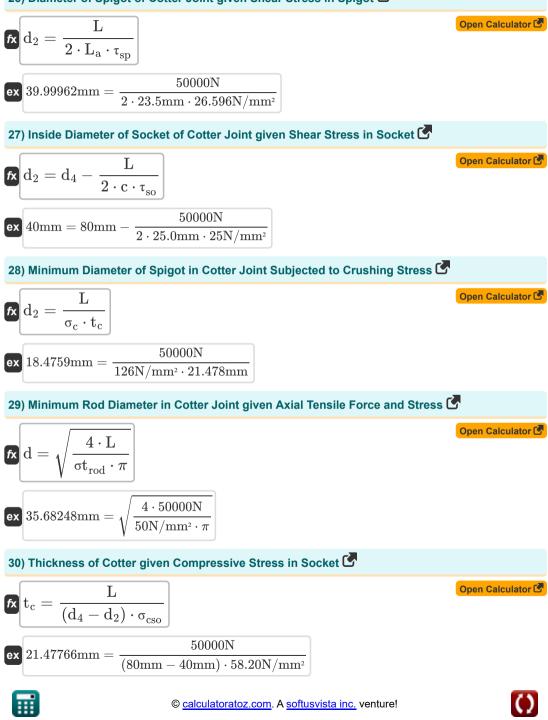
Open Calculator 🗗

21) Diameter of Socket Collar of Cotter Joint given Compressive Stress 🕻





26) Diameter of Spigot of Cotter Joint given Shear Stress in Spigot 🕑



31) Thickness of Cotter given Compressive Stress in Spigot 🖸



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36) Thickness of Spigot Collar when Rod Diameter is Available 🕑

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



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

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

$$\begin{aligned} \mathbf{fx} & \left(\sigma_{t} sp\right) = \frac{L}{\frac{\pi \cdot d_{2}^{2}}{4} - d_{2} \cdot \mathbf{t}_{c}} \end{aligned}$$

$$\begin{aligned} \mathbf{ex} & 125.7808N/mm^{2} = \frac{50000N}{\frac{\pi \cdot (40mm)^{2}}{4} - 40mm \cdot 21.478mm} \end{aligned}$$





Open Calculator 🕑

### Variables Used

- a Spigot Distance (Millimeter)
- A Cross Sectional Area of Socket (Square Millimeter)
- As Cross Sectional Area of Spigot (Square 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)
- d1 Outside Diameter of Socket (Millimeter)
- d<sub>2</sub> Diameter of Spigot (Millimeter)
- **d**<sub>3</sub> Diameter of Spigot Collar (Millimeter)
- **d**<sub>4</sub> Diameter of Socket Collar (*Millimeter*)
- dex External Diameter of Spigot (Millimeter)
- D<sub>s</sub> Spigot Diameter (Millimeter)
- F<sub>c</sub> Force on Cotter Joint (Newton)
- L Load on Cotter Joint (Newton)
- La Gap between End of Slot to End of Spigot (Millimeter)
- P Tensile Force on Rods (Newton)
- t<sub>1</sub> Thickness of Spigot Collar (Millimeter)
- t<sub>c</sub> Thickness of Cotter (Millimeter)
- V Shear Force on Cotter (Newton)
- σ<sub>b</sub> Bending Stress in Cotter (Newton per Square Millimeter)
- $\sigma_c$  Crushing Stress induced in Cotter (Newton per Square Millimeter)
- σ<sub>c1</sub> Compressive Stress in Spigot (Newton per Square Millimeter)
- σ<sub>cp</sub> Stress in Spigot (Newton per Square Millimeter)
- $\sigma_{cso}$  Compressive Stress In Socket (Newton per Square Millimeter)
- σ<sub>t</sub> Tensile Stress (Newton per Square Millimeter)
- σ<sub>t</sub>so Tensile Stress In Socket (Newton per Square Millimeter)
- σ<sub>t</sub>sp Tensile Stress In Spigot (Newton per Square Millimeter)
- σt<sub>rod</sub> Tensile Stress in Cotter Joint Rod (Newton per Square Millimeter)

- T<sub>CO</sub> Shear Stress in Cotter (Newton per Square Millimeter)
- T<sub>SO</sub> Shear Stress in Socket (Newton per Square Millimeter)
- T<sub>sp</sub> Shear Stress in Spigot (Newton per Square Millimeter)
- $\tau_p$  Permissible Shear Stress (Newton per Square Meter)

#### **Constants, Functions, Measurements used**

- Constant: pi, 3.14159265358979323846264338327950288 Archimedes' constant
- Function: sqrt, sqrt(Number) A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Measurement: Length in Millimeter (mm) Length Unit Conversion
- Measurement: Area in Square Millimeter (mm<sup>2</sup>) Area Unit Conversion
- Measurement: **Pressure** in Newton per Square Meter (N/m<sup>2</sup>) Pressure Unit Conversion
- Measurement: Force in Newton (N) Force Unit Conversion
- Measurement: Stress in Newton per Square Millimeter (N/mm<sup>2</sup>) Stress Unit Conversion





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