Important Strength and Stress Formulas PDF

Formulas

Examples

with Units

List of 13
Important Strength and Stress Formulas

1) Bending Stress in Cotter of Cotter Joint Formula ⤴

Evaluate Formula ⤴

Formula

$$\sigma_b = \left(3 \cdot \frac{L}{t_c \cdot b^2} \right) \cdot \left(\frac{d_2 + 2 \cdot d_4}{12} \right)$$

Example with Units

$$49.4838\,\text{N/mm}^2 = \left(3 \cdot \frac{50000\,\text{N}}{21.478\,\text{mm} \cdot 48.5\,\text{mm}^2} \right) \cdot \left(\frac{40\,\text{mm} + 2 \cdot 80\,\text{mm}}{12} \right)$$

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

Evaluate Formula ⤴

Formula

$$\sigma_{cso} = \frac{L}{\left(d_4 - d_2 \right) \cdot t_c}$$

Example with Units

$$58.1991\,\text{N/mm}^2 = \frac{50000\,\text{N}}{\left(80\,\text{mm} - 40\,\text{mm} \right) \cdot 21.478\,\text{mm}}$$

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

Evaluate Formula ⤴

Formula

$$\sigma_{c1} = \frac{L}{t_c \cdot d_2}$$

Example with Units

$$58.1991\,\text{N/mm}^2 = \frac{50000\,\text{N}}{21.478\,\text{mm} \cdot 40\,\text{mm}}$$

4) Compressive Stress of Spigot Formula ⤴

Evaluate Formula ⤴

Formula

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

Example with Units

$$46.5593\,\text{N/mm}^2 = \frac{50000\,\text{N}}{21.478\,\text{mm} \cdot 50.0\,\text{mm}}$$

5) Permissible Shear Stress for Cotter Formula ⤴

Evaluate Formula ⤴

Formula

$$\tau_p = \frac{P}{2 \cdot b \cdot t_c}$$

Example with Units

$$719988.7106\,\text{N/m}^2 = \frac{1500\,\text{N}}{2 \cdot 48.5\,\text{mm} \cdot 21.478\,\text{mm}}$$

6) Permissible Shear Stress for Spigot Formula ➡

Formula

$$\tau_p = \frac{P}{2 \cdot a \cdot d_{ex}}$$

Example with Units

$$957854.4061\,\text{N/m}^2 = \frac{1500\,\text{N}}{2 \cdot 17.4\,\text{mm} \cdot 45\,\text{mm}}$$

7) Shear Stress in Cotter given Cotter Thickness and Width Formula ➡

Formula

$$\tau_{co} = \frac{L}{2 \cdot t_c \cdot b}$$

Example with Units

$$23.9996\,\text{N/mm}^2 = \frac{50000\,\text{N}}{2 \cdot 21.478\,\text{mm} \cdot 48.5\,\text{mm}}$$

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

Formula

$$\tau_{so} = \frac{L}{2 \cdot \left(d_4 - d_2 \right) \cdot c}$$

Example with Units

$$25\,\text{N/mm}^2 = \frac{50000\,\text{N}}{2 \cdot \left(80\,\text{mm} - 40\,\text{mm} \right) \cdot 25.0\,\text{mm}}$$

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

Formula

$$\tau_{sp} = \frac{L}{2 \cdot L_a \cdot d_2}$$

Example with Units

$$26.5957\,\text{N/mm}^2 = \frac{50000\,\text{N}}{2 \cdot 23.5\,\text{mm} \cdot 40\,\text{mm}}$$

10) Tensile Stress in Rod of Cotter Joint Formula ➡

Formula

$$\sigma t_{rod} = \frac{4 \cdot L}{\pi \cdot d^2}$$

Example with Units

$$49.9994\,\text{N/mm}^2 = \frac{4 \cdot 50000\,\text{N}}{3.1416 \cdot 35.6827\,\text{mm}^2}$$

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

Formula

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

Example with Units

$$68.2229\,\text{N/mm}^2 = \frac{50000\,\text{N}}{\frac{3.1416}{4} \cdot \left(54\,\text{mm}^2 - 40\,\text{mm}^2 \right) - 21.478\,\text{mm} \cdot \left(54\,\text{mm} - 40\,\text{mm} \right)}$$

12) Tensile Stress in Spigot Formula 📤

Formula

$$\sigma_t = \frac{P}{\left(\frac{\pi}{4} \cdot d_{ex}^2\right) - \left(d_{ex} \cdot t_c\right)}$$

Example with Units

$$2.4041\,\text{N/mm}^2 = \frac{1500\,\text{N}}{\left(\frac{3.1416}{4} \cdot 45\,\text{mm}^2\right) - \left(45\,\text{mm} \cdot 21.478\,\text{mm}\right)}$$

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

Formula

$$\sigma_t sp = \frac{L}{\frac{\pi \cdot d_2^2}{4} - d_2 \cdot t_c}$$

Example with Units

$$125.7808\,\text{N/mm}^2 = \frac{50000\,\text{N}}{\frac{3.1416 \cdot 40\,\text{mm}^2}{4} - 40\,\text{mm} \cdot 21.478\,\text{mm}}$$

Variables used in list of Strength and Stress Formulas above

- **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)*
- **d$_2$** Diameter of Spigot *(Millimeter)*
- **d$_4$** Diameter of Socket Collar *(Millimeter)*
- **d$_{ex}$** External Diameter of Spigot *(Millimeter)*
- **D$_s$** Spigot Diameter *(Millimeter)*
- **L** Load on Cotter Joint *(Newton)*
- **L$_a$** 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$_t$so** Tensile Stress In Socket *(Newton per Square Millimeter)*
- **σ$_t$sp** Tensile Stress In Spigot *(Newton per Square Millimeter)*
- **σt$_{rod}$** Tensile Stress in Cotter Joint Rod *(Newton per Square Millimeter)*
- **τ$_{co}$** Shear Stress in Cotter *(Newton per Square Millimeter)*
- **τ$_{so}$** Shear Stress in Socket *(Newton per Square Millimeter)*

Constants, Functions, Measurements used in list of Strength and Stress Formulas above

- constant(s): **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 ➡

- **τ$_{sp}$** Shear Stress in Spigot *(Newton per Square Millimeter)*
- τ_p Permissible Shear Stress *(Newton per Square Meter)*

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