Important Forces and Loads on Joint Formulas PDF

Formulas
Examples
with Units

List of 11
Important Forces and Loads on Joint Formulas

1) Force on Cotter given Shear Stress in Cotter Formula

Evaluate Formula

Formula

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

Example with Units

$$50000.784\,\text{N} = 2 \cdot 21.478\,\text{mm} \cdot 48.5\,\text{mm} \cdot 24\,\text{N/mm}^2$$

2) Load Taken by Cotter Joint Rod given Tensile Stress in Rod Formula

Evaluate Formula

Formula

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

Example with Units

$$50000.61\,\text{N} = \frac{3.1416 \cdot 35.6827\,\text{mm}^2 \cdot 50\,\text{N/mm}^2}{4}$$

3) Load Taken by Socket of Cotter Joint given Compressive Stress Formula

Evaluate Formula

Formula

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

Example with Units

$$50000.784\,\text{N} = 58.20\,\text{N/mm}^2 \cdot \left(80\,\text{mm} - 40\,\text{mm} \right) \cdot 21.478\,\text{mm}$$

4) Load Taken by Socket of Cotter Joint given Shear Stress in Socket Formula

Evaluate Formula

Formula

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

Example with Units

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

5) Load Taken by Socket of Cotter Joint given Tensile Stress in Socket Formula

Evaluate Formula

Formula

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

Example with Units

$$50000.8227\,\text{N} = 68.224\,\text{N/mm}^2 \cdot \left(\frac{3.1416}{4} \cdot \left(54\,\text{mm}^2 - 40\,\text{mm}^2 \right) - 21.478\,\text{mm} \cdot \left(54\,\text{mm} - 40\,\text{mm} \right) \right)$$

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

Evaluate Formula

Formula

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

Example with Units

$$50000.784\,\text{N} = 21.478\,\text{mm} \cdot 40\,\text{mm} \cdot 58.2\,\text{N/mm}^2$$

7) Load Taken by Spigot of Cotter Joint given Shear Stress in Spigot Formula

Evaluate Formula

Formula

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

Example with Units

$$50000.48\,\text{N} = 2 \cdot 23.5\,\text{mm} \cdot 40\,\text{mm} \cdot 26.596\,\text{N/mm}^2$$

8) Maximum Load taken by Cotter Joint given Spigot Diameter, Thickness and Stress Formula

Evaluate Formula

Formula

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

Example with Units

$$50000.8885\,\text{N} = \left(\frac{3.1416}{4} \cdot {40\,\text{mm}}^2 - 40\,\text{mm} \cdot 21.478\,\text{mm}\right) \cdot 125.783\,\text{N/mm}^2$$

9) Permissible Shear Stress for Cotter Formula

Evaluate Formula

Formula

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

Example with Units

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

10) Permissible Shear Stress for Spigot Formula

Evaluate Formula

Formula

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

Example with Units

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

11) Tensile Stress in Spigot Formula

Evaluate 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

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

Variables used in list of Forces and Loads on Joint 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)*
- **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_{c1} Compressive 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)*
- τ_{sp} Shear Stress in Spigot *(Newton per Square Millimeter)*
- τ_p Permissible Shear Stress *(Newton per Square Meter)*

Constants, Functions, Measurements used in list of Forces and Loads on Joint 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

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