

Important Eye Formulas PDF



**Formulas
Examples
with Units**

**List of 16
Important Eye Formulas**

1) Bending Stress in Knuckle Pin given Bending Moment in Pin Formula

Formula

$$\sigma_b = \frac{32 \cdot M_b}{\pi \cdot d^3}$$

Example with Units

$$90.4914 \text{ N/mm}^2 = \frac{32 \cdot 45000 \text{ N*mm}}{3.1416 \cdot 37 \text{ mm}^3}$$

Evaluate Formula

2) Bending Stress in Knuckle Pin given Load, Thickness of Eyes and Pin Diameter Formula

Formula

$$\sigma_b = \frac{32 \cdot \frac{L}{2} \cdot \left(\frac{b}{4} + \frac{a}{3} \right)}{\pi \cdot d^3}$$

Example with Units

$$90.2275 \text{ N/mm}^2 = \frac{32 \cdot \frac{45000 \text{ N}}{2} \cdot \left(\frac{44.3 \text{ mm}}{4} + \frac{26.6 \text{ mm}}{3} \right)}{3.1416 \cdot 37 \text{ mm}^3}$$

Evaluate Formula

3) Compressive Stress in Pin Inside Eye of Knuckle Joint given Load and Pin Dimensions Formula

Formula

$$\sigma_c = \frac{L}{b \cdot d}$$

Example with Units

$$27.4541 \text{ N/mm}^2 = \frac{45000 \text{ N}}{44.3 \text{ mm} \cdot 37 \text{ mm}}$$

Evaluate Formula

4) Compressive Stress in Pin Inside Fork of Knuckle Joint given Load and Pin Dimensions Formula

Formula

$$\sigma_c = \frac{L}{2 \cdot a \cdot d}$$

Example with Units

$$22.8612 \text{ N/mm}^2 = \frac{45000 \text{ N}}{2 \cdot 26.6 \text{ mm} \cdot 37 \text{ mm}}$$

Evaluate Formula

5) Max Bending Moment in Knuckle Pin given Load, Thickness of Eye and Fork Formula

Formula

$$M_b = \frac{L}{2} \cdot \left(\frac{b}{4} + \frac{a}{3} \right)$$

Example with Units

$$448687.5 \text{ N*mm} = \frac{45000 \text{ N}}{2} \cdot \left(\frac{44.3 \text{ mm}}{4} + \frac{26.6 \text{ mm}}{3} \right)$$

Evaluate Formula



6) Shear Stress in Eye of Knuckle Joint given Load, Outer Diameter of Eye and its Thickness

Formula

Formula

$$\tau_e = \frac{L}{b \cdot (d_o - d)}$$

Example with Units

$$23.6233 \text{ N/mm}^2 = \frac{45000 \text{ N}}{44.3 \text{ mm} \cdot (80 \text{ mm} - 37 \text{ mm})}$$

Evaluate Formula 

7) Shear Stress in Fork of Knuckle Joint given Load, Outer Diameter of Eye and Pin Diameter

Formula

Formula

$$\tau_f = \frac{L}{2 \cdot a \cdot (d_o - d)}$$

Example with Units

$$19.6713 \text{ N/mm}^2 = \frac{45000 \text{ N}}{2 \cdot 26.6 \text{ mm} \cdot (80 \text{ mm} - 37 \text{ mm})}$$

Evaluate Formula 

8) Shear Stress in Pin of Knuckle Joint given Load and Pin Diameter Formula

Formula

$$\tau_p = \frac{2 \cdot L}{\pi \cdot d^2}$$

Example with Units

$$20.9261 \text{ N/mm}^2 = \frac{2 \cdot 45000 \text{ N}}{3.1416 \cdot 37 \text{ mm}^2}$$

Evaluate Formula 

9) Tensile Stress in Eye of Knuckle Joint given Load, Outer Diameter of Eye and its Thickness

Formula

Formula

$$\sigma_{te} = \frac{L}{b \cdot (d_o - d)}$$

Example with Units

$$23.6233 \text{ N/mm}^2 = \frac{45000 \text{ N}}{44.3 \text{ mm} \cdot (80 \text{ mm} - 37 \text{ mm})}$$

Evaluate Formula 

10) Tensile Stress in Fork of Knuckle Joint given Load, Outer Diameter of Eye and Pin Diameter Formula

Formula

$$\sigma_{tf} = \frac{L}{2 \cdot a \cdot (d_o - d)}$$

Example with Units

$$19.6713 \text{ N/mm}^2 = \frac{45000 \text{ N}}{2 \cdot 26.6 \text{ mm} \cdot (80 \text{ mm} - 37 \text{ mm})}$$

Evaluate Formula 

11) Tensile Stress in Rod of Knuckle Joint Formula

Formula

$$\sigma_t = \frac{4 \cdot L}{\pi \cdot d_{r1}^2}$$

Example with Units

$$59.621 \text{ N/mm}^2 = \frac{4 \cdot 45000 \text{ N}}{3.1416 \cdot 31 \text{ mm}^2}$$

Evaluate Formula 

12) Thickness of Eye End of Knuckle Joint given Bending Moment in Pin Formula

Formula

$$b = 4 \cdot \left(2 \cdot \frac{M_b}{L} - \frac{a}{3} \right)$$

Example with Units

$$44.5333 \text{ mm} = 4 \cdot \left(2 \cdot \frac{450000 \text{ N*mm}}{45000 \text{ N}} - \frac{26.6 \text{ mm}}{3} \right)$$

Evaluate Formula 



13) Thickness of Eye End of Knuckle Joint given Bending Stress in Pin Formula

Formula

$$b = 4 \cdot \left(\frac{\pi \cdot d^3 \cdot \sigma_b}{16 \cdot L} - \frac{a}{3} \right)$$

Example with Units

$$44.0989 \text{ mm} = 4 \cdot \left(\frac{3.1416 \cdot 37 \text{ mm}^3 \cdot 90 \text{ N/mm}^2}{16 \cdot 45000 \text{ N}} - \frac{26.6 \text{ mm}}{3} \right)$$

Evaluate Formula 

14) Thickness of Eye End of Knuckle Joint given Shear Stress in Eye Formula

Formula

$$b = \frac{L}{\tau_e \cdot (d_o - d)}$$

Example with Units

$$43.6047 \text{ mm} = \frac{45000 \text{ N}}{24 \text{ N/mm}^2 \cdot (80 \text{ mm} - 37 \text{ mm})}$$

Evaluate Formula 

15) Thickness of Eye End of Knuckle Joint given Tensile Stress in Eye Formula

Formula

$$b = \frac{L}{\sigma_{te} \cdot (d_o - d)}$$

Example with Units

$$23.2558 \text{ mm} = \frac{45000 \text{ N}}{45 \text{ N/mm}^2 \cdot (80 \text{ mm} - 37 \text{ mm})}$$

Evaluate Formula 

16) Thickness of Eye of Knuckle Joint given Rod Diameter Formula

Formula

$$b = 1.25 \cdot d_{r1}$$

Example with Units

$$38.75 \text{ mm} = 1.25 \cdot 31 \text{ mm}$$





Evaluate Formula 



Variables used in list of Eye Formulas above

- **a** Thickness of Fork Eye of Knuckle Joint (Millimeter)
- **b** Thickness of Eye of Knuckle Joint (Millimeter)
- **d** Diameter of Knuckle Pin (Millimeter)
- **d_o** Outer Diameter of Eye of Knuckle Joint (Millimeter)
- **d_{r1}** Diameter of Rod of Knuckle Joint (Millimeter)
- **L** Load on Knuckle Joint (Newton)
- **M_b** Bending Moment in Knuckle Pin (Newton Millimeter)
- **σ_b** Bending Stress in Knuckle Pin (Newton per Square Millimeter)
- **σ_c** Compressive Stress in Knuckle Pin (Newton per Square Millimeter)
- **σ_t** Tensile Stress in Knuckle Joint Rod (Newton per Square Millimeter)
- **σ_{te}** Tensile Stress in Eye of Knuckle Joint (Newton per Square Millimeter)
- **σ_{tf}** Tensile Stress in Fork of Knuckle Joint (Newton per Square Millimeter)
- **T_e** Shear Stress in Eye of Knuckle Joint (Newton per Square Millimeter)
- **T_f** Shear Stress in Fork of Knuckle Joint (Newton per Square Millimeter)
- **T_p** Shear Stress in Knuckle Pin (Newton per Square Millimeter)

Constants, Functions, Measurements used in list of Eye Formulas above

- **constant(s):** pi, 3.14159265358979323846264338327950288 Archimedes' constant
- **Measurement: Length** in Millimeter (mm) Length Unit Conversion 
- **Measurement: Force** in Newton (N) Force Unit Conversion 
- **Measurement: Torque** in Newton Millimeter (N*mm) Torque Unit Conversion 
- **Measurement: Stress** in Newton per Square Millimeter (N/mm²) Stress Unit Conversion 



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