Important Shear Stress in Rectangular Section Formulas PDF

Formulas
Examples
with Units

List of 10
Important Shear Stress in Rectangular Section Formulas

1) Average Shear Stress for Rectangular Section Formula

Evaluate Formula

Formula

$$\tau_{avg} = \frac{F_s}{w \cdot d_{rec}}$$

Example with Units

$$0.1773\,\text{MPa} = \frac{4.8\,\text{kN}}{95\,\text{mm} \cdot 285\,\text{mm}}$$

2) Average Shear Stress given Maximum Shear Stress for Rectangular Section Formula

Evaluate Formula

Formula

$$\tau_{avg} = \frac{2}{3} \cdot \tau_{max}$$

Example with Units

$$7.3333\,\text{MPa} = \frac{2}{3} \cdot 11\,\text{MPa}$$

3) Distance of C.G of Area (above Considered Level) from Neutral Axis for Rectangular Section Formula

Evaluate Formula

Formula

$$\bar{y} = \frac{1}{2} \cdot \left(y + \frac{d_{rec}}{2} \right)$$

Example with Units

$$73.75\,\text{mm} = \frac{1}{2} \cdot \left(5\,\text{mm} + \frac{285\,\text{mm}}{2} \right)$$

4) Distance of Considered Level from Neutral Axis for Rectangular Section Formula

Evaluate Formula

Formula

$$y = 2 \cdot \left(\bar{y} - \frac{d_{rec}}{4} \right)$$

Example with Units

$$21.5\,\text{mm} = 2 \cdot \left(82\,\text{mm} - \frac{285\,\text{mm}}{4} \right)$$

5) Maximum Shear Stress for Rectangular Section Formula

Evaluate Formula

Formula

$$\tau_{max} = \frac{3}{2} \cdot \tau_{avg}$$

Example with Units

$$0.075\,\text{MPa} = \frac{3}{2} \cdot 0.05\,\text{MPa}$$

6) Moment of Inertia of Rectangular Section about Neutral Axis Formula

Evaluate Formula

Formula

$$I = \frac{F_s}{2 \cdot \tau_{beam}} \cdot \left(\frac{d_{rec}^2}{4} - y^2 \right)$$

Example with Units

$$8.1E\text{-}6\,m^4 = \frac{4.8\,kN}{2 \cdot 6\,MPa} \cdot \left(\frac{285\,mm^2}{4} - 5\,mm^2 \right)$$

7) Shear Force for Rectangular Section Formula

Evaluate Formula

Formula

$$F_s = \frac{2 \cdot I \cdot \tau_{beam}}{\frac{d_{rec}^2}{4} - y^2}$$

Example with Units

$$994.0216\,kN = \frac{2 \cdot 0.00168\,m^4 \cdot 6\,MPa}{\frac{285\,mm^2}{4} - 5\,mm^2}$$

8) Shear Force Variation across Neutral Axis for Rectangular Section Formula

Evaluate Formula

Formula

$$F_s = \frac{2}{3} \cdot \tau_{beam} \cdot w \cdot d_{rec}$$

Example with Units

$$108.3\,kN = \frac{2}{3} \cdot 6\,MPa \cdot 95\,mm \cdot 285\,mm$$

9) Shear Stress for Rectangular Section Formula

Evaluate Formula

Formula

$$\tau_{beam} = \frac{F_s}{2 \cdot I} \cdot \left(\frac{d_{rec}^2}{4} - y^2 \right)$$

Example with Units

$$0.029\,MPa = \frac{4.8\,kN}{2 \cdot 0.00168\,m^4} \cdot \left(\frac{285\,mm^2}{4} - 5\,mm^2 \right)$$

10) Shear Stress Variation across Neutral Axis for Rectangular Section Formula

Evaluate Formula

Formula

$$\tau_{beam} = \frac{3}{2} \cdot \frac{F_s}{w \cdot d_{rec}}$$

Example with Units

$$0.2659\,MPa = \frac{3}{2} \cdot \frac{4.8\,kN}{95\,mm \cdot 285\,mm}$$

Variables used in list of Shear Stress in Rectangular Section Formulas above

- d_{rec} Depth of Rectangular Section *(Millimeter)*
- F_s Shear Force on Beam *(Kilonewton)*
- **I** Moment of Inertia of Area of Section *(Meter⁴)*
- **w** Beam Width at Considered Level *(Millimeter)*
- **y** Distance from Neutral Axis *(Millimeter)*
- $\bar{y}$ Distance of CG of Area from NA *(Millimeter)*
- τ_{avg} Average Shear Stress on Beam *(Megapascal)*
- τ_{beam} Shear Stress in Beam *(Megapascal)*
- τ_{max} Maximum Shear Stress on Beam *(Megapascal)*

Constants, Functions, Measurements used in list of Shear Stress in Rectangular Section Formulas above

- Measurement: **Length** in Millimeter (mm)
  Length Unit Conversion
- Measurement: **Pressure** in Megapascal (MPa)
  Pressure Unit Conversion
- Measurement: **Force** in Kilonewton (kN)
  Force Unit Conversion
- Measurement: **Second Moment of Area** in Meter⁴ (m⁴)
  Second Moment of Area Unit Conversion

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