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Singly Reinforced Sections Formulas

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List of 12 Singly Reinforced Sections Formulas

Singly Reinforced Sections ⬈

Singly Reinforced Flanged Sections ⬈

1) Moment Resistance of Concrete given Flange Thickness ⬈

Open Calculator ⬈

$$fx \quad M_c = \frac{1}{2} \cdot f_c \cdot W_b \cdot t_f \cdot \left(d_{eff} - \left(\frac{t_f}{2} \right) \right)$$

$$ex \quad 53.06173 \text{kN*m} = \frac{1}{2} \cdot 15\text{MPa} \cdot 18\text{mm} \cdot 99.5\text{mm} \cdot \left(4\text{m} - \left(\frac{99.5\text{mm}}{2} \right) \right)$$

2) Moment Resistance of Steel ⬈

Open Calculator ⬈

$$fx \quad M_s = (T \cdot r \cdot d_{eff}) + (A \cdot f_{TS} \cdot r \cdot d_{eff})$$

$$ex \quad 99.12568 \text{kN*m} = (100.01\text{N} \cdot 10.1 \cdot 4\text{m}) + (10\text{m}^2 \cdot 24\text{kgf}/\text{m}^2 \cdot 10.1 \cdot 4\text{m})$$

3) Total Compressive Force given Area and Tensile Steel Stress ⬈

Open Calculator ⬈

$$fx \quad C = A \cdot f_{TS}$$

$$ex \quad 240\text{kN} = 10\text{m}^2 \cdot 24\text{kgf}/\text{m}^2$$

Singly Reinforced Rectangular Sections 🡵

4) Bending Moment given Stress in Concrete 🡵

fx $$Mb_R = \frac{f_{concrete} \cdot K \cdot W_b \cdot D_B^2}{2}$$

Open Calculator 🡵

ex $$66.23001\text{N*m} = \frac{1553\text{MPa} \cdot 0.65 \cdot 18\text{mm} \cdot (2.7\text{m})^2}{2}$$

5) Depth of Heavy Beams and Girders 🡵

fx $$D_B = \left(\frac{I_n}{12}\right) + \left(\frac{I_n}{10}\right)$$

Open Calculator 🡵

ex $$1.835167\text{m} = \left(\frac{10.01\text{m}}{12}\right) + \left(\frac{10.01\text{m}}{10}\right)$$

6) Depth of Light Beams 🡵

fx $$D_B = \frac{I_n}{15}$$

Open Calculator 🡵

ex $$0.667333\text{m} = \frac{10.01\text{m}}{15}$$

7) Depth of Roof and Floor Slabs ↗

$$\text{fx} \quad D_B = \frac{I_n}{25}$$

$$\text{ex} \quad 0.4004\text{m} = \frac{10.01\text{m}}{25}$$

8) Moment Resistance of Steel given Steel Ratio ↗

$$\text{fx} \quad M_s = f_{TS} \cdot \rho_{\text{steel ratio}} \cdot r \cdot W_b \cdot (d_{\text{eff}})^2$$

$$\text{ex} \quad 25.94687\text{kN*m} = 24\text{kgf/m}^2 \cdot 37.9 \cdot 10.1 \cdot 18\text{mm} \cdot (4\text{m})^2$$

9) Moment Resistance of Steel given Stress and Area ↗

$$\text{fx} \quad M_s = (f_{TS} \cdot A_s \cdot r \cdot d_{\text{eff}})$$

$$\text{ex} \quad 96.96\text{kN*m} = (24\text{kgf/m}^2 \cdot 100.0\text{mm}^2 \cdot 10.1 \cdot 4\text{m})$$

10) Stress in Concrete ↗

$$\text{fx} \quad f_{\text{concrete}} = 2 \cdot \frac{Mb_R}{K \cdot j \cdot W_b \cdot D_B^2}$$

$$\text{ex} \quad 1553.469\text{MPa} = 2 \cdot \frac{53\text{N*m}}{0.65 \cdot 0.8 \cdot 18\text{mm} \cdot (2.7\text{m})^2}$$

Open Calculator ↗

11) Stress in Steel ⤴

Open Calculator ⤴

$$fx \quad f'_s = \frac{M_t}{A \cdot j \cdot D_B}$$

$$ex \quad 0.001389 MPa = \frac{0.03 N*m}{10 m^2 \cdot 0.8 \cdot 2.7 m}$$

12) Stress in Steel given Cross-Sectional Reinforcing Tensile Area to Beam Area Ratio ⤴

Open Calculator ⤴

$$fx \quad f'_s = \frac{Mb_R}{m_{Elastic} \cdot j \cdot W_b \cdot D_B^2}$$

$$ex \quad 841.4622 MPa = \frac{53 N*m}{0.6 \cdot 0.8 \cdot 18 mm \cdot (2.7 m)^2}$$

Variables Used

- **A** Area of Tension Reinforcement *(Square Meter)*
- **A$_s$** Area of Steel required *(Square Millimeter)*
- **C** Total Compressive Force *(Kilonewton)*
- **D$_B$** Depth of Beam *(Meter)*
- **d$_{eff}$** Effective Depth of Beam *(Meter)*
- **f$_c$** 28 Day Compressive Strength of Concrete *(Megapascal)*
- **f$_{concrete}$** Stress in Concrete *(Megapascal)*
- **f'$_s$** Stress in Compressive Steel *(Megapascal)*
- **f$_{TS}$** Tensile Stress in Steel *(Kilogram-Force per Square Meter)*
- **l$_n$** Length of Span *(Meter)*
- **j** Constant j
- **K** Constant k
- **M$_c$** Moment Resistance of Concrete *(Kilonewton Meter)*
- **m$_{Elastic}$** Modular Ratio for Elastic Shortening
- **M$_s$** Moment Resistance of Steel *(Kilonewton Meter)*
- **M$_t$** Moment in Structures *(Newton Meter)*
- **Mb$_R$** Bending Moment *(Newton Meter)*
- **r** Ratio of Distance between Centroids
- **T** Total Tension *(Newton)*
- **t$_f$** Flange Thickness *(Millimeter)*
- **W$_b$** Width of Beam *(Millimeter)*

- $\rho_{\text{steel ratio}}$ Steel Ratio

Constants, Functions, Measurements used

- Measurement: **Length** in Millimeter (mm), Meter (m)
  Length Unit Conversion

- Measurement: **Area** in Square Meter (m²), Square Millimeter (mm²)
  Area Unit Conversion

- Measurement: **Pressure** in Kilogram-Force per Square Meter (kgf/m²), Megapascal (MPa)
  Pressure Unit Conversion

- Measurement: **Energy** in Newton Meter (N*m)
  Energy Unit Conversion

- Measurement: **Force** in Newton (N), Kilonewton (kN)
  Force Unit Conversion

- Measurement: **Torque** in Kilonewton Meter (kN*m)
  Torque Unit Conversion

- Measurement: **Moment of Force** in Newton Meter (N*m)
  Moment of Force Unit Conversion

- Measurement: **Stress** in Megapascal (MPa)
  Stress Unit Conversion

Check other formula lists

- **Doubly Reinforced Rectangular Sections Formulas**

- **Singly Reinforced Sections Formulas**

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