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Shear Stress in Circular Section Formulas

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List of 19 Shear Stress in Circular Section Formulas

Shear Stress in Circular Section

1) Shear Force in Circular Section

$$\text{fx } F_s = \frac{\tau_{\text{beam}} \cdot I \cdot B}{\frac{2}{3} \cdot (R^2 - y^2)^{\frac{3}{2}}}$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b_img.jpg\)](#)

$$\text{ex } 0.875023\text{kN} = \frac{6\text{MPa} \cdot 0.00168\text{m}^4 \cdot 100\text{mm}}{\frac{2}{3} \cdot ((1200\text{mm})^2 - (5\text{mm})^2)^{\frac{3}{2}}}$$

2) Shear Force using Maximum Shear Stress

$$\text{fx } F_s = \frac{3 \cdot I \cdot \tau_{\text{max}}}{R^2}$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d_img.jpg\)](#)

$$\text{ex } 38.5\text{kN} = \frac{3 \cdot 0.00168\text{m}^4 \cdot 11\text{MPa}}{(1200\text{mm})^2}$$



3) Shear Stress Distribution for Circular Section

[Open Calculator !\[\]\(4729e517bc6a7cd81c8025b9646574fb_img.jpg\)](#)

$$\text{fx } \tau_{\max} = \frac{F_s \cdot \frac{2}{3} \cdot (R^2 - y^2)^{\frac{3}{2}}}{I \cdot B}$$

$$\text{ex } 32.91343\text{MPa} = \frac{4.8\text{kN} \cdot \frac{2}{3} \cdot ((1200\text{mm})^2 - (5\text{mm})^2)^{\frac{3}{2}}}{0.00168\text{m}^4 \cdot 100\text{mm}}$$

4) Width of Beam at Considered Level given Radius of Circular Section

[Open Calculator !\[\]\(e474458956c9a37fbf9586ddb60a7fa1_img.jpg\)](#)

$$\text{fx } B = 2 \cdot \sqrt{R^2 - y^2}$$

$$\text{ex } 2399.979\text{mm} = 2 \cdot \sqrt{(1200\text{mm})^2 - (5\text{mm})^2}$$

5) Width of Beam at Considered Level given Shear Stress for Circular Section

[Open Calculator !\[\]\(4fe57c3593bf1b21d272ae7ac8dfaf77_img.jpg\)](#)

$$\text{fx } B = \frac{F_s \cdot \frac{2}{3} \cdot (R^2 - y^2)^{\frac{3}{2}}}{I \cdot \tau_{\text{beam}}}$$

$$\text{ex } 548.5571\text{mm} = \frac{4.8\text{kN} \cdot \frac{2}{3} \cdot ((1200\text{mm})^2 - (5\text{mm})^2)^{\frac{3}{2}}}{0.00168\text{m}^4 \cdot 6\text{MPa}}$$



Average Shear Stress

6) Average Shear Force for Circular Section

$$\text{fx } F_s = \pi \cdot R^2 \cdot \tau_{\text{avg}}$$

[Open Calculator !\[\]\(23d9fc146e83b5c3013cfa32c784f8d5_img.jpg\)](#)

$$\text{ex } 226.1947\text{kN} = \pi \cdot (1200\text{mm})^2 \cdot 0.05\text{MPa}$$

7) Average Shear Stress for Circular Section

$$\text{fx } \tau_{\text{avg}} = \frac{F_s}{\pi \cdot R^2}$$

[Open Calculator !\[\]\(aa53ad6fea213b8b2226d3077e30533a_img.jpg\)](#)

$$\text{ex } 0.001061\text{MPa} = \frac{4.8\text{kN}}{\pi \cdot (1200\text{mm})^2}$$

8) Average Shear Stress for Circular Section given Maximum Shear Stress

$$\text{fx } \tau_{\text{avg}} = \frac{3}{4} \cdot \tau_{\text{max}}$$

[Open Calculator !\[\]\(626ce8ac21792b9405bfddfea8e0c96a_img.jpg\)](#)

$$\text{ex } 8.25\text{MPa} = \frac{3}{4} \cdot 11\text{MPa}$$



Maximum Shear Stress

9) Maximum Shear Force given Radius of Circular Section

$$\text{fx } F_s = \tau_{\max} \cdot \frac{3}{4} \cdot \pi \cdot R^2$$

[Open Calculator !\[\]\(74d4806277d7e73349d8e8c0897931e9_img.jpg\)](#)

$$\text{ex } 37322.12\text{kN} = 11\text{MPa} \cdot \frac{3}{4} \cdot \pi \cdot (1200\text{mm})^2$$

10) Maximum Shear Stress for Circular Section

$$\text{fx } \tau_{\max} = \frac{F_s}{3 \cdot I} \cdot R^2$$

[Open Calculator !\[\]\(8bba887393ca45b761e5cb49e755e762_img.jpg\)](#)

$$\text{ex } 1.371429\text{MPa} = \frac{4.8\text{kN}}{3 \cdot 0.00168\text{m}^4} \cdot (1200\text{mm})^2$$

11) Maximum Shear Stress for Circular Section given Average Shear Stress

$$\text{fx } \tau_{\max} = \frac{4}{3} \cdot \tau_{\text{avg}}$$

[Open Calculator !\[\]\(0fb13ad0bfa3d86868cdd3883e5665b3_img.jpg\)](#)

$$\text{ex } 0.066667\text{MPa} = \frac{4}{3} \cdot 0.05\text{MPa}$$



12) Maximum Shear Stress given Radius of Circular Section

$$\text{fx } \tau_{\text{beam}} = \frac{4}{3} \cdot \frac{F_s}{\pi \cdot R^2}$$

[Open Calculator !\[\]\(d3fb9f94af8b26d1c844efa9a98805b0_img.jpg\)](#)

$$\text{ex } 0.001415\text{MPa} = \frac{4}{3} \cdot \frac{4.8\text{kN}}{\pi \cdot (1200\text{mm})^2}$$

Moment of Inertia

13) Area Moment of Considered Area about Neutral Axis

$$\text{fx } Ay = \frac{2}{3} \cdot (R^2 - y^2)^{\frac{3}{2}}$$

[Open Calculator !\[\]\(73002692dd5e7a64e60946be3158e719_img.jpg\)](#)

$$\text{ex } 1.2\text{E}^9\text{mm}^3 = \frac{2}{3} \cdot \left((1200\text{mm})^2 - (5\text{mm})^2 \right)^{\frac{3}{2}}$$

14) Moment of Inertia of Circular Section

$$\text{fx } I = \frac{\pi}{4} \cdot R^4$$

[Open Calculator !\[\]\(104fbf564e2e5a8fbd84f31656d114c7_img.jpg\)](#)

$$\text{ex } 1.628602\text{m}^4 = \frac{\pi}{4} \cdot (1200\text{mm})^4$$



15) Moment of Inertia of Circular Section given Maximum Shear Stress

[Open Calculator !\[\]\(feabb98897b440bc8695a03336a6e2df_img.jpg\)](#)

$$\text{fx } I = \frac{F_s}{3 \cdot \tau_{\max}} \cdot R^2$$

$$\text{ex } 0.000209\text{m}^4 = \frac{4.8\text{kN}}{3 \cdot 11\text{MPa}} \cdot (1200\text{mm})^2$$

16) Moment of Inertia of Circular Section given Shear Stress

[Open Calculator !\[\]\(642aa997563f9a325b310230bb5078b7_img.jpg\)](#)

$$\text{fx } I = \frac{F_s \cdot \frac{2}{3} \cdot (R^2 - y^2)^{\frac{3}{2}}}{\tau_{\text{beam}} \cdot B}$$

$$\text{ex } 0.009216\text{m}^4 = \frac{4.8\text{kN} \cdot \frac{2}{3} \cdot ((1200\text{mm})^2 - (5\text{mm})^2)^{\frac{3}{2}}}{6\text{MPa} \cdot 100\text{mm}}$$

Radius of Circular Section

17) Radius of Circular Section given Average Shear Stress

[Open Calculator !\[\]\(c444627dab9fee9a1550c053ffaaaae2_img.jpg\)](#)

$$\text{fx } R = \sqrt{\frac{F_s}{\pi \cdot \tau_{\text{avg}}}}$$

$$\text{ex } 174.8077\text{mm} = \sqrt{\frac{4.8\text{kN}}{\pi \cdot 0.05\text{MPa}}}$$



18) Radius of Circular Section given Maximum Shear Stress

[Open Calculator !\[\]\(3d8c13c92b853674f749aac6fa869926_img.jpg\)](#)

$$\text{fx } R = \sqrt{\frac{4}{3} \cdot \frac{F_s}{\pi \cdot \tau_{\max}}}$$

$$\text{ex } 13.60876\text{mm} = \sqrt{\frac{4}{3} \cdot \frac{4.8\text{kN}}{\pi \cdot 11\text{MPa}}}$$

19) Radius of Circular Section given Width of Beam at Considered Level

[Open Calculator !\[\]\(17acf1afa8cdf0b67c53d4865a5ed469_img.jpg\)](#)

$$\text{fx } R = \sqrt{\left(\frac{B}{2}\right)^2 + y^2}$$

$$\text{ex } 50.24938\text{mm} = \sqrt{\left(\frac{100\text{mm}}{2}\right)^2 + (5\text{mm})^2}$$








Variables Used

- **A_y** First Moment of Area (Cubic Millimeter)
- **B** Width of Beam Section (Millimeter)
- **F_s** Shear Force on Beam (Kilonewton)
- **I** Moment of Inertia of Area of Section (Meter⁴)
- **R** Radius of Circular Section (Millimeter)
- **y** Distance from Neutral Axis (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

- **Constant:** **pi**, 3.14159265358979323846264338327950288
Archimedes' constant
- **Function:** **sqrt**, sqrt(Number)
Square root function
- **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 
- **Measurement:** **First Moment of Area** in Cubic Millimeter (mm³)
First Moment of Area Unit Conversion 



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- [Shear Stress in Rectangular Section Formulas](#) 
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