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Shear Stress in Circular Section Formulas

Calculators!

Examples!

Conversions!

List of 19 Shear Stress in Circular Section Formulas

Shear Stress in Circular Section

Average Shear Stress

1) Average Shear Force for Circular Section

Open Calculator

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

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

2) Average Shear Stress for Circular Section

Open Calculator

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

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

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

Open Calculator

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

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

4) Shear Force in Circular Section

Open Calculator

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

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

5) Shear Force using Maximum Shear Stress

Open Calculator

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

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

6) Shear Stress Distribution for Circular Section

Open Calculator

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

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

Maximum Shear Stress

7) Maximum Shear Force given Radius of Circular Section

Open Calculator

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

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

8) Maximum Shear Stress for Circular Section

Open Calculator

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

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

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

Open Calculator

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

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

10) Maximum Shear Stress given Radius of Circular Section

Open Calculator

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

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

Moment of Inertia

11) Area Moment of Considered Area about Neutral Axis

Open Calculator

fx $$A_y = \frac{2}{3} \cdot \left(r^2 - y^2\right)^{\frac{3}{2}}$$

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

12) Moment of Inertia of Circular Section

Open Calculator

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

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

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

Open Calculator

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

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

14) Moment of Inertia of Circular Section given Shear Stress

Open Calculator

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

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

Radius of Circular Section

15) Radius of Circular Section given Average Shear Stress

Open Calculator

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

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

16) Radius of Circular Section given Maximum Shear Stress

Open Calculator

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

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

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

Open Calculator

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

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

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

Open Calculator

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

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

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

Open Calculator

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

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

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)
  A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- 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 (m^4)
  Second Moment of Area Unit Conversion
- Measurement: **First Moment of Area** in Cubic Millimeter (mm^3)
  First Moment of Area Unit Conversion

Check other formula lists

- **Shear Stress in Circular Section Formulas**
- **Shear Stress in I Section Formulas**
- **Shear Stress in Rectangular Section Formulas**

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