



# **Stress Formulas**

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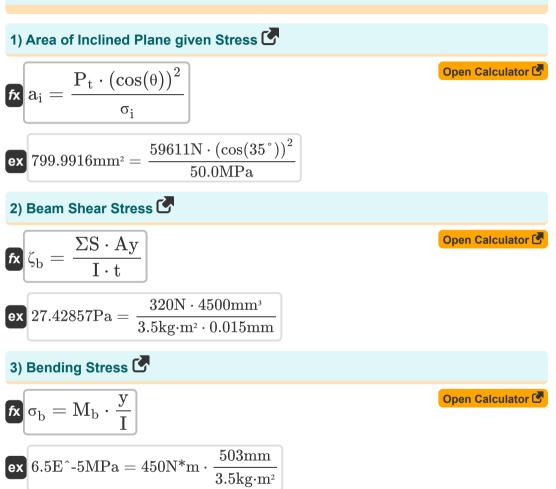
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# **List of 22 Stress Formulas**

# Stress 🕑





2/12



# 4) Brinell Hardness Number 🕑

$$\begin{array}{l} & \mbox{P} & \mbox{P} & \mbox{W} & \mbox{Open Calculator } \mbox{C} \\ \hline \mbox{BHN} = \frac{W}{\left(0.5 \cdot \pi \cdot D\right) \cdot \left(D - \left(D^2 - d_1^2\right)^{0.5}\right)} & \mbox{Open Calculator } \mbox{C} \\ \hline \mbox{S} & \mbox{S} & \mbox{S} \\ \hline \mbox{S} & \mbox{S} & \mbox{S} & \mbox{S} & \mbox{S} \\ \hline \mbox{S} & \mbox{S} & \mbox{S} & \mbox{S} \\ \hline \mbox{S} & \mbox{S} &$$





### 8) Maximum Principal Stress 🕑

$$\begin{aligned} \sigma_{\max} &= \frac{\sigma_x + \sigma_y}{2} + \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \zeta_{xy}^2} \end{aligned}$$

$$ex$$
96.05551MPa &= \frac{80MPa + 40MPa}{2} + \sqrt{\left(\frac{80MPa - 40MPa}{2}\right)^2 + (30MPa)^2}
9) Maximum Shearing Stress 
$$\Box$$

$$fx \quad \sigma_1 &= \frac{1.5 \cdot V}{A_{cs}} \end{aligned}$$

$$ex \quad 47247.64Pa &= \frac{1.5 \cdot 42N}{1333.4mm^2}$$
10) Minimum Principal Stress 
$$\Box$$

$$fx \quad \sigma_{\min} &= \frac{\sigma_x + \sigma_y}{2} - \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \zeta_{xy}^2} \end{aligned}$$

$$ex \quad 23.94449MPa = \frac{80MPa + 40MPa}{2} - \sqrt{\left(\frac{80MPa - 40MPa}{2}\right)^2 + (30MPa)^2}$$

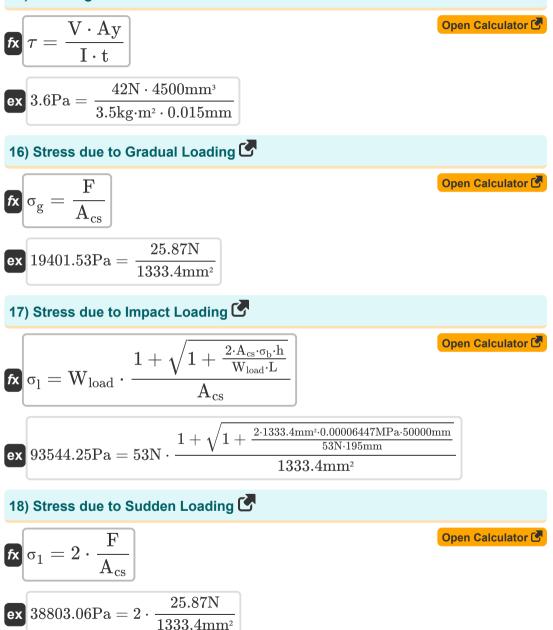


# 11) Shear Stress 🕻

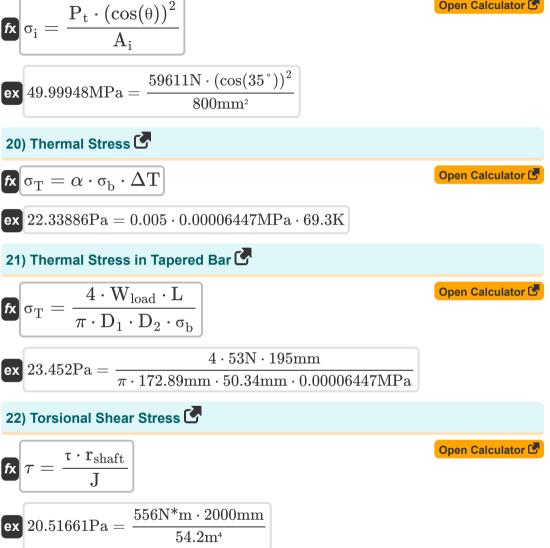
$$\begin{aligned} \mathbf{f} \mathbf{x} &= \frac{\mathbf{F}_{t}}{\mathbf{A}_{cs}} & \text{Open Calculator } \mathbf{f} \\ \mathbf{f} \mathbf{x} &= \frac{\mathbf{F}_{t}}{\mathbf{A}_{cs}} & \text{Open Calculator } \mathbf{f} \\ \mathbf{f} \mathbf{x} &= \frac{\mathbf{P}_{dp}}{1333.4 \text{mm}^{2}} & \text{Open Calculator } \mathbf{f} \\ \mathbf{f} \mathbf{x} & \zeta_{fw} &= \frac{\mathbf{P}_{dp}}{0.707 \cdot \mathbf{L} \cdot \mathbf{h}_{l}} & \text{Open Calculator } \mathbf{f} \\ \mathbf{f} \mathbf{x} & \zeta_{fw} &= \frac{\mathbf{P}_{dp}}{0.707 \cdot \mathbf{L} \cdot \mathbf{h}_{l}} & \text{Open Calculator } \mathbf{f} \\ \mathbf{f} \mathbf{x} & \zeta_{fw} &= \frac{\mathbf{0}.55\text{N}}{0.707 \cdot \mathbf{L} \cdot \mathbf{h}_{l}} & \text{Open Calculator } \mathbf{f} \\ \mathbf{f} \mathbf{x} & \zeta_{1} &= \frac{4 \cdot \mathbf{V}}{3 \cdot \mathbf{A}_{cs}} & \text{Open Calculator } \mathbf{f} \\ \mathbf{f} \mathbf{x} & \sigma_{1} &= \frac{4 \cdot \mathbf{V}}{3 \cdot \mathbf{A}_{cs}} & \text{Open Calculator } \mathbf{f} \\ \mathbf{f} \mathbf{x} & \sigma_{1} &= \frac{4 \cdot 42\text{N}}{3 \cdot 1333.4\text{mm}^{2}} & \text{Open Calculator } \mathbf{f} \\ \mathbf{f} \mathbf{x} & \zeta_{i} &= -\mathbf{P}_{t} \cdot \sin(\theta) \cdot \frac{\cos(\theta)}{\mathbf{A}_{i}} & \text{Open Calculator } \mathbf{f} \\ \mathbf{f} \mathbf{x} & \zeta_{i} &= -\mathbf{P}_{t} \cdot \sin(\theta) \cdot \frac{\cos(\theta)}{\mathbf{A}_{i}} & \text{Open Calculator } \\ \mathbf{f} \mathbf{x} & \zeta_{i} &= -\mathbf{P}_{t} \cdot \sin(\theta) \cdot \frac{\cos(\theta)}{\mathbf{A}_{i}} & \text{Open Calculator } \\ \mathbf{f} \mathbf{x} & -35.010011\text{MPa} = -59611\text{N} \cdot \sin(35^{\circ}) \cdot \frac{\cos(35^{\circ})}{800\text{mm}^{2}} & \text{Open Calculator } \\ \mathbf{f} \mathbf{x} & \mathbf{x} & -35.010011\text{MPa} = -59611\text{N} \cdot \sin(35^{\circ}) \cdot \frac{\cos(35^{\circ})}{800\text{mm}^{2}} & \text{Open Calculator } \\ \mathbf{x} & \mathbf{x}$$



### 15) Shearing Stress











# Variables Used

- $\Delta \mathbf{T}$  Change in Temperature (Kelvin)
- Acs Cross Sectional Area (Square Millimeter)
- ai Area of Inclined Plane given Stress (Square Millimeter)
- A<sub>i</sub> Area of Inclined Plane (Square Millimeter)
- Ay First Moment of Area (Cubic Millimeter)
- Bstress Bulk Stress (Megapascal)
- BHN Brinell Hardness Number
- D Diameter of Ball Indenter (Millimeter)
- D<sub>1</sub> Diameter of Bigger End (Millimeter)
- **D**<sub>2</sub> Diameter of Smaller End (Millimeter)
- **d**<sub>i</sub> Diameter of Indentation (Millimeter)
- **F** Force (Newton)
- Ft Tangential Force (Newton)
- h Height at which Load Falls (Millimeter)
- h<sub>l</sub> Leg of Weld (Millimeter)
- I Moment of Inertia (Kilogram Square Meter)
- J Polar Moment of Inertia (Meter⁴)
- L Length of Weld (Millimeter)
- Mb Bending Moment (Newton Meter)
- N.F Normal Inward Force (Newton)
- Paxial Axial Thrust (Newton)
- Pdp Load on Double Parallel Fillet Weld (Newton)
- Pt Tensile Load (Newton)
- **r**shaft Radius of Shaft (Millimeter)



- t Thickness of Material (Millimeter)
- V Shearing Force (Newton)
- W Load (Newton)
- Wload Weight of Load (Newton)
- **y** Distance from Neutral Axis (*Millimeter*)
- ζ<sub>b</sub> Beam Shear Stress (Pascal)
- +  $\zeta_{fw}$  Shear Stress in Double Parallel Fillet Weld (Pascal)
- $\zeta_i$  Shear Stress on Inclined Plane (Megapascal)
- ζ<sub>xy</sub> Shear Stress acting in xy Plane (Megapascal)
- **θ** Theta (Degree)
- **σ** Direct Stress (Pascal)
- σ<sub>1</sub> Stress on Body (Pascal)
- σ<sub>b</sub> Bending Stress (Megapascal)
- $\sigma_g$  Stress due to Gradual Loading (Pascal)
- σ<sub>i</sub> Stress on Inclined Plane (Megapascal)
- σ<sub>I</sub> Stress due to Loading (Pascal)
- σ<sub>max</sub> Maximum Principal Stress (Megapascal)
- σ<sub>min</sub> Minimum Principal Stress (Megapascal)
- σ<sub>T</sub> Thermal Stress (Pascal)
- σ<sub>x</sub> Normal Stress along x Direction (Megapascal)
- σ<sub>y</sub> Normal Stress along y Direction (Megapascal)
- ΣS Total Shear Force (Newton)
- **T** Torque (Newton Meter)
- $\alpha$  Coefficient of Thermal Expansion
- τ Shearing Stress (Pascal)



9/12



# **Constants, Functions, Measurements used**

- Constant: pi, 3.14159265358979323846264338327950288 Archimedes' constant
- Function: cos, cos(Angle) Cosine of an angle is the ratio of the side adjacent to the angle to the hypotenuse of the triangle.
- Function: sin, sin(Angle) Sine is a trigonometric function that describes the ratio of the length of the opposite side of a right triangle to the length of the hypotenuse.
- 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: Area in Square Millimeter (mm<sup>2</sup>) Area Unit Conversion
- Measurement: Pressure in Megapascal (MPa) Pressure Unit Conversion
- Measurement: Force in Newton (N) Force Unit Conversion
- Measurement: Angle in Degree (°) Angle Unit Conversion
- Measurement: Temperature Difference in Kelvin (K) Temperature Difference Unit Conversion
- Measurement: Torque in Newton Meter (N\*m) Torque Unit Conversion
- Measurement: Moment of Inertia in Kilogram Square Meter (kg⋅m²) Moment of Inertia Unit Conversion ☑
- Measurement: Moment of Force in Newton Meter (N\*m)
   Moment of Force Unit Conversion



- Measurement: Second Moment of Area in Meter<sup>4</sup> (m<sup>4</sup>) Second Moment of Area Unit Conversion
- Measurement: First Moment of Area in Cubic Millimeter (mm<sup>3</sup>) First Moment of Area Unit Conversion
- Measurement: Stress in Pascal (Pa) Stress Unit Conversion



# **Check other formula lists**

- Strain Formulas 🖸
- Stress Formulas C

Stress and Strain Formulas C

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