



[calculatoratoz.com](http://calculatoratoz.com)



[unitsconverters.com](http://unitsconverters.com)

# Structural Design Formulas

Calculators!

Examples!

Conversions!

Bookmark [calculatoratoz.com](http://calculatoratoz.com), [unitsconverters.com](http://unitsconverters.com)

Widest Coverage of Calculators and Growing - **30,000+ Calculators!**  
Calculate With a Different Unit for Each Variable - **In built Unit Conversion!**  
Widest Collection of Measurements and Units - **250+ Measurements!**

Feel free to SHARE this document with your friends!

[Please leave your feedback here...](#)



# List of 9 Structural Design Formulas

## Structural Design

### 1) Allowable Bearing Pressure

$$fx \quad f_{br} = \frac{P \cdot b}{p_t \cdot D_{rivet}}$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b\_img.jpg\)](#)

$$ex \quad 21.47363N/mm^2 = \frac{37.7N/mm \cdot 1285mm}{94mm \cdot 24mm}$$

### 2) Average Blade Lift Coefficient

$$fx \quad C_l = 6 \cdot \frac{C_T}{\sigma}$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d\_img.jpg\)](#)

$$ex \quad 0.4 = 6 \cdot \frac{0.04}{0.6}$$

### 3) Disk Loading

$$fx \quad W_{load} = \frac{W_a}{\frac{\pi \cdot d_r^2}{4}}$$

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d\_img.jpg\)](#)

$$ex \quad 5072.647N = \frac{1000N}{\frac{\pi \cdot (501mm)^2}{4}}$$




4) Joint Efficiency 

$$fx \quad J = \frac{b - D}{b}$$

Open Calculator 

$$ex \quad 0.975097 = \frac{1285\text{mm} - 32\text{mm}}{1285\text{mm}}$$

5) Life of Aircraft given Number of Flight 

$$fx \quad N_{\text{flight}} = \left( \frac{1}{D_{\text{total}}} \right)$$

Open Calculator 

$$ex \quad 20 = \left( \frac{1}{0.05} \right)$$

6) Maximum Blade Efficiency 

$$fx \quad n_{\text{bm}} = \frac{2 \cdot \frac{F_1}{F_d} - 1}{2 \cdot \frac{F_1}{F_d} + 1}$$

Open Calculator 

$$ex \quad 0.820665 = \frac{2 \cdot \frac{100\text{N}}{19.7\text{N}} - 1}{2 \cdot \frac{100\text{N}}{19.7\text{N}} + 1}$$

7) Shear Failure Load on Plate 

$$fx \quad P = \frac{2 \cdot a \cdot p_t \cdot \tau_{\text{max}}}{b}$$

Open Calculator 

$$ex \quad 35.11284\text{N/mm} = \frac{2 \cdot 4\text{mm} \cdot 94\text{mm} \cdot 60\text{N/mm}^2}{1285\text{mm}}$$



8) Shear Load per width 

$$\text{fx } P = \frac{\pi \cdot (D^2) \cdot \tau_{\max}}{4 \cdot b}$$

Open Calculator 

$$\text{ex } 37.55242\text{N/mm} = \frac{\pi \cdot ((32\text{mm})^2) \cdot 60\text{N/mm}^2}{4 \cdot 1285\text{mm}}$$

9) Ultimate Tensile Stress for Plate 

$$\text{fx } S_{\text{ut}} = \frac{P \cdot b}{p_t \cdot (b - D_{\text{rivet}})}$$

Open Calculator 

$$\text{ex } 0.408697\text{N/mm}^2 = \frac{37.7\text{N/mm} \cdot 1285\text{mm}}{94\text{mm} \cdot (1285\text{mm} - 24\text{mm})}$$








## Variables Used

- **a** Distance between Rivet and Edge of Plate (*Millimeter*)
- **b** Distance between Rivets (*Millimeter*)
- **C<sub>l</sub>** Blade Lift Coefficient
- **C<sub>T</sub>** Thrust Coefficient
- **D** Diameter (*Millimeter*)
- **d<sub>r</sub>** Diameter of Rotor (*Millimeter*)
- **D<sub>rivet</sub>** Diameter of Rivet (*Millimeter*)
- **D<sub>total</sub>** Total Damage per Flight
- **f<sub>br</sub>** Bearing Stress (*Newton per Square Millimeter*)
- **F<sub>d</sub>** Blade Drag Force (*Newton*)
- **F<sub>l</sub>** Blade Lift Force (*Newton*)
- **J** Joint Efficiency for Shell
- **n<sub>bm</sub>** Maximum Blade Efficiency
- **N<sub>flight</sub>** Number of Flights
- **P** Edge Load per Unit Width (*Newton per Millimeter*)
- **p<sub>t</sub>** Plate Thickness (*Millimeter*)
- **S<sub>ut</sub>** Ultimate Tensile Strength (*Newton per Square Millimeter*)
- **W<sub>a</sub>** Aircraft Weight (*Newton*)
- **W<sub>load</sub>** Load (*Newton*)
- **σ** Rotor Solidity
- **τ<sub>max</sub>** Maximum Shear Stress (*Newton per Square Millimeter*)



## Constants, Functions, Measurements used

- **Constant:** **pi**, 3.14159265358979323846264338327950288  
*Archimedes' constant*
- **Measurement:** **Length** in Millimeter (mm)  
*Length Unit Conversion* 
- **Measurement:** **Pressure** in Newton per Square Millimeter (N/mm<sup>2</sup>)  
*Pressure Unit Conversion* 
- **Measurement:** **Force** in Newton (N)  
*Force Unit Conversion* 
- **Measurement:** **Surface Tension** in Newton per Millimeter (N/mm)  
*Surface Tension Unit Conversion* 
- **Measurement:** **Stress** in Newton per Square Millimeter (N/mm<sup>2</sup>)  
*Stress Unit Conversion* 



## Check other formula lists

- [Aerodynamic Design Formulas](#)  • [Structural Design Formulas](#) 

Feel free to SHARE this document with your friends!

## PDF Available in

[English](#) [Spanish](#) [French](#) [German](#) [Russian](#) [Italian](#) [Portuguese](#) [Polish](#) [Dutch](#)

5/10/2024 | 7:59:27 AM UTC

[Please leave your feedback here...](#)

