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# Design of Stiffeners under Loads Formulas

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# List of 12 Design of Stiffeners under Loads Formulas

## Design of Stiffeners under Loads

### 1) Allowable Bearing Stress on Projected Area of Fasteners

$$f_x F_p = 1.2 \cdot TS$$

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

$$ex \ 9.84MPa = 1.2 \cdot 8.2MPa$$

### 2) Column Yield Stress given Cross-Sectional Area of Column Web Stiffeners

$$f_x F_{yc} = \frac{P_{bf} - (A_{cs} \cdot F_{yst})}{t_{wc} \cdot (t_f + 5 \cdot K)}$$

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

$$ex \ 50MPa = \frac{5000kN - (20m^2 \cdot 50MPa)}{2mm \cdot (15mm + 5 \cdot 5mm)}$$

### 3) Column-Web Depth Clear of Fillets

$$f_x d_c = \frac{4100 \cdot t_{wc}^3 \cdot \sqrt{F_{yc}}}{P_{bf}}$$

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

$$ex \ 46.3862mm = \frac{4100 \cdot (2mm)^3 \cdot \sqrt{50MPa}}{5000kN}$$



#### 4) Computed Force for Column-Web Depth of Fillets

$$fx \quad P_{bf} = \frac{4100 \cdot t_{wc}^3 \cdot \sqrt{F_{yc}}}{d_c}$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235\_img.jpg\)](#)

$$ex \quad 5041.979kN = \frac{4100 \cdot (2mm)^3 \cdot \sqrt{50MPa}}{46mm}$$

#### 5) Computed Load given Cross-Sectional Area of Column Web Stiffeners

$$fx \quad P_{bf} = (A_{cs} \cdot F_{yst}) + (F_{yc} \cdot t_{wc} \cdot (t_f + 5 \cdot K))$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0\_img.jpg\)](#)

$$ex \quad 5000kN = (20m^2 \cdot 50MPa) + (50MPa \cdot 2mm \cdot (15mm + 5 \cdot 5mm))$$

#### 6) Cross sectional area of Column Web Stiffeners

$$fx \quad A_{cs} = \frac{P_{bf} - F_{yc} \cdot t_{wc} \cdot (t_f + 5 \cdot K)}{F_{yst}}$$

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f\_img.jpg\)](#)

$$ex \quad 20m^2 = \frac{5000kN - 50MPa \cdot 2mm \cdot (15mm + 5 \cdot 5mm)}{50MPa}$$



## 7) Distance between Outer Face of Column Flange and Web Toe given Cross-Sectional Area

[Open Calculator !\[\]\(dfbd6b3763a6d1d9afaa974f64e2e4b5\_img.jpg\)](#)

$$\text{fx } K = \frac{\left( \frac{P_{bf} - (A_{cs} \cdot F_{yst})}{F_{yc} \cdot t_{wc}} \right) - t_f}{5}$$

$$\text{ex } 5\text{mm} = \frac{\left( \frac{5000\text{kN} - (20\text{m}^2 \cdot 50\text{MPa})}{50\text{MPa} \cdot 2\text{mm}} \right) - 15\text{mm}}{5}$$

## 8) Stiffener Yield Stress given Cross Sectional Area of Column Web Stiffeners

[Open Calculator !\[\]\(ec9132f1d27c8919987d92907322654d\_img.jpg\)](#)

$$\text{fx } F_{yst} = \frac{P_{bf} - F_{yc} \cdot t_{wc} \cdot (t_f + 5 \cdot K)}{A_{cs}}$$

$$\text{ex } 50\text{MPa} = \frac{5000\text{kN} - 50\text{MPa} \cdot 2\text{mm} \cdot (15\text{mm} + 5 \cdot 5\text{mm})}{20\text{m}^2}$$

## 9) Tensile Strength of Connected Part using Allowable Bearing Stress

[Open Calculator !\[\]\(758ebdf4629c903da74c2e079717ae32\_img.jpg\)](#)

$$\text{fx } TS = \frac{F_p}{1.2}$$

$$\text{ex } 8.166667\text{MPa} = \frac{9.8\text{MPa}}{1.2}$$



10) Thickness of Column Flange Open Calculator 

$$fx \quad t_f = 0.4 \cdot \sqrt{\frac{P_{bf}}{F_{yc}}}$$

$$ex \quad 4mm = 0.4 \cdot \sqrt{\frac{5000kN}{50MPa}}$$

11) Thickness of Column Web given Column Web Depth Clear of Fillets Open Calculator 

$$fx \quad t_{wc} = \left( \frac{d_c \cdot P_{bf}}{4100 \cdot \sqrt{F_{yc}}} \right)^{\frac{1}{3}}$$

$$ex \quad 1.994434mm = \left( \frac{46mm \cdot 5000kN}{4100 \cdot \sqrt{50MPa}} \right)^{\frac{1}{3}}$$

12) Thickness of Column Web given Cross-Sectional Area of Column Web Stiffeners Open Calculator 

$$fx \quad t_{wc} = \frac{P_{bf} - (A_{cs} \cdot F_{yst})}{F_{yc} \cdot (t_f + 5 \cdot K)}$$

$$ex \quad 2mm = \frac{5000kN - (20m^2 \cdot 50MPa)}{50MPa \cdot (15mm + 5 \cdot 5mm)}$$







## Variables Used

- **$A_{cs}$**  Cross Sectional Plate Area (Square Meter)
- **$d_c$**  Web Depth (Millimeter)
- **$F_p$**  Allowable Bearing Stress (Megapascal)
- **$F_{yc}$**  Column Yield Stress (Megapascal)
- **$F_{yst}$**  Stiffener Yield Stress (Megapascal)
- **$K$**  Distance Between Flange and Web (Millimeter)
- **$P_{bf}$**  Computed Force (Kilonewton)
- **$t_f$**  Flange Thickness (Millimeter)
- **$t_{wc}$**  Column Web Thickness (Millimeter)
- **$TS$**  Tensile Strength MPA (Megapascal)



## Constants, Functions, Measurements used

- **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 Meter (m<sup>2</sup>)  
*Area Unit Conversion* 
- **Measurement:** **Pressure** in Megapascal (MPa)  
*Pressure Unit Conversion* 
- **Measurement:** **Force** in Kilonewton (kN)  
*Force Unit Conversion* 



## Check other formula lists

- **Allowable-Stress Design Formulas** 
- **Base and Bearing Plates Formulas** 
- **Cold Formed or Light Weighted Steel Structures Formulas** 
- **Design of Stiffeners under Loads Formulas** 
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