



calculatoratoz.com



unitsconverters.com

Webs under Concentrated Loads Formulas

Calculators!

Examples!

Conversions!

Bookmark calculatoratoz.com, 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 16 Webs under Concentrated Loads Formulas

Webs under Concentrated Loads

1) Beam Depth for given Column Load

[Open Calculator !\[\]\(339a16584d5da0f0a3ca4e9ec17bf6a1_img.jpg\)](#)

$$fx \quad D = \frac{N \cdot \left(3 \cdot \left(\frac{t_w}{t_f} \right)^{1.5} \right)}{\left(\frac{R}{\left(67.5 \cdot t_w^{\frac{3}{2}} \right) \cdot \sqrt{F_y \cdot t_f}} - 1 \right)}$$

$$ex \quad 147.9322\text{mm} = \frac{160\text{mm} \cdot \left(3 \cdot \left(\frac{100\text{mm}}{15\text{mm}} \right)^{1.5} \right)}{\left(\frac{235\text{kN}}{\left(67.5 \cdot (100\text{mm})^{\frac{3}{2}} \right) \cdot \sqrt{250\text{MPa} \cdot 15\text{mm}}} - 1 \right)}$$


2) Clear Distance from Flanges for Concentrated Load with Stiffeners

[Open Calculator !\[\]\(6059a5aa8b4ca7bb793408023d6c6e42_img.jpg\)](#)

$$fx \quad h = \left(\frac{6800 \cdot t_w^3}{R} \right) \cdot \left(1 + \left(0.4 \cdot r_{wf}^3 \right) \right)$$


$$ex \quad 121.5319\text{mm} = \left(\frac{6800 \cdot (100\text{mm})^3}{235\text{kN}} \right) \cdot \left(1 + \left(0.4 \cdot (2)^3 \right) \right)$$



3) Length of Bearing for Applied Load at least Half of Depth of Beam [Open Calculator !\[\]\(4729e517bc6a7cd81c8025b9646574fb_img.jpg\)](#)

$$fx \quad N = \left(\frac{R}{\left(67.5 \cdot t_w^{\frac{3}{2}}\right) \cdot \sqrt{F_y \cdot t_f}} - 1 \right) \cdot \frac{D}{3 \cdot \left(\frac{t_w}{t_f}\right)^{1.5}}$$

$$ex \quad 130.8707\text{mm} = \left(\frac{235\text{kN}}{\left(67.5 \cdot (100\text{mm})^{\frac{3}{2}}\right) \cdot \sqrt{250\text{MPa} \cdot 15\text{mm}}} - 1 \right) \cdot \frac{121\text{mm}}{3 \cdot \left(\frac{100\text{mm}}{15\text{mm}}\right)^{1.5}}$$

4) Length of Bearing if Column Load is at Distance of Half Beam Depth [Open Calculator !\[\]\(e474458956c9a37fbf9586ddb60a7fa1_img.jpg\)](#)

$$fx \quad N = \left(\frac{R}{\left(34 \cdot t_w^{\frac{3}{2}}\right) \cdot \sqrt{F_y \cdot t_f}} - 1 \right) \cdot \frac{D}{3 \cdot \left(\frac{t_w}{t_f}\right)^{1.5}}$$

$$ex \quad 262.1256\text{mm} = \left(\frac{235\text{kN}}{\left(34 \cdot (100\text{mm})^{\frac{3}{2}}\right) \cdot \sqrt{250\text{MPa} \cdot 15\text{mm}}} - 1 \right) \cdot \frac{121\text{mm}}{3 \cdot \left(\frac{100\text{mm}}{15\text{mm}}\right)^{1.5}}$$

5) Length of Bearing when Load applied at Distance Larger than Depth of Beam [Open Calculator !\[\]\(4fe57c3593bf1b21d272ae7ac8dfaf77_img.jpg\)](#)

$$fx \quad N = \left(\frac{R}{f_a \cdot t_w} \right) - 5 \cdot k$$

$$ex \quad 135.29\text{mm} = \left(\frac{235\text{kN}}{10.431\text{MPa} \cdot 100\text{mm}} \right) - 5 \cdot 18\text{mm}$$




6) Reaction of Concentrated Load applied at least Half of Depth of Beam 

$$\text{fx } R = 67.5 \cdot t_w^2 \cdot \left(1 + 3 \cdot \left(\frac{N}{D} \right) \cdot \left(\frac{t_w}{t_f} \right)^{1.5} \right) \cdot \sqrt{\frac{F_y}{\frac{t_w}{t_f}}}$$

Open Calculator 

ex

$$286.3864\text{kN} = 67.5 \cdot (100\text{mm})^2 \cdot \left(1 + 3 \cdot \left(\frac{160\text{mm}}{121\text{mm}} \right) \cdot \left(\frac{100\text{mm}}{15\text{mm}} \right)^{1.5} \right) \cdot \sqrt{\frac{250\text{MPa}}{\frac{100\text{mm}}{15\text{mm}}}}$$

7) Reaction of Concentrated Load given Allowable Compressive Stress 

$$\text{fx } R = f_a \cdot t_w \cdot (N + 5 \cdot k)$$

Open Calculator 

ex

$$260.775\text{kN} = 10.431\text{MPa} \cdot 100\text{mm} \cdot (160\text{mm} + 5 \cdot 18\text{mm})$$


8) Reaction of Concentrated Load when Applied at distance at least Half of Beam Depth 

$$\text{fx } R = 34 \cdot t_w^2 \cdot \left(1 + 3 \cdot \left(\frac{N}{D} \right) \cdot \left(\frac{t_w}{t_f} \right)^{1.5} \right) \cdot \sqrt{\frac{F_y}{\frac{t_w}{t_f}}}$$

Open Calculator 

ex

$$144.2539\text{kN} = 34 \cdot (100\text{mm})^2 \cdot \left(1 + 3 \cdot \left(\frac{160\text{mm}}{121\text{mm}} \right) \cdot \left(\frac{100\text{mm}}{15\text{mm}} \right)^{1.5} \right) \cdot \sqrt{\frac{250\text{MPa}}{\frac{100\text{mm}}{15\text{mm}}}}$$

9) Relative Slenderness of Web and Flange 

$$\text{fx } r_{wf} = \frac{\frac{d_c}{t_w}}{\frac{l_{\max}}{b_f}}$$

Open Calculator 

ex

$$1.077564 = \frac{\frac{46\text{mm}}{100\text{mm}}}{\frac{1921\text{mm}}{4500\text{mm}}}$$



10) Required Stiffeners if Concentrated Load exceeds Load of Reaction R [Open Calculator !\[\]\(bd1a142de767a21e5362c595f844a4ff_img.jpg\)](#)


$$f_x \quad R = \left(\frac{6800 \cdot t_w^3}{h} \right) \cdot (1 + (0.4 \cdot r_{wf}^3))$$

$$ex \quad 234.0984kN = \left(\frac{6800 \cdot (100mm)^3}{122mm} \right) \cdot (1 + (0.4 \cdot (2)^3))$$

11) Slenderness of Web and Flange given Stiffeners and Concentrated Load [Open Calculator !\[\]\(830769b31eeeaca920791081939ff8ba_img.jpg\)](#)


$$f_x \quad r_{wf} = \left(\frac{\left(\frac{R \cdot h}{6800 \cdot t_w^3} \right) - 1}{0.4} \right)^{\frac{1}{3}}$$

$$ex \quad 2.003364 = \left(\frac{\left(\frac{235kN \cdot 122mm}{6800 \cdot (100mm)^3} \right) - 1}{0.4} \right)^{\frac{1}{3}}$$

12) Stress for Concentrated Load Applied at Distance Larger than Depth of Beam [Open Calculator !\[\]\(47734e4656765d20df4fdbd5b7aff048_img.jpg\)](#)

$$f_x \quad f_a = \frac{R}{t_w \cdot (N + 5 \cdot k)}$$


$$ex \quad 9.4MPa = \frac{235kN}{100mm \cdot (160mm + 5 \cdot 18mm)}$$

13) Stress when Concentrated Load is Applied Close to Beam End [Open Calculator !\[\]\(41aea2746216b27a6939d696d8e035da_img.jpg\)](#)

$$f_x \quad f_a = \frac{R}{t_w \cdot (N + 2.5 \cdot k)}$$

$$ex \quad 11.46341MPa = \frac{235kN}{100mm \cdot (160mm + 2.5 \cdot 18mm)}$$




14) Web Depth Clear of fillets 

$$fx \quad d_c = D - 2 \cdot k$$

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

$$ex \quad 85\text{mm} = 121\text{mm} - 2 \cdot 18\text{mm}$$

15) Web Thickness for Given Stress 

$$fx \quad t_w = \frac{R}{f_a \cdot (N + 5 \cdot k)}$$

[Open Calculator !\[\]\(e1d6102fe77919492c04879c8450f1f5_img.jpg\)](#)

$$ex \quad 90.116\text{mm} = \frac{235\text{kN}}{10.431\text{MPa} \cdot (160\text{mm} + 5 \cdot 18\text{mm})}$$

16) Web Thickness for given Stress Due to Load near Beam End 

$$fx \quad t_w = \frac{R}{f_a \cdot (N + 2.5 \cdot k)}$$

[Open Calculator !\[\]\(ab4e2b3fc7e7887b7a72f548aa6f5e60_img.jpg\)](#)

$$ex \quad 109.8976\text{mm} = \frac{235\text{kN}}{10.431\text{MPa} \cdot (160\text{mm} + 2.5 \cdot 18\text{mm})}$$






Variables Used

- b_f Width of Compression Flange (Millimeter)
- D Depth of Section (Millimeter)
- d_c Web Depth (Millimeter)
- f_a Compressive Stress (Megapascal)
- F_y Yield Stress of Steel (Megapascal)
- h Clear Distance between Flanges (Millimeter)
- k Distance from Flange to Web Fillet (Millimeter)
- l_{max} Maximum Unbraced Length (Millimeter)
- N Bearing or Plate Length (Millimeter)
- R Concentrated Load of Reaction (Kilonewton)
- r_{wf} Slenderness of Web and Flange
- t_f Flange Thickness (Millimeter)
- t_w Web Thickness (Millimeter)







Constants, Functions, Measurements used

- **Function:** **sqrt**, $\text{sqrt}(\text{Number})$
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:** **Force** in Kilonewton (kN)
Force Unit Conversion 
- **Measurement:** **Stress** in Megapascal (MPa)
Stress Unit Conversion 



Check other formula lists

- [Allowable-Stress Design Formulas](#) 
- [Base and Bearing Plates Formulas](#) 
- [Cold Formed or Light Weighted Steel Structures Formulas](#) 
- [Webs under Concentrated Loads Formulas](#) 

Feel free to SHARE this document with your friends!

PDF Available in

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

3/11/2024 | 5:26:10 AM UTC

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

