Important Moving Loads and Influence Lines for **Beams Formulas PDF**



List of 32

Important Moving Loads and Influence Lines for **Beams Formulas**

Evaluate Formula (

Evaluate Formula

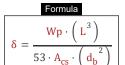
Evaluate Formula

Evaluate Formula

Evaluate Formula C

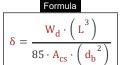
1) Calculation of Deflection Formulas

1.1) Deflection for Channel or Z Bar when Load in Middle Formula 🕝



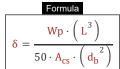
Formula Example with Units
$$\delta = \frac{\text{Wp} \cdot \left(\text{L}^3 \right)}{53 \cdot \text{A}_{\text{cs}} \cdot \left(\text{d}_{\text{b}}^2 \right)} \quad 31475.2754 \, \text{in} = \frac{1.25 \, \text{kN} \cdot \left(10.02 \, \text{ft}^3 \right)}{53 \cdot 13 \, \text{m}^2 \cdot \left(10.01 \, \text{in}^2 \right)}$$

1.2) Deflection for Channel or Z Bar when Load is Distributed Formula 🕝





1.3) Deflection for Deck Beam given Load in Middle Formula C



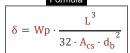
Formula Example with Units
$$\delta = \frac{\text{Wp} \cdot \left(L^3 \right)}{50 \cdot A_{\text{CS}} \cdot \left(d_b^2 \right)} \quad 33363.7919 \text{ in } = \frac{1.25 \, \text{kN} \cdot \left(10.02 \, \text{ft}^3 \right)}{50 \cdot 13 \, \text{m}^2 \cdot \left(10.01 \, \text{in}^2 \right)}$$

1.4) Deflection for Deck Beam when Load is Distributed Formula

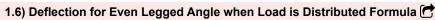


$$\delta = \frac{W_d \cdot \left(L^3\right)}{80 \cdot A_{cs} \cdot \left(d_b^2\right)} \quad \boxed{ 16682.0628 \, \text{in} \, = \frac{1.00001 \, \text{kN} \cdot \left(10.02 \, \text{ft}^3\right)}{80 \cdot 13 \, \text{m}^2 \cdot \left(10.01 \, \text{in}^2\right)} }$$

1.5) Deflection for Even Legged Angle when Load in Middle Formula 🕝



$$\delta = \text{Wp} \cdot \frac{\text{L}^3}{32 \cdot \text{A}_{\text{CS}} \cdot \text{d}_{\text{b}}^{\ 2}} \left[\begin{array}{c} \text{52130.9249}_{\,\text{in}} \\ = 1.25 \, \text{kN} \end{array} \cdot \frac{10.02 \, \text{ft}}{32 \cdot 13 \, \text{m}^2 \cdot 10.01 \, \text{in}} \right]^2$$





Example with Units

 $\delta = \frac{W_d \cdot L^3}{52 \cdot A_{cS} \cdot d_b^2} \left[25664.712_{in} = \frac{1.00001_{kN} \cdot 10.02_{ft}}{52 \cdot 13_{m^2} \cdot 10.01_{in}^2} \right]$

Evaluate Formula (

1.7) Deflection for Hollow Cylinder when Load in Middle Formula C

Evaluate Formula

$$\delta = \frac{Wp \cdot L^{3}}{24 \cdot \left(A_{cs} \cdot \left(d_{b}^{2}\right) - a \cdot \left(d^{2}\right)\right)}$$

Example with Units

$$69542.3432 \, \text{in} = \frac{1.25 \, \text{kN} \cdot 10.02 \, \text{ft}^{3}}{24 \cdot \left(13 \, \text{m}^{2} \cdot \left(10.01 \, \text{in}^{2}\right) - 10 \, \text{in}^{2} \cdot \left(10 \, \text{in}^{2}\right)\right)}$$

1.8) Deflection for Hollow Cylinder when Load is Distributed Formula C



Formula

Example with Units

$$35137.5353 \, \text{in} = \frac{1.00001 \, \text{kN} \cdot 10.02 \, \text{ft}^{3}}{38 \cdot \left(13 \, \text{m}^{2} \cdot \left(10.01 \, \text{in}^{2}\right) - 10 \, \text{in}^{2} \cdot \left(10 \, \text{in}^{2}\right)\right)}$$

1.9) Deflection for Hollow Rectangle given Load in Middle Formula 🗂



 $\delta = \frac{Wp \cdot L^{3}}{32 \cdot \left(\left(A_{cs} \cdot d_{b}^{2}\right) - \left(a \cdot d^{2}\right)\right)}$

$$52156.7574_{\,\mathrm{in}} \, = \frac{1.25_{\,\mathrm{kN}} \, \cdot \, 10.02_{\,\mathrm{ft}}^{\,\,3}}{32 \cdot \left(\, \left(\, 13_{\,\mathrm{m}^2} \, \cdot \, 10.01_{\,\mathrm{in}}^{\,\,2} \right) \, - \, \left(\, 10_{\,\mathrm{in}^2} \, \cdot \, 10_{\,\mathrm{in}}^{\,\,2} \right) \right)}$$

1.10) Deflection for Hollow Rectangle when Load is Distributed Formula 🕝

Evaluate Formula (

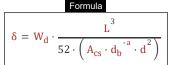
Evaluate Formula

Evaluate Formula (

Evaluate Formula

Evaluate Formula 🕝

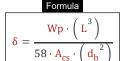
Evaluate Formula



Example with Units

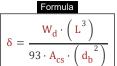
$$25489.8674_{\text{in}} = 1.00001_{\text{kN}} \cdot \frac{10.02_{\text{ft}}^{3}}{52 \cdot \left(13_{\text{m}^{2}} \cdot 10.01_{\text{in}}^{-10_{\text{in}^{2}}} \cdot 10_{\text{in}}^{2}\right)}$$

1.11) Deflection for I Beam when Load in Middle Formula



Example with Units $\delta = \frac{\text{Wp} \cdot \left(L^{3}\right)}{58 \cdot A_{cs} \cdot \left(d_{b}^{2}\right)} \left[28761.8896 \text{ in } = \frac{1.25 \text{ kN} \cdot \left(10.02 \text{ ft}^{3}\right)}{58 \cdot 13 \text{ m}^{2} \cdot \left(10.01 \text{ in}^{2}\right)} \right]$

1.12) Deflection for I Beam when Load is Distributed Formula 🕝



Example with Units $\delta = \frac{W_d \cdot \left(L^3\right)}{93 \cdot A_{cs} \cdot \left(d_b^2\right)} \left[14350.1615 \text{ in } = \frac{1.00001 \text{ kN} \cdot \left(10.02 \text{ ft}^3\right)}{93 \cdot 13 \text{ m}^2 \cdot \left(10.01 \text{ in}^2\right)} \right]$

1.13) Deflection for Solid Cylinder when Load in Middle Formula 🕝

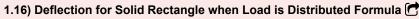
 $\delta = \frac{\text{Wp} \cdot \text{L}_{\text{c}}^{3}}{24 \cdot \text{A}_{\text{cc}} \cdot \text{d}_{\text{h}}^{2}} \left| \quad 25980.8979 \, \text{in} \right| = \frac{1.25 \, \text{kN} \cdot 2.2 \, \text{m}^{3}}{24 \cdot 13 \, \text{m}^{2} \cdot 10.01 \, \text{in}^{2}} \right|$

1.14) Deflection for Solid Cylinder when Load is Distributed Formula



1.15) Deflection for Solid Rectangle when Load in Middle Formula 🕝

 $\delta = \frac{\text{Wp} \cdot \text{L}^3}{32 \cdot \text{A}_{cs} \cdot \text{d}_h^2} \left| \int 52130.9249 \, \text{in} \right| = \frac{1.25 \, \text{kN} \cdot 10.02 \, \text{ft}^3}{32 \cdot 13 \, \text{m}^2 \cdot 10.01 \, \text{in}^2}$



Formula Example with Units
$$\delta = \frac{W_d \cdot L^3}{52 \cdot A_{cs} \cdot d_b} = \frac{1.00001 \, \text{kN} \cdot 10.02 \, \text{ft}^3}{52 \cdot 13 \, \text{m}^2 \cdot 10.01 \, \text{in}}^2$$

Example with Units

Evaluate Formula (

2) Safe Loads Formulas (7)

2.1) Greatest Safe Load for Channel or Z Bar when Load is at Middle Formula 🕝

Example with Units

 $Wp = \frac{1525 \cdot A_{cS} \cdot d_b}{I} \left[1.6504_{kN} = \frac{1525 \cdot 13_{m^2} \cdot 10.01_{in}}{10.02_{ft}} \right]$

Evaluate Formula

Example with Units

 $W_d = \frac{3050 \cdot A_{cs} \cdot d_b}{I} \qquad 3.3009_{\text{kN}} = \frac{3050 \cdot 13_{\text{m}^2} \cdot 10.01_{\text{in}}}{10.02_{\text{ft}}}$

2.2) Greatest Safe Load for Channel or Z Bar when Load is Distributed Formula (Evaluate Formula (

2.3) Greatest Safe Load for Deck Beam when Load in Middle Formula 🕝

Example with Units $Wp = \frac{1380 \cdot A_{cs} \cdot d_b}{I}$ 1.4935 kN = $\frac{1380 \cdot 13 \, m^2 \cdot 10.01 \, in}{10.02 \, ft}$ Evaluate Formula

2.4) Greatest Safe Load for Deck Beam when Load is Distributed Formula 🕝

Example with Units $W_d = \frac{2760 \cdot A_{cs} \cdot d_b}{L} \qquad 2.987_{kN} = \frac{2760 \cdot 13_{m^2} \cdot 10.01_{in}}{10.02_{ft}}$ Evaluate Formula (

2.5) Greatest Safe Load for Even Legged Angle when Load is Distributed Formula C

Example with Units Evaluate Formula

2.6) Greatest Safe Load for Even Legged Angle when Load is in Middle Formula 🕝

 $Wp = 885 \cdot A_{cs} \cdot \frac{d_b}{L} \quad 0.9578 \, \text{kN} = 885 \cdot 13 \, \text{m}^2 \cdot \frac{10.01 \, \text{in}}{10.02 \, \text{ft}}$

Example with Units

Evaluate Formula 🕝

2.7) Greatest Safe Load for Hollow Cylinder when Load in Middle Formula 🕝

Example with Units

Evaluate Formula (

 $Wp = \frac{667 \cdot \left(A_{cs} \cdot d_b - a \cdot d\right)}{I} = \frac{667 \cdot \left(13 \, \text{m}^2 \cdot 10.01 \, \text{in} - 10 \, \text{in}^2 \cdot 10 \, \text{in}\right)}{10.02 \, \text{ft}}$

2.8) Greatest Safe Load for Hollow Cylinder when Load is Distributed Formula 🕝

Formula

Example with Units

 $W_{d} = \frac{1333 \cdot \left(A_{cs} \cdot d_{b} - a \cdot d\right)}{1.4419_{kN}} = \frac{1333 \cdot \left(13 \, m^{2} \cdot 10.01_{in} - 10_{in^{2}} \cdot 10_{in}\right)}{10.02_{ft}}$

2.9) Greatest Safe Load for Hollow Rectangle when Load in Middle Formula 🕝

Example with Units

 $Wp = \frac{890 \cdot \left(\; A_{cs} \cdot d_b \; - \; a \cdot d \; \right)}{L} \; \left| \; \; \left| \; \; 0.9627 \, _{kN} \; = \frac{890 \cdot \left(\; 13 \, _{m^2} \, \cdot \, 10.01 \, _{in} \; - \; 10 \, _{in^2} \, \cdot \, 10 \, _{in} \; \right)}{10.02 \, _{ft}} \right| \;$

2.10) Greatest Safe Load for Hollow Rectangle when Load is Distributed Formula 🕝

 $W_{d} = 1780 \cdot \frac{A_{cs} \cdot d_{b} - a \cdot d}{L} = 1780 \cdot \frac{13 \, \text{m}^{2} \cdot 10.01 \, \text{in} - 10 \, \text{in}^{2} \cdot 10 \, \text{in}}{2.2 \, \text{m}}$

Example with Units

2.11) Greatest Safe Load for I Beam when Load in Middle Formula 🕝

Formula

Example with Units

 $Wp = \frac{1795 \cdot A_{cs} \cdot d_b}{L} \left| \quad | \quad 1.9426 \, \text{kN} \, = \frac{1795 \cdot 13 \, \text{m}^2 \cdot 10.01 \, \text{in}}{10.02 \, \text{ft}} \right|$

2.12) Greatest Safe Load for I Beam when Load is Distributed Formula C Evaluate Formula (

 $W_{d} = \frac{3390 \cdot A_{CS} \cdot d_{b}}{I} = \frac{3390 \cdot 13 \, m^{2} \cdot 10.01 \, in}{10.02 \, ft}$

2.13) Greatest Safe Load for Solid Cylinder when Load in Middle Formula C

Example with Units

 $Wp = \frac{667 \cdot A_{cS} \cdot d_b}{L} \quad 0.7219 \, \text{kN} = \frac{667 \cdot 13 \, \text{m}^2 \cdot 10.01 \, \text{in}}{10.02 \, \text{ft}}$

Evaluate Formula [

2.14) Greatest Safe Load for Solid Cylinder when Load is Distributed Formula 🕝

Example with Units

Evaluate Formula (

Evaluate Formula [

$$W_{d} = 1333 \cdot \frac{A_{cs} \cdot d_{b}}{L}$$

2.15) Greatest Safe Load for Solid Rectangle given Load in Middle Formula 🕝



$$Wp = 890 \cdot A_{cs} \cdot \frac{d_b}{L} \quad 0.9632 \, \text{kN} = 890 \cdot 13 \, \text{m}^2 \cdot \frac{10.01 \, \text{in}}{10.02 \, \text{ft}}$$

ple with Units Evaluate Formula
$$\bigcirc$$
 390 \cdot 13 $_{\mathrm{m}^2}$ \cdot $\frac{10.01}{\mathrm{in}}$

2.16) Greatest Safe Load for Solid Rectangle when Load is Distributed Formula 🕝

Example with Units

$$W_d = 1780 \cdot A_{cs} \cdot \frac{d_b}{L}$$
 | $1.9264 \, \text{kN} = 1780 \cdot 13 \, \text{m}^2 \cdot \frac{10.01 \, \text{in}}{10.02 \, \text{ft}}$

Variables used in list of Moving Loads and Influence Lines for Beams Formulas above

- a Interior Cross-Sectional Area of Beam (Square Inch)
- A_{cs} Cross Sectional Area of Beam (Square Meter)
- **d** Interior Depth of Beam (Inch)
- d_h Depth of Beam (Inch)
- L Length of Beam (Foot)
- L_c Distance between Supports (Meter)
- W_d Greatest Safe Distributed Load (Kilonewton)
- Wp Greatest Safe Point Load (Kilonewton)
- δ Deflection of Beam (Inch)

Constants, Functions, Measurements used in list of Moving Loads and Influence Lines for Beams Formulas above

Measurement: Length in Inch (in), Foot (ft), Meter (m)
 Length Unit Conversion

Measurement: Area in Square Meter (m²), Square Inch (in²)
 Area Unit Conversion

Measurement: Force in Kilonewton (kN)
 Force Unit Conversion

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Important Moving Loads and Influence
 Lines for Beams Formulas (*)

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Mixed fraction

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