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Moving Loads and Influence Lines for Beams Formulas

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List of 32 Moving Loads and Influence Lines for Beams Formulas

Moving Loads and Influence Lines for Beams

Calculation of Deflection

1) Deflection for Channel or Z Bar when Load in Middle

Open Calculator

$$\delta = \frac{Wp \cdot \left(L^3\right)}{53 \cdot A_{cs} \cdot \left(d_b^2\right)}$$

$$31475.28\text{in} = \frac{1.25\text{kN} \cdot \left((10.02\text{ft})^3\right)}{53 \cdot 13\text{m}^2 \cdot \left((10.01\text{in})^2\right)}$$

2) Deflection for Channel or Z Bar when Load is Distributed

Open Calculator

$$\delta = \frac{W_d \cdot \left(L^3\right)}{85 \cdot A_{cs} \cdot \left(d_b^2\right)}$$

$$15700.76\text{in} = \frac{1.00001\text{kN} \cdot \left((10.02\text{ft})^3\right)}{85 \cdot 13\text{m}^2 \cdot \left((10.01\text{in})^2\right)}$$

3) Deflection for Deck Beam given Load in Middle

Open Calculator

$$\delta = \frac{Wp \cdot \left(L^3\right)}{50 \cdot A_{cs} \cdot \left(d_b^2\right)}$$

$$33363.79\text{in} = \frac{1.25\text{kN} \cdot \left((10.02\text{ft})^3\right)}{50 \cdot 13\text{m}^2 \cdot \left((10.01\text{in})^2\right)}$$

4) Deflection for Deck Beam when Load is Distributed

Open Calculator

$$\delta = \frac{W_d \cdot \left(L^3\right)}{80 \cdot A_{cs} \cdot \left(d_b^2\right)}$$

$$16682.06\text{in} = \frac{1.00001\text{kN} \cdot \left((10.02\text{ft})^3\right)}{80 \cdot 13\text{m}^2 \cdot \left((10.01\text{in})^2\right)}$$

5) Deflection for Even Legged Angle when Load in Middle

Open Calculator

$$\delta = Wp \cdot \frac{L^3}{32 \cdot A_{cs} \cdot d_b^2}$$

$$52130.92\text{in} = 1.25\text{kN} \cdot \frac{(10.02\text{ft})^3}{32 \cdot 13\text{m}^2 \cdot (10.01\text{in})^2}$$

6) Deflection for Even Legged Angle when Load is Distributed

Open Calculator

$$\delta = \frac{W_d \cdot L^3}{52 \cdot A_{cs} \cdot d_b^2}$$

$$25664.71\text{in} = \frac{1.00001\text{kN} \cdot (10.02\text{ft})^3}{52 \cdot 13\text{m}^2 \cdot (10.01\text{in})^2}$$

7) Deflection for Hollow Cylinder when Load in Middle

Open Calculator

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

$$69542.34\text{in} = \frac{1.25\text{kN} \cdot (10.02\text{ft})^3}{24 \cdot \left(13\text{m}^2 \cdot \left((10.01\text{in})^2\right) - 10\text{in}^2 \cdot \left((10\text{in})^2\right)\right)}$$

8) Deflection for Hollow Cylinder when Load is Distributed

Open Calculator

$$\delta = \frac{W_d \cdot L^3}{38 \cdot \left(A_{cs} \cdot \left(d_b^2\right) - a \cdot \left(d^2\right)\right)}$$

$$35137.54\text{in} = \frac{1.00001\text{kN} \cdot (10.02\text{ft})^3}{38 \cdot \left(13\text{m}^2 \cdot \left((10.01\text{in})^2\right) - 10\text{in}^2 \cdot \left((10\text{in})^2\right)\right)}$$

9) Deflection for Hollow Rectangle given Load in Middle

Open Calculator

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

$$52156.76\text{in} = \frac{1.25\text{kN} \cdot (10.02\text{ft})^3}{32 \cdot \left(\left(13\text{m}^2 \cdot (10.01\text{in})^2\right) - \left(10\text{in}^2 \cdot (10\text{in})^2\right)\right)}$$

10) Deflection for Hollow Rectangle when Load is Distributed

Open Calculator

$$\delta = W_d \cdot \frac{L^3}{52 \cdot \left(A_{cs} \cdot d_b^{-a} \cdot d^2\right)}$$

$$25489.87\text{in} = 1.00001\text{kN} \cdot \frac{(10.02\text{ft})^3}{52 \cdot \left(13\text{m}^2 \cdot (10.01\text{in})^{-10\text{in}^2} \cdot (10\text{in})^2\right)}$$

11) Deflection for I Beam when Load in Middle

Open Calculator

$$\delta = \frac{Wp \cdot \left(L^3\right)}{58 \cdot A_{cs} \cdot \left(d_b^2\right)}$$

$$28761.89\text{in} = \frac{1.25\text{kN} \cdot \left((10.02\text{ft})^3\right)}{58 \cdot 13\text{m}^2 \cdot \left((10.01\text{in})^2\right)}$$

12) Deflection for I Beam when Load is Distributed

Open Calculator

$$\delta = \frac{W_d \cdot \left(L^3\right)}{93 \cdot A_{cs} \cdot \left(d_b^2\right)}$$

$$14350.16\text{in} = \frac{1.00001\text{kN} \cdot \left((10.02\text{ft})^3\right)}{93 \cdot 13\text{m}^2 \cdot \left((10.01\text{in})^2\right)}$$

13) Deflection for Solid Cylinder when Load in Middle

Open Calculator

$$\delta = \frac{Wp \cdot L_c^3}{24 \cdot A_{cs} \cdot d_b^2}$$

$$25980.9\text{in} = \frac{1.25\text{kN} \cdot (2.2\text{m})^3}{24 \cdot 13\text{m}^2 \cdot (10.01\text{in})^2}$$

14) Deflection for Solid Cylinder when Load is Distributed

Open Calculator

$$\delta = \frac{W_d \cdot L_c^3}{38 \cdot A_{cs} \cdot d_b^2}$$

$$13127.32\text{in} = \frac{1.00001\text{kN} \cdot (2.2\text{m})^3}{38 \cdot 13\text{m}^2 \cdot (10.01\text{in})^2}$$

15) Deflection for Solid Rectangle when Load in Middle

Open Calculator

$$\delta = \frac{Wp \cdot L^3}{32 \cdot A_{cs} \cdot d_b^2}$$

$$52130.92\text{in} = \frac{1.25\text{kN} \cdot (10.02\text{ft})^3}{32 \cdot 13\text{m}^2 \cdot (10.01\text{in})^2}$$

16) Deflection for Solid Rectangle when Load is Distributed

Open Calculator

$$\delta = \frac{W_d \cdot L^3}{52 \cdot A_{cs} \cdot d_b^2}$$

$$25664.71\text{in} = \frac{1.00001\text{kN} \cdot (10.02\text{ft})^3}{52 \cdot 13\text{m}^2 \cdot (10.01\text{in})^2}$$

Safe Loads

17) Greatest Safe Load for Channel or Z Bar when Load is at Middle

Open Calculator

$$Wp = \frac{1525 \cdot A_{cs} \cdot d_b}{L}$$

$$1.650435\text{kN} = \frac{1525 \cdot 13\text{m}^2 \cdot 10.01\text{in}}{10.02\text{ft}}$$

18) Greatest Safe Load for Channel or Z Bar when Load is Distributed

Open Calculator

$$W_d = \frac{3050 \cdot A_{cs} \cdot d_b}{L}$$

$$3.300869\text{kN} = \frac{3050 \cdot 13\text{m}^2 \cdot 10.01\text{in}}{10.02\text{ft}}$$

19) Greatest Safe Load for Deck Beam when Load in Middle

Open Calculator

$$Wp = \frac{1380 \cdot A_{cs} \cdot d_b}{L}$$

$$1.493508\text{kN} = \frac{1380 \cdot 13\text{m}^2 \cdot 10.01\text{in}}{10.02\text{ft}}$$

20) Greatest Safe Load for Deck Beam when Load is Distributed

Open Calculator

$$W_d = \frac{2760 \cdot A_{cs} \cdot d_b}{L}$$

$$2.987016\text{kN} = \frac{2760 \cdot 13\text{m}^2 \cdot 10.01\text{in}}{10.02\text{ft}}$$

21) Greatest Safe Load for Even Legged Angle when Load is Distributed

Open Calculator

$$W_d = \frac{1.77 \cdot A_{cs} \cdot d_b}{L}$$

$$0.001916\text{kN} = \frac{1.77 \cdot 13\text{m}^2 \cdot 10.01\text{in}}{10.02\text{ft}}$$

22) Greatest Safe Load for Even Legged Angle when Load is in Middle

Open Calculator

fx $$Wp = 885 \cdot A_{cs} \cdot \frac{d_b}{L}$$

ex $$0.957793\text{kN} = 885 \cdot 13\text{m}^2 \cdot \frac{10.01\text{in}}{10.02\text{ft}}$$

23) Greatest Safe Load for Hollow Cylinder when Load in Middle

Open Calculator

fx $$Wp = \frac{667 \cdot (A_{cs} \cdot d_b - a \cdot d)}{L}$$

ex $$0.721504\text{kN} = \frac{667 \cdot (13\text{m}^2 \cdot 10.01\text{in} - 10\text{in}^2 \cdot 10\text{in})}{10.02\text{ft}}$$

24) Greatest Safe Load for Hollow Cylinder when Load is Distributed

Open Calculator

fx $$W_d = \frac{1333 \cdot (A_{cs} \cdot d_b - a \cdot d)}{L}$$

ex $$1.441927\text{kN} = \frac{1333 \cdot (13\text{m}^2 \cdot 10.01\text{in} - 10\text{in}^2 \cdot 10\text{in})}{10.02\text{ft}}$$

25) Greatest Safe Load for Hollow Rectangle when Load in Middle

Open Calculator

fx $$Wp = \frac{890 \cdot (A_{cs} \cdot d_b - a \cdot d)}{L}$$

ex $$0.962727\text{kN} = \frac{890 \cdot (13\text{m}^2 \cdot 10.01\text{in} - 10\text{in}^2 \cdot 10\text{in})}{10.02\text{ft}}$$

26) Greatest Safe Load for Hollow Rectangle when Load is Distributed

Open Calculator

fx $$W_d = 1780 \cdot \frac{A_{cs} \cdot d_b - a \cdot d}{L_c}$$

ex $$2.672964\text{kN} = 1780 \cdot \frac{13\text{m}^2 \cdot 10.01\text{in} - 10\text{in}^2 \cdot 10\text{in}}{2.2\text{m}}$$

27) Greatest Safe Load for I Beam when Load in Middle

Open Calculator

fx $$Wp = \frac{1795 \cdot A_{cs} \cdot d_b}{L}$$

ex $$1.942643\text{kN} = \frac{1795 \cdot 13\text{m}^2 \cdot 10.01\text{in}}{10.02\text{ft}}$$

28) Greatest Safe Load for I Beam when Load is Distributed

Open Calculator

fx $$W_d = \frac{3390 \cdot A_{cs} \cdot d_b}{L}$$

ex $$3.668835\text{kN} = \frac{3390 \cdot 13\text{m}^2 \cdot 10.01\text{in}}{10.02\text{ft}}$$

29) Greatest Safe Load for Solid Cylinder when Load in Middle

Open Calculator

fx $$Wp = \frac{667 \cdot A_{cs} \cdot d_b}{L}$$

ex $$0.721862\text{kN} = \frac{667 \cdot 13\text{m}^2 \cdot 10.01\text{in}}{10.02\text{ft}}$$

30) Greatest Safe Load for Solid Cylinder when Load is Distributed

Open Calculator

fx $$W_d = 1333 \cdot \frac{A_{cs} \cdot d_b}{L}$$

ex $$1.442642\text{kN} = 1333 \cdot \frac{13\text{m}^2 \cdot 10.01\text{in}}{10.02\text{ft}}$$

31) Greatest Safe Load for Solid Rectangle given Load in Middle

Open Calculator

fx $$Wp = 890 \cdot A_{cs} \cdot \frac{d_b}{L}$$

ex $$0.963204\text{kN} = 890 \cdot 13\text{m}^2 \cdot \frac{10.01\text{in}}{10.02\text{ft}}$$

32) Greatest Safe Load for Solid Rectangle when Load is Distributed

Open Calculator

fx $$W_d = 1780 \cdot A_{cs} \cdot \frac{d_b}{L}$$

ex $$1.926409\text{kN} = 1780 \cdot 13\text{m}^2 \cdot \frac{10.01\text{in}}{10.02\text{ft}}$$

Variables Used

- **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_b** 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

- 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

Check other formula lists

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

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