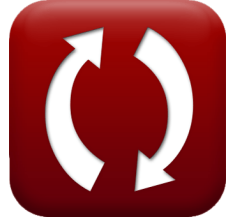




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Design of Curved Beams Formulas

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List of 20 Design of Curved Beams Formulas

Design of Curved Beams

1) Area of cross section of curved beam given bending stress at inner fiber

$$\text{fx } A = \frac{M_b \cdot h_i}{e \cdot (\sigma_{bi}) \cdot R_i}$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b_img.jpg\)](#)

$$\text{ex } 896.2693\text{mm}^2 = \frac{985000\text{N} \cdot \text{mm} \cdot 10\text{mm}}{2\text{mm} \cdot 78.5\text{N}/\text{mm}^2 \cdot 70\text{mm}}$$

2) Area of cross section of curved beam given bending stress at outer fiber

$$\text{fx } A = \frac{M_b \cdot h_o}{e \cdot (\sigma_{bo}) \cdot R_o}$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d_img.jpg\)](#)

$$\text{ex } 772.549\text{mm}^2 = \frac{985000\text{N} \cdot \text{mm} \cdot 12\text{mm}}{2\text{mm} \cdot 85\text{N}/\text{mm}^2 \cdot 90\text{mm}}$$

3) Bending moment at fibre of curved beam given bending stress and eccentricity

$$\text{fx } M_b = \frac{\sigma_b \cdot (A \cdot (R - R_N) \cdot e)}{y}$$

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d_img.jpg\)](#)

$$\text{ex } 2422.857\text{N} \cdot \text{mm} = \frac{53\text{N}/\text{mm}^2 \cdot (240\text{mm}^2 \cdot (80\text{mm} - 78\text{mm}) \cdot 2\text{mm})}{21\text{mm}}$$



4) Bending moment at fibre of curved beam given bending stress and radius of centroidal axis

$$fx \quad M_b = \frac{\sigma_b \cdot (A \cdot (R - R_N) \cdot (R_N - y))}{y}$$

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235_img.jpg\)](#)

ex

$$69051.43N*mm = \frac{53N/mm^2 \cdot (240mm^2 \cdot (80mm - 78mm) \cdot (78mm - 21mm))}{21mm}$$

5) Bending moment in curved beam given bending stress at inner fibre

$$fx \quad M_b = \frac{(\sigma_{bi}) \cdot A \cdot e \cdot R_i}{h_i}$$

[Open Calculator !\[\]\(5361750c22c4e047a52f4eac1ec2d4cc_img.jpg\)](#)

ex

$$263760N*mm = \frac{78.5N/mm^2 \cdot 240mm^2 \cdot 2mm \cdot 70mm}{10mm}$$

6) Bending moment in curved beam given bending stress at outer fibre

$$fx \quad M_b = \frac{(\sigma_{bo}) \cdot (A) \cdot e \cdot (R_o)}{h_o}$$

[Open Calculator !\[\]\(7d1d6890825e83a6a4a51febe2dcc7f3_img.jpg\)](#)

ex

$$306000N*mm = \frac{85N/mm^2 \cdot (240mm^2) \cdot 2mm \cdot (90mm)}{12mm}$$

7) Bending stress at inner fibre of curved beam given bending moment

$$fx \quad (\sigma_{bi}) = \frac{M_b \cdot h_i}{(A) \cdot e \cdot (R_i)}$$

[Open Calculator !\[\]\(5d954b3e270654ad8ab0d5913161c03c_img.jpg\)](#)

ex

$$293.1548N/mm^2 = \frac{985000N*mm \cdot 10mm}{(240mm^2) \cdot 2mm \cdot (70mm)}$$



8) Bending stress at outer fibre of curved beam given bending moment [Open Calculator !\[\]\(dfbd6b3763a6d1d9afaa974f64e2e4b5_img.jpg\)](#)

$$fx \quad (\sigma_{b0}) = \frac{M_b \cdot h_o}{(A) \cdot e \cdot (R_o)}$$

$$ex \quad 273.6111N/mm^2 = \frac{985000N \cdot mm \cdot 12mm}{(240mm^2) \cdot 2mm \cdot (90mm)}$$

9) Bending stress in fiber of curved beam [Open Calculator !\[\]\(ec9132f1d27c8919987d92907322654d_img.jpg\)](#)


$$fx \quad \sigma_b = \frac{M_b \cdot y}{A \cdot (e) \cdot (R_N - y)}$$

$$ex \quad 756.0307N/mm^2 = \frac{985000N \cdot mm \cdot 21mm}{240mm^2 \cdot (2mm) \cdot (78mm - 21mm)}$$

10) Bending stress in fibre of curved beam given eccentricity [Open Calculator !\[\]\(758ebdf4629c903da74c2e079717ae32_img.jpg\)](#)

$$fx \quad \sigma_b = \left(\frac{M_b \cdot y}{A \cdot (e) \cdot (R_N - y)} \right)$$


$$ex \quad 756.0307N/mm^2 = \left(\frac{985000N \cdot mm \cdot 21mm}{240mm^2 \cdot (2mm) \cdot (78mm - 21mm)} \right)$$

11) Bending stress in fibre of curved beam given radius of centroidal axis [Open Calculator !\[\]\(248b91fcdac4810ffd15cf33fb6aec6f_img.jpg\)](#)

$$fx \quad \sigma_b = \left(\frac{M_b \cdot y}{A \cdot (R - R_N) \cdot (R_N - y)} \right)$$

$$ex \quad 756.0307N/mm^2 = \left(\frac{985000N \cdot mm \cdot 21mm}{240mm^2 \cdot (80mm - 78mm) \cdot (78mm - 21mm)} \right)$$




12) Diameter of circular curved beam given radius of centroidal axis 

$$fx \quad d = 2 \cdot (R - R_i)$$

[Open Calculator !\[\]\(e2376d476d06eb31946dc01a69a4403a_img.jpg\)](#)


$$ex \quad 20\text{mm} = 2 \cdot (80\text{mm} - 70\text{mm})$$

13) Distance of fibre from neutral axis of rectangular curved beam given inner and outer fiber radius 

$$fx \quad y = (R_i) \cdot \ln\left(\frac{R_o}{R_i}\right)$$

[Open Calculator !\[\]\(0b5e7e25e8775f7e7e80906ada4f0021_img.jpg\)](#)


$$ex \quad 17.59201\text{mm} = (70\text{mm}) \cdot \ln\left(\frac{90\text{mm}}{70\text{mm}}\right)$$

14) Distance of fibre from neutral axis of rectangular curved beam given radius of centroidal axis 

$$fx \quad y = 2 \cdot (R - R_i)$$

[Open Calculator !\[\]\(bd3b31712ad9bab5a241210fa6925cdd_img.jpg\)](#)

$$ex \quad 20\text{mm} = 2 \cdot (80\text{mm} - 70\text{mm})$$

15) Distance of inner fiber from neutral axis of curved beam given bending stress at fibre 

$$fx \quad h_i = \frac{(\sigma_{bi}) \cdot (A) \cdot e \cdot (R_i)}{M_b}$$

[Open Calculator !\[\]\(7bc43b319a082987e20f7bf78f4bab80_img.jpg\)](#)

$$ex \quad 2.677766\text{mm} = \frac{78.5\text{N/mm}^2 \cdot (240\text{mm}^2) \cdot 2\text{mm} \cdot (70\text{mm})}{985000\text{N*mm}}$$



16) Distance of outer fibre from neutral axis of curved beam given bending stress at fibre

$$fx \quad h_o = \frac{(\sigma_{bo}) \cdot (A) \cdot e \cdot (R_o)}{M_b}$$

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

$$ex \quad 3.727919mm = \frac{85N/mm^2 \cdot (240mm^2) \cdot 2mm \cdot (90mm)}{985000N*mm}$$

17) Eccentricity between central and neutral axis of curved beam

$$fx \quad e = R - R_N$$

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

$$ex \quad 2mm = 80mm - 78mm$$

18) Eccentricity between centroidal and neutral axis of curved beam given bending stress at inner fibre

$$fx \quad e = \frac{M_b \cdot h_i}{(A) \cdot (\sigma_{bi}) \cdot (R_i)}$$

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

$$ex \quad 7.468911mm = \frac{985000N*mm \cdot 10mm}{(240mm^2) \cdot 78.5N/mm^2 \cdot (70mm)}$$


19) Eccentricity between centroidal and neutral axis of curved beam given bending stress at outer fibre

$$fx \quad e = \frac{M_b \cdot h_o}{(A) \cdot (\sigma_{bo}) \cdot (R_o)}$$

[Open Calculator !\[\]\(5abce1a84a655b073239ab33e1199487_img.jpg\)](#)

$$ex \quad 6.437908mm = \frac{985000N*mm \cdot 12mm}{(240mm^2) \cdot 85N/mm^2 \cdot (90mm)}$$



20) Eccentricity between centroidal and neutral axis of curved beam given radius of both axis 

fx $e = R - R_N$

Open Calculator 

ex $2\text{mm} = 80\text{mm} - 78\text{mm}$







Variables Used

- **A** Cross Sectional Area of Curved Beam (*Square Millimeter*)
- **d** Diameter of Circular Curved Beam (*Millimeter*)
- **e** Eccentricity Between Centroidal and Neutral Axis (*Millimeter*)
- **h_i** Distance of Inner Fibre from Neutral Axis (*Millimeter*)
- **h_o** Distance of Outer Fibre from Neutral Axis (*Millimeter*)
- **M_b** Bending Moment in Curved Beam (*Newton Millimeter*)
- **R** Radius of Centroidal Axis (*Millimeter*)
- **R_i** Radius of Inner Fibre (*Millimeter*)
- **R_N** Radius of Neutral Axis (*Millimeter*)
- **R_o** Radius of Outer Fibre (*Millimeter*)
- **y** Distance from Neutral Axis of Curved Beam (*Millimeter*)
- **σ_b** Bending Stress (*Newton per Square Millimeter*)
- **σ_{bi}** Bending Stress at Inner Fibre (*Newton per Square Millimeter*)
- **σ_{bo}** Bending Stress at Outer Fibre (*Newton per Square Millimeter*)



Constants, Functions, Measurements used

- **Function: In**, $\ln(\text{Number})$
The natural logarithm, also known as the logarithm to the base e, is the inverse function of the natural exponential function.
- **Measurement: Length** in Millimeter (mm)
Length Unit Conversion 
- **Measurement: Area** in Square Millimeter (mm^2)
Area Unit Conversion 
- **Measurement: Torque** in Newton Millimeter ($\text{N}\cdot\text{mm}$)
Torque Unit Conversion 
- **Measurement: Stress** in Newton per Square Millimeter (N/mm^2)
Stress Unit Conversion 



Check other formula lists

- [Design of Curved Beams Formulas](#) 

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