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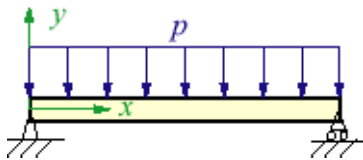
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Beam Diagram and Calculator Input



Here we display a specific beam loading case. Integrated into each beam case is a calculator that can be used to determine the maximum displacements, slopes, moments, stresses, and shear forces for this beam problem. Note that the maximum stress quoted is a positive number, and corresponds to the largest stress magnitude in the beam. It does not distinguish between tension or compression (this distinction depends on which side of the beam's neutral plane your *c* input corresponds).

Calculator Input

Length of beam, *L*:

[Line pressure load on beam, *p*](#):

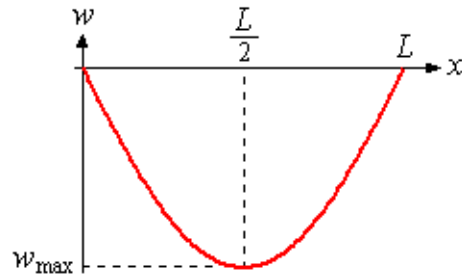
[Young's Modulus, *E*](#):

Distance from neutral axis to extreme fibers, *c*:

[Moment of Inertia, *I*](#):

[Go To Solutions](#) ⇒ Max Stress Displacement Slope Moment Shear

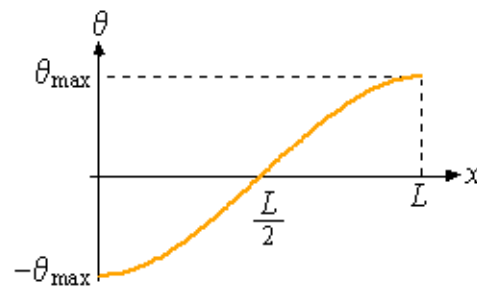
Displacement



$$w(x) = -\frac{p x (L^3 - 2x^2 L + x^3)}{24 EI}$$

$$w_{\max} = w\left(\frac{L}{2}\right) = -\frac{5 p L^4}{384 EI} = -9.72 \times 10^{-4} \text{ in}$$

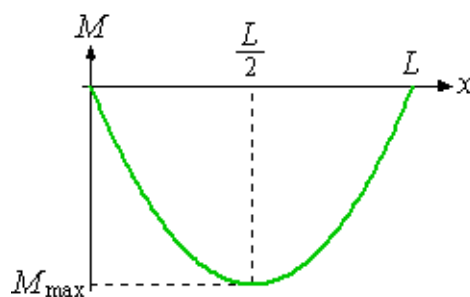
Slope



$$\theta(x) = -\frac{p (L^3 - 6x^2 L + 4x^3)}{24 EI}$$

$$\theta_{\max} = \theta(0 \& L) = \mp \frac{p L^3}{24 EI} = 0.00148 \text{ deg}$$

Moment and Maximum Bending Stress

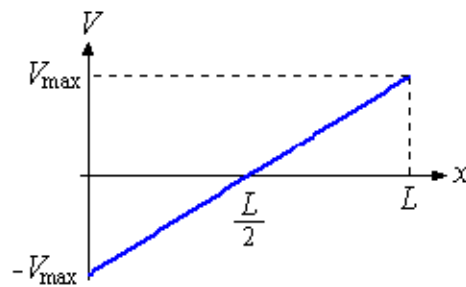


$$M(x) = -\frac{1}{2} p (L - x) x$$

$$M_{\max} = M\left(\frac{L}{2}\right) = -\frac{pL^2}{8} = -1500 \text{ lbf-ft} \quad \text{lbf-ft} \quad \text{Calc. Again}$$

$$\sigma_{\max} = \left| M_{\max} \right| \frac{c}{I} = \left| \frac{pL^2}{8Z} \right| = 175 \text{ psi} \quad \text{psi}$$

Shear



$$V(x) = -\frac{1}{2} p(L - 2x)$$

$$V_{\max} = V(0 \ \& \ L) = -\frac{pL}{2} = 600 \text{ lbf} \quad \text{lbf} \quad \text{Calc. Again}$$

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