



Strength – elastic flexural formula shows the maximum stress occurs at the extreme fibers of the beam at midspan

$$\sigma = \frac{Mc}{I}, M = PL/4, c = h/2, I = bh^3/12$$

$$\sigma = \frac{PL}{4} \frac{h}{2} \frac{12}{bh^3} = \frac{3PL}{2bh^2}$$

$$S = X\sigma = \frac{3PLX}{2bh^2} \Rightarrow h = \left[\frac{3PLX}{2bS} \right]^{1/2}$$

Deflection – from integration, is found to be maximum at midspan

$$v = \frac{PL^3}{48EI} = \frac{12PL^3}{48Ebh^3} = \frac{PL^3}{4Ebh^3} \Rightarrow h = \left[\frac{PL^3}{4Ebv} \right]^{1/3}$$