

Structures II Review – 9/10/2008

Fake Quiz Answer

What is the equation for bending stress (also called the flexure formula)?

$$F_b = \frac{Mc}{I}$$

Floor joists having cross sectional dimensions of 2in x10in are simply supported, span 15ft and carry a floor load of 50lb/ft². What is the center to center spacing between the joints to develop a max bending stress of 1400lb/in²? I=166.7 in⁴.



Known:

$$F_b = 1400 \frac{lb}{in^2}$$

$$L = 15ft$$

$$w = 50 \frac{lb}{ft^2}$$

$$I = 166.7 in^4$$

$$c = 5in$$

Find:

$$x = ?$$

Equations:

$$W = w(L)x$$

$$M_b = \frac{WL}{8}$$

$$F_b = \frac{Mc}{I}$$

$$W = w(L)x$$

$$W = 50 \frac{lb}{ft^2} (15ft)x$$

$$W = \left(750 \frac{lb}{ft}\right)x$$

$$M_b = \frac{WL}{8}$$

$$M_b = \frac{\left(750 \frac{lb}{ft}\right)x(15ft)}{8}$$

$$M_b = 1406.25lb(x)$$

$$F_b = \frac{Mc}{I}$$

$$F_b = \frac{1406.25lb(x)(5in)}{166.7in^4}$$

$$1400 \frac{lb}{in^2} = 42.18 \frac{lb}{in^3} (x)$$

$$x = \left(1400 \frac{lb}{in^2}\right) \frac{1in^3}{42.18lb}$$

$$x = 33.2in$$

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Fake Quiz Answer

What length of span would result in a max bending stress of 2400lb/in²?

Known:

$$F_b = 2400 \frac{lb}{in^2}$$

$$x = 33.2in$$

$$w = 50 \frac{lb}{ft^2}$$

$$I = 166.7 in^4$$

$$c = 5in$$

Find:

$$L = ?$$

Equations:

$$W = w(L)x$$

$$M_b = \frac{WL}{8}$$

$$F_b = \frac{Mc}{I}$$

$$W = w(L)x$$

$$W = 50 \frac{lb}{ft^2} (L) 33.2in$$

$$W = \left(138 \frac{lb}{ft} \right) L$$

$$M_b = \frac{WL}{8}$$

$$M_b = \frac{\left(138 \frac{lb}{ft} \right) (L^2)}{8}$$

$$M_b = 17.25 \frac{lb}{ft} (L^2)$$

$$F_b = \frac{Mc}{I}$$

$$F_b = \frac{17.25 \frac{lb}{ft} (L^2) (5in) \frac{1ft}{12in}}{166.7in^4}$$

$$2400 \frac{lb}{in^2} = .043 \frac{lb}{in^3} (L^2)$$

$$L^2 = 55813.95in^2$$

$$L = 236.24in$$

$$L = 19.67ft$$