ARCH 324 - Structures 2, Winter 2009

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LL = 150 PSF
DL = 62.5 PSF
TL = 212.5 PSF

\[ E_c = 3625 \text{ ksi} \quad n = 8 \]

\[ M = \frac{Wl^2}{8} = \frac{(212.5 \times \text{ksi})(12)^2}{8} = 3825 \text{ in}^2 \text{kip} = 45.9'' \text{kip} \]

\[ M_{\text{resist}} = R_c \left( 4 - \frac{x}{3} \right) \]

\[ 45.9'' \text{kip} = \left( \frac{1.35 \text{ ksi}}{2} \right) \left( 4 - \frac{x}{3} \right) \]

\[ 45.9'' \text{kip} = \left( 1.35 \text{ ksi} \right) \left( 12'' \right) \left( x \right) \left( 4 - \frac{x}{3} \right) \]

\[ 0 = -2.7x^2 + 32.4x - 45.9'' \text{kip} \]

\[ x = \frac{-32.4 \pm \sqrt{(32.4)^2 - 4(-2.7)(-45.9)}}{2(-2.7)} \]

\[ x = 1.64'' \]

\[ M = 45.9'' \text{kip} = R_T (4 - \frac{x}{3}) = A_s f_s \left( 4 - \frac{1.64''}{3} \right) = A_s (20 \text{ ksi}) \left( 4 - \frac{1.64''}{3} \right) \]

\[ A_s = 0.66 \text{ in}^2 \]