ARCH 324 - Structures 2, Winter 2009

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

$E_c = 3625$ ksi  \( n = 8 \)

\[
M = \frac{Wl^2}{8} = \frac{(212.5 \text{ ksi})(4.5)(12)^2}{8} = \frac{3825}{8} \text{ in} \cdot \text{ft} = 45.9 \text{ in} \cdot \text{ft}
\]

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

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

\[
0 = -2.7x^2 + 32.4x - 45.9
\]

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

\[
x = 1.64 \text{ in}
\]

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

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