2009-01

ARCH 324 - Structures 2, Winter 2009

von Buelow, Peter

<http://hdl.handle.net/2027.42/64938>
http://hdl.handle.net/2027.42/64938
Determine the size of the steel I.

Max Moment:

\[ \Sigma M = 0 = F_0(4) - 2400(4) + M_{\text{max}} \]
\[ M_{\text{max}} = 19200 \text{ ft-lb} = 19.2 \text{ k-ft} \]

Assume Wood controls strain:

\[ M_{\text{wood}} = \frac{F_0 I}{E} = \frac{1.4 \times (\frac{12}{2})^3}{E} = 134.4 \text{ k-ft} = 11.2 \text{ k}-\text{ft} \]

Portion of moment carried by Steel:

\[ M_{\text{steel}} = M_{\text{total}} - M_{\text{wood}} = 19.2 - 11.2 = 8.0 \text{ k-ft} \]

Strain compatibility to find d steel:

\[ \frac{E_{\text{wood}}}{E_{\text{steel}}} = \frac{6}{20} = 0.00078 \]

\[ \frac{E_{\text{wood}}}{E_{\text{steel}}} = \frac{6}{x} \]
\[ x = 5.143'' \]
\[ d_{\text{steel}} = 10.29'' \]

Find b steel:

\[ M_{\text{steel}} = 8 \times 12 = f_y S' = f_y \left( \frac{bd^2}{6} \right) = 20 \cdot \frac{b(10.29)^2}{6} \]
\[ b = 0.272'' \]