ARCH 324 - Structures 2, Winter 2009

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REACTIIONS:

\[ \Sigma M_{R_1} = 0 = 28w \cdot 8 - R_2 \cdot 18 \]

\[ R_1 = 15.56 \text{ w} \]

\[ R_2 = 12.44 \text{ w} \]

\[ \Sigma F_x = 0 \quad \checkmark \]

TRANSFORMED SECTION:

\[ h = \frac{6.5}{2w} = \frac{3.0}{2} = 15 \]

\[ I_{MA} = \frac{2.1 \cdot (10)^3}{12} = 1750 \text{ in}^4 \]
STRAIN COMPATIBILITY:

ASSUME WOOD CONTROLS - CHECK STEEL

\[ E_w = \frac{1.6}{2000} = 0.0008 \quad f_s = E_s = 10000(2000) = 27 \text{ ksi} > 22 \text{ ksi} \]

\[ \therefore \text{STEEL CONTROLS} \]

MAX STRAIN

STRAIN WOOD  STRESS STEEL

\[ E_s = \frac{22}{10000} = 0.00022 \quad f_w \cdot E = 0.00073(2000) = 1.4667 < 1.8 \text{ ksi} \]

\[ \therefore \text{OK} \]

STRAIN STEEL  STRESS WOOD

FIND MAX ALLOWABLE MOMENTS FOR EACH

\[ f = \frac{M_c}{I} \quad M = f \frac{L}{2} \cdot 1.467(1750)/5 = 513.3 \text{ k}\cdot\text{in} \]

\[ = 42.78 \text{ k}\cdot\text{ft} \]

\[ \text{(FOR STEEL)} \]

\[ = 22(1750)(5w) = 513.3 \text{ k}\cdot\text{in} \]

\[ = 42.78 \text{ k}\cdot\text{ft} \]

\[ \therefore \text{MOMENTS AGREE} \]

FIND W:

\[ H = 42.78 = 27.70 \text{ w} \]

\[ w = 1.54 \text{ k}/1 = 43.25 \text{ k \ TOTAL} \]