ARCH 324 - Structures 2, Winter 2009

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REATIONS:
\[ \Sigma H_{R_1} = 0 = 28w(8) - R_2(18) \]
\[ R_2 = 12.44 \text{ w} \]

\[ \Sigma H_{R_2} = 0 = R_1(18) - 28w(10) \]
\[ R_1 = 15.56 \text{ w} \]

\[ \Sigma F_v = 0 \checkmark \]

TRANSFORMED SECTION:

\[ h = \frac{45.70}{18} = \frac{30}{2} = 15 \text{ in} \]

\( \text{I}_{PR} = \frac{21(10)^2}{12} = 1750 \text{ in}^4 \)
**Strain Compatibility:**

Assume wood controls - check steel

\[ E_w = \frac{1.8}{2000} = 0.0009 \quad E_s = 0.0009(10000) = 27 \text{ ksi} > 22 \text{ ksi} \]

\[ \Rightarrow \text{Steel controls max strain} \]

**Strain-Wood**  
**Stress-Steel**

\[ E_s = \frac{22}{10000} = 0.00022 \quad E_w = 0.0009(10000) = 1.4667 < 1.8 \text{ ksi} \]

\[ \Rightarrow \text{OK} \]

**Strain-Steel**  
**Stress-Wood**

**Find Max Allowable Moments for Each**

\[ f = \frac{M_c}{I} \quad H = f E \cdot L \]

**For Wood**

\[ f = \frac{1.461(1750)}{15} = 513.3 \text{ k} \quad H = 42.78 \text{ k} \]

**For Steel**

\[ f = \frac{22(1750)}{15} = 513.3 \text{ k} \quad H = 42.78 \text{ k} \]

\[ \Rightarrow \text{Moments Agree} \]

**Find W:**

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

\[ w = 1.54 \text{ k} \quad \text{Total} = 43.25 \text{ k} \]