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ARCH 324 - Structures 2, Winter 2009

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ARCH 331  |  PROBLEM 12-2 II  |  18 NOV'91  

REATIONS:
\[ \Sigma H_{R1} = 0 = 28w(18) - R_2(18) \]
\[ R_2 = 12.44 \text{ w} \]
\[ \Sigma H_{R2} = 0 = R_1(18) - 28w(10) \]
\[ R_1 = 15.56 \text{ w} \]

\[ \Sigma F_v = 0 \checkmark \]

TRANSFORMED SECTION:
\[ h = \frac{3.0}{2} = 15 \]

\[ I_{PM} = \frac{21(10)^3}{12} = 1750 \text{ in}^4 \]
**Strain Compatibility:**

Assume wood controls - check steel

\[ E_w = \frac{1.0}{2000} = 0.0005 \]

\[ E_s = \frac{22}{10000} = 0.00022 \]

\[ f_w = E_w \cdot 10000 = 27 \text{ ksi} > 22 \text{ ksi} \]

\[ f_s = E_s \cdot 2000 = 1.4667 < 1.8 \text{ ksi} \]

**Steel Controls Max Strain**

\[ \text{OK} \]

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

FIND MAX ALLOWABLE MOMENTS FOR EACH

\[ f = \frac{M_c}{I} \Rightarrow M = f \cdot \frac{E}{E} \cdot 22 \text{ (ksi)} \cdot \frac{5}{3} = 513.3 \text{ k-in} \]

\[ = 42.78 \text{ k-in} \]

**FOR STEEL**

\[ = 22 \text{ (ksi)} \cdot (5 \text{ in}) = 513.3 \text{ k-in} \]

\[ = 42.78 \text{ k-in} \]

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

Find W:

\[ M = 42.78 = 27.70w \]

\[ w = 1.54 \text{ k/ft} = 43.25 \text{ k total} \]