

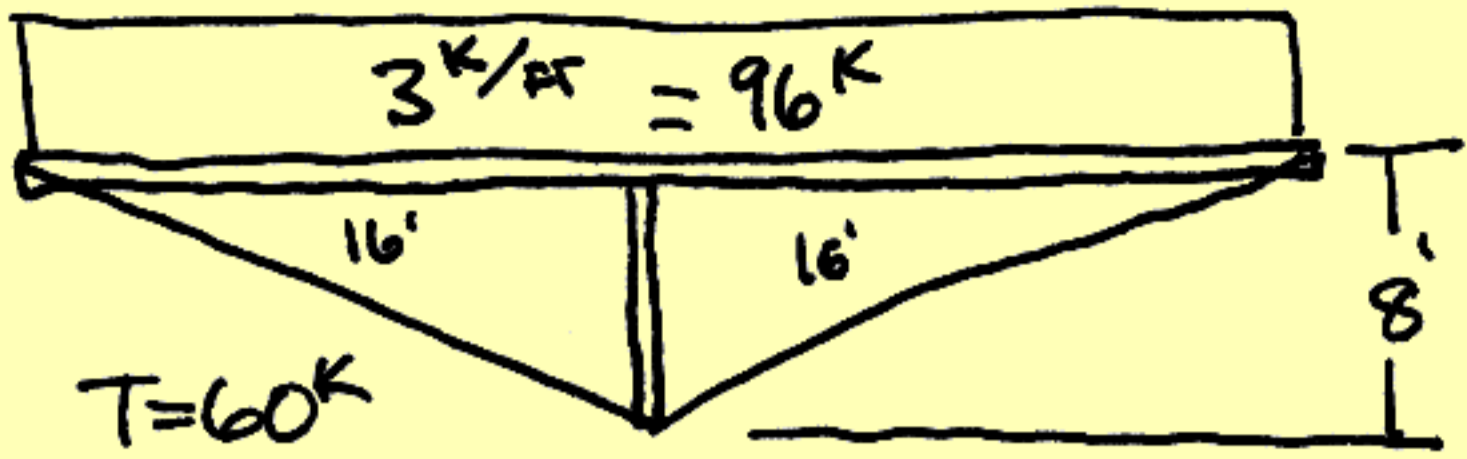
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19.3.I

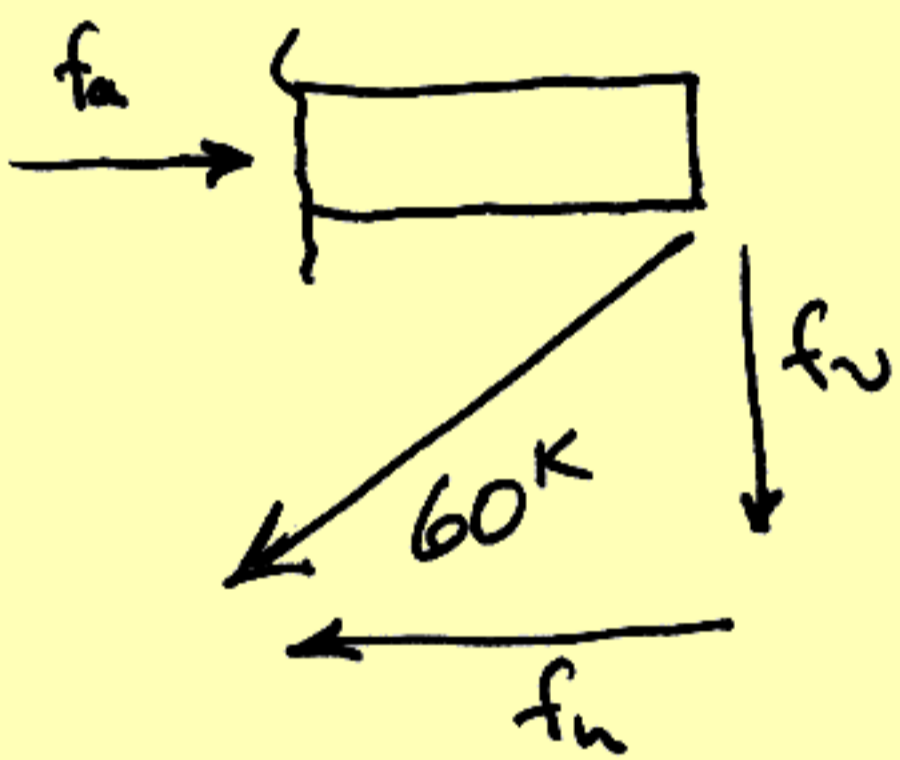


W14x34
 $I = 340 \text{ in}^4$
 $S_x = 48.6 \text{ in}^3$
 $D = 13.98 \text{ in}$
 $A = 10 \text{ in}^2$

A) FIND THE STRESS @ THE ENDS OF THE BEAM:

- NO MOMENT @ ENDS OF THE BEAM
- ONLY AXIAL FORCES DUE TO CABLES

FBD BEAM END

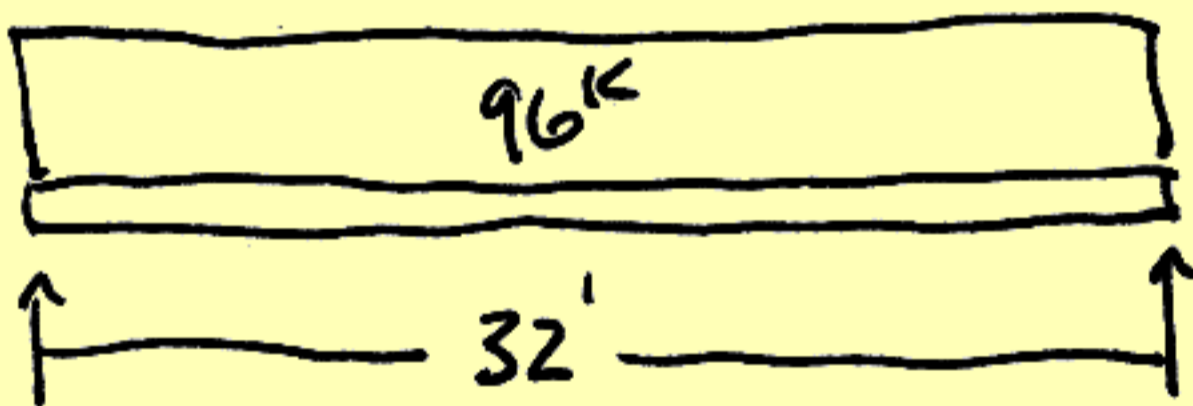


$f_a = f_h$ $\frac{f_v}{f_h} = \frac{8}{16} \Rightarrow f_v = \frac{1}{2} f_h$

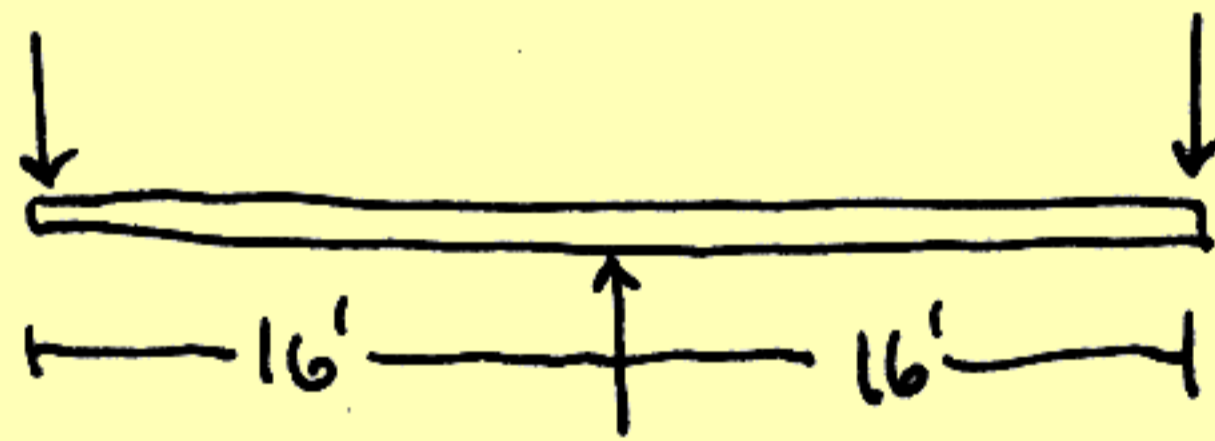
$60^2 = f_h^2 + f_v^2$
 $60^2 = f_h^2 + \left(\frac{f_h}{2}\right)^2$
 $f_h = 53.7 \text{ k}, f_v = 26.9$

$\sigma_{\text{AXIAL}} = \frac{f_a}{A} = \frac{53.7 \text{ k}}{10 \text{ in}^2} = 5.37 \text{ ksi}$
 COMPRESSION

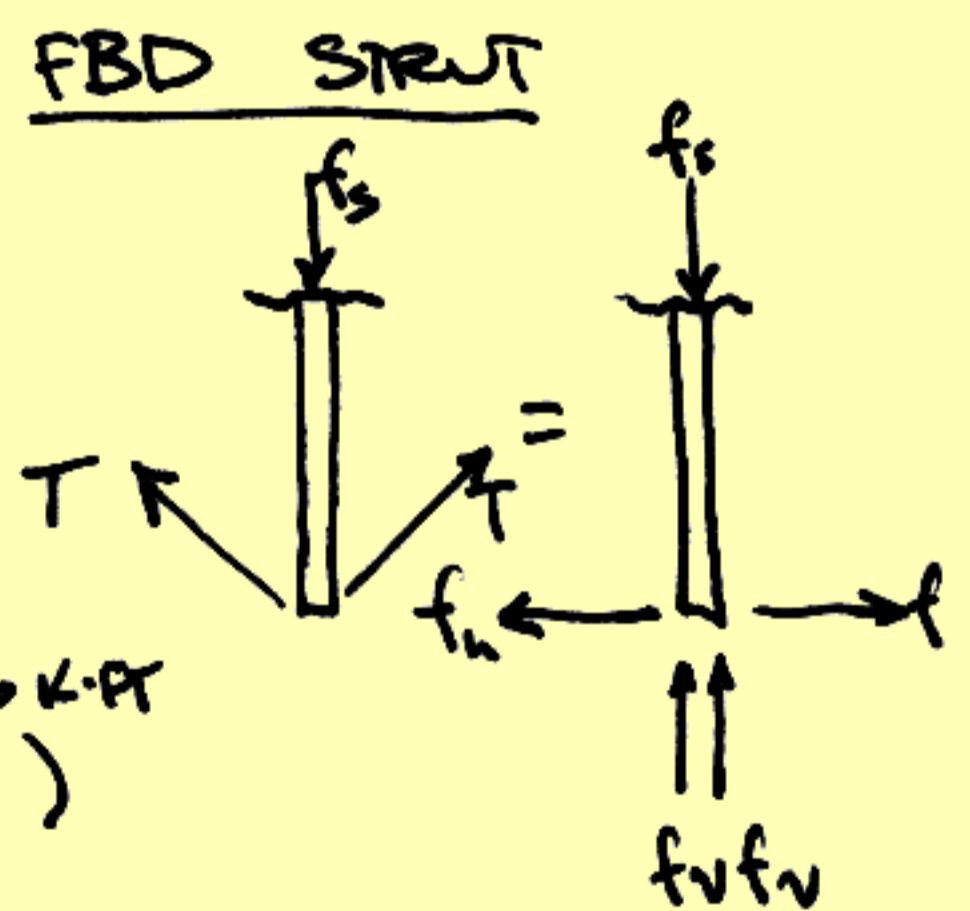
B) FIND THE STRESS IN THE TOP FIBERS OF THE BEAM:



$M_{\text{DIST.}} = \frac{WL}{8} = \frac{96 \text{ k}(32 \text{ ft})}{8} = 384 \text{ k}\cdot\text{ft}$
 (+)



$M_{\text{POINT.}} = \frac{PL}{4} = \frac{53.7 \text{ k}(32 \text{ ft})}{4} = 429.6 \text{ k}\cdot\text{ft}$
 (-)



$f_s = 2f_v = 53.7 \text{ k}$

$M_{\text{DIST}} - M_{\text{POINT}} = 384 - 429.6 = -45.6 \text{ k}\cdot\text{ft}$
 $= -547200 \text{ IN}\cdot\text{LB}$ (-, TENSION ON TOP)

$f_b = \frac{M}{S} = \frac{-547200}{48.6} = -11.259 \text{ ksi}$

$f_{\text{TOTAL}} = f_b + f_{\text{AXIAL}} = -11.259 + 5.37 = -5.88 \text{ ksi}$ TENSION IN TOP FIBERS

c) FIND THE TRUSS CENTERLINE DEFLECTION:

$$\Delta_{\text{POINT LOAD}} = \frac{PL^3}{48EI} = \frac{(53.7 \times 1000)(32 \times 12)^3}{(48)(29,000,000)(340)} = 6.43 \text{ IN } \uparrow$$

$$\Delta_{\text{DIST. LOAD}} = \frac{5WL^3}{384EI} = \frac{5(96 \times 1000)(32 \times 12)^3}{(384)(29,000,000)(340)} = 7.18 \text{ IN } \downarrow$$

$$\Delta_{\text{TOTAL}} = 6.43 - 7.18 = -.75 \text{ IN} \quad \text{--- DEFLECTION IN THE DOWN DIRECTION}$$