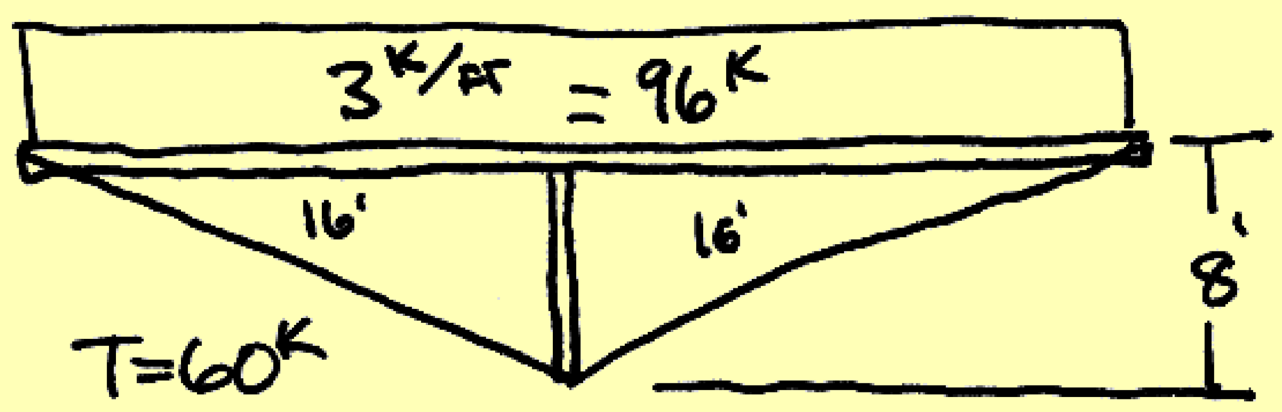
## 19.3.I




**W14×34**

$I = 340 \text{ in}^4$

$S_x = 48.6 \text{ in}^3$

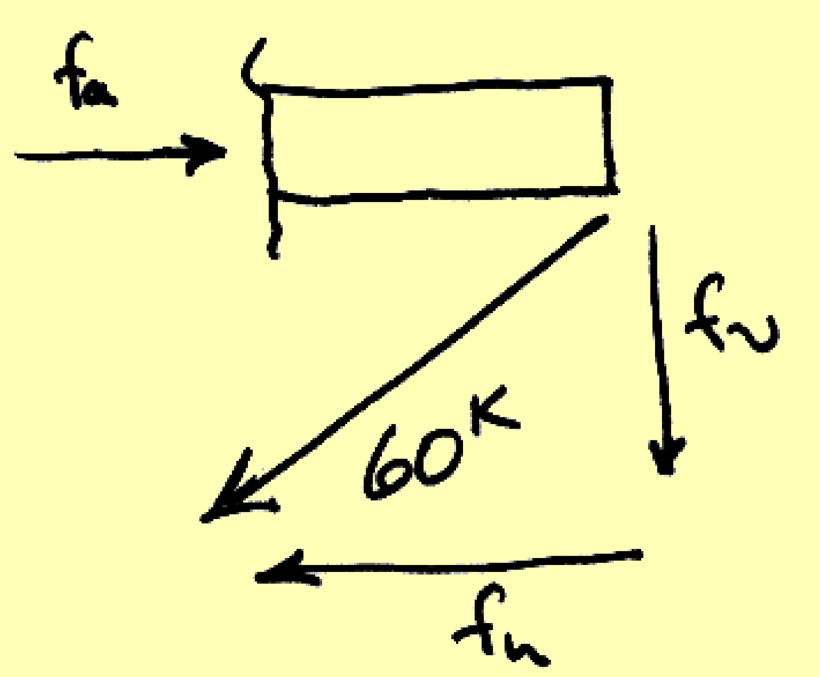
$D = 13.98 \text{ in}$

$A = 10 \text{ in}^2$

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

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

**FBD BEAM END**




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

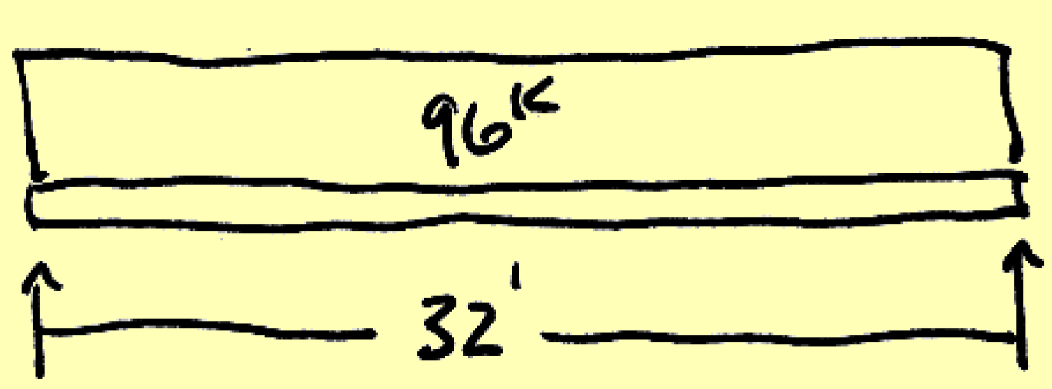
$60^2 = f_h^2 + f_v^2$

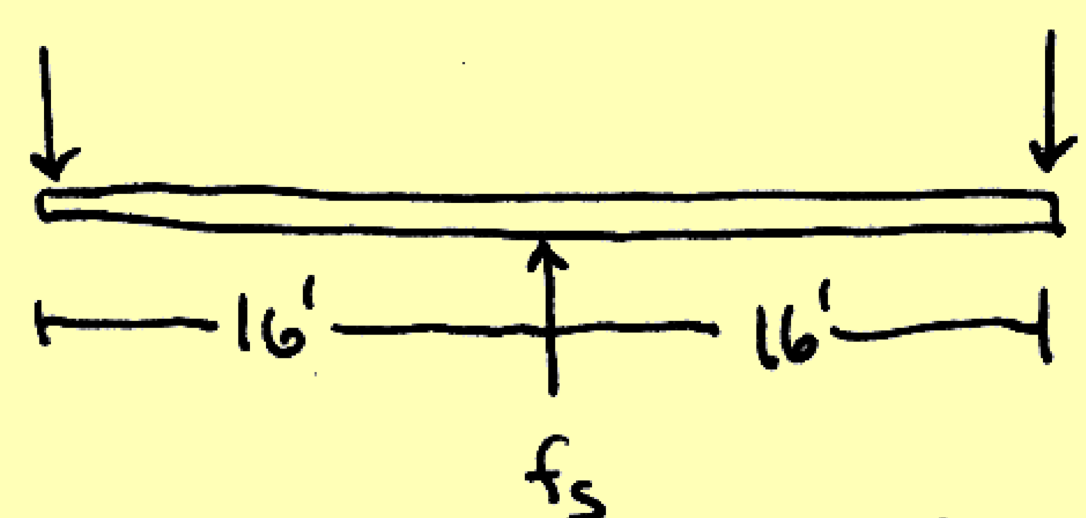
$60^2 = f_h^2 + \left(\frac{f_h}{2}\right)^2$

$f_h = 53.7 \text{ K}, \; f_v = 26.9$

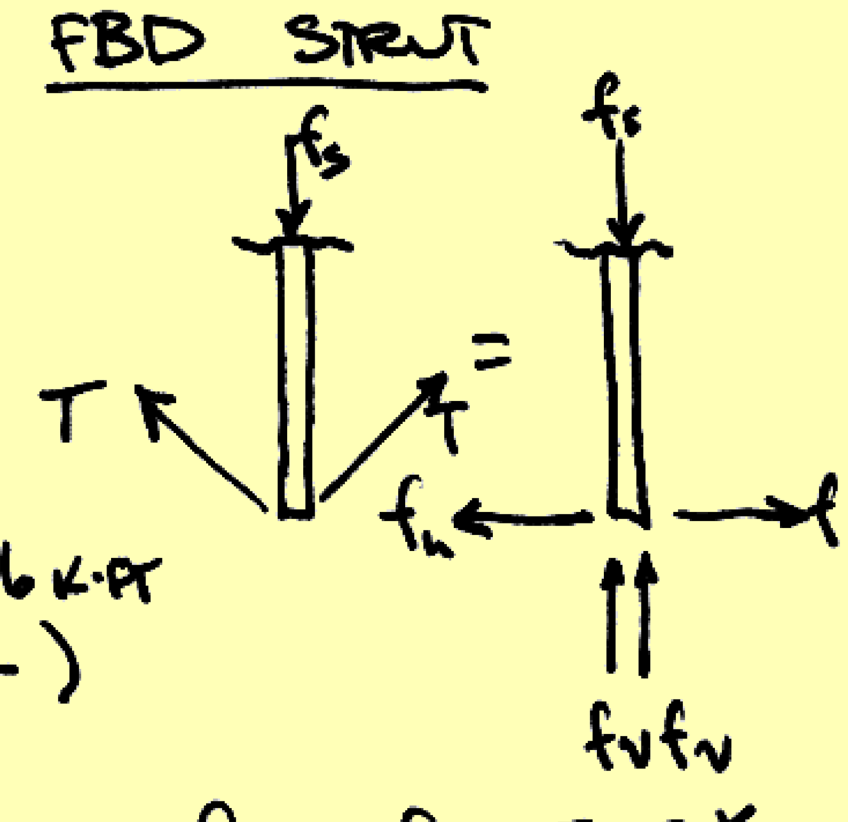
$$\sigma_{AXIAL} = \frac{f_a}{A} = \frac{53.7^K}{10 \text{ in}^2} = 5.37 \text{ ksi}$$ COMPRESSION

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




**FBD STRUT**




$M_{DIST.} = \frac{WL}{8} = \frac{96^K(32')}{8} = 384 \text{ K·FT} \; (+)$

$M_{POINT} = \frac{PL}{4} = \frac{53.7^K(32^{ft})}{4} = 429.6 \text{ K·FT} \; (-)$

$f_s = 2f_v = 53.7^K$

$M_{DIST} - M_{POINT} = 384 - 429.6 = -45.6 \text{ K·FT}$

$= -547200 \text{ IN-LB}$ (−, TENSION ON TOP)

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

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

c) FIND THE TRUSS CENTERLINE DEFLECTION:

$$\Delta_{POINT\ LOAD} = \frac{PL^3}{48EI} = \frac{(53.7\times1000)(32\times12)^3}{(48)(29{,}000{,}000)(340)} = 6.43\text{ IN} \uparrow$$

$$\Delta_{DIST.\ LOAD} = \frac{5WL^3}{384EI} = \frac{5(96\times1000)(32\times12)^3}{(384)(29{,}000{,}000)(340)} = 7.18\text{ IN} \downarrow$$

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