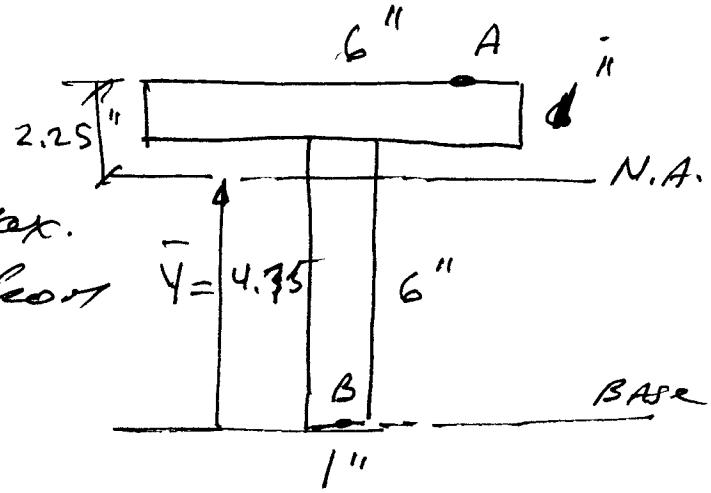
Given:

The following cross section and the max. moment as obtained from the moment diagram

$M = -20^{k'}$



determine the stresses at A & B

1) Locate the N.A. & Calculate the $I_{N.A.}$

$$\bar{Y}\left[(6\times1)+(6\times1)\right] = (6\times1)(3)+(6\times1)(6.5)$$

$$\bar{Y} = 4.75" \text{ from base}$$

$$I_{N.A.} = \frac{(1)(6)^3}{12} + (6\times1)(1.75)^2 + \frac{6\times1^3}{12} + (6\times1)(1.75)^2$$

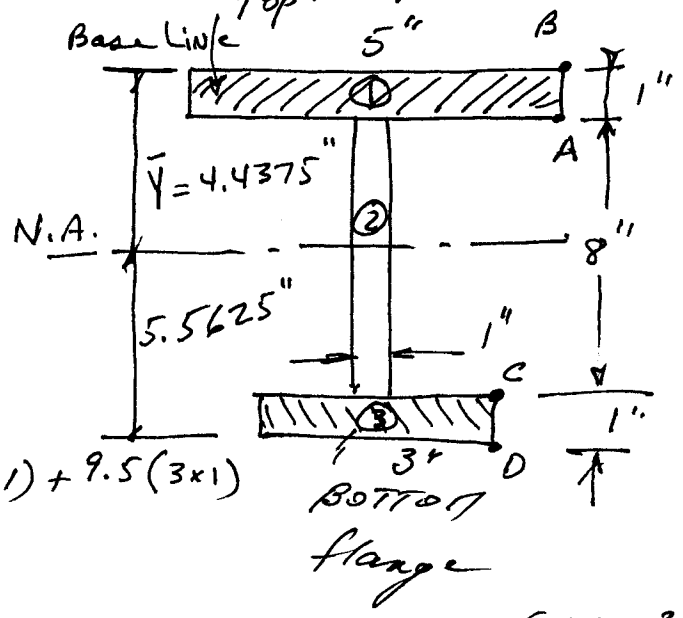
$$= 55.25 \text{ in}^4$$

$$\sigma_A = \frac{(20\times12)(2.25)}{55.25} = 9.77 \text{ ksi } \underline{\text{Tension}}$$

$$\sigma_B = \frac{(20\times12)(4.75)}{55.25} = 20.63 \text{ ksi } \underline{\text{Comp.}}$$

Compute the force acting on the top flange, F_1, and the bottom flange, F_2, due to a positive 15'-k moment.

1) Locate Centroidal Axis



$$\bar{y} \sum A = \sum_{i=1}^{3} \bar{y}_i A_i$$

$$\bar{y}(5\times1 + 8\times1 + 3\times1) = 0.5(5\times1) + 5\times(8\times1) + 9.5(3\times1)$$

$$\bar{y} = 4.4375"$$

$$I_{N.A.} = \left[\left(\frac{5\times1^3}{12}\right) + (5\times1\times3.9375^2) + \left[\left(\frac{1\times8^3}{12}\right) + (8\times1\times.5625^2)\right] + \left[\left(\frac{3\times1^3}{12}\right) + (3\times1)(5.0625)^2\right]\right]$$

(AREA (1); AREA 2; AREA 3)

$$I_{N.A.} = 200.27 \text{ in}^4$$

$$\sigma_B = \frac{(15\times12)(4.4375)}{200.27} = 3.988 \text{ ksi}$$

$$\sigma_A = \frac{(15\times12)(3.4375)}{200.27} = 3.090$$

$$\text{Average } \sigma = \frac{3.988 + 3.090}{2} = 3.539$$

$$F_1 = (3.539)(5\times1) = 17.69 \text{ kips}_C$$

$$\sigma_C = \frac{(15 \times 12)(4.5625)}{200.27} = 4.1 \text{ ksi}$$

$$\sigma_D = \frac{(15 \times 12)(5.5625)}{200.27} = 5.0 \text{ ksi}$$

$$\sigma_{Ave} = \frac{4.1 + 5}{2} = 4.55 \text{ ksi}$$

$$F_2 = 4.55 \times (3 \times 1) = 13.65 \text{ kips } (T)$$