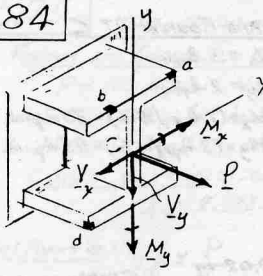
5.84



FORCES AND COURES AT C

$P = 18\ kips$

$V_x = 3\ kips$

$V_y = 10\ kips$

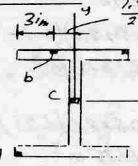
$M_x = (10\ kips)(28\ in.) = 280\ kip\cdot in$

$M_y = (3\ kips)(20\ in.) = 60\ kip\cdot in$

CROSS SECTION

W10 x 33

FLANGE WIDTH = 7.96 in.



$S_x = 35.0\ in^3$

$S_y = 9.20\ in^3$

$I_x = 170\ in^4$

$I_y = 36.6\ in^4$

$A = 9.71\ in^2$

Point a:

$$\sigma_a = \frac{P}{A} + \frac{M_x}{S_x} + \frac{M_y}{S_y}$$

$$= \frac{18\ kips}{9.71\ in^2} + \frac{280\ kip\cdot in.}{35.0\ in^3} + \frac{60\ kip\cdot in.}{9.20\ in^3}$$

$$= 1.854\ ksi + 8.000\ ksi + 6.522\ ksi$$

$\sigma_a = 16.38\ ksi$

$\tau_a = 0$

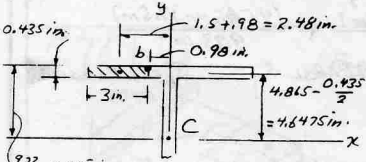
Point b:

$$\sigma_b = \frac{P}{A} + \frac{M_x}{S_x} - \frac{M_y \times b}{I_y}$$

$$= \frac{18\ kips}{9.71\ in^2} + \frac{280\ kip\cdot in.}{35.0\ in^3} - \frac{(60\ kip\cdot in.)(0.98\ in.)}{36.6\ in^4}$$

$$= 1.854\ ksi + 8.000\ ksi - 1.607\ ksi$$

$\sigma_b = 8.25\ ksi$



$Q_x = (3 \times 0.435)(4.6475)$

$= 6.065\ in^3$

$Q_y = (13 \times 0.435)(2.48)$

$= 3.236\ in^3$

$$+\leftarrow \tau_b = \frac{V_x Q_y}{I_y t} - \frac{V_y Q_x}{I_x t} = \frac{(3\ kips)(3.236\ in^3)}{(36.6\ in^4)(0.435\ in.)} - \frac{(10\ kips)(6.065\ in^3)}{(170\ in^4)(0.435\ in.)}$$

$$= 609.8\ psi - 820.1\ psi = -211\ psi = 210\ psi \leftarrow$$

$\tau_b = 210\ psi$