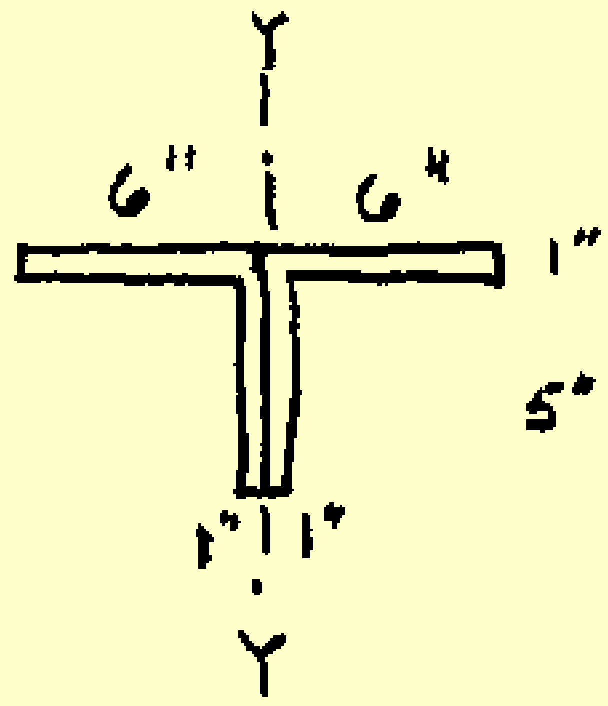
ARCH 331 | PROB. 18-1 E, H | 26 NOV 91 RJB



$$\bar{x} = \frac{\Sigma A d}{\Sigma A} = \frac{12(5.5) + 10(2.5)}{12 + 10} = 4.136'' \text{ (FROM BOTTOM)}$$

$$1.864'' \text{ (FROM TOP)}$$

$$I_x = \frac{12(1)^3}{12} + 12(1.364)^2 + \frac{2(5)^3}{12} + 10(1.636)^2$$

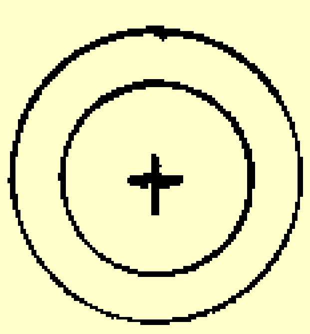
$$I_x = 70.936 \text{ in}^4 \leftarrow \text{CONTROLS}$$

$$I_y = \frac{1(12)^3}{12} + \frac{5(2)^3}{12} = 147.33 \text{ in}^4$$

$$A = 12 + 10 = 22$$

$$r_x = \sqrt{\frac{I_x}{A}} = \sqrt{\frac{70.936}{22}} = 1.7956 \text{ in}$$

$$\frac{K\ell}{r_x} = \frac{1(120)}{1.7956} = 66.83$$



6" OD
5" ID

$$I = \tfrac{1}{4}\pi 3^4 - \tfrac{1}{4}\pi 2.5^4 = 32.94 \text{ in}^4$$

$$A = \pi 3^2 - \pi 2.5^2 = 8.639 \text{ in}^2$$

$$r = \sqrt{\frac{I}{A}} = \sqrt{\frac{32.94}{8.639}} = 1.952$$

$$\frac{K\ell}{r} = \frac{1(120)}{1.952} = 61.458$$