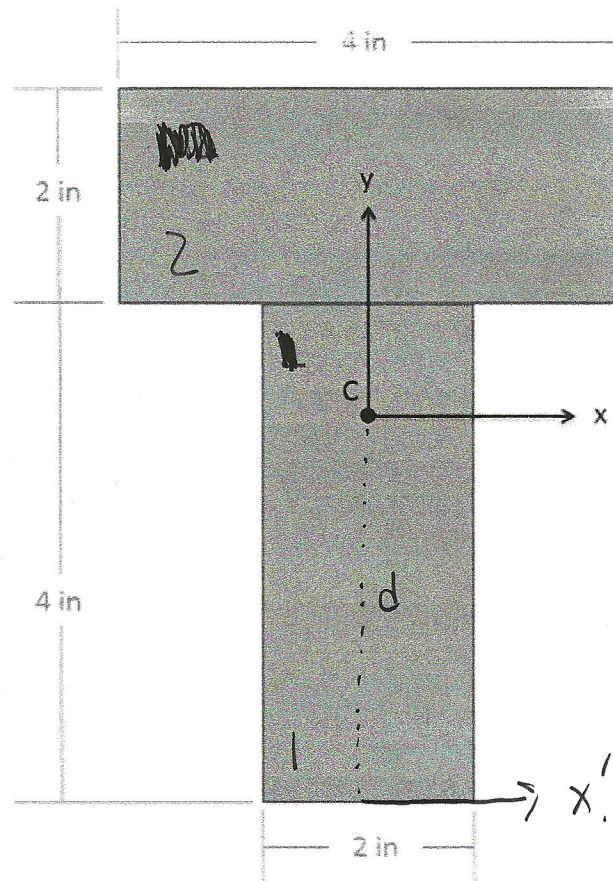


A beam is made by connecting two 2" x 4" beams in a T pattern with the cross section as shown below. Determine the location of the centroid of this combined cross section and then find the rectangular area moment of inertia about the x axis through the centroid point.



Shape	$\bar{X}$	$\bar{Y}$	Area	$I_{xxc}$	$r$	$I_{xxadj}$
1	0	2 in	8 in <sup>2</sup>	10.667 in <sup>4</sup>	1.5 in	28.667 in <sup>4</sup>
2	0	5 in	8 in <sup>2</sup>	2.667 in <sup>4</sup>	1.5 in	20.667 in <sup>4</sup>
Total	0	3.5 in	16 in <sup>2</sup>			49.334 in <sup>4</sup>

Centroid location

$$\bar{Y}_{\text{total}} = \frac{A_1 Y_1 + A_2 Y_2}{A_{\text{total}}} = \frac{(8)(2) + (5)(8)}{16}$$

$$\bar{Y}_{\text{total}} = 3.5 \text{ m}$$

$I_{xxc}$

$$I_{xx1c} = \frac{1}{12} b h^3 = \frac{1}{12} (2 \text{ m}) (4 \text{ m})^3$$

$$I_{xx1c} = 10.667 \text{ m}^4$$

$$I_{xx2c} = \frac{1}{12} b h^3 = \frac{1}{12} (4 \text{ m}) (2 \text{ m})^3$$

$$I_{xx2c} = 2.667 \text{ m}^4$$

$r$

$$r_1 = 3.5 - 2 = 1.5 \text{ m}$$

$$r_2 = 5 - 3.5 = 1.5 \text{ m}$$

$I_{xx \text{ adj}}$

$$I_{xx1 \text{ adj}} = I_{xx1c} + A_1 r_1^2$$

$$I_{xx1 \text{ adj}} = 10.667 \text{ m}^4 + (8 \text{ m}^2)(1.5 \text{ m})^2$$

$$I_{xx1 \text{ adj}} = 28.667 \text{ m}^4$$

