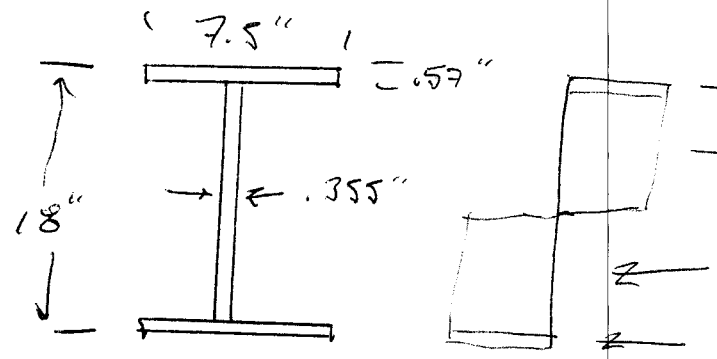
6-5

W 18x50 – MODEL AS RECTANGLES & FIND Z



$\rightarrow .57(7.5)(9-.57/2) = 37.25$

$\rightarrow \frac{(9-.57)^2(.355)}{2} = 12.61$

$$Z = \left(37.25 + \frac{25.228}{2}\right) \times 2 = 99.73 \text{ in}^3$$

Z_x CODE = 101 in^3

STRENGTH OF W 18 x 50 w/ 25' SPAN

a) CONTINUOUS LATERAL BRACING – $L_b = 0'$

$$\phi M_n = 0.9(101 \text{ in}^3)(50 \text{ KSI}) = 4545 \text{ in-K}$$
$$= 379 \text{ ft-K}$$

b) $L_b = 25' > L_r$

$C_b = 1.14$

$$F_{cr} = \frac{C_b \pi^2 E}{\left(\frac{L_b}{r_{ts}}\right)^2} \sqrt{1 + 0.078 \frac{J c}{S_x h_o} \left(\frac{L_b}{r_{ts}}\right)^2}$$

$$= \frac{1.14(\pi)^2(29000)}{\left(\frac{300}{1.98}\right)^2} \sqrt{1 + 0.078 \frac{1.24(1)}{(88.9)(17.4)} \left(\frac{300}{1.98}\right)^2}$$

$= 22.2$ KSI $\quad \phi M_n = .9(22.2)(88.9) = 1775$ in-K
$= 148$ ft-K

c) $L_b = 8.33'$

$$\phi M_n = 1.01\left[379^{k\text{-}ft} - 13.1^{k}(8.33' - 5.83')\right]$$

$$= 349.7 \text{ k-ft}$$

W 30x108 39' SPAN w/ $L_b = 19.5'$

$C_b = 1.30$

$$\phi M_n = 1.3\left(1300 - 35.6(19.5 - 7.59)\right)$$

$$= 1139 \text{ k-ft}$$