

4.7-2 An HSS $10 \times 6 \times \frac{5}{16}$ (HSS $254 \times 152.4 \times 7.9$) with $F_y = 50$ ksi (345 MPa) is used as a column. The length is 15 feet (4,500 mm). Both ends are pinned, and there is support against weak axis buckling at a point 6 feet (1,800 mm) from the top. Determine

a. the design strength for LRFD.

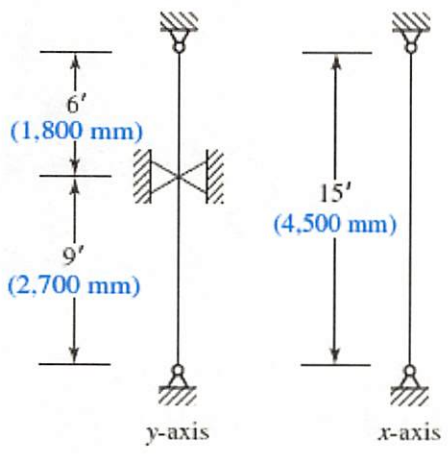
b. the allowable stress for ASD.

HSS $10 \times 6 \times \frac{5}{16}$ TABLE

$A_g = 8.76 \text{ in}^2$ $r_x = 3.66 \text{ in}$
 $r_y = 2.47 \text{ in}$

$K_x = 1.0$ $K_y = 1.0$
 $L_x = 15 \text{ ft}$ $L_y = 9 \text{ ft}$

* TABLE 1-12A $t = \frac{5}{16} \text{ in}$
 L NONSLENDER



$\frac{L_{c_x}}{r_x} = \frac{1.0(15 \text{ ft})(12 \text{ in/ft})}{3.66 \text{ in}} = 49.18$ * LARGER VALUE CONTROLS

$\frac{L_{c_y}}{r_y} = \frac{1.0(9 \text{ ft})(12 \text{ in/ft})}{2.47 \text{ in}} = 43.72$

$4.71 \sqrt{E/F_y} = 4.71 \sqrt{\frac{29,000 \text{ ksi}}{50 \text{ ksi}}} = 113.43$

$\frac{L_{c_x}}{r_x} < 4.71 \sqrt{E/F_y} \Rightarrow \text{USE EQ E3-2}$

$F_e = \frac{\pi^2 E}{(L_{c_x}/r_x)^2} = \frac{\pi^2 (29,000 \text{ ksi})}{(49.18)^2} = 118.34 \text{ ksi}$

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$$F_n = F_y (0.658^{F_y/F_e}) = 50 \text{ksi} (0.658^{50/118.34}) = 41.90 \text{ksi}$$

$$P_n = F_n A_g = 41.90 \text{ksi} (8.76 \text{in}^2) = 367.00 \text{k}$$

a) LRFD $\phi_c P_n = 0.9 (367.00 \text{k}) = \underline{\underline{330.3 \text{k}}}$

b) ASD $\frac{P_a}{\Omega_c} = \frac{367.0 \text{k}}{1.67} = \underline{\underline{219.76 \text{k}}}$