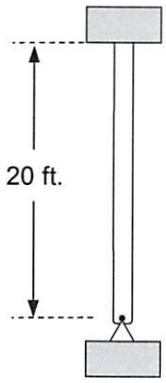
CIVL 3131 Quiz #3 S26 **Name:** _____

An **HSS8 x 6 x ¼** of **A500 Grade C** steel is 20 ft long, pinned at one end and fixed at the other. Compute the flexural buckling strength. Check for local stability.



* FROM TABLE 2-4: $F_y = 50 ksi$

* FROM TABLE C-A-7.1: $K = 0.8$

* FROM TABLE 1-11 [$A_g = 6.17 in^2$ $b/t = 22.8$; $h/t = 31.3$ $r_{min} = 2.43 in$

$$\frac{Lc}{r} = \frac{KL}{r} = \frac{0.8(20ft)\,12in/ft}{2.43in} = 79.01 < 200 \quad \text{O.K.}$$

$$4.71\sqrt{E/F_y} = 4.71\sqrt{\frac{29{,}000ksi}{50ksi}} = 113.43 > \frac{Lc}{r} \quad * \text{[USE EQ E3-2}$$

$$F_e = \frac{\pi^2 E}{(Lc/r)^2} = \frac{\pi^2(29{,}000ksi)}{(79.01)^2} = 45.85ksi$$

$$F_n = F_y\left(0.658^{F_y/F_e}\right) = 50ksi\left(0.658^{50/45.85}\right) = 31.68ksi$$

$$\phi P_n = \phi F_n A_g = 0.9(31.68ksi)6.17in^2 = \underline{175.9^k}$$

CHECK FOR LOCAL STABILITY

FROM TABLE B4.1a $\lambda_r = 1.40\sqrt{\frac{E}{F_y}} = 1.40\sqrt{\frac{29{,}000ksi}{50ksi}} = 33.72$

$\lambda = h/t = 31.3 < \lambda_r$ NONSLENDER O.K.

$$\underline{\underline{\phi P_n = 175.9^k}}$$