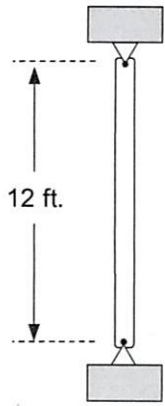


Classroom Problem 4.3-2: Use AISC Equation E3-2 or E3-3 and determine the nominal axial compressive strength of a W14 x 68 of A992 steel ($F_y=50$ ksi and $F_u=65$ ksi) with pinned ends. Also, compute the design strength for LRFD.



$k = 1.0$

FROM TABLE 1-1 (1-24)
 $A_g = 20.0 \text{ in}^2$ $r_y = 2.46 \text{ in}$ $r_x = 6.01 \text{ in}$

$$\frac{L_c}{r_{\min}} = \frac{12 \text{ ft} (12 \text{ in/ft})}{2.46 \text{ in}} = 58.54 < 200 \quad \checkmark$$

$$4.71 \sqrt{\frac{E}{F_y}} = 113.43$$

$$\frac{L_c}{r} < 4.71 \sqrt{\frac{E}{F_y}} \Rightarrow \text{E3.2}$$

$$F_e = \frac{\pi^2 E}{(L_c/r)^2} = \frac{\pi^2 (29,000 \text{ ksi})}{(58.54 \text{ in})^2} = 83.53 \text{ ksi}$$

$$F_n = F_y \left(0.658^{\frac{F_y}{F_e}} \right) = 50 \text{ ksi} \left(0.658^{\frac{50}{83.53}} \right) = 38.92 \text{ ksi}$$

$$\phi P_n = \phi F_n A_g = 0.90 (38.92 \text{ ksi}) 20.0 \text{ in}^2 = \underline{\underline{700.54 \text{ k}}}$$