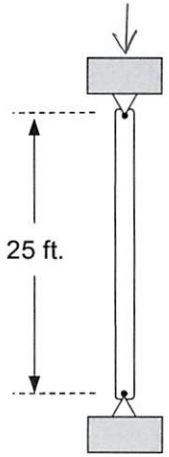
Classroom Problem 4.3-1: Use AISC **Equation E3-2** or **E3-3** and determine the nominal axial compressive strength of a **W14 x 68** of **A992** steel (F_y=50 *ksi* and F_u=65 *ksi*) with pinned ends. Also, compute the design strength for ***LRFD***.



$K = 1.0$

FROM TABLE 1-1 (1-24)

$A_g = 20.0\ in^2 \quad r_y = 2.46\ in^* \quad r_x = 6.01\ in$

$$\frac{L_c}{r_{min}} = \frac{1.0(25\,ft)(12\,in/ft)}{2.46\,in} = 121.95 < 200 \checkmark$$

$$4.71\sqrt{E/F_y} = 4.71\sqrt{\frac{29{,}000\,ksi}{50\,ksi}} = 113.43 \qquad \frac{L_c}{r_{min}} > 4.71\sqrt{E/F_y} \quad \underline{\text{USE E3-3}}$$

$$F_e = \frac{\pi^2 E}{(L_c/r)^2} = \frac{\pi^2(29{,}000\,ksi)}{(121.95)^2} = 19.25\,ksi$$

USING E3-3 $F_n = 0.877\,F_e = 0.877(19.25\,ksi) = 16.88\,ksi$

$$\phi P_n = \phi F_n A_g = 0.90(16.88\,ksi)\,20.0\,in^2 = \underline{\underline{303.81^K}}$$