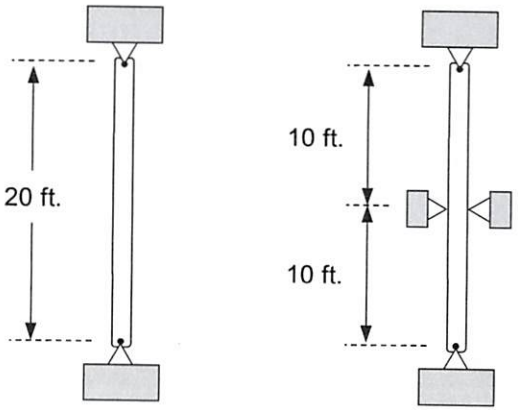
Classroom Problem 4.7-3: A **W14 x 53** with F_y = 60 *ksi* is used as a column. Can this section resist a service dead load of 100 *k* and a service live load of 300 *k*?



FROM TABLE 1-1 (1-24) $A_g = 15.6 in^2$ $r_x = 5.89 in$ $r_y = 1.92 in$

$$\frac{L_{cx}}{r_x} = \frac{20 ft (12 in/ft)}{5.89 in} = 40.75$$

$$\frac{L_{cy}}{r_y} = \frac{10 ft (12 in/ft)}{1.92 in} = 62.50^{*}$$ LARGER VALUE CONTROLS

LIMIT $4.71\sqrt{\frac{E}{F_y}} = 4.71\sqrt{\frac{29{,}000 ksi}{60 ksi}} = 103.54 > \frac{L_{c1}}{r_y} \Rightarrow$ EQ. E3-2

$$F_e = \frac{\pi^2 E}{(L_{cy}/r_y)^2} = \frac{\pi^2 (29{,}000 ksi)}{(62.50)^2} = 73.27 ksi$$

$$F_n = F_y \left(0.658^{F_y/F_e}\right) = 60 ksi \left(0.658^{60/73.27}\right) = 42.59 ksi$$

$$\phi P_n = \phi F_n A_g = 0.90 (42.59 ksi) 15.6 in^2 = \underline{598^k}$$

$$P_u = 1.2D + 1.6L = 1.2(100^k) + 1.6(300^k) = 600^k$$

$P_u > \phi P_n$ N.G.