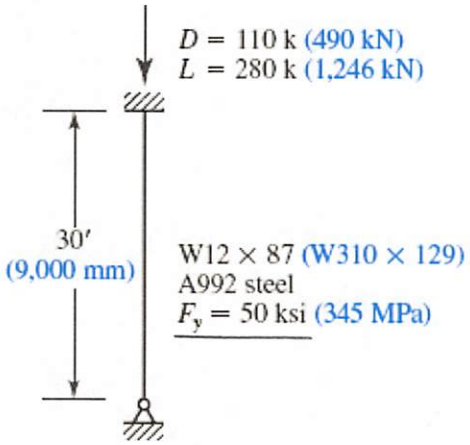
4.3-8 Determine whether the compression member shown in Figure P4.3-8 is adequate to support the given service loads.



$K = 0.8 \quad A = 25.6\,in^2 \quad r = 3.07\,in$

$$\frac{L_c}{r} = \frac{0.8(30ft)(12in/ft)}{3.07in} = 93.81$$

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

SINCE $L_c/r < 4.71\sqrt{E/F_y}$ USE EQ. E3-2

$$F_e = \frac{\pi^2 E}{(L_c/r)^2} = \frac{\pi^2(29{,}000ksi)}{(93.81)^2} = 32.52ksi$$

$$F_n = F_y(0.658^{F_y/F_e}) = 50ksi(0.658^{50/32.52}) = 26.27ksi$$

$$P_n = F_n A = 26.27ksi(25.6in^2) = \underline{672.60k}$$

a) LRFD

$$\phi_c P_n = 0.9(672.60k) = 605.34k$$

$$P_u = 1.2D + 1.6L = 1.2(110k) + 1.6(280k) = 580.0k$$

$$\phi_c P_n > P_u \quad \underline{O.K.}$$

b) ASD

$$P_a/\Omega_c = 605.34k/1.67 = 362.48^k$$

$$P_a = D + L = 110^k + 280^k = 390^k \quad \frac{P_a}{\Omega_c} < P_u \quad \underline{N.G.}$$