4- Computation of the magnified moments:

(a) For load case 1:

Column is short

⇒ design for $P_u = 1128^k$
$M_2 = M_u = 354$ ft-k

(b) For load case 2:

$$M_2 = M_{2ns} + \delta_s M_{2s}$$

$M_{2ns} = 265$ ft-k
$M_{2s} = 191$ ft-k

$$\delta_s = \frac{1}{1 - \frac{\Sigma P_u}{0.75 \Sigma P_c}} \geq 1.0$$

- $\Sigma P_u = 2P_u$ (int. col.) + 2 P_u (ext. col.)

P_u (int. col.) = 910 k
P_u (ext. col.) = $0.75(1.4\times160 + 1.7\times200 + 1.7\times50)$
= 487 k

- $\Sigma P_c = 2P_c$ (int. col.) + 2 P_c (ext. col.)

$$P_{c\,int.} = \frac{\pi^2 EI}{(k l_u)^2} \qquad k = 1.63 \quad l_u = 14\times12 - 30 = 138"$$

$$P_{c\,ext.} = \frac{\pi^2 EI}{(k l_u)^2} \qquad k = 2.1 \quad l_u = 138"$$

$$EI = \frac{0.4 E_c I_g}{(1 + \beta_d)}$$

$$\beta_d = \frac{\text{max. factored sustained shear}}{\text{total factored shear}}$$

= 0 (short-term wind load)

$$\Rightarrow EI = \frac{0.4 \times 57\sqrt{4000} \times [18\times(24)^3/12]}{(1+0)}$$

$= 29.9 \times 10^6$ k-in²

$$\Rightarrow P_{c\,int.} = \frac{\pi^2 \times 29.9\times10^6}{(1.63\times138)^2} = 5832 \text{ kips}$$

$$P_{c\,ext} = \frac{\pi^2 \times 29.9\times10^6}{(2.1\times138)^2} = 3514 \text{ kips}$$