P2.7. The building section associated with the floor plan in Figure P2.4 is shown in Figure P2.7. Assume a live load of 60 lb/ft^2 on all three floors. Calculate the axial forces produced by the live load in column C2 in the third and first stories. Consider any live load reduction if permitted by the ASCE standard.

**Compute the live load forces in column C2 in P2.4:**

\[ W_L = 60 \text{ lb/ft}^2 \]

\[ A_T = \frac{(30 + 25) \times 20}{2} = 550 \text{ ft}^2 \]

\[ K_{LT} A_T = 4 \times 550 = 2,200 \text{ ft}^2 > 400 \text{ ft}^2 \]

\[ \text{Reduce } W_L \]

**3rd Story**

\[ W = W_L \left[ 0.25 + \frac{15}{\sqrt{K_{LT} A_T}} \right] \]

\[ = 60 \left[ 0.25 + \frac{15}{\sqrt{2,200}} \right] = 34.19 \text{ psf} \]

Since 34.19 > 0.6W_L = 30, use 34.19 psf

\[ P = W A_T = 34.19 \times 550 = 18,895 \text{ kips} \]

**1st Story**

Column supports 3 floors

\[ K_{LT} A_T = 4 \times (550 \times 3) = 6600 \text{ ft}^2 \]

\[ \left( \frac{143 \text{ kips}}{43 \text{ psf}} \right) \]

\[ W = 60 \left[ 0.25 + \frac{15}{\sqrt{6600}} \right] = 26.08 \text{ psf} \]

Since 26.08 > 0.6W_L = 30, use 26.08 psf

\[ P = W A_T = 26.08 \times 550 = 45,588 \text{ kips} \]