2. The column size is given to be (18x24)

3. Are the columns slender !?

$\frac{klu}{r} \overset{?}{<} 34 - 12\frac{M_1}{M_2}$ column braced against sidesway

$\frac{klu}{r} \overset{?}{<} 22$ column unbraced against sidesway

Let's compute K : $\psi = \frac{\Sigma(EI/l_c)\ col.}{\Sigma(EI/l)\ beams}$

for the first load case (braced) we need to compute K for column AB; whereas for the second load case (unbraced) we need to compute K for both the interior and exterior column since we will compute a moment magnifier for the entire story.

$I_{col} = 0.7 \times I_g = 0.7 \times 18 \times (24)^3/12 = 14515.2\ in^4$

$I_{beam} = 0.35 I_g = 0.35 \times 18 \times (30)^3/12 = 14175\ in^4$

$l_c = 14\ ft \qquad E_c = E_b = E$

$l = 30\ ft$

for column AB (interior col.): $\psi_{top} = \psi_{bot} = \frac{2 \times 14515.2/14}{2 \times 14175/30} = 2.19$

for exterior column: $\psi_{top} = \psi_{bot} = \frac{2 \times 14515.2/14}{14175/30} = 4.39$

Load case 1 (braced) → $K_{\substack{interior \\ column\ AB}} = 0.865$

Load case 2 (unbraced) → $K_{\substack{interior \\ column\ AB}} = 1.63$

$K_{\substack{exterior \\ column}} = 2.1$

a) for load case 1:

$\frac{klu}{r} = \frac{0.865 \times (14 \times 12 - 30)}{0.3 \times 24} = 16.6$

$34 - 12\frac{M_1}{M_2} = 22 \qquad (\frac{M_1}{M_2} = 1)$

$\rightarrow \frac{klu}{r} < 34 - 12\frac{M_1}{M_2}$ ∴ ignore slenderness

b) for load case 2:

$\frac{klu}{r} = \frac{1.63 \times (14 \times 12 - 30)}{0.3 \times 24} = 31.2 > 22 \rightarrow$ slender column

$< 100 \rightarrow$ ACI moment magnification method can be used