FE-1

FACULTY OF ENGINEERING & ARCHITECTURE - AMERICAN UNIVERSITY OF BEIRUT

4 - $M_c = \delta_{ns} M_2$

where $\delta_{ns} = \frac{C_m}{1 - P_u/0.75P_c} \geq 1.0$

$C_m = 0.6 + 0.4\, M_1/M_2$
≥ 0.4

$P_c = \pi^2 EI/(k l_u)^2$

$EI = \frac{0.4 E_c I_g}{1+\beta d}$

$\beta d = \frac{P_u\ (DL)}{P_u\ (DL+LL)}$

* for column CD :

$\beta d_{ns} = \frac{80 \times 1.4}{152.8} = 0.733$

$\Rightarrow EI = \frac{E_c I_g / 2.5}{1+\beta d} = \frac{(3.12 \times 10^6 \times 32013.3)/2.5}{1+0.733} = \frac{4 \times 10^9}{1.733}$

$= 2.31 \times 10^9$ lb-in^2

$\Rightarrow P_c = \frac{\pi^2 \times 2.31 \times 10^9}{(0.87 \times 18 \times 12)^2} = 744189.7 lb = 744$ kips

$C_m = 0.6 + 0.4(-0.4) = 0.440 > 0.4$ ok

$P_u = 152.8$

$\therefore \delta_{ns} = \frac{0.440}{1 - \frac{152.8}{0.75 \times 744}} = 0.61 < 1.0$ $\Rightarrow$ Take $\delta_b = 1.0$

$M_c = 1.0 \times 107.8$

$= 107.8$ ft-k (max. moment remains at end) explain!

and design CD for $P_u = 152.8^k$

$M_u = M_c = 107.8$ ft-k

check minimum eccentricity

$e = 0.6 + 0.03h = 1.02''$

$\Rightarrow M_{min} = 152.8 \times 1.02/12 \cong 13$ ft-k $< M_2$ ok