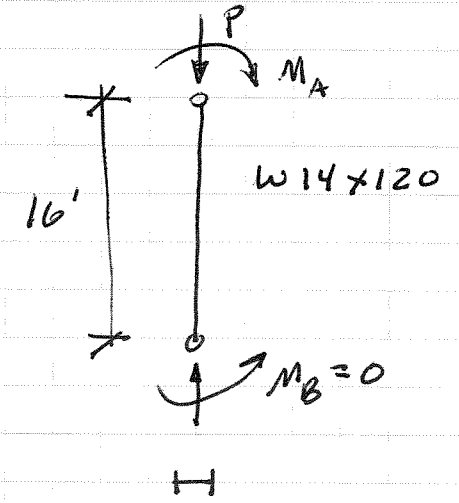
3.

$P_D = 90\ k$, $P_L = 270\ k$



a) LRFD

$P_u = 1.2(90) + 1.6(270) = 540\ k$

$\phi P_n = 1310\ k$ for $KL_y = 16f$ from Table 4-1

$\frac{P_u}{\phi P_n} = \frac{540}{1310} = 0.412 > 0.2$ ∴ use H1-1a

$$0.412 + \frac{8}{9}\left(\frac{M_u}{\phi M_n}\right) \le 1.0 \quad \therefore \frac{M_u}{\phi M_n} = 0.662$$

$\phi M_n = 774$ ft-kips with $L_b = 16$ ft from Table 3-10

$M_u = 0.662(774\ ft\text{-}kips) = 512$ ft-kips

Determine amplification factor B_1

$$C_m = 0.6 - 0.4\left(\frac{0}{M_A}\right) = 0.6$$

$$P_{e_1} = \frac{\pi^2 EI}{(KL)^2} = \frac{\pi^2(29000)(1380)}{(1.6(12))^2} = 10,700\ k$$

$$B_1 = \frac{0.6}{1 - \frac{540}{10700}} = 0.63 < 1.0 \therefore B_1 = 1.0$$

Thus with a live to dead load ratio of 3

$1.2M_D + 1.6(3M_D) = 512$ ft-kips

$M_D = 85.3$ ft-kips $M_L = 3M_D = 256$ ft-kips