

Find max axial force: $M=0$ Stand. Spec. 8.16.4.2.1

$\Phi P_o = \Phi[0.85f'_c(A_g - A_{st}) + A_{st}f_y]$

$A_g = 1017.9 \text{ in}^2$
 $A_{st} = 8.1 \text{ in}^2$

$\Phi P_o = 3058.6 \text{ kip}$ $M_n = 0$

Find axial and moment capacity at balanced strain condition: Stand. Spec 8.16.4.2.3

$\Phi P_b = \Phi[0.85f'_c b' a_b + A_s' f_s + A_s f_y]$

$\Phi M_b = \Phi[0.85f'_c b' a_b (d - d')/2 + A_s' f_s (d - d') + A_s f_y d']$

$d = 26.86 \text{ (in)}$ dist from extreme compression fiber to centroid of tension steel
 $d' = 9.14 \text{ (in)}$ dist from extreme compression fiber to centroid of comp. steel
 $d'' = 8.86 \text{ (in)}$ dist from centroid of gross section to centroid of tension steel
 $a_b = 14.31 \text{ in}$
 $\beta_1 = 0.9$
 $f_s = 36.97 \text{ ksi}$
 $b = 35.23 \text{ in}$
 $A_s' = 3.72 \text{ in}^2$ $A_s = 3.72 \text{ in}^2$

$\Phi P_b = 1199.76 \text{ kip}$
 $\Phi M_b = 17138.38 \text{ in-kip} = 1428.20 \text{ ft-kip}$

Find Moment Capacity of Section: $P=0$ Note: neglect compression steel

$c = 5.64 \text{ (in)}$ with a % error of 0.06% OK
 $b = 25.06$ Reinforcement Ratio: Used to check if $f_s = f_y$
 $\theta = 88.22$ $\rho = 0.005527$
 $\rho_b = 0.022638$ is $\rho < 75\rho_b$? OK

$\Phi M_n = A_s f_y (d - a/2) = 5428.57 \text{ in-kip} = 452.38 \text{ ft-kip}$ $\Phi_n = 0$

Determine if section is adequate for loads applied

$M_u = 139.19075 \text{ ft-kips}$
 $P_u = 3.9463256 \text{ kips}$

Points for interaction diagram: Note: points are connected with straight lines

Article 8.15.4 Stand. Spec: The combined flexural and axial load capacity of compression members shall be taken as 35% of that from 8.16.4

	P	M
1	1070.52	0
2	419.91	499.87
3	0	158.33
4	3.9463256	139.1908

Point 4 is from actual loads

Linear Interpolation Program #1 (upper line)
 Are you in upper region? No

	Pu	Mu
Value Below	1070.52	0.00
Value at desired Loc.	3.95	x = 819.464 Max
Value Above	419.91	499.87

Linear Interpolation Program #2 (lower line)
 Are you in lower region? Yes

	Pu	Mu
Value Below	419.91	499.87
Value at desired Loc.	3.95	x = 161.543 Max
Value Above	0.00	158.33