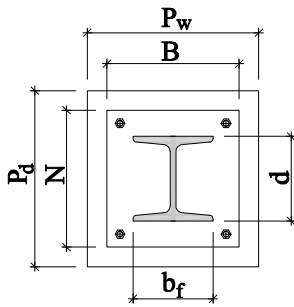




Design of Base Plate Bearing on Concrete Subjected to Concentric Loading



Loads

Dead Load, P_D =	115.0 kips
Live Load, P_L =	345.0 kips

Material Properties

Grade:	SEL("Material/ASTM"; NAME;)	=	A36
Yield stress, f_{yp} =	TAB("Material/ASTM";F _y ;NAME=Grade)	=	36 ksi

Column and Pedestal Data

Concrete strength for pedestal (f'_c):

f'_c =		=	3 ksi
Sec.:	SEL("AISC/W"; NAME;)	=	W12X96
Pedestal depth, P_d =		=	24 in
Pedestal width, P_w =		=	24 in
Depth of column, d =	TAB("AISC/W";d; NAME=Sec.)	=	12.7 in
Flange of column, b_f =	TAB("AISC/W";b _f ;NAME=Sec.)	=	12.2 in

The Required Strength

(Chapter 2 of ASCE/SEI 7)

P_u =	$1.2 \cdot P_D + 1.6 \cdot P_L$	=	690 kips
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Preliminary Base Plate Dimensions

Φ_c =		=	0.65
A_{1req} =	$\frac{P_u}{\Phi_c \cdot 0.85 \cdot f'_c}$	=	416 in ²
$N1$ =	$d + 2 \cdot 3$	=	18.7 in
N =	$MAX(N1; \sqrt{(A_{1req}) + 0.5 \cdot (0.95 \cdot d - 0.8 \cdot b_f)})$	=	22 in
$B1$ =	$b_f + 2 \cdot 3$	=	18.2 in
B =	$IF((d - b_f) < 1; MAX(B1; A_{1req}/N; N); MAX(B1; A_{1req}/N))$	=	22 in

Concrete Bearing Strength

Pedestal area, A_2 =	$P_d \cdot P_w$	=	576 in ²
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Base plate area, A_1 =	$N*B$	=	484 in ²
Check plate area=	$IF(A_1 > A_{1req}, "o.k."; "Unsafe")$	=	o.k.
P_b =	$MIN(0.85*f_c*A_1*\sqrt{A_2/A_1} ; 1.7*f_c*A_1)$	=	1346 kips
Concrete bearing strength ($\Phi_c P_p$):			
$\Phi_c P_p$ =	$\Phi_c * P_b$	=	875 kips
Check safety, check=	$IF(\Phi_c P_p > P_u, "o.k."; "Unsafe")$	=	o.k.

Base Plate Thickness

m =	$\frac{N - 0.95 * d}{2}$	=	4.97 in
n =	$\frac{B - 0.8 * b_f}{2}$	=	6.12 in
n' =	$\frac{\sqrt{d * b_f}}{4}$	=	3.11 in
X =	$\left(4 * d * \frac{b_f}{(d + b_f)^2} \right) * \left(\frac{P_u}{\Phi_c * P_b} \right)$	=	0.79
λ =	$MIN(2*\sqrt{X}/(1+\sqrt{1-X}) ; 1.00)$	=	1.00
l =	$MAX(m ; n ; \lambda*n')$	=	6.12 in
f_{pu} =	$\frac{P_u}{N*B}$	=	1.43 ksi
t_{min} =	$l * \sqrt{\frac{2 * f_{pu}}{0.9 * f_{yp}}}$	=	1.82 in
t =	$TAB("Material/plate_th"; t_fr; t_in > tmin)$	=	2.00 in

Summary: Use Plate with The Following Dimensions

Plate length=	N	=	22 in
Plate width=	B	=	22 in
Plate thickness=	t	=	2.00 in