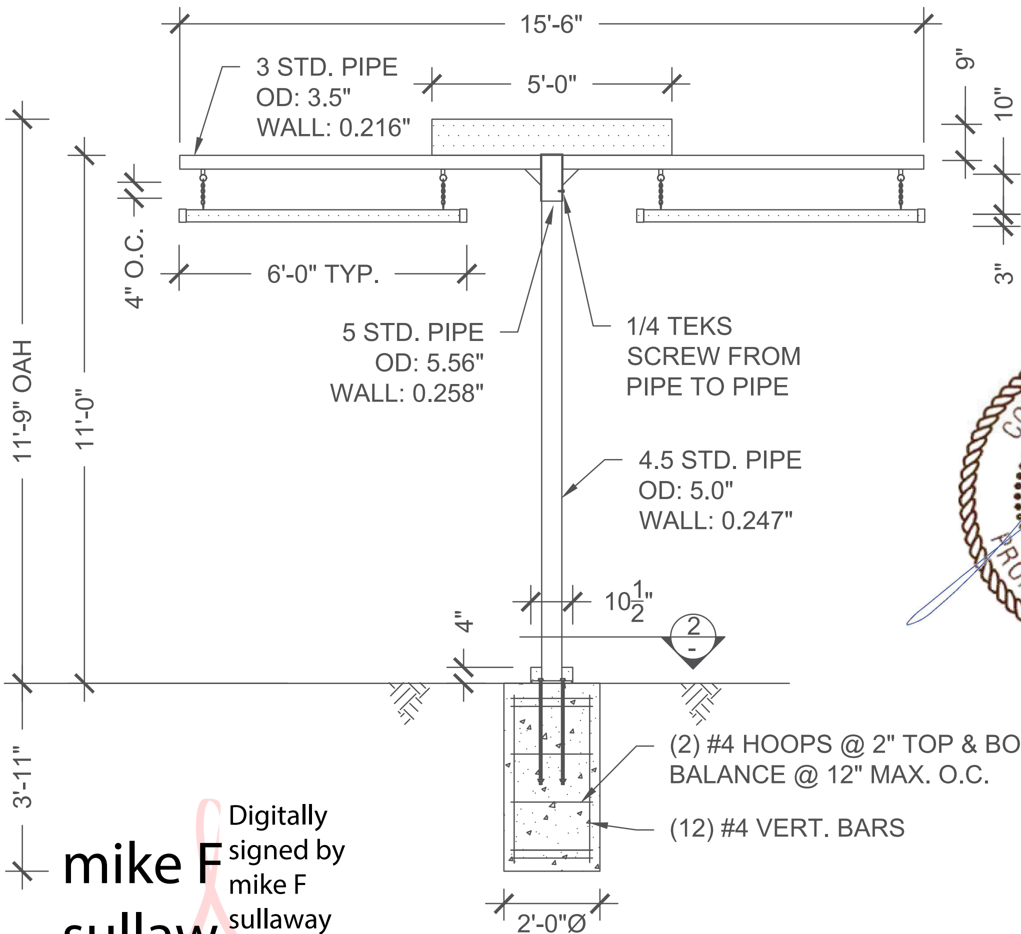
SULLAWAY ENGINEERING

10815 RANCHO BERNARDO RD., SUITE 260
SAN DIEGO, CA 92198
PROJECTMANAGER@SULLAWAYENG.COM
PHONE: 1-858-312-5150 FAX: 1-858-777-3534

PROJECT: DUTCH BROS., SIGN TYPE - CLEARANCE BAR, CHIPMAN & WARD LEE'S SUMMIT, MO 64063
PROJECT #: 32261C
CLIENT: ES&A SIGN & AWNING CO.

DATE: 9/29/2021
ENGINEER: AN/RG
LAST REVISED:



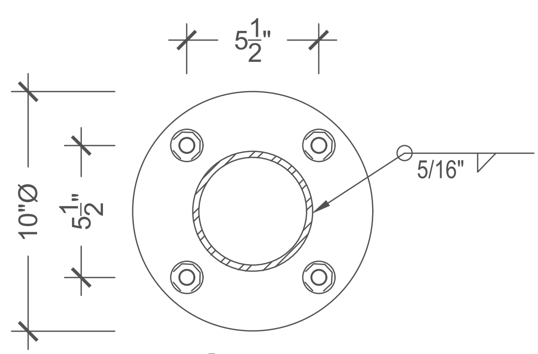
mike F sullaway

Digitally signed by mike F sullaway
Date: 2021.10.06 15:28:52 -07'00'

1 - ELEVATION

GENERAL NOTES

1. DESIGN CODE: IBC 2018
2. DESIGN LOADS: ASCE 7-16
3. WIND VELOCITY 115 MPH EXPOSURE C
4. EQUIVALENT TO IBC 2015, ASCE 7-10, WIND VELOCITY 115 MPH EXP. C
5. CONCRETE 2500 PSI MINIMUM
6. PIPE STEEL ASTM A53 GR. B, F_y = 35 KSI MIN.
7. PLATE STEEL ASTM A36
8. TEKS SCREW PER ESR-1976
9. THREADED ANCHOR ROD STEEL ASTM F1554 GR. 36
10. STEEL REINFORCEMENT IN CONCRETE ASTM A615 GR 60
11. PROVIDE MIN. 3" CLEAR COVER ON ALL STEEL EMBEDDED IN CONCRETE WHEN CAST AGAINST SOIL
12. LATERAL SOIL BEARING PER IBC CLASS 4 (150 PSF/FT)
13. WELDING STRENGTH, Fexx = 70 KSI
14. PROVIDE PROTECTION AGAINST DISSIMILAR METALS
15. ALL DIMENSIONS TO BE VERIFIED PRIOR TO FABRICATION



10"Øx$\frac{5}{8}$" STEEL PLATE
W/ (4) $\frac{5}{8}$" Ø THREADED ANCHOR RODS
MIN EMBED. = 24" INTO CONCRETE
W/NUT/WASHER/NUT @ EMBED. END

2 - BASE PLATE

SULLAWAY ENGINEERING

10815 Rancho Bernardo RD., SD, CA 92127
projectmanager@sullawayeng.com
Phone: 858-312-5150 Fax: 858-777-3534

PROJECT: DUTCH BROS. DATE: 9/29/2021
PROJ. NO.: 32261C ENGINEER: AN/RG
CLIENT: ES&A SIGN & AWNING CO.

V5.5

units; pounds, feet unless noted otherwise

Applied Wind Loads; from ASCE 7-16

$F=q_z*G*C_f*A_f$ with $q_z = 0.00256K_zK_{zt}K_dV^2$ (29.3.2 & 29.4)

C_f= 1.850 (Fig. 29.3-1) 1.00 0 max. height= 11.75

K_{zt}= 1.0 (26.8.2) (=1.0 unless unusual landscape)

K_z= from table 28.3-1 Exposure= c

K_d= 0.85 for signs (table 26.6-1)

V= 115 mph

G= 0.85 (26.9) weight= 0.161 kips

s/h= 0.064 M_{DL}= 0.00 k-ft

B/s= 6.67

Pole Loads	structure component	height at section c.g.	K_z	q_z	pressure q_z*G*C_f	A_f	shear	Wind Moment M_W
	1	0.17	0.850	24.5	38.46	0.29	11	2
	2	4.92	0.850	24.5	38.46	3.82	147	722
	3	10.63	0.850	24.5	38.46	11.95	460	4884
					sums:	16.1	618	5.61

(M_w) k-ft arm= 9.1

P_u= 0.19 kip M= 5.61 k-ft $M=\text{sqrt}(M_{DL}^2+M_w^2)$

$M_u=\text{sqrt}(1.2M_{DL}^2+1.0M_W^2)$ = 5.61 k-ft

Pole Design

section; pipe

$M_u \le \phi M_n$ with $M_n = f_yZ$ f_y= 35 ksi ϕ= 0.9

H	M_u(k-ft)	Z req'd. (in)	Size(in)	t (in)	Z	USE
at grade	5.61	2.14	3	0.216	2.2	4.5 STD. PIPE, ϕMn=13.7 k-ft

Footing Design

footprint: round

ω= 1.3 IBC 1605.3.2 IBC Table 1806.2, sections 1806.3.4, 1807.3.2 S=(1.3x2x150 psf/ft)

P= 0.48 kip S1 = S x d / 3 A = 2.34 x P / (S1 x b) S= 400

S1= 517 d =0.5xA (1+ (1+4.36x h/A) ^.5) IBC 1807.3.2.1

A= 1.09

footing: **2' - 0" dia.** **3' - 11" deep**

SULLAWAY ENGINEERING

10815 Rancho Bernardo RD., SD, CA 92127
projectmanager@sullawayeng.com
Phone: 858-312-5150 Fax: 858-777-3534

PROJECT: DUTCH BROS. DATE: 9/29/2021
PROJ. NO.: 32261C ENGINEER: AN/RG
CLIENT: ES&A SIGN & AWNING CO.

V5.5

units; pounds, feet unless noted otherwise

Check Buckling for Round HSS Section

Pole Design-AISC

section; pipe weight= 0.161 kips

F_y= 35 ksi ϕ= 0.9 E= 29,000 ksi

H	M_u(k-ft)		Size(in)	t (in)	Z	S
at grade	5.61	2.14	5	0.230	5	4

r= **1.69**
A= **3.44**
h (L) = 11.00

spec wt= 0.289 kcf
signage wt; 0.161 k
pipe weight 0.066 k
P= 0.226 k
P_r= 0.27 k

D/t= 21.8
KL/r= 156.4
K= 2
Fe= 12.1 ksi (E3-4)
4.71sqrt(E/f_y)= 137.9

F_{cr}= 10.44 for KL/r<sqrt(E/f_y) AISC Chap. E3
F_{cr}= 10.62 for KL/r>sqrt(E/f_y)
use F_{cr}= 10.62

for D/t < 0.07 E/Fy section is compact 0.07 E/F_y= 58
for D/t < 0.31 E/Fy section is non-compact 0.31 E/F_y= 257
Section is **compact**

$P_n=F_{cr}A_g$= 36.6 k $P_c=\phi Pn$= 32.9 k
$M_n=(0.021E/(D/t) + F_y)S$= 20.9 k (non-compact) (F8-2)
$M_n=F_yZ$= 15.3 k-ft (compact)
$M_n=F_{cr}S$= 3.5 k-ft (slender - slender sections NOT USED)
use M_n= 15.3 k-ft $P_u/\phi P_n$ = 0.00825
$M_c=\phi M_n$= 13.7 k-ft $M_u/\phi M_n$ = 0.40839

P_r/P_c= 0.0083 AISC Chap. H1
$P_r/2P_c$= 0.0041

P_r/P_c + 8/9 * M_r/M_c = 0.371
For P_r/P_c<0.2; $P_r/2P_c$ + M_r/M_c = 0.413
use **0.413**

SULLAWAY ENGINEERING

10815 Rancho Bernardo RD., SD, CA 92127
projectmanager@sullawayeng.com
Phone: 858-312-5150 Fax: 858-777-3534

PROJECT:	DUTCH BROS.	DATE:	9/29/2021
PROJ. NO.:	32261C	ENGINEER:	AN/RG
CLIENT:	ES&A SIGN & AWNING CO.		

units; pounds, feet unless noted otherwise

Check 3 STD. PIPE (LRFD):

Pnet=	(See Page#2)=	38.46	psf		
Tributary Area=	A_{Trib}=	6.150	ft^2	(From AutoCAD)	
Wind Load=	WL=Pnet*A_{Trib}=	0.237	kips		
Dead Load=	DL=1.2*10psf*A_{Trib}=	0.074	kips		
arm=	=	57.25	in	(From AutoCAD)	
MWL=	WL*arm=	13.54	k-in		
MDL=	DL*arm=	4.23	k-in		
Total Moment=	Mu = MDL+MWL=	1.48	k-ft		
Moment Capacity=	(Per AISC Manual) ϕMn=	5.75	k-ft		
Check:	Mu/ϕMn=	0.26			**OK**

Torsion on 4.5 STD. PIPE (LRFD): :

Tr=	MWL*2 Clearance bars=	27.086	k-in	(MWL = See Above)

Check 1/4" dia. Teks Screw

WL Shear =	0.237k * 2 pipes =	0.473	kips	(See Above)
Va=	0.6 * WL Shear =	0.284	kips	
tcontact =	=	0.187	in	
tnoncontact =	=	0.187	in	
Vcap =	=	0.990	kips	**OK**

SULLAWAY ENGINEERING
10815 Rancho Bernardo RD., SD, CA 92127
projectmanager@sullawayeng.com
Phone: 858-312-5150 Fax: 858-777-3534

PROJECT: DUTCH BROS.
PROJ. NO.: 32261C
CLIENT: ES&A SIGN & AWNING CO.
DATE: 9/292021
ENGINEER: AN/RG

units; pounds, feet unless noted otherwise

Check Pipe4.5SCH40 for torsion and combined forces (AISC 14 H3)

Tr =	27.086	k-in	(See Page#3)	Fy =	35	ksi
				D =	5.00	in^3
Fcr =	147.8933	ksi	(eq'n. H3-2a)	t =	0.230	in^3
or				E =	29000	ksi
Fcr =	171.6667	ksi	(eq'n. H3-2b)	L =	132	in
but not greater than:				C =	7.95	in^3
0.6 Fy =	21	ksi		ϕ =	0.9	
ϕTn = ϕ Fcr C =	150	k-in	OK			
Mu/ϕMn + $(Tr/\phi Tn)^2$ =	0.445	<1	OK	(eq'n. H3-6)		

SULLAWAY ENGINEERING

10815 Rancho Bernardo RD., SD, CA 92127
projectmanager@sullawayeng.com
Phone: 858-312-5150 Fax: 858-777-3534

PROJECT: DUTCH BROS.
PROJ. NO.: 32261C
CLIENT: ES&A SIGN & AWNING CO.

DATE: 9/29/2021
ENGINEER: AN/RG

units; pounds, feet unless noted otherwise

Check 10 Dia x 0.625" Steel Base Plate, A36 (LRFD):

n = 2 arm = 0.750 in b = 7.00 in t = 0.625 in T= 5149.0 lb

Mplate =	T*n*arm =	7.72 k-in	(T = From Simpson's Report)
Z=	bt^2/4=	0.68 in^3	
ϕMn =	ϕ*Fy*Z = 0.9*36ksi*Z =	22.15 k-in	**OK**

Check Vertical Rebar

2*T per bolt/#bars	2.06 k	(T = See Above)	fy =	60 ksi
# of bars (within embed. length):	5		db =	0.50 in
bar #:	4		Ab =	0.20 in^2
			ϕ =	0.75
Tc = ϕ fy Ab =	8.84 k	**OK**		

Anchor Designer™
Software
Version 2.9.7376.6

Company:		Date:	3/14/2020
Engineer:		Page:	1/6
Project:			
Address:			
Phone:			
E-mail:			

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

General
Design method:ACI 318-14
Units: Imperial units

Anchor Information:
Anchor type: Cast-in-place
Material: AB
Diameter (inch): 0.625
Effective Embedment depth, h_{ef} (inch): 24.000
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 26.13
C_{min} (inch): 3.75
S_{min} (inch): 3.75

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 48.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Ignore concrete breakout in tension: Yes
Ignore concrete breakout in shear: No
Ignore 6do requirement: No
Build-up grout pad: No

Base Plate
Diameter x Thickness (inch): 10.00 x 0.63
Yield stress: 36000 psi

Profile type/size: HSS5X0.250

Recommended Anchor
Anchor Name: PAB Pre-Assembled Anchor Bolt - PAB5 (5/8"Ø)

SIMPSON Strong-Tie®

Anchor Designer™
Software
Version 2.9.7376.6

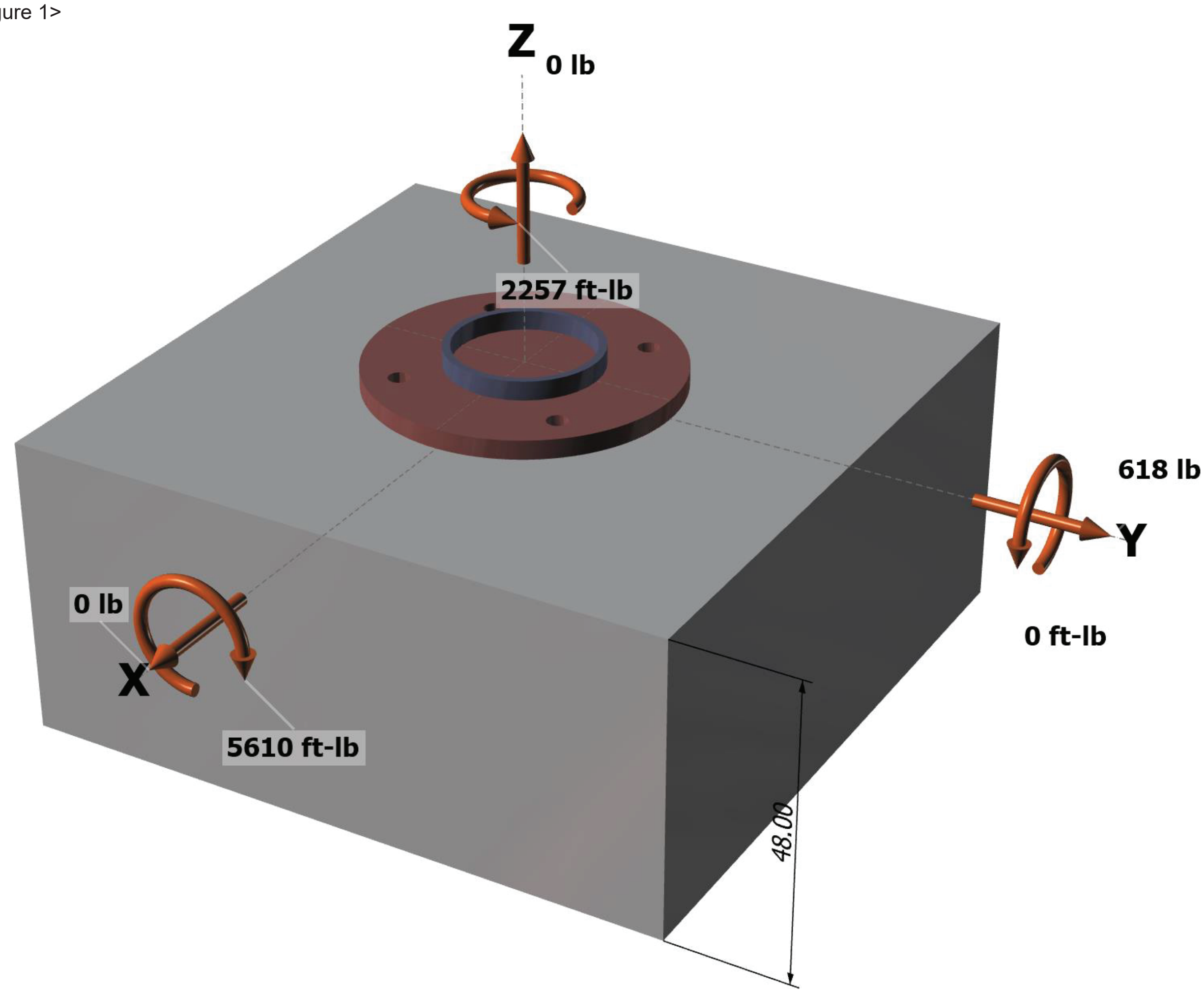
Company:		Date:	3/14/2020
Engineer:		Page:	2/6
Project:			
Address:			
Phone:			
E-mail:			

Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: Not applicable
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: No

Strength level loads:

N_{ua} [lb]: 0
V_{uax} [lb]: 0
V_{uay} [lb]: 618
M_{ux} [ft-lb]: -5610
M_{uy} [ft-lb]: 0
M_{uz} [ft-lb]: 2257

<Figure 1>

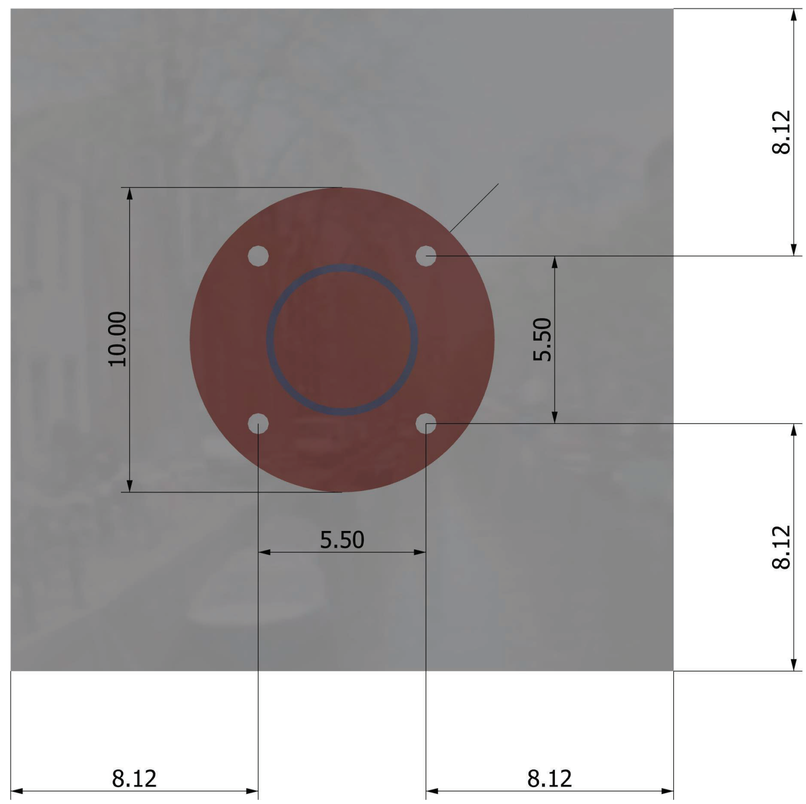


SIMPSON Strong-Tie®

Anchor Designer™
Software
Version 2.9.7376.6

Company:		Date:	3/14/2020
Engineer:		Page:	3/6
Project:			
Address:			
Phone:			
E-mail:			

<Figure 2>



Anchor Designer™
Software
Version 2.9.7376.6

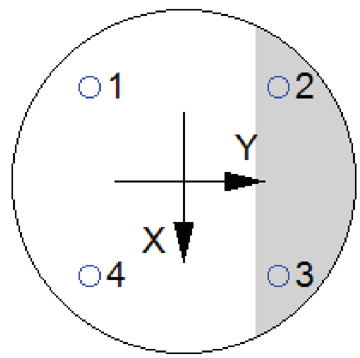
Company:		Date:	3/14/2020
Engineer:		Page:	4/6
Project:			
Address:			
Phone:			
E-mail:			

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	5149.2	1231.1	-1076.6	1635.4
2	0.0	-1231.1	-1076.6	1635.4
3	0.0	-1231.1	1385.6	1853.4
4	5149.2	1231.1	1385.6	1853.4
Sum	10298.4	0.0	618.0	6977.6

Maximum concrete compression strain (‰): 0.31
Maximum concrete compression stress (psi): 1331
Resultant tension force (lb): 0
Resultant compression force (lb): 10298
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



4. Steel Strength of Anchor in Tension (Sec. 17.4.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
13100	0.75	9825

6. Pullout Strength of Anchor in Tension (Sec. 17.4.3)

$\phi N_{pn} = \phi \Psi_{c,P} N_p = \phi \Psi_{c,P} 8 A_{brg} f'_c$ (Sec. 17.3.1, Eq. 17.4.3.1 & 17.4.3.4)

$\Psi_{c,P}$	A_{brg} (in^2)	f'_c (psi)	ϕ	ϕN_{pn} (lb)
1.0	2.10	2500	0.70	29372

SIMPSON Strong-Tie® Anchor Designer™ Software
Version 2.9.7376.6

Company:		Date:	3/14/2020
Engineer:		Page:	5/6
Project:			
Address:			
Phone:			
E-mail:			

7. Side-Face Blowout Strength of Anchor in Tension (Sec. 17.4.4)

$\phi N_{sbg} = \phi\{(1+c_{a2}/c_{a1})/4\}(1+s/6c_{a1})N_{sb} = \phi\{(1+c_{a2}/c_{a1})/4\}(1+s/6c_{a1})(160c_{a1}\sqrt{A_{brg}})\lambda\sqrt{f'_c}$ (Sec. 17.3.1, Eq. 17.4.4.1 & 17.4.4.2)

s (in)	c_{a1} (in)	c_{a2} (in)	A_{brg} (in^2)	λ_a	f'_c (psi)	ϕ	ϕN_{sbg} (lb)
5.50	8.12	8.12	2.10	1.00	2500	0.70	36650

8. Steel Strength of Anchor in Shear (Sec. 17.5.1)

V_{sa} (lb)	ϕ_{grout}	ϕ	$\phi_{grout}\phi V_{sa}$ (lb)
7865	1.0	0.65	5112

9. Concrete Breakout Strength of Anchor in Shear (Sec. 17.5.2)

Shear perpendicular to edge in x-direction:

$V_{bx} = \min|7(l_e/d_a)^{0.2}\sqrt{d_a}\lambda_a\sqrt{f'_c}c_{a1}^{1.5}; 9\lambda_a\sqrt{f'_c}c_{a1}^{1.5}|$ (Eq. 17.5.2.2a & Eq. 17.5.2.2b)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{bx} (lb)
5.00	0.625	1.00	2500	13.62	21081

$\phi V_{cbgx} = \phi\,(A_{Vc}/A_{Vco})\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{bx}$ (Sec. 17.3.1 & Eq. 17.5.2.1b)

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbgx} (lb)
444.15	834.77	1.000	0.819	1.000	1.000	21081	0.70	6432

Shear perpendicular to edge in y-direction:

$V_{by} = \min|7(l_e/d_a)^{0.2}\sqrt{d_a}\lambda_a\sqrt{f'_c}c_{a1}^{1.5}; 9\lambda_a\sqrt{f'_c}c_{a1}^{1.5}|$ (Eq. 17.5.2.2a & Eq. 17.5.2.2b)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{by} (lb)
5.00	0.625	1.00	2500	13.62	21081

$\phi V_{cbgy} = \phi\,(A_{Vc}/A_{Vco})\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{by}$ (Sec. 17.3.1 & Eq. 17.5.2.1b)

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cbgy} (lb)
444.15	834.77	1.000	0.819	1.000	1.000	21081	0.70	6432

Shear parallel to edge in x-direction:

$V_{by} = \min|7(l_e/d_a)^{0.2}\sqrt{d_a}\lambda_a\sqrt{f'_c}c_{a1}^{1.5}; 9\lambda_a\sqrt{f'_c}c_{a1}^{1.5}|$ (Eq. 17.5.2.2a & Eq. 17.5.2.2b)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{by} (lb)
5.00	0.625	1.00	2500	8.12	9704

$\phi V_{cbgx} = \phi\,(2)(A_{Vc}/A_{Vco})\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{by}$ (Sec. 17.3.1, 17.5.2.1(c) & Eq. 17.5.2.1b)

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cbgx} (lb)
264.79	296.70	1.000	1.000	1.000	1.000	9704	0.70	12125

Shear parallel to edge in y-direction:

$V_{bx} = \min|7(l_e/d_a)^{0.2}\sqrt{d_a}\lambda_a\sqrt{f'_c}c_{a1}^{1.5}; 9\lambda_a\sqrt{f'_c}c_{a1}^{1.5}|$ (Eq. 17.5.2.2a & Eq. 17.5.2.2b)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{bx} (lb)
5.00	0.625	1.00	2500	8.12	9704

$\phi V_{cbgy} = \phi\,(2)(A_{Vc}/A_{Vco})\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{bx}$ (Sec. 17.3.1, 17.5.2.1(c) & Eq. 17.5.2.1b)

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbgy} (lb)
264.79	296.70	1.000	1.000	1.000	1.000	9704	0.70	12125

10. Concrete Pryout Strength of Anchor in Shear (Sec. 17.5.3)

$\phi V_{cp} = \phi k_{cp}N_{cb} = \phi k_{cp}(A_{Nc}/A_{Nco})\Psi_{ed,N}\Psi_{c,N}\Psi_{cp,N}N_b$ (Sec. 17.3.1 & Eq. 17.5.3.1a)

k_{cp}	A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕV_{cp} (lb)
2.0	118.16	742.02	0.879	1.000	1.000	31615	0.70	6194

SIMPSON Strong-Tie®

Anchor Designer™
Software
Version 2.9.7376.6

Company:		Date:	3/14/2020
Engineer:		Page:	6/6
Project:			
Address:			
Phone:			
E-mail:			

11. Results

Interaction of Tensile and Shear Forces (Sec. R17.6)

Tension	Factored Load, N_{ua} (lb)	Design Strength, $øN_n$ (lb)	Ratio	Status
Steel	**5149**	**9825**	**0.52**	**Pass (Governs)**
Pullout	5149	29372	0.18	Pass
Side-face blowout	10298	36650	0.28	Pass

Shear	Factored Load, V_{ua} (lb)	Design Strength, $øV_n$ (lb)	Ratio	Status
Steel	1853	5112	0.36	Pass
T Concrete breakout x-	2462	6432	0.38	Pass
T Concrete breakout y+	2771	6432	0.43	Pass
|| Concrete breakout y+	2462	12125	0.20	Pass
|| Concrete breakout x+	2771	12125	0.23	Pass
Concrete breakout, combined	**-**	**-**	**0.58**	**Pass (Governs)**
Pryout	1853	6194	0.30	Pass

Interaction check	$(N_{ua}/\phi N_{ua})^{5/3}$	$(V_{ua}/\phi V_{ua})^{5/3}$	Combined Ratio	Permissible	Status
Sec. R17.6	0.34	0.40	74.0%	1.0	Pass

PAB5 (5/8"Ø) with hef = 24.000 inch meets the selected design criteria.

12. Warnings

- Concrete breakout strength in tension has not been evaluated against applied tension load(s) per designer option. Refer to ACI 318 Section 17.3.2.1 for conditions where calculations of the concrete breakout strength may not be required.

- Designer must exercise own judgement to determine if this design is suitable.