STRUCTURAL CALCULATIONS

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DATE: October 24, 2023

PROJECT: 18-220 **PB POST BASE**

BY: JOSHUA ANNETT
CHECKED BY: RICK HERNANDEZ, P.E., S.E. (OR and WA)
RON DERRICK, P.E., (CA)

FOR: **WOODSTONE STRUCTURES, LLC**

PROJECT DESCRIPTION & SCOPE OF SERVICES:
Structural design in accordance with the 2021 International Building Code (IBC) for the above referenced project as follows:

Wood-Bolted Connection Analysis

Steel Assembly Analysis

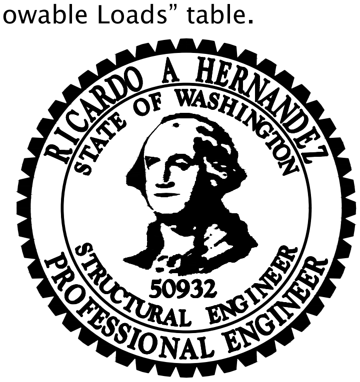
Concrete Anchor Analysis

Should conditions differ from those depicted in this report or accompanying drawings, contact this office for further direction. The analyses contained herein is for the Post Base, included fasteners, and specified concrete anchors only. Branch Engineering, Inc. has not reviewed any framing or foundation elements for any structure considered to be supporting the above referenced product and/or the connected roof.

SPECIAL INSPECTION:
Where required by authority having jurisdiction.

NOTES:
Analysis based upon measurements taken from Post Base bracket assembly, supplied by Woodstone Structures, LLC, October 2019.
No analysis of supporting structure or supporting framing has been conducted in conjunction with this report. Consult a local Engineer for each individual installation scenario.
See additional notes below "PB Allowable Loads" table.

Renews: JUNE 30, 2025



RENEWS: OCTOBER 20, 2024
DIGITALLY SIGNED

Expires: JUNE 30, 2025

Ronald J. Derrick

Digitally signed by Ronald J. Derrick
Date: 2023.10.30 09:17:59 -07'00'

STRUCTURAL ENGINEERING REPORT

DATE: October 24, 2023
PROJECT: 18-220 PB POST BASE
CLIENT: WOODSTONE STRUCTURES, LLC
REPORT BY: BRANCH ENGINEERING, INC.

POST BASE BRACKET (PB)

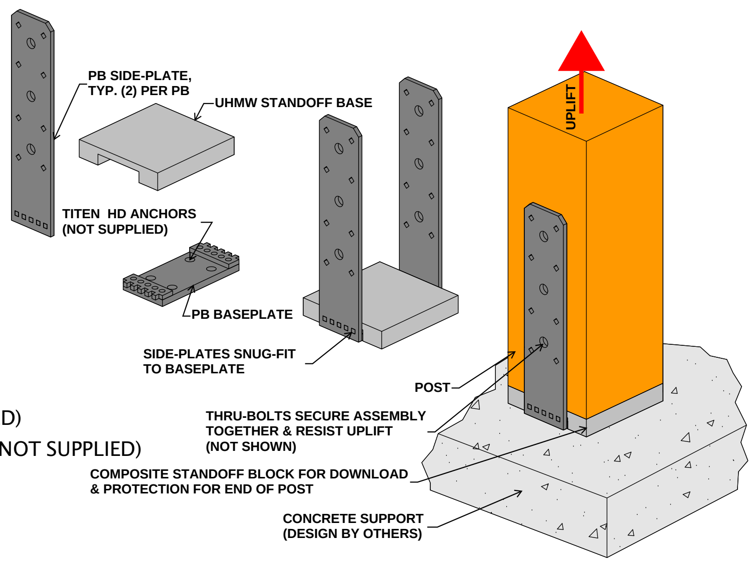
DESCRIPTION:

This structural engineering report has been requested by Woodstone Structures, LLC for preliminary analysis of a proprietary product called, "PB Post Base." The objective of this analysis is to report the allowable capacity of the product, in its current configuration, for use in supporting vertical loading in both the downward direction and in uplift.

ASSUMED MATERIAL:

(1) BASEPLATE - 3/8" ASTM A36
(2) SIDE-PLATES - 1/4" ASTM A36
(3) 1/2" DIA. ASTM A307 BOLT OR
(16) ¼"x2½" SIMPSON SDS SCREWS (DF ONLY)
(2) 1/2" DIA. TITEN HD CONCRETE ANCHOR (NOT SUPPLIED)
OR (2) 3/8" DIA. TITEN HD CONCRETE ANCHOR (NOT SUPPLIED)
OR (4) 1/4" DIA. TITEN HD CONCRETE ANCHOR w/ WASHERS (NOT SUPPLIED)
POST - SPECIES PER TABLE (NOT SUPPLIED)

OPTIONS: POST SIZE MAY VARY PER TABLE.

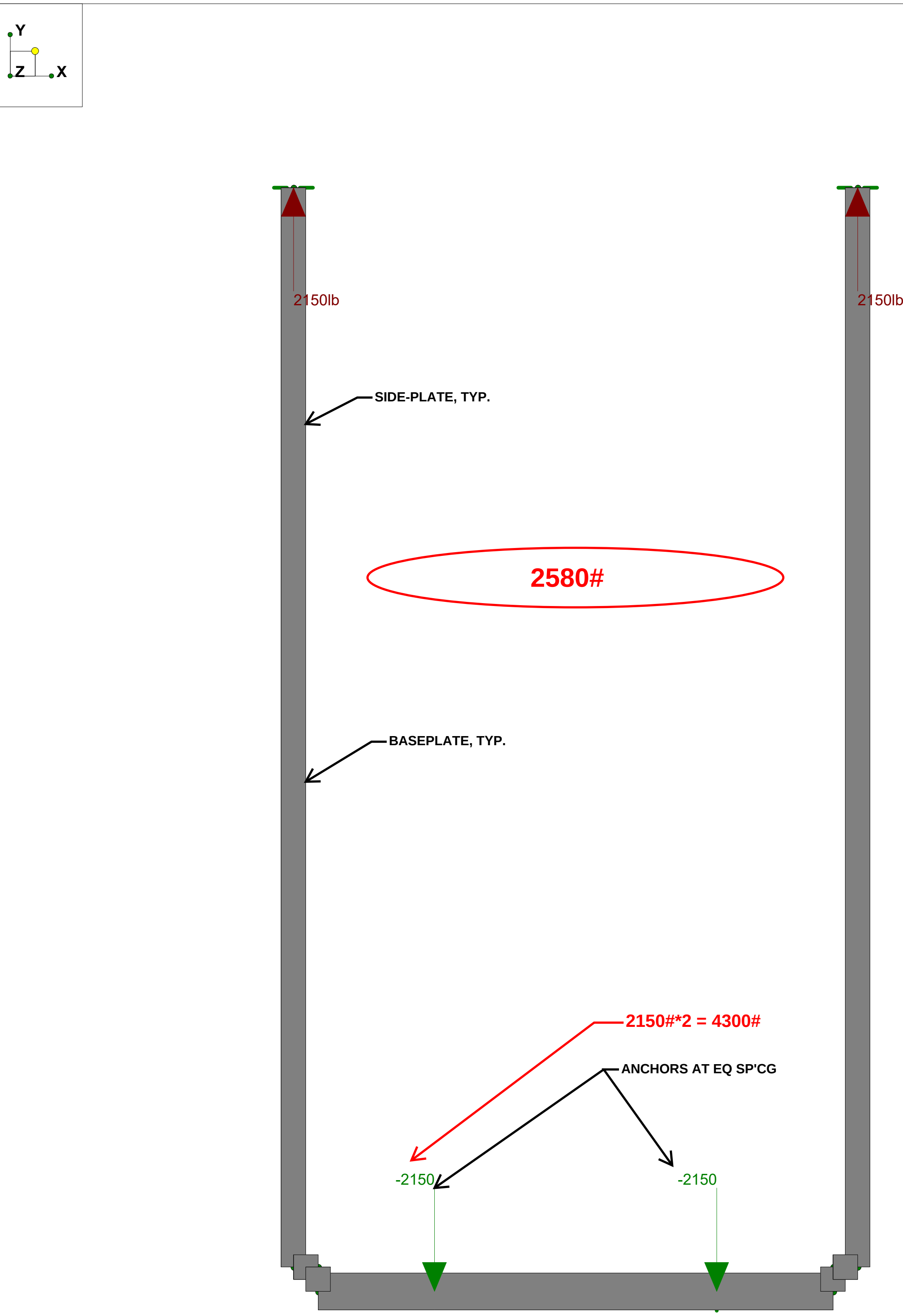


PB ALLOWABLE LOADS

MODEL No.	POST SIZE[16] (NOM.)	BASEPLATE THICKNESS	SIDE-PLATE THICKNESS	BASEPLATE FASTENER TO CONCRETE	MIN CONC. THICKNESS	MIN. EMBED	SIDE-PLATE FASTENER	DOWNLOAD (100)	DF/SP/HF UPLIFT (160)
					(in)	(in)		(lb)	(lb)
PB	4x6 or 6X6	3/8"	1/4"	(4) 1/4" TITEN HD	3.5"	2 1/2"	(3) 1/2" BOLTS	25055	1708
PB	4x6 or 6X6	3/8"	1/4"	(2) 3/8" TITEN HD	5"	3 1/4"	(3) 1/2" BOLTS	25055	1789
PB	4x6 or 6X6	3/8"	1/4"	(2) 1/2" TITEN HD	6.25"	4"	(3) 1/2" BOLTS	25055	2335
PB	6x6	3/8"	1/4"	(4) 1/4" TITEN HD	3.5"	2 1/2"	(16) SDS SCREWS	25055	1708
PB	6x6	3/8"	1/4"	(2) 3/8" TITEN HD	5"	3 1/4"	(16) SDS SCREWS	25055	1789
PB	6x6	3/8"	1/4"	(2) 1/2" TITEN HD	6.25"	4"	(16) SDS SCREWS	25055	2335

NOTES:

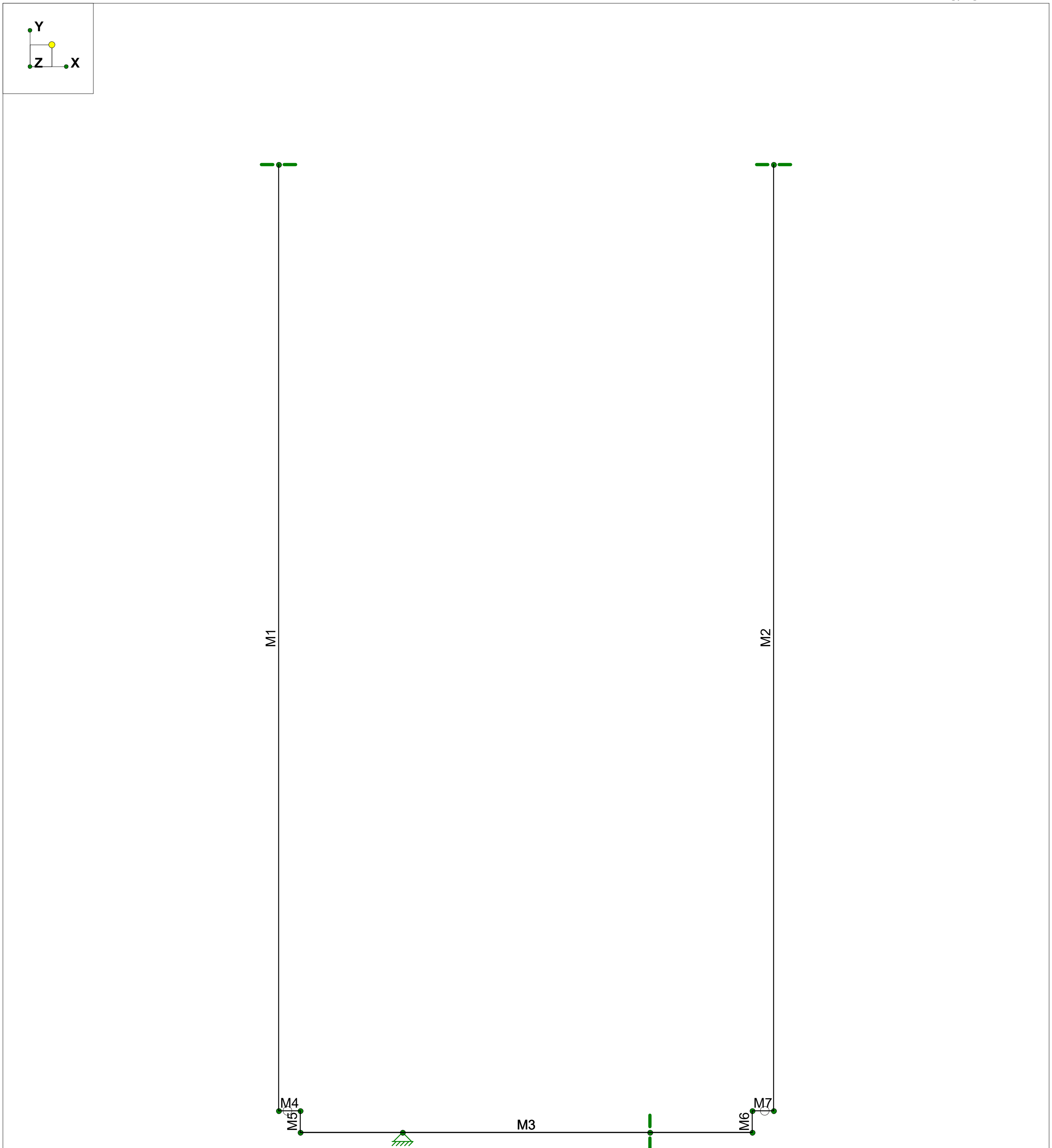
1. THE ABOVE STATED ALLOWABLE LOADS ASSUME WOOD POST SPECIES HEM-FIR OR BETTER (i.e. G≥0.43) EXCEPT FOR SDS SCREWS WHERE G≥0.50.
2. DOWNLOADS SHALL BE REDUCED WHERE LIMITED BY CAPACITY OF THE POST OR FOUNDATION.
3. ALLOWABLE LOADS SHOWN ARE FOR A SINGLE PB INSTALLED ON A CONCRETE BASE HAVING AT LEAST THE ABOVE STATED THICKNESS.
4. ANALYSIS AND ALLOWABLE LOADS ARE FOR THE STEEL BRACKET, INCLUDED BOLTS, AND SPECIFIED CONCRETE ANCHORS ONLY.
5. CONSULT WITH A LOCAL ENGINEER FOR EACH INDIVIDUAL INSTALLATION.
6. NO DESIGN OF SUPPORTING OR SUPPORTED FRAMING OR FOUNDATION HAS BEEN CONDUCTED. CONSULT AN INDEPENDENT ENGINEER FOR DESIGN OF SUCH FRAMING OR FOUNDATION.
7. UPLIFT LOADS HAVE BEEN INCREASED FOR WIND OR SEISMIC LOADING, WITH NO FURTHER INCREASE ALLOWED.
8. ALLOWABLE LOADS ARE FOR VERTICAL LOADS ONLY. LATERAL BRACING MUST BE SUPPLIED BY OTHER LATERAL FORCE RESISTING SYSTEMS DESIGNED BY OTHERS. LATERAL BRACING SYSTEMS MUST BE INDEPENDENT FROM THE PB BRACKET & POSTS.
9. ALLOWABLE LOADS SHOWN ARE FOR WET-SERVICE CONDITIONS (MOISTURE CONTENT >19%). NO INCREASE ALLOWED FOR DRY-SERVICE.
10. PROVIDE THE FOLLOWING MINIMUMS FOR BOLTS THRU WOOD POST & STEEL PLATE:
    a. EDGE DISTANCE = CENTER COLUMN ON BRACKET EACH WAY.
    b. END DISTANCE = 3 ½ INCHES (END OF POST TO CENTER OF MIDDLE THRU-BOLT)
11. PROVIDE THE FOLLOWING MINIMUMS FOR TITEN HD CONCRETE ANCHORS:
    a. 1/2" OR 3/8" DIA. ANCHOR EDGE DISTANCE = 4½ INCHES ALL AROUND.
    b. 1/4" DIA. ANCHOR EDGE DISTANCE = 3 INCHES ALL AROUND.
12. BOLT HOLES SHALL BE A MINIMUM OF 1/32" AND A MAXIMUM OF 1/16" LARGER THAN THE BOLT DIAMETER (PER 2012 NDS SEC. 11.1.3.2)
13. POST & PB ARE ASSUMED TO BE INSTALLED IN A VERTICALLY PLUMB POSITION WITH POST BEING LOADED CONCENTRICALLY ABOUT ITS CENTER EACH WAY.
14. BASEPLATE MAY EXPERIENCE INELASTIC YIELDING AT THE ABOVE STATED UPLIFT CAPACITY. SUBSEQUENT REPLACEMENT MAY BE REQUIRED.
15. THE ABOVE STATED ALLOWABLE UPLIFT LOADS APPLY TO WIND UPLIFT ONLY. CONSULT LOCAL BUILDING CODES FOR REQUIRED REDUCTION DUE TO LOAD COMBINATIONS INCLUDING OVERSTRENGTH FACTOR, WHERE UPLIFT IS DUE TO SEISMIC LOADING.
16. MULTIPLY ALLOWABLE DOWNLOAD BY 64% WHEN USING 4x6 POST.



STRENGTH LEVEL LOADS CONVERT TO SERVICE LEVEL
WL(LRFD) * 0.6 = WL(ASD)
2 * 2150# * 0.6 = 2580#

Loads: BLC 1, Uplift
Results for LC 2, Uplift
Y-direction Reaction Units are lb and lb-ft

BRANCH ENGINEERING,...		
JOSHUA ANNETT		Nov 4, 2022 at 9:03 AM
		Post Base 2022.r2d



BRANCH ENGINEERING,...		
JOSHUA ANNETT		Nov 4, 2022 at 10:46 AM
		Post Base 2022.r2d

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E5 F)	Density[lb/ft^3]	Yield[ksi]
1	A36 Gr.36	29000	11154	.3	.65	490	36

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rules	A [in2]	I (90,270) [in4]	I (0,180) [in4]
1	SIDE PL	PL1/4x2.75	Beam	None	A36 Gr.36	Typical	.688	.004	.433
2	HR2	PL1/4x1.25	Beam	None	A36 Gr.36	Typical	.313	.002	.041
3	BASEPLATE	PL3/8x2.75	Beam	None	A36 Gr.36	Typical	1.031	.012	.65

Member Primary Data

	Label	I Joint	J Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N1	N2	90	SIDE PL	Beam	None	A36 Gr.36	Typical
2	M2	N3	N4	90	SIDE PL	Beam	None	A36 Gr.36	Typical
3	M3	N5	N6	90	BASEPLATE	Beam	None	A36 Gr.36	Typical
4	M4	N2	N7	90	HR2	Beam	None	A36 Gr.36	Typical
5	M5	N7	N5	90	SIDE PL	Beam	None	A36 Gr.36	Typical
6	M6	N6	N8	90	SIDE PL	Beam	None	A36 Gr.36	Typical
7	M7	N8	N4	90	HR2	Beam	None	A36 Gr.36	Typical

Member Advanced Data

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	Defl Rati...	TOM	Inactive
1	M1						Yes			
2	M2						Yes			
3	M3						Yes			
4	M4	PIN					Yes	Default		
5	M5						Yes			
6	M6						Yes			
7	M7		PIN				Yes	Default		

Hot Rolled Steel Design Parameters

	Label	Shape	Length[in]	Lb-out[in]	Lb-in[in]	Lcomp top[in]	Lcomp bot[in]	L-torq...	K-out	K-in	Cb	Function
1	M1	SIDE PL	10.995			Lb out						Lateral
2	M2	SIDE PL	10.995			Lb out						Lateral
3	M3	BASEPLATE	5.25			Lb out						Lateral
4	M4	HR2	.25			Lb out						Lateral
5	M5	SIDE PL	.25			Lb out						Lateral
6	M6	SIDE PL	.25			Lb out						Lateral
7	M7	HR2	.25			Lb out						Lateral

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Joint	Point	Distributed
1	Uplift	WL			2		

Joint Loads and Enforced Displacements (BLC 1 : Uplift)

	Joint Label	L,D,M	Direction	Magnitude[(lb,lb-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N1	L	Y	2150
2	N3	L	Y	2150

Company	:	BRANCH ENGINEERING, INC.	Nov 4, 2022
Designer	:	JOSHUA ANNETT	9:22 AM
Job Number	:		Checked By: RICK HERNANDEZ, P.E., S.E.
Model Name	:		

Load Combinations

	Description	So...	P...	S...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...
1	LRFD																							
2	Uplift		Y		WL	1																		

Joint Reactions (By Combination)

	LC	Joint Label	X [lb]	Y [lb]	MZ [lb-ft]
1	2	N1	-1.183	0	0
2	2	N3	1.183	0	0
3	2	N9	0	-2150	0
4	2	N20	0	-2150	0
5	2	Totals:	0	-4300	
6	2	COG (in):	X: 2.875	Y: 11.245	

Member AISC 14th(360-10): LRFD Steel Code Checks (By Combination)

	LC	Member	Shape	UC Max	Loc[in]	Shear UC	Loc[in]	phi*Pnc[lb]	phi*Pnt[lb]	phi*Mn[lb-ft]	Cb	Eqn
1	2	M1	PL1/4x2.75	.048	0	.000	0	6691.459	22275	116.016	1	H1-1b
2	2	M2	PL1/4x2.75	.048	0	.000	0	6691.459	22275	116.016	1	H1-1b
3	2	M3	PL3/8x2.75	.982	4.047	.107	0	29521.251	33412.5	261.035	1	H1-1b
4	2	M4	PL1/4x1.25	.849	.25	.354	0	10118.606	10125	52.734	1	H1-1b
5	2	M5	PL1/4x2.75	.434	0	.004	0	22260.933	22275	116.016	1	H1-1b
6	2	M6	PL1/4x2.75	.434	.25	.004	0	22260.933	22275	116.016	1	H1-1b
7	2	M7	PL1/4x1.25	.849	0	.354	0	10118.606	10125	52.734	1	H1-1b

UC<1.0 = OK!

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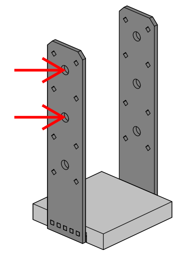
310 5th Street
Springfield, Oregon 97477
Telephone: (541) 746 0637

DATE: 11/4/2022

PROJECT: 18-220 WOODSTONE STRUCTURES
BY: JOSHUA ANNETT
CHECKED BY: RICK HERNANDEZ, P.E., S.E.
SHEET: PLvert (Post Base)

Bolted Shear Connection Design for Bolts in Standard Holes

Steel thickness:	**0.25 in**	F_y:	36 ksi	
Steel width:	**2.75 in**	F_u:	58 ksi	
Steel specification:	**A36**	ϕF_{nv}:	20.25 ksi	
Bolt diameter, d:	**0.5 in**	A_{gv}:	0.69 in^2	Shear Yielding
Bolt specification:	**A307**	A_g:	0.69 in^2	Tensile Yielding
Thread condition:	**N**	A_{nv}:	1.86 in^2	Shear Rupture
Bolt Hole Preparation Method:	**Punch**	A_e:	0.53 in^2	Tensile Rupture
Threaded Part F_u:	**60 ksi**	A_{nv}:	1.86 in^2	Block Shear
Bolt spacing, s:	**3.75 in**	A_{gv}:	2.25 in^2	Block Shear
Edge distance, L_{ev}:	**1.5 in**	A_{nt}:	0.19 in^2	Block Shear
Side distance, L_{eh}:	**1.375 in**	U_{bs}:	1	Block Shear
Number of bolts in row:	**3**	U:	1	Shear Lag Factor
Number of rows:	**1**			



Shear Yielding: ϕR_n =	14.85 kip
Tensile Yielding: ϕR_n =	22.28 kip
Shear Rupture: ϕR_n =	48.53 kip
Tensile Rupture: ϕR_n =	23.11 kip
Block Shear Rupture: ϕR_n =	44.61 kip
Bolt Shear Strength: ϕR_n =	11.93 kip
Bearing Strength at Bolt Hole: ϕR_n =	39.15 kip
Connection Design Strength:	**11.93 kips**

CAPACITY OF SIDE PLATE AT BOLT HOLES
WL(ASD) = 2 * 0.6 WL = 9,540#

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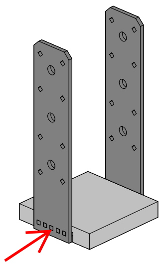
DATE: 11/4/2022

PROJECT: 18-220 WOODSTONE STRUCTURES
BY: JOSHUA ANNETT
CHECKED BY: RICK HERNANDEZ, P.E., S.E.
SHEET: PLvert (Post Base at Baseplate)

Bolted Shear Connection Design for Bolts in Standard Holes

Steel thickness:	**0.25 in**
Steel width:	**2.75 in**
Steel specification:	**A36**
Bolt diameter, d:	**0.25 in**
Bolt specification:	**A307**
Thread condition:	**N**
Bolt Hole Preparation Method:	**Punch**
Threaded Part F_u:	**60 ksi**
Bolt spacing, s:	**0.5 in**
Edge distance, L_{ev}:	**0.375 in**
Side distance, L_{eh}:	**0.375 in**
Number of bolts in row:	**1**
Number of rows:	**5**
Spacing between rows:	**0.5 in**

F_y:	36	ksi	
F_u:	58	ksi	
ϕF_{nv}:	20.25	ksi	
A_{gv}:	0.47	in^2	Shear Yielding
A_g:	0.69	in^2	Tensile Yielding
A_{nv}:	0.23	in^2	Shear Rupture
A_e:	0.22	in^2	Tensile Rupture
A_{nv}:	0.14	in^2	Block Shear
A_{gv}:	0.09	in^2	Block Shear
A_{nt}:	0.13	in^2	Block Shear
U_{bs}:	0.5		Block Shear
U:	1		Shear Lag Factor



Shear Yielding: ϕR_n =	10.13 kip
Tensile Yielding: ϕR_n =	22.28 kip
Shear Rupture: ϕR_n =	6.12 kip
Tensile Rupture: ϕR_n =	9.52 kip
Block Shear Rupture: ϕR_n =	4.24 kip
Bolt Shear Strength: ϕR_n =	
Bearing Strength at Bolt Hole: ϕR_n =	8.97 kip

Connection Design Strength: 4.24 kips

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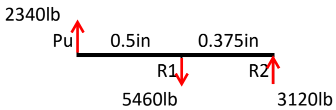
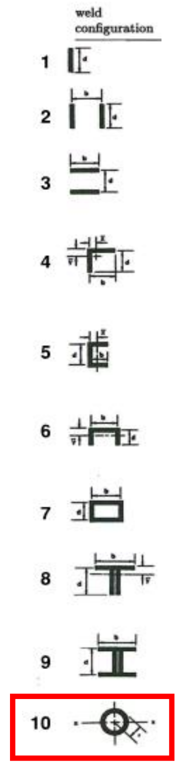
PROJECT: 18-220 WOODSTONE STRUCTURES
BY: JOSHUA ANNETT
CHECKED BY: RICK HERNANDEZ, P.E., S.E.
SHEET: weld

Combined Strength of Weld in Axial, Shear, & Bending



Axial Force, P_u		**5460 lb**	
Design Shear, V_u		**0 lb**	
Design Moment, Mu		**0 lb-ft**	
Design Torque, T_u		**0 lb-ft**	
BASE METAL Thickness		**0.375 in**	
ATTACHED PART Thickness		**0.25 in**	
		FILLET	
Depth of Preparation, S			
Weld type		10	
d		0.125 in	Outside Diameter
b		0.125 in	Inside Diameter
Section Modulus of Weld		0.01 sq in	
Reduction Factor for Weld, ϕ		0.75	
F_{EXX}		70 ksi	
Minimum Weld Size		0.125 in	
Weld Size Specified		0.125 in	
Quantity of Welds		5	
Axial Stress in Weld	f_a	31.465 ksi	1.00
Shear Stress in Weld	f_v	0.000 ksi	0.00
Bending Stress in Weld	f_b	0.000 ksi	0.00
Torsional Stress in Weld	f_t	0.000 ksi	0.00
Allowable Stress in Weld	F_w	31.50 ksi	
Combined Unity Check		1.00	OK



SIMPSON Strong-Tie® Anchor Designer™ Software
Version 2.9.7376.3

Company:	BRANCH ENGINEERING, INC.	Date:	7/27/2022
Engineer:		Page:	1/5
Project:			
Address:	310 5TH STREET		
Phone:	(541) 746-0637		
E-mail:	JOSHA@BRANCHENGINEERING.COM		

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
Units: Imperial units

Anchor Information:
Anchor type: Concrete screw
Material: Carbon Steel
Diameter (inch): 0.250
Nominal Embedment depth (inch): 2.500
Effective Embedment depth, h_{ef} (inch): 1.940
Code report: ICC-ES ESR-2713
Anchor category: 1
Anchor ductility: No
h_{min} (inch): 3.50
c_{ac} (inch): 6.00
C_{min} (inch): 1.50
S_{min} (inch): 1.50

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 3.50
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: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: Not applicable
Build-up grout pad: No

Base Plate
Length x Width x Thickness (inch): 4.12 x 2.75 x 0.25

Recommended Anchor
Anchor Name: Titen HD® - 1/4"Ø Titen HD, hnom:2.5" (64mm)
Code Report: ICC-ES ESR-2713

SIMPSON Strong-Tie®

Anchor Designer™ Software
Version 2.9.7376.3

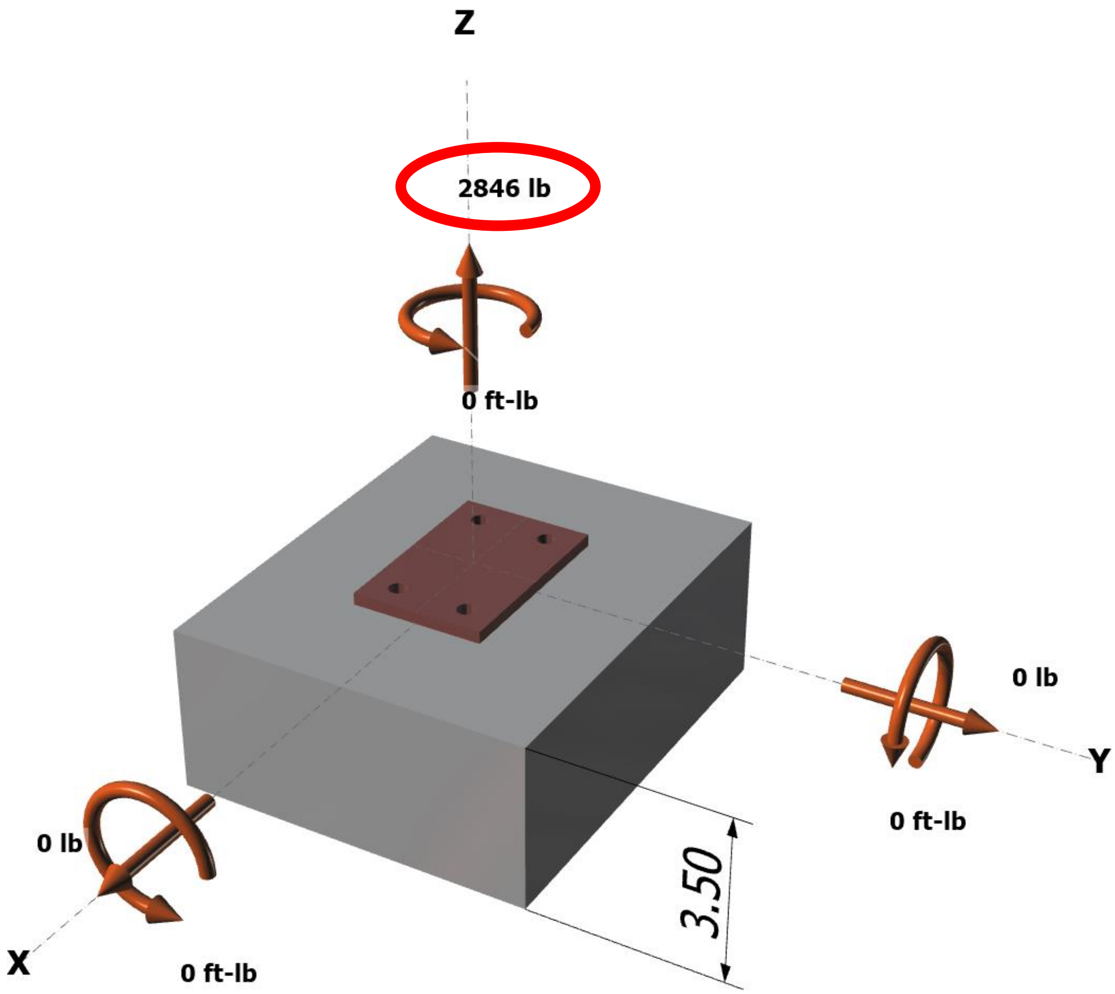
Company:	BRANCH ENGINEERING, INC.	Date:	7/27/2022
Engineer:		Page:	2/5
Project:			
Address:	310 5TH STREET		
Phone:	(541) 746-0637		
E-mail:	JOSHA@BRANCHENGINEERING.COM		

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: Yes

Strength level loads:

N_{ua} [lb]: 2846
V_{uax} [lb]: 0
V_{uay} [lb]: 0
M_{ux} [ft-lb]: 0
M_{uy} [ft-lb]: 0
M_{uz} [ft-lb]: 0

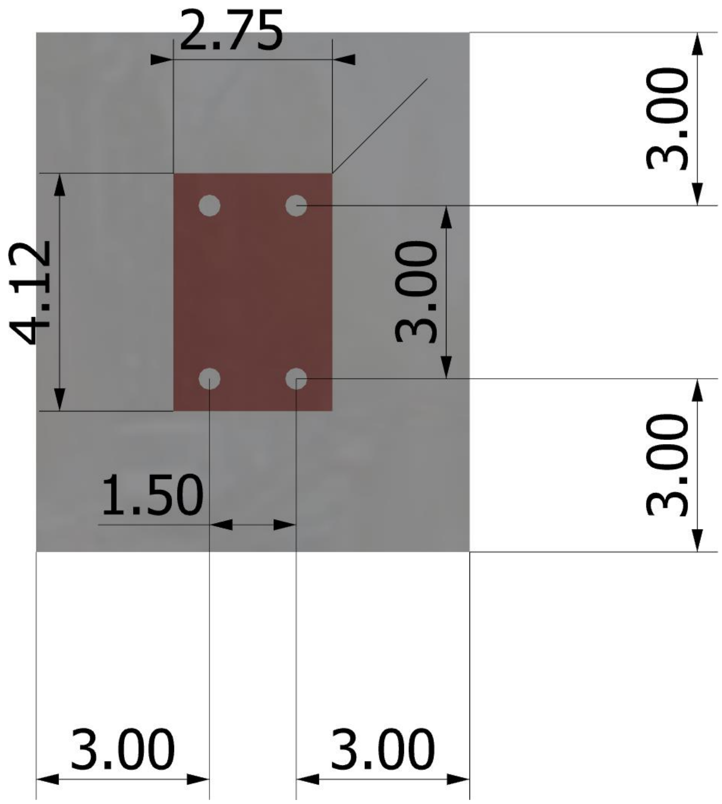
<Figure 1>



Anchor Designer™
Software
Version 2.9.7376.3

Company:	BRANCH ENGINEERING, INC.	Date:	7/27/2022
Engineer:		Page:	3/5
Project:			
Address:	310 5TH STREET		
Phone:	(541) 746-0637		
E-mail:	JOSHA@BRANCHENGINEERING.COM		

<Figure 2>

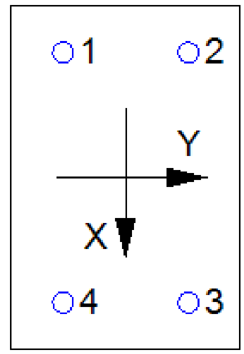


3. Resulting Anchor Forces

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	711.5	0.0	0.0	0.0
2	711.5	0.0	0.0	0.0
3	711.5	0.0	0.0	0.0
4	711.5	0.0	0.0	0.0
Sum	2846.0	0.0	0.0	0.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 2846
Resultant compression force (lb): 0
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

<Figure 3>



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

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
5195	0.65	3377

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.4.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.4.2.2a)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	2500	1.940	2297

$\phi N_{cbg} = \phi\, (A_{Nc} / A_{Nco})\, \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b$ (Sec. 17.3.1 & Eq. 17.4.2.1b)

A_{Nc} (in^2)	A_{Nco} (in^2)	$c_{a,min}$ (in)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cbg} (lb)
64.56	33.87	3.00	1.000	1.000	1.00	1.000	2297	0.65	2846

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

$\phi N_{pn} = \phi \Psi_{c,P} \lambda_a N_p (f'_c / 2{,}500)^n$ (Sec. 17.3.1, Eq. 17.4.3.1 & Code Report)

$\Psi_{c,P}$	λ_a	N_p (lb)	f'_c (psi)	n	ϕ	ϕN_{pn} (lb)
1.0	1.00	1905	2500	0.50	0.65	1238

SIMPSON Strong-Tie®

Anchor Designer™
Software
Version 2.9.7376.3

Company:	BRANCH ENGINEERING, INC.	Date:	7/27/2022
Engineer:		Page:	5/5
Project:			
Address:	310 5TH STREET		
Phone:	(541) 746-0637		
E-mail:	JOSHA@BRANCHENGINEERING.COM		

11. Results

11. Interaction of Tensile and Shear Forces

Tension	Factored Load, N_{ua} (lb)	Design Strength, $øN_n$ (lb)	Ratio	Status
Steel	712	3377	0.21	Pass
Concrete breakout	**2846**	**2846**	**1.00**	**Pass (Governs)**
Pullout	712	1238	0.57	Pass

1/4"Ø Titen HD, hnom:2.5" (64mm) meets the selected design criteria.

REDUCE CAPACITY BY OVERSTRENGTH FACTOR, WHERE APPLICABLE FOR SEISMIC DESIGN.

SIMPSON Strong-Tie®

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Project:			
Address:	310 5TH STREET		
Phone:	(541) 746-0637		
E-mail:	JOSHA@BRANCHENGINEERING.COM		

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
Units: Imperial units

Anchor Information:
Anchor type: Concrete screw
Material: Carbon Steel
Diameter (inch): 0.375
Nominal Embedment depth (inch): 3.250
Effective Embedment depth, h_{ef} (inch): 2.400
Code report: ICC-ES ESR-2713
Anchor category: 1
Anchor ductility: No
h_{min} (inch): 5.00
c_{ac} (inch): 3.63
C_{min} (inch): 1.75
S_{min} (inch): 3.00

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 5.00
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: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: Not applicable
Build-up grout pad: No

Base Plate
Length x Width x Thickness (inch): 5.63 x 2.75 x 0.25

Recommended Anchor
Anchor Name: Titen HD® - 3/8"Ø Titen HD, hnom:3.25" (83mm)
Code Report: ICC-ES ESR-2713

SIMPSON Strong-Tie®

Anchor Designer™
Software
Version 2.9.7376.3

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Engineer:		Page:	2/5
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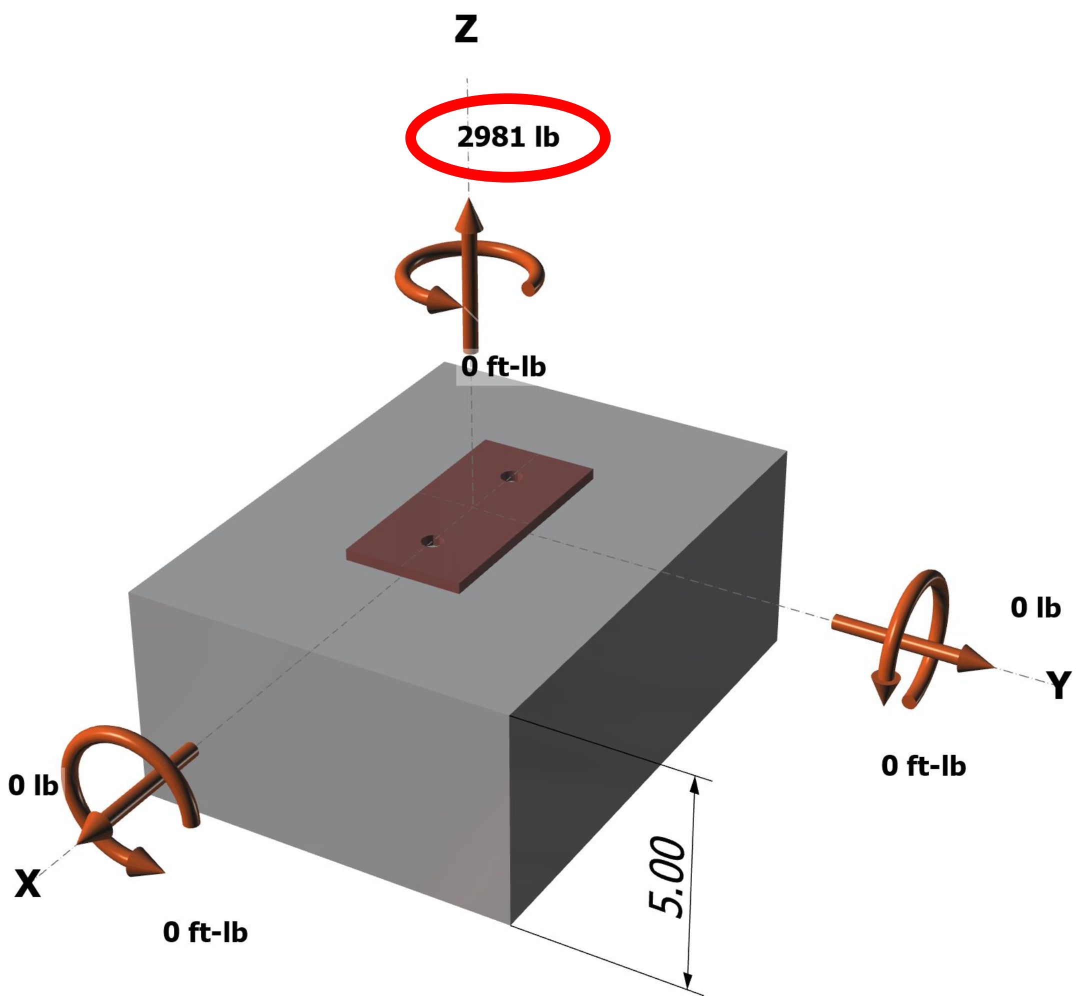
Address:	310 5TH STREET		
Phone:	(541) 746-0637		
E-mail:	JOSHA@BRANCHENGINEERING.COM		

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: Yes

Strength level loads:

N_{ua} [lb]: 2981
V_{uax} [lb]: 0
V_{uay} [lb]: 0
M_{ux} [ft-lb]: 0
M_{uy} [ft-lb]: 0
M_{uz} [ft-lb]: 0

<Figure 1>



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Anchor Designer™
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Company:	BRANCH ENGINEERING, INC.	Date:	7/27/2022
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Phone:	(541) 746-0637		
E-mail:	JOSHA@BRANCHENGINEERING.COM		

<Figure 2>

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Anchor Designer™
Software
Version 2.9.7376.3

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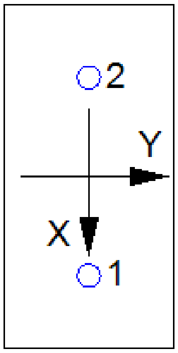
Project:			
Address:	310 5TH STREET		
Phone:	(541) 746-0637		
E-mail:	JOSHA@BRANCHENGINEERING.COM		

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	1490.5	0.0	0.0	0.0
2	1490.5	0.0	0.0	0.0
Sum	2981.0	0.0	0.0	0.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 2981
Resultant compression force (lb): 0
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

<Figure 3>



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

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
10890	0.65	7079

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.4.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.4.2.2a)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	2500	2.400	3160

$\phi N_{cbg} = \phi\, (A_{Nc} / A_{Nco})\, \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b$ (Sec. 17.3.1 & Eq. 17.4.2.1b)

A_{Nc} (in^2)	A_{Nco} (in^2)	$c_{a,min}$ (in)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cbg} (lb)
75.24	51.84	4.50	1.000	1.000	1.00	1.000	3160	0.65	2981

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

$\phi N_{pn} = \phi \Psi_{c,P} \lambda_a N_p (f'_c / 2{,}500)^n$ (Sec. 17.3.1, Eq. 17.4.3.1 & Code Report)

$\Psi_{c,P}$	λ_a	N_p (lb)	f'_c (psi)	n	ϕ	ϕN_{pn} (lb)
1.0	1.00	2700	2500	0.50	0.65	1755

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Anchor Designer™
Software
Version 2.9.7376.3

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Project:			
Address:	310 5TH STREET		
Phone:	(541) 746-0637		
E-mail:	JOSHA@BRANCHENGINEERING.COM		

11. Results

11. Interaction of Tensile and Shear Forces

Tension	Factored Load, N_{ua} (lb)	Design Strength, $øN_n$ (lb)	Ratio	Status
Steel	1491	7079	0.21	Pass
Concrete breakout	**2981**	**2981**	**1.00**	**Pass (Governs)**
Pullout	1491	1755	0.85	Pass

3/8"Ø Titen HD, hnom:3.25" (83mm) meets the selected design criteria.

REDUCE CAPACITY BY OVERSTRENGTH FACTOR, WHERE APPLICABLE FOR SEISMIC DESIGN.

Anchor Designer™
Software
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Address:	310 5TH STREET		
Phone:	(541) 746-0637		
E-mail:	JOSHA@BRANCHENGINEERING.COM		

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
Units: Imperial units

Anchor Information:
Anchor type: Concrete screw
Material: Carbon Steel
Diameter (inch): 0.500
Nominal Embedment depth (inch): 4.000
Effective Embedment depth, h_{ef} (inch): 2.990
Code report: ICC-ES ESR-2713
Anchor category: 1
Anchor ductility: No
h_{min} (inch): 6.25
c_{ac} (inch): 4.50
C_{min} (inch): 1.75
S_{min} (inch): 3.00

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 6.25
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: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: Not applicable
Build-up grout pad: No

Base Plate
Length x Width x Thickness (inch): 5.63 x 2.75 x 0.25

Recommended Anchor
Anchor Name: Titen HD® - 1/2"Ø Titen HD, hnom:4" (102mm)
Code Report: ICC-ES ESR-2713

SIMPSON Strong-Tie®

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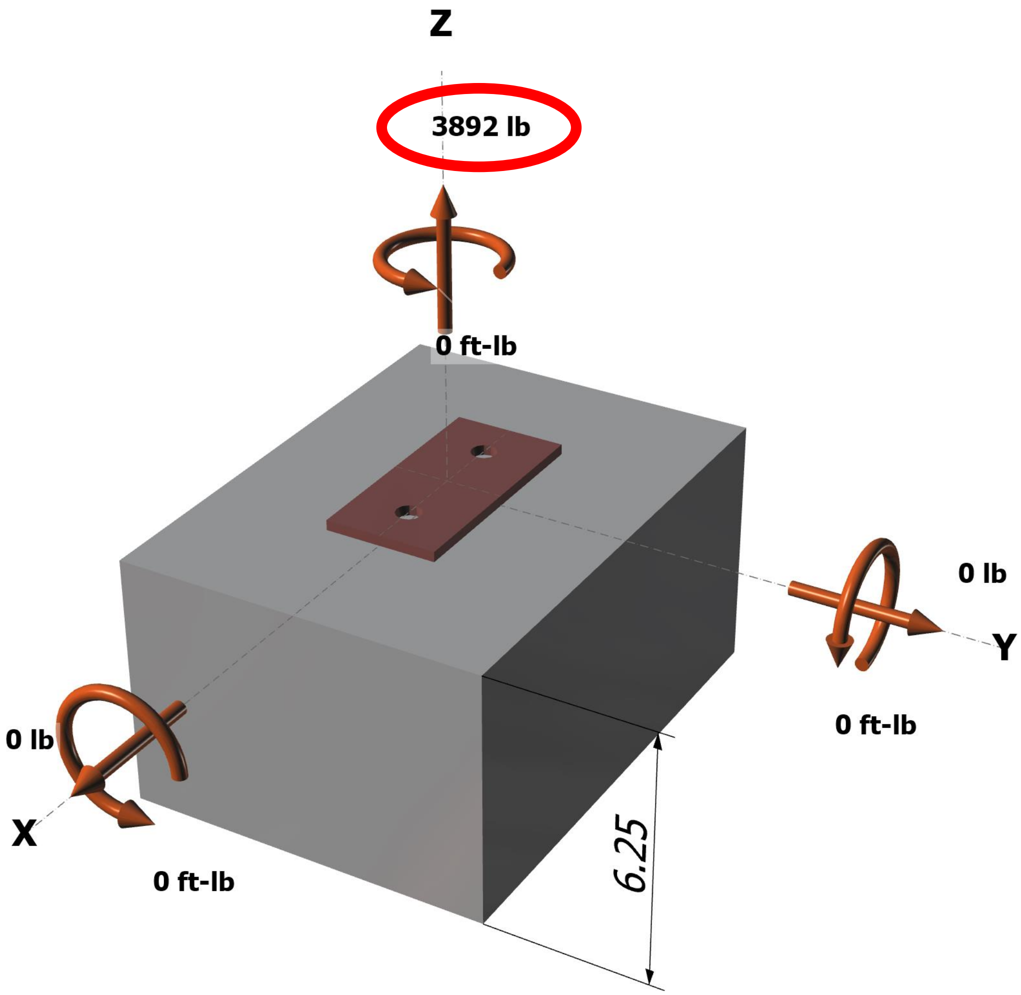
Project:			
Address:	310 5TH STREET		
Phone:	(541) 746-0637		
E-mail:	JOSHA@BRANCHENGINEERING.COM		

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: Yes

Strength level loads:

N_{ua} [lb]: 3892
V_{uax} [lb]: 0
V_{uay} [lb]: 0
M_{ux} [ft-lb]: 0
M_{uy} [ft-lb]: 0
M_{uz} [ft-lb]: 0

<Figure 1>



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<Figure 2>

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Anchor Designer™ Software
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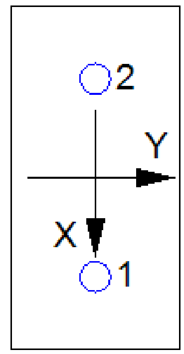
Project:			
Address:	310 5TH STREET		
Phone:	(541) 746-0637		
E-mail:	JOSHA@BRANCHENGINEERING.COM		

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	1946.0	0.0	0.0	0.0
2	1946.0	0.0	0.0	0.0
Sum	3892.0	0.0	0.0	0.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 3892
Resultant compression force (lb): 0
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

<Figure 3>



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

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
20130	0.65	13085

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.4.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.4.2.2a)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	2500	2.990	4395

$\phi N_{cbg} = \phi\,(A_{Nc} / A_{Nco})\,\Psi_{ec,N}\,\Psi_{ed,N}\,\Psi_{c,N}\,\Psi_{cp,N} N_b$ (Sec. 17.3.1 & Eq. 17.4.2.1b)

A_{Nc} (in^2)	A_{Nco} (in^2)	$c_{a,min}$ (in)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cbg} (lb)
109.61	80.46	4.50	1.000	1.000	1.00	1.000	4395	0.65	3892

REDUCE CAPACITY BY OVERSTRENGTH FACTOR, WHERE APPLICABLE FOR SEISMIC DESIGN.

11. Results

11. Interaction of Tensile and Shear Forces

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	1946	13085	0.15	Pass
Concrete breakout	**3892**	**3892**	**1.00**	**Pass (Governs)**

1/2"Ø Titen HD, hnom:4" (102mm) meets the selected design criteria.

Technical Products, Inc.
P: 262-335-3635 | F: 262-335-3606
E: tpi@technicalproductsinc.com
www.technicalproductsinc.com

UHMW STANDOFF BASE

NOT A PART OF THIS REPORT - INCLUDED FOR REFERENCE ONLY.

UHMW® Material Specifications

UHMW® is the ideal material for many wear parts in machinery and equipment. Polyethylenes are semi-crystalline materials with excellent chemical resistance, good fatigue and wear resistance, and a wide range of properties.

Physical Properties	Units	Test	UHMW®
Density	lb/in^3 g/cm^3	D792	0.034 0.93
Water Absorption, 24 hrs.	%	D570	< 0.01

Mechanical Properties	Units	Test	UHMW®
Tensile Strength	@ 72ºF psi	D638	5800
Tensile Strength	@ 150ºF psi	D638	400
Tensile Modules	psi	D638	80,000
Tensile Elongation at Break	%	D638	300
Flexural Strength at Yield	psi	D790	3500
Flexural Modulus	psi	D790	88,000
Compressive Strength	psi	D695	3000
Compressive Modulus	psi	D695	80,000
Shear Strength	psi	D732	3000
Hardness, Shore D	-	D785	D62 - D66
Izod Impact Notched	ft-lb/in	D256	No Break

Thermal Properties	Units	Test	UHMW®
Coefficient of Linear Thermal Expansion	X 10^{-5} in./in./°F	D696	11
Heat Deflection Temperature	@ 66 psi °F/°C @ 264 °F/°C	D648	203 / 95 180 / 82
Approx. Melting Temperature	ºF/ºC	D3418	275 / 136
Max. Operating Temperature	ºF/ºC	-	180 / 82
Thermal Conductivity	BTU- in/ft^2-hr.-°F x 10^{-4} cal/cm-sec-°C	C177	2.84 10.0
Flammability Rating	-	UL94	HB

Electrical Properties	Units	Test	UHMW®
Dielectric Strength	(V/mil) short time, 1/8" thick	D149	2300
Dielectric Constant	@1 MHz	D150	2.30 - 2.35
Dissipation Factor	@1 KHz	D150	0.0005
Surface Resistivity	ohm/square @ 50% RH	D257	>10^{15}
Arc Resistance	sec	D495	250 - 350

**The information provided in this table is a compilation of publicly available data. This information is provided for comparison purposes only, and is not intended to be warrantable. Further, *Technical Products, Inc.* disclaims any and all liability from errors, in accuracies, or omissions.

Branch ENGINEERING inc
Since 1977
civil • transportation
structural • geotechnical
SURVEYING
310 5th Street
Springfield, Oregon 97477
Telephone: (541) 746 0637

DATE: 11/4/2022

PROJECT: 18-220 WOODSTONE STRUCTURES
BY: JOSHUA ANNETT
CHECKED BY: RICK HERNANDEZ, P.E., S.E.
SHEET: Fasteners (POST BASE)

FASTENER LATERAL DESIGN VALUES

QTY	FASTENER DIAMETER	TYPE	SINGLE/ DOUBLE SHEAR	STEEL SIDE MEMBER THICKNESS	MAIN MEMBER	ALLOWABLE LATERAL DESIGN VALUE: PARALLEL TO GRAIN	ALLOWABLE LATERAL DESIGN VALUE: PERP. TO GRAIN	PENETRATION LENGTH INTO MAIN MEMBER, p	p/8D	LOAD DURATION FACTOR, CD	WET SERVICE FACTOR, CM	TOTAL ADJUSTED ALLOWABLE SHEAR, Z'
2	0.5	BOLT	DOUBLE	0.25	3.5	1540		THRU	1	1.6	0.7	3450
8	0.25	SDS	SINGLE	0.25	5.5	420			1	1.6	1	5376

QTY	DIAMETER	CONCRETE BREAKOUT STRENGTH, ΦcbNcb	PULLOUT STRENGTH, ΦpNp	STEEL STRENGTH, ΦsaNsa
4	0.25	2846	4952	13508
2	0.375	2981	3510	14158
2	0.5	3892	N/A	26170

MIN WL = 2846# * 0.6 = 1708#
MIN WL = 2981# * 0.6 = 1789 lb#
MIN WL = 3892# * 0.6 = 2335 lb#

THE INFORMATION BELOW IS NOT A PART OF THIS REPORT - INCLUDED FOR REFERENCE ONLY.

THRU-BOLT

NDS TABLE 12G

Thickness: Main Member t_m in.	Thickness: Side Member t_s in.	Bolt Diameter D in.	G=0.43 Hem-Fir $Z_{\parallel}$ lbs	G=0.43 Hem-Fir $Z_{\perp}$ lbs.
3-1/2	1/4	1/2	1540	890
		5/8	2260	980
		3/4	3120	1080
		7/8	3680	1160
		1	4200	1260

SDS SCREWS

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TABLE 2—REFERENCE LATERAL DESIGN VALUES (Z) FOR SINGLE SHEAR STEEL-TO-WOOD CONNECTIONS WITH SDS SCREWS[1,2]

SCREW LENGTH (inches)	STEEL SIDE MEMBER DESIGN THICKNESS[3,4], t_s (inches): 0.0584 (No. 16 gage)	0.0721 (No. 14 gage)	0.1026 (No. 12 gage)	0.1342 (No. 10 gage)	0.1795 (No. 7 gage)	0.2405 (No. 3 gage)
	Lateral Design Value (Z)[5,6,7] (lbf)					
$1^1/_2$	250	250	250	250	250	250
$1^3/_4$	250	250	250	250	250	250
2	250	290	290	290	290	290
$2^1/_2$	250	390	390	420	420	420
3	250	420	420	420	420	420
$3^1/_2$	250	420	420	420	420	420
$4^1/_2$	250	420	420	420	420	420
5	250	420	420	420	420	420
6	250	420	420	420	420	420
8	250	420	420	420	420	420

DF G≥0.50 ONLY

Branch ENGINEERING inc
Since 1977
civil · transportation structural · geotechnical SURVEYING
310 5th Street
Springfield, Oregon 97477
Telephone: (541) 746 0637

DATE: 11/4/2022

PROJECT: 18-220 WOODSTONE STRUCTURES
BY: JOSHUA ANNETT
CHECKED BY: RICK HERNANDEZ, P.E., S.E.
SHEET: Capacity Summary

FASTENER LATERAL DESIGN VALUES

COMPONENT	QTY	1/4 ALLOWABLE WIND UPLIFT LOAD w/ (4) AT EQ SPCG.	3/8 ALLOWABLE WIND UPLIFT LOAD w/ (2) ANCHORS AT EQ SPACING	1/2 ALLOWABLE WIND UPLIFT LOAD w/ (2) ANCHORS AT EQ SPACING	
THRU-BOLTS IN WOOD COLUMN		3450 lb	3450 lb	3450 lb	
CONCRETE ANCHOR		1708 lb	1789 lb	2335 lb	CONTROLS DESIGN
STEEL ASSEMBLY	2	2580 lb	2580 lb	2580 lb	
FILLET WELD IN HOLE	2	2808 lb	2808 lb	2808 lb	
BOLT HOLES IN STEEL	2	14314 lb	14314 lb	14314 lb	
SIDE-PLATE TO BASEPLATE CONNECTION	2	5085 lb	5085 lb	5085 lb	

			ALLOWABLE DOWN LOAD AT BASE	BEARING AREA
	f'_c=2500psi	CONCRETE	25055 lb	29.02sq in
SF=2	fc=3000psi	UHMW BASE	36681 lb	24.45sq in

CONTROLS DESIGN