STRUCTURAL CALCULATIONS

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DATE: May 5, 2025
PROJECT: 18-220 **PB44 POST BASE**

BY: TAYLOR WASHINGTON

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

FOR: **PATIO ROOF RISER**

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

Wood Fastener 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 are 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 any connected roof elements.

SPECIAL INSPECTION:
None

NOTES:
Analysis based upon measurements taken from Post Base assembly, supplied by Patio Roof Riser.
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.

REGISTERED PROFESSIONAL ENGINEER
104978PE
Josh Annett
2025.05.05
12:20:08-07'00'
DIGITALLY SIGNED
OREGON
MAY 14, 2024
JOSHUA J. ANNETT
RENEWS: DEC. 31, 2025

Digitally signed by Ricardo Hernandez
RICARDO A HERNANDEZ
STATE OF WASHINGTON
50932
STRUCTURAL ENGINEER
PROFESSIONAL ENGINEER
RENEWS: OCTOBER 20, 2026
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Ron Derrick
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PROFESSIONAL ENGINEER
LICENSED
P-23026
STATE OF IDAHO
TODD A. COSTLEY
DATE: 04/28/25

STRUCTURAL ENGINEERING REPORT

DATE: May 2, 2025
PROJECT: 18-220 PB44 POST BASE
CLIENT: PATIO ROOF RISER
REPORT BY: BRANCH ENGINEERING, INC.

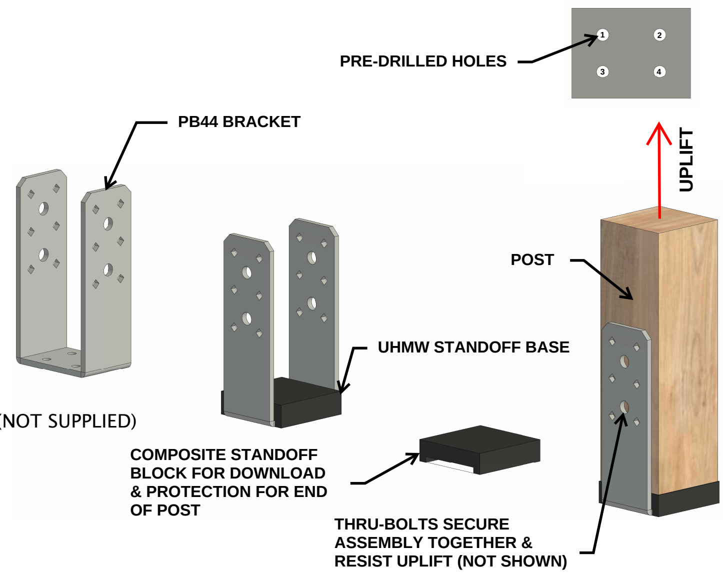
POST BASE BRACKET (PB44)

DESCRIPTION:

This structural engineering report has been requested by Patio Roof Riser for preliminary analysis of a proprietary product called, "PB44 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) POST BASE BRACKET – 1/4" ASTM A36
(2) 1/2" DIA. ASTM A307 BOLT (NOT SUPPLIED)
OR (12) ¼"x2½" SIMPSON SDS SCREWS (NOT SUPPLIED)
(2) 3/8" DIA. TITEN HD CONCRETE ANCHORS, See Notes 16 & 17. (NOT SUPPLIED)
OR (4) 1/4" DIA. TITEN HD CONCRETE ANCHORS (NOT SUPPLIED)
(4) ¼" STANDARD WASHERS (NOT SUPPLIED)
POST – SPECIES PER TABLE (NOT SUPPLIED)

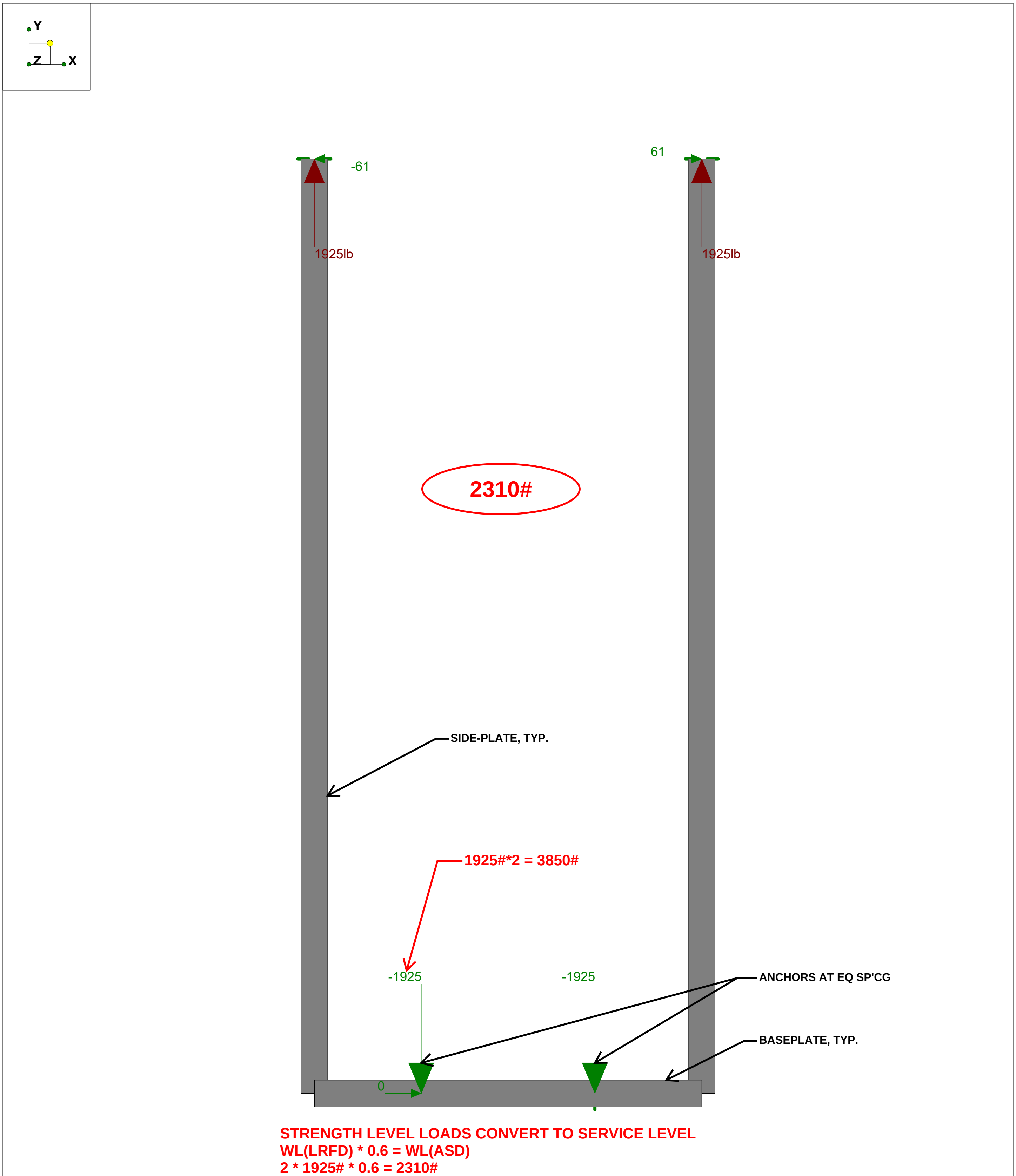


PB44 ALLOWABLE LOADS

MODEL No.	POST SIZE[16] (NOM.)	BASEPLATE THICKNESS	SIDE-PLATE THICKNESS	BASEPLATE FASTENER TO CONCRETE	MIN CONC. THICKNESS (in)	MIN. EMBED (in)	SIDE-PLATE FASTENER	DOWNLOAD (100) (lb)	DF/SP/HF UPLIFT (160) (lb)
PB44	4x4 or 4x6	1/4"	1/4"	(4) 1/4" TITEN HD	3.5"	2 1/2"	(2) 1/2" BOLTS	8045	1462
PB44	4x4 or 4x6	1/4"	1/4"	(4) 3/8" TITEN HD	5	3 1/4"	(2) 1/2" BOLTS	8045	1869
PB44	4x4 or 4x6	1/4"	1/4"	(4) 1/4" TITEN HD	3.5"	2 1/2"	(6) SDS SCREWS	8045	1462
PB44	4x4 or 4x6	1/4"	1/4"	(4) 3/8" TITEN HD	5	3 1/4"	(6) SDS SCREWS	8045	1869

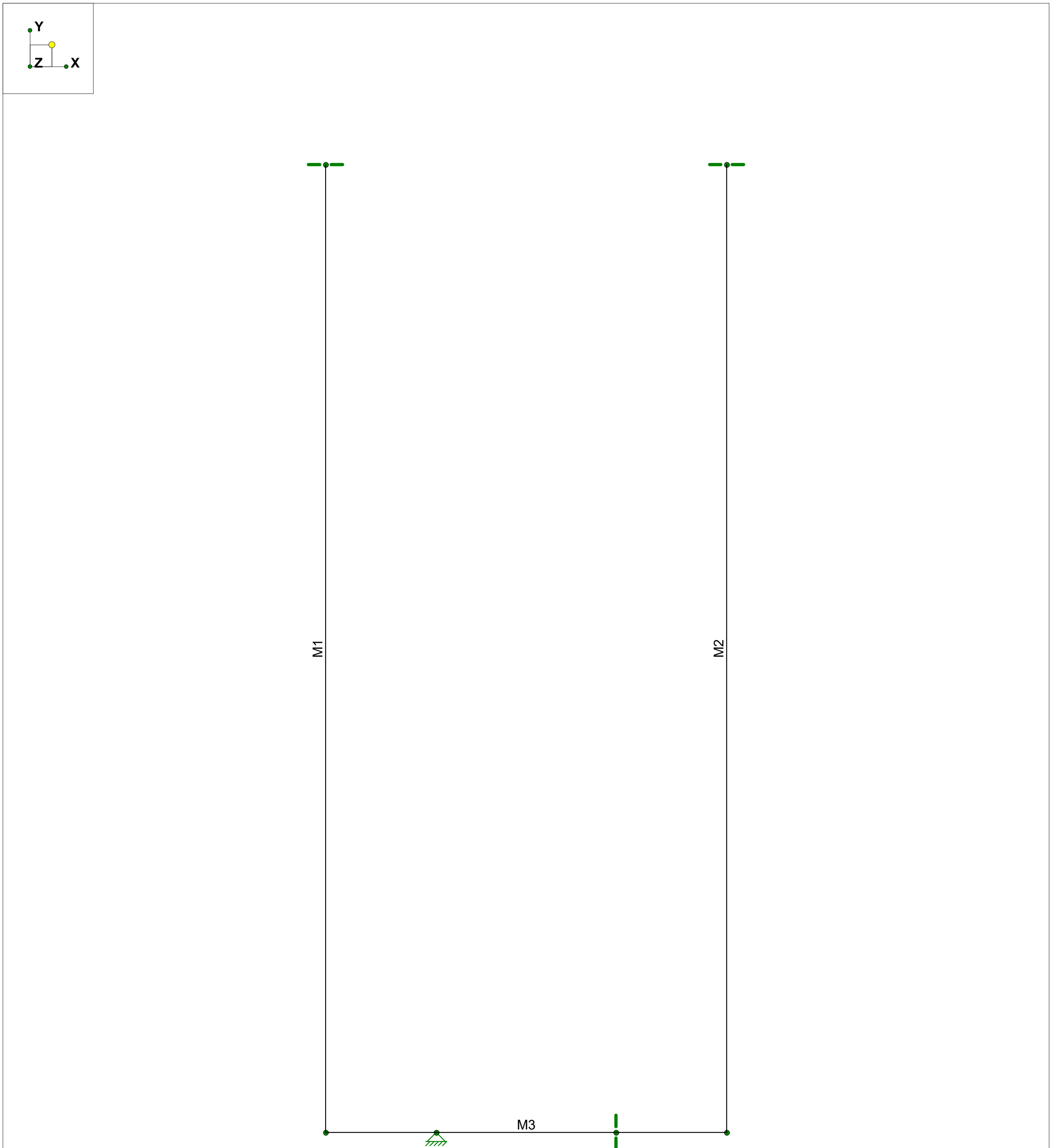
NOTES:

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 PB44 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 PB44 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 = EDGE OF BRACKET TO CENTERLINE OF THE THRU-BOLT POST EACH WAY.
    b. END DISTANCE ≥ 3 ½ INCHES (END OF POST TO CENTER OF FIRST THRU-BOLT)
11. PROVIDE THE FOLLOWING MINIMUMS FOR TITEN HD CONCRETE ANCHORS TO ANY EDGE OF SUPPORTING CONCRETE ELEMENT:
    a. 1/4" DIA. ANCHOR EDGE DISTANCE = 6 INCHES ALL AROUND.
    b. 3/8" DIA. ANCHOR EDGE DISTANCE = 4 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 NDS SEC. 12.1.3.2)
13. POST & PB44 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. THE PB BASE HAS FOUR HOLES ARRANGED IN A RECTANGULAR PATTERN. FOR INSTALLATIONS UTILIZING (2) 3/8" TITEN HD CONCRETE ANCHORS, ANCHORS MUST BE INSTALLED IN TWO PRE-DRILLED HOLES ARRANGED DIAGONALLY FROM EACH OTHER TO ENSURE PROPER STABILITY AND THE STATED ALLOWABLE LOADS. DO NOT USE TWO HOLES THAT ARE ADJACENT TO EACH OTHER IN EITHER DIRECTION. (HOLE COMBINATION 1-4 OR 2-3)
17. (2) 3/8" DIA. TITEN HD CONCRETE ANCHOR IS THE RECOMMENDED ANCHORING METHOD. 1/4" DIA. TITEN HD CONCRETE ANCHORS MAY REQUIRE WASHERS.



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

BRANCH ENGINEERING,...	
JOSHUA ANNETT	May 2, 2025 at 11:55 AM
	Post Base 2022.r2d



BRANCH ENGINEERING,...		
JOSHUA ANNETT		May 2, 2025 at 11:56 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	0.3	0.65	490	36

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rules	A [in2]	I (90,270) [i...	I (0,180) [in4]
1	SIDE PL	PL1/4x2.75	Beam	None	A36 Gr.36	Typical	0.688	0.004	0.433
2	HR2	PL1/4x1.25	Beam	None	A36 Gr.36	Typical	0.312	0.002	0.041
3	BASEPLATE	PL1/4x2.75	Beam	None	A36 Gr.36	Typical	0.688	0.004	0.433

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	N2	N4	90	BASEPLATE	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			

Hot Rolled Steel Design Parameters

	Label	Shape	Length[...	Lb-out[in]	Lb-in[in]	Lcomp top...	Lcomp bot...	L-torq...	K-out	K-in	Cb	Chan...	a[in]	Functi...
1	M1	SIDE PL	8.75			Lb out						N/A	N/A	Lateral
2	M2	SIDE PL	8.75			Lb out						N/A	N/A	Lateral
3	M3	BASEPLA...	3.625			Lb out						N/A	N/A	Lateral

Basic Load Cases

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

Load Combinations

	Description	Sol...	PD...	SR...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...
1	LRFD																							
2	Uplift		Y		WL	1																		

Joint Loads and Enforced Displacements (BLC 1 : Uplift)

	Joint Label	L,D,M	Direction	Magnitude[(lb,lb-ft), (in,rad), (...	Inactive
1	N1	L	Y	1925	
2	N3	L	Y	1925	

Member AISC 15th (360-16): 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	0.427	8.75	0.005	8.75	10274.348	22275	116.016	1	H1-1b
2	2	M2	PL1/4x2.75	0.427	8.75	0.005	8.75	10274.348	22275	116.016	1	H1-1b

UC<1.0 = OK!

Member AISC 15th (360-16): LRFD Steel Code Checks (By Combination) (Continued)

	LC	Member	Shape	UC Max	Loc[in]	Shear UC	Loc[in]	phi*Pnc[lb]	phi*Pnt[lb]	phi*Mn[lb-ft]	Cb	Eqn
3	2	M3	PL1/4x2.75	1	2.605	0.144	3.625	19504.654	22275	116.016	1	H1-1b

UC≤1.0 = OK!

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310 5th Street
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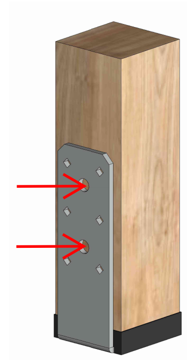
Telephone: (541) 746 0637

DATE: 5/2/2025

PROJECT: 18-220.2 WOODSTONE STRUCTURES
BY: RICK HERNANDEZ

Bolted Shear Connection Design for Bolts in Standard Holes - AISC Spec J3.10 and J4.1 - J4.3

Steel thickness:	**0.25 in**	F_y:	36 ksi	
Steel width:	**2.75 in**	F_u:	58 ksi	
Steel specification:	**A36**	ΦF_v:	20.25 ksi	Bolt Shear Strength
Bolt diameter, d:	**0.5 in**	A_{gv}:	0.94 in^2	Shear Yielding
Bolt specification:	**A307**	A_g:	0.69 in^2	Tensile Yielding
Thread condition:	**N**	A_{nv}:	0.73 in^2	Shear Rupture
Bolt spacing, s:	**2 in**	A_e:	0.55 in^2	Tensile Rupture
Edge distance, L_{ev}:	**1.75 in**	A_{nt}:	0.27 in^2	Block Shear
Side distance, L_{eh}:	**1.375 in**	U_{bs}:	1	Block Shear
Number of bolts in row:	**2**			
Number of rows:	**1**			



Shear Yielding: ΦRn =	20.25 kip
Tensile Yielding: ΦRn =	22.28 kip
Shear Rupture: ΦRn =	18.96 kip
Tensile Rupture: ΦRn =	23.79 kip
Block Shear Rupture: ΦRn =	27.08 kip
Bolt Shear Strength: ΦRn =	7.95 kip
Bearing Strength at Bolt Hole: ΦRn =	26.10 kip
Tearout Strength at Bolt Hole: ΦRn =	37.52 kip

Connection Design Strength: **7.95 kips**

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

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DATE: 5/2/2025

PROJECT: 18-220.2 WOODSTONE STRUCTURES
BY: TAYLOR WASHINGTON
CHECKED BY: JOSHUA ANNETT
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	GROUP ACTION FACTOR	TOTAL ADJUSTED ALLOWABLE SHEAR, Z'
2	0.5	BOLT	DOUBLE	0.25	3.5	1540		THRU	1	1.6	0.7	0.996	3436
6	0.25	SDS	SINGLE	0.25	3.5	420			1	1.6	1		4032

USING (3) EA. SIDE FOR CALC

QTY	FASTENER DIAMETER	TYPE	CRITICAL EDGE DIST, cac	EFFECTIVE EMBEDMENT DEPTH, hef	CONCRETE BREAKOUT STRENGTH, ΦcbNcb	PULLOUT STRENGTH, ΦpNp	STEEL STRENGTH, ΦsaNsa
4	0.25	CONC SCREW	1.5	1.94	2437	4952	13508
2	0.375	CONC SCREW	1.75	2.40	3115	3510	14158

SEE ANCHOR DESIGNS AT END OF DOCUMENT

INFORMATION SHOWN HERE IS NOT A PART OF THIS REPORT AND HAS BEEN INCLUDED HERE FOR REFERENCE ONLY

ESR-2236 ICC-ES Most Widely Accepted and Trusted Page 7 of 11

TABLE 2—REFERENCE LATERAL DESIGN VALUES (Z) FOR SINGLE SHEAR STEEL-TO-WOOD CONNECTIONS WITH SDS SCREWS[1,2,5,6,7,8]

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) (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

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N, 1 ksi = 6.89 MPa

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DATE: 5/2/2025

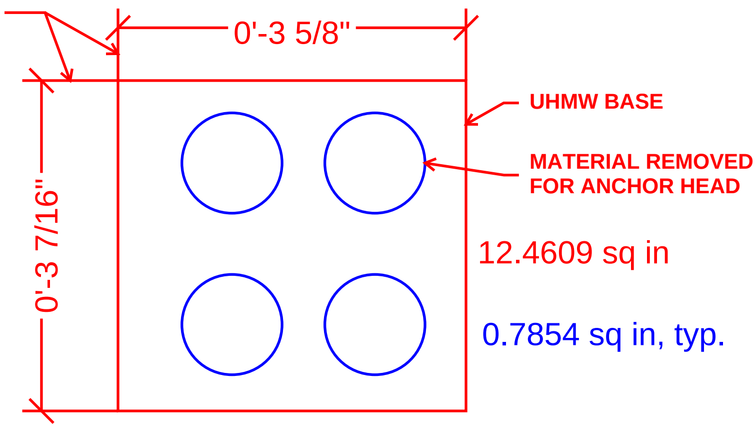
PROJECT: 18-220.2 WOODSTONE STRUCTURES
BY: TAYLOR WASHINGTON
CHECKED BY: JOSHUA ANNETT
SHEET: Capacity Summary

FASTENER LATERAL DESIGN VALUES

COMPONENT	QTY	1/4 ALLOWABLE WIND UPLIFT LOAD w/ (4) ANCHORS	3/8 ALLOWABLE WIND UPLIFT LOAD w/ (2) ANCHORS	
SIDE PLATE FASTENERS		3436 lb	3436 lb	
CONCRETE ANCHOR		1462 lb	1869 lb	CONTROLS
STEEL ASSEMBLY	2	2310 lb	2310 lb	
BOLT HOLES IN STEEL	2	9543 lb	9543 lb	

	ALLOWABLE DOWN LOAD AT BASE	BEARING AREA	
CONCRETE	8045 lb	9.32sq in	CONTROLS
UHMW BASE	13979 lb	9.32sq in	

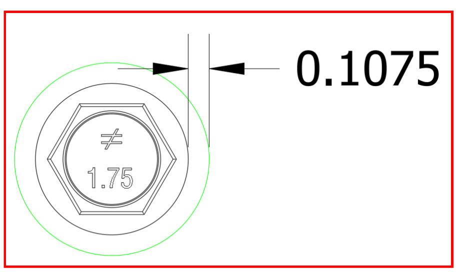
UHMW BASE DIMENSIONS CHECKING BEARING OF STANDOFF BASE ON CONCRETE, WOOD POST WILL ALWAYS HAVE LESS BEARING CAPACITY THAN UHMW.



BEARING AREA = 12.46SQ IN - 4 * 0.79 SQ IN = 9.32 SQ. IN

(0.65)(0.85)(2500)(9.32) = 12,873 LB FACTORED BEARING CAPACITY - CONCRETE
12,873 / 1.6 = 8045 MINIMUM SERVICE BEARING CAPACITY. (USE UHMW AREA AS CONSERVATIVE APPROXIMATION OF STEEL BEARING AREA).

(3000)(9.32) LB = 27960 LB FACTORED BEARING CAPACITY - UHMW
27,960 / SF=2 = 13,980 LB



SKETCH OF 3/8" ANCHOR IN 1" DIA HOLE AT UHMW BASE

INFORMATION SHOWN HERE IS NOT A PART OF THIS REPORT AND HAS BEEN INCLUDED HERE 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/in³ g/cm³	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

1.Project information

Project description:
Location:
Design name: Design

Comment:

2. Input Data & Anchor Parameters

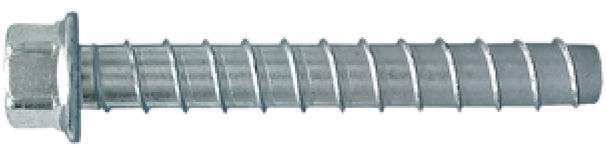
General
Design method:ACI 318-19
Units: Imperial units

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): 8.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental edge 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): 2.75 x 3.62 x 0.25

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

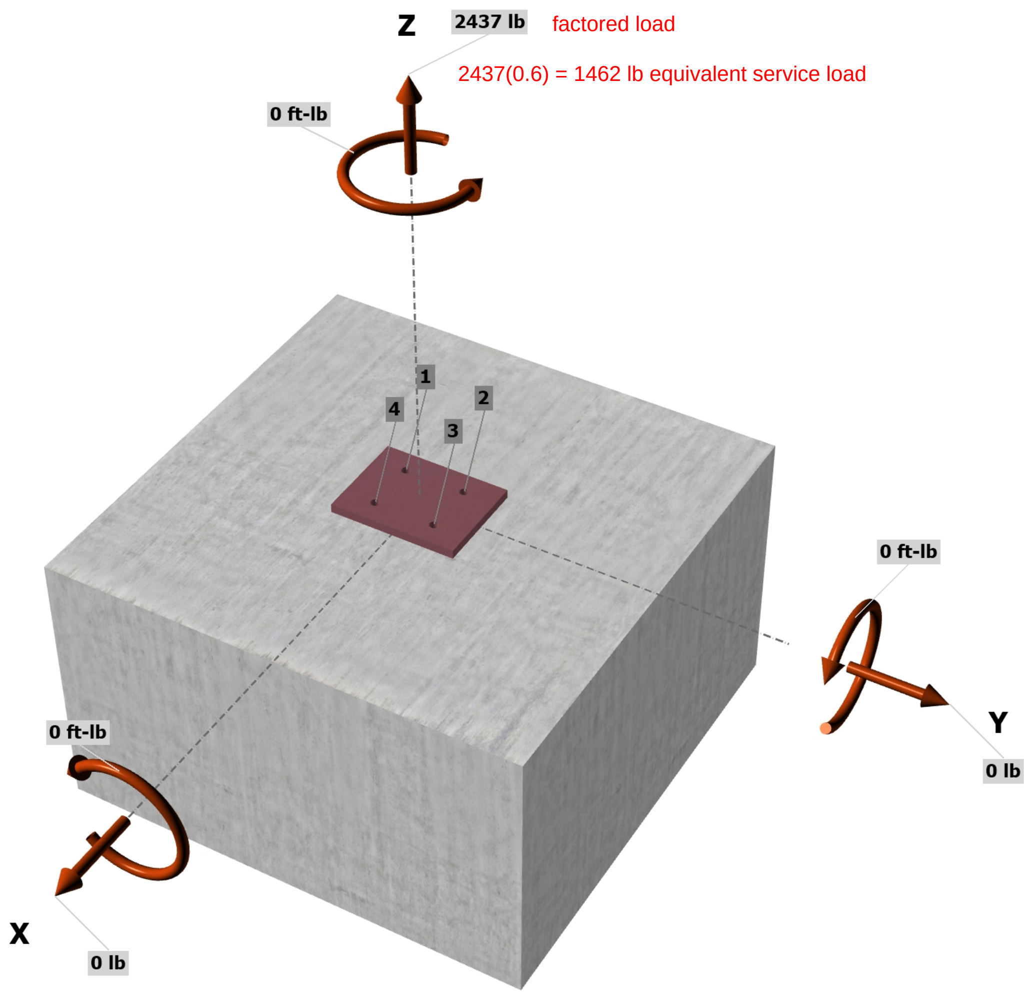


Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: Not applicable
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: Yes

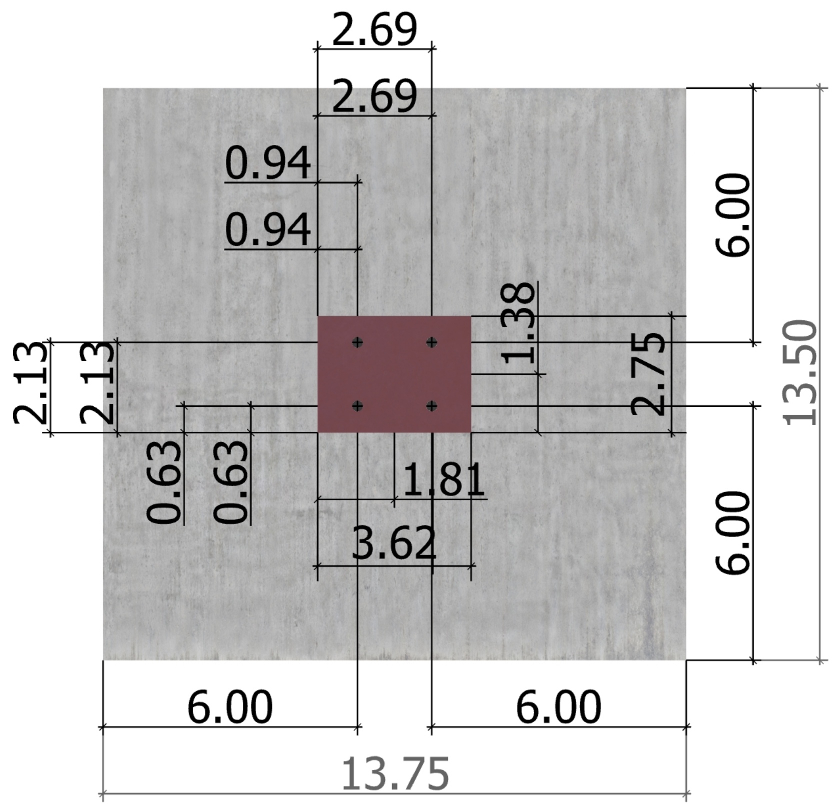
Strength level loads:

N_{ua} [lb]:	2437
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>



<Figure 2>

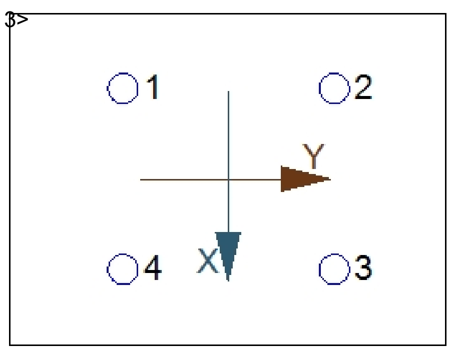


3. Resulting Anchor Forces

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	612.8	0.0	0.0	0.0
2	604.5	0.0	0.0	0.0
3	605.7	0.0	0.0	0.0
4	614.0	0.0	0.0	0.0
Sum	2437.0	0.0	0.0	0.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 2437
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.01
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00

<Figure 3>



4. Steel Strength of Anchor in Tension (Sec. 17.6.1)

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

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.6.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.6.2.2.1)

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. 17.5.1.2 & Eq. 17.6.2.1a)

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)
55.41	33.87	6.00	0.998	1.000	1.00	1.000	2297	0.65	2437

6. Pullout Strength of Anchor in Tension (Sec. 17.6.3)

$\phi N_{pn} = \phi \Psi_{c,P} \lambda_a N_p (f'_c / 2{,}500)^n$ (Sec. 17.5.1.2, Eq. 17.6.3.1 & 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

11. Results

Interaction of Tensile and Shear Forces (Sec. 17.8)

Tension	Factored Load, N_{ua} (lb)	Design Strength, $øN_n$ (lb)	Ratio	Status
Steel	614	3377	0.18	Pass
Concrete breakout	**2437**	**2437**	**1.00**	**Pass (Governs)**
Pullout	614	1238	0.50	Pass

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

STRENGTH VALUES USED IN CAPACITY CALCULATIONS. MULTIPLY STEEL STRENGTH AND PULLOUT STRENGTH BY QTY OF ANCHORS

1.Project information

Project description:
Location:
Design name: Design

Comment:

2. Input Data & Anchor Parameters

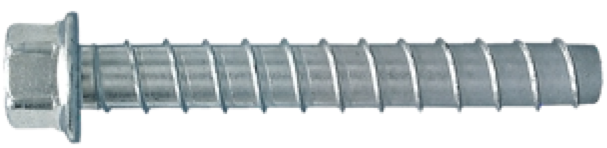
General
Design method:ACI 318-19
Units: Imperial units

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): 12.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental edge 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): 2.75 x 3.62 x 0.25

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

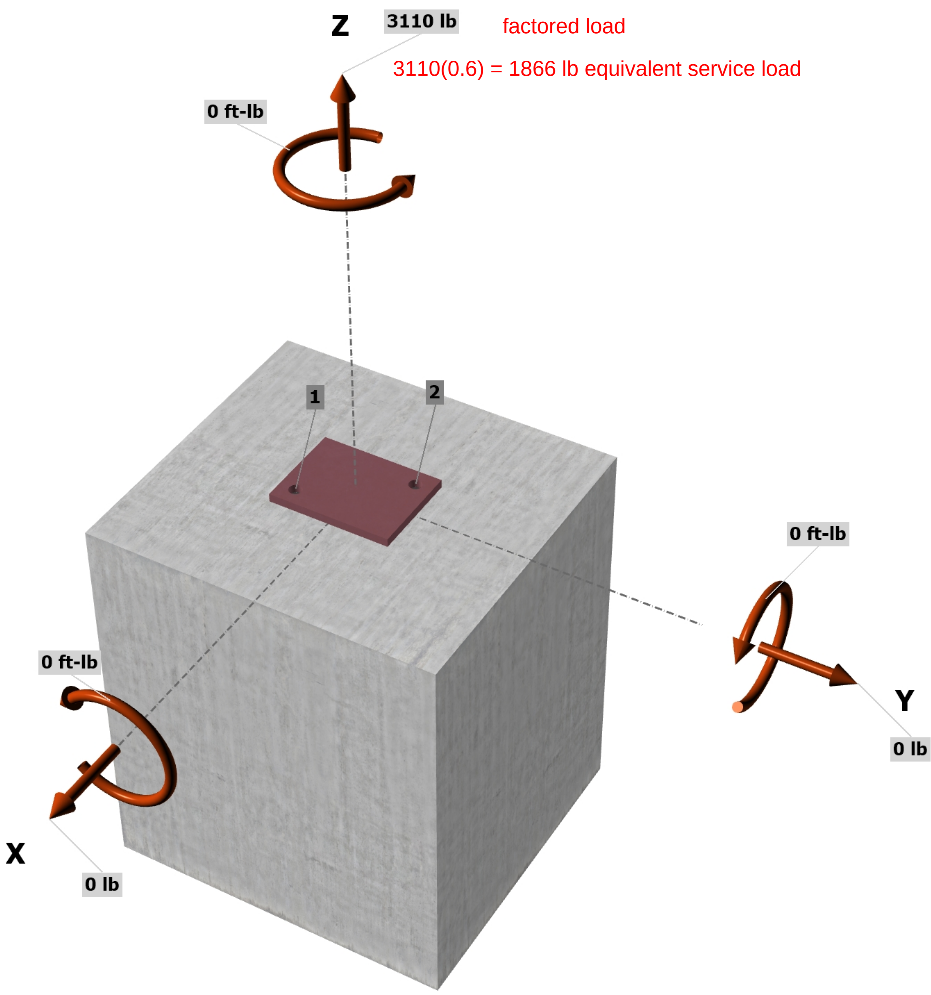


Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: Not applicable
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: Yes

Strength level loads:

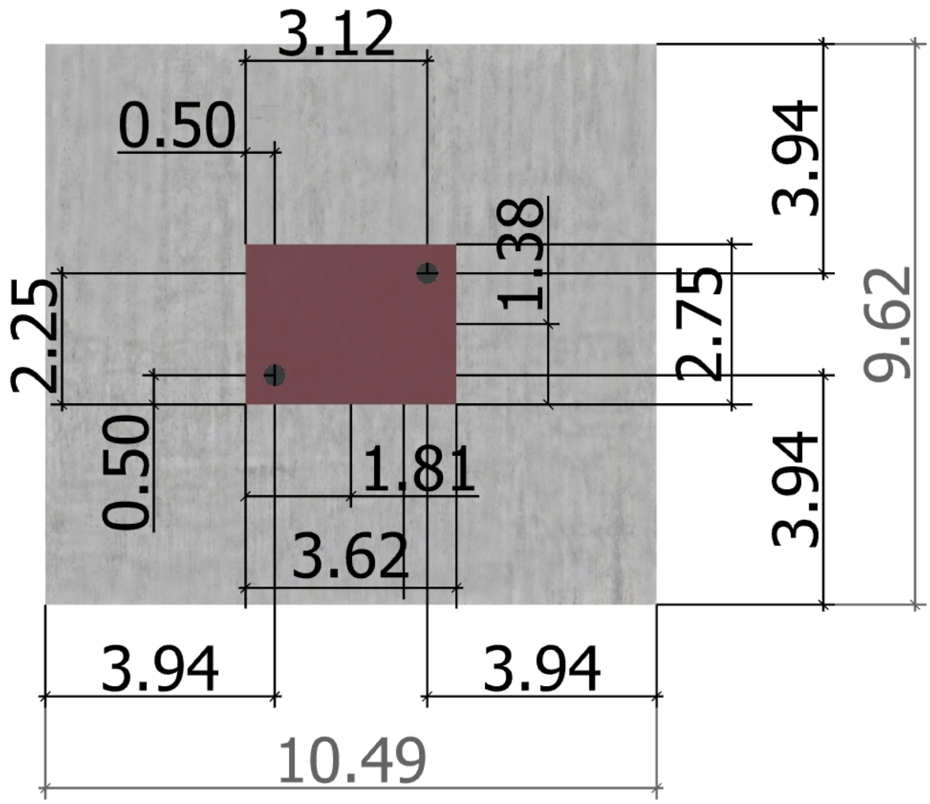
N_{ua} [lb]:	3110
V_{uax} [lb]:	0
V_{uay} [lb]:	0
M_{ux} [ft-lb]:	0
M_{uy} [ft-lb]:	0
M_{uz} [ft-lb]:	0

<Figure 1>



Company:	BRANCH ENGINEERING, INC.	Date:	4/11/2025
Engineer:		Page:	3
Project:	18-220.2		
Address:	310 5TH STREET		
Phone:	(541) 746-0637		
E-mail:	TAYLORW@BRANCHENGINEERING.COM		

<Figure 2>

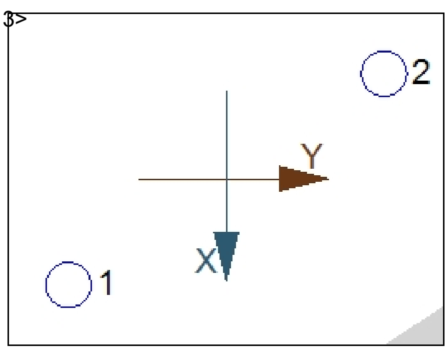


3. Resulting Anchor Forces

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	1554.9	0.0	0.0	0.0
2	1561.6	0.0	0.0	0.0
Sum	3116.4	0.0	0.0	0.0

Maximum concrete compression strain (‰): 0.05
Maximum concrete compression stress (psi): 229
Resultant tension force (lb): 3116
Resultant compression force (lb): 6
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. 17.6.1)

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

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.6.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.6.2.2.1)

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. 17.5.1.2 & Eq. 17.6.2.1a)

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)
78.72	51.84	3.94	0.999	1.000	1.00	1.000	3160	0.65	3115

6. Pullout Strength of Anchor in Tension (Sec. 17.6.3)

$\phi N_{pn} = \phi \Psi_{c,P} \lambda_a N_p (f'_c / 2{,}500)^n$ (Sec. 17.5.1.2, Eq. 17.6.3.1 & 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

11. Results

Interaction of Tensile and Shear Forces (Sec. 17.8)

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	1562	7079	0.22	Pass
Concrete breakout	**3116**	**3115**	**1.00**	**Pass (Governs)**
Pullout	1562	1755	0.89	Pass

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

STRENGTH VALUES USED IN CAPACITY CALCULATIONS. STEEL STRENGTH AND PULLOUT STRENGTH VALUES MULTIPLIED BY QTY ANCHORS