STRUCTURAL CALCULATIONS

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DATE: October 24, 2023

PROJECT: 18-220 **PATIO ROOF RISER**

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

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 Patio Roof Riser 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 patio roof.

SPECIAL INSPECTION:
None

NOTES:
Analysis based upon measurements taken from Patio Roof Riser, supplied by Woodstone Structures, LLC June 2018.
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 "PRR Allowable Loads" table.

STRUCTURAL REGISTERED PROFESSIONAL ENGINEER #67092PE DIGITALLY SIGNED OREGON DEC. 30, 2011 RICARDO HERNANDEZ
Renews: JUNE 30, 2025

RICARDO A HERNANDEZ STATE OF WASHINGTON 50932 STRUCTURAL ENGINEER PROFESSIONAL ENGINEER
RENEWS: OCTOBER 20, 2024
DIGITALLY SIGNED

REGISTERED PROFESSIONAL ENGINEER RONALD J. DERRICK NO. 46,576 CIVIL STATE OF CALIFORNIA
DIGITALLY SIGNED
Expires: JUNE 30, 2025

Ronald J. Derrick
Digitally signed by Ronald J. Derrick
Date: 2023.10.30 09:22:09 -07'00'

STRUCTURAL ENGINEERING REPORT

DATE: October 24, 2023
PROJECT: 18-220 PATIO ROOF RISER
CLIENT: WOODSTONE STRUCTURES, LLC
REPORT BY: BRANCH ENGINEERING, INC.

PATIO ROOF RISER (PRR)

DESCRIPTION:

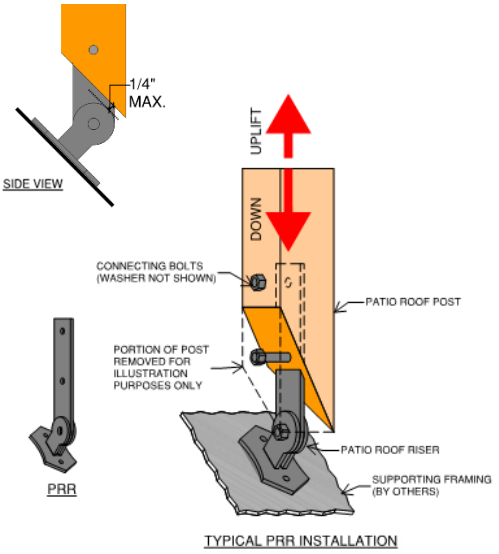
This structural engineering report has been requested by Woodstone Structures, LLC for preliminary analysis of a proprietary product called, "Patio Roof Riser." The objective of this analysis is to report the allowable capacity of the product, in its current configuration, for use in supporting vertical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

ASSUMED MATERIAL:

STEEL PLATE - 1/4" ASTM A36
(2) 1/2" DIA. ASTM A307 BOLT
(1) 5/8" DIA. ASTM A449 (GRADE 8) BOLT
(2) 3/8" DIA. ASTM A307 LAG SCREW
POST - SPECIES PER TABLE (NOT SUPPLIED)

OPTIONS:

Variable pitch per table.
Installation on 4x blocking.



TYPICAL PRR INSTALLATION

PRR ALLOWABLE LOADS

ROOF PITCH	DOUG-FIR G=0.50					HEM-FIR G=0.43					WESTERN CEDAR G=0.36				
	DEAD ONLY (90)	FLOOR (100)	SNOW (115)	ROOF (125)	UPLIFT (160)	DEAD ONLY (90)	FLOOR (100)	SNOW (115)	ROOF (125)	UPLIFT (160)	DEAD ONLY (90)	FLOOR (100)	SNOW (115)	ROOF (125)	UPLIFT (160)
	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)
SIDEWALL	1490	1490	1490	1490	1490	1490	1490	1490	1490	1490	1490	1490	1490	1490	1490
12:12	2105	2105	2105	2105	1460	2105	2105	2105	2105	1460	2025	2105	2105	2105	1460
8:12	2685	2685	2685	2685	1575	2540	2685	2685	2685	1575	2025	2255	2255	2255	1575
6:12	2780	3090	3090	3090	1660	2540	2825	2825	2825	1660	2025	2255	2255	2255	1660
5:12	2780	3090	3090	3090	1725	2540	2825	2825	2825	1725	2025	2255	2255	2255	1725
4:12	2780	3090	3090	3090	1810	2540	2825	2825	2825	1810	2025	2255	2255	2255	1810
2:12	2780	3090	3090	3090	2055	2540	2825	2825	2825	2055	2025	2255	2255	2255	2055
0:12	2780	3090	3090	3090	2480	2540	2825	2825	2825	2480	2025	2255	2255	2255	2480

NOTES:

1. FOR PRR INSTALLED ON THE FACE OF A VERTICAL WALL, USE "SIDEWALL".
2. ALLOWABLE LOADS SHOWN ARE FOR A SINGLE PRR INSTALLED AT THE INDICATED ROOF SLOPE.
3. ANALYSIS AND ALLOWABLE LOADS ARE FOR THE STEEL BRACKET ONLY.
4. CONSULT WITH A LOCAL ENGINEER FOR EACH INDIVIDUAL INSTALLATION.
5. NO DESIGN OF SUPPORTING OR SUPPORTED FRAMING HAS BEEN CONDUCTED. CONSULT AN INDEPENDENT ENGINEER FOR DESIGN OF SUCH FRAMING.
6. UPLIFT LOADS HAVE BEEN INCREASED FOR WIND OR SEISMIC LOADING, WITH NO FURTHER INCREASE ALLOWED.
7. 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 PRR SUPPORT BRACKET & POSTS.
8. UP TO 1/4" VERTICAL MOVEMENT WITHIN PRR MAY BE EXPECTED WHEN THE PRR BRACKET IS LOADED AT OR NEAR LOADS SHOWN ABOVE.
9. ALLOWABLE LOADS SHOWN ARE FOR DRY-SERVICE CONDITIONS ONLY (MOISTURE CONTENT <19%). FOR WET-SERVICE CONDITIONS, MULTIPLY BY 0.7.
10. PROVIDE THE FOLLOWING MINIMUMS FOR BOLTS THRU WOOD POST & STEEL PLATE:
    a. EDGE DISTANCE = 1 INCH
    b. END DISTANCE = 2 INCHES (END OF POST TO EXTEND TO 1/4" FROM BRACKET KNUCKLE)
    c. SPACING = 4 INCHES
11. 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)
12. INSTA-PITCH BAR IS ASSUMED TO BE INSTALLED IN A PLUMB CONDITION.
13. WELDING ON PRR BRACKET AT BASE PLATE CONNECTION TO DOUBLE-PLATE KNUCKLE IS ASSUMED TO BE COMPLETED IN ACCORDANCE WITH THE CURRENT VERSION OF AWS D1.1 OR OTHER GOVERNING DOCUMENTS AND PERIODIC SPECIAL INSPECTION PROVIDED IN ACCORDANCE WITH IBC SECTION 17. WELD ASSUMED TO BE EQUIVALENT TO (2) 1/8" FILLET WELDS 1-1/2" LONG AT EACH SLOT IN BASE PLATE.
14. ALLOWABLE LOADS HAVE BEEN BASED ON THE FULL STEEL TENSILE CAPACITY OF THE PROVIDED LAG SCREWS. WHERE INSTALLED CONDITIONS RESULT IN THE WITHDRAWAL CAPACITY OF THE LAG SCREW BEING LESS THAN ITS FULL TENSILE CAPACITY, REDUCE ALLOWABLE UPLIFT LOADS BASED ON THE RATIO OF WITHDRAWAL CAPACITY TO FULL TENSILE CAPACITY OF 1241 LBS.
15. BASEPLATE MAY EXPERIENCE YIELDING AT THE ABOVE STATED UPLIFT CAPACITY. SUBSEQUENT REPLACEMENT MAY BE REQUIRED.

STRUCTURAL ENGINEERING REPORT

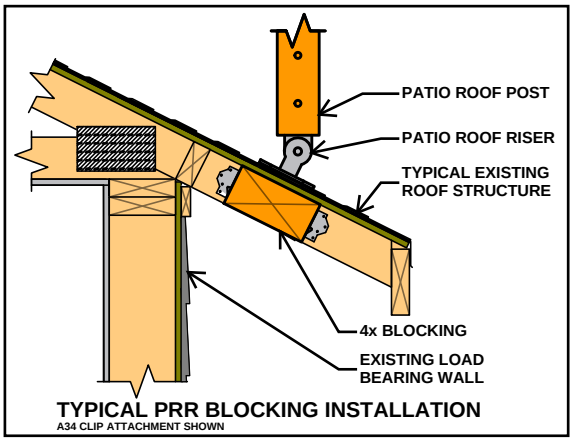
PATIO ROOF RISER (PRR) (cont.)
OPTIONAL BLOCKING INSTALLATION

INSTALLATION OPTION:

The PRR may be installed on blocking between rafters or truss members, where sufficient framing does not exist. For this installation a length 4x blocking is added between existing roof supporting members and secured with either framing clips, lag screws, or nails. Actual capacity may vary depending on the available existing roof members. Consult a local Engineer for each individual scenario.

ASSUMED MATERIALS:

PRR BRACKET & ALL INCLUDED ACCESSORIES
4x8 #2 DF BLOCKING AT EACH PRR (22½" MAX LENGTH)
(4) SIMPSON STRONG-TIE A34 FRAMING CLIPS
& ASSOCIATED FASTENERS (NOT SUPPLIED)
OR NAILS OR LAG SCREWS PER TABLES BELOW (NOT SUPPLIED)



TYPICAL PRR BLOCKING INSTALLATION
A34 CLIP ATTACHMENT SHOWN

PRR ALLOWABLE LOAD NEAR THE END OF 4x BLOCKING

ROOF PITCH	(2) A34 w/ #9x1.5" SD EA. END					(2) A34 w/ 0.131x1.5" NAILS EA. END					(6) 10d NAIL AT 1.5" SPACING EA. END					(3) 3/8" LAG SCREWS AT EQ. SPACING EA. END				
	DEAD ONLY (90)	FLOOR (100)	SNOW (115)	ROOF (125)	UPLIFT (160)	DEAD ONLY (90)	FLOOR (100)	SNOW (115)	ROOF (125)	UPLIFT (160)	DEAD ONLY (90)	FLOOR (100)	SNOW (115)	ROOF (125)	UPLIFT (160)	DEAD ONLY (90)	FLOOR (100)	SNOW (115)	ROOF (125)	UPLIFT (160)
	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)
12:12	454	505	505	505	505	335	372	372	372	372	312	347	399	434	555	179	199	229	248	318
8:12	508	565	565	565	565	366	407	407	407	407	316	351	404	439	562	182	203	233	253	324
6:12	562	624	624	624	624	397	442	442	442	442	325	362	416	452	579	189	209	241	262	335
5:12	601	667	667	667	667	420	467	467	467	467	333	370	425	462	592	193	215	247	269	344
4:12	652	725	725	725	725	450	500	500	500	500	343	381	438	477	610	200	222	255	278	355
2:12	816	907	907	907	907	541	601	601	601	601	374	416	478	520	666	220	244	281	305	391
0:12	1152	1280	1280	1280	1280	711	790	790	790	790	427	474	545	593	758	253	281	323	351	450

PRR ALLOWABLE LOAD AT MID-SPAN OF 4x BLOCKING

ROOF PITCH	(2) A34 w/ #9x1.5" SD EA. END					(2) A34 w/ 0.131x1.5" NAILS EA. END					(6) 10d NAIL AT 1.5" SPACING EA. END					(3) 3/8" LAG SCREWS AT EQ. SPACING EA. END				
	DEAD ONLY (90)	FLOOR (100)	SNOW (115)	ROOF (125)	UPLIFT (160)	DEAD ONLY (90)	FLOOR (100)	SNOW (115)	ROOF (125)	UPLIFT (160)	DEAD ONLY (90)	FLOOR (100)	SNOW (115)	ROOF (125)	UPLIFT (160)	DEAD ONLY (90)	FLOOR (100)	SNOW (115)	ROOF (125)	UPLIFT (160)
	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)
12:12	757	841	841	841	841	657	730	730	730	730	625	694	798	868	1111	358	397	457	497	636
8:12	804	894	894	894	894	714	793	793	793	793	633	703	808	879	1125	365	405	466	507	648
6:12	855	951	951	951	951	772	857	857	857	857	651	723	832	904	1157	377	419	482	524	670
5:12	893	992	992	992	992	813	904	904	904	904	666	740	851	925	1184	387	430	494	537	688
4:12	941	1046	1046	1046	1046	868	964	964	964	964	686	763	877	953	1220	400	444	511	555	711
2:12	1087	1208	1208	1208	1208	1034	1149	1149	1149	1149	749	832	957	1040	1331	440	488	562	610	781
0:12	1341	1490	1490	1490	1490	1341	1490	1490	1490	1490	853	948	1090	1185	1517	506	562	646	703	899

NOTES:

1. ALLOWABLE LOADS SHOWN ARE FOR A SINGLE PRR INSTALLED AT THE INDICATED ROOF SLOPE, AND SECURED TO 4x8 #2 DF BLOCKING SPANNING BETWEEN EXISTING ROOF MEMBERS.
2. ANALYSIS AND ALLOWABLE LOADS ARE FOR THE BLOCKING, CLIPS, AND/OR FASTENERS ONLY.
3. CONSULT WITH A LOCAL ENGINEER FOR EACH INDIVIDUAL INSTALLATION.
4. NO DESIGN OF SUPPORTING OR SUPPORTED FRAMING HAS BEEN CONDUCTED. CONSULT AN INDEPENDENT ENGINEER FOR DESIGN OF SUCH FRAMING.
5. LOADS MAY BE REDUCED TO LESS THAN 200 POUNDS WHERE LOAD IS APPLIED TO A SINGLE 2x4 RAFTER CANTILEVERING 18" BEYOND BEARING WALL.
6. UPLIFT LOADS HAVE BEEN INCREASED FOR WIND OR SEISMIC LOADING, WITH NO FURTHER INCREASE ALLOWED.
7. 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 PRR SUPPORT BRACKET & POSTS.
8. ALLOWABLE LOADS SHOWN ARE FOR DRY-SERVICE CONDITIONS ONLY (MOISTURE CONTENT <19%). FOR WET-SERVICE CONDITIONS, MULTIPLY BY 0.7.
9. SEE PRR ALLOWABLE LOAD TABLE FOR ADDITIONAL INFORMATION RELATING TO THE ALLOWABLE CAPACITY OF THE PRR.
10. LAG SCREWS SHALL HAVE A SUFFICIENT LENGTH (NOT INCLUDING THE LENGTH OF THE TAPERED TIP) SUCH THAT THE MINIMUM PENETRATION LENGTH INTO THE BLOCKING IS NOT LESS THAN 3" (8D).
11. WHERE LAG SCREW PENETRATION LENGTH (P) IS LESS THAN 8D BUT NOT LESS THAN 4D, TABULATED VALUES ABOVE SHALL BE MULTIPLIED BY P/8D.
12. EXISTING ROOF SUPPORTING MEMBER MINIMUM END DISTANCE FOR LAG SCREWS SHALL BE 7D.
13. MINIMUM EDGE DISTANCE FOR LAG SCREWS SHALL BE 4D.
14. MINIMUM SPACING BETWEEN ROWS OF LAG SCREW SHALL BE 5D.

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Springfield, Oregon 97477
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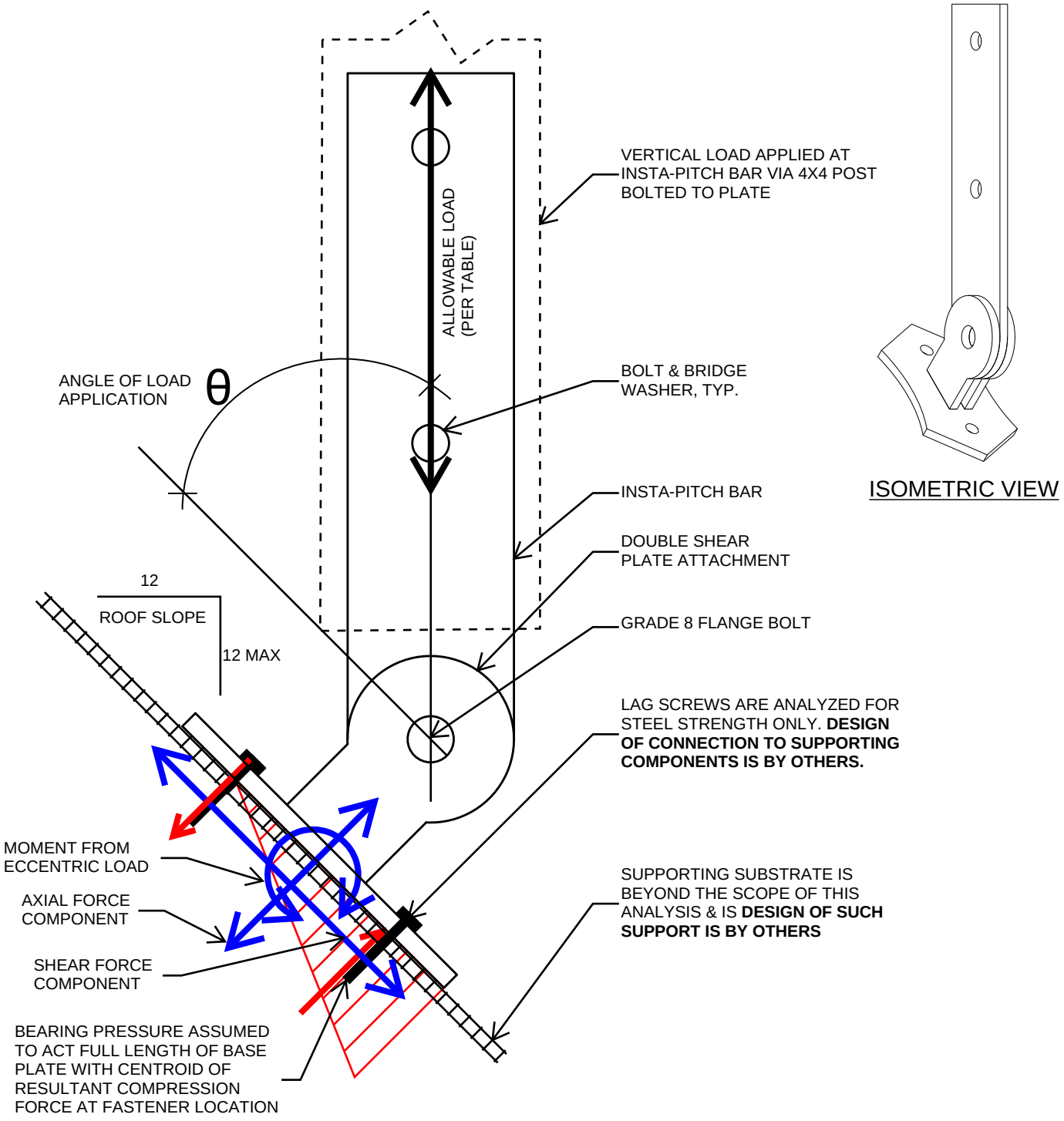
DATE: 6/12/2018

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

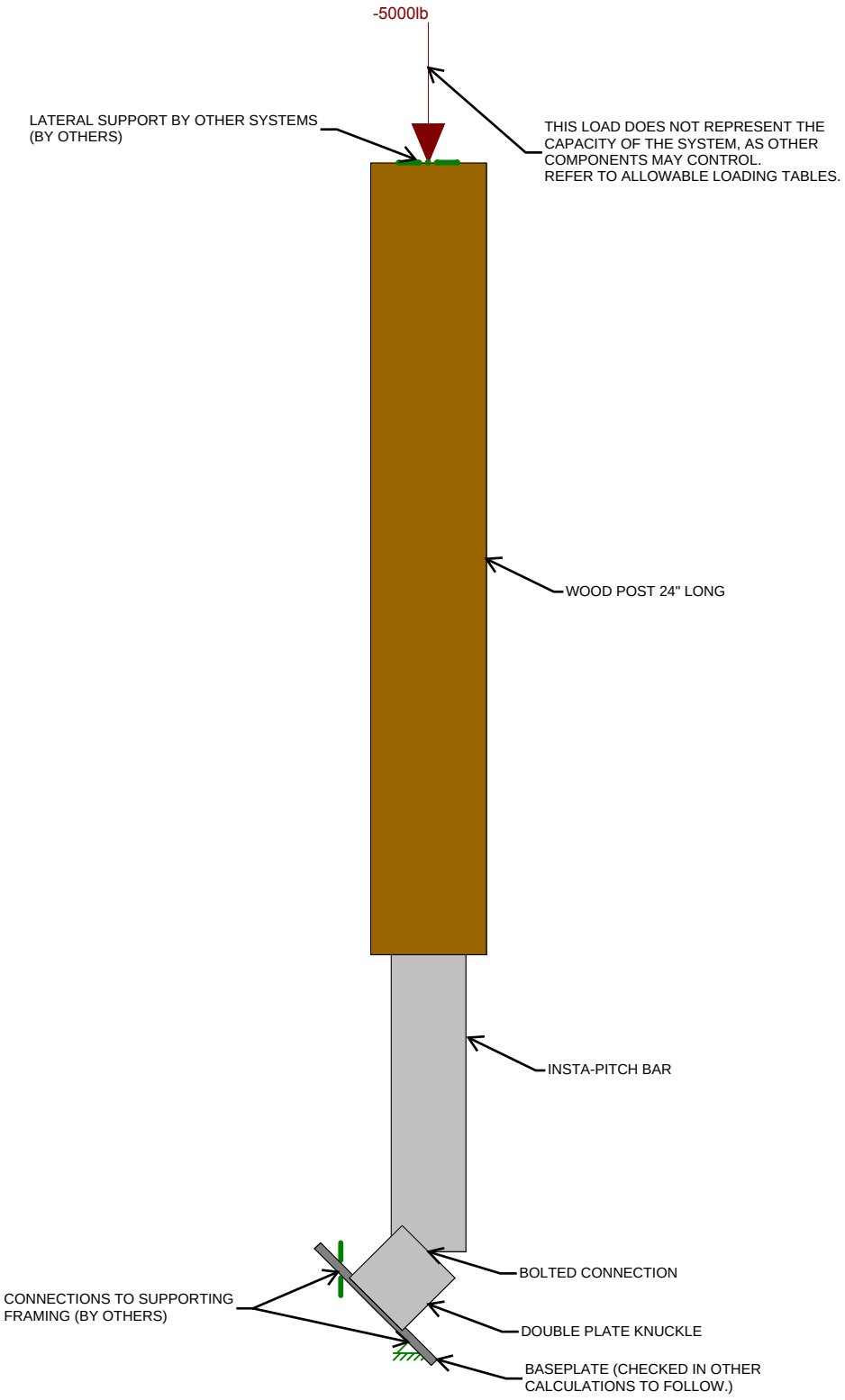
PATIO ROOF RISER SKETCH & CALCULATION ORIENTATION/AXES



ISOMETRIC VIEW

NOTE: SKETCH IS NOT TO SCALE
NOT FOR CONSTRUCTION

ASSEMBLY COMPRESSION CHECK



Loads: BLC 1,

BRANCH ENGINEERING,...		
JOSHUA ANNETT	PATIO ROOF RISER	June 28, 2018 at 4:25 PM
18-220		PRR MODEL.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	HR1A	PL1/4x2.25	Beam	None	A36 Gr.36	Typical	.563	.003	.237
2	HR2	PL1/4x2.25	Column	None	A36 Gr.36	Typical	.563	.003	.237

Member Primary Data

	Label	I Joint	J Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	BASE	N1	N2	90	HR1A	Beam	None	A36 Gr.36	Typical
2	PL1	N3	N4		HR1A	Beam	None	A36 Gr.36	Typical
3	INSTA PITCH B...	N4	N5		HR2	Column	None	A36 Gr.36	Typical
4	POST	N5	N6		WOOD1A	Column	Rectangular	#2 HF	Typical
5	PL2	N3	N4		HR1A	Beam	None	A36 Gr.36	Typical

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	BASE	HR1A	5			Lb out						La
2	PL1	HR1A	2.25			Lb out						La
3	INSTA PIT...	HR2	9			Lb out						La
4	PL2	HR1A	2.25			Lb out						La

Joint Loads and Enforced Displacements (BLC 1 :)

	Joint Label	L,D,M	Direction	Magnitude[(lb,lb-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N6	L	Y	-5000

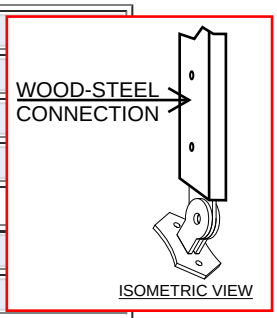
Load Combinations

	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	CAPACITY	Yes	Y		1	1.6																		

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	1	PL1	PL1/4x2.25	.735	0	.408	0	17351.297	18241.2	853.2	1.667	H1-1b
2	1	INSTA PITCH ...	PL1/4x2.25	.976	0	.000	0	8194.267	18241.2	801.892	1	H1-1a
3	1	PL2	PL1/4x2.25	.735	0	.408	0	17351.297	18241.2	853.2	1.667	H1-1b

Design Method	Allowable Stress Design (ASD)
Connection Type	Lateral loading
Fastener Type	Bolt
Loading Scenario	Double Shear - Steel Main Member



Main Member Type	Steel
Main Member Thickness	1/4 in.
Main Member: Angle of Load to Grain	0
Side Member Type	Douglas Fir-Larch (North)
Side Member Thickness	1.5 in.
Side Member: Angle of Load to Grain	0
Fastener Diameter	1/2 in.
Load Duration Factor	C_D = 1.0
Wet Service Factor	C_M = 1.0
Temperature Factor	C_t = 1.0

Connection Yield Modes

Im	2719 lbs.
Is	2062 lbs.
IIIs	1547 lbs.
IV	1946 lbs.

ASD CAPACITY FOR (2) BOLTS = 2 * 1547# = 3094#

Adjusted ASD Capacity	**1547 lbs.**

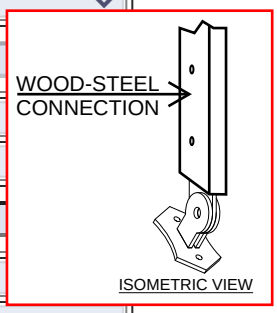
- Bolt bending yield strength of 45,000 psi is assumed.
- The Adjusted ASD Capacity is only applicable for bolts with adequate end distance, edge distance and spacing per NDS chapter 11.
- ASTM A36 Steel is assumed for 1/4 in. and thicker steel main members , and ASTM A653 Grade 33 Steel is assumed for steel main members less than 1/4 in. thick.

While every effort has been made to insure the accuracy of the information presented, and special effort has been made to assure that the information reflects the state-of-the-art, neither the American Wood Council nor its members assume any responsibility for any particular design prepared from this on-line Connection Calculator. Those using this on-line Connection Calculator assume all liability from its use.

The Connection Calculator was designed and created by Cameron Knudson, Michael Dodson and David Pollock at Washington State University. Support for development of the Connection Calculator was provided by American Wood Council.

Design Method	Allowable Stress Design (ASD)
Connection Type	Lateral loading
Fastener Type	Bolt
Loading Scenario	Double Shear - Steel Main Member

Main Member Type	Steel
Main Member Thickness	1/4 in.
Main Member: Angle of Load to Grain	0
Side Member Type	Hem-Fir
Side Member Thickness	1.5 in.
Side Member: Angle of Load to Grain	0
Fastener Diameter	1/2 in.
Load Duration Factor	C_D = 1.0
Wet Service Factor	C_M = 1.0
Temperature Factor	C_t = 1.0



Connection Yield Modes

Im	2719 lbs.
Is	1800 lbs.
IIIs	1413 lbs.
IV	1825 lbs.

ASD CAPACITY FOR (2) BOLTS = 2 * 1413# = 2826#

Adjusted ASD Capacity	**1413 lbs.**

- Bolt bending yield strength of 45,000 psi is assumed.
- The Adjusted ASD Capacity is only applicable for bolts with adequate end distance, edge distance and spacing per NDS chapter 11.
- ASTM A36 Steel is assumed for 1/4 in. and thicker steel main members , and ASTM A653 Grade 33 Steel is assumed for steel main members less than 1/4 in. thick.

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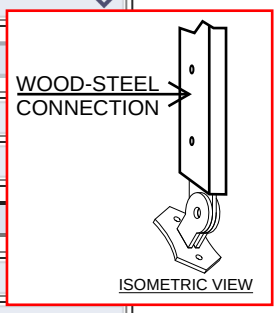
Design Method	Allowable Stress Design (ASD)
Connection Type	Lateral loading
Fastener Type	Bolt
Loading Scenario	Double Shear - Steel Main Member

Main Member Type	Steel
Main Member Thickness	1/4 in.
Main Member: Angle of Load to Grain	0
Side Member Type	Western Cedars
Side Member Thickness	1.5 in.
Side Member: Angle of Load to Grain	0
Fastener Diameter	1/2 in.
Load Duration Factor	C_D = 1.0
Wet Service Factor	C_M = 1.0
Temperature Factor	C_t = 1.0



Connection Yield Modes

Im	2719 lbs.
Is	1519 lbs.
IIIs	1268 lbs.
IV	1684 lbs.

ASD CAPACITY FOR (2) BOLTS = 2 * 1268# = 2536#

Adjusted ASD Capacity	**1268 lbs.**

- Bolt bending yield strength of 45,000 psi is assumed.
- The Adjusted ASD Capacity is only applicable for bolts with adequate end distance, edge distance and spacing per NDS chapter 11.
- ASTM A36 Steel is assumed for 1/4 in. and thicker steel main members , and ASTM A653 Grade 33 Steel is assumed for steel main members less than 1/4 in. thick.

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Branch ENGINEERING Inc
Since 1977
civil · transportation
structural · geotechnical
SURVEYING

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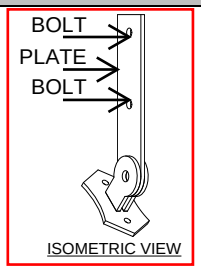
DATE: 3/31/2022

PROJECT: 18-220 WOODSTONE STRUCTURES - PRR
BY: JOSHUA ANNETT
CHECKED BY: RICK HERNANDEZ, P.E., S.E.
SHEET: (2) 0.5 BLT-PL

Bolted Shear Connection Design for Bolts in Standard Holes

Steel thickness:	**0.25 in**	F_y:	36	ksi	
Steel width:	**2.25 in**	F_u:	58	ksi	
Steel specification:	**A36**	ϕF_{nv}:	20.25	ksi	
Bolt diameter, d:	**0.5 in**	A_{gv}:	1.25	in^2	Shear Yielding
Bolt specification:	**A307**	A_g:	0.56	in^2	Tensile Yielding
Thread condition:	**N**	A_{nv}:	1.02	in^2	Shear Rupture
Bolt Hole Preparation Method:	**Punch**	A_e:	0.41	in^2	Tensile Rupture
Threaded Part F_u:	**60 ksi**	A_{nv}:	1.02	in^2	Block Shear
Bolt spacing, s:	**4 in**	A_{gv}:	1.25	in^2	Block Shear
End distance, L_{ev}:	**1 in**	A_{nt}:	0.20	in^2	Block Shear
Side distance, L_{eh}:	**1.125 in**	U_{bs}:	1		Block Shear
Number of bolts in row:	**2**	U:	1		Shear Lag Factor
Number of rows:	**1**				



ISOMETRIC VIEW

		Φ	Ω	ASD CAPACITY
Shear Yielding: ϕR_n =	27.00 kip	1.00	1.5	18.00 kip
Tensile Yielding: ϕR_n =	18.23 kip	0.90	1.67	12.13 kip
Shear Rupture: ϕR_n =	26.51 kip	0.75	2	17.67 kip
Tensile Rupture: ϕR_n =	17.67 kip	0.75	2	11.78 kip
Block Shear Rupture: ϕR_n =	29.09 kip	0.75	2	19.39 kip
Bolt Shear Strength: ϕR_n =	7.95 kip	0.75	2	5.30 kip
Bearing Strength at Bolt Hole: ϕR_n =	17.94 kip	0.75	2	11.96 kip

ASD Connection Design Strength: 5.30 kips

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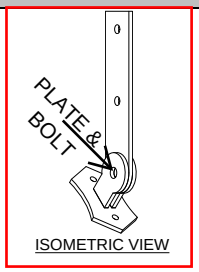
PROJECT: 18-220 WOODSTONE STRUCTURES - PRR
BY: JOSHUA ANNETT
CHECKED BY: RICK HERNANDEZ, P.E., S.E.
SHEET: 0.625 FLNG BLT-PL

Bolted Shear Connection Design for Bolts in Standard Holes

Steel thickness:	**0.25 in**
Steel width:	**2.25 in**
Steel specification:	**A36**
Bolt diameter, d:	**0.5625 in**
Bolt specification:	**A490**
Thread condition:	**N**
Bolt Hole Preparation Method:	**Drill**
Threaded Part F_u:	**150 ksi**
Bolt spacing, s:	**0 in**
End distance, L_{ev}:	**1 in**
Side distance, L_{eh}:	**1 in**
Number of bolts in row:	**1**
Number of rows:	**1**

F_y:	36 ksi		
F_u:	58 ksi		
ϕF_{nv}:	50.625 ksi		
A_{gv}:	0.25 in^2	Shear Yielding	
A_g:	0.56 in^2	Tensile Yielding	
A_{nv}:	0.17 in^2	Shear Rupture	
A_e:	0.41 in^2	Tensile Rupture	
A_{nv}:	0.17 in^2	Block Shear	
A_{gv}:	0.25 in^2	Block Shear	
A_{nt}:	0.20 in^2	Block Shear	
U_{bs}:	1	Block Shear	
U:	1	Shear Lag Factor	



ISOMETRIC VIEW

		Φ	Ω	ASD CAPACITY
Shear Yielding: ϕR_n =	5.40 kip	1.00	1.5	3.60 kip
Tensile Yielding: ϕR_n =	18.23 kip	0.90	1.67	12.13 kip
Shear Rupture: ϕR_n =	4.49 kip	0.75	2	2.99 kip
Tensile Rupture: ϕR_n =	17.67 kip	0.75	2	11.78 kip
Block Shear Rupture: ϕR_n =	12.89 kip	0.75	2	8.59 kip
Bolt Shear Strength: ϕR_n =	12.58 kip	0.75	2	8.39 kip
Bearing Strength at Bolt Hole: ϕR_n =	8.97 kip	0.75	2	5.98 kip

ASD Connection Design Strength: 2.99 kips

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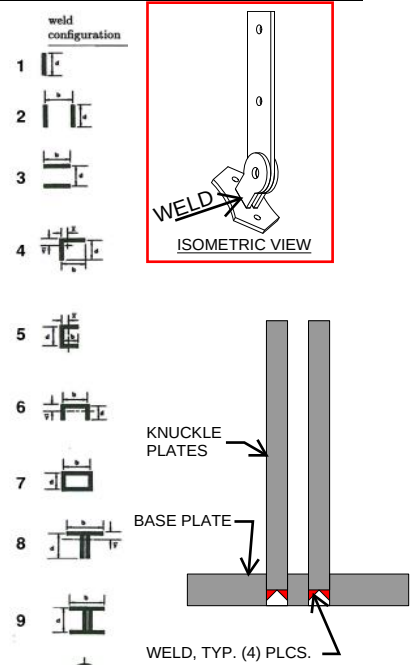
PROJECT: 18-220 WOODSTONE STRUCTURES - PRR
BY: JOSHUA ANNETT
CHECKED BY: RICK HERNANDEZ, P.E., S.E.
SHEET: WELD

Combined Strength of Weld in Axial, Shear, & Bending

ROOF SLOPE		2:12 ← MAX CASE	
Axial Force, P_u		**3340.575 lb**	
Design Shear, V_u		**556.7625 lb**	
Design Moment, Mu		**92.79375 lb-ft**	
Design Torque, T_u		**0 lb-ft**	
BASE METAL Thickness		**0.25 in**	
ATTACHED PART Thickness		**0.25 in**	
		FILLET	
Depth of Preparation, S		**0 in**	
Weld type		2	
d		1.5 in	
b		0.5 in	
Section Modulus of Weld		0.75 sq in	
Reduction Factor for Weld, ϕ		0.75	
F_{EXX}		70 ksi	
Weld Size Specified		0.125 in	
			UNTIY CHECK
Axial Stress in Weld	f_a	12.600 ksi	0.40
Shear Stress in Weld	f_v	2.100 ksi	0.07
Bending Stress in Weld	f_b	16.800 ksi	0.53
Torsional Stress in Weld	f_t	0.000 ksi	0.00
Allowable Stress in Weld	F_w	32 ksi	
Combined Unity Check		1.00	OK



ROOF SLOPE	SIDEWALL	12:12	8:12	6:12	5:12	4:12	2:12	0:12	
f_a	0.00	2.81	4.22	5.62	6.63	7.88	12.60	17.10	ksi
f_v	2.81	2.81	2.81	2.81	2.76	2.63	2.10	0.00	ksi
f_b	22.50	22.50	22.50	22.50	22.11	21.00	16.80	0.00	ksi
TOAL UC	**0.80**	**0.89**	**0.94**	**0.98**	**1.00**	**1.00**	**1.00**	**0.54**	

OK FOR ALL LOADS AT VARYING PITCH
(SEE BRACKET STABILITY CALC TO FOLLOW)

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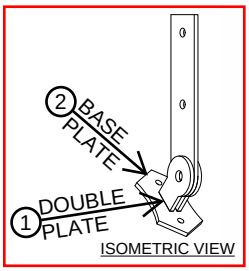
BASE PLATE GEOMETRY PARAMETERS

$N := 5\ in$ Base plate length

$s_N := 3\ in$ Anchor spacing

$B := 2.5\ in$ Base plate width



MATERIAL SPECIFICATIONS

$\Phi_b := 0.9$

$F_y := 36\ ksi$ Steel yield stress

$t_p := 0.25\ in$ Steel plate thickness

$t_{pBP} := 0.375\ in$ Base plate steel thickness

SEE SHEET: "STATICS (WOOD SPECIES)"

DESIGN FORCES

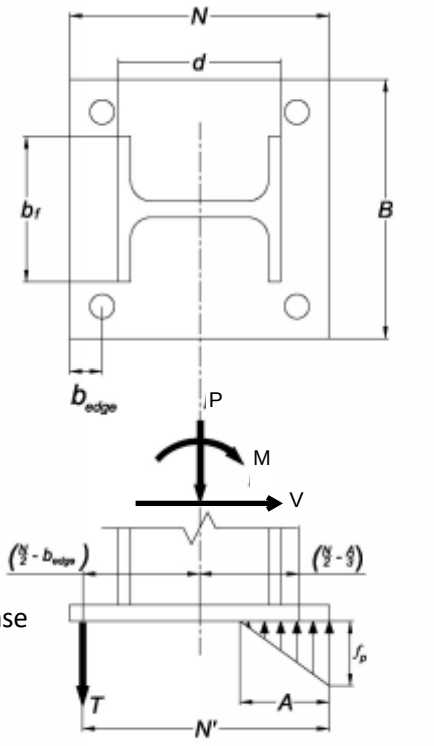
Tension Side of Base Plate

$P := 1491\ lb$ Downward axial force at column base

$V := 1491\ lb$ Shear at attacment

$L := 2\ in$ Attachment moment arm

$M_{max} := 1.6 \cdot V \cdot L = 4771.2\ lb \cdot in$ Moment at base of attachment



GENERIC BASE PLATE SHOWN

Figure B.3. General definition of variables.

STEEL BASE PLATE DESIGN

① DOUBLE PLATE ATTACHMENT BENDING

$d := 1.5\ in$ Width of connecting bending element at baseplate

$n_{pl} := 2$ Number of plates at attachment

$S_x := \frac{n_{pl} \cdot t_p \cdot d^2}{6} = 0.19\ in^3$ Elastic section modulus of engaged portion of baseplate

$\Phi M_n := \Phi_b \cdot F_y \cdot S_x = 6075\ lb \cdot in$ Moment strength of baseplate

$$BendingCheck := \frac{M_{max}}{\Phi M_n} = 0.79$$

② TENSION FORCE AT ANCHOR

$T := 1241\ lb$ Max tension at anchor line (Lag screw yielding)

② BASE PLATE BENDING - TENSION

$d := 1.5\ in$ Width of connecting bending element at baseplate

$x := \left(s_N - 0.95 \cdot d\right) \cdot 0.5 = 0.79\ in$ Effective cantilever distance of baseplate to tension anchor

$b := min\left(\frac{2 \cdot x}{\cos\left(45\ °\right)}, 2.5\ in\right) = 2.23\ in$ Effective width of baseplate engaged in bending

$Z_x := \frac{b \cdot t_{pBP}^{\ 2}}{4} = 0.08\ in^3$ Plastic section modulus of engaged portion of baseplate

$m := 1.6 \cdot T \cdot x = 1563.66\ lb \cdot in$ Moment at tension side of baseplate

$\Phi M_n := \Phi_b \cdot F_y \cdot Z_x = 2537.13\ lb \cdot in$ Moment strength of baseplate

Moment at Base Plate - Case 1

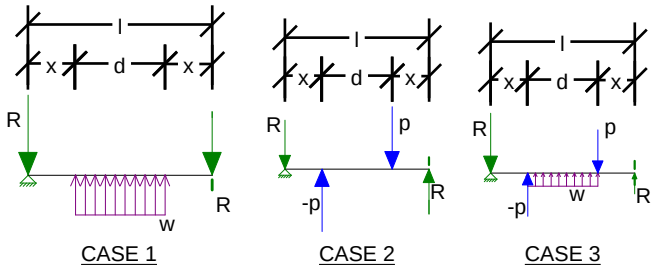
$M_1 := 1396\ lb \cdot in$ ← SEE MODEL RESULTS NEXT PAGE

Moment at Base Plate - Case 2

$M_2 := 663\ lb \cdot in$ ← SEE MODEL RESULTS NEXT PAGE

Moment at Base Plate - Case 3 (Max at 2:12)

$M_3 := 1176\ lb \cdot in$ ← SEE MODEL RESULTS NEXT PAGE



$$BendingCheck := \frac{1.6 \cdot \max\left(M_1, M_2, M_3\right)}{\Phi M_n} = 0.88$$

② SHEAR AT BASE PLATE - STEEL AT GAP BETWEEN KNUCKLE PLATE INSET IN BASE PLATE

$\Phi_V := 0.9$

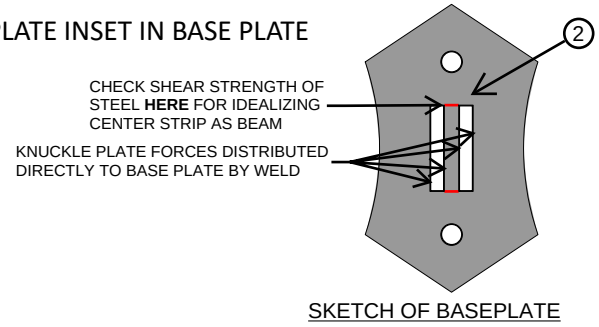
$C_v := 1.0$

$b := 0.25\ in$

$t_{pBP} = 0.38\ in$

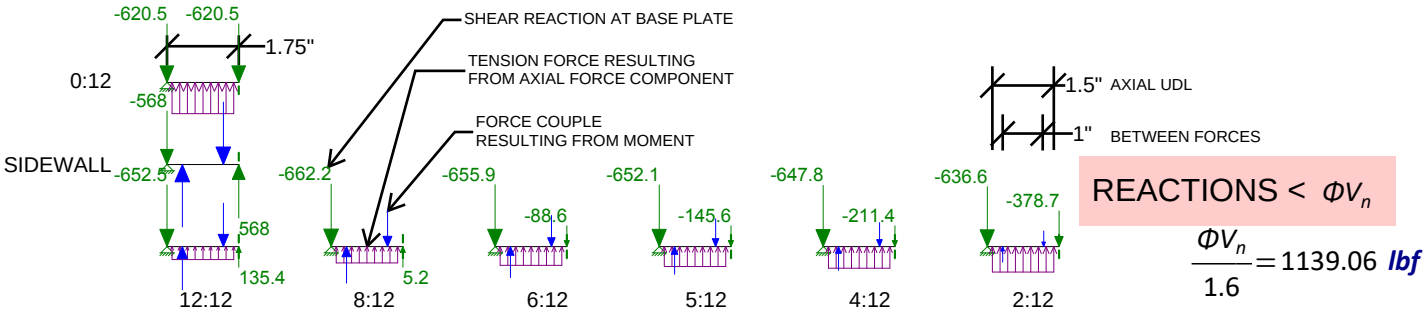
$A_w := b \cdot t_{pBP} = 0.09\ in^2$

$\Phi V_n := \Phi_V \cdot 0.6\ F_y \cdot A_w \cdot C_v = 1822.5\ lbf$



SKETCH OF BASEPLATE

BEAM MODELS OF STRIP BETWEEN KNUCKLE PLATES - LOAD CASE FACTOR = 0.5

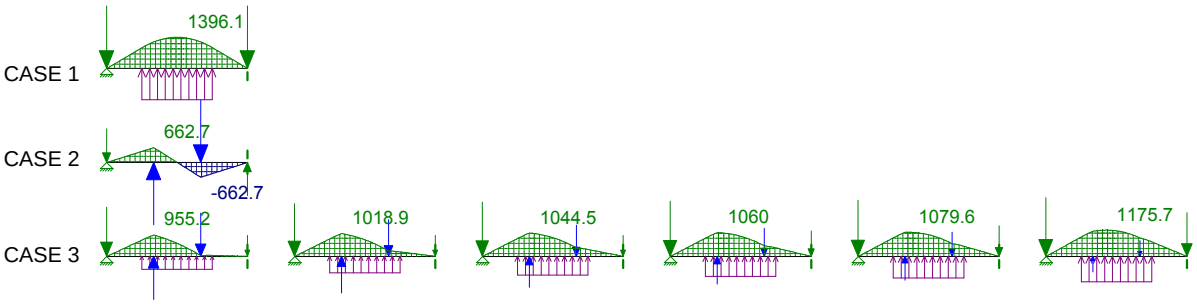


REACTIONS < ΦV_n

$\frac{\Phi V_n}{1.6} = 1139.06\ lbf$

Maximum Member Section Forces (By Combination)

		LC	Member Label		Axial[lb]	Loc[in]	Shear[lb]	Loc[in]	Moment[lb-in]	Loc[in]
CASE 1	1	1	M1	max	0	0	1241.003	2.25	1396.128	1.5
	2			min	0	0	-1241.002	0	0	0
CASE 2	3	1	M2	max	0	0	1325.387	1	662.693	1
	4			min	0	0	-662.693	0	-662.693	2
CASE 3	5	1	M3	max	0	0	1242.415	1.969	955.151	1
	6			min	0	0	-976.696	0	0	0
	7	1	M4	max	0	0	1189.271	1.969	1018.94	1
	8			min	0	0	-1046.315	0	0	0
	9	1	M5	max	0	0	1127.222	1.969	1044.49	1
	10			min	0	0	-1075.514	0	0	0
	11	1	M6	max	0	0	1089.549	1.969	1060.002	1
	12			min	0	0	-1093.243	0	0	0
	13	1	M7	max	0	0	1046.081	1.969	1079.641	1.063
	14			min	0	0	-1113.698	0	0	0
	15	1	M8	max	0	0	935.434	1.969	1175.683	1.281
	16			min	0	0	-1165.767	0	0	0



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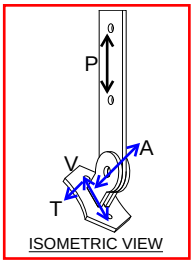
PROJECT: 18-220 WOODSTONE STRUCTURES - PRR
BY: JOSHUA ANNETT
CHECKED BY: RICK HERNANDEZ, P.E., S.E.
SHEET: STATICS (DF)

PATIO ROOF RISER BRACKET CONNECTION STABILITY (OVERTURNING & SLIDING AT ANCHORED BASE)

HARDWARE MOMENT ARM, L	ANCHOR SPACING, S	CL COL TO ANCH, A'	EDGE OF BEARING TO ANCHOR, N'	LENGTH OF BEARING, A
2 in	3 in	1.5 in	3.75 in	3.75 in
2 in		0 in	1.25 in	1.25 in



ISOMETRIC VIEW

ASD CAPACITY OF VARIOUS COMPONENTS

	5301 lb	(2) 1/2" BOLTS THRU 1/4" PLATE
	2991 lb	5/8" BOLT THRU 1/4" PLATE
Z =	8290 lb	DOUBLE SHEAR STEEL SIDE - STEEL MAIN
Z =	3094 lb	DOUBLE SHEAR WOOD SIDE - STEEL MAIN
Z =	1491 lb	SHEAR STRENGTH OF SINGLE LAG
W =	1241 lb	TENSILE STRENGTH OF LAG BOLT

ROOT DIAMETER OF LAG SCREW, Dr 0.265

ASD CAPACITIES CONTROLLING CAPACITY OF OVERALL ASSEMBLY

3094 lb MINIMUM DOWNLOAD CAPACITY OF CONNECTIONS ABOVE BASE PLATE

2991 lb MINIMUM UPLIFT CAPACITY OF CONNECTIONS ABOVE BASE PLATE

1491 lb SHEAR STRENGTH OF SINGLE LAG (SLIDING RESISTANCE)

1241 lb TENSILE STRENGTH OF LAG BOLT (OVERTURNING RESISTANCE)

ROOF PITCH	DOWNWARD VERTICAL LOAD MAGNITUDE, -P	UPLIFT VERTICAL LOAD MAGNITUDE, P	ANGLE OF LOAD APPLIED, θ	AXIAL FORCE	SHEAR	MOMENT	TENSION AT ANCHOR (DOWN LOAD CASE)	TENSION AT ANCHOR (UPLIFT CASE)	UC SHEAR, V	UC TENSION, T	MAX T OR V	BASE RATED CAPACITY FOR VERTICAL DOWN LOADS	ADJUSTED ASD CAPACITY — LOAD DURATION FACTOR: DOWN (90)	DOWN (100)	DOWN (115)	DOWN (125)	UPLIFT (160)
	(lb)	(lb)	(degrees)	(lb)	(lb)	(lb-in)	(lb)	(lb)	(%)	(%)	(%)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)
SIDEWALL	1491	1491	0.0	0.0	1491.0	2982.0	1192.8	1192.8	1.000	0.961	1.00	1491	1491	1491	1491	1491	1491
12:12	2109	1463	45.0	1491.0	1491.0	2982.1	596.4	1241.0	1.000	1.000	1.00	2109	2109	2109	2109	2109	1463
8:12	2688	1579	56.3	2236.5	1491.0	2982.1	298.2	1241.0	1.000	1.000	1.00	2688	2688	2688	2688	2688	1579
6:12	3334	1665	63.4	2982.1	1491.0	2982.1	0.0	1241.0	1.000	1.000	1.00	3094	2785	3094	3094	3094	1665
5:12	3809	1729	67.4	3516.4	1465.2	2930.3	0.0	1241.0	0.983	1.000	1.00	3094	2785	3094	3094	3094	1729
4:12	4402	1811	71.6	4175.7	1391.9	2783.8	0.0	1241.0	0.934	1.000	1.00	3094	2785	3094	3094	3094	1811
2:12	6773	2059	80.5	6681.2	1113.5	2227.1	0.0	1241.0	0.747	1.000	1.00	3094	2785	3094	3094	3094	2059
0:12	9070	2482	90.0	9069.6				1241.0		1.000		3094	2785	3094	3094	3094	2482

CAPACITIES SHOWN HERE APPLY ONLY TO INSTALLATIONS USING **DOUG-FIR (G=0.50)** POST ATTACHED TO INSTA-PITCH BAR

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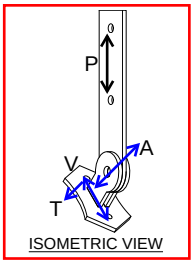
BY: JOSHUA ANNETT
CHECKED BY: RICK HERNANDEZ, P.E., S.E.
SHEET: STATICS (HF)

PATIO ROOF RISER BRACKET CONNECTION STABILITY (OVERTURNING & SLIDING AT ANCHORED BASE)

HARDWARE MOMENT ARM, L	ANCHOR SPACING, S	CL COL TO ANCH, A'	EDGE OF BEARING TO ANCHOR, N'	LENGTH OF BEARING, A
2 in	3 in	1.5 in	3.75 in	3.75 in
2 in		0 in	1.25 in	1.25 in



ISOMETRIC VIEW

ASD CAPACITY OF VARIOUS COMPONENTS

	5301 lb	(2) 1/2" BOLTS THRU 1/4" PLATE
	2991 lb	5/8" BOLT THRU 1/4" PLATE
Z =	8290 lb	DOUBLE SHEAR STEEL SIDE - STEEL MAIN
Z =	2826 lb	DOUBLE SHEAR WOOD SIDE - STEEL MAIN
Z =	1491 lb	SHEAR STRENGTH OF SINGLE LAG
W =	1241 lb	TENSILE STRENGTH OF LAG BOLT

ROOT DIAMETER OF LAG SCREW, Dr 0.265

ASD CAPACITIES CONTROLLING CAPACITY OF OVERALL ASSEMBLY

2826 lb MINIMUM DOWNLOAD CAPACITY OF CONNECTIONS ABOVE BASE PLATE

2826 lb MINIMUM UPLIFT CAPACITY OF CONNECTIONS ABOVE BASE PLATE

1491 lb SHEAR STRENGTH OF SINGLE LAG (SLIDING RESISTANCE)

1241 lb TENSILE STRENGTH OF LAG BOLT (OVERTURNING RESISTANCE)

ADJUSTED ASD CAPACITY

ROOF PITCH	DOWNWARD VERTICAL LOAD MAGNITUDE, -P	UPLIFT VERTICAL LOAD MAGNITUDE, P	ANGLE OF LOAD APPLIED, θ	AXIAL FORCE	SHEAR	MOMENT	TENSION AT ANCHOR (DOWN LOAD CASE)	TENSION AT ANCHOR (UPLIFT CASE)	UC SHEAR, V	UC TENSION, T	MAX T OR V	BASE RATED CAPACITY FOR VERTICAL DOWN LOADS	LOAD DURATION FACTOR DOWN (90)	DOWN (100)	DOWN (115)	DOWN (125)	UPLIFT (160)
	(lb)	(lb)	(degrees)	(lb)	(lb)	(lb-in)	(lb)	(lb)	(%)	(%)	(%)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)
SIDEWALL	1491	1491	0.0	0.0	1491.0	2982.0	1192.8	1192.8	1.000	0.961	1.00	1491	1491	1491	1491	1491	1491
12:12	2109	1463	45.0	1491.0	1491.0	2982.1	596.4	1241.0	1.000	1.000	1.00	2109	2109	2109	2109	2109	1463
8:12	2688	1579	56.3	2236.5	1491.0	2982.1	298.2	1241.0	1.000	1.000	1.00	2688	2543	2688	2688	2688	1579
6:12	3334	1665	63.4	2982.1	1491.0	2982.1	0.0	1241.0	1.000	1.000	1.00	2826	2543	2826	2826	2826	1665
5:12	3809	1729	67.4	3516.4	1465.2	2930.3	0.0	1241.0	0.983	1.000	1.00	2826	2543	2826	2826	2826	1729
4:12	4402	1811	71.6	4175.7	1391.9	2783.8	0.0	1241.0	0.934	1.000	1.00	2826	2543	2826	2826	2826	1811
2:12	6773	2059	80.5	6681.2	1113.5	2227.1	0.0	1241.0	0.747	1.000	1.00	2826	2543	2826	2826	2826	2059
0:12	9070	2482	90.0	9069.6				1241.0		1.000		2826	2543	2826	2826	2826	2482

CAPACITIES SHOWN HERE APPLY ONLY TO INSTALLATIONS USING **HEM-FIR (G=0.43)** POST ATTACHED TO INSTA-PITCH BAR

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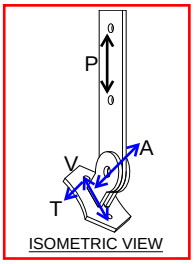
SHEET: STATICS (WC)

PATIO ROOF RISER BRACKET CONNECTION STABILITY (OVERTURNING & SLIDING AT ANCHORED BASE)

HARDWARE MOMENT ARM, L	ANCHOR SPACING, S	CL COL TO ANCH, A'	EDGE OF BEARING TO ANCHOR, N'	LENGTH OF BEARING, A
2 in	3 in	1.5 in	3.75 in	3.75 in
2 in		0 in	1.25 in	1.25 in



ISOMETRIC VIEW

ASD CAPACITY OF VARIOUS COMPONENTS

	5301 lb	(2) 1/2" BOLTS THRU 1/4" PLATE
	2991 lb	5/8" BOLT THRU 1/4" PLATE
Z =	8290 lb	DOUBLE SHEAR STEEL SIDE - STEEL MAIN
Z =	2255 lb	DOUBLE SHEAR WOOD SIDE - STEEL MAIN
Z =	1491 lb	SHEAR STRENGTH OF SINGLE LAG
W =	1241 lb	TENSILE STRENGTH OF LAG BOLT

ROOT DIAMETER OF LAG SCREW, Dr 0.265

ASD CAPACITIES CONTROLLING CAPACITY OF OVERALL ASSEMBLY

2255 lb MINIMUM DOWNLOAD CAPACITY OF CONNECTIONS ABOVE BASE PLATE

2255 lb MINIMUM UPLIFT CAPACITY OF CONNECTIONS ABOVE BASE PLATE

1491 lb SHEAR STRENGTH OF SINGLE LAG (SLIDING RESISTANCE)

1241 lb TENSILE STRENGTH OF LAG BOLT (OVERTURNING RESISTANCE)

ADJUSTED ASD CAPACITY

ROOF PITCH	DOWNWARD VERTICAL LOAD MAGNITUDE, -P	UPLIFT VERTICAL LOAD MAGNITUDE, P	ANGLE OF LOAD APPLIED, θ	AXIAL FORCE	SHEAR	MOMENT	TENSION AT ANCHOR (DOWN LOAD CASE)	TENSION AT ANCHOR (UPLIFT CASE)	UC SHEAR, V	UC TENSION, T	MAX T OR V	BASE RATED CAPACITY FOR VERTICAL DOWN LOADS	LOAD DURATION FACTOR: DOWN (90)	DOWN (100)	DOWN (115)	DOWN (125)	UPLIFT (160)
	(lb)	(lb)	(degrees)	(lb)	(lb)	(lb-in)	(lb)	(lb)	(%)	(%)	(%)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)
SIDEWALL	1491	1491	0.0	0.0	1491.0	2982.0	1192.8	1192.8	1.000	0.961	1.00	1491	1491	1491	1491	1491	1491
12:12	2109	1463	45.0	1491.0	1491.0	2982.1	596.4	1241.0	1.000	1.000	1.00	2109	2030	2109	2109	2109	1463
8:12	2688	1579	56.3	2236.5	1491.0	2982.1	298.2	1241.0	1.000	1.000	1.00	2255	2030	2255	2255	2255	1579
6:12	3334	1665	63.4	2982.1	1491.0	2982.1	0.0	1241.0	1.000	1.000	1.00	2255	2030	2255	2255	2255	1665
5:12	3809	1729	67.4	3516.4	1465.2	2930.3	0.0	1241.0	0.983	1.000	1.00	2255	2030	2255	2255	2255	1729
4:12	4402	1811	71.6	4175.7	1391.9	2783.8	0.0	1241.0	0.934	1.000	1.00	2255	2030	2255	2255	2255	1811
2:12	6773	2059	80.5	6681.2	1113.5	2227.1	0.0	1241.0	0.747	1.000	1.00	2255	2030	2255	2255	2255	2059
0:12	9070	2482	90.0	9069.6				1241.0		1.000		2255	2030	2255	2255	2255	2482

CAPACITIES SHOWN HERE APPLY ONLY TO INSTALLATIONS USING **WESTERN CEDAR (G=0.36)** POST ATTACHED TO INSTA-PITCH BAR

OPTIONAL BLOCKING INSTALLATION

DATE: 4/20/2021

Branch ENGINEERING inc
Since 1977
civil · transportation
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SURVEYING

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

PROJECT: 18-220 WOODSTONE STRUCTURES - PRR
BY: JOSHUA ANNETT
CHECKED BY: RICK HERNANDEZ, P.E., S.E.
SHEET: 4x BLKNG

Wood Beam Design

MEMBER ID: **4x BLKNG**

MEMBER DATA

↑ R1 — **SPAN** — ↑ R2 — **O'HANG**

DL 6.6 psf
LL 0 psf
SL 20 psf
s 24 in

INCLUDE SELF WEIGHT?:	**YES**		
PROPOSED MEMBER:	**4** x **4**		
SPECIES / GRADE:	**DF #2**		
MULTIPLE MEMBERS ?:	**1**		
SPAN:	**1.875**	ft	
OVERHANG:	**0**	ft	
CONTINUOUS SUPPORT OR l_u:	**1.875**	ft	
SERVICE CONDITION:	**dry**		
REPETITIVE MEMBER FACTOR:	**1**		
FLAT USE FACTOR C_{fu}:	**1.05**		
INCISED?:	**no**		
LL REDUCTION FACTOR:	**1**		

CF:	1.3
self wt	2.6031 lb
Sx	7.15 in^3
A	12.3 in^2
Fb	900 ksi
Fv	180 ksi
FcT	625 ksi
E	1600 ksi

LOAD DATA

Load	D start	D end	L start	L end	S start	S end	E	W	Start Loc	End Loc	ID
Uniform 1	**13**	–	**0**	–	**40**	–	–	–	**0**	**1.875**	
Uniform 2		–		–		–	–	–	**0**	**1**	
Uniform 3		–		–		–	–	–	**0**	**1**	
Uniform 4		–		–		–	–	–	**0**	**1**	
Uniform 5		–		–		–	–	–	**0**	**1**	
Uniform 6		–		–		–	–	–	**0**	**1**	
Point 1		–	**1490**	–		–			**0.9375**	–	
Point 2		–		–		–			**1**	–	
Point 3		–		–		–			**1**	–	
Point 4		–		–		–			**1**	–	
Tapered 1							–	–	**0**	**1**	
Tapered 2							–	–	**0**	**1**	
Frame Moment (+ for load to right)			–	–	–	–	**0**	**0**	–	–	

PRR MIN. REACTION

DEFLECTION REQUIREMENTS

Allowable Deflection D+L	**L / 240**
Allowable Deflection D+S	**L / 180**
Allowable Deflection L	**L / 360**
Allowable Deflection S	**L / 240**
Allowable Deflection W	**L / 180**

MEMBER RESULTS

Design Moment	705 lb-ft		Unity:	Design Shear	756 lb		Unity:
Allowable Moment	731 lb-ft	OK	97%	Allowable Shear	1470 lb	OK	51%

	SPAN			
Design Deflection D+L	0.02	in. = L /	1258	OK
Design Deflection D+S	0.00	in. = L /	29010	OK
Design Deflection L	0.02	in. = L /	1273	OK
Design Deflection S	0.00	in. = L /	40471	OK
Design Deflection W	0.00	in. = L /	N/A	

JOINT REACTIONS

	R1	R2	
D	15	15	
L	745	745	
S	38	38	
W	0	0	
E	0	0	
D+L	760	760	
D+S	52	52	
D+0.75(L+S)	602	602	
Uplift			
MAX. COMBINED REACTION	760	760	760

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BY: JOSHUA ANNETT
CHECKED BY: RICK HERNANDEZ, P.E., S.E.
SHEET: BLKNG CONN.

FASTENERS AT ENDS OF BLOCKING

LOAD PERPENDICULAR TO ROOF SURFACE

	QTY	Z	CD	Ceg	Z'	LOAD AT END - CHECK	LOAD AT MID - CHECK
3/8" LAG SCREWS AT EQ. SPACING EA. END	3	140	1	0.67	281	281	562
10d NAIL AT 1.5" SPACING EA. END	6	118	1	0.67	474	474	948
A34 w/ 0.131x1.5" NAILS EA. END	2	395	1	1.00	790	790	1490
A34 w/ #9x1.5" SD EA. END	2	640	1	1.00	1280	1280	1490

P*COS(ANGLE)

$UC = 1.0 = \frac{P*COS()}{Z'_T} + \frac{P*SIN()}{Z'_{II}}$

SOLVE FOR "P"

$P = \left[\frac{COS()}{Z'_T} + \frac{SIN()}{Z'_{II}}\right]^{-1}$

SUM UNITY RATIOS = 1.0 AND SOLVE TO FIND COMMON VALUE FOR LOAD FROM PRR

LOAD PARALLEL TO ROOF SURFACE

	QTY	Z	CD	Ceg	Z'	LOAD AT END - CHECK	LOAD AT MID - CHECK
3/8" LAG SCREWS AT EQ. SPACING EA. END	3	140	1	0.67	281	281	562
10d NAIL AT 1.5" SPACING EA. END	8	95	1	0.67	509	509	1018
A34 w/ 0.131x1.5" NAILS EA. END	1	395	1	1.00	395	395	790
A34 w/ #9x1.5" SD EA. END	1	495	1	1.00	495	495	990

P*SIN(ANGLE)

	ANGLE	END LOADING: 3/8" LAG SCREWS AT EQ. SPACING EA. END	10d NAIL AT 1.5" SPACING EA. END	A34 w/ 0.131x1.5" NAILS EA. END	A34 w/ #9x1.5" SD EA. END	MID SPAN LOADING: 3/8" LAG SCREWS AT EQ. SPACING EA. END	10d NAIL AT 1.5" SPACING EA. END	A34 w/ 0.131x1.5" NAILS EA. END	A34 w/ #9x1.5" SD EA. END
SIDEWALL	90	281	509	395	495	562	1018	790	990
12:12	45	199	347	372	505	397	694	730	841
8:12	34	203	351	407	565	405	703	793	894
6:12	27	209	362	442	624	419	723	857	951
5:12	23	215	370	467	667	430	740	904	992
4:12	18	222	381	500	725	444	763	964	1046
2:12	9	244	416	601	907	488	832	1149	1208
0:12	0	281	474	790	1280	562	948	1490	1490