STRUCTURAL CALCULATIONS

Branch ENGINEERING inc
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SURVEYING

DATE: October 24, 2023

PROJECT: 18-220 ***LO-PRO*** **BEAM MOUNT**

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 ***LO-PRO*** BEAM MOUNT 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 drawing file containing renderings of ***LO-PRO*** BEAM MOUNT, supplied by Woodstone Structures, LLC February 2022.
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 "***LO-PRO*** BEAM MOUNT 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 DIGITALLY SIGNED CIVIL STATE OF CALIFORNIA
Expires: JUNE 30, 2025
Ronald J. Derrick
Digitally signed by Ronald J. Derrick
Date: 2023.10.30 09:13:10 -07'00'

EUGENE-SPRINGFIELD PHILOMATH-CORVALLIS

STRUCTURAL ENGINEERING REPORT

DATE: October 24, 2023
PROJECT: 18-220 ***LO-PRO*** **BEAM MOUNT**
CLIENT: **WOODSTONE STRUCTURES, LLC**
REPORT BY: **BRANCH ENGINEERING, INC.**

LO-PRO BEAM MOUNT

DESCRIPTION:

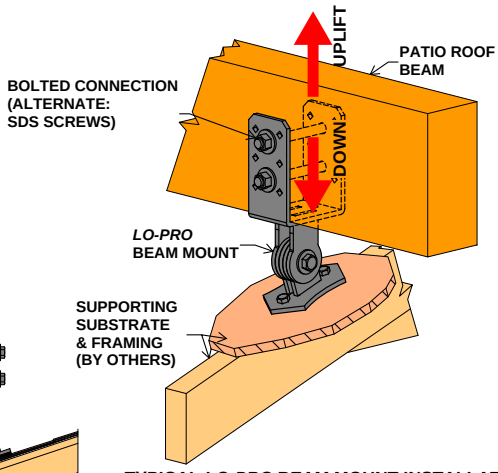
This structural engineering report has been requested by Woodstone Structures, LLC for preliminary analysis of a proprietary product called, "***LO-PRO*** **Beam Mount**." The objective of this analysis is to report the allowable capacity of the product, in its current configuration, for use in supporting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

ASSUMED MATERIAL:

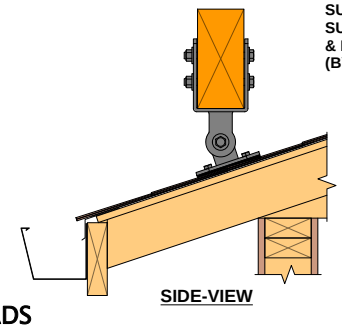
STEEL PLATE - 1/4" ASTM A36
(2) 1/2" DIA. ASTM A307 BOLT
(1) 5/8" DIA. ASTM A449 (GRADE 8) BOLT
(2) 3/8" DIA. ASTM A307 LAG SCREW
BEAM - SPECIES PER TABLE (NOT SUPPLIED)

OPTIONS:

Variable pitch per table.
Installation on 4x blocking.
(12) ¼"x1½" SDS SCREWS



TYPICAL *LO-PRO* BEAM MOUNT INSTALLATION



SIDE-VIEW

LO-PRO BEAM MOUNT 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	1355
12:12	2105	2105	2105	2105	1460	2105	2105	2105	2105	1460	2105	2105	2105	2105	1355
8:12	2685	2685	2685	2685	1575	2685	2685	2685	2685	1575	2685	2685	2685	2685	1355
6:12	3330	3330	3330	3330	1660	3330	3330	3330	3330	1620	3330	3330	3330	3330	1355
5:12	3805	3805	3805	3805	1725	3505	3805	3805	3805	1620	3680	3805	3805	3805	1355
4:12	4350	4350	4350	4350	1810	3505	3895	3895	3895	1620	3680	4090	4090	4090	1355
2:12	4350	4350	4350	4350	1885	3505	3895	3895	3895	1620	3680	4090	4090	4090	1355
0:12	4350	4350	4350	4350	1885	3505	3895	3895	3895	1620	3680	4090	4090	4090	1355

NOTES:

1. FOR ***LO-PRO*** **BEAM MOUNT** INSTALLED ON THE FACE OF A VERTICAL WALL, USE "SIDEWALL".
2. ALLOWABLE LOADS SHOWN ARE FOR A SINGLE ***LO-PRO*** **BEAM MOUNT** INSTALLED AT THE INDICATED ROOF SLOPE. ALL INSTALLATIONS SHOULD USE MIN. OF (3) ***LO-PRO*** **BEAM MOUNT** BRACKETS, UNLESS APPROVED BY ENGINEER.
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 ***LO-PRO*** **BEAM MOUNT** BRACKET.
8. UP TO 1/4" VERTICAL MOVEMENT WITHIN ***LO-PRO*** **BEAM MOUNT** MAY BE EXPECTED WHEN THE ***LO-PRO*** **BEAM MOUNT** 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. BOLT HOLES SHALL BE A MINIMUM OF 1/32" AND A MAXIMUM OF 1/16" LARGER THAN THE BOLT DIAMETER (PER NDS SEC. 11)
11. FASTENERS CONNECTING ***LO-PRO*** **BEAM MOUNT** TO BEAM SHALL HAVE MINIMUM OF 2" END DISTANCE.
12. INSTA-PITCH BAR IS ASSUMED TO BE INSTALLED IN A PLUMB CONDITION.
13. WELDING ON ***LO-PRO*** **BEAM MOUNT** 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 2018 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.
16. MINIMUM BEAM SIZE FOR FULL ALLOWABLE UPLIFT LOAD IS 4X8. FOR INSTALLATIONS USING 4X6 BEAM, MULITPLY UPLIFT ALLOWABLE LOAD BY 0.67.

STRUCTURAL ENGINEERING REPORT

LO-PRO BEAM MOUNT (cont.)

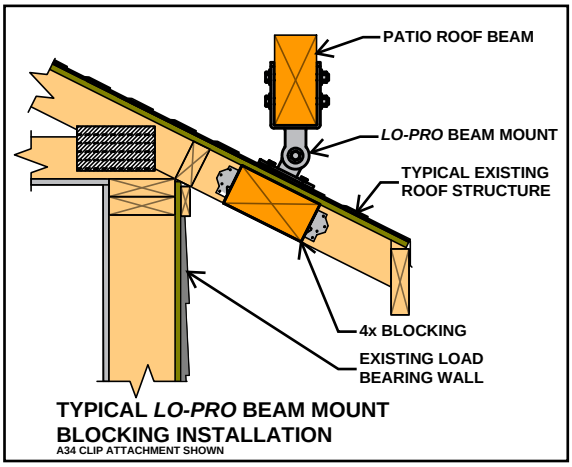
OPTIONAL BLOCKING INSTALLATION

INSTALLATION OPTION:

The ***LO-PRO* BEAM MOUNT** may be installed on blocking between rafters or truss members, where sufficient framing does not exist. For this installation a length of 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:

***LO-PRO* BEAM MOUNT** BRACKET & ALL INCLUDED ACCESSORIES
4x8 #2 DF BLOCKING AT EACH ***LO-PRO* BEAM MOUNT** (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 *LO-PRO* BEAM MOUNT BLOCKING INSTALLATION
A34 CLIP ATTACHMENT SHOWN

LO-PRO BEAM MOUNT 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

LO-PRO BEAM MOUNT 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 ***LO-PRO* BEAM MOUNT** 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 OR TRUSS TAIL 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 ***LO-PRO* BEAM MOUNT** 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 ***LO-PRO* BEAM MOUNT** ALLOWABLE LOAD TABLE FOR ADDITIONAL INFORMATION RELATING TO THE ALLOWABLE CAPACITY OF THE ***LO-PRO* BEAM MOUNT**.
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), WHERE "D" IS THE LAG SCREW DIAMETER.
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.

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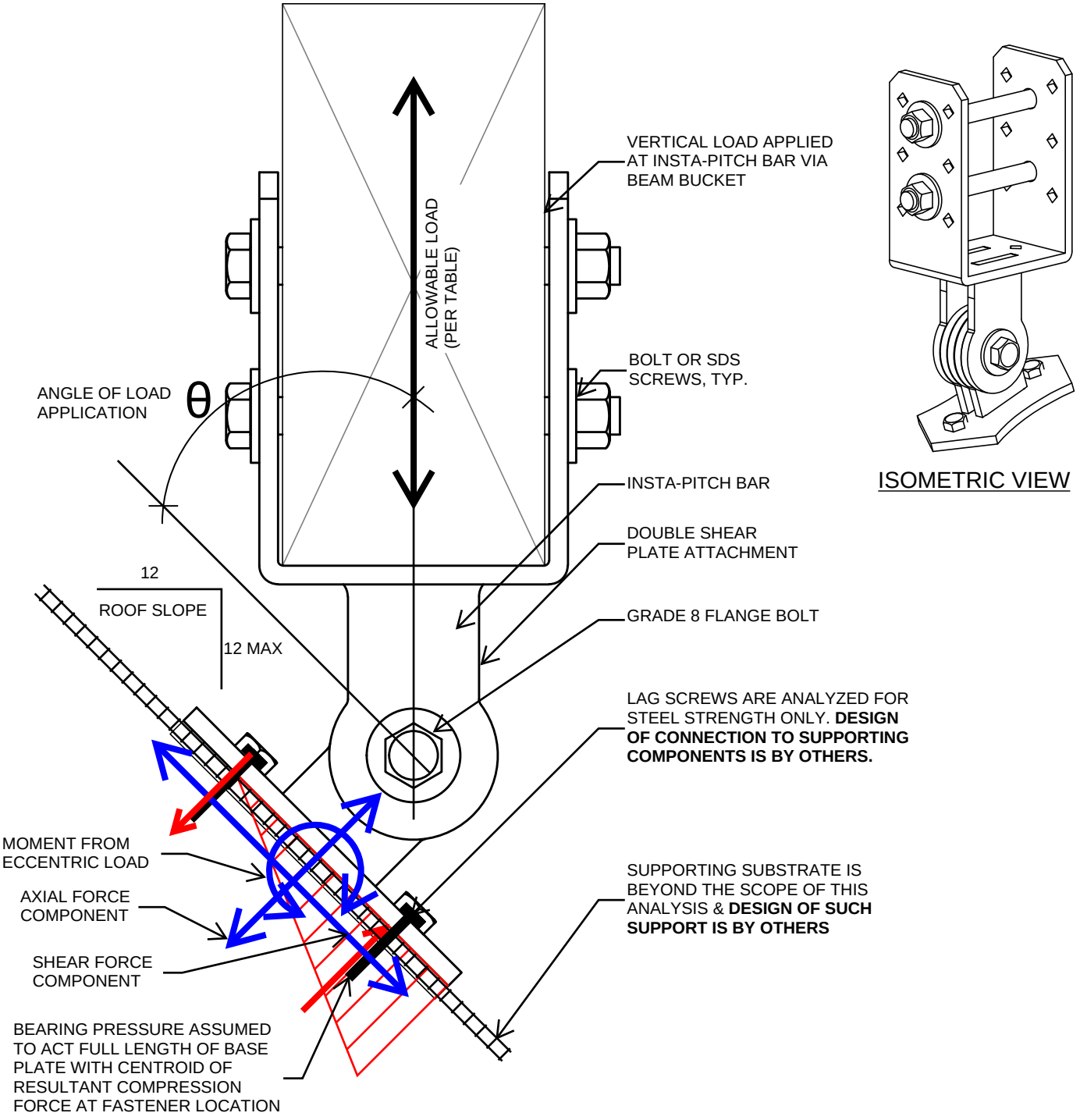
310 5th Street
Springfield, Oregon 97477
Telephone: (541) 746 0637

DATE: 2/14/2022

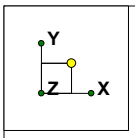
PROJECT: 18-220 WOODSTONE LO-PRO BEAM MOUNT
BY: JOSHUA ANNETT
CHECKED BY: RICK HERNANDEZ, P.E., S.E.

PATIO ROOF RISER SKETCH & CALCULATION ORIENTATION/AXES

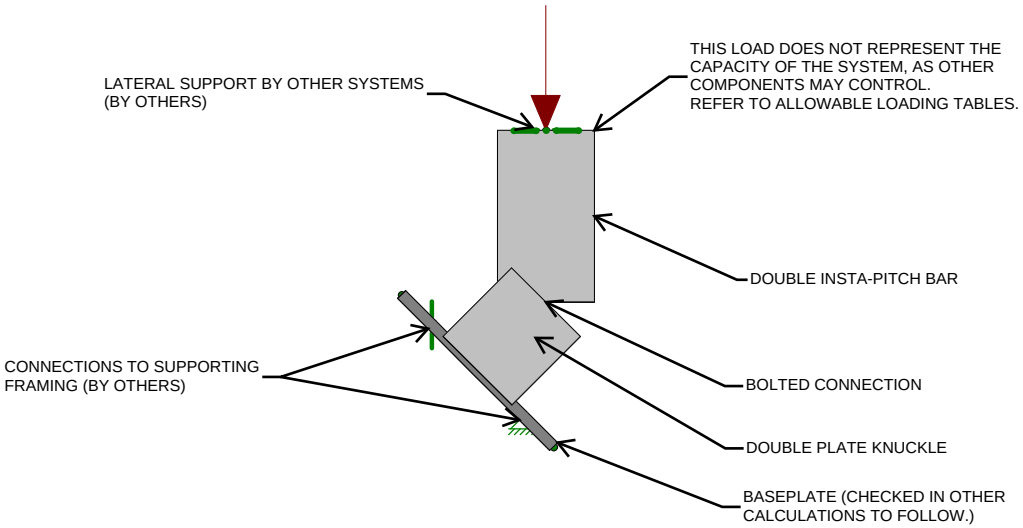


ISOMETRIC VIEW

NOTE: SKETCH IS NOT TO SCALE
NOT FOR CONSTRUCTION



ASSEMBLY COMPRESSION CHECK



Loads: BLC 1,

BRANCH ENGINEERING,...		
JOSHUA ANNETT	LO-PRO BEAM MOUNT	Feb 14, 2022 at 12:22 PM
18-220		

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	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-torqu...	K-out	K-in	Cb	Function
1	BASE	HR1A	5			Lb out						
2	PL1	HR1A	2.25			Lb out						
3	INSTA PIT...	HR2	4			Lb out						
4	PL2	HR1A	2.25			Lb out						

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	N5	L	Y	-6500

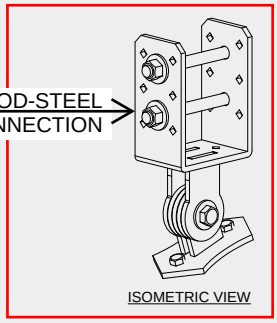
Load Combinations

	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	.986	0	.546	0	17351.297	18241.2	853.2	1.667	H1-1a
2	1	INSTA PITCH ...	PL1/4x2.25	.668	0	.000	0	15574.094	18241.2	836.716	1	H1-1a
3	1	PL2	PL1/4x2.25	.986	0	.546	0	17351.297	18241.2	853.2	1.667	H1-1a

UC≤1.0 = OK!



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

Submit Initial Values

Main Member Type	Douglas Fir-Larch
Main Member Thickness	3.5 in.
Main Member: Angle of Load to Grain	90
Side Member Type	Steel
Side Member Thickness	1/4 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

Calculate Connection Capacity

Connection Yield Mode Descriptions | Limits of Use

Diaphragm Factor Help | Load Duration Factor Help | Technical Help

Show Printable View

Connection Yield Modes

Im	1103 lbs.
Is	4350 lbs.
IIIs	1026 lbs.
IV	1194 lbs.

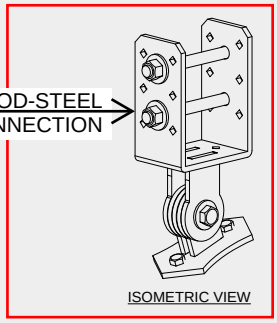
Adjusted ASD Capacity	**1026 lbs.**

ASD CAPACITY FOR (2) BOLTS = 2 * 1026# = 2052#

- 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 steel side members 1/4 in. thick, and ASTM A653 Grade 33 Steel is assumed for steel side members less than 1/4 in. thick.

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.

Codes & Standards > Calculators & Software > Connection Calculator



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

Main Member Type	Hem-Fir
Main Member Thickness	3.5 in.
Main Member: Angle of Load to Grain	90
Side Member Type	Steel
Side Member Thickness	1/4 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

Calculate Connection Capacity

Connection Yield Mode Descriptions | Limits of Use

Diaphragm Factor Help | Load Duration Factor Help | Technical Help

Show Printable View

Connection Yield Modes

Im	893 lbs.
Is	4350 lbs.
IIIs	933 lbs.
IV	1078 lbs.

Adjusted ASD Capacity	**893 lbs.**

ASD CAPACITY FOR (2) BOLTS = 2 * 893# = 1786#

- 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 steel side members 1/4 in. thick, and ASTM A653 Grade 33 Steel is assumed for steel side members less than 1/4 in. thick.

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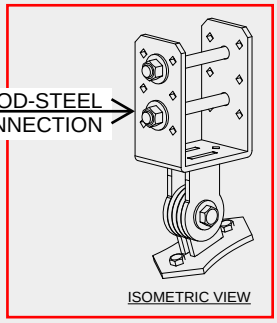
Codes & Standards > Calculators & Software > Connection Calculator



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

Submit Initial Values

Main Member Type	Western Cedars
Main Member Thickness	3.5 in.
Main Member: Angle of Load to Grain	90
Side Member Type	Steel
Side Member Thickness	1/4 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

Calculate Connection Capacity

Connection Yield Mode Descriptions | Limits of Use

Diaphragm Factor Help | Load Duration Factor Help | Technical Help

Show Printable View

Connection Yield Modes

Im	683 lbs.
Is	4350 lbs.
IIIs	825 lbs.
IV	946 lbs.

Adjusted ASD Capacity	**683 lbs.**

ASD CAPACITY FOR (2) BOLTS = 2 * 683# = 1366#

- 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 steel side members 1/4 in. thick, and ASTM A653 Grade 33 Steel is assumed for steel side members less than 1/4 in. thick.

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.

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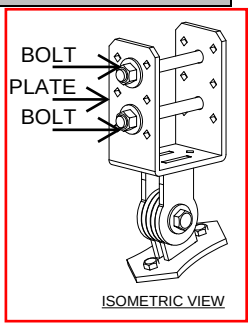
DATE: 2/16/2022

PROJECT: 18-220 WOODSTONE LO-PRO BEAM MOUNT
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**	**x 2 PLs**	**0.5 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}:	2.5 in^2	Shear Yielding
Bolt specification:	**A307**			A_g:	1.13 in^2	Tensile Yielding
Thread condition:	**N**			A_{nv}:	2.03 in^2	Shear Rupture
Bolt Hole Preparation Method:	**Punch**			A_e:	0.81 in^2	Tensile Rupture
Threaded Part F_u:	**60 ksi**			A_{nv}:	2.03 in^2	Block Shear
Bolt spacing, s:	**4 in**			A_{gv}:	2.50 in^2	Block Shear
End distance, L_{ev}:	**1 in**			A_{nt}:	0.41 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 = 54.00 kip	1.00	1.5	36.00 kip
Tensile Yielding:	ϕR_n = 36.45 kip	0.90	1.67	24.25 kip
Shear Rupture:	ϕR_n = 53.02 kip	0.75	2	35.34 kip
Tensile Rupture:	ϕR_n = 35.34 kip	0.75	2	23.56 kip
Block Shear Rupture:	ϕR_n = 58.17 kip	0.75	2	38.78 kip
Bolt Shear Strength:	ϕR_n = 7.95 kip	0.75	2	5.30 kip
Bearing Strength at Bolt Hole:	ϕR_n = 35.89 kip	0.75	2	23.93 kip

ASD Connection Design Strength: 5.30 kips

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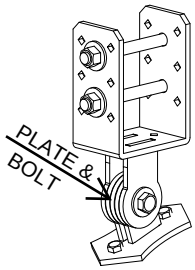
PROJECT: 18-220 WOODSTONE LO-PRO BEAM MOUNT
BY: JOSHUA ANNETT
CHECKED BY: RICK HERNANDEZ, P.E., S.E.
SHEET: 0.625 FLNG BLT-PL

Bolted Shear Connection Design for Bolts in Standard Holes

Steel thickness:	**0.25 in**	**x 2 PLs**	**0.5 in**	F_y:	36 ksi
Steel width:	**2.25 in**			F_u:	58 ksi
Steel specification:	**A36**			ϕF_{nv}:	50.625 ksi
Bolt diameter, d:	**0.5625 in**			A_{gv}:	0.5 in^2 Shear Yielding
Bolt specification:	**A490**			A_g:	1.13 in^2 Tensile Yielding
Thread condition:	**N**			A_{nv}:	0.34 in^2 Shear Rupture
Bolt Hole Preparation Method:	**Drill**			A_e:	0.81 in^2 Tensile Rupture
Threaded Part F_u:	**150 ksi**			A_{nv}:	0.34 in^2 Block Shear
Bolt spacing, s:	**0 in**			A_{gv}:	0.50 in^2 Block Shear
End distance, L_{ev}:	**1 in**			A_{nt}:	0.41 in^2 Block Shear
Side distance, L_{eh}:	**1 in**			U_{bs}:	1 Block Shear
Number of bolts in row:	**1**			U:	1 Shear Lag Factor
Number of rows:	**1**				



ISOMETRIC VIEW

		Φ	Ω	ASD CAPACITY
Shear Yielding:	ϕR_n = 10.80 kip	1.00	1.5	7.20 kip
Tensile Yielding:	ϕR_n = 36.45 kip	0.90	1.67	24.25 kip
Shear Rupture:	ϕR_n = 8.97 kip	0.75	2	5.98 kip
Tensile Rupture:	ϕR_n = 35.34 kip	0.75	2	23.56 kip
Block Shear Rupture:	ϕR_n = 25.77 kip	0.75	2	17.18 kip
Bolt Shear Strength:	ϕR_n = 12.58 kip	0.75	2	8.39 kip
Bearing Strength at Bolt Hole:	ϕR_n = 17.94 kip	0.75	2	11.96 kip

ASD Connection Design Strength: 5.98 kips

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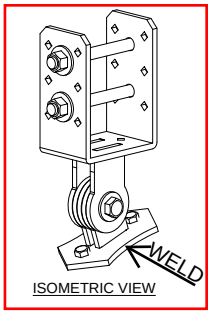
PROJECT: 18-220 WOODSTONE LO-PRO BEAM MOUNT
BY: JOSHUA ANNETT
CHECKED BY: RICK HERNANDEZ, P.E., S.E.
SHEET: WELD

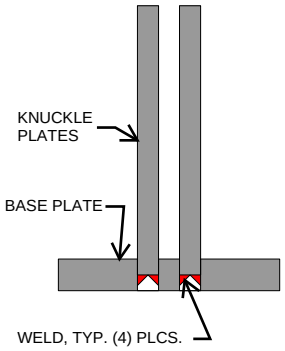
Combined Strength of Weld in Axial, Shear, & Bending

ROOF SLOPE		**2:12** ← MAX CASE	
Axial Force, P_u		**3340.6 lb**	
Design Shear, V_u		**556.8 lb**	
Design Moment, M_u		**92.8 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

weld configuration

1 2 3 4 5 6 7 8 9 10

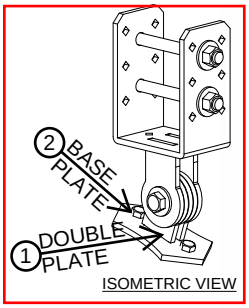




ROOF SLOPE	SIDEWALL	12:12	8:12	6:12	5:12	4:12	2:12	0:12	
f_a	0.00	2.81	4.22	5.62	6.63	7.88	12.60	17.10	ksi
f_v	2.81	2.81	2.81	2.81	2.76	2.63	2.10	0.00	ksi
f_b	22.50	22.50	22.50	22.50	22.11	21.00	16.80	0.00	ksi
TOAL UC	**0.80**	**0.89**	**0.94**	**0.98**	**1.00**	**1.00**	**1.00**	**0.54**	

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

BASE PLATE GEOMETRY PARAMETERS



ISOMETRIC VIEW

$N := 5\ in$ Base plate length

$s_N := 3\ in$ Anchor spacing

$B := 2.5\ in$ Base plate width

MATERIAL SPECIFICATIONS

$\Omega_b := 1.67$

$F_y := 36\ ksi$ 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

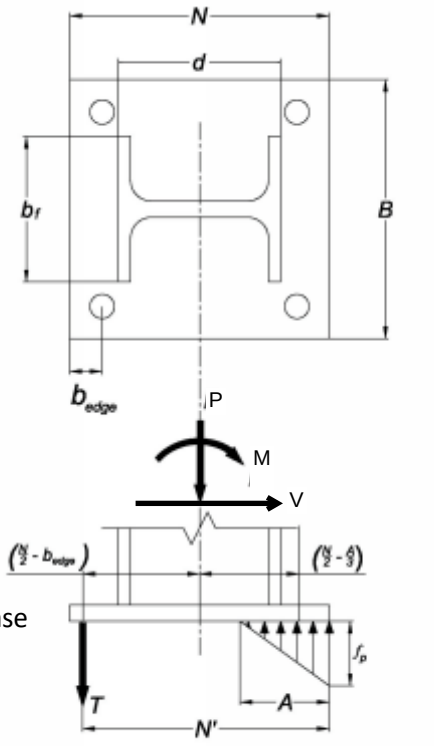
Tension Side of Base Plate

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

$V := 1491\ lb$ Shear at attachment

$L := 2\ in$ Attachment moment arm

$M_{max} := V \cdot L = 2982\ lb \cdot in$ 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

$M_\Omega := \Omega_b^{-1} \cdot F_y \cdot S_x = 4041.92\ lb \cdot in$ Moment strength of baseplate

$$BendingCheck := \frac{M_{max}}{M_\Omega} = 0.74$$

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

$m := T \cdot x = 977.29\ lb \cdot in$ Moment at tension side of baseplate

$M_\Omega := {\Omega_b}^{-1} \cdot F_y \cdot Z_x = 1688.05\ lb \cdot in$ Moment strength of baseplate

Moment at Base Plate - Case 1

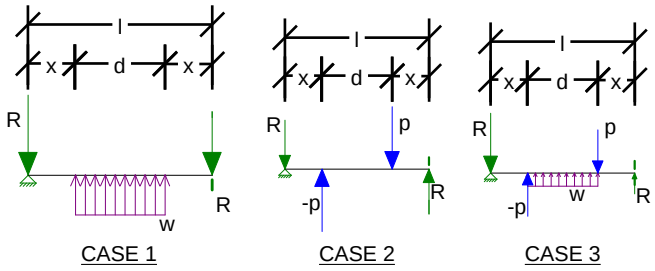
$M_1 := 1396\ lb \cdot in$ ← SEE MODEL RESULTS NEXT PAGE

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



$$BendingCheck := \frac{\max\left(M_1, M_2, M_3\right)}{M_\Omega} = 0.83$$

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

$\Omega_V := 1.67$

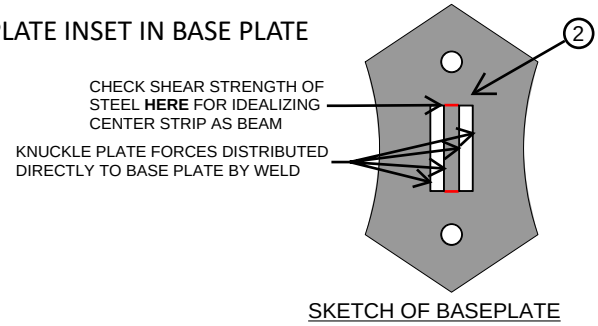
$C_v := 1.0$

$b := 0.25\ in$

$t_{pBP} = 0.38\ in$

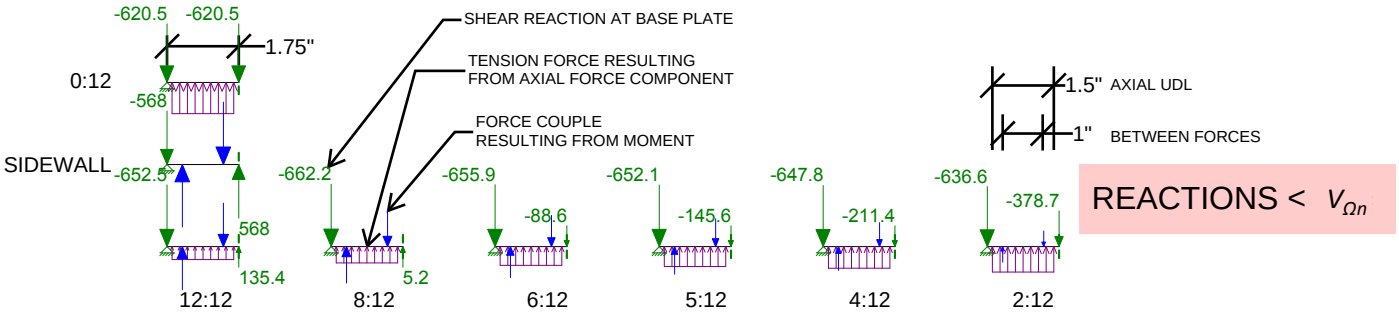
$A_w := b \cdot t_{pBP} = 0.09\ in^2$

$V_{\Omega n} := {\Omega_V}^{-1} \cdot 0.6\ F_y \cdot A_w \cdot C_v = 1212.57\ lbf$



SKETCH OF BASEPLATE

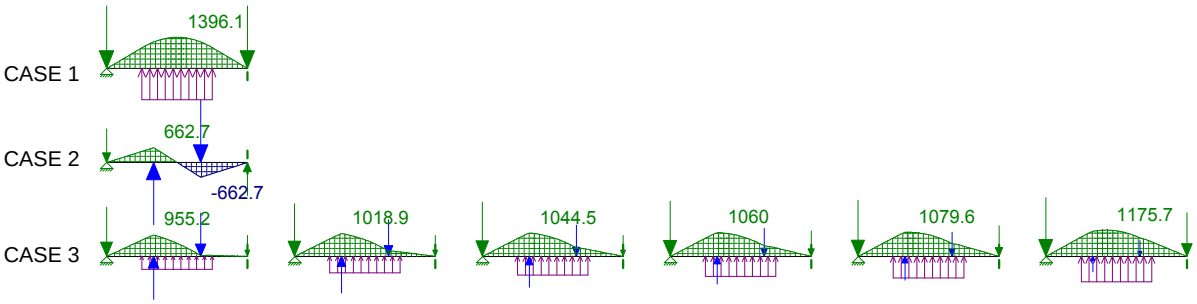
BEAM MODELS OF STRIP BETWEEN KNUCKLE PLATES - LOAD CASE FACTOR = 0.5



REACTIONS < $V_{\Omega n}$

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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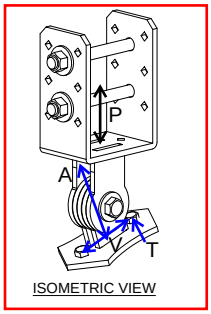
PROJECT: 18-220 WOODSTONE LO-PRO BEAM MOUNT
BY: JOSHUA ANNETT
CHECKED BY: RICK HERNANDEZ, P.E., S.E.
SHEET: STATICS (DF)

LO-PRO BEAM MOUNT 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

G= 0.5

COMPRESSION PERPENDICULAR TO GRAIN 625



ISOMETRIC VIEW

ASD CAPACITY OF VARIOUS COMPONENTS

	6500 lb	ASSEMBLY CAPACITY - RISA 2D
	5301 lb	(2) 1/2" BOLTS THRU 1/4" PLATE
	5981 lb	5/8" BOLT THRU 1/4" PLATE
Z =	8290 lb	DOUBLE SHEAR STEEL SIDE - STEEL MAIN
Z =	2052 lb	DOUBLE SHEAR STEEL SIDE - WOOD MAIN
Z =	1500 lb	(3) SDS SCREWS EA. WAY
Z =	6016 lb	COMPRESSION PERP TO GRAIN
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

5981 lb MINIMUM DOWNLOAD CAPACITY OF CONNECTIONS ABOVE BASE PLATE

1500 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	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	3334	3334	3334	3334	3334	1665
5:12	3809	1729	67.4	3516.4	1465.2	2930.3	0.0	1241.0	0.983	1.000	1.00	3809	3809	3809	3809	3809	1729
4:12	4402	1811	71.6	4175.7	1391.9	2783.8	0.0	1241.0	0.934	1.000	1.00	4402	4402	4402	4402	4402	1811
2:12	6773	2059	80.5	6681.2	1113.5	2227.1	0.0	1241.0	0.747	1.000	1.00	6016	5981	5981	5981	5981	1886
0:12	9070	2482	90.0	9069.6				1241.0		1.000		6016	5981	5981	5981	5981	1886

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

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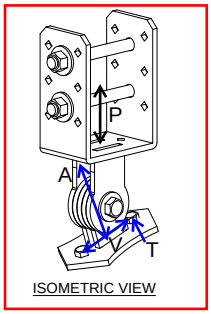
BY: JOSHUA ANNETT
CHECKED BY: RICK HERNANDEZ, P.E., S.E.
SHEET: STATICS (HF)

LO-PRO BEAM MOUNT 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

G= 0.43
COMPRESSION PERPENDICULAR TO GRAIN 405



ISOMETRIC VIEW

ASD CAPACITY OF VARIOUS COMPONENTS

	6500 lb	ASSEMBLY CAPACITY - RISA 2D
	5301 lb	(2) 1/2" BOLTS THRU 1/4" PLATE
	5981 lb	5/8" BOLT THRU 1/4" PLATE
Z =	8290 lb	DOUBLE SHEAR STEEL SIDE - STEEL MAIN
Z =	1786 lb	DOUBLE SHEAR STEEL SIDE - WOOD MAIN
Z =	1290 lb	(3) SDS SCREWS EA. WAY
Z =	3898 lb	COMPRESSION PERP TO GRAIN
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

3898 lb MINIMUM DOWNLOAD CAPACITY OF CONNECTIONS ABOVE BASE PLATE

1290 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	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	3334	3334	3334	3334	3334	1622
5:12	3809	1729	67.4	3516.4	1465.2	2930.3	0.0	1241.0	0.983	1.000	1.00	3809	3508	3809	3809	3809	1622
4:12	4402	1811	71.6	4175.7	1391.9	2783.8	0.0	1241.0	0.934	1.000	1.00	3898	3508	3898	3898	3898	1622
2:12	6773	2059	80.5	6681.2	1113.5	2227.1	0.0	1241.0	0.747	1.000	1.00	3898	3508	3898	3898	3898	1622
0:12	9070	2482	90.0	9069.6				1241.0		1.000		3898	3508	3898	3898	3898	1622

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

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

DATE: 2/16/2022

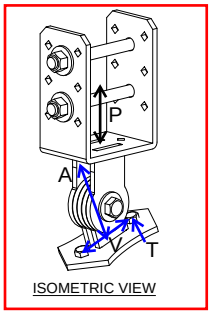
PROJECT: 18-220 WOODSTONE LO-PRO BEAM MOUNT
BY: JOSHUA ANNETT
CHECKED BY: RICK HERNANDEZ, P.E., S.E.
SHEET: STATICS (WC)

LO-PRO BEAM MOUNT BRACKET CONNECTION STABILITY (OVERTURNING & SLIDING AT ANCHORED BASE)

G= 0.36

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

COMPRESSION PERPENDICULAR TO GRAIN 425



ISOMETRIC VIEW

ASD CAPACITY OF VARIOUS COMPONENTS

	6500 lb	ASSEMBLY CAPACITY - RISA 2D
	5301 lb	(2) 1/2" BOLTS THRU 1/4" PLATE
	5981 lb	5/8" BOLT THRU 1/4" PLATE
Z =	8290 lb	DOUBLE SHEAR STEEL SIDE - STEEL MAIN
Z =	1366 lb	DOUBLE SHEAR STEEL SIDE - WOOD MAIN
Z =	1080 lb	(3) SDS SCREWS EA. WAY
Z =	4091 lb	COMPRESSION PERP TO GRAIN
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

4091 lb MINIMUM DOWNLOAD CAPACITY OF CONNECTIONS ABOVE BASE PLATE

1080 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	1358
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	1358
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	1358
6:12	3334	1665	63.4	2982.1	1491.0	2982.1	0.0	1241.0	1.000	1.000	1.00	3334	3334	3334	3334	3334	1358
5:12	3809	1729	67.4	3516.4	1465.2	2930.3	0.0	1241.0	0.983	1.000	1.00	3809	3682	3809	3809	3809	1358
4:12	4402	1811	71.6	4175.7	1391.9	2783.8	0.0	1241.0	0.934	1.000	1.00	4091	3682	4091	4091	4091	1358
2:12	6773	2059	80.5	6681.2	1113.5	2227.1	0.0	1241.0	0.747	1.000	1.00	4091	3682	4091	4091	4091	1358
0:12	9070	2482	90.0	9069.6				1241.0		1.000		4091	3682	4091	4091	4091	1358

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

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DATE: 2/16/2022

PROJECT: 18-220 WOODSTONE LO-PRO BEAM MOUNT
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**	–	–	

max reaction based on blocking connections

LO-PRO BEAM MOUNT 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 LO-PRO BEAM MOUNT

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)

		END LOADING				MID SPAN LOADING			
	ANGLE	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	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