STRUCTURAL CALCULATIONS

for

New Deck
Griffith Residence
2443 84th Ave SE
Mercer Island, WA

July 10, 2020

HOWARD S. BURTON
STATE OF WASHINGTON
28112
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Seattle Structural

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Seattle Structural Project No. P19031.00

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Seattle Structural

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Seattle Structural Project No. P19031.00

LOADS

DEAD LOAD

SELF WEIGHT OF FRAMING

DECKING 1" DECKING (1"/12"/ft)(48 PCF) = 4 PSF

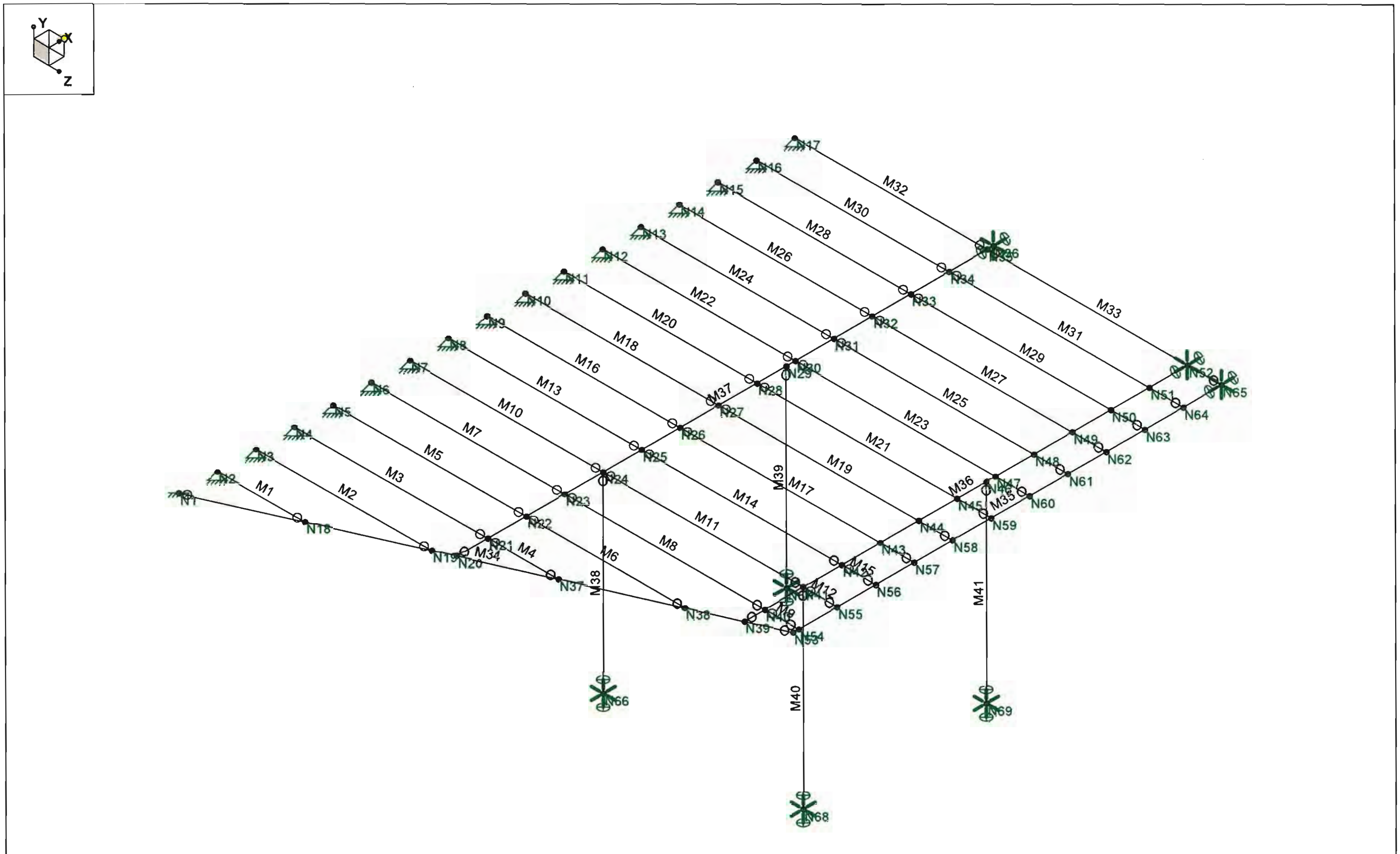
LIVE LOAD

LL = 40 PSF

SNOW LOAD

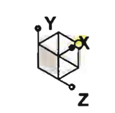
SL = 25 PSF

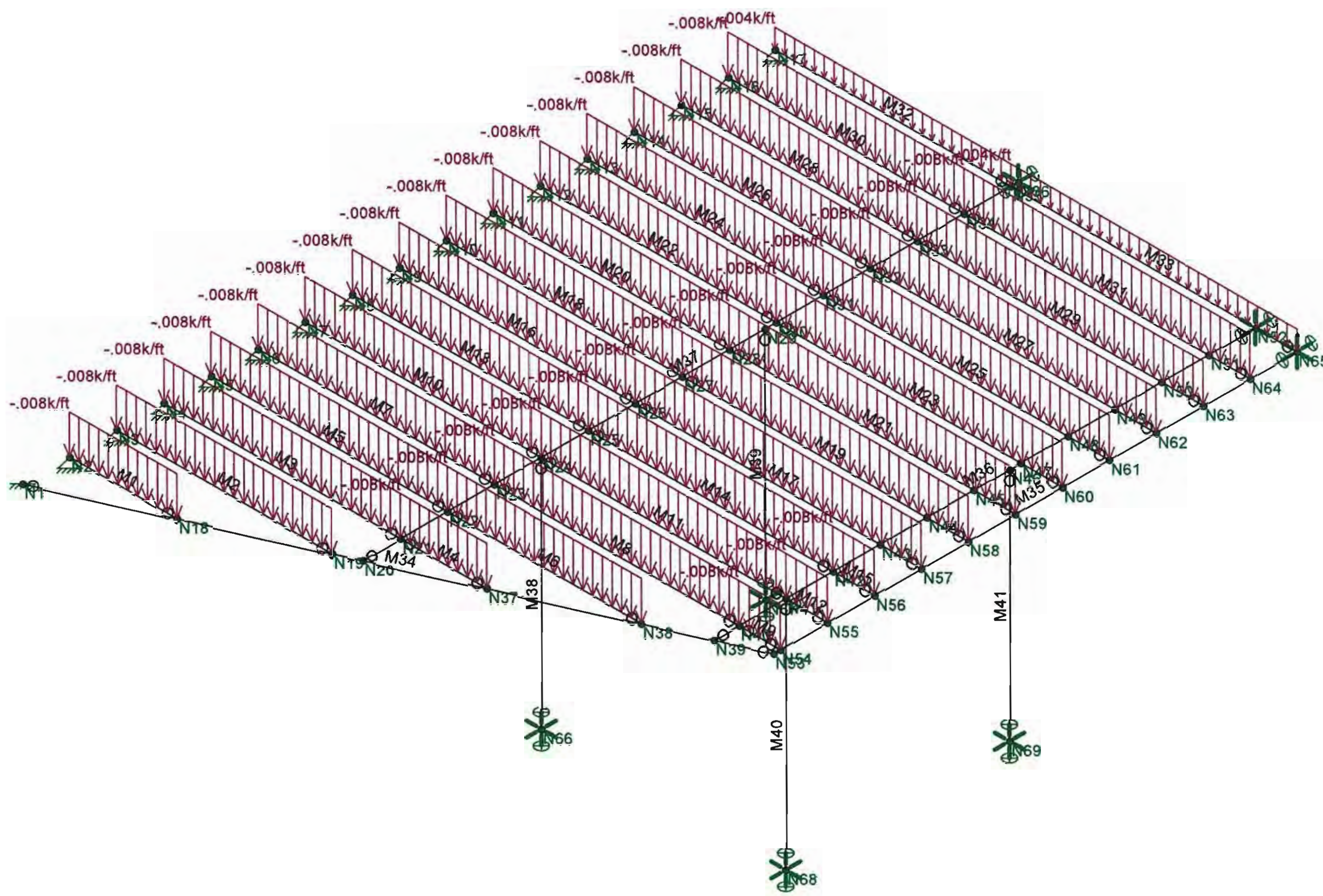
SEE P. 57 FOR SEISMIC LOADS



Seattle Structural	Kyle Grifith Deck	SK - 1
TDM		May 18, 2020 at 10:42 AM
P19031.00		Deck 3D_2020-05-07.r3d

2

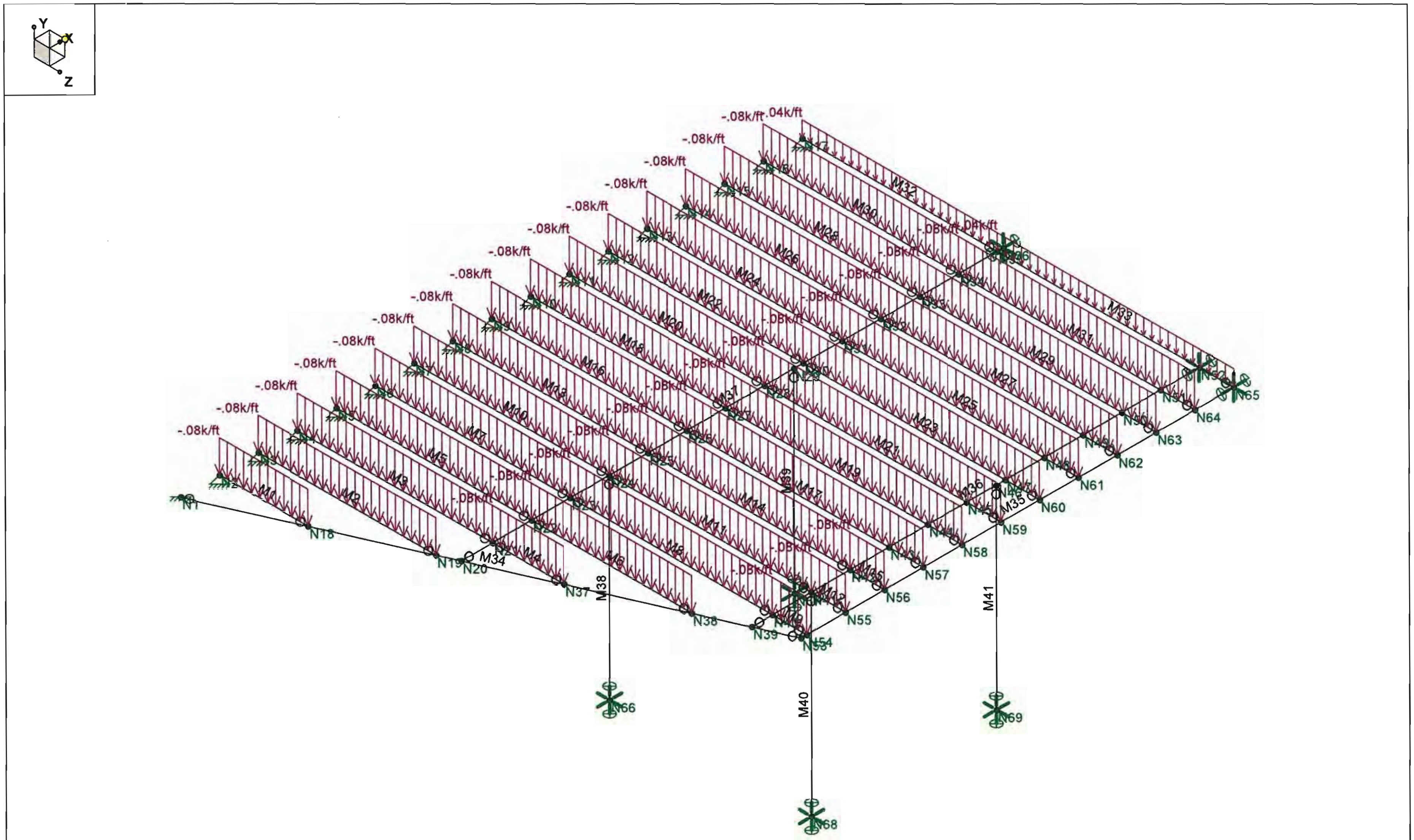




Loads: BLC 1, Dead

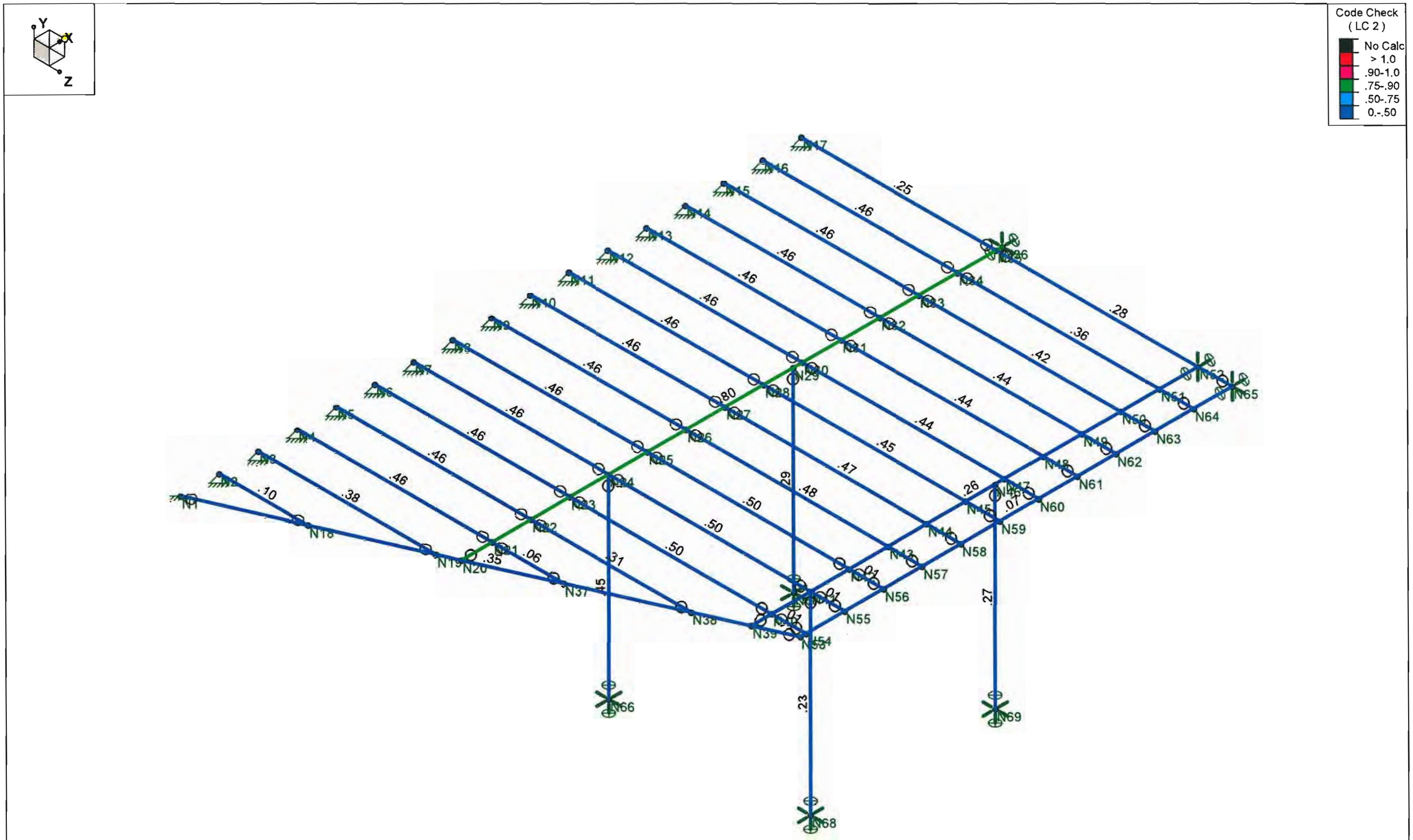
Seattle Structural	Kyle Grifith Deck	SK - 2
TDM		May 18, 2020 at 10:43 AM
P19031.00		Deck 3D_2020-05-07.r3d

4



Loads: BLC 2, Live

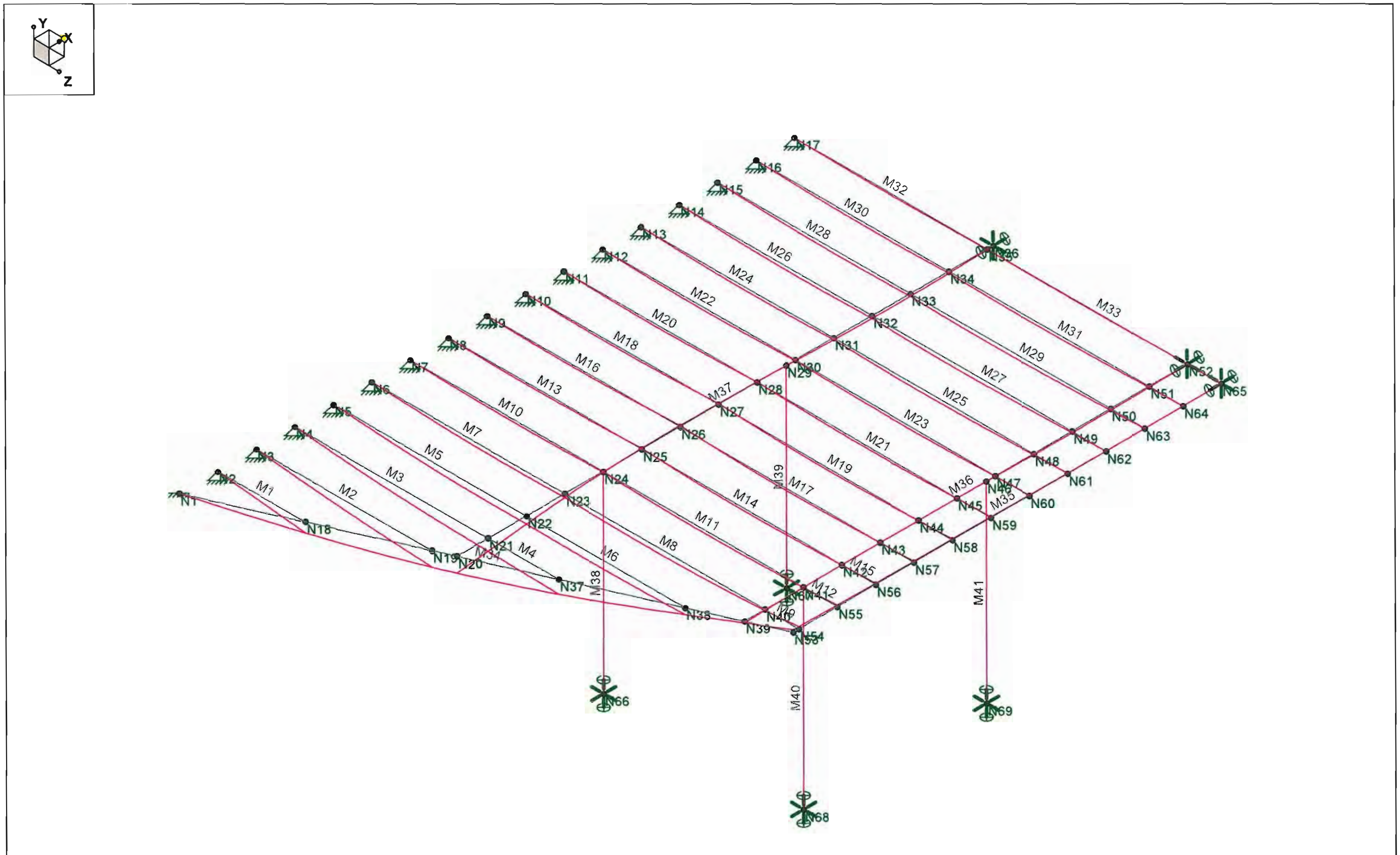
Seattle Structural	Kyle Grifith Deck	SK - 3
TDM		May 18, 2020 at 10:43 AM
P19031.00		Deck 3D_2020-05-07.r3d



Member Code Checks Displayed
Results for LC 2, D+L

Seattle Structural	Kyle Grifith Deck	SK - 4
TDM		May 18, 2020 at 10:44 AM
P19031.00		Deck 3D_2020-05-07.r3d

5



Results for LC 2, D+L

Seattle Structural	Kyle Grifith Deck	SK - 5
TDM		May 18, 2020 at 10:44 AM
P19031.00		Deck 3D_2020-05-07.r3d

Company	: Seattle Structural
Designer	: TDM
Job Number	: P19031.00
Model Name	: Kyle Grifith Deck

May 18, 2020
10:45 AM
Checked By:_____

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	24
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)
RISAConnection Code	AISC 14th(360-10): ASD
Cold Formed Steel Code	AISI S100-12: ASD
Wood Code	AWC NDS-15: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-11
Masonry Code	ACI 530-13: ASD
Aluminum Code	AA ADM1-10: ASD - Building
Stainless Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	Exact Integration
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

(Global) Model Settings, Continued

Seismic Code	ASCE 7-10
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	Yes
Ct X	.02
Ct Z	.02
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	3
R Z	3
Ct Exp. X	.75
Ct Exp. Z	.75
SD1	1
SDS	1
S1	1
TL (sec)	5
Risk Cat	I or II
Drift Cat	Other
Om Z	1
Om X	1
Cd Z	1
Cd X	1
Rho Z	1
Rho X	1

Wood Material Properties

	Label	Type	Database	Species	Grade	Cm	Emod	Nu	Therm ...	Dens[k/ft...
1	DF	Solid Sawn	Visually ...	Douglas Fir-Larch	No.2	Yes	1	.3	.3	.035
2	SP	Solid Sawn	Visually ...	Southern Pine	No.1		1	.3	.3	.035
3	HF	Solid Sawn	Visually ...	Hem-Fir	No.1		1	.3	.3	.035
4	SPF	Solid Sawn	Visually ...	Spruce-Pine-fir	No.1		1	.3	.3	.035
5	24F-1.8E DF Balanced	Glulam	NDS Tab...	24F-1.8E_DF_BAL	na	Yes	1	.3	.3	.035
6	24F-1.8E DF Unbalanc...	Glulam	NDS Tab...	24F-1.8E_DF_UNBAL	na		1	.3	.3	.035
7	24F-1.8E SP Balanced	Glulam	NDS Tab...	24F-1.8E_SP_BAL	na		1	.3	.3	.035
8	24F-1.8E SP Unbalanc...	Glulam	NDS Tab...	24F-1.8E_SP_UNBAL	na		1	.3	.3	.035

Wood Section Sets

	Label	Shape	Type	Design List	Material	Design R...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	4x8	4X8	Beam	Rectangular	DF	Typical	25.375	25.904	111.148	72.244
2	GLB 1	3.5X7.5FS	Beam	Glulam_Western	24F-1.8E DF Balanced	Typical	26.25	26.797	123.047	75.799
3	GLB 2	5.125X7.5FS	Beam	Glulam_Western	24F-1.8E DF Balanced	Typical	38.438	84.132	180.176	194.285
4	GLB 3	5.125X10.5FS	Beam	Glulam_Western	24F-1.8E DF Balanced	Typical	53.813	117.785	494.402	326.949
5	6x6 Post	6X6	Column	Posts	DF	Typical	30.25	76.255	76.255	128.871

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Dia...
1	N1	2.2009	0	0	0	
2	N2	4.1875	0	0	0	
3	N3	6.1875	0	0	0	
4	N4	8.1875	0	0	0	
5	N5	10.1875	0	0	0	
6	N6	12.1875	0	0	0	
7	N7	14.1875	0	0	0	
8	N8	16.1875	0	0	0	

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Dia...
9	N9	18.1875	0	0	0	
10	N10	20.1875	0	0	0	
11	N11	22.1875	0	0	0	
12	N12	24.1875	0	0	0	
13	N13	26.1875	0	0	0	
14	N14	28.1875	0	0	0	
15	N15	30.1875	0	0	0	
16	N16	32.1875	0	0	0	
17	N17	34.1875	0	0	0	
18	N18	4.1875	0	4.5372	0	
19	N19	6.1875	0	9.105	0	
20	N20	6.5841	0	10.0109	0	
21	N21	8.1875	0	10.0109	0	
22	N22	10.1875	0	10.0109	0	
23	N23	12.1875	0	10.0109	0	
24	N24	14.1875	0	10.0109	0	
25	N25	16.1875	0	10.0109	0	
26	N26	18.1875	0	10.0109	0	
27	N27	20.1875	0	10.0109	0	
28	N28	22.1875	0	10.0109	0	
29	N29	23.7083	0	10.0109	0	
30	N30	24.1875	0	10.0109	0	
31	N31	26.1875	0	10.0109	0	
32	N32	28.1875	0	10.0109	0	
33	N33	30.1875	0	10.0109	0	
34	N34	32.1875	0	10.0109	0	
35	N35	34.1875	0	10.0109	0	
36	N36	34.5	0	10.0109	0	
37	N37	8.1875	0	13.6728	0	
38	N38	10.1875	0	18.2405	0	
39	N39	11.1266	0	20.3854	0	
40	N40	12.1875	0	20.3854	0	
41	N41	14.1875	0	20.3854	0	
42	N42	16.1875	0	20.3854	0	
43	N43	18.1875	0	20.3854	0	
44	N44	20.1875	0	20.3854	0	
45	N45	22.1875	0	20.3854	0	
46	N46	23.7083	0	20.3854	0	
47	N47	24.1875	0	20.3854	0	
48	N48	26.1875	0	20.3854	0	
49	N49	28.1875	0	20.3854	0	
50	N50	30.1875	0	20.3854	0	
51	N51	32.1875	0	20.3854	0	
52	N52	34.1875	0	20.3854	0	
53	N53	11.8975	0	22.1458	0	
54	N54	12.1875	0	22.1458	0	
55	N55	14.1875	0	22.1458	0	
56	N56	16.1875	0	22.1458	0	
57	N57	18.1875	0	22.1458	0	
58	N58	20.1875	0	22.1458	0	
59	N59	22.1875	0	22.1458	0	
60	N60	24.1875	0	22.1458	0	
61	N61	26.1875	0	22.1458	0	
62	N62	28.1875	0	22.1458	0	
63	N63	30.1875	0	22.1458	0	
64	N64	32.1875	0	22.1458	0	
65	N65	34.1875	0	22.1458	0	

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Dia...
66	N66	14.1875	-10	10.0109	0	
67	N67	23.7083	-10	10.0109	0	
68	N68	14.1875	-10	20.3854	0	
69	N69	23.7083	-10	20.3854	0	

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]
1	N1	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
2	N2	Reaction	Reaction	Reaction			
3	N3	Reaction	Reaction	Reaction			
4	N4	Reaction	Reaction	Reaction			
5	N5	Reaction	Reaction	Reaction			
6	N6	Reaction	Reaction	Reaction			
7	N7	Reaction	Reaction	Reaction			
8	N8	Reaction	Reaction	Reaction			
9	N9	Reaction	Reaction	Reaction			
10	N10	Reaction	Reaction	Reaction			
11	N11	Reaction	Reaction	Reaction			
12	N12	Reaction	Reaction	Reaction			
13	N13	Reaction	Reaction	Reaction			
14	N14	Reaction	Reaction	Reaction			
15	N15	Reaction	Reaction	Reaction			
16	N16	Reaction	Reaction	Reaction			
17	N17	Reaction	Reaction	Reaction			
18	N36	Reaction	Reaction	Reaction	Fixed		
19	N52	Reaction	Reaction	Reaction	Fixed		
20	N65	Reaction	Reaction	Reaction	Fixed		
21	N66	Reaction	Reaction	Reaction		Fixed	
22	N67	Reaction	Reaction	Reaction		Fixed	
23	N68	Reaction	Reaction	Reaction		Fixed	
24	N69	Reaction	Reaction	Reaction		Fixed	

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design Ru...
1	M1	N2	N18			4x8	Beam	Rectangular	DF	Typical
2	M2	N3	N19			4x8	Beam	Rectangular	DF	Typical
3	M3	N4	N21			4x8	Beam	Rectangular	DF	Typical
4	M4	N21	N37			4x8	Beam	Rectangular	DF	Typical
5	M5	N5	N22			4x8	Beam	Rectangular	DF	Typical
6	M6	N22	N38			4x8	Beam	Rectangular	DF	Typical
7	M7	N6	N23			4x8	Beam	Rectangular	DF	Typical
8	M8	N23	N40			4x8	Beam	Rectangular	DF	Typical
9	M9	N40	N54			4x8	Beam	Rectangular	DF	Typical
10	M10	N7	N24			4x8	Beam	Rectangular	DF	Typical
11	M11	N24	N41			4x8	Beam	Rectangular	DF	Typical
12	M12	N41	N55			4x8	Beam	Rectangular	DF	Typical
13	M13	N8	N25			4x8	Beam	Rectangular	DF	Typical
14	M14	N25	N42			4x8	Beam	Rectangular	DF	Typical
15	M15	N42	N56			4x8	Beam	Rectangular	DF	Typical
16	M16	N9	N26			4x8	Beam	Rectangular	DF	Typical
17	M17	N26	N57			4x8	Beam	Rectangular	DF	Typical
18	M18	N10	N27			4x8	Beam	Rectangular	DF	Typical
19	M19	N27	N58			4x8	Beam	Rectangular	DF	Typical
20	M20	N11	N28			4x8	Beam	Rectangular	DF	Typical

Member Primary Data (Continued)

	Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design Ru...
21	M21	N28	N59			4x8	Beam	Rectangular	DF	Typical
22	M22	N12	N30			4x8	Beam	Rectangular	DF	Typical
23	M23	N30	N60			4x8	Beam	Rectangular	DF	Typical
24	M24	N13	N31			4x8	Beam	Rectangular	DF	Typical
25	M25	N31	N61			4x8	Beam	Rectangular	DF	Typical
26	M26	N14	N32			4x8	Beam	Rectangular	DF	Typical
27	M27	N32	N62			4x8	Beam	Rectangular	DF	Typical
28	M28	N15	N33			4x8	Beam	Rectangular	DF	Typical
29	M29	N33	N63			4x8	Beam	Rectangular	DF	Typical
30	M30	N16	N34			4x8	Beam	Rectangular	DF	Typical
31	M31	N34	N64			4x8	Beam	Rectangular	DF	Typical
32	M32	N17	N35			4x8	Beam	Rectangular	DF	Typical
33	M33	N35	N65			4x8	Beam	Rectangular	DF	Typical
34	M34	N1	N53			GLB 2	Beam	Glulam_Western	24F-1.8E DF Ba...	Typical
35	M35	N53	N65			GLB 1	Beam	Glulam_Western	24F-1.8E DF Ba...	Typical
36	M36	N39	N52			GLB 3	Beam	Glulam_Western	24F-1.8E DF Ba...	Typical
37	M37	N20	N36			GLB 3	Beam	Glulam_Western	24F-1.8E DF Ba...	Typical
38	M38	N66	N24			6x6 Post	Column	Posts	DF	Typical
39	M39	N67	N29			6x6 Post	Column	Posts	DF	Typical
40	M40	N68	N41			6x6 Post	Column	Posts	DF	Typical
41	M41	N69	N46			6x6 Post	Column	Posts	DF	Typical

Member Advanced Data

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	Defl Ratio O...	Analysis ...	Inactive	Seismi...
1	M1		BenPIN				Yes				None
2	M2		BenPIN				Yes				None
3	M3		BenPIN				Yes				None
4	M4	BenPIN	AllPIN				Yes				None
5	M5		BenPIN				Yes				None
6	M6	BenPIN	AllPIN				Yes				None
7	M7		BenPIN				Yes				None
8	M8	BenPIN	AllPIN				Yes				None
9	M9	BenPIN	AllPIN				Yes				None
10	M10		BenPIN				Yes				None
11	M11	BenPIN	AllPIN				Yes				None
12	M12	BenPIN	AllPIN				Yes				None
13	M13		BenPIN				Yes				None
14	M14	BenPIN	AllPIN				Yes				None
15	M15	BenPIN	AllPIN				Yes				None
16	M16		BenPIN				Yes				None
17	M17	BenPIN	AllPIN				Yes				None
18	M18		BenPIN				Yes				None
19	M19	BenPIN	AllPIN				Yes				None
20	M20		BenPIN				Yes				None
21	M21	BenPIN	AllPIN				Yes				None
22	M22		BenPIN				Yes				None
23	M23	BenPIN	AllPIN				Yes				None
24	M24		BenPIN				Yes				None
25	M25	BenPIN	AllPIN				Yes				None
26	M26		BenPIN				Yes				None
27	M27	BenPIN	AllPIN				Yes				None
28	M28		BenPIN				Yes				None
29	M29	BenPIN	AllPIN				Yes				None
30	M30		BenPIN				Yes				None
31	M31	BenPIN	AllPIN				Yes				None

Member Advanced Data (Continued)

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	Defl Ratio O...	Analysis ...	Inactive	Seismi...
32	M32		BenPIN				Yes				None
33	M33	BenPIN	AllPIN				Yes				None
34	M34	BenPIN	AllPIN				Yes				None
35	M35						Yes				None
36	M36	AllPIN					Yes	Default			None
37	M37	AllPIN					Yes				None
38	M38		AllPIN				Yes	** NA **			None
39	M39		AllPIN				Yes	** NA **			None
40	M40		AllPIN				Yes	** NA **			None
41	M41		AllPIN				Yes	** NA **			None

Wood Design Parameters

	Label	Shape	Length[...	le2[ft]	le1[ft]	le-bend top[ft]	le-bend bo...	Kyy	Kzz	CV	Cr	y sway	z sway
1	M1	4x8	4.537	.25		.25							
2	M2	4x8	9.105	.25		.25							
3	M3	4x8	10.011	.25		.25							
4	M4	4x8	3.662	.25		.25							
5	M5	4x8	10.011	.25		.25							
6	M6	4x8	8.23	.25		.25							
7	M7	4x8	10.011	.25		.25							
8	M8	4x8	10.375	.25		.25							
9	M9	4x8	1.76	.25		.25							
10	M10	4x8	10.011	.25		.25							
11	M11	4x8	10.375	.25		.25							
12	M12	4x8	1.76	.25		.25							
13	M13	4x8	10.011	.25		.25							
14	M14	4x8	10.375	.25		.25							
15	M15	4x8	1.76	.25		.25							
16	M16	4x8	10.011	.25		.25							
17	M17	4x8	12.135	.25		.25							
18	M18	4x8	10.011	.25		.25							
19	M19	4x8	12.135	.25		.25							
20	M20	4x8	10.011	.25		.25							
21	M21	4x8	12.135	.25		.25							
22	M22	4x8	10.011	.25		.25							
23	M23	4x8	12.135	.25		.25							
24	M24	4x8	10.011	.25		.25							
25	M25	4x8	12.135	.25		.25							
26	M26	4x8	10.011	.25		.25							
27	M27	4x8	12.135	.25		.25							
28	M28	4x8	10.011	.25		.25							
29	M29	4x8	12.135	.25		.25							
30	M30	4x8	10.011	.25		.25							
31	M31	4x8	12.135	.25		.25							
32	M32	4x8	10.011	.25		.25							
33	M33	4x8	12.135	.25		.25							
34	M34	GLB 2	24.176	5	5	5							
35	M35	GLB 1	22.29	2	2	2							
36	M36	GLB 3	23.061	2	2	2							
37	M37	GLB 3	27.916			Lbyy							
38	M38	6x6 Post	10			Lbyy							
39	M39	6x6 Post	10			Lbyy							
40	M40	6x6 Post	10			Lbyy							
41	M41	6x6 Post	10			Lbyy							

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(Me...	Surface(...
1	Dead	DL		-1				33		
2	Live	LL						33		

Member Distributed Loads (BLC 1 : Dead)

	Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F,...	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.008	-.008	0	0
2	M2	Y	-.008	-.008	0	0
3	M3	Y	-.008	-.008	0	0
4	M4	Y	-.008	-.008	0	0
5	M5	Y	-.008	-.008	0	0
6	M6	Y	-.008	-.008	0	0
7	M7	Y	-.008	-.008	0	0
8	M8	Y	-.008	-.008	0	0
9	M9	Y	-.008	-.008	0	0
10	M10	Y	-.008	-.008	0	0
11	M11	Y	-.008	-.008	0	0
12	M12	Y	-.008	-.008	0	0
13	M13	Y	-.008	-.008	0	0
14	M14	Y	-.008	-.008	0	0
15	M15	Y	-.008	-.008	0	0
16	M16	Y	-.008	-.008	0	0
17	M17	Y	-.008	-.008	0	0
18	M18	Y	-.008	-.008	0	0
19	M19	Y	-.008	-.008	0	0
20	M20	Y	-.008	-.008	0	0
21	M21	Y	-.008	-.008	0	0
22	M22	Y	-.008	-.008	0	0
23	M23	Y	-.008	-.008	0	0
24	M24	Y	-.008	-.008	0	0
25	M25	Y	-.008	-.008	0	0
26	M26	Y	-.008	-.008	0	0
27	M27	Y	-.008	-.008	0	0
28	M28	Y	-.008	-.008	0	0
29	M29	Y	-.008	-.008	0	0
30	M30	Y	-.008	-.008	0	0
31	M31	Y	-.008	-.008	0	0
32	M32	Y	-.004	-.004	0	0
33	M33	Y	-.004	-.004	0	0

Member Distributed Loads (BLC 2 : Live)

	Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F,...	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.08	-.08	0	0
2	M2	Y	-.08	-.08	0	0
3	M3	Y	-.08	-.08	0	0
4	M4	Y	-.08	-.08	0	0
5	M5	Y	-.08	-.08	0	0
6	M6	Y	-.08	-.08	0	0
7	M7	Y	-.08	-.08	0	0
8	M8	Y	-.08	-.08	0	0
9	M9	Y	-.08	-.08	0	0
10	M10	Y	-.08	-.08	0	0
11	M11	Y	-.08	-.08	0	0
12	M12	Y	-.08	-.08	0	0
13	M13	Y	-.08	-.08	0	0

Member Distributed Loads (BLC 2 : Live) (Continued)

	Member Label	Direction	Start Magnitude[k/ft,...	End Magnitude[k/ft,F,...	Start Location[ft,%]	End Location[ft,%]
14	M14	Y	-.08	-.08	0	0
15	M15	Y	-.08	-.08	0	0
16	M16	Y	-.08	-.08	0	0
17	M17	Y	-.08	-.08	0	0
18	M18	Y	-.08	-.08	0	0
19	M19	Y	-.08	-.08	0	0
20	M20	Y	-.08	-.08	0	0
21	M21	Y	-.08	-.08	0	0
22	M22	Y	-.08	-.08	0	0
23	M23	Y	-.08	-.08	0	0
24	M24	Y	-.08	-.08	0	0
25	M25	Y	-.08	-.08	0	0
26	M26	Y	-.08	-.08	0	0
27	M27	Y	-.08	-.08	0	0
28	M28	Y	-.08	-.08	0	0
29	M29	Y	-.08	-.08	0	0
30	M30	Y	-.08	-.08	0	0
31	M31	Y	-.08	-.08	0	0
32	M32	Y	-.04	-.04	0	0
33	M33	Y	-.04	-.04	0	0

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	D	Yes	Y		1	1																		
2	D+L	Yes	Y		1	1	2	1																

Load Combination Design

	Description	ASIF	CD	Service	Hot Rol...	Cold Form...	Wood	Concrete	Masonry	Aluminum	Stainless	Connection
1	D		.9	Yes			Yes					
2	D+L			Yes			Yes					

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N1	max	0	2	.428	2	0	2	0	2	0	2	0	2
2		min	0	1	.12	1	0	1	0	1	0	1	0	1
3	N2	max	0	2	.214	2	0	2	0	2	0	2	0	2
4		min	0	1	.032	1	0	1	0	1	0	1	0	1
5	N3	max	0	2	.429	2	0	2	0	2	0	2	0	2
6		min	0	1	.064	1	0	1	0	1	0	1	0	1
7	N4	max	0	2	.471	2	0	2	0	2	0	2	0	2
8		min	0	1	.071	1	0	1	0	1	0	1	0	1
9	N5	max	0	2	.471	2	0	2	0	2	0	2	0	2
10		min	0	1	.071	1	0	1	0	1	0	1	0	1
11	N6	max	0	2	.471	2	0	2	0	2	0	2	0	2
12		min	0	1	.071	1	0	1	0	1	0	1	0	1
13	N7	max	0	2	.471	2	0	2	0	2	0	2	0	2
14		min	0	1	.071	1	0	1	0	1	0	1	0	1
15	N8	max	0	2	.471	2	0	2	0	2	0	2	0	2
16		min	0	1	.071	1	0	1	0	1	0	1	0	1
17	N9	max	0	2	.471	2	0	2	0	2	0	2	0	2
18		min	0	1	.071	1	0	1	0	1	0	1	0	1
19	N10	max	0	2	.471	2	0	2	0	2	0	2	0	2

Envelope Joint Reactions (Continued)

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
20		min	0	1	.071	1	0	1	0	1	0	1	0	1
21	N11	max	0	2	.471	2	0	2	0	2	0	2	0	2
22		min	0	1	.071	1	0	1	0	1	0	1	0	1
23	N12	max	0	2	.471	2	0	2	0	2	0	2	0	2
24		min	0	1	.071	1	0	1	0	1	0	1	0	1
25	N13	max	0	2	.471	2	0	2	0	2	0	2	0	2
26		min	0	1	.071	1	0	1	0	1	0	1	0	1
27	N14	max	0	2	.471	2	0	2	0	2	0	2	0	2
28		min	0	1	.071	1	0	1	0	1	0	1	0	1
29	N15	max	0	2	.471	2	0	2	0	2	0	2	0	2
30		min	0	1	.071	1	0	1	0	1	0	1	0	1
31	N16	max	0	2	.471	2	0	2	0	2	0	2	0	2
32		min	0	1	.071	1	0	1	0	1	0	1	0	1
33	N17	max	0	2	.251	2	0	2	0	2	0	2	0	2
34		min	0	1	.051	1	0	1	0	1	0	1	0	1
35	N36	max	0	2	2.082	2	0	2	NC	NC	0	2	0	2
36		min	0	1	.397	1	0	1	NC	NC	0	1	0	1
37	N52	max	0	2	1.563	2	0	2	NC	NC	0	2	0	2
38		min	0	1	.314	1	0	1	NC	NC	0	1	0	1
39	N65	max	0	2	.122	2	0	2	NC	NC	0	2	0	2
40		min	0	1	.038	1	0	1	NC	NC	0	1	0	1
41	N66	max	0	2	6.687	2	0	2	0	2	NC	NC	0	2
42		min	0	1	1.348	1	0	1	0	1	NC	NC	0	1
43	N67	max	0	2	4.305	2	0	2	0	2	NC	NC	0	2
44		min	0	1	.726	1	0	1	0	1	NC	NC	0	1
45	N68	max	0	2	3.486	2	0	2	0	2	NC	NC	0	2
46		min	0	1	.811	1	0	1	0	1	NC	NC	0	1
47	N69	max	0	2	3.976	2	0	2	0	2	NC	NC	0	2
48		min	0	1	.827	1	0	1	0	1	NC	NC	0	1
49	Totals:	max	0	2	29.669	2	0	2						
50		min	0	1	5.651	1	0	1						

Envelope Joint Displacements

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotation...	LC	Z Rotation...	LC
1	N1	max	0	2	0	2	0	2	0	2	0	2	0	2
2		min	0	1	0	1	0	1	0	1	0	1	0	1
3	N2	max	0	2	0	2	0	2	1.109e-02	2	0	2	-7.288e-04	1
4		min	0	1	0	1	0	1	2.529e-03	1	0	1	-3.225e-03	2
5	N3	max	0	2	0	2	0	2	1.079e-02	2	0	2	-1.47e-04	1
6		min	0	1	0	1	0	1	2.247e-03	1	0	1	-6.831e-04	2
7	N4	max	0	2	0	2	0	2	9.265e-03	2	0	2	1.098e-02	2
8		min	0	1	0	1	0	1	1.825e-03	1	0	1	2.527e-03	1
9	N5	max	0	2	0	2	0	2	7.11e-03	2	0	2	1.039e-02	2
10		min	0	1	0	1	0	1	1.332e-03	1	0	1	2.364e-03	1
11	N6	max	0	2	0	2	0	2	5.165e-03	2	0	2	8.701e-03	2
12		min	0	1	0	1	0	1	8.924e-04	1	0	1	1.957e-03	1
13	N7	max	0	2	0	2	0	2	3.72e-03	2	0	2	5.169e-03	2
14		min	0	1	0	1	0	1	5.676e-04	1	0	1	1.179e-03	1
15	N8	max	0	2	0	2	0	2	3.101e-03	2	0	2	1.602e-03	2
16		min	0	1	0	1	0	1	4.219e-04	1	0	1	3.921e-04	1
17	N9	max	0	2	0	2	0	2	2.997e-03	2	0	2	-3.981e-05	1
18		min	0	1	0	1	0	1	3.943e-04	1	0	1	-1.975e-04	2
19	N10	max	0	2	0	2	0	2	3.132e-03	2	0	2	-2.486e-04	1
20		min	0	1	0	1	0	1	4.273e-04	1	0	1	-9.916e-04	2
21	N11	max	0	2	0	2	0	2	3.383e-03	2	0	2	-3.658e-04	1

Envelope Joint Displacements (Continued)

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotation...	LC	Z Rotation...	LC
22		min	0	1	0	1	0	1	4.894e-04	1	0	1	-1.545e-03	2
23	N12	max	0	2	0	2	0	2	3.781e-03	2	0	2	-5.062e-04	1
24		min	0	1	0	1	0	1	5.763e-04	1	0	1	-2.517e-03	2
25	N13	max	0	2	0	2	0	2	4.317e-03	2	0	2	-4.512e-04	1
26		min	0	1	0	1	0	1	6.794e-04	1	0	1	-2.412e-03	2
27	N14	max	0	2	0	2	0	2	4.684e-03	2	0	2	-1.809e-04	1
28		min	0	1	0	1	0	1	7.466e-04	1	0	1	-1.018e-03	2
29	N15	max	0	2	0	2	0	2	4.699e-03	2	0	2	9.255e-04	2
30		min	0	1	0	1	0	1	7.475e-04	1	0	1	1.781e-04	1
31	N16	max	0	2	0	2	0	2	4.323e-03	2	0	2	2.69e-03	2
32		min	0	1	0	1	0	1	6.772e-04	1	0	1	4.996e-04	1
33	N17	max	0	2	0	2	0	2	2.006e-03	2	0	2	3.559e-03	2
34		min	0	1	0	1	0	1	4.046e-04	1	0	1	6.594e-04	1
35	N18	max	0	2	-.135	1	0	2	7.365e-03	2	0	2	-7.288e-04	1
36		min	0	1	-.586	2	0	1	1.665e-03	1	0	1	-3.225e-03	2
37	N19	max	0	2	-.202	1	0	2	1.56e-03	2	0	2	-1.47e-04	1
38		min	0	1	-.887	2	0	1	3.358e-04	1	0	1	-6.831e-04	2
39	N20	max	0	2	-.204	1	0	2	3.183e-04	2	0	2	-3.359e-05	1
40		min	0	1	-.899	2	0	1	7.671e-05	1	0	1	-1.394e-04	2
41	N21	max	0	2	-.155	1	0	2	0	2	0	2	1.098e-02	2
42		min	0	1	-.686	2	0	1	0	1	0	1	2.527e-03	1
43	N22	max	0	2	-.096	1	0	2	0	2	0	2	1.039e-02	2
44		min	0	1	-.428	2	0	1	0	1	0	1	2.364e-03	1
45	N23	max	0	2	-.043	1	0	2	0	2	0	2	8.701e-03	2
46		min	0	1	-.194	2	0	1	0	1	0	1	1.957e-03	1
47	N24	max	0	2	-.004	1	0	2	0	2	0	2	5.169e-03	2
48		min	0	1	-.02	2	0	1	0	1	0	1	1.179e-03	1
49	N25	max	0	2	.054	2	0	2	0	2	0	2	1.602e-03	2
50		min	0	1	.014	1	0	1	0	1	0	1	3.921e-04	1
51	N26	max	0	2	.067	2	0	2	0	2	0	2	-3.981e-05	1
52		min	0	1	.017	1	0	1	0	1	0	1	-1.975e-04	2
53	N27	max	0	2	.05	2	0	2	0	2	0	2	-2.486e-04	1
54		min	0	1	.013	1	0	1	0	1	0	1	-9.916e-04	2
55	N28	max	0	2	.02	2	0	2	0	2	0	2	-3.658e-04	1
56		min	0	1	.005	1	0	1	0	1	0	1	-1.545e-03	2
57	N29	max	0	2	-.002	1	0	2	0	2	0	2	-4.745e-04	1
58		min	0	1	-.013	2	0	1	0	1	0	1	-2.276e-03	2
59	N30	max	0	2	-.005	1	0	2	0	2	0	2	-5.062e-04	1
60		min	0	1	-.028	2	0	1	0	1	0	1	-2.517e-03	2
61	N31	max	0	2	-.017	1	0	2	0	2	0	2	-4.512e-04	1
62		min	0	1	-.092	2	0	1	0	1	0	1	-2.412e-03	2
63	N32	max	0	2	-.025	1	0	2	0	2	0	2	-1.809e-04	1
64		min	0	1	-.136	2	0	1	0	1	0	1	-1.018e-03	2
65	N33	max	0	2	-.026	1	0	2	0	2	0	2	9.255e-04	2
66		min	0	1	-.138	2	0	1	0	1	0	1	1.781e-04	1
67	N34	max	0	2	-.017	1	0	2	0	2	0	2	2.69e-03	2
68		min	0	1	-.093	2	0	1	0	1	0	1	4.996e-04	1
69	N35	max	0	2	-.003	1	0	2	0	2	0	2	3.559e-03	2
70		min	0	1	-.014	2	0	1	0	1	0	1	6.594e-04	1
71	N36	max	0	2	0	2	0	2	0	2	0	2	3.579e-03	2
72		min	0	1	0	1	0	1	0	1	0	1	6.631e-04	1
73	N37	max	0	2	-.181	1	0	2	-9.555e-04	1	0	2	1.894e-03	2
74		min	0	1	-.793	2	0	1	-4.325e-03	2	0	1	4.184e-04	1
75	N38	max	0	2	-.083	1	0	2	-1.942e-03	1	0	2	3.747e-03	2
76		min	0	1	-.356	2	0	1	-8.559e-03	2	0	1	8.502e-04	1
77	N39	max	0	2	-.021	1	0	2	-2.016e-03	1	0	2	3.924e-03	2
78		min	0	1	-.081	2	0	1	-8.961e-03	2	0	1	8.825e-04	1

Envelope Joint Displacements (Continued)

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotation...	LC	Z Rotation...	LC
79	N40	max	0	2	-.013	1	0	2	-3.588e-04	1	0	2	2.107e-03	2
80		min	0	1	-.053	2	0	1	-3.052e-03	2	0	1	5.443e-04	1
81	N41	max	0	2	-.002	1	0	2	-3.588e-04	1	0	2	1.15e-03	2
82		min	0	1	-.011	2	0	1	-3.052e-03	2	0	1	3.127e-04	1
83	N42	max	0	2	.001	2	0	2	-3.588e-04	1	0	2	1.21e-04	2
84		min	0	1	.001	1	0	1	-3.052e-03	2	0	1	5.534e-05	1
85	N43	max	0	2	.001	1	0	2	-3.588e-04	1	0	2	-2.864e-05	1
86		min	0	1	0	2	0	1	-3.052e-03	2	0	1	-1.2e-04	2
87	N44	max	0	2	0	1	0	2	-3.489e-04	1	0	2	-3.396e-05	1
88		min	0	1	-.003	2	0	1	-3.003e-03	2	0	1	-5.905e-05	2
89	N45	max	0	2	0	1	0	2	-3.486e-04	1	0	2	-6.682e-05	1
90		min	0	1	-.004	2	0	1	-2.957e-03	2	0	1	-2.183e-04	2
91	N46	max	0	2	-.002	1	0	2	-3.715e-04	1	0	2	-1.846e-04	1
92		min	0	1	-.012	2	0	1	-3.034e-03	2	0	1	-8.521e-04	2
93	N47	max	0	2	-.004	1	0	2	-3.788e-04	1	0	2	-2.309e-04	1
94		min	0	1	-.018	2	0	1	-3.059e-03	2	0	1	-1.102e-03	2
95	N48	max	0	2	-.01	1	0	2	-4.548e-04	1	0	2	-2.603e-04	1
96		min	0	1	-.051	2	0	1	-3.396e-03	2	0	1	-1.307e-03	2
97	N49	max	0	2	-.015	1	0	2	-4.926e-04	1	0	2	-1.097e-04	1
98		min	0	1	-.076	2	0	1	-3.503e-03	2	0	1	-5.768e-04	2
99	N50	max	0	2	-.015	1	0	2	-4.442e-04	1	0	2	5.749e-04	2
100		min	0	1	-.076	2	0	1	-3.085e-03	2	0	1	1.189e-04	1
101	N51	max	0	2	-.01	1	0	2	-2.879e-04	1	0	2	1.661e-03	2
102		min	0	1	-.048	2	0	1	-1.977e-03	2	0	1	3.305e-04	1
103	N52	max	0	2	0	2	0	2	0	2	0	2	2.131e-03	2
104		min	0	1	0	1	0	1	0	1	0	1	4.215e-04	1
105	N53	max	0	2	.141	2	0	2	0	2	0	2	-4.13e-04	1
106		min	0	1	.029	1	0	1	0	1	0	1	-1.567e-03	2
107	N54	max	0	2	.135	2	0	2	0	2	0	2	-4.113e-04	1
108		min	0	1	.028	1	0	1	0	1	0	1	-1.56e-03	2
109	N55	max	0	2	.1	2	0	2	0	2	0	2	-3.356e-04	1
110		min	0	1	.018	1	0	1	0	1	0	1	-1.271e-03	2
111	N56	max	0	2	.076	2	0	2	0	2	0	2	-2.009e-04	1
112		min	0	1	.012	1	0	1	0	1	0	1	-7.515e-04	2
113	N57	max	0	2	.064	2	0	2	0	2	0	2	-8.61e-05	1
114		min	0	1	.009	1	0	1	0	1	0	1	-3.006e-04	2
115	N58	max	0	2	.059	2	0	2	0	2	0	2	-4.409e-05	1
116		min	0	1	.007	1	0	1	0	1	0	1	-1.418e-04	2
117	N59	max	0	2	.054	2	0	2	0	2	0	2	-8.089e-05	1
118		min	0	1	.006	1	0	1	0	1	0	1	-3.481e-04	2
119	N60	max	0	2	.041	2	0	2	0	2	0	2	-1.54e-04	1
120		min	0	1	.003	1	0	1	0	1	0	1	-7.547e-04	2
121	N61	max	0	2	.02	2	0	2	0	2	0	2	-1.771e-04	1
122		min	0	1	-.001	1	0	1	0	1	0	1	-9.355e-04	2
123	N62	max	0	2	0	2	0	2	0	2	0	2	-1.042e-04	1
124		min	0	1	-.005	1	0	1	0	1	0	1	-6.593e-04	2
125	N63	max	0	2	-.006	1	0	2	0	2	0	2	2.215e-05	1
126		min	0	1	-.01	2	0	1	0	1	0	1	-1.455e-04	2
127	N64	max	0	2	-.004	1	0	2	0	2	0	2	2.543e-04	2
128		min	0	1	-.008	2	0	1	0	1	0	1	1.296e-04	1
129	N65	max	0	2	0	2	0	2	0	2	0	2	3.866e-04	2
130		min	0	1	0	1	0	1	0	1	0	1	1.714e-04	1
131	N66	max	0	2	0	2	0	2	0	2	0	2	0	2
132		min	0	1	0	1	0	1	0	1	0	1	0	1
133	N67	max	0	2	0	2	0	2	0	2	0	2	0	2
134		min	0	1	0	1	0	1	0	1	0	1	0	1
135	N68	max	0	2	0	2	0	2	0	2	0	2	0	2

Envelope Joint Displacements (Continued)

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotation...	LC	Z Rotation...	LC
136		min	0	1	0	1	0	1	0	1	0	1	0	1
137	N69	max	0	2	0	2	0	2	0	2	0	2	0	2
138		min	0	1	0	1	0	1	0	1	0	1	0	1

Envelope Member Section Forces

	Member	Sec		Axial[k]	LC	y Shear[k]	LC	z Shear[k]	LC	Torque[...	LC	y-y Mom...	LC	z-z Moment[k-ft]	LC
1	M1	1	max	0	2	.214	2	0	2	0	2	0	2	0	2
2			min	0	1	.032	1	0	1	0	1	0	1	0	1
3		2	max	0	2	.107	2	0	2	0	2	0	2	-.027	1
4			min	0	1	.016	1	0	1	0	1	0	1	-.182	2
5		3	max	0	2	0	2	0	2	0	2	0	2	-.036	1
6			min	0	1	0	1	0	1	0	1	0	1	-.242	2
7		4	max	0	2	-.016	1	0	2	0	2	0	2	-.027	1
8			min	0	1	-.107	2	0	1	0	1	0	1	-.182	2
9		5	max	0	2	-.032	1	0	2	0	2	0	2	0	2
10			min	0	1	-.214	2	0	1	0	1	0	1	0	1
11	M2	1	max	0	2	.429	2	0	2	0	2	0	2	0	2
12			min	0	1	.064	1	0	1	0	1	0	1	0	1
13		2	max	0	2	.214	2	0	2	0	2	0	2	-.11	1
14			min	0	1	.032	1	0	1	0	1	0	1	-.732	2
15		3	max	0	2	0	2	0	2	0	2	0	2	-.147	1
16			min	0	1	0	1	0	1	0	1	0	1	-.976	2
17		4	max	0	2	-.032	1	0	2	0	2	0	2	-.11	1
18			min	0	1	-.214	2	0	1	0	1	0	1	-.732	2
19		5	max	0	2	-.064	1	0	2	0	2	0	2	0	2
20			min	0	1	-.429	2	0	1	0	1	0	1	0	1
21	M3	1	max	0	2	.471	2	0	2	0	2	0	2	0	2
22			min	0	1	.071	1	0	1	0	1	0	1	0	1
23		2	max	0	2	.236	2	0	2	0	2	0	2	-.133	1
24			min	0	1	.035	1	0	1	0	1	0	1	-.885	2
25		3	max	0	2	0	2	0	2	0	2	0	2	-.177	1
26			min	0	1	0	1	0	1	0	1	0	1	-1.18	2
27		4	max	0	2	-.035	1	0	2	0	2	0	2	-.133	1
28			min	0	1	-.236	2	0	1	0	1	0	1	-.885	2
29		5	max	0	2	-.071	1	0	2	0	2	0	2	0	2
30			min	0	1	-.471	2	0	1	0	1	0	1	0	1
31	M4	1	max	0	2	.172	2	0	2	0	2	0	2	0	2
32			min	0	1	.026	1	0	1	0	1	0	1	0	1
33		2	max	0	2	.086	2	0	2	0	2	0	2	-.018	1
34			min	0	1	.013	1	0	1	0	1	0	1	-.118	2
35		3	max	0	2	0	2	0	2	0	2	0	2	-.024	1
36			min	0	1	0	1	0	1	0	1	0	1	-.158	2
37		4	max	0	2	-.013	1	0	2	0	2	0	2	-.018	1
38			min	0	1	-.086	2	0	1	0	1	0	1	-.118	2
39		5	max	0	2	-.026	1	0	2	0	2	0	2	0	2
40			min	0	1	-.172	2	0	1	0	1	0	1	0	1
41	M5	1	max	0	2	.471	2	0	2	0	2	0	2	0	2
42			min	0	1	.071	1	0	1	0	1	0	1	0	1
43		2	max	0	2	.236	2	0	2	0	2	0	2	-.133	1
44			min	0	1	.035	1	0	1	0	1	0	1	-.885	2
45		3	max	0	2	0	2	0	2	0	2	0	2	-.177	1
46			min	0	1	0	1	0	1	0	1	0	1	-1.18	2
47		4	max	0	2	-.035	1	0	2	0	2	0	2	-.133	1
48			min	0	1	-.236	2	0	1	0	1	0	1	-.885	2
49		5	max	0	2	-.071	1	0	2	0	2	0	2	0	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[k]	LC	y Shear[k]	LC	z Shear[k]	LC	Torque[...	LC	y-y Mom...	LC	z-z Moment[k-ft]	LC
50			min	0	1	-.471	2	0	1	0	1	0	1	0	1
51	M6	1	max	0	2	.387	2	0	2	0	2	0	2	0	2
52			min	0	1	.058	1	0	1	0	1	0	1	0	1
53		2	max	0	2	.194	2	0	2	0	2	0	2	-.09	1
54			min	0	1	.029	1	0	1	0	1	0	1	-.598	2
55		3	max	0	2	0	2	0	2	0	2	0	2	-.12	1
56			min	0	1	0	1	0	1	0	1	0	1	-.797	2
57		4	max	0	2	-.029	1	0	2	0	2	0	2	-.09	1
58			min	0	1	-.194	2	0	1	0	1	0	1	-.598	2
59		5	max	0	2	-.058	1	0	2	0	2	0	2	0	2
60			min	0	1	-.387	2	0	1	0	1	0	1	0	1
61	M7	1	max	0	2	.471	2	0	2	0	2	0	2	0	2
62			min	0	1	.071	1	0	1	0	1	0	1	0	1
63		2	max	0	2	.236	2	0	2	0	2	0	2	-.133	1
64			min	0	1	.035	1	0	1	0	1	0	1	-.885	2
65		3	max	0	2	0	2	0	2	0	2	0	2	-.177	1
66			min	0	1	0	1	0	1	0	1	0	1	-1.18	2
67		4	max	0	2	-.035	1	0	2	0	2	0	2	-.133	1
68			min	0	1	-.236	2	0	1	0	1	0	1	-.885	2
69		5	max	0	2	-.071	1	0	2	0	2	0	2	0	2
70			min	0	1	-.471	2	0	1	0	1	0	1	0	1
71	M8	1	max	0	2	.488	2	0	2	0	2	0	2	0	2
72			min	0	1	.073	1	0	1	0	1	0	1	0	1
73		2	max	0	2	.244	2	0	2	0	2	0	2	-.143	1
74			min	0	1	.037	1	0	1	0	1	0	1	-.95	2
75		3	max	0	2	0	2	0	2	0	2	0	2	-.191	1
76			min	0	1	0	1	0	1	0	1	0	1	-1.267	2
77		4	max	0	2	-.037	1	0	2	0	2	0	2	-.143	1
78			min	0	1	-.244	2	0	1	0	1	0	1	-.95	2
79		5	max	0	2	-.073	1	0	2	0	2	0	2	0	2
80			min	0	1	-.488	2	0	1	0	1	0	1	0	1
81	M9	1	max	0	2	.083	2	0	2	0	2	0	2	0	2
82			min	0	1	.012	1	0	1	0	1	0	1	0	1
83		2	max	0	2	.041	2	0	2	0	2	0	2	-.004	1
84			min	0	1	.006	1	0	1	0	1	0	1	-.027	2
85		3	max	0	2	0	2	0	2	0	2	0	2	-.005	1
86			min	0	1	0	1	0	1	0	1	0	1	-.036	2
87		4	max	0	2	-.006	1	0	2	0	2	0	2	-.004	1
88			min	0	1	-.041	2	0	1	0	1	0	1	-.027	2
89		5	max	0	2	-.012	1	0	2	0	2	0	2	0	2
90			min	0	1	-.083	2	0	1	0	1	0	1	0	1
91	M10	1	max	0	2	.471	2	0	2	0	2	0	2	0	2
92			min	0	1	.071	1	0	1	0	1	0	1	0	1
93		2	max	0	2	.236	2	0	2	0	2	0	2	-.133	1
94			min	0	1	.035	1	0	1	0	1	0	1	-.885	2
95		3	max	0	2	0	2	0	2	0	2	0	2	-.177	1
96			min	0	1	0	1	0	1	0	1	0	1	-1.18	2
97		4	max	0	2	-.035	1	0	2	0	2	0	2	-.133	1
98			min	0	1	-.236	2	0	1	0	1	0	1	-.885	2
99		5	max	0	2	-.071	1	0	2	0	2	0	2	0	2
100			min	0	1	-.471	2	0	1	0	1	0	1	0	1
101	M11	1	max	0	2	.488	2	0	2	0	2	0	2	0	2
102			min	0	1	.073	1	0	1	0	1	0	1	0	1
103		2	max	0	2	.244	2	0	2	0	2	0	2	-.143	1
104			min	0	1	.037	1	0	1	0	1	0	1	-.95	2
105		3	max	0	2	0	2	0	2	0	2	0	2	-.191	1
106			min	0	1	0	1	0	1	0	1	0	1	-1.267	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[k]	LC	y Shear[k]	LC	z Shear[k]	LC	Torque[...	LC	y-y Mom...	LC	z-z Moment[k-ft]	LC
107		4	max	0	2	-.037	1	0	2	0	2	0	2	-.143	1
108			min	0	1	-.244	2	0	1	0	1	0	1	-.95	2
109		5	max	0	2	-.073	1	0	2	0	2	0	2	0	2
110			min	0	1	-.488	2	0	1	0	1	0	1	0	1
111	M12	1	max	0	2	.083	2	0	2	0	2	0	2	0	2
112			min	0	1	.012	1	0	1	0	1	0	1	0	1
113		2	max	0	2	.041	2	0	2	0	2	0	2	-.004	1
114			min	0	1	.006	1	0	1	0	1	0	1	-.027	2
115		3	max	0	2	0	2	0	2	0	2	0	2	-.005	1
116			min	0	1	0	1	0	1	0	1	0	1	-.036	2
117		4	max	0	2	-.006	1	0	2	0	2	0	2	-.004	1
118			min	0	1	-.041	2	0	1	0	1	0	1	-.027	2
119		5	max	0	2	-.012	1	0	2	0	2	0	2	0	2
120			min	0	1	-.083	2	0	1	0	1	0	1	0	1
121	M13	1	max	0	2	.471	2	0	2	0	2	0	2	0	2
122			min	0	1	.071	1	0	1	0	1	0	1	0	1
123		2	max	0	2	.236	2	0	2	0	2	0	2	-.133	1
124			min	0	1	.035	1	0	1	0	1	0	1	-.885	2
125		3	max	0	2	0	2	0	2	0	2	0	2	-.177	1
126			min	0	1	0	1	0	1	0	1	0	1	-1.18	2
127		4	max	0	2	-.035	1	0	2	0	2	0	2	-.133	1
128			min	0	1	-.236	2	0	1	0	1	0	1	-.885	2
129		5	max	0	2	-.071	1	0	2	0	2	0	2	0	2
130			min	0	1	-.471	2	0	1	0	1	0	1	0	1
131	M14	1	max	0	2	.488	2	0	2	0	2	0	2	0	2
132			min	0	1	.073	1	0	1	0	1	0	1	0	1
133		2	max	0	2	.244	2	0	2	0	2	0	2	-.143	1
134			min	0	1	.037	1	0	1	0	1	0	1	-.95	2
135		3	max	0	2	0	2	0	2	0	2	0	2	-.191	1
136			min	0	1	0	1	0	1	0	1	0	1	-1.267	2
137		4	max	0	2	-.037	1	0	2	0	2	0	2	-.143	1
138			min	0	1	-.244	2	0	1	0	1	0	1	-.95	2
139		5	max	0	2	-.073	1	0	2	0	2	0	2	0	2
140			min	0	1	-.488	2	0	1	0	1	0	1	0	1
141	M15	1	max	0	2	.083	2	0	2	0	2	0	2	0	2
142			min	0	1	.012	1	0	1	0	1	0	1	0	1
143		2	max	0	2	.041	2	0	2	0	2	0	2	-.004	1
144			min	0	1	.006	1	0	1	0	1	0	1	-.027	2
145		3	max	0	2	0	2	0	2	0	2	0	2	-.005	1
146			min	0	1	0	1	0	1	0	1	0	1	-.036	2
147		4	max	0	2	-.006	1	0	2	0	2	0	2	-.004	1
148			min	0	1	-.041	2	0	1	0	1	0	1	-.027	2
149		5	max	0	2	-.012	1	0	2	0	2	0	2	0	2
150			min	0	1	-.083	2	0	1	0	1	0	1	0	1
151	M16	1	max	0	2	.471	2	0	2	0	2	0	2	0	2
152			min	0	1	.071	1	0	1	0	1	0	1	0	1
153		2	max	0	2	.236	2	0	2	0	2	0	2	-.133	1
154			min	0	1	.035	1	0	1	0	1	0	1	-.885	2
155		3	max	0	2	0	2	0	2	0	2	0	2	-.177	1
156			min	0	1	0	1	0	1	0	1	0	1	-1.18	2
157		4	max	0	2	-.035	1	0	2	0	2	0	2	-.133	1
158			min	0	1	-.236	2	0	1	0	1	0	1	-.885	2
159		5	max	0	2	-.071	1	0	2	0	2	0	2	0	2
160			min	0	1	-.471	2	0	1	0	1	0	1	0	1
161	M17	1	max	0	2	.477	2	0	2	0	1	0	2	0	2
162			min	0	1	.07	1	0	1	-.002	2	0	1	0	1
163		2	max	0	2	.192	2	0	2	0	1	0	2	-.147	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[k]	LC	y Shear[k]	LC	z Shear[k]	LC	Torque[...	LC	y-y Mom...	LC	z-z Moment[k-ft]	LC
164			min	0	1	.027	1	0	1	-.002	2	0	1	-1.014	2
165		3	max	0	2	-.016	1	0	2	0	1	0	2	-.164	1
166			min	0	1	-.094	2	0	1	-.002	2	0	1	-1.162	2
167		4	max	0	2	-.059	1	0	2	0	1	0	2	-.051	1
168			min	0	1	-.38	2	0	1	-.002	2	0	1	-.443	2
169		5	max	0	2	.004	1	0	2	0	2	0	2	0	2
170			min	0	1	-.035	2	0	1	0	1	0	1	0	1
171	M18	1	max	0	2	.471	2	0	2	0	2	0	2	0	2
172			min	0	1	.071	1	0	1	0	1	0	1	0	1
173		2	max	0	2	.236	2	0	2	0	2	0	2	-.133	1
174			min	0	1	.035	1	0	1	0	1	0	1	-.885	2
175		3	max	0	2	0	2	0	2	0	2	0	2	-.177	1
176			min	0	1	0	1	0	1	0	1	0	1	-1.18	2
177		4	max	0	2	-.035	1	0	2	0	2	0	2	-.133	1
178			min	0	1	-.236	2	0	1	0	1	0	1	-.885	2
179		5	max	0	2	-.071	1	0	2	0	2	0	2	0	2
180			min	0	1	-.471	2	0	1	0	1	0	1	0	1
181	M19	1	max	0	2	.472	2	0	2	-.006	1	0	2	0	2
182			min	0	1	.069	1	0	1	-.025	2	0	1	0	1
183		2	max	0	2	.187	2	0	2	-.006	1	0	2	-.144	1
184			min	0	1	.026	1	0	1	-.025	2	0	1	-.999	2
185		3	max	0	2	-.017	1	0	2	-.006	1	0	2	-.158	1
186			min	0	1	-.099	2	0	1	-.025	2	0	1	-1.132	2
187		4	max	0	2	-.06	1	0	2	-.006	1	0	2	-.041	1
188			min	0	1	-.385	2	0	1	-.025	2	0	1	-.398	2
189		5	max	0	2	.018	1	0	2	0	2	0	2	0	2
190			min	0	1	.013	2	0	1	0	1	0	1	0	1
191	M20	1	max	0	2	.471	2	0	2	0	2	0	2	0	2
192			min	0	1	.071	1	0	1	0	1	0	1	0	1
193		2	max	0	2	.236	2	0	2	0	2	0	2	-.133	1
194			min	0	1	.035	1	0	1	0	1	0	1	-.885	2
195		3	max	0	2	0	2	0	2	0	2	0	2	-.177	1
196			min	0	1	0	1	0	1	0	1	0	1	-1.18	2
197		4	max	0	2	-.035	1	0	2	0	2	0	2	-.133	1
198			min	0	1	-.236	2	0	1	0	1	0	1	-.885	2
199		5	max	0	2	-.071	1	0	2	0	2	0	2	0	2
200			min	0	1	-.471	2	0	1	0	1	0	1	0	1
201	M21	1	max	0	2	.464	2	0	2	-.008	1	0	2	0	2
202			min	0	1	.067	1	0	1	-.036	2	0	1	0	1
203		2	max	0	2	.178	2	0	2	-.008	1	0	2	-.139	1
204			min	0	1	.024	1	0	1	-.036	2	0	1	-.974	2
205		3	max	0	2	-.019	1	0	2	-.008	1	0	2	-.148	1
206			min	0	1	-.108	2	0	1	-.036	2	0	1	-1.081	2
207		4	max	0	2	-.062	1	0	2	-.008	1	0	2	-.026	1
208			min	0	1	-.393	2	0	1	-.036	2	0	1	-.321	2
209		5	max	0	2	.118	2	0	2	0	2	0	2	0	2
210			min	0	1	.035	1	0	1	0	1	0	1	0	1
211	M22	1	max	0	2	.471	2	0	2	0	2	0	2	0	2
212			min	0	1	.071	1	0	1	0	1	0	1	0	1
213		2	max	0	2	.236	2	0	2	0	2	0	2	-.133	1
214			min	0	1	.035	1	0	1	0	1	0	1	-.885	2
215		3	max	0	2	0	2	0	2	0	2	0	2	-.177	1
216			min	0	1	0	1	0	1	0	1	0	1	-1.18	2
217		4	max	0	2	-.035	1	0	2	0	2	0	2	-.133	1
218			min	0	1	-.236	2	0	1	0	1	0	1	-.885	2
219		5	max	0	2	-.071	1	0	2	0	2	0	2	0	2
220			min	0	1	-.471	2	0	1	0	1	0	1	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[k]	LC	y Shear[k]	LC	z Shear[k]	LC	Torque[...	LC	y-y Mom...	LC	z-z Moment[k-ft]	LC
221	M23	1	max	0	2	.459	2	0	2	-.007	1	0	2	0	2
222			min	0	1	.066	1	0	1	-.038	2	0	1	0	1
223		2	max	0	2	.173	2	0	2	-.007	1	0	2	-.137	1
224			min	0	1	.024	1	0	1	-.038	2	0	1	-.958	2
225		3	max	0	2	-.019	1	0	2	-.007	1	0	2	-.143	1
226			min	0	1	-.113	2	0	1	-.038	2	0	1	-1.049	2
227		4	max	0	2	-.062	1	0	2	-.007	1	0	2	-.018	1
228			min	0	1	-.398	2	0	1	-.038	2	0	1	-.273	2
229		5	max	0	2	.181	2	0	2	0	2	0	2	0	2
230			min	0	1	.046	1	0	1	0	1	0	1	0	1
231	M24	1	max	0	2	.471	2	0	2	0	2	0	2	0	2
232			min	0	1	.071	1	0	1	0	1	0	1	0	1
233		2	max	0	2	.236	2	0	2	0	2	0	2	-.133	1
234			min	0	1	.035	1	0	1	0	1	0	1	-.885	2
235		3	max	0	2	0	2	0	2	0	2	0	2	-.177	1
236			min	0	1	0	1	0	1	0	1	0	1	-1.18	2
237		4	max	0	2	-.035	1	0	2	0	2	0	2	-.133	1
238			min	0	1	-.236	2	0	1	0	1	0	1	-.885	2
239		5	max	0	2	-.071	1	0	2	0	2	0	2	0	2
240			min	0	1	-.471	2	0	1	0	1	0	1	0	1
241	M25	1	max	0	2	.461	2	0	2	-.005	1	0	2	0	2
242			min	0	1	.067	1	0	1	-.03	2	0	1	0	1
243		2	max	0	2	.175	2	0	2	-.005	1	0	2	-.139	1
244			min	0	1	.024	1	0	1	-.03	2	0	1	-.965	2
245		3	max	0	2	-.019	1	0	2	-.005	1	0	2	-.148	1
246			min	0	1	-.11	2	0	1	-.03	2	0	1	-1.064	2
247		4	max	0	2	-.062	1	0	2	-.005	1	0	2	-.027	1
248			min	0	1	-.396	2	0	1	-.03	2	0	1	-.296	2
249		5	max	0	2	.009	1	0	2	0	2	0	2	0	2
250			min	0	1	-.007	2	0	1	0	1	0	1	0	1
251	M26	1	max	0	2	.471	2	0	2	0	2	0	2	0	2
252			min	0	1	.071	1	0	1	0	1	0	1	0	1
253		2	max	0	2	.236	2	0	2	0	2	0	2	-.133	1
254			min	0	1	.035	1	0	1	0	1	0	1	-.885	2
255		3	max	0	2	0	2	0	2	0	2	0	2	-.177	1
256			min	0	1	0	1	0	1	0	1	0	1	-1.18	2
257		4	max	0	2	-.035	1	0	2	0	2	0	2	-.133	1
258			min	0	1	-.236	2	0	1	0	1	0	1	-.885	2
259		5	max	0	2	-.071	1	0	2	0	2	0	2	0	2
260			min	0	1	-.471	2	0	1	0	1	0	1	0	1
261	M27	1	max	0	2	.46	2	0	2	-.002	1	0	2	0	2
262			min	0	1	.068	1	0	1	-.012	2	0	1	0	1
263		2	max	0	2	.174	2	0	2	-.002	1	0	2	-.14	1
264			min	0	1	.025	1	0	1	-.012	2	0	1	-.961	2
265		3	max	0	2	-.018	1	0	2	-.002	1	0	2	-.15	1
266			min	0	1	-.112	2	0	1	-.012	2	0	1	-1.055	2
267		4	max	0	2	-.061	1	0	2	-.002	1	0	2	-.03	1
268			min	0	1	-.397	2	0	1	-.012	2	0	1	-.283	2
269		5	max	0	2	-.011	1	0	2	0	2	0	2	0	2
270			min	0	1	-.108	2	0	1	0	1	0	1	0	1
271	M28	1	max	0	2	.471	2	0	2	0	2	0	2	0	2
272			min	0	1	.071	1	0	1	0	1	0	1	0	1
273		2	max	0	2	.236	2	0	2	0	2	0	2	-.133	1
274			min	0	1	.035	1	0	1	0	1	0	1	-.885	2
275		3	max	0	2	0	2	0	2	0	2	0	2	-.177	1
276			min	0	1	0	1	0	1	0	1	0	1	-1.18	2
277		4	max	0	2	-.035	1	0	2	0	2	0	2	-.133	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[k]	LC	y Shear[k]	LC	z Shear[k]	LC	Torque[...	LC	y-y Mom...	LC	z-z Moment[k-ft]	LC
278			min	0	1	-.236	2	0	1	0	1	0	1	-.885	2
279		5	max	0	2	-.071	1	0	2	0	2	0	2	0	2
280			min	0	1	-.471	2	0	1	0	1	0	1	0	1
281	M29	1	max	0	2	.446	2	0	2	.009	2	0	2	0	2
282			min	0	1	.066	1	0	1	.002	1	0	1	0	1
283		2	max	0	2	.161	2	0	2	.009	2	0	2	-.136	1
284			min	0	1	.023	1	0	1	.002	1	0	1	-.921	2
285		3	max	0	2	-.02	1	0	2	.009	2	0	2	-.141	1
286			min	0	1	-.125	2	0	1	.002	1	0	1	-.975	2
287		4	max	0	2	-.063	1	0	2	.009	2	0	2	-.016	1
288			min	0	1	-.411	2	0	1	.002	1	0	1	-.163	2
289		5	max	0	2	-.01	1	0	2	0	2	0	2	0	2
290			min	0	1	-.092	2	0	1	0	1	0	1	0	1
291	M30	1	max	0	2	.471	2	0	2	0	2	0	2	0	2
292			min	0	1	.071	1	0	1	0	1	0	1	0	1
293		2	max	0	2	.236	2	0	2	0	2	0	2	-.133	1
294			min	0	1	.035	1	0	1	0	1	0	1	-.885	2
295		3	max	0	2	0	2	0	2	0	2	0	2	-.177	1
296			min	0	1	0	1	0	1	0	1	0	1	-1.18	2
297		4	max	0	2	-.035	1	0	2	0	2	0	2	-.133	1
298			min	0	1	-.236	2	0	1	0	1	0	1	-.885	2
299		5	max	0	2	-.071	1	0	2	0	2	0	2	0	2
300			min	0	1	-.471	2	0	1	0	1	0	1	0	1
301	M31	1	max	0	2	.416	2	0	2	.028	2	0	2	0	2
302			min	0	1	.062	1	0	1	.005	1	0	1	0	1
303		2	max	0	2	.131	2	0	2	.028	2	0	2	-.123	1
304			min	0	1	.019	1	0	1	.005	1	0	1	-.83	2
305		3	max	0	2	-.024	1	0	2	.028	2	0	2	-.116	1
306			min	0	1	-.155	2	0	1	.005	1	0	1	-.793	2
307		4	max	0	2	-.067	1	0	2	.028	2	0	2	.11	2
308			min	0	1	-.441	2	0	1	.005	1	0	1	.021	1
309		5	max	0	2	.019	2	0	2	0	2	0	2	0	2
310			min	0	1	.006	1	0	1	0	1	0	1	0	1
311	M32	1	max	0	2	.251	2	0	2	0	2	0	2	0	2
312			min	0	1	.051	1	0	1	0	1	0	1	0	1
313		2	max	0	2	.126	2	0	2	0	2	0	2	-.096	1
314			min	0	1	.025	1	0	1	0	1	0	1	-.471	2
315		3	max	0	2	0	2	0	2	0	2	0	2	-.127	1
316			min	0	1	0	1	0	1	0	1	0	1	-.628	2
317		4	max	0	2	-.025	1	0	2	0	2	0	2	-.096	1
318			min	0	1	-.126	2	0	1	0	1	0	1	-.471	2
319		5	max	0	2	-.051	1	0	2	0	2	0	2	0	2
320			min	0	1	-.251	2	0	1	0	1	0	1	0	1
321	M33	1	max	0	2	.192	2	0	2	.038	2	0	2	0	2
322			min	0	1	.039	1	0	1	.006	1	0	1	0	1
323		2	max	0	2	.04	2	0	2	.038	2	0	2	-.071	1
324			min	0	1	.008	1	0	1	.006	1	0	1	-.351	2
325		3	max	0	2	-.023	1	0	2	.038	2	0	2	-.049	1
326			min	0	1	-.113	2	0	1	.006	1	0	1	-.24	2
327		4	max	0	2	-.054	1	0	2	.038	2	0	2	.332	2
328			min	0	1	-.265	2	0	1	.006	1	0	1	.067	1
329		5	max	0	2	-.007	1	0	2	0	2	0	2	0	2
330			min	0	1	-.033	2	0	1	0	1	0	1	0	1
331	M34	1	max	0	2	.428	2	0	2	0	2	0	2	0	2
332			min	0	1	.12	1	0	1	0	1	0	1	0	1
333		2	max	0	2	.158	2	0	2	0	2	0	2	-.52	1
334			min	0	1	.032	1	0	1	0	1	0	1	-2.182	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[k]	LC	y Shear[k]	LC	z Shear[k]	LC	Torque[...	LC	y-y Mom...	LC	z-z Moment[k-ft]	LC
335		3	max	0	2	.016	1	0	2	0	2	0	2	-.525	1
336			min	0	1	-.017	2	0	1	0	1	0	1	-2.403	2
337		4	max	0	2	-.066	1	0	2	0	2	0	2	-.37	1
338			min	0	1	-.246	2	0	1	0	1	0	1	-1.575	2
339		5	max	0	2	.213	2	0	2	0	2	0	2	0	2
340			min	0	1	.052	1	0	1	0	1	0	1	0	1
341	M35	1	max	0	2	.213	2	0	2	0	2	0	2	0	2
342			min	0	1	.052	1	0	1	0	1	0	1	0	1
343		2	max	0	2	-.021	1	0	2	0	2	0	2	-.069	1
344			min	0	1	-.072	2	0	1	0	1	0	1	-.27	2
345		3	max	0	2	0	1	0	2	0	2	0	2	.258	2
346			min	0	1	-.011	2	0	1	0	1	0	1	.046	1
347		4	max	0	2	.019	2	0	2	0	2	0	2	-.078	1
348			min	0	1	.009	1	0	1	0	1	0	1	-.32	2
349		5	max	0	2	-.031	1	0	2	0	2	0	2	0	2
350			min	0	1	-.089	2	0	1	0	1	0	1	0	1
351	M36	1	max	0	2	-.233	1	0	2	0	2	0	2	0	2
352			min	0	1	-.903	2	0	1	0	1	0	1	0	1
353		2	max	0	2	.72	2	0	2	0	2	0	2	.83	2
354			min	0	1	.171	1	0	1	0	1	0	1	.264	1
355		3	max	0	2	-.271	1	0	2	.067	2	0	2	1.717	2
356			min	0	1	-1.467	2	0	1	.02	1	0	1	.318	1
357		4	max	0	2	.246	2	0	2	-.032	1	0	2	-.556	1
358			min	0	1	.05	1	0	1	-.274	2	0	1	-2.782	2
359		5	max	0	2	-.237	1	0	2	-.188	1	0	2	-.006	1
360			min	0	1	-1.179	2	0	1	-1.294	2	0	1	-.038	2
361	M37	1	max	0	2	-.106	1	0	2	0	2	0	2	0	2
362			min	0	1	-.31	2	0	1	0	1	0	1	0	1
363		2	max	0	2	-.568	1	0	2	0	2	0	2	10.163	2
364			min	0	1	-2.864	2	0	1	0	1	0	1	2.213	1
365		3	max	0	2	.046	1	0	2	0	2	0	2	1.32	2
366			min	0	1	-.154	2	0	1	0	1	0	1	.327	1
367		4	max	0	2	1.189	2	0	2	0	2	0	2	-.763	1
368			min	0	1	.193	1	0	1	0	1	0	1	-3.986	2
369		5	max	0	2	-.397	1	0	2	0	2	0	2	0	2
370			min	0	1	-2.082	2	0	1	0	1	0	1	0	1
371	M38	1	max	6.687	2	0	2	0	2	0	2	0	2	0	2
372			min	1.348	1	0	1	0	1	0	1	0	1	0	1
373		2	max	6.668	2	0	2	0	2	0	2	0	2	0	2
374			min	1.33	1	0	1	0	1	0	1	0	1	0	1
375		3	max	6.65	2	0	2	0	2	0	2	0	2	0	2
376			min	1.312	1	0	1	0	1	0	1	0	1	0	1
377		4	max	6.631	2	0	2	0	2	0	2	0	2	0	2
378			min	1.293	1	0	1	0	1	0	1	0	1	0	1
379		5	max	6.613	2	0	2	0	2	0	2	0	2	0	2
380			min	1.275	1	0	1	0	1	0	1	0	1	0	1
381	M39	1	max	4.305	2	0	2	0	2	0	2	0	2	0	2
382			min	.726	1	0	1	0	1	0	1	0	1	0	1
383		2	max	4.287	2	0	2	0	2	0	2	0	2	0	2
384			min	.707	1	0	1	0	1	0	1	0	1	0	1
385		3	max	4.268	2	0	2	0	2	0	2	0	2	0	2
386			min	.689	1	0	1	0	1	0	1	0	1	0	1
387		4	max	4.25	2	0	2	0	2	0	2	0	2	0	2
388			min	.671	1	0	1	0	1	0	1	0	1	0	1
389		5	max	4.231	2	0	2	0	2	0	2	0	2	0	2
390			min	.652	1	0	1	0	1	0	1	0	1	0	1
391	M40	1	max	3.486	2	0	2	0	2	0	2	0	2	0	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[k]	LC	y Shear[k]	LC	z Shear[k]	LC	Torque[...	LC	y-y Mom...	LC	z-z Moment[k-ft]	LC
392			min	.811	1	0	1	0	1	0	1	0	1	0	1
393		2	max	3.467	2	0	2	0	2	0	2	0	2	0	2
394			min	.792	1	0	1	0	1	0	1	0	1	0	1
395		3	max	3.449	2	0	2	0	2	0	2	0	2	0	2
396			min	.774	1	0	1	0	1	0	1	0	1	0	1
397		4	max	3.43	2	0	2	0	2	0	2	0	2	0	2
398			min	.756	1	0	1	0	1	0	1	0	1	0	1
399		5	max	3.412	2	0	2	0	2	0	2	0	2	0	2
400			min	.737	1	0	1	0	1	0	1	0	1	0	1
401	M41	1	max	3.976	2	0	2	0	2	0	2	0	2	0	2
402			min	.827	1	0	1	0	1	0	1	0	1	0	1
403		2	max	3.958	2	0	2	0	2	0	2	0	2	0	2
404			min	.809	1	0	1	0	1	0	1	0	1	0	1
405		3	max	3.94	2	0	2	0	2	0	2	0	2	0	2
406			min	.791	1	0	1	0	1	0	1	0	1	0	1
407		4	max	3.921	2	0	2	0	2	0	2	0	2	0	2
408			min	.772	1	0	1	0	1	0	1	0	1	0	1
409		5	max	3.903	2	0	2	0	2	0	2	0	2	0	2
410			min	.754	1	0	1	0	1	0	1	0	1	0	1

Member Wood Code Checks

	LC	Member	Shape	UC Max	Loc[ft]	Shear ...	Loc[ft]	Dir	Fc' [ksi]	Ft' [ksi]	Fb1' [k...	Fb2' [k...	Fv' [ksi]	RB	CL	CP	Eqn
1	1	M1	4X8	.016	2.269	.012	0	y	.991	.621	.895	.94	.157	1.332	1	.971	3.9-3
2	1	M2	4X8	.064	4.553	.024	9.105	y	.873	.621	.895	.94	.157	1.332	1	.855	3.9-3
3	1	M3	4X8	.078	5.005	.027	0	y	.833	.621	.895	.94	.157	1.332	1	.817	3.9-3
4	1	M4	4X8	.010	1.831	.010	3.662	y	1.002	.621	.895	.94	.157	1.332	1	.982	3.9-3
5	1	M5	4X8	.078	5.005	.027	0	y	.833	.621	.895	.94	.157	1.332	1	.817	3.9-3
6	1	M6	4X8	.052	4.115	.022	8.23	y	.906	.621	.895	.94	.157	1.332	1	.887	3.9-3
7	1	M7	4X8	.078	5.005	.027	0	y	.833	.621	.895	.94	.157	1.332	1	.817	3.9-3
8	1	M8	4X8	.083	5.187	.028	10.375	y	.816	.621	.895	.94	.157	1.332	1	.799	3.9-3
9	1	M9	4X8	.002	.88	.005	1.76	y	1.016	.621	.895	.94	.157	1.332	1	.996	3.9-3
10	1	M10	4X8	.078	5.005	.027	0	y	.833	.621	.895	.94	.157	1.332	1	.817	3.9-3
11	1	M11	4X8	.083	5.187	.028	10.375	y	.816	.621	.895	.94	.157	1.332	1	.799	3.9-3
12	1	M12	4X8	.002	.88	.005	1.76	y	1.016	.621	.895	.94	.157	1.332	1	.996	3.9-3
13	1	M13	4X8	.078	5.005	.027	0	y	.833	.621	.895	.94	.157	1.332	1	.817	3.9-3
14	1	M14	4X8	.083	5.187	.028	10.375	y	.816	.621	.895	.94	.157	1.332	1	.799	3.9-3
15	1	M15	4X8	.002	.88	.005	1.76	y	1.016	.621	.895	.94	.157	1.332	1	.996	3.9-3
16	1	M16	4X8	.078	5.005	.027	0	y	.833	.621	.895	.94	.157	1.332	1	.817	3.9-3
17	1	M17	4X8	.076	4.93	.030	10.365	y	.722	.621	.895	.94	.157	1.332	1	.708	3.9-3
18	1	M18	4X8	.078	5.005	.027	0	y	.833	.621	.895	.94	.157	1.332	1	.817	3.9-3
19	1	M19	4X8	.073	4.93	.049	10.365	y	.722	.621	.895	.94	.157	1.332	1	.708	3.9-3
20	1	M20	4X8	.078	5.005	.027	0	y	.833	.621	.895	.94	.157	1.332	1	.817	3.9-3
21	1	M21	4X8	.070	4.803	.058	10.365	y	.722	.621	.895	.94	.157	1.332	1	.708	3.9-3
22	1	M22	4X8	.078	5.005	.027	0	y	.833	.621	.895	.94	.157	1.332	1	.817	3.9-3
23	1	M23	4X8	.068	4.677	.056	10.365	y	.722	.621	.895	.94	.157	1.332	1	.708	3.9-3
24	1	M24	4X8	.078	5.005	.027	0	y	.833	.621	.895	.94	.157	1.332	1	.817	3.9-3
25	1	M25	4X8	.070	4.803	.048	10.365	y	.722	.621	.895	.94	.157	1.332	1	.708	3.9-3
26	1	M26	4X8	.078	5.005	.027	0	y	.833	.621	.895	.94	.157	1.332	1	.817	3.9-3
27	1	M27	4X8	.071	4.803	.036	10.365	y	.722	.621	.895	.94	.157	1.332	1	.708	3.9-3
28	1	M28	4X8	.078	5.005	.027	0	y	.833	.621	.895	.94	.157	1.332	1	.817	3.9-3
29	1	M29	4X8	.068	4.677	.036	10.365	y	.722	.621	.895	.94	.157	1.332	1	.708	3.9-3
30	1	M30	4X8	.078	5.005	.027	0	y	.833	.621	.895	.94	.157	1.332	1	.817	3.9-3
31	1	M31	4X8	.060	4.424	.048	10.365	y	.722	.621	.895	.94	.157	1.332	1	.708	3.9-3
32	1	M32	4X8	.056	5.005	.019	0	y	.833	.621	.895	.94	.157	1.332	1	.817	3.9-3
33	1	M33	4X8	.063	10.365	.047	10.365	y	.722	.621	.889	.94	.157	9.283	.993	.708	3.9-3

Member Wood Code Checks (Continued)

	LC	Member	Shape	UC Max	Loc[ft]	Shear ...	Loc[ft]	Dir	Fc' [ksi]	Ft' [ksi]	Fb1' [k...	Fb2' [k...	Fv' [ksi]	RB	CL	CP	Eqn
34	1	M34	5.125X7....	.083	9.318	.030	22.161	y	1.019	.792	1.725	1.148	.209	4.139	.998	.969	3.9-3
35	1	M35	3.5X7.5FS	.019	4.179	.014	0	y	1.042	.792	1.725	1.148	.209	3.833	.998	.991	3.9-3
36	1	M36	5.125X10...	.069	3.123	.191	23.061	y	1.047	.792	1.704	1.148	.209	10.518	.986	.996	3.9-3
37	1	M37	5.125X10...	.191	7.561	.077	7.561	y	.134	.792	1.697	1.148	.209	11.572	.982	.127	3.9-3
38	1	M38	6X6	.097	0	.000	0	z	.458	.428	.675	.675	.153	4.671	1	.798	3.6.3
39	1	M39	6X6	.052	0	.000	0	z	.458	.428	.675	.675	.153	4.671	1	.798	3.6.3
40	1	M40	6X6	.059	0	.000	0	z	.458	.428	.675	.675	.153	4.671	1	.798	3.6.3
41	1	M41	6X6	.060	0	.000	0	z	.458	.428	.675	.675	.153	4.671	1	.798	3.6.3
42	2	M1	4X8	.095	2.269	.072	0	y	1.097	.69	.994	1.044	.175	1.332	1	.968	3.9-3
43	2	M2	4X8	.384	4.553	.145	9.105	y	.947	.69	.994	1.044	.175	1.332	1	.835	3.9-3
44	2	M3	4X8	.464	5.005	.160	0	y	.897	.69	.994	1.044	.175	1.332	1	.791	3.9-3
45	2	M4	4X8	.062	1.831	.058	3.662	y	1.111	.69	.994	1.044	.175	1.332	1	.98	3.9-3
46	2	M5	4X8	.464	5.005	.160	0	y	.897	.69	.994	1.044	.175	1.332	1	.791	3.9-3
47	2	M6	4X8	.314	4.115	.131	8.23	y	.988	.69	.994	1.044	.175	1.332	1	.872	3.9-3
48	2	M7	4X8	.464	5.005	.160	0	y	.897	.69	.994	1.044	.175	1.332	1	.791	3.9-3
49	2	M8	4X8	.499	5.187	.165	10.375	y	.875	.69	.994	1.044	.175	1.332	1	.772	3.9-3
50	2	M9	4X8	.014	.88	.028	1.76	y	1.129	.69	.994	1.044	.175	1.332	1	.995	3.9-3
51	2	M10	4X8	.464	5.005	.160	0	y	.897	.69	.994	1.044	.175	1.332	1	.791	3.9-3
52	2	M11	4X8	.499	5.187	.165	10.375	y	.875	.69	.994	1.044	.175	1.332	1	.772	3.9-3
53	2	M12	4X8	.014	.88	.028	1.76	y	1.129	.69	.994	1.044	.175	1.332	1	.995	3.9-3
54	2	M13	4X8	.464	5.005	.160	0	y	.897	.69	.994	1.044	.175	1.332	1	.791	3.9-3
55	2	M14	4X8	.499	5.187	.165	10.375	y	.875	.69	.994	1.044	.175	1.332	1	.772	3.9-3
56	2	M15	4X8	.014	.88	.028	1.76	y	1.129	.69	.994	1.044	.175	1.332	1	.995	3.9-3
57	2	M16	4X8	.464	5.005	.160	0	y	.897	.69	.994	1.044	.175	1.332	1	.791	3.9-3
58	2	M17	4X8	.476	5.056	.175	10.365	y	.761	.69	.994	1.044	.175	1.332	1	.671	3.9-3
59	2	M18	4X8	.464	5.005	.160	0	y	.897	.69	.994	1.044	.175	1.332	1	.791	3.9-3
60	2	M19	4X8	.466	5.056	.249	10.365	y	.761	.69	.994	1.044	.175	1.332	1	.671	3.9-3
61	2	M20	4X8	.464	5.005	.160	0	y	.897	.69	.994	1.044	.175	1.332	1	.791	3.9-3
62	2	M21	4X8	.450	4.93	.285	10.365	y	.761	.69	.994	1.044	.175	1.332	1	.671	3.9-3
63	2	M22	4X8	.464	5.005	.160	0	y	.897	.69	.994	1.044	.175	1.332	1	.791	3.9-3
64	2	M23	4X8	.439	4.93	.294	10.365	y	.761	.69	.994	1.044	.175	1.332	1	.671	3.9-3
65	2	M24	4X8	.464	5.005	.160	0	y	.897	.69	.994	1.044	.175	1.332	1	.791	3.9-3
66	2	M25	4X8	.444	4.93	.267	10.365	y	.761	.69	.994	1.044	.175	1.332	1	.671	3.9-3
67	2	M26	4X8	.464	5.005	.160	0	y	.897	.69	.994	1.044	.175	1.332	1	.791	3.9-3
68	2	M27	4X8	.441	4.93	.212	10.365	y	.761	.69	.994	1.044	.175	1.332	1	.671	3.9-3
69	2	M28	4X8	.464	5.005	.160	0	y	.897	.69	.994	1.044	.175	1.332	1	.791	3.9-3
70	2	M29	4X8	.416	4.677	.209	10.365	y	.761	.69	.994	1.044	.175	1.332	1	.671	3.9-3
71	2	M30	4X8	.464	5.005	.160	0	y	.897	.69	.994	1.044	.175	1.332	1	.791	3.9-3
72	2	M31	4X8	.362	4.424	.276	10.365	y	.761	.69	.994	1.044	.175	1.332	1	.671	3.9-3
73	2	M32	4X8	.247	5.005	.085	0	y	.897	.69	.994	1.044	.175	1.332	1	.791	3.9-3
74	2	M33	4X8	.280	10.365	.231	10.365	y	.761	.69	.987	1.044	.175	9.283	.992	.671	3.9-3
75	2	M34	5.125X7....	.353	9.821	.113	22.161	y	1.127	.88	1.916	1.276	.232	4.139	.998	.965	3.9-3
76	2	M35	3.5X7.5FS	.068	4.179	.052	0	y	1.156	.88	1.917	1.276	.232	3.833	.998	.99	3.9-3
77	2	M36	5.125X10...	.262	3.123	1.134	21.139	z	1.163	.88	1.889	1.276	.201	10.518	.984	.995	3.9-3
78	2	M37	5.125X10...	.802	7.561	.373	17.157	y	.134	.88	1.88	1.276	.232	11.572	.979	.115	3.9-3
79	2	M38	6X6	.450	0	.000	0	z	.491	.475	.75	.75	.17	4.671	1	.77	3.6.3
80	2	M39	6X6	.290	0	.000	0	z	.491	.475	.75	.75	.17	4.671	1	.77	3.6.3
81	2	M40	6X6	.235	0	.000	0	z	.491	.475	.75	.75	.17	4.671	1	.77	3.6.3
82	2	M41	6X6	.268	0	.000	0	z	.491	.475	.75	.75	.17	4.671	1	.77	3.6.3

Beam Deflections

	LC	Member Label	Span	Location [ft]	y' [in]	(n) L'/y' Ratio
1	1	M1	1	0	0	NC
2	1	M2	1	9.105	.044	4972
3	1	M3	1	10.011	.064	3743

Beam Deflections (Continued)

	LC	Member Label	Span	Location [ft]	y' [in]	(n) L'/y' Ratio
4	1	M4	1	0	0	NC
5	1	M5	1	10.011	.064	3743
6	1	M6	1	0	0	NC
7	1	M7	1	10.011	.064	3743
8	1	M8	1	5.187	-.023	5396
9	1	M9	1	0	0	NC
10	1	M10	1	5.005	-.02	6005
11	1	M11	1	5.187	-.023	5396
12	1	M12	1	0	0	NC
13	1	M13	1	10.011	.064	3743
14	1	M14	1	5.187	-.023	5396
15	1	M15	1	0	0	NC
16	1	M16	1	10.011	.064	3743
17	1	M17	1	5.562	-.025	5860
18	1	M18	1	10.011	.064	3743
19	1	M19	1	5.435	-.024	6183
20	1	M20	1	10.011	.064	3743
21	1	M21	1	5.309	-.022	6729
22	1	M22	1	10.011	.064	3743
23	1	M23	1	5.309	-.021	7058
24	1	M24	1	10.011	.064	3743
25	1	M25	1	5.435	-.022	6632
26	1	M26	1	10.011	.064	3743
27	1	M27	1	5.435	-.023	6462
28	1	M28	1	10.011	.064	3743
29	1	M29	1	5.309	-.021	6968
30	1	M30	1	10.011	.064	3743
31	1	M31	1	5.056	-.016	8859
32	1	M32	1	10.011	.046	5215
33	1	M33	1	9.228	0	NC
34			2	10.492	0	NC
35	1	M34	1	11.584	-.218	1330
36	1	M35	1	0	.075	7146
37	1	M36	1	0	-.018	4072
38			2	3.123	0	NC
39			3	7.207	0	NC
40			4	9.128	0	NC
41			5	11.29	0	NC
42			6	12.732	0	NC
43			7	13.212	0	NC
44			8	15.134	0	NC
45			9	17.296	0	NC
46			10	19.217	0	NC
47			11	21.139	0	NC
48	1	M37	1	0	-.199	918
49			2	11.05	.02	5660
50			3	22.682	-.026	5051
51	2	M1	1	4.537	.018	5984
52	2	M2	1	9.105	.292	748
53	2	M3	1	10.011	.427	563
54	2	M4	1	0	0	NC
55	2	M5	1	10.011	.427	563
56	2	M6	1	4.115	-.061	1626
57	2	M7	1	10.011	.427	563
58	2	M8	1	5.187	-.153	811
59	2	M9	1	0	0	NC
60	2	M10	1	5.005	-.133	903

Beam Deflections (Continued)

	LC	Member Label	Span	Location [ft]	y' [in]	(n) L'/y' Ratio
61	2	M11	1	5.187	-.153	811
62	2	M12	1	0	0	NC
63	2	M13	1	10.011	.427	563
64	2	M14	1	5.187	-.153	811
65	2	M15	1	0	0	NC
66	2	M16	1	10.011	.427	563
67	2	M17	1	5.562	-.178	817
68	2	M18	1	10.011	.427	563
69	2	M19	1	5.562	-.172	844
70	2	M20	1	10.011	.427	563
71	2	M21	1	5.562	-.162	897
72	2	M22	1	10.011	.427	563
73	2	M23	1	5.435	-.156	933
74	2	M24	1	10.011	.427	563
75	2	M25	1	5.562	-.161	907
76	2	M26	1	10.011	.427	563
77	2	M27	1	5.562	-.16	910
78	2	M28	1	10.011	.427	563
79	2	M29	1	5.435	-.146	1000
80	2	M30	1	10.011	.427	563
81	2	M31	1	5.056	-.113	1288
82	2	M32	1	10.011	.227	1057
83	2	M33	1	3.919	-.04	6245
84			2	10.492	0	NC
85	2	M34	1	11.584	-.966	300
86	2	M35	1	0	.244	2192
87	2	M36	1	0	-.069	1060
88			2	4.564	.007	6936
89			3	7.207	0	NC
90			4	9.128	0	NC
91			5	11.29	0	NC
92			6	12.732	.001	4357
93			7	14.173	.003	8585
94			8	15.374	0	NC
95			9	18.016	-.003	6993
96			10	20.178	-.005	4760
97			11	21.379	-.004	6050
98	2	M37	1	0	-.871	209
99			2	11.05	.085	1347
100			3	22.682	-.137	947

CONNECTIONS

JOIST - 4x8
V = 480# MAX
V_{ALLOW} = 1030#, SIMPSON LUS46
1,030# > 480# OK

GLB - 5½" WIDE
COLUMN CAP, TYPICAL
P = 6687# MAX
V_{ALLOW} = 33,275#, SIMPSON CC66
33,275# > 6687# OK
COLUMN CAP AT END OF BEAM
P = 1,565#
P_{ALLOW} = 18,905#, SIMPSON ECC66
18,905# > 1565# OK

BEAM AT WALL
5½ x 12 GLB
P = 2,084#, MAX (ASD) $P_U = (1.6)(2084\#) = 3334\#$
LEDGER ON CONC WALL (3x)
$F'_{c\perp} = (625\ PSI)(.67)(1.0) = 418\ PSI$
C_M C_i
BEARING AREA = (5.5")(2.5") = 13.75 IN^2

$$f_{c\perp} = \frac{2084\#}{13.75 IN^2} = 152\ PSI < F'_{c\perp} = 418\ PSI \text{ OK}$$

SEE P. 35 FOR LEDGER ANCHORS INTO WALL

POST BASE
AT NEW FOOTINGS
P = 6,687# MAX
P_A = 14,420#, SIMPSON PBS66
14,420# > 6,732# OK
AT EXISTING CONC WALL
P_A = 12,920#, SIMPSON ABU66
12,920# > 6,687# OK

SIMPSON Strong-Tie®

LUS/HUS/HHUS/HGUS

Double-Shear Face-Mount Joist Hangers

This product is preferable to similar connectors because of (a) easier installation, (b) higher loads, (c) lower installed cost, or a combination of these features.

All hangers in this series have double-shear nailing. This innovation distributes the load through two points on each joist nail for greater strength. It also allows the use of fewer nails, faster installation and the use of standard nails for all connections. (Do not bend or remove tabs.)

Material: See tables, pp. 104–113

Finish: Galvanized. Some products available in stainless steel or ZMAX® coating; see Corrosion Information, pp. 13–15.

Installation:

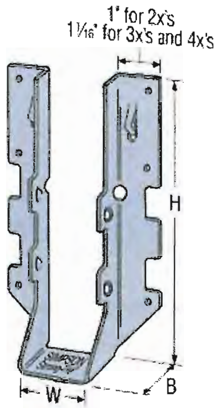
- Use all specified fasteners; see General Notes.
- Nails must be driven at an angle through the joist or truss into the header to achieve the table loads.
- Not designed for welded or nailer applications.
- 0.148" x 3¼" nails may be used where 0.148" x 3" nails are specified with no reduction in load. Where 0.162" x 3½" nails are specified, 0.148" x 3" or 0.148" x 3¼" nails may be used at 0.85 of the table load.
- With 3x carrying members, use 0.162" x 2½" nails into the header and 0.162" x 3½" nails into the joist with no load reduction.
- With 2x carrying members, use 0.148" x 1½" nails into the header and 0.148" x 3" nails into the joist, reduce the load to 0.64 of the table value.

Allowable Loads:

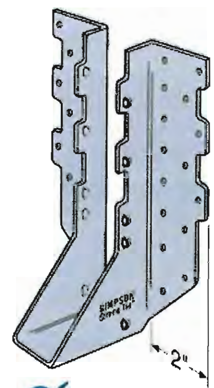
- See table on pp. 104–113 for loads.

Options:

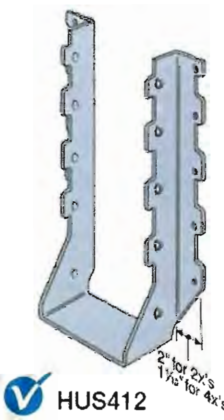
- LUS/HUS hangers cannot be modified.
- See next page for HHUS/HGUS modifications.



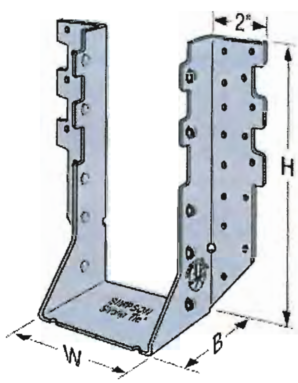
LUS28



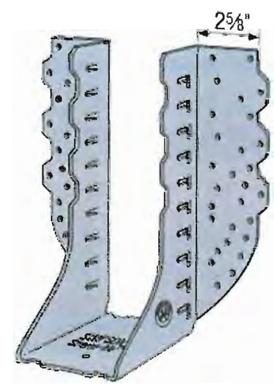
HUS210
(HUS26 and HUS28 similar)



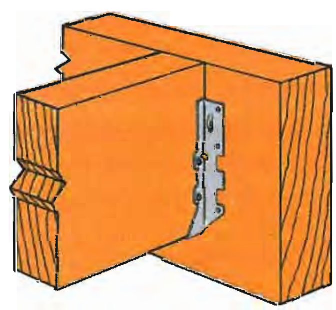
HUS412



HHUS410

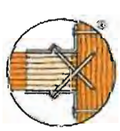


HGUS3.25/12



Typical LUS28 Installation
use 0.148" x 3" nail or 0.148" x 3¼" nail

Double-Shear Nailing



Double-Shear Nailing Top View

Double-Shear Nailing Side View – Do not bend tab

Dome Double-Shear Nailing Side View *(Available on some models)*

Joist Size	Model No.	Ga.	Dimensions (in.) W	H	B	Min./Max.	Fasteners (in.) Header	Joist	DF/SP Allowable Loads Uplift (160)	Floor (100)	Snow (115)	Roof (125)	Installed Cost Index (ICI)
Sawn Lumber Sizes													
	U314	16	2 9/16	10½	2	—	(16) 0.162 x 3½	(6) 0.148 x 1½	990	2,305	2,610	2,815	•
3x14	HU314 / HUC314	14	2 9/16	12 13/32	2½	—	(18) 0.162 x 3½	(8) 0.148 x 1½	1,510	2,680	3,025	3,240	•
	HUCQ310-SDS	14	2 9/16	9	3	—	(8) ¼ x 2½ SDS	(4) ¼ x 2½ SDS	1,350	3,120	3,590	3,860	•
3x16	U314	16	2 9/16	10½	2	—	(16) 0.162 x 3½	(6) 0.148 x 1½	990	2,305	2,610	2,815	•
	HU316 / HUC316	14	2 9/16	14 5/32	2½	—	(20) 0.162 x 3½	(8) 0.148 x 1½	1,510	2,980	3,360	3,600	•
	LUS44	18	3 9/16	3	2	—	(4) 0.162 x 3½	(2) 0.162 x 3½	410	800	905	980	Lowest
4x4	U44	16	3 9/16	2 7/8	2	—	(4) 0.162 x 3½	(2) 0.148 x 3	240	575	650	705	20%
	HU44 / HUC44	14	3 9/16	2 7/8	2½	—	(4) 0.162 x 3½	(2) 0.148 x 3	380	595	670	720	161%
	LUS46	18	3 9/16	4¾	2	—	(4) 0.162 x 3½	(4) 0.162 x 3½	1,060	1,030	1,170	1,265	Lowest
	U46	16	3 9/16	4 7/8	2	—	(8) 0.162 x 3½	(4) 0.148 x 3	535	1,150	1,305	1,410	37%
4x6	HUS46	14	3 9/16	5	2	—	(4) 0.162 x 3½	(4) 0.162 x 3½	1,165	1,055	1,195	1,290	152%
	HU46 / HUC46	14	3 9/16	4 23/32	2½	Min.	(8) 0.162 x 3½	(4) 0.148 x 3	755	1,190	1,345	1,440	163%
		14	3 9/16	4 23/32	2½	Max.	(12) 0.162 x 3½	(6) 0.148 x 3	1,135	1,785	2,015	2,165	185%
	LUS46	18	3 9/16	4¾	2	—	(4) 0.162 x 3½	(4) 0.162 x 3½	1,060	1,030	1,170	1,265	Lowest
	U46	16	3 9/16	4 7/8	2	—	(8) 0.162 x 3½	(4) 0.148 x 3	535	1,150	1,305	1,410	37%
4x8	LUS48	18	3 9/16	6¾	2	—	(6) 0.162 x 3½	(4) 0.162 x 3½	1,060	1,315	1,490	1,610	40%
	HUS48	14	3 9/16	6 15/16	2	—	(6) 0.162 x 3½	(6) 0.162 x 3½	1,320	1,580	1,790	1,930	203%
	HU48 / HUC48	14	3 9/16	6 3/32	2½	Min.	(10) 0.162 x 3½	(4) 0.148 x 3	755	1,490	1,680	1,800	213%
		14	3 9/16	6 3/32	2½	Max.	(14) 0.162 x 3½	(6) 0.148 x 3	1,135	2,085	2,350	2,530	235%
	LUS48	18	3 9/16	6¾	2	—	(6) 0.162 x 3½	(4) 0.162 x 3½	1,060	1,315	1,490	1,610	Lowest
	LUS410	18	3 9/16	8¾	2	—	(8) 0.162 x 3½	(6) 0.162 x 3½	1,445	1,830	2,075	2,245	19%
	U410	16	3 9/16	8 3/8	2	—	(14) 0.162 x 3½	(6) 0.148 x 3	990	2,015	2,280	2,465	74%
4x10	HUS410	14	3 9/16	8 15/16	2	—	(8) 0.162 x 3½	(8) 0.162 x 3½	3,220	2,110	2,385	2,575	154%
	HU410 / HUC410	14	3 9/16	8 3/8	2½	Min.	(14) 0.162 x 3½	(6) 0.148 x 3	1,135	2,085	2,350	2,520	232%
		14	3 9/16	8 3/8	2½	Max.	(18) 0.162 x 3½	(10) 0.148 x 3	1,795	2,680	3,020	3,250	253%
	HUCQ410-SDS	14	3 9/16	9	3	—	(12) ¼ x 2½ SDS	(6) ¼ x 2½ SDS	2,265	4,500	4,500	4,500	•
	LUS410	18	3 9/16	8¾	2	—	(8) 0.162 x 3½	(6) 0.162 x 3½	1,445	1,830	2,075	2,245	Lowest
	LUS414	18	3 9/16	10¾	2	—	(10) 0.162 x 3½	(6) 0.162 x 3½	1,445	2,110	2,395	2,590	33%
	U410	16	3 9/16	8 3/8	2	—	(14) 0.162 x 3½	(6) 0.148 x 3	990	2,015	2,280	2,465	46%
	HUS410	14	3 9/16	8 5/16	2	—	(8) 0.162 x 3½	(8) 0.162 x 3½	3,220	2,110	2,385	2,575	114%
4x12	HUS412	14	3 9/16	10½	2	—	(10) 0.162 x 3½	(10) 0.162 x 3½	3,435	2,635	2,985	3,220	129%
	HU412 / HUC412	14	3 9/16	10 11/32	2½	Min.	(16) 0.162 x 3½	(6) 0.148 x 3	1,135	2,385	2,690	2,880	268%
		14	3 9/16	10 11/32	2½	Max.	(22) 0.162 x 3½	(10) 0.148 x 3	1,895	3,275	3,695	3,970	290%
	HUCQ410-SDS	14	3 9/16	9	3	—	(12) ¼ x 2½ SDS	(6) ¼ x 2½ SDS	2,265	4,500	4,500	4,500	•
	HUCQ412-SDS	14	3 9/16	11	3	—	(14) ¼ x 2½ SDS	(6) ¼ x 2½ SDS	2,265	5,045	5,045	5,045	•
	LUS410	18	3 9/16	8¾	2	—	(8) 0.162 x 3½	(6) 0.162 x 3½	1,445	1,830	2,075	2,245	Lowest
	LUS414	18	3 9/16	10¾	2	—	(10) 0.162 x 3½	(6) 0.162 x 3½	1,445	2,110	2,395	2,590	33%
	U414	16	3 9/16	10	2	—	(16) 0.162 x 3½	(6) 0.148 x 3	990	2,305	2,610	2,815	93%
4x14	HUS412	14	3 9/16	10½	2	—	(10) 0.162 x 3½	(10) 0.162 x 3½	3,435	2,635	2,985	3,220	129%
	HU414 / HUC414	14	3 9/16	11 29/32	2½	Min.	(18) 0.162 x 3½	(8) 0.148 x 3	1,510	2,680	3,025	3,240	333%
		14	3 9/16	11 29/32	2½	Max.	(24) 0.162 x 3½	(12) 0.148 x 3	2,015	3,570	4,030	4,335	355%
	HUCQ412-SDS	14	3 9/16	11	3	—	(14) ¼ x 2½ SDS	(6) ¼ x 2½ SDS	2,265	5,045	5,045	5,045	•

HHUS46 AT CONC WALL

TYP JOIST

See footnotes.

SIMPSON Strong-Tie

SIMPSON Strong-Tie

Face-Mount Hangers: Load Tables for I-Joists, Glulam and SCL, 5 1/4" x 9 1/2" – 5 1/2" Glulam

These products are available with additional corrosion protection.

SS For stainless-steel fasteners, see Connector Fastener Types and Sizes Specified for Simpson Strong-Tie Connectors.

Codes: See Code Reference Key Chart.

Actual Joist Size (in.)	Model No.	Carried Member: Glulam	Carried Member: SCL	Carried Member: I-joist	Carried Member: Web Stiff Reqd.	Dimensions (in.): W	Dimensions (in.): H	Dimensions (in.): B	Min./Max.	Fasteners (in.): Face	Fasteners (in.): Joist	DF/SP Species Header: Uplift (160)	DF/SP: Floor (100)	DF/SP: Snow (115)	DF/SP: Roof (125)	SPF/HF Species Header: Floor (100)	SPF/HF: Snow (115)	SPF/HF: Roof (125)
5¼ x 9½	HU610 / HUC610		•		—	5½	7⅝	2½	Min.	(14) 0.162 x 3½	(6) 0.162 x 3½	1,345	2,085	2,350	2,530	1,795	2,025	2,180
						5½	7⅝	2½	Max.	(18) 0.162 x 3½	(8) 0.162 x 3½	1,795	2,680	3,020	3,250	2,305	2,605	2,800
	HGUS5.50/10		•		—	5½	8$^{15}/_{16}$	4	—	(46) 0.162 x 3½	(16) 0.162 x 3½	4,095	9,100	9,100	9,100	7,825	7,825	7,825
	HHUS5.50/10		•		—	5½	9	3	—	(30) 0.162 x 3½	(10) 0.162 x 3½	3,565	5,635	6,380	6,880	4,845	5,490	5,915
	HUCQ610-SDS		•		—	5½	9	3	—	(12) ¼" x 2½" SDS	(6) ¼" x 2½" SDS	2,325	4,680	5,185	5,185	3,370	3,735	3,735
	MGU5.50-SDS		•		—	5½	9¼ to 30	4½	—	(24) ¼" x 2½" SDS	(16) ¼" x 2½" SDS	7,260	9,450	9,450	9,450	6,805	6,805	6,805
5¼ x 11⅞	HHUS5.50/10		•		—	5½	9	3	—	(30) 0.162 x 3½	(10) 0.162 x 3½	3,565	5,635	6,380	6,880	4,845	5,490	5,915
	MGU5.50-SDS				—	5½	9¼ to 30	4½		(24) ¼" x 2½" SDS	(16) ¼" x 2½" SDS	7,260	9,450	9,450	9,450	6,805	6,805	6,805
	HU612 / HUC612		•		—	5½	9⅜	2½	Min.	(16) 0.162 x 3½	(6) 0.162 x 3½	1,345	2,380	2,685	2,890	2,050	2,315	2,490
						5½	9⅜	2½	Max.	(22) 0.162 x 3½	(8) 0.162 x 3½	1,795	3,275	3,695	3,970	2,820	3,180	3,425
	HGUS5.50/12		•		—	5½	10½	4	—	(56) 0.162 x 3½	(20) 0.162 x 3½	5,040	9,400	9,400	9,400	8,085	8,085	8,085
	SS HUCQ612-SDS		•		—	5½	11	3	—	(14) ¼" x 2½" SDS	(6) ¼" x 2½" SDS	2,325	5,185	5,185	5,185	3,735	3,735	3,735
5¼ x 14	HHUS5.50/10		•		—	5½	9	3	—	(30) 0.162 x 3½	(10) 0.162 x 3½	3,565	5,635	6,380	6,880	4,845	5,490	5,915
	MGU5.50-SDS				—	5½	9¼ to 30	4½	—	(24) ¼" x 2½" SDS	(16) ¼" x 2½" SDS	7,260	9,450	9,450	9,450	6,805	6,805	6,805
	SS HUCQ612-SDS		•		—	5½	11	3	—	(14) ¼" x 2½" SDS	(6) ¼" x 2½" SDS	2,325	5,185	5,185	5,185	3,735	3,735	3,735
	HGU5.50-SDS				—	5½	11 to 30	5¼	—	(36) ¼" x 2½" SDS	(24) ¼" x 2½" SDS	9,460	13,160	13,160	13,160	9,475	9,475	9,475
	HGUS5.50/14		•		—	5½	12½	4	—	(66) 0.162 x 3½	(22) 0.162 x 3½	5,515	9,695	9,695	9,695	8,340	8,340	8,340
	HU616 / HUC616		•		—	5½	12$^{11}/_{16}$	2½	Min.	(20) 0.162 x 3½	(8) 0.162 x 3½	1,795	2,975	3,360	3,610	2,565	2,895	3,110
						5½	12$^{11}/_{16}$	2½	Max.	(26) 0.162 x 3½	(12) 0.162 x 3½	2,695	3,870	4,365	4,695	3,330	3,760	4,045
	HHGU5.50-SDS				—	5½	13 to 30	5¼	—	(44) ¼" x 2¼" SDS	(28) ¼" x 2½" SDS	14,145	17,345	17,345	17,345	12,490	12,490	12,490
5¼ x 16	HHUS5.50/10		•		—	5½	9	3	—	(30) 0.162 x 3½	(10) 0.162 x 3½	3,565	5,635	6,380	6,880	4,845	5,490	5,915
	MGU5.50-SDS				—	5½	9¼ to 30	4½	—	(24) ¼" x 2½" SDS	(16) ¼" x 2½" SDS	7,260	9,450	9,450	9,450	6,805	6,805	6,805
	SS HUCQ612-SDS		•		—	5½	11	3	—	(14) ¼" x 2½" SDS	(6) ¼" x 2½" SDS	2,325	5,185	5,185	5,185	3,735	3,735	3,735
	HGU5.50-SDS				—	5½	11 to 30	5¼	—	(36) ¼" x 2½" SDS	(24) ¼" x 2½" SDS	9,460	13,160	13,160	13,160	9,475	9,475	9,476
	HGUS5.50/14		•		—	5½	12½	4	—	(66) 0.162 x 3½	(22) 0.162 x 3½	5,515	9,695	9,695	9,695	8,340	8,340	8,340
	HU616 / HUC616		•		—	5½	12$^{11}/_{16}$	2½	Min	(20) 0.162 x 3½	(8) 0.162 x 3½	1,795	2,975	3,360	3,610	2,565	2,895	3,110
						5½	12$^{11}/_{16}$	2½	Max	(26) 0.162 x 3½	(12) 0.162 x 3½	2,695	3,870	4,365	4,695	3,330	3,760	4,045
	HHGU5.50-SDS		•		—	5½	13 to 30	5¼	—	(44) ¼" x 2½" SDS	(28) ¼" x 2½" SDS	14,145	17,345	17,345	17,345	12,490	12,490	12,490
5¼ x 18	HHUS5.50/10		•		—	5½	9	3	—	(30) 0.162 x 3½	(10) 0.162 x 3½	3,565	5,635	6,380	6,880	4,845	5,490	5,915
	SS HUCQ612-SDS		•		—	5½	11	3	—	(14) ¼" x 2½" SDS	(6) ¼" x 2½" SDS	2,325	5,185	5,185	5,185	3,735	3,735	3,735
	HGUS5.50/14		•		—	5½	12½	4	—	(66) 0.162 x 3½	(22) 0.162 x 3½	5,515	9,695	9,695	9,695	8,340	8,340	8,340
	HU616 / HUC616		•		—	5½	12$^{11}/_{16}$	2½	Min.	(20) 0.162 x 3½	(8) 0.162 x 3½	1,795	2,975	3,360	3,610	2,565	2,895	3,110
						5½	12$^{11}/_{16}$	2½	Max.	(26) 0.162 x 3½	(12) 0.162 x 3½	2,695	3,870	4,365	4,695	3,330	3,760	4,045
	HGU5.50-SDS		•		—	5½	16 to 17⅞	5¼	—	(36) ¼" x 2½" SDS	(24) ¼" x 2½" SDS	9,460	13,160	13,160	13,160	9,475	9,475	9,475
	MGU5.50-SDS		•		—	5½	16 to 17⅞	4½	—	(24) ¼" x 2½" SDS	(16) ¼" x 2½" SDS	7,260	9,450	9,450	9,450	6,805	6,805	6,805
	HHGU5.50-SDS		•		—	5½	16 to 17⅞	5¼	—	(44) ¼" x 2½" SDS	(28) ¼" x 2½" SDS	14,145	17,345	17,345	17,345	12,490	12,490	12,490
5¼ x 20 to 30	MGU5.50-SDS		•		—	5½	18 to 30	4½	—	(24) ¼" x 2½" SDS	(16) ¼" x 2½" SDS	7,260	9,450	9,450	9,450	6,805	6,805	6,805
	HGU5.50-SDS		•		—	5½	18 to 30	5¼	—	(36) ¼" x 2½" SDS	(24) ¼" x 2½" SDS	9,460	13,160	13,160	13,160	9,475	9,475	9,475
	HHGU5.50-SDS		•		—	5½	18 to 30	5¼	—	(44) ¼" x 2½" SDS	(28) ¼" x 2½" SDS	14,145	17,345	17,345	17,345	12,490	12,490	12,490
5½ glulam	HU610 / HUC610		•		—	5½	7⅝	2½	Max.	(18) 0.162 x 3½	(8) 0.162 x 3½	1,795	2,680	3,020	3,250	2,305	2,605	2,800
	HGUS5.50/10	•			—	5½	8$^{15}/_{16}$	4	—	(46) 0.162 x 3½	(16) 0.162 x 3½	4,095	9,100	9,100	9,100	7,825	7,825	7,825
	HUCQ610-SDS	•			—	5½	9	3	—	(12) ¼" x 2½" SDS	(6) ¼" x 2½" SDS	2,325	4,680	5,185	5,185	3,370	3,735	3,735
	HHUS5.50/10	•			—	5½	9	3	—	(30) 0.162 x 3½	(10) 0.162 x 3½	3,565	5,635	6,380	6,880	4,845	5,490	5,915
	MGU5.62-SDS	•			—	5⅝	9¼ to 30	4½	—	(24) ¼" x 2½" SDS	(16) ¼" x 2½" SDS	7,260	9,450	9,450	9,450	6,805	6,805	6,805
	HU612 / HUC612		•		—	5½	9⅜	2½	Max.	(22) 0.162 x 3½	(8) 0.162 x 3½	1,795	3,275	3,695	3,970	2,820	3,180	3,425
	HUCQ612-SDS	•			—	5½	11	3	—	(14) ¼" x 2½" SDS	(6) ¼" x 2½" SDS	2,325	5,185	5,185	5,185	3,735	3,735	3,735
	HGU5.62-SDS	•			—	5⅝	11 to 30	5¼	—	(36) ¼" x 2½" SDS	(24) ¼" x 2½" SDS	9,460	13,160	13,160	13,160	9,475	9,475	9,475
	HGUS5.50/14	•			—	5½	12½	4	—	(66) 0.162 x 3½	(22) 0.162 x 3½	5,515	9,695	9,695	9,695	8,340	8,340	8,340
	HU616 / HUC616		•		—	5½	12$^{11}/_{16}$	2½	Max.	(26) 0.162 x 3½	(12) 0.162 x 3½	2,695	3,870	4,365	4,695	3,330	3,760	4,045
	HHGU5.62-SDS	•			—	5⅝	13 to 30	5¼	—	(44) ¼" x 2½" SDS	(28) ¼" x 2½" SDS	14,145	17,345	17,345	17,345	12,490	12,490	12,490

1. Uplift loads have been increased for earthquake or wind loading with no further increase allowed. Reduce where other loads govern.
2. Uplift loads are based on DF/SP. For SPF/HF, use 0.86 x DF/SP Uplift Load for products requiring nails and 0.72 x DF/SP Uplift Load for products requiring screws.

CC/ECC/ECCU

Column Caps

Column caps provide a strong connection for column-beam combinations.

Material: CC3¼, CC44, CC46, CC48, CC4.62, CC64, CC66, CC68, CC6-7⅛, ECC3¼, ECC44, ECC46, ECC48, ECC4.62, ECC64, ECC66, ECC68, ECC6-7⅛ — 7 gauge; all others — 3 gauge

Finish: Simpson Strong-Tie gray paint. Some products available in HDG, stainless steel or black powder coat; CCO, ECCO — no coating.

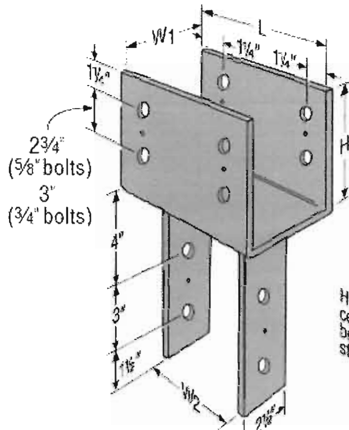
Installation:

- Use all specified fasteners; see General Notes
- Bolt holes shall be a minimum of 1⁄32" to a maximum of 1⁄16" larger than the bolt diameter (per 2015 NDS, section 12.1.3.2)
- Contact engineered wood manufacturers for connections that are not through the wide face

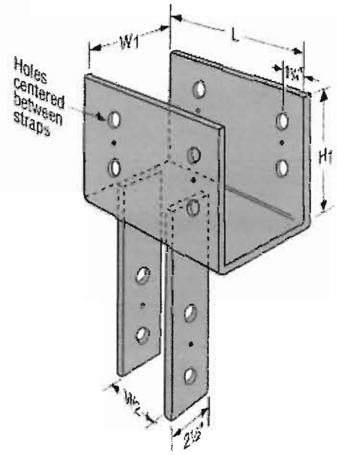
Options:

- Straps may be rotated 90° where $W_1 \geq W_2$ (see illustration) and for CC5¼-6.
- For special, custom or rough-cut lumber sizes, provide dimensions. An optional W_2 dimension may be specified. (The W_2 dimension on straps rotated 90° is limited by the W_1 dimension.)
- CCO/ECCO — Column cap only (no straps) may be ordered for field-welding to pipe or other columns. CCO/ECCO dimensions are the same as CC/ECC. Weld by Designer.
- CCOB — Any two CCOs may be specified for back-to-back welding to create a cross beam connector. Use the table loads; the load is no greater than the lesser element employed.

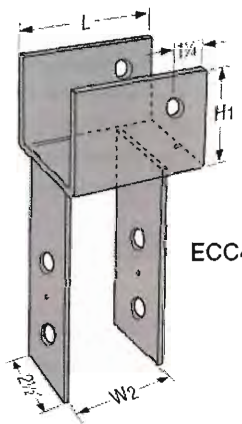
Codes: See p. 12 for Code Reference Key Chart



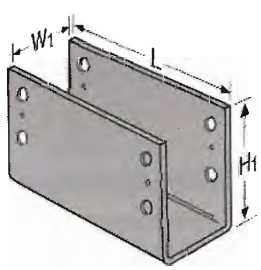
CC



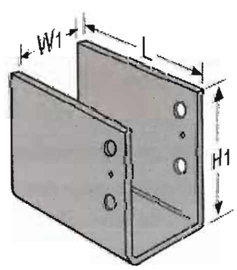
ECCU
(ECCU44 has only 2 bolts to beam)



ECC44



CCO



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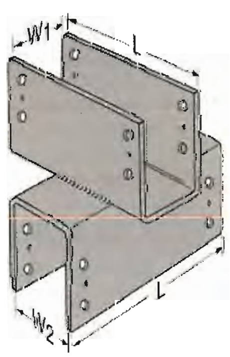
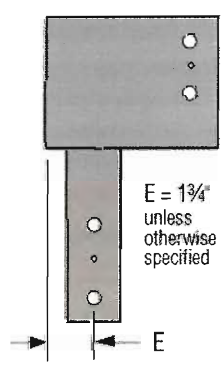
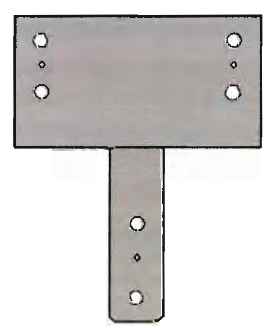


CCOB



Optional ECC with Straps Rotated 90°


Optional CC with Straps Rotated 90°

CC/ECC/ECCU

Column Caps (cont.)

These products are available with additional corrosion protection. For more information, see p. 15.

SS For stainless-steel fasteners, see p. 21.

Model No.	Beam Width (in.)	Dimensions (in.) W1	W2	L CC	L ECC	L ECCU	H1	Machine Bolts Size	Beam CC	Beam ECC	Beam ECCU	Post	Allowable Loads (DF/SP) CC Uplift (160)	CC Down (100)	ECC Down (100)	ECCU Uplift (160)	ECCU Down (100)	Code Ref.	CCO/ECCO Model No. (No Legs)
SS CC3 1/4-4	3⅛	3¼	3⅝	11	7½	9½	6½	⅝	4	2	4	2	3,150	16,980	6,835	3,150	6,835	IBC, FL, LA	CCO3 1/4 ECCO3 1/4
CC3 1/4-6	3⅛	3¼	5½	11	7½	9½	6½	⅝	4	2	4	2	3,150	21,485	10,740	3,150	10,740		
SS CC44	3½	3⅝	3⅝	7	5½	6½	4	⅝	2	1	2	2	1,850	19,020	7,655	1,850	7,655		CCO4 ECCO4
CC46	3½	3⅝	5½	11	8½	9½	6½	⅝	4	2	4	2	3,530	24,065	12,030	3,530	12,030		CCO4/6 ECCO4/6
CC48	3½	3⅝	7½	11	8½	9½	6½	⅝	4	2	4	2	3,530	24,065	16,405	3,530	16,405		
CC4.62-3.62	4½	4⅝	3⅝	11	8½	9½	6½	⅝	4	2	4	2	4,535	23,390	9,845	4,535	9,845		CCO4.62 ECCO4.62
CC4.62-4.62	4½	4⅝	4⅝	11	8½	9½	6½	⅝	4	2	4	2	4,535	30,070	12,655	4,535	12,655		
CC4.62-5.50	4½	4⅝	5½	11	8½	9½	6½	⅝	4	2	4	2	4,535	30,940	15,470	4,535	15,470		
CC5 1/4-4	5⅛	5¼	3⅝	13	9½	10½	8	¾	4	2	4	2	6,300	26,635	11,210	6,300	11,210		CCO5 1/4 ECCO5 1/4
CC5 1/4-6	5⅛	5¼	5½	13	9½	10½	8	¾	4	2	4	2	6,500	28,190	17,615	6,500	17,615		
CC5 1/4-8	5⅛	5¼	7½	13	9½	10½	8	¾	4	2	4	2	6,645	35,235	24,025	6,645	24,025		
CC64	5¼, 5½	5½	3⅝	11	7½	9½	6½	⅝	4	2	4	2	5,545	28,585	12,030	5,545	12,030		CCO6 ECCO6
SS CC66	5¼, 5½	5½	5½	11	7½	9½	6½	⅝	4	2	4	2	5,545	33,275	18,905	5,545	18,905		
CC68	5¼, 5½	5½	7½	11	9½	9½	6½	⅝	4	2	4	2	5,545	37,815	25,780	5,545	25,780		ECCO68
CC6-7 1/8	5¼, 5½	5½	7⅛	11	9½	9½	6½	⅝	4	2	4	2	5,545	37,815	24,490	5,545	24,490		
CC74	6¾	6⅞	3⅝	13	10½	10½	8	¾	4	2	4	2	6,330	33,490	15,355	6,330	15,355		CCO7 ECCO7
CC76	6¾	6⅞	5½	13	10½	10½	8	¾	4	2	4	2	6,790	37,125	24,130	6,790	24,130		
CC77	6¾	6⅞	6⅞	13	10½	10½	8	¾	4	2	4	2	7,020	48,265	29,615	7,020	29,615		
CC78	6¾	6⅞	7½	13	10½	10½	8	¾	4	2	4	2	7,145	48,265	32,090	7,145	32,905		
CC7 1/8-4	7	7⅛	3⅝	13	10½	10½	8	¾	4	2	4	2	6,360	34,730	18,375	6,360	18,375		CCO7 1/8 ECCO7 1/8
CC7 1/8-6	7	7⅛	5½	13	10½	10½	8	¾	4	2	4	2	6,825	38,500	28,875	6,825	28,875		
CC7 1/8-7 1/8	7	7⅛	7⅛	13	10½	10½	8	¾	4	2	4	2	7,105	57,750	36,750	7,105	36,750		
CC7 1/8-8	7	7⅛	7½	13	10½	10½	8	¾	4	2	4	2	7,190	52,500	39,375	7,190	39,375		
CC84	7½	7½	3⅝	13	10½	10½	8	¾	4	2	4	2	6,410	37,210	16,405	6,410	16,405		CCO8 ECCO8
CC86	7½	7½	5½	13	10½	10½	8	¾	4	2	4	2	6,885	41,250	25,780	6,885	25,780		
CC88	7½	7½	7½	13	10½	10½	8	¾	4	2	4	2	7,250	51,565	35,155	7,250	35,155		
CC94	8¾	8⅞	3⅝	13	10½	10½	8	¾	4	4	4	2	6,580	47,545	19,905	6,580	19,905		CCO9 ECCO9
CC96	8¾	8⅞	5½	13	10½	10½	8	¾	4	4	4	2	7,080	48,125	31,280	7,080	31,280		
CC98	8¾	8⅞	7½	13	10½	10½	8	¾	4	4	4	2	7,455	62,565	42,655	7,455	42,655		
CC106	9¼	9½	5½	13	10½	10½	8	¾	4	4	4	2	7,160	52,250	32,655	7,160	32,655		CCO10 ECCO10

1. Uplift loads have been increased for earthquake or wind loading with no further increase allowed. Reduce where other loads govern.
2. Downloads shall be reduced where limited by allowable loads of the post.
3. CC uplift loads do not apply to splice conditions.
4. Splice conditions with CCs must be detailed by the Designer to transfer tension loads between spliced members by means other than the column cap.
5. Column sides are assumed to be aligned in the same vertical plane as the beam sides. CC4.62 models assume a minimum 3½"-wide post.
6. Structural composite lumber columns have sides that show either the wide face or the edges of the lumber strands/veneers known as the narrow face. Values in the tables reflect installation into the wide face. See technical bulletin T-C-SCLCLM at **strongtie.com** for load reductions resulting from narrow-face installations.
7. Beam depth must be at least as tall as H_1.
8. CCO and ECCO welded to a steel column will achieve maximum load listed as CC and ECC. The steel column width shall match the beam width. Weld by Designer.

SIMPSON Strong-Tie® Anchor Designer™ Software
Version 2.7.6990.4

Company:		Date:	7/9/2020
Engineer:		Page:	1/5
Project:			
Address:			
Phone:			
E-mail:			

1.Project information

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

Project description: Deck
Location: meercer Island, WA
Fastening description:

2. Input Data & Anchor Parameters

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

Anchor Information:
Anchor type: Concrete screw
Material: Stainless Steel
Diameter (inch): 0.500
Nominal Embedment depth (inch): 3.500
Effective Embedment depth, h_{ef} (inch): 2.080
Code report: IAPMO UES ER-493
Anchor category: 1
Anchor ductility: Yes
h_{min} (inch): 5.42
c_{ac} (inch): 5.92
C_{min} (inch): 1.75
S_{min} (inch): 3.67

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 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): 16.00 x 3.00 x 0.13

Recommended Anchor
Anchor Name: Titen HD® Stainless Steel - 1/2"Ø SS Titen HD, hnom:3.5" (89mm)
Code Report: IAPMO UES ER-493

SIMPSON Strong-Tie®

Anchor Designer™
Software
Version 2.7.6990.4

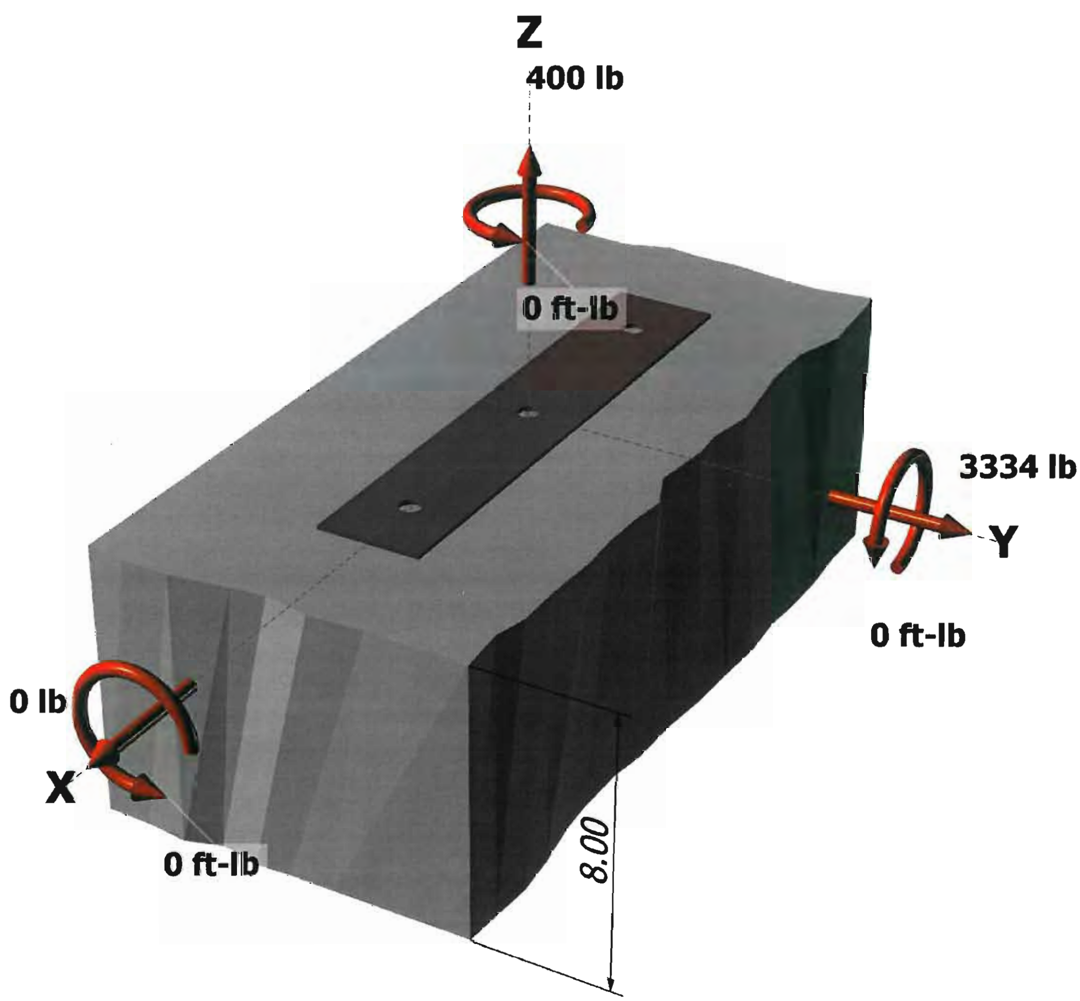
Company:		Date:	7/9/2020
Engineer:		Page:	2/5
Project:			
Address:			
Phone:			
E-mail:			

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

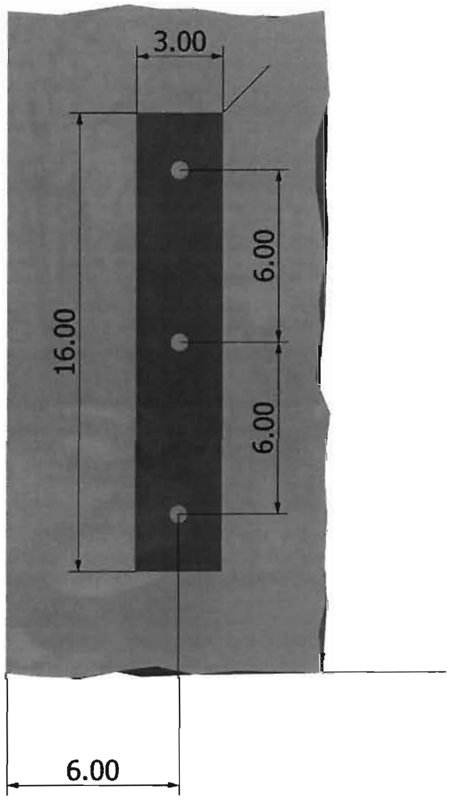
Strength level loads:

N_{ua} [lb]: 400
V_{uax} [lb]: 0
V_{uay} [lb]: 3334
M_{ux} [ft-lb]: 0
M_{uy} [ft-lb]: 0
M_{uz} [ft-lb]: 0

<Figure 1>



<Figure 2>

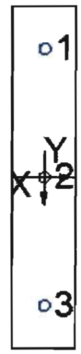


3. Resulting Anchor Forces

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	133.3	0.0	1111.3	1111.3
2	133.3	0.0	1111.3	1111.3
3	133.3	0.0	1111.3	1111.3
Sum	400.0	0.0	3334.0	3334.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 400
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



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

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
20885	0.75	15664

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

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

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	2500	2.080	2550

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

A_{Nc} (in^2)	A_{Nco} (in^2)	$c_{a,min}$ (in)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cbg} (lb)
113.82	38.94	6.00	1.000	1.000	1.00	1.000	2550	0.65	4845

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

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

$\Psi_{c,P}$	λ_a	N_p (lb)	f'_c (psi)	n	ϕ	ϕN_{pn} (lb)
1.0	1.00	2450	2500	0.50	0.65	1593

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

V_{sa} (lb)	ϕ_{grout}	ϕ	$\phi_{grout}\phi V_{sa}$ (lb)
6560	1.0	0.65	4264

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

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

k_{cp}	A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕV_{cpg} (lb)
1.0	113.82	38.94	1.000	1.000	1.000	1.000	2550	0.70	5217

11. Results

Interaction of Tensile and Shear Forces (Sec. 17.6.)

Tension	Factored Load, N_{ua} (lb)	Design Strength, øN_n (lb)	Ratio	Status
Steel	133	15664	0.01	Pass
Concrete breakout	400	4845	0.08	Pass
Pullout	**133**	**1593**	**0.08**	**Pass (Governs)**

Shear	Factored Load, V_{ua} (lb)	Design Strength, øV_n (lb)	Ratio	Status
Steel	1111	4264	0.26	Pass
Pryout	**3334**	**5217**	**0.64**	**Pass (Governs)**

Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. 17.6..2	0.00	0.64	63.9%	1.0	Pass

1/2"Ø SS Titen HD, hnom:3.5" (89mm) meets the selected design criteria.

12. Warnings

- Designer must exercise own judgement to determine if this design is suitable.
- Refer to manufacturer's product literature for hole cleaning and installation instructions.

SIMPSON Strong-Tie

PB/PBS

Regular and Standoff Post Bases

The PBS features a 1" standoff height. It reduces the potential for decay at post and column ends.

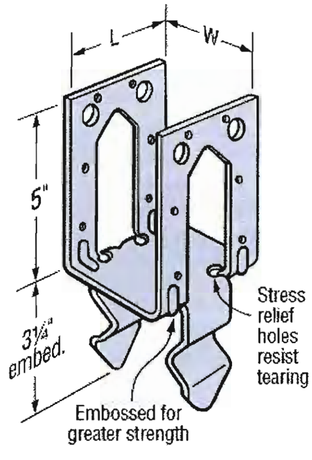
Material: PB — 12 gauge; PBS — see table

Finish: Galvanized. Some products available in ZMAX® or HDG coating; see Corrosion Information, pp. 13–15.

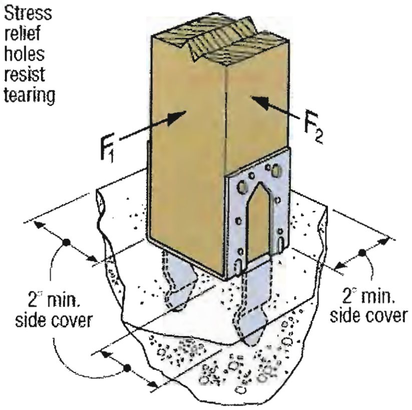
Installation:

- Use all specified fasteners; see General Notes.
- Install either nails or bolts.
- Post bases do not provide adequate resistance to prevent members from rotating about the base and therefore are not recommended for non-top-supported installations (such as fences or unbraced carports).
- PB — Holes are provided for installation with either 0.162" x 3½" nails or ½" bolts for PB66 and PB66R; all other models use 0.162" x 3½" nails only. A 2" minimum sidecover is required to obtain the full load.
- PBS — Embed into wet concrete up to the bottom of the 1" standoff base plate. A 2" minimum side cover is required to obtain the full load. Holes in the bottom of the straps allow for free concrete flow.

Codes: See p. 12 for Code Reference Key Chart



PB

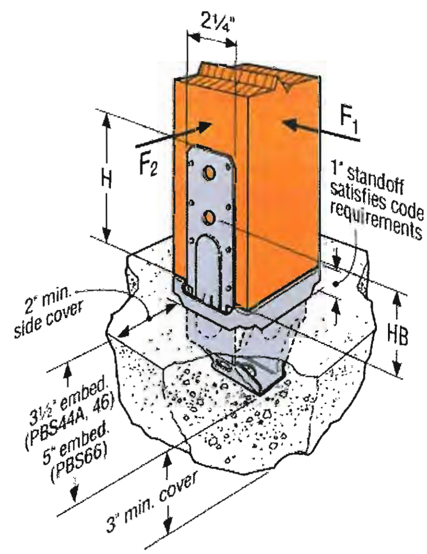


Typical PB Installation

These products are available with additional corrosion protection. For more information, see p. 15.

Model No.	Dimensions (in.) W	Dimensions (in.) L	Fasteners: Nails (in.)	Fasteners: Machine Bolts	Allowable Loads (160) Uncracked Uplift	Allowable Loads (160) Cracked Uplift	Download (100)	Code Ref.
Wind and Seismic Design Category A&B								
PB44	3 9/16	3¼	(12) 0.162 x 3½	N/A	850	850	12,685	IBC, FL, LA
PB44R	4	3¼	(12) 0.162 x 3½	N/A	850	850	12,685	
PB46	5½	3¼	(12) 0.162 x 3½	N/A	850	850	22,445	
PB66	5½	5¼	(12) 0.162 x 3½	(2) ½" dia.	850	850	25,270	
PB66R	6	5¼	(12) 0.162 x 3½	(2) ½" dia.	850	850	25,270	
Seismic Design Category C–F								
PB44	3 9/16	3¼	(12) 0.162 x 3½	N/A	850	850	12,685	IBC, FL, LA
PB44R	4	3¼	(12) 0.162 x 3½	N/A	850	850	12,685	
PB46	5½	3¼	(12) 0.162 x 3½	N/A	850	850	22,445	
PB66	5½	5¼	(12) 0.162 x 3½	(2) ½" dia.	850	850	25,270	
PB66R	5½	5¼	(12) 0.162 x 3½	(2) ½" dia.	850	850	25,270	

1. Loads may not be increased for duration of load.
2. Concrete shall have a minimum compressive strength of f'_c = 2,500 psi.
3. Multiply Seismic and Wind ASD load values by 1.4 or 1.67 respectively to obtain LRFD capacities.
4. In accordance with IBC, Section 1613.1, detached one- and two-family dwellings in Seismic Design Category (SDC) C may use "Wind and SDC A&B" allowable loads.
5. Downloads shall be reduced where limited by capacity of the post.
6. For lateral loads for all PB models: F_1 allowable = 765 lb. F_2 allowable = 1,325 lb.
7. Designer is responsible for concrete design.
8. Structural composite lumber columns have sides that show either the wide face or the edges of the lumber strands/veneers known as the narrow face. Values in the tables reflect installation into the wide face. See technical bulletin T-C-SCLCLM at **strongtie.com** for load reductions resulting from narrow-face installations.
9. **Fasteners:** Nail dimensions in the table are listed diameter by length. See pp. 21–22 for fastener information.



Typical PBS44A Installation

UPDATED 06/01/19

PB/PBS

Regular and Standoff Post Bases (cont.)

These products are available with additional corrosion protection. For more information, see p. 15.

SD Many of these products are approved for installation with Strong-Drive® SD Connector screws. See pp. 335–337 for more information.

Model No.	Nominal Post Size	Material (ga.)		Dimensions (in.)				Fasteners (in.)		Allowable Loads			Code Ref.
		Base	Strap	W	L	H	HB	Nails	Machine Bolts	Uncracked Uplift	Cracked Uplift	Download	
Wind and Seismic Design Category A&B													
PBS44A	4x4	12	14	3 9/16	3 1/2	6 1/4	3 7/16	(14) 0.162 x 3 1/2	(2) 1/2 dia.	1,235	865	10,975	IBC, FL, LA
PBS46	4x6	12	14	3 9/16	5 7/16	6 9/16	3 3/8	(14) 0.162 x 3 1/2	(2) 1/2 dia.	1,235	865	14,420	
PBS66	6x6	12	12	5 1/2	5 3/8	6 1/2	3 11/16	(14) 0.162 x 3 1/2	(2) 1/2 dia.	2,165	2,165	14,420	
Seismic Design Category C–F													
PBS44A	4x4	12	14	3 9/16	3 1/2	6 1/4	3 7/16	(14) 0.162 x 3 1/2	(2) 1/2 dia.	1,080	755	10,975	IBC, FL, LA
PBS46	4x6	12	14	3 9/16	5 7/16	6 9/16	3 3/8	(14) 0.162 x 3 1/2	(2) 1/2 dia.	1,080	755	14,420	
PBS66	6x6	12	12	5 1/2	5 3/8	6 1/2	3 11/16	(14) 0.162 x 3 1/2	(2) 1/2 dia.	2,165	2,165	14,420	

1. For higher downloads, pack grout solid under 1" standoff plate before installation. Base download on column or concrete, according to the code.
2. Concrete shall have a minimum compressive strength of f'_c = 2,500 psi.
3. Multiply Seismic and Wind ASD load values by 1.4 or 1.67 respectively to obtain LRFD capacities.
4. In accordance with IBC, Section 1613.1, detached one- and two-family dwellings in Seismic Design Category (SDC) C may use "Wind and SDC A&B" allowable loads.
5. Post bases do not provide adequate resistance to prevent members from rotating about the base and therefore are not recommended for installations that lack top support (such as fences or unbraced carports).
6. Downloads shall be reduced where limited by capacity of the post.
7. Designer is responsible for concrete design.
8. For lateral loads for all PBS models: F_1 allowable = 1,165 lb. when using nails and 230 lb. when using bolts. F_2 allowable = 835 lb. when using either nails or bolts.
9. Structural composite lumber columns have sides that show either the wide face or the edges of the lumber strands/veneers known as the narrow face. Values in the tables reflect installation into the wide face. See technical bulletin T-C-SCLCLM at **strongtie.com** for load reductions resulting from narrow-face installations.
10. **Fasteners:** Nail dimensions in the table are listed diameter by length. See pp. 21–22 for fastener information.

ABA/ABU/ABW

Adjustable and Standoff Post Bases

Additional standoff bases are on p. 321.

The AB series of retrofit adjustable post bases provide a 1" standoff for the post, are slotted for adjustability and can be installed with nails, Strong-Drive® SD Connector screws or bolts (ABU). Depending on the application needs, these adjustable standoff post bases are designed for versatility, cost-effectiveness and maximum uplift performance.

Features:

- The slot in the base enables flexible positioning around the anchor bolt, making precise post placement easier
- The 1" standoff helps prevent rot at the end of the post and meets code requirements for structural posts installed in basements or exposed to weather or water splash

Material: Varies (see table)

Finish: ZMAX® and some in stainless steel; see Corrosion Information, pp. 13–15

Installation:

- Use all specified fasteners; see General Notes.
- See our *Anchoring and Fastening Systems for Concrete and Masonry* catalog, or visit **strongtie.com** for retrofit anchor options.
- Post bases do not provide adequate resistance to prevent members from rotating about the base and therefore are not recommended for non-top-supported installations (such as fences or unbraced carports).
- Place the base, cut washer(s) or load transfer plate(s) and nut(s) on the anchor bolt(s). Make any necessary adjustments to post placement and tighten the nut securely on the anchor bolt.
- See **strongtie.com** for information on hollow column installation.

ABW

Place the standoff base and then the post in the ABW and fasten on three vertical sides, using nails or Strong-Drive SD Connector screws

– Bend up the fourth side of the ABW and fasten using the correct fasteners

ABU

Place the standoff base and then the post in the ABU

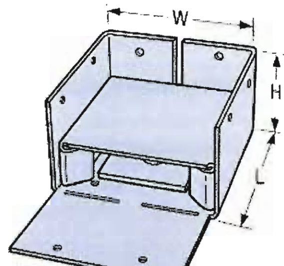
– Fasten using nails or Strong-Drive SD Connector screws or bolts (ABU88Z, ABU1010Z, ABU1212Z – SDS optional)

ABA

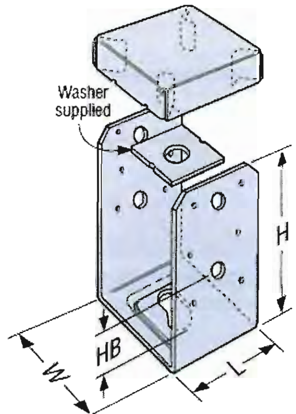
Place the post in the ABA

– Fasten using nails or Strong-Drive SD Connector screws

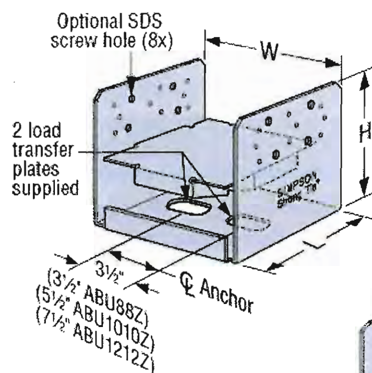
Codes: See p. 12 for Code Reference Key Chart



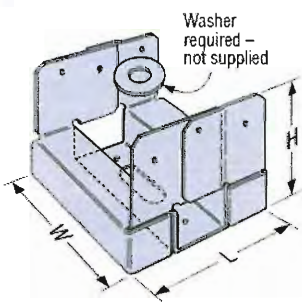
ABWZ



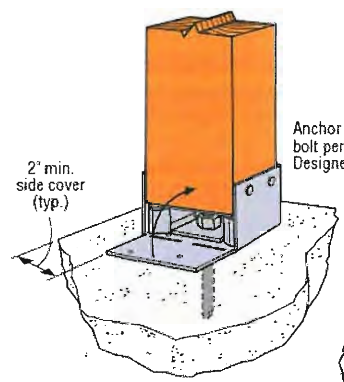
ABU44Z
(other sizes similar)



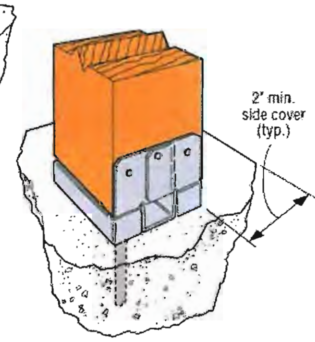
ABU88Z
(other sizes similar)



ABA44Z
(other sizes similar)



Typical ABWZ Installation

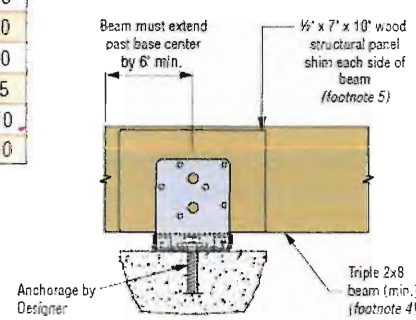


Typical ABA44Z Installation

Allowable Loads — Beam Installation

Model No.	Nominal Beam Size	Material (ga.)		Dimensions (in.)			Fasteners (in.)		DF/SP Allowable Loads		SPF/HF Allowable Loads	
		Base	Strap	W	L	H	Anchor Dia.	Nails	Uplift (160)	Down (100)	Uplift (160)	Down (100)
ABU46Z	Double 2x	12	12	3⁹⁄₁₆	5	7	⅝	(12) 0.162 x 3½	2,030	8,475	1,820	6,075
ABU46Z	4x	12	12	3⁹⁄₁₆	5	7	⅝	(12) 0.162 x 3½	2,155	9,890	1,850	7,090
ABU46RZ	Rough 4x	12	12	4	6	6¾	⅝	(12) 0.162 x 3½	2,155	9,890	1,850	7,090
ABU66Z	Triple 2x	12	10	5½	5	6¹⁄₁₆	⅝	(12) 0.162 x 3½	1,405	12,715	1,165	9,115
ABU66Z	6x	12	10	5½	5	6¹⁄₁₆	⅝	(12) 0.162 x 3½	1,905	12,920	1,640	11,110
ABU66RZ	Rough 6x	12	10	6	6	5¹³⁄₁₆	⅝	(12) 0.162 x 3½	1,905	12,920	1,640	11,110

1. Uplift loads have been increased for earthquake or wind loading with no further increase allowed. Reduce where other loads govern.
2. Downloads may not be increased for short-term loading.
3. Specifier is to design concrete and anchorage for uplift capacity.
4. Beam depth must be a minimum of 7 ¼".
5. Shims are required for double 2x (1 shim) and triple 2x (2 shims) installations as shown in the illustration. Additional fastening of shim to beam is not required.
6. **Fasteners:** Nail dimensions in the table are listed diameter by length. See pp. 21–22 for fastener information.



ABU66Z Beam Installation

ABA/ABU/ABW

Adjustable and Standoff Post Bases (cont.)

These products are available with additional corrosion protection. For more information, see p. 15.

SS For stainless-steel fasteners, see p. 21.

SD Many of these products are approved for installation with Strong-Drive® SD Connector screws. See pp. 335–337 for more information.

Allowable Loads – Post Installation

Model No.	Nominal Post Size	Material (ga.)		Dimensions (in.)				Fasteners				Allowable Loads (DF/SP)			Code Ref.
		Base	Strap	W	L	H	HB	Anchor Dia. (in.)	Nails (in.)	Bolts Qty.	Bolts Dia. (in.)	Uplift Nails	Uplift Bolts	Down (100)	
ABA44Z	4x4	16	16	3 9/16	3 3/8	3 1/16	—	½	(6) 0.148 x 3	—	—	690	—	5,925	
ABW44Z	4x4	16	16	3 9/16	3 9/16	2 ¼	—	½	(8) 0.148 x 3	—	—	1,005	—	7,180	
ABU44Z (SS)	4x4	16	12	3 9/16	3	5 ½	1 ¾	⅝	(12) 0.162 x 3 ½	2	½	1,900	2,300	7,570	
ABU44RZ	Rough 4x4	16	12	4 1/16	3	5 ¼	1 ½	⅝	(12) 0.162 x 3 ½	2	½	1,900	2,300	7,570	
ABA44RZ	Rough 4x4	16	16	4 1/16	3 ⅛	2 13/16	—	½	(6) 0.148 x 3	—	—	655	—	7,215	
ABW44RZ	Rough 4x4	16	16	4	4 1/16	1 15/16	—	½	(8) 0.148 x 3	—	—	835	—	7,180	
ABW46Z	4x6	12	16	3 9/16	5 9/16	3	—	½	(10) 0.148 x 3	—	—	845	—	4,590	
ABA46Z	4x6	14	14	3 9/16	5 3/16	3 ⅛	—	⅝	(8) 0.162 x 3 ½	—	—	870	—	10,500	
ABU46Z (SS)	4x6	12	12	3 9/16	5	7	2 ⅝	⅝	(12) 0.162 x 3 ½	2	½	2,405	2,265	12,520	
ABU46RZ	Rough 4x6	12	12	4 1/16	5	6 ¾	2 ⅜	⅝	(12) 0.162 x 3 ½	2	½	2,405	2,265	12,520	
ABW46RZ	Rough 4x6	12	16	4	6	2 13/16	—	½	(10) 0.148 x 3	—	—	780	—	4,590	IBC, FL, LA
ABA46RZ	Rough 4x6	14	14	4 1/16	5 3/16	2 ⅞	—	⅝	(8) 0.162 x 3 ½	—	—	870	—	10,695	
ABU5-5Z	5 ⅛ x 5 ⅛	12	10	5 ¼	5	6 1/16	1 ¾	⅝	(12) 0.162 x 3 ½	2	½	2,235	2,235	10,570	
ABU5-6Z	5 ⅛ x 6	12	10	6 ⅛	5	6 1/16	1 ¾	⅝	(12) 0.162 x 3 ½	2	½	2,235	2,235	10,570	
ABA66Z	6x6	14	14	5 ½	5 ⅜	3 ⅛	—	⅝	(8) 0.162 x 3 ½	—	—	850	—	10,245	
ABW66Z	6x6	12	14	5 ½	5 9/16	3	—	½	(12) 0.148 x 3	—	—	1,190	—	12,935	
ABU66Z (SS)	6x6	12	10	5 ½	5	6 1/16	1 ¾	⅝	(12) 0.162 x 3 ½	2	½	2,475	2,190	18,205	
ABU66RZ	Rough 6x6	12	10	6 1/16	5	5 13/16	1 ½	⅝	(12) 0.162 x 3 ½	2	½	2,475	2,190	18,205	
ABA66RZ	Rough 6x6	14	14	6	5 3/16	2 ⅞	—	⅝	(8) 0.162 x 3 ½	—	—	850	—	11,500	
ABW66RZ	Rough 6x6	12	14	6	6	2 13/16	—	½	(12) 0.148 x 3	—	—	1,190	—	12,935	
ABW7-7Z	7 ⅛ x 7 ⅛	12	14	7 5/16	7 5/16	3	—	½	(12) 0.148 x 3	—	—	840	—	14,530	
ABU88Z (SS)	8x8	14	12	7 ½	7	7	—	(2) ⅝	(18) 0.162 x 3 ½	—	—	2,570	—	22,405	IBC, FL
ABU88RZ	Rough 8x8	14	12	8	7	7	—	(2) ⅝	(18) 0.162 x 3 ½	—	—	2,450	—	19,870	
ABU1010Z	10x10	14	14	9 ½	9	7 ¼	—	(2) ⅝	(22) 0.162 x 3 ½	—	—	2,270	—	32,020	
ABU1010RZ	Rough 10x10	14	14	10	9	7	—	(2) ⅝	(22) 0.162 x 3 ½	—	—	1,830	—	31,650	IBC, FL, LA
ABU1212Z	12x12	12	12	11 ½	11	7 ¼	—	(2) ⅝	(22) 0.162 x 3 ½	—	—	3,000	—	34,745	
ABU1212RZ	Rough 12x12	12	12	12	11	7	—	(2) ⅝	(22) 0.162 x 3 ½	—	—	3,000	—	34,745	

1. Uplift loads have been increased for earthquake or wind loading with no further increase allowed. Reduce where other loads govern
2. Downloads may not be increased for short-term loading.
3. Specifier is to design concrete and anchorage for uplift loads.
4. ABU products may be installed with either bolts or nails (not both) to achieve table loads. ABU88Z, ABU88RZ, ABU1010Z, ABU1010RZ, and ABU1212Z/RZ may be installed with (8) ¼" x 3" Strong-Drive® SDS Heavy-Duty Connector screws (sold separately) for the same table load.
5. For higher downloads, pack grout solid under 1" standoff plate before installation. Base download on column or concrete, according to the code.
6. HB dimension is the distance from the bottom of the post up to the first bolt hole.
7. Structural composite lumber columns have sides that show either the wide face or the edges of the lumber strands/veneers. For SCL columns, the fasteners for these products should always be installed in the wide face.
8. Downloads shall be reduced where limited by allowable loads of the post.
9. **Fasteners:** Nail dimensions in the table are listed diameter by length. See pp. 21–22 for fastener information.

UPDATED 06/01/19

LEDGER CONNECTION

$V = 488^{\#}/2' = 244^{\#}/ft$

ASSUME EXIST. RIM JOIST IS 1½" THICK

SIMPSON SDWS22400DB SCREWS

$V_A = (405^{\#}/screw)(1.5"/2.375")(.7) = 179^{\#}/screw$

C_M

$S = \frac{179^{\#}/screw}{244^{\#}/ft}(12"/ft) = 8.81"/screw$

USE (2) ROWS SDWS22400DB SCREWS @ 16" o.c.

Structural and General Fastening

Strong-Drive® SDWS TIMBER Screw

Structural Wood-to-Wood Connections Including Ledgers, Indoor/Outdoor Projects

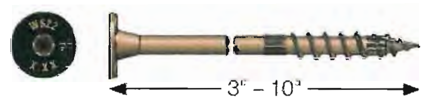
Designed to provide an easy-to-install, high-strength alternative to through-bolting and traditional lag screws. The Strong-Drive SDWS Timber screws are ideal for the contractor and do-it-yourselfer alike.

Double-barrier coating provides corrosion resistance equivalent to hot-dip galvanization, making it suitable for certain exterior and preservative-treated wood applications, as described in the evaluation report.

Codes/Standards: IAPMO-UES ER-192, State of Florida FL13975

US Patent 9,523,383

For more information, see p. 53, C-F-2019 Fastening Systems Catalog



SDWS Timber Screw — Allowable Shear Loads — Douglas Fir-Larch and Southern Pine Lumber

Size Dia.x L (in.)	Model No.	Thread Length (in.)	Reference DFL/SP Allowable Shear Loads (lb.) Wood Side Member Thickness (in.)								
			1.5	2	2.5	3	3.5	4	4.5	6	8
0.22 x 3	SDWS22300DB	1½	255	—	—	—	—	—	—	—	—
0.22 x 4	SDWS22400DB	2⅜	405	405	305	—	—	—	—	—	—
0.22 x 5	SDWS22500DB	2¾	405	405	360	360	325	—	—	—	—
0.22 x 6	SDWS22600DB	2¾	405	405	405	405	365	365	355	—	—
0.22 x 8	SDWS22800DB	2¾	405	405	405	405	395	395	395	395	—
0.22 x 10	SDWS221000DB	2¾	405	405	405	405	395	395	395	395	395

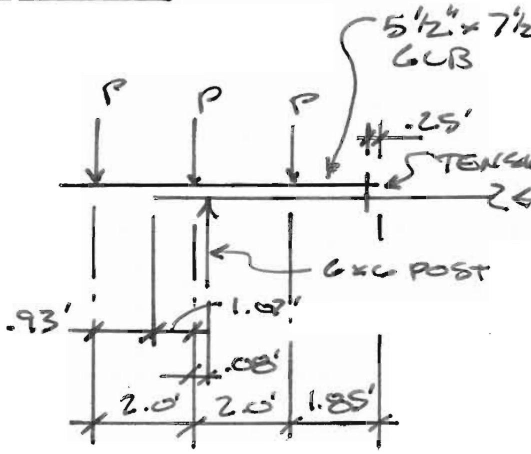
See footnotes below.

SDWS Timber Screw — Allowable Shear Loads — Spruce-Pine-Fir and Hem-Fir Lumber

Size Dia.x L (in.)	Model No.	Thread Length (in.)	Reference SPF/HF Allowable Shear Loads (lb.) Wood Side Member Thickness (in.)								
			1.5	2	2.5	3	3.5	4	4.5	6	8
0.22 x 3	SDWS22300DB	1½	190	—	—	—	—	—	—	—	—
0.22 x 4	SDWS22400DB	2⅜	385	285	215	—	—	—	—	—	—
0.22 x 5	SDWS22500DB	2¾	405	290	290	290	195	—	—	—	—
0.22 x 6	SDWS22600DB	2¾	405	365	365	365	310	310	210	—	—
0.22 x 8	SDWS22800DB	2¾	405	365	365	365	310	310	280	280	—
0.22 x 10	SDWS221000DB	2¾	405	365	365	365	310	310	280	280	280

1. All applications are based on full penetration into the main member. Full penetration is the screw length minus the side member thickness.
2. Allowable loads are shown at the wood load duration factor of $C_D = 1.0$. Loads may be increased for load duration per the building code up to a $C_D = 1.6$. Tabulated values must be multiplied by all applicable adjustment factors per the NDS.
3. Minimum fastener spacing requirements to achieve table loads: 6" end distance, 1 7⁄16" edge distance, ⅝" between staggered rows of fasteners, 4" between non-staggered rows of fasteners and 8" between fasteners in a row.
4. For in-service moisture content greater than 19%, use $C_M = 0.7$.
5. Loads are based on installation into the side grain of the wood with the screw axis perpendicular to the face of the member.

GLB "EXTENSION"



P = 85# DL
486# LL
571# TL

$M = (571^{\#})(.93') = 531^{\#'} = 6372^{\#''}$

$f_b = \frac{6372^{\#''}}{51.56 IN^3} = 124$ PSI OK

$f_v = \frac{(1.5)(571^{\#})}{41.25 IN^2} = 20.8$ PSI OK

OVERTURNING

$M_{OT} = 531^{\#'}$

$M_R = (85^{\#})(1.07' + 3.07') = 260^{\#'} < 531^{\#'}$ (85# = DL ONLY)

USE TENSION TIE NEAR END OF BEAM

$T = \frac{531^{\#'} - 260^{\#'}}{4.67'} = 59^{\#}$

USE SIMPSON LSTA9, $P_A = 740^{\#}$
W/ (8) 0.148"Ø x 2 1/2" NAILS

PCZ/EPCZ

Post Caps

PCZ/EPCZ post caps are designed with their post and beam flanges in-line so that one PCZ/EPCZ model can accommodate several post sizes. The PCZ/EPCZ uses 0.148" x 3" nails. An alternate choice of fastener is the #9 x 1½" Strong-Drive® SD Connector screw. ZMAX® finish is standard to meet exposure conditions in many environments. See additional corrosion information at **strongtie.com/info.**

Material: 16 gauge

Finish: ZMAX coating

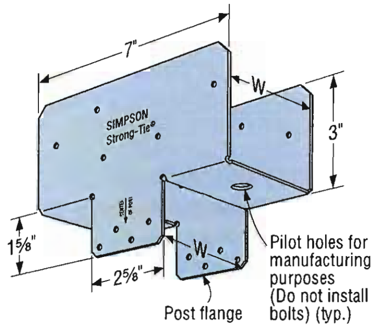
Installation:

- Use all specified fasteners; see General Notes
- Do not install bolts into pilot holes

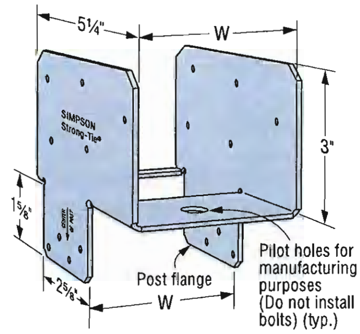
Options:

- For end conditions, specify EPCZ post caps
- For heavy-duty applications, see CCQ and CC Series
- For retrofit applications, see AC and LCE Series

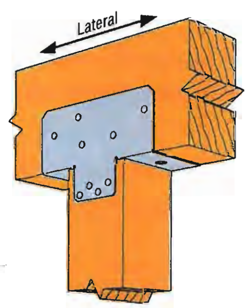
Codes: See p. 12 for Code Reference Key Chart



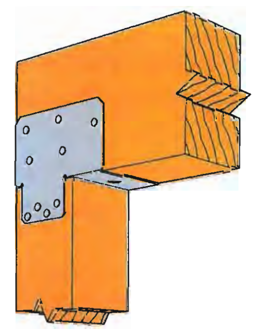
PCZ



EPCZ



Typical PCZ Post Cap Installation



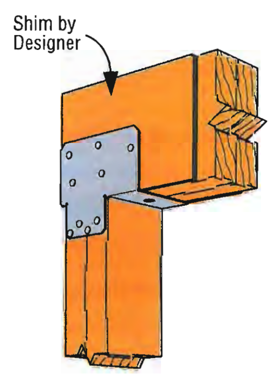
Typical EPCZ End Post Cap Installation

These products are available with additional corrosion protection. For more information, see p. 15.

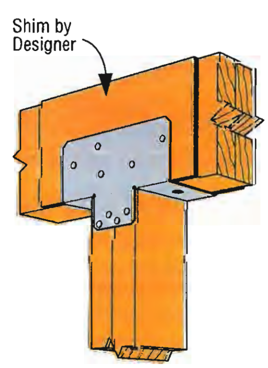
SD Many of these products are approved for installation with Strong-Drive® SD Connector screws. See pp. 335–337 for more information.

Model No.	W (in.)	Fasteners (in.)		Post Size	Allowable Loads (DF/SP)				Code Ref.
					PCZ		EPCZ		
		Beam	Post		Uplift (160)	Lateral (160)	Uplift (160)	Lateral (160)	
PC4Z	3 9/16	(10) 0.148 x 3	(8) 0.148 x 3	(2) 2x4	1,480	1,120	1,130	895	IBC, FL, LA
				4x4	1,480	1,260	1,130	1,075	
				4x6	1,480	1,260	1,130	1,230	
				4x8	1,480	1,380	1,130	1,230	
PC6Z	5½	(10) 0.148 x 3	(8) 0.148 x 3	4x6	1,480	1,260	1,435	1,075	
				6x6	1,480	1,295	1,435	1,230	
				6x8	1,480	1,380	1,435	1,230	
PC8Z	7½	(10) 0.148 x 3	(8) 0.148 x 3	4x8	1,480	1,260	1,435	1,075	
				6x8	1,480	1,295	1,435	1,230	
				8x8	1,480	1,380	1,435	1,230	

1. Allowable loads have been increased for wind or earthquake loading with no further increase allowed. Reduce where other loads govern.
2. Uplift loads do not apply to spliced conditions. Spliced conditions must be detailed by the Designer to transfer tension loads between spliced members by means other than the post cap.
3. Structural composite lumber columns have sides that show either the wide face or the edges of the lumber strands/veneers known as the narrow face. Values in the tables reflect installation into the wide face. See technical bulletin T-C-SCLCLM at **strongtie.com** for load reductions resulting from narrow-face installations.
4. Post and beam may consist of multiple members provided they are connected independently of the post cap fasteners.
5. 0.148" x 2½" nails may be used with no load reduction for uplift and 0.85 of the table loads for lateral.
6. #9 x 1½" Strong-Drive® SD Connector screws may be substituted for table fasteners with no load reduction.
7. To order models available for rough size lumber, specify RZ suffix — e.g., PC4RZ.
8. **Fasteners:** Nail dimensions in the table are diameter by length. See pp. 21–22 for fastener information.



EPCZ Post Cap Installed on Double 2x Members



PCZ Post Cap Installed on Double 2x Members

SIMPSON Strong-Tie

A-7

HRS/ST/HTP/LSTA/LSTI/MST/MSTA/MSTC/MSTI

Strap Ties

Straps are designed to transfer tension loads in a wide variety of applications.

HRS — Heavy strap designed for installation on the edge of 2x members. The HRS416Z installs with Strong-Drive® SDS Heavy-Duty Connector screws.

HTP — Heavy tie plate designed for installation on the side of 2x4 or larger members.

LSTA and MSTA — Designed for use on the edge of 2x members, with a nailing pattern that reduces the potential for splitting.

LSTI and MSTI — Light and medium straps that are suitable where pneumatic-nailing is necessary through diaphragm decking and wood chord open-web trusses.

MST — High-capacity strap that can be installed with either nails or bolts. Suitable for double 2x member connections or greater.

MSTC — High-capacity strap that utilizes a staggered nail pattern to help minimize wood splitting. Nail slots have been countersunk to provide a lower nail head profile.

Finish: Galvanized. Some products are available in stainless steel, ZMAX® coating or black powder coat (add PC to sku); contact Simpson Strong-Tie. See Corrosion Information, pp. 13–15.

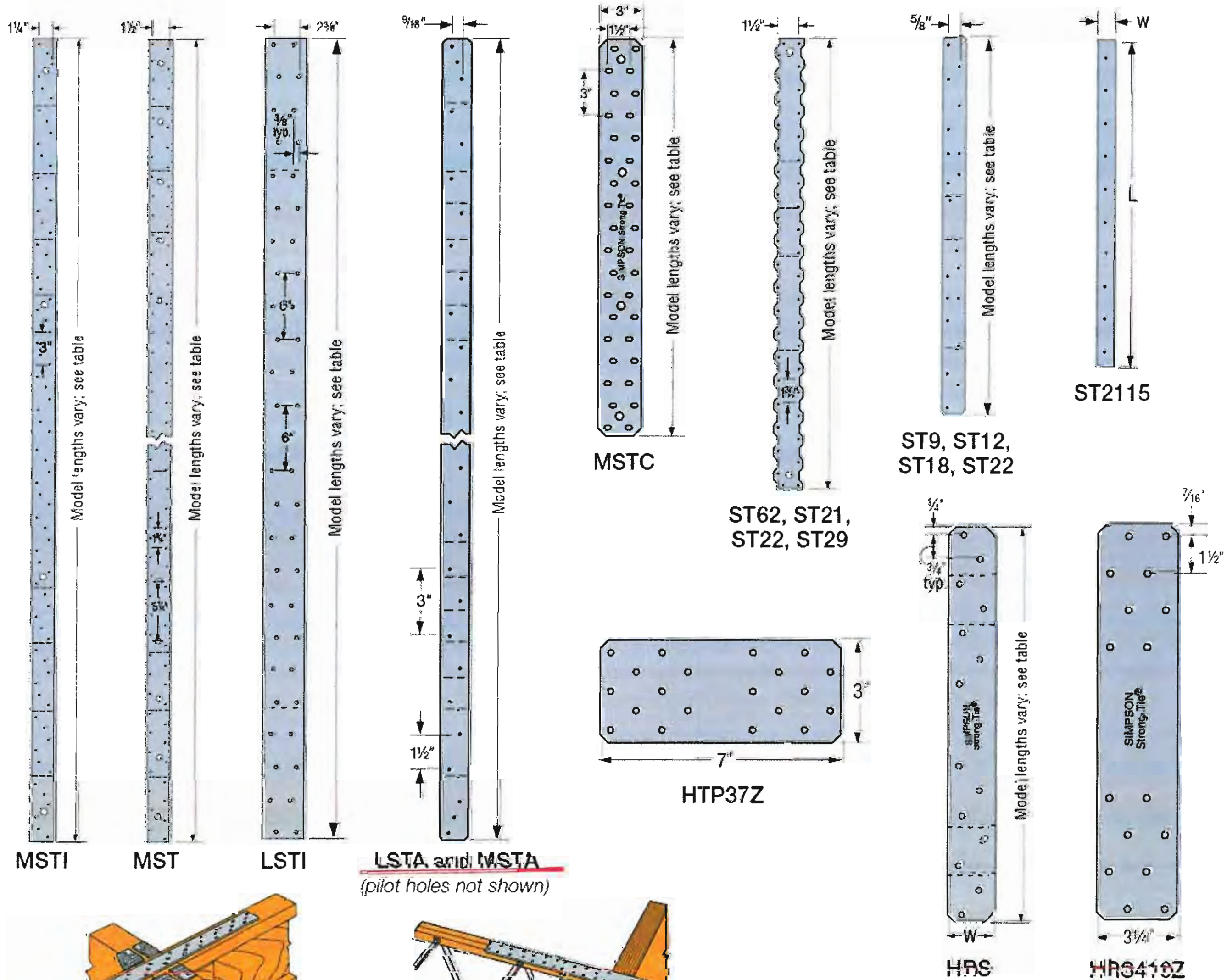
Installation: Use all specified fasteners; see General Notes

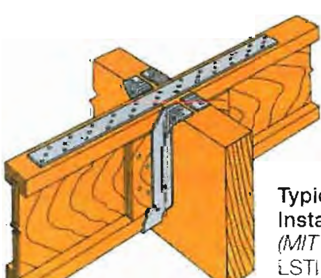
Options: Special sizes can be made to order; contact Simpson Strong-Tie

Codes: See p. 12 for Code Reference Key Chart

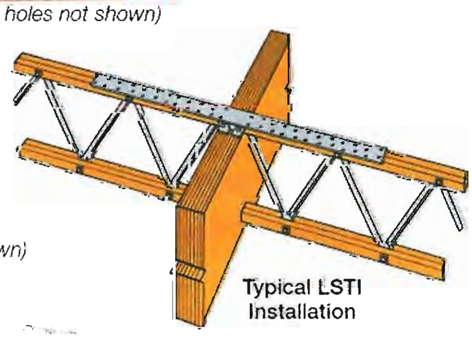
MSTC and RPS meet code requirements for reinforcing cut members (16 gauge) at top plate and RPS at sill plate.
International Residential Code® — 2012 /2015/2018 R602.6.1
International Building Code® — 2012 /2015/2018 2308.9.8

(For RPS, refer to p. 303.)

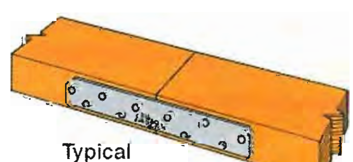




Typical MSTI Installation
(MIT hanger shown)
LSTI similar



Typical LSTI Installation



Typical HRS Installation

Straps and Ties

SIMPSON Strong-Tie®

HRS/ST/HTP/LSTA/LSTI/MST/MSTA/MSTC/MSTI

Strap Ties (cont.)

Codes: See p. 12 for Code Reference Key Chart

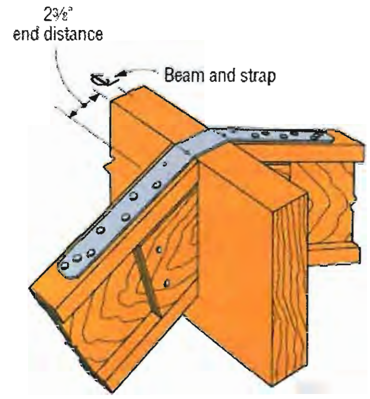
These products are available with additional corrosion protection. For more information, see p. 15.

SS For stainless-steel fasteners, see p. 21.

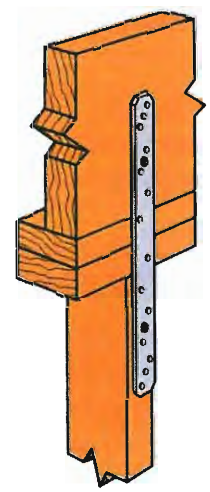
SD Many of these products are approved for installation with Strong-Drive® SD Connector screws. See pp. 335–337 for more information.

Model No.	Ga.	Dimensions (in.) W	Dimensions (in.) L	Fasteners (Total) (in.)	Allowable Tension Loads (DF/SP) (160)	Allowable Tension Loads (SPF/HF) (160)	Code Ref.
ST2115		¾	16 5/16	(10) 0.162 x 2½	660	660	
LSTA9		1¼	9	(8) 0.148 x 2½	740	635	
LSTA12		1¼	12	(10) 0.148 x 2½	925	795	
LSTA15	20	1¼	15	(12) 0.148 x 2½	1,110	955	
LSTA18		1¼	18	(14) 0.148 x 2½	1,235	1,115	
LSTA21		1¼	21	(16) 0.148 x 2½	1,235	1,235	
LSTA24		1¼	24	(18) 0.148 x 2½	1,235	1,235	
LSTA30		1¼	30	(22) 0.148 x 2½	1,640	1,640	
LSTA36		1¼	36	(24) 0.148 x 2½	1,640	1,640	IBC, FL, LA
MSTA9		1¼	9	(8) 0.148 x 2½	750	650	
MSTA12	18	1¼	12	(10) 0.148 x 2½	940	810	
MSTA15		1¼	15	(12) 0.148 x 2½	1,130	970	
MSTA18		1¼	18	(14) 0.148 x 2½	1,315	1,135	
MSTA21		1¼	21	(16) 0.148 x 2½	1,505	1,295	
MSTA24		1¼	24	(18) 0.148 x 2½	1,640	1,460	
MSTA30		1¼	30	(22) 0.148 x 2½	2,050	1,825	
MSTA36		1¼	36	(26) 0.148 x 2½	2,050	2,050	
MSTA49		1¼	49	(26) 0.148 x 2½	2,020	2,020	FL, LA
ST9	16	1¼	9	(8) 0.162 x 2½	885	765	
ST12		1¼	11⅝	(10) 0.162 x 2½	1,105	955	IBC, FL, LA
ST18		1¼	17¾	(14) 0.162 x 2½	1,420	1,335	
ST22		1¼	21⅝	(18) 0.162 x 2½	1,420	1,420	
HRS6		1⅜	6	(6) 0.148 x 2½	605	530	
HRS8	12	1⅜	8	(10) 0.148 x 2½	1,010	880	FL, LA
HRS12		1⅜	12	(14) 0.148 x 2½	1,415	1,230	
ST292		2 1/16	9 5/16	(12) 0.162 x 2½	1,260	1,120	
ST2122	20	2 1/16	12 13/16	(16) 0.162 x 2½	1,530	1,510	
ST2215		2 1/16	16 5/16	(20) 0.162 x 2½	1,875	1,875	
ST6215	16	2 1/16	16 5/16	(20) 0.162 x 2½	2,090	1,910	
ST6224		2 1/16	23 5/16	(28) 0.162 x 2½	2,535	2,535	
ST6236	14	2 1/16	33 13/16	(40) 0.162 x 2½	3,845	3,845	IBC, FL, LA
MSTI26		2 1/16	26	(26) 0.148 x 1½	2,745	2,380	
MSTI36		2 1/16	36	(36) 0.148 x 1½	3,800	3,295	
MSTI48	12	2 1/16	48	(48) 0.148 x 1½	5,070	4,390	
MSTI60		2 1/16	60	(60) 0.148 x 1½	5,070	5,070	
MSTI72		2 1/16	72	(72) 0.148 x 1½	5,070	5,070	
HTP37Z		3	7	(20) 0.148 x 1½	1,850	1,600	LA
MSTC28	16	3	28¼	(36) 0.148 x 3¼	3,460	2,990	
MSTC40		3	40¼	(52) 0.148 x 3¼	4,735	4,315	
MSTC52		3	52¼	(62) 0.148 x 3¼	4,735	4,735	IBC, FL, LA
MSTC66	14	3	65¾	(76) 0.148 x 3¼	5,850	5,850	
MSTC78		3	77¾	(76) 0.148 x 3¼	5,850	5,850	
HRS416Z	12	3¼	16	(16) ¼ x 1½ SDS	2,835	2,305	—
LSTI49	18	3¾	49	(32) 0.148 x 1½	2,970	2,560	IBC, FL, LA
LSTI73		3¾	73	(48) 0.148 x 1½	4,205	3,840	

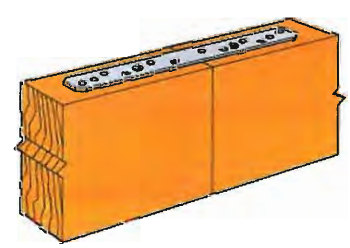
1. See pp. 260–261 for Straps and Ties General Notes.
2. **Fasteners:** Nail dimensions in the table are listed diameter by length. See pp. 21–22 for fastener information.



Typical LSTA Installation
(hanger not shown)
Bend strap one time only, max. 12/12 joist pitch.



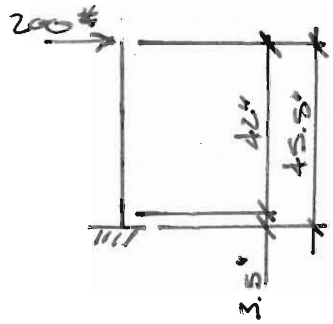
Typical LSTA18 Installation



Typical MSTA15 Installation

Straps and Ties

RAILING POST



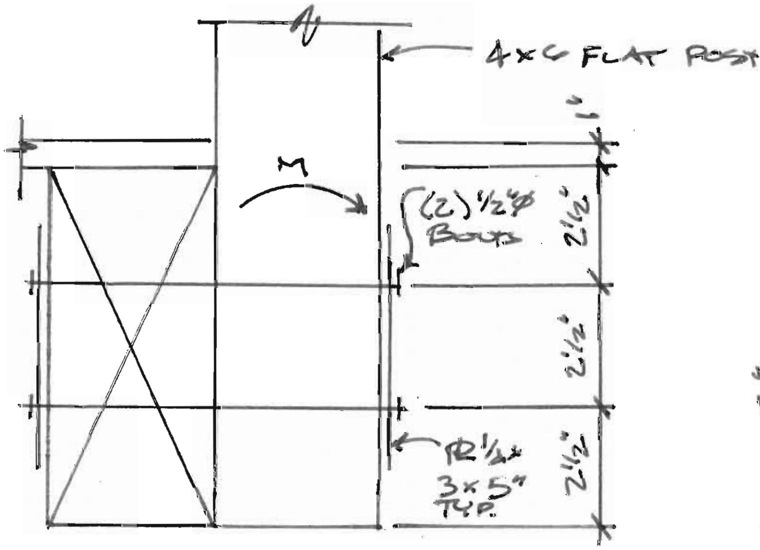
$M = (200^{\#})(45.5") = 9100^{\#"}$

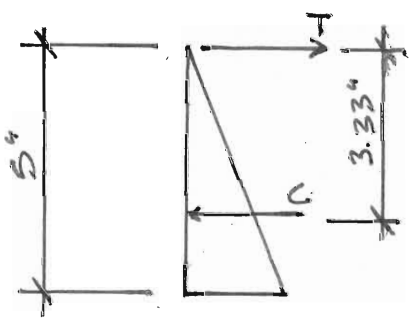
4x6 POST (FLAT) DF #2

$F_b' = (900\,PSI)(1.0)(.85)(1.0)(1.3)(1.05)$ — C_D, C_M, C_L, C_F, C_{fu}

$\times (.8) = 835\,PSI$ — C_i

$M_A = (835\,PSI)(17.65\,IN^3) = 14{,}738^{\#"} > M = 9100^{\#"}$ OK





$T = C = \frac{9100^{\#"}}{3.33"} = 3030^{\#}$

1/2"⌀ A 307 $T_A = 4420^{\#}$/BOLT $> 3030^{\#}$ OK

BRG ON WOOD

$A = (3")(5"/2) = 7.5\,IN^2$ (HALF OF STEEL PL)

$F_{c\perp}' = (625\,PSI)(.67)(1.0) = 419\,PSI$ — C_M, C_i

$P_A = (419\,PSI)(7.5\,IN^2) = 3140^{\#} > 3030^{\#}$ OK

Seattle Structural

PROJECT GRIFFITH DECK BY TDM DATE 5.18.20 PAGE 50

FOUNDATIONS

NEW FOUNDATIONS

2'-0" x 2'-0" x 0'-8" DEEP

$P = 4{,}305^{\#}$ - JOINT 67 IN RISA MODEL

$A = (2.0')^2 = 4\ SF$

$P = \frac{4305^{\#}}{4\ SF} = 1076\ PSF$ OK

$\frac{24"}{8"} = 3$ - RATIO OF DEPTH TO WIDTH - SHEAR OK BY INSPECTION

$\frac{(1.2)(4\ PSF) + (1.6)(40\ PSF)}{44\ PSF} = 1.56$

$P_u = (1.56)(1076\ PSF) = 1682\ PSF$

$L = (2' - .5')/2 = .75'$

$M_u = \frac{(2')(1.682\ KSF)(.75')^2}{2} = .95\ K'$

$m = \frac{60\ KSI}{(.85)(2.5\ KSI)} = 28.2$

$d = 8" - 3" - 1.5(.5") = 4.25"$

$R_n = \frac{(.95^{K'})(12"/ft)}{(.9)(24")(4.25")^2} = .0292$

$\rho_{REQ'D} = \frac{1}{28.2}\left(1 - \left(1 - \frac{2(28.2)(.0292)}{60}\right)^{1/2}\right) = .00049$

$.00049 < .0018$ (TEMP & SHRINKAGE)

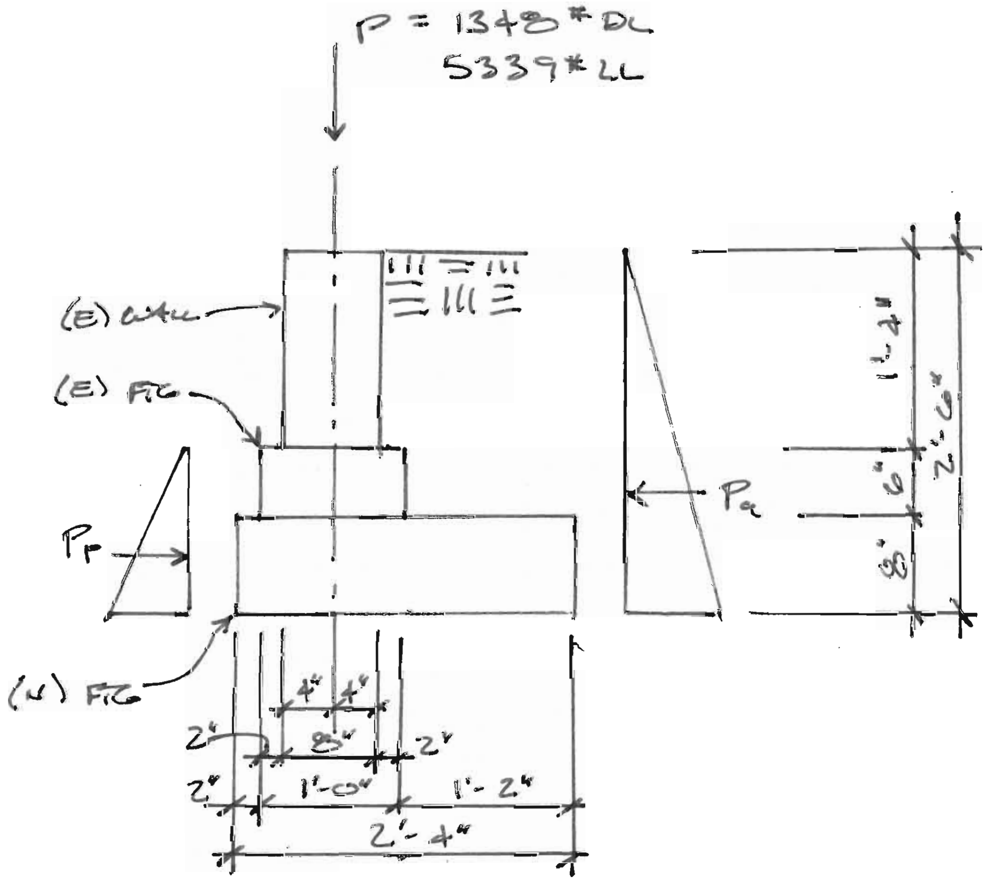
$A_{ST} = (8")(24")(.0018) = .346\ in^2$

USE (3) #4, $A_{ST} = (3)(.20\ in^2) = .6\ in^2 > .346\ in^2$

OK

FOUNDATIONS

DECK POSTS ON (E) RETAINING WALL
4' FOOTING DIMENSION PARALLEL TO WALL



35 PCF ACTIVE PRESSURE
150 PCF PASSIVE PRESSURE
110 PCF SOIL WEIGHT

$P_a = (4')(35\ PCF)(2.5')^2/2 = 438\#$ $h = 2.5'/3 = .833'$

$P_p = (4')(150\ PCF)(1.17')^2/2 = 411\#$ $h = 1.17'/3 = .39'$

FOUNDATIONS

VERTICAL LOADS & MOMENT ABOUT TOE OF FOOTING

POST (DL ONLY)		(1348#)(.67') =	903#'
(E) WALL	(4')(1.17')(.67')(150PCF) =	(470#)(.67') =	315
(E) FOOTING	(4')(.5')(1.0')(150PCF) =	(300#)(.67') =	200
(N) FOOTING	(4')(.67')(2.33')(150PCF) =	(937#)(1.17') =	1096
SOIL	(4')(1.83')(1.17')(110PCF) =	(942#)(1.75) =	1648
	DL =	3997#	4162#'
	LL =	(5339#)(.67') =	3577#'
	D+L =	9336#	7739#'

HORIZONTAL LOADS & MOMENTS

ACTIVE $P_a = (438\#)(.833') = 365\#'$

PASSIVE $P_p = (-411\#)(.390') = -160\#'$

27# 205#'

SLIDING OK BY INSPECTION: NET LATERAL FORCE = 27# OK

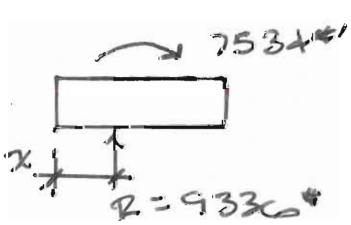
STABILITY

$$\frac{M_R}{M_{OT}} = \frac{4162\#'}{205\#'} = 20.3 > 1.5 \text{ OK}$$

SOIL PRESSURE

MOMENTS ABOUT TOE = 7739#' (D+L) − 205#' = 7534#'

R = 9336#



9336# x = 7534#'

$x = \frac{7534\#'}{9336\#} = .780' \sim b/3$

FULL LENGTH IN BEARING

TRIANG. PROFILE

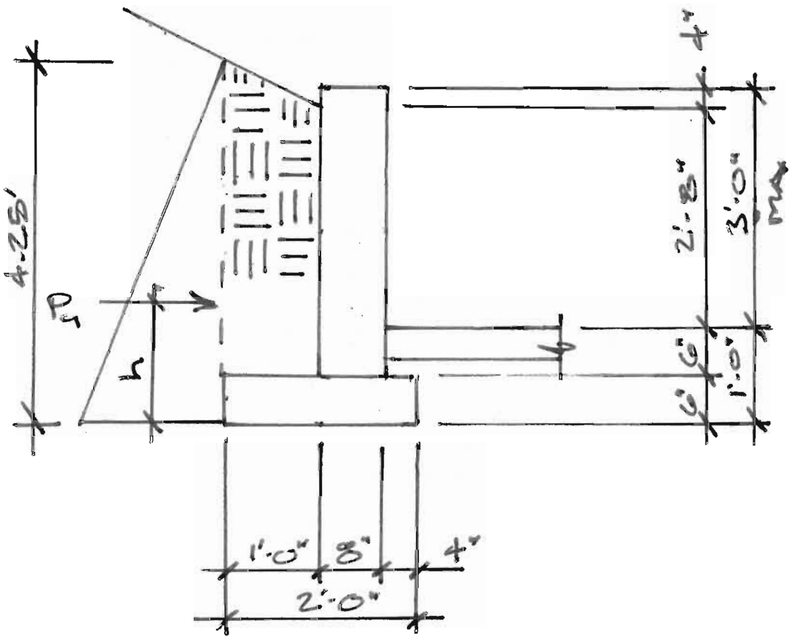
FOUNDATIONS

SOIL PRESSURE

$$P = \frac{(2)(9336^{\#})}{(4')(2.33')} = 2003 \text{ psf} \sim 2000 \text{ psf} \; \underline{OK}$$

FOUNDATIONS

RETAINING WALL



P_a = 35 PCF

$P_a = \frac{1}{2}(35\,PCF)(4.25')^2 = 316\,PLF$

$h = 4.25'/3 = 1.42'$

SLIDING IS RESISTED BY DRIVEWAY SLAB OK BY INSPECTION

VERTICAL LOADS & RESISTING MOMENT ← DIST FROM TOE

WALL	(.67')(3.5')(150 PCF) =	352 PLF	× .67' =	236 #'
FTG	(2.0')(.50')(150 PCF) =	150 PLF	× 1.00' =	150 #'
SOIL	(1.0')(3.38')(110 PCF) =	372 PLF	× 1.5' =	558 #'
		874 PLF		944 #'/ft

$M_{OT} = (316\#/ft)(1.42') = 448\#'/ft$

$\frac{M_r}{M_{OT}} = \frac{944\#'/ft}{448\#'/ft} = 2.10 > 1.5$ OK.

Seattle Structural

FOUNDATIONS

RETAINING WALL

SOIL PRESSURE

$M = 944\#'/ft - 448\#'/ft = 496\#'/ft$ ABOUT TOE
$R = 874\#/ft$

$e = \frac{496\#'/ft}{874\#/ft} = .568'$ (FROM TOE)

$3e = (3)(.568') = 1.704' < 2'$ TRIANGULAR BEARING PROFILE

$p = \frac{(2)(874\#/ft)}{(1.704')} = 1026$ PSF < 2000 PSF OK

REINFORCING

$M_u = (1.6)(448\#'/ft) = 717\#'/ft$

$d = 4"$ - REINF @ ℄ WALL

$R_n = \frac{(.717k'/ft)(12"/ft)}{(.9)(12"/ft)(4")^2} = .04979$ KSI $\quad m = 28.2$

$\rho_{REQ'D} = \frac{1}{28.2}\left(1 - \left(1 - \frac{2(28.2)(.04979)}{60}\right)^{1/2}\right) = .0008398$

USE $\rho = .0012$

$A_{st} = (.0012)(12"/ft)(8") = .115\ in^2/ft$

#4, $A = .2\ in^2$ $\quad \frac{.20\ in^2/BAR}{.115\ in^2/ft} = 1.736'/BAR \Rightarrow$ #4 @ 20" VERT

HORIZ
$A_s = (.0020)(42")(8") = .672\ in^2$ (3' MAX + 6") $\quad$ (4) #4 $A = .8\ in^2$
(2) #4 TOP & 16" OC

FOUNDATIONS

RETAINING WALL

FOOTING REINF

$M_u = [(1.2)(.5')(1.0')(.150\ kcf) + (1.6)(.372\ klf)](.5')$

$M_u = .343^{k'}/ft = 4.11^{k''}/ft$

$d = 3''$ · REINF @ MID DEPTH

$R_n = \frac{(4.11^{k''}/ft)}{(.9)(12''/ft)(3'')^2} = .04230\ ksi$

$\rho_{REQ'D} = \frac{1}{28.2}\left(1 - \left(1 - \frac{2(28.2)(.04230)}{60}\right)^{1/2}\right)$

$\rho_{REQ'D} = .000712$

$A_{ST} = (4/3)(.000712)(12''/ft)(3'') = .034\ in^2/ft$

#4 @ 20" OC TO MATCH WALL

$\frac{.2\ in^2}{1.67} = .1198\ in^2/ft > .034\ in^2/ft$ OK

CONT. REINF.

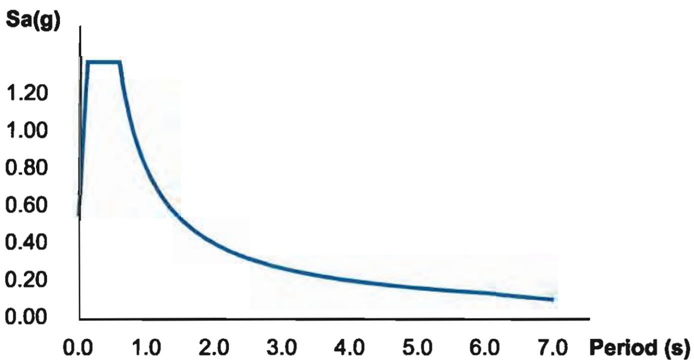
$(.0018)(6'')(24'') = .454\ in^2 \sim (2)\ \#4$

ATC Hazards by Location

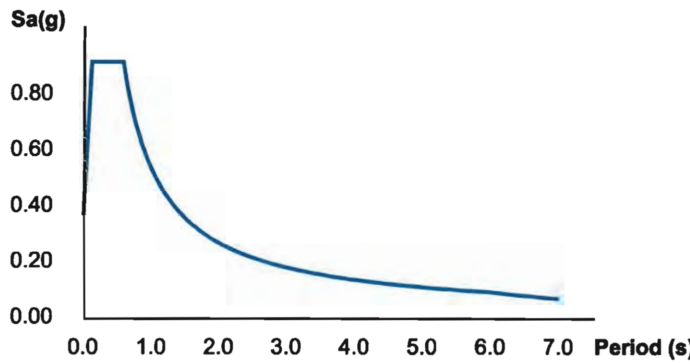
Search Information

Coordinates:	47.58779993218431, -122.22716367857362
Elevation:	70 ft
Timestamp:	2019-06-04T18:25:03.818Z
Hazard Type:	Seismic
Reference Document:	ASCE7-10
Risk Category:	II
Site Class:	D

MCER Horizontal Response Spectrum



Design Horizontal Response Spectrum



Basic Parameters

Name	Value	Description
S_S	1.37	MCE_R ground motion (period=0.2s)
S_1	0.527	MCE_R ground motion (period=1.0s)
S_{MS}	1.37	Site-modified spectral acceleration value
S_{M1}	0.791	Site-modified spectral acceleration value
S_{DS}	0.913	Numeric seismic design value at 0.2s SA
S_{D1}	0.527	Numeric seismic design value at 1.0s SA

▾Additional Information

Name	Value	Description
SDC	D	Seismic design category
F_a	1	Site amplification factor at 0.2s
F_v	1.5	Site amplification factor at 1.0s
CR_S	0.963	Coefficient of risk (0.2s)

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CR_1	0.937	Coefficient of risk (1.0s)
PGA	0.563	MCE_G peak ground acceleration
F_{PGA}	1	Site amplification factor at PGA
PGA_M	0.563	Site modified peak ground acceleration
T_L	6	Long-period transition period (s)
SsRT	1.37	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.422	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	2.573	Factored deterministic acceleration value (0.2s)
S1RT	0.527	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.563	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	1.06	Factored deterministic acceleration value (1.0s)
PGAd	0.983	Factored deterministic acceleration value (PGA)

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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Seattle Structural PS Inc.
3131 Elliot Ave, Suite 600A
Seattle, WA 98121
206-343-3000

Seismic Loads: IBC 2012

Risk Category : II
Importance Factor (I) : 1.00
Site Class : D

Ss (0.2 sec) = 137.00 %g
S1 (1.0 sec) = 52.70 %g

Fa =	1.000	Sms =	1.370	S_{DS} =	0.913	Design Category =	D
Fv =	1.500	Sm1 =	0.791	S_{D1} =	0.527	Design Category =	D

Seismic Design Category = **D**
Number of Stories: 1
Structure Type: Light Frame
Horizontal Struct Irregularities: No plan Irregularity
Vertical Structural Irregularities: No vertical Irregularity
Flexible Diaphragms: Yes
Building System: **Bearing Wall Systems**
Seismic resisting system: **Light frame (wood) walls with structural wood shear panels**
System Structural Height Limit: **65 ft**
Actual Structural Height (hn) = 12.0 ft
See ASCE7 Section 12.2.5 for exceptions and other system limitations

DESIGN COEFFICIENTS AND FACTORS

Response Modification Coefficient (R) = 6.5
Over-Strength Factor (Ωo) = 2.5
Deflection Amplification Factor (Cd) = 4
S_{DS} = 0.913
S_{D1} = 0.527

Seismic Load Effect (E) = $\rho\, Q_E$ +/- $0.2S_{DS}$ D = $\rho\, Q_E$ +/- 0.183D
Special Seismic Load Effect (Em) = $\Omega o\, Q_E$ +/- $0.2S_{DS}$ D = 2.5 Q_E +/- 0.183D

ρ = redundancy coefficient
Q_E = horizontal seismic force
D = dead load

PERMITTED ANALYTICAL PROCEDURES

Simplified Analysis - Use Equivalent Lateral Force Analysis

Equivalent Lateral-Force Analysis - Permitted

Building period coef. (C_T) =	0.020			Cu =	1.40
Approx fundamental period (Ta) =	$C_T h_n$^ =	0.129 sec	x= 0.75	Tmax = CuTa =	0.181
User calculated fundamental period (T) =		6 sec		Use T =	0.181
Long Period Transition Period (TL) =	ASCE7 map =	6			
Seismic response coef. (Cs) =	$S_{DS}I/R$ =	0.141			
need not exceed Cs =	Sd1 I /RT =	0.449			
but not less than Cs =	0.044SdsI =	0.040			
USE Cs =		0.141			

Design Base Shear V = 0.141W

Model & Seismic Response Analysis - Permitted (see code for procedure)

ALLOWABLE STORY DRIFT

Structure Type: All other structures

Allowable story drift = 0.020hsx where hsx is the story height below level x

SEISMIC

V = .141W (SEE P. 59)

W = 5.65k (FROM RISA OUTPUT, SEE P. 15)

V = (.141)(5.65k) = .797k = ~800# (ULT.)
V = (.7)(800#) = 560#

EAST-WEST SEISMIC

STRAP EACH 4x8 JOIST TO EXISTING STRUCTURE

SIMPSON LTT19
P_{ALLOW} = 1310# W/ 1/2"Ø BOLT & (8) .148"x1 1/2" NAILS

P_A = 1310# > 560# OK

NORTH-SOUTH SEISMIC

~1/4 OF LOAD TAKEN ON GRID 4 & AT BEAM NEAR EASTERN EDGE, AND 1/2 TAKEN BY BEAM AT GRID 5.

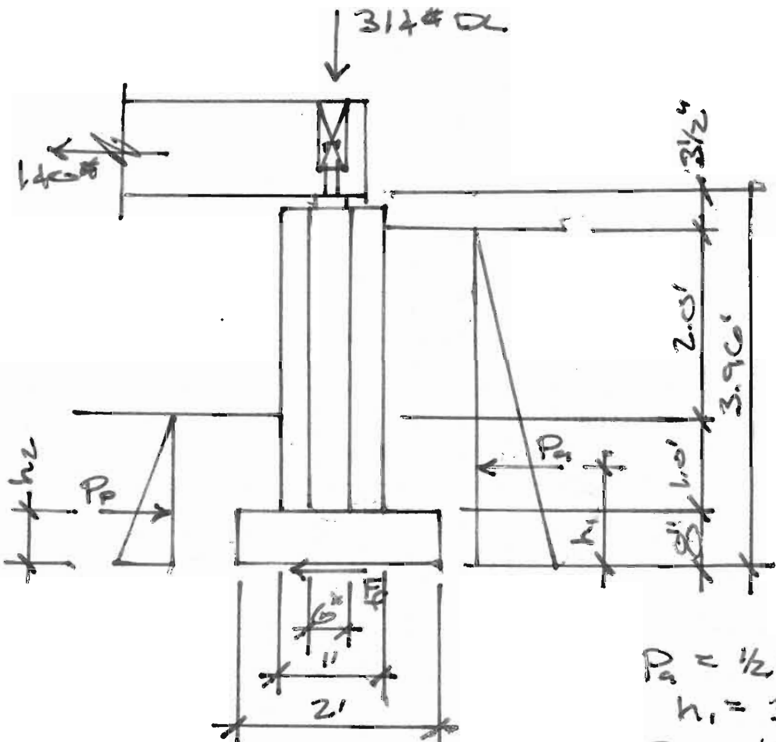
560#/4 = 140#
560#/2 = 280#

AT GRID 4, SIMPSON SDWS22400DB SCREWS FROM LEDGER INTO (E) SILL PL.
V_A = 405#/SCREW > 140#
USE SCREWS @ 12" OC OK BY INSPECTION

AT GRID 5, P = 280#
USE SIMPSON LTT19 TO EXIST CONC. WALL W/ SIMPSON 1/2"Ø x 4" NOM. EMB. STAINLESS STEEL SCREW ANCHOR
P_A = 1310# FOR LTT19 STRAP > 280# OK
SEE P. 65 FOR ANCHOR DESIGN

SEISMIC

EASTERN EDGE



P_a = 35 PCF
P_p = 150 PCF
μ = .25

$P_a = ½(35 PCF)(3.67')^2(2') = 471^{\#}$
$h_1 = 3.67'/3 = 1.222'$
$P_p = ½(150 PCF)(1.67')^2(2') = 418^{\#}$
$h_2 = 1.67'/3 = .557'$

USE 2'-0" LENGTH OF WALL & 2' ☐ FTG.

VERTICAL FORCES & MOMENTS

DIST FROM LOAD TO TOE

FOOTING	(.67')(2')(2')(150 PCF) = 402#	× 1'	=	402#'
PIER	(3.21')(1')(1')(150 PCF) = 482#	× 1'	=	482#'
WALL	(3.21')(.5')(1.0')(150 PCF) = 241#	× 1'	=	241#'
BEAM	314#	× 1'	=	314#'
	R = 1439#			M = 1439#'

$M_R = 1439^{\#'} + (418^{\#})(.557') = 1672^{\#'}$

$M_{OT} = (471^{\#})(1.222') + (140^{\#})(3.96') = 1130^{\#'}$

$\frac{M_R}{M_{OT}} = \frac{1672^{\#'}}{1130^{\#'}} = 1.48 \sim 1.5$ SAY OK

SEISMIC

SLIDING

$F_F = (.25)(1439^{\#}) = 360^{\#}$

$P_R = 360^{\#} + 418^{\#} = 778^{\#}$

$\frac{P_R}{P_S} = \frac{778^{\#}}{471^{\#}} = 1.65 \geq 1.5$ OK

SOIL PRESSURE

$M = 1130^{\#'} + 1672^{\#} - 233^{\#'} = 2569^{\#'}$

$R = 1439^{\#}$

$e = \frac{2569^{\#'}}{1439^{\#}} = 1.785'$ $L = 3(2' - 1.785') = .644'$

$P_o = \frac{(2)(1439^{\#})}{(.644')(2')} = 2234\ PSF > 2000\ PSF$

$\frac{2234}{2000} = 1.117$ ~ 11.7% OVER

SAY OK

LTT/HTT

Tension Ties

Tension ties offer a solution for resisting tension loads that are fastened with nails. The HTT4 and HTT5 tension ties feature an optimized nailing pattern which results in better performance with less deflection.

HTT5KT is sold as a kit with the holdown, bearing plate washer and Strong-Drive® SD Connector screws.

The HTT5-¾ is designed to use a ¾"-diameter anchor bolt. ¾" post-installed anchor bolts are commonly used when retrofitting tension ties to horizontal wood members.

The LTT19 light tension tie is designed for 2x joists or purlins and the LTT20B is for nail- or bolt-on applications. The 3" nail spacing makes the LTT20B suitable for wood I-joists with 0.148" x 1½". The LTTI31 is designed for wood chord open-web truss attachments to concrete or masonry walls and may also be installed vertically on a minimum 2x6 stud.

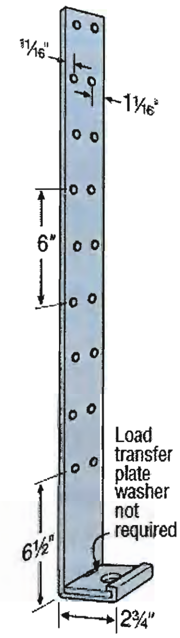
Material: See table

Finish: Galvanized. May be ordered HDG; contact Simpson Strong-Tie.

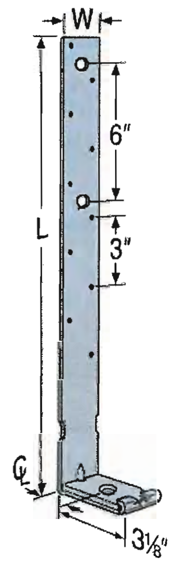
Installation:

- See Holdown and Tension Tie General Notes on pp. 49–50.
- A standard-cut washer is required for LTT19 and LTT20B when using ½" or ⅝" anchor bolts. No additional washer is required when using ¾" anchor bolt.
- For information about marriage strap at panelized roof applications, see **strongtie.com**.
- HTT5-KT requires BP 5/8-2 bearing plate and SD10212 Strong-Drive screws (included in kit).

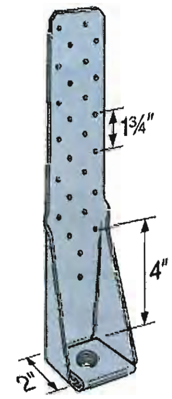
Codes: See p. 12 for Code Reference Key Chart



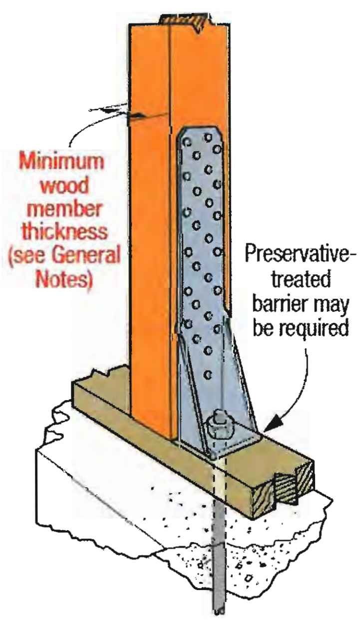
LTTI31



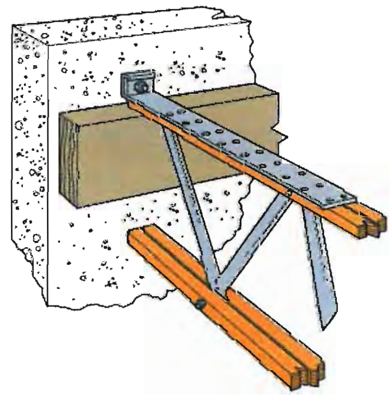
LTT20B
(LTT19 similar)



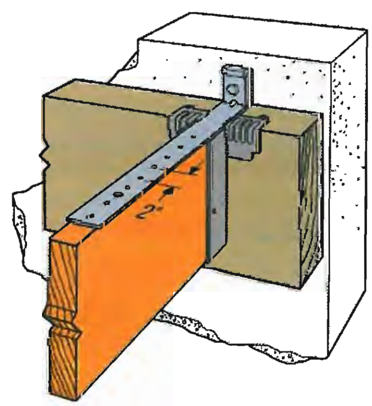
HTT5
(HTT4 similar)



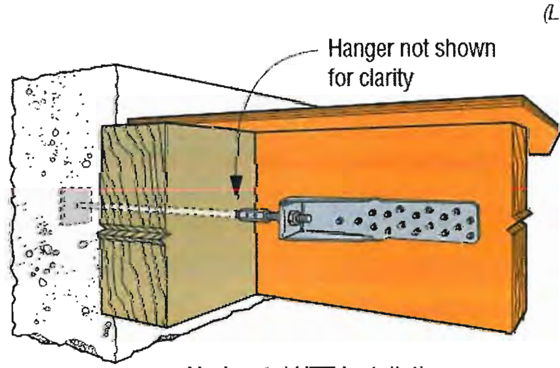
Vertical HTT5 Installation
(HTT4 similar)



Horizontal LTTI31 Installation



Horizontal LTT19 Installation
(LTT20B similar)



Horizontal HTT Installation

LTT/HTT

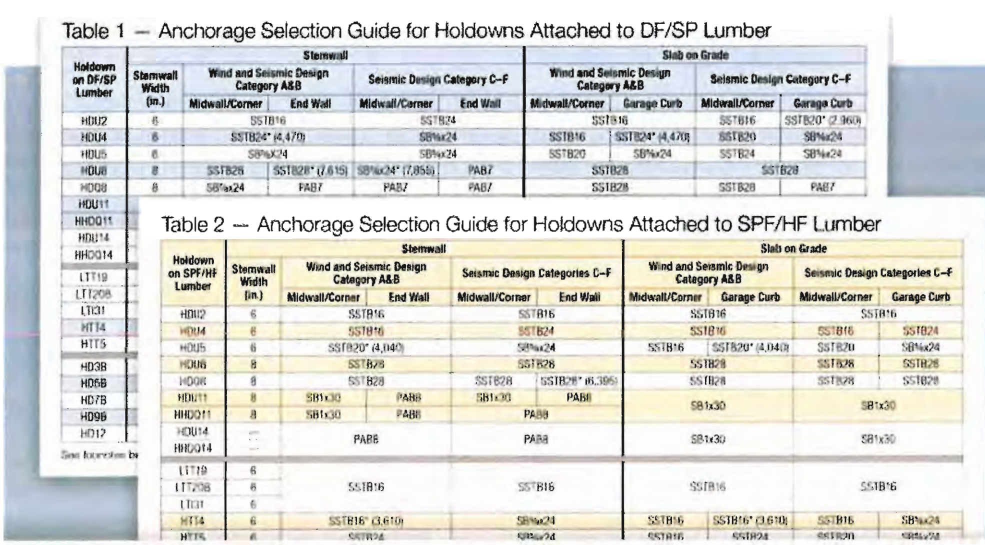
Tension Ties (cont.)

These products are available with additional corrosion protection. For more information, see p. 15.

SD Many of these products are approved for installation with Strong-Drive® SD Connector screws. See pp. 335-337 for more information.

Model No.	Ga.	Dimensions (in.) W	Dimensions (in.) L	Dimensions (in.) CL	Seat Thickness (in.)	Fasteners (in.) Anchor Bolts Diameter	Fasteners (in.) Wood Fasteners	Minimum Wood Member Size (in.)	Allowable Tension Loads (160) DF/SP	Allowable Tension Loads (160) SPF/HF	Deflection at Highest Allowable Load	Code Ref.
LTT19	16	1¾	19⅛	1⅜	5⁄16	½, ⅝ or ¾	(8) 0.148 x 1½	1½ x 3½	1,310	1,125	0.18	IBC, FL, LA
							(8) 0.148 x 1½	3 x 3½	1,310	1,125	0.18	
							(8) 0.148 x 3	3 x 3½	1,340	1,150	0.157	
LTT20B	12	2	19¾	1½	5⁄16	½, ⅝ or ¾	(10) 0.148 x 1½	3 x 3½	1,355	1,165	0.195	
							(10) 0.148 x 3	3 x 3½	1,500	1,290	0.185	
							(2) ½ Bolt	3 x 3½	1,625	1,400	0.183	
LTTI31	18	3¾	31	1⅜	¼	⅝	(18) 0.148 x 1½	3 x 3½	1,350	1,160	0.193	
HTT4	11	2½	12⅜	1 5⁄16	7⁄16	⅝	(18) 0.148 x 1½	1½ x 3½	3,000	2,580	0.09	—
							(18) 0.148 x 1½	3 x 3½	3,610	3,105	0.086	IBC, FL, LA
							(18) 0.162 x 2½	3 x 3½	4,235	3,640	0.123	
							(18) SD #10 x 1½	1½ x 5½	4,455	3,830	0.112	—
							(18) SD #10 x 1½	3 x 3½	4,455	3,830	0.112	
HTT5	11	2½	16	1 5⁄16	7⁄16	⅝	(26) 0.148 x 1½	3 x 3½	4,350	3,740	0.12	IBC, FL, LA
							(26) 0.148 x 3	3 x 3½	4,670	4,015	0.116	
							(26) 0.162 x 2½	3 x 3½	5,090[2]	4,375[2]	0.135	
							(26) SD #10 x 1½	1½ x 5½	4,555	3,915	0.114	—
HTT5KT	11	2½	16	1 5⁄16	7⁄16	⅝	(26) SD #10 x 2½	3 x 3½	5,445	5,360	0.103	—
HTT5-3/4	11	2½	16	1 5⁄16	7⁄16	¾	(26) 0.148 x 1½	1½ x 5½	4,065	3,495	0.103	IBC, FL
							(26) 0.162 x 2½	3 x 3½	5,090	4,375	0.121	
							(26) SD #10 x 1½	1½ x 7¼	4,830	4,155	0.1	

1. LTTI31 installed flush with concrete or masonry has an allowable load of 2,285 lb.
2. Allowable load for HTT5 with a BP 5/8-2 bearing-plate washer installed in the seat of the holdown is 5,295 lb. for DF/SP and 4,555 lb. for SPF/HF.
3. **Fasteners:** Nail dimensions in the table are listed diameter by length. SD and SDS screws are Strong-Drive® screws. See pp. 21–22 for fastener information.



We've made selecting the right anchor bolt for the holdown easier. Check out our Holdown Anchorage Solutions table on p. 44 or the Connector Anchor Selector online.

SIMPSON Strong-Tie ®

Anchor Designer™ Software
Version 2.7.6990.4

Company:		Date:	7/9/2020
Engineer:		Page:	1/5
Project:			
Address:			
Phone:			
E-mail:			

1.Project information

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

Project description: Deck
Location: meercer Island, WA
Fastening description:

2. Input Data & Anchor Parameters

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

Anchor Information:
Anchor type: Concrete screw
Material: Stainless Steel
Diameter (inch): 0.500
Nominal Embedment depth (inch): 3.250
Effective Embedment depth, h_{ef} (inch): 1.860
Code report: IAPMO UES ER-493
Anchor category: 1
Anchor ductility: Yes
h_{min} (inch): 5.00
c_{ac} (inch): 6.00
C_{min} (inch): 1.75
S_{min} (inch): 3.00

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 6.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: Not applicable
Build-up grout pad: No

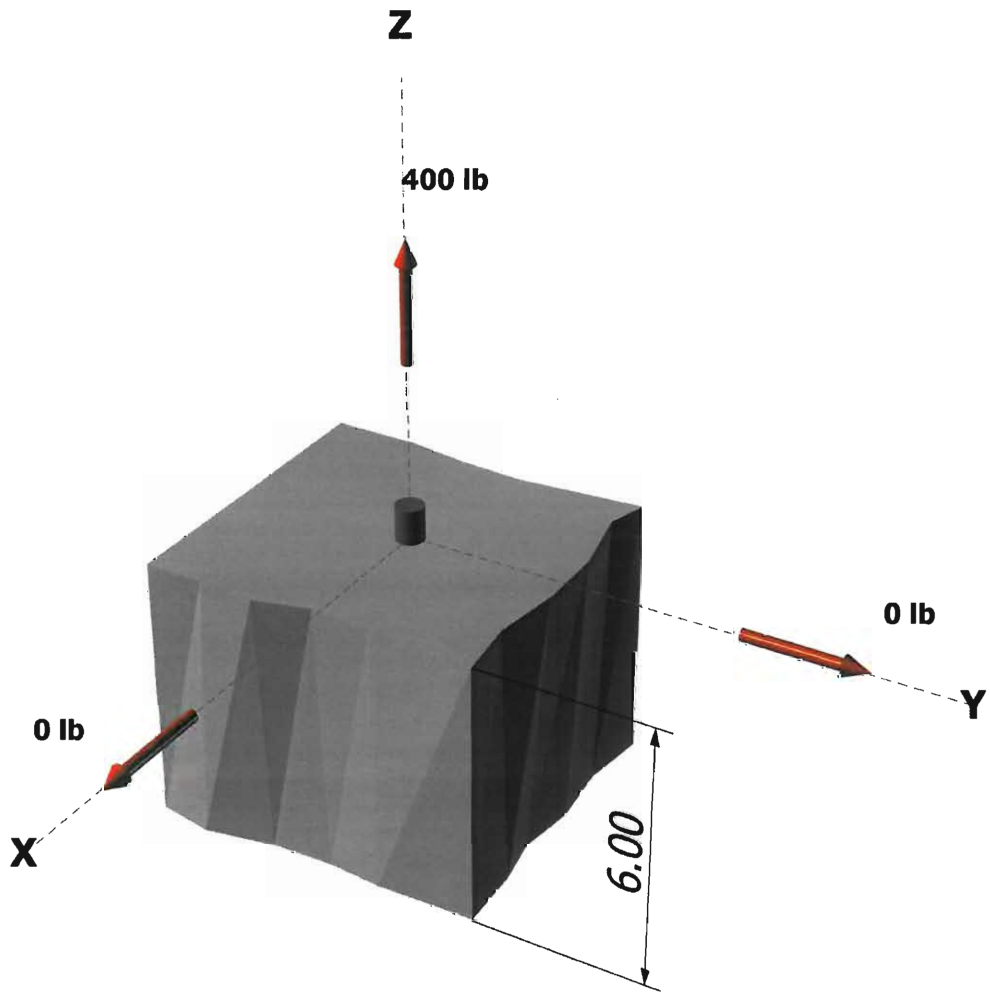
Recommended Anchor
Anchor Name: Titen HD® Stainless Steel - 1/2"Ø SS Titen HD, hnom:3.25" (83mm)
Code Report: IAPMO UES ER-493

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

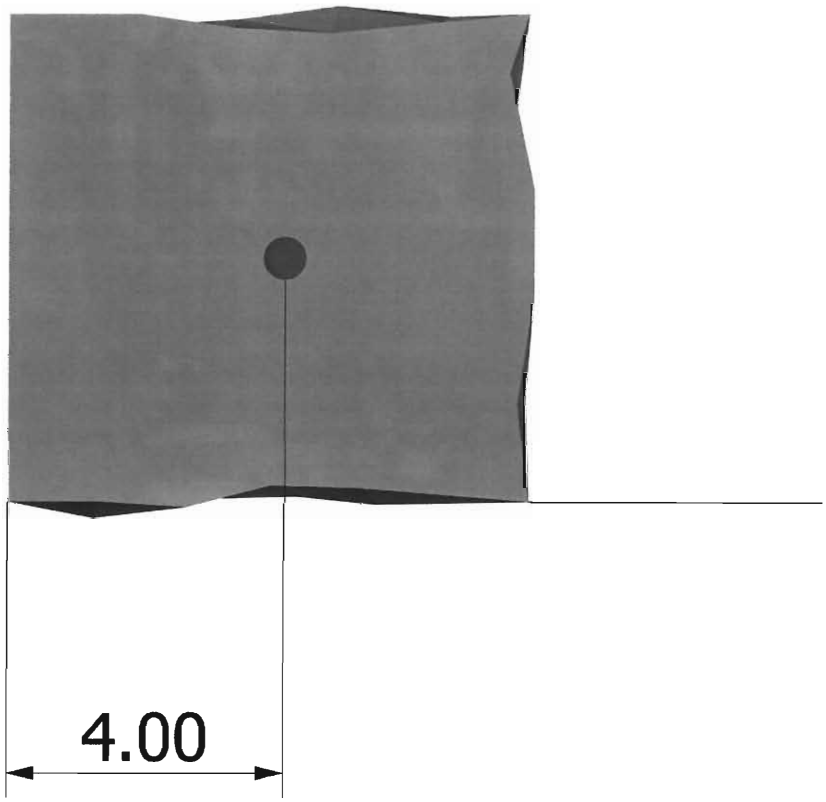
Strength level loads:

N_{ua} [lb]: 400
V_{uax} [lb]: 0
V_{uay} [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	400.0	0.0	0.0	0.0
Sum	400.0	0.0	0.0	0.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 400
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00

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

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
20885	0.75	15664

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

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

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	2500	1.860	2156

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

A_{Nc} (in^2)	A_{Nco} (in^2)	$c_{a,min}$ (in)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cb} (lb)
31.14	31.14	4.00	1.000	1.00	1.000	2156	0.65	1402

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

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

$\Psi_{c,P}$	λ_a	N_p (lb)	f'_c (psi)	n	ϕ	ϕN_{pn} (lb)
1.0	1.00	1995	2500	0.50	0.65	1297

11. Results

11. Interaction of Tensile and Shear Forces (Sec. D.7)?

Tension	Factored Load, N_{ua} (lb)	Design Strength, øN_n (lb)	Ratio	Status
Steel	400	15664	0.03	Pass
Concrete breakout	400	1402	0.29	Pass
Pullout	**400**	**1297**	**0.31**	**Pass (Governs)**

1/2"Ø SS Titen HD, hnom:3.25" (83mm) meets the selected design criteria.

12. Warnings

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

- Refer to manufacturer's product literature for hole cleaning and installation instructions.