

# Blackwell

Structural Engineers

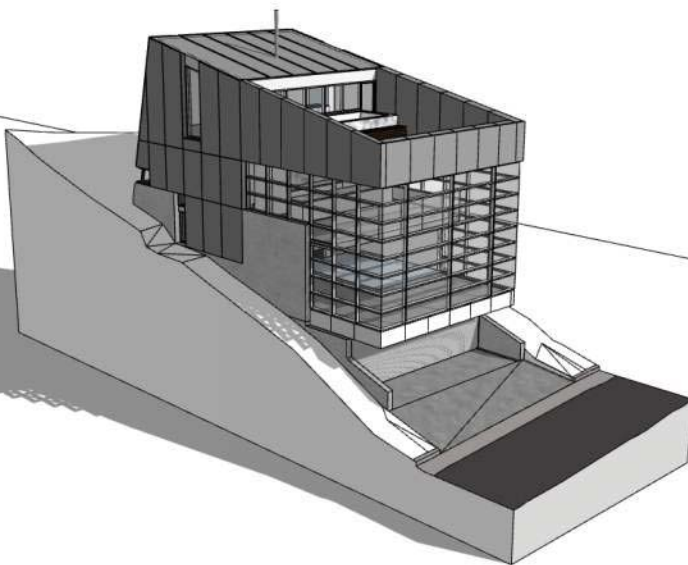


6-28-2018

## SUMMIT LOT 71 STRUCTURAL DESIGN CALCULATION PACKAGE

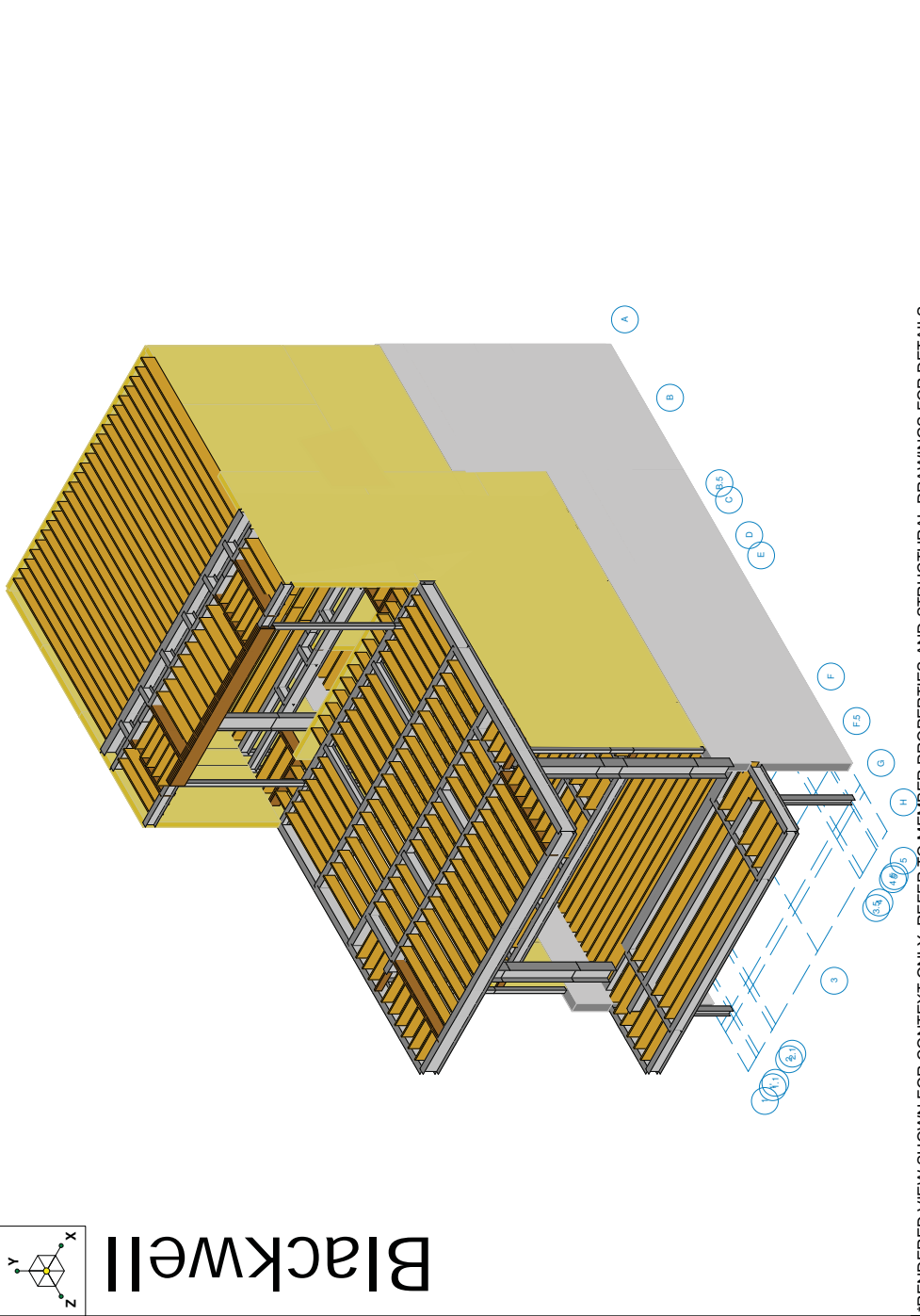
Our Project 170450  
June 26, 2018

Rev. 0 Issued for Permit





Blackwell



\*RENDERED VIEW SHOWN FOR CONTEXT ONLY. REFER TO MEMBER PROPERTIES AND STRUCTURAL DRAWINGS FOR DETAILS.

Blackwell Structural Engineers	Full Model	GENERAL RENDERING
BG	Lot 71	June 26, 2018 at 10:01 AM
170450		170450 Summit Lot 71 2018.06.24.rfl

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**MATERIAL DEFINITION**

## Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E5 F)	Density[k/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A992	29000	11154	.3	.65	.49	50	1.1	65	1.1
2	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
3	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	65	1.1
4	A500 Gr.B RND	29000	11154	.3	.65	.527	42	1.4	58	1.3
5	A500 Gr.B Rect	29000	11154	.3	.65	.527	46	1.4	58	1.3
6	A53 Gr.B	29000	11154	.3	.65	.49	35	1.6	60	1.2
7	A1085	29000	11154	.3	.65	.49	50	1.4	65	1.3

## Wood Material Properties

	Label	Type	Database	Species	Grade	Cm	Emod	Nu	Ther...	Dens[...
1	Spruce-Pine-Fir	Solid Sawn	Visually Graded	Spruce-Pine-fir	No.2		1	.3	.3	.026
2	2.0E Microllam L...	Custom	N/A	2.0E Microllam LVL	na		1	.3	.3	.035

## Custom Wood Properties

	Label	Fb [ksi]	Ft [ksi]	Fv [ksi]	Fc [ksi]	E [ksi]	E05 [ksi]	Type	CF
1	LVL PRL 1.5E 2250F	2.25	1.5	.22	1.95	1500	145.764	SCL	
2	LVL PRL 2.0E 2900F	2.9	1.9	.285	2.75	2000	194.352	SCL	
3	LVL_Microllam_1.9E_2600F	2.6	1.555	.285	2.51	1900	184.635	SCL	
4	PSL Parallam 2.0E 2900F	2.9	2.025	.29	2.9	2000	194.352	SCL	
5	PSL Parallam 1.8E	2.4	1.755	.18	2.5	1800	174.917	SCL	
6	LSL_TimberStrand_1.55E_2325F	2.325	1.07	.31	2.05	1550	150.623	SCL	
7	LSL_TimberStrand_1.3E_1700F	1.7	1.075	.4	1.4	1300	126.329	SCL	
8	2.0E Microllam LVL	2.6	1.555	.285	2.51	2000	184.6	SCL	0

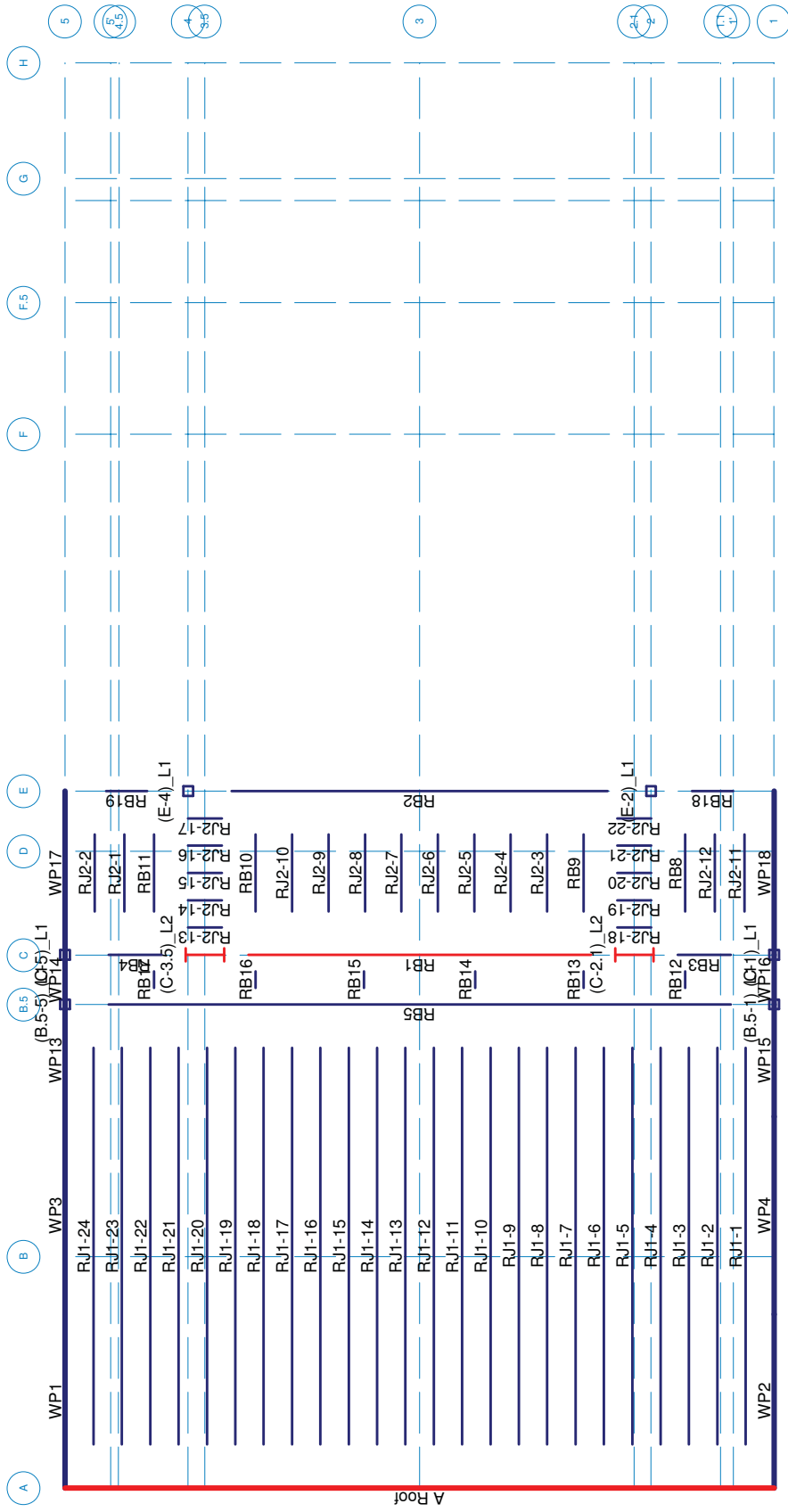
**GRAVITY SYSTEM**  
Designed using RISAFloor

**Gravity Geometry and  
Shapes Definition**



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Lateral Gravity



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170450

Roof 40'-5 9/16"

Lot 71

LABELS

June 26, 2018 at 10:00 AM

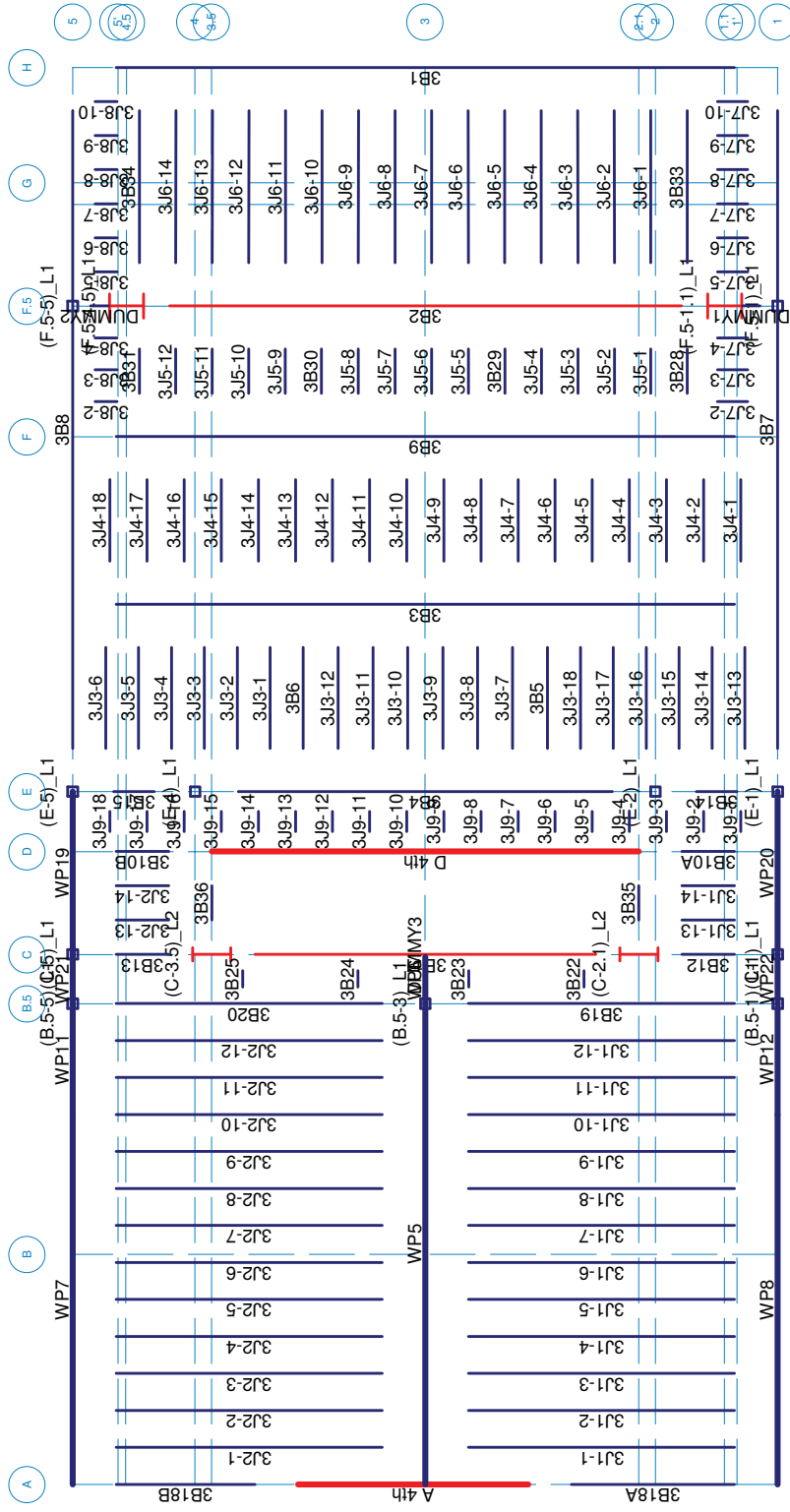
170450 Summit Lot 71 2018.06.24.rfl





# Blackwell

Lateral Gravity

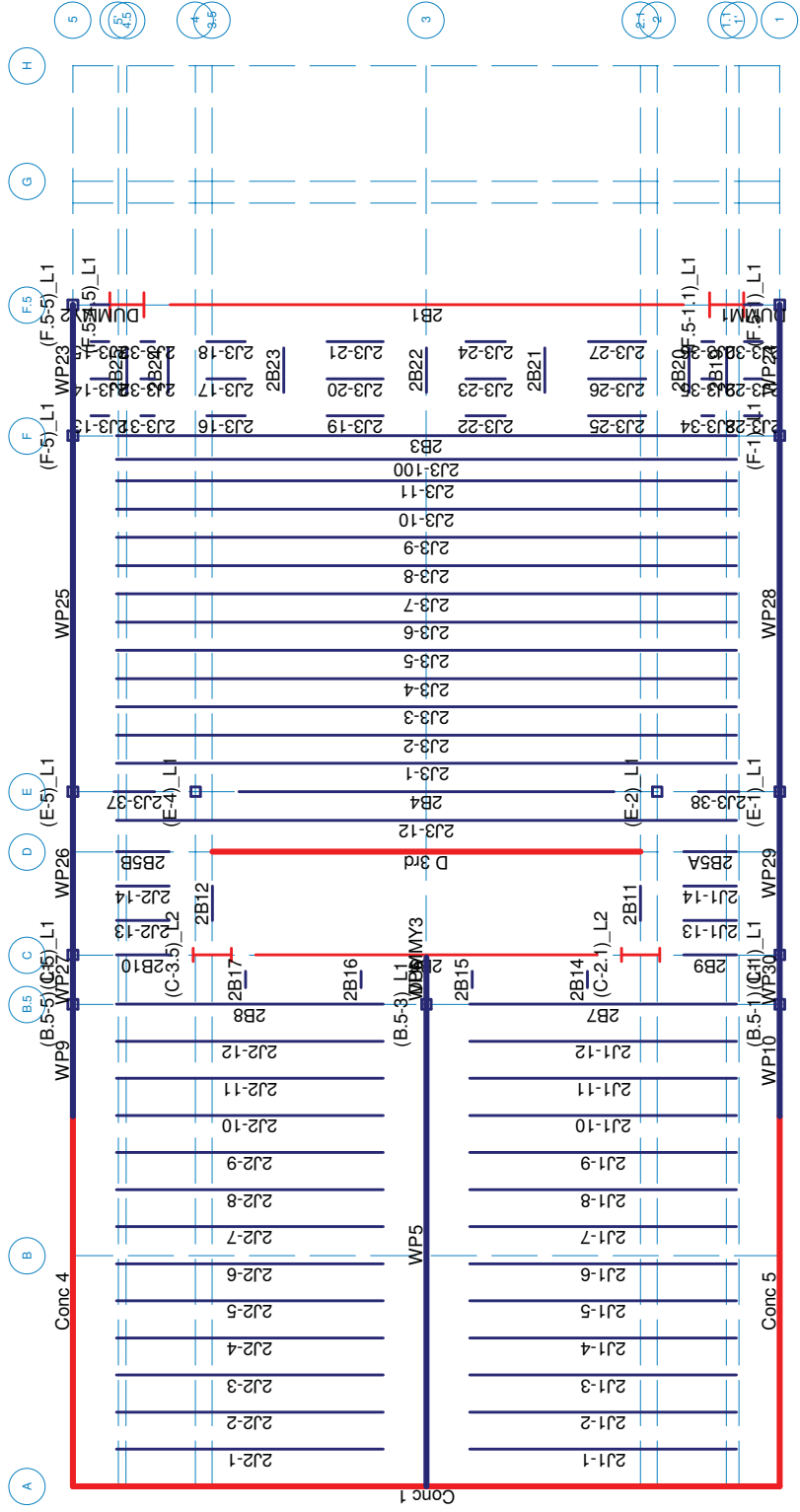


DUE TO MODELING RESTRICTIONS THE SHEAR WALLS ALONG GRIDS 1 AND 5 ARE MODELED IN THE LATERAL MODEL AND ARE NOT SHOWN IN RISAFLOOR.



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Lateral Gravity



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170450

Level 3 18'-4 1/4"

Lot 71

LABELS

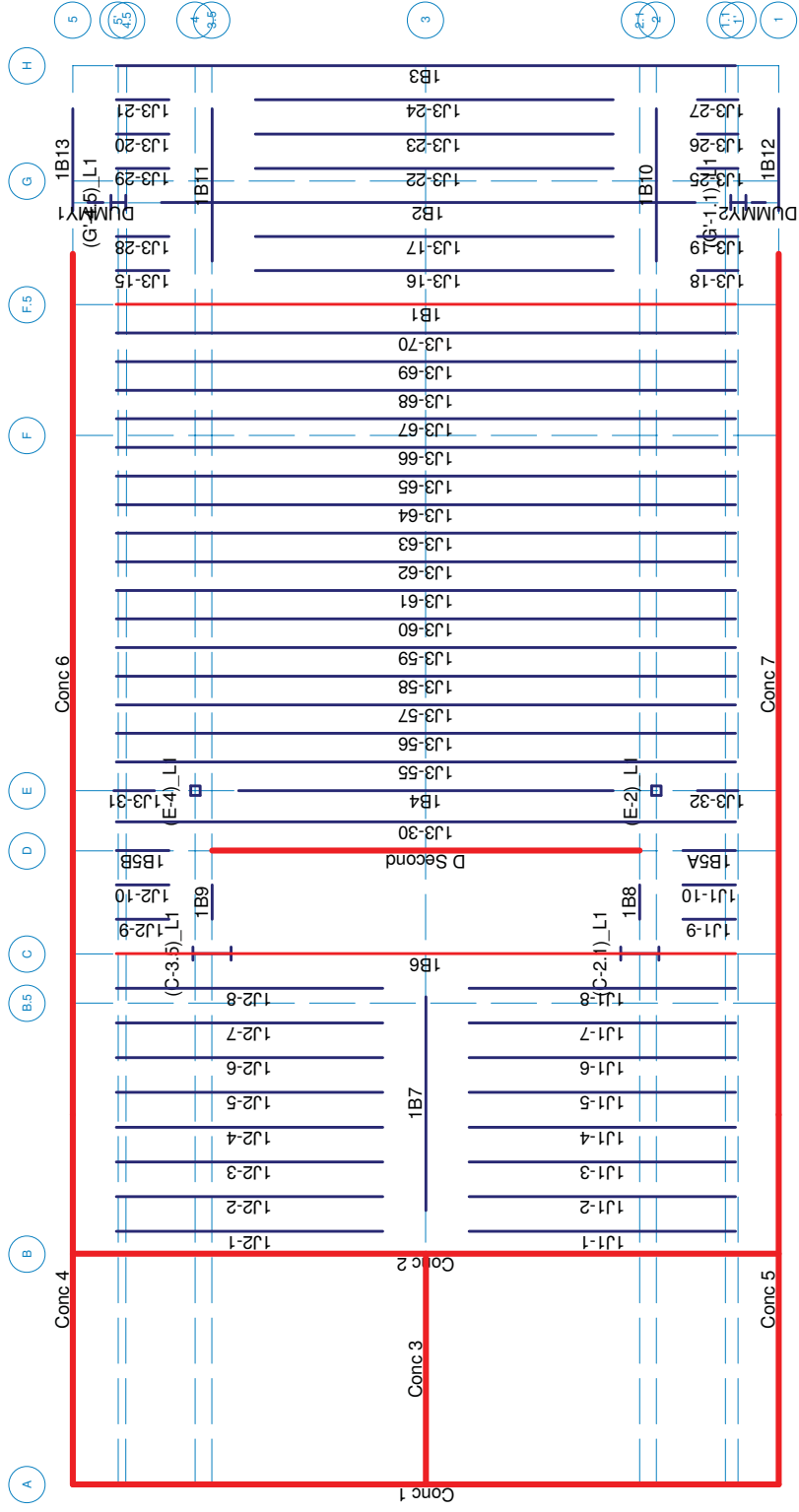
June 26, 2018 at 10:21 AM

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Lateral Gravity



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170450

Level 2 8'-11 1/4"

Lot 71

LABELS

June 26, 2018 at 10:22 AM

170450 Summit Lot 71 2018.06.24.rfl

## Column Stacks

Stack L...	Project Grid	Z [ft]	X [ft]	Lift ...	Leng...	Bot E...	Top ...	Shape	Material	Func...	Design...	Flexural L...	Shear La...	
1	(C-2.1)	C-2.1	18.42	4.83	1	8.938	0	8.938	W16x31	A992	Gravity	Typical	N/A	N/A
2					2	31.87	8.938	40.807	W16x31	A992	Lateral	Typical	N/A	N/A
3	(C-3.5)	C-3.5	18.42	19.67	1	8.938	0	8.938	W16x31	A992	Gravity	Typical	N/A	N/A
4					2	31.87	8.938	40.807	W16x31	A992	Lateral	Typical	N/A	N/A
5	(E-2)	E-2	24.08	4.25	1	40.807	0	40.807	HSS4x4x4	A500 Gr.B Rect	Gravity	Typical	N/A	N/A
6	(E-4)	E-4	24.08	20.25	1	40.807	0	40.807	HSS4x4x4	A500 Gr.B Rect	Gravity	Typical	N/A	N/A
7	(G'-4.5)	G'-5'	44.4	22.9	1	8.938	0	8.938	W6x20	A992	Gravity	Typical	N/A	N/A
8	(G'-1.1)	G'-1'	44.4	1.406	1	8.938	0	8.938	W6x20	A992	Gravity	Typical	N/A	N/A
9	(F.5-4.5)	F.5-4.5	40.96	22.6	1	19.938	8.938	28.875	W14x74	A992	Lateral	Typical	N/A	N/A
10	(F.5-1.1)	F.5-1.1	40.96	1.844	1	19.938	8.938	28.875	W14x74	A992	Lateral	Typical	N/A	N/A
11	(B.5-3)	B.5-3	16.71	12.25	1	19.938	8.938	28.875	HSS4x4x4	A500 Gr.B Rect	Gravity	Typical	N/A	N/A
12	(E-5)	E-5	24.08	24.5	1	16.771	12.104	28.875	HSS4x4x4	A500 Gr.B Rect	Gravity	Typical	N/A	N/A
13	(F.5-5)	F.5-5	40.96	24.5	1	16.771	12.104	28.875	HSS4x4x4	A500 Gr.B Rect	Gravity	Typical	N/A	N/A
14	(E-1)	E-1	24.08	0	1	16.771	12.104	28.875	HSS4x4x4	A500 Gr.B Rect	Gravity	Typical	N/A	N/A
15	(F.5-1)	F.5-1	40.96	0	1	16.771	12.104	28.875	HSS4x4x4	A500 Gr.B Rect	Gravity	Typical	N/A	N/A
16	(B.5-5)	B.5-5	16.71	24.5	1	28.703	12.104	40.807	HSS4x4x4	A500 Gr.B Rect	Gravity	Typical	N/A	N/A
17	(B.5-1)	B.5-1	16.71	0	1	28.703	12.104	40.807	HSS4x4x4	A500 Gr.B Rect	Gravity	Typical	N/A	N/A
18	(C-5)	C-5	18.42	24.5	1	28.703	12.104	40.807	HSS4x4x4	A500 Gr.B Rect	Gravity	Typical	N/A	N/A
19	(C-1)	C-1	18.42	0	1	28.703	12.104	40.807	HSS4x4x4	A500 Gr.B Rect	Gravity	Typical	N/A	N/A
20	(F-5)	F-5	36.42	24.5	1	6.25	12.104	18.354	HSS4x4x4	A500 Gr.B Rect	Gravity	Typical	N/A	N/A
21	(F-1)	F-1	36.42	0	1	6.25	12.104	18.354	HSS4x4x4	A500 Gr.B Rect	Gravity	Typical	N/A	N/A

## Beam Primary Data : Roof 40'-5 9/16"

Label	Start ...	End P...	Shape	Material	Design Rules	Funci...	Orientation	Start ...	End R...	Outrig...
1	RB1	N8	N9	W14x22	A992	Typical	Lateral	Strong Axis	Fixed	Fixed
2	RB4	N10	N8	W14x22	A992	Typical	Gravity	Strong Axis	Pinned	Pinned
3	RB3	N9	N11	W14x22	A992	Typical	Gravity	Strong Axis	Pinned	Pinned
4	RB2	N3	N5	4-1.75X16FS	2.0E Microllam...	Typical	Gravity	Strong Axis	Pinned	Pinned
5	RB10	N68	N38	2-1.75X14FS	2.0E Microllam...	Typical	Gravity	Strong Axis	Pinned	Pinned
6	RB9	N69	N39	2-1.75X14FS	2.0E Microllam...	Typical	Gravity	Strong Axis	Pinned	Pinned
7	RB16	N38	N26	W10x22	A992	Typical	Gravity	Strong Axis	Fixed	Pinned
8	RB13	N39	N27	W10x22	A992	Typical	Gravity	Strong Axis	Fixed	Pinned
9	RB5	N98	N96	W14x53	A992	Typical	Gravity	Strong Axis	Pinned	Pinned
10	RB8	N30	N37	2-1.75X14FS	2.0E Microllam...	Typical	Gravity	Strong Axis	Pinned	Pinned
11	RB11	N32	N36	2-1.75X14FS	2.0E Microllam...	Typical	Gravity	Strong Axis	Pinned	Pinned
12	RB12	N37	N171	W10x22	A992	Typical	Gravity	Strong Axis	Pinned	Pinned
13	RB17	N36	N181	W10x22	A992	Typical	Gravity	Strong Axis	Pinned	Pinned
14	RB15	N206	N207	W10x22	A992	Typical	Gravity	Strong Axis	Fixed	Pinned
15	RB14	N208	N215	W10x22	A992	Typical	Gravity	Strong Axis	Fixed	Pinned
16	RJ1-1	N40	N41	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned
17	RJ1-2	N42	N43	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned
18	RJ1-3	N44	N45	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned
19	RJ1-4	N46	N49	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned
20	RJ1-5	N50	N51	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned
21	RJ1-6	N52	N53	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned
22	RJ1-7	N54	N55	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned
23	RJ1-8	N56	N57	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned
24	RJ1-9	N58	N59	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned
25	RJ1-10	N60	N61	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned
26	RJ1-11	N62	N63	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned
27	RJ1-12	N64	N65	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned

## Beam Primary Data : Roof 40'-5 9/16" (Continued)

	Label	Start ...	End P...	Shape	Material	Design Rules	Functi...	Orientation	Start ...	End R...	Outrig...
28	RJ1-13	N66	N67	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
29	RJ1-14	N70	N71	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
30	RJ1-15	N72	N73	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
31	RJ1-16	N74	N75	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
32	RJ1-17	N76	N77	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
33	RJ1-18	N78	N79	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
34	RJ1-19	N80	N81	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
35	RJ1-20	N82	N83	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
36	RJ1-21	N84	N85	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
37	RJ1-22	N86	N87	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
38	RJ1-23	N88	N89	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
39	RJ1-24	N90	N91	Red I90x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
40	RJ2-1	N92	N93	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
41	RJ2-2	N94	N95	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
42	RJ2-3	N97	N99	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
43	RJ2-4	N101	N103	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
44	RJ2-5	N105	N107	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
45	RJ2-6	N109	N111	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
46	RJ2-7	N112	N113	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
47	RJ2-8	N114	N115	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
48	RJ2-9	N116	N117	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
49	RJ2-10	N118	N119	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
50	RJ2-11	N120	N121	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
51	RJ2-12	N122	N123	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
52	RJ2-13	N124	N125	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
53	RJ2-14	N126	N127	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
54	RJ2-15	N128	N129	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
55	RJ2-16	N130	N131	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
56	RJ2-17	N132	N133	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
57	RJ2-18	N134	N135	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
58	RJ2-19	N136	N137	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
59	RJ2-20	N138	N139	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
60	RJ2-21	N140	N141	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
61	RJ2-22	N142	N143	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
62	RB19	N3	N6	W10x22	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
63	RB18	N7	N5	W10x22	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	

## Beam Primary Data : Level 4 - 28'-10 1/2"

	Label	Start ...	End P...	Shape	Material	Design Rules	Functi...	Orientation	Start ...	End R...	Outrig...
1	3B11	N8	N10	W14x22	A992	Typical	Lateral	Strong Axis	Fixed	Fixed	
2	3B13	N10	N15	W8x18	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
3	3B12	N8	N16	W8x18	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
4	3B36	N10	N9	2-1.75X11.875FS	2.0E Microllam...	Typical	Gravity	Strong Axis	Pinned	Pinned	
5	3B35	N8	N7	2-1.75X11.875FS	2.0E Microllam...	Typical	Gravity	Strong Axis	Pinned	Pinned	
6	3B3	N224	N223	W16x45	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
7	3B10B	N9	N93	2-1.75X11.875FS	2.0E Microllam...	Typical	Gravity	Strong Axis	Pinned	Pinned	
8	3B10A	N7	N94	2-1.75X11.875FS	2.0E Microllam...	Typical	Gravity	Strong Axis	Pinned	Pinned	
9	3B1	N17	N18	W16x36	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
10	3B2	N275	N276	W12x35	A992	Typical	Lateral	Strong Axis	Fixed	Fixed	
11	3B4	N227	N228	W8x31	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
12	3B5	N331	N332	W8x18	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	

## Beam Primary Data : Level 4 - 28'-10 1/2" (Continued)

	Label	Start ...	End P...	Shape	Material	Design Rules	Functi...	Orientation	Start ...	End R...	Outrig...
13	3B6	N329	N330	W8x18	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
14	3B8	N13	N18	W16x36	A992	Typical	Gravity	Strong Axis	Fixed	Pinned	Yes
15	3B7	N5	N17	W16x36	A992	Typical	Gravity	Strong Axis	Fixed	Pinned	Yes
16	3B18B	N1	N277	3-1.75X14FS	2.0E Microllam...	Typical	Gravity	Strong Axis	Pinned	Pinned	
17	3B18A	N278	N2	3-1.75X14FS	2.0E Microllam...	Typical	Gravity	Strong Axis	Pinned	Pinned	
18	3B20	N284	N282	W10x22	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
19	3B19	N284	N280	W10x22	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
20	3B9	N283	N289	W16x45	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
21	3B30	N291	N292	W12x26	A992	Typical	Gravity	Strong Axis	Pinned	Fixed	
22	3B29	N293	N294	W12x26	A992	Typical	Gravity	Strong Axis	Pinned	Fixed	
23	3B28	N295	N296	W12x26	A992	Typical	Gravity	Strong Axis	Pinned	Fixed	
24	3B31	N297	N298	W12x26	A992	Typical	Gravity	Strong Axis	Pinned	Fixed	
25	3B22	N306	N308	W10x22	A992	Typical	Gravity	Strong Axis	Fixed	Pinned	
26	3B23	N310	N312	W10x22	A992	Typical	Gravity	Strong Axis	Fixed	Pinned	
27	3B24	N314	N318	W10x22	A992	Typical	Gravity	Strong Axis	Fixed	Pinned	
28	3B25	N336	N337	W10x22	A992	Typical	Gravity	Strong Axis	Fixed	Pinned	
29	3B14	N228	N5	W8x18	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
30	3B15	N227	N13	W8x18	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
31	3B33	N296	N236	2-1.75X11.875FS	2.0E Microllam...	Typical	Gravity	Strong Axis	Pinned	Pinned	
32	3B34	N298	N264	2-1.75X11.875FS	2.0E Microllam...	Typical	Gravity	Strong Axis	Pinned	Pinned	
33	3J2-1	N68	N69	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
34	3J2-2	N70	N71	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
35	3J2-3	N72	N73	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
36	3J2-4	N74	N75	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
37	3J2-5	N76	N77	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
38	3J2-6	N78	N79	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
39	3J2-7	N80	N81	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
40	3J2-8	N82	N83	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
41	3J2-9	N84	N85	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
42	3J2-10	N86	N87	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
43	3J2-11	N88	N89	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
44	3J2-12	N90	N91	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
45	3J1-1	N92	N68	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
46	3J1-2	N95	N70	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
47	3J1-3	N96	N72	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
48	3J1-4	N97	N74	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
49	3J1-5	N98	N76	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
50	3J1-6	N99	N78	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
51	3J1-7	N100	N80	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
52	3J1-8	N101	N82	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
53	3J1-9	N102	N84	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
54	3J1-10	N103	N86	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
55	3J1-11	N104	N88	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
56	3J1-12	N107	N90	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
57	3J2-13	N115	N116	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
58	3J2-14	N117	N118	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
59	3J1-13	N125	N126	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
60	3J1-14	N127	N128	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
61	3J7-2	N131	N132	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
62	3J7-3	N133	N134	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
63	3J7-4	N135	N136	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
64	3J7-5	N139	N140	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	

## Beam Primary Data : Level 4 - 28'-10 1/2" (Continued)

	Label	Start ...	End P...	Shape	Material	Design Rules	Functi...	Orientation	Start ...	End R...	Outrig...
65	3J7-6	N141	N142	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
66	3J7-7	N143	N144	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
67	3J7-8	N145	N146	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
68	3J7-9	N147	N148	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
69	3J7-10	N149	N150	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
70	3J8-2	N153	N154	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
71	3J8-3	N155	N156	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
72	3J8-4	N157	N158	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
73	3J8-5	N159	N160	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
74	3J8-6	N161	N162	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
75	3J8-7	N163	N164	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
76	3J8-8	N165	N166	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
77	3J8-9	N167	N168	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
78	3J8-10	N169	N170	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
79	3J5-1	N250	N251	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
80	3J5-2	N252	N253	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
81	3J5-3	N254	N255	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
82	3J5-4	N256	N257	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
83	3J5-5	N258	N259	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
84	3J5-6	N260	N261	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
85	3J5-7	N262	N263	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
86	3J5-8	N265	N266	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
87	3J5-9	N267	N268	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
88	3J5-10	N269	N270	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
89	3J5-11	N272	N274	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
90	3J5-12	N279	N281	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
91	3J6-1	N251	N285	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
92	3J6-2	N253	N286	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
93	3J6-3	N255	N287	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
94	3J6-4	N288	N290	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
95	3J6-5	N301	N302	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
96	3J6-6	N259	N303	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
97	3J6-7	N261	N304	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
98	3J6-8	N263	N305	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
99	3J6-9	N266	N307	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
100	3J6-10	N309	N311	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
101	3J6-11	N313	N317	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
102	3J6-12	N270	N319	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
103	3J6-13	N274	N320	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
104	3J6-14	N281	N321	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
105	DUMMY3	N324	N316	2X8	Spruce-Pine-Fir	Typical	Gravity	Strong Axis	Pinned	Pinned	
106	3J3-1	N327	N328	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
107	3J3-2	N333	N334	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
108	3J3-3	N335	N338	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
109	3J3-4	N339	N341	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
110	3J3-5	N343	N345	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
111	3J3-6	N347	N348	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
112	3J3-7	N349	N350	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
113	3J3-8	N351	N352	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
114	3J3-9	N181	N353	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
115	3J3-10	N183	N354	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
116	3J3-11	N355	N356	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	

## Beam Primary Data : Level 4 - 28'-10 1/2" (Continued)

	Label	Start ...	End P...	Shape	Material	Design Rules	Functi...	Orientation	Start ...	End R...	Outrig...
117	3J3-12	N357	N358	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
118	3J3-13	N359	N360	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
119	3J3-14	N361	N362	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
120	3J3-15	N363	N364	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
121	3J3-16	N365	N366	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
122	3J3-17	N367	N368	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
123	3J3-18	N369	N370	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
124	DUMMY2	N275	N28	2X8	Spruce-Pine-Fir	Typical	Gravity	Strong Axis	Pinned	Pinned	
125	DUMMY1	N276	N29	2X8	Spruce-Pine-Fir	Typical	Gravity	Strong Axis	Pinned	Pinned	
126	3J9-1	N299	N300	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
127	3J9-2	N325	N326	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
128	3J9-3	N373	N374	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
129	3J9-4	N375	N376	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
130	3J9-5	N377	N378	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
131	3J9-6	N379	N380	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
132	3J9-7	N381	N382	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
133	3J9-8	N383	N384	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
134	3J9-9	N385	N386	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
135	3J9-10	N387	N388	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
136	3J9-11	N389	N390	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
137	3J9-12	N391	N392	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
138	3J9-13	N393	N394	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
139	3J9-14	N395	N396	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
140	3J9-15	N397	N398	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
141	3J9-16	N399	N400	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
142	3J9-17	N401	N402	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
143	3J9-18	N403	N404	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
144	3J4-1	N405	N406	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
145	3J4-2	N407	N204	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
146	3J4-3	N408	N409	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
147	3J4-4	N410	N411	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
148	3J4-5	N412	N413	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
149	3J4-6	N414	N415	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
150	3J4-7	N416	N417	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
151	3J4-8	N418	N419	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
152	3J4-9	N420	N421	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
153	3J4-10	N422	N423	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
154	3J4-11	N424	N425	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
155	3J4-12	N426	N427	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
156	3J4-13	N428	N429	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
157	3J4-14	N430	N431	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
158	3J4-15	N432	N433	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
159	3J4-16	N434	N435	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
160	3J4-17	N436	N437	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
161	3J4-18	N438	N439	Red I45x11.875	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	

## Beam Primary Data : TOC - 20'-4 1/2"

Label	Start ...	End P...	Shape	Material	Design Rules	Functi...	Orientation	Start ...	End R...	Outrig...
No Data to Print ...										



## Beam Primary Data : Level 3 18'-4 1/4"

	Label	Start ...	End P...	Shape	Material	Design Rules	Functi...	Orientation	Start ...	End R...	Outrig...
1	2B1	N129	N130	W10x26	A992	Typical	Lateral	Strong Axis	Fixed	Fixed	
2	2B6	N8	N10	W14x22	A992	Typical	Lateral	Strong Axis	Fixed	Fixed	
3	2B10	N10	N13	W8x18	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
4	2B12	N10	N9	2-1.75X14FS	2.0E Microllam...	Typical	Gravity	Strong Axis	Pinned	Pinned	
5	2B5B	N9	N15	2-1.75X14FS	2.0E Microllam...	Typical	Gravity	Strong Axis	Pinned	Pinned	
6	2B9	N8	N16	W8x18	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
7	2B5A	N7	N17	2-1.75X14FS	2.0E Microllam...	Typical	Gravity	Strong Axis	Pinned	Pinned	
8	2B11	N8	N7	2-1.75X14FS	2.0E Microllam...	Typical	Gravity	Strong Axis	Pinned	Pinned	
9	2B3	N127	N128	W10x26	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
10	2B4	N113	N114	W8x18	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
11	2B8	N183	N162	W10x22	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
12	2B7	N183	N164	W10x22	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
13	2B14	N32	N33	W10x22	A992	Typical	Gravity	Strong Axis	Fixed	Pinned	
14	2B15	N34	N35	W10x22	A992	Typical	Gravity	Strong Axis	Fixed	Pinned	
15	2B16	N38	N39	W10x22	A992	Typical	Gravity	Strong Axis	Fixed	Pinned	
16	2B17	N42	N43	W10x22	A992	Typical	Gravity	Strong Axis	Fixed	Pinned	
17	2B22	N54	N55	W10x22	A992	Typical	Gravity	Strong Axis	Fixed	Pinned	
18	2B21	N56	N57	W10x22	A992	Typical	Gravity	Strong Axis	Fixed	Pinned	
19	2B23	N58	N59	W10x22	A992	Typical	Gravity	Strong Axis	Fixed	Pinned	
20	2B24	N62	N63	W10x22	A992	Typical	Gravity	Strong Axis	Fixed	Pinned	
21	2B20	N64	N65	W10x22	A992	Typical	Gravity	Strong Axis	Fixed	Pinned	
22	2B19	N130	N181	W10x22	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
23	2B25	N182	N129	W10x22	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
24	2J2-1	N82	N83	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
25	2J2-2	N84	N85	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
26	2J2-3	N86	N87	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
27	2J2-4	N88	N89	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
28	2J2-5	N90	N91	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
29	2J2-6	N92	N93	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
30	2J2-7	N94	N95	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
31	2J2-8	N96	N97	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
32	2J2-9	N98	N99	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
33	2J2-10	N100	N101	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
34	2J2-11	N102	N103	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
35	2J2-12	N104	N105	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
36	2J1-1	N106	N82	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
37	2J1-2	N107	N84	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
38	2J1-3	N108	N86	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
39	2J1-4	N110	N88	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
40	2J1-5	N111	N90	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
41	2J1-6	N112	N92	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
42	2J1-7	N115	N94	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
43	2J1-8	N116	N96	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
44	2J1-9	N117	N98	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
45	2J1-10	N119	N100	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
46	2J1-11	N120	N102	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
47	2J1-12	N121	N104	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
48	2J2-13	N109	N138	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
49	2J2-14	N124	N125	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
50	2J1-13	N145	N146	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
51	2J1-14	N132	N133	Red I45x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
52	2J3-37	N113	N161	Red I65x 14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	

## Beam Primary Data : Level 3 18'-4 1/4" (Continued)

	Label	Start ...	End P...	Shape	Material	Design Rules	Functi...	Orientation	Start ...	End R...	Outrig...
53	2J3-38	N163	N114	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
54	2J3-1	N165	N166	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
55	2J3-2	N167	N168	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
56	2J3-3	N169	N170	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
57	2J3-4	N171	N172	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
58	2J3-5	N173	N174	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
59	2J3-6	N175	N176	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
60	2J3-7	N177	N178	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
61	2J3-8	N179	N180	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
62	2J3-9	N184	N185	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
63	2J3-10	N186	N187	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
64	2J3-11	N188	N189	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
65	DUMMY3	N190	N61	2X8	Spruce-Pine-Fir	Typical	Gravity	Strong Axis	Pinned	Pinned	
66	2J3-12	N191	N192	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
67	DUMMY2	N129	N196	2X8	Spruce-Pine-Fir	Typical	Gravity	Strong Axis	Pinned	Pinned	
68	DUMM1	N130	N198	2X8	Spruce-Pine-Fir	Typical	Gravity	Strong Axis	Pinned	Pinned	
69	2J3-13	N157	N159	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
70	2J3-14	N199	N200	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
71	2J3-15	N201	N202	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
72	2J3-16	N203	N204	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
73	2J3-17	N205	N206	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
74	2J3-18	N207	N208	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
75	2J3-19	N209	N203	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
76	2J3-20	N210	N205	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
77	2J3-21	N211	N207	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
78	2J3-22	N212	N209	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
79	2J3-23	N213	N210	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
80	2J3-24	N214	N211	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
81	2J3-25	N215	N212	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
82	2J3-26	N216	N213	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
83	2J3-27	N217	N214	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
84	2J3-28	N218	N219	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
85	2J3-29	N220	N221	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
86	2J3-30	N222	N223	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
87	2J3-31	N204	N157	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
88	2J3-32	N206	N199	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
89	2J3-33	N208	N201	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
90	2J3-34	N219	N215	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
91	2J3-35	N221	N216	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
92	2J3-36	N223	N217	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
93	2J3-100	N224	N225	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	

## Beam Primary Data : TOC - 12'-1 1/4"

Label	Start ...	End P...	Shape	Material	Design Rules	Functi...	Orientation	Start ...	End R...	Outrig...
No Data to Print ...										

## Beam Primary Data : Level 2 8'-11 1/4"

	Label	Start ...	End P...	Shape	Material	Design Rules	Functi...	Orientation	Start ...	End R...	Outrig...
1	1B9	N10	N9	2-1.75X14FS	2.0E Microllam...	Typical	Gravity	Strong Axis	Pinned	Pinned	
2	1B8	N8	N7	2-1.75X14FS	2.0E Microllam...	Typical	Gravity	Strong Axis	Pinned	Pinned	
3	1B7	N129	N130	W12x26	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	

## Beam Primary Data : Level 2 8'-11 1/4" (Continued)

	Label	Start ...	End P...	Shape	Material	Design Rules	Functi...	Orientation	Start ...	End R...	Outrig...
4	1B6	N15	N17	W12x35	A992	Typical	Lateral	Strong Axis	Pinned	Pinned	
5	1B1	N38	N39	W12x72	A992	Typical	Lateral	Strong Axis	Pinned	Pinned	
6	1J2-1	N40	N41	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
7	1J2-2	N42	N43	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
8	1J2-3	N44	N45	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
9	1J2-4	N46	N47	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
10	1J2-5	N48	N49	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
11	1J2-6	N50	N51	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
12	1J2-7	N52	N53	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
13	1J2-8	N54	N55	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
14	1J1-1	N56	N40	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
15	1J1-2	N57	N42	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
16	1J1-3	N58	N44	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
17	1J1-4	N59	N46	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
18	1J1-5	N60	N48	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
19	1J1-6	N61	N50	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
20	1J1-7	N62	N52	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
21	1J1-8	N63	N54	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
22	1J1-9	N67	N68	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
23	1J1-10	N66	N69	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
24	1J2-9	N314	N315	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
25	1J2-10	N72	N73	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
26	1B2	N124	N123	W12x30	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
27	1B5B	N16	N9	2-1.75X14FS	2.0E Microllam...	Typical	Gravity	Strong Axis	Pinned	Pinned	
28	1B5A	N7	N18	2-1.75X14FS	2.0E Microllam...	Typical	Gravity	Strong Axis	Pinned	Pinned	
29	1B10	N108	N113	W12x30	A992	Typical	Gravity	Strong Axis	Pinned	Fixed	
30	1B11	N110	N112	W12x30	A992	Typical	Gravity	Strong Axis	Pinned	Fixed	
31	1B3	N13	N14	W12x26	A992	Typical	Gravity	Strong Axis	Fixed	Fixed	
32	1B13	N102	N13	W12x26	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
33	1B12	N103	N14	W12x26	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
34	1J3-15	N114	N115	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
35	1J3-16	N118	N114	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
36	1J3-17	N119	N116	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
37	1J3-18	N120	N118	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
38	1J3-19	N121	N119	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
39	1J3-20	N126	N131	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
40	1J3-21	N132	N133	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
41	1J3-22	N134	N122	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
42	1J3-23	N135	N126	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
43	1J3-24	N136	N132	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
44	1J3-25	N137	N134	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
45	1J3-26	N138	N135	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
46	1J3-27	N139	N136	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
47	1J3-28	N116	N117	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
48	1J3-29	N122	N125	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
49	DUMMY1	N123	N127	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
50	DUMMY2	N128	N124	Red I45x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
51	1B4	N177	N176	W8x18	A992	Typical	Gravity	Strong Axis	Pinned	Pinned	
52	1J3-31	N177	N140	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
53	1J3-32	N141	N176	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
54	1J3-30	N142	N143	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
55	1J3-55	N97	N98	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	

## Beam Primary Data : Level 2 8'-11 1/4" (Continued)

	Label	Start ...	End P...	Shape	Material	Design Rules	Functi...	Orientation	Start ...	End R...	Outrig...
56	1J3-56	N99	N100	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
57	1J3-57	N101	N104	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
58	1J3-58	N105	N144	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
59	1J3-59	N145	N146	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
60	1J3-60	N147	N148	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
61	1J3-61	N149	N150	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
62	1J3-62	N151	N152	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
63	1J3-63	N153	N154	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
64	1J3-64	N155	N156	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
65	1J3-65	N157	N158	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
66	1J3-66	N159	N160	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
67	1J3-67	N161	N162	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
68	1J3-68	N163	N164	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
69	1J3-69	N165	N166	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	
70	1J3-70	N167	N168	Red I65x14	Wood Product...	Typical	Gravity	Strong Axis	Pinned	Pinned	

## Beam Primary Data : Level 1 - 0'-0"

Label	Start ...	End P...	Shape	Material	Design Rules	Functi...	Orientation	Start ...	End R...	Outrig...
No Data to Print ...										

## Wood Wall Panel Parameters

	Label	Top Plate	Sill Plate	Studs	Min Stud Sp...	Max Stud Sp...	Green Lumb...	Header Size	Header Matl
1	Typical	2-2X6	2X6	2X6	16	16		4-2X6	Same as Wall
2	2"	2-2X6	2X6	2X6	16	16		4-2X6	Same as Wall
3	3"	2-2X6	2X6	2X6	16	16		4-2X6	Same as Wall
4	4"	2-2X6	2X6	2X6	16	16		4-2X6	Same as Wall
5	6"	2-2X6	2X6	2X6	16	16		4-2X6	Same as Wall

## Additional Wood Wall Panel Parameters

	Label	Schedule	Min. Panel...	Max. Pane...	Double Sid...	Max. Nail ...	Min. Nail S...	HD Chords	HD Chord ...	Hold Down
1	Typical	AWC 2015 PL...	.295	.61	No	6-in.	2-in.	2-2X6	Same as ...	HDU DF-SP
2	2"	S1_15/32_8d@2	.295	.61	No	2-in.	2-in.	2-2X6	Same as ...	HDU DF-SP
3	3"	S1_15/32_8d@3	.295	.61	No	3-in.	3-in.	2-2X6	Same as ...	HDU DF-SP
4	4"	S1_15/32_8d@4	.295	.61	No	4-in.	4-in.	2-2X6	Same as ...	HDU DF-SP
5	6"	S1_15/32_8d@6	.295	.61	No	6-in.	6-in.	2-2X6	Same as ...	HDU DF-SP

## Wall Panel Parameters

	Label	Top Floor	Bottom Floor	Start...End ...	Material ...	Material ...	Thickn...	Function	Design R...	Distance Belo...	Parape...
1	Conc 1	TOC - 20'-4 1/2"	Level 1 - 0'-...	N9 N10	Concrete	Conc25N..	10	Lateral	Typical	8.938	NA
2	Conc 2	Level 2 8'-11 1/4"	Level 1 - 0'-...	N25 N26	Concrete	Conc25N..	10	Lateral	Typical	8.938	NA
3	Conc 3	Level 2 8'-11 1/4"	Level 1 - 0'-...	N175 N129	Concrete	Conc25N..	10	Lateral	Typical	8.938	NA
4	WP1	Roof 40'-5 9/16"	Level 4 - 28...	N104 N48	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	11.932	Default...
5	WP2	Roof 40'-5 9/16"	Level 4 - 28...	N106 N47	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	11.932	Default...
6	A 4th	Level 4 - 28'-10...	TOC - 20'-4...	N278 N277	Wood	Spruce-P..	5.5 (st...	Lateral	3"	8.5	NA
7	A Roof	Roof 40'-5 9/16"	Level 4 - 28...	N48 N47	Wood	Spruce-P..	5.5 (st...	Lateral	6"	11.932	Default...
8	WP3	Roof 40'-5 9/16"	Level 4 - 28...	N100 N104	Wood	Spruce-P..	5.5 (st...	Gravity	4"	11.932	Default...
9	WP4	Roof 40'-5 9/16"	Level 4 - 28...	N102 N106	Wood	Spruce-P..	5.5 (st...	Gravity	4"	11.932	Default...
10	WP5	Level 4 - 28'-10...	Level 2 8'-1...	N284 N315	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	3.167	NA
11	WP6	Level 4 - 28'-10...	Level 2 8'-1...	N324 N284	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	3.167	NA
12	D 4th	Level 4 - 28'-10...	Level 3 18'-...	N9 N7	Wood	Spruce-P..	5.5 (st...	Lateral	6"	2.021	NA

## Wall Panel Parameters (Continued)

	Label	Top Floor	Bottom Floor	Start...	End ...	Material ...	Material ...	Thickn...	Function	Design R...	Distance Belo...	Parape...
13	D 3rd	Level 3 18'-4 1/4"	Level 2 8'-1...	N9	N7	Wood	Spruce-P..	5.5 (st...	Lateral	6"	3.167	NA
14	Conc 4	TOC - 20'-4 1/2"	Level 1 - 0'-...	N9	N13	Concrete	Conc25N..	10	Lateral	Typical	8.938	NA
15	Conc 5	TOC - 20'-4 1/2"	Level 1 - 0'-...	N10	N14	Concrete	Conc25N..	10	Lateral	Typical	8.938	NA
16	Conc 6	TOC - 12'-1 1/4"	Level 1 - 0'-...	N24	N25	Concrete	Conc25N..	10	Lateral	Typical	8.938	NA
17	Conc 7	TOC - 12'-1 1/4"	Level 1 - 0'-...	N27	N26	Concrete	Conc25N..	10	Lateral	Typical	8.938	NA
18	WP7	Level 4 - 28'-10..	TOC - 20'-4...	N1	N87	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	8.5	NA
19	WP8	Level 4 - 28'-10..	TOC - 20'-4...	N2	N103	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	8.5	NA
20	WP9	Level 3 18'-4 1/4"	TOC - 12'-1...	N193	N162	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	6.25	NA
21	WP10	Level 3 18'-4 1/4"	TOC - 12'-1...	N164	N194	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	6.25	NA
22	WP11	Level 4 - 28'-10..	Level 3 18'...	N282	N87	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	2.021	NA
23	WP12	Level 4 - 28'-10..	Level 3 18'...	N280	N103	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	2.021	NA
24	D Second	Level 2 8'-11 1/4"	Level 1 - 0'-...	N9	N7	Wood	Spruce-P..	5.5 (st...	Lateral	6"	8.938	NA
25	WP13	Roof 40'-5 9/16"	Level 4 - 28...	N100	N96	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	11.932	Default...
26	WP14	Roof 40'-5 9/16"	Level 4 - 28...	N96	N10	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	11.932	Default...
27	WP15	Roof 40'-5 9/16"	Level 4 - 28...	N102	N98	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	11.932	Default...
28	WP16	Roof 40'-5 9/16"	Level 4 - 28...	N98	N11	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	11.932	Default...
29	WP17	Roof 40'-5 9/16"	Level 4 - 28...	N10	N6	Wood	Spruce-P..	5.5 (st...	Gravity	2"	11.932	Default...
30	WP18	Roof 40'-5 9/16"	Level 4 - 28...	N11	N7	Wood	Spruce-P..	5.5 (st...	Gravity	2"	11.932	Default...
31	WP19	Level 4 - 28'-10..	Level 3 18'...	N15	N13	Wood	Spruce-P..	5.5 (st...	Gravity	6"	2.021	NA
32	WP20	Level 4 - 28'-10..	Level 3 18'...	N16	N5	Wood	Spruce-P..	5.5 (st...	Gravity	6"	2.021	NA
33	WP21	Level 4 - 28'-10..	Level 3 18'...	N282	N15	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	2.021	NA
34	WP22	Level 4 - 28'-10..	Level 3 18'...	N280	N16	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	2.021	NA
35	WP23	Level 3 18'-4 1/4"	TOC - 12'-1...	N127	N196	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	6.25	NA
36	WP24	Level 3 18'-4 1/4"	TOC - 12'-1...	N128	N198	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	6.25	NA
37	WP25	Level 3 18'-4 1/4"	TOC - 12'-1...	N127	N161	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	6.25	NA
38	WP26	Level 3 18'-4 1/4"	TOC - 12'-1...	N161	N13	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	6.25	NA
39	WP27	Level 3 18'-4 1/4"	TOC - 12'-1...	N13	N162	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	6.25	NA
40	WP28	Level 3 18'-4 1/4"	TOC - 12'-1...	N128	N163	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	6.25	NA
41	WP29	Level 3 18'-4 1/4"	TOC - 12'-1...	N163	N16	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	6.25	NA
42	WP30	Level 3 18'-4 1/4"	TOC - 12'-1...	N16	N164	Wood	Spruce-P..	5.5 (st...	Gravity	Typical	6.25	NA

## Gravity Loading

## Floors

	Label	Elevation[ft]	Area Loa...	Floor...	Deck Default	Dec...	Parent De...	Bot Rebar ...	Contin...	Top R...Ina...	S...	Spli...	No ...	Pa...
1	Roof 40'-5 ...	40.807	Roof	Floor...	Roof	90	None	N/A	N/A		N/A	.0...	Mo...	0
2	Level 4 - 2...	28.875	Interior F...	Floor...	Interior Floor	0	None	N/A	N/A		N/A	.0...	Mo...	0
3	TOC - 20'-...	20.375	Interior F...	Floor...	Interior Floor	0	None	N/A	N/A		N/A	.0...	Mo...	0
4	Level 3 18'...	18.354	Interior F...	Floor...	Interior Floor	0	None	N/A	N/A		N/A	.0...	Mo...	0
5	TOC - 12'-...	12.104	Interior F...	Floor...	Interior Floor	0	None	N/A	N/A		N/A	3...	Mo...	0
6	Level 2 8'...	8.938	Interior F...	Floor...	Interior Floor	0	None	N/A	N/A		N/A	.0...	Mo...	0
7	Level 1 - 0'...	0	Interior F...	Floor...	Interior Floor	0	None	N/A	N/A		N/A	.0...	Mo...	0

## Deck General Properties

	Label	Material Type	Deck	Unbraced[ft]	Max Spa...
1	Interior Floor	Wood Deck	1 in	1	4
2	Paver Roof	Wood Deck	1 in	1	4
3	Roof	Wood Deck	1 in	1	4

## Uniform Area Loads

	Label	Additive	PreDL[psf]	PostDL[psf]	LL[psf]	LL Type	VL[psf]	Dyn Load[psf]
1	Interior Floor				40	LL-Non		
2	Paver Roof Snow				192	SL		57.6
3	Roof				159.744	SL		57.6
4	Paver Roof Live	Yes			40	LL-Non		
5	+EQ Roof	Yes				LL-Non		6.5
6	+EQ L4 Ext	Yes				LL-Non		4.5
7	+EQ L4 Int	Yes				LL-Non		11
8	+EQ L3 South	Yes				LL-Non		
9	+EQ L3 North	Yes				LL-Non		30

## Tapered Area Loads : Roof 40'-5 9/16"

	A Point	B Point	C Point	D Point	Base Mag[psf]	Peak Mag[psf]	Category	Direction
	No Data to Print ...							

## Tapered Area Loads : Level 4 - 28'-10 1/2"

	A Point	B Point	C Point	D Point	Base Mag[psf]	Peak Mag[psf]	Category	Direction
1	N323	N322	N5	N13	0	90	SL	PY

## Tapered Area Loads : TOC - 20'-4 1/2"

	A Point	B Point	C Point	D Point	Base Mag[psf]	Peak Mag[psf]	Category	Direction
	No Data to Print ...							

## Ta

This load is 30% of the roof snow load and only contributes to the mass for seismic load calculations completed in RISA3D. The other dynamic loads in this column are added to simulate the correct seismic mass at each level based on hand calculations.

## Tapered Area Loads : TOC - 12'-1 1/4"

	A Point	B Point	C Point	D Point	Base Mag[psf]	Peak Mag[psf]	Category	Direction
	No Data to Print ...							

### ***Tapered Area Loads : Level 2 8'-11 1/4"***

A Point	B Point	C Point	D Point	Base Mag[psf]	Peak Mag[psf]	Category	Direction
No Data to Print ...							

### ***Tapered Area Loads : Level 1 - 0'-0"***

A Point	B Point	C Point	D Point	Base Mag[psf]	Peak Mag[psf]	Category	Direction
No Data to Print ...							

### ***Combinations***

	Label	Sol...	Cat...	Fa...	Cat...	Fa...	Cat...	Fa...	Cat...	Fa...	Cat...	Fac...	Cat...	Fac...	Cat...	Fac...	Cat...	Fac...	Cat...	Fac...
1	1 Dead	Yes	DL	1																
2	2 Snow	Yes	SL	1																
3	3 Live	Yes	LL	1																
4	4 ASCE Strength ...	Yes	DL	1.4																
5	5 ASCE Strength ...	Yes	DL	1.2	LL	1.6	LLS	1.6												
6	6 ASCE Strength ...	Yes	DL	1.2	LL	1.6	LLS	1.6	SL	.5	SLN	.5								
7	7 ASCE Strength ...	Yes	DL	1.2	LL	.5	LLS	1												
8	8 ASCE Strength ...	Yes	DL	1.2	SL	1.6	SLN	1.6	LL	.5	LLS	1								
9	9 ASCE ASD 1 Po...	Yes	DL	1																
10	10 ASCE ASD 2 P...	Yes	DL	1	LL	1	LLS	1												
11	11 ASCE ASD 3 (...)	Yes	DL	1	SL	1	SLN	1												
12	12 ASCE ASD 4 (...)	Yes	DL	1	LL	.75	LLS	.75												
13	13 ASCE ASD 4 (...)	Yes	DL	1	LL	.75	LLS	.75	SL	.75	SLN	.75								



**Gravity Member and Wall Utilization**

### Beam Code Summary for Hot Rolled : Roof 40'-5 9/16"

	Label	Size	Explicit	Studs	Camb.	Material	Bending	Check	Loc[ft]	LC	Defl Ch...	Loc[ft]	Cat	Shear ...	Loc[ft]	LC
1	RB1	W14x22	Yes		0	A992	.241	0	8	.079	7.42	LL	.083	0	8	
2	RB4	W14x22	Yes		0	A992	.03	3.069	8	.036	0	LL	.024	4.83	8	
3	RB3	W14x22	Yes		0	A992	.03	1.761	8	.036	0	LL	.024	0	8	
4	RB16	W10x22	Yes		0	A992	.004	.855	8	.036	0	LL	.012	0	8	
5	RB13	W10x22	Yes		0	A992	.004	.855	8	.036	0	LL	.012	0	8	
6	RB5	W14x53	Yes		0	A992	.603	12.25	8	.928	12.25	LL	.199	24.5	8	
7	RB12	W10x22	Yes		0	A992	.003	.855	8	.036	0	LL	.011	1.71	8	
8	RB17	W10x22	Yes		0	A992	.003	.855	8	.036	0	LL	.011	1.71	8	
9	RB15	W10x22	Yes		0	A992	.004	.855	8	.036	0	LL	.012	0	8	
10	RB14	W10x22	Yes		0	A992	.004	.855	8	.036	0	LL	.012	0	8	
11	RB19	W10x22	Yes		0	A992	.023	2.169	8	.036	0	LL	.026	0	8	
12	RB18	W10x22	Yes		0	A992	.023	2.081	8	.036	0	LL	.026	4.25	8	

### Beam Code Summary for Hot Rolled : Level 4 - 28'-10 1/2"

	Label	Size	Explicit	Studs	Camb.	Material	Bending	Check	Loc[ft]	LC	Defl Ch...	Loc[ft]	Cat	Shear ...	Loc[ft]	LC
1	3B11	W14x22	Yes		0	A992	.024	0	5	.036	0	LL	.01	14.84	6	
2	3B13	W8x18	Yes		0	A992	.005	2.415	5	.036	0	LL	.005	0	5	
3	3B12	W8x18	Yes		0	A992	.005	2.415	5	.036	0	LL	.005	0	5	
4	3B3	W16x45	Yes		0	A992	.68	12.25	8	.985	12.25	LL	.196	0	8	
5	3B1	W16x36	Yes		0	A992	.503	11.995	8	.733	12.25	LL	.129	24.5	8	
6	3B2	W12x35	Yes		0	A992	.479	20.787	8	.292	10.394	LL	.242	0	8	
7	3B4	W8x31	Yes		0	A992	.483	8	8	.898	8	LL	.207	0	8	
8	3B5	W8x18	Yes		0	A992	.049	3.254	8	.036	3.254	LL	.035	0	8	
9	3B6	W8x18	Yes		0	A992	.049	3.254	8	.036	3.254	LL	.035	0	8	
10	3B8	W16x36	Yes		0	A992	.76	17.042	8	.409	20.974	LL	.302	16.7...	8	
11	3B7	W16x36	Yes		0	A992	.759	17.042	8	.409	20.974	LL	.304	16.7...	8	
12	3B20	W10x22	Yes		0	A992	.037	6.125	5	.036	0	LL	.016	0	5	
13	3B19	W10x22	Yes		0	A992	.036	5.997	5	.036	0	LL	.016	0	5	
14	3B9	W16x45	Yes		0	A992	.502	12.505	8	.719	12.25	LL	.143	0	8	
15	3B30	W12x26	Yes		0	A992	.009	2.27	8	.036	0	LL	.014	0	8	
16	3B29	W12x26	Yes		0	A992	.009	2.27	8	.036	0	LL	.014	0	8	
17	3B28	W12x26	Yes		0	A992	.016	2.317	8	.036	0	LL	.019	4.54	8	
18	3B31	W12x26	Yes		0	A992	.013	2.317	8	.036	0	LL	.016	4.54	8	
19	3B22	W10x22	Yes		0	A992	0	.855	4	.036	0	LL	0	0	4	
20	3B23	W10x22	Yes		0	A992	0	.855	4	.036	0	LL	0	1.71	4	
21	3B24	W10x22	Yes		0	A992	0	.855	4	.036	0	LL	0	1.71	4	
22	3B25	W10x22	Yes		0	A992	0	.855	4	.036	0	LL	0	0	4	
23	3B14	W8x18	Yes		0	A992	.061	1.948	8	.036	0	LL	.056	0	8	
24	3B15	W8x18	Yes		0	A992	.061	1.948	8	.036	0	LL	.056	0	8	

### Beam Code Summary for Hot Rolled : TOC - 20'-4 1/2"

Label	Size	Explicit	Studs	Camb.	Material	Bending	Check	Loc[ft]	LC	Defl Ch...	Loc[ft]	Cat	Shear ...	Loc[ft]	LC
No Data to Print ...															

### Beam Code Summary for Hot Rolled : Level 3 18'-4 1/4"

	Label	Size	Explicit	Studs	Camb.	Material	Bending	Check	Loc[ft]	LC	Defl Ch...	Loc[ft]	Cat	Shear ...	Loc[ft]	LC
1	2B1	W10x26	Yes		0	A992	.094	0	5	.039	10.394	DL+...	.036	20.7...	6	
2	2B6	W14x22	Yes		0	A992	.025	0	6	.036	0	LL	.01	14.84	5	
3	2B10	W8x18	Yes		0	A992	.005	2.415	5	.036	0	LL	.005	0	5	
4	2B9	W8x18	Yes		0	A992	.005	2.415	5	.036	0	LL	.005	0	5	

### Beam Code Summary for Hot Rolled : Level 3 18'-4 1/4" (Continued)

	Label	Size	Explicit	Studs	Camb.	Material	Bending Check	Loc[ft]	LC	Defl Ch...	Loc[ft]	Cat	Shear ...	Loc[ft]	LC
5	2B3	W10x26	Yes		0	A992	.215	12.25	5	.381	12.25	DL+...	.049	0	5
6	2B4	W8x18	Yes		0	A992	.063	8	5	.095	8	DL+...	.018	0	5
7	2B8	W10x22	Yes		0	A992	.037	6.253	5	.036	0	LL	.016	0	5
8	2B7	W10x22	Yes		0	A992	.036	5.997	5	.036	0	LL	.016	0	5
9	2B14	W10x22	Yes		0	A992	0	.855	4	.036	0	LL	0	0	4
10	2B15	W10x22	Yes		0	A992	0	.855	4	.036	0	LL	0	1.71	4
11	2B16	W10x22	Yes		0	A992	0	.855	4	.036	0	LL	0	1.71	4
12	2B17	W10x22	Yes		0	A992	0	.855	4	.036	0	LL	0	0	4
13	2B22	W10x22	Yes		0	A992	.013	2.554	5	.036	0	LL	.014	4.54	5
14	2B21	W10x22	Yes		0	A992	.014	2.554	5	.036	0	LL	.014	4.54	5
15	2B23	W10x22	Yes		0	A992	.013	2.554	5	.036	0	LL	.014	4.54	5
16	2B24	W10x22	Yes		0	A992	.008	2.554	5	.036	0	LL	.009	4.54	5
17	2B20	W10x22	Yes		0	A992	.01	2.554	5	.036	0	LL	.01	4.54	5
18	2B19	W10x22	Yes		0	A992	.005	2.554	5	.036	0	LL	.005	4.54	5
19	2B25	W10x22	Yes		0	A992	.005	1.986	5	.036	0	LL	.006	0	5

### Beam Code Summary for Hot Rolled : TOC - 12'-1 1/4"

Label	Size	Explicit	Studs	Camb.	Material	Bending Check	Loc[ft]	LC	Defl Ch...	Loc[ft]	Cat	Shear ...	Loc[ft]	LC
No Data to Print ...														

### Beam Code Summary for Hot Rolled : Level 2 8'-11 1/4"

	Label	Size	Explicit	Studs	Camb.	Material	Bending Check	Loc[ft]	LC	Defl Ch...	Loc[ft]	Cat	Shear ...	Loc[ft]	LC
1	1B7	W12x26	Yes		0	A992	.401	4.884	5	.254	5.21	DL+...	.237	0	5
2	1B6	W12x35	Yes		0	A992	.376	19.651	6	.085	12.25	DL+...	.092	19.6...	5
3	1B1	W12x72	Yes		0	A992	.099	2.042	8	.27	12.505	LL	.142	0	8
4	1B2	W12x30	Yes		0	A992	.578	15.468	5	.919	10.536	DL+...	.3	21.5...	5
5	1B10	W12x30	Yes		0	A992	.317	3.54	5	.239	8.289	DL+...	.149	3.454	5
6	1B11	W12x30	Yes		0	A992	.342	3.54	5	.259	8.289	DL+...	.16	3.454	5
7	1B3	W12x26	Yes		0	A992	.336	4.594	5	.121	0	DL+...	.051	4.849	4
8	1B13	W12x26	Yes		0	A992	.021	3.678	5	.036	0	LL	.022	6.539	5
9	1B12	W12x26	Yes		0	A992	.02	3.678	5	.036	0	LL	.021	6.539	5
10	1B4	W8x18	Yes		0	A992	.066	8	5	.099	8	DL+...	.019	0	5

### Beam Code Summary for Wood : Roof 40'-5 9/16"

	Label	Size	Explicit	Material	Bending Check	Loc[ft]	LC	Defl Ch...	Loc[ft]	Cat	Shear Check	Loc[ft]	LC
1	RB2	4-1.75X16FS	Yes	2.0E ...	.234	8	11	.271	8	LL	.164	0	11
2	RB10	2-1.75X14FS	Yes	2.0E ...	.061	2.83	11	.036	0	LL	.101	0	11
3	RB9	2-1.75X14FS	Yes	2.0E ...	.061	2.83	11	.036	0	LL	.101	5.66	11
4	RB8	2-1.75X14FS	Yes	2.0E ...	.058	2.83	11	.036	0	LL	.095	0	11
5	RB11	2-1.75X14FS	Yes	2.0E ...	.058	2.83	11	.036	0	LL	.095	5.66	11

### Beam Code Summary for Wood : Level 4 - 28'-10 1/2"

	Label	Size	Explicit	Material	Bending Check	Loc[ft]	LC	Defl Ch...	Loc[ft]	Cat	Shear Check	Loc[ft]	LC
1	3B36	2-1.75X11.875FS	Yes	2.0E ...	.013	2.387	10	.036	0	LL	.026	3.58	10
2	3B35	2-1.75X11.875FS	Yes	2.0E ...	.013	2.387	10	.036	0	LL	.026	3.58	10
3	3B10B	2-1.75X11.875FS	Yes	2.0E ...	.022	2.415	10	.036	0	LL	.041	0	10
4	3B10A	2-1.75X11.875FS	Yes	2.0E ...	.022	2.415	10	.036	0	LL	.041	0	10
5	3B18B	3-1.75X14FS	Yes	2.0E ...	.282	3.916	11	.182	3.916	LL	.338	7.833	11
6	3B18A	3-1.75X14FS	Yes	2.0E ...	.343	4.695	11	.247	4.333	LL	.392	0	11
7	3B33	2-1.75X11.875FS	Yes	2.0E ...	.209	4.145	11	.199	4.145	LL	.216	8.289	11

### Beam Code Summary for Wood : Level 4 - 28'-10 1/2" (Continued)

	Label	Size	Explicit	Material	Bending Check	Loc[ft]	LC	Defl Ch...	Loc[ft]	Cat	Shear Check	Loc[ft]	LC
8	3B34	2-1.75X11.875FS	Yes	2.0E ...	.17	4.145	11	.162	4.145	LL	.178	8.289	11
9	DUMMY3	2X8	Yes	Spruc...	0	.05	9	.036	0	LL	0	0	9
10	DUMMY2	2X8	Yes	Spruc...	.089	.934	11	.036	0	LL	.222	0	11
11	DUMMY1	2X8	Yes	Spruc...	.086	.922	11	.036	0	LL	.219	0	11

### Beam Code Summary for Wood : TOC - 20'-4 1/2"

	Label	Size	Explicit	Material	Bending Check	Loc[ft]	LC	Defl Ch...	Loc[ft]	Cat	Shear Check	Loc[ft]	LC
No Data to Print ...													

### Beam Code Summary for Wood : Level 3 18'-4 1/4"

	Label	Size	Explicit	Material	Bending Check	Loc[ft]	LC	Defl Ch...	Loc[ft]	Cat	Shear Check	Loc[ft]	LC
1	2B12	2-1.75X14FS	Yes	2.0E ...	.01	2.387	10	.036	0	LL	.022	3.58	10
2	2B5B	2-1.75X14FS	Yes	2.0E ...	.011	2.415	10	.036	0	LL	.025	0	10
3	2B5A	2-1.75X14FS	Yes	2.0E ...	.011	2.415	10	.036	0	LL	.025	0	10
4	2B11	2-1.75X14FS	Yes	2.0E ...	.01	2.387	10	.036	0	LL	.022	3.58	10
5	DUMMY3	2X8	Yes	Spruc...	0	.05	9	.036	0	LL	0	0	9
6	DUMMY2	2X8	Yes	Spruc...	.019	.934	10	.036	0	LL	.048	1.869	10
7	DUMM1	2X8	Yes	Spruc...	.019	.922	10	.036	0	LL	.047	0	10

### Beam Code Summary for Wood : TOC - 12'-1 1/4"

	Label	Size	Explicit	Material	Bending Check	Loc[ft]	LC	Defl Ch...	Loc[ft]	Cat	Shear Check	Loc[ft]	LC
No Data to Print ...													

### Beam Code Summary for Wood : Level 2 8'-11 1/4"

	Label	Size	Explicit	Material	Bending Check	Loc[ft]	LC	Defl Ch...	Loc[ft]	Cat	Shear Check	Loc[ft]	LC
1	1B9	2-1.75X14FS	Yes	2.0E ...	.01	2.387	10	.036	0	LL	.022	3.58	10
2	1B8	2-1.75X14FS	Yes	2.0E ...	.01	2.387	10	.036	0	LL	.022	3.58	10
3	1B5B	2-1.75X14FS	Yes	2.0E ...	.011	2.415	10	.036	0	LL	.024	0	10
4	1B5A	2-1.75X14FS	Yes	2.0E ...	.011	2.415	10	.036	0	LL	.024	0	10

### Beam Design for Wood Products : Roof 40'-5 9/16"

	Label	Size	Explicit	Vmax[k]	V'[k]	Mmax[k-...	M'r[k-ft]	Max Start Re...	Max End ...	Min Start R...	Min End Rea...
1	RJ1-1	Red 190x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
2	RJ1-2	Red 190x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
3	RJ1-3	Red 190x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
4	RJ1-4	Red 190x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
5	RJ1-5	Red 190x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
6	RJ1-6	Red 190x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
7	RJ1-7	Red 190x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
8	RJ1-8	Red 190x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
9	RJ1-9	Red 190x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
10	RJ1-10	Red 190x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
11	RJ1-11	Red 190x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
12	RJ1-12	Red 190x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
13	RJ1-13	Red 190x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
14	RJ1-14	Red 190x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
15	RJ1-15	Red 190x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
16	RJ1-16	Red 190x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
17	RJ1-17	Red 190x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161

## Beam Design for Wood Products : Roof 40'-5 9/16" (Continued)

	Label	Size	Explicit	Vmax[k]	V'[k]	Mmax[k-...	M'r[k-ft]	Max Start Re...	Max End ...	Min Start R...	Min End Rea...
18	RJ1-18	Red I90x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
19	RJ1-19	Red I90x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
20	RJ1-20	Red I90x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
21	RJ1-21	Red I90x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
22	RJ1-22	Red I90x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
23	RJ1-23	Red I90x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
24	RJ1-24	Red I90x14	Yes	-1.469	2.921	-6.135	13.144	1.469	1.469	.161	.161
25	RJ2-1	Red I45x14	Yes	.514	2.254	-.727	6.405	.514	.514	.05	.05
26	RJ2-2	Red I45x14	Yes	.514	2.254	-.727	6.405	.514	.514	.05	.05
27	RJ2-3	Red I45x14	Yes	.629	2.254	-.89	6.405	.629	.629	.06	.06
28	RJ2-4	Red I45x14	Yes	.629	2.254	-.89	6.405	.629	.629	.06	.06
29	RJ2-5	Red I45x14	Yes	.629	2.254	-.89	6.405	.629	.629	.06	.06
30	RJ2-6	Red I45x14	Yes	.629	2.254	-.89	6.405	.629	.629	.06	.06
31	RJ2-7	Red I45x14	Yes	.629	2.254	-.89	6.405	.629	.629	.06	.06
32	RJ2-8	Red I45x14	Yes	.629	2.254	-.89	6.405	.629	.629	.06	.06
33	RJ2-9	Red I45x14	Yes	.629	2.254	-.89	6.405	.629	.629	.06	.06
34	RJ2-10	Red I45x14	Yes	.629	2.254	-.89	6.405	.629	.629	.06	.06
35	RJ2-11	Red I45x14	Yes	.514	2.254	-.727	6.405	.514	.514	.05	.05
36	RJ2-12	Red I45x14	Yes	.514	2.254	-.727	6.405	.514	.514	.05	.05
37	RJ2-13	Red I45x14	Yes	.294	2.254	-.258	6.405	.294	.294	.029	.029
38	RJ2-14	Red I45x14	Yes	.294	2.254	-.258	6.405	.294	.294	.029	.029
39	RJ2-15	Red I45x14	Yes	.294	2.254	-.258	6.405	.294	.294	.029	.029
40	RJ2-16	Red I45x14	Yes	.294	2.254	-.258	6.405	.294	.294	.029	.029
41	RJ2-17	Red I45x14	Yes	.294	2.254	-.258	6.405	.294	.294	.029	.029
42	RJ2-18	Red I45x14	Yes	.294	2.254	-.258	6.405	.294	.294	.029	.029
43	RJ2-19	Red I45x14	Yes	.294	2.254	-.258	6.405	.294	.294	.029	.029
44	RJ2-20	Red I45x14	Yes	.294	2.254	-.258	6.405	.294	.294	.029	.029
45	RJ2-21	Red I45x14	Yes	.294	2.254	-.258	6.405	.294	.294	.029	.029
46	RJ2-22	Red I45x14	Yes	.294	2.254	-.258	6.405	.294	.294	.029	.029

## Beam Design for Wood Products : Level 4 - 28'-10 1/2"

	Label	Size	Explicit	Vmax[k]	V'[k]	Mmax[k-...	M'r[k-ft]	Max Start Re...	Max End ...	Min Start R...	Min End Rea...
1	3J2-1	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
2	3J2-2	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
3	3J2-3	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
4	3J2-4	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
5	3J2-5	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
6	3J2-6	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
7	3J2-7	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
8	3J2-8	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
9	3J2-9	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
10	3J2-10	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
11	3J2-11	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
12	3J2-12	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
13	3J1-1	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
14	3J1-2	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
15	3J1-3	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
16	3J1-4	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
17	3J1-5	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
18	3J1-6	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
19	3J1-7	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291

## Beam Design for Wood Products : Level 4 - 28'-10 1/2" (Continued)

	Label	Size	Explicit	Vmax[k]	V'[k]	Mmax[k-...	M'r[k-ft]	Max Start Re...	Max End ...	Min Start R...	Min End Rea...
20	3J1-8	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
21	3J1-9	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
22	3J1-10	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
23	3J1-11	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
24	3J1-12	Red_I45x11.875	Yes	.606	1.785	-1.856	4.685	.606	.606	.291	.291
25	3J2-13	Red_I45x11.875	Yes	.114	1.785	-.138	4.685	.114	.114	.057	.057
26	3J2-14	Red_I45x11.875	Yes	.222	1.785	-.268	4.685	.222	.222	.107	.107
27	3J1-13	Red_I45x11.875	Yes	.114	1.785	-.138	4.685	.114	.114	.057	.057
28	3J1-14	Red_I45x11.875	Yes	.222	1.785	-.268	4.685	.222	.222	.107	.107
29	3J7-2	Red_I45x11.875	Yes	.428	2.053	-.336	5.388	.501	.501	.077	.077
30	3J7-3	Red_I45x11.875	Yes	.408	2.053	-.321	5.388	.478	.478	.074	.074
31	3J7-4	Red_I45x11.875	Yes	.408	2.053	-.321	5.388	.478	.478	.074	.074
32	3J7-5	Red_I45x11.875	Yes	.436	2.053	-.342	5.388	.51	.51	.078	.078
33	3J7-6	Red_I45x11.875	Yes	.436	2.053	-.342	5.388	.51	.51	.078	.078
34	3J7-7	Red_I45x11.875	Yes	.436	2.053	-.342	5.388	.51	.51	.078	.078
35	3J7-8	Red_I45x11.875	Yes	-.436	2.053	-.342	5.388	.51	.51	.078	.078
36	3J7-9	Red_I45x11.875	Yes	-.436	2.053	-.342	5.388	.51	.51	.078	.078
37	3J7-10	Red_I45x11.875	Yes	-.436	2.053	-.342	5.388	.51	.51	.078	.078
38	3J8-2	Red_I45x11.875	Yes	.314	2.053	-.182	5.388	.368	.368	.057	.057
39	3J8-3	Red_I45x11.875	Yes	.3	2.053	-.173	5.388	.351	.351	.054	.054
40	3J8-4	Red_I45x11.875	Yes	.3	2.053	-.173	5.388	.351	.351	.054	.054
41	3J8-5	Red_I45x11.875	Yes	.32	2.053	-.185	5.388	.375	.375	.058	.058
42	3J8-6	Red_I45x11.875	Yes	-.32	2.053	-.185	5.388	.375	.375	.058	.058
43	3J8-7	Red_I45x11.875	Yes	.32	2.053	-.185	5.388	.375	.375	.058	.058
44	3J8-8	Red_I45x11.875	Yes	-.32	2.053	-.185	5.388	.375	.375	.058	.058
45	3J8-9	Red_I45x11.875	Yes	-.32	2.053	-.185	5.388	.375	.375	.058	.058
46	3J8-10	Red_I45x11.875	Yes	.32	2.053	-.185	5.388	.375	.375	.058	.058
47	3J5-1	Red_I45x11.875	Yes	-.673	2.053	-.764	5.388	.788	.788	.121	.121
48	3J5-2	Red_I45x11.875	Yes	-.673	2.053	-.764	5.388	.788	.788	.121	.121
49	3J5-3	Red_I45x11.875	Yes	-.673	2.053	-.764	5.388	.788	.788	.121	.121
50	3J5-4	Red_I45x11.875	Yes	-.673	2.053	-.764	5.388	.788	.788	.121	.121
51	3J5-5	Red_I45x11.875	Yes	-.678	2.053	-.769	5.388	.794	.794	.122	.122
52	3J5-6	Red_I45x11.875	Yes	-.678	2.053	-.769	5.388	.794	.794	.122	.122
53	3J5-7	Red_I45x11.875	Yes	-.678	2.053	-.769	5.388	.794	.794	.122	.122
54	3J5-8	Red_I45x11.875	Yes	-.678	2.053	-.769	5.388	.794	.794	.122	.122
55	3J5-9	Red_I45x11.875	Yes	-.673	2.053	-.764	5.388	.788	.788	.121	.121
56	3J5-10	Red_I45x11.875	Yes	-.673	2.053	-.764	5.388	.788	.788	.121	.121
57	3J5-11	Red_I45x11.875	Yes	-.673	2.053	-.764	5.388	.788	.788	.121	.121
58	3J5-12	Red_I45x11.875	Yes	-.673	2.053	-.764	5.388	.788	.788	.121	.121
59	3J6-1	Red_I45x11.875	Yes	-1.231	2.053	-2.552	5.388	1.442	1.442	.221	.221
60	3J6-2	Red_I45x11.875	Yes	1.231	2.053	-2.552	5.388	1.442	1.442	.221	.221
61	3J6-3	Red_I45x11.875	Yes	1.236	2.053	-2.56	5.388	1.447	1.447	.222	.222
62	3J6-4	Red_I45x11.875	Yes	-1.236	2.053	-2.56	5.388	1.447	1.447	.222	.222
63	3J6-5	Red_I45x11.875	Yes	-1.231	2.053	-2.552	5.388	1.442	1.442	.221	.221
64	3J6-6	Red_I45x11.875	Yes	1.234	2.053	-2.558	5.388	1.445	1.445	.221	.221
65	3J6-7	Red_I45x11.875	Yes	-1.237	2.053	-2.564	5.388	1.449	1.449	.222	.222
66	3J6-8	Red_I45x11.875	Yes	-1.237	2.053	-2.564	5.388	1.449	1.449	.222	.222
67	3J6-9	Red_I45x11.875	Yes	1.234	2.053	-2.558	5.388	1.445	1.445	.221	.221
68	3J6-10	Red_I45x11.875	Yes	1.231	2.053	-2.552	5.388	1.442	1.442	.221	.221
69	3J6-11	Red_I45x11.875	Yes	-1.231	2.053	-2.552	5.388	1.442	1.442	.221	.221
70	3J6-12	Red_I45x11.875	Yes	1.231	2.053	-2.552	5.388	1.442	1.442	.221	.221
71	3J6-13	Red_I45x11.875	Yes	-1.231	2.053	-2.552	5.388	1.442	1.442	.221	.221

## Beam Design for Wood Products : Level 4 - 28'-10 1/2" (Continued)

	Label	Size	Explicit	Vmax[k]	V'[k]	Mmax[k-...	M'r[k-ft]	Max Start Re...	Max End ...	Min Start R...	Min End Rea...
72	3J6-14	Red_I45x11.875	Yes	1.231	2.053	-2.551	5.388	1.441	1.441	.221	.221
73	3J3-1	Red_I45x11.875	Yes	1.144	2.053	-1.81	5.388	1.292	1.231	.157	.157
74	3J3-2	Red_I45x11.875	Yes	1.144	2.053	-1.81	5.388	1.292	1.231	.157	.157
75	3J3-3	Red_I45x11.875	Yes	1.144	2.053	-1.81	5.388	1.292	1.231	.157	.157
76	3J3-4	Red_I45x11.875	Yes	1.144	2.053	-1.81	5.388	1.292	1.231	.157	.157
77	3J3-5	Red_I45x11.875	Yes	1.144	2.053	-1.81	5.388	1.292	1.231	.157	.157
78	3J3-6	Red_I45x11.875	Yes	1.144	2.053	-1.81	5.388	1.292	1.231	.157	.157
79	3J3-7	Red_I45x11.875	Yes	1.215	2.053	-1.922	5.388	1.373	1.307	.166	.166
80	3J3-8	Red_I45x11.875	Yes	1.212	2.053	-1.919	5.388	1.37	1.306	.166	.166
81	3J3-9	Red_I45x11.875	Yes	1.218	2.053	-1.927	5.388	1.377	1.31	.167	.167
82	3J3-10	Red_I45x11.875	Yes	1.218	2.053	-1.927	5.388	1.377	1.31	.167	.167
83	3J3-11	Red_I45x11.875	Yes	1.212	2.053	-1.919	5.388	1.37	1.306	.166	.166
84	3J3-12	Red_I45x11.875	Yes	1.215	2.053	-1.922	5.388	1.373	1.307	.166	.166
85	3J3-13	Red_I45x11.875	Yes	1.144	2.053	-1.81	5.388	1.292	1.231	.157	.157
86	3J3-14	Red_I45x11.875	Yes	1.144	2.053	-1.81	5.388	1.292	1.231	.157	.157
87	3J3-15	Red_I45x11.875	Yes	1.144	2.053	-1.81	5.388	1.292	1.231	.157	.157
88	3J3-16	Red_I45x11.875	Yes	1.144	2.053	-1.81	5.388	1.292	1.231	.157	.157
89	3J3-17	Red_I45x11.875	Yes	1.144	2.053	-1.81	5.388	1.292	1.231	.157	.157
90	3J3-18	Red_I45x11.875	Yes	1.144	2.053	-1.81	5.388	1.292	1.231	.157	.157
91	3J9-1	Red_I45x11.875	Yes	.003	1.607	-.001	4.216	.003	.003	.003	.003
92	3J9-2	Red_I45x11.875	Yes	.003	1.607	-.001	4.216	.003	.003	.003	.003
93	3J9-3	Red_I45x11.875	Yes	.003	1.607	-.001	4.216	.003	.003	.003	.003
94	3J9-4	Red_I45x11.875	Yes	.003	1.607	-.001	4.216	.003	.003	.003	.003
95	3J9-5	Red_I45x11.875	Yes	.003	1.607	-.001	4.216	.003	.003	.003	.003
96	3J9-6	Red_I45x11.875	Yes	.003	1.607	-.001	4.216	.003	.003	.003	.003
97	3J9-7	Red_I45x11.875	Yes	.003	1.607	-.001	4.216	.003	.003	.003	.003
98	3J9-8	Red_I45x11.875	Yes	.003	1.607	-.001	4.216	.003	.003	.003	.003
99	3J9-9	Red_I45x11.875	Yes	.003	1.607	-.001	4.216	.003	.003	.003	.003
100	3J9-10	Red_I45x11.875	Yes	.003	1.607	-.001	4.216	.003	.003	.003	.003
101	3J9-11	Red_I45x11.875	Yes	.003	1.607	-.001	4.216	.003	.003	.003	.003
102	3J9-12	Red_I45x11.875	Yes	.003	1.607	-.001	4.216	.003	.003	.003	.003
103	3J9-13	Red_I45x11.875	Yes	.003	1.607	-.001	4.216	.003	.003	.003	.003
104	3J9-14	Red_I45x11.875	Yes	.003	1.607	-.001	4.216	.003	.003	.003	.003
105	3J9-15	Red_I45x11.875	Yes	.003	1.607	-.001	4.216	.003	.003	.003	.003
106	3J9-16	Red_I45x11.875	Yes	.003	1.607	-.001	4.216	.003	.003	.003	.003
107	3J9-17	Red_I45x11.875	Yes	.003	1.607	-.001	4.216	.003	.003	.003	.003
108	3J9-18	Red_I45x11.875	Yes	.003	1.607	-.001	4.216	.003	.003	.003	.003
109	3J4-1	Red_I45x11.875	Yes	.975	2.053	-1.38	5.388	1.125	1.069	.158	.158
110	3J4-2	Red_I45x11.875	Yes	.975	2.053	-1.38	5.388	1.125	1.069	.158	.158
111	3J4-3	Red_I45x11.875	Yes	.975	2.053	-1.38	5.388	1.125	1.069	.158	.158
112	3J4-4	Red_I45x11.875	Yes	.975	2.053	-1.38	5.388	1.125	1.069	.158	.158
113	3J4-5	Red_I45x11.875	Yes	.975	2.053	-1.38	5.388	1.125	1.069	.158	.158
114	3J4-6	Red_I45x11.875	Yes	.975	2.053	-1.38	5.388	1.125	1.069	.158	.158
115	3J4-7	Red_I45x11.875	Yes	.975	2.053	-1.38	5.388	1.125	1.069	.158	.158
116	3J4-8	Red_I45x11.875	Yes	.975	2.053	-1.38	5.388	1.125	1.069	.158	.158
117	3J4-9	Red_I45x11.875	Yes	.975	2.053	-1.38	5.388	1.125	1.069	.158	.158
118	3J4-10	Red_I45x11.875	Yes	.975	2.053	-1.38	5.388	1.125	1.069	.158	.158
119	3J4-11	Red_I45x11.875	Yes	.975	2.053	-1.38	5.388	1.125	1.069	.158	.158
120	3J4-12	Red_I45x11.875	Yes	.975	2.053	-1.38	5.388	1.125	1.069	.158	.158
121	3J4-13	Red_I45x11.875	Yes	.975	2.053	-1.38	5.388	1.125	1.069	.158	.158
122	3J4-14	Red_I45x11.875	Yes	.975	2.053	-1.38	5.388	1.125	1.069	.158	.158
123	3J4-15	Red_I45x11.875	Yes	.975	2.053	-1.38	5.388	1.125	1.069	.158	.158

## Beam Design for Wood Products : Level 4 - 28'-10 1/2" (Continued)

	Label	Size	Explicit	Vmax[k]	V'[k]	Mmax[k-...]	M'r[k-ft]	Max Start Re...	Max End ...	Min Start R...	Min End Rea...
124	3J4-16	Red_I45x11.875	Yes	.975	2.053	-1.38	5.388	1.125	1.069	.158	.158
125	3J4-17	Red_I45x11.875	Yes	.975	2.053	-1.38	5.388	1.125	1.069	.158	.158
126	3J4-18	Red_I45x11.875	Yes	.975	2.053	-1.38	5.388	1.125	1.069	.158	.158

## Beam Design for Wood Products : TOC - 20'-4 1/2"

	Label	Size	Explicit	Vmax[k]	V'[k]	Mmax[k-...]	M'r[k-ft]	Max Start Re...	Max End ...	Min Start R...	Min End Rea...
No Data to Print ...											

## Beam Design for Wood Products : Level 3 18'-4 1/4"

	Label	Size	Explicit	Vmax[k]	V'[k]	Mmax[k-...]	M'r[k-ft]	Max Start Re...	Max End ...	Min Start R...	Min End Rea...
1	2J2-1	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
2	2J2-2	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
3	2J2-3	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
4	2J2-4	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
5	2J2-5	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
6	2J2-6	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
7	2J2-7	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
8	2J2-8	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
9	2J2-9	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
10	2J2-10	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
11	2J2-11	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
12	2J2-12	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
13	2J1-1	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
14	2J1-2	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
15	2J1-3	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
16	2J1-4	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
17	2J1-5	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
18	2J1-6	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
19	2J1-7	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
20	2J1-8	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
21	2J1-9	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
22	2J1-10	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
23	2J1-11	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
24	2J1-12	Red_I45x14	Yes	.608	1.96	-1.862	5.57	.608	.608	.293	.293
25	2J2-13	Red_I45x14	Yes	-.115	1.96	-.139	5.57	.115	.115	.057	.057
26	2J2-14	Red_I45x14	Yes	.223	1.96	-.269	5.57	.223	.223	.108	.108
27	2J1-13	Red_I45x14	Yes	-.115	1.96	-.139	5.57	.115	.115	.057	.057
28	2J1-14	Red_I45x14	Yes	.223	1.96	-.269	5.57	.223	.223	.108	.108
29	2J3-37	Red_I65x14	Yes	.166	2.54	-.176	8.03	.166	.166	.082	.082
30	2J3-38	Red_I65x14	Yes	.166	2.54	-.176	8.03	.166	.166	.082	.082
31	2J3-1	Red_I65x14	Yes	.948	2.54	-5.806	8.03	.948	.948	.468	.468
32	2J3-2	Red_I65x14	Yes	.948	2.54	-5.806	8.03	.948	.948	.468	.468
33	2J3-3	Red_I65x14	Yes	.948	2.54	-5.806	8.03	.948	.948	.468	.468
34	2J3-4	Red_I65x14	Yes	.948	2.54	-5.806	8.03	.948	.948	.468	.468
35	2J3-5	Red_I65x14	Yes	.948	2.54	-5.806	8.03	.948	.948	.468	.468
36	2J3-6	Red_I65x14	Yes	.948	2.54	-5.806	8.03	.948	.948	.468	.468
37	2J3-7	Red_I65x14	Yes	.948	2.54	-5.806	8.03	.948	.948	.468	.468
38	2J3-8	Red_I65x14	Yes	.948	2.54	-5.806	8.03	.948	.948	.468	.468
39	2J3-9	Red_I65x14	Yes	.948	2.54	-5.806	8.03	.948	.948	.468	.468
40	2J3-10	Red_I65x14	Yes	.948	2.54	-5.806	8.03	.948	.948	.468	.468
41	2J3-11	Red_I65x14	Yes	.843	2.54	-5.161	8.03	.843	.843	.419	.419



## Beam Design for Wood Products : Level 3 18'-4 1/4" (Continued)

	Label	Size	Explicit	Vmax[k]	V'[k]	Mmax[k-...]	M'r[k-ft]	Max Start Re...	Max End ...	Min Start R...	Min End Rea...
42	2J3-12	Red I65x14	Yes	1.004	2.54	-6.147	8.03	1.004	1.004	.494	.494
43	2J3-13	Red I45x14	Yes	-.072	1.96	-.033	5.57	.072	.072	.035	.035
44	2J3-14	Red I45x14	Yes	-.092	1.96	-.043	5.57	.092	.092	.045	.045
45	2J3-15	Red I45x14	Yes	-.092	1.96	-.043	5.57	.092	.092	.045	.045
46	2J3-16	Red I45x14	Yes	.154	1.96	-.154	5.57	.154	.154	.075	.075
47	2J3-17	Red I45x14	Yes	.198	1.96	-.198	5.57	.198	.198	.096	.095
48	2J3-18	Red I45x14	Yes	.198	1.96	-.198	5.57	.198	.198	.095	.095
49	2J3-19	Red I45x14	Yes	.19	1.96	-.235	5.57	.19	.19	.092	.092
50	2J3-20	Red I45x14	Yes	.245	1.96	-.302	5.57	.245	.245	.118	.118
51	2J3-21	Red I45x14	Yes	.245	1.96	-.302	5.57	.245	.245	.118	.118
52	2J3-22	Red I45x14	Yes	.158	1.96	-.162	5.57	.158	.158	.077	.077
53	2J3-23	Red I45x14	Yes	.203	1.96	-.209	5.57	.203	.203	.098	.098
54	2J3-24	Red I45x14	Yes	.203	1.96	-.209	5.57	.203	.203	.098	.098
55	2J3-25	Red I45x14	Yes	.192	1.96	-.24	5.57	.192	.192	.094	.094
56	2J3-26	Red I45x14	Yes	.247	1.96	-.309	5.57	.247	.247	.119	.119
57	2J3-27	Red I45x14	Yes	.247	1.96	-.309	5.57	.247	.247	.119	.119
58	2J3-28	Red I45x14	Yes	.071	1.96	-.033	5.57	.071	.071	.034	.034
59	2J3-29	Red I45x14	Yes	.091	1.96	-.042	5.57	.091	.091	.044	.044
60	2J3-30	Red I45x14	Yes	.091	1.96	-.042	5.57	.091	.091	.044	.044
61	2J3-31	Red I45x14	Yes	.055	1.96	-.02	5.57	.055	.055	.027	.027
62	2J3-32	Red I45x14	Yes	-.071	1.96	-.026	5.57	.071	.071	.034	.034
63	2J3-33	Red I45x14	Yes	-.071	1.96	-.026	5.57	.071	.071	.034	.034
64	2J3-34	Red I45x14	Yes	-.05	1.96	-.016	5.57	.05	.05	.024	.024
65	2J3-35	Red I45x14	Yes	-.064	1.96	-.021	5.57	.064	.064	.031	.031
66	2J3-36	Red I45x14	Yes	-.064	1.96	-.021	5.57	.064	.064	.031	.031
67	2J3-100	Red I65x14	Yes	.768	2.54	-4.702	8.03	.768	.768	.384	.384

## Beam Design for Wood Products : TOC - 12'-1 1/4"

Label	Size	Explicit	Vmax[k]	V'[k]	Mmax[k-...]	M'r[k-ft]	Max Start Re...	Max End ...	Min Start R...	Min End Rea...	
No Data to Print ...											

## Beam Design for Wood Products : Level 2 8'-11 1/4"

	Label	Size	Explicit	Vmax[k]	V'[k]	Mmax[k-...]	M'r[k-ft]	Max Start Re...	Max End ...	Min Start R...	Min End Rea...
1	1J2-1	Red I45x14	Yes	.474	1.96	-1.452	5.57	.474	.474	.231	.231
2	1J2-2	Red I45x14	Yes	.571	1.96	-1.748	5.57	.571	.571	.276	.276
3	1J2-3	Red I45x14	Yes	.571	1.96	-1.748	5.57	.571	.571	.276	.276
4	1J2-4	Red I45x14	Yes	.571	1.96	-1.748	5.57	.571	.571	.276	.276
5	1J2-5	Red I45x14	Yes	.571	1.96	-1.748	5.57	.571	.571	.276	.276
6	1J2-6	Red I45x14	Yes	.571	1.96	-1.748	5.57	.571	.571	.276	.276
7	1J2-7	Red I45x14	Yes	.571	1.96	-1.748	5.57	.571	.571	.276	.276
8	1J2-8	Red I45x14	Yes	.571	1.96	-1.748	5.57	.571	.571	.276	.276
9	1J1-1	Red I45x14	Yes	.474	1.96	-1.452	5.57	.474	.474	.231	.231
10	1J1-2	Red I45x14	Yes	.571	1.96	-1.748	5.57	.571	.571	.276	.276
11	1J1-3	Red I45x14	Yes	.571	1.96	-1.748	5.57	.571	.571	.276	.276
12	1J1-4	Red I45x14	Yes	.571	1.96	-1.748	5.57	.571	.571	.276	.276
13	1J1-5	Red I45x14	Yes	.571	1.96	-1.748	5.57	.571	.571	.276	.276
14	1J1-6	Red I45x14	Yes	.571	1.96	-1.748	5.57	.571	.571	.276	.276
15	1J1-7	Red I45x14	Yes	.571	1.96	-1.748	5.57	.571	.571	.276	.276
16	1J1-8	Red I45x14	Yes	.571	1.96	-1.748	5.57	.571	.571	.276	.276
17	1J1-9	Red I45x14	Yes	-.115	1.96	-.139	5.57	.115	.115	.057	.057
18	1J1-10	Red I45x14	Yes	.223	1.96	-.269	5.57	.223	.223	.108	.108

## Beam Design for Wood Products : Level 2 8'-11 1/4" (Continued)

	Label	Size	Explicit	Vmax[k]	V'[k]	Mmax[k-...]	M'r[k-ft]	Max Start Re...	Max End ...	Min Start R...	Min End Rea...
19	1J2-9	Red I45x14	Yes	-.115	1.96	-.139	5.57	.115	.115	.057	.057
20	1J2-10	Red I45x14	Yes	.223	1.96	-.269	5.57	.223	.223	.108	.108
21	1J3-15	Red I45x14	Yes	.22	1.96	-.266	5.57	.22	.22	.106	.106
22	1J3-16	Red I45x14	Yes	-.703	1.96	-2.711	5.57	.703	.703	.34	.34
23	1J3-17	Red I45x14	Yes	-.703	1.96	-2.711	5.57	.703	.703	.34	.34
24	1J3-18	Red I45x14	Yes	.194	1.96	-.206	5.57	.194	.194	.094	.094
25	1J3-19	Red I45x14	Yes	.194	1.96	-.206	5.57	.194	.194	.094	.094
26	1J3-20	Red I45x14	Yes	.222	1.96	-.268	5.57	.222	.222	.107	.107
27	1J3-21	Red I45x14	Yes	.222	1.96	-.268	5.57	.222	.222	.107	.107
28	1J3-22	Red I45x14	Yes	-.709	1.96	-2.734	5.57	.709	.709	.343	.343
29	1J3-23	Red I45x14	Yes	-.709	1.96	-2.734	5.57	.709	.709	.343	.343
30	1J3-24	Red I45x14	Yes	-.709	1.96	-2.734	5.57	.709	.709	.343	.343
31	1J3-25	Red I45x14	Yes	.195	1.96	-.208	5.57	.195	.195	.094	.094
32	1J3-26	Red I45x14	Yes	.195	1.96	-.208	5.57	.195	.195	.094	.094
33	1J3-27	Red I45x14	Yes	.195	1.96	-.208	5.57	.195	.195	.094	.094
34	1J3-28	Red I45x14	Yes	.22	1.96	-.266	5.57	.22	.22	.106	.106
35	1J3-29	Red I45x14	Yes	.222	1.96	-.268	5.57	.222	.222	.107	.107
36	DUMM...	Red I45x14	Yes	-.072	1.96	-.028	5.57	.072	.072	.035	.035
37	DUMM...	Red I45x14	Yes	-.064	1.96	-.023	5.57	.064	.064	.031	.031
38	1J3-31	Red I65x14	Yes	.174	2.54	-.185	8.03	.174	.174	.086	.086
39	1J3-32	Red I65x14	Yes	.174	2.54	-.185	8.03	.174	.174	.086	.086
40	1J3-30	Red I65x14	Yes	1.004	2.54	-6.147	8.03	1.004	1.004	.494	.494
41	1J3-55	Red I65x14	Yes	.96	2.54	-5.882	8.03	.96	.96	.474	.474
42	1J3-56	Red I65x14	Yes	.96	2.54	-5.882	8.03	.96	.96	.474	.474
43	1J3-57	Red I65x14	Yes	.96	2.54	-5.882	8.03	.96	.96	.474	.474
44	1J3-58	Red I65x14	Yes	.96	2.54	-5.882	8.03	.96	.96	.474	.474
45	1J3-59	Red I65x14	Yes	.96	2.54	-5.882	8.03	.96	.96	.474	.474
46	1J3-60	Red I65x14	Yes	.96	2.54	-5.882	8.03	.96	.96	.474	.474
47	1J3-61	Red I65x14	Yes	.96	2.54	-5.882	8.03	.96	.96	.474	.474
48	1J3-62	Red I65x14	Yes	.96	2.54	-5.882	8.03	.96	.96	.474	.474
49	1J3-63	Red I65x14	Yes	.96	2.54	-5.882	8.03	.96	.96	.474	.474
50	1J3-64	Red I65x14	Yes	.96	2.54	-5.882	8.03	.96	.96	.474	.474
51	1J3-65	Red I65x14	Yes	.96	2.54	-5.882	8.03	.96	.96	.474	.474
52	1J3-66	Red I65x14	Yes	.96	2.54	-5.882	8.03	.96	.96	.474	.474
53	1J3-67	Red I65x14	Yes	.96	2.54	-5.882	8.03	.96	.96	.474	.474
54	1J3-68	Red I65x14	Yes	.96	2.54	-5.882	8.03	.96	.96	.474	.474
55	1J3-69	Red I65x14	Yes	.96	2.54	-5.882	8.03	.96	.96	.474	.474
56	1J3-70	Red I65x14	Yes	.96	2.54	-5.882	8.03	.96	.96	.474	.474

## Hot Rolled Steel Column Code Checks

	Stack	Shape	Code Check	Elev[ft]	Shear Check	Ele...	Dir	LC	phi*Pnc [k]	phi*Pnt [k]	phi*Mn	phi*Mn z-...	Cb	Eqn
1	(C-2.1)	1 W16x...	.102	0	8	.008	0	5	217.928	410.85	26.363	202.5	1.6...	H1-...
2		2 W16x...	.113	40.807	8	.016	12...	6	136.638	410.85	26.363	202.5	2.1...	H1-...
3	(C-3.5)	1 W16x...	.102	0	8	.008	0	5	217.928	410.85	26.363	202.5	1.6...	H1-...
4		2 W16x...	.113	40.807	8	.016	8.9...	6	136.638	410.85	26.363	202.5	2.1...	H1-...
5	(E-2)	1 HSS4...	.293	18.703	8	.000	9.3...	8	87.789	139.518	16.181	16.181	1	H1-...
6	(E-4)	1 HSS4...	.293	18.703	8	.000	12...	8	87.789	139.518	16.181	16.181	1	H1-...
7	(G'-4.5)	1 W6x20	.160	0	6	.000	0	13	182.24	264.15	25.2	50.965	1	H1-...
8	(G'-1.1)	1 W6x20	.158	0	6	.000	0	13	182.24	264.15	25.2	50.965	1	H1-...
9	(F.5-4...)	1 W14x...	.174	28.875	8	.049	18...	8	862.284	981	151.875	472.5	2.56	H1-...
10	(F.5-1...)	1 W14x...	.175	28.875	8	.050	20...	8	862.284	981	151.875	472.5	2.56	H1-...

## Hot Rolled Steel Column Code Checks (Continued)

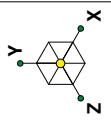
Stack	...	Shape	Code	Check	Elev[ft]	...	Shear Check	Ele...	Dir	LC	phi*Pnc [k]	phi*Pnt [k]	phi*Mn	...	phi*Mn z...	Cb	Eqn
11	(B.5-3)	1	HSS4...	.052	8.938	5	.000	8.9...		13	96.264	139.518	16.181		16.181	1	H1-...
12	(E-5)	1	HSS4...	.407	28.875	8	.009	18...		8	87.789	139.518	16.181		16.181	1	H1-...
13	(F.5-5)	1	HSS4...	.737	18.393	8	.000	12...		6	87.789	139.518	16.181		16.181	1	H1-...
14	(E-1)	1	HSS4...	.407	28.875	8	.009	20...		8	87.789	139.518	16.181		16.181	1	H1-...
15	(F.5-1)	1	HSS4...	.746	18.393	8	.000	12...		6	87.789	139.518	16.181		16.181	1	H1-...
16	(B.5-5)	1	HSS4...	.403	29.146	8	.000	12...		13	76.888	139.518	16.181		16.181	1	H1-...
17	(B.5-1)	1	HSS4...	.403	29.146	8	.000	12...		13	76.888	139.518	16.181		16.181	1	H1-...
18	(C-5)	1	HSS4...	.029	18.383	8	.000	20...		6	87.789	139.518	16.181		16.181	1	H1-...
19	(C-1)	1	HSS4...	.029	18.383	8	.000	18...		6	87.789	139.518	16.181		16.181	1	H1-...
20	(F-5)	1	HSS4...	.058	18.354	5	.004	12...		6	118.477	139.518	16.181		16.181	2.1...	H1-...
21	(F-1)	1	HSS4...	.058	18.354	5	.004	12...		6	118.477	139.518	16.181		16.181	2.1...	H1-...

## Wall Results, Wood Wall Panel

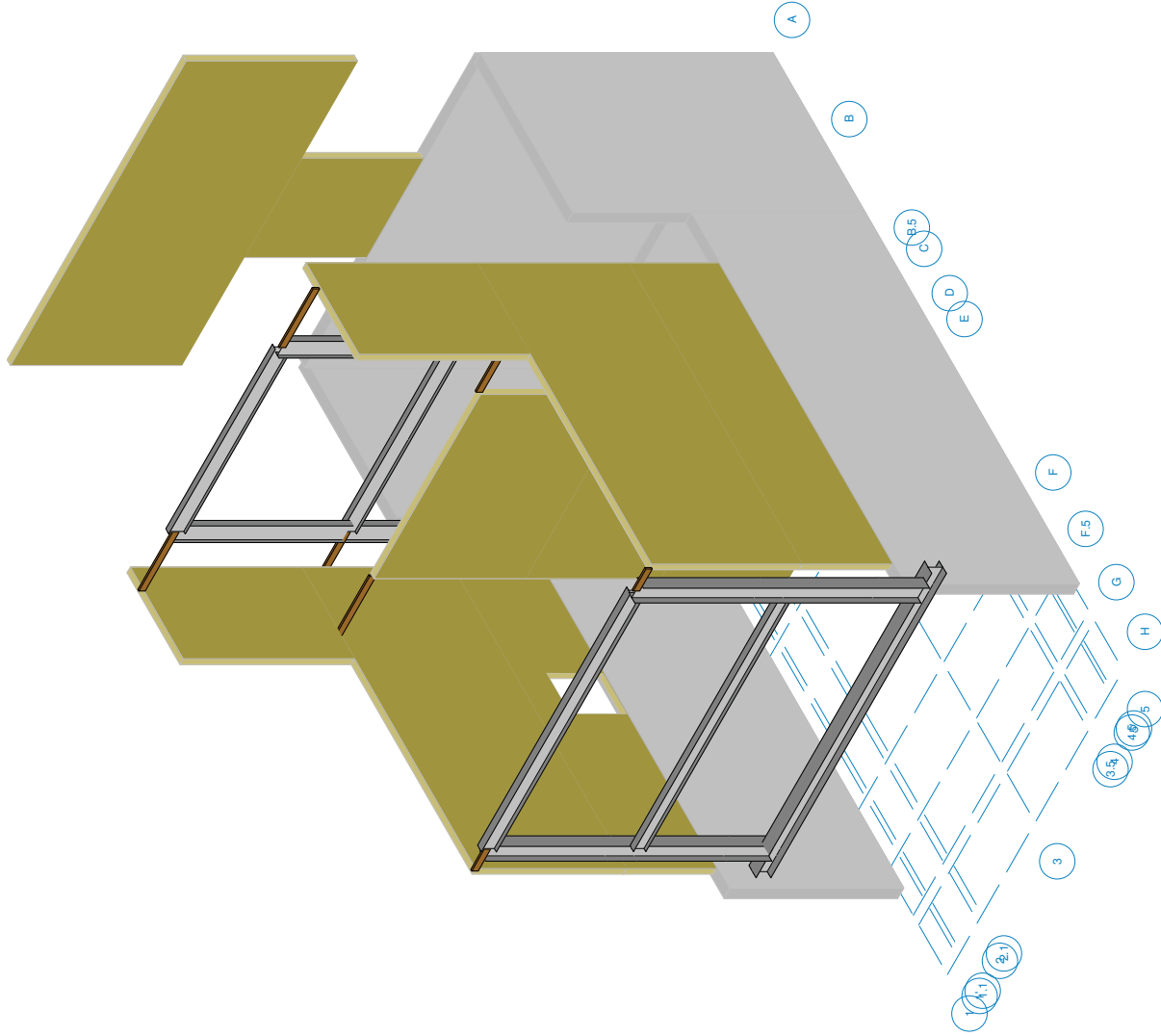
	Wall Panel	Region	Stud Size	Stud Spacing[in]	Axial Check	Gov LC
1	WP1	R1	2X6	16	.031	11
2	WP2	R1	2X6	16	.031	11
3	A 4th	R1	2X6	16	.46	11
4	A Roof	R1	2X6	16	.394	11
5	WP3	R1	2X6	16	.029	11
6	WP4	R1	2X6	16	.029	11
7	WP5	R2	2X6	16	.324	10
8		R3	2X6	16	.188	10
9	WP6	R2	2X6	16	.012	9
10		R3	2X6	16	.008	9
11	D 4th	R1	2X6	16	.039	10
12	D 3rd	R1	2X6	16	.058	10
13	WP7	R1	2X6	16	.126	13
14	WP8	R1	2X6	16	.132	13
15	WP9	R1	2X6	16	.113	10
16	WP10	R1	2X6	16	.113	10
17	WP11	R1	2X6	16	.095	10
18	WP12	R1	2X6	16	.095	10
19	D Second	R1	2X6	16	.076	10
20	WP13	R1	2X6	16	.026	11
21	WP14	R1	2X6	16	.058	11
22	WP15	R1	2X6	16	.026	11
23	WP16	R1	2X6	16	.058	11
24	WP17	R1	2X6	16	.072	11
25	WP18	R1	2X6	16	.072	11
26	WP19	R1	2X6	16	.076	11
27	WP20	R1	2X6	16	.076	11
28	WP21	R1	2X6	16	.054	11
29	WP22	R1	2X6	16	.054	11
30	WP23	R1	2X6	16	.01	10
31	WP24	R1	2X6	16	.01	10
32	WP25	R1	2X6	16	.125	10
33	WP26	R1	2X6	16	.072	13
34	WP27	R1	2X6	16	.034	11
35	WP28	R1	2X6	16	.125	10
36	WP29	R1	2X6	16	.072	13
37	WP30	R1	2X6	16	.034	11

## **LATERAL SYSTEM**

Designed using RISA3D integrated  
with RISAFloor



**Blackwell**



\*RENDERED VIEW SHOWN FOR CONTEXT ONLY. REFER TO MEMBER PROPERTIES AND STRUCTURAL DRAWINGS FOR DETAILS.

**Blackwell Structural Engineers**

**BG**

**170450**

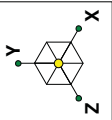
**LATERAL GENERAL RENDER**

**June 26, 2018 at 11:48 AM**

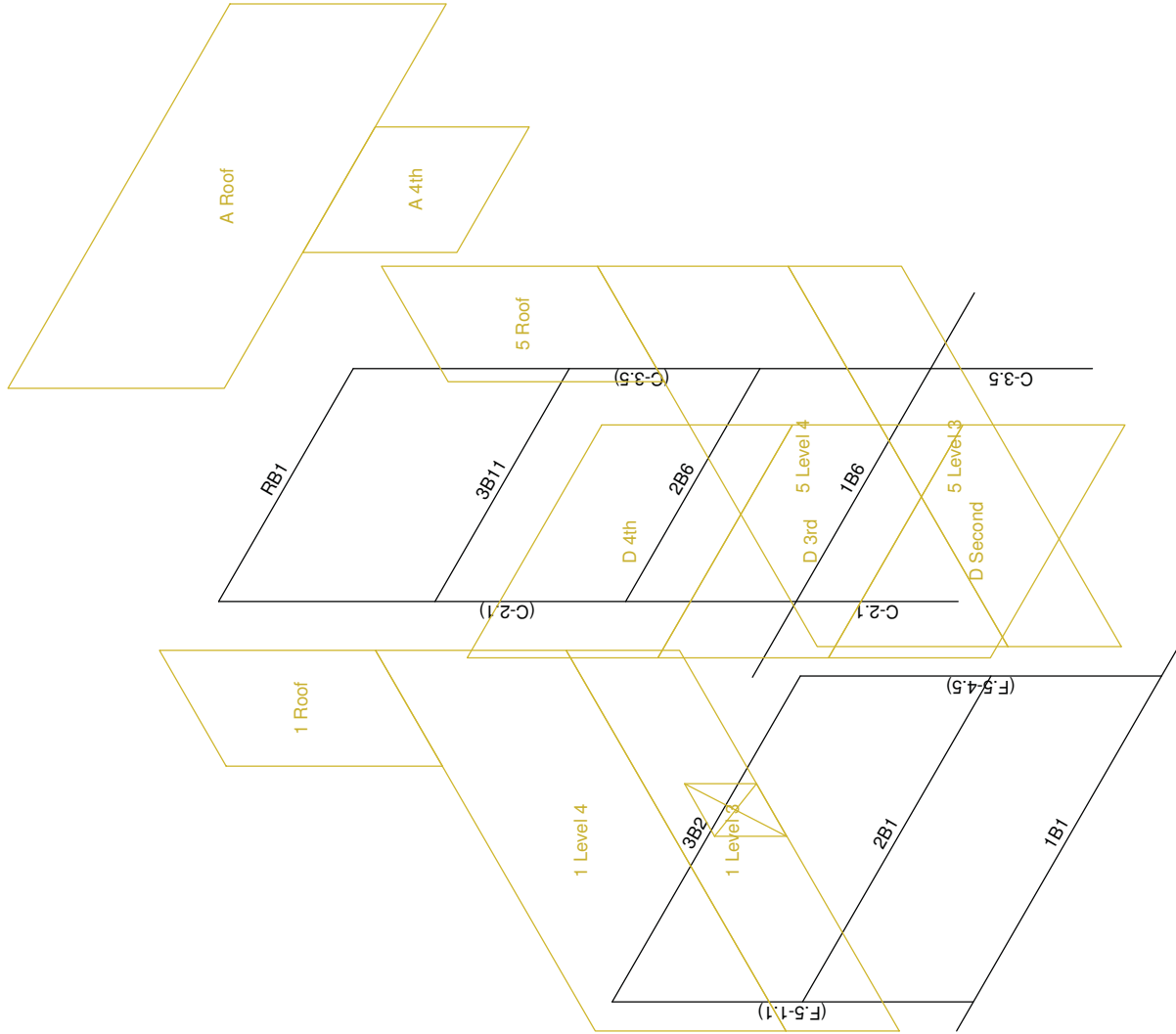
170450 Summit Lot 71 2018.06.24.rfl

**Lot 71**

## **Lateral Geometry Definition**



**Blackwell**



CONCRETE WALLS NOT SHOWN FOR CLARITY

Blackwell Structural Engineers

BG

170450

LABELS

June 26, 2018 at 11:50 AM

170450 Summit Lot 71 2018.06.24.rfl

Lot 71

## Wall Panel Data (Continued)

	Label	A Joint	B Joint	C Joint	D Joint	Material Ty..	Material Set	Thickne...	Design Rule	Panel/Spacing
9	Conc 5	F3_N10	F3_N14	N167	N165	Concrete	Conc25NW	10	Typical	N/A
10	Conc 6	F5_N24	F5_N25	N168	N166	Concrete	Conc25NW	10	Typical	N/A
11	Conc 7	F5_N27	F5_N26	N169	N167	Concrete	Conc25NW	10	Typical	N/A
12	D Second	F6_N9	F6_N7	BP_B_3	BP B 4	Wood	Spruce-Pi...	5.5 (stud)	6"	S1_15/32_8d@6   16
13	1 Roof	F1_N7	F1_N98	F2_N280	F2 N5	Wood	Spruce-Pi...	5.5 (stud)	3"	S1_15/32_8d@3   16
14	1 Level 4	F4_N198	N183	F2_N280	F4 N164	Wood	Spruce-Pi...	5.5 (stud)	4"	S1_15/32_8d@4   16
15	5 Roof	F2_N13	F1_N6	F1_N96	F2 N282	Wood	Spruce-Pi...	5.5 (stud)	3"	S1_15/32_8d@3   16
16	5 Level 4	F4_N196	N187A	F2_N282	F4 N162	Wood	Spruce-Pi...	5.5 (stud)	4"	S1_15/32_8d@4   16
17	1 Level 3	N201A	F4_N198	F4_N164	N191	Wood	Spruce-Pi...	5.5 (stud)	3"	S1_15/32_8d@3   16
18	5 Level 3	N197	F4_N196	F4_N162	N190	Wood	Spruce-Pi...	5.5 (stud)	4"	S1_15/32_8d@4   16

## Wall Panel Advanced Data

	Label	Seismic ...	Design...	SSAF	In-plane Ic...	Out-plane Ic...	K	Cm In...	Cm Ou...	Inactive
1	Conc 1	None	N/A	N/A						Exclude
2	Conc 2	None	N/A	N/A						Exclude
3	Conc 3	None	N/A	N/A						Exclude
4	A 4th	N/A	Segme..	1	N/A	N/A		N/A	N/A	
5	A Roof	N/A	Segme..	1	N/A	N/A		N/A	N/A	
6	D 4th	N/A	Segme..	1	N/A	N/A		N/A	N/A	
7	D 3rd	N/A	Segme..	1	N/A	N/A		N/A	N/A	
8	Conc 4	None	N/A	N/A						Exclude
9	Conc 5	None	N/A	N/A						Exclude
10	Conc 6	None	N/A	N/A						Exclude
11	Conc 7	None	N/A	N/A						Exclude
12	D Second	N/A	Segme..	1	N/A	N/A		N/A	N/A	
13	1 Roof	N/A	Segme..	1	N/A	N/A		N/A	N/A	
14	1 Level 4	N/A	Segme..	1	N/A	N/A		N/A	N/A	
15	5 Roof	N/A	Segme..	1	N/A	N/A		N/A	N/A	
16	5 Level 4	N/A	Segme..	1	N/A	N/A		N/A	N/A	
17	1 Level 3	N/A	Segme..	1	N/A	N/A		N/A	N/A	
18	5 Level 3	N/A	Segme..	1	N/A	N/A		N/A	N/A	

## Wood Wall Panel Parameters

	Label	Top Plate	Sill Plate	Studs	Min Stud ...	Max Stud ...	Green Lumber?	Header Size	Header Matl
1	Typical	2-2X6	2X6	2X6	16	16		4-2X6	Same as Wall
2	2"	2-2X6	2X6	2X6	16	16		4-2X6	Same as Wall
3	3"	2-2X6	2X6	2X6	16	16		4-2X6	Same as Wall
4	4"	2-2X6	2X6	2X6	16	16		4-2X6	Same as Wall
5	6"	2-2X6	2X6	2X6	16	16		4-2X6	Same as Wall

## Additional Wood Wall Panel Parameters

	Label	Schedule	Min. P..	Max. Panel Thi..	Double...	Max. ...	Min. ...	HD Cho...	HD Chord ...	Hold Down	Ecc...
1	Typical	AWC 2015 PLY 0.46..	.295	.61	No	6-in.	2-in.	2-2X6	Same as W...	HDU_DF-SP	Yes
2	2"	S1 15/32 8d@2	.295	.61	No	2-in.	2-in.	2-2X6	Same as W...	HDU_DF-SP	Yes
3	3"	S1 15/32 8d@3	.295	.61	No	3-in.	3-in.	2-2X6	Same as W...	HDU_DF-SP	Yes
4	4"	S1 15/32 8d@4	.295	.61	No	4-in.	4-in.	2-2X6	Same as W...	HDU_DF-SP	Yes
5	6"	S1 15/32 8d@6	.295	.61	No	6-in.	6-in.	2-2X6	Same as W...	HDU_DF-SP	Yes



## Floor Diaphragms

	Elevatio...	Ma...	Mass MOI...	Center of Ma...	Plus ...	Minu...	Plus ...	Minu...	Ina...	Diap...	Type	Regi...	Design...	SGAF	Material	Thic...	No Wi...
1	40.807	54...	5815.498	12.27, 12.328	%5	%5	%5	%5		D1	Flexible		N/A	N/A	N/A	N/A	
2	28.875	27...	2961.838	12.243, 9.282	%5	%5	%5	%5		D9	Flexible		N/A	N/A	N/A	N/A	
3	28.875	75...	8996.362	12.253, 35.946	%5	%5	%5	%5		D7	Flexible		N/A	N/A	N/A	N/A	
4	18.354	63...	11205.243	12.251, 6.556	%5	%5	%5	%5		D8	Flexible		N/A	N/A	N/A	N/A	
5	18.354	23...	2999.192	12.252, 31.409	%5	%5	%5	%5		D10	Flexible		N/A	N/A	N/A	N/A	
6	8.938	40...	12163.753	12.25, 11.601	%5	%5	%5	%5	Yes	D4a	Flexible		N/A	N/A	N/A	N/A	
7	8.938	66...	50954.786	12.247, 33.392	%5	%5	%5	%5	Yes	D11	Flexible		N/A	N/A	N/A	N/A	

## Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate...	Section/Shape	Type	Design List	Material	Design Rules
1	RB1	F1_N8	DEF_...			W14x22	Beam	None	A992	Typical
2	3B11	F2_N8	F2_N10			W14x22	Beam	None	A992	Typical
3	3B2	N171	DEF_...			W12x35	Beam	None	A992	Typical
4	2B1	F5_N1...	N173			W10x26	Beam	None	A992	Typical
5	2B6	F5_N8	F5_N10			W14x22	Beam	None	A992	Typical
6	1B6	BP_C_2	BP_C_1			W12x35	Beam	None	A992	Typical
7	1B1	N200	N201			W12x72	Beam	None	A992	Typical
8	C-2.1	BP_B_1	F6_N8			Base Columns	Column	Wide Flange	A992	Typical
9	C-3.5	BP_B_2	F6_N10			Base Columns	Column	Wide Flange	A992	Typical
10	DRAG1	N134	DEF_...			Drag Struts	Beam	None	Spruc...	Typical
11	DRAG2	N133	DEF_...			Drag Struts	Beam	None	Spruc...	Typical
12	DRAG3	F2_N9	N138			Drag Struts	Beam	None	Spruc...	Typical
13	DRAG4	F1_N8	N139			Drag Struts	Beam	None	Spruc...	Typical
14	DRAG5	F2_N8	N135			Drag Struts	Beam	None	Spruc...	Typical
15	DRAG6	F2_N10	N140			Drag Struts	Beam	None	Spruc...	Typical
16	DRAG7	F5_N7	N26			Drag Struts	Beam	None	Spruc...	Typical
17	DRAG8	F5_N8	N27			Drag Struts	Beam	None	Spruc...	Typical
18	DRAG9	F5_N10	N29			Drag Struts	Beam	None	Spruc...	Typical
19	DRAG10	F5_N9	N28			Drag Struts	Beam	None	Spruc...	Typical
20	(C-2.1)	F6_N8	DEF_...			W16x31	Column	None	A992	Typical
21	(C-3.5)	F6_N10	F1_N8			W16x31	Column	None	A992	Typical
22	(F.5-4.5)	N186	N171			W14x74	Column	None	A992	Typical
23	(F.5-1.1)	N187	DEF_...			W14x74	Column	None	A992	Typical
24	DRAG11	F6_N7	N149			Drag Struts	Beam	None	Spruc...	Typical
25	DRAG12	F6_N9	N150A			Drag Struts	Beam	None	Spruc...	Typical
26	DRAG13	N172	DEF_...			Drag Struts	Beam	None	Spruc...	Typical
27	DRAG14	N171	N175			Drag Struts	Beam	None	Spruc...	Typical

## Wall Panel Data

	Label	A Joint	B Joint	C Joint	D Joint	Material Ty..	Material Set	Thickne...	Design Rule	Panel/Spacing
1	Conc 1	F3_N9	F3_N10	N165	N164	Concrete	Conc25NW	10	Typical	N/A
2	Conc 2	F6_N25	F6_N26	N192A	N191A	Concrete	Conc25NW	10	Typical	N/A
3	Conc 3	F6_N175	F6_N129	N193A	N178	Concrete	Conc25NW	10	Typical	N/A
4	A 4th	DEF_S...	F2_N27...	SWHD_4	SWHD 3	Wood	Spruce-Pi...	5.5 (stud)	3"	S1_15/32_8d@3   16
5	A Roof	F1_N48	DEF_W...	F2_N2	N148	Wood	Spruce-Pi...	5.5 (stud)	6"	S1_15/32_8d@6   16
6	D 4th	F2_N9	DEF_W...	F5_N7	F5_N9	Wood	Spruce-Pi...	5.5 (stud)	6"	S1_15/32_8d@6   16
7	D 3rd	F5_N9	F5_N7	F6_N7	F6_N9	Wood	Spruce-Pi...	5.5 (stud)	6"	S1_15/32_8d@6   16
8	Conc 4	F3_N9	F3_N13...	N166	N164	Concrete	Conc25NW	10	Typical	N/A

**Lateral Loading**  
Note: vertical loads applied via  
RISAFloor

### Seismic Generation Input

Seismic Code:	<b>ASCE 7-10</b>				
Ct_X:	<b>.02</b>	T_X (sec):	<b>.224</b>	R_X:	<b>6.5</b>
Ct_Z:	<b>.02</b>	T_Z (sec):	<b>.224</b>	R_Z:	<b>6.5</b>
Ct Exp. X:	<b>.75</b>	Ct Exp. Z:	<b>.75</b>		
Risk Cat	<b>I or II</b>	TL (sec):	<b>8</b>		
SD1 (g):	<b>.363</b>	SDS (g):	<b>.582</b>	S1 (g):	<b>.304</b>
Base Elev (ft):	<b>8.94</b>	Parapet Ht (ft):	<b>0</b>		

### Seismic Generation Detail Results

T_X Used (sec):	<b>.224</b>	T_X Method A:	<b>.268</b>	T_X Upper Limit:	<b>.376</b>
T_Z Used (sec):	<b>.224</b>	T_Z Method A:	<b>.268</b>	T_Z Upper Limit:	<b>.376</b>
Importance Fac.:	<b>1</b>	Design Cat.:	<b>D</b>		
V_X (k):	<b>21.938</b>	Gov. Eqn.	<b>ASCE Eqn 12.8-2</b>	Cs_X:	<b>0.090</b>
V_Z (k):	<b>21.938</b>	Gov. Eqn.	<b>ASCE Eqn 12.8-2</b>	Cs_Z:	<b>0.090</b>

### Seismic Generation Force Results

Floor Level	Height (ft)	Weight (k)	Force X (k)	Force Z (k)	CG X (ft)	CG Z (ft)
<b>Roof 40'-5 9/16"</b>	<b>31.869</b>	<b>54.652</b>	<b>8.268</b>	<b>8.268</b>	<b>12.27</b>	<b>12.328</b>
<b>Level 4 - 28'-10 ...</b>	<b>19.937</b>	<b>27.404</b>	<b>2.594</b>	<b>2.594</b>	<b>12.243</b>	<b>9.282</b>
<b>Level 4 - 28'-10 ...</b>	<b>19.937</b>	<b>75.926</b>	<b>7.186</b>	<b>7.186</b>	<b>12.253</b>	<b>35.946</b>
<b>Level 3 18'-4 1/4"</b>	<b>9.416</b>	<b>63.04</b>	<b>2.818</b>	<b>2.818</b>	<b>12.251</b>	<b>6.556</b>
<b>Level 3 18'-4 1/4"</b>	<b>9.416</b>	<b>23.985</b>	<b>1.072</b>	<b>1.072</b>	<b>12.252</b>	<b>31.409</b>
<b>Totals</b>		<b>245.007</b>	<b>21.938</b>	<b>21.938</b>		

### Seismic Generation Diaphragm Results

Floor Level	Width (X) (ft)	Length (Z) (ft)	X Plus (ft)	X Minus (ft)	Z Plus (ft)	Z Minus (ft)
<b>Roof 40'-5 9/16"</b>	<b>24.5</b>	<b>24.08</b>	<b>1.225</b>	<b>1.225</b>	<b>1.204</b>	<b>1.204</b>
<b>Level 4 - 28'-10 ...</b>	<b>24.5</b>	<b>18.42</b>	<b>1.225</b>	<b>1.225</b>	<b>.921</b>	<b>.921</b>
<b>Level 4 - 28'-10 ...</b>	<b>24.5</b>	<b>29.636</b>	<b>1.225</b>	<b>1.225</b>	<b>1.482</b>	<b>1.482</b>
<b>Level 3 18'-4 1/4"</b>	<b>24.5</b>	<b>18.42</b>	<b>1.225</b>	<b>1.225</b>	<b>.921</b>	<b>.921</b>
<b>Level 3 18'-4 1/4"</b>	<b>24.5</b>	<b>21.347</b>	<b>1.225</b>	<b>1.225</b>	<b>1.067</b>	<b>1.067</b>

#### Lateral Design Forces Note:

Preliminary wind and seismic load analysis was completed at design outset to determine the governing case. Seismic loading including overstrength was determine to govern versus wind loading as per ASCE7; In addition, requirements of ASCE7 clause 12.12.1.1 ensures that critical deflection criteria for the structural frame is governed by seismic results when compared to IBC 1604.3 limitations.

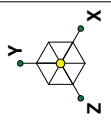
Members forming part of the wind resisting system were considered and detailed accordingly as needed.

## Frame / HR Column Seismic Design Rule

	Label	Frame Ductility	Overstrength Req'd
1	SMF SUPPORT	High	Yes
2	RBS C ROOF	High	Yes
3	RBS C LEVEL 4	High	Yes
4	RBS C LEVEL 3	High	Yes
5	RBS F.5 LEVEL 4	High	Yes
6	RBS F.5 LEVEL 3	High	Yes

## HR Beam Seismic Design Rule

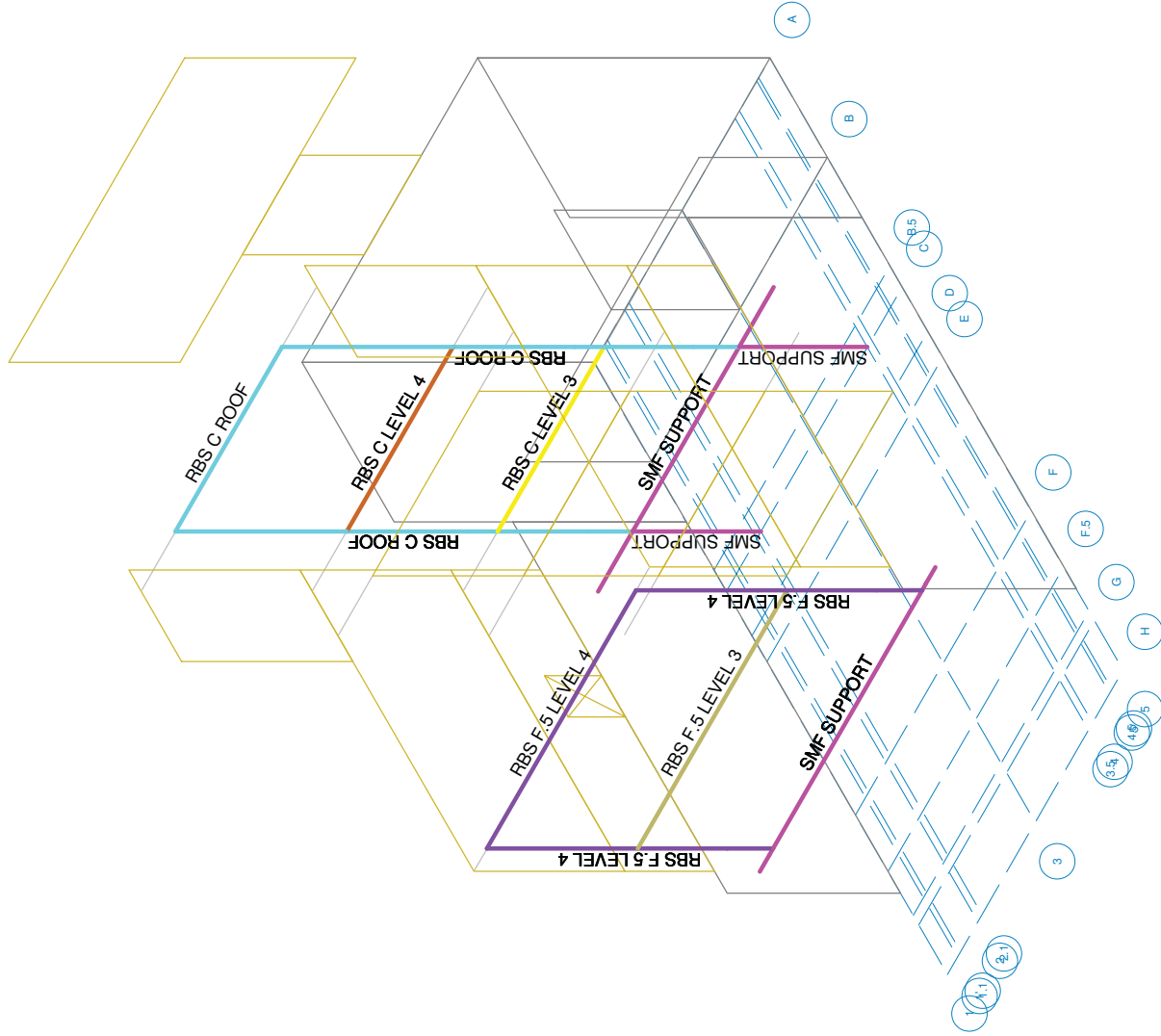
	Label	Moment Connection	Overstrength Req'd	Z Factor	Hinge Location[in]
1	SMF SUPPORT	Other/None	Yes		
2	RBS C ROOF	RBS		.663	7
3	RBS C LEVEL 4	RBS		.663	7
4	RBS C LEVEL 3	RBS		.633	7
5	RBS F.5 LEVEL 4	RBS		.696	7.625
6	RBS F.5 LEVEL 3	RBS		.653	7.625



Blackwell

Seismic Rules

None
SMF SUPPORT
RBS C ROOF
RBS C LEVEL 4
RBS C LEVEL 3
RBS F.5 LEVEL 4
RBS F.5 LEVEL 3



CONCRETE WALLS NOT SHOWN FOR CLARITY

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BG

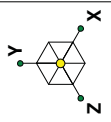
170450

Lot 71

SEISMIC DESIGN RULES

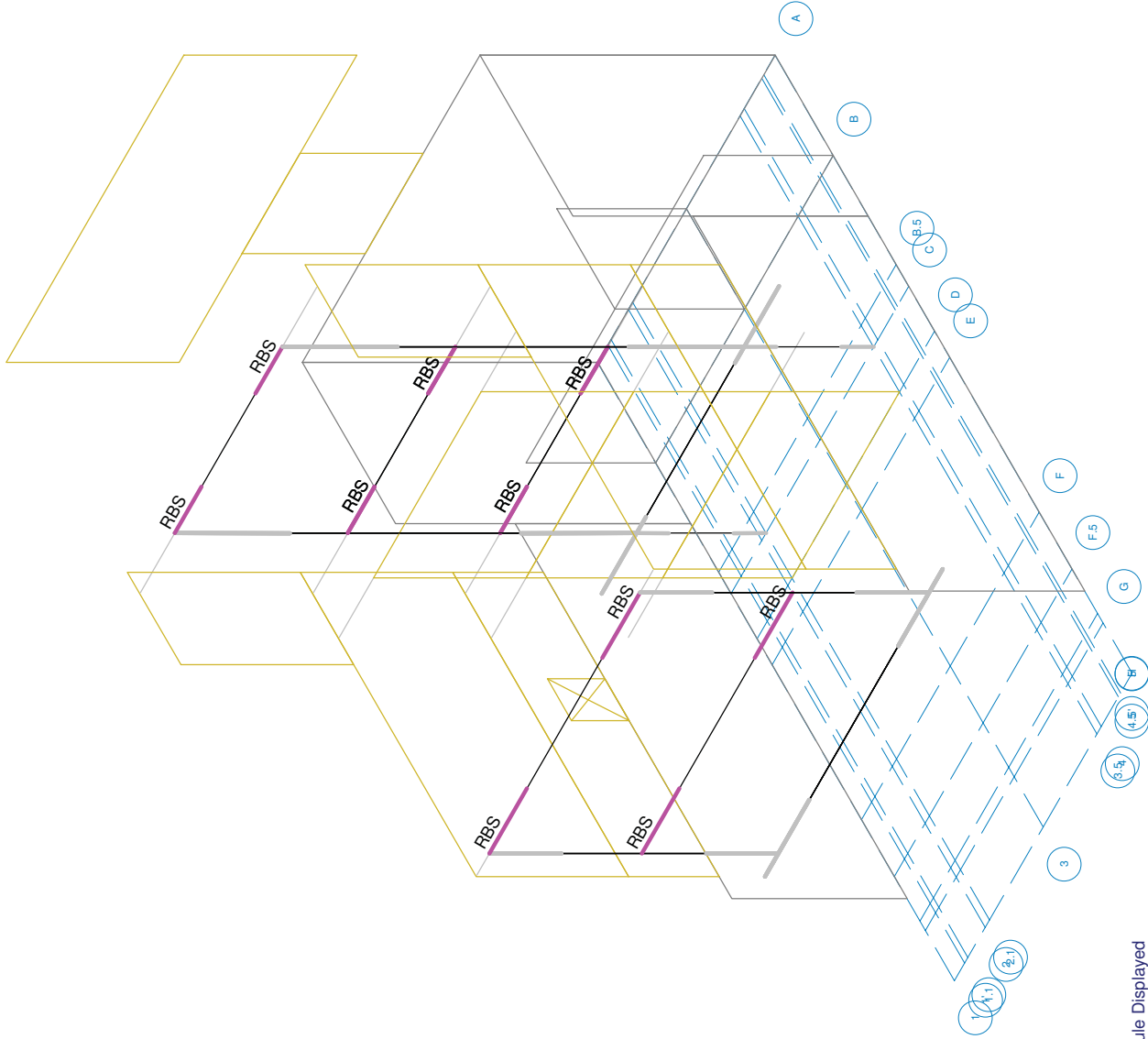
June 26, 2018 at 11:49 AM

170450 Summit Lot 71 2018.06.24.rfl



Conn Rules

- None
- RBS
- Col/Bm Clip Angle
- Col/Bm Shear Tab
- Girder/Bm Clip Angle
- Girder/Bm Shear Tab
- Flange Plate Moment
- End-Plate Moment
- Col Shear Splice
- Col Moment Splice
- Diagonal Brace
- Chevron Brace



Member Connection Design Rule Displayed  
Results for LC 28, ASCE Strength 1

Blackwell Structural Engineers

BG

170450

Lot 71

CONNECTION RULES

June 26, 2018 at 11:56 AM

170450 Summit Lot 71 2018.06.24.rfl

## Basic Load Cases

	BLC Description	Category	X Grav...	Y Grav...	Z Grav...	Joint	Point	Distributed Area(...	Surfac...
1	Dead Load	DL		-1		16	278	77	
2	Live Load	LL				14	216	56	
3	Live Load Special (public assemb	LLS							
4	Roof Live Load	RLL							
5	Snow Load	SL				4	86	14	
6	Snow Load Nonshedding	SLN							
7	Rain Load	RL							
8	Wind Load X	WLX				2			
9	Partial X Wind Load 1	WLXP1							
10	Partial X Wind Load 2	WLXP2							
11	Wind Load Z	WLZ							
12	Partial Z Wind Load 1	WLZP1							
13	Partial Z Wind Load 2	WLZP2							
14	Earthquake Load X	ELX				5			
15	Earthquake Load X Plus Z Eccentr	ELX+Z				5			
16	Earthquake Load X Minus Z Eccent	ELX-Z				5			
17	Earthquake Load Z	ELZ				5			
18	Earthquake Load Z Plus X Eccentr	ELZ+X				5			
19	Earthquake Load Z Minus X Eccent	ELZ-X				5		1	
20	Other Load 1	OL1							
21	Other Load 2	OL2							
22	Other Load 3	OL3							
23	Other Load 4	OL4							
24	Wind Load Roof +X	WLX+R							
25	Wind Load Roof -X	WLX-R							
26	Wind Load Roof +Z	WLZ+R							
27	Wind Load Roof -Z	WLZ-R							
28	Semi-Rigid Wind Load +X	WL+X							
29	Semi-Rigid Wind Load -X	WL-X							
30	Semi-Rigid Wind Load +Z	WL+Z							
31	Semi-Rigid Wind Load -Z	WL-Z							
32		None						16	
33		None						16	
34	BLC 14 Transient Area Loads	None						192	
35	BLC 17 Transient Area Loads	None						83	

## Load Combinations

	Description	S...	PDelta	S...	BLC	Factor	BLC Fa...	BLC Fa...	BLC Fa...	BLC Fa...	B...Fa...	BLC Fa...	B...Fa...	B...Fa...	B...Fa...	B...Fa...
1	Dead Load		Y		DL	1										
2	Live Load		Y		LL	1										
3	Snow Load		Y		SL	1										
4	Wind Load X		Y		WLX	1										
5	Partial X Wind Loa...		Y		WL...	1										
6	Partial X Wind Loa...		Y		WL...	1										
7	Wind Load Z		Y		WLZ	1										
8	Partial Z Wind Loa...		Y		WL...	1										
9	Partial Z Wind Loa...		Y		WL...	1										
10	Earthquake Load X		Y		ELX	1										
11	Earthquake Load Z		Y		ELZ	1										

## Load Combinations (Continued)

	Description	S...	PDelta	S...	BLC Factor	BLC Fa...	BLC Fa...	BLC Fa...	BLC Fa...	B...	B...	B...	B...	B...	B...	B...	B...	B...
12	Wind Load Roof +X		Y	WL...	1													
13	Wind Load Roof -X		Y	WL...	1													
14	Wind Load Roof +Z		Y	WL...	1													
15	Wind Load Roof -Z		Y	WL...	1													
16			Y															
17	DEFLECTION		Y															
18	DEF ASCE 5 (a)		Y	DL	1.2	Sds...	.2	ELX	1	LL	.5	LLS	1	SL	.2			
19	DEF ASCE 5 (b)		Y	DL	1.2	Sds...	.2	ELZ	1	LL	.5	LLS	1	SL	.2			
20	DEF ASCE 5 (c)		Y	DL	1.2	Sds...	.2	ELX	-1	LL	.5	LLS	1	SL	.2			
21	DEF ASCE 5 (d)		Y	DL	1.2	Sds...	.2	ELZ	-1	LL	.5	LLS	1	SL	.2			
22	DEF ASCE 7 (a)		Y	DL	.9	Sds...	-.2	ELX	1									
23	DEF ASCE 7 (b)		Y	DL	.9	Sds...	-.2	ELZ	1									
24	DEF ASCE 7 (c)		Y	DL	.9	Sds...	-.2	ELX	1									
25	DEF ASCE 7 (d)		Y	DL	.9	Sds...	-.2	ELZ	1									
26			Y															
27	LFRD		Y															
28	ASCE Strength 1	Yes	Y	DL	1.4													
29	ASCE Strength 2 (...)	Yes	Y	DL	1.2	LL	1.6	LLS	1.6									
30	ASCE Strength 2 (...)	Yes	Y	DL	1.2	LL	1.6	LLS	1.6	SL	.5	SLN	.5					
31	ASCE Strength 3 (...)	Yes	Y	DL	1.2	SL	1.6	SLN	1.6	LL	.5	LLS	1					
32	ASCE Strength 5 (...)	Yes	Y	DL	1.2	Sds...	.2	Rho...	1	LL	.5	LLS	1	SL	.2	SLN	.2	
33	ASCE Strength 5 (...)	Yes	Y	DL	1.2	Sds...	.2	Rho...	1	LL	.5	LLS	1	SL	.2	SLN	.2	
34	ASCE Strength 5 (...)	Yes	Y	DL	1.2	Sds...	.2	Rho...	-1	LL	.5	LLS	1	SL	.2	SLN	.2	
35	ASCE Strength 5 (...)	Yes	Y	DL	1.2	Sds...	.2	Rho...	-1	LL	.5	LLS	1	SL	.2	SLN	.2	
36	ASCE Strength 7 (...)	Yes	Y	DL	.9	Sds...	-.2	Rho...	1									
37	ASCE Strength 7 (...)	Yes	Y	DL	.9	Sds...	-.2	Rho...	1									
38	ASCE Strength 7 (...)	Yes	Y	DL	.9	Sds...	-.2	Rho...	-1									
39	ASCE Strength 7 (...)	Yes	Y	DL	.9	Sds...	-.2	Rho...	-1									
40	LFRD OVERSTR...	Yes	Y	DL	.9	Sds...	-.2	Rho...	-1									
41	ASCE Strength 5 (...)	Yes	Y	DL	1.2	Sds...	.2	Om...	1	LL	.5	LLS	1	SL	.2	SLN	.2	
42	ASCE Strength 5 (...)	Yes	Y	DL	1.2	Sds...	.2	Om...	1	LL	.5	LLS	1	SL	.2	SLN	.2	
43	ASCE Strength 5 (...)	Yes	Y	DL	1.2	Sds...	.2	Om...	-1	LL	.5	LLS	1	SL	.2	SLN	.2	
44	ASCE Strength 5 (...)	Yes	Y	DL	1.2	Sds...	.2	Om...	-1	LL	.5	LLS	1	SL	.2	SLN	.2	
45	ASCE Strength 7 (...)	Yes	Y	DL	.9	Sds...	-.2	Om...	1									
46	ASCE Strength 7 (...)	Yes	Y	DL	.9	Sds...	-.2	Om...	1									
47	ASCE Strength 7 (...)	Yes	Y	DL	.9	Sds...	-.2	Om...	-1									
48	ASCE Strength 7 (...)	Yes	Y	DL	.9	Sds...	-.2	Om...	-1									
49		Yes	Y															
50	ASD	Yes	Y															
51	ASCE ASD 5 (b) (a)	Yes	Y	DL	1	Sds...	.14	Rho...	.7									
52	ASCE ASD 5 (b) (...)	Yes	Y	DL	1	Sds...	.14	Rho...	.7									
53	ASCE ASD 5 (b) (c)	Yes	Y	DL	1	Sds...	.14	Rho...	-.7									
54	ASCE ASD 5 (b) (...)	Yes	Y	DL	1	Sds...	.14	Rho...	-.7									
55	ASCE ASD 6 (b) (a)	Yes	Y	DL	1	Sds...	.105	Rho...	.525	LL	.75	LLS	.75					
56	ASCE ASD 6 (b) (...)	Yes	Y	DL	1	Sds...	.105	Rho...	.525	LL	.75	LLS	.75					
57	ASCE ASD 6 (b) (c)	Yes	Y	DL	1	Sds...	.105	Rho...	-.5...	LL	.75	LLS	.75					
58	ASCE ASD 6 (b) (...)	Yes	Y	DL	1	Sds...	.105	Rho...	-.5...	LL	.75	LLS	.75					
59	ASCE ASD 6 (d) (a)	Yes	Y	DL	1	Sds...	.105	Rho...	.525	LL	.75	LLS	.75	SL	.75	SLN	.75	
60	ASCE ASD 6 (d) (...)	Yes	Y	DL	1	Sds...	.105	Rho...	.525	LL	.75	LLS	.75	SL	.75	SLN	.75	
61	ASCE ASD 6 (d) (c)	Yes	Y	DL	1	Sds...	.105	Rho...	-.5...	LL	.75	LLS	.75	SL	.75	SLN	.75	
62	ASCE ASD 6 (d) (...)	Yes	Y	DL	1	Sds...	.105	Rho...	-.5...	LL	.75	LLS	.75	SL	.75	SLN	.75	
63	ASCE ASD 8 (a)	Yes	Y	DL	.6	Sds...	-.14	Rho...	.7									



## Load Combinations (Continued)

	Description	S...	PDelta	S...	BLC Factor	BLC Fa...	BLC Fa...	BLC Fa...	BLC Fa...	B...	B...	B...	B...	B...	B...	B...	B...
64	ASCE ASD 8 (b)	Yes	Y	DL	.6	Sds...-.14	Rho... .7										
65	ASCE ASD 8 (c)	Yes	Y	DL	.6	Sds...-.14	Rho...-.7										
66	ASCE ASD 8 (d)	Yes	Y	DL	.6	Sds...-.14	Rho...-.7										
67	ASD OVERSTRE...	Yes	Y														
68	ASCE ASD 5 (b) (...)	Yes	Y	DL	1	Sds... .14	Om... .7										
69	ASCE ASD 5 (b) (...)	Yes	Y	DL	1	Sds... .14	Om... .7										
70	ASCE ASD 5 (b) (...)	Yes	Y	DL	1	Sds... .14	Om...-.7										
71	ASCE ASD 5 (b) (...)	Yes	Y	DL	1	Sds... .14	Om...-.7										
72	ASCE ASD 6 (b) (...)	Yes	Y	DL	1	Sds...105	Om...525	LL .75	LLS .75								
73	ASCE ASD 6 (b) (...)	Yes	Y	DL	1	Sds...105	Om...525	LL .75	LLS .75								
74	ASCE ASD 6 (b) (...)	Yes	Y	DL	1	Sds...105	Om...-5...	LL .75	LLS .75								
75	ASCE ASD 6 (b) (...)	Yes	Y	DL	1	Sds...105	Om...-5...	LL .75	LLS .75								
76	ASCE ASD 6 (d) (...)	Yes	Y	DL	1	Sds...105	Om...525	LL .75	LLS .75	SL .75	SLN .75						
77	ASCE ASD 6 (d) (...)	Yes	Y	DL	1	Sds...105	Om...525	LL .75	LLS .75	SL .75	SLN .75						
78	ASCE ASD 6 (d) (...)	Yes	Y	DL	1	Sds...105	Om...-5...	LL .75	LLS .75	SL .75	SLN .75						
79	ASCE ASD 6 (d) (...)	Yes	Y	DL	1	Sds...105	Om...-5...	LL .75	LLS .75	SL .75	SLN .75						
80	ASCE ASD 8 (os-a)	Yes	Y	DL	.6	Sds...-.14	Om... .7										
81	ASCE ASD 8 (os-b)	Yes	Y	DL	.6	Sds...-.14	Om... .7										
82	ASCE ASD 8 (os-c)	Yes	Y	DL	.6	Sds...-.14	Om...-.7										
83	ASCE ASD 8 (os-d)	Yes	Y	DL	.6	Sds...-.14	Om...-.7										
84		Yes	Y														
85	ASD GRAVITY	Yes	Y														
86	ASCE ASD 1	Yes	Y	DL	1												
87	ASCE ASD 2	Yes	Y	DL	1	LL 1	LLS 1										
88	ASCE ASD 3 (b)	Yes	Y	DL	1	SL 1	SLN 1										
89	ASCE ASD 4 (b)	Yes	Y	DL	1	LL .75	LLS .75	SL .75	SLN .75								
90		Y															
91	WIND DEF		Y	DL	1	WLX 1											
92		Y															
93		Y															
94	LFRD WIND		Y														
95	ASCE Strength 3 (...)		Y	DL	1.2	WLX .5											
96	ASCE Strength 3 (...)		Y	DL	1.2	WLZ .5											
97	ASCE Strength 3 (...)		Y	DL	1.2	SL 1.6	SLN 1.6	WLX .5									
98	ASCE Strength 3 (...)		Y	DL	1.2	SL 1.6	SLN 1.6	WLZ .5									
99	ASCE Strength 4 (...)		Y	DL	1.2	WLX 1	LL .5	LLS 1									
100	ASCE Strength 4 (...)		Y	DL	1.2	WLZ 1	LL .5	LLS 1									
101	ASCE Strength 4 (...)		Y	DL	1.2	WLX 1	LL .5	LLS 1	SL .5	S... .5							
102	ASCE Strength 4 (...)		Y	DL	1.2	WLZ 1	LL .5	LLS 1	SL .5	S... .5							
103	ASCE Strength 6 (...)		Y	DL	.9	WLX 1											
104	ASCE Strength 6 (...)		Y	DL	.9	WLZ 1											
105		Y															
106	ASD WIND		Y														
107	ASCE ASD 5 (a) (a)		Y	DL	1	WLX .6											
108	ASCE ASD 5 (a) (b)		Y	DL	1	WLZ .6											
109	ASCE ASD 6 (a) (a)		Y	DL	1	WLX .45	LL .75	LLS .75									
110	ASCE ASD 6 (a) (b)		Y	DL	1	WLZ .45	LL .75	LLS .75									
111	ASCE ASD 6 (c) (a)		Y	DL	1	WLX .45	LL .75	LLS .75	SL .75	S... .75							
112	ASCE ASD 6 (c) (b)		Y	DL	1	WLZ .45	LL .75	LLS .75	SL .75	S... .75							
113	ASCE ASD 7 (a)		Y	DL	.6	WLX .6											
114	ASCE ASD 7 (b)		Y	DL	.6	WLZ .6											

**Lateral Member and Wall Utilization**

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

	LC	Member	Shape	UC Max	Loc[ft]	Shear UC	Loc[ft]	Dir	phi*Pnc[k]	phi*Pnt[k]	phi*Mnyy..	phi*Mnzz...	Cb	Eqn
1	28	RB1	W14x22	.031	0	.010	0	y	49.866	292.05	16.462	70.981	1.657	H1-1b
2	28	3B11	W14x22	.016	0	.006	14.84	y	49.866	292.05	16.462	85.852	2.005	H1-1b
3	28	3B2	W12x35	.098	0	.043	0	y	88.948	463.5	43.125	174.071	1.97	H1-1b
4	28	2B1	W10x26	.066	0	.021	0	y	51.191	342.45	28.125	100.453	2.131	H1-1b
5	28	2B6	W14x22	.028	0	.006	14.84	y	49.866	292.05	16.462	124.5	3.215	H1-1b
6	28	1B6	W12x35	.186	19.651	.050	19.651	y	64.034	463.5	43.125	95.426	1.336	H1-1b
7	28	1B1	W12x72	.043	2.042	.068	4.594	y	479.183	949.5	184.5	405	1.148	H1-1b
8	28	C-2.1	W16x31	.057	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
9	28	C-3.5	W16x31	.057	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
10	28	(C-2.1)	W16x31	.062	0	.010	3.32	y	204.832	410.85	26.363	174.786	1.175	H1-1b
11	28	(C-3.5)	W16x31	.062	0	.010	3.32	y	204.832	410.85	26.363	174.783	1.175	H1-1b
12	28	(F.5-4.5)	W14x74	.049	0	.014	3.323	y	879.192	981	151.875	472.5	2.191	H1-1b
13	28	(F.5-1.1)	W14x74	.048	0	.014	3.323	y	879.192	981	151.875	472.5	2.184	H1-1b
14	29	RB1	W14x22	.026	0	.009	0	y	49.866	292.05	16.462	76.682	1.791	H1-1b
15	29	3B11	W14x22	.027	0	.010	14.84	y	49.866	292.05	16.462	77.309	1.805	H1-1b
16	29	3B2	W12x35	.174	0	.077	0	y	88.948	463.5	43.125	170.737	1.932	H1-1b
17	29	2B1	W10x26	.104	0	.036	0	y	51.191	342.45	28.125	107.124	2.273	H1-1b
18	29	2B6	W14x22	.049	0	.010	14.84	y	49.866	292.05	16.462	124.5	3.193	H1-1b*
19	29	1B6	W12x35	.345	19.651	.092	19.651	y	64.034	463.5	43.125	95.401	1.336	H1-1b
20	29	1B1	W12x72	.044	2.042	.067	4.594	y	479.183	949.5	184.5	405	1.137	H1-1b
21	29	C-2.1	W16x31	.089	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
22	29	C-3.5	W16x31	.089	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
23	29	(C-2.1)	W16x31	.106	0	.017	3.32	y	204.832	410.85	26.363	174.472	1.173	H1-1b
24	29	(C-3.5)	W16x31	.106	0	.017	3.32	y	204.832	410.85	26.363	174.47	1.173	H1-1b
25	29	(F.5-4.5)	W14x74	.061	19.938	.019	9.553	y	862.284	981	151.875	472.5	2.271	H1-1b
26	29	(F.5-1.1)	W14x74	.060	19.938	.019	9.553	y	862.284	981	151.875	472.5	2.292	H1-1b
27	30	RB1	W14x22	.101	0	.032	0	y	49.866	292.05	16.462	68.093	1.59	H1-1b
28	30	3B11	W14x22	.024	0	.010	14.84	y	49.866	292.05	16.462	100.291	2.342	H1-1b
29	30	3B2	W12x35	.309	20.788	.138	0	y	88.948	463.5	43.125	167.821	1.899	H1-1b
30	30	2B1	W10x26	.101	0	.036	0	y	51.191	342.45	28.125	117.375	2.501	H1-1b
31	30	2B6	W14x22	.053	0	.010	14.84	y	49.866	292.05	16.462	124.5	3.199	H1-1b*
32	30	1B6	W12x35	.344	19.651	.092	19.651	y	64.034	463.5	43.125	95.542	1.337	H1-1b
33	30	1B1	W12x72	.050	2.042	.070	0	y	479.183	949.5	184.5	405	1.117	H1-1b
34	30	C-2.1	W16x31	.102	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
35	30	C-3.5	W16x31	.102	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
36	30	(C-2.1)	W16x31	.115	0	.018	3.32	y	204.832	410.85	26.363	174.734	1.175	H1-1b
37	30	(C-3.5)	W16x31	.115	0	.018	3.32	y	204.832	410.85	26.363	174.732	1.175	H1-1b
38	30	(F.5-4.5)	W14x74	.107	19.938	.031	9.553	y	862.284	981	151.875	472.5	2.616	H1-1b
39	30	(F.5-1.1)	W14x74	.107	19.938	.031	9.553	y	862.284	981	151.875	472.5	2.6	H1-1b
40	31	RB1	W14x22	.264	0	.083	0	y	49.866	292.05	16.462	65.95	1.54	H1-1b
41	31	3B11	W14x22	.022	0	.007	14.84	y	49.866	292.05	16.462	124.5	3.147	H1-1b
42	31	3B2	W12x35	.543	20.788	.243	0	y	88.948	463.5	43.125	166.208	1.881	H1-1b
43	31	2B1	W10x26	.081	0	.024	0	y	51.191	342.45	28.125	117.375	3.188	H1-1b
44	31	2B6	W14x22	.044	7.42	.007	14.84	y	49.866	292.05	16.462	124.5	1.006	H1-1b*
45	31	1B6	W12x35	.214	19.651	.058	19.651	y	64.034	463.5	43.125	96.13	1.346	H1-1b
46	31	1B1	W12x72	.099	1.786	.142	0	y	479.183	949.5	184.5	405	1.295	H1-1b
47	31	C-2.1	W16x31	.102	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
48	31	C-3.5	W16x31	.102	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
49	31	(C-2.1)	W16x31	.117	31.87	.014	20.25	y	136.638	410.85	26.363	202.5	2.145	H1-1b
50	31	(C-3.5)	W16x31	.117	31.87	.014	20.25	y	136.638	410.85	26.363	202.5	2.145	H1-1b
51	31	(F.5-4.5)	W14x74	.188	19.938	.050	9.553	y	862.284	981	151.875	472.5	2.545	H1-1b

## Member AISC 14th(360-10): LRFD Steel Code Checks (Continued)

LC	Member	Shape	UC Max	Loc[ft]	Shear UC	Loc[ft]	Dir	phi*Pnc[k]	phi*Pnt[k]	phi*Mnyy...	phi*Mnzz...	Cb	Eqn	
52	31	(F.5-1.1)	W14x74	.188	19.938	.050	9.553	y	862.284	981	151.875	472.5	2.552	H1-1b
53	32	RB1	W14x22	.316	0	.054	0	y	49.866	292.05	16.462	96.985	2.265	H1-1b
54	32	3B11	W14x22	.390	14.84	.059	14.84	y	49.866	292.05	16.462	97.968	2.288	H1-1b
55	32	3B2	W12x35	.270	0	.094	0	y	88.948	463.5	43.125	192	2.367	H1-1b
56	32	2B1	W10x26	.177	0	.040	0	y	51.191	342.45	28.125	114.113	2.421	H1-1b
57	32	2B6	W14x22	.391	14.84	.057	14.84	y	49.866	292.05	16.462	99.43	2.322	H1-1b
58	32	1B6	W12x35	.316	4.849	.078	4.849	y	64.034	463.5	43.125	113.08	1.583	H1-1b
59	32	1B1	W12x72	.090	22.458	.078	20.417	y	479.183	949.5	184.5	405	1.096	H1-1b
60	32	C-2.1	W16x31	.027	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
61	32	C-3.5	W16x31	.116	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
62	32	(C-2.1)	W16x31	.162	9.627	.033	9.627	y	174.184	410.85	26.363	152.419	1.108	H1-1b
63	32	(C-3.5)	W16x31	.323	0	.051	3.32	y	204.832	410.85	26.363	174.289	1.172	H1-1b
64	32	(F.5-4.5)	W14x74	.102	19.938	.034	9.553	y	862.284	981	151.875	472.5	2.192	H1-1b
65	32	(F.5-1.1)	W14x74	.095	0	.027	3.323	y	879.192	981	151.875	472.5	3.161	H1-1b
66	33	RB1	W14x22	.059	0	.019	0	y	49.866	292.05	16.462	68.783	1.606	H1-1b
67	33	3B11	W14x22	.018	0	.007	14.84	y	49.866	292.05	16.462	94.428	2.205	H1-1b
68	33	3B2	W12x35	.174	0	.077	0	y	88.948	463.5	43.125	169.882	1.923	H1-1b
69	33	2B1	W10x26	.076	0	.026	0	y	51.191	342.45	28.125	109.005	2.313	H1-1b
70	33	2B6	W14x22	.035	7.42	.007	14.84	y	49.866	292.05	16.462	124.5	1.007	H1-1b*
71	33	1B6	W12x35	.232	19.651	.063	19.651	y	64.034	463.5	43.125	95.498	1.337	H1-1b
72	33	1B1	W12x72	.045	2.042	.067	4.594	y	479.183	949.5	184.5	405	1.135	H1-1b
73	33	C-2.1	W16x31	.071	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
74	33	C-3.5	W16x31	.071	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
75	33	(C-2.1)	W16x31	.079	0	.012	3.32	y	204.832	410.85	26.363	174.798	1.175	H1-1b
76	33	(C-3.5)	W16x31	.079	0	.012	3.32	y	204.832	410.85	26.363	174.796	1.175	H1-1b
77	33	(F.5-4.5)	W14x74	.060	19.938	.019	9.553	y	862.284	981	151.875	472.5	2.315	H1-1b
78	33	(F.5-1.1)	W14x74	.060	19.938	.019	9.553	y	862.284	981	151.875	472.5	2.335	H1-1b
79	34	RB1	W14x22	.316	14.84	.054	14.84	y	49.866	292.05	16.462	97.009	2.265	H1-1b
80	34	3B11	W14x22	.390	0	.059	0	y	49.866	292.05	16.462	97.917	2.286	H1-1b
81	34	3B2	W12x35	.269	20.788	.091	20.788	y	88.948	463.5	43.125	192	2.387	H1-1b
82	34	2B1	W10x26	.175	20.788	.040	20.788	y	51.191	342.45	28.125	112.839	2.394	H1-1b
83	34	2B6	W14x22	.392	0	.056	0	y	49.866	292.05	16.462	99.661	2.327	H1-1b
84	34	1B6	W12x35	.329	19.651	.078	19.651	y	64.034	463.5	43.125	113.186	1.584	H1-1b
85	34	1B1	W12x72	.097	2.042	.079	4.594	y	479.183	949.5	184.5	405	1.071	H1-1b
86	34	C-2.1	W16x31	.116	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
87	34	C-3.5	W16x31	.027	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
88	34	(C-2.1)	W16x31	.325	0	.052	3.32	y	204.832	410.85	26.363	174.401	1.172	H1-1b
89	34	(C-3.5)	W16x31	.164	9.627	.034	9.627	y	174.184	410.85	26.363	152.355	1.108	H1-1b
90	34	(F.5-4.5)	W14x74	.097	0	.027	3.323	y	879.192	981	151.875	472.5	3.135	H1-1b
91	34	(F.5-1.1)	W14x74	.102	19.938	.034	9.553	y	862.284	981	151.875	472.5	2.179	H1-1b
92	35	RB1	W14x22	.059	0	.019	0	y	49.866	292.05	16.462	68.783	1.606	H1-1b
93	35	3B11	W14x22	.018	0	.007	14.84	y	49.866	292.05	16.462	94.428	2.205	H1-1b
94	35	3B2	W12x35	.174	0	.077	0	y	88.948	463.5	43.125	169.882	1.923	H1-1b
95	35	2B1	W10x26	.076	0	.026	0	y	51.191	342.45	28.125	109.005	2.313	H1-1b
96	35	2B6	W14x22	.035	7.42	.007	14.84	y	49.866	292.05	16.462	124.5	1.007	H1-1b*
97	35	1B6	W12x35	.232	19.651	.063	19.651	y	64.034	463.5	43.125	95.498	1.337	H1-1b
98	35	1B1	W12x72	.045	2.042	.067	4.594	y	479.183	949.5	184.5	405	1.135	H1-1b
99	35	C-2.1	W16x31	.071	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
100	35	C-3.5	W16x31	.071	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
101	35	(C-2.1)	W16x31	.079	0	.012	3.32	y	204.832	410.85	26.363	174.798	1.175	H1-1b
102	35	(C-3.5)	W16x31	.079	0	.012	3.32	y	204.832	410.85	26.363	174.796	1.175	H1-1b
103	35	(F.5-4.5)	W14x74	.060	19.938	.019	9.553	y	862.284	981	151.875	472.5	2.315	H1-1b

## Member AISC 14th(360-10): LRFD Steel Code Checks (Continued)

LC	Member	Shape	UC Max	Loc[ft]	Shear UC	Loc[ft]	Dir	phi*Pnc[k]	phi*Pnt[k]	phi*Mnyy...	phi*Mnzz...	Cb	Eqn	
104	35	(F.5-1.1)	W14x74	.060	19.938	.019	9.553	y	862.284	981	151.875	472.5	2.335	H1-1b
105	36	RB1	W14x22	.285	0	.041	0	y	49.866	292.05	16.462	97.3	2.272	H1-1b
106	36	3B11	W14x22	.385	14.84	.056	14.84	y	49.866	292.05	16.462	97.551	2.278	H1-1b
107	36	3B2	W12x35	.164	0	.041	0	y	88.948	463.5	43.125	192	2.33	H1-1b
108	36	2B1	W10x26	.142	0	.026	0	y	51.191	342.45	28.125	109.92	2.332	H1-1b
109	36	2B6	W14x22	.373	14.84	.053	14.84	y	49.866	292.05	16.462	98.265	2.294	H1-1b
110	36	1B6	W12x35	.215	19.906	.054	19.906	y	64.034	463.5	43.125	134.723	1.886	H1-1b
111	36	1B1	W12x72	.071	22.458	.050	20.417	y	479.183	949.5	184.5	405	1.077	H1-1b
112	36	C-2.1	W16x31	.003	8.938	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b
113	36	C-3.5	W16x31	.076	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
114	36	(C-2.1)	W16x31	.198	0	.034	0	y	204.832	410.85	26.363	174.349	1.172	H1-1b
115	36	(C-3.5)	W16x31	.279	0	.044	3.32	y	204.832	410.85	26.363	174.235	1.171	H1-1b
116	36	(F.5-4.5)	W14x74	.061	19.938	.022	9.553	y	862.284	981	151.875	472.5	1.973	H1-1b
117	36	(F.5-1.1)	W14x74	.087	0	.024	3.323	y	879.192	981	151.875	472.5	2.792	H1-1b
118	37	RB1	W14x22	.017	0	.006	0	y	49.866	292.05	16.462	70.981	1.657	H1-1b
119	37	3B11	W14x22	.009	0	.004	14.84	y	49.866	292.05	16.462	85.854	2.005	H1-1b
120	37	3B2	W12x35	.055	0	.024	0	y	88.948	463.5	43.125	174.068	1.97	H1-1b
121	37	2B1	W10x26	.037	0	.012	0	y	51.191	342.45	28.125	100.453	2.131	H1-1b
122	37	2B6	W14x22	.016	0	.004	14.84	y	49.866	292.05	16.462	124.5	3.215	H1-1b
123	37	1B6	W12x35	.104	19.651	.028	19.651	y	64.034	463.5	43.125	95.426	1.336	H1-1b
124	37	1B1	W12x72	.024	2.042	.038	4.594	y	479.183	949.5	184.5	405	1.148	H1-1b
125	37	C-2.1	W16x31	.032	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
126	37	C-3.5	W16x31	.032	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
127	37	(C-2.1)	W16x31	.035	0	.005	3.32	y	204.832	410.85	26.363	174.794	1.175	H1-1b
128	37	(C-3.5)	W16x31	.035	0	.005	3.32	y	204.832	410.85	26.363	174.791	1.175	H1-1b
129	37	(F.5-4.5)	W14x74	.027	0	.008	3.323	y	879.192	981	151.875	472.5	2.191	H1-1b
130	37	(F.5-1.1)	W14x74	.027	0	.008	3.323	y	879.192	981	151.875	472.5	2.184	H1-1b
131	38	RB1	W14x22	.285	14.84	.041	14.84	y	49.866	292.05	16.462	97.327	2.273	H1-1b
132	38	3B11	W14x22	.385	0	.056	0	y	49.866	292.05	16.462	97.5	2.277	H1-1b
133	38	3B2	W12x35	.163	20.788	.040	20.788	y	88.948	463.5	43.125	192	2.339	H1-1b
134	38	2B1	W10x26	.141	20.788	.026	20.788	y	51.191	342.45	28.125	109.281	2.319	H1-1b
135	38	2B6	W14x22	.374	0	.053	0	y	49.866	292.05	16.462	98.5	2.3	H1-1b
136	38	1B6	W12x35	.206	4.594	.054	4.594	y	64.034	463.5	43.125	133.997	1.876	H1-1b
137	38	1B1	W12x72	.076	2.042	.050	4.594	y	479.183	949.5	184.5	405	1.058	H1-1b
138	38	C-2.1	W16x31	.076	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
139	38	C-3.5	W16x31	.004	8.938	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b
140	38	(C-2.1)	W16x31	.281	0	.045	3.32	y	204.832	410.85	26.363	174.364	1.172	H1-1b
141	38	(C-3.5)	W16x31	.196	0	.033	0	y	204.832	410.85	26.363	174.181	1.171	H1-1b
142	38	(F.5-4.5)	W14x74	.088	0	.024	3.323	y	879.192	981	151.875	472.5	2.77	H1-1b
143	38	(F.5-1.1)	W14x74	.060	19.938	.022	9.553	y	862.284	981	151.875	472.5	1.963	H1-1b
144	39	RB1	W14x22	.017	0	.006	0	y	49.866	292.05	16.462	70.981	1.657	H1-1b
145	39	3B11	W14x22	.009	0	.004	14.84	y	49.866	292.05	16.462	85.854	2.005	H1-1b
146	39	3B2	W12x35	.055	0	.024	0	y	88.948	463.5	43.125	174.068	1.97	H1-1b
147	39	2B1	W10x26	.037	0	.012	0	y	51.191	342.45	28.125	100.453	2.131	H1-1b
148	39	2B6	W14x22	.016	0	.004	14.84	y	49.866	292.05	16.462	124.5	3.215	H1-1b
149	39	1B6	W12x35	.104	19.651	.028	19.651	y	64.034	463.5	43.125	95.426	1.336	H1-1b
150	39	1B1	W12x72	.024	2.042	.038	4.594	y	479.183	949.5	184.5	405	1.148	H1-1b
151	39	C-2.1	W16x31	.032	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
152	39	C-3.5	W16x31	.032	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
153	39	(C-2.1)	W16x31	.035	0	.005	3.32	y	204.832	410.85	26.363	174.794	1.175	H1-1b
154	39	(C-3.5)	W16x31	.035	0	.005	3.32	y	204.832	410.85	26.363	174.791	1.175	H1-1b
155	39	(F.5-4.5)	W14x74	.027	0	.008	3.323	y	879.192	981	151.875	472.5	2.191	H1-1b

## Member AISC 14th(360-10): LFRD Steel Code Checks (Continued)

LC	Member	Shape	UC Max	Loc[ft]	Shear UC	Loc[ft]	Dir	phi*Pnc[k]	phi*Pnt[k]	phi*Mnyy...	phi*Mnzz...	Cb	Eqn	
156	39	(F.5-1.1)	W14x74	.027	0	.008	3.323	y	879.192	981	151.875	472.5	2.184	H1-1b
157	40	RB1	W14x22	.017	0	.006	0	y	49.866	292.05	16.462	70.981	1.657	H1-1b
158	40	3B11	W14x22	.009	0	.004	14.84	y	49.866	292.05	16.462	85.854	2.005	H1-1b
159	40	3B2	W12x35	.055	0	.024	0	y	88.948	463.5	43.125	174.068	1.97	H1-1b
160	40	2B1	W10x26	.037	0	.012	0	y	51.191	342.45	28.125	100.453	2.131	H1-1b
161	40	2B6	W14x22	.016	0	.004	14.84	y	49.866	292.05	16.462	124.5	3.215	H1-1b
162	40	1B6	W12x35	.104	19.651	.028	19.651	y	64.034	463.5	43.125	95.426	1.336	H1-1b
163	40	1B1	W12x72	.024	2.042	.038	4.594	y	479.183	949.5	184.5	405	1.148	H1-1b
164	40	C-2.1	W16x31	.032	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
165	40	C-3.5	W16x31	.032	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
166	40	(C-2.1)	W16x31	.035	0	.005	3.32	y	204.832	410.85	26.363	174.794	1.175	H1-1b
167	40	(C-3.5)	W16x31	.035	0	.005	3.32	y	204.832	410.85	26.363	174.791	1.175	H1-1b
168	40	(F.5-4.5)	W14x74	.027	0	.008	3.323	y	879.192	981	151.875	472.5	2.191	H1-1b
169	40	(F.5-1.1)	W14x74	.027	0	.008	3.323	y	879.192	981	151.875	472.5	2.184	H1-1b
170	41	1B6	W12x35	.492	19.906	.125	19.906	y	64.034	463.5	43.125	135.321	1.894	H1-1b
171	41	1B1	W12x72	.156	22.458	.094	20.417	y	479.183	949.5	184.5	405	1.066	H1-1b
172	41	C-2.1	W16x31	.009	8.938	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b
173	41	C-3.5	W16x31	.174	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
174	41	(C-2.1)	W16x31	.460	0	.079	0	y	204.832	410.85	26.363	174.399	1.172	H1-1b
175	41	(C-3.5)	W16x31	.642	0	.102	3.32	y	204.832	410.85	26.363	174.152	1.171	H1-1b
176	41	(F.5-4.5)	W14x74	.157	19.938	.054	9.553	y	862.284	981	151.875	472.5	1.982	H1-1b
177	41	(F.5-1.1)	W14x74	.175	0	.049	3.323	y	879.192	981	151.875	472.5	2.775	H1-1b
178	42	1B6	W12x35	.232	19.651	.063	19.651	y	64.034	463.5	43.125	95.498	1.337	H1-1b
179	42	1B1	W12x72	.045	2.042	.067	4.594	y	479.183	949.5	184.5	405	1.135	H1-1b
180	42	C-2.1	W16x31	.071	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
181	42	C-3.5	W16x31	.071	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
182	42	(C-2.1)	W16x31	.079	0	.012	3.32	y	204.832	410.85	26.363	174.798	1.175	H1-1b
183	42	(C-3.5)	W16x31	.079	0	.012	3.32	y	204.832	410.85	26.363	174.796	1.175	H1-1b
184	42	(F.5-4.5)	W14x74	.060	19.938	.019	9.553	y	862.284	981	151.875	472.5	2.315	H1-1b
185	42	(F.5-1.1)	W14x74	.060	19.938	.019	9.553	y	862.284	981	151.875	472.5	2.335	H1-1b
186	43	1B6	W12x35	.521	19.906	.124	4.594	y	64.034	463.5	43.125	192	1.046	H1-1a
187	43	1B1	W12x72	.165	2.042	.095	4.594	y	479.183	949.5	184.5	405	1.05	H1-1b
188	43	C-2.1	W16x31	.174	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
189	43	C-3.5	W16x31	.009	8.938	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b
190	43	(C-2.1)	W16x31	.647	0	.104	3.32	y	204.832	410.85	26.363	174.282	1.172	H1-1b
191	43	(C-3.5)	W16x31	.456	0	.078	0	y	204.832	410.85	26.363	174.233	1.171	H1-1b
192	43	(F.5-4.5)	W14x74	.176	0	.048	3.323	y	879.192	981	151.875	472.5	2.753	H1-1b
193	43	(F.5-1.1)	W14x74	.156	19.938	.054	9.553	y	862.284	981	151.875	472.5	1.981	H1-1b
194	44	1B6	W12x35	.232	19.651	.063	19.651	y	64.034	463.5	43.125	95.498	1.337	H1-1b
195	44	1B1	W12x72	.045	2.042	.067	4.594	y	479.183	949.5	184.5	405	1.135	H1-1b
196	44	C-2.1	W16x31	.071	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
197	44	C-3.5	W16x31	.071	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
198	44	(C-2.1)	W16x31	.079	0	.012	3.32	y	204.832	410.85	26.363	174.798	1.175	H1-1b
199	44	(C-3.5)	W16x31	.079	0	.012	3.32	y	204.832	410.85	26.363	174.796	1.175	H1-1b
200	44	(F.5-4.5)	W14x74	.060	19.938	.019	9.553	y	862.284	981	151.875	472.5	2.315	H1-1b
201	44	(F.5-1.1)	W14x74	.060	19.938	.019	9.553	y	862.284	981	151.875	472.5	2.335	H1-1b
202	45	1B6	W12x35	.407	19.906	.113	19.906	y	64.034	463.5	43.125	150.237	2.103	H1-1b
203	45	1B1	W12x72	.137	22.458	.077	22.714	y	479.183	949.5	184.5	405	1.053	H1-1b
204	45	C-2.1	W16x31	.019	8.938	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b
205	45	C-3.5	W16x31	.135	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
206	45	(C-2.1)	W16x31	.499	0	.086	0	y	204.832	410.85	26.363	174.456	1.173	H1-1b
207	45	(C-3.5)	W16x31	.598	0	.095	3.32	y	204.832	410.85	26.363	174.131	1.171	H1-1b

## Member AISC 14th(360-10): LRFD Steel Code Checks (Continued)

LC	Member	Shape	UC Max	Loc[ft]	Shear UC	Loc[ft]	Dir	phi*Pnc[k]	phi*Pnt[k]	phi*Mnyy...	phi*Mnzz...	Cb	Eqn	
208	45	(F.5-4.5)	W14x74	.125	0	.042	9.553	y	879.192	981	151.875	472.5	1.902	H1-1b
209	45	(F.5-1.1)	W14x74	.168	0	.046	0	y	879.192	981	151.875	472.5	2.473	H1-1b
210	46	1B6	W12x35	.104	19.651	.028	19.651	y	64.034	463.5	43.125	95.426	1.336	H1-1b
211	46	1B1	W12x72	.024	2.042	.038	4.594	y	479.183	949.5	184.5	405	1.148	H1-1b
212	46	C-2.1	W16x31	.032	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
213	46	C-3.5	W16x31	.032	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
214	46	(C-2.1)	W16x31	.035	0	.005	3.32	y	204.832	410.85	26.363	174.794	1.175	H1-1b
215	46	(C-3.5)	W16x31	.035	0	.005	3.32	y	204.832	410.85	26.363	174.79	1.175	H1-1b
216	46	(F.5-4.5)	W14x74	.027	0	.008	3.323	y	879.192	981	151.875	472.5	2.191	H1-1b
217	46	(F.5-1.1)	W14x74	.027	0	.008	3.323	y	879.192	981	151.875	472.5	2.184	H1-1b
218	47	1B6	W12x35	.544	19.906	.112	4.594	y	64.034	463.5	43.125	192	1.046	H1-1a
219	47	1B1	W12x72	.144	2.042	.077	1.786	y	479.183	949.5	184.5	405	1.04	H1-1b
220	47	C-2.1	W16x31	.134	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
221	47	C-3.5	W16x31	.019	8.938	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b
222	47	(C-2.1)	W16x31	.602	0	.097	3.32	y	204.832	410.85	26.363	174.27	1.172	H1-1b
223	47	(C-3.5)	W16x31	.494	0	.085	0	y	204.832	410.85	26.363	174.303	1.172	H1-1b
224	47	(F.5-4.5)	W14x74	.169	0	.046	0	y	879.192	981	151.875	472.5	2.457	H1-1b
225	47	(F.5-1.1)	W14x74	.126	0	.042	9.553	y	879.192	981	151.875	472.5	1.915	H1-1b
226	48	1B6	W12x35	.104	19.651	.028	19.651	y	64.034	463.5	43.125	95.426	1.336	H1-1b
227	48	1B1	W12x72	.024	2.042	.038	4.594	y	479.183	949.5	184.5	405	1.148	H1-1b
228	48	C-2.1	W16x31	.032	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
229	48	C-3.5	W16x31	.032	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b*
230	48	(C-2.1)	W16x31	.035	0	.005	3.32	y	204.832	410.85	26.363	174.794	1.175	H1-1b
231	48	(C-3.5)	W16x31	.035	0	.005	3.32	y	204.832	410.85	26.363	174.791	1.175	H1-1b
232	48	(F.5-4.5)	W14x74	.027	0	.008	3.323	y	879.192	981	151.875	472.5	2.191	H1-1b
233	48	(F.5-1.1)	W14x74	.027	0	.008	3.323	y	879.192	981	151.875	472.5	2.184	H1-1b
234	49	RB1	W14x22	.000	0	.000	0	y	49.866	292.05	16.462	124.5	1	H1-1b
235	49	3B11	W14x22	.000	0	.000	0	y	49.866	292.05	16.462	124.5	1	H1-1b
236	49	3B2	W12x35	.000	0	.000	0	y	88.948	463.5	43.125	192	1	H1-1b
237	49	2B1	W10x26	.000	0	.000	0	y	51.191	342.45	28.125	117.375	1	H1-1b
238	49	2B6	W14x22	.000	0	.000	0	y	49.866	292.05	16.462	124.5	1	H1-1b
239	49	1B6	W12x35	.000	0	.000	0	y	64.034	463.5	43.125	192	1	H1-1b
240	49	1B1	W12x72	.000	0	.000	0	y	479.183	949.5	184.5	405	1	H1-1b
241	49	C-2.1	W16x31	.000	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b
242	49	C-3.5	W16x31	.000	0	.000	0	y	217.928	410.85	26.363	153.612	1	H1-1b
243	49	(C-2.1)	W16x31	.000	0	.000	0	y	204.832	410.85	26.363	148.754	1	H1-1b
244	49	(C-3.5)	W16x31	.000	0	.000	0	y	204.832	410.85	26.363	148.754	1	H1-1b
245	49	(F.5-4.5)	W14x74	.000	0	.000	0	y	879.192	981	151.875	472.5	1	H1-1b
246	49	(F.5-1.1)	W14x74	.000	0	.000	0	y	879.192	981	151.875	472.5	1	H1-1b

## Envelope Wood Code Checks

Mem...	Shape	Code Check	Loc[ft]	LC	Shear Ch...	Loc[ft]	Dir	LC Fc' [...Ft' [...Fb1'..Fb2'..Fv' [... RB	CL	CP	Eqn
No Data to Print ...											

## Wood Wall Panel Axial Code Checks (AWC NDS-15: ASD)

Wall Panel	Region	Stud Size	Stud Spaci...	Axial Check	Gov LC	Chord Size	Chord Axial Ch...	Gov LC	
1	A 4th	R1	2X6	16	.899	88	2-2X6	.788	61
2	A Roof	R1	2X6	16	.44	88	2-2X6	.317	59
3	D 4th	R1	2X6	16	.065	87	2-2X6	.17	51

## Wood Wall Panel Axial Code Checks (AWC NDS-15: ASD) (Continued)

	Wall Panel	Region	Stud Size	Stud Spaci...	Axial Check	Gov LC	Chord Size	Chord Axial Ch...	Gov LC
4	D 3rd	R1	2X6	16	.08	87	2-2X6	.278	51
5	D Second	R1	2X6	16	.077	87	2-2X6	.414	53
6	1 Roof	R1	2X6	16	.086	86	2-2X6	.717	54
7	1 Level 4	R1	2X6	16	.067	86	2-2X6	.489	52
8	5 Roof	R1	2X6	16	.088	86	2-2X6	.685	52
9	5 Level 4	R1	2X6	16	.058	86	2-2X6	.518	52
10	1 Level 3	R1	2X6	16	.2	87	2-2X6	.668	64
11		R3	2X6	16	.174	87	2-2X6	.333	66
12	5 Level 3	R1	2X6	16	.16	87	2-2X6	.372	66

See note below regarding tie down forces

## Wood Wall Panel In Plane Code Checks (AWC NDS-15: ASD)



	Wall Panel	Shear Panel Label	Region	Shear Check	Shear Forc...	Gov LC	Hold-Down ...	Tension Ch...	Tie-Dow...	Gov LC
1	A 4th	S1_15/32_8d@3	R1	.908	.499	51	NC	NC	6.601	65
2	A Roof	S1_15/32_8d@6	R1	.411	.115	51	NC	NC	NC	NC
3	D 4th	S1_15/32_8d@6	R1	.6	.168	51	NC	NC	.031	51
4	D 3rd	S1_15/32_8d@6	R1	.739	.207	51	NC	NC	2.645	63
5	D Second	S1_15/32_8d@6	R1	.739	.207	51	HDU5-SDS...	.834	4.707	65
6	1 Roof	S1_15/32_8d@3	R1	.928	.51	52	NC	NC	5.811	66
7	1 Level 4	S1_15/32_8d@4	R1	.789	.339	52	NC	NC	1.952	52
8	5 Roof	S1_15/32_8d@3	R1	.928	.51	52	NC	NC	5.633	64
9	5 Level 4	S1_15/32_8d@4	R1	.786	.338	52	NC	NC	2.916	52
10	1 Level 3	S1_15/32_8d@3	R1	.704	.387	54	HDU11-SD...	.904	8.436	64
11		S1_15/32_8d@3	R3	.86	.473	54	HDU5-SDS...	.812	4.583	66
12	5 Level 3	S1_15/32_8d@4	R1	.857	.368	52	HDU4-SDS...	.844	3.853	66

### Tie Down Anchorage Note:

The tie down forces in the shear walls along grid 1 and 5 will be resolved through connection to the adjacent columns using Simpson Strong-Drive TB Wood-to-Steel Screws. See data sheet on next page.

### Fastener Calculation

Max Tie Down Force / Height of Adjacent Column = 4.134 kips / 9.25 ft = 447 lbs per foot  
 Fastener Resistance to Seismic Force = 345 lbs  
 Therefore, minimum spacing of fastener = 345/447 = 0.723 ft. Use max 8" c/c.



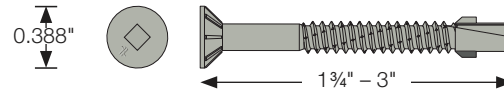
# Load Tables, Technical Data and Installation Instructions

## Strong-Drive® TB WOOD-TO-STEEL Screw

### Common Applications:

- Wood to hot-rolled steel (Maximum recommended thicknesses: 5/16")

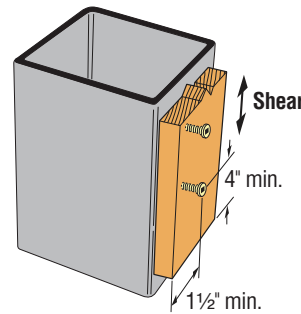
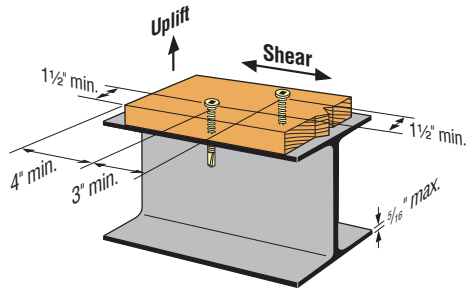
For More Product Information, see p. 100



### TB – Allowable Loads – DF and SP Lumber Attachment to Steel (Steel Members 16 ga. - 5/16" Thick)

Model No.	Length in. (mm)	Nominal Wood Thickness (in.)	Steel Thickness mil (ga.)	DF/SP Allowable Load (lb.)			
				Uplift		Shear	
				C <sub>b</sub> =1.0	C <sub>b</sub> =1.6	C <sub>b</sub> =1.0	C <sub>b</sub> =1.6
TB1460S	2 3/8 (60)	2x	54 (16)	195	195	210	335
			68 (14)	225	225	210	335
			97-312 (12 - 5/16")	245	390	215	345
TB1475S	3 (75)		54 (16)	195	195	210	335
			68 (14)	225	225	210	335
			97-312 (12 - 5/16")	245	390	215	345

1. For use with structural steel members up to 5/16" thick or cold-formed steel members 54 mil (16 ga.) or thicker.
2. Standard product available in a black phosphate, yellow zinc or N2000 coating for additional corrosion protection (TBG1460S or TBG1475S).
3. For use with 2x (1 1/2") DF/SP only.
4. For use with QD HSD60 or HSD75 Tool.
5. Use increased allowable loads (C<sub>b</sub>=1.6) only when resisting wind or seismic forces.



**Lateral Member Detailed Reports**  
are included in Appendix B

**STEEL CONNECTION DESIGN**

**Typical Steel Connections**  
Calculations are included in Appendix C

**Column to Transfer Beam Moment Connections**  
Designed using RISACONNECTION

Seal	Title Summit Lot 71	Project # 170450	Date 2017/12/05
		Designer DMV	Scale NTS
		Checked by	Sheet # D-01
MOMENT FRAME CONNECTIONS.			

Toronto 416.593.5300 | Waterloo 519.616.0895 | Victoria 778.817.1010 | Halifax 902.701.0185 | blackwell.ca

PROBLEM: AVB HAS ADVISED THAT WE REQUIRE 2 MOMENT CONNECTIONS FOR FRAMES.

FOR SIMPLICITY, USE AN END-~~R~~ MOMENT CONNECTION. THIS WILL BE THE EASIEST FOR ERECTION. USE RISACONNECTION FOR THE DESIGN OF THESE MOMENT CONNECTIONS. AVB HAS OUTLINED / SUMMARIZED THE LOADS, AND GOVERNING LOAD COMBINATIONS. MOMENT FRAMES TO DESIGN:

1. MOMENT FRAME ALONG C AND D.
2. MOMENT FRAME ALONG F.5

\* IT SHOULD BE NOTED THAT DUE TO THE ORIENTATION IS RISACONNECTION, THE BEAM / COLUMN IS IN REALITY ORIENTATED AT 90 DEGREES.

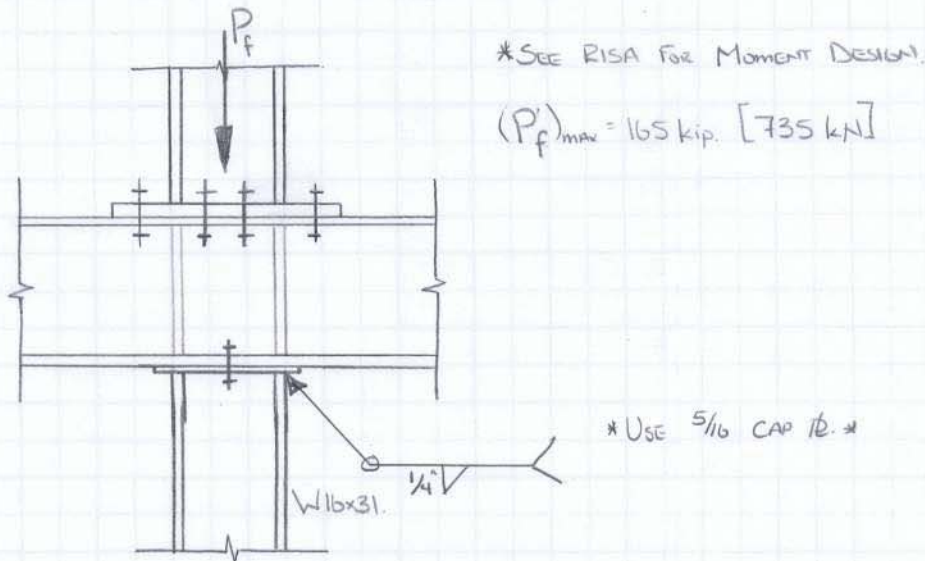
\* THE CALCULATION REPORTS (FROM RISACONNECTION) ARE PROVIDED BEGINNING ON SHEET D-03

Note that the first connection RISACONNECTION report is presented expanded with detail information on the design checks. For brevity of this report connection design reports may be "rolled up". The unity check are still easily visible for each connection.

Seal	Title Summit Lot 71.	Project # 170450	Date 2017/12/07
	MOMENT FRAME CONNECTIONS	Designer DMV.	Scale NTS.
		Checked by	Sheet # D-02.

Toronto 416.593.5300 | Waterloo 519.616.0895 | Victoria 778.817.1010 | Halifax 902.701.0185 | blackwell.ca

FOR THE MOMENT FRAME ALONG LINE F.5 THE COLUMN BELOW NEEDS TO BE CONNECTED TO TRANSFER AXIAL LOADS ONLY.



FOR SIMPLICITY OF ERECTION, PROVIDE A PLATE WELDED TO THE TOP OF THE W16x31 AND PROVIDE (2) -  $3/4"$   $\phi$  BOLTS @ EACH SIDE OF THE WEB TO GENERATE A  $P_N$  CONNECTION @ TOP. DUE TO STIFFENERS, THE LOAD IS DIRECT BEARING.

→ FROM AISC (BEARING OF CONTACT SURFACE)

$$R_N = \phi 1.80 A_{pb} F_y = (0.75)(1.80)(9.31 \text{ in}^2)(36 \text{ ksi})$$

$$R_N = 452 \text{ kip.} > P_f = 165 \text{ kip. } \underline{OK}$$

\* FOR BOLTS, USE 5% OF  $P_f$  OR 8.25 kip. AS A HORIZONTAL LOAD.

$$\rightarrow \text{FOR } 3/4" \phi \text{ A325 BOLTS, } V_r = 15.9 \text{ kip. } \underline{OK}$$

∴ USE (2) -  $3/4" \phi$  BOLTS

**Global Parameters - Description:**

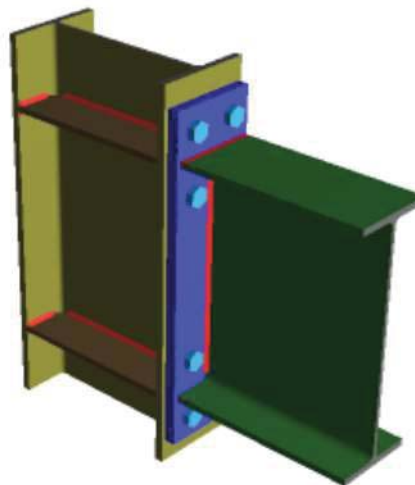
Project Title	71 Summit Lot
Company	Blackwell
Designer	DMV
Job Number	170450
Notes	2018.06.25 Revised to accommodate value engineering done on the structure. BG

**Global Parameters - Solution:**

Design Method	AISC 14th (360-10): LRFD
Bolt Group Analysis Method	Center of Rotation
Weld Analysis Method	Center of Rotation
Consider Bolt Hole Deformation?	No
Check Weld Filler Material Matching?	Yes
Check Rotational Ductility?	Yes
Full Shear Eccentricity Considered?	No
Plastic Panel-Zone Shear Deformation Considered?	No

**MF - Line C - (LC#3): 3D View**

*Column/Beam Extended End Plate Moment Connection*

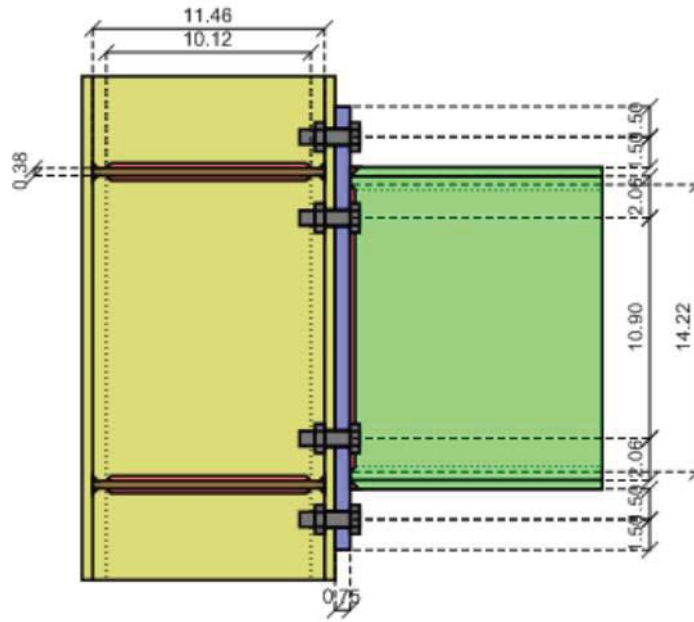


**MF - Line C - (LC#3): 2D Views**

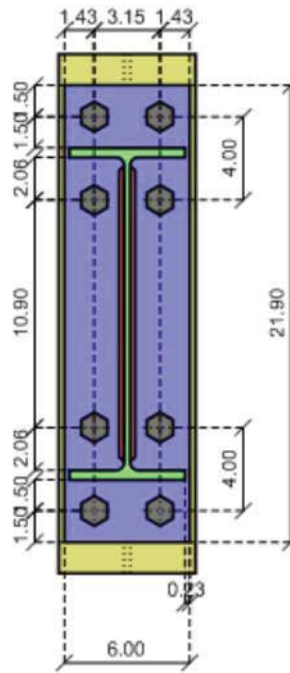
*Column/Beam Extended End Plate Moment Connection*



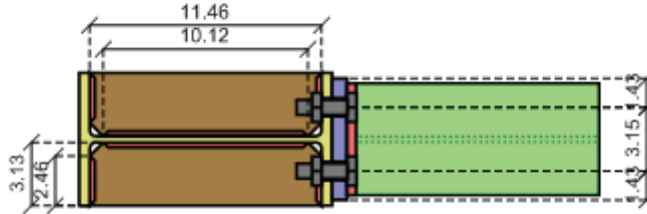
Side view



Front view

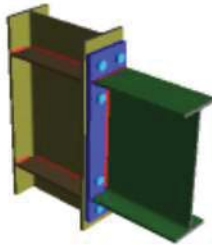


Top view



## MF - Line C - (LC#3): LRFD Results Report

**LRFD**  
Column/Beam Extended End Plate Moment Connection



### Material Properties:

Component	Section	Material	$F_y$ (ksi)	$F_u$ (ksi)
Column	W12x35	A992	50.00	65.00
Beam	W16x31	A992	50.00	65.00
Plate	P0.75x6.00x21.90	A36	36.00	58.00
Transverse Stiffener	P0.38x3.13x11.46	A36	36.00	58.00

### Input Data:

Parameter	Value	Description
Shear Load	9.96 kips	User Input Shear Load
Moment	97.67 kips-ft	User Input Moment
Axial Load	-13.58 kips	User Input Axial Force (tension)
Puf_c	69.03 kips	Required Flange Force (compression)
Puf_t	82.60 kips	Required Flange Force (tension)
Top Column Dist	196.85 in	User Input Top Column Dist
Column Force	0.00 kips	User Input Column Force
Story Shear	0.00 kips	User Input Story Shear

Note: Unless specified, all code references are from AISC 360-10

Limit State	Required	Available	Unity Check	Result
<b>Geometry Restrictions at Column</b>				<b>PASS</b>
<b>Check Min Bolt Spacing</b>	<b>Pass</b>	Condition: $S_{min} \geq (2+2/3) * d_{bolt}$ (J3.3)		
Smin	3.15 in	Min bolt spacing		
dbolt	0.75 in	Bolt diameter		
<b>Check Min Edge Distance</b>	<b>Pass</b>	Condition: $ED_{min} \geq ED_{allow}$ (J3.4)		
<b>Check Max Edge Distance</b>	<b>Pass</b>	Condition: $ED_{max} \leq \min(6.00 \text{ in}, 12*t)$ (J3.5)		
<b>Check Bolt Constructability</b>	<b>Pass</b>	Condition: $D - (2*e_{d\_vert}) - (2*g_{vert}) > d_h$		
D	21.90 in	Plate depth		

ed_vert	1.50 in				Bolts vertical edge distance
gvert	4.00 in				Bolts vertical gage
dh	0.81 in				Bolt hole diameter
<b>Web Weld Limitations</b>					<b>PASS</b>
<b>Check Weld Min Size</b>	<b>Pass</b>				
D	0.25 in				Weld size
Dmin	0.19 in				Min size allowed per Table J2.4
tmin	0.28 in				Controlling member thickness
<b>Check Web Development</b>	<b>Pass</b>				
D16	4.00				Weld fillet size in sixteenths of an inch
Dmin	2.96				Min weld to develop web capacity
<b>Check Weld Min Length</b>	<b>Pass</b>				Condition: $L_{eff} \geq 4 * D$ per J2.2b
D	0.25 in				Weld size
L <sub>eff</sub>	6.82 in				Weld effective length
<b>Bolt Shear Strength</b>					<b>PASS</b>
$R_n = F_{nv} * A_b * N_{bolt} * C$		9.96 kips	71.57 kips	<b>0.14</b>	
		$\phi = 0.75$	(J3-1)		
F <sub>nv</sub>	54.00 ksi				Shear stress N type
A <sub>b</sub>	0.44 in <sup>2</sup>				Area of bolt
N <sub>bolt</sub>	4				Number of bolts
C	1.00				Eccentricity coefficient
$\phi R_n$	71.57 kips				Bolt shear rupture strength
<b>Bolt Bearing on Column</b>					<b>PASS</b>
$R_n = 4 * R_{n-spacing}$		9.96 kips	71.57 kips	<b>0.14</b>	
		$\phi = 0.75$	(J3-6b)		
d	0.75 in				Bolt diameter
F <sub>u</sub>	65.00 ksi				Minimum tensile stress of material
t	0.52 in				Thickness of material
L <sub>c-spacing</sub>	3.19 in				Vertical distance from edges of adjacent holes
R <sub>n-spacing</sub>	23.86 kips				Strength at spaces = min(R <sub>n-spacing-tearout</sub> , R <sub>n-bearing</sub> , R <sub>n-bolt</sub> )
R <sub>n-bearing</sub>	76.05 kips				Bearing = $3.0 * d * t * F_u$
R <sub>n-spacing-tearout</sub>	161.61 kips				Tear out at spaces = $1.5 * L_c-spacing * t * F_u$
R <sub>n-bolt</sub>	23.86 kips				Bolt shear strength $R_{n-bolt} = F_{nv} * A_{bolt}$
F <sub>nv</sub>	54.00 ksi				Nominal shear stress of bolt
$\phi R_n$	71.57 kips				Bolt bearing strength
<b>Bolt Bearing on Plate at Column</b>					<b>PASS</b>
$R_n = 2 * R_{n-edge} + 2 * R_{n-spacing}$		9.96 kips	71.57 kips	<b>0.14</b>	
		$\phi = 0.75$	(J3-6b)		
d	0.75 in				Bolt diameter
F <sub>u</sub>	58.00 ksi				Minimum tensile stress of material
t	0.75 in				Thickness of material
L <sub>c-edge</sub>	1.09 in				Vertical distance from edge of hole to edge of material
L <sub>c-spacing</sub>	3.19 in				Vertical distance from edges of adjacent holes
R <sub>n-edge</sub>	23.86 kips				Strength at edge = min(R <sub>n-edge-tearout</sub> , R <sub>n-bearing</sub> , R <sub>n-bolt</sub> )
R <sub>n-spacing</sub>	23.86 kips				Strength at spaces = min(R <sub>n-spacing-tearout</sub> , R <sub>n-bearing</sub> , R <sub>n-bolt</sub> )
R <sub>n-bearing</sub>	97.88 kips				Bearing = $3.0 * d * t * F_u$
R <sub>n-edge-tearout</sub>	71.37 kips				Tear out at edge = $1.5 * L_c-edge * t * F_u$
R <sub>n-spacing-tearout</sub>	207.98 kips				Tear out at spaces = $1.5 * L_c-spacing * t * F_u$
R <sub>n-bolt</sub>	23.86 kips				Bolt shear strength $R_{n-bolt} = F_{nv} * A_{bolt}$
F <sub>nv</sub>	54.00 ksi				Nominal shear stress of bolt
$\phi R_n$	71.57 kips				Bolt bearing strength
<b>Beam Web Weld Strength</b>					<b>PASS</b>
$\phi R_n = 2 * \alpha * 1.392 * C_1 * D_{16} * L_{eff}$		9.96 kips	54.92 kips	<b>0.18</b>	
<b>Double Fillet</b>					
$1.392 = \phi * 0.6 * F_{E70} * 2^{0.5} / 2 * 1/16, \phi=0.75$ (AISC 14 <sup>th</sup> Eqn 8-2a)					
C <sub>1</sub>	1.00				Electrode strength coefficient (AISC 14 <sup>th</sup> table)

$\alpha$	0.72	8-3) Base material proration factor (re-arrangement of AISC 14 <sup>th</sup> Eqn 9-2)
D16	4.00	Weld fillet size in sixteenths of an inch
Leff	6.82 in	Weld effective length
$\phi R_n$	54.92 kips	Weld strength

<b>Beam Flange Weld Strength</b>		<b>PASS</b>
Complete Joint Penetration	(J2.6)	
Req'd Filler (Beam)	E70	
Req'd Filler (Plate)	E60	
Weld Electrode (Filler)	E70	

<b>Prying Force</b>		<b>PASS</b>
$Q_{max\_p\_i} = (w_p \cdot t_p^2 / (4 \cdot a_{i\_p})) \cdot [F_{py}^2 - 3 \cdot (F_{i\_o} / (w_p \cdot t_p))^2]^{0.5}$	(DG-16, (2-11))	
$Q_{max\_p\_o} = (w_p \cdot t_p^2 / (4 \cdot a_{o\_p})) \cdot [F_{py}^2 - 3 \cdot (F_{o\_p} / (w_p \cdot t_p))^2]^{0.5}$	(DG-16, (2-15))	
db	0.75 in	Bolt diameter
Ft	90.00 ksi	Bolt material tensile strength
w <sub>p</sub>	2.19 in	$w_p = b_p/2 - d_h$ (DG-16, (2-12))
dh	0.81 in	Hole diameter
ai <sub>p</sub>	3.60 in	Distance from the interior bolt centerline to the prying force = $3.682 \cdot (t_p/d_b)^3 - 0.085$ (DG-16, (2-13))
ao <sub>p</sub>	1.50 in	Distance from the outer bolt centerline to the prying force = $\min(a_{i\_p}, (p_{exp} - p_{fo}))$ (DG-16, (2-16))
F <sub>i<sub>p</sub></sub>	12.38 kips	Flange force per bolt at the thin plate = $[t_p^2 \cdot F_{py} \cdot (0.85 \cdot b_p/2 + 0.80 \cdot w_p) + \pi \cdot d_b^3 \cdot F_t / 8] / (4 \cdot p_{fi})$ (DG-16, (2-14))
F <sub>o<sub>p</sub></sub>	17.00 kips	Flange force per bolt at the thin plate = $[t_p^2 \cdot F_{py} \cdot (0.85 \cdot b_p/2 + 0.80 \cdot w_p) + \pi \cdot d_b^3 \cdot F_t / 8] / (4 \cdot p_{fo})$ (DG-16, (2-17))
F <sub>py</sub>	36.00 ksi	Minimum yield stress of plate
t <sub>p</sub>	0.75 in	Thickness of plate
b <sub>p</sub>	6.00 in	Plate width $b_p = \min(b_{plate}, b_{fb} + 1")$
b <sub>plate</sub>	6.00 in	Plate width
b <sub>fb</sub>	6.00 in	Beam flange width
Q <sub>max<sub>p_i</sub></sub>	2.87 kips	Maximum possible prying force for interior bolts (thin plate)
Q <sub>max<sub>p_o</sub></sub>	6.40 kips	Maximum possible prying force for outer bolts (thin plate)
p <sub>fi</sub>	2.06 in	Column bolts flange pitch (inner)
p <sub>fo</sub>	1.50 in	Column bolts flange pitch (outer)
p <sub>ext</sub>	3.00 in	$p_{ext} = d_e + p_{fo}$
d <sub>e</sub>	1.50 in	End-plate extension beyond the exterior bolt centerline

<b>Bolt Moment Strength (with prying)</b>		82.60 kips	102.79 kips	<b>0.80</b>	<b>PASS</b>
$F_p = \max[ (2 \cdot (P_t - Q_{max\_o}) \cdot h_0 + 2 \cdot (P_t - Q_{max\_i}) \cdot h_1), (2 \cdot (P_t - Q_{max\_o}) \cdot h_0 + 2 \cdot T_b \cdot h_1), (2 \cdot (P_t - Q_{max\_i}) \cdot h_1 + 2 \cdot T_b \cdot h_0), (2 \cdot T_b \cdot (h_0 + h_1)) ] / d_m$		$\phi = 0.75$	(DG-16-2 <sup>nd</sup> (2-19))		
h <sub>0</sub>	17.18 in		Distance from the centerline of the beam compression flange to the centerline of tension bolt row N 0		
h <sub>1</sub>	13.18 in		Distance from the centerline of the beam compression flange to the centerline of tension bolt row N 1		
Q <sub>max<sub>i</sub></sub>	2.87 kips		Maximum possible prying force for interior bolts		
Q <sub>max<sub>o</sub></sub>	6.40 kips		Maximum possible prying force for outer bolts		

<b>P<sub>t</sub></b>	39.76 kips	Bolt tensile strength. $P_t = F_t \cdot A_b$
<b>T<sub>b</sub></b>	28.00 kips	Minimum Bolt Pre-Tension ( $T_b = 0.7 \cdot P_t$ per table J3.1)
<b>F<sub>t</sub></b>	90.00 ksi	Bolt material tensile strength
<b>A<sub>b</sub></b>	0.44 in <sup>2</sup>	Nominal area of the bolt. $A_b = \pi \cdot d_b^2 / 4$
<b>d<sub>b</sub></b>	0.75 in	Bolt diameter
<b>d<sub>m</sub></b>	15.46 in	Moment arm between the flange forces
<b>φF<sub>p</sub></b>	102.79 kips	Bolt tensile strength (with prying)
<b>R<sub>req</sub></b>	82.60 kips	Required Flange Force (tension)

### Verify Bolt Prying Assumption

Condition for check plate behavior thick :  $\phi F_{pl} \geq 1.11 \cdot \phi F_{np}$  (DG-4-2<sup>nd</sup> (3.33), (3.35))

Condition for check flange column behavior thick :  $\phi F_{cf} \geq 1.11 \cdot \phi F_{np}$

#### Consider Bolt Prying

<b>h<sub>0</sub></b>	17.18 in	Distance from the centerline of the beam compression flange to the centerline of tension bolt row N 0
<b>h<sub>1</sub></b>	13.18 in	Distance from the centerline of the beam compression flange to the centerline of tension bolt row N 1
<b>R<sub>n</sub></b>	39.76 kips	Bolt tensile strength. $R_n = F_t \cdot A_b$
<b>F<sub>t</sub></b>	90.00 ksi	Bolt material tensile strength
<b>A<sub>b</sub></b>	0.44 in <sup>2</sup>	Nominal area of the bolt. $A_b = \pi \cdot d_b^2 / 4$
<b>d<sub>b</sub></b>	0.75 in	Bolt diameter
<b>φF<sub>np</sub></b>	117.12 kips	Available bolt moment strength (no prying): $R_{np} = 2 \cdot R_n \cdot (h_0 + h_1) / d_m$
<b>φF<sub>pl</sub></b>	124.58 kips	Available end plate flexural strength
<b>φF<sub>cf</sub></b>	141.11 kips	Available column flange flexural strength
<b>φF<sub>pl</sub> ≥ 1.11 · φF<sub>np</sub> ?</b>	Fail	Thick plate check
<b>φF<sub>cf</sub> ≥ 1.11 · φF<sub>np</sub> ?</b>	Ok	Thick flange check

**End Plate Flexural Yielding** 82.60 kips 124.58 kips **0.66** **PASS**

$R_{pl} = F_y \cdot t_p^2 \cdot Y_p / d_m$ , where  $\phi = 0.90$

(DG-4-2<sup>nd</sup> (3.10))

$Y_p = 0.5 \cdot b_p \cdot [h_1 \cdot (1/p_{fi} + 1/s) + h_0 \cdot (1/p_{fo}) - 0.5] + 2/g \cdot [h_1 \cdot (p_{fi} + s)]$

<b>F<sub>y</sub></b>	36.00 ksi	Minimum yield stress of plate
<b>t<sub>p</sub></b>	0.75 in	Thickness of plate
<b>d<sub>m</sub></b>	15.46 in	Moment arm between the flange forces
<b>Y<sub>p</sub></b>	105.68 in	Yield-line mechanism parameter
<b>s</b>	2.17 in	Yield line mechanism parameter $s = 0.5 \cdot (b_p \cdot g) / 0.5$
<b>b<sub>p</sub></b>	6.00 in	Plate width $b_p = \min(b_{plate}, b_{fb} + 1")$
<b>p<sub>fi</sub></b>	2.06 in	Value p <sub>fi</sub> in calculation $p_{fi} = \min(s, p_{fi})$
<b>h<sub>0</sub></b>	17.18 in	Distance from the centerline of the beam compression flange to the centerline of tension bolt row N 0
<b>h<sub>1</sub></b>	13.18 in	Distance from the centerline of the beam compression flange to the centerline of tension bolt row N 1
<b>p<sub>fo</sub></b>	1.50 in	Column bolts flange pitch (outer)
<b>p<sub>fi</sub></b>	2.06 in	Column bolts flange pitch (inner)
<b>g</b>	3.15 in	Beam bolts horizontal gage
<b>b<sub>plate</sub></b>	6.00 in	Plate width
<b>b<sub>fb</sub></b>	5.53 in	Beam flange width
<b>φR<sub>pl</sub></b>	124.58 kips	End plate bending strength
<b>R<sub>req</sub></b>	82.60 kips	Required Flange Force (tension)

**End Plate Shear Yielding** 41.30 kips 97.20 kips **0.42** **PASS**

$R_n = 0.6 \cdot F_y \cdot A_g$

$\phi = 1.00$  (J4-3)

<b>F<sub>y</sub></b>	36.00 ksi	Minimum yield stress of plate
<b>A<sub>g</sub></b>	4.50 in <sup>2</sup>	Gross area of the end plate

<b>b<sub>p</sub></b>	6.00 in			<i>Effective plate width</i>
<b>φR<sub>n</sub></b>	97.20 kips			<i>Shear yield strength</i>
<b>d<sub>m</sub></b>	15.46 in			<i>Moment arm between the flange forces</i>
<b>R<sub>req</sub></b>	41.30 kips			<i>Half of the required flange force (tension)</i>
<b>End Plate Shear Rupture</b>		41.30 kips	83.19 kips	<b>0.50 PASS</b>
<b>R<sub>n</sub> = 0.6 * F<sub>u</sub> * A<sub>n</sub></b>		<b>φ = 0.75</b>	(J4-4)	
<b>F<sub>u</sub></b>	58.00 ksi			<i>Minimum tensile stress of plate</i>
<b>A<sub>n</sub></b>	3.19 in <sup>2</sup>			<i>Net area of the end plate</i>
<b>b<sub>p</sub></b>	6.00 in			<i>Effective plate width</i>
<b>φR<sub>n</sub></b>	83.19 kips			<i>Shear rupture strength</i>
<b>d<sub>m</sub></b>	15.46 in			<i>Moment arm between the flange forces</i>
<b>R<sub>req</sub></b>	41.30 kips			<i>Half of the required flange force (tension)</i>
<b>Column Flexural Yielding</b>		82.60 kips	141.11 kips	<b>0.59 PASS</b>
<b>R<sub>cf</sub> = F<sub>y</sub> * t<sub>fc</sub><sup>2</sup> * Y<sub>c</sub> / d<sub>m</sub>, where φ = 0.90</b>			(DG-4-2 <sup>hd</sup> (3.21))	
<b>Y<sub>c</sub> = 0.5 * b<sub>fc</sub> * [h<sub>1</sub> * (1/s + 1/p<sub>si</sub>) + h<sub>0</sub> * (1/s + 1/p<sub>so</sub>)] + 2/g * [h<sub>1</sub> * (s + p<sub>si</sub>) + h<sub>0</sub> * (s + p<sub>so</sub>)]</b>				
<b>F<sub>y</sub></b>	50.00 ksi			<i>Minimum yield stress of column</i>
<b>t<sub>fc</sub></b>	0.52 in			<i>Column flange thickness</i>
<b>Y<sub>c</sub></b>	179.29 in			<i>Yield-line mechanism parameter</i>
<b>b<sub>fc</sub></b>	6.56 in			<i>Column flange width</i>
<b>h<sub>0</sub></b>	17.18 in			<i>Distance from the centerline of the beam compression flange to the centerline of tension bolt row N 0</i>
<b>h<sub>1</sub></b>	13.18 in			<i>Distance from the centerline of the beam compression flange to the centerline of tension bolt row N 1</i>
<b>p<sub>b</sub></b>	2.50 in			<i>Column bolt pitch</i>
<b>p<sub>si</sub></b>	2.09 in			<i>Distance from the first interior bolt centerline to the inner face of the stiffener</i>
<b>p<sub>so</sub></b>	1.53 in			<i>Distance from the first outer bolt centerline to the outer face of the stiffener</i>
<b>s</b>	2.27 in			<i>Distance from centerline of tension bolt row to the edge of the yield line s = 0.5 * (b<sub>fc</sub> * g)<sup>0.5</sup></i>
<b>g</b>	3.15 in			<i>Beam bolts horizontal gage</i>
<b>d<sub>m</sub></b>	15.46 in			<i>Moment arm between the flange forces</i>
<b>φR<sub>cf</sub></b>	141.11 kips			<i>Column flange flexural strength</i>
<b>R<sub>req</sub></b>	82.60 kips			<i>Required Flange Force (tension)</i>
<b>Transverse Stiffener</b>	Not required			<i>Check : φR<sub>unstiff</sub> &gt;= R<sub>req</sub></i>
<b>φR<sub>unstiff</sub></b>	102.56 kips			<i>Unstiffened column flange flexural strength</i>
<b>Column Web Yielding</b>		82.60 kips	102.90 kips	<b>0.80 PASS</b>
<b>R<sub>n</sub> = (6 * k + 2 * t<sub>p</sub> + N) * F<sub>y</sub> * t<sub>w</sub></b>		<b>φ = 1.00</b>	(DG-4-2 <sup>hd</sup> (3.24))	
<b>d<sub>end</sub></b>	196.85 in			<i>Top column distance</i>
<b>d<sub>col</sub></b>	12.50 in			<i>Column depth</i>
<b>k</b>	0.82 in			<i>Distance from outer face of the flange to the web toe of the fillet</i>
<b>t<sub>p</sub></b>	0.75 in			<i>End plate thickness</i>
<b>N</b>	0.44 in			<i>Length of bearing</i>
<b>F<sub>y</sub></b>	50.00 ksi			<i>Minimum yield stress of column</i>
<b>t<sub>w</sub></b>	0.30 in			<i>Column web thickness</i>
<b>φR<sub>n</sub></b>	102.90 kips			<i>Column web local yielding</i>
<b>d<sub>m</sub></b>	15.46 in			<i>Moment arm between the flange forces</i>
<b>R<sub>req</sub></b>	82.60 kips			<i>Required Flange Force (worst) in bolts due to moment</i>
<b>Column Web Buckling</b>		69.03 kips	64.67 kips	<b>N/A</b>
<b>R<sub>n</sub> = 24 * t<sub>w</sub><sup>3</sup> * (E * F<sub>y</sub>)<sup>0.5</sup> / h</b>		<b>φ = 0.90</b>	(J10-8)	
<b>d<sub>end</sub></b>	197.07 in			<i>Distance from concentrated force to top of column</i>
<b>d<sub>col</sub></b>	12.50 in			<i>Column depth</i>
<b>t<sub>w</sub></b>	0.30 in			<i>Column web thickness</i>

<b>F<sub>y</sub></b>	50.00 ksi			<i>Minimum yield stress of column</i>
<b>E</b>	29000.00 ksi			<i>Modulus of elasticity of column</i>
<b>h</b>	10.86 in			<i>Clear distance between flanges <math>h=d-2*k_{des}</math></i>
<b>φR<sub>n</sub></b>	64.67 kips			<i>Column web compression buckling</i>
<b>d<sub>m</sub></b>	15.46 in			<i>Moment arm between the flange forces</i>
<b>R<sub>req</sub></b>	69.03 kips			<i>Required Flange Force (compression)</i>
<b>Unbalanced force</b>	4.36 kips			<i>Transverse stiffeners are provided</i>
<b>Column Web Crippling</b>				
		69.03 kips	103.08 kips	<b>0.67</b> <b>PASS</b>
<b>R<sub>n</sub> = <math>0.8*t_w^2*(1+3*((N+2*t_p)/d_{col})*(t_w/t_f)^{1.5})*(E*F_y*t_f/t_w)^{0.5}</math></b>		<b>φ = 0.75</b>	(J10-4)	
<b>d<sub>end</sub></b>	197.07 in			<i>Distance from concentrated force to top of column</i>
<b>(N+2*t<sub>p</sub>)/d<sub>col</sub></b>	0.16			<i>Bearing length to column depth ratio</i>
<b>d<sub>col</sub></b>	12.50 in			<i>Column depth</i>
<b>t<sub>w</sub></b>	0.30 in			<i>Column web thickness</i>
<b>t<sub>f</sub></b>	0.52 in			<i>Column flange thickness</i>
<b>N</b>	0.44 in			<i>Length of bearing</i>
<b>t<sub>p</sub></b>	0.75 in			<i>Plate thickness</i>
<b>F<sub>y</sub></b>	50.00 ksi			<i>Minimum yield stress of column</i>
<b>E</b>	29000.00 ksi			<i>Modulus of elasticity of column</i>
<b>φR<sub>n</sub></b>	103.08 kips			<i>Column web crippling capacity</i>
<b>d<sub>m</sub></b>	15.46 in			<i>Moment arm between the flange forces</i>
<b>R<sub>req</sub></b>	69.03 kips			<i>Required Flange Force (compression)</i>
<b>Column Panel Zone Shear</b>				
		75.82 kips	101.25 kips	<b>0.75</b> <b>PASS</b>
<b>R<sub>n</sub> = <math>0.60 * F_{yc} * d_c * t_{wc}</math> (<math>P_r \leq 0.4 * P_c</math>)</b>		<b>φ = 0.90</b>	(J10-9)	
<b>P<sub>r</sub></b>	0.00 kips			<i>Axial force in the column at the connection</i>
<b>P<sub>c</sub></b>	515.00 kips			$P_c = P_y = F_{yc} * A$
<b>F<sub>yc</sub></b>	50.00 ksi			<i>Minimum yield stress of column</i>
<b>A</b>	10.30 in <sup>2</sup>			<i>Column cross-sectional area</i>
<b>d<sub>c</sub></b>	12.50 in			<i>Column depth</i>
<b>t<sub>wc</sub></b>	0.30 in			<i>Column web thickness</i>
<b>φR<sub>n</sub></b>	101.25 kips			<i>Web panel zone capacity</i>
<b>R<sub>p</sub></b>	75.82 kips			<i>Panel zone shear demand. <math>R_p = M / d_m</math></i>
<b>M</b>	97.67 kips-ft			<i>Moment demand</i>
<b>d<sub>m</sub></b>	15.46 in			<i>Moment arm from centerline forces</i>
<b>Geometry Restrictions For Stiffener</b>				
				<b>PASS</b>
<b>Check Min Thickness</b>	<b>Pass</b>			<i>Condition: <math>t_{smin} \geq \max(t_f/2, b_s/16)</math> (J10.8)</i>
<b>t<sub>f</sub></b>	0.44 in			<i>Thickness of beam flange</i>
<b>b<sub>s</sub></b>	3.13 in			<i>Stiffener width</i>
<b>t<sub>s</sub></b>	0.38 in			<i>Stiffener thickness</i>
<b>t<sub>smin</sub></b>	0.22 in			<i>Min stiffener thickness</i>
<b>Check Min Depth</b>	<b>Pass</b>			<i>Condition: <math>d_{smin} \geq (d_c - 2*t_{cf})/2</math> (J10.8)</i>
<b>d<sub>c</sub></b>	12.50 in			<i>Column depth</i>
<b>t<sub>cf</sub></b>	0.52 in			<i>Column flange thickness</i>
<b>d<sub>s</sub></b>	11.46 in			<i>Stiffener depth</i>
<b>d<sub>Smin</sub></b>	5.73 in			<i>Min stiffener depth</i>
<b>Stiffener Yield at Column Flange</b>				
		4.36 kips	59.78 kips	<b>0.07</b> <b>PASS</b>
<b>R<sub>n</sub> = <math>2 * F_{yst} * A_{st}</math></b>		<b>φ = 0.9</b>	(J4-1)	
<b>t<sub>s</sub></b>	0.38 in			<i>Stiffener thickness</i>
<b>b<sub>s</sub></b>	3.13 in			<i>Stiffener width</i>
<b>clip</b>	0.67 in			<i>Stiffener corner clip dimension</i>
<b>F<sub>yst</sub></b>	36.00 ksi			<i>Minimum yield stress of Stiffener</i>
<b>A<sub>st</sub></b>	0.92 in <sup>2</sup>			<i>Cross-sectional area = <math>(b_s - clip) * t_s</math></i>
<b>φR<sub>n</sub></b>	59.78 kips			<i>Available transverse stiffener strength</i>
<b>R<sub>req</sub></b>	4.36 kips			<i>Required transverse stiffener strength</i>
<b>Stiffener Shear At Column Web</b>				
		4.36 kips	163.94 kips	<b>0.03</b> <b>PASS</b>

$R_n = 2 * 0.6 * F_{yst} * A_{gv}$		$\phi = 1.0$	(J4-3)
$t_s$	0.38 in		Stiffener thickness
$d_p$	11.46 in		Stiffener depth
$clip$	0.67 in		Stiffener corner clip dimension
$F_{yst}$	36.00 ksi		Minimum yield stress of Stiffener
$A_{gv}$	3.79 in <sup>2</sup>		Cross-sectional area = $(d_p - 2*clip) * t_s$
$\phi R_n$	163.94 kips		Available transverse stiffener strength
$R_{req}$	4.36 kips		Required transverse stiffener strength

**Stiffener Compression** 4.36 kips 42.90 kips **0.10** **PASS**

$R_n = 2 * F_{cr} * A_{st}$		$\phi = 0.9$	(E3-1)
$t_s$	0.38 in		Stiffener thickness
$L$	11.46 in		Unbraced length
$K$	0.75		Effective length factor
$r$	0.11 in		Radius of gyration = $t_s / (12)^{0.5}$
$KL/r$	79.40		Plate slenderness
$F_y$	36.00 ksi		Minimum yield stress of material
$A_{st}$	0.92 in <sup>2</sup>		Gross area subject to compression
$E$	29000.00 ksi		Modulus of elasticity
$F_e$	45.40 ksi		Elastic buckling stress (E3-4)
$F_{cr}$	25.83 ksi		Critical stress (E3-2)
$\phi R_n$	42.90 kips		Compressive strength

**Stiffener Weld Limitations** **PASS**

<b>Weld Min Size</b>		(J2.2b)
<b>Check Weld Min Size</b>	<b>Pass</b>	
$D$	0.25 in	Weld size
$D_{min}$	0.19 in	Min size allowed per Table J2.4
$t_{min}$	0.38 in	Controlling member thickness
<b>Check Stiffener Development</b>	<b>Pass</b>	
$D_{16}$	4.00	Weld fillet size in sixteenths of an inch
$D_{min}$	2.91	Min weld to develop stiffener strength

**Stiffener Weld Strength at Column Flange** 4.36 kips 48.21 kips **0.09** **PASS**

$\phi R_n = 1.5 * 4 * C_1 * \alpha * 1.392 * D_{16} * L$		
<b>Double Fillet</b>		
$1.392 = \phi * 0.6 * F_{E70} * 2^{0.5} / 2 * 1/16, \phi=0.75$ (AISC 14 <sup>th</sup> Eqn 8-2a)		
$C_1$	1.00	Electrode strength coefficient (AISC 14 <sup>th</sup> table 8-3)
$\alpha$	0.59	Base material proration factor (re-arrangement of AISC 14 <sup>th</sup> Eqn 9-2)
$D_{16}$	4.00	Weld fillet size in sixteenths of an inch
$L$	2.46 in	Weld length
$\phi R_n$	48.21 kips	Weld strength

**Stiffener Weld Strength at Panel Zone** 4.36 kips 198.31 kips **0.02** **PASS**

$\phi R_n = 4 * C_1 * \alpha * 1.392 * D_{16} * L$		
<b>Double Fillet</b>		
$1.392 = \phi * 0.6 * F_{E70} * 2^{0.5} / 2 * 1/16, \phi=0.75$ (AISC 14 <sup>th</sup> Eqn 8-2a)		
$C_1$	1.00	Electrode strength coefficient (AISC 14 <sup>th</sup> table 8-3)
$\alpha$	0.88	Base material proration factor (re-arrangement of AISC 14 <sup>th</sup> Eqn 9-2)
$D_{16}$	4.00	Weld fillet size in sixteenths of an inch
$L$	10.12 in	Weld length
$\phi R_n$	198.31 kips	Weld strength



# MF - Line C - (LC#3): Connection Properties

Column/Beam Extended End Plate Moment Connection

## Connection

Connection Title MF - Line C - (LC#3)  
 Connection Type Column/Beam Extended End Plate Moment Connection

## Seismic Detailing

Seismic System None

## Connection Category

Bolt Pattern 4 Bolts  
 Stiffeners Plates No  
 Transverse Stiffeners Yes  
 Web Doublers No

## Loading (LRFD)

Shear Load 9.96 kips  
 Axial Load -13.58 kips  
 Moment Load 97.68 kips-ft  
 Top Column Dist 196.85 in  
 Column Force 0.00 kips  
 Story Shear 0.00 kips

## Components

**Column Section** W12x35  
 Material A992  
 Hole Type STD  
**Beam Section** W16x31  
 Material A992  
**Plate Section** P0.75x6.00x21.90  
 Material A36  
 Thickness 0.75 in  
 Width 6.00 in  
 Depth 21.90 in  
 Hole Type STD  
**Transverse Stiffener Section** P0.38x3.13x11.46  
 Material A36  
 Fy 36.00 ksi  
 Fu 58.00 ksi  
 E 29000.00 ksi  
 Full Depth Stiffener Yes  
 Thickness 0.38 in  
 Width 3.13 in  
 Depth 11.46 in  
**Column Bolts** 3/4" A325-N  
 Column Bolts A325-N  
 Diameter, in. 3/4"  
**Beam Web Weld** E70  
 Type Double Fillet  
 Fillet Size 4.00 Sixteenths  
**Beam Flange Weld** E70  
 Type CJP  
**Transverse Stiffener Weld** E70  
 Type Double Fillet  
 Fillet Size 4.00 Sixteenths

## Assembly

Plate Beam Clearance 0.24 in  
 Column Bolts Flange Pitch (Outer) 1.50 in  
 Column Bolts Flange Pitch (Inner) 2.06 in  
 Column Bolts Vertical Gage 4.00 in  
**Column Bolts Edge Distance Dimensions**  
 Column Bolts Horz Edge Dist 1.43 in  
 Column Bolts Vert Edge Dist 1.50 in  
 Column Bolts Horizontal Gage 3.15 in



**Global Parameters - Description:**

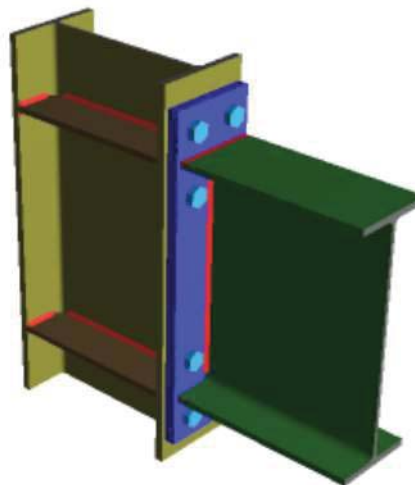
Project Title	71 Summit Lot
Company	Blackwell
Designer	DMV
Job Number	170450
Notes	2018.06.25 Revised to accommodate value engineering done on the structure. BG

**Global Parameters - Solution:**

Design Method	AISC 14th (360-10): LRFD
Bolt Group Analysis Method	Center of Rotation
Weld Analysis Method	Center of Rotation
Consider Bolt Hole Deformation?	No
Check Weld Filler Material Matching?	Yes
Check Rotational Ductility?	Yes
Full Shear Eccentricity Considered?	No
Plastic Panel-Zone Shear Deformation Considered?	No

**MF - Line C - (LC#3): 3D View**

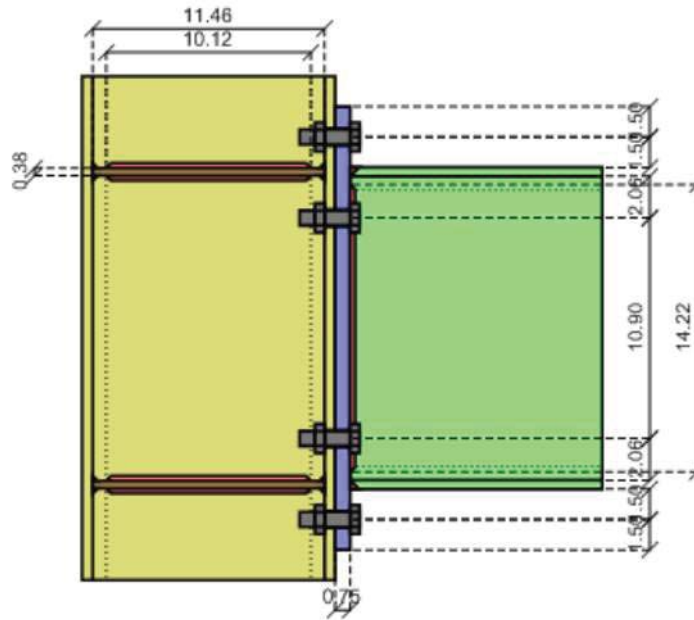
Column/Beam Extended End Plate Moment Connection



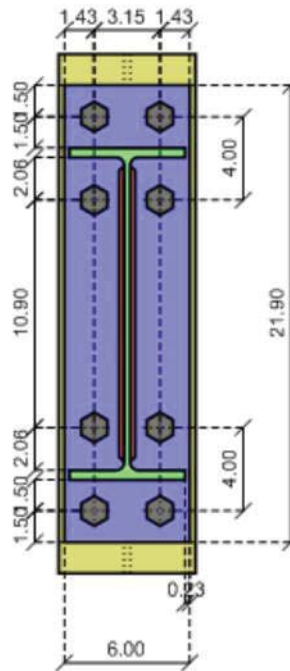
**MF - Line C - (LC#3): 2D Views**

Column/Beam Extended End Plate Moment Connection

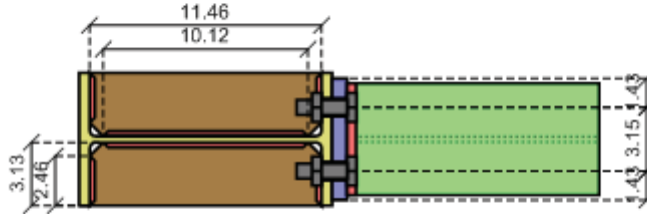
Side view



Front view

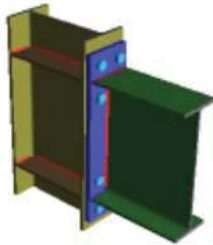


Top view



## MF - Line C - (LC#3): LRFD Results Report

**LRFD**  
Column/Beam Extended End Plate Moment Connection



### Material Properties:

Component	Section	Material	$F_y$ (ksi)	$F_u$ (ksi)
Column	W12x35	A992	50.00	65.00
Beam	W16x31	A992	50.00	65.00
Plate	P0.75x6.00x21.90	A36	36.00	58.00
Transverse Stiffener	P0.38x3.13x11.46	A36	36.00	58.00

### Input Data:

Shear Load	9.96 kips	User Input Shear Load
Moment	97.67 kips-ft	User Input Moment
Axial Load	-13.58 kips	User Input Axial Force (tension)
Puf_c	69.03 kips	Required Flange Force (compression)
Puf_t	82.60 kips	Required Flange Force (tension)
Top Column Dist	196.85 in	User Input Top Column Dist
Column Force	0.00 kips	User Input Column Force
Story Shear	0.00 kips	User Input Story Shear

Note: Unless specified, all code references are from AISC 360-10

Limit State	Required	Available	Unity Check	Result
<b>Geometry Restrictions at Column</b>				<b>PASS</b>
<b>Web Weld Limitations</b>				<b>PASS</b>
<b>Bolt Shear Strength</b>	9.96 kips	71.57 kips	<b>0.14</b>	<b>PASS</b>
<b>Bolt Bearing on Column</b>	9.96 kips	71.57 kips	<b>0.14</b>	<b>PASS</b>
<b>Bolt Bearing on Plate at Column</b>	9.96 kips	71.57 kips	<b>0.14</b>	<b>PASS</b>
<b>Beam Web Weld Strength</b>	9.96 kips	54.92 kips	<b>0.18</b>	<b>PASS</b>

<b>Beam Flange Weld Strength</b>				<b>PASS</b>
<b>Prying Force</b>				<b>PASS</b>
<b>Bolt Moment Strength (with prying)</b>	82.60 kips	102.79 kips	<b>0.80</b>	<b>PASS</b>
<b>Verify Bolt Prying Assumption</b>				
<b>End Plate Flexural Yielding</b>	82.60 kips	124.58 kips	<b>0.66</b>	<b>PASS</b>
<b>End Plate Shear Yielding</b>	41.30 kips	97.20 kips	<b>0.42</b>	<b>PASS</b>
<b>End Plate Shear Rupture</b>	41.30 kips	83.19 kips	<b>0.50</b>	<b>PASS</b>
<b>Column Flexural Yielding</b>	82.60 kips	141.11 kips	<b>0.59</b>	<b>PASS</b>
<b>Column Web Yielding</b>	82.60 kips	102.90 kips	<b>0.80</b>	<b>PASS</b>
<b>Column Web Buckling</b>	69.03 kips	64.67 kips		<b>N/A</b>
<b>Column Web Crippling</b>	69.03 kips	103.08 kips	<b>0.67</b>	<b>PASS</b>
<b>Column Panel Zone Shear</b>	75.82 kips	101.25 kips	<b>0.75</b>	<b>PASS</b>
<b>Geometry Restrictions For Stiffener</b>				<b>PASS</b>
<b>Stiffener Yield at Column Flange</b>	4.36 kips	59.78 kips	<b>0.07</b>	<b>PASS</b>
<b>Stiffener Shear At Column Web</b>	4.36 kips	163.94 kips	<b>0.03</b>	<b>PASS</b>
<b>Stiffener Compression</b>	4.36 kips	42.90 kips	<b>0.10</b>	<b>PASS</b>
<b>Stiffener Weld Limitations</b>				<b>PASS</b>
<b>Stiffener Weld Strength at Column Flange</b>	4.36 kips	48.21 kips	<b>0.09</b>	<b>PASS</b>
<b>Stiffener Weld Strength at Panel Zone</b>	4.36 kips	198.31 kips	<b>0.02</b>	<b>PASS</b>

## MF - Line C - (LC#3): Connection Properties

Column/Beam Extended End Plate Moment Connection

### Connection

Connection Title MF - Line C - (LC#3)  
Connection Type Column/Beam Extended End Plate Moment Connection

### Seismic Detailing

Seismic System None

### Connection Category

Bolt Pattern 4 Bolts  
Stiffeners Plates No  
Transverse Stiffeners Yes  
Web Doublers No

### Loading (LRFD)

Shear Load 9.96 kips  
Axial Load -13.58 kips  
Moment Load 97.68 kips-ft  
Top Column Dist 196.85 in  
Column Force 0.00 kips  
Story Shear 0.00 kips

### Components

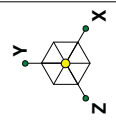
Column Section W12x35  
Material A992  
Hole Type STD  
Beam Section W16x31  
Material A992  
Plate Section P0.75x6.00x21.90  
Material A36  
Thickness 0.75 in

Width	6.00 in
Depth	21.90 in
Hole Type	STD
<b>Transverse Stiffener Section</b>	P0.38x3.13x11.46
Material	A36
Fy	36.00 ksi
Fu	58.00 ksi
E	29000.00 ksi
Full Depth Stiffener	Yes
Thickness	0.38 in
Width	3.13 in
Depth	11.46 in
<b>Column Bolts</b>	3/4" A325-N
Column Bolts	A325-N
Diameter, in.	3/4"
<b>Beam Web Weld</b>	E70
Type	Double Fillet
Fillet Size	4.00 Sixteenths
<b>Beam Flange Weld</b>	E70
Type	CJP
<b>Transverse Stiffener Weld</b>	E70
Type	Double Fillet
Fillet Size	4.00 Sixteenths
<b>Assembly</b>	
<b>Plate Beam Clearance</b>	0.24 in
<b>Column Bolts Flange Pitch (Outer)</b>	1.50 in
<b>Column Bolts Flange Pitch (Inner)</b>	2.06 in
<b>Column Bolts Vertical Gage</b>	4.00 in
<b>Column Bolts Edge Distance Dimensions</b>	
Column Bolts Horz Edge Dist	1.43 in
Column Bolts Vert Edge Dist	1.50 in
<b>Column Bolts Horizontal Gage</b>	3.15 in

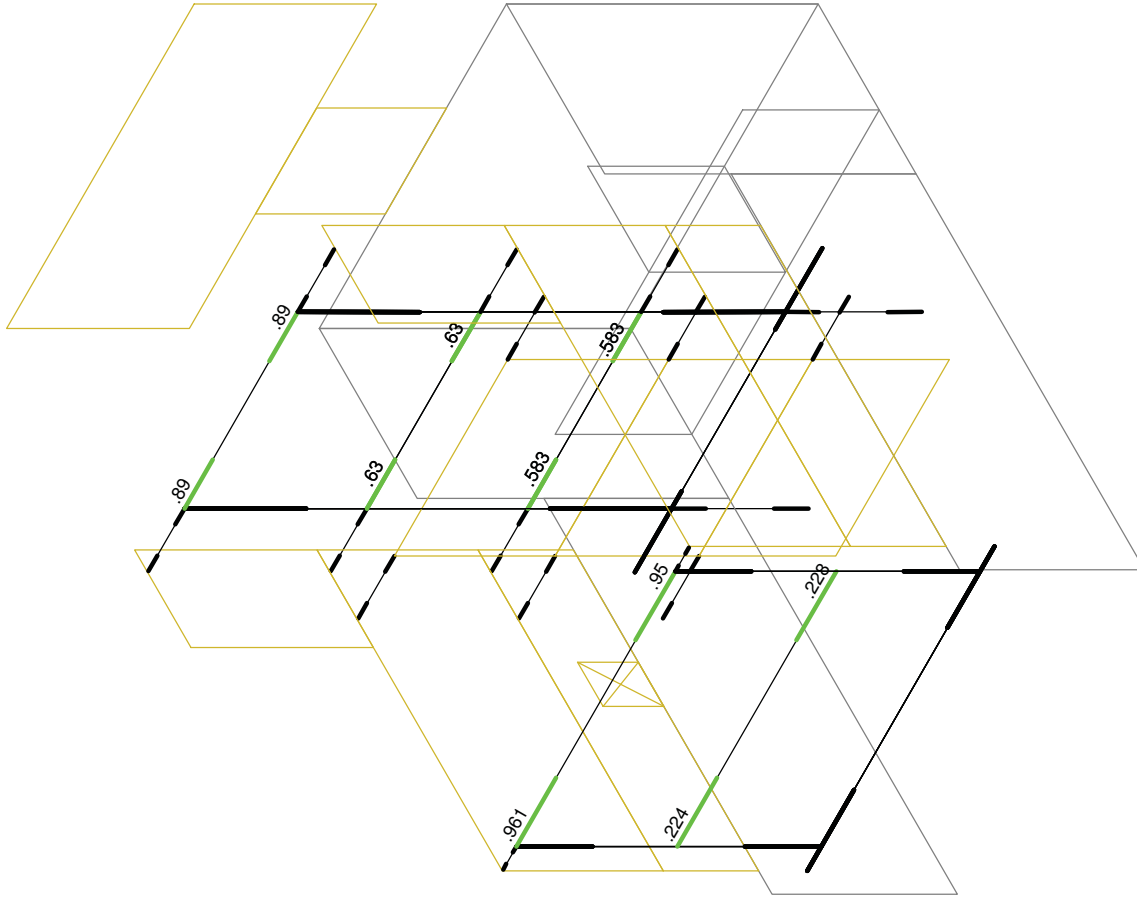
**Special Moment Frame Reduced Beam  
Section Connection Design**

Design using RISACONNECTION linked to RISA3D as per AISC 360, AISC 358 and AISC 341. For brevity of this report, the first SMF RBS connection design report is shown in detail. Remaining connection reports will be "rolled up". Unity checks in the various design categories are still visible.





Conn Results  
Pass  
Fail  
No Results



Envelope Connection Design Checks Displayed

Blackwell Structural Engineers

BG

170450

Lot 71

CONNECTION RESULTS

June 26, 2018 at 5:13 PM

170450 Summit Lot 71 2018.06.24.rfl

**Global Parameters - Description:**

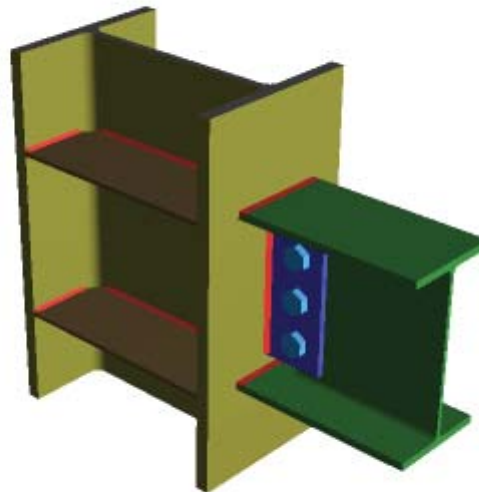
Project Title	Lot 71
Company	Blackwell Structural Engineers
Designer	BG
Job Number	170450
Notes	2018.01.29 Updates to concrete walls at level 2 2018.06.09 Updated to revised shear wall layout

**Global Parameters - Solution:**

Design Method	AISC 14th (360-10): LRFD
Bolt Group Analysis Method	Center of Rotation
Weld Analysis Method	Elastic
Consider Bolt Hole Deformation?	No
Check Weld Filler Material Matching?	Yes
Check Rotational Ductility?	Yes
Full Shear Eccentricity Considered?	No
Plastic Panel-Zone Shear Deformation Considered?	No

**2B1\_F4 I - (F.5-4.5)\_L1: 3D View**

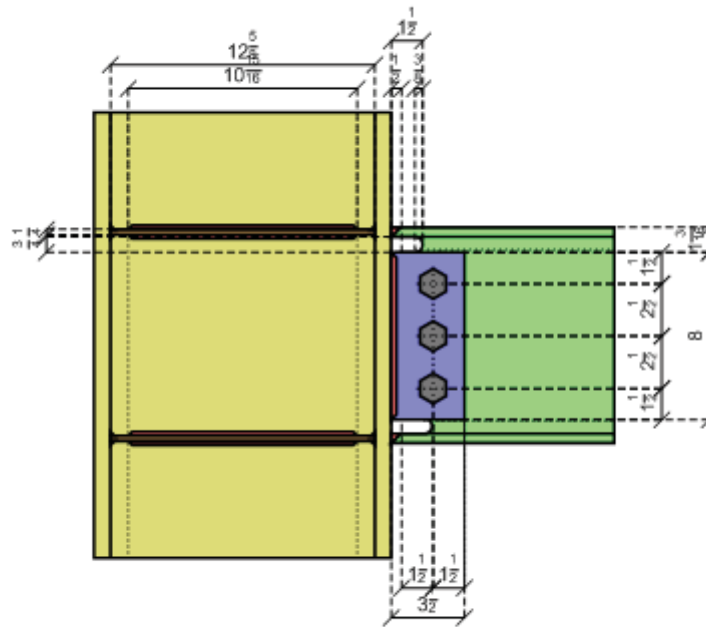
*Column/Beam Direct Weld Moment Connection*



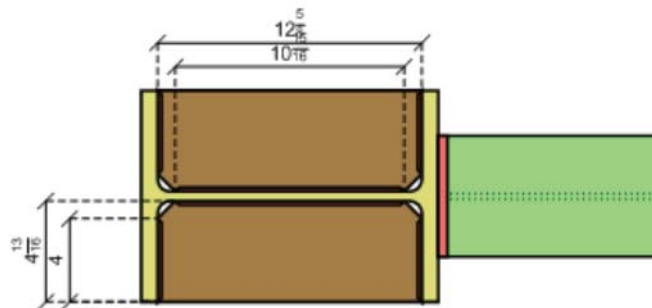
**2B1\_F4 I - (F.5-4.5)\_L1: 2D Views**

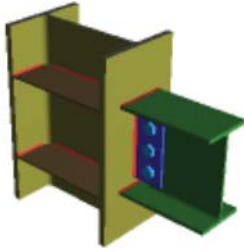
*Column/Beam Direct Weld Moment Connection*

Side view



Top view





Material Properties:

<b>Column</b>	W14x74	A992	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Beam</b>	W10x26	A992	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Plate</b>	P0.38x3.50x8.00	A36	F <sub>y</sub> = 36.00 ksi	F <sub>u</sub> = 58.00 ksi
<b>Transverse Stiffener</b>	P0.25x4.83x12.63	A572 Gr.50	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi

Input Data:

<b>Shear Load</b>	3.22 kips	User Input Shear Load
<b>Moment</b>	-19.29 kips-ft	User Input Moment
<b>Axial Load</b>	-5.24 kips	User Input Axial Force (tension)
<b>Puf_c</b>	20.86 kips	Required Flange Force (compression)
<b>Puf_t</b>	26.10 kips	Required Flange Force (tension)
<b>Top Column Dist</b>	126 1/4 in	User Input Top Column Dist
<b>Column Force</b>	11.71 kips	User Input Column Force
<b>Story Shear</b>	-6.52 kips	User Input Story Shear

Note: Unless specified, all code references are from AISC 360-10

**Governing LC: 3D - 32 - ASCE Strength 5 (a)**

Limit State	Required	Available	Unity Check	Result
<b>Geometry Restrictions at Beam</b>				<b>PASS</b>
<b>Check Min Bolt Spacing</b>	<b>Pass</b>	Condition: $S_{min} \geq (2+2/3) * d_{bolt}$ (J3.3)		
S <sub>min</sub>	2 1/2 in	Min bolt spacing		
d <sub>bolt</sub>	3/4 in	Bolt diameter		
<b>Check Max Bolt Spacing</b>	<b>Pass</b>	Condition: $S_{max} \leq \min(12 \text{ in}, 24*t)$ (J3.5a)		
S <sub>max</sub>	2 1/2 in	Max bolt spacing		
t	1/4 in	Thickness of governing element (Beam)		
<b>Check Min Edge Distance</b>	<b>Pass</b>	Condition: $ED_{min} \geq ED_{allow}$ (J3.4)		
<b>Check Max Edge Distance</b>	<b>Pass</b>	Condition: $ED_{max} \leq \min(6 \text{ in}, 12*t)$ (J3.5)		
<b>Column Weld Limitations</b>				<b>PASS</b>
<b>Weld Max/Min Size, Length</b>		(J2.2b)		
<b>Check Weld Min Size</b>	<b>Pass</b>			
D	1/4 in	Weld size		
D <sub>min</sub>	3/16 in	Min size allowed per Table J2.4		
t <sub>min</sub>	3/8 in	Controlling member thickness		
<b>Check Weld Min Length</b>	<b>Pass</b>	Condition: $L_{min} \geq 4*D$ per J2.2b		
D	1/4 in	Weld size		
L <sub>min</sub>	8 in	Min weld segment length		
<b>Beam Web Shear Yield</b>	3.22 kips	61.78 kips	<b>0.05</b>	<b>PASS</b>
$R_n = 0.6 * F_y * A_{gv} * C_v$	$\phi = 1.00$	(G2-1)		
F <sub>y</sub>	50.00 ksi	Minimum yield stress of material		
A <sub>gv</sub>	2.06 in <sup>2</sup>	Gross area subject to shear		
C <sub>v</sub>	1.00	Web shear coefficient (G2-2)		
$\phi R_n$	61.78 kips	Shear yield strength		
<b>Plate Shear Yield</b>	3.22 kips	64.80 kips	<b>0.05</b>	<b>PASS</b>
$R_n = 0.6 * F_y * A_{gv}$	$\phi = 1.00$	(J4-3)		
F <sub>y</sub>	36.00 ksi	Minimum yield stress of material		
A <sub>gv</sub>	3.00 in <sup>2</sup>	Gross area subject to shear		
$\phi R_n$	64.80 kips	Shear yield strength		
<b>Beam Web Shear Rupture</b>	3.22 kips	40.27 kips	<b>0.08</b>	<b>PASS</b>
$R_n = 0.6 * F_u * A_{nv}$	$\phi = 0.75$	(J4-4)		
F <sub>u</sub>	65.00 ksi	Minimum tensile stress of material		
A <sub>nv</sub>	1.38 in <sup>2</sup>	Net area subject to shear		
$\phi R_n$	40.27 kips	Shear rupture strength		
<b>Plate Shear Rupture</b>	3.22 kips	52.61 kips	<b>0.06</b>	<b>PASS</b>
$R_n = 0.6 * F_u * A_{nv}$	$\phi = 0.75$	(J4-4)		

<b>F<sub>u</sub></b>	58.00 ksi		<i>Minimum tensile stress of material</i>
<b>A<sub>nv</sub></b>	2.02 in <sup>2</sup>		<i>Net area subject to shear</i>
<b>φR<sub>n</sub></b>	52.61 kips		<i>Shear rupture strength</i>
<b>Beam Block Shear</b>		3.22 kips	46.26 kips <b>0.07</b> <b>PASS</b>
<b>R<sub>n</sub> = [ min(0.6*F<sub>u</sub>*A<sub>nv</sub>, 0.6*F<sub>y</sub>*A<sub>gv</sub>) + U<sub>bs</sub>*F<sub>u</sub>*A<sub>nt</sub> ]</b>		<b>φ = 0.75</b>	(J4-5)
<b>A<sub>gv</sub></b>	1.69 in <sup>2</sup>		<i>Gross area subject to shear</i>
<b>A<sub>nv</sub></b>	1.12 in <sup>2</sup>		<i>Net area subject to shear</i>
<b>U<sub>bs</sub></b>	1.00		<i>Uniform tension stress factor</i>
<b>A<sub>nt</sub></b>	0.28 in <sup>2</sup>		<i>Net area subject to tension</i>
<b>F<sub>u</sub></b>	65.00 ksi		<i>Minimum tensile stress of material</i>
<b>F<sub>y</sub></b>	50.00 ksi		<i>Minimum yield stress of material</i>
<b>φR<sub>n</sub></b>	46.26 kips		<i>Block shear strength</i>
<b>Plate Block Shear at Beam</b>		3.22 kips	56.82 kips <b>0.06</b> <b>PASS</b>
<b>R<sub>n</sub> = [ min(0.6*F<sub>u</sub>*A<sub>nv</sub>, 0.6*F<sub>y</sub>*A<sub>gv</sub>) + U<sub>bs</sub>*F<sub>u</sub>*A<sub>nt</sub> ]</b>		<b>φ = 0.75</b>	(J4-5)
<b>A<sub>gv</sub></b>	2.44 in <sup>2</sup>		<i>Gross area subject to shear</i>
<b>A<sub>nv</sub></b>	1.62 in <sup>2</sup>		<i>Net area subject to shear</i>
<b>U<sub>bs</sub></b>	1.00		<i>Uniform tension stress factor</i>
<b>A<sub>nt</sub></b>	0.40 in <sup>2</sup>		<i>Net area subject to tension</i>
<b>F<sub>u</sub></b>	58.00 ksi		<i>Minimum tensile stress of material</i>
<b>F<sub>y</sub></b>	36.00 ksi		<i>Minimum yield stress of material</i>
<b>φR<sub>n</sub></b>	56.82 kips		<i>Block shear strength</i>
<b>Bolt Bearing at Beam Web</b>		3.22 kips	53.68 kips <b>0.06</b> <b>PASS</b>
<b>R<sub>n</sub> = 3*R<sub>n</sub>-spacing</b>		<b>φ = 0.75</b>	(J3-6b)
<b>d</b>	3/4 in		<i>Bolt diameter</i>
<b>F<sub>u</sub></b>	65.00 ksi		<i>Minimum tensile stress of material</i>
<b>t</b>	1/4 in		<i>Thickness of material</i>
<b>L<sub>c</sub>-spacing</b>	1 11/16 in		<i>Vertical distance from edges of adjacent holes</i>
<b>R<sub>n</sub>-spacing</b>	23.86 kips		<i>Strength at spaces = min(R<sub>n</sub>-spacing-tearout, R<sub>n</sub>-bearing, R<sub>n</sub>-bolt)</i>
<b>R<sub>n</sub>-bearing</b>	38.02 kips		<i>Bearing = 3.0*d*t*F<sub>u</sub></i>
<b>R<sub>n</sub>-spacing-tearout</b>	42.78 kips		<i>Tear out at spaces = 1.5*L<sub>c</sub>-spacing*t*F<sub>u</sub></i>
<b>R<sub>n</sub>-bolt</b>	23.86 kips		<i>Bolt shear strength R<sub>n</sub>-bolt=F<sub>nv</sub>*A<sub>bolt</sub></i>
<b>F<sub>nv</sub></b>	54.00 ksi		<i>Nominal shear stress of bolt</i>
<b>φR<sub>n</sub></b>	53.68 kips		<i>Bolt bearing strength</i>
<b>Bolt Bearing at Shear Plate</b>		3.22 kips	53.68 kips <b>0.06</b> <b>PASS</b>
<b>R<sub>n</sub> = 1*R<sub>n</sub>-edge + 2*R<sub>n</sub>-spacing</b>		<b>φ = 0.75</b>	(J3-6b)
<b>d</b>	3/4 in		<i>Bolt diameter</i>
<b>F<sub>u</sub></b>	58.00 ksi		<i>Minimum tensile stress of material</i>
<b>t</b>	3/8 in		<i>Thickness of material</i>
<b>L<sub>c</sub>-edge</b>	1 1/16 in		<i>Vertical distance from edge of hole to edge of material</i>
<b>L<sub>c</sub>-spacing</b>	1 11/16 in		<i>Vertical distance from edges of adjacent holes</i>
<b>R<sub>n</sub>-edge</b>	23.86 kips		<i>Strength at edge = min(R<sub>n</sub>-edge-tearout, R<sub>n</sub>-bearing, R<sub>n</sub>-bolt)</i>
<b>R<sub>n</sub>-spacing</b>	23.86 kips		<i>Strength at spaces = min(R<sub>n</sub>-spacing-tearout, R<sub>n</sub>-bearing, R<sub>n</sub>-bolt)</i>
<b>R<sub>n</sub>-bearing</b>	48.94 kips		<i>Bearing = 3.0*d*t*F<sub>u</sub></i>
<b>R<sub>n</sub>-edge-tearout</b>	35.68 kips		<i>Tear out at edge = 1.5*L<sub>c</sub>-edge*t*F<sub>u</sub></i>
<b>R<sub>n</sub>-spacing-tearout</b>	55.05 kips		<i>Tear out at spaces = 1.5*L<sub>c</sub>-spacing*t*F<sub>u</sub></i>
<b>R<sub>n</sub>-bolt</b>	23.86 kips		<i>Bolt shear strength R<sub>n</sub>-bolt=F<sub>nv</sub>*A<sub>bolt</sub></i>
<b>F<sub>nv</sub></b>	54.00 ksi		<i>Nominal shear stress of bolt</i>
<b>φR<sub>n</sub></b>	53.68 kips		<i>Bolt bearing strength</i>
<b>Bolt Shear at Beam Web</b>		3.22 kips	53.68 kips <b>0.06</b> <b>PASS</b>
<b>R<sub>n</sub> = F<sub>nv</sub>*A<sub>b</sub>*N<sub>bolt</sub>*C</b>		<b>φ = 0.75</b>	(J3-1)

<b>F<sub>nv</sub></b>	54.00 ksi	<i>Shear stress N type</i>		
<b>A<sub>b</sub></b>	0.44 in <sup>2</sup>	<i>Area of bolt</i>		
<b>N<sub>bolt</sub></b>	3	<i>Number of bolts</i>		
<b>C</b>	1.00	<i>Eccentricity coefficient</i>		
<b>φR<sub>n</sub></b>	53.68 kips	<i>Bolt shear rupture strength</i>		
<b>Column Weld Strength</b>	3.22 kips	78.38 kips	<b>0.04</b>	<b>PASS</b>
<b>φR<sub>n</sub> = 2 * C<sub>1</sub> * α * 1.392 * D<sub>16</sub> * L</b>				
<b>Double Fillet</b>				
<b>1.392 = φ * 0.6 * F<sub>E70</sub> * 2<sup>0.5</sup> / 2 * 1/16, φ=0.75 (AISC 14<sup>th</sup> Eqn 8-2a)</b>				
<b>C<sub>1</sub></b>	1.00	<i>Electrode strength coefficient (AISC 14<sup>th</sup> table 8-3)</i>		
<b>α</b>	0.88	<i>Base material proration factor (re-arrangement of AISC 14<sup>th</sup> Eqn 9-2)</i>		
<b>D<sub>16</sub></b>	4.00	<i>Weld fillet size in sixteenths of an inch</i>		
<b>L</b>	8 in	<i>Weld length</i>		
<b>φR<sub>n</sub></b>	78.38 kips	<i>Weld strength</i>		
<b>Flange Weld Strength</b>				<b>PASS</b>
<b>Complete Joint Penetration</b>		(J2.6)		
<b>Req'd Filler (Column)</b>	E70			
<b>Req'd Filler (Beam)</b>	E70			
<b>Weld Electrode (Filler)</b>	E70			
<b>Beam Flange Tensile Yield</b>	26.10 kips	114.25 kips	<b>0.23</b>	<b>PASS</b>
<b>R<sub>n</sub> = F<sub>y</sub>*A<sub>g</sub></b>		<b>φ = 0.90</b>	(J4-1)	
<b>F<sub>y</sub></b>	50.00 ksi	<i>Minimum yield stress of material</i>		
<b>A<sub>g</sub></b>	2.54 in <sup>2</sup>	<i>Gross area subject to tension</i>		
<b>φR<sub>n</sub></b>	114.25 kips	<i>Tensile yield strength</i>		
<b>d<sub>m</sub></b>	9 7/8 in	<i>Moment arm between the flange forces</i>		
<b>R<sub>req</sub></b>	26.10 kips	<i>Required Flange Force (tension)</i>		
<b>Beam Flange Tensile Rupture</b>	26.10 kips	123.77 kips	<b>0.21</b>	<b>PASS</b>
<b>R<sub>n</sub> = F<sub>u</sub>*A<sub>n</sub></b>		<b>φ = 0.75</b>	(J4-2)	
<b>F<sub>u</sub></b>	65.00 ksi	<i>Minimum tensile stress of material</i>		
<b>A<sub>n</sub></b>	2.54 in <sup>2</sup>	<i>Net area subject to tension</i>		
<b>φR<sub>n</sub></b>	123.77 kips	<i>Tensile rupture strength</i>		
<b>d<sub>m</sub></b>	9 7/8 in	<i>Moment arm between the flange forces</i>		
<b>R<sub>req</sub></b>	26.10 kips	<i>Required Flange Force (tension)</i>		
<b>Beam Flange Compression</b>	20.86 kips	114.25 kips	<b>0.18</b>	<b>PASS</b>
<b>R<sub>n</sub> = F<sub>y</sub> * A<sub>g</sub></b>		<b>φ = 0.9</b>	(J4-6)	
<b>K</b>	0.65	<i>Effective length factor</i>		
<b>L</b>	3/16 ft	<i>Unbraced length</i>		
<b>r</b>	0 ft	<i>Radius of gyration</i>		
<b>KL/r</b>	9.93	<i>Plate slenderness</i>		
<b>F<sub>y</sub></b>	50.00 ksi	<i>Capacity = Minimum Yield stress for KL/r &lt;= 25</i>		
<b>A<sub>g</sub></b>	2.54 in <sup>2</sup>	<i>Gross area subject to compression</i>		
<b>φR<sub>n</sub></b>	114.25 kips	<i>Compressive strength</i>		
<b>Column Flange Bending</b>	26.10 kips	173.31 kips	<b>0.15</b>	<b>PASS</b>
<b>R<sub>n</sub> = 6.25 * F<sub>yf</sub> * t<sub>f</sub><sup>2</sup></b>		<b>φ = 0.90</b>	(J10-1)	
<b>d<sub>end</sub></b>	126 1/2 in	<i>Distance from concentrated force to top of column</i>		
<b>F<sub>yf</sub></b>	50.00 ksi	<i>Minimum yield stress of column</i>		
<b>t<sub>f</sub></b>	13/16 in	<i>Column flange thickness</i>		
<b>φR<sub>n</sub></b>	173.31 kips	<i>Column flange local bending</i>		
<b>d<sub>m</sub></b>	9 7/8 in	<i>Moment arm between the flange forces</i>		
<b>R<sub>req</sub></b>	26.10 kips	<i>Required Flange Force (tension)</i>		
<b>Column Web Yielding</b>	26.10 kips	165.15 kips	<b>0.16</b>	<b>PASS</b>
<b>R<sub>n</sub> = (5 * k + N) * F<sub>y</sub> * t<sub>w</sub></b>		<b>φ = 1.00</b>	(J10-2)	

dend	126 1/2 in	Distance from concentrated force to top of column
dcol	14 3/16 in	Column depth
k	1 3/8 in	Distance from outer face of the flange to the web toe of the fillet
N	7/16 in	Length of bearing
Fy	50.00 ksi	Minimum yield stress of column
tw	7/16 in	Column web thickness
φRn	165.15 kips	Column web local yielding
dm	9 7/8 in	Moment arm between the flange forces
Rreq	26.10 kips	Required Flange Force (worst) in bolts due to moment

<b>Column Web Buckling</b>	20.86 kips	207.18 kips	<b>0.10</b>	<b>PASS</b>
$R_n = 24 * t_w^3 * (E * F_y)^{0.5} / h$	$\phi = 0.90$	(J10-8)		
dend	126 1/2 in	Distance from concentrated force to top of column		
dcol	14 3/16 in	Column depth		
tw	7/16 in	Column web thickness		
Fy	50.00 ksi	Minimum yield stress of column		
E	29000.00 ksi	Modulus of elasticity of column		
h	11 7/16 in	Clear distance between flanges $h=d-2*k_{des}$		
φRn	207.18 kips	Column web compression buckling		
dm	9 7/8 in	Moment arm between the flange forces		
Rreq	20.86 kips	Required Flange Force (compression)		

<b>Column Web Crippling</b>	20.86 kips	201.03 kips	<b>0.10</b>	<b>PASS</b>
$R_n = 0.8 * t_w^2 * (1 + 3 * (N/d_{col}) * (t_w/t_f)^{1.5}) * (E * F_y * t_f/t_w)^{0.5}$	$\phi = 0.75$	(J10-4)		
dend	126 1/2 in	Distance from concentrated force to top of column		
N/dcol	0.03	Bearing length to column depth ratio		
dcol	14 3/16 in	Column depth		
tw	7/16 in	Column web thickness		
tf	13/16 in	Column flange thickness		
N	7/16 in	Length of bearing		
Fy	50.00 ksi	Minimum yield stress of column		
E	29000.00 ksi	Modulus of elasticity of column		
φRn	201.03 kips	Column web crippling capacity		
dm	9 7/8 in	Moment arm between the flange forces		
Rreq	20.86 kips	Required Flange Force (compression)		

<b>Column Panel Zone Shear</b>	30.00 kips	172.53 kips	<b>0.17</b>	<b>PASS</b>
$R_n = 0.60 * F_{yc} * d_c * t_{wc} (P_r \leq 0.4 * P_c)$	$\phi = 0.90$	(J10-9)		
Pr	11.71 kips	Axial force in the column at the connection		
Pc	1090.00 kips	$P_c = P_y = F_{yc} * A$		
Fyc	50.00 ksi	Minimum yield stress of column		
A	21.80 in <sup>2</sup>	Column cross-sectional area		
dc	14 3/16 in	Column depth		
twc	7/16 in	Column web thickness		
φRn	172.53 kips	Web panel zone capacity		
Rf	23.48 kips	Beam flange force. $R_f = M / d_m$		
M	19.29 kips-ft	Moment demand		
dm	9 7/8 in	Moment arm from centerline forces		
Vabove	6.52 kips	Story shear in column above connection		
Rp	30.00 kips	Panel zone shear demand. $R_p = R_f + V_{above}$		

# 2B1\_F4 I - (F.5-4.5)\_L1: Connection Properties

Column/Beam Direct Weld Moment Connection

<b>Connection</b>	
Connection Title	2B1_F4 I - (F.5-4.5)_L1
Connection Type	Column/Beam Direct Weld Moment Connection
<b>Seismic Detailing</b>	
Seismic System	None
<b>Connection Category</b>	
Beam Connection	Bolted
Column Connection Type	Flange
Transverse Stiffeners	Yes
Web Doublers	No
<b>Loading (LRFD)</b>	
Custom?	No
Shear Load	3.22 kips
Axial Load	-5.24 kips
Moment Load	-19.29 kips-ft
Top Column Dist	126 1/4 in
Column Force	11.71 kips
Story Shear	-6.52 kips
<b>Components</b>	
<b>Column Section</b>	
Material	W14x74
	A992
<b>Beam Section</b>	
Material	W10x26
Hole Type	A992
	STD
<b>Plate Section</b>	
	P0.38x3.50x8.00
Material	A36
Thickness	3/8 in
Width	3 1/2 in
Depth	8 in
Hole Type	STD
<b>Transverse Stiffener Section</b>	
	P0.25x4.83x12.63
Material	A572 Gr.50
Fy	50.00 ksi
Fu	65.00 ksi
E	29000.00 ksi
Full Depth Stiffener	Yes
Thickness	1/4 in
Width	4 13/16 in
Depth	12 5/8 in
<b>Column Weld</b>	
Type	E70
Fillet Size	Double Fillet
	4.00 Sixteenths
<b>Beam Bolts</b>	
Beam Bolts	3/4" A325-N
Diameter, in.	A325-N
Rows	3/4"
Bolts per Row	1
Longitudinal Spacing	3
Transverse Spacing	2 1/2 in
Slip Critical	3 in
	No
<b>Moment Weld</b>	
Type	E70
	CJP
<b>Transverse Stiffener Weld</b>	
Type	E70
Fillet Size	Double Fillet
	3.00 Sixteenths
<b>Assembly</b>	
Column/Beam Clearance	1/2 in
Plate Vertical Position	1 3/16 in
Beam Bolts Edge Distance Dimensions	



Beam Bolts/Beam Edge Dist	1 1/2 in
Beam Bolts Horz Edge Dist	1 1/2 in
Beam Bolts Vert Edge Dist	1 1/2 in

**Global Parameters - Description:**

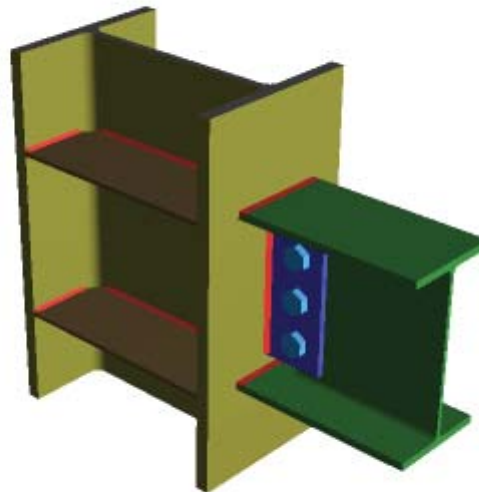
Project Title	Lot 71
Company	Blackwell Structural Engineers
Designer	BG
Job Number	170450
Notes	2018.01.29 Updates to concrete walls at level 2 2018.06.09 Updated to revised shear wall layout

**Global Parameters - Solution:**

Design Method	AISC 14th (360-10): LRFD
Bolt Group Analysis Method	Center of Rotation
Weld Analysis Method	Elastic
Consider Bolt Hole Deformation?	No
Check Weld Filler Material Matching?	Yes
Check Rotational Ductility?	Yes
Full Shear Eccentricity Considered?	No
Plastic Panel-Zone Shear Deformation Considered?	No

**2B1\_F4 J - (F.5-1.1)\_L1: 3D View**

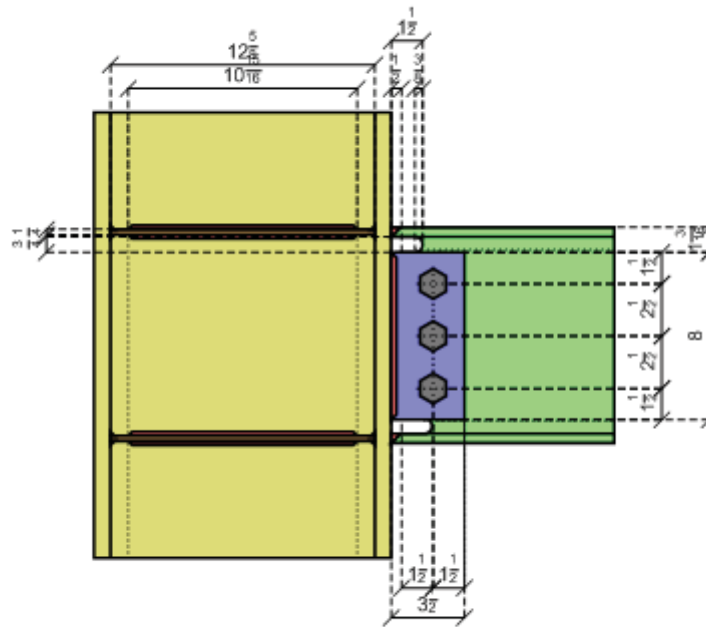
*Column/Beam Direct Weld Moment Connection*



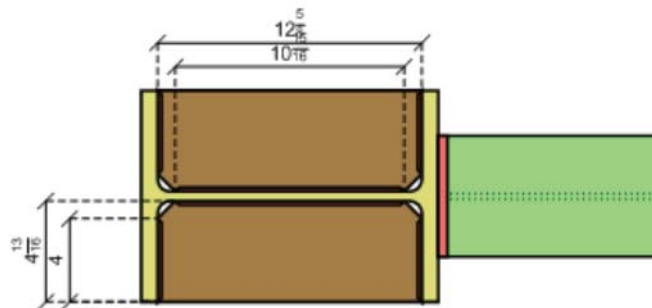
**2B1\_F4 J - (F.5-1.1)\_L1: 2D Views**

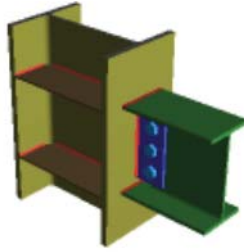
*Column/Beam Direct Weld Moment Connection*

Side view



Top view





Material Properties:

<b>Column</b>	W14x74	A992	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Beam</b>	W10x26	A992	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Plate</b>	P0.38x3.50x8.00	A36	F <sub>y</sub> = 36.00 ksi	F <sub>u</sub> = 58.00 ksi
<b>Transverse Stiffener</b>	P0.25x4.83x12.63	A572 Gr.50	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi

Input Data:

<b>Shear Load</b>	-3.18 kips	<i>User Input Shear Load</i>
<b>Moment</b>	-18.87 kips-ft	<i>User Input Moment</i>
<b>Axial Load</b>	-5.19 kips	<i>User Input Axial Force (tension)</i>
<b>Puf_c</b>	20.37 kips	<i>Required Flange Force (compression)</i>
<b>Puf_t</b>	25.56 kips	<i>Required Flange Force (tension)</i>
<b>Top Column Dist</b>	126 1/4 in	<i>User Input Top Column Dist</i>
<b>Column Force</b>	11.37 kips	<i>User Input Column Force</i>
<b>Story Shear</b>	6.49 kips	<i>User Input Story Shear</i>

Note: Unless specified, all code references are from AISC 360-10

**Governing LC: 3D - 34 - ASCE Strength 5 (c)**

Limit State	Required	Available	Unity Check	Result
<b>Geometry Restrictions at Beam</b>				<b>PASS</b>
<b>Column Weld Limitations</b>				<b>PASS</b>
<b>Beam Web Shear Yield</b>	3.18 kips	61.78 kips	<b>0.05</b>	<b>PASS</b>
<b>Plate Shear Yield</b>	3.18 kips	64.80 kips	<b>0.05</b>	<b>PASS</b>
<b>Beam Web Shear Rupture</b>	3.18 kips	40.27 kips	<b>0.08</b>	<b>PASS</b>
<b>Plate Shear Rupture</b>	3.18 kips	52.61 kips	<b>0.06</b>	<b>PASS</b>
<b>Beam Block Shear</b>	3.18 kips	45.66 kips	<b>0.07</b>	<b>PASS</b>
<b>Plate Block Shear at Beam</b>	3.18 kips	56.82 kips	<b>0.06</b>	<b>PASS</b>
<b>Bolt Bearing at Beam Web</b>	3.18 kips	53.68 kips	<b>0.06</b>	<b>PASS</b>
<b>Bolt Bearing at Shear Plate</b>	3.18 kips	53.68 kips	<b>0.06</b>	<b>PASS</b>
<b>Bolt Shear at Beam Web</b>	3.18 kips	53.68 kips	<b>0.06</b>	<b>PASS</b>
<b>Column Weld Strength</b>	3.18 kips	78.38 kips	<b>0.04</b>	<b>PASS</b>
<b>Flange Weld Strength</b>				<b>PASS</b>
<b>Beam Flange Tensile Yield</b>	25.56 kips	114.25 kips	<b>0.22</b>	<b>PASS</b>
<b>Beam Flange Tensile Rupture</b>	25.56 kips	123.77 kips	<b>0.21</b>	<b>PASS</b>
<b>Beam Flange Compression</b>	20.37 kips	114.25 kips	<b>0.18</b>	<b>PASS</b>
<b>Column Flange Bending</b>	25.56 kips	173.31 kips	<b>0.15</b>	<b>PASS</b>
<b>Column Web Yielding</b>	25.56 kips	165.15 kips	<b>0.15</b>	<b>PASS</b>
<b>Column Web Buckling</b>	20.37 kips	207.18 kips	<b>0.10</b>	<b>PASS</b>
<b>Column Web Crippling</b>	20.37 kips	201.03 kips	<b>0.10</b>	<b>PASS</b>
<b>Column Panel Zone Shear</b>	16.47 kips	172.53 kips	<b>0.10</b>	<b>PASS</b>

**2B1\_F4 J - (F.5-1.1)\_L1: Connection Properties**

*Column/Beam Direct Weld Moment Connection*

**Connection**

Connection Title

2B1\_F4 J - (F.5-1.1)\_L1

<b>Connection Type</b>	Column/Beam Direct Weld Moment Connection
<b>Seismic Detailing</b>	
<b>Seismic System</b>	None
<b>Connection Category</b>	
<b>Beam Connection</b>	Bolted
<b>Column Connection Type</b>	Flange
<b>Transverse Stiffeners</b>	Yes
<b>Web Doublers</b>	No
<b>Loading (LRFD)</b>	
<b>Custom?</b>	No
<b>Shear Load</b>	-3.18 kips
<b>Axial Load</b>	-5.19 kips
<b>Moment Load</b>	-18.87 kips-ft
<b>Top Column Dist</b>	126 1/4 in
<b>Column Force</b>	11.37 kips
<b>Story Shear</b>	6.49 kips
<b>Components</b>	
<b>Column Section</b>	W14x74
Material	A992
<b>Beam Section</b>	W10x26
Material	A992
Hole Type	STD
<b>Plate Section</b>	P0.38x3.50x8.00
Material	A36
Thickness	3/8 in
Width	3 1/2 in
Depth	8 in
Hole Type	STD
<b>Transverse Stiffener Section</b>	P0.25x4.83x12.63
Material	A572 Gr.50
Fy	50.00 ksi
Fu	65.00 ksi
E	29000.00 ksi
Full Depth Stiffener	Yes
Thickness	1/4 in
Width	4 13/16 in
Depth	12 5/8 in
<b>Column Weld</b>	E70
Type	Double Fillet
Fillet Size	4.00 Sixteenths
<b>Beam Bolts</b>	3/4" A325-N
Beam Bolts	A325-N
Diameter, in.	3/4"
Rows	1
Bolts per Row	3
Longitudinal Spacing	2 1/2 in
Transverse Spacing	3 in
Slip Critical	No
<b>Moment Weld</b>	E70
Type	CJP
<b>Transverse Stiffener Weld</b>	E70
Type	Double Fillet
Fillet Size	3.00 Sixteenths
<b>Assembly</b>	
<b>Column/Beam Clearance</b>	1/2 in
<b>Plate Vertical Position</b>	1 3/16 in
<b>Beam Bolts Edge Distance Dimensions</b>	
Beam Bolts/Beam Edge Dist	1 1/2 in
Beam Bolts Horz Edge Dist	1 1/2 in
Beam Bolts Vert Edge Dist	1 1/2 in

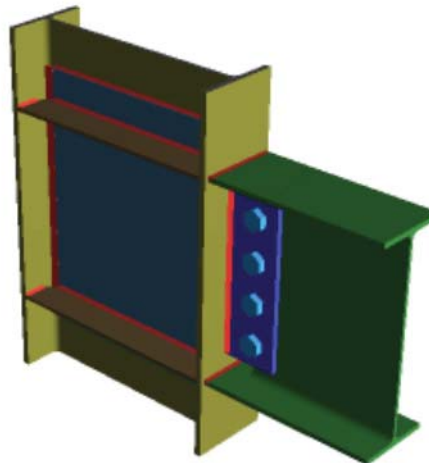
Type	Double Fillet
Fillet Size	3.00 Sixteenths
<b>Doubler Flange Weld</b>	E70
Type	CJP
<b>Doubler Web Weld</b>	E70
Type	Fillet
Fillet Size	3.00 Sixteenths

**Assembly**

<b>Column/Beam Clearance</b>	1/2 in
<b>Plate Vertical Position</b>	1 3/16 in
<b>Beam Bolts Edge Distance Dimensions</b>	
Beam Bolts/Beam Edge Dist	1 1/2 in
Beam Bolts Horz Edge Dist	1 1/2 in
Beam Bolts Vert Edge Dist	1 1/2 in

**2B6\_F4 I - (C-2.1)\_L2: 3D View**

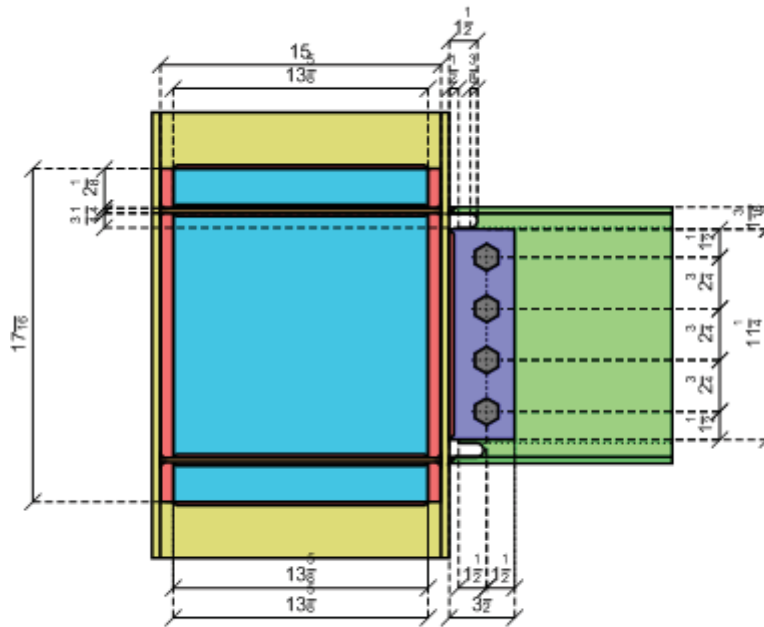
*Column/Beam Direct Weld Moment Connection*



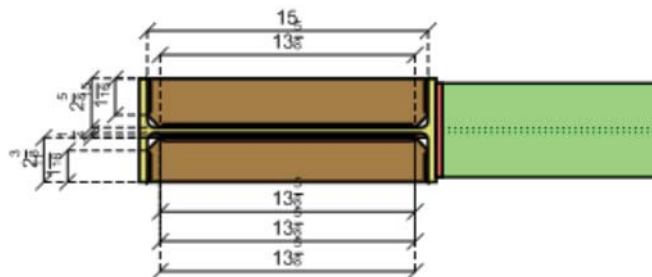
**2B6\_F4 I - (C-2.1)\_L2: 2D Views**

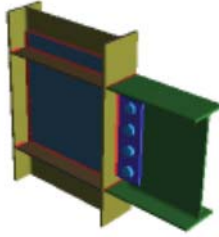
*Column/Beam Direct Weld Moment Connection*

Side view



Top view





Material Properties:				
<b>Column</b>	W16x31	A992	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Beam</b>	W14x22	A992	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Plate</b>	P0.38x3.50x11.25	A36	F <sub>y</sub> = 36.00 ksi	F <sub>u</sub> = 58.00 ksi
<b>Doubler</b>	P0.25x13.64x17.82	A572 Gr.50	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Transverse Stiffener</b>	P0.25x2.38x15.02	A572 Gr.50	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi

Input Data:		
<b>Shear Load</b>	5.34 kips	<i>User Input Shear Load</i>
<b>Moment</b>	-36.68 kips-ft	<i>User Input Moment</i>
<b>Axial Load</b>	2.36 kips	<i>User Input Axial Force (compression)</i>
<b>Puf_c</b>	34.11 kips	<i>Required Flange Force (compression)</i>
<b>Puf_t</b>	31.75 kips	<i>Required Flange Force (tension)</i>
<b>Top Column Dist</b>	269 7/16 in	<i>User Input Top Column Dist</i>
<b>Column Force</b>	12.50 kips	<i>User Input Column Force</i>
<b>Story Shear</b>	4.02 kips	<i>User Input Story Shear</i>

Note: Unless specified, all code references are from AISC 360-10

**Governing LC: 3D - 34 - ASCE Strength 5 (c)**

Limit State	Required	Available	Unity Check	Result
<b>Geometry Restrictions at Beam</b>				<b>PASS</b>
<b>Column Weld Limitations</b>				<b>PASS</b>
<b>Beam Web Shear Yield</b>	5.34 kips	79.56 kips	<b>0.07</b>	<b>PASS</b>
<b>Plate Shear Yield</b>	5.34 kips	91.12 kips	<b>0.06</b>	<b>PASS</b>
<b>Beam Web Shear Rupture</b>	5.34 kips	54.02 kips	<b>0.10</b>	<b>PASS</b>
<b>Plate Shear Rupture</b>	5.34 kips	75.85 kips	<b>0.07</b>	<b>PASS</b>
<b>Beam Block Shear</b>	5.34 kips	57.54 kips	<b>0.09</b>	<b>PASS</b>
<b>Plate Block Shear at Beam</b>	5.34 kips	76.56 kips	<b>0.07</b>	<b>PASS</b>
<b>Bolt Bearing at Beam Web</b>	5.34 kips	71.57 kips	<b>0.07</b>	<b>PASS</b>
<b>Bolt Bearing at Shear Plate</b>	5.34 kips	71.57 kips	<b>0.07</b>	<b>PASS</b>
<b>Bolt Shear at Beam Web</b>	5.34 kips	71.57 kips	<b>0.07</b>	<b>PASS</b>
<b>Column Weld Strength</b>	5.34 kips	110.23 kips	<b>0.05</b>	<b>PASS</b>
<b>Flange Weld Strength</b>				<b>PASS</b>
<b>Beam Flange Tensile Yield</b>	31.75 kips	75.38 kips	<b>0.42</b>	<b>PASS</b>
<b>Beam Flange Tensile Rupture</b>	31.75 kips	81.66 kips	<b>0.39</b>	<b>PASS</b>
<b>Beam Flange Compression</b>	34.11 kips	75.38 kips	<b>0.45</b>	<b>PASS</b>
<b>Column Flange Bending</b>	31.75 kips	54.45 kips	<b>0.58</b>	<b>PASS</b>
<b>Column Web Yielding</b>	34.11 kips	119.31 kips	<b>0.29</b>	<b>PASS</b>
<b>Column Web Buckling</b>	34.11 kips	66.64 kips	<b>0.51</b>	<b>PASS</b>
<b>Column Web Crippling</b>	34.11 kips	132.80 kips	<b>0.26</b>	<b>PASS</b>
<b>Column Panel Zone Shear</b>	28.91 kips	118.06 kips	<b>0.24</b>	<b>PASS</b>

**2B6\_F4 I - (C-2.1)\_L2: Connection Properties**

*Column/Beam Direct Weld Moment Connection*



<b>Connection</b>	
Connection Title	2B6_F4 I - (C-2.1)_L2
Connection Type	Column/Beam Direct Weld Moment Connection
<b>Seismic Detailing</b>	
Seismic System	None
<b>Connection Category</b>	
Beam Connection	Bolted
Column Connection Type	Flange
Transverse Stiffeners	Yes
Web Doublers	Yes
Web Doublers Configuration	One Side
<b>Loading (LRFD)</b>	
Custom?	No
Shear Load	5.34 kips
Axial Load	2.36 kips
Moment Load	-36.68 kips-ft
Top Column Dist	269 7/16 in
Column Force	12.50 kips
Story Shear	4.02 kips
<b>Components</b>	
<b>Column Section</b>	
Material	W16x31 A992
<b>Beam Section</b>	
Material	W14x22 A992
Hole Type	STD
<b>Plate Section</b>	
Material	P0.38x3.50x11.25 A36
Thickness	3/8 in
Width	3 1/2 in
Depth	11 1/4 in
Hole Type	STD
<b>Doubler Section</b>	
Material	P0.25x13.64x17.82 A572 Gr.50
Fy	50.00 ksi
Fu	65.00 ksi
E	29000.00 ksi
Thickness	1/4 in
Width	13 5/8 in
Depth	17 13/16 in
<b>Transverse Stiffener Section</b>	
Material	P0.25x2.38x15.02 A572 Gr.50
Fy	50.00 ksi
Fu	65.00 ksi
E	29000.00 ksi
Full Depth Stiffener	Yes
Thickness	1/4 in
Min Width	2 3/8 in
Max Width	2 5/8 in
Depth	15 in
<b>Column Weld</b>	
Type	E70 Double Fillet
Fillet Size	4.00 Sixteenths
<b>Beam Bolts</b>	
Beam Bolts	3/4" A325-N A325-N
Diameter, in.	3/4"
Rows	1
Bolts per Row	4
Longitudinal Spacing	2 3/4 in
Transverse Spacing	3 in
Slip Critical	No
<b>Moment Weld</b>	
Type	E70 CJP
<b>Transverse Stiffener Weld</b>	
Type	E70

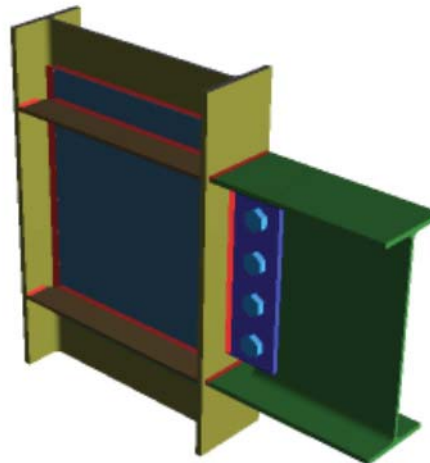
Type	Double Fillet
Fillet Size	3.00 Sixteenths
<b>Doubler Flange Weld</b>	E70
Type	CJP
<b>Doubler Web Weld</b>	E70
Type	Fillet
Fillet Size	3.00 Sixteenths

**Assembly**

<b>Column/Beam Clearance</b>	1/2 in
<b>Plate Vertical Position</b>	1 3/16 in
<b>Beam Bolts Edge Distance Dimensions</b>	
Beam Bolts/Beam Edge Dist	1 1/2 in
Beam Bolts Horz Edge Dist	1 1/2 in
Beam Bolts Vert Edge Dist	1 1/2 in

**2B6\_F4 J - (C-3.5)\_L2: 3D View**

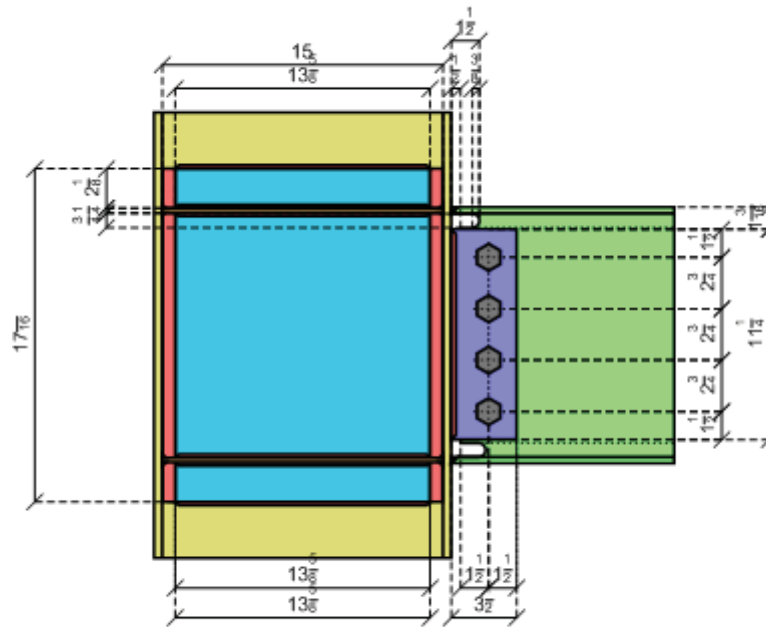
*Column/Beam Direct Weld Moment Connection*



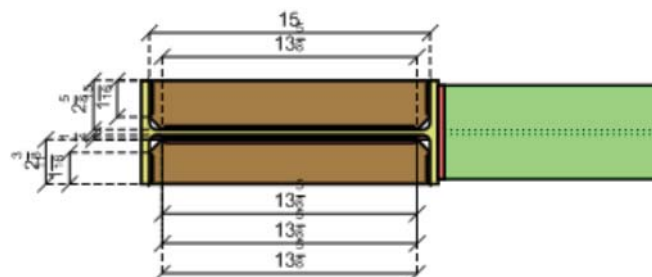
**2B6\_F4 J - (C-3.5)\_L2: 2D Views**

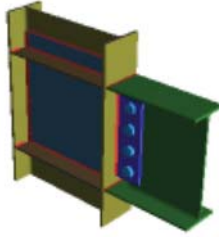
*Column/Beam Direct Weld Moment Connection*

Side view



Top view





Material Properties:				
<b>Column</b>	W16x31	A992	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Beam</b>	W14x22	A992	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Plate</b>	P0.38x3.50x11.25	A36	F <sub>y</sub> = 36.00 ksi	F <sub>u</sub> = 58.00 ksi
<b>Doubler</b>	P0.25x13.64x17.82	A572 Gr.50	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Transverse Stiffener</b>	P0.25x2.38x15.02	A572 Gr.50	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi

Input Data:		
<b>Shear Load</b>	-5.34 kips	<i>User Input Shear Load</i>
<b>Moment</b>	-36.61 kips-ft	<i>User Input Moment</i>
<b>Axial Load</b>	2.26 kips	<i>User Input Axial Force (compression)</i>
<b>Puf_c</b>	34.00 kips	<i>Required Flange Force (compression)</i>
<b>Puf_t</b>	31.74 kips	<i>Required Flange Force (tension)</i>
<b>Top Column Dist</b>	269 7/16 in	<i>User Input Top Column Dist</i>
<b>Column Force</b>	12.51 kips	<i>User Input Column Force</i>
<b>Story Shear</b>	-4.05 kips	<i>User Input Story Shear</i>

Note: Unless specified, all code references are from AISC 360-10

**Governing LC: 3D - 32 - ASCE Strength 5 (a)**

Limit State	Required	Available	Unity Check	Result
<b>Geometry Restrictions at Beam</b>				<b>PASS</b>
<b>Column Weld Limitations</b>				<b>PASS</b>
<b>Beam Web Shear Yield</b>	5.34 kips	79.56 kips	<b>0.07</b>	<b>PASS</b>
<b>Plate Shear Yield</b>	5.34 kips	91.12 kips	<b>0.06</b>	<b>PASS</b>
<b>Beam Web Shear Rupture</b>	5.34 kips	54.02 kips	<b>0.10</b>	<b>PASS</b>
<b>Plate Shear Rupture</b>	5.34 kips	75.85 kips	<b>0.07</b>	<b>PASS</b>
<b>Beam Block Shear</b>	5.34 kips	58.15 kips	<b>0.09</b>	<b>PASS</b>
<b>Plate Block Shear at Beam</b>	5.34 kips	76.56 kips	<b>0.07</b>	<b>PASS</b>
<b>Bolt Bearing at Beam Web</b>	5.34 kips	71.57 kips	<b>0.07</b>	<b>PASS</b>
<b>Bolt Bearing at Shear Plate</b>	5.34 kips	71.57 kips	<b>0.07</b>	<b>PASS</b>
<b>Bolt Shear at Beam Web</b>	5.34 kips	71.57 kips	<b>0.07</b>	<b>PASS</b>
<b>Column Weld Strength</b>	5.34 kips	110.23 kips	<b>0.05</b>	<b>PASS</b>
<b>Flange Weld Strength</b>				<b>PASS</b>
<b>Beam Flange Tensile Yield</b>	31.74 kips	75.38 kips	<b>0.42</b>	<b>PASS</b>
<b>Beam Flange Tensile Rupture</b>	31.74 kips	81.66 kips	<b>0.39</b>	<b>PASS</b>
<b>Beam Flange Compression</b>	34.00 kips	75.38 kips	<b>0.45</b>	<b>PASS</b>
<b>Column Flange Bending</b>	31.74 kips	54.45 kips	<b>0.58</b>	<b>PASS</b>
<b>Column Web Yielding</b>	34.00 kips	119.31 kips	<b>0.28</b>	<b>PASS</b>
<b>Column Web Buckling</b>	34.00 kips	66.64 kips	<b>0.51</b>	<b>PASS</b>
<b>Column Web Crippling</b>	34.00 kips	132.80 kips	<b>0.26</b>	<b>PASS</b>
<b>Column Panel Zone Shear</b>	36.92 kips	118.06 kips	<b>0.31</b>	<b>PASS</b>

**2B6\_F4 J - (C-3.5)\_L2: Connection Properties**

*Column/Beam Direct Weld Moment Connection*

<b>Connection</b>	
Connection Title	2B6_F4 J - (C-3.5)_L2
Connection Type	Column/Beam Direct Weld Moment Connection
<b>Seismic Detailing</b>	
Seismic System	None
<b>Connection Category</b>	
Beam Connection	Bolted
Column Connection Type	Flange
Transverse Stiffeners	Yes
Web Doublers	Yes
Web Doublers Configuration	One Side
<b>Loading (LRFD)</b>	
Custom?	No
Shear Load	-5.34 kips
Axial Load	2.26 kips
Moment Load	-36.61 kips-ft
Top Column Dist	269 7/16 in
Column Force	12.51 kips
Story Shear	-4.05 kips
<b>Components</b>	
<b>Column Section</b>	
Material	W16x31 A992
<b>Beam Section</b>	
Material	W14x22 A992
Hole Type	STD
<b>Plate Section</b>	
Material	P0.38x3.50x11.25 A36
Thickness	3/8 in
Width	3 1/2 in
Depth	11 1/4 in
Hole Type	STD
<b>Doubler Section</b>	
Material	P0.25x13.64x17.82 A572 Gr.50
Fy	50.00 ksi
Fu	65.00 ksi
E	29000.00 ksi
Thickness	1/4 in
Width	13 5/8 in
Depth	17 13/16 in
<b>Transverse Stiffener Section</b>	
Material	P0.25x2.38x15.02 A572 Gr.50
Fy	50.00 ksi
Fu	65.00 ksi
E	29000.00 ksi
Full Depth Stiffener	Yes
Thickness	1/4 in
Min Width	2 3/8 in
Max Width	2 5/8 in
Depth	15 in
<b>Column Weld</b>	
Type	E70 Double Fillet
Fillet Size	4.00 Sixteenths
<b>Beam Bolts</b>	
Beam Bolts	3/4" A325-N A325-N
Diameter, in.	3/4"
Rows	1
Bolts per Row	4
Longitudinal Spacing	2 3/4 in
Transverse Spacing	3 in
Slip Critical	No
<b>Moment Weld</b>	
Type	E70 CJP
<b>Transverse Stiffener Weld</b>	
Type	E70

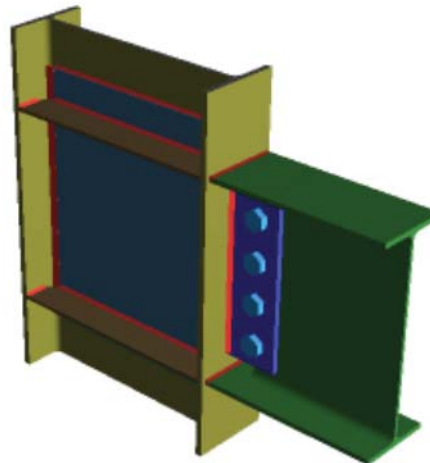
Type	Double Fillet
Fillet Size	3.00 Sixteenths
<b>Doubler Flange Weld</b>	E70
Type	CJP
<b>Doubler Web Weld</b>	E70
Type	Fillet
Fillet Size	3.00 Sixteenths

**Assembly**

<b>Column/Beam Clearance</b>	1/2 in
<b>Plate Vertical Position</b>	1 3/16 in
<b>Beam Bolts Edge Distance Dimensions</b>	
Beam Bolts/Beam Edge Dist	1 1/2 in
Beam Bolts Horz Edge Dist	1 1/2 in
Beam Bolts Vert Edge Dist	1 1/2 in

**3B11\_F2 I - (C-2.1)\_L2: 3D View**

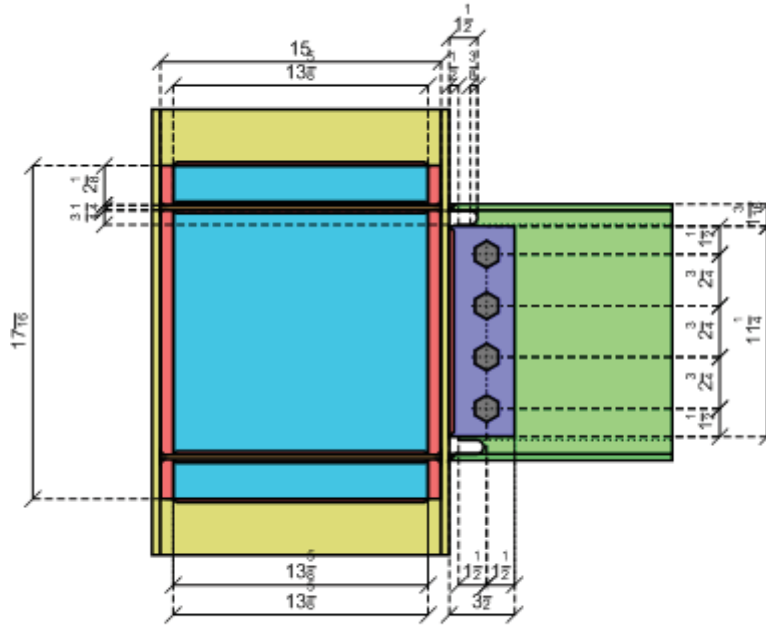
*Column/Beam Direct Weld Moment Connection*



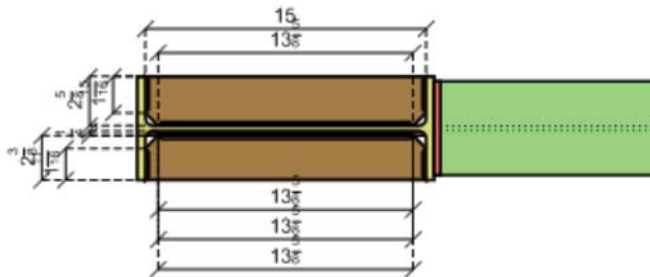
**3B11\_F2 I - (C-2.1)\_L2: 2D Views**

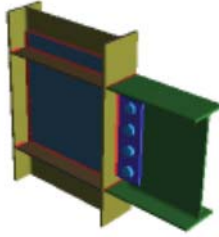
*Column/Beam Direct Weld Moment Connection*

Side view



Top view





Material Properties:

<b>Column</b>	W16x31	A992	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Beam</b>	W14x22	A992	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Plate</b>	P0.38x3.50x11.25	A36	F <sub>y</sub> = 36.00 ksi	F <sub>u</sub> = 58.00 ksi
<b>Doubler</b>	P0.25x13.64x17.82	A572 Gr.50	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Transverse Stiffener</b>	P0.25x2.38x15.02	A572 Gr.50	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi

Input Data:

<b>Shear Load</b>	5.61 kips	<i>User Input Shear Load</i>
<b>Moment</b>	-38.18 kips-ft	<i>User Input Moment</i>
<b>Axial Load</b>	-0.19 kips	<i>User Input Axial Force (tension)</i>
<b>Puf_c</b>	34.28 kips	<i>Required Flange Force (compression)</i>
<b>Puf_t</b>	34.28 kips	<i>Required Flange Force (tension)</i>
<b>Top Column Dist</b>	143 3/16 in	<i>User Input Top Column Dist</i>
<b>Column Force</b>	6.10 kips	<i>User Input Column Force</i>
<b>Story Shear</b>	3.85 kips	<i>User Input Story Shear</i>

Note: Unless specified, all code references are from AISC 360-10

**Governing LC: 3D - 34 - ASCE Strength 5 (c)**

Limit State	Required	Available	Unity Check	Result
<b>Geometry Restrictions at Beam</b>				<b>PASS</b>
<b>Column Weld Limitations</b>				<b>PASS</b>
<b>Beam Web Shear Yield</b>	5.61 kips	79.56 kips	<b>0.07</b>	<b>PASS</b>
<b>Plate Shear Yield</b>	5.61 kips	91.12 kips	<b>0.06</b>	<b>PASS</b>
<b>Beam Web Shear Rupture</b>	5.61 kips	54.02 kips	<b>0.10</b>	<b>PASS</b>
<b>Plate Shear Rupture</b>	5.61 kips	75.85 kips	<b>0.07</b>	<b>PASS</b>
<b>Beam Block Shear</b>	5.61 kips	57.54 kips	<b>0.10</b>	<b>PASS</b>
<b>Plate Block Shear at Beam</b>	5.61 kips	76.56 kips	<b>0.07</b>	<b>PASS</b>
<b>Bolt Bearing at Beam Web</b>	5.61 kips	71.57 kips	<b>0.08</b>	<b>PASS</b>
<b>Bolt Bearing at Shear Plate</b>	5.61 kips	71.57 kips	<b>0.08</b>	<b>PASS</b>
<b>Bolt Shear at Beam Web</b>	5.61 kips	71.57 kips	<b>0.08</b>	<b>PASS</b>
<b>Column Weld Strength</b>	5.61 kips	110.23 kips	<b>0.05</b>	<b>PASS</b>
<b>Flange Weld Strength</b>				<b>PASS</b>
<b>Beam Flange Tensile Yield</b>	34.28 kips	75.38 kips	<b>0.45</b>	<b>PASS</b>
<b>Beam Flange Tensile Rupture</b>	34.28 kips	81.66 kips	<b>0.42</b>	<b>PASS</b>
<b>Beam Flange Compression</b>	34.28 kips	75.38 kips	<b>0.45</b>	<b>PASS</b>
<b>Column Flange Bending</b>	34.28 kips	54.45 kips	<b>0.63</b>	<b>PASS</b>
<b>Column Web Yielding</b>	34.28 kips	119.31 kips	<b>0.29</b>	<b>PASS</b>
<b>Column Web Buckling</b>	34.28 kips	66.64 kips	<b>0.51</b>	<b>PASS</b>
<b>Column Web Crippling</b>	34.28 kips	132.80 kips	<b>0.26</b>	<b>PASS</b>
<b>Column Panel Zone Shear</b>	30.43 kips	118.06 kips	<b>0.26</b>	<b>PASS</b>

**3B11\_F2 I - (C-2.1)\_L2: Connection Properties**

*Column/Beam Direct Weld Moment Connection*



<b>Connection</b>	
Connection Title	3B11_F2 I - (C-2.1)_L2
Connection Type	Column/Beam Direct Weld Moment Connection
<b>Seismic Detailing</b>	
Seismic System	None
<b>Connection Category</b>	
Beam Connection	Bolted
Column Connection Type	Flange
Transverse Stiffeners	Yes
Web Doublers	Yes
Web Doublers Configuration	One Side
<b>Loading (LRFD)</b>	
Custom?	No
Shear Load	5.61 kips
Axial Load	-0.19 kips
Moment Load	-38.18 kips-ft
Top Column Dist	143 3/16 in
Column Force	6.10 kips
Story Shear	3.85 kips
<b>Components</b>	
<b>Column Section</b>	W16x31
Material	A992
<b>Beam Section</b>	W14x22
Material	A992
Hole Type	STD
<b>Plate Section</b>	P0.38x3.50x11.25
Material	A36
Thickness	3/8 in
Width	3 1/2 in
Depth	11 1/4 in
Hole Type	STD
<b>Doubler Section</b>	P0.25x13.64x17.82
Material	A572 Gr.50
Fy	50.00 ksi
Fu	65.00 ksi
E	29000.00 ksi
Thickness	1/4 in
Width	13 5/8 in
Depth	17 13/16 in
<b>Transverse Stiffener Section</b>	P0.25x2.38x15.02
Material	A572 Gr.50
Fy	50.00 ksi
Fu	65.00 ksi
E	29000.00 ksi
Full Depth Stiffener	Yes
Thickness	1/4 in
Min Width	2 3/8 in
Max Width	2 5/8 in
Depth	15 in
<b>Column Weld</b>	E70
Type	Double Fillet
Fillet Size	4.00 Sixteenths
<b>Beam Bolts</b>	3/4" A325-N
Beam Bolts	A325-N
Diameter, in.	3/4"
Rows	1
Bolts per Row	4
Longitudinal Spacing	2 3/4 in
Transverse Spacing	3 in
Slip Critical	No
<b>Moment Weld</b>	E70
Type	CJP
<b>Transverse Stiffener Weld</b>	E70

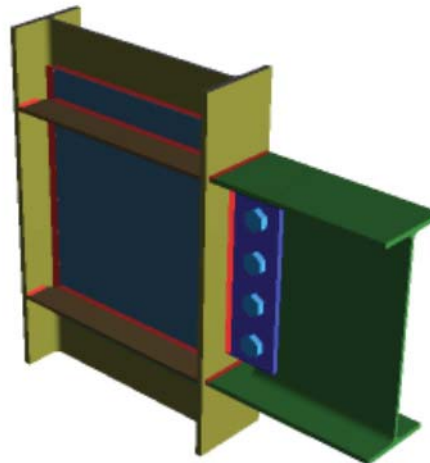
Type	Double Fillet
Fillet Size	3.00 Sixteenths
<b>Doubler Flange Weld</b>	E70
Type	CJP
<b>Doubler Web Weld</b>	E70
Type	Fillet
Fillet Size	3.00 Sixteenths

**Assembly**

<b>Column/Beam Clearance</b>	1/2 in
<b>Plate Vertical Position</b>	1 3/16 in
<b>Beam Bolts Edge Distance Dimensions</b>	
Beam Bolts/Beam Edge Dist	1 1/2 in
Beam Bolts Horz Edge Dist	1 1/2 in
Beam Bolts Vert Edge Dist	1 1/2 in

**3B11\_F2 J - (C-3.5)\_L2: 3D View**

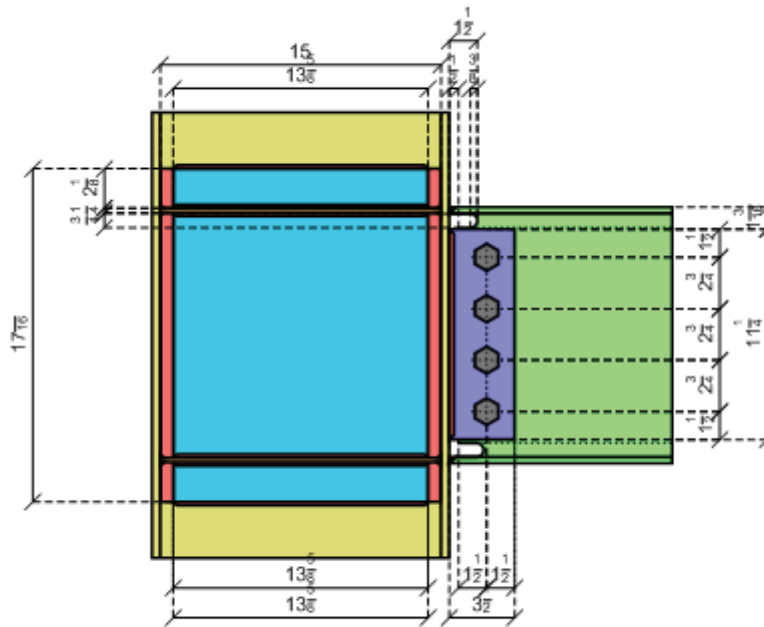
*Column/Beam Direct Weld Moment Connection*



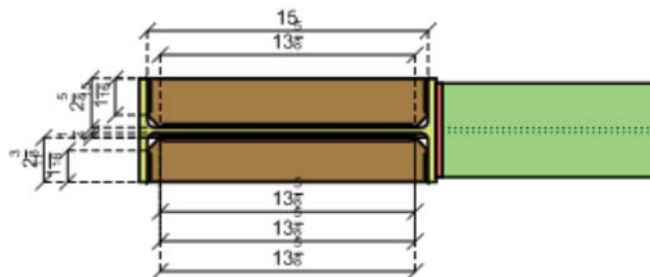
**3B11\_F2 J - (C-3.5)\_L2: 2D Views**

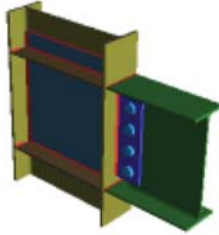
*Column/Beam Direct Weld Moment Connection*

Side view



Top view





Material Properties:

<b>Column</b>	W16x31	A992	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Beam</b>	W14x22	A992	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Plate</b>	P0.38x3.50x11.25	A36	F <sub>y</sub> = 36.00 ksi	F <sub>u</sub> = 58.00 ksi
<b>Doubler</b>	P0.25x13.64x17.82	A572 Gr.50	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Transverse Stiffener</b>	P0.25x2.38x15.02	A572 Gr.50	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi

Input Data:

<b>Shear Load</b>	-5.61 kips	<i>User Input Shear Load</i>
<b>Moment</b>	-38.19 kips-ft	<i>User Input Moment</i>
<b>Axial Load</b>	-0.15 kips	<i>User Input Axial Force (tension)</i>
<b>Puf_c</b>	34.29 kips	<i>Required Flange Force (compression)</i>
<b>Puf_t</b>	34.29 kips	<i>Required Flange Force (tension)</i>
<b>Top Column Dist</b>	143 3/16 in	<i>User Input Top Column Dist</i>
<b>Column Force</b>	6.10 kips	<i>User Input Column Force</i>
<b>Story Shear</b>	-3.84 kips	<i>User Input Story Shear</i>

Note: Unless specified, all code references are from AISC 360-10

**Governing LC: 3D - 32 - ASCE Strength 5 (a)**

Limit State	Required	Available	Unity Check	Result
<b>Geometry Restrictions at Beam</b>				<b>PASS</b>
<b>Column Weld Limitations</b>				<b>PASS</b>
<b>Beam Web Shear Yield</b>	5.61 kips	79.56 kips	<b>0.07</b>	<b>PASS</b>
<b>Plate Shear Yield</b>	5.61 kips	91.12 kips	<b>0.06</b>	<b>PASS</b>
<b>Beam Web Shear Rupture</b>	5.61 kips	54.02 kips	<b>0.10</b>	<b>PASS</b>
<b>Plate Shear Rupture</b>	5.61 kips	75.85 kips	<b>0.07</b>	<b>PASS</b>
<b>Beam Block Shear</b>	5.61 kips	58.15 kips	<b>0.10</b>	<b>PASS</b>
<b>Plate Block Shear at Beam</b>	5.61 kips	76.56 kips	<b>0.07</b>	<b>PASS</b>
<b>Bolt Bearing at Beam Web</b>	5.61 kips	71.57 kips	<b>0.08</b>	<b>PASS</b>
<b>Bolt Bearing at Shear Plate</b>	5.61 kips	71.57 kips	<b>0.08</b>	<b>PASS</b>
<b>Bolt Shear at Beam Web</b>	5.61 kips	71.57 kips	<b>0.08</b>	<b>PASS</b>
<b>Column Weld Strength</b>	5.61 kips	110.23 kips	<b>0.05</b>	<b>PASS</b>
<b>Flange Weld Strength</b>				<b>PASS</b>
<b>Beam Flange Tensile Yield</b>	34.29 kips	75.38 kips	<b>0.45</b>	<b>PASS</b>
<b>Beam Flange Tensile Rupture</b>	34.29 kips	81.66 kips	<b>0.42</b>	<b>PASS</b>
<b>Beam Flange Compression</b>	34.29 kips	75.38 kips	<b>0.45</b>	<b>PASS</b>
<b>Column Flange Bending</b>	34.29 kips	54.45 kips	<b>0.63</b>	<b>PASS</b>
<b>Column Web Yielding</b>	34.29 kips	119.31 kips	<b>0.29</b>	<b>PASS</b>
<b>Column Web Buckling</b>	34.29 kips	66.64 kips	<b>0.51</b>	<b>PASS</b>
<b>Column Web Crippling</b>	34.29 kips	132.80 kips	<b>0.26</b>	<b>PASS</b>
<b>Column Panel Zone Shear</b>	38.14 kips	118.06 kips	<b>0.32</b>	<b>PASS</b>

**3B11\_F2 J - (C-3.5)\_L2: Connection Properties**

*Column/Beam Direct Weld Moment Connection*

<b>Connection</b>	
Connection Title	3B11_F2 J - (C-3.5)_L2
Connection Type	Column/Beam Direct Weld Moment Connection
<b>Seismic Detailing</b>	
Seismic System	None
<b>Connection Category</b>	
Beam Connection	Bolted
Column Connection Type	Flange
Transverse Stiffeners	Yes
Web Doublers	Yes
Web Doublers Configuration	One Side
<b>Loading (LRFD)</b>	
Custom?	No
Shear Load	-5.61 kips
Axial Load	-0.15 kips
Moment Load	-38.19 kips-ft
Top Column Dist	143 3/16 in
Column Force	6.10 kips
Story Shear	-3.84 kips
<b>Components</b>	
<b>Column Section</b>	
Material	W16x31
Material	A992
<b>Beam Section</b>	
Material	W14x22
Material	A992
Hole Type	STD
<b>Plate Section</b>	
Material	P0.38x3.50x11.25
Material	A36
Thickness	3/8 in
Width	3 1/2 in
Depth	11 1/4 in
Hole Type	STD
<b>Doubler Section</b>	
Material	P0.25x13.64x17.82
Material	A572 Gr.50
Fy	50.00 ksi
Fu	65.00 ksi
E	29000.00 ksi
Thickness	1/4 in
Width	13 5/8 in
Depth	17 13/16 in
<b>Transverse Stiffener Section</b>	
Material	P0.25x2.38x15.02
Material	A572 Gr.50
Fy	50.00 ksi
Fu	65.00 ksi
E	29000.00 ksi
Full Depth Stiffener	Yes
Thickness	1/4 in
Min Width	2 3/8 in
Max Width	2 5/8 in
Depth	15 in
<b>Column Weld</b>	
Type	E70
Fillet Size	Double Fillet
Fillet Size	4.00 Sixteenths
<b>Beam Bolts</b>	
Beam Bolts	3/4" A325-N
Beam Bolts	A325-N
Diameter, in.	3/4"
Rows	1
Bolts per Row	4
Longitudinal Spacing	2 3/4 in
Transverse Spacing	3 in
Slip Critical	No
<b>Moment Weld</b>	
Type	E70
Type	CJP
<b>Transverse Stiffener Weld</b>	
Type	E70

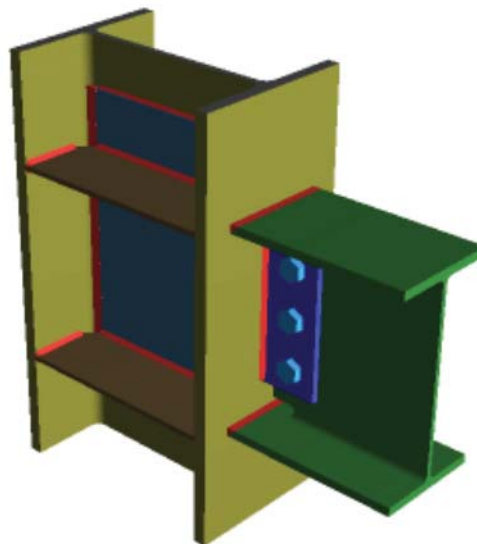
Type	Double Fillet
Fillet Size	3.00 Sixteenths
<b>Doubler Flange Weld</b>	E70
Type	CJP
<b>Doubler Web Weld</b>	E70
Type	Fillet
Fillet Size	3.00 Sixteenths

**Assembly**

<b>Column/Beam Clearance</b>	1/2 in
<b>Plate Vertical Position</b>	1 3/16 in
<b>Beam Bolts Edge Distance Dimensions</b>	
Beam Bolts/Beam Edge Dist	1 1/2 in
Beam Bolts Horz Edge Dist	1 1/2 in
Beam Bolts Vert Edge Dist	1 1/2 in

**3B2\_F2 I - (F.5-4.5)\_L1: 3D View**

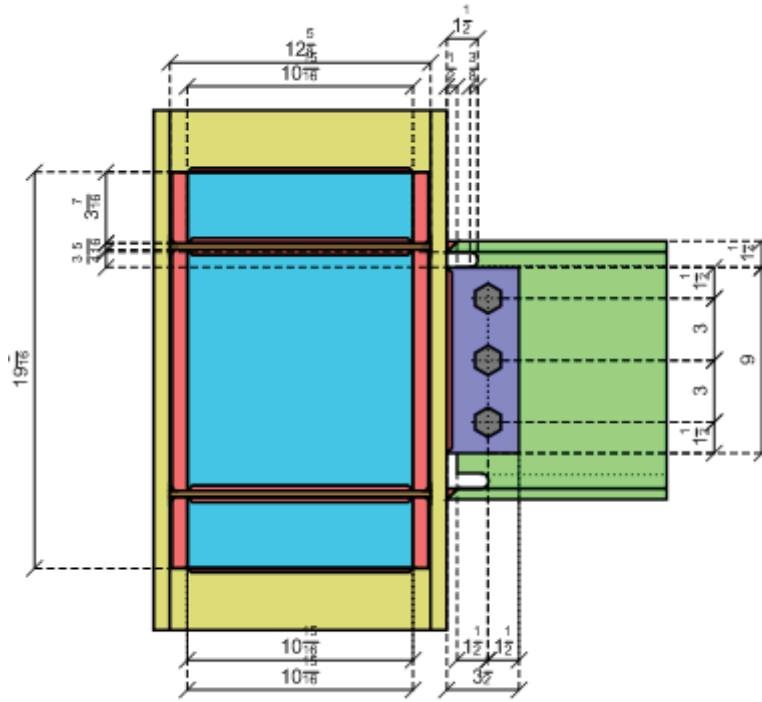
*Column/Beam Direct Weld Moment Connection*



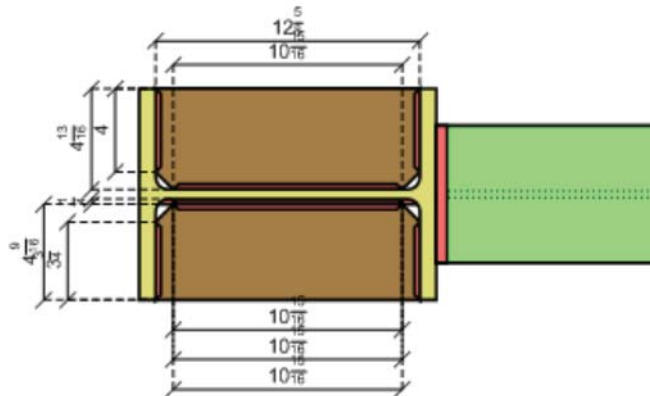
**3B2\_F2 I - (F.5-4.5)\_L1: 2D Views**

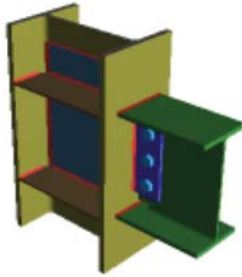
*Column/Beam Direct Weld Moment Connection*

Side view



Top view





Material Properties:

<b>Column</b>	W14x74	A992	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Beam</b>	W12x35	A992	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Plate</b>	P0.38x3.50x9.00	A36	F <sub>y</sub> = 36.00 ksi	F <sub>u</sub> = 58.00 ksi
<b>Doubler</b>	P0.25x10.94x19.19	A572 Gr.50	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Transverse Stiffener</b>	P0.31x4.58x12.63	A572 Gr.50	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi

Input Data:

<b>Shear Load</b>	27.20 kips	<i>User Input Shear Load</i>
<b>Moment</b>	-82.17 kips-ft	<i>User Input Moment</i>
<b>Axial Load</b>	0.00 kips	<i>User Input Axial Force</i>
<b>Puf_c</b>	82.31 kips	<i>Required Flange Force (compression)</i>
<b>Puf_t</b>	82.31 kips	<i>Required Flange Force (tension)</i>
<b>Top Column Dist</b>	0 in	<i>User Input Top Column Dist</i>
<b>Column Force</b>	0.00 kips	<i>User Input Column Force</i>
<b>Story Shear</b>	0.00 kips	<i>User Input Story Shear</i>

Note: Unless specified, all code references are from AISC 360-10

**Governing LC: FL - 8 - 8 ASCE  
Strength 3 (c) Post**

Limit State	Required	Available	Unity Check	Result
<b>Geometry Restrictions at Beam</b>				<b>PASS</b>
<b>Column Weld Limitations</b>				<b>PASS</b>
<b>Beam Web Shear Yield</b>	27.20 kips	89.64 kips	<b>0.30</b>	<b>PASS</b>
<b>Plate Shear Yield</b>	27.20 kips	72.90 kips	<b>0.37</b>	<b>PASS</b>
<b>Beam Web Shear Rupture</b>	27.20 kips	64.36 kips	<b>0.42</b>	<b>PASS</b>
<b>Plate Shear Rupture</b>	27.20 kips	62.40 kips	<b>0.44</b>	<b>PASS</b>
<b>Beam Block Shear</b>	27.20 kips	62.16 kips	<b>0.44</b>	<b>PASS</b>
<b>Plate Block Shear at Beam</b>	27.20 kips	62.89 kips	<b>0.43</b>	<b>PASS</b>
<b>Bolt Bearing at Beam Web</b>	27.20 kips	53.68 kips	<b>0.51</b>	<b>PASS</b>
<b>Bolt Bearing at Shear Plate</b>	27.20 kips	53.68 kips	<b>0.51</b>	<b>PASS</b>
<b>Bolt Shear at Beam Web</b>	27.20 kips	53.68 kips	<b>0.51</b>	<b>PASS</b>
<b>Column Weld Strength</b>	27.20 kips	88.18 kips	<b>0.31</b>	<b>PASS</b>
<b>Flange Weld Strength</b>				<b>PASS</b>
<b>Beam Flange Tensile Yield</b>	82.31 kips	153.50 kips	<b>0.54</b>	<b>PASS</b>
<b>Beam Flange Tensile Rupture</b>	82.31 kips	166.30 kips	<b>0.49</b>	<b>PASS</b>
<b>Beam Flange Compression</b>	82.31 kips	153.50 kips	<b>0.54</b>	<b>PASS</b>
<b>Column Flange Bending</b>	82.31 kips	86.66 kips	<b>0.95</b>	<b>PASS</b>
<b>Column Web Yielding</b>	82.31 kips	138.95 kips	<b>0.59</b>	<b>PASS</b>
<b>Column Web Buckling</b>	82.31 kips	121.35 kips	<b>0.68</b>	<b>PASS</b>
<b>Column Web Crippling</b>	82.31 kips	142.02 kips	<b>0.58</b>	<b>PASS</b>
<b>Column Panel Zone Shear</b>	82.31 kips	172.53 kips	<b>0.48</b>	<b>PASS</b>

**3B2\_F2 I - (F.5-4.5)\_L1: Connection  
Properties**

*Column/Beam Direct Weld Moment Connection*



<b>Connection</b>	
Connection Title	3B2_F2 I - (F.5-4.5)_L1
Connection Type	Column/Beam Direct Weld Moment Connection
<b>Seismic Detailing</b>	
Seismic System	None
<b>Connection Category</b>	
Beam Connection	Bolted
Column Connection Type	Flange
Transverse Stiffeners	Yes
Web Doublers	Yes
Web Doublers Configuration	One Side
<b>Loading (LRFD)</b>	
Custom?	No
Shear Load	27.20 kips
Axial Load	0.00 kips
Moment Load	-82.17 kips-ft
Top Column Dist	0 in
Column Force	0.00 kips
Story Shear	0.00 kips
<b>Components</b>	
<b>Column Section</b>	
Material	W14x74 A992
<b>Beam Section</b>	
Material	W12x35 A992
Hole Type	STD
<b>Plate Section</b>	
Material	P0.38x3.50x9.00 A36
Thickness	3/8 in
Width	3 1/2 in
Depth	9 in
Hole Type	STD
<b>Doubler Section</b>	
Material	P0.25x10.94x19.19 A572 Gr.50
Fy	50.00 ksi
Fu	65.00 ksi
E	29000.00 ksi
Thickness	1/4 in
Width	10 15/16 in
Depth	19 3/16 in
<b>Transverse Stiffener Section</b>	
Material	P0.31x4.58x12.63 A572 Gr.50
Fy	50.00 ksi
Fu	65.00 ksi
E	29000.00 ksi
Full Depth Stiffener	Yes
Thickness	5/16 in
Min Width	4 9/16 in
Max Width	4 13/16 in
Depth	12 5/8 in
<b>Column Weld</b>	
Type	E70 Double Fillet
Fillet Size	4.00 Sixteenths
<b>Beam Bolts</b>	
Beam Bolts	3/4" A325-N A325-N
Diameter, in.	3/4"
Rows	1
Bolts per Row	3
Longitudinal Spacing	3 in
Transverse Spacing	3 in
Slip Critical	No
<b>Moment Weld</b>	
Type	E70 CJP
<b>Transverse Stiffener Weld</b>	
Type	E70

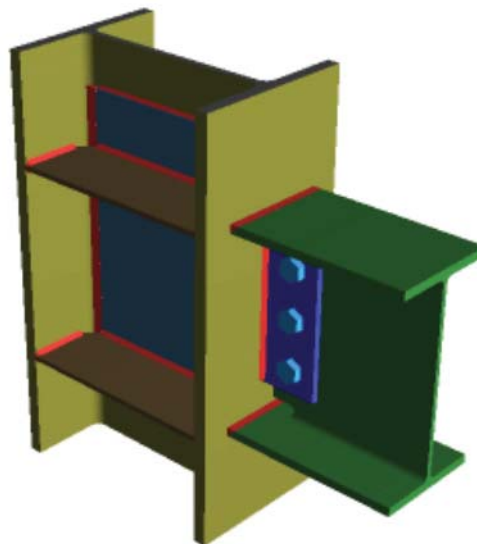
Type	Double Fillet
Fillet Size	4.00 Sixteenths
<b>Doubler Flange Weld</b>	E70
Type	CJP
<b>Doubler Web Weld</b>	E70
Type	Fillet
Fillet Size	3.00 Sixteenths

**Assembly**

<b>Column/Beam Clearance</b>	1/2 in
<b>Plate Vertical Position</b>	1 1/4 in
<b>Beam Bolts Edge Distance Dimensions</b>	
Beam Bolts/Beam Edge Dist	1 1/2 in
Beam Bolts Horz Edge Dist	1 1/2 in
Beam Bolts Vert Edge Dist	1 1/2 in

**3B2\_F2 J - (F.5-1.1)\_L1: 3D View**

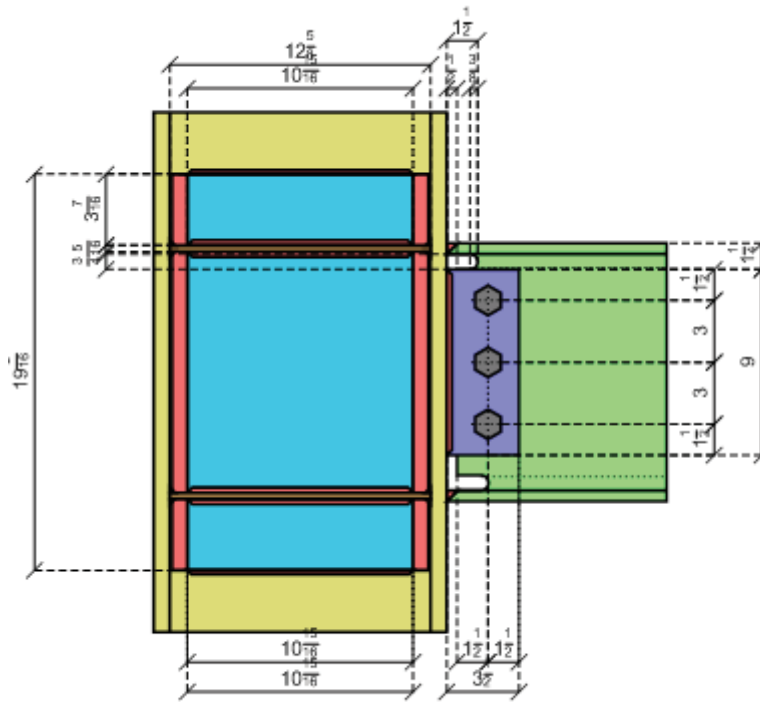
*Column/Beam Direct Weld Moment Connection*



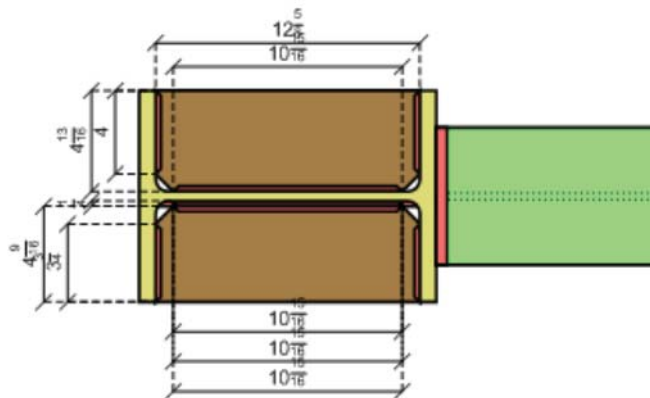
**3B2\_F2 J - (F.5-1.1)\_L1: 2D Views**

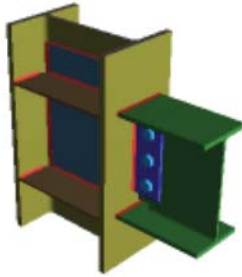
*Column/Beam Direct Weld Moment Connection*

Side view



Top view





Material Properties:

<b>Column</b>	W14x74	A992	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Beam</b>	W12x35	A992	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Plate</b>	P0.38x3.50x9.00	A36	F <sub>y</sub> = 36.00 ksi	F <sub>u</sub> = 58.00 ksi
<b>Doubler</b>	P0.25x10.94x19.19	A572 Gr.50	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Transverse Stiffener</b>	P0.31x4.58x12.63	A572 Gr.50	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi

Input Data:

<b>Shear Load</b>	-26.27 kips	<i>User Input Shear Load</i>
<b>Moment</b>	-83.18 kips-ft	<i>User Input Moment</i>
<b>Axial Load</b>	0.00 kips	<i>User Input Axial Force</i>
<b>Puf_c</b>	83.32 kips	<i>Required Flange Force (compression)</i>
<b>Puf_t</b>	83.32 kips	<i>Required Flange Force (tension)</i>
<b>Top Column Dist</b>	0 in	<i>User Input Top Column Dist</i>
<b>Column Force</b>	0.00 kips	<i>User Input Column Force</i>
<b>Story Shear</b>	0.00 kips	<i>User Input Story Shear</i>

Note: Unless specified, all code references are from AISC 360-10

**Governing LC: FL - 8 - 8 ASCE  
Strength 3 (c) Post**

Limit State	Required	Available	Unity Check	Result
<b>Geometry Restrictions at Beam</b>				<b>PASS</b>
<b>Column Weld Limitations</b>				<b>PASS</b>
<b>Beam Web Shear Yield</b>	26.27 kips	89.64 kips	<b>0.29</b>	<b>PASS</b>
<b>Plate Shear Yield</b>	26.27 kips	72.90 kips	<b>0.36</b>	<b>PASS</b>
<b>Beam Web Shear Rupture</b>	26.27 kips	64.36 kips	<b>0.41</b>	<b>PASS</b>
<b>Plate Shear Rupture</b>	26.27 kips	62.40 kips	<b>0.42</b>	<b>PASS</b>
<b>Beam Block Shear</b>	26.27 kips	70.58 kips	<b>0.37</b>	<b>PASS</b>
<b>Plate Block Shear at Beam</b>	26.27 kips	62.89 kips	<b>0.42</b>	<b>PASS</b>
<b>Bolt Bearing at Beam Web</b>	26.27 kips	53.68 kips	<b>0.49</b>	<b>PASS</b>
<b>Bolt Bearing at Shear Plate</b>	26.27 kips	53.68 kips	<b>0.49</b>	<b>PASS</b>
<b>Bolt Shear at Beam Web</b>	26.27 kips	53.68 kips	<b>0.49</b>	<b>PASS</b>
<b>Column Weld Strength</b>	26.27 kips	88.18 kips	<b>0.30</b>	<b>PASS</b>
<b>Flange Weld Strength</b>				<b>PASS</b>
<b>Beam Flange Tensile Yield</b>	83.32 kips	153.50 kips	<b>0.54</b>	<b>PASS</b>
<b>Beam Flange Tensile Rupture</b>	83.32 kips	166.30 kips	<b>0.50</b>	<b>PASS</b>
<b>Beam Flange Compression</b>	83.32 kips	153.50 kips	<b>0.54</b>	<b>PASS</b>
<b>Column Flange Bending</b>	83.32 kips	86.66 kips	<b>0.96</b>	<b>PASS</b>
<b>Column Web Yielding</b>	83.32 kips	138.95 kips	<b>0.60</b>	<b>PASS</b>
<b>Column Web Buckling</b>	83.32 kips	121.35 kips	<b>0.69</b>	<b>PASS</b>
<b>Column Web Crippling</b>	83.32 kips	142.02 kips	<b>0.59</b>	<b>PASS</b>
<b>Column Panel Zone Shear</b>	83.32 kips	172.53 kips	<b>0.48</b>	<b>PASS</b>

**3B2\_F2 J - (F.5-1.1)\_L1: Connection  
Properties**

*Column/Beam Direct Weld Moment Connection*

<b>Connection</b>	
Connection Title	3B2_F2 J - (F.5-1.1)_L1
Connection Type	Column/Beam Direct Weld Moment Connection
<b>Seismic Detailing</b>	
Seismic System	None
<b>Connection Category</b>	
Beam Connection	Bolted
Column Connection Type	Flange
Transverse Stiffeners	Yes
Web Doublers	Yes
Web Doublers Configuration	One Side
<b>Loading (LRFD)</b>	
Custom?	No
Shear Load	-26.27 kips
Axial Load	0.00 kips
Moment Load	-83.18 kips-ft
Top Column Dist	0 in
Column Force	0.00 kips
Story Shear	0.00 kips
<b>Components</b>	
<b>Column Section</b>	
Material	W14x74 A992
<b>Beam Section</b>	
Material	W12x35 A992
Hole Type	STD
<b>Plate Section</b>	
Material	P0.38x3.50x9.00 A36
Thickness	3/8 in
Width	3 1/2 in
Depth	9 in
Hole Type	STD
<b>Doubler Section</b>	
Material	P0.25x10.94x19.19 A572 Gr.50
Fy	50.00 ksi
Fu	65.00 ksi
E	29000.00 ksi
Thickness	1/4 in
Width	10 15/16 in
Depth	19 3/16 in
<b>Transverse Stiffener Section</b>	
Material	P0.31x4.58x12.63 A572 Gr.50
Fy	50.00 ksi
Fu	65.00 ksi
E	29000.00 ksi
Full Depth Stiffener	Yes
Thickness	5/16 in
Min Width	4 9/16 in
Max Width	4 13/16 in
Depth	12 5/8 in
<b>Column Weld</b>	
Type	E70 Double Fillet
Fillet Size	4.00 Sixteenths
<b>Beam Bolts</b>	
Beam Bolts	3/4" A325-N A325-N
Diameter, in.	3/4"
Rows	1
Bolts per Row	3
Longitudinal Spacing	3 in
Transverse Spacing	3 in
Slip Critical	No
<b>Moment Weld</b>	
Type	E70 CJP
<b>Transverse Stiffener Weld</b>	
Type	E70

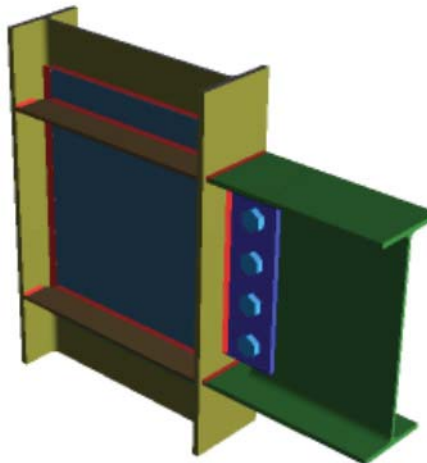
Type	Double Fillet
Fillet Size	4.00 Sixteenths
<b>Doubler Flange Weld</b>	E70
Type	CJP
<b>Doubler Web Weld</b>	E70
Type	Fillet
Fillet Size	3.00 Sixteenths

**Assembly**

<b>Column/Beam Clearance</b>	1/2 in
<b>Plate Vertical Position</b>	1 1/4 in
<b>Beam Bolts Edge Distance Dimensions</b>	
Beam Bolts/Beam Edge Dist	1 1/2 in
Beam Bolts Horz Edge Dist	1 1/2 in
Beam Bolts Vert Edge Dist	1 1/2 in

**RB1\_F1 I - (C-3.5)\_L2: 3D View**

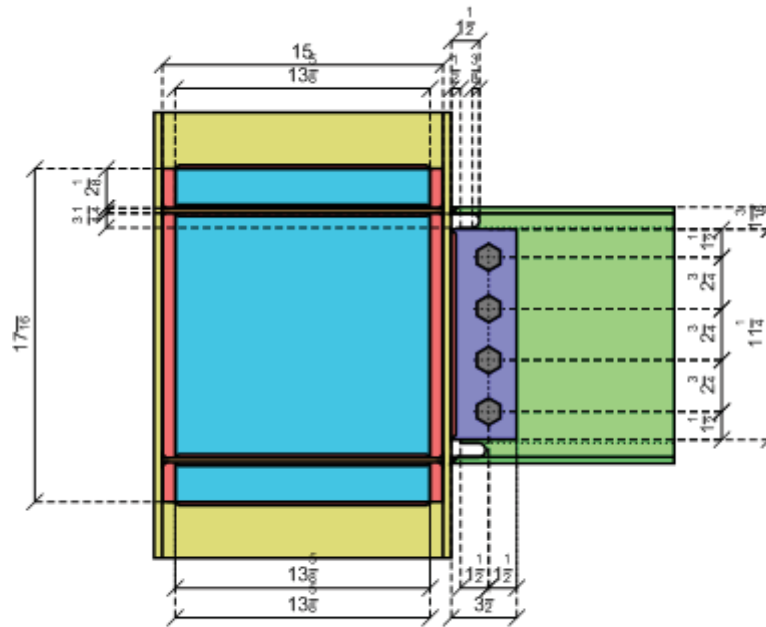
*Column/Beam Direct Weld Moment Connection*



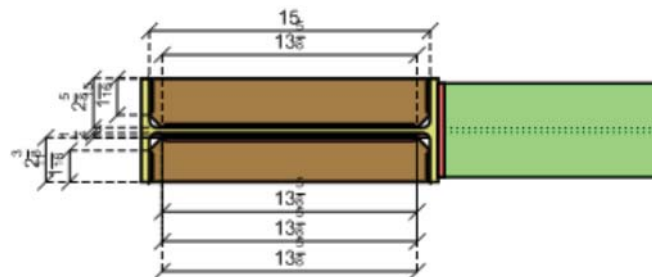
**RB1\_F1 I - (C-3.5)\_L2: 2D Views**

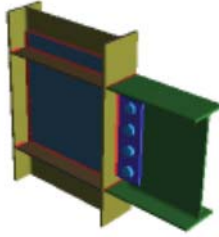
*Column/Beam Direct Weld Moment Connection*

Side view



Top view





Material Properties:				
<b>Column</b>	W16x31	A992	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Beam</b>	W14x22	A992	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Plate</b>	P0.38x3.50x11.25	A36	F <sub>y</sub> = 36.00 ksi	F <sub>u</sub> = 58.00 ksi
<b>Doubler</b>	P0.25x13.64x17.82	A572 Gr.50	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Transverse Stiffener</b>	P0.25x2.38x15.02	A572 Gr.50	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi

Input Data:		
<b>Shear Load</b>	5.09 kips	<i>User Input Shear Load</i>
<b>Moment</b>	-28.33 kips-ft	<i>User Input Moment</i>
<b>Axial Load</b>	2.42 kips	<i>User Input Axial Force (compression)</i>
<b>Puf_c</b>	26.65 kips	<i>Required Flange Force (compression)</i>
<b>Puf_t</b>	24.22 kips	<i>Required Flange Force (tension)</i>
<b>Top Column Dist</b>	0 in	<i>User Input Top Column Dist</i>
<b>Column Force</b>	0.00 kips	<i>User Input Column Force</i>
<b>Story Shear</b>	0.00 kips	<i>User Input Story Shear</i>

Note: Unless specified, all code references are from AISC 360-10

**Governing LC: 3D - 32 - ASCE Strength 5 (a)**

Limit State	Required	Available	Unity Check	Result
<b>Geometry Restrictions at Beam</b>				<b>PASS</b>
<b>Column Weld Limitations</b>				<b>PASS</b>
<b>Beam Web Shear Yield</b>	5.09 kips	79.56 kips	<b>0.06</b>	<b>PASS</b>
<b>Plate Shear Yield</b>	5.09 kips	91.12 kips	<b>0.06</b>	<b>PASS</b>
<b>Beam Web Shear Rupture</b>	5.09 kips	54.02 kips	<b>0.09</b>	<b>PASS</b>
<b>Plate Shear Rupture</b>	5.09 kips	75.85 kips	<b>0.07</b>	<b>PASS</b>
<b>Beam Block Shear</b>	5.09 kips	57.54 kips	<b>0.09</b>	<b>PASS</b>
<b>Plate Block Shear at Beam</b>	5.09 kips	76.56 kips	<b>0.07</b>	<b>PASS</b>
<b>Bolt Bearing at Beam Web</b>	5.09 kips	71.57 kips	<b>0.07</b>	<b>PASS</b>
<b>Bolt Bearing at Shear Plate</b>	5.09 kips	71.57 kips	<b>0.07</b>	<b>PASS</b>
<b>Bolt Shear at Beam Web</b>	5.09 kips	71.57 kips	<b>0.07</b>	<b>PASS</b>
<b>Column Weld Strength</b>	5.09 kips	110.23 kips	<b>0.05</b>	<b>PASS</b>
<b>Flange Weld Strength</b>				<b>PASS</b>
<b>Beam Flange Tensile Yield</b>	24.22 kips	75.38 kips	<b>0.32</b>	<b>PASS</b>
<b>Beam Flange Tensile Rupture</b>	24.22 kips	81.66 kips	<b>0.30</b>	<b>PASS</b>
<b>Beam Flange Compression</b>	26.65 kips	75.38 kips	<b>0.35</b>	<b>PASS</b>
<b>Column Flange Bending</b>	24.22 kips	27.22 kips	<b>0.89</b>	<b>PASS</b>
<b>Column Web Yielding</b>	26.65 kips	64.05 kips	<b>0.42</b>	<b>PASS</b>
<b>Column Web Buckling</b>	26.65 kips	33.32 kips	<b>0.80</b>	<b>PASS</b>
<b>Column Web Crippling</b>	26.65 kips	66.40 kips	<b>0.40</b>	<b>PASS</b>
<b>Column Panel Zone Shear</b>	25.44 kips	118.06 kips	<b>0.22</b>	<b>PASS</b>

**RB1\_F1 I - (C-3.5)\_L2: Connection Properties**

Column/Beam Direct Weld Moment Connection



<b>Connection</b>	
Connection Title	RB1_F1 I - (C-3.5)_L2
Connection Type	Column/Beam Direct Weld Moment Connection
<b>Seismic Detailing</b>	
Seismic System	None
<b>Connection Category</b>	
Beam Connection	Bolted
Column Connection Type	Flange
Transverse Stiffeners	Yes
Web Doublers	Yes
Web Doublers Configuration	One Side
<b>Loading (LRFD)</b>	
Custom?	No
Shear Load	5.09 kips
Axial Load	2.42 kips
Moment Load	-28.33 kips-ft
Top Column Dist	0 in
Column Force	0.00 kips
Story Shear	0.00 kips
<b>Components</b>	
<b>Column Section</b>	
Material	W16x31 A992
<b>Beam Section</b>	
Material	W14x22 A992
Hole Type	STD
<b>Plate Section</b>	
Material	P0.38x3.50x11.25 A36
Thickness	3/8 in
Width	3 1/2 in
Depth	11 1/4 in
Hole Type	STD
<b>Doubler Section</b>	
Material	P0.25x13.64x17.82 A572 Gr.50
Fy	50.00 ksi
Fu	65.00 ksi
E	29000.00 ksi
Thickness	1/4 in
Width	13 5/8 in
Depth	17 13/16 in
<b>Transverse Stiffener Section</b>	
Material	P0.25x2.38x15.02 A572 Gr.50
Fy	50.00 ksi
Fu	65.00 ksi
E	29000.00 ksi
Full Depth Stiffener	Yes
Thickness	1/4 in
Min Width	2 3/8 in
Max Width	2 5/8 in
Depth	15 in
<b>Column Weld</b>	
Type	E70 Double Fillet
Fillet Size	4.00 Sixteenths
<b>Beam Bolts</b>	
Beam Bolts	3/4" A325-N A325-N
Diameter, in.	3/4"
Rows	1
Bolts per Row	4
Longitudinal Spacing	2 3/4 in
Transverse Spacing	3 in
Slip Critical	No
<b>Moment Weld</b>	
Type	E70 CJP
<b>Transverse Stiffener Weld</b>	
Type	E70

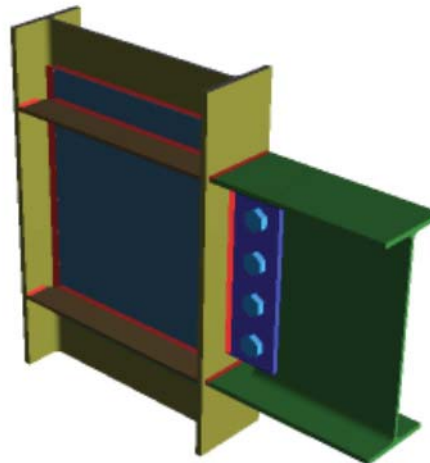
Type	Double Fillet
Fillet Size	3.00 Sixteenths
<b>Doubler Flange Weld</b>	E70
Type	CJP
<b>Doubler Web Weld</b>	E70
Type	Fillet
Fillet Size	3.00 Sixteenths

**Assembly**

<b>Column/Beam Clearance</b>	1/2 in
<b>Plate Vertical Position</b>	1 3/16 in
<b>Beam Bolts Edge Distance Dimensions</b>	
Beam Bolts/Beam Edge Dist	1 1/2 in
Beam Bolts Horz Edge Dist	1 1/2 in
Beam Bolts Vert Edge Dist	1 1/2 in

**RB1\_F1 J - (C-2.1)\_L2: 3D View**

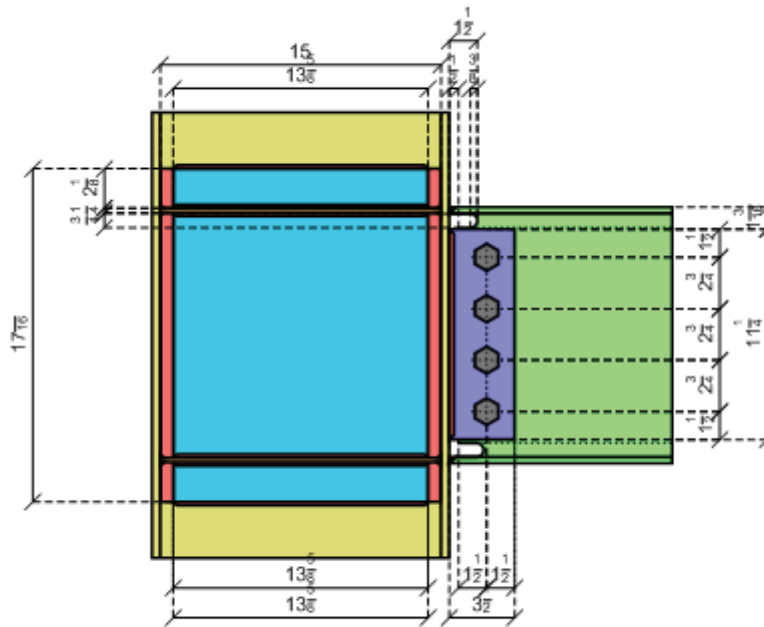
*Column/Beam Direct Weld Moment Connection*



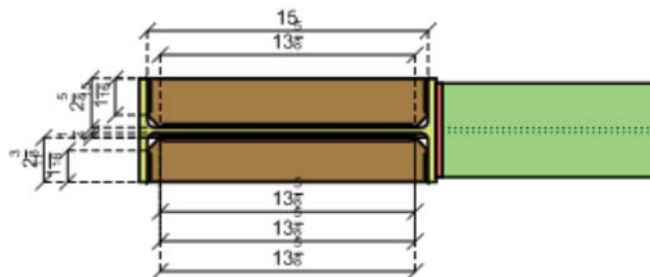
**RB1\_F1 J - (C-2.1)\_L2: 2D Views**

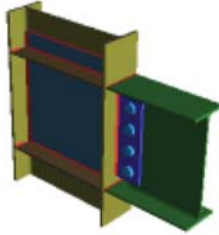
*Column/Beam Direct Weld Moment Connection*

Side view



Top view





Material Properties:

<b>Column</b>	W16x31	A992	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Beam</b>	W14x22	A992	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Plate</b>	P0.38x3.50x11.25	A36	F <sub>y</sub> = 36.00 ksi	F <sub>u</sub> = 58.00 ksi
<b>Doubler</b>	P0.25x13.64x17.82	A572 Gr.50	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi
<b>Transverse Stiffener</b>	P0.25x2.38x15.02	A572 Gr.50	F <sub>y</sub> = 50.00 ksi	F <sub>u</sub> = 65.00 ksi

Input Data:

<b>Shear Load</b>	-5.09 kips	<i>User Input Shear Load</i>
<b>Moment</b>	-28.34 kips-ft	<i>User Input Moment</i>
<b>Axial Load</b>	2.43 kips	<i>User Input Axial Force (compression)</i>
<b>Puf_c</b>	26.66 kips	<i>Required Flange Force (compression)</i>
<b>Puf_t</b>	24.23 kips	<i>Required Flange Force (tension)</i>
<b>Top Column Dist</b>	0 in	<i>User Input Top Column Dist</i>
<b>Column Force</b>	0.00 kips	<i>User Input Column Force</i>
<b>Story Shear</b>	0.00 kips	<i>User Input Story Shear</i>

Note: Unless specified, all code references are from AISC 360-10

**Governing LC: 3D - 34 - ASCE Strength 5 (c)**

Limit State	Required	Available	Unity Check	Result
<b>Geometry Restrictions at Beam</b>				<b>PASS</b>
<b>Column Weld Limitations</b>				<b>PASS</b>
<b>Beam Web Shear Yield</b>	5.09 kips	79.56 kips	<b>0.06</b>	<b>PASS</b>
<b>Plate Shear Yield</b>	5.09 kips	91.12 kips	<b>0.06</b>	<b>PASS</b>
<b>Beam Web Shear Rupture</b>	5.09 kips	54.02 kips	<b>0.09</b>	<b>PASS</b>
<b>Plate Shear Rupture</b>	5.09 kips	75.85 kips	<b>0.07</b>	<b>PASS</b>
<b>Beam Block Shear</b>	5.09 kips	58.15 kips	<b>0.09</b>	<b>PASS</b>
<b>Plate Block Shear at Beam</b>	5.09 kips	76.56 kips	<b>0.07</b>	<b>PASS</b>
<b>Bolt Bearing at Beam Web</b>	5.09 kips	71.57 kips	<b>0.07</b>	<b>PASS</b>
<b>Bolt Bearing at Shear Plate</b>	5.09 kips	71.57 kips	<b>0.07</b>	<b>PASS</b>
<b>Bolt Shear at Beam Web</b>	5.09 kips	71.57 kips	<b>0.07</b>	<b>PASS</b>
<b>Column Weld Strength</b>	5.09 kips	110.23 kips	<b>0.05</b>	<b>PASS</b>
<b>Flange Weld Strength</b>				<b>PASS</b>
<b>Beam Flange Tensile Yield</b>	24.23 kips	75.38 kips	<b>0.32</b>	<b>PASS</b>
<b>Beam Flange Tensile Rupture</b>	24.23 kips	81.66 kips	<b>0.30</b>	<b>PASS</b>
<b>Beam Flange Compression</b>	26.66 kips	75.38 kips	<b>0.35</b>	<b>PASS</b>
<b>Column Flange Bending</b>	24.23 kips	27.22 kips	<b>0.89</b>	<b>PASS</b>
<b>Column Web Yielding</b>	26.66 kips	64.05 kips	<b>0.42</b>	<b>PASS</b>
<b>Column Web Buckling</b>	26.66 kips	33.32 kips	<b>0.80</b>	<b>PASS</b>
<b>Column Web Crippling</b>	26.66 kips	66.40 kips	<b>0.40</b>	<b>PASS</b>
<b>Column Panel Zone Shear</b>	25.44 kips	118.06 kips	<b>0.22</b>	<b>PASS</b>

**RB1\_F1 J - (C-2.1)\_L2: Connection Properties**

*Column/Beam Direct Weld Moment Connection*

<b>Connection</b>	
Connection Title	RB1_F1 J - (C-2.1)_L2
Connection Type	Column/Beam Direct Weld Moment Connection
<b>Seismic Detailing</b>	
Seismic System	None
<b>Connection Category</b>	
Beam Connection	Bolted
Column Connection Type	Flange
Transverse Stiffeners	Yes
Web Doublers	Yes
Web Doublers Configuration	One Side
<b>Loading (LRFD)</b>	
Custom?	No
Shear Load	-5.09 kips
Axial Load	2.43 kips
Moment Load	-28.34 kips-ft
Top Column Dist	0 in
Column Force	0.00 kips
Story Shear	0.00 kips
<b>Components</b>	
<b>Column Section</b>	
Material	W16x31 A992
<b>Beam Section</b>	
Material	W14x22 A992
Hole Type	STD
<b>Plate Section</b>	
Material	P0.38x3.50x11.25 A36
Thickness	3/8 in
Width	3 1/2 in
Depth	11 1/4 in
Hole Type	STD
<b>Doubler Section</b>	
Material	P0.25x13.64x17.82 A572 Gr.50
Fy	50.00 ksi
Fu	65.00 ksi
E	29000.00 ksi
Thickness	1/4 in
Width	13 5/8 in
Depth	17 13/16 in
<b>Transverse Stiffener Section</b>	
Material	P0.25x2.38x15.02 A572 Gr.50
Fy	50.00 ksi
Fu	65.00 ksi
E	29000.00 ksi
Full Depth Stiffener	Yes
Thickness	1/4 in
Min Width	2 3/8 in
Max Width	2 5/8 in
Depth	15 in
<b>Column Weld</b>	
Type	E70 Double Fillet
Fillet Size	4.00 Sixteenths
<b>Beam Bolts</b>	
Beam Bolts	3/4" A325-N A325-N
Diameter, in.	3/4"
Rows	1
Bolts per Row	4
Longitudinal Spacing	2 3/4 in
Transverse Spacing	3 in
Slip Critical	No
<b>Moment Weld</b>	
Type	E70 CJP
<b>Transverse Stiffener Weld</b>	
Type	E70

Type	Double Fillet
Fillet Size	3.00 Sixteenths
<b>Doubler Flange Weld</b>	E70
Type	CJP
<b>Doubler Web Weld</b>	E70
Type	Fillet
Fillet Size	3.00 Sixteenths

**Assembly**

<b>Column/Beam Clearance</b>	1/2 in
<b>Plate Vertical Position</b>	1 3/16 in
<b>Beam Bolts Edge Distance Dimensions</b>	
Beam Bolts/Beam Edge Dist	1 1/2 in
Beam Bolts Horz Edge Dist	1 1/2 in
Beam Bolts Vert Edge Dist	1 1/2 in

**Nailer to Steel Connection and  
Diaphragm to Nailer Connection**

Seal	Title	Project #	Date
	SMF-RBS	170450	2017.11.10
	NAILER TO STEEL CONNECTION DIAPHRAGM TO NAILER CONNECTION	Designer	Scale
		AJB	NTS
		Checked by	Sheet #
			1 of 3

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NAILER CONNECTION TO RBS-SMF

\* CRITICAL CONNECTION OCCURS @ RBS IN HIGH ROOF.

$U_{max} = 7611 \#$

$l = 11'6"$

(COLUMN FACE-TO-FACE, LESS THE PROTECTED AREA)

LINE LOAD =  $661 \# / ft$

$\Omega = 2.5$

(TABLE 12.2-1 NOTE g)

$Z_f = 1654 \# / ft$  (LFRD)

$Z' = Z_{REQ} \times C_m C_t C_g C_{\Delta} C_{eg} C_{di} C_{tn} \times K_F \phi \lambda$        $C_m = 1.0$

$Z_{REQ} = \frac{1654 \#}{2.158}$

$C_t = 1.0$

$C_g = 1.0$  \* 1 FASTER PER ROW IN A /ft ANALYSIS (VERIFY ASSUMPTION @ FINAL ANSWER)

= 766 lbs

FROM NDS TABLE 12B ( $1/4" \text{ PL} + 1/2" \text{ MAIN MEMBER}$ )       $C_{\Delta} = 1.0$

$C_{eg} = 1.0$

$1/2" \text{ ZL} = 580 \#$        $N_6 \times$

$C_{di} = 1.0$

$5/8" \text{ ZL} = 720 \#$        $N_6 \times$  (TRY 9" c/c STAGGERED)

$C_{tn} = 1.0$

$3/4" \text{ ZL} = 860 \#$       (OK)

$K_F = 3.32$

$5/8" \text{ ZL} = 960 \#$  @ 9" c/c (OK)

$\phi = 0.65$

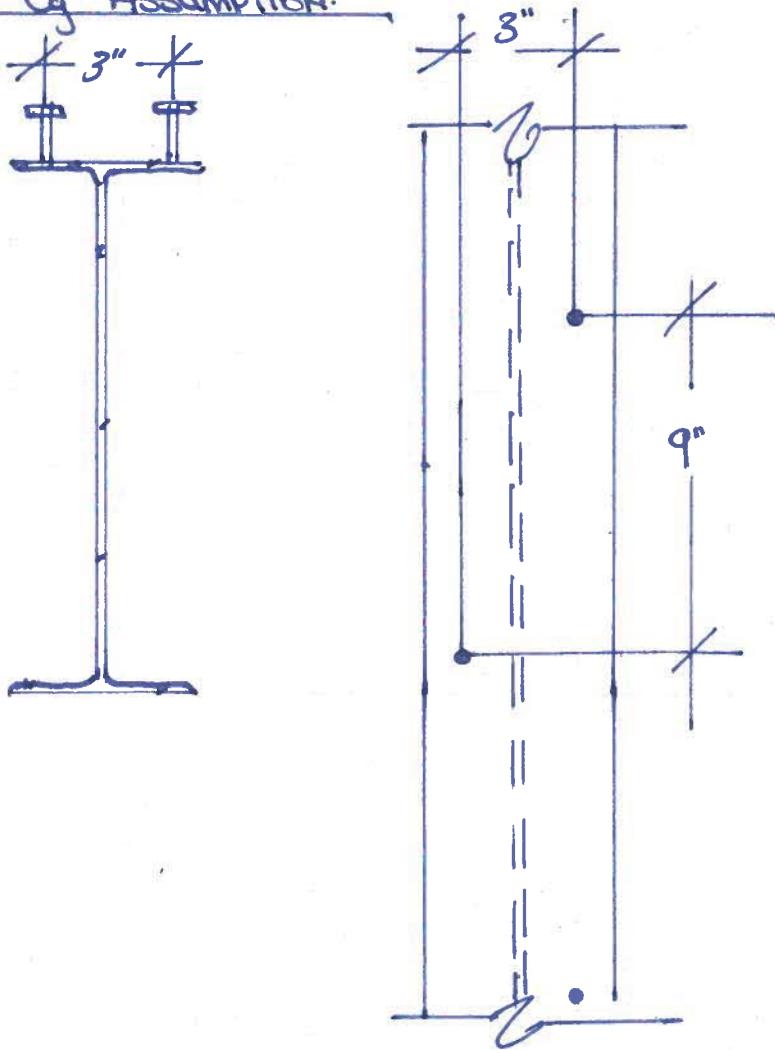
$\lambda = 1.0$



Seal	Title	Project # 170450	Date 2017.11.10
		Designer AaB	Scale MTS
		Checked by	Sheet # 2 of 3

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VERIFY  $C_g$  ASSUMPTION.



$9/4 < 3 \therefore$   
 NDS 11.3.6 SUPPLEMENTARY  
 COMMENT FULFILLED.  
 $C_{cg} = 1.0$

USE THREADED STUDS WELDED TO TOP FLANGE @ 9" c/c  
 STAGGER ROWS w/ MIN 3" SPACING BETWEEN ROWS  
 $Z = 960^{\#} > Z_{REQ} = 766^{\#}$

Seal	Title	Project #	Date
		170450	2017.11.10
		Designer	Scale
		A0B	NTS
		Checked by	Sheet #
			3 of 3

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### DIAPHRAGM CONNECTION TO NAILER

$$Z_f = 1654\# / ft \quad (\text{LFRD})$$

$$Z' = Z_{req} > C_m C_t C_g C_s C_{eg} C_{di} C_{tn} \times K_F \phi \lambda$$

$$Z_{req} = \frac{1654\#}{2.3738}$$

$$= 700\# / ft$$

$$C_m = 1.0$$

$$C_t = 1.0$$

$$C_g = 1.0$$

$$C_{di} = 1.1$$

$$C_{tn} = 1.0$$

$$K_F = 3.32$$

$$\phi = 0.65$$

$$\lambda = 1.0$$

$$t_s = 23/32''$$

$$P_{max} = 1\ 3/8''$$

$$D_{max} = \frac{P_{max}}{10} = 0.1375'' \quad (\text{TO USE } Z \text{ IN TABLES WITHOUT REDUCTION})$$

Spec

Z

10d Box NAIL

70#

$$n = \frac{700}{70} = 10 \text{ NAILS REQ'D.}$$

USE 10d Box NAILS. 2 ROWS @ Z' etc  
 $Z = 840\# > Z_{req} = 700\#$

**ANCHORAGE DESIGN**

## **Anchorage Design**

Design done using Hilti PROFIS software for all base plates, cast in plates and ledger anchorage. For report brevity, the design reports for base plate A and cast in plate 2 are included.

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**Specifier's comments:** Base Plate A

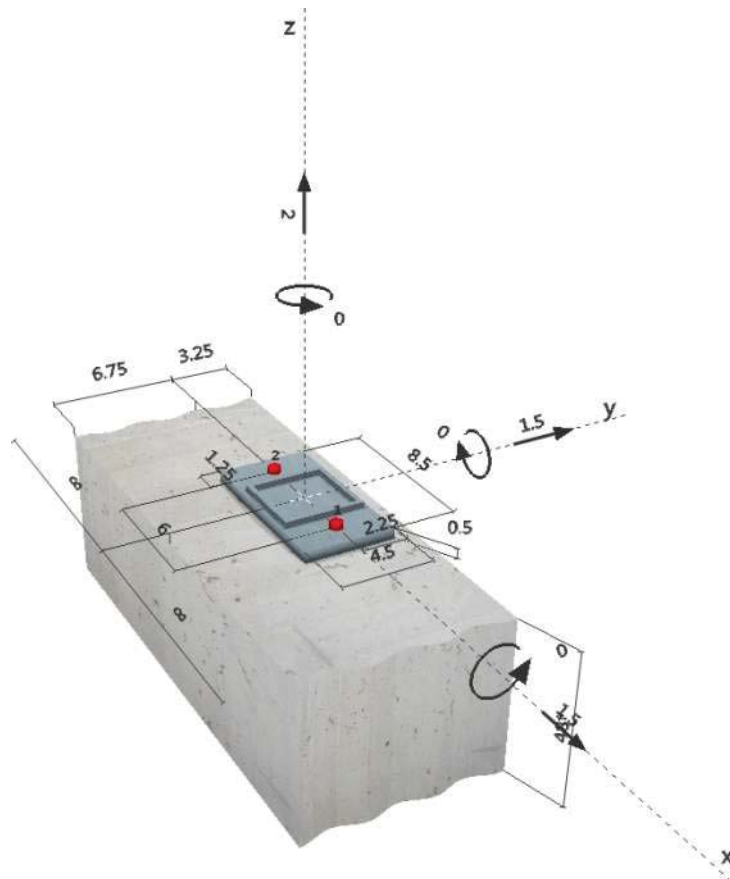
### 1 Input data



**SAFESET**

<b>Anchor type and diameter:</b>	<b>HIT-HY 200 + HIT-Z 5/8</b>
Effective embedment depth:	$h_{ef,act} = 6.000$ in. ( $h_{ef,limit} = -$ in.)
Material:	DIN EN ISO 4042
Evaluation Service Report:	ESR-3187
Issued   Valid:	11/1/2016   3/1/2018
Proof:	Design method ACI 318-14 / Chem
Stand-off installation:	$e_b = 0.000$ in. (no stand-off); $t = 0.500$ in.
Anchor plate:	$l_x \times l_y \times t = 8.500$ in. $\times$ $4.500$ in. $\times$ $0.500$ in.; (Recommended plate thickness: not calculated)
Profile:	Square HSS (AISC); (L x W x T) = $4.000$ in. $\times$ $4.000$ in. $\times$ $0.250$ in.
Base material:	cracked concrete, $f'_c = 3500$ psi; $h = 48.000$ in., Temp. short/long: 32/32 °F
<b>Installation:</b>	<b>hammer drilled hole, Installation condition: Dry</b>
Reinforcement:	tension: condition A, shear: condition A; no supplemental splitting reinforcement present edge reinforcement: none or $<$ No. 4 bar
Seismic loads (cat. C, D, E, or F)	Tension load: yes (17.2.3.4.3 (d)) Shear load: yes (17.2.3.5.3 (c))

### Geometry [in.] & Loading [kip, ft.kip]



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## 2 Load case/Resulting anchor forces

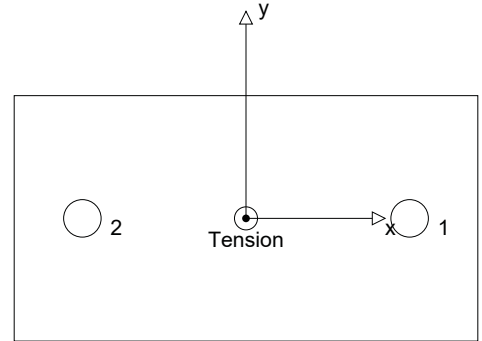
Load case: Design loads

### Anchor reactions [kip]

Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	1.000	1.061	0.750	0.750
2	1.000	1.061	0.750	0.750

max. concrete compressive strain: - [‰]  
 max. concrete compressive stress: - [psi]  
 resulting tension force in (x/y)=(0.000/0.000): 2.000 [kip]  
 resulting compression force in (x/y)=(0.000/0.000): 0.000 [kip]



## 3 Tension load

	Load $N_{ua}$ [kip]	Capacity $\phi N_n$ [kip]	Utilization $\beta_N = N_{ua}/\phi N_n$	Status
Steel Strength*	1.000	13.848	8	OK
Pullout Strength*	1.000	10.428	10	OK
Sustained Tension Load Bond Strength*	N/A	N/A	N/A	N/A
Concrete Breakout Strength**	2.000	4.978	41	OK

\* anchor having the highest loading \*\*anchor group (anchors in tension)

### 3.1 Steel Strength

$N_{sa}$  = ESR value refer to ICC-ES ESR-3187  
 $\phi N_{sa} \geq N_{ua}$  ACI 318-14 Table 17.3.1.1

#### Variables

$A_{se,N}$ [in. <sup>2</sup> ]	$f_{uta}$ [psi]
0.23	94200

#### Calculations

$N_{sa}$ [kip]	21.305
----------------	--------

#### Results

$N_{sa}$ [kip]	$\phi_{steel}$	$\phi_{nonductile}$	$\phi N_{sa}$ [kip]	$N_{ua}$ [kip]
21.305	0.650	1.000	13.848	1.000

### 3.2 Pullout Strength

$N_{pn} = N_p \lambda_a$  refer to ICC-ES ESR-3187  
 $\phi N_{pn} \geq N_{ua}$  ACI 318-14 Table 17.3.1.1

#### Variables

$\lambda_a$	$N_p$ [kip]	$\alpha_{N,seis}$
1.000	21.391	1.000

#### Calculations

-
---

#### Results

$N_{pn}$ [kip]	$\phi_{concrete}$	$\phi_{seismic}$	$\phi_{nonductile}$	$\phi N_{pn}$ [kip]	$N_{ua}$ [kip]
21.391	0.650	0.750	1.000	10.428	1.000

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### 3.3 Concrete Breakout Strength

$$N_{cbg} = \left( \frac{A_{Nc}}{A_{Nc0}} \right) \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b \quad \text{ACI 318-14 Eq. (17.4.2.1b)}$$

$$\phi N_{cbg} \geq N_{ua} \quad \text{ACI 318-14 Table 17.3.1.1}$$

$$A_{Nc} \text{ see ACI 318-14, Section 17.4.2.1, Fig. R 17.4.2.1(b)}$$

$$A_{Nc0} = 9 h_{ef}^2 \quad \text{ACI 318-14 Eq. (17.4.2.1c)}$$

$$\Psi_{ec,N} = \left( \frac{1}{1 + \frac{2 e_N}{3 h_{ef}}} \right) \leq 1.0 \quad \text{ACI 318-14 Eq. (17.4.2.4)}$$

$$\Psi_{ed,N} = 0.7 + 0.3 \left( \frac{c_{a,min}}{1.5 h_{ef}} \right) \leq 1.0 \quad \text{ACI 318-14 Eq. (17.4.2.5b)}$$

$$\Psi_{cp,N} = \text{MAX} \left( \frac{c_{a,min}}{c_{ac}}, \frac{1.5 h_{ef}}{c_{ac}} \right) \leq 1.0 \quad \text{ACI 318-14 Eq. (17.4.2.7b)}$$

$$N_b = k_c \lambda_a \sqrt{f_c} h_{ef}^{1.5} \quad \text{ACI 318-14 Eq. (17.4.2.2a)}$$

#### Variables

$h_{ef}$ [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]	$\Psi_{c,N}$
6.000	0.000	0.000	3.250	1.000
$c_{ac}$ [in.]	$k_c$	$\lambda_a$	$f_c$ [psi]	
9.000	17	1.000	3500	

#### Calculations

$A_{Nc}$ [in. <sup>2</sup> ]	$A_{Nc0}$ [in. <sup>2</sup> ]	$\Psi_{ec1,N}$	$\Psi_{ec2,N}$	$\Psi_{ed,N}$	$\Psi_{cp,N}$	$N_b$ [kip]
240.00	324.00	1.000	1.000	0.808	1.000	14.781

#### Results

$N_{cbg}$ [kip]	$\phi_{concrete}$	$\phi_{seismic}$	$\phi_{nonductile}$	$\phi N_{cbg}$ [kip]	$N_{ua}$ [kip]
8.850	0.750	0.750	1.000	4.978	2.000

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### 4 Shear load

	Load $V_{ua}$ [kip]	Capacity $\phi V_n$ [kip]	Utilization $\beta_v = V_{ua}/\phi V_n$	Status
Steel Strength*	1.061	3.656	30	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength (Concrete Breakout Strength controls)**	2.121	12.391	18	OK
Concrete edge failure in direction y+**	2.121	3.523	61	OK

\* anchor having the highest loading    \*\* anchor group (relevant anchors)

#### 4.1 Steel Strength

$$V_{sa} = \alpha_{V,seis} (0.6 A_{se,V} f_{uta}) \quad \text{refer to ICC-ES ESR-3187}$$

$$\phi V_{steel} \geq V_{ua} \quad \text{ACI 318-14 Table 17.3.1.1}$$

#### Variables

$A_{se,V}$ [in. <sup>2</sup> ]	$f_{uta}$ [psi]	$\alpha_{V,seis}$	$(0.6 A_{se,V} f_{uta})$ [kip]
0.23	94200	0.650	9.375

#### Calculations

$$\frac{V_{sa,eq} \text{ [kip]}}{6.094}$$

#### Results

$V_{sa,eq}$ [kip]	$\phi_{steel}$	$\phi_{nonductile}$	$\phi V_{sa}$ [kip]	$V_{ua}$ [kip]
6.094	0.600	1.000	3.656	1.061

#### 4.2 Pryout Strength (Concrete Breakout Strength controls)

$$V_{cpg} = k_{cp} \left[ \left( \frac{A_{Nc}}{A_{Nc0}} \right) \psi_{ec,N} \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b \right] \quad \text{ACI 318-14 Eq. (17.5.3.1b)}$$

$$\phi V_{cpg} \geq V_{ua} \quad \text{ACI 318-14 Table 17.3.1.1}$$

$$A_{Nc} \text{ see ACI 318-14, Section 17.4.2.1, Fig. R 17.4.2.1(b)}$$

$$A_{Nc0} = 9 h_{ef}^2 \quad \text{ACI 318-14 Eq. (17.4.2.1c)}$$

$$\psi_{ec,N} = \left( \frac{1}{1 + \frac{2 e_{c,N}}{3 h_{ef}}} \right) \leq 1.0 \quad \text{ACI 318-14 Eq. (17.4.2.4)}$$

$$\psi_{ed,N} = 0.7 + 0.3 \left( \frac{c_{a,min}}{1.5 h_{ef}} \right) \leq 1.0 \quad \text{ACI 318-14 Eq. (17.4.2.5b)}$$

$$\psi_{cp,N} = \text{MAX} \left( \frac{c_{a,min}}{c_{ac}}, \frac{1.5 h_{ef}}{c_{ac}} \right) \leq 1.0 \quad \text{ACI 318-14 Eq. (17.4.2.7b)}$$

$$N_b = k_c \lambda_a \sqrt{f_c} h_{ef}^{1.5} \quad \text{ACI 318-14 Eq. (17.4.2.2a)}$$

#### Variables

$k_{cp}$	$h_{ef}$ [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]
2	6.000	0.000	0.000	3.250

$\psi_{c,N}$	$c_{ac}$ [in.]	$k_c$	$\lambda_a$	$f_c$ [psi]
1.000	9.000	17	1.000	3500

#### Calculations

$A_{Nc}$ [in. <sup>2</sup> ]	$A_{Nc0}$ [in. <sup>2</sup> ]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	$N_b$ [kip]
240.00	324.00	1.000	1.000	0.808	1.000	14.781

#### Results

$V_{cpg}$ [kip]	$\phi_{concrete}$	$\phi_{seismic}$	$\phi_{nonductile}$	$\phi V_{cpg}$ [kip]	$V_{ua}$ [kip]
17.701	0.700	1.000	1.000	12.391	2.121



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### 4.3 Concrete edge failure in direction y+

$$V_{cbg} = \left( \frac{A_{Vc}}{A_{Vc0}} \right) \psi_{ec,V} \psi_{ed,V} \psi_{c,V} \psi_{h,V} \psi_{parallel,V} V_b \quad \text{ACI 318-14 Eq. (17.5.2.1b)}$$

$$\phi V_{cbg} \geq V_{ua} \quad \text{ACI 318-14 Table 17.3.1.1}$$

$$A_{Vc} \text{ see ACI 318-14, Section 17.5.2.1, Fig. R 17.5.2.1(b)}$$

$$A_{Vc0} = 4.5 c_{a1}^2 \quad \text{ACI 318-14 Eq. (17.5.2.1c)}$$

$$\psi_{ec,V} = \left( \frac{1}{1 + \frac{2e_v}{3c_{a1}}} \right) \leq 1.0 \quad \text{ACI 318-14 Eq. (17.5.2.5)}$$

$$\psi_{ed,V} = 0.7 + 0.3 \left( \frac{c_{a2}}{1.5c_{a1}} \right) \leq 1.0 \quad \text{ACI 318-14 Eq. (17.5.2.6b)}$$

$$\psi_{h,V} = \sqrt{\frac{1.5c_{a1}}{h_a}} \geq 1.0 \quad \text{ACI 318-14 Eq. (17.5.2.8)}$$

$$V_b = \left( 7 \left( \frac{l_e}{d_a} \right)^{0.2} \sqrt{d_a} \right) \lambda_a \sqrt{f_c} c_{a1}^{1.5} \quad \text{ACI 318-14 Eq. (17.5.2.2a)}$$

#### Variables

$c_{a1}$ [in.]	$c_{a2}$ [in.]	$e_{cV}$ [in.]	$\psi_{c,V}$	$h_a$ [in.]
3.250	-	0.000	1.000	48.000
$l_e$ [in.]	$\lambda_a$	$d_a$ [in.]	$f_c$ [psi]	$\psi_{parallel,V}$
5.000	1.000	0.625	3500	1.000

#### Calculations

$A_{Vc}$ [in. <sup>2</sup> ]	$A_{Vc0}$ [in. <sup>2</sup> ]	$\psi_{ec,V}$	$\psi_{ed,V}$	$\psi_{h,V}$	$V_b$ [kip]
76.78	47.53	1.000	1.000	1.000	2.907

#### Results

$V_{cbg}$ [kip]	$\phi_{concrete}$	$\phi_{seismic}$	$\phi_{nonductile}$	$\phi V_{cbg}$ [kip]	$V_{ua}$ [kip]
4.697	0.750	1.000	1.000	3.523	2.121

### 5 Combined tension and shear loads

$\beta_N$	$\beta_V$	$\zeta$	Utilization $\beta_{N,V}$ [%]	Status
0.402	0.602	5/3	65	OK

$$\beta_{N,V} = \beta_N^\zeta + \beta_V^\zeta \leq 1$$

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## 6 Warnings

- The anchor design methods in PROFIS Anchor require rigid anchor plates per current regulations (ETAG 001/Annex C, EOTA TR029, etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Anchor calculates the minimum required anchor plate thickness with FEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid base plate assumption is valid is not carried out by PROFIS Anchor. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Condition A applies when supplementary reinforcement is used. The  $\Phi$  factor is increased for non-steel Design Strengths except Pullout Strength and Pryout strength. Condition B applies when supplementary reinforcement is not used and for Pullout Strength and Pryout Strength. Refer to your local standard.
- Design Strengths of adhesive anchor systems are influenced by the cleaning method. Refer to the INSTRUCTIONS FOR USE given in the Evaluation Service Report for cleaning and installation instructions
- Checking the transfer of loads into the base material and the shear resistance are required in accordance with ACI 318 or the relevant standard!
- An anchor design approach for structures assigned to Seismic Design Category C, D, E or F is given in ACI 318-14, Chapter 17, Section 17.2.3.4.3 (a) that requires the governing design strength of an anchor or group of anchors be limited by ductile steel failure. If this is NOT the case, the connection design (tension) shall satisfy the provisions of Section 17.2.3.4.3 (b), Section 17.2.3.4.3 (c), or Section 17.2.3.4.3 (d). The connection design (shear) shall satisfy the provisions of Section 17.2.3.5.3 (a), Section 17.2.3.5.3 (b), or Section 17.2.3.5.3 (c).
- Section 17.2.3.4.3 (b) / Section 17.2.3.5.3 (a) require the attachment the anchors are connecting to the structure be designed to undergo ductile yielding at a load level corresponding to anchor forces no greater than the controlling design strength. Section 17.2.3.4.3 (c) / Section 17.2.3.5.3 (b) waive the ductility requirements and require the anchors to be designed for the maximum tension / shear that can be transmitted to the anchors by a non-yielding attachment. Section 17.2.3.4.3 (d) / Section 17.2.3.5.3 (c) waive the ductility requirements and require the design strength of the anchors to equal or exceed the maximum tension / shear obtained from design load combinations that include E, with E increased by  $\omega_0$ .
- Installation of Hilti adhesive anchor systems shall be performed by personnel trained to install Hilti adhesive anchors. Reference ACI 318-14, Section 17.8.1.

## Fastening meets the design criteria!

# BASE PLATE A



## Profis Anchor 2.7.5

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### 7 Installation data

Anchor plate, steel: -  
 Profile: Square HSS (AISC); 4.000 x 4.000 x 0.250 in.  
 Hole diameter in the fixture:  $d_f = 0.688$  in.  
 Plate thickness (input): 0.500 in.  
 Recommended plate thickness: not calculated  
 Drilling method: Hammer drilled  
 Cleaning: No cleaning of the drilled hole is required

Anchor type and diameter: HIT-HY 200 + HIT-Z 5/8  
 Installation torque: 0.059 ft.kip  
 Hole diameter in the base material: 0.750 in.  
 Hole depth in the base material: 8.250 in.  
 Minimum thickness of the base material: 10.000 in.

#### 7.1 Recommended accessories

##### Drilling

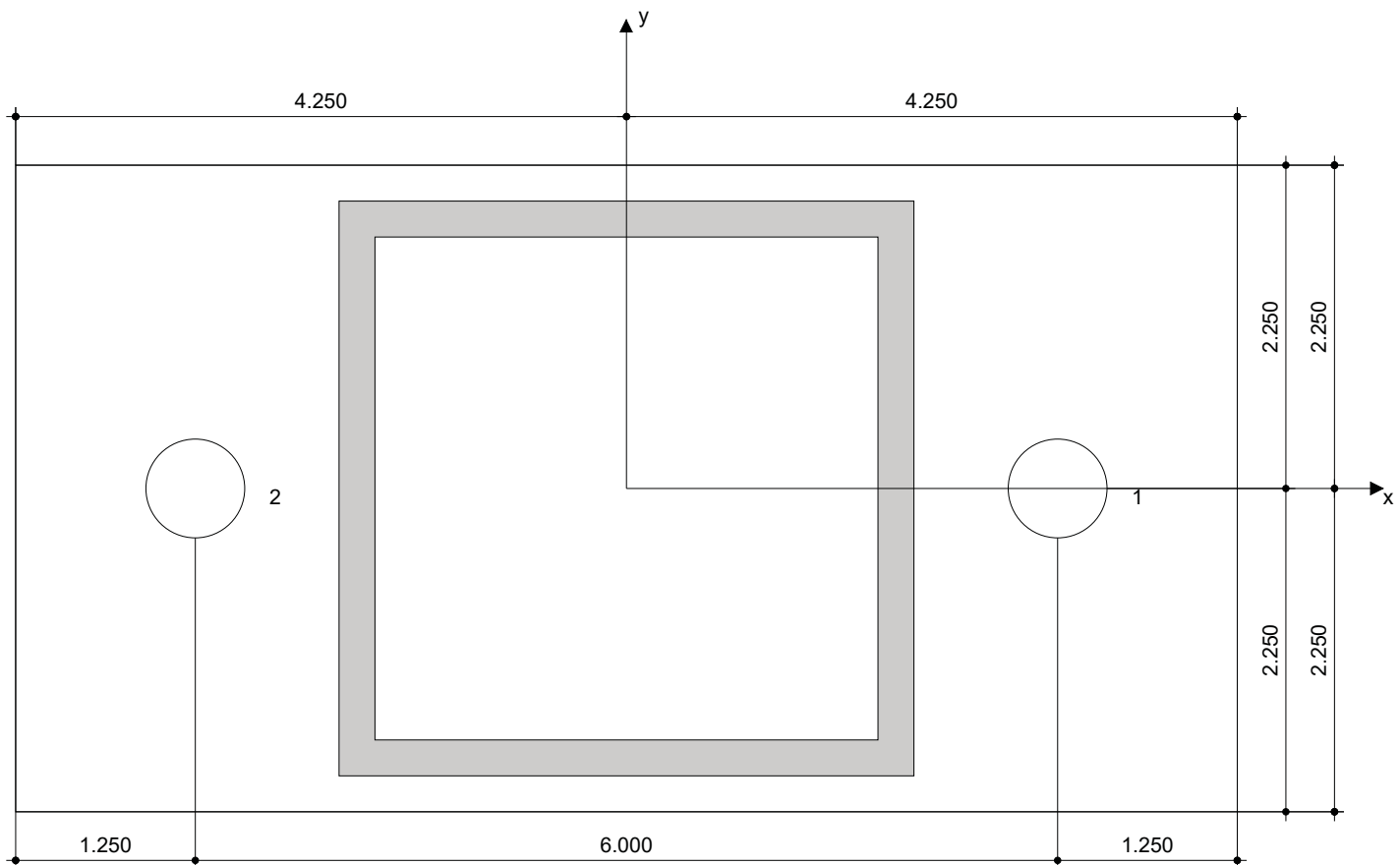
- Suitable Rotary Hammer
- Properly sized drill bit

##### Cleaning

- No accessory required

##### Setting

- Dispenser including cassette and mixer
- Torque wrench



#### Coordinates Anchor in.

Anchor	x	y	C-x	C+y	C-y	C+x
1	3.000	0.000	-	-	6.750	3.250
2	-3.000	0.000	-	-	6.750	3.250

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## 8 Remarks; Your Cooperation Duties

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- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.

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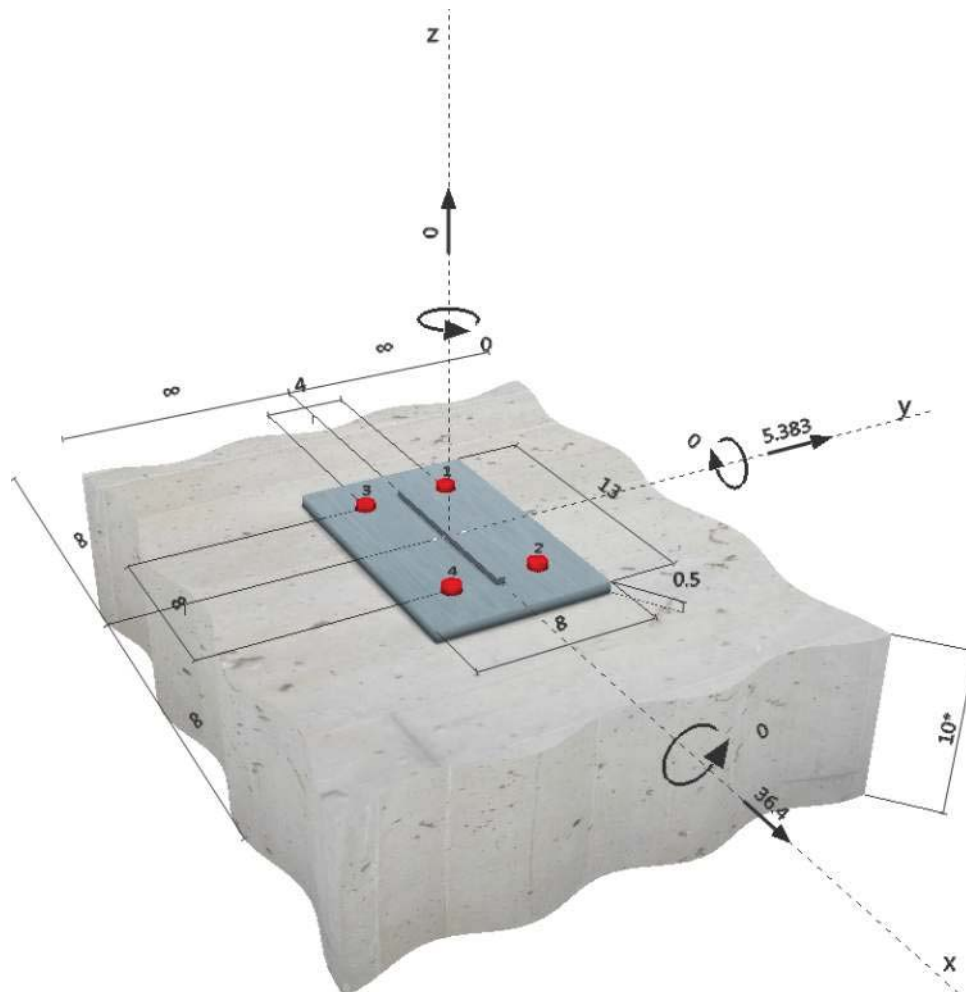
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Specifier's comments:

## 1 Input data

<b>Anchor type and diameter:</b>	<b>Hex Head ASTM F 1554 GR. 36 7/8</b>	
Effective embedment depth:	$h_{ef} = 6.000$ in.	
Material:	ASTM F 1554	
Proof:	Design method ACI 318-14 / CIP	
Stand-off installation:	$e_b = 0.000$ in. (no stand-off); $t = 0.500$ in.	
Anchor plate:	$l_x \times l_y \times t = 13.000$ in. $\times$ $8.000$ in. $\times$ $0.500$ in.; (Recommended plate thickness: not calculated)	
Profile:	Rectangular plates and bars (AISC); $(L \times W \times T) = 9.000$ in. $\times$ $0.375$ in. $\times$ $0.000$ in.	
Base material:	cracked concrete, $f_c' = 3,500$ psi; $h = 10.000$ in.	
Reinforcement:	tension: condition A, shear: condition A; edge reinforcement: none or $<$ No. 4 bar	
Seismic loads (cat. C, D, E, or F)	Tension load: yes (17.2.3.4.3 (d)) Shear load: yes (17.2.3.5.3 (c))	

## Geometry [in.] & Loading [kip, ft.kip]



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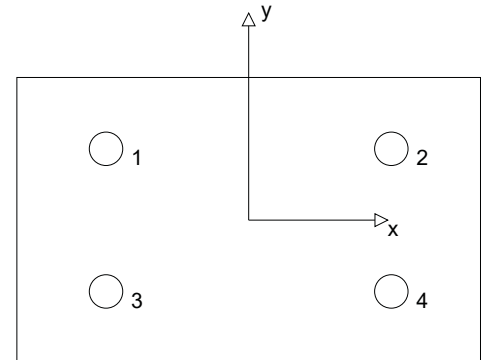
## 2 Load case/Resulting anchor forces

Load case: Design loads

### Anchor reactions [kip]

Tension force: (+Tension, -Compression)

Anchor	Tension force	Shear force	Shear force x	Shear force y
1	0.000	9.199	9.100	1.346
2	0.000	9.199	9.100	1.346
3	0.000	9.199	9.100	1.346
4	0.000	9.199	9.100	1.346



max. concrete compressive strain: - [%]  
 max. concrete compressive stress: - [psi]  
 resulting tension force in (x/y)=(0.000/0.000): 0.000 [kip]  
 resulting compression force in (x/y)=(0.000/0.000): 0.000 [kip]

## 3 Tension load

	Load $N_{ua}$ [kip]	Capacity $\phi N_n$ [kip]	Utilization $\beta_N = N_{ua}/\phi N_n$	Status
Steel Strength*	N/A	N/A	N/A	N/A
Pullout Strength*	N/A	N/A	N/A	N/A
Concrete Breakout Strength**	N/A	N/A	N/A	N/A
Concrete Side-Face Blowout, direction **	N/A	N/A	N/A	N/A

\* anchor having the highest loading \*\*anchor group (anchors in tension)

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## 4 Shear load

	Load $V_{ua}$ [kip]	Capacity $\phi V_n$ [kip]	Utilization $\beta_V = V_{ua}/\phi V_n$	Status
Steel Strength*	9.199	10.450	89	OK
Steel failure (with lever arm)*	N/A	N/A	N/A	N/A
Pryout Strength**	36.796	51.576	72	OK
Concrete edge failure in direction **	N/A	N/A	N/A	N/A

\* anchor having the highest loading \*\*anchor group (relevant anchors)

### 4.1 Steel Strength

$$V_{sa} = 0.6 A_{se,V} f_{uta} \quad \text{ACI 318-14 Eq. (17.5.1.2b)}$$

$$\phi V_{steel} \geq V_{ua} \quad \text{ACI 318-14 Table 17.3.1.1}$$

#### Variables

$A_{se,V}$ [in. <sup>2</sup> ]	$f_{uta}$ [psi]
0.46	58,000

#### Calculations

$V_{sa}$ [kip]
16.078

#### Results

$V_{sa}$ [kip]	$\phi_{steel}$	$\phi V_{sa}$ [kip]	$V_{ua}$ [kip]
16.078	0.650	10.450	9.199

### 4.2 Pryout Strength

$$V_{cp} = k_{cp} \left[ \left( \frac{A_{Nc}}{A_{Nc0}} \right) \psi_{ec,N} \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b \right] \quad \text{ACI 318-14 Eq. (17.5.3.1b)}$$

$$\phi V_{cp} \geq V_{ua} \quad \text{ACI 318-14 Table 17.3.1.1}$$

$$A_{Nc} \text{ see ACI 318-14, Section 17.4.2.1, Fig. R 17.4.2.1(b)}$$

$$A_{Nc0} = 9 h_{ef}^2 \quad \text{ACI 318-14 Eq. (17.4.2.1c)}$$

$$\psi_{ec,N} = \left( \frac{1}{1 + \frac{2 e_N}{3 h_{ef}}} \right) \leq 1.0 \quad \text{ACI 318-14 Eq. (17.4.2.4)}$$

$$\psi_{ed,N} = 0.7 + 0.3 \left( \frac{c_{a,min}}{1.5 h_{ef}} \right) \leq 1.0 \quad \text{ACI 318-14 Eq. (17.4.2.5b)}$$

$$\psi_{cp,N} = \text{MAX} \left( \frac{c_{a,min}}{c_{ac}}, \frac{1.5 h_{ef}}{c_{ac}} \right) \leq 1.0 \quad \text{ACI 318-14 Eq. (17.4.2.7b)}$$

$$N_b = k_c \lambda_a \sqrt{f_c} h_{ef}^{1.5} \quad \text{ACI 318-14 Eq. (17.4.2.2a)}$$

#### Variables

$k_{cp}$	$h_{ef}$ [in.]	$e_{c1,N}$ [in.]	$e_{c2,N}$ [in.]	$c_{a,min}$ [in.]
2	6.000	0.000	0.000	$\infty$

$\psi_{c,N}$	$c_{ac}$ [in.]	$k_c$	$\lambda_a$	$f_c$ [psi]
1.000	-	24	1.000	3,500

#### Calculations

$A_{Nc}$ [in. <sup>2</sup> ]	$A_{Nc0}$ [in. <sup>2</sup> ]	$\psi_{ec1,N}$	$\psi_{ec2,N}$	$\psi_{ed,N}$	$\psi_{cp,N}$	$N_b$ [kip]
572.00	324.00	1.000	1.000	1.000	1.000	20.868

#### Results

$V_{cp}$ [kip]	$\phi_{concrete}$	$\phi_{seismic}$	$\phi_{nonductile}$	$\phi V_{cp}$ [kip]	$V_{ua}$ [kip]
73.681	0.700	1.000	1.000	51.576	36.796

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## 5 Warnings

- The anchor design methods in PROFIS Anchor require rigid anchor plates per current regulations (ETAG 001/Annex C, EOTA TR029, etc.). This means load re-distribution on the anchors due to elastic deformations of the anchor plate are not considered - the anchor plate is assumed to be sufficiently stiff, in order not to be deformed when subjected to the design loading. PROFIS Anchor calculates the minimum required anchor plate thickness with FEM to limit the stress of the anchor plate based on the assumptions explained above. The proof if the rigid base plate assumption is valid is not carried out by PROFIS Anchor. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- Condition A applies when supplementary reinforcement is used. The  $\Phi$  factor is increased for non-steel Design Strengths except Pullout Strength and Pryout strength. Condition B applies when supplementary reinforcement is not used and for Pullout Strength and Pryout Strength. Refer to your local standard.
- Checking the transfer of loads into the base material and the shear resistance are required in accordance with ACI 318 or the relevant standard!
- An anchor design approach for structures assigned to Seismic Design Category C, D, E or F is given in ACI 318-14, Chapter 17, Section 17.2.3.4.3 (a) that requires the governing design strength of an anchor or group of anchors be limited by ductile steel failure. If this is NOT the case, the connection design (tension) shall satisfy the provisions of Section 17.2.3.4.3 (b), Section 17.2.3.4.3 (c), or Section 17.2.3.4.3 (d). The connection design (shear) shall satisfy the provisions of Section 17.2.3.5.3 (a), Section 17.2.3.5.3 (b), or Section 17.2.3.5.3 (c).
- Section 17.2.3.4.3 (b) / Section 17.2.3.5.3 (a) require the attachment the anchors are connecting to the structure be designed to undergo ductile yielding at a load level corresponding to anchor forces no greater than the controlling design strength. Section 17.2.3.4.3 (c) / Section 17.2.3.5.3 (b) waive the ductility requirements and require the anchors to be designed for the maximum tension / shear that can be transmitted to the anchors by a non-yielding attachment. Section 17.2.3.4.3 (d) / Section 17.2.3.5.3 (c) waive the ductility requirements and require the design strength of the anchors to equal or exceed the maximum tension / shear obtained from design load combinations that include E, with E increased by  $\omega_0$ .

**Fastening meets the design criteria!**



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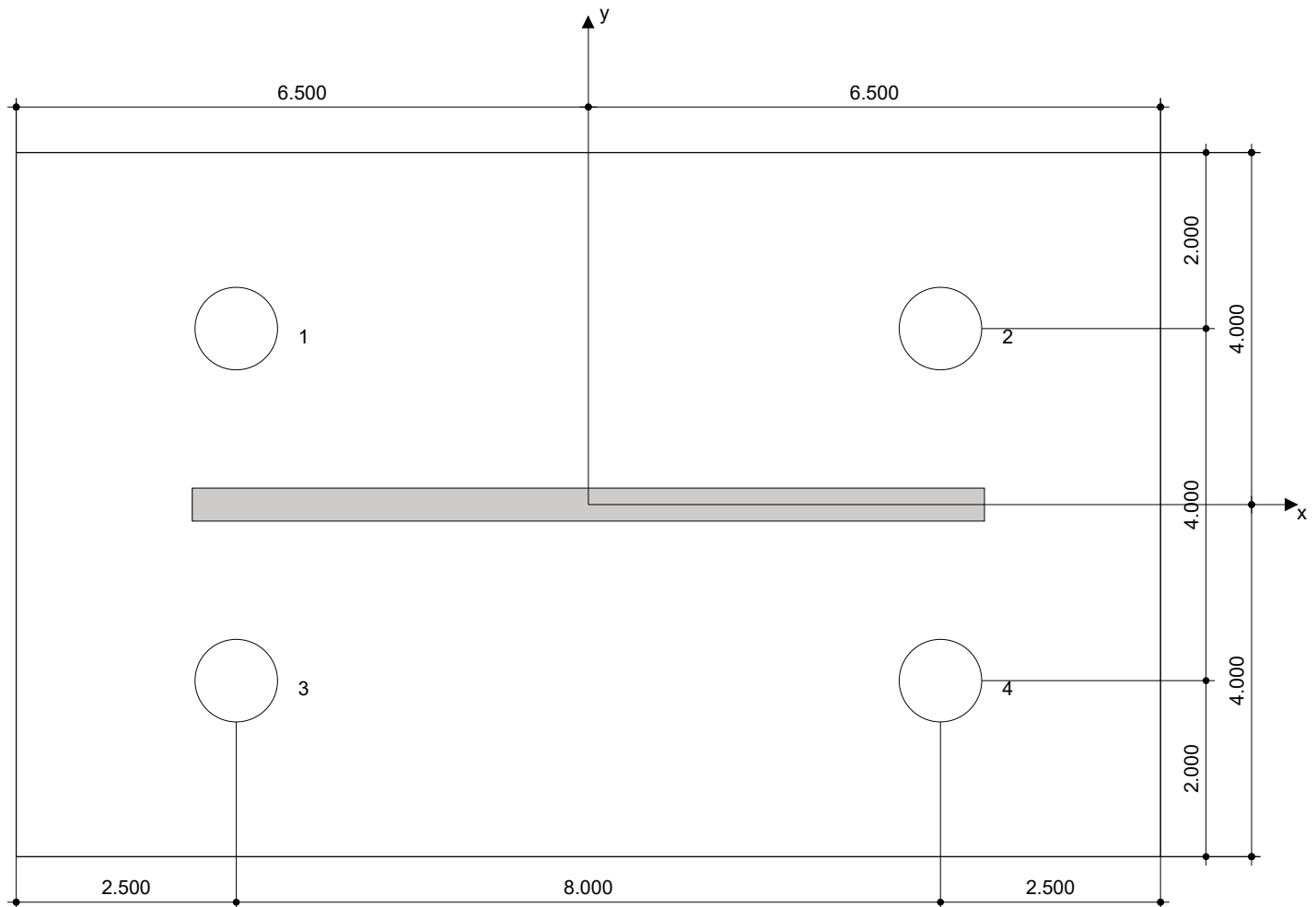
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## 6 Installation data

Anchor plate, steel: -  
Profile: Rectangular plates and bars (AISC); 9.000 x 0.375 x 0.000 in.  
Hole diameter in the fixture:  $d_f = 0.938$  in.  
Plate thickness (input): 0.500 in.  
Recommended plate thickness: not calculated  
Drilling method: -  
Cleaning: No cleaning of the drilled hole is required

Anchor type and diameter: Hex Head ASTM F 1554 GR. 36 7/8  
Installation torque: -  
Hole diameter in the base material: - in.  
Hole depth in the base material: 6.000 in.  
Minimum thickness of the base material: 7.052 in.



### Coordinates Anchor in.

Anchor	x	y	C <sub>-x</sub>	C <sub>+x</sub>	C <sub>-y</sub>	C <sub>+y</sub>
1	-4.000	2.000	-	-	-	-
2	4.000	2.000	-	-	-	-
3	-4.000	-2.000	-	-	-	-
4	4.000	-2.000	-	-	-	-

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## 7 Remarks; Your Cooperation Duties

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- You must take all necessary and reasonable steps to prevent or limit damage caused by the Software. In particular, you must arrange for the regular backup of programs and data and, if applicable, carry out the updates of the Software offered by Hilti on a regular basis. If you do not use the AutoUpdate function of the Software, you must ensure that you are using the current and thus up-to-date version of the Software in each case by carrying out manual updates via the Hilti Website. Hilti will not be liable for consequences, such as the recovery of lost or damaged data or programs, arising from a culpable breach of duty by you.

**CONCRETE FOUNDATION DESIGN**

Seal	Title SUMMIT LOT 71 TYP FOUNDATION WALL	Project # 170450	Date NOV. 23, 2017
		Designer AMG	Scale
		Checked by	Sheet # 01

Toronto 416.593.5300 | Waterloo 519.616.0895 | Victoria 778.817.1010 | Halifax 902.701.0185 | blackwell.ca

- DESIGN THE TYPICAL FOUNDATION, SEE SECTION 1/S-300
- ASSUME THE EXTERIOR GRADE IS FULL HEIGHT, AT THE GROUND LEVEL
- THE GEOTECHNICAL REPORT NOTES THAT  $K_0$  MUST BE 0.5 FOR THE AT REST CONDITION
  - CONSIDER SEISMIC PRESSURE COEFFICIENT

$$h = 9' \approx 2750 \text{ mm}$$

$$\gamma = 136 \text{ pcf} \approx 21.4 \text{ kN/m}^3 \text{ UNIT WEIGHT OF SOIL AS PER GEOTECH}$$

$$f_c' = \text{ASSUME } 30 \text{ psi} = 20.7 \text{ MPa}$$

$$\rightarrow \text{SPECIFY \#5 BARS } \phi = 0.625'' = 15.875 \text{ mm} \rightarrow A_b = 197.3 \text{ mm}^2 \approx 200 \text{ mm}^2$$

$$\hookrightarrow 60 \text{ psi GRADE} = 400 \text{ MPa}$$



$$\text{MAX MF} = 24.71 \text{ kNm/m}$$

$$\hookrightarrow \text{REBAR REQUIRED TO RESIST, \#5 @ 540 mm (21'' dc)}$$

$$\text{SPECIFY \#5 @ 18'' dc VIF, VOF, HEF}$$

- SOIL REPORT RECOMMENDS 20" STRIP FOOTINGS

# Blackwell DESIGN OF SIMPLE FOUNDATION WALLS

Last Modified by: 8 Feb. 2007  
 Project Name: Summit Lot 71  
 Project Number: 170450  
 Engineer: AMG

02

## GEOMETRY

H	2.75 m
H1	2.75 m
Hn	2.75 m
P1	2.40 kPa
P2	31.83 kPa
P1-P2	-29.43 kPa
Rb	30.27 kN/m
Rt	16.79 kN/m
Mfmax	24.71 kN-m/m
Mf @ notch	0.00 kN-m/m
$\Delta\_Hsoil$	0.1375

## SOIL PROPERTIES

$\gamma$	21.4 kN/m <sup>3</sup>
$K_o$	0.50
q	4.8 kPa

## WALL

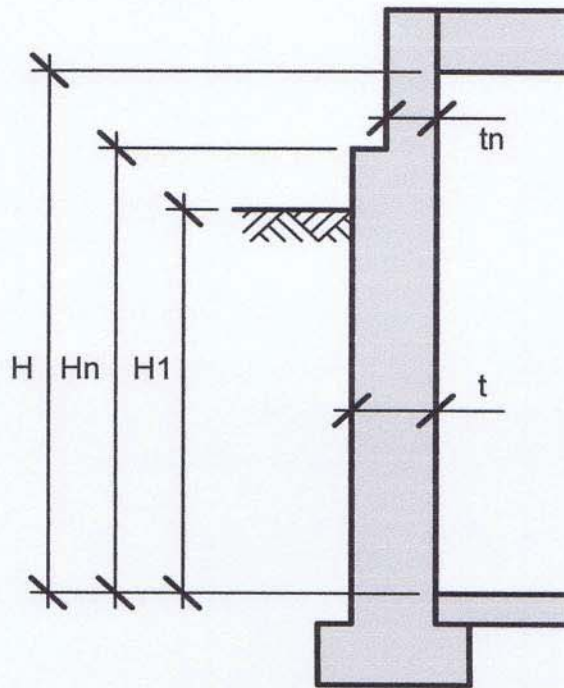
t	250 mm
tn	250 mm
Cover	40 mm
Bar Size	15 M
d	202 mm
dn	202 mm
$A_{sreq}$	370 mm <sup>2</sup> /m
Spacing	540 mm

\* Vertical Bars, Near Face

## MATERIALS

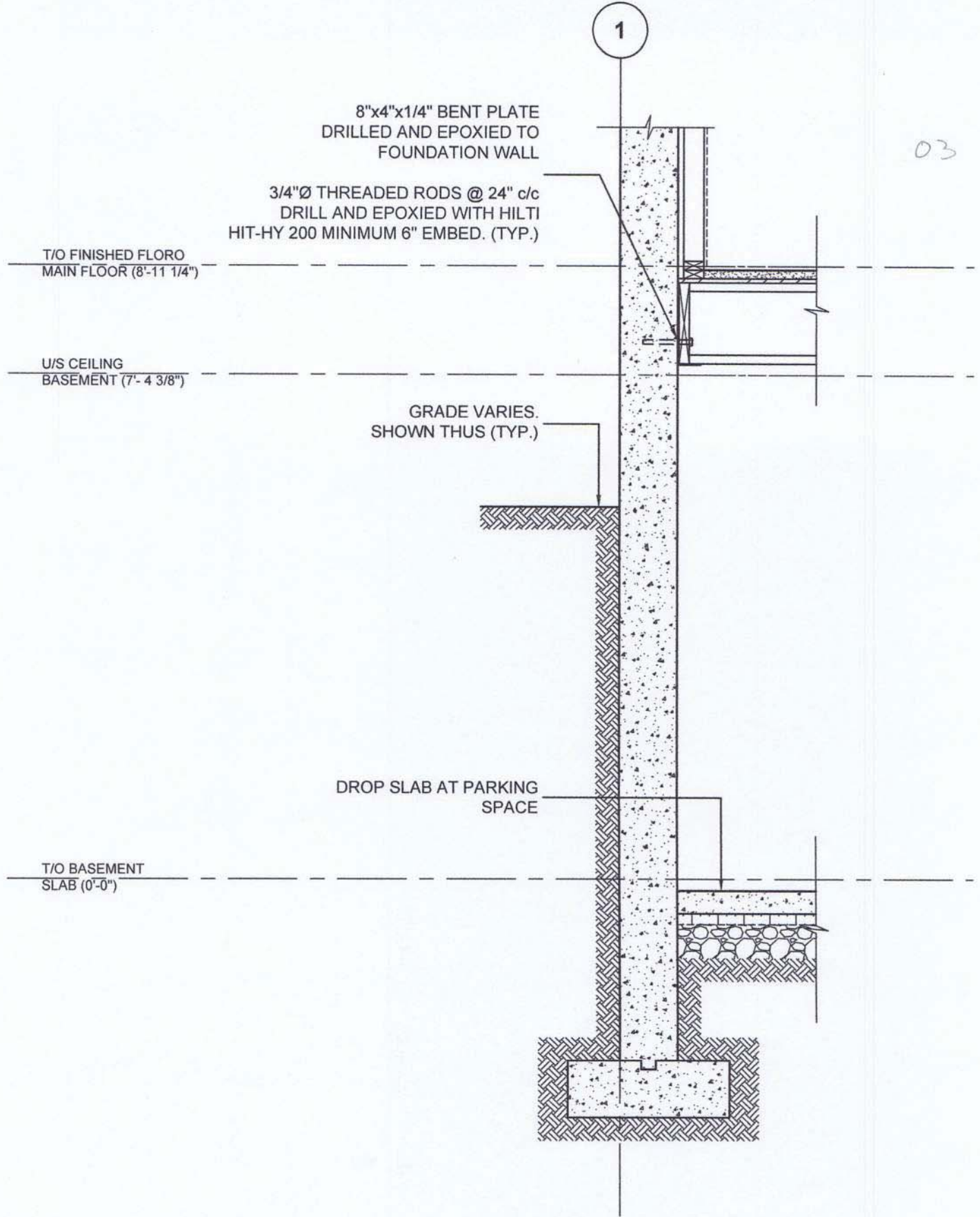
$f_c$	20.7 MPa
$\phi_c$	0.65
$\alpha_1$	0.82
C	11018.97
$\phi_s$	0.85
$f_y$	400 MPa

## SURCHARGE



#5 BARS HAVE SAME AREA AS 15M METRIC

03



8"x4"x1/4" BENT PLATE  
DRILLED AND EPOXIED TO  
FOUNDATION WALL

3/4"Ø THREADED RODS @ 24" c/c  
DRILL AND EPOXIED WITH HILTI  
HIT-HY 200 MINIMUM 6" EMBED. (TYP.)

T/O FINISHED FLOOR  
MAIN FLOOR (8'-11 1/4")

U/S CEILING  
BASEMENT (7'-4 3/8")

GRADE VARIES.  
SHOWN THUS (TYP.)

DROP SLAB AT PARKING  
SPACE

T/O BASEMENT  
SLAB (0'-0")

1  
S-300

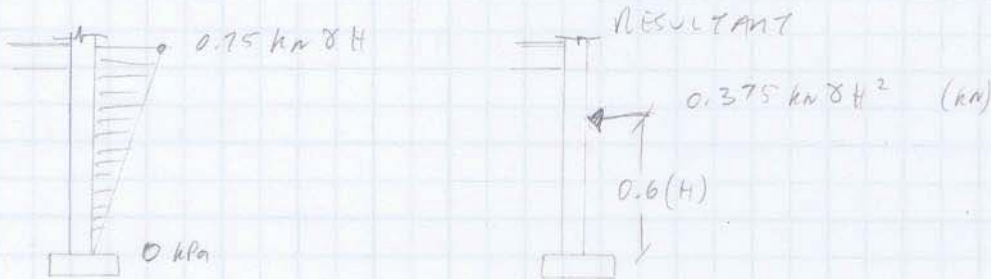
1/2" = 1'-0"

Seal	Title SUMMIT LOT 71 TYP FOUNDATION WALLS	Project # 170450	Date NOV. 24, 2017
		Designer AMG	Scale
		Checked by	Sheet # 04

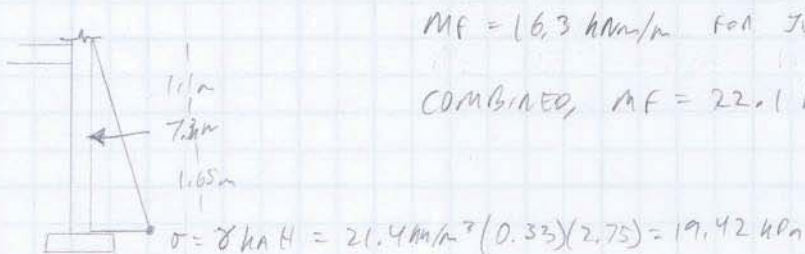
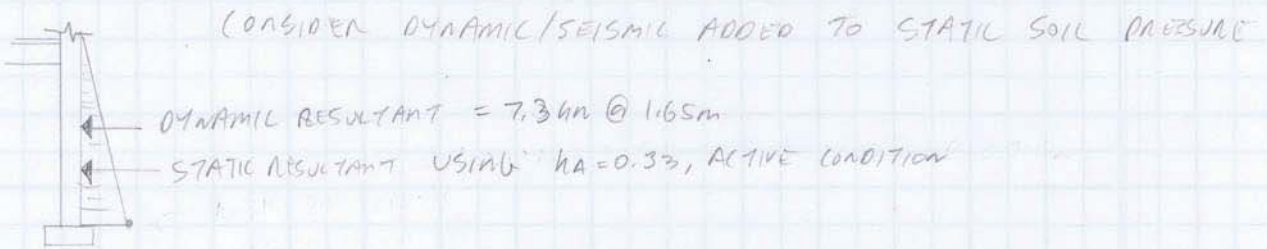
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- CONSIDER SEISMIC HORIZONTAL THRUST ON FOUNDATION WALL PRODUCED BY GROUND MOTION ACTIVE CONDITION AND ADD THAT TO THE STATIC SOIL PRESSURE

- THE GEOTECHNICAL REPORT INDICATES THAT THE DYNAMIC HORIZONTAL THRUST CAN BE APPROXIMATED AS AN INVERTED TRIANGLE, RESULTANT ACTING 0.6xH OF THE BOTTOM OF WALL



USING THE SEISMIC ACTIVE COEFFICIENT OF 0.17, THE PRESSURE IS 0 kPa TO 5.3 kPa, RESULTANT = 7.3 kN @ 2.75m(0.6) = 1.65m



THE MOMENT FROM SEISMIC IS LESS THAN THE AT REST  $M_F = 29.7 \text{ kNm}$ ,  
 ∴ THE DESIGN IS OKAY FOR SEISMIC THRUST, #5 @ 12" O/C ACCEPTABLE

Seal	Title SUMMIT LOT 71 BUTRESS WALL	Project # 170450	Date NOV. 24, 2017
		Designer AMB	Scale
		Checked by	Sheet # 05

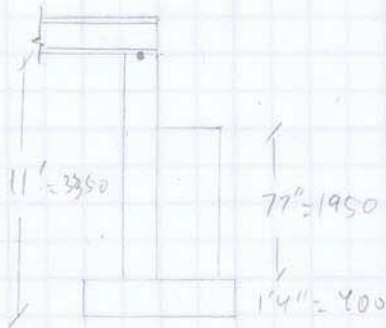
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- DESIGN A BUTRESS FOUNDATION WALL TO RESIST THE GROUND FLOOR 1B1 BEAM REACTIONS

- REFER LOT 71 1B1 BEAM REACTIONS

MAX. { GRAVITY/VERTICAL REACTIONS  $R_V = 99.6 \text{ kips} = 443.2 \text{ kN}$   
 LATERAL/HORIZONTAL REACTIONS  $H_F = 18.3 \text{ kips} = 81.5 \text{ kN}$

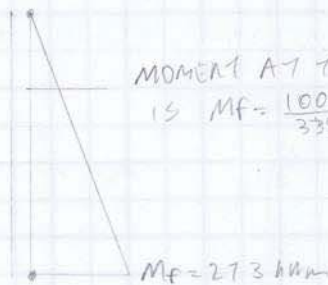
- REFER TO SECTION 7/S-300



OVERTURNING MOMENT IN BUTRESS WALL

IS  $M_F = H_F d = 81.5 \text{ kN}(3.350 \text{ m})$

$M_F = 273.0 \text{ kNm @ U/S OF FTG}$



MOMENT AT TOP OF BUTRESS (COUNTERFORT WALL)

IS  $M_F = \frac{1000}{3350}(273) = 81.5 \text{ kNm}$

300 below top of wall,  $M_F = 106 \text{ kNm}$

- SINCE THE BUTRESS IS NOT FULL HEIGHT OF THE WALL, CONFIRM 250mm THICK WALL CAN RESIST  $M_F = 106 \text{ kNm}$



OVER A 1m WIDTH, 9-#5'S REQUIRED  $M_R = 106.7 \text{ kNm}$

7-#6'S REQ'D  $M_R = 114.8 \text{ kNm}$

∴ THE WALL SECTION WILL REQUIRE AT LEAST #6 BARS @ 200 o/c, EA. FACE



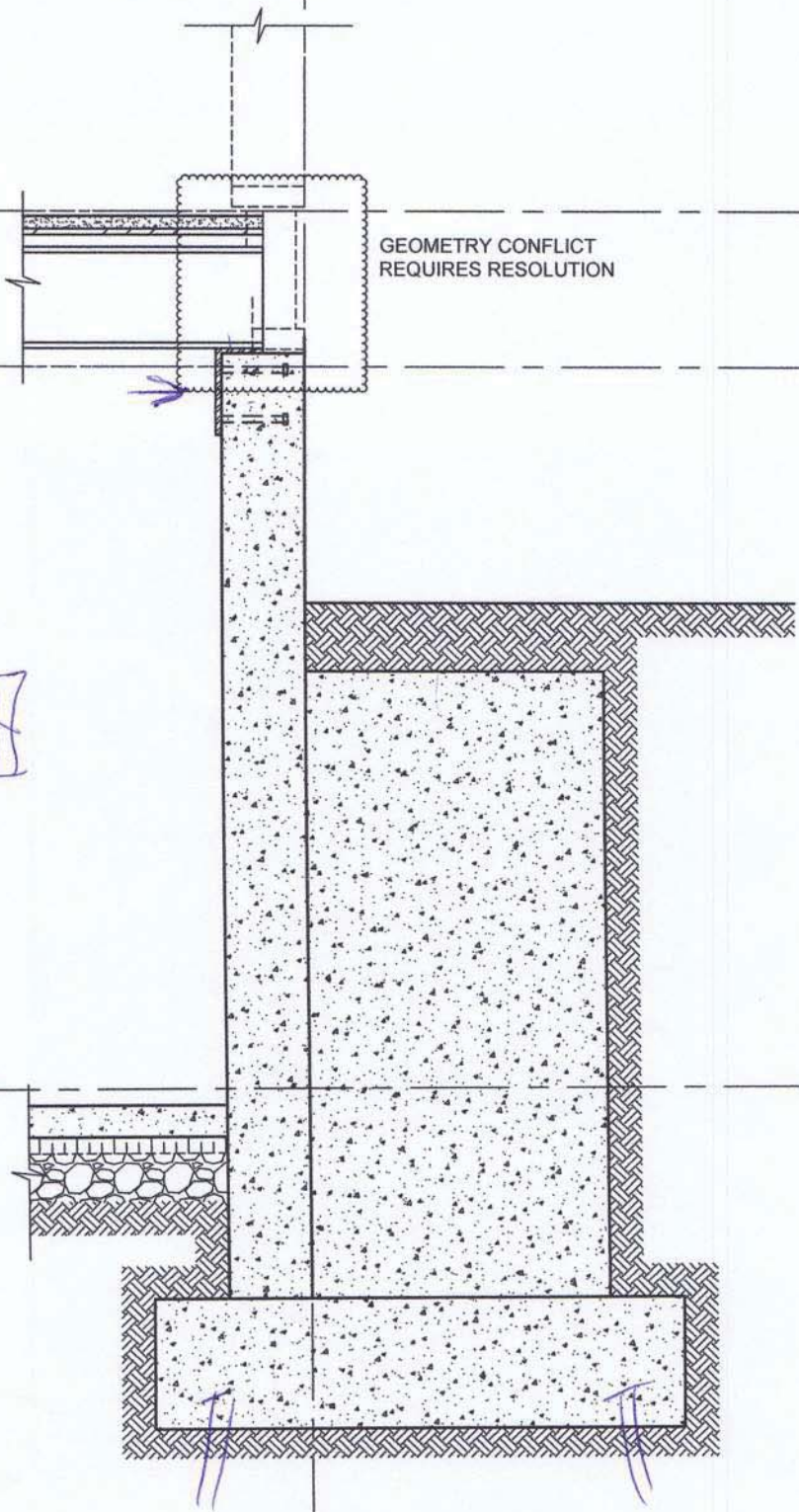
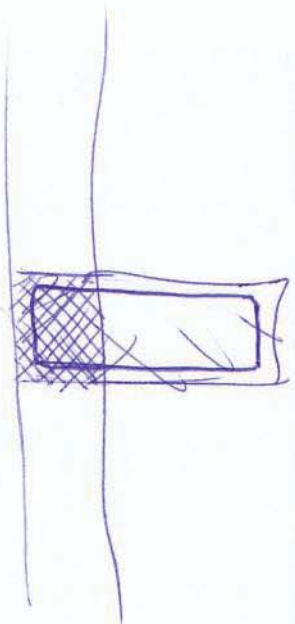
5

T/O FINISHED FLOOR  
MAIN FLOOR (8'-11 1/4")

U/S CEILING  
BASEMENT (7'-4 3/8")

GEOMETRY CONFLICT  
REQUIRES RESOLUTION

T/O BASEMENT  
SLAB (0'-0")



7  
S-300

1/2" = 1'-0"

Seat	Title SUMMIT LOT 71 BUTRESS WALL	Project # 170450	Date NOV 24, 2017
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• TRIAL SIZE:

THE BUTRESS WALL IS 10" x 36" (PLUS 10" WALL), TOTAL OF 10" x 46" (250 x 1160)

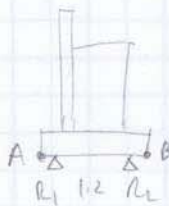
THE BASE IS 5'-4" x 2'-2" x 16" THICK ON 4 HELICAL PILES (1625 x 660 x 400)

• OVERTURNING

$M_f = 273 \text{ kNm}$

- CHECK RESISTANCE TO OVERTURNING, EVEN THOUGH THE WALL WILL REQUIRE PILES

- CONSIDER 1m LENGTH



WALL	$0.25\text{m} \times 1\text{m} \times 2.95\text{m} = 0.738\text{m}^3$	$P_0 = 24 \text{ kN/m}^3 (0.7375\text{m}^3) = 17.7 \text{ kN}$
BUTRESS	$0.15\text{m} \times 0.91 \times 1.95 = 0.444\text{m}^3$	$P_0 = 10.6 \text{ kN}$
BASE	$0.4\text{m} \times 0.66 \times 1.625 = 0.429\text{m}^3$	$P_0 = 10.3 \text{ kN}$

$M_{RA} = 0.9 [17.7\text{ kN}(0.3575\text{m}) + 10.6(0.9375\text{m}) + 10.3(0.8125\text{m})]$   
 $= 0.9 [24.63 \text{ kNm}]$

$M_{RA} = 22.2 \text{ kNm} < M_f$

$M_{RB} = 0.9 [17.7(1.2675) + 10.6(0.6875) + 10.3(0.8125)]$

$M_{RB} = 32.1 \text{ kNm} < M_f$

HELICAL REACTIONS



ABOUT C, AS A COUPLE,  $R = 455 \text{ kN}$  TO RESIST MOMENT

2 HELICALS AT EACH, EACH RESISTING  $R = 227.5 \text{ kN}$ , CONFIRM STUDY AND TIE FOR BOTTOM LEBAR

Seat	Title SUMMIT LOT 71 BUTTRESS WALL	Project # 170450	Date NOV 27, 2017
		Designer AMB	Scale
		Checked by	Sheet # 08

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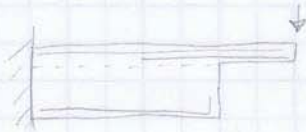
• SLIDING

THIS PARTICULAR BUTTRESS WALL DOES NOT NEED TO CHECK FOR SLIDING SINCE THE STRIP FOOTING IS CONTINUOUS AND HAS RETURNS NEARBY

∴ THE ENTIRE BASE/STRIP WILL NOT SLIDE DUE TO THE SOIL PRESSURE OR BEAM REACTIONS

• BUTTRESS WALL REINFORCING

DESIGN THE WALL AS A REINFORCED CONCRETE BEAM



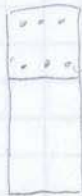
$M_f = 273 \text{ kNm}$   
 $V_f = 81.5 \text{ kN}$



3-#6 BARS,  $M_r = 306.5 \text{ kNm} > M_f = 273$

↳  $A_b = 284 \text{ mm}^2$  FOR #6 (SMALLER THAN COM)

- CONSIDER WALL PORTION ABOVE EXTERIOR GRADE,  $M_f = 106.6 \text{ kNm}$



3-#6 BARS YIELDS  $M_r = 42.8 \text{ kNm}$

4-#6 " " "  $M_r = 50.4 \text{ kNm}$

→ REASONABLE SOLUTION NOT FOUND IN 250x250, USE WALL

- CONSIDER A 750 WIDE x 250 BEAM, c/w 7-#6 BARS  $M_r = 107.9 \text{ kNm}$

- CONSIDER SHEAR IN BUTTRESS  $V_f = 81.5 \text{ kN}$

250x1160 DEEP SECTION YIELDS  $V_c = 180.4 \text{ kN}$  CONCRETE ONLY, SINCE THE BUTTRESS ISN'T FULL HEIGHT, DISCONTINUITY IN THE SECTION REQUIRES STAY & TIE ACTION

∴ SPECIFY #4 BARS @ 250 HORIZONTAL TIES AS A MINIMUM

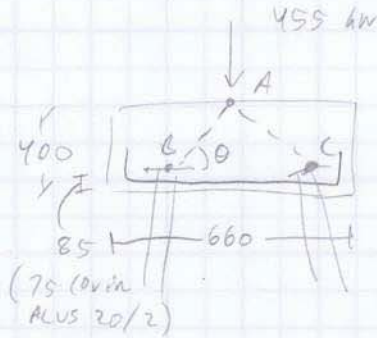
- CHECK SHEAR IN WALL

Seal	Title SUMMIT LOT 71 BUTRESS WALL	Project # 170450	Date NOV 27, 2017
		Designer AMB	Scale
		Checked by	Sheet # 09

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- DETERMINING REINFORCING WITHIN BASE/FOOTING

DESIGN START DIRECTION REINFORCING



$$\sum F_x @ \theta = 0$$

$$\theta = \tan^{-1}\left(\frac{315}{400}\right) = 38.2^\circ \text{ FOR } 400 \text{ APART}$$

$$46.4^\circ \text{ FOR } 300 \text{ APART}$$

$$F_{AB} = 227.5 \text{ kN}$$

$$0 = F_{BC} - \cos 38.2 (F_{AB}) \Rightarrow F_{BC} = 178.8 \text{ kN}$$

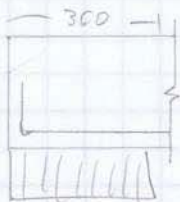
$$\#5 \text{ BAR, } A_b = 200 \text{ mm}^2 \quad T_r = 0.85(400 \text{ MPa})(200 \text{ mm}^2) = 68 \text{ kN}$$

3 - #5

$$\#6 \text{ BARS } A_b = 284 \text{ mm}^2 \quad T_r = 96.56 \text{ kN} \rightarrow 2 - \#6$$

- CONSIDER FOOTING OVERHANG (TOE REINFORCING)

$$\text{SLS } 2700 \text{ psf} = 138.9 \text{ kPa}$$



$$M_f = 1.5(138.9 \text{ kPa})(1 \text{ m}) \times 0.3^2 / 2 = 9.37 \text{ kNm} \rightarrow \text{MIN STEEL}$$

$$V_f = 1.5(138.9 \text{ kPa})(1 \text{ m})(0.3) = 62.5 \text{ kN}$$

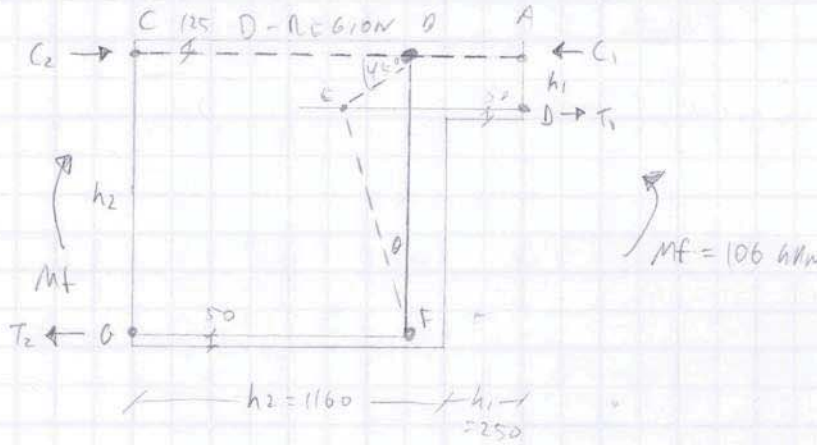
400 THICK  $\rightarrow$  MIN STEEL #5 @ 250

FTG. BASE IS 1625 x 660 x 400, SPECIFY 4 - #6 LONG DIRECTION  
10 - #6 SHORT DIRECTION  
TOP & BOTTOM

Seal	Title SUMMIT LOT 71 BUTTRESS WALL	Project # 170450	Date NOV. 27, 2017
		Designer AMG	Scale
		Checked by	Sheet # 10

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- CONSIDER THE CHANGE IN BEAM THICKNESS, DESIGN FOR SHEAR



$b = 250 \text{ mm}$   
 $f_c' = 20.7 \text{ MPa}$   
 40 mm COVER  
 $\#6 A_b = 284 \text{ mm}^2$

• COMPUTE BOUNDARY STRESSES.  $A_{s req'd} \approx \frac{M_f}{\phi_s (y \cdot (0.9d))}$

SECTION	h	d	$A_{s req'd}$	USE	$a = \frac{\phi_s A_s f_y}{\phi_c \lambda f_c b}$ ASSUM #6 ST. YIELD
1	250	200	$1732 \text{ mm}^2$	7-#6 ( $1988 \text{ mm}^2$ )	$a = 249.1 \text{ mm}$
2	1160	1100	$315 \text{ mm}^2$	2-#6 ( $568 \text{ mm}^2$ )	$a = 70.9 \text{ mm}$

$$C_1 = T_1 = 106 \text{ kNm} / (250 - 50 - 250/2) = 1413.3 \text{ kN} = F_{AB} = F_{DE}$$

$$C_2 = T_2 = 106 \text{ kNm} / (1160 - 50 - 250/2) = 107.6 \text{ kN} = F_{BC} = F_{FL}$$

$$\sum F_x @ B = 0 \rightarrow + f_{BC} - F_{AB} + \cos 45^\circ F_{BE} = 0$$

$$1413.3 - 107.6 + 0.707 F_{BE} = 0 \Rightarrow F_{BE} = -1846.8 \text{ kN}$$

$$\theta = \tan^{-1} \left( \frac{75}{910} \right) = 4.71^\circ$$

$$\sum F_x @ E = 0 \rightarrow + F_{DE} - \sin 45^\circ F_{BE} - \sin 4.71^\circ F_{FE} = 0$$

$$1413.3 - 0.707(-1846.8) - 0.082(F_{FE}) = 0 \Rightarrow F_{FE} = 1312.3 \text{ kN}$$

$$\text{CHECK } \sin 4.71^\circ F_{FE} = 107.75 \text{ kN} \approx F_{FL} \checkmark$$

$$\sum F_y @ F = 0 \rightarrow \cos 4.71^\circ F_{FE} - F_{BF} = 0 \Rightarrow F_{BF} = 1307.9 \text{ kN}$$

$$\hookrightarrow A_s = \frac{1307.9 \text{ kN}}{0.85(400 \text{ MPa})} = 3846.8 \text{ mm}^2$$

$\hookrightarrow 15\text{-}\#4$  (10540 STIRRUPS)  
 $\hookrightarrow$  NOT FEASIBLE

Seal	Title SUMMIT LOT 71 BUTRESS WALL	Project # 170450	Date NOV. 27, 2017
		Designer AMB	Scale
		Checked by	Sheet # 11

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• CHECK STAIRS

STAIR AL:

@ NODE # CCT NODE  $\rightarrow f_{cv} = 0.75 \phi_c f_c' = 10.1 \text{ MPa}$

$1413.3 \text{ kN} / (10.1 \text{ MPa} \times 250 \text{ mm}) = 559.7 \text{ mm STAIR WIDTH}$

$\rightarrow$  THIS WIDTH IS NOT FEASIBLE,  
ALONG WITH THE TIES REQUIRED

• CONSIDER ANOTHER APPROACH TO LOOK AT THE SHEAR BETWEEN THE  
250mm WALL AND THE BUTRESS

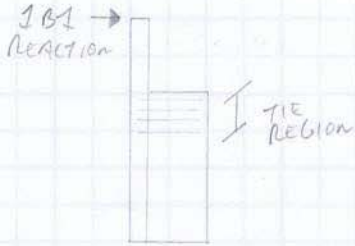
$V_f = 81.5 \text{ kN}$

$\rightarrow$  THE LENGTH OF WALL REQUIRED TO RESIST  
THAT AMOUNT OF SHEAR IS

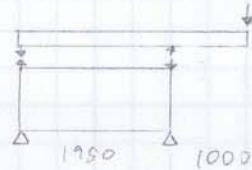
Seal	Title	Project #	Date
	SUMMIT LOT 71	170450	NOV. 28, 2017
	BUTTRESS WALL	Designer	Scale
		AMG	
		Checked by	Sheet #
			12

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- SINCE STAIR AND TIE ACTION WALL UNABLE TO THEORIZE, STAIRS INTO THE 250mm BUTTRESS WALL, CONSIDER INTERNAL SUPPORTS FROM THE WALL (750mm WIDE/LENGTH) AND THEN BEARING ON THE BUTTRESS, OR PULLING IT AWAY



INTERNALLY:



$$V_c = \phi \lambda B \sqrt{f_c'} b_w d_v$$

$$V_c = 0.65(1)(0.124) \sqrt{20.7} (250) A$$

$$V_c = 136.0 d_v$$

$$d_v = 600 \text{ FOR 81.5 kN SHEAR}$$

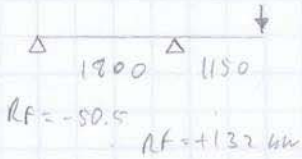
$$V_c = 136(750) = 102 \text{ kN}$$

ASSUMING LENGTHS OF 1950, 1000

$$R_L = 42 \text{ kN UPLIFT}$$

$$R_{RIGHT} = 125 \text{ kN}$$

- ASSUME THAT THE TIE REGION WILL BE 300mm, ALLOWING THE VERTICAL BARS IN THE BUTTRESS TO DEVELOP WITHIN A REGION WITH FREQUENT TIES



CHECK THIS REACTION FOR BEARING

$$0.75 \phi_c f_c' = 10.1 \text{ MPa}$$

$$\sigma = \frac{P}{A} \Rightarrow A_{req'd} = \frac{132 \text{ kN}}{10.1 \text{ MPa}} = 13069.3 \text{ mm}^2$$

FOR A 250mm BUTTRESS WALL, ONLY 52.3mm HEIGHT IS REQUIRED  $\therefore$  COMPRESSION IS OKAY

- CHECK REACTION IN TENSION,  $R_L = 132 \text{ kN}$

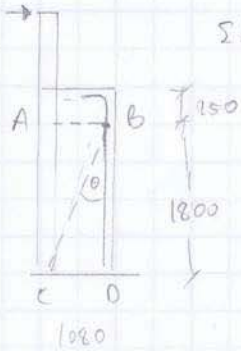
$$4 \text{ BAR } A_b = 129 \text{ mm}^2 \rightarrow T_r = 43.9 \text{ kN} \rightarrow 4 \text{ BARS REQUIRED, 2 TIES}$$

- SPECIFY 3-#4 TIES @ 150 SPACING AT TOP OF BUTTRESS WALL

Seal	Title SUMMIT LOT 71 BUTTRASS WALL	Project # 170450	Date NOV. 27, 2017
		Designer AMG	Scale
		Checked by	Sheet # 13

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• CONSIDER TOP CORNER OF BUTTRASS WALL



$$\sum F_x = 0 @ B \quad \theta = \tan^{-1}\left(\frac{1080}{1800}\right) = 31.0^\circ$$

$$F_{AB} - \sin 31.0(F_{BL}) = 0$$

$$132 \text{ kN} - \sin 31.0(F_{BL}) = 0 \Rightarrow F_{BL} = 256.6 \text{ kN TENS}$$

$$\sum F_y @ B \quad \cos 31.0(256.6) = F_{BD} = 220.0 \text{ kN}$$

$$\#6 \text{ BAR } A_b = 284 \text{ mm}^2 \quad T_r = 96.56 \text{ kN}$$

↳ 3-#6 BARS REQUIRED

• CONSIDER 182 REACTION PULLING THE WALL, SAME DIRECTION AS THE SOIL, ASSUME PUL SOIL HEIGHT OF 2.75 m

$$M_F = 24.71 \text{ kNm/m} \quad \text{SOIL PRESSURE FOR 1m WIDTH}$$

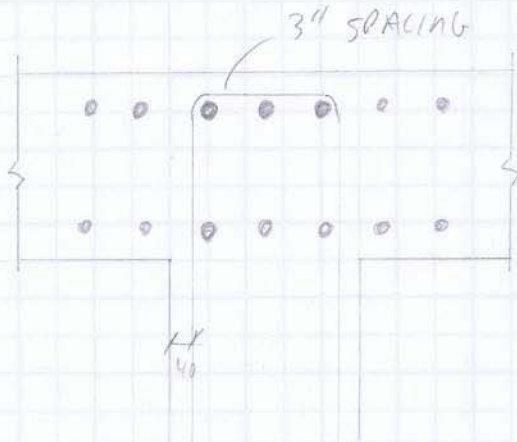
$$M_F = 273 \text{ kNm} \quad \text{MOMENT FROM REACTION}$$

$$M_{F_{TOT}} = 297.1 \text{ kNm}$$

$$1160 \times 250 \text{ r/w } 3\text{-}\#6 \quad M_r = 306.5 \text{ kNm} > M_F = 297.1 \text{ kNm}$$

$$4\text{-}\#6 \quad M_r = 401.8 \text{ kNm}$$

$$3\text{-}\#7 \quad M_r = 357.6 \text{ kNm}$$

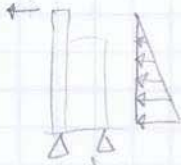




Seal	Title SUMMIT LOT 71 BUSINESS WALL	Project # 170450	Date Nov. 28, 2017
		Designer AMB	Scale
		Checked by	Sheet # 14

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- DETERMINE HELICAL PILES REQUIRED



$$M_{TOTAL} = 297.1 \text{ kNm}$$

$$R_{PILE REACTION} = 297.1 \text{ kNm} / 0.6 \text{ m} = 495.2 \text{ kN (T/C)}$$

THIS PROJECT IS USING HELI-PILE HPFT-331 (3", 5/16" WALL) HELICAL PILE WITH COMPRESSION CAPACITY OF 150 kIPS = 667.2 kN  
TENSION CAPACITY OF 62 kIPS = 275.8 kN

AT EACH END, 2 HELICAL PILES ARE REQUIRED

- AFTER DISCUSSIONS WITH AOM, WE AGREED TO INCREASE THE FOOTING SIZE SUCH TO REDUCE THE HELICAL PILE FORCES

- SPACE 6' APART = 1.83m, FOOTING BECOMES 7'4" = 2235mm LONG

$$R_{REACTION} = 297.1 \text{ kNm} / 0.914 = 324.9 \text{ kN (T/C)}$$

$$\rightarrow 162.5 \text{ kN PER HELICAL PILE} = 36.5 \text{ kIPS}$$

- IF 5' APART = 1.524m

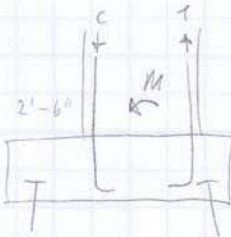
$$R_{REACTION} = 297.1 \text{ kNm} / 0.762 \text{ m} = 389.9 \text{ kN (T/C)} \rightarrow 195 \text{ kN} = 43.8 \text{ kIPS}$$

- USE 5' APART, CONSIDER UPLIFT CASE AND INCREASE FOOTING DEPTH AS REQUIRED

Seat	Title SUMMIT LOT 71 BUTTRESS WALL FOOTING	Project # 170450	Date NOV. 29, 2017
		Designer AMB	Scale
		Checked by	Sheet # 15

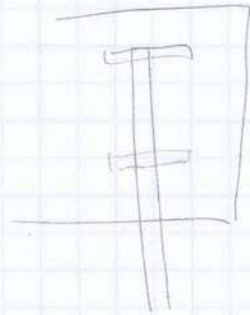
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- CONSIDER UPLIFT CONDITION IN FOOTING



TIC = 390 kN, EACH HELICAL PILE IS TAKING 195 kN = 45 kips

- AS AN ALTERNATIVE TO WELDING OR HOOKED BARS TO THE HELICAL PILE PLATE, EXTEND THE SHAFT UP AND WELD A SECOND FIELD PLATE AT THE TOP OF THE BEAM



∴ WITH A HELICAL PILE CAP PLATE AT THE TOP OF THE FOOTING, CHECK TO ENSURE THAT BEAM SHEAR IS OKAY

- USE A 26" x 26" F76 SECTION

M<sub>f</sub> = 297 kNm      c/w 7-#6 BARS M<sub>r</sub> = 357.6 kNm  
V<sub>f</sub> = 390 kN

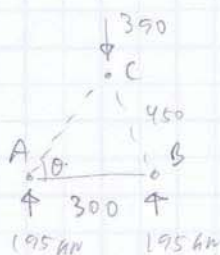
- FOR A 26" x 26" F76 V<sub>c</sub> = 238.1 kN ∴ V<sub>s</sub> IN STIRRUPS MUST BE GREATER THAN 390 - 238.1 = 151.9

2-10M STIRRUPS @ 6" O/C V<sub>s</sub> = 276.9 kN  
2-#4 STIRRUPS @ 6" O/C V<sub>s</sub> = 356 kN      V<sub>r</sub> = 594 > V<sub>f</sub>

- CHECK 2'-6" OVERHANG

$$M_f = 1.5(140 \text{ kN})(0.66)(0.762)^2 / 2 = 40.2 \text{ kNm} < M_r = 357.6 \text{ kNm}$$

- CHECK STIRRUPS FOR PILE CAP DESIGN



$$\theta = \tan^{-1}\left(\frac{450}{390}\right) = 56.3^\circ$$

$$\sum F_y @ A = 0 \Rightarrow 195 \text{ kN} - \sin 56.3^\circ (F_{AC}) \Rightarrow F_{AC} = 234.4 \text{ kN}$$

$$\sum F_x @ A = 0 \Rightarrow -\cos 56.3^\circ (F_{AC}) + F_{AB} \Rightarrow F_{AB} = 130 \text{ kN}$$

↳ 3-#4 TIES

- INCREASE STIRRUP SPACING TO 4"

∴ BUTTRESS WALL c/w 3-#7 BARS  
F76 c/w 7-#6, #4 TIES @ 4"

Seal	Title SUMMIT LOT 71 BUTTRESS WALL	Project # 170450	Date DEC. 7, 2017
		Designer AMB	Scale
		Checked by	Sheet # 16

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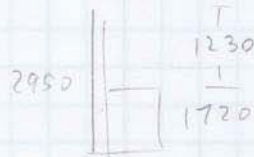
ADAM NOTED THAT THE EXTERIOR GRADE AT THE BUTTRESS WALL CHANGED, THE TOP OF BUTTRESS WALL MUST BE LOWERED

- RE-DESIGN BUTTRESS AS REQUIRED

PREVIOUS CONDITION



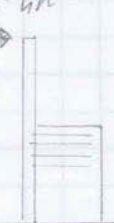
NEW CONDITION:



- ADAM CONFIRMED THAT  $P_{B1}$  REACTION WILL ONLY BE OUTWARD, PUTTING COMPRESSION ON THE TOP OF THE FOUNDATION WALL,  $\therefore$  PREVIOUS CALCS ARE CONSERVATIVE

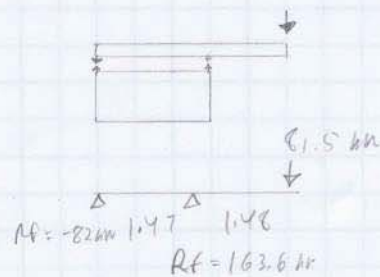
- CONSIDER TIES REQUIRED WITH LOWERED BUTTRESS WALL

$H_f = 81.5 \text{ kN}$   
 $P_{B1}$  REACTION



TIE REGION IS 20"  $\approx$  500

INTERNALLY:



- COMPRESSION  $0.75(0.65)(2017 \text{ MPa}) = 10.1 \text{ MPa}$   
 $A_{req'd} = \frac{163.6 \text{ kN}}{10.1 \text{ MPa}} = 1620 \text{ mm}^2 \rightarrow 250 \text{ mm} \times 65 \text{ mm}$   
STAY

- TIED REGION WILL HAVE 4 TIES, 2 LEGS  
 $T_r = 0.85(400)(129 \text{ mm}^2) \times 2 \times 4 = 350.9 \text{ kN} > R_f = 163.6 \text{ kN}$   
 $\rightarrow$  OKAY

Seal	Title SUMMIT LOT 71 BUTTRESS WALL	Project # 170450	Date DEC. 7, 2017
		Designer AMG	Scale
		Checked by	Sheet # 17

Toronto 416.593.5300 | Waterloo 519.616.0895 | Victoria 778.817.1010 | Halifax 902.701.0185 | blackwell.ca

- NOW CONSIDER MOMENTS/SHEARS IN FOUNDATION WALL AND IN BUTTRESS

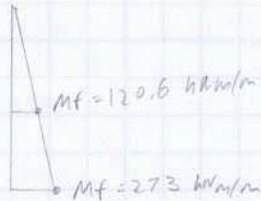
- THE MOMENT FROM THE IBI REACTION STAYS THE SAME

$$M_f = 273 \text{ kNm/m}$$

$$1160 \times 250 \text{ r/w } 3\text{-}\#7 \rightarrow M_r = 409.4 \text{ kNm}$$

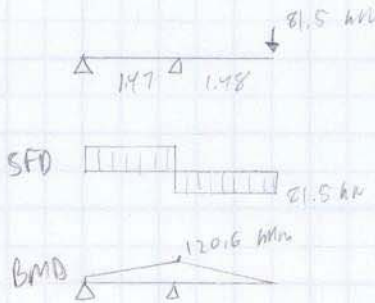
$$1160 \text{ r/w } 3\text{-}\#6 \rightarrow M_r = 306.5 \text{ kNm}$$

- MOMENT AT TOP OF BUTTRESS WALL



- MOMENT FROM SOIL PRESSURE  $M_f = 24.7 \text{ kNm}$

- MOMENT FROM INTERNAL SUPPORTS



∴ Design the 250mm foundation wall such that it can withstand

$$M_f = 120.6 \text{ kNm/m}$$

$$V_f = 81.5 \text{ kN/m}$$

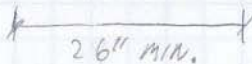


IF WALL PORTION IS  $750 \times 250$

$$V_c = 88.7 \text{ kN} = V_r > 81.5 \text{ kN} = V_f$$

$$\text{r/w } 7\text{-}\#7 \quad M_r = 131.9 \text{ kNm} > M_f = 120.6 \text{ kNm}$$

$$\text{IF } 650 \times 250 \text{ r/w } 7\text{-}\#7 \quad M_r = 124 \text{ kNm} > M_f$$



- INCREASE BUTTRESS WALL REINFORCING TO 3-#7'S,  
WALL REINFORCING TO BE 7-#7 EACH FACE,  
ENSURE TIED 'COLUMN' WITHIN FOUNDATION  
WALL IS AT LEAST 26" WIDE

**Title: Concrete Flexure**  
 Master Created By: J. David Bowick  
 Date: 08/08/2016  
 Master Last modified by:  
 Date:  
 Notes:  
 Project Name: Summit Lot 71  
 Project Number: 170450  
 Name: AMG  
 Date: 07-Dec-17

Load	
Mf	120.6 kNm

Material	
$\phi_s$	0.85
$f_y$	400 MPa
$\phi_c$	0.65
$f'_c$	20.7 MPa
$\alpha_1$	0.81895

Geometry	
b	650 mm
h	250 mm
Cover	40 mm
Aggregate	20 mm

Trial	
Bar Size	#7
$d_b$	22.225 mm
$A_b$	387 mm <sup>2</sup>
d	198.8875 mm
$A_{sreq}$	2574 mm <sup>2</sup>
No. Bars	7

Reinforcing	
Min. Clear	41.9 mm
$s_{min}$	71.8 mm
s	75 mm
<b>Row 1</b>	
Bar Size	#7
Bars	7
$A_s$	2709 mm <sup>2</sup>
d	198.8875 mm
<b>Row 2</b>	
Bar Size	30M
Bars	
$A_s$	mm <sup>2</sup>
d	123.8875 mm
<b>Row 3</b>	
Bar Size	35M
Bars	
$A_s$	mm <sup>2</sup>
d	48.8875 mm

Calculations	
T	921.06 kN
d	198.9 mm
$\beta_1 c$	128.6 mm
Mr	124.0 kNm
Mf/Mr	0.97

Bar Size	$d_b$ (mm)	$A_b$ (mm <sup>2</sup> )
10M	11.3	100.0
15M	16	200.0
20M	19.5	300.0
25M	25.2	500.0
30M	29.9	700.0
35M	35.7	1000.0
45M	45	1500.0
55M	55	2500.0
#3	9.525	71.0
#4	12.7	129.0
#5	15.875	200.0
#6	19.05	284.0
#7	22.225	387.0
#8	25.4	509.0
#9	28.65	645.0
#10	32.26	819.0
#11	35.81	1006.0
#14	43	1452.0
#18	57.3	2581.0
#18J	59.4	2678.0

**Title: Concrete Flexure**  
 Master Created By: J. David Bowick  
 Date: 08/08/2016  
 Master Last modified by:  
 Date:  
 Notes:  
 Project Name: Summit Lot 71  
 Project Number: 170450  
 Name: AMG  
 Date: 07-Dec-17

Load	
Mf	273 kNm

Material	
$\phi_s$	0.85
$f_y$	400 MPa
$\phi_c$	0.65
$f'_c$	20.7 MPa
$\alpha_1$	0.81895

Geometry	
b	250 mm
h	1160 mm
Cover	40 mm
Aggregate	20 mm

Trial	
Bar Size	#6
$d_b$	19.05 mm
$A_b$	284 mm <sup>2</sup>
d	1110.475 mm
$A_{sreq}$	755 mm <sup>2</sup>
No. Bars	3

Reinforcing	
Min. Clear	41.9 mm
$s_{min}$	71.8 mm
s	75 mm
<b>Row 1</b>	
Bar Size	#7
Bars	3
$A_s$	1161 mm <sup>2</sup>
d	1108.8875 mm
<b>Row 2</b>	
Bar Size	30M
Bars	
$A_s$	mm <sup>2</sup>
d	1033.8875 mm
<b>Row 3</b>	
Bar Size	35M
Bars	
$A_s$	mm <sup>2</sup>
d	958.8875 mm

Calculations	
T	394.74 kN
d	1108.9 mm
$\beta_1 c$	143.3 mm
Mr	409.4 kNm
Mf/Mr	0.67

Bar Size	$d_b$ (mm)	$A_b$ (mm <sup>2</sup> )
10M	11.3	100.0
15M	16	200.0
20M	19.5	300.0
25M	25.2	500.0
30M	29.9	700.0
35M	35.7	1000.0
45M	45	1500.0
55M	55	2500.0
#3	9.525	71.0
#4	12.7	129.0
#5	15.875	200.0
#6	19.05	284.0
#7	22.225	387.0
#8	25.4	509.0
#9	28.65	645.0
#10	32.26	819.0
#11	35.81	1006.0
#14	43	1452.0
#18	57.3	2581.0
#18J	59.4	2678.0

## Title: Concrete Flexure

Master Created By: J. David Bowick

Date: 8/8/2016

Master Last modified by:

Date: 2017.12.12

Notes: DESIGN FOR FTG 1 - 4'-0" x 10'-0" x 1'-4" r/w 5 #6 BARS LONG DIRECTION  
EACH FACE 8 #6 BARS SHORT DIRECTION EACH FACE

Project Name: Summit Lot 71

Project Number: 170450

Name: BG

Date: 2017.12.12

Load	
Mf	26 kNm

Material	
$\phi_s$	0.85
$f_y$	400 MPa
$\phi_c$	0.65
$f'_c$	30 MPa
$\alpha_1$	0.805

Geometry	
b	1000 mm
h	400 mm
Cover	75 mm
Aggregate	20 mm

Trial	
Bar Size	#6
$d_b$	19.05 mm
$A_b$	284 mm <sup>2</sup>
d	315.475 mm
$A_{sreq}$	244 mm <sup>2</sup>
No. Bars	1

Reinforcing	
Min. Clear	30.0 mm
$s_{min}$	49.1 mm
s	250 mm
<u>Row 1</u>	
Bar Size	#6
Bars	1
$A_s$	284 mm <sup>2</sup>
d	315.475 mm
<u>Row 2</u>	
Bar Size	#6
Bars	
$A_s$	mm <sup>2</sup>
d	65.475 mm
<u>Row 3</u>	
Bar Size	#6
Bars	
$A_s$	mm <sup>2</sup>
d	-184.525 mm

Calculations	
T	96.56 kN
d	315.5 mm
$\beta_{1c}$	6.2 mm
Mr	30.2 kNm
Mf/Mr	0.86

Bar Size	$d_b$ (mm)	$A_b$ (mm <sup>2</sup> )
10M	11.3	100.0
15M	16	200.0
20M	19.5	300.0
25M	25.2	500.0
30M	29.9	700.0
35M	35.7	1000.0
45M	45	1500.0
55M	55	2500.0
#3	9.525	71.0
#4	12.7	129.0
#5	15.875	200.0
#6	19.05	284.0
#7	22.225	387.0
#8	25.4	509.0
#9	28.65	645.0
#10	32.26	819.0
#11	35.81	1006.0
#14	43	1452.0
#18	57.3	2581.0
#18J	59.4	2678.0

**APPENDIX A - Design Loads**





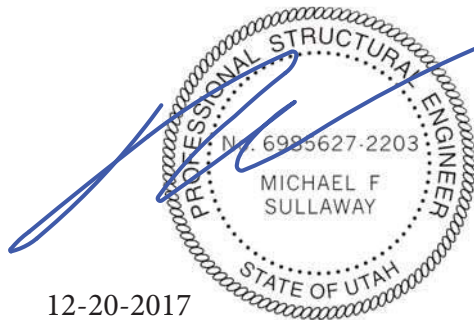
10815 Rancho Bernardo RD., SD, CA 92127  
projectmanager@sullawayeng.com  
Phone: 858-312-5150 Fax: 858-777-3534

**Design Loads**  
for  
Summit Village House 71

Summit Powder Mountain  
Eden, UT

Project # 16078

date;  
11/22/2017



12-20-2017



10815 Rancho Bernardo RD., SD, CA 92127  
 projectmanager@sullawayeng.com  
 Phone: 858-312-5150 Fax: 858-777-3534

PROJECT: Summit Village House 71

DATE: 11/22/2017

PROJ. NO.: 16078

ENGINEER: MV

CLIENT: Blackwell

building code; IBC 2015

units; pounds, feet unless noted otherwise

## Seismic Analysis- Building Structure

Design Force

(ASCE 7-10 chapter 12)

Latitude 41.362934

Longitude -111.746575

$S_1 = 0.269$  (from USGS)

$I = 1.0$

$S_{DS} = 0.636$

Risk Category II

$S_{D1} = 0.334$

Seismic Design Cat. D

$S_s = 0.812$

$F_a = 1.18$

$F_v = 1.86$

R	$\Omega$	Cd
8	3	5.5
3.25	2	3.25
6.5	3	4

ASCE Table 12.2-1 C.1. "Steel special moment frame"

ASCE Table 12.2-1 B.3. "Steel ordinary concentrically braced frame"

ASCE Table 12.2-1 A.16. "Wood frame sheer wall"

$$V = C_s W$$

$$C_s = S_{DS} / (R/I)$$

Vertical Seismic Loads

$$E_v = 0.2 S_{DS} DL$$

## Live Loads

Typical  $L_o = 40$  psf

Roof  $20$  psf

Reduction

$$L = L_o (0.25 + 15 / \sqrt{K_{LL} A_T})$$

$$R_1 = 0.6$$

$$K_{LL} = 1$$

$$R_2 = 1$$

$$L_r = L_o R_1 R_2 = 12.0 \text{ psf}$$

$A_T$ (sf)	L (psf)
200	40.00
500	36.83
750	31.91
1000	28.97
1500	25.49



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DATE: 11/22/2017

PROJ. NO.: 16078

ENGINEER: MV

CLIENT: Blackwell

building code; IBC 2015

units; pounds, feet unless noted otherwise

## Snow Load

ASCE Chap. 7

Exposure Factor:	$C_e =$	=	1.0	
Thermal Factor:	$C_t =$	=	1.0	
Importance Factor:	$I =$	=	1.0	
Roof Slope Factor:	$C_s =$	=	1.0	
Ground Snow Load:	$p_g =$	=	270	psf
Flat Roof Snow Load:	$p_f =$	$0.7 * C_e * C_t * I * p_g =$	189	psf
Sloped Roof Snow Load:	$p_s =$	$C_s * p_f =$	189	psf

## Drift

$$l_u = 19 \text{ ft}$$

$$h_d = .43 * (l_u)^{0.33} * (p_g + 10)^{0.25} - 1.5 = 3.2 \text{ ft leeward}$$

$$h_d = 2.7 \text{ ft windward} \quad w = 4h_d^2 / h_c = 11.8 \text{ ft}$$

$$h_c = 9.25 - h_b = 3.0 \text{ ft}$$

$$\gamma = 0.13p_g + 14 < 30 = 30 \text{ pcf}$$

$$h_b = 6.3 \text{ ft}$$

$$\text{drift load} = p_d = h_d \gamma = 88.5 \text{ psf}$$

$p_d = 0$  at a distance of 'w' from wall

## Unbalanced Snow Load

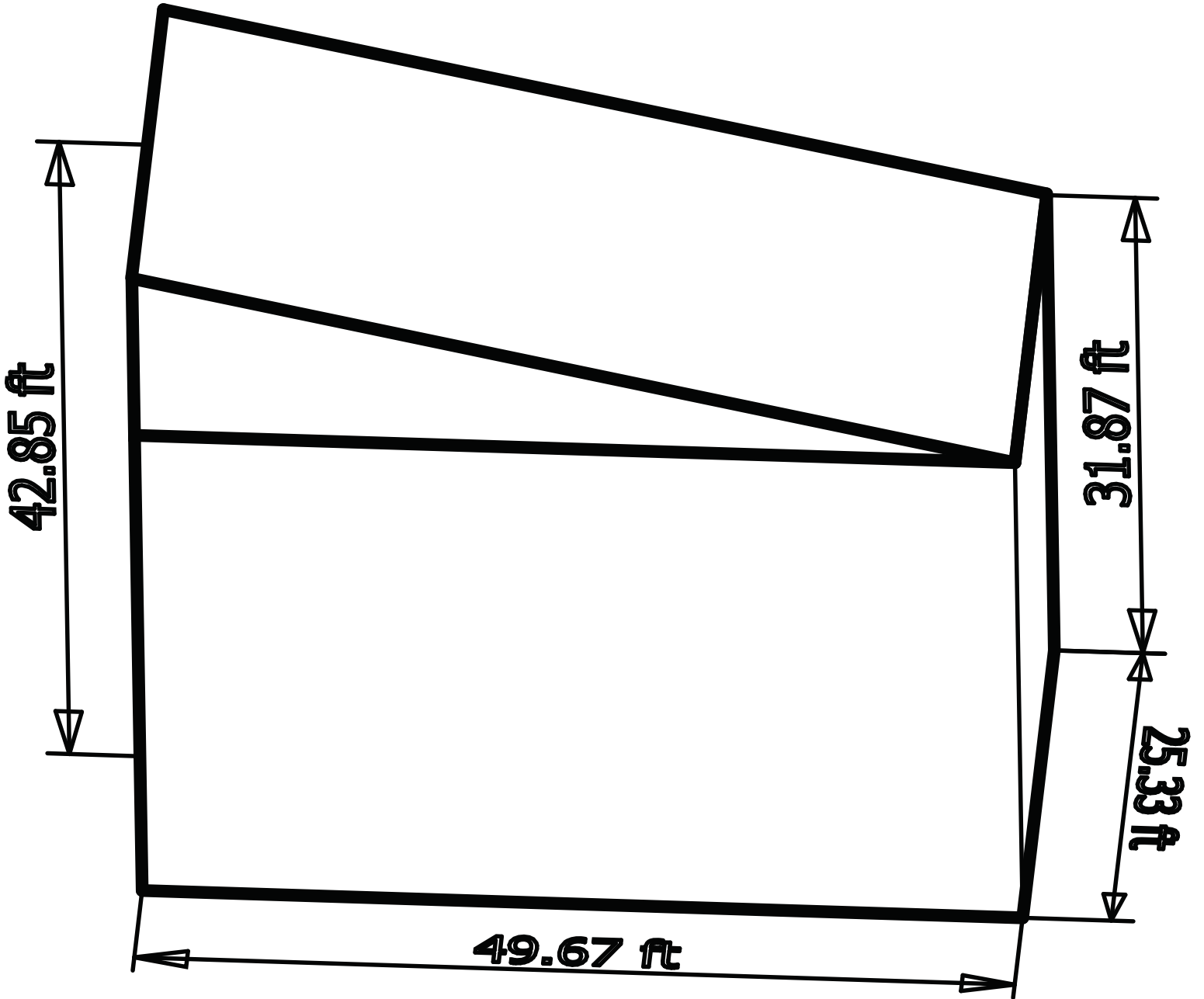
ASCE 7.6.1

$$W = 6 \text{ ft (} W < 20 \text{ft, therefore unbalanced load} = l_p \text{ \& slope} = 14 \text{ deg.)}$$

$$l p_g = 270 \text{ psf}$$

## Frost Depth

40 inches




**Design Maps Detailed Report**
**ASCE 7-10 Standard (41.36293°N, 111.74658°W)**

Site Class D – “Stiff Soil”, Risk Category I/II/III

**Section 11.4.1 — Mapped Acceleration Parameters**

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain  $S_s$ ) and 1.3 (to obtain  $S_1$ ). Maps in the 2010 ASCE-7 Standard are provided for Site Class B.

Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

 From [Figure 22-1](#) <sup>[1]</sup>

$$S_s = 0.812 \text{ g}$$

 From [Figure 22-2](#) <sup>[2]</sup>

$$S_1 = 0.269 \text{ g}$$

**Section 11.4.2 — Site Class**

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class D, based on the site soil properties in accordance with Chapter 20.

Table 20.3–1 Site Classification

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf

Any profile with more than 10 ft of soil having the characteristics:

- Plasticity index  $PI > 20$ ,
- Moisture content  $w \geq 40\%$ , and
- Undrained shear strength  $\bar{s}_u < 500$  psf

F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		
---	--------------------	--	--

 For SI: 1ft/s = 0.3048 m/s 1lb/ft<sup>2</sup> = 0.0479 kN/m<sup>2</sup>

### Section 11.4.3 — Site Coefficients and Risk-Targeted Maximum Considered Earthquake (MCE<sub>R</sub>) Spectral Response Acceleration Parameters

Table 11.4-1: Site Coefficient  $F_a$ 

Site Class	Mapped MCE <sub>R</sub> Spectral Response Acceleration Parameter at Short Period				
	$S_s \leq 0.25$	$S_s = 0.50$	$S_s = 0.75$	$S_s = 1.00$	$S_s \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of  $S_s$

For Site Class = D and  $S_s = 0.812$  g,  $F_a = 1.175$

Table 11.4-2: Site Coefficient  $F_v$ 

Site Class	Mapped MCE <sub>R</sub> Spectral Response Acceleration Parameter at 1-s Period				
	$S_1 \leq 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \geq 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of  $S_1$

For Site Class = D and  $S_1 = 0.269$  g,  $F_v = 1.861$

---

Equation (11.4-1):  $S_{MS} = F_a S_s = 1.175 \times 0.812 = 0.954 \text{ g}$

---

Equation (11.4-2):  $S_{M1} = F_v S_1 = 1.861 \times 0.269 = 0.501 \text{ g}$

---

#### Section 11.4.4 — Design Spectral Acceleration Parameters

Equation (11.4-3):  $S_{DS} = \frac{2}{3} S_{MS} = \frac{2}{3} \times 0.954 = 0.636 \text{ g}$

---

Equation (11.4-4):  $S_{D1} = \frac{2}{3} S_{M1} = \frac{2}{3} \times 0.501 = 0.334 \text{ g}$

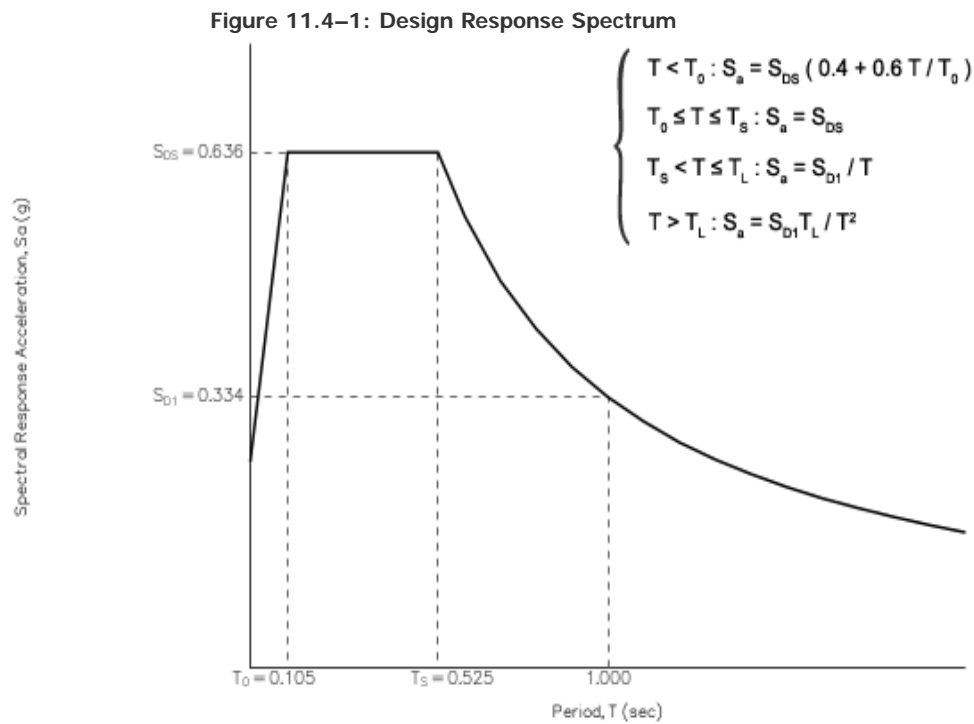
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#### Section 11.4.5 — Design Response Spectrum

From [Figure 22-12](#) <sup>[3]</sup>

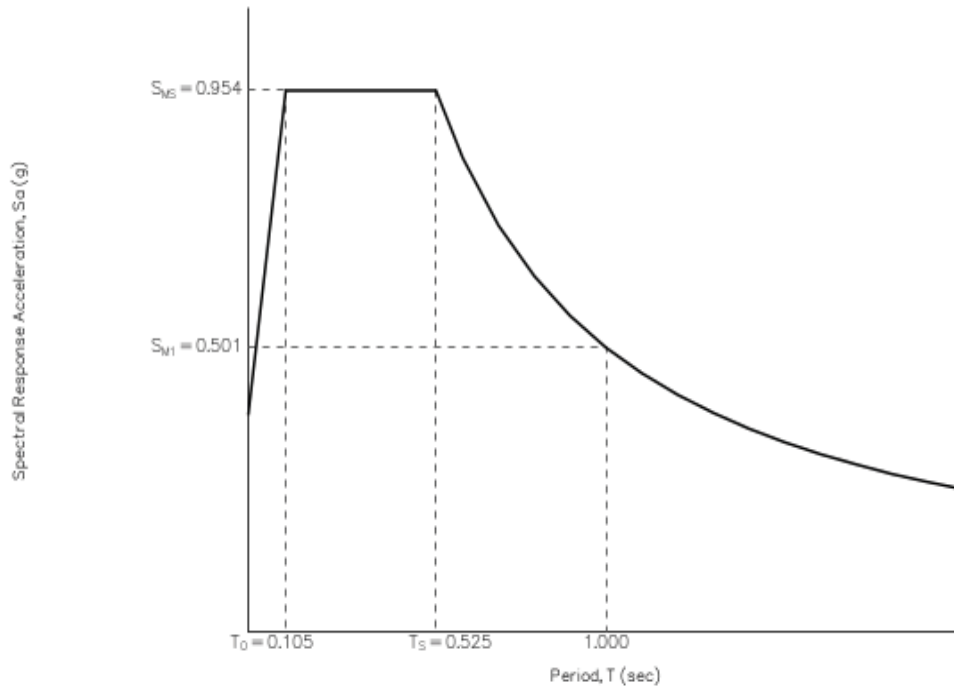
$T_L = 8 \text{ seconds}$

---



### Section 11.4.6 — Risk-Targeted Maximum Considered Earthquake (MCE<sub>R</sub>) Response Spectrum

The MCE<sub>R</sub> Response Spectrum is determined by multiplying the design response spectrum above by 1.5.





**Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F**

From [Figure 22-7](#) <sup>[4]</sup>

PGA = 0.312

Equation (11.8–1):

$$PGA_M = F_{PGA} PGA = 1.188 \times 0.312 = 0.371 \text{ g}$$

Table 11.8–1: Site Coefficient  $F_{PGA}$

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of PGA

For Site Class = D and PGA = 0.312 g,  $F_{PGA} = 1.188$

**Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)**

From [Figure 22-17](#) <sup>[5]</sup>

$C_{RS} = 0.932$

From [Figure 22-18](#) <sup>[6]</sup>

$C_{R1} = 0.927$

## Section 11.6 — Seismic Design Category

Table 11.6-1 Seismic Design Category Based on Short Period Response Acceleration Parameter

VALUE OF $S_{DS}$	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \leq S_{DS} < 0.33g$	B	B	C
$0.33g \leq S_{DS} < 0.50g$	C	C	D
$0.50g \leq S_{DS}$	D	D	D

For Risk Category = I and  $S_{DS} = 0.636 g$ , Seismic Design Category = D

Table 11.6-2 Seismic Design Category Based on 1-S Period Response Acceleration Parameter

VALUE OF $S_{D1}$	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \leq S_{D1} < 0.133g$	B	B	C
$0.133g \leq S_{D1} < 0.20g$	C	C	D
$0.20g \leq S_{D1}$	D	D	D

For Risk Category = I and  $S_{D1} = 0.334 g$ , Seismic Design Category = D

Note: When  $S_1$  is greater than or equal to 0.75g, the Seismic Design Category is E for buildings in Risk Categories I, II, and III, and F for those in Risk Category IV, irrespective of the above.

Seismic Design Category  $\equiv$  "the more severe design category in accordance with  
Table 11.6-1 or 11.6-2" = D

Note: See Section 11.6 for alternative approaches to calculating Seismic Design Category.

### References

1. Figure 22-1: [https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010\\_ASCE-7\\_Figure\\_22-1.pdf](https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-1.pdf)
2. Figure 22-2: [https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010\\_ASCE-7\\_Figure\\_22-2.pdf](https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-2.pdf)
3. Figure 22-12: [https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010\\_ASCE-7\\_Figure\\_22-12.pdf](https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-12.pdf)
4. Figure 22-7: [https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010\\_ASCE-7\\_Figure\\_22-7.pdf](https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-7.pdf)
5. Figure 22-17: [https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010\\_ASCE-7\\_Figure\\_22-17.pdf](https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-17.pdf)
6. Figure 22-18: [https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010\\_ASCE-7\\_Figure\\_22-18.pdf](https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-18.pdf)

# MecaWind Pro v2.2.7.6 per ASCE 7-10

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Date : 11/10/2017 Project No. : JobNo  
 Company Name : True Designed By : Engineer  
 Address : Address Description : Description  
 City : City Customer Name : Customer  
 State : State Proj Location : Location  
 File Location: C:\Users\Matt\AppData\Roaming\MecaWind\Default.wnd

## Directional Procedure Simplified Diaphragm Building (Ch 27 Part 2)

Basic Wind Speed(V)	=	115.00 mph	Exposure Category	=	C
Structural Category	=	II	Flexible Structure	=	No
Natural Frequency	=	N/A	Kd Directional Factor	=	0.85
Importance Factor	=	1.00	Zg	=	900.00 ft
Alpha	=	9.50	Bt	=	1.00
At	=	0.11	Bm	=	0.65
Am	=	0.15	l	=	500.00 ft
Cc	=	0.20	Zmin	=	15.00 ft
Epsilon	=	0.20	Slope of Roof(Theta)	=	12.47 Deg
Pitch of Roof	=	2.652707 : 12	Type of Roof	=	MONOSLOPE
h: Mean Roof Ht	=	37.36 ft	Eht: Eave Height	=	31.87 ft
RHt: Ridge Ht	=	42.85 ft	Overhead Type	=	No Overhang
OH: Roof Overhang at Eave	=	.00 ft	Bldg Length Along Ridge	=	25.33 ft
Bldg Length Along Ridge	=	25.33 ft	Bldg Width Across Ridge	=	49.67 ft

## Gust Factor Calculations

**Gust Factor Category I Rigid Structures - Simplified Method**  
 Gust1: For Rigid Structures (Nat. Freq.>1 Hz) use 0.85 = 0.85

**Gust Factor Category II Rigid Structures - Complete Analysis**  
 Zm:  $0.6 * Ht$  = 22.42 ft  
 lzm:  $Cc * (33 / Zm)^{0.167}$  = 0.21  
 Lzm:  $l * (Zm / 33)^{Epsilon}$  = 462.78 ft  
 Q:  $(1 / (1 + 0.63 * ((B + Ht) / Lzm)^{0.63}))^{0.5}$  = 0.91  
 Gust2:  $0.925 * ((1 + 1.7 * lzm * 3.4 * Q) / (1 + 1.7 * 3.4 * lzm))$  = 0.88

**Gust Factor Summary**  
 Not a Flexible Structure use the Lessor of Gust1 or Gust2 = 0.85

## Table 26.11-1 Internal Pressure Coefficients for Buildings, GCpi

GCpi : Internal Pressure Coefficient = +/-0.18

## Topographic Adjustment

$0.33 * z$  = 1.00  
 Kzt ( $0.33 * z$ ): Topographic factor at elevation  $0.33 * z$  = 1.00  
 Vtopo: Adjust V per Para 27.5.2:  $V * [Kzt(0.33 * z)]^{0.5}$  = 115.00 mph

## MWFRS Diaphragm Building Wind Pressures per Ch 27 Pt 2

All pressures shown are based upon STRENGTH Design, with a Load Factor of 1  
**MWFRS Pressures for Wind Normal to 25.33 ft wall (Normal to Ridge)**

### WALL PRESSURES PER TABLE 27.6-1

L/B: Bldg Dim in Wind Dir / Bldg Dim Normal to Wind Dir = 1.96  
 h: Height to top of Windward Wall = 42.85 ft  
 ph: Net Pressure at top of wall (windward + leeward) = 30.07 psf  
 p0: Net Pressure at bottom of wall (windward + leeward) = 26.31 psf

ps: Side wall pressure acting away from wall =  $.64 * ph$  = -19.13 psf  
 pl: Leeward wall pressure acting away from wall =  $.27 * ph$  = -8.25 psf  
 pwh: Windward wall press @ top acting toward wall =  $ph - pl$  = 21.82 psf  
 pw0: Windward wall press @ bot acting toward wall =  $p0 - pl$  = 18.06 psf

### ROOF PRESSURES PER TABLE 27.6-2

h: Mean Roof Height = 37.360 ft  
 Lambda: Exposure Adjustment Factor = 1.000  
 Slope: Roof Slope = 12.47 Deg

Table 27.6-2 indicates a slope less than 9.46 Deg is flat, but provides no values for Zone 1 and 2 between 9.46 Deg and 14 Deg, so any slope < 14 deg is treated as flat.

Zone	Load Case1 psf	Load Case2 psf
------	-------------------	-------------------

	Press psf	Area ft^2	Fx Kip	Fy Kip	Fz Kip	Mx K-ft	My K-ft	Mz K-ft
1	.00		.00					
2	.00		.00					
3	-31.64		.00					
4	-28.25		.00					
5	-23.18		.00					

Note: A value of '0' indicates that the zone/load case is not applicable.

**Normal to Ridge - Base Reactions - Walls+Roof +GCpi**

Description	Press psf	Area ft^2	Fx Kip	Fy Kip	Fz Kip	Mx K-ft	My K-ft	Mz K-ft
Roof (0 to h/2)	-31.64	485	.00	3.31	14.97	366.9	.0	.0
Roof (h/2 to h)	-28.25	485	.00	2.95	13.37	65.7	.0	.0
Roof (h to 2h)	-23.18	319	.00	1.60	7.23	-81.9	.0	.0
Windward Wall	21.82	278	.00	6.07	.00	226.8	.0	.0
Windward Wall	20.86	253	.00	5.28	.00	142.0	.0	.0
Windward Wall	19.98	253	.00	5.06	.00	85.4	.0	.0
Windward Wall	19.10	253	.00	4.84	.00	33.2	.0	.0
Windward Wall	18.22	47	.00	0.86	.00	0.8	.0	.0
Leeward Wall	-8.25	807	.00	6.66	.00	106.1	.0	.0
Side Wall	-19.13	1583	-30.28	.00	.00	.0	482.5	.0
Side Wall	-19.13	1583	30.28	.00	.00	.0	-482.5	.0
Side Wall	-19.13	273	-5.22	.00	.00	.0	185.3	43.2
Side Wall	-19.13	273	5.22	.00	.00	.0	-185.3	-43.2
Total	.00	6893	.00	36.64	35.56	945.0	.0	.0

**Normal to Ridge - Base Reactions - Walls Only +GCpi**

Description	Press psf	Area ft^2	Fx Kip	Fy Kip	Fz Kip	Mx K-ft	My K-ft	Mz K-ft
Windward Wall	21.82	278	.00	6.07	.00	226.8	.0	.0
Windward Wall	20.86	253	.00	5.28	.00	142.0	.0	.0
Windward Wall	19.98	253	.00	5.06	.00	85.4	.0	.0
Windward Wall	19.10	253	.00	4.84	.00	33.2	.0	.0
Windward Wall	18.22	47	.00	0.86	.00	0.8	.0	.0
Leeward Wall	-8.25	807	.00	6.66	.00	106.1	.0	.0
Side Wall	-19.13	1583	-30.28	.00	.00	.0	482.5	.0
Side Wall	-19.13	1583	30.28	.00	.00	.0	-482.5	.0
Side Wall	-19.13	273	-5.22	.00	.00	.0	185.3	43.2
Side Wall	-19.13	273	5.22	.00	.00	.0	-185.3	-43.2
Total	.00	5604	.00	28.77	.00	594.3	.0	.0

**Normal to Ridge - Base Reactions - Walls+Roof -GCpi**

Description	Press psf	Area ft^2	Fx Kip	Fy Kip	Fz Kip	Mx K-ft	My K-ft	Mz K-ft
Windward Wall	21.82	278	.00	6.07	.00	226.8	.0	.0
Windward Wall	20.86	253	.00	5.28	.00	142.0	.0	.0
Windward Wall	19.98	253	.00	5.06	.00	85.4	.0	.0
Windward Wall	19.10	253	.00	4.84	.00	33.2	.0	.0
Windward Wall	18.22	47	.00	0.86	.00	0.8	.0	.0
Leeward Wall	-8.25	807	.00	6.66	.00	106.1	.0	.0
Side Wall	-19.13	1583	-30.28	.00	.00	.0	482.5	.0
Side Wall	-19.13	1583	30.28	.00	.00	.0	-482.5	.0
Side Wall	-19.13	273	-5.22	.00	.00	.0	185.3	43.2
Side Wall	-19.13	273	5.22	.00	.00	.0	-185.3	-43.2
Total	.00	5604	.00	28.77	.00	594.3	.0	.0

**Normal to Ridge - Base Reactions - Walls Only -GCpi**

Description	Press psf	Area ft^2	Fx Kip	Fy Kip	Fz Kip	Mx K-ft	My K-ft	Mz K-ft
Windward Wall	21.82	278	.00	6.07	.00	226.8	.0	.0
Windward Wall	20.86	253	.00	5.28	.00	142.0	.0	.0
Windward Wall	19.98	253	.00	5.06	.00	85.4	.0	.0
Windward Wall	19.10	253	.00	4.84	.00	33.2	.0	.0

Windward Wall	18.22	47	.00	0.86	.00	0.8	.0	.0
Leeward Wall	-8.25	807	.00	6.66	.00	106.1	.0	.0
Side Wall	-19.13	1583	-30.28	.00	.00	.0	482.5	.0
Side Wall	-19.13	1583	30.28	.00	.00	.0	-482.5	.0
Side Wall	-19.13	273	-5.22	.00	.00	.0	185.3	43.2
Side Wall	-19.13	273	5.22	.00	.00	.0	-185.3	-43.2
-----								
Total	.00	5604	.00	28.77	.00	594.3	.0	.0

Normal to Ridge - Base Reactions - Walls+Roof MIN

Description	Press psf	Area* ft^2	Fx Kip	Fy Kip	Fz Kip	Mx K-ft	My K-ft	Mz K-ft
-----								
Total	.00	0	.00	.00	.00	.0	.0	.0

Notes - Normal to Ridge

- Note (1) X= Along Building ridge, Y = Normal to Building Ridge, Z = Vertical
- Note (2) MIN = Minimum pressures on Walls = 16 psf and Roof = 8 psf
- Note (3) Area\* = Area of the surface projected onto a vertical plane normal to wind.

MWFRS Pressures for Wind Normal to 49.67 ft wall (Along Ridge)

WALL PRESSURES PER TABLE 27.6-1

L/B: Bldg Dim in Wind Dir / Bldg Dim Normal to Wind Dir = 0.51  
 h: Height to top of Windward Wall = 42.85 ft  
 ph: Net Pressure at top of wall (windward + leeward) = 34.35 psf  
 p0: Net Pressure at bottom of wall (windward + leeward) = 30.76 psf

ps: Side wall pressure acting away from wall = .54 \* ph = -18.55 psf  
 pl: Leeward wall pressure acting away from wall = .38 \* ph = -13.05 psf  
 pwh: Windward wall press @ top acting toward wall = ph-pl = 21.30 psf  
 pw0: Windward wall press @ bot acting toward wall = p0-pl = 17.70 psf

ROOF PRESSURES PER TABLE 27.6-2

h: Mean Roof Height = 37.360 ft  
 Lambda: Exposure Adjustment Factor = 1.000  
 Slope: Roof Slope = 12.47 Deg

Table 27.6-2 indicates a slope less than 9.46 Deg is flat, but provides no values for Zone 1 and 2 between 9.46 Deg and 14 Deg, so any slope < 14 deg is treated as flat.

Zone	Load Case1 psf	Load Case2 psf
1	.00	.00
2	.00	.00
3	-31.64	.00
4	-28.25	.00
5	-23.18	.00

Note: A value of '0' indicates that the zone/load case is not applicable.

Along Ridge - Base Reactions - Walls+Roof +GCpi

Description	Press psf	Area ft^2	Fx Kip	Fy Kip	Fz Kip	Mx K-ft	My K-ft	Mz K-ft
-----								
Roof (0 to h/2)	-31.64	950	.00	6.49	29.36	242.4	-97.6	21.6
Roof (h/2 to h)	-28.25	338	.00	2.06	9.33	77.1	87.1	-19.3
Windward Wall	20.38	497	10.12	.00	.00	.0	-272.0	.0
Windward Wall	19.54	497	9.70	.00	.00	.0	-163.7	.0
Windward Wall	18.70	497	9.29	.00	.00	.0	-63.8	.0
Windward Wall	17.86	93	1.66	.00	.00	.0	-1.6	.0
Leeward Wall	-13.05	1583	20.67	.00	.00	.0	-329.3	.0
Side Wall	-18.55	807	.00	14.98	.00	238.6	.0	.0
Side Wall	-18.55	807	.00	-14.98	.00	-238.6	.0	.0
Side Wall	-18.55	278	.00	-5.16	.00	-192.8	.0	.0
Windward Wall	21.30	273	5.81	.00	.00	.0	-206.4	-48.1
Leeward Wall	-13.05	273	3.56	.00	.00	.0	-126.5	-29.5
-----								
Total	.00	6893	60.81	3.39	38.69	126.7	-1173.7	-75.2

Along Ridge - Base Reactions - Walls Only +GCpi

Description	Press psf	Area ft^2	Fx Kip	Fy Kip	Fz Kip	Mx K-ft	My K-ft	Mz K-ft
Windward Wall	20.38	497	10.12	.00	.00	.0	-272.0	.0
Windward Wall	19.54	497	9.70	.00	.00	.0	-163.7	.0
Windward Wall	18.70	497	9.29	.00	.00	.0	-63.8	.0
Windward Wall	17.86	93	1.66	.00	.00	.0	-1.6	.0
Leeward Wall	-13.05	1583	20.67	.00	.00	.0	-329.3	.0
Side Wall	-18.55	807	.00	14.98	.00	238.6	.0	.0
Side Wall	-18.55	807	.00	-14.98	.00	-238.6	.0	.0
Side Wall	-18.55	278	.00	-5.16	.00	-192.8	.0	.0
Windward Wall	21.30	273	5.81	.00	.00	.0	-206.4	-48.1
Leeward Wall	-13.05	273	3.56	.00	.00	.0	-126.5	-29.5
Total	.00	5604	60.81	-5.16	.00	-192.8	-1163.2	-77.6

Along Ridge - Base Reactions - Walls+Roof -GCpi

Description	Press psf	Area ft^2	Fx Kip	Fy Kip	Fz Kip	Mx K-ft	My K-ft	Mz K-ft
Windward Wall	20.38	497	10.12	.00	.00	.0	-272.0	.0
Windward Wall	19.54	497	9.70	.00	.00	.0	-163.7	.0
Windward Wall	18.70	497	9.29	.00	.00	.0	-63.8	.0
Windward Wall	17.86	93	1.66	.00	.00	.0	-1.6	.0
Leeward Wall	-13.05	1583	20.67	.00	.00	.0	-329.3	.0
Side Wall	-18.55	807	.00	14.98	.00	238.6	.0	.0
Side Wall	-18.55	807	.00	-14.98	.00	-238.6	.0	.0
Side Wall	-18.55	278	.00	-5.16	.00	-192.8	.0	.0
Windward Wall	21.30	273	5.81	.00	.00	.0	-206.4	-48.1
Leeward Wall	-13.05	273	3.56	.00	.00	.0	-126.5	-29.5
Total	.00	5604	60.81	-5.16	.00	-192.8	-1163.2	-77.6

Along Ridge - Base Reactions - Walls Only -GCpi

Description	Press psf	Area ft^2	Fx Kip	Fy Kip	Fz Kip	Mx K-ft	My K-ft	Mz K-ft
Windward Wall	20.38	497	10.12	.00	.00	.0	-272.0	.0
Windward Wall	19.54	497	9.70	.00	.00	.0	-163.7	.0
Windward Wall	18.70	497	9.29	.00	.00	.0	-63.8	.0
Windward Wall	17.86	93	1.66	.00	.00	.0	-1.6	.0
Leeward Wall	-13.05	1583	20.67	.00	.00	.0	-329.3	.0
Side Wall	-18.55	807	.00	14.98	.00	238.6	.0	.0
Side Wall	-18.55	807	.00	-14.98	.00	-238.6	.0	.0
Side Wall	-18.55	278	.00	-5.16	.00	-192.8	.0	.0
Windward Wall	21.30	273	5.81	.00	.00	.0	-206.4	-48.1
Leeward Wall	-13.05	273	3.56	.00	.00	.0	-126.5	-29.5
Total	.00	5604	60.81	-5.16	.00	-192.8	-1163.2	-77.6

Along Ridge - Base Reactions - Walls+Roof MIN

Description	Press psf	Area* ft^2	Fx Kip	Fy Kip	Fz Kip	Mx K-ft	My K-ft	Mz K-ft
Total	.00	0	.00	.00	.00	.0	.0	.0

Notes - Along Ridge

- Note (1) X= Along Building ridge, Y = Normal to Building Ridge, Z = Vertical  
 Note (2) MIN = Minimum pressures on Walls = 16 psf and Roof = 8 psf  
 Note (3) Area\* = Area of the surface projected onto a vertical plane normal to wind.

MWFRS Pressures for Wind Normal to 25.33 ft wall (Normal to Eave)

WALL PRESSURES PER TABLE 27.6-1	
L/B: Bldg Dim in Wind Dir / Bldg Dim Normal to Wind Dir	= 1.96
h: Height to top of Windward Wall	= 31.87 ft
ph: Net Pressure at top of wall (windward + leeward)	= 27.60 psf
p0: Net Pressure at bottom of wall (windward + leeward)	= 25.42 psf

ps: Side wall pressure acting away from wall = .64 \* ph = -17.55 psf  
 pl: Leeward wall pressure acting away from wall = .27 \* ph = -7.57 psf  
 pwh: Windward wall press @ top acting toward wall = ph-pl = 20.03 psf  
 pw0: Windward wall press @ bot acting toward wall = p0-pl = 17.85 psf

ROOF PRESSURES PER TABLE 27.6-2

h: Mean Roof Height = 37.360 ft  
 Lambda: Exposure Adjustment Factor = 1.000  
 Slope: Roof Slope = 12.47 Deg

Table 27.6-2 indicates a slope less than 9.46 Deg is flat, but provides no values for Zone 1 and 2 between 9.46 Deg and 14 Deg, so any slope < 14 deg is treated as flat.

Zone	Load Case1 psf	Load Case2 psf
1	.00	.00
2	.00	.00
3	-31.64	.00
4	-28.25	.00
5	-23.18	.00

Note: A value of '0' indicates that the zone/load case is not applicable.

Normal to Eave - Base Reactions - Walls+Roof +GCpi

Description	Press psf	Area ft^2	Fx Kip	Fy Kip	Fz Kip	Mx K-ft	My K-ft	Mz K-ft
Roof (0 to h/2)	-31.64	485	.00	3.31	14.97	-119.7	.0	.0
Roof (h/2 to h)	-28.25	485	.00	2.95	13.37	155.0	.0	.0
Roof (h to 2h)	-23.18	319	.00	1.60	7.23	201.3	.0	.0
Windward Wall	20.03	253	.00	-5.07	.00	-136.3	.0	.0
Windward Wall	19.34	253	.00	-4.90	.00	-82.7	.0	.0
Windward Wall	18.66	253	.00	-4.73	.00	-32.5	.0	.0
Windward Wall	17.98	47	.00	-0.85	.00	-0.8	.0	.0
Leeward Wall	-7.57	1085	.00	-8.22	.00	-176.0	.0	.0
Side Wall	-17.55	1583	-27.79	.00	.00	.0	442.8	.0
Side Wall	-17.55	1583	27.79	.00	.00	.0	-442.8	.0
Side Wall	-17.55	273	-4.79	.00	.00	.0	170.1	39.6
Side Wall	-17.55	273	4.79	.00	.00	.0	-170.1	-39.6
Total	.00	6893	.00	-15.91	35.56	-191.6	.0	.0

Normal to Eave - Base Reactions - Walls Only +GCpi

Description	Press psf	Area ft^2	Fx Kip	Fy Kip	Fz Kip	Mx K-ft	My K-ft	Mz K-ft
Windward Wall	20.03	253	.00	-5.07	.00	-136.3	.0	.0
Windward Wall	19.34	253	.00	-4.90	.00	-82.7	.0	.0
Windward Wall	18.66	253	.00	-4.73	.00	-32.5	.0	.0
Windward Wall	17.98	47	.00	-0.85	.00	-0.8	.0	.0
Leeward Wall	-7.57	1085	.00	-8.22	.00	-176.0	.0	.0
Side Wall	-17.55	1583	-27.79	.00	.00	.0	442.8	.0
Side Wall	-17.55	1583	27.79	.00	.00	.0	-442.8	.0
Side Wall	-17.55	273	-4.79	.00	.00	.0	170.1	39.6
Side Wall	-17.55	273	4.79	.00	.00	.0	-170.1	-39.6
Total	.00	5604	.00	-23.77	.00	-428.3	.0	.0

Normal to Eave - Base Reactions - Walls+Roof -GCpi

Description	Press psf	Area ft^2	Fx Kip	Fy Kip	Fz Kip	Mx K-ft	My K-ft	Mz K-ft
Windward Wall	20.03	253	.00	-5.07	.00	-136.3	.0	.0
Windward Wall	19.34	253	.00	-4.90	.00	-82.7	.0	.0
Windward Wall	18.66	253	.00	-4.73	.00	-32.5	.0	.0
Windward Wall	17.98	47	.00	-0.85	.00	-0.8	.0	.0
Leeward Wall	-7.57	1085	.00	-8.22	.00	-176.0	.0	.0
Side Wall	-17.55	1583	-27.79	.00	.00	.0	442.8	.0
Side Wall	-17.55	1583	27.79	.00	.00	.0	-442.8	.0
Side Wall	-17.55	273	-4.79	.00	.00	.0	170.1	39.6
Side Wall	-17.55	273	4.79	.00	.00	.0	-170.1	-39.6

-----  
 Total .00 5604 .00 -23.77 .00 -428.3 .0 .0

**Normal to Eave - Base Reactions - Walls Only -GCpi**

Description	Press psf	Area ft^2	Fx Kip	Fy Kip	Fz Kip	Mx K-ft	My K-ft	Mz K-ft
Windward Wall	20.03	253	.00	-5.07	.00	-136.3	.0	.0
Windward Wall	19.34	253	.00	-4.90	.00	-82.7	.0	.0
Windward Wall	18.66	253	.00	-4.73	.00	-32.5	.0	.0
Windward Wall	17.98	47	.00	-0.85	.00	-0.8	.0	.0
Leeward Wall	-7.57	1085	.00	-8.22	.00	-176.0	.0	.0
Side Wall	-17.55	1583	-27.79	.00	.00	.0	442.8	.0
Side Wall	-17.55	1583	27.79	.00	.00	.0	-442.8	.0
Side Wall	-17.55	273	-4.79	.00	.00	.0	170.1	39.6
Side Wall	-17.55	273	4.79	.00	.00	.0	-170.1	-39.6
Total	.00	5604	.00	-23.77	.00	-428.3	.0	.0

**Normal to Eave - Base Reactions - Walls+Roof MIN**

Description	Press psf	Area* ft^2	Fx Kip	Fy Kip	Fz Kip	Mx K-ft	My K-ft	Mz K-ft
Total	.00	0	.00	.00	.00	.0	.0	.0

**Notes - Normal to Eave**

- Note (1) X= Along Building ridge, Y = Normal to Building Ridge, Z = Vertical  
 Note (2) MIN = Minimum pressures on Walls = 16 psf and Roof = 8 psf  
 Note (3) Area\* = Area of the surface projected onto a vertical plane normal to wind.

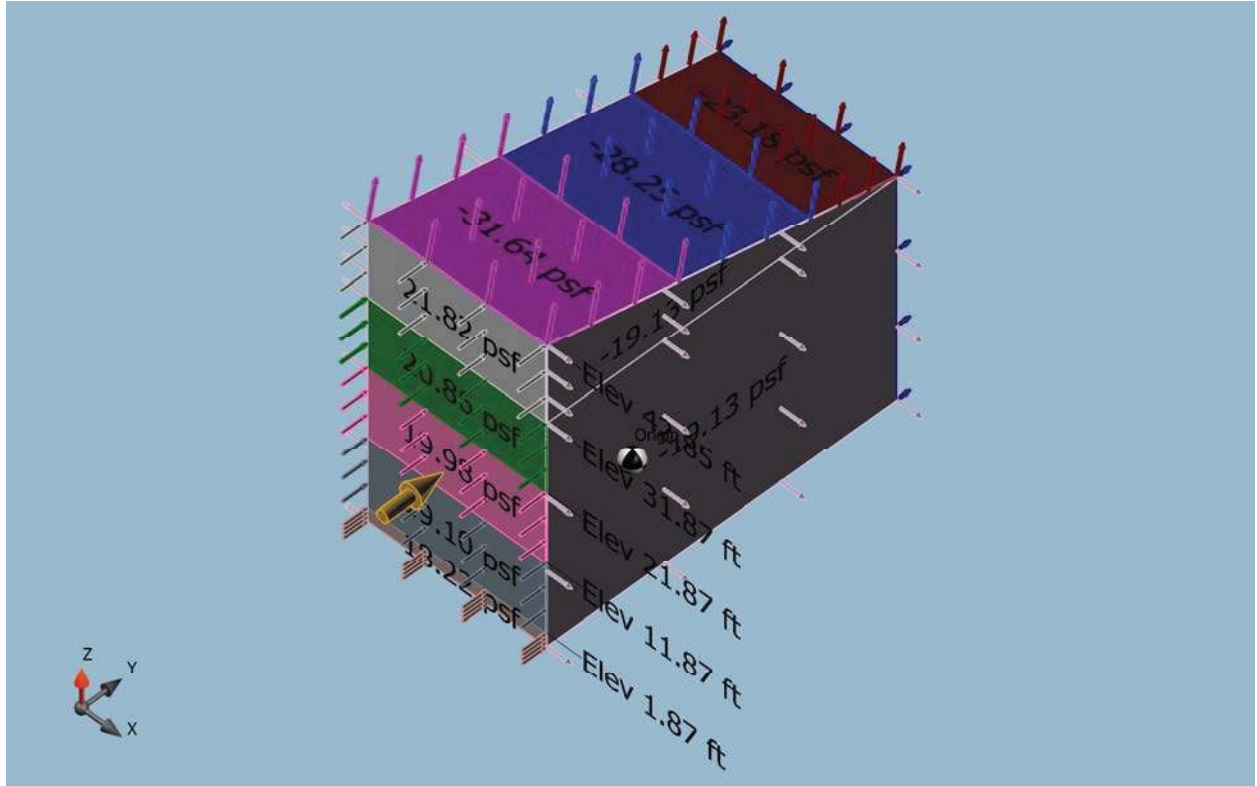
**Total Base Reaction Summary**

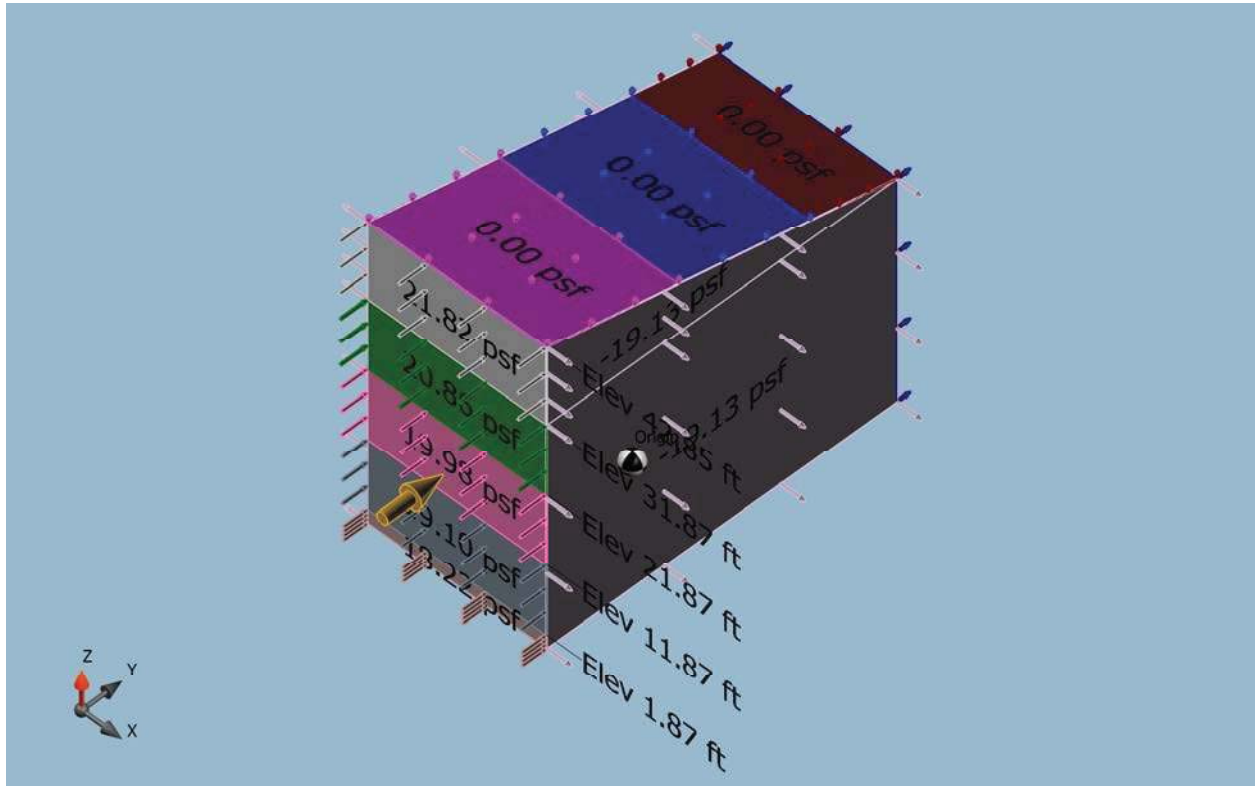
Description	Fx Kip	Fy Kip	Fz Kip	Mx K-ft	My K-ft	Mz K-ft
Normal to Ridge Walls+Roof +GCpi	.0	36.6	35.6	945.0	.0	.0
Normal to Ridge Walls Only +GCpi	.0	28.8	.0	594.3	.0	.0
Normal to Ridge Walls+Roof -GCpi	.0	28.8	.0	594.3	.0	.0
Normal to Ridge Walls Only -GCpi	.0	28.8	.0	594.3	.0	.0
Normal to Ridge Walls+Roof MIN	.0	.0	.0	.0	.0	.0
Along Ridge Walls+Roof +GCpi	60.8	3.4	38.7	126.7	-1173.7	-75.2
Along Ridge Walls Only +GCpi	60.8	-5.2	.0	-192.8	-1163.2	-77.6
Along Ridge Walls+Roof -GCpi	60.8	-5.2	.0	-192.8	-1163.2	-77.6
Along Ridge Walls Only -GCpi	60.8	-5.2	.0	-192.8	-1163.2	-77.6
Along Ridge Walls+Roof MIN	.0	.0	.0	.0	.0	.0
Normal to Eave Walls+Roof +GCpi	.0	-15.9	35.6	-191.6	.0	.0
Normal to Eave Walls Only +GCpi	.0	-23.8	.0	-428.3	.0	.0
Normal to Eave Walls+Roof -GCpi	.0	-23.8	.0	-428.3	.0	.0
Normal to Eave Walls Only -GCpi	.0	-23.8	.0	-428.3	.0	.0
Normal to Eave Walls+Roof MIN	.0	.0	.0	.0	.0	.0

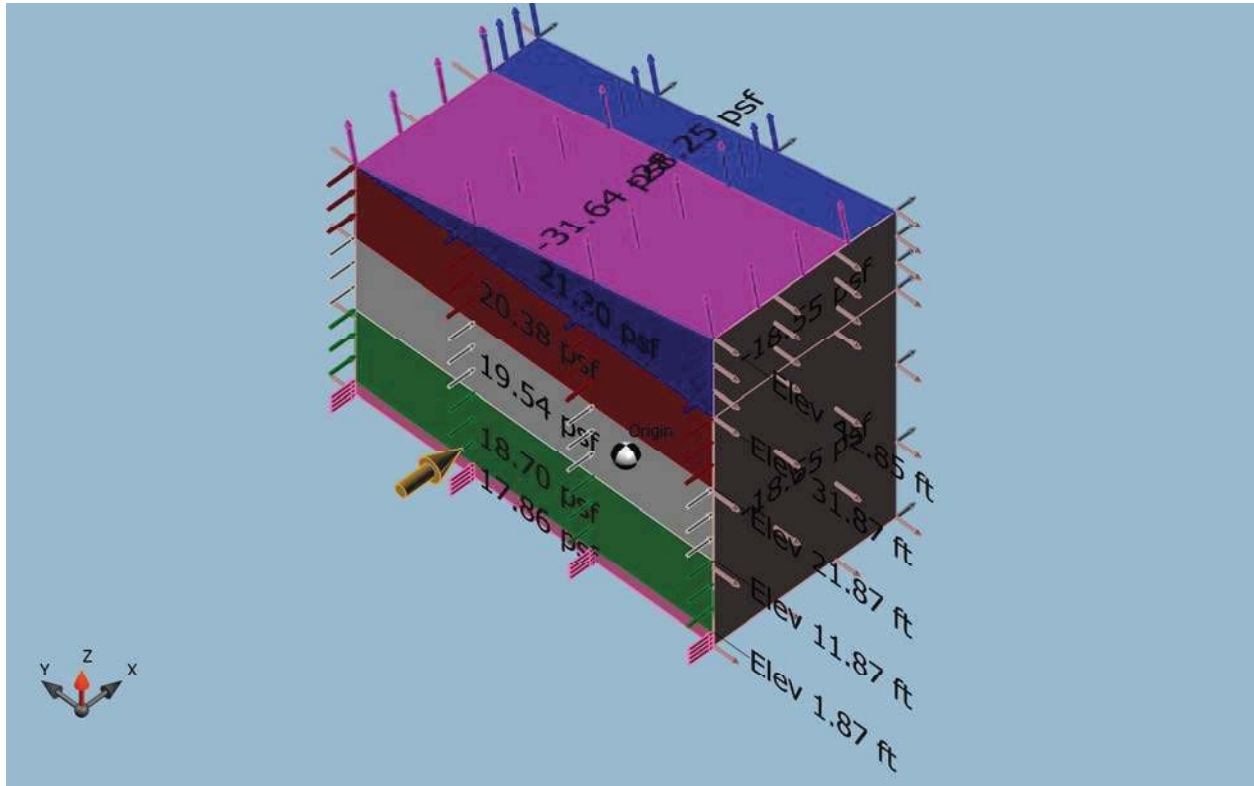
**Notes Applying to MWFRS Reactions:**

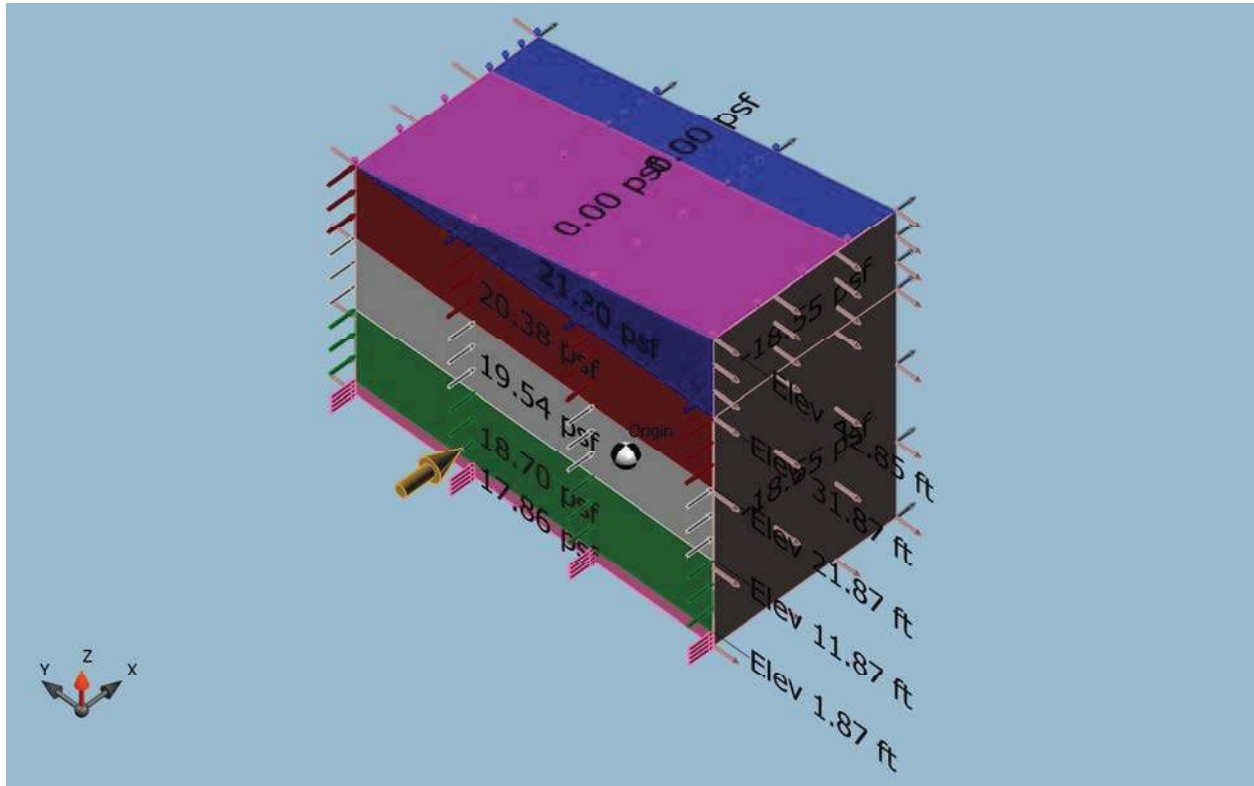
- Note (1) Per Fig 27.4-1, Note 9, Use greater of Shear calculated with or without roof.  
 Note (2) X= Along Building ridge, Y = Normal to Building Ridge, Z = Vertical  
 Note (3) MIN = Minimum pressures on Walls = 16 psf and Roof = 8 psf  
 Note (4) MIN area is the area of the surface onto a vertical plane normal to wind.  
 Note (5) Total Roof Area (incl OH Top) = 1288.52 sq. ft  
 Note (6) LC = Load Case (Some pressures can be zero, ref ASCE 7-10 Ch 27 Pt 2)

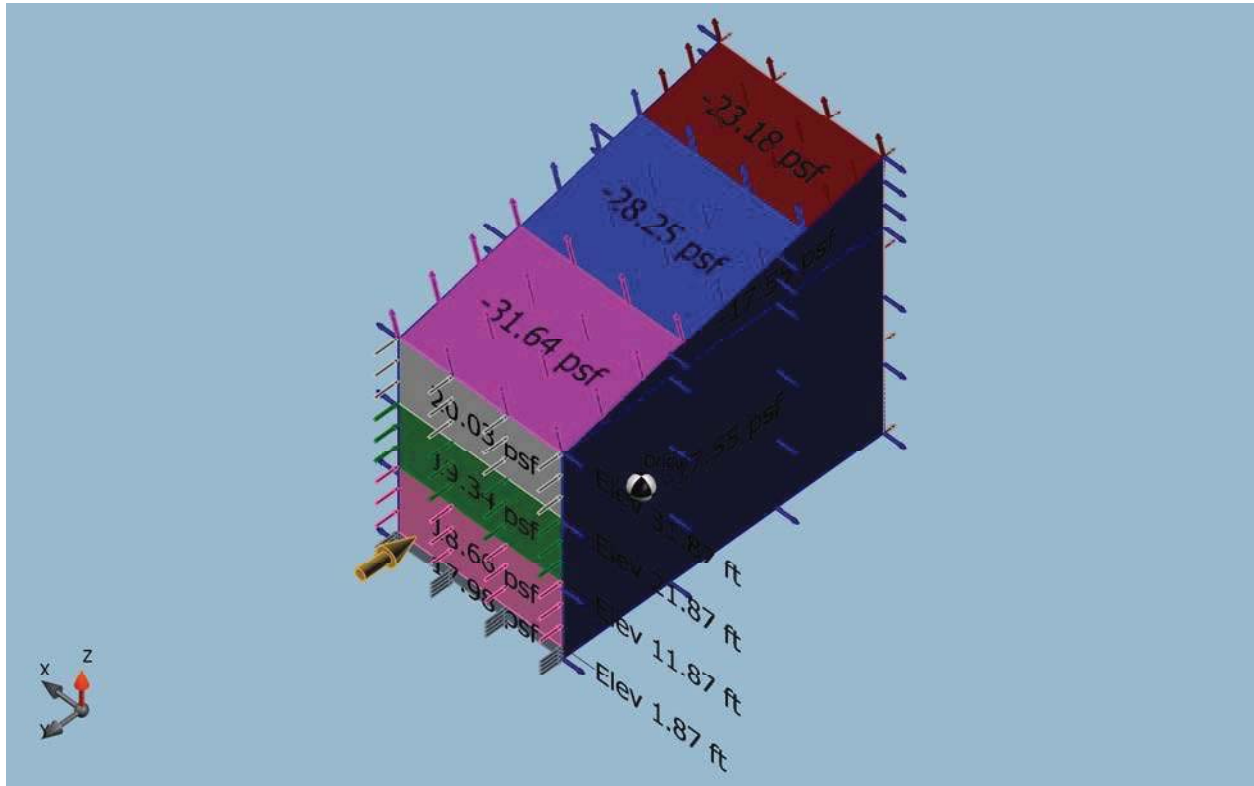


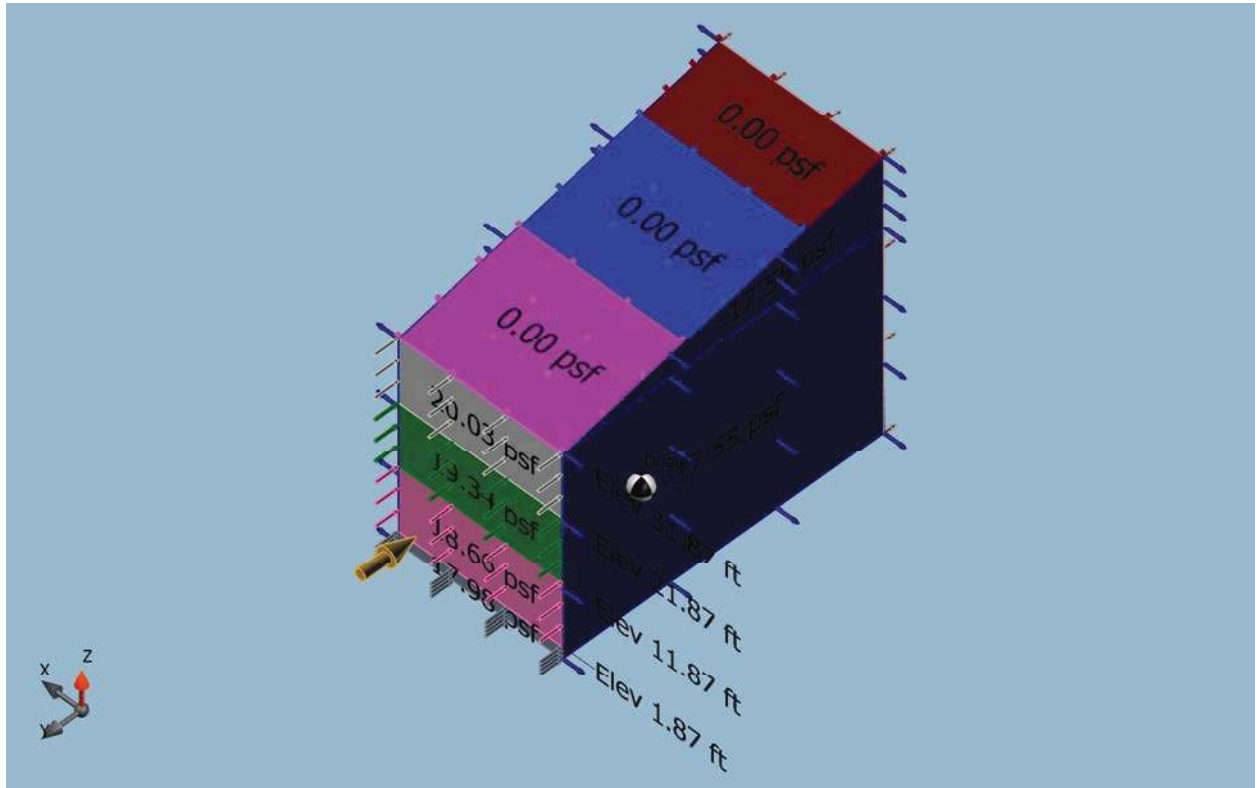






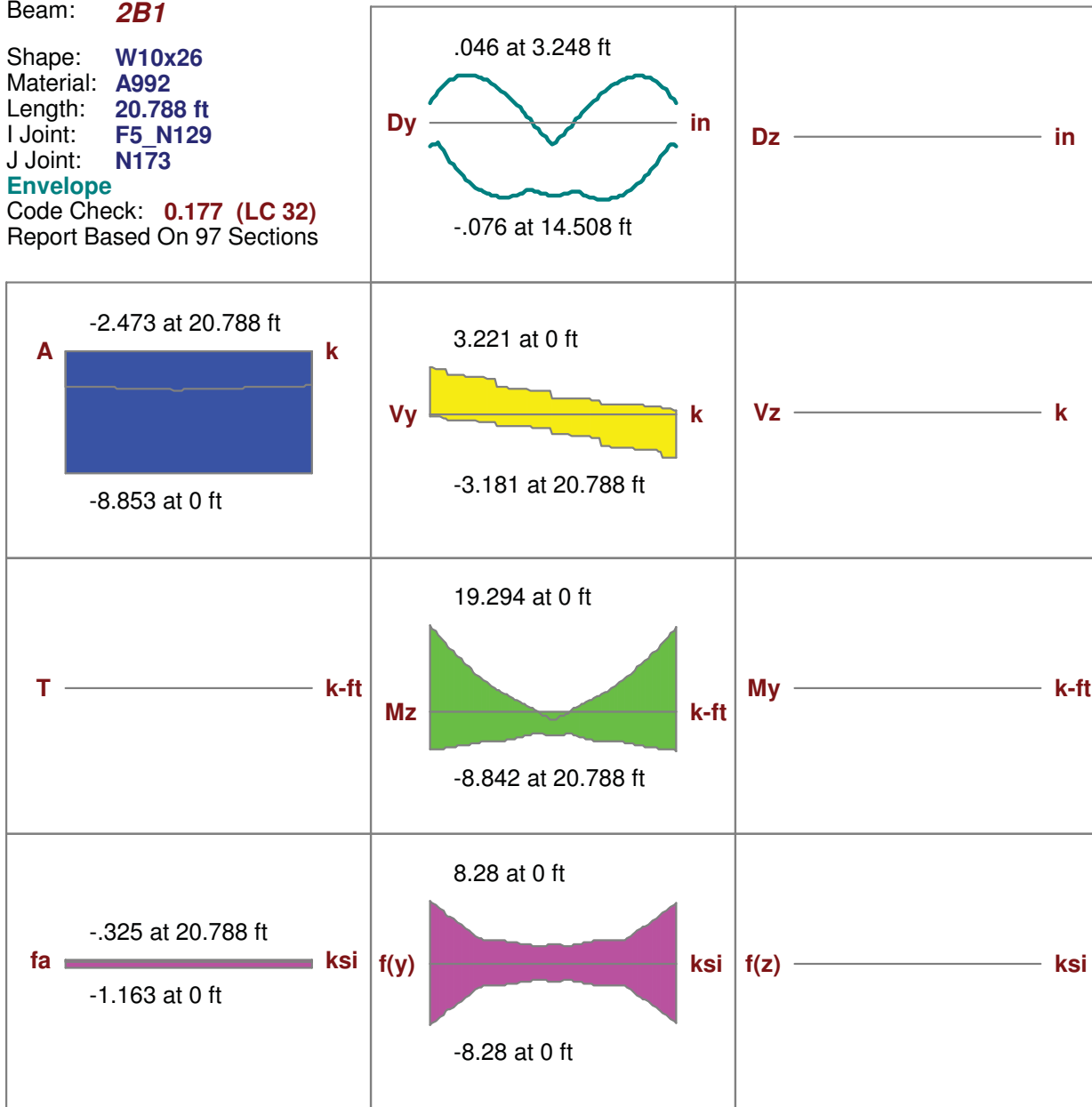






**APPENDIX B - DETAILED LATERAL MEMBER AND  
WALL REPORTS FROM RISA3D**

Beam: **2B1**  
 Shape: **W10x26**  
 Material: **A992**  
 Length: **20.788 ft**  
 I Joint: **F5\_N129**  
 J Joint: **N173**  
**Envelope**  
 Code Check: **0.177 (LC 32)**  
 Report Based On 97 Sections



**AISC 14th(360-10): LRFD Code Check**

**Direct Analysis Method**

**- Size from RISAFloor governed optimization -**

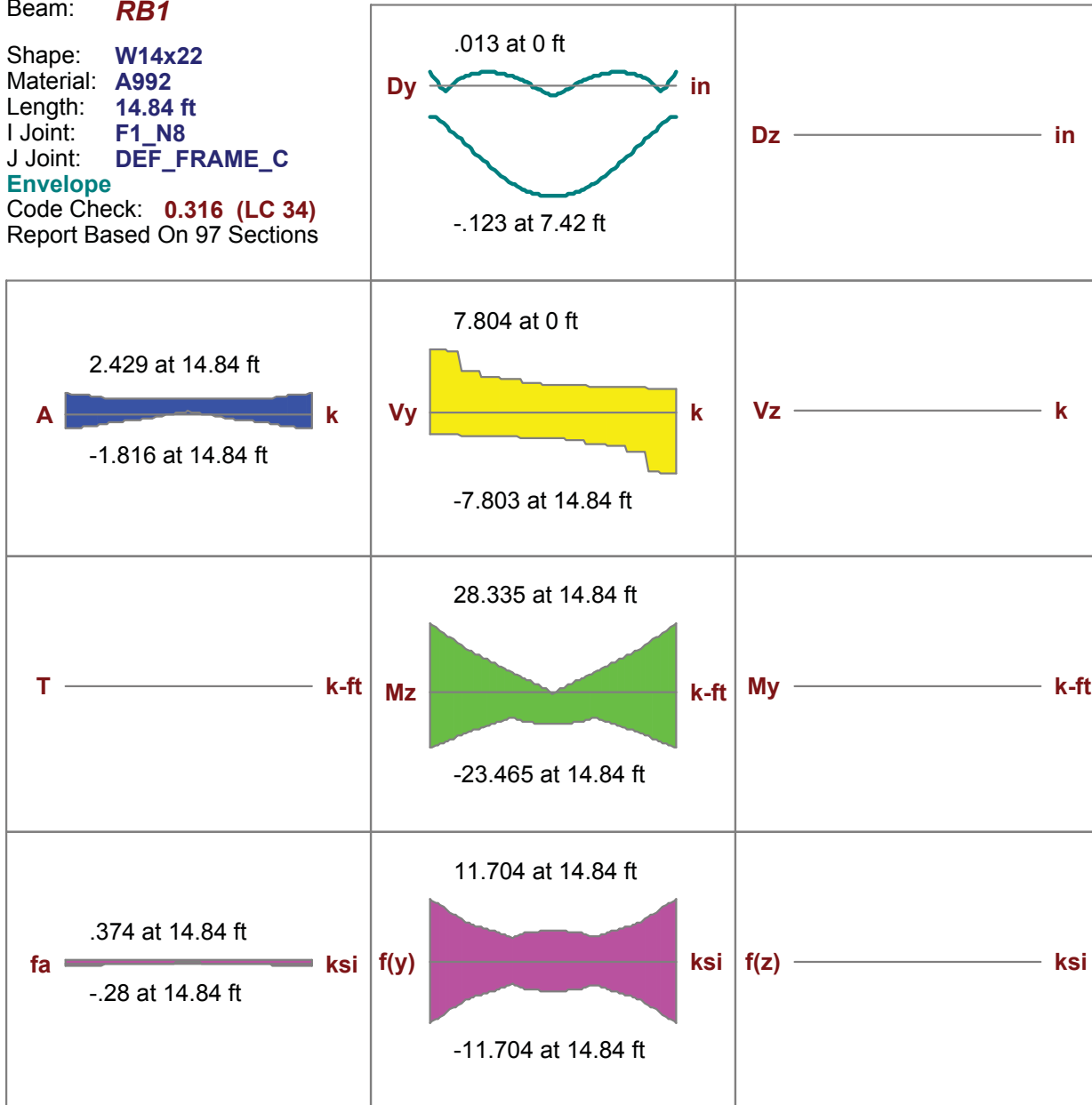
Max Bending Check	<b>0.177 (LC 32)</b>	Max Shear Check	<b>0.040 (y) (LC 32)</b>	Max Defl Ratio	<b>L/3347</b>
Location	<b>0 ft</b>	Location	<b>0 ft</b>	Location	<b>14.291 ft</b>
Equation	<b>H1-1b</b>			Span	<b>1</b>

Bending Flange	<b>Compact</b>	Compression Flange	<b>Non-Slender</b>	<b>Qs=1</b>
Bending Web	<b>Compact</b>	Compression Web	<b>Slender</b>	<b>Qa=1</b>

Fy	<b>50 ksi</b>	Lb	<b>20.788 ft</b>	z-z	<b>20.788 ft</b>
phi*Pnc	<b>51.191 k</b>	KL/r	<b>183.26</b>		<b>57.345</b>
phi*Pnt	<b>342.45 k</b>				
phi*Mny	<b>28.125 k-ft</b>	L Comp Flange	<b>20.788 ft</b>		
phi*Mnz	<b>114.113 k-ft</b>	L-torque	<b>20.788 ft</b>		
phi*Vny	<b>80.34 k</b>	Tau_b	<b>1</b>		
phi*Vnz	<b>197.895 k</b>				



Beam: **RB1**  
 Shape: **W14x22**  
 Material: **A992**  
 Length: **14.84 ft**  
 I Joint: **F1\_N8**  
 J Joint: **DEF\_FRAME\_C**  
**Envelope**  
 Code Check: **0.316 (LC 34)**  
 Report Based On 97 Sections



**AISC 14th(360-10): LRFD Code Check**

**Direct Analysis Method**

**- Size from RISAFloor governed optimization -**

Max Bending Check	<b>0.316 (LC 34)</b>	Max Shear Check	<b>0.083 (y) (LC 34)</b>	Max Defl Ratio	<b>L/1963</b>
Location	<b>14.84 ft</b>	Location	<b>0 ft</b>	Location	<b>7.42 ft</b>
Equation	<b>H1-1b</b>			Span	<b>1</b>

Bending Flange	<b>Compact</b>	Compression Flange	<b>Non-Slender</b>	<b>Qs=1</b>
Bending Web	<b>Compact</b>	Compression Web	<b>Slender</b>	<b>Qa=1</b>

Fy	<b>50 ksi</b>	Lb	<b>14.84 ft</b>	z-z	<b>14.84 ft</b>
phi*Pnc	<b>49.866 k</b>	KL/r	<b>171.47</b>		<b>32.16</b>
phi*Pnt	<b>292.05 k</b>				
phi*Mny	<b>16.462 k-ft</b>	L Comp Flange	<b>14.84 ft</b>		
phi*Mnz	<b>97.009 k-ft</b>	L-torque	<b>14.84 ft</b>		
phi*Vny	<b>94.53 k</b>	Tau_b	<b>1</b>		
phi*Vnz	<b>98.45 k</b>				

**Enveloped Seismic Detailing Results (AISC 341/358 - 2010)**

Member Type	<b>Beam</b>	Design to $\Omega_0$ Loads	<b>No</b>
Seismic Design Rule	<b>RBS C ROOF</b>	Frame Ductility Req'd	<b>High</b>
Moment Conn Type	<b>RBS</b>		
Flange	<b>Compact (Fail)</b>	Web	<b>Seismically Compact</b>
Col-BM Moment Ratio	<b>1.541 (Pass)</b>		
Span to Depth Ratio	<b>11.838 (Pass)</b>		

**Beam Flange Bracing**

Reqd Strength	<b>1.73 k</b>	<b>360-10: Eqn A-6-7</b>
Reqd Strength	<b>5.189 k</b>	<b>341-10: D1.2c</b>
Reqd Stiffness	<b>22.26 k/in</b>	<b>360-10: Eqn A-6-8</b>
Max Spacing	<b>51.803 in</b>	<b>341-10: D1.2b</b>

**Required Connection Shear Strength**

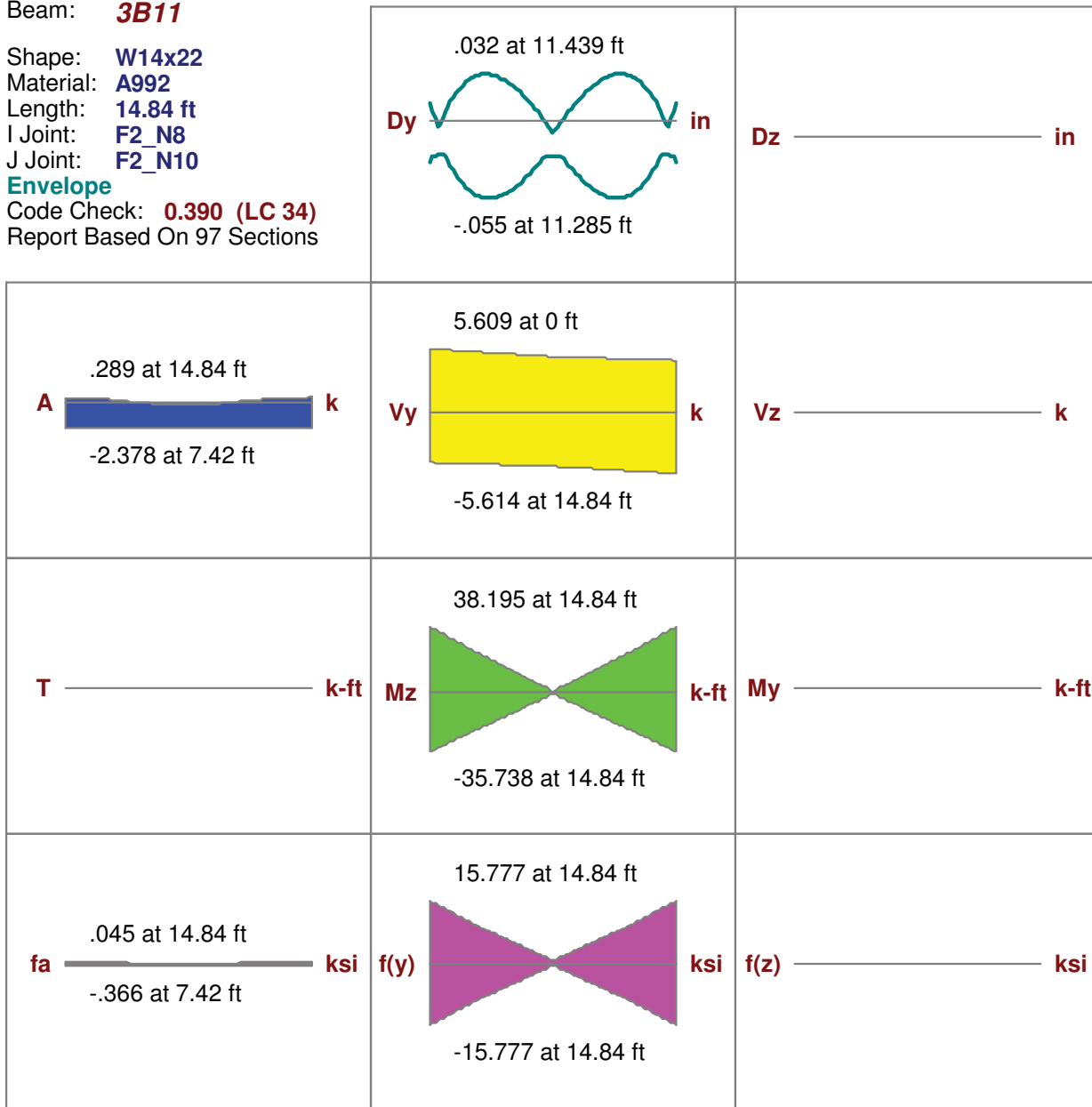
Column	Vg (k)	Vpr (k)	$\Omega_0 * Vu(k)$	Demand
(C-3.5)	<b>7.612</b>	<b>17.941</b>	<b>9.425</b>	<b>25.552</b>
(C-2.1)	<b>7.612</b>	<b>17.941</b>	<b>-9.425</b>	<b>25.552</b>

**Required Connection Moment Strength**

Column	Hinge Loc(in)	Ze(in <sup>3</sup> )	Mpr(k-ft)	$\Omega_0 * Mu(k-ft)$	Demand(k-ft)
(C-3.5)	<b>7</b>	<b>21.016</b>	<b>110.77</b>	<b>60.523</b>	<b>125.675</b>
(C-2.1)	<b>7</b>	<b>21.016</b>	<b>110.77</b>	<b>60.536</b>	<b>125.675</b>

NOTE THAT RISA USES THE FULL BEAM FLANGE IN THIS CALCULATION. AS PER AISC 358 AND VARIOUS AISC DESIGN EXAMPLES THE FLANGE WIDTH AT THE REDUCED BEAM SECTION CAN BE USED AND THEREFORE THIS MEMBER PASSES.

Beam: **3B11**  
 Shape: **W14x22**  
 Material: **A992**  
 Length: **14.84 ft**  
 I Joint: **F2\_N8**  
 J Joint: **F2\_N10**  
**Envelope**  
 Code Check: **0.390 (LC 34)**  
 Report Based On 97 Sections



**AISC 14th(360-10): LRFD Code Check**

**Direct Analysis Method**

**- Size from RISAFloor governed optimization -**

Max Bending Check	<b>0.390 (LC 34)</b>	Max Shear Check	<b>0.059 (y) (LC 32)</b>	Max Defl Ratio	<b>L/3508</b>
Location	<b>0 ft</b>	Location	<b>14.84 ft</b>	Location	<b>11.594 ft</b>
Equation	<b>H1-1b</b>			Span	<b>1</b>

Bending Flange	<b>Compact</b>	Compression Flange	<b>Non-Slender</b>	<b>Qs=1</b>
Bending Web	<b>Compact</b>	Compression Web	<b>Slender</b>	<b>Qa=1</b>

Fy	<b>50 ksi</b>	Lb	<b>14.84 ft</b>	z-z	<b>14.84 ft</b>
phi*Pnc	<b>49.866 k</b>	KL/r	<b>171.47</b>		<b>32.16</b>
phi*Pnt	<b>292.05 k</b>				
phi*Mny	<b>16.462 k-ft</b>	L Comp Flange	<b>14.84 ft</b>		
phi*Mnz	<b>97.917 k-ft</b>	L-torque	<b>14.84 ft</b>		
phi*Vny	<b>94.53 k</b>	Tau_b	<b>1</b>		
phi*Vnz	<b>90.45 k</b>				

**Enveloped Seismic Detailing Results (AISC 341/358 - 2010)**

Member Type	<b>Beam</b>	Design to $\Omega_0$ Loads	<b>No</b>
Seismic Design Rule	<b>RBS C LEVEL 4</b>	Frame Ductility Req'd	<b>High</b>
Moment Conn Type	<b>RBS</b>		
Flange	<b>Compact (Fail)</b>	Web	<b>Seismically Compact</b>
Col-BM Moment Ratio	<b>3.233 (Pass)</b>		
Span to Depth Ratio	<b>11.838 (Pass)</b>		

**Beam Flange Bracing**

Reqd Strength	<b>1.73 k</b>	<b>360-10: Eqn A-6-7</b>
Reqd Strength	<b>5.189 k</b>	<b>341-10: D1.2c</b>
Reqd Stiffness	<b>22.26 k/in</b>	<b>360-10: Eqn A-6-8</b>
Max Spacing	<b>51.803 in</b>	<b>341-10: D1.2b</b>

**Required Connection Shear Strength**

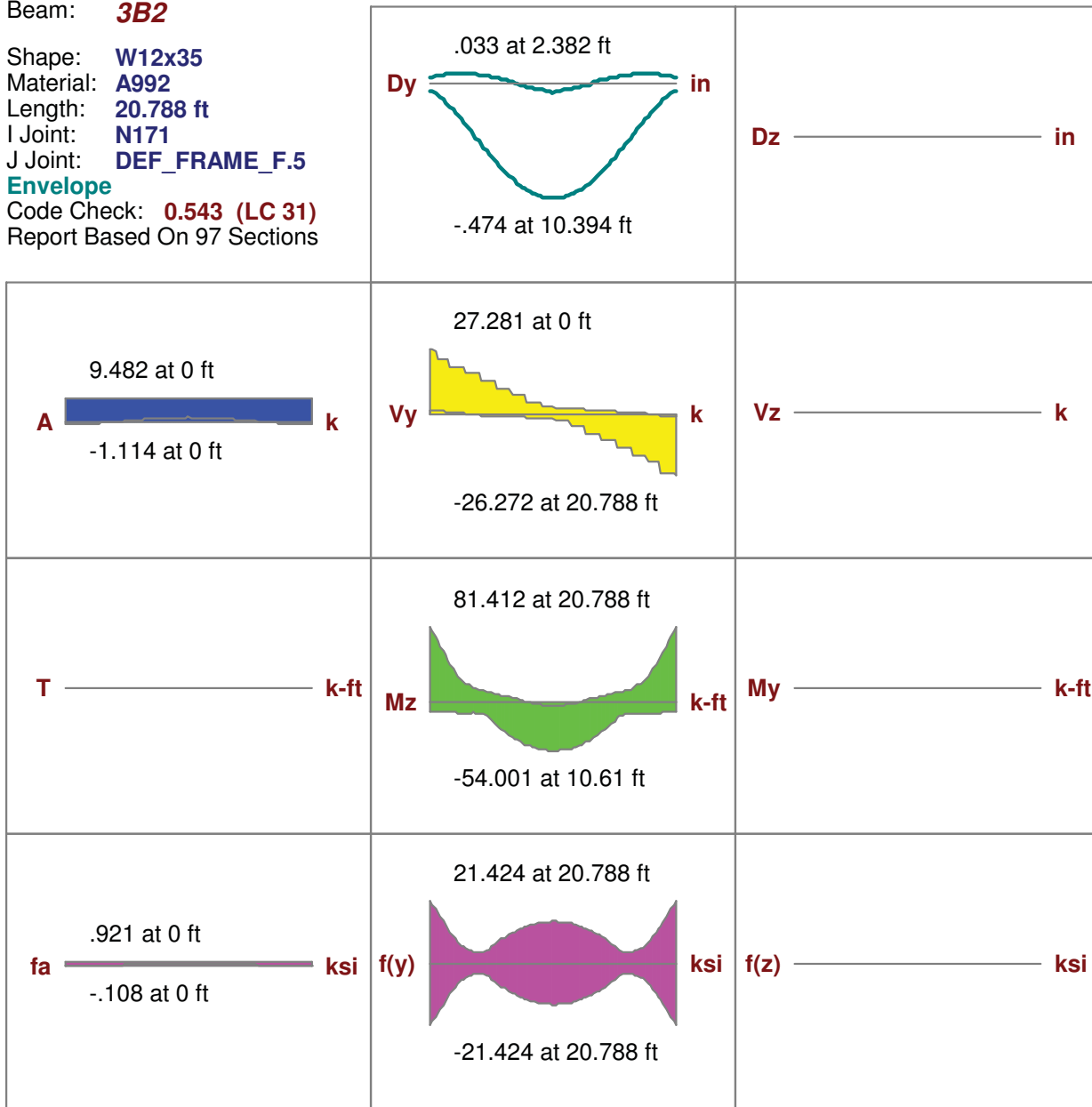
Column	Vg (k)	Vpr (k)	$\Omega_0 * Vu(k)$	Demand
(C-2.1)	.767	17.941	12.051	18.708
(C-3.5)	.767	17.941	-12.056	18.708

**Required Connection Moment Strength**

Column	Hinge Loc(in)	Ze(in <sup>3</sup> )	Mpr(k-ft)	$\Omega_0 * Mu(k-ft)$	Demand(k-ft)
(C-2.1)	7	21.016	110.77	85.973	121.683
(C-3.5)	7	21.016	110.77	86.007	121.683

NOTE THAT RISA USES THE FULL BEAM FLANGE IN THIS CALCULATION. AS PER AISC 358 AND VARIOUS AISC DESIGN EXAMPLES THE FLANGE WIDTH AT THE REDUCED BEAM SECTION CAN BE USED AND THEREFORE THIS MEMBER PASSES.

Beam: **3B2**  
 Shape: **W12x35**  
 Material: **A992**  
 Length: **20.788 ft**  
 I Joint: **N171**  
 J Joint: **DEF\_FRAME\_F.5**  
**Envelope**  
 Code Check: **0.543 (LC 31)**  
 Report Based On 97 Sections



**AISC 14th(360-10): LRFD Code Check**

**Direct Analysis Method**

**- Size from RISAFloor governed optimization -**

Max Bending Check	<b>0.543 (LC 31)</b>	Max Shear Check	<b>0.243 (y) (LC 31)</b>	Max Defl Ratio	<b>L/561</b>
Location	<b>20.788 ft</b>	Location	<b>0 ft</b>	Location	<b>10.394 ft</b>
Equation	<b>H1-1b</b>			Span	<b>1</b>

Bending Flange	<b>Compact</b>	Compression Flange	<b>Non-Slender</b>	<b>Qs=1</b>
Bending Web	<b>Compact</b>	Compression Web	<b>Slender</b>	<b>Qa=1</b>

Fy	<b>50 ksi</b>	Lb	<b>20.788 ft</b>	z-z	<b>20.788 ft</b>
phi*Pnc	<b>88.948 k</b>	KL/r	<b>161.741</b>		<b>47.422</b>
phi*Pnt	<b>463.5 k</b>				
phi*Mny	<b>43.125 k-ft</b>	L Comp Flange	<b>20.788 ft</b>		
phi*Mnz	<b>166.208 k-ft</b>	L-torque	<b>20.788 ft</b>		
phi*Vny	<b>112.5 k</b>	Tau_b	<b>1</b>		
phi*Vnz	<b>184.285 k</b>				

**Enveloped Seismic Detailing Results (AISC 341/358 - 2010)**

Member Type	<b>Beam</b>	Design to $\Omega_0$ Loads	<b>No</b>
Seismic Design Rule	<b>RBS F.5 LEVEL 4</b>	Frame Ductility Req'd	<b>High</b>
Moment Conn Type	<b>RBS</b>		
Flange	<b>Seismically Compact</b>	Web	<b>Seismically Compact</b>
Col-BM Moment Ratio	<b>2.059 (Pass)</b>		
Span to Depth Ratio	<b>18.82 (Pass)</b>		

**Beam Flange Bracing**

<b>Reqd Strength</b>	<b>3.333 k</b>	<b>360-10: Eqn A-6-7</b>
<b>Reqd Strength</b>	<b>9.999 k</b>	<b>341-10: D1.2c</b>
<b>Reqd Stiffness</b>	<b>28.885 k/in</b>	<b>360-10: Eqn A-6-8</b>
<b>Max Spacing</b>	<b>76.929 in</b>	<b>341-10: D1.2b</b>

**Required Connection Shear Strength**

Column	Vg (k)	Vpr (k)	$\Omega_0 * Vu(k)$	Demand
(F.5-4.5)	-25.761	20.873	27.281	46.634
(F.5-1.1)	-25.761	20.873	-26.272	46.634

**Required Connection Moment Strength**

Column	Hinge Loc(in)	Ze(in <sup>3</sup> )	Mpr(k-ft)	$\Omega_0 * Mu(k-ft)$	Demand(k-ft)
(F.5-4.5)	7.625	36.301	191.335	81.098	220.967
(F.5-1.1)	7.625	36.301	191.335	81.412	220.967

**Enveloped Seismic Detailing Results (AISC 341/358 - 2010)**

Member Type	<b>Beam</b>	Design to $\Omega_0$ Loads	<b>No</b>
Seismic Design Rule	<b>RBS F.5 LEVEL 3</b>	Frame Ductility Req'd	<b>High</b>
Moment Conn Type	<b>RBS</b>		
Flange	<b>Seismically Compact</b>	Web	<b>Seismically Compact</b>
Col-BM Moment Ratio	<b>8.313 (Pass)</b>		
Span to Depth Ratio	<b>22.84 (Pass)</b>		

**Beam Flange Bracing**

<b>Reqd Strength</b>	<b>2.231 k</b>	<b>360-10: Eqn A-6-7</b>
<b>Reqd Strength</b>	<b>6.694 k</b>	<b>341-10: D1.2c</b>
<b>Reqd Stiffness</b>	<b>21.909 k/in</b>	<b>360-10: Eqn A-6-8</b>
<b>Max Spacing</b>	<b>67.896 in</b>	<b>341-10: D1.2b</b>

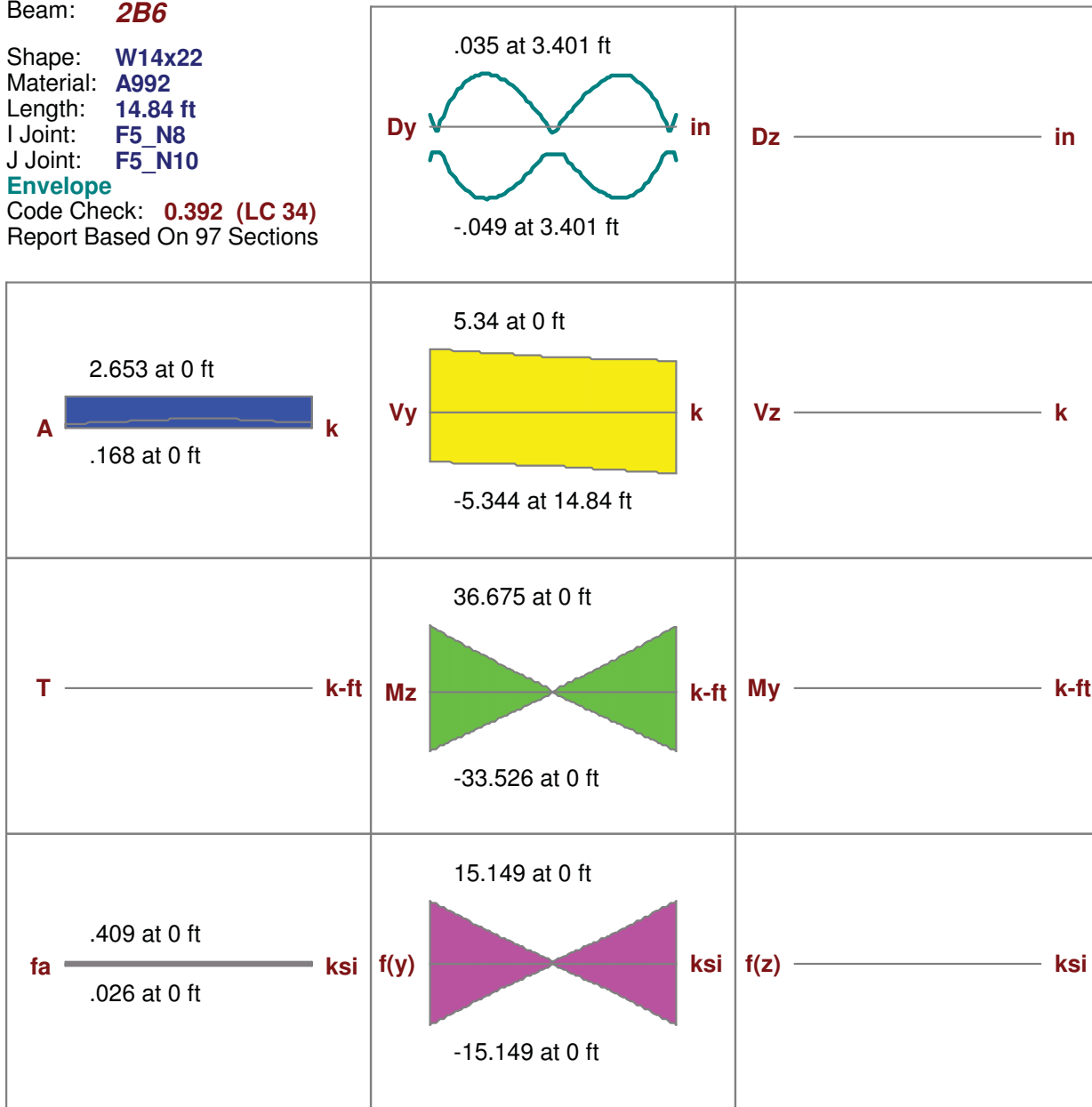
**Required Connection Shear Strength**

Column	Vg (k)	Vpr (k)	$\Omega_0 * Vu(k)$	Demand
<b>(F.5-4.5)</b>	<b>2.811</b>	<b>11.5</b>	<b>4.723</b>	<b>14.312</b>
<b>(F.5-1.1)</b>	<b>2.811</b>	<b>11.5</b>	<b>-4.684</b>	<b>14.312</b>

**Required Connection Moment Strength**

Column	Hinge Loc(in)	Ze(in <sup>3</sup> )	Mpr(k-ft)	$\Omega_0 * Mu(k-ft)$	Demand(k-ft)
<b>(F.5-4.5)</b>	<b>7.625</b>	<b>20.001</b>	<b>105.42</b>	<b>34.898</b>	<b>114.514</b>
<b>(F.5-1.1)</b>	<b>7.625</b>	<b>20.001</b>	<b>105.42</b>	<b>34.492</b>	<b>114.514</b>

Beam: **2B6**  
 Shape: **W14x22**  
 Material: **A992**  
 Length: **14.84 ft**  
 I Joint: **F5\_N8**  
 J Joint: **F5\_N10**  
**Envelope**  
 Code Check: **0.392 (LC 34)**  
 Report Based On 97 Sections



**AISC 14th(360-10): LRFD Code Check**

**Direct Analysis Method**

**- Size from RISAFloor governed optimization -**

Max Bending Check	<b>0.392 (LC 34)</b>	Max Shear Check	<b>0.057 (y) (LC 30)</b>	Max Defl Ratio	<b>L/3813</b>
Location	<b>0 ft</b>	Location	<b>14.84 ft</b>	Location	<b>3.092 ft</b>
Equation	<b>H1-1b</b>			Span	<b>1</b>

Bending Flange	<b>Compact</b>	Compression Flange	<b>Non-Slender</b>	<b>Qs=1</b>
Bending Web	<b>Compact</b>	Compression Web	<b>Slender</b>	<b>Qa=1</b>

Fy	<b>50 ksi</b>	Lb	<b>14.84 ft</b>	z-z	<b>14.84 ft</b>
phi*Pnc	<b>49.866 k</b>	KL/r	<b>171.47</b>		<b>32.16</b>
phi*Pnt	<b>292.05 k</b>				
phi*Mny	<b>16.462 k-ft</b>	L Comp Flange	<b>14.84 ft</b>		
phi*Mnz	<b>99.661 k-ft</b>	L-torque	<b>14.84 ft</b>		
phi*Vny	<b>94.53 k</b>	Tau_b	<b>1</b>		
phi*Vnz	<b>99.45 k</b>				



**Enveloped Seismic Detailing Results (AISC 341/358 - 2010)**

Member Type	<b>Beam</b>	Design to $\Omega_0$ Loads	<b>No</b>
Seismic Design Rule	<b>RBS C LEVEL 3</b>	Frame Ductility Req'd	<b>High</b>
Moment Conn Type	<b>RBS</b>		
Flange	<b>Compact (Fail)</b>	Web	<b>Seismically Compact</b>
Col-BM Moment Ratio	<b>3.141 (Pass)</b>		
Span to Depth Ratio	<b>11.838 (Pass)</b>		

**Beam Flange Bracing**

Reqd Strength	<b>1.73 k</b>	<b>360-10: Eqn A-6-7</b>
Reqd Strength	<b>5.189 k</b>	<b>341-10: D1.2c</b>
Reqd Stiffness	<b>22.26 k/in</b>	<b>360-10: Eqn A-6-8</b>
Max Spacing	<b>51.803 in</b>	<b>341-10: D1.2b</b>

**Required Connection Shear Strength**

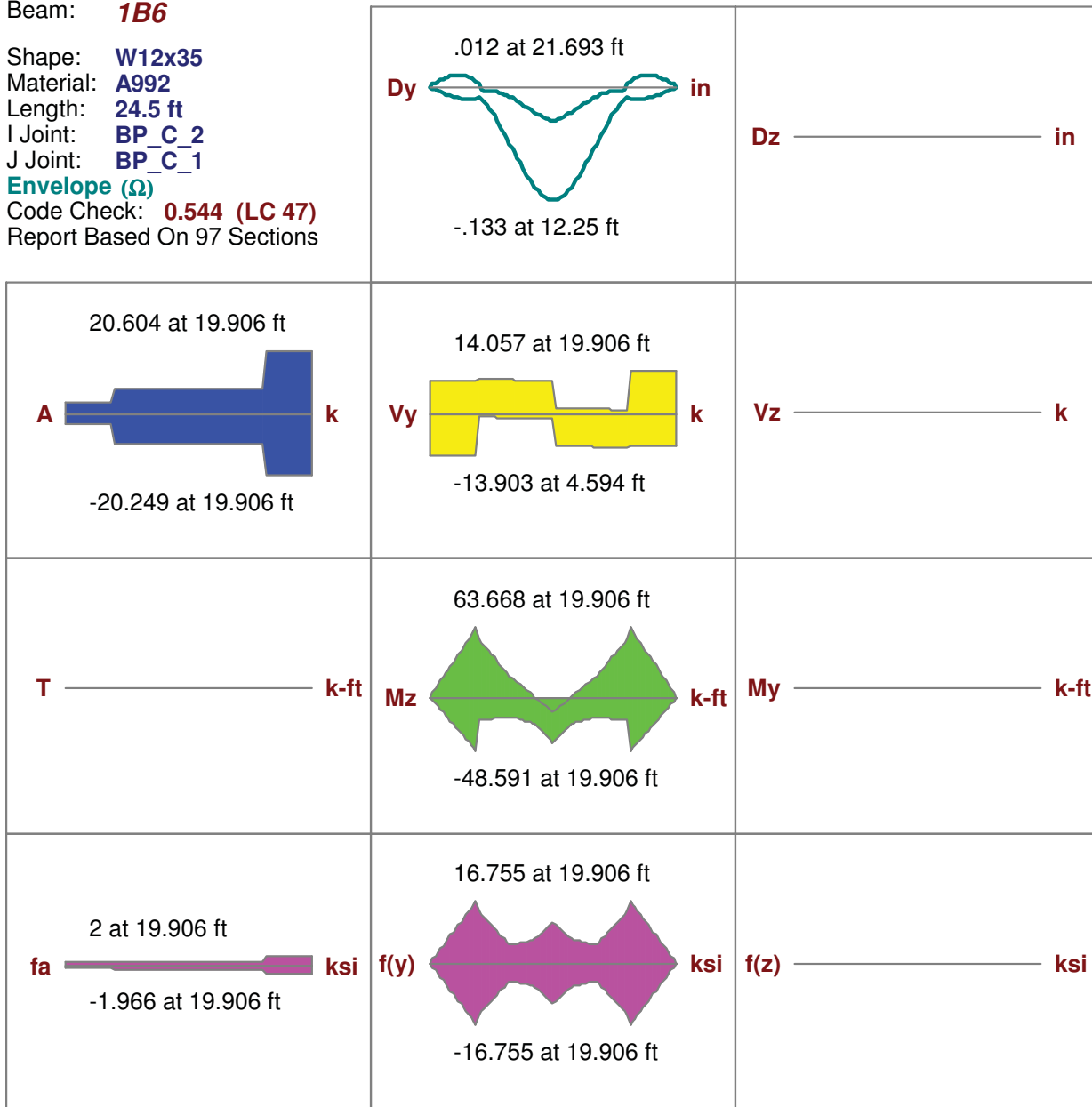
Column	Vg (k)	Vpr (k)	$\Omega_0 * Vu(k)$	Demand
(C-2.1)	<b>.768</b>	<b>17.941</b>	<b>11.43</b>	<b>18.709</b>
(C-3.5)	<b>.768</b>	<b>17.941</b>	<b>-11.434</b>	<b>18.709</b>

**Required Connection Moment Strength**

Column	Hinge Loc(in)	Ze(in <sup>3</sup> )	Mpr(k-ft)	$\Omega_0 * Mu(k-ft)$	Demand(k-ft)
(C-2.1)	<b>7</b>	<b>21.016</b>	<b>110.77</b>	<b>81.914</b>	<b>121.683</b>
(C-3.5)	<b>7</b>	<b>21.016</b>	<b>110.77</b>	<b>81.755</b>	<b>121.683</b>

NOTE THAT RISA USES THE FULL BEAM FLANGE IN THIS CALCULATION. AS PER AISC 358 AND VARIOUS AISC DESIGN EXAMPLES THE FLANGE WIDTH AT THE REDUCED BEAM SECTION CAN BE USED AND THEREFORE THIS MEMBER PASSES.

Beam: **1B6**  
 Shape: **W12x35**  
 Material: **A992**  
 Length: **24.5 ft**  
 I Joint: **BP\_C\_2**  
 J Joint: **BP\_C\_1**  
 Envelope ( $\Omega$ )  
 Code Check: **0.544 (LC 47)**  
 Report Based On 97 Sections



**AISC 14th(360-10): LRFD Code Check**

**Direct Analysis Method**

**- Size from RISAFloor governed optimization -**

Max Bending Check	<b>0.544 (LC 47)</b>	Max Shear Check	<b>0.125 (y) (LC 47)</b>	Max Defl Ratio	<b>L/1460</b>
Location	<b>19.906 ft</b>	Location	<b>19.906 ft</b>	Location	<b>12.25 ft</b>
Equation	<b>H1-1a</b>			Span	<b>2</b>

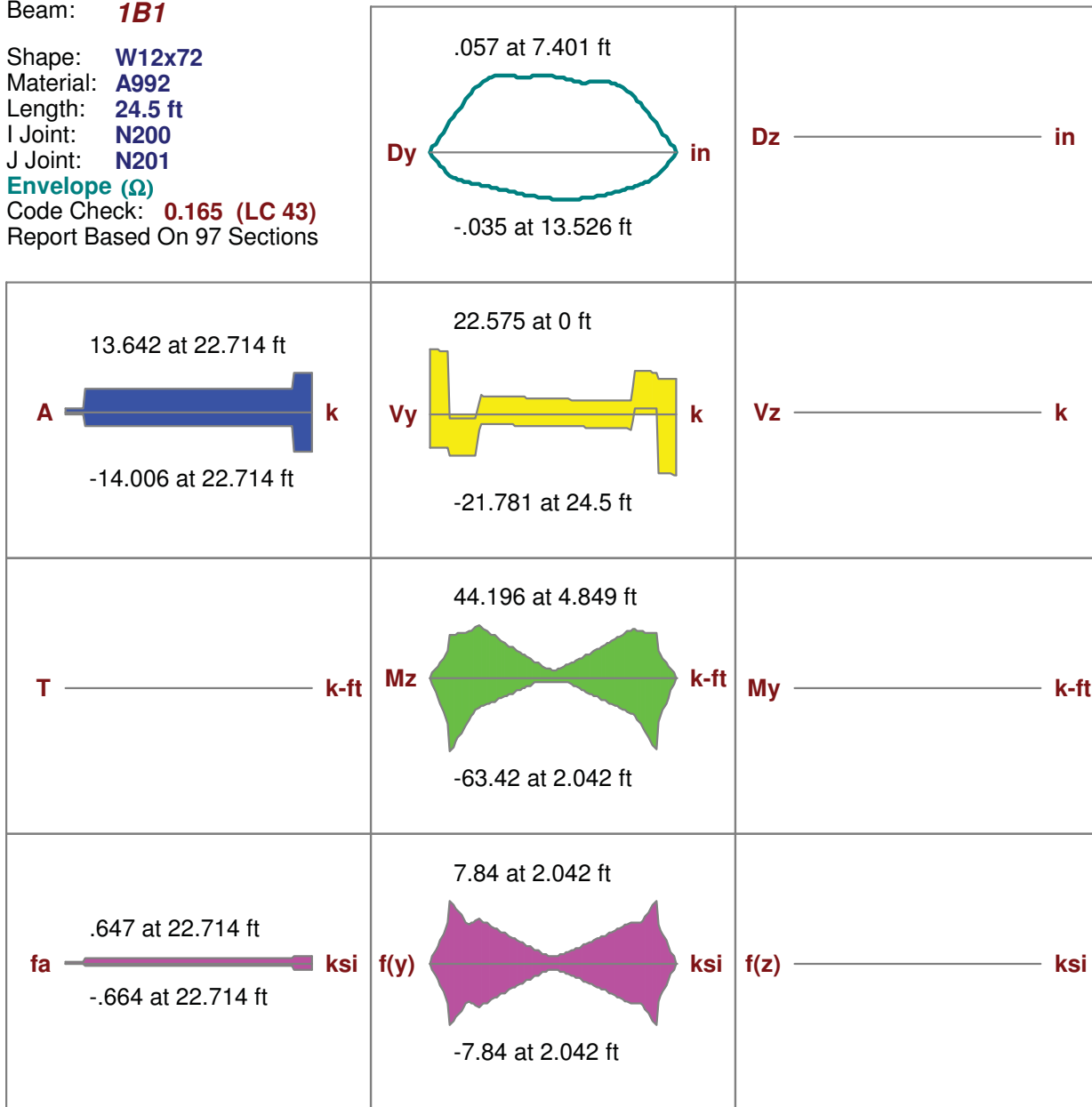
Bending Flange	<b>Compact</b>	Compression Flange	<b>Non-Slender</b>	<b>Qs=1</b>
Bending Web	<b>Compact</b>	Compression Web	<b>Slender</b>	<b>Qa=1</b>

Fy	<b>50 ksi</b>	Lb	<b>24.5 ft</b>	z-z	<b>24.5 ft</b>
phi*Pnc	<b>64.034 k</b>	KL/r	<b>190.626</b>		<b>55.891</b>
phi*Pnt	<b>463.5 k</b>				
phi*Mny	<b>43.125 k-ft</b>	L Comp Flange	<b>24.5 ft</b>		
phi*Mnz	<b>192 k-ft</b>	L-torque	<b>24.5 ft</b>		
phi*Vny	<b>112.5 k</b>	Tau_b	<b>1</b>		
phi*Vnz	<b>184.285 k</b>				

**Enveloped Seismic Detailing Results (AISC 341/358 - 2010)**

Member Type	<b>Beam</b>	Design to $\Omega_0$ Loads	<b>Yes</b>
Seismic Design Rule	<b>SMF SUPPORT</b>	Frame Ductility Req'd	<b>High</b>
Moment Conn Type	<b>Other/None</b>		
Flange	<b>Compact</b>	Web	<b>Compact</b>

Beam: **1B1**  
 Shape: **W12x72**  
 Material: **A992**  
 Length: **24.5 ft**  
 I Joint: **N200**  
 J Joint: **N201**  
 Envelope ( $\Omega$ )  
 Code Check: **0.165 (LC 43)**  
 Report Based On 97 Sections



**AISC 14th(360-10): LRFD Code Check**

**Direct Analysis Method**

**- Size from RISAFloor governed optimization -**

Max Bending Check	<b>0.165 (LC 43)</b>	Max Shear Check	<b>0.142 (y) (LC 3M)</b>	Max Defl Ratio	<b>L/5534</b>
Location	<b>2.042 ft</b>	Location	<b>0 ft</b>	Location	<b>7.911 ft</b>
Equation	<b>H1-1b</b>			Span	<b>2</b>

Bending Flange	<b>Compact</b>	Compression Flange	<b>Non-Slender</b>
Bending Web	<b>Compact</b>	Compression Web	<b>Non-Slender</b>

Fy	<b>50 ksi</b>	Lb	<b>24.5 ft</b>	z-z	<b>24.5 ft</b>
phi*Pnc	<b>479.183 k</b>	KL/r	<b>96.71</b>		<b>55.272</b>
phi*Pnt	<b>949.5 k</b>				
phi*Mny	<b>184.5 k-ft</b>	L Comp Flange	<b>1 ft</b>		
phi*Mnz	<b>405 k-ft</b>	L-torque	<b>24.5 ft</b>		
phi*Vny	<b>158.67 k</b>	Tau_b	<b>1</b>		
phi*Vnz	<b>434.16 k</b>				

**Enveloped Seismic Detailing Results (AISC 341/358 - 2010)**

Member Type	<b>Beam</b>	Design to $\Omega_0$ Loads	<b>Yes</b>
Seismic Design Rule	<b>SMF SUPPORT</b>	Frame Ductility Req'd	<b>High</b>
Moment Conn Type	<b>Other/None</b>		
Flange	<b>Compact</b>	Web	<b>Compact</b>

Column: **C-2.1**

Shape: **W16x31**

Material: **A992**

Length: **8.938 ft**

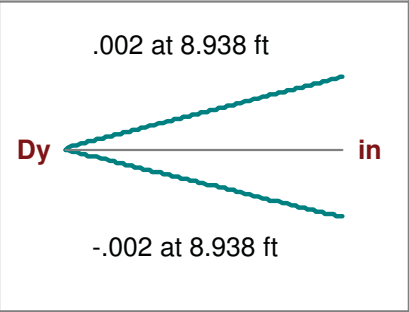
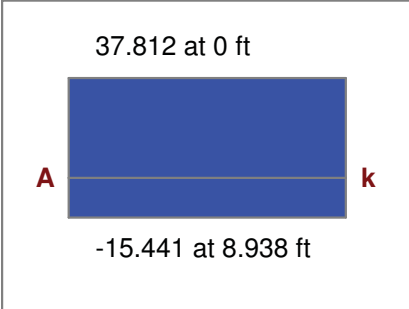
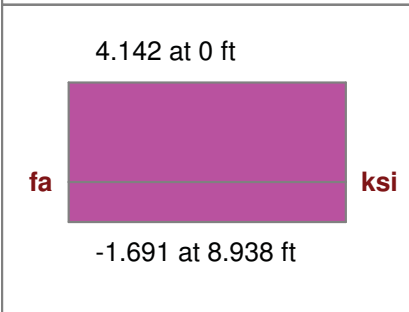
I Joint: **BP\_B\_1**

J Joint: **F6\_N8**

Envelope ( $\Omega$ )

Code Check: **0.174 (LC 43)**

Report Based On 97 Sections

<p>.002 at 8.938 ft</p>  <p><b>Dy</b> _____ <b>in</b>      <b>Dz</b> _____ <b>in</b></p> <p>-.002 at 8.938 ft</p>	
<p>37.812 at 0 ft</p>  <p><b>A</b> _____ <b>k</b></p> <p>-15.441 at 8.938 ft</p>	<p><b>Vy</b> _____ <b>k</b>      <b>Vz</b> _____ <b>k</b></p>
<p><b>T</b> _____ <b>k-ft</b></p>	<p><b>Mz</b> _____ <b>k-ft</b>      <b>My</b> _____ <b>k-ft</b></p>
<p>4.142 at 0 ft</p>  <p><b>fa</b> _____ <b>ksi</b></p> <p>-1.691 at 8.938 ft</p>	<p><b>f(y)</b> _____ <b>ksi</b>      <b>f(z)</b> _____ <b>ksi</b></p>

**AISC 14th(360-10): LRFD Code Check**

**Direct Analysis Method**

Max Bending Check **0.174 (LC 43)**  
 Location **0 ft**  
 Equation **H1-1b\***

Max Shear Check **0.000 (y) (LC 28)**  
 Location **0 ft**  
 Max Defl Ratio **L/10000**

Bending Flange **Compact**  
 Bending Web **Compact**

Compression Flange **Non-Slender** **Qs=1**  
 Compression Web **Slender** **Qa=.963**

Fy	<b>50 ksi</b>	Lb	<b>8.938 ft</b>	z-z	<b>8.938 ft</b>
phi*Pnc	<b>217.928 k</b>	KL/r	<b>92.028</b>		<b>16.735</b>
phi*Pnt	<b>410.85 k</b>				
phi*Mny	<b>26.363 k-ft</b>	L Comp Flange	<b>8.938 ft</b>		
phi*Mnz	<b>153.612 k-ft</b>	L-torque	<b>8.938 ft</b>		
phi*Vny	<b>131.175 k</b>	Tau_b	<b>1</b>		
phi*Vnz	<b>131.393 k</b>				
Cb	<b>1</b>				

**Enveloped Seismic Detailing Results (AISC 341/358 - 2010)**

Member Type	<b>Column</b>	Design to $\Omega_0$ Loads	<b>Yes</b>
Seismic Design Rule	<b>SMF SUPPORT</b>	Frame Ductility Req'd	<b>High</b>
Moment Conn Type	<b>Other/None</b>		
Flange	<b>Seismically Compact</b>	Web	<b>Seismically Compact</b>
L/r = <b>92.028</b>	<b>&gt; 60 per 341-10 E3.4c(2)(2) (For Reference Only)</b>		

Column: **C-3.5**

Shape: **W16x31**

Material: **A992**

Length: **8.938 ft**

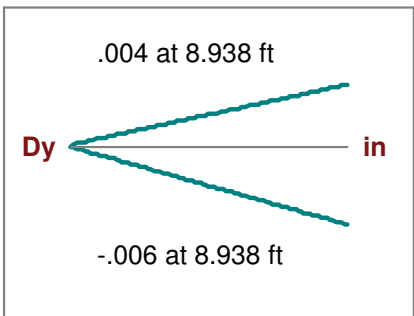
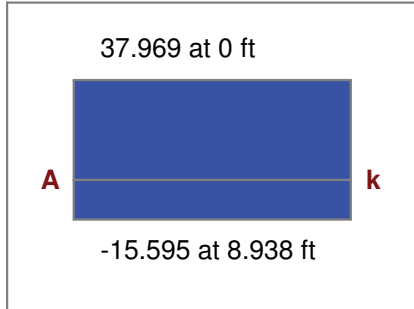
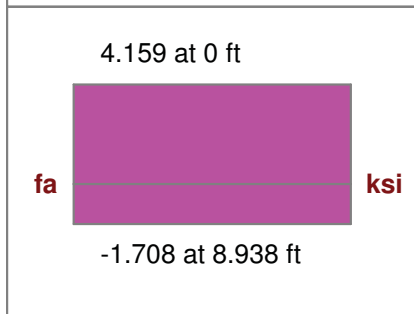
I Joint: **BP\_B\_2**

J Joint: **F6\_N10**

Envelope ( $\Omega$ )

Code Check: **0.174 (LC 41)**

Report Based On 97 Sections

<p>.004 at 8.938 ft</p>  <p><b>Dy</b> _____ <b>in</b>      <b>Dz</b> _____ <b>in</b></p> <p>-.006 at 8.938 ft</p>	
<p>37.969 at 0 ft</p>  <p><b>A</b> _____ <b>k</b></p> <p>-15.595 at 8.938 ft</p>	<p><b>Vy</b> _____ <b>k</b>      <b>Vz</b> _____ <b>k</b></p>
<p><b>T</b> _____ <b>k-ft</b></p>	<p><b>Mz</b> _____ <b>k-ft</b>      <b>My</b> _____ <b>k-ft</b></p>
<p>4.159 at 0 ft</p>  <p><b>fa</b> _____ <b>ksi</b></p> <p>-1.708 at 8.938 ft</p>	<p><b>f(y)</b> _____ <b>ksi</b>      <b>f(z)</b> _____ <b>ksi</b></p>

**AISC 14th(360-10): LRFD Code Check**

**Direct Analysis Method**

Max Bending Check **0.174 (LC 41)**  
 Location **0 ft**  
 Equation **H1-1b\***

Max Shear Check **0.000 (y) (LC 28)**  
 Location **0 ft**  
 Max Defl Ratio **L/10000**

Bending Flange **Compact**  
 Bending Web **Compact**

Compression Flange **Non-Slender** **Qs=1**  
 Compression Web **Slender** **Qa=.963**

Fy	<b>50 ksi</b>	Lb	<b>8.938 ft</b>	z-z	<b>8.938 ft</b>
phi*Pnc	<b>217.928 k</b>	KL/r	<b>92.028</b>		<b>16.735</b>
phi*Pnt	<b>410.85 k</b>				
phi*Mny	<b>26.363 k-ft</b>	L Comp Flange	<b>8.938 ft</b>		
phi*Mnz	<b>153.612 k-ft</b>	L-torque	<b>8.938 ft</b>		
phi*Vny	<b>131.175 k</b>	Tau_b	<b>1</b>		
phi*Vnz	<b>131.393 k</b>				
Cb	<b>1</b>				



**Enveloped Seismic Detailing Results (AISC 341/358 - 2010)**

Member Type	<b>Column</b>	Design to $\Omega_0$ Loads	<b>Yes</b>
Seismic Design Rule	<b>SMF SUPPORT</b>	Frame Ductility Req'd	<b>High</b>
Moment Conn Type	<b>Other/None</b>		
Flange	<b>Seismically Compact</b>	Web	<b>Seismically Compact</b>
L/r = <b>92.028</b>	<b>&gt; 60 per 341-10 E3.4c(2)(2) (For Reference Only)</b>		

Column: **(C-2.1)**

Shape: **W16x31**

Material: **A992**

Length: **31.87 ft**

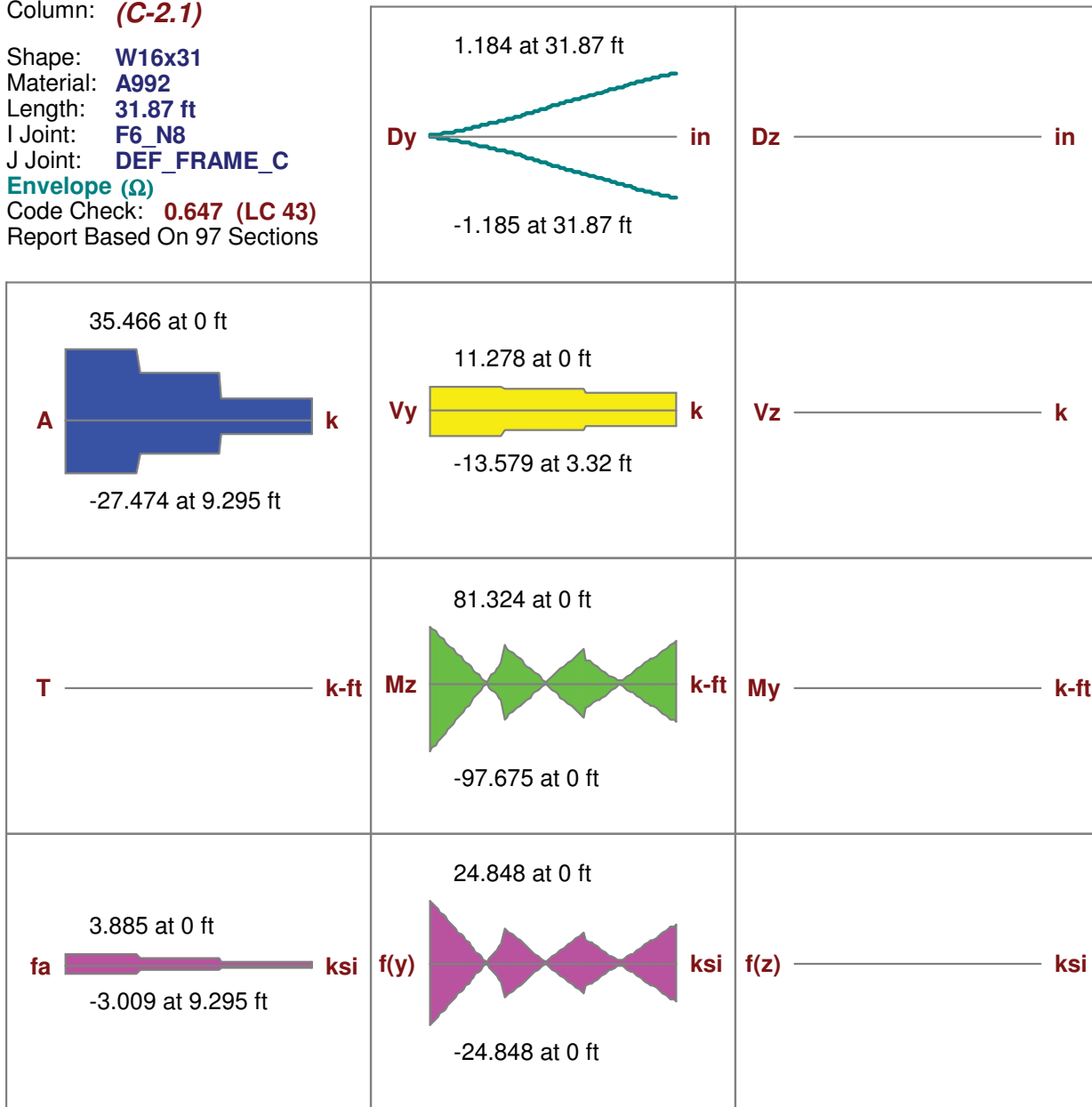
I Joint: **F6\_N8**

J Joint: **DEF\_FRAME\_C**

Envelope ( $\Omega$ )

Code Check: **0.647 (LC 43)**

Report Based On 97 Sections



**AISC 14th(360-10): LRFD Code Check**

**Direct Analysis Method**

**- Size from RISAFloor governed optimization -**

Max Bending Check **0.647 (LC 43)**

Location **0 ft**

Equation **H1-1b**

Max Shear Check **0.104 (y) (LC 43)**

Location **3.32 ft**

Max Defl Ratio **L/323**

Bending Flange

Bending Web

**Compact**

**Compact**

Compression Flange

Compression Web

**Non-Slender**

**Slender**

**Qs=1**

**Qa=.974**

Fy **50 ksi**

phi\*Pnc **204.832 k**

phi\*Pnt **410.85 k**

phi\*Mny **26.363 k-ft**

phi\*Mnz **174.282 k-ft**

phi\*Vny **131.175 k**

phi\*Vnz **131.333 k**

Lb

**9.416 ft**

KL/r

**96.961**

Tau\_b

**1**

y-y

**9.416 ft**

z-z

**9.416 ft**

**17.632**

L Comp Flange

**9.416 ft**

L-torque

**9.416 ft**

**Enveloped Seismic Detailing Results (AISC 341/358 - 2010)**

Member Type	<b>Column</b>	Design to $\Omega_0$ Loads	<b>Yes</b>
Seismic Design Rule	<b>RBS C ROOF</b>	Frame Ductility Req'd	<b>High</b>
Moment Conn Type	<b>RBS</b>		
Flange	<b>Seismically Compact</b>	Web	<b>Seismically Compact</b>

L/r = **122.862** > 60 per 341-10 E3.4c(2)(2) (For Reference Only)

**Panel Zone Summary Fail (Web Reinf. Required)**

Beam 2B6	Demand	LC	Capacity	UC
360-10: Eqn J10-9	<b>Vu = 104.0 k</b>	<b>43</b>	<b>Phi*Vn = 118.058 k</b>	<b>.881</b>
341-10: Eqn E3-7	<b>tcw &gt; .312 in</b>	N/A	<b>tcw = .275 in</b>	<b>1.133</b>
Beam 3B11	Demand	LC	Capacity	UC
360-10: Eqn J10-9	<b>Vu = 104.5 k</b>	<b>43</b>	<b>Phi*Vn = 118.058 k</b>	<b>.886</b>
341-10: Eqn E3-7	<b>tcw &gt; .312 in</b>	N/A	<b>tcw = .275 in</b>	<b>1.133</b>
Beam RB1	Demand	LC	Capacity	UC
360-10: Eqn J10-9	<b>Vu = 108.1 k</b>	<b>43</b>	<b>Phi*Vn = 118.058 k</b>	<b>.916</b>
341-10: Eqn E3-7	<b>tcw &gt; .312 in</b>	N/A	<b>tcw = .275 in</b>	<b>1.133</b>

**Continuity Plate Summary Fail (Flange Stiffener Required)**

Beam 2B6	Demand	LC	Capacity	UC	Eqn
Flange Bending	<b>Puf = 109.255 k</b>	N/A	<b>54.45 k</b>	<b>2.007</b>	360-10: Eqn J10-1
Web Yielding	<b>Puf = 109.255 k</b>	N/A	<b>62.494 k</b>	<b>1.748</b>	360-10: Eqn J10-2
Web Crippling	<b>Puf = 109.255 k</b>	N/A	<b>71.272 k</b>	<b>1.533</b>	360-10: Eqn J10-4
Flange Thick	<b>tcf &gt; .695 in</b>	N/A	<b>tcf = .44in</b>	<b>1.579</b>	341-10: E3-8
Flange Thick	<b>tcf &gt; .833 in</b>	N/A	<b>tcf = .44 in</b>	<b>1.894</b>	341-10: E3-9
Beam 3B11	Demand	LC	Capacity	UC	Eqn
Flange Bending	<b>Puf = 109.255 k</b>	N/A	<b>54.45 k</b>	<b>2.007</b>	360-10: Eqn J10-1
Web Yielding	<b>Puf = 109.255 k</b>	N/A	<b>62.494 k</b>	<b>1.748</b>	360-10: Eqn J10-2
Web Crippling	<b>Puf = 109.255 k</b>	N/A	<b>71.272 k</b>	<b>1.533</b>	360-10: Eqn J10-4
Flange Thick	<b>tcf &gt; .695 in</b>	N/A	<b>tcf = .44in</b>	<b>1.579</b>	341-10: E3-8
Flange Thick	<b>tcf &gt; .833 in</b>	N/A	<b>tcf = .44 in</b>	<b>1.894</b>	341-10: E3-9
Beam RB1	Demand	LC	Capacity	UC	Eqn
Flange Bending	<b>Puf = 112.84 k</b>	N/A	<b>27.225 k</b>	<b>4.145</b>	360-10: Eqn J10-1
Web Yielding	<b>Puf = 112.84 k</b>	N/A	<b>33.55 k</b>	<b>3.363</b>	360-10: Eqn J10-3
Web Crippling	<b>Puf = 112.84 k</b>	N/A	<b>35.636 k</b>	<b>3.166</b>	360-10: Eqn J10-5a
Flange Thick	<b>tcf &gt; .695 in</b>	N/A	<b>tcf = .44in</b>	<b>1.579</b>	341-10: E3-8
Flange Thick	<b>tcf &gt; .833 in</b>	N/A	<b>tcf = .44 in</b>	<b>1.894</b>	341-10: E3-9

**Column Beam Moment Ratio (Pass)**

Beam	Sum M*pc (k-ft)	Sum M*pb (k-ft)	Ratio	Eqn
2B6	<b>421.052</b>	<b>134.078</b>	<b>3.14 (Pass)</b>	358-10 5.4(2a)
3B11	<b>433.345</b>	<b>134.077</b>	<b>3.232 (Pass)</b>	358-10 5.4(2a)
RB1	<b>219.819</b>	<b>142.603</b>	<b>1.541 (Pass)</b>	358-10 5.4(2a)

**Column Flange Bracing Force**

Lateral bracing at Bm to Col Connection req'd when SC/WB < 2.0 (341-10: E3.4c.(2))

Beam	Demand (k)	Eqn
2B6	<b>121.66</b>	341-10 E3.4c(1)(2)
3B11	<b>121.66</b>	341-10 E3.4c(1)(2)
RB1	<b>121.66</b>	341-10 E3.4c(1)(2)

Column: **(C-3.5)**

Shape: **W16x31**

Material: **A992**

Length: **31.87 ft**

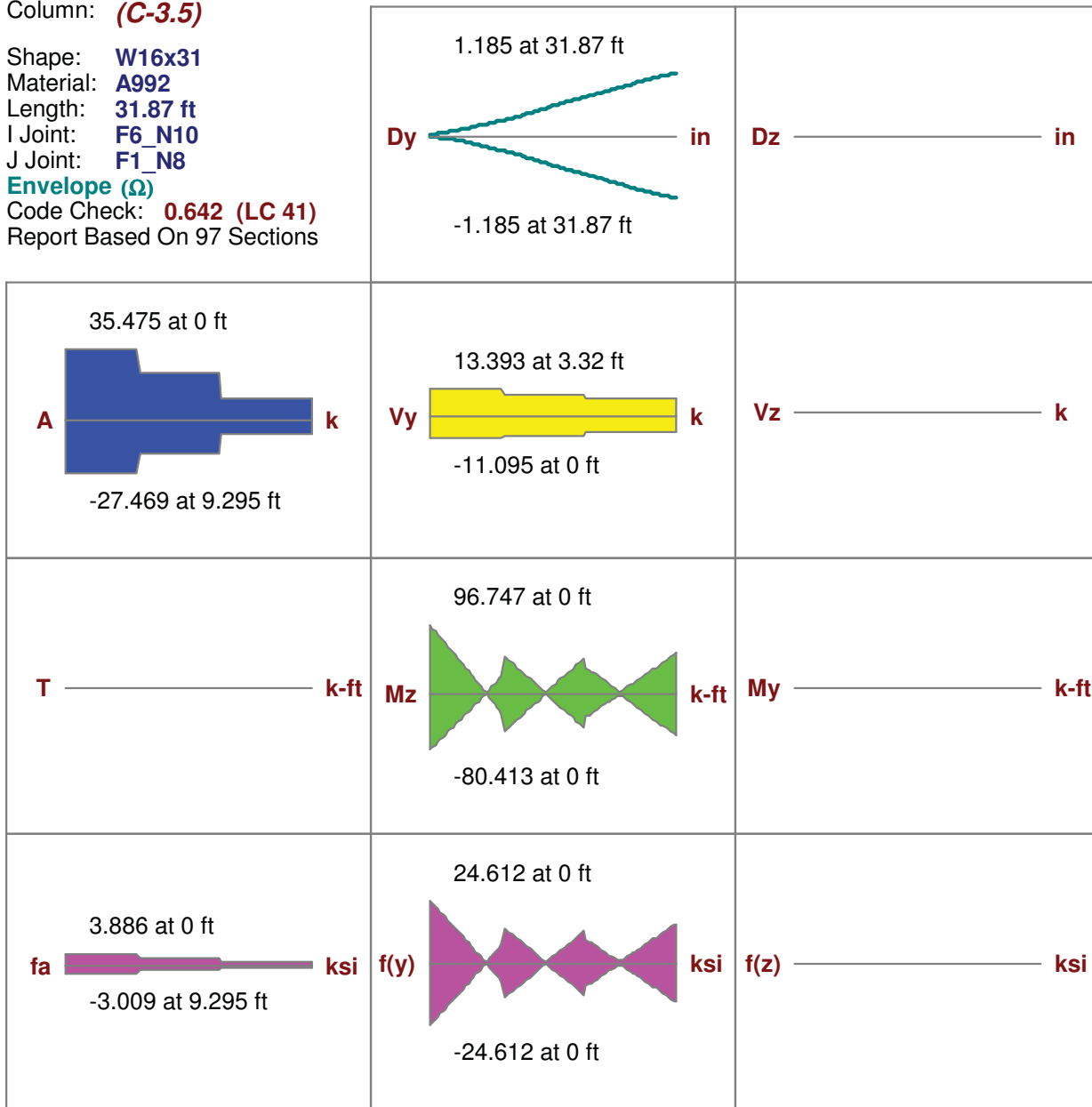
I Joint: **F6\_N10**

J Joint: **F1\_N8**

Envelope ( $\Omega$ )

Code Check: **0.642 (LC 41)**

Report Based On 97 Sections



**AISC 14th(360-10): LRFD Code Check**

**Direct Analysis Method**

**- Size from RISAFloor governed optimization -**

Max Bending Check **0.642 (LC 41)**

Location **0 ft**

Equation **H1-1b**

Max Shear Check **0.102 (y) (LC 41)**

Location **3.32 ft**

Max Defl Ratio **L/324**

Bending Flange

Bending Web

**Compact**

**Compact**

Compression Flange

Compression Web

**Non-Slender**

**Slender**

**Qs=1**

**Qa=.974**

Fy **50 ksi**

phi\*Pnc **204.832 k**

phi\*Pnt **410.85 k**

phi\*Mny **26.363 k-ft**

phi\*Mnz **174.152 k-ft**

phi\*Vny **131.175 k**

phi\*Vnz **131.333 k**

Lb

**9.416 ft**

KL/r

**96.961**

L Comp Flange

L-torque

Tau\_b

z-z

**9.416 ft**

**17.632**

**9.416 ft**

**9.416 ft**

**1**

### Enveloped Seismic Detailing Results (AISC 341/358 - 2010)

Member Type	<b>Column</b>	Design to $\Omega_0$ Loads	<b>Yes</b>
Seismic Design Rule	<b>RBS C ROOF</b>	Frame Ductility Req'd	<b>High</b>
Moment Conn Type	<b>RBS</b>		
Flange	<b>Seismically Compact</b>	Web	<b>Seismically Compact</b>

L/r = **122.862** > 60 per 341-10 E3.4c(2)(2) (For Reference Only)

#### Panel Zone Summary **Fail (Web Reinf. Required)**

Beam 2B6	Demand	LC	Capacity	UC
360-10: Eqn J10-9	<b>Vu = 104.0 k</b>	<b>41</b>	<b>Phi*Vn = 118.058 k</b>	<b>.881</b>
341-10: Eqn E3-7	<b>tcw &gt; .312 in</b>	N/A	<b>tcw = .275 in</b>	<b>1.133</b>
Beam 3B11	Demand	LC	Capacity	UC
360-10: Eqn J10-9	<b>Vu = 104.6 k</b>	<b>41</b>	<b>Phi*Vn = 118.058 k</b>	<b>.886</b>
341-10: Eqn E3-7	<b>tcw &gt; .312 in</b>	N/A	<b>tcw = .275 in</b>	<b>1.133</b>
Beam RB1	Demand	LC	Capacity	UC
360-10: Eqn J10-9	<b>Vu = 108.2 k</b>	<b>41</b>	<b>Phi*Vn = 118.058 k</b>	<b>.916</b>
341-10: Eqn E3-7	<b>tcw &gt; .312 in</b>	N/A	<b>tcw = .275 in</b>	<b>1.133</b>

#### Continuity Plate Summary **Fail (Flange Stiffener Required)**

Beam 2B6	Demand	LC	Capacity	UC	Eqn
Flange Bending	<b>Puf = 109.255 k</b>	N/A	<b>54.45 k</b>	<b>2.007</b>	360-10: Eqn J10-1
Web Yielding	<b>Puf = 109.255 k</b>	N/A	<b>62.494 k</b>	<b>1.748</b>	360-10: Eqn J10-2
Web Crippling	<b>Puf = 109.255 k</b>	N/A	<b>71.272 k</b>	<b>1.533</b>	360-10: Eqn J10-4
Flange Thick	<b>tcf &gt; .695 in</b>	N/A	<b>tcf = .44in</b>	<b>1.579</b>	341-10: E3-8
Flange Thick	<b>tcf &gt; .833 in</b>	N/A	<b>tcf = .44 in</b>	<b>1.894</b>	341-10: E3-9
Beam 3B11	Demand	LC	Capacity	UC	Eqn
Flange Bending	<b>Puf = 109.255 k</b>	N/A	<b>54.45 k</b>	<b>2.007</b>	360-10: Eqn J10-1
Web Yielding	<b>Puf = 109.255 k</b>	N/A	<b>62.494 k</b>	<b>1.748</b>	360-10: Eqn J10-2
Web Crippling	<b>Puf = 109.255 k</b>	N/A	<b>71.272 k</b>	<b>1.533</b>	360-10: Eqn J10-4
Flange Thick	<b>tcf &gt; .695 in</b>	N/A	<b>tcf = .44in</b>	<b>1.579</b>	341-10: E3-8
Flange Thick	<b>tcf &gt; .833 in</b>	N/A	<b>tcf = .44 in</b>	<b>1.894</b>	341-10: E3-9
Beam RB1	Demand	LC	Capacity	UC	Eqn
Flange Bending	<b>Puf = 112.84 k</b>	N/A	<b>27.225 k</b>	<b>4.145</b>	360-10: Eqn J10-1
Web Yielding	<b>Puf = 112.84 k</b>	N/A	<b>33.55 k</b>	<b>3.363</b>	360-10: Eqn J10-3
Web Crippling	<b>Puf = 112.84 k</b>	N/A	<b>35.636 k</b>	<b>3.166</b>	360-10: Eqn J10-5a
Flange Thick	<b>tcf &gt; .695 in</b>	N/A	<b>tcf = .44in</b>	<b>1.579</b>	341-10: E3-8
Flange Thick	<b>tcf &gt; .833 in</b>	N/A	<b>tcf = .44 in</b>	<b>1.894</b>	341-10: E3-9

#### Column Beam Moment Ratio (Pass)

Beam	Sum M*pc (k-ft)	Sum M*pb (k-ft)	Ratio	Eqn
2B6	<b>421.045</b>	<b>134.054</b>	<b>3.141 (Pass)</b>	358-10 5.4(2a)
3B11	<b>433.342</b>	<b>134.055</b>	<b>3.233 (Pass)</b>	358-10 5.4(2a)
RB1	<b>219.819</b>	<b>142.604</b>	<b>1.541 (Pass)</b>	358-10 5.4(2a)

#### Column Flange Bracing Force

Lateral bracing at Bm to Col Connection req'd when SC/WB < 2.0 (341-10: E3.4c.(2))

Beam	Demand (k)	Eqn
2B6	<b>121.66</b>	341-10 E3.4c(1)(2)
3B11	<b>121.66</b>	341-10 E3.4c(1)(2)
RB1	<b>121.66</b>	341-10 E3.4c(1)(2)

Column: **(F.5-4.5)**

Shape: **W14x74**

Material: **A992**

Length: **19.938 ft**

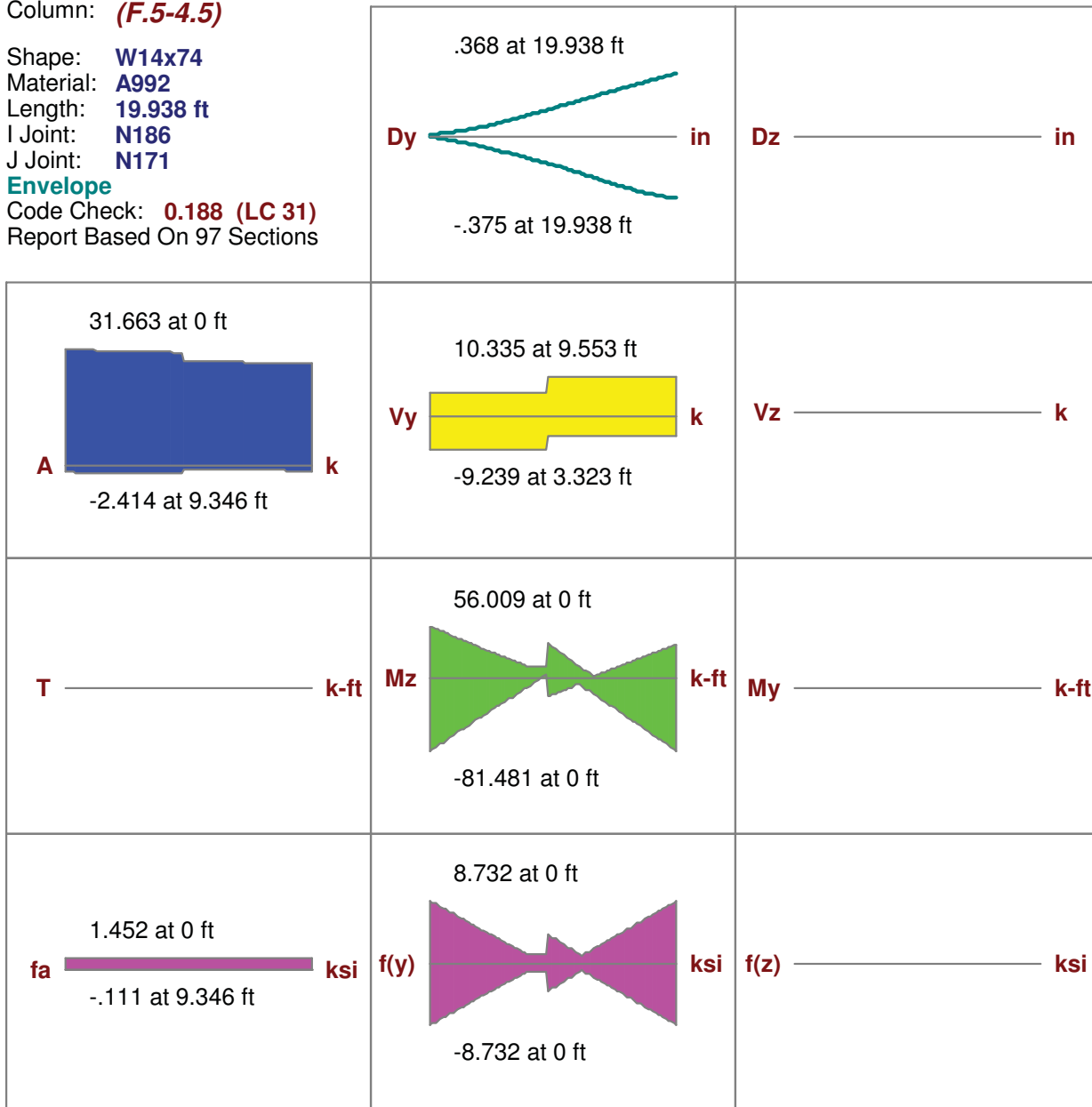
I Joint: **N186**

J Joint: **N171**

**Envelope**

Code Check: **0.188 (LC 31)**

Report Based On 97 Sections



**AISC 14th(360-10): LRFD Code Check**

**Direct Analysis Method**

**- Size from RISAFloor governed optimization -**

Max Bending Check	<b>0.188 (LC 31)</b>	Max Shear Check	<b>0.054 (y) (LC 41)</b>
Location	<b>19.938 ft</b>	Location	<b>9.553 ft</b>
Equation	<b>H1-1b</b>	Max Defl Ratio	<b>L/639</b>

Bending Flange	<b>Compact</b>	Compression Flange	<b>Non-Slender</b>
Bending Web	<b>Compact</b>	Compression Web	<b>Non-Slender</b>

Fy	<b>50 ksi</b>	Lb	y-y	z-z
phi*Pnc	<b>862.284 k</b>	KL/r	<b>-5 ft</b>	<b>-5 ft</b>
phi*Pnt	<b>981 k</b>		<b>-24.201</b>	<b>-9.936</b>
phi*Mny	<b>151.875 k-ft</b>	L Comp Flange	<b>-5 ft</b>	
phi*Mnz	<b>472.5 k-ft</b>	L-torque	<b>10.521 ft</b>	
phi*Vny	<b>191.7 k</b>	Tau_b	<b>1</b>	
phi*Vnz	<b>428.133 k</b>			

**Enveloped Seismic Detailing Results (AISC 341/358 - 2010)**

Member Type	<b>Column</b>	Design to $\Omega_0$ Loads	<b>Yes</b>
Seismic Design Rule	<b>RBS F.5 LEVEL 4</b>	Frame Ductility Req'd	<b>High</b>
Moment Conn Type	<b>RBS</b>		
Flange	<b>Seismically Compact</b>	Web	<b>Seismically Compact</b>
L/r = <b>-9.936</b> <= 60 per 341-10 E3.4c(2)(2)			

**Panel Zone Summary Fail (Web Reinf. Required)**

Beam 2B1	Demand	LC	Capacity	UC
360-10: Eqn J10-9	<b>Vu = 129.4 k</b>	<b>31</b>	<b>Phi*Vn = 172.53 k</b>	<b>.75</b>
341-10: Eqn E3-7	<b>tcw &gt; .245 in</b>	N/A	<b>tcw = .45 in</b>	<b>.544</b>

Beam 3B2	Demand	LC	Capacity	UC
360-10: Eqn J10-9	<b>Vu = 211.9 k</b>	<b>31</b>	<b>Phi*Vn = 172.53 k</b>	<b>1.228</b>
341-10: Eqn E3-7	<b>tcw &gt; .268 in</b>	N/A	<b>tcw = .45 in</b>	<b>.595</b>

**Continuity Plate Summary Fail (Flange Stiffener Required)**

Beam 2B1	Demand	LC	Capacity	UC	Eqn
Flange Bending	<b>Puf = 139.368 k</b>	N/A	<b>173.313 k</b>	<b>.804</b>	360-10: Eqn J10-1
Web Yielding	<b>Puf = 139.368 k</b>	N/A	<b>165.15 k</b>	<b>.844</b>	360-10: Eqn J10-2
Web Crippling	<b>Puf = 139.368 k</b>	N/A	<b>201.033 k</b>	<b>.693</b>	360-10: Eqn J10-4
Flange Thick	<b>tcf &gt; .855 in</b>	N/A	<b>tcf = .785in</b>	<b>1.089</b>	341-10: E3-8
Flange Thick	<b>tcf &gt; .962 in</b>	N/A	<b>tcf = .785 in</b>	<b>1.225</b>	341-10: E3-9

Beam 3B2	Demand	LC	Capacity	UC	Eqn
Flange Bending	<b>Puf = 188.544 k</b>	N/A	<b>86.657 k</b>	<b>2.176</b>	360-10: Eqn J10-1
Web Yielding	<b>Puf = 188.544 k</b>	N/A	<b>89.325 k</b>	<b>2.111</b>	360-10: Eqn J10-3
Web Crippling	<b>Puf = 188.544 k</b>	N/A	<b>101.225 k</b>	<b>1.863</b>	360-10: Eqn J10-5a
Flange Thick	<b>tcf &gt; .991 in</b>	N/A	<b>tcf = .785in</b>	<b>1.263</b>	341-10: E3-8
Flange Thick	<b>tcf &gt; 1.093 in</b>	N/A	<b>tcf = .785 in</b>	<b>1.393</b>	341-10: E3-9

**Column Beam Moment Ratio (Pass)**

Beam	Sum M*pc (k-ft)	Sum M*pb (k-ft)	Ratio	Eqn
2B1	<b>1020.978</b>	<b>122.982</b>	<b>8.302 (Pass)</b>	358-10 5.4(2a)
3B2	<b>511.219</b>	<b>245.294</b>	<b>2.084 (Pass)</b>	358-10 5.4(2a)

Column: **(F.5-1.1)**

Shape: **W14x74**

Material: **A992**

Length: **19.938 ft**

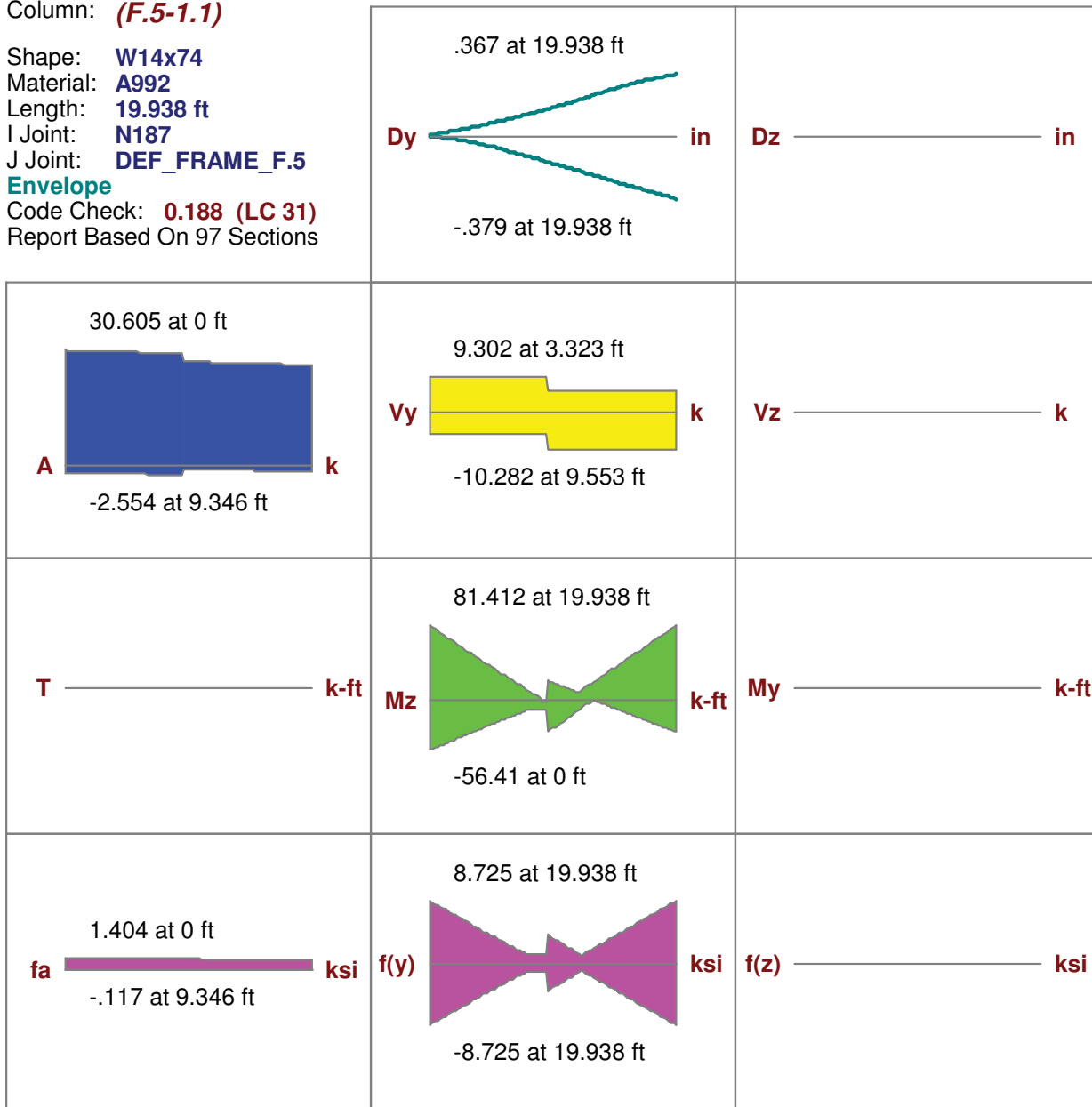
I Joint: **N187**

J Joint: **DEF\_FRAME\_F.5**

**Envelope**

Code Check: **0.188 (LC 31)**

Report Based On 97 Sections



**AISC 14th(360-10): LRFD Code Check**

**Direct Analysis Method**

**- Size from RISAFloor governed optimization -**

Max Bending Check	<b>0.188 (LC 31)</b>	Max Shear Check	<b>0.054 (y) (LC 43)</b>
Location	<b>19.938 ft</b>	Location	<b>9.553 ft</b>
Equation	<b>H1-1b</b>	Max Defl Ratio	<b>L/632</b>

Bending Flange	<b>Compact</b>	Compression Flange	<b>Non-Slender</b>
Bending Web	<b>Compact</b>	Compression Web	<b>Non-Slender</b>

Fy	<b>50 ksi</b>	Lb	y-y	z-z
phi*Pnc	<b>862.284 k</b>	KL/r	<b>-5 ft</b>	<b>-5 ft</b>
phi*Pnt	<b>981 k</b>		<b>-24.201</b>	<b>-9.936</b>
phi*Mny	<b>151.875 k-ft</b>	L Comp Flange	<b>-5 ft</b>	
phi*Mnz	<b>472.5 k-ft</b>	L-torque	<b>10.521 ft</b>	
phi*Vny	<b>191.7 k</b>	Tau_b	<b>1</b>	
phi*Vnz	<b>428.133 k</b>			



**Enveloped Seismic Detailing Results (AISC 341/358 - 2010)**

Member Type	<b>Column</b>	Design to $\Omega_0$ Loads	<b>Yes</b>
Seismic Design Rule	<b>RBS F.5 LEVEL 4</b>	Frame Ductility Req'd	<b>High</b>
Moment Conn Type	<b>RBS</b>		
Flange	<b>Seismically Compact</b>	Web	<b>Seismically Compact</b>
L/r = <b>-9.936</b> <= 60 per 341-10 E3.4c(2)(2)			

**Panel Zone Summary Fail (Web Reinf. Required)**

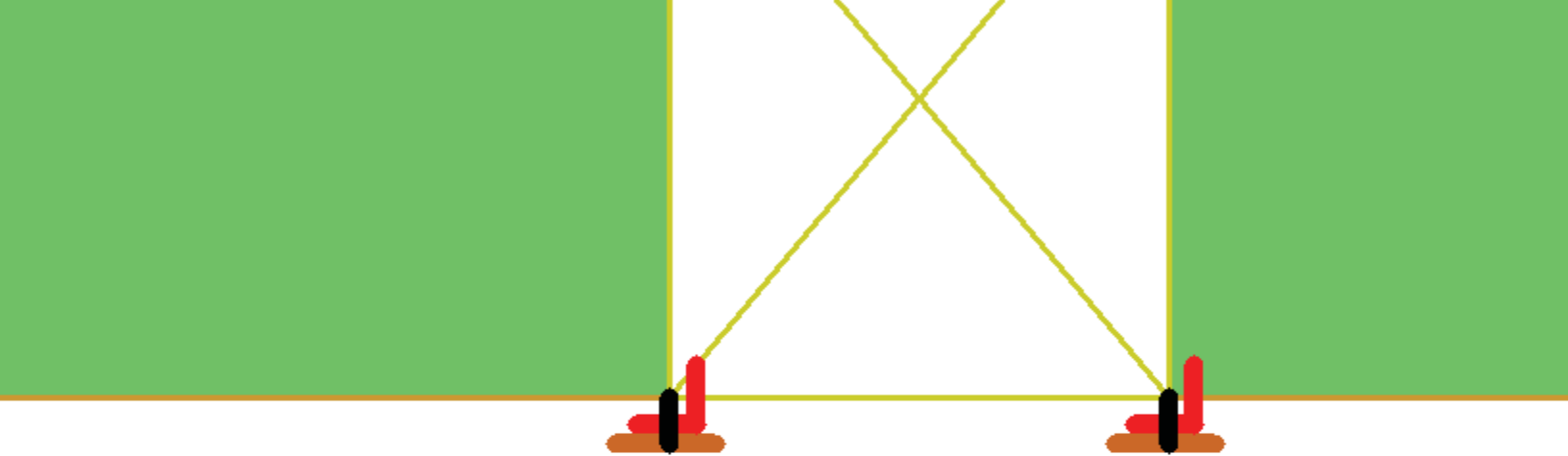
Beam 2B1	Demand	LC	Capacity	UC
360-10: Eqn J10-9	<b>Vu = 129.4 k</b>	<b>31</b>	<b>Phi*Vn = 172.53 k</b>	<b>.75</b>
341-10: Eqn E3-7	<b>tcw &gt; .245 in</b>	N/A	<b>tcw = .45 in</b>	<b>.544</b>
Beam 3B2	Demand	LC	Capacity	UC
360-10: Eqn J10-9	<b>Vu = 211.3 k</b>	<b>31</b>	<b>Phi*Vn = 172.53 k</b>	<b>1.224</b>
341-10: Eqn E3-7	<b>tcw &gt; .268 in</b>	N/A	<b>tcw = .45 in</b>	<b>.595</b>

**Continuity Plate Summary Fail (Flange Stiffener Required)**

Beam 2B1	Demand	LC	Capacity	UC	Eqn
Flange Bending	<b>Puf = 139.368 k</b>	N/A	<b>173.313 k</b>	<b>.804</b>	360-10: Eqn J10-1
Web Yielding	<b>Puf = 139.368 k</b>	N/A	<b>165.15 k</b>	<b>.844</b>	360-10: Eqn J10-2
Web Crippling	<b>Puf = 139.368 k</b>	N/A	<b>201.033 k</b>	<b>.693</b>	360-10: Eqn J10-4
Flange Thick	<b>tcf &gt; .855 in</b>	N/A	<b>tcf = .785in</b>	<b>1.089</b>	341-10: E3-8
Flange Thick	<b>tcf &gt; .962 in</b>	N/A	<b>tcf = .785 in</b>	<b>1.225</b>	341-10: E3-9
Beam 3B2	Demand	LC	Capacity	UC	Eqn
Flange Bending	<b>Puf = 188.544 k</b>	N/A	<b>86.657 k</b>	<b>2.176</b>	360-10: Eqn J10-1
Web Yielding	<b>Puf = 188.544 k</b>	N/A	<b>89.325 k</b>	<b>2.111</b>	360-10: Eqn J10-3
Web Crippling	<b>Puf = 188.544 k</b>	N/A	<b>101.225 k</b>	<b>1.863</b>	360-10: Eqn J10-5a
Flange Thick	<b>tcf &gt; .991 in</b>	N/A	<b>tcf = .785in</b>	<b>1.263</b>	341-10: E3-8
Flange Thick	<b>tcf &gt; 1.093 in</b>	N/A	<b>tcf = .785 in</b>	<b>1.393</b>	341-10: E3-9

**Column Beam Moment Ratio (Pass)**

Beam	Sum M*pc (k-ft)	Sum M*pb (k-ft)	Ratio	Eqn
2B1	<b>1021.976</b>	<b>122.936</b>	<b>8.313 (Pass)</b>	358-10 5.4(2a)
3B2	<b>511.708</b>	<b>248.559</b>	<b>2.059 (Pass)</b>	358-10 5.4(2a)



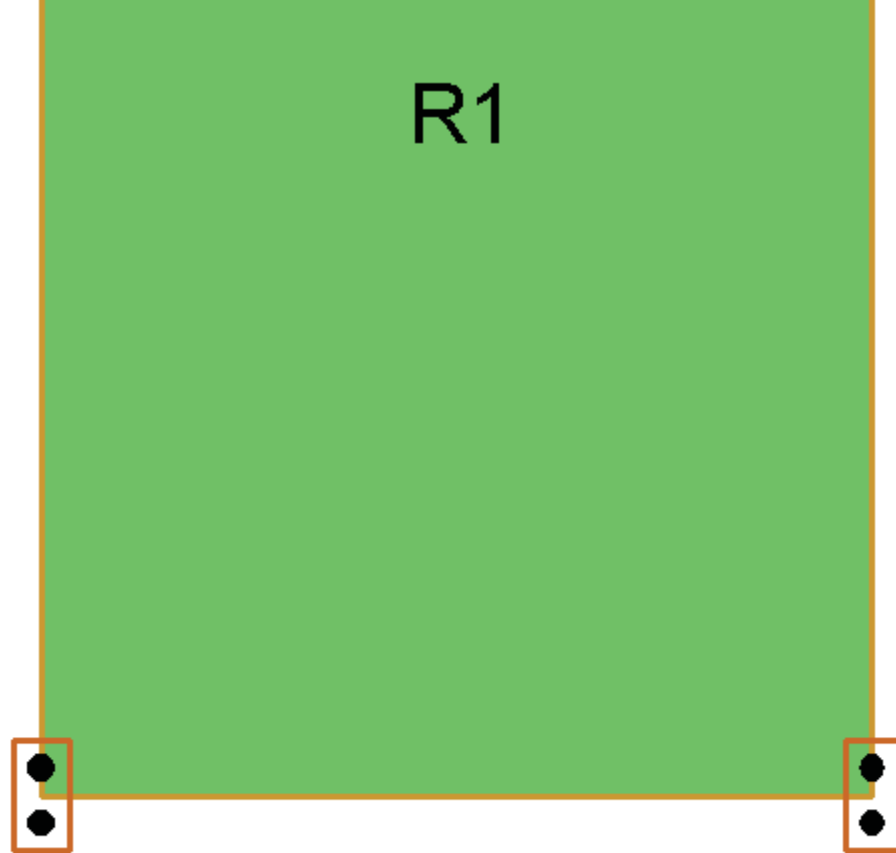
Shear LC	Controlling Hold-down	Hold-down UC	Hold-down LC
<b>54 (S)</b>	<b>HDU11-S...</b>	<b>0.904</b>	<b>64 (S)</b>

Shear LC	Hold-down	Hold-down UC	Hold-down LC
<b>(S)</b>	<b>HDU11-SDS2.5...</b>	<b>0.904</b>	<b>64 (S)</b>
<b>(S)</b>	<b>HDU5-SDS2.5_...</b>	<b>0.812</b>	<b>66 (S)</b>

# R1

Shear LC	Strap Force (k)	Strap LC	Chord UC	Chord LC
<b>52 (S)</b>	<b>1.952</b>	<b>52 (S)</b>	<b>0.489</b>	<b>0.489</b>

Shear	Strap Force (k)	Strap LC	Chord UC	Chord LC
-------	--------------------	-------------	-------------	-------------



Shear LC	Strap Force (k)	Strap LC	Chord UC
<b>52 (S)</b>	<b>5.811</b>	<b>66 (S)</b>	<b>0.717</b>

Shear	Strap Force (k)	Strap LC	Chord UC	Chord LC
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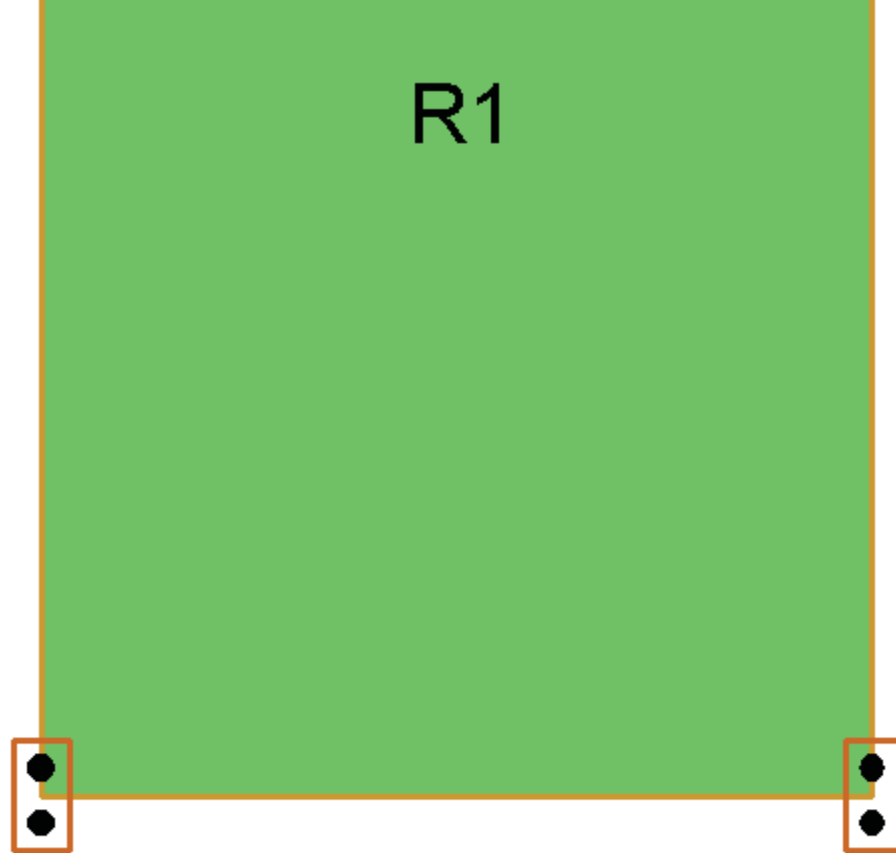
Shear LC	Controlling Hold-down	Hold-down UC	Hold-dow LC
<b>52 (S)</b>	<b>HDU4-SD...</b>	<b>0.844</b>	<b>66 (S)</b>

ear	Hold-down	Hold-down UC	Hold-dow LC
<b>(S)</b>	<b>HDU4-SDS2.5_...</b>	<b>0.844</b>	<b>66 (S)</b>

# R1

Shear LC	Strap Force (k)	Strap LC	Chord UC	Chord LC
<b>52 (S)</b>	<b>2.916</b>	<b>52 (S)</b>	<b>0.518</b>	<b>0.518</b>

Shear LC	Strap Force (k)	Strap LC	Chord UC	Chord LC
-------------	--------------------	-------------	-------------	-------------



Shear LC	Strap Force (k)	Strap LC	Chord UC
<b>52 (S)</b>	<b>5.633</b>	<b>64 (S)</b>	<b>0.685</b>

Shear	Strap Force (k)	Strap LC	Chord UC	Chord LC
-------	--------------------	-------------	-------------	-------------



Shear LC	Strap Force (k)	Strap LC	Chord UC
<b>51 (S)</b>	<b>6.601</b>	<b>65 (S)</b>	<b>0.788</b>

Shear	Strap Force (k)	Strap LC	Chord UC	Chord LC
-------	--------------------	-------------	-------------	-------------



R1



Shear LC	Strap Force (k)	Strap LC	Chord UC	Chord LC
<b>51 (S)</b>	<b>Not Req'd</b>	<b>Not Req'd</b>	<b>0.317</b>	

Shear LC	Strap Force (k)	Strap LC	Chord UC	Chord LC
-------------	--------------------	-------------	-------------	-------------

# R1

Shear LC	Strap Force (k)	Strap LC	Chord UC	Chord LC
<b>51 (S)</b>	<b>2.645</b>	<b>63 (S)</b>	<b>0.278</b>	

Shear	Strap Force (k)	Strap LC	Chord UC	Chord LC
-------	--------------------	-------------	-------------	-------------

R1



Shear LC	Strap Force (k)	Strap LC	Chord UC	
<b>51 (S)</b>	<b>0.031</b>	<b>51 (S)</b>	<b>0.170</b>	

Shear	Strap Force (k)	Strap LC	Chord UC	Chord LC
-------	--------------------	-------------	-------------	-------------

# R1

Shear LC	Controlling Hold-down	Hold-down UC	Hold-dow LC
<b>51 (S)</b>	<b>HDU5-SD...</b>	<b>0.834</b>	<b>65 (S)</b>

ear	Hold-down	Hold-down UC	Hold-dow LC
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**APPENDIX C - TYPICAL STEEL  
CONNECTION CALCULAIONS**

Seal	Title Summit Lot 71	Project # 170450	Date 2017/12/07
		Designer DMV	Scale NTS
		Checked by	Sheet # INDEX

Toronto 416.593.5300 | Waterloo 519.616.0895 | Victoria 778.817.1010 | Halifax 902.701.0185 | blackwell.ca

MARK

SECTION

- A . . . . . TYPICAL SHEAR TAB CONNECTION
- B . . . . . BEAM-TO-BEAM MOMENT CONNECTION
- C . . . . . BEAM OVER HSS COLUMN

Seal	Title Summit Lot 71.	Project # 170450.	Date 20/7/11/21.
		Designer DMV	Scale N.T.S.
		Checked by	Sheet # A-01.
SHEAR TAB CONNECTION			

Toronto 416.593.5300 | Waterloo 519.616.0895 | Victoria 778.817.1010 | Halifax 902.701.0185 | blackwell.ca

PROBLEM: WE NEED TO DESIGN CONNECTIONS FOR VARIOUS STRUCTURAL STEEL CONNECTIONS. IN DISCUSSIONS W/ AVB, WE REQUIRE SINGLE TAB CONNECTIONS FOR BEAMS UP TO AND INCLUDING W1B [W400]. FOLLOW THE LFRD APPROACH IN AISC. THE DESIGN IS BASED ON AISC TABLE 10-10a WHICH HAS BEEN PROVIDED WITHIN THIS PACKAGE.

### STEEL WF BEAM TO HSS SHEAR TAB CONNECTIONS.

→ FROM AISC: HSS WALL SLENDERNESS IS GIVEN AS:

$$\frac{(B-3t)}{t} \leq 1.40 \sqrt{\frac{E}{F_y}} \quad * t = 0.225 \text{ in.}$$

$$B \leq \left[ 1.40 \sqrt{\frac{E}{F_y}} \right] (t) + 3t$$

$$B \leq \left[ 1.40 \sqrt{\frac{29000 \text{ ksi}}{50 \text{ ksi}}} \right] (0.225 \text{ in}) + 3(0.225 \text{ in})$$

$$B \leq 8.26 \text{ in.}$$

∴ HSS SECTIONS MUST BE LESS THAN 8"

SO SLENDERNESS CAN BE NEGLECTED!

NOTE, AVB STATED THAT COLUMNS WILL NOT BE LARGER THAN HSS6"×6"×¼" THUS:

$$\frac{6 \text{ in} - 3(0.225 \text{ in})}{0.225 \text{ in}} = 23.6 \quad \underline{\text{OK!}}$$

Seal	Title Summit Lot 71 10-10a (continued) Single-Plate Connection Bolt, Weld and Single-Plate Available Strengths, kips	Project # 170450.	Date 2017/11/21
	SHEAR TAB CONNECTION	Designer DMV	Scale NTS.
		Checked by	Sheet # A-02.

Toronto 416.593.5300 | Waterloo 519.616.0895 | Victoria 778.817.1010 | Halifax 902.701.0185 | blackwell.ca

Ductility is also okay per Table K1.2A.

→ Maximum Single  $t$  Thickness:

$$t_{\text{max}} \leq \frac{F_u}{F_y} (t) = \frac{(62 \text{ ksi})}{36 \text{ ksi}} (0.225 \text{ in})$$

$$t_{\text{max}} \leq 0.3875 \text{ in } [9.8 \text{ mm}]$$

→ We are using  $5/16$  in [8.0 mm] OK!

### SHEAR TAB CONNECTION DETAILS

- Simple Shear Tab Connections are outlined on the following sheets and is re-produced from AISC
- Since connections are governed by the shear tab, limit the max shear force in the member connection schedule.
- Beam cope checks are taken from Tables 9-3b and 9-3c from AISC and summarized in the spreadsheet.



x03	18.4	0.45	7.59	0.75	1.15	3.5	248	5	81.5	159.1	129.2	81.5
x60	18.2	0.415	7.56	0.695	1.1	3.5	227	5	81.3	128.2	119.1	81.3
x55	18.1	0.39	7.53	0.63	1.03	3.5	212	5	81.3	120.5	111.9	81.3
x50	18	0.355	7.5	0.57	0.972	3.5	192	5	81.3	109.7	101.9	81.3
x46	18.1	0.36	6.06	0.605	1.01	3.5	195	5	81.3	111.2	103.3	81.3
x40	17.9	0.315	6.02	0.525	0.927	3.5	169	5	81.3	97.3	90.4	81.3
x35	17.7	0.3	6	0.425	0.827	3.5	159	5	81.3	92.7	86.1	81.3
x57	16.4	0.43	7.12	0.715	1.12	3.5	212	4	62.5	104.1	96.8	62.5
x50	16.3	0.38	7.07	0.63	1.03	3.5	186	4	62.5	92.0	85.5	62.5
x45	16.1	0.345	7.04	0.565	0.967	3.5	167	4	62.5	83.5	77.6	62.5
x40	16	0.305	7	0.505	0.907	3.5	146	4	62.5	73.8	68.6	62.5
x36	15.9	0.295	6.99	0.43	0.832	3.5	141	4	62.5	71.4	66.4	62.5
x31	15.9	0.275	5.53	0.44	0.842	3.5	131	4	62.5	66.6	61.9	61.9
x26	15.7	0.25	5.5	0.345	0.747	3.5	106	4	62.5	60.5	56.3	56.3
x99	14.16	0.485	14.565	0.78	0.4375	5.5	265	3	43.4	84.4	79.1	43.4
x82	14.3	0.51	10.1	0.855	1.45	5.5	219	3	43.4	88.7	83.1	43.4
x74	14.2	0.45	10.1	0.785	1.38	5.5	192	3	43.4	78.3	73.4	43.4
x68	14	0.415	10	0.72	1.31	5.5	174	3	43.4	72.2	67.6	43.4
x61	13.9	0.375	10	0.645	1.24	5.5	156	3	43.4	65.3	61.1	43.4
x53	13.9	0.37	8.06	0.66	1.25	5.5	154	3	43.4	64.4	60.3	43.4
x48	13.8	0.34	8.03	0.595	1.19	5.5	141	3	43.4	59.2	55.4	43.4
x43	13.7	0.305	8	0.53	1.12	5.5	125	3	43.4	53.1	49.7	43.4
x38	14.1	0.31	6.77	0.515	0.915	3.5	131	3	43.4	53.9	50.5	43.4
x34	14	0.285	6.75	0.455	0.855	3.5	120	3	43.4	49.6	46.5	43.4
x30	13.8	0.27	6.73	0.385	0.785	3.5	112	3	43.4	47.0	44.0	43.4
x26	13.9	0.255	5.03	0.42	0.82	2.75	106	3	43.4	44.4	41.6	41.6
x22	13.7	0.23	5	0.335	0.735	2.75	94.5	3	43.4	40.0	37.5	37.5
x96	12.7	0.55	12.2	0.9	1.5	5.5	210	3	43.4	95.7	89.7	43.4
x87	12.5	0.515	12.1	0.81	1.41	5.5	193	3	43.4	89.6	83.9	43.4
x79	12.4	0.47	12.1	0.735	1.33	5.5	175	3	43.4	81.8	76.6	43.4
x72	12.3	0.43	12	0.67	1.27	5.5	159	3	43.4	74.8	70.1	43.4
x65	12.1	0.39	12	0.605	1.2	5.5	142	3	43.4	67.9	63.6	43.4
x58	12.2	0.36	10	0.64	1.24	5.5	132	3	43.4	62.6	58.7	43.4
x53	12.1	0.345	10	0.575	1.18	5.5	125	3	43.4	60.0	56.2	43.4
x50	12.2	0.37	8.08	0.64	1.14	5.5	135	3	43.4	64.4	60.3	43.4
x45	12.1	0.335	8.05	0.575	1.08	5.5	122	3	43.4	58.3	54.6	43.4
x40	11.9	0.295	8.01	0.515	1.02	5.5	105	3	43.4	51.3	48.1	43.4
x35	12.5	0.3	6.56	0.52	0.82	3.5	113	3	43.4	52.2	48.9	43.4
x30	12.3	0.26	6.52	0.44	0.74	3.5	95.9	3	43.4	45.2	42.4	42.4
x26	12.2	0.23	6.49	0.38	0.68	3.5	84.2	3	43.4	40.0	37.5	37.5
x22	12.3	0.26	4.03	0.425	0.725	2.25	95.9	3	43.4	45.2	42.4	42.4
x19	12.2	0.235	4.01	0.35	0.65	2.25	86	3	43.4	40.9	38.3	38.3
x16	12	0.22	3.99	0.265	0.565	2.25	79.2	3	43.4	38.3	35.9	35.9
x14	11.9	0.2	3.97	0.225	0.525	2.25	64.3	3	43.4	34.8	32.6	32.6
x45	10.1	0.35	8.08	0.62	1.12	5.5	106	2	24.8	37.5	35.4	24.8
x39	9.92	0.315	7.99	0.53	1.03	5.5	93.7	2	24.8	33.7	31.8	24.8
x33	9.73	0.29	7.96	0.435	0.935	5.5	84.7	2	24.8	31.0	29.3	24.8
x30	10.5	0.3	5.81	0.51	0.81	2.75	94.5	2	24.8	32.1	30.3	24.8
x26	10.3	0.26	5.77	0.44	0.74	2.75	80.3	2	24.8	27.8	26.3	24.8
x22	10.2	0.24	5.75	0.36	0.66	2.75	73.4	2	24.8	25.7	24.2	24.2
x19	10.2	0.25	4.02	0.395	0.695	2.25	76.5	2	24.8	26.8	25.3	24.8
x17	10.1	0.24	4.01	0.33	0.63	2.25	72.7	2	24.8	25.7	24.2	24.2
x15	9.99	0.23	4	0.27	0.57	2.25	68.9	2	24.8	24.6	23.2	23.2
x12	9.87	0.19	3.96	0.21	0.51	2.25	56.3	2	24.8	20.3	19.2	19.2
x7	9	0.57	8.28	0.935	1.33	5.5	154	2	24.8	61.0	57.6	24.8

<p style="text-align: center;"><b>Table 10-10a (continued)</b>  <b>Single-Plate Connections</b>  <b>Bolt, Weld and Single-Plate Available Strengths, kips</b></p>																
<p>Plate  <math>F_y = 36</math> ksi</p>		<p>3/4-in.-                      diameter bolts</p>		<p>Plate Thickness, in.</p>												
				1/4		5/16		3/8		7/16		1/2		9/16		
				ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	
$n$	Bolt Group	Thread Cond.	Hole Type													
8 ( $L = 23\frac{1}{2}$ )	Group A	N	STD	67.8	102	84.7	127	—	—	—	—	—	—	—	—	
			SSLT	67.1	101	83.9	126	90.8	137	90.8	137	—	—	—	—	
		X	STD	67.8	102	84.7	127	—	—	—	—	—	—	—	—	—
			SSLT	67.1	101	83.9	126	101	151	114	172	—	—	—	—	
	Group B	N	STD	67.8	102	84.7	127	—	—	—	—	—	—	—	—	
			SSLT	67.1	101	83.9	126	101	151	114	172	—	—	—	—	
		X	STD	67.8	102	84.7	127	—	—	—	—	—	—	—	—	
			SSLT	67.1	101	83.9	126	101	151	117	176	—	—	—	—	
7 ( $L = 20\frac{1}{2}$ )	Group A	N	STD	59.7	89.5	72.1	108	—	—	—	—	—	—	—		
			SSLT	59.0	88.5	73.7	111	78.7	118	78.7	118	—	—	—		
		X	STD	59.7	89.5	74.6	112	—	—	—	—	—	—	—	—	
			SSLT	59.0	88.5	73.7	111	88.5	133	99.2	149	—	—	—		
	Group B	N	STD	59.7	89.5	74.6	112	—	—	—	—	—	—	—		
			SSLT	59.0	88.5	73.7	111	88.5	133	99.2	149	—	—	—		
		X	STD	59.7	89.5	74.6	112	—	—	—	—	—	—	—		
			SSLT	59.0	88.5	73.7	111	88.5	133	103	155	—	—	—		
6 ( $L = 17\frac{1}{2}$ )	Group A	N	STD	51.6	77.4	59.3	89.1	—	—	—	—	—	—	—		
			SSLT	50.9	76.3	63.6	95.4	66.5	100	66.5	100	—	—	—		
		X	STD	51.6	77.4	64.5	96.7	—	—	—	—	—	—	—		
			SSLT	50.9	76.3	63.6	95.4	76.3	115	83.8	126	—	—	—		
	Group B	N	STD	51.6	77.4	64.5	96.7	—	—	—	—	—	—	—		
			SSLT	50.9	76.3	63.6	95.4	76.3	115	83.8	126	—	—	—		
		X	STD	51.6	77.4	64.5	96.7	—	—	—	—	—	—	—		
			SSLT	50.9	76.3	63.6	95.4	76.3	115	89.1	134	—	—	—		
5 ( $L = 14\frac{1}{2}$ )	Group A	N	STD	43.5	65.2	54.1	81.3	54.1	81.3	54.1	81.3	—	—	—		
			SSLT	42.8	64.2	53.5	80.2	54.1	81.3	54.1	81.3	54.1	81.3	54.1		
		X	STD	43.5	65.2	54.3	81.5	65.2	97.8	68.1	102	—	—	—		
			SSLT	42.8	64.2	53.5	80.2	64.2	96.3	68.1	102	68.1	102	68.1		
	Group B	N	STD	43.5	65.2	54.3	81.5	65.2	97.8	68.1	102	—	—	—		
			SSLT	42.8	64.2	53.5	80.2	64.2	96.3	68.1	102	68.1	102	68.1		
		X	STD	43.5	65.2	54.3	81.5	65.2	97.8	76.1	114	—	—	—		
			SSLT	42.8	64.2	53.5	80.2	64.2	96.3	74.9	112	84.5	126	84.5		
Weld Size				3/16		1/4		1/4		5/16		5/16		3/8		

STD = Standard holes

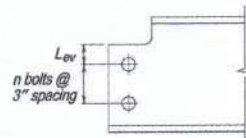
N = Threads included

<b>3/4-in.- diameter bolts</b>		<b>Table 10-10a (continued) Single-Plate Connections</b>												<b>Plate F<sub>y</sub> = 36 ksi</b>			
		<b>Bolt Group</b>		<b>Thread Cond.</b>	<b>Hole Type</b>	<b>Plate Thickness, in.</b>											
						<b>1/4</b>		<b>5/16</b>		<b>3/8</b>		<b>7/16</b>		<b>1/2</b>		<b>9/16</b>	
<b>n</b>				<b>ASD</b>	<b>LRFD</b>	<b>ASD</b>	<b>LRFD</b>	<b>ASD</b>	<b>LRFD</b>	<b>ASD</b>	<b>LRFD</b>	<b>ASD</b>	<b>LRFD</b>	<b>ASD</b>	<b>LRFD</b>		
<b>4</b> <i>(L = 11 1/2)</i>	<b>Group A</b>	<b>N</b>	<b>STD</b>	34.8	52.2	41.5	62.5	41.5	62.5	41.5	62.5	—	—	—	—		
			<b>SSLT</b>	34.7	52.0	41.5	62.5	41.5	62.5	41.5	62.5	41.5	62.5	41.5	62.5		
		<b>X</b>	<b>STD</b>	34.8	52.2	43.5	65.3	52.2	78.3	52.4	78.5	—	—	—	—		
			<b>SSLT</b>	34.7	52.0	43.4	65.1	52.0	78.1	52.4	78.5	52.4	78.5	52.4	78.5		
	<b>Group B</b>	<b>N</b>	<b>STD</b>	34.8	52.2	43.5	65.3	52.2	78.3	52.4	78.5	—	—	—	—		
			<b>SSLT</b>	34.7	52.0	43.4	65.1	52.0	78.1	52.4	78.5	52.4	78.5	52.4	78.5		
		<b>X</b>	<b>STD</b>	34.8	52.2	43.5	65.3	52.2	78.3	60.9	91.4	—	—	—	—		
			<b>SSLT</b>	34.7	52.0	43.4	65.1	52.0	78.1	60.7	91.1	64.9	97.0	64.9	97.0		
<b>3</b> <i>(L = 8 1/2)</i>	<b>Group A</b>	<b>N</b>	<b>STD</b>	25.6	38.3	28.8	43.4	28.8	43.4	28.8	43.4	—	—	—	—		
			<b>SSLT</b>	25.6	38.3	28.8	43.4	28.8	43.4	28.8	43.4	28.8	43.4	28.8	43.4		
		<b>X</b>	<b>STD</b>	25.6	38.3	31.9	47.9	36.3	54.5	36.3	54.5	—	—	—	—		
			<b>SSLT</b>	25.6	38.3	31.9	47.9	36.3	54.5	36.3	54.5	36.3	54.5	36.3	54.5		
	<b>Group B</b>	<b>N</b>	<b>STD</b>	25.6	38.3	31.9	47.9	36.3	54.5	36.3	54.5	—	—	—	—		
			<b>SSLT</b>	25.6	38.3	31.9	47.9	36.3	54.5	36.3	54.5	36.3	54.5	36.3	54.5		
		<b>X</b>	<b>STD</b>	25.6	38.3	31.9	47.9	38.3	57.5	44.7	67.1	—	—	—	—		
			<b>SSLT</b>	25.6	38.3	31.9	47.9	38.3	57.5	44.7	67.1	45.1	67.3	45.1	67.3		
<b>2</b> <i>(L = 5 1/2)</i>	<b>Group A</b>	<b>N</b>	<b>STD</b>	16.3	24.5	16.5	24.8	16.5	24.8	16.5	24.8	—	—	—	—		
			<b>SSLT</b>	16.3	24.5	16.5	24.8	16.5	24.8	16.5	24.8	16.5	24.8	16.5	24.8		
		<b>X</b>	<b>STD</b>	16.3	24.5	20.4	30.6	20.8	31.2	20.8	31.2	—	—	—	—		
			<b>SSLT</b>	16.3	24.5	20.4	30.6	20.8	31.2	20.8	31.2	20.8	31.2	20.8	31.2		
	<b>Group B</b>	<b>N</b>	<b>STD</b>	16.3	24.5	20.4	30.6	20.8	31.2	20.8	31.2	—	—	—	—		
			<b>SSLT</b>	16.3	24.5	20.4	30.6	20.8	31.2	20.8	31.2	20.8	31.2	20.8	31.2		
		<b>X</b>	<b>STD</b>	16.3	24.5	20.4	30.6	24.5	36.7	25.8	38.5	—	—	—	—		
			<b>SSLT</b>	16.3	24.5	20.4	30.6	24.5	36.7	25.8	38.5	25.8	38.5	25.8	38.5		
<b>Weld Size</b>				<b>3/16</b>		<b>1/4</b>		<b>1/4</b>		<b>5/16</b>		<b>5/16</b>		<b>3/8</b>			

STD = Standard holes

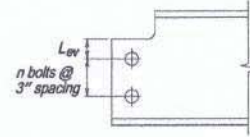
N = Threads included

**Table 9-3b (continued)**  
**Block Shear**  
**Shear Yielding**  
**Component**  
 per inch of thickness, kips/in.



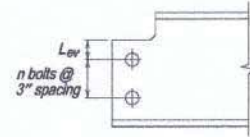
$L_{gv}$ , in.	$n$	$F_y$ , ksi				$n$	$F_y$ , ksi			
		36		50			36		50	
		$0.6F_yA_{gv}$	$\phi 0.6F_yA_{gv}$	$0.6F_yA_{gv}$	$\phi 0.6F_yA_{gv}$		$0.6F_yA_{gv}$	$\phi 0.6F_yA_{gv}$	$0.6F_yA_{gv}$	$\phi 0.6F_yA_{gv}$
		$t\Omega$	$t$	$t\Omega$	$t$		$t\Omega$	$t$	$t\Omega$	$t$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	
1¼	6	175	263	244	366	3	78.3	117	109	163
1⅜		177	265	246	368		79.6	119	111	166
1½		178	267	248	371		81.0	121	113	169
1⅝		180	269	249	374		82.3	124	114	172
1¾		181	271	251	377		83.7	126	116	174
1⅞		182	273	253	380		85.0	128	118	177
2		184	275	255	383		86.4	130	120	180
2¼		186	279	259	388		89.1	134	124	186
2½		189	283	263	394		91.8	138	128	191
2¾		192	288	266	399		94.5	142	131	197
3		194	292	270	405		97.2	146	135	203
1¼		5	143	215	199		298	2	45.9	68.8
1⅜	144		217	201	301	47.2	70.9		65.6	98.4
1½	146		219	203	304	48.6	72.9		67.5	101
1⅝	147		221	204	307	49.9	74.9		69.4	104
1¾	148		223	206	309	51.3	76.9		71.3	107
1⅞	150		225	208	312	52.7	79.0		73.1	110
2	151		227	210	315	54.0	81.0		75.0	113
2¼	154		231	214	321	56.7	85.0		78.8	118
2½	157		235	218	326	59.4	89.1		82.5	124
2¾	159		239	221	332	62.1	93.1		86.3	129
3	162		243	225	338	64.8	97.2		90.0	135
1¼	4		111	166	154	231				
1⅜		112	168	156	233					
1½		113	170	158	236					
1⅝		115	172	159	239					
1¾		116	174	161	242					
1⅞		117	176	163	245					
2		119	178	165	248					
2¼		121	182	169	253					
2½		124	186	173	259					
2¾		127	190	176	264					
3		130	194	180	270					
ASD		LRFD								
$\Omega = 2.00$	$\phi = 0.75$									

**Table 9-3c (continued)**  
**Block Shear**  
**Shear Rupture**  
**Component**  
 per inch of thickness, kips/in.



$F_u$ , ksi		58						65					
$n$	$L_{ev}$ , in.	Bolt diameter, $d$ , in.											
		$3/4$		$7/8$		1		$3/4$		$7/8$		1	
		$\frac{0.6F_u A_{nv}}{t\Omega}$	$\frac{\phi 0.6F_u A_{nv}}{t}$	$\frac{0.6F_u A_{nv}}{t\Omega}$	$\frac{\phi 0.6F_u A_{nv}}{t}$	$\frac{0.6F_u A_{nv}}{t\Omega}$	$\frac{\phi 0.6F_u A_{nv}}{t}$	$\frac{0.6F_u A_{nv}}{t\Omega}$	$\frac{\phi 0.6F_u A_{nv}}{t}$	$\frac{0.6F_u A_{nv}}{t\Omega}$	$\frac{\phi 0.6F_u A_{nv}}{t}$	$\frac{0.6F_u A_{nv}}{t\Omega}$	$\frac{\phi 0.6F_u A_{nv}}{t}$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
6	1 1/4	199	299	187	281	175	263	223	335	210	314	196	294
	1 3/8	201	302	189	284	177	266	225	338	212	318	199	298
	1 1/2	203	305	191	287	179	269	228	342	215	322	201	302
	1 5/8	206	308	194	290	182	272	230	346	217	325	204	305
	1 3/4	208	312	196	294	184	276	233	349	219	329	206	309
	1 7/8	210	315	198	297	186	279	235	353	222	333	208	313
	2	212	318	200	300	188	282	238	356	224	336	211	316
	2 1/4	216	325	204	307	192	289	243	364	229	344	216	324
	2 1/2	221	331	209	313	197	295	247	371	234	351	221	331
	2 3/4	225	338	213	320	201	302	252	378	239	358	225	338
3	229	344	217	326	206	308	257	386	244	366	230	346	
5	1 1/4	162	243	152	228	142	214	182	272	171	256	160	239
	1 3/8	164	246	154	232	145	217	184	276	173	260	162	243
	1 1/2	166	250	157	235	147	220	186	280	176	263	165	247
	1 5/8	169	253	159	238	149	223	189	283	178	267	167	250
	1 3/4	171	256	161	241	151	227	191	287	180	271	169	254
	1 7/8	173	259	163	245	153	230	194	291	183	274	172	258
	2	175	263	165	248	156	233	196	294	185	278	174	261
	2 1/4	179	269	170	254	160	240	201	302	190	285	179	269
	2 1/2	184	276	174	261	164	246	206	309	195	293	184	276
	2 3/4	188	282	178	268	169	253	211	316	200	300	189	283
3	192	289	183	274	173	259	216	324	205	307	194	291	
4	1 1/4	125	188	117	176	110	165	140	210	132	197	123	185
	1 3/8	127	191	120	179	112	168	143	214	134	201	126	188
	1 1/2	129	194	122	183	114	171	145	218	137	205	128	192
	1 5/8	132	197	124	186	116	175	147	221	139	208	130	196
	1 3/4	134	201	126	189	119	178	150	225	141	212	133	199
	1 7/8	136	204	128	192	121	181	152	229	144	216	135	203
	2	138	207	131	196	123	184	155	232	146	219	138	207
	2 1/4	142	214	135	202	127	191	160	239	151	227	143	214
	2 1/2	147	220	139	209	132	197	165	247	156	234	147	221
	2 3/4	151	227	144	215	136	204	169	254	161	241	152	229
3	156	233	148	222	140	210	174	261	166	249	157	236	
ASD		LRFD											
$\Omega = 2.00$		$\phi = 0.75$											

**Table 9-3c (continued)**  
**Block Shear**  
**Shear Rupture**  
**Component**  
 per inch of thickness, kips/in.



$F_u$ , ksi		58						65					
$n$	$L_{ev}$ , in.	Bolt diameter, $d$ , in.											
		$3/4$		$7/8$		1		$3/4$		$7/8$		1	
		$\frac{0.6F_u A_{nv}}{t\Omega}$	$\frac{\phi 0.6F_u A_{nv}}{t}$	$\frac{0.6F_u A_{nv}}{t\Omega}$	$\frac{\phi 0.6F_u A_{nv}}{t}$	$\frac{0.6F_u A_{nv}}{t\Omega}$	$\frac{\phi 0.6F_u A_{nv}}{t}$	$\frac{0.6F_u A_{nv}}{t\Omega}$	$\frac{\phi 0.6F_u A_{nv}}{t}$	$\frac{0.6F_u A_{nv}}{t\Omega}$	$\frac{\phi 0.6F_u A_{nv}}{t}$	$\frac{0.6F_u A_{nv}}{t\Omega}$	$\frac{\phi 0.6F_u A_{nv}}{t}$
		ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD	ASD	LRFD
3	1 1/4	88.1	132	82.6	124	77.2	116	98.7	148	92.6	139	86.5	130
	1 3/8	90.3	135	84.8	127	79.4	119	101	152	95.1	143	89.0	133
	1 1/2	92.4	139	87.0	131	81.6	122	104	155	97.5	146	91.4	137
	1 5/8	94.6	142	89.2	134	83.7	126	106	159	99.9	150	93.8	141
	1 3/4	96.8	145	91.4	137	85.9	129	108	163	102	154	96.3	144
	1 7/8	99.0	148	93.5	140	88.1	132	111	166	105	157	98.7	148
	2	101	152	95.7	144	90.3	135	113	170	107	161	101	152
	2 1/4	105	158	100	150	94.6	142	118	177	112	168	106	159
	2 1/2	110	165	104	157	99.0	148	123	185	117	176	111	166
	2 3/4	114	171	109	163	103	155	128	192	122	183	116	174
3	119	178	113	170	108	161	133	199	127	190	121	181	
2	1 1/4	51.1	76.7	47.8	71.8	44.6	66.9	57.3	85.9	53.6	80.4	50.0	75.0
	1 3/8	53.3	79.9	50.0	75.0	46.8	70.1	59.7	89.6	56.1	84.1	52.4	78.6
	1 1/2	55.5	83.2	52.2	78.3	48.9	73.4	62.2	93.2	58.5	87.8	54.8	82.3
	1 5/8	57.6	86.5	54.4	81.6	51.1	76.7	64.6	96.9	60.9	91.4	57.3	85.9
	1 3/4	59.8	89.7	56.6	84.8	53.3	79.9	67.0	101	63.4	95.1	59.7	89.6
	1 7/8	62.0	93.0	58.7	88.1	55.5	83.2	69.5	104	65.8	98.7	62.2	93.2
	2	64.2	96.2	60.9	91.4	57.6	86.5	71.9	108	68.3	102	64.6	96.9
	2 1/4	68.5	103	65.3	97.9	62.0	93.0	76.8	115	73.1	110	69.5	104
	2 1/2	72.9	109	69.6	104	66.3	99.5	81.7	122	78.0	117	74.3	112
	2 3/4	77.2	116	73.9	111	70.7	106	86.5	130	82.9	124	79.2	119
3	81.6	122	78.3	117	75.0	113	91.4	137	87.8	132	84.1	126	
ASD	LRFD												
$\Omega = 2.00$	$\phi = 0.75$												

Seal	Title	Project #	Date
	Summit Lot 71	170450	2017/11/30
		Designer	Scale
		DMV	NTS
	BEAM-TO-BEAM MOMENT CONNECTIONS.	Checked by	Sheet #
			B-01

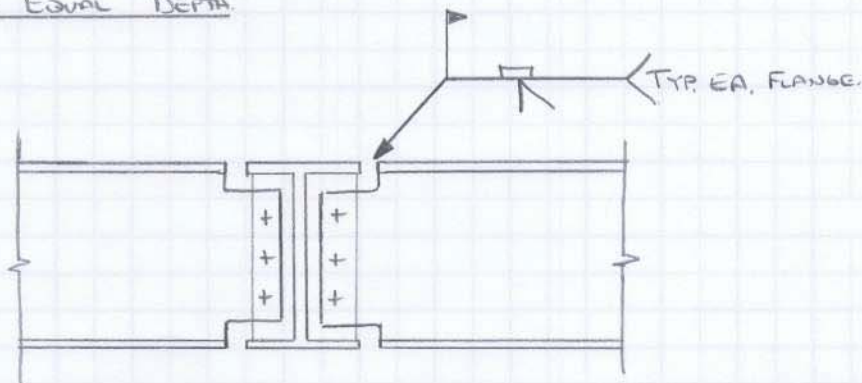
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PROBLEM: WE NEED TO DESIGN THROUGH-BEAM MOMENT CONNECTIONS. THERE ARE TWO SPECIFIC SITUATIONS THAT MUST BE INVESTIGATED:

1. BEAMS ARE EQUAL DEPTH
2. ONE BEAM IS SMALLER.

\* REFER TO SECTION A OF THIS CALCULATION PACKAGE FOR THE SHEAR TAB DESIGN.

1. BEAMS ARE EQUAL DEPTH



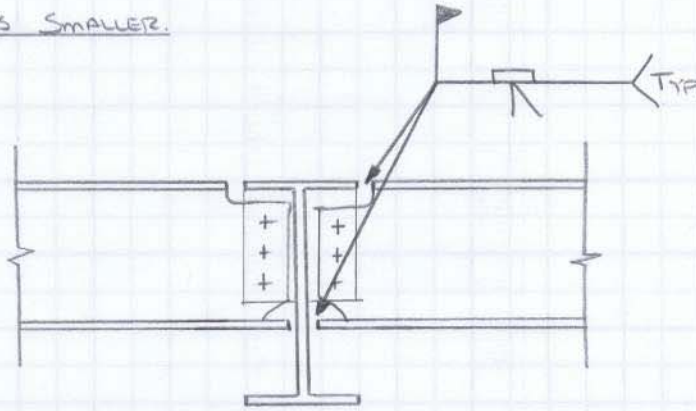
\*NOTE, BY INSPECTION AND USING E70XX ELECTRODES W/  $F_u = 70 \text{ ksi}$  AND A CJP WELD THE FULL CAPACITY OF THE BEAM WILL BE AVAILABLE. THUS, USE CJP WELDS W/ BACKER BAR. AGAIN, THE FULL SHEAR CAPACITY (SINGLE PL) IS PER THE DESIGN OUTLINED IN SECTION A.

Seal	Title Summit Lot 71	Project #	Date
		170450.	2017/11/30.
		Designer DMV	Scale NTS.
Checked by		Sheet # B-02	

BEAM-TO-BEAM MOMENT CONNECTIONS.

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2. ONE BEAM IS SMALLER.



SIMILAR, USING E70XX THE FULL CAPACITY OF THE BEAM  
WILL BE PROVIDED FOR FLEXURE. CONNECTION IS OKAY.

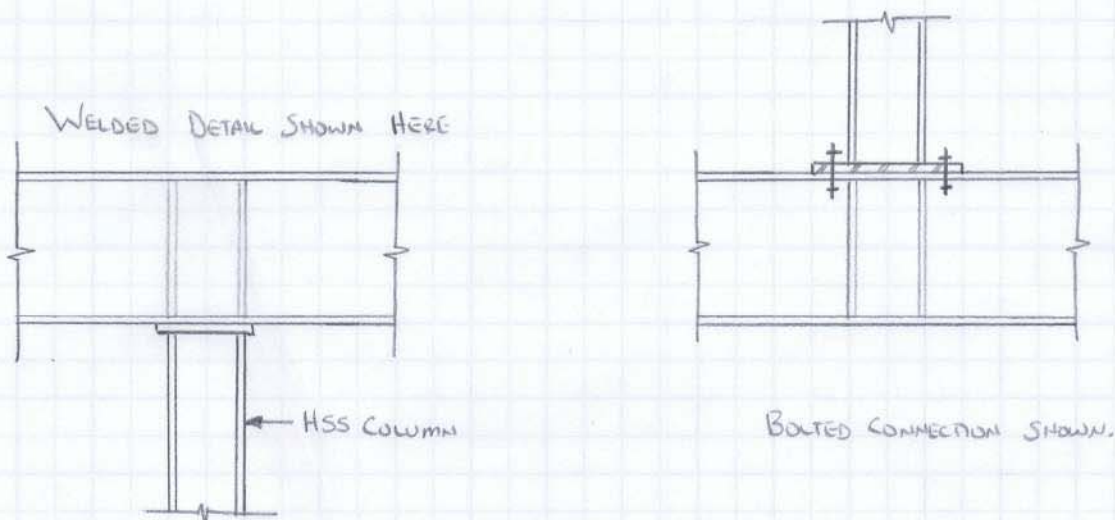


Seal	Title SUMMIT LOT  BEAM OVER HSS COLUMNS.	Project # 170450.	Date 20/7/11/30.
		Designer DMV.	Scale NTS.
		Checked by	Sheet # C-01.

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PROBLEM: WE HAVE BEEN ASKED TO DESIGN TYPICAL DETAILS FOR HSS COLUMNS WHICH ARE SUPPORTING STEEL WIDE FLANGE BEAMS AND FOR SITUATIONS WHERE HSS COLUMNS ARE SUPPORTED ON STEEL BEAMS. TO ENSURE WE COVER ALL THE BASIS, WE NEED TO CONSIDER ALL BEAMS + COLUMNS. WE WILL SETUP A SPREADSHEET TO COVER BEAMS AND COLUMNS TO SIMPLIFY THE DESIGN ASPECTS. DESIGN CONSIDERATIONS:

1. LOCAL WEB YIELDING
2. LOCAL WEB CRIPPLING
3. WEB SIDESWAY BUCKLING
4. WEB COMPRESSION BUCKLING
5. HSS CAP PLATE
6. USE OF STIFFENERS?
7. GENERAL CONNECTION DETAILS (WELDS/BOLTS)
8. LATERAL STABILITY.



Seat	Title Summit Lot 71  BEAM OVER HSS COLUMNS	Project # 170450	Date 2017/12/05
		Designer DMV	Scale NTS
		Checked by	Sheet # C-01a

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FOR THE BASIS OF OUR DESIGN REVIEW/CHECKS WE WILL RUN THROUGH ONE BEAM/COLUMN REVIEW. AVB HAS ADVISED THAT COLUMNS WILL BE HSS3"x3" TO HSS6"x6" AND BEAMS WILL BE W8 THROUGH W16. FOR OUR REVIEW, USE:

BEAM: W14x38

COLUMN: HSS6"x6"x¼"

THE SPREADSHEET WILL SUMMARIZE THE CAPACITIES AND CONNECTION DESIGN WILL BE BASED ON THE MINIMUM OF COLUMN, BEAM, & CAPACITY.

\*NOTE, THE DESIGN CHECKS/REVIEW FOR A STEEL BEAM OVER A HSS COLUMN AND A STEEL BEAM SUPPORTING A HSS COLUMN ARE THE SAME (ROTATED 180°). THUS CHECK FOR THE STEEL COLUMN SUPPORTING THE BEAM AND ROTATE THE DETAILS.

Seal	Title	Project #	Date
	Summit Lot 71.	170450.	2017/11/30
	BEAM OVER HSS COLUMNS.	Designer	Scale
		DMV.	NTS.
		Checked by	Sheet #
			C-02.

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### 1. WEB LOCAL YIELDING:

- As a conservative measure, assume the reaction force occurs within 'd' of the support.

$$R_N = \phi 2.50 k F_{yw} t_w + \phi l_b F_{yw} t_w$$

$$= (1.0)(2.50)(0.915 \text{ in})(50 \text{ ksi})(0.31 \text{ in}) + (1.0)(6.0 \text{ in})(50 \text{ ksi})(0.31 \text{ in})$$

$$R_N = 128.5 \text{ kip}$$

### 2. WEB LOCAL CRIPPLING

- Again, consider the load occurs within 'd' of the support.

(i) For  $l_b/d \leq 0.2$ .

$$R_N = \phi \left[ 0.40 t_w^2 \left[ 1 + 3 \left( \frac{l_b}{d} \right) \left( \frac{t_w}{t_f} \right)^{1.5} \right] \right] \sqrt{\frac{E F_{yw} t_f}{t_w}}$$

(ii) For  $l_b/d > 0.2$

$$R_N = \phi 0.40 t_w^2 \left[ 1 + \left( \frac{4 l_b}{d} - 0.2 \right) \left( \frac{t_w}{t_f} \right)^{1.5} \right] \sqrt{\frac{E F_{yw} t_f}{t_w}}$$

\* For W14x38  $\rightarrow l_b/d = 0.426 > 0.2 \Rightarrow$  Use (ii)

$$R_N = (0.75)(0.40)(0.31 \text{ in})^2 \left[ 1 + \left( \frac{4(6.0 \text{ in})}{14.1 \text{ in}} - 0.2 \right) \left( \frac{0.31 \text{ in}}{0.515 \text{ in}} \right)^{1.5} \right] \sqrt{\frac{(29000 \text{ ksi})(50 \text{ ksi})(0.515)}{0.31}}$$

$$R_N = 76.1 \text{ kip}$$

Seal	Title Summit Lot 71  BEAM OVER HSS COLUMN.	Project # 170450.	Date 2017/11/30.
		Designer DMV.	Scale NTS.
		Checked by	Sheet # C-03.

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### 3. WEB SIDESWAY BUCKLING

- THIS WILL GENERALLY NOT CONCERN BECAUSE THE COMPRESSION FLANGE WILL BE BRACED.
- BY USE OF STIFFENERS + LATERAL BRACING WE CAN NEGLECT THIS REQUIREMENT.

\* USE STIFFENERS + BRACING.

### 4. WEB COMPRESSION BUCKLING.

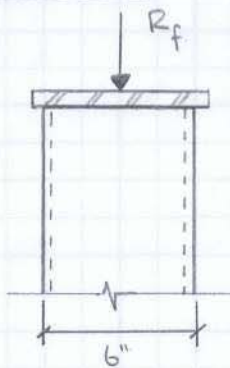
- AGAIN, WE WILL USE TRANSVERSE STIFFENERS.

$$R_N = \frac{\phi 24 t_w^3 \sqrt{E F_y}}{h}$$

$$= \frac{(0.90)(24)(0.31 \text{ in})^3 \sqrt{(29000 \text{ ksi})(50 \text{ ksi})}}{(14.10 \text{ in} - 2(0.515 \text{ in}))}$$

$$R_N = 59.3 \text{ kN}$$

### 5. HSS CAP PLATE



$$M_r = \phi Z_x F_y \rightarrow \text{FL BENDING.}$$

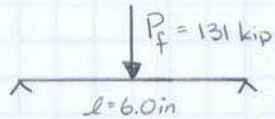
- \* NOTE HOWEVER, IF WE USE A PAIR OF TRANSVERSE FULL HEIGHT STIFFENERS ON EACH FLANGE WE CAN NEGLECT THE PLATE DESIGN REQUIREMENTS BECAUSE THE LOADING IS APPLIED DIRECTLY THROUGH THE SECTION.

Seal	Title Summit Lot 71	Project # 170450	Date 2017/12/08
	BEAM OVER HSS COLUMN.	Designer DMV	Scale NTS
		Checked by	Sheet # C-04

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→ RECALL THAT  $V_r = 131$  kip FOR A W14x38 (SEE EXCEL)

IF WE TAKE THE HSS CAP PLATE AS A SIMPLE SPAN OVER THE COLUMN FLANGES:



$$M_f = \frac{P_f l}{4} = \frac{(131 \text{ kip})(6.0 \text{ in})}{4}$$

$$M_f = 196.5 \text{ kip}\cdot\text{in}$$

$$\therefore Z_x \geq \frac{M_f}{\phi F_y} = \frac{196.5 \text{ ksi}}{(0.90)(36 \text{ ksi})}$$

$$Z_x \geq 6.06 \text{ in}^3 \quad \text{WHERE } Z_x = \frac{1}{4} b d^2 \rightarrow d \geq \sqrt{\frac{4 Z_x}{b}}$$

$$d \geq \sqrt{\frac{4(6.06 \text{ in}^3)}{6.0 \text{ in}}}$$

$$d \geq 2.0 \text{ in} \Rightarrow \text{NOT PRACTICAL.}$$

$\therefore$  AS PREVIOUSLY OUTLINED, USE (2) - FULL HEIGHT STIFFENERS (OVER THE HSS FLANGES) SUCH THAT THE COMPRESSION LOAD IS TRANSFERRED STRAIGHT THROUGH THE STEEL BEAM. THE PLATE THICKNESS THEREFORE DOES NOT CONTROL OR GOVERN THE DESIGN. RECALL, WE HAVE 2 SITUATIONS USING BOLTS + WELDS.

WELDED OPTION: USE  $\frac{5}{16}$ " PLATE THAT IS  $\frac{3}{4}$ " LARGER THAN THE COLUMN.

BOLTED OPTION: USE  $\frac{1}{2}$ " PLATE, SIZE WILL VARY BASED ON BEAM FLANGE WIDTH. USE TYPICAL GAUGES FROM AISC.

Seal	Title Summit Lot 71	Project #	Date
		170450.	20/7/12/08
		Designer DMV	Scale NTS
	BEAM OVER HSS COLUMNS.	Checked by	Sheet # C-05

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## 6. STIFFENERS

RECALL FROM PREVIOUS SHEETS: FOR W14x38:

$$\text{BEAM SHEAR CAPACITY} = 131 \text{ kip}$$

$$\text{WEB LOCAL YIELDING} = 128 \text{ kip}$$

$$\text{WEB LOCAL CRIPPLING} = 76 \text{ kip}$$

$$\text{WEB SIDESWAY BUCKLING} = \text{N/A}$$

$$\text{WEB COMPRESSION BUCKLING} = 59 \text{ kip. } * \text{ GOVERNS.}$$

$$\text{HSS } 6" \times 6" \times \frac{1}{4}" = 155 \text{ kip}$$

\* NOTE, SINCE  $(V_R)_{\text{BEAM}} < (C_r)_{\text{COLUMN}} \rightarrow \text{BEAM SHEAR GOVERNS.}$

$\therefore$  STIFFENERS MUST BE SIZED FOR  $P_f = 131 \text{ kip} - 59 \text{ kip} = 72.0 \text{ kip}$ .  
 $\Rightarrow$  DUE TO AXIAL COMPRESSION ONLY,  $P_f = 36.0 \text{ kip}$  PER PAIR OF STIFFENERS.

$\rightarrow$  TRY USING (2) -  $\frac{1}{2}"$  STIFFENERS.

### A. STIFFENER YIELD @ COLUMN FLANGE

$$R_n = \phi 2 A_{st} F_y$$

$$= (0.90)(2) [(0.5 \text{ in})(2.57 \text{ in})] (36 \text{ ksi})$$

$$R_n = 83.3 \text{ kip} \quad \underline{10K}$$

### B. STIFFENER SHEAR @ COLUMN WEB

$$R_n = \phi 0.60 (2) F_y A_{gv} \quad \phi = 1.0$$

$$= (1.0)(0.60)(2) (36 \text{ ksi}) [(12.48 \text{ in})(0.5 \text{ in})]$$

$$R_n = 269 \text{ kip} \quad \underline{10K}$$

Seal	Title Summit Lot 71  BEAM OVER HSS COLUMNS.	Project # 170450	Date 2017/12/08
		Designer DMV.	Scale NTS.
		Checked by	Sheet # C-06

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### C. STIFFENER COMPRESSION

$$R_N = \phi 2A_{st} F_{cr}$$

$$\frac{KL}{r} = \frac{0.75(12.48 \text{ in})}{\frac{0.5 \text{ in}}{\sqrt{12}}} = 64.80 < 4.71 \sqrt{\frac{E}{F_y}} = 133$$

$$\therefore F_{cr} = \left[ 0.658^{(F_y/E)} \right] F_y$$

$$F_E = \frac{\pi^2 E}{\left( \frac{KL}{r} \right)^2} = 68.16 \text{ ksi}$$

$$F_{cr} = \left[ 0.658^{(36 \text{ ksi} / 68.16 \text{ ksi})} \right] (36 \text{ ksi})$$

$$F_{cr} = 28.9 \text{ ksi}$$

$$R_N = 0.9(2) \left[ (0.5 \text{ in})(2.57 \text{ in}) \right] (28.9 \text{ ksi})$$

$$R_N = 67 \text{ kip} \quad \text{OK}$$

Seal	Title Summit Lot 71  BEAM OVER HSS COLUMNS	Project # 170450.	Date 2017/12/08
		Designer DMV	Scale NTS.
		Checked by	Sheet # C-07

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### D. STIFFENER WELD @ COLUMN FLANGE

\* Assume  $\frac{1}{4}$ " DOUBLE FILLET WELDS.

$$\begin{aligned}\phi R_N &= 1.5 \cdot 4 \cdot C_1 \cdot \alpha \cdot 1.392 \cdot D_{16} \cdot l \\ &= (1.50)(4)(1.0)(0.78)(1.392)(4)(2.57 \text{ in}) \\ \phi R_N &= 67.0 \text{ kip} \quad /OK\end{aligned}$$

### E. STIFFENER WELD @ PANEL ZONE

$$\begin{aligned}\phi R_N &= 4 C_1 \alpha 1.392 D_{16} l \\ &= 4(1.0)(1.0)(1.392)(4)(12.27 \text{ in}) \\ \phi R_N &= 273 \text{ kip} \quad /OK\end{aligned}$$



Seal	Title Summit Lot 71  BEAM OVER HSS COLUMNS	Project # 170450	Date 2017/11/21
		Designer DMV	Scale NTS
		Checked by	Sheet # C-08

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## 7. GENERAL CONNECTION DETAILS (WELDS + BOLTS)

- DESIGN/CHECKS OF STIFFENER WELDS IS OKAY, SEE EXCEL
- FOR BOLTING OF BEAMS, USE PROCEDURE/GAUGES FROM AISC
- USE (4) -  $\frac{5}{8}$ "  $\phi$  BOLTS w/  $V_r = H_r = 12.4$  kip/BOLT w/ THREADS INC.  
 $\sum (H_r)_{\text{TOTAL}} = 49.6$  kip.  $> 5\% V_r$  FOR W18x71 =  $275$  kip  $\cdot 0.05 = 13.75$  kip.
- NOTE, PROVIDE DETAILS WHERE THE BEAM IS BOTH WIDER AND SHALLOWER THAN THE COLUMN + PL. DUE TO THE USE OF STIFFENERS, BEARING IS DIRECTLY THROUGH AND THUS PL'S ARE REALLY FOR ERECTION ONLY.

## 8. LATERAL STABILITY

- FOR STEEL BEAMS CANT. OVER A COLUMN LATERAL STABILITY MUST BE CONSIDERED
- PER AISC, IF THE BEAM FRAMING INTO THE BEAM/COLUMN JOINT IS 75% OF THE DEPTH OF THE CANT. BEAM THEN THIS IS CONSIDERED TO BE BRACED. NOTE THIS ON THE TYPICAL DETAILS.

Col.	Section	HSS6x6x1/4
	Cr	155.2 kip
Cap Pl	L	6 in
	t	0.3125 in

E	29000 ksi
(Fy)b	50 ksi
(Fu)b	65 ksi
(Fy)pl	36 ksi

Section	Vr [kip]	Beam Checks				Force Per Stiff. Set	Stiffener Design and Checks								Stiffener Welds			Stiffener BRG			
		Yield	Crip.	Buck.	Min.		b(s)	h(s)	t	Yield	Shear	KL/r	Fcr	Rn	Status	Size	Flan.	Web	Status	Rn	Status
W18x71	275	223	173	187	155	0	2.95	16.75	0.750	143.1	542.7	58.0	30.2	120	OK	4	77	373	OK	149	OK
x65	248	200	143	140	140	7	2.92	16.65	0.750	141.9	539.5	57.7	30.2	119	OK	4	76	371	OK	148	OK
x60	227	182	122	111	111	22	2.97	16.58	0.750	144.2	537.0	57.4	30.3	121	OK	4	77	369	OK	150	OK
x55	212	167	108	92	92	32	2.95	16.48	0.750	143.5	533.8	57.1	30.3	121	OK	4	77	367	OK	149	OK
x50	192	150	90	69	69	43	2.94	16.38	0.750	142.8	530.6	56.7	30.4	121	OK	4	77	365	OK	149	OK
W18x46	195	153	92	72	72	42	2.22	16.48	0.750	107.8	533.8	57.1	30.3	91	OK	4	58	367	OK	112	OK
x40	169	131	71	48	48	53	2.20	16.28	0.750	106.8	527.3	56.4	30.5	90	OK	4	57	362	OK	111	OK
x35	159	121	65	42	42	57	2.25	16.20	0.750	109.4	524.9	56.1	30.5	93	OK	4	59	361	OK	114	OK
W16x57	212	189	137	138	137	9	2.69	14.65	0.500	87.0	316.4	76.1	26.5	64	OK	4	70	326	OK	91	OK
x50	186	163	107	95	95	30	2.72	14.68	0.500	88.2	317.0	76.3	26.5	65	OK	4	71	327	OK	92	OK
x45	167	145	89	71	71	42	2.71	14.48	0.500	87.7	312.7	75.2	26.7	65	OK	4	71	322	OK	91	OK
x40	146	126	70	49	49	48	2.69	14.38	0.500	87.1	310.5	74.7	26.8	65	OK	4	70	320	OK	91	OK
x36	141	119	66	44	44	48	2.75	14.40	0.500	88.9	311.0	74.8	26.8	66	OK	4	72	321	OK	93	OK
W16x31	131	111	57	36	36	47	2.02	14.40	0.500	65.3	311.0	74.8	26.8	49	OK	4	53	321	OK	68	OK
x26	106	98	48	27	27	39	2.00	14.20	0.500	64.8	306.7	73.8	27.0	49	OK	4	52	316	OK	68	OK
W14x82	219	245	205	274	155	0	3.99	12.18	0.500	129.2	263.0	63.3	29.2	105	OK	4	104	271	OK	135	OK
x74	192	213	159	188	155	0	3.99	12.08	0.500	129.2	260.8	62.7	29.3	105	OK	4	104	269	OK	135	OK
x68	174	192	136	148	136	9	3.94	11.88	0.500	127.6	256.5	61.7	29.5	104	OK	4	103	264	OK	133	OK
x61	156	171	112	109	109	23	4.00	11.90	0.500	129.6	257.0	61.8	29.4	106	OK	4	104	265	OK	135	OK
W14x53	154	169	108	105	105	25	3.03	11.90	0.500	98.2	257.0	61.8	29.4	80	OK	4	79	265	OK	102	OK
x48	141	153	92	81	81	30	3.02	11.80	0.500	97.7	254.9	61.3	29.5	80	OK	4	79	263	OK	102	OK
x43	125	134	74	58	58	33	3.00	11.70	0.500	97.2	252.7	60.8	29.6	80	OK	4	78	261	OK	101	OK
W14x38	131	128	76	59	59	36	2.57	12.48	0.500	83.3	269.5	64.8	28.9	67	OK	4	67	278	OK	87	OK
x34	120	116	65	46	46	37	2.63	12.50	0.500	85.1	270.0	65.0	28.8	68	OK	4	68	278	OK	89	OK
x30	112	107	60	39	39	36	2.62	12.30	0.500	84.7	265.7	63.9	29.0	68	OK	4	68	274	OK	88	OK
W14x26	106	103	52	33	33	36	1.77	12.40	0.500	57.2	267.8	64.4	28.9	46	OK	4	46	276	OK	60	OK
x22	94.5	90	43	24	24	35	1.75	12.20	0.500	56.7	263.5	63.4	29.1	46	OK	4	46	272	OK	59	OK
W12x96	210	268	253	397	155	0	4.98	10.45	0.500	161.2	225.7	54.3	30.8	138	OK	4	130	233	OK	168	OK
x87	193	245	225	327	155	0	4.99	10.38	0.500	161.6	224.1	53.9	30.9	139	OK	4	130	231	OK	168	OK
x79	175	219	188	247	155	0	4.99	10.28	0.500	161.6	221.9	53.4	31.0	139	OK	4	130	229	OK	168	OK
x72	159	197	158	189	155	0	4.94	10.18	0.500	160.0	219.8	52.9	31.1	138	OK	4	129	227	OK	167	OK
x65	142	176	132	142	132	5	5.00	10.10	0.500	162.0	218.2	52.5	31.1	140	OK	4	130	225	OK	169	OK
W12x58	132	164	109	111	109	12	4.06	10.33	0.500	131.6	223.0	53.7	30.9	113	OK	4	106	230	OK	137	OK
x53	125	154	102	98	98	14	4.06	10.23	0.500	131.6	220.9	53.1	31.0	113	OK	4	106	228	OK	137	OK
W12x50	135	164	116	121	116	10	3.10	10.33	0.500	100.5	223.0	53.7	30.9	86	OK	4	81	230	OK	105	OK
x45	122	146	95	89	89	16	3.09	10.23	0.500	100.0	220.9	53.1	31.0	86	OK	4	80	228	OK	104	OK
x40	105	126	74	61	61	22	3.13	10.15	0.500	101.4	219.2	52.7	31.1	88	OK	4	82	226	OK	106	OK
W12x35	113	121	75	61	61	26	2.53	11.00	0.500	82.0	237.6	57.2	30.3	69	OK	4	66	245	OK	85	OK
x30	95.9	102	57	40	40	28	2.51	10.80	0.500	81.3	233.3	56.1	30.5	69	OK	4	65	241	OK	85	OK
x26	84.2	89	45	28	28	28	2.50	10.70	0.500	80.8	231.1	55.6	30.6	69	OK	4	65	238	OK	84	OK
W12x22	95.9	102	57	40	40	28	1.39	11.05	0.500	45.0	238.7	57.4	30.3	38	OK	4	36	246	OK	47	OK
x19	86	90	48	29	29	28	1.44	11.08	0.500	46.7	239.2	57.5	30.2	39	OK	4	38	247	OK	49	OK
x16	79.2	82	45	24	24	28	1.43	10.88	0.500	46.4	234.9	56.5	30.4	39	OK	4	37	242	OK	48	OK
x14	64.3	73	39	18	18	23	1.42	10.78	0.500	46.1	232.7	56.0	30.5	39	OK	4	37	240	OK	48	OK
W10x45	106	154	113	126	106	0	3.23	8.48	0.375	78.4	137.3	58.7	30.0	65	OK	4	84	189	OK	82	OK
x39	93.7	135	94	92	92	1	3.18	8.30	0.375	77.3	134.4	57.5	30.3	65	OK	4	83	185	OK	81	OK
x33	84.7	121	83	72	72	7	3.23	8.23	0.375	78.5	133.3	57.0	30.3	66	OK	4	84	183	OK	82	OK
W10x30	94.5	120	82	74	74	10	2.22	9.13	0.375	53.9	147.8	63.2	29.2	44	OK	4	58	203	OK	56	OK
x26	80.3	102	63	49	49	16	2.20	8.93	0.375	53.4	144.6	61.8	29.4	44	OK	4	57	199	OK	56	OK
x22	73.4	92	55	38	38	18	2.25	8.95	0.375	54.7	145.0	62.0	29.4	45	OK	4	59	199	OK	57	OK
W10x19	76.5	97	59	43	43	17	1.39	8.95	0.375	33.7	145.0	62.0	29.4	27	OK	4	36	199	OK	35	OK
x17	72.7	91	57	38	38	17	1.44	8.98	0.375	35.1	145.4	62.2	29.4	29	OK	4	38	200	OK	37	OK
x15	68.9	85	57	33	33	18	1.44	8.87	0.375	34.9	143.6	61.4	29.5	29	OK	4	37	197	OK	36	OK
x12	56.3	69	40	19	19	19	1.42	8.75	0.375	34.4	141.7	60.6	29.7	28	OK	4	37	195	OK	36	OK
W8x67	154	266	327	676	154	0	3.20	7.13	0.313	64.9	96.2	59.2	29.9	54	OK	4	83	159	OK	68	OK
x58	134	231	269	484	134	0	3.24	7.00	0.313	65.5	94.5	58.2	30.1	55	OK	4	84	156	OK	68	OK
x48	102	174	164	233	102	0	3.24	6.88	0.313	65.7	92.8	57.2	30.3	55	OK	4	84	153	OK	68	OK
x40	89.1	151	140	170	89	0	3.22	6.63	0.313	65.3	89.4	55.1	30.7	56	OK	4	84	148	OK	68	OK
x35	75.5	127	104	109	76	0	3.20	6.50	0.313	64.7	87.7	54.0	30.9	56	OK	4	83	145	OK	67	OK
x31	68.4	115	90	84	68	0	3.25	6.50	0.313	65.8	87.8	54.0	30.9	56	OK	4	85	145	OK	69	OK
W8x28	68.9	116	87	84	69	0	2.65	6.81	0.313	53.6	91.9	56.6	30.4	45	OK	4	69	152	OK	56	OK
x24	58.3	98	65	54	54	2	2.69	6.81	0.313	54.4	91.9	56.6	30.4	46	OK	4	70	152	OK	57	OK
W8x21	62.1	97	67	54	54	4	2.07	7.16	0.313	42.0	96.6	59.5	29.9	35	OK	4	54	159	OK	44	OK
x18	56.2	87	59	42	42	7	2.06	7.02	0.313	41.8	94.7	58.3	30.1	35	OK	4	54	156	OK	44	OK
W8x15	59.6	92	71	51	51	4	1.45	6.99	0.313	29.3	94.3	58.1	30.1	25	OK	4	38	156	OK	31	OK
x13	55.1	85	68	42	42	6	1.44	6.87	0.313	29.1	92.7	57.1	30.3	25	OK	4	37	1			

Col.	Section HSS5x5x1/4
Cr	120 kip
Cap Pl	L 5 in t 0.3125 in

E	29000 ksi
(Fy)b	50 ksi
(Fu)b	65 ksi
(Fy)pl	36 ksi

Section	Vr [kip]	Beam Checks				Force Per Stiff. Set	Stiffener Design and Checks								Stiffener Welds			Stiffener BRG			
		Yield	Crip.	Buck.	Min.		b(s)	h(s)	t	Yield	Shear	KL/r	Fcr	Rn	Status	Size	Flan.	Web	Status	Rn	Status
W18x71	275	199	161	187	120	0	2.95	16.75	0.500	95.4	361.8	87.0	24.2	64	OK	4	77	373	OK	99	OK
x65	248	177	133	140	120	0	2.92	16.65	0.500	94.6	359.6	86.5	24.3	64	OK	4	76	371	OK	99	OK
x60	227	161	114	111	111	5	2.97	16.58	0.500	96.1	358.0	86.1	24.4	65	OK	4	77	369	OK	100	OK
x55	212	148	101	92	92	14	2.95	16.48	0.500	95.7	355.9	85.6	24.5	65	OK	4	77	367	OK	100	OK
x50	192	132	84	69	69	25	2.94	16.38	0.500	95.2	353.7	85.1	24.6	65	OK	4	77	365	OK	99	OK
W18x46	195	135	86	72	72	24	2.22	16.48	0.500	71.8	355.9	85.6	24.5	49	OK	4	58	367	OK	75	OK
x40	169	115	66	48	48	36	2.20	16.28	0.500	71.2	351.5	84.6	24.7	49	OK	4	57	362	OK	74	OK
x35	159	106	60	42	42	39	2.25	16.20	0.500	72.9	349.9	84.2	24.8	50	OK	4	59	361	OK	76	OK
W16x57	212	168	127	138	120	0	2.69	14.65	0.500	87.0	316.4	76.1	26.5	64	OK	4	70	326	OK	91	OK
x50	186	144	99	95	95	13	2.72	14.68	0.500	88.2	317.0	76.3	26.5	65	OK	4	71	327	OK	92	OK
x45	167	128	82	71	71	24	2.71	14.48	0.500	87.7	312.7	75.2	26.7	65	OK	4	71	322	OK	91	OK
x40	146	111	65	49	49	35	2.69	14.38	0.500	87.1	310.5	74.7	26.8	65	OK	4	70	320	OK	91	OK
x36	141	104	61	44	44	38	2.75	14.40	0.500	88.9	311.0	74.8	26.8	66	OK	4	72	321	OK	93	OK
W16x31	131	98	53	36	36	42	2.02	14.40	0.500	65.3	311.0	74.8	26.8	49	OK	4	53	321	OK	68	OK
x26	106	86	44	27	27	39	2.00	14.20	0.500	64.8	306.7	73.8	27.0	49	OK	4	52	316	OK	68	OK
W14x82	219	220	189	274	120	0	3.99	12.18	0.500	129.2	263.0	63.3	29.2	105	OK	4	104	271	OK	135	OK
x74	192	190	147	188	120	0	3.99	12.08	0.500	129.2	260.8	62.7	29.3	105	OK	4	104	269	OK	135	OK
x68	174	172	126	148	120	0	3.94	11.88	0.500	127.6	256.5	61.7	29.5	104	OK	4	103	264	OK	133	OK
x61	156	152	103	109	103	8	4.00	11.90	0.500	129.6	257.0	61.8	29.4	106	OK	4	104	265	OK	135	OK
W14x53	154	150	100	105	100	10	3.03	11.90	0.500	98.2	257.0	61.8	29.4	80	OK	4	79	265	OK	102	OK
x48	141	136	85	81	81	19	3.02	11.80	0.500	97.7	254.9	61.3	29.5	80	OK	4	79	263	OK	102	OK
x43	125	119	69	58	58	31	3.00	11.70	0.500	97.2	252.7	60.8	29.6	80	OK	4	78	261	OK	101	OK
W14x38	131	113	70	59	59	30	2.57	12.48	0.500	83.3	269.5	64.8	28.9	67	OK	4	67	278	OK	87	OK
x34	120	102	60	46	46	37	2.63	12.50	0.500	85.1	270.0	65.0	28.8	68	OK	4	68	278	OK	89	OK
x30	112	94	55	39	39	36	2.62	12.30	0.500	84.7	265.7	63.9	29.0	68	OK	4	68	274	OK	88	OK
W14x26	106	90	48	33	33	36	1.77	12.40	0.500	57.2	267.8	64.4	28.9	46	OK	4	46	276	OK	60	OK
x22	94.5	79	40	24	24	35	1.75	12.20	0.500	56.7	263.5	63.4	29.1	46	OK	4	46	272	OK	59	OK
W12x96	210	241	232	397	120	0	4.98	10.45	0.500	161.2	225.7	54.3	30.8	138	OK	4	130	233	OK	168	OK
x87	193	220	205	327	120	0	4.99	10.38	0.500	161.6	224.1	53.9	30.9	139	OK	4	130	231	OK	168	OK
x79	175	196	172	247	120	0	4.99	10.28	0.500	161.6	221.9	53.4	31.0	139	OK	4	130	229	OK	168	OK
x72	159	176	145	189	120	0	4.94	10.18	0.500	160.0	219.8	52.9	31.1	138	OK	4	129	227	OK	167	OK
x65	142	156	120	142	120	0	5.00	10.10	0.500	162.0	218.2	52.5	31.1	140	OK	4	130	225	OK	169	OK
W12x58	132	146	100	111	100	10	4.06	10.33	0.500	131.6	223.0	53.7	30.9	113	OK	4	106	230	OK	137	OK
x53	125	137	93	98	93	14	4.06	10.23	0.500	131.6	220.9	53.1	31.0	113	OK	4	106	228	OK	137	OK
W12x50	135	145	106	121	106	7	3.10	10.33	0.500	100.5	223.0	53.7	30.9	86	OK	4	81	230	OK	105	OK
x45	122	129	87	89	87	16	3.09	10.23	0.500	100.0	220.9	53.1	31.0	86	OK	4	80	228	OK	104	OK
x40	105	111	68	61	61	22	3.13	10.15	0.500	101.4	219.2	52.7	31.1	88	OK	4	82	226	OK	106	OK
W12x35	113	106	69	61	61	26	2.53	11.00	0.500	82.0	237.6	57.2	30.3	69	OK	4	66	245	OK	85	OK
x30	95.9	89	52	40	40	28	2.51	10.80	0.500	81.3	233.3	56.1	30.5	69	OK	4	65	241	OK	85	OK
x26	84.2	77	41	28	28	28	2.50	10.70	0.500	80.8	231.1	55.6	30.6	69	OK	4	65	238	OK	84	OK
W12x22	95.9	89	53	40	40	28	1.39	11.05	0.500	45.0	238.7	57.4	30.3	38	OK	4	36	246	OK	47	OK
x19	86	78	44	29	29	28	1.44	11.08	0.500	46.7	239.2	57.5	30.2	39	OK	4	38	247	OK	49	OK
x16	79.2	71	40	24	24	28	1.43	10.88	0.500	46.4	234.9	56.5	30.4	39	OK	4	37	242	OK	48	OK
x14	64.3	63	34	18	18	23	1.42	10.78	0.500	46.1	232.7	56.0	30.5	39	OK	4	37	240	OK	48	OK
W10x45	106	137	103	126	103	1	3.23	8.48	0.375	78.4	137.3	58.7	30.0	65	OK	4	84	189	OK	82	OK
x39	93.7	119	85	92	85	4	3.18	8.30	0.375	77.3	134.4	57.5	30.3	65	OK	4	83	185	OK	81	OK
x33	84.7	106	75	72	72	7	3.23	8.23	0.375	78.5	133.3	57.0	30.3	66	OK	4	84	183	OK	82	OK
W10x30	94.5	105	75	74	74	10	2.22	9.13	0.375	53.9	147.8	63.2	29.2	44	OK	4	58	203	OK	56	OK
x26	80.3	89	57	49	49	16	2.20	8.93	0.375	53.4	144.6	61.8	29.4	44	OK	4	57	199	OK	56	OK
x22	73.4	80	50	38	38	18	2.25	8.95	0.375	54.7	145.0	62.0	29.4	45	OK	4	59	199	OK	57	OK
W10x19	76.5	84	54	43	43	17	1.39	8.95	0.375	33.7	145.0	62.0	29.4	27	OK	4	36	199	OK	35	OK
x17	72.7	79	51	38	38	17	1.44	8.98	0.375	35.1	145.4	62.2	29.4	29	OK	4	38	200	OK	37	OK
x15	68.9	74	50	33	33	18	1.44	8.87	0.375	34.9	143.6	61.4	29.5	29	OK	4	37	197	OK	36	OK
x12	56.3	60	35	19	19	19	1.42	8.75	0.375	34.4	141.7	60.6	29.7	28	OK	4	37	195	OK	36	OK
W8x67	154	237	295	676	120	0	3.20	7.13	0.313	64.9	96.2	59.2	29.9	54	OK	4	83	159	OK	68	OK
x58	134	205	242	484	120	0	3.24	7.00	0.313	65.5	94.5	58.2	30.1	55	OK	4	84	156	OK	68	OK
x48	102	154	148	233	102	0	3.24	6.88	0.313	65.7	92.8	57.2	30.3	55	OK	4	84	153	OK	68	OK
x40	89.1	133	125	170	89	0	3.22	6.63	0.313	65.3	89.4	55.1	30.7	56	OK	4	84	148	OK	68	OK
x35	75.5	112	93	109	76	0	3.20	6.50	0.313	64.7	87.7	54.0	30.9	56	OK	4	83	145	OK	67	OK
x31	68.4	101	80	84	68	0	3.25	6.50	0.313	65.8	87.8	54.0	30.9	56	OK	4	85	145	OK	69	OK
W8x28	68.9	102	79	84	69	0	2.65	6.81	0.313	53.6	91.9	56.6	30.4	45	OK	4	69	152	OK	56	OK
x24	58.3	86	59	54	54	2	2.69	6.81	0.313	54.4	91.9	56.6	30.4	46	OK	4	70	152	OK	57	OK
W8x21	62.1	84	60	54	54	4	2.07	7.16	0.313	42.0	96.6	59.5	29.9	35	OK	4	54	159	OK	44	OK
x18	56.2	76	53	42	42	7	2.06	7.02	0.313	41.8	94.7	58.3	30.1	35	OK	4	54	156	OK	44	OK
W8x15	59.6	80	63	51	51	4	1.45	6.99	0.313	29.3	94.3	58.1	30.1	25	OK	4	38	156	OK	31	OK
x13	55.1	73	60	42	42	6	1.44	6.87	0.313	29.1	92.7	57.1	30.3	25	OK	4	37	153	OK	30	OK
x10	40.2	53	32																		

Col.	Section HSS4x4x1/4
Cr	85 kip
Cap Pl	L 4 in
t	0.3125 in

E	29000 ksi
(Fy)b	50 ksi
(Fu)b	65 ksi
(Fy)pl	36 ksi

Section	Vr [kip]	Beam Checks				Force Per Stiff. Set	Stiffener Design and Checks								Stiffener Welds			Stiffener BRG			
		Yield	Crip.	Buck.	Min.		b(s)	h(s)	t	Yield	Shear	KL/r	Fcr	Rn	Status	Size	Flan.	Web	Status	Rn	Status
W18x71	275	174	149	187	85	0	2.95	16.75	0.500	95.4	361.8	87.0	24.2	64	OK	4	77	373	OK	99	OK
x65	248	155	124	140	85	0	2.92	16.65	0.500	94.6	359.6	86.5	24.3	64	OK	4	76	371	OK	99	OK
x60	227	140	106	111	85	0	2.97	16.58	0.500	96.1	358.0	86.1	24.4	65	OK	4	77	369	OK	100	OK
x55	212	128	93	92	85	0	2.95	16.48	0.500	95.7	355.9	85.6	24.5	65	OK	4	77	367	OK	100	OK
x50	192	114	77	69	69	8	2.94	16.38	0.500	95.2	353.7	85.1	24.6	65	OK	4	77	365	OK	99	OK
W18x46	195	117	80	72	72	7	2.22	16.48	0.500	71.8	355.9	85.6	24.5	49	OK	4	58	367	OK	75	OK
x40	169	100	61	48	48	18	2.20	16.28	0.500	71.2	351.5	84.6	24.7	49	OK	4	57	362	OK	74	OK
x35	159	91	55	42	42	22	2.25	16.20	0.500	72.9	349.9	84.2	24.8	50	OK	4	59	361	OK	76	OK
W16x57	212	146	117	138	85	0	2.69	14.65	0.500	87.0	316.4	76.1	26.5	64	OK	4	70	326	OK	91	OK
x50	186	125	92	95	85	0	2.72	14.68	0.500	88.2	317.0	76.3	26.5	65	OK	4	71	327	OK	92	OK
x45	167	111	76	71	71	7	2.71	14.48	0.500	87.7	312.7	75.2	26.7	65	OK	4	71	322	OK	91	OK
x40	146	96	59	49	49	18	2.69	14.38	0.500	87.1	310.5	74.7	26.8	65	OK	4	70	320	OK	91	OK
x36	141	90	55	44	44	20	2.75	14.40	0.500	88.9	311.0	74.8	26.8	66	OK	4	72	321	OK	93	OK
W16x31	131	84	48	36	36	24	2.02	14.40	0.500	65.3	311.0	74.8	26.8	49	OK	4	53	321	OK	68	OK
x26	106	73	40	27	27	29	2.00	14.20	0.500	64.8	306.7	73.8	27.0	49	OK	4	52	316	OK	68	OK
W14x82	219	194	173	274	85	0	3.99	12.18	0.500	129.2	263.0	63.3	29.2	105	OK	4	104	271	OK	135	OK
x74	192	168	135	188	85	0	3.99	12.08	0.500	129.2	260.8	62.7	29.3	105	OK	4	104	269	OK	135	OK
x68	174	151	116	148	85	0	3.94	11.88	0.500	127.6	256.5	61.7	29.5	104	OK	4	103	264	OK	133	OK
x61	156	133	95	109	85	0	4.00	11.90	0.500	129.6	257.0	61.8	29.4	106	OK	4	104	265	OK	135	OK
W14x53	154	132	92	105	85	0	3.03	11.90	0.500	98.2	257.0	61.8	29.4	80	OK	4	79	265	OK	102	OK
x48	141	119	78	81	78	3	3.02	11.80	0.500	97.7	254.9	61.3	29.5	80	OK	4	79	263	OK	102	OK
x43	125	104	63	58	58	13	3.00	11.70	0.500	97.2	252.7	60.8	29.6	80	OK	4	78	261	OK	101	OK
W14x38	131	97	64	59	59	13	2.57	12.48	0.500	83.3	269.5	64.8	28.9	67	OK	4	67	278	OK	87	OK
x34	120	87	54	46	46	20	2.63	12.50	0.500	85.1	270.0	65.0	28.8	68	OK	4	68	278	OK	89	OK
x30	112	80	49	39	39	23	2.62	12.30	0.500	84.7	265.7	63.9	29.0	68	OK	4	68	274	OK	88	OK
W14x26	106	77	44	33	33	26	1.77	12.40	0.500	57.2	267.8	64.4	28.9	46	OK	4	46	276	OK	60	OK
x22	94.5	67	36	24	24	30	1.75	12.20	0.500	56.7	263.5	63.4	29.1	46	OK	4	46	272	OK	59	OK
W12x96	210	213	211	397	85	0	4.98	10.45	0.500	161.2	225.7	54.3	30.8	138	OK	4	130	233	OK	168	OK
x87	193	194	186	327	85	0	4.99	10.38	0.500	161.6	224.1	53.9	30.9	139	OK	4	130	231	OK	168	OK
x79	175	172	155	247	85	0	4.99	10.28	0.500	161.6	221.9	53.4	31.0	139	OK	4	130	229	OK	168	OK
x72	159	154	131	189	85	0	4.94	10.18	0.500	160.0	219.8	52.9	31.1	138	OK	4	129	227	OK	167	OK
x65	142	137	108	142	85	0	5.00	10.10	0.500	162.0	218.2	52.5	31.1	140	OK	4	130	225	OK	169	OK
W12x58	132	128	92	111	85	0	4.06	10.33	0.500	131.6	223.0	53.7	30.9	113	OK	4	106	230	OK	137	OK
x53	125	120	84	98	84	0	4.06	10.23	0.500	131.6	220.9	53.1	31.0	113	OK	4	106	228	OK	137	OK
W12x50	135	127	97	121	85	0	3.10	10.33	0.500	100.5	223.0	53.7	30.9	86	OK	4	81	230	OK	105	OK
x45	122	112	80	89	80	3	3.09	10.23	0.500	100.0	220.9	53.1	31.0	86	OK	4	80	228	OK	104	OK
x40	105	97	62	61	61	12	3.13	10.15	0.500	101.4	219.2	52.7	31.1	88	OK	4	82	226	OK	106	OK
W12x35	113	91	63	61	61	12	2.53	11.00	0.500	82.0	237.6	57.2	30.3	69	OK	4	66	245	OK	85	OK
x30	95.9	76	48	40	40	22	2.51	10.80	0.500	81.3	233.3	56.1	30.5	69	OK	4	65	241	OK	85	OK
x26	84.2	66	37	28	28	28	2.50	10.70	0.500	80.8	231.1	55.6	30.6	69	OK	4	65	238	OK	84	OK
W12x22	95.9	76	48	40	40	23	1.39	11.05	0.500	45.0	238.7	57.4	30.3	38	OK	4	36	246	OK	47	OK
x19	86	66	39	29	29	28	1.44	11.08	0.500	46.7	239.2	57.5	30.2	39	OK	4	38	247	OK	49	OK
x16	79.2	60	36	24	24	28	1.43	10.88	0.500	46.4	234.9	56.5	30.4	39	OK	4	37	242	OK	48	OK
x14	64.3	53	30	18	18	23	1.42	10.78	0.500	46.1	232.7	56.0	30.5	39	OK	4	37	240	OK	48	OK
W10x45	106	119	93	126	85	0	3.23	8.48	0.375	78.4	137.3	58.7	30.0	65	OK	4	84	189	OK	82	OK
x39	93.7	104	77	92	77	4	3.18	8.30	0.375	77.3	134.4	57.5	30.3	65	OK	4	83	185	OK	81	OK
x33	84.7	92	66	72	66	9	3.23	8.23	0.375	78.5	133.3	57.0	30.3	66	OK	4	84	183	OK	82	OK
W10x30	94.5	90	68	74	68	9	2.22	9.13	0.375	53.9	147.8	63.2	29.2	44	OK	4	58	203	OK	56	OK
x26	80.3	76	51	49	49	16	2.20	8.93	0.375	53.4	144.6	61.8	29.4	44	OK	4	57	199	OK	56	OK
x22	73.4	68	44	38	38	18	2.25	8.95	0.375	54.7	145.0	62.0	29.4	45	OK	4	59	199	OK	57	OK
W10x19	76.5	72	48	43	43	17	1.39	8.95	0.375	33.7	145.0	62.0	29.4	27	OK	4	36	199	OK	35	OK
x17	72.7	67	45	38	38	17	1.44	8.98	0.375	35.1	145.4	62.2	29.4	29	OK	4	38	200	OK	37	OK
x15	68.9	62	44	33	33	18	1.44	8.87	0.375	34.9	143.6	61.4	29.5	29	OK	4	37	197	OK	36	OK
x12	56.3	50	30	19	19	19	1.42	8.75	0.375	34.4	141.7	60.6	29.7	28	OK	4	37	195	OK	36	OK
W8x67	154	209	263	676	85	0	3.20	7.13	0.313	64.9	96.2	59.2	29.9	54	OK	4	83	159	OK	68	OK
x58	134	180	215	484	85	0	3.24	7.00	0.313	65.5	94.5	58.2	30.1	55	OK	4	84	156	OK	68	OK
x48	102	134	132	233	85	0	3.24	6.88	0.313	65.7	92.8	57.2	30.3	55	OK	4	84	153	OK	68	OK
x40	89.1	115	111	170	85	0	3.22	6.63	0.313	65.3	89.4	55.1	30.7	56	OK	4	84	148	OK	68	OK
x35	75.5	96	82	109	76	0	3.20	6.50	0.313	64.7	87.7	54.0	30.9	56	OK	4	83	145	OK	67	OK
x31	68.4	87	71	84	68	0	3.25	6.50	0.313	65.8	87.8	54.0	30.9	56	OK	4	85	145	OK	69	OK
W8x28	68.9	88	70	84	69	0	2.65	6.81	0.313	53.6	91.9	56.6	30.4	45	OK	4	69	152	OK	56	OK
x24	58.3	73	52	54	52	3	2.69	6.81	0.313	54.4	91.9	56.6	30.4	46	OK	4	70	152	OK	57	OK
W8x21	62.1	72	53	54	53	5	2.07	7.16	0.313	42.0	96.6	59.5	29.9	35	OK	4	54	159	OK	44	OK
x18	56.2	64	46	42	42	7	2.06	7.02	0.313	41.8	94.7	58.3	30.1	35	OK	4	54	156	OK	44	OK
W8x15	59.6	68	54	51	51	4	1.45	6.99	0.313	29.3	94.3	58.1	30.1	25	OK	4	38	156	OK	31	OK
x13	55.1	62	51	42	42	6	1.44	6.87	0.313	29.1	92.7	57.1	30.3	25	OK	4	37	153	OK	30	OK
x10	40.2	45	27	17	17	12	1.47	6.89													

Col.	Section HSS3x3x1/4	E	29000 ksi
	Cr 48 kip	(Fy)b	50 ksi
Cap Pl	L 3 in	(Fu)b	65 ksi
	t 0.3125 in	(Fy)pl	36 ksi

Section	Vr [kip]	Beam Checks				Force Per Stiff. Set	Stiffener Design and Checks								Stiffener Welds			Stiffener BRG			
		Yield	Crip.	Buck.	Min.		b(s)	h(s)	t	Yield	Shear	KL/r	Fcr	Rn	Status	Size	Flan.	Web	Status	Rn	Status
W18x71	275	149	140	187	48	0	2.95	16.75	0.375	71.6	271.4	116.0	17.7	35	OK	4	77	373	OK	75	OK
x65	248	132	116	140	48	0	2.92	16.65	0.375	71.0	269.7	115.4	17.9	35	OK	4	76	371	OK	74	OK
x60	227	119	99	111	48	0	2.97	16.58	0.375	72.1	268.5	114.8	18.0	36	OK	4	77	369	OK	75	OK
x55	212	109	87	92	48	0	2.95	16.48	0.375	71.7	266.9	114.1	18.1	36	OK	4	77	367	OK	75	OK
x50	192	96	72	69	48	0	2.94	16.38	0.375	71.4	265.3	113.4	18.3	36	OK	4	77	365	OK	74	OK
W18x46	195	99	75	72	48	0	2.22	16.48	0.375	53.9	266.9	114.1	18.1	27	OK	4	58	367	OK	56	OK
x40	169	84	57	48	48	0	2.20	16.28	0.375	53.4	263.7	112.8	18.4	27	OK	4	57	362	OK	56	OK
x35	159	76	50	42	42	3	2.25	16.20	0.375	54.7	262.4	112.2	18.5	28	OK	4	59	361	OK	57	OK
W16x57	212	125	108	138	48	0	2.69	14.65	0.375	65.2	237.3	101.5	20.9	38	OK	4	70	326	OK	68	OK
x50	186	106	85	95	48	0	2.72	14.68	0.375	66.2	237.7	101.7	20.9	38	OK	4	71	327	OK	69	OK
x45	167	93	70	71	48	0	2.71	14.48	0.375	65.8	234.5	100.3	21.2	39	OK	4	71	322	OK	69	OK
x40	146	80	55	49	48	0	2.69	14.38	0.375	65.3	232.9	99.6	21.4	39	OK	4	70	320	OK	68	OK
x36	141	75	50	44	44	2	2.75	14.40	0.375	66.7	233.3	99.8	21.3	39	OK	4	72	321	OK	69	OK
W16x31	131	70	44	36	36	6	2.02	14.40	0.375	49.0	233.3	99.8	21.3	29	OK	4	53	321	OK	51	OK
x26	106	61	36	27	27	10	2.00	14.20	0.375	48.6	230.0	98.4	21.6	29	OK	4	52	316	OK	51	OK
W14x82	219	169	157	274	48	0	3.99	12.18	0.375	96.9	197.2	84.4	24.8	67	OK	4	104	271	OK	101	OK
x74	192	145	124	188	48	0	3.99	12.08	0.375	96.9	195.6	83.7	24.9	67	OK	4	104	269	OK	101	OK
x68	174	130	106	148	48	0	3.94	11.88	0.375	95.7	192.4	82.3	25.2	67	OK	4	103	264	OK	100	OK
x61	156	114	86	109	48	0	4.00	11.90	0.375	97.2	192.8	82.4	25.2	68	OK	4	104	265	OK	101	OK
W14x53	154	113	84	105	48	0	3.03	11.90	0.375	73.6	192.8	82.4	25.2	51	OK	4	79	265	OK	77	OK
x48	141	102	71	81	48	0	3.02	11.80	0.375	73.3	191.2	81.8	25.3	52	OK	4	79	263	OK	76	OK
x43	125	88	57	58	48	0	3.00	11.70	0.375	72.9	189.5	81.1	25.5	52	OK	4	78	261	OK	76	OK
W14x38	131	82	58	59	48	0	2.57	12.48	0.375	62.5	202.1	86.4	24.3	42	OK	4	67	278	OK	65	OK
x34	120	73	49	46	46	1	2.63	12.50	0.375	63.8	202.5	86.6	24.3	43	OK	4	68	278	OK	66	OK
x30	112	67	44	39	39	4	2.62	12.30	0.375	63.5	199.3	85.2	24.6	43	OK	4	68	274	OK	66	OK
W14x26	106	64	40	33	33	7	1.77	12.40	0.375	42.9	200.9	85.9	24.4	29	OK	4	46	276	OK	45	OK
x22	94.5	56	32	24	24	12	1.75	12.20	0.375	42.5	197.6	84.5	24.7	29	OK	4	46	272	OK	44	OK
W12x96	210	186	190	397	48	0	4.98	10.45	0.375	120.9	169.3	72.4	27.3	92	OK	4	130	233	OK	126	OK
x87	193	168	166	327	48	0	4.99	10.38	0.375	121.2	168.1	71.9	27.4	92	OK	4	130	231	OK	126	OK
x79	175	149	139	247	48	0	4.99	10.28	0.375	121.2	166.5	71.2	27.6	93	OK	4	130	229	OK	126	OK
x72	159	133	117	189	48	0	4.94	10.18	0.375	120.0	164.8	70.5	27.7	92	OK	4	129	227	OK	125	OK
x65	142	117	96	142	48	0	5.00	10.10	0.375	121.5	163.6	70.0	27.8	94	OK	4	130	225	OK	127	OK
W12x58	132	110	83	111	48	0	4.06	10.33	0.375	98.7	167.3	71.5	27.5	75	OK	4	106	230	OK	103	OK
x53	125	103	76	98	48	0	4.06	10.23	0.375	98.7	165.6	70.8	27.6	76	OK	4	106	228	OK	103	OK
W12x50	135	108	87	121	48	0	3.10	10.33	0.375	75.4	167.3	71.5	27.5	58	OK	4	81	230	OK	79	OK
x45	122	95	72	89	48	0	3.09	10.23	0.375	75.0	165.6	70.8	27.6	58	OK	4	80	228	OK	78	OK
x40	105	82	56	61	48	0	3.13	10.15	0.375	76.1	164.4	70.3	27.7	59	OK	4	82	226	OK	79	OK
W12x35	113	76	57	61	48	0	2.53	11.00	0.375	61.5	178.2	76.2	26.5	45	OK	4	66	245	OK	64	OK
x30	95.9	63	43	40	40	4	2.51	10.80	0.375	61.0	175.0	74.8	26.8	45	OK	4	65	241	OK	64	OK
x26	84.2	54	34	28	28	10	2.50	10.70	0.375	60.6	173.3	74.1	27.0	45	OK	4	65	238	OK	63	OK
W12x22	95.9	63	43	40	40	4	1.39	11.05	0.375	33.8	179.0	76.6	26.4	25	OK	4	36	246	OK	35	OK
x19	86	54	35	29	29	9	1.44	11.08	0.375	35.1	179.4	76.7	26.4	26	OK	4	38	247	OK	37	OK
x16	79.2	49	31	24	24	12	1.43	10.88	0.375	34.8	176.2	75.3	26.7	26	OK	4	37	242	OK	36	OK
x14	64.3	43	26	18	18	15	1.42	10.78	0.375	34.6	174.6	74.7	26.8	26	OK	4	37	240	OK	36	OK
W10x45	106	102	84	126	48	0	3.23	8.48	0.313	65.5	114.6	70.3	27.7	50	OK	4	84	189	OK	68	OK
x39	93.7	88	68	92	48	0	3.18	8.30	0.313	64.5	112.2	68.9	28.0	50	OK	4	83	185	OK	67	OK
x33	84.7	77	58	72	48	0	3.23	8.23	0.313	65.5	111.3	68.3	28.2	51	OK	4	84	183	OK	68	OK
W10x30	94.5	75	60	74	48	0	2.22	9.13	0.313	45.0	123.4	75.7	26.6	33	OK	4	58	203	OK	47	OK
x26	80.3	63	46	49	46	1	2.20	8.93	0.313	44.6	120.7	74.1	27.0	33	OK	4	57	199	OK	46	OK
x22	73.4	56	39	38	38	5	2.25	8.95	0.313	45.6	121.0	74.3	26.9	34	OK	4	59	199	OK	48	OK
W10x19	76.5	59	42	43	42	3	1.39	8.95	0.313	28.1	121.0	74.3	26.9	21	OK	4	36	199	OK	29	OK
x17	72.7	55	39	38	38	5	1.44	8.98	0.313	29.3	121.4	74.5	26.9	22	OK	4	38	200	OK	30	OK
x15	68.9	51	37	33	33	7	1.44	8.87	0.313	29.2	119.9	73.6	27.1	22	OK	4	37	197	OK	30	OK
x12	56.3	41	26	19	19	15	1.42	8.75	0.313	28.8	118.2	72.6	27.3	22	OK	4	37	195	OK	30	OK
W8x67	154	180	231	676	48	0	3.20	7.13	0.313	64.9	96.2	59.2	29.9	54	OK	4	83	159	OK	68	OK
x58	134	154	188	484	48	0	3.24	7.00	0.313	65.5	94.5	58.2	30.1	55	OK	4	84	156	OK	68	OK
x48	102	114	117	233	48	0	3.24	6.88	0.313	65.7	92.8	57.2	30.3	55	OK	4	84	153	OK	68	OK
x40	89.1	97	96	170	48	0	3.22	6.63	0.313	65.3	89.4	55.1	30.7	56	OK	4	84	148	OK	68	OK
x35	75.5	81	72	109	48	0	3.20	6.50	0.313	64.7	87.7	54.0	30.9	56	OK	4	83	145	OK	67	OK
x31	68.4	72	61	84	48	0	3.25	6.50	0.313	65.8	87.8	54.0	30.9	56	OK	4	85	145	OK	69	OK
W8x28	68.9	73	61	84	48	0	2.65	6.81	0.313	53.6	91.9	56.6	30.4	45	OK	4	69	152	OK	56	OK
x24	58.3	61	45	54	45	1	2.69	6.81	0.313	54.4	91.9	56.6	30.4	46	OK	4	70	152	OK	57	OK
W8x21	62.1	59	46	54	46	1	2.07	7.16	0.313	42.0	96.6	59.5	29.9	35	OK	4	54	159	OK	44	OK
x18	56.2	53	40	42	40	4	2.06	7.02	0.313	41.8	94.7	58.3	30.1	35	OK	4	54	156	OK	44	OK
W8x15	59.6	56	46	51	46	1	1.45	6.99	0.313	29.3	94.3	58.1	30.1	25	OK	4	38	156	OK	31	OK
x13	55.1	50	43	42	42	3	1.44	6.87	0.313	29.1	92.7	57.1	30.3	25	OK	4	37	153	OK	30	OK
x10	40.2	36	23	17	17	12	1.47	6.89	0.313	29.8	93.0	57.3	30.3	25	OK	4	38	153	OK	31	OK