STRUCTURAL ENGINEERING CALCULATIONS

FOR

RED DOOR GRILL - LEE'S SUMMIT
LOT 1 STREETS OF PRYOR
LEE'S SUMMIT, MO

PREPARED BY

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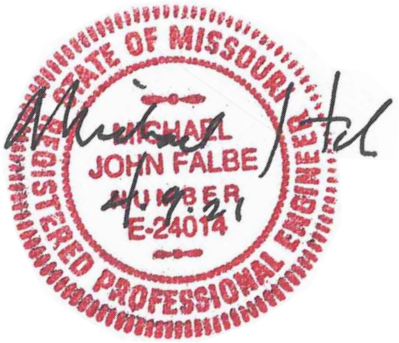
APRIL 9, 2021



BOB D. CAMPBELL & CO.
Structural Engineers Since 1957
4338 Belleview Ave. 816.531.4144
Kansas City, MO 64111 www.bdc-engrs.com

Project:	Red Door Grill
Project No.:	UPAC2101
Location:	Lee's Summit MO
By:	MJF
Date:	4/12/2021

Structural Design Criteria

Building Code:

International Building Code (IBC 2018)

Concrete:	ACI 318-14
Steel:	AISC 360-16
Wood:	NDS 2018
Connections:	ASCE 7-16

ANSI as approved in 2016

Basic Load Combinations - Allowable Stress Design (ASCE7-16)

D
D + L
D + (Lr or S or R)
D + 0.75L + 0.75(Lr or S of R)
D + (0.6W or 0.7E)
D + 0.75L + 0.75(0.6W) + 0.75(IR or S or R)
D + 0.75L + 0.75(0.7E) + 0.75S
0.6D + 0.6W
0.6D + 0.7E

Structural Design Loads

Roof Dead Load	20	psf
Roof Live Load	25	psf
Mezzanine Live Load	100	psf

Geotechnical Information

Spread footings and grade beams are designed to bear on engineered fill or undisturbed soil capable of safely sustaining 2000psf

Materials

Steel:	Beams & Columns:	ASTM A992, Grade 50
	Miscellaneous steel:	ASTM A36
	Tubes & Pipes:	ASTM A500, Grade B
Concrete:	3500 psi (footings, grade beams)	
	4000 psi (interior flatwork)	
	4500 psi w/ 6% +/- 1% air entrainment (exterior flatwork)	
Reinf. Steel:	ASTM A615 or A706 Grade 60 steel	
Wood:	Joists, beams, & trusses	No. 2 DF-L or SP
	LVL Members	Fb=2,600psf, E=1,900ksi
	PSL Members	Fb=2,900psf, E=2,000ksi

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Wind Loads

International Building Code 2018 / ASCE7-16 *Spreadsheet password = bdc*

ASCE 7-16:

Chapter 26 - General Requirements

Occupancy Risk Category	II		Table 1.5-2
Basic Wind Speed, V	109	mph	Figure 26.5-1A, B, C
Wind Directionality Factor, Kd	0.85		Table 26.6-1
Exposure Category	C		Section 26.7.3
Topographic Factor, Kzt	1.00		Section 26.8.2
Gust Effect Factor, G	0.85		Section 26.11.1
Enclosure Classification	Enclosed		Section 26.12
Internal Pressure Coefficient, Gcpi (Case 1)	0.18		Table 26.13-1
Internal Pressure Coefficient, Gcpi (Case 2)	-0.18		Table 26.13-1

Chapter 27 - Wind Loads on Buildings - MWFRS (Directional Procedure)

Windward Wall - Case 1 (Positive Internal Pressure)					
z (ft)	Kz p. 205	Velocity Pressure, qz qz = 0.00256KzKztKdV^2	Cp p. 207	Design Wind Pressure p = qGCp - qi(Gcpi)	**Design Wind Pressure Windward + Leeward**
0-15	0.85	21.98	0.8	10.38 psf	**25.71 psf**
16-20	0.90	23.27	0.8	11.26 psf	**26.59 psf**
21-25	0.94	24.30	0.8	11.96 psf	**27.29 psf**
26-30	0.98	25.34	0.8	12.67 psf	**28.00 psf**
31-40	1.04	26.89	0.8	13.72 psf	**29.05 psf**
41-50	1.09	28.18	0.8	14.60 psf	**29.93 psf**
51-60	1.13	29.21	0.8	15.31 psf	**30.63 psf**
61-70	1.17	30.25	0.8	16.01 psf	**31.34 psf**
71-80	1.21	31.28	0.8	16.71 psf	**32.04 psf**
81-90	1.24	32.06	0.8	17.24 psf	**32.57 psf**
91-100	1.26	32.57	0.8	17.59 psf	**32.92 psf**

Leeward Wall - Case 1 (Positive Internal Pressure)				
Mean Roof Height h (ft)	Kz p. 205	Velocity Pressure, qz qz = 0.00256KzKztKdV^2	Cp p. 264	Design Wind Pressure p = qGCp - qi(Gcpi)
30	0.98	25.34	-0.5	-15.33 psf

Side Wall - Case 1 (Positive Internal Pressure)				
Mean Roof Height h (ft)	Kz p. 205	Velocity Pressure, qz qz = 0.00256KzKztKdV^2	Cp p. 264	Design Wind Pressure p = qGCp - qi(Gcpi)
30	0.98	25.34	-0.7	-19.64 psf

Windward Wall - Case 2 (Negative Internal Pressure)					
z (ft)	Kz p. 205	Velocity Pressure, qz qz = 0.00256KzKztKdV^2	Cp p. 207	Design Wind Pressure p = qGCp - qi(Gcpi)	**Design Wind Pressure Windward + Leeward**
0-15	0.85	21.98	0.8	19.50 psf	**25.71 psf**
16-20	0.90	23.27	0.8	20.38 psf	**26.59 psf**
21-25	0.94	24.30	0.8	21.09 psf	**27.29 psf**
26-30	0.98	25.34	0.8	21.79 psf	**28.00 psf**
31-40	1.04	26.89	0.8	22.84 psf	**29.05 psf**
41-50	1.09	28.18	0.8	23.72 psf	**29.93 psf**
51-60	1.13	29.21	0.8	24.43 psf	**30.63 psf**
61-70	1.17	30.25	0.8	25.13 psf	**31.34 psf**
71-80	1.21	31.28	0.8	25.83 psf	**32.04 psf**
81-90	1.24	32.06	0.8	26.36 psf	**32.57 psf**
91-100	1.26	32.57	0.8	26.71 psf	**32.92 psf**

Leeward Wall - Case 2 (Negative Internal Pressure)				
Mean Roof Height h (ft)	Kz p. 205	Velocity Pressure, qz qz = 0.00256KzKztKdV^2	Cp p. 264	Design Wind Pressure p = qGCp - qi(Gcpi)
30	0.98	25.34	-0.5	-6.21 psf
Side Wall - Case 1 (Negative Internal Pressure)				
Mean Roof Height h (ft)	Kz p. 205	Velocity Pressure, qz qz = 0.00256KzKztKdV^2	Cp p. 264	Design Wind Pressure p = qGCp - qi(Gcpi)
30	0.98	25.34	-0.7	-10.51 psf

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Earthquake Loads

International Building Code 2018 / ASCE7-16 *Spreadsheet password = bdc*

			(ASCE 7-16)
Occupancy Risk Category	II		*(Table 1.5-1)*
Ss	10.0	%g	*(Figure 22-1)*
S1	6.8	%g	*(Figure 22-2)*
Site Class (per soil report or assume D	D		*(Table 20.3-1)*
Site Coefficient, Fa	1.6		*(Table 11.4-1)*
Site Coefficient, Fv	2.4		*(Table 11.4-2)*
Importance Factor,	1.0		*(Table 1.5-1)*

11.4.3 Site coefficients and adjusted maximum considered earthquake response acceleration parameter

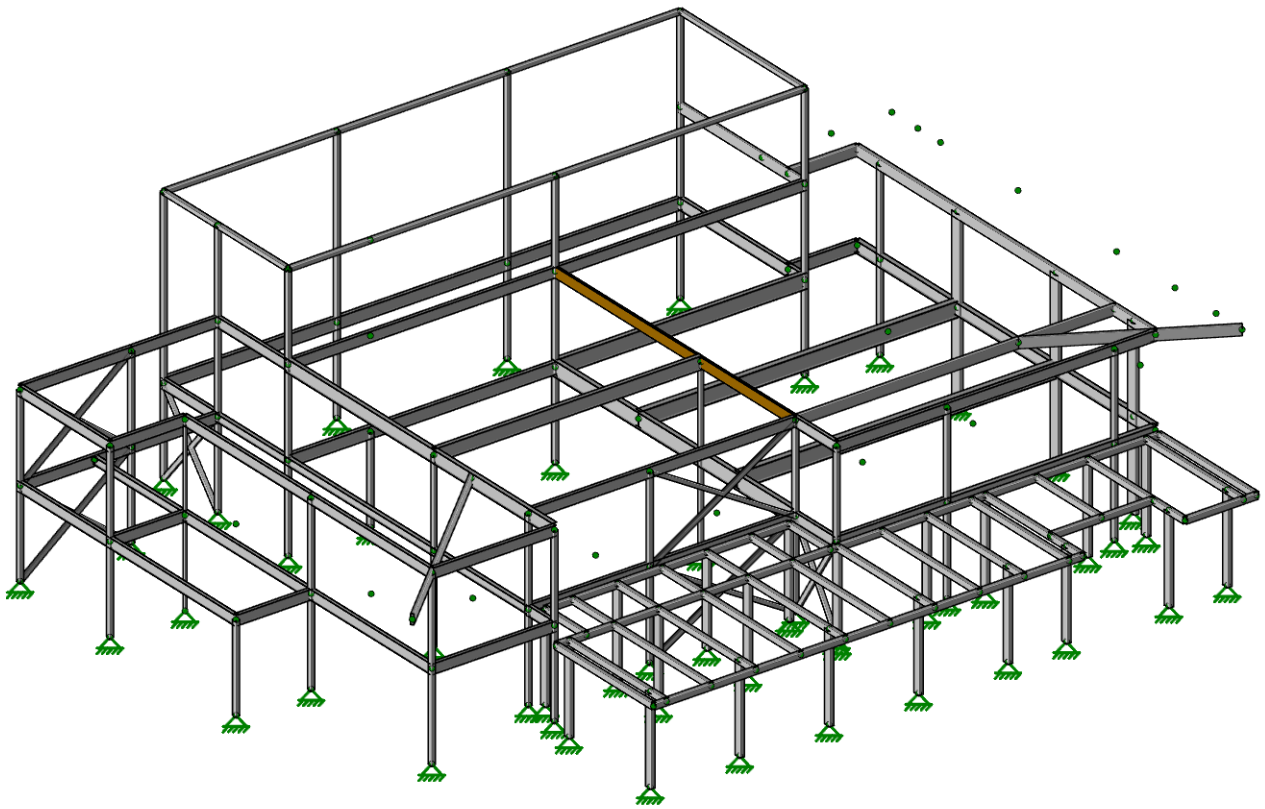
for short periods, Sms = Fa*Ss	0.160	*(Equation 11.4-1)*
at 1-second period, Sm1 = Fv*S1	0.163	*(Equation 11.4-2)*

11.4.4 Design spectral response acceleration parameters

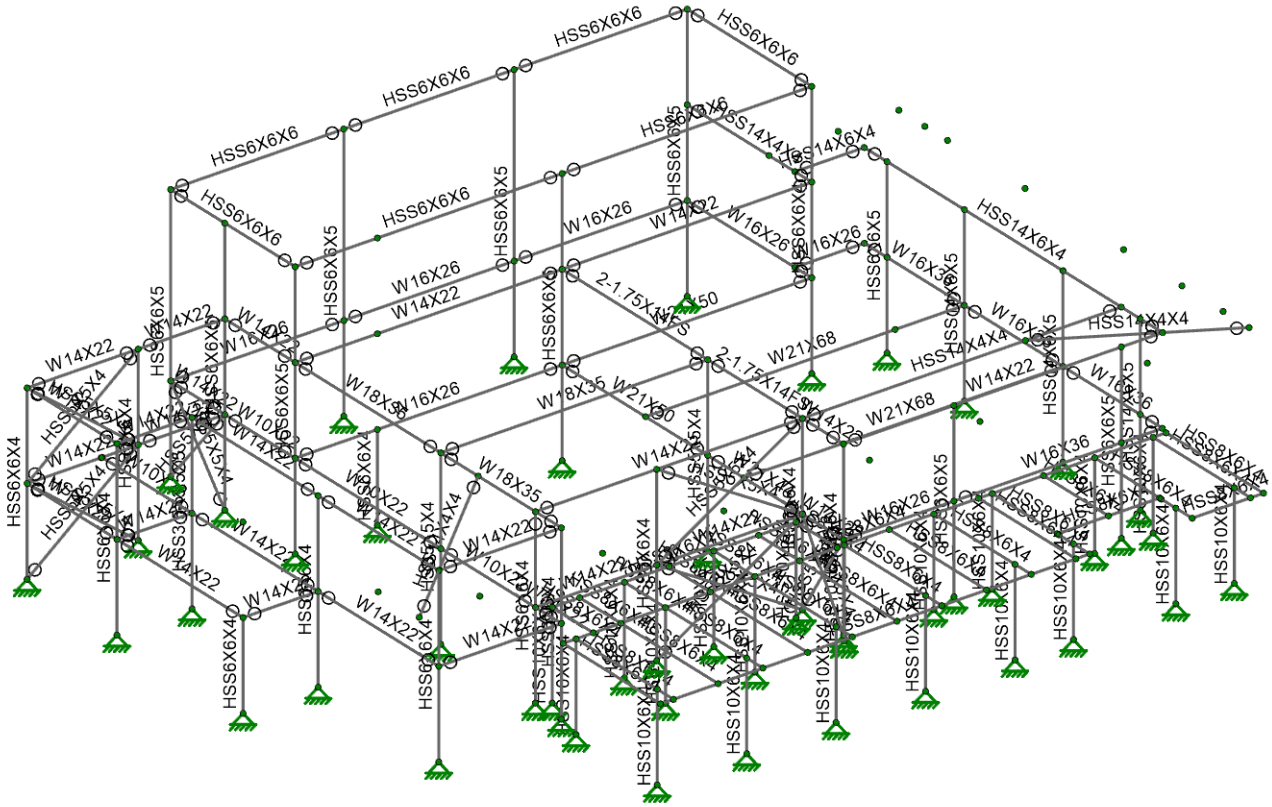
Sds = (2/3)*Sms	0.107	
Sd1 = (2/3)*Sm1	0.109	
Seismic Design Category	B	*(Tables 11.6-1 and 11.6-2,*

12.8 Equivalent Lateral Force Procedure

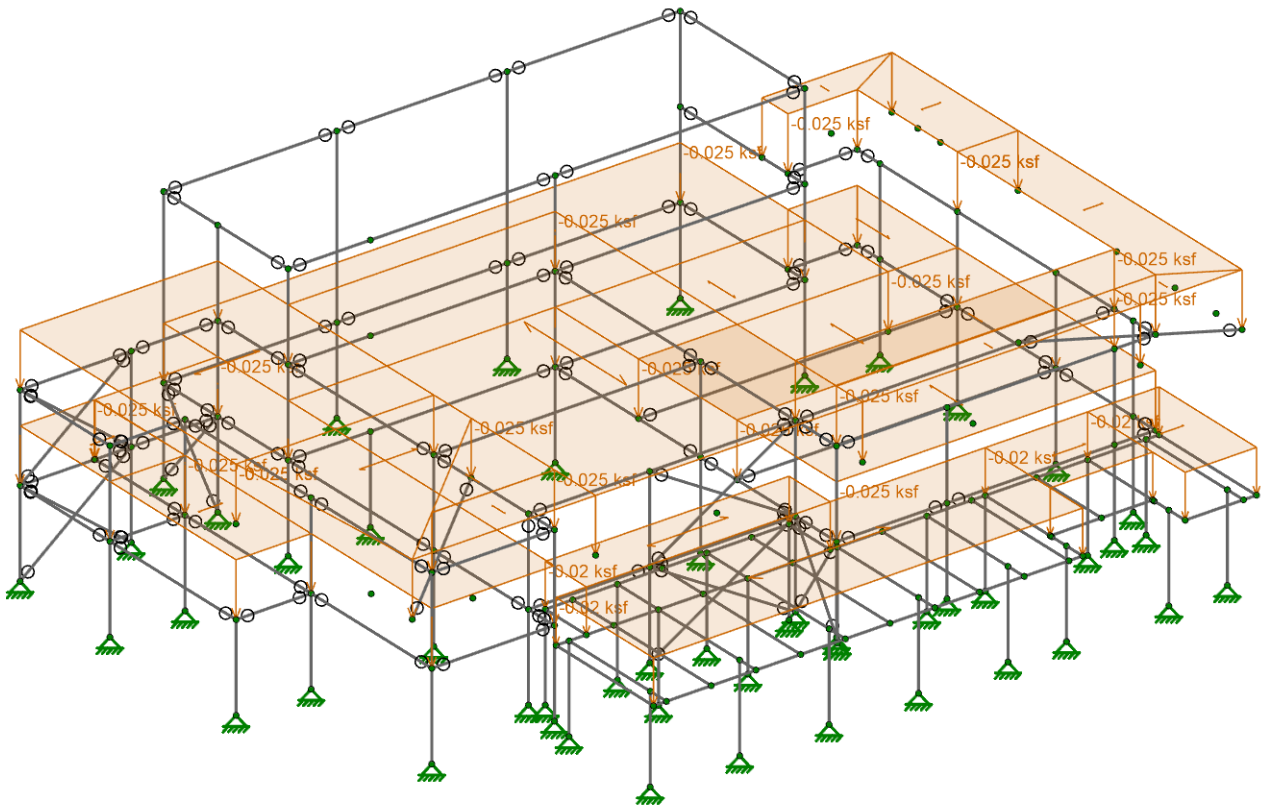
Seismic Force Resisting System	Steel system not for seismic	
Response Modification Factor, R	3.0	*(Table 12.2-1)*
Cs = Sds/(R/I)	0.036	
Seismic Base Shear, V = CsW	**0.036 W**	*(12.8-1)*
W = Effective seismic weight per Section 12.7.2		



Bob D Campbell & Co.	RDG - Lee's Summit	SK-1
RMH		Apr 12, 2021
UPAC2101		UPAC2101.r3d

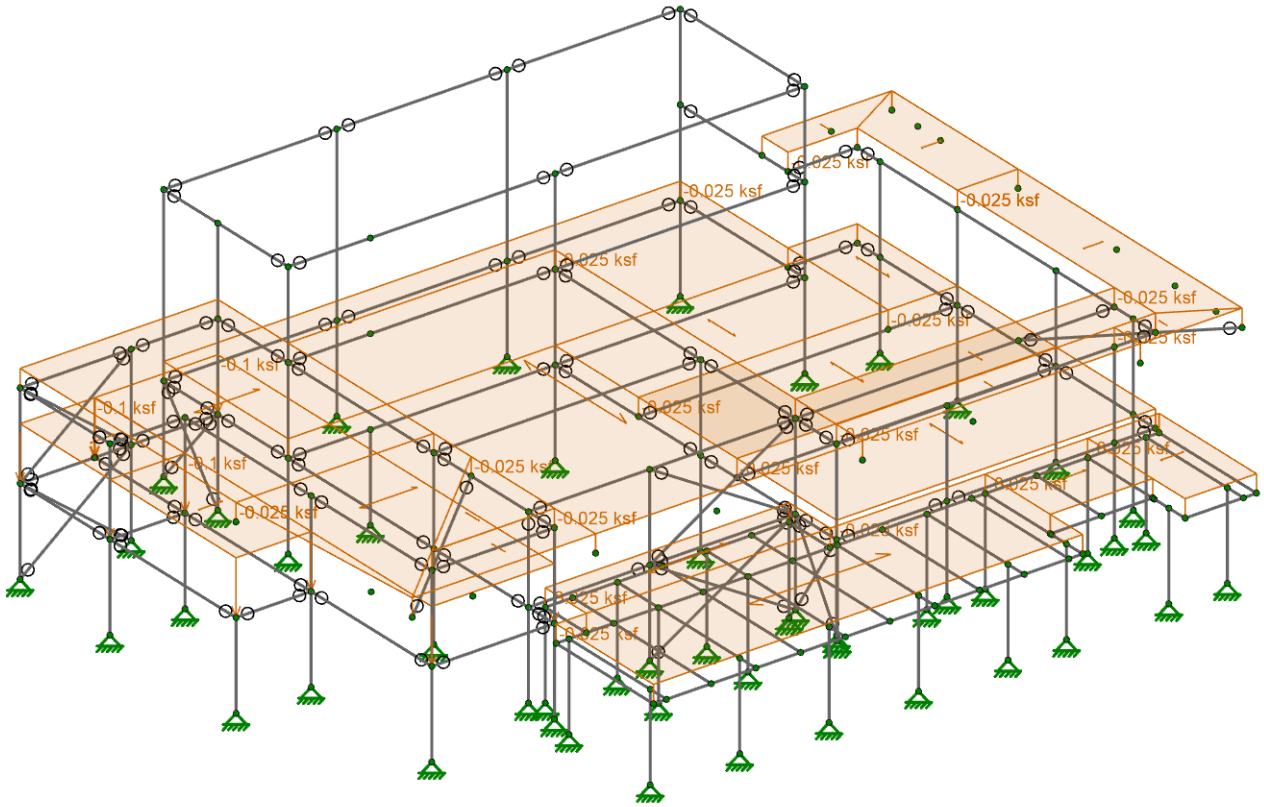


Bob D Campbell & Co.	RDG - Lee's Summit	SK-2
RMH		Apr 12, 2021
UPAC2101		UPAC2101.r3d



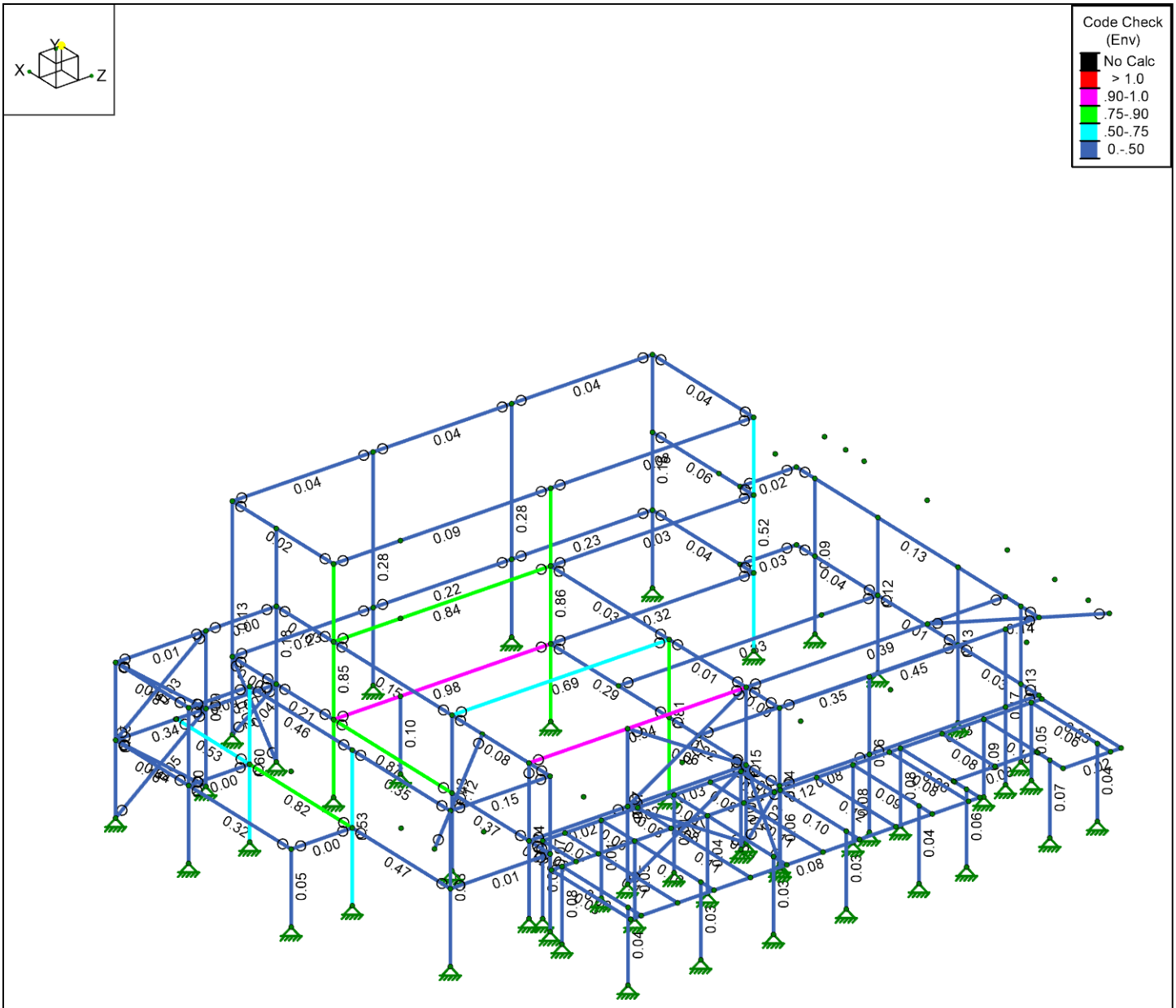
Loads: BLC 1, Dead Load

Bob D Campbell & Co.	RDG - Lee's Summit	SK-3
RMH		Apr 12, 2021
UPAC2101		UPAC2101.r3d



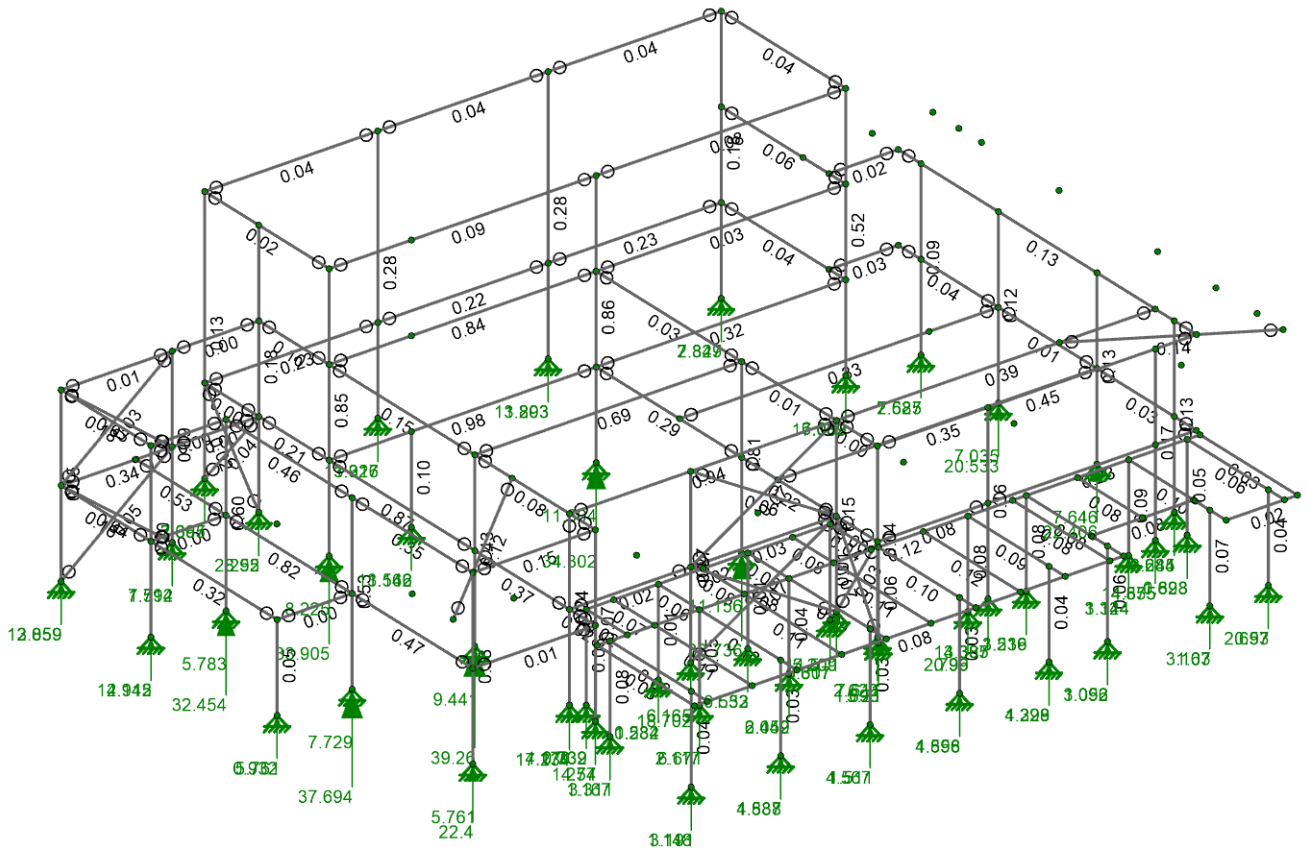
Loads: BLC 2, Live Load

Bob D Campbell & Co.	RDG - Lee's Summit	SK-4
RMH		Apr 12, 2021
UPAC2101		UPAC2101.r3d



Member Code Checks Displayed (Enveloped)

Bob D Campbell & Co.	RDG - Lee's Summit	SK-5
RMH		Apr 12, 2021
UPAC2101		UPAC2101.r3d



Member Code Checks Displayed (Enveloped)
Y-direction Reaction Units are kips and kip-ft (Enveloped)

Bob D Campbell & Co.	RDG - Lee's Summit	SK-6
RMH		Apr 12, 2021
UPAC2101		UPAC2101.r3d

Basic Load Cases

	BLC Description	Category	Y Gravity	Nodal	Distributed	Area(Member)
1	Dead Load	DL	-1			23
2	Live Load	LL				23
3	Wind Load X	WLX		2		
4	Wind Load Z	WLZ		4		
5	Seismic Load X	ELX		2		
6	Seismic Load Z	ELZ		4		
7	BLC 1 Transient Area Loads	None			420	
8	BLC 2 Transient Area Loads	None			420	

Load Combinations

	Description	Solve	PDelta	BLC	Factor	BLC	Factor	BLC
1	DL	Yes	Y	DL	1			
2	DL + LL	Yes	Y	DL	1	LL	1	
3	DL + 0.6WLX	Yes	Y	DL	1			WLX
4	DL + 0.7ELX	Yes	Y	DL	1			ELX
5	DL + 0.6WLZ	Yes	Y	DL	1			WLZ
6	DL + 0.7ELZ	Yes	Y	DL	1			ELZ
7	DL - 0.6WLX	Yes	Y	DL	1			WLX
8	DL - 0.7ELX	Yes	Y	DL	1			ELX
9	DL - 0.6WLZ	Yes	Y	DL	1			WLZ
10	DL - 0.7ELZ	Yes	Y	DL	1			ELZ
11	DL + 0.75LL + 0.75(0.6WLX)	Yes	Y	DL	1	LL	0.75	WLX
12	DL + 0.75LL + 0.75(0.7ELX)	Yes	Y	DL	1	LL	0.75	ELX
13	DL + 0.75LL + 0.75(0.6WLZ)	Yes	Y	DL	1	LL	0.75	WLZ
14	DL + 0.75LL + 0.75(0.7ELZ)	Yes	Y	DL	1	LL	0.75	ELZ
15	DL + 0.75LL - 0.75(0.6WLX)	Yes	Y	DL	1	LL	0.75	WLX
16	DL + 0.75LL - 0.75(0.7ELX)	Yes	Y	DL	1	LL	0.75	ELX
17	DL + 0.75LL - 0.75(0.6WLZ)	Yes	Y	DL	1	LL	0.75	WLZ
18	DL + 0.75LL - 0.75(0.7ELZ)	Yes	Y	DL	1	LL	0.75	ELZ
19	0.6DL + 0.6WLX	Yes	Y	DL	0.6			WLX
20	0.6DL + 0.7ELX	Yes	Y	DL	0.6			ELX
21	0.6DL + 0.6WLZ	Yes	Y	DL	0.6			WLZ
22	0.6DL + 0.7ELZ	Yes	Y	DL	0.6			ELZ
23	0.6DL - 0.6WLX	Yes	Y	DL	0.6			WLX
24	0.6DL - 0.7ELX	Yes	Y	DL	0.6			ELX
25	0.6DL - 0.6WLZ	Yes	Y	DL	0.6			WLZ
26	0.6DL - 0.7ELZ	Yes	Y	DL	0.6			ELZ

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e^{5}°F^{-1}]	Density [k/ft^{3}]	Yield [ksi]	Ry	Fu [ksi]	Rt
1	A992	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
2	A36 Gr.36	29000	11154	0.3	0.65	0.49	36	1.5	58	1.2
3	A572 Gr.50	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
4	A500 Gr.B RND	29000	11154	0.3	0.65	0.527	42	1.4	58	1.3
5	A500 Gr.B Rect	29000	11154	0.3	0.65	0.527	46	1.4	58	1.3
6	A53 Gr.B	29000	11154	0.3	0.65	0.49	35	1.6	60	1.2
7	A1085	29000	11154	0.3	0.65	0.49	50	1.25	65	1.15
8	A913 Gr.65	29000	11154	0.3	0.65	0.49	65	1.1	80	1.1

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rule	Area [in^{2}]	Iyy [in^{4}]	Izz [in^{4}]	J [in^{4}]
1	HR1	W10X33	Beam	Wide Flange	A992	Typical	9.71	36.6	171	0.583

Member Primary Data

	Label	I Node	J Node	Section/Shape	Type	Design List	Material	Design Rule
1	M1	N24	N64	HSS14X6X5	Column	Tube	A500 Gr.B Rect	Typical
2	M2	N23	N79	HSS6X6X5	Column	Tube	A500 Gr.B Rect	Typical
3	M3	N25	N63	HSS14X6X5	Column	Tube	A500 Gr.B Rect	Typical
4	M4	N26	N76	HSS14X6X5	Column	Tube	A500 Gr.B Rect	Typical
5	M5	N27	N78	HSS6X6X5	Column	Tube	A500 Gr.B Rect	Typical
6	M6	N8	N98	HSS6X6X4	Column	Tube	A500 Gr.B Rect	Typical
7	M7	N7	N100	HSS6X6X5	Column	Tube	A500 Gr.B Rect	Typical
8	M8	N6	N86	HSS6X6X5	Column	Tube	A500 Gr.B Rect	Typical
9	M9	N5	N96	HSS6X6X5	Column	Tube	A500 Gr.B Rect	Typical
10	M10	N3	N97	HSS6X6X5	Column	Tube	A500 Gr.B Rect	Typical
11	M11	N4	N94	HSS6X6X5	Column	Tube	A500 Gr.B Rect	Typical
12	M12	N2	N62	HSS6X6X4	Column	Tube	A500 Gr.B Rect	Typical
13	M13	N1	N57	HSS6X6X4	Column	Tube	A500 Gr.B Rect	Typical
14	M14	N12	N75	HSS3.5X3.5X5	Column	Tube	A500 Gr.B Rect	Typical
15	M15	N13	N67	HSS6X6X4	Column	Tube	A500 Gr.B Rect	Typical
16	M16	N10	N101	HSS6X6X5	Column	Tube	A500 Gr.B Rect	Typical
17	M17	N11	N33	HSS6X6X4	Column	Tube	A500 Gr.B Rect	Typical
18	M18	N9	N99	HSS6X6X5	Column	Tube	A500 Gr.B Rect	Typical
19	M19	N28	N84	HSS5X5X4	Column	Tube	A500 Gr.B Rect	Typical
20	M20	N22	N83	HSS6X6X5	Column	Tube	A500 Gr.B Rect	Typical
21	M21	N21	N61	HSS6X6X4	Column	Tube	A500 Gr.B Rect	Typical
22	M22	N20	N74	HSS6X6X4	Column	Tube	A500 Gr.B Rect	Typical
23	M23	N19	N60	HSS6X6X4	Column	Tube	A500 Gr.B Rect	Typical
24	M24	N18	N59	HSS6X6X4	Column	Tube	A500 Gr.B Rect	Typical
25	M25	N17	N82	HSS6X6X4	Column	Tube	A500 Gr.B Rect	Typical
26	M26	N16	N81	HSS6X6X4	Column	Tube	A500 Gr.B Rect	Typical
27	M27	N15	N80	HSS6X6X4	Column	Tube	A500 Gr.B Rect	Typical
28	M28	N14	N43	HSS6X6X4	Column	Tube	A500 Gr.B Rect	Typical
29	M29	N32	N30	W14X22	Beam	Wide Flange	A992	Typical
30	M30	N30	N42	W14X22	Beam	Wide Flange	A992	Typical
31	M31	N42	N44	W14X22	Beam	Wide Flange	A992	Typical
32	M32	N44	N45	W14X22	Beam	Wide Flange	A992	Typical
33	M33	N45	N46	W14X22	Beam	Wide Flange	A992	Typical
34	M34	N46	N47	W14X22	Beam	Wide Flange	A992	Typical
35	M35	N113	N115	HSS5X5X4	Column	Tube	A500 Gr.B Rect	Typical
36	M36	N47	N114	W10X22	Beam	Wide Flange	A992	Typical
37	M37	N114	N41	W10X22	Beam	Wide Flange	A992	Typical
38	M38	N41	N37	W10X22	Beam	Wide Flange	A992	Typical
39	M39	N37	N36	W14X22	Beam	Wide Flange	A992	Typical
40	M40	N36	N32	W14X22	Beam	Wide Flange	A992	Typical
41	M41	N42	N117	W10X22	Beam	Wide Flange	A992	Typical
42	M42	N47	N48	W14X22	Beam	Wide Flange	A992	Typical
43	M43	N48	N49	W14X22	Beam	Wide Flange	A992	Typical
44	M44	N49	N50	W14X22	Beam	Wide Flange	A992	Typical
45	M45	N50	N51	W16X26	Beam	Wide Flange	A992	Typical
46	M46	N51	N118	W16X36	Beam	Wide Flange	A992	Typical
47	M47	N118	N38	W16X36	Beam	Wide Flange	A992	Typical
48	M48	N38	N54	W16X36	Beam	Wide Flange	A992	Typical
49	M49	N54	N120	W16X36	Beam	Wide Flange	A992	Typical
50	M50	N29	N39	W16X26	Beam	Wide Flange	A992	Typical
51	M51	N120	N119	W16X26	Beam	Wide Flange	A992	Typical
52	M52	N39	N35	W16X26	Beam	Wide Flange	A992	Typical
53	M53	N35	N34	W16X26	Beam	Wide Flange	A992	Typical
54	M54	N34	N31	W16X26	Beam	Wide Flange	A992	Typical
55	M55	N31	N37	W14X22	Beam	Wide Flange	A992	Typical
56	M56	N41	N40	W16X26	Beam	Wide Flange	A992	Typical
57	M57	N40	N29	W21X50	Beam	Wide Flange	A992	Typical
58	M58	N40	N56	W21X50	Beam	Wide Flange	A992	Typical

Member Primary Data (Continued)

	Label	I Node	J Node	Section/Shape	Type	Design List	Material	Design Rule
59	M59	N56	N49	W21X44	Beam	Wide Flange	A992	Typical
60	M60	N54	N122	W21X68	Beam	Wide Flange	A992	Typical
61	M61	N38	N121	W21X68	Beam	Wide Flange	A992	Typical
62	M62	N44	N43	W14X22	Beam	Wide Flange	A992	Typical
63	M63	N43	N30	W14X22	Beam	Wide Flange	A992	Typical
64	M64	N57	N62	W14X22	Beam	Wide Flange	A992	Typical
65	M65	N62	N69	W14X22	Beam	Wide Flange	A992	Typical
66	M66	N69	N73	W14X22	Beam	Wide Flange	A992	Typical
67	M67	N73	N115	W18X35	Beam	Wide Flange	A992	Typical
68	M70	N82	N81	W14X22	Beam	Wide Flange	A992	Typical
69	M71	N81	N80	W14X22	Beam	Wide Flange	A992	Typical
70	M72	N80	N75	W14X22	Beam	Wide Flange	A992	Typical
71	M73	N75	N67	W14X22	Beam	Wide Flange	A992	Typical
72	M74	N94	N96	HSS6X6X6	Beam	Tube	A500 Gr.B Rect	Typical
73	M75	N96	N86	HSS6X6X6	Beam	Tube	A500 Gr.B Rect	Typical
74	M76	N86	N100	HSS6X6X6	Beam	Tube	A500 Gr.B Rect	Typical
75	M77	N100	N98	HSS6X6X6	Beam	Tube	A500 Gr.B Rect	Typical
76	M78	N98	N99	HSS6X6X6	Beam	Tube	A500 Gr.B Rect	Typical
77	M79	N99	N101	HSS6X6X6	Beam	Tube	A500 Gr.B Rect	Typical
78	M80	N101	N94	HSS6X6X6	Beam	Tube	A500 Gr.B Rect	Typical
79	M81	N67	N57	W14X22	Beam	Wide Flange	A992	Typical
80	M82	N73	N71	W14X22	Beam	Wide Flange	A992	Typical
81	M83	N71	N70	W14X22	Beam	Wide Flange	A992	Typical
82	M84	N70	N72	HSS14X4X4	Beam	Tube	A500 Gr.B Rect	Typical
83	M85	N123	N124	HSS14X6X4	Beam	Tube	A500 Gr.B Rect	Typical
84	M86	N125	N123	HSS14X6X4	Beam	Tube	A500 Gr.B Rect	Typical
85	M87	N125	N61	W14X22	Beam	Wide Flange	A992	Typical
86	M88	N61	N74	W14X22	Beam	Wide Flange	A992	Typical
87	M89	N74	N59	W14X22	Beam	Wide Flange	A992	Typical
88	M90	N84	N115	W18X35	Beam	Wide Flange	A992	Typical
89	M91	N74	N84	2-1.75X14FS	Beam	None	LVL_Microlam_1.9E_2600F	Typical
90	M92	N84	N71	2-1.75X14FS	Beam	None	LVL_Microlam_1.9E_2600F	Typical
91	M93	N82	N115	W18X35	Beam	Wide Flange	A992	Typical
92	M94	N74	N126	HSS14X4X4	Beam	Tube	A500 Gr.B Rect	Typical
93	M95	N137	N142	HSS14X4X4	Beam	Tube	A500 Gr.B Rect	Typical
94	M96	N133	N144	HSS14X4X4	Beam	Tube	A500 Gr.B Rect	Typical
95	M97	N2	N32	HSS5X5X4	VBrace	Tube	A500 Gr.B Rect	Typical
96	M98	N1	N36	HSS5X5X4	VBrace	Tube	A500 Gr.B Rect	Typical
97	M99	N36	N57	HSS5X5X4	VBrace	Tube	A500 Gr.B Rect	Typical
98	M100	N32	N62	HSS5X5X4	VBrace	Tube	A500 Gr.B Rect	Typical
99	M101	N4	N37	HSS5X5X4	VBrace	Tube	A500 Gr.B Rect	Typical
100	M102	N3	N31	HSS5X5X4	VBrace	Tube	A500 Gr.B Rect	Typical
101	M103	N19	N49	HSS5X5X4	VBrace	Tube	A500 Gr.B Rect	Typical
102	M104	N49	N60	HSS5X5X4	VBrace	Tube	A500 Gr.B Rect	Typical
103	M105	N74	N48	HSS5X5X4	VBrace	Tube	A500 Gr.B Rect	Typical
104	M106	N48	N20	HSS5X5X4	VBrace	Tube	A500 Gr.B Rect	Typical
105	M107	N21	N49	HSS5X5X4	VBrace	Tube	A500 Gr.B Rect	Typical
106	M108	N20	N50	HSS5X5X4	VBrace	Tube	A500 Gr.B Rect	Typical
107	M109	N176	N184	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
108	M110	N174	N178	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
109	M111	N172	N183	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
110	M112	N170	N182	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
111	M113	N168	N181	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
112	M114	N167	N177	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
113	M115	N163	N180	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
114	M116	N164	N179	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
115	M117	N146	N165	HSS10X6X4	Column	Tube	A500 Gr.B Rect	Typical
116	M118	N145	N164	HSS10X6X4	Column	Tube	A500 Gr.B Rect	Typical

Member Primary Data (Continued)

	Label	I Node	J Node	Section/Shape	Type	Design List	Material	Design Rule
117	M119	N148	N166	HSS10X6X4	Column	Tube	A500 Gr.B Rect	Typical
118	M120	N147	N163	HSS10X6X4	Column	Tube	A500 Gr.B Rect	Typical
119	M121	N150	N159	HSS10X6X4	Column	Tube	A500 Gr.B Rect	Typical
120	M122	N149	N167	HSS10X6X4	Column	Tube	A500 Gr.B Rect	Typical
121	M123	N152	N169	HSS10X6X4	Column	Tube	A500 Gr.B Rect	Typical
122	M124	N151	N168	HSS10X6X4	Column	Tube	A500 Gr.B Rect	Typical
123	M125	N154	N171	HSS10X6X4	Column	Tube	A500 Gr.B Rect	Typical
124	M126	N153	N170	HSS10X6X4	Column	Tube	A500 Gr.B Rect	Typical
125	M127	N156	N173	HSS10X6X4	Column	Tube	A500 Gr.B Rect	Typical
126	M128	N155	N172	HSS10X6X4	Column	Tube	A500 Gr.B Rect	Typical
127	M129	N158	N160	HSS10X6X4	Column	Tube	A500 Gr.B Rect	Typical
128	M130	N157	N174	HSS10X6X4	Column	Tube	A500 Gr.B Rect	Typical
129	M131	N161	N175	HSS10X6X4	Column	Tube	A500 Gr.B Rect	Typical
130	M132	N162	N176	HSS10X6X4	Column	Tube	A500 Gr.B Rect	Typical
131	M133	N185	N186	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
132	M134	N189	N190	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
133	M135	N178	N186	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
134	M136	N191	N192	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
135	M137	N192	N183	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
136	M138	N191	N185	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
137	M139	N193	N194	HSS10X6X4	Column	Tube	A500 Gr.B Rect	Typical
138	M140	N195	N196	HSS10X6X4	Column	Tube	A500 Gr.B Rect	Typical
139	M141	N197	N198	HSS10X6X4	Column	Tube	A500 Gr.B Rect	Typical
140	M142	N199	N200	HSS10X6X4	Column	Tube	A500 Gr.B Rect	Typical
141	M143	N201	N202	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
142	M144	N203	N204	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
143	M145	N205	N206	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
144	M146	N207	N208	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
145	M147	N209	N210	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
146	M148	N211	N212	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
147	M149	N198	N200	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
148	M150	N213	N198	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
149	M151	N214	N200	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
150	M152	N167	N196	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
151	M153	N163	N194	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
152	M154	N201	N215	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
153	M155	N203	N216	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical
154	M156	N207	N217	HSS8X6X4	Beam	Tube	A500 Gr.B Rect	Typical

Envelope AISC 15TH (360-16): ASD Member Steel Code Checks

	Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/om [k-ft]	Mnzz/om [k-ft]	Cb	Eqn
1	M1	HSS14X6X5	0.127	20	2	0.0111	20	z	2	168.663	305.7485	48.9046	111.5569	1.2587	H1-1b
2	M2	HSS6X6X5	0.1701	0	2	0.0048	20	z	2	85.6647	177.1138	31.2176	31.2176	3	H1-1b*
3	M3	HSS14X6X5	0.1328	0	2	0.0016	20	z	2	168.663	305.7485	48.9046	111.5569	2.6314	H1-1b*
4	M4	HSS14X6X5	0.1217	0	2	0.002	20	y	2	168.663	305.7485	48.9046	111.5569	2.5024	H1-1b*
5	M5	HSS6X6X5	0.0878	0	2	0.0016	20	y	2	85.6647	177.1138	31.2176	31.2176	1.5381	H1-1b*
6	M6	HSS6X6X4	0.5152	0	2	0.0001	20	z	2	33.1697	144.3353	25.7086	25.7086	1.8435	H1-1a
7	M7	HSS6X6X5	0.1847	0	2	0	20	z	2	39.7805	177.1138	31.2176	31.2176	1.7982	H1-1b*
8	M8	HSS6X6X5	0.2816	0	2	0	10	z	2	39.7805	177.1138	31.2176	31.2176	1.1381	H1-1a
9	M9	HSS6X6X5	0.2845	0	2	0	10	z	2	39.7805	177.1138	31.2176	31.2176	1.1024	H1-1a
10	M10	HSS6X6X5	0.1794	0	2	0.0003	30	y	2	39.7805	177.1138	31.2176	31.2176	2.4991	H1-1b*
11	M11	HSS6X6X5	0.1257	0	2	0	10	y	2	39.7805	177.1138	31.2176	31.2176	1.4854	H1-1b*
12	M12	HSS6X6X4	0.0878	0	2	0.0002	10	y	2	70.9689	144.3353	25.7086	25.7086	1.3489	H1-1b*
13	M13	HSS6X6X4	0.1531	0	2	0.0003	10	y	2	70.9689	144.3353	25.7086	25.7086	1.3476	H1-1b*
14	M14	HSS3.5X3.5X5	0.6001	0	2	0	10	y	2	54.0782	96.9581	9.503	9.503	1.3156	H1-1a
15	M15	HSS6X6X4	0.1988	0	2	0.0002	20	y	2	70.9689	144.3353	25.7086	25.7086	1.3158	H1-1b*
16	M16	HSS6X6X5	0.8523	0	2	0.0004	20	y	2	39.7805	177.1138	31.2176	31.2176	1.8183	H1-1a
17	M17	HSS6X6X4	0.0961	10	2	0.0032	10	z	2	120.8639	144.3353	25.7086	25.7086	1.6667	H1-1b

Envelope AISC 15TH (360-16): ASD Member Steel Code Checks (Continued)

	Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/om [k-ft]	Mnzz/om [k-ft]	Cb	Eqn
18	M18	HSS6X6X5	0.8623	0	2	0.0002	20	y	2	39.7805	177.1138	31.2176	31.2176	1.7739	H1-1a
19	M19	HSS5X5X4	0.808	0	2	0.0001	20	z	2	41.7521	118.4431	17.4681	17.4681	1.3155	H1-1a
20	M20	HSS6X6X5	0.1553	0	2	0.0023	20	z	2	85.6647	177.1138	31.2176	31.2176	1.3158	H1-1b*
21	M21	HSS6X6X4	0.0414	0	2	0.0002	10	z	2	70.9689	144.3353	25.7086	25.7086	1.3159	H1-1b*
22	M22	HSS6X6X4	0.1484	0	2	0.0019	10	y	2	70.9689	144.3353	25.7086	25.7086	2.5772	H1-1b*
23	M23	HSS6X6X4	0.2741	20	2	0.0039	10	z	2	70.9689	144.3353	25.7086	25.7086	1.49	H1-1a
24	M24	HSS6X6X4	0.2434	10	2	0.0002	10	y	2	70.9689	144.3353	25.7086	25.7086	1.3159	H1-1a
25	M25	HSS6X6X4	0.0668	0	2	0.0002	20	z	2	70.9689	144.3353	25.7086	25.7086	1.3145	H1-1b*
26	M26	HSS6X6X4	0.3255	10	2	0.0026	20	z	2	70.9689	144.3353	25.7086	25.7086	2.6842	H1-1a
27	M27	HSS6X6X4	0.5317	10	2	0.0002	20	y	2	70.9689	144.3353	25.7086	25.7086	1.316	H1-1a
28	M28	HSS6X6X4	0.0477	0	2	0	10	y	2	120.8639	144.3353	25.7086	25.7086	1.6667	H1-1b*
29	M29	W14X22	0.1618	6.9167	2	0.0615	13.8333	y	2	89.5635	194.3114	10.9531	82.8343	1	H1-1b
30	M30	W14X22	0.0025	4.3333	2	0.0015	8.6667	y	2	122.2667	194.3114	10.9531	82.8343	1	H1-1b
31	M31	W14X22	0.8231	9.7083	2	0.2269	0	y	2	65.6966	194.3114	10.9531	82.8343	1	H1-1b
32	M32	W14X22	0.4729	9.2917	2	0.1337	18.5833	y	2	68.3698	194.3114	10.9531	82.8343	1	H1-1b
33	M33	W14X22	0.0067	7.0833	10	0.0026	14.1667	y	2	87.8384	194.3114	10.9531	82.8343	1	H1-1b
34	M34	W14X22	0.0192	2	2	0.0293	4	y	2	157.9339	194.3114	10.9531	82.8343	1	H1-1b
35	M35	HSS5X5X4	0.4308	10	2	0.0001	20	y	2	91.2959	118.4431	17.4681	17.4681	1.316	H1-1a
36	M36	W10X22	0.3704	7.2917	2	0.1343	0	y	2	115.8461	194.3114	15.2196	64.8703	1	H1-1b
37	M37	W10X22	0.8709	11.2083	2	0.2091	22.4167	y	2	94.4439	194.3114	15.2196	64.8703	1	H1-1b
38	M38	W10X22	0.2063	5.3038	2	0.1047	0	y	2	134.2462	194.3114	15.2196	64.8703	1	H1-1b
39	M39	W14X22	0.0033	5	18	0.0018	10	y	2	112.5162	194.3114	10.9531	82.8343	1	H1-1b
40	M40	W14X22	0.3405	4.1441	2	0.1087	0	y	2	94.7893	194.3114	10.9531	82.8343	1	H1-1b
41	M41	W10X22	0.532	6.9167	2	0.2047	13.8333	y	2	118.9938	194.3114	15.2196	64.8703	1	H1-1b
42	M42	W14X22	0.0153	7	18	0.0025	14	y	2	37.2787	194.3114	10.9531	35.4679	1.1364	H1-1b
43	M43	W14X22	0.0293	8.4167	18	0.0031	16.8333	y	2	25.7855	194.3114	10.9531	26.7421	1.1364	H1-1b
44	M44	W14X22	0.0014	3.1667	10	0.0011	6.3333	y	2	123.7307	194.3114	10.9531	79.7568	1.1364	H1-1b
45	M45	W16X26	0.076	6.375	2	0.0378	0	y	2	113.8551	229.9401	13.6727	110.2794	1	H1-1b
46	M46	W16X36	0.2266	8.0278	2	0.0506	19.3168	y	2	44.0911	317.3653	26.9461	60.3636	1.2545	H1-1b
47	M47	W16X36	0.0259	3.3542	2	0.0138	0	y	2	184.1265	317.3653	26.9461	159.6806	1	H1-1b
48	M48	W16X36	0.0065	7.5833	18	0.003	15.1667	y	2	185.3742	317.3653	26.9461	159.6806	1	H1-1b
49	M49	W16X36	0.0363	12.0443	2	0.0189	12.0443	y	2	107.5978	317.3653	26.9461	158.9731	1.6461	H1-1b
50	M50	W16X26	0.0384	2.5955	2	0.0237	0	y	2	77.5372	229.9401	13.6727	110.2794	1	H1-1b
51	M51	W16X26	0.0277	4.0833	2	0.0234	0	y	2	151.8527	229.9401	13.6727	110.2794	1	H1-1b
52	M52	W16X26	0.2291	10	2	0.0719	0	y	2	73.9534	229.9401	13.6727	110.2794	1	H1-1b
53	M53	W16X26	0.224	10.0382	2	0.0702	19.6667	y	2	75.3484	229.9401	13.6727	110.2794	1	H1-1b
54	M54	W16X26	0.2326	10	2	0.0724	0	y	2	73.9534	229.9401	13.6727	110.2794	1	H1-1b
55	M55	W14X22	0.0023	4.1667	2	0.0015	8.3333	y	2	124.8159	194.3114	10.9531	82.8343	1	H1-1b
56	M56	W16X26	0.9848	9.6354	2	0.0893	9.6354	y	2	47.1755	229.9401	13.6727	22.119	1.5451	H1-1b
57	M57	W21X50	0.3216	14.4167	2	0.0782	0	y	2	143.6735	440.1198	30.4391	274.4511	1	H1-1b
58	M58	W21X50	0.2947	12.8429	2	0.055	22.4167	y	2	174.9119	440.1198	30.4391	274.4511	1	H1-1b
59	M59	W21X44	0.224	5.6207	2	0.067	0	y	2	199.5219	389.2216	25.4261	238.024	1	H1-1b
60	M60	W21X68	0.3286	18.415	2	0.0808	0	y	2	251.3132	598.8024	60.8782	399.2016	1	H1-1b
61	M61	W21X68	0.3521	18.415	2	0.0843	0	y	2	251.3132	598.8024	60.8782	399.2016	1	H1-1b
62	M62	W14X22	0.0025	4.3333	18	0.0016	8.6667	y	2	122.2667	194.3114	10.9531	82.8343	1	H1-1b
63	M63	W14X22	0.3207	9.7083	2	0.0869	19.4167	y	2	65.6966	194.3114	10.9531	82.8343	1	H1-1b
64	M64	W14X22	0.0055	6.4167	18	0.0023	12.8333	y	2	94.7893	194.3114	10.9531	82.8343	1	H1-1b
65	M65	W14X22	0.0033	5	18	0.0018	10	y	2	112.5162	194.3114	10.9531	82.8343	1	H1-1b
66	M66	W14X22	0.1041	5.4167	2	0.0507	10.8333	y	2	106.8547	194.3114	10.9531	82.8343	1	H1-1b
67	M67	W18X35	0.1481	10.9748	2	0.0465	0	y	2	104.4385	308.3832	20.1098	165.9182	1	H1-1b
68	M70	W14X22	0.1494	6.7882	2	0.0617	0	y	2	87.8384	194.3114	10.9531	82.8343	1	H1-1b
69	M71	W14X22	0.3537	9.8724	2	0.1091	18.5833	y	2	68.3698	194.3114	10.9531	82.8343	1	H1-1b
70	M72	W14X22	0.4626	9.7083	2	0.1263	19.4167	y	2	65.6966	194.3114	10.9531	82.8343	1	H1-1b
71	M73	W14X22	0.0025	4.3333	18	0.0015	8.6667	y	2	122.2667	194.3114	10.9531	82.8343	1	H1-1b
72	M74	HSS6X6X6	0.0382	10	2	0.0049	20	y	2	99.2651	208.7904	36.2675	36.2675	1.1364	H1-1b
73	M75	HSS6X6X6	0.037	9.8333	2	0.0048	19.6667	y	2	101.7351	208.7904	36.2675	36.2675	1.1364	H1-1b
74	M76	HSS6X6X6	0.0382	10	2	0.0049	20	y	2	99.2651	208.7904	36.2675	36.2675	1.1364	H1-1b
75	M77	HSS6X6X6	0.0351	9.5833	2	0.0047	19.1667	y	2	105.474	208.7904	36.2675	36.2675	1.1364	H1-1b

Envelope AISC 15TH (360-16): ASD Member Steel Code Checks (Continued)

	Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/om [k-ft]	Mnzz/om [k-ft]	Cb	Eqn
76	M78	HSS6X6X6	0.0795	14.4167	2	0.007	28.8333	y	10	49.5936	208.7904	36.2675	36.2675	1.1364	H1-1b
77	M79	HSS6X6X6	0.0909	15.4167	2	0.0078	30.8333	y	2	43.3685	208.7904	36.2675	36.2675	1.1364	H1-1b
78	M80	HSS6X6X6	0.0157	10.7812	2	0.0036	10.7812	y	2	105.474	208.7904	36.2675	36.2675	2.1625	H1-1b
79	M81	W14X22	0.1798	6.9167	2	0.0665	0	y	2	89.5635	194.3114	10.9531	82.8343	1	H1-1b
80	M82	W14X22	0.8356	15.4167	2	0.1425	30.8333	y	2	45.6545	194.3114	10.9531	82.8343	1	H1-1b
81	M83	W14X22	0.0277	14.4167	18	0.0051	28.8333	y	2	47.7294	194.3114	10.9531	82.8343	1	H1-1b
82	M84	HSS14X4X4	0.0631	4.9913	2	0.0161	0	y	2	152.3266	221.1856	21.6229	76.2076	1	H1-1b
83	M85	HSS14X6X4	0.0194	4	2	0.0094	8	y	2	192.946	246.8024	35.814	90.8982	1	H1-1b
84	M86	HSS14X6X4	0.1274	3.3481	2	0.1436	3.3481	y	2	104.8495	246.8024	35.814	90.8982	2.7727	H1-1b
85	M87	W14X22	0.4526	4.9878	2	0.068	4.6042	y	2	41.2129	194.3114	10.9531	21.5585	2.5554	H1-1b
86	M88	W14X22	0.0013	3.1667	2	0.0011	6.3333	y	2	140.5876	194.3114	10.9531	82.8343	1	H1-1b
87	M89	W14X22	0.9414	16.7014	2	0.1451	16.7014	y	2	45.6545	194.3114	10.9531	28.0253	1	H1-1b
88	M90	W18X35	0.6875	15.415	2	0.1394	30.83	y	2	78.4105	308.3832	20.1098	165.9182	1	H1-1b
89	M93	W18X35	0.0772	4.0651	2	0.0299	18.5833	y	2	125.2922	308.3832	20.1098	79.6479	1.5396	H1-1b
90	M94	HSS14X4X4	0.3867	17.6477	2	0.0773	36.83	y	2	111.1874	221.1856	21.6229	76.2076	1	H1-1b
91	M95	HSS14X4X4	0.125	9.5148	2	0.0272	28.5444	y	2	132.208	221.1856	21.6229	76.2076	1.7919	H1-1b
92	M96	HSS14X4X4	0.1415	8.2442	2	0.0969	8.2442	y	2	149.1653	221.1856	21.6229	76.2076	2.0865	H1-1b
93	M97	HSS5X5X4	0.0421	7.9652	2	0.0033	16.2694	y	2	59.4635	118.4431	17.4681	17.4681	1.1364	H1-1b
94	M98	HSS5X5X4	0.0524	0	2	0.0034	16.2694	y	2	59.4635	118.4431	17.4681	17.4681	1.1364	H1-1b*
95	M99	HSS5X5X4	0.0298	7.9652	2	0.0034	16.2694	y	2	59.4635	118.4431	17.4681	17.4681	1.1364	H1-1b
96	M100	HSS5X5X4	0.0282	7.9652	2	0.0034	16.2694	y	2	59.4635	118.4431	17.4681	17.4681	1.1364	H1-1b
97	M101	HSS5X5X4	0.0402	0	2	0.002	13.0171	y	2	76.1971	118.4431	17.4681	17.4681	1.1364	H1-1b*
98	M102	HSS5X5X4	0.0234	0	2	0.002	13.0171	y	2	76.1971	118.4431	17.4681	17.4681	1.1364	H1-1b*
99	M103	HSS5X5X4	0.066	9.5859	2	0.0043	19.5796	y	2	43.5643	118.4431	17.4681	17.4681	1.1364	H1-1b
100	M104	HSS5X5X4	0.0634	9.5859	2	0.0048	19.5796	y	2	43.5643	118.4431	17.4681	17.4681	1.1364	H1-1b
101	M105	HSS5X5X4	0.0715	9.9938	2	0.0064	19.5796	y	2	43.5643	118.4431	17.4681	17.4681	1.1364	H1-1b
102	M106	HSS5X5X4	0.0797	19.5796	2	0.0041	19.5796	y	2	43.5643	118.4431	17.4681	17.4681	1.1364	H1-1b*
103	M107	HSS5X5X4	0.0668	0	2	0.0017	11.8369	y	2	82.2436	118.4431	17.4681	17.4681	1.1364	H1-1b*
104	M108	HSS5X5X4	0.0297	0	2	0.0017	11.8369	y	2	82.2436	118.4431	17.4681	17.4681	1.1364	H1-1b*
105	M109	HSS8X6X4	0.0619	12.5	2	0.0325	12.5	y	2	134.0121	169.9521	30.0599	38.7924	1.4768	H1-1b
106	M110	HSS8X6X4	0.0991	12.5	2	0.0713	12.5	y	2	134.0121	169.9521	30.0599	38.7924	1.4934	H1-1b
107	M111	HSS8X6X4	0.0786	12.5	2	0.0654	12.5	y	2	134.0121	169.9521	30.0599	38.7924	1.5273	H1-1b
108	M112	HSS8X6X4	0.0932	12.5	2	0.0492	12.5	y	2	134.0121	169.9521	30.0599	38.7924	1.6049	H1-1b
109	M113	HSS8X6X4	0.099	12.5	2	0.0534	12.5	y	2	134.0121	169.9521	30.0599	38.7924	1.7644	H1-1b
110	M114	HSS8X6X4	0.0919	12.5	2	0.0471	12.5	y	2	134.0121	169.9521	30.0599	38.7924	1.813	H1-1b
111	M115	HSS8X6X4	0.0968	12.5	2	0.0539	12.5	y	2	134.0121	169.9521	30.0599	38.7924	1.8581	H1-1b
112	M116	HSS8X6X4	0.0636	12.5	2	0.0463	12.5	y	2	134.0121	169.9521	30.0599	38.7924	1.6686	H1-1b
113	M117	HSS10X6X4	0.0366	10	2	0.0014	10	z	2	164.2089	195.5689	31.8495	54.1717	1.6667	H1-1b
114	M118	HSS10X6X4	0.0792	10	2	0.0031	10	z	2	164.2089	195.5689	31.8495	54.1717	1.6667	H1-1b
115	M119	HSS10X6X4	0.0295	0	2	0.0002	10	z	2	164.2089	195.5689	31.8495	54.1717	1.6667	H1-1b*
116	M120	HSS10X6X4	0.0466	10	2	0.0017	10	y	2	164.2089	195.5689	31.8495	54.1717	1.6667	H1-1b
117	M121	HSS10X6X4	0.0278	0	2	0.0004	10	y	2	164.2089	195.5689	31.8495	54.1717	1.6667	H1-1b*
118	M122	HSS10X6X4	0.0433	10	2	0.0017	10	y	2	164.2089	195.5689	31.8495	54.1717	1.6667	H1-1b
119	M123	HSS10X6X4	0.0296	0	2	0.0004	10	y	2	164.2089	195.5689	31.8495	54.1717	1.6667	H1-1b*
120	M124	HSS10X6X4	0.0638	10	2	0.0029	10	y	2	164.2089	195.5689	31.8495	54.1717	1.6667	H1-1b
121	M125	HSS10X6X4	0.041	10	2	0.0014	10	y	2	164.2089	195.5689	31.8495	54.1717	1.6667	H1-1b
122	M126	HSS10X6X4	0.0751	10	2	0.0041	10	y	2	164.2089	195.5689	31.8495	54.1717	1.6667	H1-1b
123	M127	HSS10X6X4	0.0553	10	2	0.0027	10	y	2	164.2089	195.5689	31.8495	54.1717	1.6667	H1-1b
124	M128	HSS10X6X4	0.0799	10	2	0.0042	10	y	2	164.2089	195.5689	31.8495	54.1717	1.6667	H1-1b
125	M129	HSS10X6X4	0.0746	10	2	0.0041	10	y	2	164.2089	195.5689	31.8495	54.1717	1.6667	H1-1b
126	M130	HSS10X6X4	0.0881	10	2	0.0045	10	y	2	164.2089	195.5689	31.8495	54.1717	1.6667	H1-1b
127	M131	HSS10X6X4	0.0383	10	2	0.0018	10	y	2	164.2089	195.5689	31.8495	54.1717	1.6667	H1-1b
128	M132	HSS10X6X4	0.0542	10	2	0.003	10	y	2	164.2089	195.5689	31.8495	54.1717	1.6667	H1-1b
129	M133	HSS8X6X4	0.0319	7.0313	2	0.0089	15	y	2	134.0121	169.9521	30.0599	38.7924	1	H1-1b
130	M134	HSS8X6X4	0.0846	5.915	2	0.0199	0	y	2	146.6046	169.9521	30.0599	38.7924	1	H1-1b
131	M135	HSS8X6X4	0.0169	6.7891	2	0.0289	6.7891	y	2	158.1663	169.9521	30.0599	38.7924	1.6085	H1-1b
132	M136	HSS8X6X4	0.0286	7.0313	2	0.0095	15	y	2	134.0121	169.9521	30.0599	38.7924	1	H1-1b
133	M137	HSS8X6X4	0.078	6.7126	2	0.0722	32.5303	y	2	24.0435	169.9521	30.0599	38.7924	1	H1-1b

Envelope AISC 15TH (360-16): ASD Member Steel Code Checks (Continued)

	Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/om [k-ft]	Mnzz/om [k-ft]	Cb	Eqn
134	M138	HSS8X6X4	0.118	6.5297	2	0.075	31.9229	y	2	12.1785	169.9521	30.0599	38.7924	1	H1-1b
135	M139	HSS10X6X4	0.0107	10	2	0.0006	10	y	2	164.2089	195.5689	31.8495	54.1717	1.6667	H1-1b
136	M140	HSS10X6X4	0.0115	10	2	0.0005	10	y	2	164.2089	195.5689	31.8495	54.1717	1.6667	H1-1b
137	M141	HSS10X6X4	0.0256	10	2	0.0011	10	y	2	164.2089	195.5689	31.8495	54.1717	1.6667	H1-1b
138	M142	HSS10X6X4	0.0145	10	2	0.0006	10	z	2	164.2089	195.5689	31.8495	54.1717	1.6667	H1-1b
139	M143	HSS8X6X4	0.1062	0	2	0.0374	0	y	2	134.0121	169.9521	30.0599	38.7924	1.3144	H1-1b
140	M144	HSS8X6X4	0.1066	0	2	0.0362	0	y	2	134.0121	169.9521	30.0599	38.7924	1.3575	H1-1b
141	M145	HSS8X6X4	0.1205	7.3438	2	0.0357	15	y	2	134.0121	169.9521	30.0599	38.7924	1	H1-1b
142	M146	HSS8X6X4	0.1089	0	2	0.0363	0	y	2	134.0121	169.9521	30.0599	38.7924	1.3941	H1-1b
143	M147	HSS8X6X4	0.079	7.1875	2	0.0259	15	y	2	134.0121	169.9521	30.0599	38.7924	1	H1-1b
144	M148	HSS8X6X4	0.0843	4.6875	2	0.0283	10	y	2	152.9212	169.9521	30.0599	38.7924	1	H1-1b
145	M149	HSS8X6X4	0.0172	18.7733	2	0.0128	8.2133	y	2	73.5652	169.9521	30.0599	38.7924	2.053	H1-1b
146	M150	HSS8X6X4	0.0184	0	2	0.0219	0	y	2	162.9048	169.9521	30.0599	38.7924	2.0654	H1-1b
147	M151	HSS8X6X4	0.0404	0	2	0.0185	0	y	2	162.9048	169.9521	30.0599	38.7924	2.7835	H1-1b
148	M152	HSS8X6X4	0.0584	0	2	0.0209	0	y	2	162.9114	169.9521	30.0599	38.7924	3	H1-1b
149	M153	HSS8X6X4	0.0585	0	2	0.0227	0	y	2	162.9114	169.9521	30.0599	38.7924	2.9934	H1-1b
150	M154	HSS8X6X4	0.0719	0	2	0.0214	0	y	2	162.9048	169.9521	30.0599	38.7924	2.4663	H1-1b
151	M155	HSS8X6X4	0.0794	0	2	0.0215	0	y	2	162.9048	169.9521	30.0599	38.7924	2.6036	H1-1b
152	M156	HSS8X6X4	0.084	0	2	0.023	0	y	2	162.9048	169.9521	30.0599	38.7924	2.7319	H1-1b

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Structural Engineers Since 1957
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Kansas City, MO 64111 www.bdc-engrs.com

Project RED DOOR - LSMO

Date APRIL 2021 Page ___ of ___

TJI JOISTS

20'-0" SPAN : 14" TJI360

ALLOWABLE TL = 97 PLF

LL = 73 PLF

@ TYP. ROOF: (50 PSF)(16/12) = 67 PLF (< 97 PLF) ✓

(25 PSF)(16/12) = 34 PLF (< 73 PLF) ✓

@ SCREENED AREA W/ SNOW DRIFT: (70 PSF)(16/12) = 94 PLF (< 97 PLF) ✓

(46 PSF)(16/12) = 60 PLF (< 73 PLF) ✓

MEZZANINE FLR JOISTS

SPAN = 14'-2"
DL = 25 PSF
LL = 100 PSF
SPACING = 16"

} SEE ATTACHED JOIST CALCULATIONS

∴ USE DBL 2x10's @ 16" oc

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Project Title: Red Door Grill
Engineer: MJF
Project ID: UPAC2101
Project Descr:

Printed: 12 APR 2021, 4:06PM

Wood Beam

File: UPAC2101.ec6

Lic. # : KW-06011403 Bob D. Campbell and Co., Inc.

DESCRIPTION: Mezzanine Joists

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : ASCE 7-16

Wood Species : Douglas Fir-Larch
Wood Grade : No.2

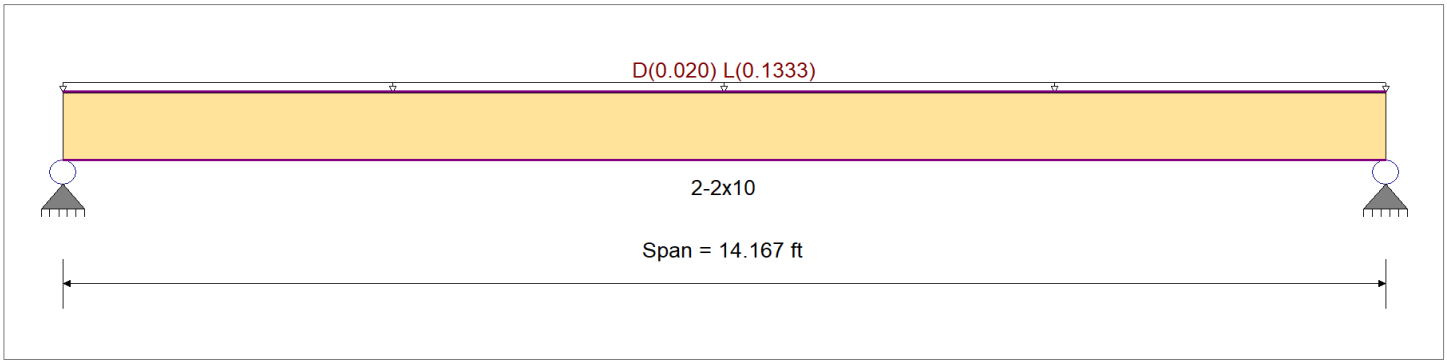
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	900.0 psi
Fb -	900.0 psi
Fc - Prll	1,350.0 psi
Fc - Perp	625.0 psi
Fv	180.0 psi
Ft	575.0 psi

E : Modulus of Elasticity

Ebend- xx	1,600.0 ksi
Eminbend - xx	580.0 ksi
Density	31.210 pcf

Repetitive Member Stress Increase



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Loads on all spans...
Uniform Load on ALL spans : D = 0.0150, L = 0.10 ksf, Tributary Width = 1.333 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.985 : 1	Maximum Shear Stress Ratio	=	0.304 : 1
Section used for this span		2-2x10	Section used for this span		2-2x10
fb: Actual	=	1,121.08 psi	fv: Actual	=	54.76 psi
Fb: Allowable	=	1,138.50 psi	Fv: Allowable	=	180.00 psi
Load Combination		+D+L+H	Load Combination		+D+L+H
Location of maximum on span	=	7.084 ft	Location of maximum on span	=	13.443 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.384 in	Ratio =	442 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.459 in	Ratio =	370 >=240
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+D+H													0.00	0.00	0.00	0.00
Length = 14.167 ft	1	0.179	0.055	0.90	1.100	1.00	1.15	1.00	1.00	1.00	0.65	183.03	1024.65	0.17	8.94	162.00
+D+L+H					1.100	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 14.167 ft	1	0.985	0.304	1.00	1.100	1.00	1.15	1.00	1.00	1.00	4.00	1,121.08	1138.50	1.01	54.76	180.00
+D+Lr+H					1.100	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 14.167 ft	1	0.129	0.040	1.25	1.100	1.00	1.15	1.00	1.00	1.00	0.65	183.03	1423.13	0.17	8.94	225.00
+D+S+H					1.100	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 14.167 ft	1	0.140	0.043	1.15	1.100	1.00	1.15	1.00	1.00	1.00	0.65	183.03	1309.28	0.17	8.94	207.00
+D+0.750Lr+0.750L+H					1.100	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 14.167 ft	1	0.623	0.192	1.25	1.100	1.00	1.15	1.00	1.00	1.00	3.16	886.56	1423.13	0.80	43.31	225.00
+D+0.750L+0.750S+H					1.100	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 14.167 ft	1	0.677	0.209	1.15	1.100	1.00	1.15	1.00	1.00	1.00	3.16	886.56	1309.28	0.80	43.31	207.00

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Project Title: Red Door Grill
Engineer: MJF
Project ID: UPAC2101
Project Descr:

Wood Beam

DESCRIPTION: Mezzanine Joists

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+D+0.60W+H					1.100	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 14.167 ft	1	0.100	0.031	1.60	1.100	1.00	1.15	1.00	1.00	1.00	0.65	183.03	1821.60	0.17	8.94	288.00
+D+0.750Lr+0.750L+0.450W+H					1.100	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 14.167 ft	1	0.487	0.150	1.60	1.100	1.00	1.15	1.00	1.00	1.00	3.16	886.56	1821.60	0.80	43.31	288.00
+D+0.750L+0.750S+0.450W+H					1.100	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 14.167 ft	1	0.487	0.150	1.60	1.100	1.00	1.15	1.00	1.00	1.00	3.16	886.56	1821.60	0.80	43.31	288.00
+0.60D+0.60W+0.60H					1.100	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 14.167 ft	1	0.060	0.019	1.60	1.100	1.00	1.15	1.00	1.00	1.00	0.39	109.82	1821.60	0.10	5.36	288.00
+D+0.70E+0.60H					1.100	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 14.167 ft	1	0.100	0.031	1.60	1.100	1.00	1.15	1.00	1.00	1.00	0.65	183.03	1821.60	0.17	8.94	288.00
+D+0.750L+0.750S+0.5250E+H					1.100	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 14.167 ft	1	0.487	0.150	1.60	1.100	1.00	1.15	1.00	1.00	1.00	3.16	886.56	1821.60	0.80	43.31	288.00
+0.60D+0.70E+H					1.100	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 14.167 ft	1	0.060	0.019	1.60	1.100	1.00	1.15	1.00	1.00	1.00	0.39	109.82	1821.60	0.10	5.36	288.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L+H	1	0.4588	7.135		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.128	1.128
Overall MINimum	0.944	0.944
+D+H	0.184	0.184
+D+L+H	1.128	1.128
+D+Lr+H	0.184	0.184
+D+S+H	0.184	0.184
+D+0.750Lr+0.750L+H	0.892	0.892
+D+0.750L+0.750S+H	0.892	0.892
+D+0.60W+H	0.184	0.184
+D+0.750Lr+0.750L+0.450W+H	0.892	0.892
+D+0.750L+0.750S+0.450W+H	0.892	0.892
+0.60D+0.60W+0.60H	0.111	0.111
+D+0.70E+0.60H	0.184	0.184
+D+0.750L+0.750S+0.5250E+H	0.892	0.892
+0.60D+0.70E+H	0.111	0.111
D Only	0.184	0.184
L Only	0.944	0.944
H Only		

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4338 Belleview Ave. 816.531.4144
Kansas City, MO 64111 www.bdc-engrs.com

Project Title: Red Door Grill
Engineer: MJF
Project ID: UPAC2101
Project Descr:

Printed: 12 APR 2021, 4:06PM

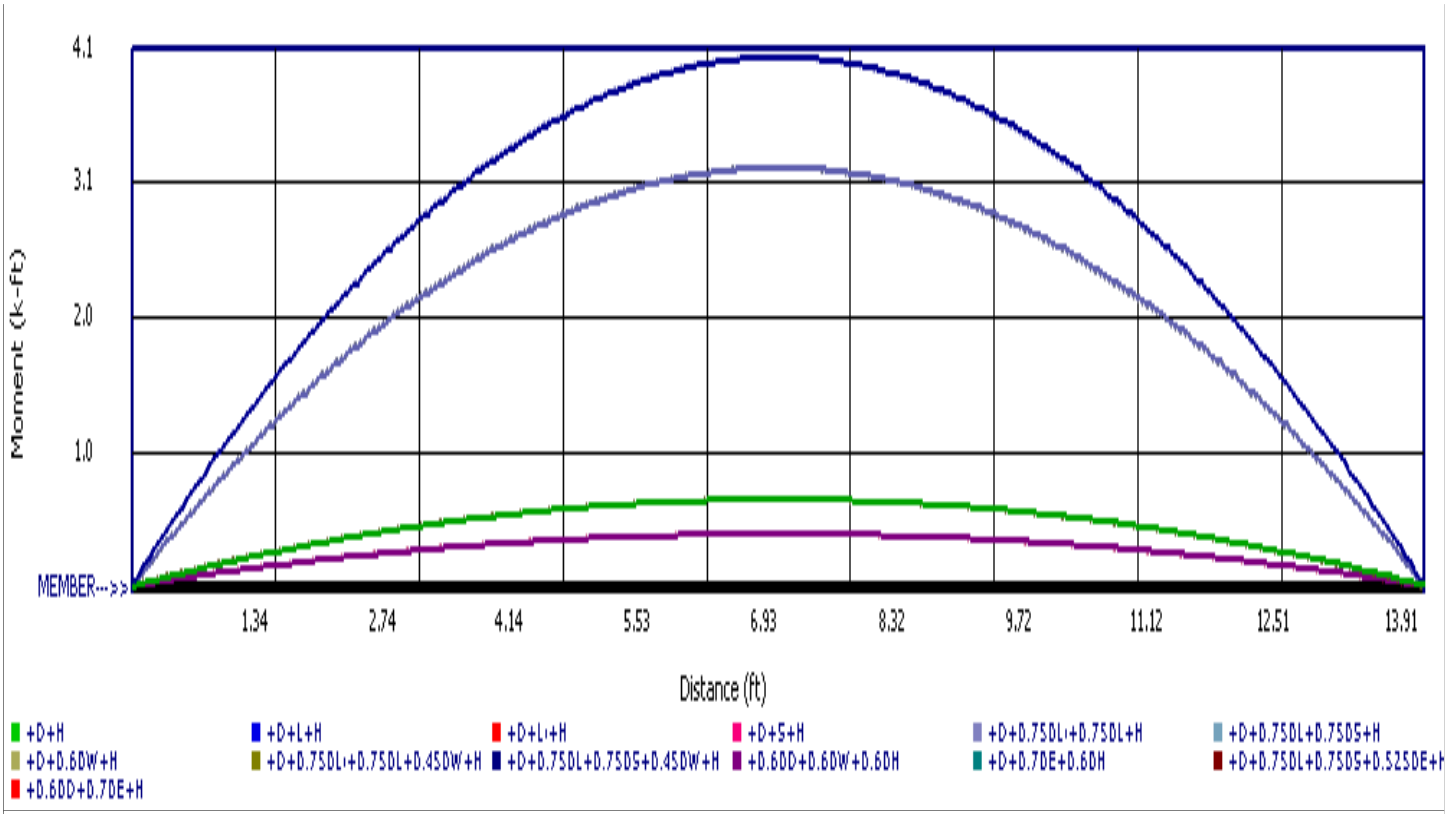
Wood Beam

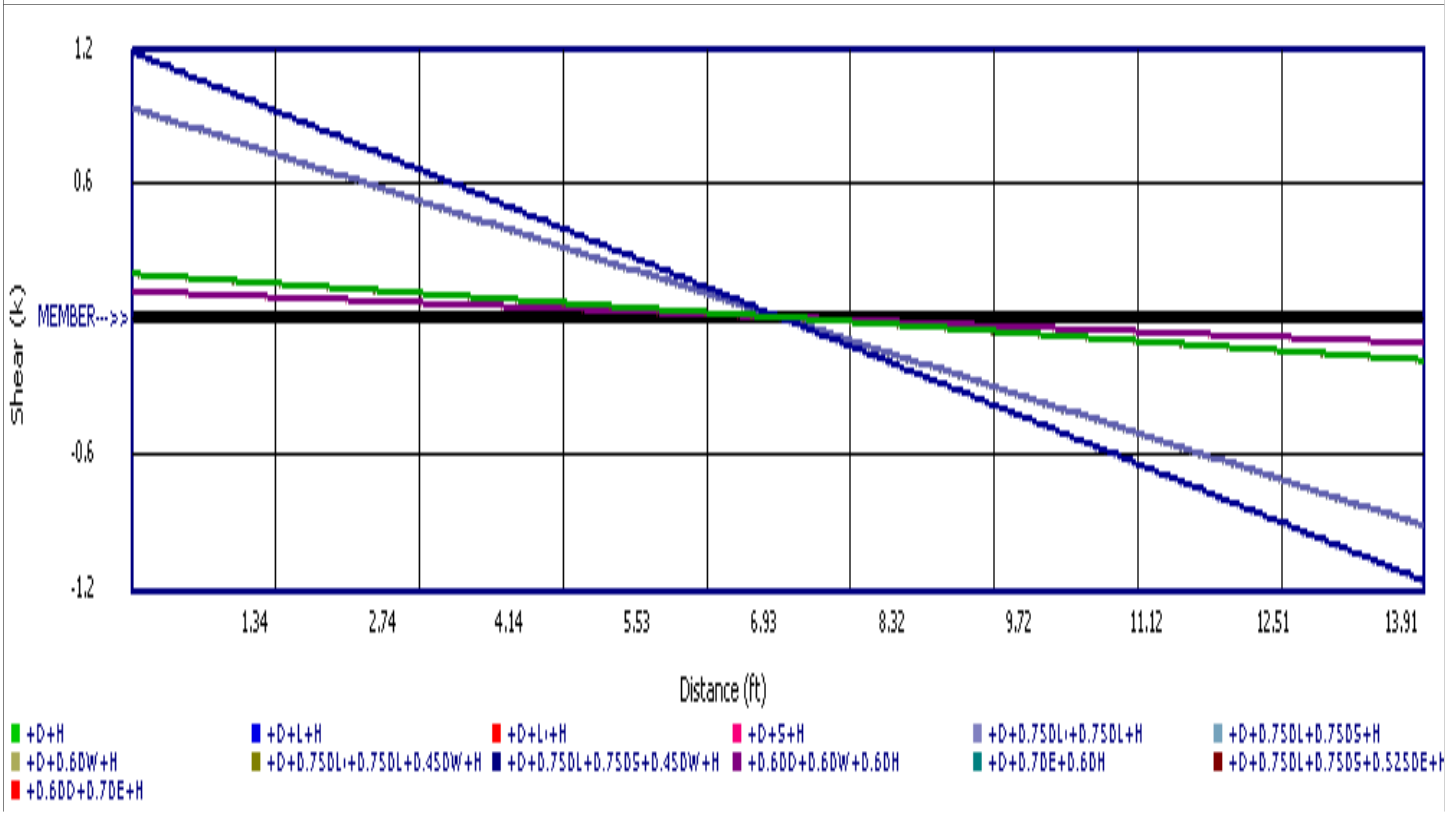
File: UPAC2101.ec6

Lic. # : KW-06011403

Bob D. Campbell and Co., Inc.

DESCRIPTION: Mezzanine Joists





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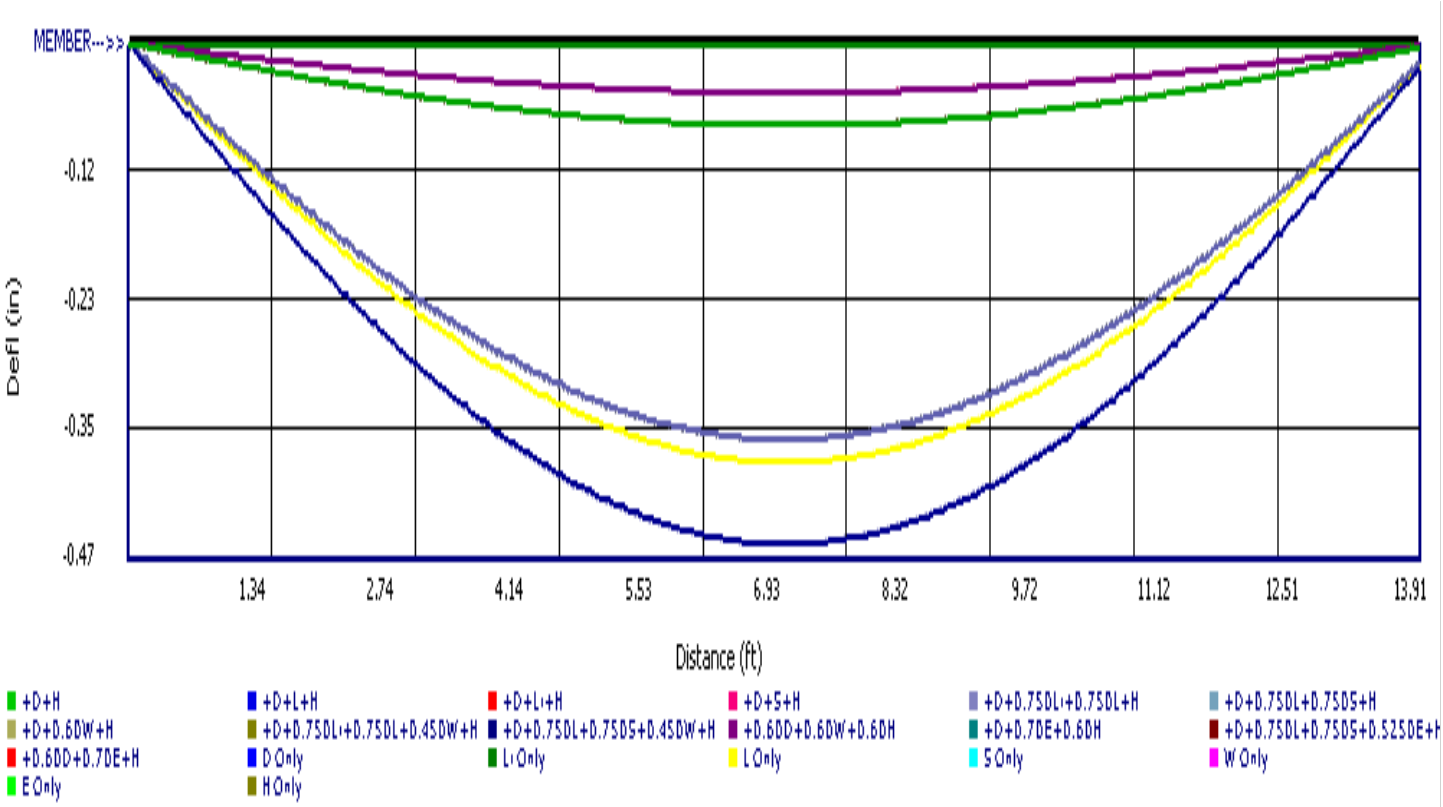

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Project RED DOOR - LEE'S SUMMIT

Date APRIL 2021 Page ___ of ___

LOAD BRG STUD WALL @ MEZZ: HT = 10'

TRIB = 15/2 = 7.5 ft

P_{VERT} = (7.5)(120psf)(16/12) = 1.2 kip

EXTERIOR WALL => 25 psf

└> ALLOWABLE P = 4.44 kip (> 1.2) ✓

∴ USE 6" x 16ga (600S162-54) STUDS @ 16" oc

(7.5)(120 psf) = 900 plf

Gr. Bm. WIDTH = 2'-0

900 plf / 2-0 = 450 psf < 2,000 psf ALLOW ✓

∴ 2'-0" WIDE GRADE BEAMS ARE ADEQUATE

COMBINED AXIAL AND LATERAL LOADS

15 psf Lateral Load

6" MEMBERS

WALL HEIGHT (ft)	STUD SPACING (in.) o.c.	600S137					600S162					600S200					600S250				
		33 ksi		50 ksi			33 ksi		50 ksi			33 ksi		50 ksi			33 ksi		50 ksi		
		33	43	54	68	97	33	43	54	68	97	33	43	54	68	97	33	43	54	68	97
8	12	1.54	2.28	3.62	4.87	7.40	2.14	3.14	5.37	7.22	11.2	2.55	4.01	7.16	9.69	15.4	2.78	4.35	7.35	10.7	18.0
	16	1.43	2.17	3.53	4.77	7.32	2.01	3.02	5.25	7.10	11.1	2.41	3.86	7.01	9.55	15.2	2.63	4.20	7.21	10.6	17.8
	24	1.20	1.95	3.34	4.59	7.16	1.74	2.77	5.02	6.88	10.8	2.13	3.56	6.71	9.27	15.0	2.35	3.89	6.92	10.3	17.5
9	12	1.44	2.19	3.54	4.78	7.33	2.02	3.03	5.26	7.11	11.1	2.41	3.84	6.92	9.43	15.0	2.63	4.18	7.13	10.4	17.5
	16	1.30	2.04	3.41	4.66	7.22	1.85	2.87	5.11	6.96	10.9	2.23	3.65	6.73	9.25	14.8	2.45	3.99	6.95	10.2	17.3
	24	1.01	1.76	3.17	4.42	7.02	1.51	2.56	4.81	6.67	10.6	1.89	3.27	6.35	8.89	14.5	2.09	3.60	6.58	9.84	16.9
10	12	1.33	2.08	3.44	4.68	7.24	1.89	2.91	5.14	6.98	10.9	2.25	3.65	6.65	9.12	14.6	2.47	3.99	6.88	10.1	17.0
	16	1.15	1.90	3.29	4.53	7.11	1.68	2.71	4.94	6.80	10.8	2.04	3.41	6.41	8.89	14.4	2.25	3.75	6.65	9.84	16.7
	24	0.81	1.55	2.98	4.23	6.85	1.27	2.32	4.57	6.42	10.4	1.62	2.96	5.94	8.45	13.9	1.81	3.28	6.20	9.35	16.2
12	12	1.08	1.81	3.20	4.44	7.02	1.54	2.56	4.76	6.66	10.6	1.89	3.19	5.96	8.33	13.5	2.09	3.54	6.25	9.24	15.6
	16	0.83	1.56	2.97	4.21	6.82	1.25	2.28	4.48	6.37	10.3	1.59	2.86	5.63	8.00	13.2	1.78	3.20	5.93	8.88	15.3
	24	0.36[4]	1.08	2.54	3.78	6.43	0.71	1.75	3.94	5.82	9.74	1.03	2.24	4.98	7.37	12.5	1.20	2.55	5.29	8.18	14.5
14	12	0.78	1.50	2.89	4.12	6.72	1.15	2.13	4.15	5.95	10.1	1.48	2.65	5.14	7.34	12.1	1.66	3.00	5.53	8.23	14.0
	16	0.47[4]	1.17	2.59	3.81	6.43	0.80	1.78	3.78	5.57	9.63	1.11	2.24	4.71	6.92	11.6	1.27	2.57	5.10	7.75	13.5
	24	-	0.57[3]	2.02[4]	3.23	5.88	0.14[3]	1.12[4]	3.11	4.87	8.83	0.43[3]	1.49	3.92	6.12	10.8	0.56[4]	1.77	4.30	6.85	12.5
16	12	0.47[3]	1.16	2.53	3.73	6.32	0.76[4]	1.67	3.45	5.08	8.73	1.05	2.09	4.25	6.25	10.5	1.21	2.43	4.78	7.13	12.2
	16	0.10[3]	0.76[3]	2.15[4]	3.33	5.94	0.36[3]	1.26[4]	3.03	4.63	8.22	0.63[3]	1.62	3.76	5.75	9.94	0.77[4]	1.92	4.26	6.56	11.6
	24	-	0.05[3]	1.47[3]	2.61[3]	5.22	-	0.51[3]	2.28[3]	3.82[4]	7.28	-	0.77[3]	2.88[4]	4.84	8.92	-	1.00[3]	3.32[4]	5.51	10.4

20 psf Lateral Load

6" MEMBERS

WALL HEIGHT (ft)	STUD SPACING (in.) o.c.	600S137					600S162					600S200					600S250				
		33 ksi		50 ksi			33 ksi		50 ksi			33 ksi		50 ksi			33 ksi		50 ksi		
		33	43	54	68	97	33	43	54	68	97	33	43	54	68	97	33	43	54	68	97
8	12	1.43	2.17	3.53	4.77	7.32	2.01	3.02	5.25	7.10	11.1	2.41	3.86	7.01	9.55	15.2	2.63	4.20	7.21	10.6	17.8
	16	1.27	2.02	3.40	4.65	7.21	1.83	2.85	5.10	6.95	10.9	2.22	3.66	6.81	9.36	15.0	2.44	3.99	7.01	10.4	17.6
	24	0.98	1.73	3.15	4.40	7.00	1.48	2.53	4.79	6.65	10.6	1.86	3.27	6.41	9.00	14.7	2.07	3.59	6.63	9.96	17.2
9	12	1.30	2.04	3.41	4.66	7.22	1.85	2.87	5.11	6.96	10.9	2.23	3.65	6.73	9.25	14.8	2.45	3.99	6.95	10.2	17.3
	16	1.11	1.85	3.25	4.50	7.09	1.63	2.66	4.91	6.77	10.7	2.00	3.40	6.48	9.01	14.6	2.21	3.73	6.70	9.97	17.0
	24	0.74	1.49	2.93	4.19	6.81	1.19	2.25	4.51	6.38	10.4	1.55	2.91	5.98	8.54	14.1	1.74	3.23	6.22	9.45	16.5
10	12	1.15	1.90	3.29	4.53	7.11	1.68	2.71	4.94	6.80	10.8	2.04	3.41	6.41	8.89	14.4	2.25	3.75	6.65	9.84	16.7
	16	0.92	1.67	3.08	4.33	6.94	1.40	2.45	4.69	6.55	10.5	1.76	3.11	6.10	8.59	14.1	1.96	3.44	6.34	9.51	16.4
	24	0.48	1.22	2.69	3.94	6.59	0.87	1.94	4.20	6.06	10.0	1.21	2.51	5.49	8.01	13.5	1.39	2.83	5.75	8.86	15.7
12	12	0.83	1.56	2.97	4.21	6.82	1.25	2.28	4.48	6.37	10.3	1.59	2.86	5.63	8.00	13.2	1.78	3.20	5.93	8.88	15.3
	16	0.51	1.24	2.68	3.92	6.56	0.88	1.92	4.11	6.00	9.92	1.21	2.44	5.19	7.58	12.7	1.39	2.76	5.50	8.41	14.8
	24	-	0.63[4]	2.13	3.36	6.05	0.20[3]	1.24	3.43	5.30	9.19	0.50[4]	1.66	4.37	6.77	11.9	0.64	1.94	4.69	7.51	13.8
14	12	0.47[4]	1.17	2.59	3.81	6.43	0.80	1.78	3.78	5.57	9.63	1.11	2.24	4.71	6.92	11.6	1.27	2.57	5.10	7.75	13.5
	16	0.08[3]	0.76[4]	2.21	3.42	6.06	0.35[3]	1.33[4]	3.33	5.10	9.09	0.65[4]	1.73	4.18	6.38	11.1	0.79[4]	2.03	4.56	7.15	12.8
	24	-	0.01[3]	1.50[3]	2.68[4]	5.36	-	0.52[3]	2.49[3]	4.21	8.09		0.79[3]	3.19[4]	5.39	9.97	-	1.03[4]	3.56	6.02	11.6
16	12	0.10[3]	0.76[3]	2.15[4]	3.33	5.94	0.36[3]	1.26[4]	3.03	4.63	8.22	0.63[3]	1.62	3.76	5.75	9.94	0.77[4]	1.92	4.26	6.56	11.6
	16	-	0.28[3]	1.69[3]	2.84[4]	5.45	-	0.75[3]	2.52[3]	4.08	7.58	0.11[3]	1.04[3]	3.16[4]	5.13	9.25	0.22[3]	1.29[4]	3.62	5.84	10.8
	24	-	-	0.85[2]	1.95[3]	4.57[3]	-	-	1.60[3]	3.09[3]	6.44[4]	-	0.01[3]	2.09[3]	4.03[3]	8.00	-	0.17[3]	2.47[3]	4.56[4]	9.40

25 psf Lateral Load

6" MEMBERS

WALL HEIGHT (ft)	STUD SPACING (in.) o.c.	600S137					600S162					600S200					600S250				
		33 ksi		50 ksi			33 ksi		50 ksi			33 ksi		50 ksi			33 ksi		50 ksi		
		33	43	54	68	97	33	43	54	68	97	33	43	54	68	97	33	43	54	68	97
8	12	1.31	2.06	3.43	4.68	7.24	1.87	2.89	5.14	6.99	11.0	2.27	3.71	6.86	9.41	15.1	2.49	4.04	7.06	10.4	17.7
	16	1.13	1.88	3.27	4.52	7.11	1.65	2.69	4.94	6.80	10.8	2.04	3.46	6.61	9.18	14.9	2.26	3.79	6.82	10.2	17.4
	24	0.76	1.51	2.96	4.22	6.85	1.22	2.28	4.56	6.43	10.4	1.59	2.98	6.12	8.72	14.4	1.79	3.30	6.35	9.65	16.9
9	12	1.15	1.90	3.29	4.54	7.12	1.68	2.72	4.96	6.81	10.8	2.06	3.46	6.54	9.07	14.7	2.27	3.80	6.76	10.0	17.1
	16	0.92	1.67	3.09	4.34	6.95	1.40	2.46	4.71	6.57	10.5	1.78	3.15	6.23	8.77	14.4	1.98	3.48	6.46	9.71	16.8
	24	0.47	1.22	2.70	3.95	6.61	0.87	1.95	4.22	6.09	10.1	1.22	2.55	5.61	8.19	13.8	1.40	2.86	5.87	9.06	16.1
10	12	0.98	1.72	3.13	4.38	6.98	1.47	2.51	4.75	6.61	10.6	1.83	3.18	6.17	8.67	14.1	2.03	3.51	6.42	9.59	16.5
	16	0.70	1.44	2.89	4.14	6.76	1.13	2.19	4.44	6.30	10.3	1.48	2.81	5.79	8.30	13.8	1.67	3.13	6.05	9.18	16.1
	24	0.15[4]	0.89	2.40	3.65	6.34	0.49	1.58	3.84	5.71	9.66	0.82	2.09	5.05	7.59	13.0	0.99	2.38	5.32	8.39	15.2
12	12	0.59	1.32	2.75	3.99	6.62	0.98	2.01	4.20	6.09	10.0	1.31	2.55	5.30	7.68	12.8	1.48	2.87	5.61	8.52	14.9
	16	0.21[4]	0.93	2.40	3.64	6.30	0.53[4]	1.58	3.76	5.64	9.55	0.85	2.04	4.77	7.17	12.3	1.01	2.35	5.09	7.95	14.3
	24	-	0.20[3]	1.73[4]	2.95	5.68	-	0.76[4]	2.94	4.79	8.66	-	1.10[4]	3.79	6.20	11.3	0.12[3]	1.36	4.11	6.86	13.1
14	12	0.17[3]	0.86[4]	2.30	3.51	6.15	0.46[3]	1.44	3.44	5.21	9.22	0.76[4]	1.86	4.31	6.51	11.2	0.91	2.16	4.69	7.29	13.0
	16	-	0.38 [3]	1.84[4]	3.04	5.71	-	0.91[3]	2.90[4]	4.64	8.58	0.21[3]	1.25[4]	3.67	5.87	10.5	0.33[3]	1.52	4.05	6.57	12.2
	24	-		1.00[3]	2.16[3]	4.87[4]	-	-	1.92[3]	3.60[3]	7.39		0.15[3]	2.51[3]	4.70[4]	9.21	-	0.34[3]	2.86[4]	5.24	10.8
16	12	-	0.40[3]	1.80[3]	2.96[4]	5.57	-	0.87[3]	2.64[4]	4.22	7.74	0.24[3]	1.18[3]	3.31	5.28	9.42	0.35[3]	1.45[4]	3.78	6.02	11.0
	16	-	-	1.25[3]	2.38[3]	5.00[4]	-	0.29[3]	2.04[3]	3.57[3]	6.99	-	0.51[3]	2.61[3]	4.56[4]	8.61	-	0.72[3]	3.03[4]	5.18	10.1
	24	-	-	0.28[2]	1.35[2]	3.96[3]	-	-	0.98[2]	2.42[3]	5.67[3]	-	-	1.37[3]	3.28[3]	7.16[4]	-	-	1.70[3]	3.70[3]	8.46[4]

NOTE: *See page 26 for Table Notes.*

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Project:	RDG - LSMO
Location:	Lee's Summit, MO
By:	MJF
Date:	4/12/2021

8" Masonry Wall - CANTILEVERED

Working stress design of 8" CMU wall with uniform vertical load and uniform lateral load *Spreadsheet password = bdc*

b	length of wall considered	12.00	in.
t	thickness of wall	7.625	in.
d		3.8125	in.
f'm	compressive strength of masonry	1500	psi
h'	effective height of wall	6.67	ft
	Uniform lateral wind load on wall	30	psf
P	Uniform vertical load on wall	250	plf

Allowable stresses

Fb	Allowable bending stress = 0.33f'm	495	psi
Fs	Allowable tensile stress of steel = 0.5fy	24000	psi
Em	Modulus of elasticity of masonry = 750f'm	1125000	psi
Es	Modulus of elasticity of steel	29000000	psi

Flexural Effects

M	max. moment in wall due to lateral (wl^2/2)	667.33	lb*ft
	size of reinforcing steel	#5	
	area of one bar	0.31	sq. in.
	spacing of bars	16	in.
As	Area of steel per foot of wall	0.23	sq. in.
n	Es/Em	25.8	
p	As/bd	0.00508	
k	(n^2p^2 + 2np)^0.5 - np	0.397	
j	1.0 - k/3	0.868	
fb	24M/jkbd^2	**266**	**psi**
fs	12M/jdAs	**10414**	**psi**

Axial Effects

Spacing of grout cells		16	
Equivalent solid thickness of wall		4.44	sq. in.
Ae		53.28	
fa	P/Ae	**5**	**psi**
r	Table 21-H-1 (UBC)	2.43	
h'/r		32.9	
Fa		**354**	**psi**

fa/Fa + fb/Fb **0.55** <1.33 (1/3 allowable stress increase for wind)

	***Equivalent solid thickness of wall**		
	Equivalent solid thickness, in.		
		8" CMU	12" CMU
solid grouted	8	6.38	9.13
16" o.c.	16	4.44	6.07
24" o.c.	24	3.79	5.04
32" o.c.	32	3.47	4.53
40" o.c.	40	3.28	4.23
48" o.c.	48	3.15	4.02
no grout	no grout	2.5	3

* for calculating Ae
* face shells + grouted cells only (web area excluded)

	Radius of Gyration = r		
		8" CMU	12" CMU
solid grouted	8	2.19	3.34
16" o.c.	16	2.43	3.67
24" o.c.	24	2.53	3.82
32" o.c.	32	2.59	3.91
40" o.c.	40	2.63	3.97
48" o.c.	48	2.66	4.02
no grout	no grout	2.8	4.29

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Kansas City, MO 64111 www.bdc-engrs.com

Project:	RDG - LSMO
Project No.:	UPAC2101
Location:	Lee's Summit, MO
By:	MJF
Date:	4/12/2021

Spread Footing 3A

This spreadsheet calculates the allowable load capacity of a square spread footing. *password=bdc*

Given:

Width of Square Footing	3	**ft**
Thickness of Footing	36	**in.**
Rebar Size	#5	
Area of Rebar	0.31	**sq. in.**
Quantity of bottom steel in each direction	4	
f'c Compressive Strength of Concrete (psi)	3500	**psi**
fy Yield Stress of Reinforcing Steel (ksi)	60	**ksi**
Allowable Soil Bearing Pressure	2	**ksf**

1. Calculate Maximum Allowable Total Load

Maximum Allowable Load = (area of footing x allowable soil bearing pressure) - (weight of footing + weght of displaced soil)

Area of Footing	9	sf
Density of concrete	150	pcf
Density of soil	120	pcf
Weight of footing	4.05	kips
Weight of displaced soil	3.24	kips
Maximum Allowable Load	**17.2**	**kips**

2. Check Thickness For Two-Way Shear

The critical perimeter is at d/2 from the face of the column.

davg (t - 3"cover - 1")	32	in.
Dimension of square column or loaded area	8	in.
bo Length of Critical Shear Perimeter	160	in.
ϕVc = 0.75*4*((f'c)^1/2)*bo*d	908.7	kips
Load Factor	1.8	
Max. Allowable Load = ϕVc / Load Factor	**504.8**	kips

Controlling Allowable Load =	**17.2**	kips
Maximum Applied Load =	15.0	kips
Check	OK	

4. Check Reinforcement

The critical section for moment is at the face of the column.

Mu = q x (tributary area) x (moment arm)	4.1	k*ft
b	36	in.
d	32	in.
As	1.24	sq. in.
C=0.85f'cba	107	a
T=Asfy	74	kips
a	0.69	in.
ϕMn = 0.9*Asfy(d-a/2)	**176.62**	k*ft

Reinforcement OK?	OK

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Kansas City, MO 64111 www.bdc-engrs.com

Project:	RDG - LSMO
Project No.:	UPAC2101
Location:	Lee's Summit, MO
By:	MJF
Date:	4/12/2021

Spread Footing 4.0

This spreadsheet calculates the allowable load capacity of a square spread footing. *password=bdc*

Given:

Width of Square Footing	4	**ft**
Thickness of Footing	36	**in.**
Rebar Size	#5	
Area of Rebar	0.31	**sq. in.**
Quantity of bottom steel in each direction	8	
f'c Compressive Strength of Concrete (psi)	3500	**psi**
fy Yield Stress of Reinforcing Steel (ksi)	60	**ksi**
Allowable Soil Bearing Pressure	2	**ksf**

1. Calculate Maximum Allowable Total Load

Maximum Allowable Load = (area of footing x allowable soil bearing pressure) - (weight of footing + weght of displaced soil)

Area of Footing	16	sf
Density of concrete	150	pcf
Density of soil	120	pcf
Weight of footing	7.20	kips
Weight of displaced soil	5.76	kips
Maximum Allowable Load	**30.6**	**kips**

2. Check Thickness For Two-Way Shear

The critical perimeter is at d/2 from the face of the column.

davg (t - 3"cover - 1")	32	in.
Dimension of square column or loaded area	8	in.
bo Length of Critical Shear Perimeter	160	in.
ϕVc = 0.75*4*((f'c)^1/2)*bo*d	908.7	kips
Load Factor	1.8	
Max. Allowable Load = ϕVc / Load Factor	**504.8**	kips

Controlling Allowable Load =	**30.6**	kips
Maximum Applied Load =	25.0	kips
Check	OK	

4. Check Reinforcement

The critical section for moment is at the face of the column.

Mu = q x (tributary area) x (moment arm)	11.1	k*ft
b	48	in.
d	32	in.
As	2.48	sq. in.
C=0.85f'cba	143	a
T=Asfy	149	kips
a	1.04	in.
ϕMn = 0.9*Asfy(d-a/2)	**351.31**	k*ft

Reinforcement OK?	OK

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Project:	RDG - LSMO
Project No.:	UPAC2101
Location:	Lee's Summit, MO
By:	MJF
Date:	4/12/2021

Spread Footing 4A

This spreadsheet calculates the allowable load capacity of a square spread footing. *password=bdc*

Given:

Width of Square Footing	4	**ft**
Thickness of Footing	36	**in.**
Rebar Size	#5	
Area of Rebar	0.31	**sq. in.**
Quantity of bottom steel in each direction	5	
f'c Compressive Strength of Concrete (psi)	3500	**psi**
fy Yield Stress of Reinforcing Steel (ksi)	60	**ksi**
Allowable Soil Bearing Pressure	2	**ksf**

1. Calculate Maximum Allowable Total Load

Maximum Allowable Load = (area of footing x allowable soil bearing pressure) - (weight of footing + weght of displaced soil)

Area of Footing	16	sf
Density of concrete	150	pcf
Density of soil	120	pcf
Weight of footing	7.20	kips
Weight of displaced soil	5.76	kips
Maximum Allowable Load	**30.6**	**kips**

2. Check Thickness For Two-Way Shear

The critical perimeter is at d/2 from the face of the column.

davg (t - 3"cover - 1")	32	in.
Dimension of square column or loaded area	8	in.
bo Length of Critical Shear Perimeter	160	in.
ϕVc = 0.75*4*((f'c)^1/2)*bo*d	908.7	kips
Load Factor	1.8	
Max. Allowable Load = ϕVc / Load Factor	**504.8**	kips

Controlling Allowable Load =	**30.6**	kips
Maximum Applied Load =	25.0	kips
Check	OK	

4. Check Reinforcement

The critical section for moment is at the face of the column.

Mu = q x (tributary area) x (moment arm)	11.1	k*ft
b	48	in.
d	32	in.
As	1.55	sq. in.
C=0.85f'cba	143	a
T=Asfy	93	kips
a	0.65	in.
ϕMn = 0.9*Asfy(d-a/2)	**220.93**	k*ft

Reinforcement OK?	OK

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Project:	RDG - LSMO
Project No.:	UPAC2101
Location:	Lee's Summit, MO
By:	MJF
Date:	4/12/2021

Spread Footing 5.0

This spreadsheet calculates the allowable load capacity of a square spread footing. *password=bdc*

Given:

Width of Square Footing	5	**ft**
Thickness of Footing	18	**in.**
Rebar Size	#4	
Area of Rebar	0.2	**sq. in.**
Quantity of bottom steel in each direction	10	
f'c Compressive Strength of Concrete (psi)	3500	**psi**
fy Yield Stress of Reinforcing Steel (ksi)	60	**ksi**
Allowable Soil Bearing Pressure	2	**ksf**

1. Calculate Maximum Allowable Total Load

Maximum Allowable Load = (area of footing x allowable soil bearing pressure) - (weight of footing + weght of displaced soil)

Area of Footing	25	sf
Density of concrete	150	pcf
Density of soil	120	pcf
Weight of footing	5.63	kips
Weight of displaced soil	4.50	kips
Maximum Allowable Load	**48.9**	**kips**

2. Check Thickness For Two-Way Shear

The critical perimeter is at d/2 from the face of the column.

davg (t - 3"cover - 1")	14	in.
Dimension of square column or loaded area	8	in.
bo Length of Critical Shear Perimeter	88	in.
ϕVc = 0.75*4*((f'c)^1/2)*bo*d	218.7	kips
Load Factor	1.8	
Max. Allowable Load = ϕVc / Load Factor	**121.5**	kips

Controlling Allowable Load =	**48.9**	kips
Maximum Applied Load =	40.0	kips
Check	OK	

4. Check Reinforcement

The critical section for moment is at the face of the column.

Mu = q x (tributary area) x (moment arm)	23.5	k*ft
b	60	in.
d	14	in.
As	2.00	sq. in.
C=0.85f'cba	179	a
T=Asfy	120	kips
a	0.67	in.
ϕMn = 0.9*Asfy(d-a/2)	**122.97**	k*ft

Reinforcement OK?	OK