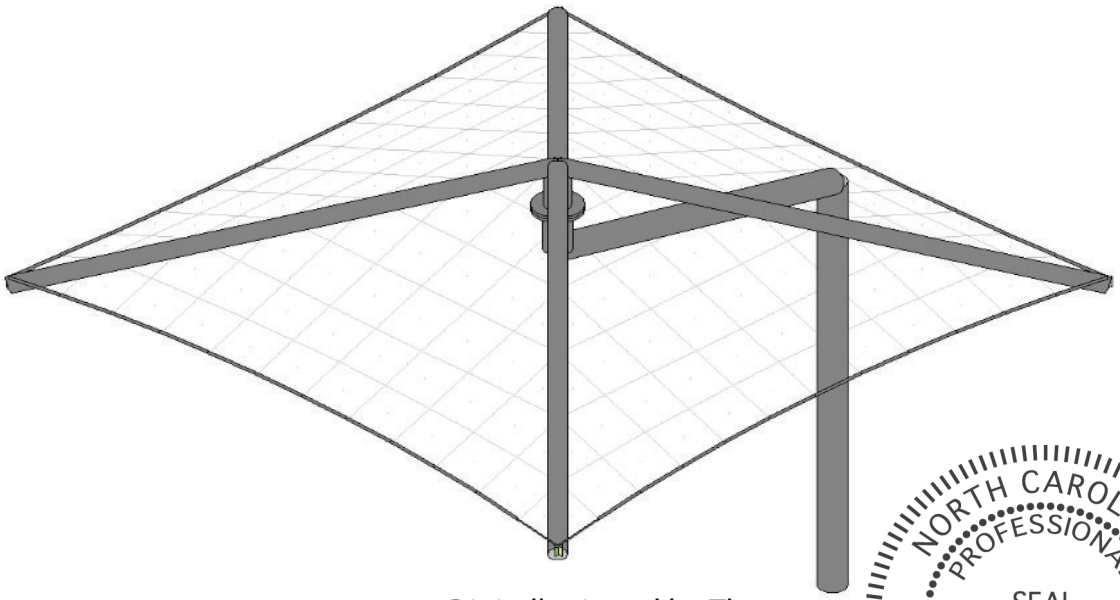
USA SHADE & Fabric Structures 2580 Esters Blvd, Suite 100. DFW Airport, TX 75261 (800)966-5005 usa-shade.com

USASHADE
& Fabric Structures

STRUCTURAL CALCULATIONS

PROJECT: **ERWIN SPLASHPAD**
LOCATION: **ERWIN, NC**

STRUCTURE: **12 ft x 12 ft x 11 ft SINGLE POST PYRAMID CANTILEVER UNIT**
(APPLIES FOR 12 ft x 12 ft x 8 ft SINGLE POST PYRAMID CANTILEVER UNIT)



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NORTH CAROLINA PROFESSIONAL SEAL 21792 ENGINEER THOMAS R. SADLER

September 29, 2020

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GENERAL INFORMATION

USA Shade Units are constructed from shop-welded Structural Hollow Steel Shapes Sections and Plate Materials. Primary pieces such as Columns, Rafters or Ridges are field bolt connected unless noted otherwise. Once the steel frame is properly erected one or more pieces of HDPE fabric are stretched using sleeve-embedded wirerope cables until the fabric reach a rigid appearance and is securely anchored to the corners and/or edges of the steel frame.

The structural analysis of this type of frame supported membrane requires acknowledge that loads applied to the fabric may induce a combination of non-uniform pressure against the HSS members and tension on the cables. This is especially critical when loads such as wind uplift act upon the fabric surface when the attachment is at the steel frame corners (see graphic below).

Our Structural analysis approach is to create a web of compression-only members (low or no resistance to tension) linking fabric plate elements to the steel frame at various points through the model. This will provide a more realistic loading mechanism with forces acting on different directions on the steel frame.

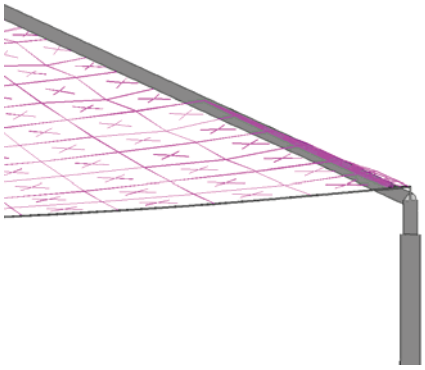


Figure 1a.

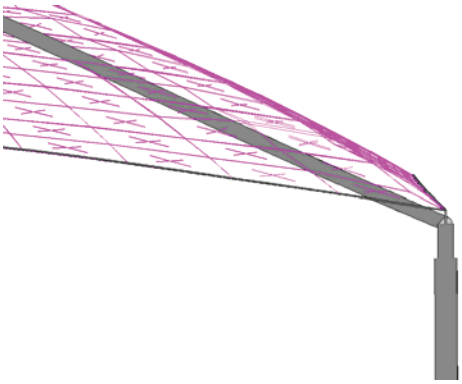


Figure 1b.

Corner details show an example of a typical case when the fabric deflects under live load (pressing downward on the rafters on Figure 1a) or uplift wind (Figure 1b). Uplift forces are carried to the frame corner as tension on the cables rather than an otherwise assumed upward uniform load applied to the rafters.

PARAMETERS AND ASSUMPTIONS:

1) CODE COMPLIANCE: IBC 2015, ASCE 7-10, ACI 318-14 & ASD 14TH Edition.

2) DESIGN SOFTWARE: Risa3D 10.0

3) BASIC LOAD CONDITIONS:

A) Dead Load (DL): Selfweight is calculated by the program.

B) Roof Live Load (RLL): 5 psf applied to the fabric.

C) Snow Load: 5 psf, steel frame with fabric attached.
10 psf, steel frame with fabric removed.

D) Wind Load: Ultimate wind speed (V_{ult}):
Steel frame with fabric attached: 115 MPH
Ultimate wind speed (V_{ult}):
Steel frame with fabric removed: 119 MPH
based on the ASCE 7-10 ultimate wind speed map 1609A for 3 sec gust, Risk Category II & Exposure C.
Refer to next page for detailed Wind Forces calculation.

E) Seismic Load: Seismic Design Category: D
Building Occupancy Category : Type II
Site Class: D
Importance factor (I_E): 1.0
Spectral response coefficients: SDS = 1.33 & SD1 = 1 (based on worst case conditions of 2.0g and 1.0g for Ss and S1 respectively)
Response Modification Coeff: (Cantilevered Column special frame) (R^a=2 1/2)
Seismic Response coefficient (C_s): 0.53
Structure DL (see take-off report): **500 lbs**
Design Base Shear: V= Cs (W) = **265 lbs**
Seismic loads are usually smaller than Wind loads for light steel frames, and will not govern the lateral analysis.

4) LOAD COMBINATIONS:

DL + LL	0.6 DL + WL (UPLIFT)
0.6 DL + 0.6 WL (XA)	DL + 0.75 [LL + 0.6 WL (XA)]
0.6 DL + 0.6 WL (ZA)	DL + 0.75 [LL + 0.6 WL (ZA)]
0.6 DL + 0.6 WL (XB)	DL + 0.75 [LL + 0.6 WL (XB)]
0.6 DL + 0.6 WL (ZB)	DL + 0.75 [LL + 0.6 WL (ZB)]

5) SOILS PARAMETERS:

Per section 1806 and assuming Material Classification Number 5:
a) Allowable End Bearing Pressure: 1,500 psf
b) Allowable Lateral Bearing Pressure: 100 psf (2x Allowed by 1806.3.4)
c) A skin friction of 250 PSF is assumed based on section 1810.3.3.1.4

WIND FORCE CALCULATION:

Per IBC 2015 section 1609.1.1 , Wind loads on every building or structure shall be determined in accordance with Chapter 26 through 30 of ASCE 7-10.
Per ASCE 7-10 Chapter 27.4.3 (Directional Procedure):

$p = q_h \times G \times C_N$

$\mathbf{q_h} = 0.00256 \times K_z \times K_{zt} \times K_d \times V^2$

$K_z = 0.85$

$K_{zt} = (1 + K_1 \times K_2 \times K_3)^2$ $\quad K_1 = 0.00$, $K_2 = 1.00$, $K_3 = 1.00$

$K_{zt} = (1 + 0.00)^2 = 1.00$

$K_d = 0.85$

$V_{fabric\ on}$ = 115 MPH [FABRIC ON] per IBC 2015 3105.4.2.1.

$V_{fabric\ off}$ = 119 MPH [FABRIC OFF]

Per IBC 2015 Eq 16-33, the Nominal Design Wind Load is √0.6*Valt = 89 MPH

$\mathbf{q_z} = 0.00256 \times 0.85 \times 1.00 \times 0.85 \times 115^2 =$ **24.46 PSF [FABRIC ON]**

$\mathbf{q_z} = 0.00256 \times 0.85 \times 1.00 \times 0.85 \times 119^2 =$ **26.19 PSF [FABRIC OFF]**

$\mathbf{G} = 0.85$

From Figure 27.4-5: Clear wind flow, Roof Angle θ=22.5°, Wind direction γ=0° ,180°

Load Case A C_{NW} = 1.1 Load Case B C_{NW} = -0.1

Load Case A C_{NL} = 0.1 Load Case B C_{NL} = -0.8

Load Case A

p =	**24.46**	**x 0.85 x 1.10 =**	**22.9**	**PSF**	**115 MPH WINDWARD (FABRIC ON)**
p =	**24.46**	**x 0.85 x 0.10 =**	**2.08**	**PSF**	**115 MPH LEEWARD (FABRIC ON)**
p =	**26.19**	**x 0.85 x 1.10 =**	**24.5**	**PSF**	**119 MPH WINDWARD (FABRIC OFF)**
p =	**26.19**	**x 0.85 x 0.10 =**	**2.23**	**PSF**	**119 MPH LEEWARD (FABRIC OFF)**

Load Case B

p =	**24.46**	**x 0.85 x (-0.1) =**	**-2.1**	**PSF**	**115 MPH WINDWARD (FABRIC ON)**
p =	**24.46**	**x 0.85 x(-0.8) =**	**-17**	**PSF**	**115 MPH LEEWARD (FABRIC ON)**
p =	**26.19**	**x 0.85 x (-0.1) =**	**-2.2**	**PSF**	**119 MPH WINDWARD (FABRIC OFF)**
p =	**26.19**	**x 0.85 x(-0.8) =**	**-18**	**PSF**	**119 MPH LEEWARD (FABRIC OFF)**

Worst Case

F =	24.46	x 0.85 x 1.1 x Af=	22.9	PSF	x Tributary Vertical Projected Area			
F =	26.19	x 0.85 x 1.1 x Af=	24.5	PSF	x Tributary Vertical Projected Area			
F =	22.9	x 0.6 x	17.1	=	234 lbs	(Direction X)	for	115 MPH
F =	24.5	x 0.6 x	20.0	=	294 lbs	(Direction X)	for	119 MPH

Wind forces obtained govern the lateral design of this steel frame,
since seismic base shear value is 265 lbs total.
Also the 115 MPH case with fabric attached governs over the
119 MPH with fabric removed case.

DRILLED PIER FOOTING DESIGN
1.0 Non-Constrained Case

Computation of Cast in Place Concrete Footing according to IBC 2015

Table 1806.2

Class of Materials	*Allowable Foundation Pressure (psf)*	*Lateral Bearing lbs/ft² /ft*	
1. Massive crystalline bedrock	*12000*	*1200*	
2. Sedimentary and foliated rock	*4000*	*400*	
3. Sandy gravel and/or gravel (GW and GP)	*3000*	*200*	
4. Sand, silty sand, clayey sand, silty gravel and clayey gravel (SW, SP, SM, SC, GM and GC)	*2000*	*150*	
5. Clay, sandy clay, silty clay, and clayey silt (CL, ML, MH, and CH)	*1500*	*100*	*Double this value is allowed section 1806.3.4*

Type of soil to use:

5	1500	200

1807.3.2.1 Nonconstrained Case

The following formula may be used in determining the depth of embedment required to resist lateral loads where NO constraint is provided at the ground surface such as rigid floor or rigid ground surface pavement.

Design Reactions, Worst Case (refer to envelope joint reactions)

Max Moment =	**9146**	*lb-ft*
Max Shear (P)=	**299**	*lb, applied lateral force*
Max Axial =	**1376**	*lb*
Max Uplift =	**-1000**	*lb*

Then:

b =	**2**	*diameter of round post or footing or diagonal dimension of square post or footing, feet*
d =	**5.9**	*depth of embedment in earth in feet but not over 12 ft for purpose of computing lateral pressure (change until it matches formula obtained value)*
h =	**30.6**	*distance in ft from ground surface to point of application of "P", calculated as Max Moment / Max Shear = 9146 / 299*
S_1 =	*393.3*	*allowable lateral soil-bearing pressure as set forth in Table 1806.2 based on a depth of one third the depth of embedment*
A =	*0.89*	*and:*
Match at:	**5.9**	***ft***
d =	6.0	***ft***

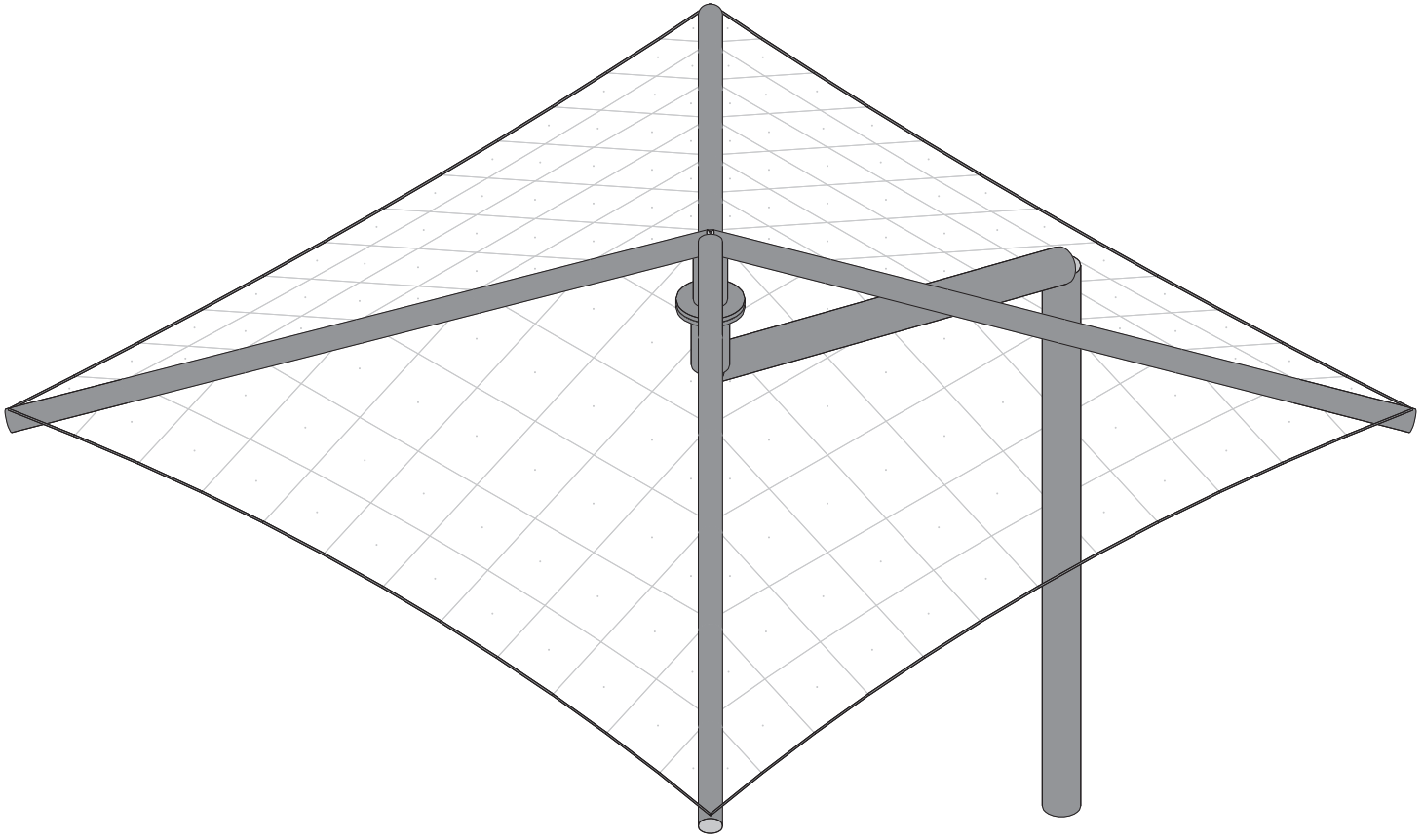
Axial Loading Check:

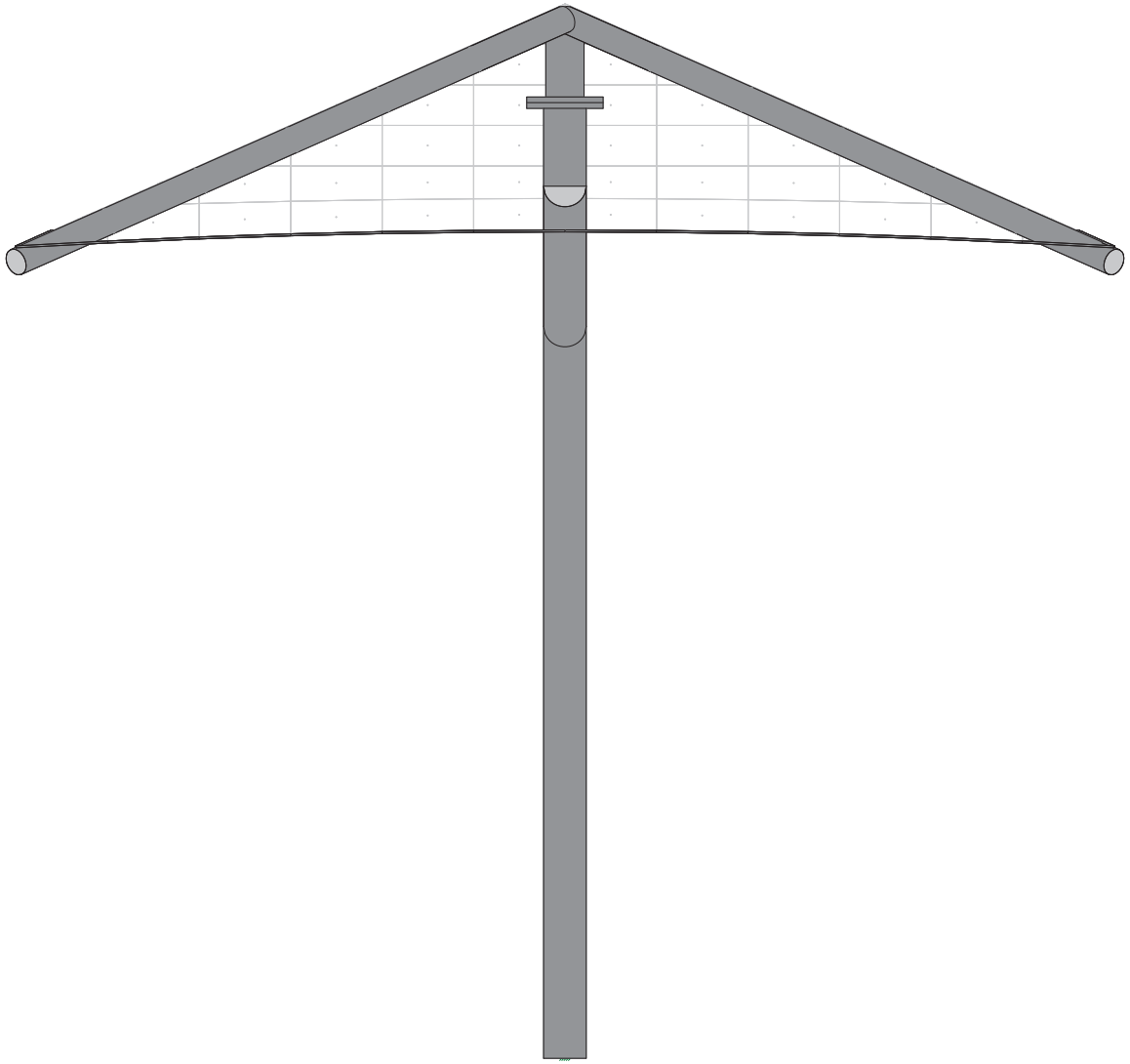
Area of footing =	*3.1*	*ft²*	
Volume of Footing =	*18.8*	*ft³*	
Weight =	*2733.2*	*lbs*	
Max Axial Load =	**1376.0**	*lbs*	
Total vertical Load =	*4109.2*	*lbs*	
AFR=	*250.0*	*psf*	*AFR=Allowable Frictional Resistance Section 1810.3.3.1.4 (max 500 psf)*
Friction Resistance=	*6283.2*	*lbs*	*Excluding upper two feet*
Actual Load=	*-2174.0*	*lbs*	
Actual Pressure =	***-692.0***	***psf***	***OK is less than allowable***
Pier Weight +Friction =	*3005.46*	*lbs*	*Using a safety factor of 3*
Max Uplift =	*1000.00*	*lbs*	
Actual Lift Force =	*-2005.46*	*psf*	***OK is less than allowable***

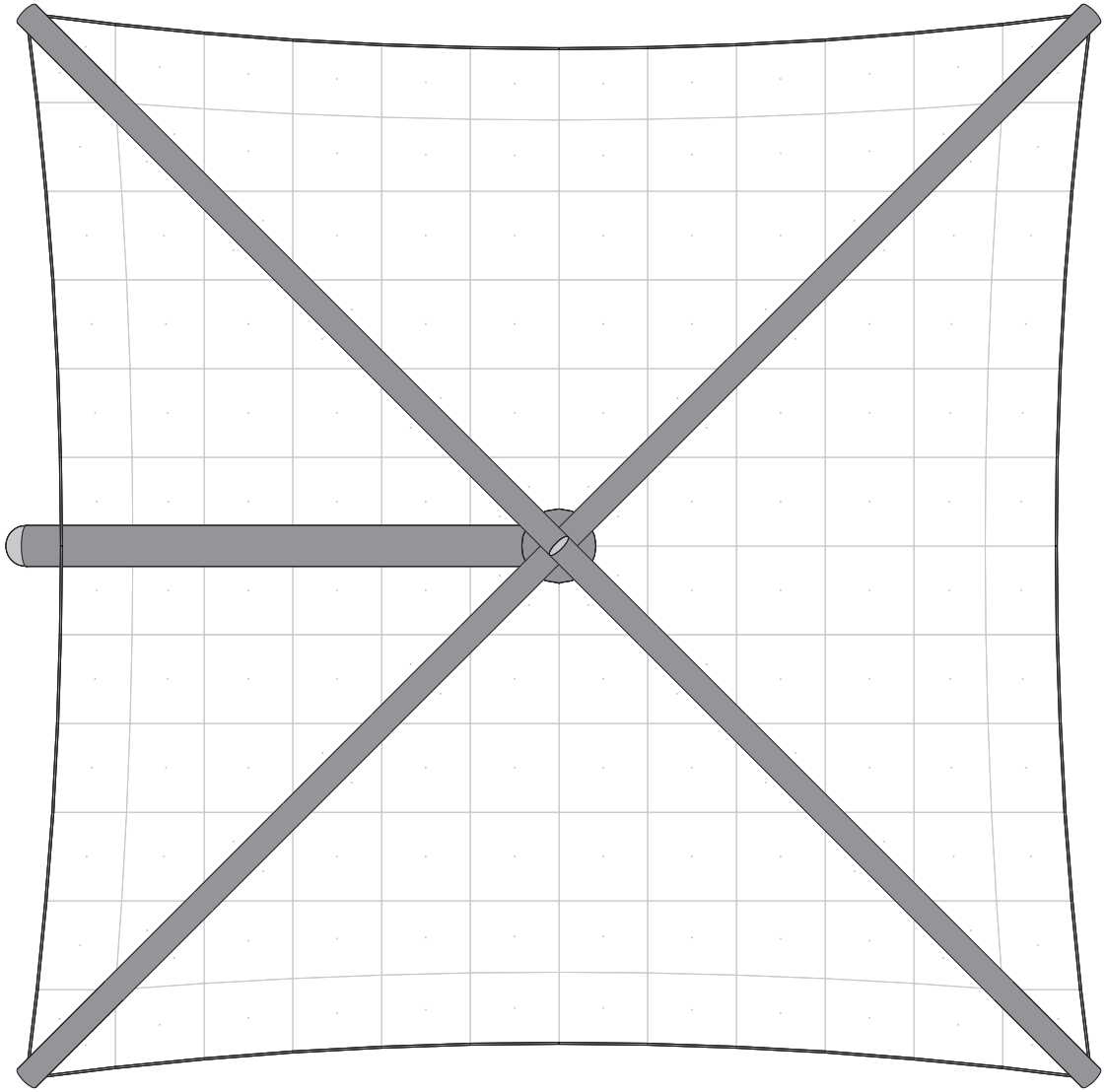
Minimum Vertical Reinforcing Steel:

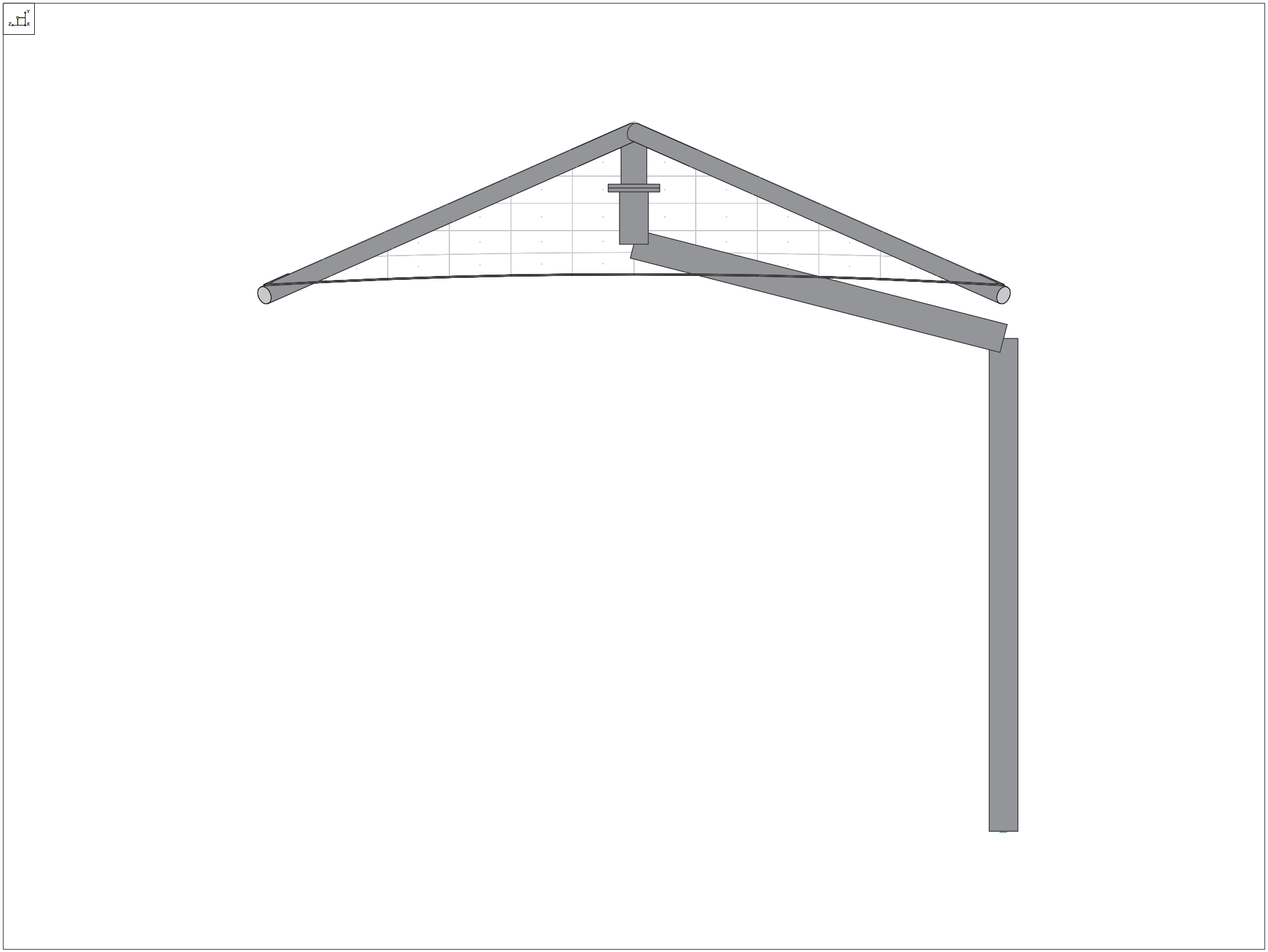
As min =	*4.52*	*in²*
# bar =	**8**	
Qty =	**6**	

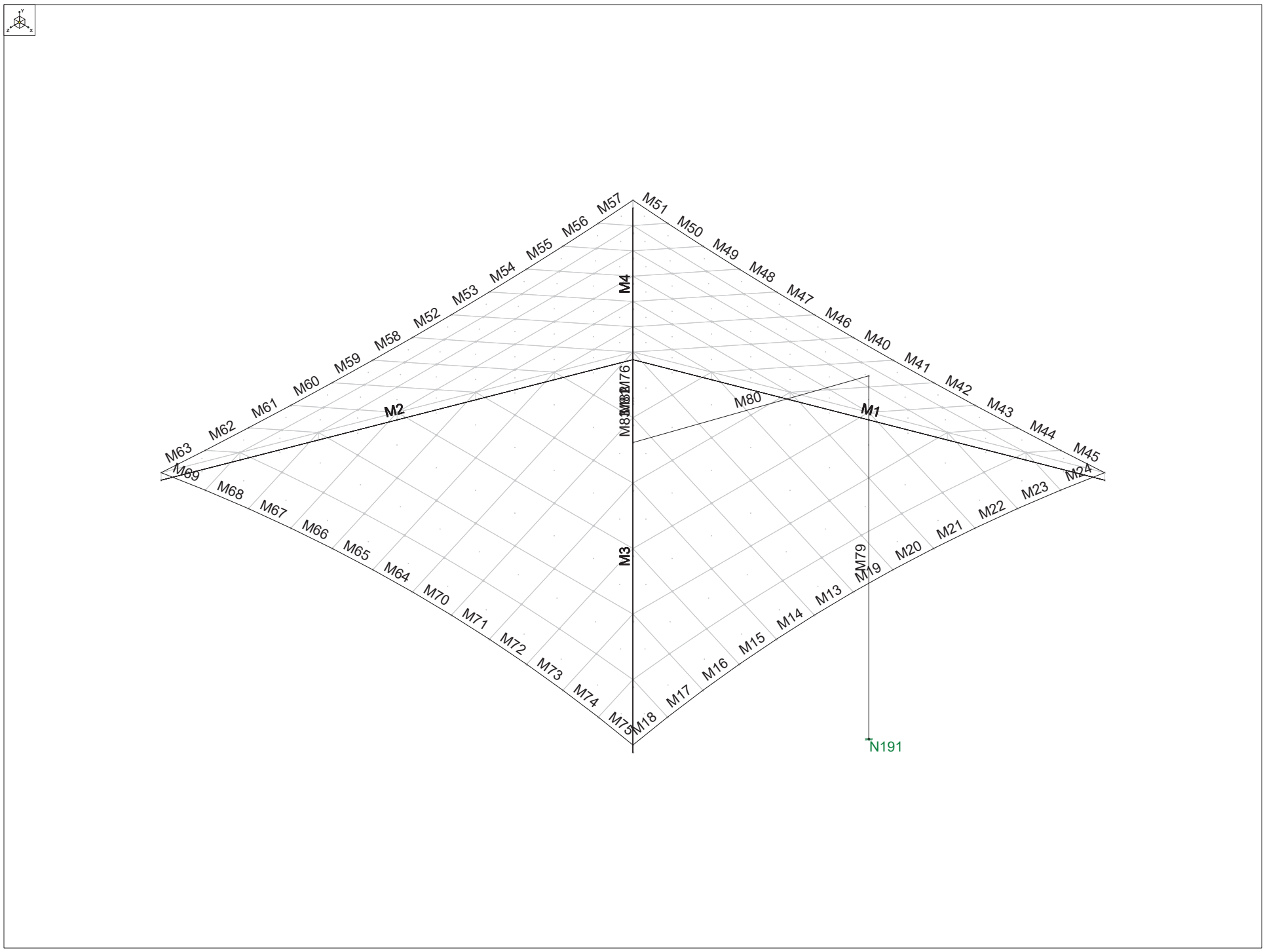
Use a footing with **2.0** ft. Diameter and a minimum of **6.0** ft. Deep










M1
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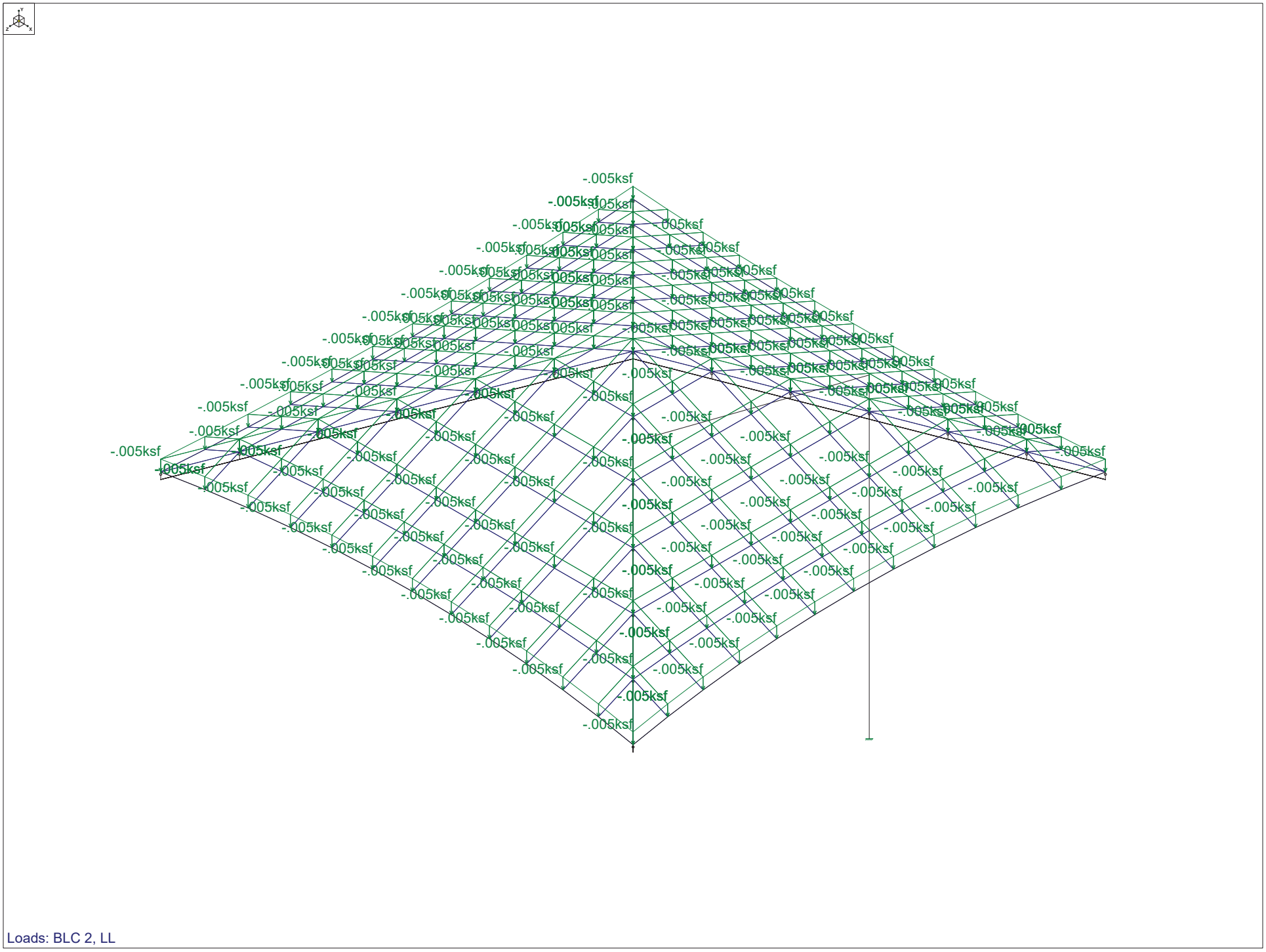
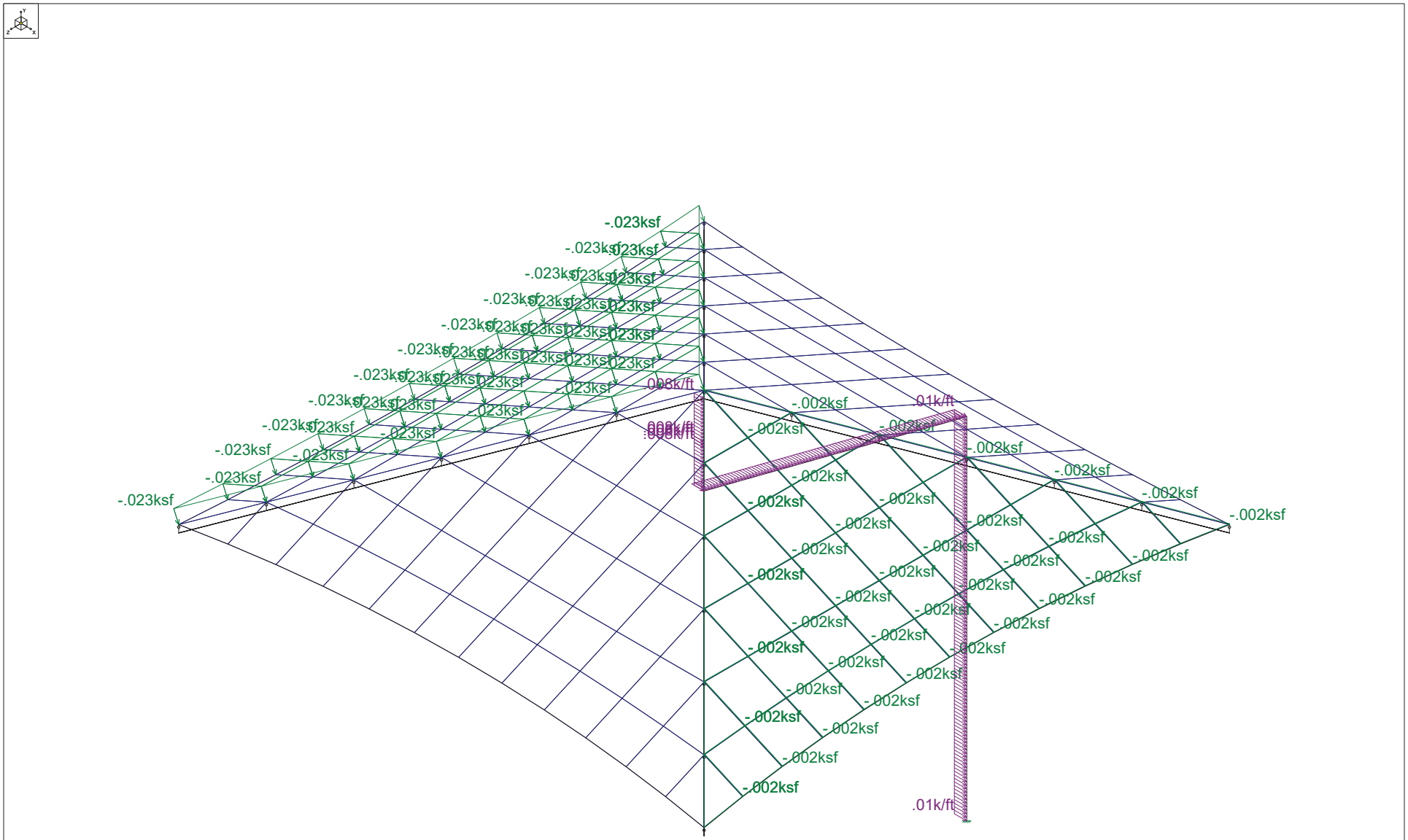
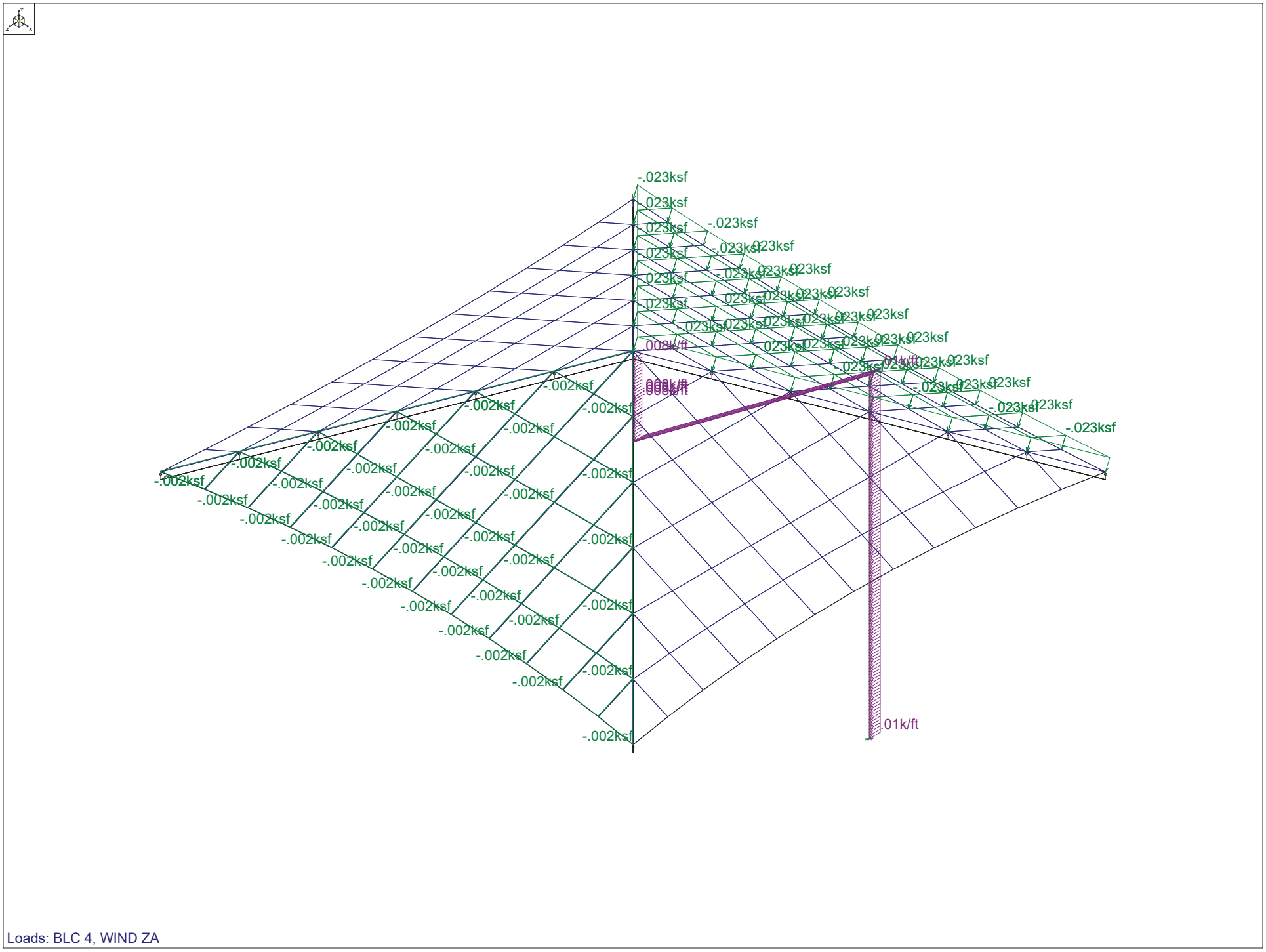


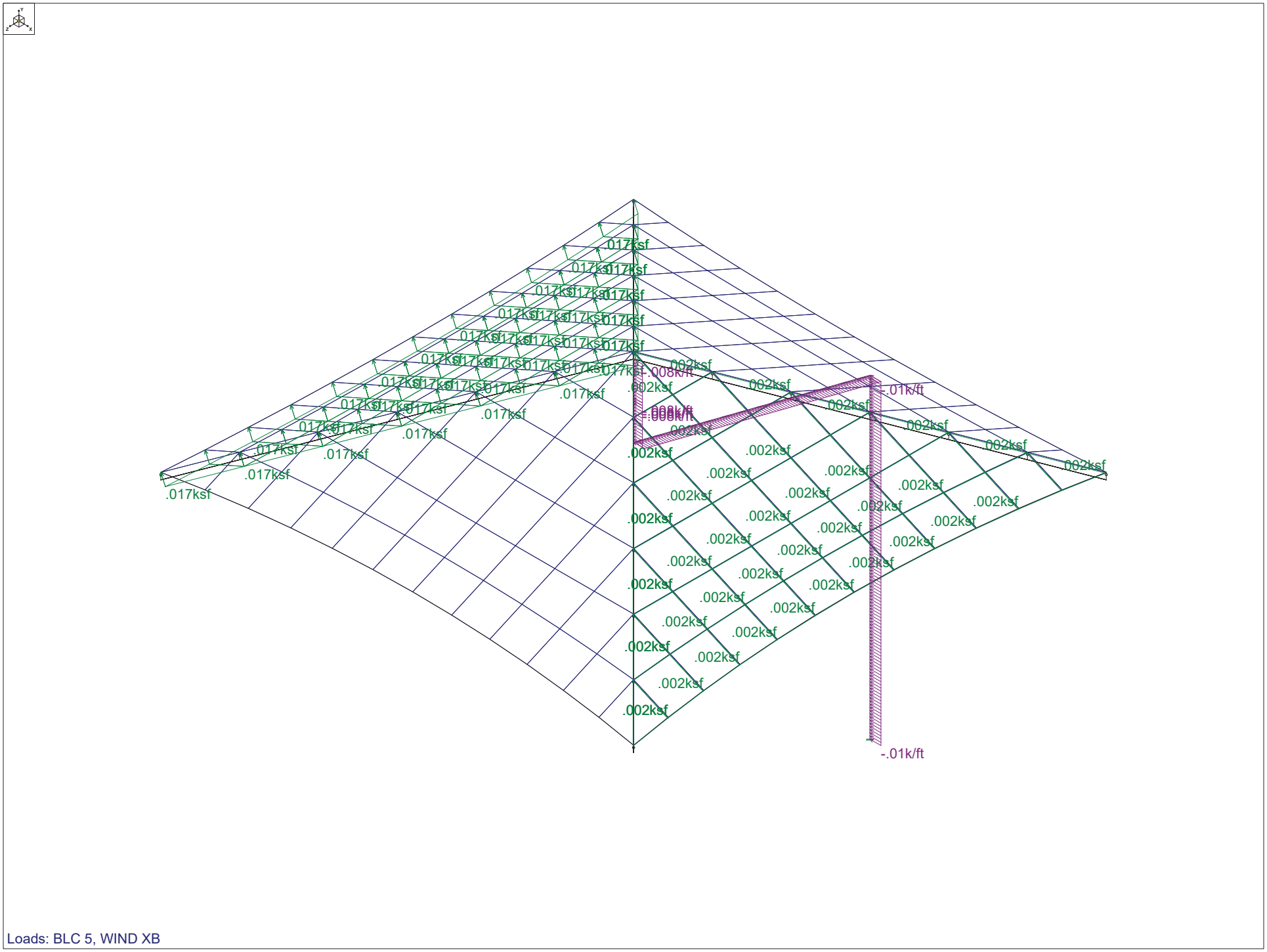
Loads: BLC 2, LL



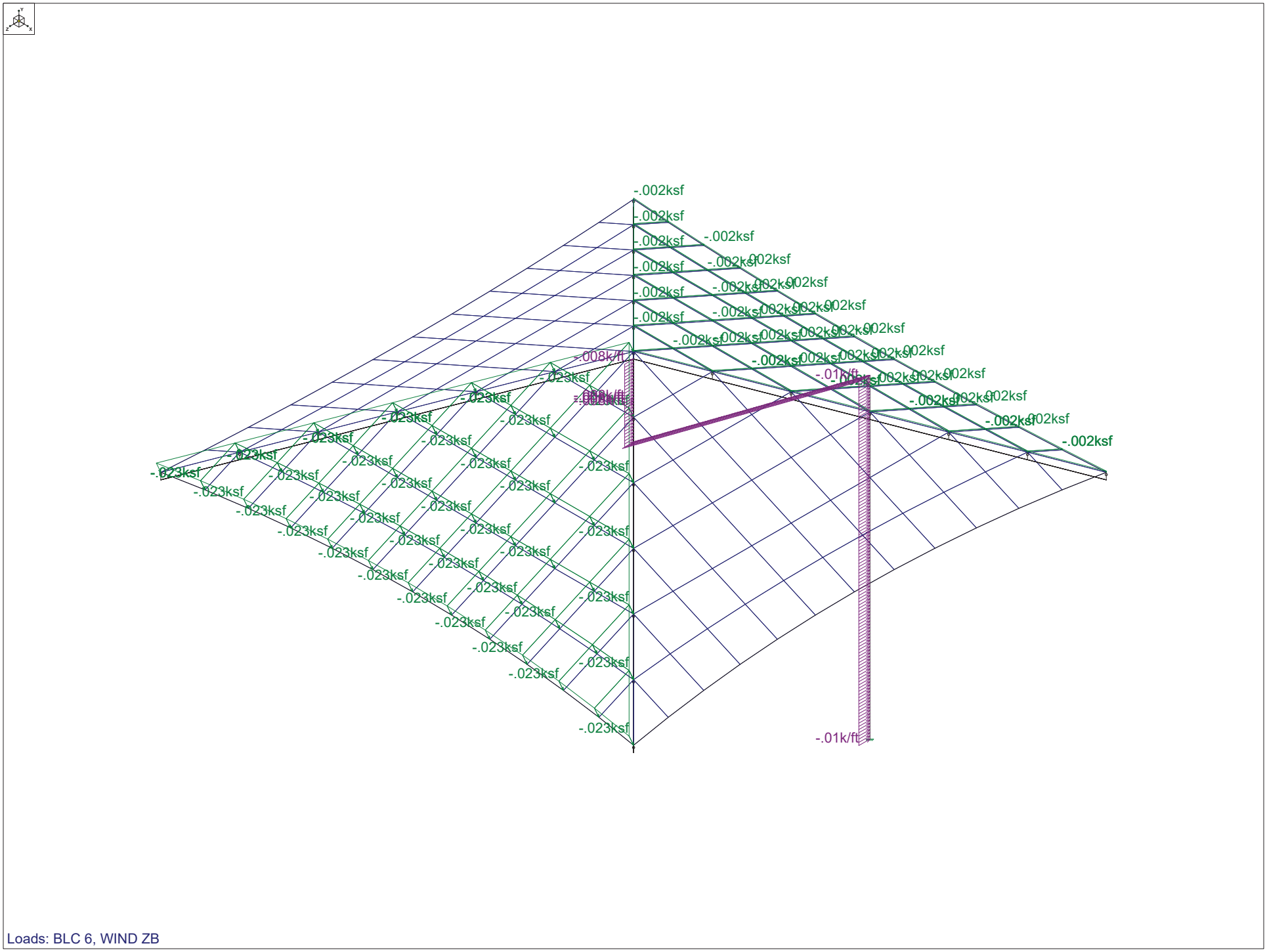
Loads: BLC 3, WIND XA



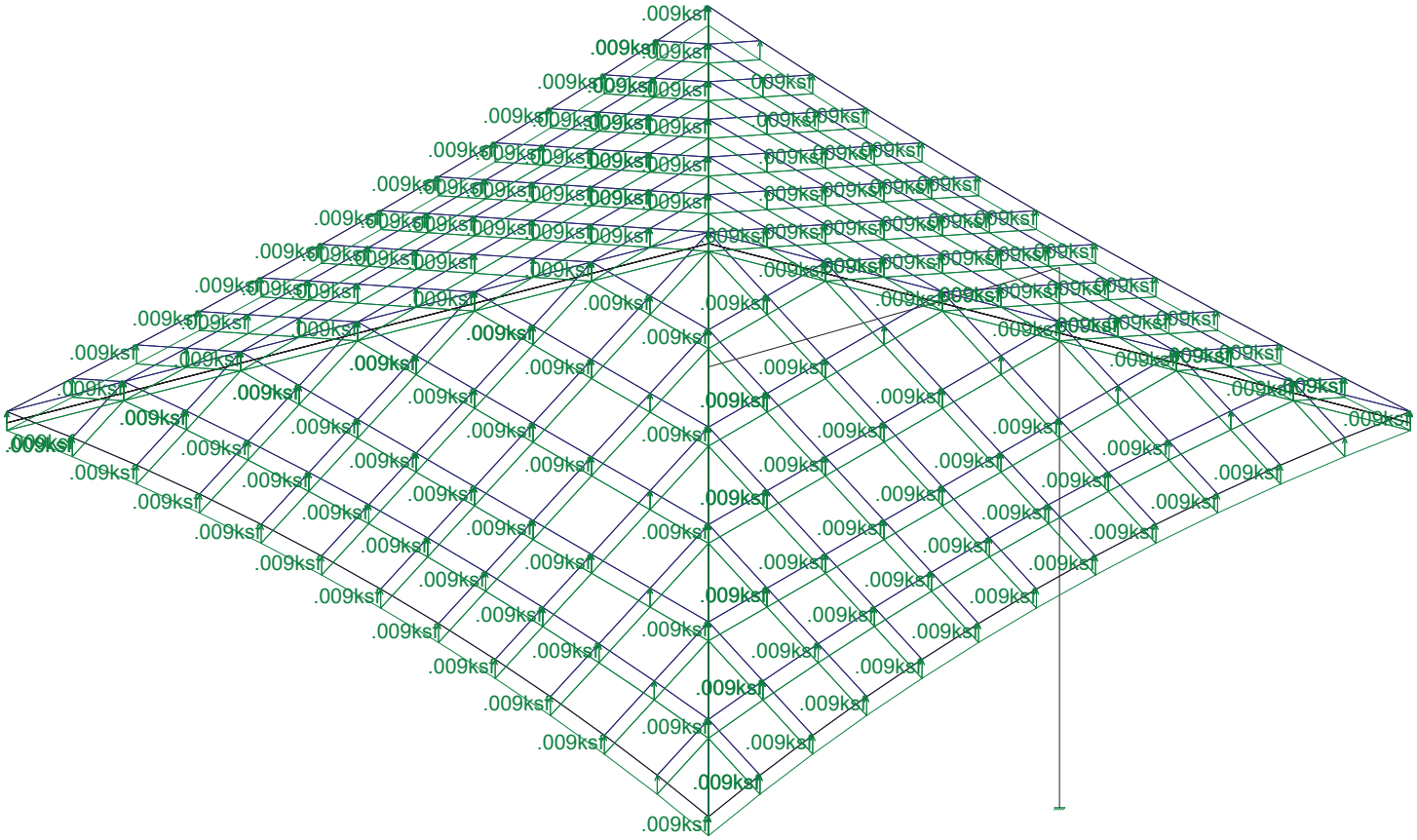
Loads: BLC 4, WIND ZA



Loads: BLC 5, WIND XB



Loads: BLC 6, WIND ZB



Loads: BLC 7, UPLIFT

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	No
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Standard Skyline
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)
RISAConnection Code	None
Cold Formed Steel Code	None
Wood Code	None
Wood Temperature	< 100F
Concrete Code	ACI 318-14
Masonry Code	None
Aluminum Code	None - Building

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

(Global) Model Settings, Continued

Seismic Code	None
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	No
Ct X	.035
Ct Z	.035
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	2.5
R Z	2.5
Footing Overturning Safety Factor	1.5
Optimize for OTM/Sliding	No
Check Concrete Bearing	No
Footing Concrete Weight (k/ft^3)	.145
Footing Concrete f'c (ksi)	2.5
Footing Concrete Ec (ksi)	2850
Lambda	1
Footing Steel fy (ksi)	60
Minimum Steel	0.0018
Maximum Steel	0.0018
Footing Top Bar	#5
Footing Top Bar Cover (in)	3
Footing Bottom Bar	#5
Footing Bottom Bar Cover (in)	3
Pedestal Bar	#6
Pedestal Bar Cover (in)	3
Pedestal Ties	#3

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E..	Density[k/ft...	Yield[ksi]	Ry	Fu[ksi]	Rt
1	50KSI	29000	11154	.3	.65	.49	50	1.1	58	1.2
2	45KSI	29000	11154	.3	.65	.49	45	1.3	58	1.1
3	WIREROPE	12000		.3	.65	0	86	1.1	58	1.2

General Material Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E5 F)	Density[k/ft^3]
1	LINK	1e+6		.3	.65	0
2	FABRIC	1500		.5	.65	.002
3	C-ONLY	10		.3	.65	0

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diap...
1	N1	6	11.7	0	0	
2	N2	6	11.7	12	0	
3	N3	1	13.913	7	0	
4	N4	2	13.47	8	0	
5	N5	3	13.028	9	0	
6	N6	4	12.585	10	0	

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diap...
7	N7	5	12.143	11	0	
8	N8	5.879	11.92	11	0	
9	N9	5.781	11.964	10	0	
10	N10	5.704	11.998	9	0	
11	N11	5.65	12.022	8	0	
12	N12	5.617	12.036	7	0	
13	N13	5.606	12.041	6	0	
14	N14	5.617	12.036	5	0	
15	N15	5.65	12.022	4	0	
16	N16	5.704	11.998	3	0	
17	N17	5.781	11.964	2	0	
18	N18	5.879	11.92	1	0	
19	N19	4.929	12.341	10	0	
20	N20	4.874	12.365	9	0	
21	N21	4.835	12.383	8	0	
22	N22	4.811	12.393	7	0	
23	N23	4.803	12.397	6	0	
24	N24	4.811	12.393	5	0	
25	N25	4.835	12.383	4	0	
26	N26	4.874	12.365	3	0	
27	N27	4.929	12.341	2	0	
28	N28	4	12.752	9	0	
29	N29	4	12.752	8	0	
30	N30	4	12.752	7	0	
31	N31	4	12.752	6	0	
32	N32	4	12.752	5	0	
33	N33	4	12.752	4	0	
34	N34	4	12.752	3	0	
35	N35	3	13.195	8	0	
36	N36	3	13.195	7	0	
37	N37	3	13.195	6	0	
38	N38	3	13.195	5	0	
39	N39	3	13.195	4	0	
40	N40	2	13.637	7	0	
41	N41	2	13.637	6	0	
42	N42	2	13.637	5	0	
43	N43	1	14.08	6	0	
44	N44	1	13.913	5	0	
45	N45	2	13.47	4	0	
46	N46	3	13.028	3	0	
47	N47	4	12.585	2	0	
48	N48	5	12.143	1	0	
49	N49	-1	13.913	5	0	
50	N50	-2	13.47	4	0	
51	N51	-3	13.028	3	0	
52	N52	-4	12.585	2	0	
53	N53	-5	12.143	1	0	
54	N54	-1	13.913	7	0	
55	N55	-2	13.47	8	0	
56	N56	-3	13.028	9	0	
57	N57	-4	12.585	10	0	
58	N58	-5	12.143	11	0	

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diap...
59	N59	6	11.867	0	0	
60	N60	5	11.92	.121	0	
61	N61	4	11.964	.219	0	
62	N62	3	11.998	.296	0	
63	N63	2	12.022	.35	0	
64	N64	1	12.036	.383	0	
65	N65	0	12.041	.394	0	
66	N66	-1	12.036	.383	0	
67	N67	-2	12.022	.35	0	
68	N68	-3	11.998	.296	0	
69	N69	-4	11.964	.219	0	
70	N70	-5	11.92	.121	0	
71	N71	5	12.309	1	0	
72	N72	4	12.341	1.071	0	
73	N73	3	12.365	1.126	0	
74	N74	2	12.383	1.165	0	
75	N75	1	12.393	1.189	0	
76	N76	0	12.397	1.197	0	
77	N77	-1	12.393	1.189	0	
78	N78	-2	12.383	1.165	0	
79	N79	-3	12.365	1.126	0	
80	N80	-4	12.341	1.071	0	
81	N81	4	12.752	2	0	
82	N82	3	12.752	2	0	
83	N83	2	12.752	2	0	
84	N84	1	12.752	2	0	
85	N85	0	12.752	2	0	
86	N86	-1	12.752	2	0	
87	N87	-2	12.752	2	0	
88	N88	-3	12.752	2	0	
89	N89	3	13.195	3	0	
90	N90	2	13.195	3	0	
91	N91	1	13.195	3	0	
92	N92	0	13.195	3	0	
93	N93	-1	13.195	3	0	
94	N94	-2	13.195	3	0	
95	N95	2	13.637	4	0	
96	N96	1	13.637	4	0	
97	N97	0	13.637	4	0	
98	N98	-1	13.637	4	0	
99	N99	1	14.08	5	0	
100	N100	0	14.08	5	0	
101	N101	-5.879	11.92	1	0	
102	N102	-5.781	11.964	2	0	
103	N103	-5.704	11.998	3	0	
104	N104	-5.65	12.022	4	0	
105	N105	-5.617	12.036	5	0	
106	N106	-5.606	12.041	6	0	
107	N107	-5.617	12.036	7	0	
108	N108	-5.65	12.022	8	0	
109	N109	-5.704	11.998	9	0	
110	N110	-5.781	11.964	10	0	

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diap...
111	N111	-5.879	11.92	11	0	
112	N112	-5	12.309	1	0	
113	N113	-4.929	12.341	2	0	
114	N114	-4.874	12.365	3	0	
115	N115	-4.835	12.383	4	0	
116	N116	-4.811	12.393	5	0	
117	N117	-4.803	12.397	6	0	
118	N118	-4.811	12.393	7	0	
119	N119	-4.835	12.383	8	0	
120	N120	-4.874	12.365	9	0	
121	N121	-4.929	12.341	10	0	
122	N122	-4	12.752	2	0	
123	N123	-4	12.752	3	0	
124	N124	-4	12.752	4	0	
125	N125	-4	12.752	5	0	
126	N126	-4	12.752	6	0	
127	N127	-4	12.752	7	0	
128	N128	-4	12.752	8	0	
129	N129	-4	12.752	9	0	
130	N130	-3	13.195	3	0	
131	N131	-3	13.195	4	0	
132	N132	-3	13.195	5	0	
133	N133	-3	13.195	6	0	
134	N134	-3	13.195	7	0	
135	N135	-3	13.195	8	0	
136	N136	-2	13.637	4	0	
137	N137	-2	13.637	5	0	
138	N138	-2	13.637	6	0	
139	N139	-2	13.637	7	0	
140	N140	-1	14.08	5	0	
141	N141	-1	14.08	6	0	
142	N142	-5	11.92	11.879	0	
143	N143	-4	11.964	11.781	0	
144	N144	-3	11.998	11.704	0	
145	N145	-2	12.022	11.65	0	
146	N146	-1	12.036	11.617	0	
147	N147	0	12.041	11.606	0	
148	N148	1	12.036	11.617	0	
149	N149	2	12.022	11.65	0	
150	N150	3	11.998	11.704	0	
151	N151	4	11.964	11.781	0	
152	N152	6	11.867	12	0	
153	N153	5	11.92	11.879	0	
154	N154	-5	12.309	11	0	
155	N155	-4	12.341	10.929	0	
156	N156	-3	12.365	10.874	0	
157	N157	-2	12.383	10.835	0	
158	N158	-1	12.393	10.811	0	
159	N159	0	12.397	10.803	0	
160	N160	1	12.393	10.811	0	
161	N161	2	12.383	10.835	0	
162	N162	3	12.365	10.874	0	

Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diap...
163	N163	5	12.309	11	0	
164	N164	4	12.341	10.929	0	
165	N165	-4	12.752	10	0	
166	N166	-3	12.752	10	0	
167	N167	-2	12.752	10	0	
168	N168	-1	12.752	10	0	
169	N169	0	12.752	10	0	
170	N170	1	12.752	10	0	
171	N171	2	12.752	10	0	
172	N172	4	12.752	10	0	
173	N173	3	12.752	10	0	
174	N174	-3	13.195	9	0	
175	N175	-2	13.195	9	0	
176	N176	-1	13.195	9	0	
177	N177	0	13.195	9	0	
178	N178	1	13.195	9	0	
179	N179	3	13.195	9	0	
180	N180	2	13.195	9	0	
181	N181	-2	13.637	8	0	
182	N182	-1	13.637	8	0	
183	N183	0	13.637	8	0	
184	N184	2	13.637	8	0	
185	N185	1	13.637	8	0	
186	N186	-1	14.08	7	0	
187	N187	1	14.08	7	0	
188	N188	0	14.08	7	0	
189	N189	0	14.522	6	0	
190	N190	0	14.355	6	0	
191	N191	0	0	0	0	
192	N192	-6	11.7	0	0	
193	N193	-6	11.867	0	0	
194	N194	-6	11.7	12	0	
195	N195	-6	11.867	12	0	
196	N196	0	12.53	6	0	
197	N197	0	11	0	0	
198	N198	0	13.443	6	0	
199	N199	0	13.505	6	0	
200	N200	0	13.38	6	0	

Member Primary Data

	Label	I Joint	J Joint	K J...Rot...		Section/Shape	Type	Design List	Material	Design Rules
1	M1	N1	N190			RAFTER	Beam	Pipe	45KSI	Typical
2	M2	N194	N190			RAFTER	Beam	Pipe	45KSI	Typical
3	M3	N190	N2			RAFTER	Beam	Pipe	45KSI	Typical
4	M4	N190	N192			RAFTER	Beam	Pipe	45KSI	Typical
5	M5	N1	N59			RIGID	None	None	LINK	Typical
6	M6	N190	N189			C-ONLY	None	None	C-ONLY	TRUSS-RULES
7	M7	N2	N152			RIGID	None	None	LINK	Typical
8	M8	N3	N187			C-ONLY	None	None	C-ONLY	TRUSS-RULES
9	M9	N4	N184			C-ONLY	None	None	C-ONLY	TRUSS-RULES

Member Primary Data (Continued)

	Label	I Joint	J Joint	K J...Rot...		Section/Shape	Type	Design List	Material	Design Rules
10	M10	N5	N179			C-ONLY	None	None	C-ONLY	TRUSS-RULES
11	M11	N6	N172			C-ONLY	None	None	C-ONLY	TRUSS-RULES
12	M12	N7	N163			C-ONLY	None	None	C-ONLY	TRUSS-RULES
13	M13	N13	N12			CABLES	Beam	None	WIREROPE	Typical
14	M14	N12	N11			CABLES	Beam	None	WIREROPE	Typical
15	M15	N11	N10			CABLES	Beam	None	WIREROPE	Typical
16	M16	N10	N9			CABLES	Beam	None	WIREROPE	Typical
17	M17	N9	N8			CABLES	Beam	None	WIREROPE	Typical
18	M18	N8	N152			CABLES	Beam	None	WIREROPE	Typical
19	M19	N13	N14			CABLES	Beam	None	WIREROPE	Typical
20	M20	N14	N15			CABLES	Beam	None	WIREROPE	Typical
21	M21	N15	N16			CABLES	Beam	None	WIREROPE	Typical
22	M22	N16	N17			CABLES	Beam	None	WIREROPE	Typical
23	M23	N17	N18			CABLES	Beam	None	WIREROPE	Typical
24	M24	N18	N59			CABLES	Beam	None	WIREROPE	Typical
25	M25	N44	N99			C-ONLY	None	None	C-ONLY	TRUSS-RULES
26	M26	N45	N95			C-ONLY	None	None	C-ONLY	TRUSS-RULES
27	M27	N46	N89			C-ONLY	None	None	C-ONLY	TRUSS-RULES
28	M28	N47	N81			C-ONLY	None	None	C-ONLY	TRUSS-RULES
29	M29	N48	N71			C-ONLY	None	None	C-ONLY	TRUSS-RULES
30	M30	N49	N140			C-ONLY	None	None	C-ONLY	TRUSS-RULES
31	M31	N50	N136			C-ONLY	None	None	C-ONLY	TRUSS-RULES
32	M32	N51	N130			C-ONLY	None	None	C-ONLY	TRUSS-RULES
33	M33	N52	N122			C-ONLY	None	None	C-ONLY	TRUSS-RULES
34	M34	N53	N112			C-ONLY	None	None	C-ONLY	TRUSS-RULES
35	M35	N54	N186			C-ONLY	None	None	C-ONLY	TRUSS-RULES
36	M36	N55	N181			C-ONLY	None	None	C-ONLY	TRUSS-RULES
37	M37	N56	N174			C-ONLY	None	None	C-ONLY	TRUSS-RULES
38	M38	N57	N165			C-ONLY	None	None	C-ONLY	TRUSS-RULES
39	M39	N58	N154			C-ONLY	None	None	C-ONLY	TRUSS-RULES
40	M40	N65	N64			CABLES	Beam	None	WIREROPE	Typical
41	M41	N64	N63			CABLES	Beam	None	WIREROPE	Typical
42	M42	N63	N62			CABLES	Beam	None	WIREROPE	Typical
43	M43	N62	N61			CABLES	Beam	None	WIREROPE	Typical
44	M44	N61	N60			CABLES	Beam	None	WIREROPE	Typical
45	M45	N60	N59			CABLES	Beam	None	WIREROPE	Typical
46	M46	N65	N66			CABLES	Beam	None	WIREROPE	Typical
47	M47	N66	N67			CABLES	Beam	None	WIREROPE	Typical
48	M48	N67	N68			CABLES	Beam	None	WIREROPE	Typical
49	M49	N68	N69			CABLES	Beam	None	WIREROPE	Typical
50	M50	N69	N70			CABLES	Beam	None	WIREROPE	Typical
51	M51	N70	N193			CABLES	Beam	None	WIREROPE	Typical
52	M52	N106	N105			CABLES	Beam	None	WIREROPE	Typical
53	M53	N105	N104			CABLES	Beam	None	WIREROPE	Typical
54	M54	N104	N103			CABLES	Beam	None	WIREROPE	Typical
55	M55	N103	N102			CABLES	Beam	None	WIREROPE	Typical
56	M56	N102	N101			CABLES	Beam	None	WIREROPE	Typical
57	M57	N101	N193			CABLES	Beam	None	WIREROPE	Typical
58	M58	N106	N107			CABLES	Beam	None	WIREROPE	Typical
59	M59	N107	N108			CABLES	Beam	None	WIREROPE	Typical
60	M60	N108	N109			CABLES	Beam	None	WIREROPE	Typical
61	M61	N109	N110			CABLES	Beam	None	WIREROPE	Typical

Member Primary Data (Continued)

	Label	I Joint	J Joint	K J...Rot...		Section/Shape	Type	Design List	Material	Design Rules
62	M62	N110	N111			CABLES	Beam	None	WIREROPE	Typical
63	M63	N111	N195			CABLES	Beam	None	WIREROPE	Typical
64	M64	N147	N146			CABLES	Beam	None	WIREROPE	Typical
65	M65	N146	N145			CABLES	Beam	None	WIREROPE	Typical
66	M66	N145	N144			CABLES	Beam	None	WIREROPE	Typical
67	M67	N144	N143			CABLES	Beam	None	WIREROPE	Typical
68	M68	N143	N142			CABLES	Beam	None	WIREROPE	Typical
69	M69	N142	N195			CABLES	Beam	None	WIREROPE	Typical
70	M70	N147	N148			CABLES	Beam	None	WIREROPE	Typical
71	M71	N148	N149			CABLES	Beam	None	WIREROPE	Typical
72	M72	N149	N150			CABLES	Beam	None	WIREROPE	Typical
73	M73	N150	N151			CABLES	Beam	None	WIREROPE	Typical
74	M74	N151	N153			CABLES	Beam	None	WIREROPE	Typical
75	M75	N153	N152			CABLES	Beam	None	WIREROPE	Typical
76	M76	N190	N199			CROWN	Column	Pipe	45KSI	Typical
77	M77	N192	N193			RIGID	None	None	LINK	Typical
78	M78	N194	N195			RIGID	None	None	LINK	Typical
79	M79	N191	N197			COLUMN/CANTI	Column	Pipe	45KSI	Typical
80	M80	N197	N196			COLUMN/CANTI	Column	Pipe	45KSI	Typical
81	M81	N198	N200			CONN PLATES	Column	None	50KSI	Typical
82	M82	N199	N198			CONN PLATES	Column	None	50KSI	Typical
83	M83	N200	N196			COLUMN/CANTI	Column	Pipe	45KSI	Typical

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Ru...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	COLUMN/CANTI	5 SCH 40 (5.563X0.258)	Column	Pipe	45KSI	Typical	4.3	15.162	15.162	30.324
2	CROWN	5.0 GA 7 RD. TUBING	Column	Pipe	45KSI	Typical	2.842	8.239	8.239	16.477
3	RAFTER	3.5 GA 8 RD. TUBING	Beam	Pipe	45KSI	Typical	1.729	2.409	2.409	4.819
4	CABLES	1/4 1	Beam	None	WIRERO...	Typical	.049	6	6	1
5	CONN PLATES	SPPYR PLATE	Column	None	50KSI	Typical	78.54	490.874	490.874	981.748

General Section Sets

	Label	Shape	Type	Material	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	RIGID		None	LINK	1e+6	1e+8	1e+8	1e+6
2	C-ONLY	ARB_C-ONLY_1	None	C-ONLY	.1	1	.1	.1

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]
1	N191	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(Mem...	Surface(Pla...
1	DL	DL		-1				48		
2	LL	LL								168
3	WIND XA	WL						6		84
4	WIND ZA	WL						6		84

Basic Load Cases (Continued)

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(Mem...	Surface(Pla...
5	WIND XB	WL						6		84
6	WIND ZB	WL						6		84
7	UPLIFT	WL								168

Load Combinations

	Description	SolvePD...			BLC	Fact...	BLC	Factor	BLC	Fac...	BLC	Fact...
1	DL + LL	Yes	C		1	1	2	1				
2	0.6 DL + 0.6 WL (XA)	Yes	C		1	.6	3	.6				
3	0.6 DL + 0.6 WL (ZA)	Yes	C		1	.6	4	.6				
4	0.6 DL + 0.6 WL (XB)	Yes	C		1	.6	5	.6				
5	0.6 DL + 0.6 WL (ZB)	Yes	C		1	.6	6	.6				
6	0.6 DL + WL (UPLIFT)	Yes	C		1	.6	7	1				
7	DL + 0.75 [LL + 0.6 WL (XA)]	Yes	C		1	1	2	.75	3	.45		
8	DL + 0.75 [LL + 0.6 WL (ZA)]	Yes	C		1	1	2	.75	4	.45		
9	DL + 0.75 [LL + 0.6 WL (XB)]	Yes	C		1	1	2	.75	5	.45		
10	DL + 0.75 [LL + 0.6 WL (ZB)]	Yes	C		1	1	2	.75	6	.45		

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N191	max	.241	4	1.376	8	.299	5	9.146	6	1.053	4	1.713	2
2		min	-.299	2	-1	6	-.299	3	-8.869	8	-1.286	2	-1.386	4
3	Totals:	max	.241	4	1.376	8	.299	5						
4		min	-.299	2	-1	6	-.299	3						

Hot Rolled Steel Design Parameters

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bo...	L-tor...	Kyy	Kzz	Cb	Function
1	M1	RAFTER	8.891			Lbyy						Lateral
2	M2	RAFTER	8.891			Lbyy						Lateral
3	M3	RAFTER	8.891			Lbyy						Lateral
4	M4	RAFTER	8.891			Lbyy						Lateral
5	M13	CABLES	1			Lbyy						Lateral
6	M14	CABLES	1.001			Lbyy						Lateral
7	M15	CABLES	1.002			Lbyy						Lateral
8	M16	CABLES	1.004			Lbyy						Lateral
9	M17	CABLES	1.006			Lbyy						Lateral
10	M18	CABLES	1.009			Lbyy						Lateral
11	M19	CABLES	1			Lbyy						Lateral
12	M20	CABLES	1.001			Lbyy						Lateral
13	M21	CABLES	1.002			Lbyy						Lateral
14	M22	CABLES	1.004			Lbyy						Lateral
15	M23	CABLES	1.006			Lbyy						Lateral
16	M24	CABLES	1.009			Lbyy						Lateral
17	M40	CABLES	1			Lbyy						Lateral
18	M41	CABLES	1.001			Lbyy						Lateral
19	M42	CABLES	1.002			Lbyy						Lateral
20	M43	CABLES	1.004			Lbyy						Lateral
21	M44	CABLES	1.006			Lbyy						Lateral

Hot Rolled Steel Design Parameters (Continued)

	Label	Shape	Length[ft]	Lbyy[ft]	Lbzz[ft]	Lcomp top[ft]	Lcomp bo...	L-tor...	Kyy	Kzz	Cb	Function
22	M45	CABLES	1.009			Lbyy						Lateral
23	M46	CABLES	1			Lbyy						Lateral
24	M47	CABLES	1.001			Lbyy						Lateral
25	M48	CABLES	1.002			Lbyy						Lateral
26	M49	CABLES	1.004			Lbyy						Lateral
27	M50	CABLES	1.006			Lbyy						Lateral
28	M51	CABLES	1.009			Lbyy						Lateral
29	M52	CABLES	1			Lbyy						Lateral
30	M53	CABLES	1.001			Lbyy						Lateral
31	M54	CABLES	1.002			Lbyy						Lateral
32	M55	CABLES	1.004			Lbyy						Lateral
33	M56	CABLES	1.006			Lbyy						Lateral
34	M57	CABLES	1.009			Lbyy						Lateral
35	M58	CABLES	1			Lbyy						Lateral
36	M59	CABLES	1.001			Lbyy						Lateral
37	M60	CABLES	1.002			Lbyy						Lateral
38	M61	CABLES	1.004			Lbyy						Lateral
39	M62	CABLES	1.006			Lbyy						Lateral
40	M63	CABLES	1.009			Lbyy						Lateral
41	M64	CABLES	1			Lbyy						Lateral
42	M65	CABLES	1.001			Lbyy						Lateral
43	M66	CABLES	1.002			Lbyy						Lateral
44	M67	CABLES	1.004			Lbyy						Lateral
45	M68	CABLES	1.006			Lbyy						Lateral
46	M69	CABLES	1.009			Lbyy						Lateral
47	M70	CABLES	1			Lbyy						Lateral
48	M71	CABLES	1.001			Lbyy						Lateral
49	M72	CABLES	1.002			Lbyy						Lateral
50	M73	CABLES	1.004			Lbyy						Lateral
51	M74	CABLES	1.006			Lbyy						Lateral
52	M75	CABLES	1.009			Lbyy						Lateral
53	M76	CROWN	.85			Lbyy						Lateral
54	M79	COLUMN/CANTI	11			Lbyy						Lateral
55	M80	COLUMN/CANTI	6.192			Lbyy						Lateral
56	M81	CONN PLATES	.063			Lbyy						Lateral
57	M82	CONN PLATES	.062			Lbyy						Lateral
58	M83	COLUMN/CANTI	.85			Lbyy						Lateral

Envelope AISC 14th(360-10): ASD Steel Code Checks

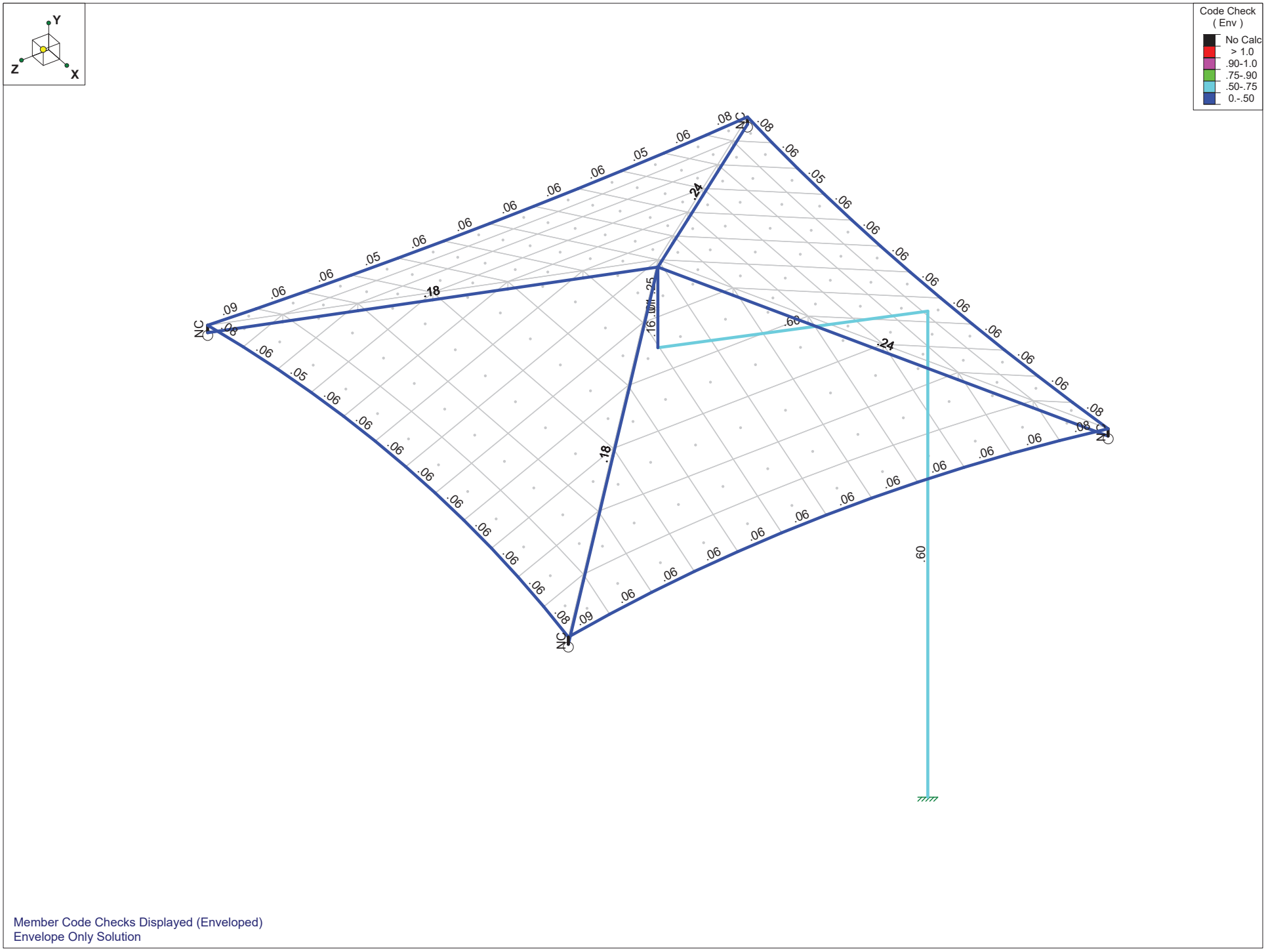
	Member	Shape	Code C...	Loc[ft]	LC	Shear ...	Loc[ft]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/o...	Mnzz/o...	Cb	Eqn
1	M1	3.5 GA 8 RD. TUBING	.238	8.891	6	.029	8.891		3	27.215	46.583	4.124	4.124	2...	H1-1b
2	M2	3.5 GA 8 RD. TUBING	.181	8.891	2	.029	8.891		2	27.215	46.583	4.124	4.124	2...	H1-1b
3	M3	3.5 GA 8 RD. TUBING	.181	0	5	.029	0		5	27.215	46.583	4.124	4.124	2...	H1-1b
4	M4	3.5 GA 8 RD. TUBING	.238	0	6	.029	0		2	27.215	46.583	4.124	4.124	2...	H1-1b
5	M13	1/4 1	.061	0	9	.976	0		6	2.522	2.523	.013	.013	1...	H1-1b
6	M14	1/4 1	.061	0	9	2.930	0		6	2.522	2.523	.013	.013	1...	H1-1b
7	M15	1/4 1	.058	0	9	4.258	0		6	2.522	2.523	.013	.013	1...	H1-1b
8	M16	1/4 1	.060	0	9	5.026	0		6	2.522	2.523	.013	.013	1...	H1-1b
9	M17	1/4 1	.059	0	9	5.721	0		6	2.522	2.523	.013	.013	1...	H1-1b
10	M18	1/4 1	.088	0	6	7.958	0		5	2.522	2.523	.013	.013	1...	H1-1b

Envelope AISC 14th(360-10): ASD Steel Code Checks (Continued)

	Member	Shape	Code C...	Loc[ft]	LC	Shear ...	Loc[ft]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/o...	Mnzz/o...	Cb	Eqn
11	M19	1/4 1	.063	0	9	.792	0		6	2.522	2.523	.013	.013	1...	H1-1b
12	M20	1/4 1	.060	0	9	2.699	0		6	2.522	2.523	.013	.013	1...	H1-1b
13	M21	1/4 1	.061	0	9	3.922	0		6	2.522	2.523	.013	.013	1...	H1-1b
14	M22	1/4 1	.058	0	9	4.536	0		6	2.522	2.523	.013	.013	1...	H1-1b
15	M23	1/4 1	.059	0	9	5.016	0		6	2.522	2.523	.013	.013	1...	H1-1b
16	M24	1/4 1	.079	0	6	7.715	0		3	2.522	2.523	.013	.013	1...	H1-1b
17	M40	1/4 1	.062	0	9	1.772	0		3	2.522	2.523	.013	.013	1...	H1-1b
18	M41	1/4 1	.061	0	9	5.221	0		3	2.522	2.523	.013	.013	1...	H1-1b
19	M42	1/4 1	.060	0	9	7.822	0		3	2.522	2.523	.013	.013	1...	H1-1b
20	M43	1/4 1	.058	0	9	9.083	0		3	2.522	2.523	.013	.013	1...	H1-1b
21	M44	1/4 1	.059	0	9	9.999	0		3	2.522	2.523	.013	.013	1...	H1-1b
22	M45	1/4 1	.083	0	6	3.423	0		3	2.522	2.523	.013	.013	1...	H1-1b
23	M46	1/4 1	.061	0	9	1.834	0		3	2.522	2.523	.013	.013	1...	H1-1b
24	M47	1/4 1	.060	0	9	5.282	0		3	2.522	2.523	.013	.013	1...	H1-1b
25	M48	1/4 1	.057	0	9	7.885	0		3	2.522	2.523	.013	.013	1...	H1-1b
26	M49	1/4 1	.054	0	8	9.140	0		3	2.522	2.523	.013	.013	1...	H1-1b
27	M50	1/4 1	.057	0	8	9.999	0		3	2.522	2.523	.013	.013	1...	H1-1b
28	M51	1/4 1	.083	0	6	7.745	0		2	2.522	2.523	.013	.013	1...	H1-1b
29	M52	1/4 1	.060	0	9	1.768	0		2	2.522	2.523	.013	.013	1...	H1-1b
30	M53	1/4 1	.058	0	9	5.217	0		2	2.522	2.523	.013	.013	1...	H1-1b
31	M54	1/4 1	.058	0	1	7.821	0		2	2.522	2.523	.013	.013	1...	H1-1b
32	M55	1/4 1	.051	0	9	9.081	0		2	2.522	2.523	.013	.013	1...	H1-1b
33	M56	1/4 1	.057	0	7	9.999	0		2	2.522	2.523	.013	.013	1...	H1-1b
34	M57	1/4 1	.079	0	6	7.960	0		3	2.522	2.523	.013	.013	1...	H1-1b
35	M58	1/4 1	.059	0	9	1.840	0		2	2.522	2.523	.013	.013	1...	H1-1b
36	M59	1/4 1	.059	0	9	5.287	0		2	2.522	2.523	.013	.013	1...	H1-1b
37	M60	1/4 1	.054	0	9	7.891	0		2	2.522	2.523	.013	.013	1...	H1-1b
38	M61	1/4 1	.055	0	7	9.146	0		2	2.522	2.523	.013	.013	1...	H1-1b
39	M62	1/4 1	.057	0	7	9.999	0		2	2.522	2.523	.013	.013	1...	H1-1b
40	M63	1/4 1	.088	0	6	7.745	0		5	2.522	2.523	.013	.013	1...	H1-1b
41	M64	1/4 1	.061	0	9	1.769	0		5	2.522	2.523	.013	.013	1...	H1-1b
42	M65	1/4 1	.059	0	9	5.220	0		5	2.522	2.523	.013	.013	1...	H1-1b
43	M66	1/4 1	.057	0	9	7.826	0		5	2.522	2.523	.013	.013	1...	H1-1b
44	M67	1/4 1	.055	0	10	9.087	0		5	2.522	2.523	.013	.013	1...	H1-1b
45	M68	1/4 1	.056	0	10	9.999	0		5	2.522	2.523	.013	.013	1...	H1-1b
46	M69	1/4 1	.084	0	6	7.945	0		2	2.522	2.523	.013	.013	1...	H1-1b
47	M70	1/4 1	.062	0	9	1.843	0		5	2.522	2.523	.013	.013	1...	H1-1b
48	M71	1/4 1	.061	0	9	5.292	0		5	2.522	2.523	.013	.013	1...	H1-1b
49	M72	1/4 1	.060	0	9	7.900	0		5	2.522	2.523	.013	.013	1...	H1-1b
50	M73	1/4 1	.059	0	9	9.158	0		5	2.522	2.523	.013	.013	1...	H1-1b
51	M74	1/4 1	.059	0	9	9.999	0		5	2.522	2.523	.013	.013	1...	H1-1b
52	M75	1/4 1	.084	0	6	3.243	0		5	2.522	2.523	.013	.013	1...	H1-1b
53	M76	5.0 GA 7 RD. TUBING	.254	0	6	.018	.85		4	76.402	76.582	9.78	9.78	1	H1-1b
54	M79	5 SCH 40 (5.563X0.258)	.601	11	6	.101	0		2	83.703	115.868	15.337	15.337	1...	H1-1b
55	M80	5 SCH 40 (5.563X0.258)	.598	0	6	.130	0		2	104.524	115.868	15.337	15.337	1...	H1-1b
56	M81	SPPYR PLATE	.006	0	6	.001	.063		4	2351.476	2351.491	391.915	391.915	1	H1-1b
57	M82	SPPYR PLATE	.006	0	6	.001	.062		4	2351.476	2351.491	391.915	391.915	1	H1-1b
58	M83	5 SCH 40 (5.563X0.258)	.162	0	6	.012	.85		4	115.644	115.868	15.337	15.337	1	H1-1b

Material Takeoff

	Material	Size	Pieces	Length[ft]	Weight[K]
1	General				
2	LINK		4	.7	0
3	C-ONLY	ARB_C-ONLY_1	21	3.5	0
4	Total General		25	4.2	0
5					
6	Hot Rolled Steel				
7	45KSI	3.5 GA 8 RD. TUBING	4	35.6	.2
8	45KSI	5.0 GA 7 RD. TUBING	1	.8	0
9	45KSI	5 SCH 40 (5.563X0.258)	3	18	.3
10	50KSI	SPPYR PLATE	2	.1	0
11	WIREROPE	1/4 1	48	48.2	0
12	Total HR Steel		58	102.7	.5



Member Code Checks Displayed (Enveloped)
Envelope Only Solution