Project Number: U2716-096-191

August 6, 2019

Sunmodo
14800 NE 65th Street
Vancouver, WA 98682

REFERENCE: Sunmodo Sunturf Ground Mount B2a
Ground Mount PV Array Installation

To Whom It May Concern:

Per request of Sunmodo, we have been asked to prepare the structural design of a ground-mounted PV solar array system with several foundation options as shown in the attached calculations. The adopted building code in this jurisdiction is the 2006 International Building Code. Vector Structural Engineering requires that we review each site specific install, and we are not liable for installs at site specific locations we have not reviewed. The following design parameters are used in our analysis:

- Minimum Design Loads for Buildings and Other Structures (ASCE 7-05)
- Design wind speed for occupancy category I structures: 110 mph
- Importance Factor: 0.77
- Wind exposure: C
- Ground snow load: 5 psf
- The ground screws and helical piers must be tested to 1.5 times uplift and 2.0 times lateral reactions found in the table below. A minimum of one ground screw or helical pier must be tested.

Load (ASD)	Value (lbs)	Factor of Safety	Test Value (lbs)
UPLIFT	2910	1.5	4365
LATERAL	1830	2	3660

Foundation concrete shall have a minimum compressive strength of 2500 psi at 28 days. Cement for all concrete shall be Type I or II with a minimum of 6% entrained air with a water/cement ratio of 0.50. Maximum aggregate size shall be 3/4". No special inspection of concrete strength is required.

Footings are designed based on an allowable soil bearing pressure of 1500 psf an allowable skin friction of 250 psf, an allowable lateral bearing pressure of 150 pcf, and a coefficient of friction of 0.3. Vector Structural Engineering strongly recommends independent soils testing be performed by a licensed geotechnical engineer to verify the assumed soil parameters.

All ground mounts are to be installed per manufacturer's recommendations. The use of solar panel support span tables provided by the manufacturer is allowed only where the site conditions and solar panel configuration match the description of the span tables. Electrical engineering is beyond our scope. All work performed must be in accordance with accepted industry-wide methods and applicable safety standards. Vector Structural Engineering assumes no responsibility for improper installation of the solar panels.

Very truly yours,

VECTOR STRUCTURAL ENGINEERING, LLC

EXPIRES: 4-30-2020

08/06/2019

Roger Alworth, P.E.
License: 11412 - Expires: 04/30/2020
Principal

Enclosures

RTA/stb

VECTOR ENGINEERS
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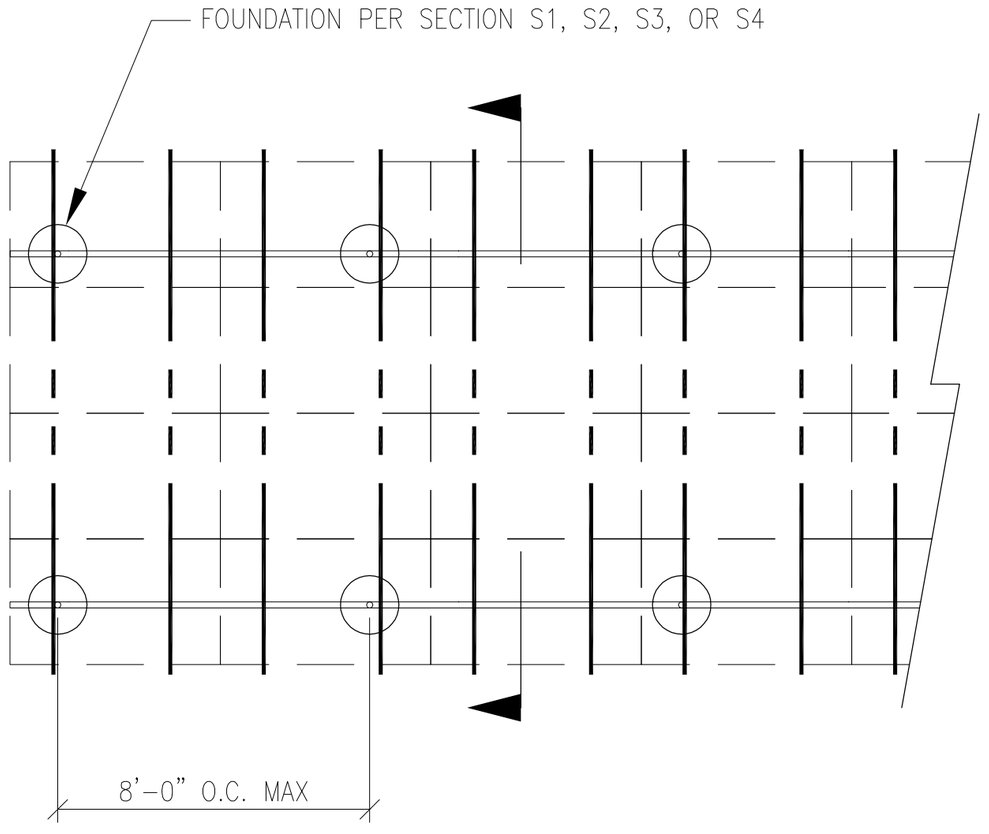
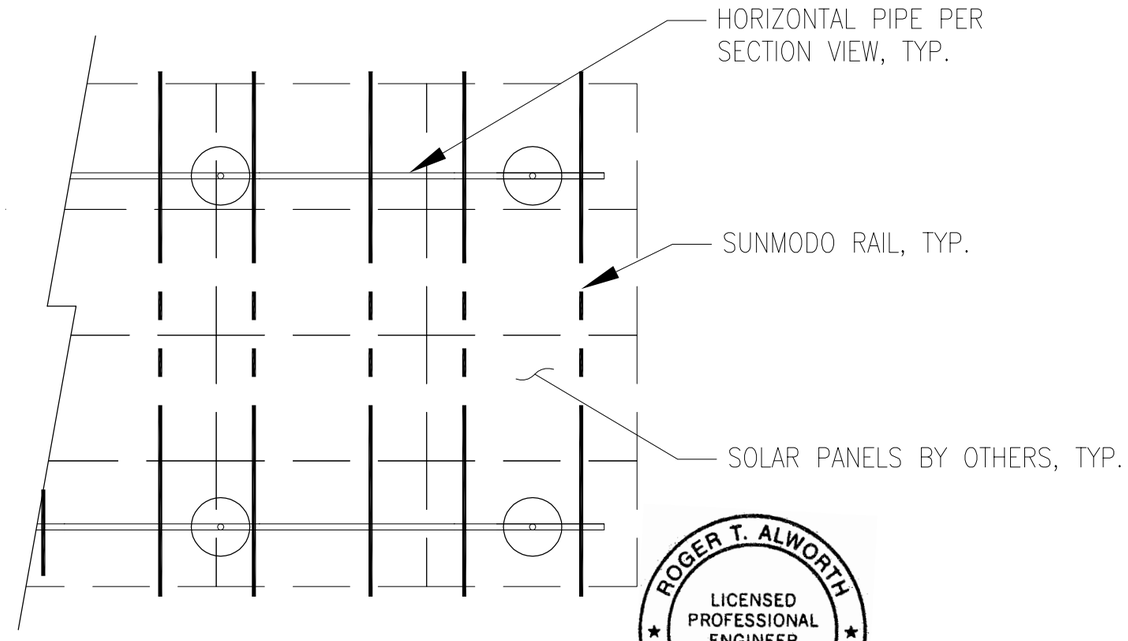
JOB NO. U2716-096-191

PROJECT SUNMODO SUNTURF GROUND MOUNTS B2A

SUBJECT ALL OPTIONS





ROGER T. ALWORTH
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EXPIRES: 4-30-2020

08/06/2019

PV ARRAY PLAN

N.T.S.

P1

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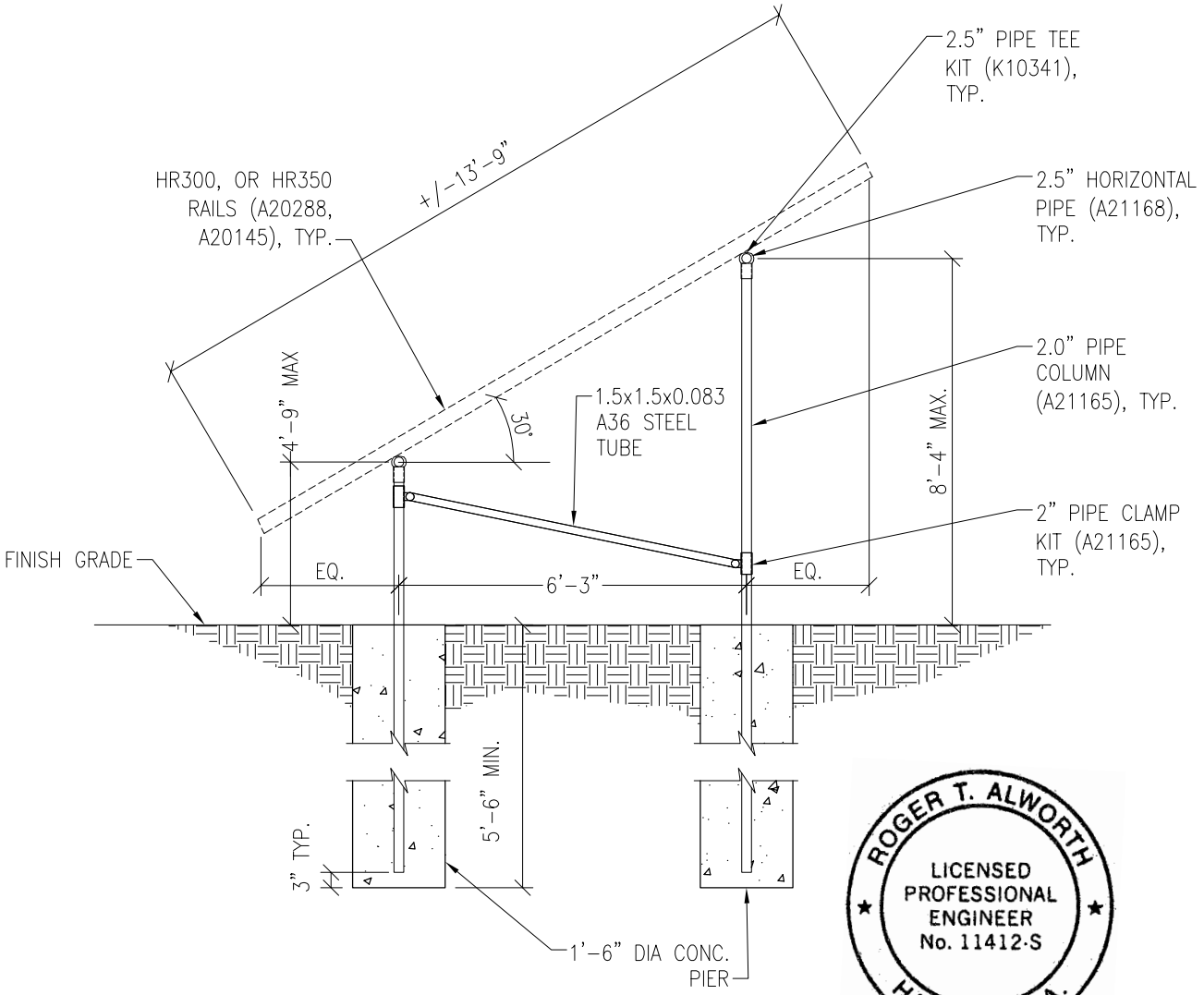
JOB NO. U2716-096-191

PROJECT SUNMODO SUNTURF GROUND MOUNTS B2A

SUBJECT DRILLED PIER OPTION



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HAWAII U.S.A.

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PV ARRAY SECTION S1

N.T.S.

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VECTOR ENGINEERS

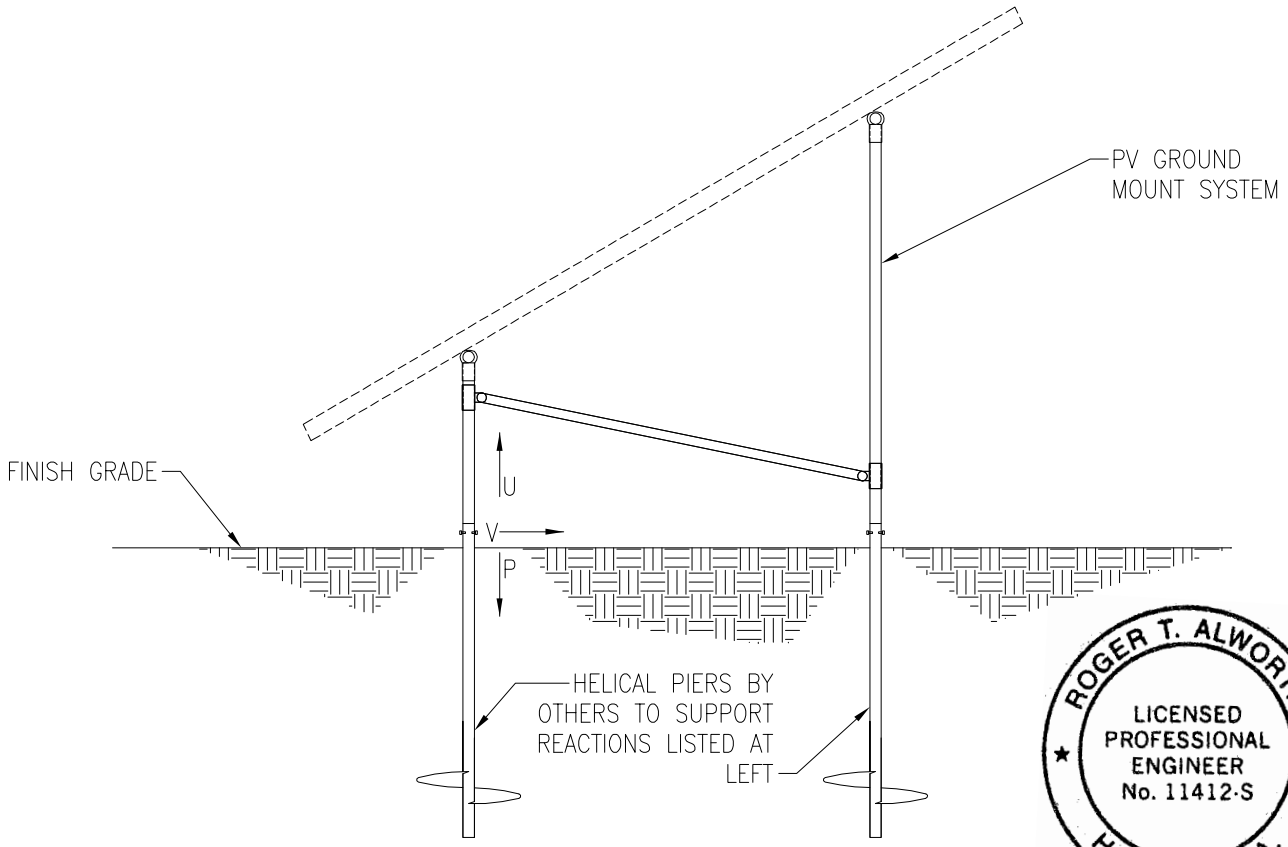
JOB NO. U2716-096-191

PROJECT SUNMODO SUNTURF GROUND MOUNTS B2A

SUBJECT HELICAL PIER OPTION

NOTES:

1. For ground mount components see Section S1.
2. A minimum of (1) helical pier must be load-tested as follows:
   - 2.1. Safety factor for uplift = 1.5,
   - 2.2. Safety factor for lateral loads = 2.0
   - 2.3. Upward deflection limit = 1/2"
   - 2.4. Lateral deflection limit = 1"
   - 2.5. The load tests must be performed by an approved contractor.



MAXIMUM REACTIONS:
U = 2,910 LBS
P = 3,290 LBS
V = 1,830 LBS

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03/26/2020

PV ARRAY SECTION

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S2

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VECTOR ENGINEERS

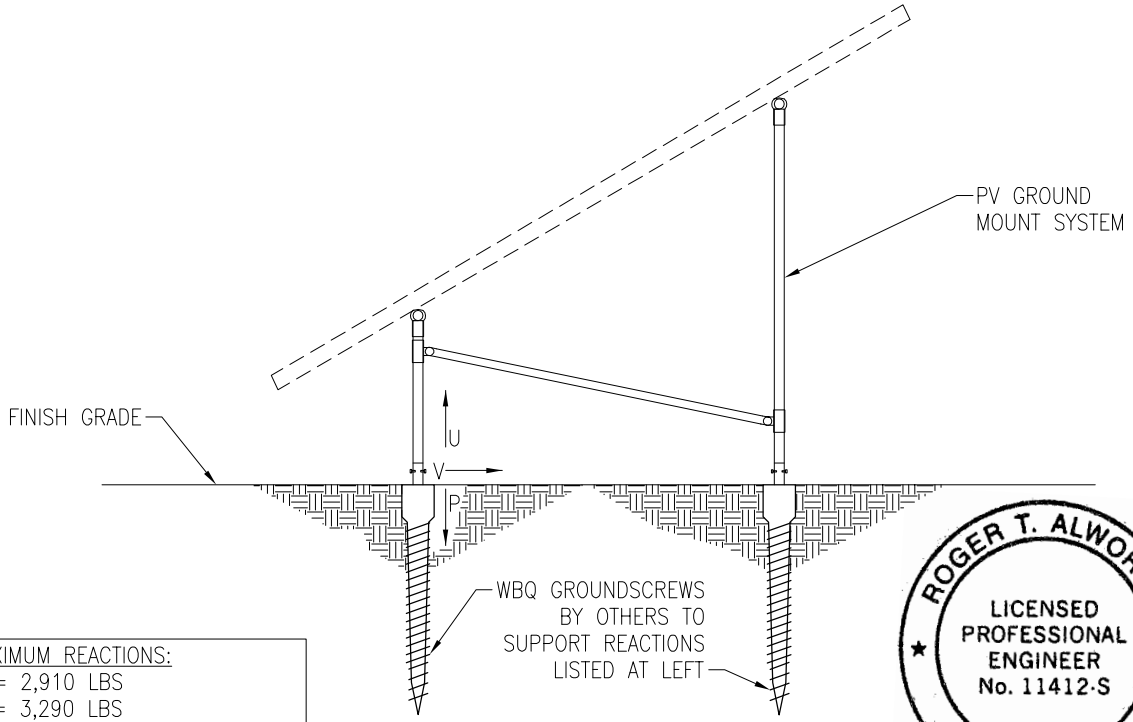
JOB NO. U2716-096-191

PROJECT SUNMODO SUNTURF GROUND MOUNTS B2A

SUBJECT GROUND SCREW OPTION

NOTES:

1. For ground mount components see Section S1.
2. A minimum of (1) ground screw must be load-tested as follows:
   - 2.1. Safety factor for uplift = 1.5,
   - 2.2. Safety factor for lateral loads = 2.0
   - 2.3. Upward deflection limit = 1/2"
   - 2.4. Lateral deflection limit = 1"
   - 2.5. The load tests must be performed by an approved contractor.



MAXIMUM REACTIONS:
U = 2,910 LBS
P = 3,290 LBS
V = 1,830 LBS

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PV ARRAY SECTION
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S3

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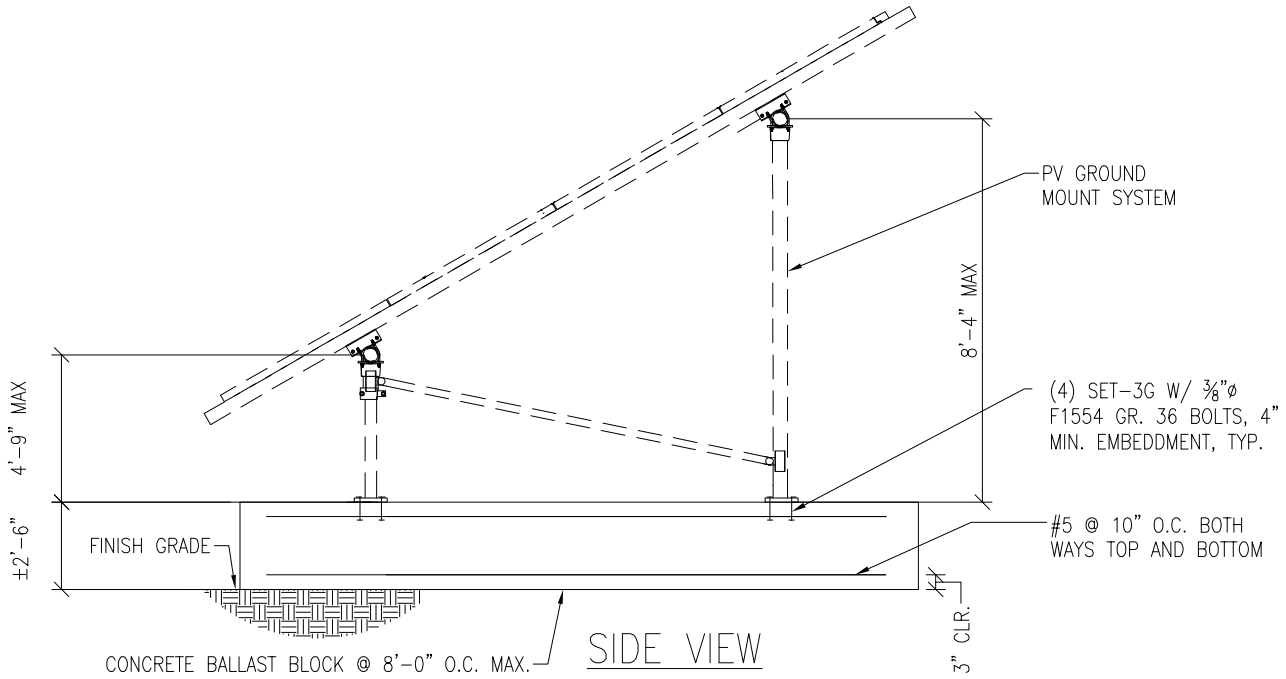
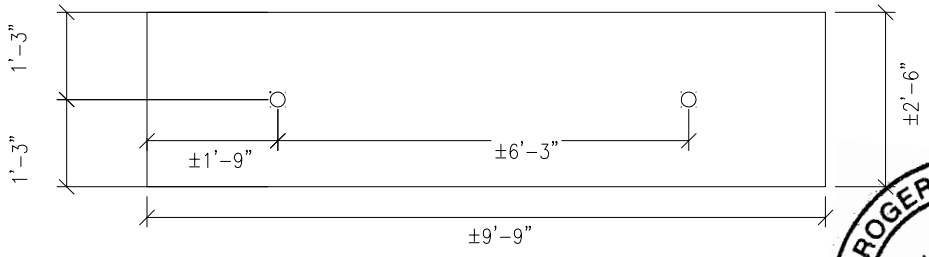
JOB NO. U2716-096-191

PROJECT SUNMODO SUNTURF GROUND MOUNTS B2A

SUBJECT BALLASTED BLOCK OPTION

NOTES:
1. For ground mount components see Section S1.





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PV ARRAY SECTION

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S4

08/06/2019

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JOB NO.: U2716-096-191 **DESIGNED:** STB
DATE: 07/29/19

PROJECT: B2a – Sunmodo Sunturf GM **SUBJECT:** Dead Load

Design Weight:

Individual Panel Weight [lb]:	50.7
Panel Transverse Length (T5) [in]:	41.2
Panel Transverse Length (T5) [ft]:	3.4
Panel Longitudinal Length (L2) [in]:	81.4
Panel Longitudinal Length (L2) [ft]:	6.8
Individual Panel Area [ft^2]:	23.3
Individual Panel Weight [psf]:	2.2
# of Panels in Transverse Direction:	4
Approximate Transverse Length (T4) [ft]:	13.7
# of Panels in Longitudinal Direction:	12
Approximate Longitudinal Length (L1) [ft]:	81.4
Transverse Column Spacing (T1) [ft]:	6.3
Longitudinal Column Spacing (L3) [ft]:	8.0
# of Columns in Longitudinal Direction:	11
# of Columns in Transverse Direction:	2
Total Number of Columns:	22
Panel Slope from Horizontal (a) [°]:	30.0
Short Column Height (H1) [ft]:	4.8
Approximate Tall Column Height (H2) [ft]:	8.4
Transverse Brace between Columns :	Yes
Approximate Brace Length (B1) [ft]:	8.0
Weight of Columns [plf]:	3.7
Weight of Cross Pipe [plf]:	3.7
Weight of Brace [plf]:	3.7
Tributary Transverse Length per Column [ft]:	6.9
Tributary Longitudinal Length per Column [ft]:	8.0
Tributary Area per Column [ft^2]:	54.9
Rail Weight [plf]:	1.0
Transverse Rail Weight per Column [lb]:	27.5
Longitudinal Rail Weight per Column [lb]:	29.2
Tall Column Weight [lb]:	30.6
Panel Weight per Column [lb]:	119.6
Rail Weight per Column [lb]:	27.5
Cross Pipe Weight per Column [lb]:	29.2
Brace Weight per Column [lb]:	14.6
Total Weight per Column (1.0 D) [lb]:	**221.5**

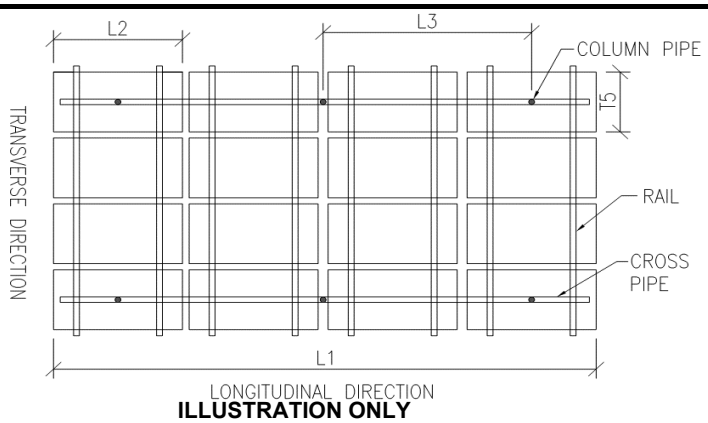


ILLUSTRATION ONLY

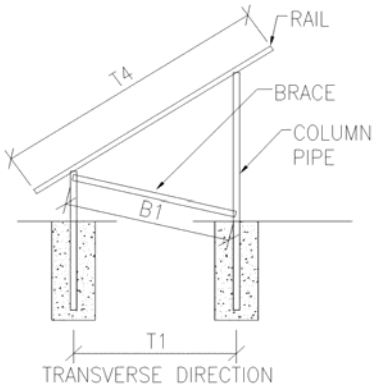


ILLUSTRATION ONLY

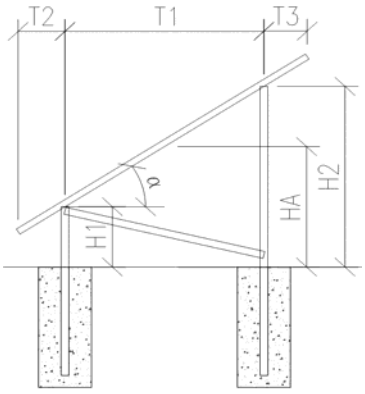


ILLUSTRATION ONLY

Assumptions:
- T2 = T3

JOB NO.: U2716-096-191 **DESIGNED:** STB
DATE: 07/29/19

PROJECT: B2a – Sunmodo Sunturf GM **SUBJECT:** Snow Load

SNOW LOAD (S):

ASCE 7 Standard:	05	
Panel Slope from Horizontal [°]:	30.0	
Snow Ground Load, p_g [psf]:	5.0	(Section 7.2)
Terrain Category:	C	(Table 7-2)
Exposure of Roof:	Fully Exposed	(Table 7-2)
Exposure Factor, C_e:	0.9	(Table 7-2)
Thermal Factor, C_t:	1.2	(Table 7-3)
Occupancy Category:	I	(Table 1-1)
Importance Factor, I_S:	0.8	(Table 7-4)
Flat Roof Snow Load, p_f [psf]:	3	(Equation 7-1)
Minimum Roof Snow Load, p_m [psf]:	0	(Section 7.3.4)
Unobstructed Slippery Surface?	Yes	(Section 7.4)
Slope Factor Figure:	Figure 7-2c	(Section 7.4)
Roof Slope Factor, C_s:	0.727	(Figure 7-2)
Sloped Roof Snow Load, p_s [psf]:	2	(Equation 7-2)
Design Snow Load, S [psf]:	2	
Tributary Transverse Length [ft]:	5.9	
Tributary Longitudinal Length [ft]:	8	
Tributary Area per Column [ft^2]:	47.6	
Snow Load per Column (1.0 S) [lb]:	**104.6**	

JOB NO.: U2716-096-191 **DESIGNED:** STB
DATE: 04/23/19

PROJECT: B2a – Sunmodo Sunturf GM **SUBJECT:** Wind Pressure

Design Wind Load:

ASCE 7 Standard:	05	
Basic Wind Speed, V [mph]:	110	
Occupancy Category:	I	
Importance, Iw:	0.77	
Exposure Category	C	(Section 6.5.6.3)
Velocity Pressure Exposure Coefficient, K_h:	0.85	(Table 6-3)
Topographic Factor, K_{ht}:	1.0	(Section 6.5.7.2)
Wind Directionality Factor, K_d:	0.85	(Table 6-4)
Internal Pressure Coefficient, GC_{pi} :	0.00	(Figure 6-5)
Velocity Pressure, q_h [psf]:	17.2	(Equation 6-15)
Gust Effect Factor, G:	0.85	(Section 6.5.8)
Panel Slope [degrees]:	30.0	

Net Pressure Coefficients (C_N) per: (Figure 6-18A)

Clear Wind Flow	C_{NW}	C_{NL}
Case 1 (γ = 0°, Load Case A)	-1.80	-1.80
Case 2 (γ = 0°, Load Case B)	-2.50	-0.50
Case 3 (γ = 180°, Load Case A)	2.10	2.10
Case 4 (γ = 180°, Load Case B)	2.60	1.00

Design Wind Pressures (p) [psf] per: (Equation 6-25)

Clear Wind Flow	q_hGC_{NW}	q_hGC_{NL}
Case 1 (γ = 0°, Load Case A)	-26.4	-26.4
Case 2 (γ = 0°, Load Case B)	-36.6	-7.3
Case 3 (γ = 180°, Load Case A)	30.8	30.8
Case 4 (γ = 180°, Load Case B)	38.1	14.6

Wind Pressure on Each Side of Panels [psf]

Clear Wind Flow	Short Col. Pressure	Long Col. Pressure
Case 1 (γ = 0°, Load Case A)	-26.4	-26.4
Case 2 (γ = 0°, Load Case B)	-7.3	-36.6
Case 3 (γ = 180°, Load Case A)	30.8	30.8
Case 4 (γ = 180°, Load Case B)	38.1	14.6

JOB NO.: U2716-096-191

PROJECT: B2a – Sunmodo Sunturf GM **SUBJECT:** Open Building Wind Loads

Design Wind Load Per ASCE 7-05

$p = q_h G C_n$

Velocity Pressure Exposure Coefficient, K_h:	0.85	(Table 6-3)
Topographic Factor, K_{ht}:	1.0	(Section 6.5.7.2)
Wind Directionality Factor, K_d:	0.85	(Table 6-4)
Ultimate Wind Speed, V [mph]:	110	
Velocity Pressure, q_h [psf]:	17.2	(Equation 6-15)
Gust Effect Factor, G:	0.85	(Section 6.5.8)

$\gamma = 90^o$ or 270^o

Force Coefficient, C_N:

Horizontal Distance from Winward Edge	Roof angle	Load Case	Obstructed Wind Flow CN
<= h	30	A	-0.8
		B	0.8
> h, <= 2h	30	A	-0.6
		B	0.5
> 2h	30	A	-0.3
		B	0.3

Design Wind Pressure, p [psf]:

	Roof angle	Load Case	Obstructed Wind Flow
<= h	30	A	-11.7
		B	11.7
> h, <= 2h	30	A	-8.8
		B	7.3
> 2h	30	A	-4.4
		B	4.4

JOB NO.: U2716-096-191 **DESIGNED:** STB

Foundation Option 1: Drilled Concrete Pier

JOB NO.: U2716-096-191 **DESIGNED:** STB
DATE: 07/29/19

PROJECT: B2a – Sunmodo Sunturf GM

Drilled Pier Design

Design Loads:

Max. Shear, V [k]:	1.8	Max. Down, P_d [k]:	3.3
Max. Moment, M [k-ft]:	0.1	Max. Uplift, P_u [k]:	2.9

Pier Properties:

Pier Diameter, b [ft]:	1.5	Volume of Concrete [ft^3]:	10
Min. Pier Diameter, b_{min} (opt'l) [ft]:		Volume of Concrete [yd^3]:	0.4
Top of Pier Elevation [ft]:	0.00	Weight of Concrete [k]:	1.5
Pier Depth, d [ft]:	5.5		
Min. Pier Depth, d_{min} (opt'l) [ft]:			
Max. Pier Depth, d_{max} (opt'l) [ft]:			

Soil Properties:

Allow. Bearing Pressure [psf]:	1,500	Optional Parameters for Uplift:		
1/3 increase for short term loads?	No			
		Skin Friction [psf]:	250	(IBC 1810.3.3.1.4)
Lateral Bearing, S [pcf]:	150	Top Length to Ignore [ft]:	0.0	
Max. Lateral Bearing (opt'l) [psf]:		1/3 increase for short term loads?	No	
Top Depth to Ignore [ft]:	0.0	Combine w/ Bearing:	No	
1/3 increase for short term loads?	No			
1/2" deflection at t/o pier allowed:	Yes			

Check Bearing:

Bearing Capacity [k]:	6.5	**Bearing capacity OK.**

Check Uplift:

Uplift Capacity [k]:	7.8	**Uplift capacity OK.**

Check Lateral Bearing:

Applied Lateral Force, P [lb]:	1,830	
Point of Application, h [ft]:	0.1	
S_{1_max} [psf]:		
S_1 [psf]:	550	
$A = 2.34*P/(S_1 b)$:	5.19	
Required Pier Depth, d_{reqd} [ft]:	5.2	**Lateral bearing capacity OK.**

JOB NO.: U2716-096-191 **DESIGNED:** STB

Foundation Option 2: Helical Pier

The ground screws and helical piers must be tested to 1.5 times uplift and 2.0 times lateral reactions found in the table below.

Load (ASD)	Value (lbs)	Factor of Safety	Test Value (lbs)
UPLIFT	2910	1.5	4365
LATERAL	1830	2	3660

JOB NO.: U2716-096-191 **DESIGNED:** STB

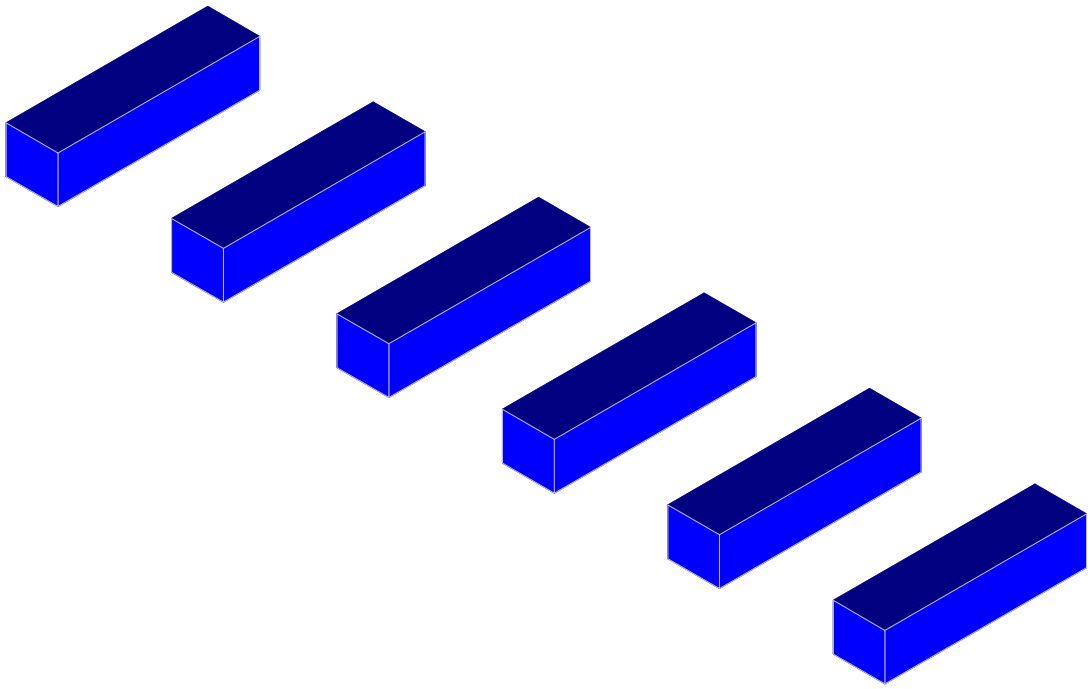
Foundation Option 3: Ground Screw

The ground screws and helical piers must be tested to 1.5 times uplift and 2.0 times lateral reactions found in the table below.

Load (ASD)	Value (lbs)	Factor of Safety	Test Value (lbs)
UPLIFT	2910	1.5	4365
LATERAL	1830	2	3660

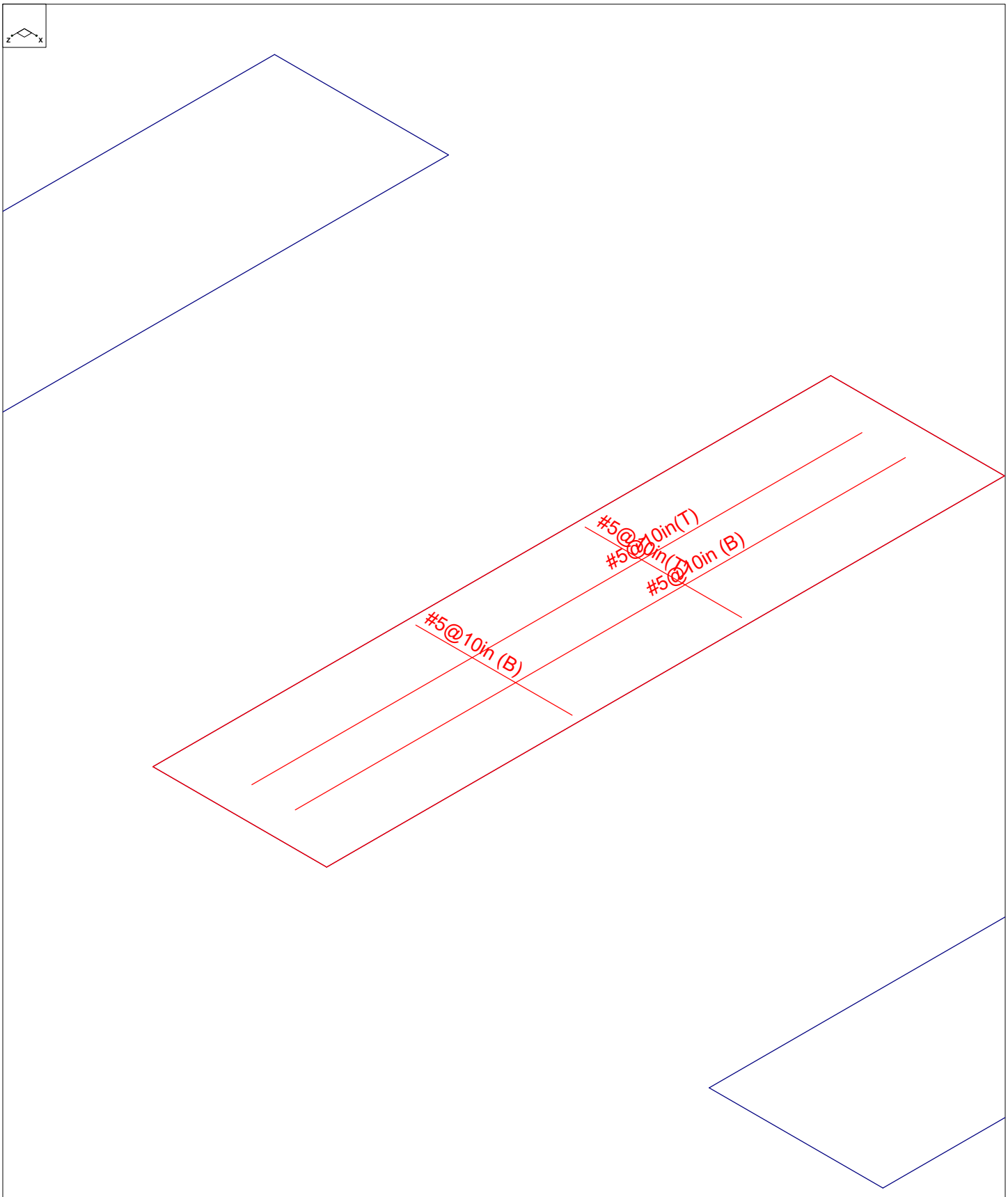
JOB NO.: U2716-096-191 **DESIGNED:** STB

Foundation Option 4: Ballasted Block



Results for LC 1, 1.0 D

Vector Structural Engineeri...		SK - 14
STB	Ground Mount	May 7, 2019 at 4:19 PM
U2716.095.191		USA B2a GM - 81 in panels.r3d



Results for LC 1, 1.0 D

Vector Structural Engineeri...	Ground Mount	SK - 13
STB		May 7, 2019 at 4:18 PM
U2716.095.191		USA B2a GM - 81 in panels.r3d

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	100
Mesh Size (in)	12
Max Iterations	10
Merge Tolerance (in)	.12
Solver	Sparse Accelerated
Coefficient of Friction	.3
No. of Shear Regions	4
Shear Region Spacing Increment (in)	4
Min 1 Bar Dia Spacing for Beams?	No
Optimize footings for OTM / Sliding?	Yes
Parme Beta Factor	.65
Pile Safety Factor	3
Concrete Stress Block	Rectangular
Concrete Rebar Set	ASTM A615
Concrete Code	ACI 318-08
HR Steel Pile Code	AISC 14th(360-10): ASD
Wood Pile Code	AWC NDS-15: ASD

Concrete Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\...	Density[lb/ft^3]	f'c[psi]	Lambda	Flex Stee..	Shear St...
1	Conc3000NW	3156	1372	.15	.6	145	3000	1	60000	60000
2	Conc3500NW	3409	1482	.15	.6	145	3500	1	60000	60000
3	Conc4000NW	3644	1584	.15	.6	145	4000	1	60000	60000
4	Conc3000LW	2085	907	.15	.6	109.999	3000	.75	60000	60000
5	Conc3500LW	2252	979	.15	.6	109.999	3500	.75	60000	60000
6	Conc4000LW	2408	1047	.15	.6	109.999	4000	.75	60000	60000
7	Conc2500NW	3156	1372	.15	.6	145	2500	1	60000	60000

General Design Parameters

	Label	Max Bending Chk	Max Shear Chk	Top Cover[in]	Bottom Cover[in]
1	Typical	1	1	3	3

Slab Rebar Parameters

	Label	Top Bar	Bottom Bar	Max Top Bar Sp..	Min Top Bar Sp...	Max Bot Bar Sp...	Min Bot Bar Sp...	Spacing Incr..	Rebar Options
1	Typical	#5	#5	10	10	10	10	1	Optimize

Soil Definitions

	Label	Subgrade Modulus[lb/ft^3]	Allowable Bearing[psf]	Depth Properties	Default?
1	Default	1e+5	1500	None	Yes

Point Loads and Moments (Cat 1 : DL)

	Label	Direction	Magnitude[lb,lb-ft]
1	R3D_N1_1	X	-16.995
2	R3D_N1_1	Y	206.315
3	R3D_N2_1	X	-4.719
4	R3D_N2_1	Y	206.111
5	R3D_N132_1	Y	205.897
6	R3D_N133_1	Y	260.217
7	R3D_N109_1	Y	206.156
8	R3D_N110A_1	Y	260.432
9	R3D_N121_1	Y	220.25

Point Loads and Moments (Cat 1 : DL) (Continued)

	Label	Direction	Magnitude[lb,lb-ft]
10	R3D_N122_1	Y	250.132
11	R3D_N133B_1	Y	220.336
12	R3D_N134B_1	Y	250.053
13	R3D_N132	X	16.955
14	R3D_N132	Y	206.748
15	R3D_N133	X	4.633
16	R3D_N133	Y	206.565

Point Loads and Moments (Cat 6 : RLL)

	Label	Direction	Magnitude[lb,lb-ft]
1	R3D_N1_1	X	-7.476
2	R3D_N1_1	Y	75.437
3	R3D_N2_1	X	-2.266
4	R3D_N2_1	Y	85.26
5	R3D_N132_1	Y	77.928
6	R3D_N133_1	Y	110.79
7	R3D_N109_1	Y	78.046
8	R3D_N110A_1	Y	110.877
9	R3D_N121_1	Y	84.884
10	R3D_N122_1	Y	105.729
11	R3D_N133B_1	Y	84.923
12	R3D_N134B_1	Y	105.681
13	R3D_N132	X	7.459
14	R3D_N132	Y	75.554
15	R3D_N133	X	2.236
16	R3D_N133	Y	85.357

Point Loads and Moments (Cat 16 : OL1)

	Label	Direction	Magnitude[lb,lb-ft]
1	R3D_N1_1	X	118.195
2	R3D_N1_1	Y	-2196.683
3	R3D_N1_1	Z	1151.232
4	R3D_N2_1	X	31.247
5	R3D_N2_1	Y	54.228
6	R3D_N2_1	Z	-13.088
7	R3D_N132_1	X	-6.606
8	R3D_N132_1	Y	-2616.71
9	R3D_N132_1	Z	1566.912
10	R3D_N133_1	X	6.576
11	R3D_N133_1	Y	130.38
12	R3D_N133_1	Z	-13.886
13	R3D_N109_1	X	6.593
14	R3D_N109_1	Y	-2601.169
15	R3D_N109_1	Z	1552.262
16	R3D_N110A_1	X	-3.171
17	R3D_N110A_1	Y	131.963
18	R3D_N110A_1	Z	-13.874
19	R3D_N121_1	X	-1.433
20	R3D_N121_1	Y	-2610.797
21	R3D_N121_1	Z	1456.834
22	R3D_N122_1	X	5.584
23	R3D_N122_1	Y	90.322
24	R3D_N122_1	Z	-14.704
25	R3D_N133B_1	X	1.528
26	R3D_N133B_1	Y	-2601.973
27	R3D_N133B_1	Z	1449.764

Point Loads and Moments (Cat 16 : OL1) (Continued)

	Label	Direction	Magnitude[lb,lb-ft]
28	R3D_N134B_1	X	-4.489
29	R3D_N134B_1	Y	85.871
30	R3D_N134B_1	Z	-14.704
31	R3D_N132	X	-118.277
32	R3D_N132	Y	-2161.609
33	R3D_N132	Z	1140.682
34	R3D_N133	X	-35.749
35	R3D_N133	Y	33.98
36	R3D_N133	Z	-13.07

Point Loads and Moments (Cat 17 : OL2)

	Label	Direction	Magnitude[lb,lb-ft]
1	R3D_N1_1	X	163.617
2	R3D_N1_1	Y	-2568.155
3	R3D_N1_1	Z	947.658
4	R3D_N2_1	X	7.768
5	R3D_N2_1	Y	732.105
6	R3D_N2_1	Z	-10.758
7	R3D_N132_1	X	-8.558
8	R3D_N132_1	Y	-3001.745
9	R3D_N132_1	Z	1288.735
10	R3D_N133_1	X	2.889
11	R3D_N133_1	Y	1041.87
12	R3D_N133_1	Z	-11.405
13	R3D_N109_1	X	9.648
14	R3D_N109_1	Y	-2974.053
15	R3D_N109_1	Z	1275.089
16	R3D_N110A_1	X	-2.17
17	R3D_N110A_1	Y	1028.251
18	R3D_N110A_1	Z	-11.38
19	R3D_N121_1	X	-1.64
20	R3D_N121_1	Y	-3044.168
21	R3D_N121_1	Z	1200.507
22	R3D_N122_1	X	3.475
23	R3D_N122_1	Y	958.12
24	R3D_N122_1	Z	-12.142
25	R3D_N133B_1	X	2.281
26	R3D_N133B_1	Y	-3030.516
27	R3D_N133B_1	Z	1192.583
28	R3D_N134B_1	X	-3.336
29	R3D_N134B_1	Y	948.422
30	R3D_N134B_1	Z	-12.137
31	R3D_N132	X	-165.343
32	R3D_N132	Y	-2548.093
33	R3D_N132	Z	938.433
34	R3D_N133	X	-8.625
35	R3D_N133	Y	724.265
36	R3D_N133	Z	-10.732

Point Loads and Moments (Cat 18 : OL3)

	Label	Direction	Magnitude[lb,lb-ft]
1	R3D_N1_1	X	-137.894
2	R3D_N1_1	Y	2562.797
3	R3D_N1_1	Z	-1343.104
4	R3D_N2_1	X	-36.455
5	R3D_N2_1	Y	-63.266

Point Loads and Moments (Cat 18 : OL3) (Continued)

	Label	Direction	Magnitude[lb,lb-ft]
6	R3D_N2_1	Z	15.27
7	R3D_N132_1	X	7.707
8	R3D_N132_1	Y	3052.829
9	R3D_N132_1	Z	-1828.064
10	R3D_N133_1	X	-7.672
11	R3D_N133_1	Y	-152.111
12	R3D_N133_1	Z	16.2
13	R3D_N109_1	X	-7.692
14	R3D_N109_1	Y	3034.697
15	R3D_N109_1	Z	-1810.972
16	R3D_N110A_1	X	3.699
17	R3D_N110A_1	Y	-153.957
18	R3D_N110A_1	Z	16.186
19	R3D_N121_1	X	1.671
20	R3D_N121_1	Y	3045.93
21	R3D_N121_1	Z	-1699.64
22	R3D_N122_1	X	-6.515
23	R3D_N122_1	Y	-105.376
24	R3D_N122_1	Z	17.155
25	R3D_N133B_1	X	-1.782
26	R3D_N133B_1	Y	3035.635
27	R3D_N133B_1	Z	-1691.391
28	R3D_N134B_1	X	5.238
29	R3D_N134B_1	Y	-100.183
30	R3D_N134B_1	Z	17.155
31	R3D_N132	X	137.99
32	R3D_N132	Y	2521.877
33	R3D_N132	Z	-1330.795
34	R3D_N133	X	41.707
35	R3D_N133	Y	-39.643
36	R3D_N133	Z	15.249

Point Loads and Moments (Cat 19 : OL4)

	Label	Direction	Magnitude[lb,lb-ft]
1	R3D_N1_1	X	-65.561
2	R3D_N1_1	Y	1597.607
3	R3D_N1_1	Z	-1156.688
4	R3D_N2_1	X	-45.796
5	R3D_N2_1	Y	496.896
6	R3D_N2_1	Z	13.163
7	R3D_N132_1	X	4.135
8	R3D_N132_1	Y	1949.176
9	R3D_N132_1	Z	-1575.219
10	R3D_N133_1	X	-8.632
11	R3D_N133_1	Y	618.551
12	R3D_N133_1	Z	13.973
13	R3D_N109_1	X	-3.239
14	R3D_N109_1	Y	1945.51
15	R3D_N109_1	Z	-1561.771
16	R3D_N110A_1	X	3.539
17	R3D_N110A_1	Y	604.993
18	R3D_N110A_1	Z	13.972
19	R3D_N121_1	X	1.07
20	R3D_N121_1	Y	1905.305
21	R3D_N121_1	Z	-1462.707
22	R3D_N122_1	X	-6.511

Point Loads and Moments (Cat 19 : OL4) (Continued)

	Label	Direction	Magnitude[lb,lb-ft]
23	R3D_N122_1	Y	618.075
24	R3D_N122_1	Z	14.744
25	R3D_N133B_1	Y	1901.562
26	R3D_N133B_1	Z	-1457.29
27	R3D_N134B_1	X	4.799
28	R3D_N134B_1	Y	617.707
29	R3D_N134B_1	Z	14.748
30	R3D_N132	X	64.314
31	R3D_N132	Y	1555.3
32	R3D_N132	Z	-1146.521
33	R3D_N133	X	52.602
34	R3D_N133	Y	524.32
35	R3D_N133	Z	13.154

Point Loads and Moments (Cat 20 : OL5)

	Label	Direction	Magnitude[lb,lb-ft]
1	R3D_N1_1	X	-37.067
2	R3D_N1_1	Y	926.392
3	R3D_N1_1	Z	-496.192
4	R3D_N2_1	X	-12.315
5	R3D_N2_1	Y	-23.453
6	R3D_N2_1	Z	4.936
7	R3D_N132_1	X	3.608
8	R3D_N132_1	Y	422.3
9	R3D_N132_1	Z	-260.246
10	R3D_N133_1	Y	-21.299
11	R3D_N133_1	Z	2.38
12	R3D_N109_1	Y	946.263
13	R3D_N109_1	Z	-561.406
14	R3D_N110A_1	X	4.827
15	R3D_N110A_1	Y	-45.189
16	R3D_N110A_1	Z	4.386
17	R3D_N121_1	X	3.831
18	R3D_N121_1	Y	509.926
19	R3D_N121_1	Z	-284.076
20	R3D_N122_1	X	3.567
21	R3D_N122_1	Y	-18.116
22	R3D_N122_1	Z	3.625
23	R3D_N133B_1	X	1.015
24	R3D_N133B_1	Y	421.06
25	R3D_N133B_1	Z	-233.507
26	R3D_N134B_1	Y	-10.525
27	R3D_N134B_1	Z	2.78
28	R3D_N132	X	28.037
29	R3D_N132	Y	376.928
30	R3D_N132	Z	-192.212
31	R3D_N133	X	4.693
32	R3D_N133	Y	-7.544
33	R3D_N133	Z	2.204

Point Loads and Moments (Cat 21 : OL6)

	Label	Direction	Magnitude[lb,lb-ft]
1	R3D_N1_1	X	35.913
2	R3D_N1_1	Y	-918.47
3	R3D_N1_1	Z	492.153
4	R3D_N2_1	X	11.532

Point Loads and Moments (Cat 21 : OL6) (Continued)

	Label	Direction	Magnitude[lb,lb-ft]
5	R3D_N2_1	Y	23.708
6	R3D_N2_1	Z	-4.651
7	R3D_N132_1	X	-3.402
8	R3D_N132_1	Y	-421.854
9	R3D_N132_1	Z	259.381
10	R3D_N133_1	Y	20.926
11	R3D_N133_1	Z	-2.366
12	R3D_N109_1	X	-1.166
13	R3D_N109_1	Y	-814.47
14	R3D_N109_1	Z	487.259
15	R3D_N110A_1	X	-6.232
16	R3D_N110A_1	Y	40.641
17	R3D_N110A_1	Z	-4.092
18	R3D_N121_1	X	-2.951
19	R3D_N121_1	Y	-475.716
20	R3D_N121_1	Z	264.212
21	R3D_N122_1	X	-1.337
22	R3D_N122_1	Y	14.901
23	R3D_N122_1	Z	-3.368
24	R3D_N133B_1	X	-1.041
25	R3D_N133B_1	Y	-427.809
26	R3D_N133B_1	Z	237.612
27	R3D_N134B_1	Y	12.295
28	R3D_N134B_1	Z	-2.689
29	R3D_N132	X	-27.385
30	R3D_N132	Y	-376.241
31	R3D_N132	Z	192.329
32	R3D_N133	X	-4.649
33	R3D_N133	Y	7.709
34	R3D_N133	Z	-2.198

Slabs

	Label	Thickness [in]	Material	Local Axis Angle [deg]	Analysis Offset [in]
1	S1	30	Conc2500NW	0	0
2	S2	30	Conc2500NW	0	0
3	S3	30	Conc2500NW	0	0
4	S4	30	Conc2500NW	0	0
5	S5	30	Conc2500NW	0	0
6	S6	30	Conc2500NW	0	0

Load Combinations

	Label	Solve	Service	A..	SF	Cat..	Fa...	Cat..	Fa...	Cat..	Fa...	Cat..	Fa...	Cat..	Fa...	Cat..	Fa...	Cat..	Fa...	Cat..	Fa...	C...	F...	C...	F...
1	1.0 D	Yes	Yes		1.5	DL	1																		
2	1.0 D + 1....	Yes	Yes		1.5	DL	1	RLL	1																
3	1.0 D + 0....	Yes	Yes		1.5	DL	1	RLL		OL1	1														
4	1.0 D + 0....	Yes	Yes		1.5	DL	1	RLL		OL2	1														
5	1.0 D + 0....	Yes	Yes		1.5	DL	1	RLL		OL3	1														
6	1.0 D + 0....	Yes	Yes		1.5	DL	1	RLL		OL4	1														
7	1.0 D + 0....	Yes	Yes		1.5	DL	1	RLL		OL5	1														
8	1.0 D + 0....	Yes	Yes		1.5	DL	1	RLL		OL6	1														
9	1.0 D + 0....	Yes	Yes		1.5	DL	1	RLL	.75	OL1	.75														
10	1.0 D + 0....	Yes	Yes		1.5	DL	1	RLL	.75	OL2	.75														
11	1.0 D + 0....	Yes	Yes		1.5	DL	1	RLL	.75	OL3	.75														
12	1.0 D + 0....	Yes	Yes		1.5	DL	1	RLL	.75	OL4	.75														
13	1.0 D + 0....	Yes	Yes		1.5	DL	1	RLL	.75	OL5	.75														
14	1.0 D + 0....	Yes	Yes		1.5	DL	1	RLL	.75	OL6	.75														

Load Combinations (Continued)

	Label	Solve	Service	A..	SF	Cat..	Fa...	Cat..	Fa...	Cat..	Fa...	Cat..	Fa...	Cat..	Fa...	Cat..	Fa...	Cat..	Fa...	Cat..	Fa...	C...	F...	C...	F...
15	0.6 D + 0....	Yes	Yes			DL	.6	RLL		OL1	1														
16	0.6 D + 0....	Yes	Yes			DL	.6	RLL		OL2	1														
17	0.6 D + 0....	Yes	Yes			DL	.6	RLL		OL3	1														
18	0.6 D + 0....	Yes	Yes			DL	.6	RLL		OL4	1														
19	0.6 D + 0....	Yes	Yes			DL	.6	RLL		OL5	1														
20	0.6 D + 0....	Yes	Yes			DL	.6	RLL		OL6	1														
21																									
22	1.4D	Yes				DL	1.4																		
23	1.2D+1.6SL	Yes				DL	1.2	RLL	1.6																
24	1.2D+1.6S...	Yes				DL	1.2	RLL	1.6	OL1	.8														
25	1.2D+1.6S...	Yes				DL	1.2	RLL	1.6	OL2	.8														
26	1.2D+1.6S...	Yes				DL	1.2	RLL	1.6	OL3	.8														
27	1.2D+1.6S...	Yes				DL	1.2	RLL	1.6	OL4	.8														
28	1.2D+1.6S...	Yes				DL	1.2	RLL	1.6	OL5	.8														
29	1.2D+1.6S...	Yes				DL	1.2	RLL	1.6	OL6	.8														
30	1.2D+1.6...	Yes				DL	1.2	RLL	.5	OL1	1.6														
31	1.2D-1.6...	Yes				DL	1.2	RLL	.5	OL2	1.6														
32	1.2D+1.6...	Yes				DL	1.2	RLL	.5	OL3	1.6														
33	1.2D-1.6...	Yes				DL	1.2	RLL	.5	OL4	1.6														
34	1.2D+1.6...	Yes				DL	1.2	RLL	.5	OL5	1.6														
35	1.2D-1.6...	Yes				DL	1.2	RLL	.5	OL6	1.6														
36	.9D+1.6Wx	Yes				DL	.9			OL1	1.6														
37	.9D-1.6Wx	Yes				DL	.9			OL2	1.6														
38	.9D+1.6Wz	Yes				DL	.9			OL3	1.6														
39	.9D-1.6Wz	Yes				DL	.9			OL4	1.6														
40	.9D+1.6W...	Yes				DL	.9			OL5	1.6														
41	.9D-1.6W90	Yes				DL	.9			OL6	1.6														

Design Strips

	Label	Rebar Angle from Pl...	No. of Design Cuts	Design Rule
1	DS1	0	50	Typical
2	DS2	90	50	Typical

Load Categories

	Category	Point Loads	Line Loads	Area Loads
1	DL	16		
2	RLL	16		
3	OL1	36		
4	OL2	36		
5	OL3	36		
6	OL4	35		
7	OL5	33		
8	OL6	34		

Strip Reinforcing

	Label	UC Top	LC	Top Bars	Governing ...	UC Bot	LC	Bot B...	Gover...	UC Shear	LC	Governing ...
1	DS1	.013	32	#5@10in	DS1-X26	.036	37	#5@1...	DS1-...	.045	37	DS1-X15
2	DS2	.002	36	#5@10in	DS2-X25	.003	32	#5@1...	DS2-...	.004	32	DS2-X46

Slab Overturning Safety Factors (By Combination)

	LC	Slab	Angle[deg]	Mo-xx[lb-ft]	Ms-xx[lb-ft]	Mo-zz[lb-ft]	Ms-zz[lb-ft]	Ms-xx/Mo-xx	Ms-zz/Mo-zz
1	1	S1	0	0	45085.284	0	11683.496	9.999+	9.999+
2	1	S2	0	0	45519.573	0	11705.941	9.999+	9.999+
3	1	S3	0	0	45461.835	0	11711.315	9.999+	9.999+
4	1	S4	0	0	45461.35	0	11711.325	9.999+	9.999+

Slab Overturning Safety Factors (By Combination) (Continued)

	LC	Slab	Angle[deg]	Mo-xx[lb-ft]	Ms-xx[lb-ft]	Mo-zz[lb-ft]	Ms-zz[lb-ft]	Ms-xx/Mo-xx	Ms-zz/Mo-zz
5	1	S5	0	0	45517.395	0	11705.269	9.999+	9.999+
6	1	S6	0	0	45089.668	0	11576.497	9.999+	9.999+
7	2	S1	0	0	45899.381	0	11935.507	9.999+	9.999+
8	2	S2	0	0	46543.169	0	11973.582	9.999+	9.999+
9	2	S3	0	0	46456.211	0	11981.35	9.999+	9.999+
10	2	S4	0	0	46455.415	0	11981.348	9.999+	9.999+
11	2	S5	0	0	46540.089	0	11972.62	9.999+	9.999+
12	2	S6	0	0	45904.743	0	11780.216	9.999+	9.999+
13	3	S1	0	20323.97	45086.569	3408.75	11683.496	2.218	3.428
14	3	S2	0	24424.437	45180.356	3506.596	11705.941	1.85	3.338
15	3	S3	0	24333.689	45275.084	3581.052	11711.315	1.861	3.27
16	3	S4	0	24253.207	45275.634	3557.072	11711.325	1.867	3.292
17	3	S5	0	24588.135	45177.91	3522.226	11705.269	1.837	3.323
18	3	S6	0	20052.479	45090.822	2689.995	11546.666	2.249	4.292
19	4	S1	0	21606.341	45086.569	3029.531	11683.496	2.087	3.857
20	4	S2	0	25152.298	45180.356	2775.249	11705.941	1.796	4.218
21	4	S3	0	25647.591	45275.084	2959.822	11711.315	1.765	3.957
22	4	S4	0	25535.546	45275.634	2946.994	11711.325	1.773	3.974
23	4	S5	0	25384.057	45177.91	2762.318	11705.269	1.78	4.237
24	4	S6	0	21436.572	45090.822	2410.734	11546.666	2.103	4.79
25	5	S1	0	0	45744.456	0	15660.371	9.999+	9.999+
26	5	S2	0	407.915	45519.573	0	15796.97	9.999+	9.999+
27	5	S3	0	0	45742.979	0	15889.209	9.999+	9.999+
28	5	S4	0	0	45786.642	0	15861.243	9.999+	9.999+
29	5	S5	0	404.106	45517.395	0	15814.533	9.999+	9.999+
30	5	S6	0	0	45896.932	0	14643.754	9.999+	9.999+
31	6	S1	0	0	48997.444	0	14929.1	9.999+	9.999+
32	6	S2	0	0	49894.648	0	15318.402	9.999+	9.999+
33	6	S3	0	0	50120.801	0	15299.705	9.999+	9.999+
34	6	S4	0	0	50124.377	0	15268.294	9.999+	9.999+
35	6	S5	0	0	49973.733	0	15354.124	9.999+	9.999+
36	6	S6	0	0	49172.579	0	14230.337	9.999+	9.999+
37	7	S1	0	0	45290.702	0	13086.114	9.999+	9.999+
38	7	S2	0	98.104	45519.573	0	12970.395	9.999+	9.999+
39	7	S3	0	0	45508.151	0	12389.55	9.999+	9.999+
40	7	S4	0	0	45537.187	0	12290.379	9.999+	9.999+
41	7	S5	0	76.035	45517.395	0	12264.335	9.999+	9.999+
42	7	S6	0	0	45213.922	0	12017.967	9.999+	9.999+
43	8	S1	0	8525.046	45086.569	1386.19	11683.496	5.289	8.428
44	8	S2	0	7652.574	45180.356	1077.764	11705.941	5.904	9.999+
45	8	S3	0	4431.773	45275.084	642.101	11711.315	9.999+	9.999+
46	8	S4	0	3988.274	45275.634	586.042	11711.325	9.999+	9.999+
47	8	S5	0	3980.757	45177.91	559.477	11705.269	9.999+	9.999+
48	8	S6	0	3471.77	45090.822	479.328	11546.666	9.999+	9.999+
49	9	S1	0	15242.977	45651.095	2556.562	11872.504	2.995	4.644
50	9	S2	0	18318.328	45794.162	2629.947	11906.672	2.5	4.527
51	9	S3	0	18250.267	45923.158	2685.789	11913.841	2.516	4.436
52	9	S4	0	18189.905	45923.884	2667.804	11913.842	2.525	4.466
53	9	S5	0	18441.101	45790.896	2641.67	11905.782	2.483	4.507
54	9	S6	0	15039.359	45656.182	2017.497	11695.585	3.036	5.797
55	10	S1	0	16204.756	45651.095	2272.148	11872.504	2.817	5.225
56	10	S2	0	18864.223	45794.162	2081.437	11906.672	2.428	5.72
57	10	S3	0	19235.693	45923.158	2219.867	11913.841	2.387	5.367
58	10	S4	0	19151.66	45923.884	2210.245	11913.842	2.398	5.39
59	10	S5	0	19038.043	45790.896	2071.739	11905.782	2.405	5.747
60	10	S6	0	16077.429	45656.182	1808.051	11695.585	2.84	6.469
61	11	S1	0	0	46190.236	0	14855.16	9.999+	9.999+

Slab Overturning Safety Factors (By Combination) (Continued)

	LC	Slab	Angle[deg]	Mo-xx[lb-ft]	Ms-xx[lb-ft]	Mo-zz[lb-ft]	Ms-zz[lb-ft]	Ms-xx/Mo-xx	Ms-zz/Mo-zz
62	11	S2	0	305.936	46287.27	0	14974.944	9.999+	9.999+
63	11	S3	0	0	46418.475	0	15047.262	9.999+	9.999+
64	11	S4	0	0	46450.867	0	15026.281	9.999+	9.999+
65	11	S5	0	303.079	46284.415	0	14987.73	9.999+	9.999+
66	11	S6	0	0	46306.423	0	14029.729	9.999+	9.999+
67	12	S1	0	0	48629.976	0	14306.707	9.999+	9.999+
68	12	S2	0	0	49568.576	0	14616.018	9.999+	9.999+
69	12	S3	0	0	49701.842	0	14605.134	9.999+	9.999+
70	12	S4	0	0	49704.168	0	14581.569	9.999+	9.999+
71	12	S5	0	0	49626.668	0	14642.424	9.999+	9.999+
72	12	S6	0	0	48763.157	0	13719.667	9.999+	9.999+
73	13	S1	0	0	45849.92	0	12924.467	9.999+	9.999+
74	13	S2	0	73.578	46287.27	0	12855.012	9.999+	9.999+
75	13	S3	0	0	46242.354	0	12422.517	9.999+	9.999+
76	13	S4	0	0	46263.776	0	12348.133	9.999+	9.999+
77	13	S5	0	57.026	46284.415	0	12325.082	9.999+	9.999+
78	13	S6	0	0	45794.165	0	12060.389	9.999+	9.999+
79	14	S1	0	6393.784	45651.095	1039.643	11872.504	7.14	9.999+
80	14	S2	0	5739.431	45794.162	808.323	11906.672	7.979	9.999+
81	14	S3	0	3323.83	45923.158	481.576	11913.841	9.999+	9.999+
82	14	S4	0	2991.205	45923.884	439.532	11913.842	9.999+	9.999+
83	14	S5	0	2985.568	45790.896	419.608	11905.782	9.999+	9.999+
84	14	S6	0	2603.828	45656.182	359.496	11695.585	9.999+	9.999+
85	15	S1	0	20323.97	27051.941	3408.75	7010.098	1.331	2.057
86	15	S2	0	24424.437	27108.214	3506.596	7023.565	1.11	2.003
87	15	S3	0	24333.689	27165.05	3581.052	7026.789	1.116	1.962
88	15	S4	0	24253.207	27165.38	3557.072	7026.795	1.12	1.975
89	15	S5	0	24588.135	27106.746	3522.226	7023.161	1.102	1.994
90	15	S6	0	20052.479	27054.493	2689.995	6928	1.349	2.575
91	16	S1	0	21606.341	27051.941	3029.531	7010.098	1.252	2.314
92	16	S2	0	25152.298	27108.214	2775.249	7023.565	1.078	2.531
93	16	S3	0	25647.591	27165.05	2959.822	7026.789	1.059	2.374
94	16	S4	0	25535.546	27165.38	2946.994	7026.795	1.064	2.384
95	16	S5	0	25384.057	27106.746	2762.318	7023.161	1.068	2.542
96	16	S6	0	21436.572	27054.493	2410.734	6928	1.262	2.874
97	17	S1	0	0	27710.343	0	10986.973	9.999+	9.999+
98	17	S2	0	407.915	27311.744	0	11114.594	9.999+	9.999+
99	17	S3	0	0	27558.245	0	11204.683	9.999+	9.999+
100	17	S4	0	0	27602.102	0	11176.713	9.999+	9.999+
101	17	S5	0	404.106	27310.437	0	11132.425	9.999+	9.999+
102	17	S6	0	0	27861.065	0	10013.155	9.999+	9.999+
103	18	S1	0	0	30963.33	0	10255.702	9.999+	9.999+
104	18	S2	0	0	31686.819	0	10636.026	9.999+	9.999+
105	18	S3	0	0	31936.067	0	10615.179	9.999+	9.999+
106	18	S4	0	0	31939.837	0	10583.764	9.999+	9.999+
107	18	S5	0	0	31766.774	0	10672.017	9.999+	9.999+
108	18	S6	0	0	31136.712	0	9599.738	9.999+	9.999+
109	19	S1	0	0	27256.588	0	8412.716	9.999+	9.999+
110	19	S2	0	98.104	27311.744	0	8288.019	9.999+	9.999+
111	19	S3	0	0	27323.417	0	7705.024	9.999+	9.999+
112	19	S4	0	0	27352.647	0	7605.849	9.999+	9.999+
113	19	S5	0	76.035	27310.437	0	7582.227	9.999+	9.999+
114	19	S6	0	0	27178.055	0	7387.368	9.999+	9.999+
115	20	S1	0	8525.046	27051.941	1386.19	7010.098	3.173	5.057
116	20	S2	0	7652.574	27108.214	1077.764	7023.565	3.542	6.517
117	20	S3	0	4431.773	27165.05	642.101	7026.789	6.13	9.999+
118	20	S4	0	3988.274	27165.38	586.042	7026.795	6.811	9.999+

Slab Overturning Safety Factors (By Combination) (Continued)

	LC	Slab	Angle[deg]	Mo-xx[lb-ft]	Ms-xx[lb-ft]	Mo-zz[lb-ft]	Ms-zz[lb-ft]	Ms-xx/Mo-xx	Ms-zz/Mo-zz
119	20	S5	0	3980.757	27106.746	559.477	7023.161	6.809	9.999+
120	20	S6	0	3471.77	27054.493	479.328	6928	7.793	9.999+

Slab Sliding Safety Factors (By Combination)

	LC	Slab	Angle[deg]	Va-xx[lb]	Vr-xx[lb]	Va-zz[lb]	Vr-zz[lb]	SR-xx	SR-zz
1	1	S1	0	21.714	2774.514	0	2774.514	9.999+	9.999+
2	1	S2	0	0	2790.762	0	2790.762	9.999+	9.999+
3	1	S3	0	0	2791.9	0	2791.9	9.999+	9.999+
4	1	S4	0	0	2791.902	0	2791.902	9.999+	9.999+
5	1	S5	0	0	2790.62	0	2790.62	9.999+	9.999+
6	1	S6	0	21.588	2774.78	0	2774.78	9.999+	9.999+
7	2	S1	0	31.456	2822.723	0	2822.723	9.999+	9.999+
8	2	S2	0	0	2847.439	0	2847.439	9.999+	9.999+
9	2	S3	0	0	2849.084	0	2849.084	9.999+	9.999+
10	2	S4	0	0	2849.084	0	2849.084	9.999+	9.999+
11	2	S5	0	0	2847.236	0	2847.236	9.999+	9.999+
12	2	S6	0	31.283	2823.053	0	2823.053	9.999+	9.999+
13	3	S1	0	127.728	2131.777	1138.144	2131.777	9.999+	1.873
14	3	S2	0	3.422	2050.001	1538.388	2050.001	9.999+	1.333
15	3	S3	0	4.152	2035.758	1442.13	2035.758	9.999+	1.412
16	3	S4	0	2.962	2037.072	1435.059	2037.072	9.999+	1.42
17	3	S5	0	.03	2044.721	1553.026	2044.721	9.999+	1.317
18	3	S6	0	132.438	2136.491	1127.611	2136.491	9.999+	1.895
19	4	S1	0	149.671	2223.699	936.899	2223.699	9.999+	2.373
20	4	S2	0	7.479	2207.022	1263.71	2207.022	9.999+	1.746
21	4	S3	0	1.835	2166.086	1188.365	2166.086	9.999+	1.823
22	4	S4	0	1.055	2167.274	1180.447	2167.274	9.999+	1.836
23	4	S5	0	5.669	2202.657	1277.33	2202.657	9.999+	1.724
24	4	S6	0	152.38	2227.631	927.701	2227.631	9.999+	2.401
25	5	S1	0	196.063	3524.373	1327.834	3524.373	9.999+	2.654
26	5	S2	0	3.992	3654.984	1794.786	3654.984	9.999+	2.036
27	5	S3	0	4.844	3674.067	1682.485	3674.067	9.999+	2.184
28	5	S4	0	3.455	3672.538	1674.236	3672.538	9.999+	2.194
29	5	S5	0	.035	3660.836	1811.864	3660.836	9.999+	2.02
30	5	S6	0	201.284	3519.45	1315.546	3519.45	9.999+	2.675
31	6	S1	0	133.07	3402.865	1143.526	3402.865	9.999+	2.976
32	6	S2	0	.301	3555.913	1547.799	3555.913	9.999+	2.297
33	6	S3	0	5.441	3548.914	1447.964	3548.914	9.999+	2.451
34	6	S4	0	4.799	3547.683	1442.542	3547.683	9.999+	2.459
35	6	S5	0	4.497	3560.938	1561.247	3560.938	9.999+	2.281
36	6	S6	0	138.504	3398.666	1133.367	3398.666	9.999+	2.999
37	7	S1	0	71.095	3045.396	491.255	3045.396	9.999+	6.199
38	7	S2	0	4.827	3061.085	557.02	3061.085	9.999+	5.495
39	7	S3	0	7.399	2939.444	280.451	2939.444	9.999+	9.999+
40	7	S4	0	1.015	2915.063	230.727	2915.063	9.999+	9.999+
41	7	S5	0	3.608	2910.92	257.866	2910.92	9.999+	9.999+
42	7	S6	0	54.318	2885.595	190.008	2885.595	9.999+	9.999+
43	8	S1	0	25.73	2506.085	487.502	2506.085	9.999+	5.141
44	8	S2	0	7.397	2558.614	483.167	2558.614	9.999+	5.296
45	8	S3	0	4.288	2653.656	260.844	2653.656	9.999+	9.999+
46	8	S4	0	1.041	2667.248	234.923	2667.248	9.999+	9.999+
47	8	S5	0	3.402	2670.342	257.015	2670.342	9.999+	9.999+
48	8	S6	0	10.446	2664.22	190.131	2664.22	9.999+	9.999+
49	9	S1	0	83.061	2328.618	853.608	2328.618	9.999+	2.728
50	9	S2	0	2.567	2277.699	1153.791	2277.699	9.999+	1.974
51	9	S3	0	3.114	2267.681	1081.597	2267.681	9.999+	2.097

Slab Sliding Safety Factors (By Combination) (Continued)

	LC	Slab	Angle[deg]	Va-xx[lb]	Vr-xx[lb]	Va-zz[lb]	Vr-zz[lb]	SR-xx	SR-zz
52	9	S4	0	2.221	2268.666	1076.295	2268.666	9.999+	2.108
53	9	S5	0	.022	2273.657	1164.77	2273.657	9.999+	1.952
54	9	S6	0	86.66	2332.268	845.708	2332.268	9.999+	2.758
55	10	S1	0	99.518	2397.559	702.675	2397.559	9.999+	3.412
56	10	S2	0	5.609	2395.465	947.782	2395.465	9.999+	2.527
57	10	S3	0	1.376	2365.427	891.274	2365.427	9.999+	2.654
58	10	S4	0	.792	2366.317	885.335	2366.317	9.999+	2.673
59	10	S5	0	4.252	2392.11	957.998	2392.11	9.999+	2.497
60	10	S6	0	101.617	2400.623	695.775	2400.623	9.999+	3.45
61	11	S1	0	159.782	3373.065	995.876	3373.065	9.999+	3.387
62	11	S2	0	2.994	3481.436	1346.09	3481.436	9.999+	2.586
63	11	S3	0	3.633	3496.413	1261.864	3496.413	9.999+	2.771
64	11	S4	0	2.591	3495.265	1255.677	3495.265	9.999+	2.784
65	11	S5	0	.026	3485.743	1358.898	3485.743	9.999+	2.565
66	11	S6	0	163.632	3369.487	986.66	3369.487	9.999+	3.415
67	12	S1	0	112.538	3281.934	857.644	3281.934	9.999+	3.827
68	12	S2	0	.225	3407.133	1160.85	3407.133	9.999+	2.935
69	12	S3	0	4.081	3402.549	1085.973	3402.549	9.999+	3.133
70	12	S4	0	3.599	3401.624	1081.907	3401.624	9.999+	3.144
71	12	S5	0	3.373	3410.82	1170.935	3410.82	9.999+	2.913
72	12	S6	0	116.546	3278.899	850.026	3278.899	9.999+	3.857
73	13	S1	0	66.057	3013.832	368.441	3013.832	9.999+	8.18
74	13	S2	0	3.62	3036.012	417.765	3036.012	9.999+	7.267
75	13	S3	0	5.549	2945.446	210.338	2945.446	9.999+	9.999+
76	13	S4	0	.761	2927.159	173.045	2927.159	9.999+	9.999+
77	13	S5	0	2.706	2923.307	193.399	2923.307	9.999+	9.999+
78	13	S6	0	53.407	2894.096	142.506	2894.096	9.999+	9.999+
79	14	S1	0	6.563	2609.349	365.627	2609.349	9.999+	7.137
80	14	S2	0	5.548	2659.158	362.375	2659.158	9.999+	7.338
81	14	S3	0	3.216	2731.105	195.633	2731.105	9.999+	9.999+
82	14	S4	0	.781	2741.298	176.192	2741.298	9.999+	9.999+
83	14	S5	0	2.551	2742.873	192.761	2742.873	9.999+	9.999+
84	14	S6	0	4.834	2728.065	142.598	2728.065	9.999+	9.999+
85	15	S1	0	136.414	1021.972	1138.144	1021.972	7.492	.898
86	15	S2	0	3.422	933.696	1538.388	933.696	9.999+	.607
87	15	S3	0	4.152	918.998	1442.13	918.998	9.999+	.637
88	15	S4	0	2.962	920.311	1435.059	920.311	9.999+	.641
89	15	S5	0	.03	928.473	1553.026	928.473	9.999+	.598
90	15	S6	0	141.073	1026.579	1127.611	1026.579	7.277	.91
91	16	S1	0	158.356	1113.893	936.899	1113.893	7.034	1.189
92	16	S2	0	7.479	1090.717	1263.71	1090.717	9.999+	.863
93	16	S3	0	1.835	1049.326	1188.365	1049.326	9.999+	.883
94	16	S4	0	1.055	1050.513	1180.447	1050.513	9.999+	.89
95	16	S5	0	5.669	1086.409	1277.33	1086.409	9.999+	.851
96	16	S6	0	161.015	1117.719	927.701	1117.719	6.942	1.205
97	17	S1	0	187.377	2414.568	1327.834	2414.568	9.999+	1.818
98	17	S2	0	3.992	2538.679	1794.786	2538.679	9.999+	1.414
99	17	S3	0	4.844	2557.306	1682.485	2557.306	9.999+	1.52
100	17	S4	0	3.455	2555.777	1674.236	2555.777	9.999+	1.527
101	17	S5	0	.035	2544.587	1811.864	2544.587	9.999+	1.404
102	17	S6	0	192.649	2409.538	1315.546	2409.538	9.999+	1.832
103	18	S1	0	124.385	2293.059	1143.526	2293.059	9.999+	2.005
104	18	S2	0	.301	2439.608	1547.799	2439.608	9.999+	1.576
105	18	S3	0	5.441	2432.154	1447.964	2432.154	9.999+	1.68
106	18	S4	0	4.799	2430.922	1442.542	2430.922	9.999+	1.685
107	18	S5	0	4.497	2444.69	1561.247	2444.69	9.999+	1.566
108	18	S6	0	129.868	2288.754	1133.367	2288.754	9.999+	2.019

Slab Sliding Safety Factors (By Combination) (Continued)

	LC	Slab	Angle[deg]	Va-xx[lb]	Vr-xx[lb]	Va-zz[lb]	Vr-zz[lb]	SR-xx	SR-zz
109	19	S1	0	62.41	1935.59	491.255	1935.59	9.999+	3.94
110	19	S2	0	4.827	1944.78	557.02	1944.78	9.999+	3.491
111	19	S3	0	7.399	1822.683	280.451	1822.683	9.999+	6.499
112	19	S4	0	1.015	1798.302	230.727	1798.302	9.999+	7.794
113	19	S5	0	3.608	1794.672	257.866	1794.672	9.999+	6.96
114	19	S6	0	45.683	1775.683	190.008	1775.683	9.999+	9.345
115	20	S1	0	34.416	1396.28	487.502	1396.28	9.999+	2.864
116	20	S2	0	7.397	1442.309	483.167	1442.309	9.999+	2.985
117	20	S3	0	4.288	1536.896	260.844	1536.896	9.999+	5.892
118	20	S4	0	1.041	1550.487	234.923	1550.487	9.999+	6.6
119	20	S5	0	3.402	1554.094	257.015	1554.094	9.999+	6.047
120	20	S6	0	19.081	1554.308	190.131	1554.308	9.999+	8.175

Envelope Slab Soil Pressures

	Label	UC	LC	Soil Pressure[psf]	Allowable Bearing[psf]	Point
1	S1	.478	5	717.208	1500	N1
2	S2	.519	5	779.171	1500	N18
3	S3	.521	5	781.48	1500	N22
4	S4	.52	5	780.03	1500	N26
5	S5	.521	5	781.442	1500	N30
6	S6	.474	5	711.361	1500	N34

Company:		Date:	5/14/2018
Engineer:		Page:	1/6
Project:			
Address:			
Phone:			
E-mail:			

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

General
Design method:ACI 318-08
Units: Imperial units

Anchor Information:
Anchor type: Bonded anchor
Material: F1554 Grade 36
Diameter (inch): 0.375
Effective Embedment depth, h_{ef} (inch): 4.000
Code report: ICC-ES ESR-4057
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 5.25
c_{ac} (inch): 7.12
C_{min} (inch): 1.75
S_{min} (inch): 3.00

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 27.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Hole condition: Dry concrete
Inspection: Periodic
Temperature range, Short/Long: 150/110°F
Ignore 6do requirement: Not applicable
Build-up grout pad: No

Base Plate
Length x Width x Thickness (inch): 4.75 x 4.75 x 0.31

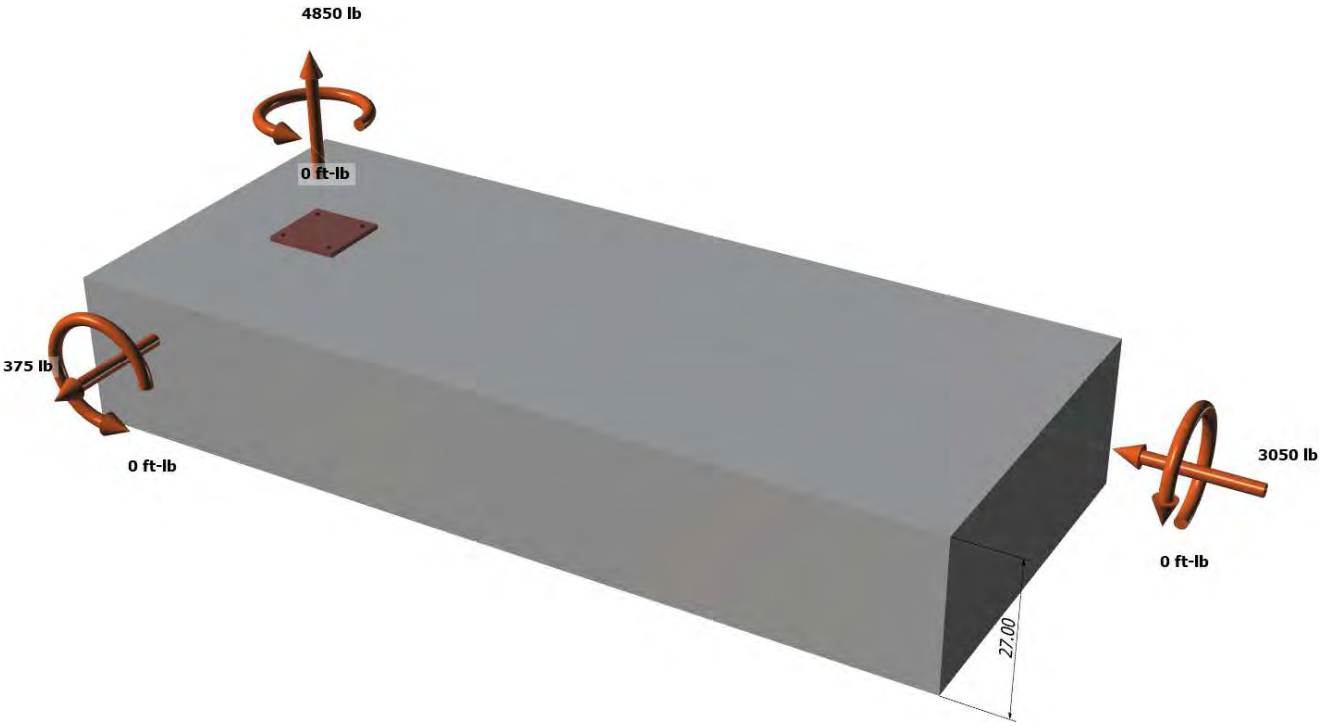
Recommended Anchor
Anchor Name: SET-3G - SET-3G w/ 3/8"Ø F1554 Gr. 36
Code Report: ICC-ES ESR-4057

Load and Geometry
Load factor source: ACI 318 Section 9.2
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: No
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: No

Strength level loads:

N_{ua} [lb]: 4850
V_{uax} [lb]: 375
V_{uay} [lb]: -3050
M_{ux} [ft-lb]: 0
M_{uy} [ft-lb]: 0
M_{uz} [ft-lb]: 0

<Figure 1>



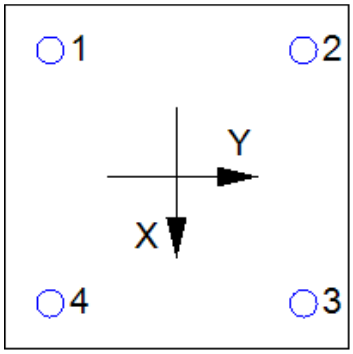
<Figure 2>

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	1212.5	93.8	-762.5	768.2
2	1212.5	93.8	-762.5	768.2
3	1212.5	93.8	-762.5	768.2
4	1212.5	93.8	-762.5	768.2
Sum	4850.0	375.0	-3050.0	3073.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 4850
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



4. Steel Strength of Anchor in Tension (Sec. D.5.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
4525	0.75	3394

5. Concrete Breakout Strength of Anchor in Tension (Sec. D.5.2)

$N_b = k_c \lambda \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. D-7)

k_c	λ	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	2500	4.000	6800

$\phi N_{cbg} = \phi (A_{Nc} / A_{Nco}) \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b$ (Sec. D.4.1 & Eq. D-5)

A_{Nc} (in^2)	A_{Nco} (in^2)	$c_{a,min}$ (in)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cbg} (lb)
240.25	144.00	7.25	1.000	1.000	1.00	1.000	6800	0.65	7374

6. Adhesive Strength of Anchor in Tension (AC308 Sec. 3.3)

$\tau_{k,cr} = \tau_{k,cr} f_{short\text{-}term} K_{sat} (f'_c / 2{,}500)^n$

$\tau_{k,cr}$ (psi)	$f_{short\text{-}term}$	K_{sat}	f'_c (psi)	n	$\tau_{k,cr}$ (psi)
1346	1.00	1.00	2500	0.24	1346

$N_{a0} = \tau_{k,cr} \pi d_a h_{ef}$ (Eq. D-16f)

$\tau_{k,cr}$ (psi)	d_a (in)	h_{ef} (in)	N_{a0} (lb)
1346	0.38	4.000	6343

$\phi N_{ag} = \phi (A_{Na} / A_{Na0}) \Psi_{ed,Na} \Psi_{g,Na} \Psi_{ec,Na} \Psi_{p,Na} N_{a0}$ (Sec. D.4.1 & Eq. D-16b)

A_{Na} (in^2)	A_{Na0} (in^2)	$\Psi_{ed,Na}$	$\Psi_{g,Na}$	$\Psi_{ec,Na}$	$\Psi_{p,Na}$	N_{a0}(lb)	ϕ	ϕN_{ag} (lb)
161.83	85.03	1.000	1.038	1.000	1.000	6343	0.55	6892

8. Steel Strength of Anchor in Shear (Sec. D.6.1)

V_{sa} (lb)	ϕ_{grout}	ϕ	$\phi_{grout}\phi V_{sa}$ (lb)
2715	1.0	0.65	1765

9. Concrete Breakout Strength of Anchor in Shear (Sec. D.6.2)

Shear perpendicular to edge in x-direction:

$V_{bx} = 7(l_e / d_a)^{0.2}\sqrt{d_a}\lambda\sqrt{f'_c}c_{a1}^{1.5}$ (Eq. D-24)

l_e (in)	d_a (in)	λ	f'_c (psi)	c_{a1} (in)	V_{bx} (lb)
3.00	0.375	1.00	2500	13.75	16564

$\phi V_{cbgx} = \phi\,(A_{Vc} / A_{Vco})\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{bx}$ (Sec. D.4.1 & Eq. D-22)

A_{Vc} (in²)	A_{Vco} (in²)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbgx} (lb)
647.11	850.78	1.000	0.805	1.000	1.000	16564	0.70	7103

Shear perpendicular to edge in y-direction:

$V_{by} = 7(l_e / d_a)^{0.2}\sqrt{d_a}\lambda\sqrt{f'_c}c_{a1}^{1.5}$ (Eq. D-24)

l_e (in)	d_a (in)	λ	f'_c (psi)	c_{a1} (in)	V_{by} (lb)
3.00	0.375	1.00	2500	10.75	11450

$\phi V_{cbgy} = \phi\,(A_{Vc} / A_{Vco})\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{by}$ (Sec. D.4.1 & Eq. D-22)

A_{Vc} (in²)	A_{Vco} (in²)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cbgy} (lb)
387.00	520.03	1.000	0.891	1.000	1.000	11450	0.70	5313

Shear parallel to edge in x-direction:

$V_{by} = 7(l_e / d_a)^{0.2}\sqrt{d_a}\lambda\sqrt{f'_c}c_{a1}^{1.5}$ (Eq. D-24)

l_e (in)	d_a (in)	λ	f'_c (psi)	c_{a1} (in)	V_{by} (lb)
3.00	0.375	1.00	2500	7.25	6342

$\phi V_{cbgx} = \phi\,(2)(A_{Vc} / A_{Vco})\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{by}$ (Sec. D.4.1, D.6.2.1(c) & Eq. D-22)

A_{Vc} (in²)	A_{Vco} (in²)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cbgx} (lb)
261.00	236.53	1.000	1.000	1.000	1.000	6342	0.70	9797

Shear parallel to edge in y-direction:

$V_{bx} = 7(l_e / d_a)^{0.2}\sqrt{d_a}\lambda\sqrt{f'_c}c_{a1}^{1.5}$ (Eq. D-24)

l_e (in)	d_a (in)	λ	f'_c (psi)	c_{a1} (in)	V_{bx} (lb)
3.00	0.375	1.00	2500	10.25	10661

$\phi V_{cbgy} = \phi\,(2)(A_{Vc} / A_{Vco})\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{bx}$ (Sec. D.4.1, D.6.2.1(c) & Eq. D-22)

A_{Vc} (in²)	A_{Vco} (in²)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbgy} (lb)
401.67	472.78	1.000	1.000	1.000	1.000	10661	0.70	12680

10. Concrete Pryout Strength of Anchor in Shear (Sec. D.6.3)

$\phi V_{cpg} = \phi \min|k_{cp}N_{ag}\,;\, k_{cp}N_{cbg}| = \phi \min|k_{cp}(A_{Na} / A_{Na0})\Psi_{ed,Na}\Psi_{g,Na}\Psi_{ec,Na}\Psi_{p,Na}N_{a0}\,;\, k_{cp}(A_{Nc} / A_{Nco})\Psi_{ec,N}\Psi_{ed,N}\Psi_{c,N}\Psi_{cp,N}N_b|$ (Eq. D-30b)

k_{cp}	A_{Na} (in²)	A_{Na0} (in²)	$\Psi_{ed,Na}$	$\Psi_{g,Na}$	$\Psi_{ec,Na}$	$\Psi_{p,Na}$	N_{a0} (lb)	N_a (lb)
2.0	161.83	85.03	1.000	1.038	1.000	1.000	6343	12531

A_{Nc} (in²)	A_{Nco} (in²)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	N_{cb} (lb)	ϕ
240.25	144.00	1.000	1.000	1.000	1.000	6800	11345	0.70

ϕV_{cpg} (lb)
15883

11. Results

Interaction of Tensile and Shear Forces (Sec. RD.7)

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	1213	3394	0.36	Pass
Concrete breakout	4850	7374	0.66	Pass
Adhesive	**4850**	**6892**	**0.70**	**Pass (Governs)**

Shear	Factored Load, V_{ua} (lb)	Design Strength, ϕV_n (lb)	Ratio	Status
Steel	768	1765	0.44	Pass
T Concrete breakout x+	375	7103	0.05	Pass
T Concrete breakout y-	3050	5313	0.57	Pass
|| Concrete breakout y-	188	9797	0.02	Pass
|| Concrete breakout x-	1525	12680	0.12	Pass
Concrete breakout, combined	**-**	**-**	**0.58**	**Pass (Governs)**
Pryout	3073	15883	0.19	Pass

Interaction check	$(N_{ua}/\phi N_{ua})^{5/3}$	$(V_{ua}/\phi V_{ua})^{5/3}$	Combined Ratio	Permissible	Status
Sec. RD.7	0.56	0.40	95.6%	1.0	Pass

SET-3G w/ 3/8"Ø F1554 Gr. 36 with hef = 4.000 inch meets the selected design criteria.

12. Warnings

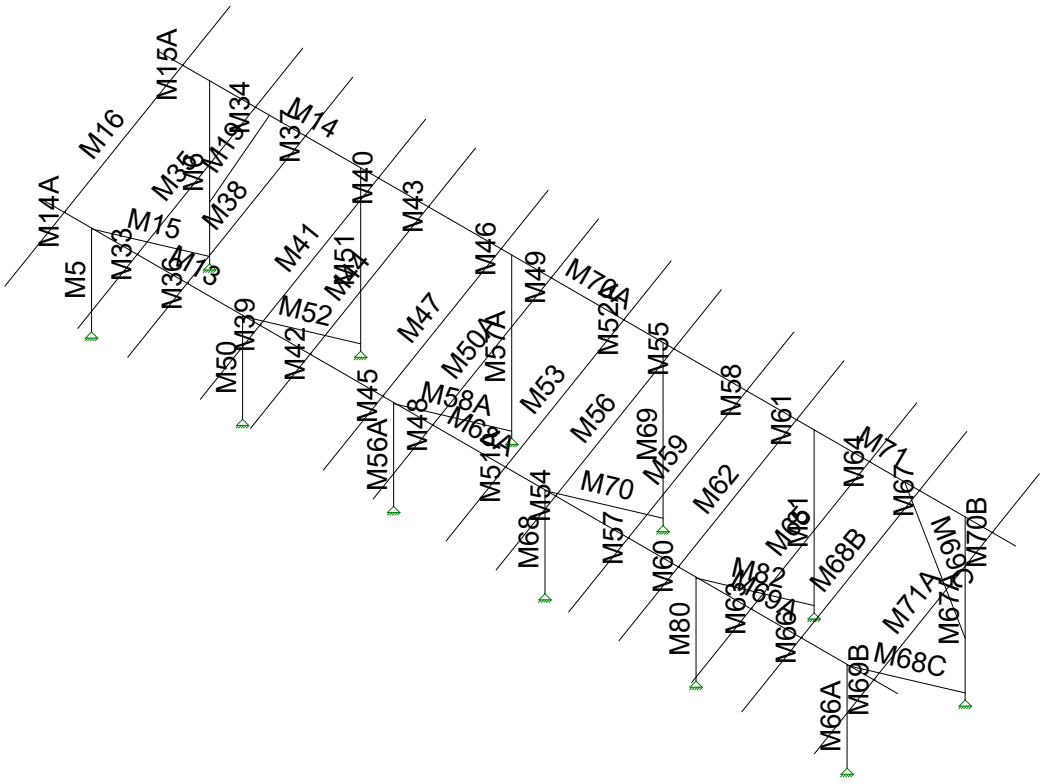
- Designer must exercise own judgement to determine if this design is suitable.

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

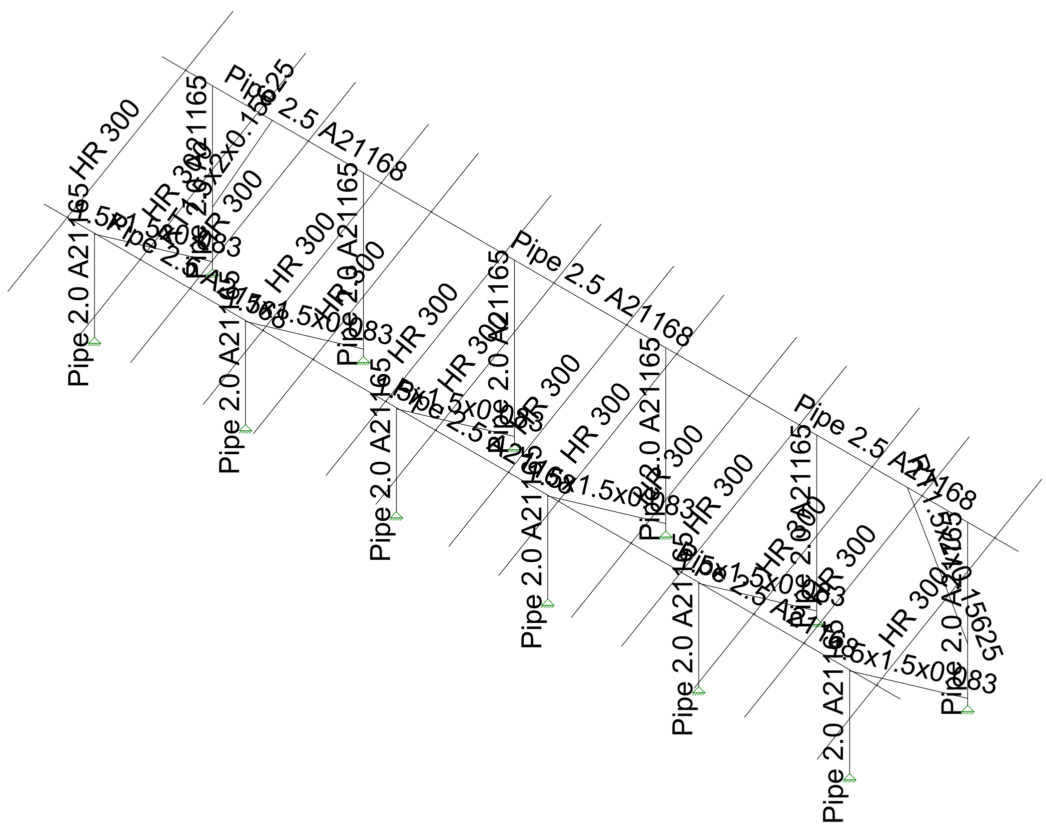
VECTOR ENGINEERS

JOB NO.: U2716-096-191 **DESIGNED:** STB

Framing Analysis



Vector Structural Engineeri...		SK - 11
STB	Ground Mount	July 29, 2019 at 9:52 AM
U2716.096.191		USA B2a GM v4.r3d



Vector Structural Engineeri...	Ground Mount	SK - 12
STB		July 29, 2019 at 9:53 AM
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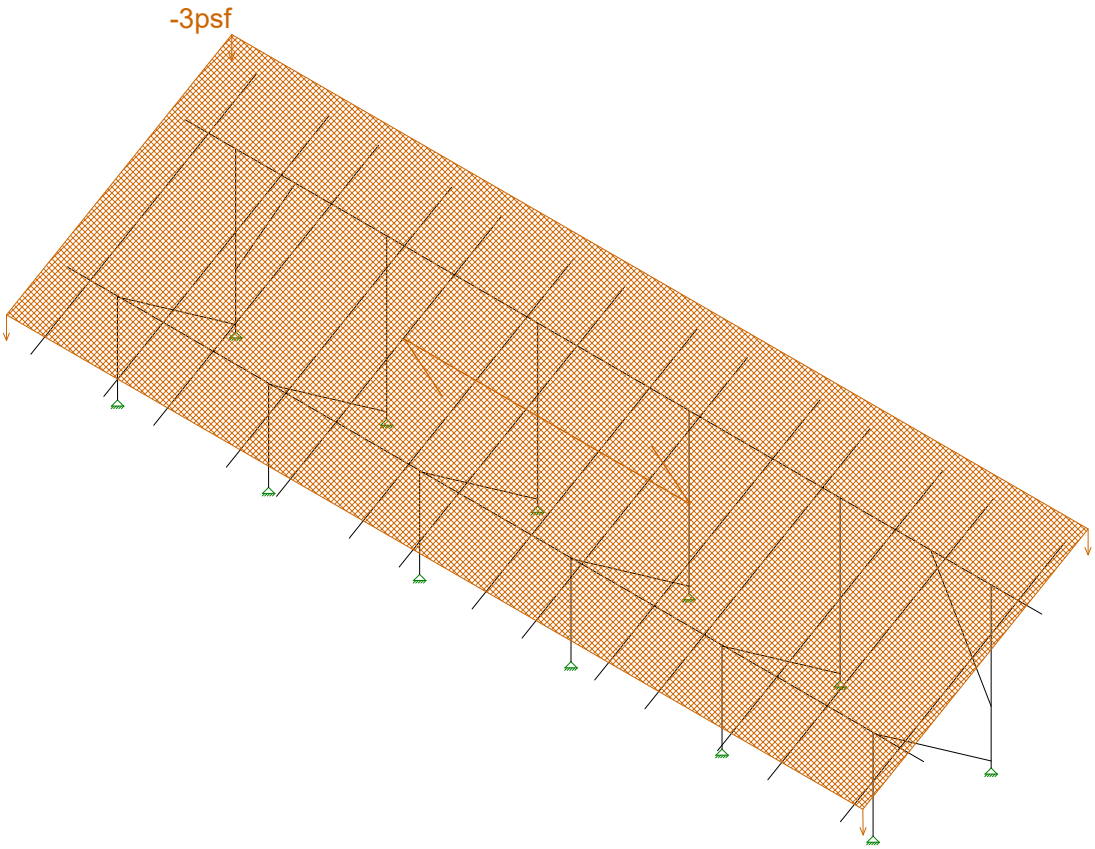
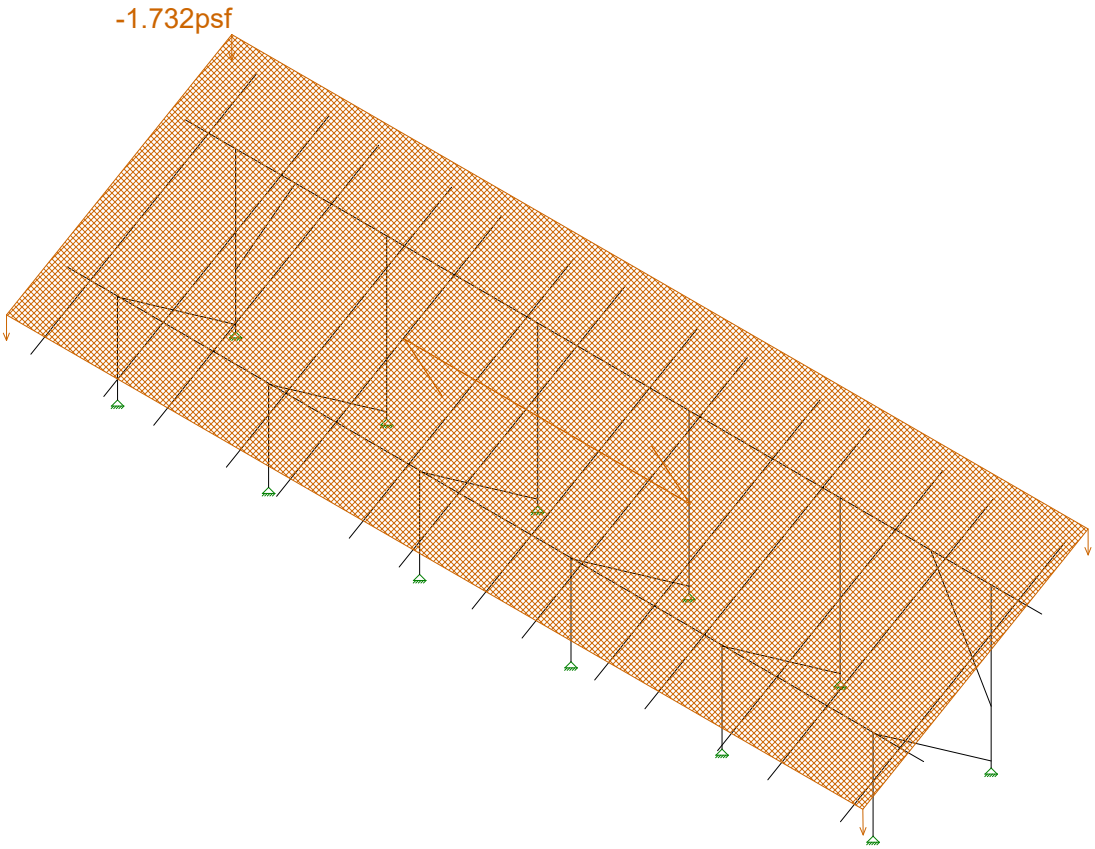


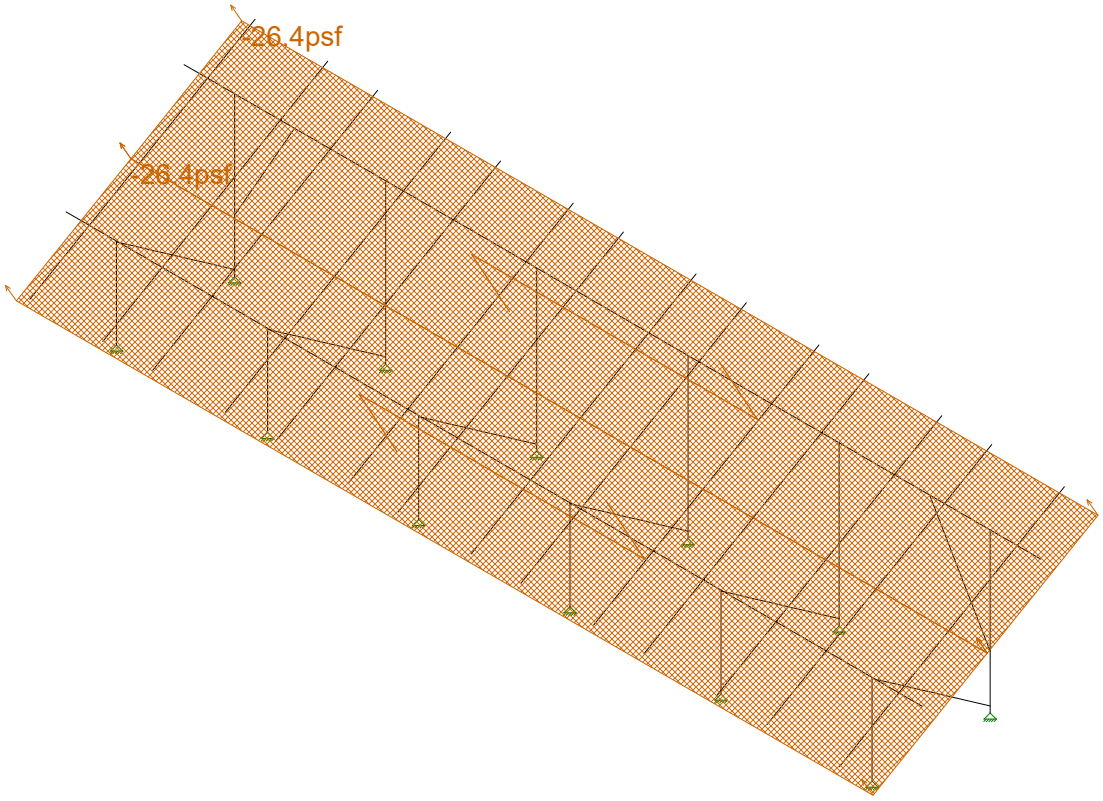
Loads: BLC 2, Solar Panel Weight

Vector Structural Engineeri...		SK - 4
STB	Ground Mount	July 29, 2019 at 9:52 AM
U2716.096.191		USA B2a GM v4.r3d



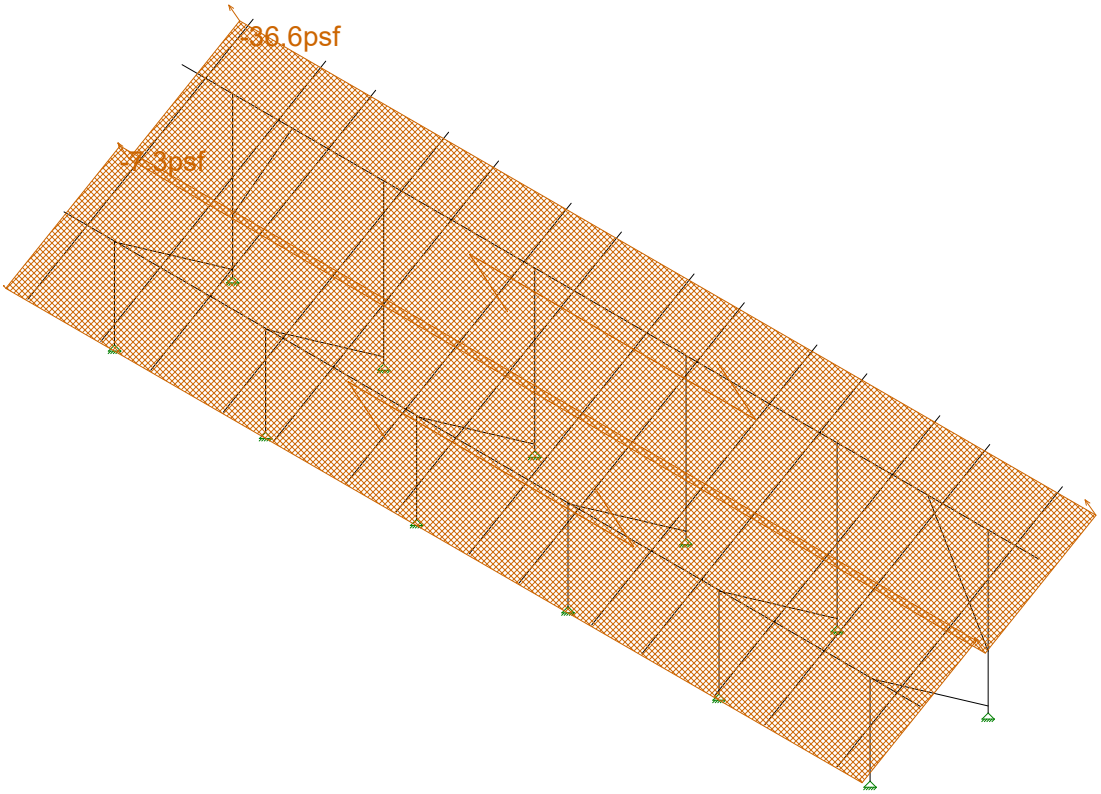
Loads: BLC 3, Roof Live/Snow

Vector Structural Engineeri...		SK - 1
STB	Ground Mount	July 29, 2019 at 9:49 AM
U2716.096.191		USA B2a GM v4.r3d



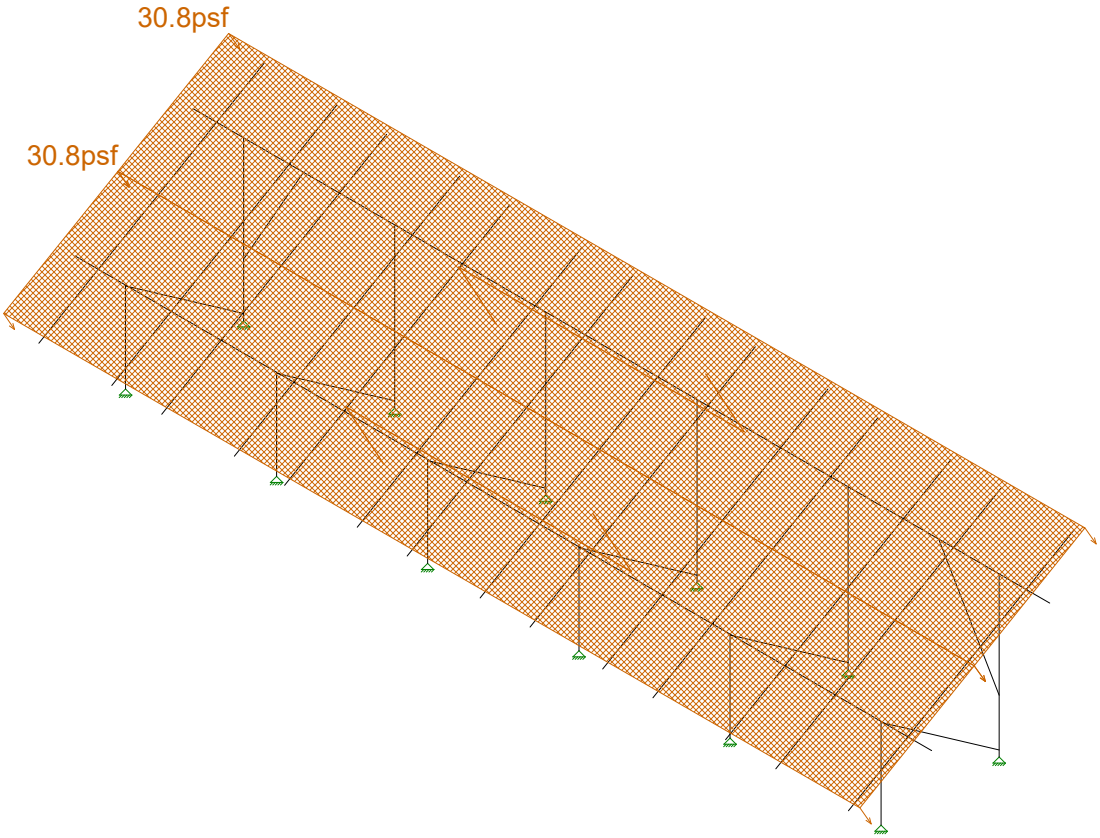
Loads: BLC 4, Wind A 0 deg

Vector Structural Engineeri...	Ground Mount	SK - 5
STB		July 29, 2019 at 9:52 AM
U2716.096.191		USA B2a GM v4.r3d



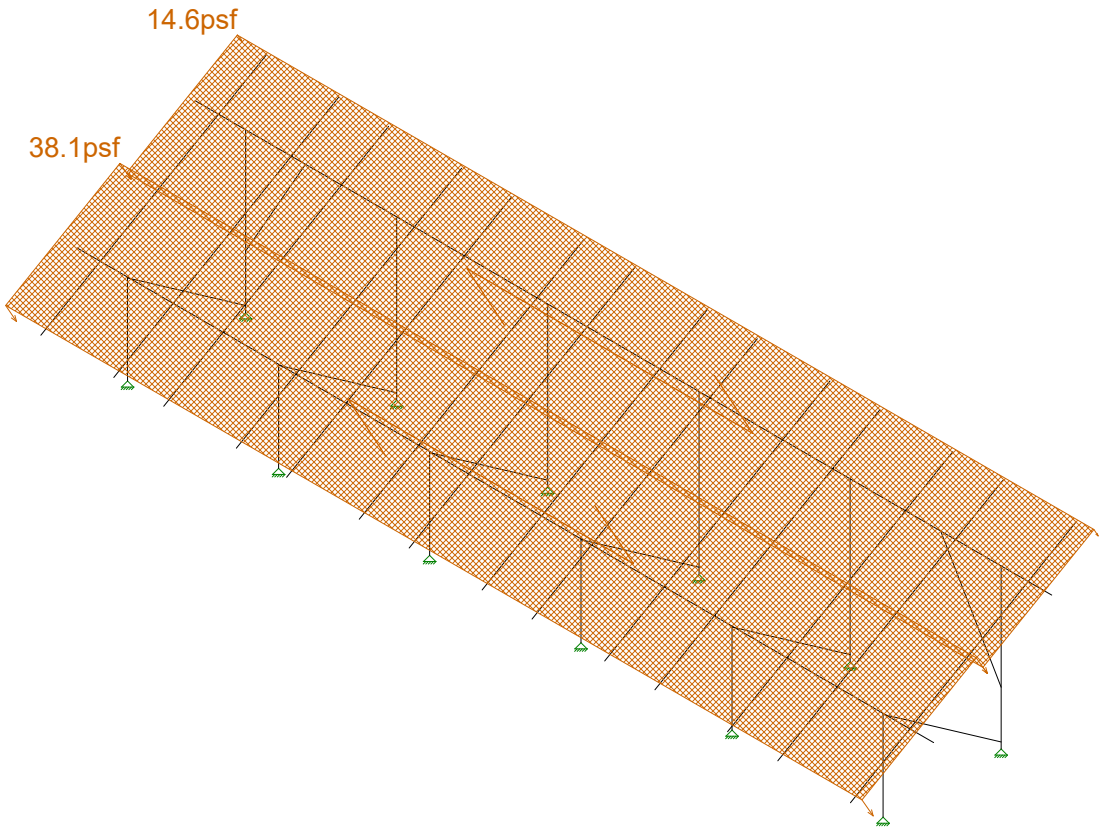
Loads: BLC 5, Wind B 0 deg

Vector Structural Engineeri...	Ground Mount	SK - 6
STB		July 29, 2019 at 9:52 AM
U2716.096.191		USA B2a GM v4.r3d



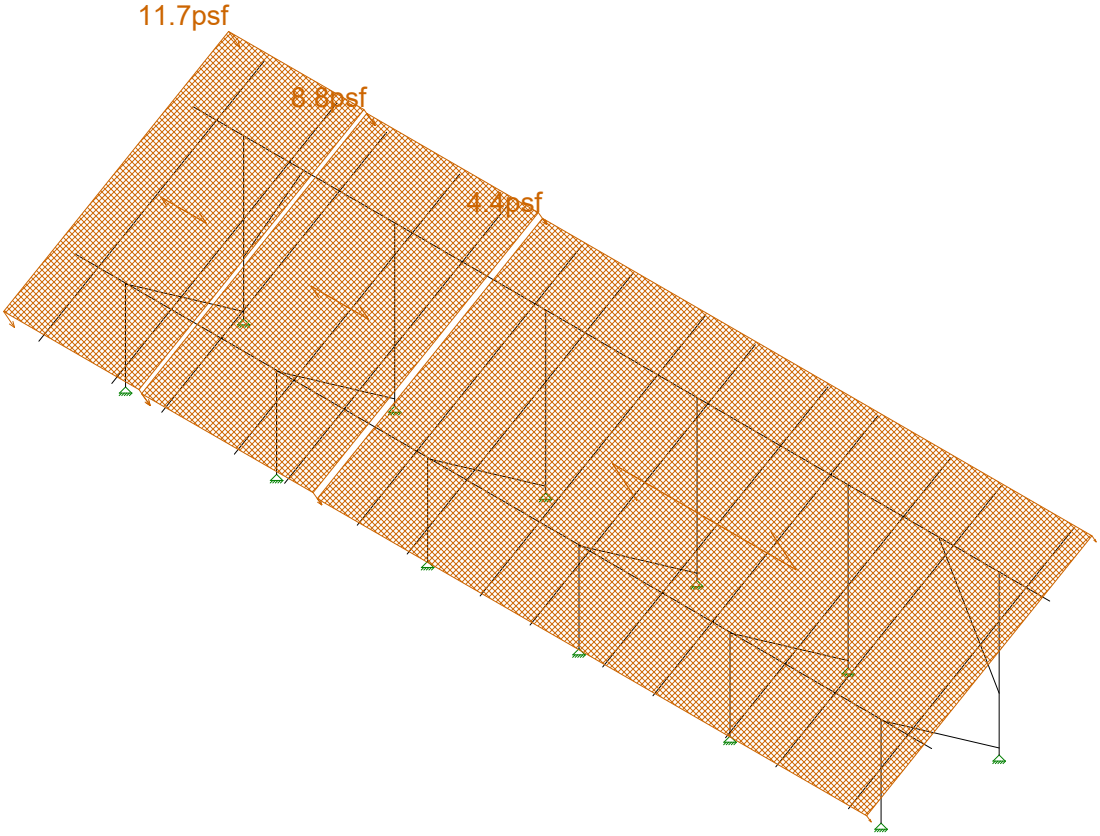
Loads: BLC 6, Wind A 180 deg

Vector Structural Engineeri...	Ground Mount	SK - 7
STB		July 29, 2019 at 9:52 AM
U2716.096.191		USA B2a GM v4.r3d



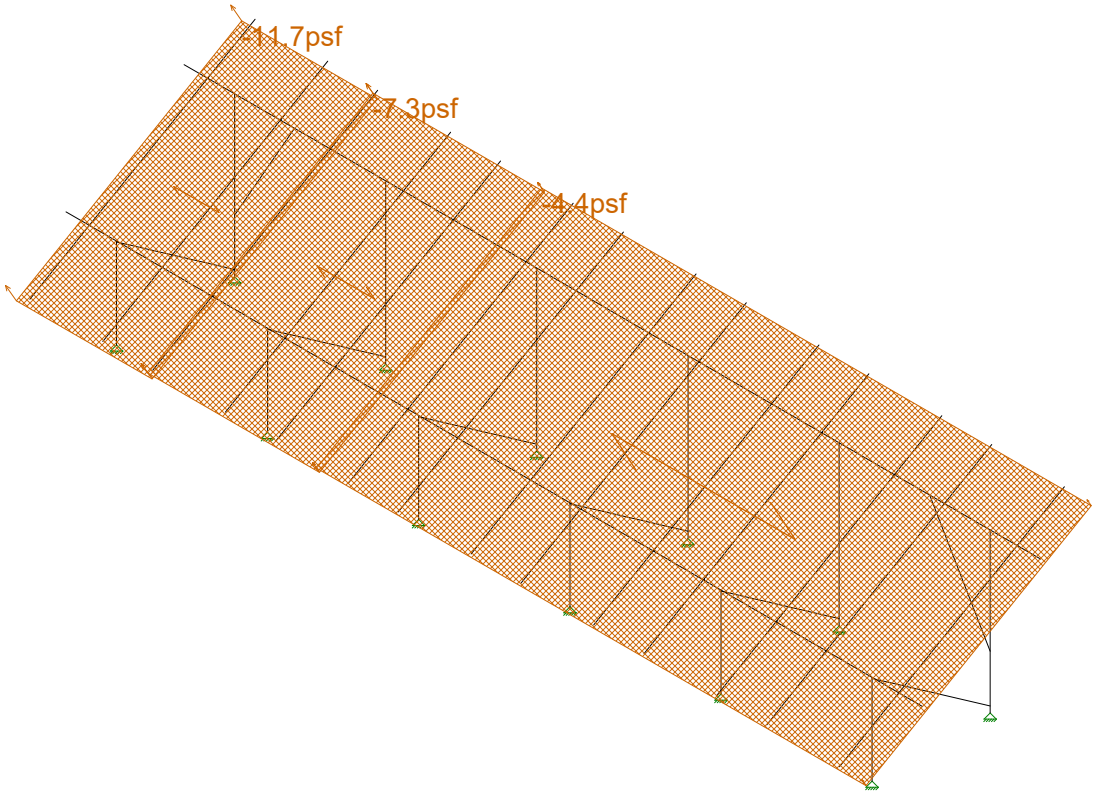
Loads: BLC 7, Wind B 180 deg

Vector Structural Engineeri...		SK - 8
STB	Ground Mount	July 29, 2019 at 9:52 AM
U2716.096.191		USA B2a GM v4.r3d



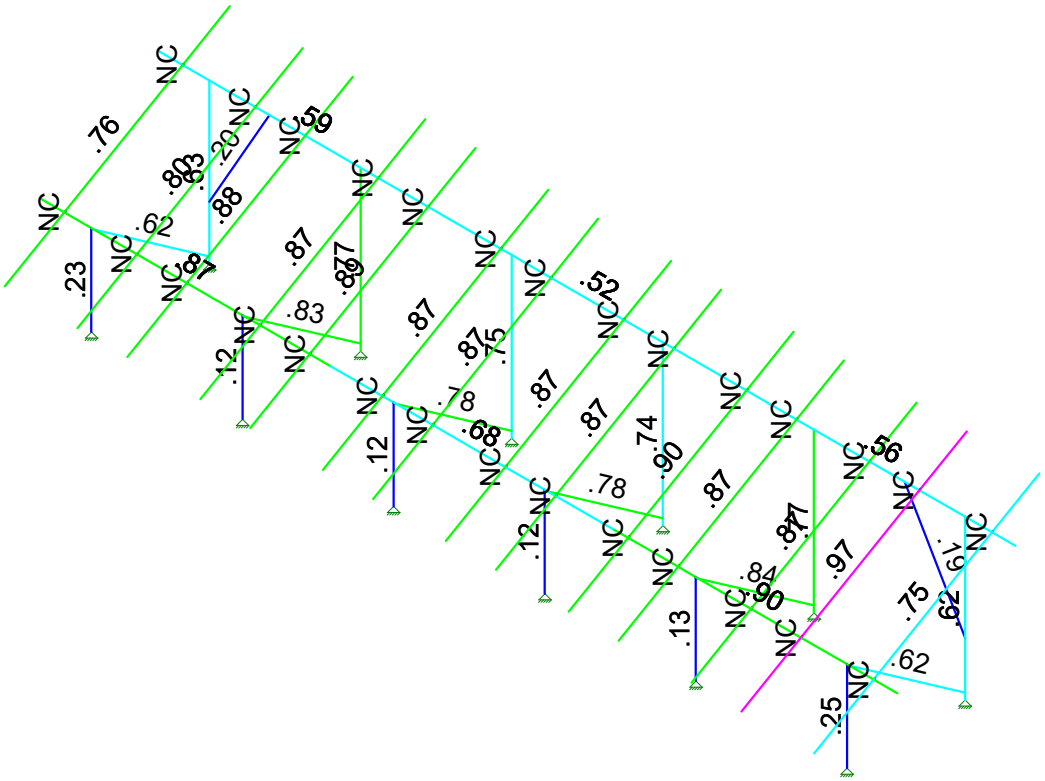
Loads: BLC 8, Wind A 90

Vector Structural Engineeri...		SK - 9
STB	Ground Mount	July 29, 2019 at 9:52 AM
U2716.096.191		USA B2a GM v4.r3d



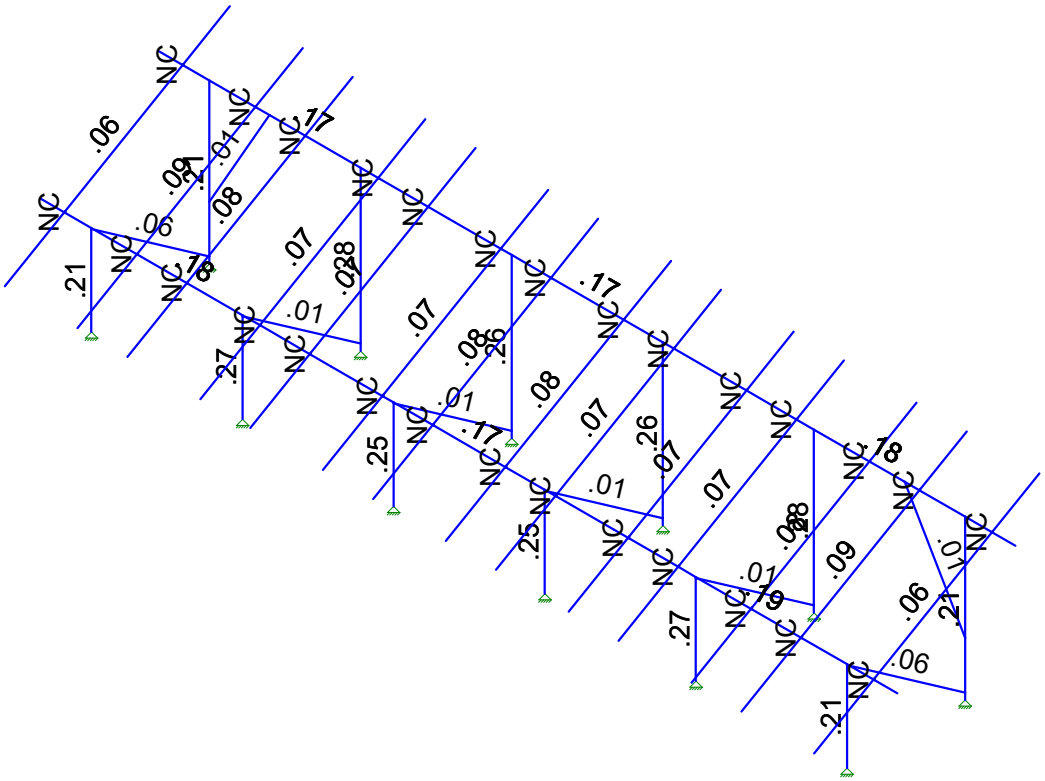
Loads: BLC 9, Wind B 90

Vector Structural Engineeri...		SK - 10
STB	Ground Mount	July 29, 2019 at 9:52 AM
U2716.096.191		USA B2a GM v4.r3d



Member Code Checks Displayed (Enveloped)
Envelope Only Solution

Vector Structural Engineeri...		SK - 2
STB	Ground Mount	July 29, 2019 at 9:49 AM
U2716.096.191		USA B2a GM v4.r3d



Member Shear Checks Displayed (Enveloped)
Envelope Only Solution

Vector Structural Engineeri...		SK - 3
STB	Ground Mount	July 29, 2019 at 9:50 AM
U2716.096.191		USA B2a GM v4.r3d

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (in/sec^2)	386.4
Wall Mesh Size (in)	24
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 13th(360-05): ASD
Adjust Stiffness?	Yes(Iterative)
RISAConnection Code	AISC 13th(360-05): ASD
Cold Formed Steel Code	AISI S100-07: ASD
Wood Code	AWC NDS-15: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-08
Masonry Code	ACI 530-08: ASD
Aluminum Code	AA ADM1-05: ASD - Building
	AISC 14th(360-10): ASD

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

(Global) Model Settings, Continued

Seismic Code	ASCE 7-10
Seismic Base Elevation (in)	15600
Add Base Weight?	Yes
Ct X	.02
Ct Z	.02
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	3
R Z	3
Ct Exp. X	.75
Ct Exp. Z	.75
SD1	1
SDS	1
S1	1
TL (sec)	5
Risk Cat	I or II
Drift Cat	Other
Om Z	1
Om X	1
Cd Z	4
Cd X	4
Rho Z	1
Rho X	1

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E5 F)	Density[lb/ft^3]	Yield[psi]	Ry	Fu[psi]	Rt
1	A992	29000	11154	.3	.65	490	50000	1.1	65000	1.1
2	A36 Gr.36	29000	11154	.3	.65	490	36000	1.5	58000	1.2
3	A572 Gr.50	29000	11154	.3	.65	490	50000	1.1	65000	1.1
4	A500 Gr.B R...	29000	11154	.3	.65	527	42000	1.4	58000	1.3
5	A500 Gr.B Re...	29000	11154	.3	.65	527	46000	1.4	58000	1.3
6	A53 Gr.B	29000	11154	.3	.65	490	35000	1.6	60000	1.2
7	A1085	29000	11154	.3	.65	490	50000	1.4	65000	1.3

Aluminum Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (...	Density[...	Table 3.3	kt	Ftu[psi]	Fty[psi]	Fcy[psi]	Fsu[psi]	Ct
1	3003-H14	10100	3787.5	.33	1.3	172.8	Table 3.3-3	1	19000	16000	13000	12000	141
2	6061-T6	10100	3787.5	.33	1.3	172.8	Table 3.3-4	1	38000	35000	35000	24000	141
3	6063-T5	10100	3787.5	.33	1.3	172.8	Table 3.3-4	1	22000	16000	16000	13000	141
4	6063-T6	10100	3787.5	.33	1.3	172.8	Table 3.3-4	1	30000	25000	25000	19000	141
5	5052-H34	10200	3787.5	.33	1.3	172.8	Table 3.3-3	1	34000	26000	24000	20000	141
6	6061-T6 W	10100	3787.5	.33	1.3	172.8	Table 3.3-3	1	24000	15000	15000	15000	141
7	6005-T5	10100	3787.5	.33	1.3	172.8	Table 3.3-3	1	38000	35000	35000	24000	141

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design R...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Post	Pipe 2.0 A21165	Column	Pipe	A572 Gr.50	Typical	.776	.499	.499	.998
2	Cross Beam	Pipe 2.5 A21168	Beam	Wide Flange	A572 Gr.50	Typical	.947	.907	.907	1.814
3	Diagonal Brace	1.5x1.5x0.083	Beam	Wide Flange	A572 Gr.50	Typical	.47	.158	.158	.236

Aluminum Section Sets

	Label	Shape	Type	Design List	Material	Design R...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	AL Posts	2.375ODX0.188	Column	Pipe	6005-T5	Typical	1.29	.778	.778	1.54
2	AL Brace	RT1.5x2x0.15625	VBrace	Rectangular Tubes	6005-T5	Typical	.996	.327	.524	.602
3	AL Rails	HR 300	Beam	Rectangular Tubes	6005-T5	Typical	.861	.288	.834	.659
4	AL Cross Beam	Cross Rail	Beam	Rectangular Tubes	6005-T5	Typical	1.909	1.97	4.366	4.017

Member Area Loads (BLC 2 : Solar Panel Weight)

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
1	N197	N200	N199	N196	Y	A-B	-3

Member Area Loads (BLC 3 : Roof Live/Snow)

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
1	N197	N200	N199	N196	PY	A-B	-2

Member Area Loads (BLC 4 : Wind A 0 deg)

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
1	N197	N200	N201	N198	Perp	A-B	-26.4
2	N198	N201	N199	N196	Perp	A-B	-26.4

Member Area Loads (BLC 5 : Wind B 0 deg)

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
1	N197	N200	N201	N198	Perp	A-B	-36.6
2	N198	N201	N199	N196	Perp	A-B	-7.3

Member Area Loads (BLC 6 : Wind A 180 deg)

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
1	N197	N200	N201	N198	Perp	A-B	30.8
2	N198	N201	N199	N196	Perp	A-B	30.8

Member Area Loads (BLC 7 : Wind B 180 deg)

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
1	N197	N200	N201	N198	Perp	A-B	14.6
2	N198	N201	N199	N196	Perp	A-B	38.1

Member Area Loads (BLC 8 : Wind A 90)

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
1	N197	N203	N202	N196	Perp	A-B	11.7
2	N203	N209	N208	N202	Perp	A-B	8.8
3	N209	N200	N199	N208	Perp	A-B	4.4

Member Area Loads (BLC 9 : Wind B 90)

	Joint A	Joint B	Joint C	Joint D	Direction	Distribution	Magnitude[psf]
1	N197	N203	N202	N196	Perp	A-B	-11.7
2	N203	N209	N208	N202	Perp	A-B	-7.3
3	N209	N200	N199	N208	Perp	A-B	-4.4

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(M...	Surface...
1	Self Weight	DL		-1.05						
2	Solar Panel Weight	DL							1	

Basic Load Cases (Continued)

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(M...	Surface...
3	Roof Live/Snow	RLL							1	
4	Wind A 0 deg	OL1							2	
5	Wind B 0 deg	OL2							2	
6	Wind A 180 deg	OL3							2	
7	Wind B 180 deg	OL4							2	
8	Wind A 90	OL5							3	
9	Wind B 90	OL6							3	
10	BLC 2 Transient Area ...	None						34		
11	BLC 3 Transient Area ...	None						34		
12	BLC 4 Transient Area ...	None						104		
13	BLC 5 Transient Area ...	None						104		
14	BLC 6 Transient Area ...	None						104		
15	BLC 7 Transient Area ...	None						104		
16	BLC 8 Transient Area ...	None						90		
17	BLC 9 Transient Area ...	None						90		

Load Combinations

	Description	S...	PD...	SRSS	BLC	Fa...	BLC	Fa...	BLC	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	1.0 D	Yes	Y		DL	1																		
2	1.0 D + 1.0 S	Yes	Y		DL	1	RLL	1																
3	1.0 D + 0.6 W1	Yes	Y		DL	1	RLL		OL1	1														
4	1.0 D + 0.6 W2	Yes	Y		DL	1	RLL		OL2	1														
5	1.0 D + 0.6 W3	Yes	Y		DL	1	RLL		OL3	1														
6	1.0 D + 0.6 W4	Yes	Y		DL	1	RLL		OL4	1														
7	1.0 D + 0.6 W5	Yes	Y		DL	1	RLL		OL5	1														
8	1.0 D + 0.6 W6	Yes	Y		DL	1	RLL		OL6	1														
9	1.0 D + 0.45 W1 + 0....	Yes	Y		DL	1	RLL	.75	OL1	.75														
10	1.0 D + 0.45 W2 + 0....	Yes	Y		DL	1	RLL	.75	OL2	.75														
11	1.0 D + 0.45 W3 + 0....	Yes	Y		DL	1	RLL	.75	OL3	.75														
12	1.0 D + 0.45 W4 + 0....	Yes	Y		DL	1	RLL	.75	OL4	.75														
13	1.0 D + 0.45 W5 + 0....	Yes	Y		DL	1	RLL	.75	OL5	.75														
14	1.0 D + 0.45 W6 + 0....	Yes	Y		DL	1	RLL	.75	OL6	.75														
15	0.6 D + 0.6 W1	Yes	Y		DL	.6	RLL		OL1	1														
16	0.6 D + 0.6 W2	Yes	Y		DL	.6	RLL		OL2	1														
17	0.6 D + 0.6 W3	Yes	Y		DL	.6	RLL		OL3	1														
18	0.6 D + 0.6 W4	Yes	Y		DL	.6	RLL		OL4	1														
19	0.6 D + 0.6 W5	Yes	Y		DL	.6	RLL		OL5	1														
20	0.6 D + 0.6 W6	Yes	Y		DL	.6	RLL		OL6	1														

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
1	N2	max	50.841	6	932.11	4	13.566	3	0	1	0	1	0	1
2		min	-28.177	15	47.749	17	-15.518	5	0	1	0	1	0	1
3	N1	max	145.025	5	2769.106	5	1344.1...	5	0	1	0	1	0	1
4		min	-161.857	16	-2449.117	16	-1151....	3	0	1	0	1	0	1
5	N132	max	8.513	16	3284.954	5	1828.2...	5	0	1	0	1	0	1
6		min	-7.872	5	-2859.625	16	-1567....	3	0	1	0	1	0	1
7	N133	max	8.929	6	1298.162	4	14.738	3	0	1	0	1	0	1
8		min	-6.377	15	-4.687	17	-16.8	5	0	1	0	1	0	1
9	N109	max	7.382	5	3266.442	5	1811.1...	5	0	1	0	1	0	1
10		min	-10.07	16	-2832.445	16	-1553....	3	0	1	0	1	0	1
11	N110A	max	5.975	20	1284.589	4	14.718	3	0	1	0	1	0	1
12		min	-5.241	7	-6.57	17	-16.791	5	0	1	0	1	0	1
13	N121	max	3.035	20	3271.567	5	1699.81	5	0	1	0	1	0	1

Envelope Joint Reactions (Continued)

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
14		min	-3.532	19	-2910.679	16	-1457....	3	0	1	0	1	0	1
15	N122	max	7.066	5	1205.276	4	15.393	3	0	1	0	1	0	1
16		min	-5.285	15	37.574	17	-17.764	5	0	1	0	1	0	1
17	N133B	max	1.43	5	3261.317	5	1691.6...	5	0	1	0	1	0	1
18		min	-2.632	16	-2897.145	16	-1450....	3	0	1	0	1	0	1
19	N134B	max	4.335	15	1195.456	4	15.379	3	0	1	0	1	0	1
20		min	-5.485	5	42.563	17	-17.779	5	0	1	0	1	0	1
21	N137C	max	163.593	16	2727.615	5	1331.91	5	0	1	0	1	0	1
22		min	-145.035	5	-2429.477	16	-1140....	3	0	1	0	1	0	1
23	N138B	max	32.818	15	924.46	4	13.501	3	0	1	0	1	0	1
24		min	-57.333	6	71.736	17	-15.57	5	0	1	0	1	0	1
25	Totals:	max	.034	8	19338.446	5	9606.7...	17						
26		min	-.036	7	-12642.666	15	-8234.36	15						

Envelope AISC 13th(360-05): ASD Steel Code Checks

	Member	Shape	Code Check	Loc[in]	LC	Shear ...	Loc[in]	Dir	LC	Pnc/om [...	Pnt/om [lb]	Mnyy/om...	Mnzz/om...	Cb	Eqn
1	M5	Pipe 2.0 A2...	.231	57.154	6	.213	57.154		5	16027.062	23232.186	1397.505	1397.505	1....	H1-1b
2	M6	Pipe 2.0 A2...	.629	33.591	5	.208	0		5	7388.533	23232.186	1397.505	1397.505	1....	H1-1a
3	M13	Pipe 2.5 A2...	.875	128....	6	.183	128....		6	11641.036	28358.413	2081.747	2081.747	1....	H1-1b
4	M14	Pipe 2.5 A2...	.588	128....	5	.171	138		16	11641.036	28358.413	2081.747	2081.747	2....	H1-1b
5	M15	1.5x1.5x0.083	.621	47.713	5	.056	0	y	5	2829.368	14085.15	624.421	624.421	1....	H1-1a
6	M80	Pipe 2.0 A2...	.125	57.154	6	.274	57.154		5	16027.062	23232.186	1397.505	1397.505	1....	H1-1b*
7	M81	Pipe 2.0 A2...	.771	3.149	5	.280	0		5	7388.533	23232.186	1397.505	1397.505	1....	H1-1a
8	M82	1.5x1.5x0.083	.840	47.713	5	.005	91.609	y	7	2829.368	14085.15	624.421	624.421	1....	H1-1a
9	M50	Pipe 2.0 A2...	.124	57.154	6	.271	57.154		5	16027.062	23232.186	1397.505	1397.505	1.7	H1-1b*
10	M51	Pipe 2.0 A2...	.765	3.149	5	.278	0		5	7388.533	23232.186	1397.505	1397.505	1....	H1-1a
11	M52	1.5x1.5x0.083	.832	47.713	5	.007	91.609	y	8	2829.368	14085.15	624.421	624.421	1....	H1-1a
12	M56A	Pipe 2.0 A2...	.119	57.154	6	.254	57.154		5	16027.062	23232.186	1397.505	1397.505	1....	H1-1b*
13	M57A	Pipe 2.0 A2...	.746	3.149	5	.260	0		5	7388.533	23232.186	1397.505	1397.505	1....	H1-1a
14	M58A	1.5x1.5x0.083	.781	47.713	5	.006	91.609	y	7	2829.368	14085.15	624.421	624.421	1....	H1-1a
15	M68	Pipe 2.0 A2...	.119	57.154	6	.253	57.154		5	16027.062	23232.186	1397.505	1397.505	1....	H1-1b*
16	M69	Pipe 2.0 A2...	.743	3.149	5	.259	0		5	7388.533	23232.186	1397.505	1397.505	1....	H1-1a
17	M70	1.5x1.5x0.083	.777	47.713	5	.005	91.609	y	5	2829.368	14085.15	624.421	624.421	1....	H1-1a
18	M68A	Pipe 2.5 A2...	.684	135	6	.173	39.375		6	11641.036	28358.413	2081.747	2081.747	1....	H1-1b
19	M69A	Pipe 2.5 A2...	.897	52.5	6	.187	50.625		6	11641.036	28358.413	2081.747	2081.747	1....	H1-1b
20	M70A	Pipe 2.5 A2...	.517	135	16	.168	33.75		16	11641.036	28358.413	2081.747	2081.747	1	H1-1b
21	M71	Pipe 2.5 A2...	.557	52.5	5	.175	43.125		16	11641.036	28358.413	2081.747	2081.747	2....	H1-1b
22	M66A	Pipe 2.0 A2...	.253	57.154	6	.211	57.154		5	16027.062	23232.186	1397.505	1397.505	1....	H1-1b
23	M67A	Pipe 2.0 A2...	.622	33.591	5	.206	0		5	7388.533	23232.186	1397.505	1397.505	1....	H1-1a
24	M68C	1.5x1.5x0.083	.615	47.713	5	.056	91.609	y	5	2829.368	14085.15	624.421	624.421	1....	H1-1a

Envelope AA ADM1-05: ASD - Building Aluminum Code Checks

	Member	Shape	Code ...	Loc[in]	LC	Shear ...	Loc[in]	Dir	LC	Fc [psi]	Ft [psi]	Fb y-y ...	Fb z-z ...	Fs y-y ...	Fs z-z ...	Cb	Cmy	Cmz	Eqn
1	M19	RT1.5x2...	.196	48.823	5	.015	0	y	5	2842.6...	19487...	21212...	21178...	12246...	12246...	1....	.6	.6	4.1.1-1
2	M16	HR 300	.758	44.722	6	.062	44.722	y	6	4406.7...	19487...	19487...	19487...	12246...	12246...	1	.6	.6	4.1.2-1
3	M35	HR 300	.795	44.722	6	.087	44.722	y	6	4406.7...	19487...	19487...	19487...	12246...	12246...	1	.6	.6	4.1.2-1
4	M38	HR 300	.876	44.722	6	.080	44.722	y	6	4406.7...	19487...	19487...	19487...	12246...	12246...	1	.6	.6	4.1.2-1
5	M41	HR 300	.867	43.002	6	.072	44.722	y	6	4406.7...	19487...	19487...	19487...	12246...	12246...	1	.6	.6	4.1.2-1
6	M44	HR 300	.895	44.722	6	.069	44.722	y	6	4406.7...	19487...	20617...	19744...	12246...	12246...	1	.6	.6	4.1.1-3
7	M47	HR 300	.867	43.002	6	.069	44.722	y	6	4406.7...	19487...	19487...	19487...	12246...	12246...	1	.6	.6	4.1.2-1
8	M50A	HR 300	.870	44.722	6	.076	44.722	y	6	4406.7...	19487...	19487...	19487...	12246...	12246...	1	.6	.6	4.1.2-1
9	M53	HR 300	.869	44.722	6	.076	44.722	y	6	4406.7...	19487...	19487...	19487...	12246...	12246...	1	.6	.6	4.1.2-1
10	M56	HR 300	.867	43.002	6	.069	44.722	y	6	4406.7...	19487...	19487...	19487...	12246...	12246...	1	.6	.6	4.1.2-1
11	M59	HR 300	.895	44.722	6	.069	44.722	y	6	4406.7...	19487...	20617...	19744...	12246...	12246...	1	.6	.6	4.1.1-3

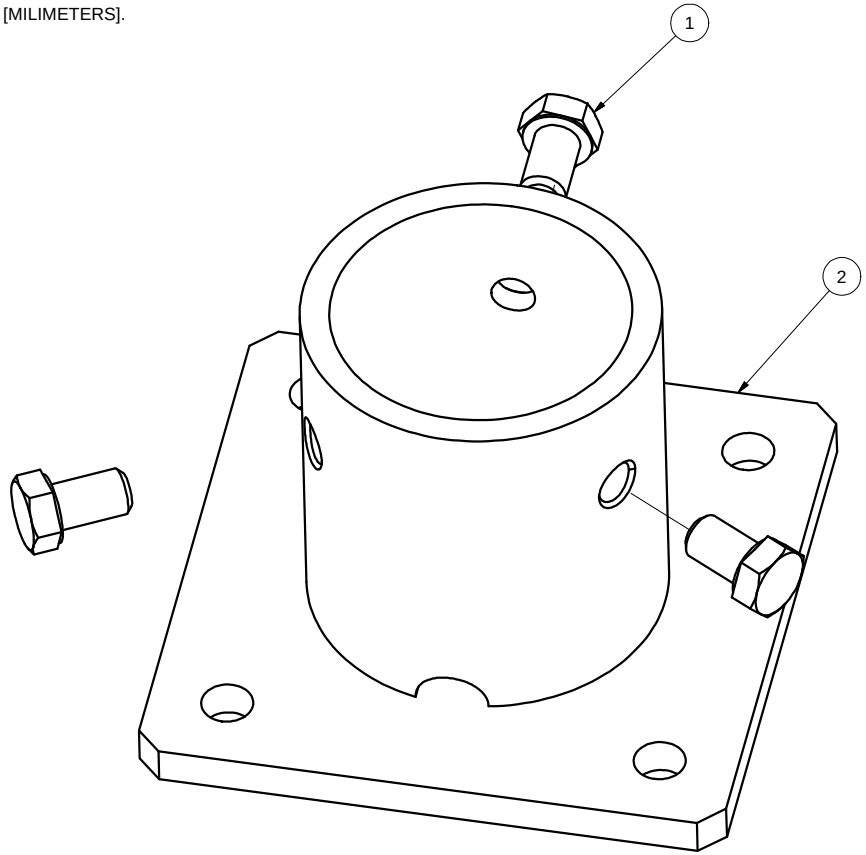
Envelope AA ADM1-05: ASD - Building Aluminum Code Checks (Continued)

	Member	Shape	Code ...	Loc[in]	LC	Shear ...	Loc[in]	Dir	LC	Fc [psi]	Ft [psi]	Fb y-y ...	Fb z-z ...	Fs y-y ...	Fs z-z ...	Cb	Cmy	Cmz	Eqn
12	M62	HR 300	.867	43.002	6	.071	44.722	y	6	4406.7...	19487....	19487....	19487....	12246....	12246....	1	.6	.6	4.1.2-1
13	M65	HR 300	.872	44.722	6	.081	44.722	y	6	4406.7...	19487....	19487....	19487....	12246....	12246....	1	.6	.6	4.1.2-1
14	M68B	HR 300	.973	44.722	6	.092	44.722	y	6	4406.7...	19487....	19487....	19487....	12246....	12246....	1	.6	.6	4.1.2-1
15	M71A	HR 300	.747	44.722	6	.062	44.722	y	6	4406.7...	19487....	19487....	19487....	12246....	12246....	1	.6	.6	4.1.2-1
16	M69C	RT1.5x2...	.194	48.902	5	.015	76.961	y	5	2833.4...	19487....	21212....	21175....	12246....	12246....	1....	.6	.6	4.1.1-1

REVISIONS			
REV	DESCRIPTION	BY	DATE
A	INITIAL RELEASE	LWF	10/20/2016

NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS SHOWN ARE INCHES [MILIMETERS].



ITEM	PART NUMBER	DESCRIPTION	QTY
2	A21120-001	2" PIPE BASE	1
1	B15018-011	HEX CAP SCREW 3/8-16 X 5/8	3

MATERIAL: SEE NOTES

Third Angle Projection:

GENERAL SPECIFICATIONS
All Dimensions in inches [millimeters]
Tolerances
X.XXX ±0.01 [0.25mm]
X.XX ±0.02 [0.50mm]
X.X ±0.039 [1.0mm]
Unless otherwise spec'd
Break all sharp edges .010-.020 unless otherwise specified.

DRAWN BY: LWF
DATE: 10/20/2016
CHECKED BY:
APPROVALS:

Sunmodo Corp.

1905 E 5TH STREET, STE A, VANCOUVER, WA 98661

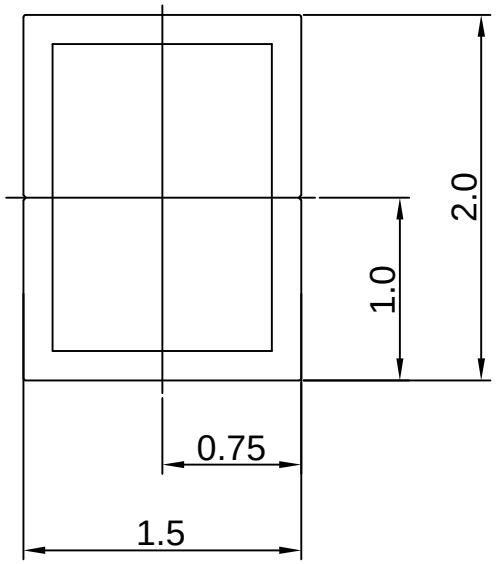
TITLE: 2" PIPE BASE KIT

B
DRAWING NUMBER: K10268-001

SCALE: NONE
SHEET 1 of 1

NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS SHOWN ARE INCHES [MILIMETERS].
2. MATERAIL: ALUMINUM 6005-T5.
   FINISH: CLEAR ANODIZED 10 ųm THICK.
3. THE UNSPECIFIED DIMENSIONS ARE SPECIFIED BY 2D CAD FILE.



Section properties:

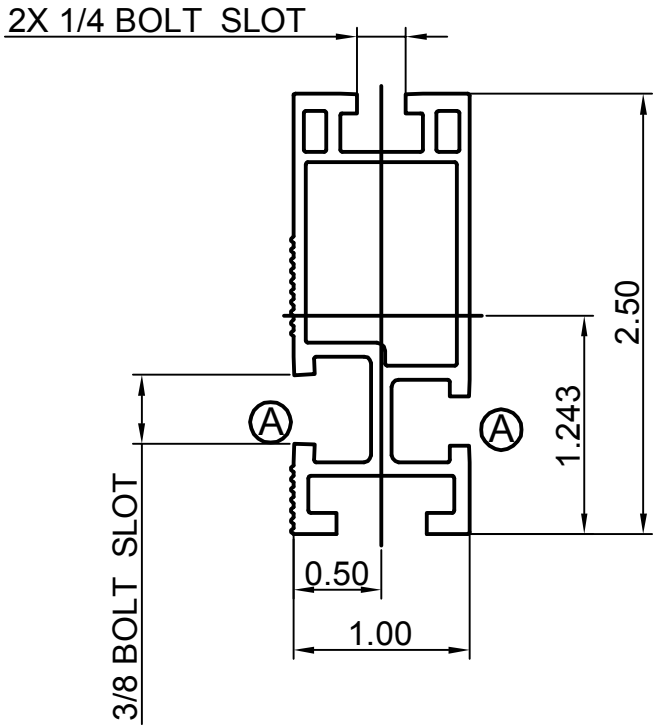
Weight: 1.156 lbs/ft
Area: 0.992 in^2
Perimeter: 12.601 in
Bounding Box: X: -1.000,1.000
Y: -0.750, 0.750
Centroid:(0.000,0.000)
Moments of Inertia(in^4): Ix=0.506,Iy=0.322
Section modulus in bending(in^3): Wx=0.675,Wy=0.322
Radii of Gyration: X: 0.714, Y: 0.570

MATERIAL: SEE NOTES		**Sunmodo Corp.**
Third Angle Projection:		1905 E 5TH STREET, SUITE A, VANCOUVER, WA 98661
GENERAL SPECIFICATIONS: All Dimensions in inches [millimeters] Tolerances: X.XXX ± 0.01 [0.25mm] X.XX ± 0.02 [0.50mm] X.X ± 0.039 [1.0mm] Unless otherwise spec'd	Break all sharp edges .010-.020 unless otherwise specified.	TITLE: 1.5X2 AL TUBE BRACE EXTRUSION
DRAWN BY: zcg	DATE: 03/12/2014	B — DRAWING NUMBER: A20164
CHECKED BY		
APPROVALS		SCALE: NONE — SHEET 1 of 1

REVISIONS			
REV	DESCRIPTON	BY	DATE
A	ADDED BOTTOM CHANNEL & CHANGED ONE 3/8 CHANNEL TO 1/4	zcg	02/21/2013

NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS SHOWN ARE INCHES [MILIMETERS].
2. MATERAIL: ALUMINUM 6005-T5.
   FINISH: CLEAR ANODIZED 15 µm THICK.
3. THE UNSPECIFIED DIMENSIONS ARE SPECIFIED BY 2D CAD FILE.



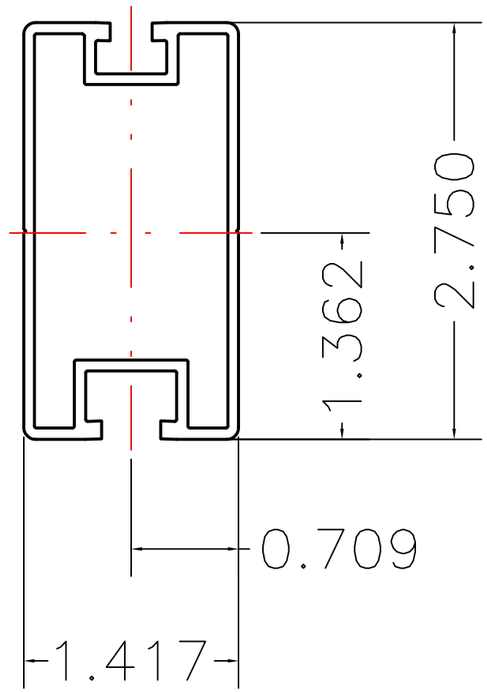
Section properties:

Weight: 0.850 lbs/ft
Area: 0.723 in^2
Perimeter: 17.325 in
Bounding Box: X: -0.500,0.500
Y: -1.243,1.257
Centroid:(0.000,0.000)
Moments of Incertia(in^4): Ix=0.486,Iy=0.095
Section modulus in bending(in^3): Wx=0.387,Wy=0.190
Radii of Gyration: X: 0.820, Y: 0.363

MATERIAL: SEE NOTES		**Sunmodo Corp.**	
Third Angle Projection:		1905 E 5TH STREET, SUITE A, VANCOUVER, WA 98661	
GENERAL SPECIFICATIONS All Dimensions in inches [millimeters] Tolerances X.XXX ± 0.01 [0.25mm] X.XX ± 0.02 [0.50mm] X.X ± 0.039 [1.0mm] Unless otherwise spec'd	Break all sharp edges .010-.020 unless otherwise specified.	TITLE: HELIO STANDARD RAIL	
DRAWN BY: zcg	DATE: 02/21/2013	B	DRAWING NUMBER: A20144
CHECKED BY			
APPROVALS		SCALE: NONE	SHEET 1 of 1

NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS SHOWN ARE INCHES [MILIMETERS].
2. MATERIAL: 6005-T5.
   FINISH: CLEAR ANODIZED 10um THICK.
3. THE UNSPECIFIED RADII ARE .02" MAX.
4. THE UNSPECIFIED DIMENSIONS ARE SPECIFIED BY 2D CAD FILE.



Section properties:

Weight: 0.862 lbs/ft
Area: 0.736 in^2
Perimeter: 19.824 in
Bounding Box: X: -0.709,0.709
Y: -1.362,1.388
Centroid:(0.000,0.000)
Moments of Incertia(in^4): Ix=0.727,Iy=0.214
Section modulus in bending(in^3): Wx=0.524,Wy=0.302
Radii of Gyration: X: 994, Y: 0.539

MATERIAL	SEE NOTES
Third Angle Projection:	
GENERAL SPECIFICATIONS	All Dimensions in Inches [millimeters]
Tolerances	X.XXX ±0.01 [0.25mm] X.XX ±0.02 [0.50mm] X.X ±0.039 [1.0mm] Unless otherwise spec'd
	Break all sharp edges .010-.020 unless otherwise specified.
DRAWN BY	KYY
DATE	01/18/2018
CHECKED BY	
APPROVALS	

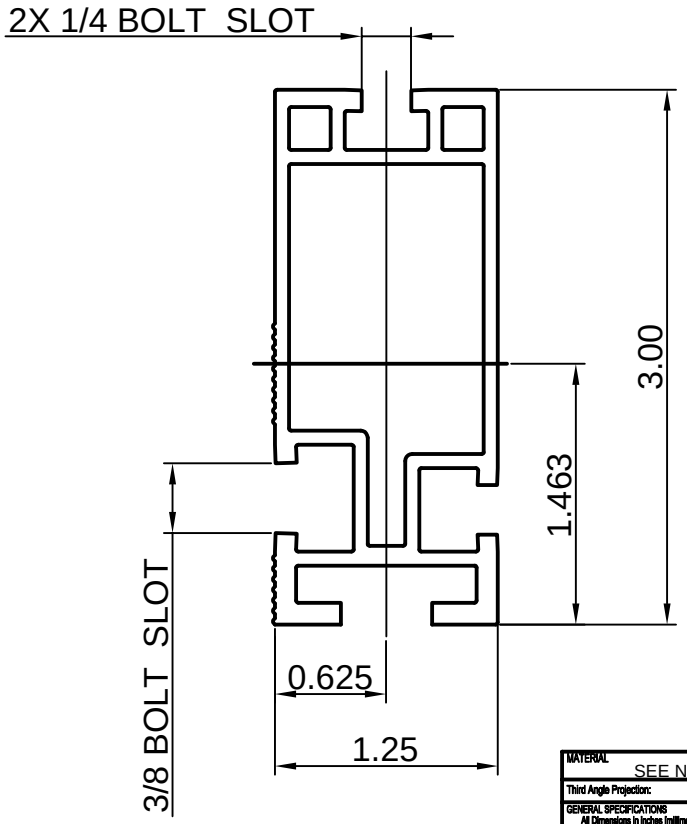
SunModo Corp.
14800 NE 65TH STREET, VANCOUVER WA 98682

TITLE	RAIL, HR300 (SUNRAY), EXTRUSION
B	DRAWING NUMBER A20288
SCALE:	NONE
SHEET	1 of 1

REV	DESCRIPTON	BY	DATE
A	0.44 WAS 0.41, 0.44 WAS 0.33	LWF	11/30/2015

NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS SHOWN ARE INCHES [MILIMETERS].
2. MATERAIL: ALUMINUM 6005-T5.
   FINISH: CLEAR ANODIZED 15 ųm THICK.
3. THE UNSPECIFIED DIMENSIONS ARE SPECIFIED BY 2D CAD FILE.



Section properties:

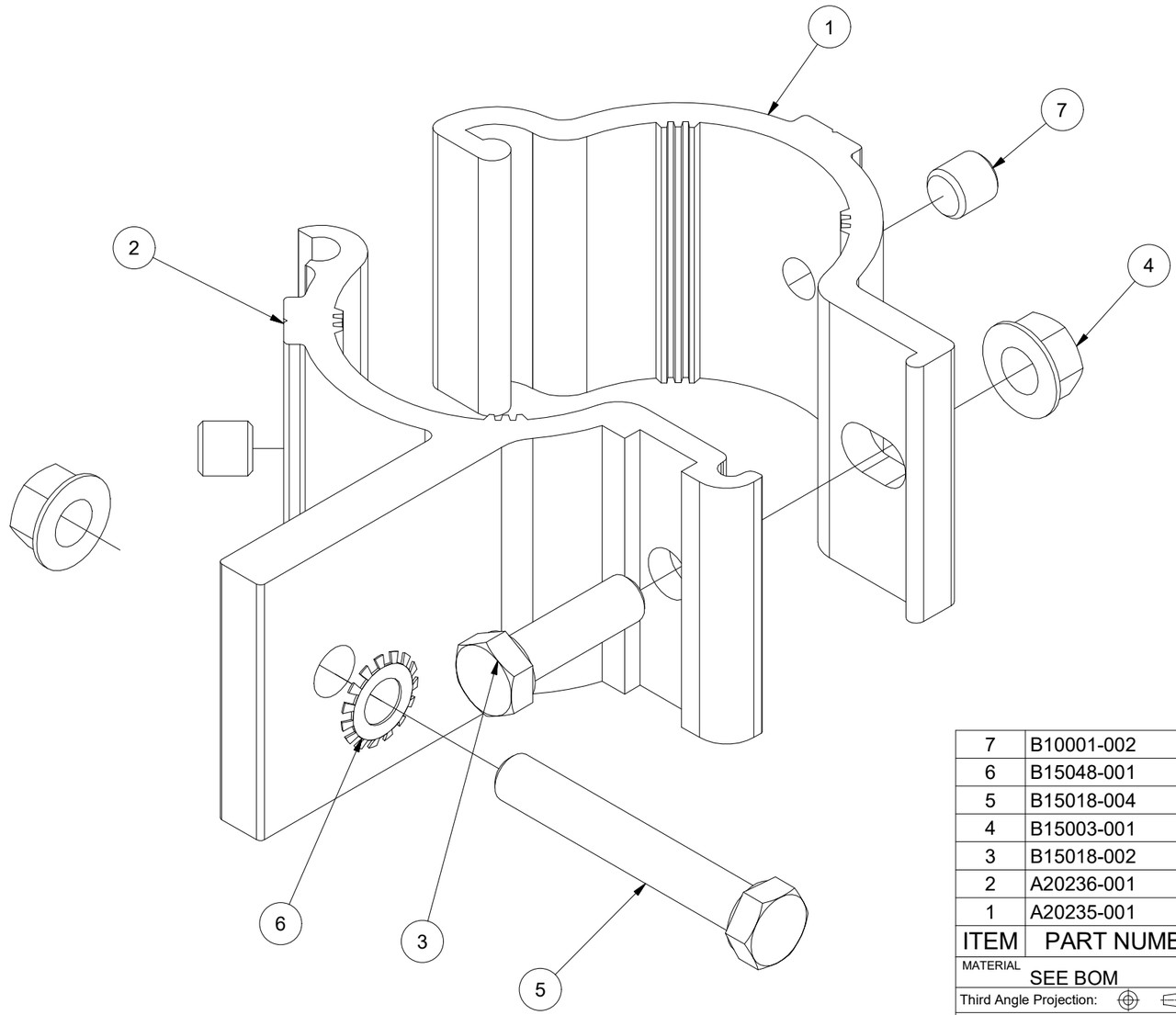
Weight: 1.151 lbs/ft
Area: 0.980 in^2
Perimeter: 22.104 in
Bounding Box: X: -0.625,0.625
Y: -1.463,1.537
Centroid:(0.000,0.000)
Moments of Inertia(in^4): Ix=1.047,Iy=0.207
Section modulus in bending(in^3): Wx=0.681,Wy=0.331
Radii of Gyration: X: 1.034, Y: 0.460

MATERIAL	SEE NOTES
Third Angle Projection:	
GENERAL SPECIFICATIONS All Dimensions in Inches [millimeters] Tolerances X.XXX ±0.01 [0.25mm] X.XX ±0.02 [0.50mm] X.X ±0.039 [1.0mm] Unless otherwise specfd	Break all sharp edges .010-.020 unless otherwise specified.
DRAWN BY: zcg	DATE: 02/21/2013
CHECKED BY	
APPROVALS	

Sunmodo Corp.

1905 E 5TH STREET, SUITE A, VANCOUVER, WA 98661

TITLE	HELIO HEAVY RAIL
B	DRAWING NUMBER A20145
SCALE: NONE	SHEET 1 of 1



ITEM	PART NUMBER	DESCRIPTION	QTY
7	B10001-002	SET SCREW M10X10	2
6	B15048-001	STAR WASHER FOR 3/8 BOLT	1
5	B15018-004	HEX CAP SCREW 3/8-16 X2.5	1
4	B15003-001	FLANGE NUT 3/8-16	2
3	B15018-002	HEX CAP SCREW 3/8-16 X 1.25	1
2	A20236-001	2 AL PIPE CLAMP, FEMALE	1
1	A20235-001	2 AL PIPE CLAMP, MALE	1

MATERIAL: SEE BOM

Third Angle Projection:

GENERAL SPECIFICATIONS
All Dimensions in inches [millimeters]
Tolerances
X.XXX ±0.01 [0.25mm]
X.XX ±0.02 [0.50mm]
X.X ±0.039 [1.0mm]
Unless otherwise spec'd

Break all sharp edges .010-.020 unless otherwise specified.

DRAWN BY: zcg
DATE: 08/12/2015
CHECKED BY:
APPROVALS:

Sunmodo Corp.

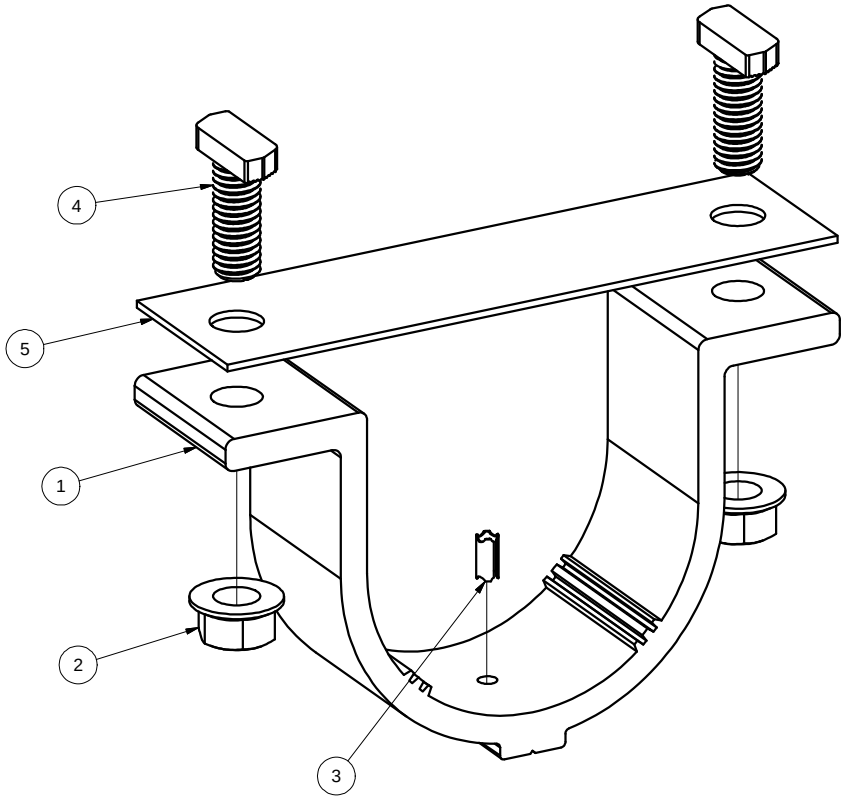
1905 E 5TH STREET, STE A, VANCOUVER, WA 98661

TITLE: 2 AL PIPE CLAMP KIT

B | DRAWING NUMBER: K10219-001

SCALE: NONE | SHEET 1 of 1

REVISIONS			
REV	DESCRIPTION	BY	DATE
A	INITIAL RELEASE	LWF	06/12/2018
B	ADD C10005-006	LWF	06/27/2018



ITEM	PART NUMBER	DESCRIPTION	QTY
5	C10005-006	PVC GASKTE T=1.5mm	1
4	B50033-001	T-BOLT, RAIL BOTTOM SLOT, 3/8-16 X 1"	2
3	B20018-002	GROUNDING PIN	1
2	B15003-001	FLANGE NUT 3/8-16	2
1	A20329-001	2.5" AL PIPE U-BOLT	1

MATERIAL: SEE NOTES

Third Angle Projection:

GENERAL SPECIFICATIONS
All Dimensions in inches [millimeters]
Tolerances
X.XXX ±0.01 [0.25mm]
X.XX ±0.02 [0.50mm]
X.X ±0.039 [1.0mm]
Unless otherwise spec'd
Break all sharp edges .010-.020 unless otherwise specified.

DRAWN BY: KYY
DATE: 06/12/2018
CHECKED BY:
APPROVALS:

SunModo Corp.

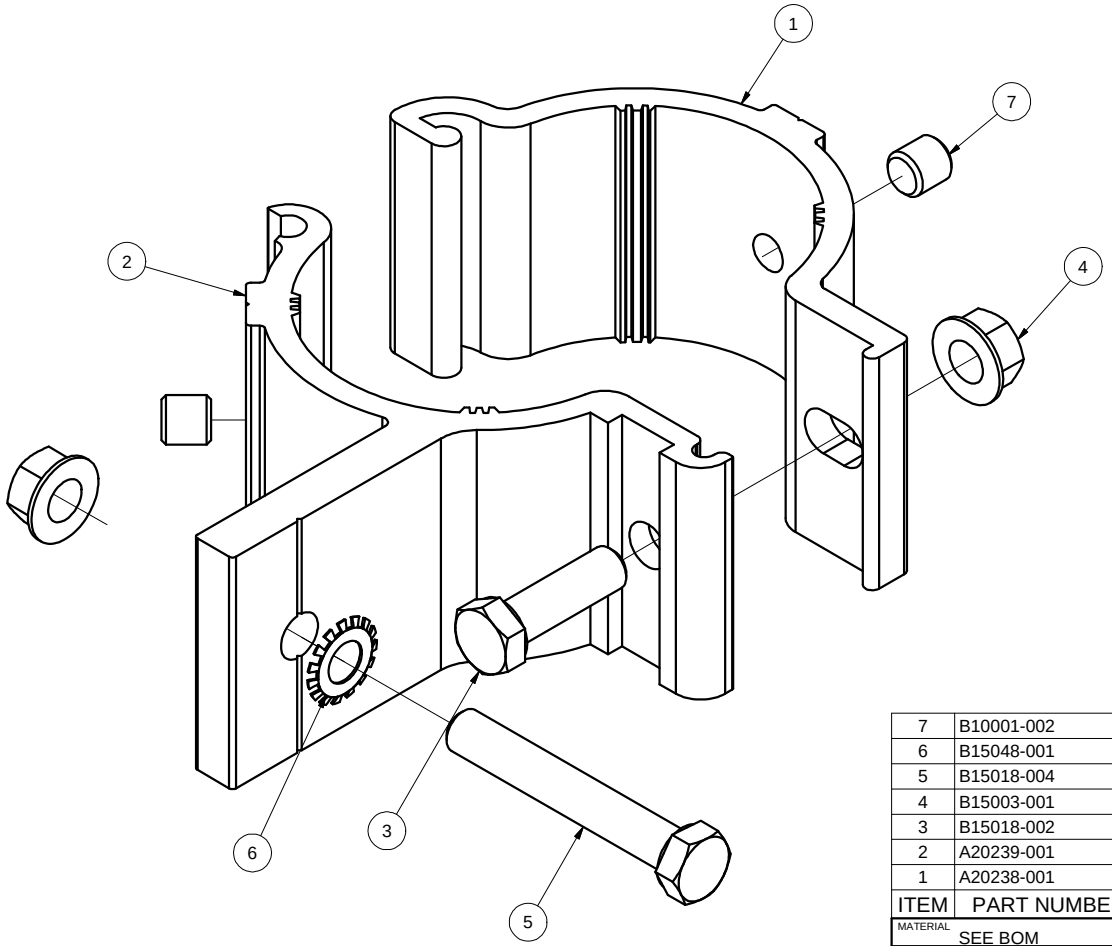
14800 NE 65TH STREET, VANCOUVER WA 98682

TITLE: 2.5" AL PIPE U-CLAMP KIT

B | DRAWING NUMBER: K10343-001

SCALE: NONE | SHEET 1 of 1

REVISIONS			
REV	DESCRIPTION	BY	DATE
A	INITIAL RELEASE	zcg	09/25/2015



ITEM	PART NUMBER	DESCRIPTION	QTY
7	B10001-002	SET SCREW M10X10	2
6	B15048-001	STAR WASHER FOR 3/8 BOLT	1
5	B15018-004	HEX CAP SCREW 3/8-16 X2.5	1
4	B15003-001	FLANGE NUT 3/8-16	2
3	B15018-002	HEX CAP SCREW 3/8-16 X 1.25	1
2	A20239-001	2.5 AL PIPE CLAMP, FEMALE	1
1	A20238-001	2.5 AL PIPE CLAMP, MALE	1

MATERIAL: SEE BOM

Third Angle Projection:

GENERAL SPECIFICATIONS
All Dimensions in inches [millimeters]
Tolerances
X.XXX ±0.01 [0.25mm]
X.XX ±0.02 [0.50mm]
X.X ±0.039 [1.0mm]
Unless otherwise spec'd
Break all sharp edges .010-.020 unless otherwise specified.

DRAWN BY: LWF
DATE: 08/21/2015
CHECKED BY:
APPROVALS:

Sunmodo Corp.

1905 E 5TH STREET, STE A, VANCOUVER, WA 98661

TITLE: 2.5 AL PIPE CLAMP KIT

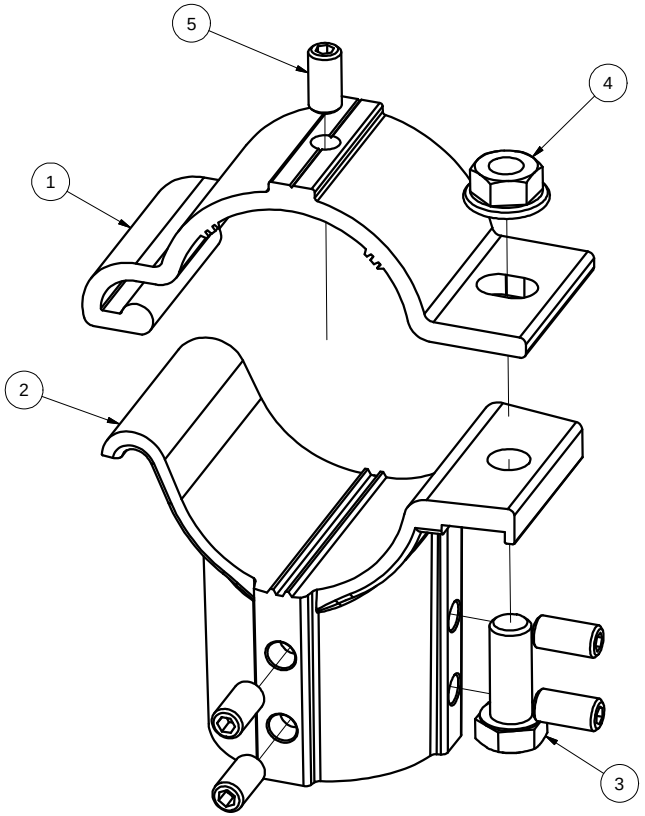
B

DRAWING NUMBER: K10222-001

SCALE: NONE

SHEET 1 of 1

REVISIONS			
REV	DESCRIPTION	BY	DATE
A	INITIAL RELEASE	LWF	06/12/2018



ITEM	PART NUMBER	DESCRIPTION	QTY
5	B10001-001	SET SCREW M10X20	5
4	B15020-001	FLANGE NUT 1/2-13	1
3	B15014-005	HEX CAP SCREW 1/2-13 X 1.25", 304 SS	1
2	A20327-001	2.5" AL PIPE TEE, FEMALE	1
1	A20326-001	2.5" AL PIPE TEE, MALE	1

MATERIAL: SEE NOTES

Third Angle Projection:

GENERAL SPECIFICATIONS
All Dimensions in inches [millimeters]
Tolerances
X.XXX ±0.01 [0.25mm]
X.XX ±0.02 [0.50mm]
X.X ±0.039 [1.0mm]
Unless otherwise spec'd
Break all sharp edges .010-.020 unless otherwise specified.

DRAWN BY: LWF
DATE: 06/12/2018
CHECKED BY:
APPROVALS:

SunModo Corp.

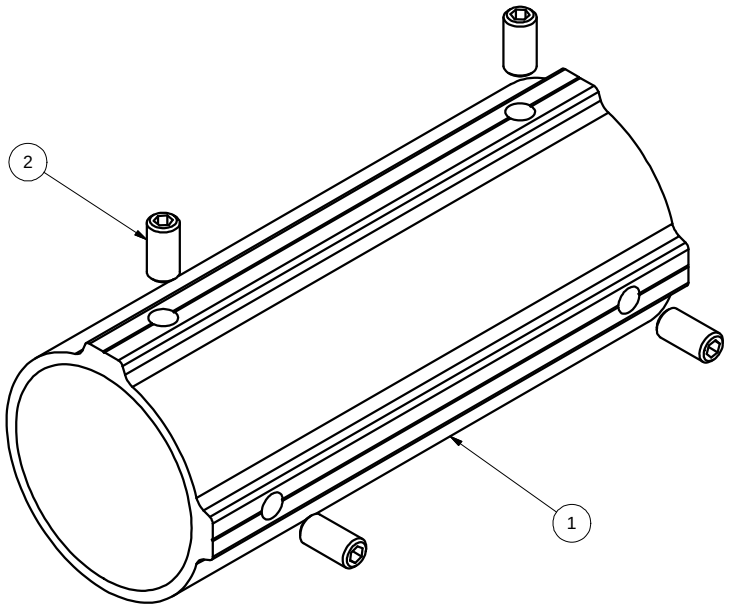
14800 NE 65TH STREET, VANCOUVER WA 98682

TITLE: 2.5" PIPE TEE KIT

B | DRAWING NUMBER: K10341-001

SCALE: NONE | SHEET 1 of 1

REVISIONS			
REV	DESCRIPTION	BY	DATE
A	INITIAL RELEASE	LWF	06/12/2018



ITEM	PART NUMBER	DESCRIPTION	QTY
2	B10001-001	SET SCREW M10X20	4
1	A20328-001	2.5" PIPE SPLICE	1

MATERIAL: SEE NOTES

Third Angle Projection:

GENERAL SPECIFICATIONS
All Dimensions in inches [millimeters]
Tolerances
X.XXX ±0.01 [0.25mm]
X.XX ±0.02 [0.50mm]
X.X ±0.039 [1.0mm]
Unless otherwise spec'd
Break all sharp edges .010-.020 unless otherwise specified.

DRAWN BY: LWF
DATE: 06/12/2018
CHECKED BY:
APPROVALS:

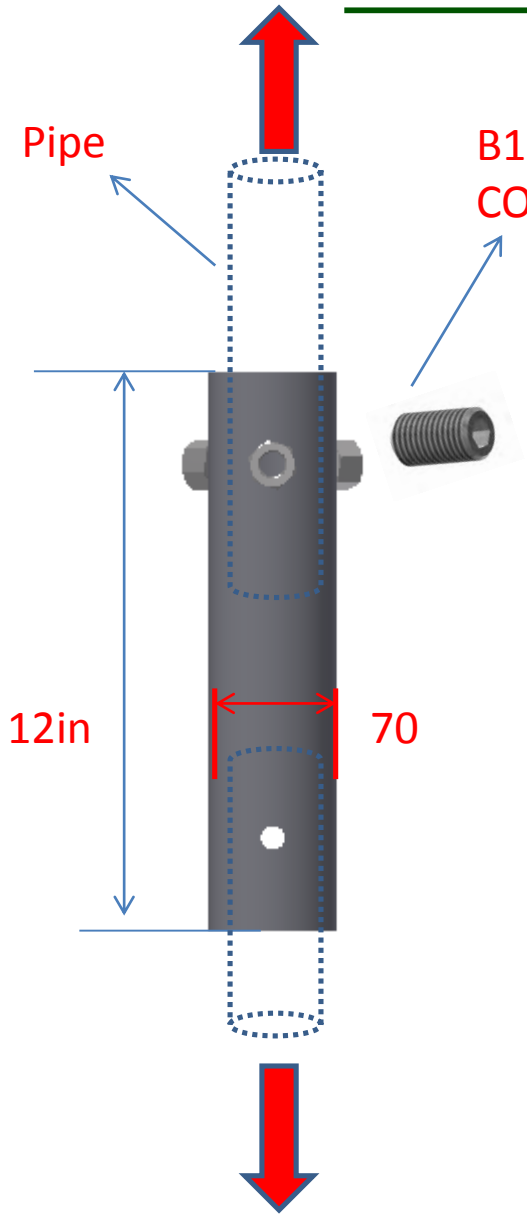
SunModo Corp.

14800 NE 65TH STREET, VANCOUVER WA 98682

TITLE: 2.5" PIPE SPLICE KIT

B | DRAWING NUMBER: K10342-001

SCALE: NONE | SHEET 1 of 1



B10051-002, SET SCREW M16X30
CONE TIPPED SET SCRE M16X30

Conditions for load test：

1. The helical auger and ground screw use the same top section, so only one was used for testing
2. A 12 inch section from the top of the auger/ground screw was used
3. Three tests on each pipe type was used
4. The auger/screw material supplied by the auger/screw supplier.