



Project Number: U2716-098-191

April 6, 2021

Sunmodo
14800 NE 65th Street
Vancouver, WA 98682

**REFERENCE: Sunmodo Sunturf Ground Mount C1 (85x45)
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 California Building Code, 2016 Edition (2015 IBC). 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 7-10)
- Design wind speed for risk category I structures: 100 mph
- Wind exposure: C
- Ground snow load: 0 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	2361	1.5	3542
LATERAL	1685	2	3370

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 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

Russell Emery, P.E.
License: C73566 - Expires: 12/31/2022
Project Engineer

Enclosures

RNE/stb

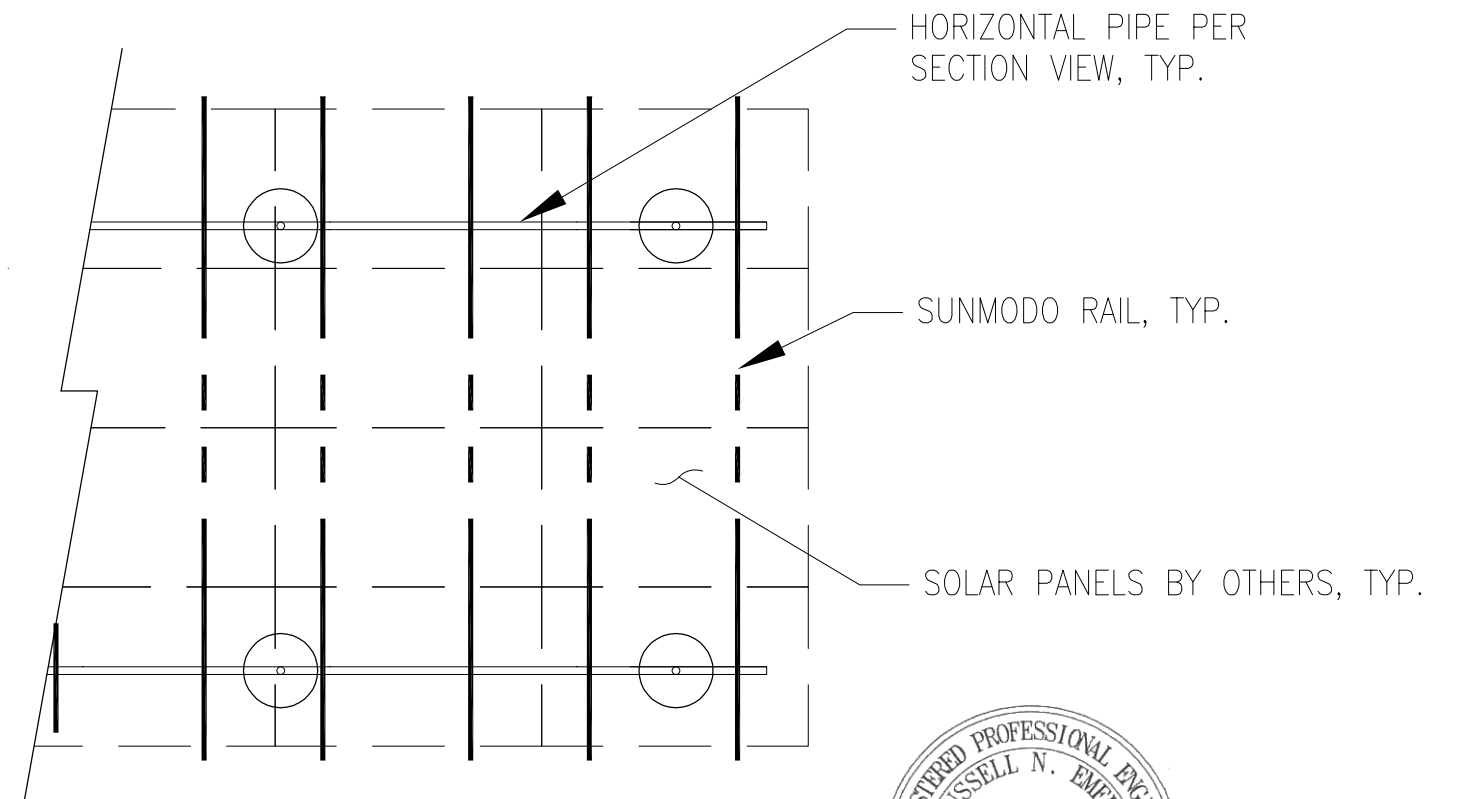
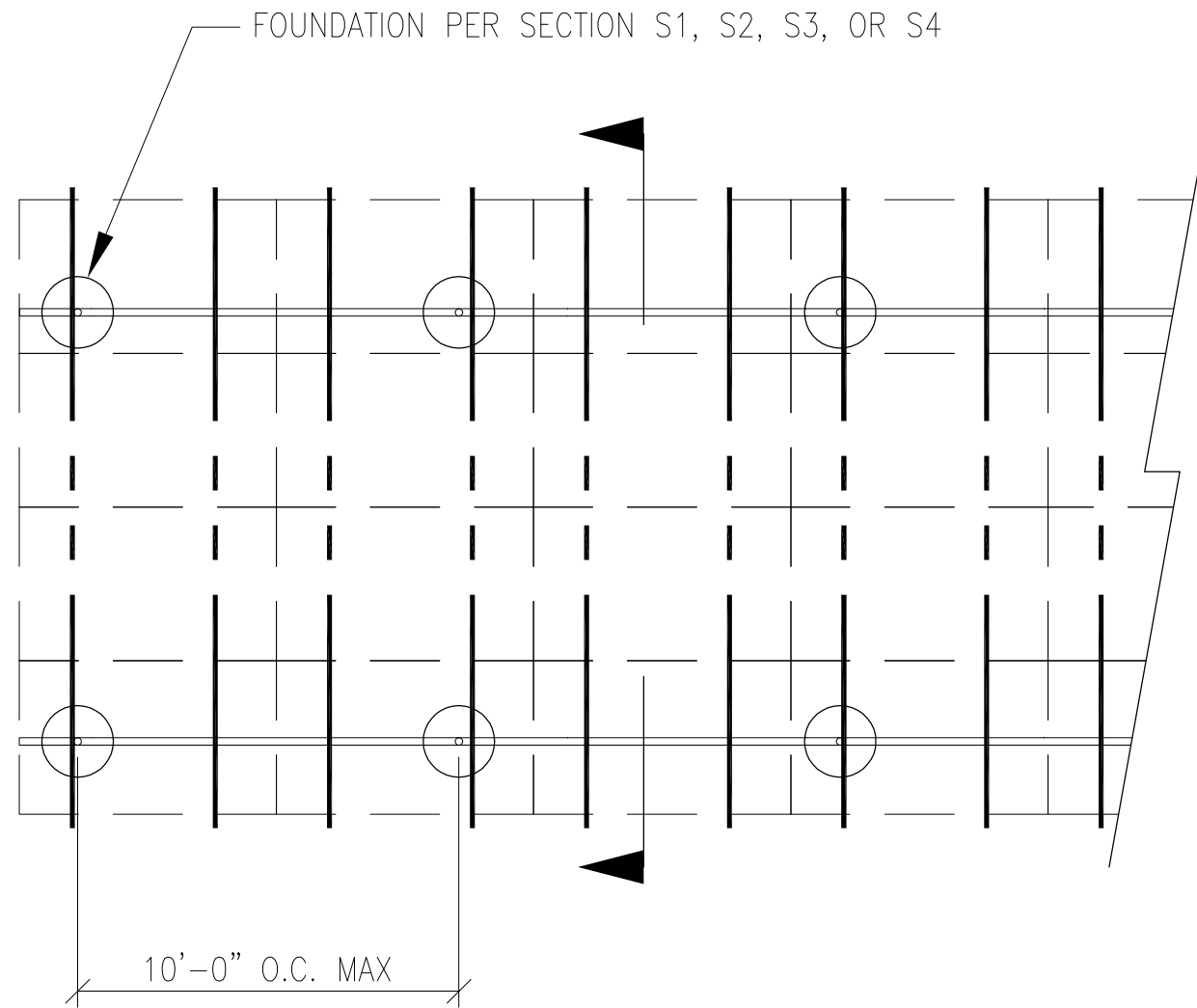


04/06/2021



JOB NO. U2716-098-191
 PROJECT SUNMODO SUNTURF GROUND MOUNTS C1
 SUBJECT ALL OPTIONS

651 W GALENA PARK BLVD. #101 (801) 990-1775
 DRAPER, UTAH 84020 (801) 990-1776 FAX



04/06/2021

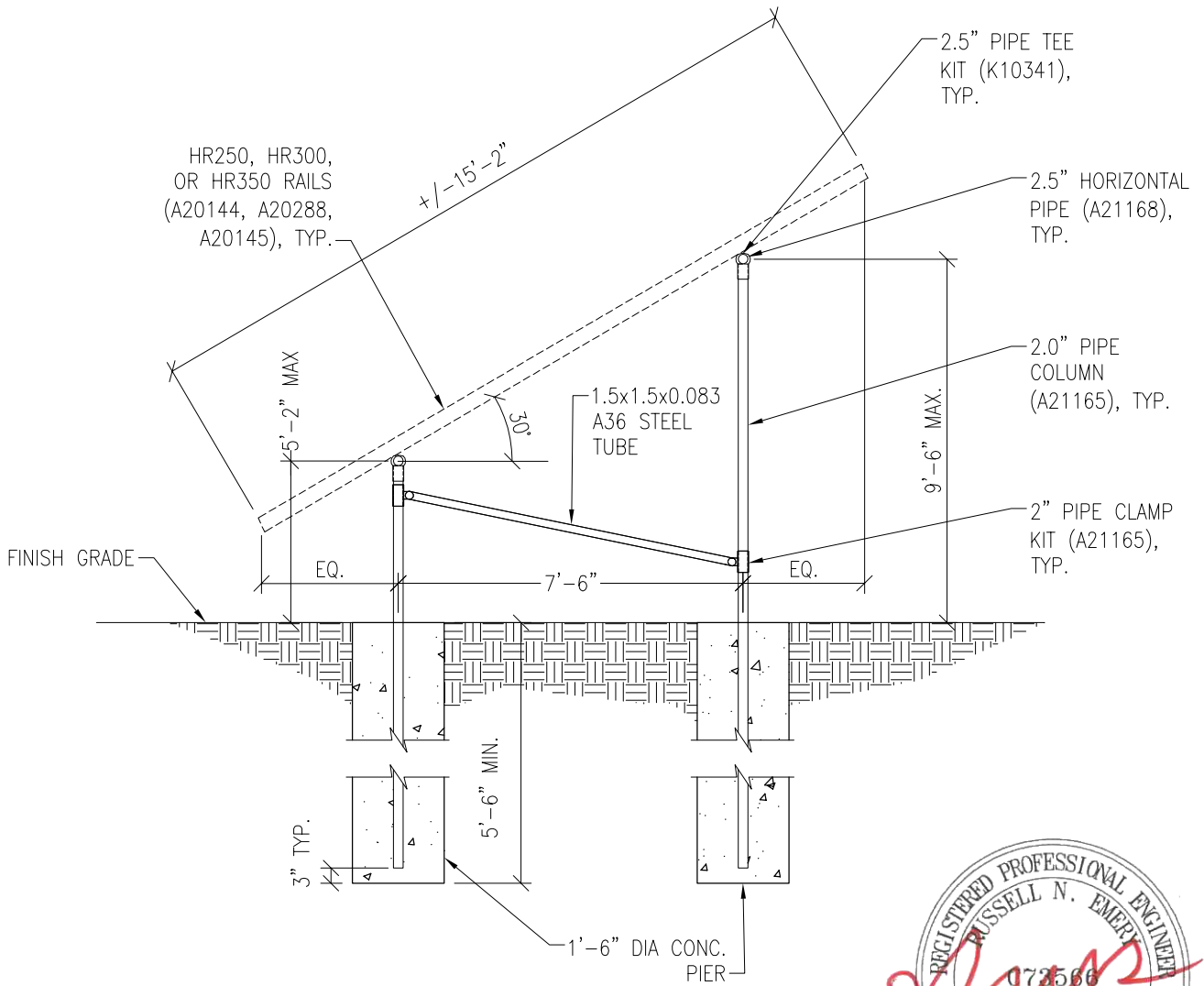
PV ARRAY PLAN

N.T.S.

P1

PROJECT SUNMODO SUNTURF GROUND MOUNTS C1

SUBJECT DRILLED PIER OPTION



04/06/2021

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PV ARRAY SECTION

N.T.S.

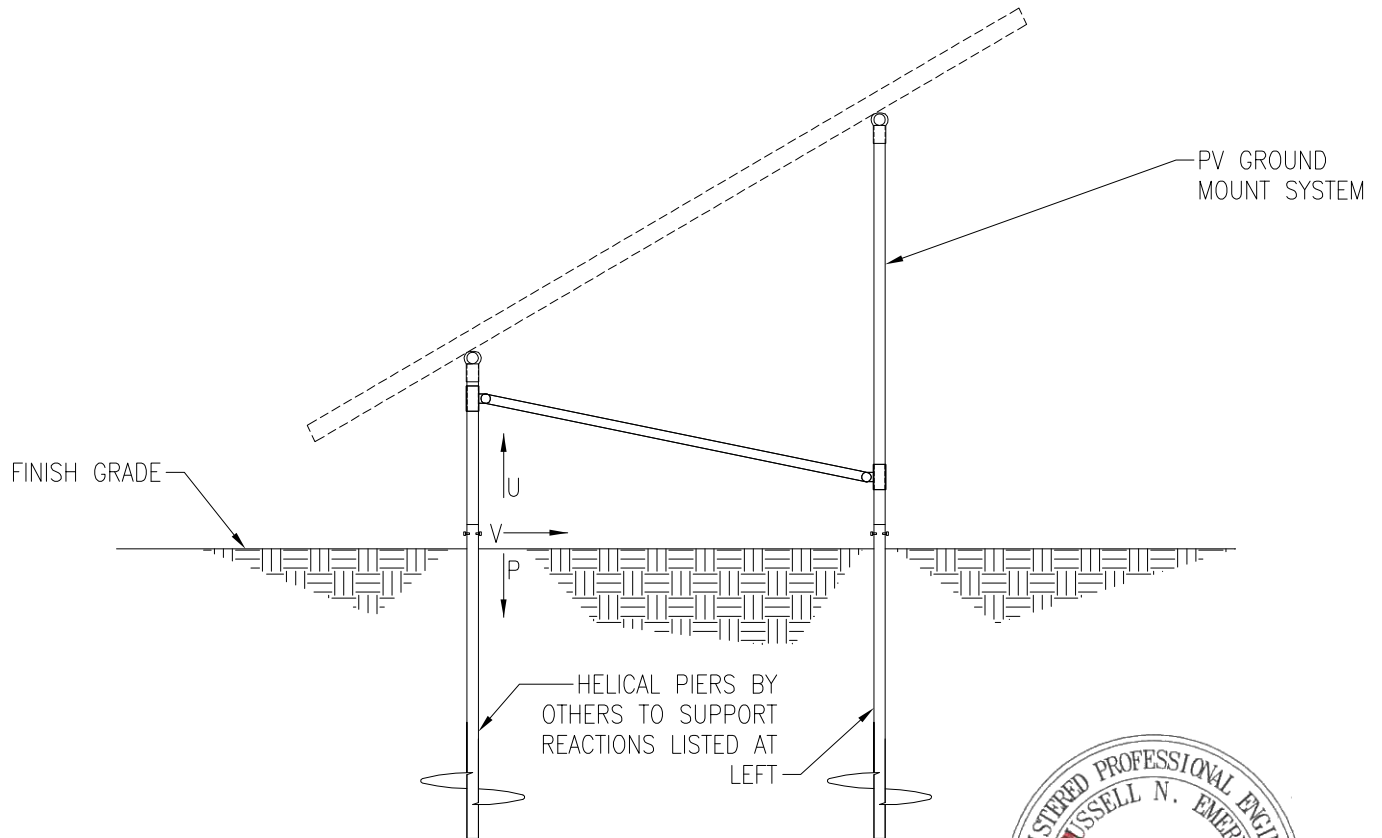
S1

PROJECT SUNMODO SUNTURF GROUND MOUNTS C1

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	= 2,361 LBS
P	= 2,873 LBS
V	= 1,685 LBS



04/06/2021

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PV ARRAY SECTION

N.T.S.

S2



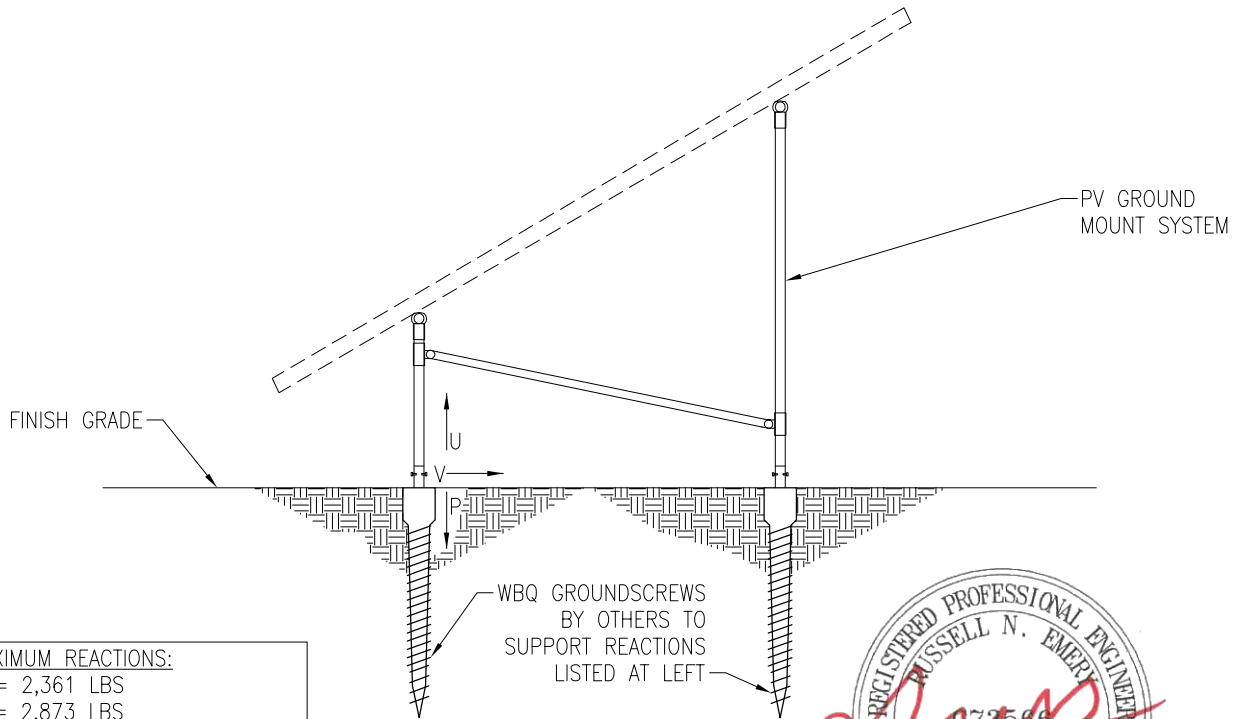
JOB NO. U2716-098-191

PROJECT SUNMODO SUNTURF GROUND MOUNTS C1

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 = 2,361 LBS
 P = 2,873 LBS
 V = 1,685 LBS



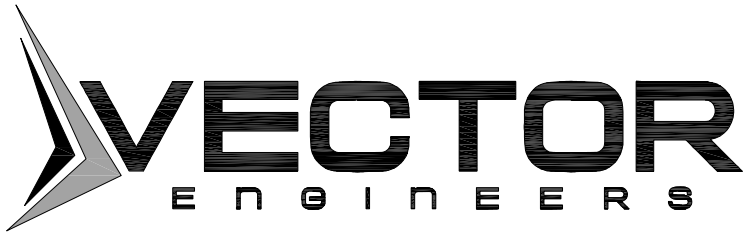
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PV ARRAY SECTION

04/06/2021

N.T.S.

S3



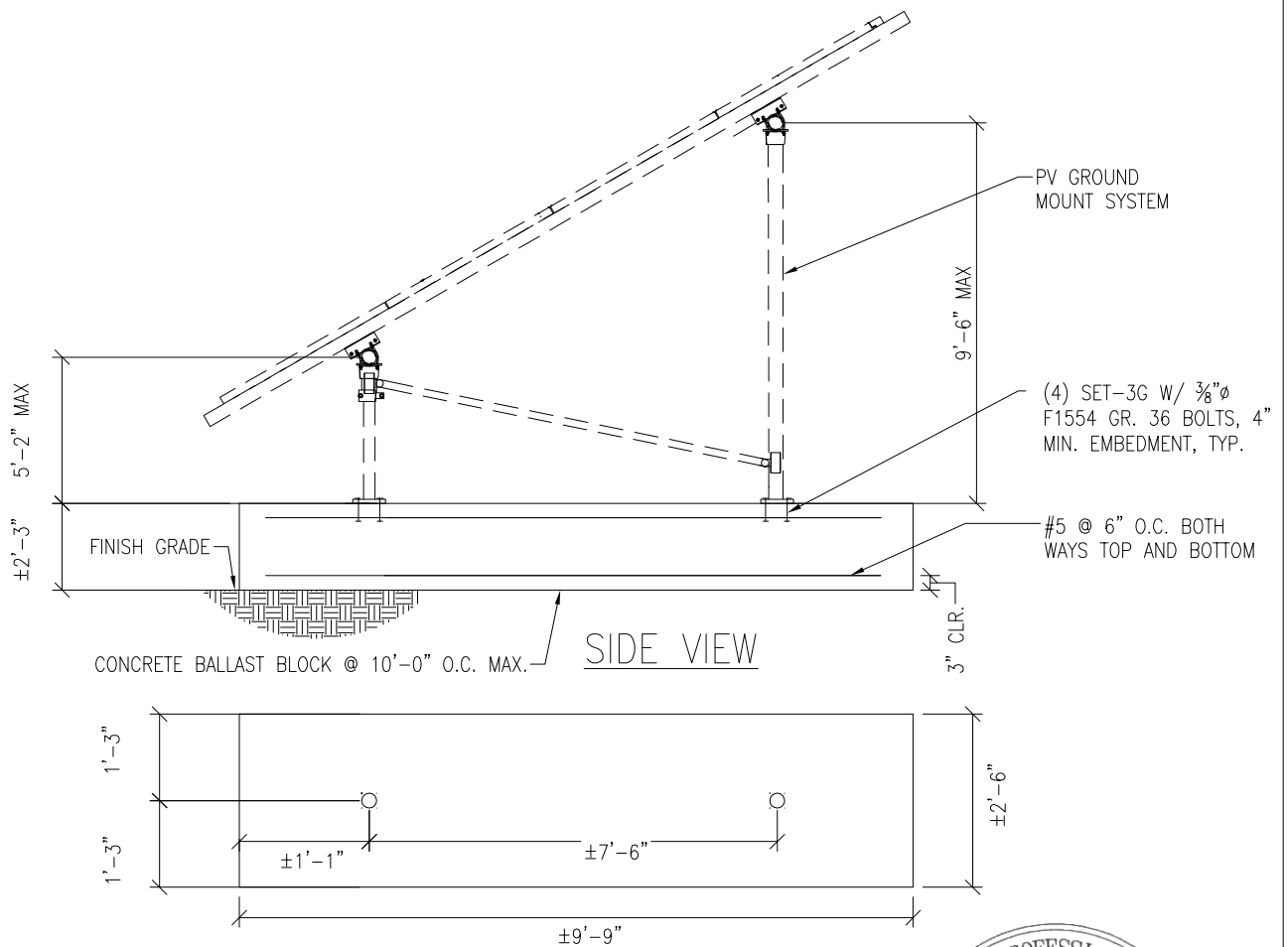
JOB NO. U2716-098-191

PROJECT SUNMOD0 SUNTURF GROUND MOUNTS C1

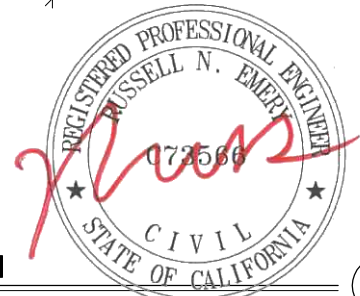
SUBJECT BALLASTED BLOCK OPTION

NOTES:

1. For ground mount components see Section S1.



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PV ARRAY SECTION

N.T.S.

S4

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651 W GALENA PARK BLVD. #101
DRAPER, UTAH 84020

(801) 990-1775
(801) 990-1776 FAX

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JOB NO.: U2716-098-191
DATE: 07/29/19

DESIGNED: STB

PROJECT: C1 – Sunmodo Sunturf GM

SUBJECT: Snow Load

SNOW LOAD (S):

ASCE 7 Standard:	10	
Panel Slope from Horizontal [°]:	30.0	
Snow Ground Load, p_g [psf]:	0.0	(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)
Risk Category:	I	(Table 1.5-1)
Importance Factor, I_s :	0.8	(Table 1.5-2)
Flat Roof Snow Load, p_f [psf]:	0	(Equation 7.3-1)
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]:	0	(Equation 7.4-1)
Design Snow Load, S [psf]:	0	
Tributary Transverse Length [ft]:	5.9	
Tributary Longitudinal Length [ft]:	10	
Tributary Area per Column [ft ²]:	59.5	
Snow Load per Column (1.0 S) [lb]:	0.0	



PROJECT: C1 – Sunmodo Sunturf GM

SUBJECT: Wind Pressure

Design Wind Load:

ASCE 7 Standard:	10	
Basic Wind Speed, V [mph]:	100	
Risk Category:	I	
Exposure Category	C	(Section 26.7.3)
Velocity Pressure Exposure Coefficient, K_h :	0.85	(Table 27.3-1)
Topographic Factor, K_{ht} :	1.0	(Section 26.8.2)
Wind Directionality Factor, K_d :	0.85	(Table 26.6-1)
Internal Pressure Coefficient, GC_{pi} :	0.00	(Table 26.11-1)
Velocity Pressure, q_h [psf]:	18.5	(Equation 27.3-1)
Gust Effect Factor, G:	0.85	(Section 26.9.1)
Panel Slope [degrees]:	30.0	

Net Pressure Coefficients (C_N) per: (Figure 27.4-4)

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

Design Wind Pressures (p) [psf] per: (Equation 27.4-3)

Clear Wind Flow	$q_h GC_{NW}$	$q_h GC_{NL}$
Case 1 ($\gamma = 0^\circ$, Load Case A)	-28.3	-28.3
Case 2 ($\gamma = 0^\circ$, Load Case B)	-39.3	-7.9
Case 3 ($\gamma = 180^\circ$, Load Case A)	33.0	33.0
Case 4 ($\gamma = 180^\circ$, Load Case B)	40.9	15.7

Wind Pressure on Each Side of Panels [psf]

Clear Wind Flow	Short Col. Pressure	Long Col. Pressure
Case 1 ($\gamma = 0^\circ$, Load Case A)	-28.3	-28.3
Case 2 ($\gamma = 0^\circ$, Load Case B)	-7.9	-39.3
Case 3 ($\gamma = 180^\circ$, Load Case A)	33.0	33.0
Case 4 ($\gamma = 180^\circ$, Load Case B)	40.9	15.7



JOB NO.: U2716-098-191

PROJECT: C1 – Sunmodo Sunturf GM

SUBJECT: Open Building Wind Loads

Design Wind Load Per ASCE 7-10

$$p = q_h G C_n$$

Velocity Pressure Exposure Coefficient, K_z :	0.85	(Table 27.3-1)
Topographic Factor, K_{zt} :	1.0	(Section 26.8.2)
Wind Directionality Factor, K_d :	0.85	(Table 26.6-1)
Ultimate Wind Speed, V [mph]:	100	

Velocity Pressure, q_h [psf]:	18.5	(Equation 27.3-1)
Gust Effect Factor, G :	0.85	(Section 26.9.1)

$\gamma = 90^\circ$ or 270°

Force Coefficient, C_N :

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

Design Wind Pressure, p [psf]:

Horizontal Distance from Winward Edge	Roof angle	Load Case	Obstructed Wind Flow
$\leq h$	30	A	-12.6
		B	12.6
$> h, \leq 2h$	30	A	-9.4
		B	7.9
$> 2h$	30	A	-4.7
		B	4.7



JOB NO.: U2716-098-191

DESIGNED: STB

Foundation Option 1: Drilled Concrete Pier



PROJECT: C1 - Sunturf Ground Mount

DRILLED CONCRETE PIER DESIGN

Column Reactions:

Max. Shear, V [k]:	1.7	Max. Down, P _d [k]:	2.9
Max. Moment, M [k-ft]:	0.0	Max. Uplift, P _u [k]:	2.4

Pier Properties:

Pier Shape:	Round	Volume of Concrete [ft ³]:	10
Pier Diameter, b [ft]:	1.5	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		

Soil Properties:

Allow. Bearing Pressure [psf]:	1,500	<u>Optional Parameters for Uplift:</u>	
1/3 increase for short term loads?	No		
Lateral Bearing, S [pcf]:	150	Skin Friction* [psf]:	250
Max. Lateral Bearing (opt'l) [psf]:		Top Length to Ignore [ft]:	0
Top Depth to Ignore [ft]:	0	1/3 increase for short term loads?	No
1/3 increase for short term loads?	No	Combine w/ Bearing:	No
1/2" deflection at t/o pier allowed:	Yes		

*per IBC Section 1810.3.3.1.4

Check Bearing:

Bearing Capacity [k]:	6.5
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Bearing capacity OK.

Check Uplift:

Uplift Capacity [k]:	7.8
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Uplift capacity OK.

Check Lateral Bearing:

Top of Pier Constrained?:	No	IBC Section 1807.3.2.1
Applied Lateral Force, P [lb]:	1,685	
Point of Application, h [ft]:	0.0	
S _{max} [psf]:		
S [psf]:	550	
A = 2.34*P/(S _b):	4.78	
Required Pier Depth, d _{reqd} [ft]:	4.80	IBC Eq. 18-1

Result: **Lateral bearing capacity OK.**

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	2361	1.5	3542
LATERAL	1685	2	3370

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.

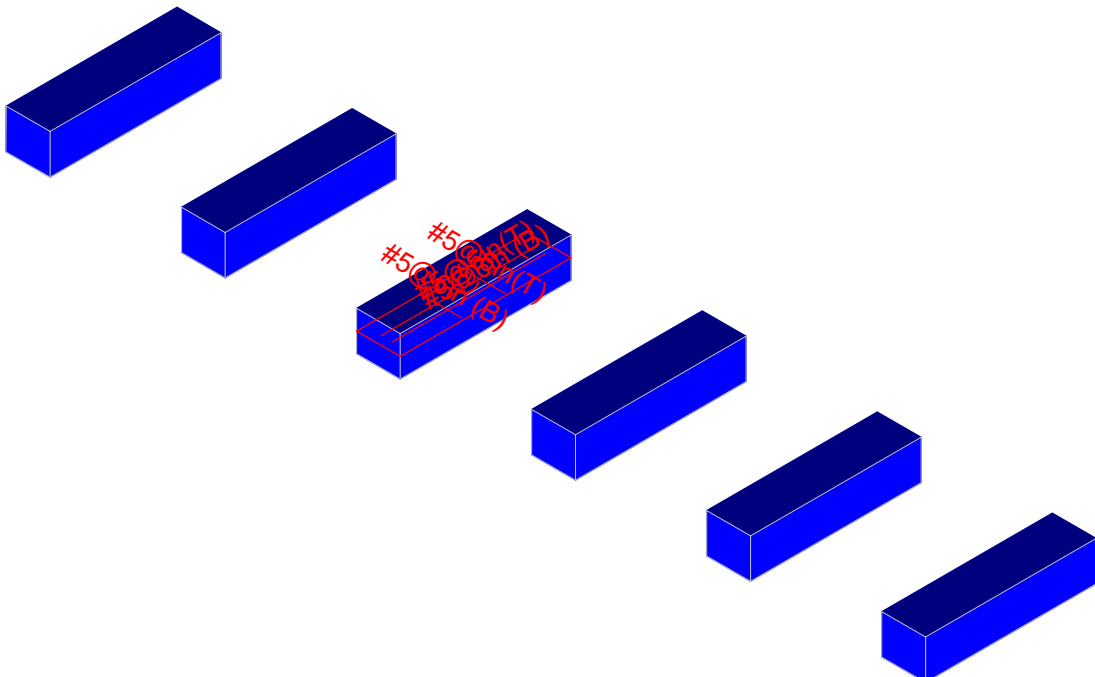
Load (ASD)	Value (lbs)	Factor of Safety	Test Value (lbs)
UPLIFT	2361	1.5	3542
LATERAL	1685	2	3370



JOB NO.: U2716-098-191

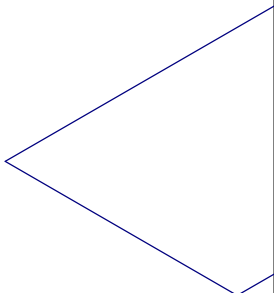
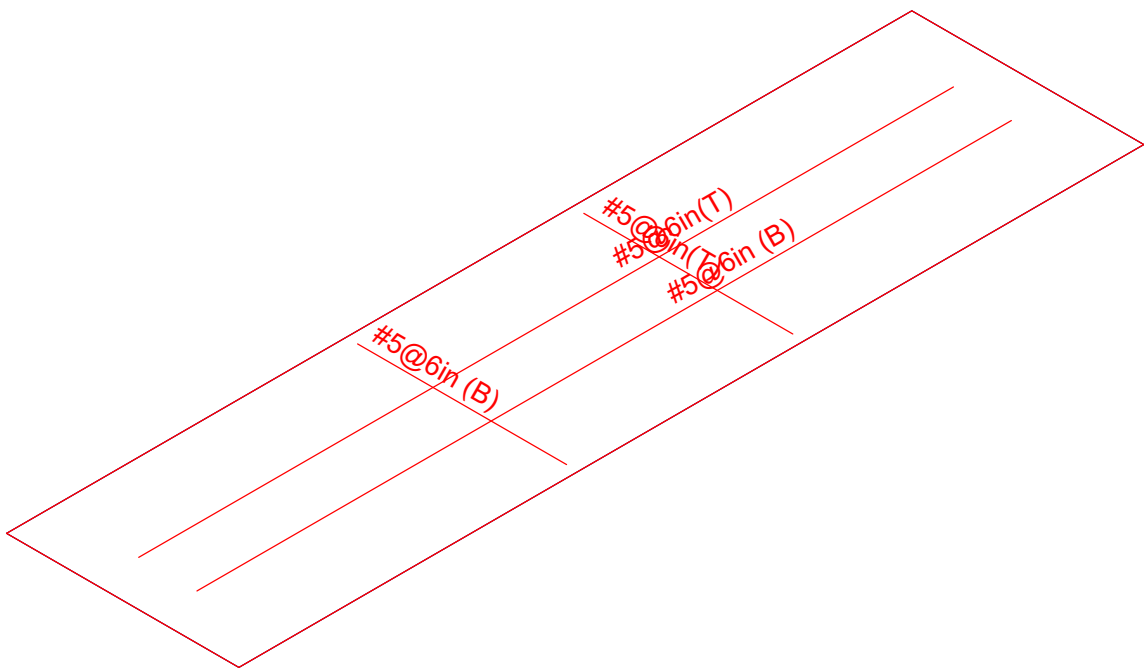
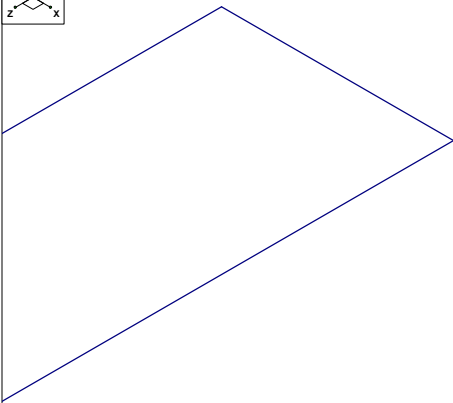
DESIGNED: STB

Foundation Option 4: Ballasted Block



Results for LC 1, 1.0 D

Vector Structural Engineeri...	Ground Mount	SK - 2
STB		Apr 6, 2021 at 4:26 PM
U2716.098.191		Sunmodo Sunturf C1 GM v6 85x45...



Results for LC 1, 1.0 D

Vector Structural Engineeri..	Ground Mount	SK - 1
STB		Apr 6, 2021 at 4:26 PM
U2716.098.191		Sunmodo Sunturf C1 GM v6 85x45...



(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
Parame Beta Factor	.65
Pile Safety Factor	3
Concrete Stress Block	0
Concrete Rebar Set	Rectangular
Concrete Code	ASTM A615
HR Steel Pile Code	ACI 318-14
Wood Pile Code	AISC 14th (360-10): ASD AWC NDS-15: ASD

Concrete Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/...	Density[lb/ft^3]	fc[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	6	6	6	6	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	X	-22.059
2	R3D_N1	Y	264.085
3	R3D_N2	X	-7.974
4	R3D_N2	Y	264.737
5	R3D_N132	Y	270.234
6	R3D_N133	X	-1.021
7	R3D_N133	Y	336.349
8	R3D_N109	Y	271.66

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

	Label	Direction	Magnitude[lb,lb-ft]
9	R3D_N110A	X	1.673
10	R3D_N110A	Y	338.019
11	R3D_N121	Y	288.838
12	R3D_N122	Y	326.235
13	R3D_N133B	Y	289.162
14	R3D_N134B	Y	326.433
15	R3D_N155	X	21.666
16	R3D_N155	Y	269.66
17	R3D_N156	X	6.99
18	R3D_N156	Y	271.453

Point Loads and Moments (Cat 16 : OL1)

	Label	Direction	Magnitude[lb,lb-ft]
1	R3D_N1	X	150.418
2	R3D_N1	Y	-3041.471
3	R3D_N1	Z	1784.286
4	R3D_N2	X	55.615
5	R3D_N2	Y	-52.204
6	R3D_N2	Z	-121.861
7	R3D_N132	X	-6.412
8	R3D_N132	Y	-3659.737
9	R3D_N132	Z	2388.879
10	R3D_N133	X	1.569
11	R3D_N133	Y	33.34
12	R3D_N133	Z	-145.466
13	R3D_N109	X	4.809
14	R3D_N109	Y	-3683.401
15	R3D_N109	Z	2404.405
16	R3D_N110A	X	-6.02
17	R3D_N110A	Y	37.385
18	R3D_N110A	Z	-145.551
19	R3D_N121	X	-6.016
20	R3D_N121	Y	-3679.635
21	R3D_N121	Z	2254.372
22	R3D_N122	X	-1.368
23	R3D_N122	Y	-24.489
24	R3D_N122	Z	-144.549
25	R3D_N133B	X	5.387
26	R3D_N133B	Y	-3679.296
27	R3D_N133B	Z	2253.95
28	R3D_N134B	X	-2.095
29	R3D_N134B	Y	-28.16
30	R3D_N134B	Z	-144.458
31	R3D_N155	X	-148.172
32	R3D_N155	Y	-3124.901
33	R3D_N155	Z	1836.253
34	R3D_N156	X	-47.693
35	R3D_N156	Y	-49.505
36	R3D_N156	Z	-124.31

Point Loads and Moments (Cat 17 : OL2)

	Label	Direction	Magnitude[lb,lb-ft]
1	R3D_N1	X	207.957
2	R3D_N1	Y	-3533.608
3	R3D_N1	Z	1468.264
4	R3D_N2	X	13.35

Point Loads and Moments (Cat 17 : OL2) (Continued)

	Label	Direction	Magnitude[lb,lb-ft]
5	R3D_N2	Y	904.18
6	R3D_N2	Z	-100.259
7	R3D_N132	X	-8.487
8	R3D_N132	Y	-4156.155
9	R3D_N132	Z	1972.671
10	R3D_N133	X	-8.026
11	R3D_N133	Y	1261.605
12	R3D_N133	Z	-120.069
13	R3D_N109	X	6.183
14	R3D_N109	Y	-4181.938
15	R3D_N109	Z	1984.331
16	R3D_N110A	X	6.477
17	R3D_N110A	Y	1271.375
18	R3D_N110A	Z	-120.108
19	R3D_N121	X	-7.963
20	R3D_N121	Y	-4228.318
21	R3D_N121	Z	1856.138
22	R3D_N122	X	3.462
23	R3D_N122	Y	1164.953
24	R3D_N122	Z	-119.057
25	R3D_N133B	X	7.022
26	R3D_N133B	Y	-4226.705
27	R3D_N133B	Z	1853.447
28	R3D_N134B	X	-5.81
29	R3D_N134B	Y	1160.193
30	R3D_N134B	Z	-118.884
31	R3D_N155	X	-204.695
32	R3D_N155	Y	-3628.708
33	R3D_N155	Z	1510.841
34	R3D_N156	X	-9.449
35	R3D_N156	Y	932.919
36	R3D_N156	Z	-102.27

Point Loads and Moments (Cat 18 : OL3)

	Label	Direction	Magnitude[lb,lb-ft]
1	R3D_N1	X	-175.399
2	R3D_N1	Y	3546.591
3	R3D_N1	Z	-2080.616
4	R3D_N2	X	-64.851
5	R3D_N2	Y	60.874
6	R3D_N2	Z	142.1
7	R3D_N132	X	7.477
8	R3D_N132	Y	4267.537
9	R3D_N132	Z	-2785.618
10	R3D_N133	X	-1.83
11	R3D_N133	Y	-38.877
12	R3D_N133	Z	169.624
13	R3D_N109	X	-5.607
14	R3D_N109	Y	4295.132
15	R3D_N109	Z	-2803.723
16	R3D_N110A	X	7.02
17	R3D_N110A	Y	-43.594
18	R3D_N110A	Z	169.724
19	R3D_N121	X	7.016
20	R3D_N121	Y	4290.741
21	R3D_N121	Z	-2628.773

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

	Label	Direction	Magnitude[lb,lb-ft]
22	R3D_N122	X	1.595
23	R3D_N122	Y	28.556
24	R3D_N122	Z	168.556
25	R3D_N133B	X	-6.282
26	R3D_N133B	Y	4290.345
27	R3D_N133B	Z	-2628.281
28	R3D_N134B	X	2.442
29	R3D_N134B	Y	32.837
30	R3D_N134B	Z	168.449
31	R3D_N155	X	172.78
32	R3D_N155	Y	3643.877
33	R3D_N155	Z	-2141.214
34	R3D_N156	X	55.614
35	R3D_N156	Y	57.727
36	R3D_N156	Z	144.955

Point Loads and Moments (Cat 19 : OL4)

	Label	Direction	Magnitude[lb,lb-ft]
1	R3D_N1	X	-84.191
2	R3D_N1	Y	2241.124
3	R3D_N1	Z	-1800.09
4	R3D_N2	X	-82.122
5	R3D_N2	Y	812.791
6	R3D_N2	Z	122.956
7	R3D_N132	X	3.893
8	R3D_N132	Y	2773.548
9	R3D_N132	Z	-2404.503
10	R3D_N133	X	-9.06
11	R3D_N133	Y	956.845
12	R3D_N133	Z	146.459
13	R3D_N109	X	-3.065
14	R3D_N109	Y	2792.358
15	R3D_N109	Z	-2421.062
16	R3D_N110A	X	15.247
17	R3D_N110A	Y	957.934
18	R3D_N110A	Z	146.57
19	R3D_N121	X	3.652
20	R3D_N121	Y	2748.85
21	R3D_N121	Z	-2273.499
22	R3D_N122	X	5.062
23	R3D_N122	Y	975.809
24	R3D_N122	Z	145.742
25	R3D_N133B	X	-3.357
26	R3D_N133B	Y	2749.578
27	R3D_N133B	Z	-2274.954
28	R3D_N134B	X	-1.166
29	R3D_N134B	Y	978.117
30	R3D_N134B	Z	145.728
31	R3D_N155	X	83.061
32	R3D_N155	Y	2304.068
33	R3D_N155	Z	-1852.666
34	R3D_N156	X	72.029
35	R3D_N156	Y	831.349
36	R3D_N156	Z	125.429

Point Loads and Moments (Cat 20 : OL5)

	Label	Direction	Magnitude[lb.-lb-ft]
1	R3D_N1	X	-48.373
2	R3D_N1	Y	1317.839
3	R3D_N1	Z	-780.805
4	R3D_N2	X	-19.387
5	R3D_N2	Y	15.491
6	R3D_N2	Z	48.106
7	R3D_N132	X	4.175
8	R3D_N132	Y	596.459
9	R3D_N132	Z	-397.64
10	R3D_N133	Y	-5.711
11	R3D_N133	Z	24.373
12	R3D_N109	X	4.341
13	R3D_N109	Y	1107.002
14	R3D_N109	Z	-724.63
15	R3D_N110A	X	12.925
16	R3D_N110A	Y	-13.371
17	R3D_N110A	Z	43.063
18	R3D_N121	X	3.626
19	R3D_N121	Y	616.695
20	R3D_N121	Z	-376.619
21	R3D_N122	Y	7.67
22	R3D_N122	Z	28.133
23	R3D_N133B	X	1.292
24	R3D_N133B	Y	613.099
25	R3D_N133B	Z	-375.519
26	R3D_N134B	Y	4.441
27	R3D_N134B	Z	24.882
28	R3D_N155	X	34.89
29	R3D_N155	Y	532.012
30	R3D_N155	Z	-304.352
31	R3D_N156	X	7.504
32	R3D_N156	Y	7.014
33	R3D_N156	Z	20.666

Point Loads and Moments (Cat 21 : OL6)

	Label	Direction	Magnitude[lb.-lb-ft]
1	R3D_N1	X	44.074
2	R3D_N1	Y	-1290.811
3	R3D_N1	Z	765.93
4	R3D_N2	X	15.598
5	R3D_N2	Y	-14.603
6	R3D_N2	Z	-46.342
7	R3D_N132	X	-3.608
8	R3D_N132	Y	-598.609
9	R3D_N132	Z	397.539
10	R3D_N133	Y	5.625
11	R3D_N133	Z	-24.332
12	R3D_N109	X	-3.306
13	R3D_N109	Y	-958.199
14	R3D_N109	Z	631.009
15	R3D_N110A	X	-10.254
16	R3D_N110A	Y	12.869
17	R3D_N110A	Z	-38.981
18	R3D_N121	X	-3.127
19	R3D_N121	Y	-615.054
20	R3D_N121	Z	375.286

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

	Label	Direction	Magnitude[lb.-lb-ft]
21	R3D N122	Y	-7.986
22	R3D N122	Z	-27.198
23	R3D N133B	Y	-613.142
24	R3D N133B	Z	375.661
25	R3D N134B	Y	-4.167
26	R3D N134B	Z	-24.696
27	R3D N155	X	-33.09
28	R3D N155	Y	-529.75
29	R3D N155	Z	304.349
30	R3D N156	X	-7.362
31	R3D N156	Y	-6.796
32	R3D N156	Z	-20.655

Slabs

	Label	Thickness [in]	Material	Local Axis Angle ...	Analysis Offset [in]	Passive Pressur...	Soil Overburden [psf]
1	S1	27	Conc2500NW	0	0	0	0
2	S2	27	Conc2500NW	0	0	0	0
3	S3	27	Conc2500NW	0	0	0	0
4	S4	27	Conc2500NW	0	0	0	0
5	S5	27	Conc2500NW	0	0	0	0
6	S6	27	Conc2500NW	0	0	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...	Cat..	Fa...	Cat..	Fa...	Cat..	Fa...	Cat..	Fa...
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	.6																			
4	1.0 D + 0....	Yes	Yes	1.5	DL	1	RLL	OL2	.6																			
5	1.0 D + 0....	Yes	Yes	1.5	DL	1	RLL	OL3	.6																			
6	1.0 D + 0....	Yes	Yes	1.5	DL	1	RLL	OL4	.6																			
7	1.0 D + 0....	Yes	Yes	1.5	DL	1	RLL	OL5	.6																			
8	1.0 D + 0....	Yes	Yes	1.5	DL	1	RLL	OL6	.6																			
9	1.0 D + 0....	Yes	Yes	1.5	DL	1	RLL	.75	OL1	.45																		
10	1.0 D + 0....	Yes	Yes	1.5	DL	1	RLL	.75	OL2	.45																		
11	1.0 D + 0....	Yes	Yes	1.5	DL	1	RLL	.75	OL3	.45																		
12	1.0 D + 0....	Yes	Yes	1.5	DL	1	RLL	.75	OL4	.45																		
13	1.0 D + 0....	Yes	Yes	1.5	DL	1	RLL	.75	OL5	.45																		
14	1.0 D + 0....	Yes	Yes	1.5	DL	1	RLL	.75	OL6	.45																		
15	0.9 D + 0....	Yes	Yes		DL	.9	RLL		OL1	.6																		
16	0.9 D + 0....	Yes	Yes		DL	.9	RLL		OL2	.6																		
17	0.9 D + 0....	Yes	Yes		DL	.9	RLL		OL3	.6																		
18	0.9 D + 0....	Yes	Yes		DL	.9	RLL		OL4	.6																		
19	0.9 D + 0....	Yes	Yes		DL	.9	RLL		OL5	.6																		
20	0.9 D + 0....	Yes	Yes		DL	.9	RLL		OL6	.6																		
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	.5																		
25	1.2D+1.6S...	Yes			DL	1.2	RLL	1.6	OL2	.5																		
26	1.2D+1.6S...	Yes			DL	1.2	RLL	1.6	OL3	.5																		
27	1.2D+1.6S...	Yes			DL	1.2	RLL	1.6	OL4	.5																		
28	1.2D+1.6S...	Yes			DL	1.2	RLL	1.6	OL5	.5																		
29	1.2D+1.6S...	Yes			DL	1.2	RLL	1.6	OL6	.5																		
30	1.2D+1.0...	Yes			DL	1.2			OL1	1																		
31	1.2D-1.0Wx	Yes			DL	1.2			OL2	1																		
32	1.2D+1.0...	Yes			DL	1.2			OL3	1																		



Load Combinations (Continued)

Label	Solve	Service	A..SF	Cat..Fa...	Cat..Fa...	Cat..Fa...	Cat..Fa...	Cat..Fa...	Cat..Fa...	Cat..Fa...	Cat..Fa...	Cat..Fa...	C...	F...	C...	F...
33	1.2D-1.0Wz	Yes		DL	1.2			OL4	1							
34	1.2D+1.0...	Yes		DL	1.2			OL5	1							
35	1.2D-1.0...	Yes		DL	1.2			OL6	1							
36	1.0D+1.0...	Yes		DL	.9			OL1	1							
37	1.0D-1.0Wx	Yes		DL	.9			OL2	1							
38	1.0D+1.0...	Yes		DL	.9			OL3	1							
39	1.0D-1.0Wz	Yes		DL	.9			OL4	1							
40	1.0D+1.0...	Yes		DL	.9			OL5	1							
41	1.0D-1.0...	Yes		DL	.9			OL6	1							

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	18	
2	OL1	36	
3	OL2	36	
4	OL3	36	
5	OL4	36	
6	OL5	33	
7	OL6	32	

Strip Reinforcing

Label	UC Top	LC	Top Bars	Governing ...	UC Bot	LC	Bot B...	Gover...	UC Shear	LC	Governing De...	
1	DS1	.015	32	#5@6in	DS1-X25	.027	37	#5@6in	DS1-...	.041	37	DS1-X45
2	DS2	.001	36	#5@6in	DS2-X26	.002	32	#5@6in	DS2-...	.006	32	DS2-X50

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	41370.29	0	10669.05	9.999+
2	1	S2	0	0	42014.239	0	10698.781	9.999+
3	1	S3	0	0	41932.151	0	10709.287	9.999+
4	1	S4	0	0	41934.248	0	10709.94	9.999+
5	1	S5	0	0	41998.101	0	10700.973	9.999+
6	1	S6	0	0	41435.005	0	10552.362	9.999+
7	2	S1	0	0	41370.29	0	10669.05	9.999+
8	2	S2	0	0	42014.239	0	10698.781	9.999+
9	2	S3	0	0	41932.151	0	10709.287	9.999+
10	2	S4	0	0	41934.248	0	10709.94	9.999+
11	2	S5	0	0	41998.101	0	10700.973	9.999+
12	2	S6	0	0	41435.005	0	10552.362	9.999+
13	3	S1	0	17941.818	41321.351	2598.4	10669.05	2.303
14	3	S2	0	21994.713	41465.752	2736.148	10706.309	1.885
15	3	S3	0	21814.346	41600.432	2788.062	10709.287	1.907
16	3	S4	0	21814.539	41603.429	2785.037	10709.94	1.907
17	3	S5	0	21854.625	41451.705	2726.336	10696.377	1.897
18	3	S6	0	18436.581	41376.472	2645.223	10681.314	2.244
19	4	S1	0	19457.201	41321.351	2270.835	10669.05	2.124
20	4	S2	0	23227.328	41465.752	2200.013	10698.781	1.785
21	4	S3	0	23363.714	41600.432	2303.601	10709.287	1.781
22	4	S4	0	23355.104	41603.429	2301.521	10709.94	1.781
23	4	S5	0	23085.203	41451.705	2193.204	10696.377	1.796



Company : Vector Structural Engineering
 Designer : STB
 Job Number : U2716.098.191
 Model Name : Ground Mount

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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	
24	4	S6	0	19983.053	41376.472	2310.936	10681.314	2.071	4.622
25	5	S1	0	0	41552.444	0	13698.987	9.999+	9.999+
26	5	S2	0	776.005	42014.239	0	13885.527	9.999+	9.999+
27	5	S3	0	169.295	41932.151	0	13937.135	9.999+	9.999+
28	5	S4	0	146.79	41934.248	0	13957.51	9.999+	9.999+
29	5	S5	0	746.487	41998.101	0	13864.844	9.999+	9.999+
30	5	S6	0	0	41590.94	0	13020.233	9.999+	9.999+
31	6	S1	0	0	44901.45	0	13184.008	9.999+	9.999+
32	6	S2	0	0	45879.571	0	13495.053	9.999+	9.999+
33	6	S3	0	0	46058.071	0	13491.018	9.999+	9.999+
34	6	S4	0	0	46070.696	0	13511.818	9.999+	9.999+
35	6	S5	0	0	45866.809	0	13505.744	9.999+	9.999+
36	6	S6	0	0	45039.092	0	12694.554	9.999+	9.999+
37	7	S1	0	0	41384.181	0	11760.523	9.999+	9.999+
38	7	S2	0	214.746	42014.239	0	11495.693	9.999+	9.999+
39	7	S3	0	0	41933.266	0	11172.666	9.999+	9.999+
40	7	S4	0	21.101	41934.248	0	11171.352	9.999+	9.999+
41	7	S5	0	116.087	41998.101	0	11138.397	9.999+	9.999+
42	7	S6	0	0	41460.908	0	10899.4	9.999+	9.999+
43	8	S1	0	7628.631	41321.351	1059.617	10669.05	5.417	9.999+
44	8	S2	0	5725.612	41465.752	727.304	10706.309	7.242	9.999+
45	8	S3	0	3642.644	41600.432	471.501	10709.287	9.999+	9.999+
46	8	S4	0	3634.199	41603.429	462.981	10709.94	9.999+	9.999+
47	8	S5	0	3583.02	41451.705	449.609	10696.377	9.999+	9.999+
48	8	S6	0	3115.623	41376.472	457.019	10681.314	9.999+	9.999+
49	9	S1	0	13456.364	41321.351	1948.8	10669.05	3.071	5.475
50	9	S2	0	16496.035	41465.752	2052.111	10706.309	2.514	5.217
51	9	S3	0	16360.76	41600.432	2091.047	10709.287	2.543	5.121
52	9	S4	0	16360.904	41603.429	2088.778	10709.94	2.543	5.127
53	9	S5	0	16390.969	41451.705	2044.752	10696.377	2.529	5.231
54	9	S6	0	13827.436	41376.472	1983.917	10681.314	2.992	5.384
55	10	S1	0	14592.901	41321.351	1703.126	10669.05	2.832	6.264
56	10	S2	0	17420.496	41465.752	1650.01	10698.781	2.38	6.484
57	10	S3	0	17522.786	41600.432	1727.701	10709.287	2.374	6.199
58	10	S4	0	17516.328	41603.429	1726.14	10709.94	2.375	6.205
59	10	S5	0	17313.902	41451.705	1644.903	10696.377	2.394	6.503
60	10	S6	0	14987.29	41376.472	1733.202	10681.314	2.761	6.163
61	11	S1	0	0	41506.905	0	12941.502	9.999+	9.999+
62	11	S2	0	582.004	42014.239	0	13088.84	9.999+	9.999+
63	11	S3	0	126.971	41932.151	0	13130.173	9.999+	9.999+
64	11	S4	0	110.092	41934.248	0	13145.617	9.999+	9.999+
65	11	S5	0	559.866	41998.101	0	13073.876	9.999+	9.999+
66	11	S6	0	0	41551.956	0	12403.265	9.999+	9.999+
67	12	S1	0	0	44018.66	0	12555.269	9.999+	9.999+
68	12	S2	0	0	44913.238	0	12795.985	9.999+	9.999+
69	12	S3	0	0	45026.591	0	12795.585	9.999+	9.999+
70	12	S4	0	0	45036.584	0	12811.348	9.999+	9.999+
71	12	S5	0	0	44899.632	0	12804.551	9.999+	9.999+
72	12	S6	0	0	44138.071	0	12159.006	9.999+	9.999+
73	13	S1	0	0	41380.708	0	11487.654	9.999+	9.999+
74	13	S2	0	161.059	42014.239	0	11296.465	9.999+	9.999+
75	13	S3	0	0	41932.988	0	11056.821	9.999+	9.999+
76	13	S4	0	15.826	41934.248	0	11055.999	9.999+	9.999+
77	13	S5	0	87.066	41998.101	0	11029.041	9.999+	9.999+
78	13	S6	0	0	41454.432	0	10812.64	9.999+	9.999+
79	14	S1	0	5721.473	41321.351	794.713	10669.05	7.222	9.999+
80	14	S2	0	4294.209	41465.752	545.478	10706.309	9.656	9.999+



Company : Vector Structural Engineering
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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	
81	14	S3	0	2731.983	41600.432	353.626	10709.287	9.999+	9.999+
82	14	S4	0	2725.65	41603.429	347.236	10709.94	9.999+	9.999+
83	14	S5	0	2687.265	41451.705	337.206	10696.377	9.999+	9.999+
84	14	S6	0	2336.717	41376.472	342.764	10681.314	9.999+	9.999+
85	15	S1	0	17941.818	37189.216	2598.4	9602.145	2.073	3.695
86	15	S2	0	21994.713	37319.177	2736.148	9635.678	1.697	3.522
87	15	S3	0	21814.346	37440.389	2788.062	9638.358	1.716	3.457
88	15	S4	0	21814.539	37443.086	2785.037	9638.946	1.716	3.461
89	15	S5	0	21854.625	37306.535	2726.336	9626.739	1.707	3.531
90	15	S6	0	18436.581	37238.825	2645.223	9613.182	2.02	3.634
91	16	S1	0	19457.201	37189.216	2270.835	9602.145	1.911	4.228
92	16	S2	0	23227.328	37319.177	2200.013	9628.902	1.607	4.377
93	16	S3	0	23363.714	37440.389	2303.601	9638.358	1.603	4.184
94	16	S4	0	23355.104	37443.086	2301.521	9638.946	1.603	4.188
95	16	S5	0	23085.203	37306.535	2193.204	9626.739	1.616	4.389
96	16	S6	0	19983.053	37238.825	2310.936	9613.182	1.864	4.16
97	17	S1	0	0	37415.415	0	12632.082	9.999+	9.999+
98	17	S2	0	776.005	37812.815	0	12815.649	9.999+	9.999+
99	17	S3	0	169.295	37738.936	0	12866.206	9.999+	9.999+
100	17	S4	0	146.79	37740.823	0	12886.516	9.999+	9.999+
101	17	S5	0	746.487	37798.291	0	12794.747	9.999+	9.999+
102	17	S6	0	0	37447.44	0	11964.997	9.999+	9.999+
103	18	S1	0	0	40764.421	0	12117.103	9.999+	9.999+
104	18	S2	0	0	41678.147	0	12425.175	9.999+	9.999+
105	18	S3	0	0	41864.855	0	12420.089	9.999+	9.999+
106	18	S4	0	0	41877.271	0	12440.824	9.999+	9.999+
107	18	S5	0	0	41666.999	0	12435.646	9.999+	9.999+
108	18	S6	0	0	40895.592	0	11639.318	9.999+	9.999+
109	19	S1	0	0	37247.152	0	10693.618	9.999+	9.999+
110	19	S2	0	214.746	37812.815	0	10425.815	9.999+	9.999+
111	19	S3	0	0	37740.051	0	10101.737	9.999+	9.999+
112	19	S4	0	21.101	37740.823	0	10100.358	9.999+	9.999+
113	19	S5	0	116.087	37798.291	0	10068.3	9.999+	9.999+
114	19	S6	0	0	37317.407	0	9844.164	9.999+	9.999+
115	20	S1	0	7628.631	37189.216	1059.617	9602.145	4.875	9.062
116	20	S2	0	5725.612	37319.177	727.304	9635.678	6.518	9.999+
117	20	S3	0	3642.644	37440.389	471.501	9638.358	9.999+	9.999+
118	20	S4	0	3634.199	37443.086	462.981	9638.946	9.999+	9.999+
119	20	S5	0	3583.02	37306.535	449.609	9626.739	9.999+	9.999+
120	20	S6	0	3115.623	37238.825	457.019	9613.182	9.999+	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	30.034	2544.354	0	2544.354	9.999+	9.999+
2	1	S2	0	1.673	2568.611	0	2568.611	9.999+	9.999+
3	1	S3	0	0	2570.229	0	2570.229	9.999+	9.999+
4	1	S4	0	0	2570.386	0	2570.386	9.999+	9.999+
5	1	S5	0	1.021	2567.682	0	2567.682	9.999+	9.999+
6	1	S6	0	28.656	2548.041	0	2548.041	9.999+	9.999+
7	2	S1	0	30.034	2544.354	0	2544.354	9.999+	9.999+
8	2	S2	0	1.673	2568.611	0	2568.611	9.999+	9.999+
9	2	S3	0	0	2570.229	0	2570.229	9.999+	9.999+
10	2	S4	0	0	2570.386	0	2570.386	9.999+	9.999+
11	2	S5	0	1.021	2567.682	0	2567.682	9.999+	9.999+
12	2	S6	0	28.656	2548.041	0	2548.041	9.999+	9.999+
13	3	S1	0	93.586	1987.492	997.455	1987.492	9.999+	1.993



Company : Vector Structural Engineering
 Designer : STB
 Job Number : U2716.098.191
 Model Name : Ground Mount

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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
14	3	S2	0	.946	1912.328	1355.312	1912.328	9.999+	1.411
15	3	S3	0	4.431	1903.487	1265.894	1903.487	9.999+	1.504
16	3	S4	0	1.975	1903.044	1265.695	1903.044	9.999+	1.504
17	3	S5	0	3.927	1914.931	1346.048	1914.931	9.999+	1.423
18	3	S6	0	88.863	1976.648	1027.166	1976.648	9.999+	1.924
19	4	S1	0	102.751	2071.057	820.803	2071.057	9.999+	2.523
20	4	S2	0	9.269	2044.709	1118.534	2044.709	9.999+	1.828
21	4	S3	0	2.701	2018.823	1042.249	2018.823	9.999+	1.937
22	4	S4	0	.727	2018.414	1040.738	2018.414	9.999+	1.939
23	4	S5	0	10.929	2046.663	1111.561	2046.663	9.999+	1.841
24	4	S6	0	99.831	2062.799	845.143	2062.799	9.999+	2.441
25	5	S1	0	174.184	3193.698	1163.11	3193.698	9.999+	2.746
26	5	S2	0	2.521	3333.888	1580.399	3333.888	9.999+	2.11
27	5	S3	0	5.166	3347.702	1476.13	3347.702	9.999+	2.268
28	5	S4	0	2.304	3348.558	1475.899	3348.558	9.999+	2.269
29	5	S5	0	2.367	3328.841	1569.596	3328.841	9.999+	2.121
30	5	S6	0	165.692	3214.33	1197.755	3214.33	9.999+	2.684
31	6	S1	0	129.821	3094.058	1006.28	3094.058	9.999+	3.075
32	6	S2	0	8.982	3243.663	1364.695	3243.663	9.999+	2.377
33	6	S3	0	5.228	3240.668	1276.654	3240.668	9.999+	2.538
34	6	S4	0	2.714	3241.371	1277.536	3241.371	9.999+	2.537
35	6	S5	0	4.122	3239.153	1354.826	3239.153	9.999+	2.391
36	6	S6	0	121.71	3112.416	1036.342	3112.416	9.999+	3.003
37	7	S1	0	70.689	2784.353	439.619	2784.353	9.999+	6.334
38	7	S2	0	12.033	2765.464	408.94	2765.464	9.999+	6.763
39	7	S3	0	2.176	2682.615	209.092	2682.615	9.999+	9.999+
40	7	S4	0	.775	2681.543	210.382	2681.543	9.999+	9.999+
41	7	S5	0	1.484	2674.017	223.96	2674.017	9.999+	9.999+
42	7	S6	0	54.092	2645.066	170.212	2645.066	9.999+	9.999+
43	8	S1	0	5.769	2309.379	431.753	2309.379	9.999+	5.349
44	8	S2	0	6.463	2398.451	355.217	2398.451	9.999+	6.752
45	8	S3	0	1.876	2458.082	208.853	2458.082	9.999+	9.999+
46	8	S4	0	0	2459.27	210.579	2459.27	9.999+	9.999+
47	8	S5	0	3.186	2460.945	223.925	2460.945	9.999+	9.999+
48	8	S6	0	4.385	2451.463	170.217	2451.463	9.999+	9.999+
49	9	S1	0	62.681	2126.708	748.091	2126.708	9.999+	2.843
50	9	S2	0	1.128	2076.399	1016.484	2076.399	9.999+	2.043
51	9	S3	0	3.323	2070.172	949.42	2070.172	9.999+	2.18
52	9	S4	0	1.482	2069.879	949.271	2069.879	9.999+	2.18
53	9	S5	0	3.201	2078.118	1009.536	2078.118	9.999+	2.058
54	9	S6	0	59.483	2119.496	770.375	2119.496	9.999+	2.751
55	10	S1	0	69.555	2189.381	615.602	2189.381	9.999+	3.556
56	10	S2	0	7.37	2175.685	838.901	2175.685	9.999+	2.593
57	10	S3	0	2.026	2156.675	781.686	2156.675	9.999+	2.759
58	10	S4	0	.545	2156.407	780.553	2156.407	9.999+	2.763
59	10	S5	0	8.452	2176.918	833.671	2176.918	9.999+	2.611
60	10	S6	0	67.709	2184.11	633.857	2184.11	9.999+	3.446
61	11	S1	0	138.146	3031.362	872.332	3031.362	9.999+	3.475
62	11	S2	0	2.309	3142.568	1185.3	3142.568	9.999+	2.651
63	11	S3	0	3.875	3153.334	1107.098	3153.334	9.999+	2.848
64	11	S4	0	1.728	3154.015	1106.924	3154.015	9.999+	2.849
65	11	S5	0	1.52	3138.551	1177.197	3138.551	9.999+	2.666
66	11	S6	0	131.433	3047.758	898.317	3047.758	9.999+	3.393
67	12	S1	0	104.874	2956.632	754.71	2956.632	9.999+	3.918
68	12	S2	0	7.155	3074.9	1023.521	3074.9	9.999+	3.004
69	12	S3	0	3.921	3073.058	957.491	3073.058	9.999+	3.209
70	12	S4	0	2.035	3073.624	958.152	3073.624	9.999+	3.208



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	
71	12	S5	0	3.347	3071.285	1016.12	3071.285	9.999+	3.023
72	12	S6	0	98.446	2971.322	777.257	2971.322	9.999+	3.823
73	13	S1	0	60.525	2724.353	329.714	2724.353	9.999+	8.263
74	13	S2	0	9.443	2716.251	306.705	2716.251	9.999+	8.856
75	13	S3	0	1.632	2654.518	156.819	2654.518	9.999+	9.999+
76	13	S4	0	.581	2653.754	157.787	2653.754	9.999+	9.999+
77	13	S5	0	.857	2647.433	167.97	2647.433	9.999+	9.999+
78	13	S6	0	47.733	2620.81	127.659	2620.81	9.999+	9.999+
79	14	S1	0	3.181	2368.123	323.815	2368.123	9.999+	7.313
80	14	S2	0	4.429	2440.991	266.412	2440.991	9.999+	9.162
81	14	S3	0	1.407	2486.119	156.64	2486.119	9.999+	9.999+
82	14	S4	0	0	2487.049	157.934	2487.049	9.999+	9.999+
83	14	S5	0	2.645	2487.629	167.943	2487.629	9.999+	9.999+
84	14	S6	0	10.453	2475.607	127.663	2475.607	9.999+	9.999+
85	15	S1	0	96.589	1733.057	997.455	1733.057	9.999+	1.737
86	15	S2	0	.779	1655.467	1355.312	1655.467	9.999+	1.221
87	15	S3	0	4.431	1646.464	1265.894	1646.464	9.999+	1.301
88	15	S4	0	1.975	1646.005	1265.695	1646.005	9.999+	1.3
89	15	S5	0	3.825	1658.162	1346.048	1658.162	9.999+	1.232
90	15	S6	0	91.729	1721.844	1027.166	1721.844	9.999+	1.676
91	16	S1	0	105.754	1816.622	820.803	1816.622	9.999+	2.213
92	16	S2	0	9.102	1787.848	1118.534	1787.848	9.999+	1.598
93	16	S3	0	2.701	1761.8	1042.249	1761.8	9.999+	1.69
94	16	S4	0	.727	1761.375	1040.738	1761.375	9.999+	1.692
95	16	S5	0	10.827	1789.895	1111.561	1789.895	9.999+	1.61
96	16	S6	0	102.696	1807.995	845.143	1807.995	9.999+	2.139
97	17	S1	0	171.18	2939.262	1163.11	2939.262	9.999+	2.527
98	17	S2	0	2.353	3077.026	1580.399	3077.026	9.999+	1.947
99	17	S3	0	5.166	3090.679	1476.13	3090.679	9.999+	2.094
100	17	S4	0	2.304	3091.52	1475.899	3091.52	9.999+	2.095
101	17	S5	0	2.469	3072.073	1569.596	3072.073	9.999+	1.957
102	17	S6	0	162.827	2959.526	1197.755	2959.526	9.999+	2.471
103	18	S1	0	126.818	2839.623	1006.28	2839.623	9.999+	2.822
104	18	S2	0	8.815	2986.802	1364.695	2986.802	9.999+	2.189
105	18	S3	0	5.228	2983.645	1276.654	2983.645	9.999+	2.337
106	18	S4	0	2.714	2984.332	1277.536	2984.332	9.999+	2.336
107	18	S5	0	4.02	2982.384	1354.826	2982.384	9.999+	2.201
108	18	S6	0	118.844	2857.612	1036.342	2857.612	9.999+	2.757
109	19	S1	0	67.686	2529.918	439.619	2529.918	9.999+	5.755
110	19	S2	0	11.866	2508.603	408.94	2508.603	9.999+	6.134
111	19	S3	0	2.176	2425.592	209.092	2425.592	9.999+	9.999+
112	19	S4	0	.775	2424.504	210.382	2424.504	9.999+	9.999+
113	19	S5	0	1.586	2417.248	223.96	2417.248	9.999+	9.999+
114	19	S6	0	51.227	2390.262	170.212	2390.262	9.999+	9.999+
115	20	S1	0	8.773	2054.944	431.753	2054.944	9.999+	4.76
116	20	S2	0	6.631	2141.59	355.217	2141.59	9.999+	6.029
117	20	S3	0	1.876	2201.059	208.853	2201.059	9.999+	9.999+
118	20	S4	0	0	2202.232	210.579	2202.232	9.999+	9.999+
119	20	S5	0	3.084	2204.177	223.925	2204.177	9.999+	9.843
120	20	S6	0	1.519	2196.659	170.217	2196.659	9.999+	9.999+

Envelope Slab Soil Pressures

Label	UC	LC	Soil Pressure[psf]	Allowable Bearing[psf]	Point	
1	S1	.419	5	628.936	1500	N170
2	S2	.459	5	689.187	1500	N177
3	S3	.46	5	689.471	1500	N184



Company : Vector Structural Engineering
Designer : STB
Job Number : U2716.098.191
Model Name : Ground Mount

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Envelope Slab Soil Pressures (Continued)

	Label	UC	LC	Soil Pressure[psf]	Allowable Bearing[psf]	Point
4	S4	.46	5	689.337	1500	N191
5	S5	.458	5	686.732	1500	N198
6	S6	.425	5	637.197	1500	N205



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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 318-14
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): 24.00
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





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Load and Geometry

Load factor source: ACI 318 Section 5.3

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]: 3968

V_{uax} [lb]: 570

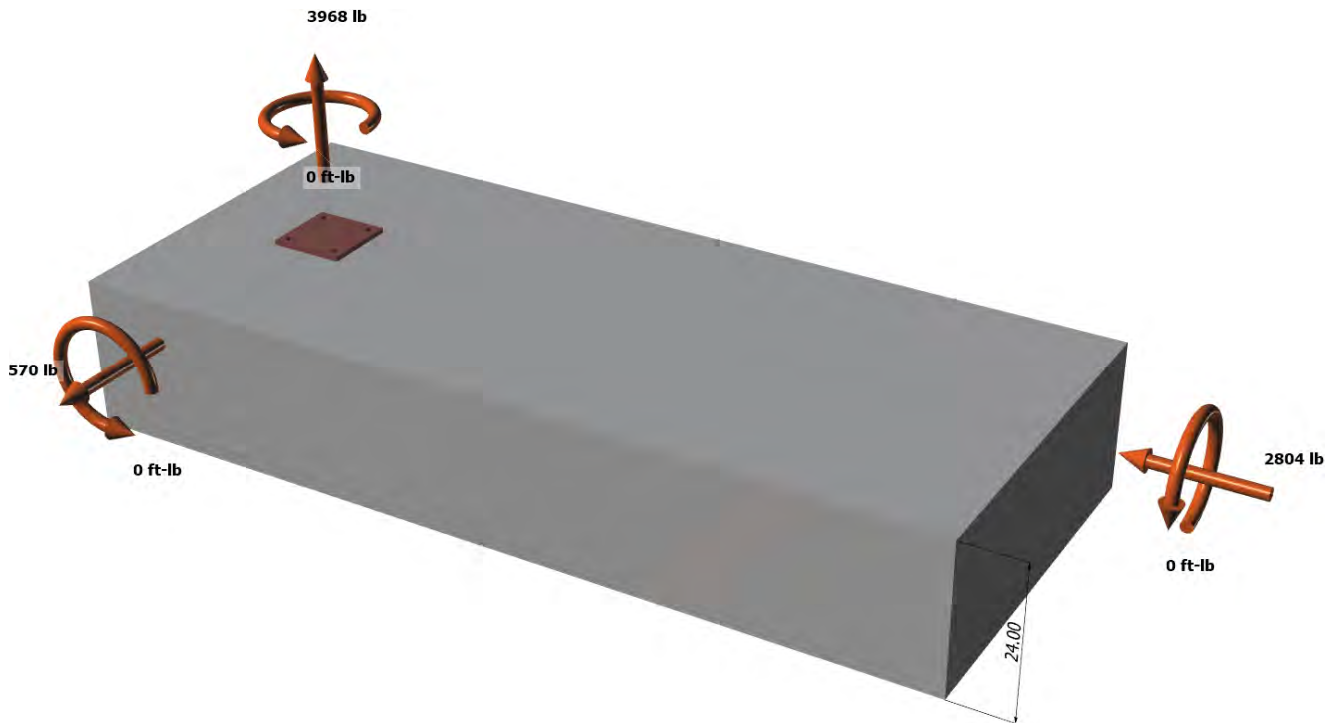
V_{uay} [lb]: -2804

M_{ux} [ft-lb]: 0

M_{uy} [ft-lb]: 0

M_{uz} [ft-lb]: 0

<Figure 1>

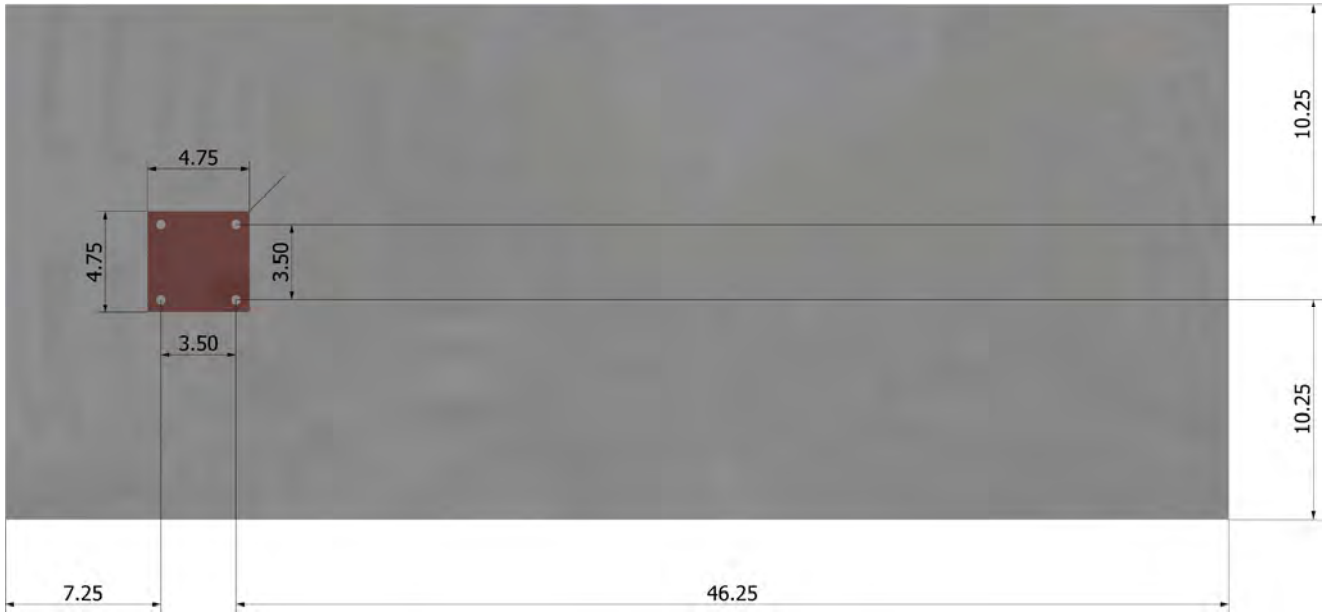


Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.



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<Figure 2>





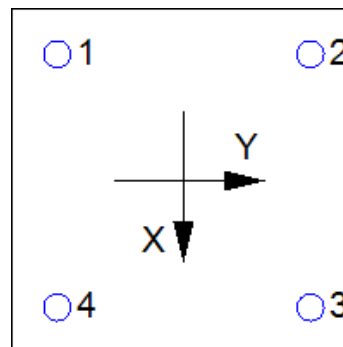
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3. Resulting Anchor Forces

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	992.0	142.5	-701.0	715.3
2	992.0	142.5	-701.0	715.3
3	992.0	142.5	-701.0	715.3
4	992.0	142.5	-701.0	715.3
Sum	3968.0	570.0	-2804.0	2861.3

Maximum concrete compression strain (%): 0.00
 Maximum concrete compression stress (psi): 0
 Resultant tension force (lb): 3968
 Resultant compression force (lb): 0
 Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
 Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
 Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
 Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



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

N _{sa} (lb)	φ	φN _{sa} (lb)
4525	0.75	3394

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

$$N_b = K_c \lambda_a \sqrt{f_c} h_{ef}^{1.5} \text{ (Eq. 17.4.2.2a)}$$

K _c	λ _a	f _c (psi)	h _{ef} (in)	N _b (lb)
17.0	1.00	2500	4.000	6800

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

A _{Nc} (in ²)	A _{Nco} (in ²)	c _{a,min} (in)	ψ _{ec,N}	ψ _{ed,N}	ψ _{c,N}	ψ _{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 (Sec. 17.4.5)

$$\tau_{k,cr} = \tau_{k,cr,short-term} K_{sat} (f_c / 2,500)^n$$

τ _{k,cr} (psi)	f _{short-term}	K _{sat}	f _c (psi)	n	τ _{k,cr} (psi)
1346	1.00	1.00	2500	0.24	1346

$$N_{ba} = \lambda_a \tau_{cr} \pi d_a h_{ef} \text{ (Eq. 17.4.5.2)}$$

λ _a	τ _{cr} (psi)	d _a (in)	h _{ef} (in)	N _{ba} (lb)
1.00	1346	0.38	4.000	6343

$$\phi N_{ag} = \phi (A_{Na} / A_{Na0}) \psi_{ec,Na} \psi_{ed,Na} \psi_{cp,Na} N_{ba} \text{ (Sec. 17.3.1 \& Eq. 17.4.5.1b)}$$

A _{Na} (in ²)	A _{Na0} (in ²)	c _{Na} (in)	c _{a,min} (in)	ψ _{ec,Na}	ψ _{ed,Na}	ψ _{cp,Na}	N _{ba} (lb)	φ	φN _{ag} (lb)
198.45	112.09	5.29	7.25	1.000	1.000	1.000	6343	0.55	6176



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

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. 17.5.2)

Shear perpendicular to edge in x-direction:

$V_{bx} = \min|7(l_e / d_a)^{0.2} \sqrt{d_a} \lambda_a \sqrt{f_c} c_{a1}^{1.5}; 9 \lambda_a \sqrt{f_c} c_{a1}^{1.5}|$ (Eq. 17.5.2.2a & Eq. 17.5.2.2b)

l_e (in)	d_a (in)	λ_a	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. 17.3.1 & Eq. 17.5.2.1b)

A_{Vc} (in ²)	A_{Vco} (in ²)	$\Psi_{ec,v}$	$\Psi_{ed,v}$	$\Psi_{c,v}$	$\Psi_{h,v}$	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:

$V_{by} = \min|7(l_e / d_a)^{0.2} \sqrt{d_a} \lambda_a \sqrt{f_c} c_{a1}^{1.5}; 9 \lambda_a \sqrt{f_c} c_{a1}^{1.5}|$ (Eq. 17.5.2.2a & Eq. 17.5.2.2b)

l_e (in)	d_a (in)	λ_a	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. 17.3.1 & Eq. 17.5.2.1b)

A_{Vc} (in ²)	A_{Vco} (in ²)	$\Psi_{ec,v}$	$\Psi_{ed,v}$	$\Psi_{c,v}$	$\Psi_{h,v}$	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:

$V_{by} = \min|7(l_e / d_a)^{0.2} \sqrt{d_a} \lambda_a \sqrt{f_c} c_{a1}^{1.5}; 9 \lambda_a \sqrt{f_c} c_{a1}^{1.5}|$ (Eq. 17.5.2.2a & Eq. 17.5.2.2b)

l_e (in)	d_a (in)	λ_a	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. 17.3.1, 17.5.2.1(c) & Eq. 17.5.2.1b)

A_{Vc} (in ²)	A_{Vco} (in ²)	$\Psi_{ec,v}$	$\Psi_{ed,v}$	$\Psi_{c,v}$	$\Psi_{h,v}$	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:

$V_{bx} = \min|7(l_e / d_a)^{0.2} \sqrt{d_a} \lambda_a \sqrt{f_c} c_{a1}^{1.5}; 9 \lambda_a \sqrt{f_c} c_{a1}^{1.5}|$ (Eq. 17.5.2.2a & Eq. 17.5.2.2b)

l_e (in)	d_a (in)	λ_a	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. 17.3.1, 17.5.2.1(c) & Eq. 17.5.2.1b)

A_{Vc} (in ²)	A_{Vco} (in ²)	$\Psi_{ec,v}$	$\Psi_{ed,v}$	$\Psi_{c,v}$	$\Psi_{h,v}$	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. 17.5.3)

$\phi V_{cp} = \phi \min|k_{cp} N_{ag}; k_{cp} N_{cbg}| = \phi \min|k_{cp} (A_{Na} / A_{Na0}) \Psi_{ec,Na} \Psi_{ed,Na} \Psi_{cp,Na} N_{ba}; k_{cp} (A_{Nc} / A_{Nco}) \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b|$ (Sec. 17.3.1 & Eq. 17.5.3.1b)

k_{cp}	A_{Na} (in ²)	A_{Na0} (in ²)	$\Psi_{ed,Na}$	$\Psi_{ec,Na}$	$\Psi_{cp,Na}$	N_{ba} (lb)	N_a (lb)
2.0	198.45	112.09	1.000	1.000	1.000	6343	11230

A_{Nc} (in ²)	A_{Nco} (in ²)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	N_{cb} (lb)	ϕ
240.25	144.00	1.000	1.000	1.000	1.000	6800	11345	0.70

Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.



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

ϕV_{cpq} (lb)
15722

11. Results

Interaction of Tensile and Shear Forces (Sec. R17.6)

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status	
Steel	992	3394	0.29	Pass	
Concrete breakout	3968	7374	0.54	Pass	
Adhesive	3968	6176	0.64	Pass (Governs)	
Shear	Factored Load, V_{ua} (lb)	Design Strength, ϕV_n (lb)	Ratio	Status	
Steel	715	1765	0.41	Pass	
T Concrete breakout x+	570	7103	0.08	Pass	
T Concrete breakout y-	2804	5313	0.53	Pass	
Concrete breakout y-	285	9797	0.03	Pass	
Concrete breakout x-	1402	12680	0.11	Pass	
Concrete breakout, combined	-	-	0.53	Pass (Governs)	
Pryout	2861	15722	0.18	Pass	
Interaction check	$(N_{ua}/\phi N_{ua})^{5/3}$	$(V_{ua}/\phi V_{ua})^{5/3}$	Combined Ratio	Permissible	Status
Sec. R17.6	0.48	0.35	83.0%	1.0	Pass

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

12. Warnings

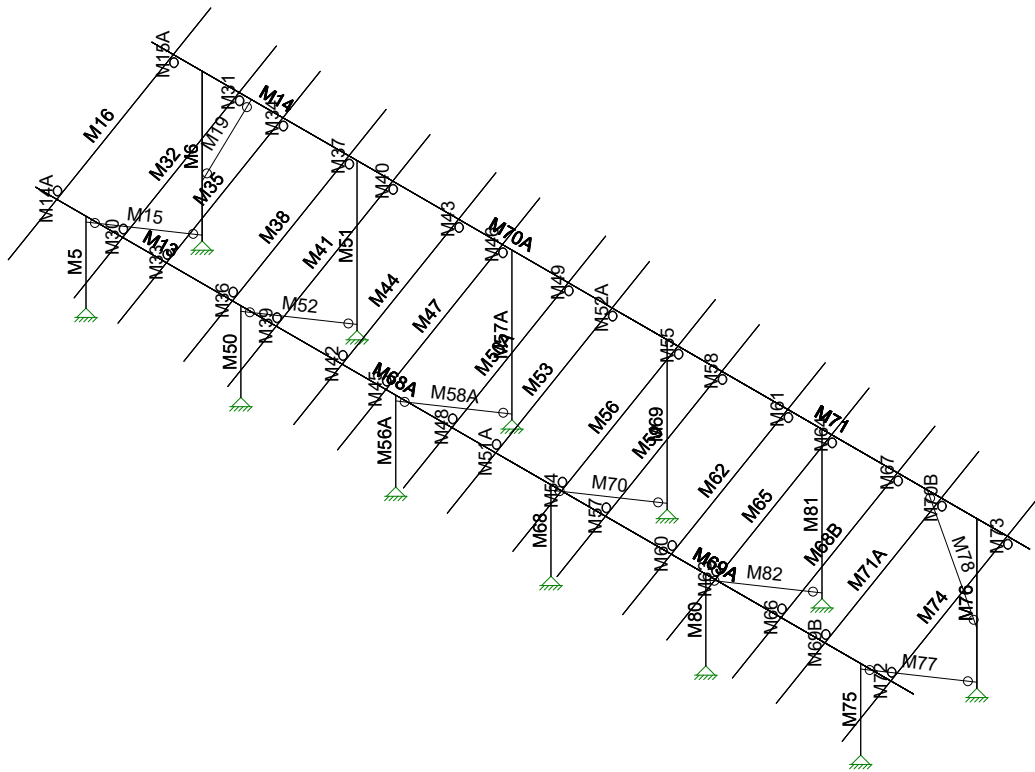
- Designer must exercise own judgement to determine if this design is suitable.
- Refer to manufacturer's product literature for hole cleaning and installation instructions.



JOB NO.: U2716-098-191

DESIGNED: STB

Framing Analysis



Vector Structural Engineeri...

STB

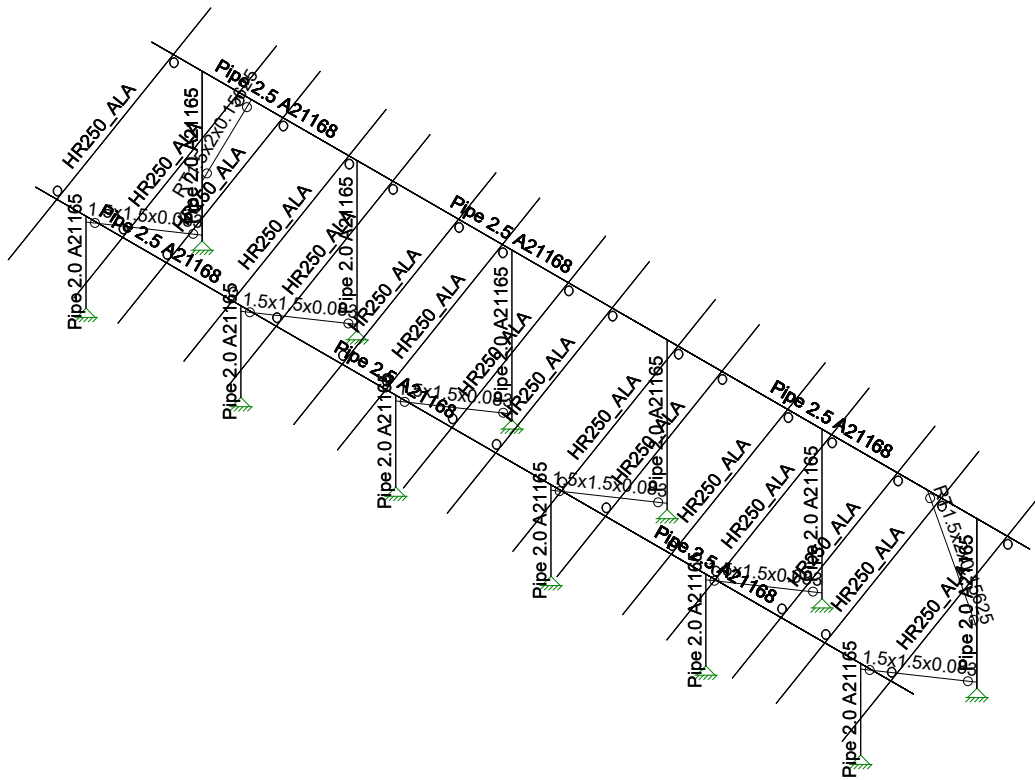
U2716.098.191

Ground Mount

SK - 3

Apr 6, 2021 at 4:19 PM

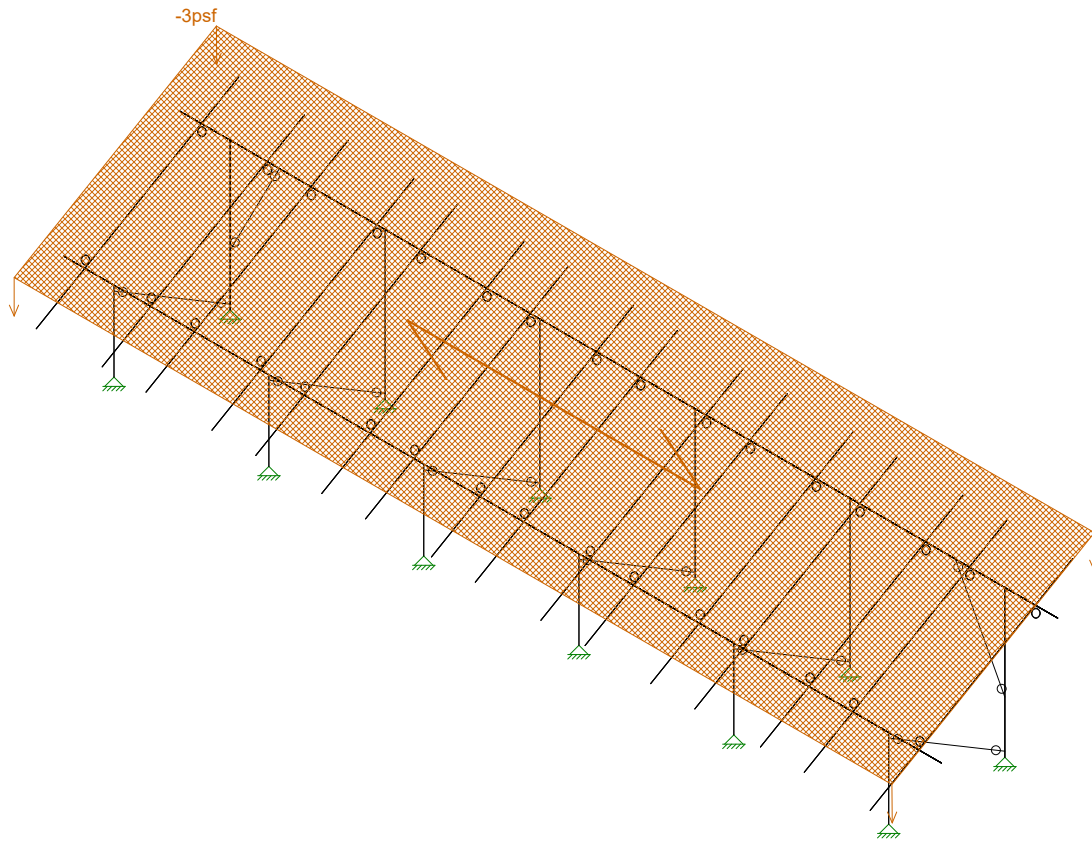
Sunmodo Sunturf C1 GM v6 85x45...



Vector Structural Engineeri...
STB
U2716.098.191

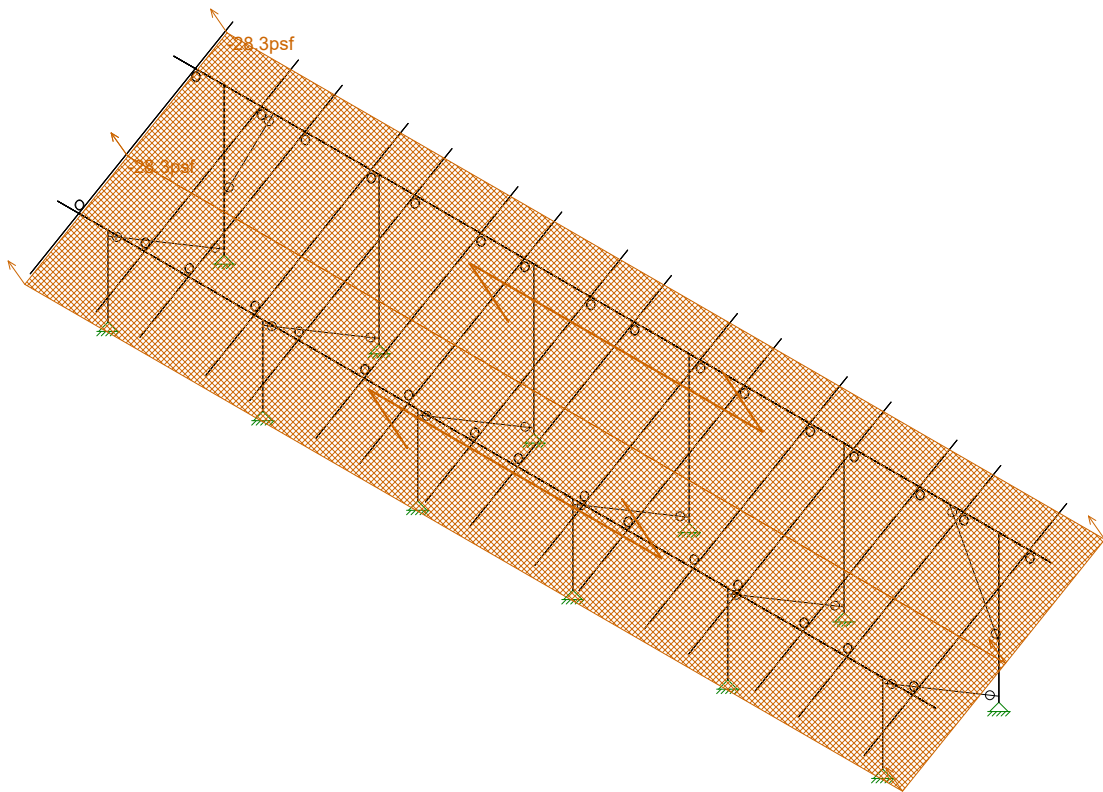
Ground Mount

SK - 4
Apr 6, 2021 at 4:19 PM
Sunmodo Sunturf C1 GM v6 85x45...



Loads: BLC 2, Solar Panel Weight

Vector Structural Engineeri...	Ground Mount	SK - 5
STB		Apr 6, 2021 at 4:19 PM
U2716.098.191		Sunmodo Sunturf C1 GM v6 85x45...



Loads: BLC 4, Wind A 0 deg

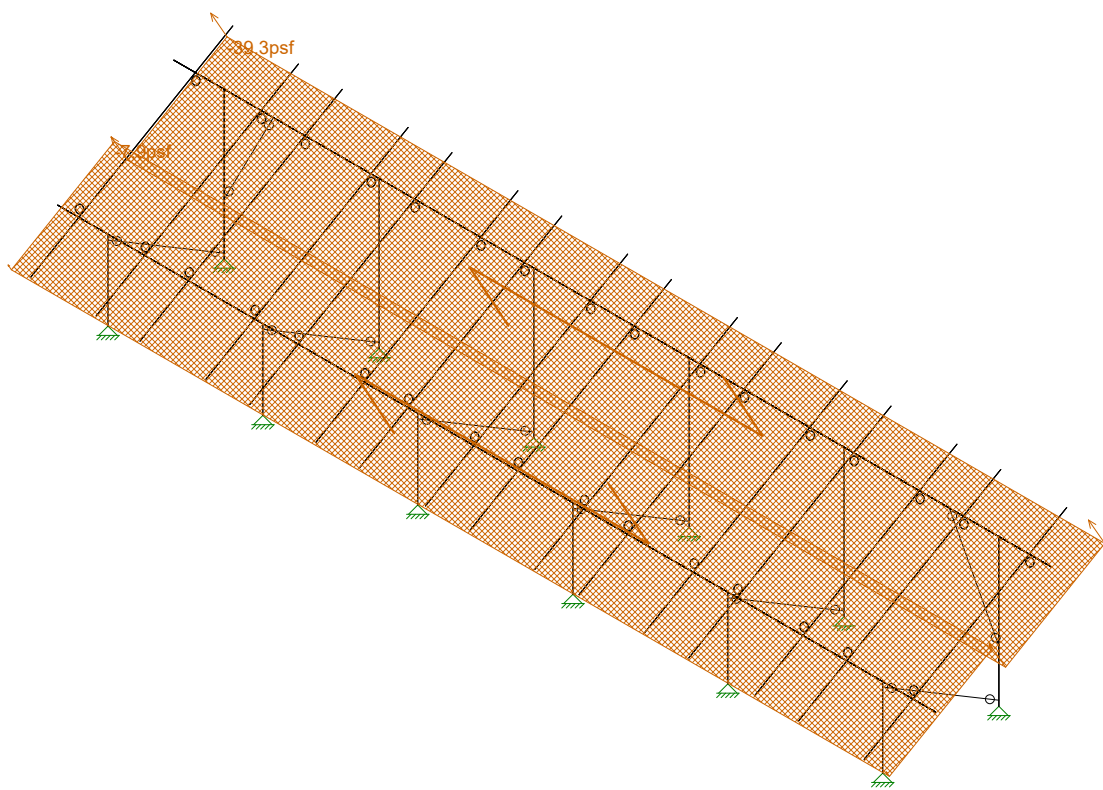
Vector Structural Engineeri...
STB
U2716.098.191

Ground Mount

SK - 6

Apr 6, 2021 at 4:19 PM

Sunmodo Sunturf C1 GM v6 85x45...



Loads: BLC 5, Wind B 0 deg

Vector Structural Engineeri...

STB

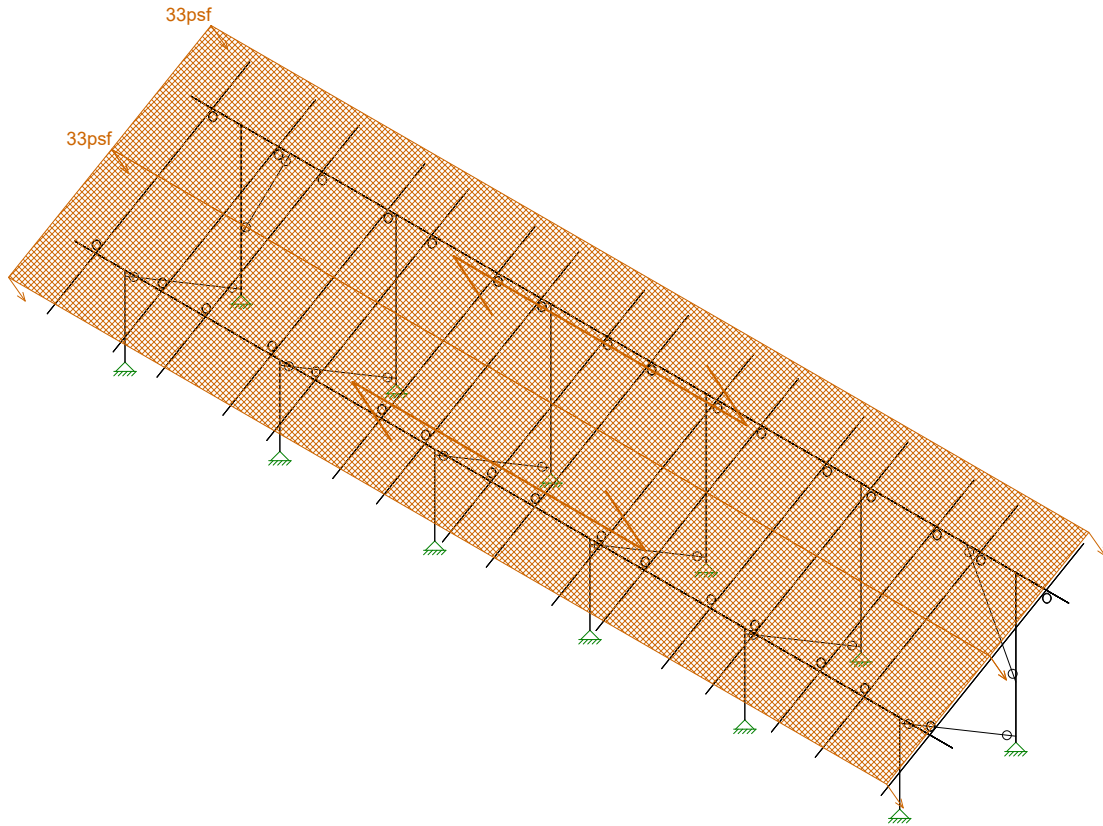
U2716.098.191

Ground Mount

SK - 7

Apr 6, 2021 at 4:19 PM

Sunmodo Sunturf C1 GM v6 85x45...



Loads: BLC 6, Wind A 180 deg

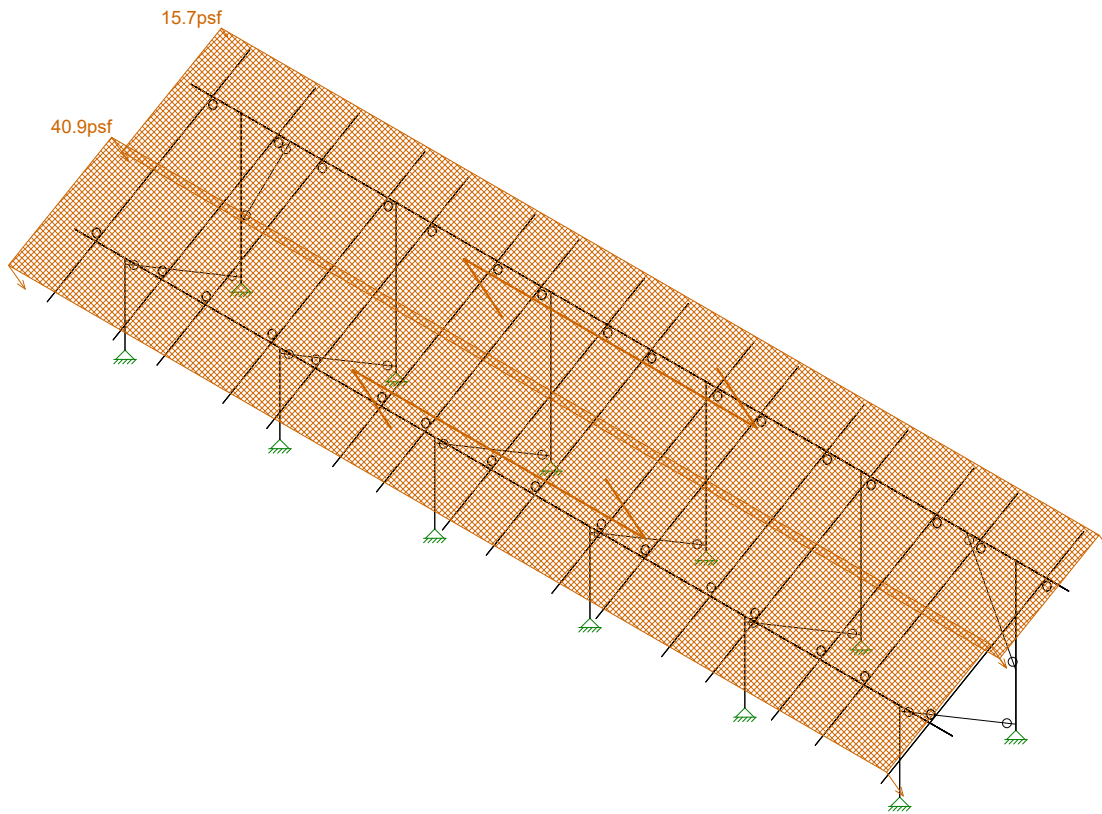
Vector Structural Engineeri...
STB
U2716.098.191

Ground Mount

SK - 8

Apr 6, 2021 at 4:19 PM

Sunmodo Sunturf C1 GM v6 85x45...



Loads: BLC 7, Wind B 180 deg

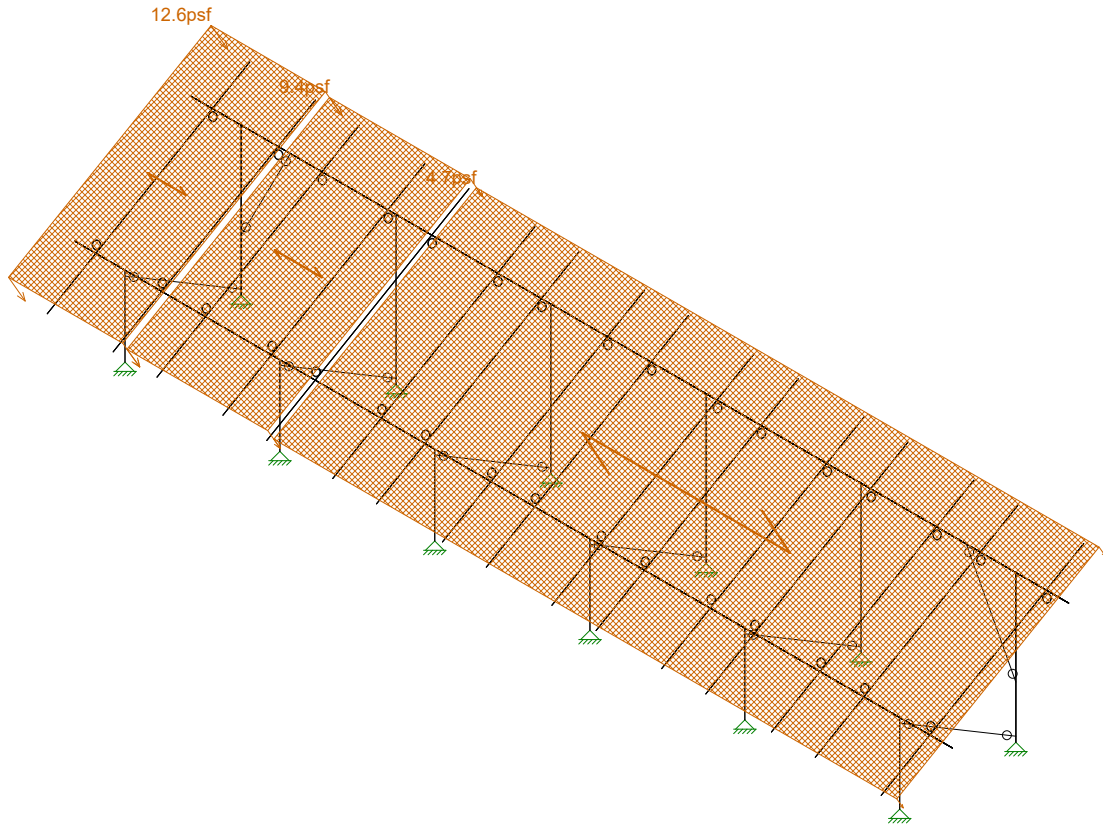
Vector Structural Engineeri...
STB
U2716.098.191

Ground Mount

SK - 9

Apr 6, 2021 at 4:19 PM

Sunmodo Sunturf C1 GM v6 85x45...



Loads: BLC 8, Wind A 90

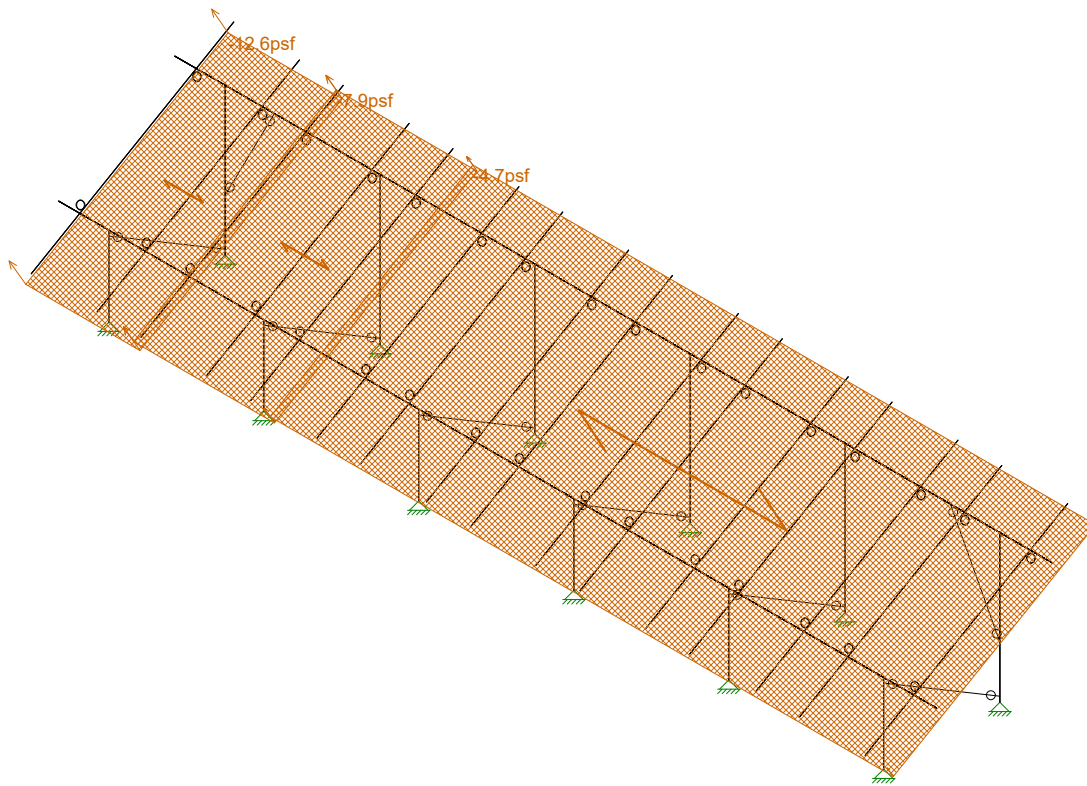
Vector Structural Engineeri...
STB
U2716.098.191

Ground Mount

SK - 10

Apr 6, 2021 at 4:20 PM

Sunmodo Sunturf C1 GM v6 85x45...

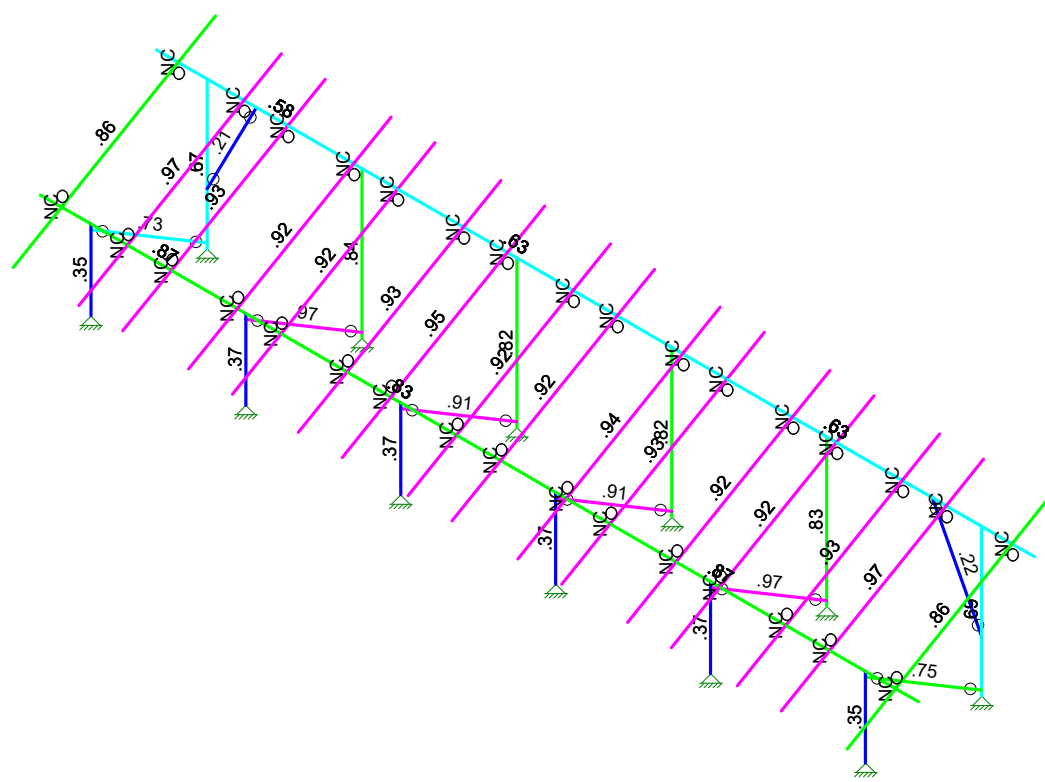


Loads: BLC 9, Wind B 90

Vector Structural Engineeri...	Ground Mount	SK - 11
STB		Apr 6, 2021 at 4:20 PM
U2716.098.191		Sunmodo Sunturf C1 GM v6 85x45...



Code Check (Env)	
Black	No Calc
Red	> 1.0
Magenta	.90-1.0
Green	.75-.90
Cyan	.50-.75
Blue	0-.50



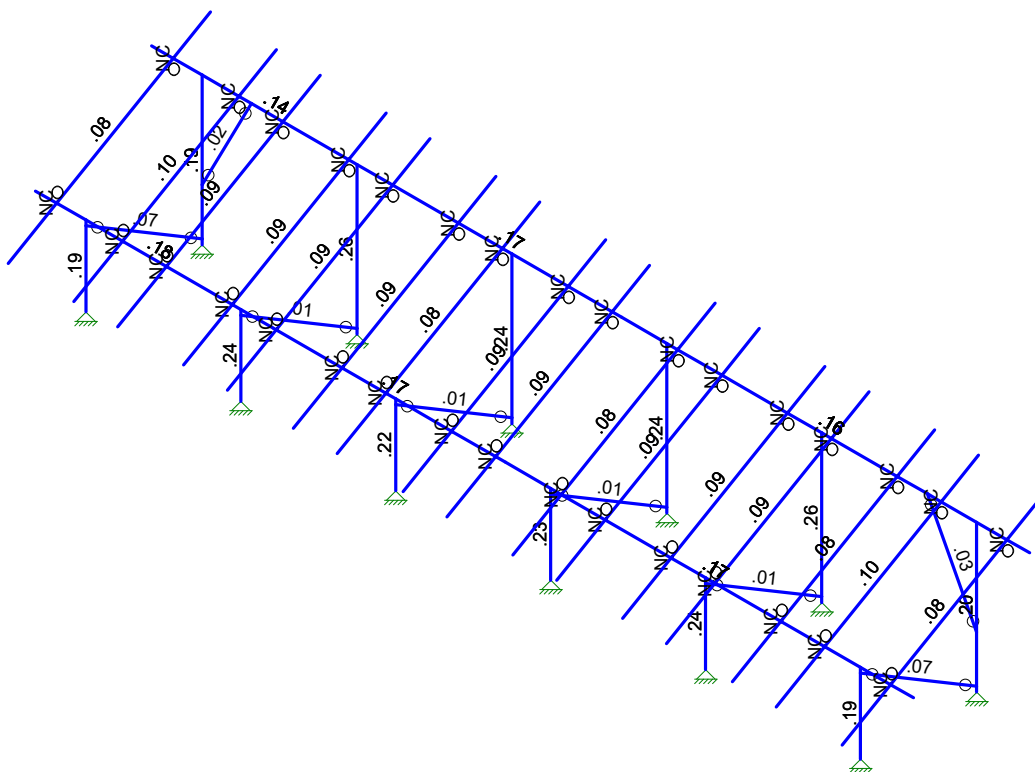
Member Code Checks Displayed (Enveloped)
Envelope Only Solution

Vector Structural Engineeri...	Ground Mount	SK - 1
STB		Apr 6, 2021 at 4:18 PM
U2716.098.191		Sunmodo Sunturf C1 GM v6 85x45...



Shear Check
(Env)

- No Calc
- > 1.0
- .90-1.0
- .75-.90
- .50-.75
- 0-.50



Member Shear Checks Displayed (Enveloped)
Envelope Only Solution

Vector Structural Engineeri...	Ground Mount	SK - 2
STB		Apr 6, 2021 at 4:18 PM
U2716.098.191		Sunmodo Sunturf C1 GM v6 85x45...

(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 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)
RISACONNECTION CODE	AISC 14th(360-10): ASD
Cold Formed Steel Code	AISI S100-16: ASD
Wood Code	AWC NDS-15: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-14
Masonry Code	ACI 530-13: ASD
Aluminum Code	AA ADM1-15: ASD - Building
Stainless Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	Exact Integration
Parame 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



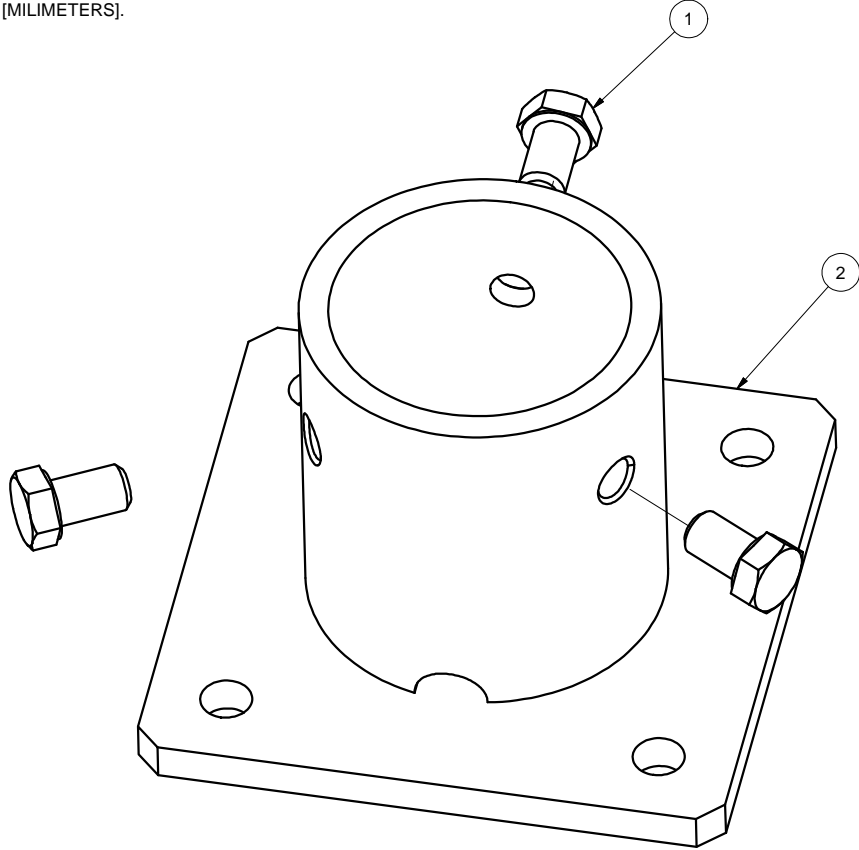
Company : Vector Structural Engineering
 Designer : STB
 Job Number : U2716.098.191
 Model Name : Ground Mount

Apr 6, 2021
 4:20 PM
 Checked By: _____

Envelope AA ADM1-15: ASD - Building Aluminum Code Checks (Continued)

Member	Shape	Code C...	Loc[in]	LC Shear ...	Loc[in]	Dir	LC Pnc/O...	Pnt/Om...	Mny/O...	Mnz/O...	Vny/O...	Vnz/O...	Cb Eqn			
12	M56	HR250_A...	.942	99.943	16	.084	45.257	y	6	2310.833	14089....	309.506	600.514	4940.308	1617.231	1...H.1-1
13	M59	HR250_A...	.934	45.257	6	.085	45.257	y	6	2310.833	14089....	309.506	666.332	4940.308	1617.231	2...H.1-1
14	M62	HR250_A...	.919	43.372	6	.088	45.257	y	6	2409.099	14089....	309.506	687.273	4940.308	1617.231	2...H.1-1
15	M65	HR250_A...	.919	43.372	6	.089	45.257	y	6	2409.099	14089....	309.506	687.273	4940.308	1617.231	2...H.1-1
16	M68B	HR250_A...	.930	45.257	6	.085	45.257	y	6	2310.833	14089....	309.506	666.257	4940.308	1617.231	2...H.1-1
17	M71A	HR250_A...	.970	43.372	6	.100	45.257	y	6	2409.099	14089....	309.506	687.273	4940.308	1617.231	2...H.1-1
18	M74	HR250_A...	.856	43.372	6	.079	45.257	y	5	2409.099	14089....	309.506	687.273	4940.308	1617.231	2...H.1-1

NOTES: UNLESS OTHERWISE SPECIFIED
 1. DIMENSIONS SHOWN ARE INCHES [MILLIMETERS].



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

2	A21120-001	2" PIPE BASE	1
1	B15018-011	HEX CAP SCREW 3/8-16 X 5/8	3
ITEM	PART NUMBER	DESCRIPTION	QTY
MATERIAL		SEE NOTES	
Third Angle Projection:			
GENERAL SPECIFICATIONS		Sunmodo Corp. 1905 E 5TH STREET, STE A, VANCOUVER, WA 98661	
Tolerances		TITLE	
X.XXX ±0.01 [0.25mm]		2" PIPE BASE KIT	
X.XX ±0.02 [0.50mm]		DRAWING NUMBER	
X.X ±0.039 [1.0mm]		B K10268-001	
Unless otherwise spec'd		SCALE: NONE	
DRAWN BY		SHEET 1 of 1	
LWF		DATE	
CHECKED BY		10/20/2016	
APPROVALS			

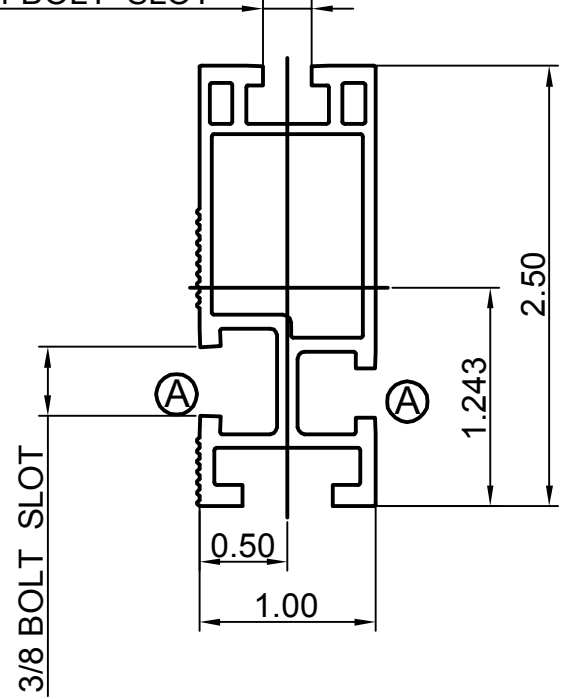
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REVISIONS			
REV	DESCRIPTION	BY	DATE
A	ADDED BOTTOM CHANNEL & CHANGED ONE 3/8 CHANNEL TO 1/4	zcg	02/21/2013

NOTES: UNLESS OTHERWISE SPECIFIED

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

2X 1/4 BOLT SLOT



Section properties:

Weight: 0.850 lbs/ft
 Area: 0.723 in²
 Perimeter: 17.325 in
 Bounding Box: X: -0.500,0.500
 Y: -1.243,1.257

Centroid:(0.000,0.000)
 Moments of Incertia(in⁴): Ix=0.486,Iy=0.095
 Section modulus in bending(in³): Wx=0.387,Wy=0.190
 Radii of Gyration: X: 0.820, Y: 0.363

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

4

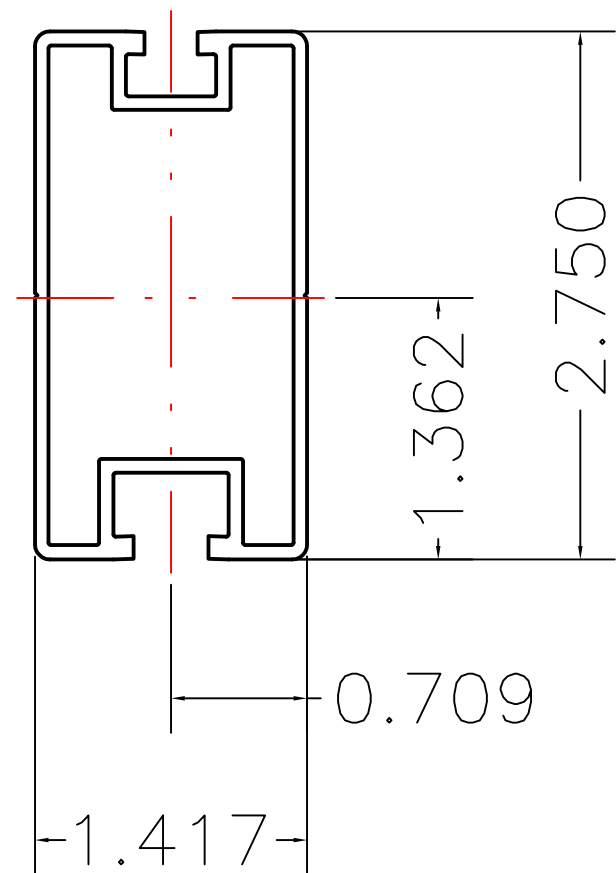
3

2

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 in²
 Perimeter: 19.824 in
 Bounding Box: X: -0.709,0.709
 Y: -1.362,1.388
 Centroid:(0.000,0.000)
 Moments of Inertia(in⁴): I_x=0.727,I_y=0.214
 Section modulus in bending(in³): W_x=0.524,W_y=0.302
 Radii of Gyration: X: 0.994, Y: 0.539

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

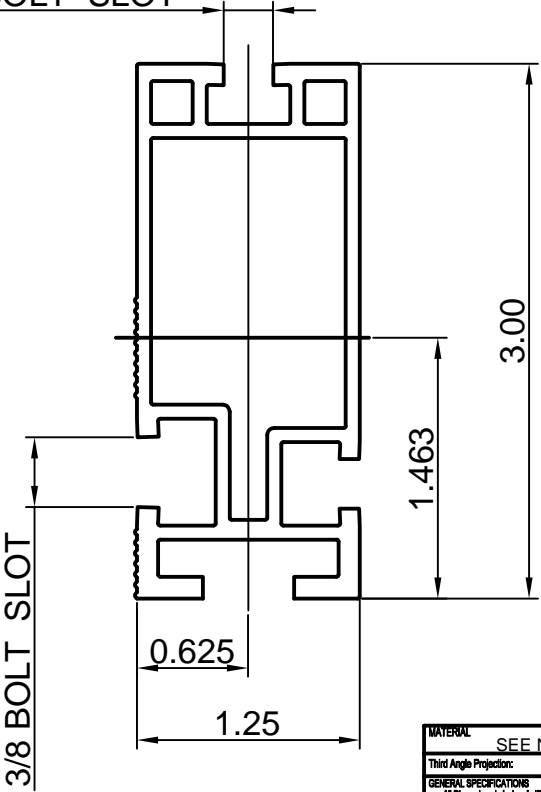
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REV	DESCRIPTON	BY	DATE
A	0.44 WAS 0.41, 0.44 WAS 0.33	LWF	11/30/2015

NOTES: UNLESS OTHERWISE SPECIFIED

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

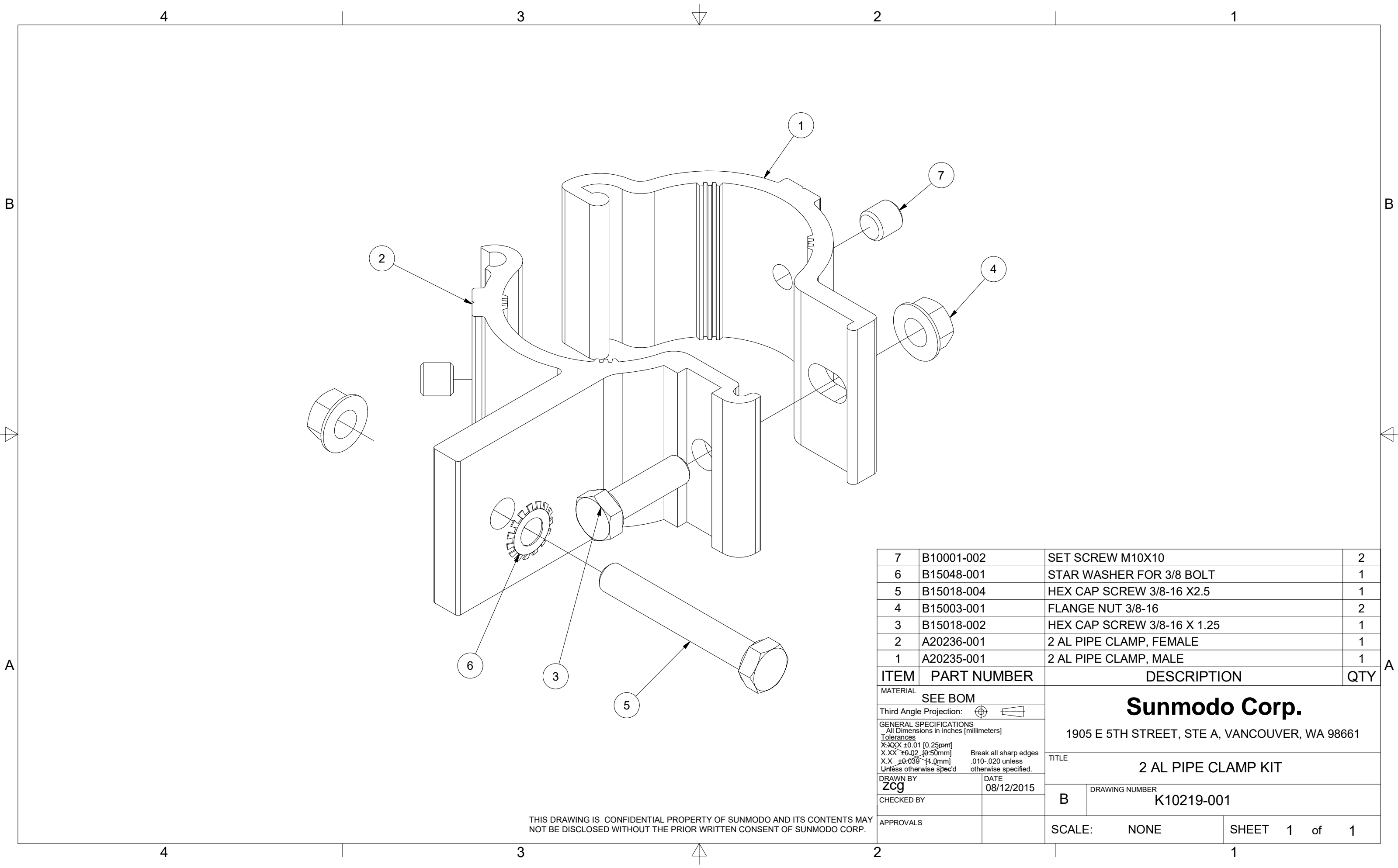
2X 1/4 BOLT SLOT



Section properties:

Weight: 1.151 lbs/ft
 Area: 0.980 in²
 Perimeter: 22.104 in
 Bounding Box: X: -0.625,0.625
 Y: -1.463,1.537
 Centroid:(0.000,0.000)
 Moments of Inertia(in⁴): Ix=1.047,Iy=0.207
 Section modulus in bending(in³): Wx=0.681,Wy=0.331
 Radii of Gyration: X: 1.034, Y: 0.460

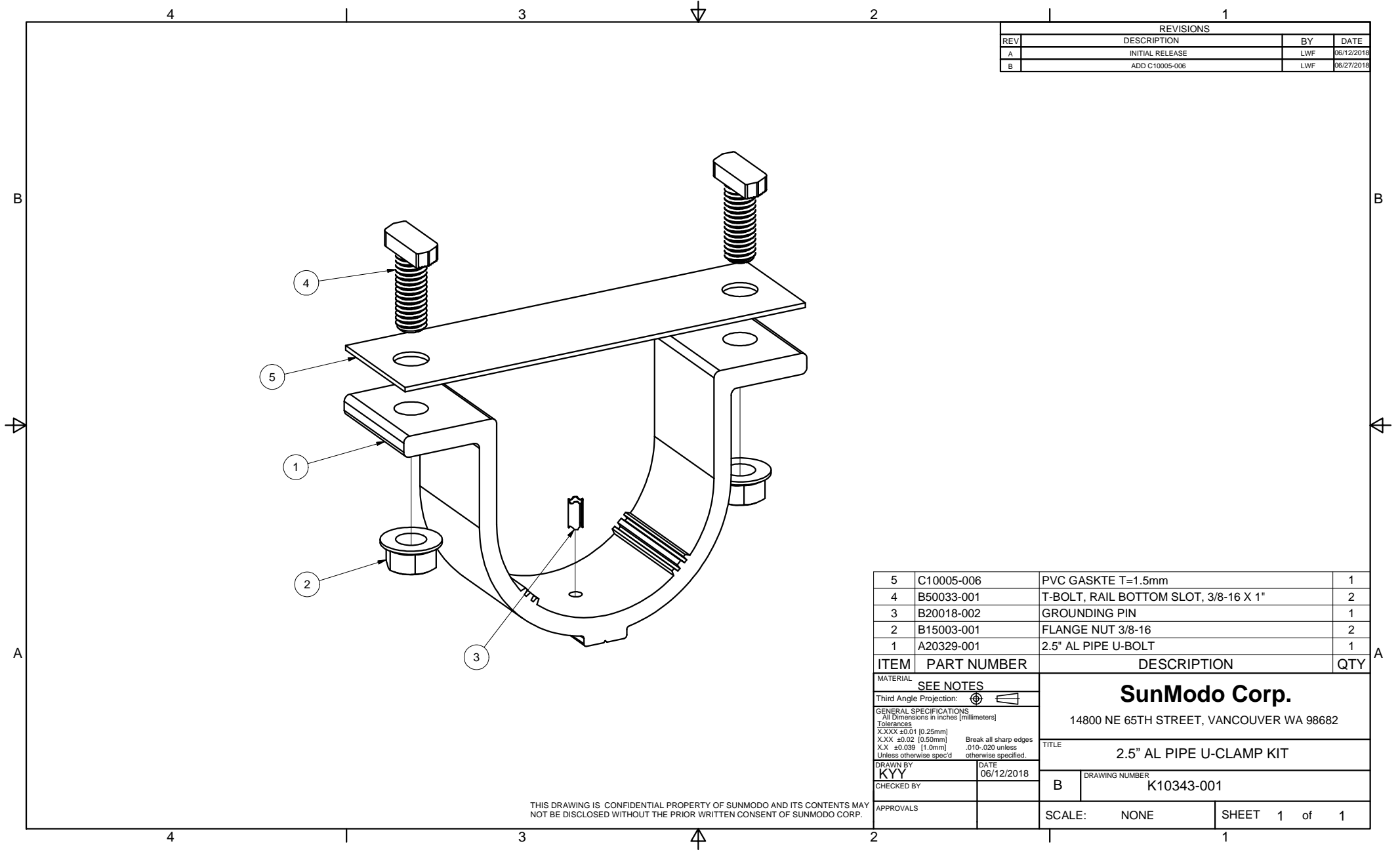
MATERIAL		SEE NOTES	
Third Angle Projection			
GENERAL SPECIFICATIONS			
All Dimensions in Inches (millimeters)			
Tolerances			
XXX ±0.01 (0.25mm)			
XX ±0.02 (0.50mm)			
X ±0.03 (1.0mm)			
Unless otherwise specified.			
Break all sharp edges 0.10-0.25 unless otherwise specified.			
DRAWN BY		DATE	
ZCJ		02/21/2013	
CHECKED BY		DATE	
APPROVALS		DATE	
		TITLE	
		HELIO HEAVY RAIL	
		DRAWING NUMBER	
		A20145	
		SCALE: NONE	
		SHEET 1 of 1	



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

ITEM	PART NUMBER	DESCRIPTION	QTY
MATERIAL		SEE BOM	
Third Angle Projection:			
GENERAL SPECIFICATIONS All Dimensions in inches (millimeters)			
Tolerances			
X.XXX ±0.01 [0.25mm]		Break all sharp edges	
X.XX ±0.02 [0.50mm]		.010-.020 unless	
X.X ±0.039 [1.0mm]		otherwise specified.	
DRAWN BY		DATE	
zcg		08/12/2015	
CHECKED BY		TITLE	
		2 AL PIPE CLAMP KIT	
APPROVALS		DRAWING NUMBER	
		B K10219-001	
SCALE:		NONE	SHEET 1 of 1

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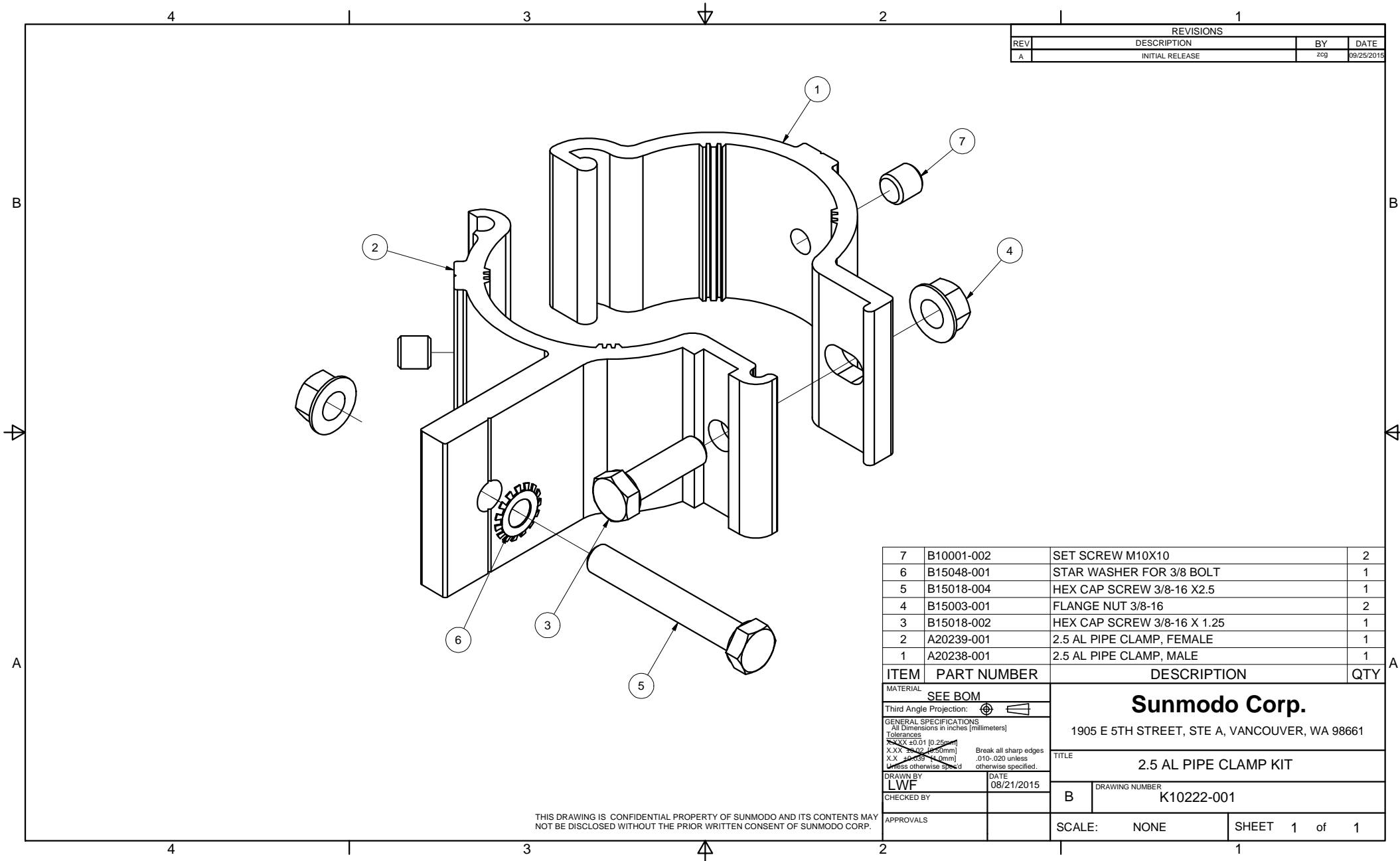


REVISIONS			
REV	DESCRIPTION	BY	DATE
A	INITIAL RELEASE	LWF	06/12/2018
B	ADD C10005-006	LWF	06/27/2018

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		SunModo Corp. 14800 NE 65TH STREET, VANCOUVER WA 98682	
Tolerances		TITLE	
X.XXX ±0.01 [0.25mm] X.XX ±0.02 [0.50mm] X.X ±0.039 [1.0mm] Unless otherwise spec'd		2.5" AL PIPE U-CLAMP KIT	
DRAWN BY	DATE	DRAWING NUMBER	
KYY	06/12/2018	B K10343-001	
CHECKED BY		SCALE: NONE SHEET 1 of 1	
APPROVALS			

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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

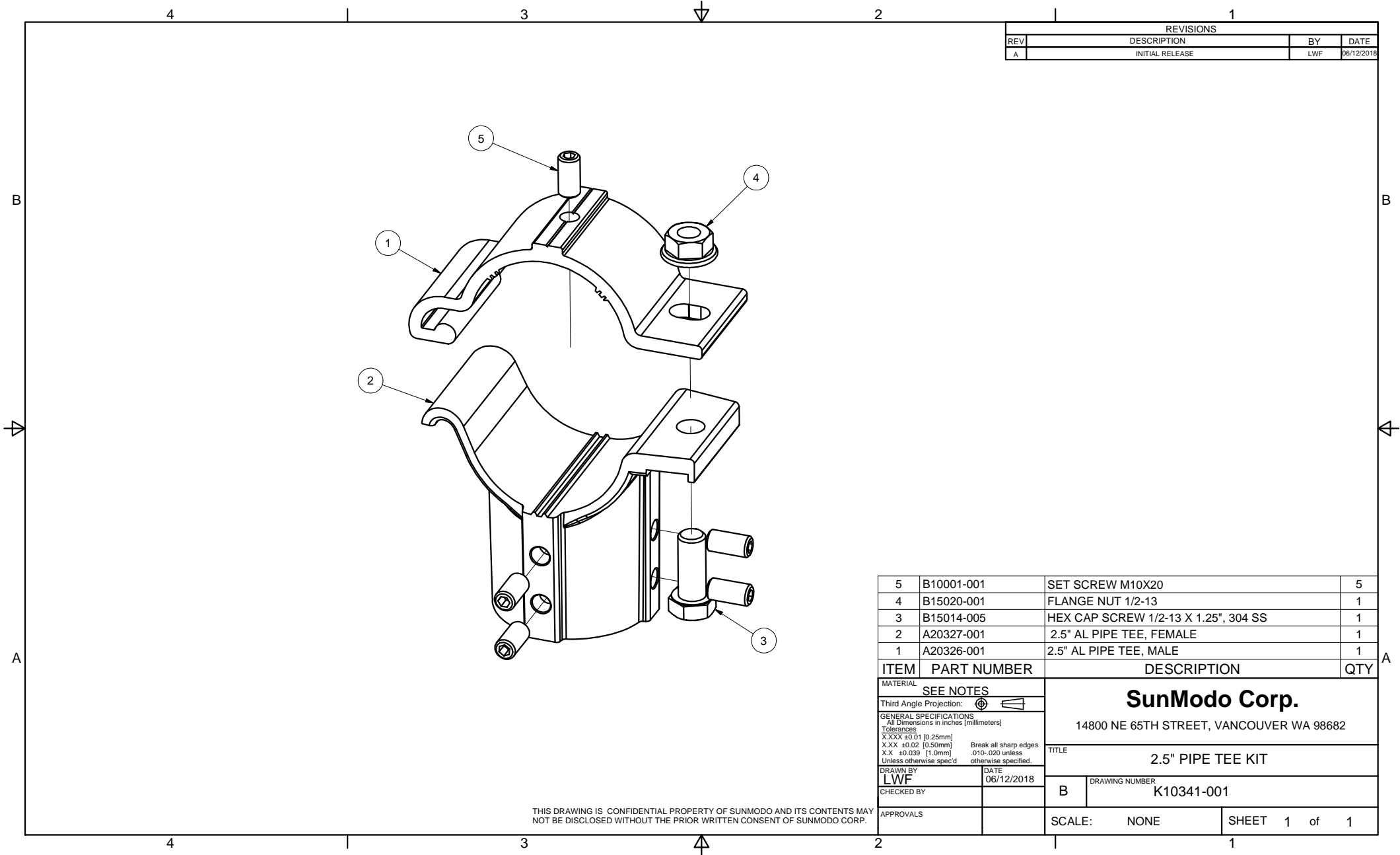
MATERIAL		SEE BOM	
Third Angle Projection:			
GENERAL SPECIFICATIONS All Dimensions in inches [millimeters] Tolerances X.XX ±0.01 [0.25mm] X.XX ±0.02 [0.50mm] X.X ±0.03 [0.75mm] Unless otherwise specified.			
DRAWN BY		DATE	
LWF		08/21/2015	
CHECKED BY		B	
APPROVALS		SCALE: NONE	
		SHEET 1 of 1	

Sunmodo Corp.
 1905 E 5TH STREET, STE A, VANCOUVER, WA 98661

TITLE: **2.5 AL PIPE CLAMP KIT**

DRAWING NUMBER: **K10222-001**

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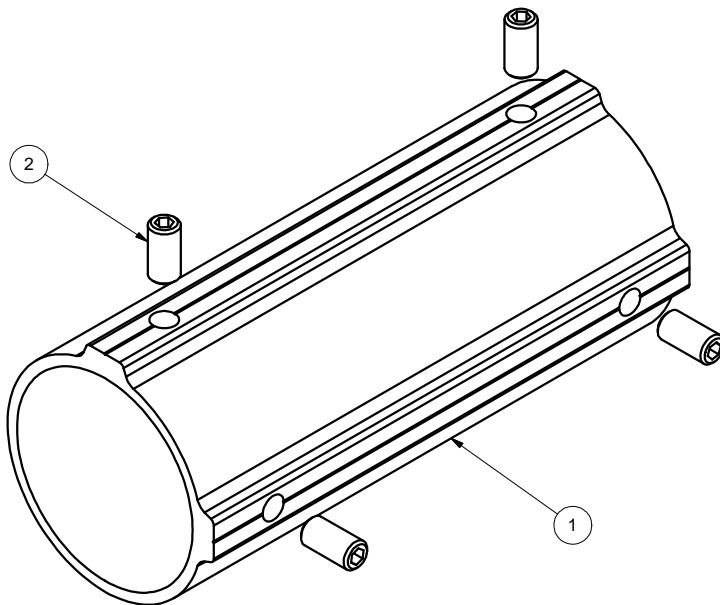
REVISIONS			
REV	DESCRIPTION	BY	DATE
A	INITIAL RELEASE	LWF	06/12/2018

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		SunModo Corp. 14800 NE 65TH STREET, VANCOUVER WA 98682	
Tolerances		TITLE	
X.XXX ±0.01 [0.25mm] X.XX ±0.02 [0.50mm] X.X ±0.039 [1.0mm] Unless otherwise spec'd		2.5" PIPE TEE KIT	
DRAWN BY		DATE	
LWF		06/12/2018	
CHECKED BY		DRAWING NUMBER	
		B K10341-001	
APPROVALS		SCALE: NONE SHEET 1 of 1	

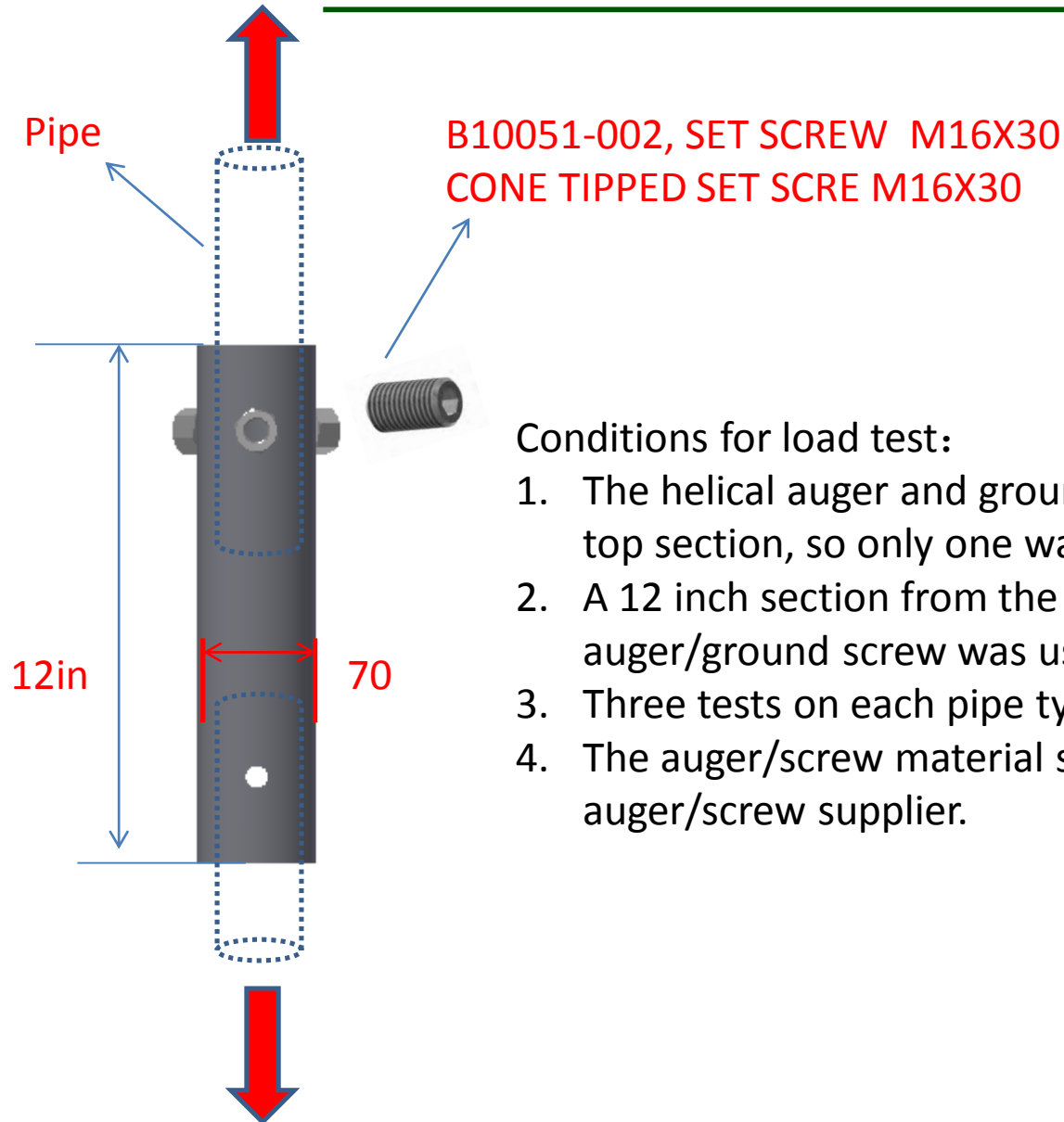
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REVISIONS			
REV	DESCRIPTION	BY	DATE
A	INITIAL RELEASE	LWF	06/12/2018



2	B10001-001	SET SCREW M10X20	4
1	A20328-001	2.5" PIPE SPLICE	1
ITEM	PART NUMBER	DESCRIPTION	QTY
MATERIAL		SEE NOTES	
Third Angle Projection:			
GENERAL SPECIFICATIONS		SunModo Corp. 14800 NE 65TH STREET, VANCOUVER WA 98682	
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		TITLE	
LWF		2.5" PIPE SPLICE KIT	
CHECKED BY		DRAWING NUMBER	
		B K10342-001	
APPROVALS		SCALE: NONE SHEET 1 of 1	

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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.