



Project Number: U2716-0371-231

July 10, 2023

Sunmodo
14800 NE 65th Street
Vancouver, WA 98682

**REFERENCE: Sunmodo Sunturf Ground Mount A14 (Large Format)
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. 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:

- Code: International Building Code, 2021 Edition
- Minimum Design Loads for Buildings and Other Structures (ASCE 7-16)
- Design wind speed for risk category I structures: 175 mph
- Wind exposure: C
- Ground snow load: 60 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	2480	1.5	3720
LATERAL	1929	2	3858

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,

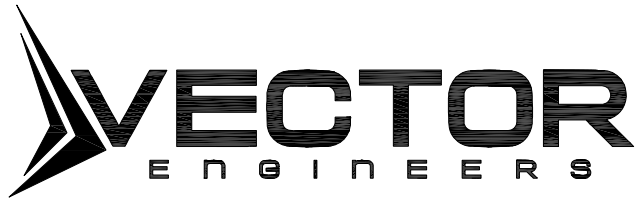
VECTOR STRUCTURAL ENGINEERING, LLC
CO Firm License: 20181009799

Eric Sumsion, P.E.
License: 56167 - Expires: 10/31/2023
Project Engineer

Enclosures

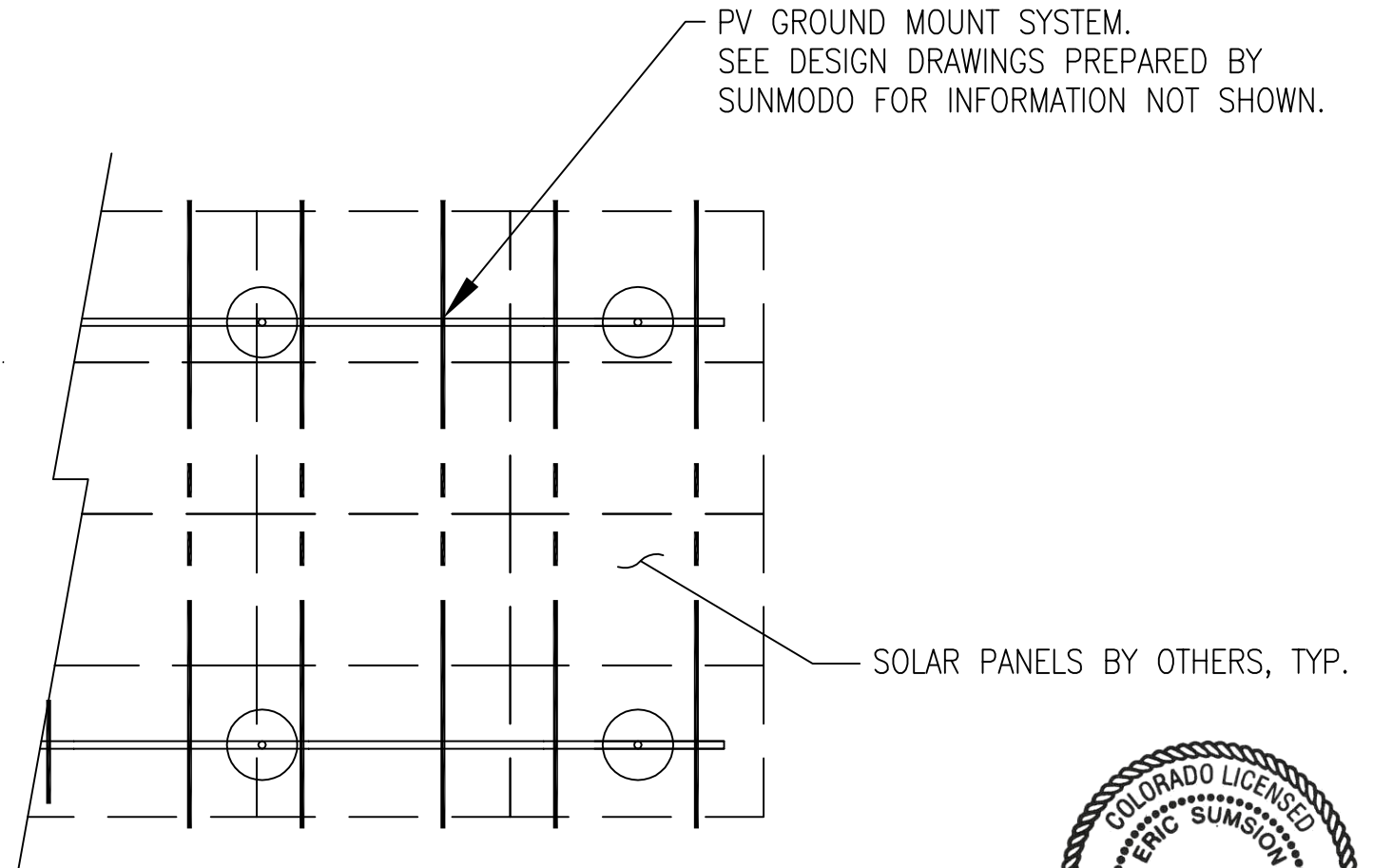
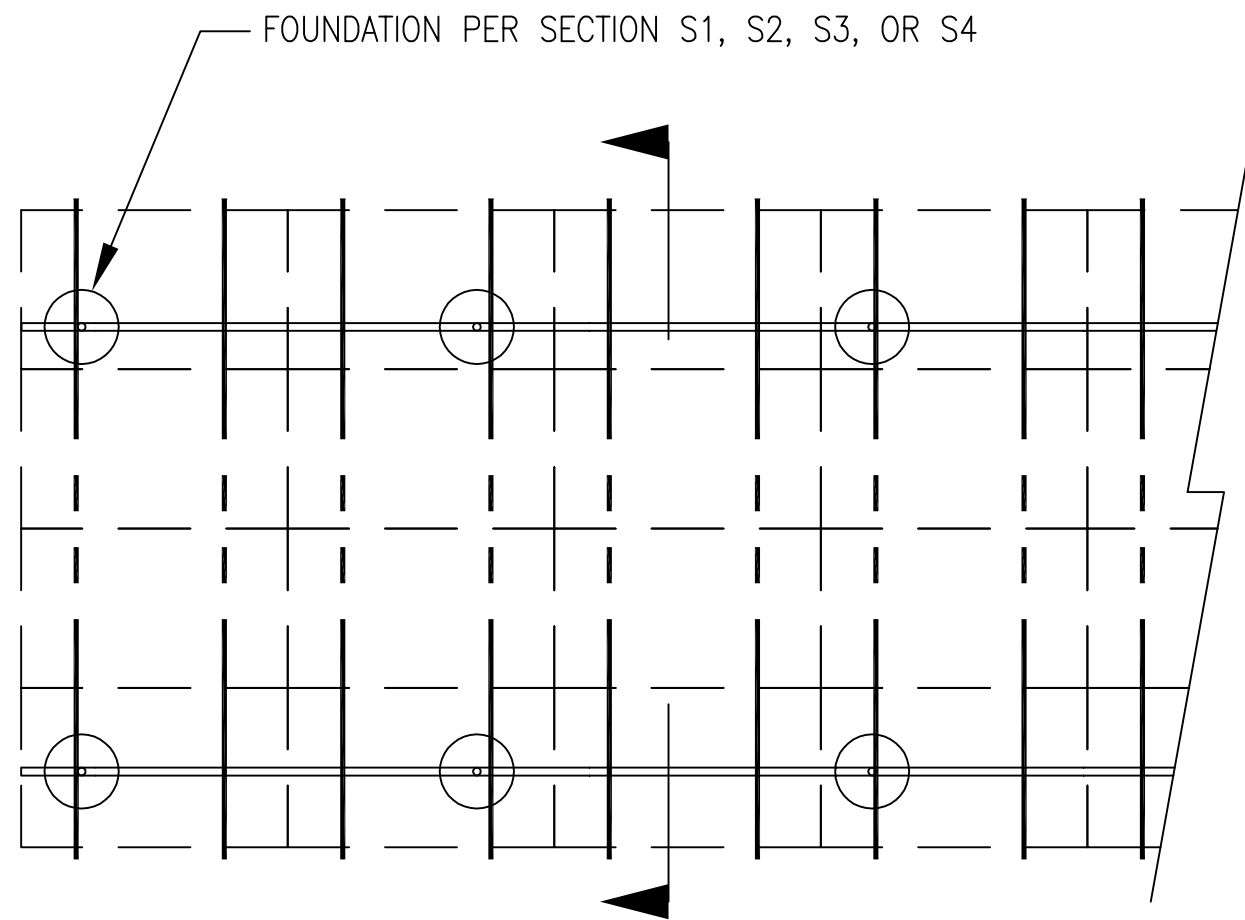
ESS/cjt





JOB NO. U2716-0371-231
PROJECT SUNMODO SUNTURF GROUND MOUNTS A14
SUBJECT ALL OPTIONS

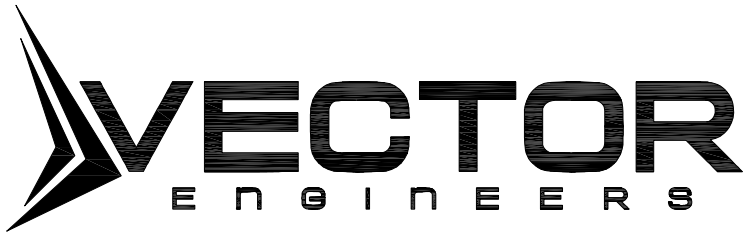
651 W GALENA PARK BLVD. #101 (801) 990-1775
DRAPER, UTAH 84020 (801) 990-1776 FAX



PV ARRAY PLAN

N.T.S.

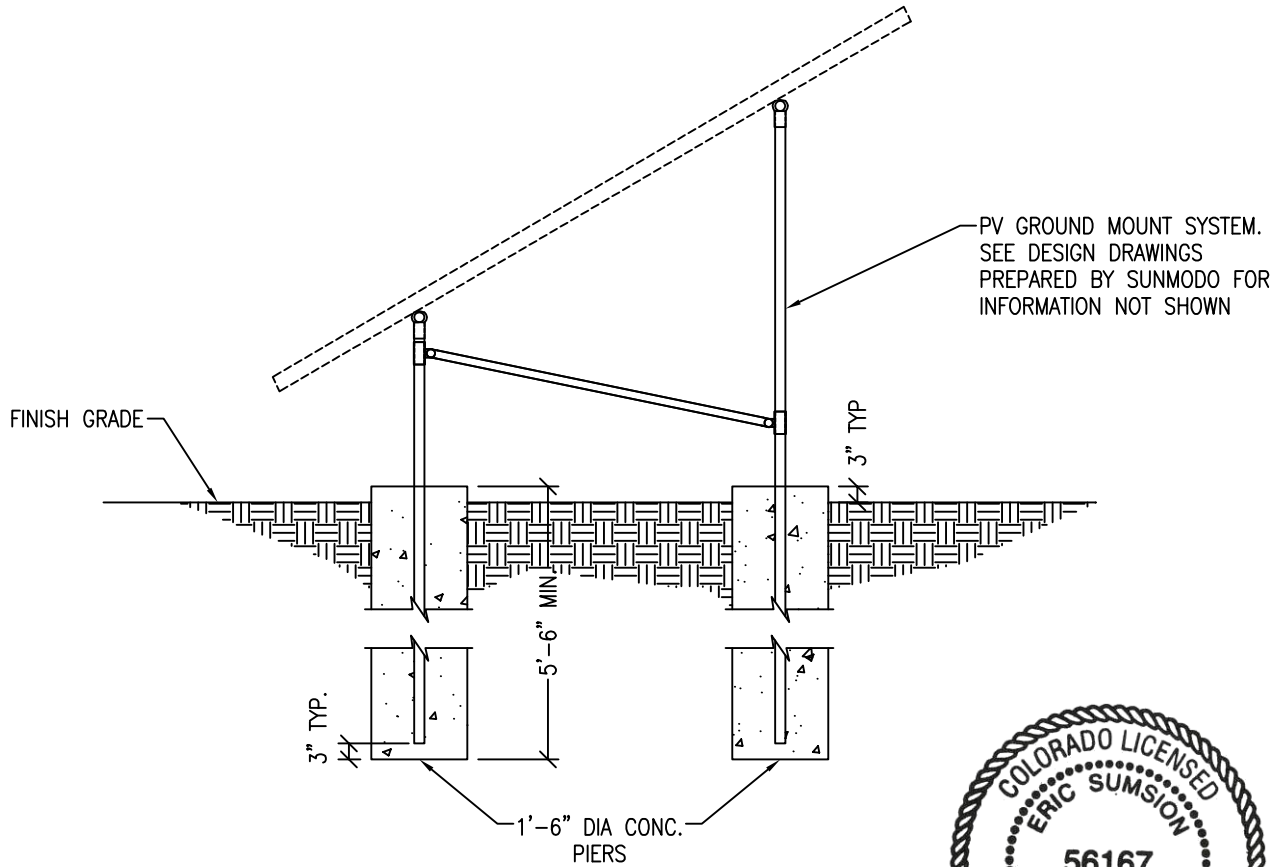
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JOB NO. U2716-0371-231

PROJECT SUNMODO SUNTURF GROUND MOUNTS A14

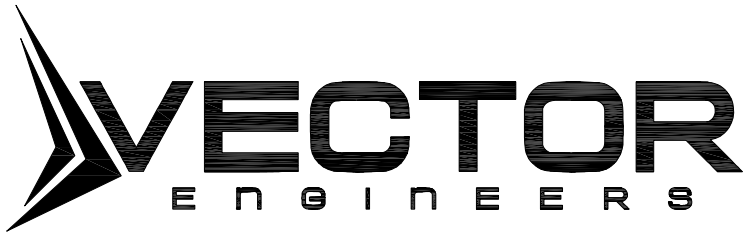
SUBJECT DRILLED PIER OPTION



PV ARRAY SECTION

N.T.S.

S1



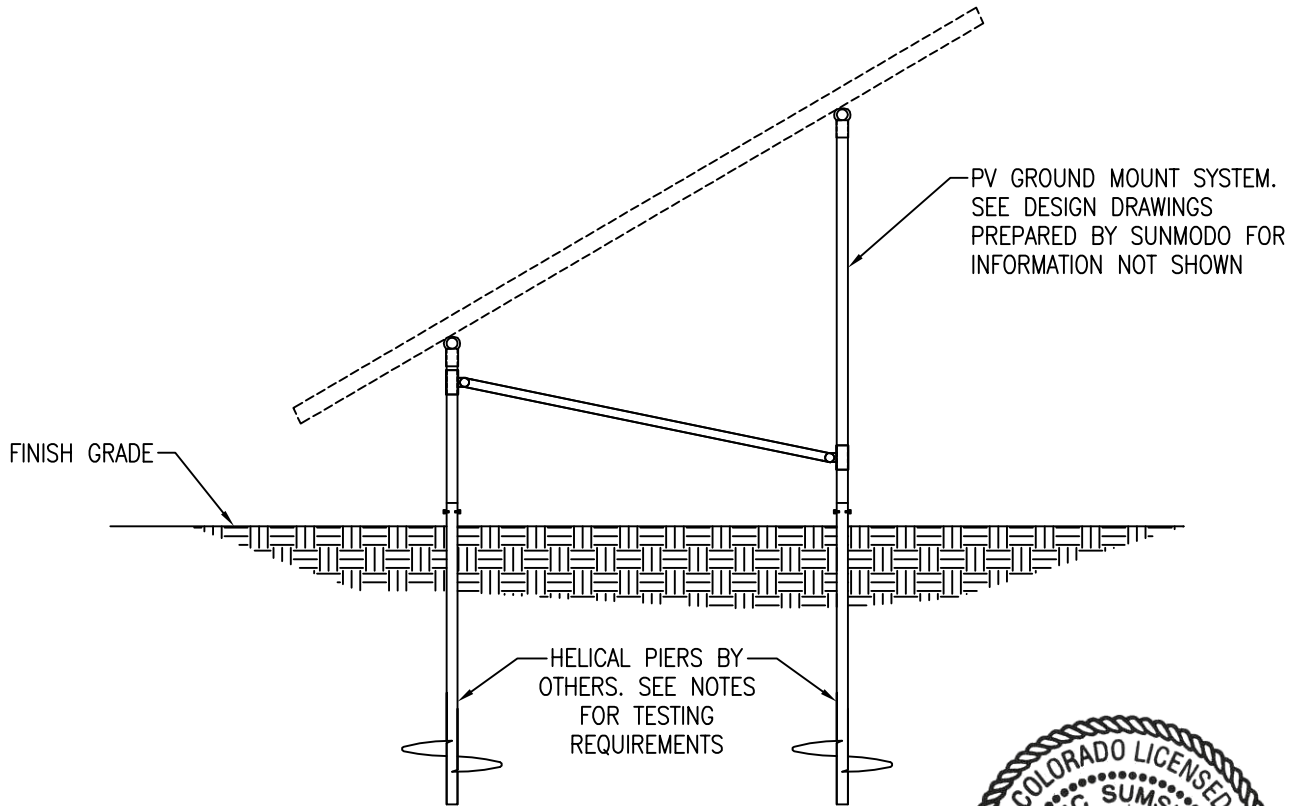
JOB NO. U2716-0371-231

PROJECT SUNMODO SUNTURF GROUND MOUNTS A14

SUBJECT HELICAL PIER OPTION

NOTES:

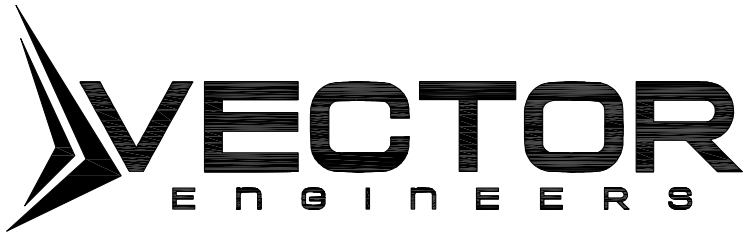
1. A minimum of (1) installed helical pier must be tested as follows:
 - 1.1. See cover page of this letter for test load values
 - 1.2. Safety factor for uplift to be 1.5
 - 1.3. Deflection limit for uplift load testing shall be 1/2"
 - 1.4. Safety factor for lateral loads to be 2.0
 - 1.5. Deflection limit for lateral load testing shall be 1"
 - 1.6. The load tests must be performed by an approved contractor



PV ARRAY SECTION

N.T.S.

S2



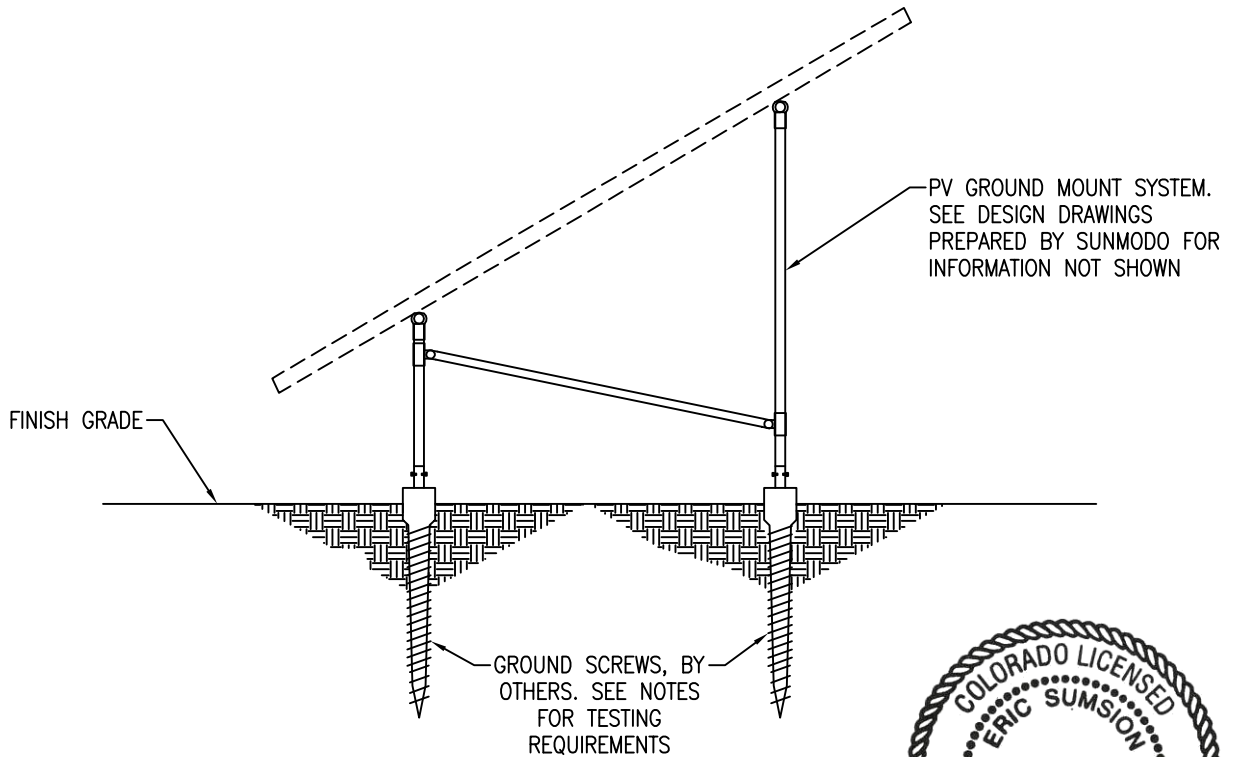
JOB NO. U2716-0371-231

PROJECT SUNMODO SUNTURF GROUND MOUNTS A14

SUBJECT GROUND SCREW OPTION

NOTES:

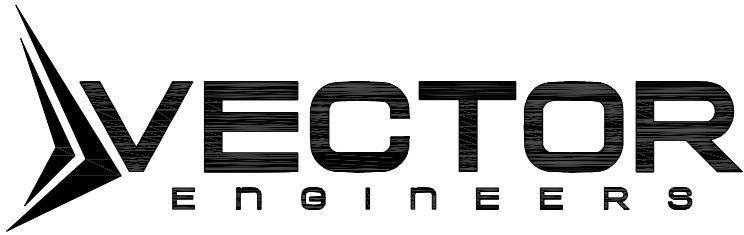
1. A minimum of (1) installed ground screw must be tested as follows:
 - 1.1. See cover page of this letter for test load values
 - 1.2. Safety factor for uplift to be 1.5
 - 1.3. Deflection limit for uplift load testing shall be 1/2"
 - 1.4. Safety factor for lateral loads to be 2.0
 - 1.5. Deflection limit for lateral load testing shall be 1"
 - 1.6. The load tests must be performed by an approved contractor



PV ARRAY SECTION

N.T.S.

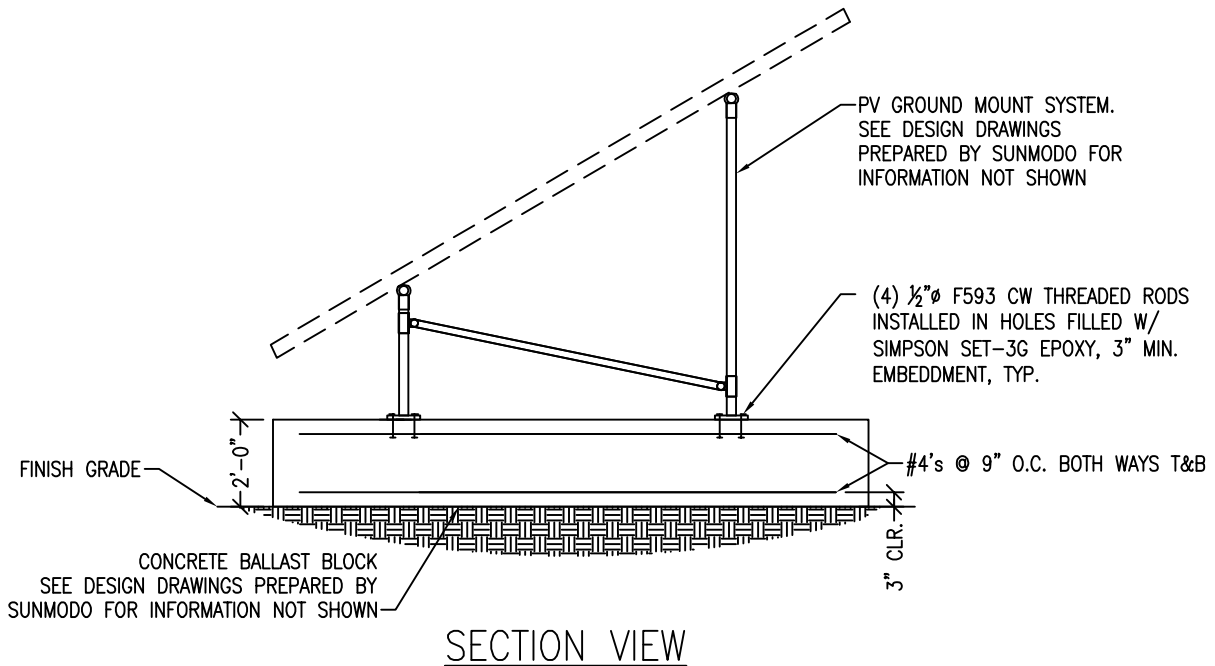
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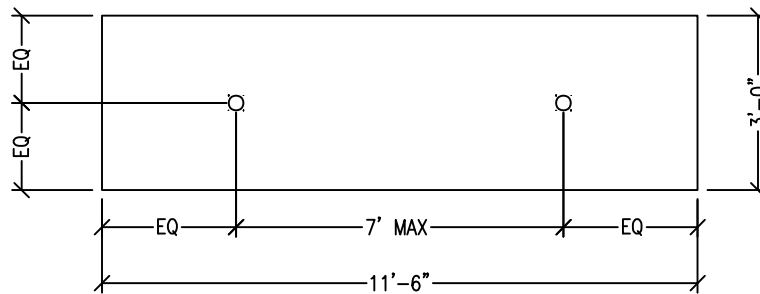
JOB NO. U2716-0371-231

PROJECT SUNMODO SUNTURF GROUND MOUNTS A14

SUBJECT BALLASTED BLOCK OPTION



SECTION VIEW



PLAN VIEW



PV ARRAY SECTION

N.T.S.

S4



JOB NO.: U2716.0371.231

PROJECT: Sunturf Package A14 Ground Mount

DESIGN LOADS



PROJECT: Sunturf Package A14 Ground Mount

SNOW LOADS

Calculations Per:	ASCE 7-16	
Snow Ground Load, p_g [psf]:	60.0	(Section 7.2)
Risk Category:	I	(Table 1.5-1)
Importance Factor, I_s :	0.8	(Table 1.5-2)
Terrain Category:	C	(Section 26.7)
Exposure of Roof:	Fully Exposed	(Table 7-3.1)
Exposure Factor, C_e :	0.9	(Table 7-3.1)
Thermal Factor, C_t :	1.2	(Table 7-3.2)
Flat Roof Snow Load, p_f [psf]:	36	(Equation 7.3-1)
Min. Roof Snow Load, p_m [psf]:	48	(Section 7.3.4)
Panel Slope from Horizontal [°]:	20.0	
Unobstructed Slippery Surface?	Yes	(Section 7.4)
Slope Factor Figure:	Figure 7-2c	(of Figure 7.4-1 - See Section 7.4)
Roof Slope Factor, C_s :	0.91	
Sloped Roof Snow Load, p_s [psf]:	33	(Equation 7.4-1)
Array Width [ft]	14.4	
Required Leading Edge Height [ft]	3.4	
Leading Edge Height [ft]	3.4	
Design Snow Load, S [psf]:	33	(1.0 Snow)



PROJECT: Sunturf Package A14 Ground Mount

WIND PRESSURES

Calculations per:	ASCE 7-16	
Design Wind Speed, V [mph]:	175	
Risk Category:	I	(Table 1.5-1)
Exposure Category:	C	(Section 26.7)
Elevation [ft]:	9192.7	
Ground Elevation Factor, K_e :	0.72	(Table 26.9-1)
α :	9.5	(Table 26.11-1)
z_g [ft]:	900	(Table 26.11-1)
Velocity Pressure Exposure Coefficient, K_h :	0.85	(Table 26.10-1)
Topographic Factor, K_{ht} :	1.0	(Section 26.8)
Wind Directionality Factor, K_d :	0.85	(Table 26.6-1)
Internal Pressure Coefficient, GC_{pi} :	0.00	(Figure 26.13-1)
Velocity Pressure, q_h [psf]:	40.56	(Equation 26.10-1)
Gust Effect Factor, G:	0.85	(Section 26.11.4)
Panel Slope [degrees]:	20.0	
Wind Flow:	Clear	
Roof Configuration:	Monoslope	

Wind Pressures in Transverse (N-S) Direction

Net Pressure Coefficients per Figure 27.3-4

Clear Wind Flow	C_{NW}	C_{NL}
Case 1 ($\gamma = 0^\circ$, Load Case A)	-1.3	-1.5
Case 2 ($\gamma = 0^\circ$, Load Case B)	-2.2	-0.2
Case 3 ($\gamma = 180^\circ$, Load Case A)	1.6	1.7
Case 4 ($\gamma = 180^\circ$, Load Case B)	2.1	0.7

Design Wind Pressures per Equation 27.3-2 [psf]

Clear Wind Flow	$q_h GC_{NW}$	$q_h GC_{NL}$
Case 1 ($\gamma = 0^\circ$, Load Case A)	-44.8	-51.7
Case 2 ($\gamma = 0^\circ$, Load Case B)	-75.8	-6.9
Case 3 ($\gamma = 180^\circ$, Load Case A)	55.2	58.6
Case 4 ($\gamma = 180^\circ$, Load Case B)	72.4	24.1
Case 5 ($\gamma = 0^\circ$, 16 psf Min. Horiz.)	-16.0	-16.0
Case 6 ($\gamma = 180^\circ$, 16 psf Min. Horiz.)	16.0	16.0



PROJECT: Sunturf Package A14 Ground Mount

SNOW LOADS

Calculations Per:	ASCE 7-16	
Snow Ground Load, p_g [psf]:	60.0	(Section 7.2)
Risk Category:	I	(Table 1.5-1)
Importance Factor, I_s :	0.8	(Table 1.5-2)
Terrain Category:	C	(Section 26.7)
Exposure of Roof:	Fully Exposed	(Table 7-3.1)
Exposure Factor, C_e :	0.9	(Table 7-3.1)
Thermal Factor, C_t :	1.2	(Table 7-3.2)
Flat Roof Snow Load, p_f [psf]:	36	(Equation 7.3-1)
Min. Roof Snow Load, p_m [psf]:	48	(Section 7.3.4)
Panel Slope from Horizontal [°]:	35.0	
Unobstructed Slippery Surface?	Yes	(Section 7.4)
Slope Factor Figure:	Figure 7-2c	(of Figure 7.4-1 - See Section 7.4)
Roof Slope Factor, C_s :	0.64	
Sloped Roof Snow Load, p_s [psf]:	23	(Equation 7.4-1)
Array Width [ft]	12.6	
Required Leading Edge Height [ft]	3.3	
Leading Edge Height [ft]	3.4	
Design Snow Load, S [psf]:	23	(1.0 Snow)



PROJECT: Sunturf Package A14 Ground Mount

WIND PRESSURES

Calculations per:	ASCE 7-16	
Design Wind Speed, V [mph]:	175	
Risk Category:	I	(Table 1.5-1)
Exposure Category:	C	(Section 26.7)
Elevation [ft]:	9192.7	
Ground Elevation Factor, K_e :	0.72	(Table 26.9-1)
α :	9.5	(Table 26.11-1)
z_g [ft]:	900	(Table 26.11-1)
Velocity Pressure Exposure Coefficient, K_h :	0.85	(Table 26.10-1)
Topographic Factor, K_{ht} :	1.0	(Section 26.8)
Wind Directionality Factor, K_d :	0.85	(Table 26.6-1)
Internal Pressure Coefficient, GC_{pi} :	0.00	(Figure 26.13-1)
Velocity Pressure, q_h [psf]:	40.56	(Equation 26.10-1)
Gust Effect Factor, G:	0.85	(Section 26.11.4)
Panel Slope [degrees]:	35.0	
Wind Flow:	Clear	
Roof Configuration:	Monoslope	

Wind Pressures in Transverse (N-S) Direction

Net Pressure Coefficients per Figure 27.3-4

Clear Wind Flow	C_{NW}	C_{NL}
Case 1 ($\gamma = 0^\circ$, Load Case A)	-1.8	-1.8
Case 2 ($\gamma = 0^\circ$, Load Case B)	-2.4	-0.6
Case 3 ($\gamma = 180^\circ$, Load Case A)	2.1	2.1
Case 4 ($\gamma = 180^\circ$, Load Case B)	2.7	1.1

Design Wind Pressures per Equation 27.3-2 [psf]

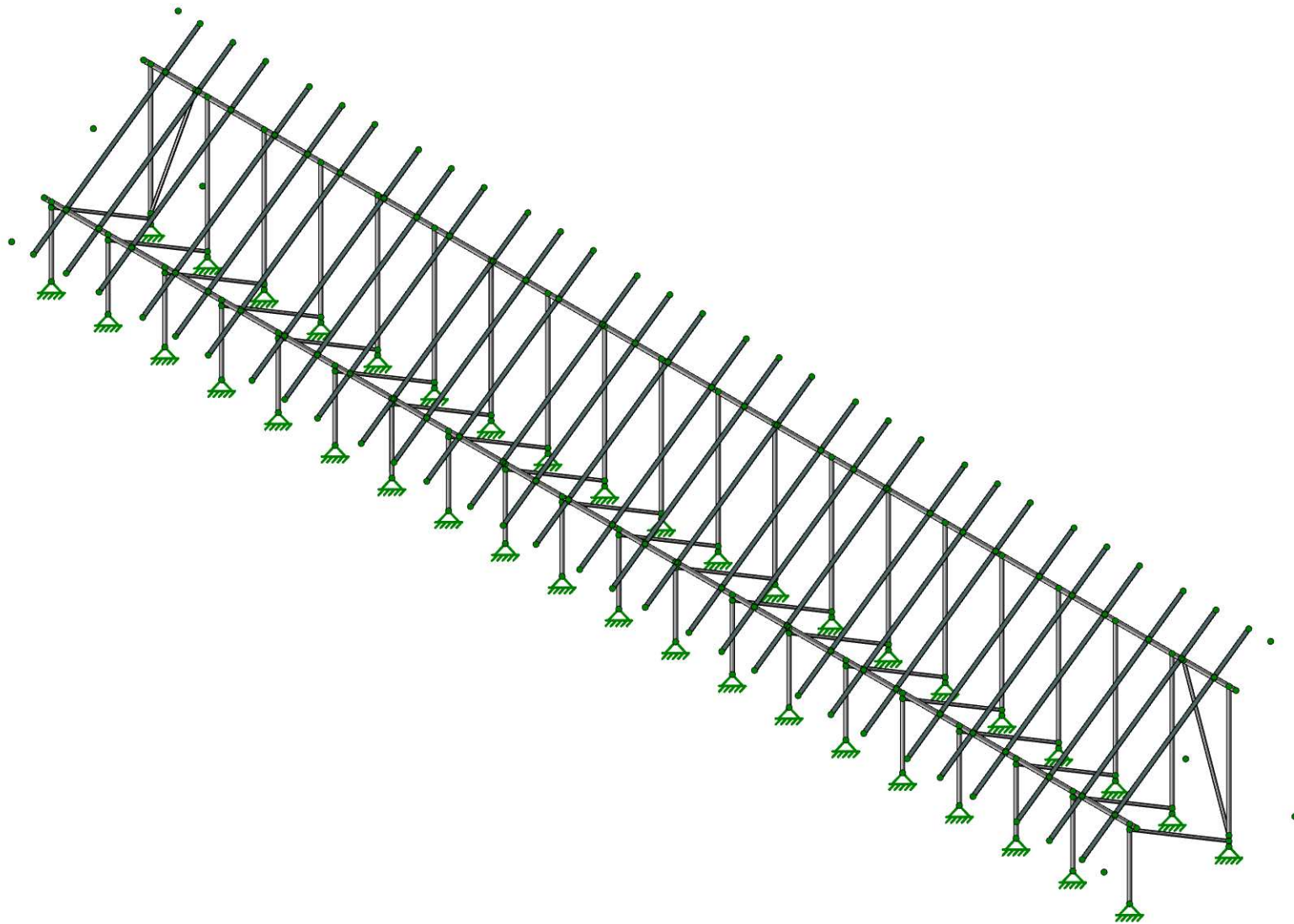
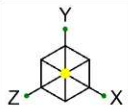
Clear Wind Flow	$q_h GC_{NW}$	$q_h GC_{NL}$
Case 1 ($\gamma = 0^\circ$, Load Case A)	-62.1	-62.1
Case 2 ($\gamma = 0^\circ$, Load Case B)	-82.7	-20.7
Case 3 ($\gamma = 180^\circ$, Load Case A)	72.4	72.4
Case 4 ($\gamma = 180^\circ$, Load Case B)	93.1	37.9
Case 5 ($\gamma = 0^\circ$, 16 psf Min. Horiz.)	-16.0	-16.0
Case 6 ($\gamma = 180^\circ$, 16 psf Min. Horiz.)	16.0	16.0



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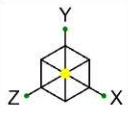
RACKING ANALYSIS



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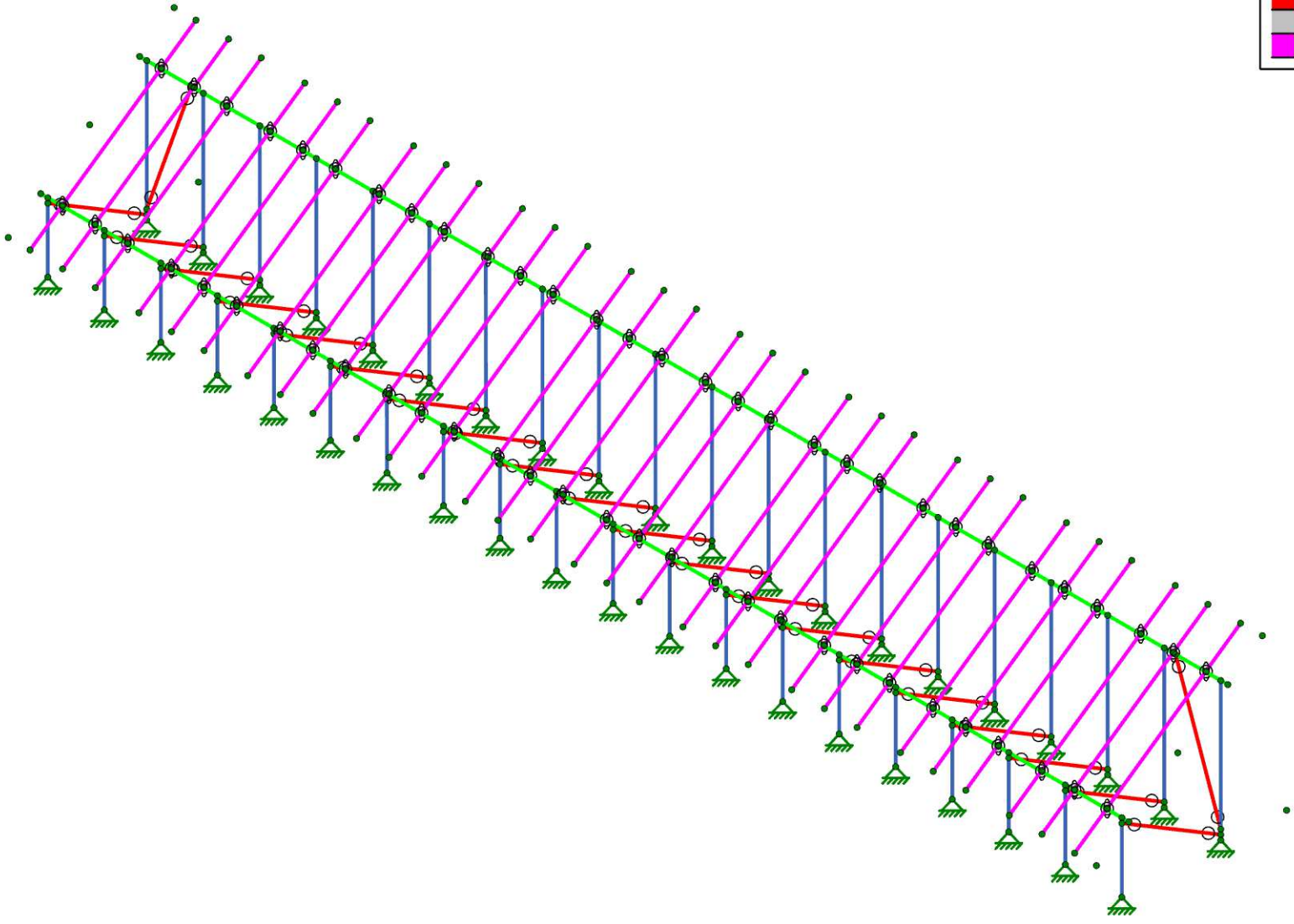
A14 Large Format Panels - 35 Degree Tilt - 4L

SK-1
Jun 20, 2023
Sunturf A14 - LF - 35deg - 4L.r3d



Section Sets

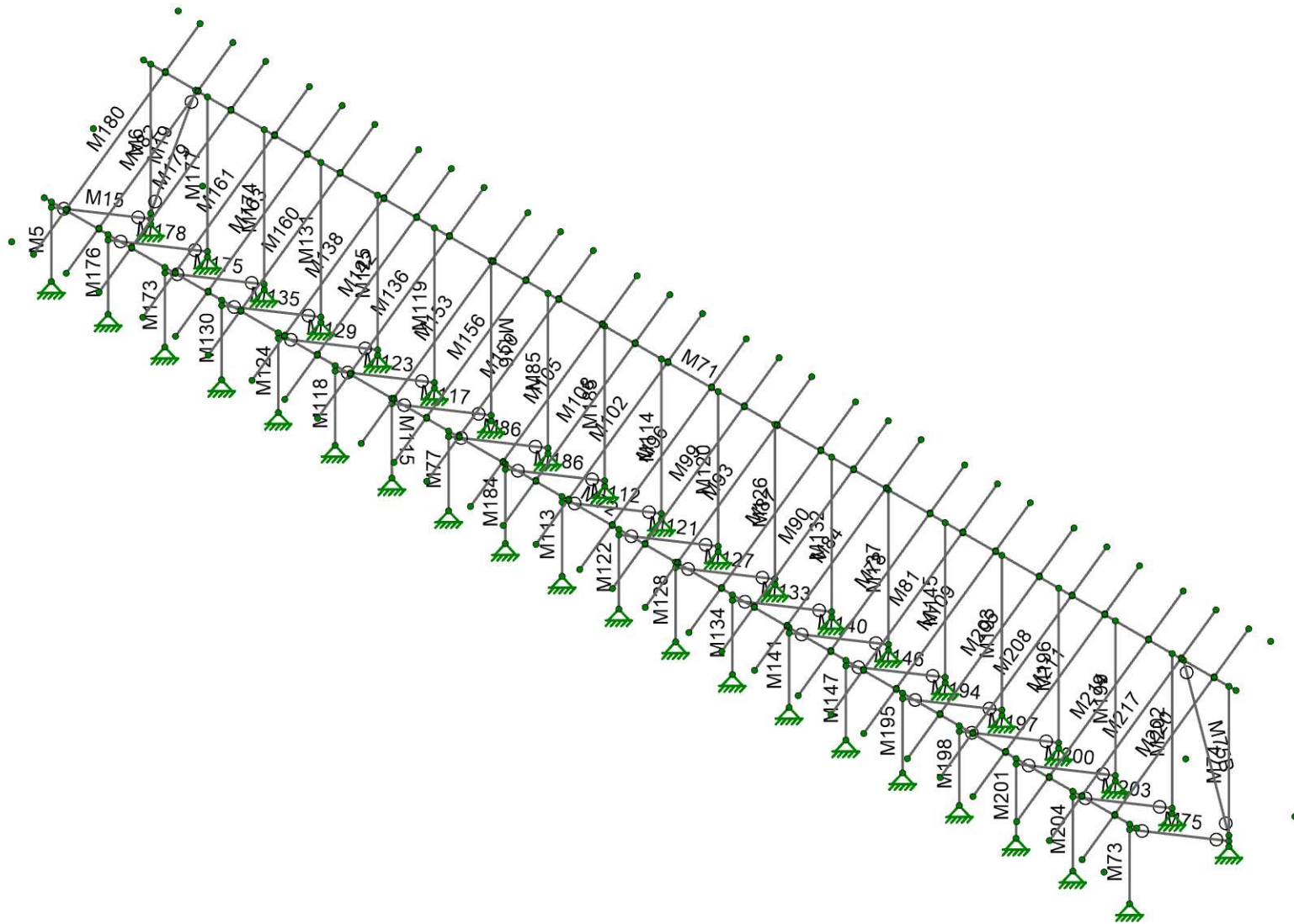
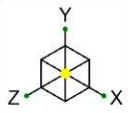
- Post
- Cross Beam
- Diagonal Brace
- RIGID
- AL Rails



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A14 Large Format Panels - 35 Degree Tilt - 4L

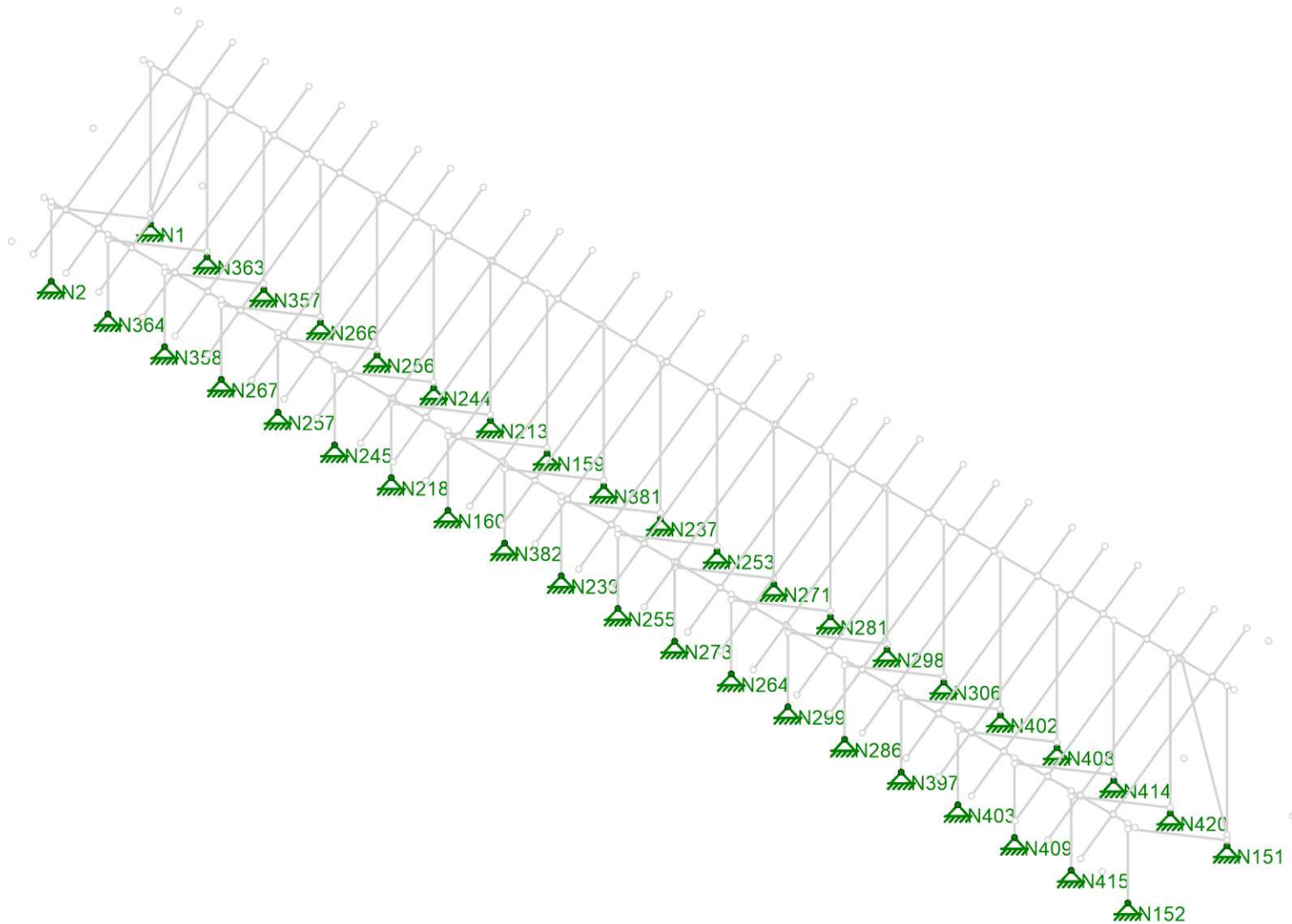
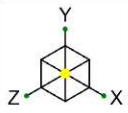
SK-2
Jun 20, 2023
Sunturf A14 - LF - 35deg - 4L.r3d



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A14 Large Format Panels - 35 Degree Tilt - 4L

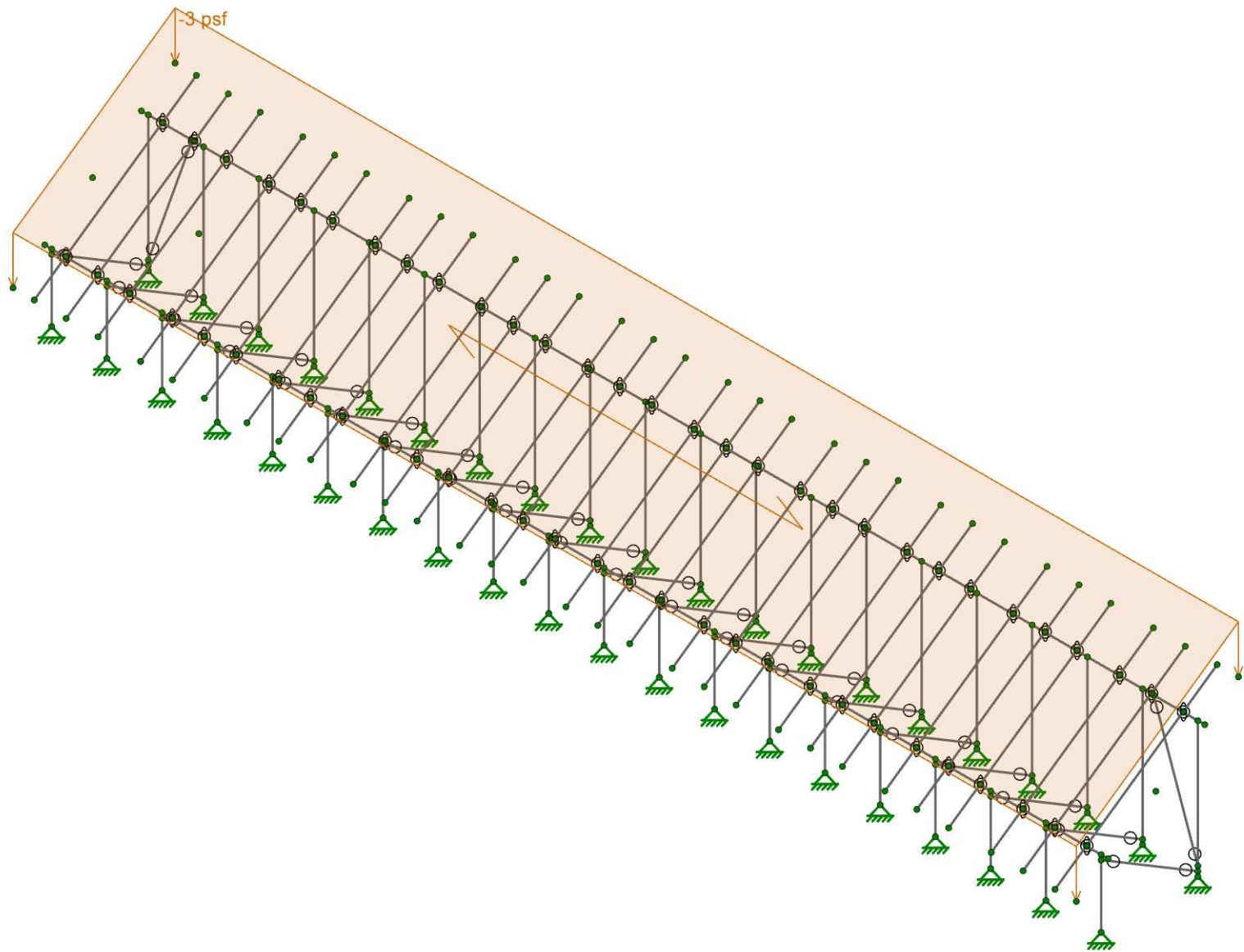
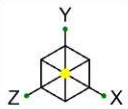
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 Sunturf A14 - LF - 35deg - 4L.r3d



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A14 Large Format Panels - 35 Degree Tilt - 4L

SK-4
 Jun 20, 2023
 Sunturf A14 - LF - 35deg - 4L.r3d



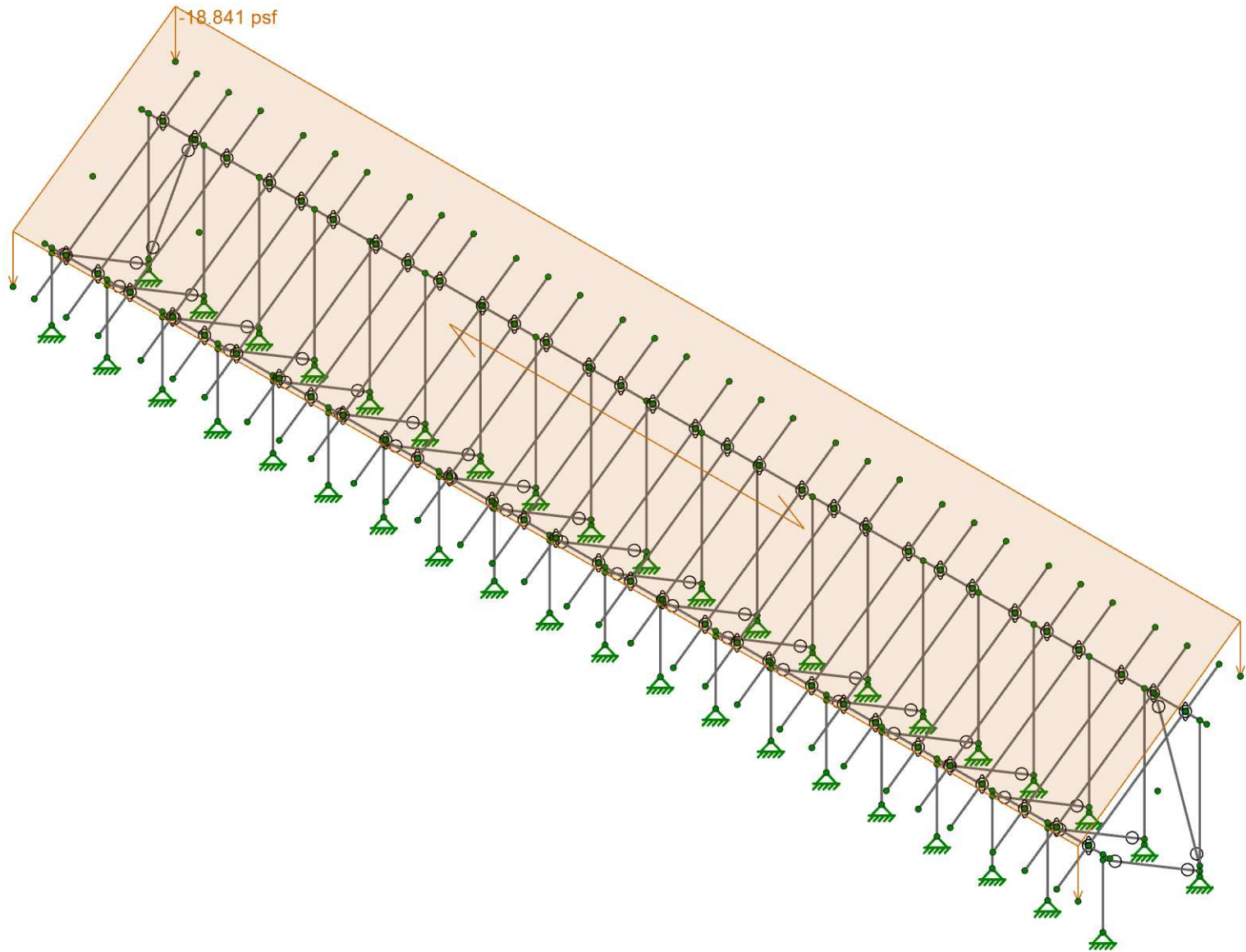
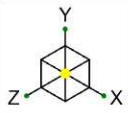
Loads: BLC 2, Solar Panel Weight



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A14 Large Format Panels - 35 Degree Tilt - 4L

SK-5
Jun 20, 2023
Sunturf A14 - LF - 35deg - 4L.r3d



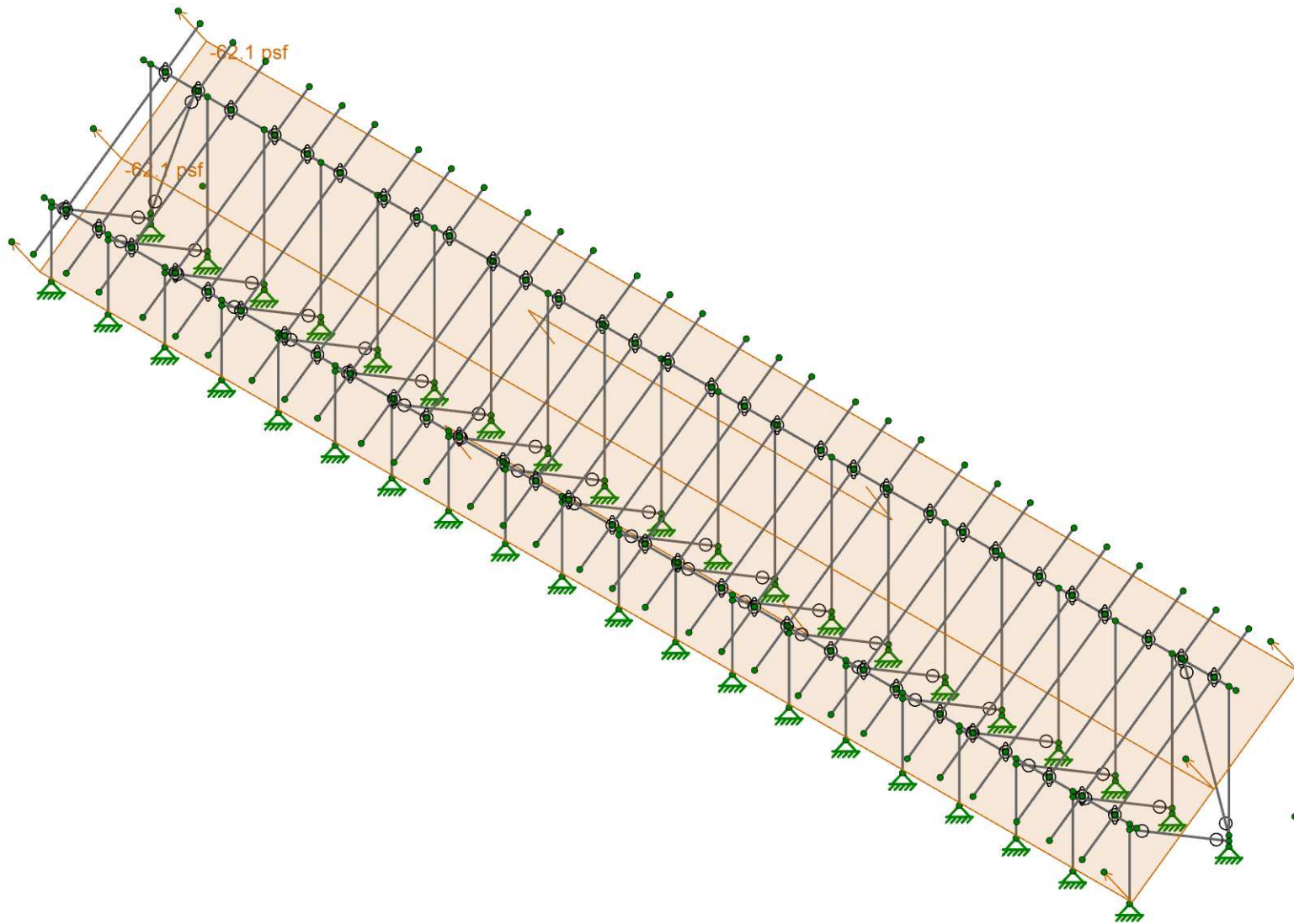
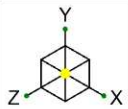
Loads: BLC 3, Roof Live/Snow



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A14 Large Format Panels - 35 Degree Tilt - 4L

SK-6
Jun 20, 2023
Sunturf A14 - LF - 35deg - 4L.r3d



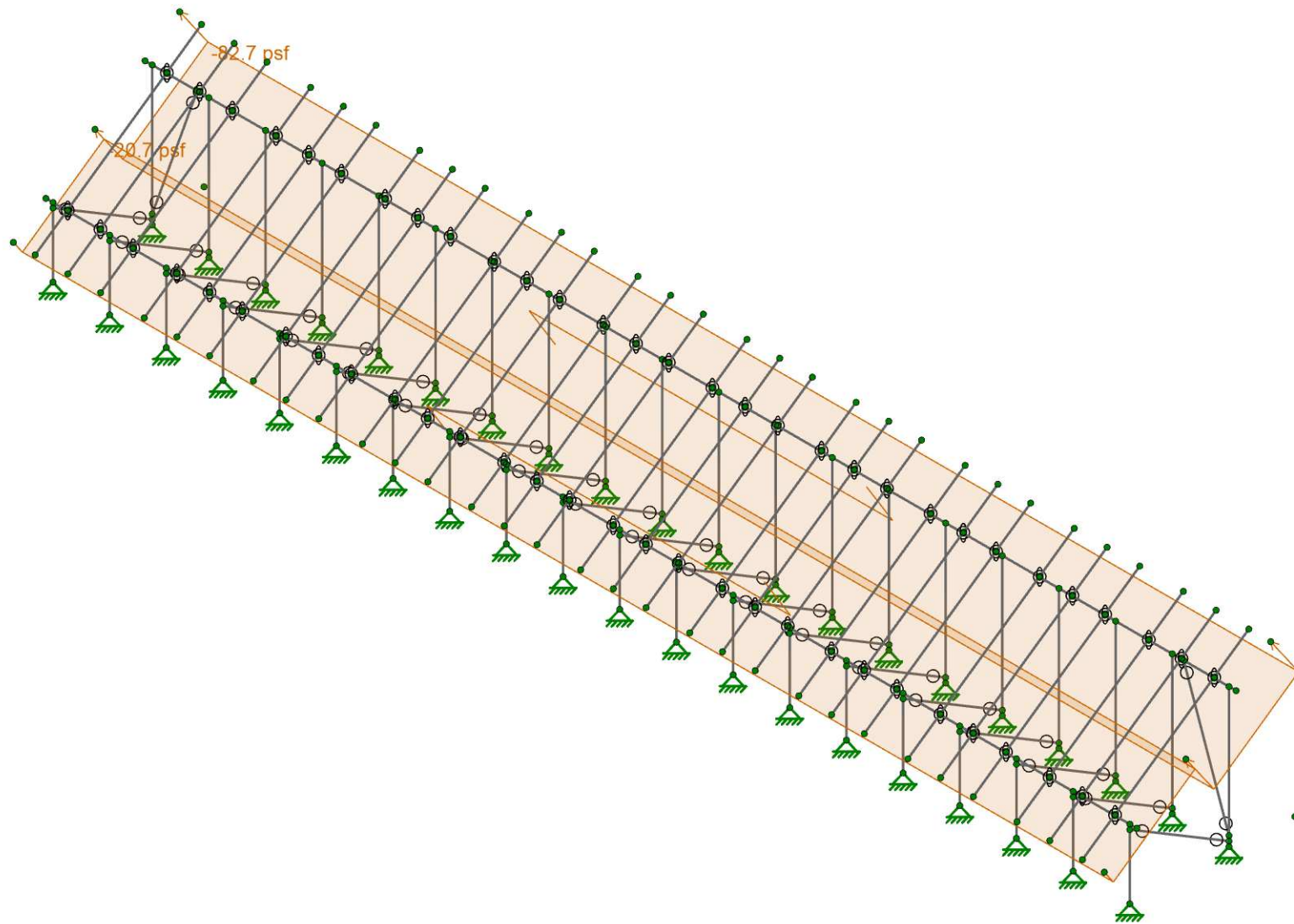
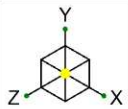
Loads: BLC 4, Wind A 0 deg



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A14 Large Format Panels - 35 Degree Tilt - 4L

SK-7
Jun 20, 2023
Sunturf A14 - LF - 35deg - 4L.r3d



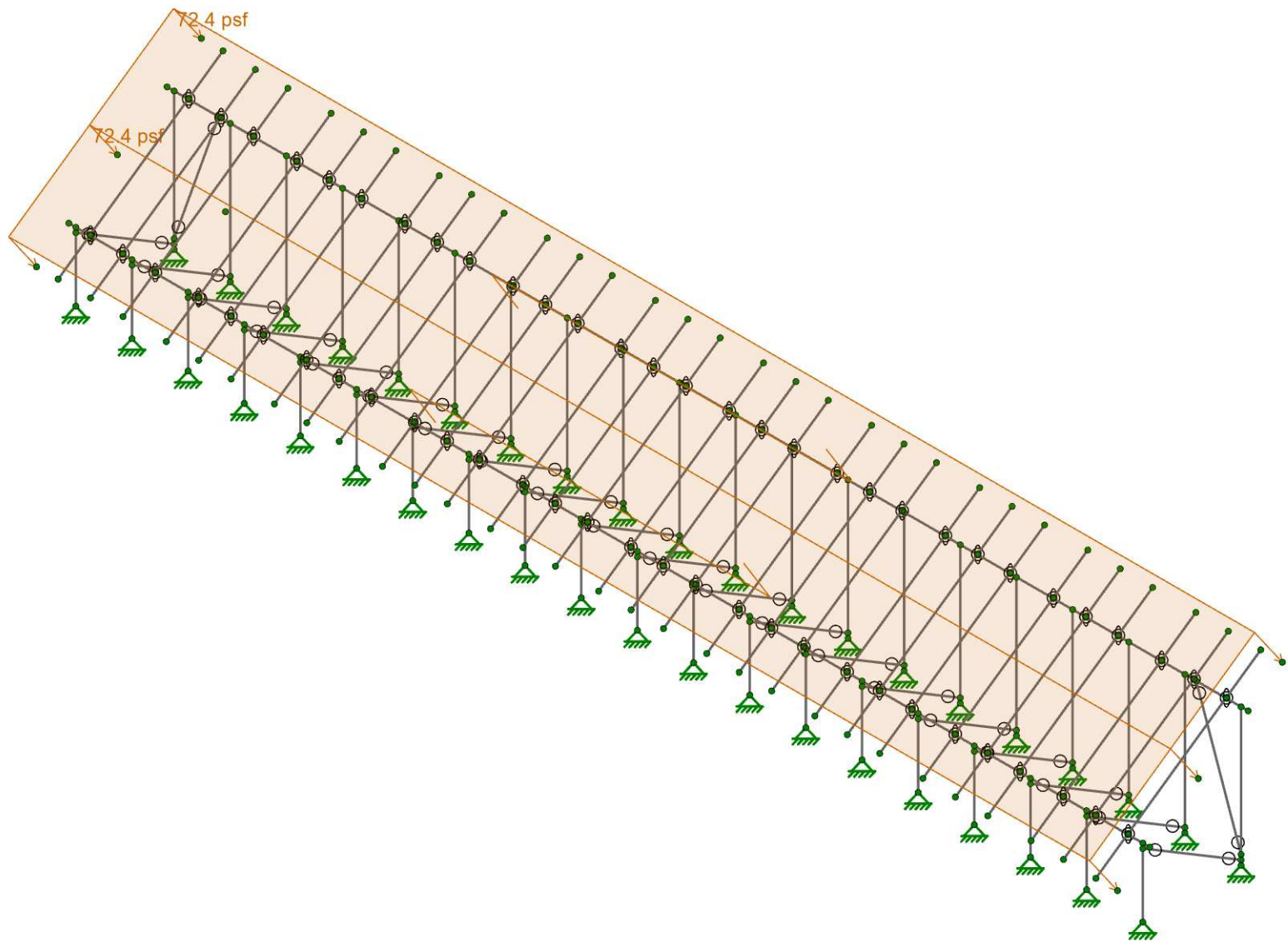
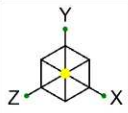
Loads: BLC 5, Wind B 0 deg



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A14 Large Format Panels - 35 Degree Tilt - 4L

SK-8
Jun 20, 2023
Sunturf A14 - LF - 35deg - 4L.r3d



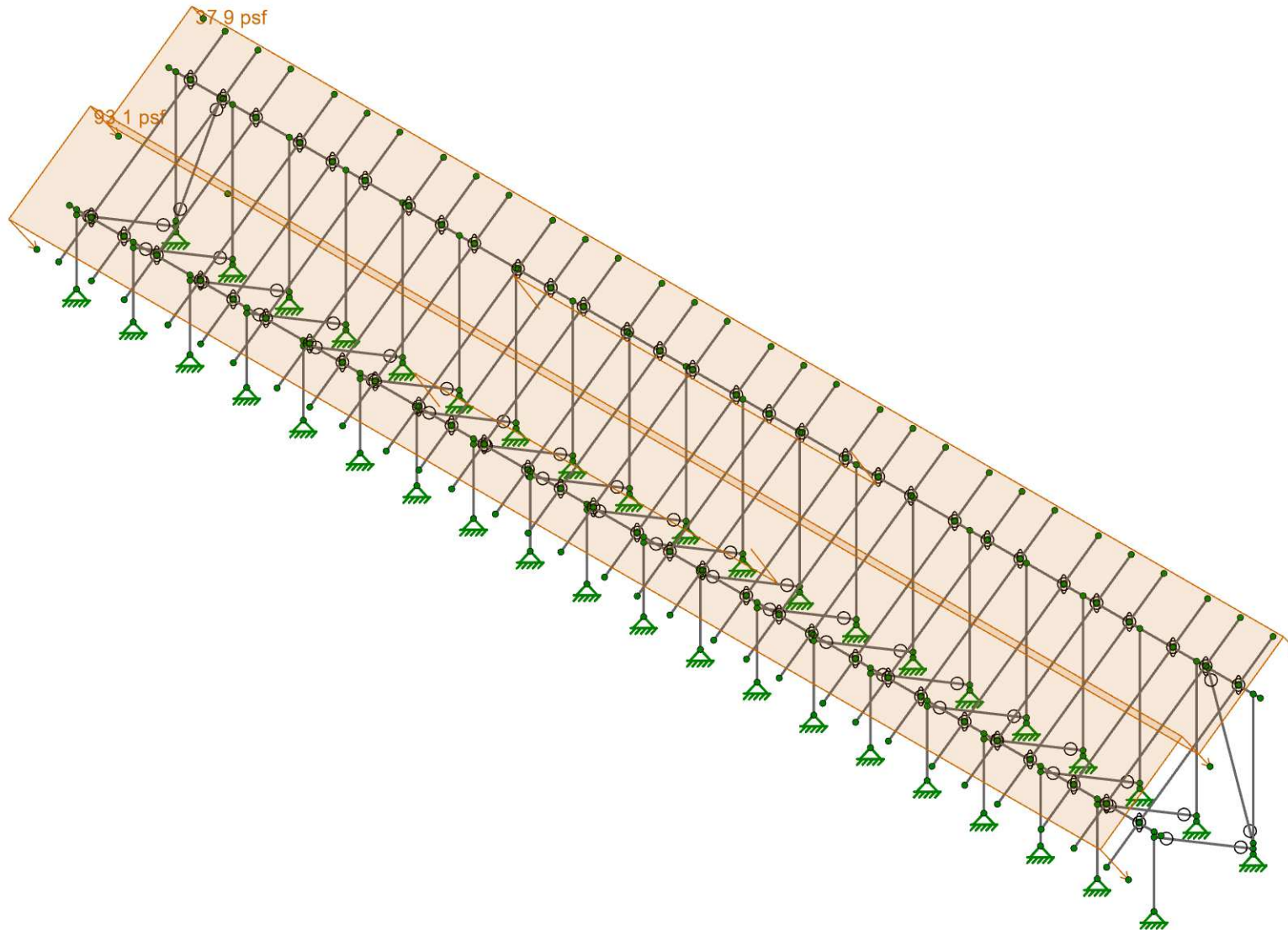
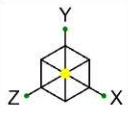
Loads: BLC 6, Wind A 180 deg



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A14 Large Format Panels - 35 Degree Tilt - 4L

SK-9
Jun 20, 2023
Sunturf A14 - LF - 35deg - 4L.r3d



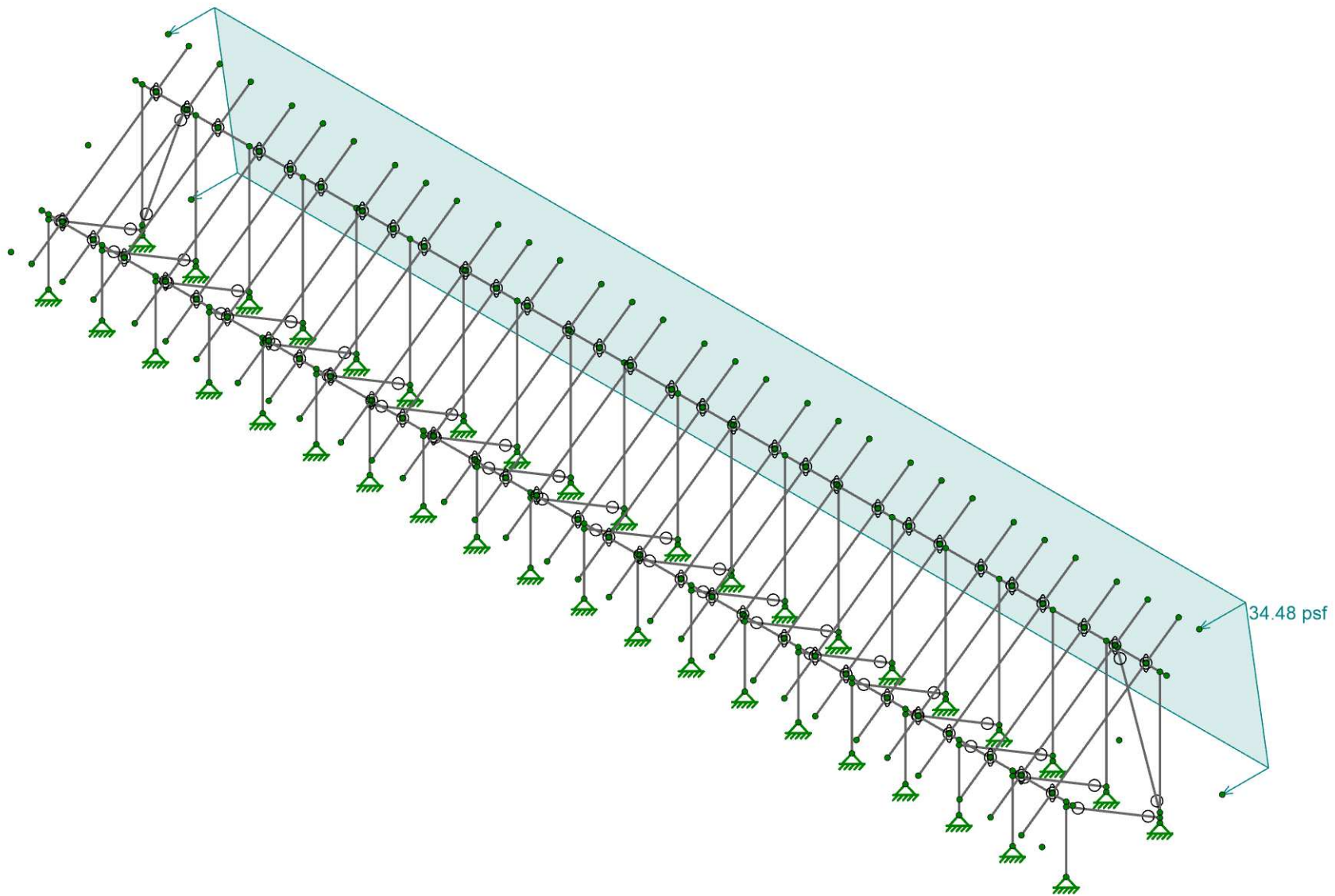
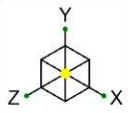
Loads: BLC 7, Wind B 180 deg



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A14 Large Format Panels - 35 Degree Tilt - 4L

SK-10
Jun 20, 2023
Sunturf A14 - LF - 35deg - 4L.r3d



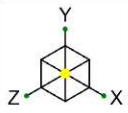
Loads: BLC 8, Wind Z



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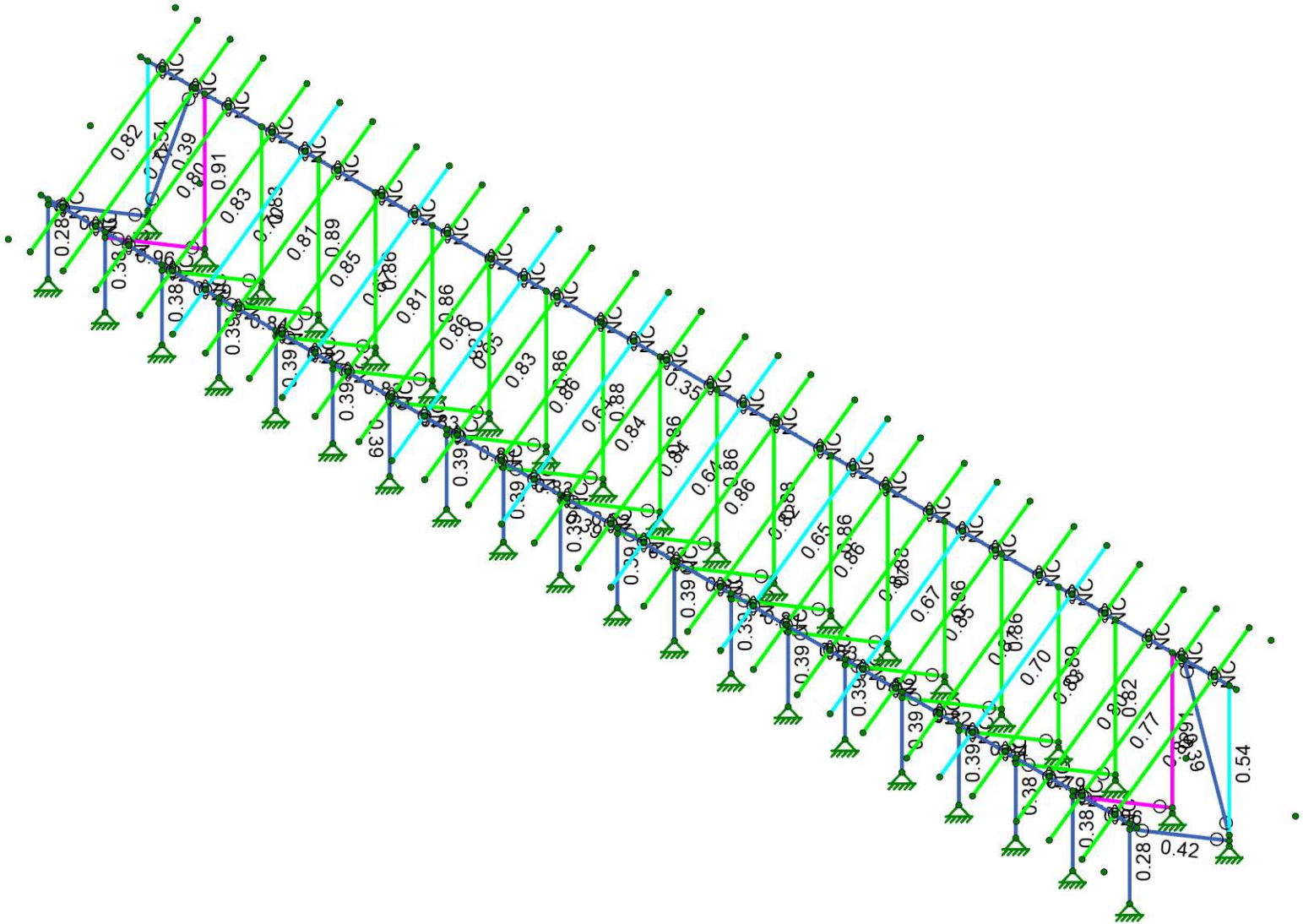
A14 Large Format Panels - 35 Degree Tilt - 4L

SK-11
Jun 20, 2023
Sunturf A14 - LF - 35deg - 4L.r3d



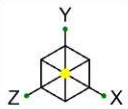
Code Check (Env)

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- > 1.0
- .90-1.0
- .75-.90
- .50-.75
- 0-.50



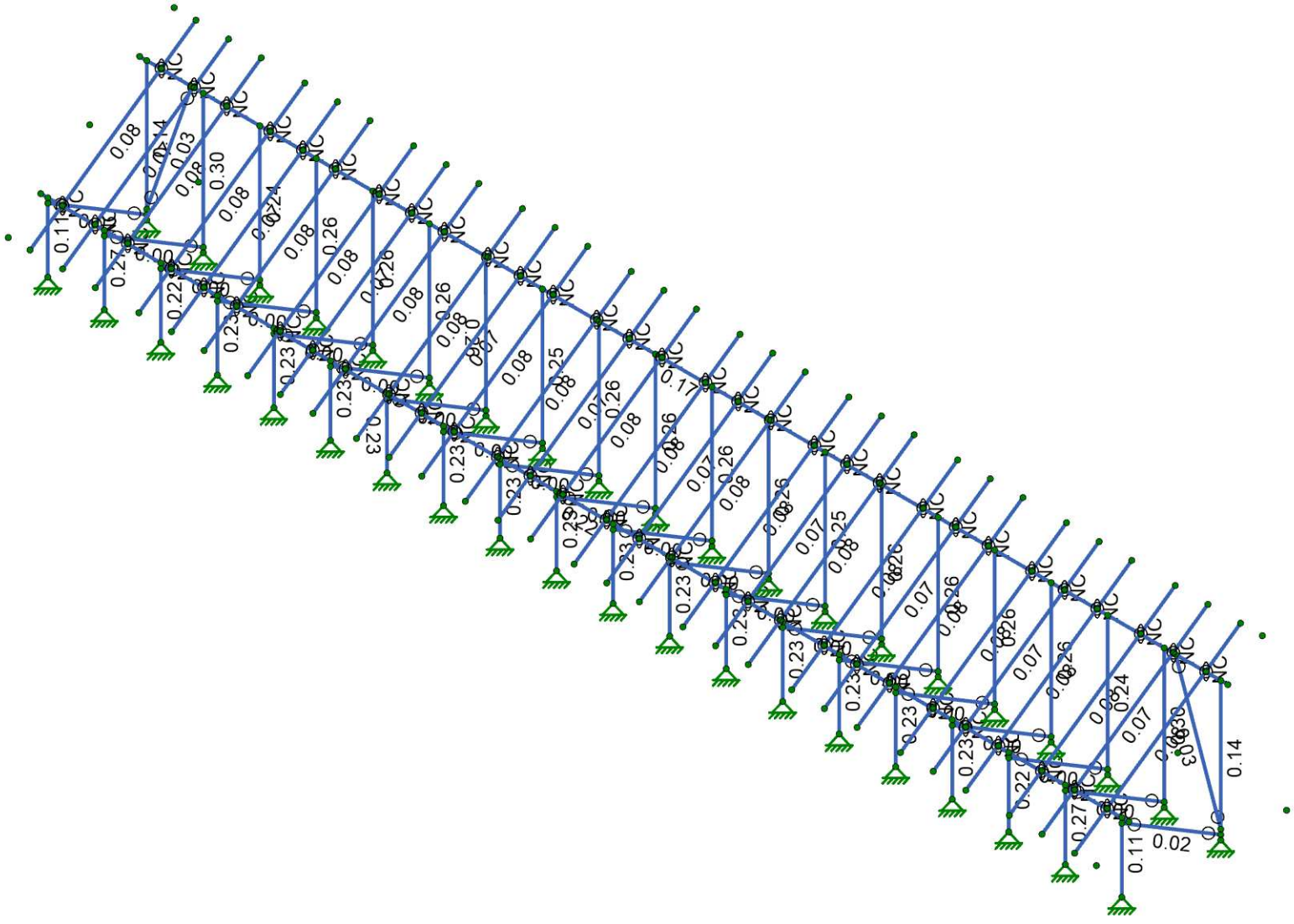
Member Code Checks Displayed (Enveloped)

	Vector Structural Engineering	A14 Large Format Panels - 35 Degree Tilt - 4L	SK-12
	CJT		Jun 20, 2023
	U2716.0371.231		Sunturf A14 - LF - 35deg - 4L.r3d




Shear Check (Env)

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



Member Shear Checks Displayed (Enveloped)

 <small>A NEMETSCHKE COMPANY</small>	Vector Structural Engineering
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A14 Large Format Panels - 35 Degree Tilt - 4L

SK-13
Jun 20, 2023
Sunturf A14 - LF - 35deg - 4L.r3d

Model Settings

Number of Reported Sections	5
Number of Internal Sections	100
Member Area Load Mesh Size (in ²)	144
Consider Shear Deformation	Yes
Consider Torsional Warping	Yes
Approximate Mesh Size (in)	24
Transfer Forces Between Intersecting Wood Walls	Yes
Increase Wood Wall Nailing Capacity for Wind Loads	Yes
Include P-Delta for Walls	Yes
Optimize Masonry and Wood Walls	Yes
Maximum Number of Iterations	3
Single	No
Multiple (Optimum)	Yes
Maximum	No

Global Axis corresponding to vertical direction	Y
Convert Existing Data	Yes
Default Global Plane for z-axis	XZ
Plate Local Axis Orientation	Nodal

Hot Rolled Steel	AISC 15th (360-16): ASD
Stiffness Adjustment	Yes (Iterative)
Notional Annex	None
Connections	None
Cold Formed Steel	None
Stiffness Adjustment	Yes (Iterative)
Wood	None
Temperature	< 100F
Concrete	ACI 318-14
Masonry	None
Aluminum	AA ADM1-15: ASD
Structure Type	Building
Stiffness Adjustment	Yes (Iterative)
Stainless	None
Stiffness Adjustment	Yes (Iterative)

Analysis Methodology	Exact Integration Method
Parme Beta Factor	0.65

Compression Stress Block	Rectangular Stress Block
Analyze using Cracked Sections	No
Leave room for horizontal rebar splices (2*d bar spacing)	Yes
List forces which were ignored for design in the Detail Report	Yes

Column Min Steel	1
Column Max Steel	8
Rebar Material Spec	ASTM A615
Warn if beam-column framing arrangement is not understood	No
Number of Shear Regions	4
Region 2 & 3 Spacing Increase Increment (in)	3.999992

Code	None
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Company : Vector Structural Engineering
Designer : CJT
Job Number : U2716.0371.231
Model Name : A14 Large Format Panels - 35 D...

6/20/2023
2:26:33 PM
Checked By :

Model Settings (Continued)

Base Elevation (ft)	15600
Include the weight of the structure in base shear calcs	Yes
T Z (sec)	
T X (sec)	
CZ	0.02
CX	0.02
R Z	3
R X	3

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e ⁵ F ⁻¹]	Density [lb/ft ³]	Yield [psi]	Ry	Fu [psi]	Rt
1	A992	29000	11154	0.3	0.65	490	50000	1.1	65000	1.1
2	A36 Gr.36	29000	11154	0.3	0.65	490	36000	1.5	58000	1.2
3	A572 Gr.50	29000	11154	0.3	0.65	490	50000	1.1	65000	1.1
4	A500 Gr.B RND	29000	11154	0.3	0.65	527	42000	1.4	58000	1.3
5	A500 Gr.B Rect	29000	11154	0.3	0.65	527	46000	1.4	58000	1.3
6	A53 Gr.B	29000	11154	0.3	0.65	490	35000	1.6	60000	1.2
7	A1085	29000	11154	0.3	0.65	490	50000	1.4	65000	1.3

Aluminum Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e ⁵ F ⁻¹]	Density [lb/ft ³]	Table B.4	kt	Ftu [psi]	Fty [psi]	Fcy [psi]	Fsu [psi]	Ct
1	3003-H14	10100	3787.5	0.33	1.3	172.8	Table B.4-1	1	19000	16000	13000	12000	141
2	6061-T6	10100	3787.5	0.33	1.3	172.8	Table B.4-2	1	38000	35000	35000	24000	141
3	6063-T5	10100	3787.5	0.33	1.3	172.8	Table B.4-2	1	22000	16000	16000	13000	141
4	6063-T6	10100	3787.5	0.33	1.3	172.8	Table B.4-2	1	30000	25000	25000	19000	141
5	5052-H34	10200	3787.5	0.33	1.3	172.8	Table B.4-1	1	34000	26000	24000	20000	141
6	6061-T6 W	10100	3787.5	0.33	1.3	172.8	Table B.4-1	1	24000	15000	15000	15000	141
7	6005-T5	10100	3787.5	0.33	1.3	172.8	Table B.4-1	1	38000	35000	35000	24000	141

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rule	Area [in ²]	Iyy [in ⁴]	Izz [in ⁴]	J [in ⁴]
1	Post	PIPE2.0A21165	Column	Pipe	A572 Gr.50	Typical	0.776	0.499	0.499	0.998
2	Cross Beam	PIPE2.5A21168	Beam	Wide Flange	A572 Gr.50	Typical	0.947	0.907	0.907	1.814
3	Diagonal Brace	1.5X1.5X0.083	HBrace	SquareTube	A572 Gr.50	Typical	0.47	0.158	0.158	0.236

Aluminum Section Sets

	Label	Shape	Type	Design List	Material	Design Rule	Area [in ²]	Iyy [in ⁴]	Izz [in ⁴]	J [in ⁴]
1	AL Posts	2.375ODX0.188	Column	Pipe	6005-T5	Typical	1.29	0.778	0.778	1.54
2	AL Brace	RT1.5X2X0.15625	VBrace	Rectangular Tubes	6005-T5	Typical	0.996	0.327	0.524	0.602
3	AL Rails	HR300 ALA	Beam	Rectangular Tubes	6005-T5	Typical	0.736	0.214	0.727	0.734
4	AL Cross Beam	CROSSRAIL	Beam	Rectangular Tubes	6005-T5	Typical	1.909	1.97	4.366	4.017

Basic Load Cases

	BLC Description	Category	Y Gravity	Distributed	Area(Member)
1	Self Weight	DL	-1.05		
2	Solar Panel Weight	DL			1
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 Z	WLZ			1
9	BLC 2 Transient Area Loads	None		54	
10	BLC 3 Transient Area Loads	None		54	
11	BLC 4 Transient Area Loads	None		184	
12	BLC 5 Transient Area Loads	None		184	
13	BLC 6 Transient Area Loads	None		184	
14	BLC 7 Transient Area Loads	None		184	
15	BLC 8 Transient Area Loads	None		132	

Member Area Loads (BLC 2 : Solar Panel Weight)

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

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

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [psf]
1	N197	N200	N199	N196	PY	A-B	-23

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

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [psf]
1	N197	N200	N201	N198	Perp	A-B	-62.1
2	N198	N201	N199	N196	Perp	A-B	-62.1

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

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [psf]
1	N197	N200	N201	N198	Perp	A-B	-82.7
2	N198	N201	N199	N196	Perp	A-B	-20.7

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

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [psf]
1	N197	N200	N201	N198	Perp	A-B	72.4
2	N198	N201	N199	N196	Perp	A-B	72.4

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

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [psf]
1	N197	N200	N201	N198	Perp	A-B	37.9
2	N198	N201	N199	N196	Perp	A-B	93.1

Member Area Loads (BLC 8 : Wind Z)

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [psf]
1	N200	N197	N307	N308	Z	Open Structure	34.48

Load Combinations

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	ASD Loads		Y								
2	1.0 D	Yes	Y	DL	1						
3	1.0 D + 1.0 S	Yes	Y	DL	1	RLL	1				
4	1.0 D + 0.6 W1	Yes	Y	DL	1	RLL		OL1	0.6	WLZ	0.6
5	1.0 D + 0.6 W2	Yes	Y	DL	1	RLL		OL2	0.6	WLZ	0.6
6	1.0 D + 0.6 W3	Yes	Y	DL	1	RLL		OL3	0.6	WLZ	-0.6
7	1.0 D + 0.6 W4	Yes	Y	DL	1	RLL		OL4	0.6	WLZ	-0.6
8	1.0 D + 0.45 W1 + 0.75 S	Yes	Y	DL	1	RLL	0.75	OL1	0.45	WLZ	0.45
9	1.0 D + 0.45 W2 + 0.75 S	Yes	Y	DL	1	RLL	0.75	OL2	0.45	WLZ	0.45
10	1.0 D + 0.45 W3 + 0.75 S	Yes	Y	DL	1	RLL	0.75	OL3	0.45	WLZ	-0.45
11	1.0 D + 0.45 W4 + 0.75 S	Yes	Y	DL	1	RLL	0.75	OL4	0.45	WLZ	-0.45
12	0.6 D + 0.6 W1	Yes	Y	DL	0.6	RLL		OL1	0.6	WLZ	0.6
13	0.6 D + 0.6 W2	Yes	Y	DL	0.6	RLL		OL2	0.6	WLZ	0.6

Load Combinations (Continued)

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
14	0.6 D + 0.6 W3	Yes	Y	DL	0.6	RLL		OL3	0.6	WLZ	-0.6
15	0.6 D + 0.6 W4	Yes	Y	DL	0.6	RLL		OL4	0.6	WLZ	-0.6
16			Y								
17	LRFD Loads		Y								
18	1.4 D		Y	DL	1.4	RLL					
19	1.2 D + 1.6 S + 0.5 W1		Y	DL	1.2	RLL	1.6	OL1	0.5		
20	1.2 D + 1.6 S + 0.5 W2		Y	DL	1.2	RLL	1.6	OL2	0.5		
21	1.2 D + 1.6 S + 0.5 W3		Y	DL	1.2	RLL	1.6	OL3	0.5		
22	1.2 D + 1.6 S + 0.5 W4		Y	DL	1.2	RLL	1.6	OL4	0.5		
23	1.2 D + 1.0 W1		Y	DL	1.2	RLL		OL1	1		
24	1.2 D + 1.0 W2		Y	DL	1.2	RLL		OL2	1		
25	1.2 D + 1.0 W3		Y	DL	1.2	RLL		OL3	1		
26	1.2 D + 1.0 W4		Y	DL	1.2	RLL		OL4	1		
27	0.9 D + 1.0 W1		Y	DL	0.9	RLL		OL1	1		
28	0.9 D + 1.0 W2		Y	DL	0.9	RLL		OL2	1		
29	0.9 D + 1.0 W3		Y	DL	0.9	RLL		OL3	1		
30	0.9 D + 1.0 W4		Y	DL	0.9	RLL		OL4	1		

Envelope Node Reactions

	Node Label	X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC	
1	N2	max	28.07	11	666.64	9	62.278	4	0	15	0	15	0	15
2		min	-6.322	12	-277.081	14	-73.412	6	0	2	0	2	0	2
3	N1	max	212.498	10	1956.157	6	858.828	14	0	15	0	15	0	15
4		min	-206.846	13	-1693.821	13	-750.535	4	0	2	0	2	0	2
5	N151	max	205.279	13	1950.282	6	858.804	14	0	15	0	15	0	15
6		min	-210.741	10	-1688.437	13	-750.466	4	0	2	0	2	0	2
7	N152	max	6.286	12	666.271	9	62.274	4	0	15	0	15	0	15
8		min	-27.852	11	-277.197	14	-73.409	6	0	2	0	2	0	2
9	N237	max	0.158	13	2815.833	6	1660.073	6	0	15	0	15	0	15
10		min	-0.474	3	-2401.726	13	-1444.136	4	0	2	0	2	0	2
11	N239	max	3.718	12	1288.058	9	92.458	4	0	15	0	15	0	15
12		min	-4.766	6	-548.253	14	-105.916	6	0	2	0	2	0	2
13	N253	max	0.473	3	2815.794	6	1660.162	6	0	15	0	15	0	15
14		min	-0.155	13	-2401.654	13	-1444.196	4	0	2	0	2	0	2
15	N255	max	4.88	6	1288.061	9	92.456	4	0	15	0	15	0	15
16		min	-3.765	12	-548.48	14	-105.911	6	0	2	0	2	0	2
17	N264	max	3.892	6	1261.01	9	92.034	4	0	15	0	15	0	15
18		min	-2.97	12	-504.352	14	-105.813	6	0	2	0	2	0	2
19	N271	max	0.776	13	2852.019	6	1684.633	6	0	15	0	15	0	15
20		min	-1.143	10	-2443.029	13	-1466.46	4	0	2	0	2	0	2
21	N273	max	3.654	12	1325.631	9	93.042	4	0	15	0	15	0	15
22		min	-5.193	11	-604.483	14	-106.078	6	0	2	0	2	0	2
23	N281	max	0.487	10	2793.874	6	1643.686	6	0	15	0	15	0	15
24		min	-0.304	13	-2374.948	13	-1429.248	4	0	2	0	2	0	2
25	N286	max	3.138	11	1274.652	9	92.149	4	0	15	0	15	0	15
26		min	-1.712	12	-504.05	14	-105.905	6	0	2	0	2	0	2
27	N298	max	2.104	13	2850.074	6	1687.976	6	0	15	0	15	0	15
28		min	-2.498	10	-2444.696	13	-1469.341	4	0	2	0	2	0	2
29	N299	max	2.865	12	1334.64	9	93.143	4	0	15	0	15	0	15
30		min	-6.799	11	-629.001	14	-106.01	6	0	2	0	2	0	2
31	N306	max	0.925	10	2825.814	6	1656.043	6	0	15	0	15	0	15
32		min	-0.867	13	-2404.033	13	-1440.741	4	0	2	0	2	0	2
33	N381	max	1.122	10	2851.384	6	1684.558	6	0	15	0	15	0	15
34		min	-0.779	13	-2442.38	13	-1466.338	4	0	2	0	2	0	2
35	N382	max	5.477	11	1325.413	9	93.061	4	0	15	0	15	0	15

Envelope Node Reactions (Continued)

Node Label		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
36		min	12	-3.72	12	-604.885	14	-106.101	6	0	2	0	2
37	N159	max	13	0.337	13	2798.871	6	1646.239	6	0	15	0	15
38		min	10	-0.552	10	-2379.443	13	-1431.543	4	0	2	0	2
39	N160	max	12	2.989	12	1263.26	9	92.103	4	0	15	0	15
40		min	6	-3.872	6	-504.924	14	-105.881	6	0	2	0	2
41	N213	max	4	1.465	4	2848.96	6	1687.394	6	0	15	0	15
42		min	15	-1.645	15	-2443.601	13	-1468.812	4	0	2	0	2
43	N218	max	7	6.546	7	1333.959	9	93.123	4	0	15	0	15
44		min	12	-4.38	12	-628.472	14	-105.993	6	0	2	0	2
45	N244	max	13	0.89	13	2822.335	6	1654.245	6	0	15	0	15
46		min	10	-0.979	10	-2401.02	13	-1439.141	4	0	2	0	2
47	N245	max	12	1.717	12	1273.326	9	92.099	4	0	15	0	15
48		min	11	-2.981	11	-504.198	14	-105.85	6	0	2	0	2
49	N256	max	10	3.173	10	2793.615	6	1660.518	6	0	15	0	15
50		min	13	-2.82	13	-2389.537	13	-1443.986	4	0	2	0	2
51	N257	max	11	7.257	11	1301.533	9	92.344	4	0	15	0	15
52		min	12	-1.834	12	-606.358	14	-105.372	6	0	2	0	2
53	N266	max	13	1.418	13	2902.76	6	1693.858	6	0	15	0	15
54		min	10	-1.401	10	-2479.217	13	-1475.531	4	0	2	0	2
55	N267	max	12	0.518	12	1324.91	9	92.184	4	0	15	0	15
56		min	11	-2.741	11	-542.704	14	-105.483	6	0	2	0	2
57	N357	max	10	3	10	2693.446	6	1588.625	14	0	15	0	15
58		min	13	-2.584	13	-2294.005	13	-1379.919	4	0	2	0	2
59	N358	max	11	6.999	11	1221.665	9	89.408	4	0	15	0	15
60		min	12	-1.267	12	-547.295	14	-102.582	6	0	2	0	2
61	N363	max	13	0.83	13	2757.063	6	1929.348	6	0	15	0	15
62		min	10	-0.97	10	-2308.67	13	-1678.83	12	0	2	0	2
63	N364	max	12	1.128	12	1524.979	9	89.221	4	0	15	0	15
64		min	11	-7.306	11	-658.138	14	-100.489	6	0	2	0	2
65	N397	max	12	1.768	12	1301.589	9	92.363	4	0	15	0	15
66		min	11	-6.978	11	-606.967	14	-105.392	6	0	2	0	2
67	N402	max	13	2.821	13	2793.39	6	1660.635	6	0	15	0	15
68		min	10	-3.198	10	-2389.287	13	-1444.045	4	0	2	0	2
69	N403	max	11	2.992	11	1324.843	9	92.186	4	0	15	0	15
70		min	12	-0.567	12	-542.376	14	-105.488	6	0	2	0	2
71	N408	max	10	1.375	10	2903.007	6	1693.671	6	0	15	0	15
72		min	13	-1.419	13	-2479.511	13	-1475.414	4	0	2	0	2
73	N409	max	12	1.232	12	1221.675	9	89.411	4	0	15	0	15
74		min	11	-6.758	11	-547.546	14	-102.587	6	0	2	0	2
75	N414	max	13	2.605	13	2691.709	6	1588.789	14	0	15	0	15
76		min	10	-3.045	10	-2292.234	13	-1379.974	4	0	2	0	2
77	N415	max	11	7.582	11	1525.117	9	89.222	4	0	15	0	15
78		min	12	-1.197	12	-657.955	14	-100.487	6	0	2	0	2
79	N420	max	10	1.043	10	2764.375	6	1929.222	6	0	15	0	15
80		min	13	-0.926	13	-2315.496	13	-1678.836	12	0	2	0	2
81	Totals:	max	5	0.002	5	50399.868	10	30092.826	6				
82		min	14	-0.001	14	-30475.647	12	-26180.59	12				

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

Member	Shape	Code Check	Loc[in]	LC	Shear	Check	Loc[in]	Dir	LC	Pnc/om [lb]	Pnt/om [lb]	Mnny/om [lb-ft]	Mnzz/om [lb-ft]	Cb	Eqn
1	M5	PIPE2.0A21165	0.278	54.165	6	0.113	54.773	6	15761.697	23232.186	1397.505	1397.505	1	H1-1b	
2	M6	PIPE2.0A21165	0.542	3.667	6	0.136	0	6	5449.109	23232.186	1397.505	1397.505	1	H1-1a	
3	M15	1.5X1.5X0.083	0.425	51.028	6	0.017	97.973	y	10	2473.713	14085.15	624.421	624.421	1.136	H1-1a
4	M19	1.5X1.5X0.083	0.392	71.169	10	0.033	115.801	y	6	1770.689	14085.15	624.421	624.421	1.136	H1-1a
5	M73	PIPE2.0A21165	0.278	54.165	6	0.113	54.773	6	15761.697	23232.186	1397.505	1397.505	1	H1-1b	

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

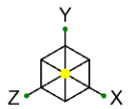
Member	Shape	Code Check	Loc[in]	LC	Shear Check	Loc[in]	Dir	LC	Pnc/om [lb]	Pnt/om [lb]	Mnyy/om [lb-ft]	Mnzz/om [lb-ft]	Cb	Eqn	
6	M74	PIPE2.0A21165	0.541	3.667	6	0.135	0	6	5449.109	23232.186	1397.505	1397.505	1	H1-1a	
7	M75	1.5X1.5X0.083	0.425	51.028	6	0.017	97.973	y	10	2473.732	14085.15	624.421	624.421	1.136	H1-1a
8	M75B	1.5X1.5X0.083	0.387	71.22	10	0.033	115.883	y	6	1768.167	14085.15	624.421	624.421	1.136	H1-1a
9	M71	PIPE2.5A21168	0.347	904.75	6	0.168	721.875	6	20336.2	28358.413	2081.747	2081.747	1	H1-1b	
10	M72	PIPE2.5A21168	0.387	904.75	6	0.216	48.125	6	20336.2	28358.413	2081.747	2081.747	1	H1-1b	
11	M112	1.5X1.5X0.083	0.821	51.028	6	0.004	97.973	y	6	2473.732	14085.15	624.421	624.421	1.136	H1-1a
12	M113	PIPE2.0A21165	0.391	54.165	14	0.229	54.773	6	15761.697	23232.186	1397.505	1397.505	1	H1-1b	
13	M114	PIPE2.0A21165	0.864	3.667	6	0.256	0	6	5449.109	23232.186	1397.505	1397.505	1	H1-1a	
14	M120	PIPE2.0A21165	0.864	3.667	6	0.256	0	6	5449.109	23232.186	1397.505	1397.505	1	H1-1a	
15	M121	1.5X1.5X0.083	0.821	51.028	6	0.004	97.973	y	6	2473.732	14085.15	624.421	624.421	1.136	H1-1a
16	M122	PIPE2.0A21165	0.391	54.165	14	0.229	54.773	6	15761.697	23232.186	1397.505	1397.505	1	H1-1b	
17	M126	PIPE2.0A21165	0.875	3.667	6	0.26	0	6	5449.109	23232.186	1397.505	1397.505	1	H1-1a	
18	M127	1.5X1.5X0.083	0.833	51.028	6	0.004	97.973	y	10	2473.732	14085.15	624.421	624.421	1.136	H1-1a
19	M128	PIPE2.0A21165	0.393	54.165	14	0.232	54.773	6	15761.697	23232.186	1397.505	1397.505	1	H1-1b	
20	M132	PIPE2.0A21165	0.856	3.667	6	0.254	0	6	5449.109	23232.186	1397.505	1397.505	1	H1-1a	
21	M133	1.5X1.5X0.083	0.813	51.028	6	0.004	97.973	y	6	2473.732	14085.15	624.421	624.421	1.136	H1-1a
22	M134	PIPE2.0A21165	0.389	54.165	14	0.226	54.773	6	15761.697	23232.186	1397.505	1397.505	1	H1-1b	
23	M137	PIPE2.0A21165	0.876	3.667	6	0.261	0	6	5449.109	23232.186	1397.505	1397.505	1	H1-1a	
24	M140	1.5X1.5X0.083	0.835	51.028	6	0.004	97.973	y	10	2473.732	14085.15	624.421	624.421	1.136	H1-1a
25	M141	PIPE2.0A21165	0.394	54.165	14	0.233	54.773	6	15761.697	23232.186	1397.505	1397.505	1	H1-1b	
26	M145	PIPE2.0A21165	0.865	3.667	6	0.256	0	6	5449.109	23232.186	1397.505	1397.505	1	H1-1a	
27	M146	1.5X1.5X0.083	0.819	51.028	6	0.003	97.973	y	10	2473.732	14085.15	624.421	624.421	1.136	H1-1a
28	M147	PIPE2.0A21165	0.389	54.165	14	0.228	54.773	6	15761.697	23232.186	1397.505	1397.505	1	H1-1b	
29	M184	PIPE2.0A21165	0.393	54.165	14	0.232	54.773	6	15761.697	23232.186	1397.505	1397.505	1	H1-1b	
30	M185	PIPE2.0A21165	0.875	3.667	6	0.26	0	6	5449.109	23232.186	1397.505	1397.505	1	H1-1a	
31	M186	1.5X1.5X0.083	0.833	51.028	6	0.004	97.973	y	10	2473.732	14085.15	624.421	624.421	1.136	H1-1a
32	M77	PIPE2.0A21165	0.389	54.165	14	0.227	54.773	6	15761.697	23232.186	1397.505	1397.505	1	H1-1b	
33	M85	PIPE2.0A21165	0.858	3.667	6	0.254	0	6	5449.109	23232.186	1397.505	1397.505	1	H1-1a	
34	M86	1.5X1.5X0.083	0.814	51.028	6	0.004	97.973	y	6	2473.732	14085.15	624.421	624.421	1.136	H1-1a
35	M115	PIPE2.0A21165	0.394	54.165	14	0.232	54.773	6	15761.672	23232.186	1397.505	1397.505	1	H1-1b	
36	M116	PIPE2.0A21165	0.875	3.667	6	0.26	0	6	5449.103	23232.186	1397.505	1397.505	1	H1-1a	
37	M117	1.5X1.5X0.083	0.835	51.028	6	0.004	97.973	y	10	2473.729	14085.15	624.421	624.421	1.136	H1-1a
38	M118	PIPE2.0A21165	0.389	54.165	14	0.228	54.773	6	15761.697	23232.186	1397.505	1397.505	1	H1-1b	
39	M119	PIPE2.0A21165	0.864	3.667	6	0.255	0	6	5449.109	23232.186	1397.505	1397.505	1	H1-1a	
40	M123	1.5X1.5X0.083	0.818	51.028	6	0.003	97.973	y	10	2473.732	14085.15	624.421	624.421	1.136	H1-1a
41	M124	PIPE2.0A21165	0.391	54.165	14	0.228	54.773	6	15761.697	23232.186	1397.505	1397.505	1	H1-1b	
42	M125	PIPE2.0A21165	0.859	3.667	6	0.256	0	6	5449.109	23232.186	1397.505	1397.505	1	H1-1a	
43	M129	1.5X1.5X0.083	0.821	51.028	6	0.003	97.973	y	3	2473.732	14085.15	624.421	624.421	1.136	H1-1a
44	M130	PIPE2.0A21165	0.389	54.165	14	0.234	54.773	6	15761.697	23232.186	1397.505	1397.505	1	H1-1b	
45	M131	PIPE2.0A21165	0.887	3.667	6	0.262	0	6	5449.109	23232.186	1397.505	1397.505	1	H1-1a	
46	M135	1.5X1.5X0.083	0.838	51.028	6	0.002	97.973	y	10	2473.732	14085.15	624.421	624.421	1.136	H1-1a
47	M173	PIPE2.0A21165	0.379	54.165	14	0.218	54.773	6	15761.697	23232.186	1397.505	1397.505	1	H1-1b	
48	M174	PIPE2.0A21165	0.825	3.667	6	0.245	0	6	5449.109	23232.186	1397.505	1397.505	1	H1-1a	
49	M175	1.5X1.5X0.083	0.786	51.028	6	0.004	97.973	y	9	2473.732	14085.15	624.421	624.421	1.136	H1-1a
50	M176	PIPE2.0A21165	0.377	54.165	14	0.271	54.773	6	15761.697	23232.186	1397.505	1397.505	1	H1-1b	
51	M177	PIPE2.0A21165	0.907	3.667	6	0.296	0	6	5449.109	23232.186	1397.505	1397.505	1	H1-1a	
52	M178	1.5X1.5X0.083	0.956	51.028	6	0.004	97.973	y	9	2473.732	14085.15	624.421	624.421	1.136	H1-1a
53	M193	PIPE2.0A21165	0.859	3.667	6	0.256	0	6	5449.109	23232.186	1397.505	1397.505	1	H1-1a	
54	M194	1.5X1.5X0.083	0.821	51.028	6	0.003	97.973	y	3	2473.732	14085.15	624.421	624.421	1.136	H1-1a
55	M195	PIPE2.0A21165	0.391	54.165	14	0.228	54.773	6	15761.697	23232.186	1397.505	1397.505	1	H1-1b	
56	M196	PIPE2.0A21165	0.887	3.667	6	0.262	0	6	5449.109	23232.186	1397.505	1397.505	1	H1-1a	
57	M197	1.5X1.5X0.083	0.838	51.028	6	0.002	97.973	y	10	2473.732	14085.15	624.421	624.421	1.136	H1-1a
58	M198	PIPE2.0A21165	0.389	54.165	14	0.234	54.773	6	15761.697	23232.186	1397.505	1397.505	1	H1-1b	
59	M199	PIPE2.0A21165	0.825	3.667	6	0.245	0	6	5449.109	23232.186	1397.505	1397.505	1	H1-1a	
60	M200	1.5X1.5X0.083	0.786	51.028	6	0.004	97.973	y	9	2473.732	14085.15	624.421	624.421	1.136	H1-1a

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

Member	Shape	Code Check	Loc[in]	LC Shear Check	Loc[in]	Dir	LC Pnc/om [lb]	Pnt/om [lb]	Mnyy/om [lb-ft]	Mnzz/om [lb-ft]	Cb	Eqn			
61	M201	PIPE2.0A21165	0.379	54.165	14	0.218	54.773	6	15761.697	23232.186	1397.505	1397.505	1	H1-1b	
62	M202	PIPE2.0A21165	0.908	3.667	6	0.296	0	6	5449.109	23232.186	1397.505	1397.505	1	H1-1a	
63	M203	1.5X1.5X0.083	0.956	51.028	6	0.004	97.973	y	9	2473.732	14085.15	624.421	624.421	1.136	H1-1a
64	M204	PIPE2.0A21165	0.377	54.165	14	0.271	54.773	6	15761.697	23232.186	1397.505	1397.505	1	H1-1b	

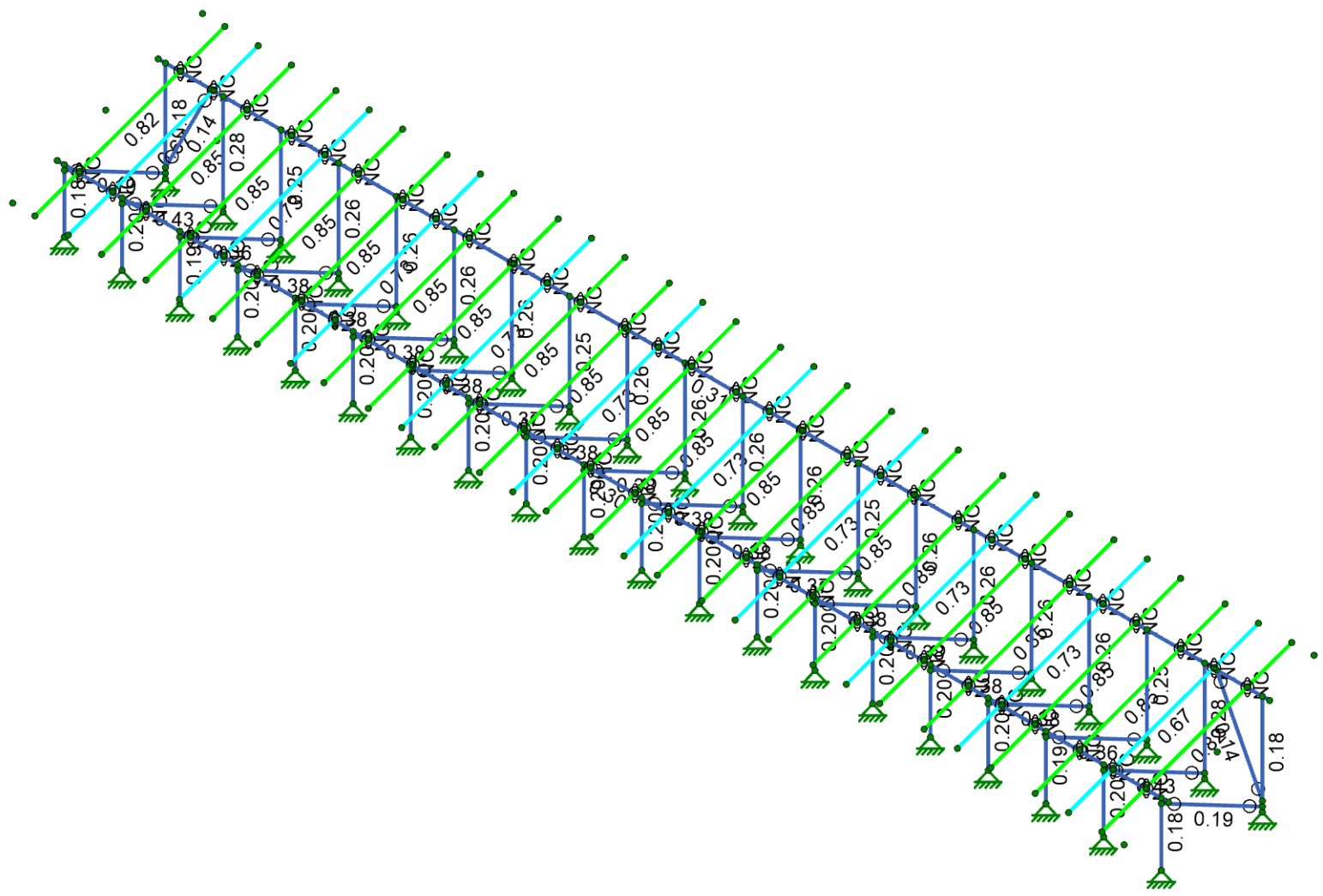
Envelope AA ADM1-15: ASD - BUILDING Member Aluminum Code Checks

Member	Shape	Code Check	Loc[in]	LC Shear Check	Loc[in]	Dir	LC Pnc/Om[lb]	Pnt/Om[lb]	Mny/Om[lb-ft]	Mnz/Om[lb-ft]	Vny/Om[lb]	Vnz/Om[lb]	Cb	Eqn			
1	M109	HR300_ALA	0.85	136.167	13	0.083	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.69	H.1-1
2	M78	HR300_ALA	0.814	136.167	13	0.083	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.704	H.1-1
3	M81	HR300_ALA	0.67	136.167	13	0.071	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.718	H.1-1
4	M84	HR300_ALA	0.862	136.167	13	0.083	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.685	H.1-1
5	M87	HR300_ALA	0.825	136.167	13	0.083	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.7	H.1-1
6	M90	HR300_ALA	0.651	136.167	13	0.071	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.726	H.1-1
7	M93	HR300_ALA	0.856	136.167	13	0.083	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.687	H.1-1
8	M96	HR300_ALA	0.841	136.167	13	0.084	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.693	H.1-1
9	M99	HR300_ALA	0.643	136.167	13	0.071	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.729	H.1-1
10	M102	HR300_ALA	0.841	136.167	13	0.084	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.693	H.1-1
11	M105	HR300_ALA	0.856	136.167	13	0.083	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.687	H.1-1
12	M108	HR300_ALA	0.643	136.167	13	0.071	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.729	H.1-1
13	M150	HR300_ALA	0.825	136.167	13	0.083	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.7	H.1-1
14	M153	HR300_ALA	0.862	136.167	13	0.083	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.685	H.1-1
15	M156	HR300_ALA	0.651	136.167	13	0.071	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.726	H.1-1
16	M136	HR300_ALA	0.815	136.167	13	0.083	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.704	H.1-1
17	M138	HR300_ALA	0.85	136.167	13	0.083	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.69	H.1-1
18	M142	HR300_ALA	0.669	136.167	13	0.071	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.718	H.1-1
19	M160	HR300_ALA	0.807	136.167	13	0.083	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.707	H.1-1
20	M161	HR300_ALA	0.826	136.167	13	0.083	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.7	H.1-1
21	M163	HR300_ALA	0.698	136.167	13	0.072	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.705	H.1-1
22	M180	HR300_ALA	0.824	136.167	13	0.082	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.785	H.1-1
23	M182	HR300_ALA	0.767	136.167	13	0.071	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.963	H.1-1
24	M205	HR300_ALA	0.807	136.167	13	0.083	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.707	H.1-1
25	M208	HR300_ALA	0.698	136.167	13	0.072	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.705	H.1-1
26	M211	HR300_ALA	0.826	136.167	13	0.083	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.7	H.1-1
27	M214	HR300_ALA	0.801	136.167	13	0.083	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.709	H.1-1
28	M217	HR300_ALA	0.767	136.167	13	0.071	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.963	H.1-1
29	M220	HR300_ALA	0.824	136.167	13	0.082	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.785	H.1-1
30	M179	HR300_ALA	0.801	136.167	13	0.083	34.042	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.709	H.1-1



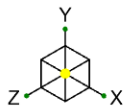
Code Check (Env)

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



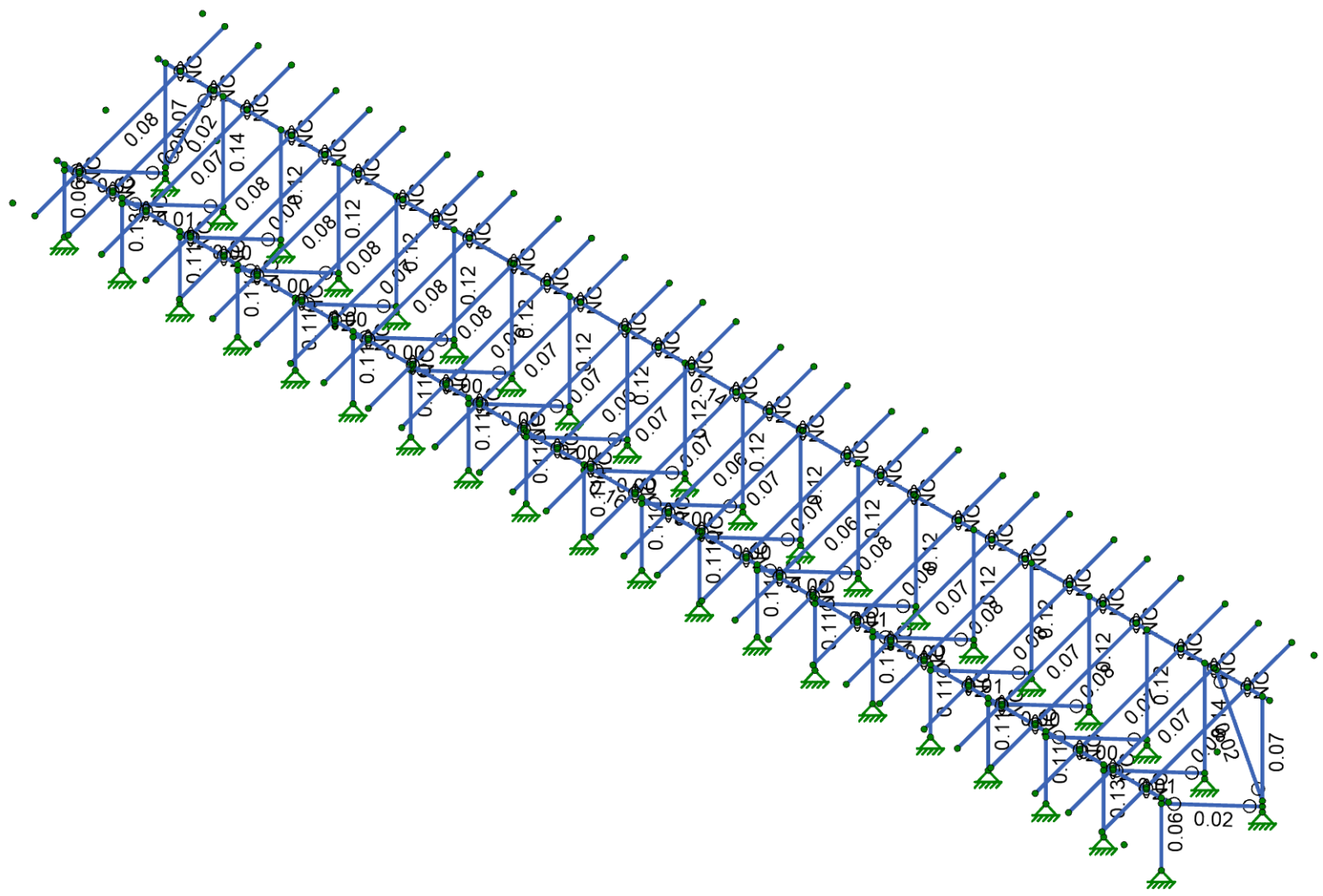
Member Code Checks Displayed (Enveloped)

	Vector Structural Engineering	A14 Large Format Panels - 20 Degree Tilt - 4L	SK-14
	LKN		Jun 20, 2023
	U2716.0371.231		Sunturf A14 - LF - 20deg - 4L.r3d




Shear Check (Env)

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



Member Shear Checks Displayed (Enveloped)

 <p>IRISA A NEMETSCHKE COMPANY</p>	Vector Structural Engineering	A14 Large Format Panels - 20 Degree Tilt - 4L	SK-15
	LKN		Jun 20, 2023
	U2716.0371.231		Sunturf A14 - LF - 20deg - 4L.r3d

Member Area Loads (BLC 2 : Solar Panel Weight)

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

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

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [psf]
1	N197	N200	N199	N196	PY	A-B	-33

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

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [psf]
1	N197	N200	N201	N198	Perp	A-B	-44.8
2	N198	N201	N199	N196	Perp	A-B	-51.7

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

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [psf]
1	N197	N200	N201	N198	Perp	A-B	-75.8
2	N198	N201	N199	N196	Perp	A-B	-6.9

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

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [psf]
1	N197	N200	N201	N198	Perp	A-B	58.6
2	N198	N201	N199	N196	Perp	A-B	55.2

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

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [psf]
1	N197	N200	N201	N198	Perp	A-B	24.1
2	N198	N201	N199	N196	Perp	A-B	72.4

Member Area Loads (BLC 8 : Wind Z)

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [psf]
1	N200	N197	N307	N308	Z	Open Structure	34.48

Envelope Node Reactions

	Node Label		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
1	N2	max	45.763	11	635.822	11	29.838	4	0	15	0	15	0	15
2		min	-18.261	12	-95.162	12	-36.936	6	0	2	0	2	0	2
3	N1	max	202.9	10	1325.16	10	427.877	14	0	15	0	15	0	15
4		min	-170.002	13	-1084.155	13	-373.212	4	0	2	0	2	0	2
5	N151	max	169.641	13	1324.026	10	427.867	14	0	15	0	15	0	15
6		min	-202.69	10	-1082.806	13	-373.202	4	0	2	0	2	0	2
7	N152	max	18.26	12	635.846	11	29.838	4	0	15	0	15	0	15
8		min	-45.766	11	-95.179	12	-36.935	6	0	2	0	2	0	2
9	N305	max	1.115	13	1934.667	10	812.715	6	0	15	0	15	0	15
10		min	-1.613	10	-1619.2	13	-701.944	4	0	2	0	2	0	2
11	N309	max	2.663	12	1261.404	11	45.927	4	0	15	0	15	0	15
12		min	-4.667	11	-228.762	12	-56.842	6	0	2	0	2	0	2
13	N230	max	2.65	10	1934.312	10	825.012	6	0	15	0	15	0	15

Envelope Node Reactions (Continued)

Node Label		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
14		min	13	-1.894	13	-1627.03	13	-711.589	4	0	2	0	2
15	N235	max	11	6.826	11	1242.402	11	46.187	4	0	15	0	15
16		min	12	-3.472	12	-211.078	12	-57.109	6	0	2	0	2
17	N239	max	13	1.104	13	1939.807	10	804.214	6	0	15	0	15
18		min	10	-1.478	10	-1617.246	13	-695.392	4	0	2	0	2
19	N241	max	12	2.249	12	1280.638	11	45.739	4	0	15	0	15
20		min	11	-4.037	11	-244.159	12	-56.662	6	0	2	0	2
21	N245	max	10	4.605	10	1920.793	10	827.159	6	0	15	0	15
22		min	13	-3.507	13	-1618.595	13	-712.947	4	0	2	0	2
23	N247	max	11	10.517	11	1222.005	11	46.234	4	0	15	0	15
24		min	12	-4.702	12	-199.321	12	-57.136	6	0	2	0	2
25	N251	max	13	1.548	13	1964.37	10	809.741	6	0	15	0	15
26		min	10	-1.856	10	-1638.856	13	-700.271	4	0	2	0	2
27	N253	max	12	2.06	12	1303.436	11	45.793	4	0	15	0	15
28		min	11	-4.287	11	-251.975	12	-56.764	6	0	2	0	2
29	N257	max	10	5.417	10	1889.213	10	814.395	6	0	15	0	15
30		min	13	-4.209	13	-1587.077	13	-702.143	4	0	2	0	2
31	N259	max	11	11.801	11	1199.795	11	45.891	4	0	15	0	15
32		min	12	-4.937	12	-196.421	12	-56.711	6	0	2	0	2
33	N263	max	13	2.056	13	2002.032	10	826.171	6	0	15	0	15
34		min	10	-2.319	10	-1680.163	13	-713.984	4	0	2	0	2
35	N265	max	12	2.13	12	1333.755	11	45.812	4	0	15	0	15
36		min	11	-5.106	11	-255.071	12	-56.804	6	0	2	0	2
37	N269	max	10	5.013	10	1842.976	10	786.309	6	0	15	0	15
38		min	13	-3.886	13	-1531.752	13	-679.687	4	0	2	0	2
39	N271	max	11	12.293	11	1146.442	11	44.687	4	0	15	0	15
40		min	12	-5.079	12	-187.651	12	-55.183	6	0	2	0	2
41	N276	max	13	2.391	13	1909.487	10	935.737	6	0	15	0	15
42		min	10	-2.893	10	-1614.859	13	-805.263	12	0	2	0	2
43	N278	max	12	5.476	12	1479.959	11	44.062	4	0	15	0	15
44		min	11	-13.317	11	-275.559	12	-54.93	6	0	2	0	2
45	N282	max	10	1.586	10	1934.675	10	812.719	6	0	15	0	15
46		min	13	-1.061	13	-1619.207	13	-701.947	4	0	2	0	2
47	N284	max	11	4.665	11	1261.399	11	45.927	4	0	15	0	15
48		min	12	-2.666	12	-228.759	12	-56.842	6	0	2	0	2
49	N288	max	13	1.949	13	1934.315	10	825.01	6	0	15	0	15
50		min	10	-2.677	10	-1627.031	13	-711.588	4	0	2	0	2
51	N290	max	12	3.47	12	1242.402	11	46.187	4	0	15	0	15
52		min	11	-6.828	11	-211.079	12	-57.109	6	0	2	0	2
53	N294	max	10	1.452	10	1939.808	10	804.212	6	0	15	0	15
54		min	13	-1.05	13	-1617.246	13	-695.391	4	0	2	0	2
55	N296	max	11	4.036	11	1280.638	11	45.739	4	0	15	0	15
56		min	12	-2.251	12	-244.161	12	-56.662	6	0	2	0	2
57	N300	max	13	3.561	13	1920.79	10	827.164	6	0	15	0	15
58		min	10	-4.632	10	-1618.592	13	-712.95	4	0	2	0	2
59	N302	max	12	4.7	12	1222.005	11	46.234	4	0	15	0	15
60		min	11	-10.518	11	-199.319	12	-57.136	6	0	2	0	2
61	N314	max	10	1.83	10	1964.368	10	809.739	6	0	15	0	15
62		min	13	-1.494	13	-1638.854	13	-700.269	4	0	2	0	2
63	N316	max	11	4.285	11	1303.442	11	45.793	4	0	15	0	15
64		min	12	-2.062	12	-251.98	12	-56.764	6	0	2	0	2
65	N320	max	13	4.264	13	1889.183	10	814.405	6	0	15	0	15
66		min	10	-5.446	10	-1587.051	13	-702.15	4	0	2	0	2
67	N322	max	12	4.935	12	1199.791	11	45.891	4	0	15	0	15
68		min	11	-11.803	11	-196.416	12	-56.711	6	0	2	0	2

Envelope Node Reactions (Continued)

Node Label	X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC		
69	N326	max	2.297	10	2002.214	10	826.145	6	0	15	0	15	0	15
70		min	-2.004	13	-1680.329	13	-713.969	4	0	2	0	2	0	2
71	N328	max	5.106	11	1333.785	11	45.811	4	0	15	0	15	0	15
72		min	-2.133	12	-255.088	12	-56.804	6	0	2	0	2	0	2
73	N332	max	3.959	13	1842.06	10	786.342	6	0	15	0	15	0	15
74		min	-5.063	10	-1530.925	13	-679.705	4	0	2	0	2	0	2
75	N334	max	5.08	12	1146.412	11	44.688	4	0	15	0	15	0	15
76		min	-12.298	11	-187.63	12	-55.185	6	0	2	0	2	0	2
77	N338	max	2.964	10	1911.497	10	935.747	6	0	15	0	15	0	15
78		min	-2.428	13	-1616.957	13	-805.277	12	0	2	0	2	0	2
79	N340	max	13.319	11	1479.947	11	44.062	4	0	15	0	15	0	15
80		min	-5.482	12	-275.54	12	-54.932	6	0	2	0	2	0	2
81	Totals:	max	0	6	56084.193	10	14648.436	14						
82		min	0	13	-26248.769	12	-12712.498	4						

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

Member	Shape	Code Check	Loc[in]	LC	Shear Check	Loc[in]	Dir	LC	Pnc/om [lb]	Pnt/om [lb]	Mnyy/om [lb-ft]	Mnzz/om [lb-ft]	Cb	Eqn	
1	M5	PIPE2.0A21165	0.183	48.324	11	0.057	48.324	6	17060.041	23232.186	1397.505	1397.505	1	H1-1b	
2	M6	PIPE2.0A21165	0.176	7.812	10	0.067	0	6	10552.503	23232.186	1397.505	1397.505	1	H1-1b	
3	M15	1.5X1.5X0.083	0.185	94.885	6	0.023	94.885	y	10	2637.382	14085.15	624.421	624.421	1.136	H1-1b*
4	M19	1.5X1.5X0.083	0.142	84.427	10	0.02	84.427	y	6	3331.201	14085.15	624.421	624.421	1.136	H1-1b*
5	M73	PIPE2.0A21165	0.183	48.324	11	0.057	48.324	6	17060.041	23232.186	1397.505	1397.505	1	H1-1b	
6	M74	PIPE2.0A21165	0.176	7.812	10	0.067	0	6	10552.503	23232.186	1397.505	1397.505	1	H1-1b	
7	M75	1.5X1.5X0.083	0.185	94.884	6	0.023	94.884	y	10	2637.401	14085.15	624.421	624.421	1.136	H1-1b*
8	M75B	1.5X1.5X0.083	0.141	84.54	10	0.02	84.54	y	6	3322.287	14085.15	624.421	624.421	1.136	H1-1b*
9	M71	PIPE2.5A21168	0.306	904.75	10	0.144	721.875	10	20336.2	28358.413	2081.747	2081.747	1	H1-1b	
10	M72	PIPE2.5A21168	0.298	904.75	11	0.159	48.125	11	20336.2	28358.413	2081.747	2081.747	1	H1-1b	
11	M149	PIPE2.0A21165	0.257	4.34	6	0.12	0	6	10552.503	23232.186	1397.505	1397.505	1	H1-1b	
12	M150	1.5X1.5X0.083	0.376	49.419	6	0.004	94.884	y	10	2637.401	14085.15	624.421	624.421	1.136	H1-1a
13	M151	PIPE2.0A21165	0.2	48.324	6	0.111	48.324	6	17060.041	23232.186	1397.505	1397.505	1	H1-1b	
14	M113	PIPE2.0A21165	0.26	4.34	6	0.122	0	6	10552.503	23232.186	1397.505	1397.505	1	H1-1b	
15	M114	1.5X1.5X0.083	0.382	49.419	6	0.004	94.884	y	10	2637.401	14085.15	624.421	624.421	1.136	H1-1a
16	M115	PIPE2.0A21165	0.201	48.324	6	0.113	48.324	6	17060.041	23232.186	1397.505	1397.505	1	H1-1b	
17	M116	PIPE2.0A21165	0.255	4.34	6	0.119	0	6	10552.503	23232.186	1397.505	1397.505	1	H1-1b	
18	M117	1.5X1.5X0.083	0.373	49.419	6	0.004	94.884	y	10	2637.401	14085.15	624.421	624.421	1.136	H1-1a
19	M118	PIPE2.0A21165	0.2	48.324	6	0.11	48.324	6	17060.041	23232.186	1397.505	1397.505	1	H1-1b	
20	M119	PIPE2.0A21165	0.26	4.34	6	0.122	0	6	10552.503	23232.186	1397.505	1397.505	1	H1-1b	
21	M120	1.5X1.5X0.083	0.383	49.419	6	0.005	94.884	y	10	2637.401	14085.15	624.421	624.421	1.136	H1-1a
22	M121	PIPE2.0A21165	0.201	48.324	6	0.114	48.324	6	17060.041	23232.186	1397.505	1397.505	1	H1-1b	
23	M122	PIPE2.0A21165	0.257	4.34	6	0.12	0	6	10552.503	23232.186	1397.505	1397.505	1	H1-1b	
24	M123	1.5X1.5X0.083	0.375	49.419	6	0.003	94.884	y	10	2637.401	14085.15	624.421	624.421	1.136	H1-1a
25	M124	PIPE2.0A21165	0.201	48.324	6	0.111	48.324	6	17060.041	23232.186	1397.505	1397.505	1	H1-1b	
26	M125	PIPE2.0A21165	0.255	4.34	6	0.12	0	6	10552.503	23232.186	1397.505	1397.505	1	H1-1b	
27	M126	1.5X1.5X0.083	0.377	49.419	6	0.005	94.884	y	11	2637.401	14085.15	624.421	624.421	1.136	H1-1a
28	M127	PIPE2.0A21165	0.2	48.324	6	0.112	48.324	6	17060.041	23232.186	1397.505	1397.505	1	H1-1b	
29	M128	PIPE2.0A21165	0.262	4.34	6	0.122	0	6	10552.503	23232.186	1397.505	1397.505	1	H1-1b	
30	M129	1.5X1.5X0.083	0.383	49.419	6	0.003	94.884	y	10	2637.401	14085.15	624.421	624.421	1.136	H1-1a
31	M130	PIPE2.0A21165	0.201	48.324	6	0.113	48.324	6	17060.041	23232.186	1397.505	1397.505	1	H1-1b	
32	M131	PIPE2.0A21165	0.247	4.34	6	0.116	0	6	10552.503	23232.186	1397.505	1397.505	1	H1-1b	
33	M132	1.5X1.5X0.083	0.365	49.419	6	0.005	94.884	y	11	2637.401	14085.15	624.421	624.421	1.136	H1-1a
34	M133	PIPE2.0A21165	0.195	48.324	6	0.108	48.324	6	17060.041	23232.186	1397.505	1397.505	1	H1-1b	
35	M134	PIPE2.0A21165	0.284	4.34	6	0.138	0	6	10552.503	23232.186	1397.505	1397.505	1	H1-1b	
36	M135	1.5X1.5X0.083	0.434	49.419	6	0.005	94.884	y	11	2637.401	14085.15	624.421	624.421	1.136	H1-1a
37	M136	PIPE2.0A21165	0.198	48.324	6	0.131	48.324	6	17060.041	23232.186	1397.505	1397.505	1	H1-1b	
38	M137	PIPE2.0A21165	0.257	4.34	6	0.12	0	6	10552.503	23232.186	1397.505	1397.505	1	H1-1b	

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

Member	Shape	Code	Check	Loc[in]	LC	Shear	Check	Loc[in]	Dir	LC	Pnc/om [lb]	Pnt/om [lb]	Mnyy/om [lb-ft]	Mnzz/om [lb-ft]	Cb	Eqn
39	M138	1.5X1.5X0.083	0.376	49.419	6	0.004	94.884	y	10	2637.401	14085.15	624.421	624.421	1.136	H1-1a	
40	M139	PIPE2.0A21165	0.2	48.324	6	0.111	48.324	6	17060.041	23232.186	1397.505	1397.505	1	H1-1b		
41	M140	PIPE2.0A21165	0.26	4.34	6	0.122	0	6	10552.503	23232.186	1397.505	1397.505	1	H1-1b		
42	M141	1.5X1.5X0.083	0.382	49.419	6	0.004	94.884	y	10	2637.401	14085.15	624.421	624.421	1.136	H1-1a	
43	M142	PIPE2.0A21165	0.201	48.324	6	0.113	48.324	6	17060.041	23232.186	1397.505	1397.505	1	H1-1b		
44	M143	PIPE2.0A21165	0.255	4.34	6	0.119	0	6	10552.503	23232.186	1397.505	1397.505	1	H1-1b		
45	M144	1.5X1.5X0.083	0.373	49.419	6	0.004	94.884	y	10	2637.401	14085.15	624.421	624.421	1.136	H1-1a	
46	M145	PIPE2.0A21165	0.2	48.324	6	0.11	48.324	6	17060.041	23232.186	1397.505	1397.505	1	H1-1b		
47	M146	PIPE2.0A21165	0.26	4.34	6	0.122	0	6	10552.503	23232.186	1397.505	1397.505	1	H1-1b		
48	M147	1.5X1.5X0.083	0.383	49.419	6	0.005	94.884	y	10	2637.401	14085.15	624.421	624.421	1.136	H1-1a	
49	M148	PIPE2.0A21165	0.201	48.324	6	0.114	48.324	6	17060.041	23232.186	1397.505	1397.505	1	H1-1b		
50	M152	PIPE2.0A21165	0.257	4.34	6	0.12	0	6	10552.503	23232.186	1397.505	1397.505	1	H1-1b		
51	M153	1.5X1.5X0.083	0.375	49.419	6	0.003	94.884	y	10	2637.401	14085.15	624.421	624.421	1.136	H1-1a	
52	M154	PIPE2.0A21165	0.201	48.324	6	0.111	48.324	6	17060.041	23232.186	1397.505	1397.505	1	H1-1b		
53	M155	PIPE2.0A21165	0.255	4.34	6	0.12	0	6	10552.503	23232.186	1397.505	1397.505	1	H1-1b		
54	M156	1.5X1.5X0.083	0.377	49.419	6	0.005	94.884	y	11	2637.401	14085.15	624.421	624.421	1.136	H1-1a	
55	M157	PIPE2.0A21165	0.2	48.324	6	0.112	48.324	6	17060.041	23232.186	1397.505	1397.505	1	H1-1b		
56	M158	PIPE2.0A21165	0.262	4.34	6	0.122	0	6	10552.503	23232.186	1397.505	1397.505	1	H1-1b		
57	M159	1.5X1.5X0.083	0.383	49.419	6	0.003	94.884	y	10	2637.401	14085.15	624.421	624.421	1.136	H1-1a	
58	M160	PIPE2.0A21165	0.201	48.324	6	0.113	48.324	6	17060.041	23232.186	1397.505	1397.505	1	H1-1b		
59	M161	PIPE2.0A21165	0.247	4.34	6	0.116	0	6	10552.503	23232.186	1397.505	1397.505	1	H1-1b		
60	M162	1.5X1.5X0.083	0.365	49.419	6	0.005	94.884	y	11	2637.401	14085.15	624.421	624.421	1.136	H1-1a	
61	M163	PIPE2.0A21165	0.195	48.324	6	0.108	48.324	6	17060.041	23232.186	1397.505	1397.505	1	H1-1b		
62	M164	PIPE2.0A21165	0.284	4.34	6	0.138	0	6	10552.503	23232.186	1397.505	1397.505	1	H1-1b		
63	M165	1.5X1.5X0.083	0.434	49.419	6	0.005	94.884	y	11	2637.401	14085.15	624.421	624.421	1.136	H1-1a	
64	M166	PIPE2.0A21165	0.198	48.324	6	0.131	48.324	6	17060.041	23232.186	1397.505	1397.505	1	H1-1b		

Envelope AA ADM1-15: ASD - BUILDING Member Aluminum Code Checks

Member	Shape	Code	Check	Loc[in]	LC	Shear	Check	Loc[in]	Dir	LC	Pnc/om [lb]	Pnt/om [lb]	Mny/om [lb-ft]	Mnz/om [lb-ft]	Vny/om [lb]	Vnz/om [lb]	Cb	Eqn
1	M109	HR300_ALA	0.824	38.5	11	0.078	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.358	H.1-1	
2	M17	HR300_ALA	0.667	127.75	13	0.07	40.25	y	11	4672.013	14342.564	533.921	934.619	7307.692	3206.154	2.178	H.1-1	
3	M21	HR300_ALA	0.85	38.5	11	0.075	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.391	H.1-1	
4	M24	HR300_ALA	0.85	38.5	11	0.076	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.391	H.1-1	
5	M27	HR300_ALA	0.73	38.5	11	0.065	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.39	H.1-1	
6	M30	HR300_ALA	0.85	38.5	11	0.075	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.391	H.1-1	
7	M33	HR300_ALA	0.85	38.5	11	0.076	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.391	H.1-1	
8	M36	HR300_ALA	0.73	38.5	11	0.065	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.39	H.1-1	
9	M39	HR300_ALA	0.85	38.5	11	0.075	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.391	H.1-1	
10	M42	HR300_ALA	0.85	38.5	11	0.075	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.391	H.1-1	
11	M45	HR300_ALA	0.73	38.5	11	0.065	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.39	H.1-1	
12	M48	HR300_ALA	0.85	38.5	11	0.075	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.391	H.1-1	
13	M51	HR300_ALA	0.85	38.5	11	0.075	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.391	H.1-1	
14	M54	HR300_ALA	0.73	38.5	11	0.064	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.39	H.1-1	
15	M57	HR300_ALA	0.85	38.5	11	0.075	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.391	H.1-1	
16	M60	HR300_ALA	0.85	38.5	11	0.075	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.391	H.1-1	
17	M63	HR300_ALA	0.73	38.5	11	0.064	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.39	H.1-1	
18	M66	HR300_ALA	0.85	38.5	11	0.075	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.391	H.1-1	
19	M69	HR300_ALA	0.85	38.5	11	0.075	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.391	H.1-1	
20	M77	HR300_ALA	0.73	38.5	11	0.065	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.39	H.1-1	
21	M80	HR300_ALA	0.85	38.5	11	0.075	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.391	H.1-1	
22	M83	HR300_ALA	0.85	38.5	11	0.075	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.391	H.1-1	
23	M86	HR300_ALA	0.73	38.5	11	0.065	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.39	H.1-1	
24	M89	HR300_ALA	0.85	38.5	11	0.076	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.391	H.1-1	
25	M92	HR300_ALA	0.85	38.5	11	0.075	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.391	H.1-1	
26	M95	HR300_ALA	0.73	38.5	11	0.065	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.39	H.1-1	



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

Member	Shape	Code	Check	Loc[in]	Lc	Shear	Check	Loc[in]	Dir	Lc	Pnc/Om[lb]	Pnt/Om[lb]	Mny/Om[lb-ft]	Mnz/Om[lb-ft]	Vny/Om[lb]	Vnz/Om[lb]	Cb	Eqn
27	M98	HR300_ALA	0.85	38.5	11	0.076	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.391	H.1-1	
28	M101	HR300_ALA	0.85	38.5	11	0.075	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.391	H.1-1	
29	M104	HR300_ALA	0.667	127.75	13	0.07	40.25	y	11	4672.013	14342.564	533.921	934.619	7307.692	3206.154	2.178	H.1-1	
30	M107	HR300_ALA	0.824	38.5	11	0.078	40.25	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.358	H.1-1	



JOB NO.: U2716.0371.231

PROJECT: SunTurf Package A14

SUBJECT: LF CALCULATIONS

DESIGN APPROACH ASD

CONNECTION CAPACITY

Location: Column Base (set screws)

Connection Type: M16 Conical Set Screws

Tensile Capacity: 2600 lbs

Tension Load: 2480 lbs

Check Connection: 95.4%

Result: **Select M16 Conical Set Screws**

Note: Uplift capacity. FOS of (2)

CONNECTION CAPACITY

Location: Column to Cross Beam

Connection Type: K10341-002

Tensile Capacity: 2195 lbs

Tension Load: 1733 lbs

Check Connection: 79.0%

Result: **Select K10341-002**

Note: Uplift capacity. FOS of (2)



JOB NO.: U2716.0371.231

PROJECT: SunTurf Package A14

SUBJECT: LF CALCULATIONS

CONNECTION CAPACITY

Location: Brace to Column

Connection Type: K10219-001

Capacity: 1335 lbs

Tension Load: 1164 lbs

Check Connection: 87.2%

Result: **Select K10219-001**

Note: Axial capacity. FOS of (2)

BOLTED TENSION CONNECTION

Location: Rail to Cross Beam

Bolt Grade: A304 SS (A2-70)

Bolt Diameter: 0.375 in

Number of Bolts: 2

Bolt Capacity: 8410 lbs (AISC Equation J3-1)

Tension Load: 1228 lbs

Check Bolt: 14.6%

Result: **Select (2) 0.375 in. dia. A304 SS (A2-70) bolts.**

Note:



JOB NO.: U2716.0371.231

PROJECT: Sunturf Package A14 Ground Mount

ALTERNATE FOUNDATION OPTION 1: DRILLED CONCRETE PIER



PROJECT: Sunturf Package A14 Ground Mount

DRILLED CONCRETE PIER DESIGN

Column Reactions:

Max. Shear, V [k]:	1.9	Max. Down, P _d [k]:	2.9
Max. Moment, M [k-ft]:	0.0	Max. Uplift, P _u [k]:	2.5

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
-----------------------	-----

Bearing capacity OK.

Check Uplift:

Uplift Capacity [k]:	7.8
----------------------	-----

Uplift capacity OK.

Check Lateral Bearing:

Top of Pier Constrained?:	No
Applied Lateral Force, P [lb]:	1,930
Point of Application, h [ft]:	0.0
S _{max} [psf]:	
S [psf]:	550
A = 2.34*P/(S _b):	5.47
Required Pier Depth, d _{reqd} [ft]:	5.50

IBC Section 1807.3.2.1

IBC Eq. 18-1

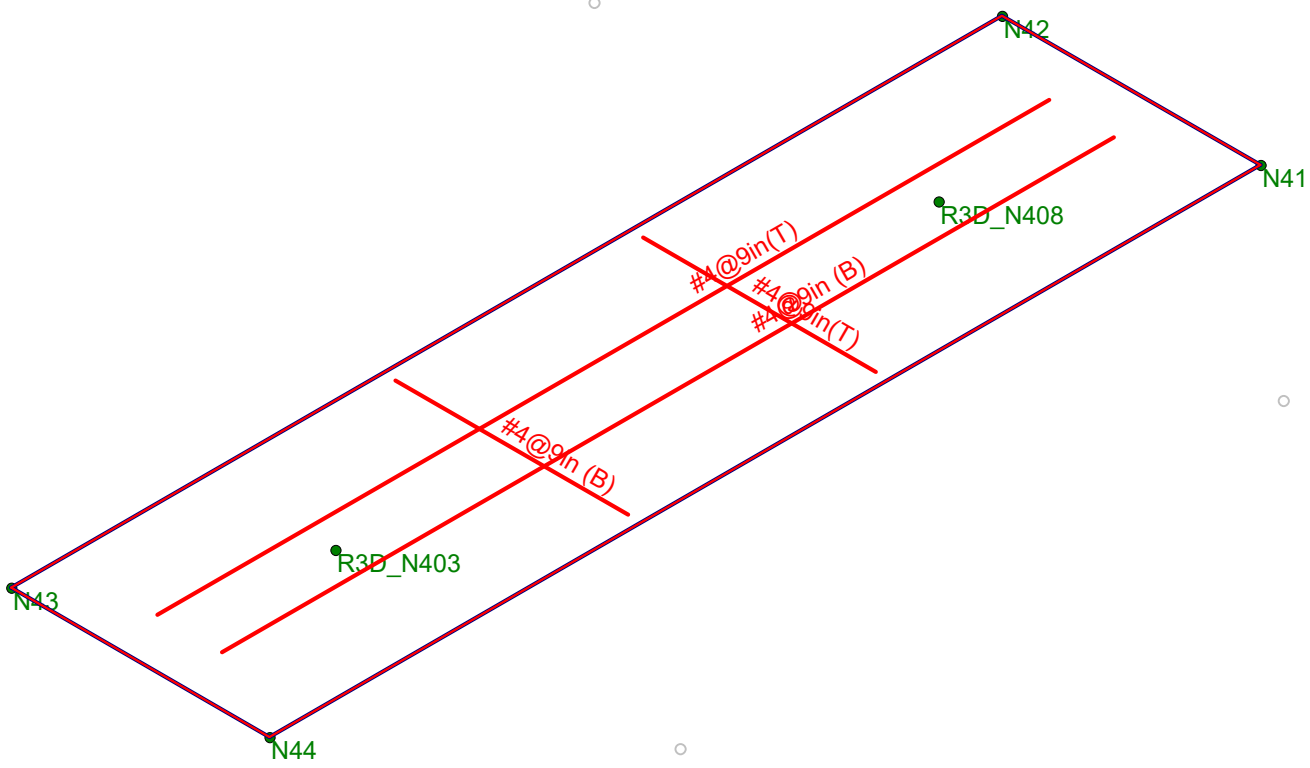
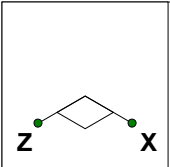
Result: **Lateral bearing capacity OK.**



JOB NO.: U2716.0371.231

PROJECT: Sunturf Package A14 Ground Mount

ALTERNATE FOUNDATION OPTION 2: CONCRETE BALLAST BLOCK



Results for LC 2, 1.0 D

Vector Structural Engineering	SunTurf A14	SK - 1
CJT		June 21, 2023 at 3:22 PM
U2716.0371.231		Sunturf A14 - LF - 35deg - 4L.r3d



Company : Vector Structural Engineering
 Designer : CJT
 Job Number : U2716.0371.231
 Model Name : SunTurf A14

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 Checked By: _____

(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)	0.12
Solver	Sparse Accelerated
Coefficient of Friction	0.3
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	0.65
Pile Safety Factor	3
Min % Steel for Pedestal	Auto
Concrete Stress Block	Rectangular
Concrete Rebar Set	ASTM A615
Include WWR	No
Concrete Code	ACI 318-14
HR Steel Pile Code	AISC 14th (360-10): ASD
Wood Pile Code	AWC NDS-15 / SDPWS-15 ASD

Concrete Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1E...	Density[lb/f...	f'c[psi]	Lambda	Flex Steel[...	Shear Stee...
1	Conc3000NW	3156	1372	0.15	0.6	145	3000	1	60000	60000
2	Conc3500NW	3409	1482	0.15	0.6	145	3500	1	60000	60000
3	Conc4000NW	3644	1584	0.15	0.6	145	4000	1	60000	60000
4	Conc3000LW	2085	907	0.15	0.6	109.999	3000	0.75	60000	60000
5	Conc3500LW	2252	979	0.15	0.6	109.999	3500	0.75	60000	60000
6	Conc4000LW	2408	1047	0.15	0.6	109.999	4000	0.75	60000	60000
7	Conc2500NW	3156	1372	0.15	0.6	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 BarBottom ...	Max Top Bar...	Min Top Bar ...	Max Bot Bar ...	Min Bot Bar ...	Spacing I...	Side Cove...	Rebar Options	
1	Typical	#4	#4	24	9	24	9	1	0	Optimize

Soil Definitions

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

Slabs

	Label	Thickness [in]	Material	Local Axis Angle...	Analysis Offset [in]	Passive Pressur...	Soil Overburden ...	lcr Factor
1	S1	24	Conc3000NW	0	0	0	0	0.25

Load Combinations

	Label	So..Se..A...	SF	Cat...	Fac...	Cat...	Fac...	Cat...	Fac...	Cat...	Fac...	Cat...	Fac...	Cat...	Fac...	Cat...	Fac...	Cat...	Fac...	
1	ASD Loa..																			
2	1.0 D	Yes	Yes	1.5	DL	1														
3	1.0 D + 1..	Yes	Yes	1.5	DL	1	RLL	1												



Company : Vector Structural Engineering
 Designer : CJT
 Job Number : U2716.0371.231
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Load Combinations (Continued)

Label	So	Se	A	SF	Cat	Fac	Cat	Fac	Cat	Fac	Cat	Fac	Cat	Fac	Cat	Fac	Cat	Fac	Cat	Fac
4	1.0 D + 0	Yes	Yes	1.5	DL	1	RLL		OL1	0.6										
5	1.0 D + 0	Yes	Yes	1.5	DL	1	RLL		OL2	0.6										
6	1.0 D + 0	Yes	Yes	1.5	DL	1	RLL		OL3	0.6										
7	1.0 D + 0	Yes	Yes	1.5	DL	1	RLL		OL4	0.6										
8	1.0 D + 0	Yes	Yes	1.5	DL	1	RLL	0.75	OL1	0.45										
9	1.0 D + 0	Yes	Yes	1.5	DL	1	RLL	0.75	OL2	0.45										
10	1.0 D + 0	Yes	Yes	1.5	DL	1	RLL	0.75	OL3	0.45										
11	1.0 D + 0	Yes	Yes	1.5	DL	1	RLL	0.75	OL4	0.45										
12	0.6 D + 0	Yes	Yes		DL	0.6	RLL		OL1	0.6										
13	0.6 D + 0	Yes	Yes		DL	0.6	RLL		OL2	0.6										
14	0.6 D + 0	Yes	Yes		DL	0.6	RLL		OL3	0.6										
15	0.6 D + 0	Yes	Yes		DL	0.6	RLL		OL4	0.6										
16																				
17	LRFD Lo..																			
18	1.4 D	Yes			DL	1.4	RLL													
19	1.2 D + 1	Yes			DL	1.2	RLL	1.6	OL1	0.5										
20	1.2 D + 1	Yes			DL	1.2	RLL	1.6	OL2	0.5										
21	1.2 D + 1	Yes			DL	1.2	RLL	1.6	OL3	0.5										
22	1.2 D + 1	Yes			DL	1.2	RLL	1.6	OL4	0.5										
23	1.2 D + 1	Yes			DL	1.2	RLL		OL1	1										
24	1.2 D + 1	Yes			DL	1.2	RLL		OL2	1										
25	1.2 D + 1	Yes			DL	1.2	RLL		OL3	1										
26	1.2 D + 1	Yes			DL	1.2	RLL		OL4	1										
27	0.9 D + 1	Yes			DL	0.9	RLL		OL1	1										
28	0.9 D + 1	Yes			DL	0.9	RLL		OL2	1										
29	0.9 D + 1	Yes			DL	0.9	RLL		OL3	1										
30	0.9 D + 1	Yes			DL	0.9	RLL		OL4	1										

Design Strips

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

Strip Reinforcing

Label	UC Top	LC	Top Bars	Governin...	UC Bot	LC	Bot Bars/...	Governin...	UC Shear	LC	Governin...	
1	DS1	0.004	27	#4@9in	DS1-X26	0.005	21	#4@9in	DS1-X25	0.004	21	DS1-X25
2	DS2	0.02	24	#4@9in	DS2-X9	0.022	25	#4@9in	DS2-X9	0.025	25	DS2-X9

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	2	S1	0	0	59089.874	0	15432.563	9.99+
2	3	S1	0	0	65462.849	0	17128.212	9.99+
3	4	S1	0	22436.475	59226.444	2744.17	15432.563	2.64
4	5	S1	0	22811.633	59226.444	2303.322	15432.563	2.596
5	6	S1	0	1665.376	59089.874	0	18631.886	9.99+
6	7	S1	0	0	61118.969	0	18310.308	9.99+
7	8	S1	0	16827.356	64180.533	2058.128	16704.3	3.814
8	9	S1	0	17108.725	64180.533	1727.492	16704.3	3.751
9	10	S1	0	1249.032	63869.605	0	19103.791	9.99+
10	11	S1	0	0	65391.427	0	18862.608	9.99+
11	12	S1	0	22436.475	35535.866	2744.17	9259.538	1.584
12	13	S1	0	22811.633	35535.866	2303.322	9259.538	1.558
13	14	S1	0	1665.376	35453.924	0	12458.86	9.99+
14	15	S1	0	0	37483.019	0	12137.283	9.99+



Company : Vector Structural Engineering
 Designer : CJT
 Job Number : U2716.0371.231
 Model Name : SunTurf A14

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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	2	S1	0	3086.513	0	3086.513	9.99+	9.99+
2	3	S1	0	3425.08	2.554	3425.08	9.99+	9.99+
3	4	S1	0	2538.477	1249.558	2538.477	9.99+	2.031
4	5	S1	0	2626.049	1047.952	2626.049	9.99+	2.506
5	6	S1	0	3725.446	1456.812	3725.446	9.99+	2.557
6	7	S1	0	3660.806	1311.153	3660.806	9.99+	2.792
7	8	S1	0	2929.412	935.253	2929.412	9.99+	3.132
8	9	S1	0	2995.091	784.048	2995.091	9.99+	3.82
9	10	S1	0	3819.638	1094.525	3819.638	9.99+	3.49
10	11	S1	0	3771.159	985.28	3771.159	9.99+	3.827
11	12	S1	0	1303.872	1249.558	1303.872	9.99+	1.043
12	13	S1	0	1391.444	1047.952	1391.444	9.99+	1.328
13	14	S1	0	2490.841	1456.812	2490.841	9.99+	1.71
14	15	S1	0	2426.201	1311.153	2426.201	9.99+	1.85

Envelope Slab Soil Pressures

Label	Max UC	Max LC	Soil Pressure[psf]	Allowable Bearing[psf]	Point
S1	0.35	6	525.098	1500	N73



JOB NO.: U2716.0371.231

PROJECT: Sunturf Package A14 Ground Mount

ANCHORAGE DESIGN FOR CONCRETE BALLAST BLOCK

Load Combinations

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	ASD Loads		Y								
2	1.0 D		Y	DL	1						
3	1.0 D + 1.0 S		Y	DL	1	RLL	1				
4	1.0 D + 0.6 W1		Y	DL	1	RLL		OL1	0.6	WLZ	0.6
5	1.0 D + 0.6 W2		Y	DL	1	RLL		OL2	0.6	WLZ	0.6
6	1.0 D + 0.6 W3		Y	DL	1	RLL		OL3	0.6	WLZ	-0.6
7	1.0 D + 0.6 W4		Y	DL	1	RLL		OL4	0.6	WLZ	-0.6
8	1.0 D + 0.45 W1 + 0.75 S		Y	DL	1	RLL	0.75	OL1	0.45	WLZ	0.45
9	1.0 D + 0.45 W2 + 0.75 S		Y	DL	1	RLL	0.75	OL2	0.45	WLZ	0.45
10	1.0 D + 0.45 W3 + 0.75 S		Y	DL	1	RLL	0.75	OL3	0.45	WLZ	-0.45
11	1.0 D + 0.45 W4 + 0.75 S		Y	DL	1	RLL	0.75	OL4	0.45	WLZ	-0.45
12	0.6 D + 0.6 W1		Y	DL	0.6	RLL		OL1	0.6	WLZ	0.6
13	0.6 D + 0.6 W2		Y	DL	0.6	RLL		OL2	0.6	WLZ	0.6
14	0.6 D + 0.6 W3		Y	DL	0.6	RLL		OL3	0.6	WLZ	-0.6
15	0.6 D + 0.6 W4		Y	DL	0.6	RLL		OL4	0.6	WLZ	-0.6
16			Y								
17	LRFD Loads		Y								
18	1.4 D	Yes	Y	DL	1.4	RLL					
19	1.2 D + 1.6 S + 0.5 W1	Yes	Y	DL	1.2	RLL	1.6	OL1	0.5		
20	1.2 D + 1.6 S + 0.5 W2	Yes	Y	DL	1.2	RLL	1.6	OL2	0.5		
21	1.2 D + 1.6 S + 0.5 W3	Yes	Y	DL	1.2	RLL	1.6	OL3	0.5		
22	1.2 D + 1.6 S + 0.5 W4	Yes	Y	DL	1.2	RLL	1.6	OL4	0.5		
23	1.2 D + 1.0 W1	Yes	Y	DL	1.2	RLL		OL1	1		
24	1.2 D + 1.0 W2	Yes	Y	DL	1.2	RLL		OL2	1		
25	1.2 D + 1.0 W3	Yes	Y	DL	1.2	RLL		OL3	1		
26	1.2 D + 1.0 W4	Yes	Y	DL	1.2	RLL		OL4	1		
27	0.9 D + 1.0 W1	Yes	Y	DL	0.9	RLL		OL1	1		
28	0.9 D + 1.0 W2	Yes	Y	DL	0.9	RLL		OL2	1		
29	0.9 D + 1.0 W3	Yes	Y	DL	0.9	RLL		OL3	1		
30	0.9 D + 1.0 W4	Yes	Y	DL	0.9	RLL		OL4	1		

Envelope Node Reactions

Node Label	X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
1 N2 max	42.783	22	896.106	20	109.815	23	0	30	0	30	0	30
2 min	-13.125	27	-346.812	29	-129.132	25	0	18	0	18	0	18
3 N1 max	336.587	25	3053.803	25	1278.909	29	0	30	0	30	0	30
4 min	-337.187	28	-2694.511	28	-1097.291	23	0	18	0	18	0	18
5 N151 max	334.65	28	3044.463	25	1278.88	29	0	30	0	30	0	30
6 min	-333.834	25	-2685.803	28	-1097.193	23	0	18	0	18	0	18
7 N152 max	13.051	27	895.55	20	109.809	23	0	30	0	30	0	30
8 min	-42.462	22	-347.052	29	-129.127	25	0	18	0	18	0	18
9 N237 max	0.338	28	4440.245	25	2551.6	25	0	30	0	30	0	30
10 min	-0.878	21	-3834.931	28	-2189.966	23	0	18	0	18	0	18
11 N239 max	5.917	27	1758.746	20	156.828	23	0	30	0	30	0	30
12 min	-7.521	25	-742.382	29	-181.061	25	0	18	0	18	0	18
13 N253 max	0.845	21	4440.183	25	2551.742	25	0	30	0	30	0	30
14 min	-0.336	28	-3834.809	28	-2190.065	23	0	18	0	18	0	18
15 N255 max	7.714	25	1758.69	20	156.824	23	0	30	0	30	0	30
16 min	-6.009	27	-742.755	29	-181.053	25	0	18	0	18	0	18
17 N264 max	6.163	25	1734.307	20	156.21	23	0	30	0	30	0	30
18 min	-4.761	27	-673.958	29	-180.88	25	0	18	0	18	0	18
19 N271 max	1.342	28	4495.102	25	2589.319	25	0	30	0	30	0	30
20 min	-1.762	21	-3897.576	28	-2223.565	23	0	18	0	18	0	18
21 N273 max	5.962	27	1794.465	20	157.68	23	0	30	0	30	0	30

Envelope Node Reactions (Continued)

Node Label		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC	
22		min	-8.223	26	-829.866	29	-181.346	25	0	18	0	18	0	18
23	N281	max	0.859	21	4407.591	25	2526.638	25	0	30	0	30	0	30
24		min	-0.563	28	-3794.992	28	-2167.8	23	0	18	0	18	0	18
25	N286	max	4.825	26	1754.528	20	156.386	23	0	30	0	30	0	30
26		min	-2.866	27	-672.539	29	-181.034	25	0	18	0	18	0	18
27	N298	max	3.485	28	4490.438	25	2593.933	25	0	30	0	30	0	30
28		min	-3.76	25	-3898.198	28	-2227.301	23	0	18	0	18	0	18
29	N299	max	5.01	27	1799.234	20	157.815	23	0	30	0	30	0	30
30		min	-10.05	26	-868.481	29	-181.246	25	0	18	0	18	0	18
31	N306	max	1.355	21	4459.068	25	2546.503	25	0	30	0	30	0	30
32		min	-1.454	28	-3842.503	28	-2186.108	23	0	18	0	18	0	18
33	N381	max	1.742	21	4494.076	25	2589.198	25	0	30	0	30	0	30
34		min	-1.351	28	-3896.506	28	-2223.377	23	0	18	0	18	0	18
35	N382	max	8.64	26	1794.041	20	157.711	23	0	30	0	30	0	30
36		min	-6.088	27	-830.54	29	-181.382	25	0	18	0	18	0	18
37	N159	max	0.615	28	4415.601	25	2530.696	25	0	30	0	30	0	30
38		min	-0.943	21	-3802.283	28	-2171.406	23	0	18	0	18	0	18
39	N160	max	4.778	27	1737.512	20	156.316	23	0	30	0	30	0	30
40		min	-6.123	25	-674.722	29	-180.989	25	0	18	0	18	0	18
41	N213	max	2.139	23	4488.672	25	2593.014	25	0	30	0	30	0	30
42		min	-2.471	30	-3896.452	28	-2226.475	23	0	18	0	18	0	18
43	N218	max	10.569	26	1798.413	20	157.783	23	0	30	0	30	0	30
44		min	-7.147	27	-867.677	29	-181.218	25	0	18	0	18	0	18
45	N244	max	1.488	28	4453.464	25	2543.638	25	0	30	0	30	0	30
46		min	-1.423	21	-3837.573	28	-2183.584	23	0	18	0	18	0	18
47	N245	max	2.859	27	1752.436	20	156.309	23	0	30	0	30	0	30
48		min	-4.606	26	-672.87	29	-180.948	25	0	18	0	18	0	18
49	N256	max	4.984	25	4400.708	25	2550.443	25	0	30	0	30	0	30
50		min	-4.63	28	-3809.974	28	-2187.654	23	0	18	0	18	0	18
51	N257	max	10.933	22	1758.517	20	156.596	23	0	30	0	30	0	30
52		min	-3.559	27	-834.303	29	-180.216	25	0	18	0	18	0	18
53	N266	max	2.327	28	4580.812	25	2606.22	25	0	30	0	30	0	30
54		min	-2.219	25	-3962.152	28	-2240.439	27	0	18	0	18	0	18
55	N267	max	1.07	27	1814.562	20	156.404	23	0	30	0	30	0	30
56		min	-4.148	22	-731.124	29	-180.415	25	0	18	0	18	0	18
57	N357	max	4.75	25	4245.106	25	2439.167	29	0	30	0	30	0	30
58		min	-4.234	28	-3660.442	28	-2089.128	23	0	18	0	18	0	18
59	N358	max	10.67	22	1664.128	20	152.099	23	0	30	0	30	0	30
60		min	-2.683	27	-747.458	29	-175.755	25	0	18	0	18	0	18
61	N363	max	1.361	28	4344.436	25	2977.13	25	0	30	0	30	0	30
62		min	-1.471	25	-3675.806	28	-2558.249	27	0	18	0	18	0	18
63	N364	max	2.563	27	2070.998	20	151.512	23	0	30	0	30	0	30
64		min	-11.082	22	-901.772	29	-172.522	25	0	18	0	18	0	18
65	N397	max	3.436	27	1758.418	20	156.626	23	0	30	0	30	0	30
66		min	-10.531	22	-835.289	29	-180.248	25	0	18	0	18	0	18
67	N402	max	4.627	28	4400.331	25	2550.626	25	0	30	0	30	0	30
68		min	-5.017	25	-3809.541	28	-2187.749	23	0	18	0	18	0	18
69	N403	max	4.513	22	1814.568	20	156.408	23	0	30	0	30	0	30
70		min	-1.168	27	-730.591	29	-180.423	25	0	18	0	18	0	18
71	N408	max	2.187	25	4581.207	25	2605.924	25	0	30	0	30	0	30
72		min	-2.332	28	-3962.631	28	-2240.242	27	0	18	0	18	0	18
73	N409	max	2.609	27	1664.065	20	152.104	23	0	30	0	30	0	30
74		min	-10.32	22	-747.876	29	-175.764	25	0	18	0	18	0	18
75	N414	max	4.266	28	4242.339	25	2439.437	29	0	30	0	30	0	30
76		min	-4.815	25	-3657.582	28	-2089.237	23	0	18	0	18	0	18



Envelope Node Reactions (Continued)

	Node Label		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
77	N415	max	11.481	22	2071.235	20	151.512	23	0	30	0	30	0	30
78		min	-2.692	27	-901.444	29	-172.519	25	0	18	0	18	0	18
79	N420	max	1.595	25	4356.064	25	2976.928	25	0	30	0	30	0	30
80		min	-1.521	28	-3686.854	28	-2558.24	27	0	18	0	18	0	18
81	Totals:	max	0.003	24	72417.214	21	45832.396	25						
82		min	-0.001	29	-51327.755	27	-39312.01	27						



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1. Project information

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

Project description:
Location:
Fastening description: Anchorage to concrete ballast block

2. Input Data & Anchor Parameters

General

Design method: ACI 318-14
Units: Imperial units

Anchor Information:

Anchor type: Bonded anchor
Material: F593 304/316SS
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 3.000
Code report: ICC-ES ESR-4057
Anchor category: -
Anchor ductility: Yes
 h_{min} (inch): 4.25
 c_{ac} (inch): 4.49
 c_{min} (inch): 1.75
 s_{min} (inch): 2.50

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 edge 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
Reduced installation torque (for AT-3G): Not applicable
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/ 1/2"Ø F593 CW (304/316SS)
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]: 3963

V_{uax} [lb]: 2978

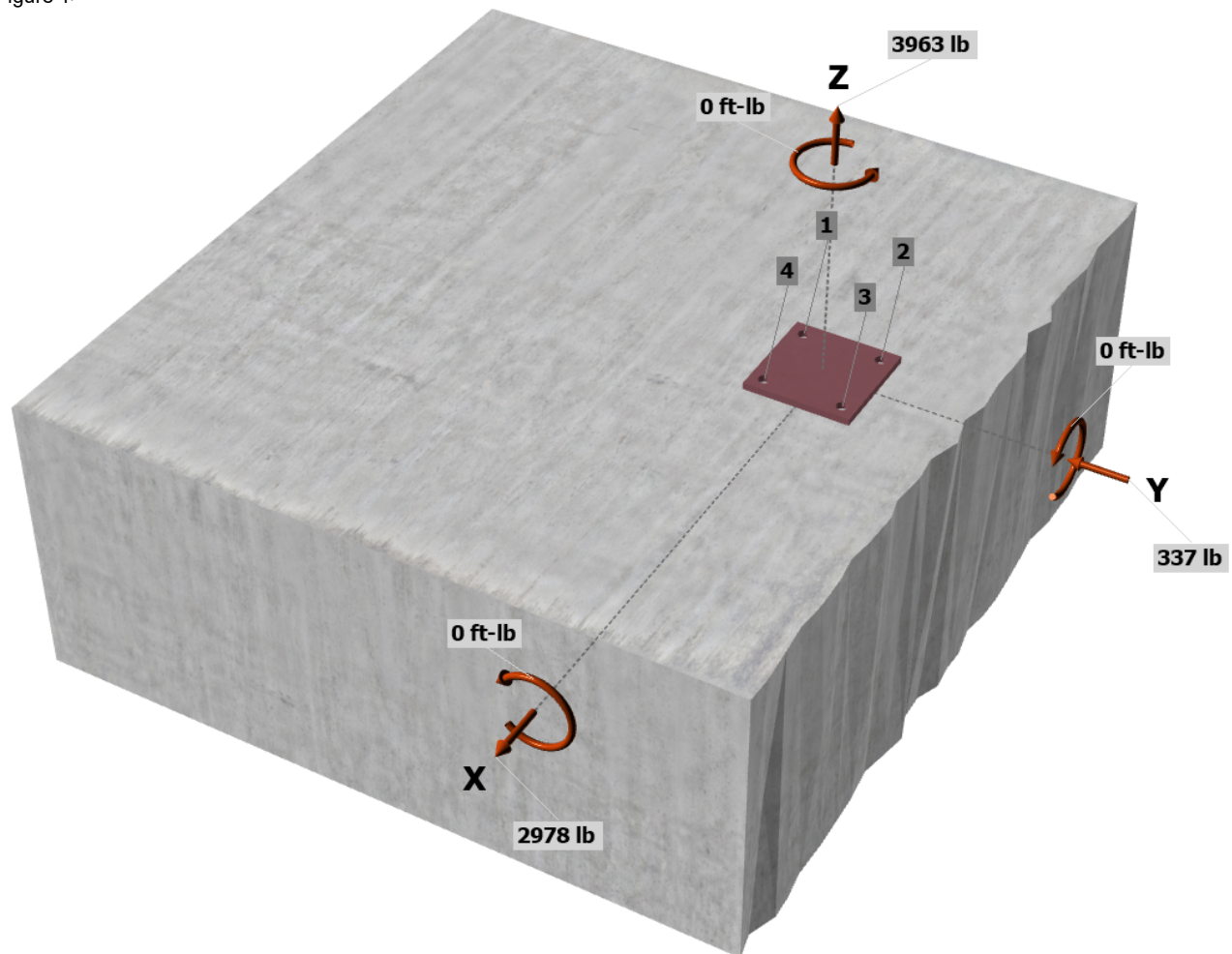
V_{uay} [lb]: -337

M_{ux} [ft-lb]: 0

M_{uy} [ft-lb]: 0

M_{uz} [ft-lb]: 0

<Figure 1>

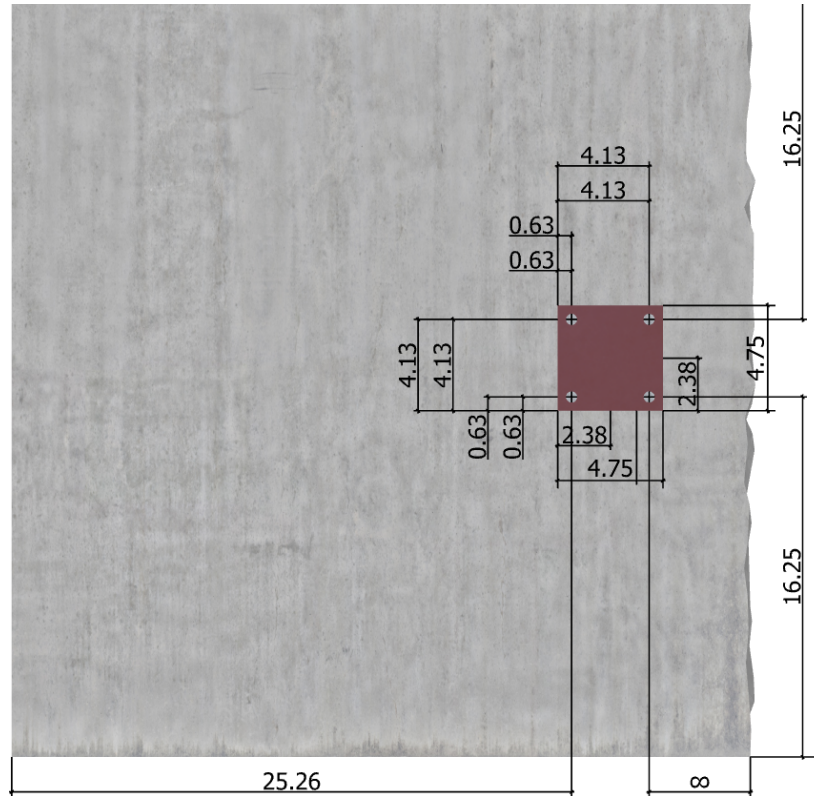


Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.



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<Figure 2>





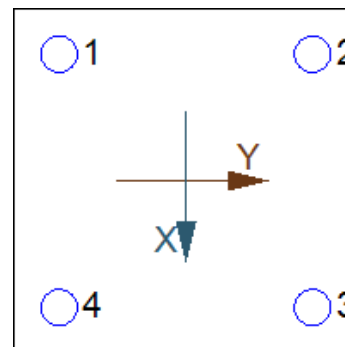
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3. Resulting Anchor Forces

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	990.8	744.5	-84.2	749.2
2	990.8	744.5	-84.2	749.3
3	990.8	744.5	-84.3	749.3
4	990.8	744.5	-84.3	749.2
Sum	3963.0	2978.0	-337.0	2997.0

Maximum concrete compression strain (%): 0.00
 Maximum concrete compression stress (psi): 0
 Resultant tension force (lb): 3963
 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)
14200	0.75	10650

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	3.000	4417

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

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)
156.25	81.00	16.25	1.000	1.000	1.00	1.000	4417	0.65	5538

6. Adhesive Strength of Anchor in Tension (Sec. 17.4.5)

$$\tau_{k,cr} = \tau_{k,cr,short-term} K_{sat} (f'_c / 2,500)^0$$

τ _{k,cr} (psi)	f _{short-term}	K _{sat}	f' _c (psi)	n	τ _{k,cr} (psi)
1304	1.00	1.00	2500	0.24	1304

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

λ _a	τ _{cr} (psi)	d _a (in)	h _{ef} (in)	N _{ba} (lb)
1.00	1304	0.50	3.000	6145

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

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)
300.11	191.09	6.91	16.25	1.000	1.000	1.000	6145	0.55	5308

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



Anchor Designer™
Software
 Version 3.1.2303.1

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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)
8520	1.0	0.65	5538

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	0.500	1.00	2500	19.75	31084

$\phi V_{cbgx} = \phi (A_{vc} / A_{vco}) \Psi_{ec,v} \Psi_{ed,v} \Psi_{c,v} \Psi_{h,v} V_{bx}$ (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)
1401.24	1755.28	1.000	0.956	1.000	1.111	31084	0.70	18445

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	0.500	1.00	2500	16.00	22665

$\phi V_{cbgy} = \phi (A_{vc} / A_{vco}) \Psi_{ec,v} \Psi_{ed,v} \Psi_{c,v} \Psi_{h,v} V_{by}$ (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)
864.00	1152.00	1.000	0.903	1.000	1.000	22665	0.70	10746

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	0.500	1.00	2500	16.25	23199

$\phi V_{cbgx} = \phi (2)(A_{vc} / A_{vco}) \Psi_{ec,v} \Psi_{ed,v} \Psi_{c,v} \Psi_{h,v} V_{by}$ (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)
1254.00	1188.28	1.000	1.000	1.000	1.008	23199	0.70	34541

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	0.500	1.00	2500	16.00	22665

$\phi V_{cbgy} = \phi (2)(A_{vc} / A_{vco}) \Psi_{ec,v} \Psi_{ed,v} \Psi_{c,v} \Psi_{h,v} V_{bx}$ (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)
864.00	1152.00	1.000	1.000	1.000	1.000	22665	0.70	23799

10. Concrete Pryout Strength of Anchor in Shear (Sec. 17.5.3)

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

k_{cp}	A_{Na} (in ²)	A_{Na0} (in ²)	$\Psi_{ed,Na}$	$\Psi_{ec,Na}$	$\Psi_{c,Na}$	N_{ba} (lb)	N_a (lb)
2.0	300.11	191.09	1.000	1.000	1.000	6145	9650

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
156.25	81.00	1.000	1.000	1.000	1.000	4417	8520	0.70

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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ϕV_{cpg} (lb)
11927

11. Results

Interaction of Tensile and Shear Forces (Sec. 17.6)

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status	
Steel	991	10650	0.09	Pass	
Concrete breakout	3963	5538	0.72	Pass	
Adhesive	3963	5308	0.75	Pass (Governs)	
Shear	Factored Load, V_{ua} (lb)	Design Strength, ϕV_n (lb)	Ratio	Status	
Steel	749	5538	0.14	Pass	
T Concrete breakout x+	2978	18445	0.16	Pass	
T Concrete breakout y-	337	10746	0.03	Pass	
Concrete breakout x+	169	34541	0.00	Pass	
Concrete breakout y-	1489	23799	0.06	Pass	
Concrete breakout, combined	-	-	0.16	Pass	
Pryout	2997	11927	0.25	Pass (Governs)	
Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. 17.6.1	0.75	0.00	74.7%	1.0	Pass

SET-3G w/ 1/2"Ø F593 CW (304/316SS) with hef = 3.000 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.