Project Number: U2716-0371-231

July 10, 2023

Sunmodo
14800 NE 65th Street
Vancouver, WA 98682

REFERENCE: Sunmodo Sunturf Ground Mount A14 (Standard 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	2486	1.5	3729
LATERAL	1764	2	3528

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

Digitally signed by Eric Sumsion
DN: CN=Eric Sumsion, email=ericQ@vectorse.com, O=VECTOR STRUCTURAL ENGINEERING LLC, C=US
Date: 2023.07.10 15:00:13-06'00'

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

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Enclosures

ESS/cjt

VECTOR ENGINEERS
651 W GALENA PARK BLVD. #101 (801) 990-1775
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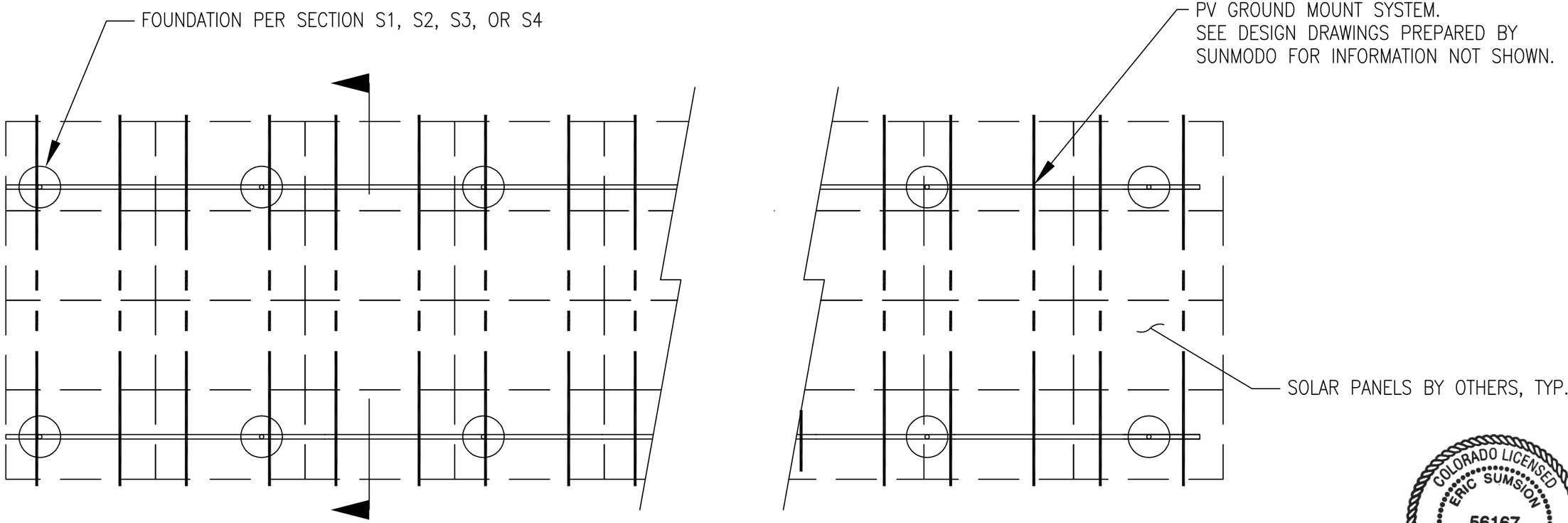
JOB NO. U2716-0371-231

PROJECT SUNMODO SUNTURF GROUND MOUNTS A14

SUBJECT ALL OPTIONS



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PV ARRAY PLAN

N.T.S.

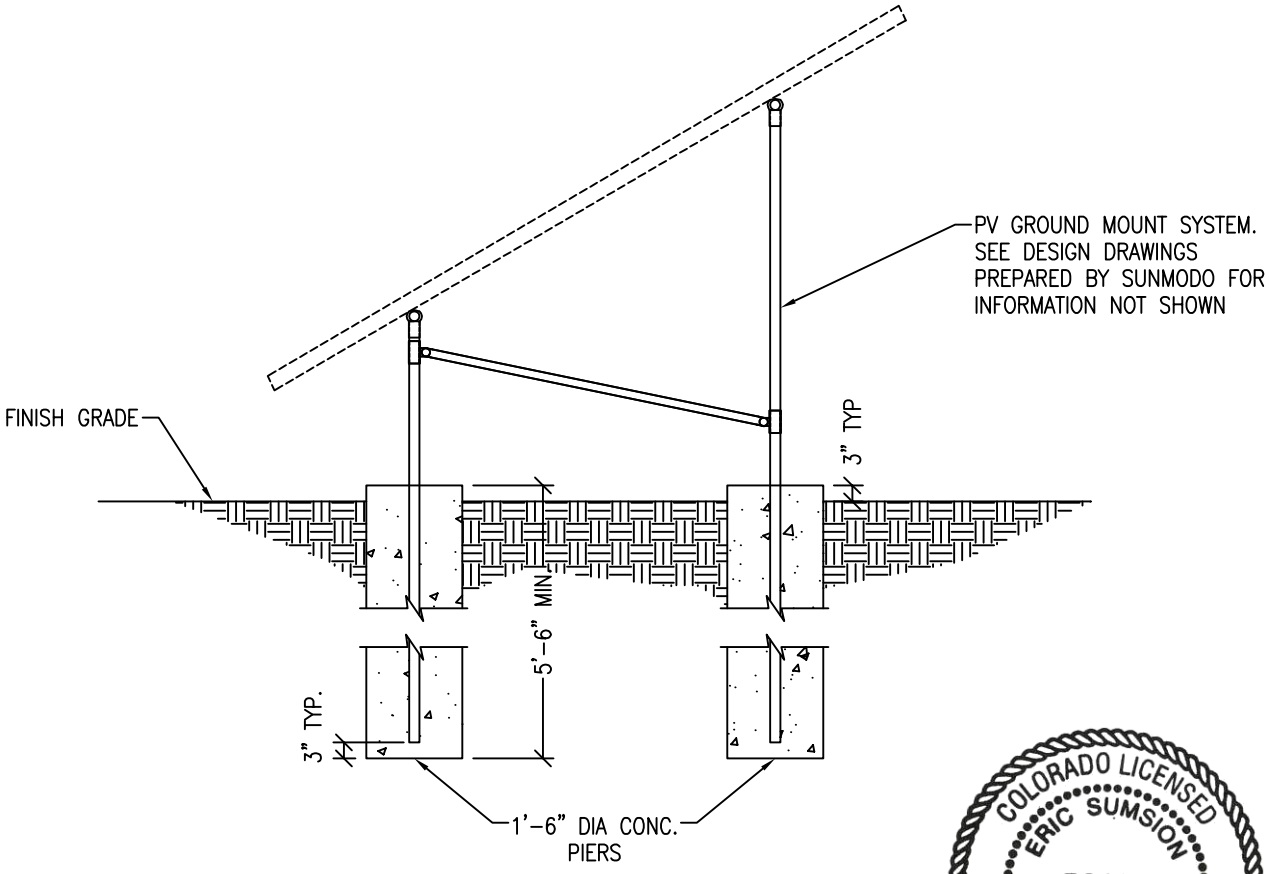
P1

VECTOR ENGINEERS

JOB NO. U2716-0371-231

PROJECT SUNMODO SUNTURF GROUND MOUNTS A14

SUBJECT DRILLED PIER OPTION



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PV ARRAY SECTION

N.T.S.

S1

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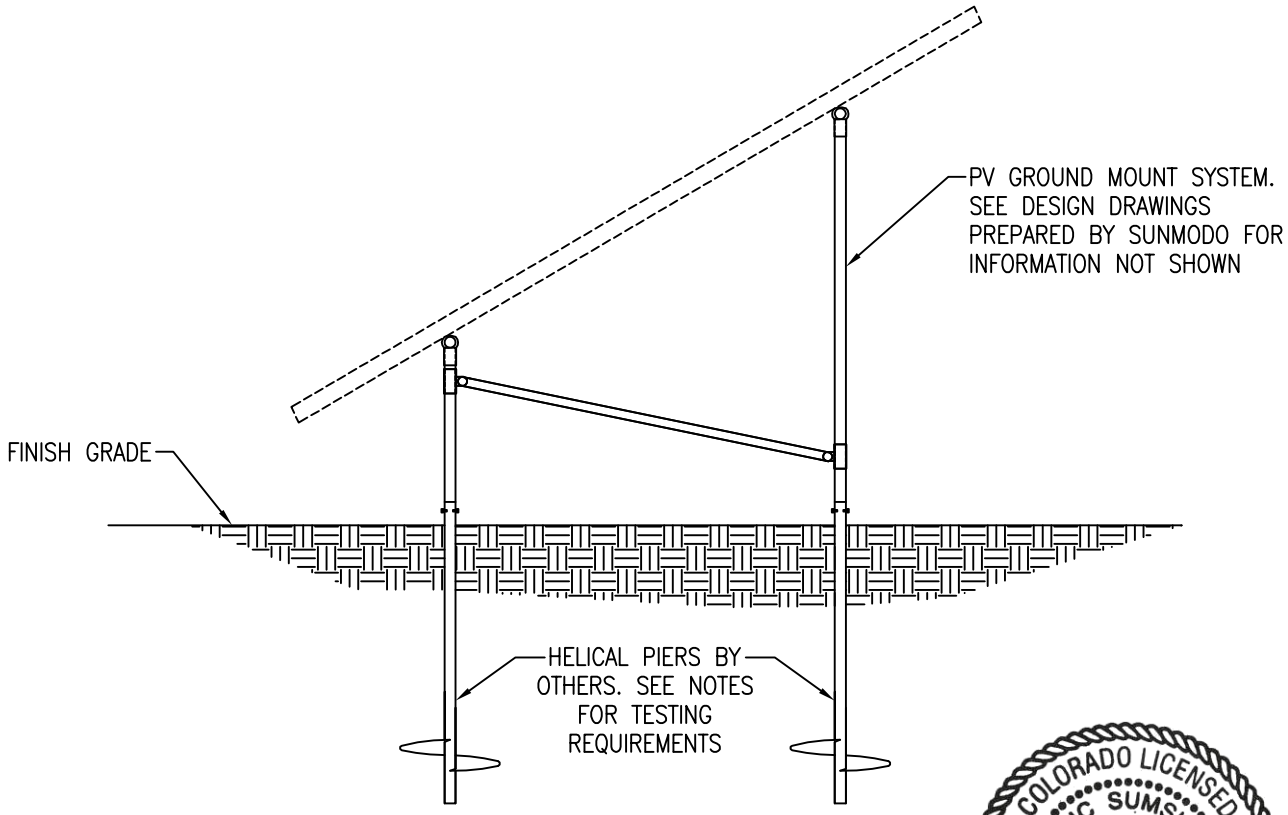
JOB NO. U2716-0371-231

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



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PV ARRAY SECTION S2

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VECTOR ENGINEERS

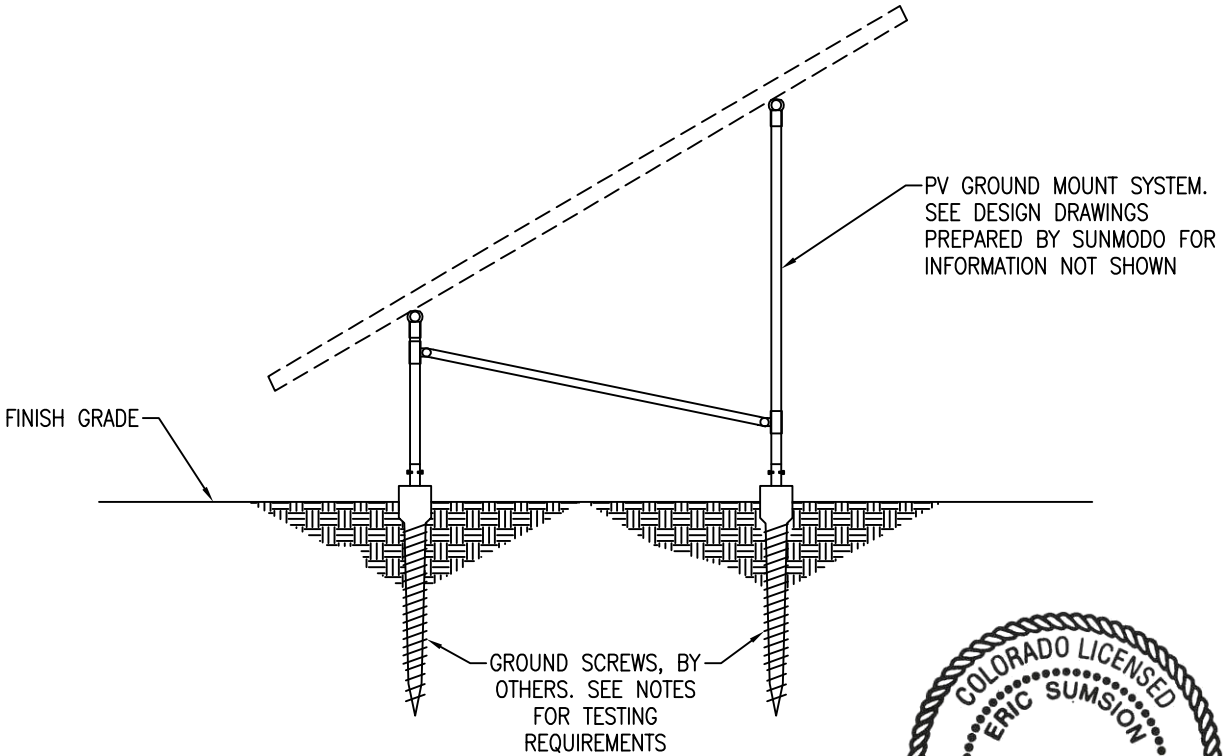
JOB NO. U2716-0371-231

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



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PV ARRAY SECTION S3

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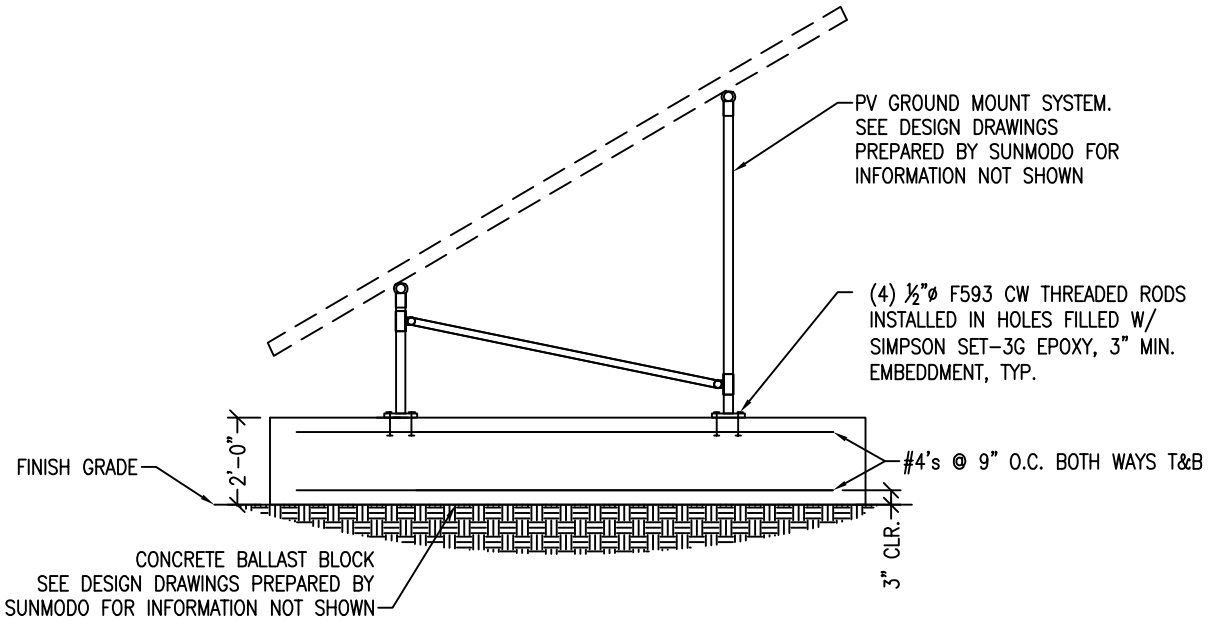
VECTOR ENGINEERS

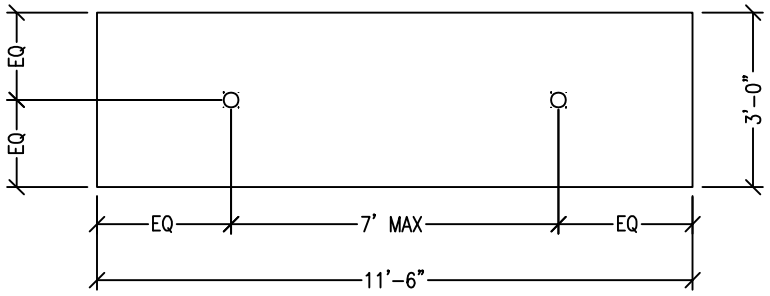
JOB NO. U2716-0371-231

PROJECT SUNMODO SUNTURF GROUND MOUNTS A14

SUBJECT BALLASTED BLOCK OPTION



SECTION VIEW



PLAN VIEW

PV ARRAY SECTION

N.T.S.

S4

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JOB NO.: U2716.0371.231

PROJECT: Sunturf Package A14 Ground Mount

DESIGN LOADS

JOB NO.: U2716.0371.231
SUBJECT: SNOW 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)

JOB NO.: U2716.0371.231
SUBJECT: WIND PRESSURES

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 (γ = 0°, Load Case A)	-1.3	-1.5
Case 2 (γ = 0°, Load Case B)	-2.2	-0.2
Case 3 (γ = 180°, Load Case A)	1.6	1.7
Case 4 (γ = 180°, Load Case B)	2.1	0.7

Design Wind Pressures per Equation 27.3-2 [psf]

Clear Wind Flow	q_hGC_{NW}	q_hGC_{NL}
Case 1 (γ = 0°, Load Case A)	-44.8	-51.7
Case 2 (γ = 0°, Load Case B)	-75.8	-6.9
Case 3 (γ = 180°, Load Case A)	55.2	58.6
Case 4 (γ = 180°, Load Case B)	72.4	24.1
Case 5 (γ = 0°, 16 psf Min. Horiz.)	-16.0	-16.0
Case 6 (γ = 180°, 16 psf Min. Horiz)	16.0	16.0

JOB NO.: U2716.0371.231
SUBJECT: SNOW 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 [°]:	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)

JOB NO.: U2716.0371.231
SUBJECT: WIND PRESSURES

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 (γ = 0°, Load Case A)	-1.8	-1.8
Case 2 (γ = 0°, Load Case B)	-2.4	-0.6
Case 3 (γ = 180°, Load Case A)	2.1	2.1
Case 4 (γ = 180°, Load Case B)	2.7	1.1

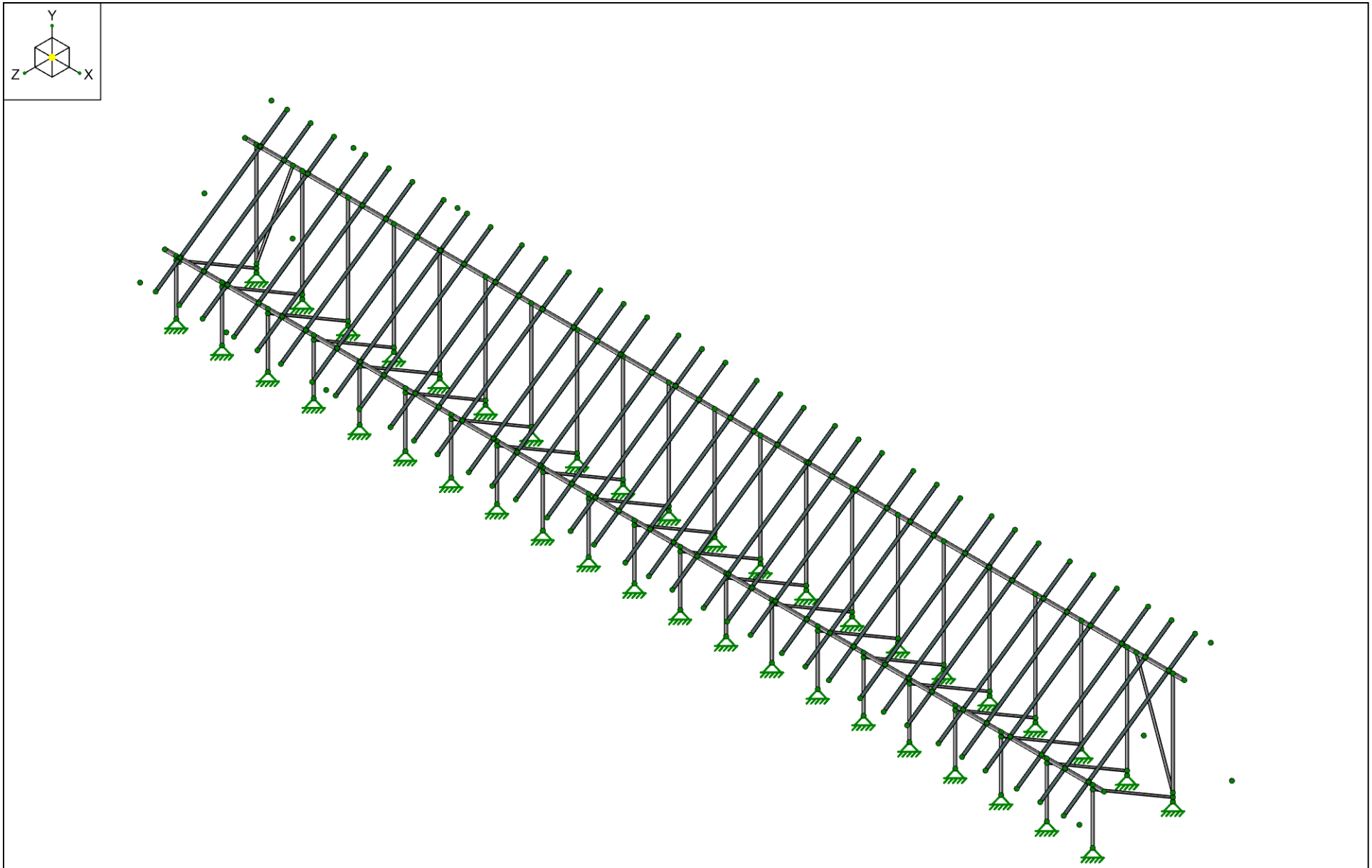
Design Wind Pressures per Equation 27.3-2 [psf]

Clear Wind Flow	q_hGC_{NW}	q_hGC_{NL}
Case 1 (γ = 0°, Load Case A)	-62.1	-62.1
Case 2 (γ = 0°, Load Case B)	-82.7	-20.7
Case 3 (γ = 180°, Load Case A)	72.4	72.4
Case 4 (γ = 180°, Load Case B)	93.1	37.9
Case 5 (γ = 0°, 16 psf Min. Horiz.)	-16.0	-16.0
Case 6 (γ = 180°, 16 psf Min. Horiz)	16.0	16.0

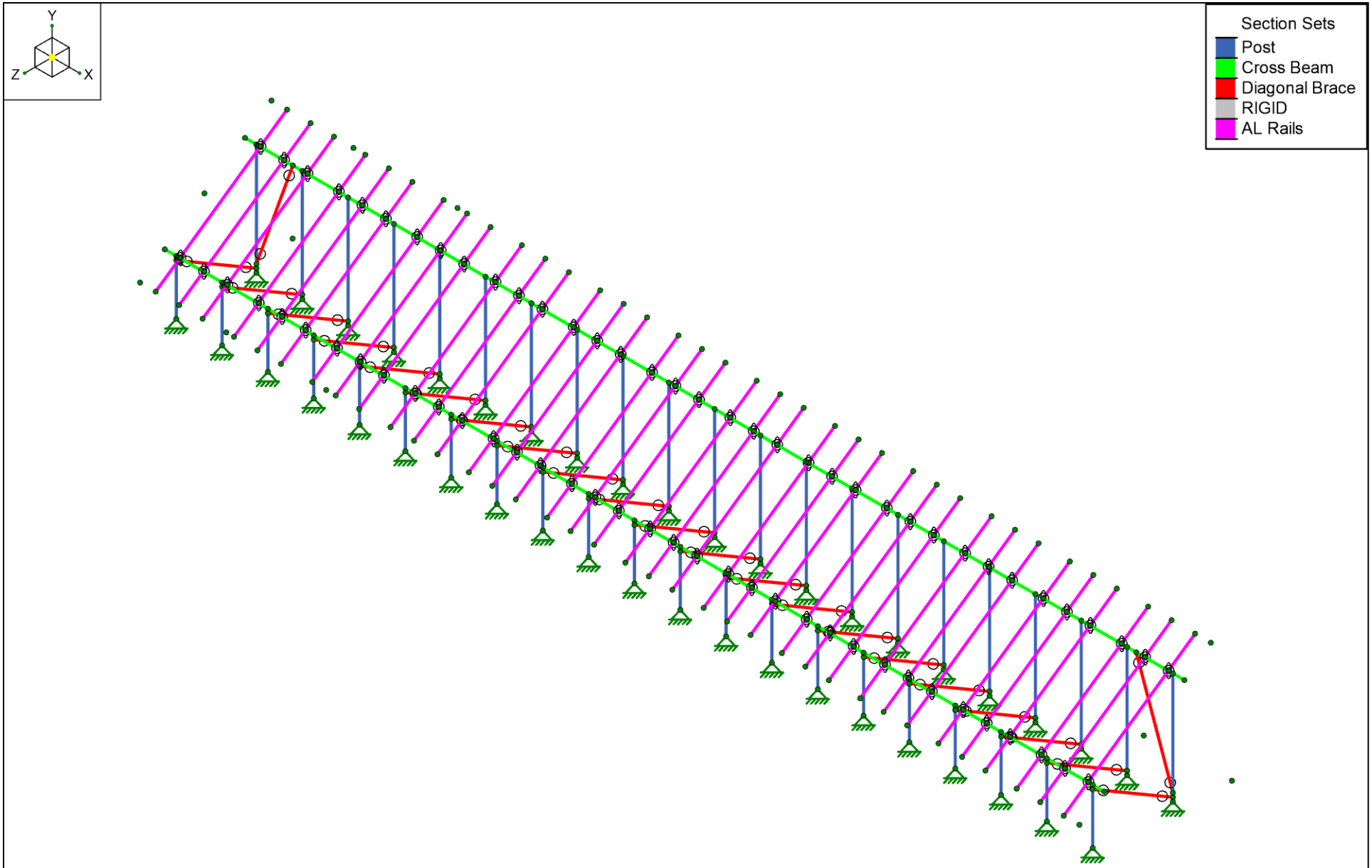
JOB NO.: U2716.0371.231

PROJECT: Sunturf Package A14 Ground Mount

RACKING ANALYSIS



RISA A NEMETSCHEK COMPANY	Vector Structural Engineering	A14 Standard Panels - 35 Degree Tilt - 4L	SK-1
	LKN		Jun 20, 2023
	U2716.0371.231		Sunturf A14 - SP - 35deg - 4L.r3d



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	LKN		Jun 20, 2023
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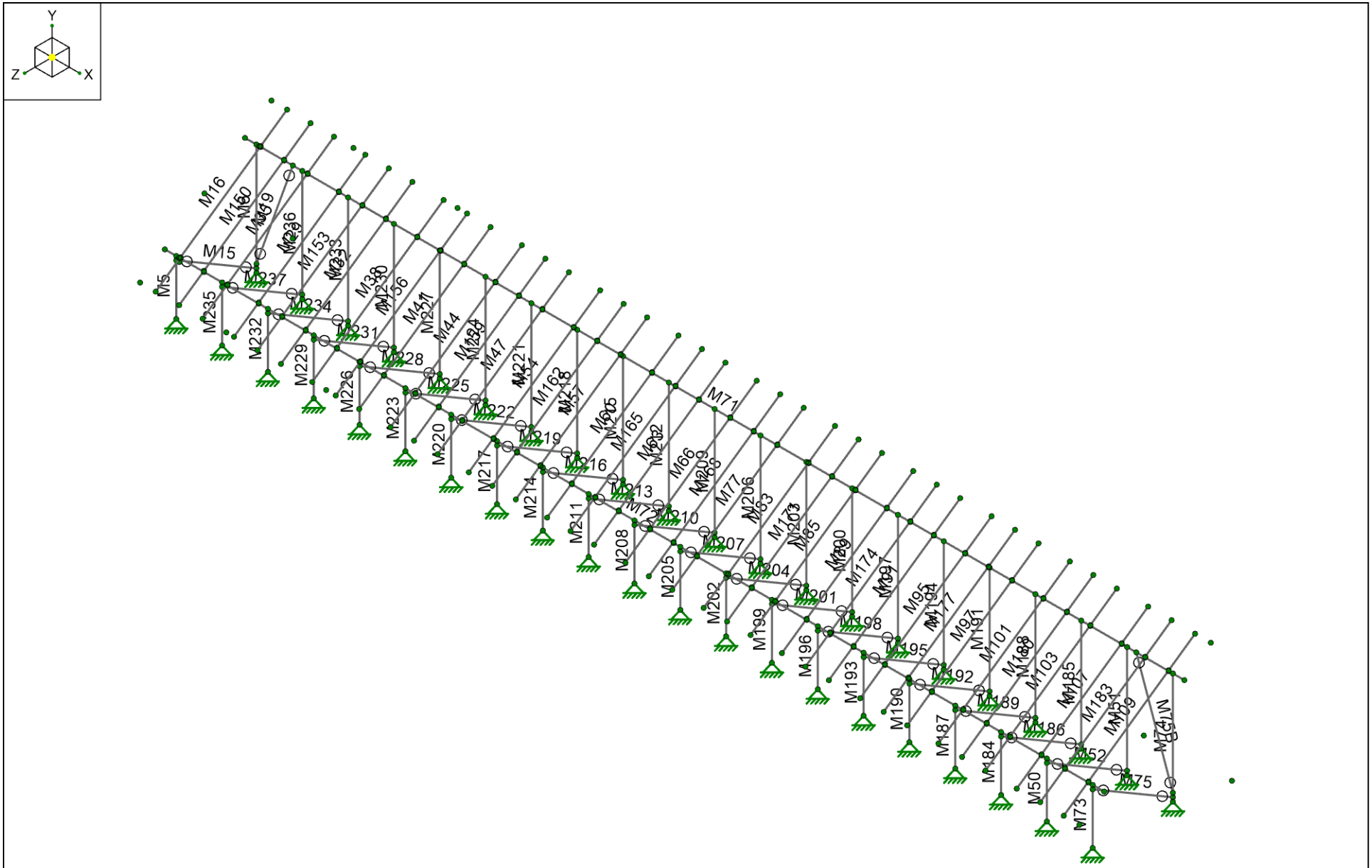

RISA A NEMETSCHEK COMPANY	Vector Structural Engineering	A14 Standard Panels - 35 Degree Tilt - 4L	SK-3
	LKN		Jun 20, 2023
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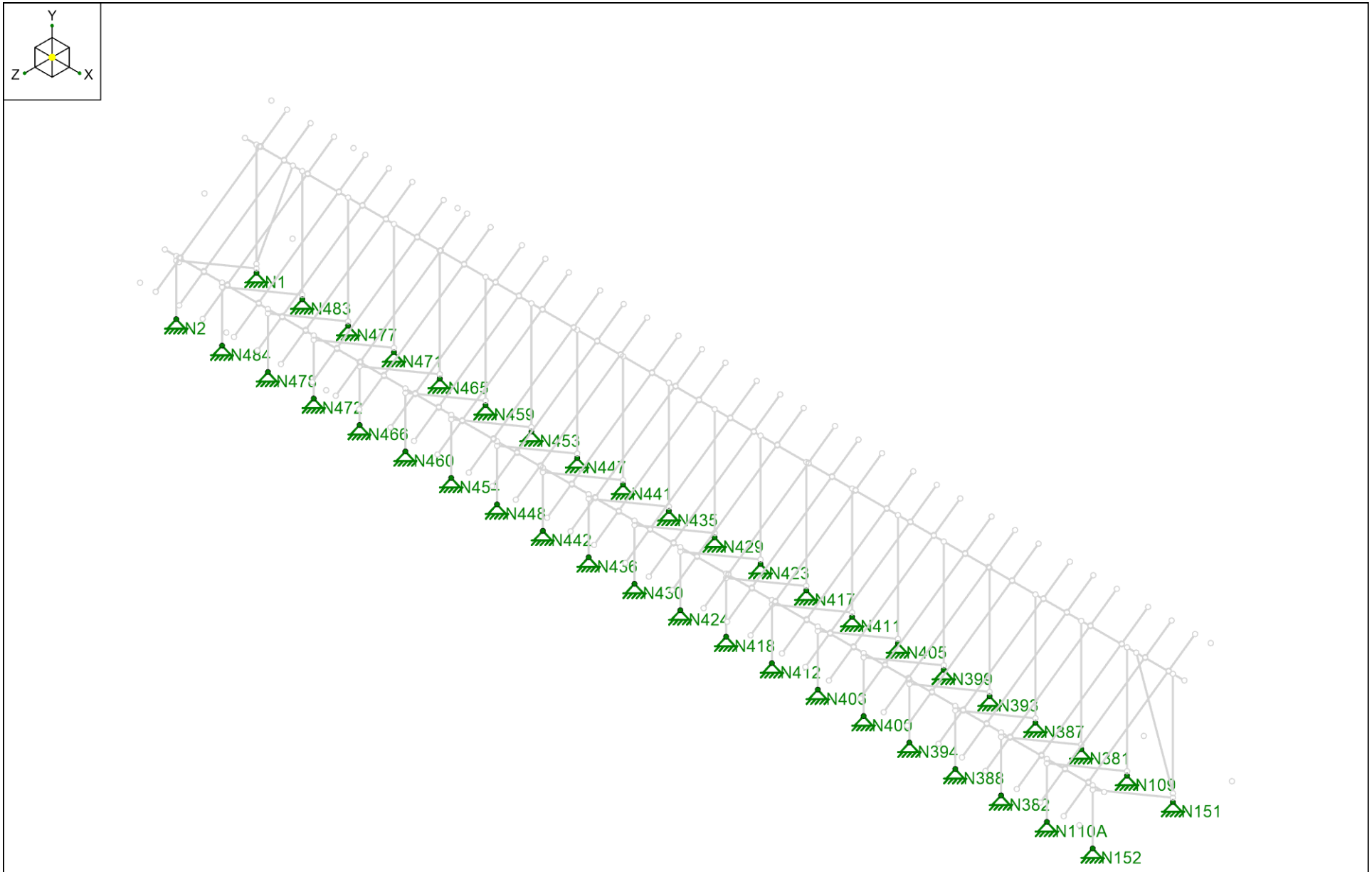

RISA A NEMETSCHEK COMPANY	Vector Structural Engineering	A14 Standard Panels - 35 Degree Tilt - 4L	SK-4
	LKN		Jun 20, 2023
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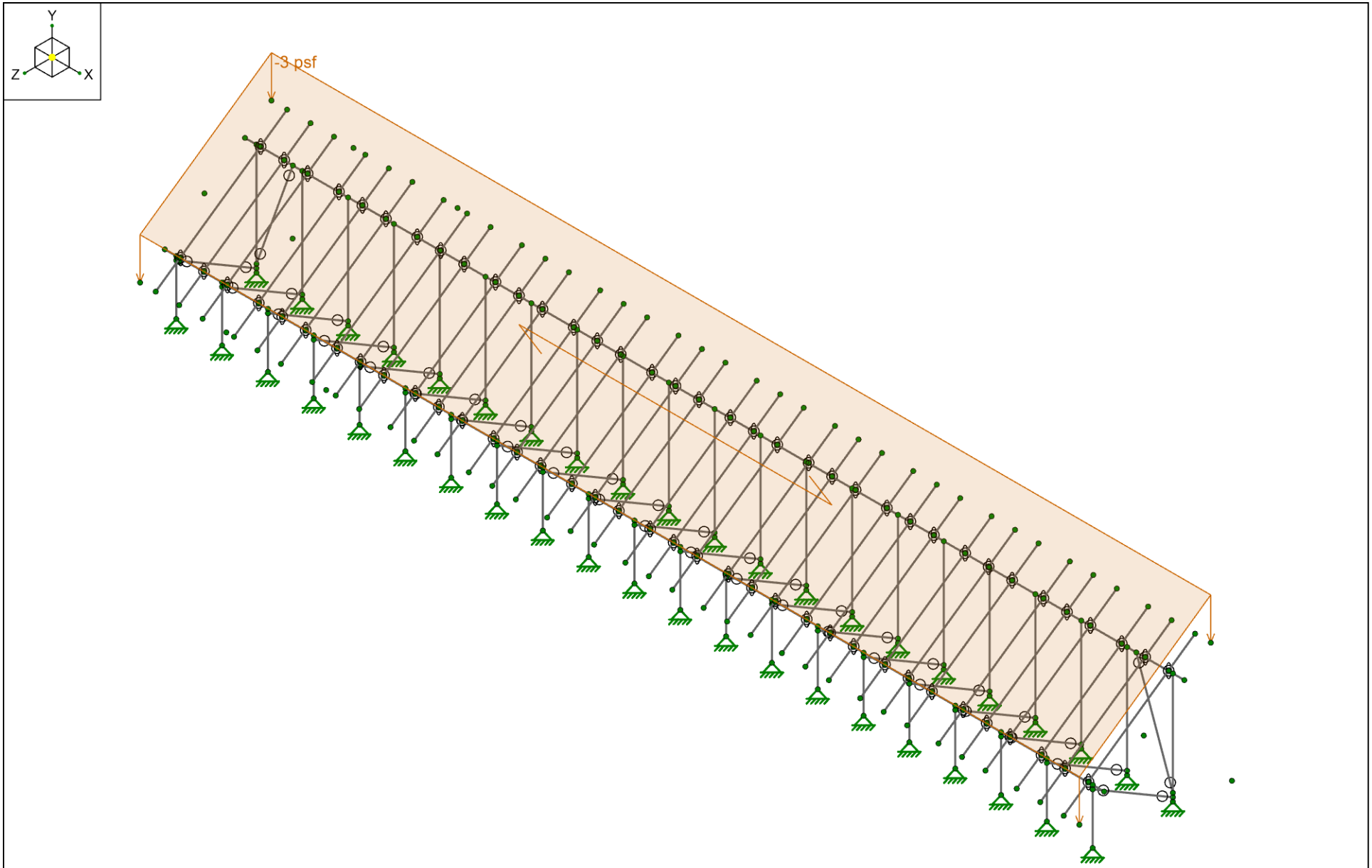
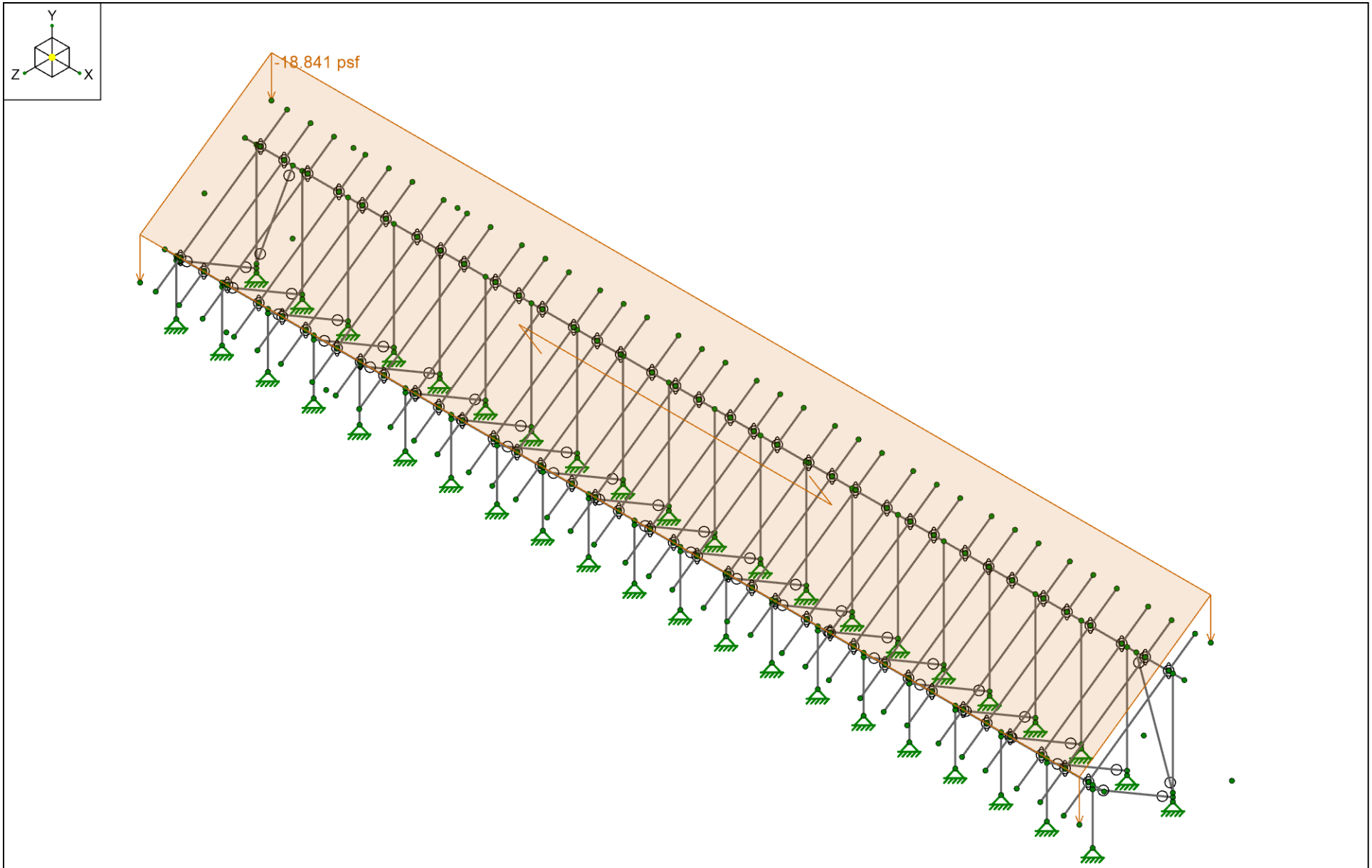


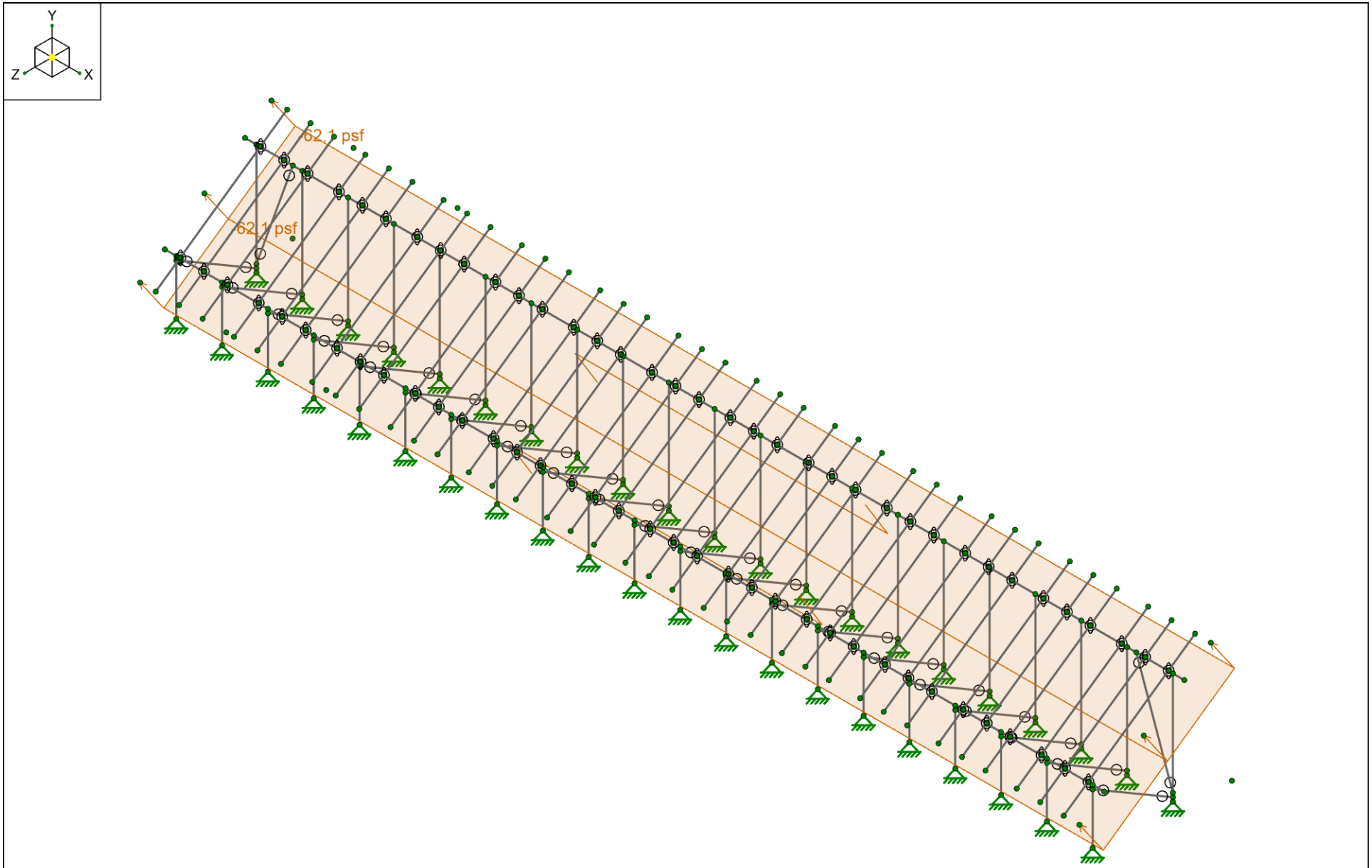
Loads: BLC 2, Solar Panel Weight

RISA A NEMETSCHEK COMPANY	Vector Structural Engineering	A14 Standard Panels - 35 Degree Tilt - 4L	SK-5
	LKN		Jun 20, 2023
	U2716.0371.231		Sunturf A14 - SP - 35deg - 4L.r3d



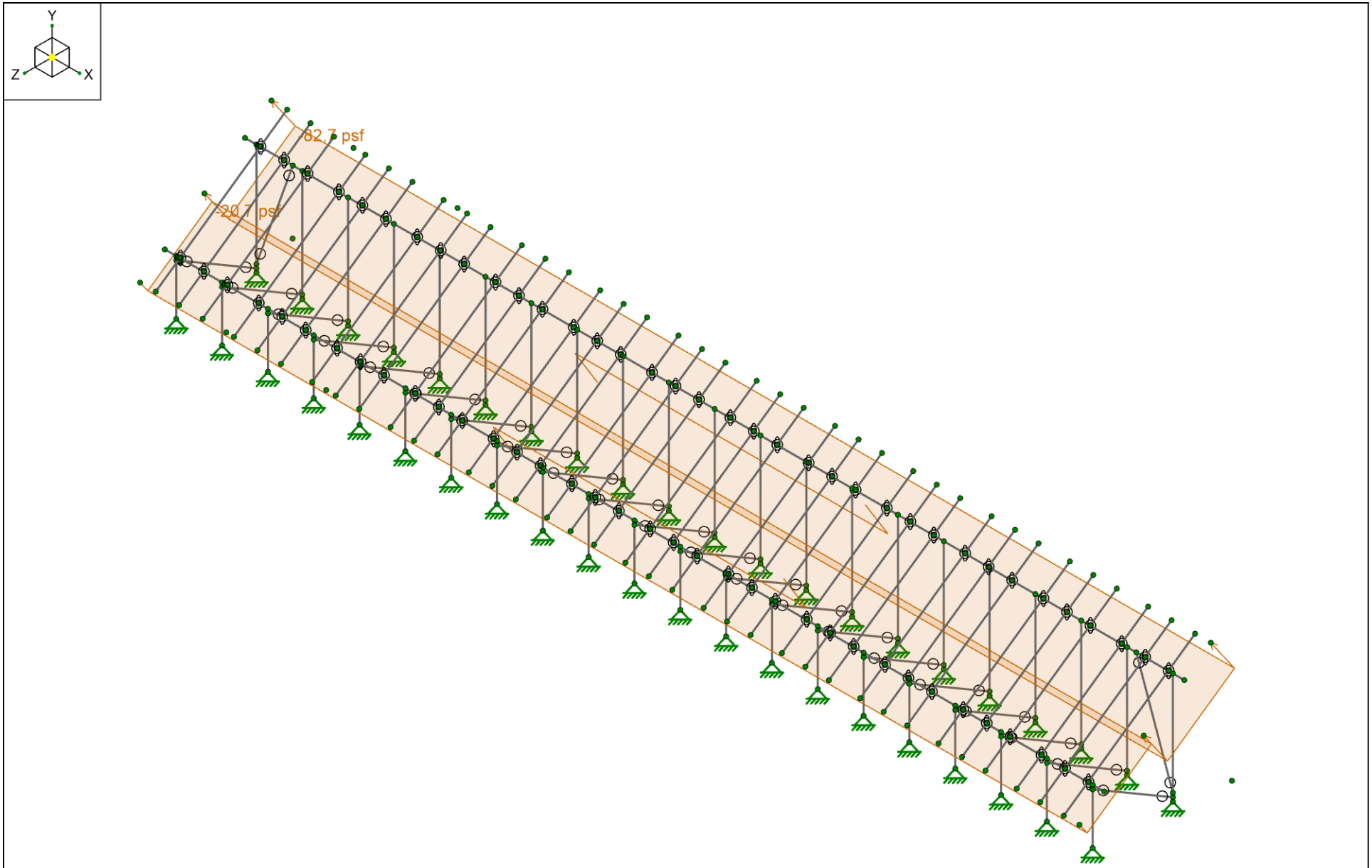
Loads: BLC 3, Roof Live/Snow

RISA A NEMETSCHEK COMPANY	Vector Structural Engineering	A14 Standard Panels - 35 Degree Tilt - 4L	SK-6
	LKN		Jun 20, 2023
	U2716.0371.231		Sunturf A14 - SP - 35deg - 4L.r3d



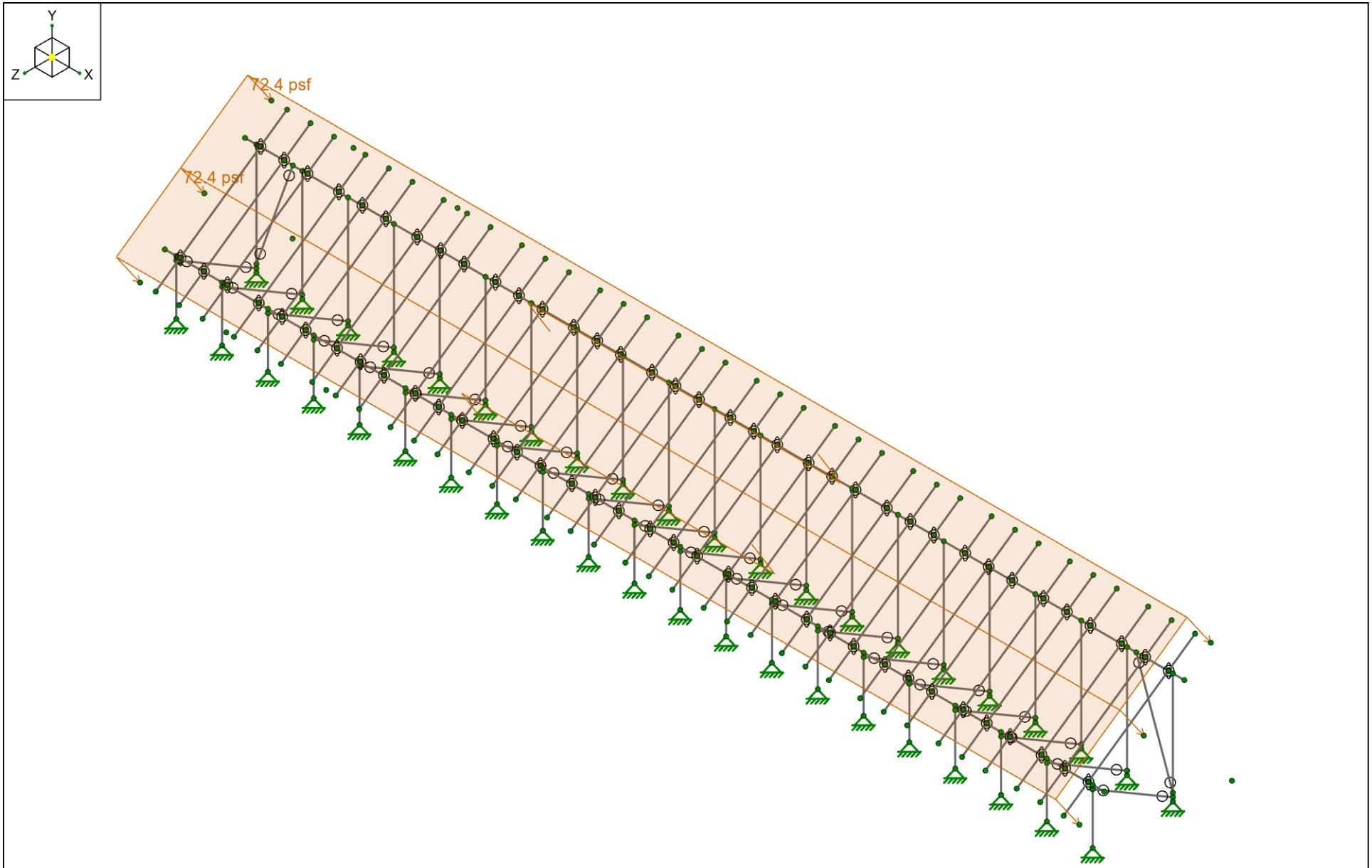
Loads: BLC 4, Wind A 0 deg

RISA A NEMETSCHEK COMPANY	Vector Structural Engineering	A14 Standard Panels - 35 Degree Tilt - 4L	SK-7
	LKN		Jun 20, 2023
	U2716.0371.231		Sunturf A14 - SP - 35deg - 4L.r3d



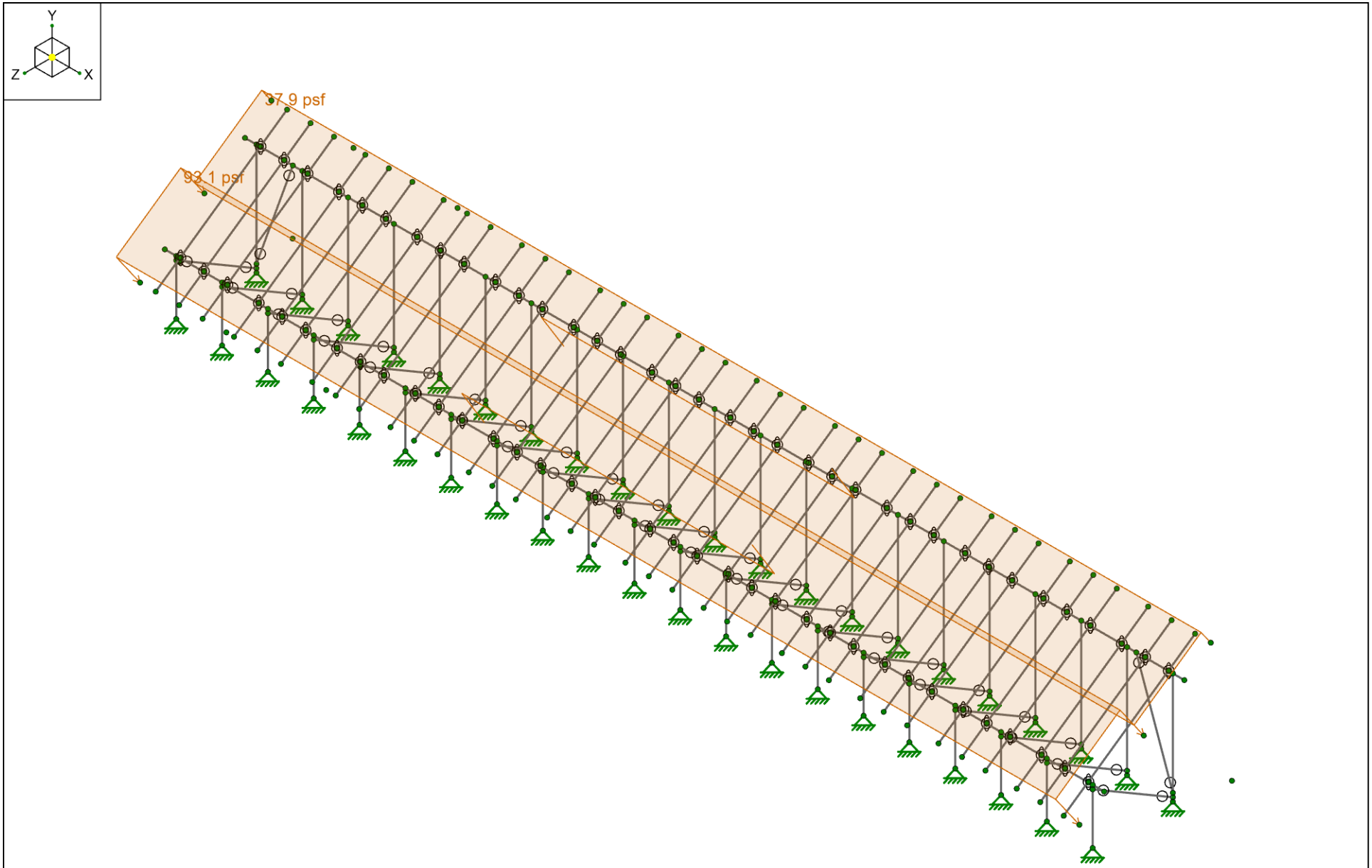
Loads: BLC 5, Wind B 0 deg

RISA A NEMETSCHEK COMPANY	Vector Structural Engineering	A14 Standard Panels - 35 Degree Tilt - 4L	SK-8
	LKN		Jun 20, 2023
	U2716.0371.231		Sunturf A14 - SP - 35deg - 4L.r3d



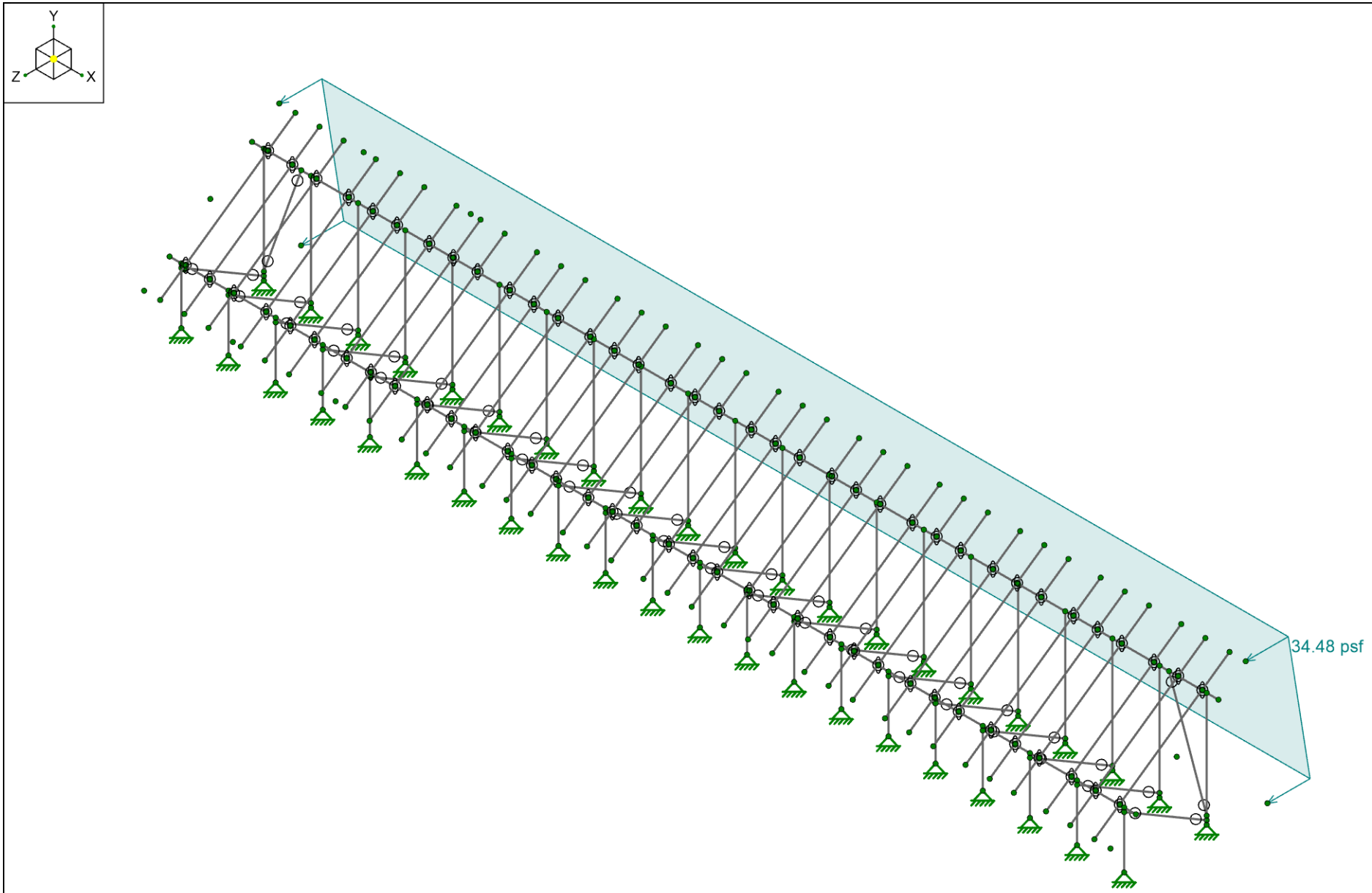
Loads: BLC 6, Wind A 180 deg

RISA A NEMETSCHEK COMPANY	Vector Structural Engineering	A14 Standard Panels - 35 Degree Tilt - 4L	SK-9
	LKN		Jun 20, 2023
	U2716.0371.231		Sunturf A14 - SP - 35deg - 4L.r3d



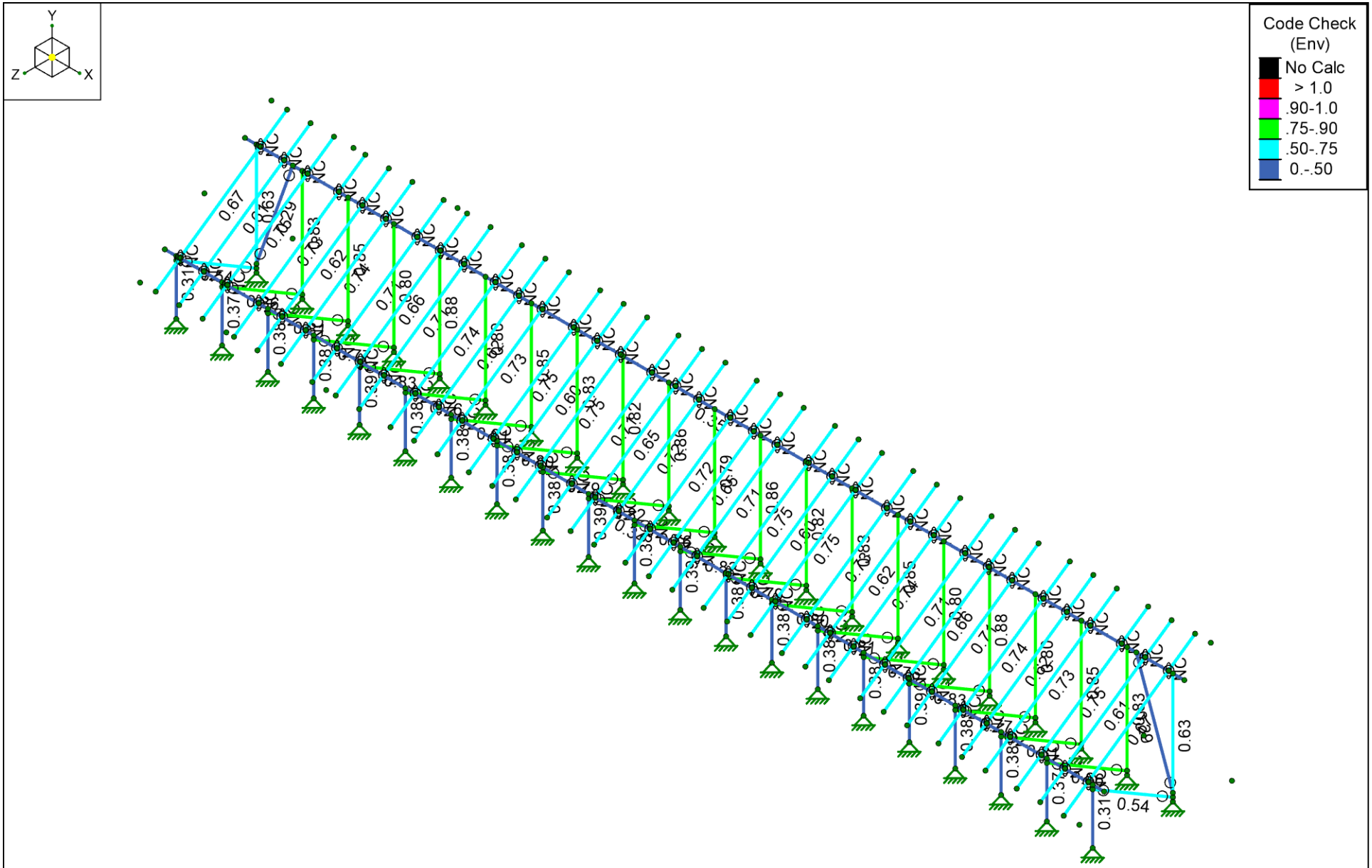
Loads: BLC 7, Wind B 180 deg

RISA A NEMETSCHEK COMPANY	Vector Structural Engineering	A14 Standard Panels - 35 Degree Tilt - 4L	SK-10
	LKN		Jun 20, 2023
	U2716.0371.231		Sunturf A14 - SP - 35deg - 4L.r3d



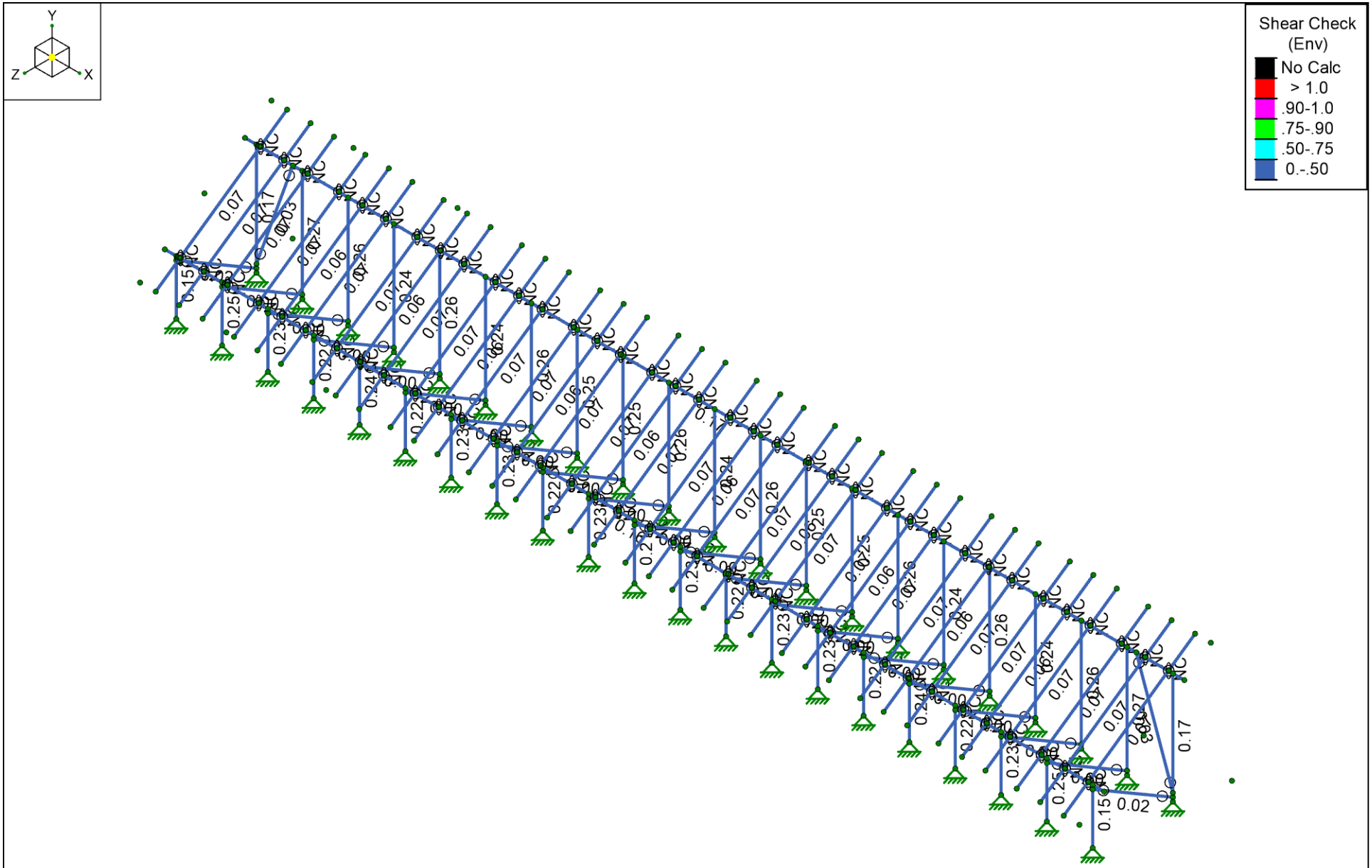
Loads: BLC 8, Wind Z

RISA A NEMETSCHEK COMPANY	Vector Structural Engineering	A14 Standard Panels - 35 Degree Tilt - 4L	SK-11
	LKN		Jun 20, 2023
	U2716.0371.231		Sunturf A14 - SP - 35deg - 4L.r3d



Member Code Checks Displayed (Enveloped)

RISA A NEMETSCHEK COMPANY	Vector Structural Engineering	A14 Standard Panels - 35 Degree Tilt - 4L	SK-12
	LKN		Jun 20, 2023
	U2716.0371.231		Sunturf A14 - SP - 35deg - 4L.r3d



Member Shear Checks Displayed (Enveloped)

RISA A NEMETSCHEK COMPANY	Vector Structural Engineering	A14 Standard Panels - 35 Degree Tilt - 4L	SK-13
	LKN		Jun 20, 2023
	U2716.0371.231		Sunturf A14 - SP - 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

Model Settings (Continued)

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

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e⁵°F⁻¹]	Density [lb/ft³]	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. [1e⁵°F⁻¹]	Density [lb/ft³]	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 [in²]	Iyy [in⁴]	Izz [in⁴]	J [in⁴]
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 [in²]	Iyy [in⁴]	Izz [in⁴]	J [in⁴]
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		56	
10	BLC 3 Transient Area Loads	None		56	
11	BLC 4 Transient Area Loads	None		208	
12	BLC 5 Transient Area Loads	None		208	
13	BLC 6 Transient Area Loads	None		208	
14	BLC 7 Transient Area Loads	None		208	
15	BLC 8 Transient Area Loads	None		152	

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	26.533	11	862.856	9	72.836	4	0	15	0	15	0	15
2		min	-9.058	12	-373.493	14	-84.707	6	0	2	0	2	0	2
3	N1	max	160.299	10	2235.667	6	1113.901	6	0	15	0	15	0	15
4		min	-147.526	13	-1921.286	13	-971.893	4	0	2	0	2	0	2
5	N109	max	0.452	9	2597.209	6	1763.773	6	0	15	0	15	0	15
6		min	-0.457	14	-2157.647	13	-1534.442	4	0	2	0	2	0	2
7	N110A	max	9.827	7	1356.747	9	89.884	4	0	15	0	15	0	15
8		min	-6.346	12	-555.789	14	-102.351	6	0	2	0	2	0	2
9	N151	max	147.379	13	2234.633	6	1113.897	6	0	15	0	15	0	15
10		min	-160.238	10	-1920.089	13	-971.879	4	0	2	0	2	0	2
11	N152	max	9.071	12	862.84	9	72.835	4	0	15	0	15	0	15
12		min	-26.556	11	-373.429	14	-84.706	6	0	2	0	2	0	2
13	N381	max	0.479	13	2804.194	6	1658.036	6	0	15	0	15	0	15
14		min	-0.811	10	-2382.899	13	-1444.458	4	0	2	0	2	0	2
15	N382	max	2.639	12	1263.874	9	92.433	4	0	15	0	15	0	15
16		min	-4.337	11	-569.531	14	-105.434	6	0	2	0	2	0	2
17	N387	max	2.496	6	2634.882	6	1579.964	6	0	15	0	15	0	15
18		min	-2.408	13	-2227.595	13	-1372.908	4	0	2	0	2	0	2
19	N388	max	4.374	11	1194.529	9	91.648	4	0	15	0	15	0	15
20		min	-0.006	12	-483.621	14	-105.5	6	0	2	0	2	0	2
21	N393	max	0.328	13	2904.734	6	1714.426	6	0	15	0	15	0	15
22		min	-0.439	6	-2485.891	13	-1495.197	4	0	2	0	2	0	2
23	N394	max	0.271	14	1345.802	9	94.682	4	0	15	0	15	0	15
24		min	-0.821	9	-607.192	14	-107.593	6	0	2	0	2	0	2
25	N399	max	1.957	13	2623.31	6	1574.623	6	0	15	0	15	0	15
26		min	-2.156	6	-2215.132	13	-1368.355	4	0	2	0	2	0	2
27	N400	max	0.074	14	1183.83	9	91.794	4	0	15	0	15	0	15
28		min	-3.714	9	-480.999	14	-105.716	6	0	2	0	2	0	2
29	N405	max	1.206	10	2796.188	6	1658.674	6	0	15	0	15	0	15
30		min	-1.087	13	-2378.6	13	-1445.066	4	0	2	0	2	0	2
31	N406	max	2.829	11	1273.964	9	93.427	4	0	15	0	15	0	15
32		min	-1.067	12	-542.557	14	-106.837	6	0	2	0	2	0	2
33	N411	max	0.327	13	2751.217	6	1641.45	6	0	15	0	15	0	15
34		min	-0.664	10	-2338.412	13	-1428.833	4	0	2	0	2	0	2
35	N412	max	3.43	12	1256.845	9	93.351	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	-4.472	6	-541.568	14	-106.838	6	0	2	0	2	0	2
37	N417	max	2.19	10	2709.427	6	1619.932	6	0	15	0	15	0	15
38		min	-1.938	13	-2300.071	13	-1409.114	4	0	2	0	2	0	2
39	N418	max	5.543	11	1239.009	9	93.021	4	0	15	0	15	0	15
40		min	-1.97	12	-530.696	14	-106.62	6	0	2	0	2	0	2
41	N423	max	1.614	13	2850.976	6	1685.333	6	0	15	0	15	0	15
42		min	-1.74	6	-2431.865	13	-1468.983	4	0	2	0	2	0	2
43	N424	max	0.811	14	1308.638	9	94.072	4	0	15	0	15	0	15
44		min	-3.104	9	-569.418	14	-107.288	6	0	2	0	2	0	2
45	N429	max	0.015	13	2605.929	6	1566.136	6	0	15	0	15	0	15
46		min	-0.003	3	-2197.935	13	-1360.945	4	0	2	0	2	0	2
47	N430	max	0	3	1171.424	9	91.535	4	0	15	0	15	0	15
48		min	-0.007	6	-471.239	14	-105.514	6	0	2	0	2	0	2
49	N435	max	1.744	6	2850.955	6	1685.324	6	0	15	0	15	0	15
50		min	-1.581	13	-2431.847	13	-1468.976	4	0	2	0	2	0	2
51	N436	max	3.1	9	1308.636	9	94.07	4	0	15	0	15	0	15
52		min	-0.826	14	-569.412	14	-107.286	6	0	2	0	2	0	2
53	N441	max	1.969	13	2709.335	6	1619.839	6	0	15	0	15	0	15
54		min	-2.189	10	-2300.005	13	-1409.039	4	0	2	0	2	0	2
55	N442	max	1.964	12	1238.961	9	93.016	4	0	15	0	15	0	15
56		min	-5.548	11	-530.604	14	-106.615	6	0	2	0	2	0	2
57	N447	max	0.666	10	2751.065	6	1641.307	6	0	15	0	15	0	15
58		min	-0.296	13	-2338.299	13	-1428.715	4	0	2	0	2	0	2
59	N448	max	4.457	6	1256.77	9	93.345	4	0	15	0	15	0	15
60		min	-3.436	12	-541.426	14	-106.832	6	0	2	0	2	0	2
61	N453	max	1.119	13	2796.112	6	1658.587	6	0	15	0	15	0	15
62		min	-1.204	10	-2378.546	13	-1444.994	4	0	2	0	2	0	2
63	N454	max	1.061	12	1273.911	9	93.422	4	0	15	0	15	0	15
64		min	-2.833	11	-542.464	14	-106.832	6	0	2	0	2	0	2
65	N459	max	2.158	6	2623.334	6	1574.633	6	0	15	0	15	0	15
66		min	-1.926	13	-2215.151	13	-1368.364	4	0	2	0	2	0	2
67	N460	max	3.71	9	1183.837	9	91.793	4	0	15	0	15	0	15
68		min	-0.087	14	-481.02	14	-105.714	6	0	2	0	2	0	2
69	N465	max	0.443	6	2904.758	6	1714.403	6	0	15	0	15	0	15
70		min	-0.296	13	-2485.92	13	-1495.18	4	0	2	0	2	0	2
71	N466	max	0.818	9	1345.789	9	94.681	4	0	15	0	15	0	15
72		min	-0.286	14	-607.165	14	-107.592	6	0	2	0	2	0	2
73	N471	max	2.436	13	2634.667	6	1579.983	6	0	15	0	15	0	15
74		min	-2.492	6	-2227.38	13	-1372.913	4	0	2	0	2	0	2
75	N472	max	-0.002	12	1194.53	9	91.647	4	0	15	0	15	0	15
76		min	-4.378	11	-483.641	14	-105.5	6	0	2	0	2	0	2
77	N477	max	0.802	10	2805.175	6	1657.967	6	0	15	0	15	0	15
78		min	-0.436	13	-2383.9	13	-1444.428	4	0	2	0	2	0	2
79	N478	max	4.327	11	1263.853	9	92.431	4	0	15	0	15	0	15
80		min	-2.64	12	-569.467	14	-105.431	6	0	2	0	2	0	2
81	N483	max	0.506	14	2595.298	6	1763.802	6	0	15	0	15	0	15
82		min	-0.463	9	-2155.591	13	-1534.438	4	0	2	0	2	0	2
83	N484	max	6.316	12	1356.726	9	89.883	4	0	15	0	15	0	15
84		min	-9.813	7	-555.751	14	-102.351	6	0	2	0	2	0	2
85	Totals:	max	0.001	10	52486.148	10	31402.732	6						
86		min	-0.001	13	-31662.983	12	-27333.312	4						

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

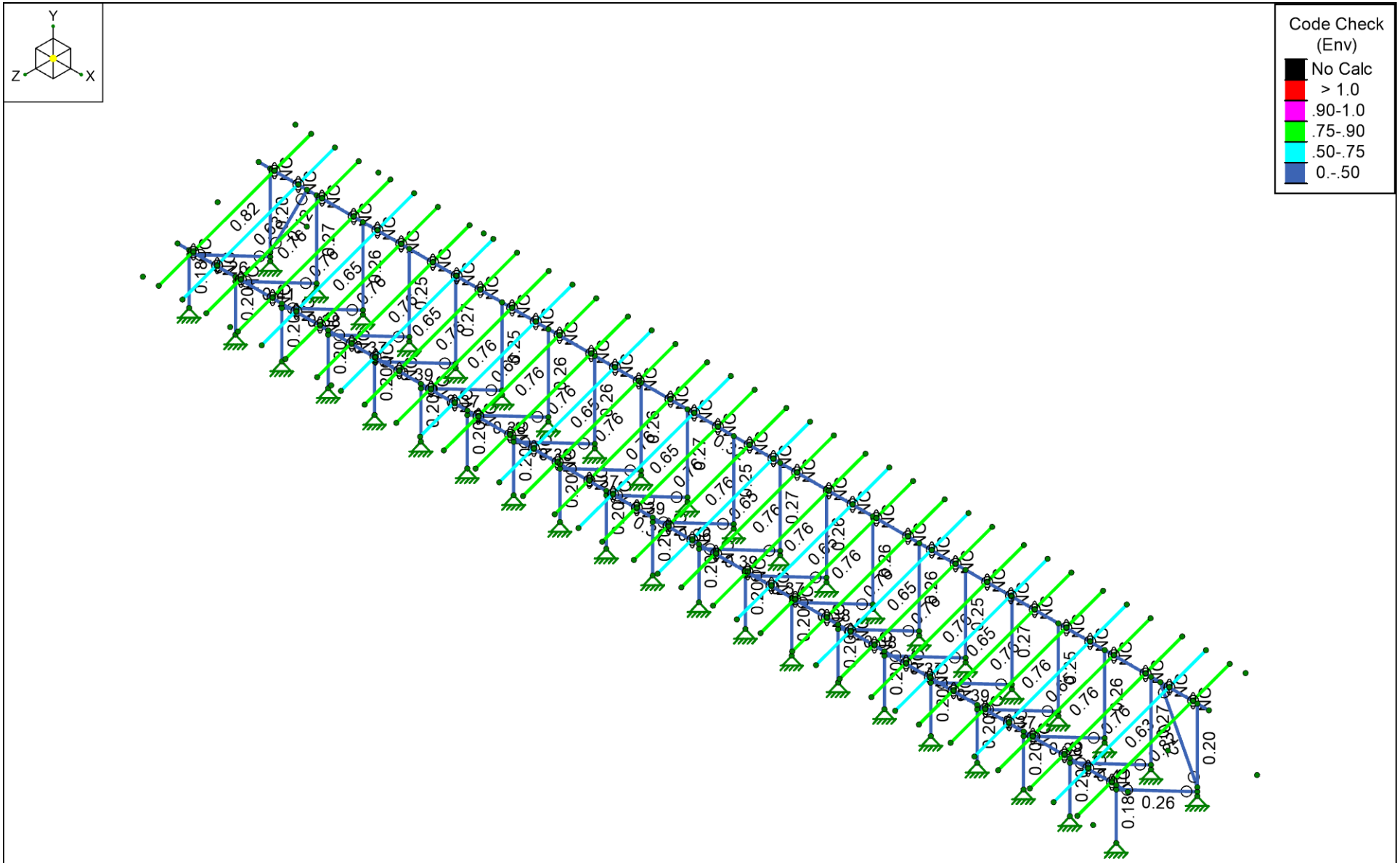
	Member	Shape	Code Check	Loc[in]	LC	Shear Check	Loc[in]	Dir	LC	Pnc/om [lb]	Pnt/om [lb]	Mnyy/om [lb-ft]	Mnzz/om [lb-ft]	Cb	Eqn
1	M5	PIPE2.0A21165	0.311	53.009	14	0.152	53.604		6	16022.065	23232.186	1397.505	1397.505	1	H1-1b
2	M6	PIPE2.0A21165	0.634	3.634	6	0.172	0		6	5547.664	23232.186	1397.505	1397.505	1	H1-1a
3	M15	1.5X1.5X0.083	0.541	50.696	6	0.021	97.337	y	10	2506.142	14085.15	624.421	624.421	1.136	H1-1a
4	M19	1.5X1.5X0.083	0.289	70.562	10	0.027	114.812	y	6	1801.298	14085.15	624.421	624.421	1.136	H1-1a
5	M50	PIPE2.0A21165	0.372	53.009	14	0.245	53.604		6	16022.065	23232.186	1397.505	1397.505	1	H1-1b
6	M51	PIPE2.0A21165	0.83	3.634	6	0.27	0		6	5547.664	23232.186	1397.505	1397.505	1	H1-1a
7	M52	1.5X1.5X0.083	0.857	50.696	6	0.004	97.337	y	6	2506.161	14085.15	624.421	624.421	1.136	H1-1a
8	M73	PIPE2.0A21165	0.311	53.009	14	0.152	53.604		6	16022.065	23232.186	1397.505	1397.505	1	H1-1b
9	M74	PIPE2.0A21165	0.633	3.634	6	0.172	0		6	5547.664	23232.186	1397.505	1397.505	1	H1-1a
10	M75	1.5X1.5X0.083	0.541	50.696	6	0.021	97.337	y	10	2506.161	14085.15	624.421	624.421	1.136	H1-1a
11	M75B	1.5X1.5X0.083	0.288	70.613	10	0.027	114.896	y	6	1798.689	14085.15	624.421	624.421	1.136	H1-1a
12	M71	PIPE2.5A21168	0.347	492	6	0.173	779		6	20336.2	28358.413	2081.747	2081.747	1	H1-1b
13	M72	PIPE2.5A21168	0.339	492	7	0.161	205		6	20336.2	28358.413	2081.747	2081.747	1	H1-1b
14	M184	PIPE2.0A21165	0.381	53.009	14	0.229	53.604		6	16022.065	23232.186	1397.505	1397.505	1	H1-1b
15	M185	PIPE2.0A21165	0.848	3.634	6	0.256	0		6	5547.664	23232.186	1397.505	1397.505	1	H1-1a
16	M186	1.5X1.5X0.083	0.805	50.696	6	0.003	97.337	y	6	2506.161	14085.15	624.421	624.421	1.136	H1-1a
17	M187	PIPE2.0A21165	0.378	53.009	14	0.216	53.604		6	16022.065	23232.186	1397.505	1397.505	1	H1-1b
18	M188	PIPE2.0A21165	0.801	3.634	6	0.243	0		6	5547.664	23232.186	1397.505	1397.505	1	H1-1a
19	M189	1.5X1.5X0.083	0.767	50.696	6	0.003	97.337	y	9	2506.161	14085.15	624.421	624.421	1.136	H1-1a
20	M190	PIPE2.0A21165	0.389	53.009	14	0.236	53.604		6	16022.065	23232.186	1397.505	1397.505	1	H1-1b
21	M191	PIPE2.0A21165	0.879	3.634	6	0.265	0		6	5547.664	23232.186	1397.505	1397.505	1	H1-1a
22	M192	1.5X1.5X0.083	0.833	50.696	6	0.002	97.337	y	5	2506.161	14085.15	624.421	624.421	1.136	H1-1a
23	M193	PIPE2.0A21165	0.379	53.009	14	0.216	53.604		6	16022.065	23232.186	1397.505	1397.505	1	H1-1b
24	M194	PIPE2.0A21165	0.797	3.634	6	0.242	0		6	5547.664	23232.186	1397.505	1397.505	1	H1-1a
25	M195	1.5X1.5X0.083	0.764	50.696	6	0.003	97.337	y	9	2506.161	14085.15	624.421	624.421	1.136	H1-1a
26	M196	PIPE2.0A21165	0.384	53.009	14	0.228	53.604		6	16022.065	23232.186	1397.505	1397.505	1	H1-1b
27	M197	PIPE2.0A21165	0.847	3.634	6	0.256	0		6	5547.664	23232.186	1397.505	1397.505	1	H1-1a
28	M198	1.5X1.5X0.083	0.805	50.696	6	0.003	97.337	y	10	2506.161	14085.15	624.421	624.421	1.136	H1-1a
29	M199	PIPE2.0A21165	0.385	53.009	14	0.226	53.604		6	16022.065	23232.186	1397.505	1397.505	1	H1-1b
30	M200	PIPE2.0A21165	0.835	3.634	6	0.253	0		6	5547.664	23232.186	1397.505	1397.505	1	H1-1a
31	M201	1.5X1.5X0.083	0.797	50.696	6	0.004	97.337	y	6	2506.161	14085.15	624.421	624.421	1.136	H1-1a
32	M202	PIPE2.0A21165	0.383	53.009	14	0.222	53.604		6	16022.065	23232.186	1397.505	1397.505	1	H1-1b
33	M203	PIPE2.0A21165	0.823	3.634	6	0.249	0		6	5547.664	23232.186	1397.505	1397.505	1	H1-1a
34	M204	1.5X1.5X0.083	0.786	50.696	6	0.003	97.337	y	10	2506.161	14085.15	624.421	624.421	1.136	H1-1a
35	M205	PIPE2.0A21165	0.387	53.009	14	0.232	53.604		6	16022.065	23232.186	1397.505	1397.505	1	H1-1b
36	M206	PIPE2.0A21165	0.863	3.634	6	0.26	0		6	5547.664	23232.186	1397.505	1397.505	1	H1-1a
37	M207	1.5X1.5X0.083	0.818	50.696	6	0.002	97.337	y	9	2506.161	14085.15	624.421	624.421	1.136	H1-1a
38	M208	PIPE2.0A21165	0.378	53.009	14	0.214	53.604		6	16022.065	23232.186	1397.505	1397.505	1	H1-1b
39	M209	PIPE2.0A21165	0.793	3.634	6	0.241	0		6	5547.664	23232.186	1397.505	1397.505	1	H1-1a
40	M210	1.5X1.5X0.083	0.76	50.696	6	0.002	97.337	y	10	2506.161	14085.15	624.421	624.421	1.136	H1-1a
41	M211	PIPE2.0A21165	0.387	53.009	14	0.232	53.604		6	16022.065	23232.186	1397.505	1397.505	1	H1-1b
42	M212	PIPE2.0A21165	0.863	3.634	6	0.26	0		6	5547.664	23232.186	1397.505	1397.505	1	H1-1a
43	M213	1.5X1.5X0.083	0.818	50.696	6	0.002	97.337	y	9	2506.161	14085.15	624.421	624.421	1.136	H1-1a
44	M214	PIPE2.0A21165	0.383	53.009	14	0.222	53.604		6	16022.065	23232.186	1397.505	1397.505	1	H1-1b
45	M215	PIPE2.0A21165	0.823	3.634	6	0.249	0		6	5547.664	23232.186	1397.505	1397.505	1	H1-1a
46	M216	1.5X1.5X0.083	0.786	50.696	6	0.003	97.337	y	10	2506.161	14085.15	624.421	624.421	1.136	H1-1a
47	M217	PIPE2.0A21165	0.385	53.009	14	0.226	53.604		6	16022.065	23232.186	1397.505	1397.505	1	H1-1b
48	M218	PIPE2.0A21165	0.835	3.634	6	0.253	0		6	5547.664	23232.186	1397.505	1397.505	1	H1-1a
49	M219	1.5X1.5X0.083	0.797	50.696	6	0.004	97.337	y	6	2506.161	14085.15	624.421	624.421	1.136	H1-1a
50	M220	PIPE2.0A21165	0.384	53.009	14	0.228	53.604		6	16022.065	23232.186	1397.505	1397.505	1	H1-1b
51	M221	PIPE2.0A21165	0.847	3.634	6	0.256	0		6	5547.664	23232.186	1397.505	1397.505	1	H1-1a
52	M222	1.5X1.5X0.083	0.805	50.696	6	0.003	97.337	y	10	2506.161	14085.15	624.421	624.421	1.136	H1-1a
53	M223	PIPE2.0A21165	0.379	53.009	14	0.216	53.604		6	16022.065	23232.186	1397.505	1397.505	1	H1-1b
54	M224	PIPE2.0A21165	0.797	3.634	6	0.242	0		6	5547.664	23232.186	1397.505	1397.505	1	H1-1a
55	M225	1.5X1.5X0.083	0.764	50.696	6	0.003	97.337	y	9	2506.161	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
56	M226	PIPE2.0A21165	0.389	53.009	14	0.236	53.604		6	16022.065	23232.186	1397.505	1397.505	1	H1-1b
57	M227	PIPE2.0A21165	0.879	3.634	6	0.265	0		6	5547.664	23232.186	1397.505	1397.505	1	H1-1a
58	M228	1.5X1.5X0.083	0.833	50.696	6	0.002	97.337	y	5	2506.161	14085.15	624.421	624.421	1.136	H1-1a
59	M229	PIPE2.0A21165	0.378	53.009	14	0.216	53.604		6	16022.065	23232.186	1397.505	1397.505	1	H1-1b
60	M230	PIPE2.0A21165	0.801	3.634	6	0.243	0		6	5547.664	23232.186	1397.505	1397.505	1	H1-1a
61	M231	1.5X1.5X0.083	0.767	50.696	6	0.003	97.337	y	9	2506.161	14085.15	624.421	624.421	1.136	H1-1a
62	M232	PIPE2.0A21165	0.381	53.009	14	0.229	53.604		6	16022.065	23232.186	1397.505	1397.505	1	H1-1b
63	M233	PIPE2.0A21165	0.848	3.634	6	0.256	0		6	5547.664	23232.186	1397.505	1397.505	1	H1-1a
64	M234	1.5X1.5X0.083	0.805	50.696	6	0.003	97.337	y	6	2506.161	14085.15	624.421	624.421	1.136	H1-1a
65	M235	PIPE2.0A21165	0.372	53.009	14	0.245	53.604		6	16022.065	23232.186	1397.505	1397.505	1	H1-1b
66	M236	PIPE2.0A21165	0.83	3.634	6	0.27	0		6	5547.664	23232.186	1397.505	1397.505	1	H1-1a
67	M237	1.5X1.5X0.083	0.857	50.696	6	0.004	97.337	y	6	2506.161	14085.15	624.421	624.421	1.136	H1-1a

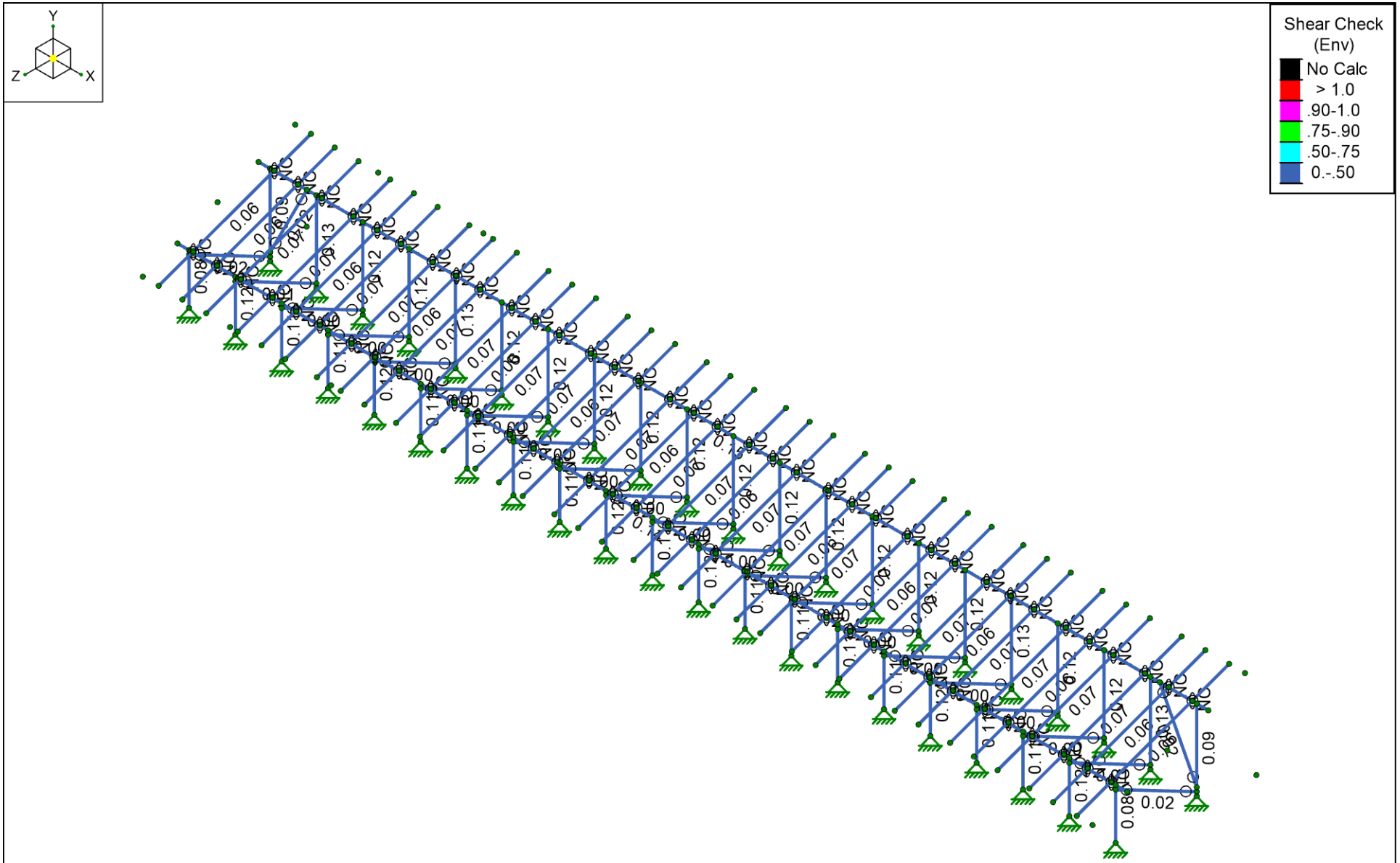
Envelope AA ADM1-15: ASD - BUILDING Member Aluminum Code Checks

	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	M16	HR300_ALA	0.666	78.75	12	0.068	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.241	H.1-1
2	M35	HR300_ALA	0.751	80.5	6	0.073	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.705	H.1-1
3	M29	HR300_ALA	0.734	80.5	6	0.072	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.712	H.1-1
4	M32	HR300_ALA	0.742	80.5	6	0.071	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.709	H.1-1
5	M38	HR300_ALA	0.71	82.25	6	0.071	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.722	H.1-1
6	M41	HR300_ALA	0.711	82.25	6	0.071	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.722	H.1-1
7	M44	HR300_ALA	0.738	80.5	6	0.072	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.711	H.1-1
8	M47	HR300_ALA	0.728	80.5	6	0.071	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.714	H.1-1
9	M54	HR300_ALA	0.747	80.5	6	0.071	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.706	H.1-1
10	M57	HR300_ALA	0.751	80.5	6	0.071	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.705	H.1-1
11	M60	HR300_ALA	0.715	82.25	6	0.071	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.72	H.1-1
12	M63	HR300_ALA	0.722	82.25	6	0.072	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.717	H.1-1
13	M66	HR300_ALA	0.722	82.25	6	0.072	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.717	H.1-1
14	M77	HR300_ALA	0.715	82.25	6	0.071	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.72	H.1-1
15	M83	HR300_ALA	0.751	80.5	6	0.071	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.705	H.1-1
16	M85	HR300_ALA	0.747	80.5	6	0.071	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.706	H.1-1
17	M89	HR300_ALA	0.728	80.5	6	0.071	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.714	H.1-1
18	M91	HR300_ALA	0.738	80.5	6	0.072	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.711	H.1-1
19	M95	HR300_ALA	0.711	82.25	6	0.071	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.722	H.1-1
20	M97	HR300_ALA	0.71	82.25	6	0.071	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.722	H.1-1
21	M101	HR300_ALA	0.742	80.5	6	0.071	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.709	H.1-1
22	M103	HR300_ALA	0.734	80.5	6	0.072	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.712	H.1-1
23	M107	HR300_ALA	0.751	80.5	6	0.073	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.705	H.1-1
24	M109	HR300_ALA	0.666	78.75	12	0.068	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.241	H.1-1
25	M150	HR300_ALA	0.608	78.75	10	0.066	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.694	H.1-1
26	M153	HR300_ALA	0.619	82.25	6	0.061	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.718	H.1-1
27	M156	HR300_ALA	0.661	80.5	12	0.061	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.205	H.1-1
28	M159	HR300_ALA	0.625	82.25	6	0.061	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.715	H.1-1
29	M162	HR300_ALA	0.601	82.25	6	0.061	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.727	H.1-1
30	M165	HR300_ALA	0.646	80.5	6	0.062	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.705	H.1-1
31	M168	HR300_ALA	0.646	80.5	6	0.062	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.705	H.1-1
32	M171	HR300_ALA	0.601	82.25	6	0.061	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.727	H.1-1
33	M174	HR300_ALA	0.625	82.25	6	0.061	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.715	H.1-1
34	M177	HR300_ALA	0.661	80.5	12	0.061	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.205	H.1-1
35	M180	HR300_ALA	0.619	82.25	6	0.061	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.718	H.1-1
36	M183	HR300_ALA	0.608	78.75	10	0.066	33.25	y	7	3550.275	14342.564	533.921	934.619	7307.692	3206.154	1.694	H.1-1



Member Code Checks Displayed (Enveloped)

RISA A NEMETSCHEK COMPANY	Vector Structural Engineering	A14 Standard Panels - 20 Degree Tilt - 4L	SK-14
	LKN		Jun 20, 2023
	U2716.0371.231		Sunturf A14 - SP - 20deg - 4L.r3d



Member Shear Checks Displayed (Enveloped)

RISA A NEMETSCHEK COMPANY	Vector Structural Engineering	A14 Standard Panels - 20 Degree Tilt - 4L	SK-15
	LKN		Jun 20, 2023
	U2716.0371.231		Sunturf A14 - SP - 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	40.027	11	823.821	11	35.708	4	0	15	0	15	0	15
2		min	-16.837	12	-124.313	12	-44.025	6	0	2	0	2	0	2
3	N1	max	176.541	10	1638.341	10	561.42	6	0	15	0	15	0	15
4		min	-144.128	13	-1337.906	13	-486.38	12	0	2	0	2	0	2
5	N109	max	0.03	13	1895.879	10	787.773	6	0	15	0	15	0	15
6		min	-0.016	10	-1560.187	13	-681.265	4	0	2	0	2	0	2
7	N110A	max	0	8	1171.849	11	45.819	4	0	15	0	15	0	15
8		min	-0.003	13	-198.966	12	-56.542	6	0	2	0	2	0	2
9	N151	max	143.688	13	1637.253	10	561.43	6	0	15	0	15	0	15
10		min	-176.274	10	-1336.547	13	-486.383	12	0	2	0	2	0	2
11	N152	max	16.839	12	823.829	11	35.708	4	0	15	0	15	0	15
12		min	-40.035	11	-124.311	12	-44.025	6	0	2	0	2	0	2
13	N237	max	2.019	13	2036.141	10	839.744	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	-2.393	10	-1697.967	13	-725.082	4	0	2	0	2	0	2
15	N239	max	1.454	12	1269.819	11	46.896	4	0	15	0	15	0	15
16		min	-4.378	11	-213.267	12	-57.914	6	0	2	0	2	0	2
17	N244	max	4.063	10	1948.023	10	811.352	6	0	15	0	15	0	15
18		min	-3.186	13	-1615.16	13	-700.826	4	0	2	0	2	0	2
19	N246	max	8.735	11	1201.489	11	46.489	4	0	15	0	15	0	15
20		min	-3.802	12	-196.974	12	-57.344	6	0	2	0	2	0	2
21	N250	max	4.636	11	1248.981	11	46.625	4	0	15	0	15	0	15
22		min	-2.053	12	-211.326	12	-57.569	6	0	2	0	2	0	2
23	N253	max	1.193	13	1972.415	10	820.562	6	0	15	0	15	0	15
24		min	-1.8	10	-1637.856	13	-708.714	4	0	2	0	2	0	2
25	N255	max	2.696	12	1218.866	11	46.62	4	0	15	0	15	0	15
26		min	-4.845	11	-200.949	12	-57.518	6	0	2	0	2	0	2
27	N257	max	2.147	10	2005.802	10	828.22	6	0	15	0	15	0	15
28		min	-1.738	13	-1667.264	13	-715.502	4	0	2	0	2	0	2
29	N260	max	1.219	13	1999.986	10	826.59	6	0	15	0	15	0	15
30		min	-1.842	10	-1658.052	13	-713.336	12	0	2	0	2	0	2
31	N264	max	8.214	11	1190.798	11	45.861	4	0	15	0	15	0	15
32		min	-3.116	12	-202.879	12	-56.6	6	0	2	0	2	0	2
33	N267	max	2.862	12	1207.924	11	46.12	4	0	15	0	15	0	15
34		min	-5.85	11	-194.853	12	-56.89	6	0	2	0	2	0	2
35	N268	max	0.325	12	1278.349	11	47.161	4	0	15	0	15	0	15
36		min	-1.043	11	-208.41	12	-58.224	6	0	2	0	2	0	2
37	N271	max	2.647	13	1905.539	10	791.148	6	0	15	0	15	0	15
38		min	-3.289	10	-1570.24	13	-684.066	4	0	2	0	2	0	2
39	N273	max	2.276	12	1178.886	11	45.936	4	0	15	0	15	0	15
40		min	-6.323	11	-199.453	12	-56.682	6	0	2	0	2	0	2
41	N275	max	0.362	13	2059.346	10	852.979	6	0	15	0	15	0	15
42		min	-0.54	10	-1724.128	13	-735.939	4	0	2	0	2	0	2
43	N281	max	4.098	10	1913.572	10	793.22	6	0	15	0	15	0	15
44		min	-3.451	13	-1578.977	13	-685.802	4	0	2	0	2	0	2
45	N298	max	1.713	10	1839.03	10	882.518	14	0	15	0	15	0	15
46		min	-1.242	13	-1534.343	13	-763.209	4	0	2	0	2	0	2
47	N299	max	12.062	11	1341.502	11	44.954	4	0	15	0	15	0	15
48		min	-5.976	12	-229.374	12	-55.583	6	0	2	0	2	0	2
49	N381	max	2.365	10	2036.151	10	839.753	6	0	15	0	15	0	15
50		min	-1.958	13	-1697.977	13	-725.089	4	0	2	0	2	0	2
51	N382	max	4.376	11	1269.813	11	46.896	4	0	15	0	15	0	15
52		min	-1.457	12	-213.261	12	-57.915	6	0	2	0	2	0	2
53	N387	max	3.246	13	1948.025	10	811.353	6	0	15	0	15	0	15
54		min	-4.093	10	-1615.16	13	-700.827	4	0	2	0	2	0	2
55	N388	max	3.8	12	1201.488	11	46.489	4	0	15	0	15	0	15
56		min	-8.737	11	-196.974	12	-57.344	6	0	2	0	2	0	2
57	N393	max	1.771	10	1972.413	10	820.562	6	0	15	0	15	0	15
58		min	-1.133	13	-1637.853	13	-708.714	4	0	2	0	2	0	2
59	N394	max	4.843	11	1218.864	11	46.62	4	0	15	0	15	0	15
60		min	-2.699	12	-200.949	12	-57.518	6	0	2	0	2	0	2
61	N399	max	1.798	13	2005.827	10	828.222	6	0	15	0	15	0	15
62		min	-2.176	10	-1667.285	13	-715.503	4	0	2	0	2	0	2
63	N400	max	2.051	12	1248.98	11	46.626	4	0	15	0	15	0	15
64		min	-4.638	11	-211.325	12	-57.569	6	0	2	0	2	0	2
65	N405	max	3.259	10	1905.539	10	791.156	6	0	15	0	15	0	15
66		min	-2.588	13	-1570.241	13	-684.072	4	0	2	0	2	0	2
67	N406	max	6.321	11	1178.884	11	45.937	4	0	15	0	15	0	15
68		min	-2.278	12	-199.448	12	-56.682	6	0	2	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	N411	max	0.511	10	2059.387	10	852.977	6	0	15	0	15	0	15
70		min	-0.3	13	-1724.165	13	-735.938	4	0	2	0	2	0	2
71	N412	max	1.041	11	1278.355	11	47.161	4	0	15	0	15	0	15
72		min	-0.327	12	-208.412	12	-58.224	6	0	2	0	2	0	2
73	N417	max	3.506	13	1913.414	10	793.25	6	0	15	0	15	0	15
74		min	-4.124	10	-1578.838	13	-685.822	4	0	2	0	2	0	2
75	N418	max	3.113	12	1190.782	11	45.862	4	0	15	0	15	0	15
76		min	-8.215	11	-202.862	12	-56.601	6	0	2	0	2	0	2
77	N423	max	1.793	10	2000.815	10	826.587	6	0	15	0	15	0	15
78		min	-1.141	13	-1658.803	13	-713.343	12	0	2	0	2	0	2
79	N424	max	5.846	11	1207.931	11	46.12	4	0	15	0	15	0	15
80		min	-2.863	12	-194.843	12	-56.89	6	0	2	0	2	0	2
81	N429	max	1.222	13	1837.138	10	882.528	14	0	15	0	15	0	15
82		min	-1.659	10	-1532.302	13	-763.207	4	0	2	0	2	0	2
83	N430	max	5.968	12	1341.505	11	44.954	4	0	15	0	15	0	15
84		min	-12.057	11	-229.385	12	-55.583	6	0	2	0	2	0	2
85	Totals:	max	0.002	13	59760.852	10	15629.704	14						
86		min	-0.003	10	-27932.281	12	-13568.061	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	0.182	48.124	11	0.077	48.124		6	17103.668	23232.186	1397.505	1397.505	1	H1-1b
2	M6	PIPE2.0A21165	0.199	7.784	6	0.085	0		6	10612.529	23232.186	1397.505	1397.505	1	H1-1b
3	M15	1.5X1.5X0.083	0.261	49.367	6	0.024	94.784	y	10	2642.964	14085.15	624.421	624.421	1.136	H1-1a
4	M19	1.5X1.5X0.083	0.123	84.159	10	0.016	84.159	y	6	3352.416	14085.15	624.421	624.421	1.136	H1-1b*
5	M50	PIPE2.0A21165	0.196	48.124	6	0.107	48.124		6	17103.668	23232.186	1397.505	1397.505	1	H1-1b
6	M51	PIPE2.0A21165	0.249	4.324	6	0.117	0		6	10612.529	23232.186	1397.505	1397.505	1	H1-1b
7	M52	1.5X1.5X0.083	0.364	49.367	6	0.002	94.784	y	10	2642.983	14085.15	624.421	624.421	1.136	H1-1a
8	M73	PIPE2.0A21165	0.182	48.124	11	0.077	48.124		6	17103.668	23232.186	1397.505	1397.505	1	H1-1b
9	M74	PIPE2.0A21165	0.199	7.784	6	0.085	0		6	10612.529	23232.186	1397.505	1397.505	1	H1-1b
10	M75	1.5X1.5X0.083	0.261	49.367	6	0.024	94.784	y	10	2642.983	14085.15	624.421	624.421	1.136	H1-1a
11	M75B	1.5X1.5X0.083	0.122	84.273	10	0.016	84.273	y	6	3343.389	14085.15	624.421	624.421	1.136	H1-1b*
12	M71	PIPE2.5A21168	0.324	492	10	0.147	779		10	20336.2	28358.413	2081.747	2081.747	1	H1-1b
13	M72	PIPE2.5A21168	0.31	492	11	0.14	779		11	20336.2	28358.413	2081.747	2081.747	1	H1-1b
14	M112	1.5X1.5X0.083	0.388	49.367	6	0.003	94.784	y	11	2642.983	14085.15	624.421	624.421	1.136	H1-1a
15	M113	PIPE2.0A21165	0.201	48.124	6	0.115	48.124		6	17103.668	23232.186	1397.505	1397.505	1	H1-1b
16	M114	PIPE2.0A21165	0.267	4.324	6	0.124	0		6	10612.529	23232.186	1397.505	1397.505	1	H1-1b
17	M115	PIPE2.0A21165	0.257	4.324	6	0.12	0		6	10612.529	23232.186	1397.505	1397.505	1	H1-1b
18	M116	1.5X1.5X0.083	0.375	49.367	6	0.004	94.784	y	10	2642.983	14085.15	624.421	624.421	1.136	H1-1a
19	M117	PIPE2.0A21165	0.199	48.124	6	0.111	48.124		6	17103.668	23232.186	1397.505	1397.505	1	H1-1b
20	M118	1.5X1.5X0.083	0.383	49.367	6	0.003	94.784	y	10	2642.983	14085.15	624.421	624.421	1.136	H1-1a
21	M119	PIPE2.0A21165	0.2	48.124	6	0.114	48.124		6	17103.668	23232.186	1397.505	1397.505	1	H1-1b
22	M120	PIPE2.0A21165	0.26	4.324	6	0.121	0		6	10612.529	23232.186	1397.505	1397.505	1	H1-1b
23	M121	1.5X1.5X0.083	0.379	49.367	6	0.004	94.784	y	10	2642.983	14085.15	624.421	624.421	1.136	H1-1a
24	M122	PIPE2.0A21165	0.2	48.124	6	0.113	48.124		6	17103.668	23232.186	1397.505	1397.505	1	H1-1b
25	M123	PIPE2.0A21165	0.263	4.324	6	0.123	0		6	10612.529	23232.186	1397.505	1397.505	1	H1-1b
26	M124	1.5X1.5X0.083	0.394	49.367	6	0.002	94.784	y	9	2642.983	14085.15	624.421	624.421	1.136	H1-1a
27	M125	PIPE2.0A21165	0.202	48.124	6	0.117	48.124		6	17103.668	23232.186	1397.505	1397.505	1	H1-1b
28	M126	PIPE2.0A21165	0.25	4.324	6	0.117	0		6	10612.529	23232.186	1397.505	1397.505	1	H1-1b
29	M127	1.5X1.5X0.083	0.365	49.367	6	0.003	94.784	y	11	2642.983	14085.15	624.421	624.421	1.136	H1-1a
30	M128	PIPE2.0A21165	0.197	48.124	6	0.108	48.124		6	17103.668	23232.186	1397.505	1397.505	1	H1-1b
31	M129	PIPE2.0A21165	0.271	4.324	6	0.126	0		6	10612.529	23232.186	1397.505	1397.505	1	H1-1b
32	M130	1.5X1.5X0.083	0.382	49.367	6	0.004	94.784	y	10	2642.983	14085.15	624.421	624.421	1.136	H1-1a
33	M131	PIPE2.0A21165	0.198	48.124	6	0.114	48.124		6	17103.668	23232.186	1397.505	1397.505	1	H1-1b
34	M132	PIPE2.0A21165	0.251	4.324	6	0.117	0		6	10612.529	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
35	M133	1.5X1.5X0.083	0.366	49.367	6	0.004	94.784	y	11	2642.983	14085.15	624.421	624.421	1.136	H1-1a
36	M134	PIPE2.0A21165	0.197	48.124	6	0.108	48.124		6	17103.668	23232.186	1397.505	1397.505	1	H1-1b
37	M135	PIPE2.0A21165	0.262	4.324	6	0.122	0		6	10612.529	23232.186	1397.505	1397.505	1	H1-1b
38	M137	PIPE2.0A21165	0.269	4.324	6	0.13	0		6	10612.529	23232.186	1397.505	1397.505	1	H1-1b
39	M140	1.5X1.5X0.083	0.408	49.367	6	0.006	94.784	y	10	2642.983	14085.15	624.421	624.421	1.136	H1-1a
40	M141	PIPE2.0A21165	0.196	48.124	6	0.123	48.124		6	17103.668	23232.186	1397.505	1397.505	1	H1-1b
41	M184	PIPE2.0A21165	0.201	48.124	6	0.115	48.124		6	17103.668	23232.186	1397.505	1397.505	1	H1-1b
42	M185	PIPE2.0A21165	0.267	4.324	6	0.124	0		6	10612.529	23232.186	1397.505	1397.505	1	H1-1b
43	M186	1.5X1.5X0.083	0.388	49.367	6	0.003	94.784	y	11	2642.983	14085.15	624.421	624.421	1.136	H1-1a
44	M187	PIPE2.0A21165	0.199	48.124	6	0.111	48.124		6	17103.668	23232.186	1397.505	1397.505	1	H1-1b
45	M188	PIPE2.0A21165	0.257	4.324	6	0.12	0		6	10612.529	23232.186	1397.505	1397.505	1	H1-1b
46	M189	1.5X1.5X0.083	0.375	49.367	6	0.004	94.784	y	10	2642.983	14085.15	624.421	624.421	1.136	H1-1a
47	M190	PIPE2.0A21165	0.2	48.124	6	0.113	48.124		6	17103.668	23232.186	1397.505	1397.505	1	H1-1b
48	M191	PIPE2.0A21165	0.26	4.324	6	0.121	0		6	10612.529	23232.186	1397.505	1397.505	1	H1-1b
49	M192	1.5X1.5X0.083	0.379	49.367	6	0.004	94.784	y	10	2642.983	14085.15	624.421	624.421	1.136	H1-1a
50	M193	PIPE2.0A21165	0.2	48.124	6	0.114	48.124		6	17103.668	23232.186	1397.505	1397.505	1	H1-1b
51	M194	PIPE2.0A21165	0.263	4.324	6	0.123	0		6	10612.529	23232.186	1397.505	1397.505	1	H1-1b
52	M195	1.5X1.5X0.083	0.383	49.367	6	0.004	94.784	y	10	2642.983	14085.15	624.421	624.421	1.136	H1-1a
53	M196	PIPE2.0A21165	0.197	48.124	6	0.108	48.124		6	17103.668	23232.186	1397.505	1397.505	1	H1-1b
54	M197	PIPE2.0A21165	0.25	4.324	6	0.117	0		6	10612.529	23232.186	1397.505	1397.505	1	H1-1b
55	M198	1.5X1.5X0.083	0.365	49.367	6	0.003	94.784	y	11	2642.983	14085.15	624.421	624.421	1.136	H1-1a
56	M199	PIPE2.0A21165	0.202	48.124	6	0.117	48.124		6	17103.668	23232.186	1397.505	1397.505	1	H1-1b
57	M200	PIPE2.0A21165	0.271	4.324	6	0.126	0		6	10612.529	23232.186	1397.505	1397.505	1	H1-1b
58	M201	1.5X1.5X0.083	0.394	49.367	6	0.002	94.784	y	9	2642.983	14085.15	624.421	624.421	1.136	H1-1a
59	M202	PIPE2.0A21165	0.197	48.124	6	0.108	48.124		6	17103.668	23232.186	1397.505	1397.505	1	H1-1b
60	M203	PIPE2.0A21165	0.251	4.324	6	0.117	0		6	10612.529	23232.186	1397.505	1397.505	1	H1-1b
61	M204	1.5X1.5X0.083	0.367	49.367	6	0.004	94.784	y	11	2642.983	14085.15	624.421	624.421	1.136	H1-1a
62	M205	PIPE2.0A21165	0.198	48.124	6	0.114	48.124		6	17103.668	23232.186	1397.505	1397.505	1	H1-1b
63	M206	PIPE2.0A21165	0.262	4.324	6	0.122	0		6	10612.529	23232.186	1397.505	1397.505	1	H1-1b
64	M207	1.5X1.5X0.083	0.382	49.367	6	0.004	94.784	y	10	2642.983	14085.15	624.421	624.421	1.136	H1-1a
65	M208	PIPE2.0A21165	0.196	48.124	6	0.123	48.124		6	17103.668	23232.186	1397.505	1397.505	1	H1-1b
66	M209	PIPE2.0A21165	0.269	4.324	6	0.13	0		6	10612.529	23232.186	1397.505	1397.505	1	H1-1b
67	M210	1.5X1.5X0.083	0.408	49.367	6	0.006	94.784	y	10	2642.983	14085.15	624.421	624.421	1.136	H1-1a

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	M16	HR300_ALA	0.824	127.75	10	0.064	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.208	H.1-1
2	M35	HR300_ALA	0.758	127.75	10	0.067	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
3	M29	HR300_ALA	0.758	127.75	10	0.067	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
4	M32	HR300_ALA	0.758	127.75	10	0.067	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
5	M38	HR300_ALA	0.758	127.75	10	0.066	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
6	M41	HR300_ALA	0.758	127.75	10	0.067	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
7	M44	HR300_ALA	0.758	127.75	10	0.067	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
8	M47	HR300_ALA	0.758	127.75	10	0.067	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
9	M54	HR300_ALA	0.758	127.75	10	0.066	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
10	M57	HR300_ALA	0.758	127.75	10	0.067	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
11	M60	HR300_ALA	0.758	127.75	10	0.067	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
12	M63	HR300_ALA	0.758	127.75	10	0.067	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
13	M66	HR300_ALA	0.758	127.75	10	0.067	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
14	M77	HR300_ALA	0.758	127.75	10	0.067	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
15	M83	HR300_ALA	0.758	127.75	10	0.067	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
16	M85	HR300_ALA	0.758	127.75	10	0.066	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
17	M89	HR300_ALA	0.758	127.75	10	0.067	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
18	M91	HR300_ALA	0.758	127.75	10	0.067	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
19	M95	HR300_ALA	0.758	127.75	10	0.067	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	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
20	M97	HR300_ALA	0.758	127.75	10	0.066	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
21	M101	HR300_ALA	0.758	127.75	10	0.067	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
22	M103	HR300_ALA	0.758	127.75	10	0.067	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
23	M107	HR300_ALA	0.758	127.75	10	0.067	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
24	M109	HR300_ALA	0.824	127.75	10	0.064	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.208	H.1-1
25	M150	HR300_ALA	0.634	127.75	10	0.061	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.257	H.1-1
26	M153	HR300_ALA	0.65	127.75	10	0.058	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
27	M156	HR300_ALA	0.65	127.75	10	0.057	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.216	H.1-1
28	M159	HR300_ALA	0.65	127.75	10	0.058	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
29	M162	HR300_ALA	0.65	127.75	10	0.057	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
30	M165	HR300_ALA	0.65	127.75	10	0.058	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.216	H.1-1
31	M168	HR300_ALA	0.65	127.75	10	0.058	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.216	H.1-1
32	M171	HR300_ALA	0.65	127.75	10	0.057	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
33	M174	HR300_ALA	0.65	127.75	10	0.058	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
34	M177	HR300_ALA	0.65	127.75	10	0.057	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.216	H.1-1
35	M180	HR300_ALA	0.65	127.75	10	0.058	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.215	H.1-1
36	M183	HR300_ALA	0.634	127.75	10	0.061	38.5	y	11	6230.805	14342.564	533.921	934.619	7307.692	3206.154	2.256	H.1-1

JOB NO.: U2716.0371.231

PROJECT: SunTurf Package A14 **SUBJECT:** SP CALCULATIONS

DESIGN APPROACH ASD

CONNECTION CAPACITY Location: Column Base (set screws)

Connection Type: M16 Conical Set Screws

Tensile Capacity: 2600 lbs

Tension Load: 2486 lbs

Check Connection: 95.6%

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: 1736 lbs

Check Connection: 79.1%

Result: **Select K10341-002**

Note: Uplift capacity. FOS of (2)

JOB NO.: U2716.0371.231

PROJECT: SunTurf Package A14 **SUBJECT:** SP CALCULATIONS

CONNECTION CAPACITY Location: Brace to Column

Connection Type:	K10219-001	
Capacity:	1335	lbs
Tension Load:	1055	lbs
Check Connection:	79.0%	
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:	1094	lbs	
Check Bolt:	13.0%		
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

JOB NO.: U2716.0371.231
SUBJECT: CONC. PIER

PROJECT: Sunturf Package A14 Ground Mount

DRILLED CONCRETE PIER DESIGN

Column Reactions:

Max. Shear, V [k]:	1.8	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		
Pier Diameter, b [ft]:	1.5	Volume of Concrete [ft^3]:	10
Top of Pier Elevation [ft]:	0.00	Volume of Concrete [yd^3]:	0.4
Pier Depth, d [ft]:	5.5	Weight of Concrete [k]:	1.5

Soil Properties:

Allow. Bearing Pressure [psf]:	1,500	Optional Parameters for Uplift:	
1/3 increase for short term loads?	No		
		Skin Friction* [psf]:	250
Lateral Bearing, S [pcf]:	150	Top Length to Ignore [ft]:	0
Max. Lateral Bearing (opt'l) [psf]:		1/3 increase for short term loads?	No
Top Depth to Ignore [ft]:	0		
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	IBC Section1807.3.2.1
Applied Lateral Force, P [lb]:	1,800	
Point of Application, h [ft]:	0.0	
S_{max} [psf]:		
S [psf]:	550	
A = 2.34*P/(Sb):	5.11	
Required Pier Depth, d_{reqd} [ft]:	5.10	IBC Eq. 18-1

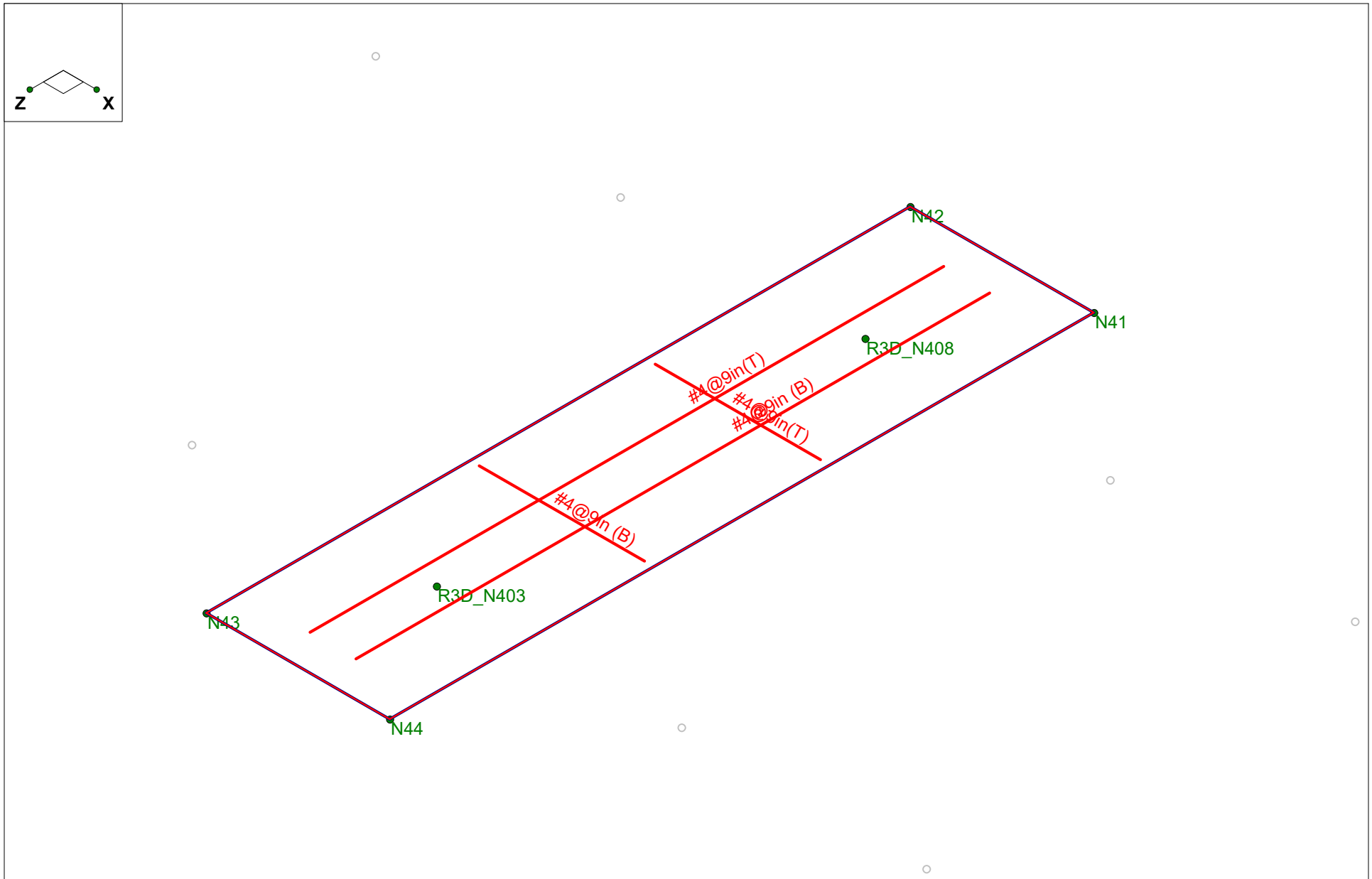
Result: **Lateral bearing capacity OK.**

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

(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 Bar	Bottom ...	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 ...	Icr 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...	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																

Load Combinations (Continued)

	Label	So..	Se..	A...	SF	Cat...	Fac...	Cat...	Fac...	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+	9.99+
2	3	S1	0	0	65462.849	0	17128.212	9.99+	9.99+
3	4	S1	0	22436.475	59226.444	2744.17	15432.563	2.64	5.624
4	5	S1	0	22811.633	59226.444	2303.322	15432.563	2.596	6.7
5	6	S1	0	1665.376	59089.874	0	18631.886	9.99+	9.99+
6	7	S1	0	0	61118.969	0	18310.308	9.99+	9.99+
7	8	S1	0	16827.356	64180.533	2058.128	16704.3	3.814	8.116
8	9	S1	0	17108.725	64180.533	1727.492	16704.3	3.751	9.67
9	10	S1	0	1249.032	63869.605	0	19103.791	9.99+	9.99+
10	11	S1	0	0	65391.427	0	18862.608	9.99+	9.99+
11	12	S1	0	22436.475	35535.866	2744.17	9259.538	1.584	3.374
12	13	S1	0	22811.633	35535.866	2303.322	9259.538	1.558	4.02
13	14	S1	0	1665.376	35453.924	0	12458.86	9.99+	9.99+
14	15	S1	0	0	37483.019	0	12137.283	9.99+	9.99+

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	0	3086.513	0	3086.513	9.99+	9.99+
2	3	S1	0	1.405	3425.08	2.554	3425.08	9.99+	9.99+
3	4	S1	0	1.997	2538.477	1249.558	2538.477	9.99+	2.031
4	5	S1	0	0.503	2626.049	1047.952	2626.049	9.99+	2.506
5	6	S1	0	2.328	3725.446	1456.812	3725.446	9.99+	2.557
6	7	S1	0	3.138	3660.806	1311.153	3660.806	9.99+	2.792
7	8	S1	0	0.444	2929.412	935.253	2929.412	9.99+	3.132
8	9	S1	0	0.677	2995.091	784.048	2995.091	9.99+	3.82
9	10	S1	0	2.8	3819.638	1094.525	3819.638	9.99+	3.49
10	11	S1	0	3.407	3771.159	985.28	3771.159	9.99+	3.827
11	12	S1	0	1.997	1303.872	1249.558	1303.872	9.99+	1.043
12	13	S1	0	0.503	1391.444	1047.952	1391.444	9.99+	1.328
13	14	S1	0	2.328	2490.841	1456.812	2490.841	9.99+	1.71
14	15	S1	0	3.138	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
1	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	39.094	22	1160.666	20	125.378	23	0	30	0	30	0	30
2		min	-16.573	27	-483.443	29	-146.267	25	0	18	0	18	0	18
3	N1	max	244.944	25	3500.438	25	1677.186	25	0	30	0	30	0	30
4		min	-243.724	28	-3062.793	28	-1439.36	23	0	18	0	18	0	18
5	N109	max	0.599	20	4079.229	25	2708.316	25	0	30	0	30	0	30
6		min	-0.661	29	-3421.361	28	-2324.41	23	0	18	0	18	0	18
7	N110A	max	15.822	26	1856.64	20	151.769	23	0	30	0	30	0	30
8		min	-10.394	27	-742.331	29	-174.496	25	0	18	0	18	0	18
9	N151	max	243.471	28	3498.817	25	1677.188	25	0	30	0	30	0	30
10		min	-244.809	25	-3060.802	28	-1439.348	23	0	18	0	18	0	18
11	N152	max	16.596	27	1160.643	20	125.377	23	0	30	0	30	0	30
12		min	-39.126	22	-483.356	29	-146.265	25	0	18	0	18	0	18
13	N381	max	0.825	28	4414.114	25	2541.236	25	0	30	0	30	0	30
14		min	-1.209	21	-3796.376	28	-2182.947	23	0	18	0	18	0	18
15	N382	max	4.355	27	1713.721	20	155.827	23	0	30	0	30	0	30
16		min	-6.863	26	-771.995	29	-179.392	25	0	18	0	18	0	18
17	N387	max	3.973	25	4143.55	25	2416.556	25	0	30	0	30	0	30
18		min	-3.919	28	-3547.283	28	-2070.202	23	0	18	0	18	0	18
19	N388	max	6.987	22	1637.811	20	154.646	23	0	30	0	30	0	30
20		min	-0.566	27	-636.621	29	-179.398	25	0	18	0	18	0	18
21	N393	max	0.525	28	4571.358	25	2628.716	25	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	-0.695	25	-3959.353	28	-2260.896	23	0	18	0	18	0	18
23	N394	max	0.349	29	1818.368	20	159.231	23	0	30	0	30	0	30
24		min	-1.147	24	-824.614	29	-182.817	25	0	18	0	18	0	18
25	N399	max	3.172	28	4125.49	25	2408.306	25	0	30	0	30	0	30
26		min	-3.427	25	-3527.492	28	-2063.173	23	0	18	0	18	0	18
27	N400	max	-0.226	27	1623.916	20	154.873	23	0	30	0	30	0	30
28		min	-5.369	20	-633.531	29	-179.732	25	0	18	0	18	0	18
29	N405	max	1.848	25	4400.528	25	2541.398	25	0	30	0	30	0	30
30		min	-1.796	28	-3789.495	28	-2183.338	23	0	18	0	18	0	18
31	N406	max	4.144	26	1735.091	20	157.352	23	0	30	0	30	0	30
32		min	-1.891	27	-726.403	29	-181.577	25	0	18	0	18	0	18
33	N411	max	0.609	28	4328.047	25	2513.615	25	0	30	0	30	0	30
34		min	-1.113	21	-3723.938	28	-2157.425	23	0	18	0	18	0	18
35	N412	max	5.479	27	1710.298	20	157.233	23	0	30	0	30	0	30
36		min	-7.063	25	-725.766	29	-181.553	25	0	18	0	18	0	18
37	N417	max	3.355	25	4261.2	25	2479.375	25	0	30	0	30	0	30
38		min	-3.199	28	-3662.118	28	-2126.353	23	0	18	0	18	0	18
39	N418	max	8.169	22	1687.75	20	156.726	23	0	30	0	30	0	30
40		min	-3.558	27	-709.206	29	-181.189	25	0	18	0	18	0	18
41	N423	max	2.608	28	4487.137	25	2583.321	25	0	30	0	30	0	30
42		min	-2.759	25	-3874.297	28	-2220.538	23	0	18	0	18	0	18
43	N424	max	0.969	29	1776.723	20	158.323	23	0	30	0	30	0	30
44		min	-4.24	20	-766.861	29	-182.312	25	0	18	0	18	0	18
45	N429	max	0.026	28	4098.089	25	2395.02	25	0	30	0	30	0	30
46		min	-0.004	22	-3500.168	28	-2051.675	23	0	18	0	18	0	18
47	N430	max	0	19	1609.116	20	154.483	23	0	30	0	30	0	30
48		min	-0.011	25	-618.893	29	-179.411	25	0	18	0	18	0	18
49	N435	max	2.764	25	4487.105	25	2583.308	25	0	30	0	30	0	30
50		min	-2.555	28	-3874.268	28	-2220.527	23	0	18	0	18	0	18
51	N436	max	4.239	20	1776.723	20	158.321	23	0	30	0	30	0	30
52		min	-0.992	29	-766.853	29	-182.309	25	0	18	0	18	0	18
53	N441	max	3.251	28	4261.061	25	2479.237	25	0	30	0	30	0	30
54		min	-3.352	25	-3662.021	28	-2126.242	23	0	18	0	18	0	18
55	N442	max	3.548	27	1687.705	20	156.719	23	0	30	0	30	0	30
56		min	-8.173	22	-709.067	29	-181.182	25	0	18	0	18	0	18
57	N447	max	1.109	21	4327.819	25	2513.4	25	0	30	0	30	0	30
58		min	-0.556	28	-3723.771	28	-2157.25	23	0	18	0	18	0	18
59	N448	max	7.04	25	1710.228	20	157.223	23	0	30	0	30	0	30
60		min	-5.489	27	-725.551	29	-181.544	25	0	18	0	18	0	18
61	N453	max	1.849	28	4400.415	25	2541.268	25	0	30	0	30	0	30
62		min	-1.844	25	-3789.419	28	-2183.233	23	0	18	0	18	0	18
63	N454	max	1.88	27	1735.041	20	157.345	23	0	30	0	30	0	30
64		min	-4.151	26	-726.263	29	-181.57	25	0	18	0	18	0	18
65	N459	max	3.429	25	4125.527	25	2408.321	25	0	30	0	30	0	30
66		min	-3.121	28	-3527.52	28	-2063.186	23	0	18	0	18	0	18
67	N460	max	5.368	20	1623.92	20	154.871	23	0	30	0	30	0	30
68		min	0.215	27	-633.564	29	-179.729	25	0	18	0	18	0	18
69	N465	max	0.7	25	4571.4	25	2628.682	25	0	30	0	30	0	30
70		min	-0.471	28	-3959.404	28	-2260.87	23	0	18	0	18	0	18
71	N466	max	1.133	24	1818.359	20	159.229	23	0	30	0	30	0	30
72		min	-0.373	29	-824.572	29	-182.816	25	0	18	0	18	0	18
73	N471	max	3.967	28	4143.208	25	2416.588	25	0	30	0	30	0	30
74		min	-3.967	25	-3546.932	28	-2070.215	23	0	18	0	18	0	18
75	N472	max	0.553	27	1637.801	20	154.645	23	0	30	0	30	0	30
76		min	-6.989	22	-636.657	29	-179.397	25	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	N477	max	1.188	21	4415.685	25	2541.12	25	0	30	0	30	0	30
78		min	-0.752	28	-3798.02	28	-2182.884	23	0	18	0	18	0	18
79	N478	max	6.848	26	1713.717	20	155.824	23	0	30	0	30	0	30
80		min	-4.355	27	-771.883	29	-179.388	25	0	18	0	18	0	18
81	N483	max	0.742	29	4076.211	25	2708.376	25	0	30	0	30	0	30
82		min	-0.603	20	-3417.961	28	-2324.424	23	0	18	0	18	0	18
83	N484	max	10.344	27	1856.61	20	151.767	23	0	30	0	30	0	30
84		min	-15.8	26	-742.295	29	-174.496	25	0	18	0	18	0	18
85	Totals:	max	0.002	25	75400.271	21	47673.693	25						
86		min	-0.001	28	-53334.291	27	-40891.336	27						

Company:	Vector Structural Engineers	Date:	6/21/2023
Engineer:	CJT	Page:	1/6
Project:	Sunturf Ground Mount A14		
Address:			
Phone:			
E-mail:			

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

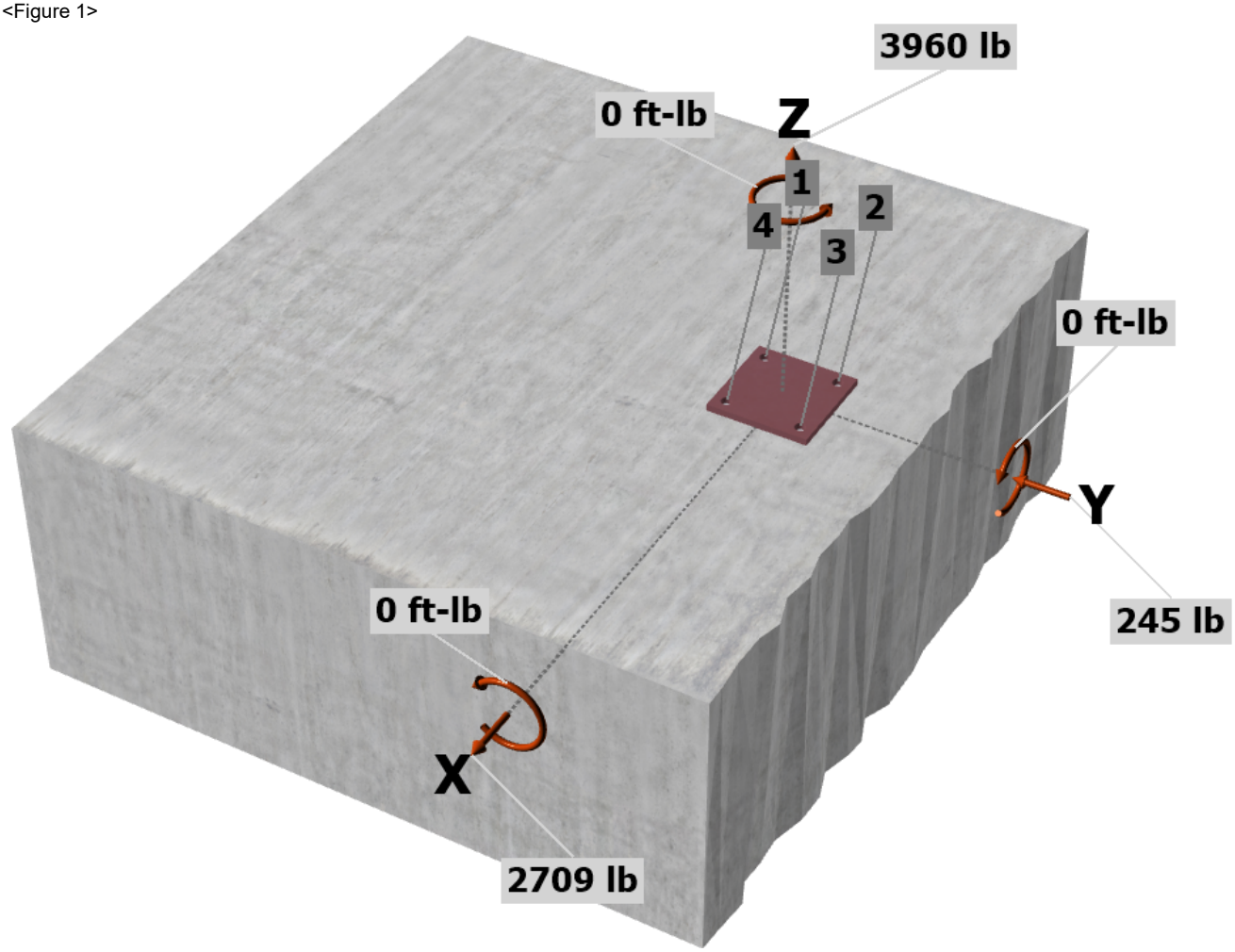
Recommended Anchor
Anchor Name: SET-3G™ - SET-3G w/ 1/2"Ø F593 CW (304/316SS)
Code Report: ICC-ES ESR-4057

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

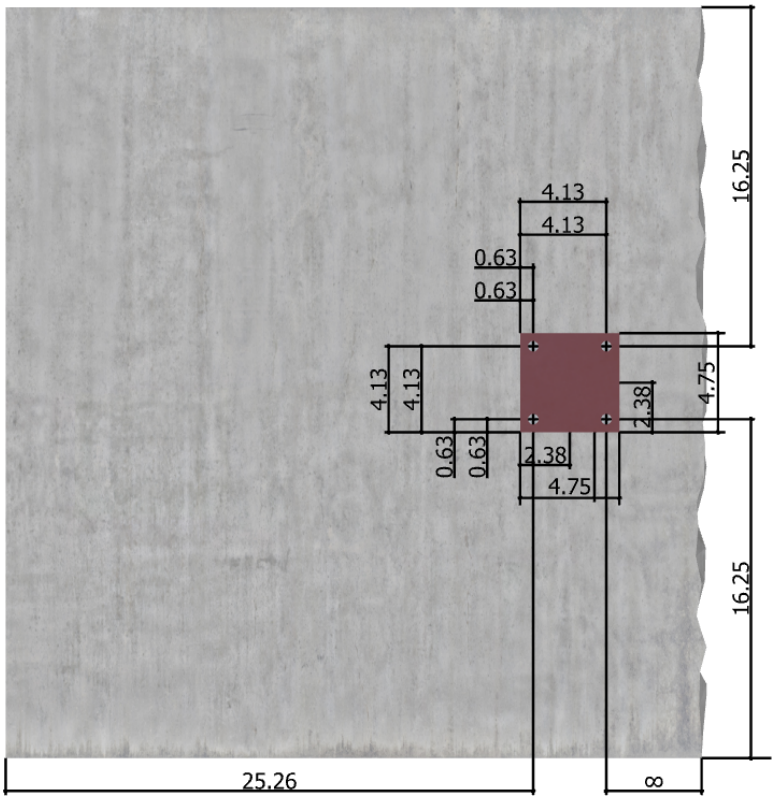
Strength level loads:

N_{ua} [lb]: 3960
V_{uax} [lb]: 2709
V_{uay} [lb]: -245
M_{ux} [ft-lb]: 0
M_{uy} [ft-lb]: 0
M_{uz} [ft-lb]: 0

<Figure 1>



<Figure 2>

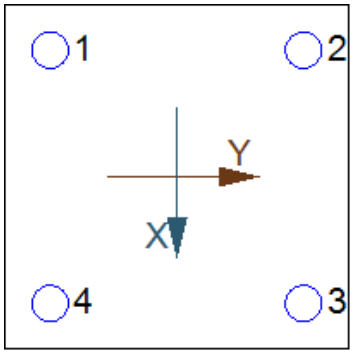


3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	990.0	677.2	-61.2	680.0
2	990.0	677.3	-61.2	680.0
3	990.0	677.3	-61.3	680.1
4	990.0	677.2	-61.3	680.0
Sum	3960.0	2709.0	-245.0	2720.1

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 3960
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)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (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

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

A_{Nc} (in²)	A_{Nco} (in²)	$c_{a,min}$ (in)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	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)

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

$\tau_{k,cr}$ (psi)	$f_{short\text{-}term}$	K_{sat}	f'_c (psi)	n	$\tau_{k,cr}$ (psi)
1304	1.00	1.00	2500	0.24	1304

$N_{ba} = \lambda_a \tau_{cr} \pi d_a h_{ef}$ (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

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

A_{Na} (in²)	A_{Na0} (in²)	c_{Na} (in)	$c_{a,min}$ (in)	$\Psi_{ec,Na}$	$\Psi_{ed,Na}$	$\Psi_{cp,Na}$	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

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} (in²)	A_{Vco} (in²)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	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} (in²)	A_{Vco} (in²)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	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} (in²)	A_{Vco} (in²)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	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} (in²)	A_{Vco} (in²)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	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)

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

k_{cp}	A_{Na} (in²)	A_{Na0} (in²)	$\Psi_{ed,Na}$	$\Psi_{ec,Na}$	$\Psi_{cp,Na}$	N_{ba} (lb)	N_a (lb)
2.0	300.11	191.09	1.000	1.000	1.000	6145	9650

A_{Nc} (in²)	A_{Nco} (in²)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	N_{cb} (lb)	ϕ
156.25	81.00	1.000	1.000	1.000	1.000	4417	8520	0.70

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	990	10650	0.09	Pass
Concrete breakout	3960	5538	0.72	Pass
Adhesive	**3960**	**5308**	**0.75**	**Pass (Governs)**

Shear	Factored Load, V_{ua} (lb)	Design Strength, ϕV_n (lb)	Ratio	Status
Steel	680	5538	0.12	Pass
T Concrete breakout x+	2709	18445	0.15	Pass
T Concrete breakout y-	245	10746	0.02	Pass
|| Concrete breakout x+	123	34541	0.00	Pass
|| Concrete breakout y-	1354	23799	0.06	Pass
Concrete breakout, combined	-	-	0.15	Pass
Pryout	**2720**	**11927**	**0.23**	**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	74.6%	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.