Project Number: U2716-0334-221

April 7, 2022

Sunmodo
14800 NE 65th Street
Vancouver, WA 98682

REFERENCE: Sunmodo Sunturf Ground Mount A11
Ground Mount PV Array Installation w/ Large Format Panels

To Whom It May Concern:

Per request of Sunmodo, we have been asked to prepare the structural design of a ground-mounted PV solar array system with several foundation options as shown in the attached calculations. The adopted building code in this jurisdiction is the International Building Code, 2018 Edition (2018 IBC). Vector Structural Engineering requires that we review each site-specific install, and we are not liable for installs at site specific locations we have not reviewed. The following design parameters are used in our analysis:

- Minimum Design Loads for Buildings and Other Structures (ASCE 7-16)
- Design wind speed for risk category I structures: 105 mph
- Wind exposure: B
- Ground snow load: 90 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	1435	1.5	2153
LATERAL	1145	2	2290

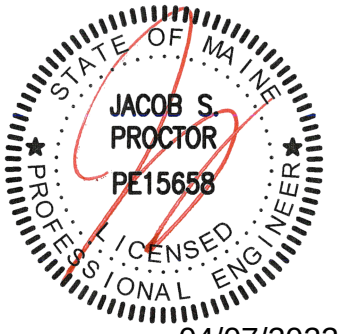
Foundation concrete shall have a minimum compressive strength of 2500 psi at 28 days. Cement for all concrete shall be Type I or II with a minimum of 6% entrained air with a water/cement ratio of 0.50. Maximum aggregate size shall be 3/4". No special inspection of concrete strength is required.

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



04/07/2022

Jacob Proctor, P.E.
License: PE15658 - Expires: 12/31/2023
Project Engineer

Enclosures

JSP/mih

VECTOR ENGINEERS
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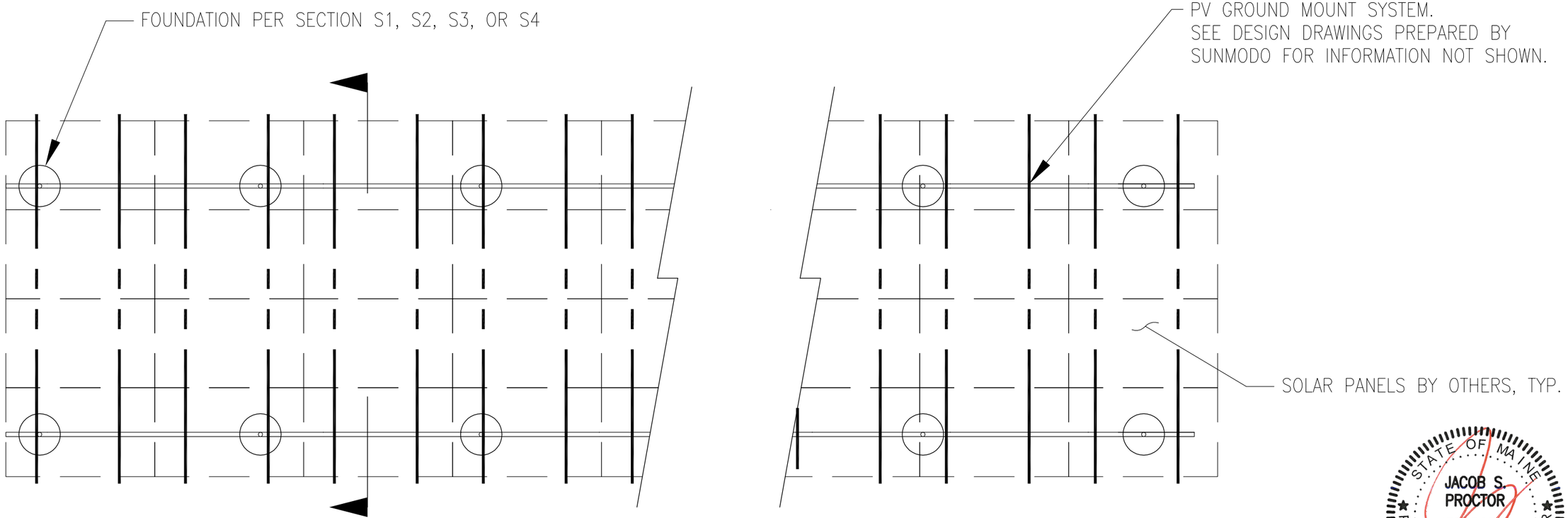
JOB NO. U2716-0334-221

PROJECT SUNMODO SUNTURF GROUND MOUNTS A11

SUBJECT ALL OPTIONS



STATE OF MAINE
JACOB S. PROCTOR
PE15658
PROFESSIONAL ENGINEER
LICENSED
04/07/2022

PV ARRAY PLAN

N.T.S.

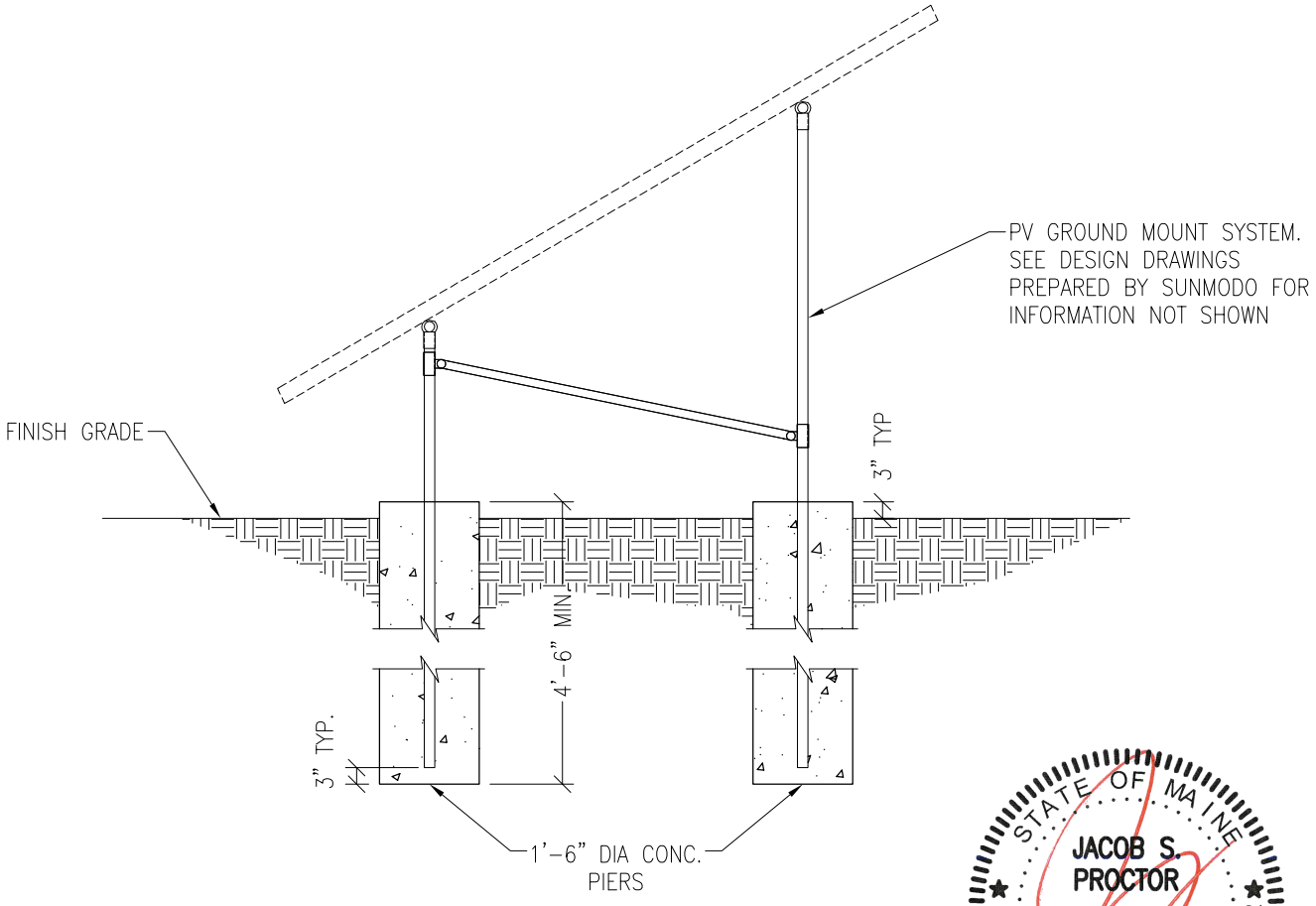
P1

VECTOR ENGINEERS

JOB NO. U2716-0334-221

PROJECT SUNMODO SUNTURF GROUND MOUNTS A11

SUBJECT DRILLED PIER OPTION



STATE OF MAINE
JACOB S. PROCTOR
PE15658
PROFESSIONAL ENGINEER / LICENSED

04/07/2022

PV ARRAY SECTION

N.T.S.

S1

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VECTOR ENGINEERS

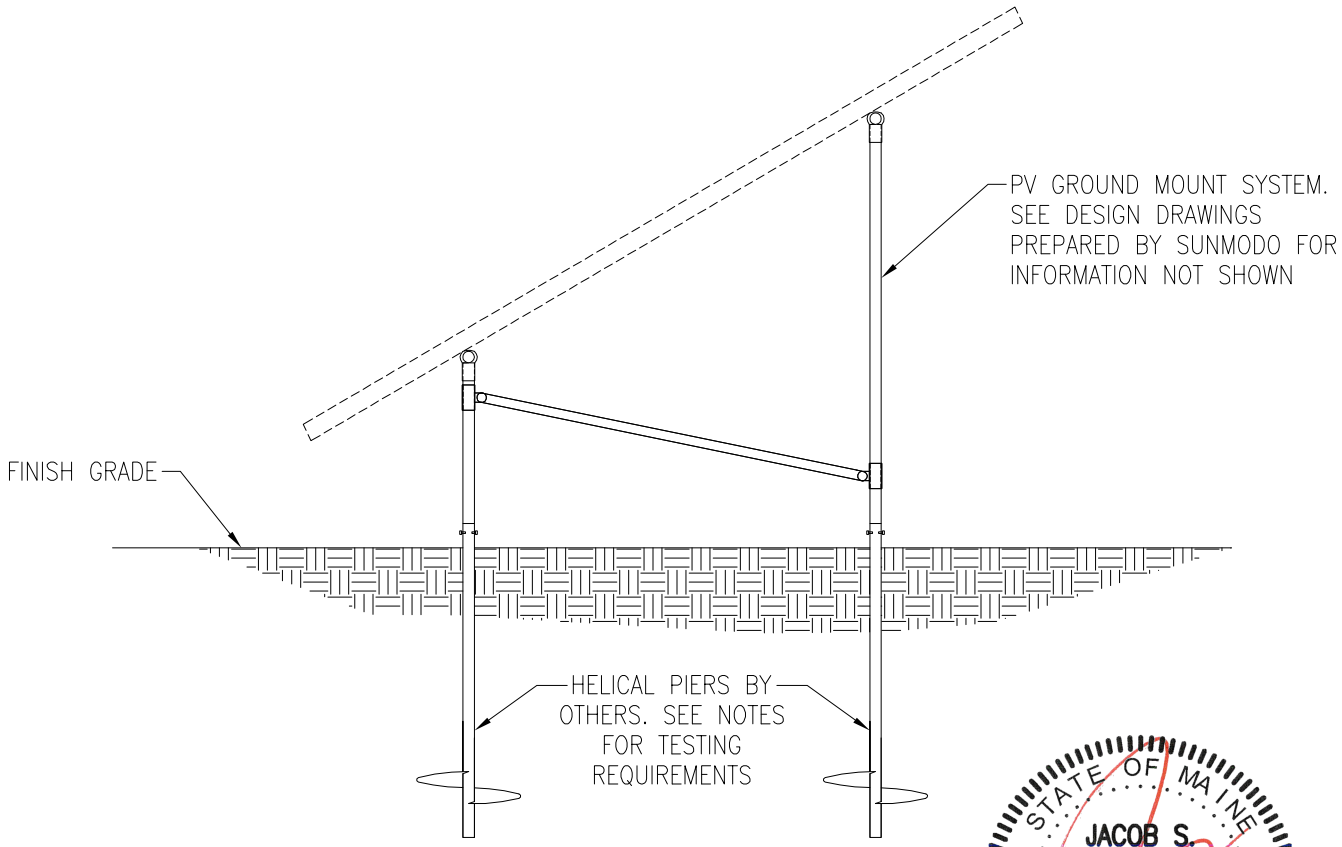
JOB NO. U2716-0334-221

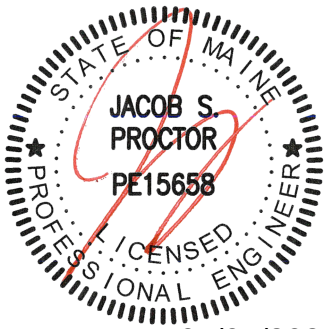
PROJECT SUNMODO SUNTURF GROUND MOUNTS A11

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

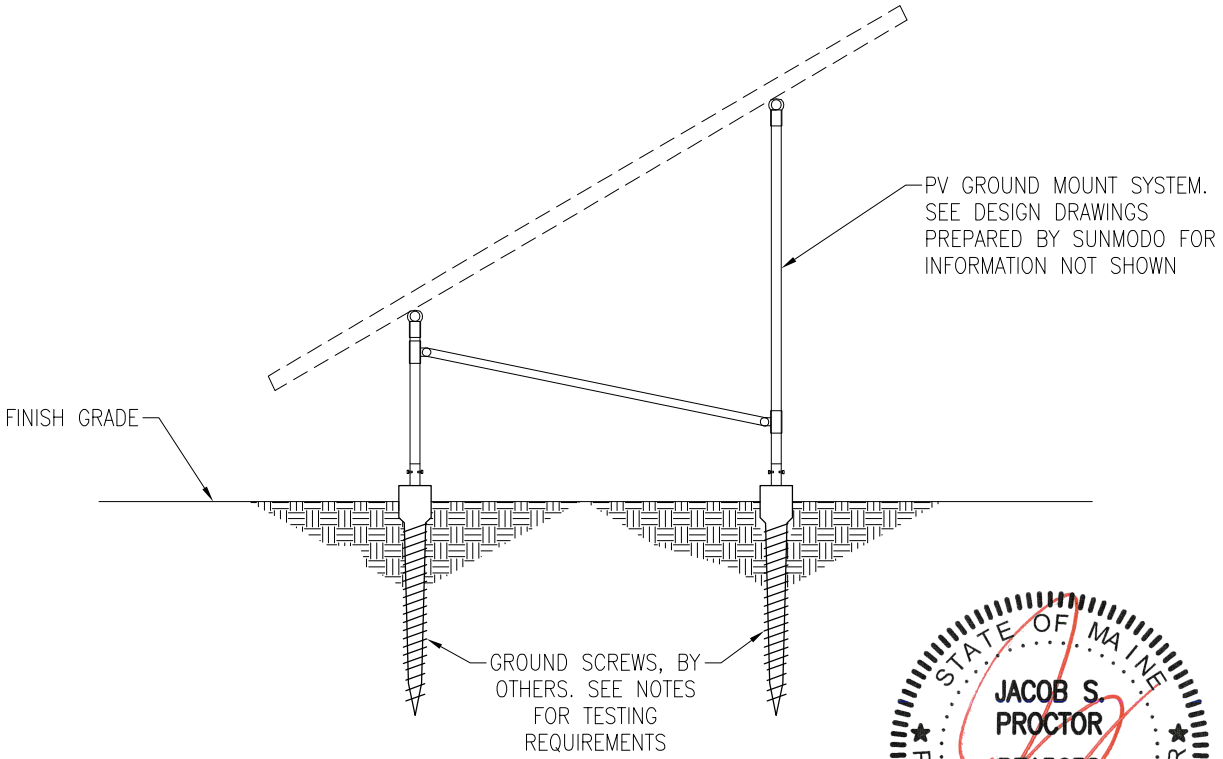
JOB NO. U2716-0334-221

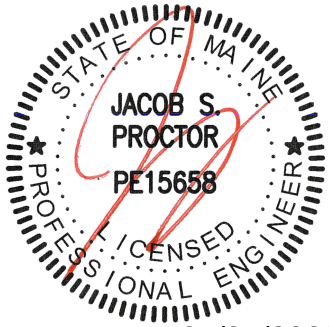
PROJECT SUNMODO SUNTURF GROUND MOUNTS A11

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

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S3

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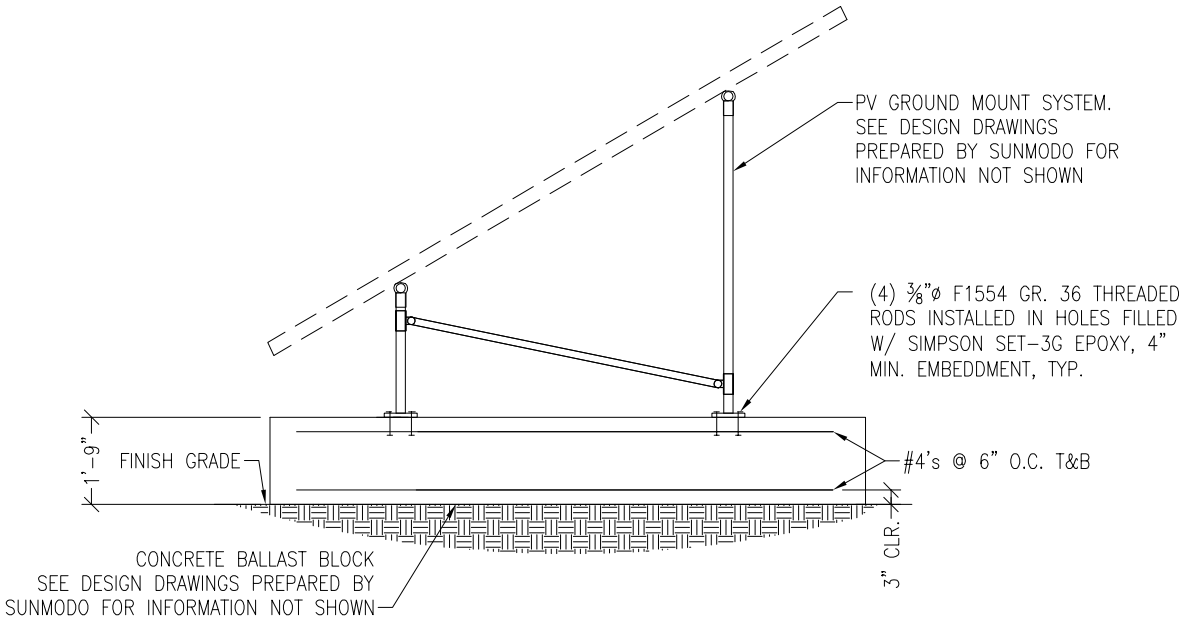
VECTOR ENGINEERS

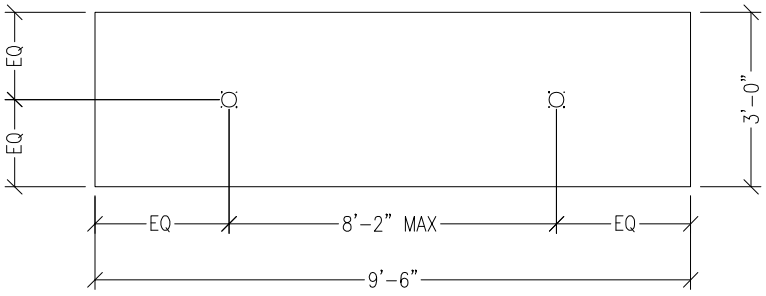
JOB NO. U2716-0334-221

PROJECT SUNMODO SUNTURF GROUND MOUNTS A11

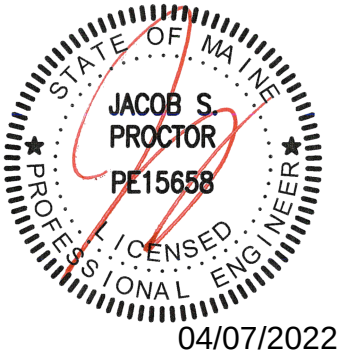
SUBJECT BALLASTED BLOCK OPTION



SECTION VIEW



PLAN VIEW



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PV ARRAY SECTION

N.T.S.

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VECTOR ENGINEERS

JOB NO.: U2716.0330.221

PROJECT: Sunturf Package A7 - 2022

DESIGN LOADS

VECTOR ENGINEERS

JOB NO.: U2716.0334.221
SUBJECT: SNOW LOADS
20° TILT

PROJECT: Sunturf Package A11 Ground Mount

SNOW LOADS

Calculations Per:	ASCE 7-16	
Snow Ground Load, p_g [psf]:	90.0	(Section 7.2)
Risk Category:	I	(Table 1.5-1)
Importance Factor, I_S:	0.8	(Table 1.5-2)
Terrain Category:	B	(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]:	54	(Equation 7.3-1)
Min. Roof Snow Load, p_m [psf]:	0	(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]:	49	(Equation 7.4-1)
Design Snow Load, S [psf]:	49	(1.0 Snow)

VECTOR ENGINEERS

JOB NO.: U2716.0334.221
SUBJECT: WIND PRESSURES
20° TILT

PROJECT: Sunturf Package A11 Ground Mount

WIND PRESSURES

Calculations per:	ASCE 7-16	
Design Wind Speed, V [mph]:	105	
Risk Category:	I	(Table 1.5-1)
Exposure Category:	B	(Section 26.7)
Elevation [ft]:	1086	
Ground Elevation Factor, K_e:	0.96	(Table 26.9-1)
α:	7.0	(Table 26.11-1)
z_g [ft]:	1200	(Table 26.11-1)
Velocity Pressure Exposure Coefficient, K_h:	0.57	(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]:	13.26	(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)	-14.6	-16.9
Case 2 (γ = 0°, Load Case B)	-24.8	-2.3
Case 3 (γ = 180°, Load Case A)	18.0	19.2
Case 4 (γ = 180°, Load Case B)	23.7	7.9
Case 5 (γ = 0°, 16 psf Min. Horiz.)	-16.0	-16.0
Case 6 (γ = 180°, 16 psf Min. Horiz)	16.0	16.0

VECTOR ENGINEERS

JOB NO.: U2716.0334.221
SUBJECT: SNOW LOADS
35° TILT

PROJECT: Sunturf Package A11 Ground Mount

SNOW LOADS

Calculations Per:	ASCE 7-16	
Snow Ground Load, p_g [psf]:	90.0	(Section 7.2)
Risk Category:	I	(Table 1.5-1)
Importance Factor, I_S:	0.8	(Table 1.5-2)
Terrain Category:	B	(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]:	54	(Equation 7.3-1)
Min. Roof Snow Load, p_m [psf]:	0	(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]:	35	(Equation 7.4-1)
Design Snow Load, S [psf]:	35	(1.0 Snow)

VECTOR ENGINEERS

JOB NO.: U2716.0334.221
SUBJECT: WIND PRESSURES
35° TILT

PROJECT: Sunturf Package A11 Ground Mount

WIND PRESSURES

Calculations per:	ASCE 7-16	
Design Wind Speed, V [mph]:	105	
Risk Category:	I	(Table 1.5-1)
Exposure Category:	B	(Section 26.7)
Elevation [ft]:	1086	
Ground Elevation Factor, K_e:	0.96	(Table 26.9-1)
α:	7.0	(Table 26.11-1)
z_g [ft]:	1200	(Table 26.11-1)
Velocity Pressure Exposure Coefficient, K_h:	0.57	(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]:	13.26	(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]

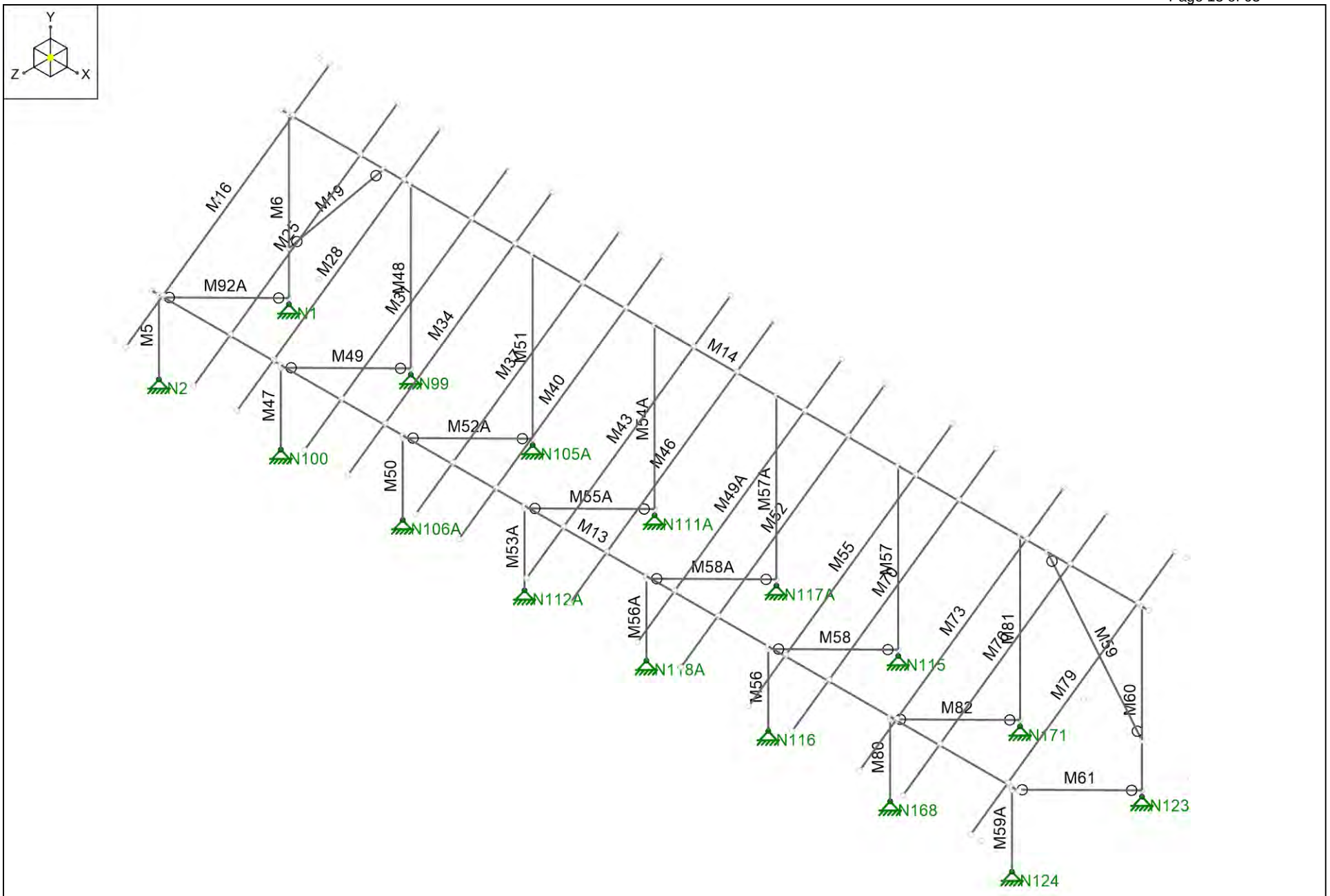
Clear Wind Flow	q_hGC_{NW}	q_hGC_{NL}
Case 1 (γ = 0°, Load Case A)	-20.3	-20.3
Case 2 (γ = 0°, Load Case B)	-27.0	-6.8
Case 3 (γ = 180°, Load Case A)	23.7	23.7
Case 4 (γ = 180°, Load Case B)	30.4	12.4
Case 5 (γ = 0°, 16 psf Min. Horiz.)	-16.0	-16.0
Case 6 (γ = 180°, 16 psf Min. Horiz)	16.0	16.0

VECTOR ENGINEERS

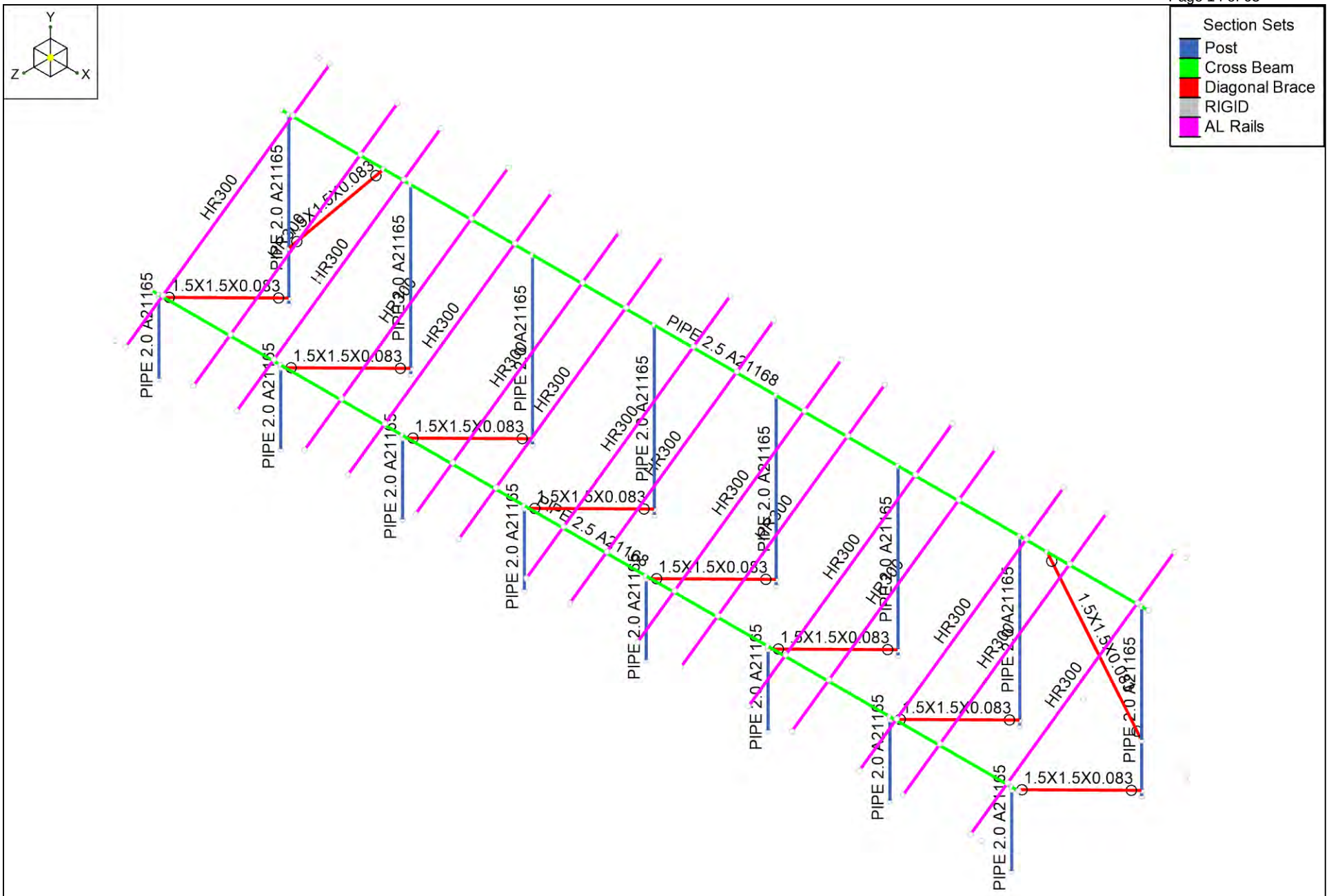
JOB NO.: U2716.0330.221

PROJECT: Sunturf Package A7 - 2022

RACKING ANALYSIS
4L CONFIGURATION



Vector Structural Engineering	Large Format Panels - 35 Degree Tilt - 4L	SK-1
MIH		Apr 07, 2022
U2716.0334.221		Sunmodo Sunturf A11 - LF - 35 - 4L.r3d



Vector Structural Engineering	Large Format Panels - 35 Degree Tilt - 4L	SK-2
MIH		Apr 07, 2022
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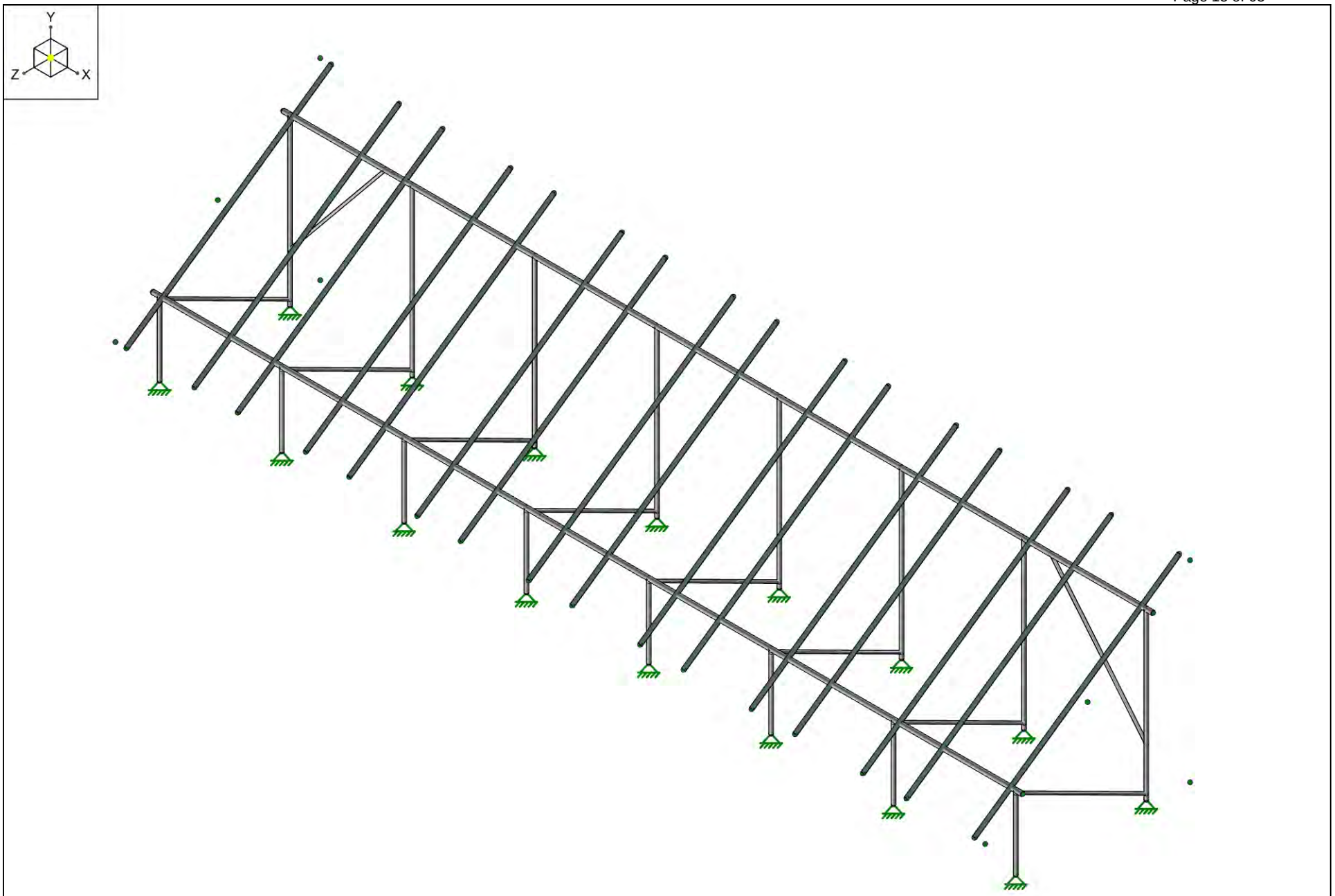

Vector Structural Engineering	Large Format Panels - 35 Degree Tilt - 4L	SK-3
MIH		Apr 07, 2022
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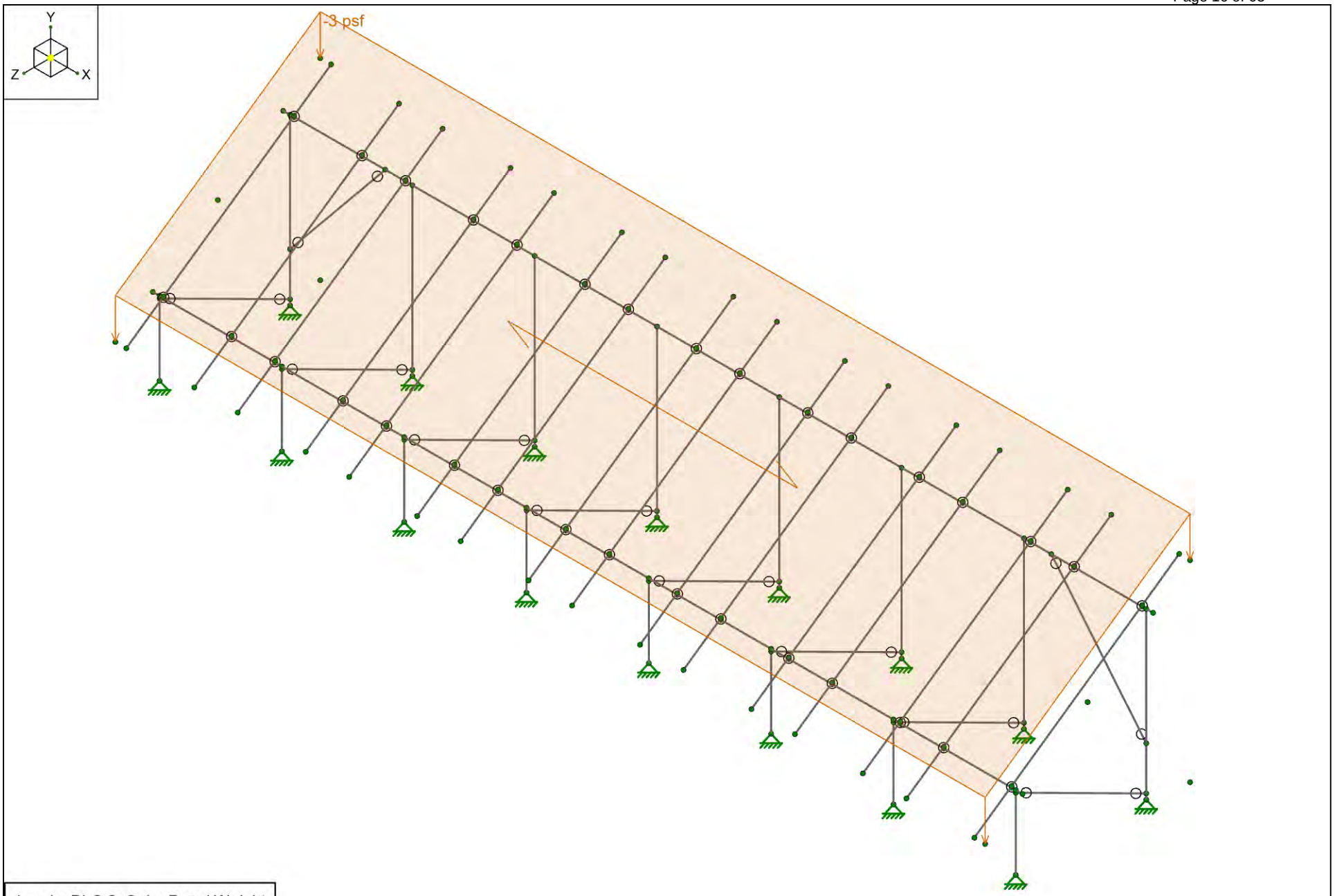
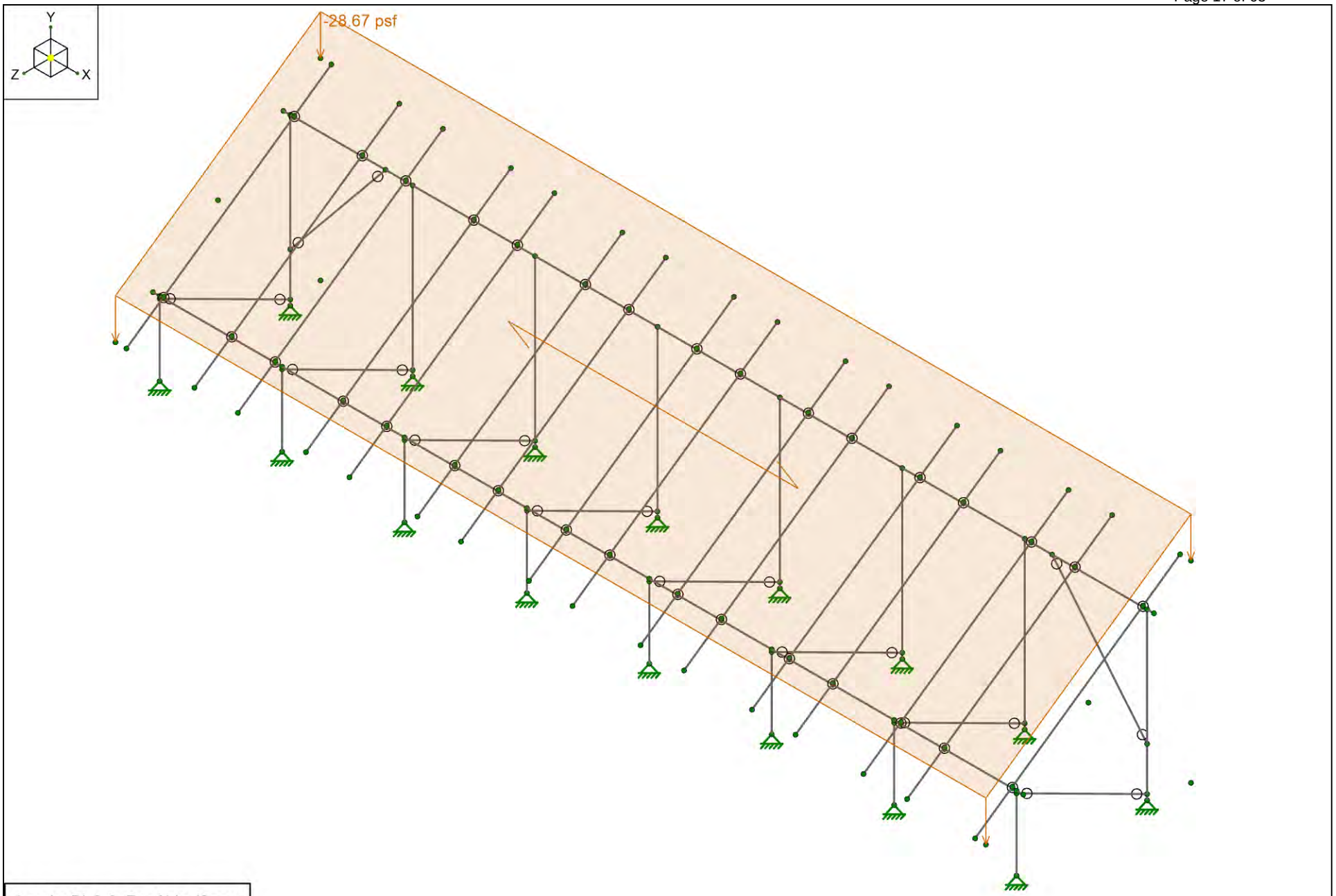


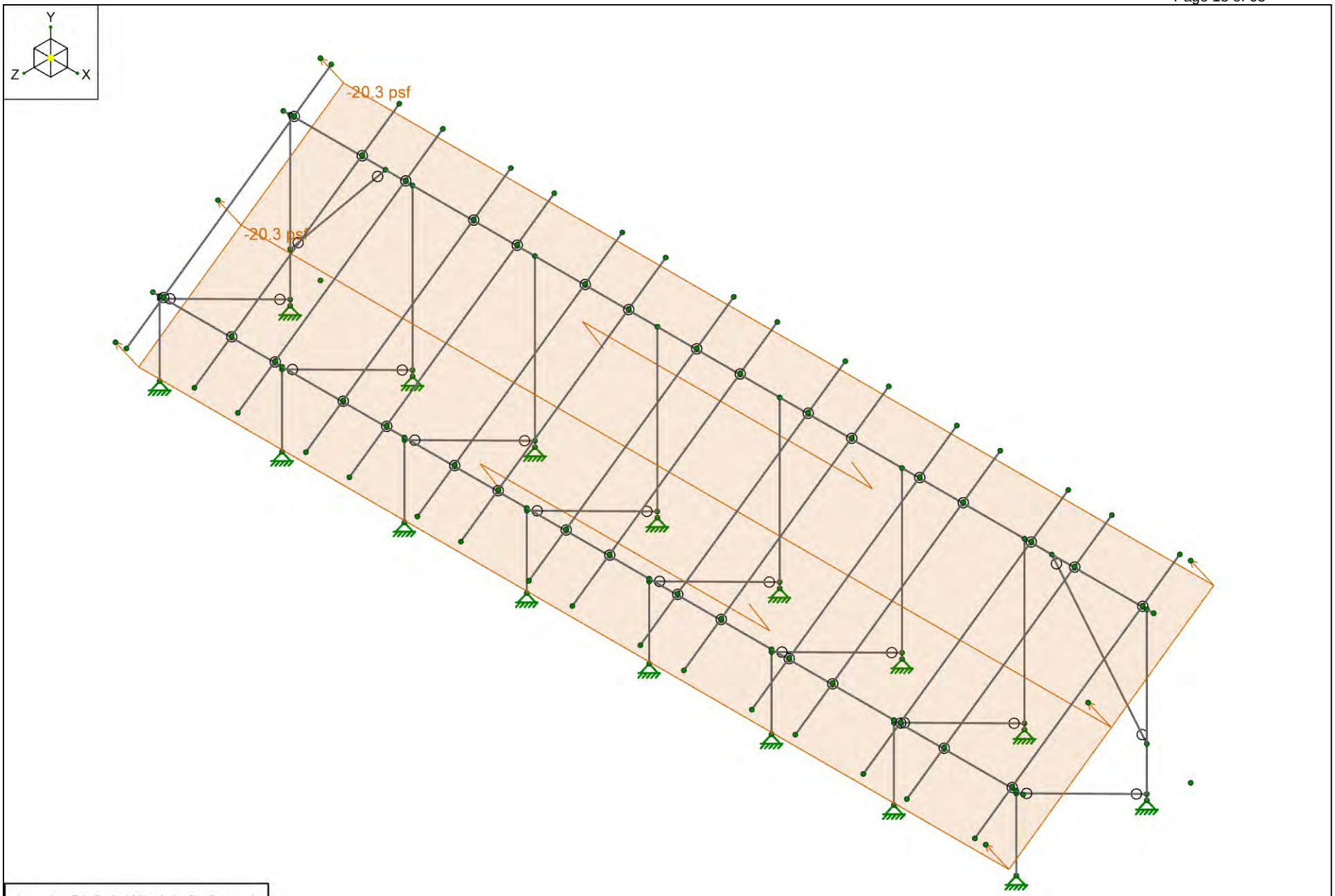
Loads: BLC 2, Solar Panel Weight

Vector Structural Engineering	Large Format Panels - 35 Degree Tilt - 4L	SK-4
MIH		Apr 07, 2022
U2716.0334.221		Sunmodo Sunturf A11 - LF - 35 - 4L.r3d



Loads: BLC 3, Roof Live/Snow

Vector Structural Engineering	Large Format Panels - 35 Degree Tilt - 4L	SK-5
MIH		Apr 07, 2022
U2716.0334.221		Sunmodo Sunturf A11 - LF - 35 - 4L.r3d



Loads: BLC 4, Wind 1: 0 Case A

Vector Structural Engineering	Large Format Panels - 35 Degree Tilt - 4L	SK-6
MIH		Apr 07, 2022
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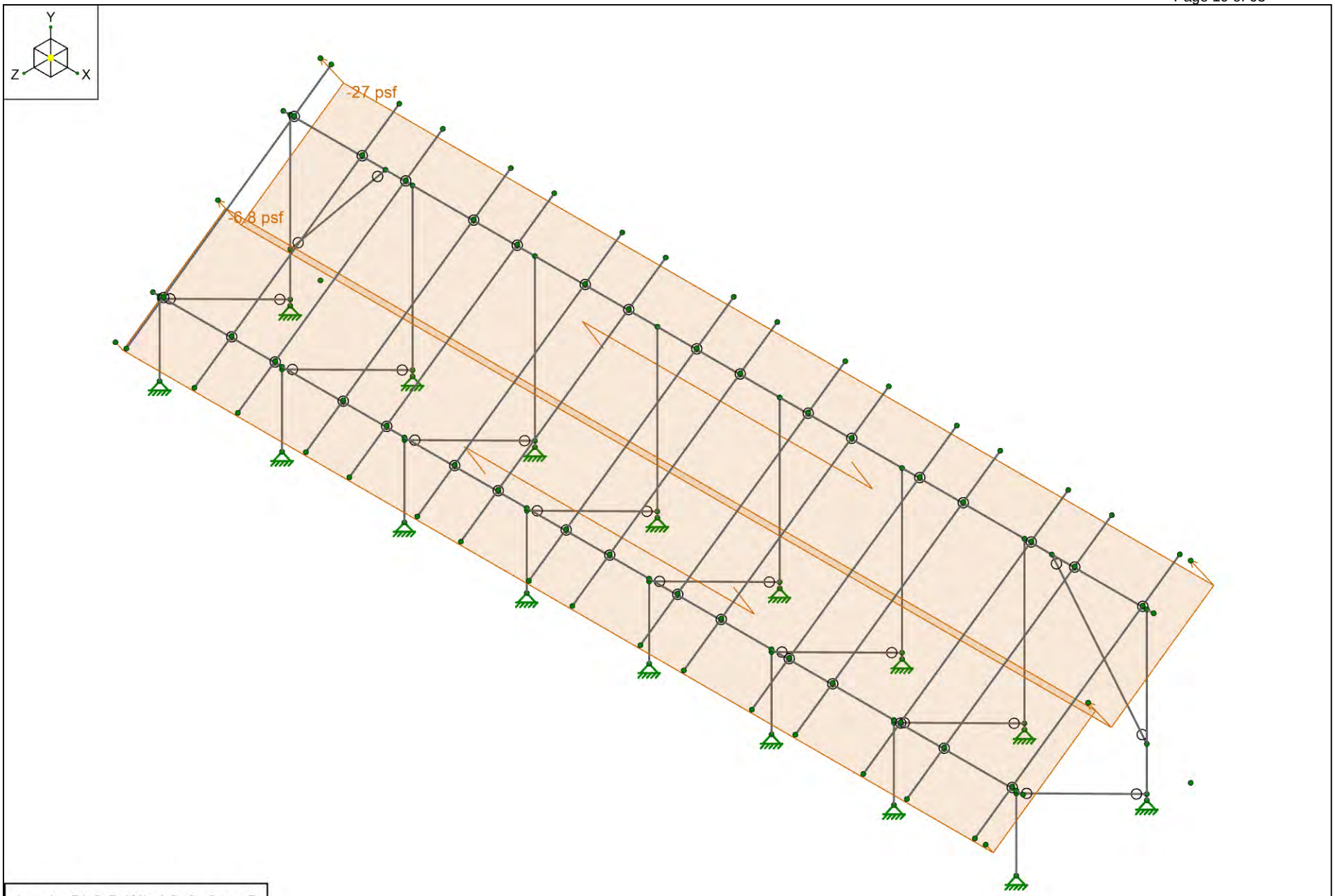
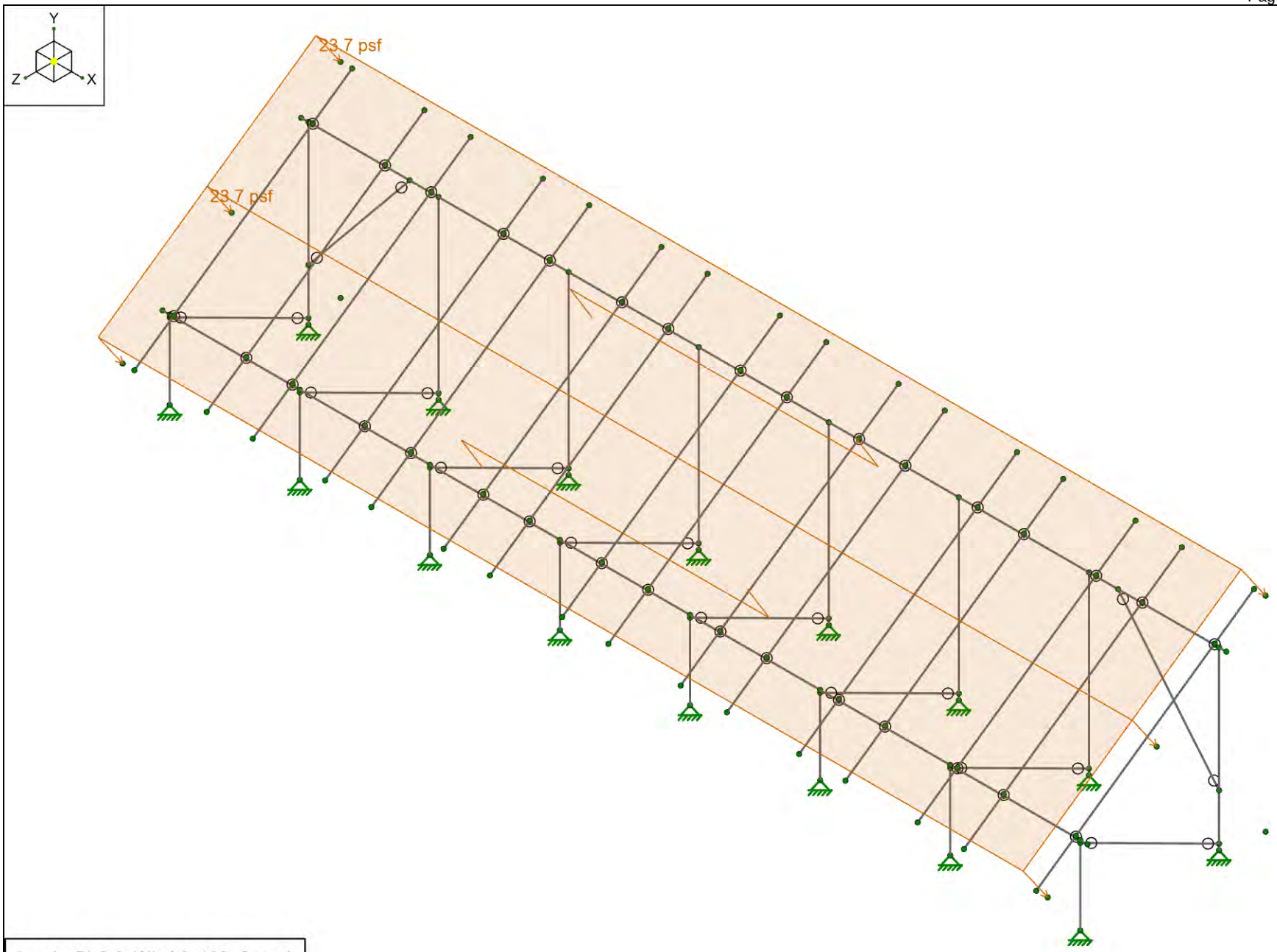


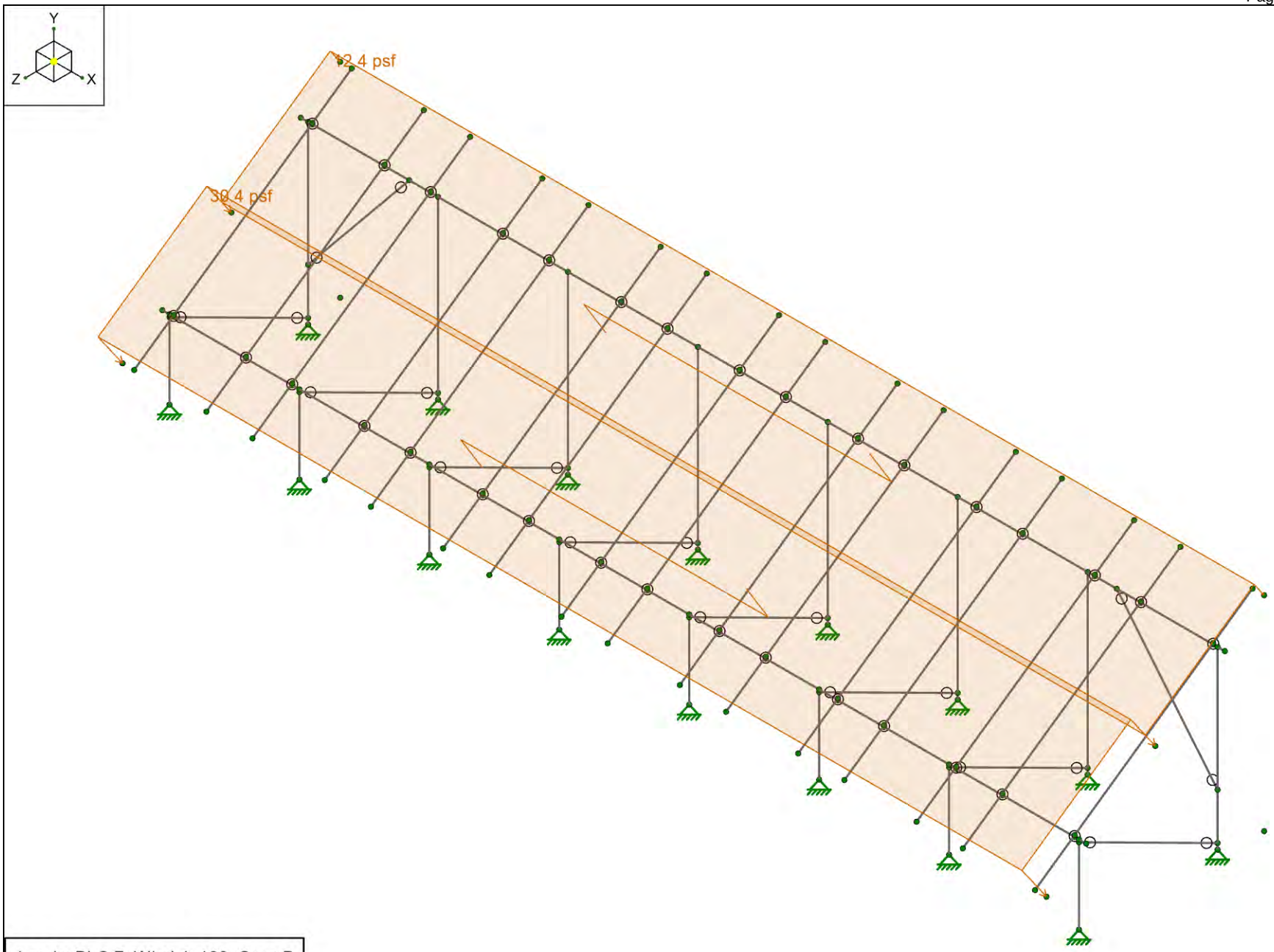
Loads: BLC 5, Wind 2: 0 Case B

Vector Structural Engineering	Large Format Panels - 35 Degree Tilt - 4L	SK-7
MIH		Apr 07, 2022
U2716.0334.221		Sunmodo Sunturf A11 - LF - 35 - 4L.r3d



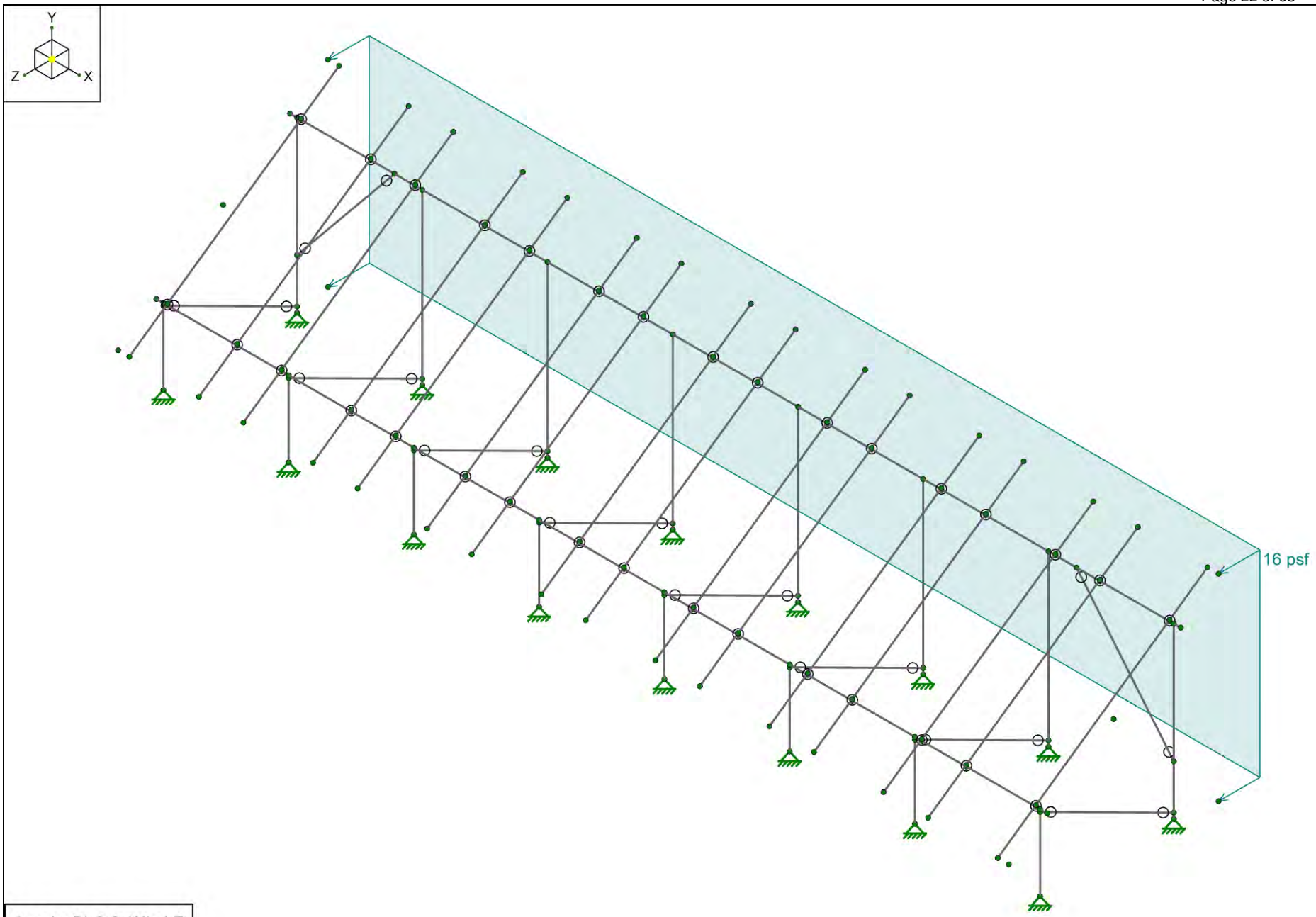
Loads: BLC 6, Wind 3: 180 Case A

Vector Structural Engineering	Large Format Panels - 35 Degree Tilt - 4L	SK-8
MIH		Apr 07, 2022
U2716.0334.221		Sunmodo Sunturf A11 - LF - 35 - 4L.r3d



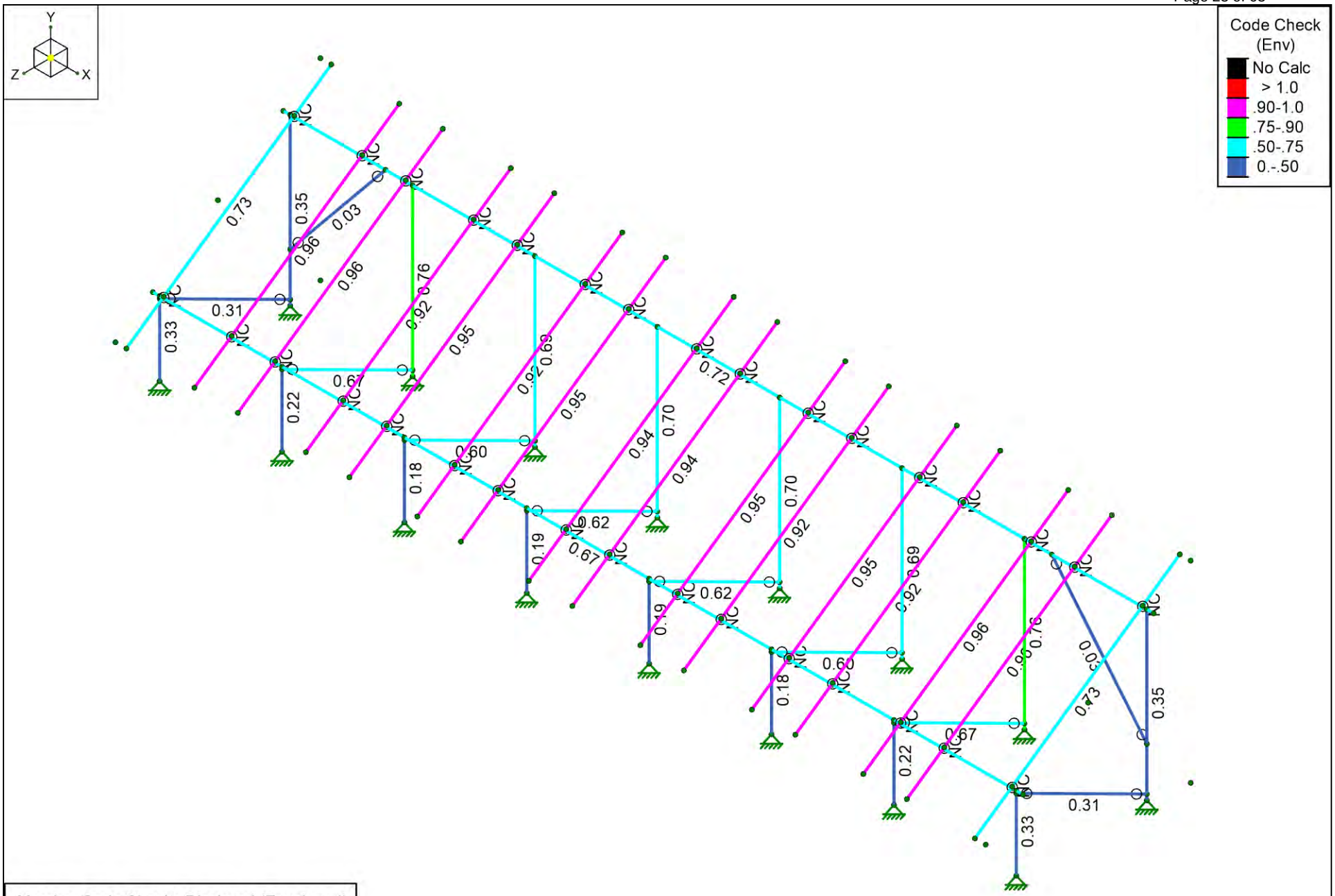
Loads: BLC 7, Wind 4: 180 Case B

Vector Structural Engineering	Large Format Panels - 35 Degree Tilt - 4L	SK-9
MIH		Apr 07, 2022
U2716.0334.221		Sunmodo Sunturf A11 - LF - 35 - 4L.r3d



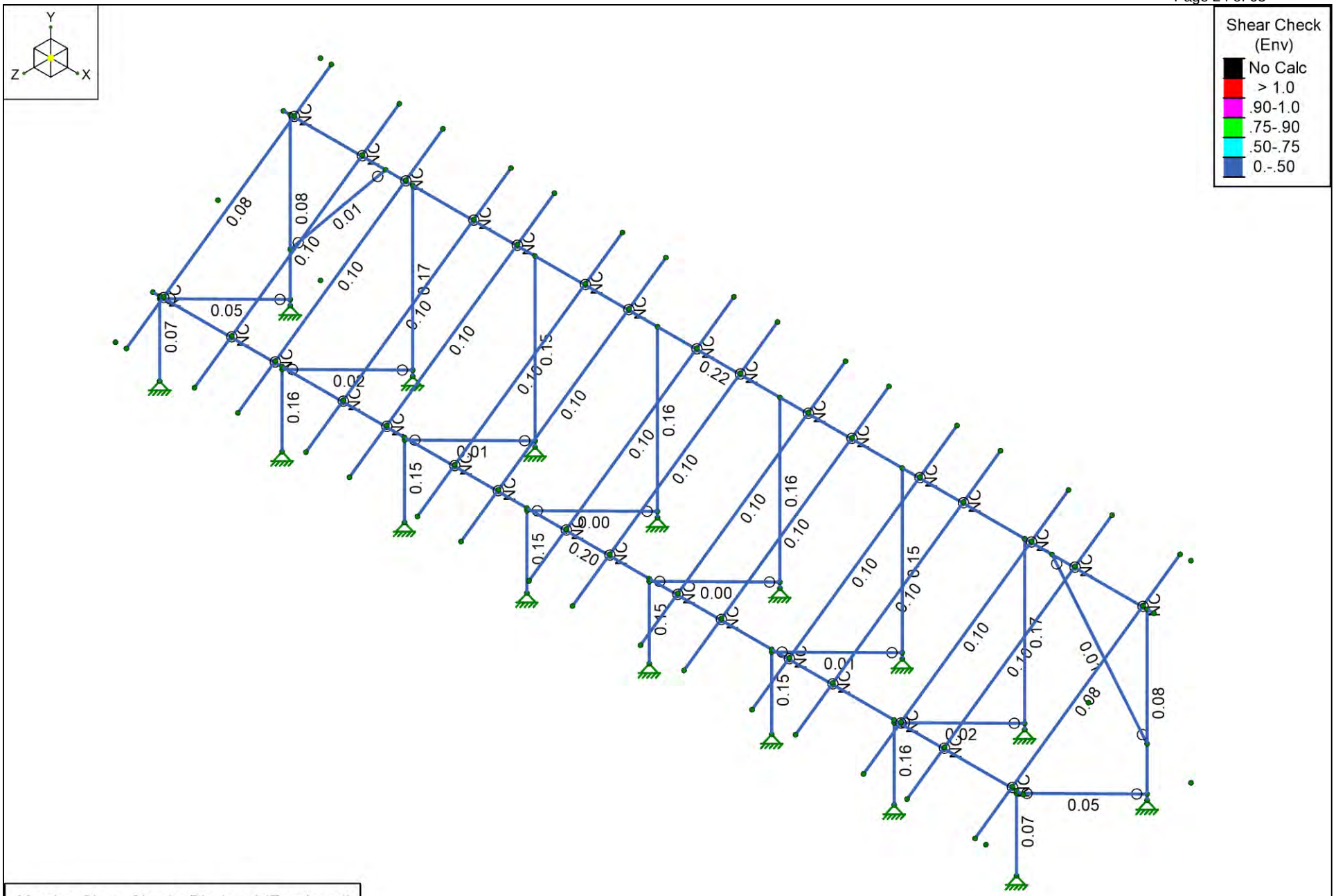
Loads: BLC 8, Wind Z

Vector Structural Engineering	Large Format Panels - 35 Degree Tilt - 4L	SK-10
MIH		Apr 07, 2022
U2716.0334.221		Sunmodo Sunturf A11 - LF - 35 - 4L.r3d



Member Code Checks Displayed (Enveloped)

Vector Structural Engineering	Large Format Panels - 35 Degree Tilt - 4L	SK-11
MIH		Apr 07, 2022
U2716.0334.221		Sunmodo Sunturf A11 - LF - 35 - 4L.r3d



Member Shear Checks Displayed (Enveloped)

Vector Structural Engineering	Large Format Panels - 35 Degree Tilt - 4L	SK-12
MIH		Apr 07, 2022
U2716.0334.221		Sunmodo Sunturf A11 - LF - 35 - 4L.r3d

Model Settings

Solution

Members

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

Wall Panels

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

Processor Core Utilization

Single	No
Multiple (Optimum)	Yes
Maximum	No

Axis

Vertical Global Axis

Global Axis corresponding to vertical direction	Y
Convert Existing Data	Yes

Default Member Orientation

Default Global Plane for z-axis	XZ

Plate Axis

Plate Local Axis Orientation	Nodal

Codes

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	None
Masonry	None
Aluminum	AA ADM1-15: ASD
Structure Type	Building
Stiffness Adjustment	Yes (Iterative)
Stainless	None
Stiffness Adjustment	Yes (Iterative)

Concrete

Compression Stress Block	Rectangular Stress Block
Analyze using Cracked Sections	Yes
Leave room for horizontal rebar splices (2*d bar spacing)	No

Model Settings (Continued)

List forces which were ignored for design in the Detail Report	Yes

Rebar

Column Min Steel	1
Column Max Steel	8
Rebar Material Spec	ASTM A615
Warn if beam-column framing arrangement is not understood	No

Shear Reinforcement

Number of Shear Regions	4
Region 2 & 3 Spacing Increase Increment (in)	4

Seismic

RISA-3D Seismic Load Options

Code	ASCE 7-16
Risk Category	I or II
Drift Cat	Other
Base Elevation (ft)	15600
Include the weight of the structure in base shear calcs	Yes

Site Parameters

S_1 (g)	1
SD_1 (g)	1
SD_S (g)	1
T_L (sec)	5

Structure Characteristics

T Z (sec)	
T X (sec)	
C_tX	0.02
C_tExp. Z	0.75
C_tExp. X	0.75
R Z	3
R X	3
Ω_0Z	1
Ω_0X	1
C_dZ	4
C_dX	4
ρ Z	1
ρ X	1

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e⁵°F⁻¹]	Density [k/ft³]	Yield [psi]	Ry	Fu [psi]	Rt
1	A992	29000	11154	0.3	0.65	0.49	50000	1.1	65000	1.1
2	A36 Gr.36	29000	11154	0.3	0.65	0.49	36000	1.5	58000	1.2
3	A572 Gr.50	29000	11154	0.3	0.65	0.49	50000	1.1	65000	1.1
4	A500 Gr.B RND	29000	11154	0.3	0.65	0.527	42000	1.4	58000	1.3
5	A500 Gr.B Rect	29000	11154	0.3	0.65	0.527	46000	1.4	58000	1.3
6	A53 Gr.B	29000	11154	0.3	0.65	0.49	35000	1.6	60000	1.2
7	A1085	29000	11154	0.3	0.65	0.49	50000	1.4	65000	1.3

Aluminum Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e⁵°F⁻¹]	Density [k/ft³]	Table B.4	kt	Ftu [psi]	Fty [psi]	Fcy [psi]	Fsu [psi]	Ct
1	3003-H14	10100	3787.5	0.33	1.3	0.173	Table B.4-1	1	19000	16000	13000	12000	141
2	6061-T6	10100	3787.5	0.33	1.3	0.173	Table B.4-2	1	38000	35000	35000	24000	141
3	6063-T5	10100	3787.5	0.33	1.3	0.173	Table B.4-2	1	22000	16000	16000	13000	141
4	6063-T6	10100	3787.5	0.33	1.3	0.173	Table B.4-2	1	30000	25000	25000	19000	141
5	5052-H34	10200	3787.5	0.33	1.3	0.173	Table B.4-1	1	34000	26000	24000	20000	141
6	6061-T6 W	10100	3787.5	0.33	1.3	0.173	Table B.4-1	1	24000	15000	15000	15000	141
7	6005-T5	10100	3787.5	0.33	1.3	0.173	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	Pipe 2.0 A21165	Column	Pipe	A572 Gr.50	Default	0.776	0.499	0.499	0.998
2	Cross Beam	Pipe 2.5 A21168	Beam	Pipe	A572 Gr.50	Default	0.947	0.907	0.907	1.814
3	Diagonal Brace	1.5x1.5x0.083	HBrace	SquareTube	A572 Gr.50	Default	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 Rails	HR300	Beam	Rectangular Tubes	6005-T5	Longitudinal	0.74	0.253	0.727	0.578

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	-35

Member Area Loads (BLC 4 : Wind 1: 0° Case A)

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [psf]
1	N197	N200	N120B	N119B	Perp	A-B	-20.3
2	N119B	N120B	N199	N196	Perp	A-B	-20.3

Member Area Loads (BLC 5 : Wind 2: 0° Case B)

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [psf]
1	N197	N200	N120B	N119B	Perp	A-B	-27
2	N119B	N120B	N199	N196	Perp	A-B	-6.8

Member Area Loads (BLC 6 : Wind 3: 180° Case A)

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [psf]
1	N197	N200	N120B	N119B	Perp	A-B	23.7
2	N119B	N120B	N199	N196	Perp	A-B	23.7

Member Area Loads (BLC 7 : Wind 4: 180° Case B)

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [psf]
1	N197	N200	N120B	N119B	Perp	A-B	12.4
2	N119B	N120B	N199	N196	Perp	A-B	30.4

Member Area Loads (BLC 8 : Wind Z)

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [psf]
1	N200	N166	N165	N197	Z	Open Structure	16

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 1: 0° Case A	OL1			2
5	Wind 2: 0° Case B	OL2			2
6	Wind 3: 180° Case A	OL3			2
7	Wind 4: 180° Case B	OL4			2
8	Wind Z	WLZ			1
9	BLC 2 Transient Area Loads	None		40	
10	BLC 3 Transient Area Loads	None		40	
11	BLC 4 Transient Area Loads	None		128	
12	BLC 5 Transient Area Loads	None		128	
13	BLC 6 Transient Area Loads	None		128	
14	BLC 7 Transient Area Loads	None		128	
15	BLC 8 Transient Area Loads	None		50	

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	0.6
9	1.0 D + 0.45 W2 + 0.75 S	Yes	Y	DL	1	RLL	0.75	OL2	0.45	WLZ	0.6
10	1.0 D + 0.45 W3 + 0.75 S	Yes	Y	DL	1	RLL	0.75	OL3	0.45	WLZ	-0.6
11	1.0 D + 0.45 W4 + 0.75 S	Yes	Y	DL	1	RLL	0.75	OL4	0.45	WLZ	-0.6
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
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								

Load Combinations (Continued)

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
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	WLZ	0.5
20	1.2 D + 1.6 S + 0.5 W2		Y	DL	1.2	RLL	1.6	OL2	0.5	WLZ	0.5
21	1.2 D + 1.6 S + 0.5 W3		Y	DL	1.2	RLL	1.6	OL3	0.5	WLZ	-0.5
22	1.2 D + 1.6 S + 0.5 W4		Y	DL	1.2	RLL	1.6	OL4	0.5	WLZ	-0.5
23	1.2 D + 1.0 W1		Y	DL	1.2	RLL		OL1	1	WLZ	1
24	1.2 D + 1.0 W2		Y	DL	1.2	RLL		OL2	1	WLZ	1
25	1.2 D + 1.0 W3		Y	DL	1.2	RLL		OL3	1	WLZ	-1
26	1.2 D + 1.0 W4		Y	DL	1.2	RLL		OL4	1	WLZ	-1
27	0.9 D + 1.0 W1		Y	DL	0.9	RLL		OL1	1	WLZ	1
28	0.9 D + 1.0 W2		Y	DL	0.9	RLL		OL2	1	WLZ	1
29	0.9 D + 1.0 W3		Y	DL	0.9	RLL		OL3	1	WLZ	-1
30	0.9 D + 1.0 W4		Y	DL	0.9	RLL		OL4	1	WLZ	-1

Envelope Node Reactions

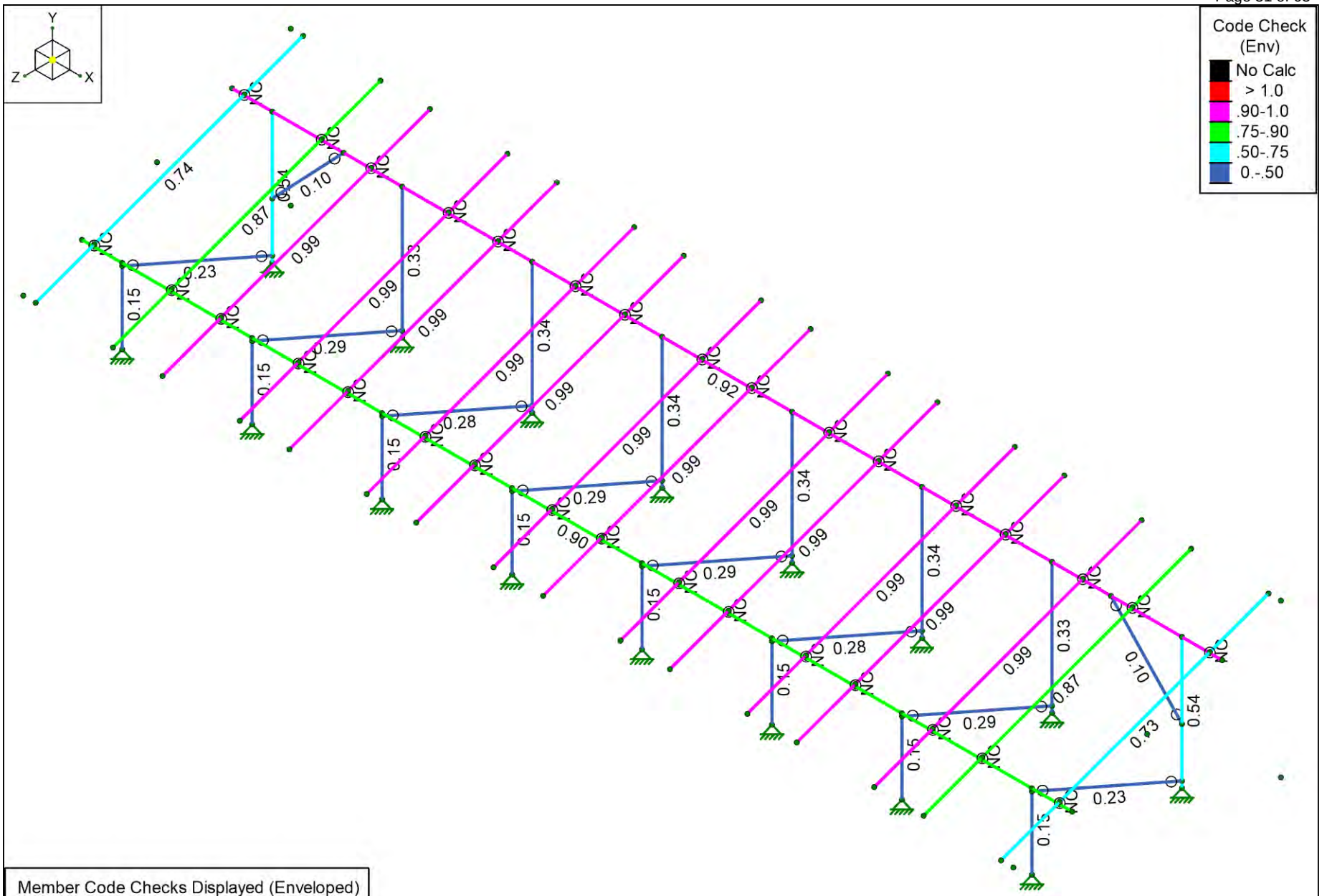
	Node Label		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
1	N2	max	89.443	11	965.355	3	31.215	4	0	15	0	15	0	15
2		min	-17.82	12	-31.442	14	-36.17	6	0	2	0	2	0	2
3	N1	max	39.271	10	1349.082	10	509.515	14	0	15	0	15	0	15
4		min	-17.224	13	-640.849	13	-441.453	4	0	2	0	2	0	2
5	N115	max	2.727	10	2639.171	10	1030.604	6	0	15	0	15	0	15
6		min	-1.606	13	-1308.98	13	-892.317	4	0	2	0	2	0	2
7	N116	max	10.383	9	1882.816	3	47.056	4	0	15	0	15	0	15
8		min	-1.465	14	-104.341	14	-54.008	6	0	2	0	2	0	2
9	N99	max	3.45	13	2897.401	10	1144.51	6	0	15	0	15	0	15
10		min	-9.71	10	-1434.528	13	-988.302	12	0	2	0	2	0	2
11	N100	max	5.14	12	2005.374	9	45.194	4	0	15	0	15	0	15
12		min	-33.338	11	-143.46	14	-51.493	6	0	2	0	2	0	2
13	N105A	max	1.571	13	2639.036	10	1030.598	6	0	15	0	15	0	15
14		min	-2.776	10	-1308.917	13	-892.308	4	0	2	0	2	0	2
15	N106A	max	1.515	14	1883.008	3	47.056	4	0	15	0	15	0	15
16		min	-10.369	9	-104.308	14	-54.008	6	0	2	0	2	0	2
17	N111A	max	0.903	13	2693.879	10	1048.91	6	0	15	0	15	0	15
18		min	-1.927	10	-1333.061	13	-908.1	4	0	2	0	2	0	2
19	N112A	max	-0.133	14	1907.56	3	47.466	4	0	15	0	15	0	15
20		min	-5.646	3	-108.446	14	-54.434	6	0	2	0	2	0	2
21	N117A	max	1.873	10	2693.9	10	1048.915	6	0	15	0	15	0	15
22		min	-0.936	13	-1333.07	13	-908.101	4	0	2	0	2	0	2
23	N118A	max	5.745	3	1907.603	3	47.466	4	0	15	0	15	0	15
24		min	0.185	14	-108.446	14	-54.434	6	0	2	0	2	0	2
25	N123	max	17.389	13	1349.947	10	509.566	14	0	15	0	15	0	15
26		min	-39.6	10	-641.114	13	-441.477	4	0	2	0	2	0	2
27	N124	max	17.799	12	963.874	3	31.215	4	0	15	0	15	0	15
28		min	-89.406	11	-31.663	14	-36.171	6	0	2	0	2	0	2
29	N168	max	33.518	11	2006.167	9	45.194	4	0	15	0	15	0	15
30		min	-5.146	12	-143.394	14	-51.493	6	0	2	0	2	0	2
31	N171	max	9.634	10	2896.584	10	1144.482	6	0	15	0	15	0	15
32		min	-3.478	13	-1434.238	13	-988.278	12	0	2	0	2	0	2
33	Totals:	max	0.001	10	28248.231	10	7074.664	14						
34		min	0	13	-6047.435	12	-6117.818	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]	Mnyy/om [lb-ft]	Mnzz/om [lb-ft]	Cb	Eqn
1	M48	Pipe 2.0 A21165	0.762	3.8	10	0.172	3.8		6	5073.764	23232.186	1397.505	1397.505	1.701	H1-1a
2	M81	Pipe 2.0 A21165	0.762	3.8	10	0.172	3.8		6	5073.764	23232.186	1397.505	1397.505	1.701	H1-1a
3	M14	Pipe 2.5 A21168	0.725	366.667	10	0.22	93.333		10	14032.946	28358.413	2081.747	2081.747	1	H1-1b
4	M57A	Pipe 2.0 A21165	0.704	3.8	10	0.158	3.8		6	5073.764	23232.186	1397.505	1397.505	1.666	H1-1a
5	M54A	Pipe 2.0 A21165	0.704	3.8	10	0.158	3.8		6	5073.764	23232.186	1397.505	1397.505	1.663	H1-1a
6	M57	Pipe 2.0 A21165	0.689	3.8	10	0.155	3.8		6	5073.764	23232.186	1397.505	1397.505	1.643	H1-1a
7	M51	Pipe 2.0 A21165	0.689	3.8	10	0.155	3.8		6	5073.764	23232.186	1397.505	1397.505	1.641	H1-1a
8	M13	Pipe 2.5 A21168	0.671	366.667	11	0.196	546.667		11	14032.946	28358.413	2081.747	2081.747	1	H1-1b
9	M49	1.5x1.5x0.083	0.67	56.004	6	0.016	107.528	y	3	2053.63	14085.15	624.421	624.421	1.136	H1-1a
10	M82	1.5x1.5x0.083	0.67	56.004	6	0.016	107.528	y	3	2053.63	14085.15	624.421	624.421	1.136	H1-1a
11	M58A	1.5x1.5x0.083	0.615	56.004	6	0.005	107.528	y	9	2053.63	14085.15	624.421	624.421	1.136	H1-1a
12	M55A	1.5x1.5x0.083	0.615	56.004	6	0.005	107.528	y	9	2053.63	14085.15	624.421	624.421	1.136	H1-1a
13	M58	1.5x1.5x0.083	0.604	56.004	6	0.007	107.528	y	9	2053.63	14085.15	624.421	624.421	1.136	H1-1a
14	M52A	1.5x1.5x0.083	0.604	56.004	6	0.007	107.528	y	9	2053.63	14085.15	624.421	624.421	1.136	H1-1a
15	M60	Pipe 2.0 A21165	0.348	3.8	10	0.075	3.8		6	5073.764	23232.186	1397.505	1397.505	1.273	H1-1a
16	M6	Pipe 2.0 A21165	0.348	3.8	10	0.075	3.8		6	5073.764	23232.186	1397.505	1397.505	1.28	H1-1a
17	M5	Pipe 2.0 A21165	0.333	54.138	11	0.074	54.138		6	16650.287	23232.186	1397.505	1397.505	1.712	H1-1b
18	M59A	Pipe 2.0 A21165	0.333	54.138	11	0.074	54.138		6	16650.287	23232.186	1397.505	1397.505	1.712	H1-1b
19	M61	1.5x1.5x0.083	0.307	56.004	6	0.046	107.528	y	10	2053.63	14085.15	624.421	624.421	1.136	H1-1a
20	M92A	1.5x1.5x0.083	0.307	56.004	6	0.046	107.528	y	10	2053.63	14085.15	624.421	624.421	1.136	H1-1a
21	M80	Pipe 2.0 A21165	0.217	52.446	11	0.165	54.138		6	16650.287	23232.186	1397.505	1397.505	1.698	H1-1b
22	M47	Pipe 2.0 A21165	0.217	52.446	11	0.165	54.138		6	16650.287	23232.186	1397.505	1397.505	1.698	H1-1b
23	M56A	Pipe 2.0 A21165	0.185	52.446	6	0.149	54.138		6	16650.287	23232.186	1397.505	1397.505	1.62	H1-1b
24	M53A	Pipe 2.0 A21165	0.185	52.446	6	0.149	54.138		6	16650.287	23232.186	1397.505	1397.505	1.62	H1-1b
25	M50	Pipe 2.0 A21165	0.184	52.446	6	0.147	54.138		6	16650.287	23232.186	1397.505	1397.505	1.887	H1-1b
26	M56	Pipe 2.0 A21165	0.184	52.446	6	0.147	54.138		6	16650.287	23232.186	1397.505	1397.505	1.892	H1-1b
27	M59	1.5x1.5x0.083	0.029	57.577	3	0.009	110.549	y	7	1942.929	14085.15	624.421	624.421	1.136	H1-1b
28	M19	1.5x1.5x0.083	0.029	57.66	3	0.009	110.707	y	7	1937.391	14085.15	624.421	624.421	1.136	H1-1b

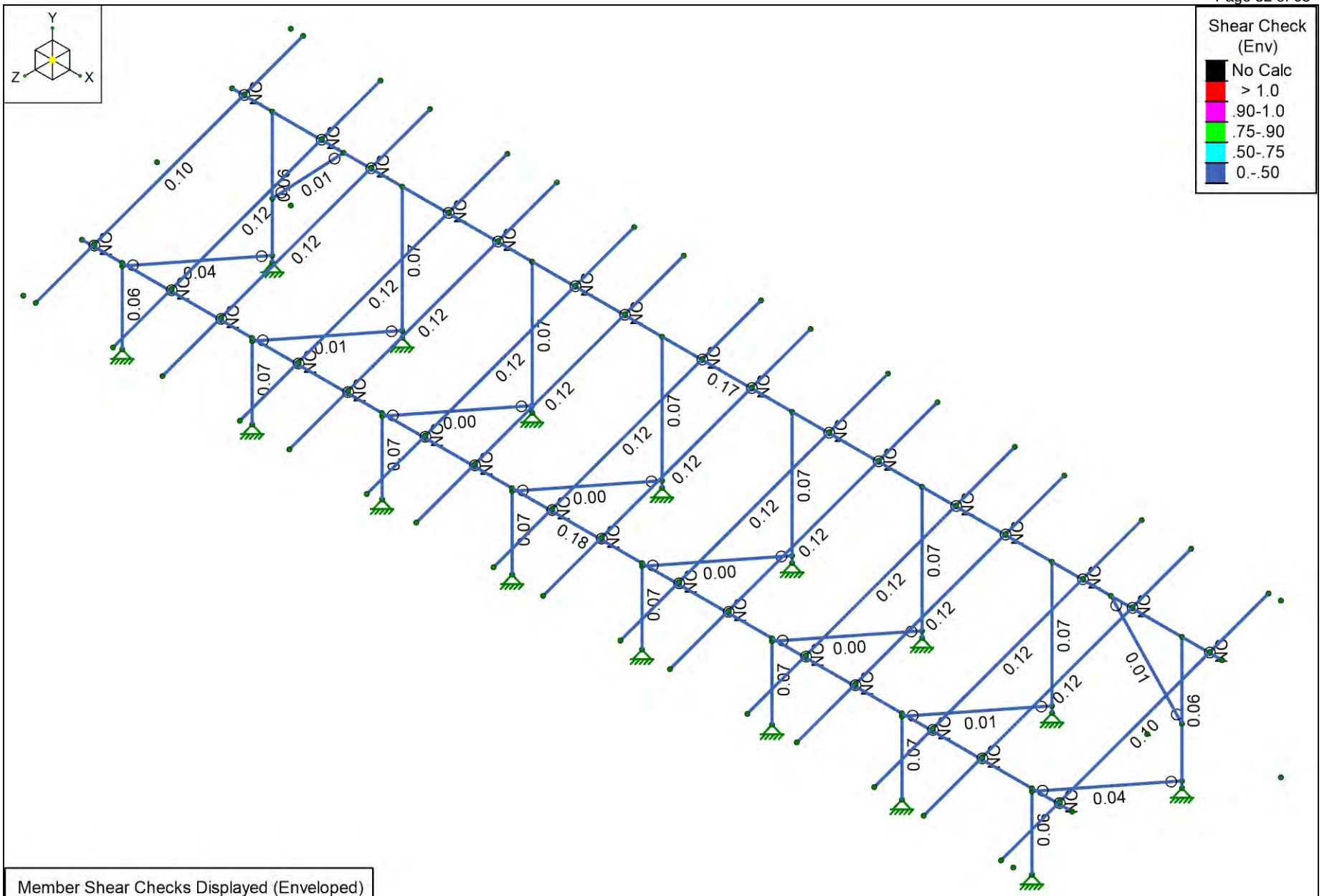
Envelope AA ADM1-15: ASD - BUILDING Member Aluminum Code Checks

	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	M25	HR300	0.963	92	10	0.099	34.5	y	11	2716.756	14429.594	560.36	934.132	5656.689	2605.145	1.697	H.1-1
2	M76	HR300	0.961	92	10	0.099	34.5	y	11	2716.756	14429.594	560.36	934.132	5656.689	2605.145	1.698	H.1-1
3	M28	HR300	0.959	93.917	10	0.097	34.5	y	11	2716.756	14429.594	560.36	934.132	5656.689	2605.145	1.78	H.1-1
4	M73	HR300	0.959	93.917	10	0.097	34.5	y	11	2716.756	14429.594	560.36	934.132	5656.689	2605.145	1.78	H.1-1
5	M55	HR300	0.951	93.917	10	0.099	34.5	y	11	2716.756	14429.594	560.36	934.132	5656.689	2605.145	1.78	H.1-1
6	M34	HR300	0.951	93.917	10	0.099	34.5	y	11	2716.756	14429.594	560.36	934.132	5656.689	2605.145	1.78	H.1-1
7	M49A	HR300	0.946	93.917	10	0.099	34.5	y	11	2716.756	14429.594	560.36	934.132	5656.689	2605.145	1.78	H.1-1
8	M40	HR300	0.946	93.917	10	0.099	34.5	y	11	2716.756	14429.594	560.36	934.132	5656.689	2605.145	1.78	H.1-1
9	M43	HR300	0.936	93.917	10	0.098	34.5	y	11	2716.756	14429.594	560.36	934.132	5656.689	2605.145	1.78	H.1-1
10	M46	HR300	0.936	93.917	10	0.098	34.5	y	11	2716.756	14429.594	560.36	934.132	5656.689	2605.145	1.78	H.1-1
11	M52	HR300	0.919	92	10	0.097	34.5	y	11	2716.756	14429.594	560.36	934.132	5656.689	2605.145	1.78	H.1-1
12	M37	HR300	0.919	92	10	0.097	34.5	y	11	2716.756	14429.594	560.36	934.132	5656.689	2605.145	1.78	H.1-1
13	M70	HR300	0.918	88.167	10	0.096	34.5	y	11	2716.756	14429.594	560.36	934.132	5656.689	2605.145	1.78	H.1-1
14	M31	HR300	0.918	88.167	10	0.096	34.5	y	11	2716.756	14429.594	560.36	934.132	5656.689	2605.145	1.78	H.1-1
15	M79	HR300	0.727	93.917	10	0.077	34.5	y	10	2716.756	14429.594	560.36	934.132	5656.689	2605.145	1.766	H.1-1
16	M16	HR300	0.725	93.917	10	0.077	34.5	y	10	2716.756	14429.594	560.36	934.132	5656.689	2605.145	1.769	H.1-1



Member Code Checks Displayed (Enveloped)

Vector Structural Engineering	Large Format Panels - 20 Degree Tilt - 4L	SK-13
MIH		Apr 07, 2022
U2716.0334.221		Sunmodo Sunturf A11 - LF - 20 - 4L.r3d



Member Shear Checks Displayed (Enveloped)

Vector Structural Engineering	Large Format Panels - 20 Degree Tilt - 4L	SK-14
MIH		Apr 07, 2022
U2716.0334.221		Sunmodo Sunturf A11 - LF - 20 - 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	-49

Member Area Loads (BLC 4 : Wind 1: 0° Case A)

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [psf]
1	N197	N200	N120B	N119B	Perp	A-B	-14.6
2	N119B	N120B	N199	N196	Perp	A-B	-16.9

Member Area Loads (BLC 5 : Wind 2: 0° Case B)

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [psf]
1	N197	N200	N120B	N119B	Perp	A-B	-24.8
2	N119B	N120B	N199	N196	Perp	A-B	-2.3

Member Area Loads (BLC 6 : Wind 3: 180° Case A)

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [psf]
1	N197	N200	N120B	N119B	Perp	A-B	19.2
2	N119B	N120B	N199	N196	Perp	A-B	18

Member Area Loads (BLC 7 : Wind 4: 180° Case B)

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [psf]
1	N197	N200	N120B	N119B	Perp	A-B	7.9
2	N119B	N120B	N199	N196	Perp	A-B	23.7

Member Area Loads (BLC 8 : Wind Z)

	Node A	Node B	Node C	Node D	Direction	Load Direction	Magnitude [psf]
1	N200	N166	N165	N197	Z	Open Structure	16

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	21.905	11	2131.453	3	23.504	4	0	15	0	15	0	15
2		min	-4.705	12	-83.843	12	-27.967	6	0	2	0	2	0	2
3	N1	max	151.777	3	2356.288	10	386.129	6	0	15	0	15	0	15
4		min	-45.68	13	-720.947	13	-331.617	12	0	2	0	2	0	2
5	N115	max	3.879	3	2779.077	10	483.997	6	0	15	0	15	0	15
6		min	-1.254	13	-860.053	13	-416.567	4	0	2	0	2	0	2
7	N116	max	6.579	3	2682.152	3	27.337	4	0	15	0	15	0	15
8		min	-0.408	12	-109.608	12	-32.669	6	0	2	0	2	0	2
9	N99	max	0.015	12	2649.429	10	499.013	6	0	15	0	15	0	15
10		min	-1.032	10	-820.508	13	-429.635	4	0	2	0	2	0	2
11	N100	max	2.306	12	2737.619	3	26.725	4	0	15	0	15	0	15
12		min	-19.157	3	-111.17	12	-31.982	6	0	2	0	2	0	2
13	N105A	max	1.231	13	2778.774	10	483.982	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	-3.853	3	-859.97	13	-416.551	4	0	2	0	2	0	2
15	N106A	max	0.405	12	2682.451	3	27.336	4	0	15	0	15	0	15
16		min	-6.439	3	-109.608	12	-32.669	6	0	2	0	2	0	2
17	N111A	max	0.218	13	2764.998	10	487.273	6	0	15	0	15	0	15
18		min	-0.803	3	-855.428	13	-419.148	4	0	2	0	2	0	2
19	N112A	max	0.277	12	2691.419	3	27.476	4	0	15	0	15	0	15
20		min	-2.776	3	-109.976	12	-32.849	6	0	2	0	2	0	2
21	N117A	max	0.808	3	2764.961	10	487.287	6	0	15	0	15	0	15
22		min	-0.236	13	-855.427	13	-419.157	4	0	2	0	2	0	2
23	N118A	max	2.972	3	2691.477	3	27.476	4	0	15	0	15	0	15
24		min	-0.278	12	-109.966	12	-32.849	6	0	2	0	2	0	2
25	N123	max	45.76	13	2357.169	10	386.157	6	0	15	0	15	0	15
26		min	-151.929	3	-721.086	13	-331.632	12	0	2	0	2	0	2
27	N124	max	4.675	12	2129.427	3	23.505	4	0	15	0	15	0	15
28		min	-22.347	11	-83.875	12	-27.968	6	0	2	0	2	0	2
29	N168	max	19.598	3	2739.519	3	26.724	4	0	15	0	15	0	15
30		min	-2.298	12	-111.132	12	-31.981	6	0	2	0	2	0	2
31	N171	max	0.962	10	2648.34	10	498.984	6	0	15	0	15	0	15
32		min	-0.013	12	-820.288	13	-429.609	4	0	2	0	2	0	2
33	Totals:	max	0.004	3	41081.279	3	3461.891	6						
34		min	0	12	-5206.26	12	-2983.604	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	M14	Pipe 2.5 A21168	0.916	446.667	3	0.171	446.667		3	14032.946	28358.413	2081.747	2081.747	1	H1-1b
2	M13	Pipe 2.5 A21168	0.899	446.667	3	0.183	533.333		11	14032.946	28358.413	2081.747	2081.747	1	H1-1b
3	M60	Pipe 2.0 A21165	0.541	35.226	3	0.057	3.523		6	10310.892	23232.186	1397.505	1397.505	1.682	H1-1a
4	M6	Pipe 2.0 A21165	0.541	35.226	3	0.057	3.523		6	10310.892	23232.186	1397.505	1397.505	1.679	H1-1a
5	M57	Pipe 2.0 A21165	0.343	3.523	10	0.071	3.523		6	10310.892	23232.186	1397.505	1397.505	1.688	H1-1a
6	M51	Pipe 2.0 A21165	0.343	3.523	10	0.071	3.523		6	10310.892	23232.186	1397.505	1397.505	1.688	H1-1a
7	M57A	Pipe 2.0 A21165	0.343	3.523	10	0.071	3.523		6	10310.892	23232.186	1397.505	1397.505	1.707	H1-1a
8	M54A	Pipe 2.0 A21165	0.343	3.523	10	0.071	3.523		6	10310.892	23232.186	1397.505	1397.505	1.705	H1-1a
9	M48	Pipe 2.0 A21165	0.332	3.523	10	0.073	3.523		6	10310.892	23232.186	1397.505	1397.505	1.902	H1-1a
10	M81	Pipe 2.0 A21165	0.332	3.523	10	0.073	3.523		6	10310.892	23232.186	1397.505	1397.505	1.904	H1-1a
11	M49	1.5x1.5x0.083	0.293	55.183	6	0.006	105.951	y	3	2115.192	14085.15	624.421	624.421	1.136	H1-1a
12	M82	1.5x1.5x0.083	0.293	55.183	6	0.006	105.951	y	3	2115.192	14085.15	624.421	624.421	1.136	H1-1a
13	M58A	1.5x1.5x0.083	0.286	55.183	6	0.003	105.951	y	3	2115.192	14085.15	624.421	624.421	1.136	H1-1a
14	M55A	1.5x1.5x0.083	0.286	55.183	6	0.003	105.951	y	3	2115.192	14085.15	624.421	624.421	1.136	H1-1a
15	M58	1.5x1.5x0.083	0.284	55.183	6	0.005	105.951	y	3	2115.192	14085.15	624.421	624.421	1.136	H1-1a
16	M52A	1.5x1.5x0.083	0.284	55.183	6	0.005	105.951	y	3	2115.192	14085.15	624.421	624.421	1.136	H1-1a
17	M61	1.5x1.5x0.083	0.231	55.183	6	0.042	105.951	y	3	2115.192	14085.15	624.421	624.421	1.136	H1-1a
18	M92A	1.5x1.5x0.083	0.231	55.183	6	0.042	105.951	y	3	2115.192	14085.15	624.421	624.421	1.136	H1-1a
19	M80	Pipe 2.0 A21165	0.154	0	3	0.071	48.323		6	17816.836	23232.186	1397.505	1397.505	1.68	H1-1b*
20	M47	Pipe 2.0 A21165	0.154	0	3	0.071	48.323		6	17816.836	23232.186	1397.505	1397.505	1.68	H1-1b*
21	M56A	Pipe 2.0 A21165	0.151	0	3	0.069	48.323		6	17816.836	23232.186	1397.505	1397.505	1.694	H1-1b*
22	M53A	Pipe 2.0 A21165	0.151	0	3	0.069	48.323		6	17816.836	23232.186	1397.505	1397.505	1.693	H1-1b*
23	M50	Pipe 2.0 A21165	0.151	0	3	0.069	48.323		6	17816.836	23232.186	1397.505	1397.505	1.712	H1-1b*
24	M56	Pipe 2.0 A21165	0.151	0	3	0.069	48.323		6	17816.836	23232.186	1397.505	1397.505	1.712	H1-1b*
25	M59A	Pipe 2.0 A21165	0.146	46.813	10	0.057	48.323		6	17816.836	23232.186	1397.505	1397.505	1.878	H1-1b
26	M5	Pipe 2.0 A21165	0.145	46.813	10	0.057	48.323		6	17816.836	23232.186	1397.505	1397.505	1.882	H1-1b
27	M59	1.5x1.5x0.083	0.097	66.832	3	0.008	66.832	y	10	5316.172	14085.15	624.421	624.421	1.136	H1-1b*
28	M19	1.5x1.5x0.083	0.097	67.003	3	0.008	67.003	y	10	5288.986	14085.15	624.421	624.421	1.136	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	M55	HR300	0.987	143.75	3	0.118	141.833	y	3	7923.859	14429.594	560.36	934.132	5656.689	2605.145	2.233	H.1-1
2	M34	HR300	0.987	143.75	3	0.118	141.833	y	3	7923.859	14429.594	560.36	934.132	5656.689	2605.145	2.233	H.1-1
3	M40	HR300	0.986	143.75	3	0.117	42.167	y	11	7923.859	14429.594	560.36	934.132	5656.689	2605.145	2.233	H.1-1
4	M49A	HR300	0.986	143.75	3	0.117	42.167	y	11	7923.859	14429.594	560.36	934.132	5656.689	2605.145	2.233	H.1-1
5	M43	HR300	0.986	143.75	3	0.117	42.167	y	11	7923.859	14429.594	560.36	934.132	5656.689	2605.145	2.233	H.1-1
6	M46	HR300	0.986	143.75	3	0.117	42.167	y	11	7923.859	14429.594	560.36	934.132	5656.689	2605.145	2.233	H.1-1
7	M28	HR300	0.986	143.75	3	0.122	42.167	y	11	7923.859	14429.594	560.36	934.132	5656.689	2605.145	2.233	H.1-1
8	M73	HR300	0.986	143.75	3	0.122	42.167	y	11	7923.859	14429.594	560.36	934.132	5656.689	2605.145	2.233	H.1-1
9	M37	HR300	0.986	143.75	3	0.117	42.167	y	11	7923.859	14429.594	560.36	934.132	5656.689	2605.145	2.233	H.1-1
10	M52	HR300	0.986	143.75	3	0.117	42.167	y	11	7923.859	14429.594	560.36	934.132	5656.689	2605.145	2.233	H.1-1
11	M70	HR300	0.986	143.75	3	0.117	141.833	y	3	7923.859	14429.594	560.36	934.132	5656.689	2605.145	2.233	H.1-1
12	M31	HR300	0.986	143.75	3	0.117	141.833	y	3	7923.859	14429.594	560.36	934.132	5656.689	2605.145	2.233	H.1-1
13	M76	HR300	0.873	40.25	11	0.125	42.167	y	3	7923.859	14429.594	560.36	934.132	5656.689	2605.145	2.556	H.1-1
14	M25	HR300	0.869	40.25	11	0.125	141.833	y	3	7923.859	14429.594	560.36	934.132	5656.689	2605.145	2.558	H.1-1
15	M16	HR300	0.738	40.25	11	0.099	42.167	y	3	7923.859	14429.594	560.36	934.132	5656.689	2605.145	2.501	H.1-1
16	M79	HR300	0.733	40.25	11	0.098	42.167	y	3	7923.859	14429.594	560.36	934.132	5656.689	2605.145	2.504	H.1-1

JOB NO.: U2716.0334.221

PROJECT: Sunturf Package A11 **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: 1435 lbs

Check Connection: 55.2%

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: 1021 lbs

Check Connection: 46.5%

Result: **Select K10341-002**

Note: Uplift capacity. FOS of (2)

JOB NO.: U2716.0334.221

PROJECT: Sunturf Package A11 **SUBJECT:** LF CALCULATIONS

CONNECTION CAPACITY Location: Brace to Column

Connection Type:	K10219-001	
Capacity:	1335	lbs
Tension Load:	1329	lbs
Check Connection:	99.6%	
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:	687	lbs	
Check Bolt:	8.2%		
Result:	**Select (2) 0.375 in. dia. A304 SS (A2-70) bolts.**		
Note:			

JOB NO.: U2716.0330.221

PROJECT: Sunturf Package A7 - 2022

ALTERNATE FOUNDATION OPTION 1:

DRILLED CONCRETE PIER

VECTOR ENGINEERS

JOB NO.: U2716.0334.221
SUBJECT: CONC. PIER
LF PANELS

PROJECT: Sunturf Package A11 Ground Mount

DRILLED CONCRETE PIER DESIGN

Column Reactions:

Max. Shear, V [k]:	1.1	Max. Down, P_d [k]:	3.0
Max. Moment, M [k-ft]:	0.0	Max. Uplift, P_u [k]:	1.5

Pier Properties:

Pier Shape:	Round		
Pier Diameter, b [ft]:	1.5	Volume of Concrete [ft^3]:	8
Top of Pier Elevation [ft]:	0.25	Volume of Concrete [yd^3]:	0.3
Pier Depth, d [ft]:	4.5	Weight of Concrete [k]:	1.3

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]:	5.3	**Bearing capacity OK.**

Check Uplift:

Uplift Capacity [k]:	6.4	**Uplift capacity OK.**

Check Lateral Bearing:

Top of Pier Constrained?:	No	IBC Section1807.3.2.1
Applied Lateral Force, P [lb]:	1,143	
Point of Application, h [ft]:	0.3	
S_{max} [psf]:		
S [psf]:	450	
A = 2.34*P/(Sb):	3.96	
Required Pier Depth, d_{reqd} [ft]:	4.20	IBC Eq. 18-1

Result: **Lateral bearing capacity OK.**

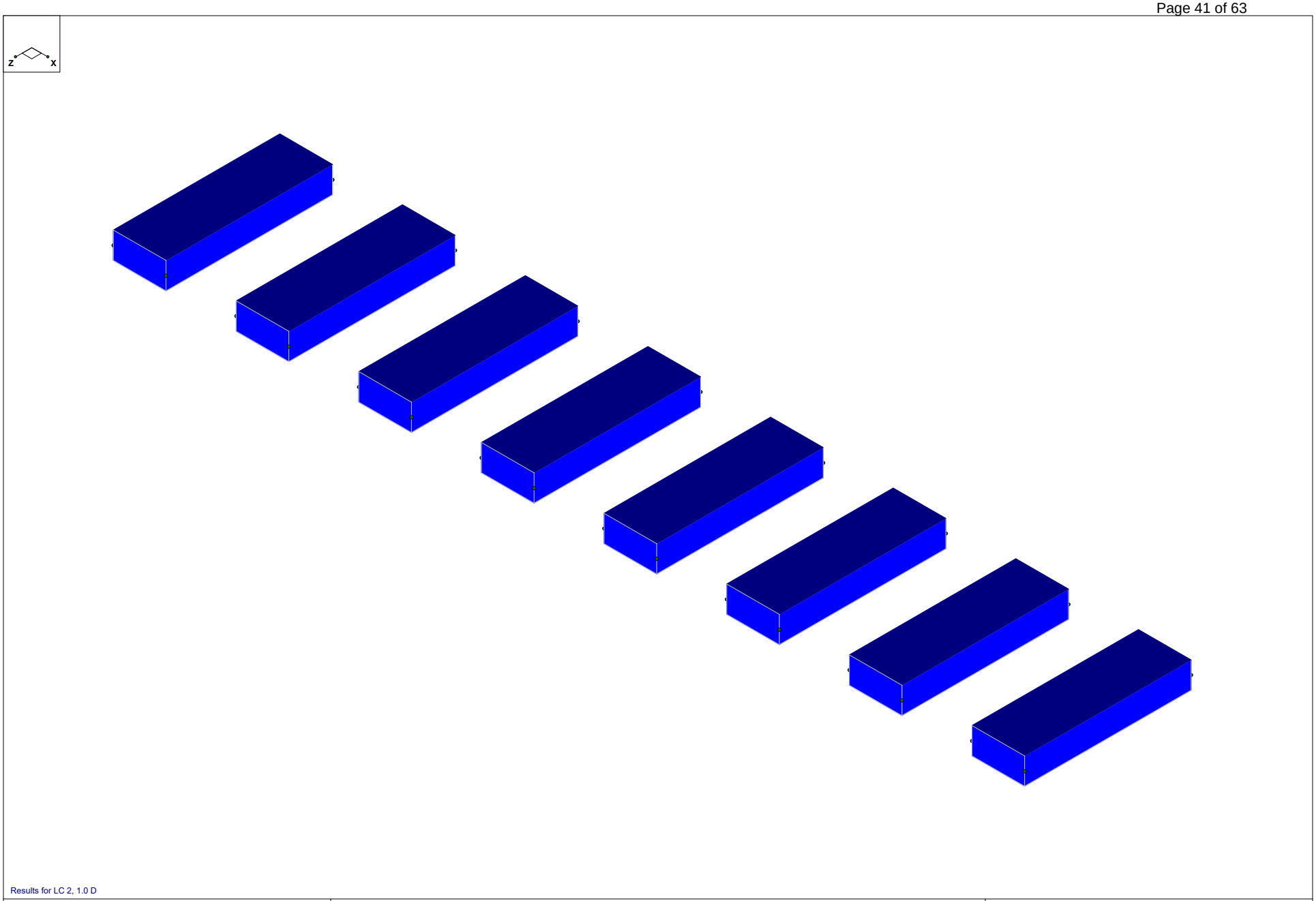
VECTOR ENGINEERS

JOB NO.: U2716.0330.221

PROJECT: Sunturf Package A7 - 2022

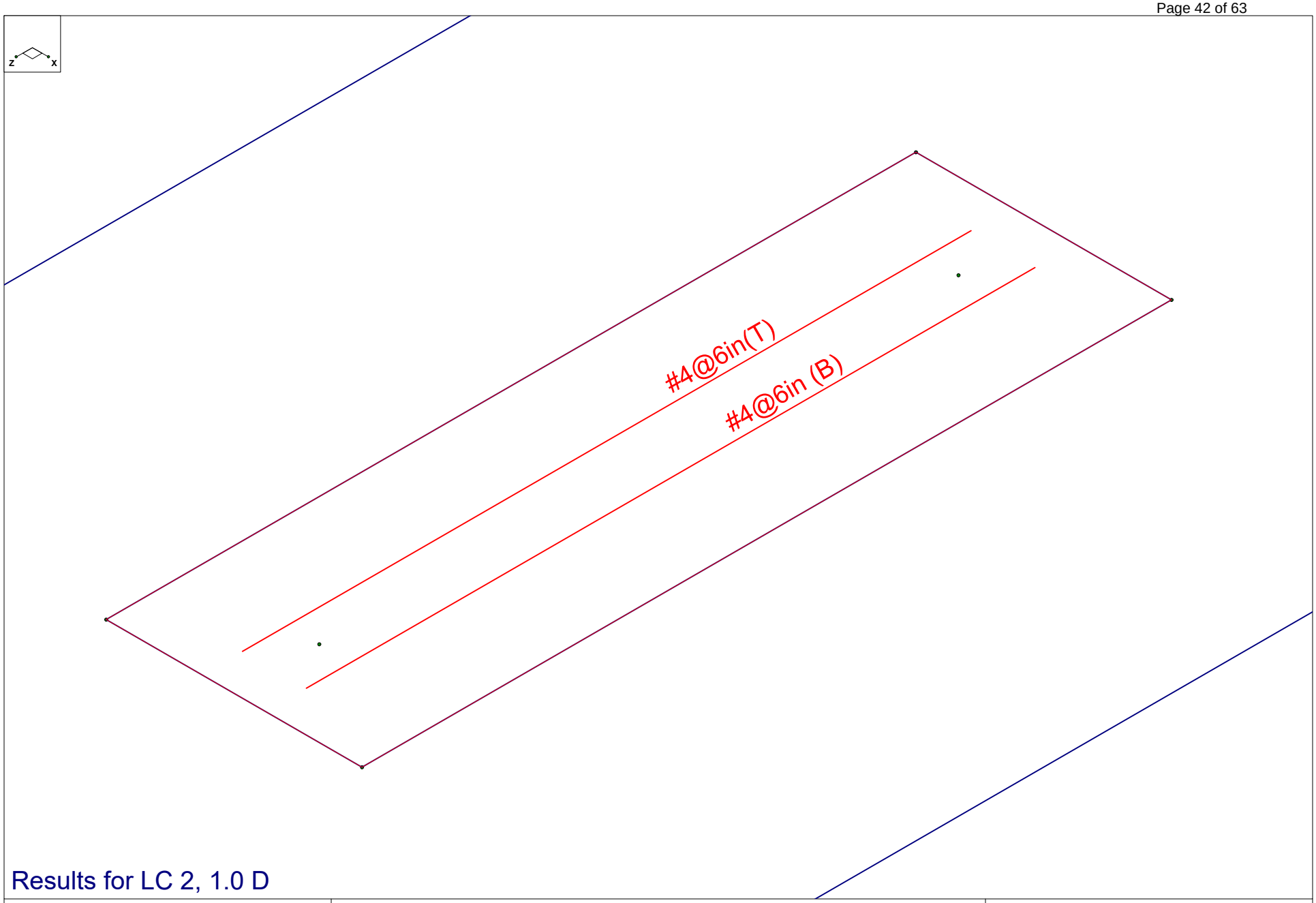
ALTERNATE FOUNDATION OPTION 2:

CONCRETE BALLAST BLOCK



Results for LC 2, 1.0 D

Vector Structural Engineering	SunTurf A11	SK - 1
MIH		Mar 17, 2022 at 10:51 AM
U2716.0334.221		Sunmodo Sunturf A11 - LF - 35.r3d



Results for LC 2, 1.0 D

Vector Structural Engineering	SunTurf A11	SK - 2
MIH		Mar 17, 2022 at 10:52 AM
U2716.0334.221		Sunmodo Sunturf A11 - LF - 35.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
Concrete Stress Block	0
Concrete Rebar Set	Rectangular
Concrete Code	ASTM A615
HR Steel Pile Code	ACI 318-14
Wood Pile Code	AISC 14th (360-10): ASD AWC NDS-15: ASD

Concrete Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1...	Density[k/f...	f'c[psi]	Lambda	Flex Steel[...	Shear Ste...
1	Conc3000NW	3156	1372	0.15	0.6	0.145	3000	1	60000	60000
2	Conc3500NW	3409	1482	0.15	0.6	0.145	3500	1	60000	60000
3	Conc4000NW	3644	1584	0.15	0.6	0.145	4000	1	60000	60000
4	Conc3000LW	2085	907	0.15	0.6	0.11	3000	0.75	60000	60000
5	Conc3500LW	2252	979	0.15	0.6	0.11	3500	0.75	60000	60000
6	Conc4000LW	2408	1047	0.15	0.6	0.11	4000	0.75	60000	60000
7	Conc2500NW	2880	1253	0.15	0.6	0.145	2500	1	60000	60000

Slab Rebar Parameters

	Label	Top Bar	Bottom ...	Max Top B...	Min Top Ba...	Max Bot Ba...	Min Bot Ba...	Spacing Incr...	Side Cover[in]	Rebar Options
1	Longitu...	#4	#4	18	6	18	6	1	0	Optimize
2	Transve...	#4	#4	18	8	18	18	1	0	Optimize
3	Default	#5	#8	18	3	18	3	1	0	Optimize

Soil Definitions

	Label	Subgrade Modulus[k/ft^3]	Allowable Bearing[psf]	Depth Properties	Default?
1	Default	172.8	1500	None	Yes

Point Loads and Moments (Cat 1 : DL)

	Label	Direction	Magnitude[lb,lb-ft]
1	R3D_N1_1	X	-5.379
2	R3D_N1_1	Y	152.106
3	R3D_N2_1	X	-9.035
4	R3D_N2_1	Y	129.211
5	R3D_N115_1	Y	243.487
6	R3D_N116_1	Y	232.888
7	R3D_N99_1	X	1.073
8	R3D_N99_1	Y	269.338
9	R3D_N99_1	Z	-1.53
10	R3D_N100_1	X	3.236
11	R3D_N100_1	Y	245.671

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

	Label	Direction	Magnitude[lb,lb-ft]
12	R3D_N105A_1	Y	243.473
13	R3D_N106A_1	Y	232.903
14	R3D_N111A_1	Y	248.733
15	R3D_N112A_1	Y	235.728
16	R3D_N117A_1	Y	248.727
17	R3D_N118A_1	Y	235.731
18	R3D_N123_1	X	5.441
19	R3D_N123_1	Y	152.261
20	R3D_N124_1	X	9.034
21	R3D_N124_1	Y	129.068
22	R3D_N168_1	X	-3.256
23	R3D_N168_1	Y	245.784
24	R3D_N171_1	X	-1.078
25	R3D_N171_1	Y	269.17
26	R3D_N171_1	Z	-1.532

Point Loads and Moments (Cat 6 : RLL)

	Label	Direction	Magnitude[lb,lb-ft]
1	R3D_N1_1	X	-38.984
2	R3D_N1_1	Y	827.345
3	R3D_N1_1	Z	3.946
4	R3D_N2_1	X	-66.664
5	R3D_N2_1	Y	832.288
6	R3D_N115_1	X	-1.948
7	R3D_N115_1	Y	1616.564
8	R3D_N115_1	Z	5.162
9	R3D_N116_1	X	-7.918
10	R3D_N116_1	Y	1642.743
11	R3D_N99_1	X	7.589
12	R3D_N99_1	Y	1752.051
13	R3D_N99_1	Z	-11.669
14	R3D_N100_1	X	25.6
15	R3D_N100_1	Y	1737.883
16	R3D_N105A_1	X	1.89
17	R3D_N105A_1	Y	1616.418
18	R3D_N105A_1	Z	5.142
19	R3D_N106A_1	X	7.858
20	R3D_N106A_1	Y	1642.885
21	R3D_N111A_1	X	1.343
22	R3D_N111A_1	Y	1649.57
23	R3D_N111A_1	Z	2.627
24	R3D_N112A_1	X	4.729
25	R3D_N112A_1	Y	1664.401
26	R3D_N117A_1	X	-1.395
27	R3D_N117A_1	Y	1649.517
28	R3D_N117A_1	Z	2.615
29	R3D_N118A_1	X	-4.809
30	R3D_N118A_1	Y	1664.428
31	R3D_N123_1	X	39.422
32	R3D_N123_1	Y	828.562
33	R3D_N123_1	Z	3.863
34	R3D_N124_1	X	66.669
35	R3D_N124_1	Y	830.98
36	R3D_N168_1	X	-25.761
37	R3D_N168_1	Y	1738.959
38	R3D_N171_1	X	-7.622

Point Loads and Moments (Cat 6 : RLL) (Continued)

	Label	Direction	Magnitude[lb,lb-ft]
39	R3D_N171_1	Y	1750.926
40	R3D_N171_1	Z	-11.685

Point Loads and Moments (Cat 21 : WLZ)

	Label	Direction	Magnitude[lb,lb-ft]
1	R3D_N1_1	Y	-46.425
2	R3D_N1_1	Z	50.266
3	R3D_N2_1	Y	46.649
4	R3D_N2_1	Z	-3.005
5	R3D_N115_1	Y	-90.532
6	R3D_N115_1	Z	96.644
7	R3D_N116_1	Y	90.767
8	R3D_N116_1	Z	-4.334
9	R3D_N99_1	Y	-101.517
10	R3D_N99_1	Z	107.822
11	R3D_N100_1	Y	100.918
12	R3D_N100_1	Z	-4.177
13	R3D_N105A_1	Y	-90.534
14	R3D_N105A_1	Z	96.645
15	R3D_N106A_1	Y	90.769
16	R3D_N106A_1	Z	-4.334
17	R3D_N111A_1	Y	-92.312
18	R3D_N111A_1	Z	98.527
19	R3D_N112A_1	Y	92.448
20	R3D_N112A_1	Z	-4.364
21	R3D_N117A_1	Y	-92.311
22	R3D_N117A_1	Z	98.527
23	R3D_N118A_1	Y	92.447
24	R3D_N118A_1	Z	-4.363
25	R3D_N123_1	Y	-46.427
26	R3D_N123_1	Z	50.267
27	R3D_N124_1	Y	46.65
28	R3D_N124_1	Z	-3.005
29	R3D_N168_1	Y	100.915
30	R3D_N168_1	Z	-4.177
31	R3D_N171_1	Y	-101.512
32	R3D_N171_1	Z	107.82

Point Loads and Moments (Cat 67 : OL1)

	Label	Direction	Magnitude[lb,lb-ft]
1	R3D_N1_1	X	25.563
2	R3D_N1_1	Y	-1109.662
3	R3D_N1_1	Z	682.782
4	R3D_N2_1	X	37.332
5	R3D_N2_1	Y	156.882
6	R3D_N2_1	Z	-46.835
7	R3D_N115_1	X	2.414
8	R3D_N115_1	Y	-2237.98
9	R3D_N115_1	Z	1385.51
10	R3D_N116_1	X	-2.298
11	R3D_N116_1	Y	351.73
12	R3D_N116_1	Z	-69.863
13	R3D_N99_1	X	-5.663
14	R3D_N99_1	Y	-2459.255
15	R3D_N99_1	Z	1536.571
16	R3D_N100_1	X	-11.629

Point Loads and Moments (Cat 67 : OL1) (Continued)

	Label	Direction	Magnitude[lb,lb-ft]
17	R3D_N100_1	Y	419.287
18	R3D_N100_1	Z	-66.813
19	R3D_N105A_1	X	-2.379
20	R3D_N105A_1	Y	-2237.95
21	R3D_N105A_1	Z	1385.529
22	R3D_N106A_1	X	2.346
23	R3D_N106A_1	Y	351.761
24	R3D_N106A_1	Z	-69.863
25	R3D_N111A_1	X	-1.386
26	R3D_N111A_1	Y	-2279.392
27	R3D_N111A_1	Z	1410.058
28	R3D_N112A_1	Y	359.032
29	R3D_N112A_1	Z	-70.448
30	R3D_N117A_1	X	1.419
31	R3D_N117A_1	Y	-2279.354
32	R3D_N117A_1	Z	1410.056
33	R3D_N118A_1	Y	359.024
34	R3D_N118A_1	Z	-70.447
35	R3D_N123_1	X	-25.838
36	R3D_N123_1	Y	-1110.153
37	R3D_N123_1	Z	682.851
38	R3D_N124_1	X	-37.289
39	R3D_N124_1	Y	157.055
40	R3D_N124_1	Z	-46.837
41	R3D_N168_1	X	11.673
42	R3D_N168_1	Y	419.243
43	R3D_N168_1	Z	-66.812
44	R3D_N171_1	X	5.687
45	R3D_N171_1	Y	-2458.759
46	R3D_N171_1	Z	1536.54

Point Loads and Moments (Cat 68 : OL2)

	Label	Direction	Magnitude[lb,lb-ft]
1	R3D_N1_1	X	32.12
2	R3D_N1_1	Y	-1225.523
3	R3D_N1_1	Z	568.313
4	R3D_N2_1	X	11.936
5	R3D_N2_1	Y	429.545
6	R3D_N2_1	Z	-38.905
7	R3D_N115_1	X	2.871
8	R3D_N115_1	Y	-2446.986
9	R3D_N115_1	Z	1154.25
10	R3D_N116_1	X	-6.156
11	R3D_N116_1	Y	878.804
12	R3D_N116_1	Z	-58.139
13	R3D_N99_1	X	-7.168
14	R3D_N99_1	Y	-2688.065
15	R3D_N99_1	Z	1279.991
16	R3D_N100_1	Y	989.676
17	R3D_N100_1	Z	-55.883
18	R3D_N105A_1	X	-2.825
19	R3D_N105A_1	Y	-2446.942
20	R3D_N105A_1	Z	1154.276
21	R3D_N106A_1	X	6.218
22	R3D_N106A_1	Y	878.839
23	R3D_N106A_1	Z	-58.14

Point Loads and Moments (Cat 68 : OL2) (Continued)

	Label	Direction	Magnitude[lb,lb-ft]
24	R3D_N111A_1	X	-1.726
25	R3D_N111A_1	Y	-2493.184
26	R3D_N111A_1	Z	1172.426
27	R3D_N112A_1	X	2.51
28	R3D_N112A_1	Y	895.054
29	R3D_N112A_1	Z	-58.496
30	R3D_N117A_1	X	1.768
31	R3D_N117A_1	Y	-2493.137
32	R3D_N117A_1	Z	1172.424
33	R3D_N118A_1	X	-2.449
34	R3D_N118A_1	Y	895.045
35	R3D_N118A_1	Z	-58.496
36	R3D_N123_1	X	-32.471
37	R3D_N123_1	Y	-1226.122
38	R3D_N123_1	Z	568.394
39	R3D_N124_1	X	-11.881
40	R3D_N124_1	Y	429.741
41	R3D_N124_1	Z	-38.907
42	R3D_N168_1	Y	989.633
43	R3D_N168_1	Z	-55.883
44	R3D_N171_1	X	7.198
45	R3D_N171_1	Y	-2687.436
46	R3D_N171_1	Z	1279.962

Point Loads and Moments (Cat 69 : OL3)

	Label	Direction	Magnitude[lb,lb-ft]
1	R3D_N1_1	X	-29.844
2	R3D_N1_1	Y	1295.516
3	R3D_N1_1	Z	-797.139
4	R3D_N2_1	X	-43.584
5	R3D_N2_1	Y	-183.158
6	R3D_N2_1	Z	54.68
7	R3D_N115_1	X	-2.818
8	R3D_N115_1	Y	2612.815
9	R3D_N115_1	Z	-1617.566
10	R3D_N116_1	X	2.683
11	R3D_N116_1	Y	-410.641
12	R3D_N116_1	Z	81.564
13	R3D_N99_1	X	6.611
14	R3D_N99_1	Y	2871.149
15	R3D_N99_1	Z	-1793.928
16	R3D_N100_1	X	13.577
17	R3D_N100_1	Y	-489.512
18	R3D_N100_1	Z	78.003
19	R3D_N105A_1	X	2.777
20	R3D_N105A_1	Y	2612.779
21	R3D_N105A_1	Z	-1617.588
22	R3D_N106A_1	X	-2.739
23	R3D_N106A_1	Y	-410.677
24	R3D_N106A_1	Z	81.565
25	R3D_N111A_1	X	1.618
26	R3D_N111A_1	Y	2661.162
27	R3D_N111A_1	Z	-1646.225
28	R3D_N112A_1	Y	-419.165
29	R3D_N112A_1	Z	82.247
30	R3D_N117A_1	X	-1.656

Point Loads and Moments (Cat 69 : OL3) (Continued)

	Label	Direction	Magnitude[lb,lb-ft]
31	R3D_N117A_1	Y	2661.118
32	R3D_N117A_1	Z	-1646.223
33	R3D_N118A_1	Y	-419.156
34	R3D_N118A_1	Z	82.246
35	R3D_N123_1	X	30.166
36	R3D_N123_1	Y	1296.09
37	R3D_N123_1	Z	-797.22
38	R3D_N124_1	X	43.535
39	R3D_N124_1	Y	-183.36
40	R3D_N124_1	Z	54.682
41	R3D_N168_1	X	-13.628
42	R3D_N168_1	Y	-489.461
43	R3D_N168_1	Z	78.002
44	R3D_N171_1	X	-6.639
45	R3D_N171_1	Y	2870.571
46	R3D_N171_1	Z	-1793.892

Point Loads and Moments (Cat 70 : OL4)

	Label	Direction	Magnitude[lb,lb-ft]
1	R3D_N1_1	X	-17.29
2	R3D_N1_1	Y	900.936
3	R3D_N1_1	Z	-719.879
4	R3D_N2_1	X	-56.413
5	R3D_N2_1	Y	100.999
6	R3D_N2_1	Z	49.45
7	R3D_N115_1	X	-1.778
8	R3D_N115_1	Y	1838.997
9	R3D_N115_1	Z	-1459.877
10	R3D_N116_1	X	-1.358
11	R3D_N116_1	Y	151.374
12	R3D_N116_1	Z	73.668
13	R3D_N99_1	X	3.783
14	R3D_N99_1	Y	2021.59
15	R3D_N99_1	Z	-1619.141
16	R3D_N100_1	X	20.415
17	R3D_N100_1	Y	128.838
18	R3D_N100_1	Z	70.2
19	R3D_N105A_1	X	1.754
20	R3D_N105A_1	Y	1838.981
21	R3D_N105A_1	Z	-1459.889
22	R3D_N106A_1	X	1.327
23	R3D_N106A_1	Y	151.351
24	R3D_N106A_1	Z	73.669
25	R3D_N111A_1	Y	1872.207
26	R3D_N111A_1	Z	-1487.77
27	R3D_N112A_1	X	2.051
28	R3D_N112A_1	Y	152.74
29	R3D_N112A_1	Z	74.401
30	R3D_N117A_1	Y	1872.18
31	R3D_N117A_1	Z	-1487.768
32	R3D_N118A_1	X	-2.083
33	R3D_N118A_1	Y	152.747
34	R3D_N118A_1	Z	74.4
35	R3D_N123_1	X	17.471
36	R3D_N123_1	Y	901.284
37	R3D_N123_1	Z	-719.93

Point Loads and Moments (Cat 70 : OL4) (Continued)

	Label	Direction	Magnitude[lb,lb-ft]
38	R3D_N124_1	X	56.385
39	R3D_N124_1	Y	100.862
40	R3D_N124_1	Z	49.451
41	R3D_N168_1	X	-20.444
42	R3D_N168_1	Y	128.878
43	R3D_N168_1	Z	70.2
44	R3D_N171_1	X	-3.8
45	R3D_N171_1	Y	2021.259
46	R3D_N171_1	Z	-1619.112

Slabs

	Label	Thickness [in]	Material	Local Axis Angle ...	Analysis Offset [in]	Passive Pressure [psf]	Soil Overb...	Icr Factor
1	S1	21	Conc3000NW	0	0	0	0	0.25
2	S2	21	Conc3000NW	0	0	0	0	0.25
3	S3	21	Conc3000NW	0	0	0	0	0.25
4	S4	21	Conc3000NW	0	0	0	0	0.25
5	S5	21	Conc3000NW	0	0	0	0	0.25
6	S6	21	Conc3000NW	0	0	0	0	0.25
7	S7	21	Conc3000NW	0	0	0	0	0.25
8	S8	21	Conc3000NW	0	0	0	0	0.25

Load Combinations

	Label	Solve	Service	A...	SF	Ca...	Fa...	Ca...	Fa...	Ca...	Fa...	Ca...	Fa...	Ca...	Fa...	Ca...	Fa...	Ca...	Fa...	Ca...	Fa...	Ca...	Fa...	Ca...	Fa...
1	ASD Loads																								
2	1.0 D	Yes	Yes		1.5	DL	1																		
3	1.0 D + 1.0 S	Yes	Yes		1.5	DL	1	RLL	1																
4	1.0 D + 0.6 W1	Yes	Yes		1.5	DL	1	RLL		OL1	0.6	WLZ	0.6												
5	1.0 D + 0.6 W2	Yes	Yes		1.5	DL	1	RLL		OL2	0.6	WLZ	0.6												
6	1.0 D + 0.6 W3	Yes	Yes		1.5	DL	1	RLL		OL3	0.6	WLZ	-0.6												
7	1.0 D + 0.6 W4	Yes	Yes		1.5	DL	1	RLL		OL4	0.6	WLZ	-0.6												
8	1.0 D + 0.45 ...	Yes	Yes		1.5	DL	1	RLL	0.75	OL1	0.45	WLZ	0.6												
9	1.0 D + 0.45 ...	Yes	Yes		1.5	DL	1	RLL	0.75	OL2	0.45	WLZ	0.6												
10	1.0 D + 0.45 ...	Yes	Yes		1.5	DL	1	RLL	0.75	OL3	0.45	WLZ	-0.6												
11	1.0 D + 0.45 ...	Yes	Yes		1.5	DL	1	RLL	0.75	OL4	0.45	WLZ	-0.6												
12	0.6 D + 0.6 W1	Yes	Yes			DL	0.6	RLL		OL1	0.6	WLZ	0.6												
13	0.6 D + 0.6 W2	Yes	Yes			DL	0.6	RLL		OL2	0.6	WLZ	0.6												
14	0.6 D + 0.6 W3	Yes	Yes			DL	0.6	RLL		OL3	0.6	WLZ	-0.6												
15	0.6 D + 0.6 W4	Yes	Yes			DL	0.6	RLL		OL4	0.6	WLZ	-0.6												
16																									
17	LRFD Loads																								
18	1.4 D	Yes				DL	1.4	RLL																	
19	1.2 D + 1.6 S ...	Yes				DL	1.2	RLL	1.6	OL1	0.5														
20	1.2 D + 1.6 S ...	Yes				DL	1.2	RLL	1.6	OL2	0.5														
21	1.2 D + 1.6 S ...	Yes				DL	1.2	RLL	1.6	OL3	0.5														
22	1.2 D + 1.6 S ...	Yes				DL	1.2	RLL	1.6	OL4	0.5														
23	1.2 D + 1.0 W1	Yes				DL	1.2	RLL		OL1	1														
24	1.2 D + 1.0 W2	Yes				DL	1.2	RLL		OL2	1														
25	1.2 D + 1.0 W3	Yes				DL	1.2	RLL		OL3	1														
26	1.2 D + 1.0 W4	Yes				DL	1.2	RLL		OL4	1														
27	0.9 D + 1.0 W1	Yes				DL	0.9	RLL		OL1	1														
28	0.9 D + 1.0 W2	Yes				DL	0.9	RLL		OL2	1														
29	0.9 D + 1.0 W3	Yes				DL	0.9	RLL		OL3	1														
30	0.9 D + 1.0 W4	Yes				DL	0.9	RLL		OL4	1														

Design Strips

	Label	Rebar Angle from Pl...	No. of Design Cuts	Design Rule
1	DS1	0	50	Longitudinal

Load Categories

	Category	Point Loads	Line Loads	Area Loads
1	DL	26		
2	RLL	40		
3	WLZ	32		
4	OL1	46		
5	OL2	46		
6	OL3	46		
7	OL4	46		

Strip Reinforcing

	Label	UC Top	LC	Top Bars	Governin...	UC Bot	LC	Bot Bars/...	Governing D...	UC Shear	LC	Governin...
1	DS1	0.047	21	#4@6in	DS1-X25	0.015	28	#4@6in	DS1-X20	0.048	21	DS1-X10

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	35601.925	0	11295.03	9.99+	9.99+
2	2	S2	0	0	36706.391	0	11612.805	9.99+	9.99+
3	2	S3	0	0	36574.67	0	11443.301	9.99+	9.99+
4	2	S4	0	0	36603.948	0	11574.523	9.99+	9.99+
5	2	S5	0	0	36603.966	0	11574.519	9.99+	9.99+
6	2	S6	0	0	36574.56	0	11562.394	9.99+	9.99+
7	2	S7	0	0	36707.181	0	11627.848	9.99+	9.99+
8	2	S8	0	0	35600.868	0	11244.497	9.99+	9.99+
9	3	S1	0	0	43510.62	0	13969.364	9.99+	9.99+
10	3	S2	0	0	53210.012	0	16789.625	9.99+	9.99+
11	3	S3	0	0	52164.597	0	15500.371	9.99+	9.99+
12	3	S4	0	0	52405.507	0	16534.853	9.99+	9.99+
13	3	S5	0	0	52405.682	0	16556.294	9.99+	9.99+
14	3	S6	0	0	52163.462	0	16468.62	9.99+	9.99+
15	3	S7	0	0	53218.793	0	16921.096	9.99+	9.99+
16	3	S8	0	0	43499.516	0	13548.149	9.99+	9.99+
17	4	S1	0	6491.301	35773.645	923.541	11295.232	5.511	9.99+
18	4	S2	0	14399.913	36889.255	1854.667	11627.884	2.562	6.27
19	4	S3	0	13088.145	36653.961	1980.532	11681.736	2.801	5.898
20	4	S4	0	13330.286	36701.496	1729.779	11574.646	2.753	6.691
21	4	S5	0	13330.091	36701.451	1729.786	11574.642	2.753	6.691
22	4	S6	0	13088.293	36654.062	1697.747	11562.605	2.801	6.811
23	4	S7	0	14397.355	36887.95	1854.33	11627.848	2.562	6.271
24	4	S8	0	6493.787	35774.823	924.072	11295.357	5.509	9.99+
25	5	S1	0	6806.727	35773.645	762.638	11295.232	5.256	9.99+
26	5	S2	0	14966.673	36889.255	1536.616	11627.884	2.465	7.567
27	5	S3	0	13607.248	36653.961	1642.946	11681.736	2.694	7.11
28	5	S4	0	13862.046	36701.496	1439.141	11574.646	2.648	8.043
29	5	S5	0	13861.804	36701.451	1438.998	11574.642	2.648	8.044
30	5	S6	0	13607.46	36654.062	1414.813	11562.605	2.694	8.173
31	5	S7	0	14963.438	36887.95	1536.119	11627.848	2.465	7.57
32	5	S8	0	6809.762	35774.823	763.313	11295.357	5.253	9.99+
33	6	S1	0	1196.057	35601.925	0.202	12168.606	9.99+	9.99+
34	6	S2	0	3138.146	36706.391	0	13735.621	9.99+	9.99+
35	6	S3	0	2645.143	36574.67	0.248	13993.736	9.99+	9.99+
36	6	S4	0	2698.198	36603.948	0.123	13590.622	9.99+	9.99+
37	6	S5	0	2698.174	36603.966	0.123	13590.545	9.99+	9.99+

Slab Overturning Safety Factors (By Combination) (Continued)

	LC	Slab	Angle[deg]	Mo-xx[lb-ft]	Ms-xx[lb-ft]	Mo-zz[lb-ft]	Ms-zz[lb-ft]	Ms-xx/Mo-xx	Ms-zz/Mo-zz
38	6	S6	0	2644.906	36574.56	0.212	13544.207	9.99+	9.99+
39	6	S7	0	3138.182	36707.181	0	13792.665	9.99+	9.99+
40	6	S8	0	1196.835	35600.868	0.201	12168.568	9.99+	9.99+
41	7	S1	0	259.678	35953.627	0.202	12068.936	9.99+	9.99+
42	7	S2	0	562.598	36950.024	0	13523.321	9.99+	9.99+
43	7	S3	0	505.529	36994.411	0.248	13774.573	9.99+	9.99+
44	7	S4	0	514.969	37022.206	0.123	13394.822	9.99+	9.99+
45	7	S5	0	514.966	37022.242	0.123	13394.767	9.99+	9.99+
46	7	S6	0	505.519	36994.443	0.212	13350.435	9.99+	9.99+
47	7	S7	0	562.582	36950.852	0	13588.965	9.99+	9.99+
48	7	S8	0	259.686	35952.03	0.201	12068.879	9.99+	9.99+
49	8	S1	0	4933.076	41667.034	692.656	13300.982	8.446	9.99+
50	8	S2	0	10941.438	49377.365	1391.135	15597.622	4.513	9.99+
51	8	S3	0	9942.155	48184.093	1485.399	15972.366	4.846	9.99+
52	8	S4	0	10126.263	48462.407	1297.334	15310.832	4.786	9.99+
53	8	S5	0	10126.115	48462.062	1297.34	15310.973	4.786	9.99+
54	8	S6	0	9942.264	48184.993	1273.127	15216.378	4.846	9.99+
55	8	S7	0	10939.513	49369.712	1390.882	15597.784	4.513	9.99+
56	8	S8	0	4934.944	41675.094	693.054	13301.587	8.445	9.99+
57	9	S1	0	5169.645	41667.034	571.979	13300.982	8.06	9.99+
58	9	S2	0	11366.508	49377.365	1152.597	15597.622	4.344	9.99+
59	9	S3	0	10331.483	48184.093	1232.209	15972.366	4.664	9.99+
60	9	S4	0	10525.082	48462.407	1079.356	15294.894	4.604	9.99+
61	9	S5	0	10524.9	48462.062	1079.249	15294.687	4.605	9.99+
62	9	S6	0	10331.639	48184.993	1061.11	15216.378	4.664	9.99+
63	9	S7	0	11364.076	49369.712	1152.224	15597.784	4.344	9.99+
64	9	S8	0	5171.925	41675.094	572.485	13301.587	8.058	9.99+
65	10	S1	0	961.962	41533.446	0.202	13666.026	9.99+	9.99+
66	10	S2	0	2494.259	49084.107	0	17087.667	9.99+	9.99+
67	10	S3	0	2110.24	48267.115	0.248	17706.304	9.99+	9.99+
68	10	S4	0	2152.39	48455.117	0.123	16806.845	9.99+	9.99+
69	10	S5	0	2152.372	48455.253	0.123	16806.584	9.99+	9.99+
70	10	S6	0	2110.059	48266.236	0.212	16702.527	9.99+	9.99+
71	10	S7	0	2494.282	49090.89	0	17221.532	9.99+	9.99+
72	10	S8	0	962.548	41524.854	0.201	13665.289	9.99+	9.99+
73	11	S1	0	259.678	41797.223	0.202	13591.274	9.99+	9.99+
74	11	S2	0	562.598	49266.832	0	16928.442	9.99+	9.99+
75	11	S3	0	505.529	48581.921	0.248	17541.932	9.99+	9.99+
76	11	S4	0	514.969	48768.81	0.123	16659.995	9.99+	9.99+
77	11	S5	0	514.966	48768.96	0.123	16659.75	9.99+	9.99+
78	11	S6	0	505.519	48581.149	0.212	16557.197	9.99+	9.99+
79	11	S7	0	562.582	49273.643	0	17068.757	9.99+	9.99+
80	11	S8	0	259.686	41788.226	0.201	13590.523	9.99+	9.99+
81	12	S1	0	6491.301	21464.187	923.541	6777.22	3.307	7.338
82	12	S2	0	14399.913	22133.553	1854.667	6976.731	1.537	3.762
83	12	S3	0	13088.145	21992.376	1980.532	7009.141	1.68	3.539
84	12	S4	0	13330.286	22020.897	1729.779	6944.837	1.652	4.015
85	12	S5	0	13330.091	22020.871	1729.786	6944.834	1.652	4.015
86	12	S6	0	13088.293	21992.437	1697.747	6937.648	1.68	4.086
87	12	S7	0	14397.355	22132.77	1854.33	6976.709	1.537	3.762
88	12	S8	0	6493.787	21464.894	924.072	6777.294	3.305	7.334
89	13	S1	0	6806.727	21464.187	762.638	6777.22	3.153	8.887
90	13	S2	0	14966.673	22133.553	1536.616	6976.731	1.479	4.54
91	13	S3	0	13607.248	21992.376	1642.946	7009.141	1.616	4.266
92	13	S4	0	13862.046	22020.897	1439.141	6944.837	1.589	4.826
93	13	S5	0	13861.804	22020.871	1438.998	6944.834	1.589	4.826
94	13	S6	0	13607.46	21992.437	1414.813	6937.648	1.616	4.904

Slab Overturning Safety Factors (By Combination) (Continued)

	LC	Slab	Angle[deg]	Mo-xx[lb-ft]	Ms-xx[lb-ft]	Mo-zz[lb-ft]	Ms-zz[lb-ft]	Ms-xx/Mo-xx	Ms-zz/Mo-zz
95	13	S7	0	14963.438	22132.77	1536.119	6976.709	1.479	4.542
96	13	S8	0	6809.762	21464.894	763.313	6777.294	3.152	8.879
97	14	S1	0	1196.057	21361.155	0.202	7670.773	9.99+	9.99+
98	14	S2	0	3138.146	22023.835	0	9090.499	7.018	9.99+
99	14	S3	0	2645.143	21944.802	0.248	9321.14	8.296	9.99+
100	14	S4	0	2698.198	21962.369	0.123	8960.812	8.14	9.99+
101	14	S5	0	2698.174	21962.38	0.123	8960.738	8.14	9.99+
102	14	S6	0	2644.906	21944.736	0.212	8919.25	8.297	9.99+
103	14	S7	0	3138.182	22024.308	0	9141.526	7.018	9.99+
104	14	S8	0	1196.835	21360.521	0.201	7670.769	9.99+	9.99+
105	15	S1	0	259.678	21712.857	0.202	7571.103	9.99+	9.99+
106	15	S2	0	562.598	22267.468	0	8878.199	9.99+	9.99+
107	15	S3	0	505.529	22364.543	0.248	9101.977	9.99+	9.99+
108	15	S4	0	514.969	22380.626	0.123	8765.013	9.99+	9.99+
109	15	S5	0	514.966	22380.655	0.123	8764.959	9.99+	9.99+
110	15	S6	0	505.519	22364.619	0.212	8725.478	9.99+	9.99+
111	15	S7	0	562.582	22267.979	0	8937.826	9.99+	9.99+
112	15	S8	0	259.686	21711.683	0.201	7571.08	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	14.413	2253.961	0	2253.961	9.99+	9.99+
2	2	S2	0	4.308	2324.069	1.53	2324.069	9.99+	9.99+
3	2	S3	0	0	2312.479	0	2312.479	9.99+	9.99+
4	2	S4	0	0	2314.905	0	2314.905	9.99+	9.99+
5	2	S5	0	0	2314.904	0	2314.904	9.99+	9.99+
6	2	S6	0	0	2312.479	0	2312.479	9.99+	9.99+
7	2	S7	0	4.334	2324.053	1.532	2324.053	9.99+	9.99+
8	2	S8	0	14.474	2253.965	0	2253.965	9.99+	9.99+
9	3	S1	0	120.061	2751.851	3.946	2751.851	9.99+	9.99+
10	3	S2	0	37.498	3371.049	13.198	3371.049	9.99+	9.99+
11	3	S3	0	9.748	3290.27	5.142	3290.27	9.99+	9.99+
12	3	S4	0	6.072	3309.096	2.627	3309.096	9.99+	9.99+
13	3	S5	0	6.204	3309.087	2.615	3309.087	9.99+	9.99+
14	3	S6	0	9.866	3290.271	5.162	3290.271	9.99+	9.99+
15	3	S7	0	37.718	3371.018	13.217	3371.018	9.99+	9.99+
16	3	S8	0	120.566	2751.828	3.863	2751.828	9.99+	9.99+
17	4	S1	0	23.323	2082.501	409.924	2082.501	9.99+	5.08
18	4	S2	0	6.067	1956.767	942.512	1956.767	9.99+	2.076
19	4	S3	0	0.019	1973.007	844.786	1973.007	9.99+	2.336
20	4	S4	0	0.831	1969.264	860.264	1969.264	9.99+	2.289
21	4	S5	0	0.851	1969.269	860.263	1969.269	9.99+	2.289
22	4	S6	0	0.07	1972.996	844.774	1972.996	9.99+	2.336
23	4	S7	0	6.082	1956.832	942.491	1956.832	9.99+	2.076
24	4	S8	0	23.402	2082.448	409.965	2082.448	9.99+	5.08
25	5	S1	0	12.02	2110.726	346.001	2110.726	9.99+	6.1
26	5	S2	0	0.008	2018.251	795.122	2018.251	9.99+	2.538
27	5	S3	0	2.036	2030.263	713.068	2030.263	9.99+	2.847
28	5	S4	0	0.471	2027.266	724.856	2027.266	9.99+	2.797
29	5	S5	0	0.409	2027.272	724.855	2027.272	9.99+	2.797
30	5	S6	0	1.971	2030.248	713.052	2030.248	9.99+	2.847
31	5	S7	0	0.015	2018.341	795.101	2018.341	9.99+	2.538
32	5	S8	0	12.138	2110.657	346.05	2110.657	9.99+	6.099
33	6	S1	0	58.471	2454.146	473.832	2454.146	9.99+	5.179
34	6	S2	0	16.421	2752.872	1093.271	2752.872	9.99+	2.518
35	6	S3	0	0.023	2708.815	977.001	2708.815	9.99+	2.773

Slab Sliding Safety Factors (By Combination) (Continued)

	LC	Slab	Angle[deg]	Va-xx[lb]	Vr-xx[lb]	Va-zz[lb]	Vr-zz[lb]	SR-xx	SR-zz
36	6	S4	0	0.971	2718.44	994.885	2718.44	9.99+	2.732
37	6	S5	0	0.994	2718.432	994.884	2718.432	9.99+	2.732
38	6	S6	0	0.081	2708.828	976.987	2708.828	9.99+	2.773
39	6	S7	0	16.494	2752.76	1093.251	2752.76	9.99+	2.518
40	6	S8	0	58.694	2454.216	473.88	2454.216	9.99+	5.179
41	7	S1	0	58.635	2434.269	430.613	2434.269	9.99+	5.653
42	7	S2	0	18.827	2711.254	993.081	2711.254	9.99+	2.73
43	7	S3	0	1.849	2670.696	887.118	2670.696	9.99+	3.011
44	7	S4	0	1.231	2679.371	904.52	2679.371	9.99+	2.962
45	7	S5	0	1.25	2679.366	904.519	2679.366	9.99+	2.962
46	7	S6	0	1.882	2670.703	887.111	2670.703	9.99+	3.011
47	7	S7	0	18.88	2711.185	993.065	2711.185	9.99+	2.73
48	7	S8	0	58.788	2434.311	430.644	2434.311	9.99+	5.653
49	8	S1	0	65.346	2498.794	317.491	2498.794	9.99+	7.87
50	8	S2	0	21.419	2833.801	713.297	2833.801	9.99+	3.973
51	8	S3	0	7.296	2791.229	651.293	2791.229	9.99+	4.286
52	8	S4	0	3.93	2801.324	661.293	2801.324	9.99+	4.236
53	8	S5	0	4.015	2801.321	661.283	2801.321	9.99+	4.236
54	8	S6	0	7.347	2791.222	651.298	2791.222	9.99+	4.286
55	8	S7	0	21.56	2833.834	713.268	2833.834	9.99+	3.973
56	8	S8	0	65.635	2498.734	317.461	2498.734	9.99+	7.871
57	9	S1	0	73.824	2519.962	269.549	2519.962	9.99+	9.349
58	9	S2	0	25.975	2879.914	602.754	2879.914	9.99+	4.778
59	9	S3	0	8.838	2834.171	552.504	2834.171	9.99+	5.13
60	9	S4	0	4.907	2844.825	559.737	2844.825	9.99+	5.082
61	9	S5	0	4.96	2844.824	559.727	2844.824	9.99+	5.083
62	9	S6	0	8.877	2834.161	552.507	2834.161	9.99+	5.13
63	9	S7	0	26.132	2879.966	602.726	2879.966	9.99+	4.778
64	9	S8	0	74.084	2519.891	269.524	2519.891	9.99+	9.349
65	10	S1	0	126.692	2777.507	359.504	2777.507	9.99+	7.726
66	10	S2	0	38.285	3430.933	844.634	3430.933	9.99+	4.062
67	10	S3	0	7.328	3343.064	742.74	3343.064	9.99+	4.501
68	10	S4	0	5.282	3363.193	758.318	3363.193	9.99+	4.435
69	10	S5	0	5.398	3363.182	758.326	3363.182	9.99+	4.435
70	10	S6	0	7.46	3343.074	742.715	3343.074	9.99+	4.501
71	10	S7	0	38.492	3430.834	844.631	3430.834	9.99+	4.062
72	10	S8	0	127.208	2777.541	359.602	2777.541	9.99+	7.724
73	11	S1	0	126.815	2762.6	327.09	2762.6	9.99+	8.446
74	11	S2	0	40.089	3399.72	769.491	3399.72	9.99+	4.418
75	11	S3	0	8.698	3314.475	675.329	3314.475	9.99+	4.908
76	11	S4	0	5.477	3333.891	690.544	3333.891	9.99+	4.828
77	11	S5	0	5.59	3333.882	690.552	3333.882	9.99+	4.828
78	11	S6	0	8.81	3314.481	675.308	3314.481	9.99+	4.908
79	11	S7	0	40.281	3399.653	769.492	3399.653	9.99+	4.418
80	11	S8	0	127.278	2762.612	327.175	2762.612	9.99+	8.444
81	12	S1	0	29.089	1180.917	409.924	1180.917	9.99+	2.881
82	12	S2	0	7.79	1027.139	943.124	1027.139	9.99+	1.089
83	12	S3	0	0.019	1048.016	844.786	1048.016	9.99+	1.241
84	12	S4	0	0.831	1043.303	860.264	1043.303	9.99+	1.213
85	12	S5	0	0.851	1043.308	860.263	1043.308	9.99+	1.213
86	12	S6	0	0.07	1048.005	844.774	1048.005	9.99+	1.241
87	12	S7	0	7.816	1027.211	943.103	1027.211	9.99+	1.089
88	12	S8	0	29.192	1180.862	409.965	1180.862	9.99+	2.88
89	13	S1	0	17.785	1209.141	346.001	1209.141	9.99+	3.495
90	13	S2	0	1.716	1088.623	795.734	1088.623	9.99+	1.368
91	13	S3	0	2.036	1105.271	713.068	1105.271	9.99+	1.55
92	13	S4	0	0.471	1101.304	724.856	1101.304	9.99+	1.519

Slab Sliding Safety Factors (By Combination) (Continued)

	LC	Slab	Angle[deg]	Va-xx[lb]	Vr-xx[lb]	Va-zz[lb]	Vr-zz[lb]	SR-xx	SR-zz
93	13	S5	0	0.409	1101.31	724.855	1101.31	9.99+	1.519
94	13	S6	0	1.971	1105.257	713.052	1105.257	9.99+	1.55
95	13	S7	0	1.719	1088.719	795.714	1088.719	9.99+	1.368
96	13	S8	0	17.927	1209.071	346.05	1209.071	9.99+	3.494
97	14	S1	0	52.705	1552.561	473.832	1552.561	9.99+	3.277
98	14	S2	0	14.698	1823.244	1092.66	1823.244	9.99+	1.669
99	14	S3	0	0.023	1783.823	977.001	1783.823	9.99+	1.826
100	14	S4	0	0.971	1792.478	994.885	1792.478	9.99+	1.802
101	14	S5	0	0.994	1792.471	994.884	1792.471	9.99+	1.802
102	14	S6	0	0.081	1783.836	976.987	1783.836	9.99+	1.826
103	14	S7	0	14.761	1823.139	1092.638	1823.139	9.99+	1.669
104	14	S8	0	52.905	1552.63	473.88	1552.63	9.99+	3.276
105	15	S1	0	52.87	1532.685	430.613	1532.685	9.99+	3.559
106	15	S2	0	17.104	1781.626	992.469	1781.626	9.99+	1.795
107	15	S3	0	1.849	1745.705	887.118	1745.705	9.99+	1.968
108	15	S4	0	1.231	1753.409	904.52	1753.409	9.99+	1.938
109	15	S5	0	1.25	1753.405	904.519	1753.405	9.99+	1.938
110	15	S6	0	1.882	1745.712	887.111	1745.712	9.99+	1.968
111	15	S7	0	17.147	1781.564	992.452	1781.564	9.99+	1.795
112	15	S8	0	52.998	1532.725	430.644	1532.725	9.99+	3.559

Envelope Slab Soil Pressures

	Label	Max UC	Max LC	Soil Pressure[psf]	Allowable Bearing[psf]	Point
1	S1	0.258	10	387.331	1500	N230
2	S2	0.361	10	541.65	1500	N237
3	S3	0.373	10	560.001	1500	N28
4	S4	0.346	10	519.7	1500	N251
5	S5	0.346	10	519.691	1500	N258
6	S6	0.343	10	514.132	1500	N265
7	S7	0.361	10	541.457	1500	N272
8	S8	0.258	10	387.542	1500	N279

VECTOR ENGINEERS

JOB NO.: U2716.0330.221

PROJECT: Sunturf Package A7 - 2022

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	0.6
9	1.0 D + 0.45 W2 + 0.75 S		Y	DL	1	RLL	0.75	OL2	0.45	WLZ	0.6
10	1.0 D + 0.45 W3 + 0.75 S		Y	DL	1	RLL	0.75	OL3	0.45	WLZ	-0.6
11	1.0 D + 0.45 W4 + 0.75 S		Y	DL	1	RLL	0.75	OL4	0.45	WLZ	-0.6
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	WLZ	0.5
20	1.2 D + 1.6 S + 0.5 W2	Yes	Y	DL	1.2	RLL	1.6	OL2	0.5	WLZ	0.5
21	1.2 D + 1.6 S + 0.5 W3	Yes	Y	DL	1.2	RLL	1.6	OL3	0.5	WLZ	-0.5
22	1.2 D + 1.6 S + 0.5 W4	Yes	Y	DL	1.2	RLL	1.6	OL4	0.5	WLZ	-0.5
23	1.2 D + 1.0 W1	Yes	Y	DL	1.2	RLL		OL1	1	WLZ	1
24	1.2 D + 1.0 W2	Yes	Y	DL	1.2	RLL		OL2	1	WLZ	1
25	1.2 D + 1.0 W3	Yes	Y	DL	1.2	RLL		OL3	1	WLZ	-1
26	1.2 D + 1.0 W4	Yes	Y	DL	1.2	RLL		OL4	1	WLZ	-1
27	0.9 D + 1.0 W1	Yes	Y	DL	0.9	RLL		OL1	1	WLZ	1
28	0.9 D + 1.0 W2	Yes	Y	DL	0.9	RLL		OL2	1	WLZ	1
29	0.9 D + 1.0 W3	Yes	Y	DL	0.9	RLL		OL3	1	WLZ	-1
30	0.9 D + 1.0 W4	Yes	Y	DL	0.9	RLL		OL4	1	WLZ	-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	146.62	22	1731.71	20	50.184	23	0	30	0	30	0	30
2		min	-29.017	27	-116.448	29	-58.083	25	0	18	0	18	0	18
3	N124	max	28.987	27	1729.44	20	50.185	23	0	30	0	30	0	30
4		min	-146.465	22	-116.83	29	-58.085	25	0	18	0	18	0	18
5	N123	max	31.486	28	2136.797	21	847.437	29	0	30	0	30	0	30
6		min	-57.179	21	-1140.449	28	-733.93	23	0	18	0	18	0	18
7	N1	max	57.032	21	2135.993	21	847.338	29	0	30	0	30	0	30
8		min	-31.172	28	-1139.929	28	-733.874	23	0	18	0	18	0	18
9	N168	max	55.587	22	3640.81	20	73.32	23	0	30	0	30	0	30
10		min	-8.435	27	-378.194	29	-81.81	25	0	18	0	18	0	18
11	N100	max	8.426	27	3638.95	20	73.32	23	0	30	0	30	0	30
12		min	-55.177	22	-378.371	29	-81.809	25	0	18	0	18	0	18
13	N99	max	6.132	28	4655.667	21	1902.728	25	0	30	0	30	0	30
14		min	-17.484	21	-2537.182	28	-1645.434	27	0	18	0	18	0	18
15	N171	max	17.062	21	4655.048	21	1902.688	25	0	30	0	30	0	30
16		min	-6.196	28	-2536.632	28	-1645.401	27	0	18	0	18	0	18
17	N116	max	16.694	20	3407.806	20	76.006	23	0	30	0	30	0	30
18		min	-2.488	29	-302.419	29	-86.119	25	0	18	0	18	0	18
19	N106A	max	2.601	29	3408.082	20	76.007	23	0	30	0	30	0	30
20		min	-16.641	20	-302.442	29	-86.12	25	0	18	0	18	0	18
21	N118A	max	9.645	20	3457.703	20	76.724	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	0.245	29	-311.249	29	-86.801	25	0	18	0	18	0	18
23	N112A	max	-0.129	29	3457.658	20	76.724	23	0	30	0	30	0	30
24		min	-9.556	20	-311.262	29	-86.802	25	0	18	0	18	0	18
25	N105A	max	2.743	28	4226.675	21	1714.29	25	0	30	0	30	0	30
26		min	-4.622	21	-2314.929	28	-1484.419	23	0	18	0	18	0	18
27	N115	max	4.267	21	4226.756	21	1714.264	25	0	30	0	30	0	30
28		min	-2.818	28	-2314.973	28	-1484.401	23	0	18	0	18	0	18
29	N111A	max	1.581	28	4318.853	21	1744.275	25	0	30	0	30	0	30
30		min	-3.408	21	-2357.175	28	-1511.047	23	0	18	0	18	0	18
31	N117A	max	3.038	21	4318.787	21	1744.274	25	0	30	0	30	0	30
32		min	-1.654	28	-2357.129	28	-1511.043	23	0	18	0	18	0	18
33	Totals:	max	0.001	21	49668.004	21	11791.551	25						
34		min	0	28	-10435.643	27	-10196.734	23						

SIMPSON Strong-Tie

Anchor Designer™ Software
Version 2.9.7376.0

Company:	Vector Structural Engineers	Date:	3/17/2022
Engineer:	MIH	Page:	1/6
Project:	Sunturf Ground Mount A11		
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: F1554 Grade 36
Diameter (inch): 0.375
Effective Embedment depth, h_{ef} (inch): 4.000
Code report: ICC-ES ESR-4057
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 5.25
c_{ac} (inch): 7.12
C_{min} (inch): 1.75
S_{min} (inch): 1.00

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Hole condition: Dry concrete
Inspection: Periodic
Temperature range, Short/Long: 150/110°F
Ignore 6do requirement: Not applicable
Build-up grout pad: No

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

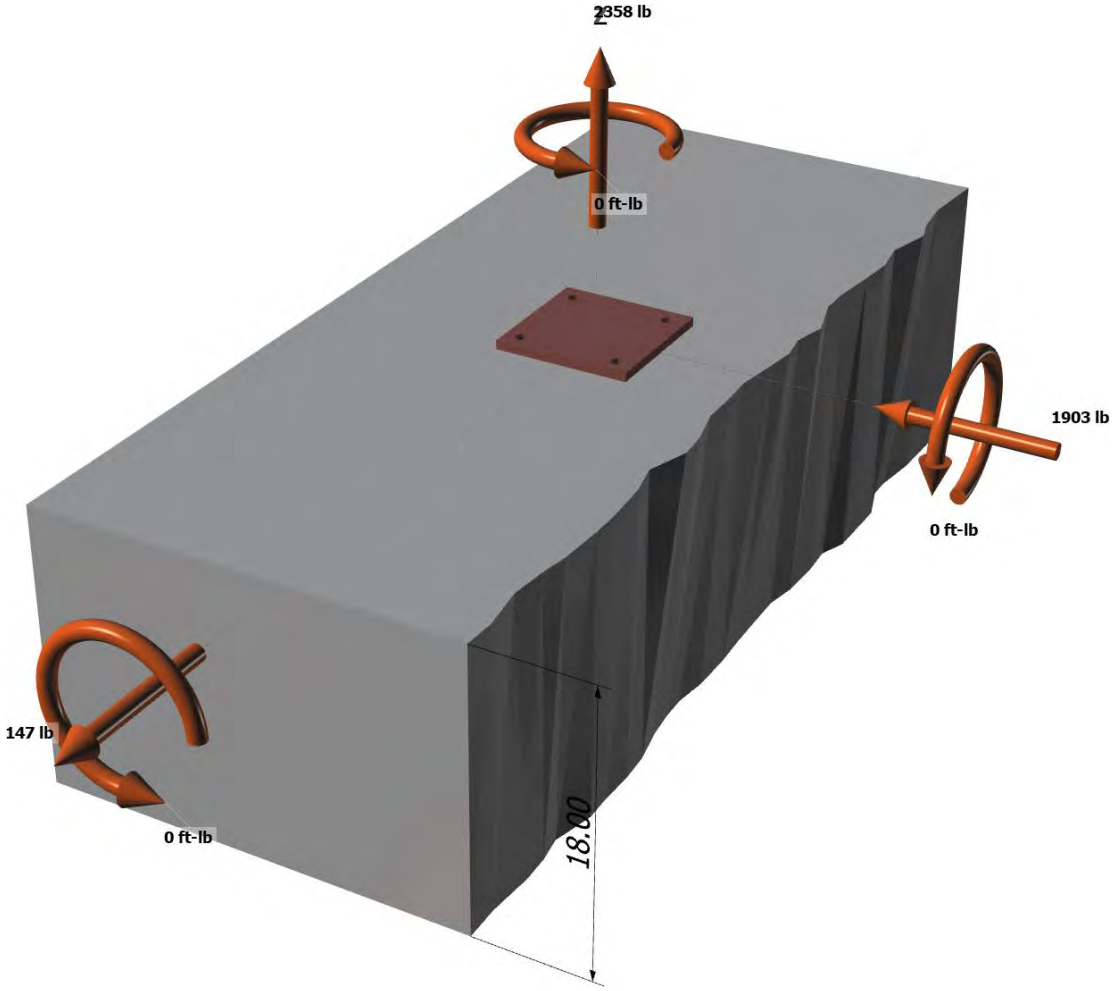
Recommended Anchor
Anchor Name: SET-3G - SET-3G w/ 3/8"Ø F1554 Gr. 36
Code Report: ICC-ES ESR-4057

Load and Geometry
Load factor source: ACI 318 Section 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

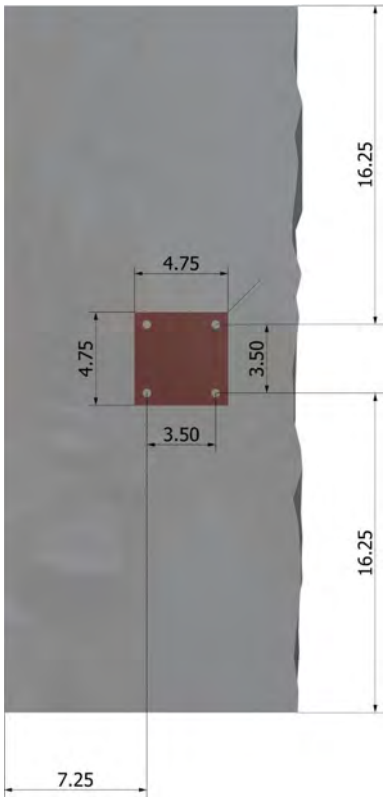
Strength level loads:

N_{ua} [lb]: 2358
V_{uax} [lb]: 147
V_{uay} [lb]: -1903
M_{ux} [ft-lb]: 0
M_{uy} [ft-lb]: 0
M_{uz} [ft-lb]: 0

<Figure 1>



<Figure 2>



SIMPSON Strong-Tie

Anchor Designer™ Software
Version 2.9.7376.0

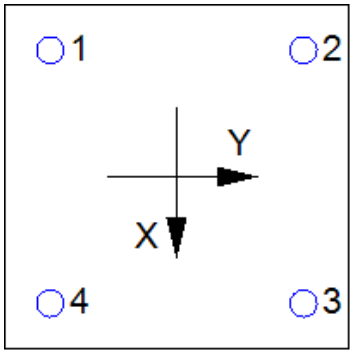
Company:	Vector Structural Engineers	Date:	3/17/2022
Engineer:	MIH	Page:	4/6
Project:	Sunturf Ground Mount A11		
Address:			
Phone:			
E-mail:			

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	589.5	36.8	-475.8	477.2
2	589.5	36.8	-475.8	477.2
3	589.5	36.8	-475.8	477.2
4	589.5	36.8	-475.8	477.2
Sum	2358.0	147.0	-1903.0	1908.7

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 2358
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



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

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

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

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.4.2.2a)

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

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

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

6. Adhesive Strength of Anchor in Tension (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)
1346	1.00	1.00	2500	0.24	1346

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

λ_a	τ_{cr} (psi)	d_a (in)	h_{ef} (in)	N_{ba} (lb)
1.00	1346	0.38	4.000	6343

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

A_{Na} (in^2)	A_{Na0} (in^2)	c_{Na} (in)	$c_{a,min}$ (in)	$\Psi_{ec,Na}$	$\Psi_{ed,Na}$	$\Psi_{cp,Na}$	N_{ba}(lb)	ϕ	ϕN_{ag} (lb)
198.45	112.09	5.29	7.25	1.000	1.000	1.000	6343	0.55	6176

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

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

9. Concrete Breakout Strength of Anchor in Shear (Sec. 17.5.2)

Shear perpendicular to edge in x-direction:

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

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{bx} (lb)
3.00	0.375	1.00	2500	19.75	28514

$\phi V_{cbgx} = \phi\,(A_{Vc} / A_{Vco})\,\Psi_{ec,V}\,\Psi_{ed,V}\,\Psi_{c,V}\,\Psi_{h,V}\,V_{bx}$ (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)
726.75	1755.28	1.000	0.773	1.000	1.283	28514	0.70	8200

Shear perpendicular to edge in y-direction:

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

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

$\phi V_{cbgy} = \phi\,(A_{Vc} / A_{Vco})\,\Psi_{ec,V}\,\Psi_{ed,V}\,\Psi_{c,V}\,\Psi_{h,V}\,V_{by}$ (Sec. 17.3.1 & Eq. 17.5.2.1b)

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cbgy} (lb)
576.47	520.03	1.000	1.000	1.000	1.000	11450	0.70	8885

Shear parallel to edge in x-direction:

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

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

$\phi V_{cbgx} = \phi\,(2)(A_{Vc} / A_{Vco})\,\Psi_{ec,V}\,\Psi_{ed,V}\,\Psi_{c,V}\,\Psi_{h,V}\,V_{by}$ (Sec. 17.3.1, 17.5.2.1(c) & Eq. 17.5.2.1b)

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cbgx} (lb)
274.59	236.53	1.000	1.000	1.000	1.000	6342	0.70	10307

Shear parallel to edge in y-direction:

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

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{bx} (lb)
3.00	0.375	1.00	2500	16.25	21280

$\phi V_{cbgy} = \phi\,(2)(A_{Vc} / A_{Vco})\,\Psi_{ec,V}\,\Psi_{ed,V}\,\Psi_{c,V}\,\Psi_{h,V}\,V_{bx}$ (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)
632.25	1188.28	1.000	1.000	1.000	1.164	21280	0.70	18447

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

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

ϕV_{cpg} (lb)
15722

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	590	3394	0.17	Pass
Concrete breakout	2358	7374	0.32	Pass
Adhesive	**2358**	**6176**	**0.38**	**Pass (Governs)**

Shear	Factored Load, V_{ua} (lb)	Design Strength, ϕV_n (lb)	Ratio	Status
Steel	**477**	**1765**	**0.27**	**Pass (Governs)**
T Concrete breakout x+	147	8200	0.02	Pass
T Concrete breakout y-	1903	8885	0.21	Pass
|| Concrete breakout y-	74	10307	0.01	Pass
|| Concrete breakout x-	952	18447	0.05	Pass
Concrete breakout, combined	-	-	0.21	Pass
Pryout	1909	15722	0.12	Pass

Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. 17.6..1	0.38	0.00	38.2%	1.0	Pass

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

12. Warnings

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

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