



Project Number: U2716.0388.241

May 20, 2024

Sunmodo
14800 NE 65th Street
Vancouver, WA 98682

**REFERENCE: SunModo Sunturf Ground Mount D6 – Standard Panels
Ground Mount PV Array Installation**

To Whom It May Concern:

Per request of SunModo, we have been asked to prepare the structural design of a ground-mounted PV solar array system with several foundation options as shown in the attached calculations. The adopted building code in this jurisdiction is the 2023 Florida Building Code (2021 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. This document does not address site-specific installations. The following design parameters are used in our analysis:

- Minimum Design Loads for Buildings and Other Structures (ASCE 7-22)
- Design wind speed for risk category I structures: 150 mph
- Wind exposure: C
- Ground snow load: 0 psf
- The ground screws and helical piers must be tested to 1.5 times uplift and 2.0 times lateral reactions found in the table below. A minimum of one ground screw or helical pier must be tested.

Load (ASD)	Value (lbs)	Factor of Safety	Test Value (lbs)
UPLIFT	2213	1.5	3320
LATERAL	1260	2	2520

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

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

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

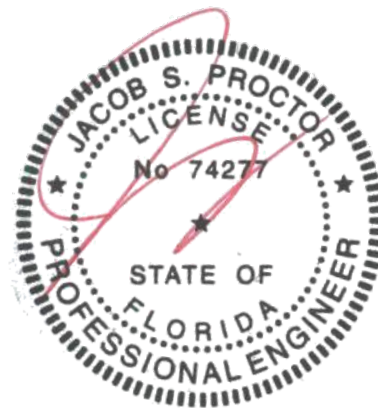
Very truly yours,

VECTOR STRUCTURAL ENGINEERING, LLC

Jacob Proctor, P.E.
License: 74277 - Expires: 02/28/2025
Project Engineer

Enclosures

JSP/cjt



05/20/2024

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No. 74277



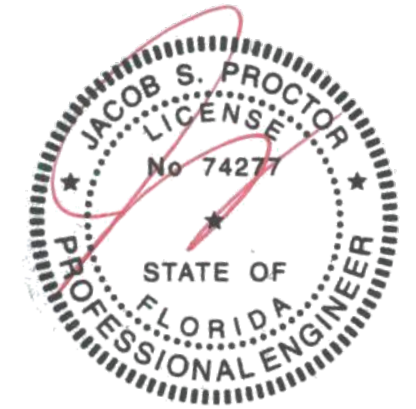
JOB NO. U2716.0388.241
 PROJECT SUNMODO SUNTURF GROUND MOUNT D6
 SUBJECT ALL OPTIONS

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

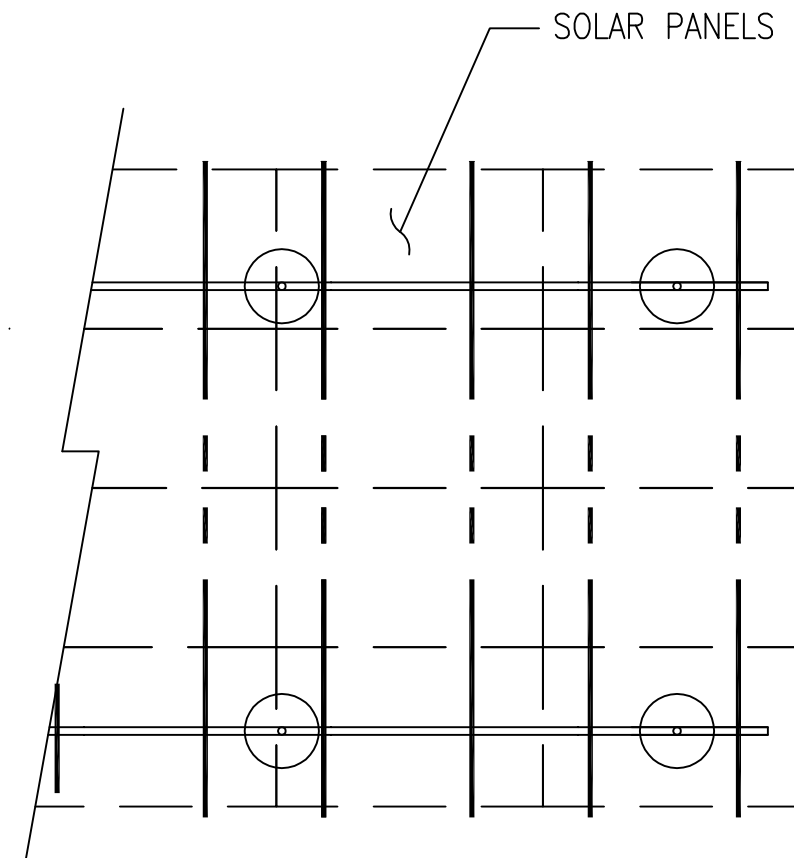
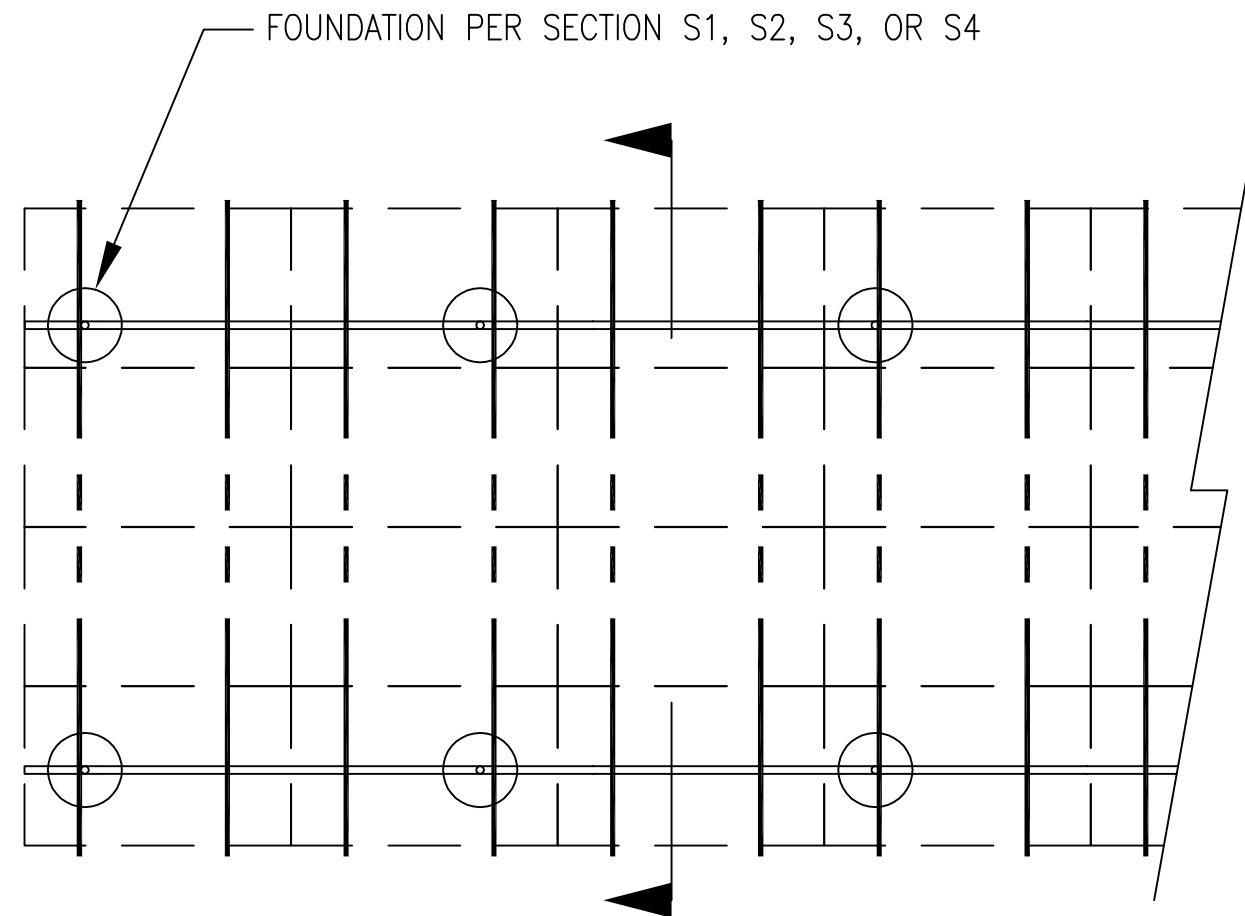
NOTES:

- SEE SUNMODO SHOP DRAWINGS FOR GROUND MOUNT MEMBER SIZES, GEOMETRY, AND POST SPACING

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. This document does not address site-specific installations.

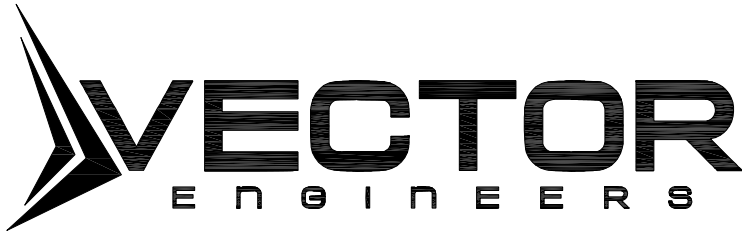


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PV ARRAY PLAN

N.T.S.



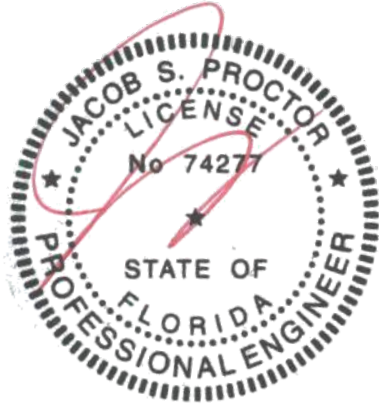
JOB NO. U2716.0388.241

PROJECT SUNMODO SUNTURF GROUND MOUNT D6

SUBJECT DRILLED PIER OPTION

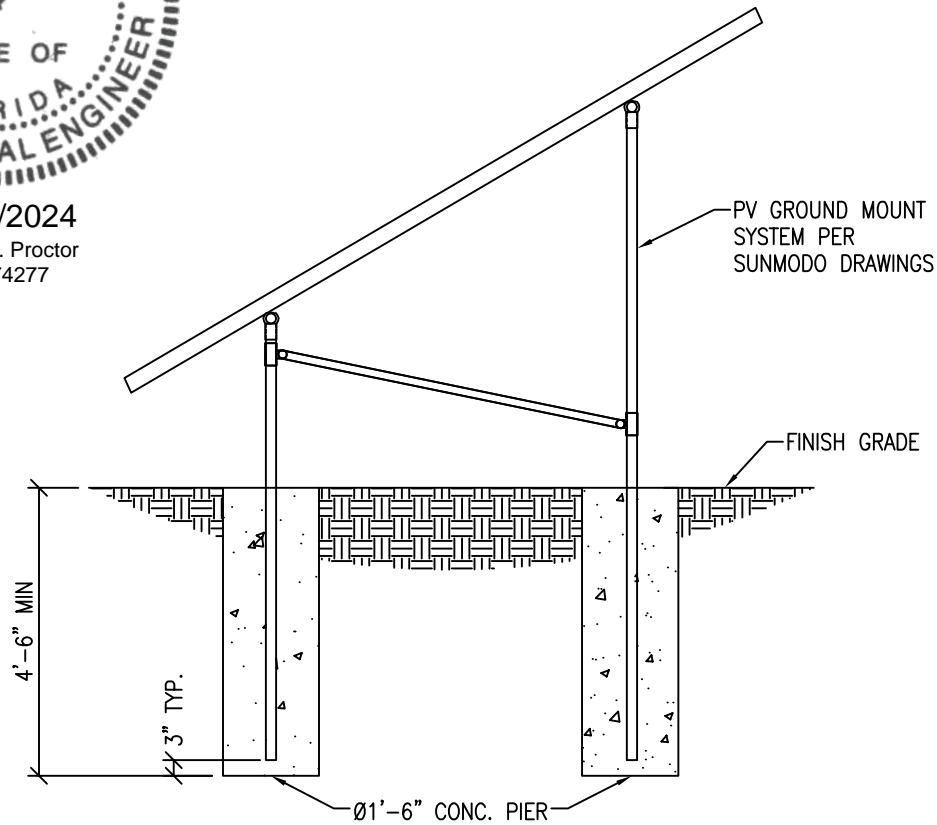
NOTES:

1. SEE SUNMODO SHOP DRAWINGS FOR GROUND MOUNT MEMBER SIZES AND GEOMETRY



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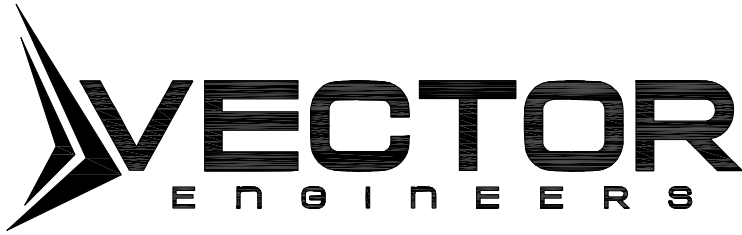
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DRILLED PIER SECTION

NTS.

S1



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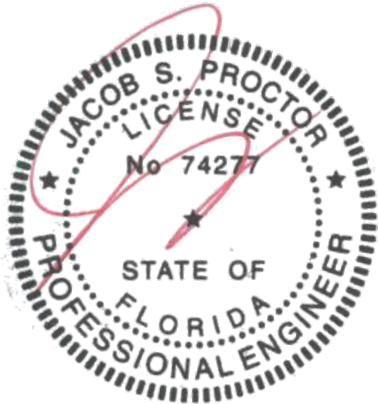
PROJECT SUNMODO SUNTURF GROUND MOUNT D6

SUBJECT HELICAL PIER OPTION

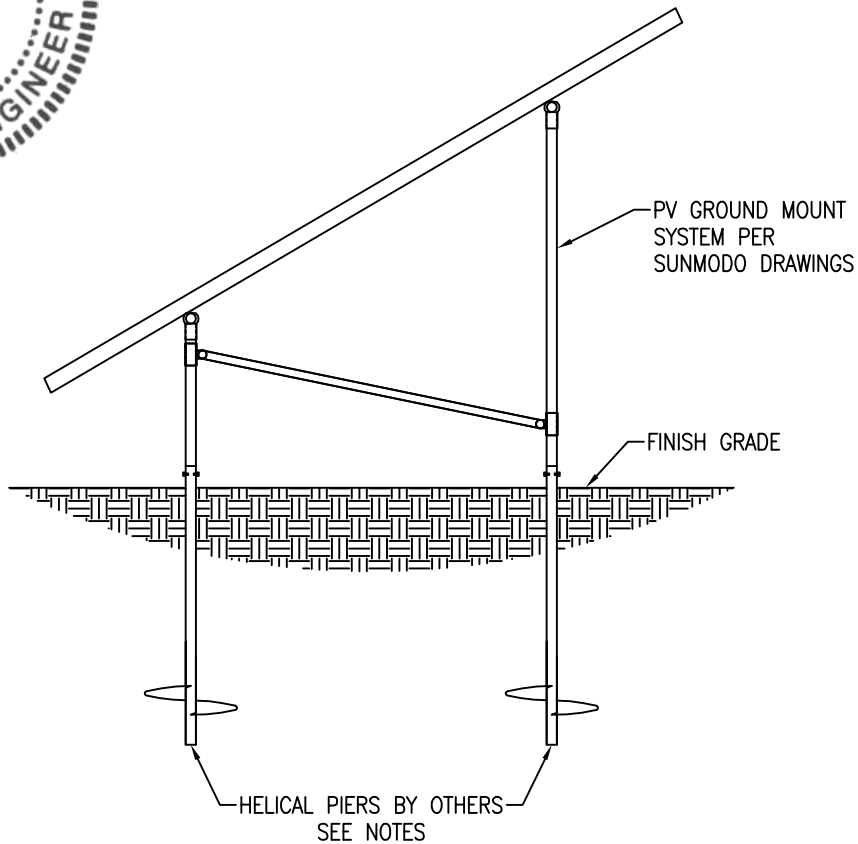
NOTES:

1. SEE SUNMODOD SHOP DRAWINGS FOR GROUND MOUNT MEMBER SIZES AND GEOMETRY
2. A MINIMUM OF (1) HELICAL PIER SHALL BE LOAD TESTED PER THE TEST LOADS LISTED ON THE COVER PAGE OF THIS LETTER. FAILURE CRITERIA IS AS FOLLOWS:
 - 2.1. LATERAL DEFLECTION OF 1" MEASURED AT GRADE UNDER LATERAL LOAD
 - 2.2. VERTICAL DEFLECTION OF 1/2" UNDER AXIAL LOAD
3. LOAD TESTS SHALL BE PERFORMED BY A LICENSED CONTRACTOR AS APPROVED BY THE AHJ

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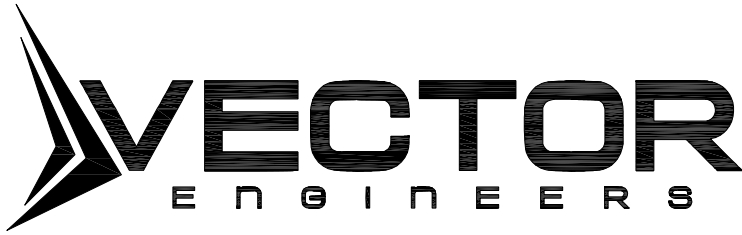
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HELICAL PIER SECTION

NTS.

S2



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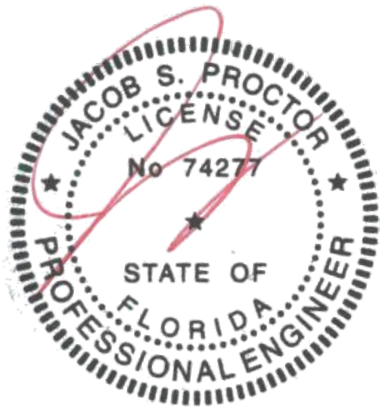
PROJECT SUNMODO SUNTURF GROUND MOUNT D6

SUBJECT GROUND SCREW OPTION

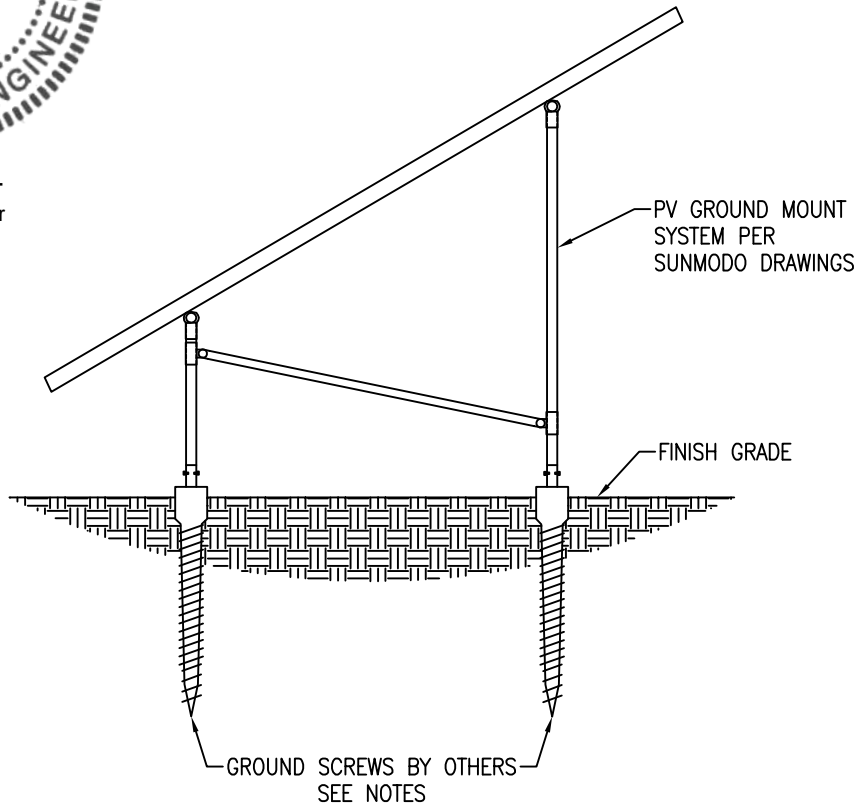
NOTES:

1. SEE SUNMODOD SHOP DRAWINGS FOR GROUND MOUNT MEMBER SIZES AND GEOMETRY
2. A MINIMUM OF (1) GROUND SCREW SHALL BE LOAD TESTED PER THE TEST LOADS LISTED ON THE COVER PAGE OF THIS LETTER. FAILURE CRITERIA IS AS FOLLOWS:
 - 2.1. LATERAL DEFLECTION OF 1" MEASURED AT GRADE UNDER LATERAL LOAD
 - 2.2. VERTICAL DEFLECTION OF 1/2" UNDER AXIAL LOAD
3. LOAD TESTS SHALL BE PERFORMED BY A LICENSED CONTRACTOR AS APPROVED BY THE AHJ

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GROUND SCREW SECTION

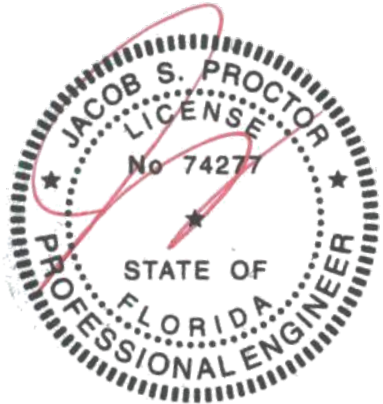
NTS.

S3

PROJECT SUNMODO SUNTURF GROUND MOUNTS D6

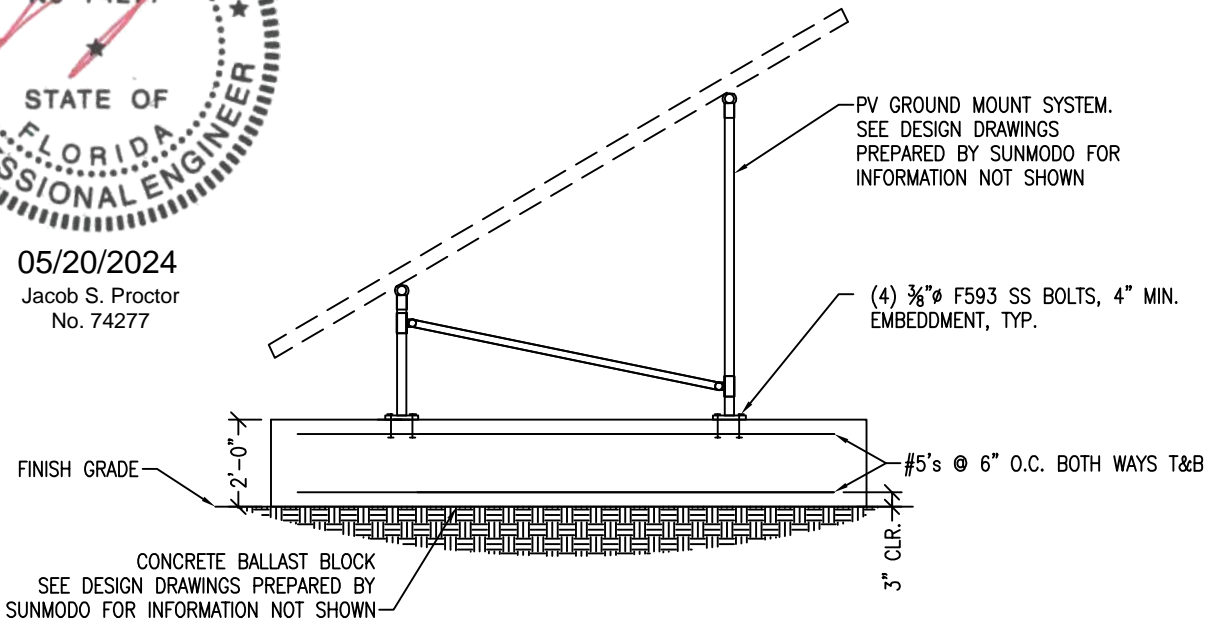
SUBJECT BALLASTED BLOCK OPTION

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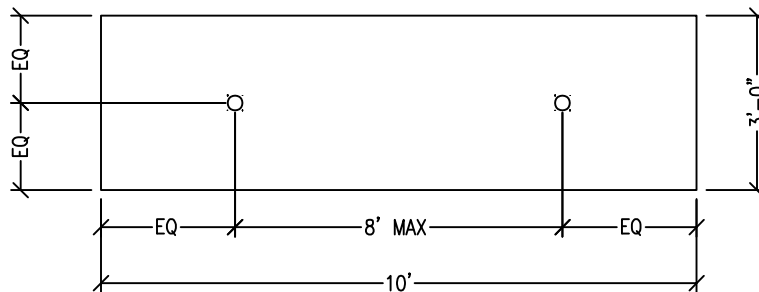


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SECTION VIEW



PLAN VIEW

PV ARRAY SECTION

N.T.S.





JOB NO.: U2716.0388.241
SUBJECT: WIND PRESSURES
CONDITION: 10° TILT

PROJECT: Sunturf Package D6 Ground Mount

WIND PRESSURES

Calculations per:	ASCE 7-22	
Design Wind Speed, V [mph]:	150	
Risk Category:	I	(Table 1.5-1)
Exposure Category:	C	(Section 26.7)
Elevation [ft]:	-156.2	
Ground Elevation Factor, K_e :		(Not applicable)
α :	9.8	(Table 26.11-1)
z_g [ft]:	2460	(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]:	49.03	(Equation 26.10-1)
Gust Effect Factor, G:	0.85	(Section 26.11.4)
Panel Slope [degrees]:	10.0	
Wind Flow:	Clear	
Roof Configuration:	Monoslope	

Wind Pressures in Transverse (N-S) Direction

Net Pressure Coefficients per Figure 27.3-4

Clear Wind Flow	C_{NW}	C_{NL}
Case 1 ($\gamma = 0^\circ$, Load Case A)	-0.7	-1.1
Case 2 ($\gamma = 0^\circ$, Load Case B)	-1.6	0.0
Case 3 ($\gamma = 180^\circ$, Load Case A)	1.0	1.5
Case 4 ($\gamma = 180^\circ$, Load Case B)	1.7	0.4

Design Wind Pressures per Equation 27.3-2 [psf]

Clear Wind Flow	$k_d q_h GC_{NW}$	$k_d q_h GC_{NL}$
Case 1 ($\gamma = 0^\circ$, Load Case A)	-24.8	-39.0
Case 2 ($\gamma = 0^\circ$, Load Case B)	-56.7	0.0
Case 3 ($\gamma = 180^\circ$, Load Case A)	35.4	53.1
Case 4 ($\gamma = 180^\circ$, Load Case B)	60.2	14.2
Case 5 ($\gamma = 0^\circ$, 16 psf Min. Horiz.)	-16.0	-16.0
Case 6 ($\gamma = 180^\circ$, 16 psf Min. Horiz)	16.0	16.0



JOB NO.: U2716.0388.241
SUBJECT: WIND PRESSURES
CONDITION: 20° TILT

PROJECT: Sunturf Package D6 Ground Mount

WIND PRESSURES

Calculations per:	ASCE 7-22	
Design Wind Speed, V [mph]:	150	
Risk Category:	I	(Table 1.5-1)
Exposure Category:	C	(Section 26.7)
Elevation [ft]:	-156.2	
Ground Elevation Factor, K_e :		(Not applicable)
α :	9.8	(Table 26.11-1)
z_g [ft]:	2460	(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]:	49.03	(Equation 26.10-1)
Gust Effect Factor, G:	0.85	(Section 26.11.4)
Panel Slope [degrees]:	20.0	
Wind Flow:	Clear	
Roof Configuration:	Monoslope	

Wind Pressures in Transverse (N-S) Direction

Net Pressure Coefficients per Figure 27.3-4

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

Design Wind Pressures per Equation 27.3-2 [psf]

Clear Wind Flow	$k_d q_h GC_{NW}$	$k_d q_h GC_{NL}$
Case 1 ($\gamma = 0^\circ$, Load Case A)	-46.0	-53.1
Case 2 ($\gamma = 0^\circ$, Load Case B)	-77.9	-7.1
Case 3 ($\gamma = 180^\circ$, Load Case A)	56.7	60.2
Case 4 ($\gamma = 180^\circ$, Load Case B)	74.4	24.8
Case 5 ($\gamma = 0^\circ$, 16 psf Min. Horiz.)	-16.0	-16.0
Case 6 ($\gamma = 180^\circ$, 16 psf Min. Horiz.)	16.0	16.0

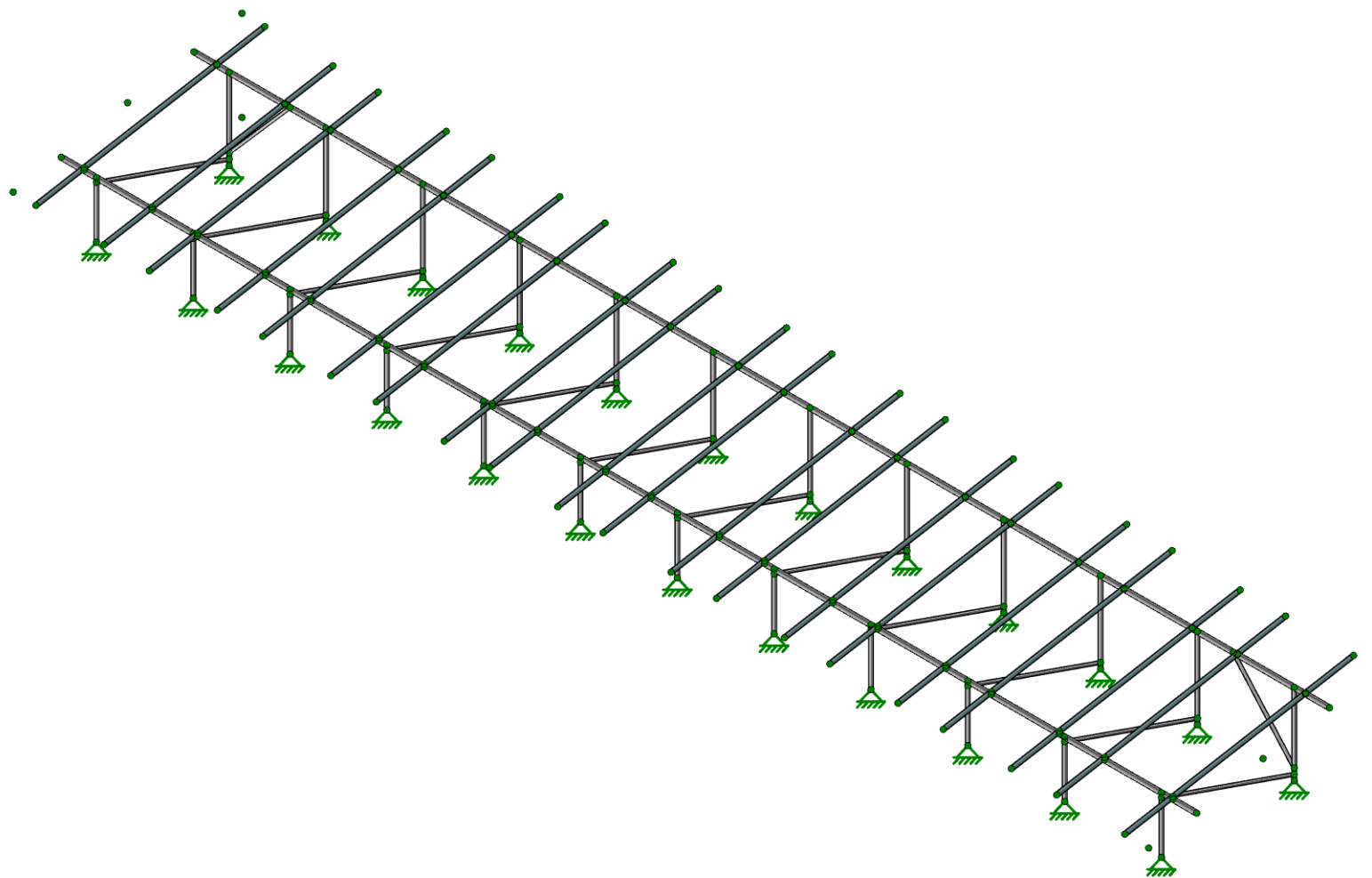
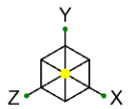


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PROJECT: Sunturf Package D6 Ground Mount

Framing Analysis

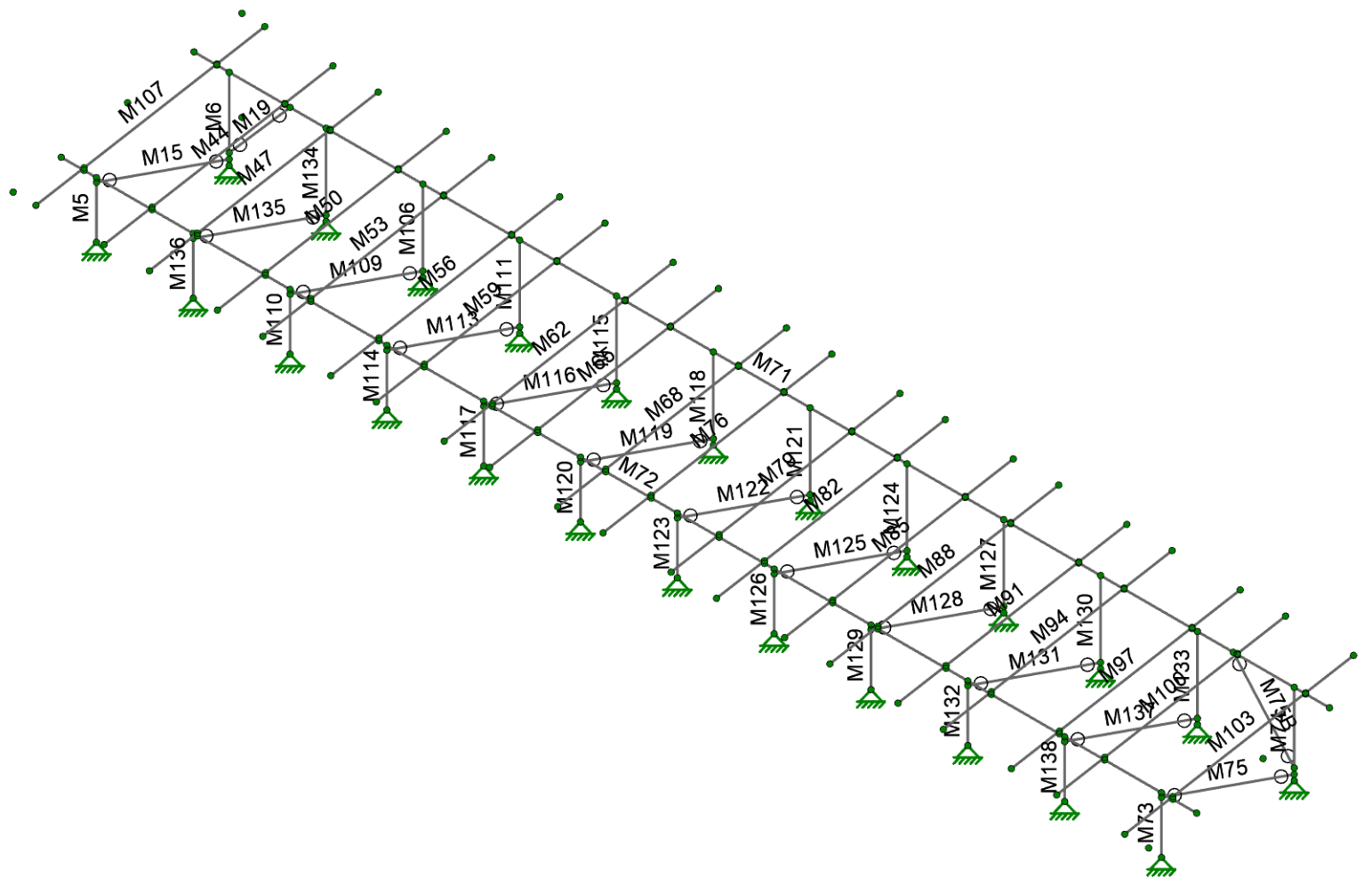
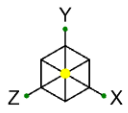
SP - 10 deg



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D6 Standard Panels - 10 Degree Tilt

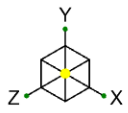
SK-1
May 20, 2024
Sunturf D6 - SP - 10deg.r3d



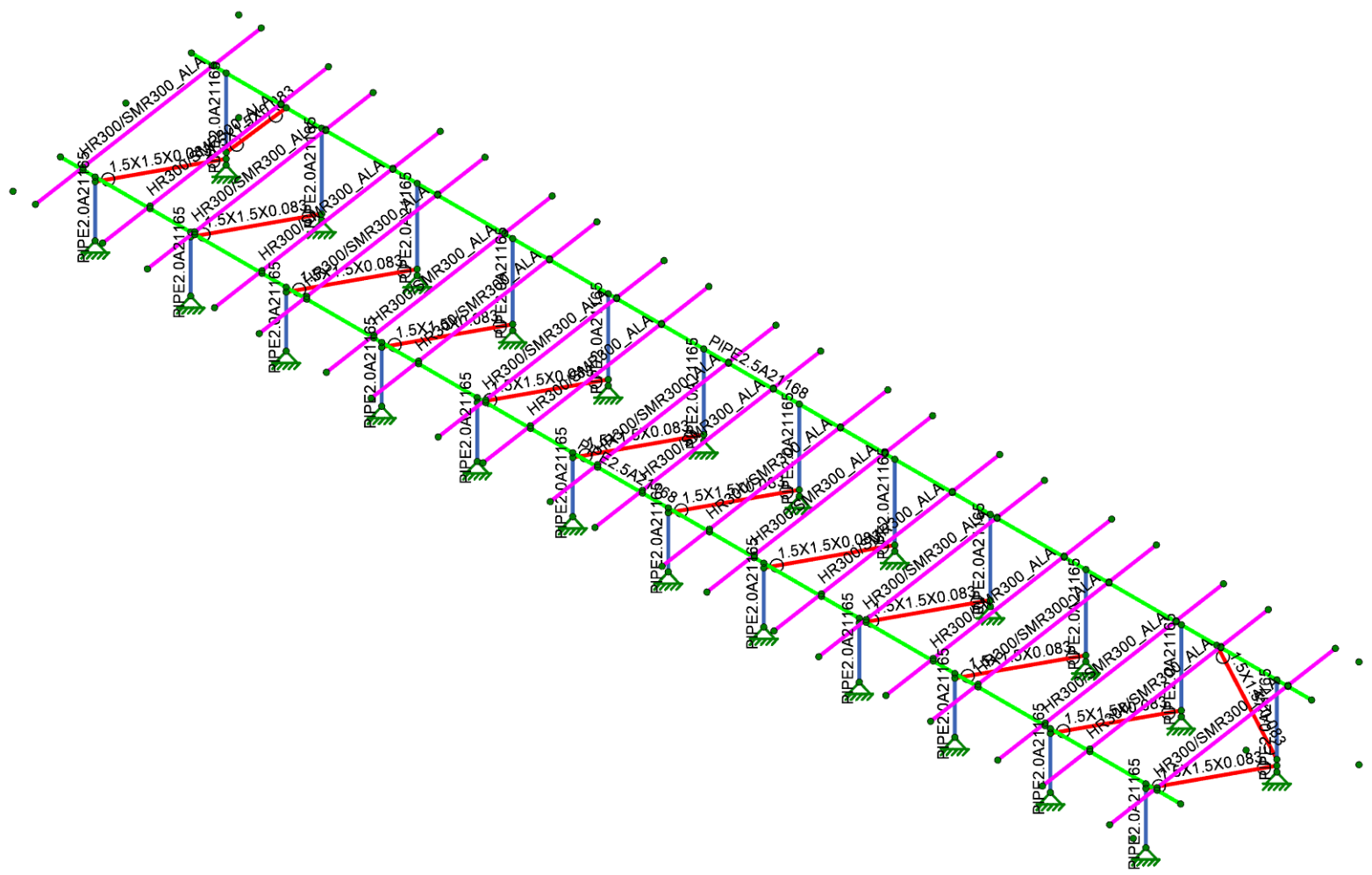
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D6 Standard Panels - 10 Degree Tilt

SK-2
 May 20, 2024
 Sunturf D6 - SP - 10deg.r3d



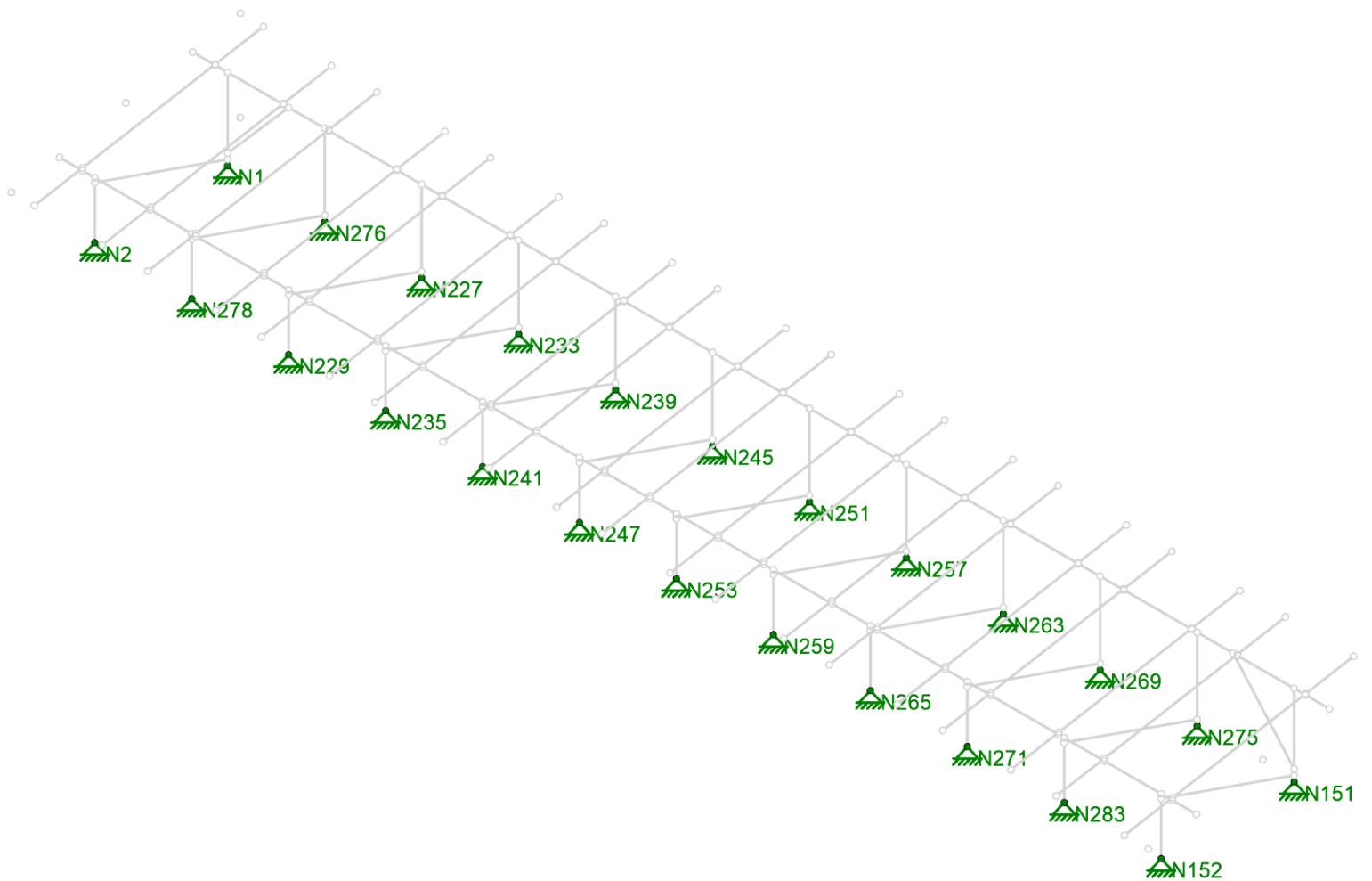
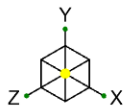
Section Sets	
█	Post
█	Cross Beam
█	Diagonal Brace
█	RIGID
█	AL Rails



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D6 Standard Panels - 10 Degree Tilt

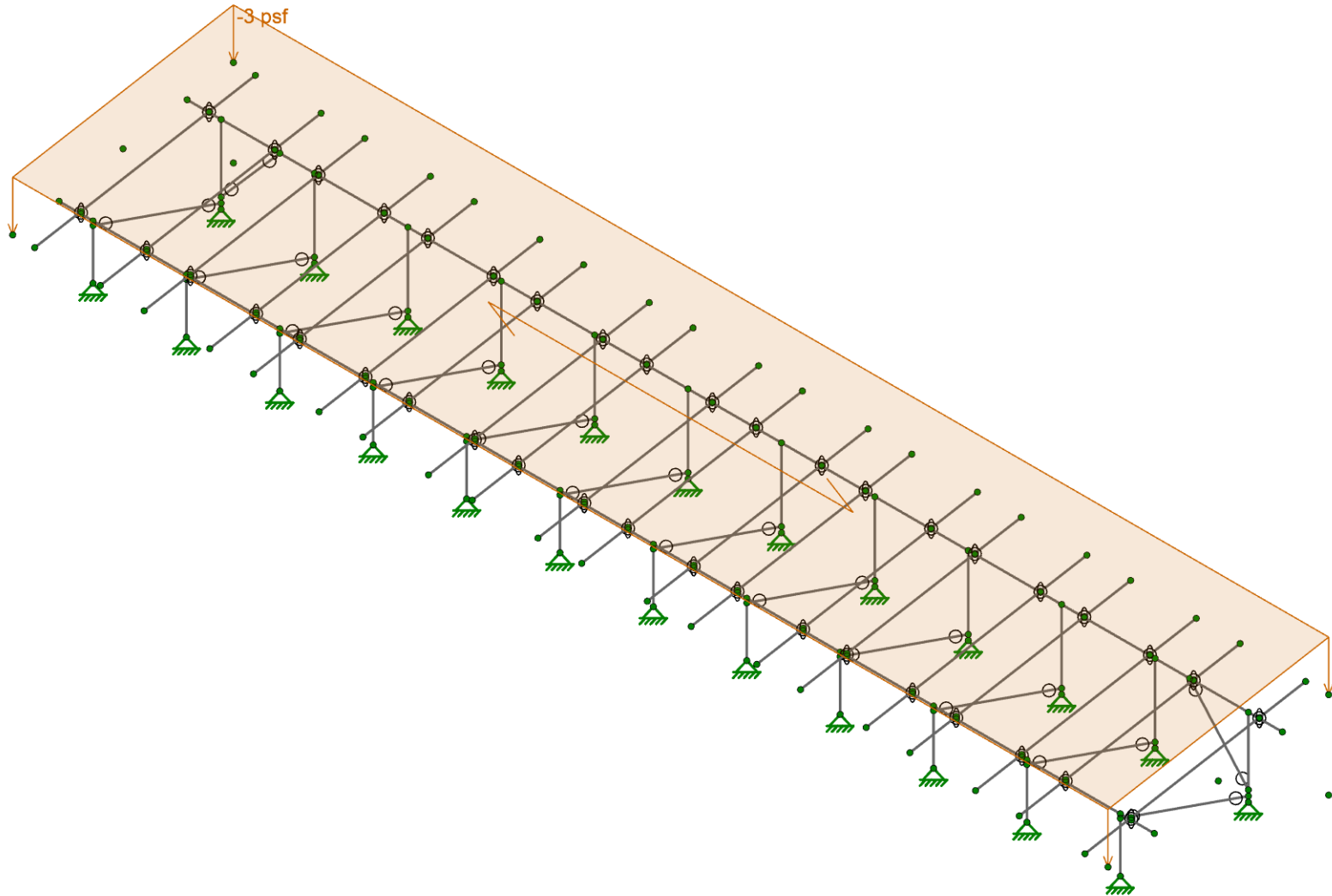
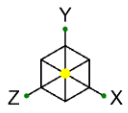
SK-3
May 20, 2024
Sunturf D6 - SP - 10deg.r3d



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D6 Standard Panels - 10 Degree Tilt

SK-4
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Sunturf D6 - SP - 10deg.r3d

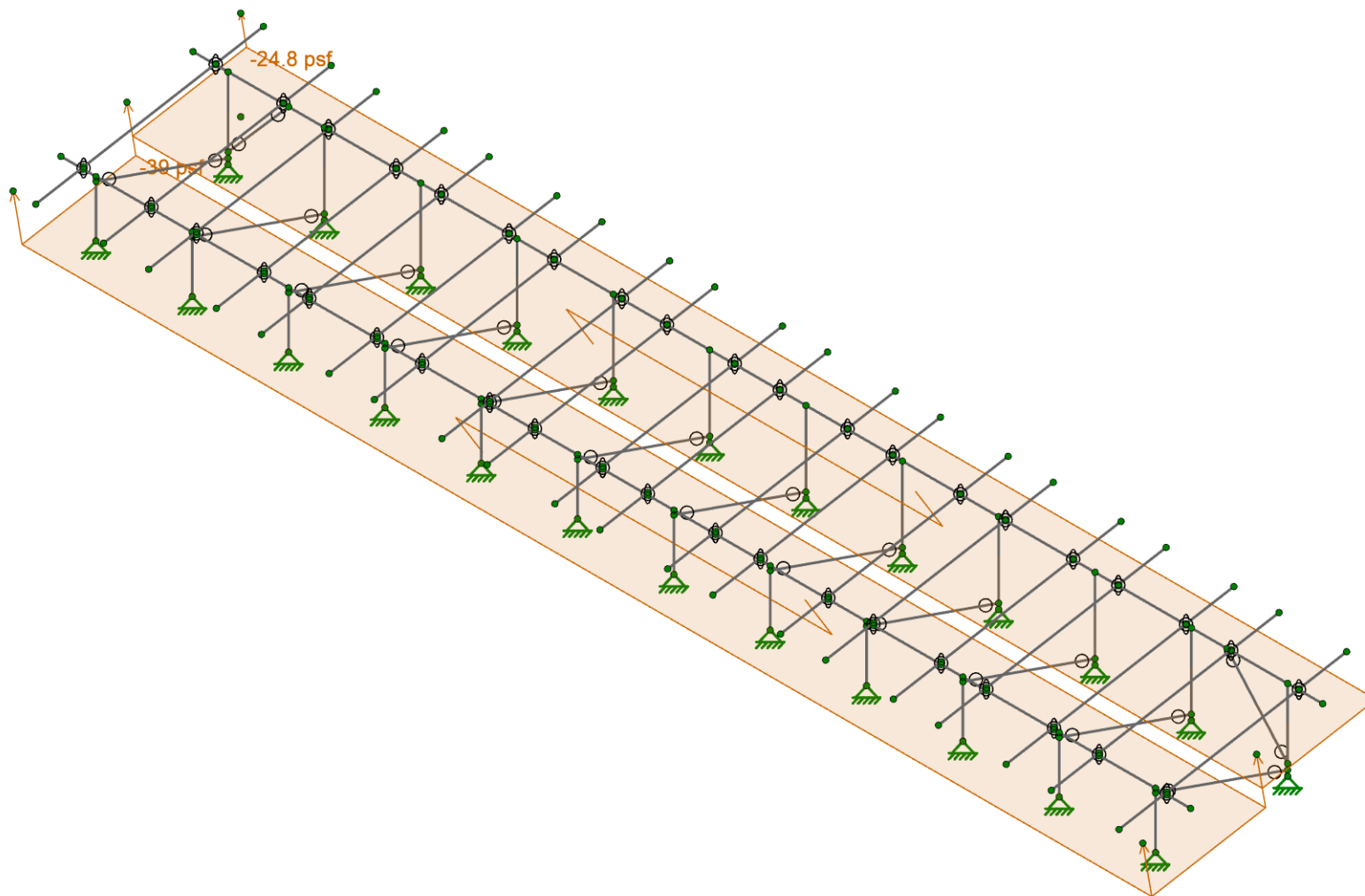
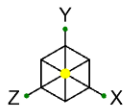


Loads: BLC 2, Solar Panel Weight

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D6 Standard Panels - 10 Degree Tilt

SK-5
May 20, 2024
Sunturf D6 - SP - 10deg.r3d



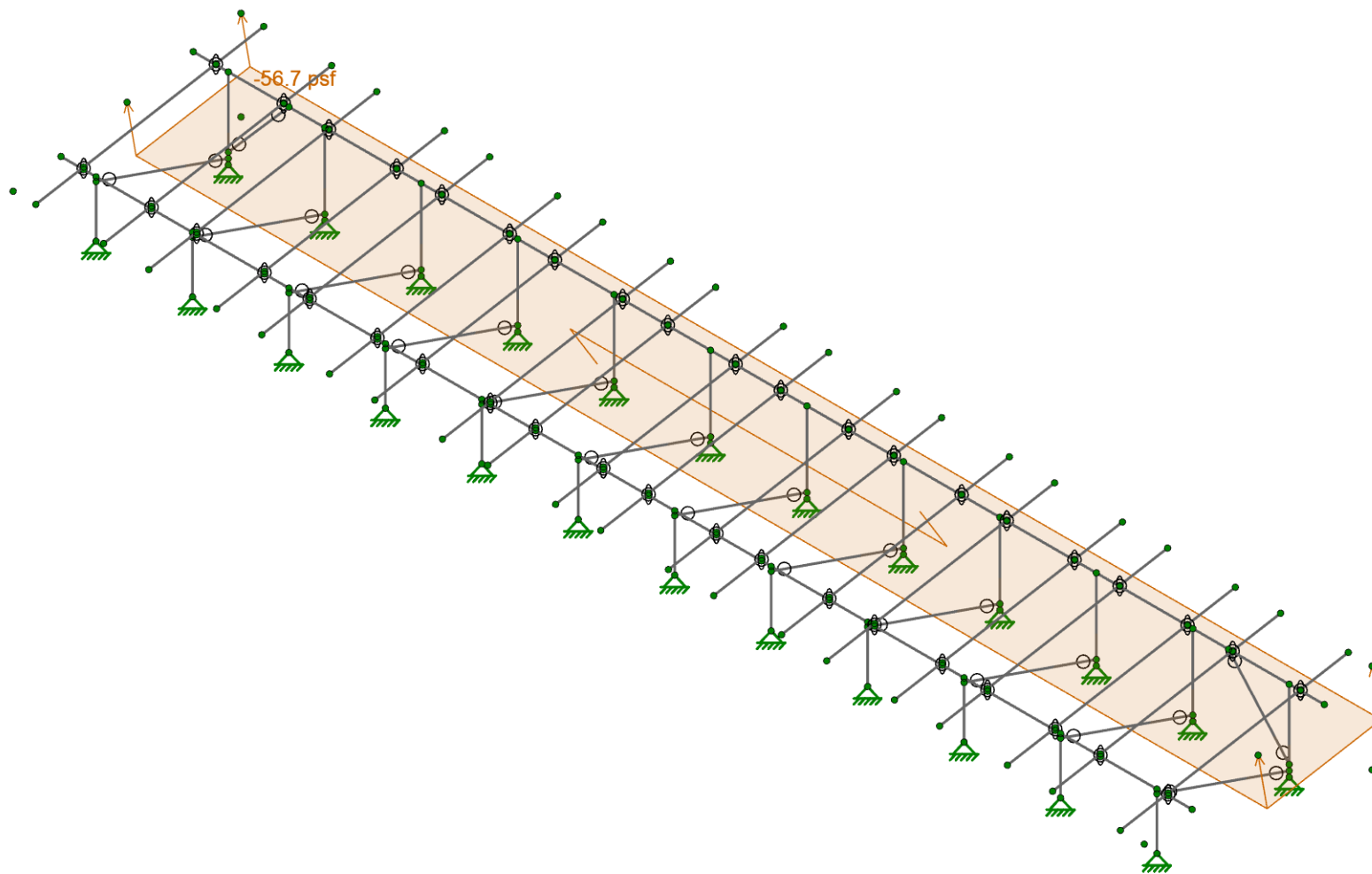
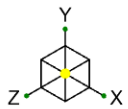
Loads: BLC 4, Wind A 0 deg



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D6 Standard Panels - 10 Degree Tilt

SK-6
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Sunturf D6 - SP - 10deg.r3d



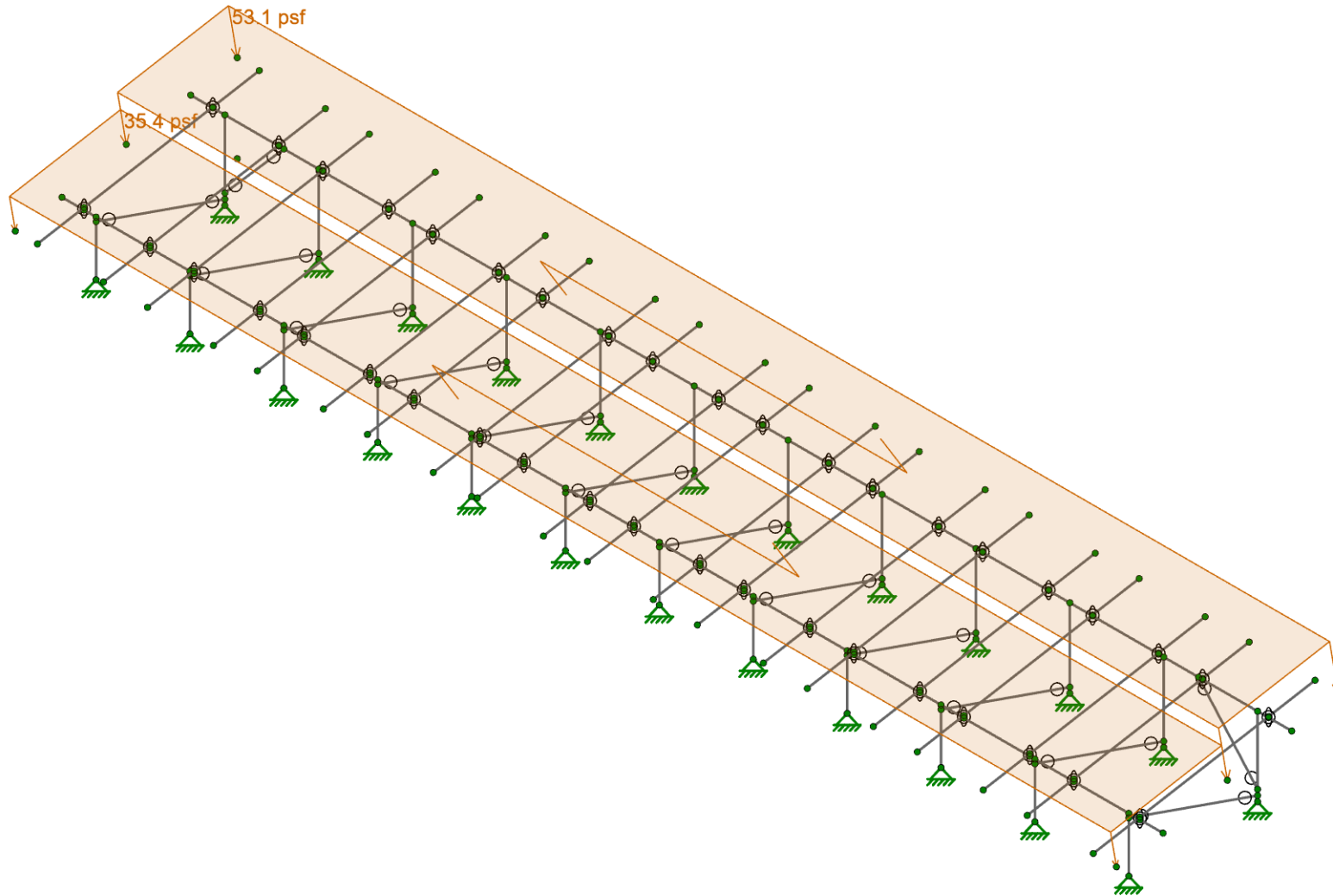
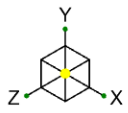
Loads: BLC 5, Wind B 0 deg



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D6 Standard Panels - 10 Degree Tilt

SK-7
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Sunturf D6 - SP - 10deg.r3d



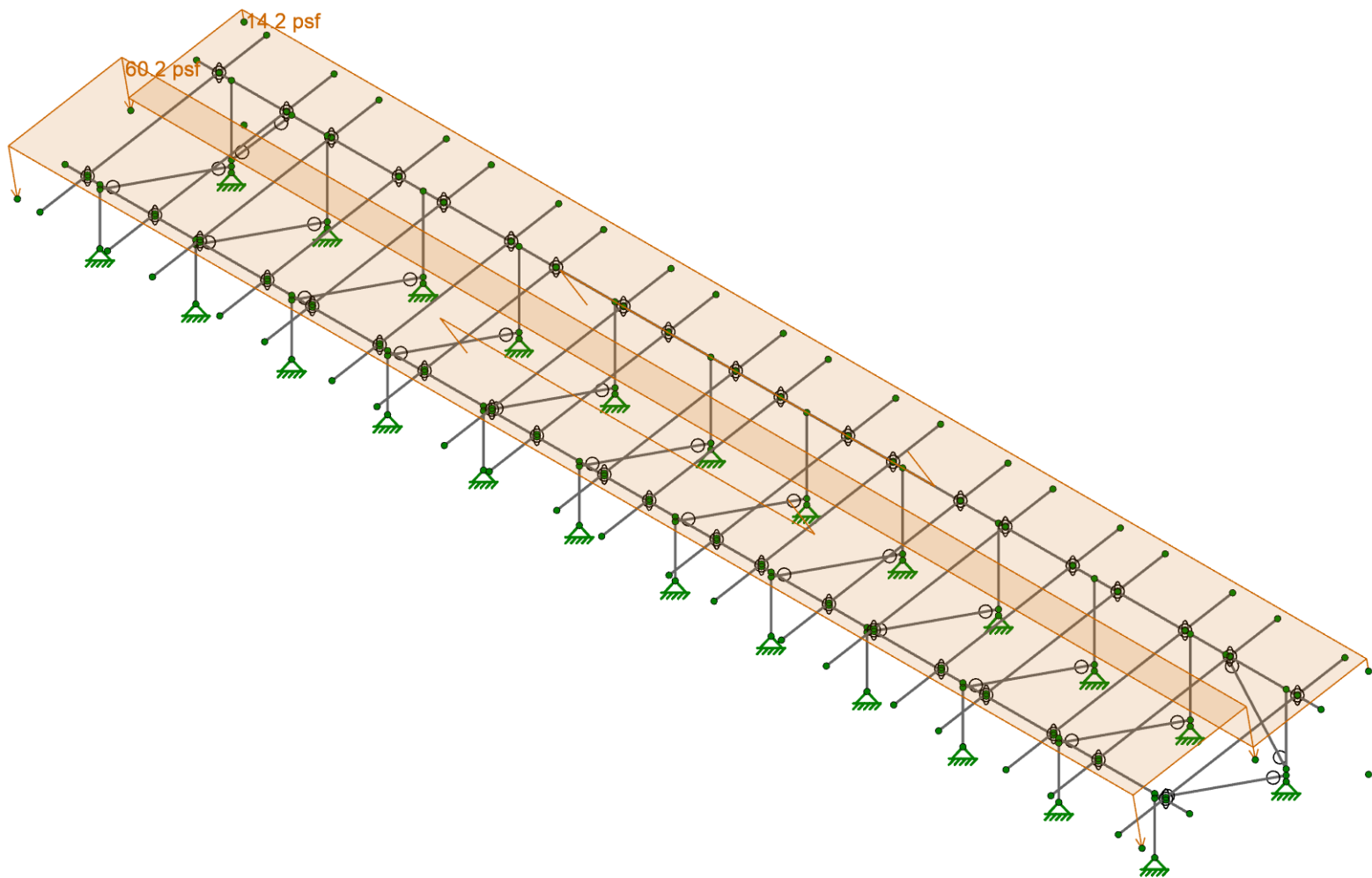
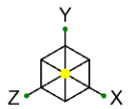
Loads: BLC 6, Wind A 180 deg



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D6 Standard Panels - 10 Degree Tilt

SK-8
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Sunturf D6 - SP - 10deg.r3d



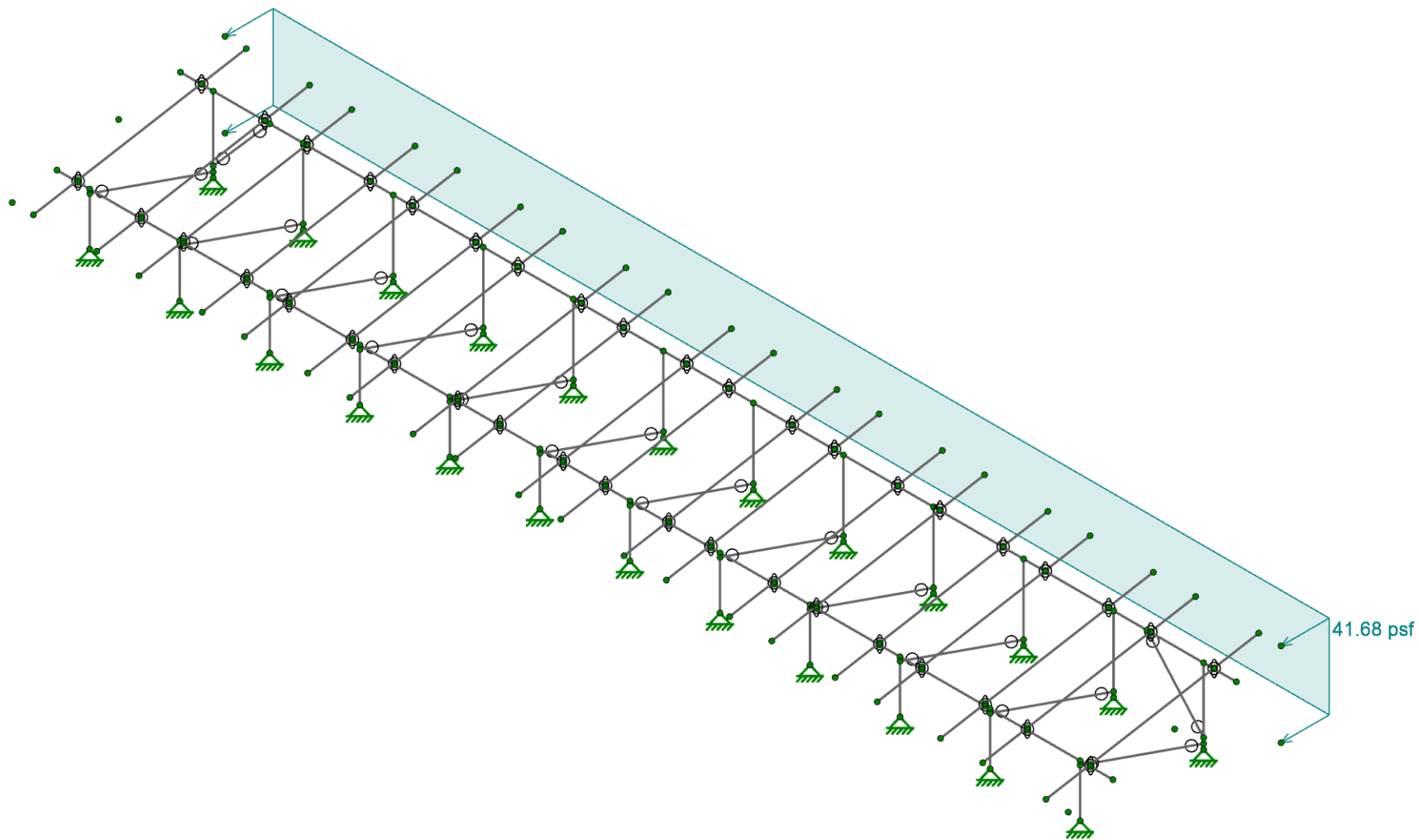
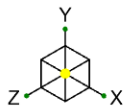
Loads: BLC 7, Wind B 180 deg



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D6 Standard Panels - 10 Degree Tilt

SK-9
May 20, 2024
Sunturf D6 - SP - 10deg.r3d



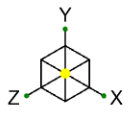
Loads: BLC 8, Wind Z



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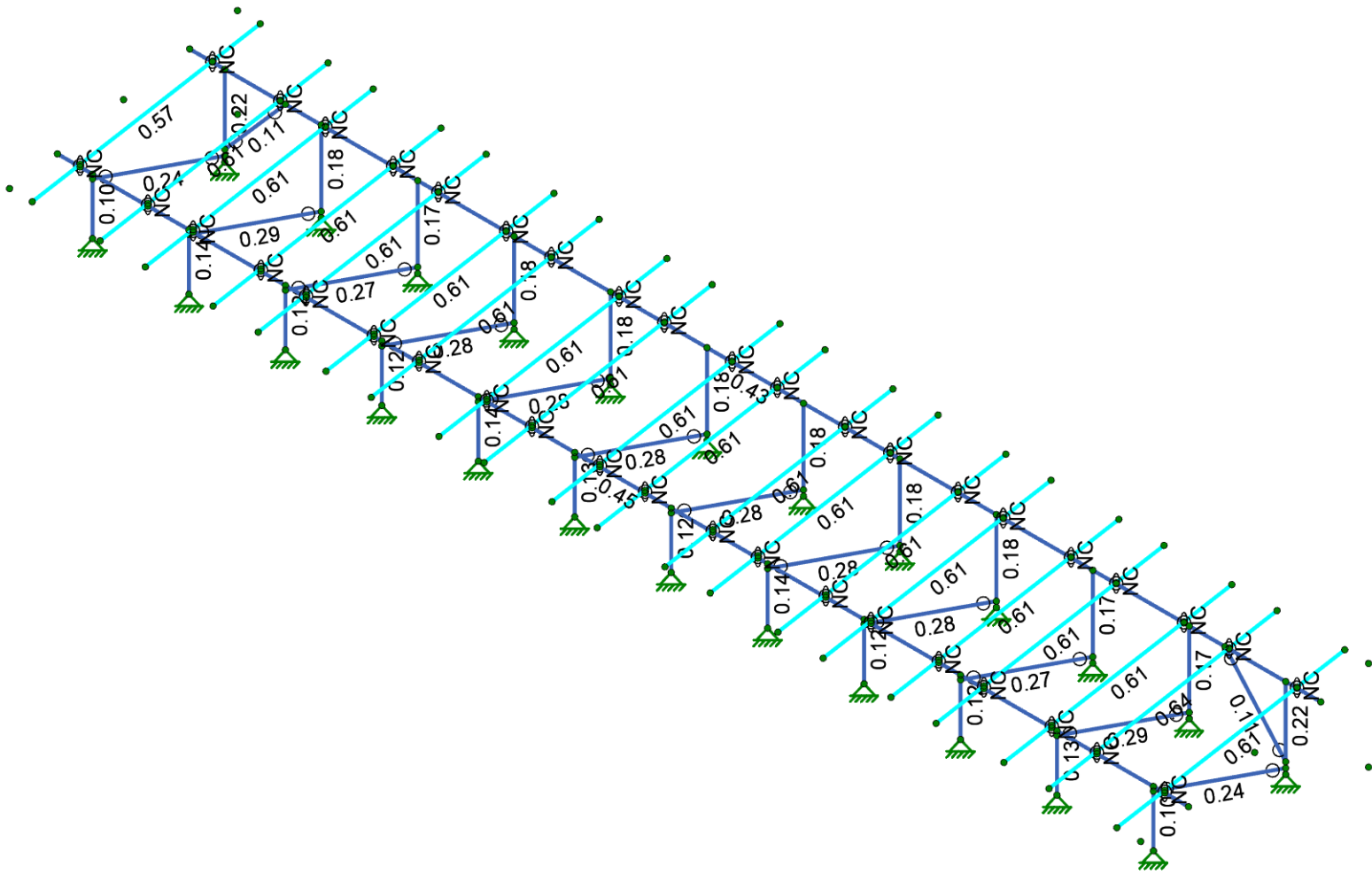
D6 Standard Panels - 10 Degree Tilt

SK-10
May 20, 2024
Sunturf D6 - SP - 10deg.r3d



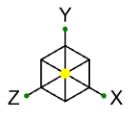
Code Check
(Env)

Black	No Calc
Red	> 1.0
Magenta	.90-1.0
Green	.75-.90
Cyan	.50-.75
Blue	0-.50



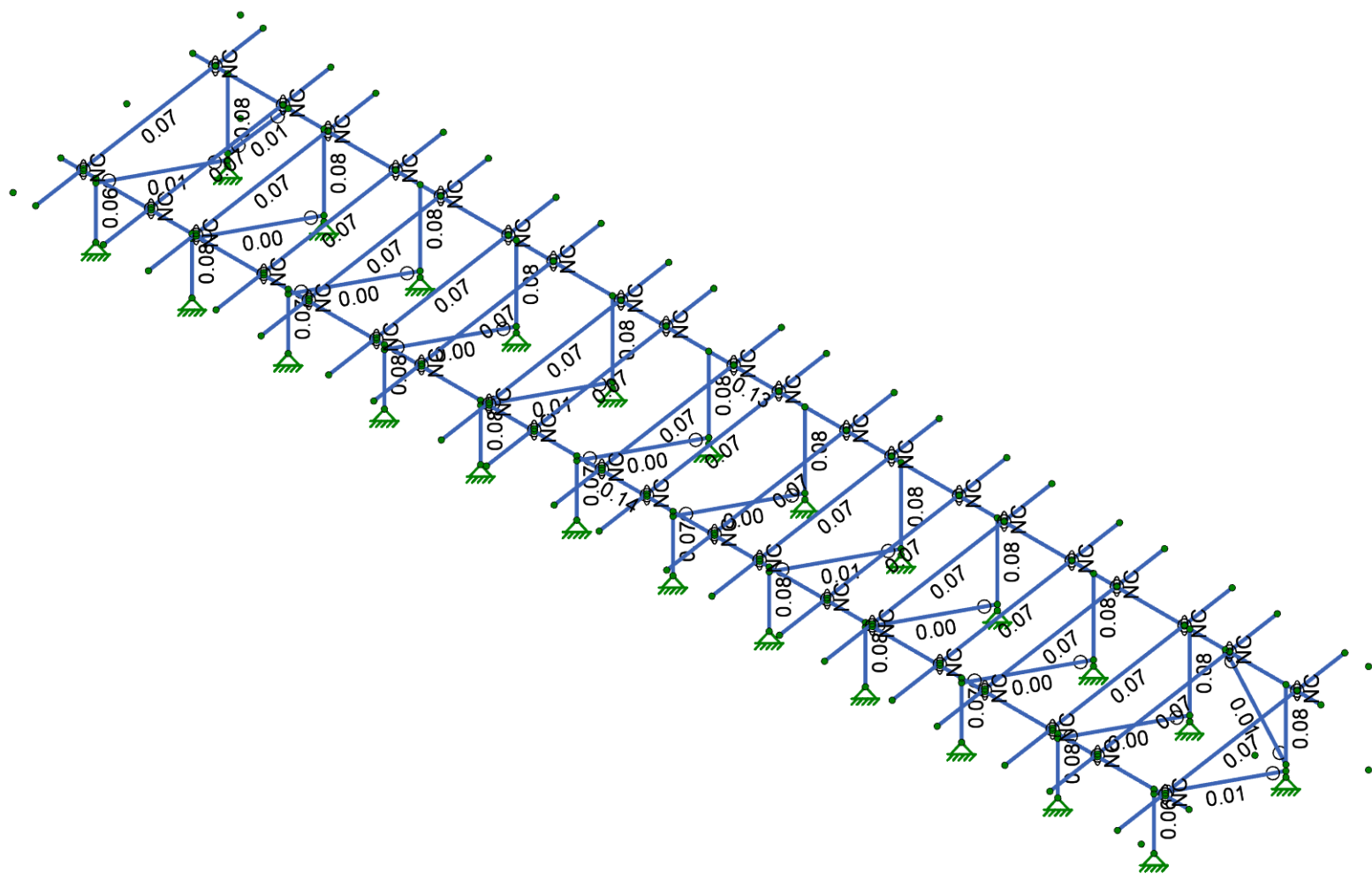
Member Code Checks Displayed (Enveloped)

	Vector Structural Engineering	D6 Standard Panels - 10 Degree Tilt	SK-11
	CJT		May 20, 2024
	U2716.0388.241		Sunturf D6 - SP - 10deg.r3d




Shear Check (Env)

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



Member Shear Checks Displayed (Enveloped)

 <p>IRISA A NEMETSCHKE COMPANY</p>	Vector Structural Engineering	D6 Standard Panels - 10 Degree Tilt	SK-12
	CJT		May 20, 2024
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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 318-19
Masonry	None
Aluminum	AA ADM1-20: ASD
Structure Type	Building
Stiffness Adjustment	Yes (Iterative)
Stainless	None
Stiffness Adjustment	Yes (Iterative)

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
Base Elevation (ft)	15600
Include the weight of the structure in base shear calcs	Yes



Company : Vector Structural Engineering
Designer : CJT
Job Number : U2716.0388.241
Model Name : D6 Standard Panels - 10 Degree ...

5/20/2024
4:12:51 PM
Checked By : MIH

Model Settings (Continued)

T Z (sec)	
T X (sec)	
C _Z	0.02
C _X	0.02
R Z	3
R X	3

Hot Rolled Steel Properties

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

Aluminum Properties

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

Hot Rolled Steel Section Sets

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

Aluminum Section Sets

	Label	Shape	Type	Design List	Material	Design Rule	Area [in ²]	Iyy [in ⁴]	Izz [in ⁴]	J [in ⁴]
1	AL Posts	2.375ODX0.188	Column	Pipe	6005-T5	Typical	1.29	0.778	0.778	1.54
2	AL Brace	RT1.5X2X0.15625	VBrace	Rectangular Tubes	6005-T5	Typical	0.996	0.327	0.524	0.602
3	AL Rails	HR300/SMR300 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			
4	Wind A 0 deg	OL1			2
5	Wind B 0 deg	OL2			1
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		40	
10	BLC 4 Transient Area Loads	None		144	
11	BLC 5 Transient Area Loads	None		72	
12	BLC 6 Transient Area Loads	None		144	
13	BLC 7 Transient Area Loads	None		144	
14	BLC 8 Transient Area Loads	None		86	

Member Area Loads (BLC 2 : Solar Panel Weight)

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

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

Node A	Node B	Node C	Node D	Direction	Load Direction	A Magnitude [psf]	B Magnitude [psf]	C Magnitude [psf]	D Magnitude [psf]	Exclude Braces	
1	N197	N200	N201	N198	Perp	A-B	-24.8	-24.8	-24.8	-24.8	Yes
2	N198	N201	N199	N196	Perp	A-B	-39	-39	-39	-39	Yes

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

Node A	Node B	Node C	Node D	Direction	Load Direction	A Magnitude [psf]	B Magnitude [psf]	C Magnitude [psf]	D Magnitude [psf]	Exclude Braces	
1	N197	N200	N201	N198	Perp	A-B	-56.7	-56.7	-56.7	-56.7	Yes

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

Node A	Node B	Node C	Node D	Direction	Load Direction	A Magnitude [psf]	B Magnitude [psf]	C Magnitude [psf]	D Magnitude [psf]	Exclude Braces	
1	N197	N200	N201	N198	Perp	A-B	53.1	53.1	53.1	53.1	Yes
2	N198	N201	N199	N196	Perp	A-B	35.4	35.4	35.4	35.4	Yes

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

Node A	Node B	Node C	Node D	Direction	Load Direction	A Magnitude [psf]	B Magnitude [psf]	C Magnitude [psf]	D Magnitude [psf]	Exclude Braces	
1	N197	N200	N201	N198	Perp	A-B	14.2	14.2	14.2	14.2	Yes
2	N198	N201	N199	N196	Perp	A-B	60.2	60.2	60.2	60.2	Yes

Member Area Loads (BLC 8 : Wind Z)

Node A	Node B	Node C	Node D	Direction	Load Direction	A Magnitude [psf]	B Magnitude [psf]	C Magnitude [psf]	D Magnitude [psf]	Exclude Braces	
1	N200	N197	N307	N308	Z	Open Structure	41.68	41.68	41.68	41.68	Yes

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
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		

Load Combinations (Continued)

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
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	1.548	14	1094.562	7	19.636	4	0	15	0	15	0	15
2		min	-2.061	5	-500.396	12	-29.176	6	0	2	0	2	0	2
3	N1	max	291.873	6	1689.765	6	446.578	6	0	15	0	15	0	15
4		min	-247.515	13	-1364.029	13	-351.718	4	0	2	0	2	0	2
5	N151	max	246.281	13	1684.103	6	447.532	6	0	15	0	15	0	15
6		min	-292.044	6	-1361.501	13	-352.675	4	0	2	0	2	0	2
7	N152	max	1.178	5	1103.324	7	19.744	4	0	15	0	15	0	15
8		min	-0.162	14	-507.334	12	-29.254	6	0	2	0	2	0	2
9	N276	max	6.896	6	1440.546	6	562.205	6	0	15	0	15	0	15
10		min	-5.569	13	-1159.582	13	-437.573	4	0	2	0	2	0	2
11	N278	max	13.98	12	1410.208	7	23.152	4	0	15	0	15	0	15
12		min	-23.937	7	-664.187	12	-34.499	6	0	2	0	2	0	2
13	N227	max	3.411	13	1712.774	6	519.83	6	0	15	0	15	0	15
14		min	-3.672	6	-1389.226	13	-408.275	4	0	2	0	2	0	2
15	N229	max	0.79	7	1336.153	7	22.758	4	0	15	0	15	0	15
16		min	-0.428	12	-625.327	12	-33.729	6	0	2	0	2	0	2
17	N233	max	5.095	6	1691.222	6	537.855	6	0	15	0	15	0	15
18		min	-3.993	13	-1372.437	13	-420.223	4	0	2	0	2	0	2
19	N235	max	10.338	7	1352.685	7	23.358	4	0	15	0	15	0	15
20		min	-5.916	12	-631.442	12	-34.679	6	0	2	0	2	0	2
21	N239	max	16.207	6	1696.698	6	540.97	6	0	15	0	15	0	15
22		min	-13.429	13	-1377.105	13	-421.83	4	0	2	0	2	0	2
23	N241	max	30.132	7	1341.692	7	23.49	4	0	15	0	15	0	15
24		min	-16.254	12	-624.383	12	-34.936	6	0	2	0	2	0	2
25	N245	max	9.499	6	1667.398	6	528.191	6	0	15	0	15	0	15
26		min	-7.882	13	-1349.168	13	-413.918	4	0	2	0	2	0	2
27	N247	max	16.714	7	1322.312	7	22.826	4	0	15	0	15	0	15
28		min	-8.816	12	-617.495	12	-33.984	6	0	2	0	2	0	2
29	N251	max	7.119	13	1666.649	6	527.971	6	0	15	0	15	0	15
30		min	-8.338	6	-1348.372	13	-413.795	4	0	2	0	2	0	2
31	N253	max	7.726	12	1321.622	7	22.8	4	0	15	0	15	0	15
32		min	-14.533	7	-617.226	12	-33.947	6	0	2	0	2	0	2
33	N257	max	13.726	13	1694.575	6	539.861	6	0	15	0	15	0	15
34		min	-16.304	6	-1375.173	13	-421.135	4	0	2	0	2	0	2
35	N259	max	16.227	12	1340.474	7	23.446	4	0	15	0	15	0	15
36		min	-30.015	7	-623.992	12	-34.873	6	0	2	0	2	0	2
37	N263	max	4.69	13	1693.03	6	539.306	6	0	15	0	15	0	15
38		min	-5.651	6	-1373.953	13	-421.028	4	0	2	0	2	0	2
39	N265	max	6.517	12	1352.52	7	23.406	4	0	15	0	15	0	15
40		min	-11.302	7	-630.963	12	-34.757	6	0	2	0	2	0	2
41	N269	max	3.454	6	1711.133	6	519.724	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		
42	min	-3.089	13	-1388.579	13	-408.704	4	0	2	0	2	0	2	
43	N271	max	0.482	12	1337.606	7	22.754	4	0	15	0	15	0	15
44	min	-0.772	7	-626.434	12	-33.713	6	0	2	0	2	0	2	
45	N275	max	6.268	13	1447.353	6	560.668	6	0	15	0	15	0	15
46	min	-7.047	6	-1159.907	13	-435.819	4	0	2	0	2	0	2	
47	N283	max	21.159	7	1396.403	7	23.042	4	0	15	0	15	0	15
48	min	-12.098	12	-654.743	12	-34.384	6	0	2	0	2	0	2	
49	Totals:	max	0.002	13	29103.958	6	5868.761	14						
50	min	-0.001	6	-15618.274	12	-4636.281	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]	Mnny/om [lb-ft]	Mnzz/om [lb-ft]	Cb	Eqn	
1	M5	PIPE2.0A21165	0.102	37.536	7	0.062	37.536	6	19283.086	23232.186	1397.505	1397.505	1	H1-1b	
2	M6	PIPE2.0A21165	0.221	7.909	6	0.078	0	6	15766.592	23232.186	1397.505	1397.505	1	H1-1b	
3	M15	1.5X1.5X0.083	0.236	51.896	6	0.011	101.673	y	6	2296.946	14085.15	624.421	624.421	1.136	H1-1a
4	M19	1.5X1.5X0.083	0.111	66.905	6	0.014	66.905	y	6	5304.481	14085.15	624.421	624.421	1.136	H1-1b*
5	M73	PIPE2.0A21165	0.102	37.536	7	0.062	37.536	6	19283.086	23232.186	1397.505	1397.505	1	H1-1b	
6	M74	PIPE2.0A21165	0.221	7.909	6	0.079	0	6	15766.592	23232.186	1397.505	1397.505	1	H1-1b	
7	M75	1.5X1.5X0.083	0.236	51.896	6	0.011	101.673	y	6	2296.946	14085.15	624.421	624.421	1.136	H1-1a
8	M75B	1.5X1.5X0.083	0.111	66.905	6	0.015	66.905	y	6	5304.481	14085.15	624.421	624.421	1.136	H1-1b*
9	M71	PIPE2.5A21168	0.432	444.708	6	0.135	307.875	6	20336.2	28358.413	2081.747	2081.747	1	H1-1b	
10	M72	PIPE2.5A21168	0.449	444.708	7	0.141	307.875	7	20336.2	28358.413	2081.747	2081.747	1	H1-1b	
11	M134	PIPE2.0A21165	0.175	4.258	6	0.082	0	6	15766.592	23232.186	1397.505	1397.505	1	H1-1b	
12	M135	1.5X1.5X0.083	0.294	51.896	6	0.005	101.673	y	7	2296.946	14085.15	624.421	624.421	1.136	H1-1a
13	M136	PIPE2.0A21165	0.137	37.536	7	0.079	37.536	6	19283.086	23232.186	1397.505	1397.505	1	H1-1b	
14	M106	PIPE2.0A21165	0.175	4.258	6	0.077	0	6	15766.592	23232.186	1397.505	1397.505	1	H1-1b	
15	M109	1.5X1.5X0.083	0.273	51.896	6	0.003	101.673	y	6	2296.946	14085.15	624.421	624.421	1.136	H1-1a
16	M110	PIPE2.0A21165	0.117	37.536	7	0.072	37.536	6	19283.086	23232.186	1397.505	1397.505	1	H1-1b	
17	M111	PIPE2.0A21165	0.178	4.258	6	0.079	0	6	15766.592	23232.186	1397.505	1397.505	1	H1-1b	
18	M113	1.5X1.5X0.083	0.282	51.896	6	0.004	101.673	y	6	2296.946	14085.15	624.421	624.421	1.136	H1-1a
19	M114	PIPE2.0A21165	0.122	37.536	7	0.075	37.536	6	19283.086	23232.186	1397.505	1397.505	1	H1-1b	
20	M115	PIPE2.0A21165	0.179	4.258	6	0.08	0	6	15766.592	23232.186	1397.505	1397.505	1	H1-1b	
21	M116	1.5X1.5X0.083	0.284	51.896	6	0.007	101.673	y	7	2296.946	14085.15	624.421	624.421	1.136	H1-1a
22	M117	PIPE2.0A21165	0.145	37.536	7	0.076	37.536	6	19283.086	23232.186	1397.505	1397.505	1	H1-1b	
23	M118	PIPE2.0A21165	0.175	4.258	6	0.078	0	6	15766.592	23232.186	1397.505	1397.505	1	H1-1b	
24	M119	1.5X1.5X0.083	0.277	51.896	6	0.004	101.673	y	7	2296.946	14085.15	624.421	624.421	1.136	H1-1a
25	M120	PIPE2.0A21165	0.126	37.536	7	0.074	37.536	6	19283.086	23232.186	1397.505	1397.505	1	H1-1b	
26	M121	PIPE2.0A21165	0.175	4.258	6	0.078	0	6	15766.592	23232.186	1397.505	1397.505	1	H1-1b	
27	M122	1.5X1.5X0.083	0.277	51.896	6	0.004	101.673	y	7	2296.946	14085.15	624.421	624.421	1.136	H1-1a
28	M123	PIPE2.0A21165	0.124	37.536	7	0.073	37.536	6	19283.086	23232.186	1397.505	1397.505	1	H1-1b	
29	M124	PIPE2.0A21165	0.179	4.258	6	0.079	0	6	15766.592	23232.186	1397.505	1397.505	1	H1-1b	
30	M125	1.5X1.5X0.083	0.283	51.896	6	0.006	101.673	y	7	2296.946	14085.15	624.421	624.421	1.136	H1-1a
31	M126	PIPE2.0A21165	0.144	37.536	7	0.076	37.536	6	19283.086	23232.186	1397.505	1397.505	1	H1-1b	
32	M127	PIPE2.0A21165	0.178	4.258	6	0.079	0	6	15766.592	23232.186	1397.505	1397.505	1	H1-1b	
33	M128	1.5X1.5X0.083	0.283	51.896	6	0.004	101.673	y	6	2296.946	14085.15	624.421	624.421	1.136	H1-1a
34	M129	PIPE2.0A21165	0.123	37.536	7	0.075	37.536	6	19283.086	23232.186	1397.505	1397.505	1	H1-1b	
35	M130	PIPE2.0A21165	0.175	4.258	6	0.077	0	6	15766.592	23232.186	1397.505	1397.505	1	H1-1b	
36	M131	1.5X1.5X0.083	0.272	51.896	6	0.003	101.673	y	6	2296.946	14085.15	624.421	624.421	1.136	H1-1a
37	M132	PIPE2.0A21165	0.117	37.536	7	0.072	37.536	6	19283.086	23232.186	1397.505	1397.505	1	H1-1b	
38	M133	PIPE2.0A21165	0.175	4.258	6	0.082	0	6	15766.592	23232.186	1397.505	1397.505	1	H1-1b	
39	M137	1.5X1.5X0.083	0.293	51.896	6	0.004	101.673	y	7	2296.946	14085.15	624.421	624.421	1.136	H1-1a
40	M138	PIPE2.0A21165	0.133	37.536	7	0.079	37.536	6	19283.086	23232.186	1397.505	1397.505	1	H1-1b	

Envelope AA ADM1-20: 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	M107	HR300/SMR300_ALA	0.565	35	7	0.066	131.249	y	6	6230.805	14342.564	533.921	934.619	7307.692	3206.154	1.866	H.1-1
2	M44	HR300/SMR300_ALA	0.606	35	7	0.072	36.75	y	7	6230.805	14342.564	533.921	934.619	7307.692	3206.154	1.847	H.1-1
3	M47	HR300/SMR300_ALA	0.612	35	7	0.068	36.75	y	7	6230.805	14342.564	533.921	934.619	7307.692	3206.154	1.816	H.1-1
4	M50	HR300/SMR300_ALA	0.612	35	7	0.068	36.75	y	7	6230.805	14342.564	533.921	934.619	7307.692	3206.154	1.817	H.1-1
5	M53	HR300/SMR300_ALA	0.612	35	7	0.069	36.75	y	7	6230.805	14342.564	533.921	934.619	7307.692	3206.154	1.817	H.1-1
6	M56	HR300/SMR300_ALA	0.612	35	7	0.067	36.75	y	7	6230.805	14342.564	533.921	934.619	7307.692	3206.154	1.816	H.1-1
7	M59	HR300/SMR300_ALA	0.612	35	7	0.067	36.75	y	7	6230.805	14342.564	533.921	934.619	7307.692	3206.154	1.818	H.1-1
8	M62	HR300/SMR300_ALA	0.612	35	7	0.071	36.75	y	7	6230.805	14342.564	533.921	934.619	7307.692	3206.154	1.816	H.1-1
9	M65	HR300/SMR300_ALA	0.612	35	7	0.068	36.75	y	7	6230.805	14342.564	533.921	934.619	7307.692	3206.154	1.818	H.1-1
10	M68	HR300/SMR300_ALA	0.612	35	7	0.072	36.75	y	7	6230.805	14342.564	533.921	934.619	7307.692	3206.154	1.817	H.1-1
11	M76	HR300/SMR300_ALA	0.612	35	7	0.072	36.75	y	7	6230.805	14342.564	533.921	934.619	7307.692	3206.154	1.817	H.1-1
12	M79	HR300/SMR300_ALA	0.612	35	7	0.069	36.75	y	7	6230.805	14342.564	533.921	934.619	7307.692	3206.154	1.818	H.1-1
13	M82	HR300/SMR300_ALA	0.612	35	7	0.071	36.75	y	7	6230.805	14342.564	533.921	934.619	7307.692	3206.154	1.816	H.1-1
14	M85	HR300/SMR300_ALA	0.612	35	7	0.067	36.75	y	7	6230.805	14342.564	533.921	934.619	7307.692	3206.154	1.818	H.1-1
15	M88	HR300/SMR300_ALA	0.612	35	7	0.067	36.75	y	7	6230.805	14342.564	533.921	934.619	7307.692	3206.154	1.816	H.1-1
16	M91	HR300/SMR300_ALA	0.612	35	7	0.069	36.75	y	7	6230.805	14342.564	533.921	934.619	7307.692	3206.154	1.817	H.1-1
17	M94	HR300/SMR300_ALA	0.612	35	7	0.068	36.75	y	7	6230.805	14342.564	533.921	934.619	7307.692	3206.154	1.817	H.1-1
18	M97	HR300/SMR300_ALA	0.612	35	7	0.068	36.75	y	7	6230.805	14342.564	533.921	934.619	7307.692	3206.154	1.816	H.1-1
19	M100	HR300/SMR300_ALA	0.639	35	7	0.07	36.75	y	7	6230.805	14342.564	533.921	934.619	7307.692	3206.154	1.792	H.1-1
20	M103	HR300/SMR300_ALA	0.611	35	7	0.066	131.249	y	6	6230.805	14342.564	533.921	934.619	7307.692	3206.154	1.975	H.1-1



JOB NO.: U2716.0388.241

PROJECT: SunTurf Package D6

SUBJECT: CALCULATIONS SP 10

DESIGN APPROACH ASD

CONNECTION CAPACITY

Location: Column Base (set screws)

Connection Type: M16 Conical Set Screws

Tensile Capacity: 2600 lbs

Tension Load: 1390 lbs

Check Connection: 53.5%

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: 1268 lbs

Check Connection: 57.8%

Result: **Select K10341-002**

Note: Uplift capacity. FOS of (2)



JOB NO.: U2716.0388.241

PROJECT: SunTurf Package D6

SUBJECT: CALCULATIONS SP 10

CONNECTION CAPACITY

Location: Brace to Column

Connection Type: K10219-001

Capacity: 1483 lbs

Tension Load: 632 lbs

Check Connection: 42.6%

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: 756 lbs

Check Bolt: 9.0%

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

Note:

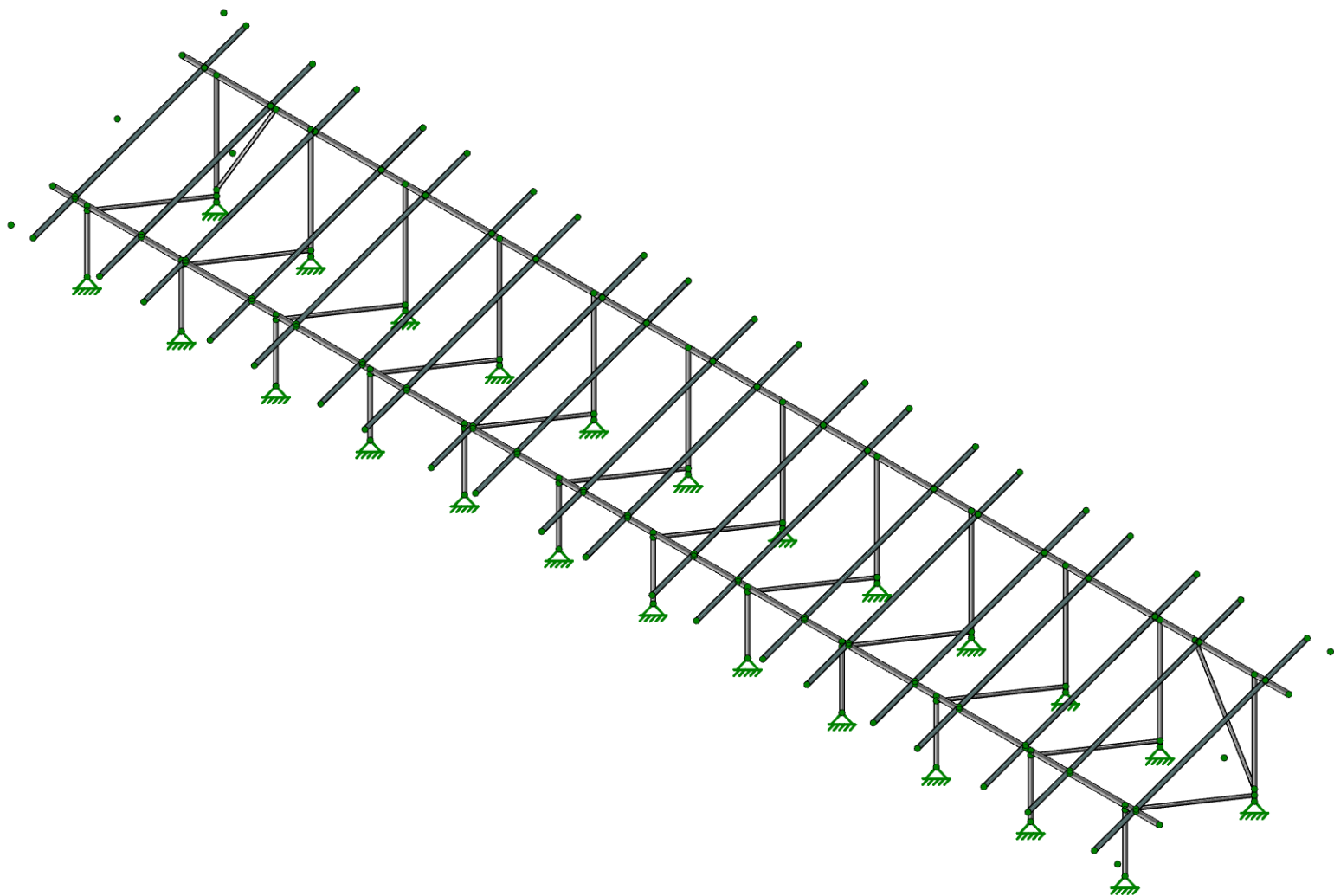
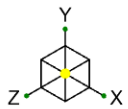


JOB NO.: U2716.0388.241

PROJECT: Sunturf Package D6 Ground Mount

Framing Analysis

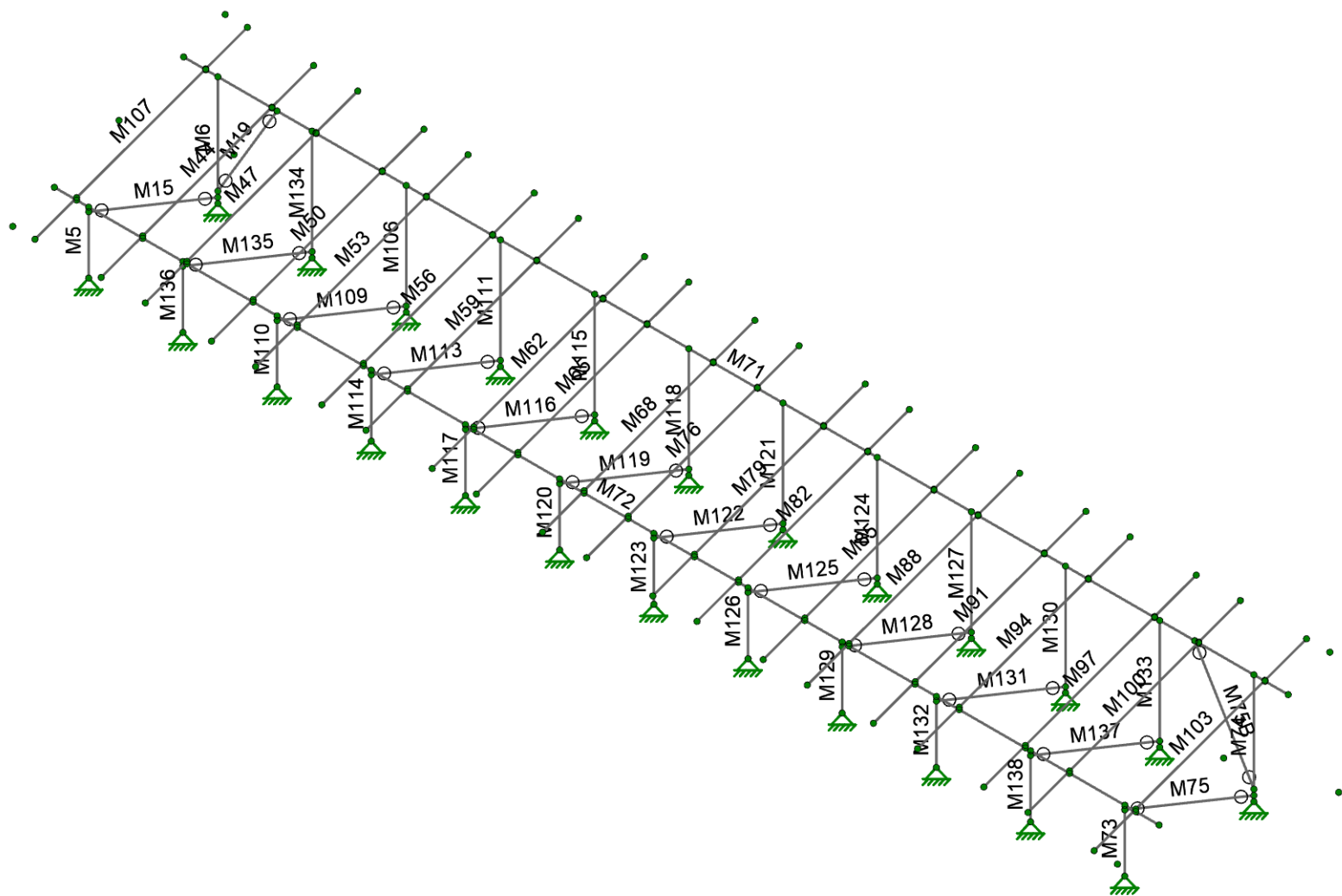
SP - 20 deg



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U2716.0388.241

D6 Standard Panels - 20 Degree Tilt

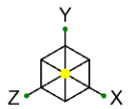
SK-1
May 20, 2024
Sunturf D6 - SP - 20deg.r3d



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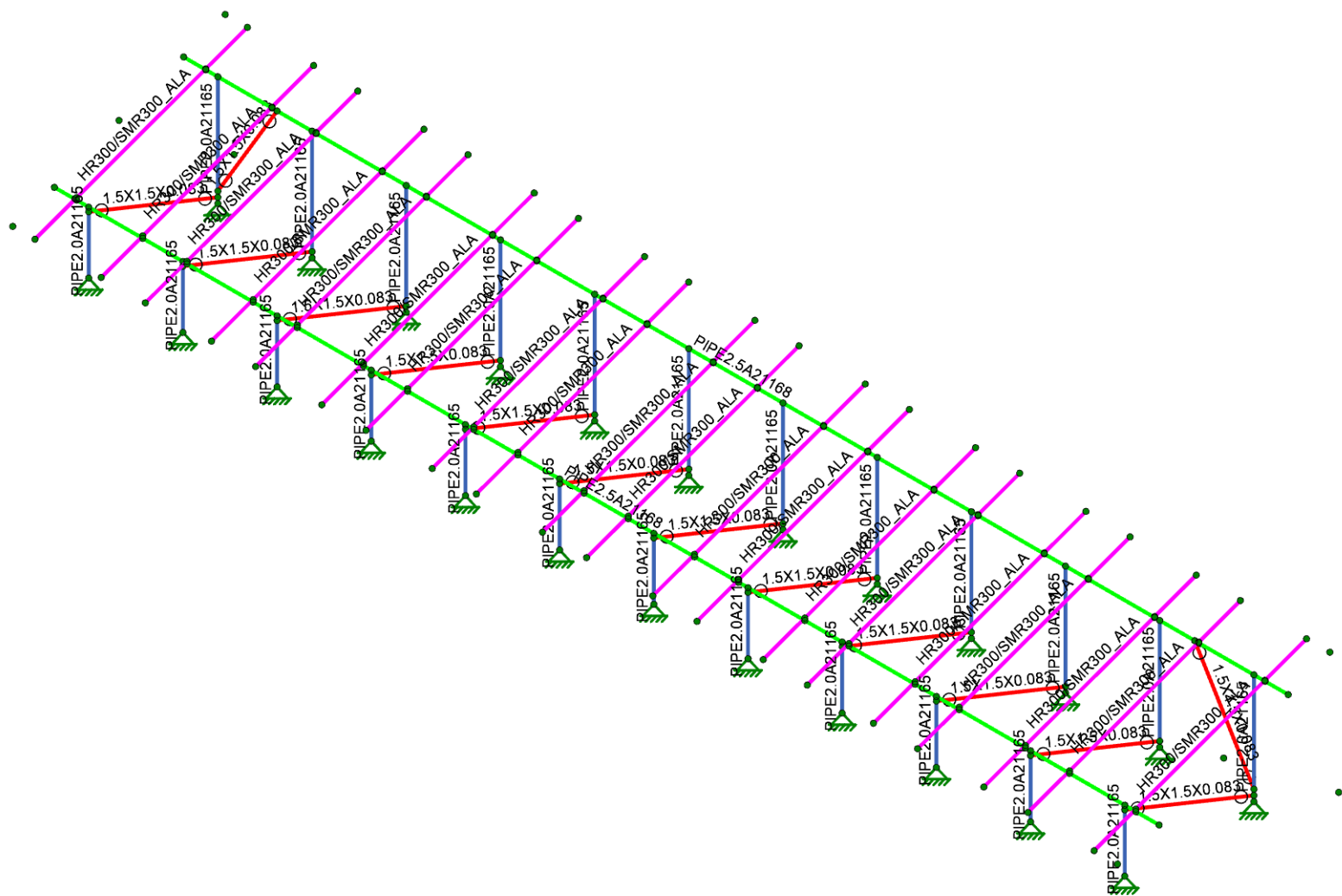
D6 Standard Panels - 20 Degree Tilt

SK-2
May 20, 2024
Sunturf D6 - SP - 20deg.r3d



Section Sets

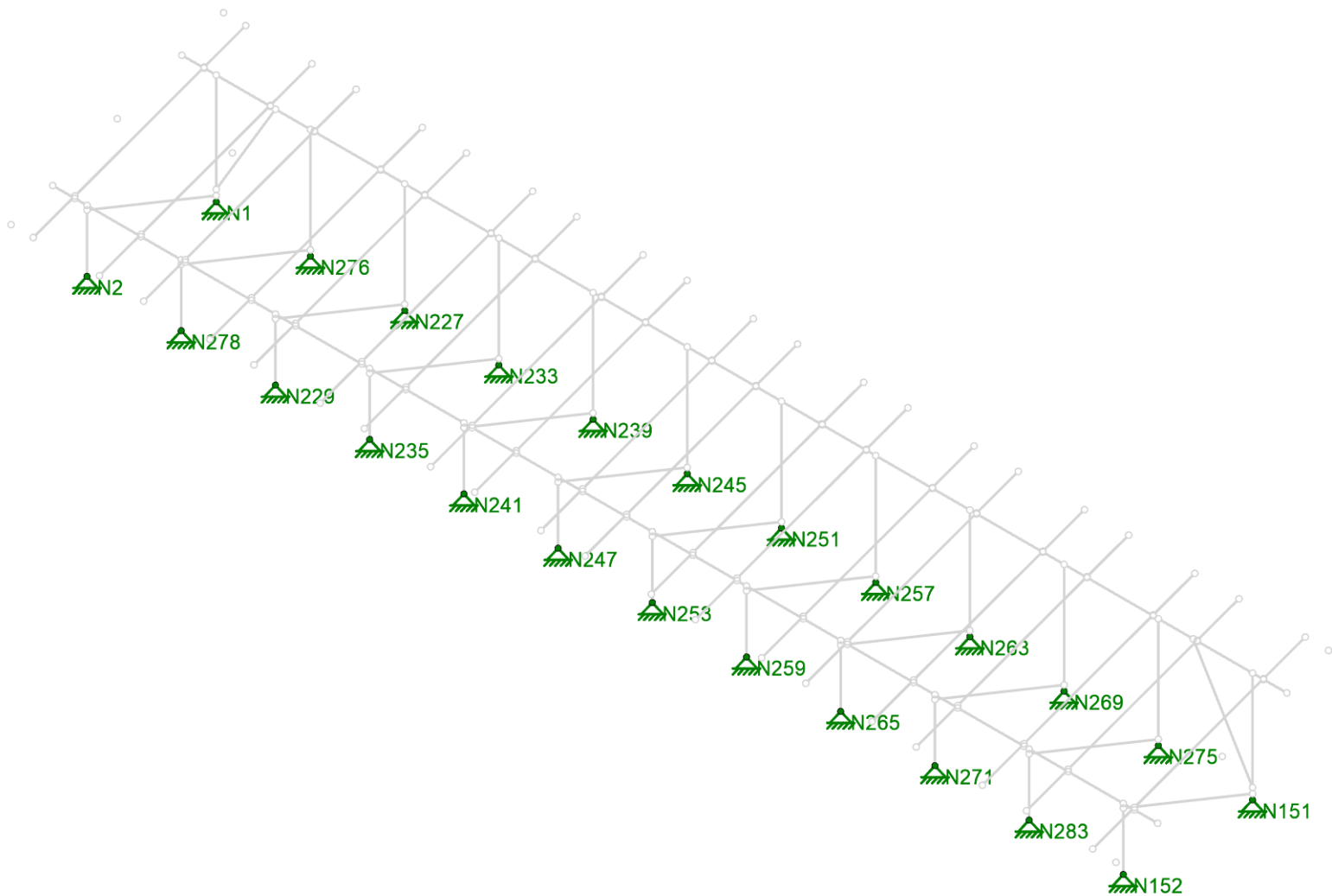
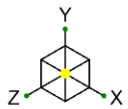
- Post
- Cross Beam
- Diagonal Brace
- RIGID
- AL Rails



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 U2716.0388.241

D6 Standard Panels - 20 Degree Tilt

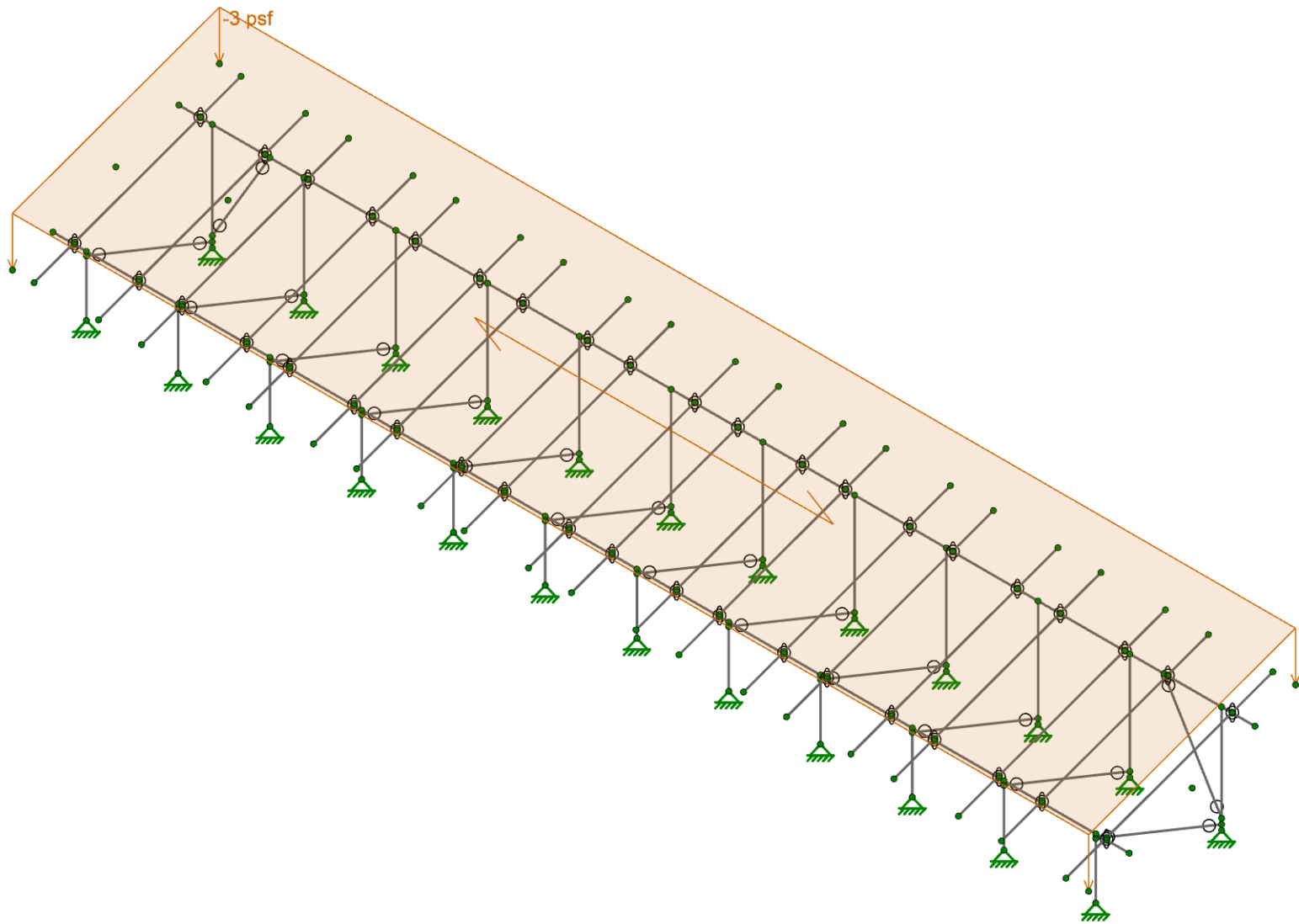
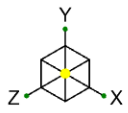
SK-3
 May 20, 2024
 Sunturf D6 - SP - 20deg.r3d



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U2716.0388.241

D6 Standard Panels - 20 Degree Tilt

SK-4
May 20, 2024
Sunturf D6 - SP - 20deg.r3d



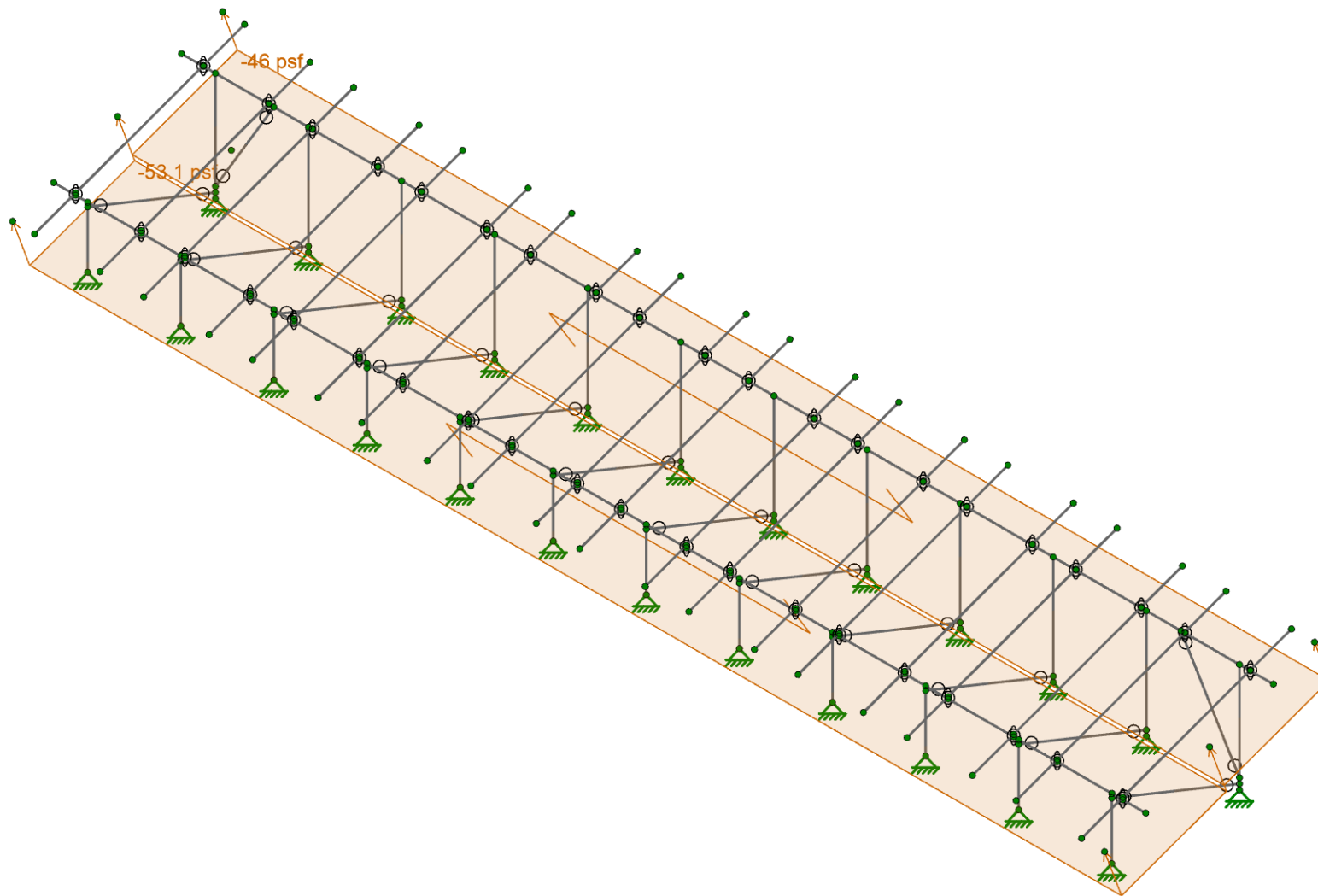
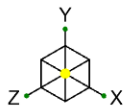
Loads: BLC 2, Solar Panel Weight



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U2716.0388.241

D6 Standard Panels - 20 Degree Tilt

SK-5
May 20, 2024
Sunturf D6 - SP - 20deg.r3d



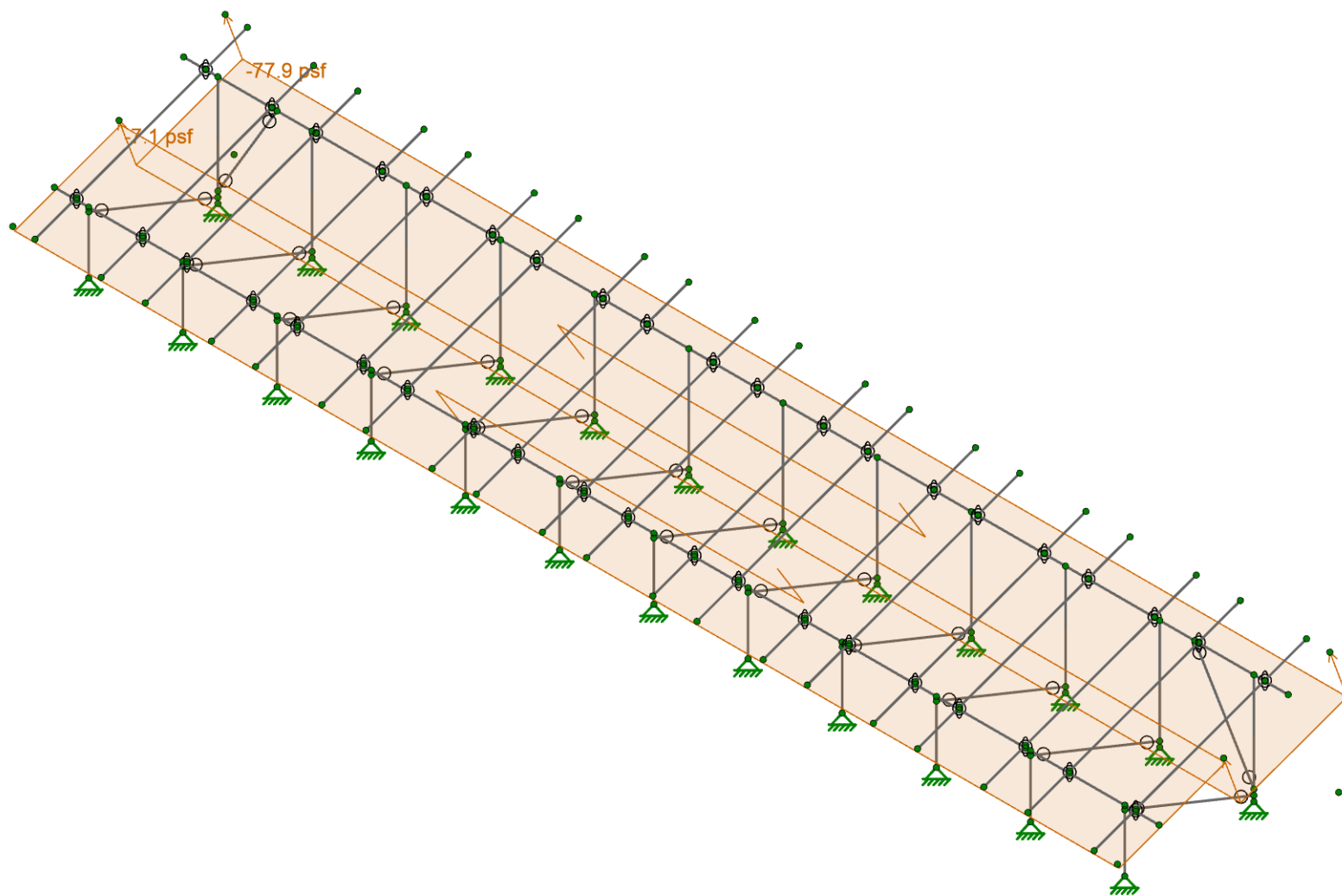
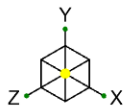
Loads: BLC 4, Wind A 0 deg



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U2716.0388.241

D6 Standard Panels - 20 Degree Tilt

SK-6
May 20, 2024
Sunturf D6 - SP - 20deg.r3d



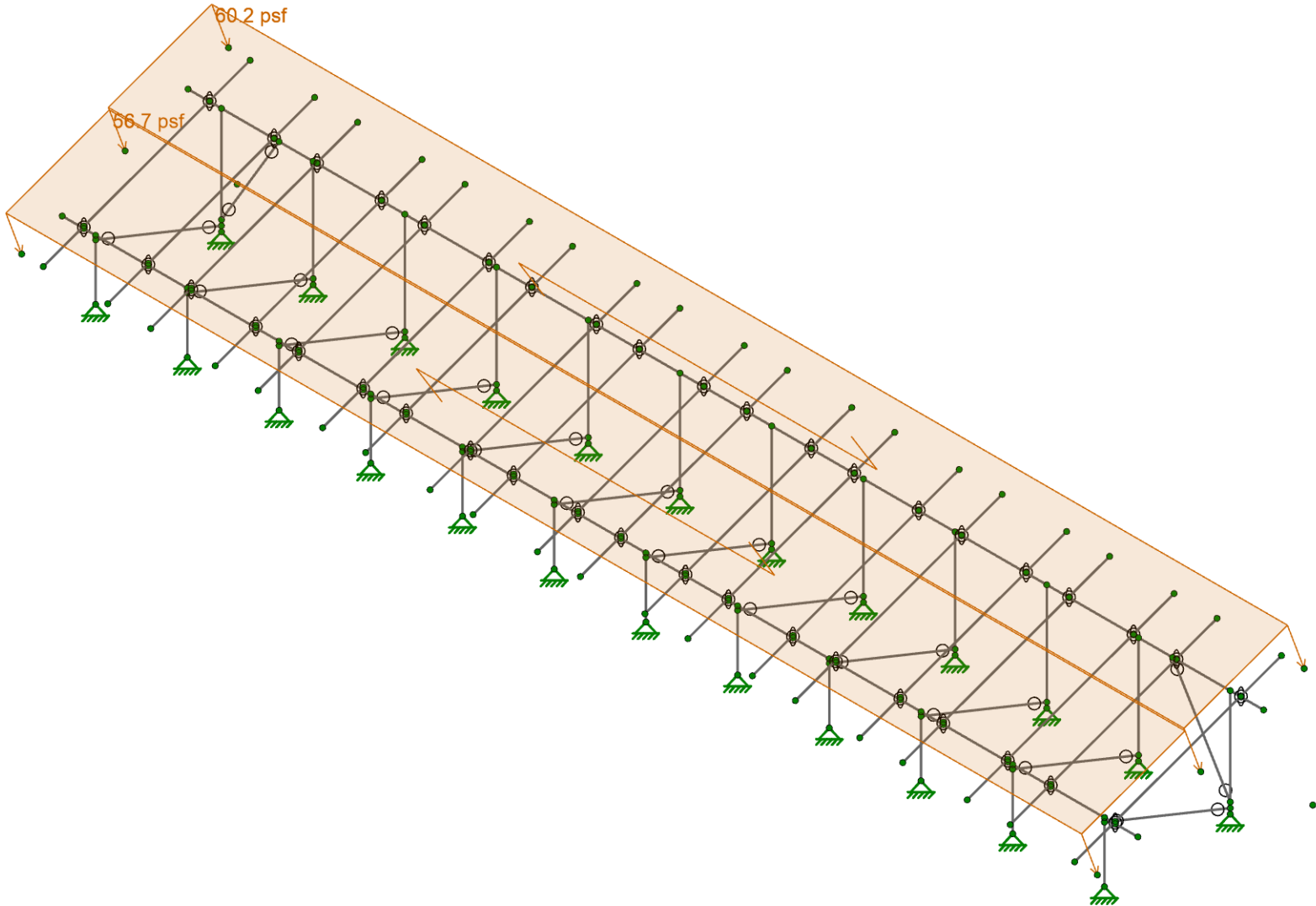
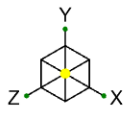
Loads: BLC 5, Wind B 0 deg



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U2716.0388.241

D6 Standard Panels - 20 Degree Tilt

SK-7
May 20, 2024
Sunturf D6 - SP - 20deg.r3d

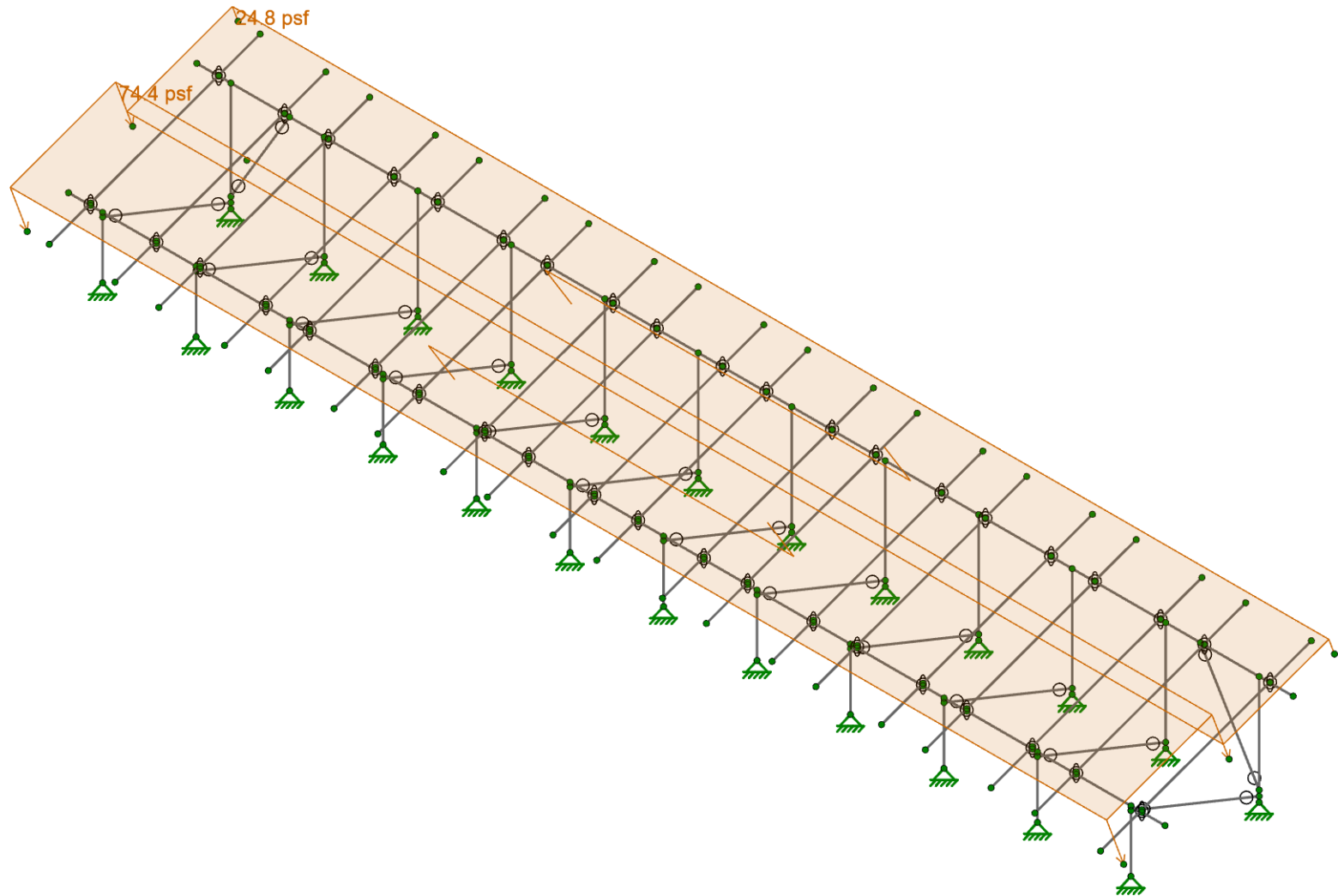
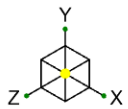


Loads: BLC 6, Wind A 180 deg

	Vector Structural Engineering
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	U2716.0388.241

D6 Standard Panels - 20 Degree Tilt

SK-8
May 20, 2024
Sunturf D6 - SP - 20deg.r3d



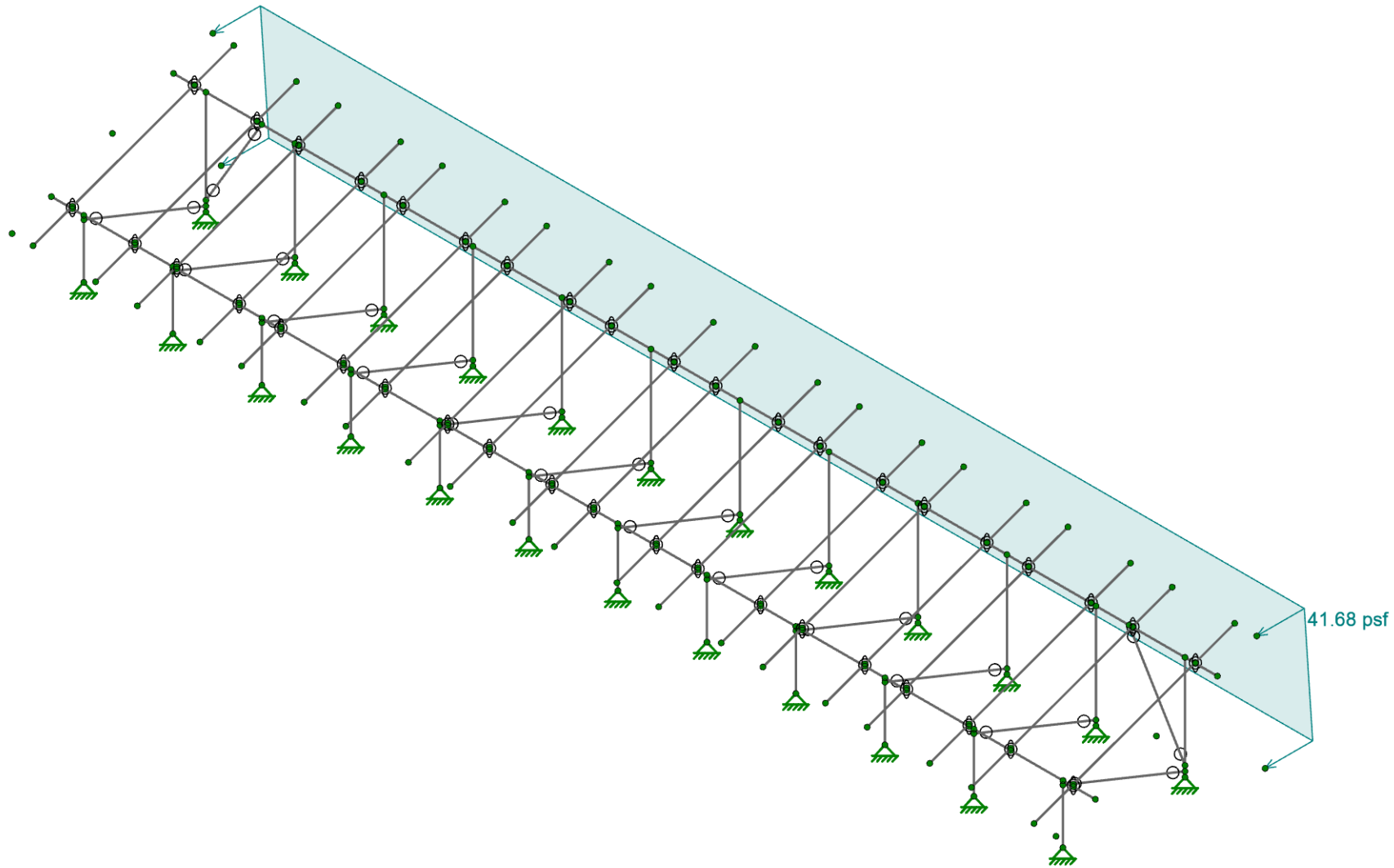
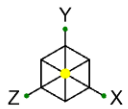
Loads: BLC 7, Wind B 180 deg



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D6 Standard Panels - 20 Degree Tilt

SK-9
May 20, 2024
Sunturf D6 - SP - 20deg.r3d



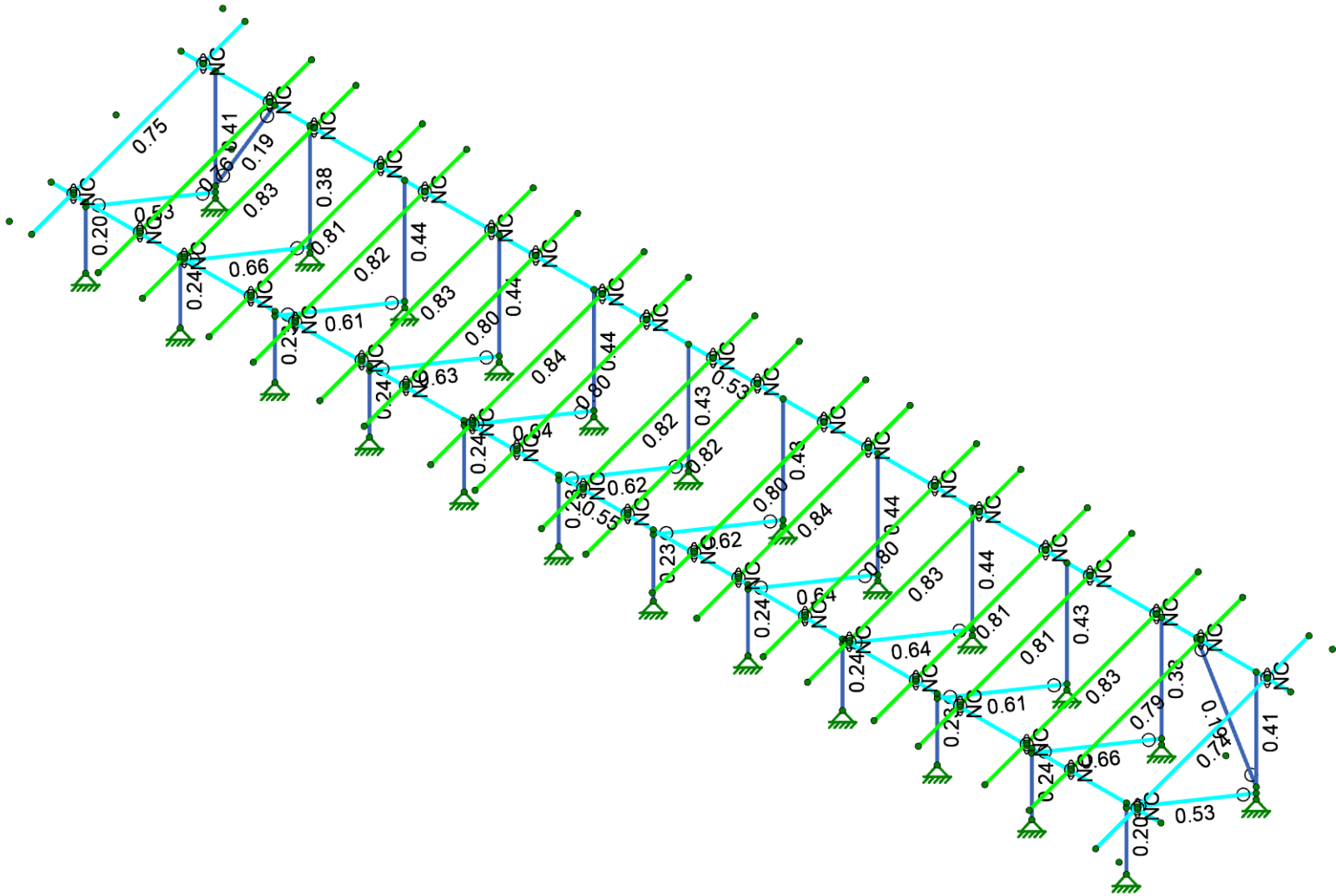
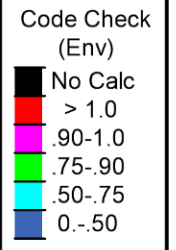
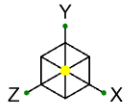
Loads: BLC 8, Wind Z



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U2716.0388.241

D6 Standard Panels - 20 Degree Tilt

SK-10
May 20, 2024
Sunturf D6 - SP - 20deg.r3d

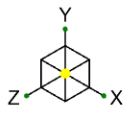


Member Code Checks Displayed (Enveloped)

	Vector Structural Engineering
	CJT
	U2716.0388.241

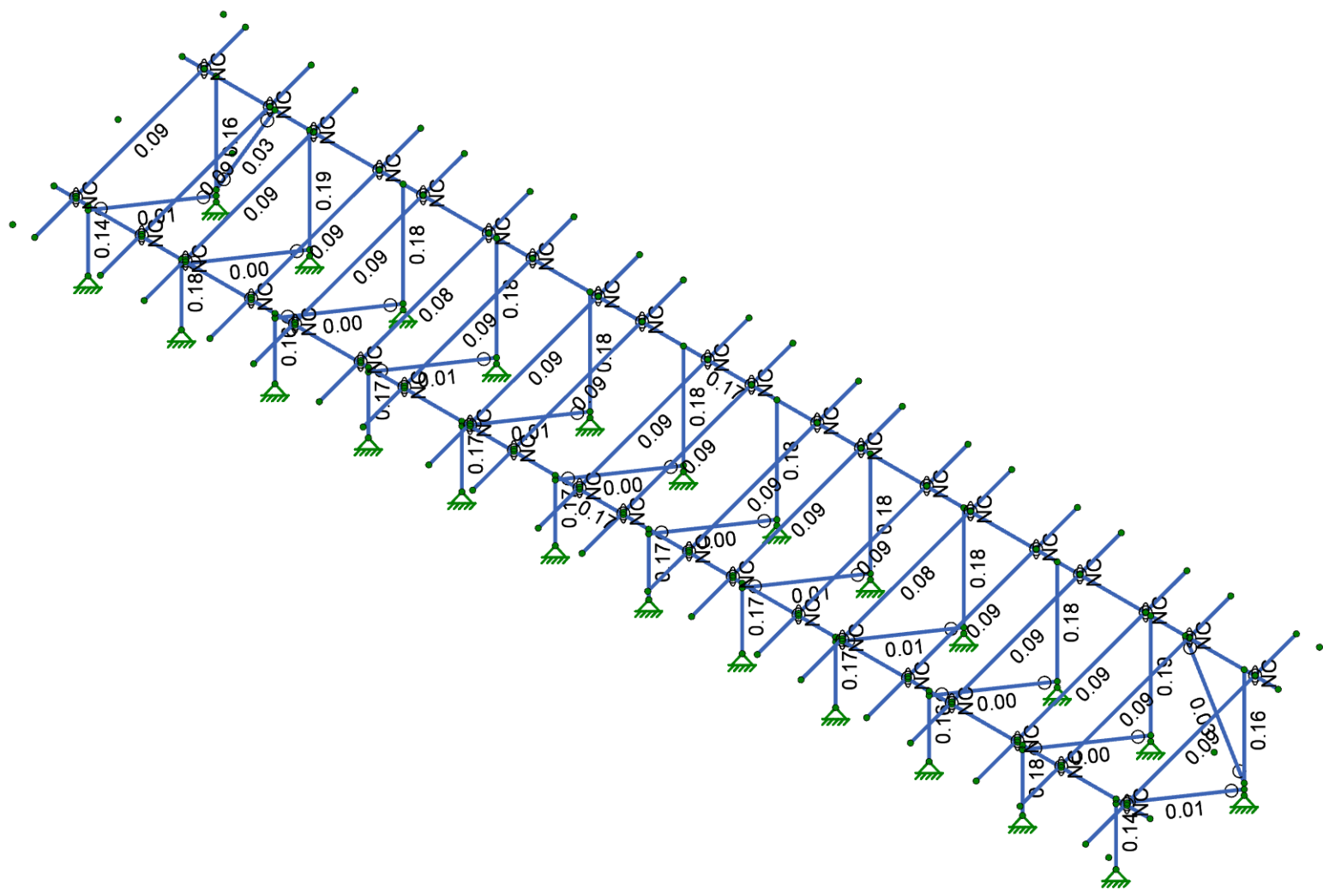
D6 Standard Panels - 20 Degree Tilt

SK-11
May 20, 2024
Sunturf D6 - SP - 20deg.r3d




Shear Check (Env)

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



Member Shear Checks Displayed (Enveloped)

 <p>IRISA A NEMETSCHKE COMPANY</p>	Vector Structural Engineering	D6 Standard Panels - 20 Degree Tilt	SK-12
	CJT		May 20, 2024
	U2716.0388.241		Sunturf D6 - SP - 20deg.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 318-19
Masonry	None
Aluminum	AA ADM1-20: ASD
Structure Type	Building
Stiffness Adjustment	Yes (Iterative)
Stainless	None
Stiffness Adjustment	Yes (Iterative)

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
Base Elevation (ft)	15600
Include the weight of the structure in base shear calcs	Yes



Company : Vector Structural Engineering
Designer : CJT
Job Number : U2716.0388.241
Model Name : D6 Standard Panels - 20 Degree ...

5/20/2024
3:59:09 PM
Checked By : MIH

Model Settings (Continued)

T Z (sec)	
T X (sec)	
C _Z	0.02
C _X	0.02
R Z	3
R X	3

Hot Rolled Steel Properties

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

Aluminum Properties

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

Hot Rolled Steel Section Sets

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

Aluminum Section Sets

	Label	Shape	Type	Design List	Material	Design Rule	Area [in ²]	Iyy [in ⁴]	Izz [in ⁴]	J [in ⁴]
1	AL Posts	2.375ODX0.188	Column	Pipe	6005-T5	Typical	1.29	0.778	0.778	1.54
2	AL Brace	RT1.5X2X0.15625	VBrace	Rectangular Tubes	6005-T5	Typical	0.996	0.327	0.524	0.602
3	AL Rails	HR300/SMR300 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			
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		40	
10	BLC 4 Transient Area Loads	None		144	
11	BLC 5 Transient Area Loads	None		144	
12	BLC 6 Transient Area Loads	None		144	
13	BLC 7 Transient Area Loads	None		144	
14	BLC 8 Transient Area Loads	None		86	

Member Area Loads (BLC 2 : Solar Panel Weight)

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

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

Node A	Node B	Node C	Node D	Direction	Load Direction	A Magnitude [psf]	B Magnitude [psf]	C Magnitude [psf]	D Magnitude [psf]	Exclude Braces	
1	N197	N200	N201	N198	Perp	A-B	-46	-46	-46	-46	Yes
2	N198	N201	N199	N196	Perp	A-B	-53.1	-53.1	-53.1	-53.1	Yes

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

Node A	Node B	Node C	Node D	Direction	Load Direction	A Magnitude [psf]	B Magnitude [psf]	C Magnitude [psf]	D Magnitude [psf]	Exclude Braces	
1	N197	N200	N201	N198	Perp	A-B	-77.9	-77.9	-77.9	-77.9	Yes
2	N198	N201	N199	N196	Perp	A-B	-7.1	-7.1	-7.1	-7.1	Yes

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

Node A	Node B	Node C	Node D	Direction	Load Direction	A Magnitude [psf]	B Magnitude [psf]	C Magnitude [psf]	D Magnitude [psf]	Exclude Braces	
1	N197	N200	N201	N198	Perp	A-B	60.2	60.2	60.2	60.2	Yes
2	N198	N201	N199	N196	Perp	A-B	56.7	56.7	56.7	56.7	Yes

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

Node A	Node B	Node C	Node D	Direction	Load Direction	A Magnitude [psf]	B Magnitude [psf]	C Magnitude [psf]	D Magnitude [psf]	Exclude Braces	
1	N197	N200	N201	N198	Perp	A-B	24.8	24.8	24.8	24.8	Yes
2	N198	N201	N199	N196	Perp	A-B	74.4	74.4	74.4	74.4	Yes

Member Area Loads (BLC 8 : Wind Z)

Node A	Node B	Node C	Node D	Direction	Load Direction	A Magnitude [psf]	B Magnitude [psf]	C Magnitude [psf]	D Magnitude [psf]	Exclude Braces	
1	N200	N197	N307	N308	Z	Open Structure	41.68	41.68	41.68	41.68	Yes

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
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					

Load Combinations (Continued)

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
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	N276	max	6.427	6	2011.076	6	1259.435	6	0	15	0	15	0	15
2		min	-6.422	13	-1873.773	13	-1083.978	4	0	2	0	2	0	2
3	N275	max	6.83	13	2023.913	6	1257.373	6	0	15	0	15	0	15
4		min	-6.394	6	-1878.005	13	-1081.796	4	0	2	0	2	0	2
5	N239	max	11.072	6	2334.128	6	1216.603	6	0	15	0	15	0	15
6		min	-11.151	13	-2211.463	13	-1048.526	4	0	2	0	2	0	2
7	N257	max	11.405	13	2330.766	6	1214.341	6	0	15	0	15	0	15
8		min	-11.215	6	-2207.709	13	-1046.654	4	0	2	0	2	0	2
9	N263	max	2.926	13	2322.717	6	1213.412	6	0	15	0	15	0	15
10		min	-3.041	6	-2199.255	13	-1045.913	4	0	2	0	2	0	2
11	N233	max	2.675	6	2318.83	6	1210.474	6	0	15	0	15	0	15
12		min	-2.436	13	-2195.205	13	-1043.569	4	0	2	0	2	0	2
13	N245	max	6.875	6	2288.991	6	1190.082	6	0	15	0	15	0	15
14		min	-6.98	13	-2158.086	13	-1026.703	4	0	2	0	2	0	2
15	N251	max	6.232	13	2287.991	6	1189.611	6	0	15	0	15	0	15
16		min	-6.042	6	-2156.683	13	-1026.33	4	0	2	0	2	0	2
17	N227	max	2.639	13	2338.024	6	1171.899	6	0	15	0	15	0	15
18		min	-2.336	6	-2212.846	13	-1012.776	4	0	2	0	2	0	2
19	N269	max	2.272	6	2334.892	6	1171.731	6	0	15	0	15	0	15
20		min	-2.549	13	-2210.811	13	-1012.939	4	0	2	0	2	0	2
21	N151	max	261.157	13	2293.25	6	1007.219	6	0	15	0	15	0	15
22		min	-257.488	6	-2184.005	13	-871.399	4	0	2	0	2	0	2
23	N1	max	256.968	6	2299.763	6	1006.335	6	0	15	0	15	0	15
24		min	-261.637	13	-2186.077	13	-870.419	4	0	2	0	2	0	2
25	N241	max	25.819	7	1193.408	7	59.897	4	0	15	0	15	0	15
26		min	-14.472	12	-467.668	12	-76.122	6	0	2	0	2	0	2
27	N259	max	14.228	12	1192.996	7	59.814	4	0	15	0	15	0	15
28		min	-25.545	7	-468.46	12	-76.037	6	0	2	0	2	0	2
29	N265	max	8.231	12	1206.888	7	59.691	4	0	15	0	15	0	15
30		min	-11.243	7	-478.385	12	-75.844	6	0	2	0	2	0	2
31	N235	max	10.44	7	1208.258	7	59.592	4	0	15	0	15	0	15
32		min	-7.7	12	-480.633	12	-75.736	6	0	2	0	2	0	2
33	N278	max	13.741	12	1255.434	7	58.776	4	0	15	0	15	0	15
34		min	-21.629	7	-498.195	12	-74.934	6	0	2	0	2	0	2
35	N247	max	13.533	7	1185.098	7	58.651	4	0	15	0	15	0	15
36		min	-6.724	12	-477.355	12	-74.848	6	0	2	0	2	0	2
37	N253	max	5.847	12	1184.687	7	58.602	4	0	15	0	15	0	15
38		min	-11.708	7	-477.562	12	-74.799	6	0	2	0	2	0	2
39	N283	max	19.258	7	1239.682	7	58.685	4	0	15	0	15	0	15
40		min	-12.13	12	-487.058	12	-74.778	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
41 N229 max	1.163	5	1202.947	7	58.366	4	0	15	0	15	0	15
42 min	-0.37	14	-491.343	12	-74.23	6	0	2	0	2	0	2
43 N271 max	0.098	12	1204.904	7	58.359	4	0	15	0	15	0	15
44 min	-0.699	5	-493.061	12	-74.226	6	0	2	0	2	0	2
45 N152 max	1.285	5	984.576	7	51.983	4	0	15	0	15	0	15
46 min	-0.445	14	-380.974	12	-65.445	6	0	2	0	2	0	2
47 N2 max	1.655	15	975.834	7	51.901	4	0	15	0	15	0	15
48 min	-2.269	4	-375.051	12	-65.373	6	0	2	0	2	0	2
49 Totals: max	0.001	13	35712.581	6	13226.144	6						
50 min	-0.001	6	-24270.799	12	-11476.689	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 M5	PIPE2.0A21165	0.204	42.832	6	0.141	42.832	6	18325.585	23232.186	1397.505	1397.505	1	H1-1b	
2 M6	PIPE2.0A21165	0.407	3.4	6	0.156	0	6	10899.705	23232.186	1397.505	1397.505	1	H1-1a	
3 M15	1.5X1.5X0.083	0.529	52.83	6	0.014	103.503	y	6	2216.462	14085.15	624.421	624.421	1.136	H1-1a
4 M19	1.5X1.5X0.083	0.193	85.751	6	0.031	85.751	y	6	3229.144	14085.15	624.421	624.421	1.136	H1-1b*
5 M73	PIPE2.0A21165	0.205	42.832	6	0.141	42.832	6	18325.585	23232.186	1397.505	1397.505	1	H1-1b	
6 M74	PIPE2.0A21165	0.406	3.4	6	0.156	0	6	10899.705	23232.186	1397.505	1397.505	1	H1-1a	
7 M75	1.5X1.5X0.083	0.529	52.829	6	0.014	103.502	y	6	2216.474	14085.15	624.421	624.421	1.136	H1-1a
8 M75B	1.5X1.5X0.083	0.192	85.751	6	0.031	85.751	y	6	3229.144	14085.15	624.421	624.421	1.136	H1-1b*
9 M71	PIPE2.5A21168	0.531	444.708	13	0.172	307.875	13	20336.2	28358.413	2081.747	2081.747	1	H1-1b	
10 M72	PIPE2.5A21168	0.545	444.708	7	0.172	307.875	7	20336.2	28358.413	2081.747	2081.747	1	H1-1b	
11 M134	PIPE2.0A21165	0.378	4.25	6	0.187	0	6	10899.705	23232.186	1397.505	1397.505	1	H1-1b	
12 M135	1.5X1.5X0.083	0.66	52.829	6	0.004	103.502	y	7	2216.474	14085.15	624.421	624.421	1.136	H1-1a
13 M136	PIPE2.0A21165	0.237	42.832	6	0.177	42.832	6	18325.585	23232.186	1397.505	1397.505	1	H1-1b	
14 M106	PIPE2.0A21165	0.435	3.4	6	0.176	0	6	10899.705	23232.186	1397.505	1397.505	1	H1-1a	
15 M109	1.5X1.5X0.083	0.615	52.829	6	0.004	103.502	y	5	2216.474	14085.15	624.421	624.421	1.136	H1-1a
16 M110	PIPE2.0A21165	0.23	42.832	6	0.164	42.832	6	18325.585	23232.186	1397.505	1397.505	1	H1-1b	
17 M111	PIPE2.0A21165	0.44	3.4	6	0.181	0	6	10899.705	23232.186	1397.505	1397.505	1	H1-1a	
18 M113	1.5X1.5X0.083	0.635	52.829	6	0.006	103.502	y	6	2216.474	14085.15	624.421	624.421	1.136	H1-1a
19 M114	PIPE2.0A21165	0.235	42.832	6	0.17	42.832	6	18325.585	23232.186	1397.505	1397.505	1	H1-1b	
20 M115	PIPE2.0A21165	0.443	3.4	6	0.182	0	6	10899.705	23232.186	1397.505	1397.505	1	H1-1a	
21 M116	1.5X1.5X0.083	0.638	52.829	6	0.007	103.502	y	7	2216.474	14085.15	624.421	624.421	1.136	H1-1a
22 M117	PIPE2.0A21165	0.24	42.832	6	0.171	42.832	6	18325.585	23232.186	1397.505	1397.505	1	H1-1b	
23 M118	PIPE2.0A21165	0.434	3.4	6	0.179	0	6	10899.705	23232.186	1397.505	1397.505	1	H1-1a	
24 M119	1.5X1.5X0.083	0.624	52.829	6	0.004	103.502	y	7	2216.474	14085.15	624.421	624.421	1.136	H1-1a
25 M120	PIPE2.0A21165	0.232	42.832	6	0.167	42.832	6	18325.585	23232.186	1397.505	1397.505	1	H1-1b	
26 M121	PIPE2.0A21165	0.434	3.4	6	0.179	0	6	10899.705	23232.186	1397.505	1397.505	1	H1-1a	
27 M122	1.5X1.5X0.083	0.624	52.829	6	0.004	103.502	y	7	2216.474	14085.15	624.421	624.421	1.136	H1-1a
28 M123	PIPE2.0A21165	0.232	42.832	6	0.167	42.832	6	18325.585	23232.186	1397.505	1397.505	1	H1-1b	
29 M124	PIPE2.0A21165	0.442	3.4	6	0.182	0	6	10899.705	23232.186	1397.505	1397.505	1	H1-1a	
30 M125	1.5X1.5X0.083	0.637	52.829	6	0.006	103.502	y	7	2216.474	14085.15	624.421	624.421	1.136	H1-1a
31 M126	PIPE2.0A21165	0.24	42.832	6	0.171	42.832	6	18325.585	23232.186	1397.505	1397.505	1	H1-1b	
32 M127	PIPE2.0A21165	0.441	3.4	6	0.182	0	6	10899.705	23232.186	1397.505	1397.505	1	H1-1a	
33 M128	1.5X1.5X0.083	0.636	52.829	6	0.006	103.502	y	6	2216.474	14085.15	624.421	624.421	1.136	H1-1a
34 M129	PIPE2.0A21165	0.236	42.832	6	0.171	42.832	6	18325.585	23232.186	1397.505	1397.505	1	H1-1b	
35 M130	PIPE2.0A21165	0.435	3.4	6	0.176	0	6	10899.705	23232.186	1397.505	1397.505	1	H1-1a	
36 M131	1.5X1.5X0.083	0.614	52.829	6	0.003	103.502	y	6	2216.474	14085.15	624.421	624.421	1.136	H1-1a
37 M132	PIPE2.0A21165	0.23	42.832	6	0.164	42.832	6	18325.585	23232.186	1397.505	1397.505	1	H1-1b	
38 M133	PIPE2.0A21165	0.378	4.25	6	0.187	0	6	10899.705	23232.186	1397.505	1397.505	1	H1-1b	
39 M137	1.5X1.5X0.083	0.659	52.829	6	0.004	103.502	y	7	2216.474	14085.15	624.421	624.421	1.136	H1-1a
40 M138	PIPE2.0A21165	0.235	42.832	6	0.177	42.832	6	18325.585	23232.186	1397.505	1397.505	1	H1-1b	

Envelope AA ADM1-20: 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	M107	HR300/SMR300_ALA	0.754	82.25	6	0.09	134.75	y	13	3577.006	14342.564	533.921	934.619	7307.692	3206.154	1.408	H.1-1	
2	M44	HR300/SMR300_ALA	0.761	80.5	6	0.093	33.25	y	7	3577.006	14342.564	533.921	934.619	7307.692	3206.154	1.413	H.1-1	
3	M47	HR300/SMR300_ALA	0.834	84	6	0.088	33.25	y	7	3577.006	14342.564	533.921	934.619	7307.692	3206.154	1.407	H.1-1	
4	M50	HR300/SMR300_ALA	0.812	84	6	0.085	33.25	y	7	3577.006	14342.564	533.921	934.619	7307.692	3206.154	1.406	H.1-1	
5	M53	HR300/SMR300_ALA	0.816	84	6	0.087	33.25	y	7	3577.006	14342.564	533.921	934.619	7307.692	3206.154	1.407	H.1-1	
6	M56	HR300/SMR300_ALA	0.832	84	6	0.085	33.25	y	7	3577.006	14342.564	533.921	934.619	7307.692	3206.154	1.407	H.1-1	
7	M59	HR300/SMR300_ALA	0.8	84	6	0.086	33.25	y	7	3577.006	14342.564	533.921	934.619	7307.692	3206.154	1.406	H.1-1	
8	M62	HR300/SMR300_ALA	0.839	84	6	0.088	134.75	y	13	3577.006	14342.564	533.921	934.619	7307.692	3206.154	1.407	H.1-1	
9	M65	HR300/SMR300_ALA	0.803	84	6	0.086	33.25	y	7	3577.006	14342.564	533.921	934.619	7307.692	3206.154	1.406	H.1-1	
10	M68	HR300/SMR300_ALA	0.824	84	6	0.091	134.75	y	13	3577.006	14342.564	533.921	934.619	7307.692	3206.154	1.407	H.1-1	
11	M76	HR300/SMR300_ALA	0.822	84	6	0.09	134.75	y	13	3577.006	14342.564	533.921	934.619	7307.692	3206.154	1.407	H.1-1	
12	M79	HR300/SMR300_ALA	0.804	84	6	0.086	33.25	y	7	3577.006	14342.564	533.921	934.619	7307.692	3206.154	1.406	H.1-1	
13	M82	HR300/SMR300_ALA	0.838	84	6	0.089	134.75	y	13	3577.006	14342.564	533.921	934.619	7307.692	3206.154	1.407	H.1-1	
14	M85	HR300/SMR300_ALA	0.8	84	6	0.086	33.25	y	7	3577.006	14342.564	533.921	934.619	7307.692	3206.154	1.406	H.1-1	
15	M88	HR300/SMR300_ALA	0.833	84	6	0.085	33.25	y	7	3577.006	14342.564	533.921	934.619	7307.692	3206.154	1.407	H.1-1	
16	M91	HR300/SMR300_ALA	0.814	84	6	0.087	33.25	y	7	3577.006	14342.564	533.921	934.619	7307.692	3206.154	1.407	H.1-1	
17	M94	HR300/SMR300_ALA	0.814	84	6	0.085	33.25	y	7	3577.006	14342.564	533.921	934.619	7307.692	3206.154	1.406	H.1-1	
18	M97	HR300/SMR300_ALA	0.834	84	6	0.088	33.25	y	7	3577.006	14342.564	533.921	934.619	7307.692	3206.154	1.407	H.1-1	
19	M100	HR300/SMR300_ALA	0.786	82.25	6	0.089	33.25	y	7	3577.006	14342.564	533.921	934.619	7307.692	3206.154	1.403	H.1-1	
20	M103	HR300/SMR300_ALA	0.738	84	6	0.09	134.75	y	13	3577.006	14342.564	533.921	934.619	7307.692	3206.154	1.404	H.1-1	



JOB NO.: U2716.0388.241

PROJECT: SunTurf Package D6

SUBJECT: CALCULATIONS SP 20

DESIGN APPROACH ASD

CONNECTION CAPACITY

Location: Column Base (set screws)

Connection Type: M16 Conical Set Screws

Tensile Capacity: 2600 lbs

Tension Load: 2213 lbs

Check Connection: 85.1%

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: 1865 lbs

Check Connection: 85.0%

Result: **Select K10341-002**

Note: Uplift capacity. FOS of (2)



JOB NO.: U2716.0388.241

PROJECT: SunTurf Package D6

SUBJECT: CALCULATIONS SP 20

CONNECTION CAPACITY

Location: Brace to Column

Connection Type: K10219-001

Capacity: 1581 lbs

Tension Load: 1420 lbs

Check Connection: 89.8%

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: 1137 lbs

Check Bolt: 13.5%

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

Note:



JOB NO.: U2716.0388.241

PROJECT: Sunturf Package D6 Ground Mount

ALTERNATE FOUNDATION OPTION 1: DRILLED CONCRETE PIER



PROJECT: Sunturf Package D6 Ground Mount

DRILLED CONCRETE PIER DESIGN

Column Reactions:

Max. Shear, V [k]:	1.3	Max. Down, P_d [k]:	2.4
Max. Moment, M [k-ft]:	0.0	Max. Uplift, P_u [k]:	2.2

Pier Properties:

Pier Shape:	Round	Volume of Concrete [ft ³]:	8
Pier Diameter, b [ft]:	1.5	Volume of Concrete [yd ³]:	0.3
Top of Pier Elevation [ft]:	0.00	Weight of Concrete [k]:	1.2
Pier Depth, d [ft]:	4.5		

Soil Properties:

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

*per IBC Section 1810.3.3.1.4

Check Bearing:

Bearing Capacity [k]:	5.3
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Bearing capacity OK.

Check Uplift:

Uplift Capacity [k]:	6.4
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Uplift capacity OK.

Check Lateral Bearing:

Top of Pier Constrained?:	No
Applied Lateral Force, P [lb]:	1,300
Point of Application, h [ft]:	0.0
S_{max} [psf]:	
S [psf]:	450
$A = 2.34 * P / (S_b)$:	4.51
Required Pier Depth, d_{reqd} [ft]:	4.50

IBC Section 1807.3.2.1

IBC Eq. 18-1

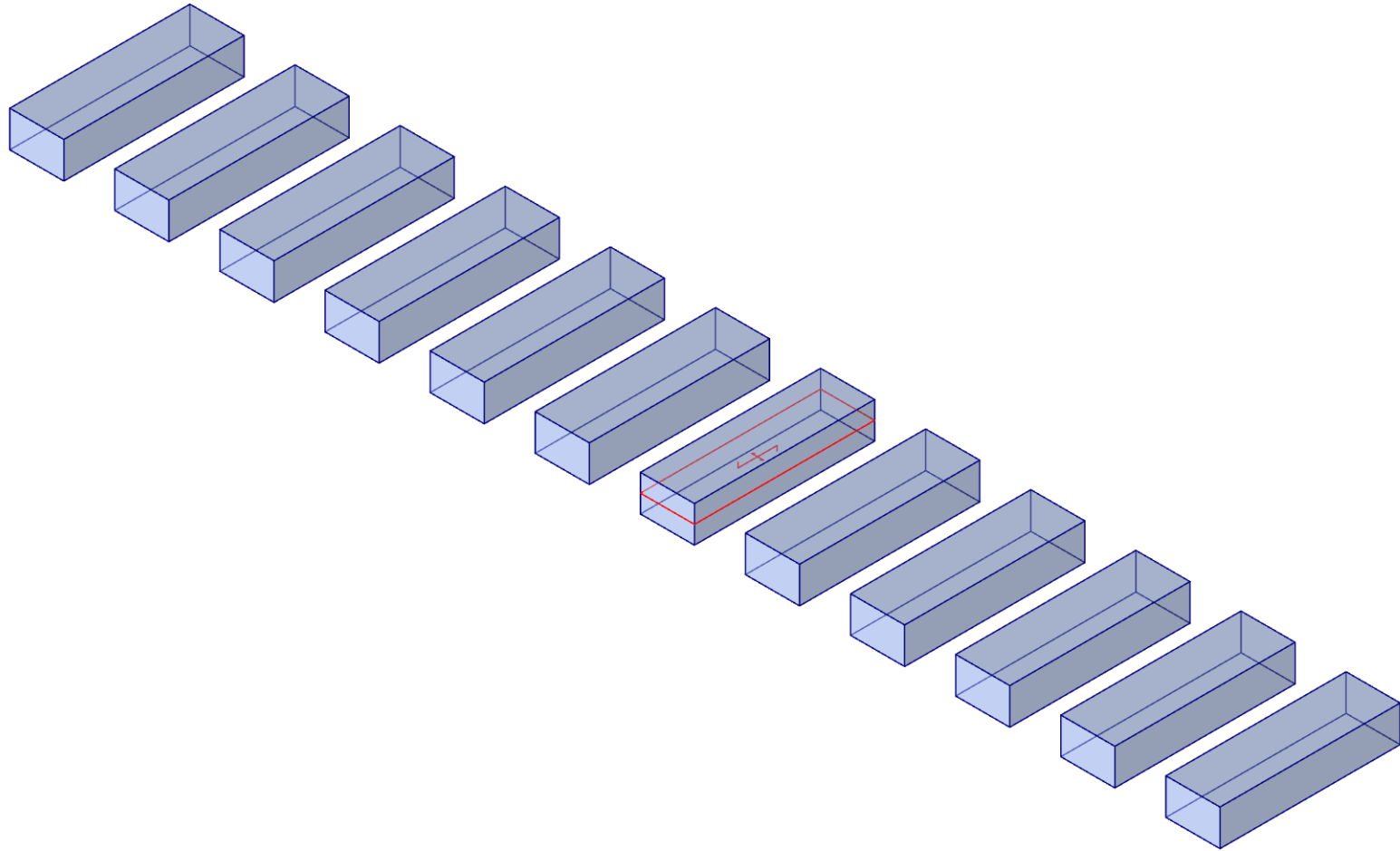
Result: **Lateral bearing capacity OK.**



JOB NO.: U2716.0388.241

PROJECT: Sunturf Package D6 Ground Mount

ALTERNATE FOUNDATION OPTION 2: CONCRETE BALLAST BLOCK



Vector Structural Engineering
CJT
U2716.0388.241

Ground Mount

SK-1
May 20, 2024
Sunturf D6 - SP - 20deg.r3d

Concrete Properties

Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e ⁵ F ⁻¹]	Density [lb/ft ³]	f _c [psi]	Lambda	Flex Steel [psi]	Shear Steel [psi]
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

Design Rules - Mat Slab

Label	Max Bending Chk	Max Shear Chk	Top Bar Bottom Bar	Min Top Bar Spacing [in]	Max Top Bar Spacing [in]	Min Bot Bar Spacing [in]	Max Bot Bar Spacing [in]	Spacing Increment [in]	Top Cover [in]	Bottom Cover [in]	Side Cover [in]	Rebar Options
1 Typical	1	1	#5 #5	3	12	3	12	1	3	3	0	Optimize

Soil Definitions

Label	Layers	Subgrade Modulus [lb/ft ³]	Allowable Bearing [psf]	Default
1 Default	Single	1e+5	1499.99999	Yes

Slab

Label	Thickness [in]	Material	Local Axis Angle [deg]	Analysis Offset [in]	Passive Pressure [psf]	Soil Overburden [psf]	Icr Factor
1 S1	24	Conc3000NW	0	0	0	0	0.25
2 S2	24	Conc3000NW	0	0	0	0	0.25
3 S3	24	Conc3000NW	0	0	0	0	0.25
4 S4	24	Conc3000NW	0	0	0	0	0.25
5 S5	24	Conc3000NW	0	0	0	0	0.25
6 S6	24	Conc3000NW	0	0	0	0	0.25
7 S7	24	Conc3000NW	0	0	0	0	0.25
8 S8	24	Conc3000NW	0	0	0	0	0.25
9 S9	24	Conc3000NW	0	0	0	0	0.25
10 S10	24	Conc3000NW	0	0	0	0	0.25
11 S11	24	Conc3000NW	0	0	0	0	0.25
12 S12	24	Conc3000NW	0	0	0	0	0.25

Load Category

Category	Node Loads
1 DL	32
2 WLZ	47
3 OL1	69
4 OL2	69
5 OL3	69
6 OL4	69

Load Combination

Label	Solve	Service	SF	Category	Factor	Category	Factor	Category	Factor
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
5 1.0 D + 0.6 W2	Yes	Yes	1.5	DL	1	RLL		OL2	0.6
6 1.0 D + 0.6 W3	Yes	Yes	1.5	DL	1	RLL		OL3	0.6

Load Combination (Continued)

	Label	Solve	Service	SF	Category	Factor	Category	Factor	Category	Factor
7	1.0 D + 0.6 W4	Yes	Yes	1.5	DL	1	RLL		OL4	0.6
8	1.0 D + 0.45 W1 + 0.75 S	Yes	Yes	1.5	DL	1	RLL	0.75	OL1	0.45
9	1.0 D + 0.45 W2 + 0.75 S	Yes	Yes	1.5	DL	1	RLL	0.75	OL2	0.45
10	1.0 D + 0.45 W3 + 0.75 S	Yes	Yes	1.5	DL	1	RLL	0.75	OL3	0.45
11	1.0 D + 0.45 W4 + 0.75 S	Yes	Yes	1.5	DL	1	RLL	0.75	OL4	0.45
12	0.6 D + 0.6 W1	Yes	Yes		DL	0.6	RLL		OL1	0.6
13	0.6 D + 0.6 W2	Yes	Yes		DL	0.6	RLL		OL2	0.6
14	0.6 D + 0.6 W3	Yes	Yes		DL	0.6	RLL		OL3	0.6
15	0.6 D + 0.6 W4	Yes	Yes		DL	0.6	RLL		OL4	0.6
16										
17	LRFD Loads									
18	1.4 D	Yes			DL	1.4	RLL			
19	1.2 D + 1.6 S + 0.5 W1	Yes			DL	1.2	RLL	1.6	OL1	0.5
20	1.2 D + 1.6 S + 0.5 W2	Yes			DL	1.2	RLL	1.6	OL2	0.5
21	1.2 D + 1.6 S + 0.5 W3	Yes			DL	1.2	RLL	1.6	OL3	0.5
22	1.2 D + 1.6 S + 0.5 W4	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 Plan Horizontal (deg)	No. of Design Cuts	Design Rule
1	DS1	0	50	Typical
2	DS2	90	50	Typical

Strip Reinforcing

	Label	UC Top	LC Top	Bars	Gov	Design Cut	UC Top	UC Bot	LC Bot	Bars/Mid	Gov	Design Cut	UC Bot	UC Shear	LC Gov	Design Cut	UC Shear
1	DS1	0.019	25	#5@6in		DS1-X25	0.022	28		#5@6in		DS1-X21	0.066	28		DS1-X10	
2	DS2	0.003	27	#5@7in		DS2-X26	0.004	25		#5@7in		DS2-X25	0.011	25		DS2-X50	

Slab Soil Pressures

	LC	Label	UC	Soil Pressure[psf]	Allowable Bearing[psf]	Node
1	2	S1	0.204	305.574	1500	N321
2	2	S2	0.202	303.042	1500	N326
3	2	S3	0.202	303.009	1500	N335
4	2	S4	0.202	302.448	1500	N342
5	2	S5	0.202	302.462	1500	N349
6	2	S6	0.202	302.462	1500	N356
7	2	S7	0.202	302.543	1500	N363
8	2	S8	0.202	302.456	1500	N370
9	2	S9	0.202	302.985	1500	N377
10	2	S10	0.202	303.027	1500	N382
11	2	S11	0.204	305.523	1500	N391
12	2	S12	0.202	302.549	1500	N398
13	3	S1	0.204	305.574	1500	N321
14	3	S2	0.202	303.042	1500	N326
15	3	S3	0.202	303.009	1500	N335

Slab Soil Pressures (Continued)

	LC	Label	UC	Soil Pressure[psf]	Allowable Bearing[psf]	Node
16	3	S4	0.202	302.448	1500	N342
17	3	S5	0.202	302.462	1500	N349
18	3	S6	0.202	302.462	1500	N356
19	3	S7	0.202	302.543	1500	N363
20	3	S8	0.202	302.456	1500	N370
21	3	S9	0.202	302.985	1500	N377
22	3	S10	0.202	303.027	1500	N382
23	3	S11	0.204	305.523	1500	N391
24	3	S12	0.202	302.549	1500	N398
25	4	S1	0.206	309.709	1500	N27
26	4	S2	0.193	289.203	1500	N32
27	4	S3	0.2	299.262	1500	N36
28	4	S4	0.2	299.73	1500	N40
29	4	S5	0.2	299.388	1500	N44
30	4	S6	0.2	299.345	1500	N48
31	4	S7	0.201	301.333	1500	N52
32	4	S8	0.2	300.067	1500	N56
33	4	S9	0.199	298.983	1500	N60
34	4	S10	0.194	290.906	1500	N64
35	4	S11	0.206	308.857	1500	N67
36	4	S12	0.201	301.501	1500	N72
37	5	S1	0.282	422.309	1500	N319
38	5	S2	0.28	420.043	1500	N326
39	5	S3	0.285	427.892	1500	N333
40	5	S4	0.287	430.575	1500	N340
41	5	S5	0.284	426.706	1500	N347
42	5	S6	0.284	426.545	1500	N354
43	5	S7	0.288	431.898	1500	N361
44	5	S8	0.287	431.077	1500	N368
45	5	S9	0.285	427.704	1500	N375
46	5	S10	0.28	420.314	1500	N382
47	5	S11	0.282	422.251	1500	N389
48	5	S12	0.288	432.288	1500	N396
49	6	S1	0.34	509.553	1500	N321
50	6	S2	0.312	467.791	1500	N328
51	6	S3	0.337	505.537	1500	N335
52	6	S4	0.336	503.499	1500	N342
53	6	S5	0.334	500.527	1500	N349
54	6	S6	0.334	500.41	1500	N356
55	6	S7	0.337	505.356	1500	N363
56	6	S8	0.336	504.009	1500	N370
57	6	S9	0.337	505.12	1500	N377
58	6	S10	0.313	469.687	1500	N384
59	6	S11	0.339	508.672	1500	N391
60	6	S12	0.337	505.747	1500	N398
61	7	S1	0.261	392.142	1500	N321
62	7	S2	0.259	388.141	1500	N326
63	7	S3	0.257	385.773	1500	N335
64	7	S4	0.256	384.123	1500	N342
65	7	S5	0.256	383.485	1500	N349
66	7	S6	0.256	383.459	1500	N356
67	7	S7	0.257	385.356	1500	N363
68	7	S8	0.256	384.412	1500	N370
69	7	S9	0.257	385.407	1500	N377
70	7	S10	0.257	385.75	1500	N382

Slab Soil Pressures (Continued)

	LC	Label	UC	Soil Pressure[psf]	Allowable Bearing[psf]	Node
71	7	S11	0.261	391.104	1500	N391
72	7	S12	0.257	385.533	1500	N398
73	8	S1	0.204	306.69	1500	N27
74	8	S2	0.195	292.661	1500	N32
75	8	S3	0.2	299.688	1500	N36
76	8	S4	0.2	300.133	1500	N40
77	8	S5	0.2	299.81	1500	N44
78	8	S6	0.2	299.776	1500	N48
79	8	S7	0.201	301.306	1500	N52
80	8	S8	0.2	300.386	1500	N56
81	8	S9	0.2	299.481	1500	N60
82	8	S10	0.196	293.935	1500	N64
83	8	S11	0.204	306.05	1500	N67
84	8	S12	0.201	301.435	1500	N72
85	9	S1	0.261	391.141	1500	N319
86	9	S2	0.261	390.792	1500	N326
87	9	S3	0.264	396.162	1500	N333
88	9	S4	0.266	398.268	1500	N340
89	9	S5	0.264	395.3	1500	N347
90	9	S6	0.263	395.178	1500	N354
91	9	S7	0.266	399.231	1500	N361
92	9	S8	0.266	398.645	1500	N368
93	9	S9	0.264	396.023	1500	N375
94	9	S10	0.261	390.992	1500	N382
95	9	S11	0.261	391.096	1500	N389
96	9	S12	0.266	399.526	1500	N396
97	10	S1	0.306	458.558	1500	N321
98	10	S2	0.284	425.585	1500	N328
99	10	S3	0.303	454.905	1500	N335
100	10	S4	0.302	453.236	1500	N342
101	10	S5	0.301	451.011	1500	N349
102	10	S6	0.301	450.923	1500	N356
103	10	S7	0.303	454.653	1500	N363
104	10	S8	0.302	453.62	1500	N370
105	10	S9	0.303	454.586	1500	N377
106	10	S10	0.285	427.024	1500	N384
107	10	S11	0.305	457.885	1500	N391
108	10	S12	0.303	454.947	1500	N398
109	11	S1	0.247	370.5	1500	N321
110	11	S2	0.245	366.866	1500	N326
111	11	S3	0.243	365.082	1500	N335
112	11	S4	0.242	363.705	1500	N342
113	11	S5	0.242	363.229	1500	N349
114	11	S6	0.242	363.21	1500	N356
115	11	S7	0.243	364.653	1500	N363
116	11	S8	0.243	363.923	1500	N370
117	11	S9	0.243	364.802	1500	N377
118	11	S10	0.243	365.069	1500	N382
119	11	S11	0.246	369.709	1500	N391
120	11	S12	0.243	364.787	1500	N398
121	12	S1	0.127	190.657	1500	N27
122	12	S2	0.112	167.989	1500	N32
123	12	S3	0.119	178.875	1500	N36
124	12	S4	0.119	179.194	1500	N40
125	12	S5	0.119	178.957	1500	N44

Slab Soil Pressures (Continued)

	LC	Label	UC	Soil Pressure[psf]	Allowable Bearing[psf]	Node
126	12	S6	0.119	178.917	1500	N48
127	12	S7	0.121	180.843	1500	N52
128	12	S8	0.12	179.53	1500	N56
129	12	S9	0.119	178.593	1500	N60
130	12	S10	0.113	169.697	1500	N64
131	12	S11	0.127	189.806	1500	N67
132	12	S12	0.121	181.007	1500	N72
133	13	S1	0.23	344.983	1500	N319
134	13	S2	0.207	309.8	1500	N326
135	13	S3	0.236	354.35	1500	N333
136	13	S4	0.236	354.641	1500	N340
137	13	S5	0.23	344.323	1500	N347
138	13	S6	0.229	343.912	1500	N354
139	13	S7	0.239	358.408	1500	N361
140	13	S8	0.237	355.906	1500	N368
141	13	S9	0.236	353.782	1500	N375
142	13	S10	0.207	310.285	1500	N382
143	13	S11	0.23	344.606	1500	N389
144	13	S12	0.24	359.472	1500	N396
145	14	S1	0.258	387.324	1500	N321
146	14	S2	0.232	348.203	1500	N328
147	14	S3	0.256	384.334	1500	N335
148	14	S4	0.255	382.52	1500	N342
149	14	S5	0.253	379.542	1500	N349
150	14	S6	0.253	379.425	1500	N356
151	14	S7	0.256	384.339	1500	N363
152	14	S8	0.255	383.026	1500	N370
153	14	S9	0.256	383.926	1500	N377
154	14	S10	0.233	350.074	1500	N384
155	14	S11	0.258	386.463	1500	N391
156	14	S12	0.256	384.727	1500	N398
157	15	S1	0.18	269.913	1500	N321
158	15	S2	0.178	266.924	1500	N326
159	15	S3	0.176	264.569	1500	N335
160	15	S4	0.175	263.144	1500	N342
161	15	S5	0.175	262.5	1500	N349
162	15	S6	0.175	262.474	1500	N356
163	15	S7	0.176	264.339	1500	N363
164	15	S8	0.176	263.43	1500	N370
165	15	S9	0.176	264.213	1500	N377
166	15	S10	0.176	264.539	1500	N382
167	15	S11	0.179	268.895	1500	N391
168	15	S12	0.176	264.514	1500	N398

Slab Stability - Overturning

	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	45012.663	0	13614.573	9.99+	9.99+
2	2	S2	0	0	45230.209	0	13535.224	9.99+	9.99+
3	2	S3	0	0	45220.004	0	13581.581	9.99+	9.99+
4	2	S4	0	0	45230.101	0	13577.458	9.99+	9.99+
5	2	S5	0	0	45204.44	0	13574.44	9.99+	9.99+
6	2	S6	0	0	45203.806	0	13569.578	9.99+	9.99+
7	2	S7	0	0	45223.18	0	13572.553	9.99+	9.99+
8	2	S8	0	0	45230.69	0	13577.676	9.99+	9.99+
9	2	S9	0	0	45219.858	0	13581.281	9.99+	9.99+

Slab Stability - Overturning (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
10	2	S10	0	0	45231.814	0	13541.634	9.99+	9.99+
11	2	S11	0	0	45009.863	0	13513.212	9.99+	9.99+
12	2	S12	0	0	45224.576	0	13581.868	9.99+	9.99+
13	3	S1	0	0	45012.663	0	13614.573	9.99+	9.99+
14	3	S2	0	0	45230.209	0	13535.224	9.99+	9.99+
15	3	S3	0	0	45220.004	0	13581.581	9.99+	9.99+
16	3	S4	0	0	45230.101	0	13577.458	9.99+	9.99+
17	3	S5	0	0	45204.44	0	13574.44	9.99+	9.99+
18	3	S6	0	0	45203.806	0	13569.578	9.99+	9.99+
19	3	S7	0	0	45223.18	0	13572.553	9.99+	9.99+
20	3	S8	0	0	45230.69	0	13577.676	9.99+	9.99+
21	3	S9	0	0	45219.858	0	13581.281	9.99+	9.99+
22	3	S10	0	0	45231.814	0	13541.634	9.99+	9.99+
23	3	S11	0	0	45009.863	0	13513.212	9.99+	9.99+
24	3	S12	0	0	45224.576	0	13581.868	9.99+	9.99+
25	4	S1	0	16327.944	45417.344	3559.623	13614.573	2.782	3.825
26	4	S2	0	15145.655	45022.589	3165.673	13540.616	2.973	4.277
27	4	S3	0	17070.73	45323.873	3469.286	13581.581	2.655	3.915
28	4	S4	0	16997.747	45286.284	3456.487	13577.458	2.664	3.928
29	4	S5	0	16757.649	45274.824	3416.287	13574.44	2.702	3.973
30	4	S6	0	16750.447	45274.482	3411.636	13573.908	2.703	3.979
31	4	S7	0	17060.646	45290.07	3478.428	13581.422	2.655	3.904
32	4	S8	0	17025	45287.153	3459.248	13577.676	2.66	3.925
33	4	S9	0	17051.623	45322.013	3468.378	13581.281	2.658	3.916
34	4	S10	0	15224.648	45028.186	3161.686	13541.634	2.958	4.283
35	4	S11	0	16296.033	45412.097	3560.892	13613.376	2.787	3.823
36	4	S12	0	17085.614	45291.222	3482.071	13581.868	2.651	3.901
37	5	S1	0	21054.321	45417.344	3563.689	13614.573	2.157	3.82
38	5	S2	0	18190.284	45022.589	2401.604	13535.224	2.475	5.636
39	5	S3	0	21363.365	45323.873	3022.756	13581.581	2.122	4.493
40	5	S4	0	21188.536	45286.284	2948.808	13577.458	2.137	4.604
41	5	S5	0	20867.02	45274.824	2923.507	13574.44	2.17	4.643
42	5	S6	0	20855.624	45274.482	2921.714	13573.908	2.171	4.646
43	5	S7	0	21302.271	45290.07	2965.858	13581.422	2.126	4.579
44	5	S8	0	21225.227	45287.153	2950.917	13577.676	2.134	4.601
45	5	S9	0	21343.873	45322.013	3020.019	13581.281	2.123	4.497
46	5	S10	0	18230.529	45028.186	2408.172	13536.366	2.47	5.621
47	5	S11	0	21033.445	45412.097	3557.56	13613.376	2.159	3.827
48	5	S12	0	21336.057	45291.222	2967.663	13581.868	2.123	4.577
49	6	S1	0	0	50095.746	0	17892.412	9.99+	9.99+
50	6	S2	0	0	50983.436	0	17179.165	9.99+	9.99+
51	6	S3	0	0	51345.311	0	17672.314	9.99+	9.99+
52	6	S4	0	0	51173.244	0	17652.333	9.99+	9.99+
53	6	S5	0	0	51101.611	0	17603.313	9.99+	9.99+
54	6	S6	0	0	51102.262	0	17543.753	9.99+	9.99+
55	6	S7	0	0	51044.567	0	17565.177	9.99+	9.99+
56	6	S8	0	0	51150.613	0	17607.299	9.99+	9.99+
57	6	S9	0	0	51359.137	0	17679.399	9.99+	9.99+
58	6	S10	0	0	50894.662	0	17221.002	9.99+	9.99+
59	6	S11	0	0	50139.675	0	16867.786	9.99+	9.99+
60	6	S12	0	0	51038.474	0	17686.371	9.99+	9.99+
61	7	S1	0	0	52910.767	0	16895.645	9.99+	9.99+
62	7	S2	0	0	55064.132	0	16818.415	9.99+	9.99+
63	7	S3	0	0	54819.853	0	17025.582	9.99+	9.99+
64	7	S4	0	0	54848.098	0	17046.213	9.99+	9.99+

Slab Stability - Overturning (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
65	7	S5	0	0	54625.074	0	16997.882	9.99+	9.99+
66	7	S6	0	0	54620.333	0	16931.426	9.99+	9.99+
67	7	S7	0	0	54722.251	0	16947.593	9.99+	9.99+
68	7	S8	0	0	54838.18	0	17002.936	9.99+	9.99+
69	7	S9	0	0	54833.182	0	17028.962	9.99+	9.99+
70	7	S10	0	0	54939.576	0	16886.171	9.99+	9.99+
71	7	S11	0	0	52978.273	0	16341.303	9.99+	9.99+
72	7	S12	0	0	54727.472	0	17078.204	9.99+	9.99+
73	8	S1	0	12245.958	45417.344	2669.717	13614.573	3.709	5.1
74	8	S2	0	11359.241	45022.589	2374.254	13540.616	3.964	5.703
75	8	S3	0	12803.048	45323.873	2601.964	13581.581	3.54	5.22
76	8	S4	0	12748.31	45286.284	2592.365	13577.458	3.552	5.237
77	8	S5	0	12568.237	45274.824	2562.215	13574.44	3.602	5.298
78	8	S6	0	12562.835	45274.482	2558.727	13573.908	3.604	5.305
79	8	S7	0	12795.484	45290.07	2608.821	13581.422	3.54	5.206
80	8	S8	0	12768.75	45287.153	2594.436	13577.676	3.547	5.233
81	8	S9	0	12788.717	45322.013	2601.283	13581.281	3.544	5.221
82	8	S10	0	11418.486	45028.186	2371.265	13541.634	3.943	5.711
83	8	S11	0	12222.025	45412.097	2670.669	13613.376	3.716	5.097
84	8	S12	0	12814.211	45291.222	2611.553	13581.868	3.534	5.201
85	9	S1	0	15790.741	45417.344	2672.767	13614.573	2.876	5.094
86	9	S2	0	13642.713	45022.589	1801.203	13535.224	3.3	7.515
87	9	S3	0	16022.524	45323.873	2267.067	13581.581	2.829	5.991
88	9	S4	0	15891.402	45286.284	2211.606	13577.458	2.85	6.139
89	9	S5	0	15650.265	45274.824	2192.63	13574.44	2.893	6.191
90	9	S6	0	15641.718	45274.482	2191.286	13573.908	2.894	6.194
91	9	S7	0	15976.703	45290.07	2224.394	13581.422	2.835	6.106
92	9	S8	0	15918.92	45287.153	2213.188	13577.676	2.845	6.135
93	9	S9	0	16007.904	45322.013	2265.014	13581.281	2.831	5.996
94	9	S10	0	13672.897	45028.186	1806.129	13536.366	3.293	7.495
95	9	S11	0	15775.084	45412.097	2668.17	13613.376	2.879	5.102
96	9	S12	0	16002.042	45291.222	2225.748	13581.868	2.83	6.102
97	10	S1	0	0	48824.975	0	16822.953	9.99+	9.99+
98	10	S2	0	0	49545.129	0	16268.179	9.99+	9.99+
99	10	S3	0	0	49813.984	0	16649.631	9.99+	9.99+
100	10	S4	0	0	49687.458	0	16633.614	9.99+	9.99+
101	10	S5	0	0	49627.319	0	16596.095	9.99+	9.99+
102	10	S6	0	0	49627.648	0	16550.21	9.99+	9.99+
103	10	S7	0	0	49589.221	0	16567.021	9.99+	9.99+
104	10	S8	0	0	49670.632	0	16599.893	9.99+	9.99+
105	10	S9	0	0	49824.318	0	16654.869	9.99+	9.99+
106	10	S10	0	0	49478.95	0	16301.16	9.99+	9.99+
107	10	S11	0	0	48857.222	0	16029.142	9.99+	9.99+
108	10	S12	0	0	49584.999	0	16660.245	9.99+	9.99+
109	11	S1	0	0	50936.241	0	16075.377	9.99+	9.99+
110	11	S2	0	0	52605.651	0	15997.617	9.99+	9.99+
111	11	S3	0	0	52419.891	0	16164.582	9.99+	9.99+
112	11	S4	0	0	52443.599	0	16179.024	9.99+	9.99+
113	11	S5	0	0	52269.915	0	16142.022	9.99+	9.99+
114	11	S6	0	0	52266.201	0	16090.964	9.99+	9.99+
115	11	S7	0	0	52347.483	0	16103.833	9.99+	9.99+
116	11	S8	0	0	52436.308	0	16146.621	9.99+	9.99+
117	11	S9	0	0	52429.851	0	16167.041	9.99+	9.99+
118	11	S10	0	0	52512.636	0	16050.037	9.99+	9.99+
119	11	S11	0	0	50986.171	0	15634.28	9.99+	9.99+

Slab Stability - Overturning (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
120	11	S12	0	0	52351.748	0	16204.12	9.99+	9.99+
121	12	S1	0	16327.944	27250.406	3559.623	8168.744	1.669	2.295
122	12	S2	0	15145.655	27013.554	3165.673	8124.369	1.784	2.566
123	12	S3	0	17070.73	27194.324	3469.286	8148.949	1.593	2.349
124	12	S4	0	16997.747	27171.77	3456.487	8146.475	1.599	2.357
125	12	S5	0	16757.649	27164.895	3416.287	8144.664	1.621	2.384
126	12	S6	0	16750.447	27164.689	3411.636	8144.345	1.622	2.387
127	12	S7	0	17060.646	27174.042	3478.428	8148.853	1.593	2.343
128	12	S8	0	17025	27172.292	3459.248	8146.606	1.596	2.355
129	12	S9	0	17051.623	27193.208	3468.378	8148.768	1.595	2.349
130	12	S10	0	15224.648	27016.912	3161.686	8124.98	1.775	2.57
131	12	S11	0	16296.033	27247.258	3560.892	8168.026	1.672	2.294
132	12	S12	0	17085.614	27174.733	3482.071	8149.121	1.591	2.34
133	13	S1	0	21054.321	27250.406	3563.689	8168.744	1.294	2.292
134	13	S2	0	18190.284	27013.554	2401.604	8121.134	1.485	3.382
135	13	S3	0	21363.365	27194.324	3022.756	8148.949	1.273	2.696
136	13	S4	0	21188.536	27171.77	2948.808	8146.475	1.282	2.763
137	13	S5	0	20867.02	27164.895	2923.507	8144.664	1.302	2.786
138	13	S6	0	20855.624	27164.689	2921.714	8144.345	1.303	2.788
139	13	S7	0	21302.271	27174.042	2965.858	8148.853	1.276	2.748
140	13	S8	0	21225.227	27172.292	2950.917	8146.606	1.28	2.761
141	13	S9	0	21343.873	27193.208	3020.019	8148.768	1.274	2.698
142	13	S10	0	18230.529	27016.912	2408.172	8121.819	1.482	3.373
143	13	S11	0	21033.445	27247.258	3557.56	8168.026	1.295	2.296
144	13	S12	0	21336.057	27174.733	2967.663	8149.121	1.274	2.746
145	14	S1	0	0	32090.681	0	12446.583	9.99+	9.99+
146	14	S2	0	0	32891.352	0	11765.075	9.99+	9.99+
147	14	S3	0	0	33257.309	0	12239.681	9.99+	9.99+
148	14	S4	0	0	33081.204	0	12221.35	9.99+	9.99+
149	14	S5	0	0	33019.835	0	12173.537	9.99+	9.99+
150	14	S6	0	0	33020.739	0	12115.922	9.99+	9.99+
151	14	S7	0	0	32955.295	0	12136.156	9.99+	9.99+
152	14	S8	0	0	33058.337	0	12176.228	9.99+	9.99+
153	14	S9	0	0	33271.194	0	12246.886	9.99+	9.99+
154	14	S10	0	0	32801.936	0	11804.349	9.99+	9.99+
155	14	S11	0	0	32135.73	0	11462.501	9.99+	9.99+
156	14	S12	0	0	32948.644	0	12253.624	9.99+	9.99+
157	15	S1	0	0	34905.702	0	11449.816	9.99+	9.99+
158	15	S2	0	0	36972.048	0	11404.325	9.99+	9.99+
159	15	S3	0	0	36731.851	0	11592.949	9.99+	9.99+
160	15	S4	0	0	36756.057	0	11615.229	9.99+	9.99+
161	15	S5	0	0	36543.297	0	11568.106	9.99+	9.99+
162	15	S6	0	0	36538.811	0	11503.594	9.99+	9.99+
163	15	S7	0	0	36632.979	0	11518.572	9.99+	9.99+
164	15	S8	0	0	36745.905	0	11571.866	9.99+	9.99+
165	15	S9	0	0	36745.239	0	11596.449	9.99+	9.99+
166	15	S10	0	0	36846.851	0	11469.518	9.99+	9.99+
167	15	S11	0	0	34974.328	0	10936.018	9.99+	9.99+
168	15	S12	0	0	36637.642	0	11645.457	9.99+	9.99+

Slab Stability - Sliding

	LC	Slab	Angle[deg]	Va-xx[lb]	Vr-xx[lb]	Va-zz[lb]	Vr-zz[lb]	SR-xx	SR-zz
1	2	S1	0	25.036	2712.9	0	2712.9	9.99+	9.99+
2	2	S2	0	1.348	2707.584	0	2707.584	9.99+	9.99+
3	2	S3	0	0	2716.316	0	2716.316	9.99+	9.99+

Slab Stability - Sliding (Continued)

	LC	Slab	Angle[deg]	Va-xx[lb]	Vr-xx[lb]	Va-zz[lb]	Vr-zz[lb]	SR-xx	SR-zz
4	2	S4	0	0	2715.492	0	2715.492	9.99+	9.99+
5	2	S5	0	1.275	2714.378	0	2714.378	9.99+	9.99+
6	2	S6	0	1.083	2714.349	0	2714.349	9.99+	9.99+
7	2	S7	0	2.217	2715.398	0	2715.398	9.99+	9.99+
8	2	S8	0	0	2715.535	0	2715.535	9.99+	9.99+
9	2	S9	0	0	2716.256	0	2716.256	9.99+	9.99+
10	2	S10	0	1.317	2707.8	0	2707.8	9.99+	9.99+
11	2	S11	0	25.041	2712.659	0	2712.659	9.99+	9.99+
12	2	S12	0	2.249	2715.474	0	2715.474	9.99+	9.99+
13	3	S1	0	25.036	2712.9	0	2712.9	9.99+	9.99+
14	3	S2	0	1.348	2707.584	0	2707.584	9.99+	9.99+
15	3	S3	0	0	2716.316	0	2716.316	9.99+	9.99+
16	3	S4	0	0	2715.492	0	2715.492	9.99+	9.99+
17	3	S5	0	1.275	2714.378	0	2714.378	9.99+	9.99+
18	3	S6	0	1.083	2714.349	0	2714.349	9.99+	9.99+
19	3	S7	0	2.217	2715.398	0	2715.398	9.99+	9.99+
20	3	S8	0	0	2715.535	0	2715.535	9.99+	9.99+
21	3	S9	0	0	2716.256	0	2716.256	9.99+	9.99+
22	3	S10	0	1.317	2707.8	0	2707.8	9.99+	9.99+
23	3	S11	0	25.041	2712.659	0	2712.659	9.99+	9.99+
24	3	S12	0	2.249	2715.474	0	2715.474	9.99+	9.99+
25	4	S1	0	155.513	2073.195	686.602	2073.195	9.99+	3.02
26	4	S2	0	8.655	2078.45	874.567	2078.45	9.99+	2.377
27	4	S3	0	1.668	2023.126	809.969	2023.126	9.99+	2.498
28	4	S4	0	9.844	2028.132	836.428	2028.132	9.99+	2.425
29	4	S5	0	11.673	2036.3	822.378	2036.3	9.99+	2.476
30	4	S6	0	10.074	2036.484	822.104	2036.484	9.99+	2.477
31	4	S7	0	21.845	2029.337	838.62	2029.337	9.99+	2.42
32	4	S8	0	10.525	2027.896	838.384	2027.896	9.99+	2.419
33	4	S9	0	1.736	2023.275	810.102	2023.275	9.99+	2.498
34	4	S10	0	7.225	2078.879	872.655	2078.879	9.99+	2.382
35	4	S11	0	155.125	2072.547	687.734	2072.547	9.99+	3.014
36	4	S12	0	22.092	2028.796	840.182	2028.796	9.99+	2.415
37	5	S1	0	249.599	2110.016	591.797	2110.016	8.454	3.565
38	5	S2	0	6.327	2229.255	751.373	2229.255	9.99+	2.967
39	5	S3	0	3.743	2113.262	687.118	2113.262	9.99+	3.076
40	5	S4	0	6.635	2128.384	719.595	2128.384	9.99+	2.958
41	5	S5	0	3.91	2131.751	700.913	2131.751	9.99+	3.041
42	5	S6	0	3.485	2131.833	700.415	2131.833	9.99+	3.044
43	5	S7	0	9.533	2126.926	724.5	2126.926	9.99+	2.936
44	5	S8	0	7.1	2128.192	722.544	2128.192	9.99+	2.945
45	5	S9	0	3.232	2113.545	686.261	2113.545	9.99+	3.08
46	5	S10	0	6.673	2228.308	751.174	2228.308	9.99+	2.966
47	5	S11	0	248.532	2110.576	591.733	2110.576	8.492	3.567
48	5	S12	0	9.27	2126.549	726.645	2126.549	9.99+	2.927
49	6	S1	0	256.514	3475.877	810.372	3475.877	9.99+	4.289
50	6	S2	0	11.053	3440.254	1031.845	3440.254	9.99+	3.334
51	6	S3	0	2.158	3535.326	954.278	3535.326	9.99+	3.705
52	6	S4	0	11.333	3525.934	987	3525.934	9.99+	3.572
53	6	S5	0	15.635	3514.409	969.403	3514.409	9.99+	3.625
54	6	S6	0	13.47	3514.139	969.039	3514.139	9.99+	3.626
55	6	S7	0	29.136	3524.69	990.053	3524.69	9.99+	3.56
56	6	S8	0	12.118	3526.307	989.504	3526.307	9.99+	3.564
57	6	S9	0	2.213	3534.994	954.285	3534.994	9.99+	3.704
58	6	S10	0	9.434	3440.427	1029.813	3440.427	9.99+	3.341

Slab Stability - Sliding (Continued)

	LC	Slab	Angle[deg]	Va-xx[lb]	Vr-xx[lb]	Va-zz[lb]	Vr-zz[lb]	SR-xx	SR-zz
59	6	S11	0	255.953	3475.938	811.548	3475.938	9.99+	4.283
60	6	S12	0	29.48	3525.482	992.019	3525.482	9.99+	3.554
61	7	S1	0	139.574	3323.299	685.7	3323.299	9.99+	4.847
62	7	S2	0	18.853	3371.224	874.765	3371.224	9.99+	3.854
63	7	S3	0	0.991	3405.513	814.991	3405.513	9.99+	4.179
64	7	S4	0	10.853	3404.901	836.07	3404.901	9.99+	4.073
65	7	S5	0	17.509	3392.573	825.671	3392.573	9.99+	4.109
66	7	S6	0	15.014	3392.291	825.541	3392.291	9.99+	4.109
67	7	S7	0	31.547	3402.137	836.593	3402.137	9.99+	4.067
68	7	S8	0	11.601	3405.228	837.326	3405.228	9.99+	4.067
69	7	S9	0	1.145	3405.334	815.661	3405.334	9.99+	4.175
70	7	S10	0	16.876	3370.484	872.055	3370.484	9.99+	3.865
71	7	S11	0	139.601	3324.101	687.406	3324.101	9.99+	4.836
72	7	S12	0	31.919	3402.873	837.711	3402.873	9.99+	4.062
73	8	S1	0	110.376	2233.122	514.951	2233.122	9.99+	4.337
74	8	S2	0	6.154	2235.734	655.925	2235.734	9.99+	3.409
75	8	S3	0	1.251	2196.424	607.477	2196.424	9.99+	3.616
76	8	S4	0	7.383	2199.972	627.321	2199.972	9.99+	3.507
77	8	S5	0	8.436	2205.819	616.784	2205.819	9.99+	3.576
78	8	S6	0	7.285	2205.95	616.578	2205.95	9.99+	3.578
79	8	S7	0	15.83	2200.852	628.965	2200.852	9.99+	3.499
80	8	S8	0	7.894	2199.805	628.788	2199.805	9.99+	3.498
81	8	S9	0	1.302	2196.52	607.577	2196.52	9.99+	3.615
82	8	S10	0	5.089	2236.11	654.491	2236.11	9.99+	3.417
83	8	S11	0	110.083	2232.575	515.801	2232.575	9.99+	4.328
84	8	S12	0	16.007	2200.466	630.136	2200.466	9.99+	3.492
85	9	S1	0	180.94	2260.737	443.848	2260.737	9.99+	5.093
86	9	S2	0	5.082	2348.837	563.529	2348.837	9.99+	4.168
87	9	S3	0	2.807	2264.026	515.339	2264.026	9.99+	4.393
88	9	S4	0	4.976	2275.161	539.696	2275.161	9.99+	4.216
89	9	S5	0	2.614	2277.407	525.685	2277.407	9.99+	4.332
90	9	S6	0	2.343	2277.462	525.312	2277.462	9.99+	4.335
91	9	S7	0	6.596	2274.044	543.375	2274.044	9.99+	4.185
92	9	S8	0	5.325	2275.028	541.908	2275.028	9.99+	4.198
93	9	S9	0	2.424	2264.223	514.696	2264.223	9.99+	4.399
94	9	S10	0	5.334	2348.181	563.38	2348.181	9.99+	4.168
95	9	S11	0	180.139	2261.097	443.799	2261.097	9.99+	5.095
96	9	S12	0	6.39	2273.78	544.984	2273.78	9.99+	4.172
97	10	S1	0	198.644	3285.133	607.779	3285.133	9.99+	5.405
98	10	S2	0	8.627	3257.087	773.884	3257.087	9.99+	4.209
99	10	S3	0	1.618	3330.574	715.709	3330.574	9.99+	4.654
100	10	S4	0	8.499	3323.323	740.25	3323.323	9.99+	4.489
101	10	S5	0	12.045	3314.401	727.052	3314.401	9.99+	4.559
102	10	S6	0	10.373	3314.191	726.779	3314.191	9.99+	4.56
103	10	S7	0	22.406	3322.367	742.54	3322.367	9.99+	4.474
104	10	S8	0	9.088	3323.614	742.128	3323.614	9.99+	4.478
105	10	S9	0	1.66	3330.31	715.714	3330.31	9.99+	4.653
106	10	S10	0	7.405	3257.27	772.359	3257.27	9.99+	4.217
107	10	S11	0	198.225	3285.118	608.661	3285.118	9.99+	5.397
108	10	S12	0	22.672	3322.98	744.015	3322.98	9.99+	4.466
109	11	S1	0	110.94	3170.699	514.275	3170.699	9.99+	6.165
110	11	S2	0	14.477	3205.314	656.074	3205.314	9.99+	4.886
111	11	S3	0	0.743	3233.214	611.244	3233.214	9.99+	5.29
112	11	S4	0	8.14	3232.549	627.052	3232.549	9.99+	5.155
113	11	S5	0	13.45	3223.024	619.253	3223.024	9.99+	5.205

Slab Stability - Sliding (Continued)

	LC	Slab	Angle[deg]	Va-xx[lb]	Vr-xx[lb]	Va-zz[lb]	Vr-zz[lb]	SR-xx	SR-zz
114	11	S6	0	11.531	3222.805	619.156	3222.805	9.99+	5.205
115	11	S7	0	24.214	3230.452	627.445	3230.452	9.99+	5.149
116	11	S8	0	8.701	3232.805	627.995	3232.805	9.99+	5.148
117	11	S9	0	0.858	3233.065	611.746	3233.065	9.99+	5.285
118	11	S10	0	12.986	3204.813	654.041	3204.813	9.99+	4.9
119	11	S11	0	110.961	3171.24	515.554	3171.24	9.99+	6.151
120	11	S12	0	24.501	3231.023	628.283	3231.023	9.99+	5.143
121	12	S1	0	165.528	988.035	686.602	988.035	5.969	1.439
122	12	S2	0	9.194	995.417	874.567	995.417	9.99+	1.138
123	12	S3	0	1.668	936.6	809.969	936.6	9.99+	1.156
124	12	S4	0	9.844	941.935	836.428	941.935	9.99+	1.126
125	12	S5	0	12.183	950.549	822.378	950.549	9.99+	1.156
126	12	S6	0	10.507	950.744	822.104	950.744	9.99+	1.156
127	12	S7	0	22.732	943.178	838.62	943.178	9.99+	1.125
128	12	S8	0	10.525	941.681	838.384	941.681	9.99+	1.123
129	12	S9	0	1.736	936.772	810.102	936.772	9.99+	1.156
130	12	S10	0	7.751	995.759	872.655	995.759	9.99+	1.141
131	12	S11	0	165.141	987.483	687.734	987.483	5.98	1.436
132	12	S12	0	22.992	942.607	840.182	942.607	9.99+	1.122
133	13	S1	0	259.614	1024.856	591.797	1024.856	3.948	1.732
134	13	S2	0	5.787	1146.221	751.373	1146.221	9.99+	1.526
135	13	S3	0	3.743	1026.736	687.118	1026.736	9.99+	1.494
136	13	S4	0	6.635	1042.187	719.595	1042.187	9.99+	1.448
137	13	S5	0	4.42	1046	700.913	1046	9.99+	1.492
138	13	S6	0	3.918	1046.093	700.415	1046.093	9.99+	1.494
139	13	S7	0	10.42	1040.767	724.5	1040.767	9.99+	1.437
140	13	S8	0	7.1	1041.978	722.544	1041.978	9.99+	1.442
141	13	S9	0	3.232	1027.043	686.261	1027.043	9.99+	1.497
142	13	S10	0	6.146	1145.188	751.174	1145.188	9.99+	1.525
143	13	S11	0	258.548	1025.512	591.733	1025.512	3.966	1.733
144	13	S12	0	10.169	1040.359	726.645	1040.359	9.99+	1.432
145	14	S1	0	246.499	2390.717	810.372	2390.717	9.699	2.95
146	14	S2	0	10.514	2357.221	1031.845	2357.221	9.99+	2.284
147	14	S3	0	2.158	2448.799	954.278	2448.799	9.99+	2.566
148	14	S4	0	11.333	2439.737	987	2439.737	9.99+	2.472
149	14	S5	0	15.125	2428.657	969.403	2428.657	9.99+	2.505
150	14	S6	0	13.037	2428.399	969.039	2428.399	9.99+	2.506
151	14	S7	0	28.249	2438.531	990.053	2438.531	9.99+	2.463
152	14	S8	0	12.118	2440.093	989.504	2440.093	9.99+	2.466
153	14	S9	0	2.213	2448.492	954.285	2448.492	9.99+	2.566
154	14	S10	0	8.907	2357.307	1029.813	2357.307	9.99+	2.289
155	14	S11	0	245.937	2390.875	811.548	2390.875	9.722	2.946
156	14	S12	0	28.58	2439.293	992.019	2439.293	9.99+	2.459
157	15	S1	0	129.56	2238.139	685.7	2238.139	9.99+	3.264
158	15	S2	0	18.314	2288.191	874.765	2288.191	9.99+	2.616
159	15	S3	0	0.991	2318.986	814.991	2318.986	9.99+	2.845
160	15	S4	0	10.853	2318.705	836.07	2318.705	9.99+	2.773
161	15	S5	0	16.999	2306.822	825.671	2306.822	9.99+	2.794
162	15	S6	0	14.581	2306.551	825.541	2306.551	9.99+	2.794
163	15	S7	0	30.66	2315.978	836.593	2315.978	9.99+	2.768
164	15	S8	0	11.601	2319.013	837.326	2319.013	9.99+	2.77
165	15	S9	0	1.145	2318.832	815.661	2318.832	9.99+	2.843
166	15	S10	0	16.349	2287.364	872.055	2287.364	9.99+	2.623
167	15	S11	0	129.585	2239.037	687.406	2239.037	9.99+	3.257
168	15	S12	0	31.019	2316.684	837.711	2316.684	9.99+	2.765



JOB NO.: U2716.0388.241

PROJECT: Sunturf Package D6 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 N1 max	413.192	25	3617.134	25	1459.956	25	0	30	0	30	0	30
2 min	-435.254	28	-3540.973	28	-1233.598	23	0	18	0	18	0	18
3 N151 max	434.488	28	3606.805	25	1461.996	25	0	30	0	30	0	30
4 min	-414.066	25	-3537.757	28	-1235.721	23	0	18	0	18	0	18
5 N241 max	42.978	26	2049.168	26	100.434	23	0	30	0	30	0	30
6 min	-25.358	27	-935.12	27	-127.193	25	0	18	0	18	0	18
7 N259 max	24.999	27	2048.156	26	100.313	23	0	30	0	30	0	30
8 min	-42.598	26	-936.012	27	-127.065	25	0	18	0	18	0	18
9 N278 max	23.004	27	2154.696	26	98.799	23	0	30	0	30	0	30
10 min	-35.376	26	-990.426	27	-125.428	25	0	18	0	18	0	18
11 N283 max	31.37	26	2128.187	26	98.661	23	0	30	0	30	0	30
12 min	-20.255	27	-971.681	27	-125.186	25	0	18	0	18	0	18
13 N247 max	22.854	26	2030.642	26	98.632	23	0	30	0	30	0	30
14 min	-12.236	27	-945.084	27	-125.294	25	0	18	0	18	0	18
15 N253 max	10.641	27	2029.819	26	98.562	23	0	30	0	30	0	30
16 min	-19.8	26	-945.24	27	-125.222	25	0	18	0	18	0	18
17 N257 max	18.771	28	3660.993	25	1777.22	25	0	30	0	30	0	30
18 min	-17.973	25	-3559.547	28	-1498.003	23	0	18	0	18	0	18
19 N239 max	17.765	25	3666.185	25	1780.604	25	0	30	0	30	0	30
20 min	-18.376	28	-3565.431	28	-1500.733	23	0	18	0	18	0	18
21 N265 max	13.42	27	2070.255	26	100.154	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	-17.989	26	-952.097	27	-126.781	25	0	18	0	18	0	18
23	N235	max	16.636	26	2072.028	26	100.013	23	0	30	0	30	0	30
24		min	-12.511	27	-955.291	27	-126.619	25	0	18	0	18	0	18
25	N245	max	10.963	25	3596.599	25	1741.12	25	0	30	0	30	0	30
26		min	-11.416	28	-3481.61	28	-1469.18	23	0	18	0	18	0	18
27	N275	max	11.209	28	3164.965	25	1843.842	25	0	30	0	30	0	30
28		min	-10.165	25	-3008.472	28	-1551.909	23	0	18	0	18	0	18
29	N276	max	10.256	25	3143.752	25	1847.317	25	0	30	0	30	0	30
30		min	-10.556	28	-3001.292	28	-1555.415	23	0	18	0	18	0	18
31	N251	max	10.184	28	3595.073	25	1740.43	25	0	30	0	30	0	30
32		min	-9.624	25	-3479.414	28	-1468.655	23	0	18	0	18	0	18
33	N263	max	5.015	28	3648.536	25	1776.096	25	0	30	0	30	0	30
34		min	-5.035	25	-3546.116	28	-1497.345	23	0	18	0	18	0	18
35	N233	max	4.457	25	3642.596	25	1771.738	25	0	30	0	30	0	30
36		min	-4.214	28	-3539.868	28	-1493.964	23	0	18	0	18	0	18
37	N227	max	4.429	28	3677.303	25	1713.802	25	0	30	0	30	0	30
38		min	-3.796	25	-3574.348	28	-1448.678	23	0	18	0	18	0	18
39	N269	max	3.678	25	3672.289	25	1713.697	25	0	30	0	30	0	30
40		min	-4.263	28	-3571.056	28	-1449.014	23	0	18	0	18	0	18
41	N2	max	1.958	30	1676.64	26	88.577	23	0	30	0	30	0	30
42		min	-2.697	23	-756.634	27	-110.79	25	0	18	0	18	0	18
43	N229	max	1.778	24	2057.757	26	98.24	23	0	30	0	30	0	30
44		min	-0.455	29	-966.908	27	-124.349	25	0	18	0	18	0	18
45	N152	max	1.191	24	1691.132	26	88.734	23	0	30	0	30	0	30
46		min	0.013	29	-766.289	27	-110.93	25	0	18	0	18	0	18
47	N271	max	0.232	27	2060.907	26	98.231	23	0	30	0	30	0	30
48		min	-1.094	24	-969.657	27	-124.346	25	0	18	0	18	0	18
49	Totals:	max	0.002	28	57585.644	25	19148.617	25						
50		min	-0.002	25	-40866.046	27	-16232.864	27						



Company:	Vector Structural Engineers	Date:	4/23/2024
Engineer:	CJT	Page:	1/6
Project:	Sunturf Ground Mount D6		
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 318-19
 Units: Imperial units

Anchor Information:

Anchor type: Bonded anchor
 Material: F593 304/316SS
 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): 24.00
 State: Cracked
 Compressive strength, f'_c (psi): 2500
 $\Psi_{c,v}$: 1.0
 Reinforcement condition: Supplementary reinforcement not present
 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/ 3/8"Ø F593 CW (304/316SS)
 Code Report: ICC-ES ESR-4057





Company:	Vector Structural Engineers	Date:	4/23/2024
Engineer:	CJT	Page:	2/6
Project:	Sunturf Ground Mount D6		
Address:			
Phone:			
E-mail:			

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]: 3575

V_{uax} [lb]: 436

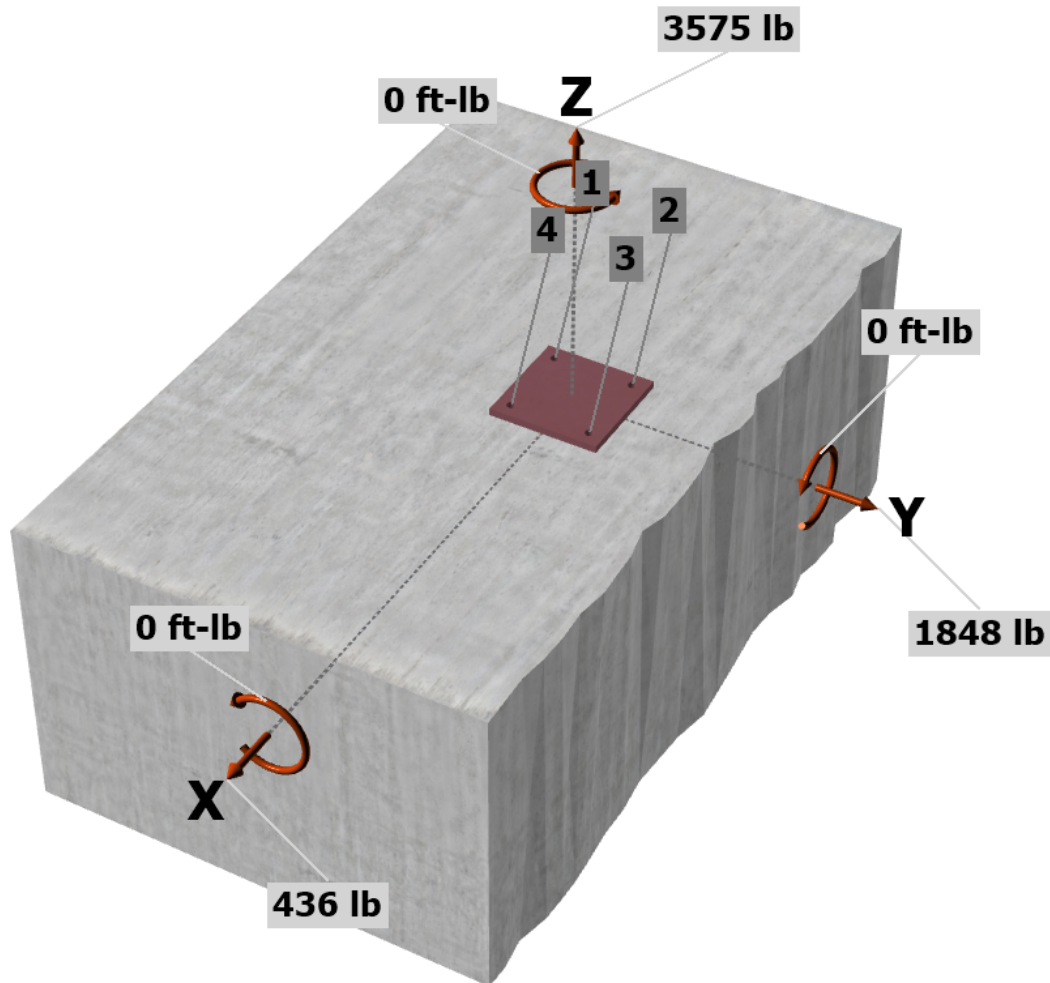
V_{uay} [lb]: 1848

M_{ux} [ft-lb]: 0

M_{uy} [ft-lb]: 0

M_{uz} [ft-lb]: 0

<Figure 1>



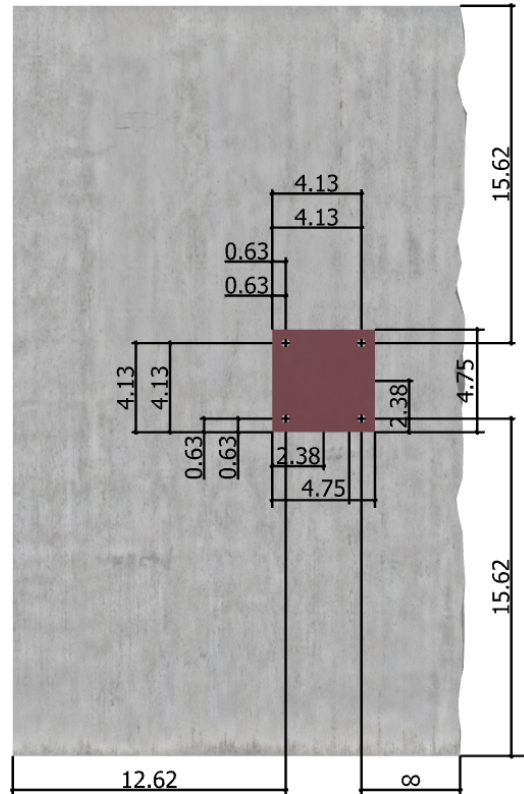
Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.



Anchor Designer™
Software
Version 3.1.2303.1

Company:	Vector Structural Engineers	Date:	4/23/2024
Engineer:	CJT	Page:	3/6
Project:	Sunturf Ground Mount D6		
Address:			
Phone:			
E-mail:			

<Figure 2>





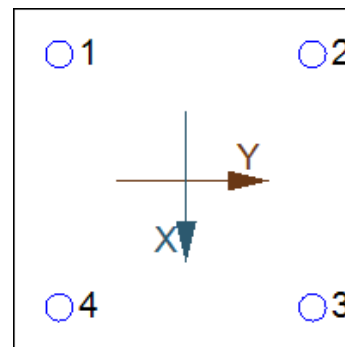
Company:	Vector Structural Engineers	Date:	4/23/2024
Engineer:	CJT	Page:	4/6
Project:	Sunturf Ground Mount D6		
Address:			
Phone:			
E-mail:			

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	893.8	109.0	462.0	474.7
2	893.8	109.0	462.0	474.7
3	893.8	109.0	462.0	474.7
4	893.8	109.0	462.0	474.6
Sum	3575.0	436.0	1848.0	1898.7

Maximum concrete compression strain (%): 0.00
 Maximum concrete compression stress (psi): 0
 Resultant tension force (lb): 3575
 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. 17.6.1)

N _{sa} (lb)	φ	φN _{sa} (lb)
7800	0.75	5850

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.6.2)

$$N_b = K_c \lambda_a \sqrt{f_c} h_{ef}^{1.5} \text{ (Eq. 17.6.2.2.1)}$$

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

$$\phi N_{cbg} = \phi (A_{Nc} / A_{Nco}) \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b \text{ (Sec. 17.5.1.2 \& Eq. 17.6.2.1a)}$$

A _{Nc} (in ²)	A _{Nco} (in ²)	C _{a,min} (in)	Ψ _{ec,N}	Ψ _{ed,N}	Ψ _{c,N}	Ψ _{cp,N}	N _b (lb)	φ	φN _{cbg} (lb)
240.25	144.00	12.62	1.000	1.000	1.00	1.000	6800	0.65	7374

6. Adhesive Strength of Anchor in Tension (Sec. 17.6.5)

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

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

$$N_{ba} = \lambda_a \tau_{cr} \pi d_a h_{ef} \text{ (Eq. 17.6.5.2.1)}$$

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

$$\phi N_{ag} = \phi (A_{Na} / A_{Na0}) \Psi_{ec,Na} \Psi_{ed,Na} \Psi_{cp,Na} N_{ba} \text{ (Sec. 17.5.1.2 \& Eq. 17.6.5.1b)}$$

A _{Na} (in ²)	A _{Na0} (in ²)	C _{Na} (in)	C _{a,min} (in)	Ψ _{ec,Na}	Ψ _{ed,Na}	Ψ _{cp,Na}	N _{ba} (lb)	φ	φN _{ag} (lb)
198.45	112.09	5.29	12.62	1.000	1.000	1.000	6343	0.55	6176

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



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8. Steel Strength of Anchor in Shear (Sec. 17.7.1)

V_{sa} (lb)	ϕ_{grout}	ϕ	$\phi_{grout}\phi V_{sa}$ (lb)
4680	1.0	0.65	3042

9. Concrete Breakout Strength of Anchor in Shear (Sec. 17.7.2)

Shear perpendicular to edge in x-direction:

$$V_{bx} = \min|7(l_e / d_a)^{0.2} \sqrt{d_a} \lambda_a \sqrt{f_c} c_{a1}^{1.5}; 9 \lambda_a \sqrt{f_c} c_{a1}^{1.5}| \text{ (Eq. 17.7.2.2.1a \& Eq. 17.7.2.2.1b)}$$

l_e (in)	d_a (in)	λ_a	f_c (psi)	c_{a1} (in)	V_{bx} (lb)
3.00	0.375	1.00	2500	19.12	27160

$$\phi V_{cbgx} = \phi (A_{vc} / A_{vco}) \psi_{ec,v} \psi_{ed,v} \psi_{c,v} \psi_{h,v} V_{bx} \text{ (Sec. 17.5.1.2 \& Eq. 17.7.2.1b)}$$

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)
1075.20	1645.08	1.000	0.832	1.000	1.093	27160	0.70	11302

Shear parallel to edge in y-direction:

$$V_{by} = \min|7(l_e / d_a)^{0.2} \sqrt{d_a} \lambda_a \sqrt{f_c} c_{a1}^{1.5}; 9 \lambda_a \sqrt{f_c} c_{a1}^{1.5}| \text{ (Eq. 17.7.2.2.1a \& Eq. 17.7.2.2.1b)}$$

l_e (in)	d_a (in)	λ_a	f_c (psi)	c_{a1} (in)	V_{by} (lb)
3.00	0.375	1.00	2500	12.62	14564

$$\phi V_{cbgy} = \phi (2)(A_{vc} / A_{vco}) \psi_{ec,v} \psi_{ed,v} \psi_{c,v} \psi_{h,v} V_{by} \text{ (Sec. 17.5.1.2, 17.7.2.1(c) \& Eq. 17.7.2.1b)}$$

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)
657.63	716.69	1.000	1.000	1.000	1.000	14564	0.70	18710

Shear parallel to edge in x-direction:

$$V_{bx} = \min|7(l_e / d_a)^{0.2} \sqrt{d_a} \lambda_a \sqrt{f_c} c_{a1}^{1.5}; 9 \lambda_a \sqrt{f_c} c_{a1}^{1.5}| \text{ (Eq. 17.7.2.2.1a \& Eq. 17.7.2.2.1b)}$$

l_e (in)	d_a (in)	λ_a	f_c (psi)	c_{a1} (in)	V_{bx} (lb)
3.00	0.375	1.00	2500	15.62	20055

$$\phi V_{cbgx} = \phi (2)(A_{vc} / A_{vco}) \psi_{ec,v} \psi_{ed,v} \psi_{c,v} \psi_{h,v} V_{bx} \text{ (Sec. 17.5.1.2, 17.7.2.1(c) \& Eq. 17.7.2.1b)}$$

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)
926.66	1097.93	1.000	1.000	1.000	1.000	20055	0.70	23697

10. Concrete Pryout Strength of Anchor in Shear (Sec. 17.7.3)

$$\phi V_{cp} = \phi \min|k_{cp} N_{ag}; k_{cp} N_{cbg}| = \phi \min|k_{cp} (A_{Na} / A_{Na0}) \psi_{ec,Na} \psi_{ed,Na} \psi_{cp,Na} N_{ba}; k_{cp} (A_{Nc} / A_{Nco}) \psi_{ec,N} \psi_{ed,N} \psi_{cp,N} N_{cb}| \text{ (Sec. 17.5.1.2 \& Eq. 17.7.3.1b)}$$

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	11229

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

$$\phi V_{cp} = 15721$$

11. Results

Interaction of Tension and Shear Forces (Sec. 17.8)

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
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Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.



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Steel	894	5850	0.15	Pass
Concrete breakout	3575	7374	0.48	Pass
Adhesive	3575	6176	0.58	Pass (Governs)

Shear	Factored Load, V_{ua} (lb)	Design Strength, ϕV_n (lb)	Ratio	Status
Steel	475	3042	0.16	Pass (Governs)
T Concrete breakout x+	436	11302	0.04	Pass
Concrete breakout y-	218	18710	0.01	Pass
Concrete breakout x-	924	23697	0.04	Pass
Concrete breakout, combined	-	-	0.04	Pass
Pryout	1899	15721	0.12	Pass

Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. 17.8.1	0.58	0.00	57.9%	1.0	Pass

SET-3G w/ 3/8"Ø F593 CW (304/316SS) 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.