



Project Number: U2716.0387.241

April 8, 2024

Sunmodo  
14800 NE 65<sup>th</sup> Street  
Vancouver, WA 98682

**REFERENCE: SunModo Sunturf Ground Mount D5 – Large Format 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. 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: 170 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	2553	1.5	3830
LATERAL	1473	2	2946

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

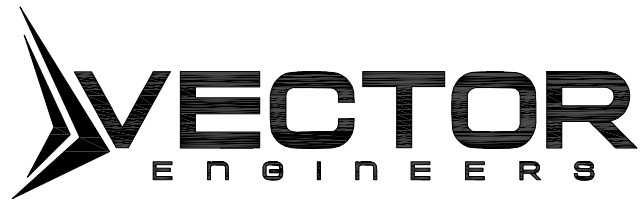
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Jacob Proctor, P.E.  
License: 74277 - Expires: 02/28/2025  
Project Engineer

Enclosures

JSP/cjt



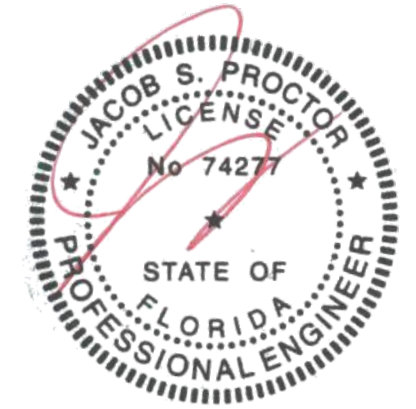
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JOB NO. U2716.0387.241  
 PROJECT SUNMODO SUNTURF GROUND MOUNT D5  
 SUBJECT ALL OPTIONS

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

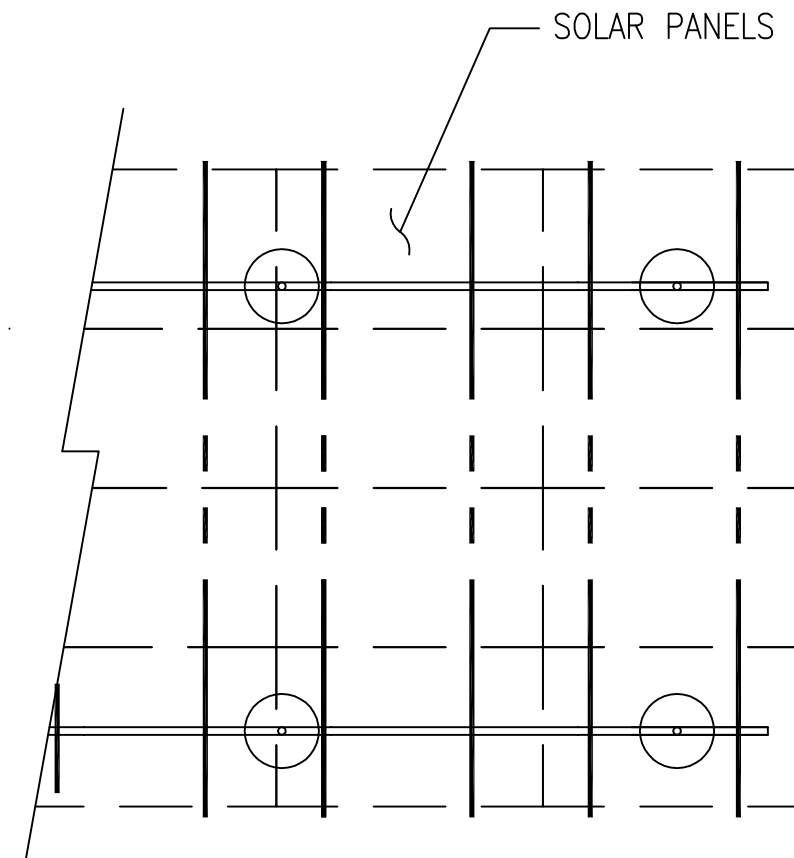
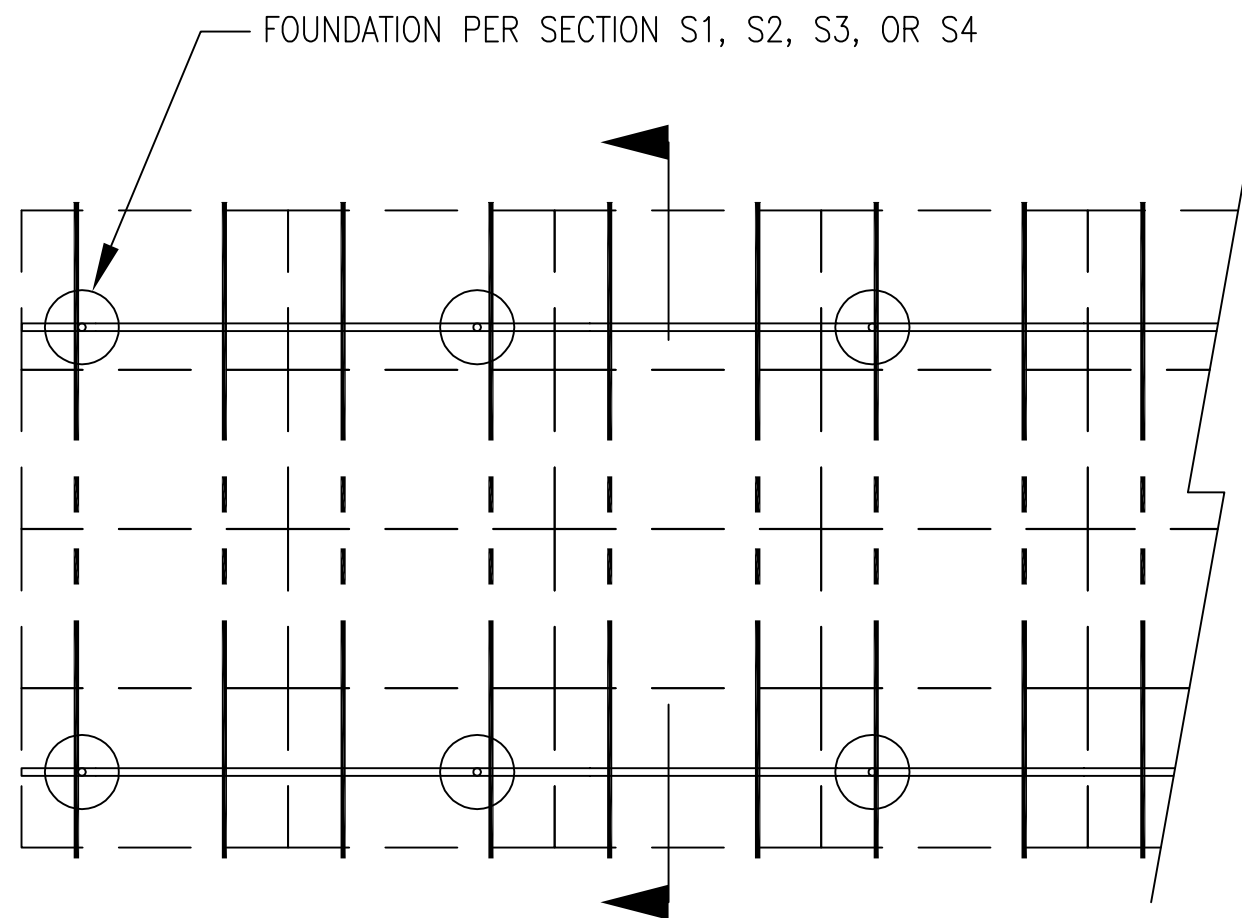
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 No. 74277

**NOTES:**

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



**PV ARRAY PLAN**

N.T.S.

**P1**



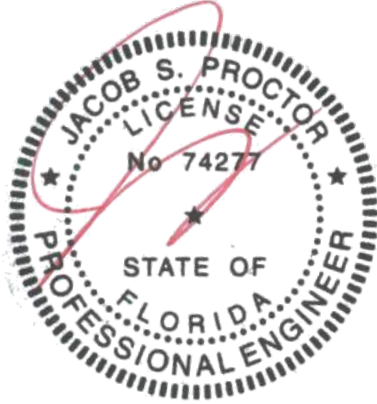
JOB NO. U2716.0387.241

PROJECT SUNMODO SUNTURF GROUND MOUNT D5

SUBJECT DRILLED PIER OPTION

**NOTES:**

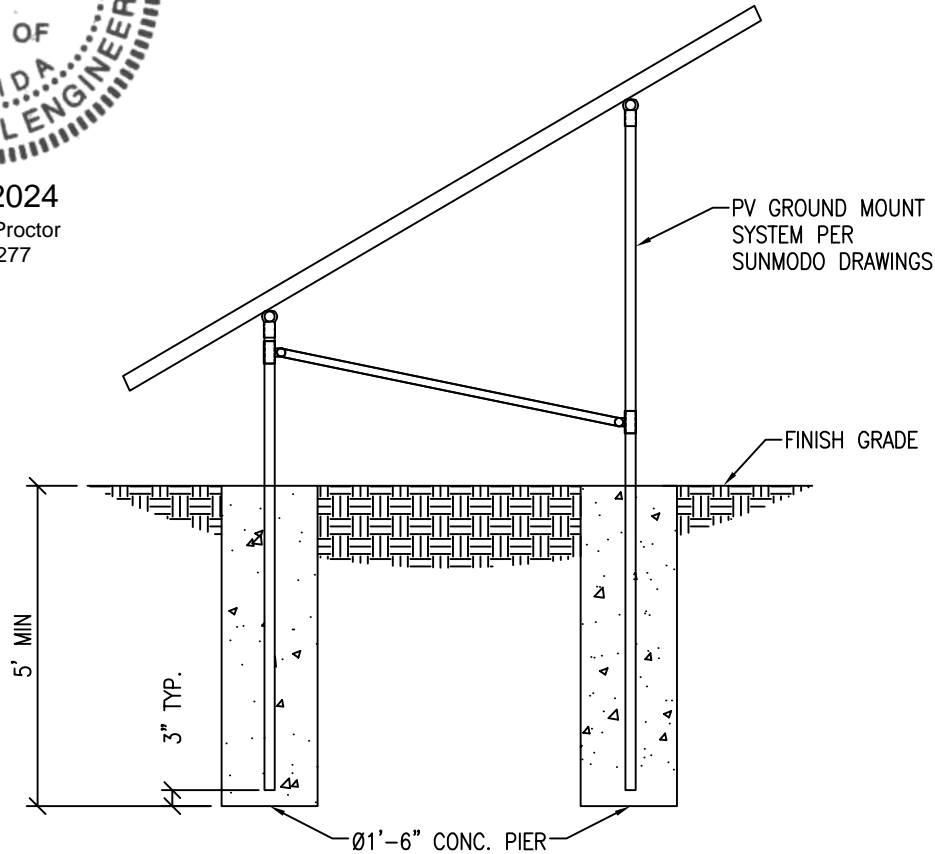
- 1. SEE SUNMODO SHOP DRAWINGS FOR GROUND MOUNT MEMBER SIZES AND GEOMETRY



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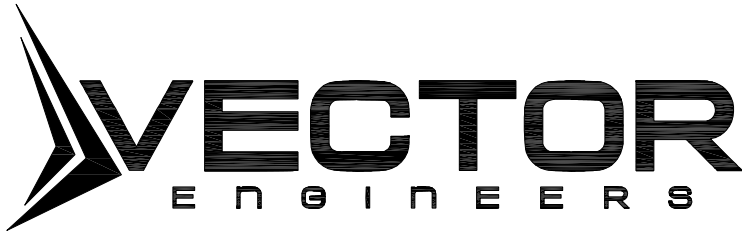
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**DRILLED PIER SECTION**

NTS.

**S1**



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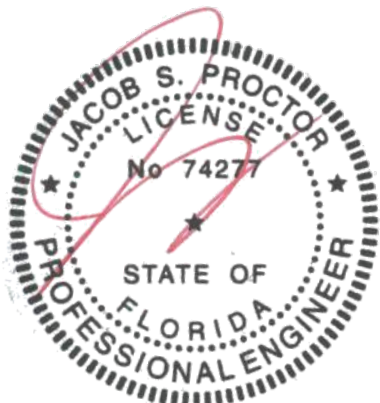
PROJECT SUNMODO SUNTURF GROUND MOUNT D5

SUBJECT HELICAL PIER OPTION

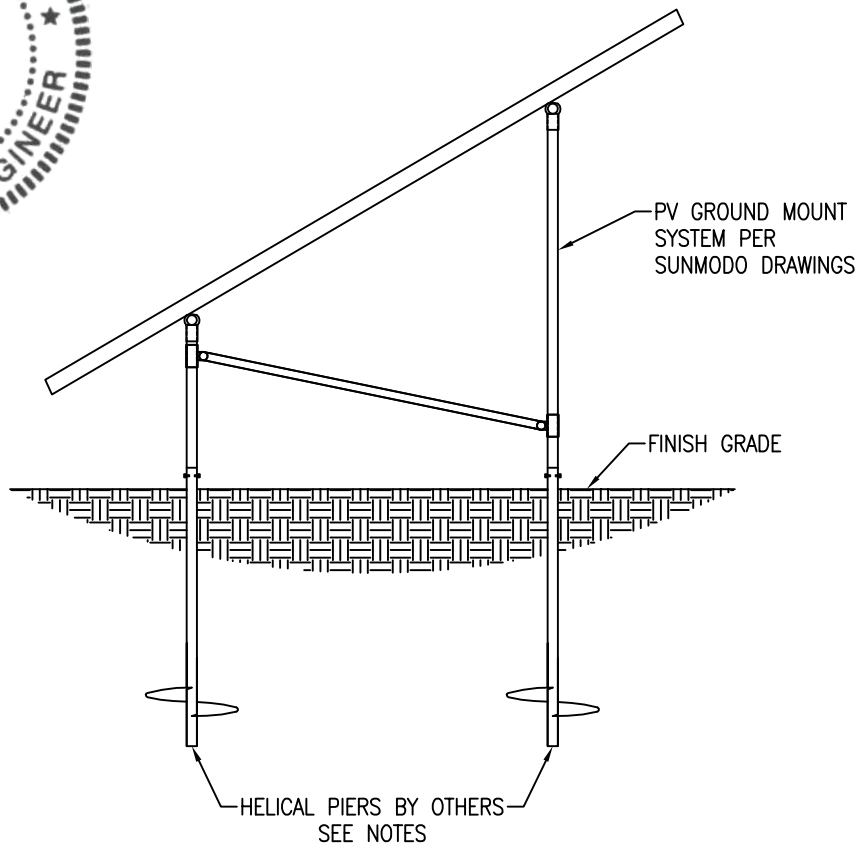
**NOTES:**

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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**HELICAL PIER SECTION**

NTS.

**S2**



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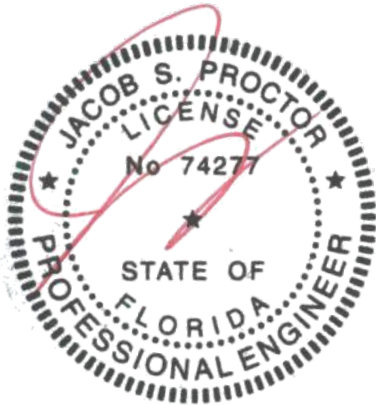
PROJECT SUNMODO SUNTURF GROUND MOUNT D5

SUBJECT GROUND SCREW OPTION

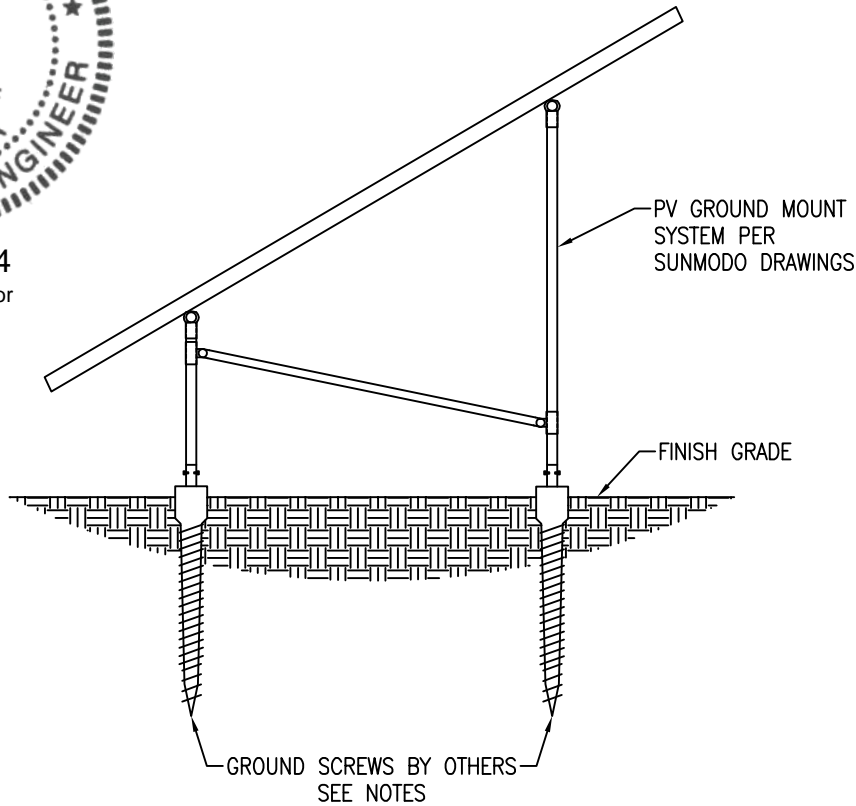
NOTES:

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
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**GROUND SCREW SECTION**

NTS.

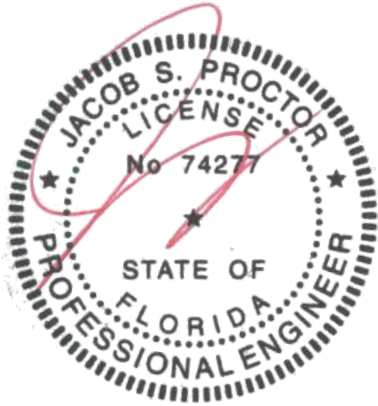
**S3**

PROJECT SUNMODO SUNTURF GROUND MOUNT D5

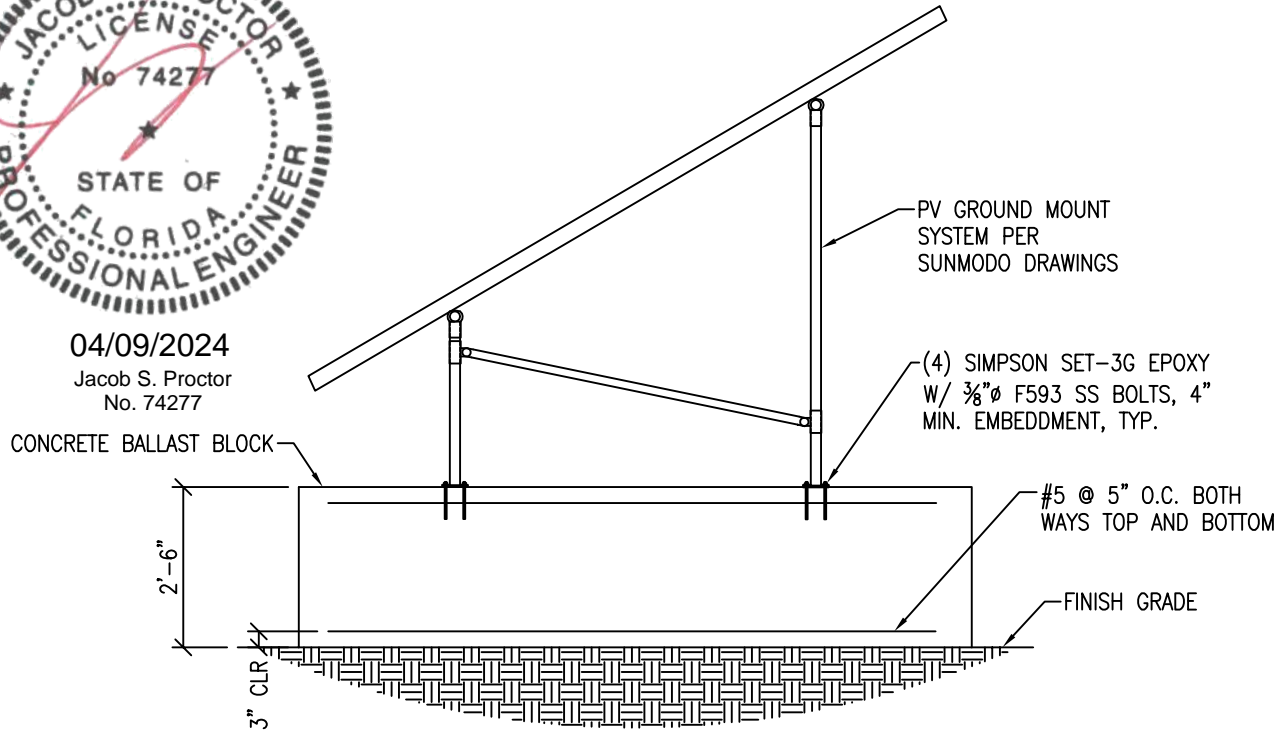
SUBJECT BALLAST BLOCK OPTION

**NOTES:**

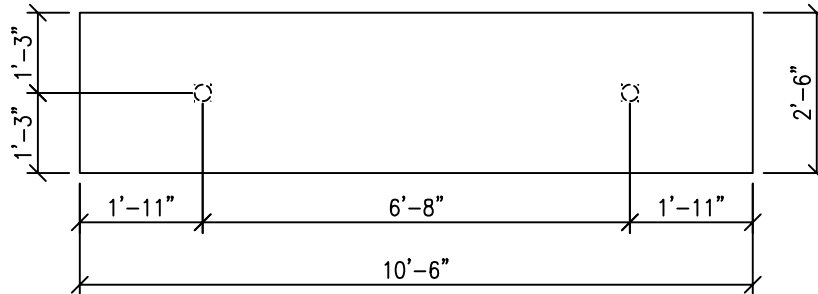
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SECTION VIEW



PLAN VIEW

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**BALLAST BLOCK SECTION**  
NTS.

**S4**



**JOB NO.:** U2716.0387.241  
**SUBJECT:** WIND PRESSURES  
**CONDITION:** 20° TILT

**PROJECT:** Sunturf Package D5 Ground Mount

**WIND PRESSURES**

Calculations per:	ASCE 7-22	
Design Wind Speed, V [mph]:	170	
Risk Category:	I	(Table 1.5-1)
Exposure Category:	C	(Section 26.7)
Elevation [ft]:	-156.2	
Ground Elevation Factor, $K_e$ :		(Not applicable)
$\alpha$ :	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]:	62.97	(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)	-59.1	-68.2
Case 2 ( $\gamma = 0^\circ$ , Load Case B)	-100.1	-9.1
Case 3 ( $\gamma = 180^\circ$ , Load Case A)	72.8	77.3
Case 4 ( $\gamma = 180^\circ$ , Load Case B)	95.5	31.8
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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**SUBJECT:** WIND PRESSURES  
**CONDITION:** 20° TILT

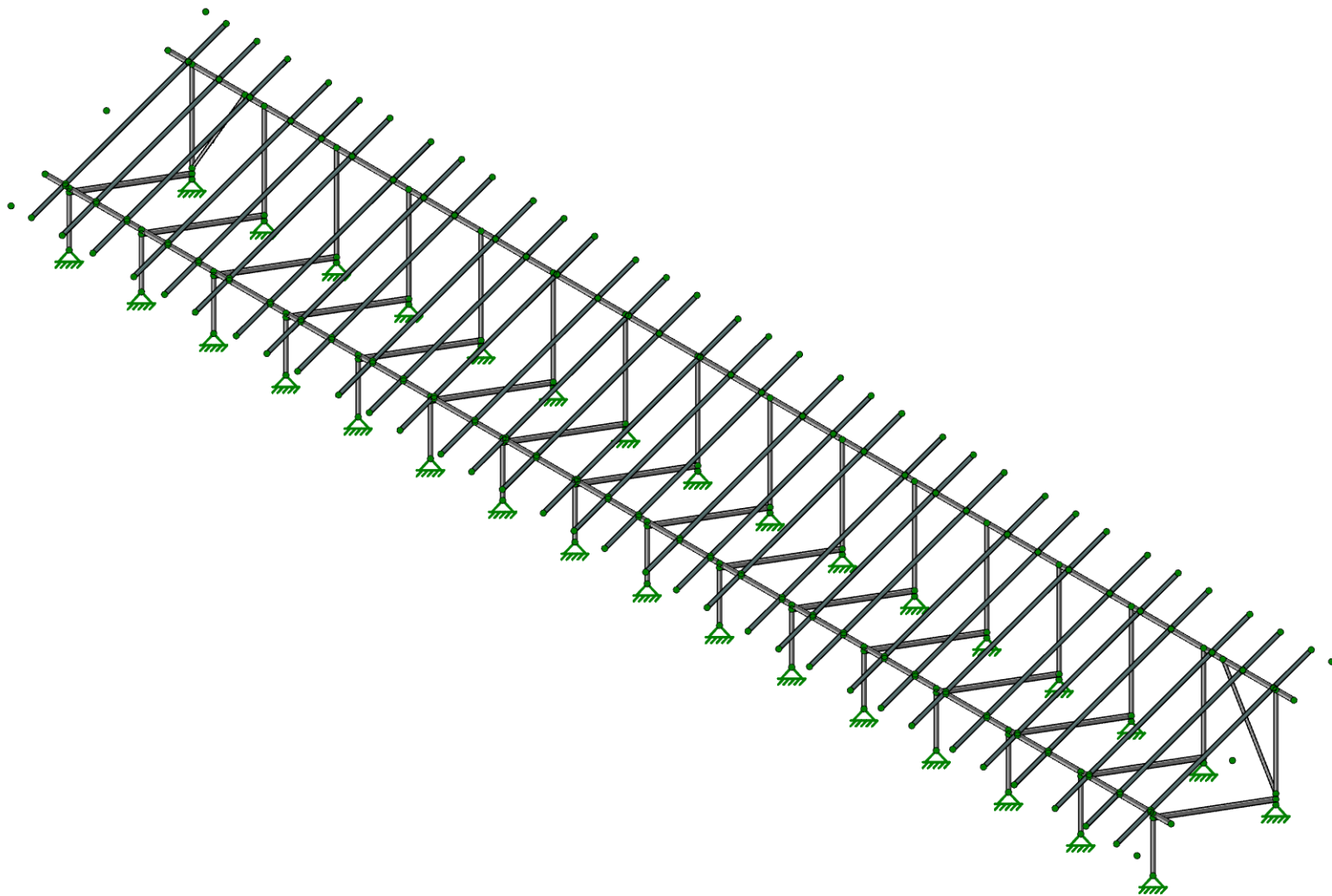
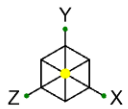
**PROJECT:** Sunturf Package D5 Ground Mount

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# Framing Analysis

## LF - 20 deg

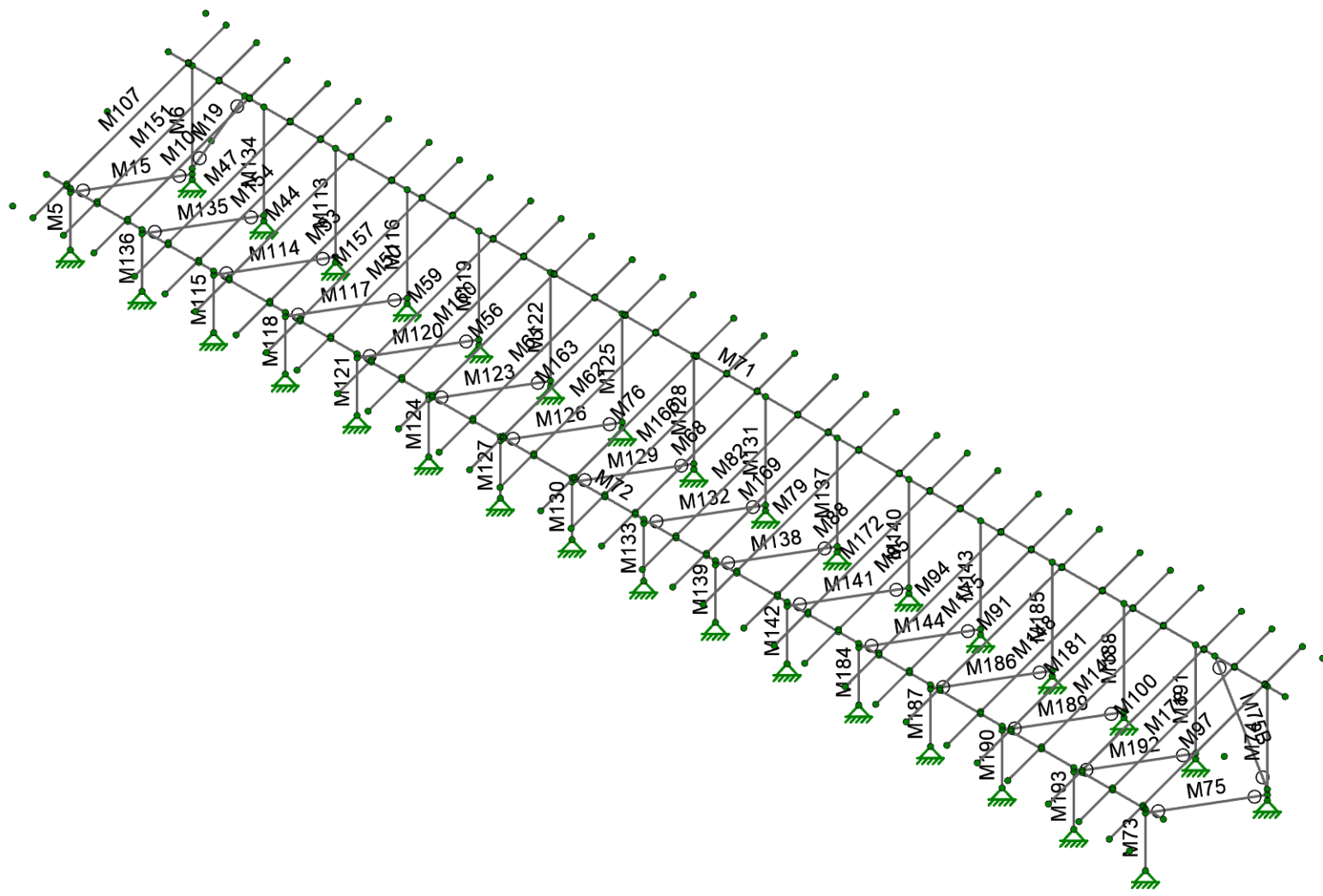
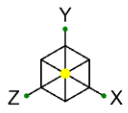




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D5 Large Format Panels - 20 Degree Tilt

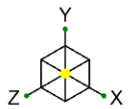
SK-1  
Mar 27, 2024  
Sunturf D5 - LF - 20deg - double brace.r...



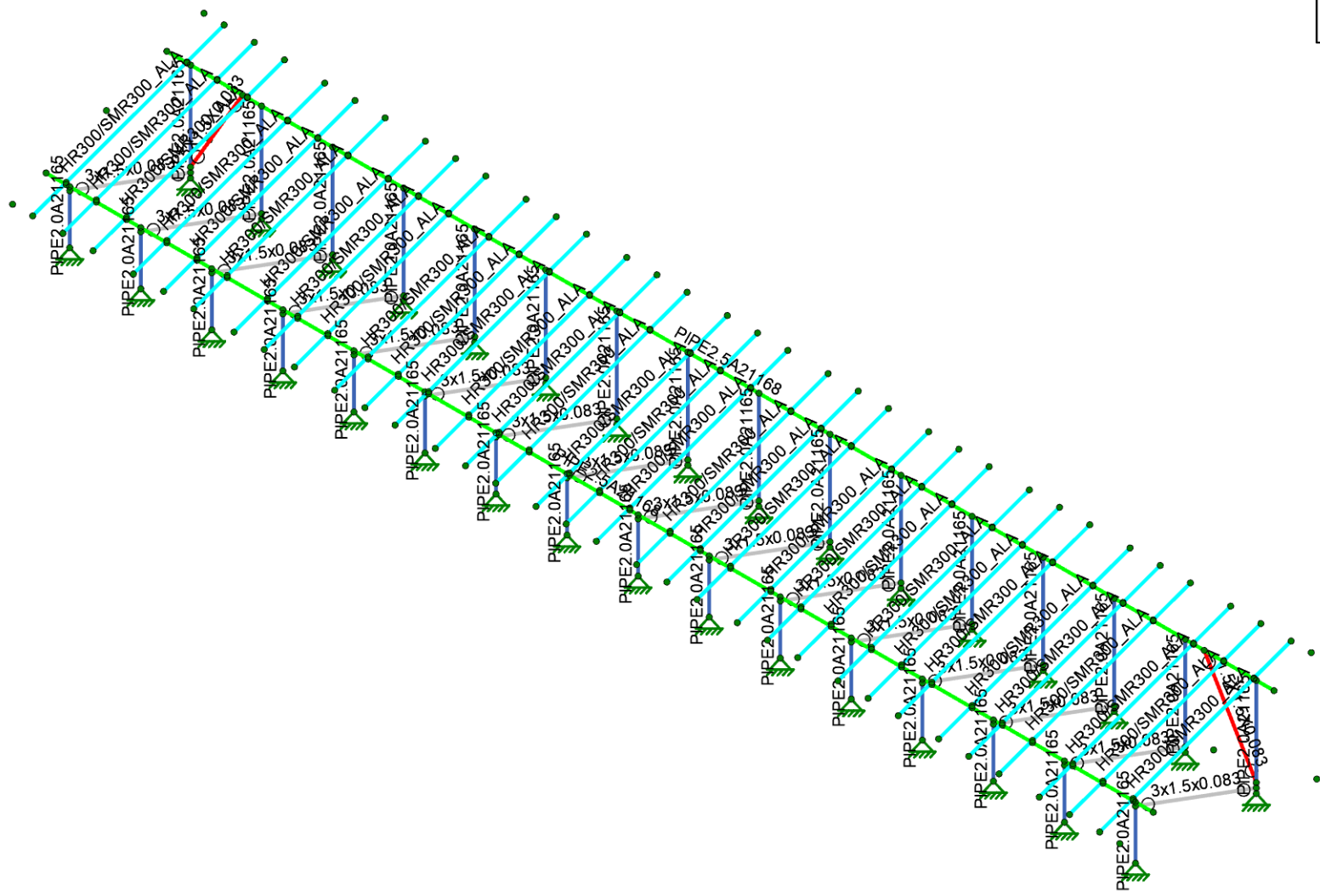
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D5 Large Format Panels - 20 Degree Tilt

SK-2  
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 Sunturf D5 - LF - 20deg - double brace.r...



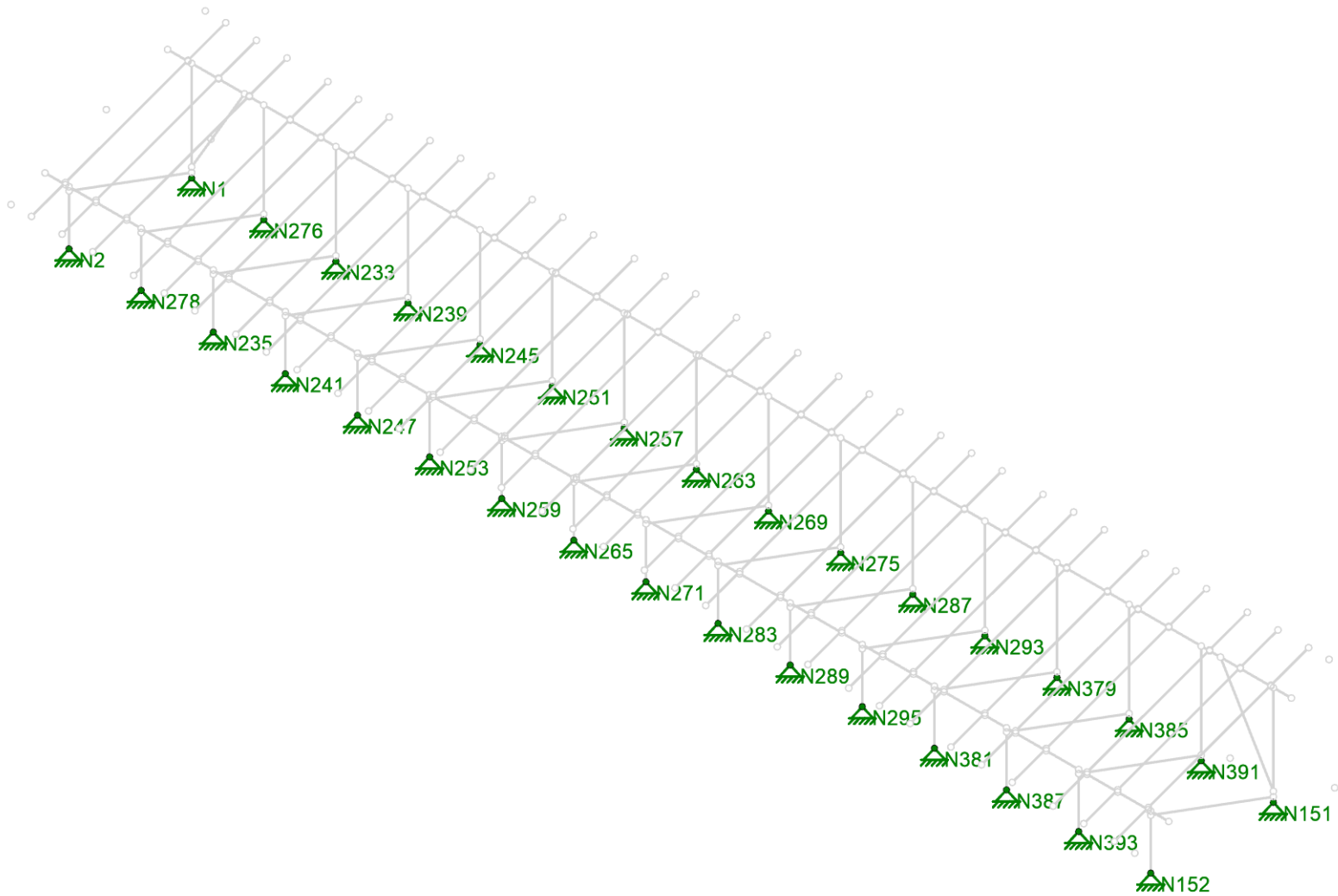
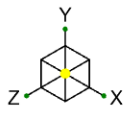
- Section Sets
- █ Post
  - █ Cross Beam
  - █ Diagonal Brace
  - █ Double Brace
  - █ RIGID
  - █ AL Rails



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D5 Large Format Panels - 20 Degree Tilt

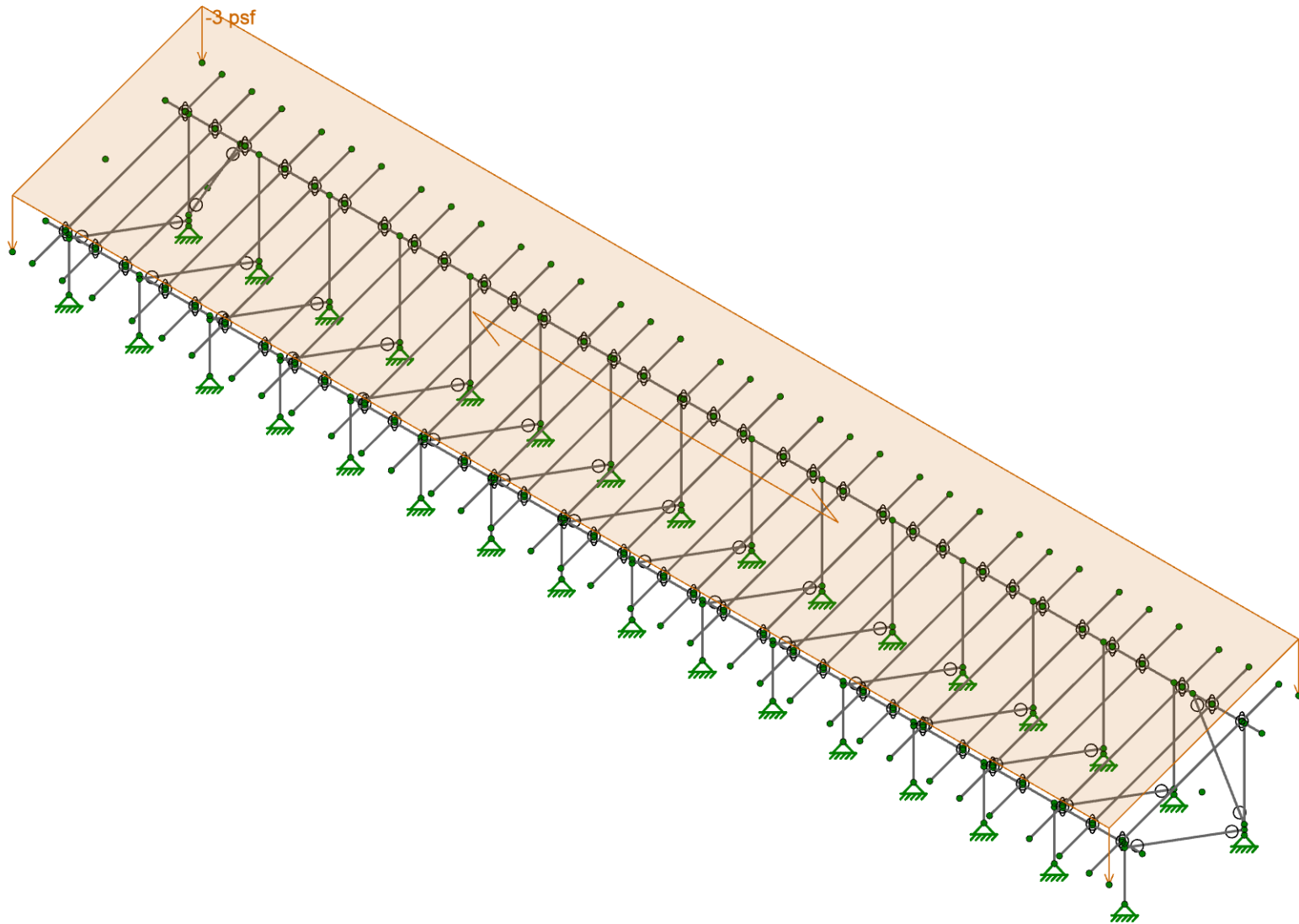
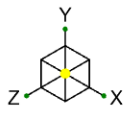
SK-3  
 Mar 27, 2024  
 Sunturf D5 - LF - 20deg - double brace.r...



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D5 Large Format Panels - 20 Degree Tilt

SK-4  
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 Sunturf D5 - LF - 20deg - double brace.r...



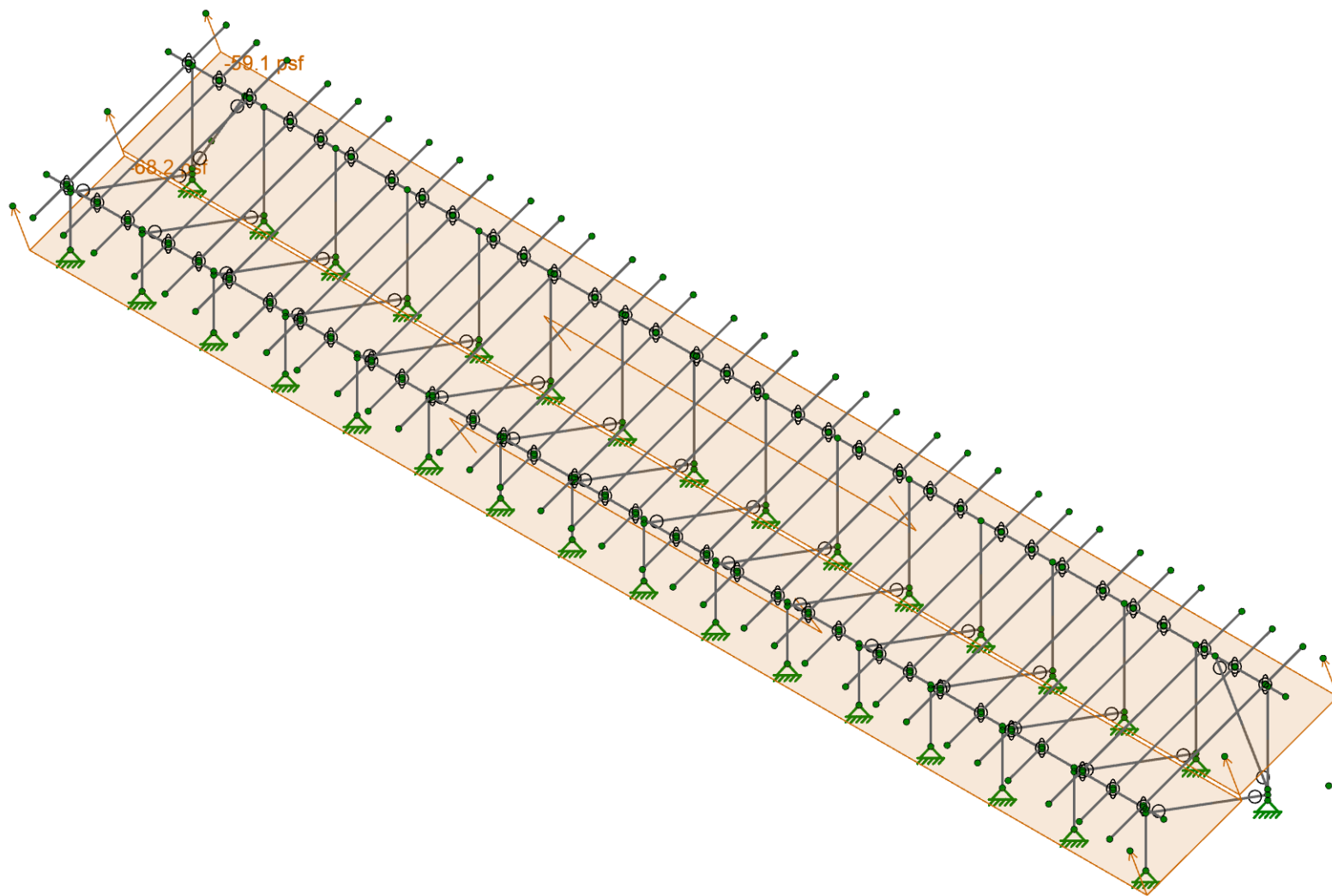
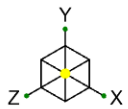
Loads: BLC 2, Solar Panel Weight




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D5 Large Format Panels - 20 Degree Tilt

SK-5  
Mar 27, 2024  
Sunturf D5 - LF - 20deg - double brace.r...

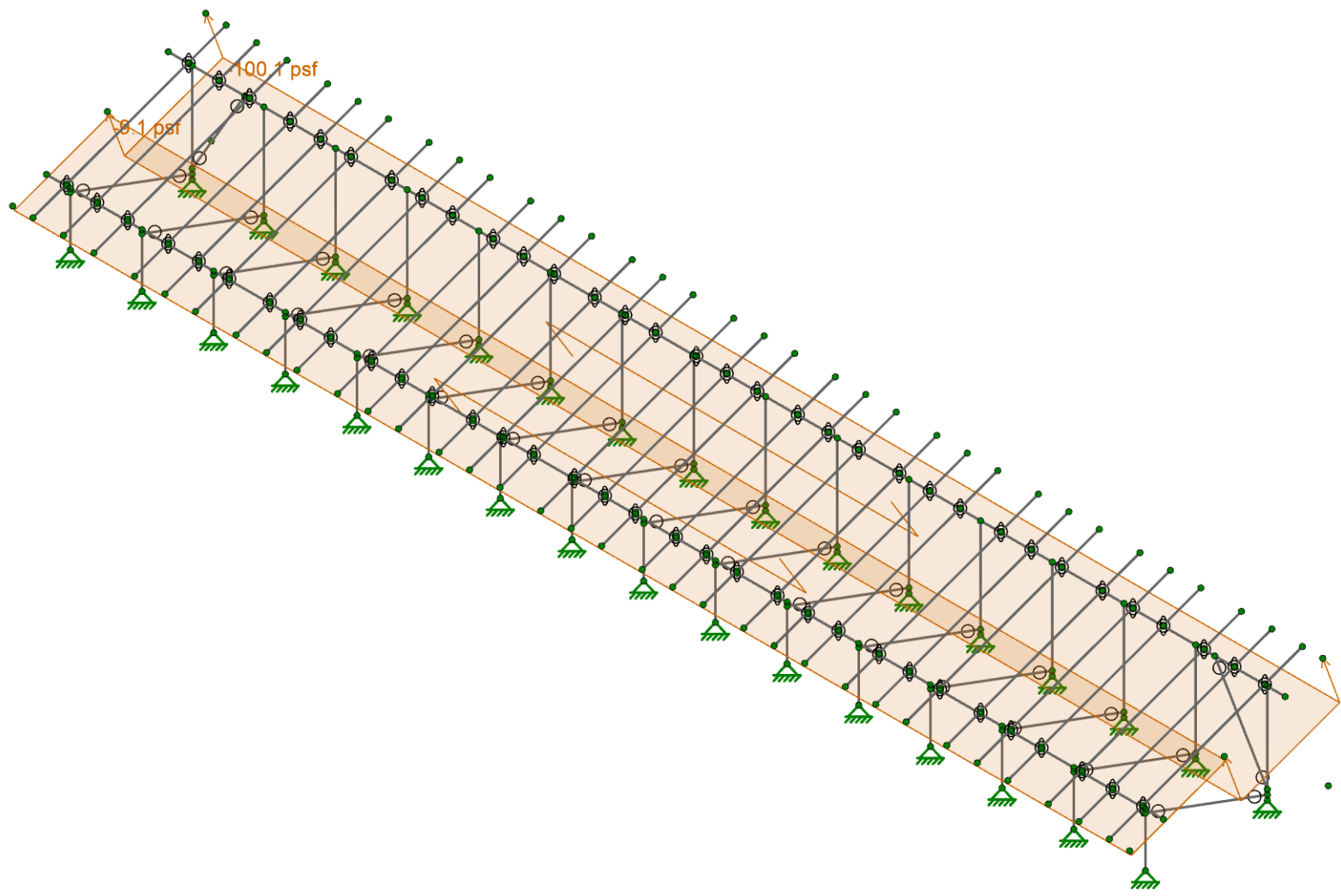
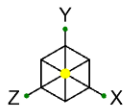


Loads: BLC 4, Wind A 0 deg

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D5 Large Format Panels - 20 Degree Tilt

SK-6
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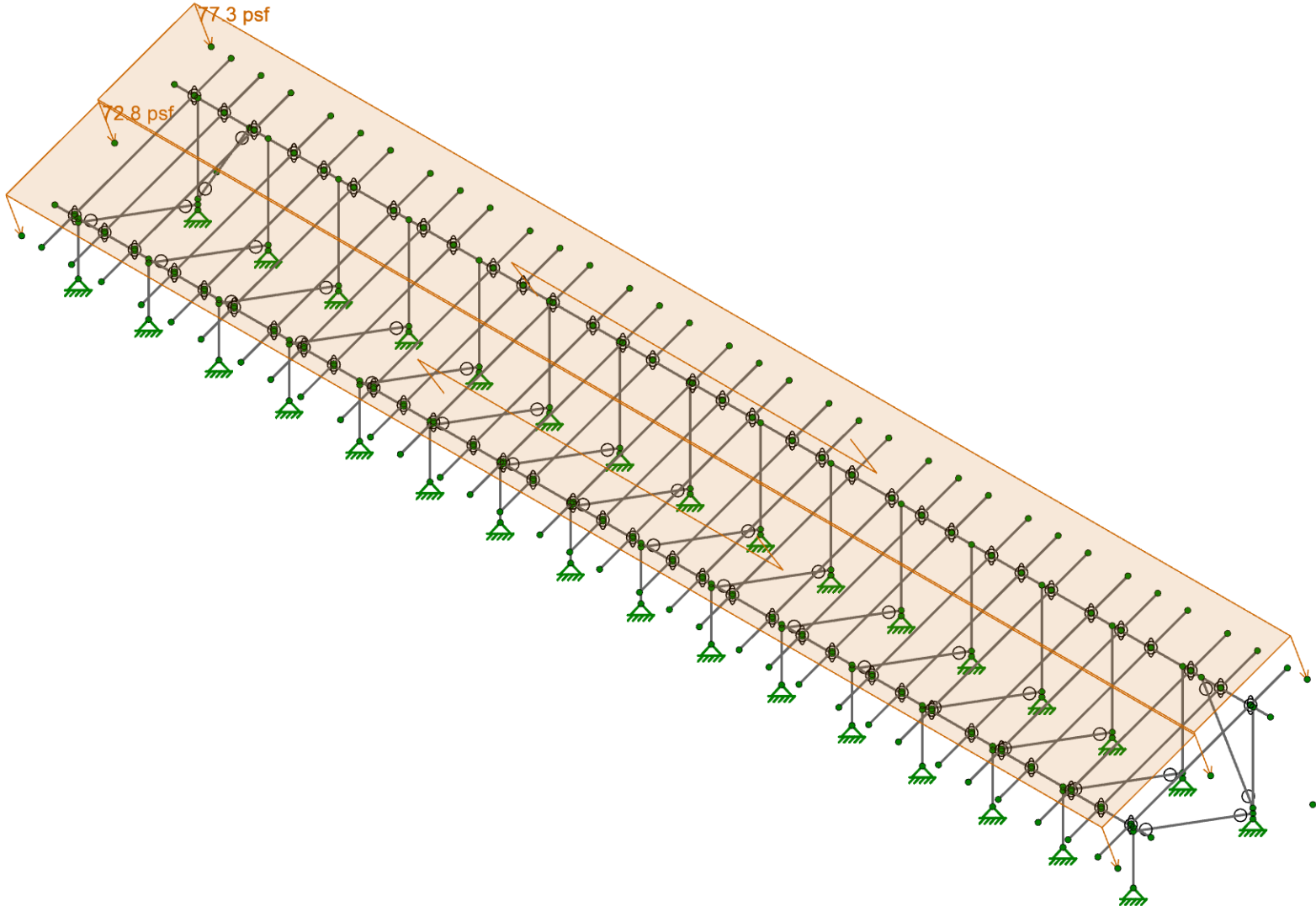
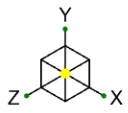
Loads: BLC 5, Wind B 0 deg



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D5 Large Format Panels - 20 Degree Tilt

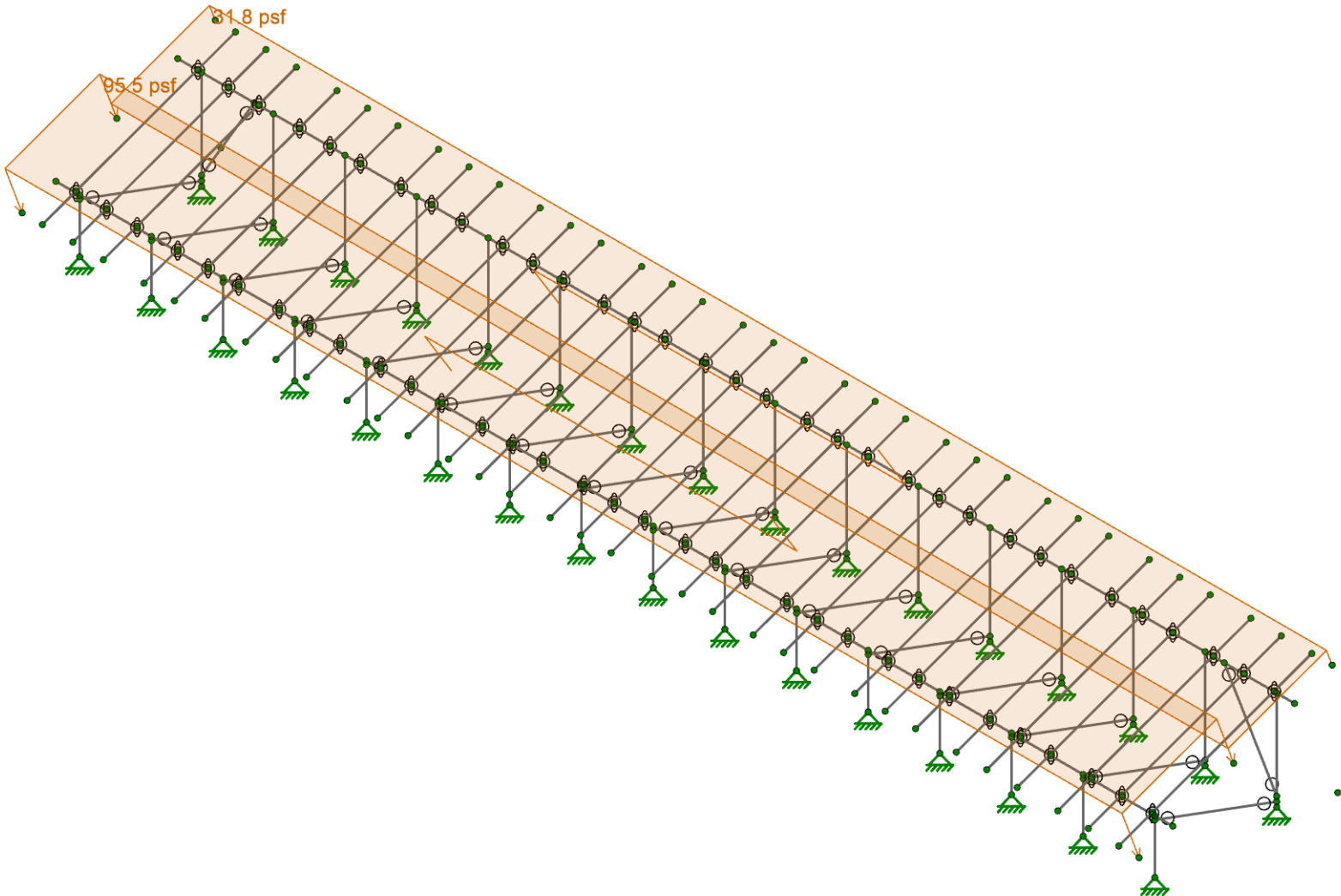
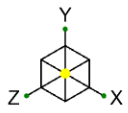
SK-7  
Mar 27, 2024  
Sunturf D5 - LF - 20deg - double brace.r...




Loads: BLC 6, Wind A 180 deg

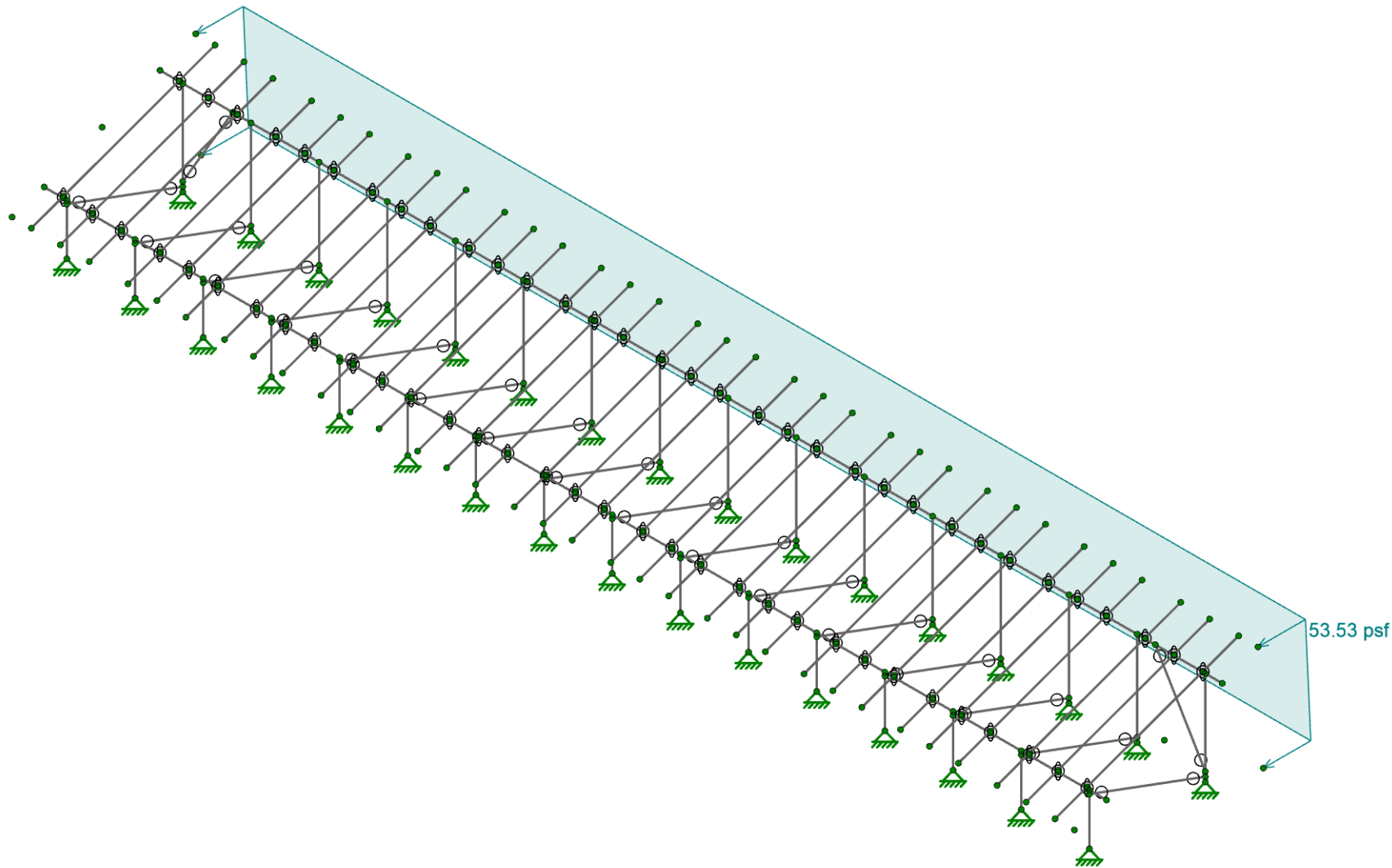
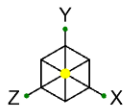
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Loads: BLC 7, Wind B 180 deg

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Loads: BLC 8, Wind Z

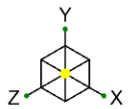


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D5 Large Format Panels - 20 Degree Tilt

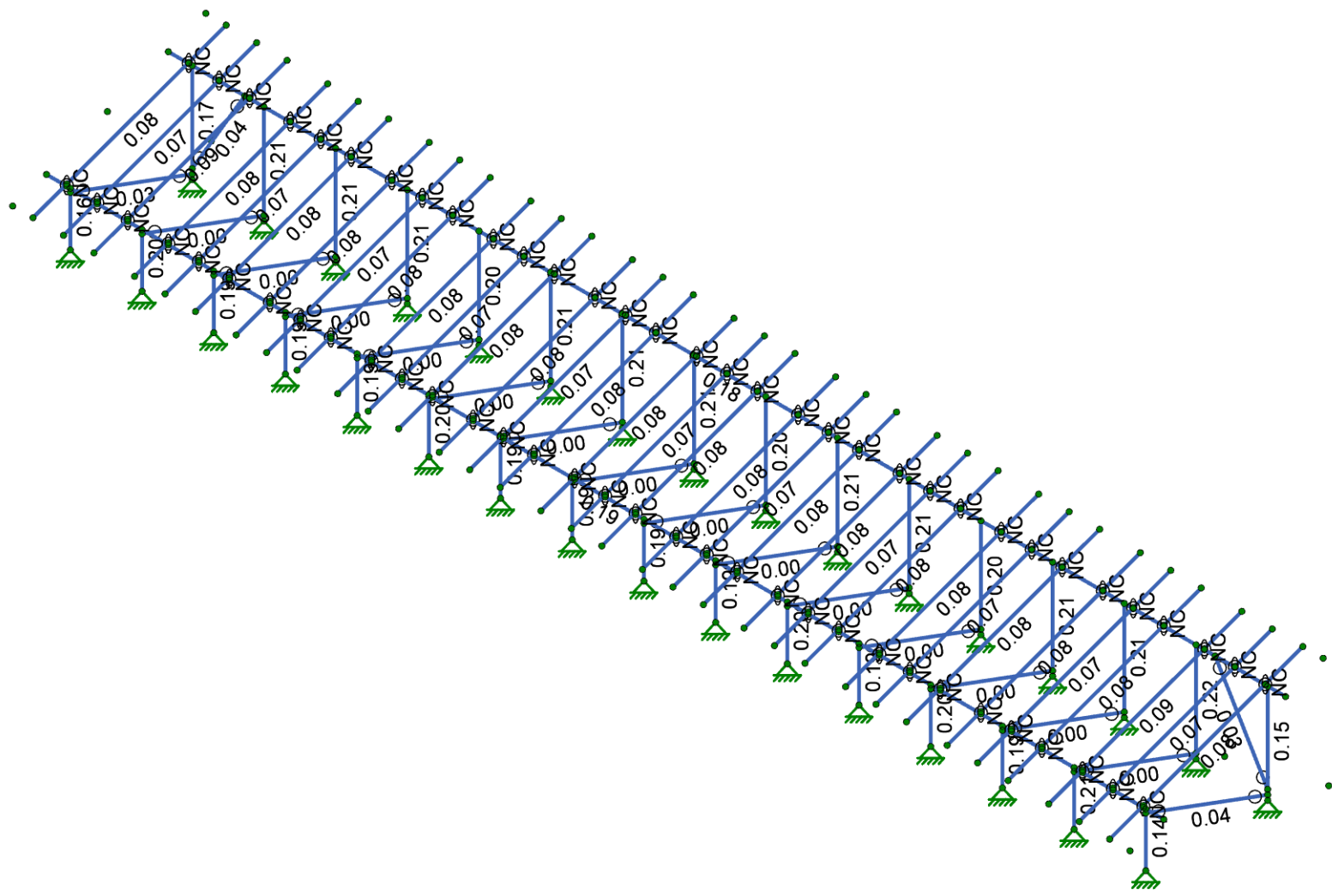
SK-10  
Mar 27, 2024  
Sunturf D5 - LF - 20deg - double brace.r...





Shear Check (Env)

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



Member Shear Checks Displayed (Enveloped)

	Vector Structural Engineering	D5 Large Format Panels - 20 Degree Tilt	SK-12
	CJT		Mar 27, 2024
	U2716.0387.241		Sunturf D5 - LF - 20deg - double brace.r...

**Model Settings**

Number of Reported Sections	5
Number of Internal Sections	100
Member Area Load Mesh Size (in <sup>2</sup> )	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



Company : Vector Structural Engineering  
Designer : CJT  
Job Number : U2716.0387.241  
Model Name : D5 Large Format Panels - 20 De...

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4:24:04 PM  
Checked By : MIH

**Model Settings (Continued)**

T Z (sec)	
T X (sec)	
C <sub>Z</sub>	0.02
C <sub>X</sub>	0.02
R Z	3
R X	3

**Hot Rolled Steel Properties**

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e <sup>6</sup> F <sup>-1</sup> ]	Density [lb/ft <sup>3</sup> ]	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 <sup>6</sup> F <sup>-1</sup> ]	Density [lb/ft <sup>3</sup> ]	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 <sup>2</sup> ]	Iyy [in <sup>4</sup> ]	Izz [in <sup>4</sup> ]	J [in <sup>4</sup> ]
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	Square Tube	A572 Gr.50	Typical	0.47	0.158	0.158	0.236
4	Double Brace	3x1.5x0.083	HBrace	Tube	A572 Gr.50	Typical	0.719	0.283	0.845	0.654

**Aluminum Section Sets**

	Label	Shape	Type	Design List	Material	Design Rule	Area [in <sup>2</sup> ]	Iyy [in <sup>4</sup> ]	Izz [in <sup>4</sup> ]	J [in <sup>4</sup> ]
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		57	
10	BLC 4 Transient Area Loads	None		196	
11	BLC 5 Transient Area Loads	None		196	
12	BLC 6 Transient Area Loads	None		196	
13	BLC 7 Transient Area Loads	None		196	
14	BLC 8 Transient Area Loads	None		133	

**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	-59.1	-59.1	-59.1	-59.1	Yes
2	N198	N201	N199	N196	Perp	A-B	-68.2	-68.2	-68.2	-68.2	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	-100.1	-100.1	-100.1	-100.1	Yes
2	N198	N201	N199	N196	Perp	A-B	-9.1	-9.1	-9.1	-9.1	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	77.3	77.3	77.3	77.3	Yes
2	N198	N201	N199	N196	Perp	A-B	72.8	72.8	72.8	72.8	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	31.8	31.8	31.8	31.8	Yes
2	N198	N201	N199	N196	Perp	A-B	95.5	95.5	95.5	95.5	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	53.53	53.53	53.53	53.53	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	N2	max	48.959	7	1015.876	7	57.954	4	0	15	0	15	0	15
2		min	-30.136	12	-426.026	12	-73.35	6	0	2	0	2	0	2
3	N1	max	327.983	6	2545.035	6	1100.629	6	0	15	0	15	0	15
4		min	-342.437	13	-2468.514	13	-954.096	4	0	2	0	2	0	2
5	N151	max	348.966	13	2260.178	6	953.083	6	0	15	0	15	0	15
6		min	-333.657	6	-2191.322	13	-827.638	4	0	2	0	2	0	2
7	N152	max	42.987	12	887.339	7	52.296	4	0	15	0	15	0	15
8		min	-70.154	7	-371.008	12	-66.1	6	0	2	0	2	0	2
9	N276	max	3.187	6	2180.948	6	1424.664	6	0	15	0	15	0	15
10		min	-3.507	13	-2045.965	13	-1226.186	4	0	2	0	2	0	2
11	N278	max	7.843	12	1319.671	7	65.901	4	0	15	0	15	0	15
12		min	-13.723	7	-566.541	12	-84.901	6	0	2	0	2	0	2
13	N233	max	4.875	13	2650.269	6	1380.598	6	0	15	0	15	0	15
14		min	-4.624	6	-2552.821	13	-1192.433	4	0	2	0	2	0	2
15	N235	max	1.861	12	1262.318	7	68.123	4	0	15	0	15	0	15
16		min	-3.282	7	-534.322	12	-87.082	6	0	2	0	2	0	2
17	N239	max	3.279	6	2610.009	6	1394.296	6	0	15	0	15	0	15
18		min	-2.908	13	-2509.032	13	-1201.566	4	0	2	0	2	0	2
19	N241	max	6.212	7	1279.611	7	68.442	4	0	15	0	15	0	15
20		min	-3.603	12	-543.797	12	-87.635	6	0	2	0	2	0	2
21	N245	max	2.847	6	2548.697	6	1342.066	6	0	15	0	15	0	15
22		min	-2.643	13	-2445.785	13	-1159.726	4	0	2	0	2	0	2
23	N247	max	6.593	7	1265.406	7	67.206	4	0	15	0	15	0	15
24		min	-3.609	12	-549.966	12	-86.117	6	0	2	0	2	0	2
25	N251	max	3.218	13	2607.206	6	1392.846	6	0	15	0	15	0	15
26		min	-3.332	6	-2508.232	13	-1201.177	4	0	2	0	2	0	2
27	N253	max	4.235	12	1265.632	7	68.524	4	0	15	0	15	0	15
28		min	-6.334	7	-534.176	12	-87.605	6	0	2	0	2	0	2
29	N257	max	1.567	6	2605.926	6	1378.079	6	0	15	0	15	0	15
30		min	-1.529	13	-2503.777	13	-1188.798	4	0	2	0	2	0	2
31	N259	max	3.515	7	1284.841	7	68.428	4	0	15	0	15	0	15
32		min	-1.781	12	-552.416	12	-87.562	6	0	2	0	2	0	2
33	N263	max	5.181	6	2587.14	6	1379.102	6	0	15	0	15	0	15
34		min	-5.103	13	-2487.318	13	-1190.044	4	0	2	0	2	0	2
35	N265	max	11.339	7	1261.978	7	68.202	4	0	15	0	15	0	15
36		min	-6.724	12	-536.359	12	-87.192	6	0	2	0	2	0	2
37	N269	max	4.807	13	2561.813	6	1357.53	6	0	15	0	15	0	15
38		min	-5.076	6	-2460.144	13	-1172.335	4	0	2	0	2	0	2
39	N271	max	4.904	12	1262.937	7	67.648	4	0	15	0	15	0	15
40		min	-8.875	7	-543.921	12	-86.583	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	N275	max	2.768	13	2612.912	6	1385.585	6	0	15	0	15
42		min	-3.122	6	-2511.392	13	-1194.93	4	0	2	0	2
43	N283	max	2.069	12	1281.66	7	68.484	4	0	15	0	15
44		min	-4.332	7	-547.828	12	-87.667	6	0	2	0	2
45	N287	max	2.788	6	2616.155	6	1395.968	6	0	15	0	15
46		min	-2.932	13	-2516.647	13	-1203.551	4	0	2	0	2
47	N289	max	6.92	7	1270.947	7	68.589	4	0	15	0	15
48		min	-4.551	12	-536.89	12	-87.758	6	0	2	0	2
49	N293	max	0.144	10	2543.985	6	1337.476	6	0	15	0	15
50		min	-0.524	13	-2440.593	13	-1155.912	4	0	2	0	2
51	N295	max	0.891	7	1266.037	7	67.056	4	0	15	0	15
52		min	-0.549	12	-551.654	12	-85.966	6	0	2	0	2
53	N379	max	2.205	13	2611.111	6	1397.316	6	0	15	0	15
54		min	-2.858	6	-2511.233	13	-1204.383	4	0	2	0	2
55	N381	max	2.964	12	1275.622	7	68.411	4	0	15	0	15
56		min	-4.361	7	-539.766	12	-87.55	6	0	2	0	2
57	N385	max	4.205	6	2632.601	6	1368.726	6	0	15	0	15
58		min	-4.767	13	-2534.492	13	-1181.891	4	0	2	0	2
59	N387	max	3.642	7	1261.448	7	67.806	4	0	15	0	15
60		min	-1.623	12	-537.153	12	-86.662	6	0	2	0	2
61	N391	max	0.874	6	2269.075	6	1472.772	6	0	15	0	15
62		min	-0.742	12	-2131.334	13	-1267.866	4	0	2	0	2
63	N393	max	23.667	7	1342.646	7	65.636	4	0	15	0	15
64		min	-13.984	12	-571.182	12	-84.552	6	0	2	0	2
65	Totals:	max	0.001	12	52468.439	6	20106.456	6				
66		min	-0.004	7	-36912.872	12	-17463.829	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	0.253	41.936	6	0.16	41.936	6	18506.511	23232.186	1397.505	1397.505	1	H1-1b	
2	M6	PIPE2.0A21165	0.459	3.446	6	0.174	0	6	10679.301	23232.186	1397.505	1397.505	1	H1-1a	
3	M15	3x1.5x0.083	0.35	56.643	6	0.034	108.755	y	6	3597.736	21540.24	952.46	1737.715	1.136	H1-1a
4	M19	1.5X1.5X0.083	0.233	47.861	6	0.035	86.692	y	6	3159.436	14085.15	624.421	624.421	1.136	H1-1a
5	M73	PIPE2.0A21165	0.279	41.936	7	0.14	41.936	6	18506.511	23232.186	1397.505	1397.505	1	H1-1b	
6	M74	PIPE2.0A21165	0.405	3.446	6	0.152	0	6	10679.301	23232.186	1397.505	1397.505	1	H1-1a	
7	M75	3x1.5x0.083	0.303	56.643	6	0.038	108.755	y	6	3597.753	21540.24	952.46	1737.715	1.136	H1-1a
8	M75B	1.5X1.5X0.083	0.229	47.861	6	0.032	86.692	y	6	3159.436	14085.15	624.421	624.421	1.136	H1-1a
9	M71	PIPE2.5A21168	0.436	681.771	13	0.178	321.406	13	20336.2	28358.413	2081.747	2081.747	1	H1-1b	
10	M72	PIPE2.5A21168	0.421	681.771	7	0.193	866.823	7	20336.2	28358.413	2081.747	2081.747	1	H1-1b	
11	M134	PIPE2.0A21165	0.475	3.446	6	0.213	0	6	10679.301	23232.186	1397.505	1397.505	1	H1-1a	
12	M135	3x1.5x0.083	0.452	56.643	6	0.005	108.755	y	5	3597.753	21540.24	952.46	1737.715	1.136	H1-1a
13	M136	PIPE2.0A21165	0.254	41.47	6	0.2	41.936	6	18506.511	23232.186	1397.505	1397.505	1	H1-1b	
14	M113	PIPE2.0A21165	0.513	3.446	6	0.208	0	6	10679.301	23232.186	1397.505	1397.505	1	H1-1a	
15	M114	3x1.5x0.083	0.439	56.643	6	0.004	108.755	y	6	3597.753	21540.24	952.46	1737.715	1.136	H1-1a
16	M115	PIPE2.0A21165	0.257	41.47	6	0.193	41.936	6	18506.511	23232.186	1397.505	1397.505	1	H1-1b	
17	M116	PIPE2.0A21165	0.512	3.446	6	0.21	0	6	10679.301	23232.186	1397.505	1397.505	1	H1-1a	
18	M117	3x1.5x0.083	0.443	56.643	6	0.003	108.755	y	6	3597.753	21540.24	952.46	1737.715	1.136	H1-1a
19	M118	PIPE2.0A21165	0.259	41.47	6	0.195	41.936	6	18506.511	23232.186	1397.505	1397.505	1	H1-1b	
20	M119	PIPE2.0A21165	0.496	3.446	6	0.203	0	6	10679.301	23232.186	1397.505	1397.505	1	H1-1a	
21	M120	3x1.5x0.083	0.426	56.643	6	0.002	108.755	y	7	3597.753	21540.24	952.46	1737.715	1.136	H1-1a
22	M121	PIPE2.0A21165	0.256	41.47	6	0.187	41.936	6	18506.511	23232.186	1397.505	1397.505	1	H1-1b	
23	M122	PIPE2.0A21165	0.511	3.446	6	0.21	0	6	10679.301	23232.186	1397.505	1397.505	1	H1-1a	
24	M123	3x1.5x0.083	0.442	56.643	6	0.004	108.755	y	6	3597.753	21540.24	952.46	1737.715	1.136	H1-1a
25	M124	PIPE2.0A21165	0.259	41.47	6	0.195	41.936	6	18506.511	23232.186	1397.505	1397.505	1	H1-1b	
26	M125	PIPE2.0A21165	0.508	3.446	6	0.208	0	6	10679.301	23232.186	1397.505	1397.505	1	H1-1a	

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

Member	Shape	Code Check	Loc[in]	LC	Shear Check	Loc[in]	Dir	LC	Pnc/om [lb]	Pnt/om [lb]	Mnyy/om [lb-ft]	Mnzz/om [lb-ft]	Cb	Eqn	
27	M126	3x1.5x0.083	0.437	56.643	6	0.002	108.755	y	7	3597.753	21540.24	952.46	1737.715	1.136	H1-1a
28	M127	PIPE2.0A21165	0.259	41.47	6	0.192	41.936		6	18506.511	23232.186	1397.505	1397.505	1	H1-1b
29	M128	PIPE2.0A21165	0.507	3.446	6	0.208	0		6	10679.301	23232.186	1397.505	1397.505	1	H1-1a
30	M129	3x1.5x0.083	0.438	56.643	6	0.004	108.755	y	6	3597.753	21540.24	952.46	1737.715	1.136	H1-1a
31	M130	PIPE2.0A21165	0.259	41.47	6	0.193	41.936		6	18506.511	23232.186	1397.505	1397.505	1	H1-1b
32	M131	PIPE2.0A21165	0.5	3.446	6	0.205	0		6	10679.301	23232.186	1397.505	1397.505	1	H1-1a
33	M132	3x1.5x0.083	0.431	56.643	6	0.003	108.755	y	7	3597.753	21540.24	952.46	1737.715	1.136	H1-1a
34	M133	PIPE2.0A21165	0.257	41.47	6	0.189	41.936		6	18506.511	23232.186	1397.505	1397.505	1	H1-1b
35	M137	PIPE2.0A21165	0.51	3.446	6	0.209	0		6	10679.301	23232.186	1397.505	1397.505	1	H1-1a
36	M138	3x1.5x0.083	0.44	56.643	6	0.002	108.755	y	7	3597.753	21540.24	952.46	1737.715	1.136	H1-1a
37	M139	PIPE2.0A21165	0.259	41.47	6	0.193	41.936		6	18506.511	23232.186	1397.505	1397.505	1	H1-1b
38	M140	PIPE2.0A21165	0.513	3.446	6	0.211	0		6	10679.301	23232.186	1397.505	1397.505	1	H1-1a
39	M141	3x1.5x0.083	0.443	56.643	6	0.004	108.755	y	6	3597.753	21540.24	952.46	1737.715	1.136	H1-1a
40	M142	PIPE2.0A21165	0.259	41.47	6	0.196	41.936		6	18506.511	23232.186	1397.505	1397.505	1	H1-1b
41	M143	PIPE2.0A21165	0.495	3.446	6	0.202	0		6	10679.301	23232.186	1397.505	1397.505	1	H1-1a
42	M144	3x1.5x0.083	0.425	56.643	6	0.002	108.755	y	5	3597.753	21540.24	952.46	1737.715	1.136	H1-1a
43	M184	PIPE2.0A21165	0.255	41.47	6	0.186	41.936		6	18506.511	23232.186	1397.505	1397.505	1	H1-1b
44	M185	PIPE2.0A21165	0.512	3.446	6	0.211	0		6	10679.301	23232.186	1397.505	1397.505	1	H1-1a
45	M186	3x1.5x0.083	0.444	56.643	6	0.003	108.755	y	6	3597.753	21540.24	952.46	1737.715	1.136	H1-1a
46	M187	PIPE2.0A21165	0.259	41.47	6	0.196	41.936		6	18506.511	23232.186	1397.505	1397.505	1	H1-1b
47	M188	PIPE2.0A21165	0.509	3.446	6	0.206	0		6	10679.301	23232.186	1397.505	1397.505	1	H1-1a
48	M189	3x1.5x0.083	0.435	56.643	6	0.003	108.755	y	6	3597.753	21540.24	952.46	1737.715	1.136	H1-1a
49	M190	PIPE2.0A21165	0.256	41.47	6	0.191	41.936		6	18506.511	23232.186	1397.505	1397.505	1	H1-1b
50	M191	PIPE2.0A21165	0.493	3.446	6	0.221	0		6	10679.301	23232.186	1397.505	1397.505	1	H1-1a
51	M192	3x1.5x0.083	0.468	56.643	6	0.004	108.755	y	7	3597.753	21540.24	952.46	1737.715	1.136	H1-1a
52	M193	PIPE2.0A21165	0.256	41.47	6	0.207	41.936		6	18506.511	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	M101	HR300/SMR300_ALA	0.957	82.417	6	0.086	30.458	y	7	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.396	H.1-1
2	M107	HR300/SMR300_ALA	0.955	80.625	6	0.083	30.458	y	7	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.426	H.1-1
3	M44	HR300/SMR300_ALA	0.934	82.417	6	0.082	30.458	y	7	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.398	H.1-1
4	M47	HR300/SMR300_ALA	0.922	82.417	6	0.082	30.458	y	7	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.399	H.1-1
5	M50	HR300/SMR300_ALA	0.922	82.417	6	0.082	30.458	y	7	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.399	H.1-1
6	M53	HR300/SMR300_ALA	0.934	82.417	6	0.082	30.458	y	7	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.398	H.1-1
7	M56	HR300/SMR300_ALA	0.966	82.417	6	0.081	30.458	y	7	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.395	H.1-1
8	M59	HR300/SMR300_ALA	0.954	82.417	6	0.085	137.958	y	13	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.396	H.1-1
9	M62	HR300/SMR300_ALA	0.892	82.417	6	0.081	30.458	y	7	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.401	H.1-1
10	M65	HR300/SMR300_ALA	0.903	82.417	6	0.082	30.458	y	7	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.4	H.1-1
11	M68	HR300/SMR300_ALA	0.966	82.417	6	0.084	137.958	y	13	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.395	H.1-1
12	M76	HR300/SMR300_ALA	0.972	82.417	6	0.081	30.458	y	7	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.395	H.1-1
13	M79	HR300/SMR300_ALA	0.916	82.417	6	0.082	30.458	y	7	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.399	H.1-1
14	M82	HR300/SMR300_ALA	0.908	82.417	6	0.081	30.458	y	7	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.4	H.1-1
15	M85	HR300/SMR300_ALA	0.938	82.417	6	0.084	137.958	y	13	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.398	H.1-1
16	M88	HR300/SMR300_ALA	0.953	82.417	6	0.082	30.458	y	7	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.396	H.1-1
17	M91	HR300/SMR300_ALA	0.952	82.417	6	0.082	30.458	y	7	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.396	H.1-1
18	M94	HR300/SMR300_ALA	0.938	82.417	6	0.084	137.958	y	13	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.398	H.1-1
19	M97	HR300/SMR300_ALA	0.961	80.625	6	0.085	137.958	y	13	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.426	H.1-1
20	M100	HR300/SMR300_ALA	0.97	82.417	6	0.086	30.458	y	7	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.395	H.1-1
21	M151	HR300/SMR300_ALA	0.685	82.417	6	0.071	30.458	y	7	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.415	H.1-1
22	M154	HR300/SMR300_ALA	0.821	82.417	6	0.074	137.958	y	13	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.396	H.1-1
23	M157	HR300/SMR300_ALA	0.82	82.417	6	0.073	137.958	y	13	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.396	H.1-1
24	M160	HR300/SMR300_ALA	0.781	82.417	6	0.071	30.458	y	7	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.4	H.1-1
25	M163	HR300/SMR300_ALA	0.848	82.417	6	0.07	30.458	y	7	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.393	H.1-1
26	M166	HR300/SMR300_ALA	0.764	84.208	6	0.07	30.458	y	7	3168.559	14342.564	533.921	934.619	7307.692	3206.154	1.401	H.1-1



Company : Vector Structural Engineering  
 Designer : CJT  
 Job Number : U2716.0387.241  
 Model Name : D5 Large Format Panels - 20 De...

3/27/2024  
 4:24:04 PM  
 Checked By : MIH

**Envelope AA ADM1-20: ASD - BUILDING Member Aluminum Code Checks (Continued)**

Member	Shape	Code Check	Loc[in]	LC	Shear Check	LOC[in]	Dir	LC	Pnc/Om[lb]	Pnt/Om[lb]	Mny/Om[lb-ft]	Mnz/Om[lb-ft]	Vny/Om[lb]	Vnz/Om[lb]	Cb	Eqn
27	M169	HR300/SMR300_ALA	0.838	82.417	6	0.072	137.958	y	133168.559	14342.564	533.921	934.619	7307.692	3206.154	1.394	H.1-1
28	M172	HR300/SMR300_ALA	0.799	82.417	6	0.072	137.958	y	133168.559	14342.564	533.921	934.619	7307.692	3206.154	1.398	H.1-1
29	M175	HR300/SMR300_ALA	0.799	82.417	6	0.072	137.958	y	133168.559	14342.564	533.921	934.619	7307.692	3206.154	1.398	H.1-1
30	M178	HR300/SMR300_ALA	0.669	82.417	6	0.069	30.458	y	73168.559	14342.564	533.921	934.619	7307.692	3206.154	1.416	H.1-1
31	M145	HR300/SMR300_ALA	0.909	82.417	6	0.082	30.458	y	73168.559	14342.564	533.921	934.619	7307.692	3206.154	1.4	H.1-1
32	M148	HR300/SMR300_ALA	0.916	82.417	6	0.082	30.458	y	73168.559	14342.564	533.921	934.619	7307.692	3206.154	1.4	H.1-1
33	M181	HR300/SMR300_ALA	0.838	82.417	6	0.073	137.958	y	133168.559	14342.564	533.921	934.619	7307.692	3206.154	1.394	H.1-1



JOB NO.: U2716.0387.241

PROJECT: SunTurf Package D5

SUBJECT: CALCULATIONS

DESIGN APPROACH ASD

CONNECTION CAPACITY

Location: Column Base (set screws)

Connection Type: M16 Conical Set Screws

Tensile Capacity: 2600 lbs

Tension Load: 2553 lbs

Check Connection: 98.2%

Result: **Select M16 Conical Set Screws**

Note: Uplift capacity. FOS of (2)

CONNECTION CAPACITY

Location: Column to Cross Beam

Connection Type: K10341-002

Tensile Capacity: 2195 lbs

Tension Load: 2167 lbs

Check Connection: 98.7%

Result: **Select K10341-002**

Note: Uplift capacity. FOS of (2)



JOB NO.: U2716.0387.241

PROJECT: SunTurf Package D5

SUBJECT: CALCULATIONS

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**CONNECTION CAPACITY**

Location: Brace to Column

Connection Type: K10219-001

Capacity: 3173 lbs

Tension Load: 1641 lbs

Check Connection: 51.7%

Result: **Select K10219-001**

Note: Axial capacity. FOS of (2)

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**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: 1153 lbs

Check Bolt: 13.7%

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

Note:

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**JOB NO.:** U2716.0387.241  
**SUBJECT:** WIND PRESSURES  
**CONDITION:** 20° TILT

**PROJECT:** Sunturf Package D5 Ground Mount

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# ALTERNATE FOUNDATION OPTION 1: DRILLED CONCRETE PIER



PROJECT: Sunturf Package D5 Ground Mount

**DRILLED CONCRETE PIER DESIGN**

**Column Reactions:**

Max. Shear, V [k]:	1.5	Max. Down, P <sub>d</sub> [k]:	2.7
Max. Moment, M [k-ft]:	0.0	Max. Uplift, P <sub>u</sub> [k]:	2.6

**Pier Properties:**

Pier Shape:	Round	Volume of Concrete [ft <sup>3</sup> ]:	9
Pier Diameter, b [ft]:	1.5	Volume of Concrete [yd <sup>3</sup> ]:	0.3
Top of Pier Elevation [ft]:	0.00	Weight of Concrete [k]:	1.3
Pier Depth, d [ft]:	5.0		

**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]:	5.9
-----------------------	-----

**Bearing capacity OK.**

**Check Uplift:**

Uplift Capacity [k]:	7.1
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**Uplift capacity OK.**

**Check Lateral Bearing:**

Top of Pier Constrained?:	No
Applied Lateral Force, P [lb]:	1,500
Point of Application, h [ft]:	0.0
S <sub>max</sub> [psf]:	
S [psf]:	500
A = 2.34*P/(Sb):	4.68
Required Pier Depth, d <sub>reqd</sub> [ft]:	4.70

IBC Section 1807.3.2.1

IBC Eq. 18-1

Result: **Lateral bearing capacity OK.**



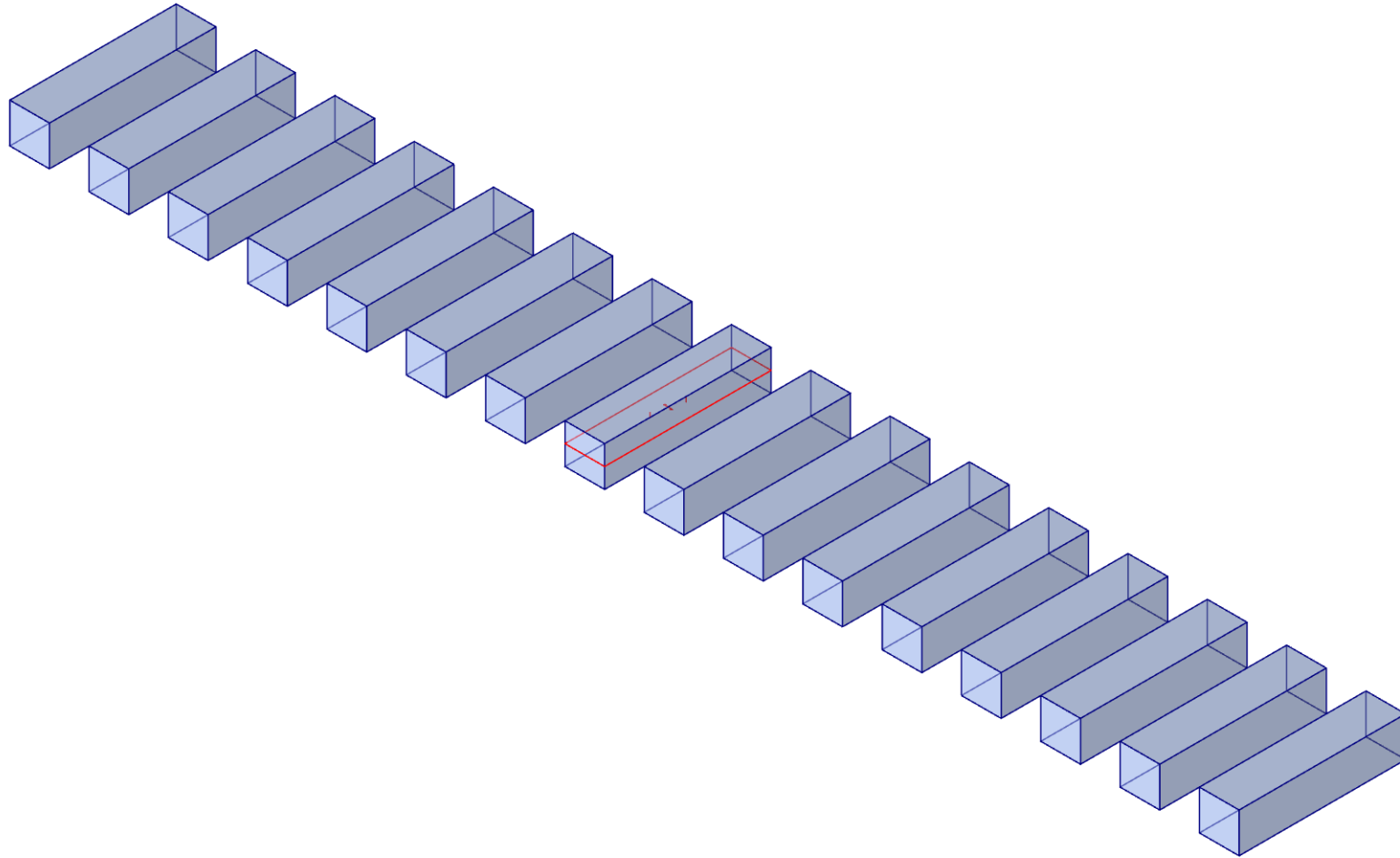


**JOB NO.:** U2716.0387.241  
**SUBJECT:** WIND PRESSURES  
**CONDITION:** 20° TILT

**PROJECT:** Sunturf Package D5 Ground Mount

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# ALTERNATE FOUNDATION OPTION 2: CONCRETE BALLAST BLOCK



Vector Structural Engineering  
CJT  
U2716.0387.241

Ground Mount

SK-1  
Mar 27, 2024 at 05:14 PM  
Sunturf D5 - LF - 20deg - double brace.r...

### Concrete Properties

Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [ $1e^{-5}F^{-1}$ ]	Density [lb/ft <sup>3</sup> ]	fc [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 <sup>3</sup> ]	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	30	Conc3000NW	0	0	0	0	0.25
2 S2	30	Conc3000NW	0	0	0	0	0.25
3 S3	30	Conc3000NW	0	0	0	0	0.25
4 S4	30	Conc3000NW	0	0	0	0	0.25
5 S5	30	Conc3000NW	0	0	0	0	0.25
6 S6	30	Conc3000NW	0	0	0	0	0.25
7 S7	30	Conc3000NW	0	0	0	0	0.25
8 S8	30	Conc3000NW	0	0	0	0	0.25
9 S9	30	Conc3000NW	0	0	0	0	0.25
10 S10	30	Conc3000NW	0	0	0	0	0.25
11 S11	30	Conc3000NW	0	0	0	0	0.25
12 S12	30	Conc3000NW	0	0	0	0	0.25
13 S13	30	Conc3000NW	0	0	0	0	0.25
14 S14	30	Conc3000NW	0	0	0	0	0.25
15 S15	30	Conc3000NW	0	0	0	0	0.25
16 S16	30	Conc3000NW	0	0	0	0	0.25

### Load Category

Category	Node Loads
1 DL	37
2 WLZ	57
3 OL1	95
4 OL2	88
5 OL3	95
6 OL4	95

### 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				

**Load Combination (Continued)**

	Label	Solve	Service	SF	Category	Factor	Category	Factor	Category	Factor
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
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	90	50	Typical
2	DS2	0	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	0.001	27	#5@5in				DS1-X26	0.002	25	#5@5in							DS1-X26	0.009	25						DS1-X50	
2	DS2	0.018	25	#5@5in				DS2-X25	0.023	28	#5@5in							DS2-X25	0.075	28						DS2-X10	

**Slab Soil Pressures**

	LC	Label	UC	Soil Pressure[psf]	Allowable Bearing[psf]	Node
1	2	S1	0.253	379.957	1500	N456
2	2	S2	0.251	375.783	1500	N461
3	2	S3	0.251	377.078	1500	N470
4	2	S4	0.251	376.687	1500	N477
5	2	S5	0.251	376.519	1500	N484
6	2	S6	0.251	376.657	1500	N491
7	2	S7	0.251	376.779	1500	N498
8	2	S8	0.251	376.596	1500	N505
9	2	S9	0.251	376.537	1500	N512
10	2	S10	0.251	376.772	1500	N519
11	2	S11	0.251	376.708	1500	N526

**Slab Soil Pressures (Continued)**

	LC	Label	UC	Soil Pressure[psf]	Allowable Bearing[psf]	Node
12	2	S12	0.251	376.505	1500	N533
13	2	S13	0.251	376.664	1500	N540
14	2	S14	0.251	377.021	1500	N547
15	2	S15	0.251	375.954	1500	N552
16	2	S16	0.252	378.678	1500	N561
17	3	S1	0.253	379.957	1500	N456
18	3	S2	0.251	375.783	1500	N461
19	3	S3	0.251	377.078	1500	N470
20	3	S4	0.251	376.687	1500	N477
21	3	S5	0.251	376.519	1500	N484
22	3	S6	0.251	376.657	1500	N491
23	3	S7	0.251	376.779	1500	N498
24	3	S8	0.251	376.596	1500	N505
25	3	S9	0.251	376.537	1500	N512
26	3	S10	0.251	376.772	1500	N519
27	3	S11	0.251	376.708	1500	N526
28	3	S12	0.251	376.505	1500	N533
29	3	S13	0.251	376.664	1500	N540
30	3	S14	0.251	377.021	1500	N547
31	3	S15	0.251	375.954	1500	N552
32	3	S16	0.252	378.678	1500	N561
33	4	S1	0.259	388.441	1500	N28
34	4	S2	0.239	358.678	1500	N32
35	4	S3	0.253	378.994	1500	N35
36	4	S4	0.251	376.333	1500	N39
37	4	S5	0.249	373.673	1500	N43
38	4	S6	0.252	377.372	1500	N48
39	4	S7	0.25	375.276	1500	N51
40	4	S8	0.251	376.478	1500	N55
41	4	S9	0.25	374.794	1500	N60
42	4	S10	0.251	376.024	1500	N63
43	4	S11	0.252	377.361	1500	N68
44	4	S12	0.249	373.325	1500	N72
45	4	S13	0.251	376.808	1500	N87
46	4	S14	0.252	378.129	1500	N91
47	4	S15	0.241	360.936	1500	N95
48	4	S16	0.257	385.892	1500	N100
49	5	S1	0.351	526.609	1500	N454
50	5	S2	0.346	518.353	1500	N461
51	5	S3	0.361	542.245	1500	N468
52	5	S4	0.36	540.661	1500	N475
53	5	S5	0.355	533.233	1500	N482
54	5	S6	0.36	540.679	1500	N489
55	5	S7	0.359	538.762	1500	N496
56	5	S8	0.359	538.352	1500	N503
57	5	S9	0.357	535.125	1500	N510
58	5	S10	0.36	539.933	1500	N517
59	5	S11	0.361	541.363	1500	N524
60	5	S12	0.355	532.656	1500	N531
61	5	S13	0.361	541.122	1500	N538
62	5	S14	0.36	540.472	1500	N545
63	5	S15	0.35	524.986	1500	N552
64	5	S16	0.338	506.771	1500	N559
65	6	S1	0.429	642.934	1500	N456
66	6	S2	0.388	582.662	1500	N463

**Slab Soil Pressures (Continued)**

	LC	Label	UC	Soil Pressure[psf]	Allowable Bearing[psf]	Node
67	6	S3	0.431	645.783	1500	N470
68	6	S4	0.427	639.852	1500	N477
69	6	S5	0.421	632.109	1500	N484
70	6	S6	0.427	640.019	1500	N491
71	6	S7	0.426	639.149	1500	N498
72	6	S8	0.425	637.476	1500	N505
73	6	S9	0.423	634.015	1500	N512
74	6	S10	0.427	640.16	1500	N519
75	6	S11	0.427	640.986	1500	N526
76	6	S12	0.421	631.44	1500	N533
77	6	S13	0.427	640.141	1500	N540
78	6	S14	0.429	643.578	1500	N547
79	6	S15	0.395	592.865	1500	N554
80	6	S16	0.408	611.943	1500	N561
81	7	S1	0.329	494.211	1500	N456
82	7	S2	0.32	479.787	1500	N461
83	7	S3	0.326	489.651	1500	N470
84	7	S4	0.324	485.66	1500	N477
85	7	S5	0.321	482.115	1500	N484
86	7	S6	0.324	486.029	1500	N491
87	7	S7	0.324	485.531	1500	N498
88	7	S8	0.323	484.852	1500	N505
89	7	S9	0.322	483.116	1500	N512
90	7	S10	0.324	486.015	1500	N519
91	7	S11	0.324	486.445	1500	N526
92	7	S12	0.321	481.76	1500	N533
93	7	S13	0.324	485.796	1500	N540
94	7	S14	0.326	488.596	1500	N547
95	7	S15	0.32	480.453	1500	N552
96	7	S16	0.32	480.183	1500	N561
97	8	S1	0.256	383.706	1500	N28
98	8	S2	0.242	362.954	1500	N32
99	8	S3	0.252	377.632	1500	N35
100	8	S4	0.25	375.703	1500	N39
101	8	S5	0.249	373.664	1500	N43
102	8	S6	0.251	376.464	1500	N48
103	8	S7	0.25	374.897	1500	N51
104	8	S8	0.251	375.781	1500	N55
105	8	S9	0.25	374.508	1500	N60
106	8	S10	0.25	375.461	1500	N63
107	8	S11	0.251	376.462	1500	N68
108	8	S12	0.249	373.402	1500	N72
109	8	S13	0.251	376.058	1500	N87
110	8	S14	0.251	376.977	1500	N91
111	8	S15	0.243	364.691	1500	N95
112	8	S16	0.254	381.545	1500	N100
113	9	S1	0.325	487.332	1500	N454
114	9	S2	0.322	482.711	1500	N461
115	9	S3	0.333	500.071	1500	N468
116	9	S4	0.333	498.949	1500	N475
117	9	S5	0.329	493.334	1500	N482
118	9	S6	0.333	498.944	1500	N489
119	9	S7	0.332	497.512	1500	N496
120	9	S8	0.331	497.187	1500	N503
121	9	S9	0.33	494.757	1500	N510

**Slab Soil Pressures (Continued)**

	LC	Label	UC	Soil Pressure[psf]	Allowable Bearing[psf]	Node
122	9	S10	0.332	498.393	1500	N517
123	9	S11	0.333	499.463	1500	N524
124	9	S12	0.329	492.901	1500	N531
125	9	S13	0.333	499.294	1500	N538
126	9	S14	0.332	498.735	1500	N545
127	9	S15	0.325	487.728	1500	N552
128	9	S16	0.315	472.205	1500	N559
129	10	S1	0.385	577.19	1500	N456
130	10	S2	0.353	530.16	1500	N463
131	10	S3	0.386	578.607	1500	N470
132	10	S4	0.383	574.061	1500	N477
133	10	S5	0.379	568.211	1500	N484
134	10	S6	0.383	574.179	1500	N491
135	10	S7	0.382	573.556	1500	N498
136	10	S8	0.382	572.256	1500	N505
137	10	S9	0.38	569.646	1500	N512
138	10	S10	0.383	574.313	1500	N519
139	10	S11	0.383	574.917	1500	N526
140	10	S12	0.378	567.707	1500	N533
141	10	S13	0.383	574.272	1500	N540
142	10	S14	0.385	576.939	1500	N547
143	10	S15	0.359	537.912	1500	N554
144	10	S16	0.369	553.627	1500	N561
145	11	S1	0.31	465.647	1500	N456
146	11	S2	0.303	453.786	1500	N461
147	11	S3	0.308	461.508	1500	N470
148	11	S4	0.306	458.416	1500	N477
149	11	S5	0.304	455.716	1500	N484
150	11	S6	0.306	458.686	1500	N491
151	11	S7	0.306	458.343	1500	N498
152	11	S8	0.305	457.788	1500	N505
153	11	S9	0.304	456.471	1500	N512
154	11	S10	0.306	458.704	1500	N519
155	11	S11	0.306	459.011	1500	N526
156	11	S12	0.304	455.446	1500	N533
157	11	S13	0.306	458.513	1500	N540
158	11	S14	0.307	460.702	1500	N547
159	11	S15	0.303	454.328	1500	N552
160	11	S16	0.303	454.807	1500	N561
161	12	S1	0.16	240.64	1500	N28
162	12	S2	0.139	208.365	1500	N32
163	12	S3	0.153	229.574	1500	N35
164	12	S4	0.151	226.809	1500	N40
165	12	S5	0.149	224.219	1500	N43
166	12	S6	0.152	227.877	1500	N48
167	12	S7	0.151	225.771	1500	N51
168	12	S8	0.151	227.002	1500	N55
169	12	S9	0.15	225.333	1500	N60
170	12	S10	0.151	226.516	1500	N63
171	12	S11	0.152	227.856	1500	N68
172	12	S12	0.149	223.872	1500	N71
173	12	S13	0.152	227.285	1500	N87
174	12	S14	0.152	228.721	1500	N91
175	12	S15	0.14	210.555	1500	N95
176	12	S16	0.159	238.49	1500	N100

**Slab Soil Pressures (Continued)**

	LC	Label	UC	Soil Pressure[psf]	Allowable Bearing[psf]	Node
177	13	S1	0.297	444.802	1500	N454
178	13	S2	0.254	381.615	1500	N461
179	13	S3	0.324	486.52	1500	N468
180	13	S4	0.314	470.658	1500	N475
181	13	S5	0.299	448.083	1500	N482
182	13	S6	0.314	470.262	1500	N489
183	13	S7	0.311	466.394	1500	N496
184	13	S8	0.308	461.932	1500	N503
185	13	S9	0.302	453.012	1500	N510
186	13	S10	0.314	470.412	1500	N517
187	13	S11	0.316	473.927	1500	N524
188	13	S12	0.298	446.439	1500	N531
189	13	S13	0.315	471.924	1500	N538
190	13	S14	0.319	478.287	1500	N545
191	13	S15	0.264	395.316	1500	N552
192	13	S16	0.254	381.67	1500	N559
193	14	S1	0.327	490.952	1500	N456
194	14	S2	0.289	433.601	1500	N463
195	14	S3	0.33	494.951	1500	N470
196	14	S4	0.326	489.178	1500	N477
197	14	S5	0.321	481.502	1500	N484
198	14	S6	0.326	489.356	1500	N491
199	14	S7	0.326	488.437	1500	N498
200	14	S8	0.325	486.837	1500	N505
201	14	S9	0.322	483.4	1500	N512
202	14	S10	0.326	489.452	1500	N519
203	14	S11	0.327	490.303	1500	N526
204	14	S12	0.321	480.838	1500	N533
205	14	S13	0.326	489.475	1500	N540
206	14	S14	0.329	492.77	1500	N547
207	14	S15	0.296	443.644	1500	N554
208	14	S16	0.307	460.472	1500	N561
209	15	S1	0.228	342.228	1500	N456
210	15	S2	0.22	329.474	1500	N461
211	15	S3	0.226	338.82	1500	N470
212	15	S4	0.223	334.985	1500	N477
213	15	S5	0.221	331.508	1500	N484
214	15	S6	0.224	335.366	1500	N491
215	15	S7	0.223	334.819	1500	N498
216	15	S8	0.223	334.214	1500	N505
217	15	S9	0.222	332.501	1500	N512
218	15	S10	0.224	335.306	1500	N519
219	15	S11	0.224	335.762	1500	N526
220	15	S12	0.221	331.158	1500	N533
221	15	S13	0.223	335.131	1500	N540
222	15	S14	0.225	337.788	1500	N547
223	15	S15	0.22	330.071	1500	N552
224	15	S16	0.219	328.711	1500	N561

**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	51380.866	0	12364.421	9.99+	9.99+
2	2	S2	0	0	51629.193	0	12275.209	9.99+	9.99+
3	2	S3	0	0	51622.83	0	12310.829	9.99+	9.99+
4	2	S4	0	0	51629.416	0	12308.744	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
5	2	S5	0	0	51605.743	0	12303.153	9.99+	9.99+
6	2	S6	0	0	51621.345	0	12307.07	9.99+	9.99+
7	2	S7	0	0	51628.924	0	12309.421	9.99+	9.99+
8	2	S8	0	0	51614.158	0	12305.29	9.99+	9.99+
9	2	S9	0	0	51607.999	0	12303.705	9.99+	9.99+
10	2	S10	0	0	51629.543	0	12309.474	9.99+	9.99+
11	2	S11	0	0	51626.085	0	12308.335	9.99+	9.99+
12	2	S12	0	0	51604.97	0	12302.906	9.99+	9.99+
13	2	S13	0	0	51628.078	0	12308.322	9.99+	9.99+
14	2	S14	0	0	51617.676	0	12309.439	9.99+	9.99+
15	2	S15	0	0	51662.818	0	12288.574	9.99+	9.99+
16	2	S16	0	0	51232.272	0	12176.729	9.99+	9.99+
17	3	S1	0	0	51380.866	0	12364.421	9.99+	9.99+
18	3	S2	0	0	51629.193	0	12275.209	9.99+	9.99+
19	3	S3	0	0	51622.83	0	12310.829	9.99+	9.99+
20	3	S4	0	0	51629.416	0	12308.744	9.99+	9.99+
21	3	S5	0	0	51605.743	0	12303.153	9.99+	9.99+
22	3	S6	0	0	51621.345	0	12307.07	9.99+	9.99+
23	3	S7	0	0	51628.924	0	12309.421	9.99+	9.99+
24	3	S8	0	0	51614.158	0	12305.29	9.99+	9.99+
25	3	S9	0	0	51607.999	0	12303.705	9.99+	9.99+
26	3	S10	0	0	51629.543	0	12309.474	9.99+	9.99+
27	3	S11	0	0	51626.085	0	12308.335	9.99+	9.99+
28	3	S12	0	0	51604.97	0	12302.906	9.99+	9.99+
29	3	S13	0	0	51628.078	0	12308.322	9.99+	9.99+
30	3	S14	0	0	51617.676	0	12309.439	9.99+	9.99+
31	3	S15	0	0	51662.818	0	12288.574	9.99+	9.99+
32	3	S16	0	0	51232.272	0	12176.729	9.99+	9.99+
33	4	S1	0	19521.163	51870.636	3649.587	12364.421	2.657	3.388
34	4	S2	0	17813.936	51482.561	2883.533	12275.209	2.89	4.257
35	4	S3	0	20967.683	51788.132	3268.951	12310.829	2.47	3.766
36	4	S4	0	20709.902	51764.03	3245.572	12308.744	2.499	3.792
37	4	S5	0	20193.121	51740.738	3190.643	12303.153	2.562	3.856
38	4	S6	0	20675.374	51758.041	3232.131	12307.07	2.503	3.808
39	4	S7	0	20674.265	51770.212	3244.736	12309.421	2.504	3.794
40	4	S8	0	20513.343	51750.276	3225.848	12305.29	2.523	3.815
41	4	S9	0	20306.263	51743.122	3204.23	12303.705	2.548	3.84
42	4	S10	0	20726.373	51770.042	3248.939	12309.474	2.498	3.789
43	4	S11	0	20747.128	51763.926	3244.431	12308.335	2.495	3.794
44	4	S12	0	20153.433	51739.442	3173.932	12302.906	2.567	3.876
45	4	S13	0	20715.624	51761.83	3238.246	12308.322	2.499	3.801
46	4	S14	0	20831.576	51781.613	3255.122	12309.439	2.486	3.782
47	4	S15	0	18511.067	51526.866	2997.797	12288.574	2.784	4.099
48	4	S16	0	17231.108	51708.815	3351.618	12333.053	3.001	3.68
49	5	S1	0	25057.642	51870.636	3734.797	12364.421	2.07	3.311
50	5	S2	0	21348.491	51482.561	2237.312	12275.209	2.412	5.487
51	5	S3	0	26146.926	51788.132	2881.055	12310.829	1.981	4.273
52	5	S4	0	25750.734	51764.03	2818.404	12308.744	2.01	4.367
53	5	S5	0	25097.036	51740.738	2781.495	12303.153	2.062	4.423
54	5	S6	0	25735.422	51758.041	2816.979	12307.07	2.011	4.369
55	5	S7	0	25685.15	51770.212	2825.536	12309.421	2.016	4.356
56	5	S8	0	25524.438	51750.276	2806.393	12305.29	2.027	4.385
57	5	S9	0	25247.735	51743.122	2789.807	12303.705	2.049	4.41
58	5	S10	0	25764.519	51770.042	2826.928	12309.474	2.009	4.354
59	5	S11	0	25820.446	51763.926	2825.496	12308.335	2.005	4.356

**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
60	5	S12	0	25043.178	51739.442	2771.479	12302.906	2.066	4.439
61	5	S13	0	25773.056	51761.83	2817.012	12308.322	2.008	4.369
62	5	S14	0	25958.547	51781.613	2863.677	12309.439	1.995	4.298
63	5	S15	0	22232.473	51526.866	2315.505	12288.574	2.318	5.307
64	5	S16	0	22201.52	51708.815	3447.26	12333.053	2.329	3.578
65	6	S1	0	0	56956.151	0	16760.784	9.99+	9.99+
66	6	S2	0	0	57790.611	0	15605.866	9.99+	9.99+
67	6	S3	0	0	57981.386	0	16144.524	9.99+	9.99+
68	6	S4	0	0	58019.68	0	16140.927	9.99+	9.99+
69	6	S5	0	0	58111.504	0	16071.964	9.99+	9.99+
70	6	S6	0	0	57915.998	0	16085.907	9.99+	9.99+
71	6	S7	0	0	58140.79	0	16141.623	9.99+	9.99+
72	6	S8	0	0	57940.934	0	16115.069	9.99+	9.99+
73	6	S9	0	0	58032.339	0	16036.917	9.99+	9.99+
74	6	S10	0	0	58083.625	0	16120.922	9.99+	9.99+
75	6	S11	0	0	57949.02	0	16140.389	9.99+	9.99+
76	6	S12	0	0	58132.639	0	16052.891	9.99+	9.99+
77	6	S13	0	0	57973.125	0	16104.166	9.99+	9.99+
78	6	S14	0	0	58010.876	0	16158.571	9.99+	9.99+
79	6	S15	0	0	57861.753	0	15783.877	9.99+	9.99+
80	6	S16	0	0	56208.94	0	14431.319	9.99+	9.99+
81	7	S1	0	0	60080.493	0	15680.171	9.99+	9.99+
82	7	S2	0	0	62344.131	0	15242.934	9.99+	9.99+
83	7	S3	0	0	62150.963	0	15509.32	9.99+	9.99+
84	7	S4	0	0	62276.222	0	15535.264	9.99+	9.99+
85	7	S5	0	0	62145.228	0	15469.741	9.99+	9.99+
86	7	S6	0	0	62148.096	0	15476.021	9.99+	9.99+
87	7	S7	0	0	62324.961	0	15531.501	9.99+	9.99+
88	7	S8	0	0	62109.182	0	15509.028	9.99+	9.99+
89	7	S9	0	0	62117.169	0	15429.204	9.99+	9.99+
90	7	S10	0	0	62298.629	0	15507.107	9.99+	9.99+
91	7	S11	0	0	62200.917	0	15529.352	9.99+	9.99+
92	7	S12	0	0	62152.699	0	15449.636	9.99+	9.99+
93	7	S13	0	0	62239.162	0	15497.532	9.99+	9.99+
94	7	S14	0	0	62142.879	0	15525.117	9.99+	9.99+
95	7	S15	0	0	62544.406	0	15427.668	9.99+	9.99+
96	7	S16	0	0	58881.045	0	14088.774	9.99+	9.99+
97	8	S1	0	14640.872	51870.636	2737.19	12364.421	3.543	4.517
98	8	S2	0	13360.452	51482.561	2162.65	12275.209	3.853	5.676
99	8	S3	0	15725.762	51788.132	2451.714	12310.829	3.293	5.021
100	8	S4	0	15532.426	51764.03	2434.179	12308.744	3.333	5.057
101	8	S5	0	15144.841	51740.738	2392.983	12303.153	3.416	5.141
102	8	S6	0	15506.531	51758.041	2424.098	12307.07	3.338	5.077
103	8	S7	0	15505.699	51770.212	2433.552	12309.421	3.339	5.058
104	8	S8	0	15385.008	51750.276	2419.386	12305.29	3.364	5.086
105	8	S9	0	15229.697	51743.122	2403.172	12303.705	3.398	5.12
106	8	S10	0	15544.78	51770.042	2436.704	12309.474	3.33	5.052
107	8	S11	0	15560.346	51763.926	2433.323	12308.335	3.327	5.058
108	8	S12	0	15115.075	51739.442	2380.449	12302.906	3.423	5.168
109	8	S13	0	15536.718	51761.83	2428.685	12308.322	3.332	5.068
110	8	S14	0	15623.682	51781.613	2441.342	12309.439	3.314	5.042
111	8	S15	0	13883.3	51526.866	2248.348	12288.574	3.711	5.466
112	8	S16	0	12923.331	51708.815	2513.714	12333.053	4.001	4.906
113	9	S1	0	18793.232	51870.636	2801.098	12364.421	2.76	4.414
114	9	S2	0	16011.368	51482.561	1677.984	12275.209	3.215	7.315

**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
115	9	S3	0	19610.195	51788.132	2160.792	12310.829	2.641	5.697
116	9	S4	0	19313.05	51764.03	2113.803	12308.744	2.68	5.823
117	9	S5	0	18822.777	51740.738	2086.122	12303.153	2.749	5.898
118	9	S6	0	19301.566	51758.041	2112.735	12307.07	2.682	5.825
119	9	S7	0	19263.862	51770.212	2119.152	12309.421	2.687	5.809
120	9	S8	0	19143.329	51750.276	2104.795	12305.29	2.703	5.846
121	9	S9	0	18935.801	51743.122	2092.355	12303.705	2.733	5.88
122	9	S10	0	19323.39	51770.042	2120.196	12309.474	2.679	5.806
123	9	S11	0	19365.335	51763.926	2119.122	12308.335	2.673	5.808
124	9	S12	0	18782.384	51739.442	2078.609	12302.906	2.755	5.919
125	9	S13	0	19329.792	51761.83	2112.759	12308.322	2.678	5.826
126	9	S14	0	19468.911	51781.613	2147.757	12309.439	2.66	5.731
127	9	S15	0	16674.355	51526.866	1736.629	12288.574	3.09	7.076
128	9	S16	0	16651.14	51708.815	2585.445	12333.053	3.105	4.77
129	10	S1	0	0	55562.33	0	15661.693	9.99+	9.99+
130	10	S2	0	0	56250.257	0	14773.202	9.99+	9.99+
131	10	S3	0	0	56391.747	0	15186.1	9.99+	9.99+
132	10	S4	0	0	56422.114	0	15182.881	9.99+	9.99+
133	10	S5	0	0	56485.064	0	15129.761	9.99+	9.99+
134	10	S6	0	0	56342.335	0	15141.198	9.99+	9.99+
135	10	S7	0	0	56512.823	0	15183.573	9.99+	9.99+
136	10	S8	0	0	56359.24	0	15162.624	9.99+	9.99+
137	10	S9	0	0	56426.254	0	15103.614	9.99+	9.99+
138	10	S10	0	0	56470.104	0	15168.06	9.99+	9.99+
139	10	S11	0	0	56368.286	0	15182.375	9.99+	9.99+
140	10	S12	0	0	56500.722	0	15115.395	9.99+	9.99+
141	10	S13	0	0	56386.863	0	15155.205	9.99+	9.99+
142	10	S14	0	0	56412.576	0	15196.288	9.99+	9.99+
143	10	S15	0	0	56312.02	0	14910.051	9.99+	9.99+
144	10	S16	0	0	54964.773	0	13867.672	9.99+	9.99+
145	11	S1	0	0	57905.586	0	14851.234	9.99+	9.99+
146	11	S2	0	0	59665.396	0	14501.002	9.99+	9.99+
147	11	S3	0	0	59518.93	0	14709.698	9.99+	9.99+
148	11	S4	0	0	59614.521	0	14728.634	9.99+	9.99+
149	11	S5	0	0	59510.357	0	14678.094	9.99+	9.99+
150	11	S6	0	0	59516.409	0	14683.783	9.99+	9.99+
151	11	S7	0	0	59650.952	0	14725.981	9.99+	9.99+
152	11	S8	0	0	59485.426	0	14708.094	9.99+	9.99+
153	11	S9	0	0	59489.876	0	14647.83	9.99+	9.99+
154	11	S10	0	0	59631.357	0	14707.699	9.99+	9.99+
155	11	S11	0	0	59557.209	0	14724.098	9.99+	9.99+
156	11	S12	0	0	59515.767	0	14662.953	9.99+	9.99+
157	11	S13	0	0	59586.391	0	14700.229	9.99+	9.99+
158	11	S14	0	0	59511.578	0	14721.198	9.99+	9.99+
159	11	S15	0	0	59824.009	0	14642.894	9.99+	9.99+
160	11	S16	0	0	56968.851	0	13610.763	9.99+	9.99+
161	12	S1	0	19521.163	31122.381	3649.587	7418.653	1.594	2.033
162	12	S2	0	17813.936	30889.537	2883.533	7365.125	1.734	2.554
163	12	S3	0	20967.683	31072.879	3268.951	7386.497	1.482	2.26
164	12	S4	0	20709.902	31058.418	3245.572	7385.246	1.5	2.275
165	12	S5	0	20193.121	31044.443	3190.643	7381.892	1.537	2.314
166	12	S6	0	20675.374	31054.825	3232.131	7384.242	1.502	2.285
167	12	S7	0	20674.265	31062.127	3244.736	7385.653	1.502	2.276
168	12	S8	0	20513.343	31050.166	3225.848	7383.174	1.514	2.289
169	12	S9	0	20306.263	31045.873	3204.23	7382.223	1.529	2.304

**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
170	12	S10	0	20726.373	31062.025	3248.939	7385.685	1.499	2.273
171	12	S11	0	20747.128	31058.356	3244.431	7385.001	1.497	2.276
172	12	S12	0	20153.433	31043.665	3173.932	7381.744	1.54	2.326
173	12	S13	0	20715.624	31057.098	3238.246	7384.993	1.499	2.281
174	12	S14	0	20831.576	31068.968	3255.122	7385.664	1.491	2.269
175	12	S15	0	18511.067	30916.12	2997.797	7373.144	1.67	2.46
176	12	S16	0	17231.108	31025.289	3351.618	7399.832	1.801	2.208
177	13	S1	0	25057.642	31122.381	3734.797	7418.653	1.242	1.986
178	13	S2	0	21348.491	30889.537	2237.312	7365.125	1.447	3.292
179	13	S3	0	26146.926	31072.879	2881.055	7386.497	1.188	2.564
180	13	S4	0	25750.734	31058.418	2818.404	7385.246	1.206	2.62
181	13	S5	0	25097.036	31044.443	2781.495	7381.892	1.237	2.654
182	13	S6	0	25735.422	31054.825	2816.979	7384.242	1.207	2.621
183	13	S7	0	25685.15	31062.127	2825.536	7385.653	1.209	2.614
184	13	S8	0	25524.438	31050.166	2806.393	7383.174	1.216	2.631
185	13	S9	0	25247.735	31045.873	2789.807	7382.223	1.23	2.646
186	13	S10	0	25764.519	31062.025	2826.928	7385.685	1.206	2.613
187	13	S11	0	25820.446	31058.356	2825.496	7385.001	1.203	2.614
188	13	S12	0	25043.178	31043.665	2771.479	7381.744	1.24	2.663
189	13	S13	0	25773.056	31057.098	2817.012	7384.993	1.205	2.622
190	13	S14	0	25958.547	31068.968	2863.677	7385.664	1.197	2.579
191	13	S15	0	22232.473	30916.12	2315.505	7373.144	1.391	3.184
192	13	S16	0	22201.52	31025.289	3447.26	7399.832	1.397	2.147
193	14	S1	0	0	36403.805	0	11815.015	9.99+	9.99+
194	14	S2	0	0	37138.934	0	10695.783	9.99+	9.99+
195	14	S3	0	0	37332.254	0	11220.192	9.99+	9.99+
196	14	S4	0	0	37367.914	0	11217.429	9.99+	9.99+
197	14	S5	0	0	37469.207	0	11150.703	9.99+	9.99+
198	14	S6	0	0	37267.46	0	11163.079	9.99+	9.99+
199	14	S7	0	0	37489.22	0	11217.855	9.99+	9.99+
200	14	S8	0	0	37295.271	0	11192.953	9.99+	9.99+
201	14	S9	0	0	37389.139	0	11115.435	9.99+	9.99+
202	14	S10	0	0	37431.808	0	11197.132	9.99+	9.99+
203	14	S11	0	0	37298.586	0	11217.055	9.99+	9.99+
204	14	S12	0	0	37490.651	0	11131.728	9.99+	9.99+
205	14	S13	0	0	37321.893	0	11180.837	9.99+	9.99+
206	14	S14	0	0	37363.806	0	11234.795	9.99+	9.99+
207	14	S15	0	0	37196.626	0	10868.447	9.99+	9.99+
208	14	S16	0	0	35716.031	0	9560.627	9.99+	9.99+
209	15	S1	0	0	39528.147	0	10734.403	9.99+	9.99+
210	15	S2	0	0	41692.454	0	10332.85	9.99+	9.99+
211	15	S3	0	0	41501.831	0	10584.989	9.99+	9.99+
212	15	S4	0	0	41624.456	0	10611.766	9.99+	9.99+
213	15	S5	0	0	41502.931	0	10548.48	9.99+	9.99+
214	15	S6	0	0	41499.558	0	10553.193	9.99+	9.99+
215	15	S7	0	0	41673.392	0	10607.733	9.99+	9.99+
216	15	S8	0	0	41463.519	0	10586.912	9.99+	9.99+
217	15	S9	0	0	41473.97	0	10507.722	9.99+	9.99+
218	15	S10	0	0	41646.812	0	10583.318	9.99+	9.99+
219	15	S11	0	0	41550.483	0	10606.018	9.99+	9.99+
220	15	S12	0	0	41510.711	0	10528.473	9.99+	9.99+
221	15	S13	0	0	41587.931	0	10574.203	9.99+	9.99+
222	15	S14	0	0	41495.808	0	10601.342	9.99+	9.99+
223	15	S15	0	0	41879.279	0	10512.238	9.99+	9.99+
224	15	S16	0	0	38388.136	0	9218.083	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	29.03	2950.043	0	2950.043	9.99+	9.99+
2	2	S2	0	0	2946.05	0	2946.05	9.99+	9.99+
3	2	S3	0	0	2954.599	0	2954.599	9.99+	9.99+
4	2	S4	0	0	2954.098	0	2954.098	9.99+	9.99+
5	2	S5	0	0	2952.757	0	2952.757	9.99+	9.99+
6	2	S6	0	0	2953.697	0	2953.697	9.99+	9.99+
7	2	S7	0	0	2954.261	0	2954.261	9.99+	9.99+
8	2	S8	0	0	2953.27	0	2953.27	9.99+	9.99+
9	2	S9	0	0	2952.889	0	2952.889	9.99+	9.99+
10	2	S10	0	0	2954.274	0	2954.274	9.99+	9.99+
11	2	S11	0	0	2954	0	2954	9.99+	9.99+
12	2	S12	0	0	2952.698	0	2952.698	9.99+	9.99+
13	2	S13	0	0	2953.997	0	2953.997	9.99+	9.99+
14	2	S14	0	0	2954.265	0	2954.265	9.99+	9.99+
15	2	S15	0	1.635	2948.277	0	2948.277	9.99+	9.99+
16	2	S16	0	31.265	2941.174	0	2941.174	9.99+	9.99+
17	3	S1	0	29.03	2950.043	0	2950.043	9.99+	9.99+
18	3	S2	0	0	2946.05	0	2946.05	9.99+	9.99+
19	3	S3	0	0	2954.599	0	2954.599	9.99+	9.99+
20	3	S4	0	0	2954.098	0	2954.098	9.99+	9.99+
21	3	S5	0	0	2952.757	0	2952.757	9.99+	9.99+
22	3	S6	0	0	2953.697	0	2953.697	9.99+	9.99+
23	3	S7	0	0	2954.261	0	2954.261	9.99+	9.99+
24	3	S8	0	0	2953.27	0	2953.27	9.99+	9.99+
25	3	S9	0	0	2952.889	0	2952.889	9.99+	9.99+
26	3	S10	0	0	2954.274	0	2954.274	9.99+	9.99+
27	3	S11	0	0	2954	0	2954	9.99+	9.99+
28	3	S12	0	0	2952.698	0	2952.698	9.99+	9.99+
29	3	S13	0	0	2953.997	0	2953.997	9.99+	9.99+
30	3	S14	0	0	2954.265	0	2954.265	9.99+	9.99+
31	3	S15	0	1.635	2948.277	0	2948.277	9.99+	9.99+
32	3	S16	0	31.265	2941.174	0	2941.174	9.99+	9.99+
33	4	S1	0	239.886	2235.492	734.561	2235.492	9.319	3.043
34	4	S2	0	6.289	2257.775	974.168	2257.775	9.99+	2.318
35	4	S3	0	5.541	2173.375	939.115	2173.375	9.99+	2.314
36	4	S4	0	6.348	2178.97	948.105	2178.97	9.99+	2.298
37	4	S5	0	6.191	2190.716	911.014	2190.716	9.99+	2.405
38	4	S6	0	6.832	2182.084	946.504	2182.084	9.99+	2.305
39	4	S7	0	3.29	2177.499	937.357	2177.499	9.99+	2.323
40	4	S8	0	11.274	2185.831	936.782	2185.831	9.99+	2.333
41	4	S9	0	9.173	2189.378	921.727	2189.378	9.99+	2.375
42	4	S10	0	4.623	2177.302	942.394	2177.302	9.99+	2.31
43	4	S11	0	6.973	2179.521	948.952	2179.521	9.99+	2.297
44	4	S12	0	0.605	2191.317	907.825	2191.317	9.99+	2.414
45	4	S13	0	4.947	2179.787	950.05	2179.787	9.99+	2.294
46	4	S14	0	5.386	2176.268	930.674	2176.268	9.99+	2.338
47	4	S15	0	14.419	2238.438	1011.14	2238.438	9.99+	2.214
48	4	S16	0	256.638	2309.527	627.191	2309.527	8.999	3.682
49	5	S1	0	324.231	2265.648	643.605	2265.648	6.988	3.52
50	5	S2	0	4.523	2411.809	844.262	2411.809	9.99+	2.857
51	5	S3	0	4.791	2266.02	822.833	2266.02	9.99+	2.754
52	5	S4	0	3.178	2279.588	831.248	2279.588	9.99+	2.742
53	5	S5	0	2.84	2286.902	787.048	2286.902	9.99+	2.906
54	5	S6	0	4.238	2280.165	832.606	2280.165	9.99+	2.739
55	5	S7	0	1.606	2277.096	814.702	2277.096	9.99+	2.795

**Slab Stability - Sliding (Continued)**

	LC	Slab	Angle[deg]	Va-xx[lb]	Vr-xx[lb]	Va-zz[lb]	Vr-zz[lb]	SR-xx	SR-zz
56	5	S8	0	5.289	2282.908	820.719	2282.908	9.99+	2.782
57	5	S9	0	4.206	2285.859	801.127	2285.859	9.99+	2.853
58	5	S10	0	1.749	2276.861	822.354	2276.861	9.99+	2.769
59	5	S11	0	4.107	2278.345	834.349	2278.345	9.99+	2.731
60	5	S12	0	0	2287.543	782.857	2287.543	9.99+	2.922
61	5	S13	0	3.287	2279.887	835.233	2279.887	9.99+	2.73
62	5	S14	0	3.611	2269.15	812.724	2269.15	9.99+	2.792
63	5	S15	0	0.886	2393.005	879.02	2393.005	9.99+	2.722
64	5	S16	0	330.118	2330.661	548.943	2330.661	7.06	4.246
65	6	S1	0	365.004	3803.585	868.202	3803.585	9.99+	4.381
66	6	S2	0	5.886	3748.94	1149.972	3748.94	9.99+	3.26
67	6	S3	0	6.498	3878.585	1109.973	3878.585	9.99+	3.494
68	6	S4	0	7.146	3869.535	1120.682	3869.535	9.99+	3.453
69	6	S5	0	6.858	3853.157	1075.038	3853.157	9.99+	3.584
70	6	S6	0	7.805	3865.301	1119.215	3865.301	9.99+	3.454
71	6	S7	0	3.621	3871.817	1106.879	3871.817	9.99+	3.498
72	6	S8	0	12.668	3860.016	1107.204	3860.016	9.99+	3.486
73	6	S9	0	10.251	3855.011	1088.424	3855.011	9.99+	3.542
74	6	S10	0	5.109	3872.087	1113.332	3872.087	9.99+	3.478
75	6	S11	0	7.933	3868.933	1122.046	3868.933	9.99+	3.448
76	6	S12	0	0.658	3852.299	1071.054	3852.299	9.99+	3.597
77	6	S13	0	5.686	3868.411	1123.332	3868.411	9.99+	3.444
78	6	S14	0	6.195	3874.34	1099.578	3874.34	9.99+	3.523
79	6	S15	0	18.579	3776.983	1194.035	3776.983	9.99+	3.163
80	6	S16	0	388.368	3696.537	741.208	3696.537	9.518	4.987
81	7	S1	0	230.208	3625.116	727.108	3625.116	9.99+	4.986
82	7	S2	0	11.769	3665.366	969.412	3665.366	9.99+	3.781
83	7	S3	0	5.667	3725.637	929.586	3725.637	9.99+	4.008
84	7	S4	0	7.562	3723.926	938.187	3723.926	9.99+	3.969
85	7	S5	0	7.772	3708.075	907.938	3708.075	9.99+	4.084
86	7	S6	0	7.728	3718.882	935.077	3718.882	9.99+	3.977
87	7	S7	0	4.217	3725.03	931.488	3725.03	9.99+	3.999
88	7	S8	0	13.519	3714.056	927.314	3714.056	9.99+	4.005
89	7	S9	0	11.196	3709.727	915.95	3709.727	9.99+	4.05
90	7	S10	0	5.847	3725.214	934.684	3725.214	9.99+	3.986
91	7	S11	0	8.009	3722.239	937.721	3722.239	9.99+	3.969
92	7	S12	0	0.804	3707.43	905.553	3707.43	9.99+	4.094
93	7	S13	0	5.476	3722.693	938.852	3722.693	9.99+	3.965
94	7	S14	0	5.943	3722.462	922.729	3722.462	9.99+	4.034
95	7	S15	0	24.806	3687.757	1004.703	3687.757	9.99+	3.67
96	7	S16	0	255.941	3534.871	621.151	3534.871	9.99+	5.691
97	8	S1	0	172.657	2414.129	550.92	2414.129	9.99+	4.382
98	8	S2	0	4.716	2429.844	730.626	2429.844	9.99+	3.326
99	8	S3	0	4.156	2368.681	704.336	2368.681	9.99+	3.363
100	8	S4	0	4.761	2372.752	711.079	2372.752	9.99+	3.337
101	8	S5	0	4.643	2381.227	683.26	2381.227	9.99+	3.485
102	8	S6	0	5.124	2374.987	709.878	2374.987	9.99+	3.346
103	8	S7	0	2.468	2371.689	703.018	2371.689	9.99+	3.374
104	8	S8	0	8.456	2377.69	702.586	2377.69	9.99+	3.384
105	8	S9	0	6.879	2380.256	691.295	2380.256	9.99+	3.443
106	8	S10	0	3.467	2371.545	706.796	2371.545	9.99+	3.355
107	8	S11	0	5.23	2373.141	711.714	2373.141	9.99+	3.334
108	8	S12	0	0.454	2381.662	680.868	2381.662	9.99+	3.498
109	8	S13	0	3.71	2373.339	712.538	2373.339	9.99+	3.331
110	8	S14	0	4.039	2370.767	698.005	2370.767	9.99+	3.396

**Slab Stability - Sliding (Continued)**

	LC	Slab	Angle[deg]	Va-xx[lb]	Vr-xx[lb]	Va-zz[lb]	Vr-zz[lb]	SR-xx	SR-zz
111	8	S15	0	10.405	2415.898	758.355	2415.898	9.99+	3.186
112	8	S16	0	184.662	2467.439	470.393	2467.439	9.99+	5.245
113	9	S1	0	235.915	2436.747	482.704	2436.747	9.99+	5.048
114	9	S2	0	3.393	2545.369	633.197	2545.369	9.99+	4.02
115	9	S3	0	3.594	2438.165	617.125	2438.165	9.99+	3.951
116	9	S4	0	2.383	2448.216	623.436	2448.216	9.99+	3.927
117	9	S5	0	2.13	2453.366	590.286	2453.366	9.99+	4.156
118	9	S6	0	3.179	2448.548	624.454	2448.548	9.99+	3.921
119	9	S7	0	1.204	2446.387	611.026	2446.387	9.99+	4.004
120	9	S8	0	3.966	2450.499	615.54	2450.499	9.99+	3.981
121	9	S9	0	3.155	2452.617	600.845	2452.617	9.99+	4.082
122	9	S10	0	1.312	2446.214	616.766	2446.214	9.99+	3.966
123	9	S11	0	3.08	2447.259	625.762	2447.259	9.99+	3.911
124	9	S12	0	0	2453.831	587.143	2453.831	9.99+	4.179
125	9	S13	0	2.465	2448.414	626.425	2448.414	9.99+	3.909
126	9	S14	0	2.708	2440.429	609.543	2440.429	9.99+	4.004
127	9	S15	0	1.073	2531.823	659.265	2531.823	9.99+	3.84
128	9	S16	0	239.772	2483.289	411.708	2483.289	9.99+	6.032
129	10	S1	0	281.011	3590.2	651.152	3590.2	9.99+	5.514
130	10	S2	0	4.415	3548.217	862.479	3548.217	9.99+	4.114
131	10	S3	0	4.874	3647.588	832.48	3647.588	9.99+	4.382
132	10	S4	0	5.36	3640.676	840.511	3640.676	9.99+	4.332
133	10	S5	0	5.144	3628.057	806.279	3628.057	9.99+	4.5
134	10	S6	0	5.854	3637.4	839.411	3637.4	9.99+	4.333
135	10	S7	0	2.716	3642.428	830.159	3642.428	9.99+	4.388
136	10	S8	0	9.501	3633.329	830.403	3633.329	9.99+	4.375
137	10	S9	0	7.688	3629.48	816.318	3629.48	9.99+	4.446
138	10	S10	0	3.832	3642.634	834.999	3642.634	9.99+	4.362
139	10	S11	0	5.95	3640.2	841.534	3640.2	9.99+	4.326
140	10	S12	0	0.493	3627.399	803.29	3627.399	9.99+	4.516
141	10	S13	0	4.264	3639.808	842.499	3639.808	9.99+	4.32
142	10	S14	0	4.646	3644.321	824.683	3644.321	9.99+	4.419
143	10	S15	0	14.343	3569.806	895.526	3569.806	9.99+	3.986
144	10	S16	0	299.092	3507.696	555.906	3507.696	9.99+	6.31
145	11	S1	0	179.914	3456.348	545.331	3456.348	9.99+	6.338
146	11	S2	0	8.827	3485.537	727.059	3485.537	9.99+	4.794
147	11	S3	0	4.25	3532.878	697.189	3532.878	9.99+	5.067
148	11	S4	0	5.671	3531.469	703.64	3531.469	9.99+	5.019
149	11	S5	0	5.829	3519.245	680.954	3519.245	9.99+	5.168
150	11	S6	0	5.796	3527.586	701.308	3527.586	9.99+	5.03
151	11	S7	0	3.163	3532.338	698.616	3532.338	9.99+	5.056
152	11	S8	0	10.139	3523.859	695.485	3523.859	9.99+	5.067
153	11	S9	0	8.397	3520.517	686.962	3520.517	9.99+	5.125
154	11	S10	0	4.386	3532.479	701.013	3532.479	9.99+	5.039
155	11	S11	0	6.007	3530.179	703.291	3530.179	9.99+	5.02
156	11	S12	0	0.603	3518.747	679.165	3518.747	9.99+	5.181
157	11	S13	0	4.107	3530.519	704.139	3530.519	9.99+	5.014
158	11	S14	0	4.458	3530.413	692.047	3530.413	9.99+	5.101
159	11	S15	0	19.014	3502.887	753.527	3502.887	9.99+	4.649
160	11	S16	0	199.772	3386.447	465.864	3386.447	9.99+	7.269
161	12	S1	0	251.498	1055.474	734.561	1055.474	4.197	1.437
162	12	S2	0	6.289	1079.355	974.168	1079.355	9.99+	1.108
163	12	S3	0	5.541	991.536	939.115	991.536	9.99+	1.056
164	12	S4	0	6.348	997.33	948.105	997.33	9.99+	1.052
165	12	S5	0	6.191	1009.614	911.014	1009.614	9.99+	1.108

**Slab Stability - Sliding (Continued)**

	LC	Slab	Angle[deg]	Va-xx[lb]	Vr-xx[lb]	Va-zz[lb]	Vr-zz[lb]	SR-xx	SR-zz
166	12	S6	0	6.832	1000.606	946.504	1000.606	9.99+	1.057
167	12	S7	0	3.29	995.794	937.357	995.794	9.99+	1.062
168	12	S8	0	11.274	1004.523	936.782	1004.523	9.99+	1.072
169	12	S9	0	9.173	1008.222	921.727	1008.222	9.99+	1.094
170	12	S10	0	4.623	995.593	942.394	995.593	9.99+	1.056
171	12	S11	0	6.973	997.921	948.952	997.921	9.99+	1.052
172	12	S12	0	0.605	1010.238	907.825	1010.238	9.99+	1.113
173	12	S13	0	4.947	998.188	950.05	998.188	9.99+	1.051
174	12	S14	0	5.386	994.561	930.674	994.561	9.99+	1.069
175	12	S15	0	15.073	1059.127	1011.14	1059.127	9.99+	1.047
176	12	S16	0	269.144	1133.057	627.191	1133.057	4.21	1.807
177	13	S1	0	335.843	1085.631	643.605	1085.631	3.233	1.687
178	13	S2	0	4.523	1233.389	844.262	1233.389	9.99+	1.461
179	13	S3	0	4.791	1084.181	822.833	1084.181	9.99+	1.318
180	13	S4	0	3.178	1097.949	831.248	1097.949	9.99+	1.321
181	13	S5	0	2.84	1105.799	787.048	1105.799	9.99+	1.405
182	13	S6	0	4.238	1098.686	832.606	1098.686	9.99+	1.32
183	13	S7	0	1.606	1095.391	814.702	1095.391	9.99+	1.345
184	13	S8	0	5.289	1101.601	820.719	1101.601	9.99+	1.342
185	13	S9	0	4.206	1104.704	801.127	1104.704	9.99+	1.379
186	13	S10	0	1.749	1095.151	822.354	1095.151	9.99+	1.332
187	13	S11	0	4.107	1096.745	834.349	1096.745	9.99+	1.314
188	13	S12	0	0	1106.464	782.857	1106.464	9.99+	1.413
189	13	S13	0	3.287	1098.288	835.233	1098.288	9.99+	1.315
190	13	S14	0	3.611	1087.443	812.724	1087.443	9.99+	1.338
191	13	S15	0	0.232	1213.694	879.02	1213.694	9.99+	1.381
192	13	S16	0	342.624	1154.192	548.943	1154.192	3.369	2.103
193	14	S1	0	353.392	2623.568	868.202	2623.568	7.424	3.022
194	14	S2	0	5.886	2570.52	1149.972	2570.52	9.99+	2.235
195	14	S3	0	6.498	2696.745	1109.973	2696.745	9.99+	2.43
196	14	S4	0	7.146	2687.895	1120.682	2687.895	9.99+	2.398
197	14	S5	0	6.858	2672.054	1075.038	2672.054	9.99+	2.486
198	14	S6	0	7.805	2683.822	1119.215	2683.822	9.99+	2.398
199	14	S7	0	3.621	2690.112	1106.879	2690.112	9.99+	2.43
200	14	S8	0	12.668	2678.708	1107.204	2678.708	9.99+	2.419
201	14	S9	0	10.251	2673.855	1088.424	2673.855	9.99+	2.457
202	14	S10	0	5.109	2690.377	1113.332	2690.377	9.99+	2.417
203	14	S11	0	7.933	2687.333	1122.046	2687.333	9.99+	2.395
204	14	S12	0	0.658	2671.22	1071.054	2671.22	9.99+	2.494
205	14	S13	0	5.686	2686.812	1123.332	2686.812	9.99+	2.392
206	14	S14	0	6.195	2692.634	1099.578	2692.634	9.99+	2.449
207	14	S15	0	17.925	2597.672	1194.035	2597.672	9.99+	2.176
208	14	S16	0	375.862	2520.068	741.208	2520.068	6.705	3.4
209	15	S1	0	218.596	2445.099	727.108	2445.099	9.99+	3.363
210	15	S2	0	11.769	2486.946	969.412	2486.946	9.99+	2.565
211	15	S3	0	5.667	2543.798	929.586	2543.798	9.99+	2.736
212	15	S4	0	7.562	2542.287	938.187	2542.287	9.99+	2.71
213	15	S5	0	7.772	2526.972	907.938	2526.972	9.99+	2.783
214	15	S6	0	7.728	2537.403	935.077	2537.403	9.99+	2.714
215	15	S7	0	4.217	2543.326	931.488	2543.326	9.99+	2.73
216	15	S8	0	13.519	2532.748	927.314	2532.748	9.99+	2.731
217	15	S9	0	11.196	2528.571	915.95	2528.571	9.99+	2.761
218	15	S10	0	5.847	2543.505	934.684	2543.505	9.99+	2.721
219	15	S11	0	8.009	2540.639	937.721	2540.639	9.99+	2.709
220	15	S12	0	0.804	2526.351	905.553	2526.351	9.99+	2.79





**Slab Stability - Sliding (Continued)**

	LC	Slab	Angle[deg]	Va-xx[lb]	Vr-xx[lb]	Va-zz[lb]	Vr-zz[lb]	SR-xx	SR-zz
221	15	S13	0	5.476	2541.094	938.852	2541.094	9.99+	2.707
222	15	S14	0	5.943	2540.756	922.729	2540.756	9.99+	2.754
223	15	S15	0	24.152	2508.446	1004.703	2508.446	9.99+	2.497
224	15	S16	0	243.436	2358.401	621.151	2358.401	9.688	3.797



**JOB NO.:** U2716.0387.241  
**SUBJECT:** WIND PRESSURES  
**CONDITION:** 20° TILT

**PROJECT:** Sunturf Package D5 Ground Mount

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# 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 N391 max	1.518	25	3552.513	25	2134.637	25	0	30	0	30	0	30
2 min	-1.362	27	-3409.023	28	-1794.253	23	0	18	0	18	0	18
3 N276 max	5.117	25	3412.945	25	2062.245	25	0	30	0	30	0	30
4 min	-5.767	28	-3272.084	28	-1732.807	23	0	18	0	18	0	18
5 N379 max	3.641	28	4106.007	25	2018.748	25	0	30	0	30	0	30
6 min	-4.64	25	-4040.147	28	-1697.88	23	0	18	0	18	0	18
7 N287 max	4.563	25	4114.15	25	2016.688	25	0	30	0	30	0	30
8 min	-4.952	28	-4048.992	28	-1696.492	23	0	18	0	18	0	18
9 N239 max	5.322	25	4104.952	25	2014.782	25	0	30	0	30	0	30
10 min	-4.854	28	-4037.433	28	-1694.451	23	0	18	0	18	0	18
11 N251 max	5.344	28	4099.62	25	2011.554	25	0	30	0	30	0	30
12 min	-5.416	25	-4034.974	28	-1692.474	23	0	18	0	18	0	18
13 N275 max	4.512	28	4110.84	25	2002.215	25	0	30	0	30	0	30
14 min	-5.008	25	-4042.638	28	-1685.214	23	0	18	0	18	0	18
15 N233 max	8.027	28	4170.48	25	1994.161	25	0	30	0	30	0	30
16 min	-7.452	25	-4109.852	28	-1680.321	23	0	18	0	18	0	18
17 N257 max	2.534	25	4100.609	25	1991.326	25	0	30	0	30	0	30
18 min	-2.553	28	-4031.304	28	-1676.698	23	0	18	0	18	0	18
19 N263 max	8.411	25	4068.318	25	1990.745	25	0	30	0	30	0	30
20 min	-8.513	28	-4001.829	28	-1675.942	23	0	18	0	18	0	18
21 N385 max	6.77	25	4143.132	25	1976.795	25	0	30	0	30	0	30

**Envelope Node Reactions (Continued)**

Node Label		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC	
22		min	-7.895	28	-4081.148	28	-1665.444	23	0	18	0	18	0	18
23	N269	max	7.914	28	4029.355	25	1958.469	25	0	30	0	30	0	30
24		min	-8.189	25	-3959.468	28	-1650.112	23	0	18	0	18	0	18
25	N245	max	4.615	25	4009.46	25	1935.343	25	0	30	0	30	0	30
26		min	-4.409	28	-3937.427	28	-1631.714	23	0	18	0	18	0	18
27	N293	max	0.221	21	4002.217	25	1928.494	25	0	30	0	30	0	30
28		min	-0.916	28	-3929.344	28	-1626.172	23	0	18	0	18	0	18
29	N1	max	528.466	25	4007.358	25	1569.137	25	0	30	0	30	0	30
30		min	-567.058	28	-3987.989	28	-1324.952	23	0	18	0	18	0	18
31	N151	max	578.4	28	3554.297	25	1346.651	25	0	30	0	30	0	30
32		min	-537.832	25	-3538.996	28	-1137.64	23	0	18	0	18	0	18
33	N289	max	11.207	26	2209.797	26	115.002	23	0	30	0	30	0	30
34		min	-7.542	27	-1073.305	27	-146.485	25	0	18	0	18	0	18
35	N283	max	3.862	27	2225.198	26	114.903	23	0	30	0	30	0	30
36		min	-7.433	26	-1089.302	27	-146.371	25	0	18	0	18	0	18
37	N241	max	10.295	26	2223.323	26	114.82	23	0	30	0	30	0	30
38		min	-6.218	27	-1084.041	27	-146.321	25	0	18	0	18	0	18
39	N253	max	7.027	27	2200.882	26	114.891	23	0	30	0	30	0	30
40		min	-10.278	26	-1068.532	27	-146.239	25	0	18	0	18	0	18
41	N259	max	5.961	26	2229.084	26	114.843	23	0	30	0	30	0	30
42		min	-3.235	27	-1095.575	27	-146.215	25	0	18	0	18	0	18
43	N381	max	4.873	27	2217.526	26	114.746	23	0	30	0	30	0	30
44		min	-7.037	26	-1078.135	27	-146.178	25	0	18	0	18	0	18
45	N265	max	18.827	26	2193.131	26	114.417	23	0	30	0	30	0	30
46		min	-11.613	27	-1070.137	27	-145.605	25	0	18	0	18	0	18
47	N235	max	3.302	27	2193.98	26	114.352	23	0	30	0	30	0	30
48		min	-5.496	26	-1067.472	27	-145.497	25	0	18	0	18	0	18
49	N387	max	6.299	26	2191.078	26	113.915	23	0	30	0	30	0	30
50		min	-3.151	27	-1070.462	27	-144.872	25	0	18	0	18	0	18
51	N271	max	8.726	27	2192.089	26	113.616	23	0	30	0	30	0	30
52		min	-14.964	26	-1079.704	27	-144.681	25	0	18	0	18	0	18
53	N247	max	11.091	26	2194.582	26	112.977	23	0	30	0	30	0	30
54		min	-6.402	27	-1087.965	27	-143.979	25	0	18	0	18	0	18
55	N295	max	1.453	26	2195.208	26	112.76	23	0	30	0	30	0	30
56		min	-0.929	27	-1090.277	27	-143.752	25	0	18	0	18	0	18
57	N278	max	13.584	27	2289.232	26	111.088	23	0	30	0	30	0	30
58		min	-22.862	26	-1122.737	27	-142.209	25	0	18	0	18	0	18
59	N393	max	39.172	26	2330.268	26	110.67	23	0	30	0	30	0	30
60		min	-23.988	27	-1135.017	27	-141.699	25	0	18	0	18	0	18
61	N2	max	80.466	26	1769.729	26	99.318	23	0	30	0	30	0	30
62		min	-50.978	27	-858.537	27	-124.608	25	0	18	0	18	0	18
63	N152	max	73.179	27	1548.396	26	90.989	23	0	30	0	30	0	30
64		min	-115.652	26	-752.111	27	-113.645	25	0	18	0	18	0	18
65	Totals:	max	0.002	27	85027.978	25	28683.633	25						
66		min	-0.006	26	-62039.908	27	-24279.258	27						



Company:	Vector Structural Engineers	Date:	3/27/2024
Engineer:	CJT	Page:	1/6
Project:	Sunturf Ground Mount D5		
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): 30.00  
 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:	3/27/2024
Engineer:	CJT	Page:	2/6
Project:	Sunturf Ground Mount D5		
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]: 4110

$V_{uax}$  [lb]: 579

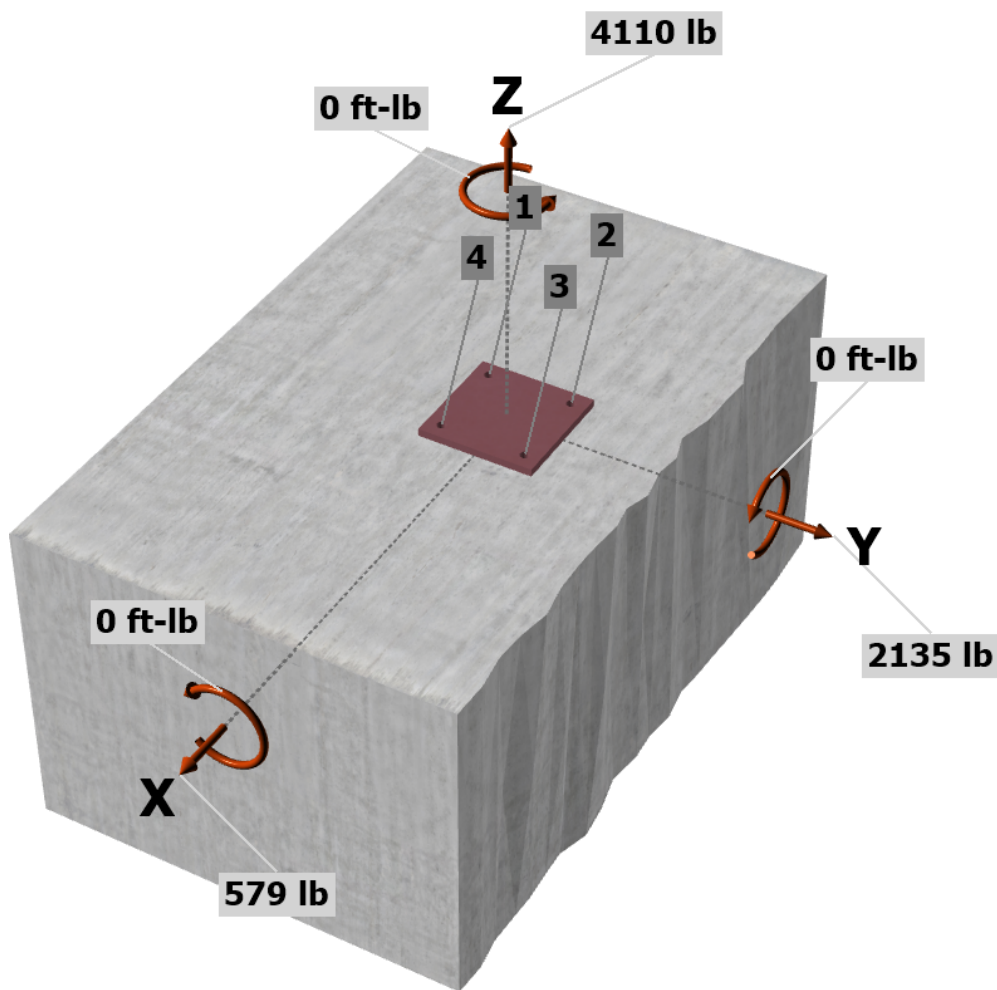
$V_{uay}$  [lb]: 2135

$M_{ux}$  [ft-lb]: 0

$M_{uy}$  [ft-lb]: 0

$M_{uz}$  [ft-lb]: 0

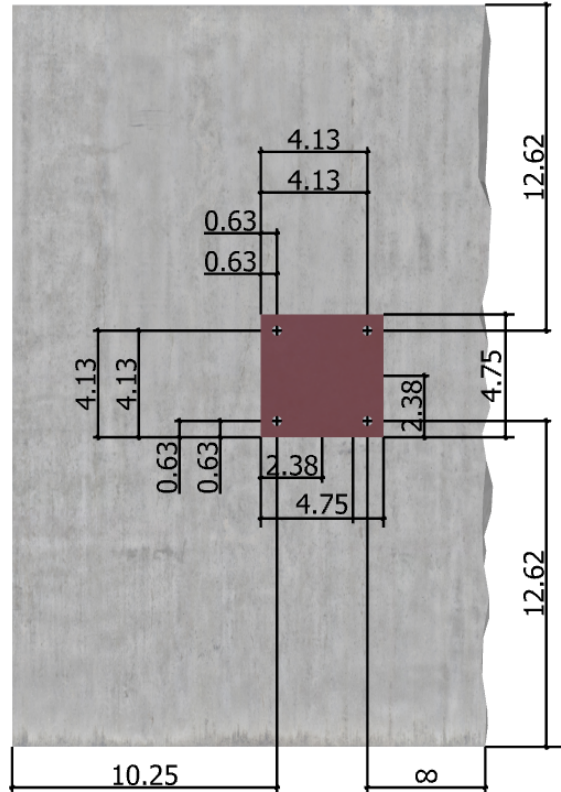
<Figure 1>





Company:	Vector Structural Engineers	Date:	3/27/2024
Engineer:	CJT	Page:	3/6
Project:	Sunturf Ground Mount D5		
Address:			
Phone:			
E-mail:			

<Figure 2>





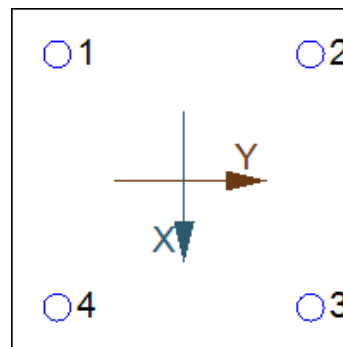
Company:	Vector Structural Engineers	Date:	3/27/2024
Engineer:	CJT	Page:	4/6
Project:	Sunturf Ground Mount D5		
Address:			
Phone:			
E-mail:			

### 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	1027.5	144.7	533.8	553.1
2	1027.5	144.8	533.8	553.1
3	1027.5	144.8	533.7	553.0
4	1027.5	144.7	533.7	553.0
Sum	4110.0	579.0	2135.0	2212.1

Maximum concrete compression strain (%): 0.00  
 Maximum concrete compression stress (psi): 0  
 Resultant tension force (lb): 4110  
 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)	$\phi$	$\phi N_{sa}$ (lb)
7800	0.75	5850

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

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

$K_c$	$\lambda_a$	$f_c$ (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 <sup>2</sup> )	$A_{Nco}$ (in <sup>2</sup> )	$C_{a,min}$ (in)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	$N_b$ (lb)	$\phi$	$\phi N_{cbg}$ (lb)
240.25	144.00	10.25	1.000	1.000	1.00	1.000	6800	0.65	7374

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

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

$\tau_{k,cr}$ (psi)	$f_{short-term}$	$K_{sat}$	$f_c$ (psi)	$n$	$\tau_{k,cr}$ (psi)
1346	1.00	1.00	2500	0.24	1346

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

$\lambda_a$	$\tau_{cr}$ (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 <sup>2</sup> )	$A_{Na0}$ (in <sup>2</sup> )	$C_{Na}$ (in)	$C_{a,min}$ (in)	$\Psi_{ec,Na}$	$\Psi_{ed,Na}$	$\Psi_{cp,Na}$	$N_{ba}$ (lb)	$\phi$	$\phi N_{ag}$ (lb)
198.45	112.09	5.29	10.25	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.





Company:	Vector Structural Engineers	Date:	3/27/2024
Engineer:	CJT	Page:	5/6
Project:	Sunturf Ground Mount D5		
Address:			
Phone:			
E-mail:			

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

$V_{sa}$ (lb)	$\phi_{grout}$	$\phi$	$\phi_{grout}\phi V_{sa}$ (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)	$\lambda_a$	$f_c$ (psi)	$c_{a1}$ (in)	$V_{bx}$ (lb)
3.00	0.375	1.00	2500	16.12	21026

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

$A_{vc}$ (in <sup>2</sup> )	$A_{vco}$ (in <sup>2</sup> )	$\psi_{ec,v}$	$\psi_{ed,v}$	$\psi_{c,v}$	$\psi_{h,v}$	$V_{bx}$ (lb)	$\phi$	$\phi V_{cbgx}$ (lb)
917.15	1169.34	1.000	0.827	1.000	1.000	21026	0.70	9548

**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)	$\lambda_a$	$f_c$ (psi)	$c_{a1}$ (in)	$V_{by}$ (lb)
3.00	0.375	1.00	2500	10.25	10661

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

$A_{vc}$ (in <sup>2</sup> )	$A_{vco}$ (in <sup>2</sup> )	$\psi_{ec,v}$	$\psi_{ed,v}$	$\psi_{c,v}$	$\psi_{h,v}$	$V_{by}$ (lb)	$\phi$	$\phi V_{cbgy}$ (lb)
441.88	472.78	1.000	1.000	1.000	1.000	10661	0.70	13949

**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)	$\lambda_a$	$f_c$ (psi)	$c_{a1}$ (in)	$V_{bx}$ (lb)
3.00	0.375	1.00	2500	12.62	14564

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

$A_{vc}$ (in <sup>2</sup> )	$A_{vco}$ (in <sup>2</sup> )	$\psi_{ec,v}$	$\psi_{ed,v}$	$\psi_{c,v}$	$\psi_{h,v}$	$V_{bx}$ (lb)	$\phi$	$\phi V_{cbgx}$ (lb)
618.63	716.69	1.000	1.000	1.000	1.000	14564	0.70	17600

**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 <sup>2</sup> )	$A_{Na0}$ (in <sup>2</sup> )	$\psi_{ed,Na}$	$\psi_{ec,Na}$	$\psi_{cp,Na}$	$N_{ba}$ (lb)	$N_a$ (lb)
2.0	198.45	112.09	1.000	1.000	1.000	6343	11229

$A_{Nc}$ (in <sup>2</sup> )	$A_{Nco}$ (in <sup>2</sup> )	$\psi_{ec,N}$	$\psi_{ed,N}$	$\psi_{c,N}$	$\psi_{cp,N}$	$N_b$ (lb)	$N_{cb}$ (lb)	$\phi$
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, $\phi N_n$ (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.



Anchor Designer™  
Software  
Version 3.1.2303.1

Company:	Vector Structural Engineers	Date:	3/27/2024
Engineer:	CJT	Page:	6/6
Project:	Sunturf Ground Mount D5		
Address:			
Phone:			
E-mail:			

Steel	1028	5850	0.18	Pass
Concrete breakout	4110	7374	0.56	Pass
<b>Adhesive</b>	<b>4110</b>	<b>6176</b>	<b>0.67</b>	<b>Pass (Governs)</b>

Shear	Factored Load, $V_{ua}$ (lb)	Design Strength, $\phi V_n$ (lb)	Ratio	Status
<b>Steel</b>	<b>553</b>	<b>3042</b>	<b>0.18</b>	<b>Pass (Governs)</b>
T Concrete breakout x+	579	9548	0.06	Pass
Concrete breakout y-	289	13949	0.02	Pass
Concrete breakout x-	1068	17600	0.06	Pass
Concrete breakout, combined	-	-	0.06	Pass
Pryout	2212	15721	0.14	Pass

Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. 17.8.1	0.67	0.00	66.5%	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.