Project Number: U2716-114-201

April 22, 2021

Sunmodo
14800 NE 65th Street
Vancouver, WA 98682

**REFERENCE: Sunmodo Sunturf Ground Mount A5**
**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 2018 International Building Code. Vector Structural Engineering requires that we review each site specific install, and we are not liable for installs at site specific locations we have not reviewed. The following design parameters are used in our analysis:

- Minimum Design Loads for Buildings and Other Structures (ASCE 7-16)
- Design wind speed for risk category I structures: 140 mph
- Wind exposure: B
- Ground snow load: 70 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 | 2713 | 1.5 | 4070 |
| LATERAL | 1908 | 2 | 3816 |

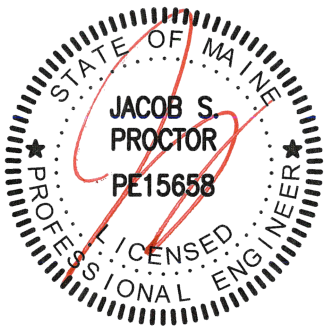
Foundation concrete shall have a minimum compressive strength of 2500 psi at 28 days. Cement for all concrete shall be Type I or II with a minimum of 6% entrained air with a water/cement ratio of 0.50. Maximum aggregate size shall be 3/4". No special inspection of concrete strength is required.

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

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

Very truly yours,

VECTOR STRUCTURAL ENGINEERING, LLC




04/22/2021

Jacob Proctor, P.E.
ME License: PE15658
Project Engineer

Enclosures

JSP/stb

VECTOR ENGINEERS
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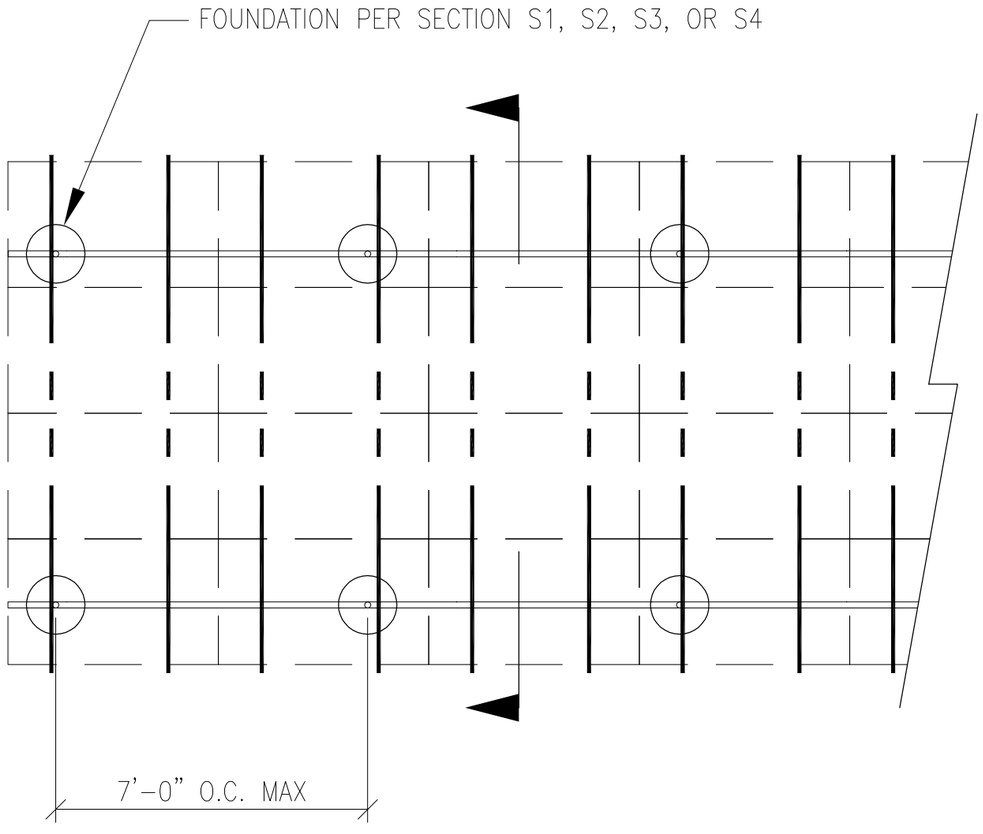
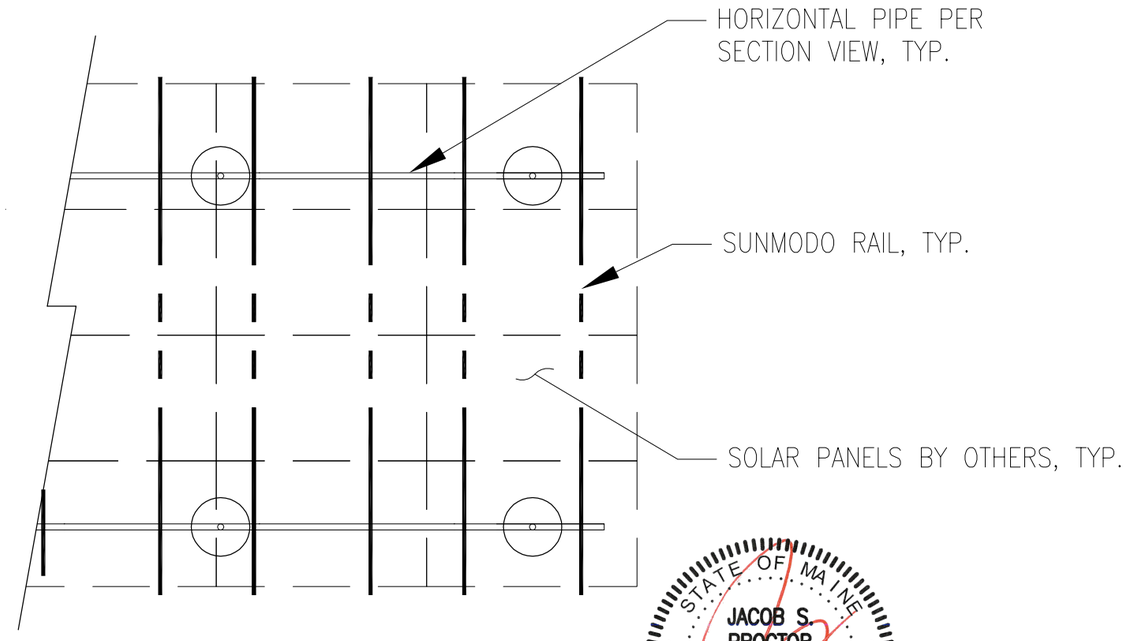
JOB NO. U2716-114-191

PROJECT SUNMODO SUNTURF GROUND MOUNTS A5

SUBJECT ALL OPTIONS




STATE OF MAINE
JACOB S. PROCTOR
PE15658
PROFESSIONAL LICENSED ENGINEER

04/22/2021

## PV ARRAY PLAN

N.T.S.

P1

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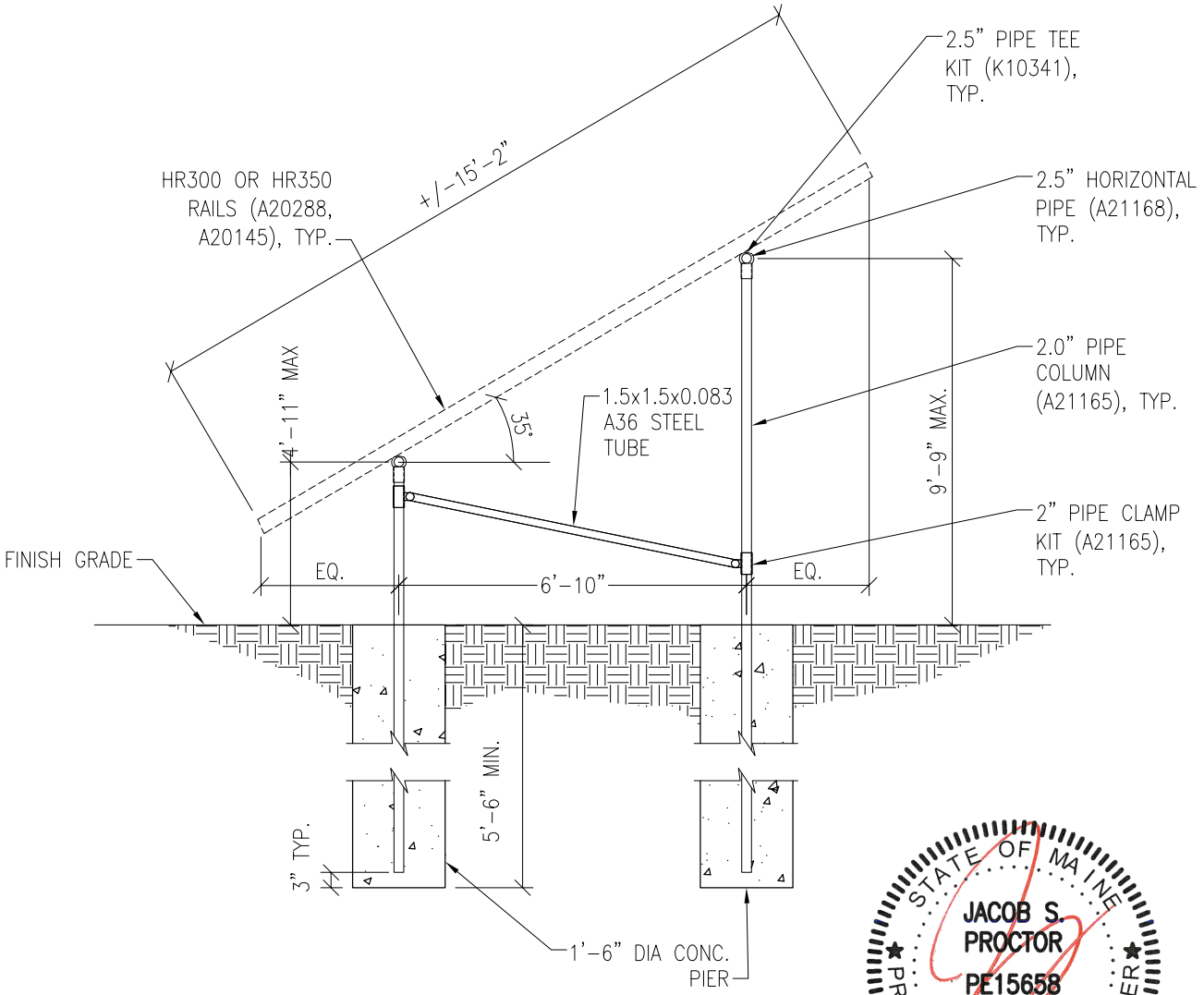
JOB NO. U2716-114-191

PROJECT SUNMODO SUNTURF GROUND MOUNTS A5

SUBJECT DRILLED PIER OPTION

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04/22/2021

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**PV ARRAY SECTION**

N.T.S.

S1


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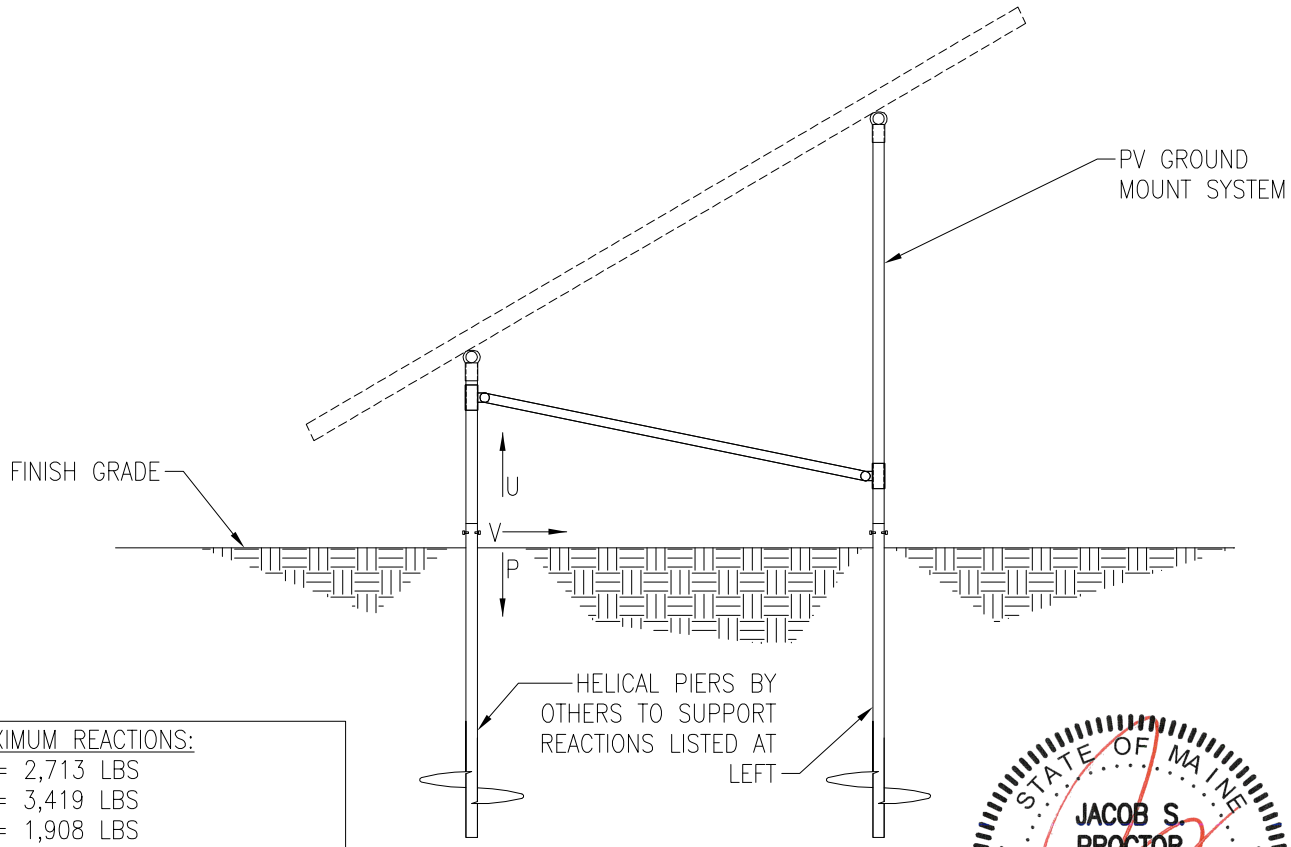
JOB NO. U2716-114-191

PROJECT SUNMODO SUNTURF GROUND MOUNTS A5

SUBJECT HELICAL PIER OPTION

NOTES:

1. For ground mount components see Section S1.
2. A minimum of (1) helical pier must be load-tested as follows:
   - 2.1. Safety factor for uplift = 1.5,
   - 2.2. Safety factor for lateral loads = 2.0
   - 2.3. Upward deflection limit = 1/2"
   - 2.4. Lateral deflection limit = 1"
   - 2.5. The load tests must be performed by an approved contractor.




MAXIMUM REACTIONS:
U = 2,713 LBS
P = 3,419 LBS
V = 1,908 LBS

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**PV ARRAY SECTION**

N.T.S.

S2

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VECTOR ENGINEERS

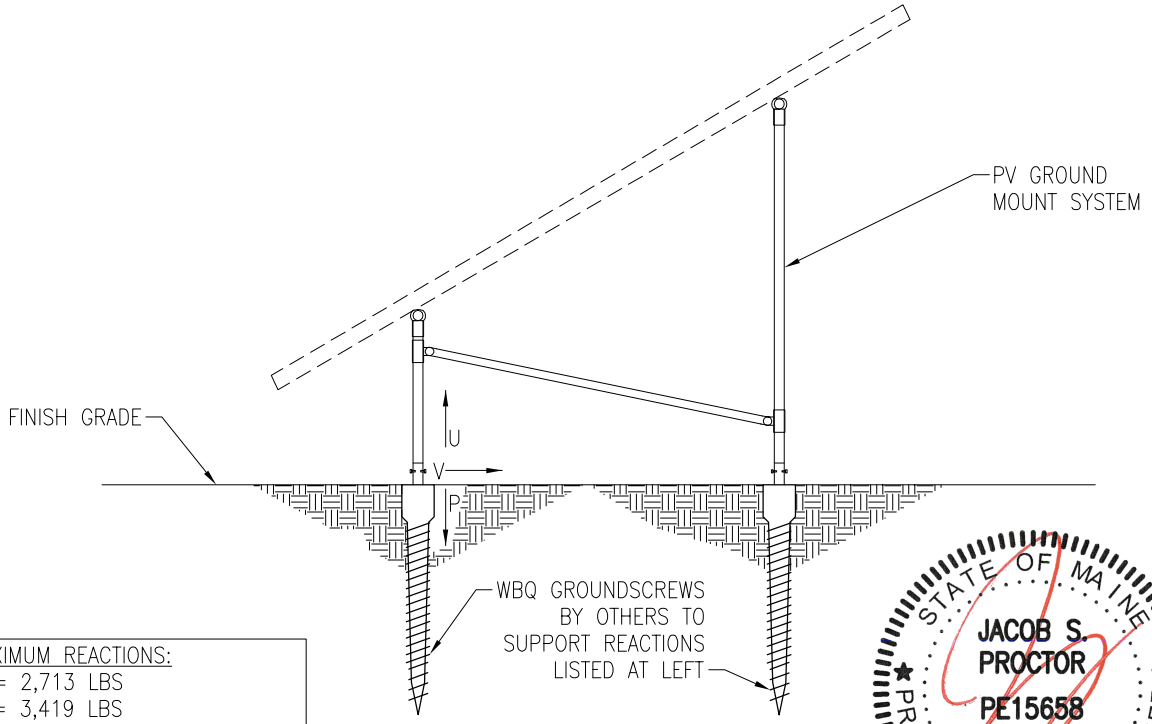
JOB NO. U2716-114-191

PROJECT SUNMODO SUNTURF GROUND MOUNTS A5

SUBJECT GROUND SCREW OPTION

NOTES:

1. For ground mount components see Section S1.
2. A minimum of (1) ground screw must be load-tested as follows:
   - 2.1. Safety factor for uplift = 1.5,
   - 2.2. Safety factor for lateral loads = 2.0
   - 2.3. Upward deflection limit = 1/2"
   - 2.4. Lateral deflection limit = 1"
   - 2.5. The load tests must be performed by an approved contractor.




MAXIMUM REACTIONS:
U = 2,713 LBS
P = 3,419 LBS
V = 1,908 LBS

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**PV ARRAY SECTION**

N.T.S.

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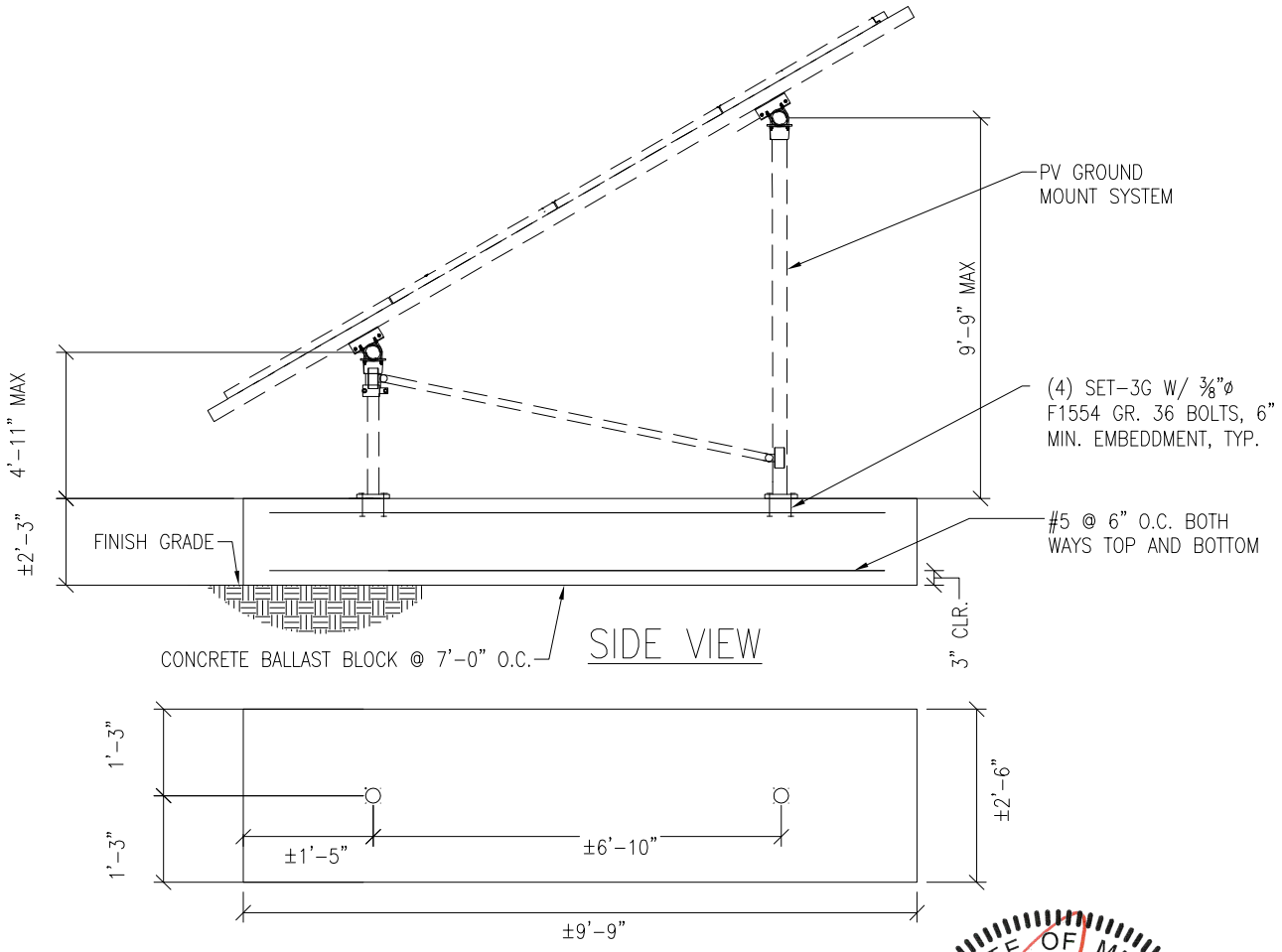
PROJECT SUNMODO SUNTURF GROUND MOUNTS A5

SUBJECT BALLASTED BLOCK OPTION

NOTES:

1. For ground mount components see Section S1.

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**PV ARRAY SECTION**

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S4

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**JOB NO.:** U2716-114-191 **DESIGNED:** STB
**DATE:** 08/01/19

**PROJECT:** A5 – Sunmodo Sunturf GM **SUBJECT:** Dead Load

**Design Weight:**

| | |
|---|---|
| Individual Panel Weight [lb]: | 50.7 |
| Panel Transverse Length (T5) [in]: | 41.2 |
| Panel Transverse Length (T5) [ft]: | 3.4 |
| Panel Longitudinal Length (L2) [in]: | 81.4 |
| Panel Longitudinal Length (L2) [ft]: | 6.8 |
| Individual Panel Area [$ft^2$]: | 23.3 |
| Individual Panel Weight [psf]: | 2.2 |
| # of Panels in Transverse Direction: | 4 |
| Approximate Transverse Length (T4) [ft]: | 13.7 |
| # of Panels in Longitudinal Direction: | 12 |
| Approximate Longitudinal Length (L1) [ft]: | 81.4 |
| Transverse Column Spacing (T1) [ft]: | 6.7 |
| Longitudinal Column Spacing (L3) [ft]: | 7.0 |
| # of Columns in Longitudinal Direction: | 12 |
| # of Columns in Transverse Direction: | 2 |
| Total Number of Columns: | 24 |
| Panel Slope from Horizontal (a) [°]: | 35.0 |
| Short Column Height (H1) [ft]: | 4.5 |
| Approximate Tall Column Height (H2) [ft]: | 9.2 |
| Transverse Brace between Columns : | Yes |
| Approximate Brace Length (B1) [ft]: | 9.0 |
| Weight of Columns [plf]: | 3.7 |
| Weight of Cross Pipe [plf]: | 3.7 |
| Weight of Brace [plf]: | 3.7 |
| Tributary Transverse Length per Column [ft]: | 6.9 |
| Tributary Longitudinal Length per Column [ft]: | 7.0 |
| Tributary Area per Column [$ft^2$]: | 48.1 |
| Rail Weight [plf]: | 1.0 |
| Transverse Rail Weight per Column [lb]: | 27.5 |
| Longitudinal Rail Weight per Column [lb]: | 25.6 |
| Tall Column Weight [lb]: | 33.6 |
| Panel Weight per Column [lb]: | 104.6 |
| Rail Weight per Column [lb]: | 27.5 |
| Cross Pipe Weight per Column [lb]: | 25.6 |
| Brace Weight per Column [lb]: | 16.4 |
| **Total Weight per Column (1.0 D) [lb]:** | **207.7** |

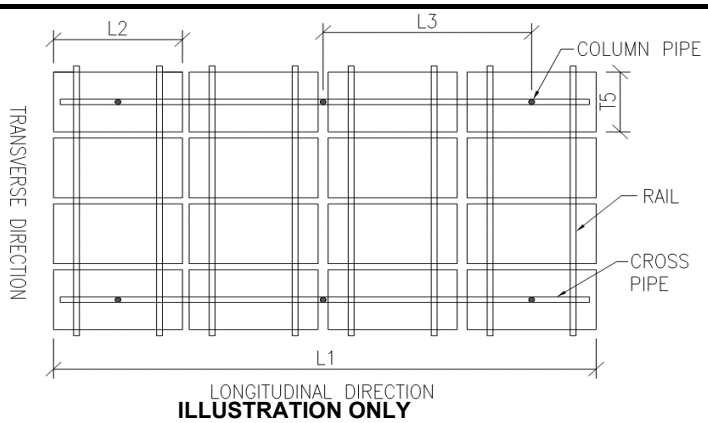



**ILLUSTRATION ONLY**

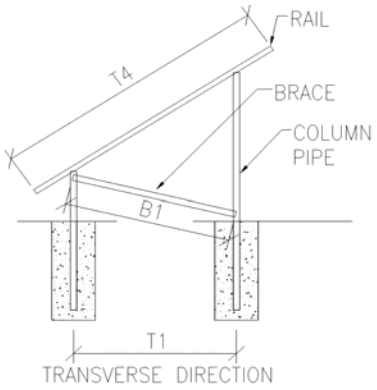



**ILLUSTRATION ONLY**

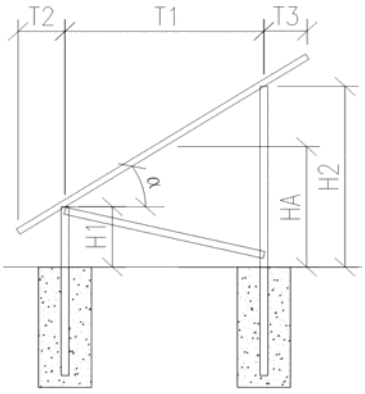



**ILLUSTRATION ONLY**

Assumptions:
- T2 = T3

**JOB NO.:** U2716-114-191 **DESIGNED:** STB
**DATE:** 08/01/19

**PROJECT:** A5 – Sunmodo Sunturf GM **SUBJECT:** Snow Load

**SNOW LOAD (S):**

| | | |
|---|---|---|
| ASCE 7 Standard: | 10 | |
| Panel Slope from Horizontal [°]: | 35.0 | |
| Snow Ground Load, $p_g$ [psf]: | 70.0 | (Section 7.2) |
| Terrain Category: | B | (Table 7-2) |
| Exposure of Roof: | Fully Exposed | (Table 7-2) |
| Exposure Factor, $C_e$: | 0.9 | (Table 7-2) |
| Thermal Factor, $C_t$: | 1.2 | (Table 7-3) |
| Risk Category: | I | (Table 1.5-1) |
| Importance Factor, $I_S$: | 0.8 | (Table 1.5-2) |
| Flat Roof Snow Load, $p_f$ [psf]: | 42 | (Equation 7.3-1) |
| Minimum Roof Snow Load, $p_m$ [psf]: | 0 | (Section 7.3.4) |
| Unobstructed Slippery Surface? | Yes | (Section 7.4) |
| Slope Factor Figure: | Figure 7-2c | (Section 7.4) |
| Roof Slope Factor, $C_s$: | 0.636 | (Figure 7-2) |
| Sloped Roof Snow Load, $p_s$ [psf]: | 27 | (Equation 7.4-1) |
| Design Snow Load, S [psf]: | 27 | |
| | | |
| Tributary Transverse Length [ft]: | 5.6 | |
| Tributary Longitudinal Length [ft]: | 7 | |
| Tributary Area per Column [$ft^2$]: | 39.4 | |
| | | |
| **Snow Load per Column (1.0 S) [lb]:** | **1060.8** | |

**JOB NO.:** U2716-114-191 **DESIGNED:** STB
**DATE:** 08/01/19

**PROJECT:** A5 – Sunmodo Sunturf GM **SUBJECT:** Wind Pressure

**Design Wind Load:**

| | | |
|---|---|---|
| ASCE 7 Standard: | 10 | |
| Basic Wind Speed, V [mph]: | 140 | |
| Risk Category: | I | |
| | | |
| Exposure Category | B | (Section 26.7.3) |
| Velocity Pressure Exposure Coefficient, $K_h$: | 0.57 | (Table 27.3-1) |
| Topographic Factor, $K_{ht}$: | 1.0 | (Section 26.8.2) |
| Wind Directionality Factor, $K_d$: | 0.85 | (Table 26.6-1) |
| Internal Pressure Coefficient, $GC_{pi}$ : | 0.00 | (Table 26.11-1) |
| Velocity Pressure, $q_h$ [psf]: | 24.3 | (Equation 27.3-1) |
| Gust Effect Factor, G: | 0.85 | (Section 26.9.1) |
| Panel Slope [degrees]: | 35.0 | |

Net Pressure Coefficients ($C_N$) per: (Figure 27.4-4)

| Clear Wind Flow | $C_{NW}$ | $C_{NL}$ |
|---|---|---|
| Case 1 (γ = 0°, Load Case A) | -1.80 | -1.80 |
| Case 2 (γ = 0°, Load Case B) | -2.43 | -0.57 |
| Case 3 (γ = 180°, Load Case A) | 2.10 | 2.17 |
| Case 4 (γ = 180°, Load Case B) | 2.67 | 1.07 |

Design Wind Pressures (p) [psf] per: (Equation 27.4-3)

| Clear Wind Flow | $q_hGC_{NW}$ | $q_hGC_{NL}$ |
|---|---|---|
| Case 1 (γ = 0°, Load Case A) | -37.2 | -37.2 |
| Case 2 (γ = 0°, Load Case B) | -50.3 | -11.7 |
| Case 3 (γ = 180°, Load Case A) | 43.4 | 44.8 |
| Case 4 (γ = 180°, Load Case B) | 55.1 | 22.0 |

Wind Pressure on Each Side of Panels [psf]

| Clear Wind Flow | Short Col. Pressure | Long Col. Pressure |
|---|---|---|
| Case 1 (γ = 0°, Load Case A) | -37.2 | -37.2 |
| Case 2 (γ = 0°, Load Case B) | -11.7 | -50.3 |
| Case 3 (γ = 180°, Load Case A) | 43.4 | 44.8 |
| Case 4 (γ = 180°, Load Case B) | 55.1 | 22.0 |

**JOB NO.:** U2716-114-191

**PROJECT:** A5 – Sunmodo Sunturf GM **SUBJECT:** Open Building Wind Loads

## Design Wind Load Per ASCE 7-10

$p = q_h G C_n$

| | | |
|---|---|---|
| Velocity Pressure Exposure Coefficient, $K_h$: | 0.57 | (Table 27.3-1) |
| Topographic Factor, $K_{ht}$: | 1.0 | (Section 26.8.2) |
| Wind Directionality Factor, $K_d$: | 0.85 | (Table 26.6-1) |
| Ultimate Wind Speed, V [mph]: | 140 | |
| Velocity Pressure, $q_h$ [psf]: | 24.3 | (Equation 27.3-1) |
| Gust Effect Factor, G: | 0.85 | (Section 26.9.1) |

$\gamma$= 90° or 270°

Force Coefficient, $C_N$:

| Horizontal Distance from Winward Edge | Roof angle | Load Case | Obstructed Wind Flow CN |
|---|---|---|---|
| <= h | 35 | A | -0.8 |
| | | B | 0.8 |
| > h, <= 2h | 35 | A | -0.6 |
| | | B | 0.5 |
| > 2h | 35 | A | -0.3 |
| | | B | 0.3 |

Design Wind Pressure, $p$ [psf]:

| | Roof angle | Load Case | Obstructed Wind Flow |
|---|---|---|---|
| <= h | 35 | A | -16.5 |
| | | B | 16.5 |
| > h, <= 2h | 35 | A | -12.4 |
| | | B | 10.3 |
| > 2h | 35 | A | -6.2 |
| | | B | 6.2 |

**JOB NO.:** U2716-114-191 **DESIGNED:** STB

# Foundation Option 1: Drilled Concrete Pier

**JOB NO.:** U2716-114-191
**SUBJECT:** CONC. PIER

**PROJECT:** A5 - Sunturf Ground Mount

## DRILLED CONCRETE PIER DESIGN

### Column Reactions:

| | | | |
|---|---|---|---|
| Max. Shear, V [k]: | 1.9 | Max. Down, $P_d$ [k]: | 3.4 |
| Max. Moment, M [k-ft]: | 0.0 | Max. Uplift, $P_u$ [k]: | 2.7 |

### Pier Properties:

| | | | |
|---|---|---|---|
| Pier Shape: | Round | | |
| Pier Diameter, b [ft]: | 1.5 | Volume of Concrete [$ft^3$]: | 10 |
| Top of Pier Elevation [ft]: | 0.00 | Volume of Concrete [$yd^3$]: | 0.4 |
| Pier Depth, d [ft]: | 5.5 | Weight of Concrete [k]: | 1.5 |

### Soil Properties:

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

*per IBC Section 1810.3.3.1.4

### Check Bearing:

| | | |
|---|---|---|
| Bearing Capacity [k]: | 6.5 | **Bearing capacity OK.** |

### Check Uplift:

| | | |
|---|---|---|
| Uplift Capacity [k]: | 7.8 | **Uplift capacity OK.** |

### Check Lateral Bearing:

| | | |
|---|---|---|
| Top of Pier Constrained?: | No | IBC Section1807.3.2.1 |
| Applied Lateral Force, P [lb]: | 1,908 | |
| Point of Application, h [ft]: | 0.0 | |
| $S_{_max}$ [psf]: | | |
| S [psf]: | 550 | |
| A = 2.34*P/(Sb): | 5.41 | |
| Required Pier Depth, $d_{reqd}$ [ft]: | 5.40 | IBC Eq. 18-1 |

Result: **Lateral bearing capacity OK.**

**JOB NO.:** U2716-114-191 **DESIGNED:** STB

# Foundation Option 2: Helical Pier

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.

| Load (ASD) | Value (lbs) | Factor of Safety | Test Value (lbs) |
|---|---|---|---|
| UPLIFT | 2713 | 1.5 | 4070 |
| LATERAL | 1908 | 2 | 3816 |

**JOB NO.:** U2716-114-191 **DESIGNED:** STB

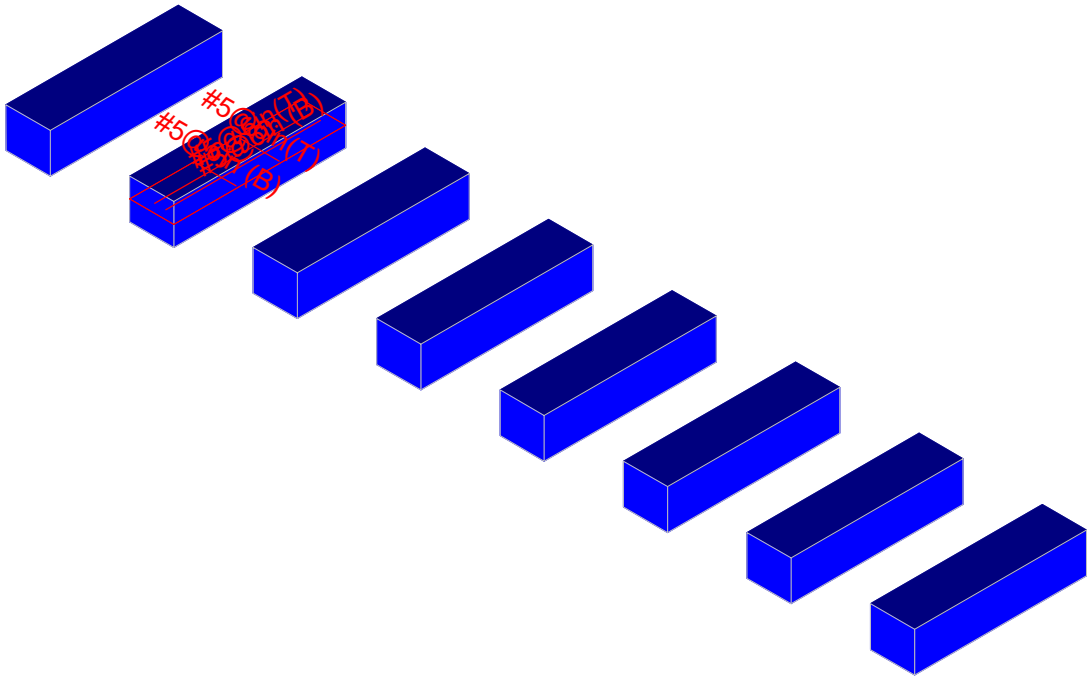
# Foundation Option 3: Ground Screw

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.

| Load (ASD) | Value (lbs) | Factor of Safety | Test Value (lbs) |
|---|---|---|---|
| UPLIFT | 2713 | 1.5 | 4070 |
| LATERAL | 1908 | 2 | 3816 |

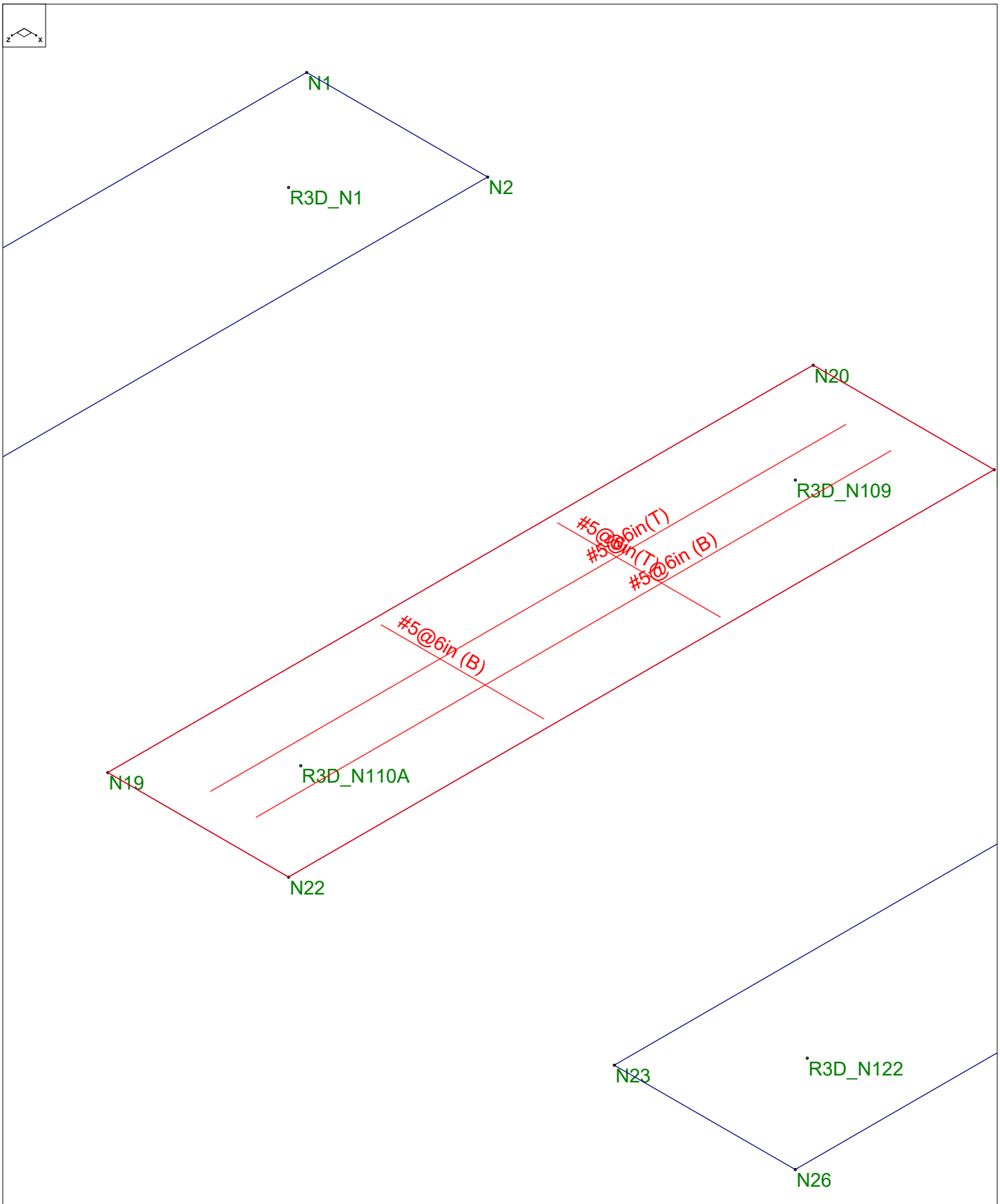
**JOB NO.:** U2716-114-191 **DESIGNED:** STB

# Foundation Option 4: Ballasted Block



Results for LC 1, 1.0 D

| | | |
|---|---|---|
| Vector Structural Engineeri... | Ground Mount | SK - 2 |
| STB | | Apr 6, 2021 at 2:19 PM |
| U2716.114.181 | | Sunmodo Sunturf A5 v3 85x45.r3d |




Results for LC 1, 1.0 D

| | | |
|---|---|---|
| Vector Structural Engineeri... | Ground Mount | SK - 1 |
| STB | | Apr 6, 2021 at 2:19 PM |
| U2716.114.181 | | Sunmodo Sunturf A5 v3 85x45.r3d |

## (Global) Model Settings

| | |
|---|---|
| Display Sections for Member Calcs | 5 |
| Max Internal Sections for Member Calcs | 100 |
| Mesh Size (in) | 12 |
| Max Iterations | 10 |
| Merge Tolerance (in) | .12 |
| Solver | Sparse Accelerated |
| Coefficient of Friction | .3 |
| | |
| No. of Shear Regions | 4 |
| Shear Region Spacing Increment (in) | 4 |
| Min 1 Bar Dia Spacing for Beams? | No |
| Optimize footings for OTM / Sliding? | Yes |
| Parme Beta Factor | .65 |
| Pile Safety Factor | 3 |
| Concrete Stress Block | 0 |
| Concrete Rebar Set | Rectangular |
| Concrete Code | ASTM A615 |
| HR Steel Pile Code | ACI 318-14 |
| Wood Pile Code | AISC 14th (360-10): ASD<br>AWC NDS-15: ASD |

## Concrete Properties

| | Label | E [ksi] | G [ksi] | Nu | Therm (/... | Density[lb/ft^3] | f'c[psi] | Lambda | Flex Stee... | Shear St... |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Conc3000NW | 3156 | 1372 | .15 | .6 | 145 | 3000 | 1 | 60000 | 60000 |
| 2 | Conc3500NW | 3409 | 1482 | .15 | .6 | 145 | 3500 | 1 | 60000 | 60000 |
| 3 | Conc4000NW | 3644 | 1584 | .15 | .6 | 145 | 4000 | 1 | 60000 | 60000 |
| 4 | Conc3000LW | 2085 | 907 | .15 | .6 | 109.999 | 3000 | .75 | 60000 | 60000 |
| 5 | Conc3500LW | 2252 | 979 | .15 | .6 | 109.999 | 3500 | .75 | 60000 | 60000 |
| 6 | Conc4000LW | 2408 | 1047 | .15 | .6 | 109.999 | 4000 | .75 | 60000 | 60000 |
| 7 | Conc2500NW | 3156 | 1372 | .15 | .6 | 145 | 2500 | 1 | 60000 | 60000 |

## General Design Parameters

| | Label | Max Bending Chk | Max Shear Chk | Top Cover[in] | Bottom Cover[in] |
|---|---|---|---|---|---|
| 1 | Typical | 1 | 1 | 3 | 3 |

## Slab Rebar Parameters

| | Label | Top Bar | Bottom Bar | Max Top Bar Sp... | Min Top Bar Sp... | Max Bot Bar Sp... | Min Bot Bar Sp... | Spacing Incr... | Rebar Options |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Typical | #5 | #5 | 6 | 6 | 6 | 6 | 1 | Optimize |

## Soil Definitions

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

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

| | Label | Direction | Magnitude[lb,lb-ft] |
|---|---|---|---|
| 1 | R3D_N1 | X | -12.871 |
| 2 | R3D_N1 | Y | 139.156 |
| 3 | R3D_N2_1 | X | -8.429 |
| 4 | R3D_N2_1 | Y | 110.78 |
| 5 | R3D_N132 | Y | 223.018 |
| 6 | R3D_N133 | Y | 224.358 |
| 7 | R3D_N109 | Y | 227.515 |
| 8 | R3D_N110A | X | 1.788 |

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

| | Label | Direction | Magnitude[lb,lb-ft] |
|---|---|---|---|
| 9 | R3D_N110A | Y | 242.243 |
| 10 | R3D_N121 | Y | 221.424 |
| 11 | R3D_N122 | Y | 220.791 |
| 12 | R3D_N133B_1 | Y | 222.996 |
| 13 | R3D_N134B | Y | 224.371 |
| 14 | R3D_N151 | Y | 221.368 |
| 15 | R3D_N152 | Y | 220.828 |
| 16 | R3D_N143A_1 | Y | 227.255 |
| 17 | R3D_N144A_1 | X | -1.754 |
| 18 | R3D_N144A_1 | Y | 241.988 |
| 19 | R3D_N149A | X | 12.937 |
| 20 | R3D_N149A | Y | 146.205 |
| 21 | R3D_N150A | X | 8.326 |
| 22 | R3D_N150A | Y | 118.271 |

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

| | Label | Direction | Magnitude[lb,lb-ft] |
|---|---|---|---|
| 1 | R3D_N1 | X | -70.115 |
| 2 | R3D_N1 | Y | 569.302 |
| 3 | R3D_N2_1 | X | -49.979 |
| 4 | R3D_N2_1 | Y | 534.875 |
| 5 | R3D_N132 | Y | 1120.203 |
| 6 | R3D_N133 | Y | 1219.849 |
| 7 | R3D_N109 | X | 1.408 |
| 8 | R3D_N109 | Y | 1144.873 |
| 9 | R3D_N110A | X | 10.796 |
| 10 | R3D_N110A | Y | 1331.008 |
| 11 | R3D_N121 | Y | 1112.254 |
| 12 | R3D_N122 | X | -1.754 |
| 13 | R3D_N122 | Y | 1197.911 |
| 14 | R3D_N133B_1 | Y | 1120.02 |
| 15 | R3D_N134B | Y | 1219.93 |
| 16 | R3D_N151 | Y | 1111.736 |
| 17 | R3D_N151 | Z | 1.185 |
| 18 | R3D_N152 | X | 1.954 |
| 19 | R3D_N152 | Y | 1198.132 |
| 20 | R3D_N143A_1 | X | -1.622 |
| 21 | R3D_N143A_1 | Y | 1143.352 |
| 22 | R3D_N143A_1 | Z | -1.404 |
| 23 | R3D_N144A_1 | X | -10.642 |
| 24 | R3D_N144A_1 | Y | 1329.471 |
| 25 | R3D_N149A | X | 70.632 |
| 26 | R3D_N149A | Y | 611.12 |
| 27 | R3D_N150A | X | 49.425 |
| 28 | R3D_N150A | Y | 579.738 |

## Point Loads and Moments (Cat 16 : OL1)

| | Label | Direction | Magnitude[lb,lb-ft] |
|---|---|---|---|
| 1 | R3D_N1 | X | 127.031 |
| 2 | R3D_N1 | Y | -1812.92 |
| 3 | R3D_N1 | Z | 975.328 |
| 4 | R3D_N2_1 | X | 39.992 |
| 5 | R3D_N2_1 | Y | 256.664 |
| 6 | R3D_N2_1 | Z | -59.905 |
| 7 | R3D_N132 | Y | -3977.528 |
| 8 | R3D_N132 | Z | 2366.738 |

## Point Loads and Moments (Cat 16 : OL1) (Continued)

| | Label | Direction | Magnitude[lb,lb-ft] |
|---|---|---|---|
| 9 | R3D_N133 | X | 2.14 |
| 10 | R3D_N133 | Y | 754.034 |
| 11 | R3D_N133 | Z | -101.89 |
| 12 | R3D_N109 | Y | -4269.345 |
| 13 | R3D_N109 | Z | 2679.911 |
| 14 | R3D_N110A | X | -17.56 |
| 15 | R3D_N110A | Y | 898.769 |
| 16 | R3D_N110A | Z | -98.9 |
| 17 | R3D_N121 | Y | -3890.841 |
| 18 | R3D_N121 | Z | 2277.093 |
| 19 | R3D_N122 | X | 1.962 |
| 20 | R3D_N122 | Y | 702.14 |
| 21 | R3D_N122 | Z | -99.77 |
| 22 | R3D_N133B_1 | Y | -3978.749 |
| 23 | R3D_N133B_1 | Z | 2368.037 |
| 24 | R3D_N134B | X | -1.017 |
| 25 | R3D_N134B | Y | 755.343 |
| 26 | R3D_N134B | Z | -101.867 |
| 27 | R3D_N151 | Y | -3896.738 |
| 28 | R3D_N151 | Z | 2283.071 |
| 29 | R3D_N152 | Y | 708.4 |
| 30 | R3D_N152 | Z | -100.003 |
| 31 | R3D_N143A_1 | Y | -4260.197 |
| 32 | R3D_N143A_1 | Z | 2668.532 |
| 33 | R3D_N144A_1 | X | 19.185 |
| 34 | R3D_N144A_1 | Y | 891.333 |
| 35 | R3D_N144A_1 | Z | -99.336 |
| 36 | R3D_N149A | X | -124.023 |
| 37 | R3D_N149A | Y | -1960.772 |
| 38 | R3D_N149A | Z | 1065.859 |
| 39 | R3D_N150A | X | -43.725 |
| 40 | R3D_N150A | Y | 286.818 |
| 41 | R3D_N150A | Z | -62.844 |

## Point Loads and Moments (Cat 17 : OL2)

| | Label | Direction | Magnitude[lb,lb-ft] |
|---|---|---|---|
| 1 | R3D_N1 | X | 169.199 |
| 2 | R3D_N1 | Y | -2078.523 |
| 3 | R3D_N1 | Z | 819.949 |
| 4 | R3D_N2_1 | X | -13.185 |
| 5 | R3D_N2_1 | Y | 701.13 |
| 6 | R3D_N2_1 | Z | -50.463 |
| 7 | R3D_N132 | Y | -4477.953 |
| 8 | R3D_N132 | Z | 1994.168 |
| 9 | R3D_N133 | X | 1.925 |
| 10 | R3D_N133 | Y | 1762.748 |
| 11 | R3D_N133 | Z | -85.859 |
| 12 | R3D_N109 | X | -1.366 |
| 13 | R3D_N109 | Y | -4774.391 |
| 14 | R3D_N109 | Z | 2262.693 |
| 15 | R3D_N110A | X | -6.195 |
| 16 | R3D_N110A | Y | 2009.287 |
| 17 | R3D_N110A | Z | -83.398 |
| 18 | R3D_N121 | Y | -4391.569 |
| 19 | R3D_N121 | Z | 1917.146 |
| 20 | R3D_N122 | Y | 1692.903 |

## Point Loads and Moments (Cat 17 : OL2) (Continued)

| | Label | Direction | Magnitude[lb,lb-ft] |
|---|---|---|---|
| 21 | R3D_N122 | Z | -84.074 |
| 22 | R3D_N133B_1 | Y | -4479.339 |
| 23 | R3D_N133B_1 | Z | 1995.776 |
| 24 | R3D_N134B | Y | 1764.239 |
| 25 | R3D_N134B | Z | -85.843 |
| 26 | R3D_N151 | X | -1.202 |
| 27 | R3D_N151 | Y | -4398.276 |
| 28 | R3D_N151 | Z | 1924.328 |
| 29 | R3D_N152 | X | 2.031 |
| 30 | R3D_N152 | Y | 1699.976 |
| 31 | R3D_N152 | Z | -84.297 |
| 32 | R3D_N143A_1 | Y | -4763.969 |
| 33 | R3D_N143A_1 | Z | 2249.827 |
| 34 | R3D_N144A_1 | X | 8.196 |
| 35 | R3D_N144A_1 | Y | 2000.009 |
| 36 | R3D_N144A_1 | Z | -83.689 |
| 37 | R3D_N149A | X | -165.469 |
| 38 | R3D_N149A | Y | -2245.346 |
| 39 | R3D_N149A | Z | 897.768 |
| 40 | R3D_N150A | X | 7.907 |
| 41 | R3D_N150A | Y | 768.874 |
| 42 | R3D_N150A | Z | -52.994 |

## Point Loads and Moments (Cat 18 : OL3)

| | Label | Direction | Magnitude[lb,lb-ft] |
|---|---|---|---|
| 1 | R3D_N1 | X | -152.89 |
| 2 | R3D_N1 | Y | 2169.78 |
| 3 | R3D_N1 | Z | -1156.495 |
| 4 | R3D_N2_1 | X | -45.722 |
| 5 | R3D_N2_1 | Y | -321.943 |
| 6 | R3D_N2_1 | Z | 71.036 |
| 7 | R3D_N132 | Y | 4757.489 |
| 8 | R3D_N132 | Z | -2806.523 |
| 9 | R3D_N133 | X | -2.542 |
| 10 | R3D_N133 | Y | -935.038 |
| 11 | R3D_N133 | Z | 120.823 |
| 12 | R3D_N109 | Y | 5105.365 |
| 13 | R3D_N109 | Z | -3178.059 |
| 14 | R3D_N110A | X | 20.511 |
| 15 | R3D_N110A | Y | -1111.187 |
| 16 | R3D_N110A | Z | 117.28 |
| 17 | R3D_N121 | Y | 4654.21 |
| 18 | R3D_N121 | Z | -2700.167 |
| 19 | R3D_N122 | X | -2.25 |
| 20 | R3D_N122 | Y | -872.554 |
| 21 | R3D_N122 | Z | 118.31 |
| 22 | R3D_N133B_1 | Y | 4758.95 |
| 23 | R3D_N133B_1 | Z | -2808.082 |
| 24 | R3D_N134B | X | 1.183 |
| 25 | R3D_N134B | Y | -936.606 |
| 26 | R3D_N134B | Z | 120.796 |
| 27 | R3D_N151 | Y | 4661.265 |
| 28 | R3D_N151 | Z | -2707.333 |
| 29 | R3D_N152 | X | 1.055 |
| 30 | R3D_N152 | Y | -880.043 |
| 31 | R3D_N152 | Z | 118.587 |

## Point Loads and Moments (Cat 18 : OL3) (Continued)

| | Label | Direction | Magnitude[lb,lb-ft] |
|---|---|---|---|
| 32 | R3D_N143A_1 | Y | 5094.418 |
| 33 | R3D_N143A_1 | Z | -3164.446 |
| 34 | R3D_N144A_1 | X | -22.461 |
| 35 | R3D_N144A_1 | Y | -1102.26 |
| 36 | R3D_N144A_1 | Z | 117.794 |
| 37 | R3D_N149A | X | 149.281 |
| 38 | R3D_N149A | Y | 2346.638 |
| 39 | R3D_N149A | Z | -1263.905 |
| 40 | R3D_N150A | X | 50.227 |
| 41 | R3D_N150A | Y | -359.236 |
| 42 | R3D_N150A | Z | 74.523 |

## Point Loads and Moments (Cat 19 : OL4)

| | Label | Direction | Magnitude[lb,lb-ft] |
|---|---|---|---|
| 1 | R3D_N1 | X | -77.326 |
| 2 | R3D_N1 | Y | 1391.854 |
| 3 | R3D_N1 | Z | -1004.569 |
| 4 | R3D_N2_1 | X | -81.327 |
| 5 | R3D_N2_1 | Y | 151.839 |
| 6 | R3D_N2_1 | Z | 61.614 |
| 7 | R3D_N132 | Y | 3124.29 |
| 8 | R3D_N132 | Z | -2433.859 |
| 9 | R3D_N133 | X | -2.096 |
| 10 | R3D_N133 | Y | 191.353 |
| 11 | R3D_N133 | Z | 104.772 |
| 12 | R3D_N109 | Y | 3381.027 |
| 13 | R3D_N109 | Z | -2751.926 |
| 14 | R3D_N110A | X | 25.433 |
| 15 | R3D_N110A | Y | 149.349 |
| 16 | R3D_N110A | Z | 101.648 |
| 17 | R3D_N121 | Y | 3046.586 |
| 18 | R3D_N121 | Z | -2342.95 |
| 19 | R3D_N122 | X | -3.828 |
| 20 | R3D_N122 | Y | 222.32 |
| 21 | R3D_N122 | Z | 102.592 |
| 22 | R3D_N133B_1 | Y | 3125.239 |
| 23 | R3D_N133B_1 | Z | -2434.755 |
| 24 | R3D_N134B | X | 1.591 |
| 25 | R3D_N134B | Y | 190.339 |
| 26 | R3D_N134B | Z | 104.746 |
| 27 | R3D_N151 | Y | 3051.159 |
| 28 | R3D_N151 | Z | -2347.257 |
| 29 | R3D_N152 | X | 3.453 |
| 30 | R3D_N152 | Y | 217.424 |
| 31 | R3D_N152 | Z | 102.808 |
| 32 | R3D_N143A_1 | Y | 3373.946 |
| 33 | R3D_N143A_1 | Z | -2743.034 |
| 34 | R3D_N144A_1 | X | -26.562 |
| 35 | R3D_N144A_1 | Y | 154.412 |
| 36 | R3D_N144A_1 | Z | 102.161 |
| 37 | R3D_N149A | X | 75.258 |
| 38 | R3D_N149A | Y | 1507.672 |
| 39 | R3D_N149A | Z | -1096.347 |
| 40 | R3D_N150A | X | 83.337 |
| 41 | R3D_N150A | Y | 157.135 |
| 42 | R3D_N150A | Z | 64.589 |

## Point Loads and Moments (Cat 20 : OL5)

| | Label | Direction | Magnitude[lb,lb-ft] |
|---|---|---|---|
| 1 | R3D_N1 | X | -50.172 |
| 2 | R3D_N1 | Y | 837.99 |
| 3 | R3D_N1 | Z | -453.359 |
| 4 | R3D_N2_1 | X | -20.081 |
| 5 | R3D_N2_1 | Y | -130.628 |
| 6 | R3D_N2_1 | Z | 24.946 |
| 7 | R3D_N132 | X | 1.978 |
| 8 | R3D_N132 | Y | 655.047 |
| 9 | R3D_N132 | Z | -389.902 |
| 10 | R3D_N133 | Y | -121.205 |
| 11 | R3D_N133 | Z | 17.696 |
| 12 | R3D_N109 | X | 4.812 |
| 13 | R3D_N109 | Y | 1699.088 |
| 14 | R3D_N109 | Z | -1052.03 |
| 15 | R3D_N110A | X | 15.442 |
| 16 | R3D_N110A | Y | -380.253 |
| 17 | R3D_N110A | Z | 36.653 |
| 18 | R3D_N121 | X | 2.24 |
| 19 | R3D_N121 | Y | 1137.501 |
| 20 | R3D_N121 | Z | -660.221 |
| 21 | R3D_N122 | Y | -193.633 |
| 22 | R3D_N122 | Z | 28.643 |
| 23 | R3D_N133B_1 | X | 2.215 |
| 24 | R3D_N133B_1 | Y | 672.654 |
| 25 | R3D_N133B_1 | Z | -405.06 |
| 26 | R3D_N134B | Y | -136.157 |
| 27 | R3D_N134B | Z | 20.265 |
| 28 | R3D_N151 | X | 1.906 |
| 29 | R3D_N151 | Y | 655.572 |
| 30 | R3D_N151 | Z | -382.042 |
| 31 | R3D_N152 | Y | -119.195 |
| 32 | R3D_N152 | Z | 16.879 |
| 33 | R3D_N143A_1 | X | 2.581 |
| 34 | R3D_N143A_1 | Y | 688.274 |
| 35 | R3D_N143A_1 | Z | -445.305 |
| 36 | R3D_N144A_1 | X | -2.644 |
| 37 | R3D_N144A_1 | Y | -150.621 |
| 38 | R3D_N144A_1 | Z | 16.613 |
| 39 | R3D_N149A | X | 34.468 |
| 40 | R3D_N149A | Y | 352.662 |
| 41 | R3D_N149A | Z | -176.759 |
| 42 | R3D_N150A | X | 6.988 |
| 43 | R3D_N150A | Y | -50.762 |
| 44 | R3D_N150A | Z | 10.469 |

## Point Loads and Moments (Cat 21 : OL6)

| | Label | Direction | Magnitude[lb,lb-ft] |
|---|---|---|---|
| 1 | R3D_N1 | X | 51.342 |
| 2 | R3D_N1 | Y | -847.508 |
| 3 | R3D_N1 | Z | 457.524 |
| 4 | R3D_N2_1 | X | 20.895 |
| 5 | R3D_N2_1 | Y | 132.201 |
| 6 | R3D_N2_1 | Z | -24.333 |
| 7 | R3D_N132 | X | -2.051 |
| 8 | R3D_N132 | Y | -656.116 |
| 9 | R3D_N132 | Z | 390.603 |

## Point Loads and Moments (Cat 21 : OL6) (Continued)

| | Label | Direction | Magnitude[lb,lb-ft] |
|---|---|---|---|
| 10 | R3D_N133 | Y | 122.263 |
| 11 | R3D_N133 | Z | -17.49 |
| 12 | R3D_N109 | X | -5.693 |
| 13 | R3D_N109 | Y | -1589.272 |
| 14 | R3D_N109 | Z | 989.609 |
| 15 | R3D_N110A | X | -17.849 |
| 16 | R3D_N110A | Y | 357.342 |
| 17 | R3D_N110A | Z | -34.321 |
| 18 | R3D_N121 | X | -1.79 |
| 19 | R3D_N121 | Y | -952.579 |
| 20 | R3D_N121 | Z | 551.6 |
| 21 | R3D_N122 | X | 2.364 |
| 22 | R3D_N122 | Y | 160.389 |
| 23 | R3D_N122 | Z | -25.421 |
| 24 | R3D_N133B_1 | X | -2.252 |
| 25 | R3D_N133B_1 | Y | -669.635 |
| 26 | R3D_N133B_1 | Z | 402.389 |
| 27 | R3D_N134B | Y | 133.567 |
| 28 | R3D_N134B | Z | -19.369 |
| 29 | R3D_N151 | X | -1.967 |
| 30 | R3D_N151 | Y | -655.498 |
| 31 | R3D_N151 | Z | 381.809 |
| 32 | R3D_N152 | Y | 118.976 |
| 33 | R3D_N152 | Z | -16.823 |
| 34 | R3D_N143A_1 | X | -2.67 |
| 35 | R3D_N143A_1 | Y | -687.431 |
| 36 | R3D_N143A_1 | Z | 445.329 |
| 37 | R3D_N144A_1 | X | 2.659 |
| 38 | R3D_N144A_1 | Y | 150.654 |
| 39 | R3D_N144A_1 | Z | -16.599 |
| 40 | R3D_N149A | X | -34.946 |
| 41 | R3D_N149A | Y | -353.501 |
| 42 | R3D_N149A | Z | 176.75 |
| 43 | R3D_N150A | X | -6.955 |
| 44 | R3D_N150A | Y | 50.778 |
| 45 | R3D_N150A | Z | -10.465 |

## Slabs

| | Label | Thickness [in] | Material | Local Axis Angle ... | Analysis Offset [in] | Passive Pressur... | Soil Overburden [psf] |
|---|---|---|---|---|---|---|---|
| 1 | S1 | 27 | Conc2500NW | 0 | 0 | 0 | 0 |
| 2 | S2 | 27 | Conc2500NW | 0 | 0 | 0 | 0 |
| 3 | S3 | 27 | Conc2500NW | 0 | 0 | 0 | 0 |
| 4 | S4 | 27 | Conc2500NW | 0 | 0 | 0 | 0 |
| 5 | S5 | 27 | Conc2500NW | 0 | 0 | 0 | 0 |
| 6 | S6 | 27 | Conc2500NW | 0 | 0 | 0 | 0 |
| 7 | S7 | 27 | Conc2500NW | 0 | 0 | 0 | 0 |
| 8 | S8 | 27 | Conc2500NW | 0 | 0 | 0 | 0 |

## Load Combinations

| | Label | Solve | Service | A... | SF | Cat... | Fa... | Cat... | Fa... | Cat... | Fa... | Cat... | Fa... | Cat... | Fa... | Cat... | Fa... | Cat... | Fa... | Cat... | Fa... | C... | F... | C... | F... |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.0 D | Yes | Yes | | 1.5 | DL | 1 | | | | | | | | | | | | | | | | | | |
| 2 | 1.0 D + 1.... | Yes | Yes | | 1.5 | DL | 1 | RLL | 1 | | | | | | | | | | | | | | | | |
| 3 | 1.0 D + 0.... | Yes | Yes | | 1.5 | DL | 1 | RLL | | OL1 | .6 | | | | | | | | | | | | | | |
| 4 | 1.0 D + 0.... | Yes | Yes | | 1.5 | DL | 1 | RLL | | OL2 | .6 | | | | | | | | | | | | | | |
| 5 | 1.0 D + 0.... | Yes | Yes | | 1.5 | DL | 1 | RLL | | OL3 | .6 | | | | | | | | | | | | | | |
| 6 | 1.0 D + 0.... | Yes | Yes | | 1.5 | DL | 1 | RLL | | OL4 | .6 | | | | | | | | | | | | | | |

## Load Combinations (Continued)

| | Label | Solve | Service | A.. | SF | Cat.. | Fa... | Cat.. | Fa... | Cat.. | Fa... | Cat.. | Fa... | Cat.. | Fa... | Cat.. | Fa... | Cat.. | Fa... | Cat.. | Fa... | C... | F... | C... | F... |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 1.0 D + 0.... | Yes | Yes | | 1.5 | DL | 1 | RLL | | OL5 | .6 | | | | | | | | | | | | | | |
| 8 | 1.0 D + 0.... | Yes | Yes | | 1.5 | DL | 1 | RLL | | OL6 | .6 | | | | | | | | | | | | | | |
| 9 | 1.0 D + 0.... | Yes | Yes | | 1.5 | DL | 1 | RLL | .75 | OL1 | .45 | | | | | | | | | | | | | | |
| 10 | 1.0 D + 0.... | Yes | Yes | | 1.5 | DL | 1 | RLL | .75 | OL2 | .45 | | | | | | | | | | | | | | |
| 11 | 1.0 D + 0.... | Yes | Yes | | 1.5 | DL | 1 | RLL | .75 | OL3 | .45 | | | | | | | | | | | | | | |
| 12 | 1.0 D + 0.... | Yes | Yes | | 1.5 | DL | 1 | RLL | .75 | OL4 | .45 | | | | | | | | | | | | | | |
| 13 | 1.0 D + 0.... | Yes | Yes | | 1.5 | DL | 1 | RLL | .75 | OL5 | .45 | | | | | | | | | | | | | | |
| 14 | 1.0 D + 0.... | Yes | Yes | | 1.5 | DL | 1 | RLL | .75 | OL6 | .45 | | | | | | | | | | | | | | |
| 15 | 0.9 D + 0.... | Yes | Yes | | | DL | .9 | RLL | | OL1 | .6 | | | | | | | | | | | | | | |
| 16 | 0.9 D + 0.... | Yes | Yes | | | DL | .9 | RLL | | OL2 | .6 | | | | | | | | | | | | | | |
| 17 | 0.9 D + 0.... | Yes | Yes | | | DL | .9 | RLL | | OL3 | .6 | | | | | | | | | | | | | | |
| 18 | 0.9 D + 0.... | Yes | Yes | | | DL | .9 | RLL | | OL4 | .6 | | | | | | | | | | | | | | |
| 19 | 0.9 D + 0.... | Yes | Yes | | | DL | .9 | RLL | | OL5 | .6 | | | | | | | | | | | | | | |
| 20 | 0.9 D + 0.... | Yes | Yes | | | DL | .9 | RLL | | OL6 | .6 | | | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | 1.4D | Yes | | | | DL | 1.4 | | | | | | | | | | | | | | | | | | |
| 23 | 1.2D+1.6SL | Yes | | | | DL | 1.2 | RLL | 1.6 | | | | | | | | | | | | | | | | |
| 24 | 1.2D+1.6S... | Yes | | | | DL | 1.2 | RLL | 1.6 | OL1 | .5 | | | | | | | | | | | | | | |
| 25 | 1.2D+1.6S... | Yes | | | | DL | 1.2 | RLL | 1.6 | OL2 | .5 | | | | | | | | | | | | | | |
| 26 | 1.2D+1.6S... | Yes | | | | DL | 1.2 | RLL | 1.6 | OL3 | .5 | | | | | | | | | | | | | | |
| 27 | 1.2D+1.6S... | Yes | | | | DL | 1.2 | RLL | 1.6 | OL4 | .5 | | | | | | | | | | | | | | |
| 28 | 1.2D+1.6S... | Yes | | | | DL | 1.2 | RLL | 1.6 | OL5 | .5 | | | | | | | | | | | | | | |
| 29 | 1.2D+1.6S... | Yes | | | | DL | 1.2 | RLL | 1.6 | OL6 | .5 | | | | | | | | | | | | | | |
| 30 | 1.2D+1.0... | Yes | | | | DL | 1.2 | | | OL1 | 1 | | | | | | | | | | | | | | |
| 31 | 1.2D-1.0Wx | Yes | | | | DL | 1.2 | | | OL2 | 1 | | | | | | | | | | | | | | |
| 32 | 1.2D+1.0... | Yes | | | | DL | 1.2 | | | OL3 | 1 | | | | | | | | | | | | | | |
| 33 | 1.2D-1.0Wz | Yes | | | | DL | 1.2 | | | OL4 | 1 | | | | | | | | | | | | | | |
| 34 | 1.2D+1.0... | Yes | | | | DL | 1.2 | | | OL5 | 1 | | | | | | | | | | | | | | |
| 35 | 1.2D-1.0... | Yes | | | | DL | 1.2 | | | OL6 | 1 | | | | | | | | | | | | | | |
| 36 | 1.0D+1.0... | Yes | | | | DL | 1 | | | OL1 | 1 | | | | | | | | | | | | | | |
| 37 | 1.0D-1.0Wx | Yes | | | | DL | 1 | | | OL2 | 1 | | | | | | | | | | | | | | |
| 38 | 1.0D+1.0... | Yes | | | | DL | 1 | | | OL3 | 1 | | | | | | | | | | | | | | |
| 39 | 1.0D-1.0Wz | Yes | | | | DL | 1 | | | OL4 | 1 | | | | | | | | | | | | | | |
| 40 | 1.0D+1.0... | Yes | | | | DL | 1 | | | OL5 | 1 | | | | | | | | | | | | | | |
| 41 | 1.0D-1.0... | Yes | | | | DL | 1 | | | OL6 | 1 | | | | | | | | | | | | | | |

## Design Strips

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

## Load Categories

| | Category | Point Loads | Line Loads | Area Loads |
|---|---|---|---|---|
| 1 | DL | 22 | | |
| 2 | RLL | 28 | | |
| 3 | OL1 | 41 | | |
| 4 | OL2 | 42 | | |
| 5 | OL3 | 42 | | |
| 6 | OL4 | 42 | | |
| 7 | OL5 | 44 | | |
| 8 | OL6 | 45 | | |

## Strip Reinforcing

| | Label | UC Top | LC | Top Bars | Governing ... | UC Bot | LC | Bot B... | Gover... | UC Shear | LC | Governing De... |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | DS1 | .016 | 26 | #5@6in | DS1-X25 | .031 | 37 | #5@6in | DS1-... | .048 | 37 | DS1-X15 |
| 2 | DS2 | .001 | 36 | #5@6in | DS2-X25 | .003 | 26 | #5@6in | DS2-... | .008 | 26 | DS2-X43 |

## Slab Overturning Safety Factors (By Combination)

| | LC | Slab | Angle[deg] | Mo-xx[lb-ft] | Ms-xx[lb-ft] | Mo-zz[lb-ft] | Ms-zz[lb-ft] | Ms-xx/Mo-xx | Ms-zz/Mo-zz |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | S1 | 0 | 0 | 39899.708 | 0 | 10300.791 | 9.999+ | 9.999+ |
| 2 | 1 | S2 | 0 | 0 | 41127.769 | 0 | 10523.621 | 9.999+ | 9.999+ |
| 3 | 1 | S3 | 0 | 0 | 40939.868 | 0 | 10493.216 | 9.999+ | 9.999+ |
| 4 | 1 | S4 | 0 | 0 | 40972.06 | 0 | 10499.656 | 9.999+ | 9.999+ |
| 5 | 1 | S5 | 0 | 0 | 40971.986 | 0 | 10499.667 | 9.999+ | 9.999+ |
| 6 | 1 | S6 | 0 | 0 | 40940.089 | 0 | 10493.191 | 9.999+ | 9.999+ |
| 7 | 1 | S7 | 0 | 0 | 41125.254 | 0 | 10530.946 | 9.999+ | 9.999+ |
| 8 | 1 | S8 | 0 | 0 | 39972.711 | 0 | 10223.201 | 9.999+ | 9.999+ |
| 9 | 2 | S1 | 0 | 0 | 45210.948 | 0 | 11951.223 | 9.999+ | 9.999+ |
| 10 | 2 | S2 | 0 | 0 | 53936.801 | 0 | 13591.013 | 9.999+ | 9.999+ |
| 11 | 2 | S3 | 0 | 0 | 52590.834 | 0 | 13384.868 | 9.999+ | 9.999+ |
| 12 | 2 | S4 | 0 | 0 | 52818.167 | 0 | 13424.594 | 9.999+ | 9.999+ |
| 13 | 2 | S5 | 0 | 0 | 52817.687 | 0 | 13424.731 | 9.999+ | 9.999+ |
| 14 | 2 | S6 | 0 | 0 | 52594.785 | 0 | 13376.131 | 9.999+ | 9.999+ |
| 15 | 2 | S7 | 0 | 0 | 53916.036 | 0 | 13649.569 | 9.999+ | 9.999+ |
| 16 | 2 | S8 | 0 | 0 | 45720.54 | 0 | 11441.645 | 9.999+ | 9.999+ |
| 17 | 3 | S1 | 0 | 9991.63 | 40072.785 | 1392.672 | 10300.791 | 4.011 | 7.396 |
| 18 | 3 | S2 | 0 | 23853.71 | 40987.998 | 2551.638 | 10531.668 | 1.718 | 4.127 |
| 19 | 3 | S3 | 0 | 21602.27 | 40907.355 | 2394.175 | 10493.216 | 1.894 | 4.383 |
| 20 | 3 | S4 | 0 | 22112.136 | 40925.394 | 2418.928 | 10499.656 | 1.851 | 4.341 |
| 21 | 3 | S5 | 0 | 22105.421 | 40925.556 | 2420.51 | 10499.667 | 1.851 | 4.338 |
| 22 | 3 | S6 | 0 | 21633.892 | 40906.94 | 2391.253 | 10493.191 | 1.891 | 4.388 |
| 23 | 3 | S7 | 0 | 23798.796 | 40985.491 | 2552.547 | 10530.946 | 1.722 | 4.126 |
| 24 | 3 | S8 | 0 | 10816.119 | 40141.558 | 1481.926 | 10318.884 | 3.711 | 6.963 |
| 25 | 4 | S1 | 0 | 10731.549 | 40072.785 | 1243.662 | 10300.791 | 3.734 | 8.283 |
| 26 | 4 | S2 | 0 | 24867.424 | 40987.998 | 2084.035 | 10531.668 | 1.648 | 5.053 |
| 27 | 4 | S3 | 0 | 22773.978 | 40907.355 | 2024 | 10493.216 | 1.796 | 5.184 |
| 28 | 4 | S4 | 0 | 23251.568 | 40925.394 | 2036.325 | 10499.656 | 1.76 | 5.156 |
| 29 | 4 | S5 | 0 | 23243.783 | 40925.556 | 2039.003 | 10499.667 | 1.761 | 5.149 |
| 30 | 4 | S6 | 0 | 22810.559 | 40906.94 | 2024.844 | 10493.191 | 1.793 | 5.182 |
| 31 | 4 | S7 | 0 | 24805.963 | 40985.491 | 2084.035 | 10530.946 | 1.652 | 5.053 |
| 32 | 4 | S8 | 0 | 11601.385 | 40141.558 | 1320.064 | 10318.884 | 3.46 | 7.817 |
| 33 | 5 | S1 | 0 | 1122.289 | 39899.708 | 0 | 11954.795 | 9.999+ | 9.999+ |
| 34 | 5 | S2 | 0 | 5093.168 | 41127.769 | 0 | 13491.564 | 8.075 | 9.999+ |
| 35 | 5 | S3 | 0 | 3659.498 | 40939.868 | 0 | 13332.495 | 9.999+ | 9.999+ |
| 36 | 5 | S4 | 0 | 4027.818 | 40972.06 | 0 | 13364.817 | 9.999+ | 9.999+ |
| 37 | 5 | S5 | 0 | 4019.155 | 40971.986 | 0 | 13369.937 | 9.999+ | 9.999+ |
| 38 | 5 | S6 | 0 | 3699.893 | 40940.089 | 0 | 13327.683 | 9.999+ | 9.999+ |
| 39 | 5 | S7 | 0 | 5039.314 | 41125.254 | 0 | 13555.387 | 8.161 | 9.999+ |
| 40 | 5 | S8 | 0 | 1289.874 | 39972.711 | 0 | 11444.418 | 9.999+ | 9.999+ |
| 41 | 6 | S1 | 0 | 0 | 40638.579 | 0 | 11672.742 | 9.999+ | 9.999+ |
| 42 | 6 | S2 | 0 | 0 | 41339.556 | 0 | 13137.069 | 9.999+ | 9.999+ |
| 43 | 6 | S3 | 0 | 0 | 41768.906 | 0 | 12950.063 | 9.999+ | 9.999+ |
| 44 | 6 | S4 | 0 | 0 | 41590.949 | 0 | 12984.191 | 9.999+ | 9.999+ |
| 45 | 6 | S5 | 0 | 0 | 41596.337 | 0 | 12989.228 | 9.999+ | 9.999+ |
| 46 | 6 | S6 | 0 | 0 | 41743.239 | 0 | 12939.967 | 9.999+ | 9.999+ |
| 47 | 6 | S7 | 0 | 0 | 41368.68 | 0 | 13213.074 | 9.999+ | 9.999+ |
| 48 | 6 | S8 | 0 | 0 | 40722.412 | 0 | 11257.702 | 9.999+ | 9.999+ |
| 49 | 7 | S1 | 0 | 477.31 | 39899.708 | 0 | 10926.154 | 9.999+ | 9.999+ |
| 50 | 7 | S2 | 0 | 1742.851 | 41127.769 | 0 | 11485.405 | 9.999+ | 9.999+ |
| 51 | 7 | S3 | 0 | 797.049 | 40939.868 | 0 | 11198.093 | 9.999+ | 9.999+ |

## Slab Overturning Safety Factors (By Combination) (Continued)

| | LC | Slab | Angle[deg] | Mo-xx[lb-ft] | Ms-xx[lb-ft] | Mo-zz[lb-ft] | Ms-zz[lb-ft] | Ms-xx/Mo-xx | Ms-zz/Mo-zz |
|---|---|---|---|---|---|---|---|---|---|
| 52 | 7 | S4 | 0 | 594.871 | 40972.06 | 0 | 10899.038 | 9.999+ | 9.999+ |
| 53 | 7 | S5 | 0 | 518.962 | 40971.986 | 0 | 10897.379 | 9.999+ | 9.999+ |
| 54 | 7 | S6 | 0 | 498.93 | 40940.089 | 0 | 10892.901 | 9.999+ | 9.999+ |
| 55 | 7 | S7 | 0 | 712.396 | 41125.254 | 0 | 10934.27 | 9.999+ | 9.999+ |
| 56 | 7 | S8 | 0 | 160.905 | 39972.711 | 0 | 10393.661 | 9.999+ | 9.999+ |
| 57 | 8 | S1 | 0 | 4667.612 | 40072.785 | 634.001 | 10300.791 | 8.585 | 9.999+ |
| 58 | 8 | S2 | 0 | 8852.809 | 40987.998 | 955.729 | 10531.668 | 4.63 | 9.999+ |
| 59 | 8 | S3 | 0 | 5289.285 | 40907.355 | 594.917 | 10493.216 | 7.734 | 9.999+ |
| 60 | 8 | S4 | 0 | 3718.247 | 40925.394 | 405.092 | 10499.656 | 9.999+ | 9.999+ |
| 61 | 8 | S5 | 0 | 3647.56 | 40925.556 | 403.159 | 10499.667 | 9.999+ | 9.999+ |
| 62 | 8 | S6 | 0 | 3636.323 | 40906.94 | 405.047 | 10493.191 | 9.999+ | 9.999+ |
| 63 | 8 | S7 | 0 | 3853.522 | 40985.491 | 402.598 | 10523.055 | 9.999+ | 9.999+ |
| 64 | 8 | S8 | 0 | 1931.158 | 40141.558 | 283.609 | 10318.884 | 9.999+ | 9.999+ |
| 65 | 9 | S1 | 0 | 7493.722 | 44163.661 | 1044.504 | 11538.615 | 5.893 | 9.999+ |
| 66 | 9 | S2 | 0 | 17890.283 | 49486.132 | 1913.728 | 12873.4 | 2.766 | 6.727 |
| 67 | 9 | S3 | 0 | 16201.702 | 49062.242 | 1795.631 | 12661.955 | 3.028 | 7.052 |
| 68 | 9 | S4 | 0 | 16584.102 | 49151.733 | 1814.196 | 12693.36 | 2.964 | 6.997 |
| 69 | 9 | S5 | 0 | 16579.066 | 49152.935 | 1815.382 | 12693.465 | 2.965 | 6.992 |
| 70 | 9 | S6 | 0 | 16225.419 | 49056.861 | 1793.44 | 12655.396 | 3.023 | 7.056 |
| 71 | 9 | S7 | 0 | 17849.097 | 49474.954 | 1914.411 | 12869.914 | 2.772 | 6.723 |
| 72 | 9 | S8 | 0 | 8112.09 | 44538.856 | 1111.445 | 11637.911 | 5.49 | 9.999+ |
| 73 | 10 | S1 | 0 | 8048.662 | 44163.661 | 932.746 | 11538.615 | 5.487 | 9.999+ |
| 74 | 10 | S2 | 0 | 18650.568 | 49486.132 | 1563.026 | 12873.4 | 2.653 | 8.236 |
| 75 | 10 | S3 | 0 | 17080.484 | 49062.242 | 1518 | 12656.036 | 2.872 | 8.337 |
| 76 | 10 | S4 | 0 | 17438.676 | 49151.733 | 1527.244 | 12693.36 | 2.819 | 8.311 |
| 77 | 10 | S5 | 0 | 17432.837 | 49152.935 | 1529.252 | 12693.465 | 2.82 | 8.3 |
| 78 | 10 | S6 | 0 | 17107.919 | 49056.861 | 1518.633 | 12655.396 | 2.867 | 8.333 |
| 79 | 10 | S7 | 0 | 18604.472 | 49474.954 | 1563.027 | 12869.914 | 2.659 | 8.234 |
| 80 | 10 | S8 | 0 | 8701.039 | 44538.856 | 990.048 | 11637.911 | 5.119 | 9.999+ |
| 81 | 11 | S1 | 0 | 841.717 | 43883.138 | 0 | 12779.118 | 9.999+ | 9.999+ |
| 82 | 11 | S2 | 0 | 3819.876 | 50734.543 | 0 | 15050.123 | 9.999+ | 9.999+ |
| 83 | 11 | S3 | 0 | 2744.623 | 49678.093 | 0 | 14791.414 | 9.999+ | 9.999+ |
| 84 | 11 | S4 | 0 | 3020.864 | 49856.641 | 0 | 14842.23 | 9.999+ | 9.999+ |
| 85 | 11 | S5 | 0 | 3014.366 | 49856.262 | 0 | 14846.168 | 9.999+ | 9.999+ |
| 86 | 11 | S6 | 0 | 2774.92 | 49681.111 | 0 | 14781.265 | 9.999+ | 9.999+ |
| 87 | 11 | S7 | 0 | 3779.486 | 50718.341 | 0 | 15138.244 | 9.999+ | 9.999+ |
| 88 | 11 | S8 | 0 | 967.405 | 44283.582 | 0 | 12052.947 | 9.999+ | 9.999+ |
| 89 | 12 | S1 | 0 | 0 | 44437.291 | 0 | 12567.579 | 9.999+ | 9.999+ |
| 90 | 12 | S2 | 0 | 0 | 50893.383 | 0 | 14784.251 | 9.999+ | 9.999+ |
| 91 | 12 | S3 | 0 | 0 | 50299.871 | 0 | 14504.59 | 9.999+ | 9.999+ |
| 92 | 12 | S4 | 0 | 0 | 50320.807 | 0 | 14556.761 | 9.999+ | 9.999+ |
| 93 | 12 | S5 | 0 | 0 | 50324.525 | 0 | 14560.636 | 9.999+ | 9.999+ |
| 94 | 12 | S6 | 0 | 0 | 50283.473 | 0 | 14490.478 | 9.999+ | 9.999+ |
| 95 | 12 | S7 | 0 | 0 | 50900.91 | 0 | 14881.51 | 9.999+ | 9.999+ |
| 96 | 12 | S8 | 0 | 0 | 44845.859 | 0 | 11912.91 | 9.999+ | 9.999+ |
| 97 | 13 | S1 | 0 | 357.983 | 43883.138 | 0 | 12007.637 | 9.999+ | 9.999+ |
| 98 | 13 | S2 | 0 | 1307.138 | 50734.543 | 0 | 13545.503 | 9.999+ | 9.999+ |
| 99 | 13 | S3 | 0 | 597.786 | 49678.093 | 0 | 13190.613 | 9.999+ | 9.999+ |
| 100 | 13 | S4 | 0 | 446.153 | 49856.641 | 0 | 12992.897 | 9.999+ | 9.999+ |
| 101 | 13 | S5 | 0 | 389.222 | 49856.262 | 0 | 12991.749 | 9.999+ | 9.999+ |
| 102 | 13 | S6 | 0 | 374.197 | 49681.111 | 0 | 12955.178 | 9.999+ | 9.999+ |
| 103 | 13 | S7 | 0 | 534.297 | 50718.341 | 0 | 13172.407 | 9.999+ | 9.999+ |
| 104 | 13 | S8 | 0 | 120.679 | 44283.582 | 0 | 11264.879 | 9.999+ | 9.999+ |
| 105 | 14 | S1 | 0 | 3500.709 | 44163.661 | 475.501 | 11538.615 | 9.999+ | 9.999+ |
| 106 | 14 | S2 | 0 | 6639.607 | 49486.132 | 716.797 | 12873.4 | 7.453 | 9.999+ |
| 107 | 14 | S3 | 0 | 3966.963 | 49062.242 | 446.187 | 12661.955 | 9.999+ | 9.999+ |
| 108 | 14 | S4 | 0 | 2788.685 | 49151.733 | 303.819 | 12693.36 | 9.999+ | 9.999+ |

## Slab Overturning Safety Factors (By Combination) (Continued)

| | LC | Slab | Angle[deg] | Mo-xx[lb-ft] | Ms-xx[lb-ft] | Mo-zz[lb-ft] | Ms-zz[lb-ft] | Ms-xx/Mo-xx | Ms-zz/Mo-zz |
|---|---|---|---|---|---|---|---|---|---|
| 109 | 14 | S5 | 0 | 2735.67 | 49152.935 | 302.369 | 12693.465 | 9.999+ | 9.999+ |
| 110 | 14 | S6 | 0 | 2727.242 | 49056.861 | 303.785 | 12661.99 | 9.999+ | 9.999+ |
| 111 | 14 | S7 | 0 | 2890.141 | 49474.954 | 301.949 | 12820.631 | 9.999+ | 9.999+ |
| 112 | 14 | S8 | 0 | 1448.368 | 44538.856 | 212.707 | 11637.911 | 9.999+ | 9.999+ |
| 113 | 15 | S1 | 0 | 9991.63 | 36065.507 | 1392.672 | 9270.712 | 3.61 | 6.657 |
| 114 | 15 | S2 | 0 | 23853.71 | 36889.198 | 2551.638 | 9478.501 | 1.546 | 3.715 |
| 115 | 15 | S3 | 0 | 21602.27 | 36816.619 | 2394.175 | 9443.894 | 1.704 | 3.945 |
| 116 | 15 | S4 | 0 | 22112.136 | 36832.855 | 2418.928 | 9449.69 | 1.666 | 3.907 |
| 117 | 15 | S5 | 0 | 22105.421 | 36833 | 2420.51 | 9449.7 | 1.666 | 3.904 |
| 118 | 15 | S6 | 0 | 21633.892 | 36816.246 | 2391.253 | 9443.872 | 1.702 | 3.949 |
| 119 | 15 | S7 | 0 | 23798.796 | 36886.942 | 2552.547 | 9477.851 | 1.55 | 3.713 |
| 120 | 15 | S8 | 0 | 10816.119 | 36127.402 | 1481.926 | 9286.996 | 3.34 | 6.267 |
| 121 | 16 | S1 | 0 | 10731.549 | 36065.507 | 1243.662 | 9270.712 | 3.361 | 7.454 |
| 122 | 16 | S2 | 0 | 24867.424 | 36889.198 | 2084.035 | 9478.501 | 1.483 | 4.548 |
| 123 | 16 | S3 | 0 | 22773.978 | 36816.619 | 2024 | 9443.894 | 1.617 | 4.666 |
| 124 | 16 | S4 | 0 | 23251.568 | 36832.855 | 2036.325 | 9449.69 | 1.584 | 4.641 |
| 125 | 16 | S5 | 0 | 23243.783 | 36833 | 2039.003 | 9449.7 | 1.585 | 4.634 |
| 126 | 16 | S6 | 0 | 22810.559 | 36816.246 | 2024.844 | 9443.872 | 1.614 | 4.664 |
| 127 | 16 | S7 | 0 | 24805.963 | 36886.942 | 2084.035 | 9477.851 | 1.487 | 4.548 |
| 128 | 16 | S8 | 0 | 11601.385 | 36127.402 | 1320.064 | 9286.996 | 3.114 | 7.035 |
| 129 | 17 | S1 | 0 | 1122.289 | 35909.738 | 0 | 10924.716 | 9.999+ | 9.999+ |
| 130 | 17 | S2 | 0 | 5093.168 | 37014.992 | 0 | 12439.202 | 7.268 | 9.999+ |
| 131 | 17 | S3 | 0 | 3659.498 | 36845.882 | 0 | 12283.174 | 9.999+ | 9.999+ |
| 132 | 17 | S4 | 0 | 4027.818 | 36874.854 | 0 | 12314.851 | 9.155 | 9.999+ |
| 133 | 17 | S5 | 0 | 4019.155 | 36874.787 | 0 | 12319.97 | 9.175 | 9.999+ |
| 134 | 17 | S6 | 0 | 3699.893 | 36846.08 | 0 | 12278.364 | 9.959 | 9.999+ |
| 135 | 17 | S7 | 0 | 5039.314 | 37012.729 | 0 | 12502.292 | 7.345 | 9.999+ |
| 136 | 17 | S8 | 0 | 1289.874 | 35975.44 | 0 | 10422.098 | 9.999+ | 9.999+ |
| 137 | 18 | S1 | 0 | 0 | 36648.608 | 0 | 10642.663 | 9.999+ | 9.999+ |
| 138 | 18 | S2 | 0 | 0 | 37226.779 | 0 | 12084.706 | 9.999+ | 9.999+ |
| 139 | 18 | S3 | 0 | 0 | 37674.92 | 0 | 11900.742 | 9.999+ | 9.999+ |
| 140 | 18 | S4 | 0 | 0 | 37493.743 | 0 | 11934.226 | 9.999+ | 9.999+ |
| 141 | 18 | S5 | 0 | 0 | 37499.138 | 0 | 11939.262 | 9.999+ | 9.999+ |
| 142 | 18 | S6 | 0 | 0 | 37649.23 | 0 | 11890.648 | 9.999+ | 9.999+ |
| 143 | 18 | S7 | 0 | 0 | 37256.155 | 0 | 12159.98 | 9.999+ | 9.999+ |
| 144 | 18 | S8 | 0 | 0 | 36725.141 | 0 | 10235.382 | 9.999+ | 9.999+ |
| 145 | 19 | S1 | 0 | 477.31 | 35909.738 | 0 | 9896.075 | 9.999+ | 9.999+ |
| 146 | 19 | S2 | 0 | 1742.851 | 37014.992 | 0 | 10433.043 | 9.999+ | 9.999+ |
| 147 | 19 | S3 | 0 | 797.049 | 36845.882 | 0 | 10148.771 | 9.999+ | 9.999+ |
| 148 | 19 | S4 | 0 | 594.871 | 36874.854 | 0 | 9849.073 | 9.999+ | 9.999+ |
| 149 | 19 | S5 | 0 | 518.962 | 36874.787 | 0 | 9847.412 | 9.999+ | 9.999+ |
| 150 | 19 | S6 | 0 | 498.93 | 36846.08 | 0 | 9843.582 | 9.999+ | 9.999+ |
| 151 | 19 | S7 | 0 | 712.396 | 37012.729 | 0 | 9881.176 | 9.999+ | 9.999+ |
| 152 | 19 | S8 | 0 | 160.905 | 35975.44 | 0 | 9371.341 | 9.999+ | 9.999+ |
| 153 | 20 | S1 | 0 | 4667.612 | 36065.507 | 634.001 | 9270.712 | 7.727 | 9.999+ |
| 154 | 20 | S2 | 0 | 8852.809 | 36889.198 | 955.729 | 9478.501 | 4.167 | 9.918 |
| 155 | 20 | S3 | 0 | 5289.285 | 36816.619 | 594.917 | 9443.894 | 6.961 | 9.999+ |
| 156 | 20 | S4 | 0 | 3718.247 | 36832.855 | 405.092 | 9449.69 | 9.906 | 9.999+ |
| 157 | 20 | S5 | 0 | 3647.56 | 36833 | 403.159 | 9449.7 | 9.999+ | 9.999+ |
| 158 | 20 | S6 | 0 | 3636.323 | 36816.246 | 405.047 | 9443.872 | 9.999+ | 9.999+ |
| 159 | 20 | S7 | 0 | 3853.522 | 36886.942 | 402.598 | 9470.75 | 9.572 | 9.999+ |
| 160 | 20 | S8 | 0 | 1931.158 | 36127.402 | 283.609 | 9286.996 | 9.999+ | 9.999+ |

## Slab Sliding Safety Factors (By Combination)

| | LC | Slab | Angle[deg] | Va-xx[lb] | Vr-xx[lb] | Va-zz[lb] | Vr-zz[lb] | SR-xx | SR-zz |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | S1 | 0 | 21.3 | 2460.688 | 0 | 2460.688 | 9.999+ | 9.999+ |
| 2 | 1 | S2 | 0 | 1.788 | 2526.635 | 0 | 2526.635 | 9.999+ | 9.999+ |
| 3 | 1 | S3 | 0 | 0 | 2518.372 | 0 | 2518.372 | 9.999+ | 9.999+ |
| 4 | 1 | S4 | 0 | 0 | 2519.917 | 0 | 2519.917 | 9.999+ | 9.999+ |
| 5 | 1 | S5 | 0 | 0 | 2519.92 | 0 | 2519.92 | 9.999+ | 9.999+ |
| 6 | 1 | S6 | 0 | 0 | 2518.366 | 0 | 2518.366 | 9.999+ | 9.999+ |
| 7 | 1 | S7 | 0 | 1.754 | 2526.48 | 0 | 2526.48 | 9.999+ | 9.999+ |
| 8 | 1 | S8 | 0 | 21.263 | 2465.05 | 0 | 2465.05 | 9.999+ | 9.999+ |
| 9 | 2 | S1 | 0 | 141.394 | 2791.941 | 0 | 2791.941 | 9.999+ | 9.999+ |
| 10 | 2 | S2 | 0 | 13.992 | 3269.399 | 0 | 3269.399 | 9.999+ | 9.999+ |
| 11 | 2 | S3 | 0 | 1.754 | 3211.421 | 0 | 3211.421 | 9.999+ | 9.999+ |
| 12 | 2 | S4 | 0 | 0 | 3221.903 | 0 | 3221.903 | 9.999+ | 9.999+ |
| 13 | 2 | S5 | 0 | 0 | 3221.935 | 0 | 3221.935 | 9.999+ | 9.999+ |
| 14 | 2 | S6 | 0 | 1.954 | 3211.326 | 1.185 | 3211.326 | 9.999+ | 9.999+ |
| 15 | 2 | S7 | 0 | 14.018 | 3268.327 | 1.404 | 3268.327 | 9.999+ | 9.999+ |
| 16 | 2 | S8 | 0 | 141.32 | 2822.308 | 0 | 2822.308 | 9.999+ | 9.999+ |
| 17 | 3 | S1 | 0 | 78.913 | 2180.562 | 549.253 | 2180.562 | 9.999+ | 3.97 |
| 18 | 3 | S2 | 0 | 8.748 | 1919.931 | 1548.607 | 1919.931 | 9.999+ | 1.24 |
| 19 | 3 | S3 | 0 | 1.177 | 1944.406 | 1306.394 | 1944.406 | 9.999+ | 1.488 |
| 20 | 3 | S4 | 0 | .61 | 1939.704 | 1359.702 | 1939.704 | 9.999+ | 1.427 |
| 21 | 3 | S5 | 0 | 1.284 | 1939.691 | 1358.909 | 1939.691 | 9.999+ | 1.427 |
| 22 | 3 | S6 | 0 | 0 | 1944.465 | 1309.841 | 1944.465 | 9.999+ | 1.485 |
| 23 | 3 | S7 | 0 | 9.758 | 1920.085 | 1541.518 | 1920.085 | 9.999+ | 1.246 |
| 24 | 3 | S8 | 0 | 79.386 | 2163.738 | 601.809 | 2163.738 | 9.999+ | 3.595 |
| 25 | 4 | S1 | 0 | 72.308 | 2212.757 | 461.692 | 2212.757 | 9.999+ | 4.793 |
| 26 | 4 | S2 | 0 | 2.748 | 2028.916 | 1307.577 | 2028.916 | 9.999+ | 1.552 |
| 27 | 4 | S3 | 0 | 0 | 2032.612 | 1099.843 | 2032.612 | 9.999+ | 1.848 |
| 28 | 4 | S4 | 0 | 0 | 2031.199 | 1145.96 | 2031.199 | 9.999+ | 1.772 |
| 29 | 4 | S5 | 0 | 1.155 | 2031.183 | 1144.985 | 2031.183 | 9.999+ | 1.774 |
| 30 | 4 | S6 | 0 | .497 | 2032.672 | 1104.018 | 2032.672 | 9.999+ | 1.841 |
| 31 | 4 | S7 | 0 | 3.164 | 2028.967 | 1299.683 | 2028.967 | 9.999+ | 1.561 |
| 32 | 4 | S8 | 0 | 73.275 | 2199.285 | 506.864 | 2199.285 | 9.999+ | 4.339 |
| 33 | 5 | S1 | 0 | 140.467 | 2793.298 | 651.276 | 2793.298 | 9.999+ | 4.289 |
| 34 | 5 | S2 | 0 | 14.095 | 3245.587 | 1836.468 | 3245.587 | 9.999+ | 1.767 |
| 35 | 5 | S3 | 0 | 1.35 | 3199.07 | 1549.114 | 3199.07 | 9.999+ | 2.065 |
| 36 | 5 | S4 | 0 | .71 | 3207.939 | 1612.372 | 3207.939 | 9.999+ | 1.99 |
| 37 | 5 | S5 | 0 | 1.525 | 3207.961 | 1611.42 | 3207.961 | 9.999+ | 1.991 |
| 38 | 5 | S6 | 0 | .633 | 3198.986 | 1553.248 | 3198.986 | 9.999+ | 2.06 |
| 39 | 5 | S7 | 0 | 15.23 | 3245.069 | 1827.991 | 3245.069 | 9.999+ | 1.775 |
| 40 | 5 | S8 | 0 | 140.967 | 2822.783 | 713.629 | 2822.783 | 9.999+ | 3.956 |
| 41 | 6 | S1 | 0 | 116.492 | 2738.553 | 565.773 | 2738.553 | 9.999+ | 4.84 |
| 42 | 6 | S2 | 0 | 17.048 | 3162.102 | 1590.167 | 3162.102 | 9.999+ | 1.989 |
| 43 | 6 | S3 | 0 | 2.297 | 3106.775 | 1344.215 | 3106.775 | 9.999+ | 2.311 |
| 44 | 6 | S4 | 0 | .954 | 3116.721 | 1398.005 | 3116.721 | 9.999+ | 2.229 |
| 45 | 6 | S5 | 0 | 1.258 | 3116.736 | 1397.452 | 3116.736 | 9.999+ | 2.23 |
| 46 | 6 | S6 | 0 | 2.072 | 3106.711 | 1346.67 | 3106.711 | 9.999+ | 2.307 |
| 47 | 6 | S7 | 0 | 17.691 | 3161.585 | 1584.524 | 3161.585 | 9.999+ | 1.995 |
| 48 | 6 | S8 | 0 | 116.42 | 2764.716 | 619.055 | 2764.716 | 9.999+ | 4.466 |
| 49 | 7 | S1 | 0 | 63.452 | 2588.013 | 257.047 | 2588.013 | 9.999+ | 9.999+ |
| 50 | 7 | S2 | 0 | 13.94 | 2764.025 | 609.227 | 2764.025 | 9.999+ | 4.537 |
| 51 | 7 | S3 | 0 | 1.344 | 2688.268 | 378.947 | 2688.268 | 9.999+ | 7.094 |
| 52 | 7 | S4 | 0 | 1.329 | 2616.487 | 230.877 | 2616.487 | 9.999+ | 9.999+ |
| 53 | 7 | S5 | 0 | 1.187 | 2616.012 | 223.323 | 2616.012 | 9.999+ | 9.999+ |
| 54 | 7 | S6 | 0 | 1.144 | 2614.914 | 219.098 | 2614.914 | 9.999+ | 9.999+ |
| 55 | 7 | S7 | 0 | 1.791 | 2623.258 | 257.215 | 2623.258 | 9.999+ | 9.999+ |
| 56 | 7 | S8 | 0 | 46.136 | 2519.392 | 99.774 | 2519.392 | 9.999+ | 9.999+ |
| 57 | 8 | S1 | 0 | 22.043 | 2331.933 | 259.915 | 2331.933 | 9.999+ | 8.972 |

## Slab Sliding Safety Factors (By Combination) (Continued)

| | LC | Slab | Angle[deg] | Va-xx[lb] | Vr-xx[lb] | Va-zz[lb] | Vr-zz[lb] | SR-xx | SR-zz |
|---|---|---|---|---|---|---|---|---|---|
| 58 | 8 | S2 | 0 | 12.337 | 2304.887 | 573.173 | 2304.887 | 9.999+ | 4.021 |
| 59 | 8 | S3 | 0 | .344 | 2375.778 | 315.707 | 2375.778 | 9.999+ | 7.525 |
| 60 | 8 | S4 | 0 | 1.351 | 2423.425 | 229.812 | 2423.425 | 9.999+ | 9.999+ |
| 61 | 8 | S5 | 0 | 1.231 | 2423.827 | 223.868 | 2423.827 | 9.999+ | 9.999+ |
| 62 | 8 | S6 | 0 | 1.18 | 2421.792 | 218.992 | 2421.792 | 9.999+ | 9.999+ |
| 63 | 8 | S7 | 0 | 1.76 | 2429.86 | 257.238 | 2429.86 | 9.999+ | 9.446 |
| 64 | 8 | S8 | 0 | 3.878 | 2410.56 | 99.771 | 2410.56 | 9.999+ | 9.999+ |
| 65 | 9 | S1 | 0 | 36.21 | 2499.033 | 411.94 | 2499.033 | 9.999+ | 6.066 |
| 66 | 9 | S2 | 0 | 3.039 | 2628.68 | 1161.455 | 2628.68 | 9.999+ | 2.263 |
| 67 | 9 | S3 | 0 | .432 | 2607.684 | 979.795 | 2607.684 | 9.999+ | 2.661 |
| 68 | 9 | S4 | 0 | .458 | 2611.247 | 1019.776 | 2611.247 | 9.999+ | 2.561 |
| 69 | 9 | S5 | 0 | .963 | 2611.26 | 1019.182 | 2611.26 | 9.999+ | 2.562 |
| 70 | 9 | S6 | 0 | 1.465 | 2607.661 | 983.269 | 2607.661 | 9.999+ | 2.652 |
| 71 | 9 | S7 | 0 | 2.318 | 2628.069 | 1155.085 | 2628.069 | 9.999+ | 2.275 |
| 72 | 9 | S8 | 0 | 35.819 | 2507.01 | 451.357 | 2507.01 | 9.999+ | 5.554 |
| 73 | 10 | S1 | 0 | 41.164 | 2523.18 | 346.269 | 2523.18 | 9.999+ | 7.287 |
| 74 | 10 | S2 | 0 | 7.539 | 2710.419 | 980.683 | 2710.419 | 9.999+ | 2.764 |
| 75 | 10 | S3 | 0 | 1.315 | 2673.839 | 824.882 | 2673.839 | 9.999+ | 3.241 |
| 76 | 10 | S4 | 0 | 0 | 2679.868 | 859.47 | 2679.868 | 9.999+ | 3.118 |
| 77 | 10 | S5 | 0 | .866 | 2679.879 | 858.739 | 2679.879 | 9.999+ | 3.121 |
| 78 | 10 | S6 | 0 | 1.838 | 2673.816 | 828.902 | 2673.816 | 9.999+ | 3.226 |
| 79 | 10 | S7 | 0 | 7.263 | 2709.731 | 973.709 | 2709.731 | 9.999+ | 2.783 |
| 80 | 10 | S8 | 0 | 40.403 | 2533.67 | 380.148 | 2533.67 | 9.999+ | 6.665 |
| 81 | 11 | S1 | 0 | 200.746 | 2958.586 | 488.457 | 2958.586 | 9.999+ | 6.057 |
| 82 | 11 | S2 | 0 | 20.171 | 3622.922 | 1377.351 | 3622.922 | 9.999+ | 2.63 |
| 83 | 11 | S3 | 0 | 2.328 | 3548.683 | 1161.836 | 3548.683 | 9.999+ | 3.054 |
| 84 | 11 | S4 | 0 | .532 | 3562.423 | 1209.279 | 3562.423 | 9.999+ | 2.946 |
| 85 | 11 | S5 | 0 | 1.144 | 3562.463 | 1208.565 | 3562.463 | 9.999+ | 2.948 |
| 86 | 11 | S6 | 0 | 1.94 | 3548.551 | 1164.047 | 3548.551 | 9.999+ | 3.048 |
| 87 | 11 | S7 | 0 | 21.059 | 3621.807 | 1372.047 | 3621.807 | 9.999+ | 2.64 |
| 88 | 11 | S8 | 0 | 201.084 | 3001.293 | 535.222 | 3001.293 | 9.999+ | 5.608 |
| 89 | 12 | S1 | 0 | 182.764 | 2917.526 | 424.33 | 2917.526 | 9.999+ | 6.876 |
| 90 | 12 | S2 | 0 | 22.386 | 3560.309 | 1192.625 | 3560.309 | 9.999+ | 2.985 |
| 91 | 12 | S3 | 0 | 3.038 | 3479.461 | 1008.161 | 3479.461 | 9.999+ | 3.451 |
| 92 | 12 | S4 | 0 | .716 | 3494.009 | 1048.504 | 3494.009 | 9.999+ | 3.332 |
| 93 | 12 | S5 | 0 | .943 | 3494.043 | 1048.089 | 3494.043 | 9.999+ | 3.334 |
| 94 | 12 | S6 | 0 | 3.019 | 3479.345 | 1009.114 | 3479.345 | 9.999+ | 3.448 |
| 95 | 12 | S7 | 0 | 22.905 | 3559.194 | 1189.446 | 3559.194 | 9.999+ | 2.992 |
| 96 | 12 | S8 | 0 | 182.674 | 2957.742 | 464.291 | 2957.742 | 9.999+ | 6.37 |
| 97 | 13 | S1 | 0 | 142.984 | 2804.621 | 192.786 | 2804.621 | 9.999+ | 9.999+ |
| 98 | 13 | S2 | 0 | 20.055 | 3261.75 | 456.92 | 3261.75 | 9.999+ | 7.139 |
| 99 | 13 | S3 | 0 | .307 | 3165.581 | 284.21 | 3165.581 | 9.999+ | 9.999+ |
| 100 | 13 | S4 | 0 | .997 | 3118.833 | 173.158 | 3118.833 | 9.999+ | 9.999+ |
| 101 | 13 | S5 | 0 | .89 | 3118.5 | 167.493 | 3118.5 | 9.999+ | 9.999+ |
| 102 | 13 | S6 | 0 | 2.323 | 3110.497 | 163.435 | 3110.497 | 9.999+ | 9.999+ |
| 103 | 13 | S7 | 0 | 10.98 | 3155.448 | 193.965 | 3155.448 | 9.999+ | 9.999+ |
| 104 | 13 | S8 | 0 | 129.961 | 2773.75 | 74.831 | 2773.75 | 9.999+ | 9.999+ |
| 105 | 14 | S1 | 0 | 78.864 | 2612.561 | 194.936 | 2612.561 | 9.999+ | 9.999+ |
| 106 | 14 | S2 | 0 | .347 | 2917.397 | 429.88 | 2917.397 | 9.999+ | 6.787 |
| 107 | 14 | S3 | 0 | 1.057 | 2931.213 | 236.78 | 2931.213 | 9.999+ | 9.999+ |
| 108 | 14 | S4 | 0 | 1.013 | 2974.037 | 172.359 | 2974.037 | 9.999+ | 9.999+ |
| 109 | 14 | S5 | 0 | .923 | 2974.361 | 167.901 | 2974.361 | 9.999+ | 9.999+ |
| 110 | 14 | S6 | 0 | .58 | 2965.656 | 165.132 | 2965.656 | 9.999+ | 9.999+ |
| 111 | 14 | S7 | 0 | 10.957 | 3010.4 | 191.875 | 3010.4 | 9.999+ | 9.999+ |
| 112 | 14 | S8 | 0 | 92.45 | 2692.126 | 74.828 | 2692.126 | 9.999+ | 9.999+ |
| 113 | 15 | S1 | 0 | 81.043 | 1934.493 | 549.253 | 1934.493 | 9.999+ | 3.522 |
| 114 | 15 | S2 | 0 | 8.926 | 1667.268 | 1548.607 | 1667.268 | 9.999+ | 1.077 |

## Slab Sliding Safety Factors (By Combination) (Continued)

| | LC | Slab | Angle[deg] | Va-xx[lb] | Vr-xx[lb] | Va-zz[lb] | Vr-zz[lb] | SR-xx | SR-zz |
|---|---|---|---|---|---|---|---|---|---|
| 115 | 15 | S3 | 0 | 1.177 | 1692.568 | 1306.394 | 1692.568 | 9.999+ | 1.296 |
| 116 | 15 | S4 | 0 | .61 | 1687.713 | 1359.702 | 1687.713 | 9.999+ | 1.241 |
| 117 | 15 | S5 | 0 | 1.284 | 1687.699 | 1358.909 | 1687.699 | 9.999+ | 1.242 |
| 118 | 15 | S6 | 0 | 0 | 1692.629 | 1309.841 | 1692.629 | 9.999+ | 1.292 |
| 119 | 15 | S7 | 0 | 9.933 | 1667.437 | 1541.518 | 1667.437 | 9.999+ | 1.082 |
| 120 | 15 | S8 | 0 | 81.512 | 1917.233 | 601.809 | 1917.233 | 9.999+ | 3.186 |
| 121 | 16 | S1 | 0 | 74.438 | 1966.689 | 461.692 | 1966.689 | 9.999+ | 4.26 |
| 122 | 16 | S2 | 0 | 2.927 | 1776.253 | 1307.577 | 1776.253 | 9.999+ | 1.358 |
| 123 | 16 | S3 | 0 | 0 | 1780.775 | 1099.843 | 1780.775 | 9.999+ | 1.619 |
| 124 | 16 | S4 | 0 | 0 | 1779.208 | 1145.96 | 1779.208 | 9.999+ | 1.553 |
| 125 | 16 | S5 | 0 | 1.155 | 1779.191 | 1144.985 | 1779.191 | 9.999+ | 1.554 |
| 126 | 16 | S6 | 0 | .497 | 1780.835 | 1104.018 | 1780.835 | 9.999+ | 1.613 |
| 127 | 16 | S7 | 0 | 3.34 | 1776.319 | 1299.683 | 1776.319 | 9.999+ | 1.367 |
| 128 | 16 | S8 | 0 | 75.401 | 1952.78 | 506.864 | 1952.78 | 9.999+ | 3.853 |
| 129 | 17 | S1 | 0 | 138.337 | 2547.23 | 651.276 | 2547.23 | 9.999+ | 3.911 |
| 130 | 17 | S2 | 0 | 13.916 | 2992.923 | 1836.468 | 2992.923 | 9.999+ | 1.63 |
| 131 | 17 | S3 | 0 | 1.35 | 2947.233 | 1549.114 | 2947.233 | 9.999+ | 1.903 |
| 132 | 17 | S4 | 0 | .71 | 2955.948 | 1612.372 | 2955.948 | 9.999+ | 1.833 |
| 133 | 17 | S5 | 0 | 1.525 | 2955.969 | 1611.42 | 2955.969 | 9.999+ | 1.834 |
| 134 | 17 | S6 | 0 | .633 | 2947.149 | 1553.248 | 2947.149 | 9.999+ | 1.897 |
| 135 | 17 | S7 | 0 | 15.055 | 2992.421 | 1827.991 | 2992.421 | 9.999+ | 1.637 |
| 136 | 17 | S8 | 0 | 138.841 | 2576.278 | 713.629 | 2576.278 | 9.999+ | 3.61 |
| 137 | 18 | S1 | 0 | 114.362 | 2492.484 | 565.773 | 2492.484 | 9.999+ | 4.405 |
| 138 | 18 | S2 | 0 | 16.869 | 2909.439 | 1590.167 | 2909.439 | 9.999+ | 1.83 |
| 139 | 18 | S3 | 0 | 2.297 | 2854.938 | 1344.215 | 2854.938 | 9.999+ | 2.124 |
| 140 | 18 | S4 | 0 | .954 | 2864.73 | 1398.005 | 2864.73 | 9.999+ | 2.049 |
| 141 | 18 | S5 | 0 | 1.258 | 2864.744 | 1397.452 | 2864.744 | 9.999+ | 2.05 |
| 142 | 18 | S6 | 0 | 2.072 | 2854.874 | 1346.67 | 2854.874 | 9.999+ | 2.12 |
| 143 | 18 | S7 | 0 | 17.516 | 2908.937 | 1584.524 | 2908.937 | 9.999+ | 1.836 |
| 144 | 18 | S8 | 0 | 114.294 | 2518.21 | 619.055 | 2518.21 | 9.999+ | 4.068 |
| 145 | 19 | S1 | 0 | 61.322 | 2341.944 | 257.047 | 2341.944 | 9.999+ | 9.111 |
| 146 | 19 | S2 | 0 | 13.762 | 2511.361 | 609.227 | 2511.361 | 9.999+ | 4.122 |
| 147 | 19 | S3 | 0 | 1.344 | 2436.431 | 378.947 | 2436.431 | 9.999+ | 6.429 |
| 148 | 19 | S4 | 0 | 1.329 | 2364.495 | 230.877 | 2364.495 | 9.999+ | 9.999+ |
| 149 | 19 | S5 | 0 | 1.187 | 2364.02 | 223.323 | 2364.02 | 9.999+ | 9.999+ |
| 150 | 19 | S6 | 0 | 1.144 | 2363.077 | 219.098 | 2363.077 | 9.999+ | 9.999+ |
| 151 | 19 | S7 | 0 | 1.616 | 2370.61 | 257.215 | 2370.61 | 9.999+ | 9.216 |
| 152 | 19 | S8 | 0 | 44.01 | 2272.887 | 99.774 | 2272.887 | 9.999+ | 9.999+ |
| 153 | 20 | S1 | 0 | 24.173 | 2085.864 | 259.915 | 2085.864 | 9.999+ | 8.025 |
| 154 | 20 | S2 | 0 | 12.516 | 2052.224 | 573.173 | 2052.224 | 9.999+ | 3.58 |
| 155 | 20 | S3 | 0 | .344 | 2123.941 | 315.707 | 2123.941 | 9.999+ | 6.728 |
| 156 | 20 | S4 | 0 | 1.351 | 2171.433 | 229.812 | 2171.433 | 9.999+ | 9.449 |
| 157 | 20 | S5 | 0 | 1.231 | 2171.835 | 223.868 | 2171.835 | 9.999+ | 9.701 |
| 158 | 20 | S6 | 0 | 1.18 | 2169.955 | 218.992 | 2169.955 | 9.999+ | 9.909 |
| 159 | 20 | S7 | 0 | 1.585 | 2177.212 | 257.238 | 2177.212 | 9.999+ | 8.464 |
| 160 | 20 | S8 | 0 | 6.004 | 2164.055 | 99.771 | 2164.055 | 9.999+ | 9.999+ |

## Envelope Slab Soil Pressures

| | Label | UC | LC | Soil Pressure[psf] | Allowable Bearing[psf] | Point |
|---|---|---|---|---|---|---|
| 1 | S1 | .34 | 5 | 509.669 | 1500 | N226 |
| 2 | S2 | .504 | 5 | 755.58 | 1500 | N233 |
| 3 | S3 | .477 | 5 | 715.657 | 1500 | N240 |
| 4 | S4 | .483 | 5 | 725.237 | 1500 | N247 |
| 5 | S5 | .483 | 5 | 725.089 | 1500 | N254 |
| 6 | S6 | .478 | 5 | 716.376 | 1500 | N261 |
| 7 | S7 | .503 | 5 | 754.502 | 1500 | N268 |

## Envelope Slab Soil Pressures (Continued)

| | Label | UC | LC | Soil Pressure[psf] | Allowable Bearing[psf] | Point |
|---|---|---|---|---|---|---|
| 8 | S8 | .35 | 5 | 524.446 | 1500 | N275 |

| | | | |
|---|---|---|---|
| Company: | | Date: | 5/14/2018 |
| Engineer: | | Page: | 1/6 |
| Project: | | | |
| Address: | | | |
| Phone: | | | |
| E-mail: | | | |

## 1.Project information

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

Project description:
Location:
Fastening description:

## 2. Input Data & Anchor Parameters

**General**
Design method:ACI 318-14
Units: Imperial units

**Anchor Information:**
Anchor type: Bonded anchor
Material: F1554 Grade 36
Diameter (inch): 0.375
Effective Embedment depth, $h_{ef}$ (inch): 6.000
Code report: ICC-ES ESR-4057
Anchor category: -
Anchor ductility: Yes
$h_{min}$ (inch): 7.25
$c_{ac}$ (inch): 10.99
$C_{min}$ (inch): 1.75
$S_{min}$ (inch): 3.00

**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: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Hole condition: Dry concrete
Inspection: Periodic
Temperature range, Short/Long: 150/110°F
Ignore 6do requirement: Not applicable
Build-up grout pad: No

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

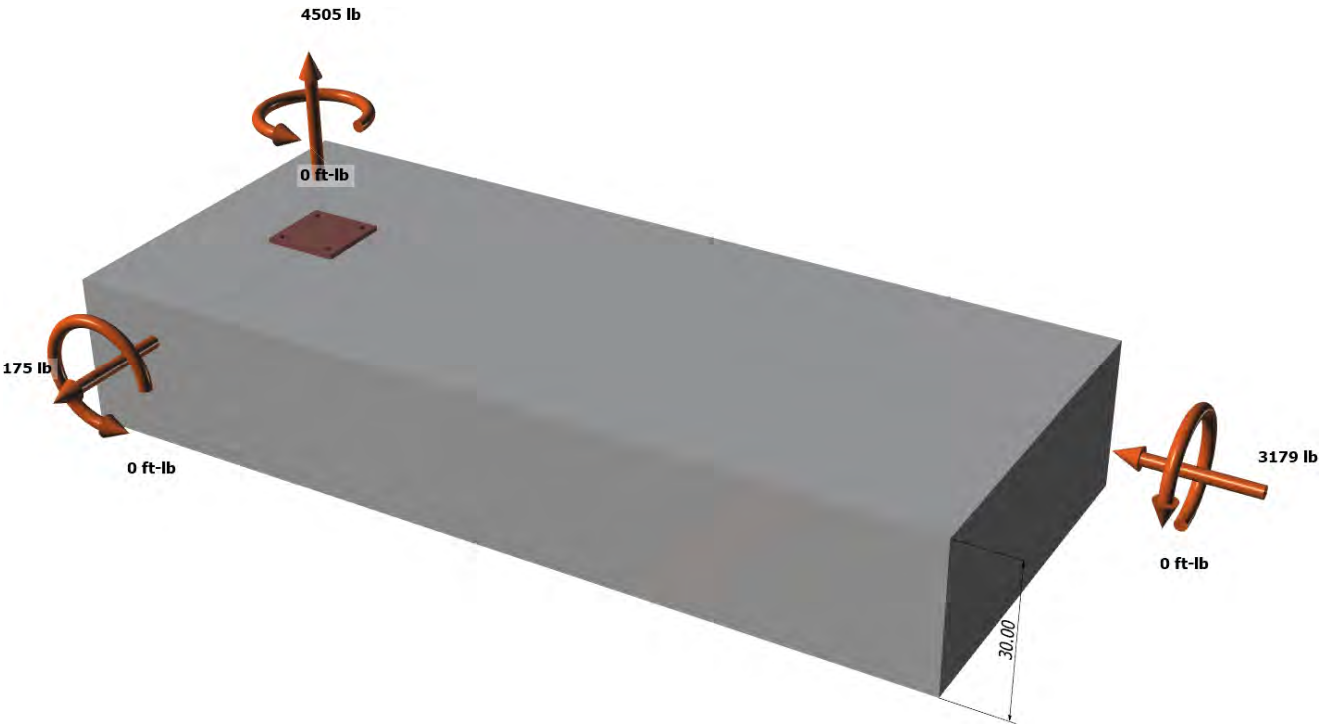
**Recommended Anchor**
Anchor Name: SET-3G - SET-3G w/ 3/8"Ø F1554 Gr. 36
Code Report: ICC-ES ESR-4057

**Load and Geometry**
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: No
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: No

Strength level loads:

$N_{ua}$ [lb]: 4505
$V_{uax}$ [lb]: 175
$V_{uay}$ [lb]: -3179
$M_{ux}$ [ft-lb]: 0
$M_{uy}$ [ft-lb]: 0
$M_{uz}$ [ft-lb]: 0

<Figure 1>



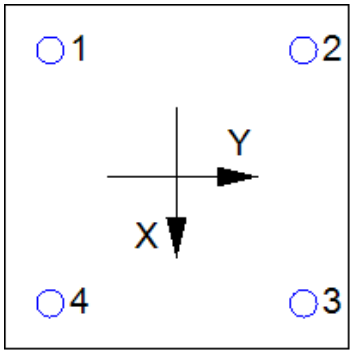
<Figure 2>

## 3. Resulting Anchor Forces

| Anchor | Tension load, $N_{ua}$ (lb) | Shear load x, $V_{uax}$ (lb) | Shear load y, $V_{uay}$ (lb) | Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb) |
|---|---|---|---|---|
| 1 | 1126.3 | 43.8 | -794.8 | 796.0 |
| 2 | 1126.3 | 43.8 | -794.8 | 796.0 |
| 3 | 1126.3 | 43.8 | -794.8 | 796.0 |
| 4 | 1126.3 | 43.8 | -794.8 | 796.0 |
| Sum | 4505.0 | 175.0 | -3179.0 | 3183.8 |

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 4505
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, $e'_{Nx}$ (inch): 0.00
Eccentricity of resultant tension forces in y-axis, $e'_{Ny}$ (inch): 0.00
Eccentricity of resultant shear forces in x-axis, $e'_{Vx}$ (inch): 0.00
Eccentricity of resultant shear forces in y-axis, $e'_{Vy}$ (inch): 0.00

<Figure 3>




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

| $N_{sa}$ (lb) | $\phi$ | $\phi N_{sa}$ (lb) |
|---|---|---|
| 4525 | 0.75 | 3394 |

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

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

| $k_c$ | $\lambda_a$ | $f'_c$ (psi) | $h_{ef}$ (in) | $N_b$ (lb) |
|---|---|---|---|---|
| 17.0 | 1.00 | 2500 | 6.000 | 12492 |

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

| $A_{Nc}$ (in²) | $A_{Nco}$ (in²) | $c_{a,min}$ (in) | $\Psi_{ec,N}$ | $\Psi_{ed,N}$ | $\Psi_{c,N}$ | $\Psi_{cp,N}$ | $N_b$ (lb) | $\phi$ | $\phi N_{cbg}$ (lb) |
|---|---|---|---|---|---|---|---|---|---|
| 424.63 | 324.00 | 7.25 | 1.000 | 0.942 | 1.00 | 1.000 | 12492 | 0.65 | 10021 |

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

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

| $\tau_{k,cr}$ (psi) | $f_{short\text{-}term}$ | $K_{sat}$ | $f'_c$ (psi) | $n$ | $\tau_{k,cr}$ (psi) |
|---|---|---|---|---|---|
| 1346 | 1.00 | 1.00 | 2500 | 0.24 | 1346 |

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

| $\lambda_a$ | $\tau_{cr}$ (psi) | $d_a$ (in) | $h_{ef}$ (in) | $N_{ba}$ (lb) |
|---|---|---|---|---|
| 1.00 | 1346 | 0.38 | 6.000 | 9514 |

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

| $A_{Na}$ (in²) | $A_{Na0}$ (in²) | $c_{Na}$ (in) | $c_{a,min}$ (in) | $\Psi_{ec,Na}$ | $\Psi_{ed,Na}$ | $\Psi_{cp,Na}$ | $N_{ba}$(lb) | $\phi$ | $\phi N_{ag}$ (lb) |
|---|---|---|---|---|---|---|---|---|---|
| 198.45 | 112.09 | 5.29 | 7.25 | 1.000 | 1.000 | 1.000 | 9514 | 0.55 | 9265 |

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

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

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

***Shear perpendicular to edge in x-direction:***

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

| $l_e$ (in) | $d_a$ (in) | $\lambda_a$ | $f'_c$ (psi) | $c_{a1}$ (in) | $V_{bx}$ (lb) |
|---|---|---|---|---|---|
| 3.00 | 0.375 | 1.00 | 2500 | 13.75 | 16564 |

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

| $A_{Vc}$ (in²) | $A_{Vco}$ (in²) | $\Psi_{ec,V}$ | $\Psi_{ed,V}$ | $\Psi_{c,V}$ | $\Psi_{h,V}$ | $V_{bx}$ (lb) | $\phi$ | $\phi V_{cbgx}$ (lb) |
|---|---|---|---|---|---|---|---|---|
| 647.11 | 850.78 | 1.000 | 0.805 | 1.000 | 1.000 | 16564 | 0.70 | 7103 |

***Shear perpendicular to edge in y-direction:***

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

| $l_e$ (in) | $d_a$ (in) | $\lambda_a$ | $f'_c$ (psi) | $c_{a1}$ (in) | $V_{by}$ (lb) |
|---|---|---|---|---|---|
| 3.00 | 0.375 | 1.00 | 2500 | 10.75 | 11450 |

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

| $A_{Vc}$ (in²) | $A_{Vco}$ (in²) | $\Psi_{ec,V}$ | $\Psi_{ed,V}$ | $\Psi_{c,V}$ | $\Psi_{h,V}$ | $V_{by}$ (lb) | $\phi$ | $\phi V_{cbgy}$ (lb) |
|---|---|---|---|---|---|---|---|---|
| 387.00 | 520.03 | 1.000 | 0.891 | 1.000 | 1.000 | 11450 | 0.70 | 5313 |

***Shear parallel to edge in x-direction:***

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

| $l_e$ (in) | $d_a$ (in) | $\lambda_a$ | $f'_c$ (psi) | $c_{a1}$ (in) | $V_{by}$ (lb) |
|---|---|---|---|---|---|
| 3.00 | 0.375 | 1.00 | 2500 | 7.25 | 6342 |

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

| $A_{Vc}$ (in²) | $A_{Vco}$ (in²) | $\Psi_{ec,V}$ | $\Psi_{ed,V}$ | $\Psi_{c,V}$ | $\Psi_{h,V}$ | $V_{by}$ (lb) | $\phi$ | $\phi V_{cbgx}$ (lb) |
|---|---|---|---|---|---|---|---|---|
| 261.00 | 236.53 | 1.000 | 1.000 | 1.000 | 1.000 | 6342 | 0.70 | 9797 |

***Shear parallel to edge in y-direction:***

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

| $l_e$ (in) | $d_a$ (in) | $\lambda_a$ | $f'_c$ (psi) | $c_{a1}$ (in) | $V_{bx}$ (lb) |
|---|---|---|---|---|---|
| 3.00 | 0.375 | 1.00 | 2500 | 10.25 | 10661 |

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

| $A_{Vc}$ (in²) | $A_{Vco}$ (in²) | $\Psi_{ec,V}$ | $\Psi_{ed,V}$ | $\Psi_{c,V}$ | $\Psi_{h,V}$ | $V_{bx}$ (lb) | $\phi$ | $\phi V_{cbgy}$ (lb) |
|---|---|---|---|---|---|---|---|---|
| 401.67 | 472.78 | 1.000 | 1.000 | 1.000 | 1.000 | 10661 | 0.70 | 12680 |

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

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

| $k_{cp}$ | $A_{Na}$ (in²) | $A_{Na0}$ (in²) | $\Psi_{ed,Na}$ | $\Psi_{ec,Na}$ | $\Psi_{cp,Na}$ | $N_{ba}$ (lb) | $N_a$ (lb) |
|---|---|---|---|---|---|---|---|
| 2.0 | 198.45 | 112.09 | 1.000 | 1.000 | 1.000 | 9514 | 16845 |

| $A_{Nc}$ (in²) | $A_{Nco}$ (in²) | $\Psi_{ec,N}$ | $\Psi_{ed,N}$ | $\Psi_{c,N}$ | $\Psi_{cp,N}$ | $N_b$ (lb) | $N_{cb}$ (lb) | $\phi$ |
|---|---|---|---|---|---|---|---|---|
| 424.63 | 324.00 | 1.000 | 0.942 | 1.000 | 1.000 | 12492 | 15417 | 0.70 |

| $\phi V_{cpg}$ (lb) |
|---|
| 21584 |

## 11. Results

### Interaction of Tensile and Shear Forces (Sec. R17.6)

| Tension | Factored Load, $N_{ua}$ (lb) | Design Strength, $\phi N_n$ (lb) | Ratio | Status |
|---|---|---|---|---|
| Steel | 1126 | 3394 | 0.33 | Pass |
| Concrete breakout | 4505 | 10021 | 0.45 | Pass |
| **Adhesive** | **4505** | **9265** | **0.49** | **Pass (Governs)** |

| Shear | Factored Load, $V_{ua}$ (lb) | Design Strength, $\phi V_n$ (lb) | Ratio | Status |
|---|---|---|---|---|
| Steel | 796 | 1765 | 0.45 | Pass |
| T Concrete breakout x+ | 175 | 7103 | 0.02 | Pass |
| T Concrete breakout y- | 3179 | 5313 | 0.60 | Pass |
| \|\| Concrete breakout y- | 88 | 9797 | 0.01 | Pass |
| \|\| Concrete breakout x- | 1590 | 12680 | 0.13 | Pass |
| **Concrete breakout, combined** | **-** | **-** | **0.60** | **Pass (Governs)** |
| Pryout | 3184 | 21584 | 0.15 | Pass |

| Interaction check | $(N_{ua}/\phi N_{ua})^{5/3}$ | $(V_{ua}/\phi V_{ua})^{5/3}$ | Combined Ratio | Permissible | Status |
|---|---|---|---|---|---|
| Sec. R17.6 | 0.30 | 0.43 | 72.6% | 1.0 | Pass |

**SET-3G w/ 3/8"Ø F1554 Gr. 36 with hef = 6.000 inch meets the selected design criteria.**

## 12. Warnings

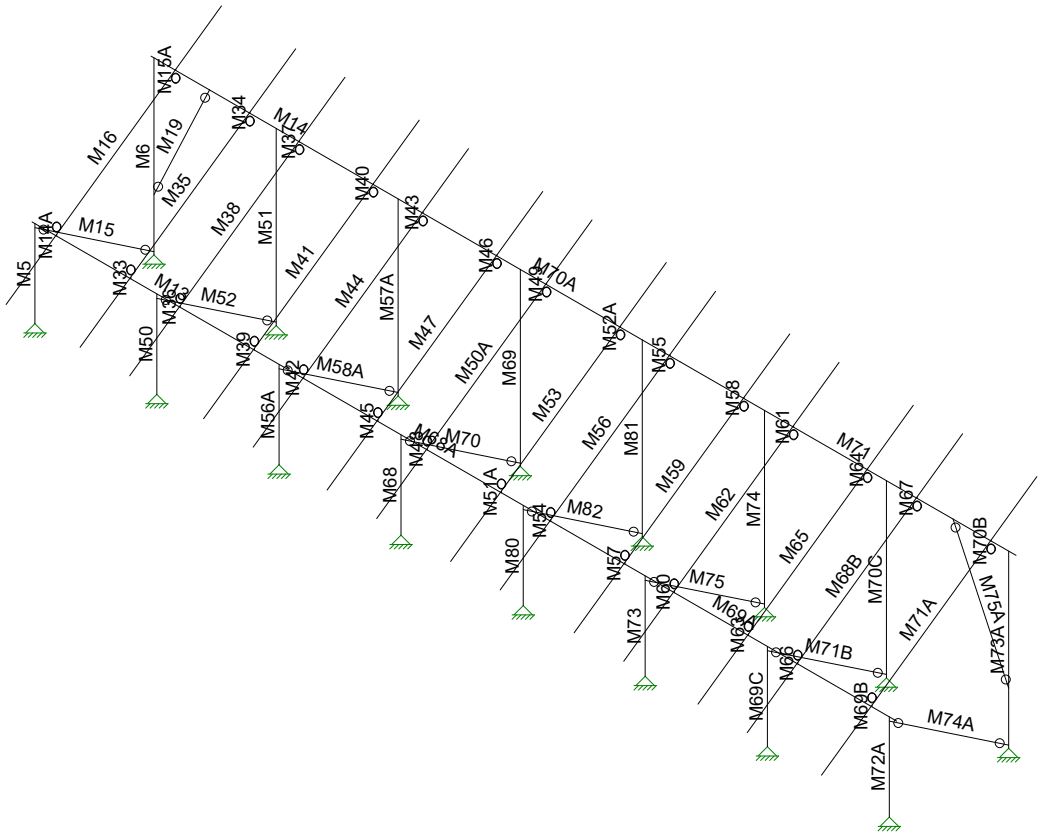
- Designer must exercise own judgement to determine if this design is suitable.

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

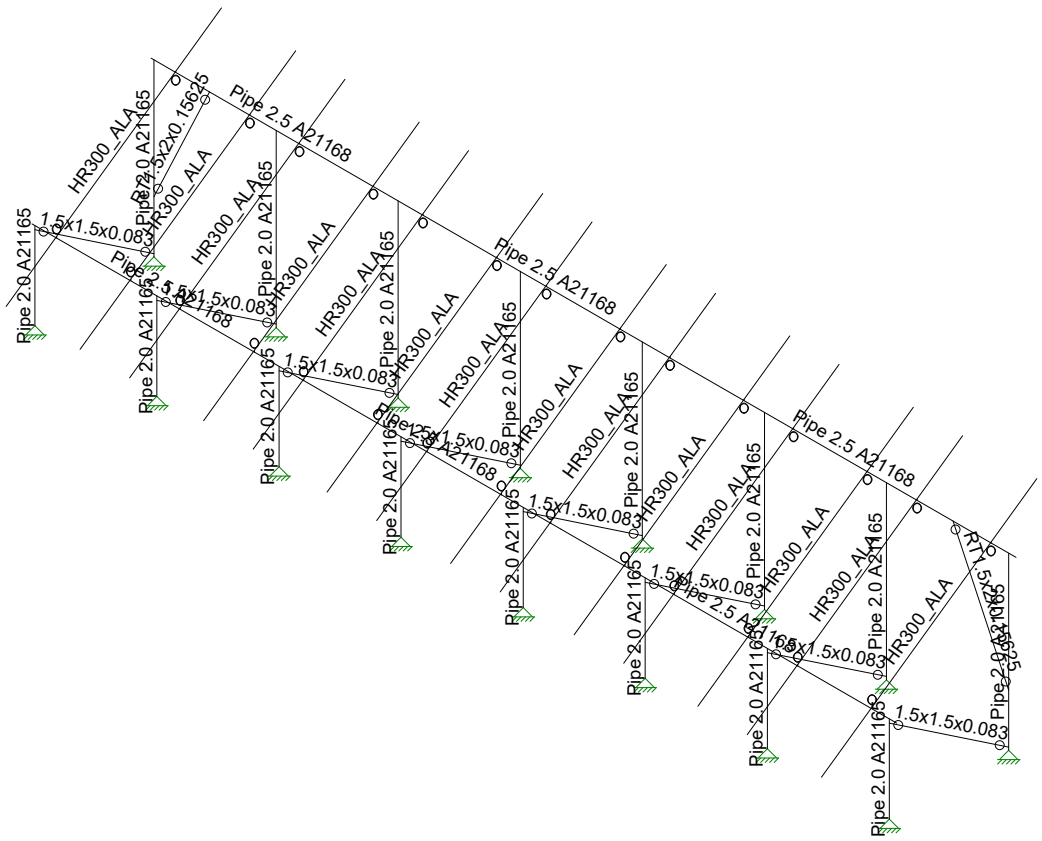
**JOB NO.:** U2716-070-181 **DESIGNED:** STB

**PROJECT:** Ground Mount Package for Ontario Canada

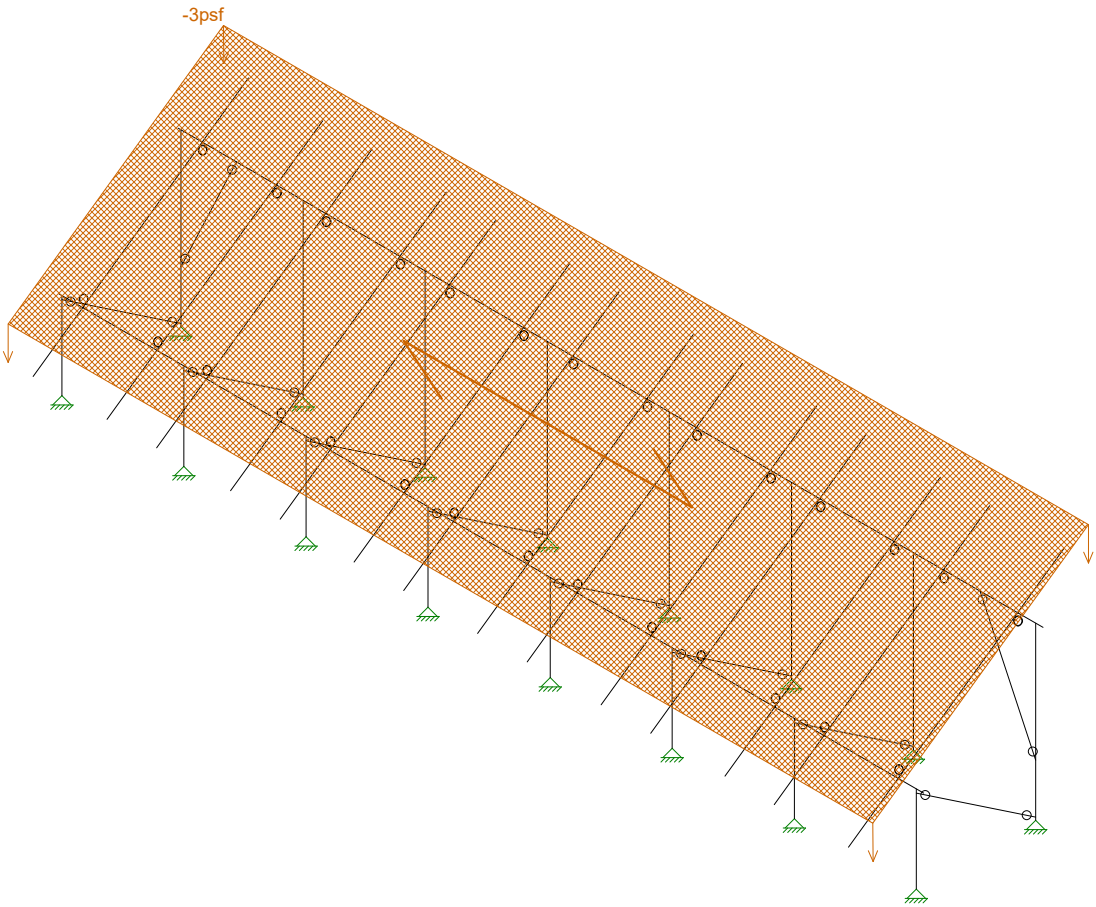
# Framing Analysis




| | | |
|---|---|---|
| Vector Structural Engineeri... | | SK - 3 |
| STB | Ground Mount | Apr 6, 2021 at 2:12 PM |
| U2716.114.191 | | Sunmodo Sunturf A5 v3 85x45.r3d |

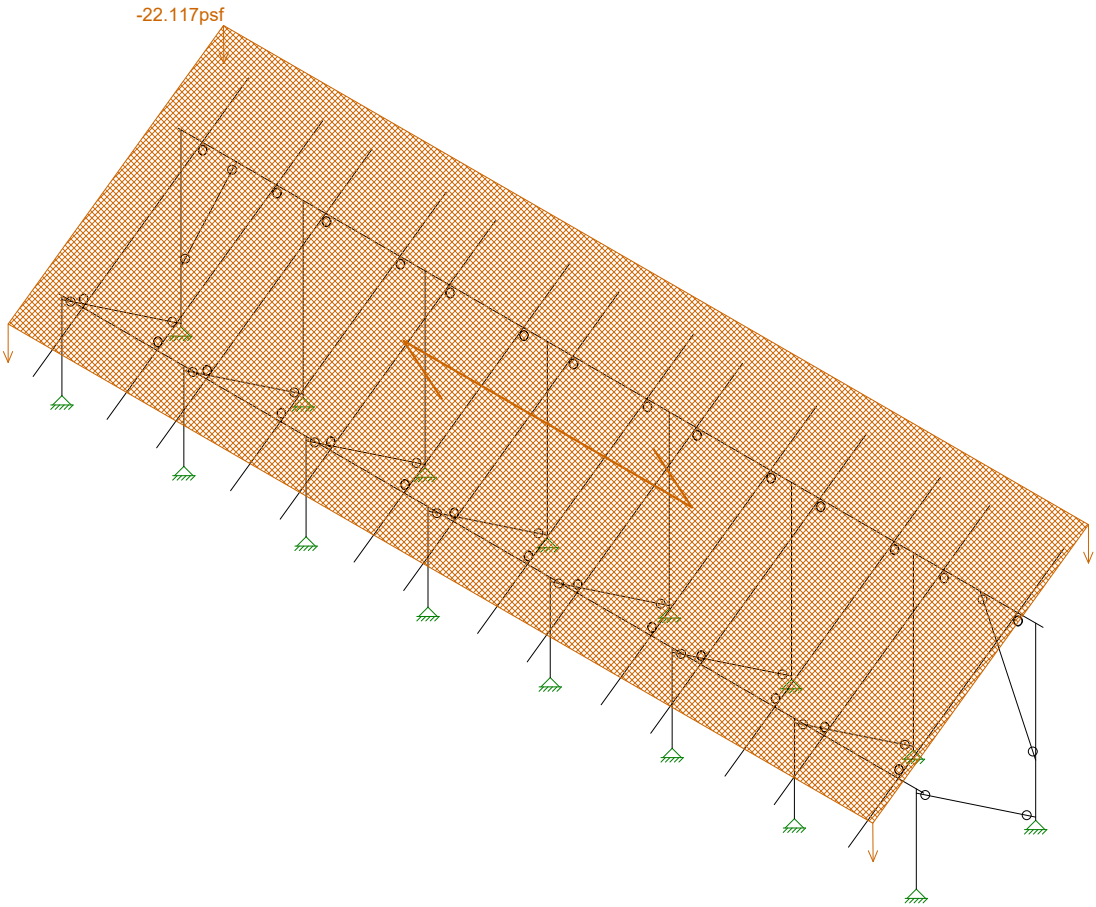



| | | |
|---|---|---|
| Vector Structural Engineeri... | | SK - 4 |
| STB | Ground Mount | Apr 6, 2021 at 2:12 PM |
| U2716.114.191 | | Sunmodo Sunturf A5 v3 85x45.r3d |



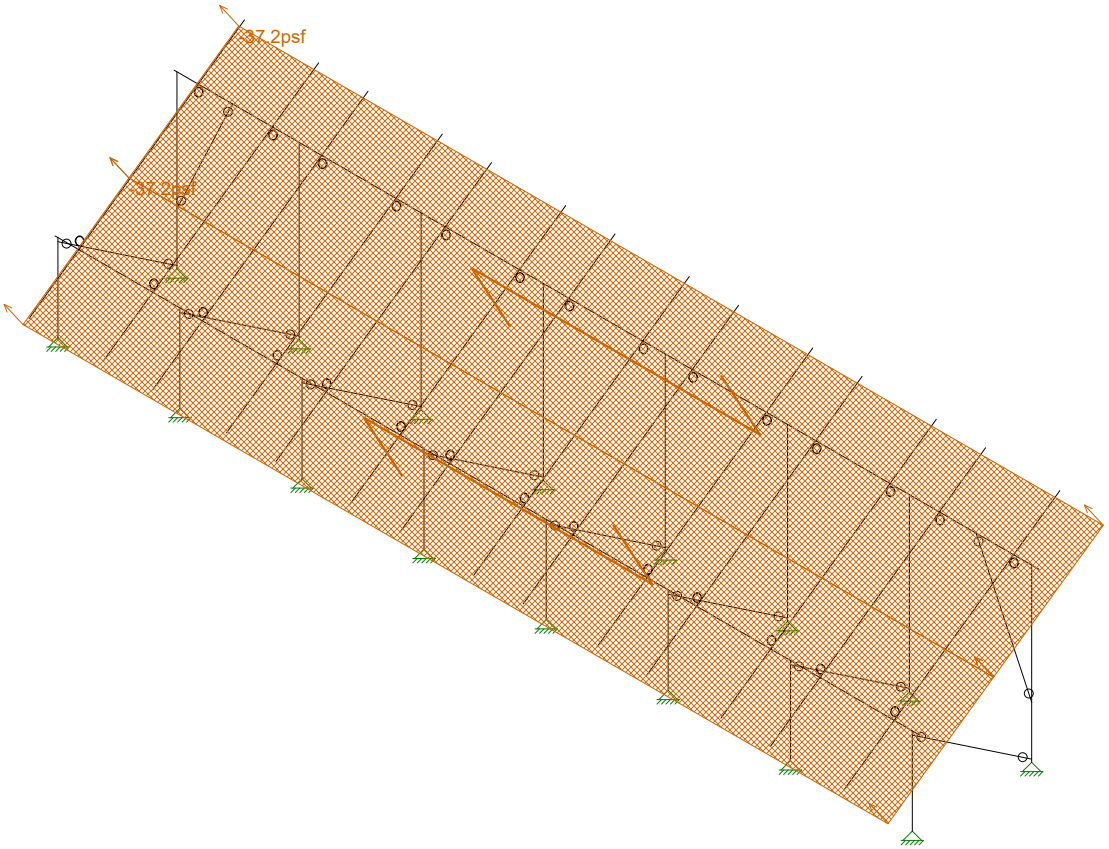

Loads: BLC 2, Solar Panel Weight

| | | |
|---|---|---|
| Vector Structural Engineeri... | | SK - 5 |
| STB | Ground Mount | Apr 6, 2021 at 2:12 PM |
| U2716.114.191 | | Sunmodo Sunturf A5 v3 85x45.r3d |



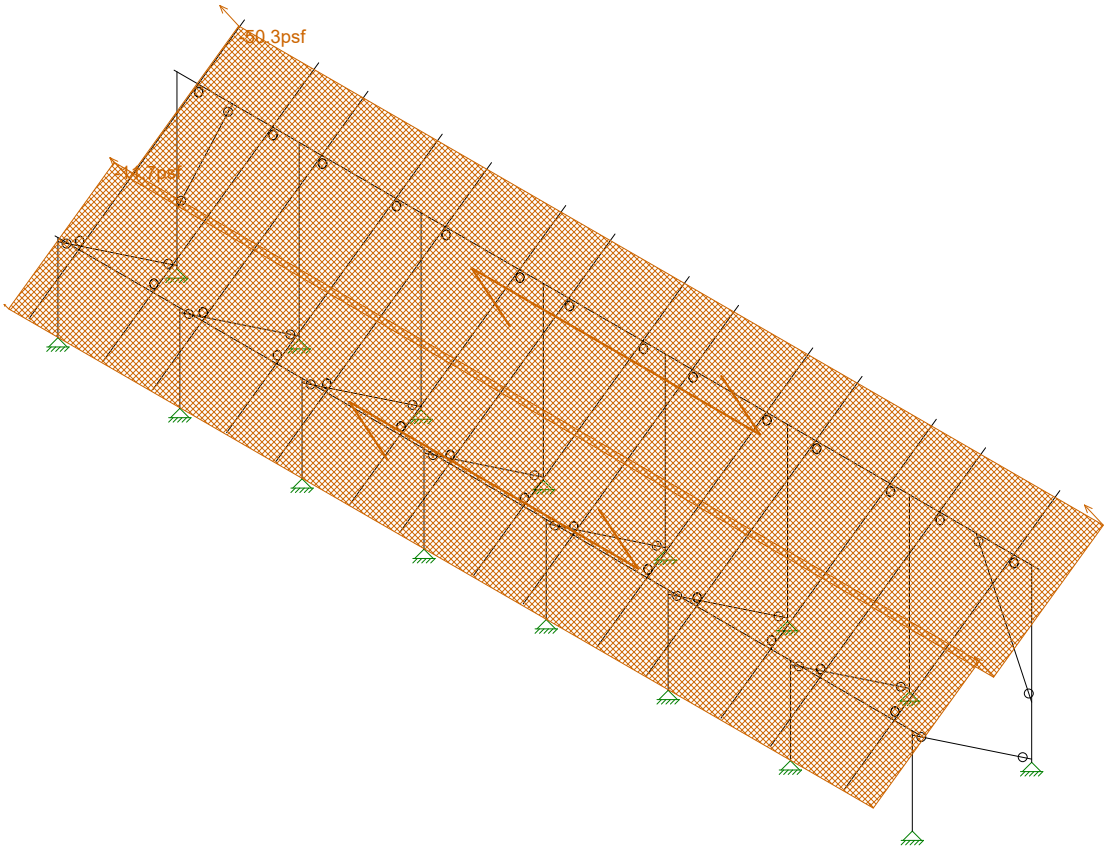

Loads: BLC 3, Roof Live/Snow

| | | |
|---|---|---|
| Vector Structural Engineeri... | | SK - 6 |
| STB | Ground Mount | Apr 6, 2021 at 2:12 PM |
| U2716.114.191 | | Sunmodo Sunturf A5 v3 85x45.r3d |



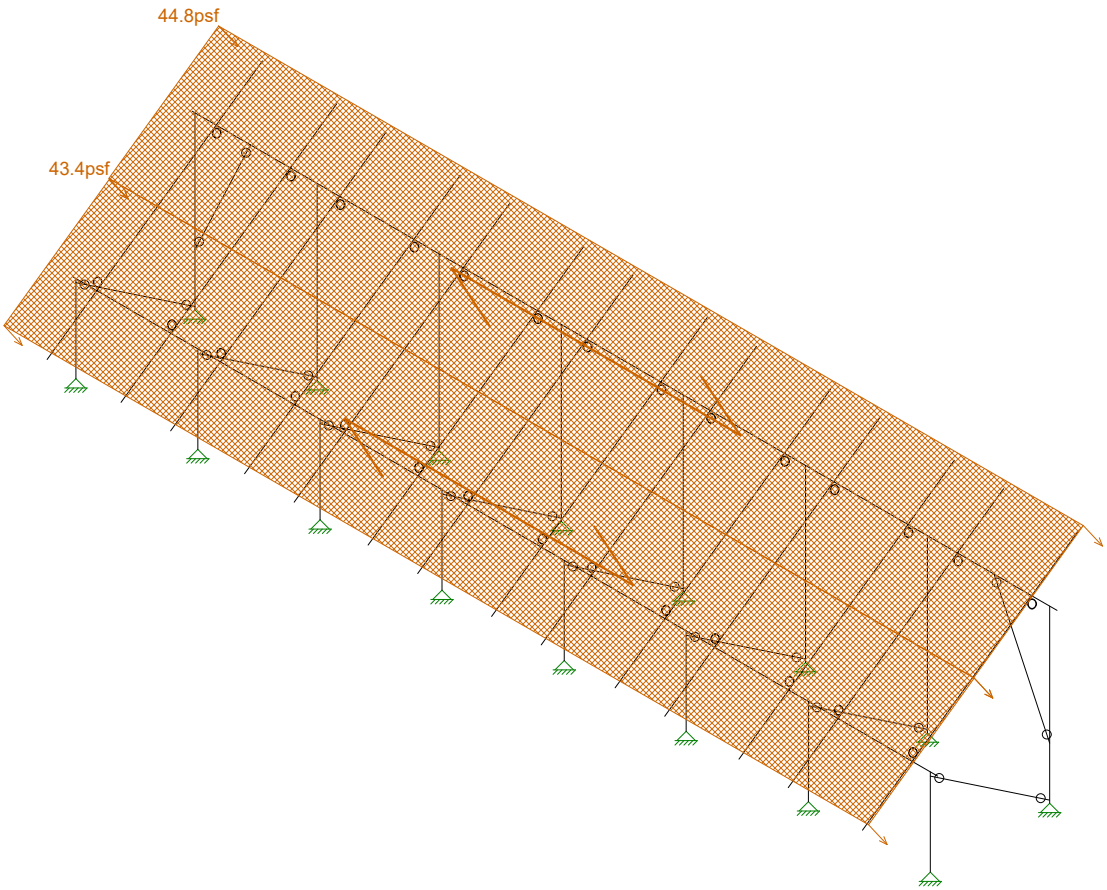

Loads: BLC 4, Wind A 0 deg

| | | |
|---|---|---|
| Vector Structural Engineeri... | | SK - 7 |
| STB | Ground Mount | Apr 6, 2021 at 2:13 PM |
| U2716.114.191 | | Sunmodo Sunturf A5 v3 85x45.r3d |



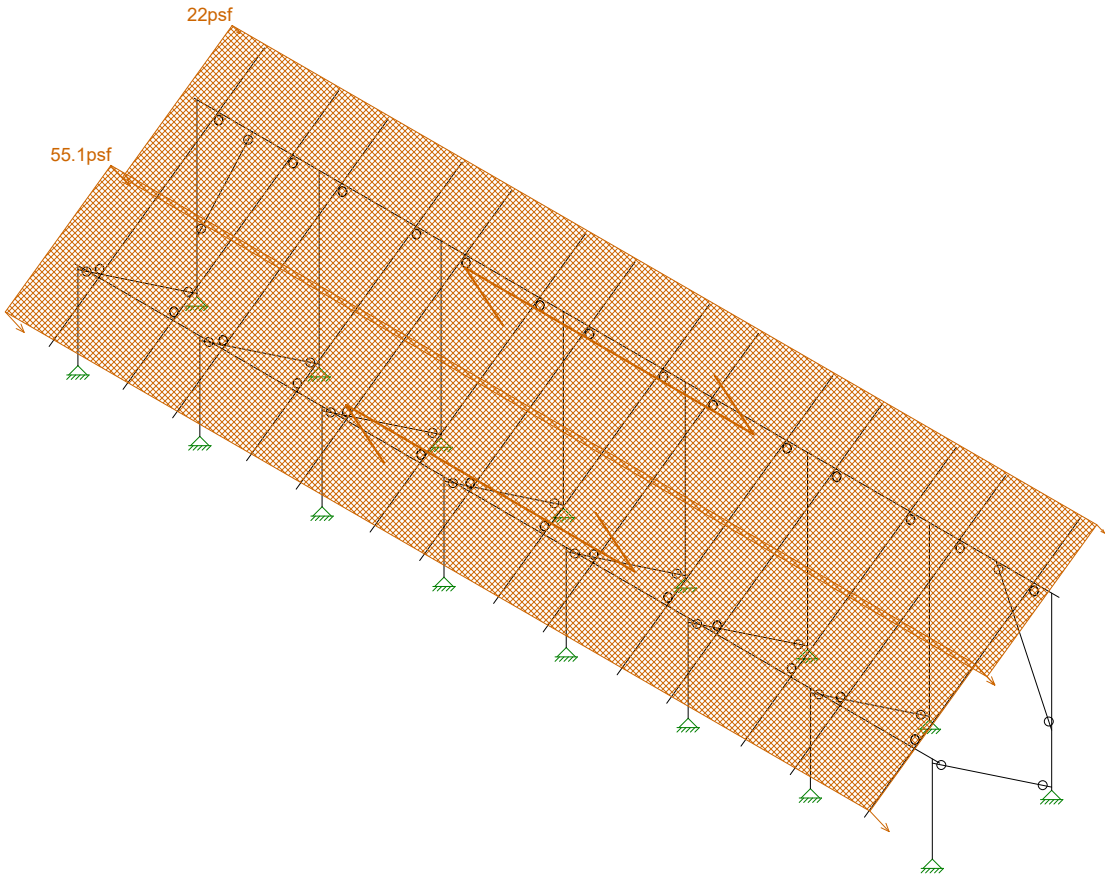

Loads: BLC 5, Wind B 0 deg

| | | |
|---|---|---|
| Vector Structural Engineeri... | | SK - 8 |
| STB | Ground Mount | Apr 6, 2021 at 2:13 PM |
| U2716.114.191 | | Sunmodo Sunturf A5 v3 85x45.r3d |



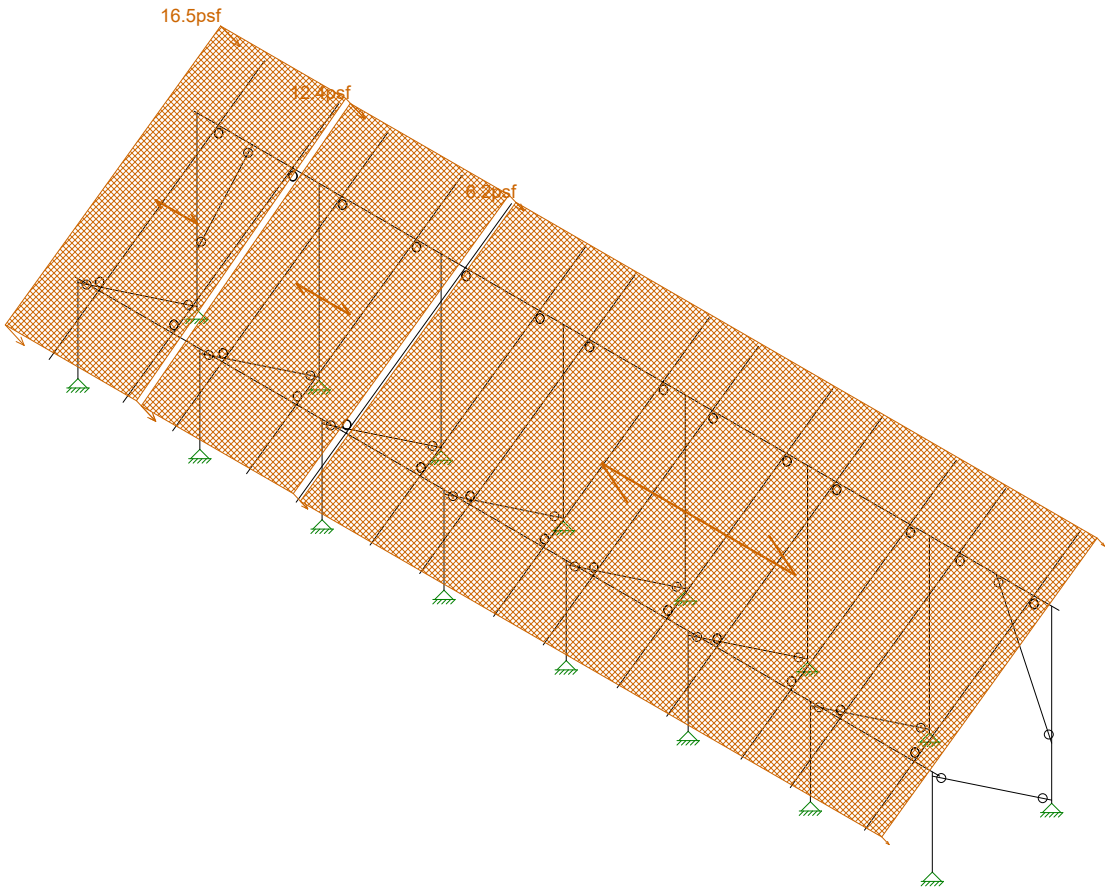

Loads: BLC 6, Wind A 180 deg

| | | |
|---|---|---|
| Vector Structural Engineeri... | | SK - 9 |
| STB | Ground Mount | Apr 6, 2021 at 2:13 PM |
| U2716.114.191 | | Sunmodo Sunturf A5 v3 85x45.r3d |



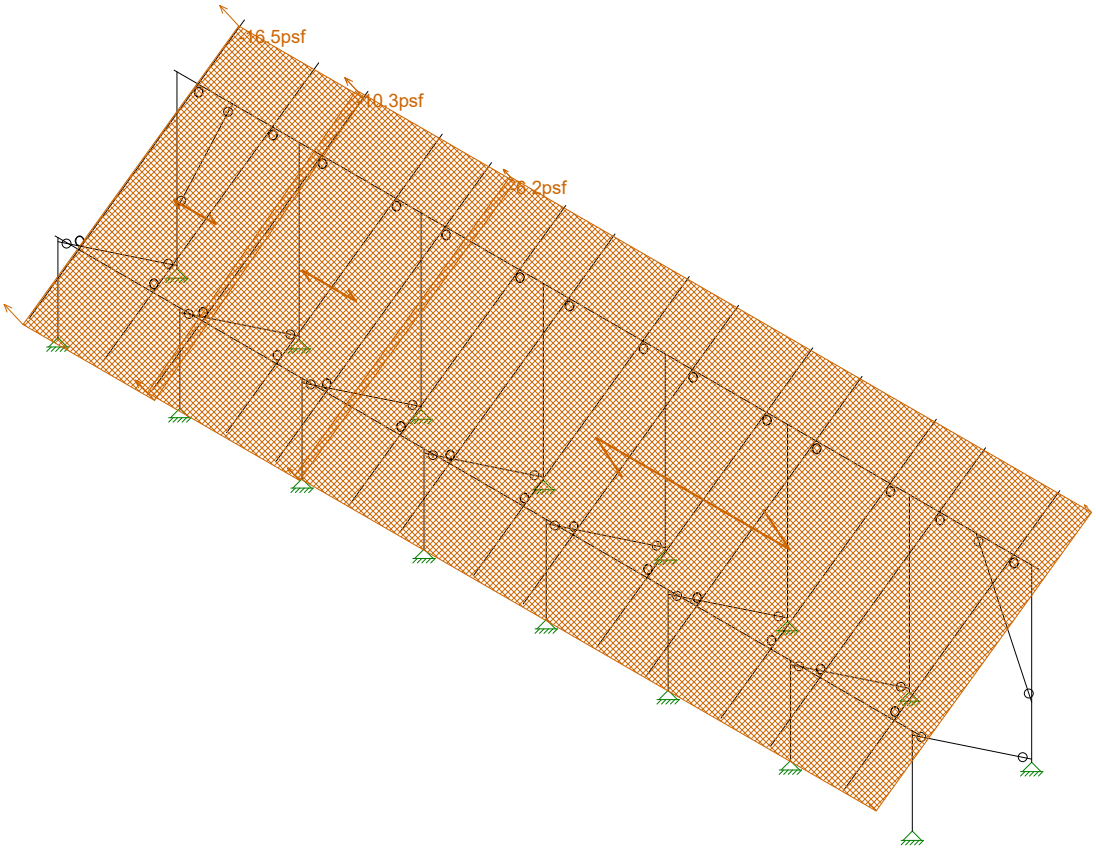

Loads: BLC 7, Wind B 180 deg

| | | |
|---|---|---|
| Vector Structural Engineeri... | | SK - 10 |
| STB | Ground Mount | Apr 6, 2021 at 2:13 PM |
| U2716.114.191 | | Sunmodo Sunturf A5 v3 85x45.r3d |



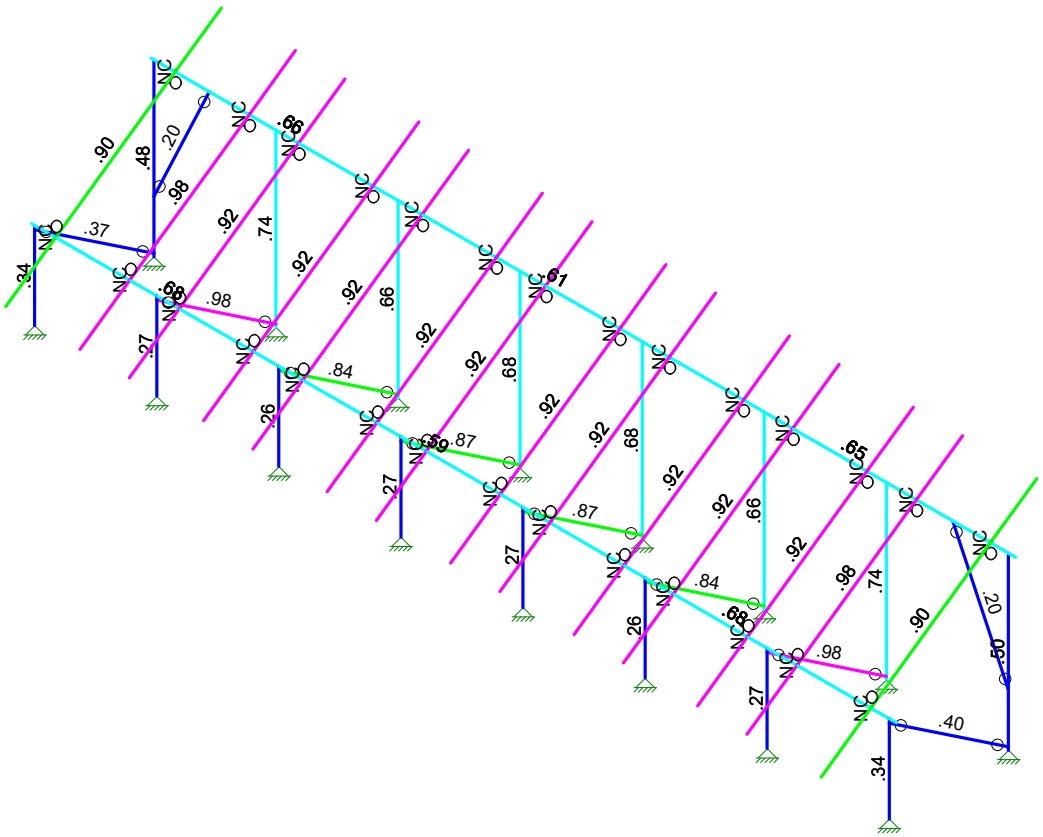

Loads: BLC 8, Wind A 90

| | | |
|---|---|---|
| Vector Structural Engineeri... | | SK - 11 |
| STB | Ground Mount | Apr 6, 2021 at 2:13 PM |
| U2716.114.191 | | Sunmodo Sunturf A5 v3 85x45.r3d |



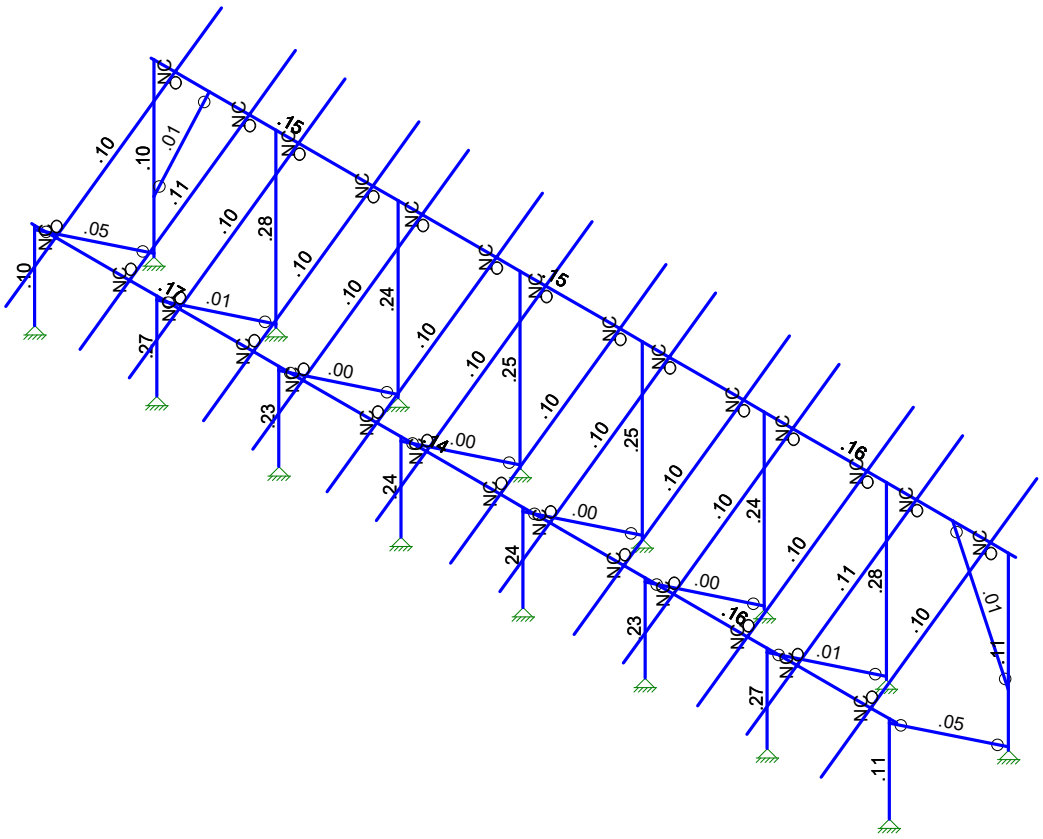

Loads: BLC 9, Wind B 90

| | | |
|---|---|---|
| Vector Structural Engineeri... | | SK - 12 |
| STB | Ground Mount | Apr 6, 2021 at 2:13 PM |
| U2716.114.191 | | Sunmodo Sunturf A5 v3 85x45.r3d |




Member Code Checks Displayed (Enveloped)
Envelope Only Solution

| | | |
|---|---|---|
| Vector Structural Engineeri... | | SK - 1 |
| STB | Ground Mount | Apr 6, 2021 at 2:09 PM |
| U2716.114.191 | | Sunmodo Sunturf A5 v3 85x45.r3d |




Member Shear Checks Displayed (Enveloped)
Envelope Only Solution

| | | |
|---|---|---|
| Vector Structural Engineeri... | | SK - 2 |
| STB | Ground Mount | Apr 6, 2021 at 2:11 PM |
| U2716.114.191 | | Sunmodo Sunturf A5 v3 85x45.r3d |

## (Global) Model Settings

| | |
|---|---|
| Display Sections for Member Calcs | 5 |
| Max Internal Sections for Member Calcs | 97 |
| Include Shear Deformation? | Yes |
| Increase Nailing Capacity for Wind? | Yes |
| Include Warping? | Yes |
| Trans Load Btwn Intersecting Wood Wall? | Yes |
| Area Load Mesh (in^2) | 144 |
| Merge Tolerance (in) | .12 |
| P-Delta Analysis Tolerance | 0.50% |
| Include P-Delta for Walls? | Yes |
| Automatically Iterate Stiffness for Walls? | Yes |
| Max Iterations for Wall Stiffness | 3 |
| Gravity Acceleration (in/sec^2) | 386.4 |
| Wall Mesh Size (in) | 24 |
| Eigensolution Convergence Tol. (1.E-) | 4 |
| Vertical Axis | Y |
| Global Member Orientation Plane | XZ |
| Static Solver | Sparse Accelerated |
| Dynamic Solver | Accelerated Solver |

| | |
|---|---|
| Hot Rolled Steel Code | AISC 14th(360-10): ASD |
| Adjust Stiffness? | Yes(Iterative) |
| RISAConnection Code | AISC 14th(360-10): ASD |
| Cold Formed Steel Code | AISI S100-16: ASD |
| Wood Code | AWC NDS-15: ASD |
| Wood Temperature | < 100F |
| Concrete Code | ACI 318-14 |
| Masonry Code | ACI 530-13: ASD |
| Aluminum Code | AA ADM1-15: ASD - Building |
| Stainless Steel Code | AISC 14th(360-10): ASD |
| Adjust Stiffness? | Yes(Iterative) |

| | |
|---|---|
| Number of Shear Regions | 4 |
| Region Spacing Increment (in) | 4 |
| Biaxial Column Method | Exact Integration |
| Parme Beta Factor (PCA) | .65 |
| Concrete Stress Block | Rectangular |
| Use Cracked Sections? | Yes |
| Use Cracked Sections Slab? | No |
| Bad Framing Warnings? | No |
| Unused Force Warnings? | Yes |
| Min 1 Bar Diam. Spacing? | No |
| Concrete Rebar Set | REBAR_SET_ASTMA615 |
| Min % Steel for Column | 1 |
| Max % Steel for Column | 8 |

## (Global) Model Settings, Continued

| | |
|---|---|
| Seismic Code | ASCE 7-10 |
| Seismic Base Elevation (in) | 15600 |
| Add Base Weight? | Yes |
| Ct X | .02 |
| Ct Z | .02 |
| T X (sec) | Not Entered |
| T Z (sec) | Not Entered |
| R X | 3 |
| R Z | 3 |
| Ct Exp. X | .75 |
| Ct Exp. Z | .75 |
| SD1 | 1 |
| SDS | 1 |
| S1 | 1 |
| TL (sec) | 5 |
| Risk Cat | I or II |
| Drift Cat | Other |
| Om Z | 1 |
| Om X | 1 |
| Cd Z | 4 |
| Cd X | 4 |
| Rho Z | 1 |
| Rho X | 1 |
| | |

## Hot Rolled Steel Properties

| | Label | E [ksi] | G [ksi] | Nu | Therm (/1E5 F) | Density[lb/ft^3] | Yield[psi] | Ry | Fu[psi] | Rt |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | A992 | 29000 | 11154 | .3 | .65 | 490 | 50000 | 1.1 | 65000 | 1.1 |
| 2 | A36 Gr.36 | 29000 | 11154 | .3 | .65 | 490 | 36000 | 1.5 | 58000 | 1.2 |
| 3 | A572 Gr.50 | 29000 | 11154 | .3 | .65 | 490 | 50000 | 1.1 | 65000 | 1.1 |
| 4 | A500 Gr.B R... | 29000 | 11154 | .3 | .65 | 527 | 42000 | 1.4 | 58000 | 1.3 |
| 5 | A500 Gr.B Re... | 29000 | 11154 | .3 | .65 | 527 | 46000 | 1.4 | 58000 | 1.3 |
| 6 | A53 Gr.B | 29000 | 11154 | .3 | .65 | 490 | 35000 | 1.6 | 60000 | 1.2 |
| 7 | A1085 | 29000 | 11154 | .3 | .65 | 490 | 50000 | 1.4 | 65000 | 1.3 |

## Aluminum Properties

| | Label | E [ksi] | G [ksi] | Nu | Therm (... | Density[... | Table B.4 | kt | Ftu[psi] | Fty[psi] | Fcy[psi] | Fsu[psi] | Ct |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3003-H14 | 10100 | 3787.5 | .33 | 1.3 | 172.8 | Table B.4-1 | 1 | 19000 | 16000 | 13000 | 12000 | 141 |
| 2 | 6061-T6 | 10100 | 3787.5 | .33 | 1.3 | 172.8 | Table B.4-2 | 1 | 38000 | 35000 | 35000 | 24000 | 141 |
| 3 | 6063-T5 | 10100 | 3787.5 | .33 | 1.3 | 172.8 | Table B.4-2 | 1 | 22000 | 16000 | 16000 | 13000 | 141 |
| 4 | 6063-T6 | 10100 | 3787.5 | .33 | 1.3 | 172.8 | Table B.4-2 | 1 | 30000 | 25000 | 25000 | 19000 | 141 |
| 5 | 5052-H34 | 10200 | 3787.5 | .33 | 1.3 | 172.8 | Table B.4-1 | 1 | 34000 | 26000 | 24000 | 20000 | 141 |
| 6 | 6061-T6 W | 10100 | 3787.5 | .33 | 1.3 | 172.8 | Table B.4-1 | 1 | 24000 | 15000 | 15000 | 15000 | 141 |
| 7 | 6005-T5 | 10100 | 3787.5 | .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 R... | A [in2] | Iyy [in4] | Izz [in4] | J [in4] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Post | Pipe 2.0 A21165 | Column | Pipe | A572 Gr.50 | Typical | .776 | .499 | .499 | .998 |
| 2 | Cross Beam | Pipe 2.5 A21168 | Beam | Wide Flange | A572 Gr.50 | Typical | .947 | .907 | .907 | 1.814 |
| 3 | Diagonal Brace | 1.5x1.5x0.083 | HBrace | SquareTube | A572 Gr.50 | Typical | .47 | .158 | .158 | .236 |

## Aluminum Section Sets

| | Label | Shape | Type | Design List | Material | Design R... | A [in2] | Iyy [in4] | Izz [in4] | J [in4] |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | AL Posts | 2.375ODX0.188 | Column | Pipe | 6005-T5 | Typical | 1.29 | .778 | .778 | 1.54 |
| 2 | AL Brace | RT1.5x2x0.15625 | VBrace | Rectangular Tubes | 6005-T5 | Typical | .996 | .327 | .524 | .602 |
| 3 | AL Rails | HR300 ALA | Beam | Rectangular Tubes | 6005-T5 | Typical | .736 | .214 | .727 | .614 |
| 4 | AL Cross Beam | Cross Rail | Beam | Rectangular Tubes | 6005-T5 | Typical | 1.909 | 1.97 | 4.366 | 4.017 |

## Member Area Loads (BLC 2 : Solar Panel Weight)

| | Joint A | Joint B | Joint C | Joint D | Direction | Distribution | Magnitude[psf] |
|---|---|---|---|---|---|---|---|
| 1 | N197 | N200 | N199 | N196 | Y | A-B | -3 |

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

| | Joint A | Joint B | Joint C | Joint D | Direction | Distribution | Magnitude[psf] |
|---|---|---|---|---|---|---|---|
| 1 | N197 | N200 | N199 | N196 | PY | A-B | -27 |

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

| | Joint A | Joint B | Joint C | Joint D | Direction | Distribution | Magnitude[psf] |
|---|---|---|---|---|---|---|---|
| 1 | N197 | N200 | N201 | N198 | Perp | A-B | -37.2 |
| 2 | N198 | N201 | N199 | N196 | Perp | A-B | -37.2 |

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

| | Joint A | Joint B | Joint C | Joint D | Direction | Distribution | Magnitude[psf] |
|---|---|---|---|---|---|---|---|
| 1 | N197 | N200 | N201 | N198 | Perp | A-B | -50.3 |
| 2 | N198 | N201 | N199 | N196 | Perp | A-B | -11.7 |

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

| | Joint A | Joint B | Joint C | Joint D | Direction | Distribution | Magnitude[psf] |
|---|---|---|---|---|---|---|---|
| 1 | N197 | N200 | N201 | N198 | Perp | A-B | 44.8 |
| 2 | N198 | N201 | N199 | N196 | Perp | A-B | 43.4 |

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

| | Joint A | Joint B | Joint C | Joint D | Direction | Distribution | Magnitude[psf] |
|---|---|---|---|---|---|---|---|
| 1 | N197 | N200 | N201 | N198 | Perp | A-B | 22 |
| 2 | N198 | N201 | N199 | N196 | Perp | A-B | 55.1 |

## Member Area Loads (BLC 8 : Wind A 90)

| | Joint A | Joint B | Joint C | Joint D | Direction | Distribution | Magnitude[psf] |
|---|---|---|---|---|---|---|---|
| 1 | N197 | N203 | N202 | N196 | Perp | A-B | 16.5 |
| 2 | N203 | N209 | N208 | N202 | Perp | A-B | 12.4 |
| 3 | N209 | N200 | N199 | N208 | Perp | A-B | 6.2 |

## Member Area Loads (BLC 9 : Wind B 90)

| | Joint A | Joint B | Joint C | Joint D | Direction | Distribution | Magnitude[psf] |
|---|---|---|---|---|---|---|---|
| 1 | N197 | N203 | N202 | N196 | Perp | A-B | -16.5 |
| 2 | N203 | N209 | N208 | N202 | Perp | A-B | -10.3 |
| 3 | N209 | N200 | N199 | N208 | Perp | A-B | -6.2 |

## Basic Load Cases

| | BLC Description | Category | X Gravity | Y Gravity | Z Gravity | Joint | Point | Distributed | Area(M... | Surface... |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Self Weight | DL | | -1.05 | | | | | | |
| 2 | Solar Panel Weight | DL | | | | | | | 1 | |

## Basic Load Cases (Continued)

| | BLC Description | Category | X Gravity | Y Gravity | Z Gravity | Joint | Point | Distributed | Area(M... | Surface... |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | Roof Live/Snow | RLL | | | | | | | 1 | |
| 4 | Wind A 0 deg | OL1 | | | | | | | 2 | |
| 5 | Wind B 0 deg | OL2 | | | | | | | 2 | |
| 6 | Wind A 180 deg | OL3 | | | | | | | 2 | |
| 7 | Wind B 180 deg | OL4 | | | | | | | 2 | |
| 8 | Wind A 90 | OL5 | | | | | | | 3 | |
| 9 | Wind B 90 | OL6 | | | | | | | 3 | |
| 10 | BLC 2 Transient Area ... | None | | | | | | 38 | | |
| 11 | BLC 3 Transient Area ... | None | | | | | | 38 | | |
| 12 | BLC 4 Transient Area ... | None | | | | | | 120 | | |
| 13 | BLC 5 Transient Area ... | None | | | | | | 120 | | |
| 14 | BLC 6 Transient Area ... | None | | | | | | 120 | | |
| 15 | BLC 7 Transient Area ... | None | | | | | | 120 | | |
| 16 | BLC 8 Transient Area ... | None | | | | | | 114 | | |
| 17 | BLC 9 Transient Area ... | None | | | | | | 114 | | |

## Load Combinations

| | Description | S... | PD... | SRSS | BLC | Fa... | BLC | Fa... | BLC | Fa... | B... | Fa... | B... | Fa... | B... | Fa... | B... | Fa... | B... | Fa... | B... | Fa... | B... | Fa... |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.0 D | Yes | Y | | DL | 1 | | | | | | | | | | | | | | | | | | |
| 2 | 1.0 D + 1.0 S | Yes | Y | | DL | 1 | RLL | 1 | | | | | | | | | | | | | | | | |
| 3 | 1.0 D + 0.6 W1 | Yes | Y | | DL | 1 | RLL | | OL1 | .6 | | | | | | | | | | | | | | |
| 4 | 1.0 D + 0.6 W2 | Yes | Y | | DL | 1 | RLL | | OL2 | .6 | | | | | | | | | | | | | | |
| 5 | 1.0 D + 0.6 W3 | Yes | Y | | DL | 1 | RLL | | OL3 | .6 | | | | | | | | | | | | | | |
| 6 | 1.0 D + 0.6 W4 | Yes | Y | | DL | 1 | RLL | | OL4 | .6 | | | | | | | | | | | | | | |
| 7 | 1.0 D + 0.6 W5 | Yes | Y | | DL | 1 | RLL | | OL5 | .6 | | | | | | | | | | | | | | |
| 8 | 1.0 D + 0.6 W6 | Yes | Y | | DL | 1 | RLL | | OL6 | .6 | | | | | | | | | | | | | | |
| 9 | 1.0 D + 0.45 W1 + 0.... | Yes | Y | | DL | 1 | RLL | .75 | OL1 | .45 | | | | | | | | | | | | | | |
| 10 | 1.0 D + 0.45 W2 + 0.... | Yes | Y | | DL | 1 | RLL | .75 | OL2 | .45 | | | | | | | | | | | | | | |
| 11 | 1.0 D + 0.45 W3 + 0.... | Yes | Y | | DL | 1 | RLL | .75 | OL3 | .45 | | | | | | | | | | | | | | |
| 12 | 1.0 D + 0.45 W4 + 0.... | Yes | Y | | DL | 1 | RLL | .75 | OL4 | .45 | | | | | | | | | | | | | | |
| 13 | 1.0 D + 0.45 W5 + 0.... | Yes | Y | | DL | 1 | RLL | .75 | OL5 | .45 | | | | | | | | | | | | | | |
| 14 | 1.0 D + 0.45 W6 + 0.... | Yes | Y | | DL | 1 | RLL | .75 | OL6 | .45 | | | | | | | | | | | | | | |
| 15 | 0.6 D + 0.6 W1 | Yes | Y | | DL | .6 | RLL | | OL1 | .6 | | | | | | | | | | | | | | |
| 16 | 0.6 D + 0.6 W2 | Yes | Y | | DL | .6 | RLL | | OL2 | .6 | | | | | | | | | | | | | | |
| 17 | 0.6 D + 0.6 W3 | Yes | Y | | DL | .6 | RLL | | OL3 | .6 | | | | | | | | | | | | | | |
| 18 | 0.6 D + 0.6 W4 | Yes | Y | | DL | .6 | RLL | | OL4 | .6 | | | | | | | | | | | | | | |
| 19 | 0.6 D + 0.6 W5 | Yes | Y | | DL | .6 | RLL | | OL5 | .6 | | | | | | | | | | | | | | |
| 20 | 0.6 D + 0.6 W6 | Yes | Y | | DL | .6 | RLL | | OL6 | .6 | | | | | | | | | | | | | | |

## Envelope Joint Reactions

| | Joint | | X [lb] | LC | Y [lb] | LC | Z [lb] | LC | MX [lb-ft] | LC | MY [lb... | LC | MZ [lb-ft] | LC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | N2 | max | 82.17 | 12 | 827.488 | 10 | 35.946 | 3 | 0 | 20 | 0 | 20 | 0 | 20 |
| 2 | | min | -19.018 | 15 | -131.614 | 17 | -42.92 | 5 | 0 | 1 | 0 | 1 | 0 | 1 |
| 3 | N1 | max | 122.878 | 11 | 1527.458 | 11 | 693.856 | 5 | 0 | 20 | 0 | 20 | 0 | 20 |
| 4 | | min | -99.011 | 16 | -1170.807 | 16 | -585.4... | 3 | 0 | 1 | 0 | 1 | 0 | 1 |
| 5 | N132 | max | 1.358 | 20 | 3213.674 | 11 | 1684.1... | 5 | 0 | 20 | 0 | 20 | 0 | 20 |
| 6 | | min | -.922 | 19 | -2549.421 | 16 | -1420.... | 3 | 0 | 1 | 0 | 1 | 0 | 1 |
| 7 | N133 | max | 1.355 | 11 | 1932.387 | 10 | 61.646 | 3 | 0 | 20 | 0 | 20 | 0 | 20 |
| 8 | | min | -1.342 | 15 | -432.387 | 17 | -72.684 | 5 | 0 | 1 | 0 | 1 | 0 | 1 |
| 9 | N109 | max | 3.615 | 20 | 3418.87 | 11 | 1907.5... | 5 | 0 | 20 | 0 | 20 | 0 | 20 |
| 10 | | min | -2.916 | 13 | -2712.726 | 16 | -1608.... | 3 | 0 | 1 | 0 | 1 | 0 | 1 |
| 11 | N110A | max | 9.442 | 20 | 2145.743 | 10 | 60.063 | 3 | 0 | 20 | 0 | 20 | 0 | 20 |
| 12 | | min | -21.612 | 12 | -528.315 | 17 | -70.365 | 5 | 0 | 1 | 0 | 1 | 0 | 1 |
| 13 | N121 | max | 1.306 | 20 | 3153.218 | 11 | 1619.8... | 5 | 0 | 20 | 0 | 20 | 0 | 20 |

## Envelope Joint Reactions (Continued)

| | Joint | | X [lb] | LC | Y [lb] | LC | Z [lb] | LC | MX [lb-ft] | LC | MY [lb... | LC | MZ [lb-ft] | LC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | | min | -.905 | 19 | -2501.535 | 16 | -1366.... | 3 | 0 | 1 | 0 | 1 | 0 | 1 |
| 15 | N122 | max | 3.262 | 12 | 1880.655 | 10 | 60.312 | 3 | 0 | 20 | 0 | 20 | 0 | 20 |
| 16 | | min | -1.39 | 20 | -396.403 | 17 | -71.228 | 5 | 0 | 1 | 0 | 1 | 0 | 1 |
| 17 | N133B | max | 1.457 | 20 | 3214.328 | 11 | 1685.0... | 5 | 0 | 20 | 0 | 20 | 0 | 20 |
| 18 | | min | -1.086 | 19 | -2550.182 | 16 | -1421.... | 3 | 0 | 1 | 0 | 1 | 0 | 1 |
| 19 | N134B | max | .422 | 15 | 1933.128 | 10 | 61.633 | 3 | 0 | 20 | 0 | 20 | 0 | 20 |
| 20 | | min | -1.483 | 12 | -433.369 | 17 | -72.667 | 5 | 0 | 1 | 0 | 1 | 0 | 1 |
| 21 | N151 | max | 1.269 | 20 | 3156.533 | 11 | 1624.24 | 5 | 0 | 20 | 0 | 20 | 0 | 20 |
| 22 | | min | -.919 | 19 | -2505.297 | 16 | -1370.... | 3 | 0 | 1 | 0 | 1 | 0 | 1 |
| 23 | N152 | max | .266 | 15 | 1883.998 | 10 | 60.46 | 3 | 0 | 20 | 0 | 20 | 0 | 20 |
| 24 | | min | -3.555 | 12 | -400.886 | 17 | -71.384 | 5 | 0 | 1 | 0 | 1 | 0 | 1 |
| 25 | N143A | max | 2.439 | 14 | 3409.106 | 11 | 1899.2... | 5 | 0 | 20 | 0 | 20 | 0 | 20 |
| 26 | | min | -1.12 | 19 | -2708.153 | 16 | -1601.... | 3 | 0 | 1 | 0 | 1 | 0 | 1 |
| 27 | N144A | max | 21.712 | 12 | 2140.107 | 10 | 60.319 | 3 | 0 | 20 | 0 | 20 | 0 | 20 |
| 28 | | min | -10.438 | 15 | -522.775 | 17 | -70.676 | 5 | 0 | 1 | 0 | 1 | 0 | 1 |
| 29 | N149A | max | 96.29 | 16 | 1648.23 | 11 | 758.37 | 5 | 0 | 20 | 0 | 20 | 0 | 20 |
| 30 | | min | -122.6... | 11 | -1265.738 | 16 | -639.7... | 3 | 0 | 1 | 0 | 1 | 0 | 1 |
| 31 | N150A | max | 21.177 | 15 | 898.819 | 10 | 37.731 | 3 | 0 | 20 | 0 | 20 | 0 | 20 |
| 32 | | min | -82.993 | 12 | -148.802 | 17 | -44.997 | 5 | 0 | 1 | 0 | 1 | 0 | 1 |
| 33 | Totals: | max | .017 | 8 | 27803.562 | 11 | 11355.... | 17 | | | | | | |
| 34 | | min | -.017 | 7 | -11736.612 | 15 | -9576.... | 15 | | | | | | |

## Envelope AISC 14th(360-10): ASD Steel Code Checks

| | Member | Shape | Code Check | Loc[in] | LC | Shear ... | Loc[in] | Dir | LC | Pnc/om [... | Pnt/om [lb] | Mnyy/om... | Mnzz/om... | Cb | Eqn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | M5 | Pipe 2.0 A2... | .336 | 57.245 | 12 | .100 | 57.245 | | 5 | 15487.045 | 23232.186 | 1397.505 | 1397.505 | 1.... | H1-1b |
| 2 | M6 | Pipe 2.0 A2... | .479 | 35.481 | 11 | .104 | 0 | | 5 | 5439 | 23232.186 | 1397.505 | 1397.505 | 1.... | H1-1a |
| 3 | M13 | Pipe 2.5 A2... | .680 | 86.25 | 12 | .174 | 84.333 | | 12 | 11641.036 | 28358.413 | 2081.747 | 2081.747 | 1.... | H1-1b |
| 4 | M14 | Pipe 2.5 A2... | .656 | 86.25 | 11 | .154 | 84.333 | | 11 | 11641.036 | 28358.413 | 2081.747 | 2081.747 | 2.... | H1-1b |
| 5 | M15 | 1.5x1.5x0.083 | .367 | 51.479 | 5 | .047 | 98.84 | y | 11 | 2430.535 | 14085.15 | 624.421 | 624.421 | 1.... | H1-1a |
| 6 | M80 | Pipe 2.0 A2... | .269 | 57.245 | 5 | .238 | 57.245 | | 5 | 15487.045 | 23232.186 | 1397.505 | 1397.505 | 1.... | H1-1b |
| 7 | M81 | Pipe 2.0 A2... | .681 | 1.223 | 5 | .251 | 0 | | 5 | 5439 | 23232.186 | 1397.505 | 1397.505 | 1.... | H1-1a |
| 8 | M82 | 1.5x1.5x0.083 | .869 | 51.479 | 5 | .004 | 0 | y | 14 | 2430.535 | 14085.15 | 624.421 | 624.421 | 1.... | H1-1a |
| 9 | M50 | Pipe 2.0 A2... | .269 | 57.245 | 5 | .272 | 57.245 | | 5 | 15487.045 | 23232.186 | 1397.505 | 1397.505 | 1.... | H1-1b |
| 10 | M51 | Pipe 2.0 A2... | .738 | 1.223 | 5 | .285 | 0 | | 5 | 5439 | 23232.186 | 1397.505 | 1397.505 | 1.... | H1-1a |
| 11 | M52 | 1.5x1.5x0.083 | .984 | 51.479 | 5 | .009 | 0 | y | 13 | 2430.535 | 14085.15 | 624.421 | 624.421 | 1.... | H1-1a |
| 12 | M56A | Pipe 2.0 A2... | .264 | 57.245 | 5 | .228 | 57.245 | | 5 | 15487.045 | 23232.186 | 1397.505 | 1397.505 | 1.... | H1-1b |
| 13 | M57A | Pipe 2.0 A2... | .664 | 1.223 | 5 | .241 | 0 | | 5 | 5439 | 23232.186 | 1397.505 | 1397.505 | 1.... | H1-1a |
| 14 | M58A | 1.5x1.5x0.083 | .837 | 51.479 | 5 | .004 | 0 | y | 14 | 2430.535 | 14085.15 | 624.421 | 624.421 | 1.... | H1-1a |
| 15 | M68 | Pipe 2.0 A2... | .269 | 57.245 | 5 | .238 | 57.245 | | 5 | 15487.045 | 23232.186 | 1397.505 | 1397.505 | 1.... | H1-1b |
| 16 | M69 | Pipe 2.0 A2... | .681 | 1.223 | 5 | .251 | 0 | | 5 | 5439 | 23232.186 | 1397.505 | 1397.505 | 1.... | H1-1a |
| 17 | M70 | 1.5x1.5x0.083 | .870 | 51.479 | 5 | .004 | 98.84 | y | 8 | 2430.535 | 14085.15 | 624.421 | 624.421 | 1.... | H1-1a |
| 18 | M68A | Pipe 2.5 A2... | .588 | 153.75 | 12 | .136 | 153.75 | | 12 | 11641.036 | 28358.413 | 2081.747 | 2081.747 | 2.... | H1-1b |
| 19 | M69A | Pipe 2.5 A2... | .683 | 141.... | 12 | .163 | 144.... | | 12 | 11641.036 | 28358.413 | 2081.747 | 2081.747 | 1.... | H1-1b |
| 20 | M70A | Pipe 2.5 A2... | .613 | 153.75 | 11 | .146 | 153.75 | | 11 | 11641.036 | 28358.413 | 2081.747 | 2081.747 | 2.5 | H1-1b |
| 21 | M71 | Pipe 2.5 A2... | .652 | 141.... | 11 | .163 | 141.... | | 11 | 11641.036 | 28358.413 | 2081.747 | 2081.747 | 1.... | H1-1b |
| 22 | M73 | Pipe 2.0 A2... | .264 | 57.245 | 5 | .229 | 57.245 | | 5 | 15487.045 | 23232.186 | 1397.505 | 1397.505 | 1.... | H1-1b |
| 23 | M74 | Pipe 2.0 A2... | .665 | 1.223 | 5 | .242 | 0 | | 5 | 5439 | 23232.186 | 1397.505 | 1397.505 | 1.... | H1-1a |
| 24 | M75 | 1.5x1.5x0.083 | .839 | 51.479 | 5 | .004 | 0 | y | 4 | 2430.535 | 14085.15 | 624.421 | 624.421 | 1.... | H1-1a |
| 25 | M69C | Pipe 2.0 A2... | .270 | 57.245 | 5 | .271 | 57.245 | | 5 | 15487.045 | 23232.186 | 1397.505 | 1397.505 | 1.... | H1-1b |
| 26 | M70C | Pipe 2.0 A2... | .736 | 1.223 | 5 | .284 | 0 | | 5 | 5439 | 23232.186 | 1397.505 | 1397.505 | 2.... | H1-1a |
| 27 | M71B | 1.5x1.5x0.083 | .979 | 51.479 | 5 | .008 | 98.84 | y | 11 | 2430.535 | 14085.15 | 624.421 | 624.421 | 1.... | H1-1a |
| 28 | M72A | Pipe 2.0 A2... | .343 | 57.245 | 12 | .110 | 57.245 | | 5 | 15487.045 | 23232.186 | 1397.505 | 1397.505 | 1.... | H1-1b |
| 29 | M73A | Pipe 2.0 A2... | .499 | 35.481 | 11 | .113 | 0 | | 5 | 5439 | 23232.186 | 1397.505 | 1397.505 | 1.... | H1-1a |
| 30 | M74A | 1.5x1.5x0.083 | .399 | 51.479 | 5 | .050 | 0 | y | 11 | 2430.535 | 14085.15 | 624.421 | 624.421 | 1.... | H1-1a |

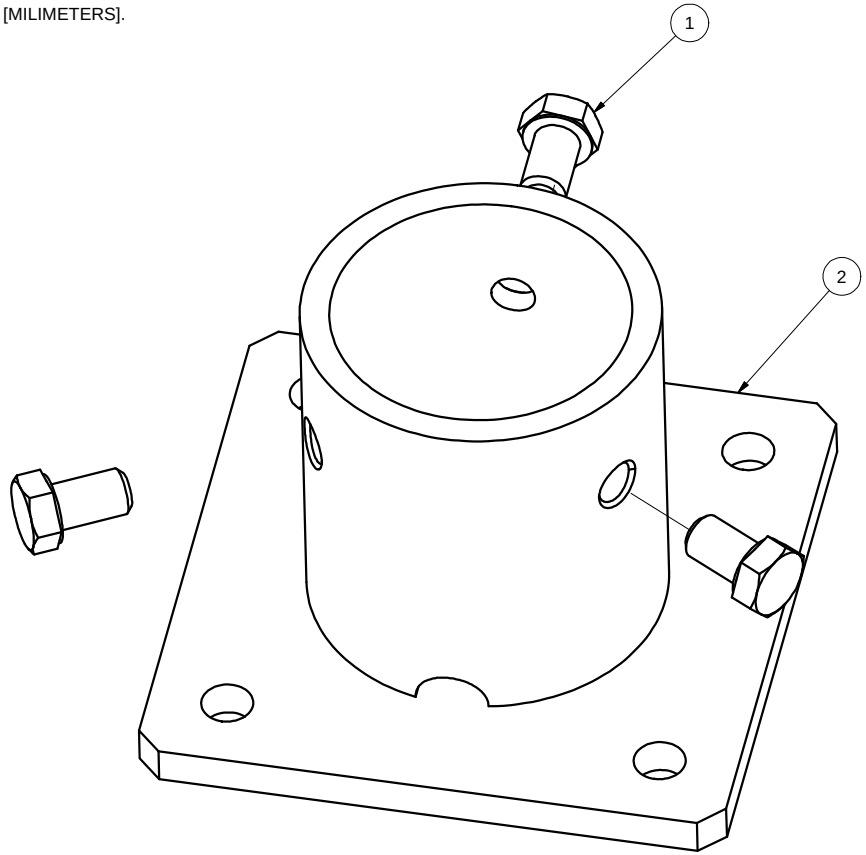
## Envelope AA ADM1-15: ASD - Building Aluminum Code Checks

| | Member | Shape | Code C... | Loc[in] | LC | Shear ... | Loc[in] | Dir | LC | Pnc/O... | Pnt/Om... | Mny/O... | Mnz/O... | Vny/O... | Vnz/O... | Cb | Eqn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | M19 | RT1.5x2x... | .202 | 56.241 | 11 | .012 | 0 | z | 5 | 2073.828 | 19411.... | 770.742 | 927.083 | 5889.423 | 3966.346 | 1.... | H.1-1 |
| 2 | M16 | HR300_A... | .899 | 41.486 | 12 | .097 | 43.372 | y | 12 | 5447.062 | 14342.... | 494.953 | 934.619 | 6030.769 | 2749.538 | 2.... | H.1-1 |
| 3 | M35 | HR300_A... | .984 | 41.486 | 12 | .108 | 43.372 | y | 12 | 5447.062 | 14342.... | 494.953 | 934.619 | 6030.769 | 2749.538 | 2.... | H.1-1 |
| 4 | M38 | HR300_A... | .920 | 41.486 | 12 | .097 | 43.372 | y | 12 | 5447.062 | 14342.... | 494.953 | 934.619 | 6030.769 | 2749.538 | 2.... | H.1-1 |
| 5 | M41 | HR300_A... | .920 | 41.486 | 12 | .096 | 43.372 | y | 12 | 5447.062 | 14342.... | 494.953 | 934.619 | 6030.769 | 2749.538 | 2.... | H.1-1 |
| 6 | M44 | HR300_A... | .920 | 41.486 | 12 | .097 | 43.372 | y | 12 | 5447.062 | 14342.... | 494.953 | 934.619 | 6030.769 | 2749.538 | 2.... | H.1-1 |
| 7 | M47 | HR300_A... | .920 | 41.486 | 12 | .097 | 43.372 | y | 12 | 5447.062 | 14342.... | 494.953 | 934.619 | 6030.769 | 2749.538 | 2.... | H.1-1 |
| 8 | M50A | HR300_A... | .920 | 41.486 | 12 | .097 | 43.372 | y | 12 | 5447.062 | 14342.... | 494.953 | 934.619 | 6030.769 | 2749.538 | 2.... | H.1-1 |
| 9 | M53 | HR300_A... | .920 | 41.486 | 12 | .097 | 43.372 | y | 12 | 5447.062 | 14342.... | 494.953 | 934.619 | 6030.769 | 2749.538 | 2.... | H.1-1 |
| 10 | M56 | HR300_A... | .920 | 41.486 | 12 | .098 | 43.372 | y | 12 | 5447.062 | 14342.... | 494.953 | 934.619 | 6030.769 | 2749.538 | 2.... | H.1-1 |
| 11 | M59 | HR300_A... | .920 | 41.486 | 12 | .097 | 43.372 | y | 12 | 5447.062 | 14342.... | 494.953 | 934.619 | 6030.769 | 2749.538 | 2.... | H.1-1 |
| 12 | M62 | HR300_A... | .920 | 41.486 | 12 | .096 | 43.372 | y | 12 | 5447.062 | 14342.... | 494.953 | 934.619 | 6030.769 | 2749.538 | 2.... | H.1-1 |
| 13 | M65 | HR300_A... | .920 | 41.486 | 12 | .097 | 43.372 | y | 12 | 5447.062 | 14342.... | 494.953 | 934.619 | 6030.769 | 2749.538 | 2.... | H.1-1 |
| 14 | M68B | HR300_A... | .984 | 41.486 | 12 | .108 | 43.372 | y | 12 | 5447.062 | 14342.... | 494.953 | 934.619 | 6030.769 | 2749.538 | 2.... | H.1-1 |
| 15 | M71A | HR300_A... | .899 | 41.486 | 12 | .097 | 43.372 | y | 12 | 5447.062 | 14342.... | 494.953 | 934.619 | 6030.769 | 2749.538 | 2.... | H.1-1 |
| 16 | M75A | RT1.5x2x... | .203 | 56.308 | 11 | .011 | 0 | z | 11 | 2068.941 | 19411.... | 770.742 | 927.083 | 5889.423 | 3966.346 | 1.... | H.1-1 |

| REVISIONS | | | |
|---|---|---|---|
| REV | DESCRIPTION | BY | DATE |
| A | INITIAL RELEASE | LWF | 10/20/2016 |

NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS SHOWN ARE INCHES [MILIMETERS].




| ITEM | PART NUMBER | DESCRIPTION | QTY |
|---|---|---|---|
| 2 | A21120-001 | 2" PIPE BASE | 1 |
| 1 | B15018-011 | HEX CAP SCREW 3/8-16 X 5/8 | 3 |

MATERIAL: SEE NOTES

Third Angle Projection:

GENERAL SPECIFICATIONS
All Dimensions in inches [millimeters]
Tolerances
X.XXX ±0.01 [0.25mm]
X.XX ±0.02 [0.50mm]
X.X ±0.039 [1.0mm]
Unless otherwise spec'd
Break all sharp edges .010-.020 unless otherwise specified.

DRAWN BY: LWF
DATE: 10/20/2016
CHECKED BY:
APPROVALS:

**Sunmodo Corp.**

1905 E 5TH STREET, STE A, VANCOUVER, WA 98661

TITLE: 2" PIPE BASE KIT

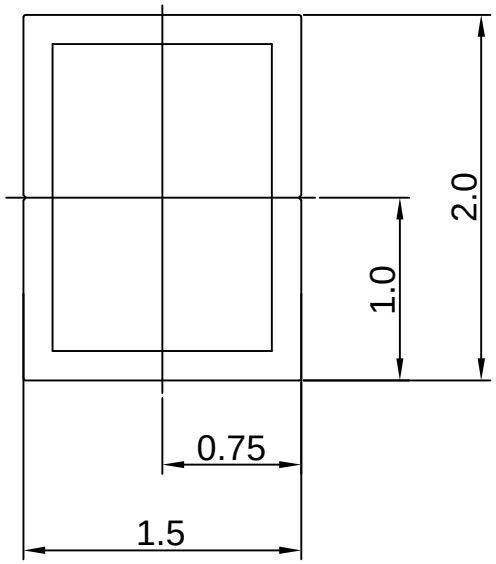
B
DRAWING NUMBER: K10268-001

SCALE: NONE
SHEET 1 of 1

THIS DRAWING IS CONFIDENTIAL PROPERTY OF SUNMODO AND ITS CONTENTS MAY NOT BE DISCLOSED WITHOUT THE PRIOR WRITTEN CONSENT OF SUNMODO CORP.

NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS SHOWN ARE INCHES [MILIMETERS].
2. MATERAIL: ALUMINUM 6005-T5.
   FINISH: CLEAR ANODIZED 10 ųm THICK.
3. THE UNSPECIFIED DIMENSIONS ARE SPECIFIED BY 2D CAD FILE.




# Section properties:

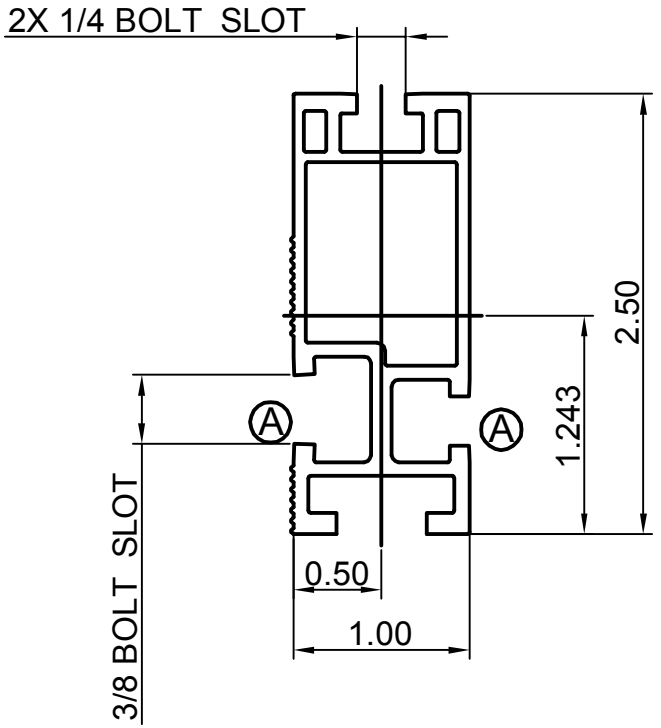
Weight: 1.156 lbs/ft
Area: 0.992 in^2
Perimeter: 12.601 in
Bounding Box: X: -1.000,1.000
Y: -0.750, 0.750
Centroid:(0.000,0.000)
Moments of Inertia(in^4): Ix=0.506,Iy=0.322
Section modulus in bending(in^3): Wx=0.675,Wy=0.322
Radii of Gyration: X: 0.714, Y: 0.570

| | | |
|---|---|---|
| MATERIAL: SEE NOTES | | **Sunmodo Corp.** |
| Third Angle Projection: | | 1905 E 5TH STREET, SUITE A, VANCOUVER, WA 98661 |
| GENERAL SPECIFICATIONS: All Dimensions in inches [millimeters] Tolerances: X.XXX ± 0.01 [0.25mm] X.XX ± 0.02 [0.50mm] X.X ± 0.039 [1.0mm] Unless otherwise spec'd | Break all sharp edges .010-.020 unless otherwise specified. | TITLE: 1.5X2 AL TUBE BRACE EXTRUSION |
| DRAWN BY: zcg | DATE: 03/12/2014 | B — DRAWING NUMBER: A20164 |
| CHECKED BY | | |
| APPROVALS | | SCALE: NONE — SHEET 1 of 1 |

| REVISIONS | | | |
|---|---|---|---|
| REV | DESCRIPTON | BY | DATE |
| A | ADDED BOTTOM CHANNEL & CHANGED ONE 3/8 CHANNEL TO 1/4 | zcg | 02/21/2013 |

NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS SHOWN ARE INCHES [MILIMETERS].
2. MATERAIL: ALUMINUM 6005-T5.
   FINISH: CLEAR ANODIZED 15 µm THICK.
3. THE UNSPECIFIED DIMENSIONS ARE SPECIFIED BY 2D CAD FILE.



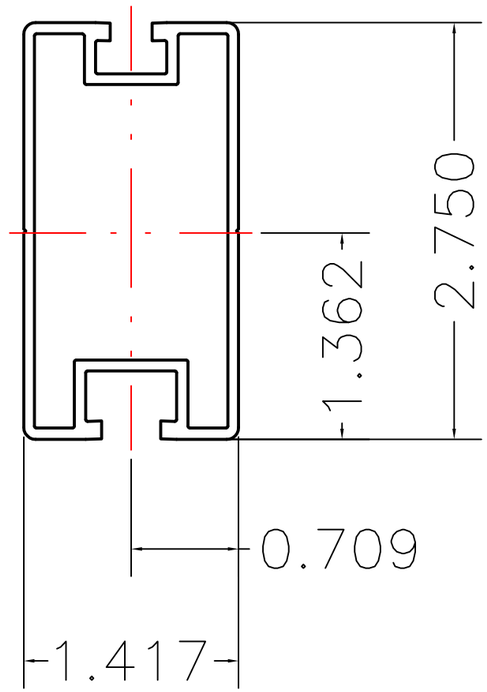

# Section properties:

Weight: 0.850 lbs/ft
Area: 0.723 in^2
Perimeter: 17.325 in
Bounding Box: X: -0.500,0.500
Y: -1.243,1.257
Centroid:(0.000,0.000)
Moments of Incertia(in^4): Ix=0.486,Iy=0.095
Section modulus in bending(in^3): Wx=0.387,Wy=0.190
Radii of Gyration: X: 0.820, Y: 0.363

| | | | |
|---|---|---|---|
| MATERIAL: SEE NOTES | | **Sunmodo Corp.** | |
| Third Angle Projection: | | 1905 E 5TH STREET, SUITE A, VANCOUVER, WA 98661 | |
| GENERAL SPECIFICATIONS<br>All Dimensions in inches [millimeters]<br>Tolerances<br>X.XXX ± 0.01 [0.25mm]<br>X.XX ± 0.02 [0.50mm]<br>X.X ± 0.039 [1.0mm]<br>Unless otherwise spec'd | Break all sharp edges .010-.020 unless otherwise specified. | TITLE: HELIO STANDARD RAIL | |
| DRAWN BY: zcg | DATE: 02/21/2013 | B | DRAWING NUMBER: A20144 |
| CHECKED BY | | | |
| APPROVALS | | SCALE: NONE | SHEET 1 of 1 |

NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS SHOWN ARE INCHES [MILIMETERS].
2. MATERIAL: 6005-T5.
   FINISH: CLEAR ANODIZED 10um THICK.
3. THE UNSPECIFIED RADII ARE .02" MAX.
4. THE UNSPECIFIED DIMENSIONS ARE SPECIFIED BY 2D CAD FILE.




# Section properties:

Weight: 0.862 lbs/ft
Area: 0.736 in^2
Perimeter: 19.824 in
Bounding Box: X: -0.709,0.709
Y: -1.362,1.388
Centroid:(0.000,0.000)
Moments of Incertia(in^4): Ix=0.727,Iy=0.214
Section modulus in bending(in^3): Wx=0.524,Wy=0.302
Radii of Gyration: X: 994, Y: 0.539

THIS DRAWING IS CONFIDENTIAL PROPERTY OF SUNMODO AND ITS CONTENTS MAY NOT BE DISCLOSED WITHOUT THE PRIOR WRITTEN CONSENT OF SUNMODO CORP.

| | |
|---|---|
| MATERIAL | SEE NOTES |
| Third Angle Projection: | |
| GENERAL SPECIFICATIONS | All Dimensions in Inches [millimeters] |
| Tolerances | X.XXX ±0.01 [0.25mm]<br>X.XX ±0.02 [0.50mm]<br>X.X ±0.039 [1.0mm]<br>Unless otherwise spec'd |
| | Break all sharp edges .010-.020 unless otherwise specified. |
| DRAWN BY | KYY |
| DATE | 01/18/2018 |
| CHECKED BY | |
| APPROVALS | |

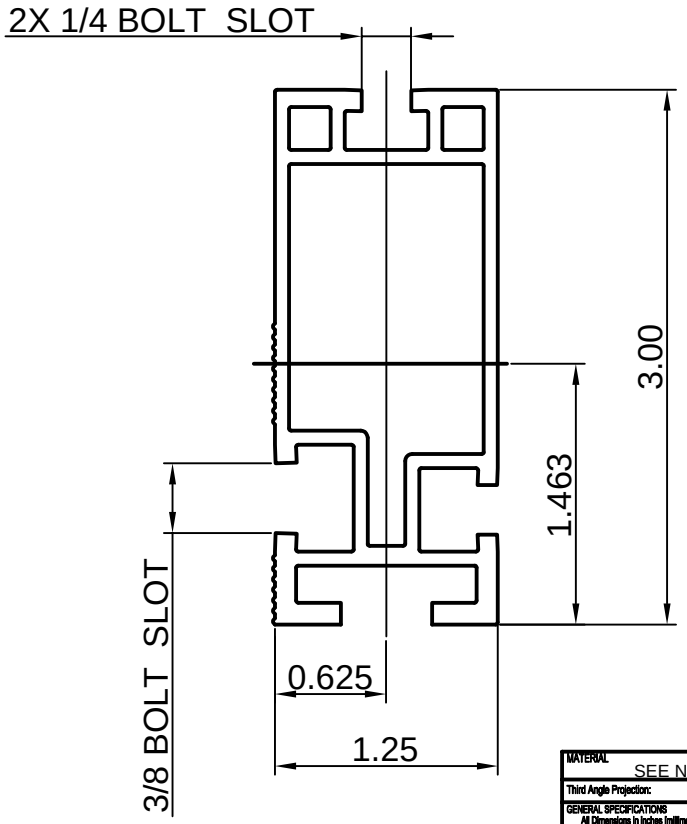
**SunModo Corp.**
14800 NE 65TH STREET, VANCOUVER WA 98682

| | |
|---|---|
| TITLE | RAIL, HR300 (SUNRAY), EXTRUSION |
| B | DRAWING NUMBER A20288 |
| SCALE: | NONE |
| SHEET | 1 of 1 |

| REV | DESCRIPTON | BY | DATE |
|---|---|---|---|
| A | 0.44 WAS 0.41, 0.44 WAS 0.33 | LWF | 11/30/2015 |

NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS SHOWN ARE INCHES [MILIMETERS].
2. MATERAIL: ALUMINUM 6005-T5.
   FINISH: CLEAR ANODIZED 15 ųm THICK.
3. THE UNSPECIFIED DIMENSIONS ARE SPECIFIED BY 2D CAD FILE.




# Section properties:

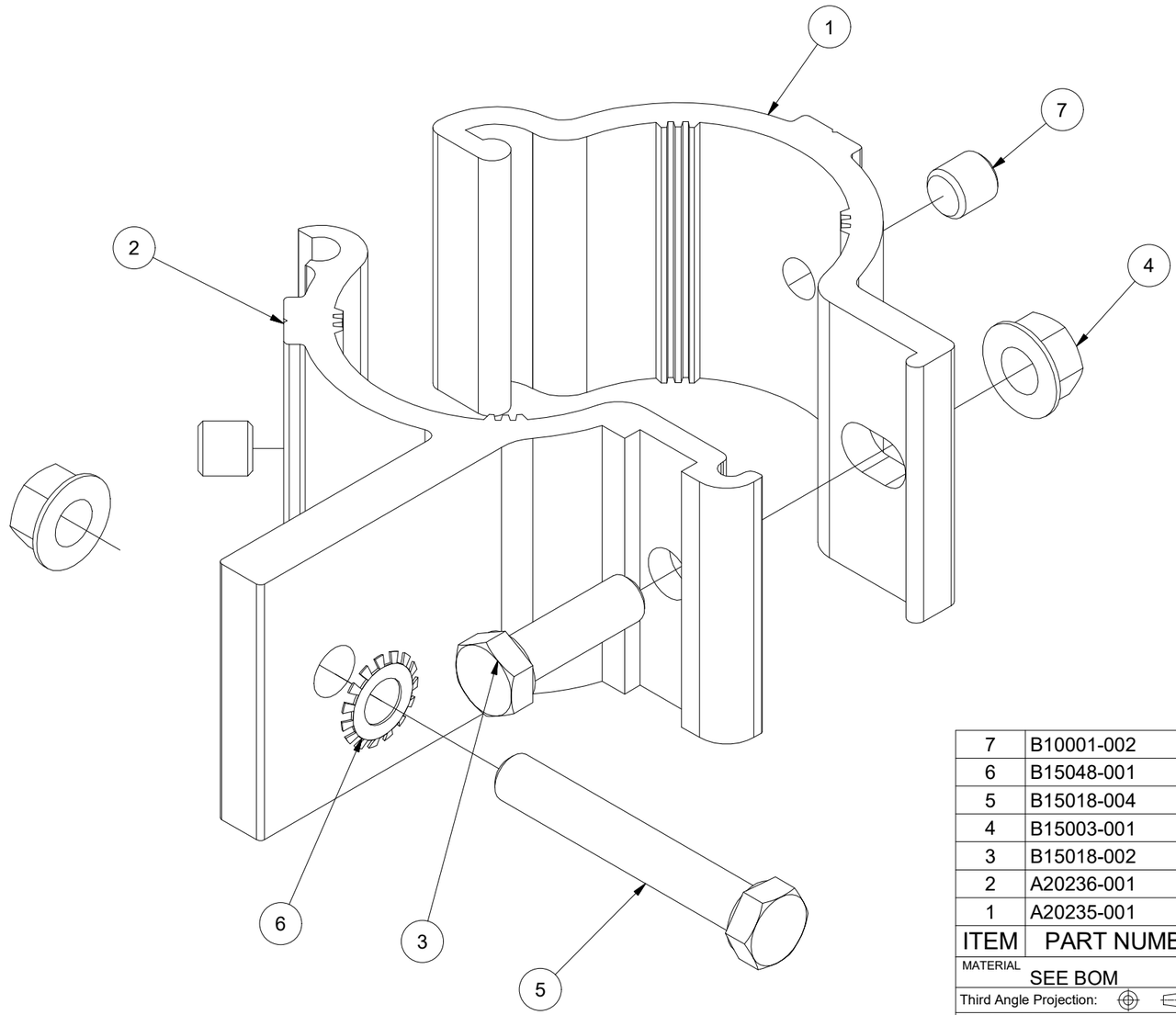
Weight: 1.151 lbs/ft
Area: 0.980 in^2
Perimeter: 22.104 in
Bounding Box: X: -0.625,0.625
Y: -1.463,1.537
Centroid:(0.000,0.000)
Moments of Inertia(in^4): Ix=1.047,Iy=0.207
Section modulus in bending(in^3): Wx=0.681,Wy=0.331
Radii of Gyration: X: 1.034, Y: 0.460

| | |
|---|---|
| MATERIAL | SEE NOTES |
| Third Angle Projection: | |
| GENERAL SPECIFICATIONS<br>All Dimensions in Inches [millimeters]<br>Tolerances<br>X.XXX ±0.01 [0.25mm]<br>X.XX ±0.02 [0.50mm]<br>X.X ±0.039 [1.0mm]<br>Unless otherwise specfd | Break all sharp edges .010-.020 unless otherwise specified. |
| DRAWN BY: zcg | DATE: 02/21/2013 |
| CHECKED BY | |
| APPROVALS | |

**Sunmodo Corp.**

1905 E 5TH STREET, SUITE A, VANCOUVER, WA 98661

| | |
|---|---|
| TITLE | HELIO HEAVY RAIL |
| B | DRAWING NUMBER A20145 |
| SCALE: NONE | SHEET 1 of 1 |




| ITEM | PART NUMBER | DESCRIPTION | QTY |
|---|---|---|---|
| 7 | B10001-002 | SET SCREW M10X10 | 2 |
| 6 | B15048-001 | STAR WASHER FOR 3/8 BOLT | 1 |
| 5 | B15018-004 | HEX CAP SCREW 3/8-16 X2.5 | 1 |
| 4 | B15003-001 | FLANGE NUT 3/8-16 | 2 |
| 3 | B15018-002 | HEX CAP SCREW 3/8-16 X 1.25 | 1 |
| 2 | A20236-001 | 2 AL PIPE CLAMP, FEMALE | 1 |
| 1 | A20235-001 | 2 AL PIPE CLAMP, MALE | 1 |

MATERIAL: SEE BOM

Third Angle Projection:

GENERAL SPECIFICATIONS
All Dimensions in inches [millimeters]
Tolerances
X.XXX ±0.01 [0.25mm]
X.XX ±0.02 [0.50mm]
X.X ±0.039 [1.0mm]
Unless otherwise spec'd

Break all sharp edges .010-.020 unless otherwise specified.

DRAWN BY: zcg
DATE: 08/12/2015
CHECKED BY:
APPROVALS:

**Sunmodo Corp.**

1905 E 5TH STREET, STE A, VANCOUVER, WA 98661

TITLE: 2 AL PIPE CLAMP KIT

B | DRAWING NUMBER: K10219-001

SCALE: NONE | SHEET 1 of 1

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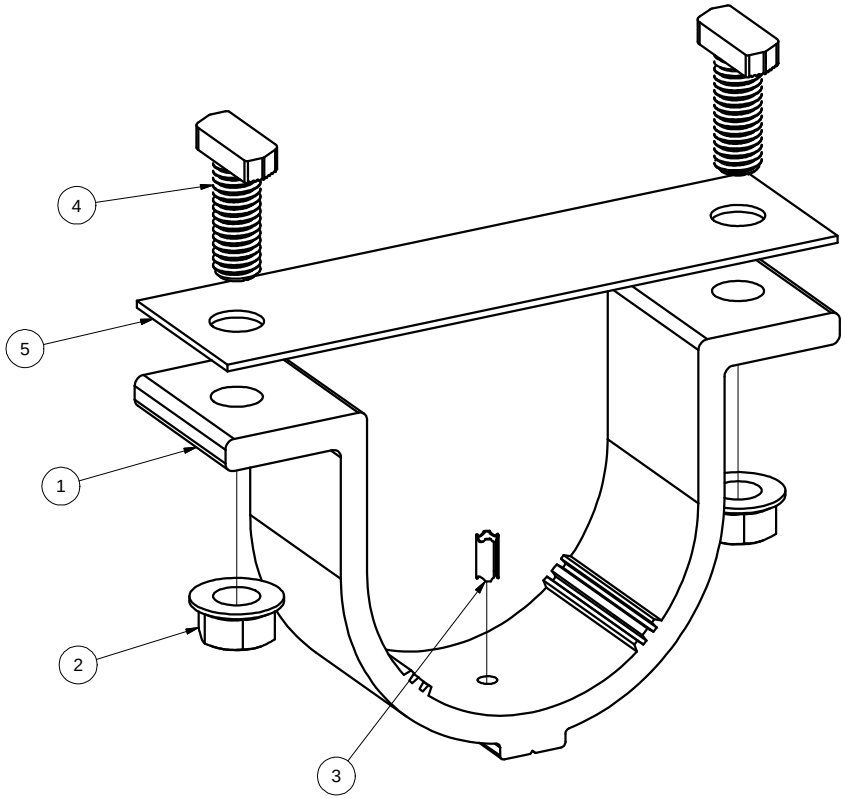
| REVISIONS | | | |
|---|---|---|---|
| REV | DESCRIPTION | BY | DATE |
| A | INITIAL RELEASE | LWF | 06/12/2018 |
| B | ADD C10005-006 | LWF | 06/27/2018 |




| ITEM | PART NUMBER | DESCRIPTION | QTY |
|---|---|---|---|
| 5 | C10005-006 | PVC GASKTE T=1.5mm | 1 |
| 4 | B50033-001 | T-BOLT, RAIL BOTTOM SLOT, 3/8-16 X 1" | 2 |
| 3 | B20018-002 | GROUNDING PIN | 1 |
| 2 | B15003-001 | FLANGE NUT 3/8-16 | 2 |
| 1 | A20329-001 | 2.5" AL PIPE U-BOLT | 1 |

MATERIAL: SEE NOTES

Third Angle Projection:

GENERAL SPECIFICATIONS
All Dimensions in inches [millimeters]
Tolerances
X.XXX ±0.01 [0.25mm]
X.XX ±0.02 [0.50mm]
X.X ±0.039 [1.0mm]
Unless otherwise spec'd
Break all sharp edges .010-.020 unless otherwise specified.

DRAWN BY: KYY
DATE: 06/12/2018
CHECKED BY:
APPROVALS:

**SunModo Corp.**

14800 NE 65TH STREET, VANCOUVER WA 98682

TITLE: 2.5" AL PIPE U-CLAMP KIT

B | DRAWING NUMBER: K10343-001

SCALE: NONE | SHEET 1 of 1

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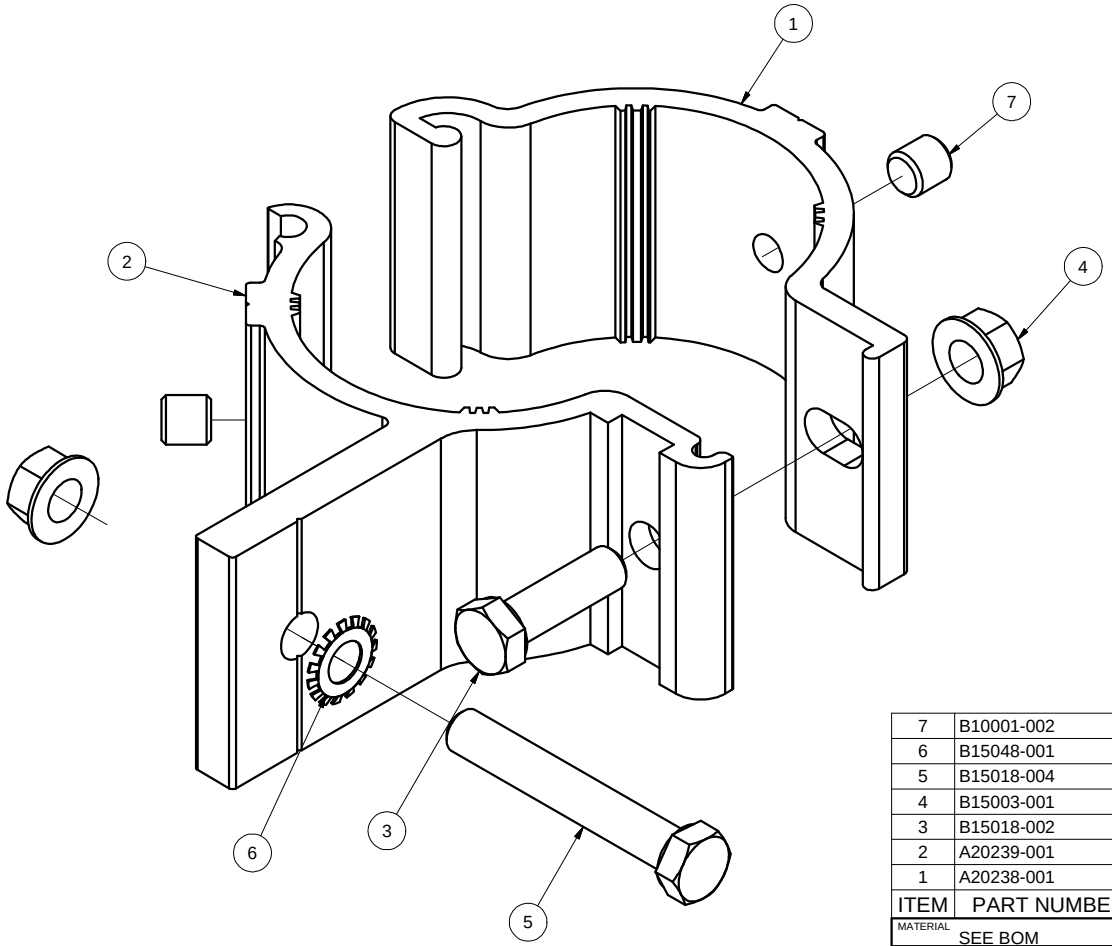
| REVISIONS | | | |
|---|---|---|---|
| REV | DESCRIPTION | BY | DATE |
| A | INITIAL RELEASE | zcg | 09/25/2015 |




| ITEM | PART NUMBER | DESCRIPTION | QTY |
|---|---|---|---|
| 7 | B10001-002 | SET SCREW M10X10 | 2 |
| 6 | B15048-001 | STAR WASHER FOR 3/8 BOLT | 1 |
| 5 | B15018-004 | HEX CAP SCREW 3/8-16 X2.5 | 1 |
| 4 | B15003-001 | FLANGE NUT 3/8-16 | 2 |
| 3 | B15018-002 | HEX CAP SCREW 3/8-16 X 1.25 | 1 |
| 2 | A20239-001 | 2.5 AL PIPE CLAMP, FEMALE | 1 |
| 1 | A20238-001 | 2.5 AL PIPE CLAMP, MALE | 1 |

MATERIAL: SEE BOM

Third Angle Projection:

GENERAL SPECIFICATIONS
All Dimensions in inches [millimeters]
Tolerances
X.XXX ±0.01 [0.25mm]
X.XX ±0.02 [0.50mm]
X.X ±0.039 [1.0mm]
Unless otherwise spec'd
Break all sharp edges .010-.020 unless otherwise specified.

DRAWN BY: LWF
DATE: 08/21/2015
CHECKED BY:
APPROVALS:

**Sunmodo Corp.**

1905 E 5TH STREET, STE A, VANCOUVER, WA 98661

TITLE: 2.5 AL PIPE CLAMP KIT

B

DRAWING NUMBER: K10222-001

SCALE: NONE

SHEET 1 of 1

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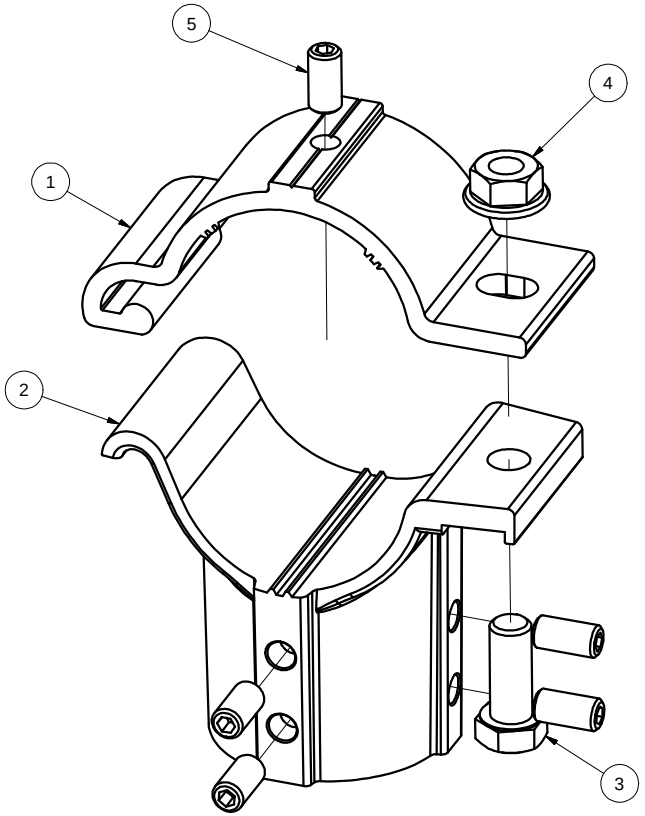
| REVISIONS | | | |
|---|---|---|---|
| REV | DESCRIPTION | BY | DATE |
| A | INITIAL RELEASE | LWF | 06/12/2018 |




| ITEM | PART NUMBER | DESCRIPTION | QTY |
|---|---|---|---|
| 5 | B10001-001 | SET SCREW M10X20 | 5 |
| 4 | B15020-001 | FLANGE NUT 1/2-13 | 1 |
| 3 | B15014-005 | HEX CAP SCREW 1/2-13 X 1.25", 304 SS | 1 |
| 2 | A20327-001 | 2.5" AL PIPE TEE, FEMALE | 1 |
| 1 | A20326-001 | 2.5" AL PIPE TEE, MALE | 1 |

MATERIAL: SEE NOTES

Third Angle Projection:

GENERAL SPECIFICATIONS
All Dimensions in inches [millimeters]
Tolerances
X.XXX ±0.01 [0.25mm]
X.XX ±0.02 [0.50mm]
X.X ±0.039 [1.0mm]
Unless otherwise spec'd
Break all sharp edges .010-.020 unless otherwise specified.

DRAWN BY: LWF
DATE: 06/12/2018
CHECKED BY:
APPROVALS:

**SunModo Corp.**

14800 NE 65TH STREET, VANCOUVER WA 98682

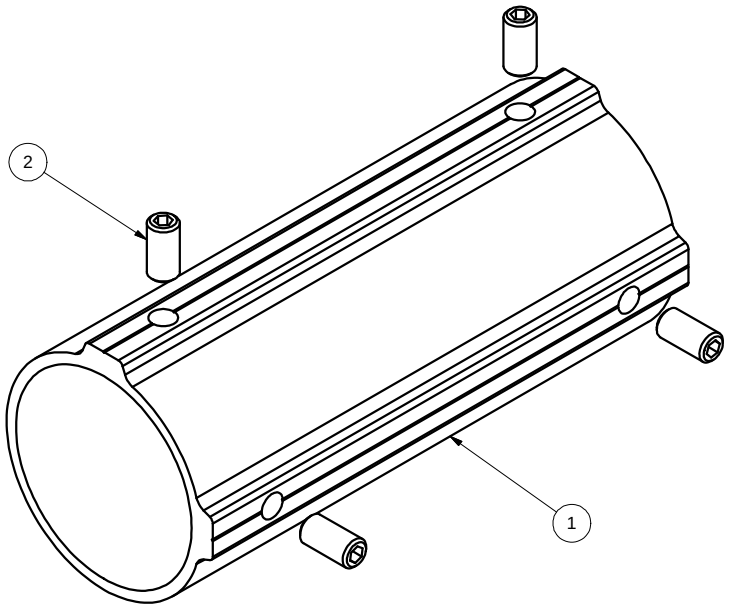
TITLE: 2.5" PIPE TEE KIT

B | DRAWING NUMBER: K10341-001

SCALE: NONE | SHEET 1 of 1

THIS DRAWING IS CONFIDENTIAL PROPERTY OF SUNMODO AND ITS CONTENTS MAY NOT BE DISCLOSED WITHOUT THE PRIOR WRITTEN CONSENT OF SUNMODO CORP.

| REVISIONS | | | |
|---|---|---|---|
| REV | DESCRIPTION | BY | DATE |
| A | INITIAL RELEASE | LWF | 06/12/2018 |




| ITEM | PART NUMBER | DESCRIPTION | QTY |
|---|---|---|---|
| 2 | B10001-001 | SET SCREW M10X20 | 4 |
| 1 | A20328-001 | 2.5" PIPE SPLICE | 1 |

MATERIAL: SEE NOTES

Third Angle Projection:

GENERAL SPECIFICATIONS
All Dimensions in inches [millimeters]
Tolerances
X.XXX ±0.01 [0.25mm]
X.XX ±0.02 [0.50mm]
X.X ±0.039 [1.0mm]
Unless otherwise spec'd
Break all sharp edges .010-.020 unless otherwise specified.

DRAWN BY: LWF
DATE: 06/12/2018
CHECKED BY:
APPROVALS:

**SunModo Corp.**

14800 NE 65TH STREET, VANCOUVER WA 98682

TITLE: 2.5" PIPE SPLICE KIT

B | DRAWING NUMBER: K10342-001

SCALE: NONE | SHEET 1 of 1

THIS DRAWING IS CONFIDENTIAL PROPERTY OF SUNMODO AND ITS CONTENTS MAY NOT BE DISCLOSED WITHOUT THE PRIOR WRITTEN CONSENT OF SUNMODO CORP.

NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS SHOWN ARE INCHES [MILIMETERS].

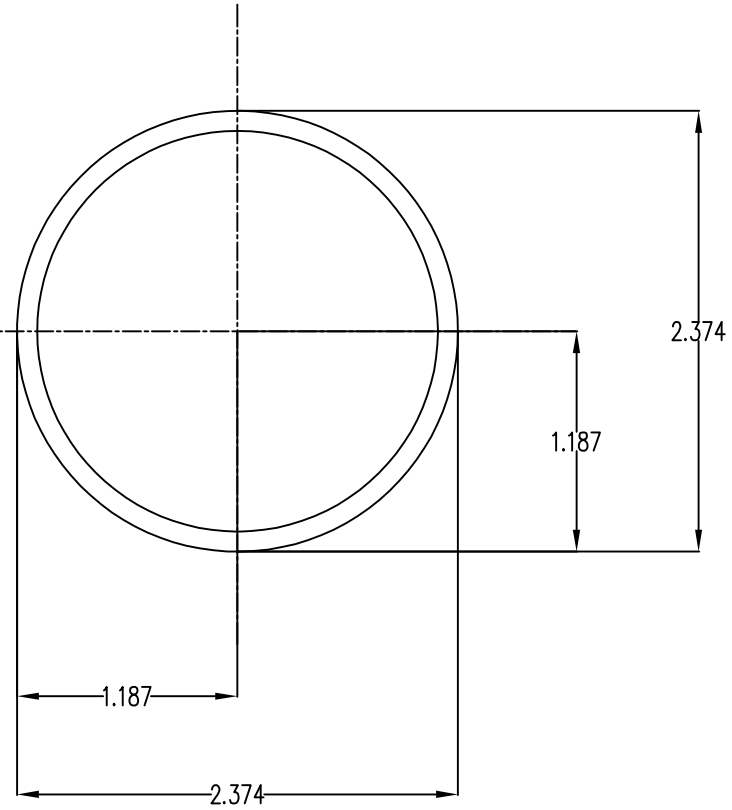
2. MATERAIL:HIGH STRENGTH STEEL PIPE OR TUBE.

3. FINISH: HOT DIP GALVANIZE PER ASTM A123 / A123M - 02.

   MINIMUM 50 KSI YIELD STRESS.

4. BREAK ALL BURRS AND SHARP EDGES.

5. ALL WELDING MUST BE IN COMPLIANCE WITH AWS CODE D1;1.




## Section properties:

Weight: 2.641 lbs/ft
Area: 0.776 in^2
Perimeter: 14.238 in
Bounding Box: X: -1.187,1.187
Y: -1.187,1.187
Centroid:(0.000,0.000)
Moments of Inertia(in^4): Ix=0.499,Iy=0.499
Section modulus in bending(in^3): Wx=0.420,Wy=0.420
Radii of Gyration: X: 0.802, Y: 0.802

| | | | |
|---|---|---|---|
| MATERIAL: SEE NOTES | | **Sunmodo Corp.** | |
| Third Angle Projection: | | 14800 NE 65TH STREET, VANCOUVER WA 98682 | |
| GENERAL SPECIFICATIONS<br>All Dimensions in Inches [millimeters]<br>Tolerances<br>XXXX ±0.01 [0.25mm]<br>XXX ±0.02 [0.50mm]<br>XX ±0.039 [1.0mm]<br>Unless otherwise spec'd | Break all sharp edges .010-.020 unless otherwise specified. | TITLE: PIPE, HSS, 2.375" OD X 12 GAUGE,L=XXX | |
| DRAWN BY: LWF | DATE: 04/03/2019 | B | DRAWING NUMBER: A21165 |
| CHECKED BY | | | |
| APPROVALS | | SCALE: NONE | SHEET 1 of 1 |

NOTES: UNLESS OTHERWISE SPECIFIED

1. DIMENSIONS SHOWN ARE INCHES [MILIMETERS].

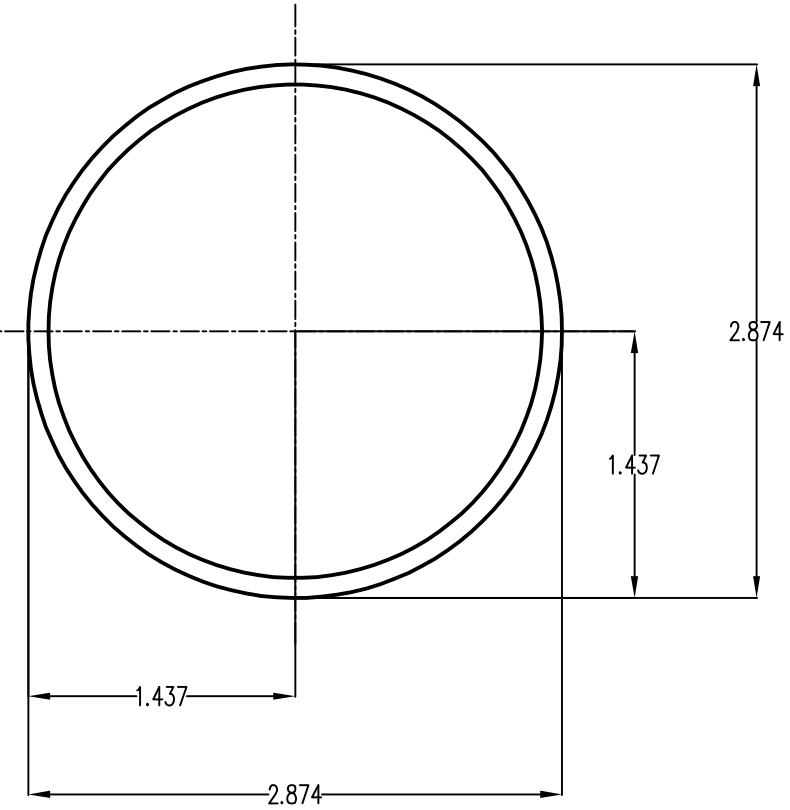
2. MATERAIL:HIGH STRENGTH STEEL PIPE OR TUBE.

3. FINISH: HOT DIP GALVANIZE PER ASTM A123 / A123M - 02.

   MINIMUM 50 KSI YIELD STRESS.

4. BREAK ALL BURRS AND SHARP EDGES.

5. ALL WELDING MUST BE IN COMPLIANCE WITH AWS CODE D1;1.




## Section properties:

Weight: 3.201 lbs/ft
Area: 0.941 in^2
Perimeter: 17.378 in
Bounding Box: X: -1.437,1.437
Y: -1.437,1.437
Centroid:(0.000,0.000)
Moments of Inertia(in^4): Ix=0.901,Iy=0.901
Section modulus in bending(in^3): Wx=0.627,Wy=0.627
Radii of Gyration: X: 0.979, Y: 0.979

| | | | |
|---|---|---|---|
| MATERIAL: SEE NOTES | | **Sunmodo Corp.** | |
| Third Angle Projection: | | 14800 NE 65TH STREET, VANCOUVER WA 98682 | |
| GENERAL SPECIFICATIONS<br>All Dimensions in Inches [millimeters]<br>Tolerances<br>X.XXX ±0.01 [0.25mm]<br>X.XX ±0.02 [0.50mm]<br>X.X ±0.039 [1.0mm]<br>Unless otherwise spec'd | Break all sharp edges .010-.020 unless otherwise specified. | TITLE: PIPE, HSS, 2.875" OD X 12 GAUGE,L=XXX | |
| DRAWN BY: LWF | DATE: 04/03/2019 | B | DRAWING NUMBER: A21168 |
| CHECKED BY | | | |
| APPROVALS | | SCALE: NONE | SHEET 1 of 1 |