



## Project Information

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<b>City,State,Zip:</b>	, 2790	<b>Date:</b>	Tuesday ,October 24, 2017
<b>Module Size:</b>	72 Cell		
<b>System Type:</b>	Ground Mount , PvMax		
<b>Schletter Sales Associate:</b>	Blaz Ruzic		

## Engineering Report

<b>Building Code:</b>	ASCE7-05	<b>Rack Setup:</b>	2V X 15
<b>Wind Speed:</b>	110 mph	<b>Vertical Count:</b>	2V
<b>Snow Load:</b>	50 psf	<b>Horizontal Count:</b>	15
<b>Tilt:</b>	30 degrees		
<b>Module Thickness</b>	35 mm	<b>Rack Count:</b>	
		<b>Module Count:</b>	1000 mm
		<b>Total Wattage:</b>	

## Installation Details

<b>Max Span:</b>	7.5 ft	<b>Ballast Width</b>	33 in	<b>Rebar Qty:</b>	2
<b>FCT:</b>	0.2 kip	<b>FCC:</b>	4.3 kip	<b>FCS:</b>	0.02 kip
<b>RCT:</b>	6.42 kip	<b>RCC:</b>	5.18 kip	<b>RCS:</b>	3.96 kip

## Billing Material

Part Number	Description	Quantity
124303-06200	S1.5 Rail 6200	12
146002-330	PvMax Support Triangle 30 degrees	7
129303-000	S1 Splice Kit	16
135007-135	Rapid5k End Clamp	8
135002-005	Grounding Rapid5k Mid Clamp Assembly	56

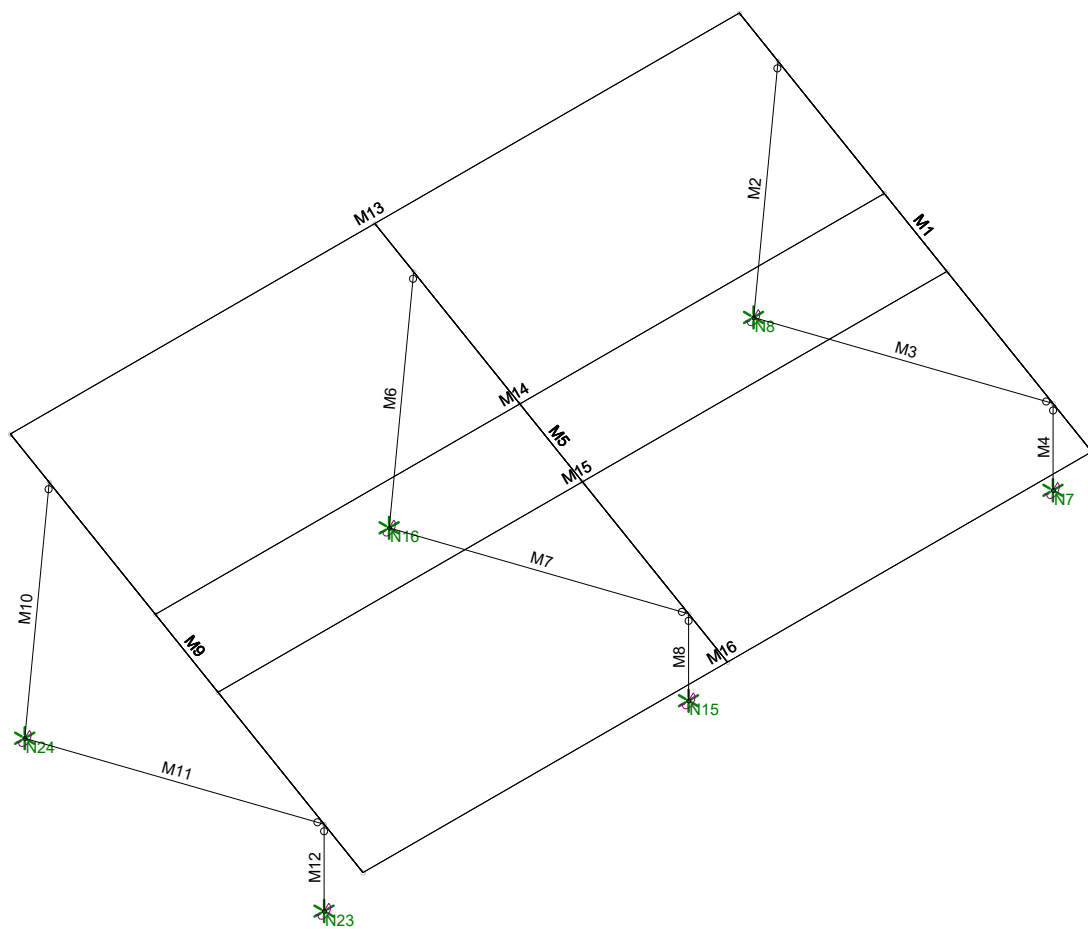


## Module Rail Arrangement & Cuts

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Location of Rail	Rails Per Row	Required Rail Length
Center	1	1140
Intermediate	2	4570
End	2	2560

Cut (4) 1143mm rail(s) & (4) 4572mm rail(s) from (4) 6200mm stock rails. Cut (4) 4572mm rail(s) from (4) 6200mm stock rails. Cut (8) 2557.5mm rail(s) from (4) 6200mm stock rails.



Schletter, Inc.	Standard PVMax Racking System Representative Calculations - ASCE 7-05	30° Tilt w/o Seismic Design
HCV		

## 1. INTRODUCTION

### 1.1 Project Description

The following sections will cover the determination of forces and structural design calculations for the Schletter, Inc. PVMax ground mount system.

### 1.2 Construction

Photovoltaic modules are attached to aluminum purlins using clamp fasteners. Purlins are clamped to inclined aluminum girders, which are then connected to aluminum struts. Each support structure is equally spaced.

PV modules are required to meet the following specifications:

	Maximum		Minimum
Height =	2000 mm	Height =	1900 mm
Width =	1050 mm	Width =	970 mm
Dead Load =	3.00 psf	Dead Load =	1.75 psf

Modules Per Row = 2  
Module Tilt = 30°  
Maximum Height Above Grade = 3 ft

### 1.3 Technical Codes

- ASCE 7-05 - Chapter 6, Wind Loads
- ASCE 7-05 - Chapter 7, Snow Loads
- ASCE 7-05 - Chapter 2, Combination of Loads
- International Building Code, IBC, 2003, 2006, 2009
- Aluminum Design Manual, Eighth Edition, 2005

## 2. LOAD ACTIONS

### 2.1 Permanent Loads

$g_{MAX}$ =	3.00 psf
$g_{MIN}$ =	1.75 psf

Self-weight of the PV modules.

### 2.2 Snow Loads

Ground Snow Load, $P_g$ =	30.00 psf	
Sloped Roof Snow Load, $P_s$ =	16.49 psf	(ASCE 7-05, Eq. 7-2)
$I_s$ =	1.00	
$C_s$ =	0.73	
$C_e$ =	0.90	
$C_t$ =	1.20	

### 2.3 Wind Loads

Design Wind Speed, $V$ =	110 mph	Exposure Category = C
Height <	15 ft	Importance Category = II

Peak Velocity Pressure,  $q_z$  = 19.00 psf Including the gust factor,  $G=0.85$ . (ASCE 7-05, Eq. 6-15)

### Pressure Coefficients

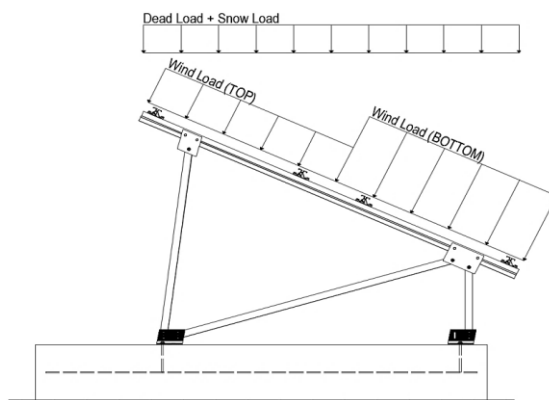
$C_{f+ TOP}$ =	1.150	(Pressure)
$C_{f+ BOTTOM}$ =	1.850	
$C_{f- TOP, OUTER PURLIN}$ =	-2.600	
$C_{f- TOP, INNER PURLIN}$ =	-2.000	(Suction)
$C_{f- BOTTOM}$ =	-1.100	

Provided pressure coefficients are the result of wind tunnel testing done by Ruscheweyh Consult. Coefficients are located in test report # 1127/0611-1e. Negative forces are applied away from the surface.

### 2.4 Seismic Loads - N/A

$S_S$ =	0.00	$R$ = 1.25
$S_{DS}$ =	0.00	$C_s$ = 0
$S_1$ =	0.00	$\rho$ = 1.3
$S_{D1}$ =	0.00	$\Omega$ = 1.25
$T_a$ =	0.00	$C_d$ = 1.25

ASCE 7, Section 12.8.1.3: A maximum  $S_S$  of 1.5 may be used to calculate the base shear,  $C_s$ , of structures under five stories and with a period,  $T$ , of 0.5 or less. Therefore, a  $S_{ds}$  of 1.0 was used to calculate  $C_s$ .



Typical loading conditions of the module dead loads, snow loads, and wind loads are shown on the left.

## 2.5 Combination of Loads

ASCE 7 requires that all structures be checked by specified combinations of loads. Applicable load combinations are provided below.

### Strength Design, LRFD

Component stresses are checked using the following LRFD load combinations:

$$\begin{aligned}
 &1.2D + 1.6S + 0.8W \\
 &1.2D + 1.6W + 0.5S \\
 &0.9D + 1.6W^M \\
 &1.54D + 1.3E + 0.2S^R \quad (\text{ASCE 7, Eq 2.3.2-1 through 2.3.2-7}) \text{ \& } (\text{ASCE 7, Section 12.4.3.2}) \\
 &0.56D + 1.3E^R \\
 &1.54D + 1.25E + 0.2S^O \\
 &0.56D + 1.25E^O
 \end{aligned}$$

### Allowable Stress Design, ASD

Member deflection checks and foundation designs are done according to the following ASD load combinations:

$$\begin{aligned}
 &1.0D + 1.0S \\
 &1.0D + 1.0W \\
 &1.0D + 0.75L + 0.75W + 0.75S \\
 &0.6D + 1.0W^M \quad (\text{ASCE 7, Eq 2.4.1-1 through 2.4.1-8}) \text{ \& } (\text{ASCE 7, Section 12.4.3.2}) \\
 &1.238D + 0.875E^O \\
 &1.1785D + 0.65625E + 0.75S^O \\
 &0.362D + 0.875E^O
 \end{aligned}$$

<sup>M</sup> Uses the minimum allowable module dead load.

<sup>R</sup> Include redundancy factor of 1.3.

<sup>O</sup> Includes overstrength factor of 1.25. Used to check seismic drift.

## 3. STRUCTURAL ANALYSIS

### 3.1 RISA Results

Appendix B.1 contains outputs from the structural analysis software package, RISA. These outputs are used to accurately determine resultant member and reaction forces from the loads seen throughout Section 2.

### 3.2 RISA Components

A member and node list has been provided below to correlate the RISA components with the design calculations in Section 4. Items of significance have been listed.

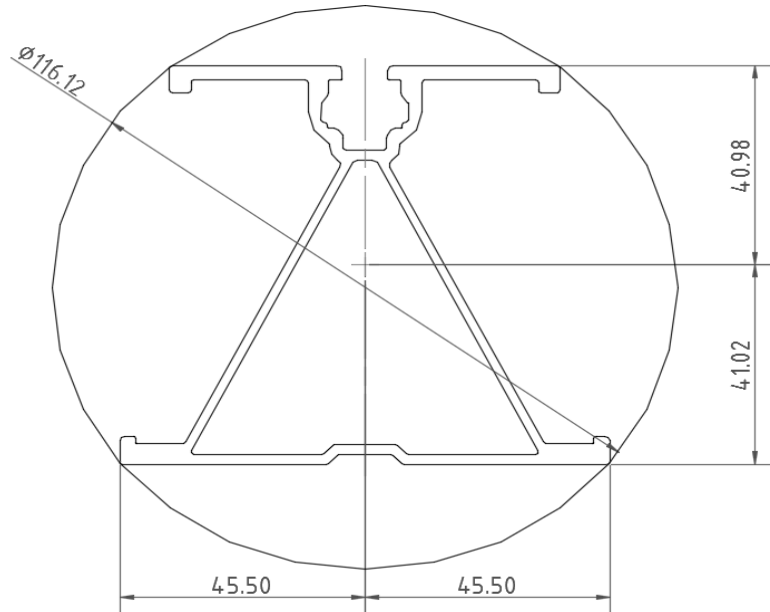
<u>Purlins</u>	<u>Location</u>	<u>Diagonal Struts</u>	<u>Location</u>	<u>Front Reactions</u>	<u>Location</u>
M13	Top	M3	Outer	N7	Outer
M14	Mid-Top	M7	Inner	N15	Inner
M15	Mid-Bottom	M11	Outer	N23	Outer
M16	Bottom				
<u>Girders</u>	<u>Location</u>	<u>Rear Struts</u>	<u>Location</u>	<u>Rear Reactions</u>	<u>Location</u>
M1	Outer	M2	Outer	N8	Outer
M5	Inner	M6	Inner	N16	Inner
M9	Outer	M10	Outer	N24	Outer
<u>Front Struts</u>	<u>Location</u>				
M4	Outer				
M8	Inner				
M12	Outer				

## 4. MEMBER DESIGN CALCULATIONS

### 4.1 Purlin Design

Aluminum purlins are used to transfer loads to the support structure. Purlins are designed as continuous beams with cantilevers. These are considered beams with internal hinges that can be joined with splices at 25% of the support respective span. See Appendix A.1 for detailed member calculations. Section units are in (mm).

Purlin Type =	<b>S1.5</b>
Aluminum Type =	6105-T5
$F_{ty}$ =	35 ksi
$L_b$ =	93 in
$\Phi F_{ty}$ STRONG-AXIS =	25.07 ksi
$\Phi F_{ty}$ WEAK-AXIS =	23.08 ksi
$S_y$ =	1.33 in <sup>3</sup>
$S_x$ =	0.60 in <sup>3</sup>
$E$ =	10100 ksi
$I_y$ =	2.16 in <sup>4</sup>
$I_x$ =	1.07 in <sup>4</sup>
$A$ =	1.25 in <sup>2</sup>
$g$ =	1.50 lbs/ft
$M_y$ =	1.684 k-ft
$M_z$ =	0.110 k-ft
$M_{y \text{ allowable}}$ =	2.779 k-ft
$M_{z \text{ allowable}}$ =	1.154 k-ft
Utilization =	<b>70%</b>

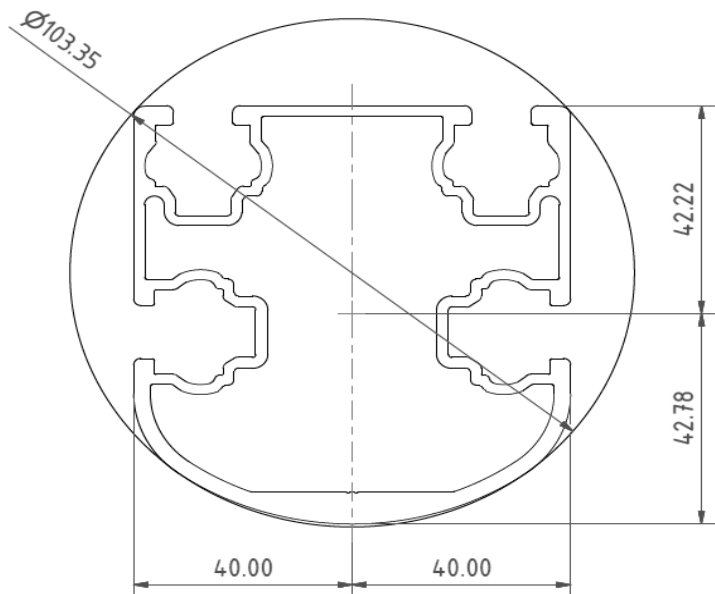


DETAIL VIEW

### 4.2 Girder Design

Loads from purlins are transferred using an inclined girder, which is connected to a set of aluminum struts. Loads on the girder result from the support reactions of the purlins. See Appendix A.2 for detailed member calculations. Section units are in (mm).

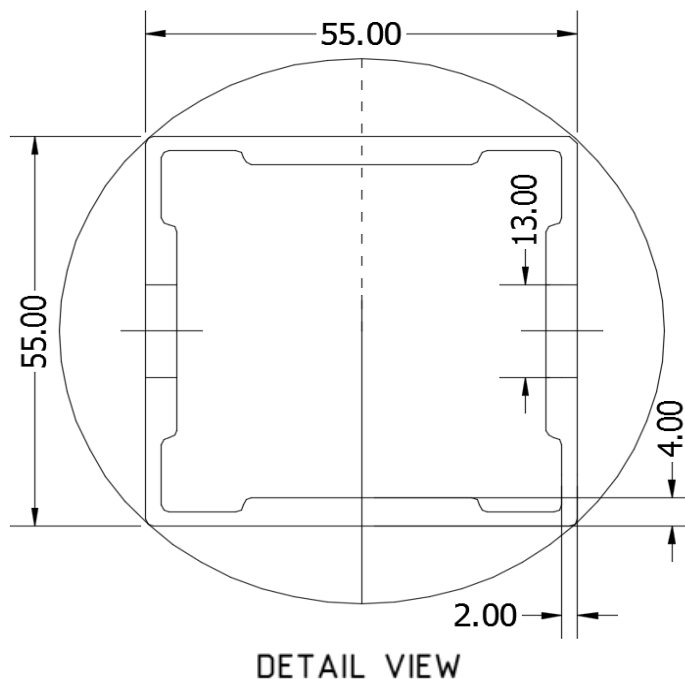
Girder Type =	<b>BF0</b>
Aluminum Type =	6105-T5
$F_{ty}$ =	35 ksi
$L_b$ =	104.56 in
$\Phi F_{ty}$ AXIAL =	31.09 ksi
$\Phi F_{ty}$ STRONG-AXIS =	29.00 ksi
$\Phi F_{ty}$ WEAK-AXIS =	33.25 ksi
$S_y$ =	1.42 in <sup>3</sup>
$S_x$ =	1.41 in <sup>3</sup>
$E$ =	10100 ksi
$I_y$ =	2.39 in <sup>4</sup>
$I_x$ =	2.22 in <sup>4</sup>
$A$ =	1.88 in <sup>2</sup>
$g$ =	2.26 lbs/ft
$M_y$ =	-3.285 k-ft
$M_z$ =	0.000 k-ft
$P_n$ =	-0.991 k
$M_{y \text{ allowable}}$ =	3.422 k-ft
$M_{z \text{ allowable}}$ =	3.907 k-ft
$P_{n \text{ allowable}}$ =	58.535 k
Utilization =	<b>98%</b>



### 4.3 Front Strut Design

The front aluminum strut connects a portion of the girder to the foundation. Vertical girder forces are then transferred down through the strut into the foundation. The strut is attached with single M12 bolts at each end. See Appendix A.3 for detailed member calculations. Section units are in (mm).

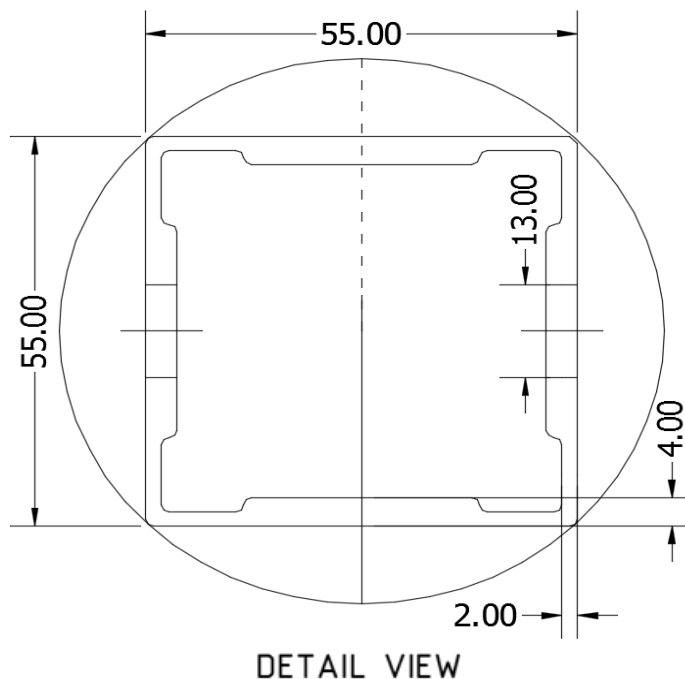
Strut Type =	<b>55x55</b>
Aluminum Type =	6105-T5
$F_{ty}$ =	35 ksi
$L_b$ =	24.80 in
$\Phi F_{ty \text{ AXIAL}}$ =	28.03 ksi
$\Phi F_{ty \text{ BENDING}}$ =	28.22 ksi
$S_y$ =	0.60 in <sup>3</sup>
$S_x$ =	0.60 in <sup>3</sup>
$E$ =	10100 ksi
$I_y$ =	0.67 in <sup>4</sup>
$I_x$ =	0.67 in <sup>4</sup>
$A$ =	0.98 in <sup>2</sup>
$g$ =	1.18 lbs/ft
$M_y$ =	0.000 k-ft
$M_z$ =	0.000 k-ft
$P_n$ =	2.508 k
$M_{y \text{ allowable}}$ =	1.408 k-ft
$M_{z \text{ allowable}}$ =	1.408 k-ft
$P_{n \text{ allowable}}$ =	27.532 k
Utilization =	<b>9%</b>



### 4.4 Diagonal Strut Design

A diagonal aluminum strut braces the support structure. It connects at a front portion of the girder and transfers horizontal forces to the rear foundation connection. The strut is attached with single M12 bolts at each end. See Appendix A.4 for detailed member calculations. Section units are in (mm).

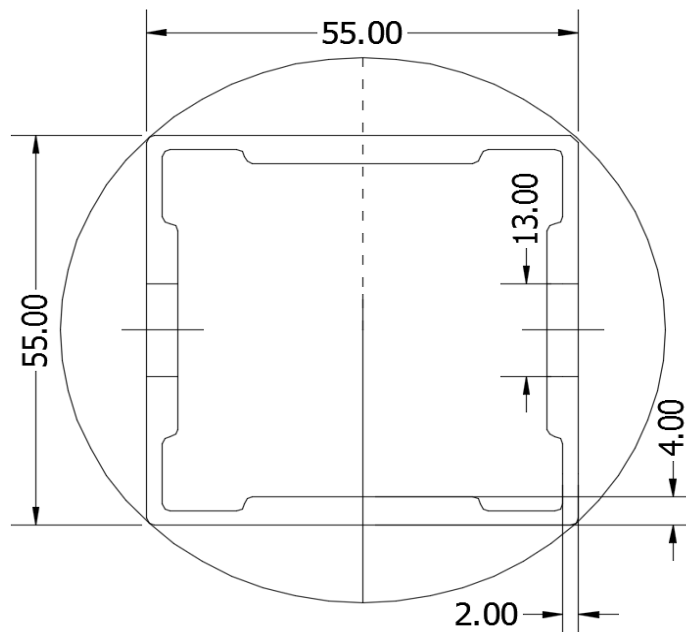
Strut Type =	<b>55x55</b>
Aluminum Type =	6105-T5
$F_{ty}$ =	35 ksi
$L_b$ =	98.03 in
$\Phi F_{ty \text{ AXIAL}}$ =	6.11 ksi
$\Phi F_{ty \text{ BENDING}}$ =	28.22 ksi
$S_y$ =	0.60 in <sup>3</sup>
$S_x$ =	0.60 in <sup>3</sup>
$E$ =	10100 ksi
$I_y$ =	0.67 in <sup>4</sup>
$I_x$ =	0.67 in <sup>4</sup>
$A$ =	0.98 in <sup>2</sup>
$g$ =	1.18 lbs/ft
$M_y$ =	0.011 k-ft
$M_z$ =	0.000 k-ft
$P_n$ =	2.639 k
$M_{y \text{ allowable}}$ =	1.408 k-ft
$M_{z \text{ allowable}}$ =	1.408 k-ft
$P_{n \text{ allowable}}$ =	6.000 k
Utilization =	<b>45%</b>



#### 4.5 Rear Strut Design

An aluminum strut connects the rear portion of the girder to the rear foundation connection. Both vertical and horizontal forces are transferred from the girder. The strut is attached with single M12 bolts at each end. See Appendix A.5 for detailed member calculations. Section units are in (mm).

Strut Type =	<b>55x55</b>
Aluminum Type =	6105-T5
$F_{ty}$ =	35 ksi
$L_b$ =	78.35 in
$\Phi F_{ty \text{ AXIAL}}$ =	8.88 ksi
$\Phi F_{ty \text{ BENDING}}$ =	28.22 ksi
$S_y$ =	0.60 in <sup>3</sup>
$S_x$ =	0.60 in <sup>3</sup>
$E$ =	10100 ksi
$I_y$ =	0.67 in <sup>4</sup>
$I_x$ =	0.67 in <sup>4</sup>
$A$ =	0.98 in <sup>2</sup>
$g$ =	1.18 lbs/ft
$M_y$ =	-0.011 k-ft
$M_z$ =	0.000 k-ft
$P_n$ =	3.216 k
$M_{y \text{ allowable}}$ =	1.408 k-ft
$M_{z \text{ allowable}}$ =	1.408 k-ft
$P_{n \text{ allowable}}$ =	8.726 k
Utilization =	<b>38%</b>



#### 5. FOUNDATION DESIGN CALCULATIONS

##### 5.1 Helical Pile Foundations

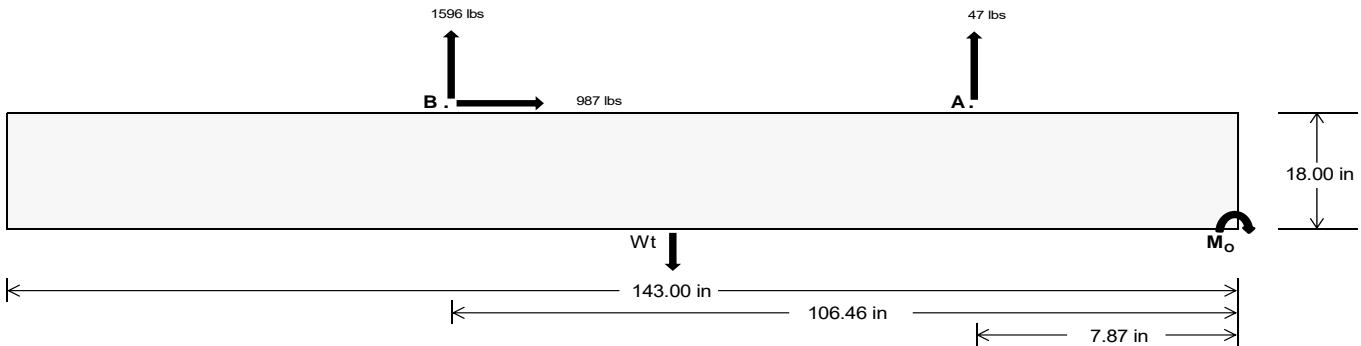
The following LRFD loads include a safety factor of 1.3, and are to be used in conjunction with a Schletter, Inc. Geotechnical Investigation Report. The forces below should fall within the guidelines provided in the Geotechnical Investigation Report. If a Geotechnical Investigation Report is not present, please proceed to Section 5.2 for a concrete foundation design.

	<u>Maximum</u>	<u>Front</u>	<u>Rear</u>
Tensile Load =	<u>206.57</u>	<u>6649.22</u>	k
Compressive Load =	<u>3260.13</u>	<u>5004.81</u>	k
Lateral Load =	<u>14.01</u>	<u>4105.58</u>	k
Moment (Weak Axis) =	<u>0.03</u>	<u>0.00</u>	k



## 5.2 Design of Ballast Foundations

Ballast foundations are used to secure the racking structure in place. The foundations are checked for potential overturning and sliding. Bearing pressures applied by the racking and ballast foundations are checked against the allowable bearing pressures provided by the IBC tables 1804.2 (2003, 2006) & 1806.2 (2009).



### Concrete Properties

Weight of Concrete = 145 pcf  
Compressive Strength = 2500 psi  
Yield Strength = 60000 psi

### Overturning Check

$M_o = 188083.4$  in-lbs  
Resisting Force Required = 2630.54 lbs  
S.F. = 1.67  
Weight Required = 4384.23 lbs  
Minimum Width = 35 in  
Weight Provided = 7559.64 lbs

### Footing Reinforcement

Use fiber reinforcing with (2) #5 rebar.

A minimum 143in long x 35in wide x 18in tall ballast foundation is required to resist overturning.

### Sliding

Force = 987.09 lbs  
Friction = 0.4  
Weight Required = 2467.73 lbs  
Resisting Weight = 7559.64 lbs  
Additional Weight Required = 0 lbs

Use a 143in long x 35in wide x 18in tall ballast foundation to resist sliding. Friction is OK.

### Cohesion

Sliding Force = 987.09 lbs  
Cohesion = 130 psf  
Area = 34.76 ft<sup>2</sup>  
Resisting = 3779.82 lbs  
Additional Weight Required = 0 lbs

Use a 143in long x 35in wide x 18in tall ballast foundation. Cohesion is OK.

### Shear Key

Additional Force = 0 lbs  
Lateral Bearing Pressure = 200 psf/ft  
Required Depth = 0.00 ft  
 $f'_c = 2500$  psi  
Length = 8 in

Shear key is not required.

### Bearing Pressure

#### Ballast Width

$P_{ftg} = (145 \text{ pcf})(11.92 \text{ ft})(1.5 \text{ ft})(2.92 \text{ ft}) = 7560 \text{ lbs}$     35 in    36 in    37 in    38 in  
7560 lbs    7776 lbs    7992 lbs    8208 lbs

ASD LC	1.0D + 1.0S				1.0D + 1.0W				1.0D + 0.75L + 0.75W + 0.75S				0.6D + 1.0W			
Width	35 in	36 in	37 in	38 in	35 in	36 in	37 in	38 in	35 in	36 in	37 in	38 in	35 in	36 in	37 in	38 in
$F_A$	1087 lbs	1087 lbs	1087 lbs	1087 lbs	1309 lbs	1309 lbs	1309 lbs	1309 lbs	1682 lbs	1682 lbs	1682 lbs	1682 lbs	-94 lbs	-94 lbs	-94 lbs	-94 lbs
$F_B$	1066 lbs	1066 lbs	1066 lbs	1066 lbs	2198 lbs	2198 lbs	2198 lbs	2198 lbs	2336 lbs	2336 lbs	2336 lbs	2336 lbs	-3193 lbs	-3193 lbs	-3193 lbs	-3193 lbs
$F_V$	142 lbs	142 lbs	142 lbs	142 lbs	1777 lbs	1777 lbs	1777 lbs	1777 lbs	1426 lbs	1426 lbs	1426 lbs	1426 lbs	-1974 lbs	-1974 lbs	-1974 lbs	-1974 lbs
$P_{total}$	9713 lbs	9929 lbs	10145 lbs	10361 lbs	11067 lbs	11283 lbs	11499 lbs	11715 lbs	11577 lbs	11793 lbs	12009 lbs	12225 lbs	1249 lbs	1379 lbs	1508 lbs	1638 lbs
$M$	2872 lbs-ft	2872 lbs-ft	2872 lbs-ft	2872 lbs-ft	3203 lbs-ft	3203 lbs-ft	3203 lbs-ft	3203 lbs-ft	4250 lbs-ft	4250 lbs-ft	4250 lbs-ft	4250 lbs-ft	5842 lbs-ft	5842 lbs-ft	5842 lbs-ft	5842 lbs-ft
$e$	0.30 ft	0.29 ft	0.28 ft	0.28 ft	0.29 ft	0.28 ft	0.28 ft	0.27 ft	0.37 ft	0.36 ft	0.35 ft	0.35 ft	4.68 ft	4.24 ft	3.87 ft	3.57 ft
$L/6$	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft
$f_{min}$	237.8 psf	237.3 psf	236.7 psf	236.2 psf	272.0 psf	270.5 psf	269.1 psf	267.7 psf	271.5 psf	270.0 psf	268.6 psf	267.3 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
$f_{max}$	321.1 psf	318.2 psf	315.5 psf	312.9 psf	364.8 psf	360.7 psf	356.9 psf	353.2 psf	394.7 psf	389.7 psf	385.1 psf	380.7 psf	222.8 psf	178.0 psf	156.4 psf	144.2 psf

Maximum Bearing Pressure = 395 psf  
Allowable Bearing Pressure = 1500 psf

Use a 143in long x 35in wide x 18in tall ballast foundation for an acceptable bearing pressure.

### Weak Side Design

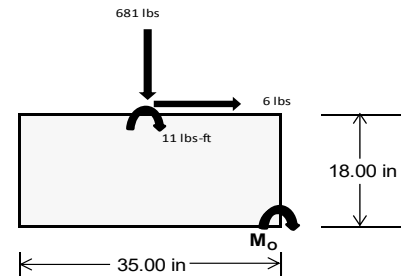
#### Overturning Check

$M_o = 972.9 \text{ ft-lbs}$   
 Resisting Force Required = 667.17 lbs  
 S.F. = 1.67  
 Weight Required = 1111.94 lbs  
 Minimum Width = 35 in  
 Weight Provided = 7559.64 lbs

*A minimum 143in long x 35in wide x 18in tall ballast foundation is required to resist overturning.*

#### Bearing Pressure

ASD LC	1.238D + 0.875E			1.1785D + 0.65625E + 0.75S			0.362D + 0.875E		
Width	35 in			35 in			35 in		
Support	Outer	Inner	Outer	Outer	Inner	Outer	Outer	Inner	Outer
$F_v$	239 lbs	566 lbs	239 lbs	681 lbs	1811 lbs	681 lbs	70 lbs	165 lbs	70 lbs
$F_v$	2 lbs	0 lbs	2 lbs	6 lbs	0 lbs	6 lbs	0 lbs	0 lbs	0 lbs
$P_{total}$	9597 lbs	7560 lbs	9597 lbs	9590 lbs	7560 lbs	9590 lbs	2806 lbs	7560 lbs	2806 lbs
$M$	6 lbs-ft	0 lbs-ft	6 lbs-ft	20 lbs-ft	0 lbs-ft	20 lbs-ft	1 lbs-ft	0 lbs-ft	1 lbs-ft
$e$	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft
$L/6$	0.49 ft	0.49 ft	0.49 ft	0.49 ft	0.49 ft	0.49 ft	0.49 ft	0.49 ft	0.49 ft
$f_{min}$	275.8 psf	217.5 psf	275.8 psf	274.7 psf	217.5 psf	274.7 psf	80.7 psf	217.5 psf	80.7 psf
$f_{max}$	276.5 psf	217.5 psf	276.5 psf	277.1 psf	217.5 psf	277.1 psf	80.8 psf	217.5 psf	80.8 psf



Maximum Bearing Pressure = 277 psf  
 Allowable Bearing Pressure = 1500 psf

*Use a 143in long x 35in wide x 18in tall ballast foundation for an acceptable bearing pressure.*

**Foundation Requirements:** 143in long x 34in wide x 18in tall ballast foundation and fiber reinforcing with (2) #5 rebar.

### 5.3 Foundation Anchors

Threaded rods are anchored to the the ballast foundations using the Simpson AT-XP epoxy solution. LRFD load results are compared to the allowable strengths of the epoxy solution. Please see the supplementary calculations provided by the Simpson Anchor Designer software.

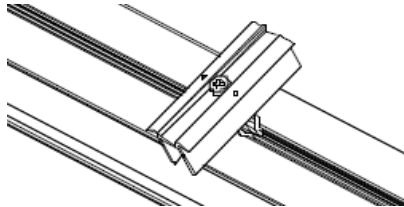
## 6. DESIGN OF JOINTS AND CONNECTIONS

### 6.1 Anchorage of Modules to Purlins and Connection of Purlins to Girders

Modules are secured to the purlins with Schletter, Inc. Rapid2+ mounting clamps. Purlins are secured to the girders with the use of 80mm mounting clamps. The reliability of calculations is uncertain due to limited standards, therefore the strength of the clamp fasteners has been evaluated by load testing.

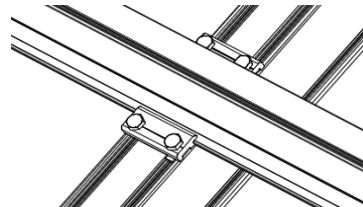
#### Fastening of Modules to Purlins

Maximum Uplifting Force =	0.875 k
Allowable Uplift =	1.214 k
Utilization =	<u>72%</u>



#### Fastening of Purlins to Girders

Maximum Uplifting Force =	2.425 k
Allowable Uplift =	4.357 k
Utilization =	<u>56%</u>



### 6.2 Strut Connections

The aluminum struts connect the aluminum girder ends to custom brackets with mounting holes. Single M12 bolts are used to attach each end of the strut to the girder and post. ASTM A193/A193M-86 equivalent stainless steel bolts are used.

#### Front Strut

Maximum Axial Load =	2.508 k
M12 Bolt Capacity =	12.808 k
Strut Bearing Capacity =	7.421 k
Utilization =	<u>34%</u>

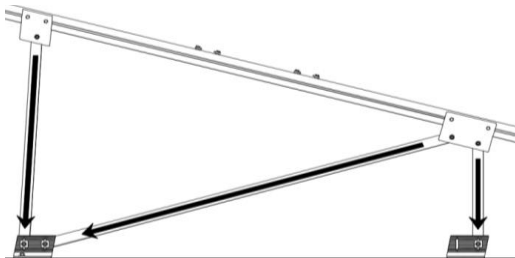
#### Rear Strut

Maximum Axial Load =	4.475 k
M12 Bolt Capacity =	12.808 k
Strut Bearing Capacity =	7.421 k
Utilization =	<u>60%</u>

#### Diagonal Strut

Maximum Axial Load =	2.775 k
M12 Bolt Shear Capacity =	12.808 k
Strut Bearing Capacity =	7.421 k
Utilization =	<u>37%</u>

Bolt and bearing capacities are accounting for double shear.  
(ASCE 8-02, Eq. 5.3.4-1)



Struts under compression are shown to demonstrate the load transfer from the girder. Single M12 bolts are located at each end of the strut and are subjected to double shear.

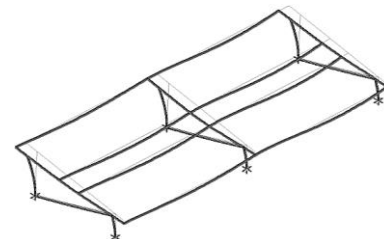
## 7. SEISMIC DESIGN

### 7.1 Seismic Drift - N/A

The racking structure has been analyzed under seismic loading. The allowable story drift of the structure must fall within the limits provided by (ASCE 7, Table 12.12-1).

Mean Height, $h_{sx}$ =	60.93 in
Allowable Story Drift for All Other Structures, $\Delta$ = {	0.020 $h_{sx}$
Max Drift, $\Delta_{MAX}$ =	1.219 in
	<u>N/A</u>

The racking structure's reaction to seismic loads is shown to the right. The deflections have been magnified to provide a clear portrayal of potential story drift.



## APPENDIX A

### A.1 Design of Aluminum Purlins - Aluminum Design Manual, 2005 Edition

Purlin = **S1.5**

Strong Axis:

#### 3.4.14

$$L_b = 93 \text{ in}$$

$$J = 0.432$$

$$257.282$$

$$S1 = \left( \frac{Bc - \frac{\theta_y}{\theta_b} Fcy}{1.6Dc} \right)^2$$

$$S1 = 0.51461$$

$$S2 = \left( \frac{C_c}{1.6} \right)^2$$

$$S2 = 1701.56$$

$$\phi F_L = \phi b [Bc - 1.6Dc \sqrt{((LbSc)/(Cb \sqrt{(lyJ)/2}))}]$$

$$\phi F_L = 28.1 \text{ ksi}$$

Weak Axis:

#### 3.4.14

$$L_b = 93$$

$$J = 0.432$$

$$163.616$$

$$S1 = \left( \frac{Bc - \frac{\theta_y}{\theta_b} Fcy}{1.6Dc} \right)^2$$

$$S1 = 0.51461$$

$$S2 = \left( \frac{C_c}{1.6} \right)^2$$

$$S2 = 1701.56$$

$$\phi F_L = \phi b [Bc - 1.6Dc \sqrt{((LbSc)/(Cb \sqrt{(lyJ)/2}))}]$$

$$\phi F_L = 29.2$$

#### 3.4.16

$$b/t = 32.195$$

$$S1 = \frac{Bp - \frac{\theta_y}{\theta_b} Fcy}{1.6Dp}$$

$$S1 = 12.2$$

$$S2 = \frac{k_1 Bp}{1.6Dp}$$

$$S2 = 46.7$$

$$\phi F_L = \phi b [Bp - 1.6Dp \cdot b/t]$$

$$\phi F_L = 25.1 \text{ ksi}$$

#### 3.4.16

$$b/t = 37.0588$$

$$S1 = \frac{Bp - \frac{\theta_y}{\theta_b} Fcy}{1.6Dp}$$

$$S1 = 12.2$$

$$S2 = \frac{k_1 Bp}{1.6Dp}$$

$$S2 = 46.7$$

$$\phi F_L = \phi b [Bp - 1.6Dp \cdot b/t]$$

$$\phi F_L = 23.1 \text{ ksi}$$

#### 3.4.16.1 Not Used

$$Rb/t =$$

$$S1 = \left( \frac{Bt - 1.17 \frac{\theta_y}{\theta_b} Fcy}{1.6Dt} \right)^2$$

$$S1 = 1.1$$

$$S2 = C_t$$

$$S2 = 141.0$$

$$\phi F_L = 1.17 \phi y Fcy$$

$$\phi F_L = 38.9 \text{ ksi}$$

#### 3.4.16.1

N/A for Weak Direction

#### 3.4.18

$$h/t = 37.0588$$

$$S1 = \frac{Bbr - \frac{\theta_y}{\theta_b} 1.3Fcy}{mDbr}$$

$$S1 = 36.9$$

$$m = 0.65$$

$$C_0 = 40.985$$

$$Cc = 41.015$$

$$S2 = \frac{k_1 Bbr}{mDbr}$$

$$S2 = 77.2$$

$$\phi F_L = \phi b [Bbr - mDbr \cdot h/t]$$

$$\phi F_L = 43.2 \text{ ksi}$$

$$\phi F_L St = 25.1 \text{ ksi}$$

$$I_x = 897074 \text{ mm}^4$$

$$2.155 \text{ in}^4$$

$$y = 41.015 \text{ mm}$$

$$S_x = 1.335 \text{ in}^3$$

$$M_{\max} St = 2.788 \text{ k-ft}$$

#### 3.4.18

$$h/t = 32.195$$

$$S1 = \frac{Bbr - \frac{\theta_y}{\theta_b} 1.3Fcy}{mDbr}$$

$$S1 = 36.9$$

$$m = 0.65$$

$$C_0 = 45.5$$

$$Cc = 45.5$$

$$S2 = \frac{k_1 Bbr}{mDbr}$$

$$S2 = 77.3$$

$$\phi F_L = 1.3 \phi y Fcy$$

$$\phi F_L = 43.2 \text{ ksi}$$

$$\phi F_L Wk = 23.1 \text{ ksi}$$

$$I_y = 446476 \text{ mm}^4$$

$$1.073 \text{ in}^4$$

$$x = 45.5 \text{ mm}$$

$$S_y = 0.599 \text{ in}^3$$

$$M_{\max} Wk = 1.152 \text{ k-ft}$$

## Compression

### 3.4.9

$$\begin{aligned} b/t &= 32.195 \\ S1 &= 12.21 \text{ (See 3.4.16 above for formula)} \\ S2 &= 32.70 \text{ (See 3.4.16 above for formula)} \\ \phi F_L &= \phi c [Bp - 1.6Dp \cdot b/t] \\ \phi F_L &= 25.1 \text{ ksi} \end{aligned}$$

$$\begin{aligned} b/t &= 37.0588 \\ S1 &= 12.21 \\ S2 &= 32.70 \\ \phi F_L &= (\phi c k_2 \cdot \sqrt{(BpE)}) / (1.6b/t) \\ \phi F_L &= 21.9 \text{ ksi} \end{aligned}$$

### 3.4.10

$$\begin{aligned} Rb/t &= 0.0 \\ S1 &= \left( \frac{Bt - \frac{\theta_y}{\theta_b} Fcy}{Dt} \right)^2 \\ S1 &= 6.87 \\ S2 &= 131.3 \\ \phi F_L &= \phi y Fcy \\ \phi F_L &= 33.25 \text{ ksi} \\ \phi F_L &= 21.94 \text{ ksi} \\ A &= 1215.13 \text{ mm}^2 \\ &= 1.88 \text{ in}^2 \\ P_{\max} &= 41.32 \text{ kips} \end{aligned}$$

## A.2 Design of Aluminum Girders - Aluminum Design Manual, 2005 Edition

Girder = **BF0**

Strong Axis:

### 3.4.14

$$\begin{aligned} L_b &= 104.56 \text{ in} \\ J &= 1.08 \\ &= 179.85 \\ S1 &= \left( \frac{Bc - \frac{\theta_y}{\theta_b} Fcy}{1.6Dc} \right)^2 \\ S1 &= 0.51461 \\ S2 &= \left( \frac{C_c}{1.6} \right)^2 \\ S2 &= 1701.56 \\ \phi F_L &= \phi b [Bc - 1.6Dc \cdot \sqrt{((LbSc)/(Cb \cdot \sqrt{(IyJ)/2}))}] \\ \phi F_L &= 29.0 \text{ ksi} \end{aligned}$$

### 3.4.16

$$\begin{aligned} b/t &= 16.2 \\ S1 &= \frac{Bp - \frac{\theta_y}{\theta_b} Fcy}{1.6Dp} \\ S1 &= 12.2 \\ S2 &= \frac{k_1 Bp}{1.6Dp} \\ S2 &= 46.7 \\ \phi F_L &= \phi b [Bp - 1.6Dp \cdot b/t] \\ \phi F_L &= 31.6 \text{ ksi} \end{aligned}$$

Weak Axis:

### 3.4.14

$$\begin{aligned} L_b &= 104.56 \\ J &= 1.08 \\ &= 190.335 \\ S1 &= \left( \frac{Bc - \frac{\theta_y}{\theta_b} Fcy}{1.6Dc} \right)^2 \\ S1 &= 0.51461 \\ S2 &= \left( \frac{C_c}{1.6} \right)^2 \\ S2 &= 1701.56 \\ \phi F_L &= \phi b [Bc - 1.6Dc \cdot \sqrt{((LbSc)/(Cb \cdot \sqrt{(IyJ)/2}))}] \\ \phi F_L &= 28.9 \end{aligned}$$

### 3.4.16

$$\begin{aligned} b/t &= 7.4 \\ S1 &= \frac{Bp - \frac{\theta_y}{\theta_b} Fcy}{1.6Dp} \\ S1 &= 12.2 \\ S2 &= \frac{k_1 Bp}{1.6Dp} \\ S2 &= 46.7 \\ \phi F_L &= \phi y Fcy \\ \phi F_L &= 33.3 \text{ ksi} \end{aligned}$$

### 3.4.16.1 Used

$$Rb/t = 18.1$$

$$S1 = \left( \frac{Bt - 1.17 \frac{\theta_y}{\theta_b} Fcy}{1.6Dt} \right)^2$$

$$S1 = 1.1$$

$$S2 = C_t$$

$$S2 = 141.0$$

$$\phi F_L = \phi b [Bt - Dt \sqrt{(Rb/t)}]$$

$$\phi F_L = 31.1 \text{ ksi}$$

### 3.4.18

$$h/t = 7.4$$

$$S1 = \frac{Bbr - \frac{\theta_y}{\theta_b} 1.3Fcy}{mDbr}$$

$$S1 = 35.2$$

$$m = 0.68$$

$$C_0 = 41.067$$

$$Cc = 43.717$$

$$S2 = \frac{k_1 Bbr}{mDbr}$$

$$S2 = 73.8$$

$$\phi F_L = 1.3\phi y Fcy$$

$$\phi F_L = 43.2 \text{ ksi}$$

$$\phi F_L St = 29.0 \text{ ksi}$$

$$I_x = 984962 \text{ mm}^4$$

$$2.366 \text{ in}^4$$

$$y = 43.717 \text{ mm}$$

$$S_x = 1.375 \text{ in}^3$$

$$M_{max} St = 3.323 \text{ k-ft}$$

### 3.4.16.1

N/A for Weak Direction

### 3.4.18

$$h/t = 16.2$$

$$S1 = \frac{Bbr - \frac{\theta_y}{\theta_b} 1.3Fcy}{mDbr}$$

$$S1 = 36.9$$

$$m = 0.65$$

$$C_0 = 40$$

$$Cc = 40$$

$$S2 = \frac{k_1 Bbr}{mDbr}$$

$$S2 = 77.3$$

$$\phi F_L = 1.3\phi y Fcy$$

$$\phi F_L = 43.2 \text{ ksi}$$

$$\phi F_L Wk = 33.3 \text{ ksi}$$

$$I_y = 923544 \text{ mm}^4$$

$$2.219 \text{ in}^4$$

$$x = 40 \text{ mm}$$

$$S_y = 1.409 \text{ in}^3$$

$$M_{max} Wk = 3.904 \text{ k-ft}$$

### Compression

### 3.4.9

$$b/t = 16.2$$

$$S1 = 12.21 \text{ (See 3.4.16 above for formula)}$$

$$S2 = 32.70 \text{ (See 3.4.16 above for formula)}$$

$$\phi F_L = \phi c [Bp - 1.6Dp \cdot b/t]$$

$$\phi F_L = 31.6 \text{ ksi}$$

$$b/t = 7.4$$

$$S1 = 12.21$$

$$S2 = 32.70$$

$$\phi F_L = \phi y Fcy$$

$$\phi F_L = 33.3 \text{ ksi}$$

### 3.4.10

$$Rb/t = 18.1$$

$$S1 = \left( \frac{Bt - \frac{\theta_y}{\theta_b} Fcy}{Dt} \right)^2$$

$$S1 = 6.87$$

$$S2 = 131.3$$

$$\phi F_L = \phi c [Bt - Dt \sqrt{(Rb/t)}]$$

$$\phi F_L = 31.09 \text{ ksi}$$

$$\phi F_L = 31.09 \text{ ksi}$$

$$A = 1215.13 \text{ mm}^2$$

$$1.88 \text{ in}^2$$

$$P_{max} = 58.55 \text{ kips}$$

### A.3 Design of Aluminum Struts (Front) - Aluminum Design Manual, 2005 Edition

Strut = **55x55**

Strong Axis:

#### 3.4.14

$$L_b = 24.8 \text{ in}$$

$$J = 0.942$$

$$38.7028$$

$$S1 = \left( \frac{Bc - \frac{\theta_y}{\theta_b} F_{cy}}{1.6Dc} \right)^2$$

$$S1 = 0.51461$$

$$S2 = \left( \frac{C_c}{1.6} \right)^2$$

$$S2 = 1701.56$$

$$\phi F_L = \phi b [Bc - 1.6Dc \sqrt{((L_b S_c) / (C_b \sqrt{(I_y J) / 2}))}]$$

$$\phi F_L = 31.4 \text{ ksi}$$

Weak Axis:

#### 3.4.14

$$L_b = 24.8$$

$$J = 0.942$$

$$38.7028$$

$$S1 = \left( \frac{Bc - \frac{\theta_y}{\theta_b} F_{cy}}{1.6Dc} \right)^2$$

$$S1 = 0.51461$$

$$S2 = \left( \frac{C_c}{1.6} \right)^2$$

$$S2 = 1701.56$$

$$\phi F_L = \phi b [Bc - 1.6Dc \sqrt{((L_b S_c) / (C_b \sqrt{(I_y J) / 2}))}]$$

$$\phi F_L = 31.4$$

#### 3.4.16

$$b/t = 24.5$$

$$S1 = \frac{Bp - \frac{\theta_y}{\theta_b} F_{cy}}{1.6Dp}$$

$$S1 = 12.2$$

$$S2 = \frac{k_1 Bp}{1.6Dp}$$

$$S2 = 46.7$$

$$\phi F_L = \phi b [Bp - 1.6Dp \cdot b/t]$$

$$\phi F_L = 28.2 \text{ ksi}$$

#### 3.4.16

$$b/t = 24.5$$

$$S1 = \frac{Bp - \frac{\theta_y}{\theta_b} F_{cy}}{1.6Dp}$$

$$S1 = 12.2$$

$$S2 = \frac{k_1 Bp}{1.6Dp}$$

$$S2 = 46.7$$

$$\phi F_L = \phi b [Bp - 1.6Dp \cdot b/t]$$

$$\phi F_L = 28.2 \text{ ksi}$$

#### 3.4.16.1 Not Used

$$Rb/t = 0.0$$

$$S1 = \left( \frac{Bt - 1.17 \frac{\theta_y}{\theta_b} F_{cy}}{1.6Dt} \right)^2$$

$$S1 = 1.1$$

$$S2 = C_t$$

$$S2 = 141.0$$

$$\phi F_L = 1.17 \phi_y F_{cy}$$

$$\phi F_L = 38.9 \text{ ksi}$$

#### 3.4.16.1

N/A for Weak Direction

#### 3.4.18

$$h/t = 24.5$$

$$S1 = \frac{Bbr - \frac{\theta_y}{\theta_b} 1.3F_{cy}}{mDbr}$$

$$S1 = 36.9$$

$$m = 0.65$$

$$C_0 = 27.5$$

$$Cc = 27.5$$

$$S2 = \frac{k_1 Bbr}{mDbr}$$

$$S2 = 77.3$$

$$\phi F_L = 1.3 \phi_y F_{cy}$$

$$\phi F_L = 43.2 \text{ ksi}$$

$$\phi F_{LSt} = 28.2 \text{ ksi}$$

$$I_x = 279836 \text{ mm}^4$$

$$0.672 \text{ in}^4$$

$$y = 27.5 \text{ mm}$$

$$S_x = 0.621 \text{ in}^3$$

$$M_{\max St} = 1.460 \text{ k-ft}$$

#### 3.4.18

$$h/t = 24.5$$

$$S1 = \frac{Bbr - \frac{\theta_y}{\theta_b} 1.3F_{cy}}{mDbr}$$

$$S1 = 36.9$$

$$m = 0.65$$

$$C_0 = 27.5$$

$$Cc = 27.5$$

$$S2 = \frac{k_1 Bbr}{mDbr}$$

$$S2 = 77.3$$

$$\phi F_L = 1.3 \phi_y F_{cy}$$

$$\phi F_L = 43.2 \text{ ksi}$$

$$\phi F_{LWk} = 28.2 \text{ ksi}$$

$$I_y = 279836 \text{ mm}^4$$

$$0.672 \text{ in}^4$$

$$x = 27.5 \text{ mm}$$

$$S_y = 0.621 \text{ in}^3$$

$$M_{\max Wk} = 1.460 \text{ k-ft}$$

## Compression

### 3.4.7

$$\lambda = 0.57371$$

$$r = 0.81 \text{ in}$$

$$S1^* = \frac{Bc - Fcy}{1.6Dc^*}$$

$$S1^* = 0.33515$$

$$S2^* = \frac{Cc}{\pi} \sqrt{Fcy/E}$$

$$S2^* = 1.23671$$

$$\phi_{cc} = 0.87952$$

$$\phi_{FL} = \phi_{cc}(Bc - Dc^*\lambda)$$

$$\phi_{FL} = 28.0279 \text{ ksi}$$

### 3.4.9

$$b/t = 24.5$$

$$S1 = 12.21 \text{ (See 3.4.16 above for formula)}$$

$$S2 = 32.70 \text{ (See 3.4.16 above for formula)}$$

$$\phi_{FL} = \phi_c[Bp - 1.6Dp*b/t]$$

$$\phi_{FL} = 28.2 \text{ ksi}$$

$$b/t = 24.5$$

$$S1 = 12.21$$

$$S2 = 32.70$$

$$\phi_{FL} = \phi_c[Bp - 1.6Dp*b/t]$$

$$\phi_{FL} = 28.2 \text{ ksi}$$

### 3.4.10

$$Rb/t = 0.0$$

$$S1 = \left( \frac{Bt - \frac{\theta_y}{\theta_b} Fcy}{Dt} \right)^2$$

$$S1 = 6.87$$

$$S2 = 131.3$$

$$\phi_{FL} = \phi_y Fcy$$

$$\phi_{FL} = 33.25 \text{ ksi}$$

$$\phi_{FL} = 28.03 \text{ ksi}$$

$$A = 663.99 \text{ mm}^2$$

$$1.03 \text{ in}^2$$

$$P_{\max} = 28.85 \text{ kips}$$

## A.4 Design of Aluminum Struts (Diagonal) - Aluminum Design Manual, 2005 Edition

$$\text{Strut} = \underline{\underline{55 \times 55}}$$

### Strong Axis:

#### 3.4.14

$$L_b = 98.03 \text{ in}$$

$$J = 0.942$$

$$152.985$$

$$S1 = \left( \frac{Bc - \frac{\theta_y}{\theta_b} Fcy}{1.6Dc} \right)^2$$

$$S1 = 0.51461$$

$$S2 = \left( \frac{Cc}{1.6} \right)^2$$

$$S2 = 1701.56$$

$$\phi_{FL} = \phi_b[Bc - 1.6Dc^*\sqrt{((LbSc)/(Cb^*\sqrt{(IyJ)/2}))}]$$

$$\phi_{FL} = 29.4 \text{ ksi}$$

### Weak Axis:

#### 3.4.14

$$L_b = 98.03$$

$$J = 0.942$$

$$152.985$$

$$S1 = \left( \frac{Bc - \frac{\theta_y}{\theta_b} Fcy}{1.6Dc} \right)^2$$

$$S1 = 0.51461$$

$$S2 = \left( \frac{Cc}{1.6} \right)^2$$

$$S2 = 1701.56$$

$$\phi_{FL} = \phi_b[Bc - 1.6Dc^*\sqrt{((LbSc)/(Cb^*\sqrt{(IyJ)/2}))}]$$

$$\phi_{FL} = 29.4$$



### 3.4.16

$$b/t = 24.5$$

$$S1 = \frac{Bp - \frac{\theta_y}{\theta_b} Fcy}{1.6Dp}$$

$$S1 = 12.2$$

$$S2 = \frac{k_1 Bp}{1.6Dp}$$

$$S2 = 46.7$$

$$\phi F_L = \phi b [Bp - 1.6Dp * b/t]$$

$$\phi F_L = 28.2 \text{ ksi}$$

### 3.4.16.1 Not Used

$$Rb/t = 0.0$$

$$S1 = \left( \frac{Bt - 1.17 \frac{\theta_y}{\theta_b} Fcy}{1.6Dt} \right)^2$$

$$S1 = 1.1$$

$$S2 = C_t$$

$$S2 = 141.0$$

$$\phi F_L = 1.17 \phi y Fcy$$

$$\phi F_L = 38.9 \text{ ksi}$$

### 3.4.18

$$h/t = 24.5$$

$$S1 = \frac{Bbr - \frac{\theta_y}{\theta_b} 1.3Fcy}{mDbr}$$

$$S1 = 36.9$$

$$m = 0.65$$

$$C_0 = 27.5$$

$$Cc = 27.5$$

$$S2 = \frac{k_1 Bbr}{mDbr}$$

$$S2 = 77.3$$

$$\phi F_L = 1.3 \phi y Fcy$$

$$\phi F_L = 43.2 \text{ ksi}$$

$$\phi F_L St = 28.2 \text{ ksi}$$

$$I_x = 279836 \text{ mm}^4$$

$$0.672 \text{ in}^4$$

$$y = 27.5 \text{ mm}$$

$$S_x = 0.621 \text{ in}^3$$

$$M_{\max} St = 1.460 \text{ k-ft}$$

### 3.4.16

$$b/t = 24.5$$

$$S1 = \frac{Bp - \frac{\theta_y}{\theta_b} Fcy}{1.6Dp}$$

$$S1 = 12.2$$

$$S2 = \frac{k_1 Bp}{1.6Dp}$$

$$S2 = 46.7$$

$$\phi F_L = \phi b [Bp - 1.6Dp * b/t]$$

$$\phi F_L = 28.2 \text{ ksi}$$

### 3.4.16.1

N/A for Weak Direction

### 3.4.18

$$h/t = 24.5$$

$$S1 = \frac{Bbr - \frac{\theta_y}{\theta_b} 1.3Fcy}{mDbr}$$

$$S1 = 36.9$$

$$m = 0.65$$

$$C_0 = 27.5$$

$$Cc = 27.5$$

$$S2 = \frac{k_1 Bbr}{mDbr}$$

$$S2 = 77.3$$

$$\phi F_L = 1.3 \phi y Fcy$$

$$\phi F_L = 43.2 \text{ ksi}$$

$$\phi F_L Wk = 28.2 \text{ ksi}$$

$$I_y = 279836 \text{ mm}^4$$

$$0.672 \text{ in}^4$$

$$x = 27.5 \text{ mm}$$

$$S_y = 0.621 \text{ in}^3$$

$$M_{\max} Wk = 1.460 \text{ k-ft}$$

### Compression

### 3.4.7

$$\lambda = 2.26776$$

$$r = 0.81 \text{ in}$$

$$S1^* = \frac{Bc - Fcy}{1.6Dc^*}$$

$$S1^* = 0.33515$$

$$S2^* = \frac{Cc}{\pi} \sqrt{Fcy/E}$$

$$S2^* = 1.23671$$

$$\phi_{cc} = 0.89749$$

$$\phi F_L = (\phi_{cc} Fcy) / (\lambda^2)$$

$$\phi F_L = 6.10803 \text{ ksi}$$

### 3.4.9

$$\begin{aligned} b/t &= 24.5 \\ S1 &= 12.21 \text{ (See 3.4.16 above for formula)} \\ S2 &= 32.70 \text{ (See 3.4.16 above for formula)} \\ \phi F_L &= \phi c [Bp - 1.6Dp \cdot b/t] \\ \phi F_L &= 28.2 \text{ ksi} \end{aligned}$$

$$\begin{aligned} b/t &= 24.5 \\ S1 &= 12.21 \\ S2 &= 32.70 \\ \phi F_L &= \phi c [Bp - 1.6Dp \cdot b/t] \\ \phi F_L &= 28.2 \text{ ksi} \end{aligned}$$

### 3.4.10

$$\begin{aligned} Rb/t &= 0.0 \\ S1 &= \left( \frac{Bt - \frac{\theta_y}{\theta_b} Fcy}{Dt} \right)^2 \\ S1 &= 6.87 \\ S2 &= 131.3 \\ \phi F_L &= \phi y Fcy \\ \phi F_L &= 33.25 \text{ ksi} \\ \phi F_L &= 6.11 \text{ ksi} \\ A &= 663.99 \text{ mm}^2 \\ &= 1.03 \text{ in}^2 \\ P_{\max} &= 6.29 \text{ kips} \end{aligned}$$

## A.5 Design of Aluminum Struts (Rear) - Aluminum Design Manual, 2005 Edition

Strut = **55x55**

Strong Axis:

### 3.4.14

$$\begin{aligned} L_b &= 78.35 \text{ in} \\ J &= 0.942 \\ &= 122.273 \\ S1 &= \left( \frac{Bc - \frac{\theta_y}{\theta_b} Fcy}{1.6Dc} \right)^2 \\ S1 &= 0.51461 \\ S2 &= \left( \frac{C_c}{1.6} \right)^2 \\ S2 &= 1701.56 \\ \phi F_L &= \phi b [Bc - 1.6Dc \cdot \sqrt{((LbSc)/(Cb \cdot \sqrt{(IyJ)/2}))}] \\ \phi F_L &= 29.8 \text{ ksi} \end{aligned}$$

Weak Axis:

### 3.4.14

$$\begin{aligned} L_b &= 78.35 \\ J &= 0.942 \\ &= 122.273 \\ S1 &= \left( \frac{Bc - \frac{\theta_y}{\theta_b} Fcy}{1.6Dc} \right)^2 \\ S1 &= 0.51461 \\ S2 &= \left( \frac{C_c}{1.6} \right)^2 \\ S2 &= 1701.56 \\ \phi F_L &= \phi b [Bc - 1.6Dc \cdot \sqrt{((LbSc)/(Cb \cdot \sqrt{(IyJ)/2}))}] \\ \phi F_L &= 29.8 \end{aligned}$$

### 3.4.16

$$\begin{aligned} b/t &= 24.5 \\ S1 &= \frac{Bp - \frac{\theta_y}{\theta_b} Fcy}{1.6Dp} \\ S1 &= 12.2 \\ S2 &= \frac{k_1 Bp}{1.6Dp} \\ S2 &= 46.7 \\ \phi F_L &= \phi b [Bp - 1.6Dp \cdot b/t] \\ \phi F_L &= 28.2 \text{ ksi} \end{aligned}$$

### 3.4.16

$$\begin{aligned} b/t &= 24.5 \\ S1 &= \frac{Bp - \frac{\theta_y}{\theta_b} Fcy}{1.6Dp} \\ S1 &= 12.2 \\ S2 &= \frac{k_1 Bp}{1.6Dp} \\ S2 &= 46.7 \\ \phi F_L &= \phi b [Bp - 1.6Dp \cdot b/t] \\ \phi F_L &= 28.2 \text{ ksi} \end{aligned}$$

### 3.4.16.1 Not Used

$$Rb/t = 0.0$$

$$S1 = \left( \frac{Bt - 1.17 \frac{\theta_y}{\theta_b} Fcy}{1.6Dt} \right)^2$$

$$S1 = 1.1$$

$$S2 = C_t$$

$$S2 = 141.0$$

$$\phi F_L = 1.17 \phi_y Fcy$$

$$\phi F_L = 38.9 \text{ ksi}$$

### 3.4.18

$$h/t = 24.5$$

$$S1 = \frac{Bbr - \frac{\theta_y}{\theta_b} 1.3Fcy}{mDbr}$$

$$S1 = 36.9$$

$$m = 0.65$$

$$C_0 = 27.5$$

$$Cc = 27.5$$

$$S2 = \frac{k_1 Bbr}{mDbr}$$

$$S2 = 77.3$$

$$\phi F_L = 1.3 \phi_y Fcy$$

$$\phi F_L = 43.2 \text{ ksi}$$

$$\phi F_L St = 28.2 \text{ ksi}$$

$$I_x = 279836 \text{ mm}^4$$

$$0.672 \text{ in}^4$$

$$y = 27.5 \text{ mm}$$

$$S_x = 0.621 \text{ in}^3$$

$$M_{\max} St = 1.460 \text{ k-ft}$$

### 3.4.16.1

N/A for Weak Direction

### 3.4.18

$$h/t = 24.5$$

$$S1 = \frac{Bbr - \frac{\theta_y}{\theta_b} 1.3Fcy}{mDbr}$$

$$S1 = 36.9$$

$$m = 0.65$$

$$C_0 = 27.5$$

$$Cc = 27.5$$

$$S2 = \frac{k_1 Bbr}{mDbr}$$

$$S2 = 77.3$$

$$\phi F_L = 1.3 \phi_y Fcy$$

$$\phi F_L = 43.2 \text{ ksi}$$

$$\phi F_L Wk = 28.2 \text{ ksi}$$

$$I_y = 279836 \text{ mm}^4$$

$$0.672 \text{ in}^4$$

$$x = 27.5 \text{ mm}$$

$$S_y = 0.621 \text{ in}^3$$

$$M_{\max} Wk = 1.460 \text{ k-ft}$$

### Compression

### 3.4.7

$$\lambda = 1.8125$$

$$r = 0.81 \text{ in}$$

$$S1^* = \frac{Bc - Fcy}{1.6Dc^*}$$

$$S1^* = 0.33515$$

$$S2^* = \frac{Cc}{\pi} \sqrt{Fcy/E}$$

$$S2^* = 1.23671$$

$$\phi_{cc} = 0.83375$$

$$\phi F_L = (\phi_{cc} Fcy)/(\lambda^2)$$

$$\phi F_L = 8.88278 \text{ ksi}$$

### 3.4.9

$$b/t = 24.5$$

$$S1 = 12.21 \text{ (See 3.4.16 above for formula)}$$

$$S2 = 32.70 \text{ (See 3.4.16 above for formula)}$$

$$\phi F_L = \phi_c [Bp - 1.6Dp^* b/t]$$

$$\phi F_L = 28.2 \text{ ksi}$$

$$b/t = 24.5$$

$$S1 = 12.21$$

$$S2 = 32.70$$

$$\phi F_L = \phi_c [Bp - 1.6Dp^* b/t]$$

$$\phi F_L = 28.2 \text{ ksi}$$

### 3.4.10

$$\begin{aligned}
 Rb/t &= 0.0 \\
 S1 &= \left( \frac{Bt - \frac{\theta_y}{\theta_b} Fcy}{Dt} \right)^2 \\
 S1 &= 6.87 \\
 S2 &= 131.3 \\
 \phi F_L &= \phi_y Fcy \\
 \phi F_L &= 33.25 \text{ ksi} \\
 \\ 
 \phi F_L &= 8.88 \text{ ksi} \\
 A &= 663.99 \text{ mm}^2 \\
 &= 1.03 \text{ in}^2 \\
 P_{\max} &= 9.14 \text{ kips}
 \end{aligned}$$

## APPENDIX B

### B.1

The following pages will contain the results from RISA. Please refer back to Section 2 for load information and Section 4-5 for member and foundation design.



Company : Schletter, Inc.  
Designer : HCV  
Job Number :  
Model Name : Standard PVMax Racking System

Nov 4, 2015

Checked By: \_\_\_\_\_

### Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distribut...	Area(Me...	Surface(...
1	Dead Load, Max	DL		-1				4		
2	Dead Load, Min	DL		-1				4		
3	Snow Load	SL						4		
4	Wind Load - Pressure	WL						4		
5	Wind Load - Suction	WL						4		
6	Seismic - Lateral	EL								

### Member Distributed Loads (BLC 1 : Dead Load, Max)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft, %]	End Location[ft, %]
1	M13	Y	-9.843	-9.843	0	0
2	M14	Y	-9.843	-9.843	0	0
3	M15	Y	-9.843	-9.843	0	0
4	M16	Y	-9.843	-9.843	0	0

### Member Distributed Loads (BLC 2 : Dead Load, Min)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft, %]	End Location[ft, %]
1	M13	Y	-5.454	-5.454	0	0
2	M14	Y	-5.454	-5.454	0	0
3	M15	Y	-5.454	-5.454	0	0
4	M16	Y	-5.454	-5.454	0	0

### Member Distributed Loads (BLC 3 : Snow Load)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft, %]	End Location[ft, %]
1	M13	Y	-46.866	-46.866	0	0
2	M14	Y	-46.866	-46.866	0	0
3	M15	Y	-46.866	-46.866	0	0
4	M16	Y	-46.866	-46.866	0	0

### Member Distributed Loads (BLC 4 : Wind Load - Pressure)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft, %]	End Location[ft, %]
1	M13	y	-71.679	-71.679	0	0
2	M14	y	-71.679	-71.679	0	0
3	M15	y	-115.31	-115.31	0	0
4	M16	y	-115.31	-115.31	0	0

### Member Distributed Loads (BLC 5 : Wind Load - Suction)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft, %]	End Location[ft, %]
1	M13	y	162.058	162.058	0	0
2	M14	y	124.66	124.66	0	0
3	M15	y	68.563	68.563	0	0
4	M16	y	68.563	68.563	0	0

### Load Combinations

	Description	S... P...	S... B...	Fa... Fa...	B... Fa...	B... Fa...	B... Fa...	B... Fa...	B... Fa...	B... Fa...	B... Fa...	B... Fa...	B... Fa...	B... Fa...	B... Fa...	B... Fa...	B... Fa...	B... Fa...
1	LRFD 1.2D + 1.6S + 0.8W	Yes Y		1 1.2	3 1.6	4 .8												
2	LRFD 1.2D + 1.6W + 0.5S	Yes Y		1 1.2	3 .5	4 1.6												
3	LRFD 0.9D + 1.6W	Yes Y		2 .9				5 1.6										
4	LATERAL - LRFD 1.54D + 1.3E ...	Yes Y		1 1.54	3 .2			6 1.3										
5	LATERAL - LRFD 0.56D + 1.3E	Yes Y		1 .56				6 1.3										
6	LATERAL - LRFD 1.54D + 1.25...	Yes Y		1 1.54	3 .2			6 1.25										
7	LATERAL - LRFD 0.56D + 1.25E	Yes Y		1 .56				6 1.25										



RISA-3D Version 13.0.0 [T:\...\\...\\...\\...\\...\\...\\...\\...\\PVMMax 72 Cell 2V 30° 110mph 30psf 7.75ft 7-05 NS.r3d] Page 19



Company : Schletter, Inc.  
Designer : HCV  
Job Number :  
Model Name : Standard PVMax Racking System

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### Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
27		14	max	61.262	1	216.678	2	1.104	3	.014	2	-.005	15	.84	3
28			min	2.909	15	-351.475	3	-29.204	1	0	15	-.114	1	-.427	2
29		15	max	61.262	1	90.29	2	8.944	1	.014	2	-.005	12	1.048	3
30			min	2.909	15	-132.865	3	-.15	10	0	15	-.122	1	-.56	2
31		16	max	61.262	1	85.745	3	47.092	1	.014	2	-.003	12	1.069	3
32			min	2.909	15	-36.097	2	2.237	15	0	15	-.098	1	-.583	2
33		17	max	61.262	1	304.355	3	85.24	1	.014	2	.003	3	.901	3
34			min	2.909	15	-162.484	2	4.006	15	0	15	-.041	1	-.497	2
35		18	max	61.262	1	522.964	3	123.389	1	.014	2	.049	1	.544	3
36			min	2.909	15	-288.871	2	5.774	15	0	15	.002	15	-.303	2
37		19	max	61.262	1	741.574	3	161.537	1	.014	2	.171	1	0	2
38			min	2.909	15	-415.259	2	7.543	15	0	15	.008	15	0	3
39	M14	1	max	39.025	1	487.109	2	-7.871	15	.014	3	.207	1	0	1
40			min	1.849	15	-611.591	3	-168.565	1	-.015	2	.01	15	0	3
41		2	max	39.025	1	360.722	2	-6.103	15	.014	3	.079	1	.455	3
42			min	1.849	15	-444.507	3	-130.417	1	-.015	2	.004	15	-.365	2
43		3	max	39.025	1	234.335	2	-4.334	15	.014	3	.006	3	.766	3
44			min	1.849	15	-277.424	3	-92.269	1	-.015	2	-.017	1	-.621	2
45		4	max	39.025	1	107.947	2	-2.566	15	.014	3	-.001	12	.932	3
46			min	1.849	15	-110.34	3	-54.12	1	-.015	2	-.08	1	-.769	2
47		5	max	39.025	1	56.744	3	-.679	10	.014	3	-.004	12	.956	3
48			min	1.849	15	-20.665	1	-15.972	1	-.015	2	-.11	1	-.807	2
49		6	max	39.025	1	223.828	3	22.176	1	.014	3	-.005	15	.835	3
50			min	1.849	15	-144.827	2	-1.664	3	-.015	2	-.108	1	-.737	2
51		7	max	39.025	1	390.911	3	60.324	1	.014	3	-.003	15	.57	3
52			min	1.849	15	-271.214	2	.816	12	-.015	2	-.072	1	-.558	2
53		8	max	39.025	1	557.995	3	98.472	1	.014	3	.003	2	.162	3
54			min	1.849	15	-397.602	2	2.614	12	-.015	2	-.007	3	-.27	2
55		9	max	39.025	1	725.079	3	136.62	1	.014	3	.097	1	.142	1
56			min	1.849	15	-523.989	2	4.411	12	-.015	2	-.003	3	-.391	3
57		10	max	39.025	1	650.376	2	-6.209	12	.015	2	.231	1	.633	2
58			min	1.849	15	-892.162	3	-174.768	1	-.014	3	.003	12	-1.087	3
59		11	max	39.025	1	523.989	2	-4.411	12	.015	2	.097	1	.142	1
60			min	1.849	15	-725.079	3	-136.62	1	-.014	3	-.003	3	-.391	3
61		12	max	39.025	1	397.602	2	-2.614	12	.015	2	.003	2	.162	3
62			min	1.849	15	-557.995	3	-98.472	1	-.014	3	-.007	3	-.27	2
63		13	max	39.025	1	271.214	2	-.816	12	.015	2	-.003	15	.57	3
64			min	1.849	15	-390.911	3	-60.324	1	-.014	3	-.072	1	-.558	2
65		14	max	39.025	1	144.827	2	1.664	3	.015	2	-.005	15	.835	3
66			min	1.849	15	-223.828	3	-22.176	1	-.014	3	-.108	1	-.737	2
67		15	max	39.025	1	20.665	1	15.972	1	.015	2	-.004	12	.956	3
68			min	1.849	15	-56.744	3	.679	10	-.014	3	-.11	1	-.807	2
69		16	max	39.025	1	110.34	3	54.12	1	.015	2	-.001	12	.932	3
70			min	1.849	15	-107.947	2	2.566	15	-.014	3	-.08	1	-.769	2
71		17	max	39.025	1	277.424	3	92.269	1	.015	2	.006	3	.766	3
72			min	1.849	15	-234.335	2	4.334	15	-.014	3	-.017	1	-.621	2
73		18	max	39.025	1	444.507	3	130.417	1	.015	2	.079	1	.455	3
74			min	1.849	15	-360.722	2	6.103	15	-.014	3	.004	15	-.365	2
75		19	max	39.025	1	611.591	3	168.565	1	.015	2	.207	1	0	1
76			min	1.849	15	-487.109	2	7.871	15	-.014	3	.01	15	0	3
77	M15	1	max	-1.959	15	690.092	2	-7.867	15	.016	2	.207	1	0	2
78			min	-41.131	1	-351.569	3	-168.549	1	-.012	3	.01	15	0	3
79		2	max	-1.959	15	503.591	2	-6.099	15	.016	2	.078	1	.264	3
80			min	-41.131	1	-261.775	3	-130.401	1	-.012	3	.004	15	-.514	2
81		3	max	-1.959	15	317.09	2	-4.33	15	.016	2	.005	3	.451	3
82			min	-41.131	1	-171.98	3	-92.253	1	-.012	3	-.017	1	-.867	2
83		4	max	-1.959	15	130.589	2	-2.561	15	.016	2	-.001	12	.56	3



Company : Schletter, Inc.  
Designer : HCV  
Job Number :  
Model Name : Standard PVMax Racking System

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### Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
84			min	-41.131	1	-82.186	3	-54.104	1	-.012	3	-.08	1	-1.06	2
85		5	max	-1.959	15	7.609	3	-.761	10	.016	2	-.005	12	.592	3
86			min	-41.131	1	-55.912	2	-15.956	1	-.012	3	-.111	1	-1.092	2
87		6	max	-1.959	15	97.403	3	22.192	1	.016	2	-.005	15	.547	3
88			min	-41.131	1	-242.413	2	-1.385	3	-.012	3	-.108	1	-.964	2
89		7	max	-1.959	15	187.198	3	60.34	1	.016	2	-.003	15	.425	3
90			min	-41.131	1	-428.914	2	.991	12	-.012	3	-.072	1	-.675	2
91		8	max	-1.959	15	276.992	3	98.488	1	.016	2	.002	2	.225	3
92			min	-41.131	1	-615.415	2	2.788	12	-.012	3	-.007	3	-.225	2
93		9	max	-1.959	15	366.787	3	136.636	1	.016	2	.097	1	.385	2
94			min	-41.131	1	-801.916	2	4.586	12	-.012	3	-.002	3	-.052	3
95		10	max	-1.959	15	988.417	2	-6.383	12	.012	3	.231	1	1.156	2
96			min	-41.131	1	-456.581	3	-174.784	1	-.016	2	.004	12	-.407	3
97		11	max	-1.959	15	801.916	2	-4.586	12	.012	3	.097	1	.385	2
98			min	-41.131	1	-366.787	3	-136.636	1	-.016	2	-.002	3	-.052	3
99		12	max	-1.959	15	615.415	2	-2.788	12	.012	3	.002	2	.225	3
100			min	-41.131	1	-276.992	3	-98.488	1	-.016	2	-.007	3	-.225	2
101		13	max	-1.959	15	428.914	2	-.991	12	.012	3	-.003	15	.425	3
102			min	-41.131	1	-187.198	3	-60.34	1	-.016	2	-.072	1	-.675	2
103		14	max	-1.959	15	242.413	2	1.385	3	.012	3	-.005	15	.547	3
104			min	-41.131	1	-97.403	3	-22.192	1	-.016	2	-.108	1	-.964	2
105		15	max	-1.959	15	55.912	2	15.956	1	.012	3	-.005	12	.592	3
106			min	-41.131	1	-7.609	3	.761	10	-.016	2	-.111	1	-1.092	2
107		16	max	-1.959	15	82.186	3	54.104	1	.012	3	-.001	12	.56	3
108			min	-41.131	1	-130.589	2	2.561	15	-.016	2	-.08	1	-1.06	2
109		17	max	-1.959	15	171.98	3	92.253	1	.012	3	.005	3	.451	3
110			min	-41.131	1	-317.09	2	4.33	15	-.016	2	-.017	1	-.867	2
111		18	max	-1.959	15	261.775	3	130.401	1	.012	3	.078	1	.264	3
112			min	-41.131	1	-503.591	2	6.099	15	-.016	2	.004	15	-.514	2
113		19	max	-1.959	15	351.569	3	168.549	1	.012	3	.207	1	0	2
114			min	-41.131	1	-690.092	2	7.867	15	-.016	2	.01	15	0	3
115	M16	1	max	-3.291	15	621.99	2	-7.56	15	.008	1	.174	1	0	2
116			min	-69.389	1	-291.627	3	-162.137	1	-.013	3	.008	15	0	3
117		2	max	-3.291	15	435.489	2	-5.791	15	.008	1	.051	1	.212	3
118			min	-69.389	1	-201.833	3	-123.989	1	-.013	3	.002	15	-.455	2
119		3	max	-3.291	15	248.988	2	-4.022	15	.008	1	.002	3	.348	3
120			min	-69.389	1	-112.039	3	-85.84	1	-.013	3	-.04	1	-.75	2
121		4	max	-3.291	15	62.487	2	-2.254	15	.008	1	-.003	12	.405	3
122			min	-69.389	1	-22.244	3	-47.692	1	-.013	3	-.097	1	-.884	2
123		5	max	-3.291	15	67.55	3	-.198	10	.008	1	-.005	12	.386	3
124			min	-69.389	1	-124.014	2	-9.544	1	-.013	3	-.122	1	-.858	2
125		6	max	-3.291	15	157.345	3	28.604	1	.008	1	-.005	15	.289	3
126			min	-69.389	1	-310.515	2	-.231	3	-.013	3	-.114	1	-.671	2
127		7	max	-3.291	15	247.139	3	66.752	1	.008	1	-.003	15	.115	3
128			min	-69.389	1	-497.016	2	1.732	12	-.013	3	-.073	1	-.323	2
129		8	max	-3.291	15	336.934	3	104.9	1	.008	1	.004	2	.185	2
130			min	-69.389	1	-683.518	2	3.53	12	-.013	3	-.005	3	-.137	3
131		9	max	-3.291	15	426.728	3	143.049	1	.008	1	.108	1	.854	2
132			min	-69.389	1	-870.019	2	5.327	12	-.013	3	0	3	-.465	3
133		10	max	-3.291	15	1056.52	2	-7.125	12	.013	3	.248	1	1.684	2
134			min	-69.389	1	-516.523	3	-181.197	1	-.008	1	.006	12	-.871	3
135		11	max	-3.291	15	870.019	2	-5.327	12	.013	3	.108	1	.854	2
136			min	-69.389	1	-426.728	3	-143.049	1	-.008	1	0	3	-.465	3
137		12	max	-3.291	15	683.518	2	-3.53	12	.013	3	.004	2	.185	2
138			min	-69.389	1	-336.934	3	-104.9	1	-.008	1	-.005	3	-.137	3
139		13	max	-3.291	15	497.016	2	-1.732	12	.013	3	-.003	15	.115	3
140			min	-69.389	1	-247.139	3	-66.752	1	-.008	1	-.073	1	-.323	2





Company : Schletter, Inc.  
Designer : HCV  
Job Number :  
Model Name : Standard PVMax Racking System

Nov 4, 2015

Checked By: \_\_\_\_\_

### Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
141		14	max	-3.291	15	310.515	2	.231	3	.013	3	-.005	15	.289	3
142			min	-69.389	1	-157.345	3	-28.604	1	-.008	1	-.114	1	-.671	2
143		15	max	-3.291	15	124.014	2	9.544	1	.013	3	-.005	12	.386	3
144			min	-69.389	1	-67.55	3	.198	10	-.008	1	-.122	1	-.858	2
145		16	max	-3.291	15	22.244	3	47.692	1	.013	3	-.003	12	.405	3
146			min	-69.389	1	-62.487	2	2.254	15	-.008	1	-.097	1	-.884	2
147		17	max	-3.291	15	112.039	3	85.84	1	.013	3	.002	3	.348	3
148			min	-69.389	1	-248.988	2	4.022	15	-.008	1	-.04	1	-.75	2
149		18	max	-3.291	15	201.833	3	123.989	1	.013	3	.051	1	.212	3
150			min	-69.389	1	-435.489	2	5.791	15	-.008	1	.002	15	-.455	2
151		19	max	-3.291	15	291.627	3	162.137	1	.013	3	.174	1	0	2
152			min	-69.389	1	-621.99	2	7.56	15	-.008	1	.008	15	0	3
153	M2	1	max	1055.368	2	2.024	4	.34	1	0	3	0	3	0	1
154			min	-1432.838	3	.476	15	.016	15	0	1	0	2	0	1
155		2	max	1055.898	2	1.953	4	.34	1	0	3	0	1	0	15
156			min	-1432.441	3	.459	15	.016	15	0	1	0	15	0	4
157		3	max	1056.427	2	1.882	4	.34	1	0	3	0	1	0	15
158			min	-1432.044	3	.443	15	.016	15	0	1	0	15	-.001	4
159		4	max	1056.956	2	1.811	4	.34	1	0	3	0	1	0	15
160			min	-1431.647	3	.426	15	.016	15	0	1	0	15	-.002	4
161		5	max	1057.486	2	1.74	4	.34	1	0	3	0	1	0	15
162			min	-1431.25	3	.409	15	.016	15	0	1	0	15	-.003	4
163		6	max	1058.015	2	1.669	4	.34	1	0	3	0	1	0	15
164			min	-1430.853	3	.392	15	.016	15	0	1	0	15	-.003	4
165		7	max	1058.544	2	1.598	4	.34	1	0	3	0	1	0	15
166			min	-1430.456	3	.376	15	.016	15	0	1	0	15	-.004	4
167		8	max	1059.073	2	1.527	4	.34	1	0	3	0	1	-.001	15
168			min	-1430.059	3	.359	15	.016	15	0	1	0	15	-.004	4
169		9	max	1059.603	2	1.456	4	.34	1	0	3	0	1	-.001	15
170			min	-1429.662	3	.342	15	.016	15	0	1	0	15	-.005	4
171		10	max	1060.132	2	1.385	4	.34	1	0	3	.001	1	-.001	15
172			min	-1429.265	3	.326	15	.016	15	0	1	0	15	-.006	4
173		11	max	1060.661	2	1.314	4	.34	1	0	3	.001	1	-.001	15
174			min	-1428.868	3	.309	15	.016	15	0	1	0	15	-.006	4
175		12	max	1061.191	2	1.243	4	.34	1	0	3	.001	1	-.002	15
176			min	-1428.472	3	.292	15	.016	15	0	1	0	15	-.006	4
177		13	max	1061.72	2	1.172	4	.34	1	0	3	.001	1	-.002	15
178			min	-1428.075	3	.273	12	.016	15	0	1	0	15	-.007	4
179		14	max	1062.249	2	1.101	4	.34	1	0	3	.002	1	-.002	15
180			min	-1427.678	3	.245	12	.016	15	0	1	0	15	-.007	4
181		15	max	1062.778	2	1.029	4	.34	1	0	3	.002	1	-.002	15
182			min	-1427.281	3	.218	12	.016	15	0	1	0	15	-.008	4
183		16	max	1063.308	2	.961	2	.34	1	0	3	.002	1	-.002	15
184			min	-1426.884	3	.19	12	.016	15	0	1	0	15	-.008	4
185		17	max	1063.837	2	.906	2	.34	1	0	3	.002	1	-.002	15
186			min	-1426.487	3	.162	12	.016	15	0	1	0	15	-.008	4
187		18	max	1064.366	2	.85	2	.34	1	0	3	.002	1	-.002	15
188			min	-1426.09	3	.135	12	.016	15	0	1	0	15	-.009	4
189		19	max	1064.896	2	.795	2	.34	1	0	3	.002	1	-.002	15
190			min	-1425.693	3	.107	12	.016	15	0	1	0	15	-.009	4
191	M3	1	max	788.434	2	8.875	4	.282	1	0	5	0	1	.009	4
192			min	-927.01	3	2.086	15	.013	15	0	1	0	15	.002	15
193		2	max	788.264	2	8.007	4	.282	1	0	5	0	1	.005	2
194			min	-927.138	3	1.882	15	.013	15	0	1	0	15	0	12
195		3	max	788.093	2	7.138	4	.282	1	0	5	0	1	.002	2
196			min	-927.266	3	1.678	15	.013	15	0	1	0	15	0	3
197		4	max	787.923	2	6.269	4	.282	1	0	5	0	1	0	2



Company : Schletter, Inc.  
Designer : HCV  
Job Number :  
Model Name : Standard PVMax Racking System

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### Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
198			min	-927.394	3	1.474	15	.013	15	0	1	0	15	-.003	3
199		5	max	787.752	2	5.4	4	.282	1	0	5	0	1	-.001	15
200			min	-927.522	3	1.269	15	.013	15	0	1	0	15	-.004	4
201		6	max	787.582	2	4.531	4	.282	1	0	5	0	1	-.002	15
202			min	-927.649	3	1.065	15	.013	15	0	1	0	15	-.007	4
203		7	max	787.412	2	3.662	4	.282	1	0	5	.001	1	-.002	15
204			min	-927.777	3	.861	15	.013	15	0	1	0	15	-.009	4
205		8	max	787.241	2	2.793	4	.282	1	0	5	.001	1	-.002	15
206			min	-927.905	3	.657	15	.013	15	0	1	0	15	-.01	4
207		9	max	787.071	2	1.924	4	.282	1	0	5	.001	1	-.003	15
208			min	-928.033	3	.452	15	.013	15	0	1	0	15	-.011	4
209		10	max	786.901	2	1.055	4	.282	1	0	5	.001	1	-.003	15
210			min	-928.16	3	.248	15	.013	15	0	1	0	15	-.012	4
211		11	max	786.73	2	.309	2	.282	1	0	5	.002	1	-.003	15
212			min	-928.288	3	-.115	3	.013	15	0	1	0	15	-.012	4
213		12	max	786.56	2	-.16	15	.282	1	0	5	.002	1	-.003	15
214			min	-928.416	3	-.682	4	.013	15	0	1	0	15	-.012	4
215		13	max	786.39	2	-.365	15	.282	1	0	5	.002	1	-.003	15
216			min	-928.544	3	-1.551	4	.013	15	0	1	0	15	-.012	4
217		14	max	786.219	2	-.569	15	.282	1	0	5	.002	1	-.003	15
218			min	-928.671	3	-2.42	4	.013	15	0	1	0	15	-.011	4
219		15	max	786.049	2	-.773	15	.282	1	0	5	.002	1	-.002	15
220			min	-928.799	3	-3.289	4	.013	15	0	1	0	15	-.009	4
221		16	max	785.879	2	-.977	15	.282	1	0	5	.002	1	-.002	15
222			min	-928.927	3	-4.158	4	.013	15	0	1	0	15	-.008	4
223		17	max	785.708	2	-1.182	15	.282	1	0	5	.002	1	-.001	15
224			min	-929.055	3	-5.027	4	.013	15	0	1	0	15	-.006	4
225		18	max	785.538	2	-1.386	15	.282	1	0	5	.002	1	0	15
226			min	-929.182	3	-5.896	4	.013	15	0	1	0	15	-.003	4
227		19	max	785.368	2	-1.59	15	.282	1	0	5	.003	1	0	1
228			min	-929.31	3	-6.765	4	.013	15	0	1	0	15	0	1
229	M4	1	max	966.868	1	0	1	-.522	15	0	1	.002	1	0	1
230			min	-21.091	3	0	1	-11.069	1	0	1	0	15	0	1
231		2	max	967.039	1	0	1	-.522	15	0	1	0	1	0	1
232			min	-20.963	3	0	1	-11.069	1	0	1	0	15	0	1
233		3	max	967.209	1	0	1	-.522	15	0	1	0	15	0	1
234			min	-20.835	3	0	1	-11.069	1	0	1	0	1	0	1
235		4	max	967.379	1	0	1	-.522	15	0	1	0	15	0	1
236			min	-20.707	3	0	1	-11.069	1	0	1	-.002	1	0	1
237		5	max	967.55	1	0	1	-.522	15	0	1	0	15	0	1
238			min	-20.58	3	0	1	-11.069	1	0	1	-.003	1	0	1
239		6	max	967.72	1	0	1	-.522	15	0	1	0	15	0	1
240			min	-20.452	3	0	1	-11.069	1	0	1	-.004	1	0	1
241		7	max	967.89	1	0	1	-.522	15	0	1	0	15	0	1
242			min	-20.324	3	0	1	-11.069	1	0	1	-.006	1	0	1
243		8	max	968.061	1	0	1	-.522	15	0	1	0	15	0	1
244			min	-20.196	3	0	1	-11.069	1	0	1	-.007	1	0	1
245		9	max	968.231	1	0	1	-.522	15	0	1	0	15	0	1
246			min	-20.069	3	0	1	-11.069	1	0	1	-.008	1	0	1
247		10	max	968.401	1	0	1	-.522	15	0	1	0	15	0	1
248			min	-19.941	3	0	1	-11.069	1	0	1	-.009	1	0	1
249		11	max	968.572	1	0	1	-.522	15	0	1	0	15	0	1
250			min	-19.813	3	0	1	-11.069	1	0	1	-.011	1	0	1
251		12	max	968.742	1	0	1	-.522	15	0	1	0	15	0	1
252			min	-19.685	3	0	1	-11.069	1	0	1	-.012	1	0	1
253		13	max	968.912	1	0	1	-.522	15	0	1	0	15	0	1
254			min	-19.558	3	0	1	-11.069	1	0	1	-.013	1	0	1



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### Envelope Member Section Forces (Continued)

Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
255	14	max	969.083	1	0	1	-522	15	0	1	0	15	0	1
256		min	-19.43	3	0	1	-11.069	1	0	1	-.014	1	0	1
257	15	max	969.253	1	0	1	-522	15	0	1	0	15	0	1
258		min	-19.302	3	0	1	-11.069	1	0	1	-.016	1	0	1
259	16	max	969.423	1	0	1	-522	15	0	1	0	15	0	1
260		min	-19.174	3	0	1	-11.069	1	0	1	-.017	1	0	1
261	17	max	969.594	1	0	1	-522	15	0	1	0	15	0	1
262		min	-19.047	3	0	1	-11.069	1	0	1	-.018	1	0	1
263	18	max	969.764	1	0	1	-522	15	0	1	0	15	0	1
264		min	-18.919	3	0	1	-11.069	1	0	1	-.02	1	0	1
265	19	max	969.934	1	0	1	-522	15	0	1	0	15	0	1
266		min	-18.791	3	0	1	-11.069	1	0	1	-.021	1	0	1
267	M6	1	max	3206.584	2	2.275	2	0	1	0	0	1	0	1
268		min	-4474.54	3	.23	12	0	1	0	1	0	1	0	1
269	2	max	3207.114	2	2.219	2	0	1	0	1	0	1	0	12
270		min	-4474.143	3	.203	12	0	1	0	1	0	1	0	2
271	3	max	3207.643	2	2.164	2	0	1	0	1	0	1	0	12
272		min	-4473.747	3	.175	12	0	1	0	1	0	1	-.002	2
273	4	max	3208.172	2	2.108	2	0	1	0	1	0	1	0	12
274		min	-4473.35	3	.147	12	0	1	0	1	0	1	-.002	2
275	5	max	3208.702	2	2.053	2	0	1	0	1	0	1	0	12
276		min	-4472.953	3	.119	12	0	1	0	1	0	1	-.003	2
277	6	max	3209.231	2	1.998	2	0	1	0	1	0	1	0	12
278		min	-4472.556	3	.082	3	0	1	0	1	0	1	-.004	2
279	7	max	3209.76	2	1.942	2	0	1	0	1	0	1	0	12
280		min	-4472.159	3	.041	3	0	1	0	1	0	1	-.005	2
281	8	max	3210.29	2	1.887	2	0	1	0	1	0	1	0	12
282		min	-4471.762	3	0	3	0	1	0	1	0	1	-.005	2
283	9	max	3210.819	2	1.832	2	0	1	0	1	0	1	0	12
284		min	-4471.365	3	-.042	3	0	1	0	1	0	1	-.006	2
285	10	max	3211.348	2	1.776	2	0	1	0	1	0	1	0	3
286		min	-4470.968	3	-.084	3	0	1	0	1	0	1	-.007	2
287	11	max	3211.877	2	1.721	2	0	1	0	1	0	1	0	3
288		min	-4470.571	3	-.126	3	0	1	0	1	0	1	-.007	2
289	12	max	3212.407	2	1.666	2	0	1	0	1	0	1	0	3
290		min	-4470.174	3	-.167	3	0	1	0	1	0	1	-.008	2
291	13	max	3212.936	2	1.61	2	0	1	0	1	0	1	0	3
292		min	-4469.777	3	-.209	3	0	1	0	1	0	1	-.008	2
293	14	max	3213.465	2	1.555	2	0	1	0	1	0	1	0	3
294		min	-4469.38	3	-.25	3	0	1	0	1	0	1	-.009	2
295	15	max	3213.995	2	1.5	2	0	1	0	1	0	1	0	3
296		min	-4468.983	3	-.292	3	0	1	0	1	0	1	-.009	2
297	16	max	3214.524	2	1.444	2	0	1	0	1	0	1	0	3
298		min	-4468.586	3	-.333	3	0	1	0	1	0	1	-.01	2
299	17	max	3215.053	2	1.389	2	0	1	0	1	0	1	0	3
300		min	-4468.189	3	-.375	3	0	1	0	1	0	1	-.011	2
301	18	max	3215.582	2	1.334	2	0	1	0	1	0	1	0	3
302		min	-4467.792	3	-.416	3	0	1	0	1	0	1	-.011	2
303	19	max	3216.112	2	1.278	2	0	1	0	1	0	1	0	3
304		min	-4467.395	3	-.458	3	0	1	0	1	0	1	-.011	2
305	M7	1	max	2639.106	2	8.9	4	0	1	0	0	1	.011	2
306		min	-2772.7	3	2.09	15	0	1	0	1	0	1	0	3
307	2	max	2638.935	2	8.031	4	0	1	0	1	0	1	.008	2
308		min	-2772.828	3	1.886	15	0	1	0	1	0	1	-.003	3
309	3	max	2638.765	2	7.162	4	0	1	0	1	0	1	.005	2
310		min	-2772.956	3	1.682	15	0	1	0	1	0	1	-.004	3
311	4	max	2638.595	2	6.293	4	0	1	0	1	0	1	.002	2



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### Envelope Member Section Forces (Continued)

Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
312		min	-2773.084	3	1.477	15	0	1	0	1	0	1	-.006	3
313	5	max	2638.424	2	5.424	4	0	1	0	1	0	1	0	2
314		min	-2773.211	3	1.273	15	0	1	0	1	0	1	-.007	3
315	6	max	2638.254	2	4.555	4	0	1	0	1	0	1	-.002	15
316		min	-2773.339	3	1.069	15	0	1	0	1	0	1	-.008	3
317	7	max	2638.084	2	3.686	4	0	1	0	1	0	1	-.002	15
318		min	-2773.467	3	.865	15	0	1	0	1	0	1	-.009	3
319	8	max	2637.913	2	2.818	4	0	1	0	1	0	1	-.002	15
320		min	-2773.595	3	.66	15	0	1	0	1	0	1	-.01	4
321	9	max	2637.743	2	2.031	2	0	1	0	1	0	1	-.003	15
322		min	-2773.722	3	.324	12	0	1	0	1	0	1	-.011	4
323	10	max	2637.573	2	1.354	2	0	1	0	1	0	1	-.003	15
324		min	-2773.85	3	-.064	3	0	1	0	1	0	1	-.012	4
325	11	max	2637.402	2	.677	2	0	1	0	1	0	1	-.003	15
326		min	-2773.978	3	-.572	3	0	1	0	1	0	1	-.012	4
327	12	max	2637.232	2	0	2	0	1	0	1	0	1	-.003	15
328		min	-2774.106	3	-1.08	3	0	1	0	1	0	1	-.012	4
329	13	max	2637.062	2	-.361	15	0	1	0	1	0	1	-.003	15
330		min	-2774.233	3	-1.587	3	0	1	0	1	0	1	-.012	4
331	14	max	2636.891	2	-.565	15	0	1	0	1	0	1	-.003	15
332		min	-2774.361	3	-2.396	4	0	1	0	1	0	1	-.011	4
333	15	max	2636.721	2	-.769	15	0	1	0	1	0	1	-.002	15
334		min	-2774.489	3	-3.265	4	0	1	0	1	0	1	-.009	4
335	16	max	2636.551	2	-.974	15	0	1	0	1	0	1	-.002	15
336		min	-2774.617	3	-4.134	4	0	1	0	1	0	1	-.008	4
337	17	max	2636.38	2	-1.178	15	0	1	0	1	0	1	-.001	15
338		min	-2774.744	3	-5.002	4	0	1	0	1	0	1	-.006	4
339	18	max	2636.21	2	-1.382	15	0	1	0	1	0	1	0	15
340		min	-2774.872	3	-5.871	4	0	1	0	1	0	1	-.003	4
341	19	max	2636.039	2	-1.586	15	0	1	0	1	0	1	0	1
342		min	-2775	3	-6.74	4	0	1	0	1	0	1	0	1
343	M8	1	max	2504.728	1	0	1	0	1	0	1	0	1	1
344		min	-161.199	3	0	1	0	1	0	1	0	1	0	1
345	2	max	2504.898	1	0	1	0	1	0	1	0	1	0	1
346		min	-161.071	3	0	1	0	1	0	1	0	1	0	1
347	3	max	2505.069	1	0	1	0	1	0	1	0	1	0	1
348		min	-160.943	3	0	1	0	1	0	1	0	1	0	1
349	4	max	2505.239	1	0	1	0	1	0	1	0	1	0	1
350		min	-160.815	3	0	1	0	1	0	1	0	1	0	1
351	5	max	2505.41	1	0	1	0	1	0	1	0	1	0	1
352		min	-160.688	3	0	1	0	1	0	1	0	1	0	1
353	6	max	2505.58	1	0	1	0	1	0	1	0	1	0	1
354		min	-160.56	3	0	1	0	1	0	1	0	1	0	1
355	7	max	2505.75	1	0	1	0	1	0	1	0	1	0	1
356		min	-160.432	3	0	1	0	1	0	1	0	1	0	1
357	8	max	2505.921	1	0	1	0	1	0	1	0	1	0	1
358		min	-160.304	3	0	1	0	1	0	1	0	1	0	1
359	9	max	2506.091	1	0	1	0	1	0	1	0	1	0	1
360		min	-160.177	3	0	1	0	1	0	1	0	1	0	1
361	10	max	2506.261	1	0	1	0	1	0	1	0	1	0	1
362		min	-160.049	3	0	1	0	1	0	1	0	1	0	1
363	11	max	2506.432	1	0	1	0	1	0	1	0	1	0	1
364		min	-159.921	3	0	1	0	1	0	1	0	1	0	1
365	12	max	2506.602	1	0	1	0	1	0	1	0	1	0	1
366		min	-159.793	3	0	1	0	1	0	1	0	1	0	1
367	13	max	2506.772	1	0	1	0	1	0	1	0	1	0	1
368		min	-159.666	3	0	1	0	1	0	1	0	1	0	1



Company : Schletter, Inc.  
Designer : HCV  
Job Number :  
Model Name : Standard PVMax Racking System

Nov 4, 2015

Checked By: \_\_\_\_\_

### Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
369		14	max	2506.943	1	0	1	0	1	0	1	0	1	0	1
370			min	-159.538	3	0	1	0	1	0	1	0	1	0	1
371		15	max	2507.113	1	0	1	0	1	0	1	0	1	0	1
372			min	-159.41	3	0	1	0	1	0	1	0	1	0	1
373		16	max	2507.283	1	0	1	0	1	0	1	0	1	0	1
374			min	-159.282	3	0	1	0	1	0	1	0	1	0	1
375		17	max	2507.454	1	0	1	0	1	0	1	0	1	0	1
376			min	-159.155	3	0	1	0	1	0	1	0	1	0	1
377		18	max	2507.624	1	0	1	0	1	0	1	0	1	0	1
378			min	-159.027	3	0	1	0	1	0	1	0	1	0	1
379		19	max	2507.794	1	0	1	0	1	0	1	0	1	0	1
380			min	-158.899	3	0	1	0	1	0	1	0	1	0	1
381	M10	1	max	1055.368	2	2.024	4	-.016	15	0	1	0	2	0	1
382			min	-1432.838	3	.476	15	-.34	1	0	3	0	3	0	1
383		2	max	1055.898	2	1.953	4	-.016	15	0	1	0	15	0	15
384			min	-1432.441	3	.459	15	-.34	1	0	3	0	1	0	4
385		3	max	1056.427	2	1.882	4	-.016	15	0	1	0	15	0	15
386			min	-1432.044	3	.443	15	-.34	1	0	3	0	1	-.001	4
387		4	max	1056.956	2	1.811	4	-.016	15	0	1	0	15	0	15
388			min	-1431.647	3	.426	15	-.34	1	0	3	0	1	-.002	4
389		5	max	1057.486	2	1.74	4	-.016	15	0	1	0	15	0	15
390			min	-1431.25	3	.409	15	-.34	1	0	3	0	1	-.003	4
391		6	max	1058.015	2	1.669	4	-.016	15	0	1	0	15	0	15
392			min	-1430.853	3	.392	15	-.34	1	0	3	0	1	-.003	4
393		7	max	1058.544	2	1.598	4	-.016	15	0	1	0	15	0	15
394			min	-1430.456	3	.376	15	-.34	1	0	3	0	1	-.004	4
395		8	max	1059.073	2	1.527	4	-.016	15	0	1	0	15	-.001	15
396			min	-1430.059	3	.359	15	-.34	1	0	3	0	1	-.004	4
397		9	max	1059.603	2	1.456	4	-.016	15	0	1	0	15	-.001	15
398			min	-1429.662	3	.342	15	-.34	1	0	3	0	1	-.005	4
399		10	max	1060.132	2	1.385	4	-.016	15	0	1	0	15	-.001	15
400			min	-1429.265	3	.326	15	-.34	1	0	3	-.001	1	-.006	4
401		11	max	1060.661	2	1.314	4	-.016	15	0	1	0	15	-.001	15
402			min	-1428.868	3	.309	15	-.34	1	0	3	-.001	1	-.006	4
403		12	max	1061.191	2	1.243	4	-.016	15	0	1	0	15	-.002	15
404			min	-1428.472	3	.292	15	-.34	1	0	3	-.001	1	-.006	4
405		13	max	1061.72	2	1.172	4	-.016	15	0	1	0	15	-.002	15
406			min	-1428.075	3	.273	12	-.34	1	0	3	-.001	1	-.007	4
407		14	max	1062.249	2	1.101	4	-.016	15	0	1	0	15	-.002	15
408			min	-1427.678	3	.245	12	-.34	1	0	3	-.002	1	-.007	4
409		15	max	1062.778	2	1.029	4	-.016	15	0	1	0	15	-.002	15
410			min	-1427.281	3	.218	12	-.34	1	0	3	-.002	1	-.008	4
411		16	max	1063.308	2	.961	2	-.016	15	0	1	0	15	-.002	15
412			min	-1426.884	3	.19	12	-.34	1	0	3	-.002	1	-.008	4
413		17	max	1063.837	2	.906	2	-.016	15	0	1	0	15	-.002	15
414			min	-1426.487	3	.162	12	-.34	1	0	3	-.002	1	-.008	4
415		18	max	1064.366	2	.85	2	-.016	15	0	1	0	15	-.002	15
416			min	-1426.09	3	.135	12	-.34	1	0	3	-.002	1	-.009	4
417		19	max	1064.896	2	.795	2	-.016	15	0	1	0	15	-.002	15
418			min	-1425.693	3	.107	12	-.34	1	0	3	-.002	1	-.009	4
419	M11	1	max	788.434	2	8.875	4	-.013	15	0	1	0	15	.009	4
420			min	-927.01	3	2.086	15	-.282	1	0	5	0	1	.002	15
421		2	max	788.264	2	8.007	4	-.013	15	0	1	0	15	.005	2
422			min	-927.138	3	1.882	15	-.282	1	0	5	0	1	0	12
423		3	max	788.093	2	7.138	4	-.013	15	0	1	0	15	.002	2
424			min	-927.266	3	1.678	15	-.282	1	0	5	0	1	0	3
425		4	max	787.923	2	6.269	4	-.013	15	0	1	0	15	0	2





Company : Schletter, Inc.  
Designer : HCV  
Job Number :  
Model Name : Standard PVMax Racking System

Nov 4, 2015

Checked By: \_\_\_\_\_

### Envelope Member Section Forces (Continued)

Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
426		min	-927.394	3	1.474	15	-.282	1	0	5	0	1	-.003	3
427	5	max	787.752	2	5.4	4	-.013	15	0	1	0	15	-.001	15
428		min	-927.522	3	1.269	15	-.282	1	0	5	0	1	-.004	4
429	6	max	787.582	2	4.531	4	-.013	15	0	1	0	15	-.002	15
430		min	-927.649	3	1.065	15	-.282	1	0	5	0	1	-.007	4
431	7	max	787.412	2	3.662	4	-.013	15	0	1	0	15	-.002	15
432		min	-927.777	3	.861	15	-.282	1	0	5	-.001	1	-.009	4
433	8	max	787.241	2	2.793	4	-.013	15	0	1	0	15	-.002	15
434		min	-927.905	3	.657	15	-.282	1	0	5	-.001	1	-.01	4
435	9	max	787.071	2	1.924	4	-.013	15	0	1	0	15	-.003	15
436		min	-928.033	3	.452	15	-.282	1	0	5	-.001	1	-.011	4
437	10	max	786.901	2	1.055	4	-.013	15	0	1	0	15	-.003	15
438		min	-928.16	3	.248	15	-.282	1	0	5	-.001	1	-.012	4
439	11	max	786.73	2	.309	2	-.013	15	0	1	0	15	-.003	15
440		min	-928.288	3	-.115	3	-.282	1	0	5	-.002	1	-.012	4
441	12	max	786.56	2	-.16	15	-.013	15	0	1	0	15	-.003	15
442		min	-928.416	3	-.682	4	-.282	1	0	5	-.002	1	-.012	4
443	13	max	786.39	2	-.365	15	-.013	15	0	1	0	15	-.003	15
444		min	-928.544	3	-1.551	4	-.282	1	0	5	-.002	1	-.012	4
445	14	max	786.219	2	-.569	15	-.013	15	0	1	0	15	-.003	15
446		min	-928.671	3	-2.42	4	-.282	1	0	5	-.002	1	-.011	4
447	15	max	786.049	2	-.773	15	-.013	15	0	1	0	15	-.002	15
448		min	-928.799	3	-3.289	4	-.282	1	0	5	-.002	1	-.009	4
449	16	max	785.879	2	-.977	15	-.013	15	0	1	0	15	-.002	15
450		min	-928.927	3	-4.158	4	-.282	1	0	5	-.002	1	-.008	4
451	17	max	785.708	2	-1.182	15	-.013	15	0	1	0	15	-.001	15
452		min	-929.055	3	-5.027	4	-.282	1	0	5	-.002	1	-.006	4
453	18	max	785.538	2	-1.386	15	-.013	15	0	1	0	15	0	15
454		min	-929.182	3	-5.896	4	-.282	1	0	5	-.002	1	-.003	4
455	19	max	785.368	2	-1.59	15	-.013	15	0	1	0	15	0	1
456		min	-929.31	3	-6.765	4	-.282	1	0	5	-.003	1	0	1
457	M12	1	max	966.868	1	0	11.069	1	0	1	0	15	0	1
458		min	-21.091	3	0	1	.522	15	0	1	-.002	1	0	1
459	2	max	967.039	1	0	1	11.069	1	0	1	0	15	0	1
460		min	-20.963	3	0	1	.522	15	0	1	0	1	0	1
461	3	max	967.209	1	0	1	11.069	1	0	1	0	1	0	1
462		min	-20.835	3	0	1	.522	15	0	1	0	15	0	1
463	4	max	967.379	1	0	1	11.069	1	0	1	.002	1	0	1
464		min	-20.707	3	0	1	.522	15	0	1	0	15	0	1
465	5	max	967.55	1	0	1	11.069	1	0	1	.003	1	0	1
466		min	-20.58	3	0	1	.522	15	0	1	0	15	0	1
467	6	max	967.72	1	0	1	11.069	1	0	1	.004	1	0	1
468		min	-20.452	3	0	1	.522	15	0	1	0	15	0	1
469	7	max	967.89	1	0	1	11.069	1	0	1	.006	1	0	1
470		min	-20.324	3	0	1	.522	15	0	1	0	15	0	1
471	8	max	968.061	1	0	1	11.069	1	0	1	.007	1	0	1
472		min	-20.196	3	0	1	.522	15	0	1	0	15	0	1
473	9	max	968.231	1	0	1	11.069	1	0	1	.008	1	0	1
474		min	-20.069	3	0	1	.522	15	0	1	0	15	0	1
475	10	max	968.401	1	0	1	11.069	1	0	1	.009	1	0	1
476		min	-19.941	3	0	1	.522	15	0	1	0	15	0	1
477	11	max	968.572	1	0	1	11.069	1	0	1	.011	1	0	1
478		min	-19.813	3	0	1	.522	15	0	1	0	15	0	1
479	12	max	968.742	1	0	1	11.069	1	0	1	.012	1	0	1
480		min	-19.685	3	0	1	.522	15	0	1	0	15	0	1
481	13	max	968.912	1	0	1	11.069	1	0	1	.013	1	0	1
482		min	-19.558	3	0	1	.522	15	0	1	0	15	0	1



Company : Schletter, Inc.  
Designer : HCV  
Job Number :  
Model Name : Standard PVMax Racking System

Nov 4, 2015

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### Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
483		14	max	969.083	1	0	1	11.069	1	0	1	.014	1	0	1
484			min	-19.43	3	0	1	.522	15	0	1	0	15	0	1
485		15	max	969.253	1	0	1	11.069	1	0	1	.016	1	0	1
486			min	-19.302	3	0	1	.522	15	0	1	0	15	0	1
487		16	max	969.423	1	0	1	11.069	1	0	1	.017	1	0	1
488			min	-19.174	3	0	1	.522	15	0	1	0	15	0	1
489		17	max	969.594	1	0	1	11.069	1	0	1	.018	1	0	1
490			min	-19.047	3	0	1	.522	15	0	1	0	15	0	1
491		18	max	969.764	1	0	1	11.069	1	0	1	.02	1	0	1
492			min	-18.919	3	0	1	.522	15	0	1	0	15	0	1
493		19	max	969.934	1	0	1	11.069	1	0	1	.021	1	0	1
494			min	-18.791	3	0	1	.522	15	0	1	0	15	0	1
495	M1	1	max	161.543	1	741.491	3	-2.909	15	0	2	.171	1	0	15
496			min	7.543	15	-414.302	2	-61.169	1	0	3	.008	15	-.014	2
497		2	max	162.385	1	740.397	3	-2.909	15	0	2	.133	1	.243	2
498			min	7.797	15	-415.761	2	-61.169	1	0	3	.006	15	-.464	3
499		3	max	599.842	3	540.916	2	-2.893	15	0	3	.095	1	.491	2
500			min	-360.862	2	-575.26	3	-60.975	1	0	2	.005	15	-.909	3
501		4	max	600.474	3	539.457	2	-2.893	15	0	3	.057	1	.157	1
502			min	-360.019	2	-576.355	3	-60.975	1	0	2	.003	15	-.551	3
503		5	max	601.106	3	537.998	2	-2.893	15	0	3	.02	1	-.005	15
504			min	-359.177	2	-577.449	3	-60.975	1	0	2	0	15	-.193	3
505		6	max	601.737	3	536.538	2	-2.893	15	0	3	0	15	.165	3
506			min	-358.334	2	-578.543	3	-60.975	1	0	2	-.018	1	-.512	2
507		7	max	602.369	3	535.079	2	-2.893	15	0	3	-.003	15	.525	3
508			min	-357.492	2	-579.637	3	-60.975	1	0	2	-.056	1	-.844	2
509		8	max	603.001	3	533.62	2	-2.893	15	0	3	-.004	15	.885	3
510			min	-356.65	2	-580.732	3	-60.975	1	0	2	-.094	1	-1.176	2
511		9	max	618.777	3	50.633	2	-4.742	15	0	9	.061	1	1.03	3
512			min	-287.249	2	.446	15	-100.046	1	0	3	.003	15	-1.343	2
513		10	max	619.409	3	49.174	2	-4.742	15	0	9	0	15	1.008	3
514			min	-286.407	2	.006	15	-100.046	1	0	3	-.001	1	-1.374	2
515		11	max	620.041	3	47.715	2	-4.742	15	0	9	-.003	15	.987	3
516			min	-285.564	2	-1.772	4	-100.046	1	0	3	-.063	1	-1.404	2
517		12	max	635.54	3	391.196	3	-2.783	15	0	2	.092	1	.865	3
518			min	-216.057	2	-640.705	2	-58.938	1	0	3	.004	15	-1.246	2
519		13	max	636.172	3	390.102	3	-2.783	15	0	2	.056	1	.623	3
520			min	-215.215	2	-642.165	2	-58.938	1	0	3	.003	15	-.848	2
521		14	max	636.804	3	389.008	3	-2.783	15	0	2	.019	1	.381	3
522			min	-214.372	2	-643.624	2	-58.938	1	0	3	0	15	-.449	2
523		15	max	637.436	3	387.913	3	-2.783	15	0	2	0	15	.14	3
524			min	-213.53	2	-645.083	2	-58.938	1	0	3	-.018	1	-.07	1
525		16	max	638.068	3	386.819	3	-2.783	15	0	2	-.003	15	.352	2
526			min	-212.687	2	-646.542	2	-58.938	1	0	3	-.054	1	-.1	3
527		17	max	638.699	3	385.725	3	-2.783	15	0	2	-.004	15	.753	2
528			min	-211.845	2	-648.001	2	-58.938	1	0	3	-.091	1	-.34	3
529		18	max	-7.814	15	624.287	2	-3.291	15	0	3	-.006	15	.379	2
530			min	-162.974	1	-290.676	3	-69.477	1	0	2	-.131	1	-.167	3
531		19	max	-7.56	15	622.828	2	-3.291	15	0	3	-.008	15	.013	3
532			min	-162.132	1	-291.77	3	-69.477	1	0	2	-.174	1	-.008	1
533	M5	1	max	363.581	1	2451.741	3	0	1	0	1	0	1	.029	2
534			min	13.161	12	-1440.277	2	0	1	0	1	0	1	0	15
535		2	max	364.424	1	2450.647	3	0	1	0	1	0	1	.923	2
536			min	13.582	12	-1441.736	2	0	1	0	1	0	1	-1.513	3
537		3	max	1840.244	3	1443.917	2	0	1	0	1	0	1	1.787	2
538			min	-1147.73	2	-1682.312	3	0	1	0	1	0	1	-2.989	3
539		4	max	1840.875	3	1442.458	2	0	1	0	1	0	1	.891	2



Company : Schletter, Inc.  
Designer : HCV  
Job Number :  
Model Name : Standard PVMax Racking System

Nov 4, 2015

Checked By: \_\_\_\_\_

### Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
540			min	-1146.888	2	-1683.406	3	0	1	0	1	0	1	-1.944	3
541		5	max	1841.507	3	1440.999	2	0	1	0	1	0	1	.043	1
542			min	-1146.046	2	-1684.501	3	0	1	0	1	0	1	-.899	3
543		6	max	1842.139	3	1439.539	2	0	1	0	1	0	1	.147	3
544			min	-1145.203	2	-1685.595	3	0	1	0	1	0	1	-.898	2
545		7	max	1842.771	3	1438.08	2	0	1	0	1	0	1	1.193	3
546			min	-1144.361	2	-1686.689	3	0	1	0	1	0	1	-1.791	2
547		8	max	1843.403	3	1436.621	2	0	1	0	1	0	1	2.24	3
548			min	-1143.518	2	-1687.783	3	0	1	0	1	0	1	-2.683	2
549		9	max	1862.279	3	171.992	2	0	1	0	1	0	1	2.581	3
550			min	-992.658	2	.44	15	0	1	0	1	0	1	-3.073	2
551		10	max	1862.911	3	170.532	2	0	1	0	1	0	1	2.496	3
552			min	-991.816	2	0	15	0	1	0	1	0	1	-3.18	2
553		11	max	1863.543	3	169.073	2	0	1	0	1	0	1	2.411	3
554			min	-990.973	2	-1.65	4	0	1	0	1	0	1	-3.285	2
555		12	max	1882.972	3	1097.277	3	0	1	0	1	0	1	2.111	3
556			min	-840.326	2	-1781.036	2	0	1	0	1	0	1	-2.937	2
557		13	max	1883.603	3	1096.183	3	0	1	0	1	0	1	1.431	3
558			min	-839.484	2	-1782.495	2	0	1	0	1	0	1	-1.831	2
559		14	max	1884.235	3	1095.089	3	0	1	0	1	0	1	.751	3
560			min	-838.642	2	-1783.954	2	0	1	0	1	0	1	-.724	2
561		15	max	1884.867	3	1093.994	3	0	1	0	1	0	1	.383	2
562			min	-837.799	2	-1785.413	2	0	1	0	1	0	1	0	15
563		16	max	1885.499	3	1092.9	3	0	1	0	1	0	1	1.492	2
564			min	-836.957	2	-1786.873	2	0	1	0	1	0	1	-.607	3
565		17	max	1886.13	3	1091.806	3	0	1	0	1	0	1	2.601	2
566			min	-836.115	2	-1788.332	2	0	1	0	1	0	1	-1.285	3
567		18	max	-14.67	12	2117.688	2	0	1	0	1	0	1	1.329	2
568			min	-363.246	1	-1032.437	3	0	1	0	1	0	1	-.668	3
569		19	max	-14.248	12	2116.229	2	0	1	0	1	0	1	.016	1
570			min	-362.403	1	-1033.531	3	0	1	0	1	0	1	-.027	3
571	M9	1	max	161.543	1	741.491	3	61.169	1	0	3	-.008	15	0	15
572			min	7.543	15	-414.302	2	2.909	15	0	2	-.171	1	-.014	2
573		2	max	162.385	1	740.397	3	61.169	1	0	3	-.006	15	.243	2
574			min	7.797	15	-415.761	2	2.909	15	0	2	-.133	1	-.464	3
575		3	max	599.842	3	540.916	2	60.975	1	0	2	-.005	15	.491	2
576			min	-360.862	2	-575.26	3	2.893	15	0	3	-.095	1	-.909	3
577		4	max	600.474	3	539.457	2	60.975	1	0	2	-.003	15	.157	1
578			min	-360.019	2	-576.355	3	2.893	15	0	3	-.057	1	-.551	3
579		5	max	601.106	3	537.998	2	60.975	1	0	2	0	15	-.005	15
580			min	-359.177	2	-577.449	3	2.893	15	0	3	-.02	1	-.193	3
581		6	max	601.737	3	536.538	2	60.975	1	0	2	.018	1	.165	3
582			min	-358.334	2	-578.543	3	2.893	15	0	3	0	15	-.512	2
583		7	max	602.369	3	535.079	2	60.975	1	0	2	.056	1	.525	3
584			min	-357.492	2	-579.637	3	2.893	15	0	3	.003	15	-.844	2
585		8	max	603.001	3	533.62	2	60.975	1	0	2	.094	1	.885	3
586			min	-356.65	2	-580.732	3	2.893	15	0	3	.004	15	-1.176	2
587		9	max	618.777	3	50.633	2	100.046	1	0	3	-.003	15	1.03	3
588			min	-287.249	2	.446	15	4.742	15	0	9	-.061	1	-1.343	2
589		10	max	619.409	3	49.174	2	100.046	1	0	3	.001	1	1.008	3
590			min	-286.407	2	.006	15	4.742	15	0	9	0	15	-1.374	2
591		11	max	620.041	3	47.715	2	100.046	1	0	3	.063	1	.987	3
592			min	-285.564	2	-1.772	4	4.742	15	0	9	.003	15	-1.404	2
593		12	max	635.54	3	391.196	3	58.938	1	0	3	-.004	15	.865	3
594			min	-216.057	2	-640.705	2	2.783	15	0	2	-.092	1	-1.246	2
595		13	max	636.172	3	390.102	3	58.938	1	0	3	-.003	15	.623	3
596			min	-215.215	2	-642.165	2	2.783	15	0	2	-.056	1	-.848	2





Company : Schletter, Inc.  
Designer : HCV  
Job Number :  
Model Name : Standard PVMax Racking System

Nov 4, 2015

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### Envelope Member Section Forces (Continued)

Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
597	14	max	636.804	3	389.008	3	58.938	1	0	3	0	15	.381	3
598		min	-214.372	2	-643.624	2	2.783	15	0	2	-.019	1	-.449	2
599	15	max	637.436	3	387.913	3	58.938	1	0	3	.018	1	.14	3
600		min	-213.53	2	-645.083	2	2.783	15	0	2	0	15	-.07	1
601	16	max	638.068	3	386.819	3	58.938	1	0	3	.054	1	.352	2
602		min	-212.687	2	-646.542	2	2.783	15	0	2	.003	15	-.1	3
603	17	max	638.699	3	385.725	3	58.938	1	0	3	.091	1	.753	2
604		min	-211.845	2	-648.001	2	2.783	15	0	2	.004	15	-.34	3
605	18	max	-7.814	15	624.287	2	69.477	1	0	2	.131	1	.379	2
606		min	-162.974	1	-290.676	3	3.291	15	0	3	.006	15	-.167	3
607	19	max	-7.56	15	622.828	2	69.477	1	0	2	.174	1	.013	3
608		min	-162.132	1	-291.77	3	3.291	15	0	3	.008	15	-.008	1

### Envelope Member Section Deflections

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
1	M13	1	max	0	1	.209	2	.011	3	1.441e-2	2	NC	1	NC	1
2			min	0	15	-.06	3	-.007	2	-4.177e-3	3	NC	1	NC	1
3		2	max	0	1	.138	2	.019	1	1.55e-2	2	NC	4	NC	2
4			min	0	15	.004	15	-.003	10	-3.872e-3	3	1096.525	3	9544.322	1
5		3	max	0	1	.248	3	.044	1	1.658e-2	2	NC	5	NC	2
6			min	0	15	.002	15	0	10	-3.567e-3	3	603.622	3	4129.548	1
7		4	max	0	1	.335	3	.065	1	1.767e-2	2	NC	5	NC	3
8			min	0	15	.001	15	0	10	-3.262e-3	3	471.388	3	2816.51	1
9		5	max	0	1	.359	3	.075	1	1.875e-2	2	NC	5	NC	3
10			min	0	15	.001	15	0	10	-2.957e-3	3	443.848	3	2455.599	1
11		6	max	0	1	.323	3	.071	1	1.984e-2	2	NC	5	NC	5
12			min	0	15	.002	15	-.002	10	-2.652e-3	3	485.916	3	2608.443	1
13		7	max	0	1	.238	3	.053	1	2.093e-2	2	NC	4	NC	2
14			min	0	15	.004	15	-.005	10	-2.347e-3	3	624.141	3	3460.115	1
15		8	max	0	1	.255	2	.034	3	2.201e-2	2	NC	4	NC	2
16			min	0	15	.006	15	-.01	10	-2.042e-3	3	988.874	3	6641.392	1
17		9	max	0	1	.321	2	.034	3	2.31e-2	2	NC	4	NC	1
18			min	0	15	.007	15	-.019	2	-1.737e-3	3	1651.362	2	8145.239	3
19		10	max	0	1	.351	2	.034	3	2.419e-2	2	NC	4	NC	1
20		min	0	1	-.018	3	-.024	2	-1.432e-3	3	1308.632	2	8186.074	3	
21	11	max	0	15	.321	2	.034	3	2.31e-2	2	NC	4	NC	1	
22		min	0	1	.007	15	-.019	2	-1.737e-3	3	1651.362	2	8145.239	3	
23	12	max	0	15	.255	2	.034	3	2.201e-2	2	NC	4	NC	2	
24		min	0	1	.006	15	-.01	10	-2.042e-3	3	988.874	3	6641.392	1	
25	13	max	0	15	.238	3	.053	1	2.093e-2	2	NC	4	NC	2	
26		min	0	1	.004	15	-.005	10	-2.347e-3	3	624.141	3	3460.115	1	
27	14	max	0	15	.323	3	.071	1	1.984e-2	2	NC	5	NC	5	
28		min	0	1	.002	15	-.002	10	-2.652e-3	3	485.916	3	2608.443	1	
29	15	max	0	15	.359	3	.075	1	1.875e-2	2	NC	5	NC	3	
30		min	0	1	.001	15	0	10	-2.957e-3	3	443.848	3	2455.599	1	
31	16	max	0	15	.335	3	.065	1	1.767e-2	2	NC	5	NC	3	
32		min	0	1	.001	15	0	10	-3.262e-3	3	471.388	3	2816.51	1	
33	17	max	0	15	.248	3	.044	1	1.658e-2	2	NC	5	NC	2	
34		min	0	1	.002	15	0	10	-3.567e-3	3	603.622	3	4129.548	1	
35	18	max	0	15	.138	2	.019	1	1.55e-2	2	NC	4	NC	2	
36		min	0	1	.004	15	-.003	10	-3.872e-3	3	1096.525	3	9544.322	1	
37	19	max	0	15	.209	2	.011	3	1.441e-2	2	NC	1	NC	1	
38		min	0	1	-.06	3	-.007	2	-4.177e-3	3	NC	1	NC	1	
39	M14	1	max	0	1	.434	3	.01	3	7.981e-3	2	NC	1	NC	1
40			min	0	15	-.624	2	-.006	2	-6.44e-3	3	NC	1	NC	1



Company : Schletter, Inc.  
Designer : HCV  
Job Number :  
Model Name : Standard PVMax Racking System

Nov 4, 2015

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### Envelope Member Section Deflections (Continued)

Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
41	2	max	0	1	.655	3	.012	3	9.142e-3	2	NC	5	NC	1
42		min	0	15	-.842	2	-.003	10	-7.5e-3	3	840.444	3	NC	1
43	3	max	0	1	.851	3	.033	1	1.03e-2	2	NC	5	NC	2
44		min	0	15	-1.038	2	-.001	10	-8.56e-3	3	446.501	3	5510.276	1
45	4	max	0	1	1.001	3	.053	1	1.147e-2	2	NC	15	NC	3
46		min	0	15	-1.199	2	0	10	-9.62e-3	3	323.717	2	3461.99	1
47	5	max	0	1	1.098	3	.064	1	1.263e-2	2	NC	15	NC	3
48		min	0	15	-1.315	2	0	10	-1.068e-2	3	269.404	2	2882.416	1
49	6	max	0	1	1.139	3	.062	1	1.379e-2	2	NC	15	NC	3
50		min	0	15	-1.384	2	-.001	10	-1.174e-2	3	244.967	2	2971.457	1
51	7	max	0	1	1.132	3	.048	1	1.495e-2	2	NC	15	NC	2
52		min	0	15	-1.41	2	-.005	10	-1.28e-2	3	236.841	2	3855.625	1
53	8	max	0	1	1.092	3	.03	3	1.611e-2	2	NC	15	NC	2
54		min	0	15	-1.404	2	-.009	10	-1.386e-2	3	238.737	2	7246.971	1
55	9	max	0	1	1.043	3	.03	3	1.727e-2	2	NC	15	NC	1
56		min	0	15	-1.382	2	-.017	2	-1.492e-2	3	245.536	2	9228.385	3
57	10	max	0	1	1.018	3	.03	3	1.843e-2	2	NC	15	NC	1
58		min	0	1	-1.368	2	-.022	2	-1.598e-2	3	250.013	2	9260.255	3
59	11	max	0	15	1.043	3	.03	3	1.727e-2	2	NC	15	NC	1
60		min	0	1	-1.382	2	-.017	2	-1.492e-2	3	245.536	2	9228.385	3
61	12	max	0	15	1.092	3	.03	3	1.611e-2	2	NC	15	NC	2
62		min	0	1	-1.404	2	-.009	10	-1.386e-2	3	238.737	2	7246.971	1
63	13	max	0	15	1.132	3	.048	1	1.495e-2	2	NC	15	NC	2
64		min	0	1	-1.41	2	-.005	10	-1.28e-2	3	236.841	2	3855.625	1
65	14	max	0	15	1.139	3	.062	1	1.379e-2	2	NC	15	NC	3
66		min	0	1	-1.384	2	-.001	10	-1.174e-2	3	244.967	2	2971.457	1
67	15	max	0	15	1.098	3	.064	1	1.263e-2	2	NC	15	NC	3
68		min	0	1	-1.315	2	0	10	-1.068e-2	3	269.404	2	2882.416	1
69	16	max	0	15	1.001	3	.053	1	1.147e-2	2	NC	15	NC	3
70		min	0	1	-1.199	2	0	10	-9.62e-3	3	323.717	2	3461.99	1
71	17	max	0	15	.851	3	.033	1	1.03e-2	2	NC	5	NC	2
72		min	0	1	-1.038	2	-.001	10	-8.56e-3	3	446.501	3	5510.276	1
73	18	max	0	15	.655	3	.012	3	9.142e-3	2	NC	5	NC	1
74		min	0	1	-.842	2	-.003	10	-7.5e-3	3	840.444	3	NC	1
75	19	max	0	15	.434	3	.01	3	7.981e-3	2	NC	1	NC	1
76		min	0	1	-.624	2	-.006	2	-6.44e-3	3	NC	1	NC	1
77	M15	1	max	0	15	.443	.009	3	5.527e-3	3	NC	1	NC	1
78		min	0	1	-.623	2	-.006	2	-8.317e-3	2	NC	1	NC	1
79	2	max	0	15	.609	3	.012	1	6.427e-3	3	NC	5	NC	1
80		min	0	1	-.885	2	-.003	10	-9.536e-3	2	709.316	2	NC	1
81	3	max	0	15	.759	3	.034	1	7.328e-3	3	NC	5	NC	2
82		min	0	1	-1.118	2	0	10	-1.076e-2	2	375.762	2	5473.855	1
83	4	max	0	15	.884	3	.054	1	8.229e-3	3	NC	15	NC	3
84		min	0	1	-1.3	2	0	10	-1.198e-2	2	274.531	2	3442.273	1
85	5	max	0	15	.976	3	.065	1	9.13e-3	3	NC	15	NC	3
86		min	0	1	-1.421	2	0	10	-1.319e-2	2	232.95	2	2865.824	1
87	6	max	0	15	1.033	3	.063	1	1.003e-2	3	NC	15	NC	3
88		min	0	1	-1.479	2	0	10	-1.441e-2	2	217.312	2	2951.473	1
89	7	max	0	15	1.059	3	.048	1	1.093e-2	3	NC	15	NC	2
90		min	0	1	-1.48	2	-.004	10	-1.563e-2	2	216.923	2	3819.203	1
91	8	max	0	15	1.06	3	.028	3	1.183e-2	3	NC	15	NC	2
92		min	0	1	-1.443	2	-.008	10	-1.685e-2	2	226.811	2	7112.863	1
93	9	max	0	15	1.048	3	.028	3	1.273e-2	3	NC	15	NC	1
94		min	0	1	-1.393	2	-.016	2	-1.807e-2	2	241.486	2	9970.32	3
95	10	max	0	1	1.039	3	.028	3	1.363e-2	3	NC	15	NC	1
96		min	0	1	-1.367	2	-.021	2	-1.929e-2	2	250.051	2	NC	1
97	11	max	0	1	1.048	3	.028	3	1.273e-2	3	NC	15	NC	1



Company : Schletter, Inc.  
Designer : HCV  
Job Number :  
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### Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
98			min	0	15	-1.393	2	-.016	2	-1.807e-2	2	241.486	2	9970.32	3
99		12	max	0	1	1.06	3	.028	3	1.183e-2	3	NC	15	NC	2
100			min	0	15	-1.443	2	-.008	10	-1.685e-2	2	226.811	2	7112.863	1
101		13	max	0	1	1.059	3	.048	1	1.093e-2	3	NC	15	NC	2
102			min	0	15	-1.48	2	-.004	10	-1.563e-2	2	216.923	2	3819.203	1
103		14	max	0	1	1.033	3	.063	1	1.003e-2	3	NC	15	NC	3
104			min	0	15	-1.479	2	0	10	-1.441e-2	2	217.312	2	2951.473	1
105		15	max	0	1	.976	3	.065	1	9.13e-3	3	NC	15	NC	3
106			min	0	15	-1.421	2	0	10	-1.319e-2	2	232.95	2	2865.824	1
107		16	max	0	1	.884	3	.054	1	8.229e-3	3	NC	15	NC	3
108			min	0	15	-1.3	2	0	10	-1.198e-2	2	274.531	2	3442.273	1
109		17	max	0	1	.759	3	.034	1	7.328e-3	3	NC	5	NC	2
110			min	0	15	-1.118	2	0	10	-1.076e-2	2	375.762	2	5473.855	1
111		18	max	0	1	.609	3	.012	1	6.427e-3	3	NC	5	NC	1
112			min	0	15	-.885	2	-.003	10	-9.536e-3	2	709.316	2	NC	1
113		19	max	0	1	.443	3	.009	3	5.527e-3	3	NC	1	NC	1
114			min	0	15	-.623	2	-.006	2	-8.317e-3	2	NC	1	NC	1
115	M16	1	max	0	15	.185	2	.008	3	1.049e-2	3	NC	1	NC	1
116			min	0	1	-.155	3	-.005	2	-1.208e-2	2	NC	1	NC	1
117		2	max	0	15	.073	1	.019	1	1.151e-2	3	NC	4	NC	2
118			min	0	1	-.112	3	-.002	10	-1.266e-2	2	1513.48	2	9639.102	1
119		3	max	0	15	.017	9	.044	1	1.253e-2	3	NC	5	NC	2
120			min	0	1	-.081	3	0	10	-1.323e-2	2	846.271	2	4141.665	1
121		4	max	0	15	.008	4	.066	1	1.355e-2	3	NC	5	NC	3
122			min	0	1	-.088	2	.003	10	-1.381e-2	2	680.482	2	2811.467	1
123		5	max	0	15	.009	9	.076	1	1.457e-2	3	NC	5	NC	3
124			min	0	1	-.091	2	.003	10	-1.439e-2	2	674.775	2	2439.561	1
125		6	max	0	15	.022	9	.072	1	1.559e-2	3	NC	4	NC	3
126			min	0	1	-.118	3	0	10	-1.497e-2	2	814.781	2	2574.302	1
127		7	max	0	15	.074	1	.055	1	1.66e-2	3	NC	3	NC	2
128			min	0	1	-.169	3	-.002	10	-1.554e-2	2	1307.567	2	3372.254	1
129		8	max	0	15	.157	1	.029	1	1.762e-2	3	NC	1	NC	2
130			min	0	1	-.227	3	-.006	10	-1.612e-2	2	2592.459	3	6240.011	1
131		9	max	0	15	.24	2	.024	3	1.864e-2	3	NC	4	NC	1
132			min	0	1	-.277	3	-.014	2	-1.67e-2	2	1534.393	3	NC	1
133		10	max	0	1	.281	2	.024	3	1.966e-2	3	NC	5	NC	1
134			min	0	1	-.298	3	-.019	2	-1.728e-2	2	1301.309	3	NC	1
135		11	max	0	1	.24	2	.024	3	1.864e-2	3	NC	4	NC	1
136			min	0	15	-.277	3	-.014	2	-1.67e-2	2	1534.393	3	NC	1
137		12	max	0	1	.157	1	.029	1	1.762e-2	3	NC	1	NC	2
138			min	0	15	-.227	3	-.006	10	-1.612e-2	2	2592.459	3	6240.011	1
139		13	max	0	1	.074	1	.055	1	1.66e-2	3	NC	3	NC	2
140			min	0	15	-.169	3	-.002	10	-1.554e-2	2	1307.567	2	3372.254	1
141		14	max	0	1	.022	9	.072	1	1.559e-2	3	NC	4	NC	3
142			min	0	15	-.118	3	0	10	-1.497e-2	2	814.781	2	2574.302	1
143		15	max	0	1	.009	9	.076	1	1.457e-2	3	NC	5	NC	3
144			min	0	15	-.091	2	.003	10	-1.439e-2	2	674.775	2	2439.561	1
145		16	max	0	1	.008	4	.066	1	1.355e-2	3	NC	5	NC	3
146			min	0	15	-.088	2	.003	10	-1.381e-2	2	680.482	2	2811.467	1
147		17	max	0	1	.017	9	.044	1	1.253e-2	3	NC	5	NC	2
148			min	0	15	-.081	3	0	10	-1.323e-2	2	846.271	2	4141.665	1
149		18	max	0	1	.073	1	.019	1	1.151e-2	3	NC	4	NC	2
150			min	0	15	-.112	3	-.002	10	-1.266e-2	2	1513.48	2	9639.102	1
151		19	max	0	1	.185	2	.008	3	1.049e-2	3	NC	1	NC	1
152			min	0	15	-.155	3	-.005	2	-1.208e-2	2	NC	1	NC	1
153	M2	1	max	.008	2	.011	2	.008	1	-8.54e-6	15	NC	1	NC	2
154			min	-.011	3	-.017	3	0	15	-1.797e-4	1	6929.631	2	9696.417	1



Company : Schletter, Inc.  
Designer : HCV  
Job Number :  
Model Name : Standard PVMax Racking System

Nov 4, 2015

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### Envelope Member Section Deflections (Continued)

Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
155	2	max	.007	2	.01	2	.007	1	-8.118e-6	15	NC	1	NC	1
156		min	-.01	3	-.017	3	0	15	-1.708e-4	1	8086.292	2	NC	1
157	3	max	.007	2	.008	2	.007	1	-7.696e-6	15	NC	1	NC	1
158		min	-.009	3	-.016	3	0	15	-1.619e-4	1	9681.299	2	NC	1
159	4	max	.007	2	.006	2	.006	1	-7.273e-6	15	NC	1	NC	1
160		min	-.009	3	-.016	3	0	15	-1.53e-4	1	NC	1	NC	1
161	5	max	.006	2	.005	2	.005	1	-6.851e-6	15	NC	1	NC	1
162		min	-.008	3	-.015	3	0	15	-1.441e-4	1	NC	1	NC	1
163	6	max	.006	2	.004	2	.005	1	-6.429e-6	15	NC	1	NC	1
164		min	-.008	3	-.015	3	0	15	-1.352e-4	1	NC	1	NC	1
165	7	max	.005	2	.002	2	.004	1	-6.007e-6	15	NC	1	NC	1
166		min	-.007	3	-.014	3	0	15	-1.263e-4	1	NC	1	NC	1
167	8	max	.005	2	.001	2	.004	1	-5.584e-6	15	NC	1	NC	1
168		min	-.007	3	-.013	3	0	15	-1.174e-4	1	NC	1	NC	1
169	9	max	.004	2	0	2	.003	1	-5.162e-6	15	NC	1	NC	1
170		min	-.006	3	-.012	3	0	15	-1.085e-4	1	NC	1	NC	1
171	10	max	.004	2	0	2	.003	1	-4.74e-6	15	NC	1	NC	1
172		min	-.005	3	-.012	3	0	15	-9.961e-5	1	NC	1	NC	1
173	11	max	.004	2	-.002	2	.002	1	-4.317e-6	15	NC	1	NC	1
174		min	-.005	3	-.011	3	0	15	-9.072e-5	1	NC	1	NC	1
175	12	max	.003	2	-.002	15	.002	1	-3.895e-6	15	NC	1	NC	1
176		min	-.004	3	-.01	3	0	15	-8.183e-5	1	NC	1	NC	1
177	13	max	.003	2	-.002	15	.001	1	-3.473e-6	15	NC	1	NC	1
178		min	-.004	3	-.009	3	0	15	-7.293e-5	1	NC	1	NC	1
179	14	max	.002	2	-.002	15	0	1	-3.051e-6	15	NC	1	NC	1
180		min	-.003	3	-.007	3	0	15	-6.404e-5	1	NC	1	NC	1
181	15	max	.002	2	-.001	15	0	1	-2.628e-6	15	NC	1	NC	1
182		min	-.002	3	-.006	3	0	15	-5.515e-5	1	NC	1	NC	1
183	16	max	.001	2	-.001	15	0	1	-2.206e-6	15	NC	1	NC	1
184		min	-.002	3	-.005	3	0	15	-4.625e-5	1	NC	1	NC	1
185	17	max	0	2	0	15	0	1	-1.784e-6	15	NC	1	NC	1
186		min	-.001	3	-.003	4	0	15	-3.736e-5	1	NC	1	NC	1
187	18	max	0	2	0	15	0	1	-1.361e-6	15	NC	1	NC	1
188		min	0	3	-.002	4	0	15	-2.847e-5	1	NC	1	NC	1
189	19	max	0	1	0	1	0	1	-9.392e-7	15	NC	1	NC	1
190		min	0	1	0	1	0	1	-1.957e-5	1	NC	1	NC	1
191	M3	1	max	0	1	0	1	1	3.906e-6	1	NC	1	NC	1
192		min	0	1	0	1	0	1	1.879e-7	15	NC	1	NC	1
193	2	max	0	3	0	15	0	15	2.442e-5	1	NC	1	NC	1
194		min	0	2	-.003	4	0	1	1.153e-6	15	NC	1	NC	1
195	3	max	.001	3	-.001	15	0	15	4.493e-5	1	NC	1	NC	1
196		min	0	2	-.006	4	0	1	2.119e-6	15	NC	1	NC	1
197	4	max	.002	3	-.002	15	0	15	6.544e-5	1	NC	1	NC	1
198		min	-.001	2	-.009	4	0	1	3.084e-6	15	NC	1	NC	1
199	5	max	.002	3	-.003	15	0	15	8.595e-5	1	NC	1	NC	1
200		min	-.002	2	-.012	4	0	1	4.05e-6	15	8390.057	4	NC	1
201	6	max	.003	3	-.004	15	0	15	1.065e-4	1	NC	5	NC	1
202		min	-.002	2	-.015	4	0	1	5.015e-6	15	6808.112	4	NC	1
203	7	max	.003	3	-.004	15	0	15	1.27e-4	1	NC	5	NC	1
204		min	-.003	2	-.018	4	0	1	5.981e-6	15	5854.939	4	NC	1
205	8	max	.004	3	-.005	15	0	10	1.475e-4	1	NC	5	NC	1
206		min	-.003	2	-.02	4	0	3	6.947e-6	15	5267.229	4	NC	1
207	9	max	.004	3	-.005	15	0	1	1.68e-4	1	NC	5	NC	1
208		min	-.003	2	-.021	4	0	3	7.912e-6	15	4921.018	4	NC	1
209	10	max	.005	3	-.005	15	0	1	1.885e-4	1	NC	5	NC	1
210		min	-.004	2	-.022	4	0	12	8.878e-6	15	4756.268	4	NC	1
211	11	max	.005	3	-.005	15	0	1	2.09e-4	1	NC	5	NC	1



Company : Schletter, Inc.  
Designer : HCV  
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### Envelope Member Section Deflections (Continued)

Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
212		min	-.004	2	-.022	4	0	15	9.843e-6	15	4748.797	4	NC	1
213		max	.006	3	-.005	15	.001	1	2.295e-4	1	NC	5	NC	1
214		min	-.005	2	-.021	4	0	15	1.081e-5	15	4901.006	4	NC	1
215		max	.006	3	-.005	15	.002	1	2.5e-4	1	NC	5	NC	1
216		min	-.005	2	-.02	4	0	15	1.177e-5	15	5244.002	4	NC	1
217		max	.007	3	-.004	15	.002	1	2.705e-4	1	NC	5	NC	1
218		min	-.006	2	-.018	4	0	15	1.274e-5	15	5853.601	4	NC	1
219		max	.007	3	-.004	15	.003	1	2.911e-4	1	NC	3	NC	1
220		min	-.006	2	-.015	4	0	15	1.371e-5	15	6897.383	4	NC	1
221		max	.008	3	-.003	15	.004	1	3.116e-4	1	NC	1	NC	1
222		min	-.006	2	-.012	4	0	15	1.467e-5	15	8780.86	4	NC	1
223		max	.008	3	-.002	15	.005	1	3.321e-4	1	NC	1	NC	1
224		min	-.007	2	-.009	4	0	15	1.564e-5	15	NC	1	NC	1
225		max	.009	3	-.001	15	.006	1	3.526e-4	1	NC	1	NC	1
226		min	-.007	2	-.005	3	0	15	1.66e-5	15	NC	1	NC	1
227		max	.009	3	0	10	.007	1	3.731e-4	1	NC	1	NC	1
228		min	-.008	2	-.002	3	0	15	1.757e-5	15	NC	1	NC	1
229	M4	max	.002	1	.007	2	0	15	1.402e-4	1	NC	1	NC	3
230		min	0	3	-.009	3	-.007	1	6.637e-6	15	NC	1	3318.355	1
231		max	.002	1	.007	2	0	15	1.402e-4	1	NC	1	NC	3
232		min	0	3	-.009	3	-.007	1	6.637e-6	15	NC	1	3600.377	1
233		max	.002	1	.007	2	0	15	1.402e-4	1	NC	1	NC	2
234		min	0	3	-.008	3	-.006	1	6.637e-6	15	NC	1	3936.536	1
235		max	.002	1	.006	2	0	15	1.402e-4	1	NC	1	NC	2
236		min	0	3	-.008	3	-.006	1	6.637e-6	15	NC	1	4340.806	1
237		max	.002	1	.006	2	0	15	1.402e-4	1	NC	1	NC	2
238		min	0	3	-.007	3	-.005	1	6.637e-6	15	NC	1	4832.183	1
239		max	.002	1	.005	2	0	15	1.402e-4	1	NC	1	NC	2
240		min	0	3	-.007	3	-.005	1	6.637e-6	15	NC	1	5437.013	1
241		max	.002	1	.005	2	0	15	1.402e-4	1	NC	1	NC	2
242		min	0	3	-.006	3	-.004	1	6.637e-6	15	NC	1	6192.692	1
243		max	.001	1	.005	2	0	15	1.402e-4	1	NC	1	NC	2
244		min	0	3	-.006	3	-.003	1	6.637e-6	15	NC	1	7153.753	1
245		max	.001	1	.004	2	0	15	1.402e-4	1	NC	1	NC	2
246		min	0	3	-.005	3	-.003	1	6.637e-6	15	NC	1	8402.275	1
247		max	.001	1	.004	2	0	15	1.402e-4	1	NC	1	NC	1
248		min	0	3	-.005	3	-.002	1	6.637e-6	15	NC	1	NC	1
249		max	.001	1	.003	2	0	15	1.402e-4	1	NC	1	NC	1
250		min	0	3	-.004	3	-.002	1	6.637e-6	15	NC	1	NC	1
251		max	0	1	.003	2	0	15	1.402e-4	1	NC	1	NC	1
252		min	0	3	-.004	3	-.002	1	6.637e-6	15	NC	1	NC	1
253		max	0	1	.002	2	0	15	1.402e-4	1	NC	1	NC	1
254		min	0	3	-.003	3	-.001	1	6.637e-6	15	NC	1	NC	1
255		max	0	1	.002	2	0	15	1.402e-4	1	NC	1	NC	1
256		min	0	3	-.003	3	0	1	6.637e-6	15	NC	1	NC	1
257		max	0	1	.002	2	0	15	1.402e-4	1	NC	1	NC	1
258		min	0	3	-.002	3	0	1	6.637e-6	15	NC	1	NC	1
259		max	0	1	.001	2	0	15	1.402e-4	1	NC	1	NC	1
260		min	0	3	-.002	3	0	1	6.637e-6	15	NC	1	NC	1
261		max	0	1	0	2	0	15	1.402e-4	1	NC	1	NC	1
262		min	0	3	-.001	3	0	1	6.637e-6	15	NC	1	NC	1
263		max	0	1	0	2	0	15	1.402e-4	1	NC	1	NC	1
264		min	0	3	0	3	0	1	6.637e-6	15	NC	1	NC	1
265		max	0	1	0	1	0	1	1.402e-4	1	NC	1	NC	1
266		min	0	1	0	1	0	1	6.637e-6	15	NC	1	NC	1
267	M6	max	.024	2	.037	2	0	1	0	1	NC	3	NC	1
268		min	-.033	3	-.052	3	0	1	0	1	2076.654	2	NC	1





Company : Schletter, Inc.  
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### Envelope Member Section Deflections (Continued)

Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
269	2	max	.023	2	.034	2	0	1	0	1	NC	3	NC	1
270		min	-.031	3	-.049	3	0	1	0	1	2282.02	2	NC	1
271	3	max	.021	2	.031	2	0	1	0	1	NC	3	NC	1
272		min	-.03	3	-.047	3	0	1	0	1	2530.275	2	NC	1
273	4	max	.02	2	.027	2	0	1	0	1	NC	3	NC	1
274		min	-.028	3	-.044	3	0	1	0	1	2833.711	2	NC	1
275	5	max	.019	2	.024	2	0	1	0	1	NC	3	NC	1
276		min	-.026	3	-.041	3	0	1	0	1	3209.512	2	NC	1
277	6	max	.017	2	.021	2	0	1	0	1	NC	3	NC	1
278		min	-.024	3	-.038	3	0	1	0	1	3682.296	2	NC	1
279	7	max	.016	2	.018	2	0	1	0	1	NC	3	NC	1
280		min	-.022	3	-.035	3	0	1	0	1	4288.351	2	NC	1
281	8	max	.015	2	.015	2	0	1	0	1	NC	1	NC	1
282		min	-.02	3	-.032	3	0	1	0	1	5083.004	2	NC	1
283	9	max	.013	2	.013	2	0	1	0	1	NC	1	NC	1
284		min	-.019	3	-.029	3	0	1	0	1	6154.091	2	NC	1
285	10	max	.012	2	.01	2	0	1	0	1	NC	1	NC	1
286		min	-.017	3	-.026	3	0	1	0	1	7648.109	2	NC	1
287	11	max	.011	2	.008	2	0	1	0	1	NC	1	NC	1
288		min	-.015	3	-.024	3	0	1	0	1	9824.948	2	NC	1
289	12	max	.009	2	.006	2	0	1	0	1	NC	1	NC	1
290		min	-.013	3	-.021	3	0	1	0	1	NC	1	NC	1
291	13	max	.008	2	.004	2	0	1	0	1	NC	1	NC	1
292		min	-.011	3	-.018	3	0	1	0	1	NC	1	NC	1
293	14	max	.007	2	.003	2	0	1	0	1	NC	1	NC	1
294		min	-.009	3	-.015	3	0	1	0	1	NC	1	NC	1
295	15	max	.005	2	.001	2	0	1	0	1	NC	1	NC	1
296		min	-.007	3	-.012	3	0	1	0	1	NC	1	NC	1
297	16	max	.004	2	0	2	0	1	0	1	NC	1	NC	1
298		min	-.006	3	-.009	3	0	1	0	1	NC	1	NC	1
299	17	max	.003	2	0	2	0	1	0	1	NC	1	NC	1
300		min	-.004	3	-.006	3	0	1	0	1	NC	1	NC	1
301	18	max	.001	2	0	2	0	1	0	1	NC	1	NC	1
302		min	-.002	3	-.003	3	0	1	0	1	NC	1	NC	1
303	19	max	0	1	0	1	0	1	0	1	NC	1	NC	1
304		min	0	1	0	1	0	1	0	1	NC	1	NC	1
305	M7	1	max	0	1	0	1	0	1	1	NC	1	NC	1
306		min	0	1	0	1	0	1	0	1	NC	1	NC	1
307	2	max	.002	3	0	15	0	1	0	1	NC	1	NC	1
308		min	-.001	2	-.004	3	0	1	0	1	NC	1	NC	1
309	3	max	.003	3	-.001	15	0	1	0	1	NC	1	NC	1
310		min	-.003	2	-.007	3	0	1	0	1	NC	1	NC	1
311	4	max	.005	3	-.002	15	0	1	0	1	NC	1	NC	1
312		min	-.004	2	-.011	3	0	1	0	1	NC	1	NC	1
313	5	max	.006	3	-.003	15	0	1	0	1	NC	1	NC	1
314		min	-.006	2	-.014	3	0	1	0	1	8136.622	3	NC	1
315	6	max	.008	3	-.004	15	0	1	0	1	NC	1	NC	1
316		min	-.007	2	-.017	3	0	1	0	1	6862.833	3	NC	1
317	7	max	.009	3	-.004	15	0	1	0	1	NC	2	NC	1
318		min	-.009	2	-.019	3	0	1	0	1	5934.701	4	NC	1
319	8	max	.011	3	-.005	15	0	1	0	1	NC	2	NC	1
320		min	-.01	2	-.021	3	0	1	0	1	5333.899	4	NC	1
321	9	max	.012	3	-.005	15	0	1	0	1	NC	5	NC	1
322		min	-.011	2	-.022	3	0	1	0	1	4979.348	4	NC	1
323	10	max	.014	3	-.005	15	0	1	0	1	NC	5	NC	1
324		min	-.013	2	-.022	3	0	1	0	1	4809.433	4	NC	1
325	11	max	.015	3	-.005	15	0	1	0	1	NC	5	NC	1



Company : Schletter, Inc.  
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### Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
326			min	-.014	2	-.022	3	0	1	0	1	4799.174	4	NC	1
327		12	max	.017	3	-.005	15	0	1	0	1	NC	5	NC	1
328			min	-.016	2	-.022	3	0	1	0	1	4950.641	4	NC	1
329		13	max	.018	3	-.005	15	0	1	0	1	NC	5	NC	1
330			min	-.017	2	-.021	3	0	1	0	1	5294.992	4	NC	1
331		14	max	.02	3	-.004	15	0	1	0	1	NC	2	NC	1
332			min	-.019	2	-.019	3	0	1	0	1	5908.551	4	NC	1
333		15	max	.021	3	-.004	15	0	1	0	1	NC	1	NC	1
334			min	-.02	2	-.017	3	0	1	0	1	6960.238	4	NC	1
335		16	max	.023	3	-.003	15	0	1	0	1	NC	1	NC	1
336			min	-.021	2	-.015	3	0	1	0	1	8858.982	4	NC	1
337		17	max	.024	3	-.002	15	0	1	0	1	NC	1	NC	1
338			min	-.023	2	-.012	3	0	1	0	1	NC	1	NC	1
339		18	max	.026	3	-.001	15	0	1	0	1	NC	1	NC	1
340			min	-.024	2	-.009	3	0	1	0	1	NC	1	NC	1
341		19	max	.027	3	0	10	0	1	0	1	NC	1	NC	1
342			min	-.026	2	-.006	3	0	1	0	1	NC	1	NC	1
343	M8	1	max	.006	1	.025	2	0	1	0	1	NC	1	NC	1
344			min	0	3	-.028	3	0	1	0	1	NC	1	NC	1
345		2	max	.006	1	.024	2	0	1	0	1	NC	1	NC	1
346			min	0	3	-.026	3	0	1	0	1	NC	1	NC	1
347		3	max	.005	1	.022	2	0	1	0	1	NC	1	NC	1
348			min	0	3	-.025	3	0	1	0	1	NC	1	NC	1
349		4	max	.005	1	.021	2	0	1	0	1	NC	1	NC	1
350			min	0	3	-.023	3	0	1	0	1	NC	1	NC	1
351		5	max	.005	1	.02	2	0	1	0	1	NC	1	NC	1
352			min	0	3	-.022	3	0	1	0	1	NC	1	NC	1
353		6	max	.004	1	.018	2	0	1	0	1	NC	1	NC	1
354			min	0	3	-.02	3	0	1	0	1	NC	1	NC	1
355		7	max	.004	1	.017	2	0	1	0	1	NC	1	NC	1
356			min	0	3	-.019	3	0	1	0	1	NC	1	NC	1
357		8	max	.004	1	.015	2	0	1	0	1	NC	1	NC	1
358			min	0	3	-.017	3	0	1	0	1	NC	1	NC	1
359		9	max	.003	1	.014	2	0	1	0	1	NC	1	NC	1
360			min	0	3	-.015	3	0	1	0	1	NC	1	NC	1
361		10	max	.003	1	.013	2	0	1	0	1	NC	1	NC	1
362			min	0	3	-.014	3	0	1	0	1	NC	1	NC	1
363		11	max	.003	1	.011	2	0	1	0	1	NC	1	NC	1
364			min	0	3	-.012	3	0	1	0	1	NC	1	NC	1
365		12	max	.002	1	.01	2	0	1	0	1	NC	1	NC	1
366			min	0	3	-.011	3	0	1	0	1	NC	1	NC	1
367		13	max	.002	1	.008	2	0	1	0	1	NC	1	NC	1
368			min	0	3	-.009	3	0	1	0	1	NC	1	NC	1
369		14	max	.002	1	.007	2	0	1	0	1	NC	1	NC	1
370			min	0	3	-.008	3	0	1	0	1	NC	1	NC	1
371		15	max	.001	1	.006	2	0	1	0	1	NC	1	NC	1
372			min	0	3	-.006	3	0	1	0	1	NC	1	NC	1
373		16	max	0	1	.004	2	0	1	0	1	NC	1	NC	1
374			min	0	3	-.005	3	0	1	0	1	NC	1	NC	1
375		17	max	0	1	.003	2	0	1	0	1	NC	1	NC	1
376			min	0	3	-.003	3	0	1	0	1	NC	1	NC	1
377		18	max	0	1	.001	2	0	1	0	1	NC	1	NC	1
378			min	0	3	-.002	3	0	1	0	1	NC	1	NC	1
379		19	max	0	1	0	1	0	1	0	1	NC	1	NC	1
380			min	0	1	0	1	0	1	0	1	NC	1	NC	1
381	M10	1	max	.008	2	.011	2	0	15	1.797e-4	1	NC	1	NC	2
382			min	-.011	3	-.017	3	-.008	1	8.54e-6	15	6929.631	2	9696.417	1



Company : Schletter, Inc.  
Designer : HCV  
Job Number :  
Model Name : Standard PVMax Racking System

Nov 4, 2015

Checked By: \_\_\_\_\_

### Envelope Member Section Deflections (Continued)

Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
383	2	max	.007	2	.01	2	0	15	1.708e-4	1	NC	1	NC	1
384		min	-.01	3	-.017	3	-.007	1	8.118e-6	15	8086.292	2	NC	1
385	3	max	.007	2	.008	2	0	15	1.619e-4	1	NC	1	NC	1
386		min	-.009	3	-.016	3	-.007	1	7.696e-6	15	9681.299	2	NC	1
387	4	max	.007	2	.006	2	0	15	1.53e-4	1	NC	1	NC	1
388		min	-.009	3	-.016	3	-.006	1	7.273e-6	15	NC	1	NC	1
389	5	max	.006	2	.005	2	0	15	1.441e-4	1	NC	1	NC	1
390		min	-.008	3	-.015	3	-.005	1	6.851e-6	15	NC	1	NC	1
391	6	max	.006	2	.004	2	0	15	1.352e-4	1	NC	1	NC	1
392		min	-.008	3	-.015	3	-.005	1	6.429e-6	15	NC	1	NC	1
393	7	max	.005	2	.002	2	0	15	1.263e-4	1	NC	1	NC	1
394		min	-.007	3	-.014	3	-.004	1	6.007e-6	15	NC	1	NC	1
395	8	max	.005	2	.001	2	0	15	1.174e-4	1	NC	1	NC	1
396		min	-.007	3	-.013	3	-.004	1	5.584e-6	15	NC	1	NC	1
397	9	max	.004	2	0	2	0	15	1.085e-4	1	NC	1	NC	1
398		min	-.006	3	-.012	3	-.003	1	5.162e-6	15	NC	1	NC	1
399	10	max	.004	2	0	2	0	15	9.961e-5	1	NC	1	NC	1
400		min	-.005	3	-.012	3	-.003	1	4.74e-6	15	NC	1	NC	1
401	11	max	.004	2	-.002	2	0	15	9.072e-5	1	NC	1	NC	1
402		min	-.005	3	-.011	3	-.002	1	4.317e-6	15	NC	1	NC	1
403	12	max	.003	2	-.002	15	0	15	8.183e-5	1	NC	1	NC	1
404		min	-.004	3	-.01	3	-.002	1	3.895e-6	15	NC	1	NC	1
405	13	max	.003	2	-.002	15	0	15	7.293e-5	1	NC	1	NC	1
406		min	-.004	3	-.009	3	-.001	1	3.473e-6	15	NC	1	NC	1
407	14	max	.002	2	-.002	15	0	15	6.404e-5	1	NC	1	NC	1
408		min	-.003	3	-.007	3	0	1	3.051e-6	15	NC	1	NC	1
409	15	max	.002	2	-.001	15	0	15	5.515e-5	1	NC	1	NC	1
410		min	-.002	3	-.006	3	0	1	2.628e-6	15	NC	1	NC	1
411	16	max	.001	2	-.001	15	0	15	4.625e-5	1	NC	1	NC	1
412		min	-.002	3	-.005	3	0	1	2.206e-6	15	NC	1	NC	1
413	17	max	0	2	0	15	0	15	3.736e-5	1	NC	1	NC	1
414		min	-.001	3	-.003	4	0	1	1.784e-6	15	NC	1	NC	1
415	18	max	0	2	0	15	0	15	2.847e-5	1	NC	1	NC	1
416		min	0	3	-.002	4	0	1	1.361e-6	15	NC	1	NC	1
417	19	max	0	1	0	1	0	1	1.957e-5	1	NC	1	NC	1
418		min	0	1	0	1	0	1	9.392e-7	15	NC	1	NC	1
419	M11	1	max	0	1	0	1	1	-1.879e-7	15	NC	1	NC	1
420		min	0	1	0	1	0	1	-3.906e-6	1	NC	1	NC	1
421	2	max	0	3	0	15	0	1	-1.153e-6	15	NC	1	NC	1
422		min	0	2	-.003	4	0	15	-2.442e-5	1	NC	1	NC	1
423	3	max	.001	3	-.001	15	0	1	-2.119e-6	15	NC	1	NC	1
424		min	0	2	-.006	4	0	15	-4.493e-5	1	NC	1	NC	1
425	4	max	.002	3	-.002	15	0	1	-3.084e-6	15	NC	1	NC	1
426		min	-.001	2	-.009	4	0	15	-6.544e-5	1	NC	1	NC	1
427	5	max	.002	3	-.003	15	0	1	-4.05e-6	15	NC	1	NC	1
428		min	-.002	2	-.012	4	0	15	-8.595e-5	1	8390.057	4	NC	1
429	6	max	.003	3	-.004	15	0	1	-5.015e-6	15	NC	5	NC	1
430		min	-.002	2	-.015	4	0	15	-1.065e-4	1	6808.112	4	NC	1
431	7	max	.003	3	-.004	15	0	1	-5.981e-6	15	NC	5	NC	1
432		min	-.003	2	-.018	4	0	15	-1.27e-4	1	5854.939	4	NC	1
433	8	max	.004	3	-.005	15	0	3	-6.947e-6	15	NC	5	NC	1
434		min	-.003	2	-.02	4	0	10	-1.475e-4	1	5267.229	4	NC	1
435	9	max	.004	3	-.005	15	0	3	-7.912e-6	15	NC	5	NC	1
436		min	-.003	2	-.021	4	0	1	-1.68e-4	1	4921.018	4	NC	1
437	10	max	.005	3	-.005	15	0	12	-8.878e-6	15	NC	5	NC	1
438		min	-.004	2	-.022	4	0	1	-1.885e-4	1	4756.268	4	NC	1
439	11	max	.005	3	-.005	15	0	15	-9.843e-6	15	NC	5	NC	1





Company : Schletter, Inc.  
 Designer : HCV  
 Job Number :  
 Model Name : Standard PVMax Racking System

Nov 4, 2015

Checked By: \_\_\_\_\_

### Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
440			min	-.004	2	-.022	4	0	1	-2.09e-4	1	4748.797	4	NC	1
441		12	max	.006	3	-.005	15	0	15	-1.081e-5	15	NC	5	NC	1
442			min	-.005	2	-.021	4	-.001	1	-2.295e-4	1	4901.006	4	NC	1
443		13	max	.006	3	-.005	15	0	15	-1.177e-5	15	NC	5	NC	1
444			min	-.005	2	-.02	4	-.002	1	-2.5e-4	1	5244.002	4	NC	1
445		14	max	.007	3	-.004	15	0	15	-1.274e-5	15	NC	5	NC	1
446			min	-.006	2	-.018	4	-.002	1	-2.705e-4	1	5853.601	4	NC	1
447		15	max	.007	3	-.004	15	0	15	-1.371e-5	15	NC	3	NC	1
448			min	-.006	2	-.015	4	-.003	1	-2.911e-4	1	6897.383	4	NC	1
449		16	max	.008	3	-.003	15	0	15	-1.467e-5	15	NC	1	NC	1
450			min	-.006	2	-.012	4	-.004	1	-3.116e-4	1	8780.86	4	NC	1
451		17	max	.008	3	-.002	15	0	15	-1.564e-5	15	NC	1	NC	1
452			min	-.007	2	-.009	4	-.005	1	-3.321e-4	1	NC	1	NC	1
453		18	max	.009	3	-.001	15	0	15	-1.66e-5	15	NC	1	NC	1
454			min	-.007	2	-.005	3	-.006	1	-3.526e-4	1	NC	1	NC	1
455		19	max	.009	3	0	10	0	15	-1.757e-5	15	NC	1	NC	1
456			min	-.008	2	-.002	3	-.007	1	-3.731e-4	1	NC	1	NC	1
457	M12	1	max	.002	1	.007	2	.007	1	-6.637e-6	15	NC	1	NC	3
458			min	0	3	-.009	3	0	15	-1.402e-4	1	NC	1	3318.355	1
459		2	max	.002	1	.007	2	.007	1	-6.637e-6	15	NC	1	NC	3
460			min	0	3	-.009	3	0	15	-1.402e-4	1	NC	1	3600.377	1
461		3	max	.002	1	.007	2	.006	1	-6.637e-6	15	NC	1	NC	2
462			min	0	3	-.008	3	0	15	-1.402e-4	1	NC	1	3936.536	1
463		4	max	.002	1	.006	2	.006	1	-6.637e-6	15	NC	1	NC	2
464			min	0	3	-.008	3	0	15	-1.402e-4	1	NC	1	4340.806	1
465		5	max	.002	1	.006	2	.005	1	-6.637e-6	15	NC	1	NC	2
466			min	0	3	-.007	3	0	15	-1.402e-4	1	NC	1	4832.183	1
467		6	max	.002	1	.005	2	.005	1	-6.637e-6	15	NC	1	NC	2
468			min	0	3	-.007	3	0	15	-1.402e-4	1	NC	1	5437.013	1
469		7	max	.002	1	.005	2	.004	1	-6.637e-6	15	NC	1	NC	2
470			min	0	3	-.006	3	0	15	-1.402e-4	1	NC	1	6192.692	1
471		8	max	.001	1	.005	2	.003	1	-6.637e-6	15	NC	1	NC	2
472			min	0	3	-.006	3	0	15	-1.402e-4	1	NC	1	7153.753	1
473		9	max	.001	1	.004	2	.003	1	-6.637e-6	15	NC	1	NC	2
474			min	0	3	-.005	3	0	15	-1.402e-4	1	NC	1	8402.275	1
475		10	max	.001	1	.004	2	.002	1	-6.637e-6	15	NC	1	NC	1
476			min	0	3	-.005	3	0	15	-1.402e-4	1	NC	1	NC	1
477		11	max	.001	1	.003	2	.002	1	-6.637e-6	15	NC	1	NC	1
478			min	0	3	-.004	3	0	15	-1.402e-4	1	NC	1	NC	1
479		12	max	0	1	.003	2	.002	1	-6.637e-6	15	NC	1	NC	1
480			min	0	3	-.004	3	0	15	-1.402e-4	1	NC	1	NC	1
481		13	max	0	1	.002	2	.001	1	-6.637e-6	15	NC	1	NC	1
482			min	0	3	-.003	3	0	15	-1.402e-4	1	NC	1	NC	1
483		14	max	0	1	.002	2	0	1	-6.637e-6	15	NC	1	NC	1
484			min	0	3	-.003	3	0	15	-1.402e-4	1	NC	1	NC	1
485		15	max	0	1	.002	2	0	1	-6.637e-6	15	NC	1	NC	1
486			min	0	3	-.002	3	0	15	-1.402e-4	1	NC	1	NC	1
487		16	max	0	1	.001	2	0	1	-6.637e-6	15	NC	1	NC	1
488			min	0	3	-.002	3	0	15	-1.402e-4	1	NC	1	NC	1
489		17	max	0	1	0	2	0	1	-6.637e-6	15	NC	1	NC	1
490			min	0	3	-.001	3	0	15	-1.402e-4	1	NC	1	NC	1
491		18	max	0	1	0	2	0	1	-6.637e-6	15	NC	1	NC	1
492			min	0	3	0	3	0	15	-1.402e-4	1	NC	1	NC	1
493		19	max	0	1	0	1	0	1	-6.637e-6	15	NC	1	NC	1
494			min	0	1	0	1	0	1	-1.402e-4	1	NC	1	NC	1
495	M1	1	max	.011	3	.209	2	0	1	7.168e-3	2	NC	1	NC	1
496			min	-.007	2	-.06	3	0	15	-1.703e-2	3	NC	1	NC	1



Company : Schletter, Inc.  
Designer : HCV  
Job Number :  
Model Name : Standard PVMax Racking System

Nov 4, 2015

Checked By: \_\_\_\_\_

### Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
497		2	max	.011	3	.101	2	0	15	3.512e-3	2	NC	5	NC	1
498			min	-.007	2	-.028	3	-.006	1	-8.454e-3	3	1258.061	2	NC	1
499		3	max	.011	3	.018	3	0	15	1.88e-5	10	NC	5	NC	1
500			min	-.007	2	-.014	2	-.008	1	-1.508e-4	1	609.733	2	NC	1
501		4	max	.011	3	.086	3	0	15	3.961e-3	2	NC	15	NC	1
502			min	-.007	2	-.14	2	-.007	1	-4.141e-3	3	388.444	2	NC	1
503		5	max	.011	3	.17	3	0	15	7.932e-3	2	NC	15	NC	1
504			min	-.007	2	-.271	2	-.005	1	-8.179e-3	3	282.417	2	NC	1
505		6	max	.011	3	.258	3	0	15	1.19e-2	2	8787.568	15	NC	1
506			min	-.007	2	-.397	2	-.002	1	-1.222e-2	3	223.682	2	NC	1
507		7	max	.011	3	.343	3	0	1	1.587e-2	2	7430.422	15	NC	1
508			min	-.006	2	-.509	2	0	3	-1.626e-2	3	188.861	2	NC	1
509		8	max	.01	3	.412	3	0	1	1.985e-2	2	6625.923	15	NC	1
510			min	-.006	2	-.598	2	0	15	-2.029e-2	3	168.205	2	NC	1
511		9	max	.01	3	.458	3	0	15	2.228e-2	2	6204.296	15	NC	1
512			min	-.006	2	-.653	2	0	1	-2.087e-2	3	157.419	2	NC	1
513		10	max	.01	3	.474	3	0	1	2.369e-2	2	6075.2	15	NC	1
514			min	-.006	2	-.672	2	0	15	-1.912e-2	3	154.264	2	NC	1
515		11	max	.01	3	.463	3	0	1	2.509e-2	2	6203.863	15	NC	1
516			min	-.006	2	-.653	2	0	15	-1.737e-2	3	158.001	2	NC	1
517		12	max	.009	3	.424	3	0	15	2.403e-2	2	6624.991	15	NC	1
518			min	-.006	2	-.595	2	0	1	-1.511e-2	3	169.912	2	NC	1
519		13	max	.009	3	.362	3	0	15	1.927e-2	2	7428.772	15	NC	1
520			min	-.006	2	-.502	2	0	1	-1.209e-2	3	192.89	2	NC	1
521		14	max	.009	3	.282	3	.002	1	1.452e-2	2	8784.757	15	NC	1
522			min	-.006	2	-.386	2	0	15	-9.067e-3	3	232.104	2	NC	1
523		15	max	.009	3	.192	3	.005	1	9.763e-3	2	NC	15	NC	1
524			min	-.006	2	-.257	2	0	15	-6.046e-3	3	299.404	2	NC	1
525		16	max	.008	3	.098	3	.007	1	5.008e-3	2	NC	15	NC	1
526			min	-.006	2	-.128	2	0	15	-3.025e-3	3	423.478	2	NC	1
527		17	max	.008	3	.006	3	.007	1	5.009e-4	1	NC	5	NC	1
528			min	-.005	2	-.007	2	0	15	-3.167e-6	3	687.118	2	NC	1
529		18	max	.008	3	.094	2	.005	1	6.235e-3	2	NC	5	NC	1
530			min	-.005	2	-.077	3	0	15	-2.164e-3	3	1452.515	2	NC	1
531		19	max	.008	3	.185	2	0	15	1.241e-2	2	NC	1	NC	1
532			min	-.005	2	-.155	3	0	1	-4.417e-3	3	NC	1	NC	1
533	M5	1	max	.034	3	.351	2	0	1	0	1	NC	1	NC	1
534			min	-.024	2	-.018	3	0	1	0	1	NC	1	NC	1
535		2	max	.034	3	.168	2	0	1	0	1	NC	5	NC	1
536			min	-.024	2	-.003	3	0	1	0	1	747.753	2	NC	1
537		3	max	.034	3	.053	3	0	1	0	1	NC	5	NC	1
538			min	-.024	2	-.041	2	0	1	0	1	348.985	2	NC	1
539		4	max	.033	3	.186	3	0	1	0	1	9371.595	15	NC	1
540			min	-.024	2	-.294	2	0	1	0	1	211.627	2	NC	1
541		5	max	.033	3	.372	3	0	1	0	1	6506.265	15	NC	1
542			min	-.023	2	-.572	2	0	1	0	1	147.735	2	NC	1
543		6	max	.032	3	.583	3	0	1	0	1	4980.041	15	NC	1
544			min	-.023	2	-.85	2	0	1	0	1	113.486	2	NC	1
545		7	max	.031	3	.79	3	0	1	0	1	4103.918	15	NC	1
546			min	-.023	2	-1.103	2	0	1	0	1	93.726	2	NC	1
547		8	max	.031	3	.964	3	0	1	0	1	3596.938	15	NC	1
548			min	-.022	2	-1.306	2	0	1	0	1	82.25	2	NC	1
549		9	max	.03	3	1.077	3	0	1	0	1	3337.552	15	NC	1
550			min	-.022	2	-1.436	2	0	1	0	1	76.364	2	NC	1
551		10	max	.029	3	1.117	3	0	1	0	1	3259.447	15	NC	1
552			min	-.021	2	-1.48	2	0	1	0	1	74.65	2	NC	1
553		11	max	.028	3	1.089	3	0	1	0	1	3337.802	15	NC	1



Company : Schletter, Inc.  
Designer : HCV  
Job Number :  
Model Name : Standard PVMax Racking System

Nov 4, 2015

Checked By: \_\_\_\_\_

### Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
554			min	-.021	2	-1.436	2	0	1	0	1	76.681	2	NC	1
555		12	max	.028	3	.993	3	0	1	0	1	3597.524	15	NC	1
556			min	-.021	2	-1.301	2	0	1	0	1	83.298	2	NC	1
557		13	max	.027	3	.839	3	0	1	0	1	4105.079	15	NC	1
558			min	-.02	2	-1.085	2	0	1	0	1	96.479	2	NC	1
559		14	max	.026	3	.646	3	0	1	0	1	4982.26	15	NC	1
560			min	-.02	2	-.819	2	0	1	0	1	119.796	2	NC	1
561		15	max	.025	3	.432	3	0	1	0	1	6510.595	15	NC	1
562			min	-.02	2	-.532	2	0	1	0	1	161.794	2	NC	1
563		16	max	.025	3	.217	3	0	1	0	1	9380.615	15	NC	1
564			min	-.019	2	-.256	2	0	1	0	1	244.331	2	NC	1
565		17	max	.024	3	.018	3	0	1	0	1	NC	5	NC	1
566			min	-.019	2	-.021	2	0	1	0	1	432.426	2	NC	1
567		18	max	.024	3	.148	2	0	1	0	1	NC	5	NC	1
568			min	-.019	2	-.15	3	0	1	0	1	981.417	2	NC	1
569		19	max	.024	3	.281	2	0	1	0	1	NC	1	NC	1
570			min	-.019	2	-.298	3	0	1	0	1	NC	1	NC	1
571	M9	1	max	.011	3	.209	2	0	15	1.703e-2	3	NC	1	NC	1
572			min	-.007	2	-.06	3	0	1	-7.168e-3	2	NC	1	NC	1
573		2	max	.011	3	.101	2	.006	1	8.454e-3	3	NC	5	NC	1
574			min	-.007	2	-.028	3	0	15	-3.512e-3	2	1258.061	2	NC	1
575		3	max	.011	3	.018	3	.008	1	1.508e-4	1	NC	5	NC	1
576			min	-.007	2	-.014	2	0	15	-1.88e-5	10	609.733	2	NC	1
577		4	max	.011	3	.086	3	.007	1	4.141e-3	3	NC	15	NC	1
578			min	-.007	2	-.14	2	0	15	-3.961e-3	2	388.444	2	NC	1
579		5	max	.011	3	.17	3	.005	1	8.179e-3	3	NC	15	NC	1
580			min	-.007	2	-.271	2	0	15	-7.932e-3	2	282.417	2	NC	1
581		6	max	.011	3	.258	3	.002	1	1.222e-2	3	8787.568	15	NC	1
582			min	-.007	2	-.397	2	0	15	-1.19e-2	2	223.682	2	NC	1
583		7	max	.011	3	.343	3	0	3	1.626e-2	3	7430.422	15	NC	1
584			min	-.006	2	-.509	2	0	1	-1.587e-2	2	188.861	2	NC	1
585		8	max	.01	3	.412	3	0	15	2.029e-2	3	6625.923	15	NC	1
586			min	-.006	2	-.598	2	0	1	-1.985e-2	2	168.205	2	NC	1
587		9	max	.01	3	.458	3	0	1	2.087e-2	3	6204.296	15	NC	1
588			min	-.006	2	-.653	2	0	15	-2.228e-2	2	157.419	2	NC	1
589		10	max	.01	3	.474	3	0	15	1.912e-2	3	6075.2	15	NC	1
590			min	-.006	2	-.672	2	0	1	-2.369e-2	2	154.264	2	NC	1
591		11	max	.01	3	.463	3	0	15	1.737e-2	3	6203.863	15	NC	1
592			min	-.006	2	-.653	2	0	1	-2.509e-2	2	158.001	2	NC	1
593		12	max	.009	3	.424	3	0	1	1.511e-2	3	6624.991	15	NC	1
594			min	-.006	2	-.595	2	0	15	-2.403e-2	2	169.912	2	NC	1
595		13	max	.009	3	.362	3	0	1	1.209e-2	3	7428.772	15	NC	1
596			min	-.006	2	-.502	2	0	15	-1.927e-2	2	192.89	2	NC	1
597		14	max	.009	3	.282	3	0	15	9.067e-3	3	8784.757	15	NC	1
598			min	-.006	2	-.386	2	-.002	1	-1.452e-2	2	232.104	2	NC	1
599		15	max	.009	3	.192	3	0	15	6.046e-3	3	NC	15	NC	1
600			min	-.006	2	-.257	2	-.005	1	-9.763e-3	2	299.404	2	NC	1
601		16	max	.008	3	.098	3	0	15	3.025e-3	3	NC	15	NC	1
602			min	-.006	2	-.128	2	-.007	1	-5.008e-3	2	423.478	2	NC	1
603		17	max	.008	3	.006	3	0	15	3.167e-6	3	NC	5	NC	1
604			min	-.005	2	-.007	2	-.007	1	-5.009e-4	1	687.118	2	NC	1
605		18	max	.008	3	.094	2	0	15	2.164e-3	3	NC	5	NC	1
606			min	-.005	2	-.077	3	-.005	1	-6.235e-3	2	1452.515	2	NC	1
607		19	max	.008	3	.185	2	0	1	4.417e-3	3	NC	1	NC	1
608			min	-.005	2	-.155	3	0	15	-1.241e-2	2	NC	1	NC	1



Anchor Designer™  
Software  
Version 2.4.6025.0

Company:	Schletter, Inc.	Date:	8/1/2016
Engineer:	HCV	Page:	1/5
Project:	Standard PVMax - Worst Case, 14-40 Inch Width		
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 318-05  
Units: Imperial units

#### Anchor Information:

Anchor type: Bonded anchor  
Material: A193 Grade B8/B8M (304/316SS)  
Diameter (inch): 0.500  
Effective Embedment depth,  $h_{ef}$  (inch): 6.000  
Code report: IAPMO UES ER-263  
Anchor category: -  
Anchor ductility: Yes  
 $h_{min}$  (inch): 8.50  
 $c_{ac}$  (inch): 9.67  
 $c_{min}$  (inch): 1.75  
 $s_{min}$  (inch): 3.00

#### Load and Geometry

Load factor source: ACI 318 Section 9.2  
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

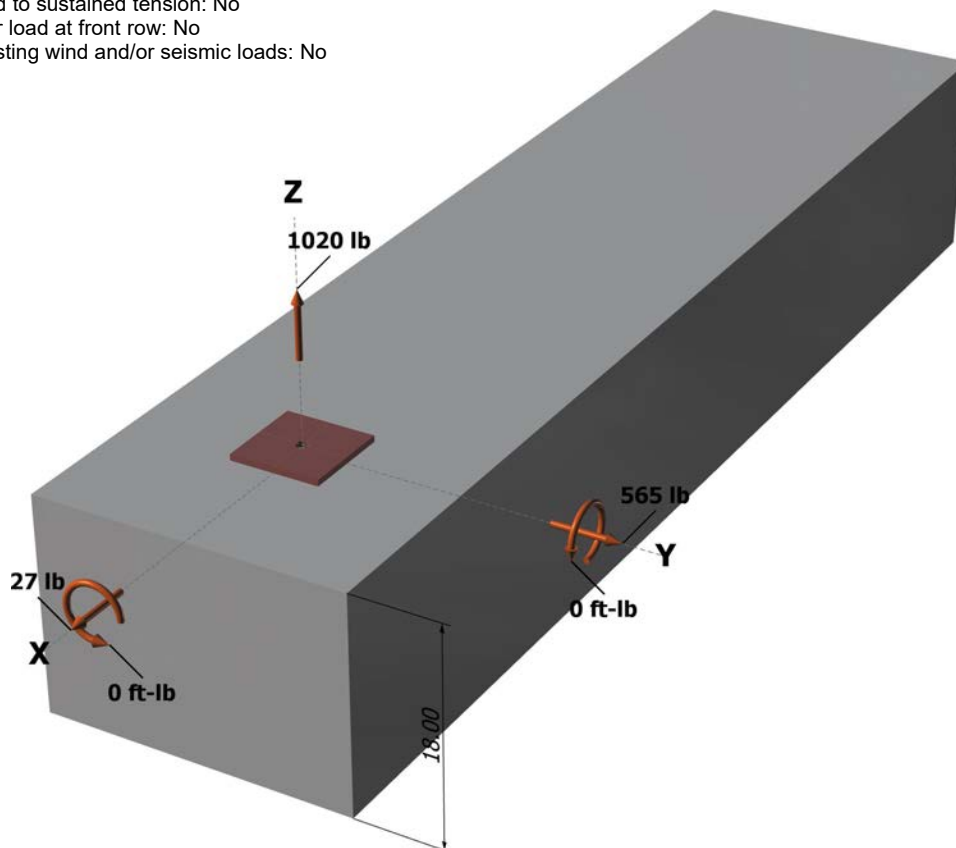
#### Base Material

Concrete: Normal-weight  
Concrete thickness,  $h$  (inch): 18.00  
State: Cracked  
Compressive strength,  $f'_c$  (psi): 2500  
 $\Psi_{c,v}$ : 1.0  
Reinforcement condition: B tension, B shear  
Supplemental reinforcement: Not applicable  
Reinforcement provided at corners: No  
Do not evaluate concrete breakout in tension: No  
Do not evaluate concrete breakout in shear: No  
Hole condition: Dry concrete  
Inspection: Periodic  
Temperature range, Short/Long: 110/75°F  
Ignore 6do requirement: Not applicable  
Build-up grout pad: No

#### Base Plate

Length x Width x Thickness (inch): 4.00 x 4.00 x 0.28

<Figure 1>



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

Simpson Strong-Tie Company Inc. 5956 W. Las Positas Boulevard Pleasanton, CA 94588 Phone: 925.560.9000 Fax: 925.847.3871 www.strongtie.com



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Address:			
Phone:			
E-mail:			

<Figure 2>



**Recommended Anchor**

Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)  
Code Report: IAPMO UES ER-263





# Anchor Designer™ Software Version 2.4.6025.0

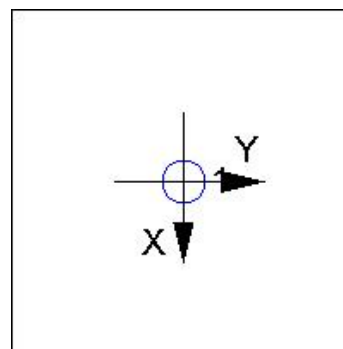
Company:	Schletter, Inc.	Date:	8/1/2016
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Address:			
Phone:			
E-mail:			

## 3. Resulting Anchor Forces

Anchor	Tension load, $N_{ua}$ (lb)	Shear load x, $V_{uax}$ (lb)	Shear load y, $V_{uay}$ (lb)	Shear load combined, $\sqrt{(V_{uax})^2 + (V_{uay})^2}$ (lb)
1	1020.0	27.0	565.0	565.6
Sum	1020.0	27.0	565.0	565.6

Maximum concrete compression strain (‰): 0.00  
Maximum concrete compression stress (psi): 0  
Resultant tension force (lb): 1020  
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. D.5.1)

$N_{sa}$ (lb)	$\phi$	$\phi N_{sa}$ (lb)
8095	0.75	6071

## 5. Concrete Breakout Strength of Anchor in Tension (Sec. D.5.2)

$$N_b = k_c \lambda \sqrt{f'_c} h_{ef}^{1.5} \text{ (Eq. D-7)}$$

$k_c$	$\lambda$	$f'_c$ (psi)	$h_{ef}$ (in)	$N_b$ (lb)
17.0	1.00	2500	5.247	10215

$$\phi N_{cb} = \phi (A_{Nc} / A_{Nco}) \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b \text{ (Sec. D.4.1 & Eq. D-4)}$$

$A_{Nc}$ (in <sup>2</sup> )	$A_{Nco}$ (in <sup>2</sup> )	$\psi_{ed,N}$	$\psi_{c,N}$	$\psi_{cp,N}$	$N_b$ (lb)	$\phi$	$\phi N_{cb}$ (lb)
220.36	247.75	0.967	1.00	1.000	10215	0.65	5710

## 6. Adhesive Strength of Anchor in Tension (AC308 Sec. 3.3)

$$\tau_{k,cr} = \tau_{k,cr} f_{short-term} K_{sat}$$

$\tau_{k,cr}$ (psi)	$f_{short-term}$	$K_{sat}$	$\tau_{k,cr}$ (psi)
1035	1.00	1.00	1035

$$N_{a0} = \tau_{k,cr} \pi d_a h_{ef} \text{ (Eq. D-16f)}$$

$\tau_{k,cr}$ (psi)	$d_a$ (in)	$h_{ef}$ (in)	$N_{a0}$ (lb)
1035	0.50	6.000	9755

$$\phi N_a = \phi (A_{Na} / A_{Na0}) \psi_{ed,Na} \psi_{p,Na} N_{a0} \text{ (Sec. D.4.1 & Eq. D-16a)}$$

$A_{Na}$ (in <sup>2</sup> )	$A_{Na0}$ (in <sup>2</sup> )	$\psi_{ed,Na}$	$\psi_{p,Na}$	$N_{a0}$ (lb)	$\phi$	$\phi N_a$ (lb)
109.66	109.66	1.000	1.000	9755	0.55	5365

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

Simpson Strong-Tie Company Inc. 5956 W. Las Positas Boulevard Pleasanton, CA 94588 Phone: 925.560.9000 Fax: 925.847.3871 www.strongtie.com



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Address:			
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### 8. Steel Strength of Anchor in Shear (Sec. D.6.1)

$V_{sa}$ (lb)	$\phi_{grout}$	$\phi$	$\phi_{grout}\phi V_{sa}$ (lb)
4855	1.0	0.65	3156

### 9. Concrete Breakout Strength of Anchor in Shear (Sec. D.6.2)

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

$$V_{by} = 7(l_e / d_a)^{0.2} \sqrt{d_a \lambda} \sqrt{f_c c_{a1}}^{1.5} \text{ (Eq. D-24)}$$

$l_e$ (in)	$d_a$ (in)	$\lambda$	$f_c$ (psi)	$c_{a1}$ (in)	$V_{by}$ (lb)
4.00	0.50	1.00	2500	7.00	6947

$$\phi V_{cby} = \phi (A_{vc} / A_{vco}) \psi_{ed,v} \psi_{c,v} \psi_{h,v} V_{by} \text{ (Sec. D.4.1 & Eq. D-21)}$$

$A_{vc}$ (in <sup>2</sup> )	$A_{vco}$ (in <sup>2</sup> )	$\psi_{ed,v}$	$\psi_{c,v}$	$\psi_{h,v}$	$V_{by}$ (lb)	$\phi$	$\phi V_{cby}$ (lb)
192.89	220.50	0.925	1.000	1.000	6947	0.70	3934

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

$$V_{bx} = 7(l_e / d_a)^{0.2} \sqrt{d_a \lambda} \sqrt{f_c c_{a1}}^{1.5} \text{ (Eq. D-24)}$$

$l_e$ (in)	$d_a$ (in)	$\lambda$	$f_c$ (psi)	$c_{a1}$ (in)	$V_{bx}$ (lb)
4.00	0.50	1.00	2500	7.87	8282

$$\phi V_{cbx} = \phi (A_{vc} / A_{vco}) \psi_{ed,v} \psi_{c,v} \psi_{h,v} V_{bx} \text{ (Sec. D.4.1 & Eq. D-21)}$$

$A_{vc}$ (in <sup>2</sup> )	$A_{vco}$ (in <sup>2</sup> )	$\psi_{ed,v}$	$\psi_{c,v}$	$\psi_{h,v}$	$V_{bx}$ (lb)	$\phi$	$\phi V_{cbx}$ (lb)
165.27	278.72	0.878	1.000	1.000	8282	0.70	3018

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

$$V_{by} = 7(l_e / d_a)^{0.2} \sqrt{d_a \lambda} \sqrt{f_c c_{a1}}^{1.5} \text{ (Eq. D-24)}$$

$l_e$ (in)	$d_a$ (in)	$\lambda$	$f_c$ (psi)	$c_{a1}$ (in)	$V_{by}$ (lb)
4.00	0.50	1.00	2500	7.00	6947

$$\phi V_{cbx} = \phi (2)(A_{vc} / A_{vco}) \psi_{ed,v} \psi_{c,v} \psi_{h,v} V_{by} \text{ (Sec. D.4.1, D.6.2.1(c) & Eq. D-21)}$$

$A_{vc}$ (in <sup>2</sup> )	$A_{vco}$ (in <sup>2</sup> )	$\psi_{ed,v}$	$\psi_{c,v}$	$\psi_{h,v}$	$V_{by}$ (lb)	$\phi$	$\phi V_{cbx}$ (lb)
192.89	220.50	1.000	1.000	1.000	6947	0.70	8508

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

$$V_{bx} = 7(l_e / d_a)^{0.2} \sqrt{d_a \lambda} \sqrt{f_c c_{a1}}^{1.5} \text{ (Eq. D-24)}$$

$l_e$ (in)	$d_a$ (in)	$\lambda$	$f_c$ (psi)	$c_{a1}$ (in)	$V_{bx}$ (lb)
4.00	0.50	1.00	2500	7.87	8282

$$\phi V_{cby} = \phi (2)(A_{vc} / A_{vco}) \psi_{ed,v} \psi_{c,v} \psi_{h,v} V_{bx} \text{ (Sec. D.4.1, D.6.2.1(c) & Eq. D-21)}$$

$A_{vc}$ (in <sup>2</sup> )	$A_{vco}$ (in <sup>2</sup> )	$\psi_{ed,v}$	$\psi_{c,v}$	$\psi_{h,v}$	$V_{bx}$ (lb)	$\phi$	$\phi V_{cby}$ (lb)
165.27	278.72	1.000	1.000	1.000	8282	0.70	6875

### 10. Concrete Pryout Strength of Anchor in Shear (Sec. D.6.3)

$$\phi V_{cp} = \phi \min[k_{cp} N_a ; k_{cp} N_{cb}] = \phi \min[k_{cp} (A_{Na} / A_{Na0}) \psi_{ed,Na} \psi_{p,Na} N_{a0} ; k_{cp} (A_{Nc} / A_{Nco}) \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b] \text{ (Eq. D-30a)}$$

$k_{cp}$	$A_{Na}$ (in <sup>2</sup> )	$A_{Na0}$ (in <sup>2</sup> )	$\psi_{ed,Na}$	$\psi_{p,Na}$	$N_{a0}$ (lb)	$N_a$ (lb)
2.0	109.66	109.66	1.000	1.000	9755	9755

$A_{Nc}$ (in <sup>2</sup> )	$A_{Nco}$ (in <sup>2</sup> )	$\psi_{ed,N}$	$\psi_{c,N}$	$\psi_{cp,N}$	$N_b$ (lb)	$N_{cb}$ (lb)	$\phi$	$\phi V_{cp}$ (lb)
220.36	247.75	0.967	1.000	1.000	10215	8785	0.70	12298





Company:	Schletter, Inc.	Date:	8/1/2016
Engineer:	HCV	Page:	5/5
Project:	Standard PVMax - Worst Case, 14-40 Inch Width		
Address:			
Phone:			
E-mail:			

## 11. Results

### Interaction of Tensile and Shear Forces (Sec. D.7)

Tension	Factored Load, $N_{ua}$ (lb)	Design Strength, $\phi N_n$ (lb)	Ratio	Status	
Steel	1020	6071	0.17	Pass	
Concrete breakout	1020	5710	0.18	Pass	
<b>Adhesive</b>	<b>1020</b>	<b>5365</b>	<b>0.19</b>	<b>Pass (Governs)</b>	
Shear	Factored Load, $V_{ua}$ (lb)	Design Strength, $\phi V_n$ (lb)	Ratio	Status	
<b>Steel</b>	<b>566</b>	<b>3156</b>	<b>0.18</b>	<b>Pass (Governs)</b>	
T Concrete breakout y+	565	3934	0.14	Pass	
T Concrete breakout x+	27	3018	0.01	Pass	
Concrete breakout y+	27	8508	0.00	Pass	
Concrete breakout x+	565	6875	0.08	Pass	
Concrete breakout, combined	-	-	0.14	Pass	
Pryout	566	12298	0.05	Pass	
Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. D.7.1	0.19	0.00	19.0 %	1.0	Pass

**AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS) with hef = 6.000 inch meets the selected design criteria.**

## 12. Warnings

- This temperature range is currently outside the scope of ACI 318-11 and ACI 355.4, and is provided for historical purposes.
- Designer must exercise own judgement to determine if this design is suitable.
- Refer to manufacturer's product literature for hole cleaning and installation instructions.





Anchor Designer™  
Software  
Version 2.4.6025.0

Company:	Schletter, Inc.	Date:	8/1/2016
Engineer:	HCV	Page:	1/5
Project:	Standard PVMax - Worst Case, 32-40 Inch Width		
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 318-05  
Units: Imperial units

#### Anchor Information:

Anchor type: Bonded anchor  
Material: A193 Grade B8/B8M (304/316SS)  
Diameter (inch): 0.500  
Effective Embedment depth,  $h_{ef}$  (inch): 6.000  
Code report: IAPMO UES ER-263  
Anchor category: -  
Anchor ductility: Yes  
 $h_{min}$  (inch): 8.50  
 $c_{ac}$  (inch): 9.67  
 $c_{min}$  (inch): 1.75  
 $s_{min}$  (inch): 3.00

#### Load and Geometry

Load factor source: ACI 318 Section 9.2  
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

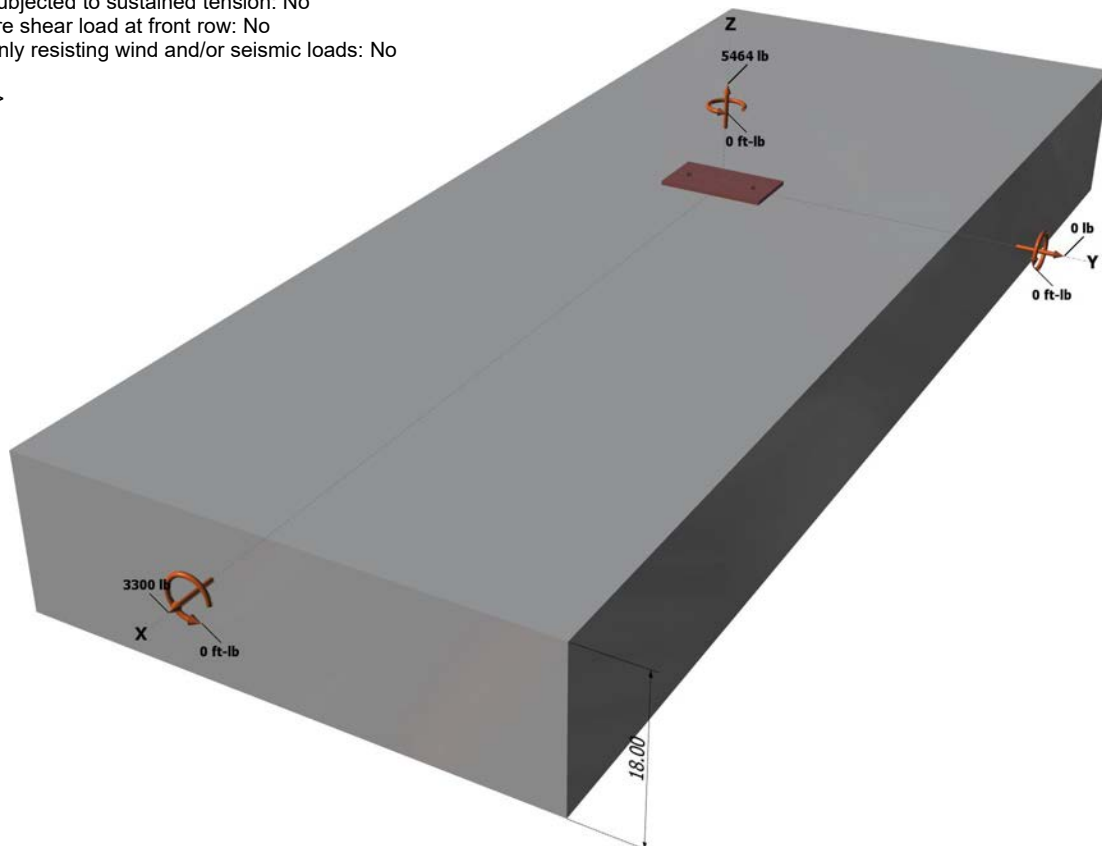
#### Base Material

Concrete: Normal-weight  
Concrete thickness,  $h$  (inch): 18.00  
State: Cracked  
Compressive strength,  $f'_c$  (psi): 2500  
 $\Psi_{c,v}$ : 1.0  
Reinforcement condition: B tension, B shear  
Supplemental reinforcement: Not applicable  
Reinforcement provided at corners: No  
Do not evaluate concrete breakout in tension: No  
Do not evaluate concrete breakout in shear: No  
Hole condition: Dry concrete  
Inspection: Periodic  
Temperature range, Short/Long: 110/75°F  
Ignore 6do requirement: Not applicable  
Build-up grout pad: No

#### Base Plate

Length x Width x Thickness (inch): 4.00 x 7.00 x 0.28

<Figure 1>



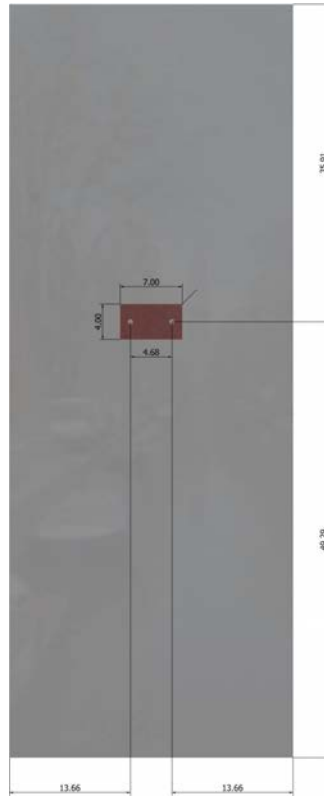
Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.

Simpson Strong-Tie Company Inc. 5956 W. Las Positas Boulevard Pleasanton, CA 94588 Phone: 925.560.9000 Fax: 925.847.3871 www.strongtie.com



Company:	Schletter, Inc.	Date:	8/1/2016
Engineer:	HCV	Page:	2/5
Project:	Standard PVMax - Worst Case, 32-40 Inch Width		
Address:			
Phone:			
E-mail:			

<Figure 2>



**Recommended Anchor**

Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)  
Code Report: IAPMO UES ER-263





# Anchor Designer™ Software Version 2.4.6025.0

Company:	Schletter, Inc.	Date:	8/1/2016
Engineer:	HCV	Page:	3/5
Project:	Standard PVMax - Worst Case, 32-40 Inch Width		
Address:			
Phone:			
E-mail:			

## 3. Resulting Anchor Forces

Anchor	Tension load, $N_{ua}$ (lb)	Shear load x, $V_{uax}$ (lb)	Shear load y, $V_{uay}$ (lb)	Shear load combined, $\sqrt{(V_{uax})^2 + (V_{uay})^2}$ (lb)
1	2732.0	1650.0	0.0	1650.0
2	2732.0	1650.0	0.0	1650.0
Sum	5464.0	3300.0	0.0	3300.0

Maximum concrete compression strain (%): 0.00

Maximum concrete compression stress (psi): 0

Resultant tension force (lb): 5464

Resultant compression force (lb): 0

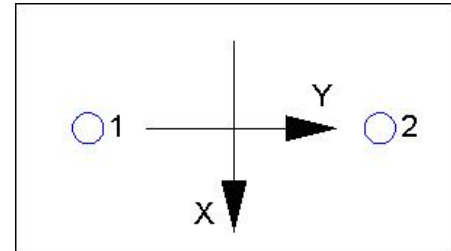
Eccentricity of resultant tension forces in x-axis,  $e'_{Nx}$  (inch): 0.00

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. D.5.1)

$N_{sa}$ (lb)	$\phi$	$\phi N_{sa}$ (lb)
8095	0.75	6071

## 5. Concrete Breakout Strength of Anchor in Tension (Sec. D.5.2)

$$N_b = k_c \lambda \sqrt{f'_c} h_{ef}^{1.5} \text{ (Eq. D-7)}$$

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

$$\phi N_{cbg} = \phi (A_{Nc} / A_{Nco}) \psi_{ec,N} \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b \text{ (Sec. D.4.1 & Eq. D-5)}$$

$A_{Nc}$ (in <sup>2</sup> )	$A_{Nco}$ (in <sup>2</sup> )	$\psi_{ec,N}$	$\psi_{ed,N}$	$\psi_{c,N}$	$\psi_{cp,N}$	$N_b$ (lb)	$\phi$	$\phi N_{cbg}$ (lb)
408.24	324.00	1.000	1.000	1.00	1.000	12492	0.65	10231

## 6. Adhesive Strength of Anchor in Tension (AC308 Sec. 3.3)

$$\tau_{k,cr} = \tau_{k,crf} \text{ short-term } K_{sat}$$

$\tau_{k,cr}$ (psi)	$f_{\text{short-term}}$	$K_{sat}$	$\tau_{k,cr}$ (psi)
1035	1.00	1.00	1035

$$N_{a0} = \tau_{k,cr} \pi d_a h_{ef} \text{ (Eq. D-16f)}$$

$\tau_{k,cr}$ (psi)	$d_a$ (in)	$h_{ef}$ (in)	$N_{a0}$ (lb)
1035	0.50	6.000	9755

$$\phi N_{ag} = \phi (A_{Na} / A_{Na0}) \psi_{ed,Na} \psi_{g,Na} \psi_{ec,Na} \psi_{p,Na} N_{a0} \text{ (Sec. D.4.1 & Eq. D-16b)}$$

$A_{Na}$ (in <sup>2</sup> )	$A_{Na0}$ (in <sup>2</sup> )	$\psi_{ed,Na}$	$\psi_{g,Na}$	$\psi_{ec,Na}$	$\psi_{p,Na}$	$N_{a0}$ (lb)	$\phi$	$\phi N_{ag}$ (lb)
158.66	109.66	1.000	1.043	1.000	1.000	9755	0.55	8093

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

Simpson Strong-Tie Company Inc. 5956 W. Las Positas Boulevard Pleasanton, CA 94588 Phone: 925.560.9000 Fax: 925.847.3871 www.strongtie.com



**Anchor Designer™**  
Software  
Version 2.4.6025.0

Company:	Schletter, Inc.	Date:	8/1/2016
Engineer:	HCV	Page:	4/5
Project:	Standard PVMax - Worst Case, 32-40 Inch Width		
Address:			
Phone:			
E-mail:			

### 8. Steel Strength of Anchor in Shear (Sec. D.6.1)

$V_{sa}$ (lb)	$\phi_{grout}$	$\phi$	$\phi_{grout}\phi V_{sa}$ (lb)
4855	1.0	0.65	3156

### 9. Concrete Breakout Strength of Anchor in Shear (Sec. D.6.2)

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

$$V_{bx} = 7(l_e / d_a)^{0.2} \sqrt{d_a \lambda} \sqrt{f'_c c_{a1}^{1.5}} \text{ (Eq. D-24)}$$

$l_e$ (in)	$d_a$ (in)	$\lambda$	$f'_c$ (psi)	$c_{a1}$ (in)	$V_{bx}$ (lb)
4.00	0.50	1.00	2500	12.00	15593

$$\phi V_{cbgx} = \phi (A_{Vc} / A_{Vco}) \psi_{ec,V} \psi_{ed,V} \psi_{c,V} \psi_{h,V} V_{bx} \text{ (Sec. D.4.1 \& Eq. D-22)}$$

$A_{Vc}$ (in <sup>2</sup> )	$A_{Vco}$ (in <sup>2</sup> )	$\psi_{ec,V}$	$\psi_{ed,V}$	$\psi_{c,V}$	$\psi_{h,V}$	$V_{bx}$ (lb)	$\phi$	$\phi V_{cbgx}$ (lb)
576.00	648.00	1.000	0.928	1.000	1.000	15593	0.70	9001

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

$$V_{by} = 7(l_e / d_a)^{0.2} \sqrt{d_a \lambda} \sqrt{f'_c c_{a1}^{1.5}} \text{ (Eq. D-24)}$$

$l_e$ (in)	$d_a$ (in)	$\lambda$	$f'_c$ (psi)	$c_{a1}$ (in)	$V_{by}$ (lb)
4.00	0.50	1.00	2500	13.66	18939

$$\phi V_{cbx} = \phi (2)(A_{Vc} / A_{Vco}) \psi_{ed,V} \psi_{c,V} \psi_{h,V} V_{by} \text{ (Sec. D.4.1, D.6.2.1(c) \& Eq. D-21)}$$

$A_{Vc}$ (in <sup>2</sup> )	$A_{Vco}$ (in <sup>2</sup> )	$\psi_{ed,V}$	$\psi_{c,V}$	$\psi_{h,V}$	$V_{by}$ (lb)	$\phi$	$\phi V_{cbx}$ (lb)
737.64	839.68	1.000	1.000	1.000	18939	0.70	23292

### 10. Concrete Pryout Strength of Anchor in Shear (Sec. D.6.3)

$$\phi V_{cp} = \phi \min |k_{cp} N_{ag}; k_{cp} N_{cbg}| = \phi \min |k_{cp} (A_{Na} / A_{Na0}) \psi_{ed,Na} \psi_{g,Na} \psi_{ec,Na} \psi_{p,Na} N_{a0}; k_{cp} (A_{Nc} / A_{Nco}) \psi_{ec,N} \psi_{ed,N} \psi_{c,N} \psi_{cp,N} N_b| \text{ (Eq. D-30b)}$$

$k_{cp}$	$A_{Na}$ (in <sup>2</sup> )	$A_{Na0}$ (in <sup>2</sup> )	$\psi_{ed,Na}$	$\psi_{g,Na}$	$\psi_{ec,Na}$	$\psi_{p,Na}$	$N_{a0}$ (lb)	$N_a$ (lb)
2.0	158.66	109.66	1.000	1.043	1.000	1.000	9755	14715

$A_{Nc}$ (in <sup>2</sup> )	$A_{Nco}$ (in <sup>2</sup> )	$\psi_{ec,N}$	$\psi_{ed,N}$	$\psi_{c,N}$	$\psi_{cp,N}$	$N_b$ (lb)	$N_{cb}$ (lb)	$\phi$
408.24	324.00	1.000	1.000	1.000	1.000	12492	15740	0.70

$$\frac{\phi V_{cp}}{20601}$$

### 11. Results

#### Interaction of Tensile and Shear Forces (Sec. D.7)

Tension	Factored Load, $N_{ua}$ (lb)	Design Strength, $\phi N_n$ (lb)	Ratio	Status
Steel	2732	6071	0.45	Pass
Concrete breakout	5464	10231	0.53	Pass
<b>Adhesive</b>	<b>5464</b>	<b>8093</b>	<b>0.68</b>	<b>Pass (Governs)</b>
Shear	Factored Load, $V_{ua}$ (lb)	Design Strength, $\phi V_n$ (lb)	Ratio	Status
<b>Steel</b>	<b>1650</b>	<b>3156</b>	<b>0.52</b>	<b>Pass (Governs)</b>
T Concrete breakout x+	3300	9001	0.37	Pass

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



Anchor Designer™  
Software  
Version 2.4.6025.0

Company:	Schletter, Inc.	Date:	8/1/2016
Engineer:	HCV	Page:	5/5
Project:	Standard PVMax - Worst Case, 32-40 Inch Width		
Address:			
Phone:			
E-mail:			

Concrete breakout y-	1650	23292	0.07	Pass
Pryout	3300	20601	0.16	Pass

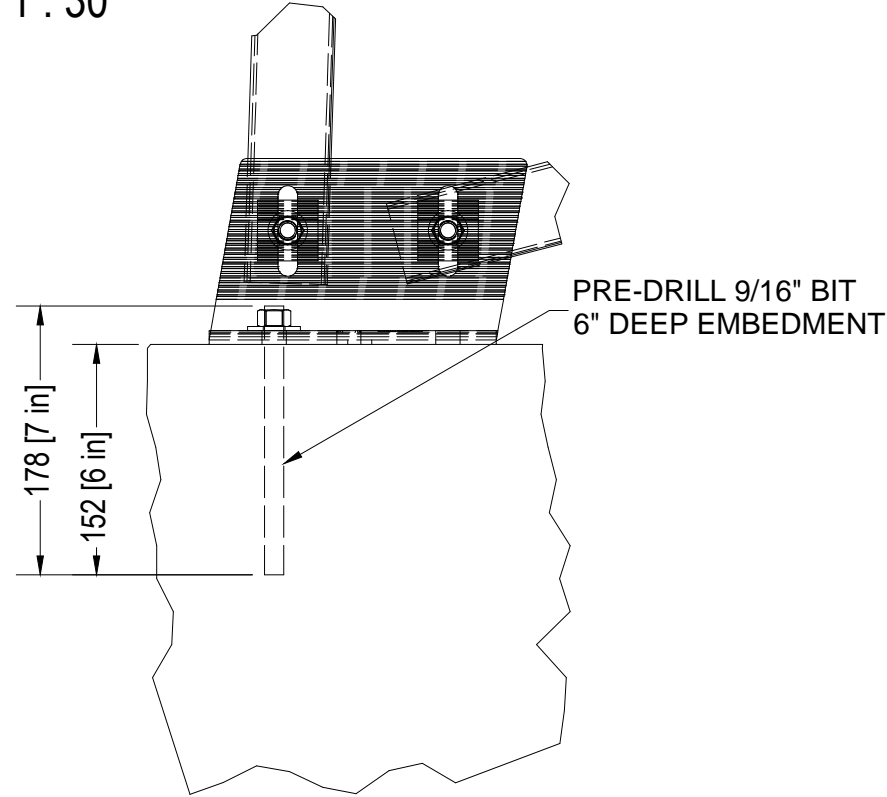
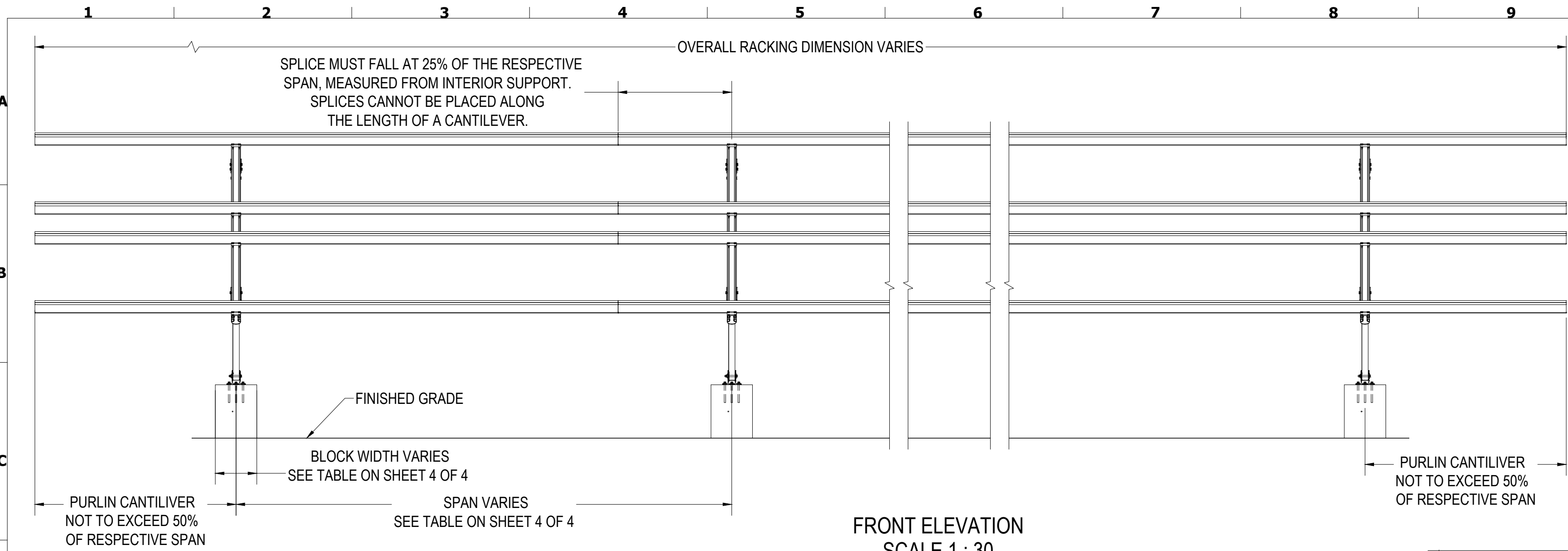
Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. D.7.3	0.68	0.52	119.8 %	1.2	Pass

**AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS) with hef = 6.000 inch meets the selected design criteria.**

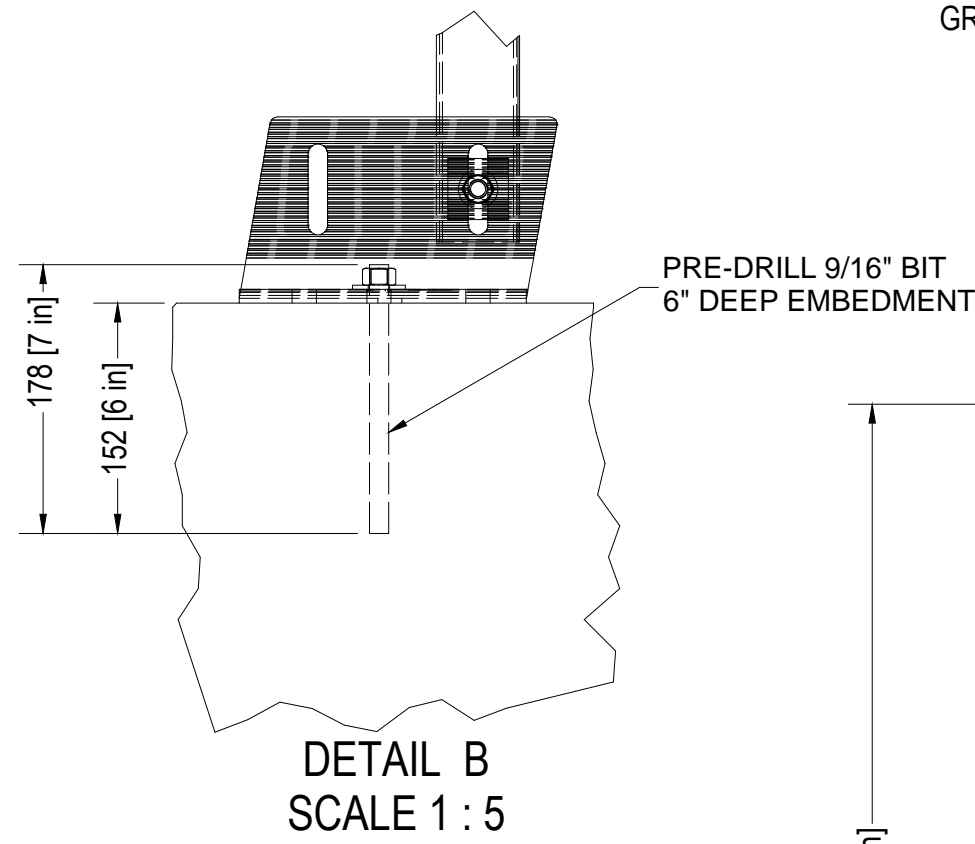
## 12. Warnings

- This temperature range is currently outside the scope of ACI 318-11 and ACI 355.4, and is provided for historical purposes.
- Designer must exercise own judgement to determine if this design is suitable.
- Refer to manufacturer's product literature for hole cleaning and installation instructions.

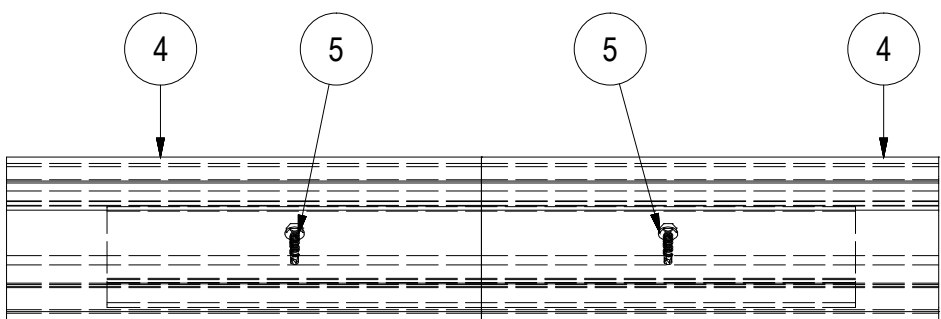




DETAIL A  
SCALE 1 : 5



DETAIL B  
SCALE 1 : 5



SPLICE DETAIL  
SCALE 1 : 5

PARTS LIST			
ITEM	PART NUMBER	DESCRIPTION	
1	146002-320	Standard, PvMax3, 72 Cell, 20°, Triangle	
2	146002-325	Standard, PvMax3, 72 Cell, 25°, Triangle	
3	146002-330	Standard, PvMax3, 72 Cell, 30°, Triangle	
4	124303-001	Rail, S1.5, Custom	
5	129303-000	Splice, S1.5, Kit	

NO.	DRAWN:	CHECKED:	REVIEWED:	APPROVED:	REVISIONS:
0	BushBr 9/27/2014				New Drawing
1	BushBr 3/12/2015				Notes, embedments New Tables, and Sheets
2	BushBr 11/5/2015				Change Ballast Size, Max Dead Load, Add 2015
3	BushBr 11/18/2015				Change Ballast Size
4	VasqHu 08/01/2016				Updated Load Tables
5					
6					
7					
8					

Client:  
**Schletter Inc**  
2201 North Forbes Boulevard  
Tucson, AZ 85745



1001 COMMERCE CENTER DR., SHELBY, NC 28150  
TEL: (704) 595 - 4200 | Fax: (704) 595 - 4210

EMAIL: MAIL@SCHLETTER.US  
WWW.SCHLETTER.US

Standard PvMax, 72 Cell, 20° - 30°  
Racking Structure  
Dimensions and Specifications

ISSUED BY: SCHLETTER INC.  
PROPRIETARY AND CONFIDENTIAL

Project Site:  
**Schletter Inc**  
1001 Commerce Center Dr  
Shelby, NC 28150

Drawing Number:

**v.01**

JOB NUMBER: v  
SHEET: 1 of 4

SCALE:  
SEE DRAWING VIEWS

DESIGN CRITERIA:  
FOR STRUCTURAL DESIGN INFORMATION AND APPLICABLE BUILDING CODES,  
REFERENCE ACCOMPANYING LETTER OF ACCEPTANCE AND CALCULATIONS.

LOADS:  
MODULE DEAD LOAD = MAX 3.0 PSF, MIN 1.75 PSF  
SNOW LOAD = SEE TABLE FOR SPECIFIC SNOW LOAD (Is = 1.00, Ct= 1.20, Ce = 0.90, Cs = SEE TABLE)

WIND DESIGN:  
DESIGN BASED UPON WIND TUNNEL TEST REPORT # RC 1127/0611\_1e  
BASIC WIND SPEED = SEE TABLE FOR SPECIFIC WIND SPEED  
EXPOSURE: C  
RISK CATEGORY = II (ASCE 7-10)  
lw = 1.0 (ASCE 7-05)

SEISMIC LOADS:  
SEISMIC DESIGN CATEGORY: E  
SOIL SITE CLASS = D  
Sds = 1.67 SD1 = 1.0  
Ie = 1.0 SS = 2.5  
S1 = 1.0 R = 1.25

INSTALLATION TOLERANCES:  
ARRAY TILT ANGULAR TOLERANCE ±1.0°  
LATERAL SUPPORT PLACEMENT IS ±2.5"  
SUPPORT HEIGHT VARIATION TOLERANCE IS ±0.5"  
TOTAL LATERAL DEVIATION OF SUPPORTS WITHIN AN ARRAY IS ±2.5"

GENERAL:  
1. THE STRUCTURAL CONSTRUCTION DOCUMENTS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE METHOD OR SEQUENCE OF CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR AND PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO, BRACING, SHORING FOR LOADS DUE TO CONSTRUCTION EQUIPMENT, ETC. THE STRUCTURAL ENGINEER SHALL NOT BE RESPONSIBLE FOR THE CONTRACTOR'S MEANS, METHODS, TECHNIQUES, SEQUENCES FOR PROCEDURE OF CONSTRUCTION, OR THE SAFETY PRECAUTIONS AND THE PROGRAMS INCIDENT THERE TO (NOR SHALL OBSERVATION VISITS TO THE SITE INCLUDE INSPECTION OF THESE ITEMS). THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN AND IMPLEMENTATION OF ALL SCAFFOLDING, BRACING AND SHORING.  
2. WHERE REFERENCE IS MADE TO VARIOUS TEST STANDARDS FOR MATERIALS, SUCH STANDARDS SHALL BE THE LATEST EDITION AND/OR ADDENDA.

ALUMINUM:  
1. ALL ALUMINUM SHALL CONFORM WITH THE LATEST ALUMINUM DESIGN HANDBOOK.  
2. ALL ALUMINUM SECTIONS SHALL BE:  
a. SEMI-HOLLOW AND HOLLOW SHALL BE 6105-T5, 6005A-T6, OR 6005-T5  
b. SOLIDS SHALL BE 6063-T6

STEEL:  
1. ALL BOLTS AND WASHERS SHALL BE 304 STAINLESS STEEL CLASS 2 (A2-70).  
2. ALL NUTS SHALL BE 316 STAINLESS STEEL CLASS 2 (A4-70).

TORQUE:  
TORX BOLT FOR RAPID 2+ MODULE CLAMPS IS 14 N-M (10.5 FT-LBS)  
M6 AND 1/4" BOLT TORQUE IS 6 N-M (4.5 FT-LBS)  
M8 AND 5/16" BOLT TORQUE IS 14 N-M (10.5 FT-LBS)  
M10 AND 3/8" BOLT TORQUE IS 30 N-M (23 FT-LBS)  
M12 AND 1/2" BOLT TORQUE IS 50 N-M (37 FT-LBS)  
M16 AND 5/8" BOLT TORQUE IS 121 N-M (89 FT-LBS)  
M20 AND 3/4" BOLT TORQUE IS 244 N-M (180 FT-LBS)

MODULE SIZE:  
RACKING SYSTEM DESIGNED FOR MODULE SIZE: MINIMUM = 1900 X 970  
VERTICAL MODULE GAP: 23 mm MAXIMUM = 2000 X 1050  
HORIZONTAL MODULE GAP: 5 mm

NOTE:  
1. MODULES MUST BE CENTERED ON ARRAY  
2. ARRAY LENGTH NOT TO EXCEED 150 FT  
3. RECOMMENDED SPEED FOR INSTALLATION OF SELF-DRILLING 1/4" DIAMETER SCREWS IS 1200-1800 RPMs.

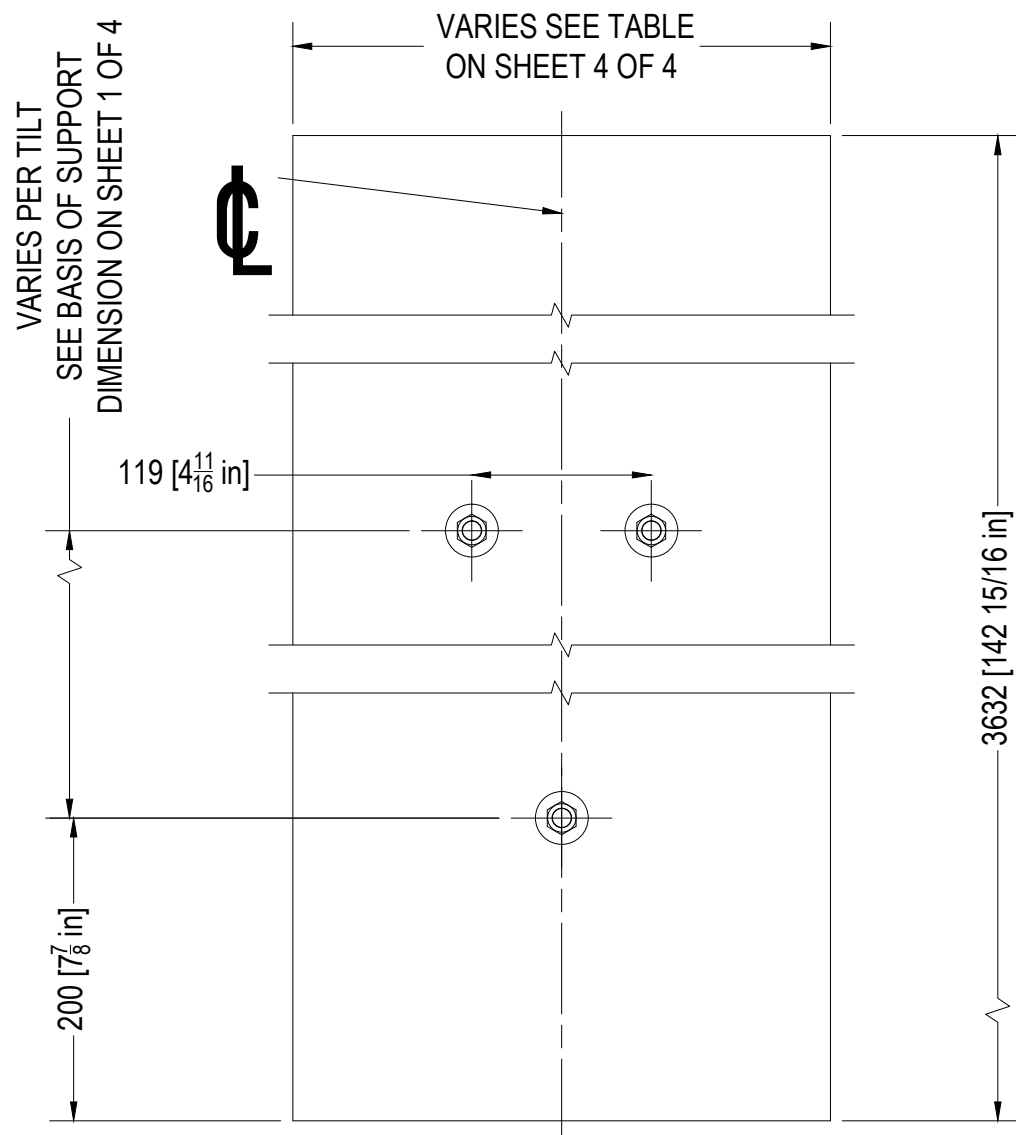
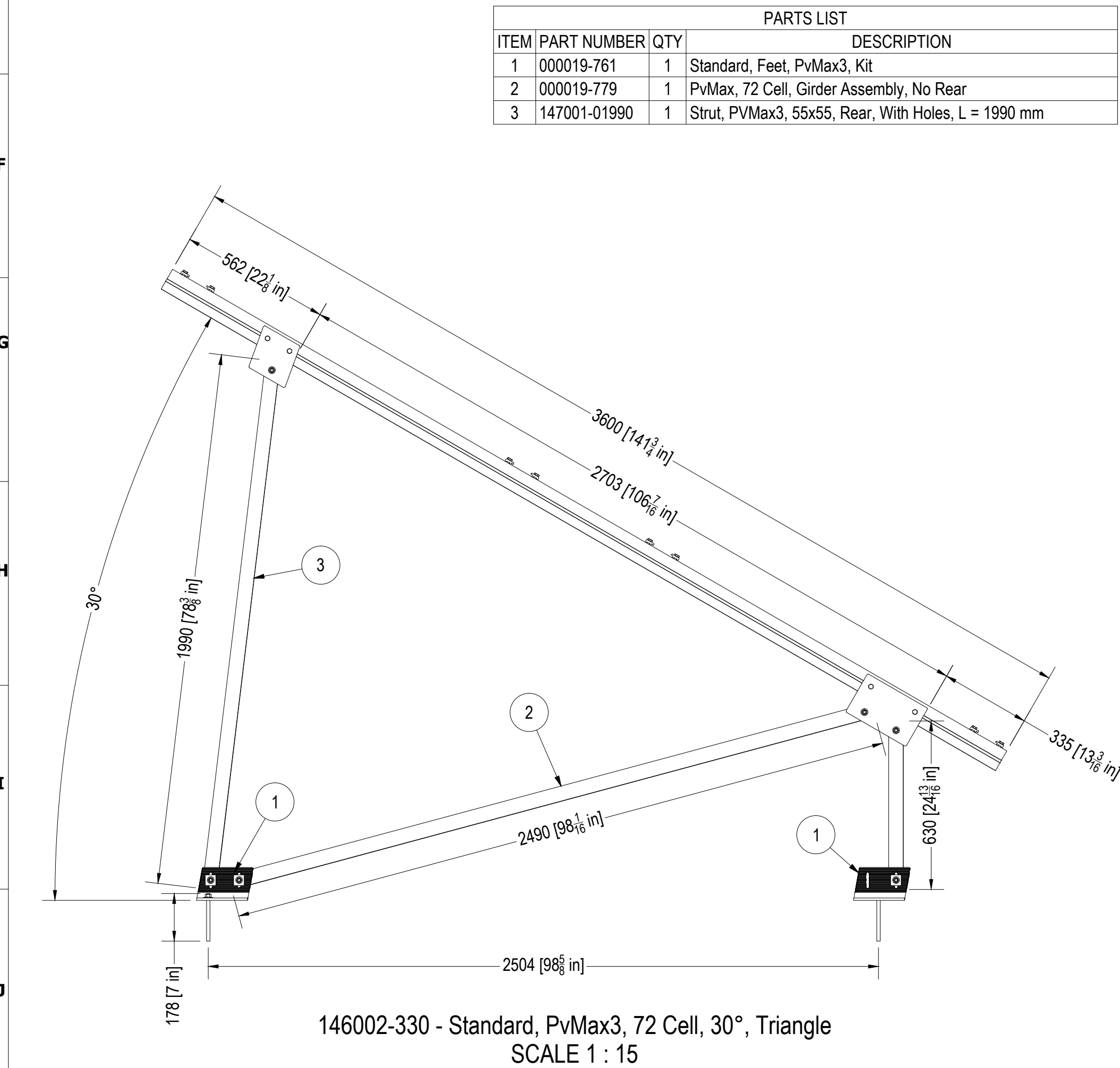
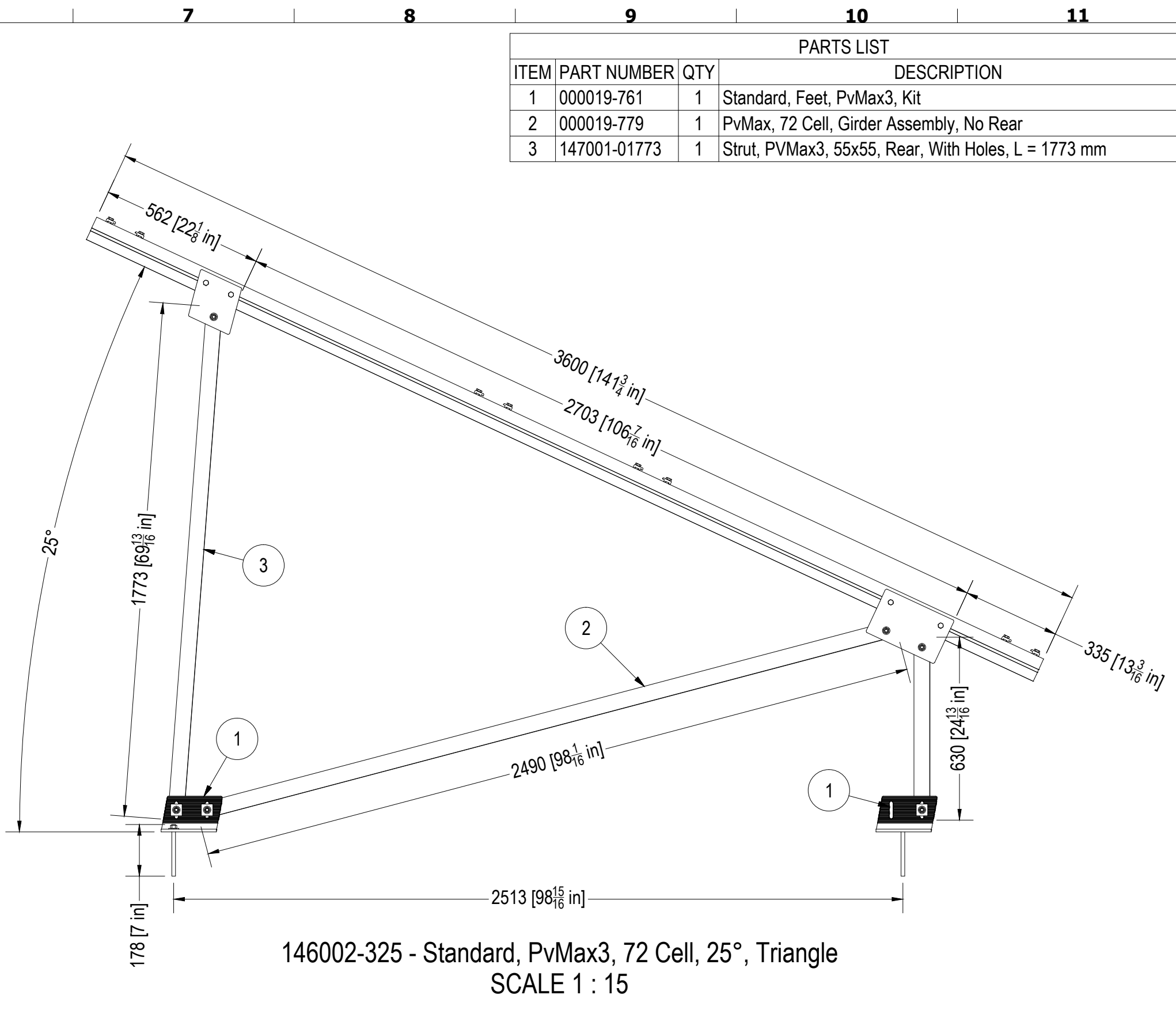
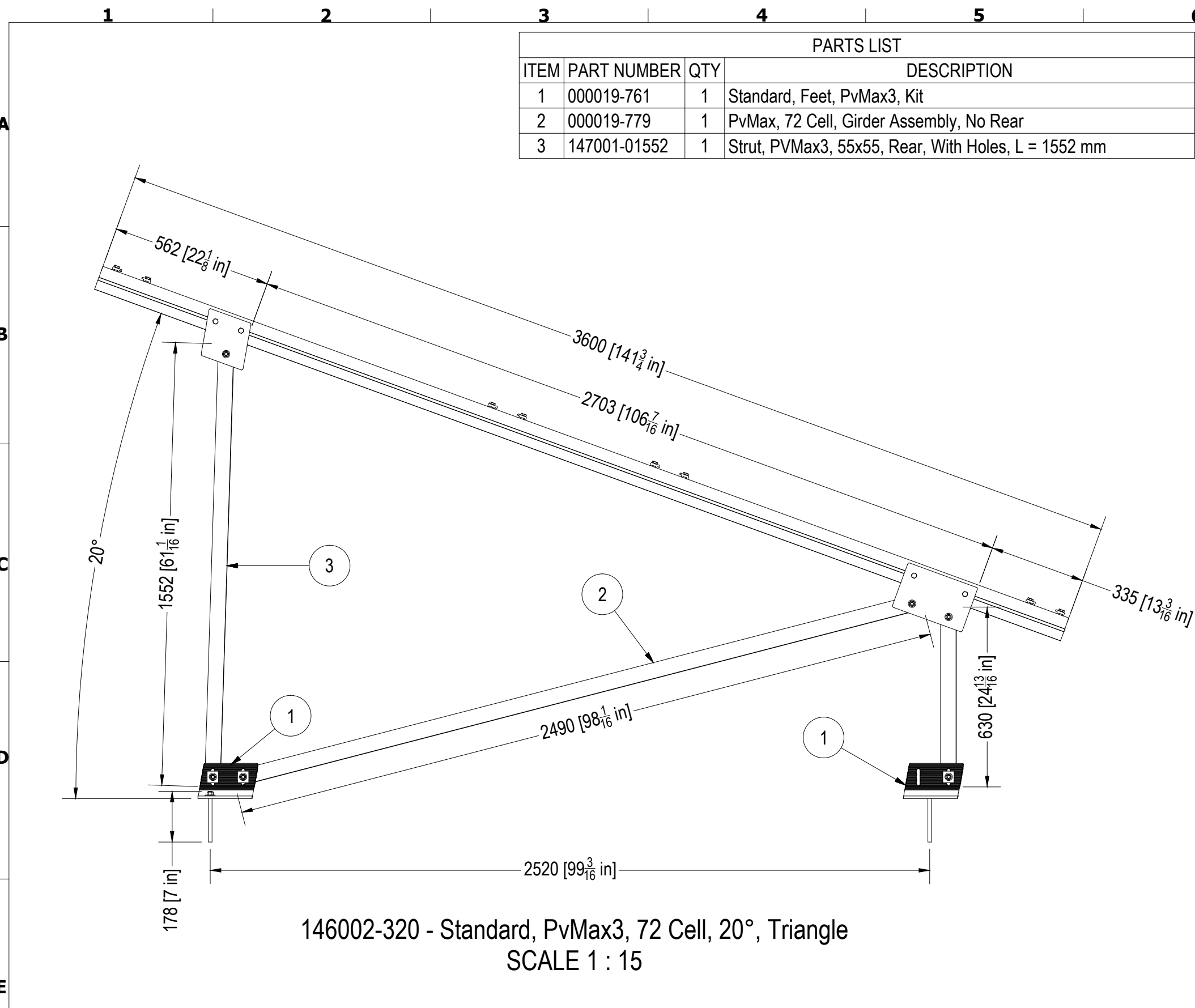
FOUNDATIONS:  
1. NO SOILS REPORT PROVIDED. FOUNDATION DESIGN IS BASED ON MINIMUM IBC SOIL BEARING VALUE = 1500 PSF PER IBC TABLE 1804.2 (2003, 2006), & 1806.2 (2009, 2012, 2015). BALLAST BLOCKS SHALL BE BUILT ON UNDISTURBED SOIL OR COMPACTED FILL MATERIAL NOT LESS THAN 12" IN DEPTH.  
2. THE STRUCTURAL ENGINEER IS NOT RESPONSIBLE FOR ANY GEOTECHNICAL ASPECTS OF THIS PROJECT. IT IS RECOMMENDED THAT THE OWNER RETAIN A REGISTERED GEOTECHNICAL ENGINEER TO CONDUCT A GEOTECHNICAL INVESTIGATION AND PREPARE A REPORT WITH RECOMMENDATIONS FOR FOUNDATION AND EARTHWORK PROCEDURES.

CONCRETE:  
1. ALL CONCRETE WORK SHALL CONFORM WITH THE REQUIREMENTS OF ACI 301 AND ACI 318. CEMENT PER ASTM C150, TYPE II. AGGREGATE PER ASTM C33. CONCRETE SHALL BE READY MIXED IN ACCORDANCE WITH ASTM C94 AND SHALL BE DESIGNED FOR A MINIMUM 28 DAY COMPRESSIVE STRENGTH AS FOLLOWS:  
FOUNDATIONS ..... 3,000 PSI\*  
\*DESIGNED FOR 2,500 PSI  
2. FIBER REINFORCEMENT USED IN CONCRETE SHALL BE BASF MASTERFIBER MAC 100 OR EQUIVALENT. THE AMOUNT TO BE MIXED IN CONCRETE IS 3LB/CU.YD

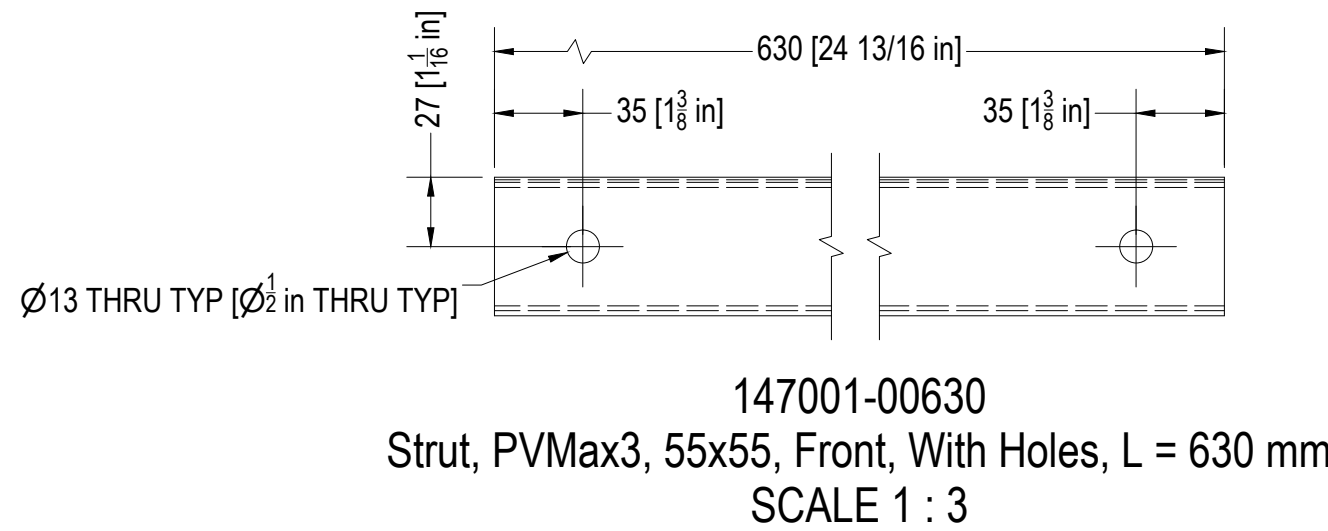
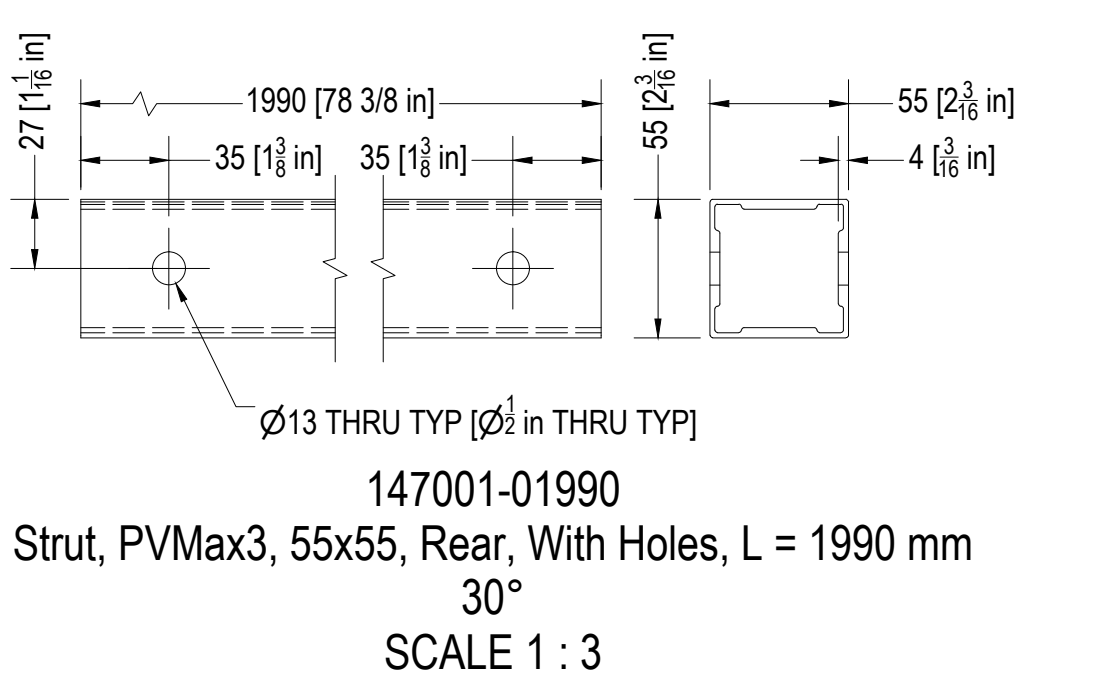
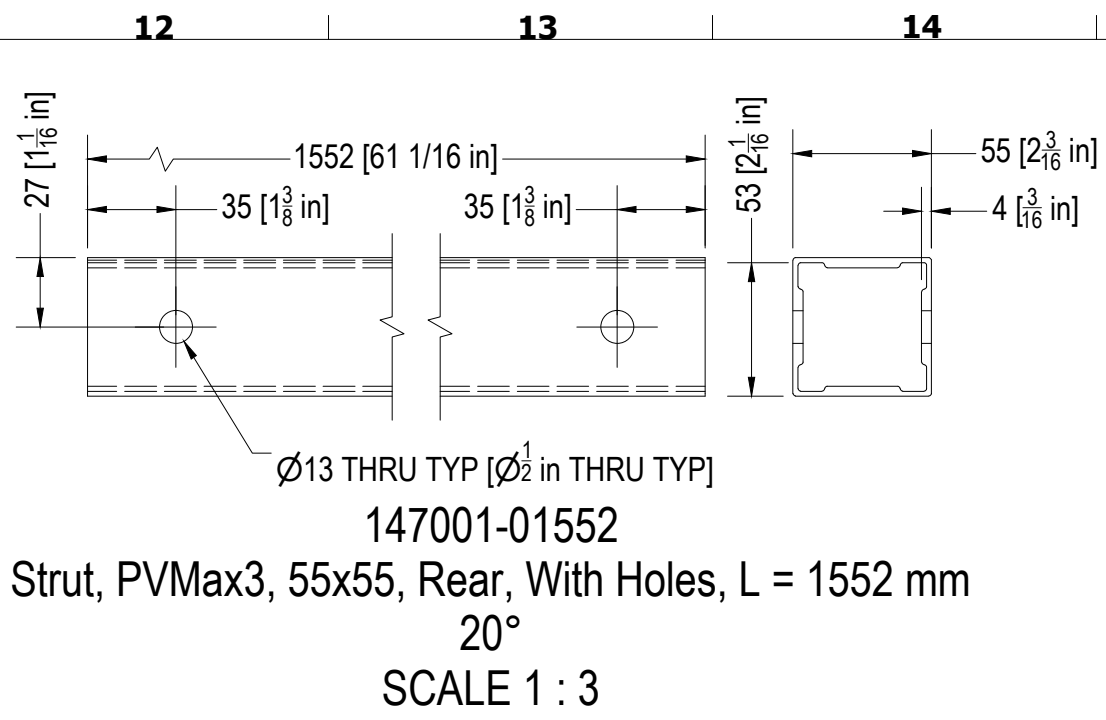
REINFORCING:  
1. REINFORCING STEEL SHALL CONFORM TO ASTM A615 (Fy=60ksi) DEFORMED BARS. NO TACK WELDING OF REINFORCING BARS ALLOWED WITHOUT PRIOR REVIEW OF PROCEDURE WITH THE STRUCTURAL ENGINEER. LATEST ACI CODE AND DETAILING MANUAL APPLY.  
2. ACCURATELY PLACE OR SUPPORT ALL REINFORCING TO HAVE A CLEAR CONCRETE COVERAGE OF 3"

POST-INSTALLED ANCHORS:  
1. ADHESIVE BOLTS OR DOWELS SHALL BE A THREADED ROD OR REINFORCING STEEL INSTALLED WITH THE FOLLOWING APPROVED PRODUCT SATISFYING CRACKED CONCRETE REQUIREMENTS IN ACCORDANCE WITH ACI 318, APPENDIX D.  
SIMPSON "AT-XP" IAPMO UES ER - 263  
2. THE CONTRACTOR MAY NOT USE SUBSTITUTES FOR ADHESIVE ANCHORS WITHOUT PRIOR APPROVAL OF THE STRUCTURAL ENGINEER.  
3. FOR MINIMUM EMBEDMENT LENGTH SEE DETAILS. INSTALL ALL BOLTS AS OUTLINED IN MANUFACTURER'S SPECIFICATIONS, UTILIZING PROPER SIZE AND TYPE OF DRILL, CLEANING HOLE, PLACING OF ADHESIVE, INSERTING AND TIGHTENING BOLT.  
4. PERIODIC INSPECTION OF POST-INSTALLED ANCHORS IS REQUIRED

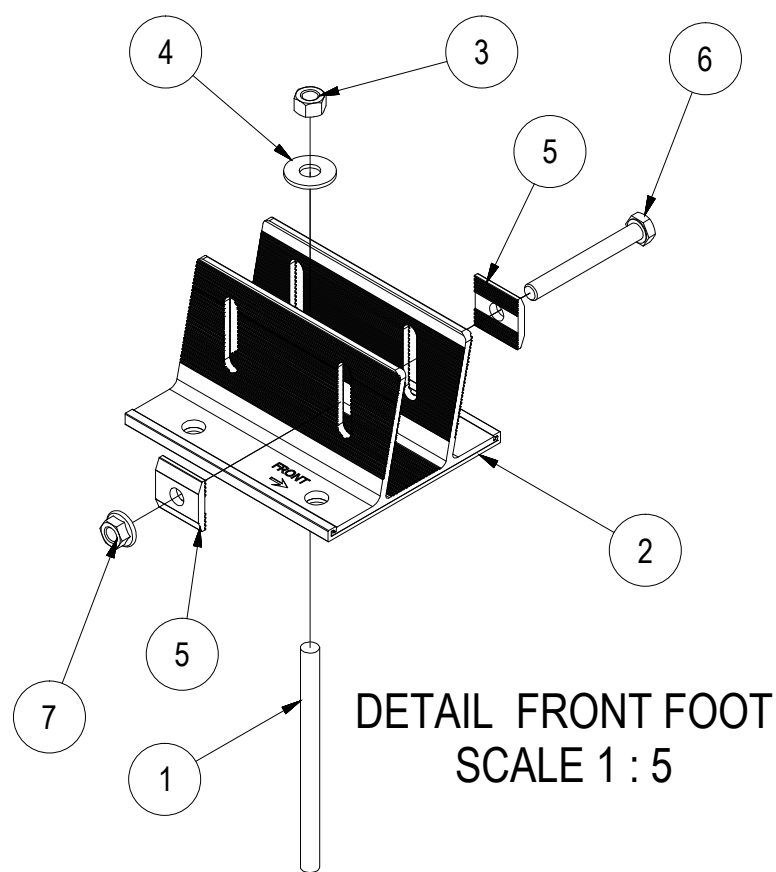
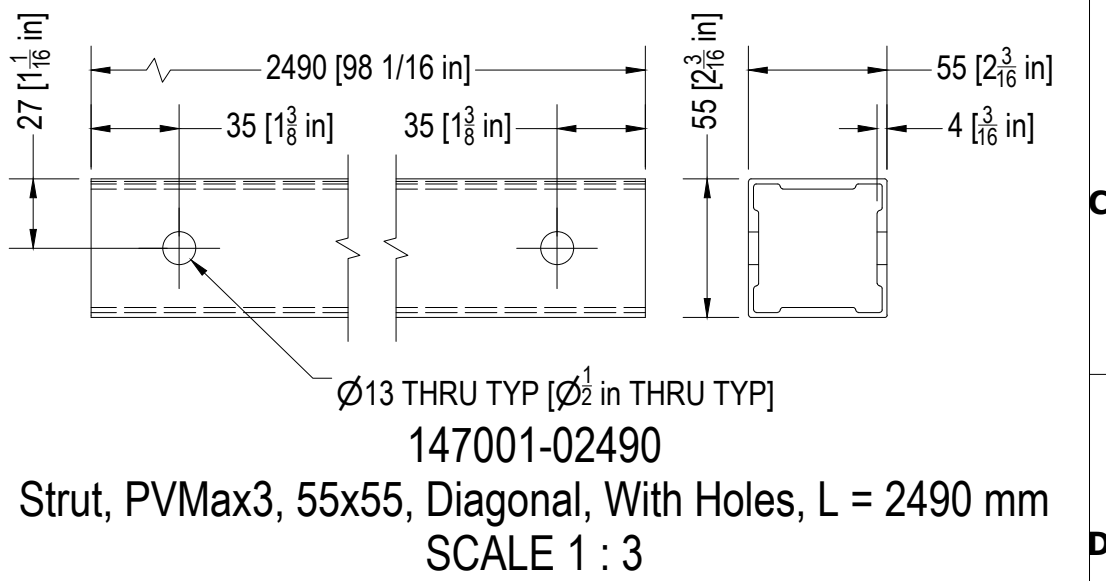
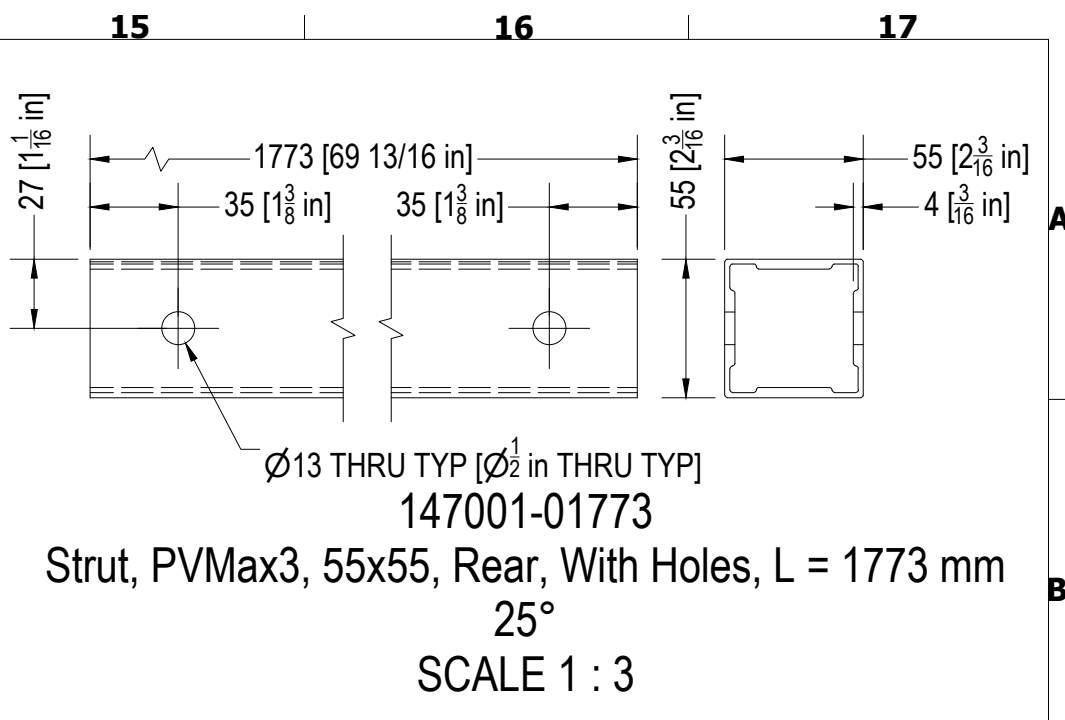
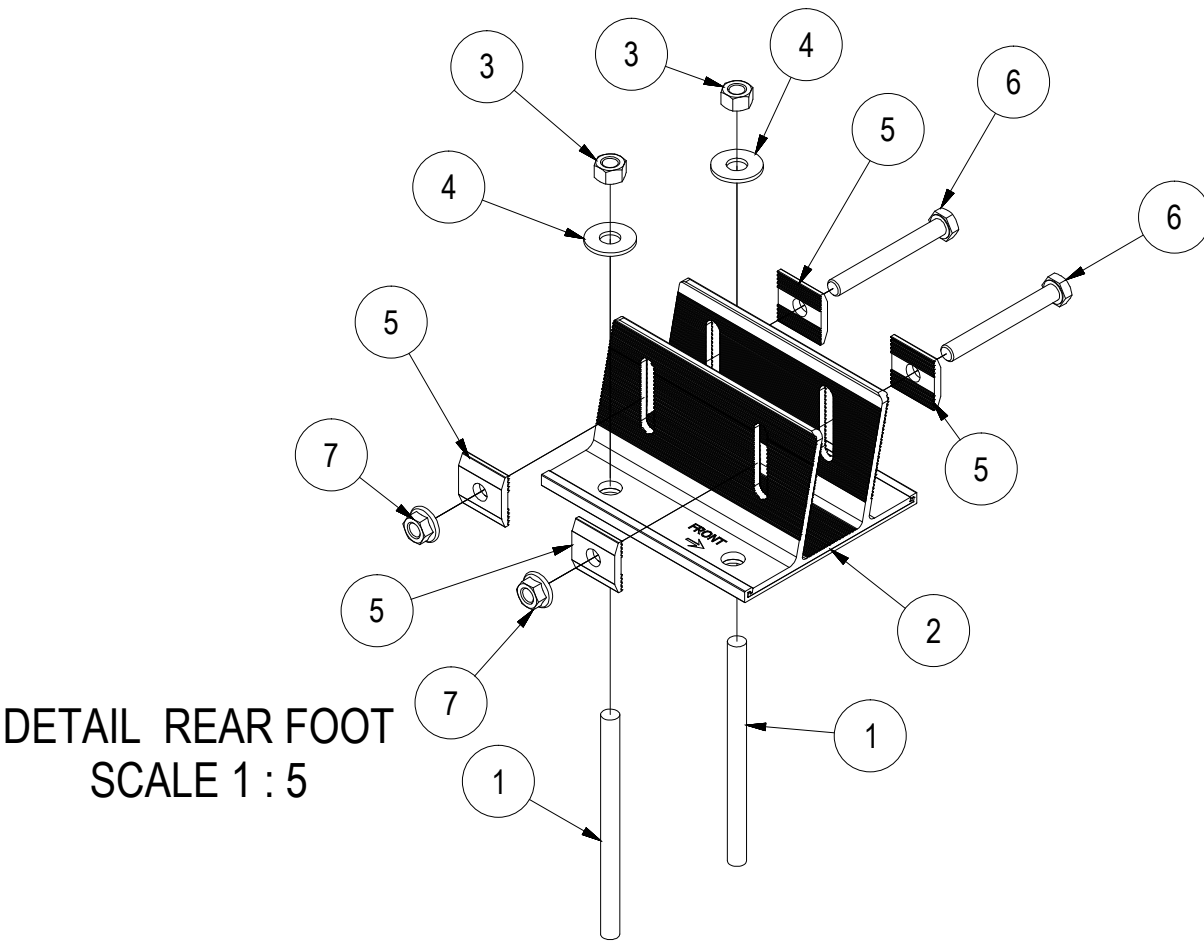




FOUNDATION DETAIL  
SCALE 1 : 5



PARTS LIST			
ITEM	PART NUMBER	QTY	DESCRIPTION
1	119024-00178	3	Threaded Rod, 1/2in-13 UNC, 304 SS, Grade B8, L=178mm
2	147003-020	2	Base, PvMax3, Univ, 5 Holes, 2 Slots, Pre-Assembly
3	943919-122	3	Nut, 1/2" - 13 UNC, ASME-B18.2.2, 316 SS
4	943929-030	3	Washer, Flat, 1/2", ASME - B18.21.1 A-W, 304 SS
5	147005-000	6	Claw, Base, PvMax3
6	943612-100	3	Screw, Hex Head, M12x100mm, DIN 931, 304 SS
7	943912-012	3	Nut, Flange, Serrated, M12, DIN 6923, 316 SS



NO.	DRAWN:	CHECKED:	REVIEWED:	APPROVED:	REVISIONS:
0	BushBr 9/27/2014				New Drawing
1	BushBr 3/12/2015				Notes, embedments New Tables, and Sheets
2	BushBr 11/5/2015				Change Ballast Size, Max Dead Load, Add 2015
3	BushBr 11/18/2015				Change Ballast Size
4	VasqHu 08/01/2016				Updated Load Tables
5					
6					
7					
8					

Client:  
Schletter Inc  
2201 North Forbes Boulevard  
Tucson, AZ 85745

**SCHLETTER**  
1001 COMMERCE CENTER DR. | SHELBY, NC 28150  
TEL: (704) 595 - 4200 | Fax: (704) 595 - 4210  
EMAIL: MAIL@SCHLETTER.US  
WWW.SCHLETTER.US

Standard PvMax, 72 Cell, 20° - 30°  
Racking Structure  
Details and Parts List

ISSUED BY: SCHLETTER INC.  
PROPRIETARY AND CONFIDENTIAL

Project Site:  
Schletter Inc  
1001 Commerce Center Dr  
Shelby, NC 28150

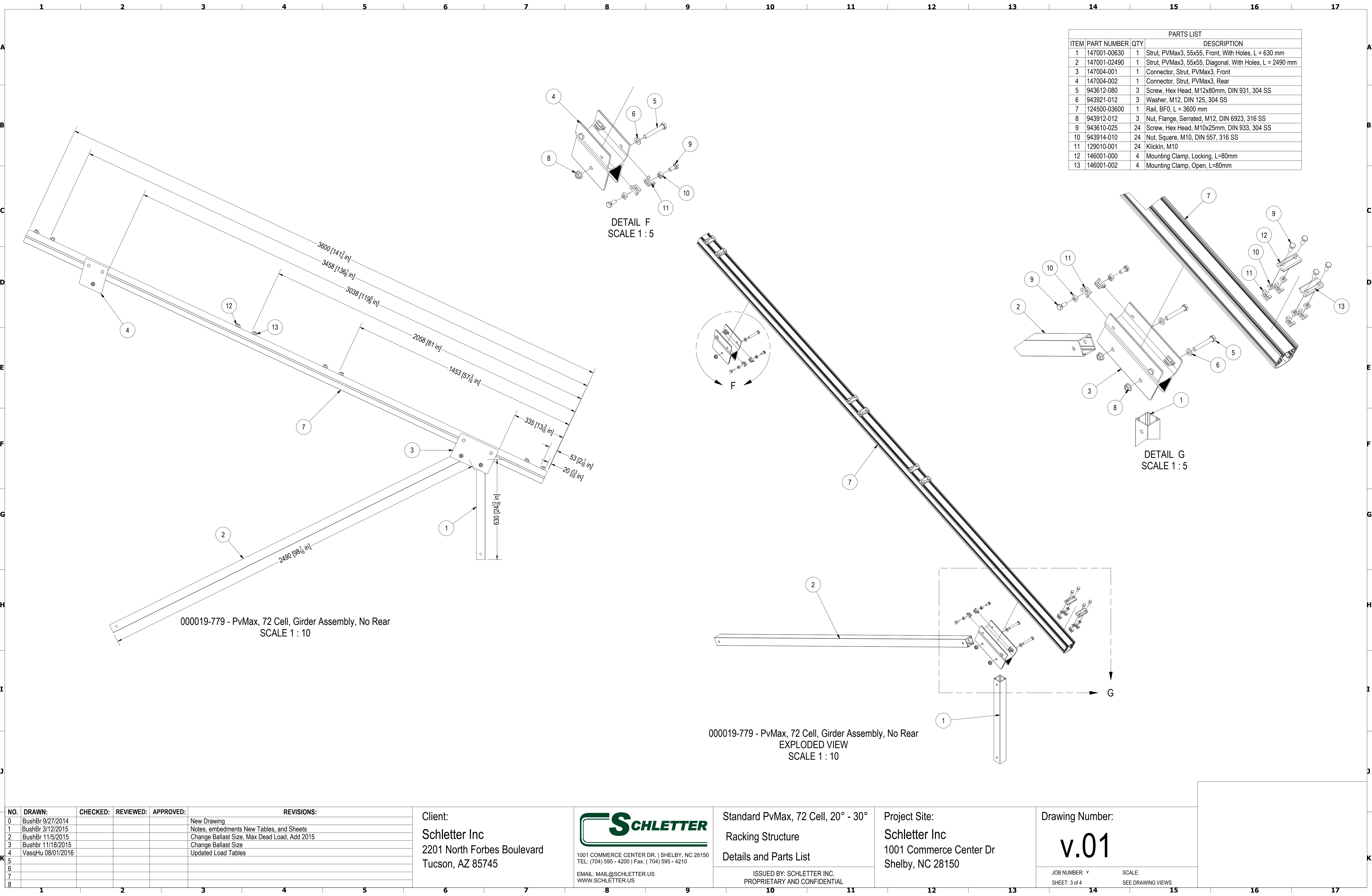
Drawing Number:

v.01

JOB NUMBER: v  
SHEET: 2 of 4

SCALE:  
SEE DRAWING VIEWS





PARTS LIST			
ITEM	PART NUMBER	QTY	DESCRIPTION
1	147001-00630	1	Strut, PVMax3, 55x55, Front, With Holes, L = 630 mm
2	147001-02490	1	Strut, PVMax3, 55x55, Diagonal, With Holes, L = 2490 mm
3	147004-001	1	Connector, Strut, PVMax3, Front
4	147004-002	1	Connector, Strut, PVMax3, Rear
5	943612-080	3	Screw, Hex Head, M12x80mm, DIN 931, 304 SS
6	943921-012	3	Washer, M12, DIN 125, 304 SS
7	124500-03600	1	Rail, BF0, L = 3600 mm
8	943912-012	3	Nut, Flange, Serrated, M12, DIN 6923, 316 SS
9	943610-025	24	Screw, Hex Head, M10x25mm, DIN 933, 304 SS
10	943914-010	24	Nut, Square, M10, DIN 557, 316 SS
11	129010-001	24	Klickin, M10
12	146001-000	4	Mounting Clamp, Locking, L=80mm
13	146001-002	4	Mounting Clamp, Open, L=80mm

NO.	DRAWN:	CHECKED:	REVIEWED:	APPROVED:	REVISIONS:
0	BushBr 9/27/2014				New Drawing
1	BushBr 3/12/2015				Notes, embedments New Tables, and Sheets
2	BushBr 11/5/2015				Change Ballast Size, Max Dead Load, Add 2015
3	BushBr 11/18/2015				Change Ballast Size
4	VasqHu 08/01/2016				Updated Load Tables
5					
6					
7					
8					

Client:  
**Schletter Inc**  
2201 North Forbes Boulevard  
Tucson, AZ 85745



1001 COMMERCE CENTER DR. | SHELBY, NC 28150  
TEL: (704) 595 - 4200 | Fax: (704) 595 - 4210

EMAIL: MAIL@SCHLETTER.US  
WWW.SCHLETTER.US

Standard PvMax, 72 Cell, 20° - 30°  
Racking Structure  
Details and Parts List

ISSUED BY: SCHLETTER INC.  
PROPRIETARY AND CONFIDENTIAL

Project Site:  
**Schletter Inc**  
1001 Commerce Center Dr  
Shelby, NC 28150

Drawing Number:

**v.01**

JOB NUMBER: v  
SHEET: 3 of 4

SCALE:  
SEE DRAWING VIEWS



Slope Factor By Tilt	
Tilt	Cs
15°	1.00
20°	0.91
25°	0.82
30°	0.73
35°	0.64

ASCE 7-05													
TILT	MAX WIND	GROUND SNOW	ROOF SNOW	MAX SPAN	FRONT CONNECTION			REAR CONNECTION			BALLAST WIDTH	# OF REBAR	
					TENSION	COMPRESSION	SHEAR	TENSION	COMPRESSION	SHEAR			
20°	85 MPH	0 PSF	0.00 PSF	12.50 FT	0.94 KIP	3.24 KIP	0.00 KIP	5.56 KIP	3.99 KIP	2.53 KIP	29 IN	(2) #5	
		10 PSF	6.87 PSF	12.50 FT	0.94 KIP	3.64 KIP	0.01 KIP	5.56 KIP	4.43 KIP	2.53 KIP	29 IN	(2) #5	
		20 PSF	13.75 PSF	11.00 FT	0.82 KIP	3.92 KIP	0.02 KIP	4.87 KIP	4.46 KIP	2.22 KIP	26 IN	(2) #5	
		30 PSF	20.62 PSF	9.25 FT	0.68 KIP	4.23 KIP	0.02 KIP	4.07 KIP	4.74 KIP	1.85 KIP	22 IN	(1) #5	
		40 PSF	27.49 PSF	8.00 FT	0.58 KIP	4.46 KIP	0.02 KIP	3.49 KIP	4.94 KIP	1.58 KIP	19 IN	(1) #5	
		50 PSF	34.36 PSF	7.00 FT	0.50 KIP	4.59 KIP	0.01 KIP	3.02 KIP	5.03 KIP	1.37 KIP	16 IN	(1) #5	
	90 MPH	60 PSF	41.42 PSF	6.25 FT	0.44 KIP	4.70 KIP	0.01 KIP	2.66 KIP	5.10 KIP	1.21 KIP	14 IN	(1) #5	
		0 PSF	0.00 PSF	11.75 FT	1.02 KIP	3.35 KIP	0.00 KIP	5.88 KIP	4.13 KIP	2.66 KIP	31 IN	(2) #5	
		10 PSF	6.87 PSF	11.75 FT	1.02 KIP	3.73 KIP	0.01 KIP	5.88 KIP	4.54 KIP	2.66 KIP	31 IN	(2) #5	
		20 PSF	13.75 PSF	11.00 FT	0.95 KIP	4.06 KIP	0.02 KIP	5.49 KIP	4.64 KIP	2.49 KIP	29 IN	(2) #5	
		30 PSF	20.62 PSF	9.00 FT	0.76 KIP	4.23 KIP	0.02 KIP	4.46 KIP	4.75 KIP	2.02 KIP	24 IN	(2) #5	
		40 PSF	27.49 PSF	7.75 FT	0.65 KIP	4.42 KIP	0.01 KIP	3.80 KIP	4.90 KIP	1.72 KIP	20 IN	(1) #5	
	100 MPH	50 PSF	34.36 PSF	6.75 FT	0.56 KIP	4.51 KIP	0.01 KIP	3.27 KIP	4.94 KIP	1.48 KIP	18 IN	(1) #5	
		60 PSF	41.42 PSF	6.25 FT	0.51 KIP	4.78 KIP	0.01 KIP	3.01 KIP	5.20 KIP	1.35 KIP	16 IN	(1) #5	
		0 PSF	0.00 PSF	10.50 FT	1.17 KIP	3.59 KIP	0.00 KIP	6.52 KIP	4.43 KIP	2.93 KIP	34 IN	(2) #5	
		10 PSF	6.87 PSF	10.00 FT	1.11 KIP	3.73 KIP	0.01 KIP	6.20 KIP	4.55 KIP	2.79 KIP	33 IN	(2) #5	
		20 PSF	13.75 PSF	9.50 FT	1.05 KIP	3.84 KIP	0.01 KIP	5.87 KIP	4.64 KIP	2.64 KIP	31 IN	(2) #5	
		30 PSF	20.62 PSF	8.50 FT	0.93 KIP	4.23 KIP	0.01 KIP	5.22 KIP	4.77 KIP	2.35 KIP	28 IN	(2) #5	
	110 MPH	40 PSF	27.49 PSF	7.50 FT	0.81 KIP	4.48 KIP	0.01 KIP	4.57 KIP	4.99 KIP	2.05 KIP	24 IN	(2) #5	
		50 PSF	34.36 PSF	6.50 FT	0.69 KIP	4.51 KIP	0.01 KIP	3.91 KIP	4.96 KIP	1.75 KIP	21 IN	(1) #5	
		60 PSF	41.42 PSF	6.00 FT	0.64 KIP	4.74 KIP	0.01 KIP	3.58 KIP	5.17 KIP	1.60 KIP	19 IN	(1) #5	
		0 PSF	0.00 PSF	9.00 FT	1.24 KIP	3.62 KIP	0.00 KIP	6.76 KIP	4.47 KIP	3.02 KIP	36 IN	(3) #5	
		10 PSF	6.87 PSF	8.75 FT	1.20 KIP	3.80 KIP	0.01 KIP	6.56 KIP	4.64 KIP	2.93 KIP	35 IN	(2) #5	
		20 PSF	13.75 PSF	8.25 FT	1.13 KIP	3.84 KIP	0.01 KIP	6.16 KIP	4.64 KIP	2.75 KIP	33 IN	(2) #5	
	120 MPH	30 PSF	20.62 PSF	8.00 FT	1.09 KIP	4.22 KIP	0.01 KIP	5.97 KIP	4.78 KIP	2.66 KIP	32 IN	(2) #5	
		40 PSF	27.49 PSF	7.00 FT	0.94 KIP	4.38 KIP	0.01 KIP	5.17 KIP	4.90 KIP	2.30 KIP	27 IN	(2) #5	
		50 PSF	34.36 PSF	6.25 FT	0.83 KIP	4.52 KIP	0.01 KIP	4.56 KIP	4.98 KIP	2.03 KIP	24 IN	(2) #5	
		60 PSF	41.42 PSF	5.75 FT	0.76 KIP	4.71 KIP	0.01 KIP	4.15 KIP	5.14 KIP	1.84 KIP	22 IN	(1) #5	
		0 PSF	0.00 PSF	7.75 FT	1.29 KIP	3.63 KIP	0.00 KIP	6.90 KIP	4.47 KIP	3.06 KIP	37 IN	(3) #5	
		10 PSF	6.87 PSF	7.75 FT	1.29 KIP	3.87 KIP	0.00 KIP	6.90 KIP	4.73 KIP	3.06 KIP	37 IN	(3) #5	
	130 MPH	20 PSF	13.75 PSF	7.50 FT	1.24 KIP	3.98 KIP	0.01 KIP	6.66 KIP	4.82 KIP	2.96 KIP	35 IN	(2) #5	
		30 PSF	20.62 PSF	7.25 FT	1.20 KIP	4.07 KIP	0.01 KIP	6.42 KIP	4.89 KIP	2.85 KIP	34 IN	(2) #5	
		40 PSF	27.49 PSF	6.75 FT	1.11 KIP	4.44 KIP	0.01 KIP	5.94 KIP	4.99 KIP	2.63 KIP	32 IN	(2) #5	
		50 PSF	34.36 PSF	6.00 FT	0.97 KIP	4.52 KIP	0.01 KIP	5.21 KIP	5.01 KIP	2.30 KIP	28 IN	(2) #5	
		60 PSF	41.42 PSF	5.50 FT	0.88 KIP	4.67 KIP	0.01 KIP	4.73 KIP	5.11 KIP	2.08 KIP	25 IN	(2) #5	
		0 PSF	0.00 PSF	6.50 FT	1.27 KIP	3.49 KIP	0.00 KIP	6.71 KIP	4.28 KIP	2.96 KIP	36 IN	(3) #5	
20°	110 MPH	10 PSF	6.87 PSF	6.50 FT	1.27 KIP	3.69 KIP	0.00 KIP	6.71 KIP	4.49 KIP	2.96 KIP	36 IN	(3) #5	
		20 PSF	13.75 PSF	6.50 FT	1.27 KIP	3.89 KIP	0.01 KIP	6.71 KIP	4.71 KIP	2.96 KIP	36 IN	(3) #5	
		30 PSF	20.62 PSF	6.50 FT	1.27 KIP	4.10 KIP	0.01 KIP	6.71 KIP	4.93 KIP	2.96 KIP	36 IN	(3) #5	
		40 PSF	27.49 PSF	6.25 FT	1.22 KIP	4.32 KIP	0.01 KIP	6.43 KIP	4.93 KIP	2.83 KIP	34 IN	(2) #5	
		50 PSF	34.36 PSF	5.75 FT	1.11 KIP	4.53 KIP	0.01 KIP	5.86 KIP	5.03 KIP	2.57 KIP	31 IN	(2) #5	
		60 PSF	41.42 PSF	5.25 FT	1.01 KIP	4.63 KIP	0.01 KIP	5.28 KIP	5.07 KIP	2.31 KIP	29 IN	(2) #5	

ASCE 7-10													
TILT	MAX WIND	GROUND SNOW	ROOF SNOW	MAX SPAN	FRONT CONNECTION			REAR CONNECTION			BALLAST WIDTH	# OF REBAR	
					TENSION	COMPRESSION	SHEAR	TENSION	COMPRESSION	SHEAR			
20°	110 MPH	0 PSF	0.00 PSF	12.25 FT	0.97 KIP	3.30 KIP	0.00 KIP	5.71 KIP	4.06 KIP	2.59 KIP	29 IN	(2) #5	
		10 PSF	6.87 PSF	12.00 FT	0.95 KIP	3.62 KIP	0.01 KIP	5.59 KIP	4.40 KIP	2.54 KIP	28 IN	(2) #5	
		20 PSF	13.75 PSF	11.00 FT	0.87 KIP	3.97 KIP	0.02 KIP	5.11 KIP	4.53 KIP	2.32 KIP	26 IN	(2) #5	
		30 PSF	20.62 PSF	9.25 FT	0.72 KIP	4.28 KIP	0.02 KIP	4.27 KIP	4.80 KIP	1.94 KIP	22 IN	(1) #5	
		40 PSF	27.49 PSF	8.00 FT	0.62 KIP	4.50 KIP	0.02 KIP	3.66 KIP	4.99 KIP	1.66 KIP	19 IN	(1) #5	
		50 PSF	34.36 PSF	7.00 FT	0.53 KIP	4.62 KIP	0.01 KIP	3.17 KIP	5.07 KIP	1.43 KIP	16 IN	(1) #5	
	115 MPH	60 PSF	41.42 PSF	6.25 FT	0.47 KIP	4.73 KIP	0.01 KIP	2.80 KIP	5.14 KIP	1.26 KIP	14 IN	(1) #5	
		0 PSF	0.00 PSF	11.75 FT	1.04 KIP	3.41 KIP	0.00 KIP	6.00 KIP	4.20 KIP	2.72 KIP	30 IN	(2) #5	
		10 PSF	6.87 PSF	11.50 FT	1.02 KIP	3.71 KIP	0.01 KIP	5.87 KIP	4.51 KIP	2.66 KIP	30 IN	(2) #5	
		20 PSF	13.75 PSF	10.75 FT	0.95 KIP	4.00 KIP	0.02 KIP	5.48 KIP	4.58 KIP	2.48 KIP	28 IN	(2) #5	
		30 PSF	20.62 PSF	9.00 FT	0.78 KIP	4.25 KIP	0.02 KIP	4.55 KIP	4.78 KIP	2.06 KIP	23 IN	(1) #5	
		40 PSF	27.49 PSF	7.75 FT	0.67 KIP	4.43 KIP	0.01 KIP	3.88 KIP	4.92 KIP	1.75 KIP	20 IN	(1) #5	
130 MPH	50 PSF	34.36 PSF	6.75 FT	0.57 KIP	4.52 KIP	0.01 KIP	3.34 KIP	4.96 KIP	1.51 KIP	17 IN	(1) #5		
	60 PSF	41.42 PSF	6.25 FT	0.53 KIP	4.80 KIP	0.01 KIP	3.07 KIP	5.22 KIP	1.38 KIP	16 IN	(1) #5		
	0 PSF	0.00 PSF	10.25 FT	1.21 KIP	3.67 KIP	0.00 KIP	6.73 KIP	4.53 KIP	3.02 KIP	34 IN	(2) #5		
	10 PSF	6.87 PSF	9.75 FT	1.15 KIP	3.80 KIP	0.01 KIP	6.39 KIP	4.64 KIP	2.87 KIP	32 IN	(2) #5		
	20 PSF	13.75 PSF	9.25 FT	1.09 KIP	3.89 KIP	0.01 KIP	6.04 KIP	4.71 KIP	2.71 KIP	31 IN	(2) #5		
	30 PSF	20.62 PSF	8.50 FT	0.99 KIP	4.30 KIP	0.01 KIP	5.53 KIP	4.86 KIP	2.48 KIP	28 IN	(2) #5		
140 MPH	40 PSF	27.49 PSF	7.25 FT	0.84 KIP	4.38 KIP	0.01 KIP	4.66 KIP	4.88 KIP	2.09 KIP	24 IN	(2) #5		
	50 PSF	34.36 PSF	6.50 FT	0.74 KIP	4.56 KIP	0.01 KIP	4.14 KIP	5.03 KIP	1.85 KIP	21 IN	(1) #5		
	60 PSF	41.42 PSF	6.00 FT	0.68 KIP	4.79 KIP	0.01 KIP	3.79 KIP	5.23 KIP	1.69 KIP	19 IN	(1) #5		
	0 PSF	0.00 PSF	9.00 FT	1.26 KIP	3.66 KIP	0.00 KIP	6.84 KIP	4.52 KIP	3.06 KIP	35 IN	(2) #5		
	10 PSF	6.87 PSF	8.75 FT	1.22 KIP	3.84 KIP	0.01 KIP	6.64 KIP	4.69 KIP	2.97 KIP	34 IN	(2) #5		
	20 PSF	13.75 PSF	8.25 FT	1.14 KIP	3.87 KIP	0.01 KIP	6.24 KIP	4.89 KIP	2.79 KIP	32 IN	(2) #5		
150 MPH	30 PSF	20.62 PSF	8.00 FT	1.11 KIP	4.24 KIP	0.01 KIP	6.04 KIP	4.81 KIP	2.70 KIP	31 IN	(2) #5		
	40 PSF	27.49 PSF	7.00 FT	0.96 KIP	4.40 KIP	0.01 KIP	5.23 KIP	4.91 KIP	2.33 KIP	27 IN	(2) #5		
	50 PSF	34.36 PSF	6.25 FT	0.85 KIP	4.53 KIP	0.01 KIP	4.62 KIP	5.00 KIP	2.05 KIP	24 IN	(2) #5		
	60 PSF	41.42 PSF	5.75 FT	0.77 KIP	4.72 KIP	0.01 KIP	4.21 KIP	5.16 KIP	1.86 KIP	22 IN	(1) #5		
	0 PSF	0.00 PSF	8.00 FT	1.30 KIP	3.67 KIP	0.00 KIP	6.96 KIP	4.52 KIP	3.10 KIP	35 IN	(2) #5		
	10 PSF	6.87 PSF	8.00 FT	1.30 KIP	3.92 KIP	0.01 KIP	6.96 KIP	4.80 KIP	3.10 KIP	35 IN	(2) #5		
160 MPH	20 PSF	13.75 PSF	7.50 FT	1.21 KIP	3.91 KIP	0.01 KIP	6.50 KIP	4.73 KIP	2.89 KIP	33 IN	(2) #5		
	30 PSF	20.62 PSF	7.25 FT	1.17 KIP	4.02 KIP	0.01 KIP	6.27 KIP	4.81 KIP	2.78 KIP	32 IN	(2) #5		
	40 PSF	27.49 PSF	6.75 FT	1.08 KIP	4.41 KIP	0.01 KIP	5.80 KIP	4.94 KIP	2.57 KIP	30 IN	(2) #5		
	50 PSF	34.36 PSF	6.25 FT	0.99 KIP	4.69 KIP	0.01 KIP	5.33 KIP	5.20 KIP	2.36 KIP	27 IN	(2) #5		
	60 PSF	41.42 PSF	5.50 FT	0.86 KIP	4.64 KIP	0.01 KIP	4.61 KIP	5.07 KIP	2.03 KIP	24 IN	(2) #5		
	0 PSF	0.00 PSF	7.00 FT	1.30 KIP	3.59 KIP	0.00 KIP	6.88 KIP	4.41 KIP	3.05 KIP	35 IN	(2) #5		
20°	160 MPH	10 PSF	6.87 PSF	7.00 FT	1.30 KIP	3.81 KIP	0.00 KIP	6.88 KIP	4.65 KIP	3.05 KIP	35 IN	(2) #5	
		20 PSF	13.75 PSF	7.00 FT	1.30 KIP	4.03 KIP	0.01 KIP	6.88 KIP	4.88 KIP	3.05 KIP	35 IN	(2) #5	
		30 PSF	20.62 PSF	6.75 FT	1.25 KIP	4.09 KIP	0.01 KIP	6.62 KIP	4.92 KIP	2.93 KIP	34 IN	(2) #5	
		40 PSF	27.49 PSF	6.50 FT	1.20 KIP	4.42 KIP	0.01 KIP	6.35 KIP	4.97 KIP	2.80 KIP	32 IN	(2) #5	
		50 PSF	34.36 PSF	6.00 FT	1.10 KIP	4.66 KIP	0.01 KIP	5.81 KIP	5.18 KIP	2.56 KIP	30 IN	(2) #5	
		60 PSF	41.42 PSF	5.50 FT	1.00 KIP	4.80 KIP	0.01 KIP	5.26 KIP	5.26 KIP	2.31 KIP	27 IN	(2) #5	



Slope Factor By Tilt	
Tilt	Cs
15°	1.00
20°	0.91
25°	0.82
30°	0.73
35°	0.64

ASCE 7-05													
TILT	MAX WIND	GROUND SNOW	ROOF SNOW	MAX SPAN	FRONT CONNECTION			REAR CONNECTION			BALLAST WIDTH	# OF REBAR	
					TENSION	COMPRESSION	SHEAR	TENSION	COMPRESSION	SHEAR			
25°	85 MPH	0 PSF	0.00 PSF	12.25 FT	0.47 KIP	2.90 KIP	0.01 KIP	5.82 KIP	4.18 KIP	3.14 KIP	30 IN	(2) #5	
		10 PSF	6.19 PSF	12.25 FT	0.47 KIP	3.24 KIP	0.01 KIP	5.82 KIP	4.54 KIP	3.14 KIP	30 IN	(2) #5	
		20 PSF	12.37 PSF	11.25 FT	0.43 KIP	3.59 KIP	0.02 KIP	5.33 KIP	4.49 KIP	2.88 KIP	28 IN	(2) #5	
		30 PSF	18.56 PSF	9.75 FT	0.37 KIP	3.98 KIP	0.02 KIP	4.60 KIP	4.61 KIP	2.48 KIP	24 IN	(2) #5	
		40 PSF	24.74 PSF	8.75 FT	0.33 KIP	4.35 KIP	0.02 KIP	4.10 KIP	4.93 KIP	2.21 KIP	21 IN	(1) #5	
		50 PSF	30.39 PSF	7.75 FT	0.28 KIP	4.53 KIP	0.02 KIP	3.50 KIP	5.04 KIP	1.94 KIP	19 IN	(1) #5	
	90 MPH	60 PSF	37.11 PSF	7.00 FT	0.25 KIP	4.70 KIP	0.02 KIP	3.23 KIP	5.15 KIP	1.74 KIP	17 IN	(1) #5	
		0 PSF	0.00 PSF	11.50 FT	0.52 KIP	2.99 KIP	0.01 KIP	6.14 KIP	4.33 KIP	3.30 KIP	32 IN	(2) #5	
		10 PSF	6.19 PSF	11.50 FT	0.52 KIP	3.31 KIP	0.01 KIP	6.14 KIP	4.67 KIP	3.30 KIP	32 IN	(2) #5	
		20 PSF	12.37 PSF	11.00 FT	0.50 KIP	3.64 KIP	0.02 KIP	5.87 KIP	4.78 KIP	3.15 KIP	30 IN	(2) #5	
		30 PSF	18.56 PSF	9.75 FT	0.44 KIP	4.09 KIP	0.02 KIP	5.18 KIP	4.79 KIP	2.78 KIP	27 IN	(2) #5	
		40 PSF	24.74 PSF	8.50 FT	0.38 KIP	4.32 KIP	0.02 KIP	4.48 KIP	4.93 KIP	2.41 KIP	23 IN	(1) #5	
	100 MPH	50 PSF	30.39 PSF	7.50 FT	0.33 KIP	4.47 KIP	0.02 KIP	3.92 KIP	5.00 KIP	2.10 KIP	20 IN	(1) #5	
		60 PSF	37.11 PSF	6.75 FT	0.29 KIP	4.60 KIP	0.02 KIP	3.50 KIP	5.06 KIP	1.87 KIP	18 IN	(1) #5	
		0 PSF	0.00 PSF	10.25 FT	0.62 KIP	3.18 KIP	0.00 KIP	6.79 KIP	4.64 KIP	3.63 KIP	35 IN	(2) #5	
		10 PSF	6.19 PSF	10.00 FT	0.61 KIP	3.38 KIP	0.01 KIP	6.62 KIP	4.81 KIP	3.53 KIP	34 IN	(2) #5	
		20 PSF	12.37 PSF	9.50 FT	0.57 KIP	3.47 KIP	0.01 KIP	6.27 KIP	4.84 KIP	3.35 KIP	32 IN	(2) #5	
		30 PSF	18.56 PSF	9.00 FT	0.54 KIP	4.00 KIP	0.02 KIP	5.93 KIP	4.83 KIP	3.16 KIP	31 IN	(2) #5	
	110 MPH	40 PSF	24.74 PSF	8.00 FT	0.48 KIP	4.26 KIP	0.02 KIP	5.23 KIP	4.92 KIP	2.79 KIP	27 IN	(2) #5	
		50 PSF	30.39 PSF	7.25 FT	0.43 KIP	4.49 KIP	0.02 KIP	4.71 KIP	5.09 KIP	2.51 KIP	24 IN	(2) #5	
		60 PSF	37.11 PSF	6.50 FT	0.38 KIP	4.59 KIP	0.02 KIP	4.18 KIP	5.10 KIP	2.22 KIP	22 IN	(1) #5	
		0 PSF	0.00 PSF	8.75 FT	0.67 KIP	3.19 KIP	0.00 KIP	7.00 KIP	4.67 KIP	3.72 KIP	36 IN	(3) #5	
		10 PSF	6.19 PSF	8.75 FT	0.67 KIP	3.43 KIP	0.01 KIP	7.00 KIP	4.92 KIP	3.72 KIP	36 IN	(3) #5	
		20 PSF	12.37 PSF	8.25 FT	0.63 KIP	3.46 KIP	0.01 KIP	6.58 KIP	4.86 KIP	3.49 KIP	34 IN	(2) #5	
	120 MPH	30 PSF	18.56 PSF	8.00 FT	0.61 KIP	3.77 KIP	0.01 KIP	6.37 KIP	4.94 KIP	3.38 KIP	33 IN	(2) #5	
		40 PSF	24.74 PSF	7.75 FT	0.59 KIP	4.34 KIP	0.02 KIP	6.15 KIP	5.08 KIP	3.26 KIP	32 IN	(2) #5	
		50 PSF	30.39 PSF	7.00 FT	0.53 KIP	4.53 KIP	0.02 KIP	5.51 KIP	5.19 KIP	2.92 KIP	29 IN	(2) #5	
		60 PSF	37.11 PSF	6.25 FT	0.47 KIP	4.58 KIP	0.02 KIP	4.87 KIP	5.14 KIP	2.57 KIP	26 IN	(2) #5	
		0 PSF	0.00 PSF	7.50 FT	0.71 KIP	3.17 KIP	0.00 KIP	7.10 KIP	4.65 KIP	3.75 KIP	37 IN	(3) #5	
		10 PSF	6.19 PSF	7.50 FT	0.71 KIP	3.38 KIP	0.01 KIP	7.10 KIP	4.86 KIP	3.75 KIP	37 IN	(3) #5	
	130 MPH	20 PSF	12.37 PSF	7.50 FT	0.71 KIP	3.59 KIP	0.01 KIP	7.10 KIP	5.08 KIP	3.75 KIP	37 IN	(3) #5	
		30 PSF	18.56 PSF	7.25 FT	0.69 KIP	3.67 KIP	0.01 KIP	6.85 KIP	5.10 KIP	3.61 KIP	35 IN	(2) #5	
		40 PSF	24.74 PSF	7.00 FT	0.66 KIP	4.12 KIP	0.01 KIP	6.59 KIP	5.11 KIP	3.48 KIP	34 IN	(2) #5	
		50 PSF	30.39 PSF	6.50 FT	0.61 KIP	4.39 KIP	0.01 KIP	6.08 KIP	5.07 KIP	3.20 KIP	32 IN	(2) #5	
		60 PSF	37.11 PSF	6.00 FT	0.56 KIP	4.56 KIP	0.01 KIP	5.56 KIP	5.17 KIP	2.92 KIP	30 IN	(2) #5	
		0 PSF	0.00 PSF	6.25 FT	0.71 KIP	3.03 KIP	0.00 KIP	6.85 KIP	4.41 KIP	3.60 KIP	36 IN	(3) #5	
25°	110 MPH	10 PSF	6.19 PSF	6.25 FT	0.71 KIP	3.20 KIP	0.00 KIP	6.85 KIP	4.59 KIP	3.60 KIP	36 IN	(3) #5	
		20 PSF	12.37 PSF	6.25 FT	0.71 KIP	3.37 KIP	0.01 KIP	6.85 KIP	4.76 KIP	3.60 KIP	36 IN	(3) #5	
		30 PSF	18.56 PSF	6.25 FT	0.71 KIP	3.54 KIP	0.01 KIP	6.85 KIP	4.94 KIP	3.60 KIP	36 IN	(3) #5	
		40 PSF	24.74 PSF	6.25 FT	0.71 KIP	3.86 KIP	0.01 KIP	6.85 KIP	5.12 KIP	3.60 KIP	36 IN	(3) #5	
		50 PSF	30.39 PSF	6.00 FT	0.68 KIP	4.23 KIP	0.01 KIP	6.55 KIP	5.05 KIP	3.43 KIP	35 IN	(2) #5	
		60 PSF	37.11 PSF	5.75 FT	0.65 KIP	4.55 KIP	0.01 KIP	6.24 KIP	5.20 KIP	3.27 KIP	33 IN	(2) #5	

ASCE 7-10													
TILT	MAX WIND	GROUND SNOW	ROOF SNOW	MAX SPAN	FRONT CONNECTION			REAR CONNECTION			BALLAST WIDTH	# OF REBAR	
					TENSION	COMPRESSION	SHEAR	TENSION	COMPRESSION	SHEAR			
25°	110 MPH	0 PSF	0.00 PSF	12.00 FT	0.49 KIP	2.95 KIP	0.01 KIP	5.98 KIP	4.26 KIP	3.22 KIP	30 IN	(2) #5	
		10 PSF	6.19 PSF	12.00 FT	0.49 KIP	3.28 KIP	0.01 KIP	5.98 KIP	4.61 KIP	3.22 KIP	30 IN	(2) #5	
		20 PSF	12.37 PSF	11.25 FT	0.46 KIP	3.64 KIP	0.02 KIP	5.59 KIP	4.65 KIP	3.01 KIP	28 IN	(2) #5	
		30 PSF	18.56 PSF	9.75 FT	0.39 KIP	4.02 KIP	0.02 KIP	4.82 KIP	4.68 KIP	2.60 KIP	24 IN	(2) #5	
		40 PSF	24.74 PSF	8.75 FT	0.35 KIP	4.38 KIP	0.02 KIP	4.30 KIP	4.99 KIP	2.32 KIP	21 IN	(1) #5	
		50 PSF	30.39 PSF	7.75 FT	0.31 KIP	4.56 KIP	0.02 KIP	3.78 KIP	5.10 KIP	2.03 KIP	19 IN	(1) #5	
	115 MPH	60 PSF	37.11 PSF	7.00 FT	0.27 KIP	4.73 KIP	0.02 KIP	3.39 KIP	5.20 KIP	1.82 KIP	17 IN	(1) #5	
		0 PSF	0.00 PSF	11.50 FT	0.54 KIP	3.04 KIP	0.01 KIP	6.28 KIP	4.41 KIP	3.37 KIP	31 IN	(2) #5	
		10 PSF	6.19 PSF	11.50 FT	0.54 KIP	3.36 KIP	0.01 KIP	6.28 KIP	4.75 KIP	3.37 KIP	31 IN	(2) #5	
		20 PSF	12.37 PSF	10.75 FT	0.50 KIP	3.58 KIP	0.02 KIP	5.85 KIP	4.74 KIP	3.14 KIP	29 IN	(2) #5	
		30 PSF	18.56 PSF	9.75 FT	0.45 KIP	4.11 KIP	0.02 KIP	5.29 KIP	4.82 KIP	2.84 KIP	26 IN	(2) #5	
		40 PSF	24.74 PSF	8.50 FT	0.39 KIP	4.34 KIP	0.02 KIP	4.58 KIP	4.96 KIP	2.46 KIP	23 IN	(1) #5	
130 MPH	50 PSF	30.39 PSF	7.50 FT	0.34 KIP	4.48 KIP	0.02 KIP	4.01 KIP	5.02 KIP	2.15 KIP	20 IN	(1) #5		
	60 PSF	37.11 PSF	6.75 FT	0.30 KIP	4.62 KIP	0.02 KIP	3.57 KIP	5.09 KIP	1.91 KIP	18 IN	(1) #5		
	0 PSF	0.00 PSF	10.00 FT	0.65 KIP	3.25 KIP	0.00 KIP	7.00 KIP	4.75 KIP	3.73 KIP	35 IN	(2) #5		
	10 PSF	6.19 PSF	9.50 FT	0.62 KIP	3.35 KIP	0.01 KIP	6.64 KIP	4.78 KIP	3.54 KIP	33 IN	(2) #5		
	20 PSF	12.37 PSF	9.25 FT	0.60 KIP	3.51 KIP	0.01 KIP	6.45 KIP	4.91 KIP	3.44 KIP	32 IN	(2) #5		
	30 PSF	18.56 PSF	8.75 FT	0.56 KIP	3.95 KIP	0.02 KIP	6.09 KIP	4.89 KIP	3.24 KIP	30 IN	(2) #5		
25°	140 MPH	40 PSF	24.74 PSF	8.00 FT	0.51 KIP	4.32 KIP	0.02 KIP	5.54 KIP	5.01 KIP	2.95 KIP	28 IN	(2) #5	
		50 PSF	30.39 PSF	7.00 FT	0.44 KIP	4.39 KIP	0.02 KIP	4.79 KIP	4.97 KIP	2.55 KIP	24 IN	(2) #5	
		60 PSF	37.11 PSF	6.50 FT	0.41 KIP	4.64 KIP	0.02 KIP	4.42 KIP	5.17 KIP	2.35 KIP	22 IN	(1) #5	
		0 PSF	0.00 PSF	8.75 FT	0.69 KIP	3.22 KIP	0.00 KIP	7.09 KIP	4.72 KIP	3.76 KIP	35 IN	(2) #5	
		10 PSF	6.19 PSF	8.50 FT	0.66 KIP	3.37 KIP	0.01 KIP	6.88 KIP	4.82 KIP	3.65 KIP	34 IN	(2) #5	
		20 PSF	12.37 PSF	8.25 FT	0.64 KIP	3.49 KIP	0.01 KIP	6.66 KIP	4.91 KIP	3.53 KIP	33 IN	(2) #5	
	140 MPH	30 PSF	18.56 PSF	8.00 FT	0.62 KIP	3.79 KIP	0.01 KIP	6.45 KIP	4.98 KIP	3.42 KIP	32 IN	(2) #5	
		40 PSF	24.74 PSF	7.50 FT	0.58 KIP	4.21 KIP	0.02 KIP	6.02 KIP	4.93 KIP	3.19 KIP	30 IN	(2) #5	
		50 PSF	30.39 PSF	6.75 FT	0.52 KIP	4.37 KIP	0.02 KIP	5.37 KIP	5.00 KIP	2.84 KIP	27 IN	(2) #5	
		60 PSF	37.11 PSF	6.25 FT	0.48 KIP	4.59 KIP	0.02 KIP	4.93 KIP	5.15 KIP	2.60 KIP	25 IN	(2) #5	
		0 PSF	0.00 PSF	7.50 FT	0.69 KIP	3.11 KIP	0.00 KIP	6.93 KIP	4.55 KIP	3.66 KIP	34 IN	(2) #5	
		10 PSF	6.19 PSF	7.50 FT	0.69 KIP	3.31 KIP	0.01 KIP	6.93 KIP	4.76 KIP	3.66 KIP	34 IN	(2) #5	
150 MPH	20 PSF	12.37 PSF	7.50 FT	0.69 KIP	3.52 KIP	0.01 KIP	6.93 KIP	4.98 KIP	3.66 KIP	34 IN	(2) #5		
	30 PSF	18.56 PSF	7.25 FT	0.67 KIP	3.60 KIP	0.01 KIP	6.68 KIP	5.00 KIP	3.53 KIP	33 IN	(2) #5		
	40 PSF	24.74 PSF	7.00 FT	0.64 KIP	4.09 KIP	0.01 KIP	6.43 KIP	5.01 KIP	3.40 KIP	32 IN	(2) #5		
	50 PSF	30.39 PSF	6.50 FT	0.59 KIP	4.36 KIP	0.01 KIP	5.93 KIP	5.03 KIP	3.13 KIP	30 IN	(2) #5		
	60 PSF	37.11 PSF	6.00 FT	0.54 KIP	4.54 KIP	0.01 KIP	5.43 KIP	5.13 KIP	2.85 KIP	28 IN	(2) #5		
	0 PSF	0.00 PSF	6.75 FT	0.72 KIP	3.12 KIP	0.00 KIP	7.06 KIP	4.57 KIP	3.71 KIP	35 IN	(2) #5		
160 MPH	10 PSF	6.19 PSF	6.75 FT	0.72 KIP	3.31 KIP	0.00 KIP	7.06 KIP	4.76 KIP	3.71 KIP	35 IN	(2) #5		
	20 PSF	12.37 PSF	6.75 FT	0.72 KIP	3.50 KIP	0.01 KIP	7.06 KIP	4.95 KIP	3.71 KIP	35 IN	(2) #5		
	30 PSF	18.56 PSF	6.75 FT	0.72 KIP	3.68 KIP	0.01 KIP	7.06 KIP	5.14 KIP	3.71 KIP	35 IN	(2) #5		
	40 PSF	24.74 PSF	6.50 FT	0.70 KIP	3.95 KIP	0.01 KIP	6.77 KIP	5.11 KIP	3.56 KIP	34 IN	(2) #5		
	50 PSF	30.39 PSF	6.25 FT	0.67 KIP	4.34 KIP	0.01 KIP	6.48 KIP	5.07 KIP	3.40 KIP	33 IN	(2) #5		
	60 PSF	37.11 PSF	5.75 FT	0.61 KIP	4.48 KIP	0.01 KIP	5.90 KIP	5.10 KIP	3.09 KIP	30 IN	(2) #5		



Slope Factor By Tilt	
Tilt	Cs
15°	1.00
20°	0.91
25°	0.82
30°	0.73
35°	0.64

ASCE 7-05													
TILT	MAX WIND	GROUND SNOW	ROOF SNOW	MAX SPAN	FRONT CONNECTION			REAR CONNECTION			BALLAST WIDTH	# OF REBAR	
					TENSION	COMPRESSION	SHEAR	TENSION	COMPRESSION	SHEAR			
30°	85 MPH	0 PSF	0.00 PSF	12.00 FT	0.09 KIP	2.64 KIP	0.01 KIP	6.17 KIP	4.42 KIP	3.87 KIP	31 IN	(2) #5	
		10 PSF	5.50 PSF	12.00 FT	0.09 KIP	2.92 KIP	0.02 KIP	6.17 KIP	4.71 KIP	3.87 KIP	31 IN	(2) #5	
		20 PSF	11.00 PSF	11.50 FT	0.09 KIP	3.28 KIP	0.02 KIP	5.91 KIP	4.79 KIP	3.70 KIP	30 IN	(2) #5	
		30 PSF	16.49 PSF	10.00 FT	0.07 KIP	3.62 KIP	0.02 KIP	5.11 KIP	4.39 KIP	3.20 KIP	26 IN	(2) #5	
		40 PSF	21.99 PSF	9.25 FT	0.07 KIP	4.06 KIP	0.03 KIP	4.71 KIP	4.73 KIP	2.95 KIP	24 IN	(2) #5	
		50 PSF	27.49 PSF	8.50 FT	0.06 KIP	4.38 KIP	0.03 KIP	4.31 KIP	4.97 KIP	2.70 KIP	22 IN	(1) #5	
	90 MPH	60 PSF	32.99 PSF	7.75 FT	0.05 KIP	4.58 KIP	0.03 KIP	3.90 KIP	5.08 KIP	2.44 KIP	20 IN	(1) #5	
		0 PSF	0.00 PSF	11.25 FT	0.13 KIP	2.71 KIP	0.01 KIP	6.50 KIP	4.58 KIP	4.06 KIP	33 IN	(2) #5	
		10 PSF	5.50 PSF	11.25 FT	0.13 KIP	2.98 KIP	0.01 KIP	6.50 KIP	4.85 KIP	4.06 KIP	33 IN	(2) #5	
		20 PSF	11.00 PSF	10.75 FT	0.12 KIP	3.18 KIP	0.02 KIP	6.20 KIP	4.89 KIP	3.88 KIP	31 IN	(2) #5	
		30 PSF	16.49 PSF	10.00 FT	0.11 KIP	3.73 KIP	0.02 KIP	5.75 KIP	4.78 KIP	3.60 KIP	29 IN	(2) #5	
		40 PSF	21.99 PSF	9.00 FT	0.10 KIP	4.04 KIP	0.02 KIP	5.15 KIP	4.76 KIP	3.22 KIP	26 IN	(2) #5	
	100 MPH	50 PSF	27.49 PSF	8.25 FT	0.09 KIP	4.34 KIP	0.03 KIP	4.70 KIP	4.97 KIP	2.93 KIP	24 IN	(2) #5	
		60 PSF	32.99 PSF	7.50 FT	0.08 KIP	4.51 KIP	0.02 KIP	4.24 KIP	5.05 KIP	2.65 KIP	22 IN	(1) #5	
		0 PSF	0.00 PSF	9.75 FT	0.18 KIP	2.79 KIP	0.00 KIP	6.97 KIP	4.77 KIP	4.33 KIP	35 IN	(2) #5	
		10 PSF	5.50 PSF	9.50 FT	0.18 KIP	2.95 KIP	0.01 KIP	6.78 KIP	4.87 KIP	4.21 KIP	34 IN	(2) #5	
		20 PSF	11.00 PSF	9.25 FT	0.17 KIP	3.09 KIP	0.01 KIP	6.59 KIP	4.96 KIP	4.10 KIP	33 IN	(2) #5	
		30 PSF	16.49 PSF	8.75 FT	0.16 KIP	3.46 KIP	0.02 KIP	6.22 KIP	4.89 KIP	3.86 KIP	32 IN	(2) #5	
	110 MPH	40 PSF	21.99 PSF	8.50 FT	0.16 KIP	4.01 KIP	0.02 KIP	6.03 KIP	4.94 KIP	3.74 KIP	31 IN	(2) #5	
		50 PSF	27.49 PSF	7.75 FT	0.14 KIP	4.25 KIP	0.02 KIP	5.47 KIP	4.97 KIP	3.39 KIP	28 IN	(2) #5	
		60 PSF	32.99 PSF	7.25 FT	0.13 KIP	4.53 KIP	0.02 KIP	5.09 KIP	5.16 KIP	3.15 KIP	26 IN	(2) #5	
		0 PSF	0.00 PSF	8.00 FT	0.21 KIP	2.69 KIP	0.00 KIP	6.88 KIP	4.61 KIP	4.25 KIP	35 IN	(2) #5	
		10 PSF	5.50 PSF	8.00 FT	0.21 KIP	2.88 KIP	0.01 KIP	6.88 KIP	4.80 KIP	4.25 KIP	35 IN	(2) #5	
		20 PSF	11.00 PSF	8.00 FT	0.21 KIP	3.07 KIP	0.01 KIP	6.88 KIP	4.99 KIP	4.25 KIP	35 IN	(2) #5	
	120 MPH	30 PSF	16.49 PSF	7.75 FT	0.21 KIP	3.26 KIP	0.01 KIP	6.65 KIP	5.00 KIP	4.11 KIP	34 IN	(2) #5	
		40 PSF	21.99 PSF	7.50 FT	0.20 KIP	3.73 KIP	0.02 KIP	6.42 KIP	5.01 KIP	3.96 KIP	33 IN	(2) #5	
		50 PSF	27.49 PSF	7.50 FT	0.20 KIP	4.30 KIP	0.02 KIP	6.42 KIP	5.18 KIP	3.96 KIP	33 IN	(2) #5	
		60 PSF	32.99 PSF	6.75 FT	0.18 KIP	4.38 KIP	0.02 KIP	5.72 KIP	5.08 KIP	3.53 KIP	30 IN	(2) #5	
		0 PSF	0.00 PSF	6.75 FT	0.24 KIP	2.63 KIP	0.00 KIP	6.84 KIP	4.51 KIP	4.20 KIP	36 IN	(3) #5	
		10 PSF	5.50 PSF	6.75 FT	0.24 KIP	2.79 KIP	0.00 KIP	6.84 KIP	4.66 KIP	4.20 KIP	36 IN	(3) #5	
	130 MPH	20 PSF	11.00 PSF	6.75 FT	0.24 KIP	2.95 KIP	0.01 KIP	6.84 KIP	4.82 KIP	4.20 KIP	36 IN	(3) #5	
		30 PSF	16.49 PSF	6.75 FT	0.24 KIP	3.11 KIP	0.01 KIP	6.84 KIP	4.98 KIP	4.20 KIP	36 IN	(3) #5	
		40 PSF	21.99 PSF	6.75 FT	0.24 KIP	3.53 KIP	0.01 KIP	6.84 KIP	5.13 KIP	4.20 KIP	36 IN	(3) #5	
		50 PSF	27.49 PSF	6.50 FT	0.23 KIP	3.90 KIP	0.01 KIP	6.56 KIP	5.07 KIP	4.03 KIP	35 IN	(2) #5	
		60 PSF	32.99 PSF	6.50 FT	0.23 KIP	4.39 KIP	0.02 KIP	6.56 KIP	5.22 KIP	4.03 KIP	35 IN	(2) #5	
		0 PSF	0.00 PSF	6.00 FT	0.28 KIP	2.68 KIP	0.00 KIP	7.06 KIP	4.59 KIP	4.32 KIP	38 IN	(3) #5	
30°	85 MPH	10 PSF	5.50 PSF	6.00 FT	0.28 KIP	2.82 KIP	0.00 KIP	7.06 KIP	4.73 KIP	4.32 KIP	38 IN	(3) #5	
		20 PSF	11.00 PSF	6.00 FT	0.28 KIP	2.97 KIP	0.01 KIP	7.06 KIP	4.86 KIP	4.32 KIP	38 IN	(3) #5	
		30 PSF	16.49 PSF	6.00 FT	0.28 KIP	3.11 KIP	0.01 KIP	7.06 KIP	5.00 KIP	4.32 KIP	38 IN	(3) #5	
		40 PSF	21.99 PSF	6.00 FT	0.28 KIP	3.31 KIP	0.01 KIP	7.06 KIP	5.14 KIP	4.32 KIP	38 IN	(3) #5	
		50 PSF	27.49 PSF	6.00 FT	0.28 KIP	3.77 KIP	0.01 KIP	7.06 KIP	5.28 KIP	4.32 KIP	38 IN	(3) #5	
		60 PSF	32.99 PSF	5.75 FT	0.27 KIP	4.04 KIP	0.01 KIP	6.73 KIP	5.16 KIP	4.11 KIP	36 IN	(3) #5	

ASCE 7-10													
TILT	MAX WIND	GROUND SNOW	ROOF SNOW	MAX SPAN	FRONT CONNECTION			REAR CONNECTION			BALLAST WIDTH	# OF REBAR	
					TENSION	COMPRESSION	SHEAR	TENSION	COMPRESSION	SHEAR			
30°	110 MPH	0 PSF	0.00 PSF	11.75 FT	0.11 KIP	2.68 KIP	0.01 KIP	6.33 KIP	4.51 KIP	3.97 KIP	31 IN	(2) #5	
		10 PSF	5.50 PSF	11.75 FT	0.11 KIP	2.96 KIP	0.01 KIP	6.33 KIP	4.79 KIP	3.97 KIP	31 IN	(2) #5	
		20 PSF	11.00 PSF	11.25 FT	0.10 KIP	3.26 KIP	0.02 KIP	6.06 KIP	4.85 KIP	3.79 KIP	29 IN	(2) #5	
		30 PSF	16.49 PSF	10.00 FT	0.09 KIP	3.66 KIP	0.02 KIP	5.36 KIP	4.54 KIP	3.35 KIP	26 IN	(2) #5	
		40 PSF	21.99 PSF	9.00 FT	0.08 KIP	3.99 KIP	0.02 KIP	4.80 KIP	4.66 KIP	3.00 KIP	23 IN	(1) #5	
		50 PSF	27.49 PSF	8.50 FT	0.07 KIP	4.41 KIP	0.03 KIP	4.52 KIP	5.03 KIP	2.83 KIP	22 IN	(1) #5	
	115 MPH	60 PSF	32.99 PSF	7.75 FT	0.06 KIP	4.62 KIP	0.03 KIP	4.09 KIP	5.14 KIP	2.56 KIP	20 IN	(1) #5	
		0 PSF	0.00 PSF	11.25 FT	0.13 KIP	2.75 KIP	0.01 KIP	6.64 KIP	4.66 KIP	4.15 KIP	32 IN	(2) #5	
		10 PSF	5.50 PSF	11.00 FT	0.13 KIP	2.96 KIP	0.01 KIP	6.49 KIP	4.82 KIP	4.05 KIP	31 IN	(2) #5	
		20 PSF	11.00 PSF	10.50 FT	0.12 KIP	3.13 KIP	0.02 KIP	6.18 KIP	4.85 KIP	3.86 KIP	30 IN	(2) #5	
		30 PSF	16.49 PSF	10.00 FT	0.12 KIP	3.75 KIP	0.02 KIP	5.88 KIP	4.85 KIP	3.67 KIP	29 IN	(2) #5	
		40 PSF	21.99 PSF	9.00 FT	0.10 KIP	4.06 KIP	0.02 KIP	5.26 KIP	4.80 KIP	3.28 KIP	26 IN	(2) #5	
130 MPH	50 PSF	27.49 PSF	8.25 FT	0.09 KIP	4.35 KIP	0.03 KIP	4.80 KIP	5.00 KIP	2.99 KIP	24 IN	(2) #5		
	60 PSF	32.99 PSF	7.50 FT	0.08 KIP	4.53 KIP	0.02 KIP	4.33 KIP	5.07 KIP	2.70 KIP	22 IN	(1) #5		
	0 PSF	0.00 PSF	9.25 FT	0.19 KIP	2.77 KIP	0.00 KIP	6.98 KIP	4.75 KIP	4.33 KIP	34 IN	(2) #5		
	10 PSF	5.50 PSF	9.25 FT	0.19 KIP	3.00 KIP	0.01 KIP	6.98 KIP	4.97 KIP	4.33 KIP	34 IN	(2) #5		
	20 PSF	11.00 PSF	8.75 FT	0.18 KIP	3.04 KIP	0.01 KIP	6.58 KIP	4.89 KIP	4.08 KIP	32 IN	(2) #5		
	30 PSF	16.49 PSF	8.50 FT	0.17 KIP	3.42 KIP	0.02 KIP	6.38 KIP	4.95 KIP	3.96 KIP	31 IN	(2) #5		
30°	140 MPH	40 PSF	21.99 PSF	8.25 FT	0.17 KIP	3.95 KIP	0.02 KIP	6.18 KIP	4.99 KIP	3.83 KIP	30 IN	(2) #5	
		50 PSF	27.49 PSF	7.75 FT	0.16 KIP	4.30 KIP	0.02 KIP	5.78 KIP	5.06 KIP	3.58 KIP	29 IN	(2) #5	
		60 PSF	32.99 PSF	7.00 FT	0.14 KIP	4.41 KIP	0.02 KIP	5.18 KIP	5.05 KIP	3.20 KIP	26 IN	(2) #5	
		0 PSF	0.00 PSF	8.00 FT	0.22 KIP	2.72 KIP	0.00 KIP	6.97 KIP	4.66 KIP	4.30 KIP	34 IN	(2) #5	
		10 PSF	5.50 PSF	8.00 FT	0.22 KIP	2.91 KIP	0.01 KIP	6.97 KIP	4.85 KIP	4.30 KIP	34 IN	(2) #5	
		20 PSF	11.00 PSF	8.00 FT	0.22 KIP	3.10 KIP	0.01 KIP	6.97 KIP	5.04 KIP	4.30 KIP	34 IN	(2) #5	
	150 MPH	30 PSF	16.49 PSF	7.75 FT	0.21 KIP	3.27 KIP	0.01 KIP	6.73 KIP	5.06 KIP	4.16 KIP	33 IN	(2) #5	
		40 PSF	21.99 PSF	7.50 FT	0.20 KIP	3.74 KIP	0.02 KIP	6.50 KIP	5.06 KIP	4.01 KIP	32 IN	(2) #5	
		50 PSF	27.49 PSF	7.25 FT	0.20 KIP	4.17 KIP	0.02 KIP	6.27 KIP	5.04 KIP	3.87 KIP	31 IN	(2) #5	
		60 PSF	32.99 PSF	6.75 FT	0.18 KIP	4.39 KIP	0.02 KIP	5.80 KIP	5.10 KIP	3.57 KIP	29 IN	(2) #5	
		0 PSF	0.00 PSF	7.00 FT	0.24 KIP	2.67 KIP	0.00 KIP	6.95 KIP	4.59 KIP	4.27 KIP	35 IN	(2) #5	
		10 PSF	5.50 PSF	7.00 FT	0.24 KIP	2.84 KIP	0.00 KIP	6.95 KIP	4.75 KIP	4.27 KIP	35 IN	(2) #5	
160 MPH	20 PSF	11.00 PSF	7.00 FT	0.24 KIP	3.01 KIP	0.01 KIP	6.95 KIP	4.91 KIP	4.27 KIP	35 IN	(2) #5		
	30 PSF	16.49 PSF	7.00 FT	0.24 KIP	3.17 KIP	0.01 KIP	6.95 KIP	5.08 KIP	4.27 KIP	35 IN	(2) #5		
	40 PSF	21.99 PSF	7.00 FT	0.24 KIP	3.64 KIP	0.01 KIP	6.95 KIP	5.24 KIP	4.27 KIP	35 IN	(2) #5		
	50 PSF	27.49 PSF	6.75 FT	0.23 KIP	4.02 KIP	0.02 KIP	6.68 KIP	5.19 KIP	4.10 KIP	34 IN	(2) #5		
	60 PSF	32.99 PSF	6.50 FT	0.23 KIP	4.36 KIP	0.02 KIP	6.40 KIP	5.14 KIP	3.93 KIP	32 IN	(2) #5		
	0 PSF	0.00 PSF	6.25 FT	0.27 KIP	2.66 KIP	0.00 KIP	6.99 KIP	4.56 KIP	4.28 KIP	36 IN	(3) #5		
160 MPH	10 PSF	5.50 PSF	6.25 FT	0.27 KIP	2.81 KIP	0.00 KIP	6.99 KIP	4.71 KIP	4.28 KIP	36 IN	(3) #5		
	20 PSF	11.00 PSF	6.25 FT	0.27 KIP	2.96 KIP	0.01 KIP	6.99 KIP	4.85 KIP	4.28 KIP	36 IN	(3) #5		
	30 PSF	16.49 PSF	6.25 FT	0.27 KIP	3.11 KIP	0.01 KIP	6.99 KIP	5.00 KIP	4.28 KIP	36 IN	(3) #5		
	40 PSF	21.99 PSF	6.25 FT	0.27 KIP	3.39 KIP	0.01 KIP	6.99 KIP	5.14 KIP	4.28 KIP	36 IN	(3) #5		
	50 PSF	27.49 PSF	6.25 FT	0.27 KIP	3.86 KIP	0.01 KIP	6.99 KIP	5.28 KIP	4.28 KIP	36 IN	(3) #5		
	60 PSF	32.99 PSF	6.00 FT	0.26 KIP	4.16 KIP	0.01 KIP	6.68 KIP	5.18 KIP	4.09 KIP	34 IN	(2) #5		