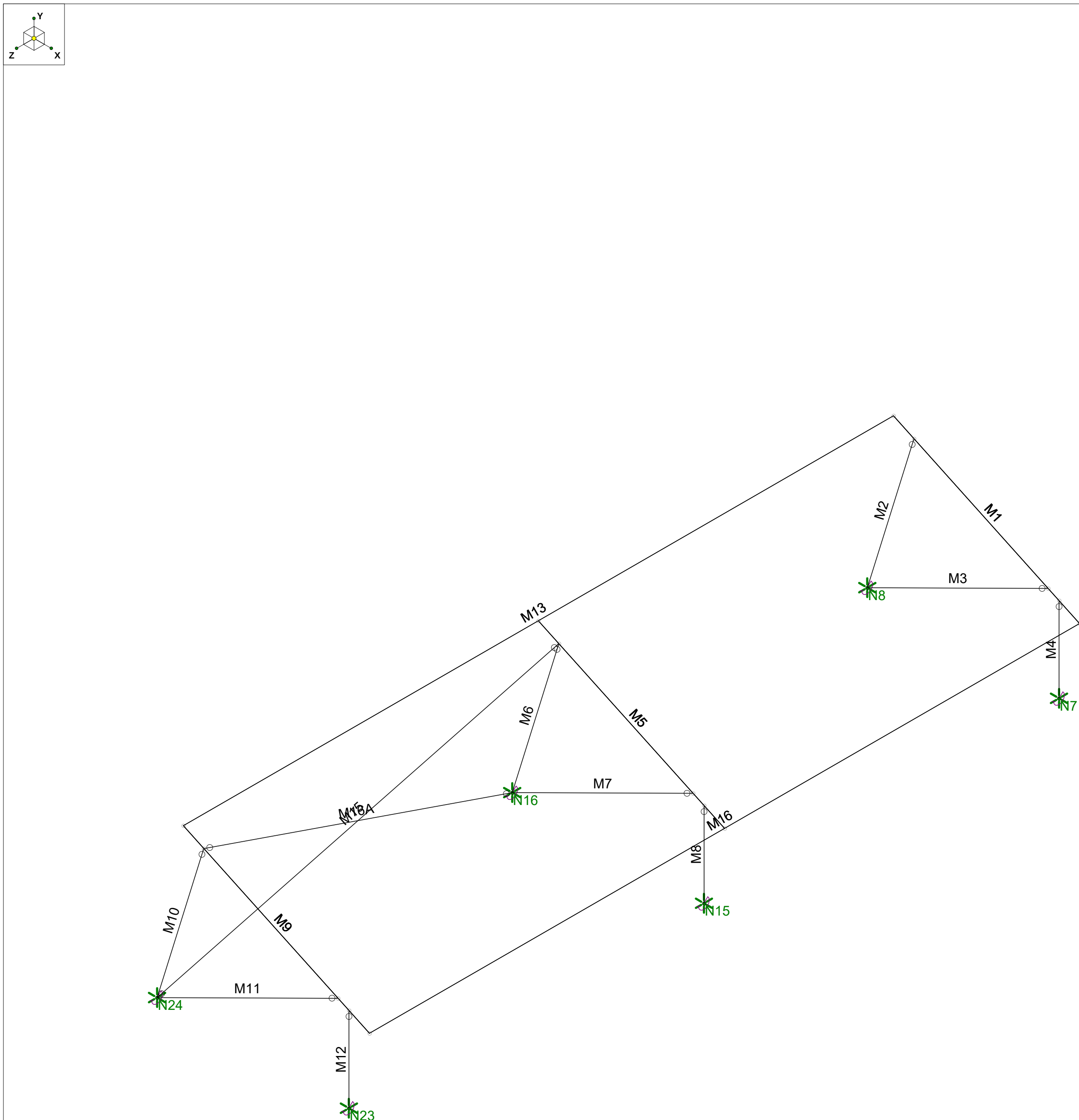


Schletter, Inc.		25° Tilt w/o Seismic Design
HCV	Standard PVMini Racking System	
	Representative Calculations - ASCE 7-10	

1. INTRODUCTION

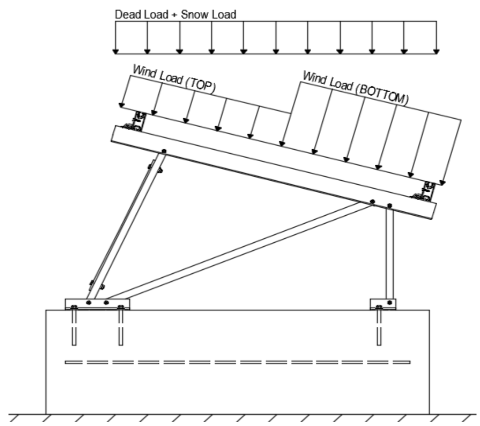
1.1 Project Description
The following sections will cover the determination of forces and structural design calculations for the Schletter, Inc. PVMini ground mount system.

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 =	1700	mm	Height =	1550	mm
Width =	1050	mm	Width =	970	mm
Dead Load =	3.00	psf	Dead Load =	1.75	psf

Modules Per Row = 1
Module Tilt = 25°
Maximum Height Above Grade = 3 ft



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

1.3 Technical Codes
- ASCE 7-10 - Chapter 26-31, Wind Loads
- ASCE 7-10 - Chapter 7, Snow Loads
- ASCE 7-10 - Chapter 2, Combination of Loads
- International Building Code, IBC, 2012, 2015
- 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 = 18.56 psf *(ASCE 7-10, Eq. 7.4-1)*
I_s = 1.00
C_s = 0.82
C_e = 0.90
C_t = 1.20

2.3 Wind Loads
Design Wind Speed, V = 110 mph
Height ≤ 15 ft

Exposure Category = C
Importance Category = II

Peak Velocity Pressure, q_z = 19.00 psf *Including the gust factor, G=0.85. (ASCE 7-10, Eq. 27.3-1)*

Pressure Coefficients

$Cf+_{TOP}$	=	1.1	*(Pressure)*
$Cf+_{BOTTOM}$	=	1.7	
$Cf-_{TOP}$	=	-2.2	*(Suction)*
$Cf-_{BOTTOM}$	=	-1	

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	ρ =	1.3
S_{D1} =	0.00	Ω =	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.

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:

1.2D + 1.6S + 0.5W
1.2D + 1.0W + 0.5S
0.9D + 1.0W ^{M}
1.54D + 1.3E + 0.2S ^{R}
0.56D + 1.3E ^{R}
1.54D + 1.25E + 0.2S ^{O}
0.56D + 1.25E ^{O}

(ASCE 7, Eq 2.3.2-1 through 2.3.2-7) & (ASCE 7, Section 12.4.3.2)

Allowable Stress Design, ASD

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

1.0D + 1.0S
1.0D + 0.6W
1.0D + 0.75L + 0.45W + 0.75S
0.6D + 0.6W ^{M}
1.238D + 0.875E ^{O}
1.1785D + 0.65625E + 0.75S ^{O}
0.362D + 0.875E ^{O}

(ASCE 7, Eq 2.4.1-1 through 2.4.1-8) & (ASCE 7, Section 12.4.3.2)

^{M} *Uses the minimum allowable module dead load.*
^{R} *Include redundancy factor of 1.3.*
^{O} *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.

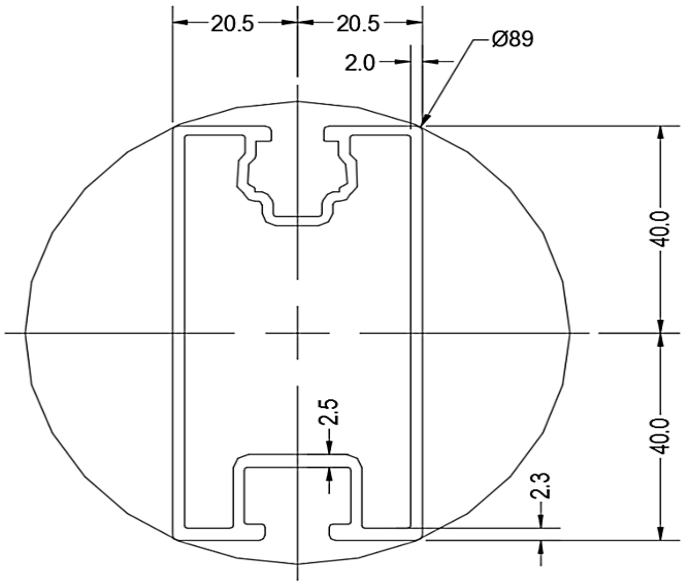
Purlins	Location	Diagonal Struts	Location	Front Reactions	Location
M13	Top	M3	Outer	N7	Outer
M16	Bottom	M7	Inner	N15	Inner
		M11	Outer	N23	Outer
Girders	Location	**Rear Struts**	Location	**Rear Reactions**	Location
M1	Outer	M2	Outer	N8	Outer
M5	Inner	M6	Inner	N16	Inner
M9	Outer	M10	Outer	N24	Outer
Front Struts	Location	**Bracing**			
M4	Outer	M15			
M8	Inner	M16A			
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 continous 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).

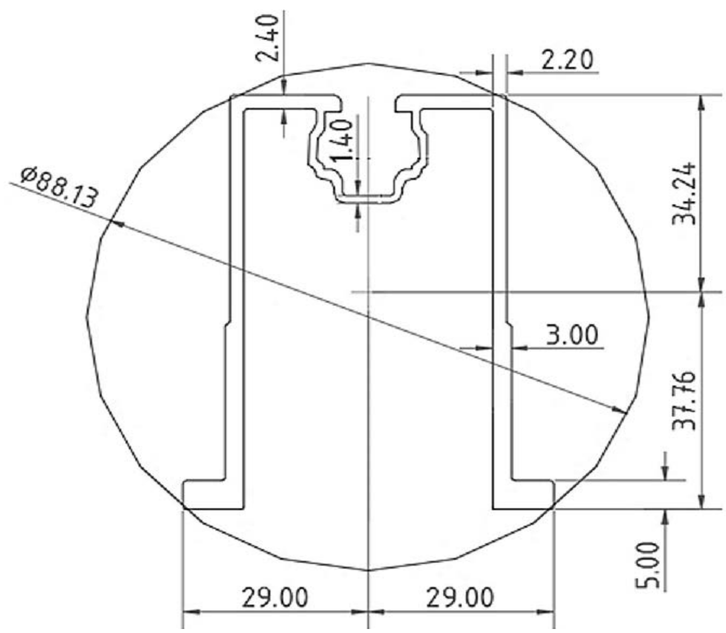
Purlin Type =	**ProfiPlusXT**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	96	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	28.76	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	22.71	ksi
S_y =	0.75	in^3
S_x =	0.44	in^3
E =	10100	ksi
I_y =	1.20	in^4
I_x =	0.36	in^4
A =	0.96	in^2
g =	1.15	lbs/ft
M_y =	1.022	k-ft
M_z =	0.235	k-ft
$M_{y\ allowable}$ =	1.787	k-ft
$M_{z\ allowable}$ =	0.838	k-ft
Utilization =	85%	



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).

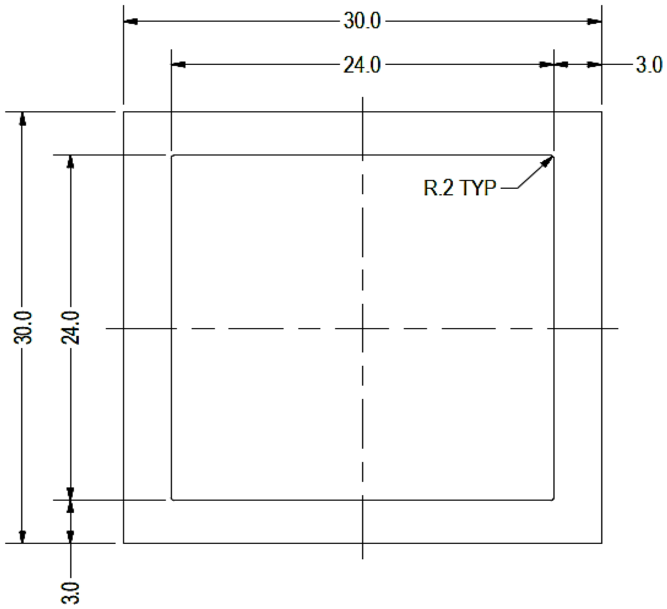
Girder Type =	**Flex Profi**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	33.78	in
$\Phi F_{ty\ AXIAL}$ =	14.29	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.76	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	13.46	ksi
S_y =	0.59	in^3
S_x =	0.46	in^3
E =	10100	ksi
I_y =	0.88	in^4
I_x =	0.52	in^4
A =	0.89	in^2
g =	1.07	lbs/ft
M_y =	0.568	k-ft
M_z =	0.000	k-ft
P_n =	0.308	k
$M_{y\ allowable}$ =	1.460	k-ft
$M_{z\ allowable}$ =	0.513	k-ft
$P_{n\ allowable}$ =	12.764	k
Utilization =	41%	



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 M8 bolts at each end. See Appendix A.3 for detailed member calculations. Section units are in (mm).

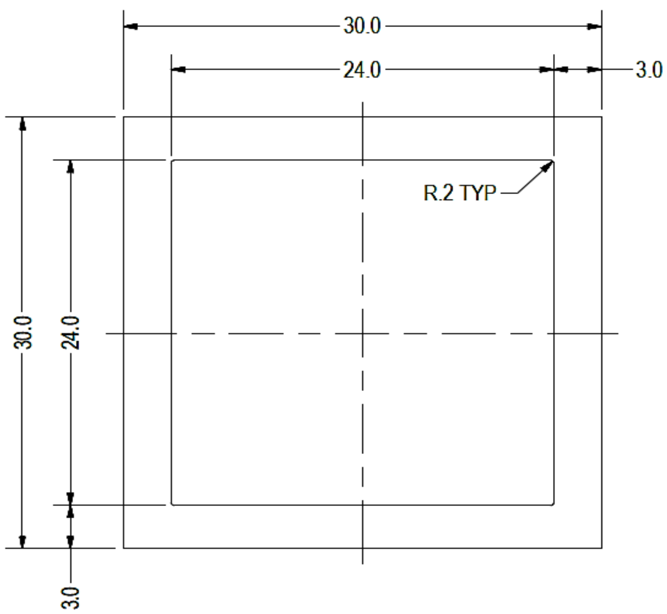
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	18.00	in
$\Phi F_{ty\ AXIAL}$ =	24.52	ksi
$\Phi F_{ty\ BENDING}$ =	31.19	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.001	k-ft
P_n =	1.375	k
$M_{y\ allowable}$ =	0.423	k-ft
$M_{z\ allowable}$ =	0.423	k-ft
$P_{n\ allowable}$ =	12.310	k
Utilization =	11%	



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 M8 bolts at each end. See Appendix A.4 for detailed member calculations. Section units are in (mm).

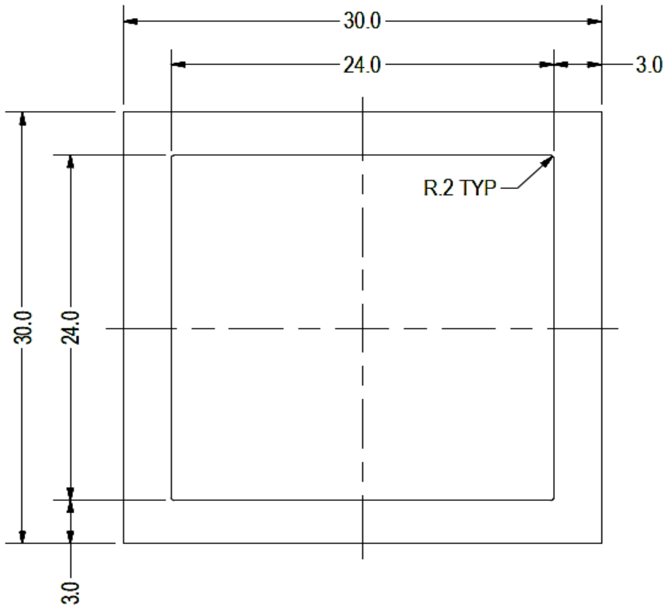
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	46.38	in
$\Phi F_{ty\ AXIAL}$ =	7.60	ksi
$\Phi F_{ty\ BENDING}$ =	29.80	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.467	k
$M_{y\ allowable}$ =	0.404	k-ft
$M_{z\ allowable}$ =	0.404	k-ft
$P_{n\ allowable}$ =	3.814	k
Utilization =	12%	



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 M8 bolts at each end. See Appendix A.5 for detailed member calculations. Section units are in (mm).

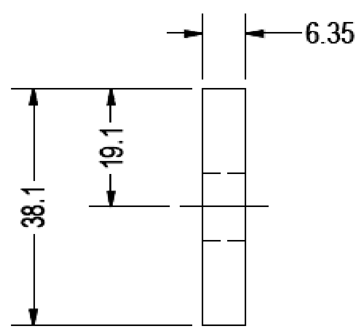
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	36.18	in
$\Phi F_{ty\ AXIAL}$ =	11.59	ksi
$\Phi F_{ty\ BENDING}$ =	30.23	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	1.143	k
$M_{y\ allowable}$ =	0.410	k-ft
$M_{z\ allowable}$ =	0.410	k-ft
$P_{n\ allowable}$ =	5.820	k
Utilization =	20%	



4.6 Cross Brace Design

In order to resist weak side loading, aluminum cross bracing kits are provided. The cross bracing is attached at one end of a rear aluminum strut diagonally down to the bottom end of an adjacent strut. Single M10 bolts are provided at each of the cross bracing. Section units are in (mm).

Brace Type =	**1.5x0.25**	
Aluminum Type =	6061-T6	
F_{ty} =	35	ksi
Φ =	0.90	
S_y =	0.02	in^3
E =	10100	ksi
I_y =	33.25	in^4
A =	0.38	in^2
g =	0.45	lbs/ft
M_y =	0.006	k-ft
P_n =	0.041	k
$M_{y\ allowable}$ =	0.046	k-ft
$P_{n\ allowable}$ =	11.813	k
Utilization =	14%	



A cross brace kit is required every 14 bays and is to be installed in centermost bays.

5. FOUNDATION DESIGN CALCULATIONS

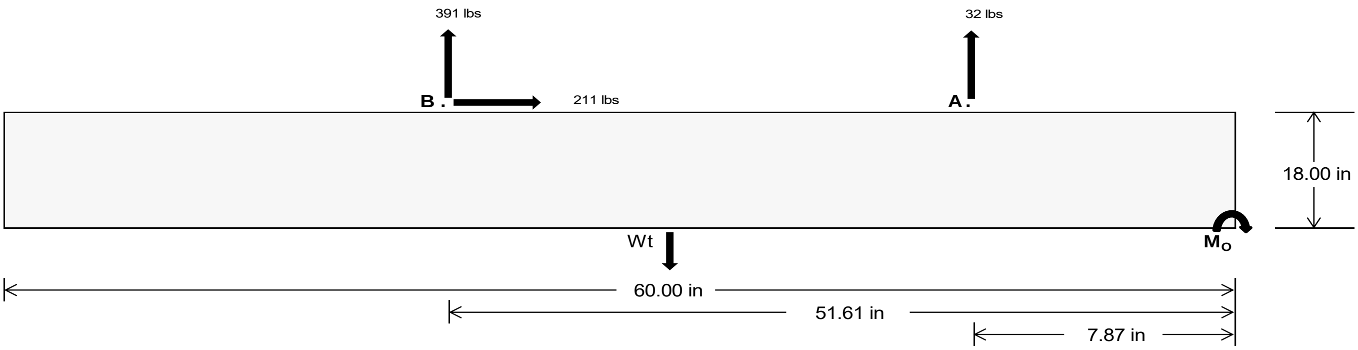
5.1 Helical Pile Foundations

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.

Maximum	Front	Rear	
Tensile Load =	146.29	1701.36	k
Compressive Load =	1787.40	1472.92	k
Lateral Load =	5.33	915.99	k
Moment (Weak Axis) =	0.01	0.00	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 table 1806.2 (2012, 2015).



Concrete Properties

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

Footing Reinforcement

Use fiber reinforcing with (1) #5 rebar.

Overturning Check

M_O = 24238.0 in-lbs
Resisting Force Required = 807.93 lbs
S.F. = 1.67
Weight Required = 1346.55 lbs
Minimum Width = 21 in in
Weight Provided = 1903.13 lbs

A minimum 60in long x 21in wide x 18in tall ballast foundation is required to resist overturning.

Sliding

Force = 211.20 lbs
Friction = 0.4
Weight Required = 527.99 lbs
Resisting Weight = 1903.13 lbs
Additional Weight Required = 0 lbs

Use a 60in long x 21in wide x 18in tall ballast foundation to resist sliding. Friction is OK.

Cohesion

Sliding Force = 211.20 lbs
Cohesion = 130 psf
Area = 8.75 ft^2
Resisting = 951.56 lbs
Additional Weight Required = 0 lbs

Use a 60in long x 21in 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			
	21 in	22 in	23 in	24 in
P_{ftg} = (145 pcf)(5 ft)(1.5 ft)(1.75 ft) =	1903 lbs	1994 lbs	2084 lbs	2175 lbs

ASD LC	1.0D + 1.0S				1.0D + 0.6W				1.0D + 0.75L + 0.45W + 0.75S				0.6D + 0.6W			
Width	21 in	22 in	23 in	24 in	21 in	22 in	23 in	24 in	21 in	22 in	23 in	24 in	21 in	22 in	23 in	24 in
F_A	696 lbs	696 lbs	696 lbs	696 lbs	482 lbs	482 lbs	482 lbs	482 lbs	827 lbs	827 lbs	827 lbs	827 lbs	-63 lbs	-63 lbs	-63 lbs	-63 lbs
F_B	502 lbs	502 lbs	502 lbs	502 lbs	519 lbs	519 lbs	519 lbs	519 lbs	724 lbs	724 lbs	724 lbs	724 lbs	-782 lbs	-782 lbs	-782 lbs	-782 lbs
F_V	74 lbs	74 lbs	74 lbs	74 lbs	385 lbs	385 lbs	385 lbs	385 lbs	339 lbs	339 lbs	339 lbs	339 lbs	-422 lbs	-422 lbs	-422 lbs	-422 lbs
P_{total}	3101 lbs	3192 lbs	3283 lbs	3373 lbs	2904 lbs	2995 lbs	3085 lbs	3176 lbs	3454 lbs	3544 lbs	3635 lbs	3726 lbs	296 lbs	351 lbs	405 lbs	460 lbs
M	490 lbs-ft	490 lbs-ft	490 lbs-ft	490 lbs-ft	532 lbs-ft	532 lbs-ft	532 lbs-ft	532 lbs-ft	729 lbs-ft	729 lbs-ft	729 lbs-ft	729 lbs-ft	659 lbs-ft	659 lbs-ft	659 lbs-ft	659 lbs-ft
e	0.16 ft	0.15 ft	0.15 ft	0.15 ft	0.18 ft	0.18 ft	0.17 ft	0.17 ft	0.21 ft	0.21 ft	0.20 ft	0.20 ft	2.22 ft	1.88 ft	1.63 ft	1.43 ft
L/6	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft
f_{min}	287.3 psf	284.1 psf	281.2 psf	278.5 psf	259.0 psf	257.1 psf	255.4 psf	253.8 psf	294.7 psf	291.2 psf	288.0 psf	285.0 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	421.6 psf	412.3 psf	403.9 psf	396.1 psf	404.8 psf	396.3 psf	388.6 psf	381.4 psf	494.8 psf	482.2 psf	470.6 psf	460.1 psf	407.1 psf	205.1 psf	161.2 psf	143.6 psf

Maximum Bearing Pressure = 495 psf
Allowable Bearing Pressure = 1500 psf

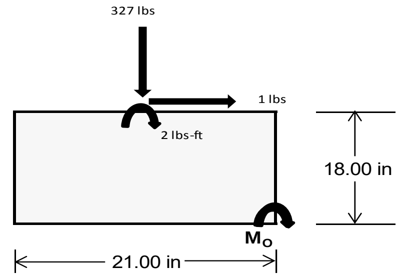
Use a 60in long x 21in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O =	282.8 ft-lbs
Resisting Force Required =	323.16 lbs
S.F. =	1.67
Weight Required =	538.60 lbs
Minimum Width =	21 in in
Weight Provided =	1903.13 lbs

A minimum 60in long x 21in 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	21 in			21 in			21 in		
Support	Outer	Inner	Outer	Outer	Inner	Outer	Outer	Inner	Outer
F_Y	91 lbs	244 lbs	86 lbs	332 lbs	983 lbs	327 lbs	27 lbs	71 lbs	25 lbs
F_V	5 lbs	5 lbs	0 lbs	23 lbs	22 lbs	1 lbs	2 lbs	1 lbs	0 lbs
P_{total}	2447 lbs	2600 lbs	2442 lbs	2575 lbs	3226 lbs	2570 lbs	716 lbs	760 lbs	714 lbs
M	8 lbs-ft	7 lbs-ft	0 lbs-ft	39 lbs-ft	33 lbs-ft	4 lbs-ft	2 lbs-ft	2 lbs-ft	0 lbs-ft
e	0.00 ft	0.00 ft	0.00 ft	0.02 ft	0.01 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft
L/6	0.29 ft	1.74 ft	1.75 ft	1.72 ft	1.73 ft	1.75 ft	1.74 ft	1.74 ft	1.75 ft
f_{min}	276.6 sqft	294.3 sqft	278.9 sqft	278.9 sqft	355.9 sqft	292.3 sqft	80.9 sqft	86.1 sqft	81.6 sqft
f_{max}	282.7 psf	300.1 psf	279.3 psf	309.7 psf	381.5 psf	295.2 psf	82.7 psf	87.7 psf	81.7 psf

Maximum Bearing Pressure = 381 psf
Allowable Bearing Pressure = 1500 psf

Use a 60in long x 21in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Foundation Requirements: 60in long x 21in wide x 18in tall ballast foundation and fiber reinforcing with (1) #5 rebar.

5.3 Foundation Anchors

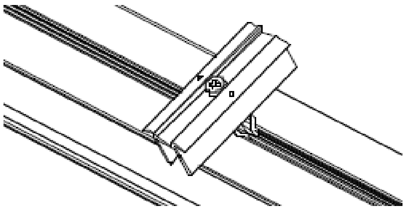
Threaded rods are anchored to the the ballast foundations using the Simpson AT-XP epoxy solution. LRFD load results are compared to the allowable strengths of the epoxy solution. Please see the supplementary calculations provided by the Simpson Anchor Designer software.

6. DESIGN OF JOINTS AND CONNECTIONS

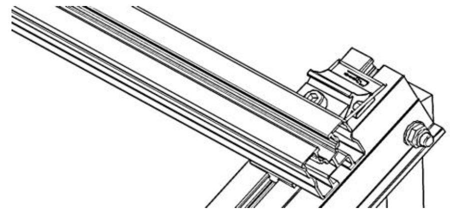
6.1 Anchorage of Modules to Purlins and Connection of Purlins to Girders

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

Fastening of Modules to Purlins		
Maximum Uplifting Force =	0.386	k
Allowable Uplift =	1.214	k
Utilization =	32%	



Fastening of Purlins to Girders		
Maximum Uplifting Force =	1.086	k
Allowable Uplift =	1.116	k
Utilization =	97%	



6.2 Bolted Connections

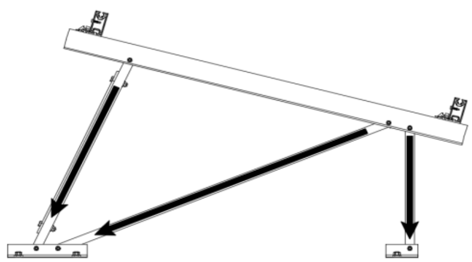
The aluminum struts connect the aluminum girder ends to custom brackets with mounting holes. Cross bracing is attached to rear struts to provide lateral stability. Single M8 bolts are used to attach each end of the strut to the girder and post. ASTM A193/A193M-86 equivalent stainless steel bolts are used.

Front Strut		
Maximum Axial Load =	1.375	k
M8 Bolt Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	24%	

Rear Strut		
Maximum Axial Load =	1.174	k
M8 Bolt Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	21%	

Diagonal Strut		
Maximum Axial Load =	0.467	k
M8 Bolt Shear Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	8%	

Bracing		
Maximum Axial Load =	0.041	k
M10 Bolt Capacity =	8.894	k
Strut Bearing Capacity =	7.952	k
Utilization =	1%	



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 M8 bolts are located at each end of the strut and are subjected to double shear.

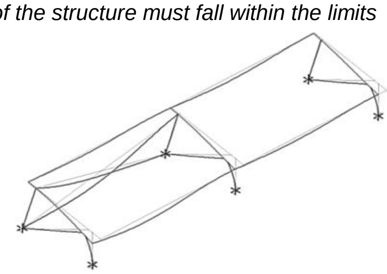
7. SEISMIC DESIGN

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} =	30.83	in
Allowable Story Drift for All Other Structures, Δ = {	$0.020h_{sx}$ 0.617	in
Max Drift, Δ_{MAX} =	0.063	in
N/A		

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 = **ProfiPlus XT**

Strong Axis:

3.4.14

L_b = 96.00 in

J = 0.427

200.222

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

S1 = 0.51461

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

S2 = 1701.56

φF_L= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]

φF_L= 28.8 ksi

3.4.16

b/t = 6.6

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 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

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

Weak Axis:

3.4.14

L_b = 96.00 in

J = 0.427

217.57

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

S1 = 0.51461

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

S2 = 1701.56

φF_L= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]

φF_L= 28.6

3.4.16

b/t = 37.95

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 22.7 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 37.95

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

S1 = 38.1

m = 0.63

C_0 = 40.784

Cc = 39.216

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

S2 = 79.7

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L St$= 28.8 ksi

Ix = 498305 mm^4

1.197 in^4

y = 40.784 mm

Sx = 0.746 in³

$M_{max}St$ = 1.787 k-ft

3.4.18

h/t = 6.6

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

S1 = 36.9

m = 0.65

C_0 = 20.5

Cc = 20.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L Wk$= 22.7 ksi

Iy = 148662 mm^4

0.357 in^4

x = 20.5 mm

Sy = 0.443 in³

$M_{max}Wk$ = 0.838 k-ft

<u>Compression</u>

3.4.9

b/t = 6.6

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φyFcy

φF_L= 33.3 ksi

b/t = 37.95

S1 = 12.21

S2 = 32.70

φF_L= (φck2*√(BpE))/(1.6b/t)

φF_L= 21.4 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

φF_L= φyFcy

φF_L= 33.25 ksi

φF_L= 21.42 ksi

A = 620.02 mm^2

0.96 in^2

P_{max} = 20.59 kips

Girder = **Flex Profi**

Strong Axis:
3.4.11
L_b = 33.78 in
ry = 1.374
Cb = 1.32
21.4323

$$S1 = \frac{1.2(Bc - \frac{\theta_y}{\theta_b} Fcy)}{Dc}$$

S1 = 1.37733

$$S2 = 1.2C_c$$

S2 = 79.2
φF_L= φb[Bc-Dc*Lb/(1.2*ry*√(Cb))
φF_L= 29.8 ksi

3.4.15
N/A for Strong Direction

3.4.16
b/t = 4.29

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

S1 = 12.2

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

S2 = 46.7
φF_L= φyFcy
φF_L= 33.3 ksi

3.4.16
N/A for Strong Direction

Weak Axis:
3.4.11
L_b = 33.78 in
ry = 1.374
Cb = 1.32
24.5845

$$S1 = \frac{1.2(Bc - \frac{\theta_y}{\theta_b} Fcy)}{Dc}$$

S1 = 1.37733

$$S2 = 1.2C_c$$

S2 = 79.2
φF_L= φb[Bc-Dc*Lb/(1.2*ry*√(Cb))
φF_L= 29.8 ksi

3.4.15
b/t = 24.46

$$S1 = \frac{Bp - \frac{\theta_y}{\theta_b} Fcy}{5.1Dp}$$

S1 = 3.8

$$S2 = \frac{k_1 Bp}{5.1Dp}$$

S2 = 14.7
F_{UT}= (φbk2*√(BpE))/(5.1b/t)
F_{UT}= 9.4 ksi

3.4.16
N/A for Weak Direction

3.4.16
b/t = 24.46

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

S1 = 12.2

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

S2 = 46.7
F_{ST}= φb[Bp-1.6Dp*b/t]
F_{ST}= 28.2 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

φF_L = 1.17φyFcy

φF_L = 38.9 ksi

3.4.16.1

N/A for Weak Direction

3.4.16.2

N/A for Strong Direction

3.4.16.2

b/t = 24.46

t = 2.6

ds = 6.05

rs = 3.49

S = 21.70

ρst = 0.22

F_{UT}= 9.37

F_{ST}= 28.24

φF_L= Fut + (Fst - Fut)ρst < Fst

φF_L= 13.5 ksi

3.4.18

h/t = 24.46

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

S1 = 34.4

m = 0.70

C_0 = 34.23

Cc = 37.77

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

S2 = 72.1

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 29.8 ksi

Ix = 364470 mm^4

0.876 in^4

y = 37.77 mm

Sx = 0.589 in^3

M_{max}St = 1.460 k-ft

3.4.18

h/t = 4.29

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

S1 = 36.9

m = 0.65

C_0 = 29

Cc = 29

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 13.5 ksi

Iy = 217168 mm^4

0.522 in^4

x = 29 mm

Sy = 0.457 in^3

M_{max}Wk = 0.513 k-ft

Compression

3.4.7

λ = 0.46067

r = 1.374 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.90326

φF_L= φcc(Bc-Dc*λ)

φF_L= 30.1251 ksi

3.4.8

b/t = 24.46
S1 = 3.83
S2 = 10.30
φF_L = (φck2*√(BpE))/(5.1b/t)
φF_L = 10.4 ksi

3.4.9

b/t = 4.29
S1 = 12.21 (See 3.4.16 above for formula)
S2 = 32.70 (See 3.4.16 above for formula)
φF_L = φyFcy
φF_L = 33.3 ksi

b/t = 24.46
S1 = 12.21
S2 = 32.70
φF_L = φc[Bp-1.6Dp*b/t]
φF_L = 28.2 ksi

3.4.9.1

b/t = 24.46
t = 2.6
ds = 6.05
rs = 3.49
S = 21.70
ρst = 0.22
F_{UT} = 10.43
F_{ST} = 28.24
φF_L = Fut + (Fst - Fut)ρst < Fst
φF_L = 14.3 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
φF_L = φyFcy
φF_L = 33.25 ksi

φF_L = 14.29 ksi
A = 576.21 mm^2
0.89 in^2
P_{max} = 12.76 kips

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 18.00 in

J = 0.16

47.2194

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

S1 = 0.51461

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

S2 = 1701.56

φF_L= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]

φF_L= 31.2 ksi

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 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

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 31.2 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

M_{max}St = 0.423 k-ft

Weak Axis:

3.4.14

L_b = 18.00 in

J = 0.16

47.2194

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

S1 = 0.51461

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

S2 = 1701.56

φF_L= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]

φF_L= 31.2

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 31.2 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

M_{max}Wk = 0.423 k-ft

Compression

3.4.7

λ = 0.77182

r = 0.437 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.83792

φF_L= φcc(Bc-Dc*λ)

φF_L= 24.5226 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φyFcy

φF_L= 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

φF_L= φyFcy

φF_L= 33.3 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

φF_L= φyFcy

φF_L= 33.25 ksi

φF_L= 24.52 ksi

A = 323.87 mm^2

0.50 in^2

P_{max} = 12.31 kips

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 46.38 in

J = 0.16

121.663

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

S1 = 0.51461

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

S2 = 1701.56

φF_L= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]

φF_L= 29.8 ksi

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 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

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 29.8 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

M_{max}St = 0.404 k-ft

Weak Axis:

3.4.14

L_b = 46.38 in

J = 0.16

121.663

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

S1 = 0.51461

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

S2 = 1701.56

φF_L= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]

φF_L= 29.8

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 33.3 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

M_{max}Wk = 0.450 k-ft

Compression

3.4.7

$\lambda =$ 1.98863

$r =$ 0.437 in

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

$S1^* =$ 0.33515

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

$S2^* =$ 1.23671

$\varphi cc =$ 0.85841

$\varphi F_L = (\varphi ccFcy)/(\lambda^2)$

$\varphi F_L =$ 7.59722 ksi

3.4.9

$b/t =$ 7.75

$S1 =$ 12.21 (See 3.4.16 above for formula)

$S2 =$ 32.70 (See 3.4.16 above for formula)

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

$b/t =$ 7.75

$S1 =$ 12.21

$S2 =$ 32.70

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 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

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.25 ksi

$\varphi F_L =$ 7.60 ksi

$A =$ 323.87 mm^2

0.50 in^2

$P_{max} =$ 3.81 kips

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 36.18 in

J = 0.16

94.9139

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

S1 = 0.51461

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

S2 = 1701.56

φF_L= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]

φF_L= 30.2 ksi

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 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

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 30.2 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

M_{max}St = 0.410 k-ft

Weak Axis:

3.4.14

L_b = 36.18 in

J = 0.16

94.9139

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

S1 = 0.51461

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

S2 = 1701.56

φF_L= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]

φF_L= 30.2

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 33.3 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

M_{max}Wk = 0.450 k-ft

Compression

3.4.7

$\lambda =$ 1.5514

r = 0.437 in

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

$S1^* =$ 0.33515

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

$S2^* =$ 1.23671

$\varphi cc =$ 0.7972

$\varphi F_L = (\varphi ccFcy)/(\lambda^2)$

$\varphi F_L =$ 11.5927 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 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

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.25 ksi

$\varphi F_L =$ 11.59 ksi

A = 323.87 mm^2

0.50 in^2

$P_{max} =$ 5.82 kips

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.

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distribut...	Area(Me...	Surface(...
1	Dead Load, Max	DL		-1				2		
2	Dead Load, Min	DL		-1				2		
3	Snow Load	SL						2		
4	Wind Load - Pressure	WL						2		
5	Wind Load - Suction	WL						2		
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	-8.366	-8.366	0	0
2	M16	Y	-8.366	-8.366	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	-4.45	-4.45	0	0
2	M16	Y	-4.45	-4.45	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	-51.748	-51.748	0	0
2	M16	Y	-51.748	-51.748	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	-58.278	-58.278	0	0
2	M16	y	-90.067	-90.067	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	116.557	116.557	0	0
2	M16	y	52.98	52.98	0	0

Load Combinations

	Description	S...	P...	S...	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 + 0.5W	Yes	Y		1	1.2	3	1.6	4	.5														
2	LRFD 1.2D + 1.0W + 0.5S	Yes	Y		1	1.2	3	.5	4	1														
3	LRFD 0.9D + 1.0W	Yes	Y		2	.9					5	1												
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												
8																								
9	ASD 1.0D + 1.0S	Yes	Y		1	1	3	1																
10	ASD 1.0D + 0.6W	Yes	Y		1	1			4	.6														
11	ASD 1.0D + 0.75L + 0.45W + 0....	Yes	Y		1	1	3	.75	4	.45														
12	ASD 0.6D + 0.6W	Yes	Y		2	.6					5	.6												
13	LATERAL - ASD 1.238D + 0.875E	Yes	Y		1	1.2...					6	.875												
14	LATERAL - ASD 1.1785D + 0.65...	Yes	Y		1	1.1...	3	.75			6	.656												
15	LATERAL - ASD 0.362D + 0.875E	Yes	Y		1	.362					6	.875												

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N8	max	168.178	2	305.32	1	-.002	15	0	2	0	1	0	1
2		min	-220.776	3	-399.182	3	-.203	1	0	3	0	1	0	1
3	N7	max	0	15	504.68	1	-.078	15	0	15	0	1	0	1
4		min	-.186	1	-24.351	3	-1.856	1	-.003	1	0	1	0	1
5	N15	max	0	15	1374.92	1	.673	1	.001	1	0	1	0	1
6		min	-1.921	1	-112.534	3	-.311	3	0	3	0	1	0	1
7	N16	max	668.265	2	1133.016	1	-.269	10	0	1	0	1	0	1
8		min	-704.607	3	-1308.738	3	-37.124	3	0	3	0	1	0	1
9	N23	max	0	15	504.355	1	4.101	1	.007	1	0	1	0	1
10		min	-.186	1	-23.859	3	.163	15	0	15	0	1	0	1
11	N24	max	168.744	2	311.076	1	37.357	3	.002	1	0	1	0	1
12		min	-220.852	3	-396.336	3	.04	10	0	3	0	1	0	1
13	Totals:	max	1003.093	2	4133.367	1	0	10						
14		min	-1146.391	3	-2265	3	0	3						

Envelope Member Section Forces

	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
1	M2	1	max	348.926	1	.641	4	.715	1	0	15	0	3	0	1
2			min	-360.122	3	.151	15	-.03	3	-.001	1	0	1	0	1
3		2	max	349.042	1	.595	4	.715	1	0	15	0	15	0	15
4			min	-360.035	3	.141	15	-.03	3	-.001	1	0	1	0	4
5		3	max	349.159	1	.55	4	.715	1	0	15	0	1	0	15
6			min	-359.947	3	.13	15	-.03	3	-.001	1	0	3	0	4
7		4	max	349.275	1	.504	4	.715	1	0	15	0	1	0	15
8			min	-359.86	3	.119	15	-.03	3	-.001	1	0	3	0	4
9		5	max	349.391	1	.458	4	.715	1	0	15	0	1	0	15
10			min	-359.773	3	.108	15	-.03	3	-.001	1	0	3	0	4
11		6	max	349.508	1	.413	4	.715	1	0	15	0	1	0	15
12			min	-359.685	3	.098	15	-.03	3	-.001	1	0	3	0	4
13		7	max	349.624	1	.367	4	.715	1	0	15	0	1	0	15
14			min	-359.598	3	.087	15	-.03	3	-.001	1	0	3	0	4
15		8	max	349.741	1	.321	4	.715	1	0	15	0	1	0	15
16			min	-359.511	3	.076	15	-.03	3	-.001	1	0	3	0	4
17		9	max	349.857	1	.276	4	.715	1	0	15	0	1	0	15
18			min	-359.423	3	.065	15	-.03	3	-.001	1	0	3	0	4
19		10	max	349.974	1	.23	4	.715	1	0	15	0	1	0	15
20			min	-359.336	3	.055	15	-.03	3	-.001	1	0	3	0	4
21		11	max	350.09	1	.184	4	.715	1	0	15	0	1	0	15
22			min	-359.249	3	.044	15	-.03	3	-.001	1	0	3	0	4
23		12	max	350.206	1	.139	4	.715	1	0	15	.001	1	0	15
24			min	-359.162	3	.033	15	-.03	3	-.001	1	0	3	0	4
25		13	max	350.323	1	.098	2	.715	1	0	15	.001	1	0	15
26			min	-359.074	3	.018	12	-.03	3	-.001	1	0	3	0	4
27		14	max	350.439	1	.063	2	.715	1	0	15	.001	1	0	15
28			min	-358.987	3	-.002	3	-.03	3	-.001	1	0	3	0	4
29		15	max	350.556	1	.027	2	.715	1	0	15	.001	1	0	15
30			min	-358.9	3	-.029	3	-.03	3	-.001	1	0	3	0	4
31		16	max	350.672	1	-.008	2	.715	1	0	15	.002	1	0	15
32			min	-358.812	3	-.056	3	-.03	3	-.001	1	0	3	0	4
33		17	max	350.788	1	-.02	15	.715	1	0	15	.002	1	0	15
34			min	-358.725	3	-.09	4	-.03	3	-.001	1	0	3	0	4
35		18	max	350.905	1	-.031	15	.715	1	0	15	.002	1	0	15
36			min	-358.638	3	-.135	4	-.03	3	-.001	1	0	3	0	4
37		19	max	351.021	1	-.042	15	.715	1	0	15	.002	1	0	15

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
38			min	-358.55	3	-.181	4	-.03	3	-.001	1	0	3	0	4
39	M3	1	max	102.182	2	1.776	4	-.028	15	0	15	.002	1	0	4
40			min	-128.742	3	.418	15	-.747	1	0	1	0	15	0	15
41		2	max	102.114	2	1.599	4	-.028	15	0	15	.002	1	0	4
42			min	-128.794	3	.376	15	-.747	1	0	1	0	15	0	12
43		3	max	102.045	2	1.422	4	-.028	15	0	15	.002	1	0	2
44			min	-128.845	3	.335	15	-.747	1	0	1	0	15	0	3
45		4	max	101.976	2	1.245	4	-.028	15	0	15	.002	1	0	15
46			min	-128.897	3	.293	15	-.747	1	0	1	0	15	0	4
47		5	max	101.908	2	1.067	4	-.028	15	0	15	.002	1	0	15
48			min	-128.948	3	.251	15	-.747	1	0	1	0	15	0	4
49		6	max	101.839	2	.89	4	-.028	15	0	15	.002	1	0	15
50			min	-129	3	.21	15	-.747	1	0	1	0	15	0	4
51		7	max	101.771	2	.713	4	-.028	15	0	15	.001	1	0	15
52			min	-129.051	3	.168	15	-.747	1	0	1	0	15	0	4
53		8	max	101.702	2	.536	4	-.028	15	0	15	.001	1	0	15
54			min	-129.103	3	.126	15	-.747	1	0	1	0	15	-.001	4
55		9	max	101.633	2	.359	4	-.028	15	0	15	.001	1	0	15
56			min	-129.154	3	.085	15	-.747	1	0	1	0	15	-.001	4
57		10	max	101.565	2	.181	4	-.028	15	0	15	0	1	0	15
58			min	-129.205	3	.043	15	-.747	1	0	1	0	15	-.001	4
59		11	max	101.496	2	.024	2	-.028	15	0	15	0	1	0	15
60			min	-129.257	3	-.021	3	-.747	1	0	1	0	15	-.001	4
61		12	max	101.428	2	-.04	15	-.028	15	0	15	0	1	0	15
62			min	-129.308	3	-.173	4	-.747	1	0	1	0	15	-.001	4
63		13	max	101.359	2	-.082	15	-.028	15	0	15	0	1	0	15
64			min	-129.36	3	-.35	4	-.747	1	0	1	0	15	-.001	4
65		14	max	101.29	2	-.123	15	-.028	15	0	15	0	1	0	15
66			min	-129.411	3	-.527	4	-.747	1	0	1	0	12	-.001	4
67		15	max	101.222	2	-.165	15	-.028	15	0	15	0	1	0	15
68			min	-129.463	3	-.705	4	-.747	1	0	1	0	12	0	4
69		16	max	101.153	2	-.207	15	-.028	15	0	15	0	15	0	15
70			min	-129.514	3	-.882	4	-.747	1	0	1	0	1	0	4
71		17	max	101.085	2	-.248	15	-.028	15	0	15	0	15	0	15
72			min	-129.566	3	-1.059	4	-.747	1	0	1	0	1	0	4
73		18	max	101.016	2	-.29	15	-.028	15	0	15	0	15	0	15
74			min	-129.617	3	-1.236	4	-.747	1	0	1	0	1	0	4
75		19	max	100.947	2	-.332	15	-.028	15	0	15	0	15	0	1
76			min	-129.669	3	-1.413	4	-.747	1	0	1	0	1	0	1
77	M4	1	max	503.515	1	0	1	-.078	15	0	1	0	3	0	1
78			min	-25.225	3	0	1	-2.026	1	0	1	0	1	0	1
79		2	max	503.58	1	0	1	-.078	15	0	1	0	15	0	1
80			min	-25.176	3	0	1	-2.026	1	0	1	0	1	0	1
81		3	max	503.644	1	0	1	-.078	15	0	1	0	15	0	1
82			min	-25.128	3	0	1	-2.026	1	0	1	0	1	0	1
83		4	max	503.709	1	0	1	-.078	15	0	1	0	15	0	1
84			min	-25.079	3	0	1	-2.026	1	0	1	0	1	0	1
85		5	max	503.774	1	0	1	-.078	15	0	1	0	15	0	1
86			min	-25.031	3	0	1	-2.026	1	0	1	0	1	0	1
87		6	max	503.839	1	0	1	-.078	15	0	1	0	15	0	1
88			min	-24.982	3	0	1	-2.026	1	0	1	0	1	0	1
89		7	max	503.903	1	0	1	-.078	15	0	1	0	15	0	1
90			min	-24.934	3	0	1	-2.026	1	0	1	-.001	1	0	1
91		8	max	503.968	1	0	1	-.078	15	0	1	0	15	0	1
92			min	-24.885	3	0	1	-2.026	1	0	1	-.001	1	0	1
93		9	max	504.033	1	0	1	-.078	15	0	1	0	15	0	1
94			min	-24.837	3	0	1	-2.026	1	0	1	-.001	1	0	1

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
95		10	max	504.097	1	0	1	-.078	15	0	1	0	15	0	1
96			min	-24.788	3	0	1	-2.026	1	0	1	-.002	1	0	1
97		11	max	504.162	1	0	1	-.078	15	0	1	0	15	0	1
98			min	-24.74	3	0	1	-2.026	1	0	1	-.002	1	0	1
99		12	max	504.227	1	0	1	-.078	15	0	1	0	15	0	1
100			min	-24.691	3	0	1	-2.026	1	0	1	-.002	1	0	1
101		13	max	504.291	1	0	1	-.078	15	0	1	0	15	0	1
102			min	-24.643	3	0	1	-2.026	1	0	1	-.002	1	0	1
103		14	max	504.356	1	0	1	-.078	15	0	1	0	15	0	1
104			min	-24.594	3	0	1	-2.026	1	0	1	-.002	1	0	1
105		15	max	504.421	1	0	1	-.078	15	0	1	0	15	0	1
106			min	-24.545	3	0	1	-2.026	1	0	1	-.003	1	0	1
107		16	max	504.486	1	0	1	-.078	15	0	1	0	15	0	1
108			min	-24.497	3	0	1	-2.026	1	0	1	-.003	1	0	1
109		17	max	504.55	1	0	1	-.078	15	0	1	0	15	0	1
110			min	-24.448	3	0	1	-2.026	1	0	1	-.003	1	0	1
111		18	max	504.615	1	0	1	-.078	15	0	1	0	15	0	1
112			min	-24.4	3	0	1	-2.026	1	0	1	-.003	1	0	1
113		19	max	504.68	1	0	1	-.078	15	0	1	0	15	0	1
114			min	-24.351	3	0	1	-2.026	1	0	1	-.003	1	0	1
115	M6	1	max	1141.044	1	.641	4	.219	1	0	1	0	3	0	1
116			min	-1174.157	3	.151	15	-.12	3	0	15	0	11	0	1
117		2	max	1141.161	1	.595	4	.219	1	0	1	0	3	0	15
118			min	-1174.069	3	.14	15	-.12	3	0	15	0	15	0	4
119		3	max	1141.277	1	.55	4	.219	1	0	1	0	1	0	15
120			min	-1173.982	3	.13	15	-.12	3	0	15	0	15	0	4
121		4	max	1141.393	1	.504	4	.219	1	0	1	0	1	0	15
122			min	-1173.895	3	.119	15	-.12	3	0	15	0	15	0	4
123		5	max	1141.51	1	.458	4	.219	1	0	1	0	1	0	15
124			min	-1173.807	3	.108	15	-.12	3	0	15	0	12	0	4
125		6	max	1141.626	1	.413	4	.219	1	0	1	0	1	0	15
126			min	-1173.72	3	.098	15	-.12	3	0	15	0	3	0	4
127		7	max	1141.743	1	.377	2	.219	1	0	1	0	1	0	15
128			min	-1173.633	3	.086	12	-.12	3	0	15	0	3	0	4
129		8	max	1141.859	1	.341	2	.219	1	0	1	0	1	0	15
130			min	-1173.546	3	.068	12	-.12	3	0	15	0	3	0	4
131		9	max	1141.975	1	.306	2	.219	1	0	1	0	1	0	15
132			min	-1173.458	3	.05	12	-.12	3	0	15	0	3	0	4
133		10	max	1142.092	1	.27	2	.219	1	0	1	0	1	0	15
134			min	-1173.371	3	.032	12	-.12	3	0	15	0	3	0	4
135		11	max	1142.208	1	.234	2	.219	1	0	1	0	1	0	15
136			min	-1173.284	3	.012	3	-.12	3	0	15	0	3	0	4
137		12	max	1142.325	1	.199	2	.219	1	0	1	0	1	0	15
138			min	-1173.196	3	-.015	3	-.12	3	0	15	0	3	0	2
139		13	max	1142.441	1	.163	2	.219	1	0	1	0	1	0	12
140			min	-1173.109	3	-.042	3	-.12	3	0	15	0	3	0	2
141		14	max	1142.557	1	.128	2	.219	1	0	1	0	1	0	12
142			min	-1173.022	3	-.068	3	-.12	3	0	15	0	3	0	2
143		15	max	1142.674	1	.092	2	.219	1	0	1	0	1	0	12
144			min	-1172.934	3	-.095	3	-.12	3	0	15	0	3	0	2
145		16	max	1142.79	1	.057	2	.219	1	0	1	0	1	0	12
146			min	-1172.847	3	-.122	3	-.12	3	0	15	0	3	0	2
147		17	max	1142.907	1	.021	2	.219	1	0	1	0	1	0	12
148			min	-1172.76	3	-.148	3	-.12	3	0	15	0	3	0	2
149		18	max	1143.023	1	-.015	2	.219	1	0	1	0	1	0	12
150			min	-1172.673	3	-.175	3	-.12	3	0	15	0	3	0	2
151		19	max	1143.139	1	-.042	15	.219	1	0	1	0	1	0	12

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
152			min	-1172.585	3	-.202	3	-.12	3	0	15	0	3	0	2
153	M7	1	max	466.953	2	1.779	4	.017	1	0	2	0	2	0	2
154			min	-397.893	3	.418	15	-.003	10	0	3	0	3	0	12
155		2	max	466.885	2	1.602	4	.017	1	0	2	0	2	0	2
156			min	-397.945	3	.377	15	-.003	10	0	3	0	3	0	3
157		3	max	466.816	2	1.425	4	.017	1	0	2	0	2	0	2
158			min	-397.996	3	.335	15	-.003	10	0	3	0	3	0	3
159		4	max	466.747	2	1.247	4	.017	1	0	2	0	2	0	2
160			min	-398.048	3	.294	15	-.003	10	0	3	0	3	0	3
161		5	max	466.679	2	1.07	4	.017	1	0	2	0	2	0	15
162			min	-398.099	3	.252	15	-.003	10	0	3	0	3	0	3
163		6	max	466.61	2	.893	4	.017	1	0	2	0	2	0	15
164			min	-398.15	3	.21	15	-.003	10	0	3	0	3	0	4
165		7	max	466.542	2	.716	4	.017	1	0	2	0	2	0	15
166			min	-398.202	3	.169	15	-.003	10	0	3	0	3	0	4
167		8	max	466.473	2	.539	4	.017	1	0	2	0	2	0	15
168			min	-398.253	3	.127	15	-.003	10	0	3	0	3	-.001	4
169		9	max	466.404	2	.361	2	.017	1	0	2	0	2	0	15
170			min	-398.305	3	.085	15	-.003	10	0	3	0	3	-.001	4
171		10	max	466.336	2	.223	2	.017	1	0	2	0	2	0	15
172			min	-398.356	3	.02	12	-.003	10	0	3	0	3	-.001	4
173		11	max	466.267	2	.085	2	.017	1	0	2	0	2	0	15
174			min	-398.408	3	-.083	3	-.003	10	0	3	0	3	-.001	4
175		12	max	466.199	2	-.04	15	.017	1	0	2	0	2	0	15
176			min	-398.459	3	-.186	3	-.003	10	0	3	0	3	-.001	4
177		13	max	466.13	2	-.081	15	.017	1	0	2	0	2	0	15
178			min	-398.511	3	-.347	4	-.003	10	0	3	0	3	-.001	4
179		14	max	466.061	2	-.123	15	.017	1	0	2	0	2	0	15
180			min	-398.562	3	-.525	4	-.003	10	0	3	0	3	-.001	4
181		15	max	465.993	2	-.165	15	.017	1	0	2	0	2	0	15
182			min	-398.614	3	-.702	4	-.003	10	0	3	0	3	0	4
183		16	max	465.924	2	-.206	15	.017	1	0	2	0	2	0	15
184			min	-398.665	3	-.879	4	-.003	10	0	3	0	3	0	4
185		17	max	465.856	2	-.248	15	.017	1	0	2	0	2	0	15
186			min	-398.716	3	-1.056	4	-.003	10	0	3	0	3	0	4
187		18	max	465.787	2	-.29	15	.017	1	0	2	0	2	0	15
188			min	-398.768	3	-1.233	4	-.003	10	0	3	0	3	0	4
189		19	max	465.718	2	-.331	15	.017	1	0	2	0	2	0	1
190			min	-398.819	3	-1.411	4	-.003	10	0	3	0	3	0	1
191	M8	1	max	1373.755	1	0	1	.868	1	0	1	0	15	0	1
192			min	-113.407	3	0	1	-.305	3	0	1	0	1	0	1
193		2	max	1373.82	1	0	1	.868	1	0	1	0	1	0	1
194			min	-113.359	3	0	1	-.305	3	0	1	0	3	0	1
195		3	max	1373.884	1	0	1	.868	1	0	1	0	1	0	1
196			min	-113.31	3	0	1	-.305	3	0	1	0	3	0	1
197		4	max	1373.949	1	0	1	.868	1	0	1	0	1	0	1
198			min	-113.262	3	0	1	-.305	3	0	1	0	3	0	1
199		5	max	1374.014	1	0	1	.868	1	0	1	0	1	0	1
200			min	-113.213	3	0	1	-.305	3	0	1	0	3	0	1
201		6	max	1374.079	1	0	1	.868	1	0	1	0	1	0	1
202			min	-113.164	3	0	1	-.305	3	0	1	0	3	0	1
203		7	max	1374.143	1	0	1	.868	1	0	1	0	1	0	1
204			min	-113.116	3	0	1	-.305	3	0	1	0	3	0	1
205		8	max	1374.208	1	0	1	.868	1	0	1	0	1	0	1
206			min	-113.067	3	0	1	-.305	3	0	1	0	3	0	1
207		9	max	1374.273	1	0	1	.868	1	0	1	0	1	0	1
208			min	-113.019	3	0	1	-.305	3	0	1	0	3	0	1

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
209		10	max	1374.337	1	0	1	.868	1	0	1	0	1	0	1
210			min	-112.97	3	0	1	-.305	3	0	1	0	3	0	1
211		11	max	1374.402	1	0	1	.868	1	0	1	0	1	0	1
212			min	-112.922	3	0	1	-.305	3	0	1	0	3	0	1
213		12	max	1374.467	1	0	1	.868	1	0	1	0	1	0	1
214			min	-112.873	3	0	1	-.305	3	0	1	0	3	0	1
215		13	max	1374.531	1	0	1	.868	1	0	1	0	1	0	1
216			min	-112.825	3	0	1	-.305	3	0	1	0	3	0	1
217		14	max	1374.596	1	0	1	.868	1	0	1	.001	1	0	1
218			min	-112.776	3	0	1	-.305	3	0	1	0	3	0	1
219		15	max	1374.661	1	0	1	.868	1	0	1	.001	1	0	1
220			min	-112.728	3	0	1	-.305	3	0	1	0	3	0	1
221		16	max	1374.726	1	0	1	.868	1	0	1	.001	1	0	1
222			min	-112.679	3	0	1	-.305	3	0	1	0	3	0	1
223		17	max	1374.79	1	0	1	.868	1	0	1	.001	1	0	1
224			min	-112.631	3	0	1	-.305	3	0	1	0	3	0	1
225		18	max	1374.855	1	0	1	.868	1	0	1	.001	1	0	1
226			min	-112.582	3	0	1	-.305	3	0	1	0	3	0	1
227		19	max	1374.92	1	0	1	.868	1	0	1	.001	1	0	1
228			min	-112.534	3	0	1	-.305	3	0	1	0	3	0	1
229	M10	1	max	364.006	1	.633	4	-.008	15	.001	1	0	1	0	1
230			min	-344.492	3	.15	15	-.207	1	0	3	0	3	0	1
231		2	max	364.122	1	.588	4	-.008	15	.001	1	0	1	0	15
232			min	-344.404	3	.139	15	-.207	1	0	3	0	3	0	4
233		3	max	364.239	1	.542	4	-.008	15	.001	1	0	1	0	15
234			min	-344.317	3	.129	15	-.207	1	0	3	0	3	0	4
235		4	max	364.355	1	.496	4	-.008	15	.001	1	0	1	0	15
236			min	-344.23	3	.118	15	-.207	1	0	3	0	3	0	4
237		5	max	364.471	1	.451	4	-.008	15	.001	1	0	1	0	15
238			min	-344.142	3	.107	15	-.207	1	0	3	0	3	0	4
239		6	max	364.588	1	.405	4	-.008	15	.001	1	0	1	0	15
240			min	-344.055	3	.096	15	-.207	1	0	3	0	3	0	4
241		7	max	364.704	1	.359	4	-.008	15	.001	1	0	1	0	15
242			min	-343.968	3	.086	15	-.207	1	0	3	0	3	0	4
243		8	max	364.821	1	.314	4	-.008	15	.001	1	0	2	0	15
244			min	-343.88	3	.075	15	-.207	1	0	3	0	3	0	4
245		9	max	364.937	1	.268	4	-.008	15	.001	1	0	2	0	15
246			min	-343.793	3	.064	15	-.207	1	0	3	0	3	0	4
247		10	max	365.053	1	.222	4	-.008	15	.001	1	0	15	0	15
248			min	-343.706	3	.054	15	-.207	1	0	3	0	3	0	4
249		11	max	365.17	1	.177	4	-.008	15	.001	1	0	15	0	15
250			min	-343.619	3	.043	15	-.207	1	0	3	0	3	0	4
251		12	max	365.286	1	.134	2	-.008	15	.001	1	0	15	0	15
252			min	-343.531	3	.032	15	-.207	1	0	3	0	1	0	4
253		13	max	365.403	1	.098	2	-.008	15	.001	1	0	15	0	15
254			min	-343.444	3	.021	15	-.207	1	0	3	0	1	0	4
255		14	max	365.519	1	.063	2	-.008	15	.001	1	0	15	0	15
256			min	-343.357	3	-.004	1	-.207	1	0	3	0	1	0	4
257		15	max	365.635	1	.027	2	-.008	15	.001	1	0	15	0	15
258			min	-343.269	3	-.04	1	-.207	1	0	3	0	1	0	4
259		16	max	365.752	1	-.008	2	-.008	15	.001	1	0	15	0	15
260			min	-343.182	3	-.076	1	-.207	1	0	3	0	1	0	4
261		17	max	365.868	1	-.022	15	-.008	15	.001	1	0	15	0	15
262			min	-343.095	3	-.111	1	-.207	1	0	3	0	1	0	4
263		18	max	365.985	1	-.032	15	-.008	15	.001	1	0	15	0	15
264			min	-343.007	3	-.147	1	-.207	1	0	3	0	1	0	4
265		19	max	366.101	1	-.043	15	-.008	15	.001	1	0	15	0	15

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
266			min	-342.92	3	-.189	4	-.207	1	0	3	0	1	0	4
267	M11	1	max	101.941	2	1.781	4	.852	1	.001	1	0	3	0	4
268			min	-129.374	3	.419	15	.016	12	0	15	-.002	1	0	15
269		2	max	101.872	2	1.604	4	.852	1	.001	1	0	3	0	4
270			min	-129.426	3	.377	15	.016	12	0	15	-.002	1	0	12
271		3	max	101.804	2	1.427	4	.852	1	.001	1	0	3	0	2
272			min	-129.477	3	.335	15	.016	12	0	15	-.002	1	0	3
273		4	max	101.735	2	1.249	4	.852	1	.001	1	0	3	0	15
274			min	-129.529	3	.294	15	.016	12	0	15	-.002	1	0	3
275		5	max	101.667	2	1.072	4	.852	1	.001	1	0	3	0	15
276			min	-129.58	3	.252	15	.016	12	0	15	-.002	1	0	4
277		6	max	101.598	2	.895	4	.852	1	.001	1	0	3	0	15
278			min	-129.631	3	.21	15	.016	12	0	15	-.001	1	0	4
279		7	max	101.529	2	.718	4	.852	1	.001	1	0	3	0	15
280			min	-129.683	3	.169	15	.016	12	0	15	-.001	1	0	4
281		8	max	101.461	2	.541	4	.852	1	.001	1	0	3	0	15
282			min	-129.734	3	.127	15	.016	12	0	15	-.001	1	-.001	4
283		9	max	101.392	2	.363	4	.852	1	.001	1	0	3	0	15
284			min	-129.786	3	.086	15	.016	12	0	15	0	1	-.001	4
285		10	max	101.324	2	.186	4	.852	1	.001	1	0	3	0	15
286			min	-129.837	3	.044	15	.016	12	0	15	0	1	-.001	4
287		11	max	101.255	2	.024	2	.852	1	.001	1	0	3	0	15
288			min	-129.889	3	-.039	3	.016	12	0	15	0	1	-.001	4
289		12	max	101.186	2	-.039	15	.852	1	.001	1	0	3	0	15
290			min	-129.94	3	-.168	4	.016	12	0	15	0	1	-.001	4
291		13	max	101.118	2	-.081	15	.852	1	.001	1	0	3	0	15
292			min	-129.992	3	-.345	4	.016	12	0	15	0	1	-.001	4
293		14	max	101.049	2	-.123	15	.852	1	.001	1	0	3	0	15
294			min	-130.043	3	-.523	4	.016	12	0	15	0	2	-.001	4
295		15	max	100.981	2	-.164	15	.852	1	.001	1	0	1	0	15
296			min	-130.095	3	-.7	4	.016	12	0	15	0	10	0	4
297		16	max	100.912	2	-.206	15	.852	1	.001	1	0	1	0	15
298			min	-130.146	3	-.877	4	.016	12	0	15	0	15	0	4
299		17	max	100.843	2	-.248	15	.852	1	.001	1	0	1	0	15
300			min	-130.197	3	-1.054	4	.016	12	0	15	0	15	0	4
301		18	max	100.775	2	-.289	15	.852	1	.001	1	0	1	0	15
302			min	-130.249	3	-1.231	4	.016	12	0	15	0	15	0	4
303		19	max	100.706	2	-.331	15	.852	1	.001	1	0	1	0	1
304			min	-130.3	3	-1.409	4	.016	12	0	15	0	15	0	1
305	M12	1	max	503.191	1	0	1	4.471	1	0	1	0	1	0	1
306			min	-24.732	3	0	1	.163	15	0	1	0	3	0	1
307		2	max	503.255	1	0	1	4.471	1	0	1	0	1	0	1
308			min	-24.684	3	0	1	.163	15	0	1	0	15	0	1
309		3	max	503.32	1	0	1	4.471	1	0	1	0	1	0	1
310			min	-24.635	3	0	1	.163	15	0	1	0	15	0	1
311		4	max	503.385	1	0	1	4.471	1	0	1	.001	1	0	1
312			min	-24.587	3	0	1	.163	15	0	1	0	15	0	1
313		5	max	503.449	1	0	1	4.471	1	0	1	.002	1	0	1
314			min	-24.538	3	0	1	.163	15	0	1	0	15	0	1
315		6	max	503.514	1	0	1	4.471	1	0	1	.002	1	0	1
316			min	-24.489	3	0	1	.163	15	0	1	0	15	0	1
317		7	max	503.579	1	0	1	4.471	1	0	1	.002	1	0	1
318			min	-24.441	3	0	1	.163	15	0	1	0	15	0	1
319		8	max	503.643	1	0	1	4.471	1	0	1	.003	1	0	1
320			min	-24.392	3	0	1	.163	15	0	1	0	15	0	1
321		9	max	503.708	1	0	1	4.471	1	0	1	.003	1	0	1
322			min	-24.344	3	0	1	.163	15	0	1	0	15	0	1

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
323		10	max	503.773	1	0	1	4.471	1	0	1	.004	1	0	1
324			min	-24.295	3	0	1	.163	15	0	1	0	15	0	1
325		11	max	503.838	1	0	1	4.471	1	0	1	.004	1	0	1
326			min	-24.247	3	0	1	.163	15	0	1	0	15	0	1
327		12	max	503.902	1	0	1	4.471	1	0	1	.004	1	0	1
328			min	-24.198	3	0	1	.163	15	0	1	0	15	0	1
329		13	max	503.967	1	0	1	4.471	1	0	1	.005	1	0	1
330			min	-24.15	3	0	1	.163	15	0	1	0	15	0	1
331		14	max	504.032	1	0	1	4.471	1	0	1	.005	1	0	1
332			min	-24.101	3	0	1	.163	15	0	1	0	15	0	1
333		15	max	504.096	1	0	1	4.471	1	0	1	.006	1	0	1
334			min	-24.053	3	0	1	.163	15	0	1	0	15	0	1
335		16	max	504.161	1	0	1	4.471	1	0	1	.006	1	0	1
336			min	-24.004	3	0	1	.163	15	0	1	0	15	0	1
337		17	max	504.226	1	0	1	4.471	1	0	1	.006	1	0	1
338			min	-23.956	3	0	1	.163	15	0	1	0	15	0	1
339		18	max	504.291	1	0	1	4.471	1	0	1	.007	1	0	1
340			min	-23.907	3	0	1	.163	15	0	1	0	15	0	1
341		19	max	504.355	1	0	1	4.471	1	0	1	.007	1	0	1
342			min	-23.859	3	0	1	.163	15	0	1	0	15	0	1
343	M1	1	max	151.936	1	338.064	3	-3.234	15	0	1	.172	1	.013	1
344			min	5.572	15	-346.647	1	-87.301	1	0	3	.006	15	-.01	3
345		2	max	152.054	1	337.874	3	-3.234	15	0	1	.154	1	.088	1
346			min	5.608	15	-346.9	1	-87.301	1	0	3	.006	15	-.084	3
347		3	max	104.033	1	7.482	9	-3.209	15	0	12	.133	1	.162	1
348			min	-1.355	10	-18.915	3	-87.143	1	0	1	.005	15	-.156	3
349		4	max	104.151	1	7.271	9	-3.209	15	0	12	.114	1	.162	1
350			min	-1.257	10	-19.105	3	-87.143	1	0	1	.004	15	-.151	3
351		5	max	104.269	1	7.06	9	-3.209	15	0	12	.095	1	.162	1
352			min	-1.158	10	-19.295	3	-87.143	1	0	1	.004	15	-.147	3
353		6	max	104.387	1	6.849	9	-3.209	15	0	12	.077	1	.163	1
354			min	-1.06	10	-19.484	3	-87.143	1	0	1	.003	15	-.143	3
355		7	max	104.505	1	6.638	9	-3.209	15	0	12	.058	1	.163	1
356			min	-.962	10	-19.674	3	-87.143	1	0	1	.002	15	-.139	3
357		8	max	104.623	1	6.428	9	-3.209	15	0	12	.039	1	.163	1
358			min	-.863	10	-19.864	3	-87.143	1	0	1	.001	15	-.135	3
359		9	max	104.741	1	6.217	9	-3.209	15	0	12	.02	1	.164	1
360			min	-.765	10	-20.054	3	-87.143	1	0	1	0	15	-.13	3
361		10	max	104.859	1	6.006	9	-3.209	15	0	12	0	1	.164	1
362			min	-.667	10	-20.244	3	-87.143	1	0	1	0	10	-.126	3
363		11	max	104.977	1	5.795	9	-3.209	15	0	12	0	12	.165	1
364			min	-.568	10	-20.433	3	-87.143	1	0	1	-.018	1	-.121	3
365		12	max	105.095	1	5.584	9	-3.209	15	0	12	-.001	12	.169	2
366			min	-.47	10	-20.682	2	-87.143	1	0	1	-.037	1	-.117	3
367		13	max	105.213	1	5.373	9	-3.209	15	0	12	-.002	12	.174	2
368			min	-.371	10	-20.935	2	-87.143	1	0	1	-.056	1	-.112	3
369		14	max	105.331	1	5.162	9	-3.209	15	0	12	-.003	15	.178	2
370			min	-.273	10	-21.188	2	-87.143	1	0	1	-.075	1	-.108	3
371		15	max	105.449	1	4.951	9	-3.209	15	0	12	-.003	15	.183	2
372			min	-.175	10	-21.441	2	-87.143	1	0	1	-.094	1	-.103	3
373		16	max	88.885	2	56.918	2	-3.236	15	0	1	-.004	15	.187	2
374			min	-19.325	3	-123.229	3	-87.778	1	0	12	-.113	1	-.098	3
375		17	max	89.003	2	56.665	2	-3.236	15	0	1	-.005	15	.183	1
376			min	-19.236	3	-123.419	3	-87.778	1	0	12	-.132	1	-.071	3
377		18	max	-5.581	15	393.599	1	-3.315	15	0	3	-.006	15	.099	1
378			min	-151.416	1	-146.501	3	-89.99	1	0	1	-.152	1	-.039	3
379		19	max	-5.545	15	393.346	1	-3.315	15	0	3	-.006	15	.014	1

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
380			min	-151.298	1	-146.691	3	-89.99	1	0	1	-.171	1	-.008	3
381	M5	1	max	333.963	1	1115.91	3	-.101	10	0	1	.005	1	.021	3
382			min	10.784	12	-1145.125	1	-33.356	3	0	3	0	10	-.025	1
383		2	max	334.081	1	1115.72	3	-.101	10	0	1	0	2	.223	1
384			min	10.843	12	-1145.378	1	-33.356	3	0	3	-.003	3	-.221	3
385		3	max	181.892	3	7.938	9	3.795	3	0	3	0	2	.467	1
386			min	-19.562	10	-68.599	2	-.503	2	0	1	-.01	3	-.458	3
387		4	max	181.98	3	7.727	9	3.795	3	0	3	0	2	.472	1
388			min	-19.464	10	-68.852	2	-.503	2	0	1	-.009	3	-.445	3
389		5	max	182.069	3	7.516	9	3.795	3	0	3	0	2	.478	1
390			min	-19.365	10	-69.105	2	-.503	2	0	1	-.009	3	-.431	3
391		6	max	182.157	3	7.305	9	3.795	3	0	3	0	2	.483	1
392			min	-19.267	10	-69.358	2	-.503	2	0	1	-.008	3	-.417	3
393		7	max	182.246	3	7.094	9	3.795	3	0	3	0	2	.489	1
394			min	-19.169	10	-69.611	2	-.503	2	0	1	-.007	3	-.403	3
395		8	max	182.334	3	6.883	9	3.795	3	0	3	0	2	.495	1
396			min	-19.07	10	-69.864	2	-.503	2	0	1	-.006	3	-.389	3
397		9	max	182.423	3	6.673	9	3.795	3	0	3	0	2	.5	1
398			min	-18.972	10	-70.117	2	-.503	2	0	1	-.005	3	-.376	3
399		10	max	182.511	3	6.462	9	3.795	3	0	3	0	10	.506	1
400			min	-18.874	10	-70.37	2	-.503	2	0	1	-.005	3	-.362	3
401		11	max	182.6	3	6.251	9	3.795	3	0	3	0	10	.512	1
402			min	-18.775	10	-70.623	2	-.503	2	0	1	-.004	3	-.348	3
403		12	max	182.689	3	6.04	9	3.795	3	0	3	0	10	.518	1
404			min	-18.677	10	-70.876	2	-.503	2	0	1	-.003	1	-.334	3
405		13	max	182.777	3	5.829	9	3.795	3	0	3	0	10	.525	2
406			min	-18.579	10	-71.129	2	-.503	2	0	1	-.003	1	-.32	3
407		14	max	182.866	3	5.618	9	3.795	3	0	3	0	10	.54	2
408			min	-18.48	10	-71.382	2	-.503	2	0	1	-.002	1	-.306	3
409		15	max	182.954	3	5.407	9	3.795	3	0	3	0	15	.555	2
410			min	-18.382	10	-71.635	2	-.503	2	0	1	-.002	1	-.292	3
411		16	max	307.512	2	295.411	2	3.771	3	0	1	0	3	.568	2
412			min	-65.101	3	-377.203	3	-.523	2	0	15	-.001	1	-.275	3
413		17	max	307.63	2	295.158	2	3.771	3	0	1	0	3	.529	1
414			min	-65.013	3	-377.392	3	-.523	2	0	15	-.001	1	-.193	3
415		18	max	-11.47	12	1294.087	1	3.468	3	0	3	.002	3	.253	1
416			min	-334.943	1	-480.77	3	-.124	2	0	1	0	2	-.089	3
417		19	max	-11.411	12	1293.834	1	3.468	3	0	3	.002	3	.015	3
418			min	-334.825	1	-480.96	3	-.124	2	0	1	0	2	-.028	1
419	M9	1	max	151.215	1	338.046	3	116.397	1	0	3	-.006	15	.013	1
420			min	5.544	15	-346.627	1	4.486	15	0	1	-.172	1	-.01	3
421		2	max	151.333	1	337.857	3	116.397	1	0	3	-.004	12	.088	1
422			min	5.579	15	-346.88	1	4.486	15	0	1	-.147	1	-.084	3
423		3	max	103.948	1	7.453	9	82.142	1	0	1	.002	3	.162	1
424			min	-.833	10	-18.856	3	1.603	12	0	15	-.12	1	-.156	3
425		4	max	104.066	1	7.242	9	82.142	1	0	1	.003	3	.162	1
426			min	-.735	10	-19.046	3	1.603	12	0	15	-.102	1	-.151	3
427		5	max	104.184	1	7.031	9	82.142	1	0	1	.003	3	.162	1
428			min	-.636	10	-19.236	3	1.603	12	0	15	-.085	1	-.147	3
429		6	max	104.302	1	6.821	9	82.142	1	0	1	.004	3	.163	1
430			min	-.538	10	-19.425	3	1.603	12	0	15	-.067	1	-.143	3
431		7	max	104.42	1	6.61	9	82.142	1	0	1	.004	3	.163	1
432			min	-.439	10	-19.615	3	1.603	12	0	15	-.049	1	-.139	3
433		8	max	104.538	1	6.399	9	82.142	1	0	1	.005	3	.163	1
434			min	-.341	10	-19.805	3	1.603	12	0	15	-.031	1	-.135	3
435		9	max	104.656	1	6.188	9	82.142	1	0	1	.005	3	.164	1
436			min	-.243	10	-19.995	3	1.603	12	0	15	-.013	1	-.13	3

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
437		10	max	104.774	1	5.977	9	82.142	1	0	1	.006	3	.164	1
438			min	-.144	10	-20.189	2	1.603	12	0	15	0	2	-.126	3
439		11	max	104.892	1	5.766	9	82.142	1	0	1	.022	1	.165	1
440			min	-.046	10	-20.442	2	1.603	12	0	15	0	15	-.121	3
441		12	max	105.01	1	5.555	9	82.142	1	0	1	.04	1	.169	2
442			min	.052	10	-20.695	2	1.603	12	0	15	.002	15	-.117	3
443		13	max	105.128	1	5.344	9	82.142	1	0	1	.058	1	.174	2
444			min	.151	10	-20.948	2	1.603	12	0	15	.002	15	-.113	3
445		14	max	105.246	1	5.133	9	82.142	1	0	1	.076	1	.178	2
446			min	.249	10	-21.201	2	1.603	12	0	15	.003	15	-.108	3
447		15	max	105.364	1	4.922	9	82.142	1	0	1	.094	1	.183	2
448			min	.347	10	-21.454	2	1.603	12	0	15	.003	15	-.103	3
449		16	max	89.189	2	56.717	2	82.894	1	0	15	.113	1	.187	2
450			min	-19.378	3	-123.675	3	1.621	12	0	1	.004	15	-.098	3
451		17	max	89.307	2	56.464	2	82.894	1	0	15	.131	1	.183	1
452			min	-19.29	3	-123.864	3	1.621	12	0	1	.005	15	-.071	3
453		18	max	-5.57	15	393.599	1	87.412	1	0	1	.15	1	.099	1
454			min	-151.109	1	-146.499	3	1.897	12	0	3	.006	15	-.039	3
455		19	max	-5.535	15	393.346	1	87.412	1	0	1	.169	1	.014	1
456			min	-150.991	1	-146.689	3	1.897	12	0	3	.006	15	-.008	3
457	M13	1	max	116.684	1	346.012	1	-5.544	15	.013	1	.172	1	0	1
458			min	4.487	15	-338.031	3	-151.196	1	-.01	3	.006	15	0	3
459		2	max	116.684	1	244.205	1	-4.249	15	.013	1	.053	1	.256	3
460			min	4.487	15	-238.488	3	-115.801	1	-.01	3	.002	15	-.262	1
461		3	max	116.684	1	142.398	1	-2.954	15	.013	1	.002	3	.424	3
462			min	4.487	15	-138.946	3	-80.406	1	-.01	3	-.034	1	-.434	1
463		4	max	116.684	1	40.591	1	-1.66	15	.013	1	-.001	12	.503	3
464			min	4.487	15	-39.403	3	-45.01	1	-.01	3	-.09	1	-.515	1
465		5	max	116.684	1	60.14	3	-.365	15	.013	1	-.003	12	.494	3
466			min	4.487	15	-61.215	1	-9.615	1	-.01	3	-.114	1	-.506	1
467		6	max	116.684	1	159.683	3	25.78	1	.013	1	-.003	12	.396	3
468			min	4.487	15	-163.022	1	.402	12	-.01	3	-.107	1	-.407	1
469		7	max	116.684	1	259.225	3	61.176	1	.013	1	-.002	12	.21	3
470			min	4.487	15	-264.829	1	1.665	12	-.01	3	-.068	1	-.216	1
471		8	max	116.684	1	358.768	3	96.571	1	.013	1	.002	1	.064	1
472			min	4.487	15	-366.636	1	2.929	12	-.01	3	0	3	-.065	3
473		9	max	116.684	1	458.311	3	131.966	1	.013	1	.104	1	.435	1
474			min	4.487	15	-468.443	1	4.192	12	-.01	3	.003	12	-.428	3
475		10	max	116.684	1	557.853	3	167.362	1	.011	2	.237	1	.897	1
476			min	4.487	15	-570.249	1	5.455	12	-.013	1	.007	12	-.879	3
477		11	max	87.623	1	468.442	1	-4.063	12	.01	3	.099	1	.435	1
478			min	3.234	15	-458.311	3	-131.241	1	-.013	1	0	12	-.428	3
479		12	max	87.623	1	366.636	1	-2.8	12	.01	3	.001	2	.064	1
480			min	3.234	15	-358.768	3	-95.845	1	-.013	1	-.004	3	-.065	3
481		13	max	87.623	1	264.829	1	-1.537	12	.01	3	-.003	15	.21	3
482			min	3.234	15	-259.225	3	-60.45	1	-.013	1	-.071	1	-.216	1
483		14	max	87.623	1	163.022	1	-.274	12	.01	3	-.004	15	.396	3
484			min	3.234	15	-159.683	3	-25.055	1	-.013	1	-.109	1	-.407	1
485		15	max	87.623	1	61.215	1	10.341	1	.01	3	-.004	15	.494	3
486			min	3.234	15	-60.14	3	.393	15	-.013	1	-.116	1	-.506	1
487		16	max	87.623	1	39.403	3	45.736	1	.01	3	-.003	12	.503	3
488			min	3.234	15	-40.592	1	1.688	15	-.013	1	-.091	1	-.515	1
489		17	max	87.623	1	138.946	3	81.131	1	.01	3	0	12	.424	3
490			min	3.234	15	-142.398	1	2.983	15	-.013	1	-.035	1	-.434	1
491		18	max	87.623	1	238.488	3	116.526	1	.01	3	.053	1	.256	3
492			min	3.234	15	-244.205	1	4.278	15	-.013	1	.002	15	-.262	1
493		19	max	87.623	1	338.031	3	151.922	1	.01	3	.172	1	0	1

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
494			min	3.234	15	-346.012	1	5.572	15	-.013	1	.006	15	0	3
495	M16	1	max	-1.896	12	394.005	1	-5.535	15	.008	3	.169	1	0	1
496			min	-87.062	1	-146.714	3	-151.006	1	-.014	1	.006	15	0	3
497		2	max	-1.896	12	278.069	1	-4.24	15	.008	3	.05	1	.111	3
498			min	-87.062	1	-103.684	3	-115.611	1	-.014	1	.002	15	-.299	1
499		3	max	-1.896	12	162.134	1	-2.945	15	.008	3	-.001	12	.184	3
500			min	-87.062	1	-60.654	3	-80.216	1	-.014	1	-.037	1	-.494	1
501		4	max	-1.896	12	46.199	1	-1.651	15	.008	3	-.003	15	.219	3
502			min	-87.062	1	-17.625	3	-44.82	1	-.014	1	-.092	1	-.587	1
503		5	max	-1.896	12	25.405	3	-.356	15	.008	3	-.004	15	.216	3
504			min	-87.062	1	-69.736	1	-9.425	1	-.014	1	-.116	1	-.576	1
505		6	max	-1.896	12	68.435	3	25.97	1	.008	3	-.004	15	.174	3
506			min	-87.062	1	-185.671	1	.575	12	-.014	1	-.109	1	-.463	1
507		7	max	-1.896	12	111.465	3	61.366	1	.008	3	-.003	15	.094	3
508			min	-87.062	1	-301.607	1	1.838	12	-.014	1	-.07	1	-.246	1
509		8	max	-1.896	12	154.495	3	96.761	1	.008	3	.002	2	.073	1
510			min	-87.062	1	-417.542	1	3.101	12	-.014	1	-.002	3	-.024	3
511		9	max	-1.896	12	197.524	3	132.156	1	.008	3	.102	1	.496	1
512			min	-87.062	1	-533.477	1	4.364	12	-.014	1	.002	12	-.181	3
513		10	max	-3.315	15	-15.554	15	167.551	1	0	15	.235	1	1.022	1
514			min	-89.682	1	-649.412	1	-8.647	3	-.014	1	.008	12	-.375	3
515		11	max	-3.315	15	533.477	1	-4.52	12	.014	1	.102	1	.496	1
516			min	-89.682	1	-197.524	3	-131.849	1	-.008	3	.003	12	-.181	3
517		12	max	-3.315	15	417.542	1	-3.257	12	.014	1	.001	2	.073	1
518			min	-89.682	1	-154.495	3	-96.454	1	-.008	3	0	3	-.024	3
519		13	max	-3.315	15	301.606	1	-1.994	12	.014	1	-.003	12	.094	3
520			min	-89.682	1	-111.465	3	-61.059	1	-.008	3	-.069	1	-.246	1
521		14	max	-3.315	15	185.671	1	-.73	12	.014	1	-.004	12	.174	3
522			min	-89.682	1	-68.435	3	-25.664	1	-.008	3	-.108	1	-.463	1
523		15	max	-3.315	15	69.736	1	9.732	1	.014	1	-.004	12	.216	3
524			min	-89.682	1	-25.405	3	.366	15	-.008	3	-.115	1	-.576	1
525		16	max	-3.315	15	17.625	3	45.127	1	.014	1	-.003	12	.219	3
526			min	-89.682	1	-46.199	1	1.661	15	-.008	3	-.091	1	-.587	1
527		17	max	-3.315	15	60.654	3	80.522	1	.014	1	0	12	.184	3
528			min	-89.682	1	-162.134	1	2.956	15	-.008	3	-.035	1	-.494	1
529		18	max	-3.315	15	103.684	3	115.918	1	.014	1	.053	1	.111	3
530			min	-89.682	1	-278.07	1	4.25	15	-.008	3	.002	15	-.299	1
531		19	max	-3.315	15	146.714	3	151.313	1	.014	1	.171	1	0	1
532			min	-89.682	1	-394.005	1	5.545	15	-.008	3	.006	15	0	3
533	M15	1	max	0	2	2.789	4	.028	3	0	1	0	1	0	1
534			min	-39.351	3	0	2	-.03	1	0	3	0	3	0	1
535		2	max	0	2	2.479	4	.028	3	0	1	0	1	0	2
536			min	-39.416	3	0	2	-.03	1	0	3	0	3	-.001	4
537		3	max	0	2	2.169	4	.028	3	0	1	0	1	0	2
538			min	-39.481	3	0	2	-.03	1	0	3	0	3	-.002	4
539		4	max	0	2	1.859	4	.028	3	0	1	0	1	0	2
540			min	-39.547	3	0	2	-.03	1	0	3	0	3	-.003	4
541		5	max	0	2	1.549	4	.028	3	0	1	0	1	0	2
542			min	-39.612	3	0	2	-.03	1	0	3	0	3	-.004	4
543		6	max	0	2	1.24	4	.028	3	0	1	0	1	0	2
544			min	-39.677	3	0	2	-.03	1	0	3	0	3	-.005	4
545		7	max	0	2	.93	4	.028	3	0	1	0	3	0	2
546			min	-39.742	3	0	2	-.03	1	0	3	0	1	-.005	4
547		8	max	0	2	.62	4	.028	3	0	1	0	3	0	2
548			min	-39.807	3	0	2	-.03	1	0	3	0	1	-.006	4
549		9	max	0	2	.31	4	.028	3	0	1	0	3	0	2
550			min	-39.873	3	0	2	-.03	1	0	3	0	1	-.006	4

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
551		10	max	0	2	0	1	.028	3	0	1	0	3	0	2
552			min	-39.938	3	0	1	-.03	1	0	3	0	1	-.006	4
553		11	max	0	2	0	2	.028	3	0	1	0	3	0	2
554			min	-40.003	3	-.31	4	-.03	1	0	3	0	1	-.006	4
555		12	max	0	2	0	2	.028	3	0	1	0	3	0	2
556			min	-40.068	3	-.62	4	-.03	1	0	3	0	1	-.006	4
557		13	max	0	2	0	2	.028	3	0	1	0	3	0	2
558			min	-40.133	3	-.93	4	-.03	1	0	3	0	1	-.005	4
559		14	max	0	2	0	2	.028	3	0	1	0	3	0	2
560			min	-40.198	3	-1.24	4	-.03	1	0	3	0	1	-.005	4
561		15	max	0	2	0	2	.028	3	0	1	0	3	0	2
562			min	-40.264	3	-1.549	4	-.03	1	0	3	0	1	-.004	4
563		16	max	0	2	0	2	.028	3	0	1	0	3	0	2
564			min	-40.329	3	-1.859	4	-.03	1	0	3	0	1	-.003	4
565		17	max	0	2	0	2	.028	3	0	1	0	3	0	2
566			min	-40.394	3	-2.169	4	-.03	1	0	3	0	1	-.002	4
567		18	max	0	2	0	2	.028	3	0	1	0	3	0	2
568			min	-40.459	3	-2.479	4	-.03	1	0	3	0	1	-.001	4
569		19	max	0	2	0	2	.028	3	0	1	0	3	0	1
570			min	-40.524	3	-2.789	4	-.03	1	0	3	0	1	0	1
571	M16A	1	max	-.947	10	2.789	4	.021	1	0	3	0	3	0	1
572			min	-40.05	3	.656	15	-.012	3	0	1	0	1	0	1
573		2	max	-.875	10	2.479	4	.021	1	0	3	0	3	0	15
574			min	-39.985	3	.583	15	-.012	3	0	1	0	1	-.001	4
575		3	max	-.802	10	2.169	4	.021	1	0	3	0	3	0	15
576			min	-39.92	3	.51	15	-.012	3	0	1	0	1	-.002	4
577		4	max	-.73	10	1.859	4	.021	1	0	3	0	3	0	15
578			min	-39.855	3	.437	15	-.012	3	0	1	0	1	-.003	4
579		5	max	-.657	10	1.549	4	.021	1	0	3	0	3	0	15
580			min	-39.789	3	.364	15	-.012	3	0	1	0	1	-.004	4
581		6	max	-.585	10	1.24	4	.021	1	0	3	0	3	-.001	15
582			min	-39.724	3	.291	15	-.012	3	0	1	0	1	-.005	4
583		7	max	-.512	10	.93	4	.021	1	0	3	0	3	-.001	15
584			min	-39.659	3	.219	15	-.012	3	0	1	0	1	-.005	4
585		8	max	-.44	10	.62	4	.021	1	0	3	0	3	-.001	15
586			min	-39.594	3	.146	15	-.012	3	0	1	0	1	-.006	4
587		9	max	-.368	10	.31	4	.021	1	0	3	0	3	-.001	15
588			min	-39.529	3	.073	15	-.012	3	0	1	0	1	-.006	4
589		10	max	-.295	10	0	1	.021	1	0	3	0	3	-.001	15
590			min	-39.464	3	0	1	-.012	3	0	1	0	1	-.006	4
591		11	max	-.223	10	-.073	15	.021	1	0	3	0	3	-.001	15
592			min	-39.398	3	-.31	4	-.012	3	0	1	0	1	-.006	4
593		12	max	-.15	10	-.146	15	.021	1	0	3	0	3	-.001	15
594			min	-39.333	3	-.62	4	-.012	3	0	1	0	1	-.006	4
595		13	max	-.078	10	-.219	15	.021	1	0	3	0	2	-.001	15
596			min	-39.268	3	-.93	4	-.012	3	0	1	0	4	-.005	4
597		14	max	-.005	10	-.291	15	.021	1	0	3	0	1	-.001	15
598			min	-39.203	3	-1.24	4	-.012	3	0	1	0	3	-.005	4
599		15	max	.067	10	-.364	15	.021	1	0	3	0	1	0	15
600			min	-39.138	3	-1.549	4	-.012	3	0	1	0	3	-.004	4
601		16	max	.139	10	-.437	15	.021	1	0	3	0	1	0	15
602			min	-39.072	3	-1.859	4	-.012	3	0	1	0	3	-.003	4
603		17	max	.212	10	-.51	15	.021	1	0	3	0	1	0	15
604			min	-39.007	3	-2.169	4	-.012	3	0	1	0	3	-.002	4
605		18	max	.284	10	-.583	15	.021	1	0	3	0	1	0	15
606			min	-38.942	3	-2.479	4	-.012	3	0	1	0	3	-.001	4
607		19	max	.357	10	-.656	15	.021	1	0	3	0	1	0	1

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
608			min	-38.877	3	-2.789	4	-.012	3	0	1	0	3	0	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	M2	1	max	.003	1	.009	2	.016	1	-5.068e-5	15	NC	3	NC	3
2			min	-.003	3	-.008	3	0	3	-1.374e-3	1	4215.442	2	2219.344	1
3		2	max	.003	1	.008	2	.015	1	-4.852e-5	15	NC	3	NC	3
4			min	-.003	3	-.008	3	0	3	-1.316e-3	1	4581.023	2	2396.303	1
5		3	max	.003	1	.007	2	.014	1	-4.637e-5	15	NC	3	NC	3
6			min	-.003	3	-.007	3	0	3	-1.258e-3	1	5012.318	2	2604.93	1
7		4	max	.003	1	.007	2	.013	1	-4.421e-5	15	NC	3	NC	3
8			min	-.003	3	-.007	3	0	3	-1.2e-3	1	5524.52	2	2852.847	1
9		5	max	.002	1	.006	2	.012	1	-4.205e-5	15	NC	1	NC	3
10			min	-.003	3	-.007	3	0	3	-1.142e-3	1	6137.688	2	3150.224	1
11		6	max	.002	1	.005	2	.01	1	-3.989e-5	15	NC	1	NC	3
12			min	-.002	3	-.006	3	0	3	-1.084e-3	1	6878.728	2	3510.879	1
13		7	max	.002	1	.005	2	.009	1	-3.774e-5	15	NC	1	NC	3
14			min	-.002	3	-.006	3	0	3	-1.026e-3	1	7784.406	2	3953.968	1
15		8	max	.002	1	.004	2	.008	1	-3.558e-5	15	NC	1	NC	2
16			min	-.002	3	-.006	3	0	3	-9.677e-4	1	8906.063	2	4506.702	1
17		9	max	.002	1	.004	2	.007	1	-3.342e-5	15	NC	1	NC	2
18			min	-.002	3	-.005	3	0	3	-9.096e-4	1	NC	1	5208.814	1
19		10	max	.002	1	.003	2	.006	1	-3.126e-5	15	NC	1	NC	2
20			min	-.002	3	-.005	3	0	3	-8.516e-4	1	NC	1	6120.262	1
21		11	max	.001	1	.003	2	.005	1	-2.911e-5	15	NC	1	NC	2
22			min	-.001	3	-.004	3	0	3	-7.935e-4	1	NC	1	7335.17	1
23		12	max	.001	1	.002	2	.004	1	-2.695e-5	15	NC	1	NC	2
24			min	-.001	3	-.004	3	0	3	-7.354e-4	1	NC	1	9008.584	1
25		13	max	.001	1	.002	2	.003	1	-2.479e-5	15	NC	1	NC	1
26			min	-.001	3	-.003	3	0	3	-6.773e-4	1	NC	1	NC	1
27		14	max	0	1	.001	2	.002	1	-2.263e-5	15	NC	1	NC	1
28			min	0	3	-.003	3	0	3	-6.192e-4	1	NC	1	NC	1
29		15	max	0	1	0	2	.002	1	-2.048e-5	15	NC	1	NC	1
30			min	0	3	-.002	3	0	3	-5.611e-4	1	NC	1	NC	1
31		16	max	0	1	0	2	.001	1	-1.832e-5	15	NC	1	NC	1
32			min	0	3	-.002	3	0	3	-5.031e-4	1	NC	1	NC	1
33		17	max	0	1	0	2	0	1	-1.616e-5	15	NC	1	NC	1
34			min	0	3	-.001	3	0	12	-4.45e-4	1	NC	1	NC	1
35		18	max	0	1	0	2	0	1	-1.4e-5	15	NC	1	NC	1
36			min	0	3	0	3	0	12	-3.869e-4	1	NC	1	NC	1
37		19	max	0	1	0	1	0	1	-1.047e-5	12	NC	1	NC	1
38			min	0	1	0	1	0	1	-3.288e-4	1	NC	1	NC	1
39	M3	1	max	0	1	0	1	0	1	1.531e-4	1	NC	1	NC	1
40			min	0	1	0	1	0	1	4.978e-6	12	NC	1	NC	1
41		2	max	0	3	0	2	0	12	1.906e-4	1	NC	1	NC	1
42			min	0	2	0	3	0	1	6.911e-6	15	NC	1	NC	1
43		3	max	0	3	0	2	0	12	2.281e-4	1	NC	1	NC	1
44			min	0	2	-.002	3	-.001	1	8.307e-6	15	NC	1	NC	1
45		4	max	0	3	0	2	0	12	2.656e-4	1	NC	1	NC	1
46			min	0	2	-.002	3	-.001	1	9.702e-6	15	NC	1	NC	1
47		5	max	0	3	0	2	0	12	3.031e-4	1	NC	1	NC	1
48			min	0	2	-.003	3	-.001	1	1.11e-5	15	NC	1	NC	1
49		6	max	0	3	0	2	0	3	3.406e-4	1	NC	1	NC	1
50			min	0	2	-.004	3	-.001	1	1.249e-5	15	NC	1	NC	1
51		7	max	0	3	0	2	0	3	3.781e-4	1	NC	1	NC	1

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
52			min	0	2	-.005	3	-.001	1	1.389e-5	15	NC	1	NC	1
53		8	max	0	3	.001	2	0	3	4.156e-4	1	NC	1	NC	1
54			min	0	2	-.005	3	0	1	1.528e-5	15	NC	1	NC	1
55		9	max	0	3	.002	2	0	3	4.53e-4	1	NC	1	NC	1
56			min	0	2	-.006	3	0	2	1.668e-5	15	NC	1	NC	1
57		10	max	0	3	.002	2	0	1	4.905e-4	1	NC	1	NC	1
58			min	0	2	-.006	3	0	15	1.807e-5	15	NC	1	NC	1
59		11	max	0	3	.003	2	.001	1	5.28e-4	1	NC	1	NC	1
60			min	0	2	-.007	3	0	15	1.947e-5	15	NC	1	NC	1
61		12	max	0	3	.003	2	.002	1	5.655e-4	1	NC	1	NC	1
62			min	0	2	-.007	3	0	15	2.087e-5	15	NC	1	NC	1
63		13	max	0	3	.004	2	.003	1	6.03e-4	1	NC	1	NC	1
64			min	0	2	-.008	3	0	15	2.226e-5	15	NC	1	NC	1
65		14	max	.001	3	.005	2	.004	1	6.405e-4	1	NC	1	NC	1
66			min	0	2	-.008	3	0	15	2.366e-5	15	9735.987	2	NC	1
67		15	max	.001	3	.006	2	.005	1	6.78e-4	1	NC	1	NC	2
68			min	0	2	-.008	3	0	15	2.505e-5	15	8202.804	2	9397.54	1
69		16	max	.001	3	.007	2	.006	1	7.155e-4	1	NC	3	NC	2
70			min	0	2	-.008	3	0	15	2.645e-5	15	7011.889	2	7858.004	1
71		17	max	.001	3	.008	2	.007	1	7.53e-4	1	NC	3	NC	2
72			min	-.001	2	-.008	3	0	15	2.784e-5	15	6077.292	2	6756.784	1
73		18	max	.001	3	.009	2	.008	1	7.905e-4	1	NC	3	NC	2
74			min	-.001	2	-.008	3	0	15	2.924e-5	15	5337.32	2	5942.427	1
75		19	max	.001	3	.01	2	.009	1	8.28e-4	1	NC	3	NC	2
76			min	-.001	2	-.008	3	0	15	3.063e-5	15	4747.366	2	5326.132	1
77	M4	1	max	.002	1	.01	2	0	15	-3.992e-5	15	NC	1	NC	3
78			min	0	3	-.008	3	-.006	1	-1.095e-3	1	NC	1	2978.705	1
79		2	max	.002	1	.009	2	0	15	-3.992e-5	15	NC	1	NC	3
80			min	0	3	-.008	3	-.006	1	-1.095e-3	1	NC	1	3248.916	1
81		3	max	.002	1	.009	2	0	15	-3.992e-5	15	NC	1	NC	3
82			min	0	3	-.007	3	-.005	1	-1.095e-3	1	NC	1	3570.538	1
83		4	max	.002	1	.008	2	0	15	-3.992e-5	15	NC	1	NC	2
84			min	0	3	-.007	3	-.005	1	-1.095e-3	1	NC	1	3957.126	1
85		5	max	.002	1	.008	2	0	15	-3.992e-5	15	NC	1	NC	2
86			min	0	3	-.006	3	-.004	1	-1.095e-3	1	NC	1	4427.146	1
87		6	max	.002	1	.007	2	0	15	-3.992e-5	15	NC	1	NC	2
88			min	0	3	-.006	3	-.004	1	-1.095e-3	1	NC	1	5006.282	1
89		7	max	.002	1	.007	2	0	15	-3.992e-5	15	NC	1	NC	2
90			min	0	3	-.005	3	-.003	1	-1.095e-3	1	NC	1	5731.121	1
91		8	max	.001	1	.006	2	0	15	-3.992e-5	15	NC	1	NC	2
92			min	0	3	-.005	3	-.003	1	-1.095e-3	1	NC	1	6655.238	1
93		9	max	.001	1	.006	2	0	15	-3.992e-5	15	NC	1	NC	2
94			min	0	3	-.004	3	-.002	1	-1.095e-3	1	NC	1	7859.678	1
95		10	max	.001	1	.005	2	0	15	-3.992e-5	15	NC	1	NC	2
96			min	0	3	-.004	3	-.002	1	-1.095e-3	1	NC	1	9471.858	1
97		11	max	.001	1	.004	2	0	15	-3.992e-5	15	NC	1	NC	1
98			min	0	3	-.004	3	-.002	1	-1.095e-3	1	NC	1	NC	1
99		12	max	0	1	.004	2	0	15	-3.992e-5	15	NC	1	NC	1
100			min	0	3	-.003	3	-.001	1	-1.095e-3	1	NC	1	NC	1
101		13	max	0	1	.003	2	0	15	-3.992e-5	15	NC	1	NC	1
102			min	0	3	-.003	3	0	1	-1.095e-3	1	NC	1	NC	1
103		14	max	0	1	.003	2	0	15	-3.992e-5	15	NC	1	NC	1
104			min	0	3	-.002	3	0	1	-1.095e-3	1	NC	1	NC	1
105		15	max	0	1	.002	2	0	15	-3.992e-5	15	NC	1	NC	1
106			min	0	3	-.002	3	0	1	-1.095e-3	1	NC	1	NC	1
107		16	max	0	1	.002	2	0	15	-3.992e-5	15	NC	1	NC	1
108			min	0	3	-.001	3	0	1	-1.095e-3	1	NC	1	NC	1

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
109		17	max	0	1	.001	2	0	15	-3.992e-5	15	NC	1	NC	1
110			min	0	3	0	3	0	1	-1.095e-3	1	NC	1	NC	1
111		18	max	0	1	0	2	0	15	-3.992e-5	15	NC	1	NC	1
112			min	0	3	0	3	0	1	-1.095e-3	1	NC	1	NC	1
113		19	max	0	1	0	1	0	1	-3.992e-5	15	NC	1	NC	1
114			min	0	1	0	1	0	1	-1.095e-3	1	NC	1	NC	1
115	M6	1	max	.01	1	.028	2	.005	1	2.393e-4	1	NC	3	NC	2
116			min	-.011	3	-.023	3	-.003	3	2.789e-6	10	1288.602	2	7521.228	1
117		2	max	.01	1	.026	2	.004	1	2.262e-4	3	NC	3	NC	2
118			min	-.01	3	-.022	3	-.003	3	1.92e-6	10	1377.135	2	8170.568	1
119		3	max	.009	1	.025	2	.004	1	2.192e-4	3	NC	3	NC	2
120			min	-.009	3	-.021	3	-.002	3	1.051e-6	10	1478.366	2	8940.039	1
121		4	max	.009	1	.023	2	.004	1	2.122e-4	3	NC	3	NC	2
122			min	-.009	3	-.019	3	-.002	3	1.825e-7	10	1594.836	2	9860.127	1
123		5	max	.008	1	.021	2	.003	1	2.051e-4	3	NC	3	NC	1
124			min	-.008	3	-.018	3	-.002	3	-6.862e-7	10	1729.817	2	NC	1
125		6	max	.007	1	.019	2	.003	1	1.981e-4	3	NC	3	NC	1
126			min	-.008	3	-.017	3	-.002	3	-4.091e-6	2	1887.591	2	NC	1
127		7	max	.007	1	.018	2	.003	1	1.911e-4	3	NC	3	NC	1
128			min	-.007	3	-.016	3	-.002	3	-8.006e-6	2	2073.876	2	NC	1
129		8	max	.006	1	.016	2	.002	1	1.84e-4	3	NC	3	NC	1
130			min	-.006	3	-.015	3	-.002	3	-1.192e-5	2	2296.469	2	NC	1
131		9	max	.006	1	.014	2	.002	1	1.77e-4	3	NC	3	NC	1
132			min	-.006	3	-.013	3	-.001	3	-1.584e-5	2	2566.29	2	NC	1
133		10	max	.005	1	.013	2	.002	1	1.7e-4	3	NC	3	NC	1
134			min	-.005	3	-.012	3	-.001	3	-1.975e-5	2	2899.113	2	NC	1
135		11	max	.005	1	.011	2	.001	1	1.629e-4	3	NC	3	NC	1
136			min	-.005	3	-.011	3	0	3	-2.367e-5	2	3318.6	2	NC	1
137		12	max	.004	1	.009	2	.001	1	1.559e-4	3	NC	3	NC	1
138			min	-.004	3	-.009	3	0	3	-2.758e-5	2	3861.931	2	NC	1
139		13	max	.003	1	.008	2	0	1	1.489e-4	3	NC	3	NC	1
140			min	-.004	3	-.008	3	0	3	-3.15e-5	2	4591.063	2	NC	1
141		14	max	.003	1	.006	2	0	1	1.418e-4	3	NC	3	NC	1
142			min	-.003	3	-.007	3	0	3	-3.541e-5	2	5617.508	2	NC	1
143		15	max	.002	1	.005	2	0	1	1.348e-4	3	NC	3	NC	1
144			min	-.002	3	-.005	3	0	3	-3.933e-5	2	7164.267	2	NC	1
145		16	max	.002	1	.004	2	0	1	1.278e-4	3	NC	1	NC	1
146			min	-.002	3	-.004	3	0	3	-4.324e-5	2	9751.632	2	NC	1
147		17	max	.001	1	.002	2	0	1	1.208e-4	3	NC	1	NC	1
148			min	-.001	3	-.003	3	0	3	-4.716e-5	2	NC	1	NC	1
149		18	max	0	1	.001	2	0	1	1.137e-4	3	NC	1	NC	1
150			min	0	3	-.001	3	0	3	-5.107e-5	2	NC	1	NC	1
151		19	max	0	1	0	1	0	1	1.067e-4	3	NC	1	NC	1
152			min	0	1	0	1	0	1	-5.499e-5	2	NC	1	NC	1
153	M7	1	max	0	1	0	1	0	1	2.532e-5	2	NC	1	NC	1
154			min	0	1	0	1	0	1	-4.942e-5	3	NC	1	NC	1
155		2	max	0	3	.001	2	0	3	2.108e-5	2	NC	1	NC	1
156			min	0	2	-.002	3	0	2	-3.667e-5	3	NC	1	NC	1
157		3	max	0	3	.003	2	0	3	1.916e-5	1	NC	1	NC	1
158			min	0	2	-.004	3	0	2	-2.392e-5	3	NC	1	NC	1
159		4	max	0	3	.004	2	0	3	1.941e-5	1	NC	1	NC	1
160			min	0	2	-.005	3	0	2	-1.118e-5	3	NC	1	NC	1
161		5	max	.001	3	.006	2	0	3	1.966e-5	1	NC	1	NC	1
162			min	-.001	2	-.007	3	0	2	5.793e-7	15	8359.494	2	NC	1
163		6	max	.001	3	.007	2	.001	3	1.99e-5	1	NC	3	NC	1
164			min	-.001	2	-.009	3	0	2	6.665e-7	15	6704.645	2	NC	1
165		7	max	.002	3	.008	2	.001	3	2.706e-5	3	NC	3	NC	1

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
166			min	-.002	2	-.01	3	0	1	-1.655e-7	2	5573.652	2	NC	1
167		8	max	.002	3	.01	2	.001	3	3.981e-5	3	NC	3	NC	1
168			min	-.002	2	-.012	3	0	1	-4.414e-6	2	4744.905	2	NC	1
169		9	max	.002	3	.011	2	.001	3	5.255e-5	3	NC	3	NC	1
170			min	-.002	2	-.013	3	0	1	-8.662e-6	2	4107.992	2	NC	1
171		10	max	.002	3	.013	2	.001	3	6.53e-5	3	NC	3	NC	1
172			min	-.003	2	-.014	3	-.001	1	-1.291e-5	2	3601.727	2	NC	1
173		11	max	.003	3	.014	2	.002	3	7.805e-5	3	NC	3	NC	1
174			min	-.003	2	-.016	3	-.001	1	-1.716e-5	2	3189.387	2	NC	1
175		12	max	.003	3	.016	2	.002	3	9.079e-5	3	NC	3	NC	1
176			min	-.003	2	-.017	3	-.001	1	-2.141e-5	2	2847.493	2	NC	1
177		13	max	.003	3	.018	2	.002	3	1.035e-4	3	NC	3	NC	1
178			min	-.004	2	-.018	3	-.002	1	-2.566e-5	2	2560.222	2	NC	1
179		14	max	.003	3	.02	2	.002	3	1.163e-4	3	NC	3	NC	1
180			min	-.004	2	-.019	3	-.002	1	-2.99e-5	2	2316.437	2	NC	1
181		15	max	.004	3	.022	2	.002	3	1.29e-4	3	NC	3	NC	1
182			min	-.004	2	-.02	3	-.002	1	-3.415e-5	2	2108.001	2	NC	1
183		16	max	.004	3	.024	2	.002	3	1.418e-4	3	NC	3	NC	1
184			min	-.004	2	-.021	3	-.002	1	-3.84e-5	2	1928.786	2	NC	1
185		17	max	.004	3	.026	2	.002	3	1.545e-4	3	NC	3	NC	1
186			min	-.005	2	-.021	3	-.002	1	-4.265e-5	2	1774.061	2	NC	1
187		18	max	.004	3	.028	2	.001	3	1.673e-4	3	NC	3	NC	1
188			min	-.005	2	-.022	3	-.002	1	-4.69e-5	2	1640.099	2	NC	1
189		19	max	.005	3	.03	2	.001	3	1.8e-4	3	NC	3	NC	1
190			min	-.005	2	-.023	3	-.003	1	-5.115e-5	2	1523.922	2	NC	1
191	M8	1	max	.007	1	.032	2	.003	1	-3.91e-6	10	NC	1	NC	2
192			min	0	3	-.023	3	0	3	-1.714e-4	1	NC	1	7056.444	1
193		2	max	.006	1	.03	2	.003	1	-3.91e-6	10	NC	1	NC	2
194			min	0	3	-.022	3	0	3	-1.714e-4	1	NC	1	7693.42	1
195		3	max	.006	1	.029	2	.002	1	-3.91e-6	10	NC	1	NC	2
196			min	0	3	-.021	3	0	3	-1.714e-4	1	NC	1	8451.741	1
197		4	max	.005	1	.027	2	.002	1	-3.91e-6	10	NC	1	NC	2
198			min	0	3	-.019	3	0	3	-1.714e-4	1	NC	1	9363.373	1
199		5	max	.005	1	.025	2	.002	1	-3.91e-6	10	NC	1	NC	1
200			min	0	3	-.018	3	0	3	-1.714e-4	1	NC	1	NC	1
201		6	max	.005	1	.023	2	.002	1	-3.91e-6	10	NC	1	NC	1
202			min	0	3	-.017	3	0	3	-1.714e-4	1	NC	1	NC	1
203		7	max	.004	1	.021	2	.001	1	-3.91e-6	10	NC	1	NC	1
204			min	0	3	-.015	3	0	3	-1.714e-4	1	NC	1	NC	1
205		8	max	.004	1	.02	2	.001	1	-3.91e-6	10	NC	1	NC	1
206			min	0	3	-.014	3	0	3	-1.714e-4	1	NC	1	NC	1
207		9	max	.004	1	.018	2	.001	1	-3.91e-6	10	NC	1	NC	1
208			min	0	3	-.013	3	0	3	-1.714e-4	1	NC	1	NC	1
209		10	max	.003	1	.016	2	0	1	-3.91e-6	10	NC	1	NC	1
210			min	0	3	-.012	3	0	3	-1.714e-4	1	NC	1	NC	1
211		11	max	.003	1	.014	2	0	1	-3.91e-6	10	NC	1	NC	1
212			min	0	3	-.01	3	0	3	-1.714e-4	1	NC	1	NC	1
213		12	max	.003	1	.012	2	0	1	-3.91e-6	10	NC	1	NC	1
214			min	0	3	-.009	3	0	3	-1.714e-4	1	NC	1	NC	1
215		13	max	.002	1	.011	2	0	1	-3.91e-6	10	NC	1	NC	1
216			min	0	3	-.008	3	0	3	-1.714e-4	1	NC	1	NC	1
217		14	max	.002	1	.009	2	0	1	-3.91e-6	10	NC	1	NC	1
218			min	0	3	-.006	3	0	3	-1.714e-4	1	NC	1	NC	1
219		15	max	.001	1	.007	2	0	1	-3.91e-6	10	NC	1	NC	1
220			min	0	3	-.005	3	0	3	-1.714e-4	1	NC	1	NC	1
221		16	max	.001	1	.005	2	0	1	-3.91e-6	10	NC	1	NC	1
222			min	0	3	-.004	3	0	3	-1.714e-4	1	NC	1	NC	1

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
223		17	max	0	1	.004	2	0	1	-3.91e-6	10	NC	1	NC	1
224			min	0	3	-.003	3	0	3	-1.714e-4	1	NC	1	NC	1
225		18	max	0	1	.002	2	0	1	-3.91e-6	10	NC	1	NC	1
226			min	0	3	-.001	3	0	3	-1.714e-4	1	NC	1	NC	1
227		19	max	0	1	0	1	0	1	-3.91e-6	10	NC	1	NC	1
228			min	0	1	0	1	0	1	-1.714e-4	1	NC	1	NC	1
229	M10	1	max	.003	1	.009	2	0	3	1.136e-3	1	NC	3	NC	1
230			min	-.003	3	-.008	3	-.002	1	-2.201e-4	3	4218.605	2	NC	1
231		2	max	.003	1	.008	2	0	3	1.077e-3	1	NC	3	NC	1
232			min	-.003	3	-.008	3	-.002	1	-2.137e-4	3	4584.551	2	NC	1
233		3	max	.003	1	.007	2	0	3	1.017e-3	1	NC	3	NC	1
234			min	-.003	3	-.007	3	-.002	1	-2.072e-4	3	5016.293	2	NC	1
235		4	max	.003	1	.007	2	0	3	9.578e-4	1	NC	3	NC	1
236			min	-.003	3	-.007	3	-.002	1	-2.008e-4	3	5529.046	2	NC	1
237		5	max	.003	1	.006	2	0	3	8.983e-4	1	NC	3	NC	1
238			min	-.002	3	-.007	3	-.002	1	-1.943e-4	3	6142.901	2	NC	1
239		6	max	.002	1	.005	2	0	3	8.389e-4	1	NC	1	NC	1
240			min	-.002	3	-.006	3	-.002	1	-1.879e-4	3	6884.807	2	NC	1
241		7	max	.002	1	.005	2	0	3	7.795e-4	1	NC	1	NC	1
242			min	-.002	3	-.006	3	-.001	1	-1.814e-4	3	7791.591	2	NC	1
243		8	max	.002	1	.004	2	0	3	7.2e-4	1	NC	1	NC	1
244			min	-.002	3	-.006	3	-.001	1	-1.75e-4	3	8914.682	2	NC	1
245		9	max	.002	1	.004	2	0	3	6.606e-4	1	NC	1	NC	1
246			min	-.002	3	-.005	3	-.001	1	-1.685e-4	3	NC	1	NC	1
247		10	max	.002	1	.003	2	0	3	6.012e-4	1	NC	1	NC	1
248			min	-.002	3	-.005	3	-.001	1	-1.62e-4	3	NC	1	NC	1
249		11	max	.001	1	.003	2	0	3	5.417e-4	1	NC	1	NC	1
250			min	-.001	3	-.004	3	0	1	-1.556e-4	3	NC	1	NC	1
251		12	max	.001	1	.002	2	0	3	4.823e-4	1	NC	1	NC	1
252			min	-.001	3	-.004	3	0	1	-1.491e-4	3	NC	1	NC	1
253		13	max	.001	1	.002	2	0	3	4.229e-4	1	NC	1	NC	1
254			min	-.001	3	-.003	3	0	1	-1.427e-4	3	NC	1	NC	1
255		14	max	0	1	.001	2	0	3	3.634e-4	1	NC	1	NC	1
256			min	0	3	-.003	3	0	1	-1.362e-4	3	NC	1	NC	1
257		15	max	0	1	0	2	0	3	3.04e-4	1	NC	1	NC	1
258			min	0	3	-.002	3	0	1	-1.298e-4	3	NC	1	NC	1
259		16	max	0	1	0	2	0	3	2.446e-4	1	NC	1	NC	1
260			min	0	3	-.002	3	0	1	-1.233e-4	3	NC	1	NC	1
261		17	max	0	1	0	2	0	3	1.851e-4	1	NC	1	NC	1
262			min	0	3	-.001	3	0	1	-1.169e-4	3	NC	1	NC	1
263		18	max	0	1	0	2	0	3	1.257e-4	1	NC	1	NC	1
264			min	0	3	0	3	0	1	-1.104e-4	3	NC	1	NC	1
265		19	max	0	1	0	1	0	1	6.625e-5	1	NC	1	NC	1
266			min	0	1	0	1	0	1	-1.039e-4	3	NC	1	NC	1
267	M11	1	max	0	1	0	1	0	1	4.837e-5	3	NC	1	NC	1
268			min	0	1	0	1	0	1	-3.23e-5	1	NC	1	NC	1
269		2	max	0	3	0	2	0	2	3.334e-5	3	NC	1	NC	1
270			min	0	2	0	3	0	3	-1.014e-4	1	NC	1	NC	1
271		3	max	0	3	0	2	0	10	1.831e-5	3	NC	1	NC	1
272			min	0	2	-.002	3	0	3	-1.706e-4	1	NC	1	NC	1
273		4	max	0	3	0	2	0	10	3.283e-6	3	NC	1	NC	1
274			min	0	2	-.003	3	0	3	-2.397e-4	1	NC	1	NC	1
275		5	max	0	3	0	2	0	10	-8.182e-6	12	NC	1	NC	1
276			min	0	2	-.003	3	-.001	1	-3.088e-4	1	NC	1	NC	1
277		6	max	0	3	0	2	0	15	-1.388e-5	15	NC	1	NC	1
278			min	0	2	-.004	3	-.002	1	-3.78e-4	1	NC	1	NC	1
279		7	max	0	3	0	2	0	15	-1.649e-5	15	NC	1	NC	1

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
280			min	0	2	-.005	3	-.003	1	-4.471e-4	1	NC	1	NC	1
281		8	max	0	3	.001	2	0	15	-1.91e-5	15	NC	1	NC	1
282			min	0	2	-.005	3	-.004	1	-5.163e-4	1	NC	1	NC	1
283		9	max	0	3	.002	2	0	15	-2.171e-5	15	NC	1	NC	2
284			min	0	2	-.006	3	-.005	1	-5.854e-4	1	NC	1	9825.861	1
285		10	max	0	3	.002	2	0	15	-2.432e-5	15	NC	1	NC	2
286			min	0	2	-.007	3	-.006	1	-6.545e-4	1	NC	1	7865.929	1
287		11	max	0	3	.003	2	0	15	-2.693e-5	15	NC	1	NC	2
288			min	0	2	-.007	3	-.007	1	-7.237e-4	1	NC	1	6495.133	1
289		12	max	0	3	.003	2	0	15	-2.954e-5	15	NC	1	NC	2
290			min	0	2	-.007	3	-.008	1	-7.928e-4	1	NC	1	5498.609	1
291		13	max	0	3	.004	2	0	15	-3.215e-5	15	NC	1	NC	2
292			min	0	2	-.008	3	-.01	1	-8.619e-4	1	NC	1	4751.991	1
293		14	max	.001	3	.005	2	0	15	-3.476e-5	15	NC	1	NC	2
294			min	0	2	-.008	3	-.011	1	-9.311e-4	1	9748.057	2	4179.159	1
295		15	max	.001	3	.006	2	0	15	-3.737e-5	15	NC	1	NC	2
296			min	0	2	-.008	3	-.012	1	-1.e-3	1	8212.027	2	3731.387	1
297		16	max	.001	3	.007	2	0	15	-3.999e-5	15	NC	3	NC	3
298			min	0	2	-.008	3	-.014	1	-1.069e-3	1	7019.108	2	3376.323	1
299		17	max	.001	3	.008	2	0	15	-4.26e-5	15	NC	3	NC	3
300			min	-.001	2	-.008	3	-.015	1	-1.138e-3	1	6083.074	2	3091.839	1
301		18	max	.001	3	.009	2	0	15	-4.521e-5	15	NC	3	NC	3
302			min	-.001	2	-.008	3	-.016	1	-1.208e-3	1	5342.057	2	2862.445	1
303		19	max	.001	3	.01	2	0	15	-4.782e-5	15	NC	3	NC	3
304			min	-.001	2	-.008	3	-.017	1	-1.277e-3	1	4751.334	2	2677.101	1
305	M12	1	max	.002	1	.01	2	.014	1	1.147e-3	1	NC	1	NC	3
306			min	0	3	-.008	3	0	15	4.36e-5	15	NC	1	1360.072	1
307		2	max	.002	1	.009	2	.013	1	1.147e-3	1	NC	1	NC	3
308			min	0	3	-.008	3	0	15	4.36e-5	15	NC	1	1483.135	1
309		3	max	.002	1	.009	2	.012	1	1.147e-3	1	NC	1	NC	3
310			min	0	3	-.007	3	0	15	4.36e-5	15	NC	1	1629.628	1
311		4	max	.002	1	.008	2	.011	1	1.147e-3	1	NC	1	NC	3
312			min	0	3	-.007	3	0	15	4.36e-5	15	NC	1	1805.725	1
313		5	max	.002	1	.008	2	.01	1	1.147e-3	1	NC	1	NC	3
314			min	0	3	-.006	3	0	15	4.36e-5	15	NC	1	2019.837	1
315		6	max	.002	1	.007	2	.008	1	1.147e-3	1	NC	1	NC	3
316			min	0	3	-.006	3	0	15	4.36e-5	15	NC	1	2283.664	1
317		7	max	.002	1	.007	2	.007	1	1.147e-3	1	NC	1	NC	3
318			min	0	3	-.005	3	0	15	4.36e-5	15	NC	1	2613.872	1
319		8	max	.001	1	.006	2	.006	1	1.147e-3	1	NC	1	NC	3
320			min	0	3	-.005	3	0	15	4.36e-5	15	NC	1	3034.864	1
321		9	max	.001	1	.006	2	.005	1	1.147e-3	1	NC	1	NC	3
322			min	0	3	-.004	3	0	15	4.36e-5	15	NC	1	3583.555	1
323		10	max	.001	1	.005	2	.004	1	1.147e-3	1	NC	1	NC	2
324			min	0	3	-.004	3	0	15	4.36e-5	15	NC	1	4317.98	1
325		11	max	.001	1	.004	2	.004	1	1.147e-3	1	NC	1	NC	2
326			min	0	3	-.004	3	0	15	4.36e-5	15	NC	1	5333.733	1
327		12	max	0	1	.004	2	.003	1	1.147e-3	1	NC	1	NC	2
328			min	0	3	-.003	3	0	15	4.36e-5	15	NC	1	6797.576	1
329		13	max	0	1	.003	2	.002	1	1.147e-3	1	NC	1	NC	2
330			min	0	3	-.003	3	0	15	4.36e-5	15	NC	1	9022.346	1
331		14	max	0	1	.003	2	.002	1	1.147e-3	1	NC	1	NC	1
332			min	0	3	-.002	3	0	15	4.36e-5	15	NC	1	NC	1
333		15	max	0	1	.002	2	.001	1	1.147e-3	1	NC	1	NC	1
334			min	0	3	-.002	3	0	15	4.36e-5	15	NC	1	NC	1
335		16	max	0	1	.002	2	0	1	1.147e-3	1	NC	1	NC	1
336			min	0	3	-.001	3	0	15	4.36e-5	15	NC	1	NC	1

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
337		17	max	0	1	.001	2	0	1	1.147e-3	1	NC	1	NC	1
338			min	0	3	0	3	0	15	4.36e-5	15	NC	1	NC	1
339		18	max	0	1	0	2	0	1	1.147e-3	1	NC	1	NC	1
340			min	0	3	0	3	0	15	4.36e-5	15	NC	1	NC	1
341		19	max	0	1	0	1	0	1	1.147e-3	1	NC	1	NC	1
342			min	0	1	0	1	0	1	4.36e-5	15	NC	1	NC	1
343	M1	1	max	.007	3	.024	3	.002	3	1.543e-2	1	NC	1	NC	1
344			min	-.008	2	-.027	1	-.005	1	-1.498e-2	3	NC	1	NC	1
345		2	max	.007	3	.014	3	0	3	7.249e-3	1	NC	4	NC	2
346			min	-.008	2	-.015	1	-.012	1	-7.419e-3	3	3817.981	1	6935.363	1
347		3	max	.007	3	.004	3	0	3	5.802e-7	3	NC	4	NC	2
348			min	-.008	2	-.004	1	-.016	1	-7.789e-4	1	1974.477	1	4205.02	1
349		4	max	.007	3	.006	1	0	3	5.632e-6	3	NC	5	NC	3
350			min	-.008	2	-.004	3	-.019	1	-6.584e-4	1	1396.441	1	3478.956	1
351		5	max	.007	3	.014	1	0	3	1.068e-5	3	NC	5	NC	3
352			min	-.008	2	-.011	3	-.019	1	-5.379e-4	1	1118.59	1	3339.694	1
353		6	max	.007	3	.021	1	0	3	1.574e-5	3	NC	5	NC	3
354			min	-.008	2	-.016	3	-.018	1	-4.175e-4	1	961.541	1	3571.968	1
355		7	max	.007	3	.026	1	0	3	2.079e-5	3	NC	5	NC	2
356			min	-.008	2	-.02	3	-.016	1	-2.97e-4	1	866.456	1	4249.925	1
357		8	max	.007	3	.03	1	0	3	2.584e-5	3	NC	5	NC	2
358			min	-.008	2	-.023	3	-.013	1	-1.765e-4	1	808.869	1	5825.151	1
359		9	max	.007	3	.032	1	0	3	3.089e-5	3	NC	5	NC	1
360			min	-.008	2	-.024	3	-.009	1	-5.606e-5	1	777.355	1	NC	1
361		10	max	.007	3	.033	1	0	3	6.441e-5	1	NC	5	NC	1
362			min	-.008	2	-.025	3	-.005	1	2.717e-6	15	766.645	1	NC	1
363		11	max	.007	3	.032	1	0	3	1.849e-4	1	NC	5	NC	1
364			min	-.008	2	-.024	3	-.001	1	7.136e-6	15	775.132	1	NC	1
365		12	max	.007	3	.03	1	.002	1	3.054e-4	1	NC	5	NC	2
366			min	-.008	2	-.022	3	0	15	1.156e-5	15	804.217	1	6749.568	1
367		13	max	.007	3	.026	1	.006	1	4.258e-4	1	NC	5	NC	2
368			min	-.008	2	-.019	3	0	15	1.598e-5	15	858.897	1	4687.209	1
369		14	max	.007	3	.02	1	.008	1	5.463e-4	1	NC	5	NC	3
370			min	-.008	2	-.015	3	0	15	2.039e-5	15	950.139	1	3843.344	1
371		15	max	.007	3	.013	1	.009	1	6.668e-4	1	NC	5	NC	3
372			min	-.008	2	-.01	3	0	15	2.481e-5	15	1101.474	1	3540.21	1
373		16	max	.007	3	.005	1	.009	1	7.523e-4	1	NC	5	NC	3
374			min	-.008	2	-.004	3	0	15	2.797e-5	15	1367.83	2	3649.078	1
375		17	max	.007	3	.003	3	.007	1	2.974e-5	3	NC	4	NC	2
376			min	-.008	2	-.006	2	0	15	-9.698e-6	2	1922.243	1	4378.576	1
377		18	max	.007	3	.011	3	.002	1	8.695e-3	1	NC	4	NC	2
378			min	-.008	2	-.018	2	0	15	-3.304e-3	3	3704.984	1	7184.965	1
379		19	max	.007	3	.019	3	0	3	1.756e-2	1	NC	1	NC	1
380			min	-.008	2	-.03	2	-.004	1	-6.7e-3	3	NC	1	NC	1
381	M5	1	max	.021	3	.072	3	.001	3	8.386e-7	3	NC	1	NC	1
382			min	-.027	2	-.083	1	-.006	1	5.387e-8	15	NC	1	NC	1
383		2	max	.021	3	.041	3	.002	3	6.079e-5	3	NC	5	NC	1
384			min	-.027	2	-.047	1	-.006	1	-7.769e-5	1	1278.241	1	NC	1
385		3	max	.021	3	.013	3	.003	3	1.196e-4	3	NC	5	NC	1
386			min	-.027	2	-.013	1	-.005	1	-1.545e-4	1	657.698	1	NC	1
387		4	max	.021	3	.017	1	.003	3	1.169e-4	3	NC	5	NC	1
388			min	-.027	2	-.01	3	-.004	1	-1.454e-4	1	463.683	1	NC	1
389		5	max	.021	3	.042	1	.004	3	1.141e-4	3	NC	15	NC	1
390			min	-.027	2	-.03	3	-.004	1	-1.363e-4	1	370.34	1	NC	1
391		6	max	.021	3	.062	1	.004	3	1.114e-4	3	NC	15	NC	1
392			min	-.027	2	-.045	3	-.003	1	-1.271e-4	1	317.462	1	NC	1
393		7	max	.021	3	.078	1	.004	3	1.087e-4	3	NC	15	NC	1

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
394			min	-.027	2	-.057	3	-.003	1	-1.18e-4	1	285.309	1	NC	1
395		8	max	.021	3	.09	1	.004	3	1.06e-4	3	NC	15	NC	1
396			min	-.027	2	-.065	3	-.003	1	-1.089e-4	1	265.671	1	NC	1
397		9	max	.021	3	.097	1	.004	3	1.032e-4	3	NC	15	NC	1
398			min	-.027	2	-.069	3	-.002	1	-9.975e-5	1	254.703	1	NC	1
399		10	max	.021	3	.099	1	.004	3	1.005e-4	3	NC	15	NC	1
400			min	-.027	2	-.07	3	-.002	1	-9.062e-5	1	250.62	1	NC	1
401		11	max	.021	3	.097	1	.003	3	9.778e-5	3	NC	15	NC	1
402			min	-.027	2	-.068	3	-.002	1	-8.149e-5	1	252.857	1	NC	1
403		12	max	.021	3	.09	1	.003	3	9.505e-5	3	NC	15	NC	1
404			min	-.027	2	-.062	3	-.002	1	-7.235e-5	1	261.843	1	NC	1
405		13	max	.021	3	.079	1	.003	3	9.233e-5	3	NC	15	NC	1
406			min	-.027	2	-.053	3	-.002	1	-6.322e-5	1	279.189	1	NC	1
407		14	max	.021	3	.062	1	.002	3	8.96e-5	3	NC	15	NC	1
408			min	-.027	2	-.042	3	-.002	1	-5.409e-5	1	308.473	1	NC	1
409		15	max	.021	3	.041	1	.002	3	8.687e-5	3	NC	5	NC	1
410			min	-.027	2	-.027	3	-.002	1	-4.796e-5	2	357.42	1	NC	1
411		16	max	.021	3	.015	1	.001	3	8.133e-5	3	NC	5	NC	1
412			min	-.027	2	-.01	3	-.003	1	-4.565e-5	2	444.653	1	NC	1
413		17	max	.021	3	.01	3	0	3	8.712e-6	3	NC	5	NC	1
414			min	-.027	2	-.017	2	-.003	1	-2.592e-4	1	627.804	1	NC	1
415		18	max	.021	3	.031	3	0	3	3.635e-6	3	NC	5	NC	1
416			min	-.027	2	-.054	2	-.003	1	-1.329e-4	1	1217.403	1	NC	1
417		19	max	.021	3	.054	3	0	3	0	15	NC	1	NC	1
418			min	-.027	2	-.092	1	-.003	1	-1.686e-7	3	NC	1	NC	1
419	M9	1	max	.007	3	.024	3	.001	3	1.498e-2	3	NC	1	NC	1
420			min	-.008	2	-.027	1	-.007	1	-1.543e-2	1	NC	1	NC	1
421		2	max	.007	3	.014	3	0	3	7.417e-3	3	NC	4	NC	2
422			min	-.008	2	-.015	1	-.001	1	-7.538e-3	1	3818.8	1	8134.498	1
423		3	max	.007	3	.004	3	.002	1	2.051e-4	1	NC	4	NC	2
424			min	-.008	2	-.004	1	0	3	-6.528e-6	3	1974.909	1	5062.324	1
425		4	max	.007	3	.006	1	.004	1	1.027e-4	1	NC	5	NC	2
426			min	-.008	2	-.004	3	0	3	-1.531e-5	3	1396.737	1	4299.519	1
427		5	max	.007	3	.014	1	.005	1	1.163e-5	2	NC	5	NC	2
428			min	-.008	2	-.011	3	-.001	3	-2.41e-5	3	1118.808	1	4274.951	1
429		6	max	.007	3	.021	1	.004	1	-8.244e-7	10	NC	5	NC	2
430			min	-.008	2	-.016	3	-.002	3	-1.02e-4	1	961.708	1	4821.988	1
431		7	max	.007	3	.026	1	.002	1	-7.471e-6	15	NC	5	NC	2
432			min	-.008	2	-.02	3	-.002	3	-2.044e-4	1	866.586	1	6294.134	1
433		8	max	.007	3	.03	1	0	2	-1.125e-5	15	NC	5	NC	1
434			min	-.008	2	-.023	3	-.002	3	-3.068e-4	1	808.971	1	NC	1
435		9	max	.007	3	.032	1	0	10	-1.503e-5	15	NC	5	NC	1
436			min	-.008	2	-.024	3	-.004	1	-4.092e-4	1	777.434	1	NC	1
437		10	max	.007	3	.033	1	0	15	-1.881e-5	15	NC	5	NC	1
438			min	-.008	2	-.025	3	-.008	1	-5.116e-4	1	766.703	1	NC	1
439		11	max	.007	3	.032	1	0	15	-2.259e-5	15	NC	5	NC	2
440			min	-.008	2	-.024	3	-.011	1	-6.14e-4	1	775.172	1	7268.751	1
441		12	max	.007	3	.03	1	0	15	-2.636e-5	15	NC	5	NC	2
442			min	-.008	2	-.022	3	-.014	1	-7.163e-4	1	804.238	1	4808.032	1
443		13	max	.007	3	.026	1	0	15	-3.014e-5	15	NC	5	NC	3
444			min	-.008	2	-.019	3	-.016	1	-8.187e-4	1	858.899	1	3770.887	1
445		14	max	.007	3	.02	1	0	15	-3.392e-5	15	NC	5	NC	3
446			min	-.008	2	-.015	3	-.018	1	-9.211e-4	1	950.121	1	3296.785	1
447		15	max	.007	3	.013	1	0	15	-3.77e-5	15	NC	5	NC	3
448			min	-.008	2	-.01	3	-.018	1	-1.023e-3	1	1101.431	1	3159.242	1
449		16	max	.007	3	.005	1	0	15	-4.043e-5	15	NC	5	NC	3
450			min	-.008	2	-.004	3	-.017	1	-1.098e-3	1	1368.235	2	3344.243	1

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
451		17	max	.007	3	.003	3	0	15	-1.1e-6	3	NC	4	NC	2
452			min	-.008	2	-.006	2	-.014	1	-5.183e-4	1	1922.151	1	4089.911	1
453		18	max	.007	3	.011	3	0	15	3.319e-3	3	NC	4	NC	2
454			min	-.008	2	-.018	2	-.009	1	-8.955e-3	1	3704.807	1	6806.725	1
455		19	max	.007	3	.019	3	0	3	6.7e-3	3	NC	1	NC	1
456			min	-.008	2	-.03	2	-.002	1	-1.756e-2	1	NC	1	NC	1
457	M13	1	max	.007	1	.024	3	.007	3	3.97e-3	3	NC	1	NC	1
458			min	-.001	3	-.027	1	-.008	2	-4.628e-3	1	NC	1	NC	1
459		2	max	.007	1	.178	3	.05	1	4.796e-3	3	NC	5	NC	3
460			min	-.001	3	-.186	1	0	10	-5.629e-3	1	1208.187	1	3498.089	1
461		3	max	.007	1	.305	3	.126	1	5.623e-3	3	NC	5	NC	3
462			min	-.001	3	-.316	1	.005	15	-6.631e-3	1	664.054	1	1466.074	1
463		4	max	.007	1	.384	3	.19	1	6.449e-3	3	NC	5	NC	3
464			min	-.001	3	-.399	1	.007	15	-7.632e-3	1	517.108	1	983.584	1
465		5	max	.007	1	.407	3	.222	1	7.275e-3	3	NC	5	NC	3
466			min	-.001	3	-.423	1	.008	15	-8.634e-3	1	484.552	1	847.653	1
467		6	max	.007	1	.376	3	.211	1	8.101e-3	3	NC	5	NC	3
468			min	-.001	3	-.392	1	.008	15	-9.635e-3	1	526.02	1	890.211	1
469		7	max	.007	1	.301	3	.16	1	8.928e-3	3	NC	5	NC	3
470			min	-.001	3	-.316	1	.006	10	-1.064e-2	1	664.794	1	1160.548	1
471		8	max	.007	1	.203	3	.085	1	9.754e-3	3	NC	5	NC	3
472			min	-.001	3	-.216	1	-.003	10	-1.164e-2	1	1015.434	1	2123.393	1
473		9	max	.006	1	.113	3	.02	3	1.058e-2	3	NC	4	NC	1
474			min	-.001	3	-.125	1	-.012	2	-1.264e-2	1	1970.598	1	NC	1
475		10	max	.006	1	.072	3	.021	3	1.141e-2	3	NC	4	NC	1
476			min	-.001	3	-.083	1	-.027	2	-1.364e-2	1	3448.69	1	NC	1
477		11	max	.006	1	.113	3	.025	3	1.058e-2	3	NC	4	NC	2
478			min	-.001	3	-.125	1	-.012	2	-1.264e-2	1	1970.6	1	8710.905	1
479		12	max	.006	1	.203	3	.093	1	9.755e-3	3	NC	5	NC	5
480			min	-.001	3	-.216	1	-.003	10	-1.164e-2	1	1015.435	1	1951.823	1
481		13	max	.006	1	.301	3	.17	1	8.929e-3	3	NC	5	NC	5
482			min	-.001	3	-.316	1	.006	10	-1.064e-2	1	664.795	1	1097.61	1
483		14	max	.006	1	.376	3	.22	1	8.103e-3	3	NC	5	NC	5
484			min	-.001	3	-.392	1	.008	15	-9.634e-3	1	526.02	1	851.798	1
485		15	max	.006	1	.407	3	.23	1	7.278e-3	3	NC	5	NC	5
486			min	-.002	3	-.423	1	.009	15	-8.632e-3	1	484.552	1	815.563	1
487		16	max	.006	1	.384	3	.198	1	6.452e-3	3	NC	5	NC	3
488			min	-.002	3	-.398	1	.007	15	-7.63e-3	1	517.108	1	948.182	1
489		17	max	.006	1	.305	3	.131	1	5.626e-3	3	NC	5	NC	3
490			min	-.002	3	-.316	1	.005	15	-6.629e-3	1	664.055	1	1411.133	1
491		18	max	.006	1	.178	3	.053	1	4.8e-3	3	NC	5	NC	3
492			min	-.002	3	-.186	1	0	10	-5.627e-3	1	1208.189	1	3340.577	1
493		19	max	.005	1	.024	3	.007	3	3.974e-3	3	NC	1	NC	1
494			min	-.002	3	-.027	1	-.008	2	-4.625e-3	1	NC	1	NC	1
495	M16	1	max	.002	1	.019	3	.007	3	4.92e-3	2	NC	1	NC	1
496			min	0	3	-.03	2	-.008	2	-3.061e-3	3	NC	1	NC	1
497		2	max	.002	1	.088	3	.053	1	5.979e-3	2	NC	5	NC	3
498			min	0	3	-.21	1	0	10	-3.667e-3	3	1061.55	1	3266.476	1
499		3	max	.002	1	.145	3	.132	1	7.057e-3	1	NC	5	NC	3
500			min	0	3	-.359	1	.005	15	-4.272e-3	3	583.486	1	1395.203	1
501		4	max	.003	1	.181	3	.198	1	8.152e-3	1	NC	5	NC	3
502			min	0	3	-.452	1	.008	15	-4.878e-3	3	454.409	1	943.257	1
503		5	max	.003	1	.194	3	.23	1	9.247e-3	1	NC	5	NC	5
504			min	0	3	-.48	1	.009	15	-5.484e-3	3	425.863	1	815.138	1
505		6	max	.003	1	.182	3	.219	1	1.034e-2	1	NC	5	NC	5
506			min	0	3	-.445	1	.008	15	-6.09e-3	3	462.428	1	855.369	1
507		7	max	.003	1	.151	3	.168	1	1.144e-2	1	NC	5	NC	5

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
508			min	0	3	-.358	1	.006	10	-6.695e-3	3	584.711	1	1109.195	1
509		8	max	.003	1	.11	3	.091	1	1.253e-2	1	NC	5	NC	5
510			min	0	3	-.244	1	-.003	10	-7.301e-3	3	894.069	1	1997.015	1
511		9	max	.003	1	.071	3	.023	3	1.363e-2	1	NC	4	NC	2
512			min	0	3	-.14	1	-.013	2	-7.907e-3	3	1739.935	1	9499.886	1
513		10	max	.003	1	.054	3	.021	3	1.472e-2	1	NC	4	NC	1
514			min	0	3	-.092	1	-.027	2	-8.513e-3	3	3058.117	1	NC	1
515		11	max	.003	1	.071	3	.021	3	1.363e-2	1	NC	4	NC	1
516			min	0	3	-.14	1	-.012	2	-7.906e-3	3	1739.935	1	NC	1
517		12	max	.003	1	.11	3	.088	1	1.253e-2	1	NC	5	NC	3
518			min	0	3	-.244	1	-.003	10	-7.3e-3	3	894.07	1	2058.454	1
519		13	max	.003	1	.151	3	.164	1	1.144e-2	1	NC	5	NC	3
520			min	0	3	-.358	1	.006	10	-6.694e-3	3	584.711	1	1135.426	1
521		14	max	.003	1	.182	3	.214	1	1.034e-2	1	NC	5	NC	3
522			min	0	3	-.445	1	.008	15	-6.088e-3	3	462.428	1	874.011	1
523		15	max	.004	1	.194	3	.225	1	9.249e-3	1	NC	5	NC	3
524			min	0	3	-.48	1	.009	15	-5.481e-3	3	425.864	1	833.292	1
525		16	max	.004	1	.181	3	.193	1	8.154e-3	1	NC	5	NC	3
526			min	0	3	-.452	1	.007	15	-4.875e-3	3	454.409	1	966.66	1
527		17	max	.004	1	.145	3	.128	1	7.06e-3	1	NC	5	NC	3
528			min	0	3	-.359	1	.005	15	-4.269e-3	3	583.487	1	1437.764	1
529		18	max	.004	1	.088	3	.051	1	5.981e-3	2	NC	5	NC	3
530			min	0	3	-.211	1	0	10	-3.662e-3	3	1061.55	1	3409.482	1
531		19	max	.004	1	.019	3	.007	3	4.922e-3	2	NC	1	NC	1
532			min	0	3	-.03	2	-.008	2	-3.056e-3	3	NC	1	NC	1
533	M15	1	max	0	1	0	1	0	1	3.442e-4	3	NC	1	NC	1
534			min	0	1	0	1	0	1	-8.388e-5	2	NC	1	NC	1
535		2	max	0	3	-.006	15	.001	1	8.336e-4	3	NC	5	NC	1
536			min	0	10	-.025	4	0	3	-6.801e-4	1	4200.778	4	NC	1
537		3	max	0	3	-.011	15	.004	1	1.323e-3	3	9093.797	15	NC	1
538			min	0	10	-.048	4	-.003	3	-1.311e-3	1	2137.633	4	NC	1
539		4	max	0	3	-.016	15	.008	1	1.812e-3	3	6238.876	15	NC	4
540			min	0	10	-.07	4	-.006	3	-1.941e-3	1	1466.541	4	8358.265	1
541		5	max	0	3	-.021	15	.013	1	2.302e-3	3	4868.258	15	NC	4
542			min	0	10	-.09	4	-.011	3	-2.571e-3	1	1144.357	4	5515.557	1
543		6	max	0	3	-.025	15	.019	1	2.791e-3	3	4097.154	15	NC	4
544			min	0	10	-.107	4	-.015	3	-3.202e-3	1	963.097	4	4031.102	1
545		7	max	0	3	-.028	15	.024	1	3.28e-3	3	3633.436	15	NC	4
546			min	0	10	-.121	4	-.02	3	-3.832e-3	1	854.093	4	3159.896	1
547		8	max	0	3	-.031	15	.03	1	3.77e-3	3	3355.136	15	NC	4
548			min	0	10	-.131	4	-.025	3	-4.463e-3	1	788.675	4	2610.851	1
549		9	max	0	3	-.032	15	.034	1	4.259e-3	3	3205.338	15	NC	4
550			min	0	10	-.137	4	-.029	3	-5.093e-3	1	753.463	4	2250.983	1
551		10	max	0	3	-.033	15	.038	1	4.748e-3	3	3157.949	15	NC	4
552			min	0	10	-.139	4	-.033	3	-5.724e-3	1	742.323	4	2013.316	1
553		11	max	0	3	-.032	15	.041	1	5.238e-3	3	3205.338	15	NC	5
554			min	0	10	-.137	4	-.035	3	-6.354e-3	1	753.463	4	1862.643	1
555		12	max	0	3	-.031	15	.042	1	5.727e-3	3	3355.136	15	NC	5
556			min	0	10	-.131	4	-.036	3	-6.984e-3	1	788.675	4	1781.537	1
557		13	max	0	3	-.028	15	.041	1	6.217e-3	3	3633.436	15	NC	5
558			min	0	10	-.121	4	-.035	3	-7.615e-3	1	854.093	4	1765.089	1
559		14	max	0	3	-.025	15	.038	1	6.706e-3	3	4097.154	15	NC	5
560			min	0	10	-.108	4	-.032	3	-8.245e-3	1	963.097	4	1821.194	1
561		15	max	0	3	-.021	15	.032	1	7.195e-3	3	4868.258	15	NC	4
562			min	0	10	-.091	4	-.027	3	-8.876e-3	1	1144.357	4	1978.318	1
563		16	max	0	3	-.017	15	.024	1	7.685e-3	3	6238.876	15	NC	4
564			min	0	10	-.071	4	-.019	3	-9.506e-3	1	1466.541	4	2313.535	1

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
565		17	max	0	3	-.011	15	.011	1	8.174e-3	3	9093.797	15	NC	4
566			min	0	10	-.049	4	-.008	3	-1.014e-2	1	2137.633	4	3068.48	1
567		18	max	.001	3	-.006	15	.007	3	8.663e-3	3	NC	5	NC	4
568			min	0	10	-.026	4	-.011	2	-1.077e-2	1	4200.778	4	5465.307	1
569		19	max	.001	3	.003	3	.025	3	9.153e-3	3	NC	1	NC	1
570			min	0	10	-.004	1	-.029	2	-1.14e-2	1	NC	1	NC	1
571	M16A	1	max	0	10	0	10	.008	3	3.091e-3	3	NC	1	NC	1
572			min	-.001	3	-.002	1	-.009	2	-3.355e-3	1	NC	1	NC	1
573		2	max	0	10	-.006	15	.006	1	2.958e-3	3	NC	5	NC	2
574			min	-.001	3	-.025	4	-.001	10	-3.193e-3	1	4200.778	4	8729.279	1
575		3	max	0	10	-.011	15	.015	1	2.824e-3	3	9093.797	15	NC	4
576			min	0	3	-.049	4	-.004	3	-3.031e-3	1	2137.633	4	4934.32	1
577		4	max	0	10	-.017	15	.022	1	2.69e-3	3	6238.876	15	NC	4
578			min	0	3	-.071	4	-.008	3	-2.87e-3	1	1466.541	4	3748.853	1
579		5	max	0	10	-.021	15	.027	1	2.556e-3	3	4868.258	15	NC	4
580			min	0	3	-.09	4	-.01	3	-2.708e-3	1	1144.357	4	3233.651	1
581		6	max	0	10	-.025	15	.029	1	2.422e-3	3	4097.154	15	NC	4
582			min	0	3	-.107	4	-.012	3	-2.546e-3	1	963.097	4	3006.668	1
583		7	max	0	10	-.028	15	.031	1	2.289e-3	3	3633.436	15	NC	4
584			min	0	3	-.121	4	-.013	3	-2.384e-3	1	854.093	4	2947.946	1
585		8	max	0	10	-.031	15	.03	1	2.155e-3	3	3355.136	15	NC	4
586			min	0	3	-.131	4	-.013	3	-2.222e-3	1	788.675	4	3016.081	1
587		9	max	0	10	-.032	15	.028	1	2.021e-3	3	3205.338	15	NC	4
588			min	0	3	-.137	4	-.012	3	-2.06e-3	1	753.463	4	3204.742	1
589		10	max	0	10	-.033	15	.026	1	1.887e-3	3	3157.949	15	NC	4
590			min	0	3	-.139	4	-.011	3	-1.898e-3	1	742.323	4	3532.367	1
591		11	max	0	10	-.032	15	.022	1	1.753e-3	3	3205.338	15	NC	4
592			min	0	3	-.137	4	-.01	3	-1.748e-3	2	753.463	4	4045.881	1
593		12	max	0	10	-.031	15	.019	1	1.62e-3	3	3355.136	15	NC	4
594			min	0	3	-.13	4	-.008	3	-1.599e-3	2	788.675	4	4838.484	1
595		13	max	0	10	-.028	15	.015	1	1.486e-3	3	3633.436	15	NC	3
596			min	0	3	-.12	4	-.006	3	-1.45e-3	2	854.093	4	6095.216	1
597		14	max	0	10	-.025	15	.011	1	1.352e-3	3	4097.154	15	NC	2
598			min	0	3	-.107	4	-.004	3	-1.302e-3	2	963.097	4	8213.012	1
599		15	max	0	10	-.021	15	.007	1	1.218e-3	3	4868.258	15	NC	1
600			min	0	3	-.09	4	-.002	3	-1.153e-3	2	1144.357	4	NC	1
601		16	max	0	10	-.016	15	.004	1	1.084e-3	3	6238.876	15	NC	1
602			min	0	3	-.07	4	-.001	3	-1.004e-3	2	1466.541	4	NC	1
603		17	max	0	10	-.011	15	.001	1	9.505e-4	3	9093.797	15	NC	1
604			min	0	3	-.048	4	0	3	-8.557e-4	2	2137.633	4	NC	1
605		18	max	0	10	-.006	15	0	4	8.167e-4	3	NC	5	NC	1
606			min	0	3	-.024	4	0	2	-7.071e-4	2	4200.778	4	NC	1
607		19	max	0	1	0	1	0	1	6.828e-4	3	NC	1	NC	1
608			min	0	1	0	1	0	1	-5.584e-4	2	NC	1	NC	1

Company:	Schletter, Inc.	Date:	12/10/2015
Engineer:	HCV	Page:	1/5
Project:	Standard PVMini - Worst Case		
Address:			
Phone:			
E-mail:			

SIMPSON Strong-Tie

Anchor Designer™
Software
Version 2.4.5673.0

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

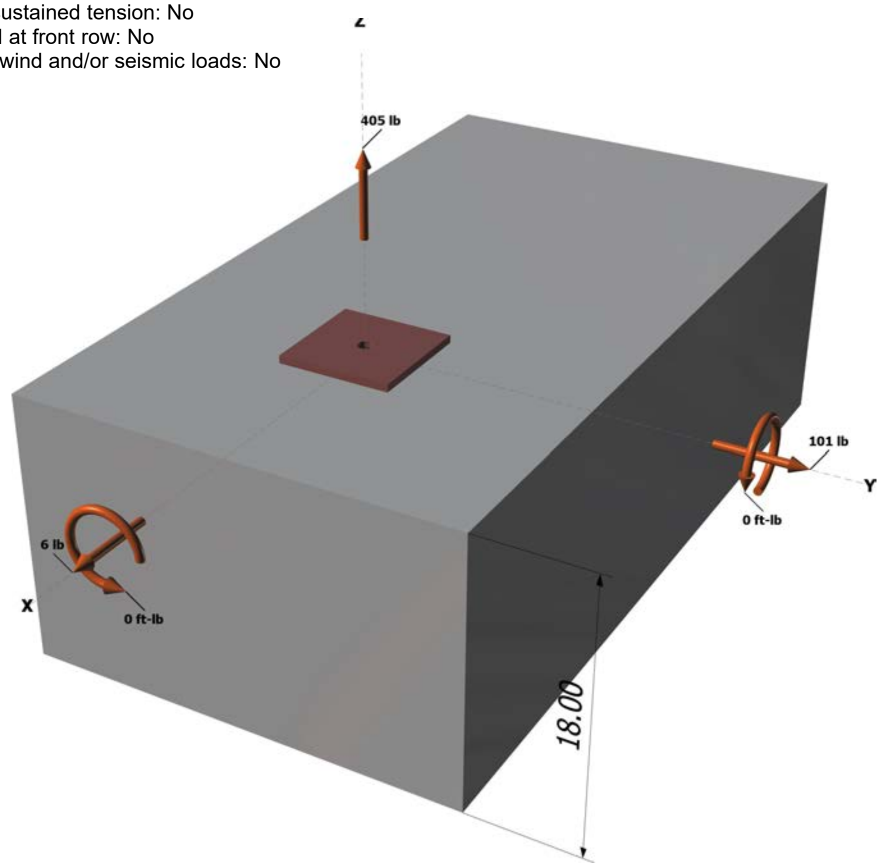
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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



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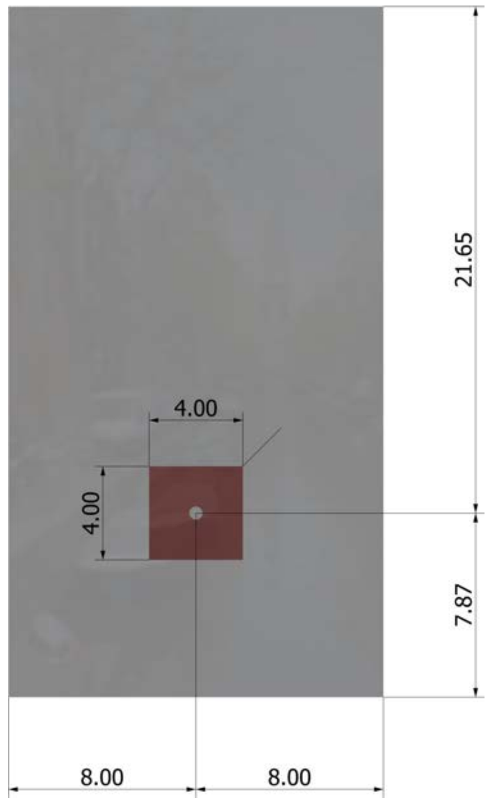


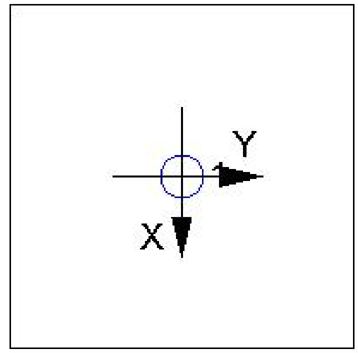
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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	405.0	6.0	101.0	101.2
Sum	405.0	6.0	101.0	101.2

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 405
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)	ϕ	ϕN_{sa} (lb)
8095	0.75	6071

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

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

k_c	λ	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	2500	5.333	10469

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

A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cb} (lb)
253.92	256.00	0.995	1.00	1.000	10469	0.65	6717

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

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

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

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

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

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

A_{Na} (in^2)	A_{Na0} (in^2)	$\Psi_{ed,Na}$	$\Psi_{p,Na}$	N_{a0} (lb)	ϕ	ϕN_a (lb)
109.66	109.66	1.000	1.000	9755	0.55	5365

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

V_{sa} (lb)	ϕ_{grout}	ϕ	$\phi_{grout}\phi V_{sa}$ (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:

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

l_e (in)	d_a (in)	λ	f'_c (psi)	c_{a1} (in)	V_{by} (lb)
4.00	0.50	1.00	2500	8.00	8488

$\phi V_{cby} = \phi\,(A_{Vc} / A_{Vco})\,\Psi_{ed,V}\,\Psi_{c,V}\,\Psi_{h,V}V_{by}$ (Sec. D.4.1 & Eq. D-21)

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cby} (lb)
238.44	288.00	0.897	1.000	1.000	8488	0.70	4411

Shear perpendicular to edge in x-direction:

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

l_e (in)	d_a (in)	λ	f'_c (psi)	c_{a1} (in)	V_{bx} (lb)
4.00	0.50	1.00	2500	7.87	8282

$\phi V_{cbx} = \phi\,(A_{Vc} / A_{Vco})\,\Psi_{ed,V}\,\Psi_{c,V}\,\Psi_{h,V}V_{bx}$ (Sec. D.4.1 & Eq. D-21)

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbx} (lb)
188.88	278.72	0.903	1.000	1.000	8282	0.70	3549

Shear parallel to edge in x-direction:

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

l_e (in)	d_a (in)	λ	f'_c (psi)	c_{a1} (in)	V_{by} (lb)
4.00	0.50	1.00	2500	8.00	8488

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

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cbx} (lb)
238.44	288.00	1.000	1.000	1.000	8488	0.70	9838

Shear parallel to edge in y-direction:

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

l_e (in)	d_a (in)	λ	f'_c (psi)	c_{a1} (in)	V_{bx} (lb)
4.00	0.50	1.00	2500	7.87	8282

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

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cby} (lb)
188.88	278.72	1.000	1.000	1.000	8282	0.70	7858

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

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

k_{cp}	A_{Na} (in^2)	A_{Na0} (in^2)	$\Psi_{ed,Na}$	$\Psi_{p,Na}$	N_{a0} (lb)	N_a (lb)
2.0	109.66	109.66	1.000	1.000	9755	9755

A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	N_{cb} (lb)	ϕ	ϕV_{cp} (lb)
253.92	256.00	0.995	1.000	1.000	10469	10334	0.70	13657

11. Results

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

Tension	Factored Load, N_{ua} (lb)	Design Strength, øN_n (lb)	Ratio	Status
Steel	405	6071	0.07	Pass
Concrete breakout	405	6717	0.06	Pass
Adhesive	**405**	**5365**	**0.08**	**Pass (Governs)**

Shear	Factored Load, V_{ua} (lb)	Design Strength, øV_n (lb)	Ratio	Status
Steel	**101**	**3156**	**0.03**	**Pass (Governs)**
T Concrete breakout y+	101	4411	0.02	Pass
T Concrete breakout x+	6	3549	0.00	Pass
|| Concrete breakout y+	6	9838	0.00	Pass
|| Concrete breakout x+	101	7858	0.01	Pass
Concrete breakout, combined	-	-	0.02	Pass
Pryout	101	13657	0.01	Pass

Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. D.7.1	0.08	0.00	7.5 %	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 2.4.5673.0

Company:	Schletter, Inc.	Date:	12/10/2015
Engineer:	HCV	Page:	1/5
Project:	Standard PVMini - Worst Case		
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

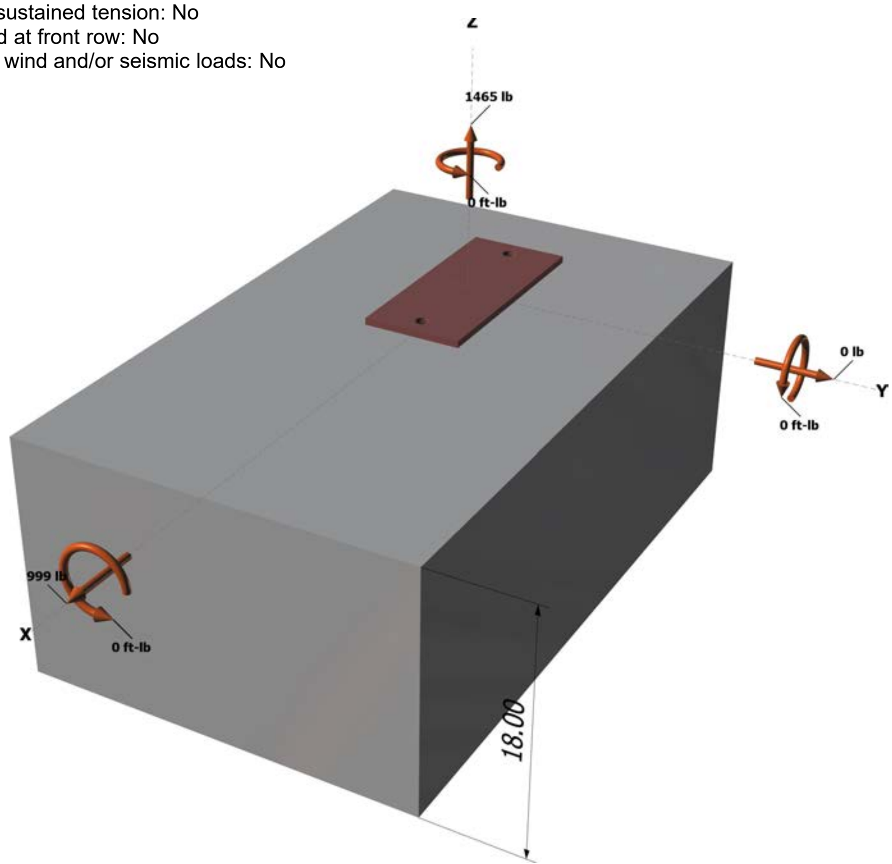
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

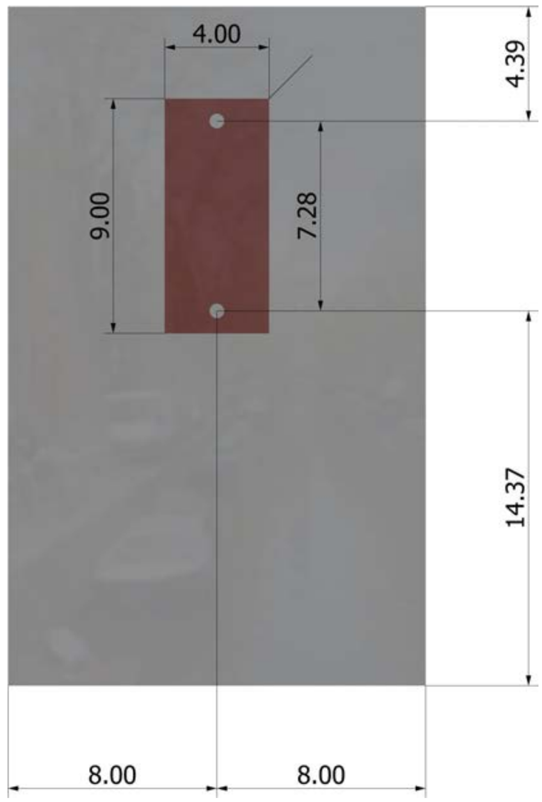
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout 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): 9.00 x 4.00 x 0.28

<Figure 1>



<Figure 2>



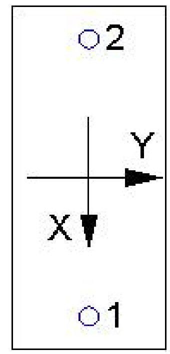
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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	732.5	499.5	0.0	499.5
2	732.5	499.5	0.0	499.5
Sum	1465.0	999.0	0.0	999.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 1465
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)	ϕ	ϕN_{sa} (lb)
8095	0.75	6071

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

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

k_c	λ	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	2500	5.333	10469

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

A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cbg} (lb)
314.72	256.00	1.000	0.865	1.00	1.000	10469	0.65	7233

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

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

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

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

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

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

A_{Na} (in^2)	A_{Na0} (in^2)	$\Psi_{ed,Na}$	$\Psi_{g,Na}$	$\Psi_{ec,Na}$	$\Psi_{p,Na}$	N_{a0}(lb)	ϕ	ϕN_{ag} (lb)
177.03	109.66	0.952	1.021	1.000	1.000	9755	0.55	8418

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

V_{sa} (lb)	ϕ_{grout}	ϕ	$\phi_{grout}\phi V_{sa}$ (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:

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

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

$\phi V_{cbx} = \phi\,(A_{Vc} / A_{Vco})\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{bx}$ (Sec. D.4.1 & Eq. D-21)

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbx} (lb)
288.00	648.00	0.833	1.000	1.000	15593	0.70	4043

Shear parallel to edge in x-direction:

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

l_e (in)	d_a (in)	λ	f'_c (psi)	c_{a1} (in)	V_{by} (lb)
4.00	0.50	1.00	2500	8.00	8488

$\phi V_{cbgx} = \phi\,(2)(A_{Vc} / A_{Vco})\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{by}$ (Sec. D.4.1, D.6.2.1(c) & Eq. D-22)

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cbgx} (lb)
284.04	288.00	1.000	1.000	1.000	1.000	8488	0.70	11720

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

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

k_{cp}	A_{Na} (in^2)	A_{Na0} (in^2)	$\Psi_{ed,Na}$	$\Psi_{g,Na}$	$\Psi_{ec,Na}$	$\Psi_{p,Na}$	N_{a0} (lb)	N_a (lb)
2.0	177.03	109.66	0.952	1.021	1.000	1.000	9755	15305

A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	N_{cb} (lb)	ϕ
314.72	256.00	1.000	0.865	1.000	1.000	10469	11128	0.70

ϕV_{cpg} (lb)
15580

11. Results

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

Tension	Factored Load, N_{ua} (lb)	Design Strength, $øN_n$ (lb)	Ratio	Status
Steel	733	6071	0.12	Pass
Concrete breakout	**1465**	**7233**	**0.20**	**Pass (Governs)**
Adhesive	1465	8418	0.17	Pass

Shear	Factored Load, V_{ua} (lb)	Design Strength, $øV_n$ (lb)	Ratio	Status
Steel	500	3156	0.16	Pass
T Concrete breakout x+	**999**	**4043**	**0.25**	**Pass (Governs)**
|| Concrete breakout y-	**999**	**11720**	**0.09**	**Pass (Governs)**
Pryout	999	15580	0.06	Pass

Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status

Sec. D.7.3	0.20	0.25	45.0 %	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.