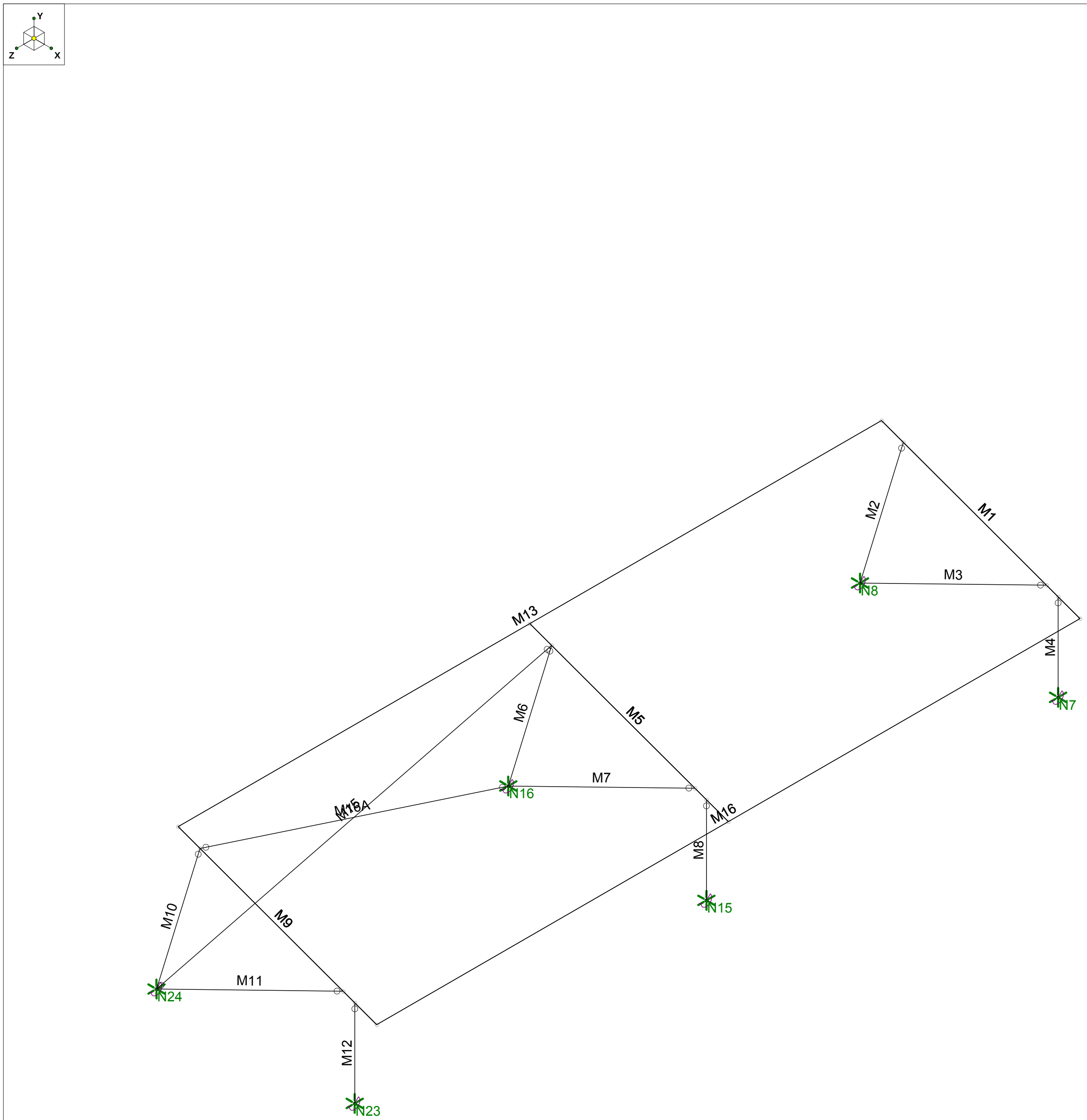


Schletter, Inc.	Standard PVMini Racking System	20° Tilt w/o Seismic Design
HCV	Representative Calculations - ASCE 7-05	

1. INTRODUCTION

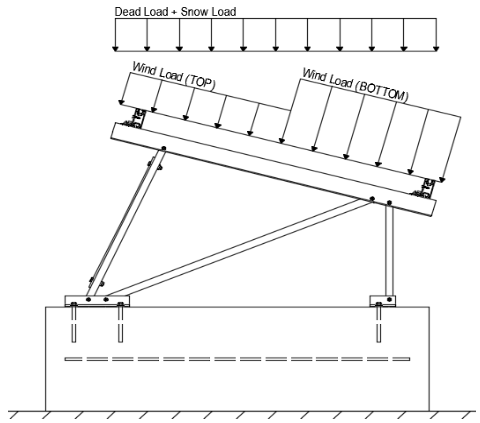
1.1 Project Description
The following sections will cover the determination of forces and structural design calculations for the Schletter, Inc. PVMini ground mount system.

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 = 20°
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 7-05 - Chapter 6, Wind Loads
- ASCE 7-05 - Chapter 7, Snow Loads
- ASCE 7-05 - Chapter 2, Combination of Loads
- International Building Code, IBC, 2003, 2006, 2009
- Aluminum Design Manual, Eighth Edition, 2005

2. LOAD ACTIONS

2.1 Permanent Loads
g_{MAX} = 3.00 psf
g_{MIN} = 1.75 psf

Self-weight of the PV modules.

2.2 Snow Loads
Ground Snow Load, P_g = 30.00 psf
Sloped Roof Snow Load, P_s = 20.62 psf *(ASCE 7-05, Eq. 7-2)*
I_s = 1.00
C_s = 0.91
C_e = 0.90
C_t = 1.20

2.3 Wind Loads
Design Wind Speed, V = 130 mph — Exposure Category = C
Height ≤ 15 ft — Importance Category = II

Peak Velocity Pressure, q_z = 26.53 psf *Including the gust factor, G=0.85. (ASCE 7-05, Eq. 6-15)*

Pressure Coefficients

$Cf+_{TOP}$	=	1.05	*(Pressure)*
$Cf+_{BOTTOM}$	=	1.65	
$Cf-_{TOP}$	=	-2.12	*(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 + 0.8W
1.2D + 1.6W + 0.5S
0.9D + 1.6W [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 + 1.0W
1.0D + 0.75L + 0.75W + 0.75S
0.6D + 1.0W [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
M13	Top
M16	Bottom

Girders	Location
M1	Outer
M5	Inner
M9	Outer

Front Struts	Location
M4	Outer
M8	Inner
M12	Outer

Diagonal Struts	Location
M3	Outer
M7	Inner
M11	Outer

Rear Struts	Location
M2	Outer
M6	Inner
M10	Outer

Bracing
M15
M16A

Front Reactions	Location
N7	Outer
N15	Inner
N23	Outer

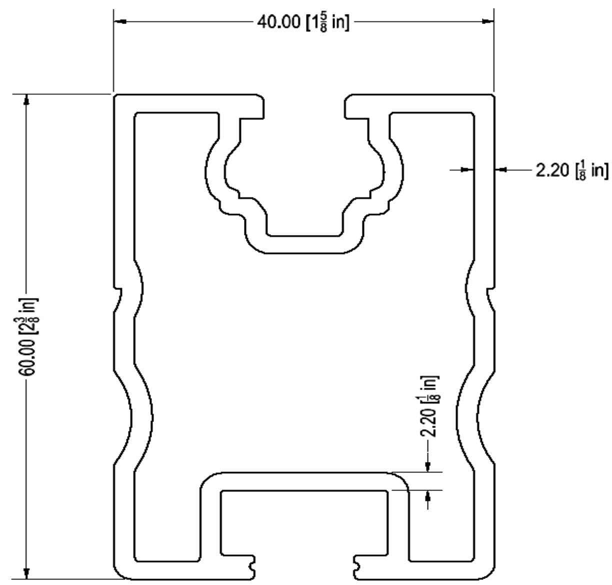
Rear Reactions	Location
N8	Outer
N16	Inner
N24	Outer

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).

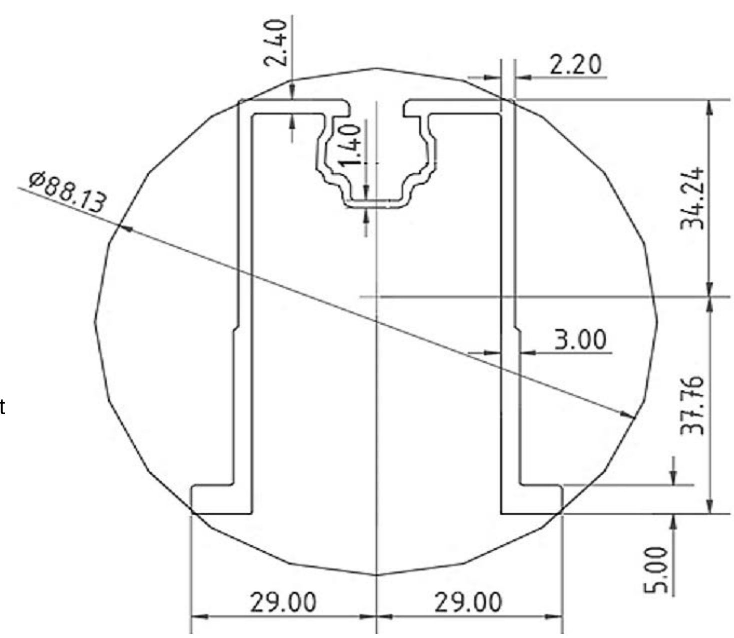
Purlin Type =	**ProfiPlus**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	42	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.99	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	28.47	ksi
S_y =	0.51	in^3
S_x =	0.37	in^3
E =	10100	ksi
I_y =	0.60	in^4
I_x =	0.29	in^4
A =	0.90	in^2
g =	1.08	lbs/ft
M_y =	-0.337	k-ft
M_z =	-0.014	k-ft
$M_{y\ allowable}$ =	1.276	k-ft
$M_{z\ allowable}$ =	0.871	k-ft
Utilization =	28%	



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).

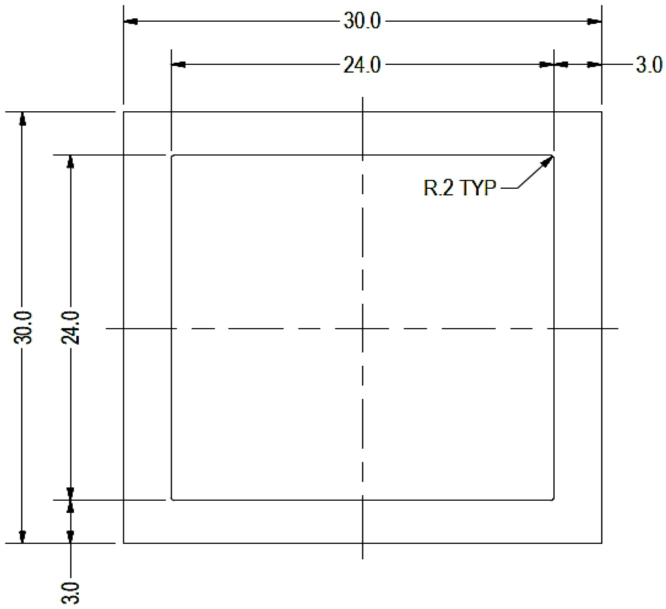
Girder Type =	**Flex Profi**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	33.78	in
$\Phi F_{ty\ AXIAL}$ =	14.29	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.83	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	13.46	ksi
S_y =	0.59	in^3
S_x =	0.46	in^3
E =	10100	ksi
I_y =	0.88	in^4
I_x =	0.52	in^4
A =	0.89	in^2
g =	1.07	lbs/ft
M_y =	-0.452	k-ft
M_z =	-0.018	k-ft
P_n =	0.057	k
$M_{y\ allowable}$ =	1.464	k-ft
$M_{z\ allowable}$ =	0.513	k-ft
$P_{n\ allowable}$ =	12.764	k
Utilization =	35%	



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).

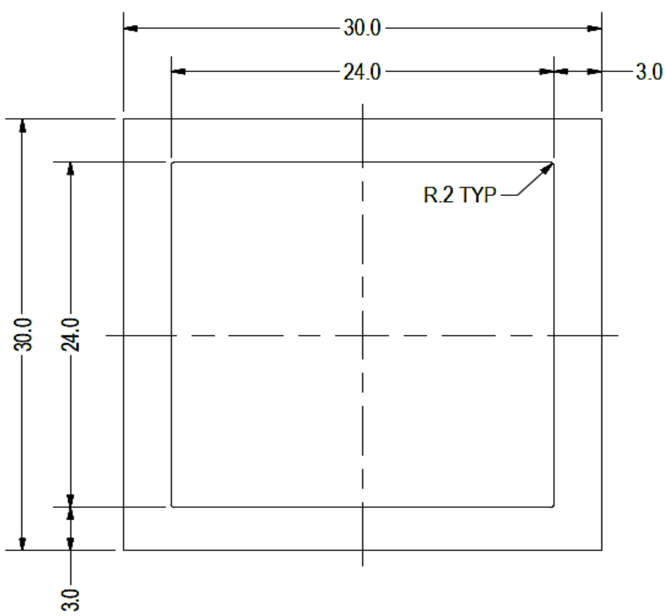
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	18.00	in
$\Phi F_{ty\ AXIAL}$ =	24.52	ksi
$\Phi F_{ty\ BENDING}$ =	31.19	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.890	k
$M_{y\ allowable}$ =	0.423	k-ft
$M_{z\ allowable}$ =	0.423	k-ft
$P_{n\ allowable}$ =	12.310	k
Utilization =	7%	



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).

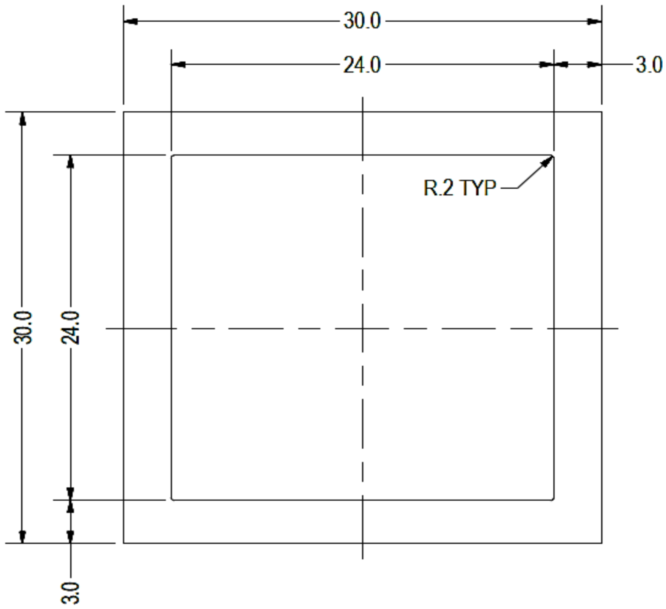
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	46.38	in
$\Phi F_{ty\ AXIAL}$ =	7.60	ksi
$\Phi F_{ty\ BENDING}$ =	29.80	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.310	k
$M_{y\ allowable}$ =	0.404	k-ft
$M_{z\ allowable}$ =	0.404	k-ft
$P_{n\ allowable}$ =	3.814	k
Utilization =	8%	



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).

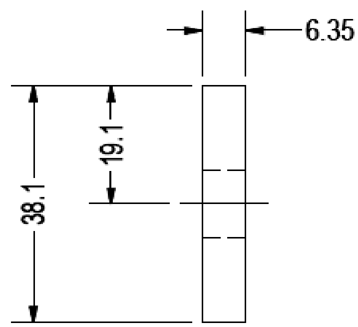
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	33.07	in
$\Phi F_{ty\ AXIAL}$ =	13.55	ksi
$\Phi F_{ty\ BENDING}$ =	30.37	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.661	k
$M_{y\ allowable}$ =	0.411	k-ft
$M_{z\ allowable}$ =	0.411	k-ft
$P_{n\ allowable}$ =	6.803	k
Utilization =	10%	



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 =	0.001	k-ft
P_n =	0.098	k
$M_{y\ allowable}$ =	0.046	k-ft
$P_{n\ allowable}$ =	11.813	k
Utilization =	3%	



A cross brace kit is required every 66 bays and is to be installed in centermost bays.

5. FOUNDATION DESIGN CALCULATIONS

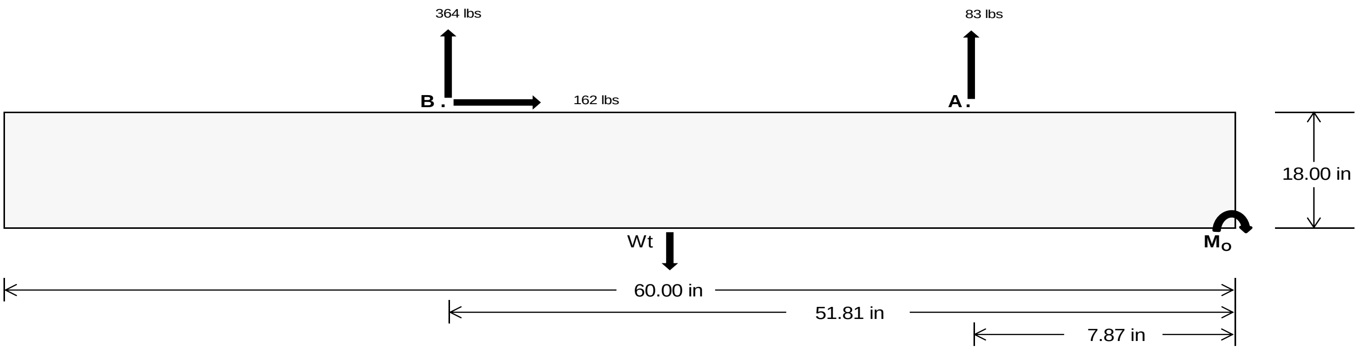
5.1 Helical Pile Foundations

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 =	348.48	1516.11	k
Compressive Load =	1156.55	973.17	k
Lateral Load =	1.39	675.17	k
Moment (Weak Axis) =	0.00	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 tables 1804.2 (2003, 2006) & 1806.2 (2009).



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 = 22437.6 in-lbs
Resisting Force Required = 747.92 lbs
S.F. = 1.67
Weight Required = 1246.53 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 = 162.30 lbs
Friction = 0.4
Weight Required = 405.75 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 = 162.30 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 + 1.0W				1.0D + 0.75L + 0.75W + 0.75S				0.6D + 1.0W			
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	338 lbs	338 lbs	338 lbs	338 lbs	480 lbs	480 lbs	480 lbs	480 lbs	587 lbs	587 lbs	587 lbs	587 lbs	-166 lbs	-166 lbs	-166 lbs	-166 lbs
F_B	238 lbs	238 lbs	238 lbs	238 lbs	415 lbs	415 lbs	415 lbs	415 lbs	471 lbs	471 lbs	471 lbs	471 lbs	-728 lbs	-728 lbs	-728 lbs	-728 lbs
F_V	19 lbs	19 lbs	19 lbs	19 lbs	284 lbs	284 lbs	284 lbs	284 lbs	226 lbs	226 lbs	226 lbs	226 lbs	-325 lbs	-325 lbs	-325 lbs	-325 lbs
P_{total}	2479 lbs	2570 lbs	2660 lbs	2751 lbs	2798 lbs	2889 lbs	2979 lbs	3070 lbs	2961 lbs	3052 lbs	3142 lbs	3233 lbs	248 lbs	302 lbs	356 lbs	411 lbs
M	219 lbs-ft	219 lbs-ft	219 lbs-ft	219 lbs-ft	556 lbs-ft	556 lbs-ft	556 lbs-ft	556 lbs-ft	567 lbs-ft	567 lbs-ft	567 lbs-ft	567 lbs-ft	530 lbs-ft	530 lbs-ft	530 lbs-ft	530 lbs-ft
e	0.09 ft	0.09 ft	0.08 ft	0.08 ft	0.20 ft	0.19 ft	0.19 ft	0.18 ft	0.19 ft	0.19 ft	0.18 ft	0.18 ft	2.14 ft	1.76 ft	1.49 ft	1.29 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}	253.3 psf	251.6 psf	250.2 psf	248.8 psf	243.5 psf	242.3 psf	241.3 psf	240.3 psf	260.7 psf	258.8 psf	257.0 psf	255.3 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	313.4 psf	309.0 psf	305.1 psf	301.4 psf	396.0 psf	387.9 psf	380.5 psf	373.7 psf	416.1 psf	407.1 psf	398.8 psf	391.3 psf	262.7 psf	147.5 psf	122.4 psf	113.2 psf

Maximum Bearing Pressure = 416 psf
Allowable Bearing Pressure = 1500 psf

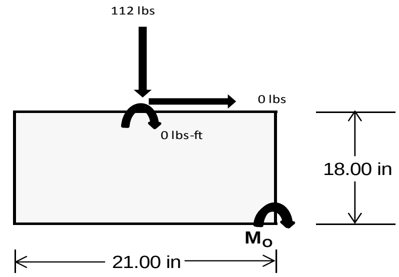
Use a 60in long x 21in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O =	0.0 ft-lbs
Resisting Force Required =	0.00 lbs
S.F. =	1.67
Weight Required =	0.00 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	46 lbs	112 lbs	44 lbs	164 lbs	471 lbs	162 lbs	14 lbs	33 lbs	13 lbs
F_V	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs
P_{total}	2402 lbs	2469 lbs	2400 lbs	2407 lbs	2714 lbs	2404 lbs	702 lbs	722 lbs	702 lbs
M	0 lbs-ft	0 lbs-ft	0 lbs-ft	0 lbs-ft	0 lbs-ft	0 lbs-ft	0 lbs-ft	0 lbs-ft	0 lbs-ft
e	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft
L/6	0.29 ft	1.75 ft	1.75 ft	1.75 ft	1.75 ft	1.75 ft	1.75 ft	1.75 ft	1.75 ft
f_{min}	274.5 sqft	282.1 sqft	274.2 sqft	274.9 sqft	310.1 sqft	274.7 sqft	80.3 sqft	82.5 sqft	80.2 sqft
f_{max}	274.6 psf	282.1 psf	274.3 psf	275.3 psf	310.2 psf	274.9 psf	80.3 psf	82.5 psf	80.2 psf

Maximum Bearing Pressure = 310 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.

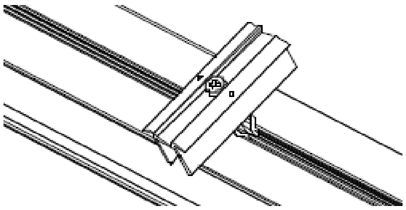
6. DESIGN OF JOINTS AND CONNECTIONS

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.

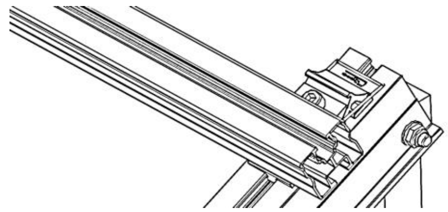
Fastening of Modules to Purlins

Maximum Uplifting Force =	0.850 k
Allowable Uplift =	1.214 k
Utilization =	70%



Fastening of Purlins to Girders

Maximum Uplifting Force =	1.062 k
Allowable Uplift =	1.116 k
Utilization =	95%



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 =	0.890 k
M8 Bolt Capacity =	5.692 k
Strut Bearing Capacity =	7.952 k
Utilization =	16%

Rear Strut

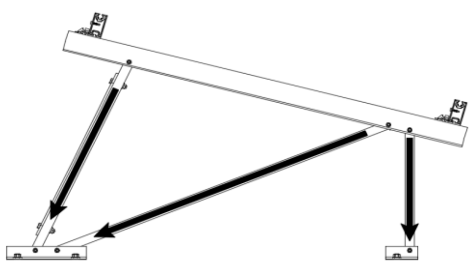
Maximum Axial Load =	1.063 k
M8 Bolt Capacity =	5.692 k
Strut Bearing Capacity =	7.952 k
Utilization =	19%

Diagonal Strut

Maximum Axial Load =	0.310 k
M8 Bolt Shear Capacity =	5.692 k
Strut Bearing Capacity =	7.952 k
Utilization =	5%

Bracing

Maximum Axial Load =	0.098 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.

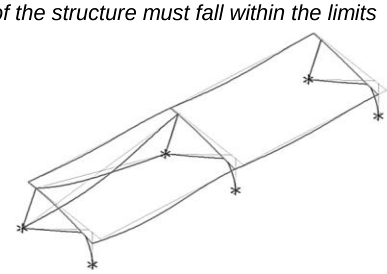
7. SEISMIC DESIGN

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} =	29.57 in	
Allowable Story Drift for All Other Structures, Δ = {	$0.020h_{sx}$	
	0.591 in	
Max Drift, Δ_{MAX} =	0.002 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**

Strong Axis:

3.4.14

L_b = 42.00 in

J = 0.255

109.366

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

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= 30.0 ksi

3.4.16

b/t = 7.4

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

S1 = 12.2

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

S2 = 46.7

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 = 42.00 in

J = 0.255

113.57

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

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= 29.9

3.4.16

b/t = 23.9

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.5 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 23.9

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

S1 = 36.9

m = 0.65

C_0 = 30

Cc = 30

$$S2 = \frac{k_1Bbr}{mDbr}$$

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L St$= 30.0 ksi

Ix = 250988 mm^4

0.603 in^4

y = 30 mm

Sx = 0.511 in^3

$M_{max}St$ = 1.276 k-ft

3.4.18

h/t = 7.4

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

S1 = 36.9

m = 0.65

C_0 = 20

Cc = 20

$$S2 = \frac{k_1Bbr}{mDbr}$$

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L Wk$= 28.5 ksi

Iy = 120291 mm^4

0.289 in^4

x = 20 mm

Sy = 0.367 in^3

$M_{max}Wk$ = 0.871 k-ft

<u>Compression</u>

3.4.9

b/t = 7.4

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 = 23.9

S1 = 12.21

S2 = 32.70

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.5 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= 28.47 ksi

A = 578.06 mm^2

0.90 in^2

P_{max} = 25.51 kips

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

Girder = **Flex Profi**

Strong Axis:

3.4.11

L_b = 33.78 in

ry = 1.374

Cb = 1.37

21.005

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

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 = 1.37

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 = 1.464 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

$\lambda =$ 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

$\varphi cc =$ 0.83792

$\varphi F_L = \varphi cc(Bc\text{-}Dc^*\lambda)$

$\varphi F_L =$ 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)

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 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

$\varphi F_L =$ 24.52 ksi

A = 323.87 mm^2

0.50 in^2

$P_{max} =$ 12.31 kips

Strut = **30x30x3**

Strong Axis:		Weak Axis:	
3.4.14		**3.4.14**	
L_b =	46.38 in	L_b =	46.38 in
J =	0.16	J =	0.16
	121.663		121.663
$S1 = \left(\frac{Bc - \frac{\theta_y}{\theta_b}Fcy}{1.6Dc}\right)^2$		$S1 = \left(\frac{Bc - \frac{\theta_y}{\theta_b}Fcy}{1.6Dc}\right)^2$	
S1 =	0.51461	S1 =	0.51461
$S2 = \left(\frac{C_c}{1.6}\right)^2$		$S2 = \left(\frac{C_c}{1.6}\right)^2$	
S2 =	1701.56	S2 =	1701.56
φF_L=	φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]	φF_L=	φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
φF_L=	29.8 ksi	φF_L=	29.8
3.4.16		**3.4.16**	
b/t =	7.75	b/t =	7.75
$S1 = \frac{Bp - \frac{\theta_y}{\theta_b}Fcy}{1.6Dp}$		$S1 = \frac{Bp - \frac{\theta_y}{\theta_b}Fcy}{1.6Dp}$	
S1 =	12.2	S1 =	12.2
$S2 = \frac{k_1 Bp}{1.6Dp}$		$S2 = \frac{k_1 Bp}{1.6Dp}$	
S2 =	46.7	S2 =	46.7
φF_L=	φyFcy	φF_L=	φyFcy
φF_L=	33.3 ksi	φF_L=	33.3 ksi
3.4.16.1	Not Used	**3.4.16.1**	
Rb/t =	0.0	N/A for Weak Direction	
$S1 = \left(\frac{Bt - 1.17\frac{\theta_y}{\theta_b}Fcy}{1.6Dt}\right)^2$			
S1 =	1.1		
$S2 = C_t$			
S2 =	141.0		
φF_L=	1.17φyFcy		
φF_L=	38.9 ksi		
3.4.18		**3.4.18**	
h/t =	7.75	h/t =	7.75
$S1 = \frac{Bbr - \frac{\theta_y}{\theta_b}1.3Fcy}{mDbr}$		$S1 = \frac{Bbr - \frac{\theta_y}{\theta_b}1.3Fcy}{mDbr}$	
S1 =	36.9	S1 =	36.9
m =	0.65	m =	0.65
C_0 =	15	C_0 =	15
Cc =	15	Cc =	15
$S2 = \frac{k_1 Bbr}{mDbr}$		$S2 = \frac{k_1 Bbr}{mDbr}$	
S2 =	77.3	S2 =	77.3
φF_L=	1.3φyFcy	φF_L=	1.3φyFcy
φF_L=	43.2 ksi	φF_L=	43.2 ksi
φF_LSt=	29.8 ksi	φF_LWk=	33.3 ksi
Ix =	39958.2 mm^4	Iy =	39958.2 mm^4
	0.096 in^4		0.096 in^4
y =	15 mm	x =	15 mm
Sx =	0.163 in^3	Sy =	0.163 in^3
M_{max}St =	0.404 k-ft	M_{max}Wk =	0.450 k-ft

Compression

3.4.7

λ = 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

φcc = 0.85841

φF_L = (φccFcy)/(λ²)

φF_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)

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 = 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 = 33.07 in

J = 0.16

86.7548

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

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= 30.4 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= 30.4 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

M_{max}St = 0.411 k-ft

Weak Axis:

3.4.14

L_b = 33.07 in

J = 0.16

86.7548

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

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= 30.4

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

<u>Compression</u>

3.4.7

λ = 1.41804

r = 0.437 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.77853

φF_L= (φccFcy)/(λ²)

φF_L= 13.5508 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= 13.55 ksi

A = 323.87 mm^2

0.50 in^2

P_{max} = 6.80 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	-57.498	-57.498	0	0
2	M16	Y	-57.498	-57.498	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	-77.697	-77.697	0	0
2	M16	y	-122.096	-122.096	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	156.875	156.875	0	0
2	M16	y	73.997	73.997	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 + 0.8W	Yes	Y		1	1.2	3	1.6	4	.8														
2	LRFD 1.2D + 1.6W + 0.5S	Yes	Y		1	1.2	3	.5	4	1.6														
3	LRFD 0.9D + 1.6W	Yes	Y		2	.9					5	1.6												
4	LATERAL - LRFD 1.54D + 1.3E ...	Yes	Y		1	1.54	3	.2			6	1.3												
5	LATERAL - LRFD 0.56D + 1.3E	Yes	Y		1	.56					6	1.3												
6	LATERAL - LRFD 1.54D + 1.25...	Yes	Y		1	1.54	3	.2			6	1.25												
7	LATERAL - LRFD 0.56D + 1.25E	Yes	Y		1	.56					6	1.25												
8																								
9	ASD 1.0D + 1.0S	Yes	Y		1	1	3	1																
10	ASD 1.0D + 1.0W	Yes	Y		1	1			4	1														
11	ASD 1.0D + 0.75L + 0.75W + 0....	Yes	Y		1	1	3	.75	4	.75														
12	ASD 0.6D + 1.0W	Yes	Y		2	.6					5	1												
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	152.542	2	245.745	2	.006	10	0	10	0	1	0	1
2		min	-182.116	3	-375.251	3	-.185	3	0	3	0	1	0	1
3	N7	max	0	15	293.175	1	.049	10	0	10	0	1	0	1
4		min	-.11	2	-74.09	3	-.351	1	0	1	0	1	0	1
5	N15	max	0	15	889.657	2	.058	9	0	9	0	1	0	1
6		min	-1.066	2	-268.062	3	-.558	3	0	3	0	1	0	1
7	N16	max	461.534	2	748.593	2	0	11	0	9	0	1	0	1
8		min	-519.358	3	-1166.238	3	-75.364	3	0	3	0	1	0	1
9	N23	max	0	15	293.438	1	.398	3	0	3	0	1	0	1
10		min	-.11	2	-73.61	3	-.049	10	0	10	0	1	0	1
11	N24	max	152.542	2	247.893	2	75.987	3	0	9	0	1	0	1
12		min	-182.61	3	-374.63	3	-.007	10	0	3	0	1	0	1
13	Totals:	max	765.332	2	2701.601	2	0	9						
14		min	-884.384	3	-2331.881	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	213.597	1	.65	4	.069	1	0	10	0	15	0	1
2			min	-353.592	3	.153	15	-.116	3	0	3	0	1	0	1
3		2	max	213.703	1	.608	4	.069	1	0	10	0	9	0	15
4			min	-353.512	3	.143	15	-.116	3	0	3	0	3	0	4
5		3	max	213.81	1	.567	4	.069	1	0	10	0	9	0	15
6			min	-353.432	3	.134	15	-.116	3	0	3	0	3	0	4
7		4	max	213.916	1	.526	4	.069	1	0	10	0	9	0	15
8			min	-353.352	3	.124	15	-.116	3	0	3	0	3	0	4
9		5	max	214.023	1	.484	4	.069	1	0	10	0	9	0	15
10			min	-353.272	3	.114	15	-.116	3	0	3	0	3	0	4
11		6	max	214.13	1	.443	4	.069	1	0	10	0	9	0	15
12			min	-353.192	3	.105	15	-.116	3	0	3	0	3	0	4
13		7	max	214.236	1	.402	4	.069	1	0	10	0	9	0	15
14			min	-353.112	3	.095	15	-.116	3	0	3	0	3	0	4
15		8	max	214.343	1	.361	4	.069	1	0	10	0	9	0	15
16			min	-353.032	3	.085	15	-.116	3	0	3	0	3	0	4
17		9	max	214.449	1	.319	4	.069	1	0	10	0	9	0	15
18			min	-352.952	3	.075	15	-.116	3	0	3	0	3	0	4
19		10	max	214.556	1	.278	4	.069	1	0	10	0	9	0	15
20			min	-352.872	3	.066	15	-.116	3	0	3	0	3	0	4
21		11	max	214.662	1	.237	4	.069	1	0	10	0	9	0	15
22			min	-352.793	3	.056	15	-.116	3	0	3	0	3	0	4
23		12	max	214.769	1	.196	4	.069	1	0	10	0	9	0	15
24			min	-352.713	3	.046	15	-.116	3	0	3	0	3	0	4
25		13	max	214.875	1	.154	4	.069	1	0	10	0	9	0	15
26			min	-352.633	3	.037	15	-.116	3	0	3	0	3	0	4
27		14	max	214.982	1	.115	2	.069	1	0	10	0	9	0	15
28			min	-352.553	3	.027	15	-.116	3	0	3	0	3	0	4
29		15	max	215.088	1	.083	2	.069	1	0	10	0	9	0	15
30			min	-352.473	3	.013	12	-.116	3	0	3	0	3	0	4
31		16	max	215.195	1	.051	2	.069	1	0	10	0	9	0	15
32			min	-352.393	3	-.005	3	-.116	3	0	3	0	3	0	4
33		17	max	215.302	1	.018	2	.069	1	0	10	0	9	0	15
34			min	-352.313	3	-.03	3	-.116	3	0	3	0	3	0	4
35		18	max	215.408	1	-.012	15	.069	1	0	10	0	9	0	15
36			min	-352.233	3	-.054	3	-.116	3	0	3	0	3	0	4
37		19	max	215.515	1	-.022	15	.069	1	0	10	0	9	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	-352.153	3	-.093	4	-.116	3	0	3	0	3	0	4
39	M3	1	max	103.894	2	1.8	4	.012	10	0	10	0	1	0	4
40			min	-88.832	3	.423	15	-.102	1	0	1	0	10	0	15
41		2	max	103.826	2	1.622	4	.012	10	0	10	0	1	0	4
42			min	-88.883	3	.382	15	-.102	1	0	1	0	10	0	15
43		3	max	103.758	2	1.444	4	.012	10	0	10	0	1	0	2
44			min	-88.934	3	.34	15	-.102	1	0	1	0	10	0	3
45		4	max	103.691	2	1.267	4	.012	10	0	10	0	1	0	15
46			min	-88.985	3	.298	15	-.102	1	0	1	0	10	0	4
47		5	max	103.623	2	1.089	4	.012	10	0	10	0	1	0	15
48			min	-89.036	3	.256	15	-.102	1	0	1	0	10	0	4
49		6	max	103.555	2	.911	4	.012	10	0	10	0	1	0	15
50			min	-89.087	3	.215	15	-.102	1	0	1	0	10	0	4
51		7	max	103.487	2	.734	4	.012	10	0	10	0	1	0	15
52			min	-89.138	3	.173	15	-.102	1	0	1	0	10	0	4
53		8	max	103.419	2	.556	4	.012	10	0	10	0	1	0	15
54			min	-89.188	3	.131	15	-.102	1	0	1	0	10	0	4
55		9	max	103.351	2	.378	4	.012	10	0	10	0	1	0	15
56			min	-89.239	3	.089	15	-.102	1	0	1	0	10	-.001	4
57		10	max	103.283	2	.201	4	.012	10	0	10	0	1	0	15
58			min	-89.29	3	.047	15	-.102	1	0	1	0	10	-.001	4
59		11	max	103.216	2	.037	2	.012	10	0	10	0	1	0	15
60			min	-89.341	3	-.003	3	-.102	1	0	1	0	10	-.001	4
61		12	max	103.148	2	-.036	15	.012	10	0	10	0	1	0	15
62			min	-89.392	3	-.155	4	-.102	1	0	1	0	10	-.001	4
63		13	max	103.08	2	-.078	15	.012	10	0	10	0	1	0	15
64			min	-89.443	3	-.332	4	-.102	1	0	1	0	10	-.001	4
65		14	max	103.012	2	-.12	15	.012	10	0	10	0	9	0	15
66			min	-89.494	3	-.51	4	-.102	1	0	1	0	10	-.001	4
67		15	max	102.944	2	-.161	15	.012	10	0	10	0	10	0	15
68			min	-89.545	3	-.688	4	-.102	1	0	1	0	1	0	4
69		16	max	102.876	2	-.203	15	.012	10	0	10	0	10	0	15
70			min	-89.596	3	-.865	4	-.102	1	0	1	0	1	0	4
71		17	max	102.808	2	-.245	15	.012	10	0	10	0	10	0	15
72			min	-89.647	3	-1.043	4	-.102	1	0	1	0	1	0	4
73		18	max	102.741	2	-.287	15	.012	10	0	10	0	10	0	15
74			min	-89.697	3	-1.22	4	-.102	1	0	1	0	1	0	4
75		19	max	102.673	2	-.328	15	.012	10	0	10	0	10	0	1
76			min	-89.748	3	-1.398	4	-.102	1	0	1	0	1	0	1
77	M4	1	max	292.011	1	0	1	.051	10	0	1	0	3	0	1
78			min	-74.963	3	0	1	-.369	1	0	1	0	2	0	1
79		2	max	292.075	1	0	1	.051	10	0	1	0	15	0	1
80			min	-74.915	3	0	1	-.369	1	0	1	0	1	0	1
81		3	max	292.14	1	0	1	.051	10	0	1	0	10	0	1
82			min	-74.866	3	0	1	-.369	1	0	1	0	1	0	1
83		4	max	292.205	1	0	1	.051	10	0	1	0	10	0	1
84			min	-74.818	3	0	1	-.369	1	0	1	0	1	0	1
85		5	max	292.269	1	0	1	.051	10	0	1	0	10	0	1
86			min	-74.769	3	0	1	-.369	1	0	1	0	1	0	1
87		6	max	292.334	1	0	1	.051	10	0	1	0	10	0	1
88			min	-74.721	3	0	1	-.369	1	0	1	0	1	0	1
89		7	max	292.399	1	0	1	.051	10	0	1	0	10	0	1
90			min	-74.672	3	0	1	-.369	1	0	1	0	1	0	1
91		8	max	292.464	1	0	1	.051	10	0	1	0	10	0	1
92			min	-74.624	3	0	1	-.369	1	0	1	0	1	0	1
93		9	max	292.528	1	0	1	.051	10	0	1	0	10	0	1
94			min	-74.575	3	0	1	-.369	1	0	1	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
95		10	max	292.593	1	0	1	.051	10	0	1	0	10	0	1
96			min	-74.527	3	0	1	-.369	1	0	1	0	1	0	1
97		11	max	292.658	1	0	1	.051	10	0	1	0	10	0	1
98			min	-74.478	3	0	1	-.369	1	0	1	0	1	0	1
99		12	max	292.722	1	0	1	.051	10	0	1	0	10	0	1
100			min	-74.429	3	0	1	-.369	1	0	1	0	1	0	1
101		13	max	292.787	1	0	1	.051	10	0	1	0	10	0	1
102			min	-74.381	3	0	1	-.369	1	0	1	0	1	0	1
103		14	max	292.852	1	0	1	.051	10	0	1	0	10	0	1
104			min	-74.332	3	0	1	-.369	1	0	1	0	1	0	1
105		15	max	292.917	1	0	1	.051	10	0	1	0	10	0	1
106			min	-74.284	3	0	1	-.369	1	0	1	0	1	0	1
107		16	max	292.981	1	0	1	.051	10	0	1	0	10	0	1
108			min	-74.235	3	0	1	-.369	1	0	1	0	1	0	1
109		17	max	293.046	1	0	1	.051	10	0	1	0	10	0	1
110			min	-74.187	3	0	1	-.369	1	0	1	0	1	0	1
111		18	max	293.111	1	0	1	.051	10	0	1	0	10	0	1
112			min	-74.138	3	0	1	-.369	1	0	1	0	1	0	1
113		19	max	293.175	1	0	1	.051	10	0	1	0	10	0	1
114			min	-74.09	3	0	1	-.369	1	0	1	0	1	0	1
115	M6	1	max	658.852	1	.644	4	.013	9	0	3	0	3	0	1
116			min	-1063.005	3	.152	15	-.308	3	0	1	0	1	0	1
117		2	max	658.958	1	.603	4	.013	9	0	3	0	3	0	15
118			min	-1062.926	3	.142	15	-.308	3	0	1	0	1	0	4
119		3	max	659.065	1	.562	4	.013	9	0	3	0	3	0	15
120			min	-1062.846	3	.133	15	-.308	3	0	1	0	1	0	4
121		4	max	659.171	1	.521	4	.013	9	0	3	0	3	0	15
122			min	-1062.766	3	.123	15	-.308	3	0	1	0	1	0	4
123		5	max	659.278	1	.479	4	.013	9	0	3	0	3	0	15
124			min	-1062.686	3	.113	15	-.308	3	0	1	0	1	0	4
125		6	max	659.384	1	.438	4	.013	9	0	3	0	9	0	15
126			min	-1062.606	3	.104	15	-.308	3	0	1	0	3	0	4
127		7	max	659.491	1	.397	4	.013	9	0	3	0	9	0	15
128			min	-1062.526	3	.094	15	-.308	3	0	1	0	3	0	4
129		8	max	659.597	1	.356	4	.013	9	0	3	0	9	0	15
130			min	-1062.446	3	.084	15	-.308	3	0	1	0	3	0	4
131		9	max	659.704	1	.322	2	.013	9	0	3	0	9	0	15
132			min	-1062.366	3	.075	15	-.308	3	0	1	0	3	0	4
133		10	max	659.81	1	.29	2	.013	9	0	3	0	9	0	15
134			min	-1062.286	3	.065	15	-.308	3	0	1	0	3	0	4
135		11	max	659.917	1	.258	2	.013	9	0	3	0	9	0	15
136			min	-1062.206	3	.053	12	-.308	3	0	1	0	3	0	4
137		12	max	660.024	1	.225	2	.013	9	0	3	0	9	0	15
138			min	-1062.126	3	.036	12	-.308	3	0	1	0	3	0	4
139		13	max	660.13	1	.193	2	.013	9	0	3	0	9	0	15
140			min	-1062.047	3	.02	12	-.308	3	0	1	0	3	0	4
141		14	max	660.237	1	.161	2	.013	9	0	3	0	9	0	15
142			min	-1061.967	3	.003	3	-.308	3	0	1	0	3	0	4
143		15	max	660.343	1	.129	2	.013	9	0	3	0	9	0	15
144			min	-1061.887	3	-.022	3	-.308	3	0	1	0	3	0	4
145		16	max	660.45	1	.097	2	.013	9	0	3	0	9	0	15
146			min	-1061.807	3	-.046	3	-.308	3	0	1	0	3	0	2
147		17	max	660.556	1	.065	2	.013	9	0	3	0	9	0	15
148			min	-1061.727	3	-.07	3	-.308	3	0	1	0	3	0	2
149		18	max	660.663	1	.032	2	.013	9	0	3	0	9	0	15
150			min	-1061.647	3	-.094	3	-.308	3	0	1	0	3	0	2
151		19	max	660.769	1	0	2	.013	9	0	3	0	9	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
152			min	-1061.567	3	-.118	3	-.308	3	0	1	0	3	0	2
153	M7	1	max	310.456	2	1.798	4	.013	3	0	9	0	9	0	2
154			min	-216.523	3	.423	15	-.004	9	0	3	0	3	0	15
155		2	max	310.388	2	1.621	4	.013	3	0	9	0	9	0	2
156			min	-216.573	3	.382	15	-.004	9	0	3	0	3	0	12
157		3	max	310.32	2	1.443	4	.013	3	0	9	0	9	0	2
158			min	-216.624	3	.34	15	-.004	9	0	3	0	3	0	3
159		4	max	310.253	2	1.265	4	.013	3	0	9	0	9	0	2
160			min	-216.675	3	.298	15	-.004	9	0	3	0	3	0	3
161		5	max	310.185	2	1.088	4	.013	3	0	9	0	9	0	15
162			min	-216.726	3	.256	15	-.004	9	0	3	0	3	0	4
163		6	max	310.117	2	.91	4	.013	3	0	9	0	9	0	15
164			min	-216.777	3	.214	15	-.004	9	0	3	0	3	0	4
165		7	max	310.049	2	.733	4	.013	3	0	9	0	9	0	15
166			min	-216.828	3	.173	15	-.004	9	0	3	0	3	0	4
167		8	max	309.981	2	.555	4	.013	3	0	9	0	9	0	15
168			min	-216.879	3	.131	15	-.004	9	0	3	0	3	0	4
169		9	max	309.913	2	.377	4	.013	3	0	9	0	9	0	15
170			min	-216.93	3	.089	15	-.004	9	0	3	0	3	-.001	4
171		10	max	309.845	2	.209	2	.013	3	0	9	0	9	0	15
172			min	-216.981	3	.047	15	-.004	9	0	3	0	3	-.001	4
173		11	max	309.778	2	.071	2	.013	3	0	9	0	9	0	15
174			min	-217.032	3	-.03	3	-.004	9	0	3	0	3	-.001	4
175		12	max	309.71	2	-.036	15	.013	3	0	9	0	9	0	15
176			min	-217.082	3	-.156	4	-.004	9	0	3	0	3	-.001	4
177		13	max	309.642	2	-.078	15	.013	3	0	9	0	9	0	15
178			min	-217.133	3	-.333	4	-.004	9	0	3	0	3	-.001	4
179		14	max	309.574	2	-.12	15	.013	3	0	9	0	9	0	15
180			min	-217.184	3	-.511	4	-.004	9	0	3	0	3	-.001	4
181		15	max	309.506	2	-.161	15	.013	3	0	9	0	9	0	15
182			min	-217.235	3	-.689	4	-.004	9	0	3	0	3	0	4
183		16	max	309.438	2	-.203	15	.013	3	0	9	0	9	0	15
184			min	-217.286	3	-.866	4	-.004	9	0	3	0	3	0	4
185		17	max	309.37	2	-.245	15	.013	3	0	9	0	9	0	15
186			min	-217.337	3	-1.044	4	-.004	9	0	3	0	3	0	4
187		18	max	309.303	2	-.287	15	.013	3	0	9	0	9	0	15
188			min	-217.388	3	-1.222	4	-.004	9	0	3	0	3	0	4
189		19	max	309.235	2	-.328	15	.013	3	0	9	0	9	0	1
190			min	-217.439	3	-1.399	4	-.004	9	0	3	0	3	0	1
191	M8	1	max	888.493	2	0	1	.061	9	0	1	0	1	0	1
192			min	-268.936	3	0	1	-.534	3	0	1	0	3	0	1
193		2	max	888.557	2	0	1	.061	9	0	1	0	9	0	1
194			min	-268.887	3	0	1	-.534	3	0	1	0	3	0	1
195		3	max	888.622	2	0	1	.061	9	0	1	0	9	0	1
196			min	-268.839	3	0	1	-.534	3	0	1	0	3	0	1
197		4	max	888.687	2	0	1	.061	9	0	1	0	9	0	1
198			min	-268.79	3	0	1	-.534	3	0	1	0	3	0	1
199		5	max	888.752	2	0	1	.061	9	0	1	0	9	0	1
200			min	-268.742	3	0	1	-.534	3	0	1	0	3	0	1
201		6	max	888.816	2	0	1	.061	9	0	1	0	9	0	1
202			min	-268.693	3	0	1	-.534	3	0	1	0	3	0	1
203		7	max	888.881	2	0	1	.061	9	0	1	0	9	0	1
204			min	-268.645	3	0	1	-.534	3	0	1	0	3	0	1
205		8	max	888.946	2	0	1	.061	9	0	1	0	9	0	1
206			min	-268.596	3	0	1	-.534	3	0	1	0	3	0	1
207		9	max	889.01	2	0	1	.061	9	0	1	0	9	0	1
208			min	-268.548	3	0	1	-.534	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	889.075	2	0	1	.061	9	0	1	0	9	0	1
210			min	-268.499	3	0	1	-.534	3	0	1	0	3	0	1
211		11	max	889.14	2	0	1	.061	9	0	1	0	9	0	1
212			min	-268.451	3	0	1	-.534	3	0	1	0	3	0	1
213		12	max	889.204	2	0	1	.061	9	0	1	0	9	0	1
214			min	-268.402	3	0	1	-.534	3	0	1	0	3	0	1
215		13	max	889.269	2	0	1	.061	9	0	1	0	9	0	1
216			min	-268.353	3	0	1	-.534	3	0	1	0	3	0	1
217		14	max	889.334	2	0	1	.061	9	0	1	0	9	0	1
218			min	-268.305	3	0	1	-.534	3	0	1	0	3	0	1
219		15	max	889.399	2	0	1	.061	9	0	1	0	9	0	1
220			min	-268.256	3	0	1	-.534	3	0	1	0	3	0	1
221		16	max	889.463	2	0	1	.061	9	0	1	0	9	0	1
222			min	-268.208	3	0	1	-.534	3	0	1	0	3	0	1
223		17	max	889.528	2	0	1	.061	9	0	1	0	9	0	1
224			min	-268.159	3	0	1	-.534	3	0	1	0	3	0	1
225		18	max	889.593	2	0	1	.061	9	0	1	0	9	0	1
226			min	-268.111	3	0	1	-.534	3	0	1	0	3	0	1
227		19	max	889.657	2	0	1	.061	9	0	1	0	9	0	1
228			min	-268.062	3	0	1	-.534	3	0	1	0	3	0	1
229	M10	1	max	214.751	1	.649	4	.006	10	0	1	0	9	0	1
230			min	-293.319	3	.153	15	-.07	1	0	3	0	3	0	1
231		2	max	214.858	1	.608	4	.006	10	0	1	0	9	0	15
232			min	-293.239	3	.143	15	-.07	1	0	3	0	3	0	4
233		3	max	214.964	1	.567	4	.006	10	0	1	0	9	0	15
234			min	-293.159	3	.134	15	-.07	1	0	3	0	3	0	4
235		4	max	215.071	1	.526	4	.006	10	0	1	0	9	0	15
236			min	-293.079	3	.124	15	-.07	1	0	3	0	3	0	4
237		5	max	215.178	1	.484	4	.006	10	0	1	0	10	0	15
238			min	-292.999	3	.114	15	-.07	1	0	3	0	3	0	4
239		6	max	215.284	1	.443	4	.006	10	0	1	0	10	0	15
240			min	-292.919	3	.105	15	-.07	1	0	3	0	3	0	4
241		7	max	215.391	1	.402	4	.006	10	0	1	0	10	0	15
242			min	-292.839	3	.095	15	-.07	1	0	3	0	3	0	4
243		8	max	215.497	1	.361	4	.006	10	0	1	0	10	0	15
244			min	-292.759	3	.085	15	-.07	1	0	3	0	3	0	4
245		9	max	215.604	1	.319	4	.006	10	0	1	0	10	0	15
246			min	-292.679	3	.075	15	-.07	1	0	3	0	3	0	4
247		10	max	215.71	1	.278	4	.006	10	0	1	0	10	0	15
248			min	-292.599	3	.066	15	-.07	1	0	3	0	3	0	4
249		11	max	215.817	1	.237	4	.006	10	0	1	0	10	0	15
250			min	-292.519	3	.056	15	-.07	1	0	3	0	3	0	4
251		12	max	215.923	1	.195	4	.006	10	0	1	0	10	0	15
252			min	-292.44	3	.046	15	-.07	1	0	3	0	3	0	4
253		13	max	216.03	1	.154	4	.006	10	0	1	0	10	0	15
254			min	-292.36	3	.037	15	-.07	1	0	3	0	3	0	4
255		14	max	216.136	1	.115	2	.006	10	0	1	0	10	0	15
256			min	-292.28	3	.027	15	-.07	1	0	3	0	3	0	4
257		15	max	216.243	1	.083	2	.006	10	0	1	0	10	0	15
258			min	-292.2	3	.017	15	-.07	1	0	3	0	3	0	4
259		16	max	216.349	1	.05	2	.006	10	0	1	0	10	0	15
260			min	-292.12	3	.008	15	-.07	1	0	3	0	3	0	4
261		17	max	216.456	1	.018	2	.006	10	0	1	0	10	0	15
262			min	-292.04	3	-.015	9	-.07	1	0	3	0	3	0	4
263		18	max	216.563	1	-.012	15	.006	10	0	1	0	10	0	15
264			min	-291.96	3	-.052	4	-.07	1	0	3	0	3	0	4
265		19	max	216.669	1	-.022	15	.006	10	0	1	0	10	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	-291.88	3	-.093	4	-.07	1	0	3	0	3	0	4
267	M11	1	max	103.523	2	1.8	4	.102	1	0	3	0	3	0	4
268			min	-89.588	3	.423	15	-.038	3	0	10	0	1	0	15
269		2	max	103.456	2	1.622	4	.102	1	0	3	0	3	0	4
270			min	-89.639	3	.382	15	-.038	3	0	10	0	1	0	15
271		3	max	103.388	2	1.444	4	.102	1	0	3	0	3	0	2
272			min	-89.69	3	.34	15	-.038	3	0	10	0	1	0	3
273		4	max	103.32	2	1.267	4	.102	1	0	3	0	3	0	15
274			min	-89.741	3	.298	15	-.038	3	0	10	0	1	0	4
275		5	max	103.252	2	1.089	4	.102	1	0	3	0	3	0	15
276			min	-89.792	3	.256	15	-.038	3	0	10	0	1	0	4
277		6	max	103.184	2	.911	4	.102	1	0	3	0	3	0	15
278			min	-89.843	3	.215	15	-.038	3	0	10	0	1	0	4
279		7	max	103.116	2	.734	4	.102	1	0	3	0	3	0	15
280			min	-89.894	3	.173	15	-.038	3	0	10	0	1	0	4
281		8	max	103.048	2	.556	4	.102	1	0	3	0	3	0	15
282			min	-89.945	3	.131	15	-.038	3	0	10	0	1	0	4
283		9	max	102.981	2	.378	4	.102	1	0	3	0	3	0	15
284			min	-89.995	3	.089	15	-.038	3	0	10	0	1	-.001	4
285		10	max	102.913	2	.201	4	.102	1	0	3	0	3	0	15
286			min	-90.046	3	.047	15	-.038	3	0	10	0	1	-.001	4
287		11	max	102.845	2	.037	2	.102	1	0	3	0	3	0	15
288			min	-90.097	3	-.013	3	-.038	3	0	10	0	1	-.001	4
289		12	max	102.777	2	-.036	15	.102	1	0	3	0	3	0	15
290			min	-90.148	3	-.155	4	-.038	3	0	10	0	1	-.001	4
291		13	max	102.709	2	-.078	15	.102	1	0	3	0	3	0	15
292			min	-90.199	3	-.332	4	-.038	3	0	10	0	1	-.001	4
293		14	max	102.641	2	-.12	15	.102	1	0	3	0	3	0	15
294			min	-90.25	3	-.51	4	-.038	3	0	10	0	1	-.001	4
295		15	max	102.573	2	-.161	15	.102	1	0	3	0	3	0	15
296			min	-90.301	3	-.688	4	-.038	3	0	10	0	10	0	4
297		16	max	102.506	2	-.203	15	.102	1	0	3	0	3	0	15
298			min	-90.352	3	-.865	4	-.038	3	0	10	0	10	0	4
299		17	max	102.438	2	-.245	15	.102	1	0	3	0	3	0	15
300			min	-90.403	3	-1.043	4	-.038	3	0	10	0	10	0	4
301		18	max	102.37	2	-.287	15	.102	1	0	3	0	3	0	15
302			min	-90.454	3	-1.221	4	-.038	3	0	10	0	10	0	4
303		19	max	102.302	2	-.328	15	.102	1	0	3	0	3	0	1
304			min	-90.504	3	-1.398	4	-.038	3	0	10	0	10	0	1
305	M12	1	max	292.274	1	0	1	.393	3	0	1	0	2	0	1
306			min	-74.483	3	0	1	-.05	10	0	1	0	3	0	1
307		2	max	292.338	1	0	1	.393	3	0	1	0	1	0	1
308			min	-74.435	3	0	1	-.05	10	0	1	0	10	0	1
309		3	max	292.403	1	0	1	.393	3	0	1	0	1	0	1
310			min	-74.386	3	0	1	-.05	10	0	1	0	10	0	1
311		4	max	292.468	1	0	1	.393	3	0	1	0	1	0	1
312			min	-74.338	3	0	1	-.05	10	0	1	0	10	0	1
313		5	max	292.533	1	0	1	.393	3	0	1	0	1	0	1
314			min	-74.289	3	0	1	-.05	10	0	1	0	10	0	1
315		6	max	292.597	1	0	1	.393	3	0	1	0	1	0	1
316			min	-74.241	3	0	1	-.05	10	0	1	0	10	0	1
317		7	max	292.662	1	0	1	.393	3	0	1	0	1	0	1
318			min	-74.192	3	0	1	-.05	10	0	1	0	10	0	1
319		8	max	292.727	1	0	1	.393	3	0	1	0	3	0	1
320			min	-74.143	3	0	1	-.05	10	0	1	0	10	0	1
321		9	max	292.791	1	0	1	.393	3	0	1	0	3	0	1
322			min	-74.095	3	0	1	-.05	10	0	1	0	10	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	292.856	1	0	1	.393	3	0	1	0	3	0	1
324			min	-74.046	3	0	1	-.05	10	0	1	0	10	0	1
325		11	max	292.921	1	0	1	.393	3	0	1	0	3	0	1
326			min	-73.998	3	0	1	-.05	10	0	1	0	10	0	1
327		12	max	292.986	1	0	1	.393	3	0	1	0	3	0	1
328			min	-73.949	3	0	1	-.05	10	0	1	0	10	0	1
329		13	max	293.05	1	0	1	.393	3	0	1	0	3	0	1
330			min	-73.901	3	0	1	-.05	10	0	1	0	10	0	1
331		14	max	293.115	1	0	1	.393	3	0	1	0	3	0	1
332			min	-73.852	3	0	1	-.05	10	0	1	0	10	0	1
333		15	max	293.18	1	0	1	.393	3	0	1	0	3	0	1
334			min	-73.804	3	0	1	-.05	10	0	1	0	10	0	1
335		16	max	293.244	1	0	1	.393	3	0	1	0	3	0	1
336			min	-73.755	3	0	1	-.05	10	0	1	0	10	0	1
337		17	max	293.309	1	0	1	.393	3	0	1	0	3	0	1
338			min	-73.707	3	0	1	-.05	10	0	1	0	10	0	1
339		18	max	293.374	1	0	1	.393	3	0	1	0	3	0	1
340			min	-73.658	3	0	1	-.05	10	0	1	0	10	0	1
341		19	max	293.438	1	0	1	.393	3	0	1	0	3	0	1
342			min	-73.61	3	0	1	-.05	10	0	1	0	10	0	1
343	M1	1	max	53.773	1	334.705	3	1.174	10	0	2	.02	1	0	2
344			min	1.855	15	-222.147	2	-10.071	1	0	3	-.002	10	0	3
345		2	max	53.869	1	334.509	3	1.174	10	0	2	.018	1	.049	2
346			min	1.884	15	-222.409	2	-10.071	1	0	3	-.002	10	-.073	3
347		3	max	42.505	1	3.782	9	1.169	10	0	10	.015	1	.096	2
348			min	-3.164	10	-18.738	3	-10.026	1	0	1	-.002	10	-.144	3
349		4	max	42.601	1	3.563	9	1.169	10	0	10	.013	1	.1	2
350			min	-3.084	10	-18.935	3	-10.026	1	0	1	-.002	10	-.14	3
351		5	max	42.696	1	3.344	9	1.169	10	0	10	.011	1	.104	2
352			min	-3.005	10	-19.132	3	-10.026	1	0	1	-.001	10	-.136	3
353		6	max	42.792	1	3.126	9	1.169	10	0	10	.009	1	.107	2
354			min	-2.925	10	-19.328	3	-10.026	1	0	1	-.001	10	-.132	3
355		7	max	42.887	1	2.907	9	1.169	10	0	10	.007	1	.111	2
356			min	-2.846	10	-19.525	3	-10.026	1	0	1	0	10	-.127	3
357		8	max	42.983	1	2.688	9	1.169	10	0	10	.004	1	.115	2
358			min	-2.766	10	-19.722	3	-10.026	1	0	1	0	10	-.123	3
359		9	max	43.078	1	2.47	9	1.169	10	0	10	.002	3	.119	2
360			min	-2.686	10	-19.919	3	-10.026	1	0	1	0	10	-.119	3
361		10	max	43.174	1	2.251	9	1.169	10	0	10	.002	3	.124	2
362			min	-2.607	10	-20.116	3	-10.026	1	0	1	0	10	-.115	3
363		11	max	43.269	1	2.032	9	1.169	10	0	10	0	3	.128	2
364			min	-2.527	10	-20.312	3	-10.026	1	0	1	-.002	1	-.11	3
365		12	max	43.365	1	1.814	9	1.169	10	0	10	0	10	.132	2
366			min	-2.448	10	-20.509	3	-10.026	1	0	1	-.004	1	-.106	3
367		13	max	43.46	1	1.595	9	1.169	10	0	10	0	10	.136	2
368			min	-2.368	10	-20.706	3	-10.026	1	0	1	-.006	1	-.101	3
369		14	max	43.556	1	1.377	9	1.169	10	0	10	.001	10	.141	2
370			min	-2.288	10	-20.903	3	-10.026	1	0	1	-.009	1	-.097	3
371		15	max	43.651	1	1.158	9	1.169	10	0	10	.001	10	.145	2
372			min	-2.209	10	-21.099	3	-10.026	1	0	1	-.011	1	-.092	3
373		16	max	79.597	2	52.824	2	1.18	10	0	1	.002	10	.149	2
374			min	-30.977	3	-86.482	3	-10.12	1	0	10	-.013	1	-.087	3
375		17	max	79.692	2	52.561	2	1.18	10	0	1	.002	10	.137	2
376			min	-30.905	3	-86.679	3	-10.12	1	0	10	-.015	1	-.068	3
377		18	max	-1.883	15	318.41	2	1.23	10	0	3	.002	10	.069	2
378			min	-53.824	1	-157.386	3	-10.488	1	0	2	-.018	1	-.034	3
379		19	max	-1.854	15	318.147	2	1.23	10	0	3	.002	10	0	2

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	-53.729	1	-157.583	3	-10.488	1	0	2	-.02	1	0	3
381	M5	1	max	139.838	1	1054.94	3	0	1	0	9	.011	3	0	3
382			min	-6.211	3	-690.256	2	-68.401	3	0	3	0	11	0	2
383		2	max	139.933	1	1054.743	3	0	1	0	9	0	9	.149	2
384			min	-6.14	3	-690.519	2	-68.401	3	0	3	-.004	3	-.228	3
385		3	max	103.854	1	5.388	9	7.216	3	0	3	0	9	.296	2
386			min	.179	10	-67.618	3	-.068	9	0	1	-.018	3	-.452	3
387		4	max	103.95	1	5.169	9	7.216	3	0	3	0	9	.309	2
388			min	.259	10	-67.815	3	-.068	9	0	1	-.017	3	-.437	3
389		5	max	104.045	1	4.95	9	7.216	3	0	3	0	9	.322	2
390			min	.338	10	-68.012	3	-.068	9	0	1	-.015	3	-.422	3
391		6	max	104.141	1	4.732	9	7.216	3	0	3	0	9	.334	2
392			min	.418	10	-68.209	3	-.068	9	0	1	-.014	3	-.408	3
393		7	max	104.237	1	4.513	9	7.216	3	0	3	0	9	.347	2
394			min	.498	10	-68.405	3	-.068	9	0	1	-.012	3	-.393	3
395		8	max	104.332	1	4.294	9	7.216	3	0	3	0	9	.36	2
396			min	.577	10	-68.602	3	-.068	9	0	1	-.01	3	-.378	3
397		9	max	104.428	1	4.076	9	7.216	3	0	3	0	9	.373	2
398			min	.657	10	-68.799	3	-.068	9	0	1	-.009	3	-.363	3
399		10	max	104.523	1	3.857	9	7.216	3	0	3	0	1	.386	2
400			min	.736	10	-68.996	3	-.068	9	0	1	-.007	3	-.348	3
401		11	max	104.619	1	3.638	9	7.216	3	0	3	0	1	.399	2
402			min	.816	10	-69.193	3	-.068	9	0	1	-.006	3	-.333	3
403		12	max	104.714	1	3.42	9	7.216	3	0	3	0	1	.412	2
404			min	.895	10	-69.389	3	-.068	9	0	1	-.004	3	-.318	3
405		13	max	104.81	1	3.201	9	7.216	3	0	3	0	1	.425	2
406			min	.975	10	-69.586	3	-.068	9	0	1	-.003	3	-.303	3
407		14	max	104.905	1	2.982	9	7.216	3	0	3	0	1	.438	2
408			min	1.055	10	-69.783	3	-.068	9	0	1	-.001	3	-.288	3
409		15	max	105.001	1	2.764	9	7.216	3	0	3	0	3	.451	2
410			min	1.134	10	-69.98	3	-.068	9	0	1	0	9	-.273	3
411		16	max	243.045	2	163.28	2	7.19	3	0	3	.002	3	.463	2
412			min	-92.328	3	-226.79	3	-.071	9	0	1	0	9	-.256	3
413		17	max	243.14	2	163.018	2	7.19	3	0	3	.003	3	.427	2
414			min	-92.257	3	-226.987	3	-.071	9	0	1	0	9	-.207	3
415		18	max	-.441	3	994.242	2	6.656	3	0	3	.005	3	.215	2
416			min	-140.022	1	-480.652	3	-.013	9	0	9	0	9	-.104	3
417		19	max	-.369	3	993.98	2	6.656	3	0	3	.006	3	0	3
418			min	-139.927	1	-480.849	3	-.013	9	0	9	0	9	0	2
419	M9	1	max	53.773	1	334.628	3	72.094	3	0	3	.002	10	0	2
420			min	1.853	15	-222.147	2	-1.174	10	0	2	-.02	1	0	3
421		2	max	53.868	1	334.432	3	72.094	3	0	3	.002	10	.049	2
422			min	1.882	15	-222.409	2	-1.174	10	0	2	-.018	1	-.073	3
423		3	max	42.852	1	3.773	9	10.026	1	0	1	.014	3	.096	2
424			min	-2.875	10	-18.633	3	-2.869	3	0	10	-.015	1	-.144	3
425		4	max	42.948	1	3.555	9	10.026	1	0	1	.013	3	.1	2
426			min	-2.795	10	-18.83	3	-2.869	3	0	10	-.013	1	-.14	3
427		5	max	43.043	1	3.336	9	10.026	1	0	1	.013	3	.104	2
428			min	-2.715	10	-19.027	3	-2.869	3	0	10	-.011	1	-.136	3
429		6	max	43.139	1	3.117	9	10.026	1	0	1	.012	3	.107	2
430			min	-2.636	10	-19.223	3	-2.869	3	0	10	-.009	1	-.132	3
431		7	max	43.234	1	2.899	9	10.026	1	0	1	.011	3	.111	2
432			min	-2.556	10	-19.42	3	-2.869	3	0	10	-.007	1	-.127	3
433		8	max	43.33	1	2.68	9	10.026	1	0	1	.011	3	.115	2
434			min	-2.477	10	-19.617	3	-2.869	3	0	10	-.004	1	-.123	3
435		9	max	43.425	1	2.461	9	10.026	1	0	1	.01	3	.119	2
436			min	-2.397	10	-19.814	3	-2.869	3	0	10	-.002	1	-.119	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	43.521	1	2.243	9	10.026	1	0	1	.009	3	.124	2
438			min	-2.318	10	-20.011	3	-2.869	3	0	10	0	1	-.114	3
439		11	max	43.616	1	2.024	9	10.026	1	0	1	.009	3	.128	2
440			min	-2.238	10	-20.207	3	-2.869	3	0	10	0	10	-.11	3
441		12	max	43.712	1	1.805	9	10.026	1	0	1	.008	3	.132	2
442			min	-2.158	10	-20.404	3	-2.869	3	0	10	0	10	-.106	3
443		13	max	43.807	1	1.587	9	10.026	1	0	1	.008	3	.136	2
444			min	-2.079	10	-20.601	3	-2.869	3	0	10	0	10	-.101	3
445		14	max	43.903	1	1.368	9	10.026	1	0	1	.009	1	.141	2
446			min	-1.999	10	-20.798	3	-2.869	3	0	10	-.001	10	-.097	3
447		15	max	43.998	1	1.149	9	10.026	1	0	1	.011	1	.145	2
448			min	-1.92	10	-20.995	3	-2.869	3	0	10	-.001	10	-.092	3
449		16	max	79.687	2	52.577	2	10.12	1	0	10	.013	1	.149	2
450			min	-32.063	3	-86.925	3	-2.896	3	0	3	-.002	10	-.087	3
451		17	max	79.782	2	52.315	2	10.12	1	0	10	.015	1	.137	2
452			min	-31.991	3	-87.121	3	-2.896	3	0	3	-.002	10	-.068	3
453		18	max	-1.88	15	318.41	2	10.488	1	0	2	.018	1	.069	2
454			min	-53.824	1	-157.378	3	-2.505	3	0	3	-.002	10	-.034	3
455		19	max	-1.852	15	318.147	2	10.488	1	0	2	.02	1	0	2
456			min	-53.728	1	-157.574	3	-2.505	3	0	3	-.002	10	0	3
457	M13	1	max	72.09	3	222.094	2	-1.853	15	0	2	.02	1	0	2
458			min	-1.174	10	-334.675	3	-53.771	1	0	3	-.002	10	0	3
459		2	max	72.09	3	159.102	2	-1.06	10	0	2	.014	3	.112	3
460			min	-1.174	10	-238.882	3	-40.027	1	0	3	-.004	2	-.074	2
461		3	max	72.09	3	96.11	2	.196	10	0	2	.011	3	.186	3
462			min	-1.174	10	-143.089	3	-26.284	1	0	3	-.011	1	-.124	2
463		4	max	72.09	3	33.118	2	1.452	10	0	2	.008	3	.223	3
464			min	-1.174	10	-47.296	3	-12.54	1	0	3	-.019	1	-.149	2
465		5	max	72.09	3	48.497	3	4.088	2	0	2	.005	3	.223	3
466			min	-1.174	10	-29.976	1	-5.981	3	0	3	-.021	1	-.149	2
467		6	max	72.09	3	144.29	3	14.947	1	0	2	.003	3	.185	3
468			min	-1.174	10	-92.865	2	-5.32	3	0	3	-.018	1	-.126	2
469		7	max	72.09	3	240.083	3	28.691	1	0	2	.001	3	.11	3
470			min	-1.174	10	-155.857	2	-4.658	3	0	3	-.009	1	-.077	2
471		8	max	72.09	3	335.877	3	42.434	1	0	2	.006	2	0	15
472			min	-1.174	10	-218.849	2	-3.996	3	0	3	0	3	-.004	2
473		9	max	72.09	3	431.67	3	56.178	1	0	2	.024	1	.093	1
474			min	-1.174	10	-281.841	2	-3.335	3	0	3	-.002	3	-.151	3
475		10	max	72.09	3	-6.864	15	69.922	1	0	2	.048	1	.215	2
476			min	-1.174	10	-527.463	3	2.09	12	0	3	-.014	3	-.337	3
477		11	max	10.084	1	281.841	2	4.22	3	0	3	.024	1	.093	1
478			min	-1.174	10	-431.67	3	-56.178	1	0	2	-.012	3	-.151	3
479		12	max	10.084	1	218.849	2	4.882	3	0	3	.006	2	0	15
480			min	-1.174	10	-335.876	3	-42.434	1	0	2	-.01	3	-.004	2
481		13	max	10.084	1	155.857	2	5.543	3	0	3	.001	10	.11	3
482			min	-1.174	10	-240.083	3	-28.69	1	0	2	-.009	1	-.077	2
483		14	max	10.084	1	92.865	2	6.205	3	0	3	0	15	.185	3
484			min	-1.174	10	-144.29	3	-14.947	1	0	2	-.018	1	-.126	2
485		15	max	10.084	1	29.976	1	6.867	3	0	3	0	15	.223	3
486			min	-1.174	10	-48.497	3	-4.088	2	0	2	-.021	1	-.149	2
487		16	max	10.084	1	47.296	3	12.54	1	0	3	0	12	.223	3
488			min	-1.174	10	-33.118	2	-1.452	10	0	2	-.019	1	-.149	2
489		17	max	10.084	1	143.089	3	26.284	1	0	3	.002	3	.186	3
490			min	-1.174	10	-96.11	2	-.196	10	0	2	-.011	1	-.124	2
491		18	max	10.084	1	238.882	3	40.028	1	0	3	.006	3	.112	3
492			min	-1.174	10	-159.102	2	1.06	10	0	2	-.004	2	-.074	2
493		19	max	10.084	1	334.675	3	53.771	1	0	3	.02	1	0	2

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	-1.174	10	-222.094	2	1.855	15	0	2	-.002	10	0	3
495	M16	1	max	2.507	3	318.211	2	-1.852	15	0	3	.02	1	0	2
496			min	-10.476	1	-157.594	3	-53.731	1	0	2	-.002	10	0	3
497		2	max	2.507	3	227.593	2	-1.044	10	0	3	.003	9	.053	3
498			min	-10.476	1	-113.37	3	-39.987	1	0	2	-.004	2	-.106	2
499		3	max	2.507	3	136.975	2	.212	10	0	3	0	3	.088	3
500			min	-10.476	1	-69.145	3	-26.244	1	0	2	-.011	1	-.177	2
501		4	max	2.507	3	46.357	2	1.468	10	0	3	0	15	.106	3
502			min	-10.476	1	-24.92	3	-12.5	1	0	2	-.019	1	-.213	2
503		5	max	2.507	3	19.304	3	4.121	2	0	3	0	15	.108	3
504			min	-10.476	1	-44.261	2	-3.75	3	0	2	-.021	1	-.213	2
505		6	max	2.507	3	63.529	3	14.987	1	0	3	0	15	.091	3
506			min	-10.476	1	-134.879	2	-3.088	3	0	2	-.018	1	-.178	2
507		7	max	2.507	3	107.753	3	28.731	1	0	3	.001	10	.058	3
508			min	-10.476	1	-225.497	2	-2.426	3	0	2	-.009	1	-.108	2
509		8	max	2.507	3	151.978	3	42.474	1	0	3	.006	2	.008	3
510			min	-10.476	1	-316.115	2	-1.765	3	0	2	-.007	3	-.003	2
511		9	max	2.507	3	196.202	3	56.218	1	0	3	.024	1	.138	2
512			min	-10.476	1	-406.733	2	-1.103	3	0	2	-.007	3	-.06	3
513		10	max	1.23	10	-6.861	15	69.961	1	0	15	.048	1	.314	2
514			min	-10.476	1	-497.351	2	-.811	3	0	2	-.007	3	-.145	3
515		11	max	1.23	10	406.733	2	-.149	3	0	2	.024	1	.138	2
516			min	-10.475	1	-196.202	3	-56.218	1	0	3	-.002	3	-.06	3
517		12	max	1.23	10	316.115	2	.513	3	0	2	.006	2	.008	3
518			min	-10.475	1	-151.978	3	-42.474	1	0	3	-.002	3	-.003	2
519		13	max	1.23	10	225.497	2	1.174	3	0	2	.001	10	.058	3
520			min	-10.475	1	-107.753	3	-28.73	1	0	3	-.009	1	-.108	2
521		14	max	1.23	10	134.879	2	1.836	3	0	2	0	12	.091	3
522			min	-10.475	1	-63.529	3	-14.987	1	0	3	-.018	1	-.178	2
523		15	max	1.23	10	44.261	2	2.498	3	0	2	0	3	.108	3
524			min	-10.475	1	-19.304	3	-4.121	2	0	3	-.021	1	-.213	2
525		16	max	1.23	10	24.92	3	12.5	1	0	2	.001	3	.106	3
526			min	-10.475	1	-46.357	2	-1.468	10	0	3	-.019	1	-.213	2
527		17	max	1.23	10	69.145	3	26.244	1	0	2	.003	3	.088	3
528			min	-10.475	1	-136.975	2	-.212	10	0	3	-.011	1	-.177	2
529		18	max	1.23	10	113.37	3	39.988	1	0	2	.004	3	.053	3
530			min	-10.475	1	-227.593	2	1.044	10	0	3	-.004	2	-.106	2
531		19	max	1.23	10	157.594	3	53.731	1	0	2	.02	1	0	2
532			min	-10.475	1	-318.211	2	1.854	15	0	3	-.002	10	0	3
533	M15	1	max	0	1	.727	3	.169	3	0	1	0	1	0	1
534			min	-96.464	3	0	1	0	1	0	3	0	3	0	1
535		2	max	0	1	.646	3	.169	3	0	1	0	1	0	1
536			min	-96.523	3	0	1	0	1	0	3	0	3	0	3
537		3	max	0	1	.565	3	.169	3	0	1	0	1	0	1
538			min	-96.583	3	0	1	0	1	0	3	0	3	0	3
539		4	max	0	1	.485	3	.169	3	0	1	0	1	0	1
540			min	-96.643	3	0	1	0	1	0	3	0	3	0	3
541		5	max	0	1	.404	3	.169	3	0	1	0	1	0	1
542			min	-96.702	3	0	1	0	1	0	3	0	3	0	3
543		6	max	0	1	.323	3	.169	3	0	1	0	1	0	1
544			min	-96.762	3	0	1	0	1	0	3	0	3	0	3
545		7	max	0	1	.242	3	.169	3	0	1	0	3	0	1
546			min	-96.822	3	0	1	0	1	0	3	0	1	0	3
547		8	max	0	1	.162	3	.169	3	0	1	0	3	0	1
548			min	-96.881	3	0	1	0	1	0	3	0	1	0	3
549		9	max	0	1	.081	3	.169	3	0	1	0	3	0	1
550			min	-96.941	3	0	1	0	1	0	3	0	1	0	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
551		10	max	0	1	0	1	.169	3	0	1	0	3	0	1
552			min	-97.001	3	0	1	0	1	0	3	0	1	0	3
553		11	max	0	1	0	1	.169	3	0	1	0	3	0	1
554			min	-97.06	3	-.081	3	0	1	0	3	0	1	0	3
555		12	max	0	1	0	1	.169	3	0	1	0	3	0	1
556			min	-97.12	3	-.162	3	0	1	0	3	0	1	0	3
557		13	max	0	1	0	1	.169	3	0	1	0	3	0	1
558			min	-97.18	3	-.242	3	0	1	0	3	0	1	0	3
559		14	max	0	1	0	1	.169	3	0	1	0	3	0	1
560			min	-97.239	3	-.323	3	0	1	0	3	0	1	0	3
561		15	max	0	1	0	1	.169	3	0	1	0	3	0	1
562			min	-97.299	3	-.404	3	0	1	0	3	0	1	0	3
563		16	max	0	1	0	1	.169	3	0	1	0	3	0	1
564			min	-97.359	3	-.485	3	0	1	0	3	0	1	0	3
565		17	max	0	1	0	1	.169	3	0	1	0	3	0	1
566			min	-97.418	3	-.565	3	0	1	0	3	0	1	0	3
567		18	max	0	1	0	1	.169	3	0	1	0	3	0	1
568			min	-97.478	3	-.646	3	0	1	0	3	0	1	0	3
569		19	max	0	1	0	1	.169	3	0	1	0	3	0	1
570			min	-97.538	3	-.727	3	0	1	0	3	0	1	0	1
571	M16A	1	max	0	1	1.244	4	.017	9	0	3	0	3	0	1
572			min	-96.033	3	0	1	-.068	3	0	9	0	9	0	1
573		2	max	0	1	1.106	4	.017	9	0	3	0	3	0	1
574			min	-95.973	3	0	1	-.068	3	0	9	0	9	0	4
575		3	max	0	1	.968	4	.017	9	0	3	0	3	0	1
576			min	-95.913	3	0	1	-.068	3	0	9	0	9	0	4
577		4	max	0	1	.829	4	.017	9	0	3	0	3	0	1
578			min	-95.854	3	0	1	-.068	3	0	9	0	9	0	4
579		5	max	0	1	.691	4	.017	9	0	3	0	3	0	1
580			min	-95.794	3	0	1	-.068	3	0	9	0	9	0	4
581		6	max	0	1	.553	4	.017	9	0	3	0	3	0	1
582			min	-95.734	3	0	1	-.068	3	0	9	0	9	-.001	4
583		7	max	0	1	.415	4	.017	9	0	3	0	3	0	1
584			min	-95.675	3	0	1	-.068	3	0	9	0	9	-.001	4
585		8	max	0	1	.276	4	.017	9	0	3	0	3	0	1
586			min	-95.615	3	0	1	-.068	3	0	9	0	9	-.001	4
587		9	max	0	1	.138	4	.017	9	0	3	0	3	0	1
588			min	-95.555	3	0	1	-.068	3	0	9	0	9	-.001	4
589		10	max	0	1	0	1	.017	9	0	3	0	3	0	1
590			min	-95.496	3	0	1	-.068	3	0	9	0	9	-.001	4
591		11	max	.052	13	0	1	.017	9	0	3	0	3	0	1
592			min	-95.436	3	-.138	4	-.068	3	0	9	0	9	-.001	4
593		12	max	.134	13	0	1	.017	9	0	3	0	3	0	1
594			min	-95.376	3	-.276	4	-.068	3	0	9	0	9	-.001	4
595		13	max	.218	4	0	1	.017	9	0	3	0	1	0	1
596			min	-95.317	3	-.415	4	-.068	3	0	9	0	4	-.001	4
597		14	max	.32	4	0	1	.017	9	0	3	0	9	0	1
598			min	-95.257	3	-.553	4	-.068	3	0	9	0	3	-.001	4
599		15	max	.422	4	0	1	.017	9	0	3	0	9	0	1
600			min	-95.197	3	-.691	4	-.068	3	0	9	0	3	0	4
601		16	max	.524	4	0	1	.017	9	0	3	0	9	0	1
602			min	-95.138	3	-.829	4	-.068	3	0	9	0	3	0	4
603		17	max	.626	4	0	1	.017	9	0	3	0	9	0	1
604			min	-95.078	3	-.968	4	-.068	3	0	9	0	3	0	4
605		18	max	.728	4	0	1	.017	9	0	3	0	9	0	1
606			min	-95.018	3	-1.106	4	-.068	3	0	9	0	3	0	4
607		19	max	.83	4	0	1	.017	9	0	3	0	9	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	-94.959	3	-1.244	4	-.068	3	0	9	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	.002	1	.007	2	.001	9	1.75e-5	10	NC	3	NC	1
2			min	-.003	3	-.006	3	-.002	3	-1.686e-4	3	5013.653	2	NC	1
3		2	max	.002	1	.006	2	.001	9	1.669e-5	10	NC	3	NC	1
4			min	-.003	3	-.006	3	-.002	3	-1.599e-4	3	5456.653	2	NC	1
5		3	max	.002	1	.006	2	.001	9	1.588e-5	10	NC	1	NC	1
6			min	-.003	3	-.006	3	-.001	3	-1.511e-4	3	5981.018	2	NC	1
7		4	max	.001	1	.005	2	0	9	1.506e-5	10	NC	1	NC	1
8			min	-.002	3	-.005	3	-.001	3	-1.423e-4	3	6606.184	2	NC	1
9		5	max	.001	1	.005	2	0	9	1.425e-5	10	NC	1	NC	1
10			min	-.002	3	-.005	3	-.001	3	-1.335e-4	3	7358.004	2	NC	1
11		6	max	.001	1	.004	2	0	9	1.344e-5	10	NC	1	NC	1
12			min	-.002	3	-.005	3	-.001	3	-1.247e-4	3	8271.444	2	NC	1
13		7	max	.001	1	.004	2	0	9	1.262e-5	10	NC	1	NC	1
14			min	-.002	3	-.005	3	0	3	-1.159e-4	3	9394.723	2	NC	1
15		8	max	.001	1	.003	2	0	9	1.181e-5	10	NC	1	NC	1
16			min	-.002	3	-.004	3	0	3	-1.071e-4	3	NC	1	NC	1
17		9	max	0	1	.003	2	0	9	1.1e-5	10	NC	1	NC	1
18			min	-.002	3	-.004	3	0	3	-9.844e-5	1	NC	1	NC	1
19		10	max	0	1	.002	2	0	9	1.019e-5	10	NC	1	NC	1
20			min	-.001	3	-.004	3	0	3	-9.135e-5	1	NC	1	NC	1
21		11	max	0	1	.002	2	0	9	9.372e-6	10	NC	1	NC	1
22			min	-.001	3	-.003	3	0	3	-8.426e-5	1	NC	1	NC	1
23		12	max	0	1	.002	2	0	9	8.559e-6	10	NC	1	NC	1
24			min	-.001	3	-.003	3	0	3	-7.717e-5	1	NC	1	NC	1
25		13	max	0	1	.001	2	0	9	7.746e-6	10	NC	1	NC	1
26			min	0	3	-.003	3	0	3	-7.008e-5	1	NC	1	NC	1
27		14	max	0	1	0	2	0	9	6.933e-6	10	NC	1	NC	1
28			min	0	3	-.002	3	0	3	-6.299e-5	1	NC	1	NC	1
29		15	max	0	1	0	2	0	9	6.12e-6	10	NC	1	NC	1
30			min	0	3	-.002	3	0	3	-5.59e-5	1	NC	1	NC	1
31		16	max	0	1	0	2	0	1	5.307e-6	10	NC	1	NC	1
32			min	0	3	-.001	3	0	3	-4.881e-5	1	NC	1	NC	1
33		17	max	0	1	0	2	0	1	4.494e-6	10	NC	1	NC	1
34			min	0	3	0	3	0	3	-4.172e-5	1	NC	1	NC	1
35		18	max	0	1	0	2	0	1	3.681e-6	10	NC	1	NC	1
36			min	0	3	0	3	0	3	-3.463e-5	1	NC	1	NC	1
37		19	max	0	1	0	1	0	1	2.868e-6	10	NC	1	NC	1
38			min	0	1	0	1	0	1	-2.754e-5	1	NC	1	NC	1
39	M3	1	max	0	1	0	1	0	1	1.273e-5	1	NC	1	NC	1
40			min	0	1	0	1	0	1	-1.328e-6	10	NC	1	NC	1
41		2	max	0	3	0	2	0	10	1.862e-5	1	NC	1	NC	1
42			min	0	2	0	3	0	9	-2.046e-6	10	NC	1	NC	1
43		3	max	0	3	0	2	0	10	2.451e-5	1	NC	1	NC	1
44			min	0	2	-.001	3	0	9	-2.764e-6	10	NC	1	NC	1
45		4	max	0	3	0	2	0	10	3.039e-5	1	NC	1	NC	1
46			min	0	2	-.002	3	0	9	-3.482e-6	10	NC	1	NC	1
47		5	max	0	3	0	2	0	3	3.628e-5	1	NC	1	NC	1
48			min	0	2	-.003	3	0	9	-4.2e-6	10	NC	1	NC	1
49		6	max	0	3	0	2	0	3	4.217e-5	1	NC	1	NC	1
50			min	0	2	-.004	3	0	9	-4.919e-6	10	NC	1	NC	1
51		7	max	0	3	0	2	0	3	4.805e-5	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	-.004	3	0	9	-5.637e-6	10	NC	1	NC	1
53		8	max	0	3	0	2	0	1	5.394e-5	1	NC	1	NC	1
54			min	0	2	-.005	3	0	10	-6.355e-6	10	NC	1	NC	1
55		9	max	0	3	0	2	0	1	5.983e-5	1	NC	1	NC	1
56			min	0	2	-.005	3	0	10	-7.073e-6	10	NC	1	NC	1
57		10	max	0	3	.001	2	0	1	6.571e-5	1	NC	1	NC	1
58			min	0	2	-.006	3	0	10	-7.791e-6	10	NC	1	NC	1
59		11	max	0	3	.002	2	0	1	7.16e-5	1	NC	1	NC	1
60			min	0	2	-.006	3	0	10	-8.509e-6	10	NC	1	NC	1
61		12	max	0	3	.002	2	0	1	7.749e-5	1	NC	1	NC	1
62			min	0	2	-.006	3	0	10	-9.227e-6	10	NC	1	NC	1
63		13	max	0	3	.003	2	0	1	8.337e-5	1	NC	1	NC	1
64			min	0	2	-.007	3	0	10	-9.945e-6	10	NC	1	NC	1
65		14	max	0	3	.004	2	0	1	8.926e-5	1	NC	1	NC	1
66			min	0	2	-.007	3	0	10	-1.066e-5	10	NC	1	NC	1
67		15	max	0	3	.004	2	0	1	9.515e-5	1	NC	1	NC	1
68			min	0	2	-.007	3	0	10	-1.138e-5	10	NC	1	NC	1
69		16	max	0	3	.005	2	.001	1	1.01e-4	1	NC	1	NC	1
70			min	0	2	-.007	3	0	10	-1.21e-5	10	8921.101	2	NC	1
71		17	max	0	3	.006	2	.001	1	1.069e-4	1	NC	1	NC	1
72			min	-.001	2	-.007	3	0	10	-1.282e-5	10	7596.86	2	NC	1
73		18	max	0	3	.007	2	.001	1	1.128e-4	1	NC	3	NC	1
74			min	-.001	2	-.007	3	0	10	-1.354e-5	10	6577.077	2	NC	1
75		19	max	.001	3	.008	2	.001	1	1.187e-4	1	NC	3	NC	1
76			min	-.001	2	-.007	3	0	10	-1.425e-5	10	5783.085	2	NC	1
77	M4	1	max	.001	1	.007	2	0	10	1.465e-5	10	NC	1	NC	1
78			min	0	3	-.006	3	-.001	1	-1.207e-4	1	NC	1	NC	1
79		2	max	.001	1	.007	2	0	10	1.465e-5	10	NC	1	NC	1
80			min	0	3	-.006	3	-.001	1	-1.207e-4	1	NC	1	NC	1
81		3	max	.001	1	.007	2	0	10	1.465e-5	10	NC	1	NC	1
82			min	0	3	-.006	3	0	1	-1.207e-4	1	NC	1	NC	1
83		4	max	.001	1	.006	2	0	10	1.465e-5	10	NC	1	NC	1
84			min	0	3	-.005	3	0	1	-1.207e-4	1	NC	1	NC	1
85		5	max	.001	1	.006	2	0	10	1.465e-5	10	NC	1	NC	1
86			min	0	3	-.005	3	0	1	-1.207e-4	1	NC	1	NC	1
87		6	max	.001	1	.005	2	0	10	1.465e-5	10	NC	1	NC	1
88			min	0	3	-.005	3	0	1	-1.207e-4	1	NC	1	NC	1
89		7	max	0	1	.005	2	0	10	1.465e-5	10	NC	1	NC	1
90			min	0	3	-.004	3	0	1	-1.207e-4	1	NC	1	NC	1
91		8	max	0	1	.005	2	0	10	1.465e-5	10	NC	1	NC	1
92			min	0	3	-.004	3	0	1	-1.207e-4	1	NC	1	NC	1
93		9	max	0	1	.004	2	0	10	1.465e-5	10	NC	1	NC	1
94			min	0	3	-.003	3	0	1	-1.207e-4	1	NC	1	NC	1
95		10	max	0	1	.004	2	0	10	1.465e-5	10	NC	1	NC	1
96			min	0	3	-.003	3	0	1	-1.207e-4	1	NC	1	NC	1
97		11	max	0	1	.003	2	0	10	1.465e-5	10	NC	1	NC	1
98			min	0	3	-.003	3	0	1	-1.207e-4	1	NC	1	NC	1
99		12	max	0	1	.003	2	0	10	1.465e-5	10	NC	1	NC	1
100			min	0	3	-.002	3	0	1	-1.207e-4	1	NC	1	NC	1
101		13	max	0	1	.002	2	0	10	1.465e-5	10	NC	1	NC	1
102			min	0	3	-.002	3	0	1	-1.207e-4	1	NC	1	NC	1
103		14	max	0	1	.002	2	0	10	1.465e-5	10	NC	1	NC	1
104			min	0	3	-.002	3	0	1	-1.207e-4	1	NC	1	NC	1
105		15	max	0	1	.002	2	0	10	1.465e-5	10	NC	1	NC	1
106			min	0	3	-.001	3	0	1	-1.207e-4	1	NC	1	NC	1
107		16	max	0	1	.001	2	0	10	1.465e-5	10	NC	1	NC	1
108			min	0	3	-.001	3	0	1	-1.207e-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
109		17	max	0	1	0	2	0	10	1.465e-5	10	NC	1	NC	1
110			min	0	3	0	3	0	1	-1.207e-4	1	NC	1	NC	1
111		18	max	0	1	0	2	0	10	1.465e-5	10	NC	1	NC	1
112			min	0	3	0	3	0	1	-1.207e-4	1	NC	1	NC	1
113		19	max	0	1	0	1	0	1	1.465e-5	10	NC	1	NC	1
114			min	0	1	0	1	0	1	-1.207e-4	1	NC	1	NC	1
115	M6	1	max	.005	1	.02	2	0	9	3.76e-4	3	NC	3	NC	1
116			min	-.009	3	-.017	3	-.005	3	-9.139e-8	1	1623.285	2	6469.849	3
117		2	max	.005	1	.019	2	0	9	3.665e-4	3	NC	3	NC	1
118			min	-.008	3	-.016	3	-.005	3	-8.642e-8	1	1735.842	2	6906.898	3
119		3	max	.005	1	.018	2	0	9	3.569e-4	3	NC	3	NC	1
120			min	-.008	3	-.016	3	-.004	3	-8.144e-8	1	1864.694	2	7421.691	3
121		4	max	.005	1	.017	2	0	9	3.473e-4	3	NC	3	NC	1
122			min	-.007	3	-.015	3	-.004	3	-4.097e-7	9	2013.126	2	8031.435	3
123		5	max	.004	1	.015	2	0	9	3.378e-4	3	NC	3	NC	1
124			min	-.007	3	-.014	3	-.004	3	-1.187e-6	9	2185.371	2	8758.865	3
125		6	max	.004	1	.014	2	0	9	3.282e-4	3	NC	3	NC	1
126			min	-.006	3	-.013	3	-.003	3	-1.965e-6	9	2386.976	2	9634.511	3
127		7	max	.004	1	.013	2	0	9	3.186e-4	3	NC	3	NC	1
128			min	-.006	3	-.012	3	-.003	3	-2.743e-6	9	2625.347	2	NC	1
129		8	max	.003	1	.011	2	0	9	3.091e-4	3	NC	3	NC	1
130			min	-.005	3	-.011	3	-.003	3	-3.521e-6	9	2910.594	2	NC	1
131		9	max	.003	1	.01	2	0	9	2.995e-4	3	NC	3	NC	1
132			min	-.005	3	-.01	3	-.002	3	-4.299e-6	9	3256.882	2	NC	1
133		10	max	.003	1	.009	2	0	9	2.899e-4	3	NC	3	NC	1
134			min	-.004	3	-.009	3	-.002	3	-5.077e-6	9	3684.684	2	NC	1
135		11	max	.002	1	.008	2	0	9	2.804e-4	3	NC	3	NC	1
136			min	-.004	3	-.008	3	-.002	3	-5.854e-6	9	4224.721	2	NC	1
137		12	max	.002	1	.007	2	0	9	2.708e-4	3	NC	3	NC	1
138			min	-.003	3	-.007	3	-.001	3	-6.632e-6	9	4925.28	2	NC	1
139		13	max	.002	1	.006	2	0	9	2.612e-4	3	NC	3	NC	1
140			min	-.003	3	-.006	3	-.001	3	-7.41e-6	9	5866.851	2	NC	1
141		14	max	.002	1	.005	2	0	9	2.517e-4	3	NC	1	NC	1
142			min	-.002	3	-.005	3	0	3	-8.188e-6	9	7194.326	2	NC	1
143		15	max	.001	1	.004	2	0	9	2.421e-4	3	NC	1	NC	1
144			min	-.002	3	-.004	3	0	3	-8.966e-6	9	9197.498	2	NC	1
145		16	max	0	1	.003	2	0	9	2.325e-4	3	NC	1	NC	1
146			min	-.001	3	-.003	3	0	3	-9.744e-6	9	NC	1	NC	1
147		17	max	0	1	.002	2	0	9	2.229e-4	3	NC	1	NC	1
148			min	0	3	-.002	3	0	3	-1.052e-5	9	NC	1	NC	1
149		18	max	0	1	0	2	0	9	2.134e-4	3	NC	1	NC	1
150			min	0	3	-.001	3	0	3	-1.13e-5	9	NC	1	NC	1
151		19	max	0	1	0	1	0	1	2.038e-4	3	NC	1	NC	1
152			min	0	1	0	1	0	1	-1.208e-5	9	NC	1	NC	1
153	M7	1	max	0	1	0	1	0	1	5.528e-6	9	NC	1	NC	1
154			min	0	1	0	1	0	1	-9.323e-5	3	NC	1	NC	1
155		2	max	0	3	.001	2	0	3	5.036e-6	9	NC	1	NC	1
156			min	0	2	-.002	3	0	9	-7.21e-5	3	NC	1	NC	1
157		3	max	0	3	.002	2	0	3	4.545e-6	9	NC	1	NC	1
158			min	0	2	-.003	3	0	9	-5.096e-5	3	NC	1	NC	1
159		4	max	0	3	.003	2	.001	3	4.053e-6	9	NC	1	NC	1
160			min	0	2	-.005	3	0	9	-2.983e-5	3	NC	1	NC	1
161		5	max	0	3	.004	2	.002	3	3.561e-6	9	NC	1	NC	1
162			min	0	2	-.006	3	0	9	-8.699e-6	3	NC	1	NC	1
163		6	max	0	3	.005	2	.002	3	1.243e-5	3	NC	1	NC	1
164			min	0	2	-.008	3	0	9	0	1	8802.335	2	NC	1
165		7	max	0	3	.006	2	.002	3	3.356e-5	3	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
166			min	-.001	2	-.009	3	0	9	0	10	7295.95	2	NC	1
167		8	max	0	3	.007	2	.002	3	5.47e-5	3	NC	3	NC	1
168			min	-.001	2	-.01	3	0	9	0	10	6185.215	2	NC	1
169		9	max	.001	3	.009	2	.003	3	7.583e-5	3	NC	3	NC	1
170			min	-.002	2	-.012	3	0	9	0	5	5327.432	2	NC	1
171		10	max	.001	3	.01	2	.003	3	9.696e-5	3	NC	3	NC	1
172			min	-.002	2	-.013	3	0	9	0	5	4643.522	2	NC	1
173		11	max	.001	3	.011	2	.003	3	1.181e-4	3	NC	3	NC	1
174			min	-.002	2	-.014	3	0	9	0	5	4085.888	2	NC	1
175		12	max	.002	3	.013	2	.003	3	1.392e-4	3	NC	3	NC	1
176			min	-.002	2	-.015	3	0	9	-7.804e-8	13	3623.889	2	NC	1
177		13	max	.002	3	.014	2	.003	3	1.604e-4	3	NC	3	NC	1
178			min	-.002	2	-.016	3	0	9	-3.737e-7	9	3236.666	2	NC	1
179		14	max	.002	3	.016	2	.003	3	1.815e-4	3	NC	3	NC	1
180			min	-.003	2	-.017	3	0	9	-8.656e-7	9	2909.342	2	NC	1
181		15	max	.002	3	.018	2	.003	3	2.026e-4	3	NC	3	NC	1
182			min	-.003	2	-.018	3	0	9	-1.357e-6	9	2630.899	2	NC	1
183		16	max	.002	3	.019	2	.003	3	2.238e-4	3	NC	3	NC	1
184			min	-.003	2	-.019	3	0	9	-1.849e-6	9	2392.92	2	NC	1
185		17	max	.002	3	.021	2	.003	3	2.449e-4	3	NC	3	NC	1
186			min	-.003	2	-.019	3	0	9	-2.341e-6	9	2188.834	2	NC	1
187		18	max	.002	3	.023	2	.003	3	2.66e-4	3	NC	3	NC	1
188			min	-.003	2	-.02	3	0	9	-2.833e-6	9	2013.418	2	NC	1
189		19	max	.002	3	.025	2	.002	3	2.871e-4	3	NC	3	NC	1
190			min	-.004	2	-.021	3	0	9	-3.325e-6	9	1862.472	2	NC	1
191	M8	1	max	.004	2	.023	2	0	9	-8.968e-8	10	NC	1	NC	1
192			min	-.001	3	-.018	3	-.002	3	-2.175e-4	3	NC	1	NC	1
193		2	max	.004	2	.022	2	0	9	-8.968e-8	10	NC	1	NC	1
194			min	-.001	3	-.017	3	-.002	3	-2.175e-4	3	NC	1	NC	1
195		3	max	.004	2	.021	2	0	9	-8.968e-8	10	NC	1	NC	1
196			min	-.001	3	-.016	3	-.001	3	-2.175e-4	3	NC	1	NC	1
197		4	max	.004	2	.019	2	0	9	-8.968e-8	10	NC	1	NC	1
198			min	-.001	3	-.015	3	-.001	3	-2.175e-4	3	NC	1	NC	1
199		5	max	.003	2	.018	2	0	9	-8.968e-8	10	NC	1	NC	1
200			min	0	3	-.014	3	-.001	3	-2.175e-4	3	NC	1	NC	1
201		6	max	.003	2	.017	2	0	9	-8.968e-8	10	NC	1	NC	1
202			min	0	3	-.013	3	-.001	3	-2.175e-4	3	NC	1	NC	1
203		7	max	.003	2	.015	2	0	9	-8.968e-8	10	NC	1	NC	1
204			min	0	3	-.012	3	0	3	-2.175e-4	3	NC	1	NC	1
205		8	max	.003	2	.014	2	0	9	-8.968e-8	10	NC	1	NC	1
206			min	0	3	-.011	3	0	3	-2.175e-4	3	NC	1	NC	1
207		9	max	.002	2	.013	2	0	9	-8.968e-8	10	NC	1	NC	1
208			min	0	3	-.01	3	0	3	-2.175e-4	3	NC	1	NC	1
209		10	max	.002	2	.012	2	0	9	-8.968e-8	10	NC	1	NC	1
210			min	0	3	-.009	3	0	3	-2.175e-4	3	NC	1	NC	1
211		11	max	.002	2	.01	2	0	9	-8.968e-8	10	NC	1	NC	1
212			min	0	3	-.008	3	0	3	-2.175e-4	3	NC	1	NC	1
213		12	max	.002	2	.009	2	0	9	-8.968e-8	10	NC	1	NC	1
214			min	0	3	-.007	3	0	3	-2.175e-4	3	NC	1	NC	1
215		13	max	.001	2	.008	2	0	9	-8.968e-8	10	NC	1	NC	1
216			min	0	3	-.006	3	0	3	-2.175e-4	3	NC	1	NC	1
217		14	max	.001	2	.006	2	0	9	-8.968e-8	10	NC	1	NC	1
218			min	0	3	-.005	3	0	3	-2.175e-4	3	NC	1	NC	1
219		15	max	0	2	.005	2	0	9	-8.968e-8	10	NC	1	NC	1
220			min	0	3	-.004	3	0	3	-2.175e-4	3	NC	1	NC	1
221		16	max	0	2	.004	2	0	9	-8.968e-8	10	NC	1	NC	1
222			min	0	3	-.003	3	0	3	-2.175e-4	3	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	2	.003	2	0	9	-8.968e-8	10	NC	1	NC	1
224			min	0	3	-.002	3	0	3	-2.175e-4	3	NC	1	NC	1
225		18	max	0	2	.001	2	0	9	-8.968e-8	10	NC	1	NC	1
226			min	0	3	-.001	3	0	3	-2.175e-4	3	NC	1	NC	1
227		19	max	0	1	0	1	0	1	-8.968e-8	10	NC	1	NC	1
228			min	0	1	0	1	0	1	-2.175e-4	3	NC	1	NC	1
229	M10	1	max	.002	1	.007	2	0	3	1.55e-4	1	NC	3	NC	1
230			min	-.002	3	-.006	3	-.001	1	-4.808e-4	3	5020.277	2	NC	1
231		2	max	.002	1	.006	2	0	3	1.479e-4	1	NC	3	NC	1
232			min	-.002	3	-.006	3	-.001	1	-4.662e-4	3	5464.025	2	NC	1
233		3	max	.002	1	.006	2	0	3	1.408e-4	1	NC	1	NC	1
234			min	-.002	3	-.006	3	-.001	1	-4.516e-4	3	5989.306	2	NC	1
235		4	max	.001	1	.005	2	0	3	1.337e-4	1	NC	1	NC	1
236			min	-.002	3	-.005	3	0	1	-4.37e-4	3	6615.604	2	NC	1
237		5	max	.001	1	.005	2	0	3	1.267e-4	1	NC	1	NC	1
238			min	-.002	3	-.005	3	0	1	-4.225e-4	3	7368.836	2	NC	1
239		6	max	.001	1	.004	2	0	3	1.196e-4	1	NC	1	NC	1
240			min	-.002	3	-.005	3	0	1	-4.079e-4	3	8284.06	2	NC	1
241		7	max	.001	1	.004	2	0	3	1.125e-4	1	NC	1	NC	1
242			min	-.002	3	-.005	3	0	1	-3.933e-4	3	9409.624	2	NC	1
243		8	max	.001	1	.003	2	0	3	1.054e-4	1	NC	1	NC	1
244			min	-.001	3	-.004	3	0	1	-3.787e-4	3	NC	1	NC	1
245		9	max	0	1	.003	2	0	3	9.834e-5	1	NC	1	NC	1
246			min	-.001	3	-.004	3	0	1	-3.641e-4	3	NC	1	NC	1
247		10	max	0	1	.002	2	0	3	9.126e-5	1	NC	1	NC	1
248			min	-.001	3	-.004	3	0	1	-3.496e-4	3	NC	1	NC	1
249		11	max	0	1	.002	2	0	3	8.418e-5	1	NC	1	NC	1
250			min	-.001	3	-.003	3	0	1	-3.35e-4	3	NC	1	NC	1
251		12	max	0	1	.002	2	0	3	7.71e-5	1	NC	1	NC	1
252			min	0	3	-.003	3	0	1	-3.204e-4	3	NC	1	NC	1
253		13	max	0	1	.001	2	0	3	7.002e-5	1	NC	1	NC	1
254			min	0	3	-.003	3	0	1	-3.058e-4	3	NC	1	NC	1
255		14	max	0	1	0	2	0	3	6.294e-5	1	NC	1	NC	1
256			min	0	3	-.002	3	0	1	-2.912e-4	3	NC	1	NC	1
257		15	max	0	1	0	2	0	3	5.586e-5	1	NC	1	NC	1
258			min	0	3	-.002	3	0	1	-2.766e-4	3	NC	1	NC	1
259		16	max	0	1	0	2	0	3	4.878e-5	1	NC	1	NC	1
260			min	0	3	-.001	3	0	1	-2.621e-4	3	NC	1	NC	1
261		17	max	0	1	0	2	0	3	4.17e-5	1	NC	1	NC	1
262			min	0	3	-.001	3	0	1	-2.475e-4	3	NC	1	NC	1
263		18	max	0	1	0	2	0	3	3.462e-5	1	NC	1	NC	1
264			min	0	3	0	3	0	1	-2.329e-4	3	NC	1	NC	1
265		19	max	0	1	0	1	0	1	2.754e-5	1	NC	1	NC	1
266			min	0	1	0	1	0	1	-2.183e-4	3	NC	1	NC	1
267	M11	1	max	0	1	0	1	0	1	1.006e-4	3	NC	1	NC	1
268			min	0	1	0	1	0	1	-1.273e-5	1	NC	1	NC	1
269		2	max	0	3	0	2	0	1	7.966e-5	3	NC	1	NC	1
270			min	0	2	0	3	0	3	-1.861e-5	1	NC	1	NC	1
271		3	max	0	3	0	2	0	1	5.875e-5	3	NC	1	NC	1
272			min	0	2	-.001	3	0	3	-2.448e-5	1	NC	1	NC	1
273		4	max	0	3	0	2	0	1	3.783e-5	3	NC	1	NC	1
274			min	0	2	-.002	3	-.001	3	-3.036e-5	1	NC	1	NC	1
275		5	max	0	3	0	2	0	1	1.691e-5	3	NC	1	NC	1
276			min	0	2	-.003	3	-.002	3	-3.624e-5	1	NC	1	NC	1
277		6	max	0	3	0	2	0	1	4.963e-6	10	NC	1	NC	1
278			min	0	2	-.004	3	-.002	3	-4.211e-5	1	NC	1	NC	1
279		7	max	0	3	0	2	0	10	5.69e-6	10	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	-.004	3	-.002	3	-4.799e-5	1	NC	1	NC	1
281		8	max	0	3	0	2	0	10	6.417e-6	10	NC	1	NC	1
282			min	0	2	-.005	3	-.002	3	-5.386e-5	1	NC	1	NC	1
283		9	max	0	3	0	2	0	10	7.143e-6	10	NC	1	NC	1
284			min	0	2	-.005	3	-.003	3	-6.677e-5	3	NC	1	NC	1
285		10	max	0	3	.001	2	0	10	7.87e-6	10	NC	1	NC	1
286			min	0	2	-.006	3	-.003	3	-8.768e-5	3	NC	1	NC	1
287		11	max	0	3	.002	2	0	10	8.596e-6	10	NC	1	NC	1
288			min	0	2	-.006	3	-.003	3	-1.086e-4	3	NC	1	NC	1
289		12	max	0	3	.002	2	0	10	9.323e-6	10	NC	1	NC	1
290			min	0	2	-.007	3	-.003	3	-1.295e-4	3	NC	1	NC	1
291		13	max	0	3	.003	2	0	10	1.005e-5	10	NC	1	NC	1
292			min	0	2	-.007	3	-.003	3	-1.504e-4	3	NC	1	NC	1
293		14	max	0	3	.004	2	0	10	1.078e-5	10	NC	1	NC	1
294			min	0	2	-.007	3	-.003	3	-1.714e-4	3	NC	1	NC	1
295		15	max	0	3	.004	2	0	10	1.15e-5	10	NC	1	NC	1
296			min	0	2	-.007	3	-.003	3	-1.923e-4	3	NC	1	NC	1
297		16	max	0	3	.005	2	0	10	1.223e-5	10	NC	1	NC	1
298			min	0	2	-.007	3	-.003	3	-2.132e-4	3	8931.615	2	NC	1
299		17	max	0	3	.006	2	0	10	1.296e-5	10	NC	1	NC	1
300			min	-.001	2	-.007	3	-.002	3	-2.341e-4	3	7604.874	2	NC	1
301		18	max	0	3	.007	2	0	10	1.368e-5	10	NC	3	NC	1
302			min	-.001	2	-.007	3	-.002	3	-2.55e-4	3	6583.373	2	NC	1
303		19	max	.001	3	.008	2	0	10	1.441e-5	10	NC	3	NC	1
304			min	-.001	2	-.007	3	-.002	3	-2.76e-4	3	5788.175	2	NC	1
305	M12	1	max	.001	1	.007	2	.001	3	2.902e-4	3	NC	1	NC	1
306			min	0	3	-.006	3	0	10	-1.483e-5	10	NC	1	NC	1
307		2	max	.001	1	.007	2	.001	3	2.902e-4	3	NC	1	NC	1
308			min	0	3	-.006	3	0	10	-1.483e-5	10	NC	1	NC	1
309		3	max	.001	1	.007	2	.001	3	2.902e-4	3	NC	1	NC	1
310			min	0	3	-.006	3	0	10	-1.483e-5	10	NC	1	NC	1
311		4	max	.001	1	.006	2	0	3	2.902e-4	3	NC	1	NC	1
312			min	0	3	-.005	3	0	10	-1.483e-5	10	NC	1	NC	1
313		5	max	.001	1	.006	2	0	3	2.902e-4	3	NC	1	NC	1
314			min	0	3	-.005	3	0	10	-1.483e-5	10	NC	1	NC	1
315		6	max	.001	1	.005	2	0	3	2.902e-4	3	NC	1	NC	1
316			min	0	3	-.005	3	0	10	-1.483e-5	10	NC	1	NC	1
317		7	max	0	1	.005	2	0	3	2.902e-4	3	NC	1	NC	1
318			min	0	3	-.004	3	0	10	-1.483e-5	10	NC	1	NC	1
319		8	max	0	1	.005	2	0	3	2.902e-4	3	NC	1	NC	1
320			min	0	3	-.004	3	0	10	-1.483e-5	10	NC	1	NC	1
321		9	max	0	1	.004	2	0	3	2.902e-4	3	NC	1	NC	1
322			min	0	3	-.004	3	0	10	-1.483e-5	10	NC	1	NC	1
323		10	max	0	1	.004	2	0	3	2.902e-4	3	NC	1	NC	1
324			min	0	3	-.003	3	0	10	-1.483e-5	10	NC	1	NC	1
325		11	max	0	1	.003	2	0	3	2.902e-4	3	NC	1	NC	1
326			min	0	3	-.003	3	0	10	-1.483e-5	10	NC	1	NC	1
327		12	max	0	1	.003	2	0	3	2.902e-4	3	NC	1	NC	1
328			min	0	3	-.002	3	0	10	-1.483e-5	10	NC	1	NC	1
329		13	max	0	1	.002	2	0	3	2.902e-4	3	NC	1	NC	1
330			min	0	3	-.002	3	0	10	-1.483e-5	10	NC	1	NC	1
331		14	max	0	1	.002	2	0	3	2.902e-4	3	NC	1	NC	1
332			min	0	3	-.002	3	0	10	-1.483e-5	10	NC	1	NC	1
333		15	max	0	1	.002	2	0	3	2.902e-4	3	NC	1	NC	1
334			min	0	3	-.001	3	0	10	-1.483e-5	10	NC	1	NC	1
335		16	max	0	1	.001	2	0	3	2.902e-4	3	NC	1	NC	1
336			min	0	3	-.001	3	0	10	-1.483e-5	10	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	0	2	0	3	2.902e-4	3	NC	1	NC	1
338			min	0	3	0	3	0	10	-1.483e-5	10	NC	1	NC	1
339		18	max	0	1	0	2	0	3	2.902e-4	3	NC	1	NC	1
340			min	0	3	0	3	0	10	-1.483e-5	10	NC	1	NC	1
341		19	max	0	1	0	1	0	1	2.902e-4	3	NC	1	NC	1
342			min	0	1	0	1	0	1	-1.483e-5	10	NC	1	NC	1
343	M1	1	max	.006	3	.022	3	.003	3	4.788e-3	2	NC	1	NC	1
344			min	-.007	2	-.018	2	0	9	-6.83e-3	3	NC	1	NC	1
345		2	max	.006	3	.012	3	.002	3	2.369e-3	2	NC	4	NC	1
346			min	-.007	2	-.01	2	0	9	-3.347e-3	3	5050.397	3	NC	1
347		3	max	.006	3	.003	3	.002	3	7.122e-5	3	NC	4	NC	1
348			min	-.007	2	-.002	2	-.001	9	-5.838e-5	9	2620.75	3	NC	1
349		4	max	.006	3	.005	2	.001	3	6.989e-5	3	NC	4	NC	1
350			min	-.007	2	-.004	3	-.002	1	-4.769e-5	9	1874.106	3	NC	1
351		5	max	.006	3	.011	2	.001	3	6.855e-5	3	NC	4	NC	1
352			min	-.007	2	-.01	3	-.002	1	-3.7e-5	9	1519.388	3	NC	1
353		6	max	.006	3	.016	2	0	3	6.722e-5	3	NC	4	NC	1
354			min	-.007	2	-.015	3	-.001	1	-2.631e-5	9	1322.641	3	NC	1
355		7	max	.006	3	.02	2	0	3	6.589e-5	3	NC	4	NC	1
356			min	-.007	2	-.019	3	-.001	1	-1.562e-5	9	1194.111	2	NC	1
357		8	max	.006	3	.022	2	0	3	6.456e-5	3	NC	4	NC	1
358			min	-.007	2	-.021	3	0	9	-4.928e-6	9	1104.029	2	NC	1
359		9	max	.006	3	.024	2	0	3	6.323e-5	3	NC	4	NC	1
360			min	-.007	2	-.023	3	0	9	-2.268e-6	10	1051.005	2	NC	1
361		10	max	.006	3	.025	2	0	3	6.19e-5	3	NC	4	NC	1
362			min	-.007	2	-.023	3	0	9	-3.864e-6	10	1026.971	2	NC	1
363		11	max	.006	3	.025	2	0	3	6.056e-5	3	NC	4	NC	1
364			min	-.007	2	-.022	3	0	10	-5.46e-6	10	1029.053	2	NC	1
365		12	max	.006	3	.023	2	0	3	6.077e-5	1	NC	4	NC	1
366			min	-.007	2	-.02	3	0	10	-7.055e-6	10	1058.492	2	NC	1
367		13	max	.006	3	.02	2	.001	1	7.393e-5	1	NC	4	NC	1
368			min	-.007	2	-.018	3	0	10	-8.651e-6	10	1121.292	2	NC	1
369		14	max	.006	3	.016	2	.001	1	8.709e-5	1	NC	4	NC	1
370			min	-.007	2	-.014	3	0	10	-1.025e-5	10	1231.24	2	NC	1
371		15	max	.006	3	.011	2	.002	1	1.002e-4	1	NC	4	NC	1
372			min	-.007	2	-.009	3	0	10	-1.184e-5	10	1418.498	2	NC	1
373		16	max	.006	3	.004	2	.001	1	1.103e-4	1	NC	4	NC	1
374			min	-.007	2	-.004	3	0	10	-1.305e-5	10	1756.468	2	NC	1
375		17	max	.006	3	.002	3	.001	1	5.429e-5	3	NC	4	NC	1
376			min	-.007	2	-.004	2	0	10	-5.018e-6	10	2476.792	2	NC	1
377		18	max	.006	3	.009	3	0	3	3.322e-3	2	NC	4	NC	1
378			min	-.007	2	-.013	2	0	10	-1.758e-3	3	4791.119	2	NC	1
379		19	max	.006	3	.017	3	0	3	6.701e-3	2	NC	1	NC	1
380			min	-.007	2	-.023	2	0	9	-3.604e-3	3	NC	1	NC	1
381	M5	1	max	.017	3	.066	3	.003	3	6.859e-6	3	NC	1	NC	1
382			min	-.02	2	-.056	2	0	9	0	15	NC	1	NC	1
383		2	max	.017	3	.037	3	.004	3	1.011e-4	3	NC	4	NC	1
384			min	-.02	2	-.03	2	0	9	-6.658e-6	9	1639.285	3	NC	1
385		3	max	.017	3	.009	3	.005	3	1.936e-4	3	NC	5	NC	1
386			min	-.02	2	-.006	2	0	9	-1.323e-5	9	851.159	3	NC	1
387		4	max	.017	3	.015	2	.006	3	1.895e-4	3	NC	5	NC	1
388			min	-.02	2	-.014	3	0	9	-1.236e-5	9	609.53	3	NC	1
389		5	max	.017	3	.033	2	.007	3	1.854e-4	3	NC	5	NC	1
390			min	-.02	2	-.032	3	0	9	-1.148e-5	9	494.899	3	NC	1
391		6	max	.017	3	.049	2	.007	3	1.813e-4	3	NC	5	NC	1
392			min	-.02	2	-.047	3	0	9	-1.06e-5	9	429.799	2	NC	1
393		7	max	.017	3	.061	2	.007	3	1.772e-4	3	NC	5	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	-.02	2	-.058	3	0	9	-9.723e-6	9	383.429	2	9700.517	3
395		8	max	.017	3	.07	2	.007	3	1.731e-4	3	NC	5	NC	1
396			min	-.02	2	-.066	3	0	9	-8.845e-6	9	354.44	2	9606.645	3
397		9	max	.017	3	.076	2	.007	3	1.691e-4	3	NC	5	NC	1
398			min	-.02	2	-.07	3	0	9	-7.967e-6	9	337.375	2	9837.42	3
399		10	max	.017	3	.078	2	.006	3	1.65e-4	3	NC	5	NC	1
400			min	-.02	2	-.07	3	0	9	-7.089e-6	9	329.636	2	NC	1
401		11	max	.017	3	.077	2	.006	3	1.609e-4	3	NC	5	NC	1
402			min	-.02	2	-.068	3	0	9	-6.212e-6	9	330.296	2	NC	1
403		12	max	.017	3	.072	2	.005	3	1.568e-4	3	NC	5	NC	1
404			min	-.02	2	-.062	3	0	9	-5.334e-6	9	339.752	2	NC	1
405		13	max	.017	3	.064	2	.004	3	1.527e-4	3	NC	5	NC	1
406			min	-.02	2	-.054	3	0	9	-4.456e-6	9	359.933	2	NC	1
407		14	max	.017	3	.051	2	.004	3	1.486e-4	3	NC	5	NC	1
408			min	-.02	2	-.042	3	0	9	-3.579e-6	9	395.266	2	NC	1
409		15	max	.017	3	.034	2	.003	3	1.445e-4	3	NC	5	NC	1
410			min	-.02	2	-.028	3	0	9	-2.701e-6	9	455.441	2	NC	1
411		16	max	.017	3	.014	2	.002	3	1.37e-4	3	NC	5	NC	1
412			min	-.02	2	-.012	3	0	9	-2.358e-6	9	564.034	2	NC	1
413		17	max	.017	3	.007	3	.002	3	4.922e-5	3	NC	5	NC	1
414			min	-.02	2	-.011	2	0	9	-1.473e-5	9	795.436	2	NC	1
415		18	max	.017	3	.028	3	.001	3	2.353e-5	3	NC	4	NC	1
416			min	-.02	2	-.041	2	0	9	-7.588e-6	9	1538.974	2	NC	1
417		19	max	.017	3	.05	3	0	3	0	15	NC	1	NC	1
418			min	-.02	2	-.072	2	0	9	-1.002e-6	3	NC	1	NC	1
419	M9	1	max	.006	3	.021	3	.003	3	6.844e-3	3	NC	1	NC	1
420			min	-.007	2	-.018	2	0	9	-4.788e-3	2	NC	1	NC	1
421		2	max	.006	3	.011	3	.001	3	3.396e-3	3	NC	4	NC	1
422			min	-.007	2	-.01	2	0	10	-2.369e-3	2	5053.425	3	NC	1
423		3	max	.006	3	.003	3	.001	1	5.789e-5	1	NC	4	NC	1
424			min	-.007	2	-.002	2	0	3	-7.119e-6	10	2622.359	3	NC	1
425		4	max	.006	3	.005	2	.002	1	4.472e-5	1	NC	4	NC	1
426			min	-.007	2	-.005	3	-.001	3	-5.532e-6	10	1875.247	3	NC	1
427		5	max	.006	3	.011	2	.002	1	3.155e-5	1	NC	4	NC	1
428			min	-.007	2	-.011	3	-.002	3	-8.68e-6	3	1520.268	3	NC	1
429		6	max	.006	3	.016	2	.001	1	1.839e-5	1	NC	4	NC	1
430			min	-.007	2	-.016	3	-.003	3	-1.88e-5	3	1323.355	3	9356.341	3
431		7	max	.006	3	.02	2	.001	1	5.217e-6	1	NC	4	NC	1
432			min	-.007	2	-.019	3	-.004	3	-2.893e-5	3	1194.359	2	8582.939	3
433		8	max	.006	3	.022	2	0	1	8.172e-7	10	NC	4	NC	1
434			min	-.007	2	-.022	3	-.004	3	-3.905e-5	3	1104.268	2	8168.273	3
435		9	max	.006	3	.024	2	0	1	2.404e-6	10	NC	4	NC	1
436			min	-.007	2	-.023	3	-.004	3	-4.917e-5	3	1051.241	2	8011.009	3
437		10	max	.006	3	.025	2	0	1	3.992e-6	10	NC	4	NC	1
438			min	-.007	2	-.023	3	-.004	3	-5.929e-5	3	1027.21	2	8069.399	3
439		11	max	.006	3	.025	2	0	10	5.579e-6	10	NC	4	NC	1
440			min	-.007	2	-.022	3	-.004	3	-6.942e-5	3	1029.3	2	8338.9	3
441		12	max	.006	3	.023	2	0	10	7.166e-6	10	NC	4	NC	1
442			min	-.007	2	-.021	3	-.004	3	-7.954e-5	3	1058.752	2	8848.165	3
443		13	max	.006	3	.02	2	0	10	8.753e-6	10	NC	4	NC	1
444			min	-.007	2	-.018	3	-.004	3	-8.966e-5	3	1121.574	2	9668.991	3
445		14	max	.006	3	.016	2	0	10	1.034e-5	10	NC	4	NC	1
446			min	-.007	2	-.014	3	-.003	3	-9.979e-5	3	1231.555	2	NC	1
447		15	max	.006	3	.011	2	0	10	1.193e-5	10	NC	4	NC	1
448			min	-.007	2	-.009	3	-.003	3	-1.099e-4	3	1418.863	2	NC	1
449		16	max	.006	3	.004	2	0	10	1.312e-5	10	NC	4	NC	1
450			min	-.007	2	-.004	3	-.002	3	-1.146e-4	3	1756.916	2	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
451		17	max	.006	3	.002	3	0	10	8.718e-6	3	NC	4	NC	1
452			min	-.007	2	-.004	2	-.001	3	-5.038e-5	9	2477.376	2	NC	1
453		18	max	.006	3	.009	3	0	10	1.79e-3	3	NC	4	NC	1
454			min	-.007	2	-.013	2	0	9	-3.322e-3	2	4792.211	2	NC	1
455		19	max	.006	3	.017	3	0	3	3.602e-3	3	NC	1	NC	1
456			min	-.007	2	-.023	2	0	9	-6.702e-3	2	NC	1	NC	1
457	M13	1	max	0	9	.021	3	.006	3	3.598e-3	3	NC	1	NC	1
458			min	-.003	3	-.018	2	-.007	2	-3.116e-3	2	NC	1	NC	1
459		2	max	0	9	.052	3	.004	3	4.437e-3	3	NC	4	NC	1
460			min	-.003	3	-.04	2	-.006	2	-3.846e-3	2	2717.377	3	NC	1
461		3	max	0	9	.078	3	.004	3	5.276e-3	3	NC	4	NC	1
462			min	-.003	3	-.058	2	-.007	2	-4.576e-3	2	1469.041	3	NC	1
463		4	max	0	9	.097	3	.005	9	6.115e-3	3	NC	4	NC	1
464			min	-.003	3	-.072	2	-.007	2	-5.306e-3	2	1110.784	3	NC	1
465		5	max	0	9	.106	3	.006	3	6.954e-3	3	NC	5	NC	1
466			min	-.003	3	-.079	2	-.009	2	-6.035e-3	2	992.291	3	NC	1
467		6	max	0	9	.105	3	.008	3	7.793e-3	3	NC	5	NC	1
468			min	-.003	3	-.079	2	-.011	2	-6.765e-3	2	996.663	3	NC	1
469		7	max	0	9	.097	3	.01	3	8.632e-3	3	NC	4	NC	1
470			min	-.003	3	-.075	2	-.014	2	-7.495e-3	2	1103.608	3	NC	1
471		8	max	0	9	.085	3	.013	3	9.471e-3	3	NC	4	NC	1
472			min	-.003	3	-.067	2	-.017	2	-8.225e-3	2	1325.913	3	8148.225	2
473		9	max	0	9	.072	3	.015	3	1.031e-2	3	NC	4	NC	1
474			min	-.003	3	-.059	2	-.019	2	-8.955e-3	2	1653.718	3	6654.032	2
475		10	max	0	9	.066	3	.017	3	1.115e-2	3	NC	4	NC	4
476			min	-.003	3	-.056	2	-.02	2	-9.685e-3	2	1873.593	3	6172.536	2
477		11	max	0	9	.072	3	.018	3	1.031e-2	3	NC	4	NC	1
478			min	-.003	3	-.059	2	-.019	2	-8.955e-3	2	1653.718	3	6654.052	2
479		12	max	0	9	.085	3	.018	3	9.474e-3	3	NC	4	NC	1
480			min	-.003	3	-.067	2	-.017	2	-8.225e-3	2	1325.913	3	6727.949	3
481		13	max	0	9	.097	3	.018	3	8.637e-3	3	NC	4	NC	1
482			min	-.003	3	-.075	2	-.014	2	-7.495e-3	2	1103.608	3	7116.453	3
483		14	max	0	9	.106	3	.016	3	7.8e-3	3	NC	5	NC	1
484			min	-.003	3	-.079	2	-.011	2	-6.765e-3	2	996.663	3	8096.059	3
485		15	max	0	9	.106	3	.014	3	6.963e-3	3	NC	5	NC	1
486			min	-.003	3	-.079	2	-.009	2	-6.035e-3	2	992.29	3	9993.916	3
487		16	max	0	9	.097	3	.012	3	6.126e-3	3	NC	4	NC	1
488			min	-.003	3	-.072	2	-.007	2	-5.306e-3	2	1110.784	3	NC	1
489		17	max	0	9	.079	3	.01	3	5.289e-3	3	NC	4	NC	1
490			min	-.003	3	-.058	2	-.007	2	-4.576e-3	2	1469.041	3	NC	1
491		18	max	0	9	.052	3	.008	3	4.451e-3	3	NC	4	NC	1
492			min	-.003	3	-.04	2	-.006	2	-3.846e-3	2	2717.376	3	NC	1
493		19	max	0	9	.022	3	.006	3	3.614e-3	3	NC	1	NC	1
494			min	-.003	3	-.018	2	-.007	2	-3.116e-3	2	NC	1	NC	1
495	M16	1	max	0	9	.017	3	.006	3	3.816e-3	2	NC	1	NC	1
496			min	0	3	-.023	2	-.007	2	-2.774e-3	3	NC	1	NC	1
497		2	max	0	9	.033	3	.008	3	4.712e-3	2	NC	4	NC	1
498			min	0	3	-.053	2	-.006	2	-3.39e-3	3	2769.508	2	NC	1
499		3	max	0	9	.047	3	.01	3	5.608e-3	2	NC	4	NC	1
500			min	0	3	-.079	2	-.007	2	-4.006e-3	3	1493.588	2	NC	1
501		4	max	0	9	.058	3	.012	3	6.504e-3	2	NC	4	NC	1
502			min	0	3	-.098	2	-.007	2	-4.622e-3	3	1124.595	2	NC	1
503		5	max	0	9	.063	3	.014	3	7.401e-3	2	NC	5	NC	1
504			min	0	3	-.107	2	-.009	2	-5.238e-3	3	998.067	2	NC	1
505		6	max	0	9	.065	3	.015	3	8.297e-3	2	NC	5	NC	1
506			min	0	3	-.108	2	-.011	2	-5.854e-3	3	992.553	2	8844.996	3
507		7	max	0	9	.062	3	.016	3	9.193e-3	2	NC	4	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
508			min	0	3	-.101	2	-.014	2	-6.47e-3	3	1082.634	2	7869.401	3
509		8	max	0	9	.058	3	.017	3	1.009e-2	2	NC	4	NC	1
510			min	0	3	-.089	2	-.017	2	-7.086e-3	3	1271.97	2	7411.865	3
511		9	max	0	9	.052	3	.017	3	1.099e-2	2	NC	4	NC	1
512			min	0	3	-.078	2	-.019	2	-7.702e-3	3	1541.452	2	6590.101	2
513		10	max	0	9	.05	3	.017	3	1.188e-2	2	NC	4	NC	4
514			min	0	3	-.072	2	-.02	2	-8.318e-3	3	1715.196	2	6116.099	2
515		11	max	0	9	.052	3	.016	3	1.099e-2	2	NC	4	NC	1
516			min	0	3	-.078	2	-.019	2	-7.7e-3	3	1541.452	2	6590.114	2
517		12	max	0	9	.057	3	.015	3	1.009e-2	2	NC	4	NC	1
518			min	0	3	-.089	2	-.017	2	-7.083e-3	3	1271.97	2	8059.122	2
519		13	max	0	9	.062	3	.013	3	9.193e-3	2	NC	4	NC	1
520			min	0	3	-.101	2	-.014	2	-6.465e-3	3	1082.634	2	NC	1
521		14	max	0	9	.065	3	.012	3	8.297e-3	2	NC	5	NC	1
522			min	0	3	-.108	2	-.011	2	-5.847e-3	3	992.553	2	NC	1
523		15	max	0	9	.063	3	.01	3	7.401e-3	2	NC	5	NC	1
524			min	0	3	-.107	2	-.009	2	-5.23e-3	3	998.067	2	NC	1
525		16	max	0	9	.057	3	.009	3	6.505e-3	2	NC	4	NC	1
526			min	0	3	-.098	2	-.007	2	-4.612e-3	3	1124.595	2	NC	1
527		17	max	0	9	.047	3	.008	3	5.609e-3	2	NC	4	NC	1
528			min	0	3	-.079	2	-.007	2	-3.995e-3	3	1493.588	2	NC	1
529		18	max	0	9	.033	3	.007	3	4.713e-3	2	NC	4	NC	1
530			min	0	3	-.054	2	-.006	2	-3.377e-3	3	2769.508	2	NC	1
531		19	max	0	9	.017	3	.006	3	3.817e-3	2	NC	1	NC	1
532			min	0	3	-.023	2	-.007	2	-2.76e-3	3	NC	1	NC	1
533	M15	1	max	0	1	0	1	0	1	3.583e-4	3	NC	1	NC	1
534			min	0	1	0	1	0	1	-4.003e-5	2	NC	1	NC	1
535		2	max	0	3	0	15	0	1	7.422e-4	3	NC	1	NC	1
536			min	0	1	-.002	4	0	3	-4.147e-4	2	NC	1	NC	1
537		3	max	0	3	0	15	.002	1	1.126e-3	3	NC	1	NC	1
538			min	0	1	-.003	4	-.003	3	-7.893e-4	2	NC	1	NC	1
539		4	max	0	3	-.001	15	.005	1	1.51e-3	3	NC	1	NC	4
540			min	0	1	-.004	4	-.006	3	-1.164e-3	2	NC	1	5798.71	3
541		5	max	0	3	-.001	15	.008	1	1.894e-3	3	NC	1	NC	4
542			min	0	1	-.006	4	-.01	3	-1.539e-3	2	9422.892	4	3791.014	3
543		6	max	0	3	-.002	15	.011	1	2.278e-3	3	NC	1	NC	4
544			min	0	1	-.007	4	-.014	3	-1.913e-3	2	7930.359	4	2752.905	3
545		7	max	0	3	-.002	15	.014	2	2.662e-3	3	NC	3	NC	4
546			min	-.001	1	-.008	4	-.018	3	-2.288e-3	2	7032.798	4	2147.782	3
547		8	max	0	3	-.002	15	.018	2	3.046e-3	3	NC	3	NC	4
548			min	-.001	1	-.008	4	-.023	3	-2.662e-3	2	6494.126	4	1768.207	3
549		9	max	0	3	-.002	15	.021	2	3.43e-3	3	NC	3	NC	4
550			min	-.001	1	-.009	4	-.026	3	-3.037e-3	2	6204.181	4	1520.154	3
551		10	max	0	3	-.002	15	.023	2	3.814e-3	3	NC	3	NC	4
552			min	-.002	1	-.009	4	-.03	3	-3.412e-3	2	6112.457	4	1356.524	3
553		11	max	0	3	-.002	15	.025	1	4.198e-3	3	NC	3	NC	4
554			min	-.002	1	-.009	4	-.032	3	-3.786e-3	2	6204.181	4	1252.62	3
555		12	max	0	3	-.002	15	.025	1	4.582e-3	3	NC	3	NC	4
556			min	-.002	1	-.008	4	-.033	3	-4.161e-3	2	6494.126	4	1196.166	3
557		13	max	0	3	-.002	12	.025	1	4.965e-3	3	NC	3	NC	4
558			min	-.002	1	-.008	4	-.032	3	-4.536e-3	2	7032.798	4	1183.512	3
559		14	max	0	3	-.001	12	.023	1	5.349e-3	3	NC	1	NC	4
560			min	-.002	1	-.007	4	-.03	3	-4.91e-3	2	7930.359	4	1219.701	3
561		15	max	.001	3	0	12	.02	1	5.733e-3	3	NC	1	NC	4
562			min	-.003	1	-.006	4	-.025	3	-5.285e-3	2	9422.892	4	1323.58	3
563		16	max	.001	3	0	3	.014	1	6.117e-3	3	NC	1	NC	4
564			min	-.003	1	-.005	4	-.018	3	-5.659e-3	2	NC	1	1546.467	3

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	.001	3	0	3	.007	1	6.501e-3	3	NC	1	NC	4
566			min	-.003	1	-.003	4	-.009	3	-6.034e-3	2	NC	1	2049.478	3
567		18	max	.001	3	.002	2	.004	3	6.885e-3	3	NC	1	NC	4
568			min	-.003	1	-.002	4	-.007	2	-6.409e-3	2	NC	1	3647.767	3
569		19	max	.001	3	.004	2	.02	3	7.269e-3	3	NC	1	NC	1
570			min	-.003	1	0	9	-.021	2	-6.783e-3	2	NC	1	NC	1
571	M16A	1	max	0	2	.001	2	.006	3	2.127e-3	3	NC	1	NC	1
572			min	-.001	3	0	9	-.007	2	-2.17e-3	2	NC	1	NC	1
573		2	max	0	2	0	10	0	9	2.042e-3	3	NC	1	NC	1
574			min	-.001	3	-.002	4	-.002	2	-2.069e-3	2	NC	1	NC	1
575		3	max	0	2	0	15	.003	1	1.956e-3	3	NC	1	NC	4
576			min	-.001	3	-.003	4	-.004	3	-1.967e-3	2	NC	1	5685.713	3
577		4	max	0	2	-.001	15	.005	1	1.871e-3	3	NC	1	NC	4
578			min	-.001	3	-.005	4	-.007	3	-1.866e-3	2	NC	1	4321.42	3
579		5	max	0	2	-.001	15	.007	1	1.786e-3	3	NC	1	NC	4
580			min	-.001	3	-.006	4	-.009	3	-1.765e-3	2	9422.892	4	3729.21	3
581		6	max	0	2	-.002	15	.008	1	1.701e-3	3	NC	1	NC	4
582			min	0	3	-.007	4	-.011	3	-1.664e-3	2	7930.359	4	3469.253	3
583		7	max	0	2	-.002	15	.008	1	1.616e-3	3	NC	3	NC	4
584			min	0	3	-.008	4	-.011	3	-1.562e-3	2	7032.798	4	3403.579	3
585		8	max	0	2	-.002	15	.008	1	1.53e-3	3	NC	3	NC	4
586			min	0	3	-.008	4	-.011	3	-1.461e-3	2	6494.126	4	3484.78	3
587		9	max	0	2	-.002	15	.008	1	1.445e-3	3	NC	3	NC	4
588			min	0	3	-.009	4	-.011	3	-1.36e-3	2	6204.181	4	3706.02	3
589		10	max	0	2	-.002	15	.007	1	1.36e-3	3	NC	3	NC	4
590			min	0	3	-.009	4	-.01	3	-1.259e-3	2	6112.457	4	4089.327	3
591		11	max	0	2	-.002	15	.006	1	1.275e-3	3	NC	3	NC	4
592			min	0	3	-.009	4	-.009	3	-1.157e-3	2	6204.181	4	4690.238	3
593		12	max	0	2	-.002	15	.005	1	1.189e-3	3	NC	3	NC	4
594			min	0	3	-.008	4	-.007	3	-1.056e-3	2	6494.126	4	5619.117	3
595		13	max	0	2	-.002	15	.004	1	1.104e-3	3	NC	3	NC	1
596			min	0	3	-.008	4	-.005	3	-9.55e-4	2	7032.798	4	7095.837	3
597		14	max	0	2	-.002	15	.003	1	1.019e-3	3	NC	1	NC	1
598			min	0	3	-.007	4	-.004	3	-8.538e-4	2	7930.359	4	9594.762	3
599		15	max	0	2	-.001	15	.001	1	9.337e-4	3	NC	1	NC	1
600			min	0	3	-.006	4	-.002	3	-7.525e-4	2	9422.892	4	NC	1
601		16	max	0	2	-.001	15	0	9	8.485e-4	3	NC	1	NC	1
602			min	0	3	-.004	4	-.001	3	-6.513e-4	2	NC	1	NC	1
603		17	max	0	2	0	15	0	4	7.633e-4	3	NC	1	NC	1
604			min	0	3	-.003	4	0	2	-5.501e-4	2	NC	1	NC	1
605		18	max	0	2	0	15	0	4	6.781e-4	3	NC	1	NC	1
606			min	0	3	-.002	4	0	2	-4.488e-4	2	NC	1	NC	1
607		19	max	0	1	0	1	0	1	5.928e-4	3	NC	1	NC	1
608			min	0	1	0	1	0	1	-3.476e-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:			

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

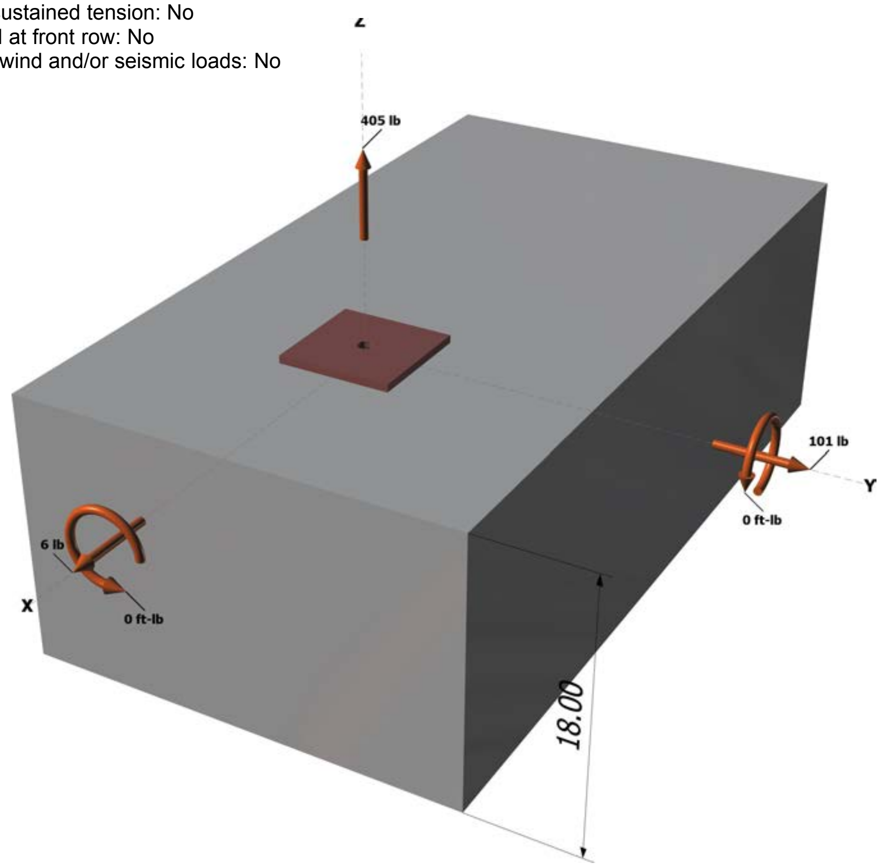
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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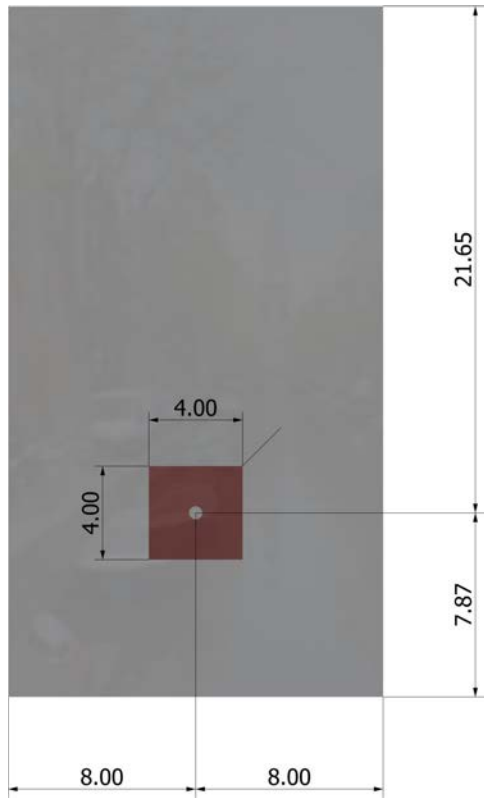


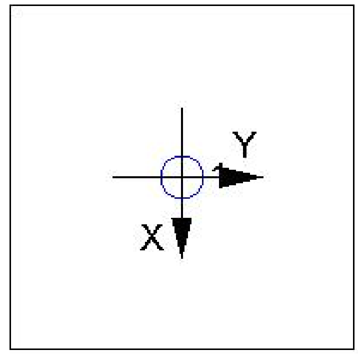
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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, ϕN_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, ϕV_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.

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

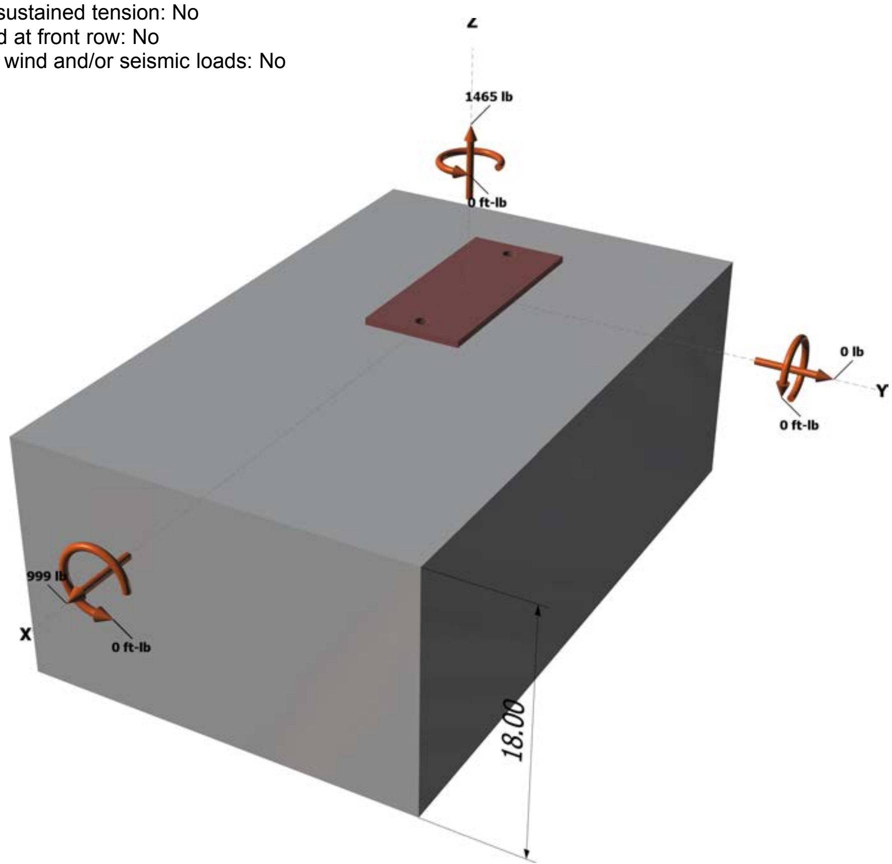
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

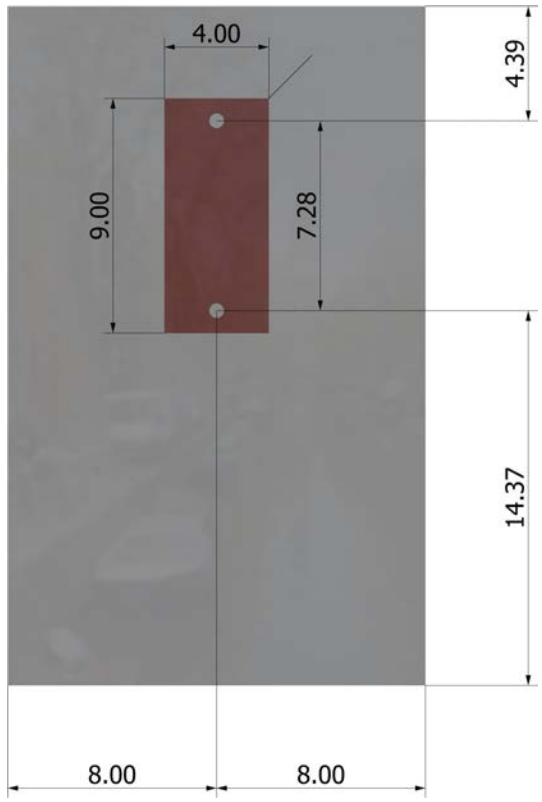
<Figure 1>



Anchor Designer™
Software
Version 2.4.5673.0

Company:	Schletter, Inc.	Date:	12/10/2015
Engineer:	HCV	Page:	2/5
Project:	Standard PVMini - Worst Case		
Address:			
Phone:			
E-mail:			

<Figure 2>



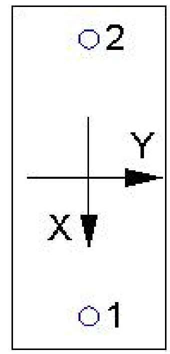
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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, ϕN_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, ϕV_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.