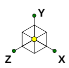
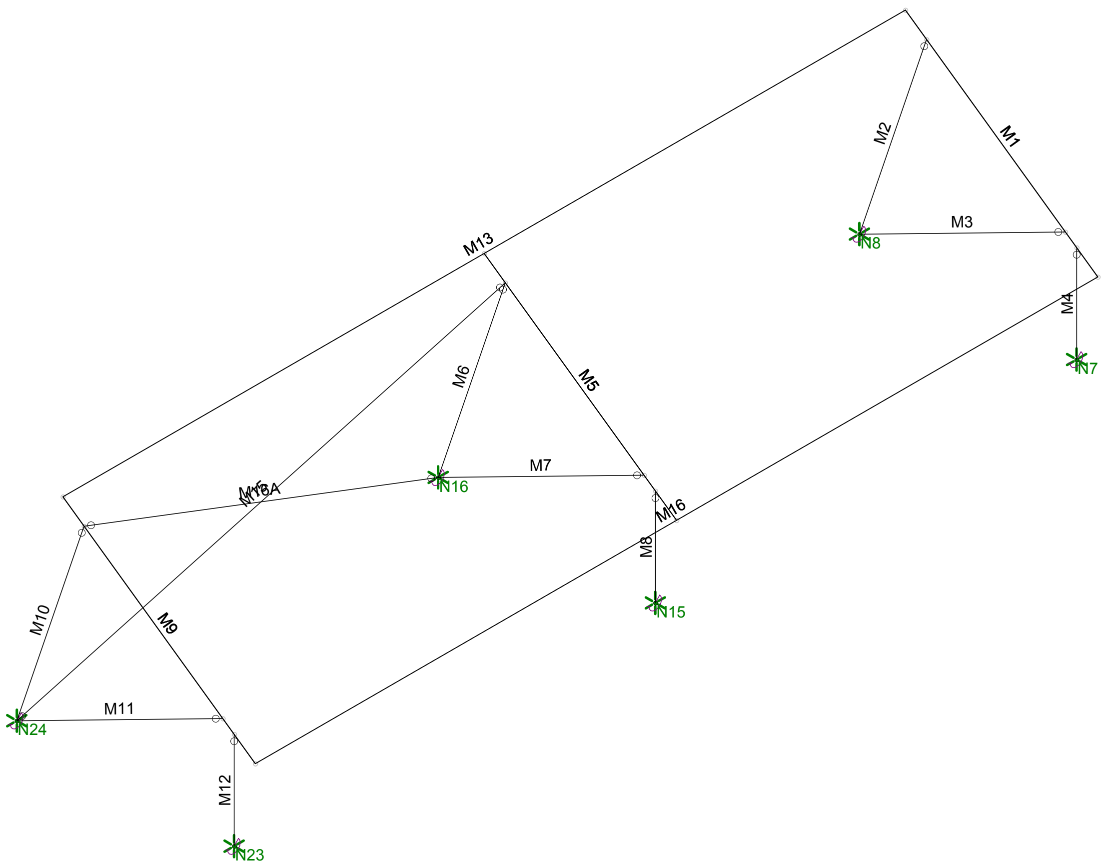




Schletter, Inc.		35° Tilt w/o Seismic Design
HCV	Standard PVMini Racking System	
	Representative Calculations - ASCE 7-05	

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.

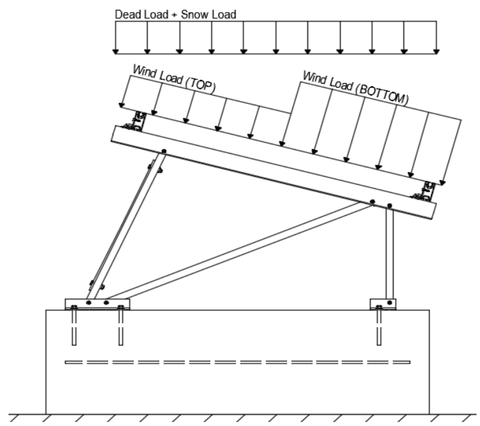
1.2 Construction

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 = 35°
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 =	14.43	psf	*(ASCE 7-05, Eq. 7-2)*
I_s =	1.00		
C_s =	0.64		
C_e =	0.90		
C_t =	1.20		

2.3 Wind Loads

Design Wind Speed, V = 120 mph — Exposure Category = C
Height ≤ 15 ft — Importance Category = II

Peak Velocity Pressure, q_z = 22.61 psf — *Including the gust factor, G=0.85. (ASCE 7-05, Eq. 6-15)*

Pressure Coefficients

$Cf+_{TOP}$ =	1.2	*(Pressure)*	
$Cf+_{BOTTOM}$ =	2		
$Cf-_{TOP}$ =	-2.4	*(Suction)*	
$Cf-_{BOTTOM}$ =	-1.2		

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.

<u>Strength Design, LRFD</u>

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)

<u>Allowable Stress Design, ASD</u>

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	**Diagonal Struts**	Location	**Front Reactions**	Location
M13	Top	M3	Outer	N7	Outer
M16	Bottom	M7	Inner	N15	Inner
		M11	Outer	N23	Outer

Girders	Location	**Rear Struts**	Location	**Rear Reactions**	Location
M1	Outer	M2	Outer	N8	Outer
M5	Inner	M6	Inner	N16	Inner
M9	Outer	M10	Outer	N24	Outer

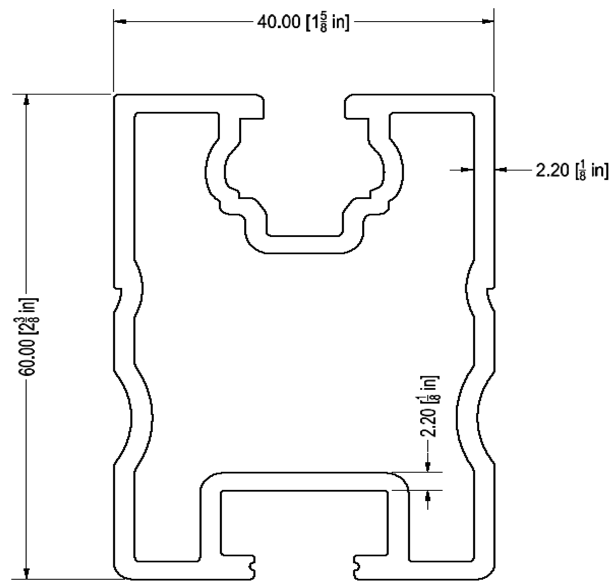
Front Struts	Location	**Bracing**
M4	Outer	M15
M8	Inner	M16A
M12	Outer	

4. MEMBER DESIGN CALCULATIONS

4.1 Purlin Design

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

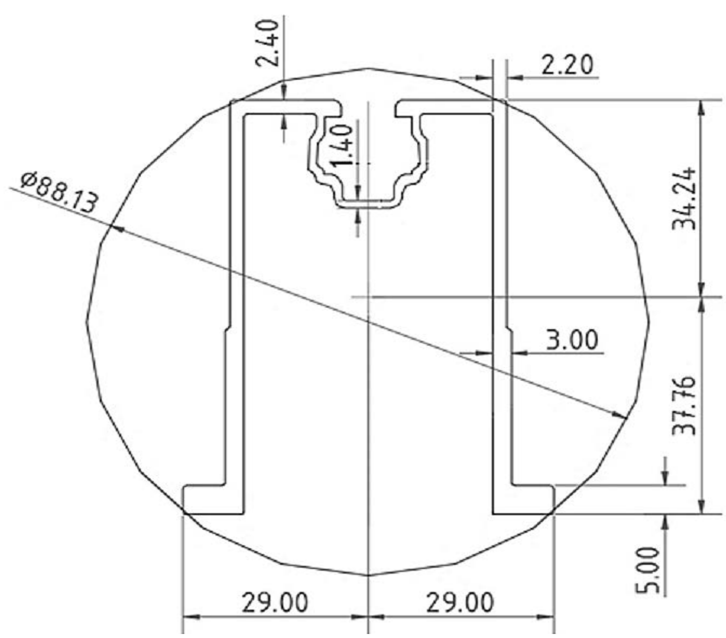
Purlin Type =	**ProfiPlus**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	45	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.87	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	28.47	ksi
S_y =	0.51	in^3
S_x =	0.37	in^3
E =	10100	ksi
I_y =	0.60	in^4
I_x =	0.29	in^4
A =	0.90	in^2
g =	1.08	lbs/ft
M_y =	0.351	k-ft
M_z =	0.037	k-ft
$M_{y\ allowable}$ =	1.271	k-ft
$M_{z\ allowable}$ =	0.871	k-ft
Utilization =	32%	



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).

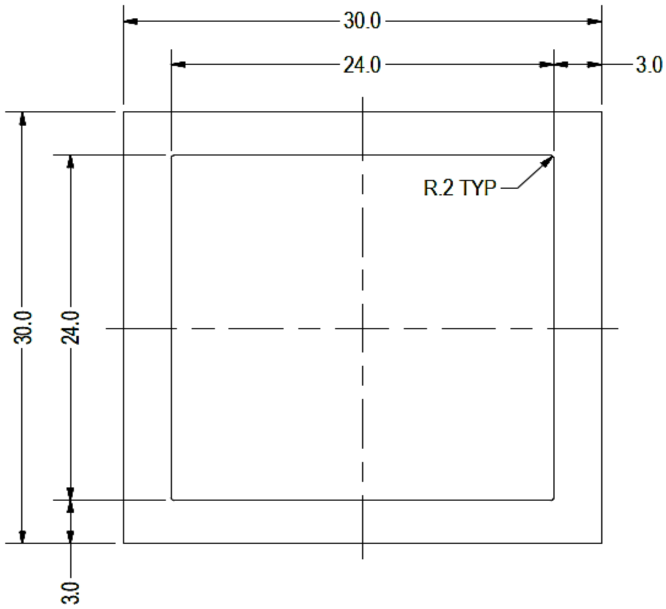
Girder Type =	**Flex Profi**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	33.78	in
$\Phi F_{ty\ AXIAL}$ =	14.29	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.70	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	13.46	ksi
S_y =	0.59	in^3
S_x =	0.46	in^3
E =	10100	ksi
I_y =	0.88	in^4
I_x =	0.52	in^4
A =	0.89	in^2
g =	1.07	lbs/ft
M_y =	0.567	k-ft
M_z =	0.000	k-ft
P_n =	0.263	k
$M_{y\ allowable}$ =	1.457	k-ft
$M_{z\ allowable}$ =	0.513	k-ft
$P_{n\ allowable}$ =	12.764	k
Utilization =	41%	



4.3 Front Strut Design

The front aluminum strut connects a portion of the girder to the foundation. Vertical girder forces are then transferred down through the strut into the foundation. The strut is attached with single M8 bolts at each end. See Appendix A.3 for detailed member calculations. Section units are in (mm).

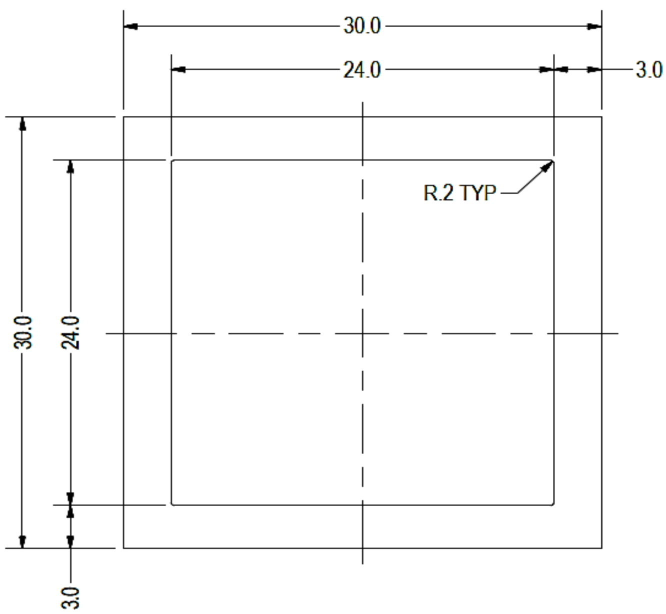
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	18.00	in
$\Phi F_{ty\ AXIAL}$ =	24.52	ksi
$\Phi F_{ty\ BENDING}$ =	31.19	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.632	k
$M_{y\ allowable}$ =	0.423	k-ft
$M_{z\ allowable}$ =	0.423	k-ft
$P_{n\ allowable}$ =	12.310	k
Utilization =	5%	



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).

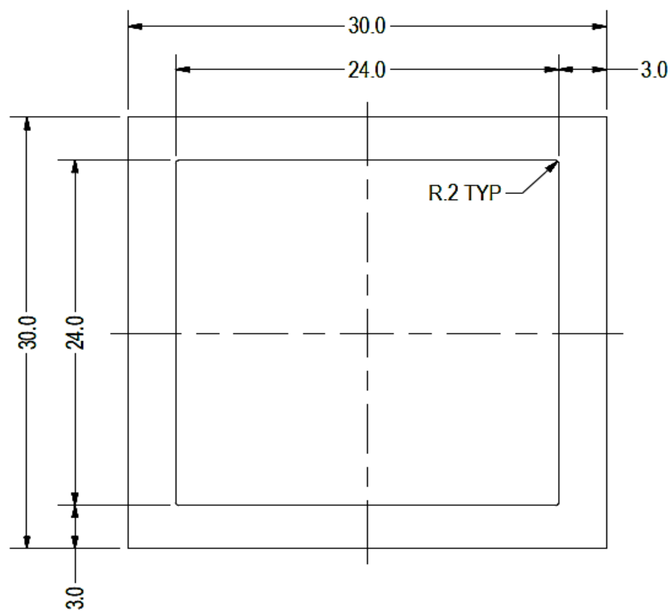
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	46.38	in
$\Phi F_{ty\ AXIAL}$ =	7.60	ksi
$\Phi F_{ty\ BENDING}$ =	29.80	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.736	k
$M_{y\ allowable}$ =	0.404	k-ft
$M_{z\ allowable}$ =	0.404	k-ft
$P_{n\ allowable}$ =	3.814	k
Utilization =	19%	



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).

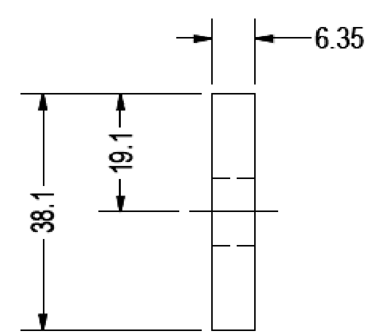
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	42.32	in
$\Phi F_{ty\ AXIAL}$ =	8.86	ksi
$\Phi F_{ty\ BENDING}$ =	29.96	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.599	k
$M_{y\ allowable}$ =	0.406	k-ft
$M_{z\ allowable}$ =	0.406	k-ft
$P_{n\ allowable}$ =	4.450	k
Utilization =	13%	



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 =	0.002	k-ft
P_n =	0.140	k
$M_{y\ allowable}$ =	0.046	k-ft
$P_{n\ allowable}$ =	11.813	k
Utilization =	6%	



A cross brace kit is required every 35 bays and is to be installed in centermost bays.

5. FOUNDATION DESIGN CALCULATIONS

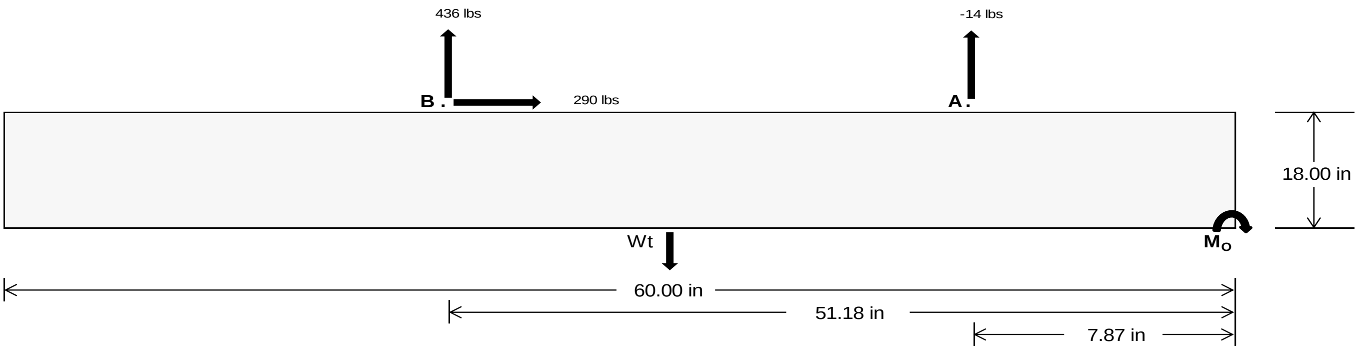
5.1 Helical Pile Foundations

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 =	18.86	1813.74	k
Compressive Load =	821.48	1176.88	k
Lateral Load =	1.60	1206.62	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 = 27403.4 in-lbs
Resisting Force Required = 913.45 lbs
S.F. = 1.67
Weight Required = 1522.41 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 = 289.99 lbs
Friction = 0.4
Weight Required = 724.97 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 = 289.99 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	275 lbs	275 lbs	275 lbs	275 lbs	326 lbs	326 lbs	326 lbs	326 lbs	422 lbs	422 lbs	422 lbs	422 lbs	29 lbs	29 lbs	29 lbs	29 lbs
F_B	175 lbs	175 lbs	175 lbs	175 lbs	532 lbs	532 lbs	532 lbs	532 lbs	512 lbs	512 lbs	512 lbs	512 lbs	-871 lbs	-871 lbs	-871 lbs	-871 lbs
F_V	25 lbs	25 lbs	25 lbs	25 lbs	521 lbs	521 lbs	521 lbs	521 lbs	407 lbs	407 lbs	407 lbs	407 lbs	-580 lbs	-580 lbs	-580 lbs	-580 lbs
P_{total}	2353 lbs	2444 lbs	2534 lbs	2625 lbs	2761 lbs	2852 lbs	2942 lbs	3033 lbs	2837 lbs	2927 lbs	3018 lbs	3109 lbs	299 lbs	354 lbs	408 lbs	463 lbs
M	236 lbs-ft	236 lbs-ft	236 lbs-ft	236 lbs-ft	443 lbs-ft	443 lbs-ft	443 lbs-ft	443 lbs-ft	486 lbs-ft	486 lbs-ft	486 lbs-ft	486 lbs-ft	721 lbs-ft	721 lbs-ft	721 lbs-ft	721 lbs-ft
e	0.10 ft	0.10 ft	0.09 ft	0.09 ft	0.16 ft	0.16 ft	0.15 ft	0.15 ft	0.17 ft	0.17 ft	0.16 ft	0.16 ft	2.41 ft	2.04 ft	1.77 ft	1.56 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}	236.6 psf	235.7 psf	234.9 psf	234.2 psf	254.8 psf	253.1 psf	251.6 psf	250.2 psf	257.5 psf	255.7 psf	254.0 psf	252.5 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	301.2 psf	297.4 psf	294.0 psf	290.8 psf	376.3 psf	369.0 psf	362.5 psf	356.4 psf	390.9 psf	383.0 psf	375.8 psf	369.2 psf	1247.6 psf	278.7 psf	193.6 psf	163.9 psf

Maximum Bearing Pressure = 1248 psf
Allowable Bearing Pressure = 1500 psf

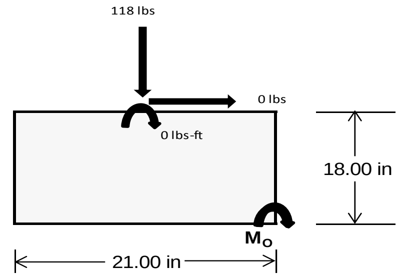
Use a 60in long x 21in wide x 18in tall ballast foundation for an acceptable bearing pressure.

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	51 lbs	118 lbs	48 lbs	142 lbs	378 lbs	139 lbs	15 lbs	34 lbs	14 lbs
F_V	0 lbs	0 lbs	0 lbs	1 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs
P_{total}	2407 lbs	2474 lbs	2404 lbs	2385 lbs	2621 lbs	2382 lbs	704 lbs	723 lbs	703 lbs
M	0 lbs-ft	0 lbs-ft	0 lbs-ft	1 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}	275.0 sqft	282.7 sqft	274.7 sqft	272.3 sqft	299.4 sqft	272.1 sqft	80.4 sqft	82.7 sqft	80.3 sqft
f_{max}	275.2 psf	282.8 psf	274.8 psf	272.8 psf	299.7 psf	272.4 psf	80.5 psf	82.7 psf	80.4 psf

Maximum Bearing Pressure =	300 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.

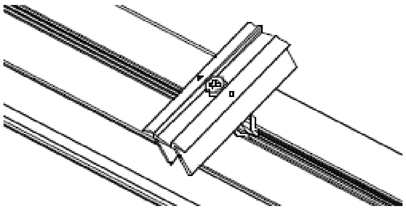
6. DESIGN OF JOINTS AND CONNECTIONS

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.

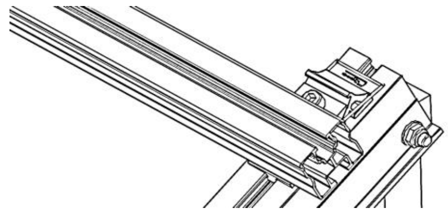
Fastening of Modules to Purlins

Maximum Uplifting Force =	0.819	k
Allowable Uplift =	1.214	k
Utilization =	67%	



Fastening of Purlins to Girders

Maximum Uplifting Force =	1.101	k
Allowable Uplift =	1.116	k
Utilization =	99%	



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 =	0.632	k
M8 Bolt Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	11%	

Rear Strut

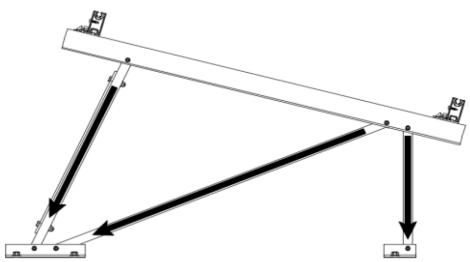
Maximum Axial Load =	1.082	k
M8 Bolt Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	19%	

Diagonal Strut

Maximum Axial Load =	0.736	k
M8 Bolt Shear Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	13%	

Bracing

Maximum Axial Load =	0.140	k
M10 Bolt Capacity =	8.894	k
Strut Bearing Capacity =	7.952	k
Utilization =	2%	



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.

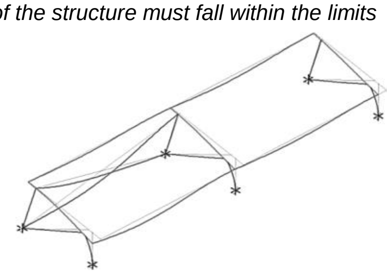
7. SEISMIC DESIGN

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} =	33.11	in
Allowable Story Drift for All Other Structures, Δ = {	$0.020h_{sx}$	
	0.662	in
Max Drift, Δ_{MAX} =	0.005	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 = **<u>ProfiPlus</u>**

Strong Axis:

3.4.14

L_b = 45.00 in

J = 0.255

117.177

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

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 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 = 45.00 in

J = 0.255

121.682

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.8

3.4.16

b/t = 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

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L St$= 29.9 ksi

Ix = 250988 mm^4

0.603 in^4

y = 30 mm

Sx = 0.511 in^3

$M_{max}St$ = 1.271 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

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

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

Girder = **Flex Profi**

Strong Axis:

3.4.11

L_b = 33.78 in

ry = 1.374

Cb = 1.28

21.7681

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

S1 = 1.37733

$$S2 = 1.2C_c$$

S2 = 79.2

φF_L= φb[Bc-Dc*Lb/(1.2*ry*√(Cb))

φF_L= 29.7 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 = 1.28

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= 29.7 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

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_LSt= 29.7 ksi
Ix = 364470 mm^4
0.876 in^4
y = 37.77 mm
Sx = 0.589 in^3
M_{max}St = 1.457 k-ft

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

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

$\varphi F_L =$ 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

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 46.38 in
J = 0.16
121.663

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

S1 = 0.51461

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

S2 = 1701.56
φF_L= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
φF_L= 29.8 ksi

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7
φF_L= φyFcy
φF_L= 33.3 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0
φF_L= 1.17φyFcy
φF_L= 38.9 ksi

3.4.18

h/t = 7.75

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

S1 = 36.9
m = 0.65
C_0 = 15
Cc = 15

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

S2 = 77.3
φF_L= 1.3φyFcy
φF_L= 43.2 ksi

φF_LSt= 29.8 ksi
Ix = 39958.2 mm^4
0.096 in^4
y = 15 mm
Sx = 0.163 in^3
M_{max}St = 0.404 k-ft

Weak Axis:

3.4.14

L_b = 46.38 in
J = 0.16
121.663

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

S1 = 0.51461

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

S2 = 1701.56
φF_L= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
φF_L= 29.8

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7
φF_L= φyFcy
φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9
m = 0.65
C_0 = 15
Cc = 15

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

S2 = 77.3
φF_L= 1.3φyFcy
φF_L= 43.2 ksi

φF_LWk= 33.3 ksi
Iy = 39958.2 mm^4
0.096 in^4
x = 15 mm
Sy = 0.163 in^3
M_{max}Wk = 0.450 k-ft

Compression

3.4.7

$\lambda =$ 1.98863

r = 0.437 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 0.85841

φcc = 0.85841

φF_L= (φccFcy)/(λ^2)

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 = 42.32 in

J = 0.16

111.025

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

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 = 7.75

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

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= 30.0 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

M_{max}St = 0.406 k-ft

Weak Axis:

3.4.14

L_b = 42.32 in

J = 0.16

111.025

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

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

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 33.3 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

M_{max}Wk = 0.450 k-ft

Compression

3.4.7

$\lambda =$ 1.81475

r = 0.437 in

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

$S1^* =$ 0.33515

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

$S2^* =$ 1.23671

$\varphi cc =$ 0.83406

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

$\varphi F_L =$ 8.86409 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

$\varphi F_L =$ 8.86 ksi

A = 323.87 mm^2

0.50 in^2

$P_{max} =$ 4.45 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	-40.249	-40.249	0	0
2	M16	Y	-40.249	-40.249	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	-75.661	-75.661	0	0
2	M16	y	-126.102	-126.102	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	151.323	151.323	0	0
2	M16	y	75.661	75.661	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	273.736	2	295.828	2	.004	10	0	10	0	1	0	1
2		min	-316.729	3	-449.901	3	-.151	3	0	3	0	1	0	1
3	N7	max	.026	3	232.044	1	.042	10	0	10	0	1	0	1
4		min	-.126	2	9.376	15	-.526	1	0	1	0	1	0	1
5	N15	max	.131	3	631.905	1	.12	9	0	9	0	1	0	1
6		min	-1.228	2	20.532	15	-.81	3	-.001	3	0	1	0	1
7	N16	max	842.726	2	905.295	2	0	2	0	9	0	1	0	1
8		min	-928.17	3	-1395.184	3	-100.238	3	0	3	0	1	0	1
9	N23	max	.027	3	232.451	1	.57	1	0	1	0	1	0	1
10		min	-.127	2	9.491	15	-.042	10	0	10	0	1	0	1
11	N24	max	273.737	2	298.182	2	101.192	3	0	9	0	1	0	1
12		min	-317.596	3	-449.576	3	-.004	10	0	3	0	1	0	1
13	Totals:	max	1388.718	2	2495.291	2	0	11						
14		min	-1562.312	3	-2126.482	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	193.598	2	.679	4	.076	1	0	10	0	10	0	1
2			min	-369.621	3	.16	15	-.062	3	0	3	0	1	0	1
3		2	max	193.733	2	.621	4	.076	1	0	10	0	10	0	15
4			min	-369.52	3	.146	15	-.062	3	0	3	0	3	0	4
5		3	max	193.868	2	.564	4	.076	1	0	10	0	10	0	15
6			min	-369.419	3	.133	15	-.062	3	0	3	0	3	0	4
7		4	max	194.003	2	.506	4	.076	1	0	10	0	15	0	15
8			min	-369.318	3	.119	15	-.062	3	0	3	0	3	0	4
9		5	max	194.138	2	.449	4	.076	1	0	10	0	9	0	15
10			min	-369.217	3	.106	15	-.062	3	0	3	0	3	0	4
11		6	max	194.273	2	.391	4	.076	1	0	10	0	9	0	15
12			min	-369.116	3	.092	15	-.062	3	0	3	0	3	0	4
13		7	max	194.407	2	.334	4	.076	1	0	10	0	9	0	15
14			min	-369.014	3	.079	15	-.062	3	0	3	0	3	0	4
15		8	max	194.542	2	.276	4	.076	1	0	10	0	9	0	15
16			min	-368.913	3	.065	15	-.062	3	0	3	0	3	0	4
17		9	max	194.677	2	.219	4	.076	1	0	10	0	9	0	15
18			min	-368.812	3	.051	15	-.062	3	0	3	0	3	0	4
19		10	max	194.812	2	.161	4	.076	1	0	10	0	9	0	15
20			min	-368.711	3	.037	12	-.062	3	0	3	0	3	0	4
21		11	max	194.947	2	.111	2	.076	1	0	10	0	9	0	15
22			min	-368.61	3	.015	12	-.062	3	0	3	0	3	0	4
23		12	max	195.082	2	.066	2	.076	1	0	10	0	9	0	15
24			min	-368.509	3	-.014	3	-.062	3	0	3	0	3	0	4
25		13	max	195.217	2	.022	2	.076	1	0	10	0	9	0	15
26			min	-368.408	3	-.048	3	-.062	3	0	3	0	3	0	4
27		14	max	195.351	2	-.016	15	.076	1	0	10	0	9	0	15
28			min	-368.306	3	-.081	3	-.062	3	0	3	0	3	0	4
29		15	max	195.486	2	-.03	15	.076	1	0	10	0	9	0	15
30			min	-368.205	3	-.126	4	-.062	3	0	3	0	3	0	4
31		16	max	195.621	2	-.043	15	.076	1	0	10	0	9	0	15
32			min	-368.104	3	-.184	4	-.062	3	0	3	0	3	0	4
33		17	max	195.756	2	-.057	15	.076	1	0	10	0	9	0	15
34			min	-368.003	3	-.241	4	-.062	3	0	3	0	3	0	4
35		18	max	195.891	2	-.07	15	.076	1	0	10	0	9	0	15
36			min	-367.902	3	-.299	4	-.062	3	0	3	0	3	0	4
37		19	max	196.026	2	-.084	15	.076	1	0	10	0	9	0	12

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
38			min	-367.801	3	-.356	4	-.062	3	0	3	0	3	0	4
39	M3	1	max	238.902	2	1.736	4	.007	10	0	10	0	1	0	4
40			min	-224.453	3	.408	15	-.114	1	0	1	0	10	0	12
41		2	max	238.832	2	1.56	4	.007	10	0	10	0	1	0	2
42			min	-224.506	3	.367	15	-.114	1	0	1	0	10	0	3
43		3	max	238.762	2	1.383	4	.007	10	0	10	0	1	0	2
44			min	-224.558	3	.325	15	-.114	1	0	1	0	10	0	3
45		4	max	238.692	2	1.207	4	.007	10	0	10	0	1	0	15
46			min	-224.611	3	.284	15	-.114	1	0	1	0	10	0	4
47		5	max	238.622	2	1.03	4	.007	10	0	10	0	1	0	15
48			min	-224.663	3	.242	15	-.114	1	0	1	0	10	0	4
49		6	max	238.552	2	.854	4	.007	10	0	10	0	1	0	15
50			min	-224.716	3	.201	15	-.114	1	0	1	0	10	0	4
51		7	max	238.482	2	.678	4	.007	10	0	10	0	1	0	15
52			min	-224.768	3	.159	15	-.114	1	0	1	0	10	0	4
53		8	max	238.412	2	.501	4	.007	10	0	10	0	1	0	15
54			min	-224.821	3	.118	15	-.114	1	0	1	0	10	-.001	4
55		9	max	238.342	2	.325	4	.007	10	0	10	0	1	0	15
56			min	-224.873	3	.076	15	-.114	1	0	1	0	10	-.001	4
57		10	max	238.272	2	.149	4	.007	10	0	10	0	1	0	15
58			min	-224.926	3	.034	12	-.114	1	0	1	0	10	-.001	4
59		11	max	238.202	2	.006	2	.007	10	0	10	0	1	0	15
60			min	-224.978	3	-.054	3	-.114	1	0	1	0	10	-.001	4
61		12	max	238.132	2	-.048	15	.007	10	0	10	0	1	0	15
62			min	-225.031	3	-.204	4	-.114	1	0	1	0	10	-.001	4
63		13	max	238.062	2	-.089	15	.007	10	0	10	0	1	0	15
64			min	-225.083	3	-.381	4	-.114	1	0	1	0	10	-.001	4
65		14	max	237.992	2	-.131	15	.007	10	0	10	0	1	0	15
66			min	-225.136	3	-.557	4	-.114	1	0	1	0	10	-.001	4
67		15	max	237.922	2	-.172	15	.007	10	0	10	0	1	0	15
68			min	-225.188	3	-.733	4	-.114	1	0	1	0	10	0	4
69		16	max	237.852	2	-.214	15	.007	10	0	10	0	9	0	15
70			min	-225.241	3	-.91	4	-.114	1	0	1	0	10	0	4
71		17	max	237.782	2	-.255	15	.007	10	0	10	0	10	0	15
72			min	-225.293	3	-1.086	4	-.114	1	0	1	0	1	0	4
73		18	max	237.712	2	-.297	15	.007	10	0	10	0	10	0	15
74			min	-225.346	3	-1.262	4	-.114	1	0	1	0	1	0	4
75		19	max	237.642	2	-.338	15	.007	10	0	10	0	10	0	1
76			min	-225.398	3	-1.439	4	-.114	1	0	1	0	1	0	1
77	M4	1	max	230.879	1	0	1	.043	10	0	1	0	3	0	1
78			min	9.024	15	0	1	-.547	1	0	1	0	2	0	1
79		2	max	230.944	1	0	1	.043	10	0	1	0	15	0	1
80			min	9.044	15	0	1	-.547	1	0	1	0	1	0	1
81		3	max	231.008	1	0	1	.043	10	0	1	0	10	0	1
82			min	9.063	15	0	1	-.547	1	0	1	0	1	0	1
83		4	max	231.073	1	0	1	.043	10	0	1	0	10	0	1
84			min	9.083	15	0	1	-.547	1	0	1	0	1	0	1
85		5	max	231.138	1	0	1	.043	10	0	1	0	10	0	1
86			min	9.102	15	0	1	-.547	1	0	1	0	1	0	1
87		6	max	231.203	1	0	1	.043	10	0	1	0	10	0	1
88			min	9.122	15	0	1	-.547	1	0	1	0	1	0	1
89		7	max	231.267	1	0	1	.043	10	0	1	0	10	0	1
90			min	9.141	15	0	1	-.547	1	0	1	0	1	0	1
91		8	max	231.332	1	0	1	.043	10	0	1	0	10	0	1
92			min	9.161	15	0	1	-.547	1	0	1	0	1	0	1
93		9	max	231.397	1	0	1	.043	10	0	1	0	10	0	1
94			min	9.18	15	0	1	-.547	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	231.461	1	0	1	.043	10	0	1	0	10	0	1
96			min	9.2	15	0	1	-.547	1	0	1	0	1	0	1
97		11	max	231.526	1	0	1	.043	10	0	1	0	10	0	1
98			min	9.219	15	0	1	-.547	1	0	1	0	1	0	1
99		12	max	231.591	1	0	1	.043	10	0	1	0	10	0	1
100			min	9.239	15	0	1	-.547	1	0	1	0	1	0	1
101		13	max	231.656	1	0	1	.043	10	0	1	0	10	0	1
102			min	9.259	15	0	1	-.547	1	0	1	0	1	0	1
103		14	max	231.72	1	0	1	.043	10	0	1	0	10	0	1
104			min	9.278	15	0	1	-.547	1	0	1	0	1	0	1
105		15	max	231.785	1	0	1	.043	10	0	1	0	10	0	1
106			min	9.298	15	0	1	-.547	1	0	1	0	1	0	1
107		16	max	231.85	1	0	1	.043	10	0	1	0	10	0	1
108			min	9.317	15	0	1	-.547	1	0	1	0	1	0	1
109		17	max	231.914	1	0	1	.043	10	0	1	0	10	0	1
110			min	9.337	15	0	1	-.547	1	0	1	0	1	0	1
111		18	max	231.979	1	0	1	.043	10	0	1	0	10	0	1
112			min	9.356	15	0	1	-.547	1	0	1	0	1	0	1
113		19	max	232.044	1	0	1	.043	10	0	1	0	10	0	1
114			min	9.376	15	0	1	-.547	1	0	1	0	1	0	1
115	M6	1	max	596.189	2	.679	4	.014	9	0	3	0	3	0	1
116			min	-1081.933	3	.16	15	-.288	3	0	2	0	2	0	1
117		2	max	596.324	2	.622	4	.014	9	0	3	0	3	0	15
118			min	-1081.832	3	.146	15	-.288	3	0	2	0	2	0	4
119		3	max	596.459	2	.564	4	.014	9	0	3	0	3	0	15
120			min	-1081.731	3	.133	15	-.288	3	0	2	0	2	0	4
121		4	max	596.594	2	.507	4	.014	9	0	3	0	3	0	15
122			min	-1081.63	3	.119	15	-.288	3	0	2	0	2	0	4
123		5	max	596.729	2	.449	4	.014	9	0	3	0	3	0	15
124			min	-1081.529	3	.098	12	-.288	3	0	2	0	2	0	4
125		6	max	596.864	2	.397	2	.014	9	0	3	0	3	0	15
126			min	-1081.428	3	.075	12	-.288	3	0	2	0	1	0	4
127		7	max	596.999	2	.352	2	.014	9	0	3	0	3	0	15
128			min	-1081.326	3	.053	12	-.288	3	0	2	0	1	0	4
129		8	max	597.134	2	.307	2	.014	9	0	3	0	9	0	12
130			min	-1081.225	3	.03	12	-.288	3	0	2	0	3	0	4
131		9	max	597.268	2	.262	2	.014	9	0	3	0	9	0	12
132			min	-1081.124	3	.004	3	-.288	3	0	2	0	3	0	4
133		10	max	597.403	2	.218	2	.014	9	0	3	0	9	0	12
134			min	-1081.023	3	-.029	3	-.288	3	0	2	0	3	0	4
135		11	max	597.538	2	.173	2	.014	9	0	3	0	9	0	12
136			min	-1080.922	3	-.063	3	-.288	3	0	2	0	3	0	2
137		12	max	597.673	2	.128	2	.014	9	0	3	0	9	0	12
138			min	-1080.821	3	-.096	3	-.288	3	0	2	0	3	0	2
139		13	max	597.808	2	.083	2	.014	9	0	3	0	9	0	12
140			min	-1080.719	3	-.13	3	-.288	3	0	2	0	3	0	2
141		14	max	597.943	2	.038	2	.014	9	0	3	0	9	0	12
142			min	-1080.618	3	-.164	3	-.288	3	0	2	0	3	0	2
143		15	max	598.078	2	-.006	2	.014	9	0	3	0	9	0	12
144			min	-1080.517	3	-.197	3	-.288	3	0	2	0	3	0	2
145		16	max	598.212	2	-.043	15	.014	9	0	3	0	9	0	12
146			min	-1080.416	3	-.231	3	-.288	3	0	2	0	3	0	2
147		17	max	598.347	2	-.057	15	.014	9	0	3	0	9	0	3
148			min	-1080.315	3	-.264	3	-.288	3	0	2	0	3	0	2
149		18	max	598.482	2	-.07	15	.014	9	0	3	0	9	0	3
150			min	-1080.214	3	-.298	4	-.288	3	0	2	0	3	0	2
151		19	max	598.617	2	-.084	15	.014	9	0	3	0	9	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
152			min	-1080.113	3	-.355	4	-.288	3	0	2	0	3	0	2
153	M7	1	max	735.672	2	1.739	4	.055	3	0	9	0	1	0	2
154			min	-624.42	3	.409	15	-.015	1	0	3	0	3	0	3
155		2	max	735.602	2	1.562	4	.055	3	0	9	0	1	0	2
156			min	-624.472	3	.367	15	-.015	1	0	3	0	3	0	3
157		3	max	735.532	2	1.386	4	.055	3	0	9	0	1	0	2
158			min	-624.525	3	.326	15	-.015	1	0	3	0	3	0	3
159		4	max	735.462	2	1.21	4	.055	3	0	9	0	1	0	2
160			min	-624.577	3	.284	15	-.015	1	0	3	0	3	0	3
161		5	max	735.392	2	1.033	4	.055	3	0	9	0	1	0	15
162			min	-624.63	3	.243	15	-.015	1	0	3	0	3	0	3
163		6	max	735.322	2	.857	4	.055	3	0	9	0	1	0	15
164			min	-624.682	3	.201	15	-.015	1	0	3	0	3	0	4
165		7	max	735.252	2	.68	4	.055	3	0	9	0	1	0	15
166			min	-624.735	3	.16	15	-.015	1	0	3	0	3	0	4
167		8	max	735.182	2	.504	4	.055	3	0	9	0	1	0	15
168			min	-624.787	3	.118	15	-.015	1	0	3	0	3	-.001	4
169		9	max	735.112	2	.338	2	.055	3	0	9	0	1	0	15
170			min	-624.84	3	.062	12	-.015	1	0	3	0	3	-.001	4
171		10	max	735.042	2	.201	2	.055	3	0	9	0	1	0	15
172			min	-624.892	3	-.017	3	-.015	1	0	3	0	3	-.001	4
173		11	max	734.972	2	.063	2	.055	3	0	9	0	1	0	15
174			min	-624.945	3	-.12	3	-.015	1	0	3	0	3	-.001	4
175		12	max	734.902	2	-.047	15	.055	3	0	9	0	1	0	15
176			min	-624.997	3	-.224	3	-.015	1	0	3	0	3	-.001	4
177		13	max	734.832	2	-.089	15	.055	3	0	9	0	1	0	15
178			min	-625.05	3	-.378	4	-.015	1	0	3	0	3	-.001	4
179		14	max	734.762	2	-.13	15	.055	3	0	9	0	1	0	15
180			min	-625.102	3	-.554	4	-.015	1	0	3	0	3	-.001	4
181		15	max	734.692	2	-.172	15	.055	3	0	9	0	1	0	15
182			min	-625.155	3	-.731	4	-.015	1	0	3	0	3	0	4
183		16	max	734.622	2	-.213	15	.055	3	0	9	0	1	0	15
184			min	-625.207	3	-.907	4	-.015	1	0	3	0	3	0	4
185		17	max	734.552	2	-.255	15	.055	3	0	9	0	9	0	15
186			min	-625.26	3	-1.083	4	-.015	1	0	3	0	3	0	4
187		18	max	734.482	2	-.296	15	.055	3	0	9	0	9	0	15
188			min	-625.312	3	-1.26	4	-.015	1	0	3	0	3	0	4
189		19	max	734.412	2	-.338	15	.055	3	0	9	0	9	0	1
190			min	-625.365	3	-1.436	4	-.015	1	0	3	0	3	0	1
191	M8	1	max	630.74	1	0	1	.126	9	0	1	0	2	0	1
192			min	20.181	15	0	1	-.82	3	0	1	0	3	0	1
193		2	max	630.805	1	0	1	.126	9	0	1	0	9	0	1
194			min	20.2	15	0	1	-.82	3	0	1	0	3	0	1
195		3	max	630.87	1	0	1	.126	9	0	1	0	9	0	1
196			min	20.22	15	0	1	-.82	3	0	1	0	3	0	1
197		4	max	630.934	1	0	1	.126	9	0	1	0	9	0	1
198			min	20.239	15	0	1	-.82	3	0	1	0	3	0	1
199		5	max	630.999	1	0	1	.126	9	0	1	0	9	0	1
200			min	20.259	15	0	1	-.82	3	0	1	0	3	0	1
201		6	max	631.064	1	0	1	.126	9	0	1	0	9	0	1
202			min	20.278	15	0	1	-.82	3	0	1	0	3	0	1
203		7	max	631.128	1	0	1	.126	9	0	1	0	9	0	1
204			min	20.298	15	0	1	-.82	3	0	1	0	3	0	1
205		8	max	631.193	1	0	1	.126	9	0	1	0	9	0	1
206			min	20.317	15	0	1	-.82	3	0	1	0	3	0	1
207		9	max	631.258	1	0	1	.126	9	0	1	0	9	0	1
208			min	20.337	15	0	1	-.82	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	631.322	1	0	1	.126	9	0	1	0	9	0	1
210			min	20.357	15	0	1	-.82	3	0	1	0	3	0	1
211		11	max	631.387	1	0	1	.126	9	0	1	0	9	0	1
212			min	20.376	15	0	1	-.82	3	0	1	0	3	0	1
213		12	max	631.452	1	0	1	.126	9	0	1	0	9	0	1
214			min	20.396	15	0	1	-.82	3	0	1	0	3	0	1
215		13	max	631.517	1	0	1	.126	9	0	1	0	9	0	1
216			min	20.415	15	0	1	-.82	3	0	1	0	3	0	1
217		14	max	631.581	1	0	1	.126	9	0	1	0	9	0	1
218			min	20.435	15	0	1	-.82	3	0	1	0	3	0	1
219		15	max	631.646	1	0	1	.126	9	0	1	0	9	0	1
220			min	20.454	15	0	1	-.82	3	0	1	-.001	3	0	1
221		16	max	631.711	1	0	1	.126	9	0	1	0	9	0	1
222			min	20.474	15	0	1	-.82	3	0	1	-.001	3	0	1
223		17	max	631.775	1	0	1	.126	9	0	1	0	9	0	1
224			min	20.493	15	0	1	-.82	3	0	1	-.001	3	0	1
225		18	max	631.84	1	0	1	.126	9	0	1	0	9	0	1
226			min	20.513	15	0	1	-.82	3	0	1	-.001	3	0	1
227		19	max	631.905	1	0	1	.126	9	0	1	0	9	0	1
228			min	20.532	15	0	1	-.82	3	0	1	-.001	3	0	1
229	M10	1	max	194.818	2	.679	4	.004	3	0	1	0	1	0	1
230			min	-274.413	3	.16	15	-.099	1	0	3	0	3	0	1
231		2	max	194.953	2	.621	4	.004	3	0	1	0	1	0	15
232			min	-274.312	3	.146	15	-.099	1	0	3	0	3	0	4
233		3	max	195.088	2	.564	4	.004	3	0	1	0	1	0	15
234			min	-274.211	3	.133	15	-.099	1	0	3	0	3	0	4
235		4	max	195.223	2	.506	4	.004	3	0	1	0	1	0	15
236			min	-274.11	3	.119	15	-.099	1	0	3	0	3	0	4
237		5	max	195.358	2	.449	4	.004	3	0	1	0	1	0	15
238			min	-274.009	3	.106	15	-.099	1	0	3	0	3	0	4
239		6	max	195.492	2	.391	4	.004	3	0	1	0	1	0	15
240			min	-273.908	3	.092	15	-.099	1	0	3	0	3	0	4
241		7	max	195.627	2	.334	4	.004	3	0	1	0	1	0	15
242			min	-273.807	3	.079	15	-.099	1	0	3	0	3	0	4
243		8	max	195.762	2	.276	4	.004	3	0	1	0	9	0	15
244			min	-273.705	3	.065	15	-.099	1	0	3	0	3	0	4
245		9	max	195.897	2	.219	4	.004	3	0	1	0	10	0	15
246			min	-273.604	3	.051	15	-.099	1	0	3	0	3	0	4
247		10	max	196.032	2	.161	4	.004	3	0	1	0	10	0	15
248			min	-273.503	3	.038	15	-.099	1	0	3	0	3	0	4
249		11	max	196.167	2	.111	2	.004	3	0	1	0	10	0	15
250			min	-273.402	3	.02	12	-.099	1	0	3	0	3	0	4
251		12	max	196.302	2	.066	2	.004	3	0	1	0	10	0	15
252			min	-273.301	3	-.005	3	-.099	1	0	3	0	3	0	4
253		13	max	196.437	2	.022	2	.004	3	0	1	0	10	0	15
254			min	-273.2	3	-.038	3	-.099	1	0	3	0	3	0	4
255		14	max	196.571	2	-.016	15	.004	3	0	1	0	10	0	15
256			min	-273.099	3	-.072	3	-.099	1	0	3	0	3	0	4
257		15	max	196.706	2	-.03	15	.004	3	0	1	0	10	0	15
258			min	-272.997	3	-.126	4	-.099	1	0	3	0	3	0	4
259		16	max	196.841	2	-.043	15	.004	3	0	1	0	10	0	15
260			min	-272.896	3	-.184	4	-.099	1	0	3	0	3	0	4
261		17	max	196.976	2	-.057	15	.004	3	0	1	0	10	0	15
262			min	-272.795	3	-.241	4	-.099	1	0	3	0	3	0	4
263		18	max	197.111	2	-.07	15	.004	3	0	1	0	10	0	15
264			min	-272.694	3	-.299	4	-.099	1	0	3	0	3	0	4
265		19	max	197.246	2	-.084	15	.004	3	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	-272.593	3	-.356	4	-.099	1	0	3	0	3	0	4
267	M11	1	max	238.472	2	1.736	4	.116	1	0	3	0	3	0	4
268			min	-225.442	3	.408	15	-.072	3	0	10	0	1	0	12
269		2	max	238.402	2	1.56	4	.116	1	0	3	0	3	0	2
270			min	-225.494	3	.367	15	-.072	3	0	10	0	1	0	3
271		3	max	238.332	2	1.383	4	.116	1	0	3	0	3	0	2
272			min	-225.547	3	.325	15	-.072	3	0	10	0	1	0	3
273		4	max	238.262	2	1.207	4	.116	1	0	3	0	3	0	15
274			min	-225.599	3	.284	15	-.072	3	0	10	0	1	0	4
275		5	max	238.192	2	1.03	4	.116	1	0	3	0	3	0	15
276			min	-225.652	3	.242	15	-.072	3	0	10	0	1	0	4
277		6	max	238.122	2	.854	4	.116	1	0	3	0	3	0	15
278			min	-225.704	3	.201	15	-.072	3	0	10	0	1	0	4
279		7	max	238.052	2	.678	4	.116	1	0	3	0	3	0	15
280			min	-225.757	3	.159	15	-.072	3	0	10	0	1	0	4
281		8	max	237.982	2	.501	4	.116	1	0	3	0	3	0	15
282			min	-225.809	3	.118	15	-.072	3	0	10	0	1	-.001	4
283		9	max	237.912	2	.325	4	.116	1	0	3	0	3	0	15
284			min	-225.862	3	.076	15	-.072	3	0	10	0	1	-.001	4
285		10	max	237.842	2	.149	4	.116	1	0	3	0	3	0	15
286			min	-225.914	3	.034	12	-.072	3	0	10	0	1	-.001	4
287		11	max	237.772	2	.006	2	.116	1	0	3	0	3	0	15
288			min	-225.967	3	-.055	3	-.072	3	0	10	0	1	-.001	4
289		12	max	237.702	2	-.048	15	.116	1	0	3	0	3	0	15
290			min	-226.019	3	-.204	4	-.072	3	0	10	0	1	-.001	4
291		13	max	237.632	2	-.089	15	.116	1	0	3	0	3	0	15
292			min	-226.072	3	-.381	4	-.072	3	0	10	0	1	-.001	4
293		14	max	237.562	2	-.131	15	.116	1	0	3	0	3	0	15
294			min	-226.124	3	-.557	4	-.072	3	0	10	0	1	-.001	4
295		15	max	237.492	2	-.172	15	.116	1	0	3	0	3	0	15
296			min	-226.177	3	-.733	4	-.072	3	0	10	0	1	0	4
297		16	max	237.422	2	-.214	15	.116	1	0	3	0	3	0	15
298			min	-226.229	3	-.91	4	-.072	3	0	10	0	1	0	4
299		17	max	237.352	2	-.255	15	.116	1	0	3	0	3	0	15
300			min	-226.282	3	-1.086	4	-.072	3	0	10	0	10	0	4
301		18	max	237.282	2	-.297	15	.116	1	0	3	0	3	0	15
302			min	-226.334	3	-1.262	4	-.072	3	0	10	0	10	0	4
303		19	max	237.212	2	-.338	15	.116	1	0	3	0	3	0	1
304			min	-226.387	3	-1.439	4	-.072	3	0	10	0	10	0	1
305	M12	1	max	231.286	1	0	1	.593	1	0	1	0	2	0	1
306			min	9.14	15	0	1	-.043	10	0	1	0	3	0	1
307		2	max	231.351	1	0	1	.593	1	0	1	0	1	0	1
308			min	9.159	15	0	1	-.043	10	0	1	0	15	0	1
309		3	max	231.416	1	0	1	.593	1	0	1	0	1	0	1
310			min	9.179	15	0	1	-.043	10	0	1	0	10	0	1
311		4	max	231.481	1	0	1	.593	1	0	1	0	1	0	1
312			min	9.198	15	0	1	-.043	10	0	1	0	10	0	1
313		5	max	231.545	1	0	1	.593	1	0	1	0	1	0	1
314			min	9.218	15	0	1	-.043	10	0	1	0	10	0	1
315		6	max	231.61	1	0	1	.593	1	0	1	0	1	0	1
316			min	9.237	15	0	1	-.043	10	0	1	0	10	0	1
317		7	max	231.675	1	0	1	.593	1	0	1	0	1	0	1
318			min	9.257	15	0	1	-.043	10	0	1	0	10	0	1
319		8	max	231.739	1	0	1	.593	1	0	1	0	1	0	1
320			min	9.276	15	0	1	-.043	10	0	1	0	10	0	1
321		9	max	231.804	1	0	1	.593	1	0	1	0	1	0	1
322			min	9.296	15	0	1	-.043	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	231.869	1	0	1	.593	1	0	1	0	1	0	1
324			min	9.315	15	0	1	-.043	10	0	1	0	10	0	1
325		11	max	231.933	1	0	1	.593	1	0	1	0	1	0	1
326			min	9.335	15	0	1	-.043	10	0	1	0	10	0	1
327		12	max	231.998	1	0	1	.593	1	0	1	0	1	0	1
328			min	9.354	15	0	1	-.043	10	0	1	0	10	0	1
329		13	max	232.063	1	0	1	.593	1	0	1	0	1	0	1
330			min	9.374	15	0	1	-.043	10	0	1	0	10	0	1
331		14	max	232.128	1	0	1	.593	1	0	1	0	1	0	1
332			min	9.393	15	0	1	-.043	10	0	1	0	10	0	1
333		15	max	232.192	1	0	1	.593	1	0	1	0	1	0	1
334			min	9.413	15	0	1	-.043	10	0	1	0	10	0	1
335		16	max	232.257	1	0	1	.593	1	0	1	0	1	0	1
336			min	9.432	15	0	1	-.043	10	0	1	0	10	0	1
337		17	max	232.322	1	0	1	.593	1	0	1	0	1	0	1
338			min	9.452	15	0	1	-.043	10	0	1	0	10	0	1
339		18	max	232.386	1	0	1	.593	1	0	1	0	1	0	1
340			min	9.471	15	0	1	-.043	10	0	1	0	10	0	1
341		19	max	232.451	1	0	1	.593	1	0	1	0	1	0	1
342			min	9.491	15	0	1	-.043	10	0	1	0	10	0	1
343	M1	1	max	71.968	1	346.362	3	.963	10	0	2	.03	1	0	2
344			min	3.387	15	-216.035	2	-15.338	1	0	3	-.002	10	0	3
345		2	max	72.128	1	346.19	3	.963	10	0	2	.027	1	.047	2
346			min	3.435	15	-216.264	2	-15.338	1	0	3	-.002	10	-.075	3
347		3	max	120.114	3	3.933	9	.96	10	0	10	.023	1	.093	2
348			min	-29.385	2	-30.754	2	-15.3	1	0	1	-.001	10	-.149	3
349		4	max	120.234	3	3.742	9	.96	10	0	10	.02	1	.1	2
350			min	-29.225	2	-30.983	2	-15.3	1	0	1	-.001	10	-.147	3
351		5	max	120.354	3	3.551	9	.96	10	0	10	.017	1	.107	2
352			min	-29.065	2	-31.212	2	-15.3	1	0	1	-.001	10	-.146	3
353		6	max	120.474	3	3.361	9	.96	10	0	10	.013	1	.114	2
354			min	-28.905	2	-31.441	2	-15.3	1	0	1	0	10	-.144	3
355		7	max	120.594	3	3.17	9	.96	10	0	10	.01	1	.12	2
356			min	-28.745	2	-31.669	2	-15.3	1	0	1	0	10	-.142	3
357		8	max	120.714	3	2.98	9	.96	10	0	10	.007	1	.127	2
358			min	-28.585	2	-31.898	2	-15.3	1	0	1	0	10	-.14	3
359		9	max	120.834	3	2.789	9	.96	10	0	10	.004	3	.134	2
360			min	-28.424	2	-32.127	2	-15.3	1	0	1	0	10	-.138	3
361		10	max	120.954	3	2.598	9	.96	10	0	10	.002	3	.141	2
362			min	-28.264	2	-32.356	2	-15.3	1	0	1	0	10	-.136	3
363		11	max	121.075	3	2.408	9	.96	10	0	10	0	3	.148	2
364			min	-28.104	2	-32.584	2	-15.3	1	0	1	-.003	1	-.134	3
365		12	max	121.195	3	2.217	9	.96	10	0	10	0	10	.155	2
366			min	-27.944	2	-32.813	2	-15.3	1	0	1	-.007	1	-.132	3
367		13	max	121.315	3	2.026	9	.96	10	0	10	0	10	.163	2
368			min	-27.784	2	-33.042	2	-15.3	1	0	1	-.01	1	-.13	3
369		14	max	121.435	3	1.836	9	.96	10	0	10	0	10	.17	2
370			min	-27.624	2	-33.271	2	-15.3	1	0	1	-.013	1	-.128	3
371		15	max	121.555	3	1.645	9	.96	10	0	10	.001	10	.177	2
372			min	-27.463	2	-33.499	2	-15.3	1	0	1	-.017	1	-.125	3
373		16	max	85.217	2	175.897	2	.967	10	0	1	.001	10	.182	2
374			min	1.645	15	-209.8	3	-15.398	1	0	3	-.02	1	-.121	3
375		17	max	85.377	2	175.669	2	.967	10	0	1	.001	10	.144	2
376			min	1.694	15	-209.971	3	-15.398	1	0	3	-.023	1	-.076	3
377		18	max	-3.434	15	333.234	2	1.01	10	0	3	.002	10	.073	2
378			min	-72.141	1	-173.886	3	-15.959	1	0	2	-.027	1	-.038	3
379		19	max	-3.386	15	333.005	2	1.01	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	-71.98	1	-174.057	3	-15.959	1	0	2	-.03	1	0	3
381	M5	1	max	181.85	1	1092.752	3	0	11	0	9	.014	3	0	3
382			min	-5.284	3	-670.159	2	-91.001	3	0	3	0	11	0	2
383		2	max	182.01	1	1092.58	3	0	11	0	9	0	9	.145	2
384			min	-5.164	3	-670.388	2	-91.001	3	0	3	-.006	3	-.236	3
385		3	max	331.973	3	4.365	9	9.804	3	0	3	0	9	.288	2
386			min	-84.425	2	-99.529	2	-.146	9	0	9	-.025	3	-.468	3
387		4	max	332.093	3	4.175	9	9.804	3	0	3	0	9	.31	2
388			min	-84.264	2	-99.757	2	-.146	9	0	9	-.023	3	-.46	3
389		5	max	332.213	3	3.984	9	9.804	3	0	3	0	9	.331	2
390			min	-84.104	2	-99.986	2	-.146	9	0	9	-.021	3	-.452	3
391		6	max	332.333	3	3.794	9	9.804	3	0	3	0	9	.353	2
392			min	-83.944	2	-100.215	2	-.146	9	0	9	-.019	3	-.444	3
393		7	max	332.453	3	3.603	9	9.804	3	0	3	0	9	.375	2
394			min	-83.784	2	-100.443	2	-.146	9	0	9	-.017	3	-.436	3
395		8	max	332.573	3	3.412	9	9.804	3	0	3	0	9	.396	2
396			min	-83.624	2	-100.672	2	-.146	9	0	9	-.014	3	-.428	3
397		9	max	332.693	3	3.222	9	9.804	3	0	3	0	9	.418	2
398			min	-83.464	2	-100.901	2	-.146	9	0	9	-.012	3	-.42	3
399		10	max	332.814	3	3.031	9	9.804	3	0	3	0	1	.44	2
400			min	-83.303	2	-101.13	2	-.146	9	0	9	-.01	3	-.412	3
401		11	max	332.934	3	2.84	9	9.804	3	0	3	0	2	.462	2
402			min	-83.143	2	-101.358	2	-.146	9	0	9	-.008	3	-.404	3
403		12	max	333.054	3	2.65	9	9.804	3	0	3	0	2	.484	2
404			min	-82.983	2	-101.587	2	-.146	9	0	9	-.006	3	-.396	3
405		13	max	333.174	3	2.459	9	9.804	3	0	3	0	2	.506	2
406			min	-82.823	2	-101.816	2	-.146	9	0	9	-.004	3	-.387	3
407		14	max	333.294	3	2.269	9	9.804	3	0	3	0	2	.528	2
408			min	-82.663	2	-102.045	2	-.146	9	0	9	-.002	3	-.379	3
409		15	max	333.414	3	2.078	9	9.804	3	0	3	0	3	.551	2
410			min	-82.503	2	-102.273	2	-.146	9	0	9	0	9	-.371	3
411		16	max	263.039	2	548.582	2	9.786	3	0	3	.002	3	.567	2
412			min	3.488	15	-591.679	3	-.147	9	0	2	0	9	-.358	3
413		17	max	263.199	2	548.353	2	9.786	3	0	3	.004	3	.448	2
414			min	3.536	15	-591.851	3	-.147	9	0	2	0	9	-.229	3
415		18	max	-2.41	12	1039.332	2	8.961	3	0	2	.006	3	.225	2
416			min	-181.994	1	-529.003	3	-.026	9	0	9	0	9	-.114	3
417		19	max	-2.33	12	1039.103	2	8.961	3	0	2	.008	3	0	3
418			min	-181.834	1	-529.175	3	-.026	9	0	9	0	9	0	2
419	M9	1	max	71.962	1	346.242	3	96.86	3	0	3	.002	10	0	2
420			min	3.379	15	-216.035	2	-.963	10	0	2	-.03	1	0	3
421		2	max	72.122	1	346.07	3	96.86	3	0	3	.002	10	.047	2
422			min	3.427	15	-216.264	2	-.963	10	0	2	-.027	1	-.075	3
423		3	max	119.414	3	3.928	9	15.264	1	0	1	.017	3	.093	2
424			min	-28.937	2	-30.726	2	-2.901	3	0	10	-.023	1	-.149	3
425		4	max	119.534	3	3.737	9	15.264	1	0	1	.017	3	.1	2
426			min	-28.777	2	-30.955	2	-2.901	3	0	10	-.02	1	-.147	3
427		5	max	119.655	3	3.547	9	15.264	1	0	1	.016	3	.107	2
428			min	-28.616	2	-31.183	2	-2.901	3	0	10	-.017	1	-.145	3
429		6	max	119.775	3	3.356	9	15.264	1	0	1	.015	3	.114	2
430			min	-28.456	2	-31.412	2	-2.901	3	0	10	-.013	1	-.144	3
431		7	max	119.895	3	3.166	9	15.264	1	0	1	.015	3	.12	2
432			min	-28.296	2	-31.641	2	-2.901	3	0	10	-.01	1	-.142	3
433		8	max	120.015	3	2.975	9	15.264	1	0	1	.014	3	.127	2
434			min	-28.136	2	-31.87	2	-2.901	3	0	10	-.007	1	-.14	3
435		9	max	120.135	3	2.784	9	15.264	1	0	1	.013	3	.134	2
436			min	-27.976	2	-32.098	2	-2.901	3	0	10	-.003	1	-.138	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	120.255	3	2.594	9	15.264	1	0	1	.013	3	.141	2
438			min	-27.816	2	-32.327	2	-2.901	3	0	10	0	1	-.136	3
439		11	max	120.375	3	2.403	9	15.264	1	0	1	.012	3	.148	2
440			min	-27.655	2	-32.556	2	-2.901	3	0	10	0	10	-.134	3
441		12	max	120.495	3	2.212	9	15.264	1	0	1	.012	3	.155	2
442			min	-27.495	2	-32.784	2	-2.901	3	0	10	0	10	-.132	3
443		13	max	120.616	3	2.022	9	15.264	1	0	1	.011	3	.162	2
444			min	-27.335	2	-33.013	2	-2.901	3	0	10	0	10	-.13	3
445		14	max	120.736	3	1.831	9	15.264	1	0	1	.013	1	.17	2
446			min	-27.175	2	-33.242	2	-2.901	3	0	10	0	10	-.128	3
447		15	max	120.856	3	1.641	9	15.264	1	0	1	.017	1	.177	2
448			min	-27.015	2	-33.471	2	-2.901	3	0	10	-.001	10	-.125	3
449		16	max	85.464	2	175.546	2	15.364	1	0	10	.02	1	.182	2
450			min	1.719	15	-210.532	3	-2.977	3	0	3	-.001	10	-.122	3
451		17	max	85.624	2	175.318	2	15.364	1	0	10	.023	1	.144	2
452			min	1.768	15	-210.704	3	-2.977	3	0	3	-.001	10	-.076	3
453		18	max	-3.426	15	333.234	2	15.971	1	0	2	.027	1	.073	2
454			min	-72.126	1	-173.87	3	-2.483	3	0	3	-.002	10	-.038	3
455		19	max	-3.378	15	333.005	2	15.971	1	0	2	.03	1	0	2
456			min	-71.965	1	-174.042	3	-2.483	3	0	3	-.002	10	0	3
457	M13	1	max	96.851	3	215.954	2	-3.379	15	0	2	.03	1	0	2
458			min	-.963	10	-346.314	3	-71.958	1	0	3	-.002	10	0	3
459		2	max	96.851	3	154.777	2	-2.562	15	0	2	.019	3	.124	3
460			min	-.963	10	-247.13	3	-53.859	1	0	3	-.004	2	-.077	2
461		3	max	96.851	3	93.6	2	-1.135	10	0	2	.014	3	.206	3
462			min	-.963	10	-147.946	3	-35.76	1	0	3	-.015	1	-.129	2
463		4	max	96.851	3	32.422	2	1.122	10	0	2	.01	3	.247	3
464			min	-.963	10	-48.762	3	-17.661	1	0	3	-.026	1	-.155	2
465		5	max	96.851	3	50.422	3	4.869	2	0	2	.006	3	.247	3
466			min	-.963	10	-28.755	2	-8.108	3	0	3	-.029	1	-.156	2
467		6	max	96.851	3	149.606	3	18.537	1	0	2	.003	3	.205	3
468			min	-.963	10	-89.932	2	-6.919	3	0	3	-.025	1	-.131	2
469		7	max	96.851	3	248.79	3	36.636	1	0	2	0	10	.122	3
470			min	-.963	10	-151.11	2	-5.73	3	0	3	-.014	1	-.081	2
471		8	max	96.851	3	347.974	3	54.735	1	0	2	.008	2	0	9
472			min	-.963	10	-212.287	2	-4.541	3	0	3	-.002	3	-.005	2
473		9	max	96.851	3	447.158	3	72.834	1	0	2	.032	1	.096	2
474			min	-.963	10	-273.464	2	-3.352	3	0	3	-.003	3	-.168	3
475		10	max	96.851	3	-6.425	15	90.933	1	0	2	.066	1	.223	2
476			min	-.963	10	-546.342	3	1.74	12	0	3	-.018	3	-.375	3
477		11	max	15.365	1	273.464	2	4.353	3	0	3	.032	1	.096	2
478			min	-.963	10	-447.158	3	-72.827	1	0	2	-.016	3	-.168	3
479		12	max	15.365	1	212.287	2	5.542	3	0	3	.008	2	0	9
480			min	-.963	10	-347.974	3	-54.728	1	0	2	-.014	3	-.005	2
481		13	max	15.365	1	151.11	2	6.731	3	0	3	0	10	.122	3
482			min	-.963	10	-248.79	3	-36.629	1	0	2	-.014	1	-.081	2
483		14	max	15.365	1	89.932	2	7.92	3	0	3	-.001	15	.205	3
484			min	-.963	10	-149.606	3	-18.53	1	0	2	-.025	1	-.131	2
485		15	max	15.365	1	28.755	2	9.109	3	0	3	-.001	15	.247	3
486			min	-.963	10	-50.422	3	-4.869	2	0	2	-.029	1	-.156	2
487		16	max	15.365	1	48.762	3	17.667	1	0	3	0	12	.247	3
488			min	-.963	10	-32.422	2	-1.121	10	0	2	-.026	1	-.155	2
489		17	max	15.365	1	147.946	3	35.766	1	0	3	.003	3	.206	3
490			min	-.963	10	-93.6	2	1.135	10	0	2	-.015	1	-.129	2
491		18	max	15.365	1	247.13	3	53.865	1	0	3	.009	3	.124	3
492			min	-.963	10	-154.777	2	2.57	15	0	2	-.004	2	-.077	2
493		19	max	15.365	1	346.314	3	71.964	1	0	3	.03	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	-.963	10	-215.954	2	3.387	15	0	2	-.002	10	0	3
495	M16	1	max	2.488	3	333.112	2	-3.378	15	0	3	.03	1	0	2
496			min	-15.944	1	-174.079	3	-71.97	1	0	2	-.002	10	0	3
497		2	max	2.488	3	238.307	2	-2.561	15	0	3	.005	9	.062	3
498			min	-15.944	1	-125.336	3	-53.871	1	0	2	-.004	2	-.119	2
499		3	max	2.488	3	143.503	2	-1.16	10	0	3	0	3	.104	3
500			min	-15.944	1	-76.594	3	-35.772	1	0	2	-.015	1	-.199	2
501		4	max	2.488	3	48.698	2	1.096	10	0	3	-.001	15	.126	3
502			min	-15.944	1	-27.851	3	-17.673	1	0	2	-.026	1	-.239	2
503		5	max	2.488	3	20.892	3	4.829	2	0	3	-.001	15	.128	3
504			min	-15.944	1	-46.107	2	-5.308	3	0	2	-.029	1	-.239	2
505		6	max	2.488	3	69.634	3	18.524	1	0	3	-.001	15	.109	3
506			min	-15.944	1	-140.911	2	-4.119	3	0	2	-.025	1	-.2	2
507		7	max	2.488	3	118.377	3	36.623	1	0	3	0	10	.07	3
508			min	-15.944	1	-235.716	2	-2.93	3	0	2	-.014	1	-.122	2
509		8	max	2.488	3	167.12	3	54.722	1	0	3	.008	2	.01	3
510			min	-15.944	1	-330.521	2	-1.741	3	0	2	-.009	3	-.004	2
511		9	max	2.488	3	215.862	3	72.821	1	0	3	.032	1	.154	2
512			min	-15.944	1	-425.325	2	-.552	3	0	2	-.01	3	-.07	3
513		10	max	1.009	10	-6.421	15	90.92	1	0	15	.066	1	.351	2
514			min	-15.944	1	-520.13	2	-2.325	3	0	2	-.01	3	-.17	3
515		11	max	1.009	10	425.325	2	-.898	12	0	2	.032	1	.154	2
516			min	-15.933	1	-215.862	3	-72.806	1	0	3	-.002	3	-.07	3
517		12	max	1.009	10	330.521	2	.053	3	0	2	.008	2	.01	3
518			min	-15.933	1	-167.12	3	-54.707	1	0	3	-.003	3	-.004	2
519		13	max	1.009	10	235.716	2	1.242	3	0	2	0	10	.07	3
520			min	-15.933	1	-118.377	3	-36.608	1	0	3	-.014	1	-.122	2
521		14	max	1.009	10	140.911	2	2.431	3	0	2	-.001	12	.109	3
522			min	-15.933	1	-69.634	3	-18.51	1	0	3	-.025	1	-.2	2
523		15	max	1.009	10	46.107	2	3.62	3	0	2	0	12	.128	3
524			min	-15.933	1	-20.892	3	-4.829	2	0	3	-.029	1	-.239	2
525		16	max	1.009	10	27.851	3	17.688	1	0	2	.001	3	.126	3
526			min	-15.933	1	-48.698	2	-1.096	10	0	3	-.026	1	-.239	2
527		17	max	1.009	10	76.594	3	35.787	1	0	2	.004	3	.104	3
528			min	-15.933	1	-143.503	2	1.161	10	0	3	-.015	1	-.199	2
529		18	max	1.009	10	125.337	3	53.886	1	0	2	.006	3	.062	3
530			min	-15.933	1	-238.307	2	2.569	15	0	3	-.004	2	-.119	2
531		19	max	1.009	10	174.079	3	71.985	1	0	2	.03	1	0	2
532			min	-15.933	1	-333.112	2	3.386	15	0	3	-.002	10	0	3
533	M15	1	max	0	1	.792	3	.149	3	0	1	0	1	0	1
534			min	-138.476	3	0	1	0	1	0	3	0	3	0	1
535		2	max	0	1	.704	3	.149	3	0	1	0	1	0	1
536			min	-138.551	3	0	1	0	1	0	3	0	3	0	3
537		3	max	0	1	.616	3	.149	3	0	1	0	1	0	1
538			min	-138.627	3	0	1	0	1	0	3	0	3	0	3
539		4	max	0	1	.528	3	.149	3	0	1	0	1	0	1
540			min	-138.702	3	0	1	0	1	0	3	0	3	0	3
541		5	max	0	1	.44	3	.149	3	0	1	0	1	0	1
542			min	-138.778	3	0	1	0	1	0	3	0	3	0	3
543		6	max	0	1	.352	3	.149	3	0	1	0	1	0	1
544			min	-138.853	3	0	1	0	1	0	3	0	3	0	3
545		7	max	0	1	.264	3	.149	3	0	1	0	3	0	1
546			min	-138.929	3	0	1	0	1	0	3	0	1	0	3
547		8	max	0	1	.176	3	.149	3	0	1	0	3	0	1
548			min	-139.004	3	0	1	0	1	0	3	0	1	0	3
549		9	max	0	1	.088	3	.149	3	0	1	0	3	0	1
550			min	-139.08	3	0	1	0	1	0	3	0	1	-.001	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	.149	3	0	1	0	3	0	1
552			min	-139.155	3	0	1	0	1	0	3	0	1	-.001	3
553		11	max	0	1	0	1	.149	3	0	1	0	3	0	1
554			min	-139.231	3	-.088	3	0	1	0	3	0	1	-.001	3
555		12	max	0	1	0	1	.149	3	0	1	0	3	0	1
556			min	-139.306	3	-.176	3	0	1	0	3	0	1	0	3
557		13	max	0	1	0	1	.149	3	0	1	0	3	0	1
558			min	-139.382	3	-.264	3	0	1	0	3	0	1	0	3
559		14	max	0	1	0	1	.149	3	0	1	0	3	0	1
560			min	-139.457	3	-.352	3	0	1	0	3	0	1	0	3
561		15	max	0	1	0	1	.149	3	0	1	0	3	0	1
562			min	-139.533	3	-.44	3	0	1	0	3	0	1	0	3
563		16	max	0	1	0	1	.149	3	0	1	0	3	0	1
564			min	-139.609	3	-.528	3	0	1	0	3	0	1	0	3
565		17	max	0	1	0	1	.149	3	0	1	0	3	0	1
566			min	-139.684	3	-.616	3	0	1	0	3	0	1	0	3
567		18	max	0	1	0	1	.149	3	0	1	0	3	0	1
568			min	-139.76	3	-.704	3	0	1	0	3	0	1	0	3
569		19	max	0	1	0	1	.149	3	0	1	0	3	0	1
570			min	-139.835	3	-.792	3	0	1	0	3	0	1	0	1
571	M16A	1	max	0	2	1.356	4	.037	1	0	3	0	3	0	1
572			min	-137.802	3	0	2	-.062	3	0	1	0	1	0	1
573		2	max	0	2	1.205	4	.037	1	0	3	0	3	0	2
574			min	-137.727	3	0	2	-.062	3	0	1	0	1	0	4
575		3	max	0	2	1.054	4	.037	1	0	3	0	3	0	2
576			min	-137.651	3	0	2	-.062	3	0	1	0	1	0	4
577		4	max	0	2	.904	4	.037	1	0	3	0	3	0	2
578			min	-137.576	3	0	2	-.062	3	0	1	0	1	0	4
579		5	max	0	2	.753	4	.037	1	0	3	0	3	0	2
580			min	-137.5	3	0	2	-.062	3	0	1	0	1	-.001	4
581		6	max	0	2	.602	4	.037	1	0	3	0	3	0	2
582			min	-137.425	3	0	2	-.062	3	0	1	0	1	-.001	4
583		7	max	0	2	.452	4	.037	1	0	3	0	3	0	2
584			min	-137.349	3	0	2	-.062	3	0	1	0	1	-.002	4
585		8	max	0	2	.301	4	.037	1	0	3	0	3	0	2
586			min	-137.274	3	0	2	-.062	3	0	1	0	1	-.002	4
587		9	max	0	2	.151	4	.037	1	0	3	0	3	0	2
588			min	-137.198	3	0	2	-.062	3	0	1	0	1	-.002	4
589		10	max	0	2	0	1	.037	1	0	3	0	3	0	2
590			min	-137.123	3	0	1	-.062	3	0	1	0	1	-.002	4
591		11	max	.058	1	0	2	.037	1	0	3	0	3	0	2
592			min	-137.047	3	-.151	4	-.062	3	0	1	0	1	-.002	4
593		12	max	.159	1	0	2	.037	1	0	3	0	3	0	2
594			min	-136.972	3	-.301	4	-.062	3	0	1	0	1	-.002	4
595		13	max	.26	1	0	2	.037	1	0	3	0	1	0	2
596			min	-136.896	3	-.452	4	-.062	3	0	1	0	3	-.002	4
597		14	max	.36	1	0	2	.037	1	0	3	0	1	0	2
598			min	-136.82	3	-.602	4	-.062	3	0	1	0	3	-.001	4
599		15	max	.461	1	0	2	.037	1	0	3	0	1	0	2
600			min	-136.745	3	-.753	4	-.062	3	0	1	0	3	-.001	4
601		16	max	.562	1	0	2	.037	1	0	3	0	1	0	2
602			min	-136.669	3	-.904	4	-.062	3	0	1	0	3	0	4
603		17	max	.671	4	0	2	.037	1	0	3	0	1	0	2
604			min	-136.594	3	-1.054	4	-.062	3	0	1	0	3	0	4
605		18	max	.801	4	0	2	.037	1	0	3	0	1	0	2
606			min	-136.518	3	-1.205	4	-.062	3	0	1	0	3	0	4
607		19	max	.93	4	0	2	.037	1	0	3	0	1	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
608			min	-136.443	3	-1.356	4	-.062	3	0	1	0	3	0	1

Envelope Member Section Deflections

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
1	M2	1	max	.002	2	.011	2	.002	9	1.689e-5	10	NC	3	NC	1
2			min	-.004	3	-.011	3	-.003	3	-2.533e-4	1	3888.002	2	NC	1
3		2	max	.002	2	.01	2	.002	9	1.608e-5	10	NC	3	NC	1
4			min	-.004	3	-.011	3	-.003	3	-2.413e-4	1	4251.022	2	NC	1
5		3	max	.002	2	.009	2	.002	9	1.527e-5	10	NC	3	NC	1
6			min	-.003	3	-.01	3	-.002	3	-2.292e-4	1	4684.139	2	NC	1
7		4	max	.002	2	.008	2	.002	9	1.446e-5	10	NC	1	NC	1
8			min	-.003	3	-.01	3	-.002	3	-2.172e-4	1	5204.413	2	NC	1
9		5	max	.002	2	.007	2	.002	9	1.366e-5	10	NC	1	NC	1
10			min	-.003	3	-.01	3	-.002	3	-2.051e-4	1	5834.62	2	NC	1
11		6	max	.001	2	.006	2	.001	9	1.285e-5	10	NC	1	NC	1
12			min	-.003	3	-.009	3	-.002	3	-1.931e-4	1	6605.653	2	NC	1
13		7	max	.001	2	.006	2	.001	9	1.204e-5	10	NC	1	NC	1
14			min	-.003	3	-.009	3	-.001	3	-1.81e-4	1	7560.201	2	NC	1
15		8	max	.001	2	.005	2	.001	9	1.123e-5	10	NC	1	NC	1
16			min	-.002	3	-.008	3	-.001	3	-1.69e-4	1	8758.556	2	NC	1
17		9	max	.001	2	.004	2	0	9	1.042e-5	10	NC	1	NC	1
18			min	-.002	3	-.007	3	0	3	-1.569e-4	1	NC	1	NC	1
19		10	max	.001	2	.003	2	0	9	9.617e-6	10	NC	1	NC	1
20			min	-.002	3	-.007	3	0	3	-1.449e-4	1	NC	1	NC	1
21		11	max	0	2	.003	2	0	9	8.809e-6	10	NC	1	NC	1
22			min	-.002	3	-.006	3	0	3	-1.329e-4	1	NC	1	NC	1
23		12	max	0	2	.002	2	0	9	8.001e-6	10	NC	1	NC	1
24			min	-.001	3	-.005	3	0	3	-1.208e-4	1	NC	1	NC	1
25		13	max	0	2	.002	2	0	9	7.193e-6	10	NC	1	NC	1
26			min	-.001	3	-.005	3	0	3	-1.088e-4	1	NC	1	NC	1
27		14	max	0	2	.001	2	0	9	6.385e-6	10	NC	1	NC	1
28			min	-.001	3	-.004	3	0	3	-9.672e-5	1	NC	1	NC	1
29		15	max	0	2	0	2	0	9	5.577e-6	10	NC	1	NC	1
30			min	0	3	-.003	3	0	3	-8.467e-5	1	NC	1	NC	1
31		16	max	0	2	0	2	0	9	4.769e-6	10	NC	1	NC	1
32			min	0	3	-.003	3	0	3	-7.263e-5	1	NC	1	NC	1
33		17	max	0	2	0	2	0	9	3.961e-6	10	NC	1	NC	1
34			min	0	3	-.002	3	0	3	-6.058e-5	1	NC	1	NC	1
35		18	max	0	2	0	2	0	9	3.153e-6	10	NC	1	NC	1
36			min	0	3	0	3	0	3	-4.854e-5	1	NC	1	NC	1
37		19	max	0	1	0	1	0	1	2.345e-6	10	NC	1	NC	1
38			min	0	1	0	1	0	1	-3.742e-5	9	NC	1	NC	1
39	M3	1	max	0	1	0	1	0	1	1.793e-5	9	NC	1	NC	1
40			min	0	1	0	1	0	1	-1.129e-6	10	NC	1	NC	1
41		2	max	0	3	0	2	0	10	2.439e-5	1	NC	1	NC	1
42			min	0	2	0	3	0	9	-1.514e-6	10	NC	1	NC	1
43		3	max	0	3	0	2	0	3	3.123e-5	1	NC	1	NC	1
44			min	0	2	-.002	3	0	9	-1.899e-6	10	NC	1	NC	1
45		4	max	0	3	0	2	0	3	3.806e-5	1	NC	1	NC	1
46			min	0	2	-.003	3	0	9	-2.284e-6	10	NC	1	NC	1
47		5	max	0	3	0	2	0	3	4.489e-5	1	NC	1	NC	1
48			min	0	2	-.004	3	0	9	-2.669e-6	10	NC	1	NC	1
49		6	max	0	3	0	2	0	3	5.172e-5	1	NC	1	NC	1
50			min	0	2	-.005	3	0	9	-3.054e-6	10	NC	1	NC	1
51		7	max	0	3	0	2	0	3	5.855e-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	-.005	3	0	9	-3.439e-6	10	NC	1	NC	1
53		8	max	0	3	.001	2	0	3	6.539e-5	1	NC	1	NC	1
54			min	-.001	2	-.006	3	0	9	-3.824e-6	10	NC	1	NC	1
55		9	max	.001	3	.001	2	0	3	7.222e-5	1	NC	1	NC	1
56			min	-.001	2	-.007	3	0	10	-4.209e-6	10	NC	1	NC	1
57		10	max	.001	3	.002	2	0	3	7.905e-5	1	NC	1	NC	1
58			min	-.001	2	-.007	3	0	10	-4.594e-6	10	NC	1	NC	1
59		11	max	.001	3	.002	2	0	1	8.588e-5	1	NC	1	NC	1
60			min	-.002	2	-.008	3	0	10	-4.979e-6	10	NC	1	NC	1
61		12	max	.002	3	.003	2	0	1	9.271e-5	1	NC	1	NC	1
62			min	-.002	2	-.008	3	0	10	-5.364e-6	10	NC	1	NC	1
63		13	max	.002	3	.004	2	0	1	9.954e-5	1	NC	1	NC	1
64			min	-.002	2	-.008	3	0	10	-5.749e-6	10	NC	1	NC	1
65		14	max	.002	3	.005	2	.001	1	1.064e-4	1	NC	1	NC	1
66			min	-.002	2	-.009	3	0	10	-6.134e-6	10	NC	1	NC	1
67		15	max	.002	3	.005	2	.001	1	1.132e-4	1	NC	1	NC	1
68			min	-.002	2	-.009	3	0	10	-6.519e-6	10	8393.561	2	NC	1
69		16	max	.002	3	.006	2	.002	1	1.2e-4	1	NC	1	NC	1
70			min	-.002	2	-.009	3	0	10	-6.904e-6	10	7137.321	2	NC	1
71		17	max	.002	3	.007	2	.002	1	1.269e-4	1	NC	1	NC	1
72			min	-.002	2	-.009	3	0	10	-7.289e-6	10	6160.5	2	NC	1
73		18	max	.002	3	.009	2	.002	1	1.337e-4	1	NC	1	NC	1
74			min	-.003	2	-.009	3	0	10	-7.674e-6	10	5392.752	2	NC	1
75		19	max	.003	3	.01	2	.002	1	1.405e-4	1	NC	3	NC	1
76			min	-.003	2	-.009	3	0	10	-8.059e-6	10	4784.229	2	NC	1
77	M4	1	max	.001	1	.013	2	0	10	1.067e-5	10	NC	1	NC	1
78			min	0	15	-.011	3	-.002	1	-1.782e-4	1	NC	1	NC	1
79		2	max	.001	1	.012	2	0	10	1.067e-5	10	NC	1	NC	1
80			min	0	15	-.011	3	-.002	1	-1.782e-4	1	NC	1	NC	1
81		3	max	0	1	.011	2	0	10	1.067e-5	10	NC	1	NC	1
82			min	0	15	-.01	3	-.001	1	-1.782e-4	1	NC	1	NC	1
83		4	max	0	1	.011	2	0	10	1.067e-5	10	NC	1	NC	1
84			min	0	15	-.009	3	-.001	1	-1.782e-4	1	NC	1	NC	1
85		5	max	0	1	.01	2	0	10	1.067e-5	10	NC	1	NC	1
86			min	0	15	-.009	3	-.001	1	-1.782e-4	1	NC	1	NC	1
87		6	max	0	1	.009	2	0	10	1.067e-5	10	NC	1	NC	1
88			min	0	15	-.008	3	-.001	1	-1.782e-4	1	NC	1	NC	1
89		7	max	0	1	.008	2	0	10	1.067e-5	10	NC	1	NC	1
90			min	0	15	-.007	3	0	1	-1.782e-4	1	NC	1	NC	1
91		8	max	0	1	.008	2	0	10	1.067e-5	10	NC	1	NC	1
92			min	0	15	-.007	3	0	1	-1.782e-4	1	NC	1	NC	1
93		9	max	0	1	.007	2	0	10	1.067e-5	10	NC	1	NC	1
94			min	0	15	-.006	3	0	1	-1.782e-4	1	NC	1	NC	1
95		10	max	0	1	.006	2	0	10	1.067e-5	10	NC	1	NC	1
96			min	0	15	-.006	3	0	1	-1.782e-4	1	NC	1	NC	1
97		11	max	0	1	.006	2	0	10	1.067e-5	10	NC	1	NC	1
98			min	0	15	-.005	3	0	1	-1.782e-4	1	NC	1	NC	1
99		12	max	0	1	.005	2	0	10	1.067e-5	10	NC	1	NC	1
100			min	0	15	-.004	3	0	1	-1.782e-4	1	NC	1	NC	1
101		13	max	0	1	.004	2	0	10	1.067e-5	10	NC	1	NC	1
102			min	0	15	-.004	3	0	1	-1.782e-4	1	NC	1	NC	1
103		14	max	0	1	.004	2	0	10	1.067e-5	10	NC	1	NC	1
104			min	0	15	-.003	3	0	1	-1.782e-4	1	NC	1	NC	1
105		15	max	0	1	.003	2	0	10	1.067e-5	10	NC	1	NC	1
106			min	0	15	-.002	3	0	1	-1.782e-4	1	NC	1	NC	1
107		16	max	0	1	.002	2	0	10	1.067e-5	10	NC	1	NC	1
108			min	0	15	-.002	3	0	1	-1.782e-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	.001	2	0	10	1.067e-5	10	NC	1	NC	1
110			min	0	15	-.001	3	0	1	-1.782e-4	1	NC	1	NC	1
111		18	max	0	1	0	2	0	10	1.067e-5	10	NC	1	NC	1
112			min	0	15	0	3	0	1	-1.782e-4	1	NC	1	NC	1
113		19	max	0	1	0	1	0	1	1.067e-5	10	NC	1	NC	1
114			min	0	1	0	1	0	1	-1.782e-4	1	NC	1	NC	1
115	M6	1	max	.006	2	.034	2	0	9	5.657e-4	3	NC	3	NC	1
116			min	-.011	3	-.033	3	-.008	3	-3.473e-7	9	1253.811	2	5628.012	3
117		2	max	.006	2	.032	2	0	9	5.475e-4	3	NC	3	NC	1
118			min	-.011	3	-.031	3	-.007	3	-1.149e-6	1	1343.617	2	5945.073	3
119		3	max	.006	2	.029	2	0	9	5.292e-4	3	NC	3	NC	1
120			min	-.01	3	-.03	3	-.007	3	-2.089e-6	1	1446.782	2	6326.313	3
121		4	max	.005	2	.027	2	0	9	5.109e-4	3	NC	3	NC	1
122			min	-.009	3	-.028	3	-.006	3	-3.03e-6	1	1565.982	2	6784.81	3
123		5	max	.005	2	.025	2	0	9	4.926e-4	3	NC	3	NC	1
124			min	-.009	3	-.026	3	-.006	3	-3.971e-6	1	1704.663	2	7338.052	3
125		6	max	.005	2	.023	2	0	9	4.743e-4	3	NC	3	NC	1
126			min	-.008	3	-.024	3	-.005	3	-4.911e-6	1	1867.334	2	8009.692	3
127		7	max	.004	2	.021	2	0	9	4.56e-4	3	NC	3	NC	1
128			min	-.008	3	-.023	3	-.005	3	-5.852e-6	1	2060.014	2	8832.24	3
129		8	max	.004	2	.019	2	0	9	4.377e-4	3	NC	3	NC	1
130			min	-.007	3	-.021	3	-.004	3	-6.792e-6	1	2290.908	2	9851.293	3
131		9	max	.003	2	.017	2	0	9	4.194e-4	3	NC	3	NC	1
132			min	-.006	3	-.019	3	-.004	3	-7.733e-6	1	2571.498	2	NC	1
133		10	max	.003	2	.015	2	0	9	4.011e-4	3	NC	3	NC	1
134			min	-.006	3	-.017	3	-.003	3	-8.674e-6	1	2918.364	2	NC	1
135		11	max	.003	2	.013	2	0	9	3.828e-4	3	NC	3	NC	1
136			min	-.005	3	-.015	3	-.003	3	-9.614e-6	1	3356.355	2	NC	1
137		12	max	.002	2	.011	2	0	9	3.645e-4	3	NC	3	NC	1
138			min	-.004	3	-.013	3	-.002	3	-1.055e-5	1	3924.497	2	NC	1
139		13	max	.002	2	.009	2	0	9	3.462e-4	3	NC	3	NC	1
140			min	-.004	3	-.012	3	-.002	3	-1.15e-5	1	4687.784	2	NC	1
141		14	max	.002	2	.007	2	0	9	3.279e-4	3	NC	1	NC	1
142			min	-.003	3	-.01	3	-.002	3	-1.244e-5	1	5763.146	2	NC	1
143		15	max	.001	2	.006	2	0	9	3.096e-4	3	NC	1	NC	1
144			min	-.003	3	-.008	3	-.001	3	-1.338e-5	1	7384.331	2	NC	1
145		16	max	.001	2	.004	2	0	9	2.914e-4	3	NC	1	NC	1
146			min	-.002	3	-.006	3	0	3	-1.432e-5	1	NC	1	NC	1
147		17	max	0	2	.003	2	0	9	2.731e-4	3	NC	1	NC	1
148			min	-.001	3	-.004	3	0	3	-1.526e-5	1	NC	1	NC	1
149		18	max	0	2	.001	2	0	9	2.548e-4	3	NC	1	NC	1
150			min	0	3	-.002	3	0	3	-1.62e-5	1	NC	1	NC	1
151		19	max	0	1	0	1	0	1	2.365e-4	3	NC	1	NC	1
152			min	0	1	0	1	0	1	-1.714e-5	1	NC	1	NC	1
153	M7	1	max	0	1	0	1	0	1	8.217e-6	1	NC	1	NC	1
154			min	0	1	0	1	0	1	-1.126e-4	3	NC	1	NC	1
155		2	max	0	3	.001	2	0	3	7.904e-6	1	NC	1	NC	1
156			min	0	2	-.002	3	0	1	-8.431e-5	3	NC	1	NC	1
157		3	max	0	3	.003	2	.001	3	7.592e-6	1	NC	1	NC	1
158			min	0	2	-.004	3	0	1	-5.602e-5	3	NC	1	NC	1
159		4	max	.001	3	.004	2	.001	3	7.279e-6	1	NC	1	NC	1
160			min	-.001	2	-.006	3	0	1	-2.773e-5	3	NC	1	NC	1
161		5	max	.002	3	.005	2	.002	3	6.966e-6	1	NC	1	NC	1
162			min	-.002	2	-.008	3	0	9	0	2	8680.546	2	NC	1
163		6	max	.002	3	.007	2	.002	3	2.885e-5	3	NC	1	NC	1
164			min	-.002	2	-.01	3	0	9	0	10	6944.191	2	NC	1
165		7	max	.002	3	.008	2	.003	3	5.714e-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	-.003	2	-.012	3	0	9	0	5	5757.721	2	NC	1
167		8	max	.003	3	.009	2	.003	3	8.544e-5	3	NC	1	NC	1
168			min	-.003	2	-.014	3	0	9	-1.823e-7	13	4888.913	2	NC	1
169		9	max	.003	3	.011	2	.003	3	1.137e-4	3	NC	3	NC	1
170			min	-.004	2	-.015	3	0	9	-7.763e-7	9	4221.993	2	NC	1
171		10	max	.004	3	.012	2	.003	3	1.42e-4	3	NC	3	NC	1
172			min	-.004	2	-.017	3	0	9	-1.726e-6	9	3692.725	2	NC	1
173		11	max	.004	3	.014	2	.003	3	1.703e-4	3	NC	3	NC	1
174			min	-.005	2	-.018	3	0	9	-2.676e-6	9	3262.489	2	NC	1
175		12	max	.004	3	.016	2	.004	3	1.986e-4	3	NC	3	NC	1
176			min	-.005	2	-.02	3	0	9	-3.626e-6	9	2906.538	2	NC	1
177		13	max	.005	3	.018	2	.004	3	2.269e-4	3	NC	3	NC	1
178			min	-.006	2	-.021	3	0	9	-4.575e-6	9	2608.156	2	NC	1
179		14	max	.005	3	.02	2	.004	3	2.552e-4	3	NC	3	NC	1
180			min	-.006	2	-.022	3	0	9	-5.525e-6	9	2355.55	2	NC	1
181		15	max	.006	3	.022	2	.004	3	2.835e-4	3	NC	3	NC	1
182			min	-.006	2	-.023	3	0	9	-6.475e-6	9	2140.09	2	NC	1
183		16	max	.006	3	.024	2	.004	3	3.118e-4	3	NC	3	NC	1
184			min	-.007	2	-.024	3	0	9	-7.424e-6	9	1955.271	2	NC	1
185		17	max	.006	3	.026	2	.004	3	3.401e-4	3	NC	3	NC	1
186			min	-.007	2	-.025	3	0	9	-8.374e-6	9	1796.066	2	NC	1
187		18	max	.007	3	.028	2	.004	3	3.683e-4	3	NC	3	NC	1
188			min	-.008	2	-.026	3	0	9	-9.324e-6	9	1658.521	2	NC	1
189		19	max	.007	3	.03	2	.004	3	3.966e-4	3	NC	3	NC	1
190			min	-.008	2	-.027	3	0	9	-1.027e-5	9	1539.477	2	NC	1
191	M8	1	max	.003	1	.039	2	0	9	-1.274e-7	10	NC	1	NC	1
192			min	0	15	-.033	3	-.003	3	-2.877e-4	3	NC	1	7456.858	3
193		2	max	.003	1	.037	2	0	9	-1.274e-7	10	NC	1	NC	1
194			min	0	15	-.031	3	-.002	3	-2.877e-4	3	NC	1	8130.366	3
195		3	max	.003	1	.035	2	0	9	-1.274e-7	10	NC	1	NC	1
196			min	0	15	-.029	3	-.002	3	-2.877e-4	3	NC	1	8932.161	3
197		4	max	.003	1	.033	2	0	9	-1.274e-7	10	NC	1	NC	1
198			min	0	15	-.027	3	-.002	3	-2.877e-4	3	NC	1	9896.037	3
199		5	max	.002	1	.03	2	0	9	-1.274e-7	10	NC	1	NC	1
200			min	0	15	-.026	3	-.002	3	-2.877e-4	3	NC	1	NC	1
201		6	max	.002	1	.028	2	0	9	-1.274e-7	10	NC	1	NC	1
202			min	0	15	-.024	3	-.002	3	-2.877e-4	3	NC	1	NC	1
203		7	max	.002	1	.026	2	0	9	-1.274e-7	10	NC	1	NC	1
204			min	0	15	-.022	3	-.001	3	-2.877e-4	3	NC	1	NC	1
205		8	max	.002	1	.024	2	0	9	-1.274e-7	10	NC	1	NC	1
206			min	0	15	-.02	3	-.001	3	-2.877e-4	3	NC	1	NC	1
207		9	max	.002	1	.022	2	0	9	-1.274e-7	10	NC	1	NC	1
208			min	0	15	-.018	3	0	3	-2.877e-4	3	NC	1	NC	1
209		10	max	.002	1	.02	2	0	9	-1.274e-7	10	NC	1	NC	1
210			min	0	15	-.016	3	0	3	-2.877e-4	3	NC	1	NC	1
211		11	max	.001	1	.017	2	0	9	-1.274e-7	10	NC	1	NC	1
212			min	0	15	-.015	3	0	3	-2.877e-4	3	NC	1	NC	1
213		12	max	.001	1	.015	2	0	9	-1.274e-7	10	NC	1	NC	1
214			min	0	15	-.013	3	0	3	-2.877e-4	3	NC	1	NC	1
215		13	max	.001	1	.013	2	0	9	-1.274e-7	10	NC	1	NC	1
216			min	0	15	-.011	3	0	3	-2.877e-4	3	NC	1	NC	1
217		14	max	0	1	.011	2	0	9	-1.274e-7	10	NC	1	NC	1
218			min	0	15	-.009	3	0	3	-2.877e-4	3	NC	1	NC	1
219		15	max	0	1	.009	2	0	9	-1.274e-7	10	NC	1	NC	1
220			min	0	15	-.007	3	0	3	-2.877e-4	3	NC	1	NC	1
221		16	max	0	1	.007	2	0	9	-1.274e-7	10	NC	1	NC	1
222			min	0	15	-.005	3	0	3	-2.877e-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	1	.004	2	0	9	-1.274e-7	10	NC	1	NC	1
224			min	0	15	-.004	3	0	3	-2.877e-4	3	NC	1	NC	1
225		18	max	0	1	.002	2	0	9	-1.274e-7	10	NC	1	NC	1
226			min	0	15	-.002	3	0	3	-2.877e-4	3	NC	1	NC	1
227		19	max	0	1	0	1	0	1	-1.274e-7	10	NC	1	NC	1
228			min	0	1	0	1	0	1	-2.877e-4	3	NC	1	NC	1
229	M10	1	max	.002	2	.011	2	0	10	2.482e-4	1	NC	3	NC	1
230			min	-.003	3	-.011	3	-.002	1	-6.477e-4	3	3891.149	2	NC	1
231		2	max	.002	2	.01	2	0	10	2.363e-4	1	NC	3	NC	1
232			min	-.003	3	-.011	3	-.002	1	-6.243e-4	3	4254.574	2	NC	1
233		3	max	.002	2	.009	2	0	10	2.244e-4	1	NC	3	NC	1
234			min	-.003	3	-.01	3	-.002	1	-6.009e-4	3	4688.195	2	NC	1
235		4	max	.002	2	.008	2	0	3	2.125e-4	1	NC	1	NC	1
236			min	-.002	3	-.01	3	-.001	1	-5.775e-4	3	5209.104	2	NC	1
237		5	max	.002	2	.007	2	0	3	2.006e-4	1	NC	1	NC	1
238			min	-.002	3	-.009	3	-.001	1	-5.54e-4	3	5840.12	2	NC	1
239		6	max	.001	2	.006	2	0	3	1.887e-4	1	NC	1	NC	1
240			min	-.002	3	-.009	3	-.001	1	-5.306e-4	3	6612.194	2	NC	1
241		7	max	.001	2	.006	2	0	3	1.768e-4	1	NC	1	NC	1
242			min	-.002	3	-.008	3	-.001	1	-5.072e-4	3	7568.104	2	NC	1
243		8	max	.001	2	.005	2	0	3	1.649e-4	1	NC	1	NC	1
244			min	-.002	3	-.008	3	-.001	1	-4.838e-4	3	8768.27	2	NC	1
245		9	max	.001	2	.004	2	0	3	1.53e-4	1	NC	1	NC	1
246			min	-.002	3	-.007	3	0	1	-4.603e-4	3	NC	1	NC	1
247		10	max	.001	2	.003	2	0	3	1.41e-4	1	NC	1	NC	1
248			min	-.001	3	-.007	3	0	1	-4.369e-4	3	NC	1	NC	1
249		11	max	0	2	.003	2	0	3	1.291e-4	1	NC	1	NC	1
250			min	-.001	3	-.006	3	0	1	-4.135e-4	3	NC	1	NC	1
251		12	max	0	2	.002	2	0	3	1.172e-4	1	NC	1	NC	1
252			min	-.001	3	-.005	3	0	1	-3.9e-4	3	NC	1	NC	1
253		13	max	0	2	.002	2	0	3	1.053e-4	1	NC	1	NC	1
254			min	0	3	-.005	3	0	1	-3.666e-4	3	NC	1	NC	1
255		14	max	0	2	.001	2	0	3	9.344e-5	1	NC	1	NC	1
256			min	0	3	-.004	3	0	1	-3.432e-4	3	NC	1	NC	1
257		15	max	0	2	0	2	0	3	8.154e-5	1	NC	1	NC	1
258			min	0	3	-.003	3	0	1	-3.198e-4	3	NC	1	NC	1
259		16	max	0	2	0	2	0	3	6.964e-5	1	NC	1	NC	1
260			min	0	3	-.003	3	0	1	-2.963e-4	3	NC	1	NC	1
261		17	max	0	2	0	2	0	3	5.774e-5	1	NC	1	NC	1
262			min	0	3	-.002	3	0	1	-2.729e-4	3	NC	1	NC	1
263		18	max	0	2	0	2	0	3	4.584e-5	1	NC	1	NC	1
264			min	0	3	0	3	0	1	-2.495e-4	3	NC	1	NC	1
265		19	max	0	1	0	1	0	1	3.393e-5	1	NC	1	NC	1
266			min	0	1	0	1	0	1	-2.26e-4	3	NC	1	NC	1
267	M11	1	max	0	1	0	1	0	1	1.082e-4	3	NC	1	NC	1
268			min	0	1	0	1	0	1	-1.633e-5	1	NC	1	NC	1
269		2	max	0	3	0	2	0	1	8.124e-5	3	NC	1	NC	1
270			min	0	2	0	3	0	3	-2.342e-5	1	NC	1	NC	1
271		3	max	0	3	0	2	0	1	5.424e-5	3	NC	1	NC	1
272			min	0	2	-.002	3	0	3	-3.051e-5	1	NC	1	NC	1
273		4	max	0	3	0	2	0	1	2.724e-5	3	NC	1	NC	1
274			min	0	2	-.003	3	-.001	3	-3.76e-5	1	NC	1	NC	1
275		5	max	0	3	0	2	0	1	2.712e-6	10	NC	1	NC	1
276			min	0	2	-.004	3	-.002	3	-4.468e-5	1	NC	1	NC	1
277		6	max	0	3	0	2	0	10	3.108e-6	10	NC	1	NC	1
278			min	0	2	-.005	3	-.002	3	-5.177e-5	1	NC	1	NC	1
279		7	max	0	3	0	2	0	10	3.504e-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	-.005	3	-.002	3	-5.886e-5	1	NC	1	NC	1
281		8	max	0	3	.001	2	0	10	3.9e-6	10	NC	1	NC	1
282			min	-.001	2	-.006	3	-.003	3	-8.075e-5	3	NC	1	NC	1
283		9	max	.001	3	.001	2	0	10	4.296e-6	10	NC	1	NC	1
284			min	-.001	2	-.007	3	-.003	3	-1.077e-4	3	NC	1	NC	1
285		10	max	.001	3	.002	2	0	10	4.691e-6	10	NC	1	NC	1
286			min	-.001	2	-.007	3	-.003	3	-1.347e-4	3	NC	1	NC	1
287		11	max	.001	3	.002	2	0	10	5.087e-6	10	NC	1	NC	1
288			min	-.002	2	-.008	3	-.003	3	-1.617e-4	3	NC	1	NC	1
289		12	max	.002	3	.003	2	0	10	5.483e-6	10	NC	1	NC	1
290			min	-.002	2	-.008	3	-.003	3	-1.887e-4	3	NC	1	NC	1
291		13	max	.002	3	.004	2	0	10	5.879e-6	10	NC	1	NC	1
292			min	-.002	2	-.009	3	-.003	3	-2.157e-4	3	NC	1	NC	1
293		14	max	.002	3	.005	2	0	10	6.275e-6	10	NC	1	NC	1
294			min	-.002	2	-.009	3	-.003	3	-2.427e-4	3	NC	1	NC	1
295		15	max	.002	3	.005	2	0	10	6.671e-6	10	NC	1	NC	1
296			min	-.002	2	-.009	3	-.003	3	-2.697e-4	3	8404.567	2	NC	1
297		16	max	.002	3	.006	2	0	10	7.067e-6	10	NC	1	NC	1
298			min	-.002	2	-.009	3	-.003	3	-2.967e-4	3	7145.839	2	NC	1
299		17	max	.002	3	.007	2	0	10	7.463e-6	10	NC	1	NC	1
300			min	-.002	2	-.009	3	-.003	3	-3.237e-4	3	6167.264	2	NC	1
301		18	max	.002	3	.009	2	0	10	7.859e-6	10	NC	1	NC	1
302			min	-.003	2	-.009	3	-.003	3	-3.507e-4	3	5398.255	2	NC	1
303		19	max	.003	3	.01	2	0	10	8.255e-6	10	NC	3	NC	1
304			min	-.003	2	-.009	3	-.003	3	-3.777e-4	3	4788.812	2	NC	1
305	M12	1	max	.001	1	.013	2	.002	1	4.349e-4	3	NC	1	NC	1
306			min	0	15	-.011	3	0	10	-1.093e-5	10	NC	1	NC	1
307		2	max	.001	1	.012	2	.002	1	4.349e-4	3	NC	1	NC	1
308			min	0	15	-.011	3	0	10	-1.093e-5	10	NC	1	NC	1
309		3	max	0	1	.011	2	.002	1	4.349e-4	3	NC	1	NC	1
310			min	0	15	-.01	3	0	10	-1.093e-5	10	NC	1	NC	1
311		4	max	0	1	.01	2	.001	1	4.349e-4	3	NC	1	NC	1
312			min	0	15	-.009	3	0	10	-1.093e-5	10	NC	1	NC	1
313		5	max	0	1	.01	2	.001	1	4.349e-4	3	NC	1	NC	1
314			min	0	15	-.009	3	0	10	-1.093e-5	10	NC	1	NC	1
315		6	max	0	1	.009	2	.001	1	4.349e-4	3	NC	1	NC	1
316			min	0	15	-.008	3	0	10	-1.093e-5	10	NC	1	NC	1
317		7	max	0	1	.008	2	0	1	4.349e-4	3	NC	1	NC	1
318			min	0	15	-.008	3	0	10	-1.093e-5	10	NC	1	NC	1
319		8	max	0	1	.008	2	0	1	4.349e-4	3	NC	1	NC	1
320			min	0	15	-.007	3	0	10	-1.093e-5	10	NC	1	NC	1
321		9	max	0	1	.007	2	0	1	4.349e-4	3	NC	1	NC	1
322			min	0	15	-.006	3	0	10	-1.093e-5	10	NC	1	NC	1
323		10	max	0	1	.006	2	0	1	4.349e-4	3	NC	1	NC	1
324			min	0	15	-.006	3	0	10	-1.093e-5	10	NC	1	NC	1
325		11	max	0	1	.006	2	0	1	4.349e-4	3	NC	1	NC	1
326			min	0	15	-.005	3	0	10	-1.093e-5	10	NC	1	NC	1
327		12	max	0	1	.005	2	0	1	4.349e-4	3	NC	1	NC	1
328			min	0	15	-.004	3	0	10	-1.093e-5	10	NC	1	NC	1
329		13	max	0	1	.004	2	0	1	4.349e-4	3	NC	1	NC	1
330			min	0	15	-.004	3	0	10	-1.093e-5	10	NC	1	NC	1
331		14	max	0	1	.003	2	0	1	4.349e-4	3	NC	1	NC	1
332			min	0	15	-.003	3	0	10	-1.093e-5	10	NC	1	NC	1
333		15	max	0	1	.003	2	0	1	4.349e-4	3	NC	1	NC	1
334			min	0	15	-.003	3	0	10	-1.093e-5	10	NC	1	NC	1
335		16	max	0	1	.002	2	0	1	4.349e-4	3	NC	1	NC	1
336			min	0	15	-.002	3	0	10	-1.093e-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	.001	2	0	1	4.349e-4	3	NC	1	NC	1
338			min	0	15	-.001	3	0	10	-1.093e-5	10	NC	1	NC	1
339		18	max	0	1	0	2	0	1	4.349e-4	3	NC	1	NC	1
340			min	0	15	0	3	0	10	-1.093e-5	10	NC	1	NC	1
341		19	max	0	1	0	1	0	1	4.349e-4	3	NC	1	NC	1
342			min	0	1	0	1	0	1	-1.093e-5	10	NC	1	NC	1
343	M1	1	max	.01	3	.027	3	.004	3	5.381e-3	2	NC	1	NC	1
344			min	-.01	2	-.022	2	0	9	-8.079e-3	3	NC	1	NC	1
345		2	max	.01	3	.017	3	.004	3	2.657e-3	2	NC	4	NC	1
346			min	-.01	2	-.013	2	-.002	9	-3.983e-3	3	5325.951	2	NC	1
347		3	max	.01	3	.007	3	.003	3	3.789e-5	3	NC	4	NC	1
348			min	-.01	2	-.005	2	-.002	9	-1.207e-4	1	2730.822	2	NC	1
349		4	max	.01	3	.002	2	.002	3	4.062e-5	3	NC	4	NC	1
350			min	-.01	2	-.002	3	-.002	9	-1.011e-4	1	1858.007	3	NC	1
351		5	max	.01	3	.009	2	.002	3	4.335e-5	3	NC	4	NC	1
352			min	-.01	2	-.009	3	-.003	9	-8.206e-5	9	1452.373	3	NC	1
353		6	max	.01	3	.015	2	.002	3	4.607e-5	3	NC	4	NC	1
354			min	-.01	2	-.014	3	-.002	9	-6.624e-5	9	1234.154	3	NC	1
355		7	max	.01	3	.019	2	.001	3	4.88e-5	3	NC	4	NC	1
356			min	-.01	2	-.019	3	-.002	9	-5.041e-5	9	1106.389	3	NC	1
357		8	max	.01	3	.022	2	.001	3	5.153e-5	3	NC	4	NC	1
358			min	-.01	2	-.022	3	-.002	9	-3.459e-5	9	1031.345	3	NC	1
359		9	max	.01	3	.025	2	.001	3	5.426e-5	3	NC	4	NC	1
360			min	-.01	2	-.024	3	-.001	9	-1.877e-5	9	992.115	3	NC	1
361		10	max	.01	3	.026	2	.001	3	5.699e-5	3	NC	4	NC	1
362			min	-.01	2	-.024	3	0	9	-2.941e-6	9	981.118	3	NC	1
363		11	max	.01	3	.025	2	.001	3	5.971e-5	3	NC	4	NC	1
364			min	-.01	2	-.023	3	0	9	-1.644e-6	10	990.865	2	NC	1
365		12	max	.009	3	.023	2	.001	3	6.244e-5	3	NC	4	NC	1
366			min	-.01	2	-.021	3	0	10	-2.933e-6	10	1027.701	2	NC	1
367		13	max	.009	3	.02	2	.002	1	7.522e-5	1	NC	4	NC	1
368			min	-.01	2	-.018	3	0	10	-4.223e-6	10	1103.273	2	NC	1
369		14	max	.009	3	.016	2	.002	1	9.481e-5	1	NC	4	NC	1
370			min	-.01	2	-.014	3	0	10	-5.512e-6	10	1237.83	2	NC	1
371		15	max	.009	3	.01	2	.002	1	1.144e-4	1	NC	4	NC	1
372			min	-.01	2	-.008	3	0	10	-6.801e-6	10	1461.834	3	NC	1
373		16	max	.009	3	.002	2	.002	1	1.285e-4	1	NC	4	NC	1
374			min	-.01	2	-.002	3	0	10	-7.745e-6	10	1846.66	3	NC	1
375		17	max	.009	3	.006	3	.002	1	9.029e-5	3	NC	4	NC	1
376			min	-.01	2	-.008	2	0	10	-1.995e-5	9	2679.617	3	NC	1
377		18	max	.009	3	.015	3	.001	3	4.005e-3	2	NC	1	NC	1
378			min	-.01	2	-.019	2	0	10	-2.245e-3	3	5254.415	3	NC	1
379		19	max	.009	3	.024	3	0	3	8.081e-3	2	NC	1	NC	1
380			min	-.01	2	-.03	2	0	9	-4.624e-3	3	5629.054	2	NC	1
381	M5	1	max	.028	3	.083	3	.004	3	1.309e-5	3	NC	1	NC	1
382			min	-.031	2	-.068	2	0	9	0	1	3831.498	3	NC	1
383		2	max	.028	3	.05	3	.006	3	1.673e-4	3	NC	4	NC	1
384			min	-.031	2	-.041	2	0	9	-1.157e-5	9	1715.74	2	NC	1
385		3	max	.028	3	.02	3	.008	3	3.184e-4	3	NC	5	NC	1
386			min	-.031	2	-.015	2	0	9	-2.305e-5	9	879.473	2	NC	1
387		4	max	.028	3	.008	2	.009	3	3.054e-4	3	NC	5	NC	1
388			min	-.031	2	-.006	3	0	9	-2.199e-5	9	611.135	3	9817.767	3
389		5	max	.028	3	.028	2	.009	3	2.924e-4	3	NC	5	NC	1
390			min	-.031	2	-.027	3	0	9	-2.094e-5	9	477.414	3	8215.782	3
391		6	max	.028	3	.045	2	.01	3	2.794e-4	3	NC	5	NC	1
392			min	-.031	2	-.045	3	0	9	-1.988e-5	9	405.825	3	7421.778	3
393		7	max	.028	3	.059	2	.01	3	2.664e-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	-.031	2	-.058	3	0	9	-1.882e-5	9	364.103	3	7060.62	3
395		8	max	.028	3	.07	2	.01	3	2.534e-4	3	NC	5	NC	1
396			min	-.031	2	-.067	3	0	9	-1.777e-5	9	339.028	2	6988.476	3
397		9	max	.028	3	.077	2	.009	3	2.404e-4	3	NC	5	NC	1
398			min	-.031	2	-.072	3	0	9	-1.671e-5	9	323.008	2	7151.818	3
399		10	max	.028	3	.08	2	.009	3	2.274e-4	3	NC	5	NC	1
400			min	-.03	2	-.074	3	0	9	-1.566e-5	9	316.442	2	7545.696	3
401		11	max	.028	3	.079	2	.008	3	2.144e-4	3	NC	5	NC	1
402			min	-.03	2	-.071	3	0	9	-1.46e-5	9	318.67	2	8203.695	3
403		12	max	.028	3	.073	2	.007	3	2.014e-4	3	NC	5	NC	1
404			min	-.03	2	-.065	3	0	9	-1.355e-5	9	330.545	2	9205.092	3
405		13	max	.028	3	.064	2	.006	3	1.884e-4	3	NC	5	NC	1
406			min	-.03	2	-.056	3	0	9	-1.249e-5	9	354.912	2	NC	1
407		14	max	.027	3	.049	2	.006	3	1.753e-4	3	NC	5	NC	1
408			min	-.03	2	-.042	3	0	9	-1.143e-5	9	398.309	2	NC	1
409		15	max	.027	3	.03	2	.005	3	1.623e-4	3	NC	5	NC	1
410			min	-.03	2	-.026	3	0	9	-1.038e-5	9	476.188	2	NC	1
411		16	max	.027	3	.006	2	.004	3	1.441e-4	3	NC	5	NC	1
412			min	-.03	2	-.006	3	0	9	-1.028e-5	9	613.977	3	NC	1
413		17	max	.027	3	.018	3	.003	3	1.415e-6	12	NC	5	NC	1
414			min	-.03	2	-.024	2	0	9	-3.304e-5	9	890.596	3	NC	1
415		18	max	.027	3	.044	3	.002	3	-1.074e-7	11	NC	4	NC	1
416			min	-.03	2	-.058	2	0	9	-1.692e-5	9	1746.395	3	NC	1
417		19	max	.027	3	.071	3	0	3	-4.24e-8	15	NC	3	NC	1
418			min	-.03	2	-.095	2	0	9	-2.321e-6	3	1794.861	2	NC	1
419	M9	1	max	.01	3	.026	3	.004	3	8.105e-3	3	NC	1	NC	1
420			min	-.01	2	-.022	2	0	9	-5.38e-3	2	NC	1	NC	1
421		2	max	.01	3	.016	3	.002	3	3.967e-3	3	NC	4	NC	1
422			min	-.01	2	-.013	2	0	10	-2.657e-3	2	5326.454	2	NC	1
423		3	max	.01	3	.006	3	.002	1	1.024e-4	1	NC	4	NC	1
424			min	-.01	2	-.005	2	0	10	-9.508e-5	3	2596.733	3	NC	1
425		4	max	.01	3	.002	2	.002	1	8.384e-5	1	NC	4	NC	1
426			min	-.01	2	-.003	3	-.001	3	-9.692e-5	3	1777.468	3	NC	1
427		5	max	.01	3	.009	2	.002	1	6.532e-5	1	NC	4	NC	1
428			min	-.01	2	-.01	3	-.002	3	-9.877e-5	3	1405.997	3	8081.935	3
429		6	max	.01	3	.015	2	.002	1	4.679e-5	1	NC	4	NC	1
430			min	-.01	2	-.015	3	-.004	3	-1.006e-4	3	1202.881	3	7022.399	3
431		7	max	.01	3	.019	2	.002	1	2.827e-5	1	NC	4	NC	1
432			min	-.01	2	-.019	3	-.004	3	-1.025e-4	3	1083.087	3	6409.468	3
433		8	max	.01	3	.022	2	.001	1	9.744e-6	1	NC	4	NC	1
434			min	-.01	2	-.022	3	-.005	3	-1.043e-4	3	1012.707	3	6068.222	3
435		9	max	.01	3	.025	2	0	1	0	11	NC	4	NC	1
436			min	-.01	2	-.024	3	-.005	3	-1.061e-4	3	976.368	3	5919.621	3
437		10	max	.01	3	.026	2	0	11	4.762e-7	10	NC	4	NC	1
438			min	-.01	2	-.025	3	-.005	3	-1.08e-4	3	967.19	3	5929.909	3
439		11	max	.01	3	.025	2	0	10	1.757e-6	10	NC	4	NC	1
440			min	-.01	2	-.024	3	-.005	3	-1.098e-4	3	983.291	3	6093.074	3
441		12	max	.01	3	.023	2	0	10	3.038e-6	10	NC	4	NC	1
442			min	-.01	2	-.022	3	-.005	3	-1.117e-4	3	1026.895	3	6427.185	3
443		13	max	.01	3	.02	2	0	10	4.319e-6	10	NC	4	NC	1
444			min	-.01	2	-.019	3	-.005	3	-1.135e-4	3	1103.289	2	6980.864	3
445		14	max	.009	3	.016	2	0	10	5.6e-6	10	NC	4	NC	1
446			min	-.01	2	-.014	3	-.004	3	-1.153e-4	3	1234.129	3	7855.047	3
447		15	max	.009	3	.01	2	0	10	6.881e-6	10	NC	4	NC	1
448			min	-.01	2	-.009	3	-.003	3	-1.199e-4	1	1447.651	3	9261.831	3
449		16	max	.009	3	.002	2	0	10	7.807e-6	10	NC	4	NC	1
450			min	-.01	2	-.002	3	-.003	3	-1.333e-4	1	1829.594	3	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
451		17	max	.009	3	.006	3	0	10	1.496e-4	3	NC	4	NC	1
452			min	-.01	2	-.008	2	-.002	1	-4.601e-5	9	2655.694	3	NC	1
453		18	max	.009	3	.015	3	0	10	2.366e-3	3	NC	1	NC	1
454			min	-.01	2	-.019	2	-.001	9	-4.005e-3	2	5208.43	3	NC	1
455		19	max	.009	3	.024	3	0	3	4.62e-3	3	NC	1	NC	1
456			min	-.01	2	-.03	2	0	9	-8.082e-3	2	5643.596	2	NC	1
457	M13	1	max	0	9	.026	3	.01	3	3.992e-3	3	NC	1	NC	1
458			min	-.004	3	-.022	2	-.01	2	-3.344e-3	2	NC	1	NC	1
459		2	max	0	9	.065	3	.008	3	4.923e-3	3	NC	4	NC	1
460			min	-.004	3	-.048	2	-.009	2	-4.125e-3	2	2295.023	3	NC	1
461		3	max	0	9	.099	3	.008	3	5.855e-3	3	NC	4	NC	1
462			min	-.004	3	-.071	2	-.009	2	-4.907e-3	2	1241.027	3	NC	1
463		4	max	0	9	.122	3	.009	3	6.786e-3	3	NC	4	NC	2
464			min	-.004	3	-.087	2	-.01	2	-5.688e-3	2	938.789	3	8315.864	1
465		5	max	0	9	.134	3	.012	3	7.717e-3	3	NC	4	NC	2
466			min	-.004	3	-.096	2	-.013	2	-6.47e-3	2	839.216	3	8158.039	1
467		6	max	0	9	.133	3	.015	3	8.649e-3	3	NC	4	NC	1
468			min	-.004	3	-.097	2	-.016	2	-7.251e-3	2	843.79	3	9505.493	9
469		7	max	0	9	.123	3	.019	3	9.58e-3	3	NC	4	NC	1
470			min	-.004	3	-.091	2	-.021	2	-8.033e-3	2	935.806	3	8378.074	2
471		8	max	0	9	.106	3	.022	3	1.051e-2	3	NC	4	NC	1
472			min	-.004	3	-.082	2	-.025	2	-8.814e-3	2	1126.959	3	5864.453	2
473		9	max	0	9	.091	3	.025	3	1.144e-2	3	NC	4	NC	4
474			min	-.004	3	-.073	2	-.029	2	-9.596e-3	2	1409.836	3	4705.676	2
475		10	max	0	9	.083	3	.028	3	1.237e-2	3	NC	4	NC	4
476			min	-.004	3	-.068	2	-.031	2	-1.038e-2	2	1600.032	3	4338.52	2
477		11	max	0	9	.091	3	.03	3	1.145e-2	3	NC	4	NC	4
478			min	-.004	3	-.073	2	-.029	2	-9.596e-3	2	1409.834	3	4374.899	3
479		12	max	0	9	.107	3	.031	3	1.052e-2	3	NC	4	NC	1
480			min	-.004	3	-.082	2	-.025	2	-8.814e-3	2	1126.957	3	4321.088	3
481		13	max	0	9	.123	3	.029	3	9.591e-3	3	NC	4	NC	1
482			min	-.004	3	-.091	2	-.021	2	-8.033e-3	2	935.805	3	4586.34	3
483		14	max	0	9	.134	3	.027	3	8.663e-3	3	NC	4	NC	1
484			min	-.004	3	-.097	2	-.016	2	-7.251e-3	2	843.789	3	5226.204	3
485		15	max	0	9	.134	3	.024	3	7.735e-3	3	NC	4	NC	2
486			min	-.004	3	-.096	2	-.013	2	-6.47e-3	2	839.215	3	6458.998	3
487		16	max	0	9	.123	3	.02	3	6.807e-3	3	NC	4	NC	2
488			min	-.004	3	-.087	2	-.01	2	-5.688e-3	2	938.788	3	8315.88	1
489		17	max	0	9	.1	3	.016	3	5.879e-3	3	NC	4	NC	1
490			min	-.004	3	-.071	2	-.009	2	-4.907e-3	2	1241.026	3	NC	1
491		18	max	0	9	.066	3	.012	3	4.951e-3	3	NC	4	NC	1
492			min	-.004	3	-.048	2	-.009	2	-4.125e-3	2	2295.02	3	NC	1
493		19	max	0	9	.027	3	.01	3	4.023e-3	3	NC	1	NC	1
494			min	-.004	3	-.022	2	-.01	2	-3.344e-3	2	NC	1	NC	1
495	M16	1	max	0	9	.024	3	.009	3	4.416e-3	2	NC	1	NC	1
496			min	0	3	-.03	2	-.01	2	-3.427e-3	3	NC	1	NC	1
497		2	max	0	9	.046	3	.012	3	5.452e-3	2	NC	4	NC	1
498			min	0	3	-.07	2	-.009	2	-4.182e-3	3	2295.135	2	NC	1
499		3	max	0	9	.066	3	.016	3	6.488e-3	2	NC	4	NC	1
500			min	0	3	-.103	2	-.009	2	-4.936e-3	3	1237.37	2	NC	1
501		4	max	0	9	.08	3	.019	3	7.524e-3	2	NC	4	NC	2
502			min	0	3	-.127	2	-.01	2	-5.691e-3	3	931.168	2	8349.691	1
503		5	max	0	9	.089	3	.022	3	8.56e-3	2	NC	4	NC	2
504			min	0	3	-.139	2	-.012	2	-6.445e-3	3	825.703	2	6985.73	3
505		6	max	0	9	.091	3	.025	3	9.596e-3	2	NC	4	NC	1
506			min	0	3	-.14	2	-.016	2	-7.199e-3	3	820.09	2	5791.762	3
507		7	max	0	9	.088	3	.027	3	1.063e-2	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	-.131	2	-.02	2	-7.954e-3	3	892.797	2	5146.038	3
509		8	max	0	9	.081	3	.028	3	1.167e-2	2	NC	4	NC	1
510			min	0	3	-.116	2	-.025	2	-8.708e-3	3	1045.966	2	4843.372	3
511		9	max	0	9	.074	3	.028	3	1.27e-2	2	NC	4	NC	4
512			min	0	3	-.102	2	-.029	2	-9.463e-3	3	1262.986	2	4742.472	2
513		10	max	0	9	.071	3	.027	3	1.374e-2	2	NC	4	NC	4
514			min	0	3	-.095	2	-.03	2	-1.022e-2	3	1401.98	2	4370.677	2
515		11	max	0	9	.074	3	.026	3	1.27e-2	2	NC	4	NC	4
516			min	0	3	-.102	2	-.029	2	-9.459e-3	3	1262.986	2	4742.476	2
517		12	max	0	9	.081	3	.024	3	1.167e-2	2	NC	4	NC	1
518			min	0	3	-.116	2	-.025	2	-8.702e-3	3	1045.966	2	5917.265	2
519		13	max	0	9	.087	3	.022	3	1.063e-2	2	NC	4	NC	1
520			min	0	3	-.131	2	-.02	2	-7.944e-3	3	892.797	2	7137.271	3
521		14	max	0	9	.091	3	.02	3	9.597e-3	2	NC	4	NC	1
522			min	0	3	-.14	2	-.016	2	-7.186e-3	3	820.09	2	8688.267	3
523		15	max	0	9	.088	3	.017	3	8.561e-3	2	NC	4	NC	2
524			min	0	3	-.139	2	-.012	2	-6.428e-3	3	825.703	2	8198.877	1
525		16	max	0	9	.08	3	.015	3	7.525e-3	2	NC	4	NC	2
526			min	0	3	-.127	2	-.01	2	-5.67e-3	3	931.168	2	8353.661	1
527		17	max	0	9	.066	3	.013	3	6.489e-3	2	NC	4	NC	1
528			min	0	3	-.103	2	-.009	2	-4.913e-3	3	1237.37	2	NC	1
529		18	max	0	9	.046	3	.011	3	5.453e-3	2	NC	4	NC	1
530			min	0	3	-.07	2	-.009	2	-4.155e-3	3	2295.135	2	NC	1
531		19	max	0	9	.024	3	.009	3	4.418e-3	2	NC	1	NC	1
532			min	0	3	-.03	2	-.01	2	-3.397e-3	3	NC	1	NC	1
533	M15	1	max	0	1	0	1	0	1	4.241e-4	3	NC	1	NC	1
534			min	0	1	0	1	0	1	-4.514e-5	2	NC	1	NC	1
535		2	max	0	3	0	15	0	1	8.129e-4	3	NC	1	NC	1
536			min	0	2	-.003	4	0	3	-4.215e-4	2	NC	1	NC	1
537		3	max	0	3	-.001	15	.003	2	1.202e-3	3	NC	1	NC	1
538			min	0	2	-.005	4	-.003	3	-7.978e-4	2	NC	1	8452.97	3
539		4	max	0	3	-.002	15	.006	2	1.591e-3	3	NC	1	NC	4
540			min	0	2	-.008	4	-.007	3	-1.174e-3	2	8308.601	4	4695.409	3
541		5	max	0	3	-.002	15	.01	2	1.979e-3	3	NC	3	NC	4
542			min	0	2	-.01	4	-.012	3	-1.55e-3	2	6483.285	4	3095.585	3
543		6	max	0	3	-.003	15	.014	2	2.368e-3	3	NC	5	NC	4
544			min	-.001	2	-.011	4	-.017	3	-1.927e-3	2	5456.37	4	2260.976	3
545		7	max	0	3	-.003	15	.018	2	2.757e-3	3	NC	5	NC	4
546			min	-.001	2	-.013	4	-.023	3	-2.303e-3	2	4838.816	4	1771.487	3
547		8	max	0	3	-.003	15	.022	2	3.146e-3	3	NC	5	NC	4
548			min	-.002	2	-.014	4	-.028	3	-2.679e-3	2	4468.19	4	1463.148	3
549		9	max	.001	3	-.003	15	.026	2	3.535e-3	3	NC	5	NC	4
550			min	-.002	2	-.015	4	-.033	3	-3.056e-3	2	4268.698	4	1261.11	3
551		10	max	.001	3	-.003	15	.029	2	3.923e-3	3	NC	5	NC	4
552			min	-.002	2	-.015	4	-.037	3	-3.432e-3	2	4205.588	4	1127.693	3
553		11	max	.001	3	-.003	15	.03	2	4.312e-3	3	NC	5	NC	4
554			min	-.002	2	-.015	4	-.039	3	-3.808e-3	2	4268.698	4	1043.095	3
555		12	max	.001	3	-.003	15	.031	2	4.701e-3	3	NC	5	NC	4
556			min	-.003	2	-.014	4	-.04	3	-4.185e-3	2	4468.19	4	997.513	3
557		13	max	.002	3	-.003	15	.029	2	5.09e-3	3	NC	5	NC	4
558			min	-.003	2	-.013	4	-.039	3	-4.561e-3	2	4838.816	4	988.166	3
559		14	max	.002	3	-.002	2	.026	2	5.478e-3	3	NC	5	NC	4
560			min	-.003	2	-.012	4	-.035	3	-4.937e-3	2	5456.37	4	1019.453	3
561		15	max	.002	3	0	2	.02	2	5.867e-3	3	NC	3	NC	4
562			min	-.003	2	-.01	4	-.028	3	-5.314e-3	2	6483.285	4	1107.291	3
563		16	max	.002	3	.002	2	.013	1	6.256e-3	3	NC	1	NC	4
564			min	-.004	2	-.008	4	-.018	3	-5.69e-3	2	8308.601	4	1294.797	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	.002	3	.005	2	.004	1	6.645e-3	3	NC	1	NC	4
566			min	-.004	2	-.005	4	-.004	3	-6.066e-3	2	NC	1	1717.171	3
567		18	max	.002	3	.007	2	.013	3	7.034e-3	3	NC	1	NC	4
568			min	-.004	2	-.003	4	-.014	2	-6.443e-3	2	NC	1	3058.251	3
569		19	max	.002	3	.01	2	.036	3	7.422e-3	3	NC	1	NC	1
570			min	-.004	2	-.002	3	-.033	2	-6.819e-3	2	NC	1	NC	1
571	M16A	1	max	.001	2	.003	2	.011	3	2.079e-3	3	NC	1	NC	1
572			min	-.002	3	-.003	3	-.011	2	-2.169e-3	2	NC	1	NC	1
573		2	max	.001	2	0	2	.003	3	2.005e-3	3	NC	1	NC	1
574			min	-.002	3	-.004	3	-.005	2	-2.071e-3	2	NC	1	8514.325	3
575		3	max	.001	2	-.001	15	.002	1	1.932e-3	3	NC	1	NC	4
576			min	-.002	3	-.006	3	-.003	3	-1.973e-3	2	NC	1	4825.288	3
577		4	max	.001	2	-.002	15	.005	1	1.858e-3	3	NC	1	NC	4
578			min	-.002	3	-.008	4	-.008	3	-1.874e-3	2	8308.601	4	3676.849	3
579		5	max	0	2	-.002	15	.007	1	1.785e-3	3	NC	3	NC	4
580			min	-.002	3	-.01	4	-.011	3	-1.776e-3	2	6483.285	4	3182.328	3
581		6	max	0	2	-.003	15	.008	1	1.711e-3	3	NC	5	NC	4
582			min	-.002	3	-.012	4	-.013	3	-1.678e-3	2	5456.37	4	2970.65	3
583		7	max	0	2	-.003	15	.009	1	1.638e-3	3	NC	5	NC	4
584			min	-.001	3	-.013	4	-.014	3	-1.58e-3	2	4838.816	4	2926.197	3
585		8	max	0	2	-.003	15	.009	1	1.564e-3	3	NC	5	NC	4
586			min	-.001	3	-.014	4	-.014	3	-1.481e-3	2	4468.19	4	3010.49	3
587		9	max	0	2	-.003	15	.008	1	1.491e-3	3	NC	5	NC	4
588			min	-.001	3	-.015	4	-.013	3	-1.383e-3	2	4268.698	4	3220.45	3
589		10	max	0	2	-.003	15	.008	1	1.417e-3	3	NC	5	NC	4
590			min	-.001	3	-.015	4	-.012	3	-1.285e-3	2	4205.588	4	3579.527	3
591		11	max	0	2	-.003	15	.007	1	1.344e-3	3	NC	5	NC	4
592			min	0	3	-.015	4	-.01	3	-1.186e-3	2	4268.698	4	4143.883	3
593		12	max	0	2	-.003	15	.005	1	1.27e-3	3	NC	5	NC	4
594			min	0	3	-.014	4	-.008	3	-1.088e-3	2	4468.19	4	5025.897	3
595		13	max	0	2	-.003	15	.004	1	1.197e-3	3	NC	5	NC	4
596			min	0	3	-.013	4	-.006	3	-9.898e-4	2	4838.816	4	6455.313	3
597		14	max	0	2	-.003	15	.003	1	1.123e-3	3	NC	5	NC	1
598			min	0	3	-.011	4	-.004	3	-8.916e-4	2	5456.37	4	8949.39	3
599		15	max	0	2	-.002	15	.002	1	1.05e-3	3	NC	3	NC	1
600			min	0	3	-.01	4	-.002	3	-7.933e-4	2	6483.285	4	NC	1
601		16	max	0	2	-.002	15	.001	4	9.762e-4	3	NC	1	NC	1
602			min	0	3	-.008	4	0	3	-6.95e-4	2	8308.601	4	NC	1
603		17	max	0	2	-.001	15	0	4	9.027e-4	3	NC	1	NC	1
604			min	0	3	-.005	4	0	2	-5.967e-4	2	NC	1	NC	1
605		18	max	0	2	0	15	0	3	8.292e-4	3	NC	1	NC	1
606			min	0	3	-.003	4	0	2	-4.984e-4	2	NC	1	NC	1
607		19	max	0	1	0	1	0	1	7.557e-4	3	NC	1	NC	1
608			min	0	1	0	1	0	1	-4.001e-4	2	NC	1	NC	1

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

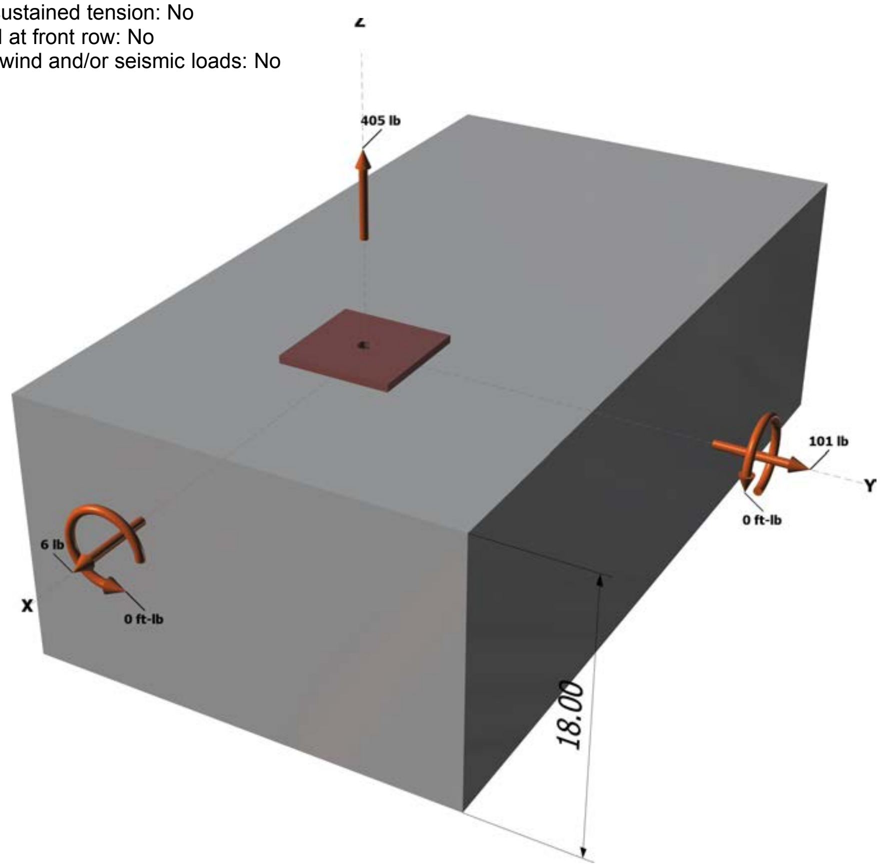
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

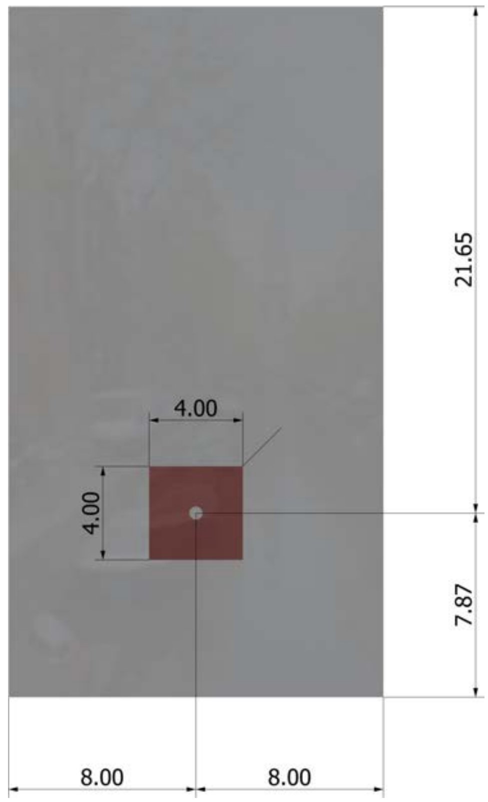
Load and Geometry
Load factor source: ACI 318 Section 9.2
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: No
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: No

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

<Figure 1>



<Figure 2>



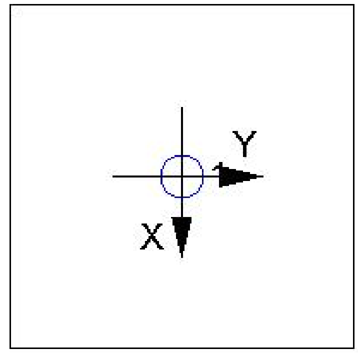
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	405.0	6.0	101.0	101.2
Sum	405.0	6.0	101.0	101.2

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 405
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



4. Steel Strength of Anchor in Tension(Sec. D.5.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
8095	0.75	6071

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in y-direction:

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

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

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

Shear parallel to edge in x-direction:

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

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

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

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

Shear parallel to edge in y-direction:

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

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

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

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

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

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

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

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

11. Results

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

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

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

Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. D.7.1	0.08	0.00	7.5 %	1.0	Pass

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

12. Warnings

- This temperature range is currently outside the scope of ACI 318-11 and ACI 355.4, and is provided for historical purposes.

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

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

SIMPSON Strong-Tie

Anchor Designer™ Software
Version 2.4.5673.0

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

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

General
Design method:ACI 318-05
Units: Imperial units

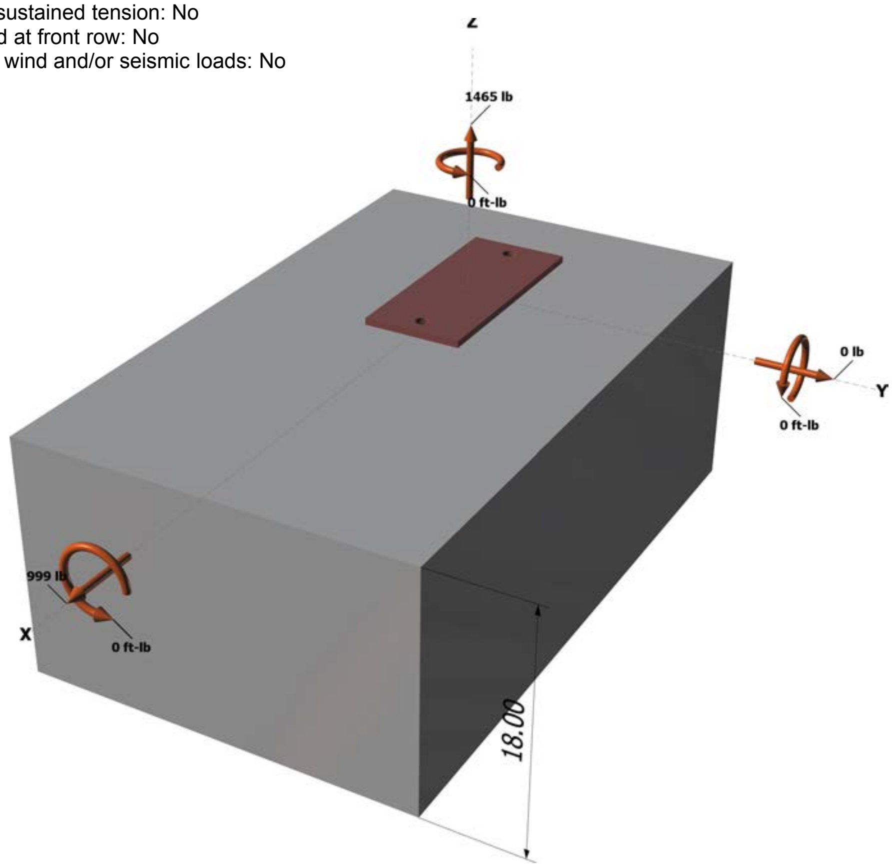
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

Load and Geometry
Load factor source: ACI 318 Section 9.2
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: No
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: No

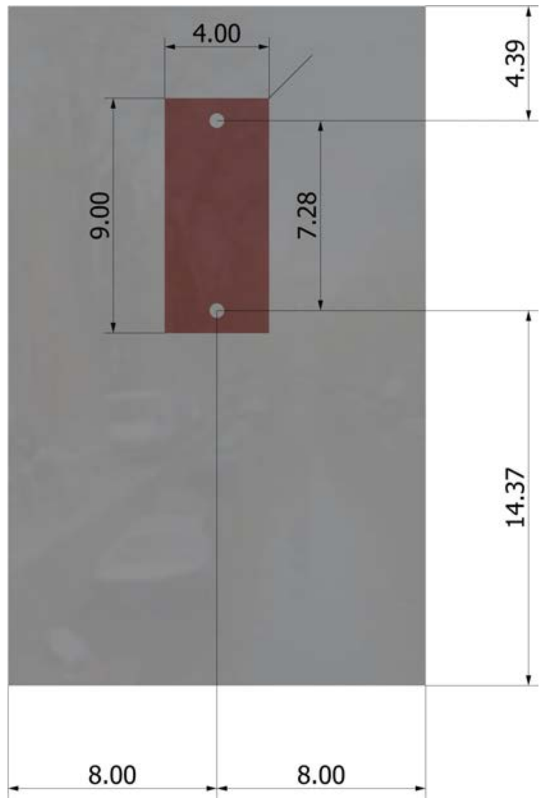
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout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

Base Plate
Length x Width x Thickness (inch): 9.00 x 4.00 x 0.28

<Figure 1>



<Figure 2>



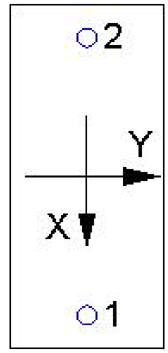
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	732.5	499.5	0.0	499.5
2	732.5	499.5	0.0	499.5
Sum	1465.0	999.0	0.0	999.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 1465
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



4. Steel Strength of Anchor in Tension(Sec. D.5.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
8095	0.75	6071

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

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

Shear parallel to edge in x-direction:

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

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

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

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

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

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

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

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

ϕV_{cpg} (lb)
15580

11. Results

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

Tension	Factored Load, N_{ua} (lb)	Design Strength, 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.