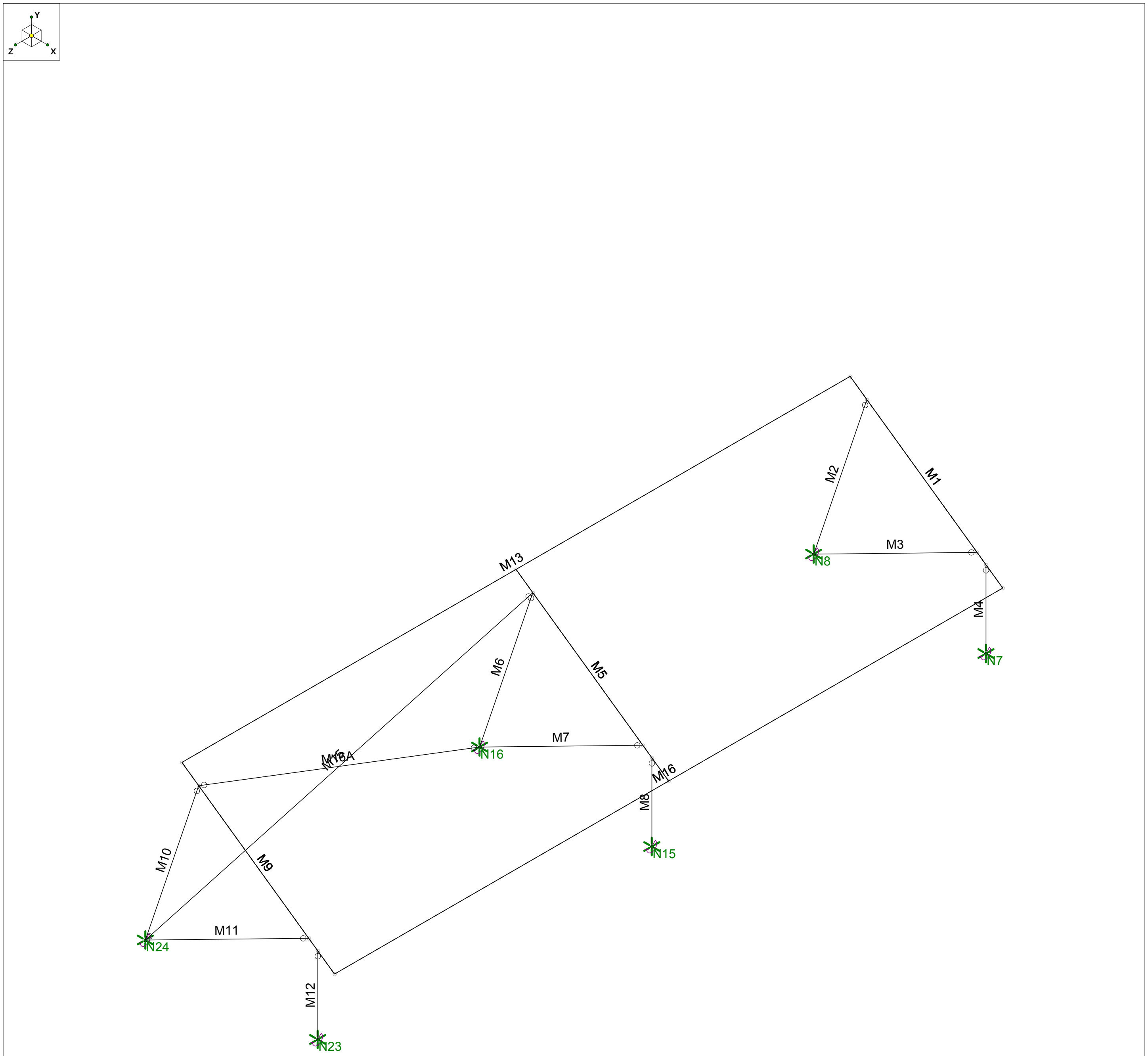


Schletter, Inc.		35° Tilt w/o Seismic Design
HCV	Standard PVMini Racking System	
	Representative Calculations - ASCE 7-05	

1. INTRODUCTION

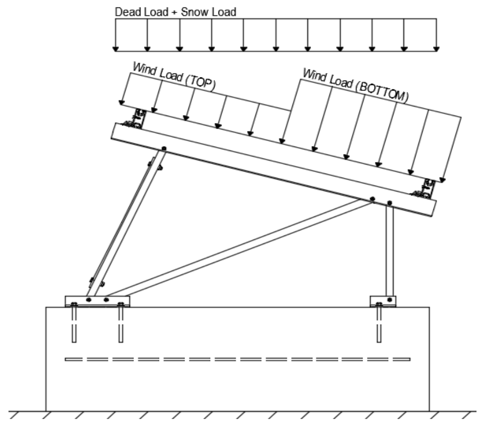
1.1 Project Description
The following sections will cover the determination of forces and structural design calculations for the Schletter, Inc. PVMini ground mount system.

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	*Self-weight of the PV modules.*
g_{MIN} =	1.75	psf	

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 =	85	mph	Exposure Category = C
Height ≤	15	ft	Importance Category = II

Peak Velocity Pressure, q_z =	11.34	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.

Strength Design, LRFD

Component stresses are checked using the following LRFD load combinations:

1.2D + 1.6S + 0.8W
1.2D + 1.6W + 0.5S
0.9D + 1.6W ^{M}
1.54D + 1.3E + 0.2S ^{R}
0.56D + 1.3E ^{R}
1.54D + 1.25E + 0.2S ^{O}
0.56D + 1.25E ^{O}

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

Allowable Stress Design, ASD

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

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

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

^{M} *Uses the minimum allowable module dead load.*
^{R} *Include redundancy factor of 1.3.*
^{O} *Includes overstrength factor of 1.25. Used to check seismic drift.*

3. STRUCTURAL ANALYSIS

3.1 RISA Results

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

3.2 RISA Components

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

Purlins	Location	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

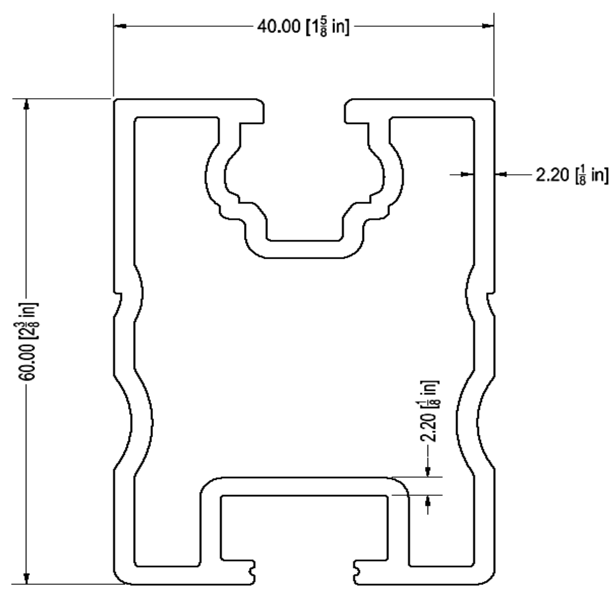
Front Struts	Location	Bracing
M4	Outer	M15
M8	Inner	M16A
M12	Outer	

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).

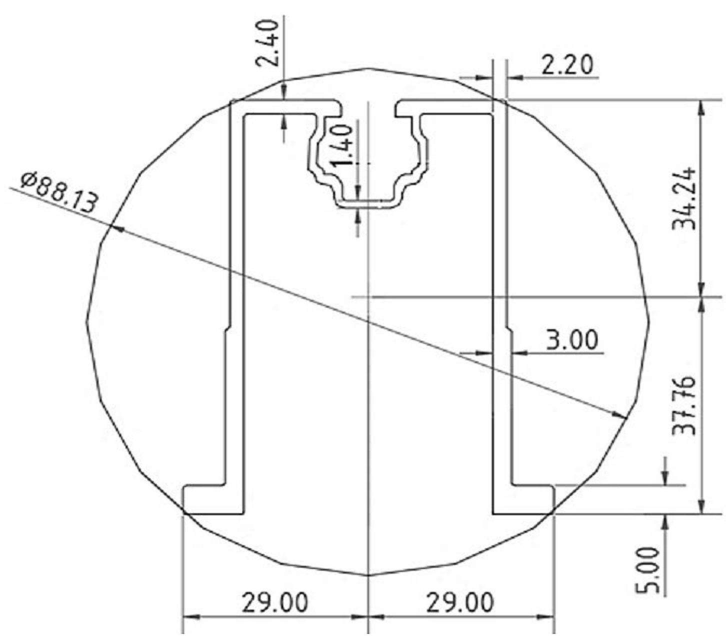
Purlin Type =	**ProfiPlus**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	93	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	28.28	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	28.47	ksi
S_y =	0.51	in^3
S_x =	0.37	in^3
E =	10100	ksi
I_y =	0.60	in^4
I_x =	0.29	in^4
A =	0.90	in^2
g =	1.08	lbs/ft
M_y =	0.834	k-ft
M_z =	0.238	k-ft
$M_{y\ allowable}$ =	1.203	k-ft
$M_{z\ allowable}$ =	0.871	k-ft
Utilization =	97%	



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).

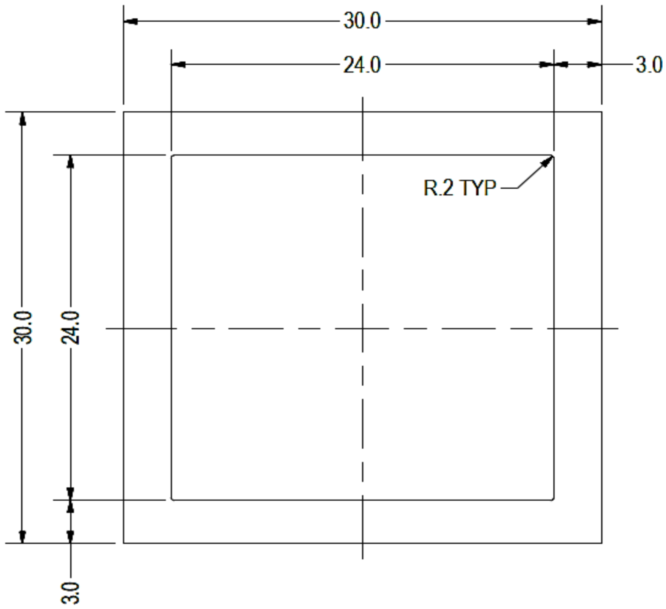
Girder Type =	**Flex Profi**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	33.78	in
$\Phi F_{ty\ AXIAL}$ =	14.29	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.82	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	13.46	ksi
S_y =	0.59	in^3
S_x =	0.46	in^3
E =	10100	ksi
I_y =	0.88	in^4
I_x =	0.52	in^4
A =	0.89	in^2
g =	1.07	lbs/ft
M_y =	0.656	k-ft
M_z =	0.000	k-ft
P_n =	0.303	k
$M_{y\ allowable}$ =	1.463	k-ft
$M_{z\ allowable}$ =	0.513	k-ft
$P_{n\ allowable}$ =	12.764	k
Utilization =	47%	



4.3 Front Strut Design

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

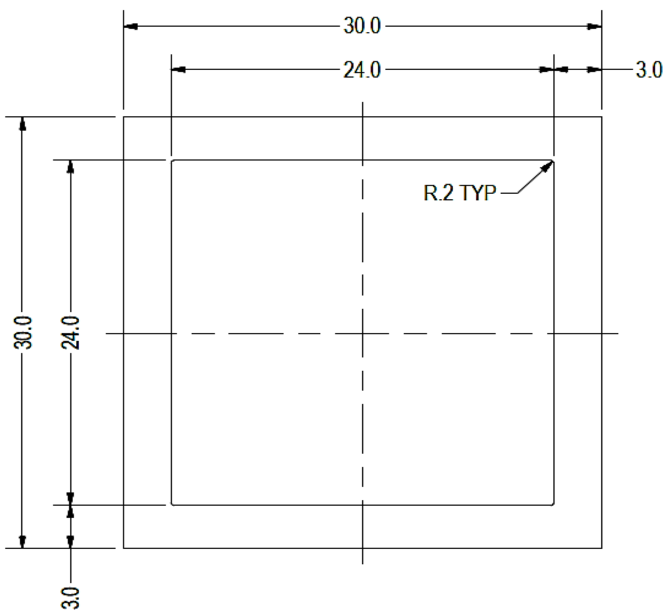
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	18.00	in
$\Phi F_{ty\ AXIAL}$ =	24.52	ksi
$\Phi F_{ty\ BENDING}$ =	31.19	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.001	k-ft
P_n =	1.050	k
$M_{y\ allowable}$ =	0.423	k-ft
$M_{z\ allowable}$ =	0.423	k-ft
$P_{n\ allowable}$ =	12.310	k
Utilization =	9%	



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).

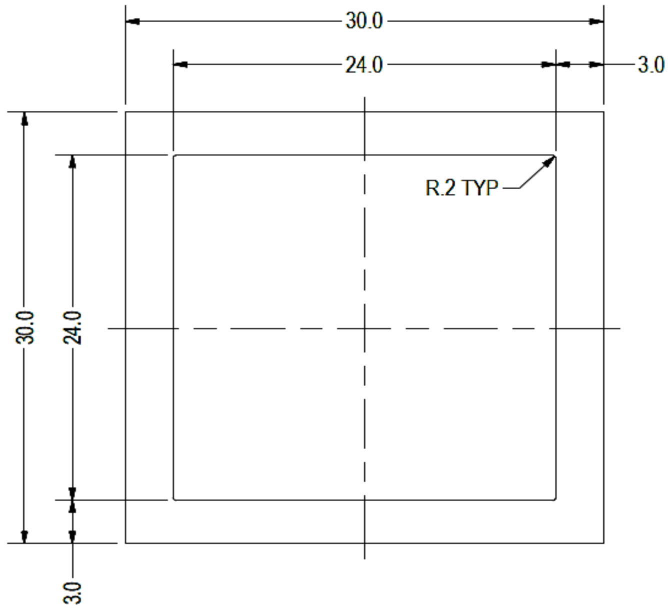
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	46.38	in
$\Phi F_{ty\ AXIAL}$ =	7.60	ksi
$\Phi F_{ty\ BENDING}$ =	29.80	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.789	k
$M_{y\ allowable}$ =	0.404	k-ft
$M_{z\ allowable}$ =	0.404	k-ft
$P_{n\ allowable}$ =	3.814	k
Utilization =	21%	



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).

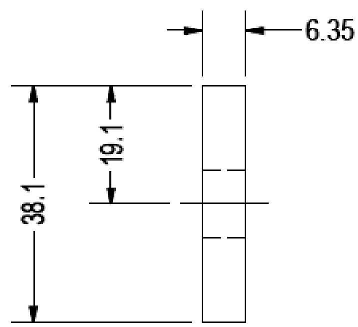
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	42.32	in
$\Phi F_{ty\ AXIAL}$ =	8.86	ksi
$\Phi F_{ty\ BENDING}$ =	29.96	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.902	k
$M_{y\ allowable}$ =	0.406	k-ft
$M_{z\ allowable}$ =	0.406	k-ft
$P_{n\ allowable}$ =	4.450	k
Utilization =	20%	



4.6 Cross Brace Design

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

Brace Type =	**1.5x0.25**	
Aluminum Type =	6061-T6	
F_{ty} =	35	ksi
Φ =	0.90	
S_y =	0.02	in^3
E =	10100	ksi
I_y =	33.25	in^4
A =	0.38	in^2
g =	0.45	lbs/ft
M_y =	0.006	k-ft
P_n =	0.056	k
$M_{y\ allowable}$ =	0.046	k-ft
$P_{n\ allowable}$ =	11.813	k
Utilization =	14%	



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

5. FOUNDATION DESIGN CALCULATIONS

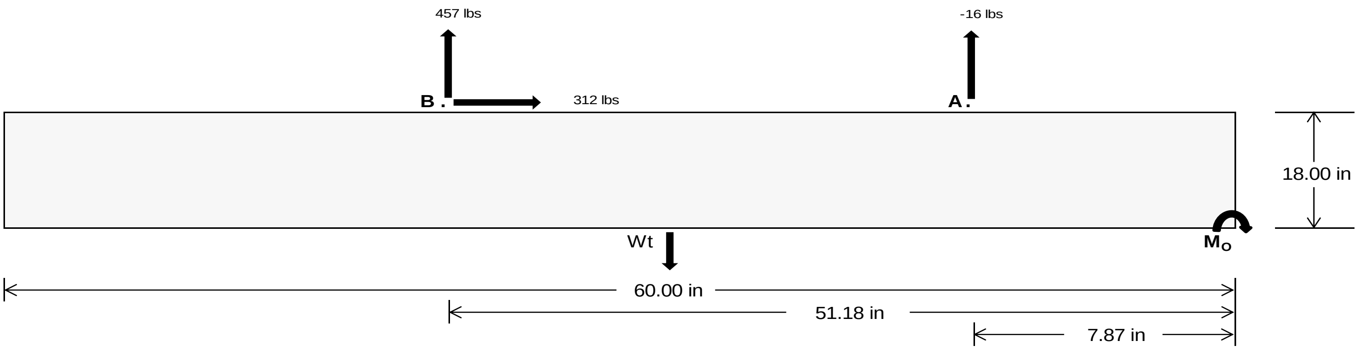
5.1 Helical Pile Foundations

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

Maximum	Front	Rear	
Tensile Load =	35.97	1903.94	k
Compressive Load =	1364.88	1415.96	k
Lateral Load =	5.58	1298.80	k
Moment (Weak Axis) =	0.01	0.00	k

5.2 Design of Ballast Foundations

Ballast foundations are used to secure the racking structure in place. The foundations are checked for potential overturning and sliding. Bearing pressures applied by the racking and ballast foundations are checked against the allowable bearing pressures provided by the IBC 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 = 28874.0 in-lbs
Resisting Force Required = 962.47 lbs
S.F. = 1.67
Weight Required = 1604.11 lbs
Minimum Width = 22 in in
Weight Provided = 1993.75 lbs

A minimum 60in long x 22in wide x 18in tall ballast foundation is required to resist overturning.

Sliding
Force = 312.03 lbs
Friction = 0.4
Weight Required = 780.08 lbs
Resisting Weight = 1993.75 lbs
Additional Weight Required = 0 lbs

Use a 60in long x 22in wide x 18in tall ballast foundation to resist sliding. Friction is OK.

Cohesion
Sliding Force = 312.03 lbs
Cohesion = 130 psf
Area = 9.17 ft^2
Resisting = 996.88 lbs
Additional Weight Required = 0 lbs

Use a 60in long x 22in 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			
	22 in	23 in	24 in	25 in
P_{ftg} = (145 pcf)(5 ft)(1.5 ft)(1.83 ft) =	1994 lbs	2084 lbs	2175 lbs	2266 lbs

ASD LC	1.0D + 1.0S				1.0D + 1.0W				1.0D + 0.75L + 0.75W + 0.75S				0.6D + 1.0W			
Width	22 in	23 in	24 in	25 in	22 in	23 in	24 in	25 in	22 in	23 in	24 in	25 in	22 in	23 in	24 in	25 in
F_A	548 lbs	548 lbs	548 lbs	548 lbs	381 lbs	381 lbs	381 lbs	381 lbs	642 lbs	642 lbs	642 lbs	642 lbs	32 lbs	32 lbs	32 lbs	32 lbs
F_B	372 lbs	372 lbs	372 lbs	372 lbs	607 lbs	607 lbs	607 lbs	607 lbs	696 lbs	696 lbs	696 lbs	696 lbs	-914 lbs	-914 lbs	-914 lbs	-914 lbs
F_V	74 lbs	74 lbs	74 lbs	74 lbs	574 lbs	574 lbs	574 lbs	574 lbs	479 lbs	479 lbs	479 lbs	479 lbs	-624 lbs	-624 lbs	-624 lbs	-624 lbs
P_{total}	2914 lbs	3005 lbs	3096 lbs	3186 lbs	2982 lbs	3072 lbs	3163 lbs	3253 lbs	3332 lbs	3423 lbs	3513 lbs	3604 lbs	315 lbs	369 lbs	424 lbs	478 lbs
M	466 lbs-ft	466 lbs-ft	466 lbs-ft	466 lbs-ft	491 lbs-ft	491 lbs-ft	491 lbs-ft	491 lbs-ft	674 lbs-ft	674 lbs-ft	674 lbs-ft	674 lbs-ft	736 lbs-ft	736 lbs-ft	736 lbs-ft	736 lbs-ft
e	0.16 ft	0.15 ft	0.15 ft	0.15 ft	0.16 ft	0.16 ft	0.16 ft	0.15 ft	0.20 ft	0.20 ft	0.19 ft	0.19 ft	2.34 ft	2.00 ft	1.74 ft	1.54 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}	257.0 psf	255.3 psf	253.7 psf	252.2 psf	261.0 psf	259.1 psf	257.4 psf	255.8 psf	275.3 psf	272.8 psf	270.5 psf	268.4 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	378.9 psf	371.9 psf	365.4 psf	359.5 psf	389.5 psf	382.0 psf	375.2 psf	368.9 psf	451.7 psf	441.5 psf	432.2 psf	423.6 psf	713.8 psf	254.3 psf	185.5 psf	159.5 psf

Maximum Bearing Pressure = 714 psf
Allowable Bearing Pressure = 1500 psf

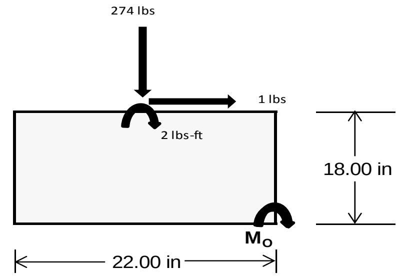
Use a 60in long x 22in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O = 247.6 ft-lbs
Resisting Force Required = 270.10 lbs
S.F. = 1.67
Weight Required = 450.17 lbs
Minimum Width = 22 in in
Weight Provided = 1993.75 lbs

A minimum 60in long x 22in 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	22 in			22 in			22 in		
Support	Outer	Inner	Outer	Outer	Inner	Outer	Outer	Inner	Outer
F_Y	91 lbs	230 lbs	86 lbs	279 lbs	770 lbs	274 lbs	27 lbs	67 lbs	25 lbs
F_V	7 lbs	6 lbs	0 lbs	24 lbs	22 lbs	1 lbs	2 lbs	2 lbs	0 lbs
P_{total}	2559 lbs	2698 lbs	2555 lbs	2629 lbs	3120 lbs	2624 lbs	748 lbs	789 lbs	747 lbs
M	11 lbs-ft	9 lbs-ft	1 lbs-ft	41 lbs-ft	34 lbs-ft	4 lbs-ft	3 lbs-ft	3 lbs-ft	0 lbs-ft
e	0.00 ft	0.00 ft	0.00 ft	0.02 ft	0.01 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft
L/6	0.31 ft	1.83 ft	1.83 ft	1.80 ft	1.81 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft
f_{min}	275.4 sqft	291.1 sqft	278.5 sqft	272.3 sqft	328.3 sqft	284.8 sqft	80.6 sqft	85.1 sqft	81.4 sqft
f_{max}	283.1 psf	297.6 psf	278.9 psf	301.3 psf	352.4 psf	287.7 psf	82.7 psf	87.0 psf	81.5 psf

Maximum Bearing Pressure = 352 psf
Allowable Bearing Pressure = 1500 psf

Use a 60in long x 22in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Foundation Requirements: 60in long x 22in wide x 18in tall ballast foundation and fiber reinforcing with (1) #5 rebar.

5.3 Foundation Anchors

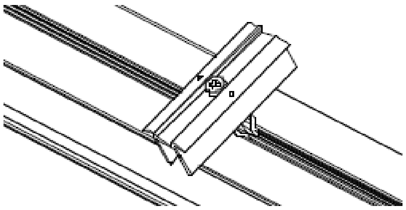
Threaded rods are anchored to the the ballast foundations using the Simpson AT-XP epoxy solution. LRFD load results are compared to the allowable strengths of the epoxy solution. Please see the supplementary calculations provided by the Simpson Anchor Designer software.

6. DESIGN OF JOINTS AND CONNECTIONS

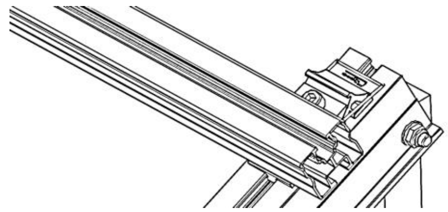
6.1 Anchorage of Modules to Purlins and Connection of Purlins to Girders

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 =	0.403 k
Allowable Uplift =	1.214 k
Utilization =	33%



Fastening of Purlins to Girders	
Maximum Uplifting Force =	1.107 k
Allowable Uplift =	1.116 k
Utilization =	99%



6.2 Bolted Connections

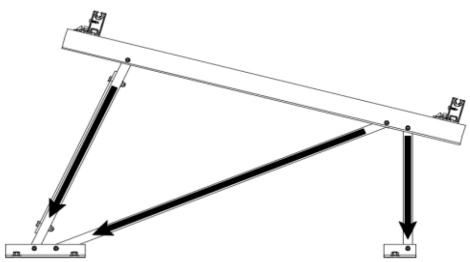
The aluminum struts connect the aluminum girder ends to custom brackets with mounting holes. Cross bracing is attached to rear struts to provide lateral stability. Single M8 bolts are used to attach each end of the strut to the girder and post. ASTM A193/A193M-86 equivalent stainless steel bolts are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

Front Strut	
Maximum Axial Load =	1.050 k
M8 Bolt Capacity =	5.692 k
Strut Bearing Capacity =	7.952 k
Utilization =	18%

Rear Strut	
Maximum Axial Load =	1.197 k
M8 Bolt Capacity =	5.692 k
Strut Bearing Capacity =	7.952 k
Utilization =	21%

Diagonal Strut	
Maximum Axial Load =	0.789 k
M8 Bolt Shear Capacity =	5.692 k
Strut Bearing Capacity =	7.952 k
Utilization =	14%

Bracing	
Maximum Axial Load =	0.056 k
M10 Bolt Capacity =	8.894 k
Strut Bearing Capacity =	7.952 k
Utilization =	1%



Bolt and bearing capacities are accounting for double shear (ASCE 8-02, Eq. 5.3.4-1). Struts under compression are shown to demonstrate the load transfer from the girder. Single M8 bolts are located at each end of the strut and are subjected to double shear.

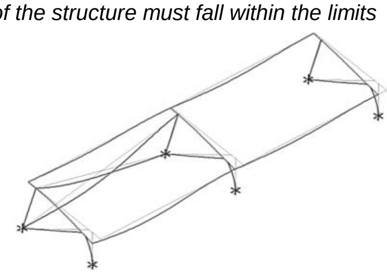
7. SEISMIC DESIGN

7.1 Seismic Drift - N/A

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

Mean Height, h_{sx} =	33.11 in
Allowable Story Drift for All Other Structures, Δ = {	$0.020h_{sx}$
	0.662 in
Max Drift, Δ_{MAX} =	0.083 in
N/A	

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



APPENDIX A

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

Purlin = **ProfiPlus**

Strong Axis:

3.4.14

L_b = 93.00 in

J = 0.255

242.167

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 28.3 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 = 93.00 in

J = 0.255

251.476

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 28.2

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

$\varphi F_L St$= 28.3 ksi
Ix = 250988 mm^4
0.603 in^4
y = 30 mm
Sx = 0.511 in^3
$M_{max}St$ = 1.203 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

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

Girder = **Flex Profi**

Strong Axis:

3.4.11

L_b = 33.78 in

ry = 1.374

Cb = 1.36

21.0529

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

S1 = 1.37733

$$S2 = 1.2C_c$$

S2 = 79.2

φF_L= φb[Bc-Dc*Lb/(1.2*ry*√(Cb))

φF_L= 29.8 ksi

3.4.15

N/A for Strong Direction

3.4.16

b/t = 4.29

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16

N/A for Strong Direction

Weak Axis:

3.4.11

L_b = 33.78 in

ry = 1.374

Cb = 1.36

24.5845

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

S1 = 1.37733

$$S2 = 1.2C_c$$

S2 = 79.2

φF_L= φb[Bc-Dc*Lb/(1.2*ry*√(Cb))

φF_L= 29.8 ksi

3.4.15

b/t = 24.46

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

S1 = 3.8

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

S2 = 14.7

F_{UT}= (φbk2*√(BpE))/(5.1b/t)

F_{UT}= 9.4 ksi

3.4.16

N/A for Weak Direction

3.4.16

b/t = 24.46

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

S1 = 12.2

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

S2 = 46.7

F_{ST}= φb[Bp-1.6Dp*b/t]

F_{ST}= 28.2 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.16.1

N/A for Weak Direction

3.4.16.2

N/A for Strong Direction

3.4.16.2

b/t = 24.46

t = 2.6

ds = 6.05

rs = 3.49

S = 21.70

ρst = 0.22

F_{UT}= 9.37

F_{ST}= 28.24

φF_L= Fut + (Fst - Fut)ρst < Fst

φF_L= 13.5 ksi

3.4.18

h/t = 24.46

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

S1 = 34.4

m = 0.70

C_0 = 34.23

Cc = 37.77

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

S2 = 72.1

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 29.8 ksi

Ix = 364470 mm^4

0.876 in^4

y = 37.77 mm

Sx = 0.589 in^3

M_{max}St = 1.463 k-ft

3.4.18

h/t = 4.29

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

S1 = 36.9

m = 0.65

C_0 = 29

Cc = 29

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 13.5 ksi

Iy = 217168 mm^4

0.522 in^4

x = 29 mm

Sy = 0.457 in^3

M_{max}Wk = 0.513 k-ft

Compression

3.4.7

λ = 0.46067

r = 1.374 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.90326

φF_L= φcc(Bc-Dc*λ)

φF_L= 30.1251 ksi

3.4.8

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

3.4.9

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

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

3.4.9.1

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

3.4.10

Rb/t = 0.0

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

S1 = 6.87
S2 = 131.3
φF_L= φyFcy
φF_L= 33.25 ksi

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

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 18.00 in

J = 0.16

47.2194

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.2 ksi

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 31.2 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

M_{max}St = 0.423 k-ft

Weak Axis:

3.4.14

L_b = 18.00 in

J = 0.16

47.2194

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.2

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 31.2 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

M_{max}Wk = 0.423 k-ft

Compression

3.4.7

$\lambda =$ 0.77182

r = 0.437 in

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

$S1^* =$ 0.33515

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

$S2^* =$ 1.23671

$\varphi cc =$ 0.83792

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

$\varphi F_L =$ 24.5226 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.25 ksi

$\varphi F_L =$ 24.52 ksi

A = 323.87 mm^2

0.50 in^2

$P_{max} =$ 12.31 kips

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 in³

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 in³

M_{max}Wk = 0.450 k-ft

Compression

3.4.7

λ = 1.98863

r = 0.437 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.85841

φF_L = (φccFcy)/(λ²)

φF_L = 7.59722 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L = φyFcy

φF_L = 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

φF_L = φyFcy

φF_L = 33.3 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

φF_L = φyFcy

φF_L = 33.25 ksi

φF_L = 7.60 ksi

A = 323.87 mm^2

0.50 in^2

P_{max} = 3.81 kips

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 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	-37.962	-37.962	0	0
2	M16	y	-63.27	-63.27	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	75.924	75.924	0	0
2	M16	y	37.962	37.962	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	249.347	2	315.934	2	-.005	15	0	15	0	1	0	1
2		min	-310.537	3	-444.603	3	-.205	1	0	1	0	1	0	1
3	N7	max	.028	3	425.548	1	-.105	15	0	15	0	1	0	1
4		min	-.182	2	17.884	15	-2.043	1	-.004	1	0	1	0	1
5	N15	max	.225	3	1049.908	1	.702	1	.001	1	0	1	0	1
6		min	-1.815	2	39.43	15	-.439	3	0	3	0	1	0	1
7	N16	max	942.904	2	1089.201	2	-.291	10	0	1	0	1	0	1
8		min	-999.079	3	-1464.568	3	-50.004	3	0	3	0	1	0	1
9	N23	max	.028	3	425.213	1	4.289	1	.007	1	0	1	0	1
10		min	-.182	2	18.051	15	.209	15	0	15	0	1	0	1
11	N24	max	249.924	2	320.575	2	50.314	3	.002	1	0	1	0	1
12		min	-310.659	3	-441.954	3	.029	10	0	12	0	1	0	1
13	Totals:	max	1439.994	2	3419.693	1	0	11						
14		min	-1619.994	3	-2126.537	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	275.719	1	.677	4	.571	1	0	15	0	12	0	1
2			min	-366.895	3	.159	15	-.025	3	-.001	1	0	1	0	1
3		2	max	275.853	1	.62	4	.571	1	0	15	0	12	0	15
4			min	-366.794	3	.146	15	-.025	3	-.001	1	0	1	0	4
5		3	max	275.988	1	.562	4	.571	1	0	15	0	15	0	15
6			min	-366.693	3	.132	15	-.025	3	-.001	1	0	1	0	4
7		4	max	276.123	1	.505	4	.571	1	0	15	0	15	0	15
8			min	-366.592	3	.119	15	-.025	3	-.001	1	0	1	0	4
9		5	max	276.258	1	.447	4	.571	1	0	15	0	1	0	15
10			min	-366.491	3	.105	15	-.025	3	-.001	1	0	3	0	4
11		6	max	276.393	1	.39	4	.571	1	0	15	0	1	0	15
12			min	-366.39	3	.092	15	-.025	3	-.001	1	0	3	0	4
13		7	max	276.528	1	.332	4	.571	1	0	15	0	1	0	15
14			min	-366.288	3	.078	15	-.025	3	-.001	1	0	3	0	4
15		8	max	276.663	1	.275	4	.571	1	0	15	0	1	0	15
16			min	-366.187	3	.065	15	-.025	3	-.001	1	0	3	0	4
17		9	max	276.797	1	.217	4	.571	1	0	15	0	1	0	15
18			min	-366.086	3	.051	15	-.025	3	-.001	1	0	3	0	4
19		10	max	276.932	1	.16	4	.571	1	0	15	0	1	0	15
20			min	-365.985	3	.037	12	-.025	3	-.001	1	0	3	0	4
21		11	max	277.067	1	.108	2	.571	1	0	15	0	1	0	15
22			min	-365.884	3	.015	12	-.025	3	-.001	1	0	3	0	4
23		12	max	277.202	1	.063	2	.571	1	0	15	0	1	0	15
24			min	-365.783	3	-.013	3	-.025	3	-.001	1	0	3	0	4
25		13	max	277.337	1	.018	2	.571	1	0	15	0	1	0	15
26			min	-365.682	3	-.047	3	-.025	3	-.001	1	0	3	0	4
27		14	max	277.472	1	-.016	15	.571	1	0	15	.001	1	0	15
28			min	-365.58	3	-.081	3	-.025	3	-.001	1	0	3	0	4
29		15	max	277.607	1	-.03	15	.571	1	0	15	.001	1	0	15
30			min	-365.479	3	-.128	4	-.025	3	-.001	1	0	3	0	4
31		16	max	277.742	1	-.043	15	.571	1	0	15	.001	1	0	15
32			min	-365.378	3	-.185	4	-.025	3	-.001	1	0	3	0	4
33		17	max	277.876	1	-.057	15	.571	1	0	15	.001	1	0	15
34			min	-365.277	3	-.243	4	-.025	3	-.001	1	0	3	0	4
35		18	max	278.011	1	-.07	15	.571	1	0	15	.001	1	0	15
36			min	-365.176	3	-.3	4	-.025	3	-.001	1	0	3	0	4
37		19	max	278.146	1	-.084	15	.571	1	0	15	.002	1	0	12

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
38			min	-365.075	3	-.358	4	-.025	3	-.001	1	0	3	0	4
39	M3	1	max	196.944	2	1.735	4	-.03	15	0	15	.002	1	0	4
40			min	-218.474	3	.408	15	-.661	1	0	1	0	15	0	12
41		2	max	196.874	2	1.558	4	-.03	15	0	15	.002	1	0	2
42			min	-218.526	3	.366	15	-.661	1	0	1	0	15	0	3
43		3	max	196.804	2	1.382	4	-.03	15	0	15	.002	1	0	2
44			min	-218.579	3	.325	15	-.661	1	0	1	0	15	0	3
45		4	max	196.734	2	1.205	4	-.03	15	0	15	.002	1	0	15
46			min	-218.631	3	.284	15	-.661	1	0	1	0	15	0	4
47		5	max	196.664	2	1.029	4	-.03	15	0	15	.002	1	0	15
48			min	-218.684	3	.242	15	-.661	1	0	1	0	15	0	4
49		6	max	196.594	2	.853	4	-.03	15	0	15	.002	1	0	15
50			min	-218.736	3	.201	15	-.661	1	0	1	0	15	0	4
51		7	max	196.524	2	.676	4	-.03	15	0	15	.001	1	0	15
52			min	-218.789	3	.159	15	-.661	1	0	1	0	15	0	4
53		8	max	196.454	2	.5	4	-.03	15	0	15	.001	1	0	15
54			min	-218.841	3	.118	15	-.661	1	0	1	0	15	-.001	4
55		9	max	196.384	2	.324	4	-.03	15	0	15	.001	1	0	15
56			min	-218.894	3	.076	15	-.661	1	0	1	0	15	-.001	4
57		10	max	196.314	2	.147	4	-.03	15	0	15	0	1	0	15
58			min	-218.946	3	.035	12	-.661	1	0	1	0	15	-.001	4
59		11	max	196.244	2	.003	2	-.03	15	0	15	0	1	0	15
60			min	-218.999	3	-.054	3	-.661	1	0	1	0	15	-.001	4
61		12	max	196.174	2	-.048	15	-.03	15	0	15	0	1	0	15
62			min	-219.051	3	-.206	4	-.661	1	0	1	0	15	-.001	4
63		13	max	196.104	2	-.09	15	-.03	15	0	15	0	1	0	15
64			min	-219.104	3	-.382	4	-.661	1	0	1	0	15	-.001	4
65		14	max	196.034	2	-.131	15	-.03	15	0	15	0	1	0	15
66			min	-219.156	3	-.558	4	-.661	1	0	1	0	15	-.001	4
67		15	max	195.964	2	-.173	15	-.03	15	0	15	0	1	0	15
68			min	-219.209	3	-.735	4	-.661	1	0	1	0	12	0	4
69		16	max	195.894	2	-.214	15	-.03	15	0	15	0	1	0	15
70			min	-219.261	3	-.911	4	-.661	1	0	1	0	12	0	4
71		17	max	195.824	2	-.255	15	-.03	15	0	15	0	15	0	15
72			min	-219.314	3	-1.087	4	-.661	1	0	1	0	1	0	4
73		18	max	195.754	2	-.297	15	-.03	15	0	15	0	15	0	15
74			min	-219.366	3	-1.264	4	-.661	1	0	1	0	1	0	4
75		19	max	195.684	2	-.338	15	-.03	15	0	15	0	15	0	1
76			min	-219.419	3	-1.44	4	-.661	1	0	1	0	1	0	1
77	M4	1	max	424.383	1	0	1	-.105	15	0	1	0	3	0	1
78			min	17.533	15	0	1	-2.199	1	0	1	0	2	0	1
79		2	max	424.448	1	0	1	-.105	15	0	1	0	12	0	1
80			min	17.552	15	0	1	-2.199	1	0	1	0	1	0	1
81		3	max	424.512	1	0	1	-.105	15	0	1	0	15	0	1
82			min	17.572	15	0	1	-2.199	1	0	1	0	1	0	1
83		4	max	424.577	1	0	1	-.105	15	0	1	0	15	0	1
84			min	17.591	15	0	1	-2.199	1	0	1	0	1	0	1
85		5	max	424.642	1	0	1	-.105	15	0	1	0	15	0	1
86			min	17.611	15	0	1	-2.199	1	0	1	0	1	0	1
87		6	max	424.707	1	0	1	-.105	15	0	1	0	15	0	1
88			min	17.63	15	0	1	-2.199	1	0	1	-.001	1	0	1
89		7	max	424.771	1	0	1	-.105	15	0	1	0	15	0	1
90			min	17.65	15	0	1	-2.199	1	0	1	-.001	1	0	1
91		8	max	424.836	1	0	1	-.105	15	0	1	0	15	0	1
92			min	17.669	15	0	1	-2.199	1	0	1	-.001	1	0	1
93		9	max	424.901	1	0	1	-.105	15	0	1	0	15	0	1
94			min	17.689	15	0	1	-2.199	1	0	1	-.002	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	424.965	1	0	1	-.105	15	0	1	0	15	0	1
96			min	17.708	15	0	1	-2.199	1	0	1	-.002	1	0	1
97		11	max	425.03	1	0	1	-.105	15	0	1	0	15	0	1
98			min	17.728	15	0	1	-2.199	1	0	1	-.002	1	0	1
99		12	max	425.095	1	0	1	-.105	15	0	1	0	15	0	1
100			min	17.747	15	0	1	-2.199	1	0	1	-.002	1	0	1
101		13	max	425.16	1	0	1	-.105	15	0	1	0	15	0	1
102			min	17.767	15	0	1	-2.199	1	0	1	-.002	1	0	1
103		14	max	425.224	1	0	1	-.105	15	0	1	0	15	0	1
104			min	17.786	15	0	1	-2.199	1	0	1	-.003	1	0	1
105		15	max	425.289	1	0	1	-.105	15	0	1	0	15	0	1
106			min	17.806	15	0	1	-2.199	1	0	1	-.003	1	0	1
107		16	max	425.354	1	0	1	-.105	15	0	1	0	15	0	1
108			min	17.825	15	0	1	-2.199	1	0	1	-.003	1	0	1
109		17	max	425.418	1	0	1	-.105	15	0	1	0	15	0	1
110			min	17.845	15	0	1	-2.199	1	0	1	-.003	1	0	1
111		18	max	425.483	1	0	1	-.105	15	0	1	0	15	0	1
112			min	17.864	15	0	1	-2.199	1	0	1	-.003	1	0	1
113		19	max	425.548	1	0	1	-.105	15	0	1	0	15	0	1
114			min	17.884	15	0	1	-2.199	1	0	1	-.004	1	0	1
115	M6	1	max	899.369	1	.682	4	.138	1	0	1	0	3	0	1
116			min	-1196.615	3	.16	15	-.137	3	0	15	0	11	0	1
117		2	max	899.504	1	.625	4	.138	1	0	1	0	3	0	15
118			min	-1196.514	3	.147	15	-.137	3	0	15	0	11	0	4
119		3	max	899.639	1	.567	4	.138	1	0	1	0	3	0	15
120			min	-1196.412	3	.133	15	-.137	3	0	15	0	15	0	4
121		4	max	899.774	1	.51	4	.138	1	0	1	0	3	0	15
122			min	-1196.311	3	.118	12	-.137	3	0	15	0	15	0	4
123		5	max	899.909	1	.452	4	.138	1	0	1	0	1	0	15
124			min	-1196.21	3	.096	12	-.137	3	0	15	0	15	0	4
125		6	max	900.044	1	.404	2	.138	1	0	1	0	1	0	15
126			min	-1196.109	3	.073	12	-.137	3	0	15	0	15	0	4
127		7	max	900.179	1	.36	2	.138	1	0	1	0	1	0	12
128			min	-1196.008	3	.051	12	-.137	3	0	15	0	12	0	4
129		8	max	900.313	1	.315	2	.138	1	0	1	0	1	0	12
130			min	-1195.907	3	.028	12	-.137	3	0	15	0	3	0	4
131		9	max	900.448	1	.27	2	.138	1	0	1	0	1	0	12
132			min	-1195.806	3	0	3	-.137	3	0	15	0	3	0	4
133		10	max	900.583	1	.225	2	.138	1	0	1	0	1	0	12
134			min	-1195.704	3	-.033	3	-.137	3	0	15	0	3	0	2
135		11	max	900.718	1	.18	2	.138	1	0	1	0	1	0	12
136			min	-1195.603	3	-.066	3	-.137	3	0	15	0	3	0	2
137		12	max	900.853	1	.136	2	.138	1	0	1	0	1	0	12
138			min	-1195.502	3	-.1	3	-.137	3	0	15	0	3	0	2
139		13	max	900.988	1	.091	2	.138	1	0	1	0	1	0	12
140			min	-1195.401	3	-.133	3	-.137	3	0	15	0	3	0	2
141		14	max	901.123	1	.046	2	.138	1	0	1	0	1	0	12
142			min	-1195.3	3	-.167	3	-.137	3	0	15	0	3	0	2
143		15	max	901.258	1	.001	2	.138	1	0	1	0	1	0	12
144			min	-1195.199	3	-.201	3	-.137	3	0	15	0	3	0	2
145		16	max	901.392	1	-.043	15	.138	1	0	1	0	1	0	12
146			min	-1195.097	3	-.234	3	-.137	3	0	15	0	3	0	2
147		17	max	901.527	1	-.056	15	.138	1	0	1	0	1	0	3
148			min	-1194.996	3	-.268	3	-.137	3	0	15	0	3	0	2
149		18	max	901.662	1	-.07	15	.138	1	0	1	0	1	0	3
150			min	-1194.895	3	-.301	3	-.137	3	0	15	0	3	0	2
151		19	max	901.797	1	-.083	15	.138	1	0	1	0	1	0	3

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
152			min	-1194.794	3	-.352	4	-.137	3	0	15	0	3	0	2
153	M7	1	max	789.336	2	1.741	4	.025	3	0	2	0	2	0	2
154			min	-688.454	3	.409	15	-.004	10	0	3	0	3	0	3
155		2	max	789.266	2	1.564	4	.025	3	0	2	0	2	0	2
156			min	-688.507	3	.367	15	-.004	10	0	3	0	3	0	3
157		3	max	789.196	2	1.388	4	.025	3	0	2	0	2	0	2
158			min	-688.559	3	.326	15	-.004	10	0	3	0	3	0	3
159		4	max	789.126	2	1.212	4	.025	3	0	2	0	2	0	2
160			min	-688.612	3	.285	15	-.004	10	0	3	0	3	0	3
161		5	max	789.056	2	1.035	4	.025	3	0	2	0	2	0	15
162			min	-688.664	3	.243	15	-.004	10	0	3	0	3	0	3
163		6	max	788.986	2	.859	4	.025	3	0	2	0	2	0	15
164			min	-688.717	3	.202	15	-.004	10	0	3	0	3	0	3
165		7	max	788.916	2	.682	4	.025	3	0	2	0	2	0	15
166			min	-688.769	3	.16	15	-.004	10	0	3	0	3	0	4
167		8	max	788.846	2	.506	4	.025	3	0	2	0	2	0	15
168			min	-688.822	3	.118	12	-.004	10	0	3	0	3	-.001	4
169		9	max	788.776	2	.351	2	.025	3	0	2	0	2	0	15
170			min	-688.874	3	.049	12	-.004	10	0	3	0	3	-.001	4
171		10	max	788.706	2	.214	2	.025	3	0	2	0	2	0	15
172			min	-688.927	3	-.037	3	-.004	10	0	3	0	3	-.001	4
173		11	max	788.636	2	.076	2	.025	3	0	2	0	2	0	15
174			min	-688.979	3	-.14	3	-.004	10	0	3	0	3	-.001	4
175		12	max	788.566	2	-.047	15	.025	3	0	2	0	2	0	15
176			min	-689.032	3	-.243	3	-.004	10	0	3	0	3	-.001	4
177		13	max	788.496	2	-.089	15	.025	3	0	2	0	2	0	15
178			min	-689.084	3	-.376	4	-.004	10	0	3	0	3	-.001	4
179		14	max	788.426	2	-.13	15	.025	3	0	2	0	2	0	15
180			min	-689.137	3	-.552	4	-.004	10	0	3	0	3	-.001	4
181		15	max	788.356	2	-.172	15	.025	3	0	2	0	2	0	15
182			min	-689.189	3	-.729	4	-.004	10	0	3	0	3	0	4
183		16	max	788.286	2	-.213	15	.025	3	0	2	0	2	0	15
184			min	-689.242	3	-.905	4	-.004	10	0	3	0	3	0	4
185		17	max	788.216	2	-.254	15	.025	3	0	2	0	2	0	15
186			min	-689.294	3	-1.081	4	-.004	10	0	3	0	3	0	4
187		18	max	788.146	2	-.296	15	.025	3	0	2	0	2	0	15
188			min	-689.347	3	-1.258	4	-.004	10	0	3	0	3	0	4
189		19	max	788.076	2	-.337	15	.025	3	0	2	0	2	0	1
190			min	-689.399	3	-1.434	4	-.004	10	0	3	0	3	0	1
191	M8	1	max	1048.743	1	0	1	.846	1	0	1	0	15	0	1
192			min	39.078	15	0	1	-.448	3	0	1	0	1	0	1
193		2	max	1048.808	1	0	1	.846	1	0	1	0	1	0	1
194			min	39.098	15	0	1	-.448	3	0	1	0	3	0	1
195		3	max	1048.872	1	0	1	.846	1	0	1	0	1	0	1
196			min	39.117	15	0	1	-.448	3	0	1	0	3	0	1
197		4	max	1048.937	1	0	1	.846	1	0	1	0	1	0	1
198			min	39.137	15	0	1	-.448	3	0	1	0	3	0	1
199		5	max	1049.002	1	0	1	.846	1	0	1	0	1	0	1
200			min	39.156	15	0	1	-.448	3	0	1	0	3	0	1
201		6	max	1049.067	1	0	1	.846	1	0	1	0	1	0	1
202			min	39.176	15	0	1	-.448	3	0	1	0	3	0	1
203		7	max	1049.131	1	0	1	.846	1	0	1	0	1	0	1
204			min	39.195	15	0	1	-.448	3	0	1	0	3	0	1
205		8	max	1049.196	1	0	1	.846	1	0	1	0	1	0	1
206			min	39.215	15	0	1	-.448	3	0	1	0	3	0	1
207		9	max	1049.261	1	0	1	.846	1	0	1	0	1	0	1
208			min	39.234	15	0	1	-.448	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	1049.325	1	0	1	.846	1	0	1	0	1	0	1
210			min	39.254	15	0	1	-.448	3	0	1	0	3	0	1
211		11	max	1049.39	1	0	1	.846	1	0	1	0	1	0	1
212			min	39.273	15	0	1	-.448	3	0	1	0	3	0	1
213		12	max	1049.455	1	0	1	.846	1	0	1	0	1	0	1
214			min	39.293	15	0	1	-.448	3	0	1	0	3	0	1
215		13	max	1049.52	1	0	1	.846	1	0	1	0	1	0	1
216			min	39.312	15	0	1	-.448	3	0	1	0	3	0	1
217		14	max	1049.584	1	0	1	.846	1	0	1	0	1	0	1
218			min	39.332	15	0	1	-.448	3	0	1	0	3	0	1
219		15	max	1049.649	1	0	1	.846	1	0	1	.001	1	0	1
220			min	39.351	15	0	1	-.448	3	0	1	0	3	0	1
221		16	max	1049.714	1	0	1	.846	1	0	1	.001	1	0	1
222			min	39.371	15	0	1	-.448	3	0	1	0	3	0	1
223		17	max	1049.778	1	0	1	.846	1	0	1	.001	1	0	1
224			min	39.391	15	0	1	-.448	3	0	1	0	3	0	1
225		18	max	1049.843	1	0	1	.846	1	0	1	.001	1	0	1
226			min	39.41	15	0	1	-.448	3	0	1	0	3	0	1
227		19	max	1049.908	1	0	1	.846	1	0	1	.001	1	0	1
228			min	39.43	15	0	1	-.448	3	0	1	0	3	0	1
229	M10	1	max	292.469	1	.672	4	.005	3	.001	1	0	1	0	1
230			min	-342.624	3	.159	15	-.246	1	0	3	0	3	0	1
231		2	max	292.603	1	.615	4	.005	3	.001	1	0	1	0	15
232			min	-342.523	3	.145	15	-.246	1	0	3	0	3	0	4
233		3	max	292.738	1	.557	4	.005	3	.001	1	0	1	0	15
234			min	-342.421	3	.132	15	-.246	1	0	3	0	3	0	4
235		4	max	292.873	1	.5	4	.005	3	.001	1	0	1	0	15
236			min	-342.32	3	.118	15	-.246	1	0	3	0	3	0	4
237		5	max	293.008	1	.443	4	.005	3	.001	1	0	1	0	15
238			min	-342.219	3	.105	15	-.246	1	0	3	0	3	0	4
239		6	max	293.143	1	.385	4	.005	3	.001	1	0	1	0	15
240			min	-342.118	3	.091	15	-.246	1	0	3	0	3	0	4
241		7	max	293.278	1	.328	4	.005	3	.001	1	0	1	0	15
242			min	-342.017	3	.078	15	-.246	1	0	3	0	3	0	4
243		8	max	293.413	1	.27	4	.005	3	.001	1	0	1	0	15
244			min	-341.916	3	.064	15	-.246	1	0	3	0	3	0	4
245		9	max	293.548	1	.213	4	.005	3	.001	1	0	1	0	15
246			min	-341.815	3	.05	15	-.246	1	0	3	0	3	0	4
247		10	max	293.682	1	.155	4	.005	3	.001	1	0	1	0	15
248			min	-341.713	3	.037	15	-.246	1	0	3	0	3	0	4
249		11	max	293.817	1	.108	2	.005	3	.001	1	0	11	0	15
250			min	-341.612	3	.023	15	-.246	1	0	3	0	3	0	4
251		12	max	293.952	1	.063	2	.005	3	.001	1	0	15	0	15
252			min	-341.511	3	.007	12	-.246	1	0	3	0	3	0	4
253		13	max	294.087	1	.019	2	.005	3	.001	1	0	15	0	15
254			min	-341.41	3	-.024	1	-.246	1	0	3	0	3	0	4
255		14	max	294.222	1	-.017	15	.005	3	.001	1	0	15	0	15
256			min	-341.309	3	-.075	4	-.246	1	0	3	0	1	0	4
257		15	max	294.357	1	-.031	15	.005	3	.001	1	0	15	0	15
258			min	-341.208	3	-.132	4	-.246	1	0	3	0	1	0	4
259		16	max	294.492	1	-.044	15	.005	3	.001	1	0	15	0	15
260			min	-341.107	3	-.19	4	-.246	1	0	3	0	1	0	4
261		17	max	294.626	1	-.058	15	.005	3	.001	1	0	15	0	15
262			min	-341.005	3	-.247	4	-.246	1	0	3	0	1	0	4
263		18	max	294.761	1	-.071	15	.005	3	.001	1	0	15	0	15
264			min	-340.904	3	-.305	4	-.246	1	0	3	0	1	0	4
265		19	max	294.896	1	-.085	15	.005	3	.001	1	0	15	0	15

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
266			min	-340.803	3	-.362	4	-.246	1	0	3	0	1	0	4
267	M11	1	max	196.674	2	1.739	4	.726	1	.001	1	0	3	0	4
268			min	-219.136	3	.409	15	0	3	0	15	-.002	1	0	12
269		2	max	196.604	2	1.563	4	.726	1	.001	1	0	3	0	1
270			min	-219.188	3	.367	15	0	3	0	15	-.002	1	0	3
271		3	max	196.534	2	1.386	4	.726	1	.001	1	0	3	0	1
272			min	-219.241	3	.326	15	0	3	0	15	-.002	1	0	3
273		4	max	196.464	2	1.21	4	.726	1	.001	1	0	3	0	15
274			min	-219.293	3	.284	15	0	3	0	15	-.002	1	0	3
275		5	max	196.394	2	1.034	4	.726	1	.001	1	0	3	0	15
276			min	-219.346	3	.243	15	0	3	0	15	-.002	1	0	4
277		6	max	196.324	2	.857	4	.726	1	.001	1	0	3	0	15
278			min	-219.398	3	.201	15	0	3	0	15	-.001	1	0	4
279		7	max	196.254	2	.681	4	.726	1	.001	1	0	3	0	15
280			min	-219.451	3	.16	15	0	3	0	15	-.001	1	0	4
281		8	max	196.184	2	.504	4	.726	1	.001	1	0	3	0	15
282			min	-219.503	3	.118	15	0	3	0	15	-.001	1	-.001	4
283		9	max	196.114	2	.328	4	.726	1	.001	1	0	3	0	15
284			min	-219.556	3	.077	15	0	3	0	15	0	1	-.001	4
285		10	max	196.044	2	.152	4	.726	1	.001	1	0	3	0	15
286			min	-219.608	3	.023	12	0	3	0	15	0	1	-.001	4
287		11	max	195.974	2	.006	1	.726	1	.001	1	0	3	0	15
288			min	-219.661	3	-.072	3	0	3	0	15	0	1	-.001	4
289		12	max	195.904	2	-.047	15	.726	1	.001	1	0	3	0	15
290			min	-219.713	3	-.201	4	0	3	0	15	0	1	-.001	4
291		13	max	195.834	2	-.089	15	.726	1	.001	1	0	3	0	15
292			min	-219.766	3	-.377	4	0	3	0	15	0	1	-.001	4
293		14	max	195.764	2	-.13	15	.726	1	.001	1	0	3	0	15
294			min	-219.818	3	-.554	4	0	3	0	15	0	1	-.001	4
295		15	max	195.694	2	-.172	15	.726	1	.001	1	0	3	0	15
296			min	-219.871	3	-.73	4	0	3	0	15	0	2	0	4
297		16	max	195.624	2	-.213	15	.726	1	.001	1	0	3	0	15
298			min	-219.923	3	-.907	4	0	3	0	15	0	10	0	4
299		17	max	195.554	2	-.255	15	.726	1	.001	1	0	1	0	15
300			min	-219.976	3	-1.083	4	0	3	0	15	0	15	0	4
301		18	max	195.484	2	-.296	15	.726	1	.001	1	0	1	0	15
302			min	-220.028	3	-1.259	4	0	3	0	15	0	15	0	4
303		19	max	195.414	2	-.338	15	.726	1	.001	1	0	1	0	1
304			min	-220.081	3	-1.436	4	0	3	0	15	0	15	0	1
305	M12	1	max	424.048	1	0	1	4.612	1	0	1	0	2	0	1
306			min	17.699	15	0	1	.209	15	0	1	0	3	0	1
307		2	max	424.113	1	0	1	4.612	1	0	1	0	1	0	1
308			min	17.719	15	0	1	.209	15	0	1	0	12	0	1
309		3	max	424.178	1	0	1	4.612	1	0	1	0	1	0	1
310			min	17.738	15	0	1	.209	15	0	1	0	15	0	1
311		4	max	424.242	1	0	1	4.612	1	0	1	.001	1	0	1
312			min	17.758	15	0	1	.209	15	0	1	0	15	0	1
313		5	max	424.307	1	0	1	4.612	1	0	1	.002	1	0	1
314			min	17.777	15	0	1	.209	15	0	1	0	15	0	1
315		6	max	424.372	1	0	1	4.612	1	0	1	.002	1	0	1
316			min	17.797	15	0	1	.209	15	0	1	0	15	0	1
317		7	max	424.436	1	0	1	4.612	1	0	1	.003	1	0	1
318			min	17.816	15	0	1	.209	15	0	1	0	15	0	1
319		8	max	424.501	1	0	1	4.612	1	0	1	.003	1	0	1
320			min	17.836	15	0	1	.209	15	0	1	0	15	0	1
321		9	max	424.566	1	0	1	4.612	1	0	1	.003	1	0	1
322			min	17.855	15	0	1	.209	15	0	1	0	15	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
323		10	max	424.631	1	0	1	4.612	1	0	1	.004	1	0	1
324			min	17.875	15	0	1	.209	15	0	1	0	15	0	1
325		11	max	424.695	1	0	1	4.612	1	0	1	.004	1	0	1
326			min	17.895	15	0	1	.209	15	0	1	0	15	0	1
327		12	max	424.76	1	0	1	4.612	1	0	1	.005	1	0	1
328			min	17.914	15	0	1	.209	15	0	1	0	15	0	1
329		13	max	424.825	1	0	1	4.612	1	0	1	.005	1	0	1
330			min	17.934	15	0	1	.209	15	0	1	0	15	0	1
331		14	max	424.889	1	0	1	4.612	1	0	1	.005	1	0	1
332			min	17.953	15	0	1	.209	15	0	1	0	15	0	1
333		15	max	424.954	1	0	1	4.612	1	0	1	.006	1	0	1
334			min	17.973	15	0	1	.209	15	0	1	0	15	0	1
335		16	max	425.019	1	0	1	4.612	1	0	1	.006	1	0	1
336			min	17.992	15	0	1	.209	15	0	1	0	15	0	1
337		17	max	425.084	1	0	1	4.612	1	0	1	.007	1	0	1
338			min	18.012	15	0	1	.209	15	0	1	0	15	0	1
339		18	max	425.148	1	0	1	4.612	1	0	1	.007	1	0	1
340			min	18.031	15	0	1	.209	15	0	1	0	15	0	1
341		19	max	425.213	1	0	1	4.612	1	0	1	.007	1	0	1
342			min	18.051	15	0	1	.209	15	0	1	0	15	0	1
343	M1	1	max	161.565	1	342.711	3	-4.214	15	0	1	.182	1	0	2
344			min	7.316	15	-270.359	1	-92.103	1	0	3	.008	15	0	3
345		2	max	161.725	1	342.539	3	-4.214	15	0	1	.162	1	.059	1
346			min	7.365	15	-270.588	1	-92.103	1	0	3	.007	15	-.074	3
347		3	max	117.448	3	7.369	9	-4.19	15	0	12	.141	1	.116	1
348			min	-14.167	10	-28.049	2	-92.071	1	0	1	.006	15	-.147	3
349		4	max	117.568	3	7.178	9	-4.19	15	0	12	.121	1	.118	1
350			min	-14.033	10	-28.277	2	-92.071	1	0	1	.005	15	-.145	3
351		5	max	117.688	3	6.987	9	-4.19	15	0	12	.101	1	.121	2
352			min	-13.9	10	-28.506	2	-92.071	1	0	1	.005	15	-.143	3
353		6	max	117.808	3	6.797	9	-4.19	15	0	12	.081	1	.128	2
354			min	-13.766	10	-28.735	2	-92.071	1	0	1	.004	15	-.141	3
355		7	max	117.929	3	6.606	9	-4.19	15	0	12	.061	1	.134	2
356			min	-13.633	10	-28.963	2	-92.071	1	0	1	.003	15	-.139	3
357		8	max	118.049	3	6.416	9	-4.19	15	0	12	.041	1	.14	2
358			min	-13.499	10	-29.192	2	-92.071	1	0	1	.002	15	-.137	3
359		9	max	118.169	3	6.225	9	-4.19	15	0	12	.021	1	.147	2
360			min	-13.366	10	-29.421	2	-92.071	1	0	1	0	15	-.135	3
361		10	max	118.289	3	6.034	9	-4.19	15	0	12	.001	3	.153	2
362			min	-13.232	10	-29.65	2	-92.071	1	0	1	0	10	-.133	3
363		11	max	118.409	3	5.844	9	-4.19	15	0	12	0	12	.159	2
364			min	-13.099	10	-29.878	2	-92.071	1	0	1	-.019	1	-.13	3
365		12	max	118.529	3	5.653	9	-4.19	15	0	12	-.001	12	.166	2
366			min	-12.965	10	-30.107	2	-92.071	1	0	1	-.039	1	-.128	3
367		13	max	118.649	3	5.462	9	-4.19	15	0	12	-.003	12	.172	2
368			min	-12.832	10	-30.336	2	-92.071	1	0	1	-.059	1	-.126	3
369		14	max	118.769	3	5.272	9	-4.19	15	0	12	-.004	15	.179	2
370			min	-12.698	10	-30.565	2	-92.071	1	0	1	-.079	1	-.123	3
371		15	max	118.889	3	5.081	9	-4.19	15	0	12	-.005	15	.186	2
372			min	-12.565	10	-30.793	2	-92.071	1	0	1	-.099	1	-.121	3
373		16	max	94.802	2	141.617	2	-4.22	15	0	1	-.005	15	.191	2
374			min	2.627	15	-205.549	3	-92.599	1	0	12	-.12	1	-.117	3
375		17	max	94.962	2	141.389	2	-4.22	15	0	1	-.006	15	.16	2
376			min	2.675	15	-205.721	3	-92.599	1	0	12	-.14	1	-.072	3
377		18	max	-7.332	15	370.909	2	-4.326	15	0	3	-.007	15	.081	2
378			min	-161.142	1	-165.682	3	-95.056	1	0	2	-.16	1	-.036	3
379		19	max	-7.284	15	370.681	2	-4.326	15	0	3	-.008	15	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	-160.982	1	-165.853	3	-95.056	1	0	2	-.181	1	0	3
381	M5	1	max	350.884	1	1134.714	3	-.109	10	0	1	.005	1	0	3
382			min	13.807	12	-896.769	1	-44.871	3	0	3	0	10	0	2
383		2	max	351.044	1	1134.542	3	-.109	10	0	1	0	2	.194	1
384			min	13.887	12	-896.998	1	-44.871	3	0	3	-.005	3	-.246	3
385		3	max	370.079	3	5.957	9	5.202	3	0	3	0	2	.385	1
386			min	-69.69	2	-105.768	2	-.501	2	0	1	-.014	3	-.487	3
387		4	max	370.199	3	5.766	9	5.202	3	0	3	0	2	.395	1
388			min	-69.53	2	-105.997	2	-.501	2	0	1	-.013	3	-.479	3
389		5	max	370.319	3	5.575	9	5.202	3	0	3	0	2	.406	2
390			min	-69.37	2	-106.226	2	-.501	2	0	1	-.012	3	-.471	3
391		6	max	370.439	3	5.385	9	5.202	3	0	3	0	2	.429	2
392			min	-69.21	2	-106.454	2	-.501	2	0	1	-.011	3	-.463	3
393		7	max	370.559	3	5.194	9	5.202	3	0	3	0	2	.452	2
394			min	-69.049	2	-106.683	2	-.501	2	0	1	-.01	3	-.456	3
395		8	max	370.679	3	5.004	9	5.202	3	0	3	0	2	.475	2
396			min	-68.889	2	-106.912	2	-.501	2	0	1	-.009	3	-.448	3
397		9	max	370.799	3	4.813	9	5.202	3	0	3	0	2	.498	2
398			min	-68.729	2	-107.141	2	-.501	2	0	1	-.008	3	-.44	3
399		10	max	370.92	3	4.622	9	5.202	3	0	3	0	10	.522	2
400			min	-68.569	2	-107.369	2	-.501	2	0	1	-.006	3	-.432	3
401		11	max	371.04	3	4.432	9	5.202	3	0	3	0	10	.545	2
402			min	-68.409	2	-107.598	2	-.501	2	0	1	-.005	3	-.424	3
403		12	max	371.16	3	4.241	9	5.202	3	0	3	0	10	.568	2
404			min	-68.249	2	-107.827	2	-.501	2	0	1	-.004	3	-.416	3
405		13	max	371.28	3	4.051	9	5.202	3	0	3	0	10	.592	2
406			min	-68.088	2	-108.055	2	-.501	2	0	1	-.003	3	-.407	3
407		14	max	371.4	3	3.86	9	5.202	3	0	3	0	10	.615	2
408			min	-67.928	2	-108.284	2	-.501	2	0	1	-.002	1	-.399	3
409		15	max	371.52	3	3.669	9	5.202	3	0	3	0	15	.639	2
410			min	-67.768	2	-108.513	2	-.501	2	0	1	-.002	1	-.391	3
411		16	max	302.867	2	590.827	2	5.186	3	0	1	0	12	.656	2
412			min	6.432	15	-647.675	3	-.544	2	0	15	-.002	1	-.378	3
413		17	max	303.027	2	590.598	2	5.186	3	0	1	.001	3	.528	2
414			min	6.481	15	-647.847	3	-.544	2	0	15	-.001	1	-.237	3
415		18	max	-14.711	12	1224.406	2	4.731	3	0	15	.002	3	.265	2
416			min	-351.814	1	-546.111	3	-.127	2	0	1	0	2	-.118	3
417		19	max	-14.631	12	1224.178	2	4.731	3	0	15	.003	3	0	3
418			min	-351.654	1	-546.283	3	-.127	2	0	1	0	2	0	2
419	M9	1	max	160.829	1	342.68	3	119.605	1	0	3	-.008	15	0	2
420			min	7.28	15	-270.341	1	5.776	15	0	1	-.181	1	0	3
421		2	max	160.99	1	342.509	3	119.605	1	0	3	-.005	12	.059	1
422			min	7.329	15	-270.57	1	5.776	15	0	1	-.155	1	-.074	3
423		3	max	117.743	3	7.349	9	87.247	1	0	1	.004	3	.116	1
424			min	-13.595	10	-28.057	2	1.882	12	0	12	-.128	1	-.147	3
425		4	max	117.863	3	7.159	9	87.247	1	0	1	.004	3	.118	1
426			min	-13.461	10	-28.285	2	1.882	12	0	12	-.109	1	-.145	3
427		5	max	117.983	3	6.968	9	87.247	1	0	1	.005	3	.121	2
428			min	-13.328	10	-28.514	2	1.882	12	0	12	-.09	1	-.143	3
429		6	max	118.103	3	6.777	9	87.247	1	0	1	.006	3	.128	2
430			min	-13.194	10	-28.743	2	1.882	12	0	12	-.071	1	-.141	3
431		7	max	118.223	3	6.587	9	87.247	1	0	1	.006	3	.134	2
432			min	-13.061	10	-28.972	2	1.882	12	0	12	-.052	1	-.139	3
433		8	max	118.344	3	6.396	9	87.247	1	0	1	.007	3	.14	2
434			min	-12.928	10	-29.2	2	1.882	12	0	12	-.033	1	-.137	3
435		9	max	118.464	3	6.206	9	87.247	1	0	1	.007	3	.146	2
436			min	-12.794	10	-29.429	2	1.882	12	0	12	-.014	1	-.135	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	118.584	3	6.015	9	87.247	1	0	1	.008	3	.153	2
438			min	-12.661	10	-29.658	2	1.882	12	0	12	0	2	-.133	3
439		11	max	118.704	3	5.824	9	87.247	1	0	1	.023	1	.159	2
440			min	-12.527	10	-29.886	2	1.882	12	0	12	.001	15	-.13	3
441		12	max	118.824	3	5.634	9	87.247	1	0	1	.042	1	.166	2
442			min	-12.394	10	-30.115	2	1.882	12	0	12	.002	15	-.128	3
443		13	max	118.944	3	5.443	9	87.247	1	0	1	.061	1	.172	2
444			min	-12.26	10	-30.344	2	1.882	12	0	12	.003	15	-.126	3
445		14	max	119.064	3	5.252	9	87.247	1	0	1	.08	1	.179	2
446			min	-12.127	10	-30.573	2	1.882	12	0	12	.004	15	-.123	3
447		15	max	119.184	3	5.062	9	87.247	1	0	1	.099	1	.186	2
448			min	-11.993	10	-30.801	2	1.882	12	0	12	.005	15	-.121	3
449		16	max	95.194	2	141.372	2	87.83	1	0	15	.119	1	.191	2
450			min	2.736	15	-206.069	3	1.883	12	0	1	.005	15	-.117	3
451		17	max	95.354	2	141.143	2	87.83	1	0	15	.138	1	.16	2
452			min	2.785	15	-206.241	3	1.883	12	0	1	.006	15	-.072	3
453		18	max	-7.319	15	370.911	2	92.609	1	0	2	.158	1	.081	2
454			min	-160.803	1	-165.678	3	2.269	12	0	3	.007	15	-.036	3
455		19	max	-7.271	15	370.682	2	92.609	1	0	2	.179	1	0	2
456			min	-160.643	1	-165.85	3	2.269	12	0	3	.008	15	0	3
457	M13	1	max	119.933	1	269.87	1	-7.28	15	0	2	.181	1	0	1
458			min	5.777	15	-342.669	3	-160.806	1	0	3	.008	15	0	3
459		2	max	119.933	1	190.299	1	-5.592	15	0	2	.059	1	.252	3
460			min	5.777	15	-241.572	3	-123.401	1	0	3	.003	15	-.198	1
461		3	max	119.933	1	110.728	1	-3.903	15	0	2	.002	3	.416	3
462			min	5.777	15	-140.475	3	-85.997	1	0	3	-.031	1	-.328	1
463		4	max	119.933	1	31.158	1	-2.215	15	0	2	-.002	12	.493	3
464			min	5.777	15	-39.377	3	-48.593	1	0	3	-.089	1	-.389	1
465		5	max	119.933	1	61.72	3	-.526	15	0	2	-.003	12	.484	3
466			min	5.777	15	-48.413	1	-11.188	1	0	3	-.115	1	-.381	1
467		6	max	119.933	1	162.817	3	26.216	1	0	2	-.004	12	.387	3
468			min	5.777	15	-127.983	1	.435	12	0	3	-.109	1	-.305	1
469		7	max	119.933	1	263.914	3	63.621	1	0	2	-.003	12	.203	3
470			min	5.777	15	-207.554	1	2.073	12	0	3	-.07	1	-.161	1
471		8	max	119.933	1	365.011	3	101.025	1	0	2	.002	2	.052	1
472			min	5.777	15	-287.125	1	3.711	12	0	3	0	3	-.067	3
473		9	max	119.933	1	466.109	3	138.429	1	0	2	.104	1	.334	1
474			min	5.777	15	-366.695	1	5.349	12	0	3	.004	12	-.425	3
475		10	max	119.933	1	567.206	3	175.834	1	0	2	.239	1	.684	1
476			min	5.777	15	-446.266	1	6.987	12	0	3	.009	12	-.87	3
477		11	max	92.462	1	366.695	1	-5.176	12	0	3	.1	1	.334	1
478			min	4.215	15	-466.109	3	-137.688	1	0	2	0	12	-.425	3
479		12	max	92.462	1	287.125	1	-3.538	12	0	3	.001	2	.052	1
480			min	4.215	15	-365.011	3	-100.284	1	0	2	-.004	3	-.067	3
481		13	max	92.462	1	207.554	1	-1.9	12	0	3	-.003	15	.203	3
482			min	4.215	15	-263.914	3	-62.88	1	0	2	-.073	1	-.161	1
483		14	max	92.462	1	127.983	1	-.262	12	0	3	-.005	15	.387	3
484			min	4.215	15	-162.817	3	-25.475	1	0	2	-.111	1	-.305	1
485		15	max	92.462	1	48.413	1	11.929	1	0	3	-.005	15	.484	3
486			min	4.215	15	-61.72	3	.562	15	0	2	-.117	1	-.381	1
487		16	max	92.462	1	39.377	3	49.334	1	0	3	-.004	12	.493	3
488			min	4.215	15	-31.158	1	2.251	15	0	2	-.09	1	-.389	1
489		17	max	92.462	1	140.475	3	86.738	1	0	3	0	12	.416	3
490			min	4.215	15	-110.729	1	3.939	15	0	2	-.032	1	-.328	1
491		18	max	92.462	1	241.572	3	124.142	1	0	3	.059	1	.252	3
492			min	4.215	15	-190.299	1	5.628	15	0	2	.003	15	-.198	1
493		19	max	92.462	1	342.669	3	161.547	1	0	3	.182	1	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
494			min	4.215	15	-269.87	1	7.316	15	0	2	.008	15	0	3
495	M16	1	max	-2.267	12	370.959	2	-7.271	15	0	3	.179	1	0	2
496			min	-92.214	1	-165.885	3	-160.661	1	0	2	.008	15	0	3
497		2	max	-2.267	12	261.598	2	-5.582	15	0	3	.056	1	.122	3
498			min	-92.214	1	-117.091	3	-123.257	1	0	2	.003	15	-.272	2
499		3	max	-2.267	12	152.236	2	-3.894	15	0	3	-.001	12	.202	3
500			min	-92.214	1	-68.297	3	-85.852	1	0	2	-.034	1	-.45	2
501		4	max	-2.267	12	42.875	2	-2.205	15	0	3	-.004	12	.239	3
502			min	-92.214	1	-19.503	3	-48.448	1	0	2	-.092	1	-.534	2
503		5	max	-2.267	12	29.291	3	-.517	15	0	3	-.005	15	.235	3
504			min	-92.214	1	-66.486	2	-11.043	1	0	2	-.117	1	-.524	2
505		6	max	-2.267	12	78.085	3	26.361	1	0	3	-.005	15	.189	3
506			min	-92.214	1	-175.847	2	.65	12	0	2	-.111	1	-.42	2
507		7	max	-2.267	12	126.879	3	63.765	1	0	3	-.003	15	.101	3
508			min	-92.214	1	-285.208	2	2.288	12	0	2	-.072	1	-.221	2
509		8	max	-2.267	12	175.673	3	101.17	1	0	3	.001	2	.071	2
510			min	-92.214	1	-394.569	2	3.926	12	0	2	-.003	3	-.03	3
511		9	max	-2.267	12	224.467	3	138.574	1	0	3	.102	1	.458	2
512			min	-92.214	1	-503.93	2	5.564	12	0	2	.002	12	-.202	3
513		10	max	-4.325	15	-13.527	15	175.979	1	0	15	.238	1	.939	2
514			min	-94.71	1	-613.291	2	-11.121	3	0	2	.01	12	-.416	3
515		11	max	-4.325	15	503.93	2	-5.792	12	0	2	.103	1	.458	2
516			min	-94.71	1	-224.467	3	-138.234	1	0	3	.004	12	-.202	3
517		12	max	-4.325	15	394.569	2	-4.153	12	0	2	.001	2	.071	2
518			min	-94.71	1	-175.673	3	-100.83	1	0	3	0	9	-.03	3
519		13	max	-4.325	15	285.208	2	-2.515	12	0	2	-.003	12	.101	3
520			min	-94.71	1	-126.879	3	-63.426	1	0	3	-.071	1	-.221	2
521		14	max	-4.325	15	175.847	2	-.877	12	0	2	-.005	12	.189	3
522			min	-94.71	1	-78.085	3	-26.021	1	0	3	-.11	1	-.42	2
523		15	max	-4.325	15	66.486	2	11.383	1	0	2	-.005	12	.235	3
524			min	-94.71	1	-29.291	3	.53	15	0	3	-.116	1	-.524	2
525		16	max	-4.325	15	19.503	3	48.788	1	0	2	-.003	12	.239	3
526			min	-94.71	1	-42.875	2	2.219	15	0	3	-.09	1	-.534	2
527		17	max	-4.325	15	68.297	3	86.192	1	0	2	0	12	.202	3
528			min	-94.71	1	-152.236	2	3.907	15	0	3	-.032	1	-.45	2
529		18	max	-4.325	15	117.091	3	123.596	1	0	2	.058	1	.122	3
530			min	-94.71	1	-261.598	2	5.596	15	0	3	.003	15	-.272	2
531		19	max	-4.325	15	165.885	3	161.001	1	0	2	.181	1	0	2
532			min	-94.71	1	-370.959	2	7.284	15	0	3	.008	15	0	3
533	M15	1	max	0	2	2.713	4	.036	3	0	1	0	1	0	1
534			min	-54.605	3	0	2	-.03	1	0	3	0	3	0	1
535		2	max	0	2	2.412	4	.036	3	0	1	0	1	0	2
536			min	-54.68	3	0	2	-.03	1	0	3	0	3	-.001	4
537		3	max	0	2	2.11	4	.036	3	0	1	0	1	0	2
538			min	-54.756	3	0	2	-.03	1	0	3	0	3	-.002	4
539		4	max	0	2	1.809	4	.036	3	0	1	0	1	0	2
540			min	-54.831	3	0	2	-.03	1	0	3	0	3	-.003	4
541		5	max	0	2	1.507	4	.036	3	0	1	0	1	0	2
542			min	-54.907	3	0	2	-.03	1	0	3	0	3	-.004	4
543		6	max	0	2	1.206	4	.036	3	0	1	0	1	0	2
544			min	-54.982	3	0	2	-.03	1	0	3	0	3	-.005	4
545		7	max	0	2	.904	4	.036	3	0	1	0	3	0	2
546			min	-55.058	3	0	2	-.03	1	0	3	0	1	-.005	4
547		8	max	0	2	.603	4	.036	3	0	1	0	3	0	2
548			min	-55.133	3	0	2	-.03	1	0	3	0	1	-.005	4
549		9	max	0	2	.301	4	.036	3	0	1	0	3	0	2
550			min	-55.209	3	0	2	-.03	1	0	3	0	1	-.006	4

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
551		10	max	0	2	0	1	.036	3	0	1	0	3	0	2
552			min	-55.284	3	0	1	-.03	1	0	3	0	1	-.006	4
553		11	max	0	2	0	2	.036	3	0	1	0	3	0	2
554			min	-55.36	3	-.301	4	-.03	1	0	3	0	1	-.006	4
555		12	max	0	2	0	2	.036	3	0	1	0	3	0	2
556			min	-55.435	3	-.603	4	-.03	1	0	3	0	1	-.005	4
557		13	max	0	2	0	2	.036	3	0	1	0	3	0	2
558			min	-55.511	3	-.904	4	-.03	1	0	3	0	1	-.005	4
559		14	max	0	2	0	2	.036	3	0	1	0	3	0	2
560			min	-55.586	3	-1.206	4	-.03	1	0	3	0	1	-.005	4
561		15	max	0	2	0	2	.036	3	0	1	0	3	0	2
562			min	-55.662	3	-1.507	4	-.03	1	0	3	0	1	-.004	4
563		16	max	0	2	0	2	.036	3	0	1	0	3	0	2
564			min	-55.738	3	-1.809	4	-.03	1	0	3	0	1	-.003	4
565		17	max	0	2	0	2	.036	3	0	1	0	3	0	2
566			min	-55.813	3	-2.11	4	-.03	1	0	3	0	1	-.002	4
567		18	max	0	2	0	2	.036	3	0	1	0	3	0	2
568			min	-55.889	3	-2.412	4	-.03	1	0	3	0	1	-.001	4
569		19	max	0	2	0	2	.036	3	0	1	0	3	0	1
570			min	-55.964	3	-2.713	4	-.03	1	0	3	0	1	0	1
571	M16A	1	max	-1.073	10	2.713	4	.02	1	0	3	0	3	0	1
572			min	-55.36	3	.638	15	-.014	3	0	2	0	1	0	1
573		2	max	-.989	10	2.412	4	.02	1	0	3	0	3	0	15
574			min	-55.285	3	.567	15	-.014	3	0	2	0	1	-.001	4
575		3	max	-.905	10	2.11	4	.02	1	0	3	0	3	0	15
576			min	-55.209	3	.496	15	-.014	3	0	2	0	1	-.002	4
577		4	max	-.822	10	1.809	4	.02	1	0	3	0	3	0	15
578			min	-55.134	3	.425	15	-.014	3	0	2	0	1	-.003	4
579		5	max	-.738	10	1.507	4	.02	1	0	3	0	3	0	15
580			min	-55.058	3	.354	15	-.014	3	0	2	0	1	-.004	4
581		6	max	-.654	10	1.206	4	.02	1	0	3	0	3	-.001	15
582			min	-54.983	3	.283	15	-.014	3	0	2	0	1	-.005	4
583		7	max	-.57	10	.904	4	.02	1	0	3	0	3	-.001	15
584			min	-54.907	3	.213	15	-.014	3	0	2	0	1	-.005	4
585		8	max	-.486	10	.603	4	.02	1	0	3	0	3	-.001	15
586			min	-54.832	3	.142	15	-.014	3	0	2	0	1	-.005	4
587		9	max	-.402	10	.301	4	.02	1	0	3	0	3	-.001	15
588			min	-54.756	3	.071	15	-.014	3	0	2	0	1	-.006	4
589		10	max	-.318	10	0	1	.02	1	0	3	0	3	-.001	15
590			min	-54.681	3	0	1	-.014	3	0	2	0	1	-.006	4
591		11	max	-.234	10	-.071	15	.02	1	0	3	0	3	-.001	15
592			min	-54.605	3	-.301	4	-.014	3	0	2	0	1	-.006	4
593		12	max	-.15	10	-.142	15	.02	1	0	3	0	3	-.001	15
594			min	-54.53	3	-.603	4	-.014	3	0	2	0	1	-.005	4
595		13	max	-.066	10	-.213	15	.02	1	0	3	0	2	-.001	15
596			min	-54.454	3	-.904	4	-.014	3	0	2	0	3	-.005	4
597		14	max	.018	10	-.283	15	.02	1	0	3	0	1	-.001	15
598			min	-54.378	3	-1.206	4	-.014	3	0	2	0	3	-.005	4
599		15	max	.102	10	-.354	15	.02	1	0	3	0	1	0	15
600			min	-54.303	3	-1.507	4	-.014	3	0	2	0	3	-.004	4
601		16	max	.186	10	-.425	15	.02	1	0	3	0	1	0	15
602			min	-54.227	3	-1.809	4	-.014	3	0	2	0	3	-.003	4
603		17	max	.269	10	-.496	15	.02	1	0	3	0	1	0	15
604			min	-54.152	3	-2.11	4	-.014	3	0	2	0	3	-.002	4
605		18	max	.353	10	-.567	15	.02	1	0	3	0	1	0	15
606			min	-54.076	3	-2.412	4	-.014	3	0	2	0	3	-.001	4
607		19	max	.437	10	-.638	15	.02	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	-54.001	3	-2.713	4	-.014	3	0	2	0	3	0	1

Envelope Member Section Deflections

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
1	M2	1	max	.003	1	.011	2	.017	1	-7.033e-5	15	NC	3	NC	3
2			min	-.004	3	-.011	3	0	3	-1.541e-3	1	4010	2	2451.642	1
3		2	max	.003	1	.01	2	.016	1	-6.719e-5	15	NC	3	NC	3
4			min	-.004	3	-.011	3	0	3	-1.473e-3	1	4387.587	2	2629.789	1
5		3	max	.003	1	.009	2	.015	1	-6.406e-5	15	NC	1	NC	3
6			min	-.003	3	-.01	3	0	3	-1.404e-3	1	4838.714	2	2840.938	1
7		4	max	.002	1	.008	2	.014	1	-6.092e-5	15	NC	1	NC	3
8			min	-.003	3	-.01	3	0	3	-1.336e-3	1	5381.435	2	3092.805	1
9		5	max	.002	1	.007	2	.013	1	-5.779e-5	15	NC	1	NC	3
10			min	-.003	3	-.009	3	0	3	-1.268e-3	1	6039.899	2	3395.693	1
11		6	max	.002	1	.006	2	.011	1	-5.465e-5	15	NC	1	NC	3
12			min	-.003	3	-.009	3	0	3	-1.2e-3	1	6846.93	2	3763.597	1
13		7	max	.002	1	.005	2	.01	1	-5.151e-5	15	NC	1	NC	3
14			min	-.003	3	-.008	3	0	3	-1.131e-3	1	7847.996	2	4215.911	1
15		8	max	.002	1	.005	2	.009	1	-4.838e-5	15	NC	1	NC	2
16			min	-.002	3	-.008	3	0	3	-1.063e-3	1	9107.469	2	4780.142	1
17		9	max	.002	1	.004	2	.008	1	-4.524e-5	15	NC	1	NC	2
18			min	-.002	3	-.007	3	0	3	-9.948e-4	1	NC	1	5496.384	1
19		10	max	.001	1	.003	2	.007	1	-4.211e-5	15	NC	1	NC	2
20			min	-.002	3	-.007	3	0	3	-9.265e-4	1	NC	1	6425.023	1
21		11	max	.001	1	.003	2	.006	1	-3.897e-5	15	NC	1	NC	2
22			min	-.002	3	-.006	3	0	3	-8.582e-4	1	NC	1	7660.615	1
23		12	max	.001	1	.002	2	.005	1	-3.583e-5	15	NC	1	NC	2
24			min	-.001	3	-.005	3	0	3	-7.9e-4	1	NC	1	9358.492	1
25		13	max	0	1	.002	2	.004	1	-3.27e-5	15	NC	1	NC	1
26			min	-.001	3	-.005	3	0	3	-7.217e-4	1	NC	1	NC	1
27		14	max	0	1	.001	2	.003	1	-2.956e-5	15	NC	1	NC	1
28			min	-.001	3	-.004	3	0	3	-6.535e-4	1	NC	1	NC	1
29		15	max	0	1	0	2	.002	1	-2.643e-5	15	NC	1	NC	1
30			min	0	3	-.003	3	0	3	-5.852e-4	1	NC	1	NC	1
31		16	max	0	1	0	2	.001	1	-2.329e-5	15	NC	1	NC	1
32			min	0	3	-.002	3	0	3	-5.169e-4	1	NC	1	NC	1
33		17	max	0	1	0	2	0	1	-2.015e-5	15	NC	1	NC	1
34			min	0	3	-.002	3	0	12	-4.487e-4	1	NC	1	NC	1
35		18	max	0	1	0	2	0	1	-1.702e-5	15	NC	1	NC	1
36			min	0	3	0	3	0	12	-3.804e-4	1	NC	1	NC	1
37		19	max	0	1	0	1	0	1	-1.091e-5	12	NC	1	NC	1
38			min	0	1	0	1	0	1	-3.122e-4	1	NC	1	NC	1
39	M3	1	max	0	1	0	1	0	1	1.496e-4	1	NC	1	NC	1
40			min	0	1	0	1	0	1	5.348e-6	12	NC	1	NC	1
41		2	max	0	3	0	2	0	12	1.819e-4	1	NC	1	NC	1
42			min	0	2	0	3	0	1	7.923e-6	12	NC	1	NC	1
43		3	max	0	3	0	2	0	12	2.141e-4	1	NC	1	NC	1
44			min	0	2	-.002	3	-.001	1	9.635e-6	15	NC	1	NC	1
45		4	max	0	3	0	2	0	12	2.464e-4	1	NC	1	NC	1
46			min	0	2	-.003	3	-.001	1	1.113e-5	15	NC	1	NC	1
47		5	max	0	3	0	2	0	3	2.787e-4	1	NC	1	NC	1
48			min	0	2	-.004	3	-.001	1	1.262e-5	15	NC	1	NC	1
49		6	max	0	3	0	2	0	3	3.11e-4	1	NC	1	NC	1
50			min	0	2	-.004	3	-.001	1	1.411e-5	15	NC	1	NC	1
51		7	max	0	3	0	2	0	3	3.433e-4	1	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
52			min	0	2	-.005	3	0	1	1.56e-5	15	NC	1	NC	1
53		8	max	0	3	.001	2	0	3	3.756e-4	1	NC	1	NC	1
54			min	0	2	-.006	3	0	1	1.709e-5	15	NC	1	NC	1
55		9	max	.001	3	.001	2	0	3	4.079e-4	1	NC	1	NC	1
56			min	0	2	-.007	3	0	2	1.858e-5	15	NC	1	NC	1
57		10	max	.001	3	.002	2	0	1	4.402e-4	1	NC	1	NC	1
58			min	-.001	2	-.007	3	0	15	2.007e-5	15	NC	1	NC	1
59		11	max	.001	3	.002	2	.001	1	4.725e-4	1	NC	1	NC	1
60			min	-.001	2	-.008	3	0	15	2.156e-5	15	NC	1	NC	1
61		12	max	.002	3	.003	2	.002	1	5.048e-4	1	NC	1	NC	1
62			min	-.001	2	-.008	3	0	15	2.305e-5	15	NC	1	NC	1
63		13	max	.002	3	.004	2	.003	1	5.371e-4	1	NC	1	NC	1
64			min	-.001	2	-.008	3	0	15	2.454e-5	15	NC	1	NC	1
65		14	max	.002	3	.004	2	.004	1	5.694e-4	1	NC	1	NC	1
66			min	-.002	2	-.009	3	0	15	2.603e-5	15	NC	1	NC	1
67		15	max	.002	3	.005	2	.005	1	6.016e-4	1	NC	1	NC	2
68			min	-.002	2	-.009	3	0	15	2.752e-5	15	8562.915	2	8830.284	1
69		16	max	.002	3	.006	2	.006	1	6.339e-4	1	NC	1	NC	2
70			min	-.002	2	-.009	3	0	15	2.901e-5	15	7263.734	2	7367.217	1
71		17	max	.002	3	.007	2	.007	1	6.662e-4	1	NC	1	NC	2
72			min	-.002	2	-.009	3	0	15	3.05e-5	15	6257.501	2	6309.596	1
73		18	max	.002	3	.008	2	.008	1	6.985e-4	1	NC	1	NC	2
74			min	-.002	2	-.009	3	0	15	3.2e-5	15	5469.185	2	5518.985	1
75		19	max	.002	3	.01	2	.009	1	7.308e-4	1	NC	3	NC	2
76			min	-.002	2	-.009	3	0	15	3.349e-5	15	4846.022	2	4913.097	1
77	M4	1	max	.002	1	.012	2	0	15	-5.113e-5	12	NC	1	NC	3
78			min	0	15	-.011	3	-.007	1	-1.167e-3	1	NC	1	2722.666	1
79		2	max	.002	1	.012	2	0	15	-5.113e-5	12	NC	1	NC	3
80			min	0	15	-.01	3	-.007	1	-1.167e-3	1	NC	1	2970.244	1
81		3	max	.002	1	.011	2	0	15	-5.113e-5	12	NC	1	NC	3
82			min	0	15	-.01	3	-.006	1	-1.167e-3	1	NC	1	3264.898	1
83		4	max	.002	1	.01	2	0	15	-5.113e-5	12	NC	1	NC	3
84			min	0	15	-.009	3	-.005	1	-1.167e-3	1	NC	1	3619.046	1
85		5	max	.002	1	.01	2	0	15	-5.113e-5	12	NC	1	NC	2
86			min	0	15	-.008	3	-.005	1	-1.167e-3	1	NC	1	4049.605	1
87		6	max	.001	1	.009	2	0	15	-5.113e-5	12	NC	1	NC	2
88			min	0	15	-.008	3	-.004	1	-1.167e-3	1	NC	1	4580.105	1
89		7	max	.001	1	.008	2	0	15	-5.113e-5	12	NC	1	NC	2
90			min	0	15	-.007	3	-.004	1	-1.167e-3	1	NC	1	5244.061	1
91		8	max	.001	1	.008	2	0	15	-5.113e-5	12	NC	1	NC	2
92			min	0	15	-.007	3	-.003	1	-1.167e-3	1	NC	1	6090.556	1
93		9	max	.001	1	.007	2	0	15	-5.113e-5	12	NC	1	NC	2
94			min	0	15	-.006	3	-.003	1	-1.167e-3	1	NC	1	7193.839	1
95		10	max	.001	1	.006	2	0	15	-5.113e-5	12	NC	1	NC	2
96			min	0	15	-.005	3	-.002	1	-1.167e-3	1	NC	1	8670.645	1
97		11	max	0	1	.006	2	0	15	-5.113e-5	12	NC	1	NC	1
98			min	0	15	-.005	3	-.002	1	-1.167e-3	1	NC	1	NC	1
99		12	max	0	1	.005	2	0	15	-5.113e-5	12	NC	1	NC	1
100			min	0	15	-.004	3	-.001	1	-1.167e-3	1	NC	1	NC	1
101		13	max	0	1	.004	2	0	15	-5.113e-5	12	NC	1	NC	1
102			min	0	15	-.004	3	-.001	1	-1.167e-3	1	NC	1	NC	1
103		14	max	0	1	.003	2	0	15	-5.113e-5	12	NC	1	NC	1
104			min	0	15	-.003	3	0	1	-1.167e-3	1	NC	1	NC	1
105		15	max	0	1	.003	2	0	15	-5.113e-5	12	NC	1	NC	1
106			min	0	15	-.002	3	0	1	-1.167e-3	1	NC	1	NC	1
107		16	max	0	1	.002	2	0	15	-5.113e-5	12	NC	1	NC	1
108			min	0	15	-.002	3	0	1	-1.167e-3	1	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
109		17	max	0	1	.001	2	0	15	-5.113e-5	12	NC	1	NC	1
110			min	0	15	-.001	3	0	1	-1.167e-3	1	NC	1	NC	1
111		18	max	0	1	0	2	0	15	-5.113e-5	12	NC	1	NC	1
112			min	0	15	0	3	0	1	-1.167e-3	1	NC	1	NC	1
113		19	max	0	1	0	1	0	1	-5.113e-5	12	NC	1	NC	1
114			min	0	1	0	1	0	1	-1.167e-3	1	NC	1	NC	1
115	M6	1	max	.009	1	.039	2	.005	1	3.493e-4	3	NC	3	NC	2
116			min	-.013	3	-.036	3	-.004	3	1.512e-6	10	1099.747	2	8079.769	1
117		2	max	.009	1	.036	2	.005	1	3.374e-4	3	NC	3	NC	2
118			min	-.012	3	-.034	3	-.004	3	6.146e-7	10	1176.997	2	8784.209	1
119		3	max	.008	1	.034	2	.004	1	3.254e-4	3	NC	3	NC	2
120			min	-.011	3	-.032	3	-.004	3	-2.83e-7	10	1265.535	2	9617.218	1
121		4	max	.008	1	.031	2	.004	1	3.135e-4	3	NC	3	NC	1
122			min	-.01	3	-.03	3	-.003	3	-3.24e-6	2	1367.606	2	NC	1
123		5	max	.007	1	.029	2	.004	1	3.016e-4	3	NC	3	NC	1
124			min	-.01	3	-.028	3	-.003	3	-6.585e-6	2	1486.104	2	NC	1
125		6	max	.007	1	.026	2	.003	1	2.897e-4	3	NC	3	NC	1
126			min	-.009	3	-.026	3	-.003	3	-9.931e-6	2	1624.814	2	NC	1
127		7	max	.006	1	.024	2	.003	1	2.777e-4	3	NC	3	NC	1
128			min	-.008	3	-.024	3	-.003	3	-1.328e-5	2	1788.782	2	NC	1
129		8	max	.006	1	.021	2	.002	1	2.658e-4	3	NC	3	NC	1
130			min	-.008	3	-.022	3	-.002	3	-1.662e-5	2	1984.889	2	NC	1
131		9	max	.005	1	.019	2	.002	1	2.539e-4	3	NC	3	NC	1
132			min	-.007	3	-.02	3	-.002	3	-1.997e-5	2	2222.765	2	NC	1
133		10	max	.005	1	.017	2	.002	1	2.419e-4	3	NC	3	NC	1
134			min	-.006	3	-.018	3	-.002	3	-2.331e-5	2	2516.308	2	NC	1
135		11	max	.004	1	.015	2	.001	1	2.3e-4	3	NC	3	NC	1
136			min	-.006	3	-.016	3	-.002	3	-2.666e-5	2	2886.355	2	NC	1
137		12	max	.004	1	.013	2	.001	1	2.181e-4	3	NC	3	NC	1
138			min	-.005	3	-.014	3	-.001	3	-3.e-5	2	3365.627	2	NC	1
139		13	max	.003	1	.011	2	0	1	2.061e-4	3	NC	3	NC	1
140			min	-.004	3	-.012	3	-.001	3	-3.335e-5	2	4008.626	2	NC	1
141		14	max	.003	1	.009	2	0	1	1.942e-4	3	NC	3	NC	1
142			min	-.003	3	-.01	3	0	3	-3.67e-5	2	4913.41	2	NC	1
143		15	max	.002	1	.007	2	0	1	1.823e-4	3	NC	3	NC	1
144			min	-.003	3	-.008	3	0	3	-4.004e-5	2	6276.019	2	NC	1
145		16	max	.002	1	.005	2	0	1	1.703e-4	3	NC	1	NC	1
146			min	-.002	3	-.006	3	0	3	-4.339e-5	2	8553.766	2	NC	1
147		17	max	.001	1	.003	2	0	1	1.584e-4	3	NC	1	NC	1
148			min	-.001	3	-.004	3	0	3	-4.673e-5	2	NC	1	NC	1
149		18	max	0	1	.002	2	0	1	1.465e-4	3	NC	1	NC	1
150			min	0	3	-.002	3	0	3	-5.008e-5	2	NC	1	NC	1
151		19	max	0	1	0	1	0	1	1.345e-4	3	NC	1	NC	1
152			min	0	1	0	1	0	1	-5.342e-5	2	NC	1	NC	1
153	M7	1	max	0	1	0	1	0	1	2.536e-5	2	NC	1	NC	1
154			min	0	1	0	1	0	1	-6.409e-5	3	NC	1	NC	1
155		2	max	0	3	.002	2	0	3	2.114e-5	2	NC	1	NC	1
156			min	0	2	-.002	3	0	2	-4.643e-5	3	NC	1	NC	1
157		3	max	0	3	.003	2	0	3	2.034e-5	1	NC	1	NC	1
158			min	0	2	-.004	3	0	2	-2.878e-5	3	NC	1	NC	1
159		4	max	.001	3	.005	2	0	3	2.038e-5	1	NC	1	NC	1
160			min	-.001	2	-.007	3	0	2	-1.113e-5	3	9612.452	2	NC	1
161		5	max	.002	3	.006	2	.001	3	2.041e-5	1	NC	1	NC	1
162			min	-.002	2	-.009	3	0	2	7.772e-7	15	7252.888	2	NC	1
163		6	max	.002	3	.008	2	.001	3	2.418e-5	3	NC	3	NC	1
164			min	-.002	2	-.011	3	0	1	9.132e-7	15	5809.967	2	NC	1
165		7	max	.003	3	.01	2	.001	3	4.183e-5	3	NC	3	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
166			min	-.003	2	-.013	3	0	1	7.904e-8	2	4827.446	2	NC	1
167		8	max	.003	3	.011	2	.002	3	5.948e-5	3	NC	3	NC	1
168			min	-.003	2	-.014	3	0	1	-4.134e-6	2	4110.229	2	NC	1
169		9	max	.003	3	.013	2	.002	3	7.714e-5	3	NC	3	NC	1
170			min	-.004	2	-.016	3	0	1	-8.347e-6	2	3561.002	2	NC	1
171		10	max	.004	3	.015	2	.002	3	9.479e-5	3	NC	3	NC	1
172			min	-.004	2	-.018	3	-.001	1	-1.256e-5	2	3125.786	2	NC	1
173		11	max	.004	3	.017	2	.002	3	1.124e-4	3	NC	3	NC	1
174			min	-.005	2	-.019	3	-.001	1	-1.677e-5	2	2772.176	2	NC	1
175		12	max	.005	3	.019	2	.002	3	1.301e-4	3	NC	3	NC	1
176			min	-.005	2	-.021	3	-.001	1	-2.099e-5	2	2479.472	2	NC	1
177		13	max	.005	3	.021	2	.002	3	1.477e-4	3	NC	3	NC	1
178			min	-.006	2	-.022	3	-.002	1	-2.52e-5	2	2233.76	2	NC	1
179		14	max	.006	3	.023	2	.002	3	1.654e-4	3	NC	3	NC	1
180			min	-.006	2	-.023	3	-.002	1	-2.941e-5	2	2025.282	2	NC	1
181		15	max	.006	3	.025	2	.002	3	1.831e-4	3	NC	3	NC	1
182			min	-.007	2	-.025	3	-.002	1	-3.363e-5	2	1846.946	2	NC	1
183		16	max	.007	3	.027	2	.002	3	2.007e-4	3	NC	3	NC	1
184			min	-.007	2	-.026	3	-.002	1	-3.784e-5	2	1693.443	2	NC	1
185		17	max	.007	3	.03	2	.002	3	2.184e-4	3	NC	3	NC	1
186			min	-.008	2	-.027	3	-.002	1	-4.205e-5	2	1560.698	2	NC	1
187		18	max	.007	3	.032	2	.002	3	2.36e-4	3	NC	3	NC	1
188			min	-.008	2	-.028	3	-.002	1	-4.627e-5	2	1445.519	2	NC	1
189		19	max	.008	3	.034	2	.002	3	2.537e-4	3	NC	3	NC	1
190			min	-.009	2	-.029	3	-.003	1	-5.048e-5	2	1345.369	2	NC	1
191	M8	1	max	.005	1	.045	2	.003	1	-7.936e-6	10	NC	1	NC	2
192			min	0	15	-.035	3	-.001	3	-2.128e-4	1	NC	1	7238.476	1
193		2	max	.005	1	.042	2	.002	1	-7.936e-6	10	NC	1	NC	2
194			min	0	15	-.033	3	-.001	3	-2.128e-4	1	NC	1	7891.824	1
195		3	max	.004	1	.04	2	.002	1	-7.936e-6	10	NC	1	NC	2
196			min	0	15	-.031	3	-.001	3	-2.128e-4	1	NC	1	8669.639	1
197		4	max	.004	1	.037	2	.002	1	-7.936e-6	10	NC	1	NC	2
198			min	0	15	-.029	3	-.001	3	-2.128e-4	1	NC	1	9604.708	1
199		5	max	.004	1	.035	2	.002	1	-7.936e-6	10	NC	1	NC	1
200			min	0	15	-.027	3	0	3	-2.128e-4	1	NC	1	NC	1
201		6	max	.004	1	.032	2	.002	1	-7.936e-6	10	NC	1	NC	1
202			min	0	15	-.025	3	0	3	-2.128e-4	1	NC	1	NC	1
203		7	max	.003	1	.03	2	.001	1	-7.936e-6	10	NC	1	NC	1
204			min	0	15	-.023	3	0	3	-2.128e-4	1	NC	1	NC	1
205		8	max	.003	1	.027	2	.001	1	-7.936e-6	10	NC	1	NC	1
206			min	0	15	-.021	3	0	3	-2.128e-4	1	NC	1	NC	1
207		9	max	.003	1	.025	2	.001	1	-7.936e-6	10	NC	1	NC	1
208			min	0	15	-.02	3	0	3	-2.128e-4	1	NC	1	NC	1
209		10	max	.002	1	.022	2	0	1	-7.936e-6	10	NC	1	NC	1
210			min	0	15	-.018	3	0	3	-2.128e-4	1	NC	1	NC	1
211		11	max	.002	1	.02	2	0	1	-7.936e-6	10	NC	1	NC	1
212			min	0	15	-.016	3	0	3	-2.128e-4	1	NC	1	NC	1
213		12	max	.002	1	.017	2	0	1	-7.936e-6	10	NC	1	NC	1
214			min	0	15	-.014	3	0	3	-2.128e-4	1	NC	1	NC	1
215		13	max	.002	1	.015	2	0	1	-7.936e-6	10	NC	1	NC	1
216			min	0	15	-.012	3	0	3	-2.128e-4	1	NC	1	NC	1
217		14	max	.001	1	.012	2	0	1	-7.936e-6	10	NC	1	NC	1
218			min	0	15	-.01	3	0	3	-2.128e-4	1	NC	1	NC	1
219		15	max	.001	1	.01	2	0	1	-7.936e-6	10	NC	1	NC	1
220			min	0	15	-.008	3	0	3	-2.128e-4	1	NC	1	NC	1
221		16	max	0	1	.007	2	0	1	-7.936e-6	10	NC	1	NC	1
222			min	0	15	-.006	3	0	3	-2.128e-4	1	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
223		17	max	0	1	.005	2	0	1	-7.936e-6	10	NC	1	NC	1
224			min	0	15	-.004	3	0	3	-2.128e-4	1	NC	1	NC	1
225		18	max	0	1	.002	2	0	1	-7.936e-6	10	NC	1	NC	1
226			min	0	15	-.002	3	0	3	-2.128e-4	1	NC	1	NC	1
227		19	max	0	1	0	1	0	1	-7.936e-6	10	NC	1	NC	1
228			min	0	1	0	1	0	1	-2.128e-4	1	NC	1	NC	1
229	M10	1	max	.003	1	.011	2	0	3	1.261e-3	1	NC	3	NC	1
230			min	-.004	3	-.011	3	-.002	1	-3.21e-4	3	4011.422	2	NC	1
231		2	max	.003	1	.01	2	0	3	1.195e-3	1	NC	3	NC	1
232			min	-.003	3	-.011	3	-.002	1	-3.105e-4	3	4389.222	2	NC	1
233		3	max	.003	1	.009	2	0	3	1.129e-3	1	NC	3	NC	1
234			min	-.003	3	-.01	3	-.002	1	-2.999e-4	3	4840.62	2	NC	1
235		4	max	.003	1	.008	2	0	3	1.063e-3	1	NC	1	NC	1
236			min	-.003	3	-.01	3	-.002	1	-2.893e-4	3	5383.69	2	NC	1
237		5	max	.002	1	.007	2	0	3	9.968e-4	1	NC	1	NC	1
238			min	-.003	3	-.009	3	-.002	1	-2.788e-4	3	6042.606	2	NC	1
239		6	max	.002	1	.006	2	0	3	9.308e-4	1	NC	1	NC	1
240			min	-.003	3	-.009	3	-.002	1	-2.682e-4	3	6850.234	2	NC	1
241		7	max	.002	1	.005	2	0	3	8.648e-4	1	NC	1	NC	1
242			min	-.002	3	-.008	3	-.002	1	-2.576e-4	3	7852.097	2	NC	1
243		8	max	.002	1	.005	2	0	3	7.989e-4	1	NC	1	NC	1
244			min	-.002	3	-.008	3	-.002	1	-2.471e-4	3	9112.658	2	NC	1
245		9	max	.002	1	.004	2	0	3	7.329e-4	1	NC	1	NC	1
246			min	-.002	3	-.007	3	-.002	1	-2.365e-4	3	NC	1	NC	1
247		10	max	.002	1	.003	2	0	3	6.669e-4	1	NC	1	NC	1
248			min	-.002	3	-.007	3	-.001	1	-2.259e-4	3	NC	1	NC	1
249		11	max	.001	1	.003	2	0	3	6.01e-4	1	NC	1	NC	1
250			min	-.002	3	-.006	3	-.001	1	-2.154e-4	3	NC	1	NC	1
251		12	max	.001	1	.002	2	0	3	5.35e-4	1	NC	1	NC	1
252			min	-.001	3	-.006	3	0	1	-2.048e-4	3	NC	1	NC	1
253		13	max	.001	1	.002	2	0	3	4.691e-4	1	NC	1	NC	1
254			min	-.001	3	-.005	3	0	1	-1.942e-4	3	NC	1	NC	1
255		14	max	0	1	.001	2	0	3	4.031e-4	1	NC	1	NC	1
256			min	0	3	-.004	3	0	1	-1.837e-4	3	NC	1	NC	1
257		15	max	0	1	0	2	0	3	3.371e-4	1	NC	1	NC	1
258			min	0	3	-.003	3	0	1	-1.731e-4	3	NC	1	NC	1
259		16	max	0	1	0	2	0	3	2.712e-4	1	NC	1	NC	1
260			min	0	3	-.003	3	0	1	-1.625e-4	3	NC	1	NC	1
261		17	max	0	1	0	2	0	3	2.052e-4	1	NC	1	NC	1
262			min	0	3	-.002	3	0	1	-1.52e-4	3	NC	1	NC	1
263		18	max	0	1	0	2	0	3	1.392e-4	1	NC	1	NC	1
264			min	0	3	0	3	0	1	-1.414e-4	3	NC	1	NC	1
265		19	max	0	1	0	1	0	1	7.326e-5	1	NC	1	NC	1
266			min	0	1	0	1	0	1	-1.308e-4	3	NC	1	NC	1
267	M11	1	max	0	1	0	1	0	1	6.255e-5	3	NC	1	NC	1
268			min	0	1	0	1	0	1	-3.638e-5	1	NC	1	NC	1
269		2	max	0	3	0	2	0	11	4.288e-5	3	NC	1	NC	1
270			min	0	2	0	3	0	3	-9.885e-5	1	NC	1	NC	1
271		3	max	0	3	0	2	0	2	2.322e-5	3	NC	1	NC	1
272			min	0	2	-.002	3	0	3	-1.613e-4	1	NC	1	NC	1
273		4	max	0	3	0	2	0	10	3.551e-6	3	NC	1	NC	1
274			min	0	2	-.003	3	0	3	-2.238e-4	1	NC	1	NC	1
275		5	max	0	3	0	2	0	10	-1.092e-5	12	NC	1	NC	1
276			min	0	2	-.004	3	-.001	3	-2.863e-4	1	NC	1	NC	1
277		6	max	0	3	0	2	0	15	-1.584e-5	15	NC	1	NC	1
278			min	0	2	-.005	3	-.002	1	-3.487e-4	1	NC	1	NC	1
279		7	max	0	3	0	2	0	15	-1.88e-5	15	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
280			min	0	2	-.005	3	-.002	1	-4.112e-4	1	NC	1	NC	1
281		8	max	0	3	0	2	0	15	-2.176e-5	15	NC	1	NC	1
282			min	0	2	-.006	3	-.003	1	-4.737e-4	1	NC	1	NC	1
283		9	max	.001	3	.001	2	0	15	-2.472e-5	15	NC	1	NC	1
284			min	0	2	-.007	3	-.004	1	-5.362e-4	1	NC	1	NC	1
285		10	max	.001	3	.002	2	0	15	-2.768e-5	15	NC	1	NC	2
286			min	-.001	2	-.007	3	-.006	1	-5.986e-4	1	NC	1	8203.085	1
287		11	max	.001	3	.002	2	0	15	-3.064e-5	15	NC	1	NC	2
288			min	-.001	2	-.008	3	-.007	1	-6.611e-4	1	NC	1	6714.762	1
289		12	max	.002	3	.003	2	0	15	-3.36e-5	15	NC	1	NC	2
290			min	-.001	2	-.008	3	-.008	1	-7.236e-4	1	NC	1	5637.325	1
291		13	max	.002	3	.004	2	0	15	-3.656e-5	15	NC	1	NC	2
292			min	-.001	2	-.008	3	-.01	1	-7.861e-4	1	NC	1	4831.982	1
293		14	max	.002	3	.004	2	0	15	-3.951e-5	15	NC	1	NC	2
294			min	-.002	2	-.009	3	-.011	1	-8.485e-4	1	NC	1	4214.427	1
295		15	max	.002	3	.005	2	0	15	-4.247e-5	15	NC	1	NC	3
296			min	-.002	2	-.009	3	-.012	1	-9.11e-4	1	8573.683	2	3730.996	1
297		16	max	.002	3	.006	2	0	15	-4.543e-5	15	NC	1	NC	3
298			min	-.002	2	-.009	3	-.014	1	-9.735e-4	1	7272.13	2	3346.189	1
299		17	max	.002	3	.007	2	0	15	-4.839e-5	15	NC	1	NC	3
300			min	-.002	2	-.009	3	-.015	1	-1.036e-3	1	6264.216	2	3035.767	1
301		18	max	.002	3	.008	2	0	15	-5.135e-5	15	NC	1	NC	3
302			min	-.002	2	-.009	3	-.017	1	-1.098e-3	1	5474.687	2	2782.728	1
303		19	max	.002	3	.009	2	0	15	-5.431e-5	15	NC	3	NC	3
304			min	-.002	2	-.009	3	-.018	1	-1.161e-3	1	4850.633	2	2574.888	1
305	M12	1	max	.002	1	.012	2	.015	1	1.148e-3	1	NC	1	NC	3
306			min	0	15	-.011	3	0	15	5.468e-5	15	NC	1	1313.289	1
307		2	max	.002	1	.012	2	.013	1	1.148e-3	1	NC	1	NC	3
308			min	0	15	-.01	3	0	15	5.468e-5	15	NC	1	1432.271	1
309		3	max	.002	1	.011	2	.012	1	1.148e-3	1	NC	1	NC	3
310			min	0	15	-.01	3	0	15	5.468e-5	15	NC	1	1573.897	1
311		4	max	.002	1	.01	2	.011	1	1.148e-3	1	NC	1	NC	3
312			min	0	15	-.009	3	0	15	5.468e-5	15	NC	1	1744.137	1
313		5	max	.002	1	.01	2	.01	1	1.148e-3	1	NC	1	NC	3
314			min	0	15	-.009	3	0	15	5.468e-5	15	NC	1	1951.124	1
315		6	max	.001	1	.009	2	.009	1	1.148e-3	1	NC	1	NC	3
316			min	0	15	-.008	3	0	15	5.468e-5	15	NC	1	2206.167	1
317		7	max	.001	1	.008	2	.008	1	1.148e-3	1	NC	1	NC	3
318			min	0	15	-.007	3	0	15	5.468e-5	15	NC	1	2525.377	1
319		8	max	.001	1	.008	2	.007	1	1.148e-3	1	NC	1	NC	3
320			min	0	15	-.007	3	0	15	5.468e-5	15	NC	1	2932.348	1
321		9	max	.001	1	.007	2	.006	1	1.148e-3	1	NC	1	NC	3
322			min	0	15	-.006	3	0	15	5.468e-5	15	NC	1	3462.767	1
323		10	max	.001	1	.006	2	.005	1	1.148e-3	1	NC	1	NC	2
324			min	0	15	-.005	3	0	15	5.468e-5	15	NC	1	4172.743	1
325		11	max	0	1	.006	2	.004	1	1.148e-3	1	NC	1	NC	2
326			min	0	15	-.005	3	0	15	5.468e-5	15	NC	1	5154.694	1
327		12	max	0	1	.005	2	.003	1	1.148e-3	1	NC	1	NC	2
328			min	0	15	-.004	3	0	15	5.468e-5	15	NC	1	6569.849	1
329		13	max	0	1	.004	2	.002	1	1.148e-3	1	NC	1	NC	2
330			min	0	15	-.004	3	0	15	5.468e-5	15	NC	1	8720.67	1
331		14	max	0	1	.003	2	.002	1	1.148e-3	1	NC	1	NC	1
332			min	0	15	-.003	3	0	15	5.468e-5	15	NC	1	NC	1
333		15	max	0	1	.003	2	.001	1	1.148e-3	1	NC	1	NC	1
334			min	0	15	-.002	3	0	15	5.468e-5	15	NC	1	NC	1
335		16	max	0	1	.002	2	0	1	1.148e-3	1	NC	1	NC	1
336			min	0	15	-.002	3	0	15	5.468e-5	15	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
337		17	max	0	1	.001	2	0	1	1.148e-3	1	NC	1	NC	1
338			min	0	15	-.001	3	0	15	5.468e-5	15	NC	1	NC	1
339		18	max	0	1	0	2	0	1	1.148e-3	1	NC	1	NC	1
340			min	0	15	0	3	0	15	5.468e-5	15	NC	1	NC	1
341		19	max	0	1	0	1	0	1	1.148e-3	1	NC	1	NC	1
342			min	0	1	0	1	0	1	5.468e-5	15	NC	1	NC	1
343	M1	1	max	.01	3	.027	3	.002	3	2.208e-2	1	NC	1	NC	1
344			min	-.009	2	-.024	2	-.006	1	-2.791e-2	3	NC	1	NC	1
345		2	max	.01	3	.016	3	.001	3	1.048e-2	1	NC	4	NC	2
346			min	-.009	2	-.015	2	-.013	1	-1.383e-2	3	4780.778	2	6584.853	1
347		3	max	.01	3	.007	3	0	3	-1.726e-5	12	NC	4	NC	2
348			min	-.009	2	-.005	2	-.017	1	-9.079e-4	1	2454.309	2	3994.039	1
349		4	max	.009	3	.003	1	0	3	-1.213e-5	12	NC	4	NC	3
350			min	-.009	2	-.002	3	-.02	1	-7.843e-4	1	1717.451	2	3306.194	1
351		5	max	.009	3	.01	2	0	3	-7.003e-6	12	NC	5	NC	3
352			min	-.009	2	-.008	3	-.02	1	-6.608e-4	1	1361.525	2	3176.267	1
353		6	max	.009	3	.016	2	0	3	-7.543e-7	3	NC	5	NC	3
354			min	-.009	2	-.014	3	-.019	1	-5.372e-4	1	1158.958	2	3401.028	1
355		7	max	.009	3	.021	2	0	3	6.904e-6	3	NC	5	NC	2
356			min	-.009	2	-.018	3	-.017	1	-4.137e-4	1	1034.992	2	4054.055	1
357		8	max	.009	3	.025	2	0	3	1.456e-5	3	NC	5	NC	2
358			min	-.009	2	-.021	3	-.014	1	-2.902e-4	1	958.511	2	5576.636	1
359		9	max	.009	3	.027	2	0	3	2.222e-5	3	NC	5	NC	1
360			min	-.009	2	-.023	3	-.01	1	-1.666e-4	1	915.006	2	NC	1
361		10	max	.009	3	.028	2	0	3	2.988e-5	3	NC	5	NC	1
362			min	-.009	2	-.024	3	-.005	1	-4.308e-5	1	897.862	2	NC	1
363		11	max	.009	3	.027	2	0	3	8.046e-5	1	NC	5	NC	1
364			min	-.009	2	-.023	3	-.001	1	4.087e-6	15	905.278	2	NC	1
365		12	max	.009	3	.026	2	.003	1	2.04e-4	1	NC	5	NC	2
366			min	-.009	2	-.021	3	0	15	9.692e-6	15	939.628	2	6309.092	1
367		13	max	.009	3	.022	2	.006	1	3.275e-4	1	NC	5	NC	2
368			min	-.009	2	-.018	3	0	15	1.53e-5	15	1008.74	2	4401.202	1
369		14	max	.009	3	.017	2	.008	1	4.511e-4	1	NC	5	NC	3
370			min	-.009	2	-.014	3	0	15	2.09e-5	15	1130.452	2	3616.9	1
371		15	max	.009	3	.01	2	.01	1	5.746e-4	1	NC	4	NC	3
372			min	-.009	2	-.008	3	0	15	2.651e-5	15	1346.341	2	3336.246	1
373		16	max	.009	3	.002	1	.009	1	6.584e-4	1	NC	4	NC	3
374			min	-.009	2	-.002	3	0	15	3.034e-5	15	1756.301	1	3442.383	1
375		17	max	.009	3	.006	3	.007	1	2.349e-5	3	NC	4	NC	2
376			min	-.009	2	-.008	2	0	15	-2.03e-4	1	2469.426	1	4133.839	1
377		18	max	.009	3	.014	3	.003	1	1.5e-2	2	NC	2	NC	2
378			min	-.009	2	-.02	2	0	15	-6.835e-3	3	4772.44	1	6787.143	1
379		19	max	.009	3	.023	3	0	3	3.039e-2	2	NC	1	NC	1
380			min	-.009	2	-.032	2	-.004	1	-1.382e-2	3	5850.789	2	NC	1
381	M5	1	max	.031	3	.088	3	.002	3	1.602e-6	3	NC	1	NC	1
382			min	-.035	2	-.083	2	-.007	1	5.472e-8	10	3474.446	3	NC	1
383		2	max	.031	3	.054	3	.003	3	9.62e-5	3	NC	5	NC	1
384			min	-.035	2	-.05	2	-.006	1	-5.222e-5	1	1418.769	2	NC	1
385		3	max	.03	3	.022	3	.004	3	1.889e-4	3	NC	5	NC	1
386			min	-.035	2	-.018	2	-.005	1	-1.045e-4	1	727.894	2	NC	1
387		4	max	.03	3	.01	2	.005	3	1.818e-4	3	NC	5	NC	1
388			min	-.035	2	-.005	3	-.005	1	-9.986e-5	1	508.784	2	NC	1
389		5	max	.03	3	.034	2	.005	3	1.747e-4	3	NC	5	NC	1
390			min	-.035	2	-.028	3	-.004	1	-9.526e-5	1	402.897	2	NC	1
391		6	max	.03	3	.054	2	.006	3	1.676e-4	3	NC	15	NC	1
392			min	-.035	2	-.046	3	-.004	1	-9.066e-5	1	342.599	2	NC	1
393		7	max	.03	3	.071	2	.006	3	1.605e-4	3	NC	15	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
394			min	-.035	2	-.06	3	-.003	1	-8.606e-5	1	305.663	2	NC	1
395		8	max	.03	3	.083	2	.006	3	1.534e-4	3	NC	15	NC	1
396			min	-.035	2	-.07	3	-.003	1	-8.146e-5	1	282.836	2	NC	1
397		9	max	.03	3	.091	2	.005	3	1.462e-4	3	NC	15	NC	1
398			min	-.035	2	-.075	3	-.003	1	-7.686e-5	1	269.8	2	NC	1
399		10	max	.03	3	.095	2	.005	3	1.391e-4	3	NC	15	NC	1
400			min	-.035	2	-.077	3	-.002	1	-7.226e-5	1	264.584	2	NC	1
401		11	max	.03	3	.093	2	.005	3	1.32e-4	3	NC	15	NC	1
402			min	-.035	2	-.074	3	-.002	1	-6.766e-5	1	266.648	2	NC	1
403		12	max	.03	3	.087	2	.004	3	1.249e-4	3	NC	15	NC	1
404			min	-.035	2	-.068	3	-.002	1	-6.306e-5	1	276.693	2	NC	1
405		13	max	.029	3	.075	2	.004	3	1.178e-4	3	NC	15	NC	1
406			min	-.034	2	-.058	3	-.002	1	-5.845e-5	1	297.045	2	NC	1
407		14	max	.029	3	.058	2	.003	3	1.107e-4	3	NC	15	NC	1
408			min	-.034	2	-.044	3	-.002	1	-5.385e-5	1	333.021	2	NC	1
409		15	max	.029	3	.035	2	.003	3	1.036e-4	3	NC	5	NC	1
410			min	-.034	2	-.027	3	-.002	1	-4.925e-5	1	397.068	2	NC	1
411		16	max	.029	3	.007	1	.002	3	9.19e-5	3	NC	5	NC	1
412			min	-.034	2	-.006	3	-.003	1	-5.418e-5	1	523.931	2	NC	1
413		17	max	.029	3	.019	3	.001	3	-1.209e-5	15	NC	5	NC	1
414			min	-.035	2	-.028	2	-.003	1	-2.859e-4	1	848.461	1	NC	1
415		18	max	.029	3	.046	3	0	3	-6.218e-6	15	NC	5	NC	1
416			min	-.034	2	-.068	2	-.003	1	-1.465e-4	1	1669.064	3	NC	1
417		19	max	.029	3	.074	3	0	3	-3.953e-8	15	NC	3	NC	1
418			min	-.034	2	-.111	2	-.003	1	-3.37e-7	3	1669.669	2	NC	1
419	M9	1	max	.01	3	.027	3	.002	3	2.791e-2	3	NC	1	NC	1
420			min	-.009	2	-.024	2	-.008	1	-2.208e-2	1	NC	1	NC	1
421		2	max	.01	3	.016	3	0	3	1.38e-2	3	NC	4	NC	2
422			min	-.009	2	-.015	2	-.002	1	-1.076e-2	1	4781.965	2	7630.805	1
423		3	max	.01	3	.006	3	.003	1	3.566e-4	1	NC	4	NC	2
424			min	-.009	2	-.005	2	0	3	-4.872e-5	3	2454.934	2	4739.502	1
425		4	max	.01	3	.003	1	.005	1	2.522e-4	1	NC	4	NC	3
426			min	-.009	2	-.002	3	0	3	-5.495e-5	3	1717.886	2	4018.775	1
427		5	max	.009	3	.01	2	.005	1	1.478e-4	1	NC	5	NC	3
428			min	-.009	2	-.009	3	-.002	3	-6.119e-5	3	1361.852	2	3987.548	1
429		6	max	.009	3	.016	2	.004	1	4.346e-5	1	NC	5	NC	3
430			min	-.009	2	-.014	3	-.002	3	-6.743e-5	3	1159.214	2	4483.57	1
431		7	max	.009	3	.021	2	.002	1	4.602e-6	10	NC	5	NC	2
432			min	-.009	2	-.018	3	-.003	3	-7.367e-5	3	1035.196	2	5818.243	1
433		8	max	.009	3	.025	2	0	2	-7.477e-6	10	NC	5	NC	2
434			min	-.009	2	-.021	3	-.003	3	-1.653e-4	1	958.672	2	9660.225	1
435		9	max	.009	3	.027	2	0	10	-1.241e-5	15	NC	5	NC	1
436			min	-.009	2	-.023	3	-.004	1	-2.697e-4	1	915.13	2	NC	1
437		10	max	.009	3	.028	2	0	15	-1.714e-5	15	NC	5	NC	1
438			min	-.009	2	-.024	3	-.008	1	-3.741e-4	1	897.948	2	9636.138	3
439		11	max	.009	3	.027	2	0	15	-2.187e-5	15	NC	5	NC	2
440			min	-.009	2	-.023	3	-.011	1	-4.784e-4	1	905.321	2	7020.478	1
441		12	max	.009	3	.026	2	0	15	-2.661e-5	15	NC	5	NC	2
442			min	-.009	2	-.021	3	-.015	1	-5.828e-4	1	939.615	2	4601.91	1
443		13	max	.009	3	.022	2	0	15	-3.134e-5	15	NC	5	NC	2
444			min	-.009	2	-.018	3	-.017	1	-6.872e-4	1	1008.645	2	3594.259	1
445		14	max	.009	3	.017	2	0	15	-3.607e-5	15	NC	5	NC	3
446			min	-.009	2	-.014	3	-.019	1	-7.916e-4	1	1130.216	2	3135.042	1
447		15	max	.009	3	.01	2	0	15	-4.08e-5	15	NC	4	NC	3
448			min	-.009	2	-.008	3	-.019	1	-8.96e-4	1	1345.82	2	2999.984	1
449		16	max	.009	3	.002	1	0	15	-4.402e-5	15	NC	4	NC	3
450			min	-.009	2	-.002	3	-.018	1	-9.685e-4	1	1756.169	1	3173.028	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	15	6.344e-5	3	NC	4	NC	2
452			min	-.009	2	-.008	2	-.015	1	-2.84e-4	1	2469.261	1	3878.542	1
453		18	max	.009	3	.014	3	0	15	6.88e-3	3	NC	2	NC	2
454			min	-.009	2	-.02	2	-.01	1	-1.512e-2	2	4772.132	1	6452.25	1
455		19	max	.009	3	.023	3	0	3	1.382e-2	3	NC	1	NC	1
456			min	-.009	2	-.032	2	-.002	1	-3.039e-2	2	5877.551	2	NC	1
457	M13	1	max	.008	1	.027	3	.01	3	3.942e-3	3	NC	1	NC	1
458			min	-.002	3	-.024	2	-.009	2	-3.722e-3	2	NC	1	NC	1
459		2	max	.008	1	.305	3	.057	1	4.942e-3	3	NC	5	NC	3
460			min	-.002	3	-.242	1	.001	10	-4.702e-3	2	667.951	3	3023.002	1
461		3	max	.008	1	.532	3	.146	1	5.942e-3	3	NC	15	NC	3
462			min	-.002	3	-.422	1	.007	15	-5.683e-3	2	367.862	3	1239.809	1
463		4	max	.008	1	.674	3	.222	1	6.942e-3	3	NC	15	NC	3
464			min	-.002	3	-.535	1	.01	15	-6.663e-3	2	287.511	3	823.347	1
465		5	max	.007	1	.713	3	.26	1	7.942e-3	3	NC	15	NC	3
466			min	-.002	3	-.566	1	.012	15	-7.644e-3	2	271.089	3	705.233	1
467		6	max	.007	1	.652	3	.248	1	8.941e-3	3	NC	15	NC	5
468			min	-.002	3	-.519	1	.012	15	-8.624e-3	2	297.498	3	737.42	1
469		7	max	.007	1	.511	3	.19	1	9.941e-3	3	NC	5	NC	5
470			min	-.002	3	-.409	1	.009	15	-9.604e-3	2	383.889	3	957.72	1
471		8	max	.007	1	.329	3	.102	1	1.094e-2	3	NC	5	NC	5
472			min	-.002	3	-.267	1	-.003	10	-1.058e-2	2	614.642	3	1743.79	1
473		9	max	.007	1	.163	3	.029	3	1.194e-2	3	NC	5	NC	2
474			min	-.002	3	-.138	2	-.017	2	-1.157e-2	2	1363.716	3	8981.911	1
475		10	max	.007	1	.088	3	.031	3	1.294e-2	3	NC	4	NC	1
476			min	-.002	3	-.083	2	-.035	2	-1.255e-2	2	3048.853	3	7376.22	2
477		11	max	.007	1	.163	3	.036	3	1.194e-2	3	NC	5	NC	2
478			min	-.002	3	-.138	2	-.017	2	-1.157e-2	2	1363.714	3	7129.554	3
479		12	max	.007	1	.329	3	.11	1	1.094e-2	3	NC	5	NC	5
480			min	-.002	3	-.267	1	-.003	10	-1.059e-2	2	614.641	3	1623.512	1
481		13	max	.006	1	.511	3	.199	1	9.944e-3	3	NC	5	NC	5
482			min	-.002	3	-.409	1	.01	10	-9.605e-3	2	383.889	3	913.866	1
483		14	max	.006	1	.652	3	.257	1	8.945e-3	3	NC	15	NC	15
484			min	-.002	3	-.519	1	.012	15	-8.624e-3	2	297.498	3	710.867	1
485		15	max	.006	1	.713	3	.268	1	7.946e-3	3	NC	15	NC	15
486			min	-.002	3	-.566	1	.013	15	-7.644e-3	2	271.089	3	683.244	1
487		16	max	.006	1	.674	3	.228	1	6.947e-3	3	NC	15	NC	5
488			min	-.002	3	-.534	1	.011	15	-6.664e-3	2	287.511	3	799.291	1
489		17	max	.006	1	.532	3	.15	1	5.948e-3	3	NC	15	NC	3
490			min	-.002	3	-.422	1	.007	15	-5.683e-3	2	367.862	3	1202.657	1
491		18	max	.006	1	.305	3	.06	1	4.949e-3	3	NC	5	NC	3
492			min	-.002	3	-.242	1	.001	10	-4.703e-3	2	667.95	3	2915.221	1
493		19	max	.006	1	.027	3	.01	3	3.95e-3	3	NC	1	NC	1
494			min	-.002	3	-.024	2	-.009	2	-3.723e-3	2	NC	1	NC	1
495	M16	1	max	.002	1	.023	3	.009	3	4.74e-3	2	NC	1	NC	1
496			min	0	3	-.032	2	-.009	2	-3.297e-3	3	NC	1	NC	1
497		2	max	.002	1	.161	3	.061	1	6.005e-3	2	NC	5	NC	3
498			min	0	3	-.336	2	.001	10	-4.119e-3	3	613.328	2	2847.492	1
499		3	max	.002	1	.274	3	.152	1	7.27e-3	2	NC	15	NC	3
500			min	0	3	-.583	2	.007	15	-4.94e-3	3	337.581	2	1188.278	1
501		4	max	.002	1	.346	3	.23	1	8.534e-3	2	NC	15	NC	5
502			min	0	3	-.738	2	.011	15	-5.762e-3	3	263.559	2	794.523	1
503		5	max	.002	1	.368	3	.268	1	9.799e-3	2	NC	15	NC	15
504			min	0	3	-.782	2	.013	15	-6.584e-3	3	248.049	2	682.173	1
505		6	max	.003	1	.341	3	.256	1	1.106e-2	2	NC	15	NC	15
506			min	0	3	-.718	2	.012	15	-7.406e-3	3	271.336	2	712.777	1
507		7	max	.003	1	.275	3	.197	1	1.233e-2	2	NC	5	NC	5

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
508			min	0	3	-.567	2	.01	15	-8.227e-3	3	347.938	2	921.351	1
509		8	max	.003	1	.189	3	.108	1	1.359e-2	2	NC	5	NC	5
510			min	0	3	-.371	2	-.003	10	-9.049e-3	3	549.017	2	1653.762	1
511		9	max	.003	1	.11	3	.033	3	1.486e-2	2	NC	5	NC	2
512			min	0	3	-.192	2	-.017	2	-9.871e-3	3	1165.414	2	7754.225	3
513		10	max	.003	1	.074	3	.029	3	1.612e-2	2	NC	4	NC	1
514			min	0	3	-.111	2	-.034	2	-1.069e-2	3	2376.333	2	7434.622	2
515		11	max	.003	1	.11	3	.029	3	1.486e-2	2	NC	5	NC	2
516			min	0	3	-.192	2	-.016	2	-9.87e-3	3	1165.414	2	8253.683	1
517		12	max	.003	1	.189	3	.105	1	1.359e-2	2	NC	5	NC	5
518			min	0	3	-.371	2	-.003	10	-9.047e-3	3	549.017	2	1694.382	1
519		13	max	.003	1	.275	3	.193	1	1.233e-2	2	NC	5	NC	5
520			min	0	3	-.567	2	.009	15	-8.224e-3	3	347.938	2	939.273	1
521		14	max	.003	1	.341	3	.252	1	1.106e-2	2	NC	15	NC	5
522			min	0	3	-.718	2	.012	15	-7.402e-3	3	271.336	2	725.873	1
523		15	max	.004	1	.368	3	.263	1	9.8e-3	2	NC	15	NC	12
524			min	0	3	-.782	2	.012	15	-6.579e-3	3	248.049	2	695.27	1
525		16	max	.004	1	.346	3	.225	1	8.536e-3	2	NC	15	NC	5
526			min	0	3	-.738	2	.011	15	-5.756e-3	3	263.559	2	811.892	1
527		17	max	.004	1	.274	3	.148	1	7.271e-3	2	NC	15	NC	3
528			min	0	3	-.583	2	.007	15	-4.934e-3	3	337.581	2	1220.999	1
529		18	max	.004	1	.161	3	.058	1	6.007e-3	2	NC	5	NC	3
530			min	0	3	-.336	2	.001	10	-4.111e-3	3	613.329	2	2964.032	1
531		19	max	.004	1	.023	3	.009	3	4.742e-3	2	NC	1	NC	1
532			min	0	3	-.032	2	-.009	2	-3.288e-3	3	NC	1	NC	1
533	M15	1	max	0	1	0	1	0	1	3.992e-4	3	NC	1	NC	1
534			min	0	1	0	1	0	1	-6.539e-5	2	NC	1	NC	1
535		2	max	0	3	-.006	15	.001	1	9.369e-4	3	NC	5	NC	1
536			min	0	10	-.024	4	0	3	-6.325e-4	2	4354.283	4	NC	1
537		3	max	0	3	-.011	15	.004	1	1.475e-3	3	9426.102	15	NC	1
538			min	0	10	-.046	4	-.004	3	-1.2e-3	2	2215.746	4	NC	1
539		4	max	0	3	-.016	15	.008	1	2.012e-3	3	6466.856	15	NC	4
540			min	0	10	-.067	4	-.008	3	-1.767e-3	2	1520.131	4	7093.337	3
541		5	max	0	3	-.02	15	.013	1	2.55e-3	3	5046.154	15	NC	4
542			min	0	10	-.086	4	-.013	3	-2.334e-3	2	1186.174	4	4677.631	3
543		6	max	0	3	-.024	15	.018	1	3.088e-3	3	4246.872	15	NC	4
544			min	0	10	-.103	4	-.019	3	-2.901e-3	2	998.291	4	3417.063	3
545		7	max	0	3	-.027	15	.024	1	3.626e-3	3	3766.209	15	NC	4
546			min	0	10	-.116	4	-.026	3	-3.468e-3	2	885.304	4	2677.623	3
547		8	max	0	3	-.029	15	.029	1	4.163e-3	3	3477.739	15	NC	4
548			min	0	10	-.126	4	-.031	3	-4.035e-3	2	817.495	4	2211.778	3
549		9	max	0	3	-.031	15	.034	1	4.701e-3	3	3322.468	15	NC	4
550			min	0	10	-.132	4	-.037	3	-4.602e-3	2	780.996	4	1906.51	3
551		10	max	0	3	-.031	15	.038	1	5.239e-3	3	3273.347	15	NC	4
552			min	0	10	-.134	4	-.041	3	-5.169e-3	2	769.449	4	1704.918	3
553		11	max	0	3	-.031	15	.04	1	5.776e-3	3	3322.468	15	NC	4
554			min	0	10	-.132	4	-.044	3	-5.736e-3	2	780.996	4	1577.099	3
555		12	max	0	3	-.03	15	.041	1	6.314e-3	3	3477.739	15	NC	5
556			min	0	10	-.126	4	-.045	3	-6.304e-3	2	817.495	4	1508.246	3
557		13	max	0	3	-.027	15	.04	1	6.852e-3	3	3766.209	15	NC	5
558			min	0	10	-.116	4	-.043	3	-6.871e-3	2	885.304	4	1494.167	3
559		14	max	.001	3	-.024	15	.036	1	7.39e-3	3	4246.872	15	NC	4
560			min	0	10	-.103	4	-.039	3	-7.438e-3	2	998.291	4	1541.523	3
561		15	max	.001	3	-.02	15	.03	1	7.927e-3	3	5046.154	15	NC	4
562			min	0	10	-.087	4	-.032	3	-8.005e-3	2	1186.174	4	1674.39	3
563		16	max	.001	3	-.016	15	.021	1	8.465e-3	3	6466.856	15	NC	4
564			min	0	10	-.068	4	-.021	3	-8.572e-3	2	1520.131	4	1957.974	3

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
565		17	max	.001	3	-.011	15	.008	1	9.003e-3	3	9426.102	15	NC	4
566			min	-.001	10	-.047	4	-.006	3	-9.139e-3	2	2215.746	4	2596.738	3
567		18	max	.001	3	-.006	15	.014	3	9.541e-3	3	NC	5	NC	4
568			min	-.001	10	-.025	4	-.016	2	-9.706e-3	2	4354.283	4	4624.833	3
569		19	max	.001	3	.005	2	.038	3	1.008e-2	3	NC	1	NC	1
570			min	-.001	10	-.003	9	-.039	2	-1.027e-2	2	NC	1	NC	1
571	M16A	1	max	0	10	.001	2	.011	3	2.984e-3	3	NC	1	NC	1
572			min	-.001	3	-.002	9	-.011	2	-2.786e-3	2	NC	1	NC	1
573		2	max	0	10	-.006	15	.005	1	2.865e-3	3	NC	5	NC	2
574			min	-.001	3	-.024	4	-.002	10	-2.666e-3	2	4354.283	4	9223.654	1
575		3	max	0	10	-.011	15	.014	1	2.746e-3	3	9426.102	15	NC	4
576			min	-.001	3	-.047	4	-.003	3	-2.545e-3	2	2215.746	4	5214.73	1
577		4	max	0	10	-.016	15	.02	1	2.628e-3	3	6466.856	15	NC	4
578			min	-.001	3	-.068	4	-.008	3	-2.425e-3	2	1520.131	4	3962.723	1
579		5	max	0	10	-.02	15	.025	1	2.509e-3	3	5046.154	15	NC	4
580			min	-.001	3	-.087	4	-.011	3	-2.304e-3	2	1186.174	4	3418.949	1
581		6	max	0	10	-.024	15	.028	1	2.39e-3	3	4246.872	15	NC	4
582			min	-.001	3	-.103	4	-.013	3	-2.184e-3	2	998.291	4	3179.844	1
583		7	max	0	10	-.027	15	.029	1	2.272e-3	3	3766.209	15	NC	4
584			min	0	3	-.116	4	-.014	3	-2.064e-3	2	885.304	4	3118.756	1
585		8	max	0	10	-.029	15	.028	1	2.153e-3	3	3477.739	15	NC	4
586			min	0	3	-.126	4	-.014	3	-1.943e-3	2	817.495	4	3192.074	1
587		9	max	0	10	-.031	15	.027	1	2.035e-3	3	3322.468	15	NC	4
588			min	0	3	-.131	4	-.013	3	-1.823e-3	2	780.996	4	3393.333	1
589		10	max	0	10	-.031	15	.024	1	1.916e-3	3	3273.347	15	NC	4
590			min	0	3	-.133	4	-.012	3	-1.702e-3	2	769.449	4	3742.397	1
591		11	max	0	10	-.031	15	.021	1	1.797e-3	3	3322.468	15	NC	4
592			min	0	3	-.131	4	-.01	3	-1.582e-3	2	780.996	4	4289.57	1
593		12	max	0	10	-.029	15	.017	1	1.679e-3	3	3477.739	15	NC	4
594			min	0	3	-.125	4	-.008	3	-1.462e-3	2	817.495	4	5134.789	1
595		13	max	0	10	-.027	15	.014	1	1.56e-3	3	3766.209	15	NC	3
596			min	0	3	-.116	4	-.006	3	-1.341e-3	2	885.304	4	6476.83	1
597		14	max	0	10	-.024	15	.01	1	1.441e-3	3	4246.872	15	NC	2
598			min	0	3	-.103	4	-.004	3	-1.221e-3	2	998.291	4	8743.387	1
599		15	max	0	10	-.02	15	.006	1	1.323e-3	3	5046.154	15	NC	1
600			min	0	3	-.086	4	-.002	3	-1.1e-3	2	1186.174	4	NC	1
601		16	max	0	10	-.016	15	.003	1	1.204e-3	3	6466.856	15	NC	1
602			min	0	3	-.067	4	0	3	-9.8e-4	2	1520.131	4	NC	1
603		17	max	0	10	-.011	15	.001	9	1.086e-3	3	9426.102	15	NC	1
604			min	0	3	-.046	4	0	10	-8.596e-4	2	2215.746	4	NC	1
605		18	max	0	10	-.006	15	0	3	9.67e-4	3	NC	5	NC	1
606			min	0	3	-.024	4	0	2	-7.392e-4	2	4354.283	4	NC	1
607		19	max	0	1	0	1	0	1	8.484e-4	3	NC	1	NC	1
608			min	0	1	0	1	0	1	-6.188e-4	2	NC	1	NC	1

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

Anchor Designer™ Software
Version 2.4.5673.0

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

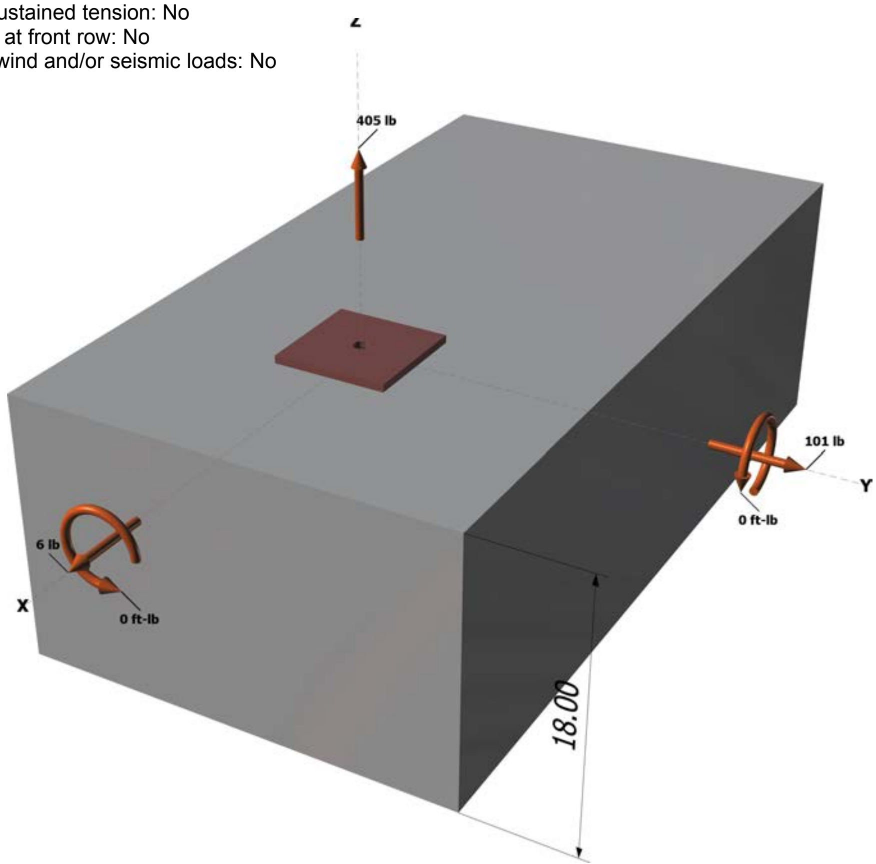
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

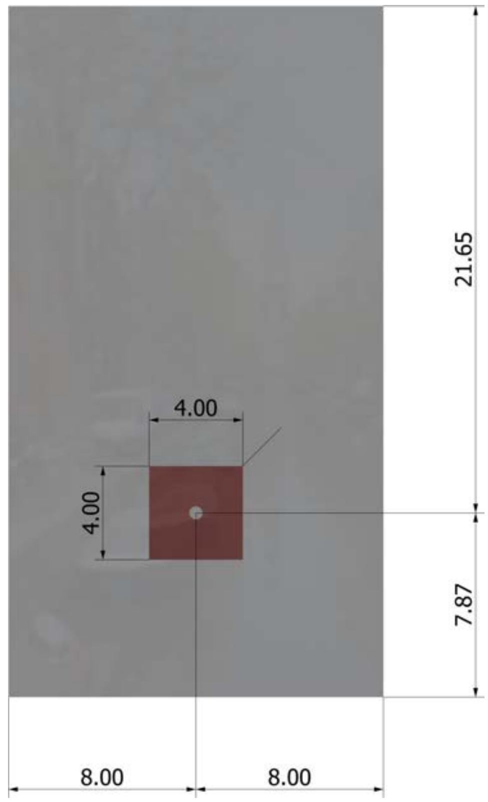
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout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

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

<Figure 1>



<Figure 2>



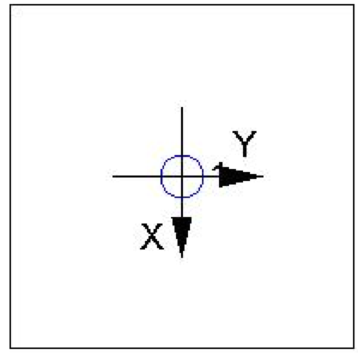
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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.

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

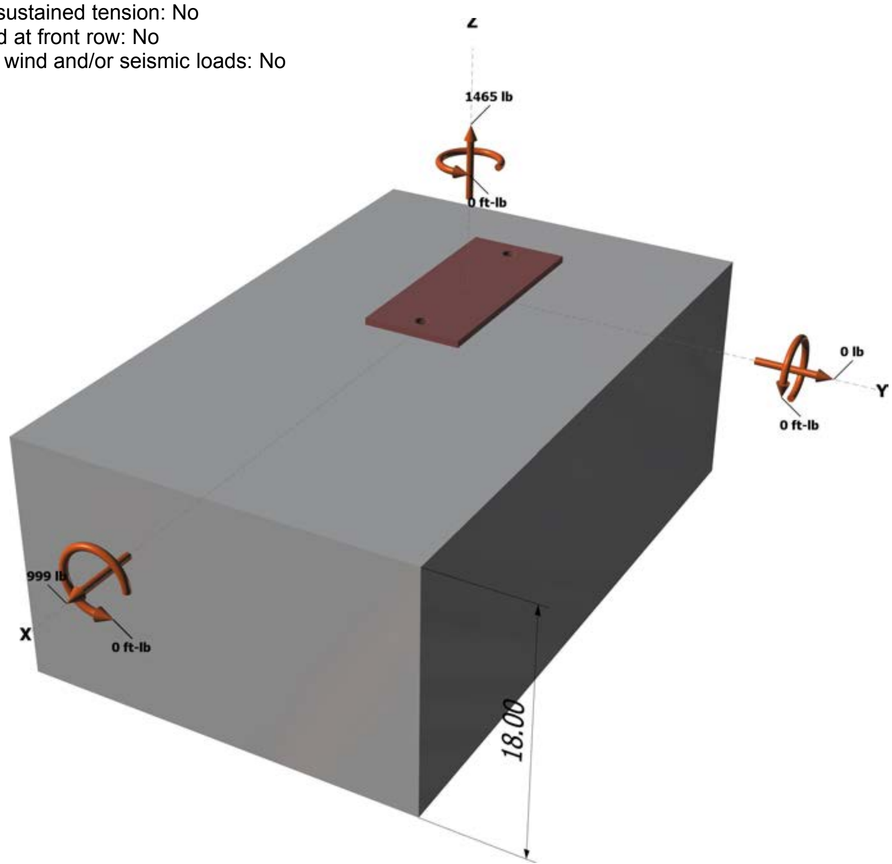
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

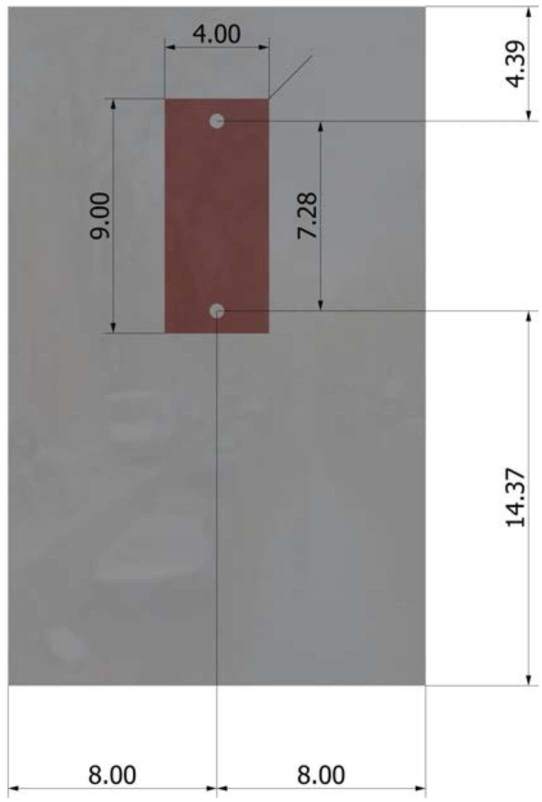
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout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



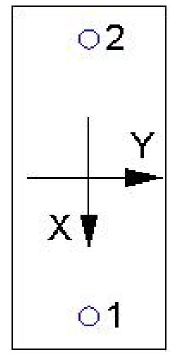
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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.