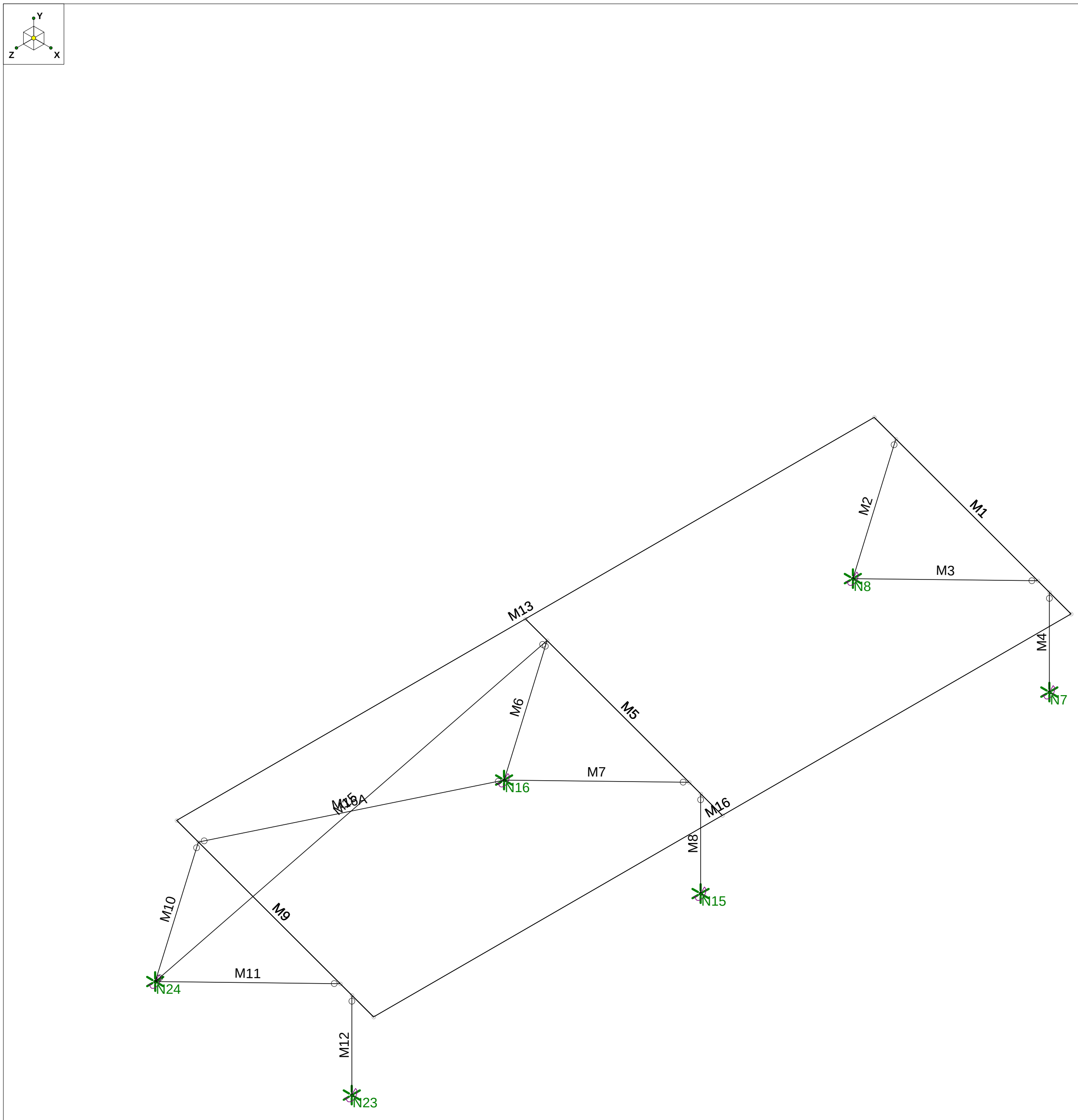


Schletter, Inc.		20ÁTilt w/o Seismic Design
HCV	Standard PVMini Racking System	
	Representative Calculations - ASCE 7-10	

1. INTRODUCTION

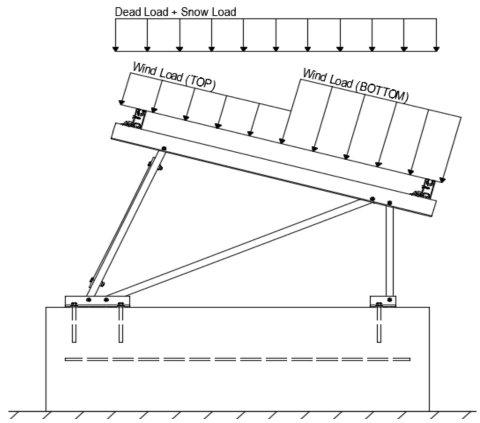
1.1 Project Description
The following sections will cover the determination of forces and structural design calculations for the Schletter, Inc. PVMini ground mount system.

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

PV modules are required to meet the following specifications:

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

Modules Per Row = 1
Module Tilt = 20°
Maximum Height Above Grade = 3 ft



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

1.3 Technical Codes
- ASCE 7-10 - Chapter 26-31, Wind Loads
- ASCE 7-10 - Chapter 7, Snow Loads
- ASCE 7-10 - Chapter 2, Combination of Loads
- International Building Code, IBC, 2012, 2015
- Aluminum Design Manual, Eighth Edition, 2005

2. LOAD ACTIONS

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

Self-weight of the PV modules.

2.2 Snow Loads
Ground Snow Load, P_g = 30.00 psf
Sloped Roof Snow Load, P_s = 20.62 psf *(ASCE 7-10, Eq. 7.4-1)*
I_s = 1.00
C_s = 0.91
C_e = 0.90
C_t = 1.20

2.3 Wind Loads
Design Wind Speed, V = 115 mph
Height ≤ 15 ft

Exposure Category = C
Importance Category = II

Peak Velocity Pressure, q_z = 20.76 psf *Including the gust factor, G=0.85. (ASCE 7-10, Eq. 27.3-1)*

Pressure Coefficients

$Cf+_{TOP}$	=	1.05	*(Pressure)*
$Cf+_{BOTTOM}$	=	1.65	
$Cf-_{TOP}$	=	-2.12	*(Suction)*
$Cf-_{BOTTOM}$	=	-1	

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

2.4 Seismic Loads - N/A

S_S =	0.00	R =	1.25
S_{DS} =	0.00	C_S =	0
S_1 =	0.00	ρ =	1.3
S_{D1} =	0.00	Ω =	1.25
T_a =	0.00	C_d =	1.25

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

2.5 Combination of Loads

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

Strength Design, LRFD

Component stresses are checked using the following LRFD load combinations:

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

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

Allowable Stress Design, ASD

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

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

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

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

3. STRUCTURAL ANALYSIS

3.1 RISA Results

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

3.2 RISA Components

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

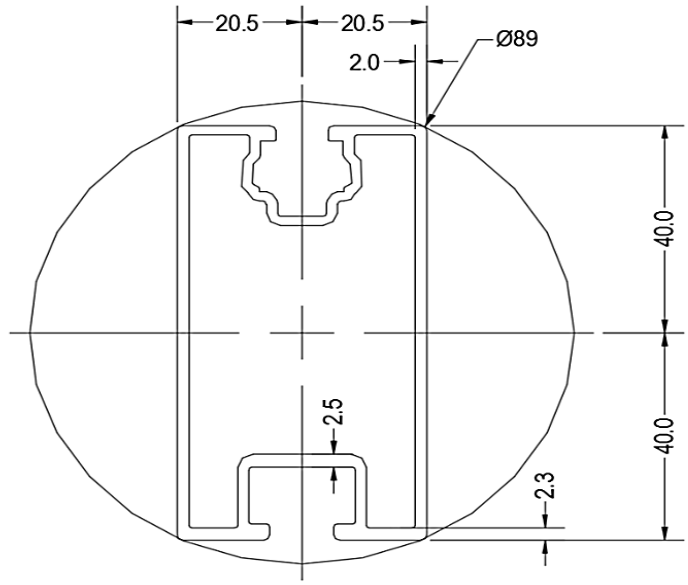
Purlins	Location	Diagonal Struts	Location	Front Reactions	Location
M13	Top	M3	Outer	N7	Outer
M16	Bottom	M7	Inner	N15	Inner
		M11	Outer	N23	Outer
Girders	Location	**Rear Struts**	Location	**Rear Reactions**	Location
M1	Outer	M2	Outer	N8	Outer
M5	Inner	M6	Inner	N16	Inner
M9	Outer	M10	Outer	N24	Outer
Front Struts	Location	**Bracing**			
M4	Outer	M15			
M8	Inner	M16A			
M12	Outer				

4. MEMBER DESIGN CALCULATIONS

4.1 Purlin Design

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

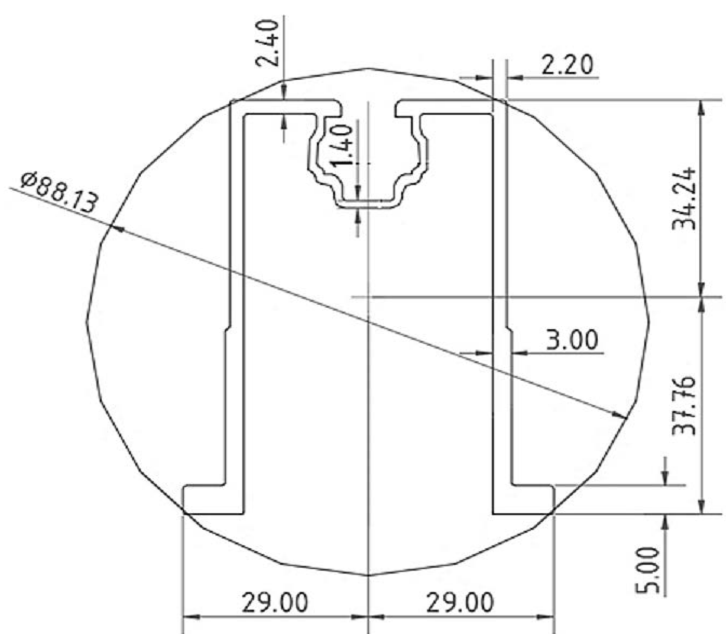
Purlin Type =	**ProfiPlusXT**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	93	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	28.83	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	22.71	ksi
S_y =	0.75	in^3
S_x =	0.44	in^3
E =	10100	ksi
I_y =	1.20	in^4
I_x =	0.36	in^4
A =	0.96	in^2
g =	1.15	lbs/ft
M_y =	1.065	k-ft
M_z =	0.197	k-ft
$M_{y\ allowable}$ =	1.791	k-ft
$M_{z\ allowable}$ =	0.838	k-ft
Utilization =	83%	



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).

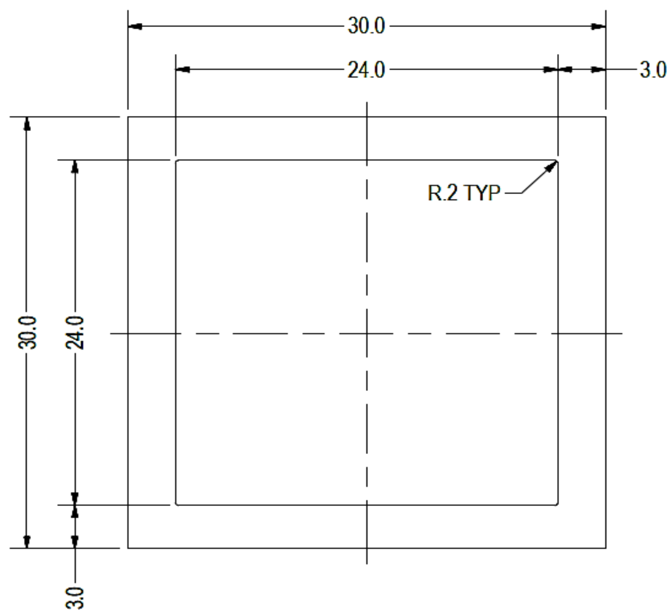
Girder Type =	**Flex Profi**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	33.78	in
$\Phi F_{ty\ AXIAL}$ =	14.29	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.73	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	13.46	ksi
S_y =	0.59	in^3
S_x =	0.46	in^3
E =	10100	ksi
I_y =	0.88	in^4
I_x =	0.52	in^4
A =	0.89	in^2
g =	1.07	lbs/ft
M_y =	0.563	k-ft
M_z =	0.000	k-ft
P_n =	0.294	k
$M_{y\ allowable}$ =	1.459	k-ft
$M_{z\ allowable}$ =	0.513	k-ft
$P_{n\ allowable}$ =	12.764	k
Utilization =	41%	



4.3 Front Strut Design

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

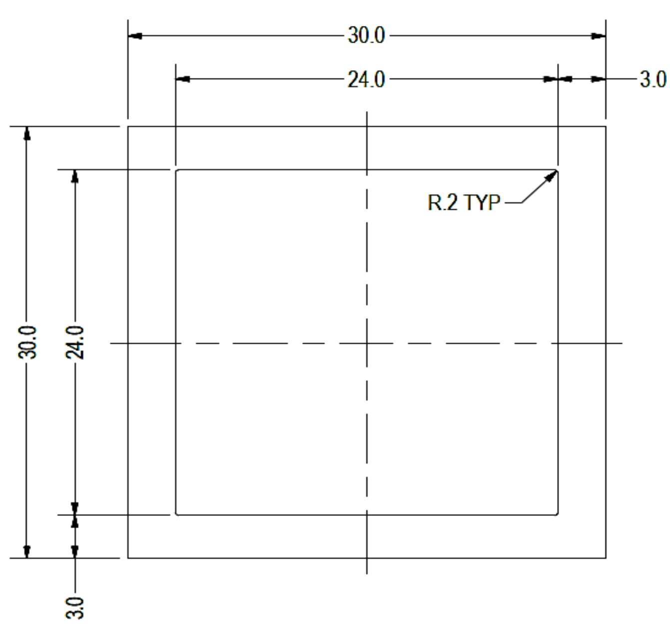
Strut Type =	30x30x3	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	18.00	in
$\Phi F_{ty\ AXIAL}$ =	24.52	ksi
$\Phi F_{ty\ BENDING}$ =	31.19	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.001	k-ft
P_n =	1.510	k
$M_{y\ allowable}$ =	0.423	k-ft
$M_{z\ allowable}$ =	0.423	k-ft
$P_{n\ allowable}$ =	12.310	k
Utilization =	13%	



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).

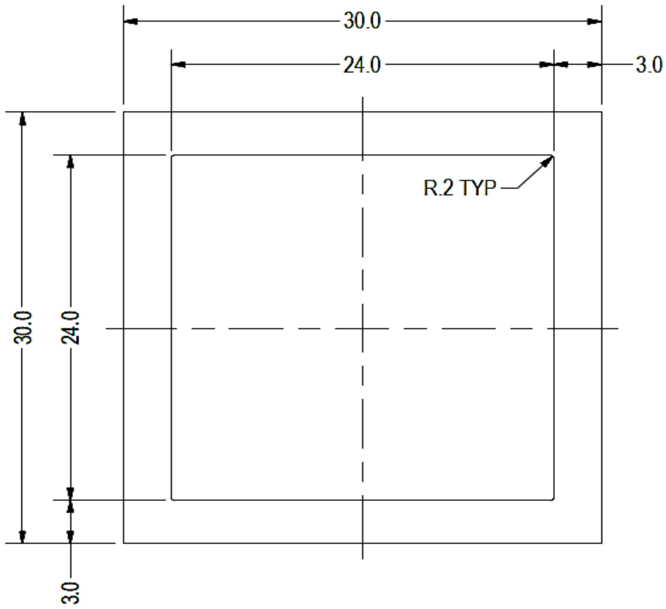
Strut Type =	30x30x3	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	46.38	in
$\Phi F_{ty\ AXIAL}$ =	7.60	ksi
$\Phi F_{ty\ BENDING}$ =	29.80	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.331	k
$M_{y\ allowable}$ =	0.404	k-ft
$M_{z\ allowable}$ =	0.404	k-ft
$P_{n\ allowable}$ =	3.814	k
Utilization =	9%	



4.5 Rear Strut Design

An aluminum strut connects the rear portion of the girder to the rear foundation connection. Both vertical and horizontal forces are transferred from the girder. The strut is attached with single M8 bolts at each end. See Appendix A.5 for detailed member calculations. Section units are in (mm).

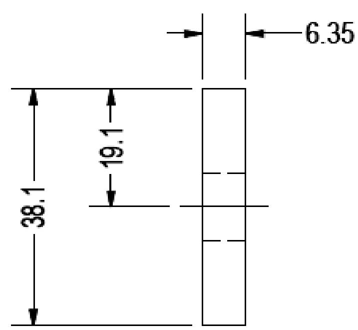
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	33.07	in
$\Phi F_{ty\ AXIAL}$ =	13.55	ksi
$\Phi F_{ty\ BENDING}$ =	30.37	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	1.225	k
$M_{y\ allowable}$ =	0.411	k-ft
$M_{z\ allowable}$ =	0.411	k-ft
$P_{n\ allowable}$ =	6.803	k
Utilization =	18%	



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 =	0.036	k
$M_{y\ allowable}$ =	0.046	k-ft
$P_{n\ allowable}$ =	11.813	k
Utilization =	13%	



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

5. FOUNDATION DESIGN CALCULATIONS

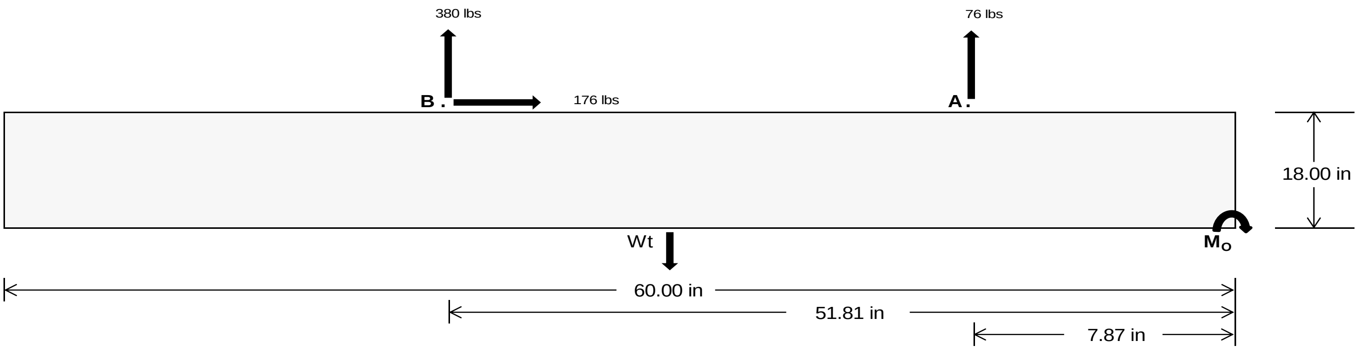
5.1 Helical Pile Foundations

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 =	338.76	1651.36	k
Compressive Load =	1962.83	1523.45	k
Lateral Load =	4.40	764.86	k
Moment (Weak Axis) =	0.01	0.00	k

5.2 Design of Ballast Foundations

Ballast foundations are used to secure the racking structure in place. The foundations are checked for potential overturning and sliding. Bearing pressures applied by the racking and ballast foundations are checked against the allowable bearing pressures provided by the IBC table 1806.2 (2012, 2015).



Concrete Properties

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

Footing Reinforcement

Use fiber reinforcing with (1) #5 rebar.

Overturning Check

M_O =	23441.2 in-lbs
Resisting Force Required =	781.37 lbs
S.F. =	1.67
Weight Required =	1302.29 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 =	176.37 lbs
Friction =	0.4
Weight Required =	440.94 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 =	176.37 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 + 0.6W				1.0D + 0.75L + 0.45W + 0.75S				0.6D + 0.6W			
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	740 lbs	740 lbs	740 lbs	740 lbs	555 lbs	555 lbs	555 lbs	555 lbs	916 lbs	916 lbs	916 lbs	916 lbs	-152 lbs	-152 lbs	-152 lbs	-152 lbs
F_B	541 lbs	541 lbs	541 lbs	541 lbs	489 lbs	489 lbs	489 lbs	489 lbs	731 lbs	731 lbs	731 lbs	731 lbs	-759 lbs	-759 lbs	-759 lbs	-759 lbs
F_V	65 lbs	65 lbs	65 lbs	65 lbs	318 lbs	318 lbs	318 lbs	318 lbs	283 lbs	283 lbs	283 lbs	283 lbs	-353 lbs	-353 lbs	-353 lbs	-353 lbs
P_{total}	3275 lbs	3366 lbs	3456 lbs	3547 lbs	3037 lbs	3128 lbs	3219 lbs	3309 lbs	3641 lbs	3732 lbs	3822 lbs	3913 lbs	285 lbs	339 lbs	394 lbs	448 lbs
M	479 lbs-ft	479 lbs-ft	479 lbs-ft	479 lbs-ft	611 lbs-ft	611 lbs-ft	611 lbs-ft	611 lbs-ft	785 lbs-ft	785 lbs-ft	785 lbs-ft	785 lbs-ft	570 lbs-ft	570 lbs-ft	570 lbs-ft	570 lbs-ft
e	0.15 ft	0.14 ft	0.14 ft	0.13 ft	0.20 ft	0.20 ft	0.19 ft	0.18 ft	0.22 ft	0.21 ft	0.21 ft	0.20 ft	2.00 ft	1.68 ft	1.45 ft	1.27 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}	294.6 psf	291.3 psf	288.2 psf	285.4 psf	251.4 psf	249.9 psf	248.6 psf	247.3 psf	294.5 psf	291.1 psf	288.1 psf	285.3 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	419.9 psf	411.1 psf	403.1 psf	395.6 psf	411.3 psf	402.9 psf	395.2 psf	388.1 psf	499.9 psf	487.6 psf	476.4 psf	466.0 psf	207.8 psf	144.0 psf	124.8 psf	116.8 psf

Maximum Bearing Pressure =	500 psf
Allowable Bearing Pressure =	1500 psf

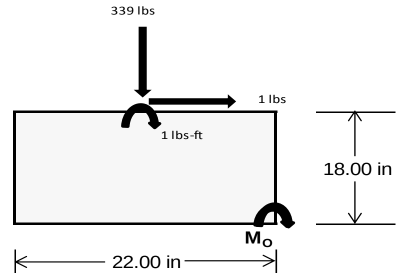
Use a 60in long x 22in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O = 308.0 ft-lbs
Resisting Force Required = 336.05 lbs
S.F. = 1.67
Weight Required = 560.08 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	87 lbs	239 lbs	82 lbs	343 lbs	1044 lbs	339 lbs	25 lbs	70 lbs	24 lbs
F_V	4 lbs	3 lbs	0 lbs	18 lbs	17 lbs	1 lbs	1 lbs	1 lbs	0 lbs
P_{total}	2555 lbs	2707 lbs	2551 lbs	2693 lbs	3393 lbs	2688 lbs	747 lbs	792 lbs	746 lbs
M	6 lbs-ft	5 lbs-ft	0 lbs-ft	31 lbs-ft	25 lbs-ft	2 lbs-ft	2 lbs-ft	2 lbs-ft	0 lbs-ft
e	0.00 ft	0.00 ft	0.00 ft	0.01 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	1.81 ft	1.82 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft
f_{min}	276.8 sqft	293.5 sqft	278.2 sqft	282.8 sqft	361.1 sqft	292.4 sqft	80.9 sqft	85.8 sqft	81.3 sqft
f_{max}	280.7 psf	297.2 psf	278.4 psf	304.8 psf	379.3 psf	294.1 psf	82.1 psf	86.9 psf	81.4 psf

Maximum Bearing Pressure = 379 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.

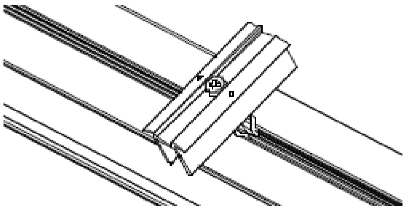
6. DESIGN OF JOINTS AND CONNECTIONS

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.

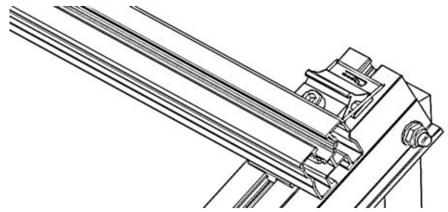
Fastening of Modules to Purlins

Maximum Uplifting Force =	0.408	k
Allowable Uplift =	1.214	k
Utilization =	34%	



Fastening of Purlins to Girders

Maximum Uplifting Force =	1.109	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 =	1.510	k
M8 Bolt Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	27%	

Rear Strut

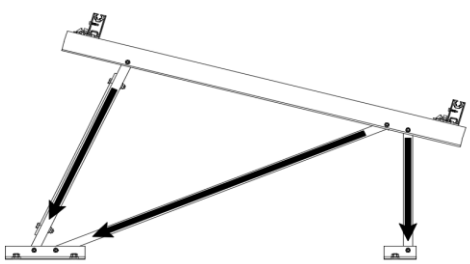
Maximum Axial Load =	1.225	k
M8 Bolt Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	22%	

Diagonal Strut

Maximum Axial Load =	0.331	k
M8 Bolt Shear Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	6%	

Bracing

Maximum Axial Load =	0.036	k
M10 Bolt Capacity =	8.894	k
Strut Bearing Capacity =	7.952	k
Utilization =	0%	



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

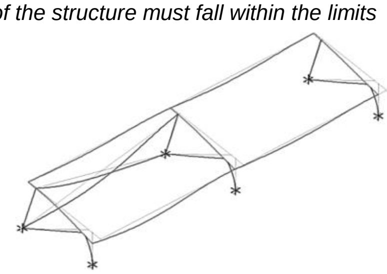
7. SEISMIC DESIGN

7.1 Seismic Drift - N/A

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

Mean Height, h_{sx} =	29.57	in
Allowable Story Drift for All Other Structures, Δ = {	$0.020h_{sx}$	
	0.591	in
Max Drift, Δ_{MAX} =	0.047	in
N/A		

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



APPENDIX A

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

Purlin = **ProfiPlus XT**

Strong Axis:

3.4.14

L_b = 93.00 in

J = 0.427

193.965

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 28.8 ksi

3.4.16

b/t = 6.6

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

Weak Axis:

3.4.14

L_b = 93.00 in

J = 0.427

210.771

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 28.6

3.4.16

b/t = 37.95

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 22.7 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 37.95

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

S1 = 38.1

m = 0.63

C_0 = 40.784

Cc = 39.216

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

S2 = 79.7

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L St$= 28.8 ksi

Ix = 498305 mm^4

1.197 in^4

y = 40.784 mm

Sx = 0.746 in^3

$M_{max}St$ = 1.791 k-ft

3.4.18

h/t = 6.6

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

S1 = 36.9

m = 0.65

C_0 = 20.5

Cc = 20.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L Wk$= 22.7 ksi

Iy = 148662 mm^4

0.357 in^4

x = 20.5 mm

Sy = 0.443 in^3

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

<u>Compression</u>

3.4.9

b/t = 6.6

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φyFcy

φF_L= 33.3 ksi

b/t = 37.95

S1 = 12.21

S2 = 32.70

φF_L= (φck2*√(BpE))/(1.6b/t)

φF_L= 21.4 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

φF_L= φyFcy

φF_L= 33.25 ksi

φF_L= 21.42 ksi

A = 620.02 mm^2

0.96 in^2

P_{max} = 20.59 kips

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 = 1.30
21.5728

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

S1 = 1.37733

$$S2 = 1.2C_c$$

S2 = 79.2
φF_L= φb[Bc-Dc*Lb/(1.2*ry*√(Cb))
φF_L= 29.7 ksi

3.4.15

N/A for Strong Direction

3.4.16

b/t = 4.29

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

S1 = 12.2

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

S2 = 46.7
φF_L= φyFcy
φF_L= 33.3 ksi

3.4.16

N/A for Strong Direction

Weak Axis:

3.4.11

L_b = 33.78 in
ry = 1.374
Cb = 1.30
24.5845

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

S1 = 1.37733

$$S2 = 1.2C_c$$

S2 = 79.2
φF_L= φb[Bc-Dc*Lb/(1.2*ry*√(Cb))
φF_L= 29.7 ksi

3.4.15

b/t = 24.46

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

S1 = 3.8

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

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

3.4.16

N/A for Weak Direction

3.4.16

b/t = 24.46

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

S1 = 12.2

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

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

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.16.2

N/A for Strong Direction

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= 29.7 ksi

Ix = 364470 mm^4

0.876 in^4

y = 37.77 mm

Sx = 0.589 in^3

M_{max}St = 1.459 k-ft

3.4.16.1

N/A for Weak 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 = 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:		Weak Axis:	
3.4.14		**3.4.14**	
L_b =	18.00 in	L_b =	18.00 in
J =	0.16	J =	0.16
	47.2194		47.2194
$S1 = \left(\frac{Bc - \frac{\theta_y}{\theta_b}Fcy}{1.6Dc}\right)^2$		$S1 = \left(\frac{Bc - \frac{\theta_y}{\theta_b}Fcy}{1.6Dc}\right)^2$	
S1 =	0.51461	S1 =	0.51461
$S2 = \left(\frac{C_c}{1.6}\right)^2$		$S2 = \left(\frac{C_c}{1.6}\right)^2$	
S2 =	1701.56	S2 =	1701.56
φF_L=	φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]	φF_L=	φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
φF_L=	31.2 ksi	φF_L=	31.2
3.4.16		**3.4.16**	
b/t =	7.75	b/t =	7.75
$S1 = \frac{Bp - \frac{\theta_y}{\theta_b}Fcy}{1.6Dp}$		$S1 = \frac{Bp - \frac{\theta_y}{\theta_b}Fcy}{1.6Dp}$	
S1 =	12.2	S1 =	12.2
$S2 = \frac{k_1 Bp}{1.6Dp}$		$S2 = \frac{k_1 Bp}{1.6Dp}$	
S2 =	46.7	S2 =	46.7
φF_L=	φyFcy	φF_L=	φyFcy
φF_L=	33.3 ksi	φF_L=	33.3 ksi
3.4.16.1	Not Used	**3.4.16.1**	
Rb/t =	0.0	N/A for Weak Direction	
$S1 = \left(\frac{Bt - 1.17\frac{\theta_y}{\theta_b}Fcy}{1.6Dt}\right)^2$			
S1 =	1.1		
$S2 = C_t$			
S2 =	141.0		
φF_L=	1.17φyFcy		
φF_L=	38.9 ksi		
3.4.18		**3.4.18**	
h/t =	7.75	h/t =	7.75
$S1 = \frac{Bbr - \frac{\theta_y}{\theta_b}1.3Fcy}{mDbr}$		$S1 = \frac{Bbr - \frac{\theta_y}{\theta_b}1.3Fcy}{mDbr}$	
S1 =	36.9	S1 =	36.9
m =	0.65	m =	0.65
C_0 =	15	C_0 =	15
Cc =	15	Cc =	15
$S2 = \frac{k_1 Bbr}{mDbr}$		$S2 = \frac{k_1 Bbr}{mDbr}$	
S2 =	77.3	S2 =	77.3
φF_L=	1.3φyFcy	φF_L=	1.3φyFcy
φF_L=	43.2 ksi	φF_L=	43.2 ksi
φF_LSt=	31.2 ksi	φF_LWk=	31.2 ksi
Ix =	39958.2 mm^4	Iy =	39958.2 mm^4
	0.096 in^4		0.096 in^4
y =	15 mm	x =	15 mm
Sx =	0.163 in^3	Sy =	0.163 in^3
M_{max}St =	0.423 k-ft	M_{max}Wk =	0.423 k-ft

Compression

3.4.7

$\lambda =$ 0.77182

r = 0.437 in

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

$S1^* =$ 0.33515

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

$S2^* =$ 1.23671

$\varphi cc =$ 0.83792

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

$\varphi F_L =$ 24.5226 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.25 ksi

$\varphi F_L =$ 24.52 ksi

A = 323.87 mm^2

0.50 in^2

$P_{max} =$ 12.31 kips

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 46.38 in

J = 0.16

121.663

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.8 ksi

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 29.8 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

M_{max}St = 0.404 k-ft

Weak Axis:

3.4.14

L_b = 46.38 in

J = 0.16

121.663

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.8

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 33.3 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

M_{max}Wk = 0.450 k-ft

Compression

3.4.7

$\lambda =$ 1.98863

r = 0.437 in

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

$S1^* =$ 0.33515

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

$S2^* =$ 1.23671

$\varphi cc =$ 0.85841

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

$\varphi F_L =$ 7.59722 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.25 ksi

$\varphi F_L =$ 7.60 ksi

A = 323.87 mm^2

0.50 in^2

$P_{max} =$ 3.81 kips

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 33.07 in

J = 0.16

86.7548

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 30.4 ksi

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 30.4 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

M_{max}St = 0.411 k-ft

Weak Axis:

3.4.14

L_b = 33.07 in

J = 0.16

86.7548

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 30.4

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 33.3 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

M_{max}Wk = 0.450 k-ft

Compression

3.4.7

$\lambda =$ 1.41804

r = 0.437 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.77853

φF_L = $(\varphi ccFcy)/(\lambda^2)$

φF_L = 13.5508 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L = $\varphi yFcy$

φF_L = 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

φF_L = $\varphi yFcy$

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 = $\varphi yFcy$

φF_L = 33.25 ksi

φF_L = 13.55 ksi

A = 323.87 mm^2

0.50 in^2

P_{max} = 6.80 kips

APPENDIX B

B.1

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

Basic Load Cases

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

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

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	Y	-8.366	-8.366	0	0
2	M16	Y	-8.366	-8.366	0	0

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

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	Y	-4.45	-4.45	0	0
2	M16	Y	-4.45	-4.45	0	0

Member Distributed Loads (BLC 3 : Snow Load)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	Y	-57.498	-57.498	0	0
2	M16	Y	-57.498	-57.498	0	0

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

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	y	-60.802	-60.802	0	0
2	M16	y	-95.545	-95.545	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	122.761	122.761	0	0
2	M16	y	57.906	57.906	0	0

Load Combinations

	Description	S...	P...	S...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	LRFD 1.2D + 1.6S + 0.5W	Yes	Y		1	1.2	3	1.6	4	.5														
2	LRFD 1.2D + 1.0W + 0.5S	Yes	Y		1	1.2	3	.5	4	1														
3	LRFD 0.9D + 1.0W	Yes	Y		2	.9					5	1												
4	LATERAL - LRFD 1.54D + 1.3E ...	Yes	Y		1	1.54	3	.2			6	1.3												
5	LATERAL - LRFD 0.56D + 1.3E	Yes	Y		1	.56					6	1.3												
6	LATERAL - LRFD 1.54D + 1.25...	Yes	Y		1	1.54	3	.2			6	1.25												
7	LATERAL - LRFD 0.56D + 1.25E	Yes	Y		1	.56					6	1.25												
8																								
9	ASD 1.0D + 1.0S	Yes	Y		1	1	3	1																
10	ASD 1.0D + 0.6W	Yes	Y		1	1			4	.6														
11	ASD 1.0D + 0.75L + 0.45W + 0....	Yes	Y		1	1	3	.75	4	.45														
12	ASD 0.6D + 0.6W	Yes	Y		2	.6					5	.6												
13	LATERAL - ASD 1.238D + 0.875E	Yes	Y		1	1.2...					6	.875												
14	LATERAL - ASD 1.1785D + 0.65...	Yes	Y		1	1.1...	3	.75			6	.656												
15	LATERAL - ASD 0.362D + 0.875E	Yes	Y		1	.362					6	.875												

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N8	max	138.276	2	322.151	1	0	5	0	1	0	1	0	1
2		min	-184.518	3	-387.256	3	-.128	1	0	3	0	1	0	1
3	N7	max	0	15	527.602	1	-.058	15	0	15	0	1	0	1
4		min	-.184	1	-70.784	3	-1.497	1	-.003	1	0	1	0	1
5	N15	max	0	15	1509.873	1	.579	1	.001	1	0	1	0	1
6		min	-1.917	1	-260.584	3	-.285	3	0	3	0	1	0	1
7	N16	max	553.88	2	1171.888	1	-.183	10	0	1	0	1	0	1
8		min	-588.35	3	-1270.279	3	-33.163	3	0	3	0	1	0	1
9	N23	max	0	15	527.371	1	3.385	1	.006	1	0	1	0	1
10		min	-.184	1	-70.349	3	.123	15	0	15	0	1	0	1
11	N24	max	138.742	2	327.591	1	33.408	3	.002	1	0	1	0	1
12		min	-184.595	3	-384.491	3	.033	10	0	3	0	1	0	1
13	Totals:	max	828.844	2	4386.477	1	0	1						
14		min	-957.772	3	-2443.744	3	0	12						

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	373.974	1	.644	4	.728	1	0	15	0	3	0	1
2			min	-366.873	3	.152	15	-.046	3	-.001	1	0	1	0	1
3		2	max	374.08	1	.602	4	.728	1	0	15	0	1	0	15
4			min	-366.793	3	.143	15	-.046	3	-.001	1	0	10	0	4
5		3	max	374.187	1	.561	4	.728	1	0	15	0	1	0	15
6			min	-366.713	3	.133	15	-.046	3	-.001	1	0	3	0	4
7		4	max	374.293	1	.52	4	.728	1	0	15	0	1	0	15
8			min	-366.634	3	.123	15	-.046	3	-.001	1	0	3	0	4
9		5	max	374.4	1	.478	4	.728	1	0	15	0	1	0	15
10			min	-366.554	3	.113	15	-.046	3	-.001	1	0	3	0	4
11		6	max	374.506	1	.437	4	.728	1	0	15	0	1	0	15
12			min	-366.474	3	.104	15	-.046	3	-.001	1	0	3	0	4
13		7	max	374.613	1	.396	4	.728	1	0	15	0	1	0	15
14			min	-366.394	3	.094	15	-.046	3	-.001	1	0	3	0	4
15		8	max	374.719	1	.355	4	.728	1	0	15	0	1	0	15
16			min	-366.314	3	.084	15	-.046	3	-.001	1	0	3	0	4
17		9	max	374.826	1	.313	4	.728	1	0	15	0	1	0	15
18			min	-366.234	3	.075	15	-.046	3	-.001	1	0	3	0	4
19		10	max	374.932	1	.272	4	.728	1	0	15	0	1	0	15
20			min	-366.154	3	.065	15	-.046	3	-.001	1	0	3	0	4
21		11	max	375.039	1	.231	4	.728	1	0	15	.001	1	0	15
22			min	-366.074	3	.055	15	-.046	3	-.001	1	0	3	0	4
23		12	max	375.145	1	.19	4	.728	1	0	15	.001	1	0	15
24			min	-365.994	3	.046	15	-.046	3	-.001	1	0	3	0	4
25		13	max	375.252	1	.148	4	.728	1	0	15	.001	1	0	15
26			min	-365.914	3	.036	15	-.046	3	-.001	1	0	3	0	4
27		14	max	375.359	1	.107	4	.728	1	0	15	.001	1	0	15
28			min	-365.834	3	.026	15	-.046	3	-.001	1	0	3	0	4
29		15	max	375.465	1	.073	2	.728	1	0	15	.001	1	0	15
30			min	-365.755	3	.014	12	-.046	3	-.001	1	0	3	0	4
31		16	max	375.572	1	.041	2	.728	1	0	15	.002	1	0	15
32			min	-365.675	3	-.005	3	-.046	3	-.001	1	0	3	0	4
33		17	max	375.678	1	.009	10	.728	1	0	15	.002	1	0	15
34			min	-365.595	3	-.03	1	-.046	3	-.001	1	0	3	0	4
35		18	max	375.785	1	-.013	15	.728	1	0	15	.002	1	0	15
36			min	-365.515	3	-.062	1	-.046	3	-.001	1	0	3	0	4
37		19	max	375.891	1	-.022	15	.728	1	0	15	.002	1	0	15

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
38			min	-365.435	3	-.099	4	-.046	3	-.001	1	0	3	0	4
39	M3	1	max	66.398	2	1.795	4	-.023	15	0	15	.002	1	0	4
40			min	-98.261	9	.423	15	-.687	1	0	1	0	15	0	15
41		2	max	66.33	2	1.618	4	-.023	15	0	15	.002	1	0	4
42			min	-98.317	9	.381	15	-.687	1	0	1	0	15	0	15
43		3	max	66.262	2	1.44	4	-.023	15	0	15	.002	1	0	2
44			min	-98.374	9	.339	15	-.687	1	0	1	0	15	0	3
45		4	max	66.194	2	1.262	4	-.023	15	0	15	.002	1	0	15
46			min	-98.43	9	.297	15	-.687	1	0	1	0	15	0	4
47		5	max	66.127	2	1.085	4	-.023	15	0	15	.001	1	0	15
48			min	-98.487	9	.256	15	-.687	1	0	1	0	15	0	4
49		6	max	66.059	2	.907	4	-.023	15	0	15	.001	1	0	15
50			min	-98.543	9	.214	15	-.687	1	0	1	0	15	0	4
51		7	max	65.991	2	.729	4	-.023	15	0	15	.001	1	0	15
52			min	-98.6	9	.172	15	-.687	1	0	1	0	15	0	4
53		8	max	65.923	2	.552	4	-.023	15	0	15	.001	1	0	15
54			min	-98.657	9	.13	15	-.687	1	0	1	0	15	0	4
55		9	max	65.855	2	.374	4	-.023	15	0	15	0	1	0	15
56			min	-98.713	9	.089	15	-.687	1	0	1	0	15	-.001	4
57		10	max	65.787	2	.196	4	-.023	15	0	15	0	1	0	15
58			min	-98.77	9	.047	15	-.687	1	0	1	0	15	-.001	4
59		11	max	65.719	2	.03	2	-.023	15	0	15	0	1	0	15
60			min	-98.826	9	-.003	3	-.687	1	0	1	0	15	-.001	4
61		12	max	65.652	2	-.037	15	-.023	15	0	15	0	1	0	15
62			min	-98.883	9	-.159	4	-.687	1	0	1	0	15	-.001	4
63		13	max	65.584	2	-.078	15	-.023	15	0	15	0	1	0	15
64			min	-98.939	9	-.337	4	-.687	1	0	1	0	12	-.001	4
65		14	max	65.516	2	-.12	15	-.023	15	0	15	0	1	0	15
66			min	-98.996	9	-.514	4	-.687	1	0	1	0	12	-.001	4
67		15	max	65.448	2	-.162	15	-.023	15	0	15	0	1	0	15
68			min	-99.052	9	-.692	4	-.687	1	0	1	0	3	0	4
69		16	max	65.38	2	-.204	15	-.023	15	0	15	0	15	0	15
70			min	-99.109	9	-.869	4	-.687	1	0	1	0	1	0	4
71		17	max	65.312	2	-.245	15	-.023	15	0	15	0	15	0	15
72			min	-99.166	9	-1.047	4	-.687	1	0	1	0	1	0	4
73		18	max	65.244	2	-.287	15	-.023	15	0	15	0	15	0	15
74			min	-99.222	9	-1.225	4	-.687	1	0	1	0	1	0	4
75		19	max	65.176	2	-.329	15	-.023	15	0	15	0	15	0	1
76			min	-99.279	9	-1.402	4	-.687	1	0	1	0	1	0	1
77	M4	1	max	526.437	1	0	1	-.058	15	0	1	0	3	0	1
78			min	-71.658	3	0	1	-1.641	1	0	1	0	1	0	1
79		2	max	526.502	1	0	1	-.058	15	0	1	0	15	0	1
80			min	-71.609	3	0	1	-1.641	1	0	1	0	1	0	1
81		3	max	526.567	1	0	1	-.058	15	0	1	0	15	0	1
82			min	-71.561	3	0	1	-1.641	1	0	1	0	1	0	1
83		4	max	526.632	1	0	1	-.058	15	0	1	0	15	0	1
84			min	-71.512	3	0	1	-1.641	1	0	1	0	1	0	1
85		5	max	526.696	1	0	1	-.058	15	0	1	0	15	0	1
86			min	-71.464	3	0	1	-1.641	1	0	1	0	1	0	1
87		6	max	526.761	1	0	1	-.058	15	0	1	0	15	0	1
88			min	-71.415	3	0	1	-1.641	1	0	1	0	1	0	1
89		7	max	526.826	1	0	1	-.058	15	0	1	0	15	0	1
90			min	-71.366	3	0	1	-1.641	1	0	1	0	1	0	1
91		8	max	526.89	1	0	1	-.058	15	0	1	0	15	0	1
92			min	-71.318	3	0	1	-1.641	1	0	1	-.001	1	0	1
93		9	max	526.955	1	0	1	-.058	15	0	1	0	15	0	1
94			min	-71.269	3	0	1	-1.641	1	0	1	-.001	1	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
95		10	max	527.02	1	0	1	-.058	15	0	1	0	15	0	1
96			min	-71.221	3	0	1	-1.641	1	0	1	-.001	1	0	1
97		11	max	527.085	1	0	1	-.058	15	0	1	0	15	0	1
98			min	-71.172	3	0	1	-1.641	1	0	1	-.001	1	0	1
99		12	max	527.149	1	0	1	-.058	15	0	1	0	15	0	1
100			min	-71.124	3	0	1	-1.641	1	0	1	-.002	1	0	1
101		13	max	527.214	1	0	1	-.058	15	0	1	0	15	0	1
102			min	-71.075	3	0	1	-1.641	1	0	1	-.002	1	0	1
103		14	max	527.279	1	0	1	-.058	15	0	1	0	15	0	1
104			min	-71.027	3	0	1	-1.641	1	0	1	-.002	1	0	1
105		15	max	527.343	1	0	1	-.058	15	0	1	0	15	0	1
106			min	-70.978	3	0	1	-1.641	1	0	1	-.002	1	0	1
107		16	max	527.408	1	0	1	-.058	15	0	1	0	15	0	1
108			min	-70.93	3	0	1	-1.641	1	0	1	-.002	1	0	1
109		17	max	527.473	1	0	1	-.058	15	0	1	0	15	0	1
110			min	-70.881	3	0	1	-1.641	1	0	1	-.002	1	0	1
111		18	max	527.537	1	0	1	-.058	15	0	1	0	15	0	1
112			min	-70.833	3	0	1	-1.641	1	0	1	-.003	1	0	1
113		19	max	527.602	1	0	1	-.058	15	0	1	0	15	0	1
114			min	-70.784	3	0	1	-1.641	1	0	1	-.003	1	0	1
115	M6	1	max	1223.049	1	.638	4	.264	1	0	1	0	3	0	1
116			min	-1197.667	3	.151	15	-.127	3	0	15	0	1	0	1
117		2	max	1223.155	1	.596	4	.264	1	0	1	0	3	0	15
118			min	-1197.587	3	.142	15	-.127	3	0	15	0	11	0	4
119		3	max	1223.262	1	.555	4	.264	1	0	1	0	2	0	15
120			min	-1197.507	3	.132	15	-.127	3	0	15	0	15	0	4
121		4	max	1223.368	1	.514	4	.264	1	0	1	0	1	0	15
122			min	-1197.427	3	.122	15	-.127	3	0	15	0	12	0	4
123		5	max	1223.475	1	.473	4	.264	1	0	1	0	1	0	15
124			min	-1197.347	3	.113	15	-.127	3	0	15	0	3	0	4
125		6	max	1223.581	1	.431	4	.264	1	0	1	0	1	0	15
126			min	-1197.267	3	.103	15	-.127	3	0	15	0	3	0	4
127		7	max	1223.688	1	.39	4	.264	1	0	1	0	1	0	15
128			min	-1197.187	3	.093	15	-.127	3	0	15	0	3	0	4
129		8	max	1223.794	1	.349	4	.264	1	0	1	0	1	0	15
130			min	-1197.107	3	.084	15	-.127	3	0	15	0	3	0	4
131		9	max	1223.901	1	.316	2	.264	1	0	1	0	1	0	15
132			min	-1197.028	3	.074	15	-.127	3	0	15	0	3	0	4
133		10	max	1224.007	1	.284	2	.264	1	0	1	0	1	0	15
134			min	-1196.948	3	.064	15	-.127	3	0	15	0	3	0	4
135		11	max	1224.114	1	.252	2	.264	1	0	1	0	1	0	15
136			min	-1196.868	3	.052	12	-.127	3	0	15	0	3	0	4
137		12	max	1224.221	1	.219	2	.264	1	0	1	0	1	0	15
138			min	-1196.788	3	.036	12	-.127	3	0	15	0	3	0	4
139		13	max	1224.327	1	.187	2	.264	1	0	1	0	1	0	15
140			min	-1196.708	3	.02	12	-.127	3	0	15	0	3	0	4
141		14	max	1224.434	1	.155	2	.264	1	0	1	0	1	0	15
142			min	-1196.628	3	0	3	-.127	3	0	15	0	3	0	4
143		15	max	1224.54	1	.123	2	.264	1	0	1	0	1	0	15
144			min	-1196.548	3	-.025	3	-.127	3	0	15	0	3	0	4
145		16	max	1224.647	1	.091	2	.264	1	0	1	0	1	0	15
146			min	-1196.468	3	-.049	3	-.127	3	0	15	0	3	0	2
147		17	max	1224.753	1	.059	2	.264	1	0	1	0	1	0	15
148			min	-1196.388	3	-.073	3	-.127	3	0	15	0	3	0	2
149		18	max	1224.86	1	.026	2	.264	1	0	1	0	1	0	15
150			min	-1196.308	3	-.097	3	-.127	3	0	15	0	3	0	2
151		19	max	1224.966	1	-.006	2	.264	1	0	1	0	1	0	15

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
152			min	-1196.228	3	-.121	3	-.127	3	0	15	0	3	0	2
153	M7	1	max	330.663	2	1.794	4	.014	1	0	2	0	2	0	2
154			min	-265.128	3	.423	15	-.003	10	0	3	0	3	0	12
155		2	max	330.595	2	1.617	4	.014	1	0	2	0	2	0	2
156			min	-265.179	3	.381	15	-.003	10	0	3	0	3	0	3
157		3	max	330.528	2	1.439	4	.014	1	0	2	0	2	0	2
158			min	-265.229	3	.339	15	-.003	10	0	3	0	3	0	3
159		4	max	330.46	2	1.261	4	.014	1	0	2	0	2	0	2
160			min	-265.28	3	.297	15	-.003	10	0	3	0	3	0	3
161		5	max	330.392	2	1.084	4	.014	1	0	2	0	2	0	15
162			min	-265.331	3	.256	15	-.003	10	0	3	0	3	0	4
163		6	max	330.324	2	.906	4	.014	1	0	2	0	2	0	15
164			min	-265.382	3	.214	15	-.003	10	0	3	0	3	0	4
165		7	max	330.256	2	.728	4	.014	1	0	2	0	2	0	15
166			min	-265.433	3	.172	15	-.003	10	0	3	0	3	0	4
167		8	max	330.188	2	.551	4	.014	1	0	2	0	2	0	15
168			min	-265.484	3	.13	15	-.003	10	0	3	0	3	-.001	4
169		9	max	330.12	2	.373	4	.014	1	0	2	0	2	0	15
170			min	-265.535	3	.089	15	-.003	10	0	3	0	3	-.001	4
171		10	max	330.052	2	.217	2	.014	1	0	2	0	2	0	15
172			min	-265.586	3	.043	12	-.003	10	0	3	0	3	-.001	4
173		11	max	329.985	2	.078	2	.014	1	0	2	0	2	0	15
174			min	-265.637	3	-.045	3	-.003	10	0	3	0	3	-.001	4
175		12	max	329.917	2	-.037	15	.014	1	0	2	0	2	0	15
176			min	-265.688	3	-.16	4	-.003	10	0	3	0	3	-.001	4
177		13	max	329.849	2	-.078	15	.014	1	0	2	0	2	0	15
178			min	-265.738	3	-.338	4	-.003	10	0	3	0	3	-.001	4
179		14	max	329.781	2	-.12	15	.014	1	0	2	0	2	0	15
180			min	-265.789	3	-.515	4	-.003	10	0	3	0	3	-.001	4
181		15	max	329.713	2	-.162	15	.014	1	0	2	0	2	0	15
182			min	-265.84	3	-.693	4	-.003	10	0	3	0	3	0	4
183		16	max	329.645	2	-.204	15	.014	1	0	2	0	2	0	15
184			min	-265.891	3	-.871	4	-.003	10	0	3	0	3	0	4
185		17	max	329.577	2	-.246	15	.014	1	0	2	0	2	0	15
186			min	-265.942	3	-1.048	4	-.003	10	0	3	0	3	0	4
187		18	max	329.51	2	-.287	15	.014	1	0	2	0	2	0	15
188			min	-265.993	3	-1.226	4	-.003	10	0	3	0	3	0	4
189		19	max	329.442	2	-.329	15	.014	1	0	2	0	2	0	1
190			min	-266.044	3	-1.404	4	-.003	10	0	3	0	3	0	1
191	M8	1	max	1508.708	1	0	1	.768	1	0	1	0	15	0	1
192			min	-261.458	3	0	1	-.273	3	0	1	0	1	0	1
193		2	max	1508.773	1	0	1	.768	1	0	1	0	1	0	1
194			min	-261.409	3	0	1	-.273	3	0	1	0	3	0	1
195		3	max	1508.838	1	0	1	.768	1	0	1	0	1	0	1
196			min	-261.361	3	0	1	-.273	3	0	1	0	3	0	1
197		4	max	1508.902	1	0	1	.768	1	0	1	0	1	0	1
198			min	-261.312	3	0	1	-.273	3	0	1	0	3	0	1
199		5	max	1508.967	1	0	1	.768	1	0	1	0	1	0	1
200			min	-261.264	3	0	1	-.273	3	0	1	0	3	0	1
201		6	max	1509.032	1	0	1	.768	1	0	1	0	1	0	1
202			min	-261.215	3	0	1	-.273	3	0	1	0	3	0	1
203		7	max	1509.097	1	0	1	.768	1	0	1	0	1	0	1
204			min	-261.166	3	0	1	-.273	3	0	1	0	3	0	1
205		8	max	1509.161	1	0	1	.768	1	0	1	0	1	0	1
206			min	-261.118	3	0	1	-.273	3	0	1	0	3	0	1
207		9	max	1509.226	1	0	1	.768	1	0	1	0	1	0	1
208			min	-261.069	3	0	1	-.273	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	1509.291	1	0	1	.768	1	0	1	0	1	0	1
210			min	-261.021	3	0	1	-.273	3	0	1	0	3	0	1
211		11	max	1509.355	1	0	1	.768	1	0	1	0	1	0	1
212			min	-260.972	3	0	1	-.273	3	0	1	0	3	0	1
213		12	max	1509.42	1	0	1	.768	1	0	1	0	1	0	1
214			min	-260.924	3	0	1	-.273	3	0	1	0	3	0	1
215		13	max	1509.485	1	0	1	.768	1	0	1	0	1	0	1
216			min	-260.875	3	0	1	-.273	3	0	1	0	3	0	1
217		14	max	1509.55	1	0	1	.768	1	0	1	0	1	0	1
218			min	-260.827	3	0	1	-.273	3	0	1	0	3	0	1
219		15	max	1509.614	1	0	1	.768	1	0	1	0	1	0	1
220			min	-260.778	3	0	1	-.273	3	0	1	0	3	0	1
221		16	max	1509.679	1	0	1	.768	1	0	1	.001	1	0	1
222			min	-260.73	3	0	1	-.273	3	0	1	0	3	0	1
223		17	max	1509.744	1	0	1	.768	1	0	1	.001	1	0	1
224			min	-260.681	3	0	1	-.273	3	0	1	0	3	0	1
225		18	max	1509.808	1	0	1	.768	1	0	1	.001	1	0	1
226			min	-260.633	3	0	1	-.273	3	0	1	0	3	0	1
227		19	max	1509.873	1	0	1	.768	1	0	1	.001	1	0	1
228			min	-260.584	3	0	1	-.273	3	0	1	0	3	0	1
229	M10	1	max	385.402	1	.634	4	-.005	15	.001	1	0	1	0	1
230			min	-353.465	3	.151	15	-.152	1	0	3	0	3	0	1
231		2	max	385.509	1	.593	4	-.005	15	.001	1	0	1	0	15
232			min	-353.385	3	.141	15	-.152	1	0	3	0	3	0	4
233		3	max	385.615	1	.551	4	-.005	15	.001	1	0	1	0	15
234			min	-353.305	3	.132	15	-.152	1	0	3	0	3	0	4
235		4	max	385.722	1	.51	4	-.005	15	.001	1	0	1	0	15
236			min	-353.225	3	.122	15	-.152	1	0	3	0	3	0	4
237		5	max	385.828	1	.469	4	-.005	15	.001	1	0	1	0	15
238			min	-353.145	3	.112	15	-.152	1	0	3	0	3	0	4
239		6	max	385.935	1	.428	4	-.005	15	.001	1	0	2	0	15
240			min	-353.066	3	.102	15	-.152	1	0	3	0	3	0	4
241		7	max	386.041	1	.386	4	-.005	15	.001	1	0	2	0	15
242			min	-352.986	3	.093	15	-.152	1	0	3	0	3	0	4
243		8	max	386.148	1	.345	4	-.005	15	.001	1	0	15	0	15
244			min	-352.906	3	.083	15	-.152	1	0	3	0	3	0	4
245		9	max	386.255	1	.304	4	-.005	15	.001	1	0	15	0	15
246			min	-352.826	3	.073	15	-.152	1	0	3	0	3	0	4
247		10	max	386.361	1	.263	4	-.005	15	.001	1	0	15	0	15
248			min	-352.746	3	.064	15	-.152	1	0	3	0	3	0	4
249		11	max	386.468	1	.221	4	-.005	15	.001	1	0	15	0	15
250			min	-352.666	3	.054	15	-.152	1	0	3	0	1	0	4
251		12	max	386.574	1	.18	4	-.005	15	.001	1	0	15	0	15
252			min	-352.586	3	.044	15	-.152	1	0	3	0	1	0	4
253		13	max	386.681	1	.139	4	-.005	15	.001	1	0	15	0	15
254			min	-352.506	3	.035	15	-.152	1	0	3	0	1	0	4
255		14	max	386.787	1	.105	2	-.005	15	.001	1	0	15	0	15
256			min	-352.426	3	.019	1	-.152	1	0	3	0	1	0	4
257		15	max	386.894	1	.073	2	-.005	15	.001	1	0	15	0	15
258			min	-352.346	3	-.013	1	-.152	1	0	3	0	1	0	4
259		16	max	387	1	.041	2	-.005	15	.001	1	0	15	0	15
260			min	-352.266	3	-.045	1	-.152	1	0	3	0	1	0	4
261		17	max	387.107	1	.009	10	-.005	15	.001	1	0	15	0	15
262			min	-352.187	3	-.077	1	-.152	1	0	3	0	1	0	4
263		18	max	387.213	1	-.014	12	-.005	15	.001	1	0	15	0	15
264			min	-352.107	3	-.11	1	-.152	1	0	3	0	1	0	4
265		19	max	387.32	1	-.024	15	-.005	15	.001	1	0	15	0	15

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
266			min	-352.027	3	-.142	1	-.152	1	0	3	0	1	0	4
267	M11	1	max	66.1	2	1.8	4	.805	1	.001	1	0	3	0	4
268			min	-98.158	9	.423	15	.016	12	0	15	-.002	1	0	15
269		2	max	66.033	2	1.622	4	.805	1	.001	1	0	3	0	4
270			min	-98.215	9	.382	15	.016	12	0	15	-.002	1	0	12
271		3	max	65.965	2	1.445	4	.805	1	.001	1	0	3	0	2
272			min	-98.271	9	.34	15	.016	12	0	15	-.002	1	0	3
273		4	max	65.897	2	1.267	4	.805	1	.001	1	0	3	0	15
274			min	-98.328	9	.298	15	.016	12	0	15	-.002	1	0	3
275		5	max	65.829	2	1.09	4	.805	1	.001	1	0	3	0	15
276			min	-98.384	9	.256	15	.016	12	0	15	-.001	1	0	4
277		6	max	65.761	2	.912	4	.805	1	.001	1	0	3	0	15
278			min	-98.441	9	.215	15	.016	12	0	15	-.001	1	0	4
279		7	max	65.693	2	.734	4	.805	1	.001	1	0	3	0	15
280			min	-98.497	9	.173	15	.016	12	0	15	-.001	1	0	4
281		8	max	65.625	2	.557	4	.805	1	.001	1	0	3	0	15
282			min	-98.554	9	.131	15	.016	12	0	15	0	1	0	4
283		9	max	65.558	2	.379	4	.805	1	.001	1	0	3	0	15
284			min	-98.61	9	.089	15	.016	12	0	15	0	1	-.001	4
285		10	max	65.49	2	.201	4	.805	1	.001	1	0	3	0	15
286			min	-98.667	9	.048	15	.016	12	0	15	0	1	-.001	4
287		11	max	65.422	2	.03	2	.805	1	.001	1	0	3	0	15
288			min	-98.724	9	-.021	3	.016	12	0	15	0	1	-.001	4
289		12	max	65.354	2	-.036	15	.805	1	.001	1	0	3	0	15
290			min	-98.78	9	-.154	4	.016	12	0	15	0	1	-.001	4
291		13	max	65.286	2	-.078	15	.805	1	.001	1	0	3	0	15
292			min	-98.837	9	-.332	4	.016	12	0	15	0	2	-.001	4
293		14	max	65.218	2	-.119	15	.805	1	.001	1	0	3	0	15
294			min	-98.893	9	-.509	4	.016	12	0	15	0	10	-.001	4
295		15	max	65.15	2	-.161	15	.805	1	.001	1	0	1	0	15
296			min	-98.95	9	-.687	4	.016	12	0	15	0	15	0	4
297		16	max	65.083	2	-.203	15	.805	1	.001	1	0	1	0	15
298			min	-99.006	9	-.865	4	.016	12	0	15	0	15	0	4
299		17	max	65.015	2	-.245	15	.805	1	.001	1	0	1	0	15
300			min	-99.063	9	-1.042	4	.016	12	0	15	0	15	0	4
301		18	max	64.947	2	-.286	15	.805	1	.001	1	0	1	0	15
302			min	-99.119	9	-1.22	4	.016	12	0	15	0	15	0	4
303		19	max	64.879	2	-.328	15	.805	1	.001	1	.001	1	0	1
304			min	-99.176	9	-1.398	4	.016	12	0	15	0	15	0	1
305	M12	1	max	526.206	1	0	1	3.707	1	0	1	0	1	0	1
306			min	-71.223	3	0	1	.123	15	0	1	0	3	0	1
307		2	max	526.271	1	0	1	3.707	1	0	1	0	1	0	1
308			min	-71.174	3	0	1	.123	15	0	1	0	15	0	1
309		3	max	526.335	1	0	1	3.707	1	0	1	0	1	0	1
310			min	-71.126	3	0	1	.123	15	0	1	0	15	0	1
311		4	max	526.4	1	0	1	3.707	1	0	1	.001	1	0	1
312			min	-71.077	3	0	1	.123	15	0	1	0	15	0	1
313		5	max	526.465	1	0	1	3.707	1	0	1	.001	1	0	1
314			min	-71.029	3	0	1	.123	15	0	1	0	15	0	1
315		6	max	526.53	1	0	1	3.707	1	0	1	.002	1	0	1
316			min	-70.98	3	0	1	.123	15	0	1	0	15	0	1
317		7	max	526.594	1	0	1	3.707	1	0	1	.002	1	0	1
318			min	-70.932	3	0	1	.123	15	0	1	0	15	0	1
319		8	max	526.659	1	0	1	3.707	1	0	1	.002	1	0	1
320			min	-70.883	3	0	1	.123	15	0	1	0	15	0	1
321		9	max	526.724	1	0	1	3.707	1	0	1	.003	1	0	1
322			min	-70.835	3	0	1	.123	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	526.788	1	0	1	3.707	1	0	1	.003	1	0	1
324			min	-70.786	3	0	1	.123	15	0	1	0	15	0	1
325		11	max	526.853	1	0	1	3.707	1	0	1	.003	1	0	1
326			min	-70.738	3	0	1	.123	15	0	1	0	15	0	1
327		12	max	526.918	1	0	1	3.707	1	0	1	.004	1	0	1
328			min	-70.689	3	0	1	.123	15	0	1	0	15	0	1
329		13	max	526.982	1	0	1	3.707	1	0	1	.004	1	0	1
330			min	-70.64	3	0	1	.123	15	0	1	0	15	0	1
331		14	max	527.047	1	0	1	3.707	1	0	1	.004	1	0	1
332			min	-70.592	3	0	1	.123	15	0	1	0	15	0	1
333		15	max	527.112	1	0	1	3.707	1	0	1	.005	1	0	1
334			min	-70.543	3	0	1	.123	15	0	1	0	15	0	1
335		16	max	527.177	1	0	1	3.707	1	0	1	.005	1	0	1
336			min	-70.495	3	0	1	.123	15	0	1	0	15	0	1
337		17	max	527.241	1	0	1	3.707	1	0	1	.005	1	0	1
338			min	-70.446	3	0	1	.123	15	0	1	0	15	0	1
339		18	max	527.306	1	0	1	3.707	1	0	1	.006	1	0	1
340			min	-70.398	3	0	1	.123	15	0	1	0	15	0	1
341		19	max	527.371	1	0	1	3.707	1	0	1	.006	1	0	1
342			min	-70.349	3	0	1	.123	15	0	1	0	15	0	1
343	M1	1	max	130.459	1	345.226	3	-2.44	15	0	1	.143	1	.014	1
344			min	4.36	15	-374.1	1	-72.262	1	0	3	.005	15	-.011	3
345		2	max	130.555	1	345.029	3	-2.44	15	0	1	.127	1	.095	1
346			min	4.389	15	-374.363	1	-72.262	1	0	3	.004	15	-.086	3
347		3	max	110.168	1	7.025	9	-2.417	15	0	12	.11	1	.175	1
348			min	3.982	15	-21.474	3	-71.985	1	0	1	.004	15	-.159	3
349		4	max	110.263	1	6.806	9	-2.417	15	0	12	.094	1	.175	1
350			min	4.01	15	-21.67	3	-71.985	1	0	1	.003	15	-.154	3
351		5	max	110.359	1	6.587	9	-2.417	15	0	12	.079	1	.175	1
352			min	4.039	15	-21.867	3	-71.985	1	0	1	.003	15	-.15	3
353		6	max	110.454	1	6.369	9	-2.417	15	0	12	.063	1	.175	1
354			min	4.068	15	-22.064	3	-71.985	1	0	1	.002	15	-.145	3
355		7	max	110.55	1	6.15	9	-2.417	15	0	12	.048	1	.176	1
356			min	4.097	15	-22.261	3	-71.985	1	0	1	.002	15	-.14	3
357		8	max	110.645	1	5.931	9	-2.417	15	0	12	.032	1	.176	1
358			min	4.126	15	-22.458	3	-71.985	1	0	1	.001	15	-.135	3
359		9	max	110.741	1	5.713	9	-2.417	15	0	12	.016	1	.177	1
360			min	4.155	15	-22.654	3	-71.985	1	0	1	0	15	-.13	3
361		10	max	110.836	1	5.494	9	-2.417	15	0	12	0	1	.177	1
362			min	4.183	15	-22.851	3	-71.985	1	0	1	0	10	-.125	3
363		11	max	110.932	1	5.275	9	-2.417	15	0	12	0	12	.178	1
364			min	4.212	15	-23.048	3	-71.985	1	0	1	-.015	1	-.12	3
365		12	max	111.027	1	5.057	9	-2.417	15	0	12	0	12	.178	1
366			min	4.241	15	-23.245	3	-71.985	1	0	1	-.03	1	-.115	3
367		13	max	111.123	1	4.838	9	-2.417	15	0	12	-.001	12	.179	1
368			min	4.27	15	-23.442	3	-71.985	1	0	1	-.046	1	-.11	3
369		14	max	111.218	1	4.619	9	-2.417	15	0	12	-.002	15	.18	1
370			min	4.299	15	-23.638	3	-71.985	1	0	1	-.062	1	-.105	3
371		15	max	111.314	1	4.401	9	-2.417	15	0	12	-.003	15	.183	2
372			min	4.327	15	-23.835	3	-71.985	1	0	1	-.077	1	-.1	3
373		16	max	82.653	2	29.032	10	-2.44	15	0	1	-.003	15	.187	2
374			min	-31.322	3	-88.051	3	-72.586	1	0	12	-.094	1	-.094	3
375		17	max	82.748	2	28.813	10	-2.44	15	0	1	-.004	15	.197	1
376			min	-31.25	3	-88.248	3	-72.586	1	0	12	-.109	1	-.075	3
377		18	max	-4.369	15	423.966	1	-2.498	15	0	3	-.004	15	.107	1
378			min	-130.051	1	-155.852	3	-74.334	1	0	1	-.126	1	-.042	3
379		19	max	-4.34	15	423.704	1	-2.498	15	0	3	-.005	15	.015	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
380			min	-129.956	1	-156.048	3	-74.334	1	0	1	-.142	1	-.008	3
381	M5	1	max	287.955	1	1139.088	3	-.067	10	0	1	.004	1	.022	3
382			min	8.311	12	-1234.801	1	-29.812	3	0	3	0	10	-.028	1
383		2	max	288.051	1	1138.891	3	-.067	10	0	1	0	2	.24	1
384			min	8.359	12	-1235.064	1	-29.812	3	0	3	-.003	3	-.225	3
385		3	max	220.713	1	8.766	9	3.391	3	0	3	0	2	.503	1
386			min	5.818	10	-70.687	3	-.397	2	0	1	-.009	3	-.467	3
387		4	max	220.809	1	8.547	9	3.391	3	0	3	0	2	.507	1
388			min	5.898	10	-70.883	3	-.397	2	0	1	-.008	3	-.452	3
389		5	max	220.904	1	8.328	9	3.391	3	0	3	0	2	.512	1
390			min	5.977	10	-71.08	3	-.397	2	0	1	-.008	3	-.437	3
391		6	max	221	1	8.11	9	3.391	3	0	3	0	2	.517	1
392			min	6.057	10	-71.277	3	-.397	2	0	1	-.007	3	-.421	3
393		7	max	221.095	1	7.891	9	3.391	3	0	3	0	2	.521	1
394			min	6.136	10	-71.474	3	-.397	2	0	1	-.006	3	-.406	3
395		8	max	221.191	1	7.672	9	3.391	3	0	3	0	2	.526	1
396			min	6.216	10	-71.671	3	-.397	2	0	1	-.005	3	-.39	3
397		9	max	221.286	1	7.454	9	3.391	3	0	3	0	2	.531	1
398			min	6.296	10	-71.867	3	-.397	2	0	1	-.005	3	-.375	3
399		10	max	221.382	1	7.235	9	3.391	3	0	3	0	10	.536	1
400			min	6.375	10	-72.064	3	-.397	2	0	1	-.004	3	-.359	3
401		11	max	221.477	1	7.016	9	3.391	3	0	3	0	10	.54	1
402			min	6.455	10	-72.261	3	-.397	2	0	1	-.003	3	-.343	3
403		12	max	221.573	1	6.798	9	3.391	3	0	3	0	10	.545	1
404			min	6.534	10	-72.458	3	-.397	2	0	1	-.003	3	-.328	3
405		13	max	221.668	1	6.579	9	3.391	3	0	3	0	10	.55	1
406			min	6.614	10	-72.655	3	-.397	2	0	1	-.002	1	-.312	3
407		14	max	221.764	1	6.36	9	3.391	3	0	3	0	10	.556	1
408			min	6.694	10	-72.851	3	-.397	2	0	1	-.002	1	-.296	3
409		15	max	221.859	1	6.142	9	3.391	3	0	3	0	15	.561	1
410			min	6.773	10	-73.048	3	-.397	2	0	1	-.002	1	-.28	3
411		16	max	294.178	2	175.309	2	3.365	3	0	1	0	3	.566	1
412			min	-102.649	3	-264.805	3	-.407	2	0	15	-.001	1	-.263	3
413		17	max	294.274	2	175.047	2	3.365	3	0	1	0	3	.569	1
414			min	-102.577	3	-265.002	3	-.407	2	0	15	0	1	-.205	3
415		18	max	-8.937	12	1393.921	1	3.093	3	0	3	.002	3	.272	1
416			min	-288.735	1	-511.63	3	-.097	2	0	1	0	2	-.095	3
417		19	max	-8.889	12	1393.659	1	3.093	3	0	3	.002	3	.016	3
418			min	-288.639	1	-511.827	3	-.097	2	0	1	0	2	-.03	1
419	M9	1	max	129.854	1	345.21	3	94.196	1	0	3	-.005	15	.014	1
420			min	4.338	15	-374.084	1	3.323	15	0	1	-.142	1	-.011	3
421		2	max	129.949	1	345.013	3	94.196	1	0	3	-.003	12	.095	1
422			min	4.367	15	-374.346	1	3.323	15	0	1	-.122	1	-.086	3
423		3	max	110.141	1	6.999	9	68.024	1	0	1	.003	3	.175	1
424			min	4.151	15	-21.416	3	1.004	12	0	15	-.1	1	-.159	3
425		4	max	110.236	1	6.78	9	68.024	1	0	1	.003	3	.175	1
426			min	4.18	15	-21.613	3	1.004	12	0	15	-.085	1	-.154	3
427		5	max	110.332	1	6.561	9	68.024	1	0	1	.004	3	.175	1
428			min	4.209	15	-21.81	3	1.004	12	0	15	-.07	1	-.15	3
429		6	max	110.427	1	6.343	9	68.024	1	0	1	.004	3	.175	1
430			min	4.238	15	-22.006	3	1.004	12	0	15	-.056	1	-.145	3
431		7	max	110.523	1	6.124	9	68.024	1	0	1	.004	3	.176	1
432			min	4.267	15	-22.203	3	1.004	12	0	15	-.041	1	-.14	3
433		8	max	110.618	1	5.905	9	68.024	1	0	1	.004	3	.176	1
434			min	4.296	15	-22.4	3	1.004	12	0	15	-.026	1	-.135	3
435		9	max	110.714	1	5.687	9	68.024	1	0	1	.005	3	.177	1
436			min	4.324	15	-22.597	3	1.004	12	0	15	-.011	1	-.13	3

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
437		10	max	110.809	1	5.468	9	68.024	1	0	1	.005	3	.177	1
438			min	4.353	15	-22.794	3	1.004	12	0	15	0	2	-.125	3
439		11	max	110.905	1	5.249	9	68.024	1	0	1	.018	1	.178	1
440			min	4.382	15	-22.99	3	1.004	12	0	15	0	15	-.12	3
441		12	max	111	1	5.031	9	68.024	1	0	1	.033	1	.178	1
442			min	4.411	15	-23.187	3	1.004	12	0	15	.001	15	-.115	3
443		13	max	111.096	1	4.812	9	68.024	1	0	1	.048	1	.179	1
444			min	4.44	15	-23.384	3	1.004	12	0	15	.002	15	-.11	3
445		14	max	111.191	1	4.593	9	68.024	1	0	1	.062	1	.18	1
446			min	4.468	15	-23.581	3	1.004	12	0	15	.002	15	-.105	3
447		15	max	111.287	1	4.375	9	68.024	1	0	1	.077	1	.183	2
448			min	4.497	15	-23.778	3	1.004	12	0	15	.003	15	-.1	3
449		16	max	82.905	2	28.679	10	68.76	1	0	15	.093	1	.187	2
450			min	-31.416	3	-88.458	3	1.022	12	0	1	.003	15	-.094	3
451		17	max	83	2	28.461	10	68.76	1	0	15	.108	1	.197	1
452			min	-31.344	3	-88.655	3	1.022	12	0	1	.004	15	-.075	3
453		18	max	-4.36	15	423.967	1	72.436	1	0	1	.124	1	.107	1
454			min	-129.769	1	-155.85	3	1.249	12	0	3	.004	15	-.042	3
455		19	max	-4.331	15	423.704	1	72.436	1	0	1	.14	1	.015	1
456			min	-129.673	1	-156.047	3	1.249	12	0	3	.005	15	-.008	3
457	M13	1	max	94.403	1	373.509	1	-4.338	15	.014	1	.142	1	0	1
458			min	3.323	15	-345.199	3	-129.839	1	-.011	3	.005	15	0	3
459		2	max	94.403	1	263.644	1	-3.323	15	.014	1	.043	1	.253	3
460			min	3.323	15	-243.57	3	-99.38	1	-.011	3	.001	15	-.274	1
461		3	max	94.403	1	153.779	1	-2.308	15	.014	1	.002	3	.419	3
462			min	3.323	15	-141.94	3	-68.92	1	-.011	3	-.029	1	-.454	1
463		4	max	94.403	1	43.914	1	-1.293	15	.014	1	0	12	.498	3
464			min	3.323	15	-40.311	3	-38.461	1	-.011	3	-.075	1	-.539	1
465		5	max	94.403	1	61.318	3	-.278	15	.014	1	-.002	12	.489	3
466			min	3.323	15	-65.951	1	-8.002	1	-.011	3	-.095	1	-.53	1
467		6	max	94.403	1	162.947	3	22.458	1	.014	1	-.002	12	.392	3
468			min	3.323	15	-175.817	1	.252	12	-.011	3	-.089	1	-.426	1
469		7	max	94.403	1	264.577	3	52.917	1	.014	1	-.002	12	.208	3
470			min	3.323	15	-285.682	1	1.242	12	-.011	3	-.057	1	-.227	1
471		8	max	94.403	1	366.206	3	83.377	1	.014	1	.002	1	.066	1
472			min	3.323	15	-395.547	1	2.232	12	-.011	3	0	3	-.063	3
473		9	max	94.403	1	467.835	3	113.836	1	.014	1	.087	1	.454	1
474			min	3.323	15	-505.412	1	3.223	12	-.011	3	.002	12	-.422	3
475		10	max	94.403	1	569.465	3	144.295	1	.012	2	.198	1	.937	1
476			min	3.323	15	-615.277	1	4.213	12	-.014	1	.006	12	-.869	3
477		11	max	72.49	1	505.412	1	-3.105	12	.011	3	.083	1	.454	1
478			min	2.44	15	-467.835	3	-113.227	1	-.014	1	0	3	-.422	3
479		12	max	72.49	1	395.547	1	-2.115	12	.011	3	.001	2	.066	1
480			min	2.44	15	-366.206	3	-82.768	1	-.014	1	-.003	3	-.063	3
481		13	max	72.49	1	285.682	1	-1.124	12	.011	3	-.002	15	.208	3
482			min	2.44	15	-264.577	3	-52.308	1	-.014	1	-.059	1	-.227	1
483		14	max	72.49	1	175.817	1	-.108	3	.011	3	-.003	15	.392	3
484			min	2.44	15	-162.947	3	-21.849	1	-.014	1	-.091	1	-.426	1
485		15	max	72.49	1	65.951	1	8.611	1	.011	3	-.003	15	.489	3
486			min	2.44	15	-61.318	3	.3	15	-.014	1	-.097	1	-.53	1
487		16	max	72.49	1	40.311	3	39.07	1	.011	3	-.002	12	.498	3
488			min	2.44	15	-43.914	1	1.315	15	-.014	1	-.076	1	-.539	1
489		17	max	72.49	1	141.94	3	69.529	1	.011	3	0	12	.419	3
490			min	2.44	15	-153.779	1	2.33	15	-.014	1	-.03	1	-.454	1
491		18	max	72.49	1	243.57	3	99.989	1	.011	3	.043	1	.253	3
492			min	2.44	15	-263.644	1	3.345	15	-.014	1	.001	15	-.274	1
493		19	max	72.49	1	345.199	3	130.448	1	.011	3	.143	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	2.44	15	-373.509	1	4.36	15	-.014	1	.005	15	0	3
495	M16	1	max	-1.248	12	424.316	1	-4.331	15	.008	3	.14	1	0	1
496			min	-72.189	1	-156.067	3	-129.685	1	-.015	1	.005	15	0	3
497		2	max	-1.248	12	299.492	1	-3.316	15	.008	3	.041	1	.115	3
498			min	-72.189	1	-110.285	3	-99.226	1	-.015	1	.001	15	-.312	1
499		3	max	-1.248	12	174.668	1	-2.301	15	.008	3	0	12	.19	3
500			min	-72.189	1	-64.503	3	-68.766	1	-.015	1	-.031	1	-.516	1
501		4	max	-1.248	12	49.844	1	-1.286	15	.008	3	-.003	15	.226	3
502			min	-72.189	1	-18.721	3	-38.307	1	-.015	1	-.077	1	-.612	1
503		5	max	-1.248	12	27.061	3	-.271	15	.008	3	-.003	15	.222	3
504			min	-72.189	1	-74.98	1	-7.847	1	-.015	1	-.097	1	-.602	1
505		6	max	-1.248	12	72.843	3	22.612	1	.008	3	-.003	15	.179	3
506			min	-72.189	1	-199.804	1	.411	12	-.015	1	-.091	1	-.483	1
507		7	max	-1.248	12	118.625	3	53.071	1	.008	3	-.002	15	.097	3
508			min	-72.189	1	-324.628	1	1.401	12	-.015	1	-.058	1	-.258	1
509		8	max	-1.248	12	164.407	3	83.531	1	.008	3	.002	2	.076	1
510			min	-72.189	1	-449.452	1	2.391	12	-.015	1	-.002	3	-.025	3
511		9	max	-1.248	12	210.189	3	113.99	1	.008	3	.086	1	.517	1
512			min	-72.189	1	-574.276	1	3.382	12	-.015	1	.001	12	-.186	3
513		10	max	-2.498	15	-15.62	15	144.45	1	0	15	.197	1	1.065	1
514			min	-74.115	1	-699.1	1	-6.749	3	-.015	1	.006	12	-.387	3
515		11	max	-2.498	15	574.276	1	-3.526	12	.015	1	.086	1	.517	1
516			min	-74.115	1	-210.189	3	-113.707	1	-.008	3	.002	12	-.186	3
517		12	max	-2.498	15	449.452	1	-2.536	12	.015	1	.001	2	.076	1
518			min	-74.115	1	-164.407	3	-83.248	1	-.008	3	0	3	-.025	3
519		13	max	-2.498	15	324.628	1	-1.546	12	.015	1	-.002	12	.097	3
520			min	-74.115	1	-118.625	3	-52.788	1	-.008	3	-.058	1	-.258	1
521		14	max	-2.498	15	199.804	1	-.555	12	.015	1	-.003	12	.179	3
522			min	-74.115	1	-72.843	3	-22.329	1	-.008	3	-.09	1	-.483	1
523		15	max	-2.498	15	74.98	1	8.13	1	.015	1	-.003	12	.222	3
524			min	-74.115	1	-27.061	3	.28	15	-.008	3	-.096	1	-.602	1
525		16	max	-2.498	15	18.721	3	38.59	1	.015	1	-.002	12	.226	3
526			min	-74.115	1	-49.844	1	1.295	15	-.008	3	-.076	1	-.612	1
527		17	max	-2.498	15	64.503	3	69.049	1	.015	1	0	12	.19	3
528			min	-74.115	1	-174.668	1	2.31	15	-.008	3	-.03	1	-.516	1
529		18	max	-2.498	15	110.285	3	99.509	1	.015	1	.043	1	.115	3
530			min	-74.115	1	-299.492	1	3.325	15	-.008	3	.001	15	-.312	1
531		19	max	-2.498	15	156.067	3	129.968	1	.015	1	.142	1	0	1
532			min	-74.115	1	-424.316	1	4.34	15	-.008	3	.005	15	0	3
533	M15	1	max	0	2	2.7	4	.029	3	0	1	0	1	0	1
534			min	-34.946	3	0	2	-.034	1	0	3	0	3	0	1
535		2	max	0	2	2.4	4	.029	3	0	1	0	1	0	2
536			min	-35.006	3	0	2	-.034	1	0	3	0	3	-.001	4
537		3	max	0	2	2.1	4	.029	3	0	1	0	1	0	2
538			min	-35.066	3	0	2	-.034	1	0	3	0	3	-.002	4
539		4	max	0	2	1.8	4	.029	3	0	1	0	1	0	2
540			min	-35.125	3	0	2	-.034	1	0	3	0	3	-.003	4
541		5	max	0	2	1.5	4	.029	3	0	1	0	1	0	2
542			min	-35.185	3	0	2	-.034	1	0	3	0	3	-.004	4
543		6	max	0	2	1.2	4	.029	3	0	1	0	1	0	2
544			min	-35.245	3	0	2	-.034	1	0	3	0	3	-.004	4
545		7	max	0	2	.9	4	.029	3	0	1	0	3	0	2
546			min	-35.304	3	0	2	-.034	1	0	3	0	1	-.005	4
547		8	max	0	2	.6	4	.029	3	0	1	0	3	0	2
548			min	-35.364	3	0	2	-.034	1	0	3	0	1	-.005	4
549		9	max	0	2	.3	4	.029	3	0	1	0	3	0	2
550			min	-35.424	3	0	2	-.034	1	0	3	0	1	-.005	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	.029	3	0	1	0	3	0	2
552			min	-35.483	3	0	1	-.034	1	0	3	0	1	-.006	4
553		11	max	0	2	0	2	.029	3	0	1	0	3	0	2
554			min	-35.543	3	-.3	4	-.034	1	0	3	0	1	-.005	4
555		12	max	0	2	0	2	.029	3	0	1	0	3	0	2
556			min	-35.603	3	-.6	4	-.034	1	0	3	0	1	-.005	4
557		13	max	0	2	0	2	.029	3	0	1	0	3	0	2
558			min	-35.662	3	-.9	4	-.034	1	0	3	0	1	-.005	4
559		14	max	0	2	0	2	.029	3	0	1	0	3	0	2
560			min	-35.722	3	-1.2	4	-.034	1	0	3	0	1	-.004	4
561		15	max	0	2	0	2	.029	3	0	1	0	3	0	2
562			min	-35.782	3	-1.5	4	-.034	1	0	3	0	1	-.004	4
563		16	max	0	2	0	2	.029	3	0	1	0	3	0	2
564			min	-35.841	3	-1.8	4	-.034	1	0	3	0	1	-.003	4
565		17	max	0	2	0	2	.029	3	0	1	0	3	0	2
566			min	-35.901	3	-2.1	4	-.034	1	0	3	0	1	-.002	4
567		18	max	0	2	0	2	.029	3	0	1	0	3	0	2
568			min	-35.961	3	-2.4	4	-.034	1	0	3	0	1	-.001	4
569		19	max	0	2	0	2	.029	3	0	1	0	3	0	1
570			min	-36.02	3	-2.7	4	-.034	1	0	3	0	1	0	1
571	M16A	1	max	-.797	10	2.7	4	.022	1	0	3	0	3	0	1
572			min	-35.514	3	.635	15	-.012	3	0	1	0	1	0	1
573		2	max	-.731	10	2.4	4	.022	1	0	3	0	3	0	15
574			min	-35.454	3	.564	15	-.012	3	0	1	0	1	-.001	4
575		3	max	-.665	10	2.1	4	.022	1	0	3	0	3	0	15
576			min	-35.395	3	.494	15	-.012	3	0	1	0	1	-.002	4
577		4	max	-.598	10	1.8	4	.022	1	0	3	0	3	0	15
578			min	-35.335	3	.423	15	-.012	3	0	1	0	1	-.003	4
579		5	max	-.532	10	1.5	4	.022	1	0	3	0	3	0	15
580			min	-35.275	3	.353	15	-.012	3	0	1	0	1	-.004	4
581		6	max	-.466	10	1.2	4	.022	1	0	3	0	3	-.001	15
582			min	-35.216	3	.282	15	-.012	3	0	1	0	1	-.004	4
583		7	max	-.4	10	.9	4	.022	1	0	3	0	3	-.001	15
584			min	-35.156	3	.212	15	-.012	3	0	1	0	1	-.005	4
585		8	max	-.333	10	.6	4	.022	1	0	3	0	3	-.001	15
586			min	-35.096	3	.141	15	-.012	3	0	1	0	1	-.005	4
587		9	max	-.267	10	.3	4	.022	1	0	3	0	3	-.001	15
588			min	-35.037	3	.071	15	-.012	3	0	1	0	1	-.005	4
589		10	max	-.201	10	0	1	.022	1	0	3	0	3	-.001	15
590			min	-34.977	3	0	1	-.012	3	0	1	0	1	-.006	4
591		11	max	-.134	10	-.071	15	.022	1	0	3	0	3	-.001	15
592			min	-34.917	3	-.3	4	-.012	3	0	1	0	1	-.005	4
593		12	max	-.068	10	-.141	15	.022	1	0	3	0	3	-.001	15
594			min	-34.858	3	-.6	4	-.012	3	0	1	0	1	-.005	4
595		13	max	-.002	10	-.212	15	.022	1	0	3	0	2	-.001	15
596			min	-34.798	3	-.9	4	-.012	3	0	1	0	4	-.005	4
597		14	max	.065	10	-.282	15	.022	1	0	3	0	1	-.001	15
598			min	-34.738	3	-1.2	4	-.012	3	0	1	0	3	-.004	4
599		15	max	.131	10	-.353	15	.022	1	0	3	0	1	0	15
600			min	-34.679	3	-1.5	4	-.012	3	0	1	0	3	-.004	4
601		16	max	.197	10	-.423	15	.022	1	0	3	0	1	0	15
602			min	-34.619	3	-1.8	4	-.012	3	0	1	0	3	-.003	4
603		17	max	.263	10	-.494	15	.022	1	0	3	0	1	0	15
604			min	-34.559	3	-2.1	4	-.012	3	0	1	0	3	-.002	4
605		18	max	.33	10	-.564	15	.022	1	0	3	0	1	0	15
606			min	-34.5	3	-2.4	4	-.012	3	0	1	0	3	-.001	4
607		19	max	.396	10	-.635	15	.022	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	-34.44	3	-2.7	4	-.012	3	0	1	0	3	0	1

Envelope Member Section Deflections

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
1	M2	1	max	.003	1	.008	2	.014	1	-3.657e-5	15	NC	3	NC	3
2			min	-.003	3	-.007	3	0	3	-1.086e-3	1	4394.829	2	2424.162	1
3		2	max	.003	1	.007	2	.013	1	-3.506e-5	15	NC	3	NC	3
4			min	-.003	3	-.006	3	0	3	-1.042e-3	1	4763.78	2	2623.705	1
5		3	max	.003	1	.006	2	.012	1	-3.356e-5	15	NC	3	NC	3
6			min	-.003	3	-.006	3	0	3	-9.976e-4	1	5197.02	2	2858.688	1
7		4	max	.003	1	.006	2	.011	1	-3.205e-5	15	NC	3	NC	3
8			min	-.002	3	-.006	3	0	3	-9.532e-4	1	5709.119	2	3137.713	1
9		5	max	.002	1	.005	2	.01	1	-3.054e-5	15	NC	3	NC	3
10			min	-.002	3	-.005	3	0	3	-9.088e-4	1	6319.237	2	3472.264	1
11		6	max	.002	1	.005	2	.009	1	-2.904e-5	15	NC	1	NC	3
12			min	-.002	3	-.005	3	0	3	-8.645e-4	1	7052.973	2	3877.947	1
13		7	max	.002	1	.004	2	.008	1	-2.753e-5	15	NC	1	NC	2
14			min	-.002	3	-.005	3	0	3	-8.201e-4	1	7945.163	2	4376.419	1
15		8	max	.002	1	.004	2	.007	1	-2.602e-5	15	NC	1	NC	2
16			min	-.002	3	-.005	3	0	3	-7.757e-4	1	9044.26	2	4998.461	1
17		9	max	.002	1	.003	2	.006	1	-2.451e-5	15	NC	1	NC	2
18			min	-.002	3	-.004	3	0	3	-7.313e-4	1	NC	1	5789.062	1
19		10	max	.002	1	.003	2	.005	1	-2.301e-5	15	NC	1	NC	2
20			min	-.001	3	-.004	3	0	3	-6.87e-4	1	NC	1	6816.191	1
21		11	max	.001	1	.002	2	.004	1	-2.15e-5	15	NC	1	NC	2
22			min	-.001	3	-.004	3	0	3	-6.426e-4	1	NC	1	8186.671	1
23		12	max	.001	1	.002	2	.003	1	-1.999e-5	15	NC	1	NC	1
24			min	-.001	3	-.003	3	0	3	-5.982e-4	1	NC	1	NC	1
25		13	max	.001	1	.002	2	.003	1	-1.849e-5	15	NC	1	NC	1
26			min	0	3	-.003	3	0	3	-5.539e-4	1	NC	1	NC	1
27		14	max	0	1	.001	2	.002	1	-1.698e-5	15	NC	1	NC	1
28			min	0	3	-.002	3	0	3	-5.095e-4	1	NC	1	NC	1
29		15	max	0	1	0	2	.001	1	-1.547e-5	15	NC	1	NC	1
30			min	0	3	-.002	3	0	3	-4.651e-4	1	NC	1	NC	1
31		16	max	0	1	0	2	0	1	-1.396e-5	15	NC	1	NC	1
32			min	0	3	-.002	3	0	3	-4.207e-4	1	NC	1	NC	1
33		17	max	0	1	0	2	0	1	-1.246e-5	15	NC	1	NC	1
34			min	0	3	-.001	3	0	3	-3.764e-4	1	NC	1	NC	1
35		18	max	0	1	0	2	0	1	-1.095e-5	15	NC	1	NC	1
36			min	0	3	0	3	0	12	-3.32e-4	1	NC	1	NC	1
37		19	max	0	1	0	1	0	1	-8.345e-6	12	NC	1	NC	1
38			min	0	1	0	1	0	1	-2.876e-4	1	NC	1	NC	1
39	M3	1	max	0	1	0	1	0	1	1.322e-4	1	NC	1	NC	1
40			min	0	1	0	1	0	1	3.944e-6	12	NC	1	NC	1
41		2	max	0	9	0	2	0	12	1.663e-4	1	NC	1	NC	1
42			min	0	2	0	3	0	1	5.497e-6	15	NC	1	NC	1
43		3	max	0	9	0	2	0	12	2.003e-4	1	NC	1	NC	1
44			min	0	2	-.002	3	0	1	6.653e-6	15	NC	1	NC	1
45		4	max	0	9	0	2	0	12	2.344e-4	1	NC	1	NC	1
46			min	0	2	-.002	3	-.001	1	7.809e-6	15	NC	1	NC	1
47		5	max	0	9	0	2	0	12	2.685e-4	1	NC	1	NC	1
48			min	0	2	-.003	3	-.001	1	8.965e-6	15	NC	1	NC	1
49		6	max	0	9	0	2	0	3	3.026e-4	1	NC	1	NC	1
50			min	0	2	-.004	3	-.001	1	1.012e-5	15	NC	1	NC	1
51		7	max	0	9	.001	2	0	3	3.367e-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	-.004	3	0	1	1.128e-5	15	NC	1	NC	1
53		8	max	0	9	.001	2	0	3	3.708e-4	1	NC	1	NC	1
54			min	0	2	-.005	3	0	1	1.243e-5	15	NC	1	NC	1
55		9	max	0	9	.002	2	0	3	4.048e-4	1	NC	1	NC	1
56			min	0	2	-.006	3	0	1	1.359e-5	15	NC	1	NC	1
57		10	max	0	9	.002	2	0	1	4.389e-4	1	NC	1	NC	1
58			min	0	2	-.006	3	0	15	1.474e-5	15	NC	1	NC	1
59		11	max	0	9	.003	2	.001	1	4.73e-4	1	NC	1	NC	1
60			min	0	2	-.007	3	0	15	1.59e-5	15	NC	1	NC	1
61		12	max	0	9	.003	2	.002	1	5.071e-4	1	NC	1	NC	1
62			min	0	2	-.007	3	0	15	1.706e-5	15	NC	1	NC	1
63		13	max	0	9	.004	2	.003	1	5.412e-4	1	NC	1	NC	1
64			min	0	2	-.007	3	0	15	1.821e-5	15	NC	1	NC	1
65		14	max	0	9	.005	2	.003	1	5.753e-4	1	NC	1	NC	1
66			min	0	2	-.007	3	0	15	1.937e-5	15	9570.672	2	NC	1
67		15	max	0	9	.006	2	.004	1	6.093e-4	1	NC	3	NC	1
68			min	0	2	-.008	3	0	15	2.052e-5	15	8086.666	2	NC	1
69		16	max	0	9	.007	2	.005	1	6.434e-4	1	NC	3	NC	2
70			min	0	2	-.008	3	0	15	2.168e-5	15	6928.368	2	9500.865	1
71		17	max	0	9	.008	2	.006	1	6.775e-4	1	NC	3	NC	2
72			min	0	2	-.008	3	0	15	2.284e-5	15	6015.812	2	8202.277	1
73		18	max	.001	9	.009	2	.006	1	7.116e-4	1	NC	3	NC	2
74			min	0	2	-.008	3	0	15	2.399e-5	15	5291.002	2	7248.677	1
75		19	max	.001	9	.01	2	.007	1	7.457e-4	1	NC	3	NC	2
76			min	0	2	-.008	3	0	15	2.515e-5	15	4711.647	2	6533.94	1
77	M4	1	max	.003	1	.009	2	0	15	-3.023e-5	15	NC	1	NC	2
78			min	0	3	-.007	3	-.005	1	-9.085e-4	1	NC	1	3666.994	1
79		2	max	.002	1	.008	2	0	15	-3.023e-5	15	NC	1	NC	2
80			min	0	3	-.006	3	-.005	1	-9.085e-4	1	NC	1	3999.91	1
81		3	max	.002	1	.008	2	0	15	-3.023e-5	15	NC	1	NC	2
82			min	0	3	-.006	3	-.004	1	-9.085e-4	1	NC	1	4396.154	1
83		4	max	.002	1	.007	2	0	15	-3.023e-5	15	NC	1	NC	2
84			min	0	3	-.006	3	-.004	1	-9.085e-4	1	NC	1	4872.426	1
85		5	max	.002	1	.007	2	0	15	-3.023e-5	15	NC	1	NC	2
86			min	0	3	-.005	3	-.004	1	-9.085e-4	1	NC	1	5451.477	1
87		6	max	.002	1	.006	2	0	15	-3.023e-5	15	NC	1	NC	2
88			min	0	3	-.005	3	-.003	1	-9.085e-4	1	NC	1	6164.949	1
89		7	max	.002	1	.006	2	0	15	-3.023e-5	15	NC	1	NC	2
90			min	0	3	-.005	3	-.003	1	-9.085e-4	1	NC	1	7057.917	1
91		8	max	.002	1	.005	2	0	15	-3.023e-5	15	NC	1	NC	2
92			min	0	3	-.004	3	-.002	1	-9.085e-4	1	NC	1	8196.385	1
93		9	max	.001	1	.005	2	0	15	-3.023e-5	15	NC	1	NC	2
94			min	0	3	-.004	3	-.002	1	-9.085e-4	1	NC	1	9680.203	1
95		10	max	.001	1	.004	2	0	15	-3.023e-5	15	NC	1	NC	1
96			min	0	3	-.003	3	-.002	1	-9.085e-4	1	NC	1	NC	1
97		11	max	.001	1	.004	2	0	15	-3.023e-5	15	NC	1	NC	1
98			min	0	3	-.003	3	-.001	1	-9.085e-4	1	NC	1	NC	1
99		12	max	0	1	.003	2	0	15	-3.023e-5	15	NC	1	NC	1
100			min	0	3	-.003	3	-.001	1	-9.085e-4	1	NC	1	NC	1
101		13	max	0	1	.003	2	0	15	-3.023e-5	15	NC	1	NC	1
102			min	0	3	-.002	3	0	1	-9.085e-4	1	NC	1	NC	1
103		14	max	0	1	.002	2	0	15	-3.023e-5	15	NC	1	NC	1
104			min	0	3	-.002	3	0	1	-9.085e-4	1	NC	1	NC	1
105		15	max	0	1	.002	2	0	15	-3.023e-5	15	NC	1	NC	1
106			min	0	3	-.002	3	0	1	-9.085e-4	1	NC	1	NC	1
107		16	max	0	1	.001	2	0	15	-3.023e-5	15	NC	1	NC	1
108			min	0	3	-.001	3	0	1	-9.085e-4	1	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
109		17	max	0	1	0	2	0	15	-3.023e-5	15	NC	1	NC	1
110			min	0	3	0	3	0	1	-9.085e-4	1	NC	1	NC	1
111		18	max	0	1	0	2	0	15	-3.023e-5	15	NC	1	NC	1
112			min	0	3	0	3	0	1	-9.085e-4	1	NC	1	NC	1
113		19	max	0	1	0	1	0	1	-3.023e-5	15	NC	1	NC	1
114			min	0	1	0	1	0	1	-9.085e-4	1	NC	1	NC	1
115	M6	1	max	.01	1	.024	2	.004	1	1.987e-4	3	NC	3	NC	2
116			min	-.01	3	-.019	3	-.003	3	2.554e-6	10	1372.28	2	7794.929	1
117		2	max	.009	1	.023	2	.004	1	1.933e-4	3	NC	3	NC	2
118			min	-.009	3	-.018	3	-.002	3	1.846e-6	10	1465.013	2	8452.291	1
119		3	max	.009	1	.021	2	.004	1	1.879e-4	3	NC	3	NC	2
120			min	-.009	3	-.017	3	-.002	3	1.137e-6	10	1570.853	2	9231.51	1
121		4	max	.008	1	.02	2	.003	1	1.825e-4	3	NC	3	NC	1
122			min	-.008	3	-.016	3	-.002	3	4.291e-7	10	1692.419	2	NC	1
123		5	max	.008	1	.018	2	.003	1	1.771e-4	3	NC	3	NC	1
124			min	-.008	3	-.015	3	-.002	3	-2.792e-7	10	1833.084	2	NC	1
125		6	max	.007	1	.017	2	.003	1	1.717e-4	3	NC	3	NC	1
126			min	-.007	3	-.014	3	-.002	3	-9.874e-7	10	1997.264	2	NC	1
127		7	max	.007	1	.015	2	.002	1	1.664e-4	3	NC	3	NC	1
128			min	-.007	3	-.013	3	-.002	3	-3.539e-6	2	2190.85	2	NC	1
129		8	max	.006	1	.014	2	.002	1	1.61e-4	3	NC	3	NC	1
130			min	-.006	3	-.012	3	-.001	3	-7.177e-6	2	2421.88	2	NC	1
131		9	max	.006	1	.012	2	.002	1	1.556e-4	3	NC	3	NC	1
132			min	-.005	3	-.011	3	-.001	3	-1.082e-5	2	2701.608	2	NC	1
133		10	max	.005	1	.011	2	.001	1	1.502e-4	3	NC	3	NC	1
134			min	-.005	3	-.01	3	-.001	3	-1.445e-5	2	3046.296	2	NC	1
135		11	max	.004	1	.01	2	.001	1	1.448e-4	3	NC	3	NC	1
136			min	-.004	3	-.009	3	0	3	-1.809e-5	2	3480.333	2	NC	1
137		12	max	.004	1	.008	2	0	1	1.394e-4	3	NC	3	NC	1
138			min	-.004	3	-.008	3	0	3	-2.173e-5	2	4042.049	2	NC	1
139		13	max	.003	1	.007	2	0	1	1.34e-4	3	NC	3	NC	1
140			min	-.003	3	-.007	3	0	3	-2.537e-5	2	4795.323	2	NC	1
141		14	max	.003	1	.006	2	0	1	1.286e-4	3	NC	3	NC	1
142			min	-.003	3	-.006	3	0	3	-2.901e-5	2	5855.131	2	NC	1
143		15	max	.002	1	.004	2	0	1	1.232e-4	3	NC	3	NC	1
144			min	-.002	3	-.005	3	0	3	-3.265e-5	2	7451.412	2	NC	1
145		16	max	.002	1	.003	2	0	1	1.179e-4	3	NC	1	NC	1
146			min	-.002	3	-.003	3	0	3	-3.629e-5	2	NC	1	NC	1
147		17	max	.001	1	.002	2	0	1	1.125e-4	3	NC	1	NC	1
148			min	-.001	3	-.002	3	0	3	-3.993e-5	2	NC	1	NC	1
149		18	max	0	1	.001	2	0	1	1.071e-4	3	NC	1	NC	1
150			min	0	3	-.001	3	0	3	-4.356e-5	2	NC	1	NC	1
151		19	max	0	1	0	1	0	1	1.017e-4	3	NC	1	NC	1
152			min	0	1	0	1	0	1	-4.72e-5	2	NC	1	NC	1
153	M7	1	max	0	1	0	1	0	1	2.146e-5	2	NC	1	NC	1
154			min	0	1	0	1	0	1	-4.653e-5	3	NC	1	NC	1
155		2	max	0	3	.001	2	0	3	1.933e-5	1	NC	1	NC	1
156			min	0	2	-.002	3	0	1	-3.506e-5	3	NC	1	NC	1
157		3	max	0	3	.003	2	0	3	1.836e-5	1	NC	1	NC	1
158			min	0	2	-.003	3	0	1	-2.36e-5	3	NC	1	NC	1
159		4	max	0	3	.004	2	0	3	1.738e-5	1	NC	1	NC	1
160			min	0	2	-.005	3	0	1	-1.214e-5	3	NC	1	NC	1
161		5	max	0	3	.005	2	0	3	1.64e-5	1	NC	3	NC	1
162			min	0	2	-.006	3	0	1	-6.708e-7	3	8607.816	2	NC	1
163		6	max	0	3	.007	2	0	3	1.542e-5	1	NC	3	NC	1
164			min	-.001	2	-.008	3	0	1	4.473e-7	15	6898.406	2	NC	1
165		7	max	.001	3	.008	2	.001	3	2.226e-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	-.001	2	-.009	3	0	1	4.778e-7	15	5729.571	2	NC	1
167		8	max	.001	3	.009	2	.001	3	3.372e-5	3	NC	3	NC	1
168			min	-.001	2	-.011	3	0	1	-2.579e-6	2	4872.834	2	NC	1
169		9	max	.001	3	.011	2	.001	3	4.519e-5	3	NC	3	NC	1
170			min	-.002	2	-.012	3	0	1	-6.013e-6	2	4214.353	2	NC	1
171		10	max	.002	3	.012	2	.001	3	5.665e-5	3	NC	3	NC	1
172			min	-.002	2	-.013	3	-.001	1	-9.447e-6	2	3691.025	2	NC	1
173		11	max	.002	3	.014	2	.001	3	6.812e-5	3	NC	3	NC	1
174			min	-.002	2	-.015	3	-.001	1	-1.288e-5	2	3264.953	2	NC	1
175		12	max	.002	3	.016	2	.002	3	7.958e-5	3	NC	3	NC	1
176			min	-.002	2	-.016	3	-.001	1	-1.632e-5	2	2911.88	2	NC	1
177		13	max	.002	3	.018	2	.002	3	9.105e-5	3	NC	3	NC	1
178			min	-.002	2	-.017	3	-.002	1	-1.975e-5	2	2615.442	2	NC	1
179		14	max	.002	3	.019	2	.002	3	1.025e-4	3	NC	3	NC	1
180			min	-.003	2	-.018	3	-.002	1	-2.318e-5	2	2364.1	2	NC	1
181		15	max	.002	3	.021	2	.002	3	1.14e-4	3	NC	3	NC	1
182			min	-.003	2	-.019	3	-.002	1	-2.662e-5	2	2149.415	2	NC	1
183		16	max	.003	3	.023	2	.001	3	1.254e-4	3	NC	3	NC	1
184			min	-.003	2	-.019	3	-.002	1	-3.005e-5	2	1965.021	2	NC	1
185		17	max	.003	3	.025	2	.001	3	1.369e-4	3	NC	3	NC	1
186			min	-.003	2	-.02	3	-.002	1	-3.349e-5	2	1805.997	2	NC	1
187		18	max	.003	3	.028	2	.001	3	1.484e-4	3	NC	3	NC	1
188			min	-.004	2	-.021	3	-.002	1	-3.692e-5	2	1668.466	2	NC	1
189		19	max	.003	3	.03	2	.001	3	1.598e-4	3	NC	3	NC	1
190			min	-.004	2	-.022	3	-.002	1	-4.035e-5	2	1549.328	2	NC	1
191	M8	1	max	.007	1	.028	2	.002	1	-1.616e-6	10	NC	1	NC	2
192			min	-.001	3	-.019	3	0	3	-1.256e-4	3	NC	1	7971.675	1
193		2	max	.007	1	.026	2	.002	1	-1.616e-6	10	NC	1	NC	2
194			min	-.001	3	-.018	3	0	3	-1.256e-4	3	NC	1	8691.304	1
195		3	max	.006	1	.025	2	.002	1	-1.616e-6	10	NC	1	NC	2
196			min	-.001	3	-.017	3	0	3	-1.256e-4	3	NC	1	9548.022	1
197		4	max	.006	1	.023	2	.002	1	-1.616e-6	10	NC	1	NC	1
198			min	-.001	3	-.016	3	0	3	-1.256e-4	3	NC	1	NC	1
199		5	max	.006	1	.022	2	.002	1	-1.616e-6	10	NC	1	NC	1
200			min	0	3	-.015	3	0	3	-1.256e-4	3	NC	1	NC	1
201		6	max	.005	1	.02	2	.001	1	-1.616e-6	10	NC	1	NC	1
202			min	0	3	-.014	3	0	3	-1.256e-4	3	NC	1	NC	1
203		7	max	.005	1	.018	2	.001	1	-1.616e-6	10	NC	1	NC	1
204			min	0	3	-.013	3	0	3	-1.256e-4	3	NC	1	NC	1
205		8	max	.004	1	.017	2	.001	1	-1.616e-6	10	NC	1	NC	1
206			min	0	3	-.012	3	0	3	-1.256e-4	3	NC	1	NC	1
207		9	max	.004	1	.015	2	0	1	-1.616e-6	10	NC	1	NC	1
208			min	0	3	-.011	3	0	3	-1.256e-4	3	NC	1	NC	1
209		10	max	.004	1	.014	2	0	1	-1.616e-6	10	NC	1	NC	1
210			min	0	3	-.01	3	0	3	-1.256e-4	3	NC	1	NC	1
211		11	max	.003	1	.012	2	0	1	-1.616e-6	10	NC	1	NC	1
212			min	0	3	-.009	3	0	3	-1.256e-4	3	NC	1	NC	1
213		12	max	.003	1	.011	2	0	1	-1.616e-6	10	NC	1	NC	1
214			min	0	3	-.007	3	0	3	-1.256e-4	3	NC	1	NC	1
215		13	max	.002	1	.009	2	0	1	-1.616e-6	10	NC	1	NC	1
216			min	0	3	-.006	3	0	3	-1.256e-4	3	NC	1	NC	1
217		14	max	.002	1	.008	2	0	1	-1.616e-6	10	NC	1	NC	1
218			min	0	3	-.005	3	0	3	-1.256e-4	3	NC	1	NC	1
219		15	max	.002	1	.006	2	0	1	-1.616e-6	10	NC	1	NC	1
220			min	0	3	-.004	3	0	3	-1.256e-4	3	NC	1	NC	1
221		16	max	.001	1	.005	2	0	1	-1.616e-6	10	NC	1	NC	1
222			min	0	3	-.003	3	0	3	-1.256e-4	3	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
223		17	max	0	1	.003	2	0	1	-1.616e-6	10	NC	1	NC	1
224			min	0	3	-.002	3	0	3	-1.256e-4	3	NC	1	NC	1
225		18	max	0	1	.002	2	0	1	-1.616e-6	10	NC	1	NC	1
226			min	0	3	-.001	3	0	3	-1.256e-4	3	NC	1	NC	1
227		19	max	0	1	0	1	0	1	-1.616e-6	10	NC	1	NC	1
228			min	0	1	0	1	0	1	-1.256e-4	3	NC	1	NC	1
229	M10	1	max	.003	1	.008	2	0	3	9.488e-4	1	NC	3	NC	1
230			min	-.003	3	-.007	3	-.002	1	-2.053e-4	3	4400.19	2	NC	1
231		2	max	.003	1	.007	2	0	3	8.999e-4	1	NC	3	NC	1
232			min	-.003	3	-.006	3	-.002	1	-1.995e-4	3	4769.706	2	NC	1
233		3	max	.003	1	.006	2	0	3	8.509e-4	1	NC	3	NC	1
234			min	-.003	3	-.006	3	-.002	1	-1.937e-4	3	5203.63	2	NC	1
235		4	max	.003	1	.006	2	0	3	8.02e-4	1	NC	3	NC	1
236			min	-.002	3	-.006	3	-.002	1	-1.879e-4	3	5716.562	2	NC	1
237		5	max	.002	1	.005	2	0	3	7.53e-4	1	NC	3	NC	1
238			min	-.002	3	-.006	3	-.001	1	-1.821e-4	3	6327.705	2	NC	1
239		6	max	.002	1	.005	2	0	3	7.041e-4	1	NC	1	NC	1
240			min	-.002	3	-.005	3	-.001	1	-1.763e-4	3	7062.713	2	NC	1
241		7	max	.002	1	.004	2	0	3	6.551e-4	1	NC	1	NC	1
242			min	-.002	3	-.005	3	-.001	1	-1.705e-4	3	7956.505	2	NC	1
243		8	max	.002	1	.004	2	0	3	6.062e-4	1	NC	1	NC	1
244			min	-.002	3	-.005	3	-.001	1	-1.647e-4	3	9057.645	2	NC	1
245		9	max	.002	1	.003	2	0	3	5.572e-4	1	NC	1	NC	1
246			min	-.002	3	-.004	3	0	1	-1.59e-4	3	NC	1	NC	1
247		10	max	.002	1	.003	2	0	3	5.083e-4	1	NC	1	NC	1
248			min	-.001	3	-.004	3	0	1	-1.532e-4	3	NC	1	NC	1
249		11	max	.001	1	.002	2	0	3	4.593e-4	1	NC	1	NC	1
250			min	-.001	3	-.004	3	0	1	-1.474e-4	3	NC	1	NC	1
251		12	max	.001	1	.002	2	0	3	4.104e-4	1	NC	1	NC	1
252			min	-.001	3	-.003	3	0	1	-1.416e-4	3	NC	1	NC	1
253		13	max	.001	1	.002	2	0	3	3.614e-4	1	NC	1	NC	1
254			min	0	3	-.003	3	0	1	-1.358e-4	3	NC	1	NC	1
255		14	max	0	1	.001	2	0	3	3.125e-4	1	NC	1	NC	1
256			min	0	3	-.002	3	0	1	-1.3e-4	3	NC	1	NC	1
257		15	max	0	1	0	2	0	3	2.635e-4	1	NC	1	NC	1
258			min	0	3	-.002	3	0	1	-1.242e-4	3	NC	1	NC	1
259		16	max	0	1	0	2	0	3	2.146e-4	1	NC	1	NC	1
260			min	0	3	-.002	3	0	1	-1.184e-4	3	NC	1	NC	1
261		17	max	0	1	0	2	0	3	1.656e-4	1	NC	1	NC	1
262			min	0	3	-.001	3	0	1	-1.126e-4	3	NC	1	NC	1
263		18	max	0	1	0	2	0	3	1.167e-4	1	NC	1	NC	1
264			min	0	3	0	3	0	1	-1.069e-4	3	NC	1	NC	1
265		19	max	0	1	0	1	0	1	6.771e-5	1	NC	1	NC	1
266			min	0	1	0	1	0	1	-1.011e-4	3	NC	1	NC	1
267	M11	1	max	0	1	0	1	0	1	4.65e-5	3	NC	1	NC	1
268			min	0	1	0	1	0	1	-3.248e-5	1	NC	1	NC	1
269		2	max	0	9	0	2	0	1	3.327e-5	3	NC	1	NC	1
270			min	0	2	0	3	0	3	-9.313e-5	1	NC	1	NC	1
271		3	max	0	9	0	2	0	10	2.003e-5	3	NC	1	NC	1
272			min	0	2	-.002	3	0	3	-1.538e-4	1	NC	1	NC	1
273		4	max	0	9	0	2	0	10	6.8e-6	3	NC	1	NC	1
274			min	0	2	-.002	3	0	3	-2.144e-4	1	NC	1	NC	1
275		5	max	0	9	0	2	0	10	-4.778e-6	12	NC	1	NC	1
276			min	0	2	-.003	3	0	1	-2.751e-4	1	NC	1	NC	1
277		6	max	0	9	0	2	0	15	-1.121e-5	15	NC	1	NC	1
278			min	0	2	-.004	3	-.001	1	-3.357e-4	1	NC	1	NC	1
279		7	max	0	9	.001	2	0	15	-1.329e-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	-3.964e-4	1	NC	1	NC	1
281		8	max	0	9	.001	2	0	15	-1.538e-5	15	NC	1	NC	1
282			min	0	2	-.005	3	-.003	1	-4.571e-4	1	NC	1	NC	1
283		9	max	0	9	.002	2	0	15	-1.747e-5	15	NC	1	NC	1
284			min	0	2	-.006	3	-.004	1	-5.177e-4	1	NC	1	NC	1
285		10	max	0	9	.002	2	0	15	-1.955e-5	15	NC	1	NC	2
286			min	0	2	-.006	3	-.005	1	-5.784e-4	1	NC	1	9272.676	1
287		11	max	0	9	.003	2	0	15	-2.164e-5	15	NC	1	NC	2
288			min	0	2	-.007	3	-.006	1	-6.39e-4	1	NC	1	7655.575	1
289		12	max	0	9	.003	2	0	15	-2.372e-5	15	NC	1	NC	2
290			min	0	2	-.007	3	-.007	1	-6.997e-4	1	NC	1	6486.111	1
291		13	max	0	9	.004	2	0	15	-2.581e-5	15	NC	1	NC	2
292			min	0	2	-.007	3	-.008	1	-7.603e-4	1	NC	1	5614.168	1
293		14	max	0	9	.005	2	0	15	-2.79e-5	15	NC	1	NC	2
294			min	0	2	-.007	3	-.009	1	-8.21e-4	1	9583.857	2	4948.514	1
295		15	max	0	9	.006	2	0	15	-2.998e-5	15	NC	3	NC	2
296			min	0	2	-.008	3	-.01	1	-8.816e-4	1	8096.695	2	4431.105	1
297		16	max	0	9	.007	2	0	15	-3.207e-5	15	NC	3	NC	2
298			min	0	2	-.008	3	-.011	1	-9.423e-4	1	6936.177	2	4023.629	1
299		17	max	0	9	.008	2	0	15	-3.415e-5	15	NC	3	NC	2
300			min	0	2	-.008	3	-.012	1	-1.003e-3	1	6022.033	2	3700.061	1
301		18	max	.001	9	.009	2	0	15	-3.624e-5	15	NC	3	NC	3
302			min	0	2	-.008	3	-.013	1	-1.064e-3	1	5296.071	2	3442.33	1
303		19	max	.001	9	.01	2	0	15	-3.833e-5	15	NC	3	NC	3
304			min	0	2	-.008	3	-.014	1	-1.124e-3	1	4715.871	2	3237.728	1
305	M12	1	max	.003	1	.009	2	.012	1	9.739e-4	1	NC	1	NC	3
306			min	0	3	-.007	3	0	15	3.372e-5	15	NC	1	1639.004	1
307		2	max	.002	1	.008	2	.011	1	9.739e-4	1	NC	1	NC	3
308			min	0	3	-.006	3	0	15	3.372e-5	15	NC	1	1787.353	1
309		3	max	.002	1	.008	2	.01	1	9.739e-4	1	NC	1	NC	3
310			min	0	3	-.006	3	0	15	3.372e-5	15	NC	1	1963.943	1
311		4	max	.002	1	.007	2	.009	1	9.739e-4	1	NC	1	NC	3
312			min	0	3	-.006	3	0	15	3.372e-5	15	NC	1	2176.217	1
313		5	max	.002	1	.007	2	.008	1	9.739e-4	1	NC	1	NC	3
314			min	0	3	-.005	3	0	15	3.372e-5	15	NC	1	2434.314	1
315		6	max	.002	1	.006	2	.007	1	9.739e-4	1	NC	1	NC	3
316			min	0	3	-.005	3	0	15	3.372e-5	15	NC	1	2752.339	1
317		7	max	.002	1	.006	2	.006	1	9.739e-4	1	NC	1	NC	3
318			min	0	3	-.005	3	0	15	3.372e-5	15	NC	1	3150.38	1
319		8	max	.002	1	.005	2	.005	1	9.739e-4	1	NC	1	NC	3
320			min	0	3	-.004	3	0	15	3.372e-5	15	NC	1	3657.854	1
321		9	max	.001	1	.005	2	.004	1	9.739e-4	1	NC	1	NC	2
322			min	0	3	-.004	3	0	15	3.372e-5	15	NC	1	4319.26	1
323		10	max	.001	1	.004	2	.004	1	9.739e-4	1	NC	1	NC	2
324			min	0	3	-.003	3	0	15	3.372e-5	15	NC	1	5204.558	1
325		11	max	.001	1	.004	2	.003	1	9.739e-4	1	NC	1	NC	2
326			min	0	3	-.003	3	0	15	3.372e-5	15	NC	1	6428.981	1
327		12	max	0	1	.003	2	.002	1	9.739e-4	1	NC	1	NC	2
328			min	0	3	-.003	3	0	15	3.372e-5	15	NC	1	8193.553	1
329		13	max	0	1	.003	2	.002	1	9.739e-4	1	NC	1	NC	1
330			min	0	3	-.002	3	0	15	3.372e-5	15	NC	1	NC	1
331		14	max	0	1	.002	2	.001	1	9.739e-4	1	NC	1	NC	1
332			min	0	3	-.002	3	0	15	3.372e-5	15	NC	1	NC	1
333		15	max	0	1	.002	2	0	1	9.739e-4	1	NC	1	NC	1
334			min	0	3	-.002	3	0	15	3.372e-5	15	NC	1	NC	1
335		16	max	0	1	.001	2	0	1	9.739e-4	1	NC	1	NC	1
336			min	0	3	-.001	3	0	15	3.372e-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	0	2	0	1	9.739e-4	1	NC	1	NC	1
338			min	0	3	0	3	0	15	3.372e-5	15	NC	1	NC	1
339		18	max	0	1	0	2	0	1	9.739e-4	1	NC	1	NC	1
340			min	0	3	0	3	0	15	3.372e-5	15	NC	1	NC	1
341		19	max	0	1	0	1	0	1	9.739e-4	1	NC	1	NC	1
342			min	0	1	0	1	0	1	3.372e-5	15	NC	1	NC	1
343	M1	1	max	.006	3	.023	3	.001	3	1.567e-2	1	NC	1	NC	1
344			min	-.007	2	-.028	1	-.005	1	-1.438e-2	3	NC	1	NC	1
345		2	max	.006	3	.013	3	0	3	7.446e-3	1	NC	4	NC	2
346			min	-.007	2	-.015	1	-.01	1	-7.115e-3	3	3541.86	1	8396.051	1
347		3	max	.006	3	.003	3	0	3	1.565e-5	3	NC	4	NC	2
348			min	-.007	2	-.003	1	-.014	1	-6.212e-4	1	1831.876	1	5090.975	1
349		4	max	.006	3	.007	1	0	3	1.884e-5	3	NC	5	NC	2
350			min	-.007	2	-.005	3	-.016	1	-5.189e-4	1	1295.784	1	4212.122	1
351		5	max	.006	3	.016	1	0	3	2.202e-5	3	NC	5	NC	2
352			min	-.007	2	-.012	3	-.016	1	-4.166e-4	1	1038.123	1	4043.72	1
353		6	max	.006	3	.023	1	0	3	2.52e-5	3	NC	5	NC	2
354			min	-.007	2	-.017	3	-.015	1	-3.143e-4	1	892.513	1	4325.28	1
355		7	max	.006	3	.029	1	0	3	2.839e-5	3	NC	5	NC	2
356			min	-.007	2	-.021	3	-.013	1	-2.12e-4	1	804.383	1	5146.843	1
357		8	max	.006	3	.033	1	0	3	3.157e-5	3	NC	5	NC	2
358			min	-.007	2	-.024	3	-.011	1	-1.097e-4	1	751.042	1	7056.205	1
359		9	max	.006	3	.035	1	0	3	3.476e-5	3	NC	5	NC	1
360			min	-.007	2	-.025	3	-.008	1	-9.31e-6	2	721.897	1	NC	1
361		10	max	.006	3	.036	1	0	3	9.49e-5	1	NC	5	NC	1
362			min	-.007	2	-.025	3	-.005	1	3.477e-6	15	712.063	1	NC	1
363		11	max	.006	3	.035	1	0	3	1.972e-4	1	NC	5	NC	1
364			min	-.008	2	-.024	3	-.001	1	6.894e-6	15	720.059	1	NC	1
365		12	max	.006	3	.033	1	.002	1	2.995e-4	1	NC	5	NC	2
366			min	-.008	2	-.022	3	0	15	1.031e-5	15	747.19	1	8161.411	1
367		13	max	.006	3	.029	1	.004	1	4.018e-4	1	NC	5	NC	2
368			min	-.008	2	-.019	3	0	15	1.373e-5	15	798.107	1	5669.259	1
369		14	max	.006	3	.023	1	.006	1	5.041e-4	1	NC	5	NC	2
370			min	-.008	2	-.015	3	0	15	1.715e-5	15	883.006	1	4649.058	1
371		15	max	.006	3	.015	1	.007	1	6.064e-4	1	NC	5	NC	2
372			min	-.008	2	-.01	3	0	15	2.057e-5	15	1023.756	1	4282.421	1
373		16	max	.006	3	.006	1	.007	1	6.805e-4	1	NC	5	NC	2
374			min	-.008	2	-.004	3	0	15	2.306e-5	15	1272.541	1	4413.787	1
375		17	max	.006	3	.002	3	.005	1	8.322e-5	1	NC	4	NC	2
376			min	-.008	2	-.005	2	0	15	3.499e-6	15	1786.465	1	5295.631	1
377		18	max	.006	3	.01	3	.002	1	8.845e-3	1	NC	4	NC	2
378			min	-.008	2	-.017	1	0	15	-3.293e-3	3	3443.067	1	8689.363	1
379		19	max	.006	3	.018	3	0	3	1.778e-2	1	NC	1	NC	1
380			min	-.008	2	-.031	1	-.003	1	-6.679e-3	3	NC	1	NC	1
381	M5	1	max	.018	3	.069	3	.001	3	6.855e-7	3	NC	1	NC	1
382			min	-.024	2	-.085	1	-.005	1	4.254e-8	15	NC	1	NC	1
383		2	max	.018	3	.039	3	.002	3	5.137e-5	3	NC	5	NC	1
384			min	-.024	2	-.047	1	-.005	1	-8.444e-5	1	1200.261	1	NC	1
385		3	max	.018	3	.01	3	.003	3	1.011e-4	3	NC	5	NC	1
386			min	-.024	2	-.011	1	-.004	1	-1.677e-4	1	617.77	1	NC	1
387		4	max	.018	3	.021	1	.003	3	9.954e-5	3	NC	5	NC	1
388			min	-.024	2	-.013	3	-.004	1	-1.574e-4	1	435.844	1	NC	1
389		5	max	.018	3	.047	1	.003	3	9.799e-5	3	NC	15	NC	1
390			min	-.024	2	-.033	3	-.003	1	-1.472e-4	1	348.364	1	NC	1
391		6	max	.018	3	.069	1	.003	3	9.645e-5	3	NC	15	NC	1
392			min	-.024	2	-.048	3	-.003	1	-1.369e-4	1	298.846	1	NC	1
393		7	max	.018	3	.086	1	.004	3	9.49e-5	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	-.024	2	-.059	3	-.003	1	-1.267e-4	1	268.778	1	NC	1
395		8	max	.018	3	.098	1	.003	3	9.335e-5	3	NC	15	NC	1
396			min	-.024	2	-.067	3	-.003	1	-1.164e-4	1	250.459	1	NC	1
397		9	max	.018	3	.106	1	.003	3	9.18e-5	3	NC	15	NC	1
398			min	-.024	2	-.071	3	-.002	1	-1.062e-4	1	240.289	1	NC	1
399		10	max	.018	3	.108	1	.003	3	9.025e-5	3	NC	15	NC	1
400			min	-.024	2	-.072	3	-.002	1	-9.592e-5	1	236.6	1	NC	1
401		11	max	.018	3	.106	1	.003	3	8.871e-5	3	NC	15	NC	1
402			min	-.024	2	-.069	3	-.002	1	-8.568e-5	1	238.868	1	NC	1
403		12	max	.018	3	.098	1	.003	3	8.716e-5	3	NC	15	NC	1
404			min	-.024	2	-.064	3	-.002	1	-7.543e-5	1	247.507	1	NC	1
405		13	max	.018	3	.086	1	.002	3	8.561e-5	3	NC	15	NC	1
406			min	-.024	2	-.055	3	-.002	1	-6.518e-5	1	264.047	1	NC	1
407		14	max	.018	3	.069	1	.002	3	8.406e-5	3	NC	15	NC	1
408			min	-.024	2	-.043	3	-.002	1	-5.493e-5	1	291.872	1	NC	1
409		15	max	.018	3	.046	1	.002	3	8.251e-5	3	NC	5	NC	1
410			min	-.024	2	-.029	3	-.002	1	-4.468e-5	1	338.273	1	NC	1
411		16	max	.018	3	.018	1	.001	3	7.868e-5	3	NC	5	NC	1
412			min	-.024	2	-.012	3	-.002	1	-4.168e-5	1	420.788	1	NC	1
413		17	max	.018	3	.007	3	0	3	2.045e-5	3	NC	5	NC	1
414			min	-.024	2	-.014	1	-.002	1	-2.112e-4	1	593.283	1	NC	1
415		18	max	.018	3	.029	3	0	3	9.712e-6	3	NC	5	NC	1
416			min	-.024	2	-.053	1	-.003	1	-1.082e-4	1	1149.835	1	NC	1
417		19	max	.018	3	.051	3	0	3	0	15	NC	1	NC	1
418			min	-.024	2	-.094	1	-.003	1	-1.308e-7	3	NC	1	NC	1
419	M9	1	max	.006	3	.023	3	0	3	1.438e-2	3	NC	1	NC	1
420			min	-.007	2	-.029	1	-.006	1	-1.567e-2	1	NC	1	NC	1
421		2	max	.006	3	.013	3	0	3	7.128e-3	3	NC	4	NC	2
422			min	-.007	2	-.015	1	-.001	1	-7.703e-3	1	3542.729	1	9713.806	1
423		3	max	.006	3	.003	3	.002	1	1.109e-4	1	NC	4	NC	2
424			min	-.007	2	-.003	1	0	3	3.907e-6	15	1832.337	1	6029.749	1
425		4	max	.006	3	.007	1	.004	1	2.499e-5	1	NC	5	NC	2
426			min	-.007	2	-.005	3	0	3	-1.699e-6	3	1296.107	1	5106.978	1
427		5	max	.006	3	.016	1	.004	1	2.791e-6	10	NC	5	NC	2
428			min	-.007	2	-.012	3	-.001	3	-6.097e-5	1	1038.368	1	5057.824	1
429		6	max	.006	3	.023	1	.003	1	-4.261e-6	10	NC	5	NC	2
430			min	-.007	2	-.017	3	-.001	3	-1.469e-4	1	892.708	1	5669.392	1
431		7	max	.006	3	.029	1	.002	1	-7.695e-6	15	NC	5	NC	2
432			min	-.007	2	-.021	3	-.002	3	-2.329e-4	1	804.543	1	7314.288	1
433		8	max	.006	3	.033	1	0	2	-1.06e-5	15	NC	5	NC	1
434			min	-.007	2	-.024	3	-.002	3	-3.189e-4	1	751.175	1	NC	1
435		9	max	.006	3	.035	1	0	10	-1.35e-5	15	NC	5	NC	1
436			min	-.007	2	-.025	3	-.003	1	-4.048e-4	1	722.01	1	NC	1
437		10	max	.006	3	.036	1	0	15	-1.64e-5	15	NC	5	NC	1
438			min	-.007	2	-.025	3	-.006	1	-4.908e-4	1	712.159	1	NC	1
439		11	max	.006	3	.035	1	0	15	-1.93e-5	15	NC	5	NC	2
440			min	-.008	2	-.025	3	-.009	1	-5.767e-4	1	720.14	1	9237.998	1
441		12	max	.006	3	.033	1	0	15	-2.22e-5	15	NC	5	NC	2
442			min	-.008	2	-.023	3	-.011	1	-6.627e-4	1	747.258	1	5995.502	1
443		13	max	.006	3	.029	1	0	15	-2.51e-5	15	NC	5	NC	2
444			min	-.008	2	-.019	3	-.013	1	-7.487e-4	1	798.164	1	4661.005	1
445		14	max	.006	3	.023	1	0	15	-2.8e-5	15	NC	5	NC	2
446			min	-.008	2	-.015	3	-.015	1	-8.346e-4	1	883.051	1	4054.217	1
447		15	max	.006	3	.015	1	0	15	-3.09e-5	15	NC	5	NC	2
448			min	-.008	2	-.01	3	-.015	1	-9.206e-4	1	1023.79	1	3871.929	1
449		16	max	.006	3	.006	1	0	15	-3.304e-5	15	NC	5	NC	2
450			min	-.008	2	-.004	3	-.014	1	-9.847e-4	1	1272.565	1	4088.443	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
451		17	max	.006	3	.003	3	0	15	-1.087e-5	12	NC	4	NC	2
452			min	-.008	2	-.005	2	-.012	1	-5.293e-4	1	1786.499	1	4990.47	1
453		18	max	.006	3	.01	3	0	15	3.301e-3	3	NC	4	NC	2
454			min	-.008	2	-.017	1	-.008	1	-9.071e-3	1	3443.126	1	8293.421	1
455		19	max	.006	3	.018	3	0	3	6.679e-3	3	NC	1	NC	1
456			min	-.008	2	-.031	1	-.002	1	-1.778e-2	1	NC	1	NC	1
457	M13	1	max	.006	1	.023	3	.006	3	4.003e-3	3	NC	1	NC	1
458			min	0	3	-.029	1	-.007	2	-4.991e-3	1	NC	1	NC	1
459		2	max	.006	1	.167	3	.039	1	4.831e-3	3	NC	5	NC	2
460			min	-.001	3	-.185	1	0	10	-6.053e-3	1	1190.053	1	4274.732	1
461		3	max	.006	1	.284	3	.098	1	5.66e-3	3	NC	5	NC	3
462			min	-.001	3	-.313	1	.003	15	-7.114e-3	1	653.951	1	1802.279	1
463		4	max	.006	1	.358	3	.148	1	6.489e-3	3	NC	5	NC	3
464			min	-.001	3	-.394	1	.005	15	-8.176e-3	1	509.049	1	1213.125	1
465		5	max	.006	1	.38	3	.172	1	7.317e-3	3	NC	5	NC	3
466			min	-.001	3	-.419	1	.006	15	-9.238e-3	1	476.698	1	1048.226	1
467		6	max	.006	1	.351	3	.163	1	8.146e-3	3	NC	5	NC	3
468			min	-.001	3	-.388	1	.006	15	-1.03e-2	1	516.928	1	1104.167	1
469		7	max	.006	1	.281	3	.124	1	8.974e-3	3	NC	5	NC	3
470			min	-.001	3	-.314	1	.002	10	-1.136e-2	1	651.957	1	1446.737	1
471		8	max	.006	1	.191	3	.064	1	9.803e-3	3	NC	5	NC	2
472			min	-.001	3	-.216	1	-.004	10	-1.242e-2	1	991.36	1	2683.504	1
473		9	max	.005	1	.107	3	.017	3	1.063e-2	3	NC	4	NC	1
474			min	-.001	3	-.126	1	-.013	2	-1.348e-2	1	1901.743	1	NC	1
475		10	max	.005	1	.069	3	.018	3	1.146e-2	3	NC	4	NC	1
476			min	-.001	3	-.085	1	-.024	2	-1.455e-2	1	3271.358	1	NC	1
477		11	max	.005	1	.107	3	.021	3	1.063e-2	3	NC	4	NC	1
478			min	-.001	3	-.126	1	-.012	2	-1.348e-2	1	1901.744	1	NC	1
479		12	max	.005	1	.191	3	.07	1	9.804e-3	3	NC	5	NC	3
480			min	-.001	3	-.216	1	-.004	10	-1.242e-2	1	991.36	1	2476.965	1
481		13	max	.005	1	.281	3	.13	1	8.976e-3	3	NC	5	NC	5
482			min	-.001	3	-.314	1	.002	10	-1.136e-2	1	651.957	1	1373.333	1
483		14	max	.005	1	.351	3	.17	1	8.147e-3	3	NC	5	NC	5
484			min	-.001	3	-.388	1	.006	15	-1.03e-2	1	516.928	1	1060.029	1
485		15	max	.005	1	.38	3	.179	1	7.319e-3	3	NC	5	NC	3
486			min	-.001	3	-.419	1	.006	15	-9.237e-3	1	476.699	1	1011.773	1
487		16	max	.005	1	.358	3	.154	1	6.491e-3	3	NC	5	NC	3
488			min	-.001	3	-.394	1	.005	15	-8.175e-3	1	509.05	1	1173.371	1
489		17	max	.005	1	.284	3	.102	1	5.663e-3	3	NC	5	NC	3
490			min	-.001	3	-.313	1	.004	15	-7.114e-3	1	653.952	1	1741.441	1
491		18	max	.005	1	.167	3	.04	1	4.834e-3	3	NC	5	NC	2
492			min	-.001	3	-.185	1	0	10	-6.052e-3	1	1190.054	1	4103.852	1
493		19	max	.005	1	.023	3	.006	3	4.006e-3	3	NC	1	NC	1
494			min	-.001	3	-.028	1	-.007	2	-4.99e-3	1	NC	1	NC	1
495	M16	1	max	.002	1	.018	3	.006	3	5.234e-3	1	NC	1	NC	1
496			min	0	3	-.031	1	-.008	2	-3.048e-3	3	NC	1	NC	1
497		2	max	.002	1	.085	3	.041	1	6.382e-3	1	NC	5	NC	2
498			min	0	3	-.208	1	0	10	-3.648e-3	3	1048.492	1	4019.433	1
499		3	max	.002	1	.14	3	.102	1	7.529e-3	1	NC	5	NC	3
500			min	0	3	-.354	1	.004	15	-4.248e-3	3	576.211	1	1723.564	1
501		4	max	.002	1	.175	3	.154	1	8.677e-3	1	NC	5	NC	3
502			min	0	3	-.446	1	.005	15	-4.849e-3	3	448.605	1	1168.203	1
503		5	max	.002	1	.186	3	.178	1	9.824e-3	1	NC	5	NC	3
504			min	0	3	-.474	1	.006	15	-5.449e-3	3	420.207	1	1011.96	1
505		6	max	.002	1	.175	3	.169	1	1.097e-2	1	NC	5	NC	5
506			min	0	3	-.439	1	.006	15	-6.049e-3	3	455.877	1	1065.278	1
507		7	max	.002	1	.145	3	.128	1	1.212e-2	1	NC	5	NC	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
508			min	0	3	-.354	1	.002	10	-6.649e-3	3	575.455	1	1389.304	1
509		8	max	.003	1	.105	3	.068	1	1.327e-2	1	NC	5	NC	2
510			min	0	3	-.243	1	-.004	10	-7.249e-3	3	876.681	1	2540.478	1
511		9	max	.003	1	.068	3	.02	3	1.441e-2	1	NC	4	NC	1
512			min	0	3	-.141	1	-.013	2	-7.849e-3	3	1689.926	1	NC	1
513		10	max	.003	1	.051	3	.018	3	1.556e-2	1	NC	4	NC	1
514			min	0	3	-.094	1	-.024	2	-8.449e-3	3	2928.143	1	NC	1
515		11	max	.003	1	.068	3	.018	3	1.441e-2	1	NC	4	NC	1
516			min	0	3	-.141	1	-.013	2	-7.849e-3	3	1689.926	1	NC	1
517		12	max	.003	1	.105	3	.066	1	1.327e-2	1	NC	5	NC	3
518			min	0	3	-.243	1	-.004	10	-7.248e-3	3	876.681	1	2612.045	1
519		13	max	.003	1	.145	3	.126	1	1.212e-2	1	NC	5	NC	3
520			min	0	3	-.354	1	.002	10	-6.648e-3	3	575.455	1	1419.404	1
521		14	max	.003	1	.175	3	.166	1	1.097e-2	1	NC	5	NC	3
522			min	0	3	-.439	1	.006	15	-6.047e-3	3	455.877	1	1086.709	1
523		15	max	.003	1	.186	3	.175	1	9.826e-3	1	NC	5	NC	3
524			min	0	3	-.474	1	.006	15	-5.447e-3	3	420.207	1	1032.935	1
525		16	max	.003	1	.175	3	.15	1	8.678e-3	1	NC	5	NC	3
526			min	0	3	-.446	1	.005	15	-4.846e-3	3	448.605	1	1195.372	1
527		17	max	.003	1	.14	3	.099	1	7.531e-3	1	NC	5	NC	3
528			min	0	3	-.354	1	.003	15	-4.245e-3	3	576.212	1	1773.133	1
529		18	max	.003	1	.085	3	.039	1	6.384e-3	1	NC	5	NC	2
530			min	0	3	-.208	1	0	10	-3.645e-3	3	1048.493	1	4185.822	1
531		19	max	.003	1	.018	3	.006	3	5.237e-3	1	NC	1	NC	1
532			min	0	3	-.031	1	-.008	2	-3.044e-3	3	NC	1	NC	1
533	M15	1	max	0	1	0	1	0	1	3.215e-4	3	NC	1	NC	1
534			min	0	1	0	1	0	1	-8.855e-5	2	NC	1	NC	1
535		2	max	0	3	-.005	15	.001	1	8.178e-4	3	NC	5	NC	1
536			min	0	10	-.021	4	0	3	-7.461e-4	1	4688.414	4	NC	1
537		3	max	0	3	-.01	15	.004	1	1.314e-3	3	NC	15	NC	1
538			min	0	10	-.042	4	-.003	3	-1.42e-3	1	2385.774	4	NC	1
539		4	max	0	3	-.014	15	.008	1	1.81e-3	3	6963.098	15	NC	3
540			min	0	10	-.061	4	-.006	3	-2.093e-3	1	1636.78	4	8345.246	1
541		5	max	0	3	-.018	15	.013	1	2.307e-3	3	5433.376	15	NC	4
542			min	0	10	-.078	4	-.01	3	-2.767e-3	1	1277.196	4	5471.546	1
543		6	max	0	3	-.022	15	.019	1	2.803e-3	3	4572.76	15	NC	4
544			min	0	10	-.092	4	-.015	3	-3.44e-3	1	1074.896	4	3981.098	1
545		7	max	0	3	-.024	15	.024	1	3.299e-3	3	4055.213	15	NC	4
546			min	0	10	-.104	4	-.019	3	-4.114e-3	1	953.238	4	3110.479	1
547		8	max	0	3	-.026	15	.03	1	3.796e-3	3	3744.607	15	NC	4
548			min	0	10	-.113	4	-.024	3	-4.787e-3	1	880.226	4	2563.579	1
549		9	max	0	3	-.028	15	.035	1	4.292e-3	3	3577.421	15	NC	4
550			min	0	10	-.118	4	-.028	3	-5.461e-3	1	840.926	4	2205.851	1
551		10	max	0	3	-.028	15	.039	1	4.788e-3	3	3524.531	15	NC	4
552			min	0	10	-.12	4	-.031	3	-6.134e-3	1	828.494	4	1969.785	1
553		11	max	0	3	-.028	15	.042	1	5.284e-3	3	3577.421	15	NC	5
554			min	0	10	-.118	4	-.034	3	-6.808e-3	1	840.926	4	1819.955	1
555		12	max	0	3	-.026	15	.043	1	5.781e-3	3	3744.607	15	NC	5
556			min	0	10	-.113	4	-.035	3	-7.481e-3	1	880.226	4	1738.77	1
557		13	max	0	3	-.024	15	.042	1	6.277e-3	3	4055.213	15	NC	5
558			min	0	10	-.105	4	-.034	3	-8.155e-3	1	953.238	4	1721.082	1
559		14	max	0	3	-.022	15	.039	1	6.773e-3	3	4572.76	15	NC	5
560			min	0	10	-.093	4	-.032	3	-8.828e-3	1	1074.896	4	1774.335	1
561		15	max	0	3	-.018	15	.034	1	7.27e-3	3	5433.376	15	NC	4
562			min	0	10	-.078	4	-.027	3	-9.502e-3	1	1277.196	4	1926.043	1
563		16	max	0	3	-.014	15	.025	1	7.766e-3	3	6963.098	15	NC	4
564			min	0	10	-.062	4	-.019	3	-1.018e-2	1	1636.78	4	2250.992	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
565		17	max	0	3	-.01	15	.013	1	8.262e-3	3	NC	15	NC	4
566			min	0	10	-.043	4	-.009	3	-1.085e-2	1	2385.774	4	2983.872	1
567		18	max	0	3	-.005	15	.004	3	8.759e-3	3	NC	5	NC	4
568			min	0	10	-.022	4	-.008	2	-1.152e-2	1	4688.414	4	5311.981	1
569		19	max	0	3	.004	3	.021	3	9.255e-3	3	NC	1	NC	1
570			min	0	10	-.004	1	-.025	2	-1.22e-2	1	NC	1	NC	1
571	M16A	1	max	0	10	0	3	.007	3	3.14e-3	3	NC	1	NC	1
572			min	0	3	-.002	1	-.008	2	-3.76e-3	1	NC	1	NC	1
573		2	max	0	10	-.005	15	.005	1	3.001e-3	3	NC	5	NC	2
574			min	0	3	-.022	4	-.001	10	-3.577e-3	1	4688.414	4	9202.613	1
575		3	max	0	10	-.01	15	.014	1	2.861e-3	3	NC	15	NC	4
576			min	0	3	-.042	4	-.004	3	-3.394e-3	1	2385.774	4	5201.746	1
577		4	max	0	10	-.014	15	.02	1	2.721e-3	3	6963.098	15	NC	4
578			min	0	3	-.061	4	-.008	3	-3.211e-3	1	1636.78	4	3951.916	1
579		5	max	0	10	-.018	15	.024	1	2.582e-3	3	5433.376	15	NC	4
580			min	0	3	-.078	4	-.01	3	-3.028e-3	1	1277.196	4	3408.695	1
581		6	max	0	10	-.022	15	.027	1	2.442e-3	3	4572.76	15	NC	4
582			min	0	3	-.092	4	-.012	3	-2.845e-3	1	1074.896	4	3169.305	1
583		7	max	0	10	-.024	15	.028	1	2.302e-3	3	4055.213	15	NC	4
584			min	0	3	-.104	4	-.013	3	-2.662e-3	1	953.238	4	3107.267	1
585		8	max	0	10	-.026	15	.027	1	2.163e-3	3	3744.607	15	NC	4
586			min	0	3	-.113	4	-.013	3	-2.479e-3	1	880.226	4	3178.915	1
587		9	max	0	10	-.028	15	.026	1	2.023e-3	3	3577.421	15	NC	4
588			min	0	3	-.118	4	-.012	3	-2.296e-3	1	840.926	4	3377.545	1
589		10	max	0	10	-.028	15	.023	1	1.883e-3	3	3524.531	15	NC	4
590			min	0	3	-.12	4	-.011	3	-2.113e-3	1	828.494	4	3722.541	1
591		11	max	0	10	-.028	15	.02	1	1.744e-3	3	3577.421	15	NC	4
592			min	0	3	-.118	4	-.009	3	-1.93e-3	1	840.926	4	4263.275	1
593		12	max	0	10	-.026	15	.017	1	1.604e-3	3	3744.607	15	NC	4
594			min	0	3	-.112	4	-.008	3	-1.747e-3	1	880.226	4	5097.804	1
595		13	max	0	10	-.024	15	.013	1	1.464e-3	3	4055.213	15	NC	3
596			min	0	3	-.104	4	-.006	3	-1.564e-3	1	953.238	4	6420.759	1
597		14	max	0	10	-.022	15	.01	1	1.325e-3	3	4572.76	15	NC	2
598			min	0	3	-.092	4	-.004	3	-1.381e-3	1	1074.896	4	8649.48	1
599		15	max	0	10	-.018	15	.006	1	1.185e-3	3	5433.376	15	NC	1
600			min	0	3	-.077	4	-.003	3	-1.198e-3	1	1277.196	4	NC	1
601		16	max	0	10	-.014	15	.003	1	1.045e-3	3	6963.098	15	NC	1
602			min	0	3	-.06	4	-.001	3	-1.016e-3	2	1636.78	4	NC	1
603		17	max	0	10	-.01	15	.001	1	9.055e-4	3	NC	15	NC	1
604			min	0	3	-.041	4	0	3	-8.578e-4	2	2385.774	4	NC	1
605		18	max	0	10	-.005	15	0	4	7.658e-4	3	NC	5	NC	1
606			min	0	3	-.021	4	0	2	-6.999e-4	2	4688.414	4	NC	1
607		19	max	0	1	0	1	0	1	6.261e-4	3	NC	1	NC	1
608			min	0	1	0	1	0	1	-5.421e-4	2	NC	1	NC	1

Anchor Designer™
Software
Version 2.4.5673.0

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

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

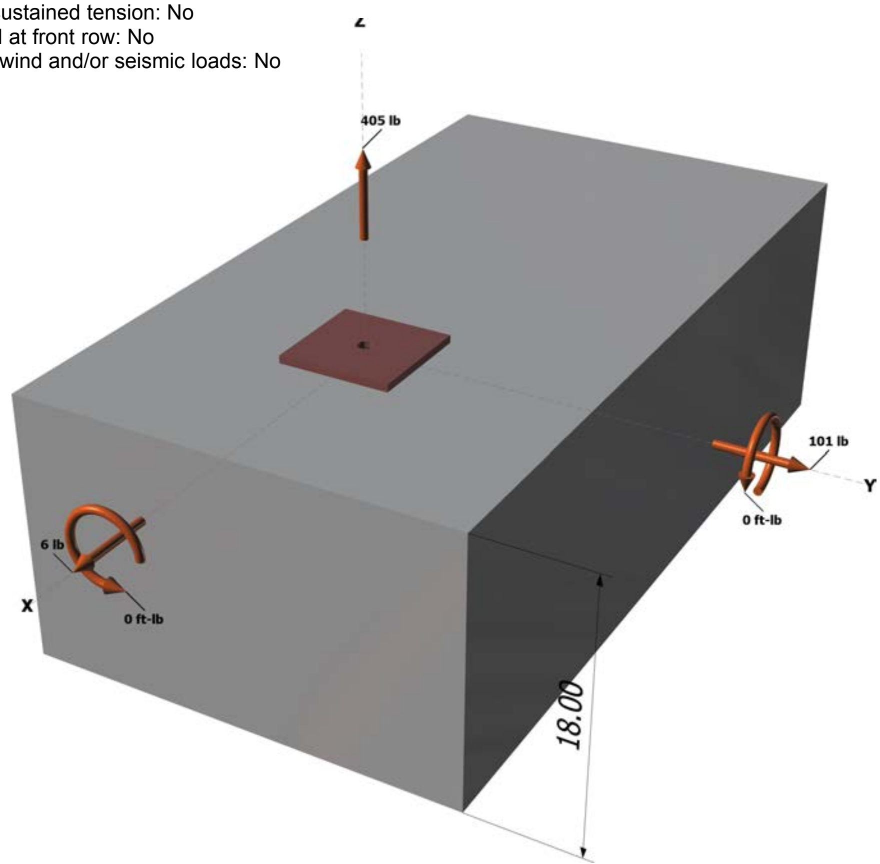
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

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

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

<Figure 1>



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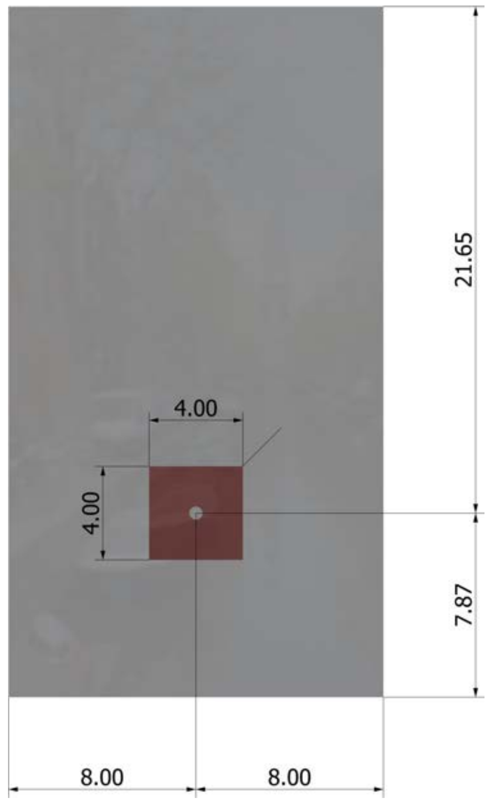


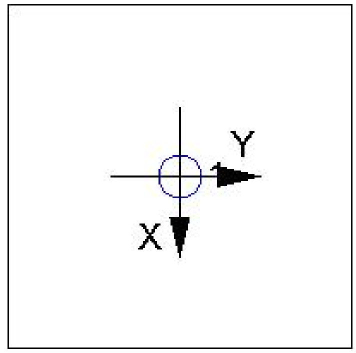
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

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

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

<Figure 3>



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in y-direction:

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

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

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

Shear parallel to edge in x-direction:

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

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

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

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

Shear parallel to edge in y-direction:

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

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

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

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

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

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

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

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

11. Results

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

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

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

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

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

12. Warnings

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

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

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

Anchor Designer™
Software
Version 2.4.5673.0

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

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

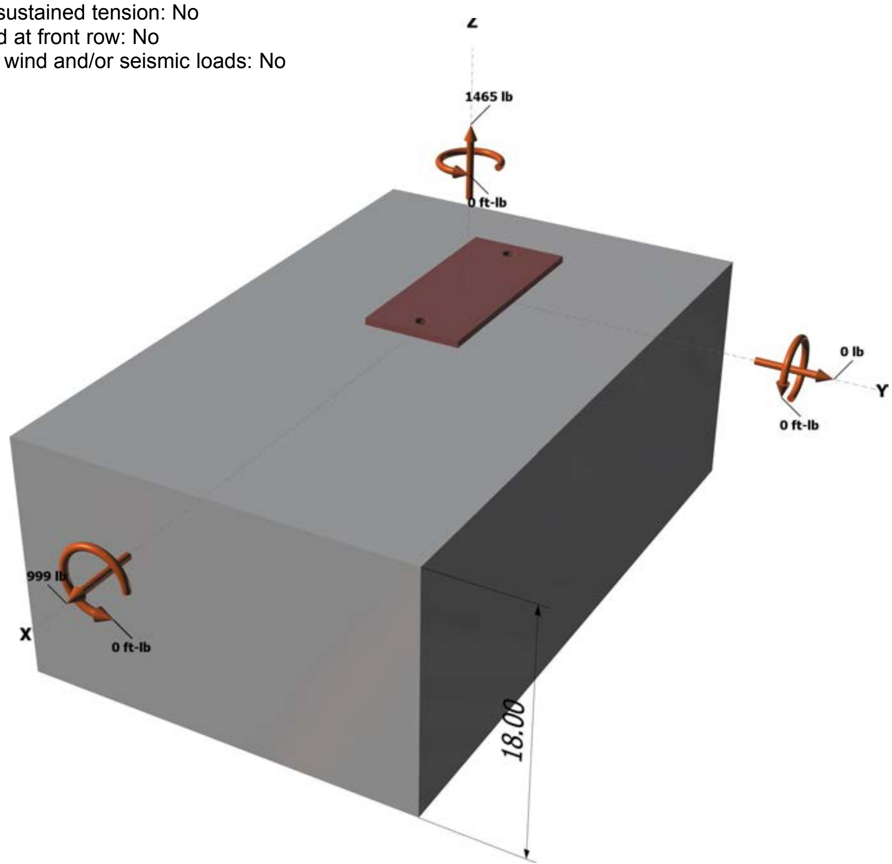
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

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

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

<Figure 1>



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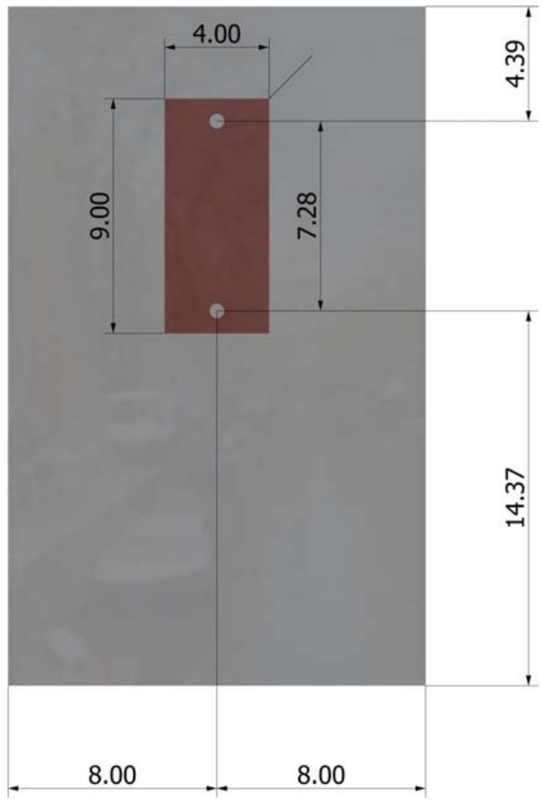


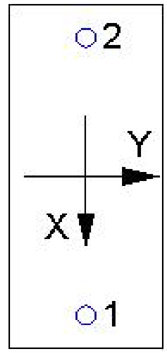
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

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