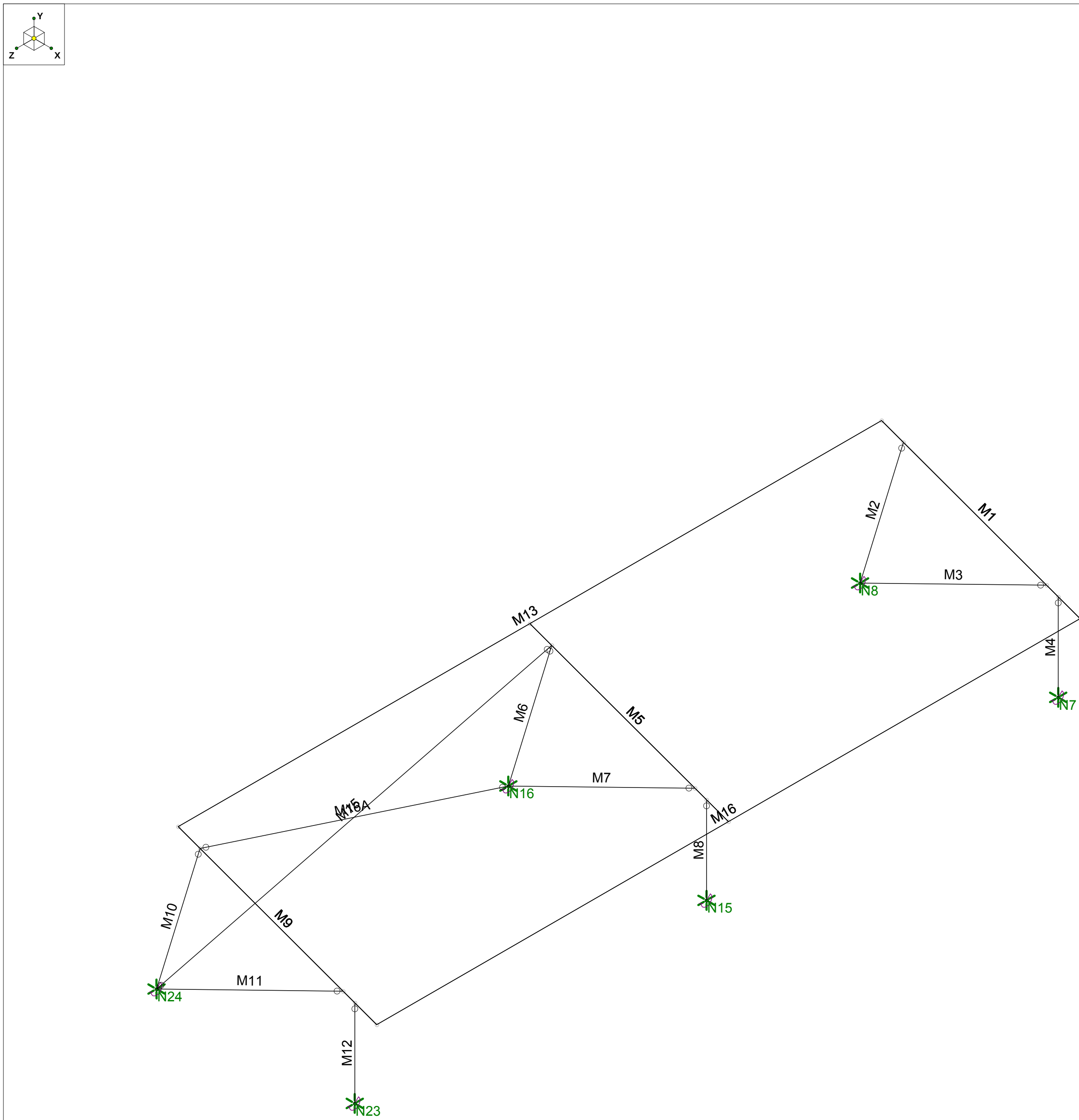


Schletter, Inc.		20° Tilt w/o Seismic Design
HCV	Standard PVMini Racking System	
	Representative Calculations - ASCE 7-05	

1. INTRODUCTION

1.1 Project Description

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

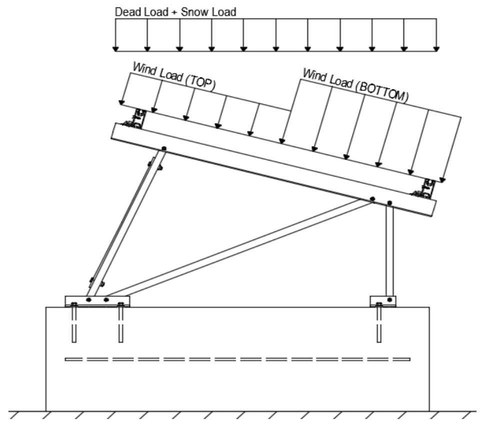
1.2 Construction

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

PV modules are required to meet the following specifications:

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

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



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

1.3 Technical Codes

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

2. LOAD ACTIONS

2.1 Permanent Loads

g_{MAX} = 3.00 psf

g_{MIN} = 1.75 psf

Self-weight of the PV modules.

2.2 Snow Loads

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

2.3 Wind Loads

Design Wind Speed, V =	110	mph	Exposure Category = C
Height ≤	15	ft	Importance Category = II

Peak Velocity Pressure, q_z = 19.00 psf *Including the gust factor, G=0.85. (ASCE 7-05, Eq. 6-15)*

Pressure Coefficients

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

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

2.4 Seismic Loads - N/A

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

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

2.5 Combination of Loads

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

Strength Design, LRFD

Component stresses are checked using the following LRFD load combinations:

1.2D + 1.6S + 0.8W
1.2D + 1.6W + 0.5S
0.9D + 1.6W [M]
1.54D + 1.3E + 0.2S [R]
0.56D + 1.3E [R]
1.54D + 1.25E + 0.2S [O]
0.56D + 1.25E [O]

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

Allowable Stress Design, ASD

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

1.0D + 1.0S
1.0D + 1.0W
1.0D + 0.75L + 0.75W + 0.75S
0.6D + 1.0W [M]
1.238D + 0.875E [O]
1.1785D + 0.65625E + 0.75S [O]
0.362D + 0.875E [O]

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

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

3. STRUCTURAL ANALYSIS

3.1 RISA Results

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

3.2 RISA Components

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

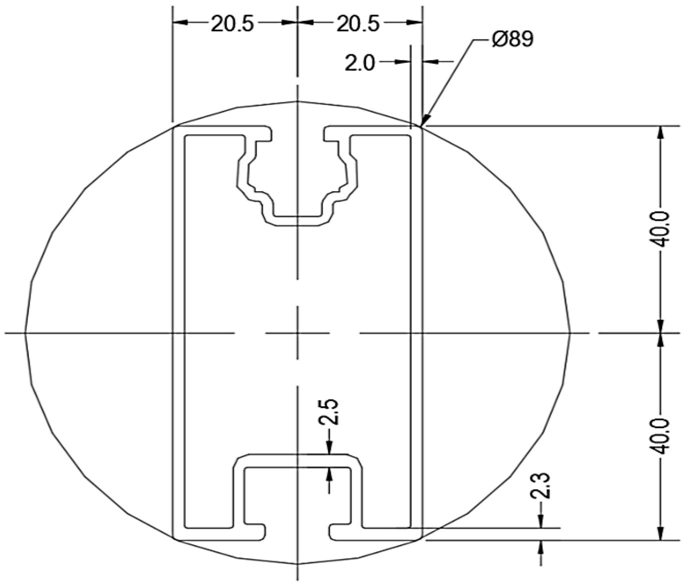
Purlins	Location	Diagonal Struts	Location	Front Reactions	Location
M13	Top	M3	Outer	N7	Outer
M16	Bottom	M7	Inner	N15	Inner
		M11	Outer	N23	Outer
Girders	Location	**Rear Struts**	Location	**Rear Reactions**	Location
M1	Outer	M2	Outer	N8	Outer
M5	Inner	M6	Inner	N16	Inner
M9	Outer	M10	Outer	N24	Outer
Front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

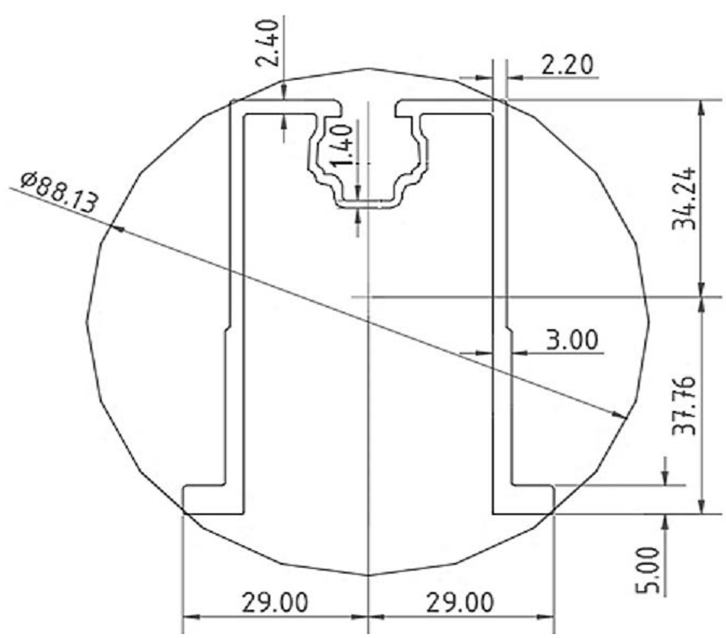
Purlin Type =	**ProfiPlusXT**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	60	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.75	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	22.71	ksi
S_y =	0.75	in^3
S_x =	0.44	in^3
E =	10100	ksi
I_y =	1.20	in^4
I_x =	0.36	in^4
A =	0.96	in^2
g =	1.15	lbs/ft
M_y =	0.484	k-ft
M_z =	0.088	k-ft
$M_{y\ allowable}$ =	1.848	k-ft
$M_{z\ allowable}$ =	0.838	k-ft
Utilization =	37%	



4.2 Girder Design

Loads from purlins are transferred using an inclined girder, which is connected to a set of aluminum struts. Loads on the girder result from the support reactions of the purlins. See Appendix A.2 for detailed member calculations. Section units are in (mm).

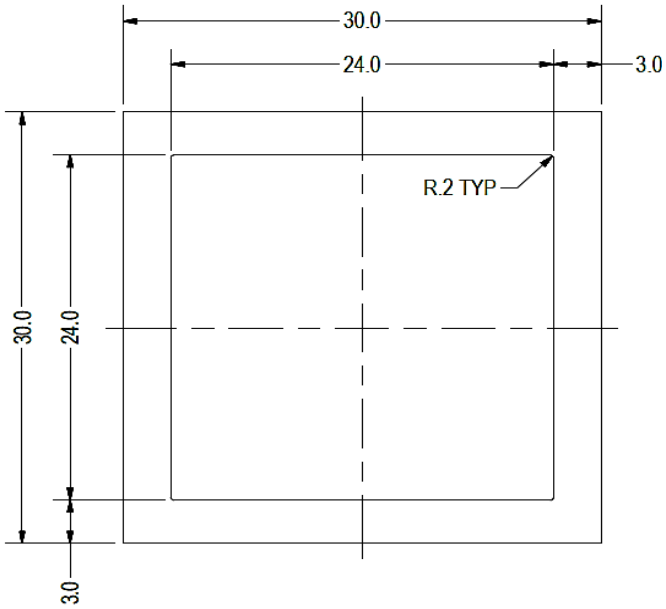
Girder Type =	**Flex Profi**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	33.78	in
$\Phi F_{ty\ AXIAL}$ =	14.29	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.76	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	13.46	ksi
S_y =	0.59	in^3
S_x =	0.46	in^3
E =	10100	ksi
I_y =	0.88	in^4
I_x =	0.52	in^4
A =	0.89	in^2
g =	1.07	lbs/ft
M_y =	0.474	k-ft
M_z =	0.000	k-ft
P_n =	0.261	k
$M_{y\ allowable}$ =	1.460	k-ft
$M_{z\ allowable}$ =	0.513	k-ft
$P_{n\ allowable}$ =	12.764	k
Utilization =	35%	



4.3 Front Strut Design

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

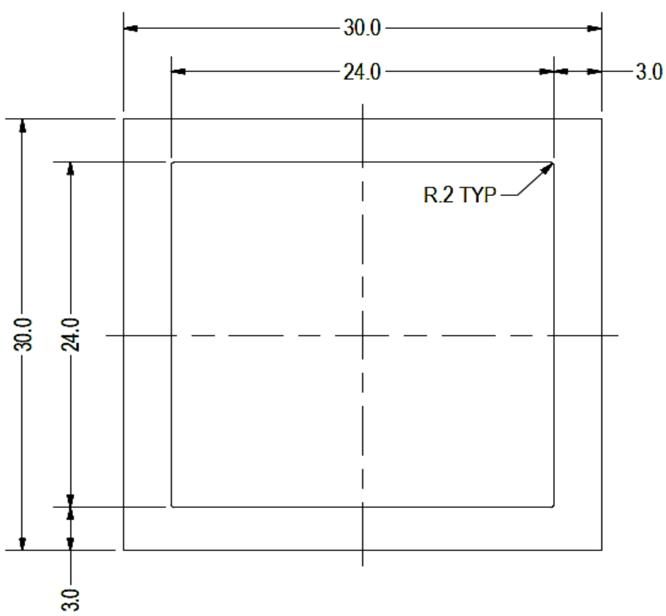
Strut Type =	**<u>30x30x3</u>**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	<u>18.00</u>	in
$\Phi F_{ty\ AXIAL}$ =	24.52	ksi
$\Phi F_{ty\ BENDING}$ =	31.19	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	1.088	k
$M_{y\ allowable}$ =	0.423	k-ft
$M_{z\ allowable}$ =	0.423	k-ft
$P_{n\ allowable}$ =	12.310	k
Utilization =	<u>9%</u>	



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).

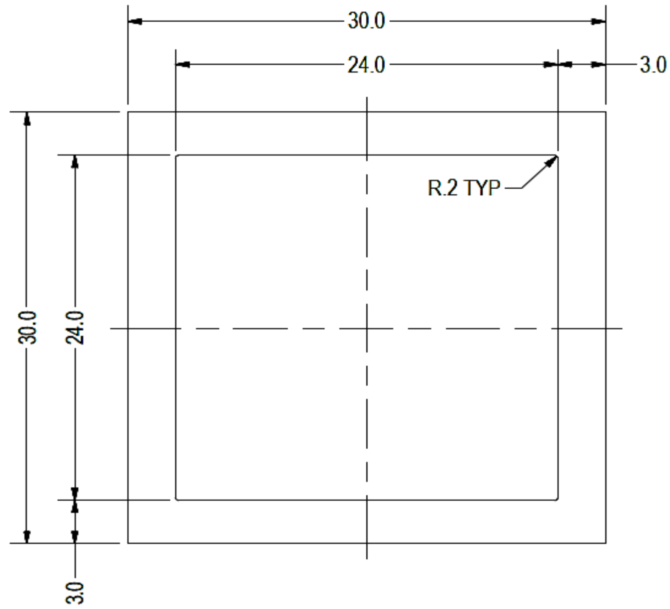
Strut Type =	**<u>30x30x3</u>**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	<u>46.38</u>	in
$\Phi F_{ty\ AXIAL}$ =	7.60	ksi
$\Phi F_{ty\ BENDING}$ =	29.80	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.320	k
$M_{y\ allowable}$ =	0.404	k-ft
$M_{z\ allowable}$ =	0.404	k-ft
$P_{n\ allowable}$ =	3.814	k
Utilization =	<u>8%</u>	



4.5 Rear Strut Design

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

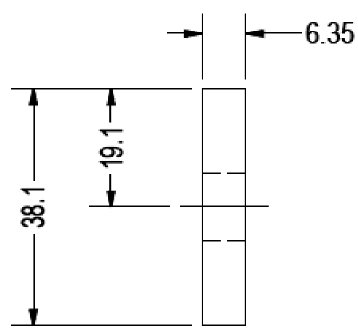
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	33.07	in
$\Phi F_{ty\ AXIAL}$ =	13.55	ksi
$\Phi F_{ty\ BENDING}$ =	30.37	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.856	k
$M_{y\ allowable}$ =	0.411	k-ft
$M_{z\ allowable}$ =	0.411	k-ft
$P_{n\ allowable}$ =	6.803	k
Utilization =	13%	



4.6 Cross Brace Design

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

Brace Type =	**1.5x0.25**	
Aluminum Type =	6061-T6	
F_{ty} =	35	ksi
Φ =	0.90	
S_y =	0.02	in^3
E =	10100	ksi
I_y =	33.25	in^4
A =	0.38	in^2
g =	0.45	lbs/ft
M_y =	0.003	k-ft
P_n =	0.062	k
$M_{y\ allowable}$ =	0.046	k-ft
$P_{n\ allowable}$ =	11.813	k
Utilization =	7%	



A cross brace kit is required every 28 bays and is to be installed in centermost bays.

5. FOUNDATION DESIGN CALCULATIONS

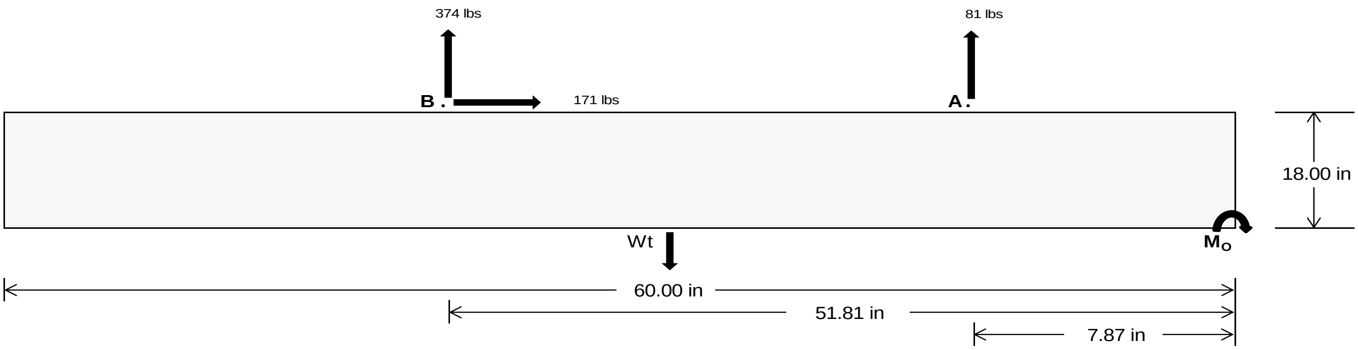
5.1 Helical Pile Foundations

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 =	340.87	1557.27	k
Compressive Load =	1413.84	1097.06	k
Lateral Load =	1.57	710.55	k
Moment (Weak Axis) =	0.00	0.00	k

5.2 Design of Ballast Foundations

Ballast foundations are used to secure the racking structure in place. The foundations are checked for potential overturning and sliding. Bearing pressures applied by the racking and ballast foundations are checked against the allowable bearing pressures provided by the IBC tables 1804.2 (2003, 2006) & 1806.2 (2009).



Concrete Properties

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

Footing Reinforcement

Use fiber reinforcing with (1) #5 rebar.

Overturning Check

M_O = 23077.1 in-lbs
Resisting Force Required = 769.24 lbs
S.F. = 1.67
Weight Required = 1282.06 lbs
Minimum Width = 21 in in
Weight Provided = 1903.13 lbs

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

Sliding

Force = 170.78 lbs
Friction = 0.4
Weight Required = 426.95 lbs
Resisting Weight = 1903.13 lbs
Additional Weight Required = 0 lbs

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

Cohesion

Sliding Force = 170.78 lbs
Cohesion = 130 psf
Area = 8.75 ft^2
Resisting = 951.56 lbs
Additional Weight Required = 0 lbs

Use a 60in long x 21in wide x 18in tall ballast foundation. Cohesion is OK.

Shear Key

Additional Force = 0 lbs
Lateral Bearing Pressure = 200 psf/ft
Required Depth = 0.00 ft
f'_c = 2500 psi
Length = 8 in

Shear key is not required.

Bearing Pressure

	Ballast Width			
	21 in	22 in	23 in	24 in
P_{ftg} = (145 pcf)(5 ft)(1.5 ft)(1.75 ft) =	1903 lbs	1994 lbs	2084 lbs	2175 lbs

ASD LC	1.0D + 1.0S				1.0D + 1.0W				1.0D + 0.75L + 0.75W + 0.75S				0.6D + 1.0W			
Width	21 in	22 in	23 in	24 in	21 in	22 in	23 in	24 in	21 in	22 in	23 in	24 in	21 in	22 in	23 in	24 in
F_A	481 lbs	481 lbs	481 lbs	481 lbs	508 lbs	508 lbs	508 lbs	508 lbs	705 lbs	705 lbs	705 lbs	705 lbs	-162 lbs	-162 lbs	-162 lbs	-162 lbs
F_B	344 lbs	344 lbs	344 lbs	344 lbs	448 lbs	448 lbs	448 lbs	448 lbs	567 lbs	567 lbs	567 lbs	567 lbs	-748 lbs	-748 lbs	-748 lbs	-748 lbs
F_V	34 lbs	34 lbs	34 lbs	34 lbs	302 lbs	302 lbs	302 lbs	302 lbs	250 lbs	250 lbs	250 lbs	250 lbs	-342 lbs	-342 lbs	-342 lbs	-342 lbs
P_{total}	2728 lbs	2818 lbs	2909 lbs	3000 lbs	2859 lbs	2950 lbs	3040 lbs	3131 lbs	3175 lbs	3266 lbs	3356 lbs	3447 lbs	232 lbs	287 lbs	341 lbs	395 lbs
M	312 lbs-ft	312 lbs-ft	312 lbs-ft	312 lbs-ft	576 lbs-ft	576 lbs-ft	576 lbs-ft	576 lbs-ft	644 lbs-ft	644 lbs-ft	644 lbs-ft	644 lbs-ft	548 lbs-ft	548 lbs-ft	548 lbs-ft	548 lbs-ft
e	0.11 ft	0.11 ft	0.11 ft	0.10 ft	0.20 ft	0.20 ft	0.19 ft	0.18 ft	0.20 ft	0.20 ft	0.19 ft	0.19 ft	2.36 ft	1.91 ft	1.61 ft	1.38 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}	269.0 psf	266.6 psf	264.5 psf	262.5 psf	247.7 psf	246.4 psf	245.1 psf	244.0 psf	274.5 psf	271.9 psf	269.5 psf	267.4 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	354.5 psf	348.3 psf	342.6 psf	337.4 psf	405.7 psf	397.2 psf	389.4 psf	382.2 psf	451.2 psf	440.6 psf	430.9 psf	422.0 psf	619.4 psf	176.7 psf	132.6 psf	118.2 psf

Maximum Bearing Pressure = 619 psf
Allowable Bearing Pressure = 1500 psf

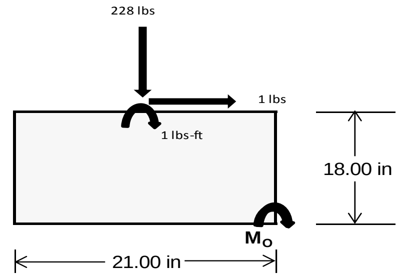
Use a 60in long x 21in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O = 197.1 ft-lbs
Resisting Force Required = 225.29 lbs
S.F. = 1.67
Weight Required = 375.49 lbs
Minimum Width = 21 in in
Weight Provided = 1903.13 lbs

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



Bearing Pressure

ASD LC	1.238D + 0.875E			1.1785D + 0.65625E + 0.75S			0.362D + 0.875E		
Width	21 in			21 in			21 in		
Support	Outer	Inner	Outer	Outer	Inner	Outer	Outer	Inner	Outer
F_Y	61 lbs	157 lbs	58 lbs	228 lbs	673 lbs	225 lbs	18 lbs	46 lbs	17 lbs
F_V	0 lbs	0 lbs	0 lbs	1 lbs	1 lbs	0 lbs	0 lbs	0 lbs	0 lbs
P_{total}	2417 lbs	2514 lbs	2414 lbs	2471 lbs	2916 lbs	2467 lbs	707 lbs	735 lbs	706 lbs
M	0 lbs-ft	0 lbs-ft	0 lbs-ft	2 lbs-ft	1 lbs-ft	0 lbs-ft	0 lbs-ft	0 lbs-ft	0 lbs-ft
e	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft
L/6	0.29 ft	1.75 ft	1.75 ft	1.75 ft	1.75 ft	1.75 ft	1.75 ft	1.75 ft	1.75 ft
f_{min}	276.1 sqft	287.2 sqft	275.8 sqft	281.5 sqft	332.9 sqft	281.8 sqft	80.7 sqft	84.0 sqft	80.6 sqft
f_{max}	276.3 psf	287.3 psf	275.9 psf	283.2 psf	333.5 psf	282.2 psf	80.8 psf	84.0 psf	80.7 psf

Maximum Bearing Pressure = 334 psf
Allowable Bearing Pressure = 1500 psf

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

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

5.3 Foundation Anchors

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

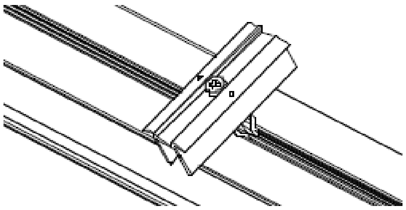
6. DESIGN OF JOINTS AND CONNECTIONS

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

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

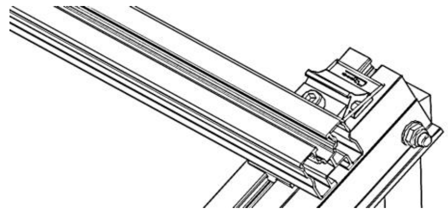
Fastening of Modules to Purlins

Maximum Uplifting Force =	0.604 k
Allowable Uplift =	1.214 k
Utilization =	50%



Fastening of Purlins to Girders

Maximum Uplifting Force =	1.072 k
Allowable Uplift =	1.116 k
Utilization =	96%



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 =	1.088 k
M8 Bolt Capacity =	5.692 k
Strut Bearing Capacity =	7.952 k
Utilization =	19%

Rear Strut

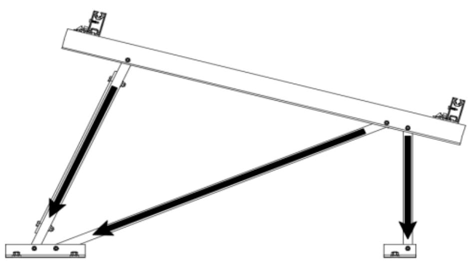
Maximum Axial Load =	1.115 k
M8 Bolt Capacity =	5.692 k
Strut Bearing Capacity =	7.952 k
Utilization =	20%

Diagonal Strut

Maximum Axial Load =	0.320 k
M8 Bolt Shear Capacity =	5.692 k
Strut Bearing Capacity =	7.952 k
Utilization =	6%

Bracing

Maximum Axial Load =	0.062 k
M10 Bolt Capacity =	8.894 k
Strut Bearing Capacity =	7.952 k
Utilization =	1%



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

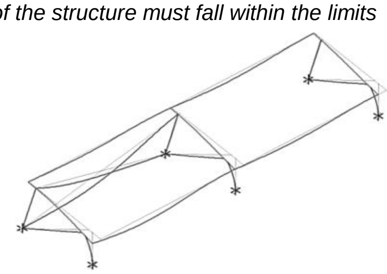
7. SEISMIC DESIGN

7.1 Seismic Drift - N/A

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

Mean Height, h_{sx} =	29.57 in
Allowable Story Drift for All Other Structures, Δ = {	$0.020h_{sx}$ 0.591 in
Max Drift, Δ_{MAX} =	0.008 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 = 60.00 in

J = 0.427

125.139

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

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= 29.7 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 = 60.00 in

J = 0.427

135.981

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

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= 29.6

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

$\varphi F_L St$= 29.7 ksi
Ix = 498305 mm^4
1.197 in^4
y = 40.784 mm
Sx = 0.746 in^3
$M_{max}St$ = 1.848 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

Girder = **Flex Profi**

Strong Axis:

3.4.11

L_b = 33.78 in

ry = 1.374

Cb = 1.32

21.4323

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

S1 = 1.37733

$$S2 = 1.2C_c$$

S2 = 79.2

φF_L= φb[Bc-Dc*Lb/(1.2*ry*√(Cb))

φF_L= 29.8 ksi

3.4.15

N/A for Strong Direction

3.4.16

b/t = 4.29

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16

N/A for Strong Direction

Weak Axis:

3.4.11

L_b = 33.78 in

ry = 1.374

Cb = 1.32

24.5845

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

S1 = 1.37733

$$S2 = 1.2C_c$$

S2 = 79.2

φF_L= φb[Bc-Dc*Lb/(1.2*ry*√(Cb))

φF_L= 29.8 ksi

3.4.15

b/t = 24.46

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

S1 = 3.8

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

S2 = 14.7

F_{UT}= (φbk2*√(BpE))/(5.1b/t)

F_{UT}= 9.4 ksi

3.4.16

N/A for Weak Direction

3.4.16

b/t = 24.46

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

S1 = 12.2

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

S2 = 46.7

F_{ST}= φb[Bp-1.6Dp*b/t]

F_{ST}= 28.2 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.16.2

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= 29.8 ksi

Ix = 364470 mm^4

0.876 in^4

y = 37.77 mm

Sx = 0.589 in^3

M_{max}St = 1.460 k-ft

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

3.4.16.1

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

3.4.8

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

3.4.9

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

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

3.4.9.1

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

3.4.10

Rb/t = 0.0

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

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

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

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 18.00 in

J = 0.16

47.2194

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.2 ksi

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 31.2 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

M_{max}St = 0.423 k-ft

Weak Axis:

3.4.14

L_b = 18.00 in

J = 0.16

47.2194

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.2

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 31.2 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

M_{max}Wk = 0.423 k-ft

Compression

3.4.7

λ = 0.77182

r = 0.437 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.83792

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

φF_L = 24.5226 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

$\varphi F_L = \varphi yFcy$

φF_L = 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

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

$\varphi F_L = \varphi yFcy$

φF_L = 33.25 ksi

φF_L = 24.52 ksi

A = 323.87 mm^2

0.50 in^2

P_{max} = 12.31 kips

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

λ = 1.98863

r = 0.437 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.85841

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

φF_L = 7.59722 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

$\varphi F_L = \varphi yFcy$

φF_L = 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

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

$\varphi F_L = \varphi yFcy$

φF_L = 33.25 ksi

φF_L = 7.60 ksi

A = 323.87 mm^2

0.50 in^2

P_{max} = 3.81 kips

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 33.07 in

J = 0.16

86.7548

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 30.4 ksi

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 30.4 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

M_{max}St = 0.411 k-ft

Weak Axis:

3.4.14

L_b = 33.07 in

J = 0.16

86.7548

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 30.4

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 33.3 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

M_{max}Wk = 0.450 k-ft

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

$\varphi cc =$ 0.77853

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

$\varphi F_L =$ 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)

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 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

$\varphi F_L =$ 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	-55.629	-55.629	0	0
2	M16	y	-87.418	-87.418	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	112.319	112.319	0	0
2	M16	y	52.98	52.98	0	0

Load Combinations

	Description	S...	P...	S...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	LRFD 1.2D + 1.6S + 0.8W	Yes	Y		1	1.2	3	1.6	4	.8														
2	LRFD 1.2D + 1.6W + 0.5S	Yes	Y		1	1.2	3	.5	4	1.6														
3	LRFD 0.9D + 1.6W	Yes	Y		2	.9					5	1.6												
4	LATERAL - LRFD 1.54D + 1.3E ...	Yes	Y		1	1.54	3	.2			6	1.3												
5	LATERAL - LRFD 0.56D + 1.3E	Yes	Y		1	.56					6	1.3												
6	LATERAL - LRFD 1.54D + 1.25...	Yes	Y		1	1.54	3	.2			6	1.25												
7	LATERAL - LRFD 0.56D + 1.25E	Yes	Y		1	.56					6	1.25												
8																								
9	ASD 1.0D + 1.0S	Yes	Y		1	1	3	1																
10	ASD 1.0D + 1.0W	Yes	Y		1	1			4	1														
11	ASD 1.0D + 0.75L + 0.75W + 0....	Yes	Y		1	1	3	.75	4	.75														
12	ASD 0.6D + 1.0W	Yes	Y		2	.6					5	1												
13	LATERAL - ASD 1.238D + 0.875E	Yes	Y		1	1.2...					6	.875												
14	LATERAL - ASD 1.1785D + 0.65..	Yes	Y		1	1.1...	3	.75			6	.656												
15	LATERAL - ASD 0.362D + 0.875E	Yes	Y		1	.362					6	.875												

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N8	max	143.975	2	259.257	2	.008	14	0	9	0	1	0	1
2		min	-178.732	3	-375.697	3	-.136	3	0	3	0	1	0	1
3	N7	max	0	15	376.067	1	-.021	15	0	15	0	1	0	1
4		min	-.14	2	-72.778	3	-.58	1	-.001	1	0	1	0	1
5	N15	max	0	15	1087.566	1	.268	1	0	1	0	1	0	1
6		min	-1.207	2	-262.206	3	-.414	3	0	3	0	1	0	1
7	N16	max	496.335	2	843.896	1	0	10	0	1	0	1	0	1
8		min	-546.578	3	-1197.901	3	-53.714	3	0	3	0	1	0	1
9	N23	max	0	15	376.064	1	1.203	1	.002	1	0	1	0	1
10		min	-.14	2	-72.367	3	.036	10	0	10	0	1	0	1
11	N24	max	143.975	2	262.006	2	54.144	3	0	1	0	1	0	1
12		min	-178.968	3	-374.142	3	.002	10	0	3	0	1	0	1
13	Totals:	max	782.799	2	3182.872	1	0	1						
14		min	-904.569	3	-2355.091	3	0	3						

Envelope Member Section Forces

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
1	M2	1	max	269.557	1	.647	4	.261	1	0	15	0	3	0	1
2			min	-356.177	3	.153	15	-.082	3	0	1	0	1	0	1
3		2	max	269.664	1	.606	4	.261	1	0	15	0	9	0	15
4			min	-356.097	3	.143	15	-.082	3	0	1	0	3	0	4
5		3	max	269.77	1	.565	4	.261	1	0	15	0	1	0	15
6			min	-356.017	3	.133	15	-.082	3	0	1	0	3	0	4
7		4	max	269.877	1	.524	4	.261	1	0	15	0	1	0	15
8			min	-355.938	3	.124	15	-.082	3	0	1	0	3	0	4
9		5	max	269.983	1	.482	4	.261	1	0	15	0	1	0	15
10			min	-355.858	3	.114	15	-.082	3	0	1	0	3	0	4
11		6	max	270.09	1	.441	4	.261	1	0	15	0	1	0	15
12			min	-355.778	3	.104	15	-.082	3	0	1	0	3	0	4
13		7	max	270.196	1	.4	4	.261	1	0	15	0	1	0	15
14			min	-355.698	3	.095	15	-.082	3	0	1	0	3	0	4
15		8	max	270.303	1	.359	4	.261	1	0	15	0	1	0	15
16			min	-355.618	3	.085	15	-.082	3	0	1	0	3	0	4
17		9	max	270.409	1	.317	4	.261	1	0	15	0	1	0	15
18			min	-355.538	3	.075	15	-.082	3	0	1	0	3	0	4
19		10	max	270.516	1	.276	4	.261	1	0	15	0	1	0	15
20			min	-355.458	3	.066	15	-.082	3	0	1	0	3	0	4
21		11	max	270.622	1	.235	4	.261	1	0	15	0	1	0	15
22			min	-355.378	3	.056	15	-.082	3	0	1	0	3	0	4
23		12	max	270.729	1	.194	4	.261	1	0	15	0	1	0	15
24			min	-355.298	3	.046	15	-.082	3	0	1	0	3	0	4
25		13	max	270.835	1	.152	4	.261	1	0	15	0	1	0	15
26			min	-355.218	3	.036	15	-.082	3	0	1	0	3	0	4
27		14	max	270.942	1	.111	4	.261	1	0	15	0	1	0	15
28			min	-355.138	3	.027	15	-.082	3	0	1	0	3	0	4
29		15	max	271.049	1	.078	2	.261	1	0	15	0	1	0	15
30			min	-355.059	3	.014	12	-.082	3	0	1	0	3	0	4
31		16	max	271.155	1	.046	2	.261	1	0	15	0	1	0	15
32			min	-354.979	3	-.004	3	-.082	3	0	1	0	3	0	4
33		17	max	271.262	1	.014	2	.261	1	0	15	0	1	0	15
34			min	-354.899	3	-.028	3	-.082	3	0	1	0	3	0	4
35		18	max	271.368	1	-.012	15	.261	1	0	15	0	1	0	15
36			min	-354.819	3	-.054	4	-.082	3	0	1	0	3	0	4
37		19	max	271.475	1	-.022	15	.261	1	0	15	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
38			min	-354.739	3	-.095	4	-.082	3	0	1	0	3	0	4
39	M3	1	max	87.381	2	1.798	4	-.009	15	0	15	0	1	0	4
40			min	-84.227	3	.423	15	-.247	1	0	1	0	15	0	15
41		2	max	87.314	2	1.62	4	-.009	15	0	15	0	1	0	4
42			min	-84.277	3	.381	15	-.247	1	0	1	0	15	0	15
43		3	max	87.246	2	1.443	4	-.009	15	0	15	0	1	0	2
44			min	-84.328	3	.34	15	-.247	1	0	1	0	15	0	3
45		4	max	87.178	2	1.265	4	-.009	15	0	15	0	1	0	15
46			min	-84.379	3	.298	15	-.247	1	0	1	0	15	0	4
47		5	max	87.11	2	1.088	4	-.009	15	0	15	0	1	0	15
48			min	-84.43	3	.256	15	-.247	1	0	1	0	15	0	4
49		6	max	87.042	2	.91	4	-.009	15	0	15	0	1	0	15
50			min	-84.481	3	.214	15	-.247	1	0	1	0	15	0	4
51		7	max	86.974	2	.732	4	-.009	15	0	15	0	1	0	15
52			min	-84.532	3	.173	15	-.247	1	0	1	0	15	0	4
53		8	max	86.906	2	.555	4	-.009	15	0	15	0	1	0	15
54			min	-84.583	3	.131	15	-.247	1	0	1	0	15	0	4
55		9	max	86.839	2	.377	4	-.009	15	0	15	0	1	0	15
56			min	-84.634	3	.089	15	-.247	1	0	1	0	15	-.001	4
57		10	max	86.771	2	.199	4	-.009	15	0	15	0	1	0	15
58			min	-84.685	3	.047	15	-.247	1	0	1	0	15	-.001	4
59		11	max	86.703	2	.034	2	-.009	15	0	15	0	1	0	15
60			min	-84.736	3	-.002	3	-.247	1	0	1	0	15	-.001	4
61		12	max	86.635	2	-.036	15	-.009	15	0	15	0	1	0	15
62			min	-84.786	3	-.156	4	-.247	1	0	1	0	15	-.001	4
63		13	max	86.567	2	-.078	15	-.009	15	0	15	0	1	0	15
64			min	-84.837	3	-.334	4	-.247	1	0	1	0	10	-.001	4
65		14	max	86.499	2	-.12	15	-.009	15	0	15	0	1	0	15
66			min	-84.888	3	-.511	4	-.247	1	0	1	0	10	-.001	4
67		15	max	86.431	2	-.162	15	-.009	15	0	15	0	9	0	15
68			min	-84.939	3	-.689	4	-.247	1	0	1	0	2	0	4
69		16	max	86.364	2	-.203	15	-.009	15	0	15	0	15	0	15
70			min	-84.99	3	-.867	4	-.247	1	0	1	0	1	0	4
71		17	max	86.296	2	-.245	15	-.009	15	0	15	0	15	0	15
72			min	-85.041	3	-1.044	4	-.247	1	0	1	0	1	0	4
73		18	max	86.228	2	-.287	15	-.009	15	0	15	0	15	0	15
74			min	-85.092	3	-1.222	4	-.247	1	0	1	0	1	0	4
75		19	max	86.16	2	-.329	15	-.009	15	0	15	0	15	0	1
76			min	-85.143	3	-1.4	4	-.247	1	0	1	0	1	0	1
77	M4	1	max	374.902	1	0	1	-.021	15	0	1	0	3	0	1
78			min	-73.652	3	0	1	-.618	1	0	1	0	2	0	1
79		2	max	374.967	1	0	1	-.021	15	0	1	0	15	0	1
80			min	-73.603	3	0	1	-.618	1	0	1	0	1	0	1
81		3	max	375.031	1	0	1	-.021	15	0	1	0	15	0	1
82			min	-73.555	3	0	1	-.618	1	0	1	0	1	0	1
83		4	max	375.096	1	0	1	-.021	15	0	1	0	15	0	1
84			min	-73.506	3	0	1	-.618	1	0	1	0	1	0	1
85		5	max	375.161	1	0	1	-.021	15	0	1	0	15	0	1
86			min	-73.457	3	0	1	-.618	1	0	1	0	1	0	1
87		6	max	375.225	1	0	1	-.021	15	0	1	0	15	0	1
88			min	-73.409	3	0	1	-.618	1	0	1	0	1	0	1
89		7	max	375.29	1	0	1	-.021	15	0	1	0	15	0	1
90			min	-73.36	3	0	1	-.618	1	0	1	0	1	0	1
91		8	max	375.355	1	0	1	-.021	15	0	1	0	15	0	1
92			min	-73.312	3	0	1	-.618	1	0	1	0	1	0	1
93		9	max	375.42	1	0	1	-.021	15	0	1	0	15	0	1
94			min	-73.263	3	0	1	-.618	1	0	1	0	1	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
95		10	max	375.484	1	0	1	-.021	15	0	1	0	15	0	1
96			min	-73.215	3	0	1	-.618	1	0	1	0	1	0	1
97		11	max	375.549	1	0	1	-.021	15	0	1	0	15	0	1
98			min	-73.166	3	0	1	-.618	1	0	1	0	1	0	1
99		12	max	375.614	1	0	1	-.021	15	0	1	0	15	0	1
100			min	-73.118	3	0	1	-.618	1	0	1	0	1	0	1
101		13	max	375.678	1	0	1	-.021	15	0	1	0	15	0	1
102			min	-73.069	3	0	1	-.618	1	0	1	0	1	0	1
103		14	max	375.743	1	0	1	-.021	15	0	1	0	15	0	1
104			min	-73.021	3	0	1	-.618	1	0	1	0	1	0	1
105		15	max	375.808	1	0	1	-.021	15	0	1	0	15	0	1
106			min	-72.972	3	0	1	-.618	1	0	1	0	1	0	1
107		16	max	375.872	1	0	1	-.021	15	0	1	0	15	0	1
108			min	-72.924	3	0	1	-.618	1	0	1	0	1	0	1
109		17	max	375.937	1	0	1	-.021	15	0	1	0	15	0	1
110			min	-72.875	3	0	1	-.618	1	0	1	0	1	0	1
111		18	max	376.002	1	0	1	-.021	15	0	1	0	15	0	1
112			min	-72.827	3	0	1	-.618	1	0	1	0	1	0	1
113		19	max	376.067	1	0	1	-.021	15	0	1	0	15	0	1
114			min	-72.778	3	0	1	-.618	1	0	1	-.001	1	0	1
115	M6	1	max	854.183	1	.642	4	.08	1	0	3	0	3	0	1
116			min	-1115.49	3	.152	15	-.206	3	0	2	0	2	0	1
117		2	max	854.29	1	.6	4	.08	1	0	3	0	3	0	15
118			min	-1115.41	3	.142	15	-.206	3	0	2	0	2	0	4
119		3	max	854.397	1	.559	4	.08	1	0	3	0	3	0	15
120			min	-1115.33	3	.132	15	-.206	3	0	2	0	2	0	4
121		4	max	854.503	1	.518	4	.08	1	0	3	0	1	0	15
122			min	-1115.25	3	.123	15	-.206	3	0	2	0	2	0	4
123		5	max	854.61	1	.477	4	.08	1	0	3	0	1	0	15
124			min	-1115.17	3	.113	15	-.206	3	0	2	0	3	0	4
125		6	max	854.716	1	.435	4	.08	1	0	3	0	1	0	15
126			min	-1115.091	3	.103	15	-.206	3	0	2	0	3	0	4
127		7	max	854.823	1	.394	4	.08	1	0	3	0	1	0	15
128			min	-1115.011	3	.094	15	-.206	3	0	2	0	3	0	4
129		8	max	854.929	1	.356	2	.08	1	0	3	0	1	0	15
130			min	-1114.931	3	.084	15	-.206	3	0	2	0	3	0	4
131		9	max	855.036	1	.324	2	.08	1	0	3	0	1	0	15
132			min	-1114.851	3	.074	15	-.206	3	0	2	0	3	0	4
133		10	max	855.142	1	.292	2	.08	1	0	3	0	1	0	15
134			min	-1114.771	3	.065	15	-.206	3	0	2	0	3	0	4
135		11	max	855.249	1	.26	2	.08	1	0	3	0	1	0	15
136			min	-1114.691	3	.054	12	-.206	3	0	2	0	3	0	4
137		12	max	855.355	1	.227	2	.08	1	0	3	0	1	0	15
138			min	-1114.611	3	.038	12	-.206	3	0	2	0	3	0	4
139		13	max	855.462	1	.195	2	.08	1	0	3	0	1	0	15
140			min	-1114.531	3	.022	12	-.206	3	0	2	0	3	0	4
141		14	max	855.569	1	.163	2	.08	1	0	3	0	1	0	15
142			min	-1114.451	3	.005	3	-.206	3	0	2	0	3	0	4
143		15	max	855.675	1	.131	2	.08	1	0	3	0	1	0	15
144			min	-1114.371	3	-.019	3	-.206	3	0	2	0	3	0	2
145		16	max	855.782	1	.099	2	.08	1	0	3	0	1	0	15
146			min	-1114.291	3	-.043	3	-.206	3	0	2	0	3	0	2
147		17	max	855.888	1	.067	2	.08	1	0	3	0	1	0	15
148			min	-1114.212	3	-.068	3	-.206	3	0	2	0	3	0	2
149		18	max	855.995	1	.034	2	.08	1	0	3	0	1	0	15
150			min	-1114.132	3	-.092	3	-.206	3	0	2	0	3	0	2
151		19	max	856.101	1	.002	2	.08	1	0	3	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	-1114.052	3	-.116	3	-.206	3	0	2	0	3	0	2
153	M7	1	max	320.131	2	1.797	4	.008	3	0	1	0	1	0	2
154			min	-239.462	3	.423	15	-.008	11	0	3	0	3	0	12
155		2	max	320.064	2	1.619	4	.008	3	0	1	0	1	0	2
156			min	-239.513	3	.381	15	-.008	11	0	3	0	3	0	12
157		3	max	319.996	2	1.442	4	.008	3	0	1	0	1	0	2
158			min	-239.564	3	.34	15	-.008	11	0	3	0	3	0	3
159		4	max	319.928	2	1.264	4	.008	3	0	1	0	1	0	2
160			min	-239.615	3	.298	15	-.008	11	0	3	0	3	0	3
161		5	max	319.86	2	1.086	4	.008	3	0	1	0	1	0	15
162			min	-239.666	3	.256	15	-.008	11	0	3	0	3	0	4
163		6	max	319.792	2	.909	4	.008	3	0	1	0	1	0	15
164			min	-239.717	3	.214	15	-.008	11	0	3	0	3	0	4
165		7	max	319.724	2	.731	4	.008	3	0	1	0	1	0	15
166			min	-239.768	3	.172	15	-.008	11	0	3	0	3	0	4
167		8	max	319.656	2	.553	4	.008	3	0	1	0	1	0	15
168			min	-239.818	3	.131	15	-.008	11	0	3	0	3	0	4
169		9	max	319.589	2	.376	4	.008	3	0	1	0	1	0	15
170			min	-239.869	3	.089	15	-.008	11	0	3	0	3	-.001	4
171		10	max	319.521	2	.211	2	.008	3	0	1	0	1	0	15
172			min	-239.92	3	.046	12	-.008	11	0	3	0	3	-.001	4
173		11	max	319.453	2	.072	2	.008	3	0	1	0	1	0	15
174			min	-239.971	3	-.039	3	-.008	11	0	3	0	3	-.001	4
175		12	max	319.385	2	-.036	15	.008	3	0	1	0	1	0	15
176			min	-240.022	3	-.157	4	-.008	11	0	3	0	3	-.001	4
177		13	max	319.317	2	-.078	15	.008	3	0	1	0	1	0	15
178			min	-240.073	3	-.335	4	-.008	11	0	3	0	3	-.001	4
179		14	max	319.249	2	-.12	15	.008	3	0	1	0	1	0	15
180			min	-240.124	3	-.513	4	-.008	11	0	3	0	3	-.001	4
181		15	max	319.181	2	-.162	15	.008	3	0	1	0	1	0	15
182			min	-240.175	3	-.69	4	-.008	11	0	3	0	3	0	4
183		16	max	319.114	2	-.203	15	.008	3	0	1	0	1	0	15
184			min	-240.226	3	-.868	4	-.008	11	0	3	0	3	0	4
185		17	max	319.046	2	-.245	15	.008	3	0	1	0	1	0	15
186			min	-240.276	3	-1.046	4	-.008	11	0	3	0	3	0	4
187		18	max	318.978	2	-.287	15	.008	3	0	1	0	1	0	15
188			min	-240.327	3	-1.223	4	-.008	11	0	3	0	3	0	4
189		19	max	318.91	2	-.329	15	.008	3	0	1	0	1	0	1
190			min	-240.378	3	-1.401	4	-.008	11	0	3	0	3	0	1
191	M8	1	max	1086.401	1	0	1	.325	1	0	1	0	2	0	1
192			min	-263.079	3	0	1	-.397	3	0	1	0	1	0	1
193		2	max	1086.466	1	0	1	.325	1	0	1	0	1	0	1
194			min	-263.031	3	0	1	-.397	3	0	1	0	3	0	1
195		3	max	1086.53	1	0	1	.325	1	0	1	0	1	0	1
196			min	-262.982	3	0	1	-.397	3	0	1	0	3	0	1
197		4	max	1086.595	1	0	1	.325	1	0	1	0	1	0	1
198			min	-262.934	3	0	1	-.397	3	0	1	0	3	0	1
199		5	max	1086.66	1	0	1	.325	1	0	1	0	1	0	1
200			min	-262.885	3	0	1	-.397	3	0	1	0	3	0	1
201		6	max	1086.724	1	0	1	.325	1	0	1	0	1	0	1
202			min	-262.837	3	0	1	-.397	3	0	1	0	3	0	1
203		7	max	1086.789	1	0	1	.325	1	0	1	0	1	0	1
204			min	-262.788	3	0	1	-.397	3	0	1	0	3	0	1
205		8	max	1086.854	1	0	1	.325	1	0	1	0	1	0	1
206			min	-262.74	3	0	1	-.397	3	0	1	0	3	0	1
207		9	max	1086.919	1	0	1	.325	1	0	1	0	1	0	1
208			min	-262.691	3	0	1	-.397	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	1086.983	1	0	1	.325	1	0	1	0	1	0	1
210			min	-262.643	3	0	1	-.397	3	0	1	0	3	0	1
211		11	max	1087.048	1	0	1	.325	1	0	1	0	1	0	1
212			min	-262.594	3	0	1	-.397	3	0	1	0	3	0	1
213		12	max	1087.113	1	0	1	.325	1	0	1	0	1	0	1
214			min	-262.546	3	0	1	-.397	3	0	1	0	3	0	1
215		13	max	1087.177	1	0	1	.325	1	0	1	0	1	0	1
216			min	-262.497	3	0	1	-.397	3	0	1	0	3	0	1
217		14	max	1087.242	1	0	1	.325	1	0	1	0	1	0	1
218			min	-262.449	3	0	1	-.397	3	0	1	0	3	0	1
219		15	max	1087.307	1	0	1	.325	1	0	1	0	1	0	1
220			min	-262.4	3	0	1	-.397	3	0	1	0	3	0	1
221		16	max	1087.372	1	0	1	.325	1	0	1	0	1	0	1
222			min	-262.351	3	0	1	-.397	3	0	1	0	3	0	1
223		17	max	1087.436	1	0	1	.325	1	0	1	0	1	0	1
224			min	-262.303	3	0	1	-.397	3	0	1	0	3	0	1
225		18	max	1087.501	1	0	1	.325	1	0	1	0	1	0	1
226			min	-262.254	3	0	1	-.397	3	0	1	0	3	0	1
227		19	max	1087.566	1	0	1	.325	1	0	1	0	1	0	1
228			min	-262.206	3	0	1	-.397	3	0	1	0	3	0	1
229	M10	1	max	271.572	1	.647	4	-.003	15	0	1	0	1	0	1
230			min	-325.427	3	.153	15	-.103	1	0	3	0	3	0	1
231		2	max	271.678	1	.606	4	-.003	15	0	1	0	1	0	15
232			min	-325.347	3	.143	15	-.103	1	0	3	0	3	0	4
233		3	max	271.785	1	.565	4	-.003	15	0	1	0	1	0	15
234			min	-325.267	3	.133	15	-.103	1	0	3	0	3	0	4
235		4	max	271.892	1	.524	4	-.003	15	0	1	0	1	0	15
236			min	-325.188	3	.124	15	-.103	1	0	3	0	3	0	4
237		5	max	271.998	1	.482	4	-.003	15	0	1	0	1	0	15
238			min	-325.108	3	.114	15	-.103	1	0	3	0	3	0	4
239		6	max	272.105	1	.441	4	-.003	15	0	1	0	9	0	15
240			min	-325.028	3	.104	15	-.103	1	0	3	0	3	0	4
241		7	max	272.211	1	.4	4	-.003	15	0	1	0	15	0	15
242			min	-324.948	3	.095	15	-.103	1	0	3	0	3	0	4
243		8	max	272.318	1	.358	4	-.003	15	0	1	0	15	0	15
244			min	-324.868	3	.085	15	-.103	1	0	3	0	3	0	4
245		9	max	272.424	1	.317	4	-.003	15	0	1	0	15	0	15
246			min	-324.788	3	.075	15	-.103	1	0	3	0	3	0	4
247		10	max	272.531	1	.276	4	-.003	15	0	1	0	15	0	15
248			min	-324.708	3	.065	15	-.103	1	0	3	0	3	0	4
249		11	max	272.637	1	.235	4	-.003	15	0	1	0	15	0	15
250			min	-324.628	3	.056	15	-.103	1	0	3	0	3	0	4
251		12	max	272.744	1	.193	4	-.003	15	0	1	0	15	0	15
252			min	-324.548	3	.046	15	-.103	1	0	3	0	3	0	4
253		13	max	272.85	1	.152	4	-.003	15	0	1	0	15	0	15
254			min	-324.468	3	.036	15	-.103	1	0	3	0	3	0	4
255		14	max	272.957	1	.111	4	-.003	15	0	1	0	15	0	15
256			min	-324.389	3	.027	15	-.103	1	0	3	0	3	0	4
257		15	max	273.064	1	.078	2	-.003	15	0	1	0	15	0	15
258			min	-324.309	3	.017	15	-.103	1	0	3	0	3	0	4
259		16	max	273.17	1	.046	2	-.003	15	0	1	0	15	0	15
260			min	-324.229	3	.007	9	-.103	1	0	3	0	3	0	4
261		17	max	273.277	1	.014	2	-.003	15	0	1	0	15	0	15
262			min	-324.149	3	-.02	9	-.103	1	0	3	0	3	0	4
263		18	max	273.383	1	-.012	15	-.003	15	0	1	0	15	0	15
264			min	-324.069	3	-.054	4	-.103	1	0	3	0	3	0	4
265		19	max	273.49	1	-.022	15	-.003	15	0	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	-323.989	3	-.095	4	-.103	1	0	3	0	3	0	4
267	M11	1	max	86.907	2	1.798	4	.273	1	0	1	0	3	0	4
268			min	-84.838	3	.423	15	-.017	3	0	15	0	1	0	15
269		2	max	86.839	2	1.62	4	.273	1	0	1	0	3	0	4
270			min	-84.889	3	.381	15	-.017	3	0	15	0	1	0	12
271		3	max	86.771	2	1.443	4	.273	1	0	1	0	3	0	2
272			min	-84.939	3	.34	15	-.017	3	0	15	0	1	0	3
273		4	max	86.703	2	1.265	4	.273	1	0	1	0	3	0	15
274			min	-84.99	3	.298	15	-.017	3	0	15	0	1	0	3
275		5	max	86.635	2	1.087	4	.273	1	0	1	0	3	0	15
276			min	-85.041	3	.256	15	-.017	3	0	15	0	1	0	4
277		6	max	86.567	2	.91	4	.273	1	0	1	0	3	0	15
278			min	-85.092	3	.214	15	-.017	3	0	15	0	1	0	4
279		7	max	86.499	2	.732	4	.273	1	0	1	0	3	0	15
280			min	-85.143	3	.173	15	-.017	3	0	15	0	1	0	4
281		8	max	86.432	2	.554	4	.273	1	0	1	0	3	0	15
282			min	-85.194	3	.131	15	-.017	3	0	15	0	1	0	4
283		9	max	86.364	2	.377	4	.273	1	0	1	0	3	0	15
284			min	-85.245	3	.089	15	-.017	3	0	15	0	1	-.001	4
285		10	max	86.296	2	.199	4	.273	1	0	1	0	3	0	15
286			min	-85.296	3	.047	15	-.017	3	0	15	0	1	-.001	4
287		11	max	86.228	2	.034	2	.273	1	0	1	0	3	0	15
288			min	-85.347	3	-.019	3	-.017	3	0	15	0	1	-.001	4
289		12	max	86.16	2	-.036	15	.273	1	0	1	0	3	0	15
290			min	-85.397	3	-.156	4	-.017	3	0	15	0	1	-.001	4
291		13	max	86.092	2	-.078	15	.273	1	0	1	0	3	0	15
292			min	-85.448	3	-.334	4	-.017	3	0	15	0	1	-.001	4
293		14	max	86.024	2	-.12	15	.273	1	0	1	0	3	0	15
294			min	-85.499	3	-.511	4	-.017	3	0	15	0	2	-.001	4
295		15	max	85.956	2	-.162	15	.273	1	0	1	0	3	0	15
296			min	-85.55	3	-.689	4	-.017	3	0	15	0	10	0	4
297		16	max	85.889	2	-.203	15	.273	1	0	1	0	3	0	15
298			min	-85.601	3	-.867	4	-.017	3	0	15	0	10	0	4
299		17	max	85.821	2	-.245	15	.273	1	0	1	0	3	0	15
300			min	-85.652	3	-1.044	4	-.017	3	0	15	0	10	0	4
301		18	max	85.753	2	-.287	15	.273	1	0	1	0	3	0	15
302			min	-85.703	3	-1.222	4	-.017	3	0	15	0	10	0	4
303		19	max	85.685	2	-.329	15	.273	1	0	1	0	1	0	1
304			min	-85.754	3	-1.4	4	-.017	3	0	15	0	15	0	1
305	M12	1	max	374.899	1	0	1	1.282	1	0	1	0	2	0	1
306			min	-73.241	3	0	1	.037	10	0	1	0	3	0	1
307		2	max	374.964	1	0	1	1.282	1	0	1	0	1	0	1
308			min	-73.192	3	0	1	.037	10	0	1	0	15	0	1
309		3	max	375.028	1	0	1	1.282	1	0	1	0	1	0	1
310			min	-73.144	3	0	1	.037	10	0	1	0	15	0	1
311		4	max	375.093	1	0	1	1.282	1	0	1	0	1	0	1
312			min	-73.095	3	0	1	.037	10	0	1	0	15	0	1
313		5	max	375.158	1	0	1	1.282	1	0	1	0	1	0	1
314			min	-73.047	3	0	1	.037	10	0	1	0	15	0	1
315		6	max	375.223	1	0	1	1.282	1	0	1	0	1	0	1
316			min	-72.998	3	0	1	.037	10	0	1	0	15	0	1
317		7	max	375.287	1	0	1	1.282	1	0	1	0	1	0	1
318			min	-72.95	3	0	1	.037	10	0	1	0	15	0	1
319		8	max	375.352	1	0	1	1.282	1	0	1	0	1	0	1
320			min	-72.901	3	0	1	.037	10	0	1	0	15	0	1
321		9	max	375.417	1	0	1	1.282	1	0	1	0	1	0	1
322			min	-72.853	3	0	1	.037	10	0	1	0	10	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
323		10	max	375.481	1	0	1	1.282	1	0	1	.001	1	0	1
324			min	-72.804	3	0	1	.037	10	0	1	0	10	0	1
325		11	max	375.546	1	0	1	1.282	1	0	1	.001	1	0	1
326			min	-72.756	3	0	1	.037	10	0	1	0	10	0	1
327		12	max	375.611	1	0	1	1.282	1	0	1	.001	1	0	1
328			min	-72.707	3	0	1	.037	10	0	1	0	10	0	1
329		13	max	375.675	1	0	1	1.282	1	0	1	.001	1	0	1
330			min	-72.659	3	0	1	.037	10	0	1	0	10	0	1
331		14	max	375.74	1	0	1	1.282	1	0	1	.002	1	0	1
332			min	-72.61	3	0	1	.037	10	0	1	0	10	0	1
333		15	max	375.805	1	0	1	1.282	1	0	1	.002	1	0	1
334			min	-72.562	3	0	1	.037	10	0	1	0	10	0	1
335		16	max	375.87	1	0	1	1.282	1	0	1	.002	1	0	1
336			min	-72.513	3	0	1	.037	10	0	1	0	10	0	1
337		17	max	375.934	1	0	1	1.282	1	0	1	.002	1	0	1
338			min	-72.465	3	0	1	.037	10	0	1	0	10	0	1
339		18	max	375.999	1	0	1	1.282	1	0	1	.002	1	0	1
340			min	-72.416	3	0	1	.037	10	0	1	0	10	0	1
341		19	max	376.064	1	0	1	1.282	1	0	1	.002	1	0	1
342			min	-72.367	3	0	1	.037	10	0	1	0	10	0	1
343	M1	1	max	81.119	1	335.253	3	-.905	15	0	1	.051	1	.014	1
344			min	2.735	15	-272.61	1	-25.908	1	0	3	.002	15	-.015	3
345		2	max	81.214	1	335.057	3	-.905	15	0	1	.045	1	.073	1
346			min	2.764	15	-272.872	1	-25.908	1	0	3	.002	15	-.087	3
347		3	max	66.7	1	4.913	9	-.895	15	0	3	.039	1	.132	1
348			min	.622	10	-20.765	3	-25.751	1	0	1	.001	15	-.159	3
349		4	max	66.795	1	4.695	9	-.895	15	0	3	.034	1	.132	1
350			min	.702	10	-20.962	3	-25.751	1	0	1	.001	15	-.154	3
351		5	max	66.891	1	4.476	9	-.895	15	0	3	.028	1	.133	1
352			min	.781	10	-21.159	3	-25.751	1	0	1	0	15	-.15	3
353		6	max	66.986	1	4.257	9	-.895	15	0	3	.022	1	.134	1
354			min	.861	10	-21.356	3	-25.751	1	0	1	0	15	-.145	3
355		7	max	67.082	1	4.039	9	-.895	15	0	3	.017	1	.135	1
356			min	.941	10	-21.552	3	-25.751	1	0	1	0	15	-.14	3
357		8	max	67.177	1	3.82	9	-.895	15	0	3	.011	1	.139	2
358			min	1.02	10	-21.749	3	-25.751	1	0	1	0	15	-.136	3
359		9	max	67.273	1	3.601	9	-.895	15	0	3	.006	1	.143	2
360			min	1.1	10	-21.946	3	-25.751	1	0	1	0	15	-.131	3
361		10	max	67.368	1	3.383	9	-.895	15	0	3	.001	3	.147	2
362			min	1.179	10	-22.143	3	-25.751	1	0	1	0	15	-.126	3
363		11	max	67.464	1	3.164	9	-.895	15	0	3	0	3	.151	2
364			min	1.259	10	-22.34	3	-25.751	1	0	1	-.005	1	-.121	3
365		12	max	67.559	1	2.945	9	-.895	15	0	3	0	12	.155	2
366			min	1.339	10	-22.536	3	-25.751	1	0	1	-.011	1	-.116	3
367		13	max	67.655	1	2.727	9	-.895	15	0	3	0	15	.16	2
368			min	1.418	10	-22.733	3	-25.751	1	0	1	-.017	1	-.111	3
369		14	max	67.75	1	2.508	9	-.895	15	0	3	0	15	.164	2
370			min	1.498	10	-22.93	3	-25.751	1	0	1	-.022	1	-.107	3
371		15	max	67.846	1	2.289	9	-.895	15	0	3	0	15	.169	2
372			min	1.577	10	-23.127	3	-25.751	1	0	1	-.028	1	-.102	3
373		16	max	79.667	2	40.711	2	-.904	15	0	1	-.001	15	.173	2
374			min	-30.226	3	-85.183	3	-25.974	1	0	12	-.034	1	-.096	3
375		17	max	79.762	2	40.448	2	-.904	15	0	1	-.001	15	.164	2
376			min	-30.154	3	-85.38	3	-25.974	1	0	12	-.039	1	-.077	3
377		18	max	-2.763	15	341.384	2	-.925	15	0	3	-.002	15	.091	2
378			min	-81.187	1	-154.861	3	-26.614	1	0	2	-.045	1	-.044	3
379		19	max	-2.734	15	341.121	2	-.925	15	0	3	-.002	15	.017	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
380			min	-81.092	1	-155.057	3	-26.614	1	0	2	-.051	1	-.011	3
381	M5	1	max	191.714	1	1079.328	3	0	2	0	1	.007	3	.03	3
382			min	2.794	12	-874.204	1	-48.631	3	0	3	0	10	-.028	1
383		2	max	191.81	1	1079.131	3	0	2	0	1	0	1	.161	1
384			min	2.842	12	-874.466	1	-48.631	3	0	3	-.003	3	-.205	3
385		3	max	144.798	1	6.605	9	5.244	3	0	3	0	1	.347	1
386			min	.456	10	-65.869	3	-.344	1	0	1	-.014	3	-.434	3
387		4	max	144.893	1	6.387	9	5.244	3	0	3	0	1	.352	1
388			min	.535	10	-66.066	3	-.344	1	0	1	-.012	3	-.419	3
389		5	max	144.989	1	6.168	9	5.244	3	0	3	0	1	.357	1
390			min	.615	10	-66.263	3	-.344	1	0	1	-.011	3	-.405	3
391		6	max	145.084	1	5.949	9	5.244	3	0	3	0	1	.362	1
392			min	.694	10	-66.46	3	-.344	1	0	1	-.01	3	-.391	3
393		7	max	145.18	1	5.731	9	5.244	3	0	3	0	1	.367	1
394			min	.774	10	-66.657	3	-.344	1	0	1	-.009	3	-.376	3
395		8	max	145.275	1	5.512	9	5.244	3	0	3	0	1	.372	2
396			min	.853	10	-66.853	3	-.344	1	0	1	-.008	3	-.362	3
397		9	max	145.371	1	5.293	9	5.244	3	0	3	0	1	.384	2
398			min	.933	10	-67.05	3	-.344	1	0	1	-.007	3	-.347	3
399		10	max	145.466	1	5.075	9	5.244	3	0	3	0	2	.397	2
400			min	1.013	10	-67.247	3	-.344	1	0	1	-.006	3	-.333	3
401		11	max	145.562	1	4.856	9	5.244	3	0	3	0	2	.41	2
402			min	1.092	10	-67.444	3	-.344	1	0	1	-.004	3	-.318	3
403		12	max	145.657	1	4.637	9	5.244	3	0	3	0	2	.423	2
404			min	1.172	10	-67.641	3	-.344	1	0	1	-.003	3	-.303	3
405		13	max	145.753	1	4.419	9	5.244	3	0	3	0	2	.436	2
406			min	1.251	10	-67.837	3	-.344	1	0	1	-.002	3	-.289	3
407		14	max	145.848	1	4.2	9	5.244	3	0	3	0	2	.449	2
408			min	1.331	10	-68.034	3	-.344	1	0	1	0	3	-.274	3
409		15	max	145.944	1	3.981	9	5.244	3	0	3	0	3	.463	2
410			min	1.411	10	-68.231	3	-.344	1	0	1	0	1	-.259	3
411		16	max	260.695	2	170.747	2	5.22	3	0	3	0	3	.474	2
412			min	-96.902	3	-241.585	3	-.352	1	0	2	0	1	-.243	3
413		17	max	260.79	2	170.485	2	5.22	3	0	3	.002	3	.437	2
414			min	-96.83	3	-241.781	3	-.352	1	0	2	0	1	-.19	3
415		18	max	-4.766	12	1093.023	2	4.824	3	0	3	.003	3	.203	2
416			min	-191.866	1	-489.888	3	-.08	1	0	1	0	1	-.085	3
417		19	max	-4.719	12	1092.76	2	4.824	3	0	3	.004	3	.021	3
418			min	-191.771	1	-490.085	3	-.08	1	0	1	0	1	-.034	2
419	M9	1	max	80.888	1	335.218	3	51.73	3	0	3	-.002	15	.014	1
420			min	2.725	15	-272.608	1	.922	15	0	1	-.05	1	-.015	3
421		2	max	80.984	1	335.021	3	51.73	3	0	3	0	12	.073	1
422			min	2.754	15	-272.871	1	.922	15	0	1	-.045	1	-.087	3
423		3	max	66.884	1	4.892	9	25.179	1	0	1	.01	3	.131	1
424			min	.993	10	-20.697	3	-1.698	3	0	15	-.038	1	-.159	3
425		4	max	66.979	1	4.673	9	25.179	1	0	1	.009	3	.132	1
426			min	1.072	10	-20.894	3	-1.698	3	0	15	-.033	1	-.154	3
427		5	max	67.075	1	4.455	9	25.179	1	0	1	.009	3	.133	1
428			min	1.152	10	-21.091	3	-1.698	3	0	15	-.027	1	-.149	3
429		6	max	67.17	1	4.236	9	25.179	1	0	1	.009	3	.134	1
430			min	1.232	10	-21.288	3	-1.698	3	0	15	-.022	1	-.145	3
431		7	max	67.266	1	4.017	9	25.179	1	0	1	.008	3	.135	1
432			min	1.311	10	-21.485	3	-1.698	3	0	15	-.016	1	-.14	3
433		8	max	67.361	1	3.799	9	25.179	1	0	1	.008	3	.139	2
434			min	1.391	10	-21.681	3	-1.698	3	0	15	-.011	1	-.136	3
435		9	max	67.457	1	3.58	9	25.179	1	0	1	.007	3	.143	2
436			min	1.47	10	-21.878	3	-1.698	3	0	15	-.006	1	-.131	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	67.552	1	3.361	9	25.179	1	0	1	.007	3	.147	2
438			min	1.55	10	-22.075	3	-1.698	3	0	15	0	1	-.126	3
439		11	max	67.648	1	3.143	9	25.179	1	0	1	.007	3	.151	2
440			min	1.63	10	-22.272	3	-1.698	3	0	15	0	15	-.121	3
441		12	max	67.743	1	2.924	9	25.179	1	0	1	.011	1	.155	2
442			min	1.709	10	-22.469	3	-1.698	3	0	15	0	15	-.116	3
443		13	max	67.839	1	2.705	9	25.179	1	0	1	.016	1	.16	2
444			min	1.789	10	-22.665	3	-1.698	3	0	15	0	15	-.112	3
445		14	max	67.934	1	2.487	9	25.179	1	0	1	.022	1	.164	2
446			min	1.868	10	-22.862	3	-1.698	3	0	15	0	15	-.107	3
447		15	max	68.03	1	2.268	9	25.179	1	0	1	.027	1	.169	2
448			min	1.948	10	-23.059	3	-1.698	3	0	15	0	15	-.102	3
449		16	max	79.782	2	40.394	2	25.43	1	0	15	.033	1	.172	2
450			min	-30.713	3	-85.565	3	-1.706	3	0	1	.001	15	-.096	3
451		17	max	79.878	2	40.131	2	25.43	1	0	15	.039	1	.164	2
452			min	-30.642	3	-85.762	3	-1.706	3	0	1	.001	15	-.077	3
453		18	max	-2.753	15	341.384	2	26.698	1	0	2	.044	1	.091	2
454			min	-80.954	1	-154.856	3	-1.379	3	0	3	.002	15	-.044	3
455		19	max	-2.725	15	341.121	2	26.698	1	0	2	.05	1	.017	2
456			min	-80.859	1	-155.053	3	-1.379	3	0	3	.002	15	-.011	3
457	M13	1	max	51.727	3	272.322	1	-2.725	15	.014	1	.05	1	0	1
458			min	.922	15	-335.228	3	-80.884	1	-.015	3	.002	15	0	3
459		2	max	51.727	3	193.607	1	-2.07	15	.014	1	.011	1	.159	3
460			min	.922	15	-238.022	3	-61.233	1	-.015	3	0	10	-.129	1
461		3	max	51.727	3	114.891	1	-1.416	15	.014	1	.006	3	.264	3
462			min	.922	15	-140.816	3	-41.582	1	-.015	3	-.018	1	-.215	1
463		4	max	51.727	3	36.176	1	-.761	15	.014	1	.004	3	.316	3
464			min	.922	15	-43.611	3	-21.93	1	-.015	3	-.035	1	-.257	1
465		5	max	51.727	3	53.595	3	.842	10	.014	1	.002	3	.313	3
466			min	.922	15	-42.539	1	-2.636	3	-.015	3	-.042	1	-.255	1
467		6	max	51.727	3	150.801	3	17.372	1	.014	1	0	3	.256	3
468			min	.922	15	-121.255	1	-1.678	3	-.015	3	-.038	1	-.21	1
469		7	max	51.727	3	248.007	3	37.023	1	.014	1	0	3	.145	3
470			min	.922	15	-199.97	1	-.72	3	-.015	3	-.023	1	-.121	1
471		8	max	51.727	3	345.213	3	56.674	1	.014	1	.004	2	.012	1
472			min	.922	15	-278.685	1	.239	3	-.015	3	0	15	-.019	3
473		9	max	51.727	3	442.419	3	76.326	1	.014	1	.04	1	.189	1
474			min	.922	15	-357.4	1	.901	12	-.015	3	0	12	-.238	3
475		10	max	51.727	3	539.625	3	95.977	1	.014	1	.088	1	.409	1
476			min	.922	15	-436.116	1	1.54	12	-.015	3	-.006	3	-.511	3
477		11	max	25.958	1	357.4	1	-.611	12	.015	3	.04	1	.189	1
478			min	.905	15	-442.419	3	-76.095	1	-.014	1	-.006	3	-.238	3
479		12	max	25.958	1	278.685	1	.223	3	.015	3	.004	2	.012	1
480			min	.905	15	-345.213	3	-56.444	1	-.014	1	-.006	3	-.019	3
481		13	max	25.958	1	199.97	1	1.181	3	.015	3	0	15	.145	3
482			min	.905	15	-248.007	3	-36.793	1	-.014	1	-.023	1	-.121	1
483		14	max	25.958	1	121.254	1	2.14	3	.015	3	-.001	15	.256	3
484			min	.905	15	-150.801	3	-17.141	1	-.014	1	-.038	1	-.21	1
485		15	max	25.958	1	42.539	1	3.098	3	.015	3	-.001	15	.313	3
486			min	.905	15	-53.595	3	-.842	10	-.014	1	-.042	1	-.255	1
487		16	max	25.958	1	43.611	3	22.161	1	.015	3	-.001	12	.316	3
488			min	.905	15	-36.176	1	.771	15	-.014	1	-.035	1	-.257	1
489		17	max	25.958	1	140.816	3	41.812	1	.015	3	0	3	.264	3
490			min	.905	15	-114.892	1	1.426	15	-.014	1	-.017	1	-.215	1
491		18	max	25.958	1	238.022	3	61.463	1	.015	3	.011	1	.159	3
492			min	.905	15	-193.607	1	2.08	15	-.014	1	0	10	-.129	1
493		19	max	25.958	1	335.228	3	81.115	1	.015	3	.051	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	.905	15	-272.322	1	2.735	15	-.014	1	.002	15	0	3
495	M16	1	max	1.38	3	341.248	2	-2.725	15	.011	3	.05	1	0	2
496			min	-26.646	1	-155.071	3	-80.863	1	-.017	2	.002	15	0	3
497		2	max	1.38	3	242.57	2	-2.07	15	.011	3	.011	1	.074	3
498			min	-26.646	1	-110.61	3	-61.212	1	-.017	2	0	10	-.162	2
499		3	max	1.38	3	143.892	2	-1.415	15	.011	3	0	12	.123	3
500			min	-26.646	1	-66.15	3	-41.561	1	-.017	2	-.018	1	-.27	2
501		4	max	1.38	3	45.215	2	-.76	15	.011	3	-.001	15	.147	3
502			min	-26.646	1	-21.69	3	-21.91	1	-.017	2	-.035	1	-.322	2
503		5	max	1.38	3	22.77	3	.843	10	.011	3	-.001	15	.147	3
504			min	-26.646	1	-53.463	2	-2.258	1	-.017	2	-.042	1	-.32	2
505		6	max	1.38	3	67.23	3	17.393	1	.011	3	-.001	15	.122	3
506			min	-26.646	1	-152.14	2	-.681	3	-.017	2	-.038	1	-.263	2
507		7	max	1.38	3	111.69	3	37.044	1	.011	3	0	15	.072	3
508			min	-26.646	1	-250.818	2	.247	12	-.017	2	-.023	1	-.151	2
509		8	max	1.38	3	156.15	3	56.695	1	.011	3	.004	2	.016	2
510			min	-26.646	1	-349.496	2	.886	12	-.017	2	-.004	3	-.002	3
511		9	max	1.38	3	200.61	3	76.346	1	.011	3	.04	1	.238	2
512			min	-26.646	1	-448.173	2	1.525	12	-.017	2	-.003	3	-.101	3
513		10	max	-.927	15	-9.976	15	95.998	1	0	15	.088	1	.514	2
514			min	-26.646	1	-546.851	2	-3.782	3	-.017	2	.002	12	-.225	3
515		11	max	-.925	15	448.173	2	-1.916	12	.017	2	.04	1	.238	2
516			min	-26.564	1	-200.61	3	-76.114	1	-.011	3	0	12	-.101	3
517		12	max	-.925	15	349.496	2	-1.277	12	.017	2	.004	2	.016	2
518			min	-26.564	1	-156.15	3	-56.462	1	-.011	3	0	3	-.002	3
519		13	max	-.925	15	250.818	2	-.638	12	.017	2	0	15	.072	3
520			min	-26.564	1	-111.69	3	-36.811	1	-.011	3	-.023	1	-.151	2
521		14	max	-.925	15	152.14	2	.052	3	.017	2	-.001	12	.122	3
522			min	-26.564	1	-67.23	3	-17.16	1	-.011	3	-.038	1	-.263	2
523		15	max	-.925	15	53.463	2	2.491	1	.017	2	0	12	.147	3
524			min	-26.564	1	-22.77	3	-.843	10	-.011	3	-.042	1	-.32	2
525		16	max	-.925	15	21.69	3	22.143	1	.017	2	0	12	.147	3
526			min	-26.564	1	-45.215	2	.77	15	-.011	3	-.035	1	-.322	2
527		17	max	-.925	15	66.15	3	41.794	1	.017	2	0	3	.123	3
528			min	-26.564	1	-143.892	2	1.425	15	-.011	3	-.017	1	-.27	2
529		18	max	-.925	15	110.61	3	61.445	1	.017	2	.011	1	.074	3
530			min	-26.564	1	-242.57	2	2.079	15	-.011	3	0	10	-.162	2
531		19	max	-.925	15	155.071	3	81.096	1	.017	2	.051	1	0	2
532			min	-26.564	1	-341.248	2	2.734	15	-.011	3	.002	15	0	3
533	M15	1	max	0	1	1.025	3	.079	3	0	1	0	1	0	1
534			min	-61.419	3	0	1	0	1	0	3	0	3	0	1
535		2	max	0	1	.911	3	.079	3	0	1	0	1	0	1
536			min	-61.478	3	0	1	0	1	0	3	0	3	0	3
537		3	max	0	1	.798	3	.079	3	0	1	0	1	0	1
538			min	-61.538	3	0	1	0	1	0	3	0	3	0	3
539		4	max	0	1	.684	3	.079	3	0	1	0	1	0	1
540			min	-61.598	3	0	1	0	1	0	3	0	3	0	3
541		5	max	0	1	.57	3	.079	3	0	1	0	1	0	1
542			min	-61.657	3	0	1	0	1	0	3	0	3	-.001	3
543		6	max	0	1	.456	3	.079	3	0	1	0	1	0	1
544			min	-61.717	3	0	1	0	1	0	3	0	3	-.001	3
545		7	max	0	1	.342	3	.079	3	0	1	0	3	0	1
546			min	-61.777	3	0	1	0	1	0	3	0	1	-.001	3
547		8	max	0	1	.228	3	.079	3	0	1	0	3	0	1
548			min	-61.836	3	0	1	0	1	0	3	0	1	-.001	3
549		9	max	0	1	.114	3	.079	3	0	1	0	3	0	1
550			min	-61.896	3	0	1	0	1	0	3	0	1	-.001	3

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
551		10	max	0	1	0	1	.079	3	0	1	0	3	0	1
552			min	-61.956	3	0	1	0	1	0	3	0	1	-.001	3
553		11	max	0	1	0	1	.079	3	0	1	0	3	0	1
554			min	-62.015	3	-.114	3	0	1	0	3	0	1	-.001	3
555		12	max	0	1	0	1	.079	3	0	1	0	3	0	1
556			min	-62.075	3	-.228	3	0	1	0	3	0	1	-.001	3
557		13	max	0	1	0	1	.079	3	0	1	0	3	0	1
558			min	-62.135	3	-.342	3	0	1	0	3	0	1	-.001	3
559		14	max	0	1	0	1	.079	3	0	1	0	3	0	1
560			min	-62.194	3	-.456	3	0	1	0	3	0	1	-.001	3
561		15	max	0	1	0	1	.079	3	0	1	0	3	0	1
562			min	-62.254	3	-.57	3	0	1	0	3	0	1	-.001	3
563		16	max	0	1	0	1	.079	3	0	1	0	3	0	1
564			min	-62.314	3	-.684	3	0	1	0	3	0	1	0	3
565		17	max	0	1	0	1	.079	3	0	1	0	3	0	1
566			min	-62.373	3	-.798	3	0	1	0	3	0	1	0	3
567		18	max	0	1	0	1	.079	3	0	1	0	3	0	1
568			min	-62.433	3	-.911	3	0	1	0	3	0	1	0	3
569		19	max	0	1	0	1	.079	3	0	1	0	3	0	1
570			min	-62.493	3	-1.025	3	0	1	0	3	0	1	0	1
571	M16A	1	max	0	2	1.755	4	.036	1	0	3	0	3	0	1
572			min	-61.557	3	0	2	-.036	3	0	1	0	1	0	1
573		2	max	0	2	1.56	4	.036	1	0	3	0	3	0	2
574			min	-61.498	3	0	2	-.036	3	0	1	0	1	0	4
575		3	max	0	2	1.365	4	.036	1	0	3	0	3	0	2
576			min	-61.438	3	0	2	-.036	3	0	1	0	1	0	4
577		4	max	0	2	1.17	4	.036	1	0	3	0	3	0	2
578			min	-61.378	3	0	2	-.036	3	0	1	0	1	-.001	4
579		5	max	0	2	.975	4	.036	1	0	3	0	3	0	2
580			min	-61.319	3	0	2	-.036	3	0	1	0	1	-.002	4
581		6	max	0	2	.78	4	.036	1	0	3	0	3	0	2
582			min	-61.259	3	0	2	-.036	3	0	1	0	1	-.002	4
583		7	max	0	2	.585	4	.036	1	0	3	0	3	0	2
584			min	-61.199	3	0	2	-.036	3	0	1	0	1	-.002	4
585		8	max	0	2	.39	4	.036	1	0	3	0	3	0	2
586			min	-61.14	3	0	2	-.036	3	0	1	0	1	-.002	4
587		9	max	0	2	.195	4	.036	1	0	3	0	3	0	2
588			min	-61.08	3	0	2	-.036	3	0	1	0	1	-.002	4
589		10	max	0	2	0	1	.036	1	0	3	0	3	0	2
590			min	-61.02	3	0	1	-.036	3	0	1	0	1	-.003	4
591		11	max	0	2	0	2	.036	1	0	3	0	3	0	2
592			min	-60.961	3	-.195	4	-.036	3	0	1	0	1	-.002	4
593		12	max	0	2	0	2	.036	1	0	3	0	3	0	2
594			min	-60.901	3	-.39	4	-.036	3	0	1	0	1	-.002	4
595		13	max	.062	13	0	2	.036	1	0	3	0	1	0	2
596			min	-60.841	3	-.585	4	-.036	3	0	1	0	4	-.002	4
597		14	max	.144	13	0	2	.036	1	0	3	0	1	0	2
598			min	-60.782	3	-.78	4	-.036	3	0	1	0	3	-.002	4
599		15	max	.226	13	0	2	.036	1	0	3	0	1	0	2
600			min	-60.722	3	-.975	4	-.036	3	0	1	0	3	-.002	4
601		16	max	.308	13	0	2	.036	1	0	3	0	1	0	2
602			min	-60.662	3	-1.17	4	-.036	3	0	1	0	3	-.001	4
603		17	max	.39	13	0	2	.036	1	0	3	0	1	0	2
604			min	-60.603	3	-1.365	4	-.036	3	0	1	0	3	0	4
605		18	max	.473	13	0	2	.036	1	0	3	0	1	0	2
606			min	-60.543	3	-1.56	4	-.036	3	0	1	0	3	0	4
607		19	max	.555	13	0	2	.036	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	-60.483	3	-1.755	4	-.036	3	0	1	0	3	0	1

Envelope Member Section Deflections

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
1	M2	1	max	.002	1	.007	2	.005	1	-1.311e-5	15	NC	3	NC	2
2			min	-.003	3	-.007	3	-.001	3	-3.803e-4	1	4502.178	2	6806.33	1
3		2	max	.002	1	.007	2	.005	1	-1.257e-5	15	NC	3	NC	2
4			min	-.003	3	-.006	3	-.001	3	-3.646e-4	1	4884.721	2	7368.337	1
5		3	max	.002	1	.006	2	.004	1	-1.204e-5	15	NC	3	NC	2
6			min	-.003	3	-.006	3	-.001	3	-3.49e-4	1	5334.752	2	8030.415	1
7		4	max	.002	1	.006	2	.004	1	-1.151e-5	15	NC	3	NC	2
8			min	-.002	3	-.006	3	0	3	-3.334e-4	1	5867.761	2	8816.926	1
9		5	max	.002	1	.005	2	.003	1	-1.097e-5	15	NC	1	NC	2
10			min	-.002	3	-.005	3	0	3	-3.178e-4	1	6504.166	2	9760.409	1
11		6	max	.002	1	.005	2	.003	1	-1.044e-5	15	NC	1	NC	1
12			min	-.002	3	-.005	3	0	3	-3.021e-4	1	7271.321	2	NC	1
13		7	max	.001	1	.004	2	.003	1	-9.907e-6	15	NC	1	NC	1
14			min	-.002	3	-.005	3	0	3	-2.865e-4	1	8206.564	2	NC	1
15		8	max	.001	1	.004	2	.002	1	-9.373e-6	15	NC	1	NC	1
16			min	-.002	3	-.005	3	0	3	-2.709e-4	1	9361.979	2	NC	1
17		9	max	.001	1	.003	2	.002	1	-8.84e-6	15	NC	1	NC	1
18			min	-.002	3	-.004	3	0	3	-2.553e-4	1	NC	1	NC	1
19		10	max	.001	1	.003	2	.002	1	-8.306e-6	15	NC	1	NC	1
20			min	-.001	3	-.004	3	0	3	-2.396e-4	1	NC	1	NC	1
21		11	max	0	1	.002	2	.001	1	-7.773e-6	15	NC	1	NC	1
22			min	-.001	3	-.004	3	0	3	-2.24e-4	1	NC	1	NC	1
23		12	max	0	1	.002	2	.001	1	-7.239e-6	15	NC	1	NC	1
24			min	-.001	3	-.003	3	0	3	-2.084e-4	1	NC	1	NC	1
25		13	max	0	1	.001	2	0	1	-6.706e-6	15	NC	1	NC	1
26			min	0	3	-.003	3	0	3	-1.928e-4	1	NC	1	NC	1
27		14	max	0	1	.001	2	0	1	-6.172e-6	15	NC	1	NC	1
28			min	0	3	-.002	3	0	3	-1.771e-4	1	NC	1	NC	1
29		15	max	0	1	0	2	0	1	-5.639e-6	15	NC	1	NC	1
30			min	0	3	-.002	3	0	3	-1.615e-4	1	NC	1	NC	1
31		16	max	0	1	0	2	0	1	-5.105e-6	15	NC	1	NC	1
32			min	0	3	-.002	3	0	3	-1.459e-4	1	NC	1	NC	1
33		17	max	0	1	0	2	0	1	-4.572e-6	15	NC	1	NC	1
34			min	0	3	-.001	3	0	3	-1.303e-4	1	NC	1	NC	1
35		18	max	0	1	0	2	0	1	-3.928e-6	10	NC	1	NC	1
36			min	0	3	0	3	0	3	-1.146e-4	1	NC	1	NC	1
37		19	max	0	1	0	1	0	1	-3.138e-6	10	NC	1	NC	1
38			min	0	1	0	1	0	1	-9.9e-5	1	NC	1	NC	1
39	M3	1	max	0	1	0	1	0	1	4.55e-5	1	NC	1	NC	1
40			min	0	1	0	1	0	1	1.45e-6	10	NC	1	NC	1
41		2	max	0	3	0	2	0	10	5.807e-5	1	NC	1	NC	1
42			min	0	2	0	3	0	1	2.037e-6	15	NC	1	NC	1
43		3	max	0	3	0	2	0	10	7.063e-5	1	NC	1	NC	1
44			min	0	2	-.002	3	0	1	2.464e-6	15	NC	1	NC	1
45		4	max	0	3	0	2	0	10	8.32e-5	1	NC	1	NC	1
46			min	0	2	-.002	3	0	1	2.89e-6	15	NC	1	NC	1
47		5	max	0	3	0	2	0	3	9.577e-5	1	NC	1	NC	1
48			min	0	2	-.003	3	0	1	3.317e-6	15	NC	1	NC	1
49		6	max	0	3	0	2	0	3	1.083e-4	1	NC	1	NC	1
50			min	0	2	-.004	3	0	1	3.744e-6	15	NC	1	NC	1
51		7	max	0	3	0	2	0	3	1.209e-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	4.171e-6	15	NC	1	NC	1
53		8	max	0	3	.001	2	0	2	1.335e-4	1	NC	1	NC	1
54			min	0	2	-.005	3	0	9	4.598e-6	15	NC	1	NC	1
55		9	max	0	3	.001	2	0	2	1.46e-4	1	NC	1	NC	1
56			min	0	2	-.006	3	0	9	5.025e-6	15	NC	1	NC	1
57		10	max	0	3	.002	2	0	2	1.586e-4	1	NC	1	NC	1
58			min	0	2	-.006	3	0	15	5.451e-6	15	NC	1	NC	1
59		11	max	0	3	.002	2	0	1	1.712e-4	1	NC	1	NC	1
60			min	0	2	-.007	3	0	15	5.878e-6	15	NC	1	NC	1
61		12	max	0	3	.003	2	0	1	1.838e-4	1	NC	1	NC	1
62			min	0	2	-.007	3	0	15	6.305e-6	15	NC	1	NC	1
63		13	max	0	3	.004	2	0	1	1.963e-4	1	NC	1	NC	1
64			min	0	2	-.007	3	0	15	6.732e-6	15	NC	1	NC	1
65		14	max	0	3	.004	2	.001	1	2.089e-4	1	NC	1	NC	1
66			min	0	2	-.007	3	0	15	7.159e-6	15	NC	1	NC	1
67		15	max	0	3	.005	2	.002	1	2.215e-4	1	NC	1	NC	1
68			min	0	2	-.008	3	0	15	7.586e-6	15	8702.481	2	NC	1
69		16	max	0	3	.006	2	.002	1	2.34e-4	1	NC	1	NC	1
70			min	0	2	-.008	3	0	15	8.012e-6	15	7416.163	2	NC	1
71		17	max	0	3	.007	2	.002	1	2.466e-4	1	NC	3	NC	1
72			min	0	2	-.008	3	0	15	8.439e-6	15	6410.811	2	NC	1
73		18	max	0	3	.008	2	.002	1	2.592e-4	1	NC	3	NC	1
74			min	0	2	-.008	3	0	15	8.866e-6	15	5617.799	2	NC	1
75		19	max	0	3	.009	2	.003	1	2.717e-4	1	NC	3	NC	1
76			min	0	2	-.008	3	0	15	9.293e-6	15	4987.748	2	NC	1
77	M4	1	max	.002	1	.008	2	0	15	-1.132e-5	15	NC	1	NC	2
78			min	0	3	-.007	3	-.002	1	-3.267e-4	1	NC	1	9744.889	1
79		2	max	.002	1	.008	2	0	15	-1.132e-5	15	NC	1	NC	1
80			min	0	3	-.006	3	-.002	1	-3.267e-4	1	NC	1	NC	1
81		3	max	.002	1	.007	2	0	15	-1.132e-5	15	NC	1	NC	1
82			min	0	3	-.006	3	-.002	1	-3.267e-4	1	NC	1	NC	1
83		4	max	.001	1	.007	2	0	15	-1.132e-5	15	NC	1	NC	1
84			min	0	3	-.006	3	-.001	1	-3.267e-4	1	NC	1	NC	1
85		5	max	.001	1	.007	2	0	15	-1.132e-5	15	NC	1	NC	1
86			min	0	3	-.005	3	-.001	1	-3.267e-4	1	NC	1	NC	1
87		6	max	.001	1	.006	2	0	15	-1.132e-5	15	NC	1	NC	1
88			min	0	3	-.005	3	-.001	1	-3.267e-4	1	NC	1	NC	1
89		7	max	.001	1	.006	2	0	15	-1.132e-5	15	NC	1	NC	1
90			min	0	3	-.005	3	-.001	1	-3.267e-4	1	NC	1	NC	1
91		8	max	.001	1	.005	2	0	15	-1.132e-5	15	NC	1	NC	1
92			min	0	3	-.004	3	0	1	-3.267e-4	1	NC	1	NC	1
93		9	max	0	1	.005	2	0	15	-1.132e-5	15	NC	1	NC	1
94			min	0	3	-.004	3	0	1	-3.267e-4	1	NC	1	NC	1
95		10	max	0	1	.004	2	0	15	-1.132e-5	15	NC	1	NC	1
96			min	0	3	-.003	3	0	1	-3.267e-4	1	NC	1	NC	1
97		11	max	0	1	.004	2	0	15	-1.132e-5	15	NC	1	NC	1
98			min	0	3	-.003	3	0	1	-3.267e-4	1	NC	1	NC	1
99		12	max	0	1	.003	2	0	15	-1.132e-5	15	NC	1	NC	1
100			min	0	3	-.003	3	0	1	-3.267e-4	1	NC	1	NC	1
101		13	max	0	1	.003	2	0	15	-1.132e-5	15	NC	1	NC	1
102			min	0	3	-.002	3	0	1	-3.267e-4	1	NC	1	NC	1
103		14	max	0	1	.002	2	0	15	-1.132e-5	15	NC	1	NC	1
104			min	0	3	-.002	3	0	1	-3.267e-4	1	NC	1	NC	1
105		15	max	0	1	.002	2	0	15	-1.132e-5	15	NC	1	NC	1
106			min	0	3	-.002	3	0	1	-3.267e-4	1	NC	1	NC	1
107		16	max	0	1	.001	2	0	15	-1.132e-5	15	NC	1	NC	1
108			min	0	3	-.001	3	0	1	-3.267e-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	-1.132e-5	15	NC	1	NC	1
110			min	0	3	0	3	0	1	-3.267e-4	1	NC	1	NC	1
111		18	max	0	1	0	2	0	15	-1.132e-5	15	NC	1	NC	1
112			min	0	3	0	3	0	1	-3.267e-4	1	NC	1	NC	1
113		19	max	0	1	0	1	0	1	-1.132e-5	15	NC	1	NC	1
114			min	0	1	0	1	0	1	-3.267e-4	1	NC	1	NC	1
115	M6	1	max	.007	1	.021	2	.002	1	2.817e-4	3	NC	3	NC	1
116			min	-.009	3	-.017	3	-.004	3	-8.042e-8	2	1601.821	2	8801.94	3
117		2	max	.007	1	.019	2	.002	1	2.744e-4	3	NC	3	NC	1
118			min	-.009	3	-.016	3	-.004	3	-7.602e-8	2	1712.743	2	9416.113	3
119		3	max	.006	1	.018	2	.002	1	2.672e-4	3	NC	3	NC	1
120			min	-.008	3	-.015	3	-.003	3	-7.162e-8	2	1839.705	2	NC	1
121		4	max	.006	1	.017	2	.001	1	2.6e-4	3	NC	3	NC	1
122			min	-.008	3	-.014	3	-.003	3	-3.862e-7	11	1985.937	2	NC	1
123		5	max	.005	1	.015	2	.001	1	2.528e-4	3	NC	3	NC	1
124			min	-.007	3	-.014	3	-.003	3	-2.231e-6	1	2155.607	2	NC	1
125		6	max	.005	1	.014	2	.001	1	2.455e-4	3	NC	3	NC	1
126			min	-.007	3	-.013	3	-.003	3	-5.561e-6	1	2354.171	2	NC	1
127		7	max	.005	1	.013	2	.001	1	2.383e-4	3	NC	3	NC	1
128			min	-.006	3	-.012	3	-.002	3	-8.891e-6	1	2588.916	2	NC	1
129		8	max	.004	1	.012	2	0	1	2.311e-4	3	NC	3	NC	1
130			min	-.006	3	-.011	3	-.002	3	-1.222e-5	1	2869.789	2	NC	1
131		9	max	.004	1	.01	2	0	1	2.238e-4	3	NC	3	NC	1
132			min	-.005	3	-.01	3	-.002	3	-1.555e-5	1	3210.728	2	NC	1
133		10	max	.004	1	.009	2	0	1	2.166e-4	3	NC	3	NC	1
134			min	-.005	3	-.009	3	-.002	3	-1.888e-5	1	3631.874	2	NC	1
135		11	max	.003	1	.008	2	0	1	2.094e-4	3	NC	3	NC	1
136			min	-.004	3	-.008	3	-.001	3	-2.221e-5	1	4163.453	2	NC	1
137		12	max	.003	1	.007	2	0	1	2.022e-4	3	NC	3	NC	1
138			min	-.004	3	-.007	3	-.001	3	-2.554e-5	1	4852.97	2	NC	1
139		13	max	.002	1	.006	2	0	1	1.949e-4	3	NC	3	NC	1
140			min	-.003	3	-.006	3	0	3	-2.887e-5	1	5779.616	2	NC	1
141		14	max	.002	1	.005	2	0	1	1.877e-4	3	NC	3	NC	1
142			min	-.003	3	-.005	3	0	3	-3.22e-5	1	7085.941	2	NC	1
143		15	max	.002	1	.004	2	0	1	1.805e-4	3	NC	1	NC	1
144			min	-.002	3	-.004	3	0	3	-3.553e-5	1	9057.052	2	NC	1
145		16	max	.001	1	.003	2	0	1	1.732e-4	3	NC	1	NC	1
146			min	-.002	3	-.003	3	0	3	-3.886e-5	1	NC	1	NC	1
147		17	max	0	1	.002	2	0	1	1.66e-4	3	NC	1	NC	1
148			min	-.001	3	-.002	3	0	3	-4.219e-5	1	NC	1	NC	1
149		18	max	0	1	0	2	0	1	1.588e-4	3	NC	1	NC	1
150			min	0	3	-.001	3	0	3	-4.552e-5	1	NC	1	NC	1
151		19	max	0	1	0	1	0	1	1.515e-4	3	NC	1	NC	1
152			min	0	1	0	1	0	1	-4.885e-5	1	NC	1	NC	1
153	M7	1	max	0	1	0	1	0	1	2.229e-5	1	NC	1	NC	1
154			min	0	1	0	1	0	1	-6.934e-5	3	NC	1	NC	1
155		2	max	0	3	.001	2	0	3	1.963e-5	1	NC	1	NC	1
156			min	0	2	-.002	3	0	1	-5.34e-5	3	NC	1	NC	1
157		3	max	0	3	.002	2	0	3	1.697e-5	1	NC	1	NC	1
158			min	0	2	-.003	3	0	1	-3.747e-5	3	NC	1	NC	1
159		4	max	0	3	.003	2	0	3	1.431e-5	1	NC	1	NC	1
160			min	0	2	-.005	3	0	1	-2.153e-5	3	NC	1	NC	1
161		5	max	0	3	.004	2	.001	3	1.165e-5	1	NC	1	NC	1
162			min	0	2	-.006	3	0	1	-5.591e-6	3	NC	1	NC	1
163		6	max	0	3	.005	2	.001	3	1.035e-5	3	NC	1	NC	1
164			min	-.001	2	-.007	3	0	1	0	2	8658.808	2	NC	1
165		7	max	0	3	.006	2	.002	3	2.628e-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	0	2	7179.139	2	NC	1
167		8	max	.001	3	.008	2	.002	3	4.222e-5	3	NC	3	NC	1
168			min	-.001	2	-.01	3	0	1	-6.477e-7	9	6088.474	2	NC	1
169		9	max	.001	3	.009	2	.002	3	5.816e-5	3	NC	3	NC	1
170			min	-.002	2	-.011	3	0	1	-2.775e-6	9	5246.375	2	NC	1
171		10	max	.001	3	.01	2	.002	3	7.409e-5	3	NC	3	NC	1
172			min	-.002	2	-.012	3	0	1	-4.903e-6	9	4575.022	2	NC	1
173		11	max	.002	3	.011	2	.002	3	9.003e-5	3	NC	3	NC	1
174			min	-.002	2	-.014	3	0	1	-7.03e-6	9	4027.591	2	NC	1
175		12	max	.002	3	.013	2	.002	3	1.06e-4	3	NC	3	NC	1
176			min	-.002	2	-.015	3	0	1	-9.158e-6	9	3573.959	2	NC	1
177		13	max	.002	3	.014	2	.002	3	1.219e-4	3	NC	3	NC	1
178			min	-.002	2	-.015	3	0	1	-1.129e-5	9	3193.635	2	NC	1
179		14	max	.002	3	.016	2	.002	3	1.378e-4	3	NC	3	NC	1
180			min	-.003	2	-.016	3	0	1	-1.341e-5	9	2872.021	2	NC	1
181		15	max	.002	3	.018	2	.002	3	1.538e-4	3	NC	3	NC	1
182			min	-.003	2	-.017	3	0	1	-1.554e-5	9	2598.313	2	NC	1
183		16	max	.002	3	.019	2	.002	3	1.697e-4	3	NC	3	NC	1
184			min	-.003	2	-.018	3	-.001	1	-1.767e-5	9	2364.269	2	NC	1
185		17	max	.002	3	.021	2	.002	3	1.857e-4	3	NC	3	NC	1
186			min	-.003	2	-.019	3	-.001	1	-2.029e-5	1	2163.454	2	NC	1
187		18	max	.003	3	.023	2	.002	3	2.016e-4	3	NC	3	NC	1
188			min	-.003	2	-.019	3	-.001	1	-2.295e-5	1	1990.757	2	NC	1
189		19	max	.003	3	.025	2	.002	3	2.175e-4	3	NC	3	NC	1
190			min	-.004	2	-.02	3	-.001	1	-2.561e-5	1	1842.069	2	NC	1
191	M8	1	max	.005	1	.024	2	.001	1	-7.887e-8	10	NC	1	NC	1
192			min	-.001	3	-.018	3	-.001	3	-1.668e-4	3	NC	1	NC	1
193		2	max	.005	1	.022	2	0	1	-7.887e-8	10	NC	1	NC	1
194			min	-.001	3	-.017	3	-.001	3	-1.668e-4	3	NC	1	NC	1
195		3	max	.005	1	.021	2	0	1	-7.887e-8	10	NC	1	NC	1
196			min	-.001	3	-.016	3	-.001	3	-1.668e-4	3	NC	1	NC	1
197		4	max	.004	1	.02	2	0	1	-7.887e-8	10	NC	1	NC	1
198			min	-.001	3	-.015	3	0	3	-1.668e-4	3	NC	1	NC	1
199		5	max	.004	1	.018	2	0	1	-7.887e-8	10	NC	1	NC	1
200			min	0	3	-.014	3	0	3	-1.668e-4	3	NC	1	NC	1
201		6	max	.004	1	.017	2	0	1	-7.887e-8	10	NC	1	NC	1
202			min	0	3	-.013	3	0	3	-1.668e-4	3	NC	1	NC	1
203		7	max	.003	1	.016	2	0	1	-7.887e-8	10	NC	1	NC	1
204			min	0	3	-.012	3	0	3	-1.668e-4	3	NC	1	NC	1
205		8	max	.003	1	.014	2	0	1	-7.887e-8	10	NC	1	NC	1
206			min	0	3	-.011	3	0	3	-1.668e-4	3	NC	1	NC	1
207		9	max	.003	1	.013	2	0	1	-7.887e-8	10	NC	1	NC	1
208			min	0	3	-.01	3	0	3	-1.668e-4	3	NC	1	NC	1
209		10	max	.003	1	.012	2	0	1	-7.887e-8	10	NC	1	NC	1
210			min	0	3	-.009	3	0	3	-1.668e-4	3	NC	1	NC	1
211		11	max	.002	1	.011	2	0	1	-7.887e-8	10	NC	1	NC	1
212			min	0	3	-.008	3	0	3	-1.668e-4	3	NC	1	NC	1
213		12	max	.002	1	.009	2	0	1	-7.887e-8	10	NC	1	NC	1
214			min	0	3	-.007	3	0	3	-1.668e-4	3	NC	1	NC	1
215		13	max	.002	1	.008	2	0	1	-7.887e-8	10	NC	1	NC	1
216			min	0	3	-.006	3	0	3	-1.668e-4	3	NC	1	NC	1
217		14	max	.001	1	.007	2	0	1	-7.887e-8	10	NC	1	NC	1
218			min	0	3	-.005	3	0	3	-1.668e-4	3	NC	1	NC	1
219		15	max	.001	1	.005	2	0	1	-7.887e-8	10	NC	1	NC	1
220			min	0	3	-.004	3	0	3	-1.668e-4	3	NC	1	NC	1
221		16	max	0	1	.004	2	0	1	-7.887e-8	10	NC	1	NC	1
222			min	0	3	-.003	3	0	3	-1.668e-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	-7.887e-8	10	NC	1	NC	1
224			min	0	3	-.002	3	0	3	-1.668e-4	3	NC	1	NC	1
225		18	max	0	1	.001	2	0	1	-7.887e-8	10	NC	1	NC	1
226			min	0	3	0	3	0	3	-1.668e-4	3	NC	1	NC	1
227		19	max	0	1	0	1	0	1	-7.887e-8	10	NC	1	NC	1
228			min	0	1	0	1	0	1	-1.668e-4	3	NC	1	NC	1
229	M10	1	max	.002	1	.007	2	0	3	3.985e-4	1	NC	3	NC	1
230			min	-.003	3	-.007	3	-.001	1	-3.513e-4	3	4508.958	2	NC	1
231		2	max	.002	1	.007	2	0	3	3.785e-4	1	NC	3	NC	1
232			min	-.003	3	-.006	3	-.001	1	-3.405e-4	3	4892.219	2	NC	1
233		3	max	.002	1	.006	2	0	3	3.584e-4	1	NC	3	NC	1
234			min	-.002	3	-.006	3	-.001	1	-3.298e-4	3	5343.121	2	NC	1
235		4	max	.002	1	.006	2	0	3	3.384e-4	1	NC	3	NC	1
236			min	-.002	3	-.006	3	-.001	1	-3.19e-4	3	5877.192	2	NC	1
237		5	max	.002	1	.005	2	0	3	3.183e-4	1	NC	1	NC	1
238			min	-.002	3	-.006	3	0	1	-3.083e-4	3	6514.906	2	NC	1
239		6	max	.002	1	.005	2	0	3	2.983e-4	1	NC	1	NC	1
240			min	-.002	3	-.005	3	0	1	-2.976e-4	3	7283.692	2	NC	1
241		7	max	.001	1	.004	2	0	3	2.782e-4	1	NC	1	NC	1
242			min	-.002	3	-.005	3	0	1	-2.868e-4	3	8220.99	2	NC	1
243		8	max	.001	1	.004	2	0	3	2.582e-4	1	NC	1	NC	1
244			min	-.002	3	-.005	3	0	1	-2.761e-4	3	9379.036	2	NC	1
245		9	max	.001	1	.003	2	0	3	2.381e-4	1	NC	1	NC	1
246			min	-.001	3	-.004	3	0	1	-2.653e-4	3	NC	1	NC	1
247		10	max	.001	1	.003	2	0	3	2.181e-4	1	NC	1	NC	1
248			min	-.001	3	-.004	3	0	1	-2.546e-4	3	NC	1	NC	1
249		11	max	0	1	.002	2	0	3	1.98e-4	1	NC	1	NC	1
250			min	-.001	3	-.004	3	0	1	-2.439e-4	3	NC	1	NC	1
251		12	max	0	1	.002	2	0	3	1.78e-4	1	NC	1	NC	1
252			min	-.001	3	-.003	3	0	1	-2.331e-4	3	NC	1	NC	1
253		13	max	0	1	.001	2	0	3	1.579e-4	1	NC	1	NC	1
254			min	0	3	-.003	3	0	1	-2.224e-4	3	NC	1	NC	1
255		14	max	0	1	.001	2	0	3	1.379e-4	1	NC	1	NC	1
256			min	0	3	-.002	3	0	1	-2.116e-4	3	NC	1	NC	1
257		15	max	0	1	0	2	0	3	1.178e-4	1	NC	1	NC	1
258			min	0	3	-.002	3	0	1	-2.009e-4	3	NC	1	NC	1
259		16	max	0	1	0	2	0	3	9.778e-5	1	NC	1	NC	1
260			min	0	3	-.002	3	0	1	-1.902e-4	3	NC	1	NC	1
261		17	max	0	1	0	2	0	3	7.773e-5	1	NC	1	NC	1
262			min	0	3	-.001	3	0	1	-1.794e-4	3	NC	1	NC	1
263		18	max	0	1	0	2	0	3	5.768e-5	1	NC	1	NC	1
264			min	0	3	0	3	0	1	-1.687e-4	3	NC	1	NC	1
265		19	max	0	1	0	1	0	1	3.762e-5	1	NC	1	NC	1
266			min	0	1	0	1	0	1	-1.579e-4	3	NC	1	NC	1
267	M11	1	max	0	1	0	1	0	1	7.275e-5	3	NC	1	NC	1
268			min	0	1	0	1	0	1	-1.769e-5	1	NC	1	NC	1
269		2	max	0	3	0	2	0	1	5.658e-5	3	NC	1	NC	1
270			min	0	2	0	3	0	3	-3.596e-5	1	NC	1	NC	1
271		3	max	0	3	0	2	0	2	4.041e-5	3	NC	1	NC	1
272			min	0	2	-.002	3	0	3	-5.423e-5	1	NC	1	NC	1
273		4	max	0	3	0	2	0	2	2.424e-5	3	NC	1	NC	1
274			min	0	2	-.002	3	0	3	-7.25e-5	1	NC	1	NC	1
275		5	max	0	3	0	2	0	2	8.068e-6	3	NC	1	NC	1
276			min	0	2	-.003	3	-.001	3	-9.077e-5	1	NC	1	NC	1
277		6	max	0	3	0	2	0	2	-3.794e-6	15	NC	1	NC	1
278			min	0	2	-.004	3	-.001	3	-1.09e-4	1	NC	1	NC	1
279		7	max	0	3	0	2	0	10	-4.44e-6	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	3	-1.273e-4	1	NC	1	NC	1
281		8	max	0	3	.001	2	0	10	-5.086e-6	15	NC	1	NC	1
282			min	0	2	-.005	3	-.002	3	-1.456e-4	1	NC	1	NC	1
283		9	max	0	3	.001	2	0	10	-5.733e-6	15	NC	1	NC	1
284			min	0	2	-.006	3	-.002	3	-1.639e-4	1	NC	1	NC	1
285		10	max	0	3	.002	2	0	10	-6.379e-6	15	NC	1	NC	1
286			min	0	2	-.006	3	-.002	3	-1.821e-4	1	NC	1	NC	1
287		11	max	0	3	.002	2	0	10	-7.025e-6	15	NC	1	NC	1
288			min	0	2	-.007	3	-.002	3	-2.004e-4	1	NC	1	NC	1
289		12	max	0	3	.003	2	0	10	-7.672e-6	15	NC	1	NC	1
290			min	0	2	-.007	3	-.002	1	-2.187e-4	1	NC	1	NC	1
291		13	max	0	3	.004	2	0	10	-8.318e-6	15	NC	1	NC	1
292			min	0	2	-.007	3	-.003	1	-2.369e-4	1	NC	1	NC	1
293		14	max	0	3	.004	2	0	10	-8.964e-6	15	NC	1	NC	1
294			min	0	2	-.008	3	-.003	1	-2.552e-4	1	NC	1	NC	1
295		15	max	0	3	.005	2	0	10	-9.61e-6	15	NC	1	NC	1
296			min	0	2	-.008	3	-.003	1	-2.735e-4	1	8714.444	2	NC	1
297		16	max	0	3	.006	2	0	10	-1.026e-5	15	NC	1	NC	1
298			min	0	2	-.008	3	-.004	1	-2.918e-4	1	7425.325	2	NC	1
299		17	max	0	3	.007	2	0	10	-1.09e-5	15	NC	3	NC	1
300			min	0	2	-.008	3	-.004	1	-3.1e-4	1	6418.005	2	NC	1
301		18	max	0	3	.008	2	0	10	-1.155e-5	15	NC	3	NC	1
302			min	0	2	-.008	3	-.005	1	-3.283e-4	1	5623.588	2	NC	1
303		19	max	0	3	.009	2	0	10	-1.22e-5	15	NC	3	NC	2
304			min	0	2	-.008	3	-.005	1	-3.466e-4	1	4992.519	2	9550.286	1
305	M12	1	max	.002	1	.008	2	.004	1	3.027e-4	1	NC	1	NC	2
306			min	0	3	-.007	3	0	10	1.058e-5	15	NC	1	4736.794	1
307		2	max	.002	1	.008	2	.004	1	3.027e-4	1	NC	1	NC	2
308			min	0	3	-.006	3	0	10	1.058e-5	15	NC	1	5165.54	1
309		3	max	.002	1	.007	2	.003	1	3.027e-4	1	NC	1	NC	2
310			min	0	3	-.006	3	0	10	1.058e-5	15	NC	1	5675.905	1
311		4	max	.001	1	.007	2	.003	1	3.027e-4	1	NC	1	NC	2
312			min	0	3	-.006	3	0	10	1.058e-5	15	NC	1	6289.401	1
313		5	max	.001	1	.007	2	.003	1	3.027e-4	1	NC	1	NC	2
314			min	0	3	-.005	3	0	10	1.058e-5	15	NC	1	7035.334	1
315		6	max	.001	1	.006	2	.002	1	3.027e-4	1	NC	1	NC	2
316			min	0	3	-.005	3	0	10	1.058e-5	15	NC	1	7954.462	1
317		7	max	.001	1	.006	2	.002	1	3.027e-4	1	NC	1	NC	2
318			min	0	3	-.005	3	0	10	1.058e-5	15	NC	1	9104.845	1
319		8	max	.001	1	.005	2	.002	1	3.027e-4	1	NC	1	NC	1
320			min	0	3	-.004	3	0	10	1.058e-5	15	NC	1	NC	1
321		9	max	0	1	.005	2	.002	1	3.027e-4	1	NC	1	NC	1
322			min	0	3	-.004	3	0	10	1.058e-5	15	NC	1	NC	1
323		10	max	0	1	.004	2	.001	1	3.027e-4	1	NC	1	NC	1
324			min	0	3	-.003	3	0	10	1.058e-5	15	NC	1	NC	1
325		11	max	0	1	.004	2	.001	1	3.027e-4	1	NC	1	NC	1
326			min	0	3	-.003	3	0	10	1.058e-5	15	NC	1	NC	1
327		12	max	0	1	.003	2	0	1	3.027e-4	1	NC	1	NC	1
328			min	0	3	-.003	3	0	10	1.058e-5	15	NC	1	NC	1
329		13	max	0	1	.003	2	0	1	3.027e-4	1	NC	1	NC	1
330			min	0	3	-.002	3	0	10	1.058e-5	15	NC	1	NC	1
331		14	max	0	1	.002	2	0	1	3.027e-4	1	NC	1	NC	1
332			min	0	3	-.002	3	0	10	1.058e-5	15	NC	1	NC	1
333		15	max	0	1	.002	2	0	1	3.027e-4	1	NC	1	NC	1
334			min	0	3	-.002	3	0	10	1.058e-5	15	NC	1	NC	1
335		16	max	0	1	.001	2	0	1	3.027e-4	1	NC	1	NC	1
336			min	0	3	-.001	3	0	10	1.058e-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	3.027e-4	1	NC	1	NC	1
338			min	0	3	0	3	0	10	1.058e-5	15	NC	1	NC	1
339		18	max	0	1	0	2	0	1	3.027e-4	1	NC	1	NC	1
340			min	0	3	0	3	0	10	1.058e-5	15	NC	1	NC	1
341		19	max	0	1	0	1	0	1	3.027e-4	1	NC	1	NC	1
342			min	0	1	0	1	0	1	1.058e-5	15	NC	1	NC	1
343	M1	1	max	.006	3	.023	3	.002	3	5.372e-3	1	NC	1	NC	1
344			min	-.007	2	-.022	1	-.002	1	-6.474e-3	3	NC	1	NC	1
345		2	max	.006	3	.013	3	.002	3	2.549e-3	1	NC	4	NC	1
346			min	-.007	2	-.012	1	-.004	1	-3.182e-3	3	4558.455	2	NC	1
347		3	max	.006	3	.003	3	.001	3	4.89e-5	3	NC	4	NC	1
348			min	-.007	2	-.002	1	-.005	1	-2.215e-4	1	2349.809	2	NC	1
349		4	max	.006	3	.006	2	0	3	4.851e-5	3	NC	4	NC	1
350			min	-.007	2	-.005	3	-.006	1	-1.846e-4	1	1649.12	2	NC	1
351		5	max	.006	3	.013	2	0	3	4.812e-5	3	NC	5	NC	1
352			min	-.007	2	-.012	3	-.006	1	-1.478e-4	1	1310.368	2	NC	1
353		6	max	.006	3	.019	2	0	3	4.774e-5	3	NC	5	NC	1
354			min	-.007	2	-.017	3	-.005	1	-1.11e-4	1	1117.254	2	NC	1
355		7	max	.006	3	.024	2	0	3	4.735e-5	3	NC	5	NC	1
356			min	-.007	2	-.021	3	-.005	1	-7.412e-5	1	998.637	2	NC	1
357		8	max	.006	3	.027	2	0	3	4.696e-5	3	NC	5	NC	1
358			min	-.007	2	-.024	3	-.004	1	-3.729e-5	1	924.814	2	NC	1
359		9	max	.006	3	.029	2	0	3	4.657e-5	3	NC	5	NC	1
360			min	-.007	2	-.025	3	-.003	1	-7.781e-6	9	881.791	2	NC	1
361		10	max	.006	3	.03	2	0	3	4.618e-5	3	NC	5	NC	1
362			min	-.007	2	-.026	3	-.001	1	1.075e-6	15	862.939	2	NC	1
363		11	max	.006	3	.029	2	0	3	7.323e-5	1	NC	5	NC	1
364			min	-.007	2	-.025	3	0	9	2.367e-6	15	865.948	2	NC	1
365		12	max	.006	3	.028	2	0	1	1.101e-4	1	NC	5	NC	1
366			min	-.007	2	-.023	3	0	15	3.66e-6	15	891.945	2	NC	1
367		13	max	.006	3	.024	2	.002	1	1.469e-4	1	NC	5	NC	1
368			min	-.007	2	-.02	3	0	15	4.953e-6	15	946.059	2	NC	1
369		14	max	.006	3	.019	2	.002	1	1.837e-4	1	NC	5	NC	1
370			min	-.007	2	-.015	3	0	15	6.246e-6	15	1039.973	2	NC	1
371		15	max	.006	3	.013	2	.003	1	2.206e-4	1	NC	5	NC	1
372			min	-.007	2	-.01	3	0	15	7.539e-6	15	1199.151	2	NC	1
373		16	max	.006	3	.005	2	.003	1	2.474e-4	1	NC	4	NC	1
374			min	-.007	2	-.004	3	0	15	8.482e-6	15	1485.323	2	NC	1
375		17	max	.006	3	.003	3	.002	1	3.9e-5	3	NC	4	NC	1
376			min	-.007	2	-.004	2	0	15	1.114e-6	15	2091.58	2	NC	1
377		18	max	.006	3	.01	3	0	1	3.344e-3	2	NC	4	NC	1
378			min	-.007	2	-.015	2	0	15	-1.576e-3	3	4032.061	2	NC	1
379		19	max	.006	3	.018	3	0	3	6.714e-3	2	NC	1	NC	1
380			min	-.007	2	-.027	2	-.001	1	-3.221e-3	3	NC	1	NC	1
381	M5	1	max	.016	3	.064	3	.002	3	2.451e-6	3	NC	1	NC	1
382			min	-.02	2	-.06	1	-.002	1	0	15	NC	1	NC	1
383		2	max	.016	3	.036	3	.003	3	7.548e-5	3	NC	4	NC	1
384			min	-.02	2	-.033	1	-.002	1	-3.712e-5	1	1704.558	1	NC	1
385		3	max	.016	3	.01	3	.004	3	1.471e-4	3	NC	5	NC	1
386			min	-.02	2	-.007	1	-.002	1	-7.356e-5	1	876.129	1	NC	1
387		4	max	.016	3	.015	2	.004	3	1.44e-4	3	NC	5	NC	1
388			min	-.02	2	-.012	3	-.002	1	-6.946e-5	1	617.255	1	NC	1
389		5	max	.016	3	.034	2	.005	3	1.409e-4	3	NC	5	NC	1
390			min	-.02	2	-.03	3	-.002	1	-6.537e-5	1	489.999	2	NC	1
391		6	max	.016	3	.05	2	.005	3	1.378e-4	3	NC	5	NC	1
392			min	-.02	2	-.044	3	-.002	1	-6.128e-5	1	417.051	2	NC	1
393		7	max	.016	3	.063	2	.005	3	1.347e-4	3	NC	5	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
394			min	-.02	2	-.055	3	-.002	1	-5.718e-5	1	372.177	2	NC	1
395		8	max	.016	3	.072	2	.005	3	1.317e-4	3	NC	5	NC	1
396			min	-.02	2	-.062	3	-.002	1	-5.309e-5	1	344.158	2	NC	1
397		9	max	.016	3	.078	2	.005	3	1.286e-4	3	NC	5	NC	1
398			min	-.02	2	-.066	3	-.001	1	-4.9e-5	1	327.704	2	NC	1
399		10	max	.016	3	.08	2	.005	3	1.255e-4	3	NC	5	NC	1
400			min	-.02	2	-.067	3	-.001	1	-4.49e-5	1	320.303	2	NC	1
401		11	max	.016	3	.079	2	.004	3	1.224e-4	3	NC	5	NC	1
402			min	-.02	2	-.064	3	-.001	1	-4.081e-5	1	321.062	2	NC	1
403		12	max	.016	3	.074	2	.004	3	1.193e-4	3	NC	5	NC	1
404			min	-.02	2	-.059	3	-.001	1	-3.671e-5	1	330.378	2	NC	1
405		13	max	.016	3	.065	2	.003	3	1.162e-4	3	NC	5	NC	1
406			min	-.02	2	-.051	3	-.001	1	-3.262e-5	1	350.137	2	NC	1
407		14	max	.016	3	.052	2	.003	3	1.131e-4	3	NC	5	NC	1
408			min	-.021	2	-.04	3	-.001	1	-2.853e-5	1	384.664	2	NC	1
409		15	max	.016	3	.035	2	.002	3	1.101e-4	3	NC	5	NC	1
410			min	-.021	2	-.027	3	-.001	1	-2.443e-5	1	443.42	2	NC	1
411		16	max	.016	3	.014	2	.002	3	1.043e-4	3	NC	5	NC	1
412			min	-.021	2	-.011	3	-.001	1	-2.274e-5	1	549.43	2	NC	1
413		17	max	.016	3	.007	3	.001	3	3.497e-5	3	NC	5	NC	1
414			min	-.021	2	-.012	2	-.001	1	-7.822e-5	1	775.405	2	NC	1
415		18	max	.016	3	.027	3	0	3	1.682e-5	3	NC	4	NC	1
416			min	-.021	2	-.042	2	0	1	-4.002e-5	1	1503.99	2	NC	1
417		19	max	.016	3	.047	3	0	3	0	15	NC	1	NC	1
418			min	-.021	2	-.074	2	0	1	-3.665e-7	3	NC	1	NC	1
419	M9	1	max	.006	3	.023	3	.002	3	6.479e-3	3	NC	1	NC	1
420			min	-.007	2	-.022	1	-.002	1	-5.372e-3	1	NC	1	NC	1
421		2	max	.006	3	.013	3	0	3	3.211e-3	3	NC	4	NC	1
422			min	-.007	2	-.012	1	0	9	-2.629e-3	1	4559.216	2	NC	1
423		3	max	.006	3	.003	3	.001	1	6.214e-5	1	NC	4	NC	1
424			min	-.007	2	-.002	1	0	3	2.e-6	15	2350.214	2	NC	1
425		4	max	.006	3	.006	2	.002	1	3.569e-5	2	NC	4	NC	1
426			min	-.007	2	-.005	3	-.001	3	-4.421e-6	3	1649.42	2	NC	1
427		5	max	.006	3	.013	2	.002	1	2.493e-5	2	NC	5	NC	1
428			min	-.007	2	-.012	3	-.002	3	-1.252e-5	3	1310.62	2	NC	1
429		6	max	.006	3	.019	2	.002	1	1.417e-5	2	NC	5	NC	1
430			min	-.007	2	-.017	3	-.002	3	-2.772e-5	1	1117.479	2	NC	1
431		7	max	.006	3	.024	2	.001	1	3.413e-6	2	NC	5	NC	1
432			min	-.007	2	-.021	3	-.003	3	-5.768e-5	1	998.848	2	NC	1
433		8	max	.006	3	.027	2	0	2	-1.165e-6	10	NC	5	NC	1
434			min	-.007	2	-.024	3	-.003	3	-8.763e-5	1	925.018	2	NC	1
435		9	max	.006	3	.029	2	0	2	-2.612e-6	10	NC	5	NC	1
436			min	-.007	2	-.025	3	-.003	3	-1.176e-4	1	881.993	2	NC	1
437		10	max	.006	3	.03	2	0	2	-4.058e-6	10	NC	5	NC	1
438			min	-.007	2	-.026	3	-.003	3	-1.475e-4	1	863.144	2	NC	1
439		11	max	.006	3	.029	2	0	10	-5.505e-6	10	NC	5	NC	1
440			min	-.007	2	-.025	3	-.003	3	-1.775e-4	1	866.161	2	NC	1
441		12	max	.006	3	.028	2	0	10	-6.951e-6	10	NC	5	NC	1
442			min	-.007	2	-.023	3	-.003	1	-2.074e-4	1	892.17	2	NC	1
443		13	max	.006	3	.024	2	0	10	-8.359e-6	15	NC	5	NC	1
444			min	-.007	2	-.02	3	-.004	1	-2.374e-4	1	946.304	2	NC	1
445		14	max	.006	3	.019	2	0	10	-9.395e-6	15	NC	5	NC	1
446			min	-.007	2	-.016	3	-.005	1	-2.674e-4	1	1040.247	2	NC	1
447		15	max	.006	3	.013	2	0	10	-1.043e-5	15	NC	5	NC	1
448			min	-.007	2	-.01	3	-.005	1	-2.973e-4	1	1199.468	2	NC	1
449		16	max	.006	3	.005	2	0	10	-1.125e-5	15	NC	4	NC	1
450			min	-.007	2	-.004	3	-.005	1	-3.209e-4	1	1485.711	2	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
451		17	max	.006	3	.003	3	0	10	1.222e-6	3	NC	4	NC	1
452			min	-.007	2	-.004	2	-.004	1	-1.943e-4	1	2092.082	2	NC	1
453		18	max	.006	3	.01	3	0	10	1.597e-3	3	NC	4	NC	1
454			min	-.007	2	-.015	2	-.003	1	-3.344e-3	2	4032.989	2	NC	1
455		19	max	.006	3	.018	3	0	3	3.221e-3	3	NC	1	NC	1
456			min	-.007	2	-.027	2	0	1	-6.715e-3	2	NC	1	NC	1
457	M13	1	max	.002	1	.023	3	.006	3	4.017e-3	3	NC	1	NC	1
458			min	-.002	3	-.022	1	-.007	2	-3.847e-3	1	NC	1	NC	1
459		2	max	.002	1	.065	3	.005	9	4.748e-3	3	NC	4	NC	1
460			min	-.002	3	-.056	1	-.004	2	-4.551e-3	1	2876.239	3	NC	1
461		3	max	.002	1	.1	3	.015	1	5.478e-3	3	NC	4	NC	2
462			min	-.002	3	-.086	1	-.004	10	-5.256e-3	1	1565.891	3	6211.967	1
463		4	max	.002	1	.123	3	.023	1	6.209e-3	3	NC	5	NC	2
464			min	-.002	3	-.105	1	-.004	10	-5.961e-3	1	1198.719	3	4387.854	1
465		5	max	.002	1	.133	3	.026	1	6.94e-3	3	NC	5	NC	2
466			min	-.002	3	-.114	1	-.005	10	-6.665e-3	1	1092.038	3	3963.558	1
467		6	max	.002	1	.129	3	.022	1	7.67e-3	3	NC	5	NC	2
468			min	-.002	3	-.112	1	-.006	10	-7.37e-3	1	1131.071	3	4427.118	1
469		7	max	.002	1	.114	3	.014	9	8.401e-3	3	NC	5	NC	2
470			min	-.002	3	-.1	1	-.008	10	-8.075e-3	1	1315.375	3	6501.299	1
471		8	max	.002	1	.093	3	.012	3	9.132e-3	3	NC	4	NC	1
472			min	-.002	3	-.083	1	-.013	2	-8.779e-3	1	1710.255	3	NC	1
473		9	max	.002	1	.073	3	.014	3	9.862e-3	3	NC	4	NC	1
474			min	-.002	3	-.067	1	-.018	2	-9.484e-3	1	2392.632	3	NC	1
475		10	max	.002	1	.064	3	.016	3	1.059e-2	3	NC	4	NC	1
476			min	-.002	3	-.06	1	-.02	2	-1.019e-2	1	2939.495	3	9161.379	2
477		11	max	.002	1	.073	3	.018	3	9.863e-3	3	NC	4	NC	1
478			min	-.002	3	-.067	1	-.018	2	-9.484e-3	1	2392.631	3	NC	1
479		12	max	.002	1	.093	3	.019	3	9.133e-3	3	NC	4	NC	1
480			min	-.002	3	-.083	1	-.013	2	-8.78e-3	1	1710.254	3	9632.506	3
481		13	max	.002	1	.115	3	.019	3	8.404e-3	3	NC	5	NC	2
482			min	-.002	3	-.1	1	-.008	10	-8.075e-3	1	1315.374	3	6472.835	1
483		14	max	.002	1	.129	3	.022	1	7.674e-3	3	NC	5	NC	2
484			min	-.002	3	-.112	1	-.006	10	-7.371e-3	1	1131.071	3	4422.707	1
485		15	max	.002	1	.133	3	.026	1	6.944e-3	3	NC	5	NC	2
486			min	-.002	3	-.114	1	-.005	10	-6.666e-3	1	1092.038	3	3968.291	1
487		16	max	.002	1	.123	3	.023	1	6.214e-3	3	NC	5	NC	2
488			min	-.002	3	-.105	1	-.004	10	-5.962e-3	1	1198.719	3	4402.234	1
489		17	max	.002	1	.1	3	.015	1	5.485e-3	3	NC	4	NC	2
490			min	-.002	3	-.086	1	-.004	10	-5.257e-3	1	1565.891	3	6248.742	1
491		18	max	.002	1	.065	3	.008	3	4.755e-3	3	NC	4	NC	1
492			min	-.002	3	-.056	1	-.004	2	-4.553e-3	1	2876.238	3	NC	1
493		19	max	.002	1	.023	3	.006	3	4.025e-3	3	NC	1	NC	1
494			min	-.002	3	-.022	1	-.007	2	-3.848e-3	1	NC	1	NC	1
495	M16	1	max	0	1	.018	3	.006	3	4.558e-3	2	NC	1	NC	1
496			min	0	3	-.027	2	-.007	2	-3.1e-3	3	NC	1	NC	1
497		2	max	0	1	.039	3	.008	3	5.393e-3	2	NC	4	NC	1
498			min	0	3	-.07	2	-.005	2	-3.623e-3	3	2772.305	2	NC	1
499		3	max	0	1	.057	3	.014	1	6.228e-3	2	NC	4	NC	2
500			min	0	3	-.107	2	-.004	10	-4.145e-3	3	1506.861	2	6237.135	1
501		4	max	0	1	.069	3	.022	1	7.062e-3	2	NC	5	NC	2
502			min	0	3	-.131	2	-.004	10	-4.667e-3	3	1150.223	2	4407.384	1
503		5	max	0	1	.075	3	.025	1	7.897e-3	2	NC	5	NC	2
504			min	0	3	-.142	2	-.005	10	-5.19e-3	3	1043.033	2	3985.277	1
505		6	max	0	1	.075	3	.022	1	8.732e-3	2	NC	5	NC	2
506			min	0	3	-.139	2	-.006	10	-5.712e-3	3	1072.375	2	4461.298	1
507		7	max	0	1	.069	3	.017	3	9.567e-3	2	NC	5	NC	2

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	-.125	2	-.008	10	-6.234e-3	3	1232.07	2	6589.657	1
509		8	max	0	1	.06	3	.018	3	1.04e-2	2	NC	4	NC	1
510			min	0	3	-.104	2	-.013	2	-6.757e-3	3	1569.402	2	NC	1
511		9	max	0	1	.051	3	.017	3	1.124e-2	2	NC	4	NC	1
512			min	0	3	-.084	2	-.018	2	-7.279e-3	3	2126.356	2	NC	1
513		10	max	0	1	.047	3	.016	3	1.207e-2	2	NC	4	NC	1
514			min	0	3	-.074	2	-.021	2	-7.801e-3	3	2549.699	2	9072.242	2
515		11	max	0	1	.051	3	.015	3	1.124e-2	2	NC	4	NC	1
516			min	0	3	-.084	2	-.018	2	-7.278e-3	3	2126.356	2	NC	1
517		12	max	.001	1	.06	3	.015	3	1.04e-2	2	NC	4	NC	1
518			min	0	3	-.104	2	-.013	2	-6.755e-3	3	1569.402	2	NC	1
519		13	max	.001	1	.069	3	.014	3	9.568e-3	2	NC	5	NC	2
520			min	0	3	-.125	2	-.008	10	-6.232e-3	3	1232.07	2	6584.778	1
521		14	max	.001	1	.075	3	.022	1	8.733e-3	2	NC	5	NC	2
522			min	0	3	-.139	2	-.006	10	-5.709e-3	3	1072.375	2	4469.408	1
523		15	max	.001	1	.075	3	.025	1	7.898e-3	2	NC	5	NC	2
524			min	0	3	-.142	2	-.005	10	-5.186e-3	3	1043.033	2	4000.236	1
525		16	max	.001	1	.069	3	.022	1	7.063e-3	2	NC	5	NC	2
526			min	0	3	-.131	2	-.004	10	-4.663e-3	3	1150.223	2	4433.235	1
527		17	max	.001	1	.057	3	.014	1	6.229e-3	2	NC	4	NC	2
528			min	0	3	-.107	2	-.004	10	-4.139e-3	3	1506.861	2	6292.125	1
529		18	max	.001	1	.039	3	.007	3	5.394e-3	2	NC	4	NC	1
530			min	0	3	-.07	2	-.005	2	-3.616e-3	3	2772.305	2	NC	1
531		19	max	.001	1	.018	3	.006	3	4.559e-3	2	NC	1	NC	1
532			min	0	3	-.027	2	-.007	2	-3.093e-3	3	NC	1	NC	1
533	M15	1	max	0	1	0	1	0	1	3.427e-4	3	NC	1	NC	1
534			min	0	1	0	1	0	1	-7.486e-5	2	NC	1	NC	1
535		2	max	0	3	-.001	15	0	1	7.621e-4	3	NC	1	NC	1
536			min	0	2	-.005	4	0	3	-5.053e-4	2	NC	1	NC	1
537		3	max	0	3	-.002	15	.003	1	1.181e-3	3	NC	3	NC	1
538			min	0	2	-.009	4	-.003	3	-9.357e-4	2	7610.203	4	NC	1
539		4	max	0	3	-.003	15	.006	1	1.601e-3	3	NC	5	NC	4
540			min	0	2	-.013	4	-.006	3	-1.366e-3	2	5221.044	4	7665.572	3
541		5	max	0	3	-.004	15	.009	1	2.02e-3	3	NC	5	NC	4
542			min	0	2	-.017	4	-.009	3	-1.796e-3	2	4074.034	4	5002.33	3
543		6	max	0	3	-.005	15	.013	1	2.439e-3	3	NC	15	NC	4
544			min	0	2	-.02	4	-.014	3	-2.227e-3	2	3428.73	4	3627.964	3
545		7	max	0	3	-.005	15	.017	1	2.859e-3	3	NC	15	NC	4
546			min	0	2	-.023	4	-.018	3	-2.666e-3	1	3040.665	4	2827.908	3
547		8	max	0	3	-.006	15	.021	1	3.278e-3	3	NC	15	NC	4
548			min	-.001	2	-.025	4	-.022	3	-3.106e-3	1	2807.767	4	2326.519	3
549		9	max	0	3	-.006	15	.025	1	3.697e-3	3	NC	15	NC	4
550			min	-.001	2	-.026	4	-.026	3	-3.546e-3	1	2682.408	4	1999.051	3
551		10	max	0	3	-.006	15	.028	1	4.117e-3	3	NC	15	NC	4
552			min	-.001	2	-.026	4	-.029	3	-3.985e-3	1	2642.751	4	1783.087	3
553		11	max	0	3	-.006	15	.03	1	4.536e-3	3	NC	15	NC	4
554			min	-.002	2	-.026	4	-.031	3	-4.425e-3	1	2682.408	4	1645.914	3
555		12	max	0	3	-.006	15	.031	1	4.956e-3	3	NC	15	NC	5
556			min	-.002	2	-.025	4	-.032	3	-4.865e-3	1	2807.767	4	1571.257	3
557		13	max	0	3	-.005	15	.03	1	5.375e-3	3	NC	15	NC	5
558			min	-.002	2	-.023	4	-.031	3	-5.304e-3	1	3040.665	4	1554.233	3
559		14	max	0	3	-.005	15	.028	1	5.794e-3	3	NC	15	NC	4
560			min	-.002	2	-.021	4	-.029	3	-5.744e-3	1	3428.73	4	1601.402	3
561		15	max	0	3	-.004	15	.024	1	6.214e-3	3	NC	5	NC	4
562			min	-.002	2	-.018	4	-.025	3	-6.184e-3	1	4074.034	4	1737.454	3
563		16	max	0	3	-.003	12	.018	1	6.633e-3	3	NC	5	NC	4
564			min	-.002	2	-.014	4	-.018	3	-6.623e-3	1	5221.044	4	2029.692	3

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
565		17	max	0	3	-.001	12	.009	1	7.052e-3	3	NC	3	NC	4
566			min	-.003	2	-.01	4	-.008	3	-7.063e-3	1	7610.203	4	2689.475	3
567		18	max	.001	3	0	3	.004	3	7.472e-3	3	NC	1	NC	4
568			min	-.003	2	-.005	4	-.007	2	-7.503e-3	1	NC	1	4786.227	3
569		19	max	.001	3	.004	3	.019	3	7.891e-3	3	NC	1	NC	1
570			min	-.003	2	-.002	9	-.021	2	-7.943e-3	1	NC	1	NC	1
571	M16A	1	max	0	10	0	10	.007	3	2.813e-3	3	NC	1	NC	1
572			min	-.001	3	0	9	-.008	2	-2.866e-3	2	NC	1	NC	1
573		2	max	0	10	-.001	15	.002	9	2.689e-3	3	NC	1	NC	1
574			min	-.001	3	-.005	4	-.002	2	-2.728e-3	2	NC	1	NC	1
575		3	max	0	10	-.002	15	.006	1	2.565e-3	3	NC	3	NC	4
576			min	0	3	-.009	4	-.004	3	-2.591e-3	2	7610.203	4	6364.888	1
577		4	max	0	10	-.003	15	.01	1	2.441e-3	3	NC	5	NC	4
578			min	0	3	-.013	4	-.008	3	-2.454e-3	2	5221.044	4	4832.032	1
579		5	max	0	10	-.004	15	.012	1	2.318e-3	3	NC	5	NC	4
580			min	0	3	-.017	4	-.011	3	-2.316e-3	2	4074.034	4	4164.319	1
581		6	max	0	10	-.005	15	.014	1	2.194e-3	3	NC	15	NC	4
582			min	0	3	-.02	4	-.012	3	-2.179e-3	2	3428.73	4	3868.085	1
583		7	max	0	10	-.005	15	.014	1	2.07e-3	3	NC	15	NC	4
584			min	0	3	-.023	4	-.013	3	-2.042e-3	2	3040.665	4	3788.039	1
585		8	max	0	10	-.006	15	.014	1	1.946e-3	3	NC	15	NC	4
586			min	0	3	-.025	4	-.013	3	-1.904e-3	2	2807.767	4	3870.133	1
587		9	max	0	10	-.006	15	.014	1	1.822e-3	3	NC	15	NC	4
588			min	0	3	-.026	4	-.012	3	-1.767e-3	2	2682.408	4	4105.234	1
589		10	max	0	10	-.006	15	.012	1	1.699e-3	3	NC	15	NC	4
590			min	0	3	-.026	4	-.011	3	-1.63e-3	2	2642.751	4	4515.472	1
591		11	max	0	10	-.006	15	.011	1	1.575e-3	3	NC	15	NC	4
592			min	0	3	-.026	4	-.01	3	-1.493e-3	2	2682.408	4	5158.31	1
593		12	max	0	10	-.006	15	.009	1	1.451e-3	3	NC	15	NC	4
594			min	0	3	-.025	4	-.008	3	-1.355e-3	2	2807.767	4	6147.8	1
595		13	max	0	10	-.005	15	.007	1	1.327e-3	3	NC	15	NC	2
596			min	0	3	-.023	4	-.006	3	-1.218e-3	2	3040.665	4	7708.957	1
597		14	max	0	10	-.005	15	.005	1	1.204e-3	3	NC	15	NC	1
598			min	0	3	-.02	4	-.004	3	-1.081e-3	2	3428.73	4	NC	1
599		15	max	0	10	-.004	15	.003	1	1.08e-3	3	NC	5	NC	1
600			min	0	3	-.017	4	-.003	3	-9.433e-4	2	4074.034	4	NC	1
601		16	max	0	10	-.003	15	.002	1	9.561e-4	3	NC	5	NC	1
602			min	0	3	-.013	4	-.001	3	-8.06e-4	2	5221.044	4	NC	1
603		17	max	0	10	-.002	15	0	9	8.323e-4	3	NC	3	NC	1
604			min	0	3	-.009	4	0	3	-6.687e-4	2	7610.203	4	NC	1
605		18	max	0	10	-.001	15	0	4	7.086e-4	3	NC	1	NC	1
606			min	0	3	-.005	4	0	2	-5.314e-4	2	NC	1	NC	1
607		19	max	0	1	0	1	0	1	5.848e-4	3	NC	1	NC	1
608			min	0	1	0	1	0	1	-3.941e-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

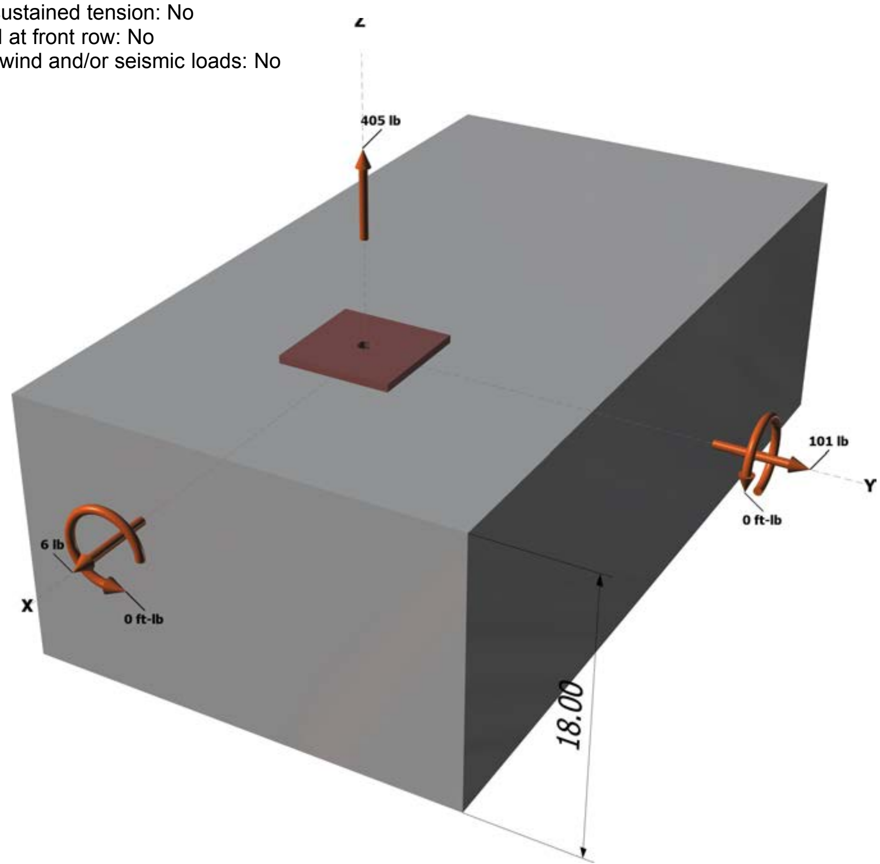
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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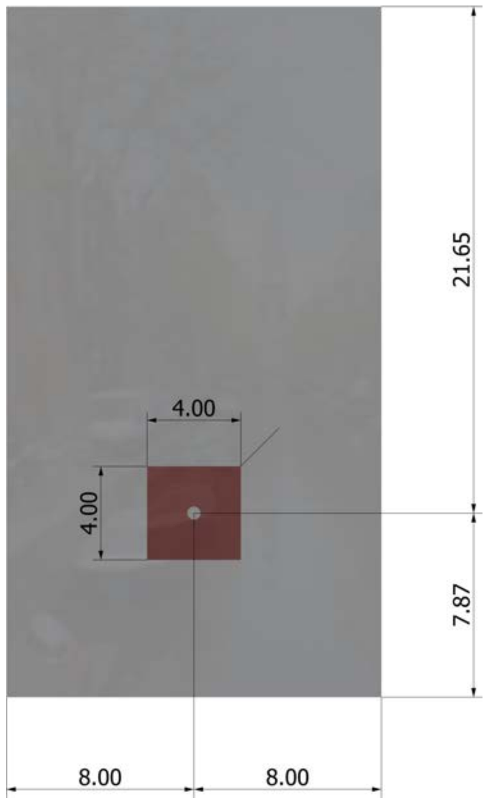


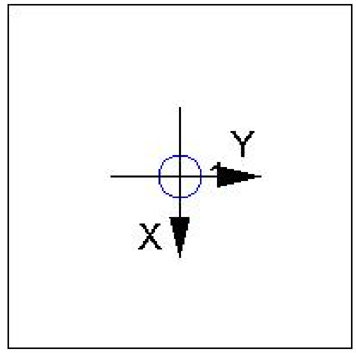
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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)

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

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

Anchor Designer™ Software
Version 2.4.5673.0

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

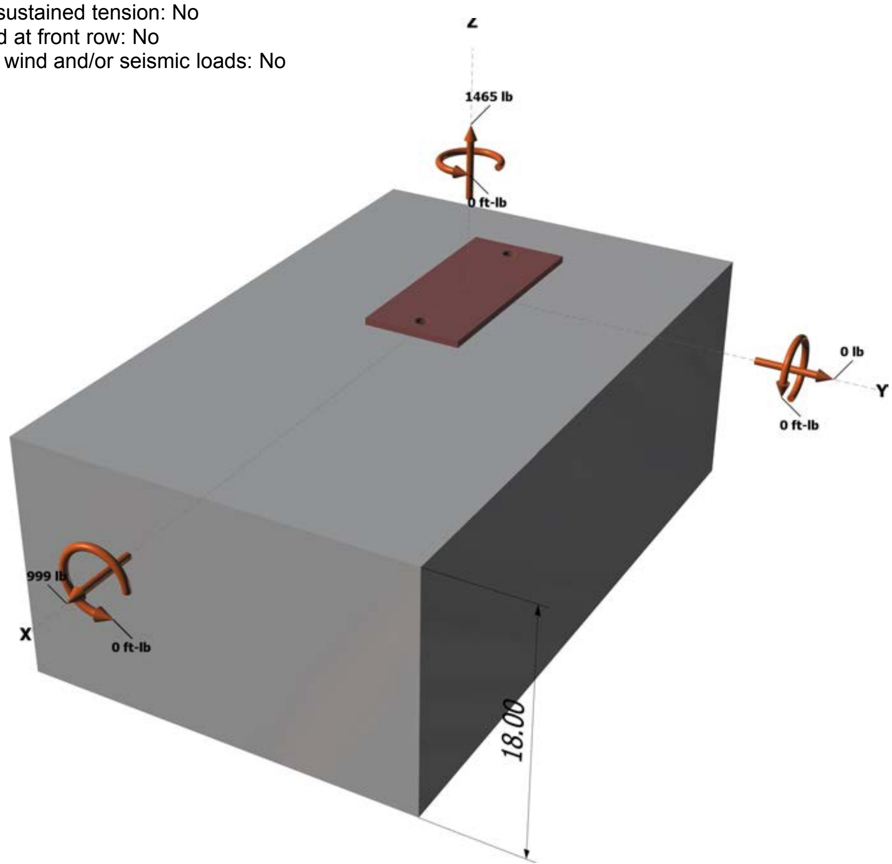
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

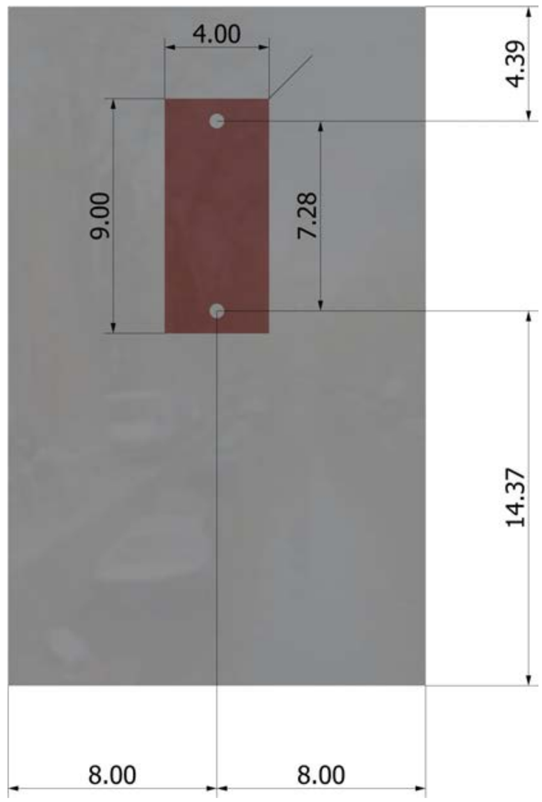
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout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

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

<Figure 1>



<Figure 2>



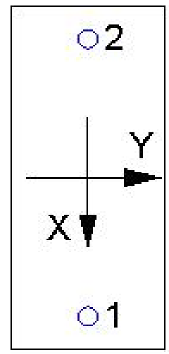
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

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

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

<Figure 3>



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

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

Shear parallel to edge in x-direction:

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

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

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

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

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

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

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

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

ϕV_{cpg} (lb)
15580

11. Results

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

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

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

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

Sec. D.7.3	0.20	0.25	45.0 %	1.2	Pass

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

12. Warnings

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

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

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