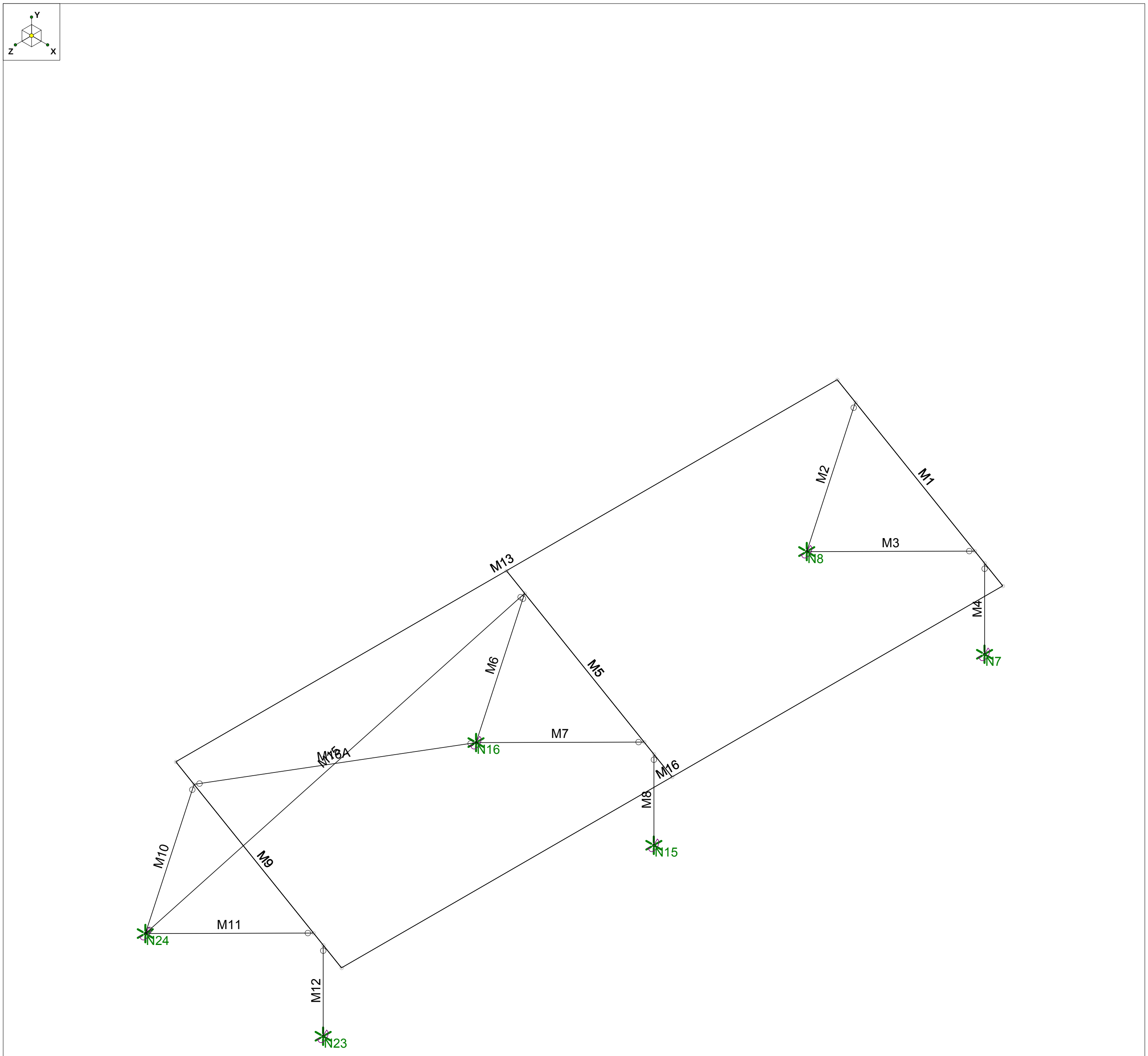


Schletter, Inc.		30° Tilt w/ Seismic Design
HCV	Standard PVMini Racking System	
	Representative Calculations - ASCE 7-05	

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.

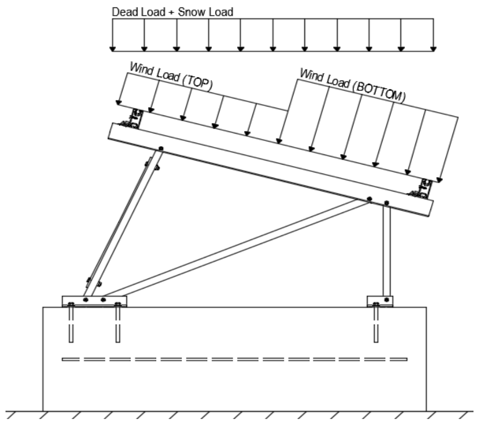
1.2 Construction

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 = 30°
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 = 16.49 psf *(ASCE 7-05, Eq. 7-2)*
I_s = 1.00
C_s = 0.73
C_e = 0.90
C_t = 1.20

2.3 Wind Loads

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

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

Pressure Coefficients

$Cf+_{TOP}$	=	1.15	*(Pressure)*
$Cf+_{BOTTOM}$	=	1.85	
$Cf-_{TOP}$	=	-2.3	*(Suction)*
$Cf-_{BOTTOM}$	=	-1.1	

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

S_S =	2.50	R =	1.25
S_{DS} =	1.67	C_S =	0.8
S_1 =	1.00	ρ =	1.3
S_{D1} =	1.00	Ω =	1.25
T_a =	0.04	C_d =	1.25

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

2.5 Combination of Loads

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

Strength Design, LRFD

Component stresses are checked using the following LRFD load combinations:

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

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

Allowable Stress Design, ASD

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

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

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

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

3. STRUCTURAL ANALYSIS

3.1 RISA Results

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

3.2 RISA Components

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

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

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

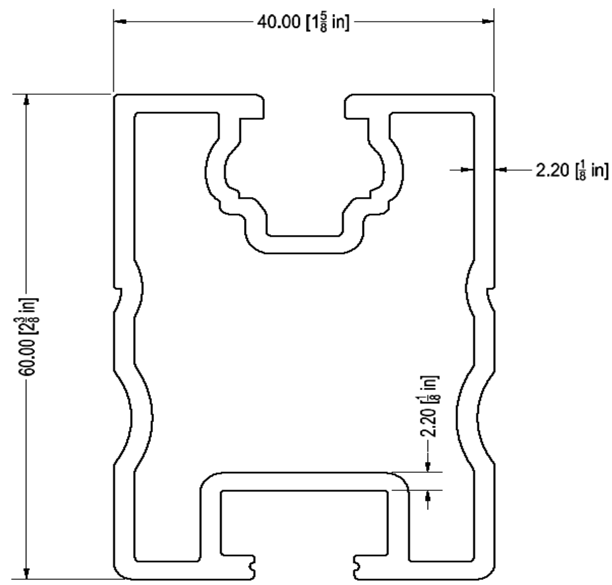
Front Struts	Location	**Bracing**
M4	Outer	M15
M8	Inner	M16A
M12	Outer	

4. MEMBER DESIGN CALCULATIONS

4.1 Purlin Design

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

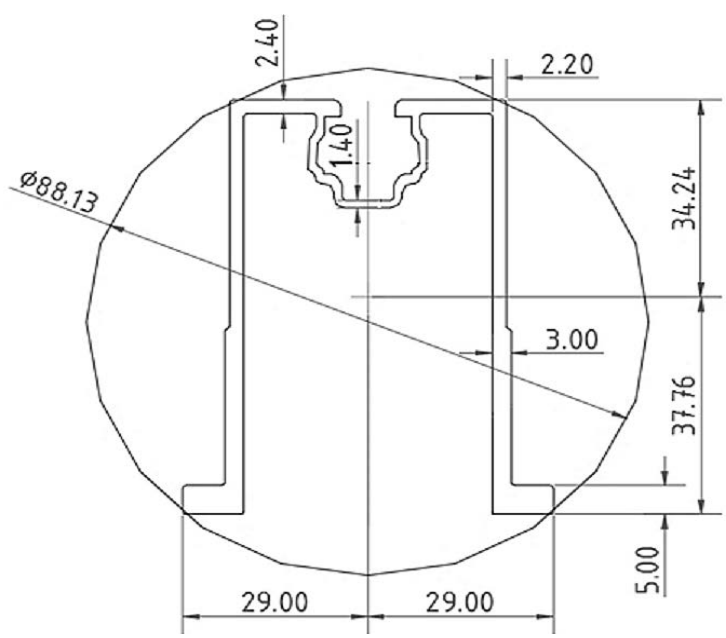
Purlin Type =	**ProfiPlus**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	45	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.87	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	28.47	ksi
S_y =	0.51	in^3
S_x =	0.37	in^3
E =	10100	ksi
I_y =	0.60	in^4
I_x =	0.29	in^4
A =	0.90	in^2
g =	1.08	lbs/ft
M_y =	0.337	k-ft
M_z =	0.034	k-ft
$M_{y\ allowable}$ =	1.271	k-ft
$M_{z\ allowable}$ =	0.871	k-ft
Utilization =	30%	



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).

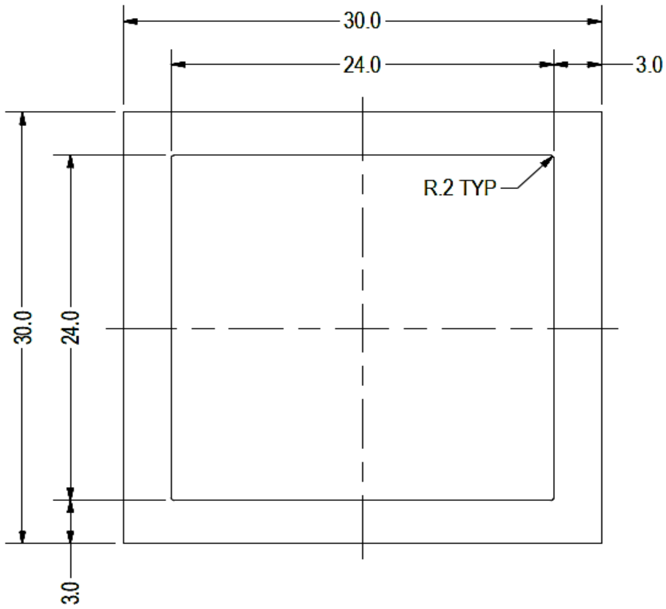
Girder Type =	**Flex Profi**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	33.78	in
$\Phi F_{ty\ AXIAL}$ =	14.29	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.76	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	13.46	ksi
S_y =	0.59	in^3
S_x =	0.46	in^3
E =	10100	ksi
I_y =	0.88	in^4
I_x =	0.52	in^4
A =	0.89	in^2
g =	1.07	lbs/ft
M_y =	0.512	k-ft
M_z =	0.000	k-ft
P_n =	0.267	k
$M_{y\ allowable}$ =	1.460	k-ft
$M_{z\ allowable}$ =	0.513	k-ft
$P_{n\ allowable}$ =	12.764	k
Utilization =	37%	



4.3 Front Strut Design

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

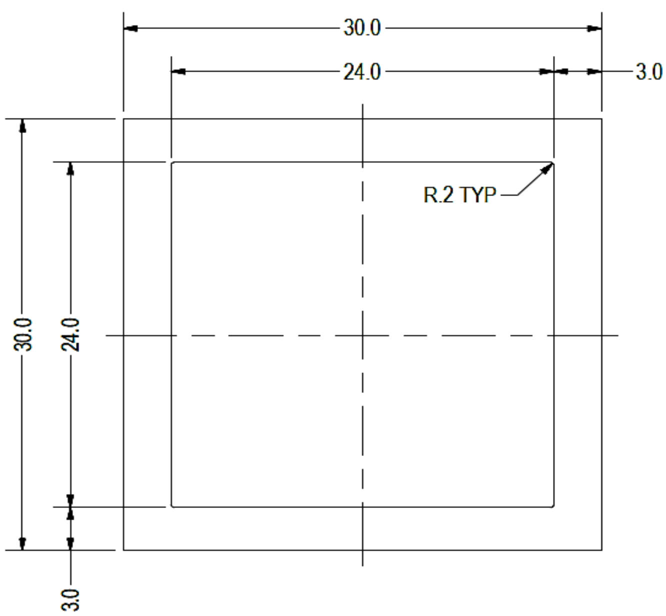
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	18.00	in
$\Phi F_{ty\ AXIAL}$ =	24.52	ksi
$\Phi F_{ty\ BENDING}$ =	31.19	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	-0.025	k-ft
P_n =	0.132	k
$M_{y\ allowable}$ =	0.423	k-ft
$M_{z\ allowable}$ =	0.423	k-ft
$P_{n\ allowable}$ =	12.310	k
Utilization =	7%	



4.4 Diagonal Strut Design

A diagonal aluminum strut braces the support structure. It connects at a front portion of the girder and transfers horizontal forces to the rear foundation connection. The strut is attached with single M8 bolts at each end. See Appendix A.4 for detailed member calculations. Section units are in (mm).

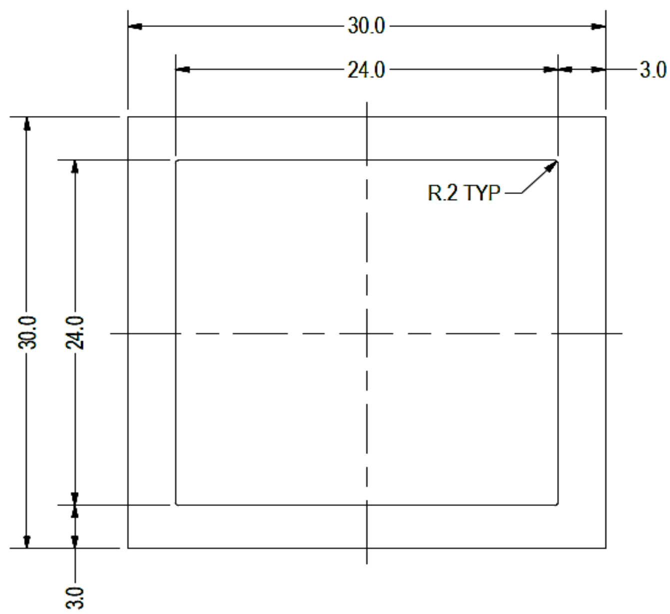
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	46.38	in
$\Phi F_{ty\ AXIAL}$ =	7.60	ksi
$\Phi F_{ty\ BENDING}$ =	29.80	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.571	k
$M_{y\ allowable}$ =	0.404	k-ft
$M_{z\ allowable}$ =	0.404	k-ft
$P_{n\ allowable}$ =	3.814	k
Utilization =	15%	



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).

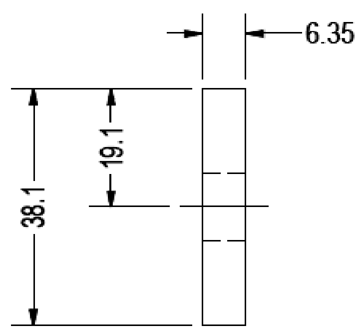
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	39.29	in
$\Phi F_{ty\ AXIAL}$ =	10.06	ksi
$\Phi F_{ty\ BENDING}$ =	30.09	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.604	k
$M_{y\ allowable}$ =	0.408	k-ft
$M_{z\ allowable}$ =	0.408	k-ft
$P_{n\ allowable}$ =	5.050	k
Utilization =	12%	



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 =	0.169	k
$M_{y\ allowable}$ =	0.046	k-ft
$P_{n\ allowable}$ =	11.813	k
Utilization =	8%	



A cross brace kit is required every 24 bays and is to be installed in centermost bays.

5. FOUNDATION DESIGN CALCULATIONS

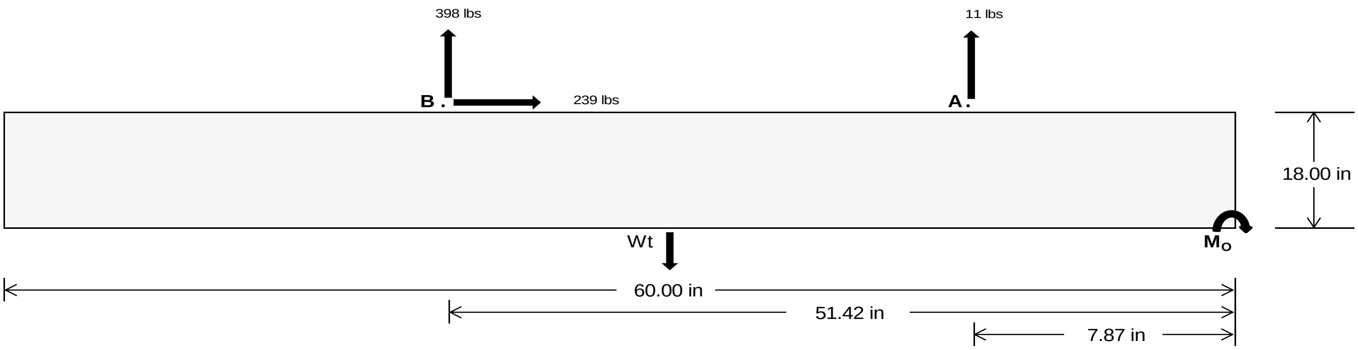
5.1 Helical Pile Foundations

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 =	49.61	1659.31	k
Compressive Load =	927.67	1086.20	k
Lateral Load =	20.31	992.63	k
Moment (Weak Axis) =	0.03	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 = 24871.6 in-lbs
Resisting Force Required = 829.05 lbs
S.F. = 1.67
Weight Required = 1381.76 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 = 238.57 lbs
Friction = 0.4
Weight Required = 596.43 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 = 238.57 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	303 lbs	303 lbs	303 lbs	303 lbs	370 lbs	370 lbs	370 lbs	370 lbs	477 lbs	477 lbs	477 lbs	477 lbs	-22 lbs	-22 lbs	-22 lbs	-22 lbs
F_B	202 lbs	202 lbs	202 lbs	202 lbs	481 lbs	481 lbs	481 lbs	481 lbs	493 lbs	493 lbs	493 lbs	493 lbs	-797 lbs	-797 lbs	-797 lbs	-797 lbs
F_V	25 lbs	25 lbs	25 lbs	25 lbs	426 lbs	426 lbs	426 lbs	426 lbs	337 lbs	337 lbs	337 lbs	337 lbs	-477 lbs	-477 lbs	-477 lbs	-477 lbs
P_{total}	2409 lbs	2499 lbs	2590 lbs	2681 lbs	2754 lbs	2845 lbs	2936 lbs	3026 lbs	2873 lbs	2964 lbs	3054 lbs	3145 lbs	323 lbs	377 lbs	431 lbs	486 lbs
M	236 lbs-ft	236 lbs-ft	236 lbs-ft	236 lbs-ft	464 lbs-ft	464 lbs-ft	464 lbs-ft	464 lbs-ft	505 lbs-ft	505 lbs-ft	505 lbs-ft	505 lbs-ft	665 lbs-ft	665 lbs-ft	665 lbs-ft	665 lbs-ft
e	0.10 ft	0.09 ft	0.09 ft	0.09 ft	0.17 ft	0.16 ft	0.16 ft	0.15 ft	0.18 ft	0.17 ft	0.17 ft	0.16 ft	2.06 ft	1.77 ft	1.54 ft	1.37 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}	243.0 psf	241.8 psf	240.7 psf	239.8 psf	251.2 psf	249.6 psf	248.2 psf	246.9 psf	259.1 psf	257.2 psf	255.5 psf	253.9 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	307.6 psf	303.5 psf	299.8 psf	296.4 psf	378.4 psf	371.1 psf	364.4 psf	358.3 psf	397.6 psf	389.4 psf	381.9 psf	375.1 psf	281.4 psf	186.6 psf	156.8 psf	143.3 psf

Maximum Bearing Pressure = 398 psf
Allowable Bearing Pressure = 1500 psf

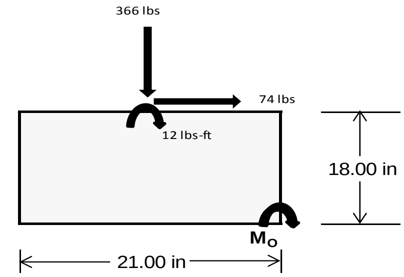
Use a 60in long x 21in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Seismic Design

Overturning Check

M_O = 197.2 ft-lbs
Resisting Force Required = 225.37 lbs
S.F. = 1.67
Weight Required = 375.62 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	116 lbs	46 lbs	54 lbs	203 lbs	366 lbs	155 lbs	81 lbs	-38 lbs	20 lbs
F_V	12 lbs	98 lbs	12 lbs	9 lbs	74 lbs	9 lbs	12 lbs	98 lbs	12 lbs
P_{total}	2472 lbs	2402 lbs	2410 lbs	2446 lbs	2609 lbs	2398 lbs	770 lbs	651 lbs	709 lbs
M	33 lbs-ft	163 lbs-ft	34 lbs-ft	24 lbs-ft	123 lbs-ft	27 lbs-ft	33 lbs-ft	163 lbs-ft	34 lbs-ft
e	0.01 ft	0.07 ft	0.01 ft	0.01 ft	0.05 ft	0.01 ft	0.04 ft	0.25 ft	0.05 ft
L/6	0.29 ft	1.61 ft	1.72 ft	1.73 ft	1.66 ft	1.73 ft	1.66 ft	1.25 ft	1.65 ft
f_{min}	269.7 sqft	210.5 sqft	262.1 sqft	270.1 sqft	250.0 sqft	263.6 sqft	75.0 sqft	10.4 sqft	67.8 sqft
f_{max}	295.5 psf	338.6 psf	288.6 psf	288.8 psf	346.3 psf	284.4 psf	101.0 psf	138.4 psf	94.2 psf

Maximum Bearing Pressure = 346 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.

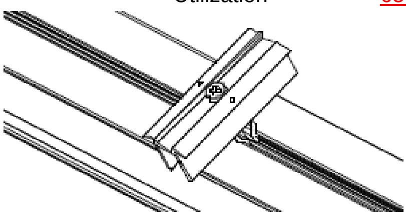
6. DESIGN OF JOINTS AND CONNECTIONS

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.

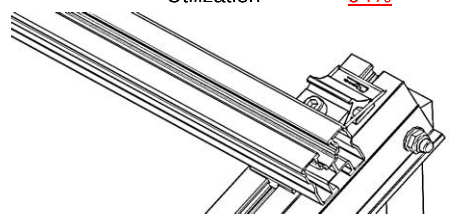
Fastening of Modules to Purlins

Maximum Uplifting Force =	0.784 k
Allowable Uplift =	1.214 k
Utilization =	65%



Fastening of Purlins to Girders

Maximum Uplifting Force =	1.052 k
Allowable Uplift =	1.116 k
Utilization =	94%



6.2 Bolted Connections

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

Front Strut

Maximum Axial Load =	0.714 k
M8 Bolt Capacity =	5.692 k
Strut Bearing Capacity =	7.952 k
Utilization =	13%

Rear Strut

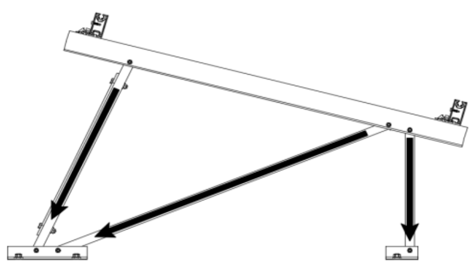
Maximum Axial Load =	1.042 k
M8 Bolt Capacity =	5.692 k
Strut Bearing Capacity =	7.952 k
Utilization =	18%

Diagonal Strut

Maximum Axial Load =	0.571 k
M8 Bolt Shear Capacity =	5.692 k
Strut Bearing Capacity =	7.952 k
Utilization =	10%

Bracing

Maximum Axial Load =	0.169 k
M10 Bolt Capacity =	8.894 k
Strut Bearing Capacity =	7.952 k
Utilization =	2%



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

7. SEISMIC DESIGN

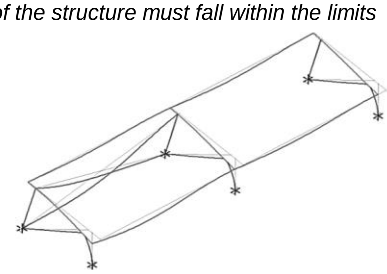
7.1 Seismic Drift

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} =	32.32 in
Allowable Story Drift for All Other Structures, Δ = {	$0.020h_{sx}$ 0.646 in
Max Drift, Δ_{MAX} =	0.05 in

0.05 ≤ 0.646, OK.

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



APPENDIX A

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

Purlin = **ProfiPlus**

Strong Axis:

3.4.14

L_b = 45.00 in

J = 0.255

117.177

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.9 ksi

3.4.16

b/t = 7.4

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

Weak Axis:

3.4.14

L_b = 45.00 in

J = 0.255

121.682

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.8

3.4.16

b/t = 23.9

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.5 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 23.9

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

S1 = 36.9

m = 0.65

C_0 = 30

Cc = 30

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L St$= 29.9 ksi

Ix = 250988 mm^4

0.603 in^4

y = 30 mm

Sx = 0.511 in^3

$M_{max}St$ = 1.271 k-ft

3.4.18

h/t = 7.4

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

S1 = 36.9

m = 0.65

C_0 = 20

Cc = 20

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L Wk$= 28.5 ksi

Iy = 120291 mm^4

0.289 in^4

x = 20 mm

Sy = 0.367 in^3

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

Compression

3.4.9

b/t = 7.4

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φyFcy

φF_L= 33.3 ksi

b/t = 23.9

S1 = 12.21

S2 = 32.70

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.5 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

φF_L= φyFcy

φF_L= 33.25 ksi

φF_L= 28.47 ksi

A = 578.06 mm^2

0.90 in^2

P_{max} = 25.51 kips

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

Girder = **Flex Profi**

Strong Axis:

3.4.11

L_b = 33.78 in

ry = 1.374

Cb = 1.32

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

3.4.16.1

N/A for Weak Direction

3.4.16.2

N/A for Strong Direction

3.4.16.2

b/t = 24.46

t = 2.6

ds = 6.05

rs = 3.49

S = 21.70

ρst = 0.22

F_{UT}= 9.37

F_{ST}= 28.24

φF_L= Fut + (Fst - Fut)ρst < Fst

φF_L= 13.5 ksi

3.4.18

h/t = 24.46

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

S1 = 34.4

m = 0.70

C_0 = 34.23

Cc = 37.77

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

S2 = 72.1

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 29.8 ksi

Ix = 364470 mm^4

0.876 in^4

y = 37.77 mm

Sx = 0.589 in^3

M_{max}St = 1.460 k-ft

3.4.18

h/t = 4.29

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

S1 = 36.9

m = 0.65

C_0 = 29

Cc = 29

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 13.5 ksi

Iy = 217168 mm^4

0.522 in^4

x = 29 mm

Sy = 0.457 in^3

M_{max}Wk = 0.513 k-ft

Compression

3.4.7

λ = 0.46067

r = 1.374 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.90326

φF_L= φcc(Bc-Dc*λ)

φF_L= 30.1251 ksi

3.4.8

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

3.4.9

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

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

3.4.9.1

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

3.4.10

Rb/t = 0.0

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

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

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

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 18.00 in

J = 0.16

47.2194

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.2 ksi

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 31.2 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

M_{max}St = 0.423 k-ft

Weak Axis:

3.4.14

L_b = 18.00 in

J = 0.16

47.2194

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.2

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 31.2 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

M_{max}Wk = 0.423 k-ft

Compression

3.4.7

$\lambda =$ 0.77182

r = 0.437 in

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

$S1^{*} =$ 0.33515

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

$S2^{*} =$ 1.23671

$\varphi cc =$ 0.83792

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

$\varphi F_L =$ 24.5226 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.25 ksi

$\varphi F_L =$ 24.52 ksi

A = 323.87 mm^2

0.50 in^2

$P_{max} =$ 12.31 kips

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

Strut = **30x30x3**

Strong Axis:

3.4.14

$L_b =$ 46.38 in

J = 0.16

121.663

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.8 ksi

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 29.8 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in³

M_{max}St = 0.404 k-ft

Weak Axis:

3.4.14

$L_b =$ 46.38 in

J = 0.16

121.663

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.8

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 33.3 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in³

M_{max}Wk = 0.450 k-ft

Compression

3.4.7

λ = 1.98863

r = 0.437 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.85841

φF_L= (φccFcy)/(λ²)

φF_L= 7.59722 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φyFcy

φF_L= 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

φF_L= φyFcy

φF_L= 33.25 ksi

φF_L= 7.60 ksi

A = 323.87 mm^2

0.50 in^2

P_{max} = 3.81 kips

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 39.29 in

J = 0.16

103.073

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

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= 30.1 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= 30.1 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

M_{max}St = 0.408 k-ft

Weak Axis:

3.4.14

L_b = 39.29 in

J = 0.16

103.073

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

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= 30.1

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

$\lambda =$ 1.68476

r = 0.437 in

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

$S1^* =$ 0.33515

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

$S2^* =$ 1.23671

$\varphi cc =$ 0.81587

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

$\varphi F_L =$ 10.0603 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

$\varphi F_L =$ 10.06 ksi

A = 323.87 mm^2

0.50 in^2

$P_{max} =$ 5.05 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			.8			4		

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	-45.999	-45.999	0	0
2	M16	Y	-45.999	-45.999	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	-72.509	-72.509	0	0
2	M16	y	-116.645	-116.645	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	145.018	145.018	0	0
2	M16	y	69.356	69.356	0	0

Member Distributed Loads (BLC 6 : Seismic - Lateral)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	Z	6.693	6.693	0	0
2	M16	Z	6.693	6.693	0	0
3	M13	Z	0	0	0	0
4	M16	Z	0	0	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																

Load Combinations (Continued)

	Description	S...	P...	S...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
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	222.505	2	271.273	2	.004	10	0	10	0	1	0	1
2		min	-260.982	3	-409.581	3	-2.353	4	0	3	0	1	0	1
3	N7	max	.002	3	256.042	1	.036	10	0	10	0	1	0	1
4		min	-.12	2	3.388	12	-15.292	4	-.024	4	0	1	0	1
5	N15	max	0	15	713.595	1	.114	9	0	9	0	1	0	1
6		min	-1.168	2	-38.16	3	-15.626	5	-.025	4	0	1	0	1
7	N16	max	691.322	2	835.538	2	0	2	0	9	0	1	0	1
8		min	-763.564	3	-1276.394	3	-130.719	4	0	3	0	1	0	1
9	N23	max	.002	3	256.357	1	.579	1	0	1	0	1	0	1
10		min	-.12	2	.334	15	-14.56	5	-.023	5	0	1	0	1
11	N24	max	222.505	2	273.598	2	88.476	3	0	9	0	1	0	1
12		min	-261.649	3	-409.003	3	-3.36	5	0	3	0	1	0	1
13	Totals:	max	1134.924	2	2520.141	2	0	3						
14		min	-1286.244	3	-2123.654	3	-181.486	4						

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	194.315	2	.653	6	1.058	4	0	10	0	10	0	1
2			min	-350.604	3	.153	15	-.073	3	0	4	0	4	0	1
3		2	max	194.441	2	.602	6	.944	4	0	10	0	5	0	15
4			min	-350.509	3	.141	15	-.073	3	0	4	0	3	0	6
5		3	max	194.567	2	.551	6	.829	4	0	10	0	5	0	15
6			min	-350.415	3	.128	15	-.073	3	0	4	0	3	0	6
7		4	max	194.693	2	.5	6	.715	4	0	10	0	4	0	15
8			min	-350.321	3	.116	15	-.073	3	0	4	0	3	0	6
9		5	max	194.818	2	.449	6	.6	4	0	10	0	4	0	15
10			min	-350.226	3	.104	15	-.073	3	0	4	0	3	0	6
11		6	max	194.944	2	.398	6	.486	4	0	10	0	4	0	15
12			min	-350.132	3	.092	15	-.073	3	0	4	0	3	0	6
13		7	max	195.07	2	.346	6	.371	4	0	10	0	4	0	15
14			min	-350.037	3	.08	15	-.073	3	0	4	0	3	0	6
15		8	max	195.196	2	.295	6	.257	4	0	10	0	4	0	15
16			min	-349.943	3	.068	15	-.073	3	0	4	0	3	0	6
17		9	max	195.322	2	.244	6	.143	4	0	10	0	4	0	15
18			min	-349.849	3	.056	15	-.073	3	0	4	0	3	0	6
19		10	max	195.448	2	.193	6	.085	1	0	10	0	4	0	15
20			min	-349.754	3	.044	15	-.073	3	0	4	0	3	0	6
21		11	max	195.574	2	.143	2	.085	1	0	10	0	4	0	15
22			min	-349.66	3	.032	15	-.113	5	0	4	0	3	0	6
23		12	max	195.699	2	.103	2	.085	1	0	10	0	4	0	15
24			min	-349.565	3	.013	12	-.228	5	0	4	0	3	0	6
25		13	max	195.825	2	.063	2	.085	1	0	10	0	4	0	15
26			min	-349.471	3	-.013	3	-.342	5	0	4	0	3	0	6
27		14	max	195.951	2	.023	2	.085	1	0	10	0	4	0	15
28			min	-349.377	3	-.043	3	-.456	5	0	4	0	3	0	6

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
29		15	max	196.077	2	-.016	15	.085	1	0	10	0	4	0	15
30			min	-349.282	3	-.072	3	-.571	5	0	4	0	3	0	6
31		16	max	196.203	2	-.028	15	.085	1	0	10	0	4	0	15
32			min	-349.188	3	-.114	4	-.685	5	0	4	0	3	0	6
33		17	max	196.329	2	-.04	15	.085	1	0	10	0	4	0	15
34			min	-349.093	3	-.165	4	-.8	5	0	4	0	3	0	6
35		18	max	196.455	2	-.052	15	.085	1	0	10	0	14	0	15
36			min	-348.999	3	-.216	4	-.914	5	0	4	0	3	0	6
37		19	max	196.581	2	-.064	15	.085	1	0	10	0	1	0	15
38			min	-348.905	3	-.267	4	-1.028	5	0	4	0	3	0	6
39	M3	1	max	183.61	2	1.757	6	.006	10	0	5	0	4	0	6
40			min	-173.449	3	.412	15	-1.324	4	0	1	0	10	0	15
41		2	max	183.541	2	1.58	6	.006	10	0	5	0	1	0	2
42			min	-173.501	3	.37	15	-1.19	4	0	1	0	10	0	12
43		3	max	183.471	2	1.403	6	.006	10	0	5	0	1	0	2
44			min	-173.553	3	.329	15	-1.057	4	0	1	0	5	0	3
45		4	max	183.402	2	1.226	6	.006	10	0	5	0	1	0	15
46			min	-173.605	3	.287	15	-.923	4	0	1	0	5	0	4
47		5	max	183.333	2	1.049	6	.006	10	0	5	0	1	0	15
48			min	-173.657	3	.246	15	-.789	4	0	1	0	5	0	4
49		6	max	183.263	2	.873	6	.006	10	0	5	0	1	0	15
50			min	-173.709	3	.204	15	-.656	4	0	1	0	5	0	4
51		7	max	183.194	2	.696	6	.006	10	0	5	0	1	0	15
52			min	-173.761	3	.163	15	-.522	4	0	1	0	5	0	4
53		8	max	183.125	2	.519	6	.006	10	0	5	0	1	0	15
54			min	-173.813	3	.121	15	-.388	4	0	1	0	5	-.001	4
55		9	max	183.055	2	.342	6	.006	10	0	5	0	1	0	15
56			min	-173.865	3	.08	15	-.255	4	0	1	0	5	-.001	4
57		10	max	182.986	2	.165	6	.006	10	0	5	0	1	0	15
58			min	-173.917	3	.038	15	-.122	1	0	1	0	5	-.001	4
59		11	max	182.917	2	.018	2	.043	5	0	5	0	1	0	15
60			min	-173.969	3	-.037	3	-.122	1	0	1	0	5	-.001	4
61		12	max	182.847	2	-.045	15	.176	5	0	5	0	1	0	15
62			min	-174.021	3	-.189	4	-.122	1	0	1	0	5	-.001	4
63		13	max	182.778	2	-.087	15	.31	5	0	5	0	1	0	15
64			min	-174.073	3	-.365	4	-.122	1	0	1	0	5	-.001	4
65		14	max	182.709	2	-.128	15	.444	5	0	5	0	1	0	15
66			min	-174.125	3	-.542	4	-.122	1	0	1	0	5	-.001	4
67		15	max	182.639	2	-.17	15	.577	5	0	5	0	9	0	15
68			min	-174.177	3	-.719	4	-.122	1	0	1	0	5	0	4
69		16	max	182.57	2	-.211	15	.711	5	0	5	0	9	0	15
70			min	-174.229	3	-.896	4	-.122	1	0	1	0	5	0	4
71		17	max	182.501	2	-.253	15	.845	5	0	5	0	10	0	15
72			min	-174.281	3	-1.073	4	-.122	1	0	1	0	4	0	4
73		18	max	182.431	2	-.295	15	.978	5	0	5	0	10	0	15
74			min	-174.333	3	-1.25	4	-.122	1	0	1	0	4	0	4
75		19	max	182.362	2	-.336	15	1.112	5	0	5	0	5	0	1
76			min	-174.385	3	-1.426	4	-.122	1	0	1	0	1	0	1
77	M4	1	max	254.877	1	0	1	.037	10	0	1	0	5	0	1
78			min	2.806	12	0	1	-14.46	4	0	1	0	2	0	1
79		2	max	254.942	1	0	1	.037	10	0	1	0	10	0	1
80			min	2.838	12	0	1	-14.516	4	0	1	-.001	4	0	1
81		3	max	255.007	1	0	1	.037	10	0	1	0	10	0	1
82			min	2.87	12	0	1	-14.572	4	0	1	-.003	4	0	1
83		4	max	255.072	1	0	1	.037	10	0	1	0	10	0	1
84			min	2.903	12	0	1	-14.628	4	0	1	-.004	4	0	1
85		5	max	255.136	1	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
86			min	2.935	12	0	1	-14.684	4	0	1	-.005	4	0	1
87		6	max	255.201	1	0	1	.037	10	0	1	0	10	0	1
88			min	2.967	12	0	1	-14.74	4	0	1	-.007	4	0	1
89		7	max	255.266	1	0	1	.037	10	0	1	0	10	0	1
90			min	3	12	0	1	-14.796	4	0	1	-.008	4	0	1
91		8	max	255.33	1	0	1	.037	10	0	1	0	10	0	1
92			min	3.032	12	0	1	-14.852	4	0	1	-.009	4	0	1
93		9	max	255.395	1	0	1	.037	10	0	1	0	10	0	1
94			min	3.064	12	0	1	-14.909	4	0	1	-.01	4	0	1
95		10	max	255.46	1	0	1	.037	10	0	1	0	10	0	1
96			min	3.097	12	0	1	-14.965	4	0	1	-.012	4	0	1
97		11	max	255.525	1	0	1	.037	10	0	1	0	10	0	1
98			min	3.129	12	0	1	-15.021	4	0	1	-.013	4	0	1
99		12	max	255.589	1	0	1	.037	10	0	1	0	10	0	1
100			min	3.161	12	0	1	-15.077	4	0	1	-.015	4	0	1
101		13	max	255.654	1	0	1	.037	10	0	1	0	10	0	1
102			min	3.194	12	0	1	-15.133	4	0	1	-.016	4	0	1
103		14	max	255.719	1	0	1	.037	10	0	1	0	10	0	1
104			min	3.226	12	0	1	-15.189	4	0	1	-.017	4	0	1
105		15	max	255.783	1	0	1	.037	10	0	1	0	10	0	1
106			min	3.258	12	0	1	-15.245	4	0	1	-.019	4	0	1
107		16	max	255.848	1	0	1	.037	10	0	1	0	10	0	1
108			min	3.291	12	0	1	-15.301	4	0	1	-.02	4	0	1
109		17	max	255.913	1	0	1	.037	10	0	1	0	10	0	1
110			min	3.323	12	0	1	-15.357	4	0	1	-.021	4	0	1
111		18	max	255.977	1	0	1	.037	10	0	1	0	10	0	1
112			min	3.356	12	0	1	-15.413	4	0	1	-.023	4	0	1
113		19	max	256.042	1	0	1	.037	10	0	1	0	10	0	1
114			min	3.388	12	0	1	-15.469	4	0	1	-.024	4	0	1
115	M6	1	max	601.557	2	.638	6	1.006	4	0	3	0	3	0	1
116			min	-1042.315	3	.142	15	-.277	3	0	5	0	2	0	1
117		2	max	601.683	2	.587	6	.892	4	0	3	0	3	0	15
118			min	-1042.221	3	.13	15	-.277	3	0	5	0	2	0	6
119		3	max	601.809	2	.535	6	.778	4	0	3	0	4	0	15
120			min	-1042.126	3	.117	15	-.277	3	0	5	0	2	0	6
121		4	max	601.935	2	.484	6	.663	4	0	3	0	4	0	15
122			min	-1042.032	3	.105	15	-.277	3	0	5	0	2	0	6
123		5	max	602.061	2	.442	2	.549	4	0	3	0	4	0	15
124			min	-1041.937	3	.093	15	-.277	3	0	5	0	2	0	6
125		6	max	602.187	2	.402	2	.434	4	0	3	0	4	0	15
126			min	-1041.843	3	.081	15	-.277	3	0	5	0	2	0	6
127		7	max	602.312	2	.363	2	.32	4	0	3	0	4	0	15
128			min	-1041.749	3	.067	12	-.277	3	0	5	0	3	0	6
129		8	max	602.438	2	.323	2	.206	4	0	3	0	4	0	15
130			min	-1041.654	3	.047	12	-.277	3	0	5	0	3	0	2
131		9	max	602.564	2	.283	2	.091	4	0	3	0	4	0	15
132			min	-1041.56	3	.027	12	-.277	3	0	5	0	3	0	2
133		10	max	602.69	2	.243	2	.017	9	0	3	0	4	0	15
134			min	-1041.465	3	.003	3	-.277	3	0	5	0	3	0	2
135		11	max	602.816	2	.203	2	.017	9	0	3	0	4	0	15
136			min	-1041.371	3	-.027	3	-.277	3	0	5	0	3	0	2
137		12	max	602.942	2	.163	2	.017	9	0	3	0	4	0	15
138			min	-1041.277	3	-.057	3	-.277	3	0	5	0	3	0	2
139		13	max	603.068	2	.123	2	.017	9	0	3	0	4	0	12
140			min	-1041.182	3	-.086	3	-.374	5	0	5	0	3	0	2
141		14	max	603.194	2	.084	2	.017	9	0	3	0	4	0	12
142			min	-1041.088	3	-.116	3	-.488	5	0	5	0	3	0	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
143		15	max	603.319	2	.044	2	.017	9	0	3	0	4	0	12
144			min	-1040.993	3	-.146	3	-.602	5	0	5	0	3	0	2
145		16	max	603.445	2	.004	2	.017	9	0	3	0	4	0	12
146			min	-1040.899	3	-.176	3	-.717	5	0	5	0	3	0	2
147		17	max	603.571	2	-.036	2	.017	9	0	3	0	4	0	12
148			min	-1040.805	3	-.206	3	-.831	5	0	5	0	3	0	2
149		18	max	603.697	2	-.063	15	.017	9	0	3	0	4	0	12
150			min	-1040.71	3	-.236	3	-.946	5	0	5	0	3	0	2
151		19	max	603.823	2	-.075	15	.017	9	0	3	0	9	0	3
152			min	-1040.616	3	-.284	4	-1.06	5	0	5	0	3	0	2
153	M7	1	max	571.344	2	1.776	4	.038	3	0	9	0	4	0	2
154			min	-475.711	3	.424	15	-1.323	4	0	3	0	3	0	3
155		2	max	571.274	2	1.599	4	.038	3	0	9	0	4	0	2
156			min	-475.763	3	.383	15	-1.189	4	0	3	0	3	0	3
157		3	max	571.205	2	1.422	4	.038	3	0	9	0	1	0	2
158			min	-475.815	3	.341	15	-1.056	4	0	3	0	3	0	3
159		4	max	571.136	2	1.245	4	.038	3	0	9	0	1	0	2
160			min	-475.867	3	.299	15	-.922	4	0	3	0	3	0	3
161		5	max	571.066	2	1.069	4	.038	3	0	9	0	1	0	15
162			min	-475.919	3	.258	15	-.788	4	0	3	0	5	0	3
163		6	max	570.997	2	.892	4	.038	3	0	9	0	1	0	15
164			min	-475.971	3	.216	15	-.655	4	0	3	0	5	0	6
165		7	max	570.928	2	.715	4	.038	3	0	9	0	1	0	15
166			min	-476.023	3	.175	15	-.521	4	0	3	0	5	0	6
167		8	max	570.858	2	.538	4	.038	3	0	9	0	1	0	15
168			min	-476.075	3	.133	15	-.387	4	0	3	0	5	-.001	6
169		9	max	570.789	2	.361	4	.038	3	0	9	0	1	0	15
170			min	-476.127	3	.079	12	-.254	4	0	3	0	5	-.001	6
171		10	max	570.72	2	.208	2	.038	3	0	9	0	1	0	15
172			min	-476.179	3	.01	3	-.12	4	0	3	0	5	-.001	6
173		11	max	570.65	2	.07	2	.038	3	0	9	0	1	0	15
174			min	-476.231	3	-.094	3	-.015	1	0	3	-.001	5	-.001	6
175		12	max	570.581	2	-.033	15	.148	5	0	9	0	1	0	15
176			min	-476.283	3	-.197	3	-.015	1	0	3	0	5	-.001	6
177		13	max	570.512	2	-.075	15	.282	5	0	9	0	1	0	15
178			min	-476.335	3	-.347	6	-.015	1	0	3	0	5	-.001	6
179		14	max	570.442	2	-.116	15	.416	5	0	9	0	1	0	15
180			min	-476.387	3	-.523	6	-.015	1	0	3	0	5	-.001	6
181		15	max	570.373	2	-.158	15	.549	5	0	9	0	1	0	15
182			min	-476.439	3	-.7	6	-.015	1	0	3	0	5	0	6
183		16	max	570.304	2	-.199	15	.683	5	0	9	0	1	0	15
184			min	-476.491	3	-.877	6	-.015	1	0	3	0	5	0	6
185		17	max	570.235	2	-.241	15	.817	5	0	9	0	9	0	15
186			min	-476.543	3	-1.054	6	-.015	1	0	3	0	5	0	6
187		18	max	570.165	2	-.283	15	.951	5	0	9	0	9	0	15
188			min	-476.595	3	-1.231	6	-.015	1	0	3	0	3	0	6
189		19	max	570.096	2	-.324	15	1.084	5	0	9	0	9	0	1
190			min	-476.647	3	-1.408	6	-.015	1	0	3	0	3	0	1
191	M8	1	max	712.43	1	0	1	.12	9	0	1	0	4	0	1
192			min	-39.034	3	0	1	-14.727	4	0	1	0	3	0	1
193		2	max	712.495	1	0	1	.12	9	0	1	0	9	0	1
194			min	-38.985	3	0	1	-14.783	4	0	1	-.001	4	0	1
195		3	max	712.56	1	0	1	.12	9	0	1	0	9	0	1
196			min	-38.937	3	0	1	-14.839	4	0	1	-.003	4	0	1
197		4	max	712.625	1	0	1	.12	9	0	1	0	9	0	1
198			min	-38.888	3	0	1	-14.895	4	0	1	-.004	4	0	1
199		5	max	712.689	1	0	1	.12	9	0	1	0	9	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
200			min	-38.84	3	0	1	-14.951	4	0	1	-.005	4	0	1
201		6	max	712.754	1	0	1	.12	9	0	1	0	9	0	1
202			min	-38.791	3	0	1	-15.007	4	0	1	-.007	4	0	1
203		7	max	712.819	1	0	1	.12	9	0	1	0	9	0	1
204			min	-38.743	3	0	1	-15.063	4	0	1	-.008	4	0	1
205		8	max	712.883	1	0	1	.12	9	0	1	0	9	0	1
206			min	-38.694	3	0	1	-15.119	4	0	1	-.009	4	0	1
207		9	max	712.948	1	0	1	.12	9	0	1	0	9	0	1
208			min	-38.646	3	0	1	-15.175	4	0	1	-.011	4	0	1
209		10	max	713.013	1	0	1	.12	9	0	1	0	9	0	1
210			min	-38.597	3	0	1	-15.232	4	0	1	-.012	4	0	1
211		11	max	713.077	1	0	1	.12	9	0	1	0	9	0	1
212			min	-38.549	3	0	1	-15.288	4	0	1	-.013	4	0	1
213		12	max	713.142	1	0	1	.12	9	0	1	0	9	0	1
214			min	-38.5	3	0	1	-15.344	4	0	1	-.015	4	0	1
215		13	max	713.207	1	0	1	.12	9	0	1	0	9	0	1
216			min	-38.452	3	0	1	-15.4	4	0	1	-.016	4	0	1
217		14	max	713.272	1	0	1	.12	9	0	1	0	9	0	1
218			min	-38.403	3	0	1	-15.456	4	0	1	-.018	4	0	1
219		15	max	713.336	1	0	1	.12	9	0	1	0	9	0	1
220			min	-38.355	3	0	1	-15.512	4	0	1	-.019	4	0	1
221		16	max	713.401	1	0	1	.12	9	0	1	0	9	0	1
222			min	-38.306	3	0	1	-15.568	4	0	1	-.02	4	0	1
223		17	max	713.466	1	0	1	.12	9	0	1	0	9	0	1
224			min	-38.257	3	0	1	-15.624	4	0	1	-.022	4	0	1
225		18	max	713.53	1	0	1	.12	9	0	1	0	9	0	1
226			min	-38.209	3	0	1	-15.68	4	0	1	-.023	4	0	1
227		19	max	713.595	1	0	1	.12	9	0	1	0	9	0	1
228			min	-38.16	3	0	1	-15.736	4	0	1	-.025	4	0	1
229	M10	1	max	195.535	2	.687	4	1.11	5	0	1	0	1	0	1
230			min	-273.066	3	.175	15	-.102	1	-.001	5	0	3	0	1
231		2	max	195.661	2	.635	4	.995	5	0	1	0	4	0	15
232			min	-272.971	3	.163	15	-.102	1	-.001	5	0	3	0	4
233		3	max	195.787	2	.584	4	.881	5	0	1	0	4	0	15
234			min	-272.877	3	.151	15	-.102	1	-.001	5	0	3	0	4
235		4	max	195.913	2	.533	4	.767	5	0	1	0	4	0	15
236			min	-272.782	3	.139	15	-.102	1	-.001	5	0	3	0	4
237		5	max	196.039	2	.482	4	.652	5	0	1	0	4	0	15
238			min	-272.688	3	.127	15	-.102	1	-.001	5	0	3	0	4
239		6	max	196.165	2	.431	4	.538	5	0	1	0	4	0	15
240			min	-272.594	3	.115	15	-.102	1	-.001	5	0	3	0	4
241		7	max	196.291	2	.38	4	.423	5	0	1	0	4	0	15
242			min	-272.499	3	.103	15	-.102	1	-.001	5	0	3	0	4
243		8	max	196.417	2	.329	4	.309	5	0	1	0	4	0	15
244			min	-272.405	3	.091	15	-.102	1	-.001	5	0	3	0	4
245		9	max	196.542	2	.277	4	.194	5	0	1	0	5	0	15
246			min	-272.31	3	.079	15	-.102	1	-.001	5	0	3	0	4
247		10	max	196.668	2	.226	4	.08	5	0	1	0	5	0	15
248			min	-272.216	3	.06	12	-.102	1	-.001	5	0	3	0	4
249		11	max	196.794	2	.175	4	.002	10	0	1	0	5	0	15
250			min	-272.122	3	.04	12	-.102	1	-.001	5	0	3	0	4
251		12	max	196.92	2	.124	4	.002	10	0	1	0	5	0	15
252			min	-272.027	3	.02	12	-.163	4	-.001	5	0	3	0	4
253		13	max	197.046	2	.073	4	.002	10	0	1	0	5	0	15
254			min	-271.933	3	-.001	3	-.277	4	-.001	5	0	3	0	4
255		14	max	197.172	2	.028	5	.002	10	0	1	0	5	0	15
256			min	-271.838	3	-.031	3	-.392	4	-.001	5	0	3	0	4

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
257		15	max	197.298	2	.009	5	.002	10	0	1	0	5	0	15
258			min	-271.744	3	-.061	3	-.506	4	-.001	5	0	3	0	4
259		16	max	197.423	2	-.005	15	.002	10	0	1	0	5	0	15
260			min	-271.65	3	-.091	3	-.62	4	-.001	5	0	3	0	4
261		17	max	197.549	2	-.017	15	.002	10	0	1	0	5	0	15
262			min	-271.555	3	-.133	6	-.735	4	-.001	5	0	3	0	4
263		18	max	197.675	2	-.029	15	.002	10	0	1	0	5	0	12
264			min	-271.461	3	-.184	6	-.849	4	-.001	5	0	3	0	4
265		19	max	197.801	2	-.041	15	.002	10	0	1	0	5	0	12
266			min	-271.366	3	-.235	6	-.964	4	-.001	5	0	3	0	4
267	M11	1	max	183.198	2	1.746	6	.125	1	0	4	0	5	0	2
268			min	-174.315	3	.405	15	-1.267	5	0	10	0	1	0	15
269		2	max	183.129	2	1.57	6	.125	1	0	4	0	3	0	2
270			min	-174.367	3	.363	15	-1.133	5	0	10	0	1	0	12
271		3	max	183.059	2	1.393	6	.125	1	0	4	0	3	0	2
272			min	-174.419	3	.322	15	-.999	5	0	10	0	1	0	3
273		4	max	182.99	2	1.216	6	.125	1	0	4	0	3	0	15
274			min	-174.471	3	.28	15	-.866	5	0	10	0	1	0	4
275		5	max	182.921	2	1.039	6	.125	1	0	4	0	3	0	15
276			min	-174.523	3	.239	15	-.732	5	0	10	0	1	0	4
277		6	max	182.852	2	.862	6	.125	1	0	4	0	3	0	15
278			min	-174.575	3	.197	15	-.598	5	0	10	0	4	0	4
279		7	max	182.782	2	.685	6	.125	1	0	4	0	3	0	15
280			min	-174.627	3	.155	15	-.465	5	0	10	0	4	0	4
281		8	max	182.713	2	.509	6	.125	1	0	4	0	3	0	15
282			min	-174.679	3	.114	15	-.331	5	0	10	0	4	-.001	4
283		9	max	182.644	2	.332	6	.125	1	0	4	0	3	0	15
284			min	-174.731	3	.072	15	-.197	5	0	10	0	4	-.001	4
285		10	max	182.574	2	.156	2	.125	1	0	4	0	3	0	15
286			min	-174.783	3	.031	15	-.064	5	0	10	0	4	-.001	4
287		11	max	182.505	2	.018	2	.125	1	0	4	0	3	0	15
288			min	-174.835	3	-.041	3	-.056	3	0	10	0	4	-.001	4
289		12	max	182.436	2	-.052	15	.235	4	0	4	0	3	0	15
290			min	-174.887	3	-.199	4	-.056	3	0	10	0	4	-.001	4
291		13	max	182.366	2	-.094	15	.369	4	0	4	0	3	0	15
292			min	-174.938	3	-.376	4	-.056	3	0	10	0	4	-.001	4
293		14	max	182.297	2	-.136	15	.502	4	0	4	0	3	0	15
294			min	-174.99	3	-.553	4	-.056	3	0	10	0	4	-.001	4
295		15	max	182.228	2	-.177	15	.636	4	0	4	0	3	0	15
296			min	-175.042	3	-.73	4	-.056	3	0	10	0	4	0	4
297		16	max	182.158	2	-.219	15	.77	4	0	4	0	3	0	15
298			min	-175.094	3	-.907	4	-.056	3	0	10	0	5	0	4
299		17	max	182.089	2	-.26	15	.904	4	0	4	0	3	0	15
300			min	-175.146	3	-1.083	4	-.056	3	0	10	0	5	0	4
301		18	max	182.02	2	-.302	15	1.037	4	0	4	0	3	0	15
302			min	-175.198	3	-1.26	4	-.056	3	0	10	0	10	0	4
303		19	max	181.95	2	-.343	15	1.171	4	0	4	0	4	0	1
304			min	-175.25	3	-1.437	4	-.056	3	0	10	0	10	0	1
305	M12	1	max	255.193	1	0	1	.604	1	0	1	0	4	0	1
306			min	-.017	15	0	1	-13.552	5	0	1	0	3	0	1
307		2	max	255.257	1	0	1	.604	1	0	1	0	1	0	1
308			min	.002	15	0	1	-13.608	5	0	1	-.001	5	0	1
309		3	max	255.322	1	0	1	.604	1	0	1	0	1	0	1
310			min	.022	15	0	1	-13.664	5	0	1	-.002	5	0	1
311		4	max	255.387	1	0	1	.604	1	0	1	0	1	0	1
312			min	.041	15	0	1	-13.72	5	0	1	-.004	5	0	1
313		5	max	255.452	1	0	1	.604	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
314			min	.061	15	0	1	-13.776	5	0	1	-.005	5	0	1
315		6	max	255.516	1	0	1	.604	1	0	1	0	1	0	1
316			min	.08	15	0	1	-13.832	5	0	1	-.006	5	0	1
317		7	max	255.581	1	0	1	.604	1	0	1	0	1	0	1
318			min	.1	15	0	1	-13.889	5	0	1	-.007	5	0	1
319		8	max	255.646	1	0	1	.604	1	0	1	0	1	0	1
320			min	.119	15	0	1	-13.945	5	0	1	-.009	5	0	1
321		9	max	255.71	1	0	1	.604	1	0	1	0	1	0	1
322			min	.139	15	0	1	-14.001	5	0	1	-.01	5	0	1
323		10	max	255.775	1	0	1	.604	1	0	1	0	1	0	1
324			min	.159	15	0	1	-14.057	5	0	1	-.011	5	0	1
325		11	max	255.84	1	0	1	.604	1	0	1	0	1	0	1
326			min	.178	15	0	1	-14.113	5	0	1	-.012	5	0	1
327		12	max	255.905	1	0	1	.604	1	0	1	0	1	0	1
328			min	.198	15	0	1	-14.169	5	0	1	-.014	5	0	1
329		13	max	255.969	1	0	1	.604	1	0	1	0	1	0	1
330			min	.217	15	0	1	-14.225	5	0	1	-.015	5	0	1
331		14	max	256.034	1	0	1	.604	1	0	1	0	1	0	1
332			min	.237	15	0	1	-14.281	5	0	1	-.016	5	0	1
333		15	max	256.099	1	0	1	.604	1	0	1	0	1	0	1
334			min	.256	15	0	1	-14.337	5	0	1	-.017	5	0	1
335		16	max	256.163	1	0	1	.604	1	0	1	0	1	0	1
336			min	.276	15	0	1	-14.393	5	0	1	-.019	5	0	1
337		17	max	256.228	1	0	1	.604	1	0	1	0	1	0	1
338			min	.295	15	0	1	-14.449	5	0	1	-.02	5	0	1
339		18	max	256.293	1	0	1	.604	1	0	1	0	1	0	1
340			min	.315	15	0	1	-14.505	5	0	1	-.021	5	0	1
341		19	max	256.357	1	0	1	.604	1	0	1	0	1	0	1
342			min	.334	15	0	1	-14.561	5	0	1	-.023	5	0	1
343	M1	1	max	70.534	1	330.638	3	.814	10	0	2	.03	1	0	2
344			min	4.957	10	-213.689	2	-16.088	4	0	3	-.002	10	0	3
345		2	max	70.673	1	330.457	3	.814	10	0	2	.027	1	.047	2
346			min	5.074	10	-213.93	2	-15.846	4	0	3	-.001	10	-.072	3
347		3	max	87.907	3	4.592	4	.812	10	0	10	.023	1	.092	2
348			min	-17.183	10	-24.227	2	-15.101	1	0	1	-.001	10	-.142	3
349		4	max	88.012	3	4.281	4	.812	10	0	10	.02	1	.098	2
350			min	-17.066	10	-24.468	2	-15.101	1	0	1	-.001	10	-.14	3
351		5	max	88.117	3	3.975	14	.812	10	0	10	.016	1	.103	2
352			min	-16.95	10	-24.71	2	-15.101	1	0	1	0	10	-.137	3
353		6	max	88.222	3	3.737	14	.812	10	0	10	.013	1	.108	2
354			min	-16.834	10	-24.952	2	-15.101	1	0	1	0	10	-.134	3
355		7	max	88.326	3	3.5	14	.812	10	0	10	.01	1	.114	2
356			min	-16.717	10	-25.194	2	-15.101	1	0	1	0	10	-.132	3
357		8	max	88.431	3	3.262	14	.812	10	0	10	.007	1	.119	2
358			min	-16.601	10	-25.436	2	-15.101	1	0	1	0	10	-.129	3
359		9	max	88.536	3	3.024	14	.812	10	0	10	.003	1	.125	2
360			min	-16.485	10	-25.678	2	-15.101	1	0	1	0	10	-.126	3
361		10	max	88.64	3	2.787	14	.812	10	0	10	.002	3	.13	2
362			min	-16.368	10	-25.919	2	-15.101	1	0	1	0	10	-.123	3
363		11	max	88.745	3	2.549	14	.812	10	0	10	0	3	.136	2
364			min	-16.252	10	-26.161	2	-15.101	1	0	1	-.003	1	-.12	3
365		12	max	88.85	3	2.312	14	.812	10	0	10	0	10	.142	2
366			min	-16.136	10	-26.403	2	-15.101	1	0	1	-.006	1	-.117	3
367		13	max	88.955	3	2.074	14	.812	10	0	10	0	10	.147	2
368			min	-16.019	10	-26.645	2	-15.101	1	0	1	-.01	1	-.114	3
369		14	max	89.059	3	1.836	14	.812	10	0	10	0	10	.153	2
370			min	-15.903	10	-26.887	2	-15.101	1	0	1	-.013	1	-.111	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
371		15	max	89.164	3	1.613	9	.812	10	0	10	0	10	.159	2
372			min	-15.786	10	-27.129	2	-15.101	1	0	1	-.016	1	-.108	3
373		16	max	86.188	2	124.768	2	.817	10	0	1	.001	10	.164	2
374			min	-5.761	3	-160.656	3	-15.209	1	0	5	-.02	1	-.104	3
375		17	max	86.327	2	124.526	2	.817	10	0	1	.001	10	.137	2
376			min	-5.656	3	-160.838	3	-15.209	1	0	5	-.023	1	-.069	3
377		18	max	-4.753	12	316.063	2	.854	10	0	5	.001	10	.069	2
378			min	-70.672	1	-157.968	3	-24.105	4	0	2	-.026	1	-.035	3
379		19	max	-4.683	12	315.821	2	.854	10	0	5	.002	10	0	2
380			min	-70.532	1	-158.149	3	-23.863	4	0	2	-.03	1	0	3
381	M5	1	max	177.447	1	1046.757	3	0	11	0	9	.028	4	0	3
382			min	-4.325	3	-666.658	2	-79.58	3	0	3	0	11	0	2
383		2	max	177.586	1	1046.575	3	0	11	0	9	.024	4	.144	2
384			min	-4.22	3	-666.9	2	-79.58	3	0	3	-.005	3	-.226	3
385		3	max	237.124	3	4.737	9	8.536	3	0	3	.02	4	.286	2
386			min	-48.563	2	-80.008	2	-15.656	4	0	4	-.022	3	-.448	3
387		4	max	237.229	3	4.536	9	8.536	3	0	3	.017	4	.304	2
388			min	-48.424	2	-80.25	2	-15.414	4	0	4	-.02	3	-.438	3
389		5	max	237.334	3	4.334	9	8.536	3	0	3	.013	4	.321	2
390			min	-48.284	2	-80.492	2	-15.172	4	0	4	-.018	3	-.428	3
391		6	max	237.438	3	4.132	9	8.536	3	0	3	.01	4	.339	2
392			min	-48.144	2	-80.734	2	-14.93	4	0	4	-.016	3	-.417	3
393		7	max	237.543	3	3.931	9	8.536	3	0	3	.007	4	.356	2
394			min	-48.005	2	-80.976	2	-14.688	4	0	4	-.014	3	-.407	3
395		8	max	237.648	3	3.729	9	8.536	3	0	3	.004	4	.374	2
396			min	-47.865	2	-81.217	2	-14.446	4	0	4	-.013	3	-.396	3
397		9	max	237.753	3	3.528	9	8.536	3	0	3	0	4	.391	2
398			min	-47.726	2	-81.459	2	-14.204	4	0	4	-.011	3	-.385	3
399		10	max	237.857	3	3.326	9	8.536	3	0	3	0	1	.409	2
400			min	-47.586	2	-81.701	2	-13.962	4	0	4	-.009	3	-.375	3
401		11	max	237.962	3	3.125	9	8.536	3	0	3	0	2	.427	2
402			min	-47.446	2	-81.943	2	-13.72	4	0	4	-.007	3	-.364	3
403		12	max	238.067	3	2.923	9	8.536	3	0	3	0	2	.445	2
404			min	-47.307	2	-82.185	2	-13.478	4	0	4	-.008	4	-.353	3
405		13	max	238.171	3	2.722	9	8.536	3	0	3	0	2	.463	2
406			min	-47.167	2	-82.427	2	-13.236	4	0	4	-.011	4	-.343	3
407		14	max	238.276	3	2.52	9	8.536	3	0	3	0	2	.48	2
408			min	-47.027	2	-82.668	2	-12.994	4	0	4	-.014	4	-.332	3
409		15	max	238.381	3	2.319	9	8.536	3	0	3	0	3	.498	2
410			min	-46.888	2	-82.91	2	-12.752	4	0	4	-.017	4	-.321	3
411		16	max	266.777	2	395.749	2	8.512	3	0	3	.002	3	.512	2
412			min	-22.603	3	-449.066	3	-11.432	4	0	4	-.02	4	-.306	3
413		17	max	266.917	2	395.507	2	8.512	3	0	3	.004	3	.426	2
414			min	-22.498	3	-449.247	3	-11.19	4	0	4	-.022	4	-.209	3
415		18	max	-2.249	12	990.139	2	7.828	3	0	4	.005	3	.214	2
416			min	-177.598	1	-483.416	3	-25.406	5	0	9	-.028	4	-.104	3
417		19	max	-2.179	12	989.897	2	7.828	3	0	4	.007	3	0	3
418			min	-177.459	1	-483.597	3	-25.164	5	0	9	-.033	4	0	2
419	M9	1	max	70.509	1	330.545	3	108.045	4	0	3	.002	10	0	2
420			min	.959	15	-213.689	2	-.814	10	0	2	-.03	1	0	3
421		2	max	70.649	1	330.363	3	108.287	4	0	3	.022	5	.047	2
422			min	1.001	15	-213.93	2	-.814	10	0	2	-.026	1	-.072	3
423		3	max	87.301	3	4.023	9	15.032	1	0	1	.043	5	.092	2
424			min	-16.841	10	-24.201	2	-20.019	5	0	5	-.023	1	-.142	3
425		4	max	87.406	3	3.822	9	15.032	1	0	1	.039	5	.098	2
426			min	-16.725	10	-24.443	2	-19.777	5	0	5	-.02	1	-.139	3
427		5	max	87.51	3	3.62	9	15.032	1	0	1	.035	5	.103	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
428			min	-16.608	10	-24.684	2	-19.535	5	0	5	-.016	1	-.137	3
429		6	max	87.615	3	3.419	9	15.032	1	0	1	.03	5	.108	2
430			min	-16.492	10	-24.926	2	-19.293	5	0	5	-.013	1	-.134	3
431		7	max	87.72	3	3.217	9	15.032	1	0	1	.026	5	.114	2
432			min	-16.376	10	-25.168	2	-19.051	5	0	5	-.01	1	-.131	3
433		8	max	87.824	3	3.016	9	15.032	1	0	1	.022	5	.119	2
434			min	-16.259	10	-25.41	2	-18.809	5	0	5	-.007	1	-.129	3
435		9	max	87.929	3	2.814	9	15.032	1	0	1	.018	5	.125	2
436			min	-16.143	10	-25.652	2	-18.567	5	0	5	-.003	1	-.126	3
437		10	max	88.034	3	2.612	9	15.032	1	0	1	.014	4	.13	2
438			min	-16.027	10	-25.894	2	-18.325	5	0	5	0	1	-.123	3
439		11	max	88.139	3	2.411	9	15.032	1	0	1	.011	4	.136	2
440			min	-15.91	10	-26.135	2	-18.083	5	0	5	0	10	-.12	3
441		12	max	88.243	3	2.209	9	15.032	1	0	1	.01	3	.142	2
442			min	-15.794	10	-26.377	2	-17.841	5	0	5	0	10	-.117	3
443		13	max	88.348	3	2.008	9	15.032	1	0	1	.01	1	.147	2
444			min	-15.678	10	-26.619	2	-17.599	5	0	5	0	10	-.114	3
445		14	max	88.453	3	1.806	9	15.032	1	0	1	.013	1	.153	2
446			min	-15.561	10	-26.861	2	-17.357	5	0	5	-.001	5	-.111	3
447		15	max	88.557	3	1.605	9	15.032	1	0	1	.016	1	.159	2
448			min	-15.445	10	-27.103	2	-17.115	5	0	5	-.005	5	-.108	3
449		16	max	86.372	2	124.45	2	15.143	1	0	10	.02	1	.164	2
450			min	-6.84	3	-161.26	3	-15.733	5	0	4	-.008	5	-.104	3
451		17	max	86.511	2	124.208	2	15.143	1	0	10	.023	1	.137	2
452			min	-6.735	3	-161.442	3	-15.491	5	0	4	-.012	5	-.069	3
453		18	max	7.269	5	316.063	2	15.756	1	0	2	.026	1	.069	2
454			min	-70.638	1	-157.957	3	-28.798	5	0	3	-.018	5	-.035	3
455		19	max	7.334	5	315.821	2	15.756	1	0	2	.03	1	0	2
456			min	-70.499	1	-158.138	3	-28.556	5	0	3	-.024	5	0	3
457	M13	1	max	108.045	4	213.614	2	-.959	15	0	2	.03	1	0	2
458			min	-.814	10	-330.6	3	-70.505	1	0	3	-.002	10	0	3
459		2	max	103.952	4	152.886	2	-.246	15	0	2	.016	3	.118	3
460			min	-.814	10	-235.716	3	-52.811	1	0	3	-.004	2	-.076	2
461		3	max	99.86	4	92.159	2	.604	5	0	2	.012	3	.196	3
462			min	-.814	10	-140.833	3	-35.118	1	0	3	-.014	1	-.127	2
463		4	max	95.768	4	31.431	2	1.706	5	0	2	.009	3	.235	3
464			min	-.814	10	-45.949	3	-17.424	1	0	3	-.025	1	-.153	2
465		5	max	91.675	4	48.934	3	4.152	2	0	2	.006	3	.235	3
466			min	-.814	10	-29.297	2	-6.903	3	0	3	-.029	1	-.154	2
467		6	max	87.583	4	143.818	3	17.964	1	0	2	.003	5	.195	3
468			min	-.814	10	-90.025	2	-5.867	3	0	3	-.025	1	-.129	2
469		7	max	84.566	3	238.701	3	35.658	1	0	2	.005	5	.115	3
470			min	-.814	10	-150.753	2	-4.83	3	0	3	-.014	1	-.079	2
471		8	max	84.566	3	333.585	3	53.352	1	0	2	.008	4	0	14
472			min	-.814	10	-211.48	2	-3.794	3	0	3	-.001	3	-.004	3
473		9	max	84.566	3	428.468	3	71.046	1	0	2	.031	1	.098	2
474			min	-.814	10	-272.208	2	-2.757	3	0	3	-.003	3	-.163	3
475		10	max	84.566	3	-6.866	15	88.74	1	0	2	.064	1	.224	2
476			min	-.814	10	-523.352	3	1.44	12	0	3	-.015	3	-.361	3
477		11	max	48.808	4	272.208	2	5.581	5	0	3	.031	1	.098	2
478			min	-.814	10	-428.468	3	-71.021	1	0	2	-.014	3	-.163	3
479		12	max	44.716	4	211.48	2	6.683	5	0	3	.007	2	0	14
480			min	-.814	10	-333.585	3	-53.327	1	0	2	-.012	3	-.004	3
481		13	max	40.624	4	150.753	2	7.784	5	0	3	0	10	.115	3
482			min	-.814	10	-238.701	3	-35.633	1	0	2	-.014	1	-.079	2
483		14	max	36.531	4	90.025	2	8.886	5	0	3	-.002	10	.195	3
484			min	-.814	10	-143.818	3	-17.94	1	0	2	-.025	1	-.129	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
485		15	max	32.439	4	29.297	2	10.564	4	0	3	0	5	.235	3
486			min	-.814	10	-48.934	3	-4.152	2	0	2	-.029	1	-.154	2
487		16	max	28.347	4	45.949	3	17.448	1	0	3	.005	5	.235	3
488			min	-.814	10	-31.431	2	-.945	10	0	2	-.025	1	-.153	2
489		17	max	24.254	4	140.833	3	35.142	1	0	3	.01	5	.196	3
490			min	-.814	10	-92.159	2	1.023	10	0	2	-.014	1	-.127	2
491		18	max	20.162	4	235.716	3	52.836	1	0	3	.017	4	.118	3
492			min	-.814	10	-152.886	2	2.99	10	0	2	-.004	2	-.076	2
493		19	max	16.07	4	330.6	3	70.53	1	0	3	.03	1	0	2
494			min	-.814	10	-213.614	2	4.958	10	0	2	-.002	10	0	3
495	M16	1	max	28.548	5	315.916	2	7.334	5	0	3	.03	1	0	2
496			min	-15.73	1	-158.166	3	-70.503	1	0	2	-.024	5	0	3
497		2	max	24.455	5	225.764	2	8.436	5	0	3	.005	9	.057	3
498			min	-15.73	1	-113.724	3	-52.809	1	0	2	-.021	5	-.113	2
499		3	max	20.363	5	135.612	2	9.538	5	0	3	0	3	.095	3
500			min	-15.73	1	-69.282	3	-35.115	1	0	2	-.02	4	-.188	2
501		4	max	16.271	5	45.46	2	10.64	5	0	3	-.001	12	.114	3
502			min	-15.73	1	-24.84	3	-17.421	1	0	2	-.025	1	-.226	2
503		5	max	12.178	5	19.602	3	11.741	5	0	3	-.003	12	.115	3
504			min	-15.73	1	-44.691	2	-4.49	3	0	2	-.029	1	-.226	2
505		6	max	8.086	5	64.045	3	17.966	1	0	3	-.002	10	.098	3
506			min	-15.73	1	-134.843	2	-3.454	3	0	2	-.025	1	-.189	2
507		7	max	3.993	5	108.487	3	35.66	1	0	3	.003	5	.062	3
508			min	-15.73	1	-224.995	2	-2.417	3	0	2	-.014	1	-.114	2
509		8	max	2.31	3	152.929	3	53.354	1	0	3	.009	4	.008	3
510			min	-15.73	1	-315.147	2	-1.381	3	0	2	-.008	3	-.001	2
511		9	max	2.31	3	197.371	3	71.048	1	0	3	.031	1	.149	2
512			min	-15.73	1	-405.299	2	-.345	3	0	2	-.008	3	-.065	3
513		10	max	16.887	5	-6.76	15	88.742	1	0	14	.064	1	.337	2
514			min	-15.73	1	-495.45	2	-2.127	3	0	2	-.008	3	-.157	3
515		11	max	12.795	5	405.299	2	4.505	5	0	2	.031	1	.149	2
516			min	-15.714	1	-197.371	3	-71.015	1	0	3	-.009	5	-.065	3
517		12	max	8.703	5	315.147	2	5.607	5	0	2	.007	2	.008	3
518			min	-15.714	1	-152.929	3	-53.321	1	0	3	-.007	5	-.001	2
519		13	max	4.61	5	224.995	2	6.709	5	0	2	0	10	.062	3
520			min	-15.714	1	-108.487	3	-35.627	1	0	3	-.014	1	-.114	2
521		14	max	.854	10	134.843	2	7.811	5	0	2	0	12	.098	3
522			min	-15.714	1	-64.045	3	-17.933	1	0	3	-.025	1	-.189	2
523		15	max	.854	10	44.691	2	9.467	4	0	2	.002	5	.115	3
524			min	-15.714	1	-19.602	3	-4.131	2	0	3	-.029	1	-.226	2
525		16	max	.854	10	24.84	3	17.455	1	0	2	.006	5	.114	3
526			min	-15.714	1	-45.46	2	-.931	10	0	3	-.025	1	-.226	2
527		17	max	.854	10	69.282	3	35.149	1	0	2	.01	5	.095	3
528			min	-15.714	1	-135.612	2	1.036	10	0	3	-.014	1	-.188	2
529		18	max	.854	10	113.724	3	52.843	1	0	2	.017	4	.057	3
530			min	-19.791	4	-225.764	2	3.004	10	0	3	-.004	2	-.113	2
531		19	max	.854	10	158.166	3	70.537	1	0	2	.03	1	0	2
532			min	-23.884	4	-315.916	2	4.682	12	0	3	-.002	10	0	5
533	M15	1	max	0	1	.785	3	.145	3	0	1	0	1	0	1
534			min	-117.062	3	0	1	0	1	0	3	0	3	0	1
535		2	max	0	1	.698	3	.145	3	0	1	0	1	0	1
536			min	-117.133	3	0	1	0	1	0	3	0	3	0	3
537		3	max	0	1	.611	3	.145	3	0	1	0	1	0	1
538			min	-117.203	3	0	1	0	1	0	3	0	3	0	3
539		4	max	0	1	.524	3	.145	3	0	1	0	1	0	1
540			min	-117.274	3	0	1	0	1	0	3	0	3	0	3
541		5	max	0	1	.436	3	.145	3	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
542			min	-117.344	3	0	1	0	1	0	3	0	3	0	3
543		6	max	0	1	.349	3	.145	3	0	1	0	1	0	1
544			min	-117.415	3	0	1	0	1	0	3	0	3	0	3
545		7	max	0	1	.262	3	.145	3	0	1	0	3	0	1
546			min	-117.485	3	0	1	0	1	0	3	0	1	0	3
547		8	max	0	1	.175	3	.145	3	0	1	0	3	0	1
548			min	-117.556	3	0	1	0	1	0	3	0	1	0	3
549		9	max	0	1	.087	3	.145	3	0	1	0	3	0	1
550			min	-117.626	3	0	1	0	1	0	3	0	1	0	3
551		10	max	0	1	0	1	.145	3	0	1	0	3	0	1
552			min	-117.697	3	0	1	0	1	0	3	0	1	0	3
553		11	max	0	1	0	1	.145	3	0	1	0	3	0	1
554			min	-117.767	3	-.087	3	0	1	0	3	0	1	0	3
555		12	max	0	1	0	1	.145	3	0	1	0	3	0	1
556			min	-117.838	3	-.175	3	0	1	0	3	0	1	0	3
557		13	max	0	1	0	1	.145	3	0	1	0	3	0	1
558			min	-117.908	3	-.262	3	0	1	0	3	0	1	0	3
559		14	max	0	1	0	1	.145	3	0	1	0	3	0	1
560			min	-117.979	3	-.349	3	0	1	0	3	0	1	0	3
561		15	max	0	1	0	1	.145	3	0	1	0	3	0	1
562			min	-118.049	3	-.436	3	0	1	0	3	0	1	0	3
563		16	max	0	1	0	1	.145	3	0	1	0	3	0	1
564			min	-118.12	3	-.524	3	0	1	0	3	0	1	0	3
565		17	max	0	1	0	1	.145	3	0	1	0	3	0	1
566			min	-118.19	3	-.611	3	0	1	0	3	0	1	0	3
567		18	max	0	1	0	1	.145	3	0	1	0	3	0	1
568			min	-118.261	3	-.698	3	0	1	0	3	0	1	0	3
569		19	max	0	1	0	1	.145	3	0	1	0	3	0	1
570			min	-118.331	3	-.785	3	0	1	0	3	0	1	0	1
571	M16A	1	max	0	2	2.053	4	.328	4	0	3	0	3	0	1
572			min	-169.312	4	0	2	-.06	3	0	1	0	4	0	1
573		2	max	0	2	1.825	4	.295	4	0	3	0	3	0	2
574			min	-169.288	4	0	2	-.06	3	0	1	0	4	0	4
575		3	max	0	2	1.597	4	.262	4	0	3	0	3	0	2
576			min	-169.265	4	0	2	-.06	3	0	1	0	4	-.001	4
577		4	max	0	2	1.369	4	.228	4	0	3	0	3	0	2
578			min	-169.242	4	0	2	-.06	3	0	1	0	1	-.001	4
579		5	max	0	2	1.14	4	.195	4	0	3	0	3	0	2
580			min	-169.219	4	0	2	-.06	3	0	1	0	1	-.002	4
581		6	max	0	2	.912	4	.162	4	0	3	0	3	0	2
582			min	-169.196	4	0	2	-.06	3	0	1	0	1	-.002	4
583		7	max	0	2	.684	4	.129	4	0	3	0	3	0	2
584			min	-169.173	4	0	2	-.06	3	0	1	0	1	-.002	4
585		8	max	0	2	.456	4	.096	4	0	3	0	5	0	2
586			min	-169.15	4	0	2	-.06	3	0	1	0	1	-.002	4
587		9	max	0	2	.228	4	.063	4	0	3	0	5	0	2
588			min	-169.127	4	0	2	-.06	3	0	1	0	1	-.003	4
589		10	max	0	2	0	1	.04	1	0	3	0	5	0	2
590			min	-169.103	4	0	1	-.06	3	0	1	0	1	-.003	4
591		11	max	0	2	0	2	.04	1	0	3	0	5	0	2
592			min	-169.08	4	-.228	4	-.06	3	0	1	0	1	-.003	4
593		12	max	.068	1	0	2	.04	1	0	3	0	5	0	2
594			min	-169.057	4	-.456	4	-.06	3	0	1	0	1	-.002	4
595		13	max	.162	1	0	2	.04	1	0	3	0	5	0	2
596			min	-169.034	4	-.684	4	-.073	5	0	1	0	3	-.002	4
597		14	max	.256	1	0	2	.04	1	0	3	0	5	0	2
598			min	-169.011	4	-.912	4	-.106	5	0	1	0	3	-.002	4

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
599		15	max	.35	1	0	2	.04	1	0	3	0	5	0	2
600			min	-168.988	4	-1.14	4	-.139	5	0	1	0	3	-.002	4
601		16	max	.444	1	0	2	.04	1	0	3	0	1	0	2
602			min	-168.965	4	-1.369	4	-.172	5	0	1	0	3	-.001	4
603		17	max	.538	1	0	2	.04	1	0	3	0	1	0	2
604			min	-169.017	5	-1.597	4	-.205	5	0	1	0	3	-.001	4
605		18	max	.632	1	0	2	.04	1	0	3	0	1	0	2
606			min	-169.071	5	-1.825	4	-.238	5	0	1	0	5	0	4
607		19	max	.726	1	0	2	.04	1	0	3	0	1	0	1
608			min	-169.124	5	-2.053	4	-.271	5	0	1	0	5	0	1

Envelope Member Section Deflections

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
1	M2	1	max	.002	2	.009	2	.002	9	8.279e-4	5	NC	3	NC	1
2			min	-.003	3	-.009	3	-.009	5	-2.438e-4	1	4314.383	2	NC	1
3		2	max	.002	2	.008	2	.002	9	8.487e-4	5	NC	3	NC	1
4			min	-.003	3	-.009	3	-.009	5	-2.325e-4	1	4712.473	2	NC	1
5		3	max	.002	2	.008	2	.002	9	8.694e-4	5	NC	1	NC	1
6			min	-.003	3	-.008	3	-.009	5	-2.211e-4	1	5186.689	2	NC	1
7		4	max	.002	2	.007	2	.002	1	8.901e-4	5	NC	1	NC	1
8			min	-.003	3	-.008	3	-.009	5	-2.098e-4	1	5755.592	2	NC	1
9		5	max	.001	2	.006	2	.001	1	9.108e-4	5	NC	1	NC	1
10			min	-.003	3	-.008	3	-.008	5	-1.984e-4	1	6443.985	2	NC	1
11		6	max	.001	2	.005	2	.001	1	9.316e-4	5	NC	1	NC	1
12			min	-.002	3	-.007	3	-.008	5	-1.871e-4	1	7285.556	2	NC	1
13		7	max	.001	2	.005	2	.001	1	9.523e-4	5	NC	1	NC	1
14			min	-.002	3	-.007	3	-.008	5	-1.758e-4	1	8326.95	2	NC	1
15		8	max	.001	2	.004	2	.001	1	9.73e-4	5	NC	1	NC	1
16			min	-.002	3	-.006	3	-.007	5	-1.644e-4	1	9634.213	2	NC	1
17		9	max	.001	2	.003	2	0	1	9.938e-4	5	NC	1	NC	1
18			min	-.002	3	-.006	3	-.007	5	-1.531e-4	1	NC	1	NC	1
19		10	max	0	2	.003	2	0	1	1.014e-3	5	NC	1	NC	1
20			min	-.002	3	-.006	3	-.006	5	-1.417e-4	1	NC	1	NC	1
21		11	max	0	2	.002	2	0	1	1.035e-3	5	NC	1	NC	1
22			min	-.002	3	-.005	3	-.006	5	-1.304e-4	1	NC	1	NC	1
23		12	max	0	2	.002	2	0	1	1.056e-3	5	NC	1	NC	1
24			min	-.001	3	-.004	3	-.005	5	-1.191e-4	1	NC	1	NC	1
25		13	max	0	2	.002	2	0	1	1.077e-3	5	NC	1	NC	1
26			min	-.001	3	-.004	3	-.005	5	-1.077e-4	1	NC	1	NC	1
27		14	max	0	2	.001	2	0	1	1.097e-3	5	NC	1	NC	1
28			min	0	3	-.003	3	-.004	5	-9.638e-5	1	NC	1	NC	1
29		15	max	0	2	0	2	0	1	1.118e-3	5	NC	1	NC	1
30			min	0	3	-.003	3	-.003	5	-8.504e-5	1	NC	1	NC	1
31		16	max	0	2	0	2	0	1	1.139e-3	5	NC	1	NC	1
32			min	0	3	-.002	3	-.002	5	-7.37e-5	1	NC	1	NC	1
33		17	max	0	2	0	2	0	1	1.16e-3	5	NC	1	NC	1
34			min	0	3	-.001	3	-.002	5	-6.236e-5	1	NC	1	NC	1
35		18	max	0	2	0	2	0	1	1.18e-3	5	NC	1	NC	1
36			min	0	3	0	3	0	5	-5.102e-5	1	NC	1	NC	1
37		19	max	0	1	0	1	0	1	1.201e-3	5	NC	1	NC	1
38			min	0	1	0	1	0	1	-3.968e-5	1	NC	1	NC	1
39	M3	1	max	0	1	0	1	0	1	1.88e-5	1	NC	1	NC	1
40			min	0	1	0	1	0	1	-5.659e-4	5	NC	1	NC	1
41		2	max	0	3	0	2	.003	5	2.603e-5	1	NC	1	NC	1
42			min	0	2	0	3	0	9	-5.688e-4	5	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
43		3	max	0	3	0	2	.006	5	3.326e-5	1	NC	1	NC	1
44			min	0	2	-.002	3	0	9	-5.717e-4	5	NC	1	NC	1
45		4	max	0	3	0	2	.009	5	4.049e-5	1	NC	1	NC	1
46			min	0	2	-.003	3	0	9	-5.746e-4	5	NC	1	NC	1
47		5	max	0	3	0	2	.012	4	4.771e-5	1	NC	1	NC	1
48			min	0	2	-.003	3	0	9	-5.774e-4	5	NC	1	NC	1
49		6	max	0	3	0	2	.014	4	5.494e-5	1	NC	1	NC	1
50			min	0	2	-.004	3	0	9	-5.803e-4	5	NC	1	NC	1
51		7	max	0	3	0	2	.017	4	6.217e-5	1	NC	1	NC	1
52			min	0	2	-.005	3	0	9	-5.832e-4	5	NC	1	NC	1
53		8	max	0	3	0	2	.02	4	6.94e-5	1	NC	1	NC	1
54			min	0	2	-.006	3	0	9	-5.86e-4	5	NC	1	NC	1
55		9	max	0	3	.001	2	.023	4	7.662e-5	1	NC	1	NC	1
56			min	0	2	-.006	3	0	10	-5.889e-4	5	NC	1	NC	1
57		10	max	0	3	.002	2	.025	4	8.385e-5	1	NC	1	NC	1
58			min	-.001	2	-.007	3	0	10	-5.918e-4	5	NC	1	NC	1
59		11	max	.001	3	.002	2	.028	4	9.108e-5	1	NC	1	NC	1
60			min	-.001	2	-.007	3	0	10	-5.946e-4	5	NC	1	NC	1
61		12	max	.001	3	.003	2	.03	4	9.831e-5	1	NC	1	NC	1
62			min	-.001	2	-.007	3	0	10	-5.975e-4	5	NC	1	NC	1
63		13	max	.001	3	.003	2	.032	4	1.055e-4	1	NC	1	NC	1
64			min	-.001	2	-.008	3	0	10	-6.004e-4	5	NC	1	NC	1
65		14	max	.001	3	.004	2	.034	4	1.128e-4	1	NC	1	NC	1
66			min	-.002	2	-.008	3	0	10	-6.032e-4	5	NC	1	NC	1
67		15	max	.002	3	.005	2	.037	4	1.2e-4	1	NC	1	NC	1
68			min	-.002	2	-.008	3	0	10	-6.061e-4	5	9487.261	2	NC	1
69		16	max	.002	3	.006	2	.039	4	1.272e-4	1	NC	1	NC	1
70			min	-.002	2	-.008	3	0	10	-6.09e-4	5	7995.276	2	NC	1
71		17	max	.002	3	.007	2	.041	4	1.344e-4	1	NC	1	NC	1
72			min	-.002	2	-.008	3	0	10	-6.118e-4	5	6850.444	2	NC	1
73		18	max	.002	3	.008	2	.043	4	1.417e-4	1	NC	1	NC	1
74			min	-.002	2	-.008	3	0	10	-6.147e-4	5	5960.796	2	NC	1
75		19	max	.002	3	.009	2	.044	4	1.489e-4	1	NC	3	NC	1
76			min	-.002	2	-.008	3	0	10	-6.176e-4	5	5262.552	2	NC	1
77	M4	1	max	.001	1	.01	2	0	10	3.027e-3	5	NC	1	NC	1
78			min	0	12	-.009	3	-.047	4	-1.788e-4	1	NC	1	412.798	4
79		2	max	.001	1	.01	2	0	10	3.027e-3	5	NC	1	NC	1
80			min	0	12	-.009	3	-.043	4	-1.788e-4	1	NC	1	449.945	4
81		3	max	.001	1	.009	2	0	10	3.027e-3	5	NC	1	NC	1
82			min	0	12	-.008	3	-.039	4	-1.788e-4	1	NC	1	494.15	4
83		4	max	.001	1	.009	2	0	10	3.027e-3	5	NC	1	NC	1
84			min	0	12	-.008	3	-.035	4	-1.788e-4	1	NC	1	547.272	4
85		5	max	0	1	.008	2	0	10	3.027e-3	5	NC	1	NC	1
86			min	0	12	-.007	3	-.032	4	-1.788e-4	1	NC	1	611.842	4
87		6	max	0	1	.008	2	0	10	3.027e-3	5	NC	1	NC	1
88			min	0	12	-.007	3	-.028	4	-1.788e-4	1	NC	1	691.382	4
89		7	max	0	1	.007	2	0	10	3.027e-3	5	NC	1	NC	1
90			min	0	12	-.006	3	-.024	4	-1.788e-4	1	NC	1	790.906	4
91		8	max	0	1	.006	2	0	10	3.027e-3	5	NC	1	NC	1
92			min	0	12	-.006	3	-.021	4	-1.788e-4	1	NC	1	917.754	4
93		9	max	0	1	.006	2	0	10	3.027e-3	5	NC	1	NC	1
94			min	0	12	-.005	3	-.018	4	-1.788e-4	1	NC	1	1083.03	4
95		10	max	0	1	.005	2	0	10	3.027e-3	5	NC	1	NC	1
96			min	0	12	-.005	3	-.015	4	-1.788e-4	1	NC	1	1304.187	4
97		11	max	0	1	.005	2	0	10	3.027e-3	5	NC	1	NC	1
98			min	0	12	-.004	3	-.012	4	-1.788e-4	1	NC	1	1609.965	4
99		12	max	0	1	.004	2	0	10	3.027e-3	5	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
100			min	0	12	-.004	3	-.009	4	-1.788e-4	1	NC	1	2050.496	4
101		13	max	0	1	.003	2	0	10	3.027e-3	5	NC	1	NC	1
102			min	0	12	-.003	3	-.007	4	-1.788e-4	1	NC	1	2719.806	4
103		14	max	0	1	.003	2	0	10	3.027e-3	5	NC	1	NC	1
104			min	0	12	-.003	3	-.005	4	-1.788e-4	1	NC	1	3811.829	4
105		15	max	0	1	.002	2	0	10	3.027e-3	5	NC	1	NC	1
106			min	0	12	-.002	3	-.003	4	-1.788e-4	1	NC	1	5782.147	4
107		16	max	0	1	.002	2	0	10	3.027e-3	5	NC	1	NC	1
108			min	0	12	-.002	3	-.002	4	-1.788e-4	1	NC	1	9925.787	4
109		17	max	0	1	.001	2	0	10	3.027e-3	5	NC	1	NC	1
110			min	0	12	-.001	3	0	4	-1.788e-4	1	NC	1	NC	1
111		18	max	0	1	0	2	0	10	3.027e-3	5	NC	1	NC	1
112			min	0	12	0	3	0	4	-1.788e-4	1	NC	1	NC	1
113		19	max	0	1	0	1	0	1	3.027e-3	5	NC	1	NC	1
114			min	0	1	0	1	0	1	-1.788e-4	1	NC	1	NC	1
115	M6	1	max	.006	2	.029	2	0	9	8.763e-4	4	NC	3	NC	1
116			min	-.01	3	-.027	3	-.009	5	-8.672e-8	2	1378.227	2	6164.499	3
117		2	max	.006	2	.027	2	0	9	8.975e-4	4	NC	3	NC	1
118			min	-.01	3	-.025	3	-.009	5	-1.142e-6	1	1476.157	2	6538.924	3
119		3	max	.005	2	.025	2	0	9	9.186e-4	4	NC	3	NC	1
120			min	-.009	3	-.024	3	-.009	5	-2.243e-6	1	1588.564	2	6984.923	3
121		4	max	.005	2	.023	2	0	9	9.397e-4	4	NC	3	NC	1
122			min	-.008	3	-.023	3	-.009	5	-3.344e-6	1	1718.361	2	7517.671	3
123		5	max	.005	2	.021	2	0	9	9.609e-4	4	NC	3	NC	1
124			min	-.008	3	-.021	3	-.009	5	-4.446e-6	1	1869.3	2	8157.336	3
125		6	max	.004	2	.019	2	0	9	9.82e-4	4	NC	3	NC	1
126			min	-.007	3	-.02	3	-.008	5	-5.547e-6	1	2046.296	2	8931.109	3
127		7	max	.004	2	.017	2	0	9	1.003e-3	4	NC	3	NC	1
128			min	-.007	3	-.018	3	-.008	5	-6.648e-6	1	2255.912	2	9876.278	3
129		8	max	.004	2	.016	2	0	9	1.024e-3	4	NC	3	NC	1
130			min	-.006	3	-.017	3	-.008	5	-7.749e-6	1	2507.098	2	NC	1
131		9	max	.003	2	.014	2	0	9	1.045e-3	4	NC	3	NC	1
132			min	-.006	3	-.015	3	-.007	5	-8.85e-6	1	2812.393	2	NC	1
133		10	max	.003	2	.012	2	0	9	1.067e-3	4	NC	3	NC	1
134			min	-.005	3	-.014	3	-.007	5	-9.951e-6	1	3189.907	2	NC	1
135		11	max	.003	2	.011	2	0	9	1.088e-3	4	NC	3	NC	1
136			min	-.004	3	-.012	3	-.006	5	-1.105e-5	1	3666.802	2	NC	1
137		12	max	.002	2	.009	2	0	9	1.109e-3	4	NC	3	NC	1
138			min	-.004	3	-.011	3	-.006	5	-1.215e-5	1	4285.752	2	NC	1
139		13	max	.002	2	.008	2	0	9	1.13e-3	4	NC	3	NC	1
140			min	-.003	3	-.009	3	-.005	5	-1.325e-5	1	5117.861	2	NC	1
141		14	max	.002	2	.006	2	0	9	1.151e-3	4	NC	1	NC	1
142			min	-.003	3	-.008	3	-.004	5	-1.436e-5	1	6291.084	2	NC	1
143		15	max	.001	2	.005	2	0	9	1.172e-3	4	NC	1	NC	1
144			min	-.002	3	-.006	3	-.003	5	-1.546e-5	1	8061.27	2	NC	1
145		16	max	0	2	.004	2	0	9	1.193e-3	4	NC	1	NC	1
146			min	-.002	3	-.005	3	-.003	5	-1.656e-5	1	NC	1	NC	1
147		17	max	0	2	.002	2	0	9	1.215e-3	4	NC	1	NC	1
148			min	-.001	3	-.003	3	-.002	5	-1.766e-5	1	NC	1	NC	1
149		18	max	0	2	.001	2	0	1	1.236e-3	4	NC	1	NC	1
150			min	0	3	-.002	3	0	5	-1.876e-5	1	NC	1	NC	1
151		19	max	0	1	0	1	0	1	1.257e-3	4	NC	1	NC	1
152			min	0	1	0	1	0	1	-1.986e-5	1	NC	1	NC	1
153	M7	1	max	0	1	0	1	0	1	9.377e-6	1	NC	1	NC	1
154			min	0	1	0	1	0	1	-5.921e-4	4	NC	1	NC	1
155		2	max	0	3	.001	2	.003	4	8.964e-6	1	NC	1	NC	1
156			min	0	2	-.002	3	0	1	-5.854e-4	4	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
157		3	max	0	3	.002	2	.006	4	8.55e-6	1	NC	1	NC	1
158			min	0	2	-.004	3	0	1	-5.787e-4	4	NC	1	NC	1
159		4	max	0	3	.004	2	.009	4	8.137e-6	1	NC	1	NC	1
160			min	-.001	2	-.006	3	0	1	-5.719e-4	4	NC	1	NC	1
161		5	max	.001	3	.005	2	.012	4	7.723e-6	1	NC	1	NC	1
162			min	-.001	2	-.007	3	0	1	-5.652e-4	4	9601.845	2	NC	1
163		6	max	.002	3	.006	2	.015	4	2.336e-5	3	NC	1	NC	1
164			min	-.002	2	-.009	3	0	1	-5.585e-4	4	7688.377	2	NC	1
165		7	max	.002	3	.007	2	.018	4	4.832e-5	3	NC	1	NC	1
166			min	-.002	2	-.011	3	0	9	-5.517e-4	4	6376.906	2	NC	1
167		8	max	.002	3	.009	2	.021	4	7.329e-5	3	NC	1	NC	1
168			min	-.003	2	-.012	3	0	9	-5.45e-4	4	5413.612	2	NC	1
169		9	max	.002	3	.01	2	.023	4	9.825e-5	3	NC	3	NC	1
170			min	-.003	2	-.014	3	0	9	-5.383e-4	4	4672.079	2	NC	1
171		10	max	.003	3	.011	2	.026	4	1.232e-4	3	NC	3	NC	1
172			min	-.003	2	-.015	3	0	9	-5.315e-4	4	4082.222	2	NC	1
173		11	max	.003	3	.013	2	.029	4	1.482e-4	3	NC	3	NC	1
174			min	-.004	2	-.016	3	0	9	-5.248e-4	4	3601.9	2	NC	1
175		12	max	.003	3	.014	2	.031	4	1.731e-4	3	NC	3	NC	1
176			min	-.004	2	-.018	3	0	9	-5.181e-4	4	3204.072	2	NC	1
177		13	max	.004	3	.016	2	.033	4	1.981e-4	3	NC	3	NC	1
178			min	-.004	2	-.019	3	0	9	-5.113e-4	4	2870.429	2	NC	1
179		14	max	.004	3	.018	2	.036	4	2.231e-4	3	NC	3	NC	1
180			min	-.005	2	-.02	3	0	9	-5.046e-4	4	2588.003	2	NC	1
181		15	max	.004	3	.02	2	.038	4	2.48e-4	3	NC	3	NC	1
182			min	-.005	2	-.021	3	0	9	-4.979e-4	4	2347.258	2	NC	1
183		16	max	.005	3	.022	2	.04	4	2.73e-4	3	NC	3	NC	1
184			min	-.005	2	-.022	3	0	9	-4.911e-4	4	2140.97	2	NC	1
185		17	max	.005	3	.023	2	.042	4	2.98e-4	3	NC	3	NC	1
186			min	-.006	2	-.022	3	0	9	-4.844e-4	4	1963.531	2	NC	1
187		18	max	.005	3	.025	2	.044	4	3.229e-4	3	NC	3	NC	1
188			min	-.006	2	-.023	3	0	9	-4.777e-4	4	1810.507	2	NC	1
189		19	max	.005	3	.027	2	.046	4	3.479e-4	3	NC	3	NC	1
190			min	-.006	2	-.024	3	0	9	-4.709e-4	4	1678.348	2	NC	1
191	M8	1	max	.003	1	.033	2	0	9	2.884e-3	4	NC	1	NC	1
192			min	0	3	-.027	3	-.048	4	-2.545e-4	3	NC	1	405.519	4
193		2	max	.003	1	.031	2	0	9	2.884e-3	4	NC	1	NC	1
194			min	0	3	-.025	3	-.044	4	-2.545e-4	3	NC	1	442.013	4
195		3	max	.003	1	.029	2	0	9	2.884e-3	4	NC	1	NC	1
196			min	0	3	-.024	3	-.04	4	-2.545e-4	3	NC	1	485.441	4
197		4	max	.003	1	.027	2	0	9	2.884e-3	4	NC	1	NC	1
198			min	0	3	-.022	3	-.036	4	-2.545e-4	3	NC	1	537.629	4
199		5	max	.003	1	.025	2	0	9	2.884e-3	4	NC	1	NC	1
200			min	0	3	-.021	3	-.032	4	-2.545e-4	3	NC	1	601.065	4
201		6	max	.002	1	.024	2	0	9	2.884e-3	4	NC	1	NC	1
202			min	0	3	-.019	3	-.028	4	-2.545e-4	3	NC	1	679.207	4
203		7	max	.002	1	.022	2	0	9	2.884e-3	4	NC	1	NC	1
204			min	0	3	-.018	3	-.025	4	-2.545e-4	3	NC	1	776.983	4
205		8	max	.002	1	.02	2	0	9	2.884e-3	4	NC	1	NC	1
206			min	0	3	-.016	3	-.021	4	-2.545e-4	3	NC	1	901.605	4
207		9	max	.002	1	.018	2	0	9	2.884e-3	4	NC	1	NC	1
208			min	0	3	-.015	3	-.018	4	-2.545e-4	3	NC	1	1063.981	4
209		10	max	.002	1	.016	2	0	9	2.884e-3	4	NC	1	NC	1
210			min	0	3	-.013	3	-.015	4	-2.545e-4	3	NC	1	1281.257	4
211		11	max	.002	1	.014	2	0	9	2.884e-3	4	NC	1	NC	1
212			min	0	3	-.012	3	-.012	4	-2.545e-4	3	NC	1	1581.672	4
213		12	max	.001	1	.013	2	0	9	2.884e-3	4	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
214			min	0	3	-.01	3	-.01	4	-2.545e-4	3	NC	1	2014.478	4
215		13	max	.001	1	.011	2	0	9	2.884e-3	4	NC	1	NC	1
216			min	0	3	-.009	3	-.007	4	-2.545e-4	3	NC	1	2672.055	4
217		14	max	0	1	.009	2	0	9	2.884e-3	4	NC	1	NC	1
218			min	0	3	-.007	3	-.005	4	-2.545e-4	3	NC	1	3744.939	4
219		15	max	0	1	.007	2	0	9	2.884e-3	4	NC	1	NC	1
220			min	0	3	-.006	3	-.003	4	-2.545e-4	3	NC	1	5680.734	4
221		16	max	0	1	.005	2	0	9	2.884e-3	4	NC	1	NC	1
222			min	0	3	-.004	3	-.002	4	-2.545e-4	3	NC	1	9751.791	4
223		17	max	0	1	.004	2	0	9	2.884e-3	4	NC	1	NC	1
224			min	0	3	-.003	3	0	4	-2.545e-4	3	NC	1	NC	1
225		18	max	0	1	.002	2	0	9	2.884e-3	4	NC	1	NC	1
226			min	0	3	-.001	3	0	4	-2.545e-4	3	NC	1	NC	1
227		19	max	0	1	0	1	0	1	2.884e-3	4	NC	1	NC	1
228			min	0	1	0	1	0	1	-2.545e-4	3	NC	1	NC	1
229	M10	1	max	.002	2	.009	2	0	10	2.402e-4	1	NC	3	NC	1
230			min	-.003	3	-.009	3	-.005	4	-5.652e-4	3	4318.583	2	NC	1
231		2	max	.002	2	.008	2	0	10	2.287e-4	1	NC	3	NC	1
232			min	-.002	3	-.009	3	-.005	4	-5.458e-4	3	4717.194	2	NC	1
233		3	max	.002	2	.008	2	0	3	2.352e-4	4	NC	1	NC	1
234			min	-.002	3	-.008	3	-.005	4	-5.265e-4	3	5192.057	2	NC	1
235		4	max	.002	2	.007	2	0	3	2.839e-4	4	NC	1	NC	1
236			min	-.002	3	-.008	3	-.005	4	-5.071e-4	3	5761.772	2	NC	1
237		5	max	.001	2	.006	2	0	3	3.326e-4	4	NC	1	NC	1
238			min	-.002	3	-.008	3	-.005	4	-4.877e-4	3	6451.192	2	NC	1
239		6	max	.001	2	.005	2	0	3	3.814e-4	4	NC	1	NC	1
240			min	-.002	3	-.007	3	-.005	4	-4.683e-4	3	7294.081	2	NC	1
241		7	max	.001	2	.005	2	0	3	4.301e-4	4	NC	1	NC	1
242			min	-.002	3	-.007	3	-.005	4	-4.489e-4	3	8337.193	2	NC	1
243		8	max	.001	2	.004	2	0	3	4.788e-4	4	NC	1	NC	1
244			min	-.002	3	-.006	3	-.005	4	-4.295e-4	3	9646.732	2	NC	1
245		9	max	.001	2	.003	2	0	3	5.275e-4	4	NC	1	NC	1
246			min	-.001	3	-.006	3	-.005	4	-4.101e-4	3	NC	1	NC	1
247		10	max	0	2	.003	2	0	3	5.762e-4	4	NC	1	NC	1
248			min	-.001	3	-.006	3	-.005	4	-3.907e-4	3	NC	1	NC	1
249		11	max	0	2	.002	2	0	3	6.249e-4	4	NC	1	NC	1
250			min	-.001	3	-.005	3	-.004	4	-3.713e-4	3	NC	1	NC	1
251		12	max	0	2	.002	2	0	3	6.736e-4	4	NC	1	NC	1
252			min	-.001	3	-.005	3	-.004	4	-3.519e-4	3	NC	1	NC	1
253		13	max	0	2	.002	2	0	3	7.223e-4	4	NC	1	NC	1
254			min	0	3	-.004	3	-.004	4	-3.325e-4	3	NC	1	NC	1
255		14	max	0	2	.001	2	0	3	7.71e-4	4	NC	1	NC	1
256			min	0	3	-.003	3	-.003	4	-3.131e-4	3	NC	1	NC	1
257		15	max	0	2	0	2	0	3	8.197e-4	4	NC	1	NC	1
258			min	0	3	-.003	3	-.003	4	-2.937e-4	3	NC	1	NC	1
259		16	max	0	2	0	2	0	3	8.684e-4	4	NC	1	NC	1
260			min	0	3	-.002	3	-.002	4	-2.743e-4	3	NC	1	NC	1
261		17	max	0	2	0	2	0	3	9.171e-4	4	NC	1	NC	1
262			min	0	3	-.001	3	-.001	4	-2.549e-4	3	NC	1	NC	1
263		18	max	0	2	0	2	0	3	9.658e-4	4	NC	1	NC	1
264			min	0	3	0	3	0	4	-2.355e-4	3	NC	1	NC	1
265		19	max	0	1	0	1	0	1	1.015e-3	4	NC	1	NC	1
266			min	0	1	0	1	0	1	-2.161e-4	3	NC	1	NC	1
267	M11	1	max	0	1	0	1	0	1	1.02e-4	3	NC	1	NC	1
268			min	0	1	0	1	0	1	-4.783e-4	4	NC	1	NC	1
269		2	max	0	3	0	2	.002	4	7.774e-5	3	NC	1	NC	1
270			min	0	2	0	3	0	3	-5.158e-4	4	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
271		3	max	0	3	0	2	.005	4	5.348e-5	3	NC	1	NC	1
272			min	0	2	-.002	3	0	3	-5.534e-4	4	NC	1	NC	1
273		4	max	0	3	0	2	.007	4	2.922e-5	3	NC	1	NC	1
274			min	0	2	-.003	3	-.001	3	-5.909e-4	4	NC	1	NC	1
275		5	max	0	3	0	2	.01	4	4.955e-6	3	NC	1	NC	1
276			min	0	2	-.003	3	-.002	3	-6.284e-4	4	NC	1	NC	1
277		6	max	0	3	0	2	.012	4	2.866e-6	10	NC	1	NC	1
278			min	0	2	-.004	3	-.002	3	-6.659e-4	4	NC	1	NC	1
279		7	max	0	3	0	2	.015	5	3.249e-6	10	NC	1	NC	1
280			min	0	2	-.005	3	-.002	3	-7.034e-4	4	NC	1	NC	1
281		8	max	0	3	0	2	.017	5	3.632e-6	10	NC	1	NC	1
282			min	0	2	-.006	3	-.002	3	-7.409e-4	4	NC	1	NC	1
283		9	max	0	3	.001	2	.02	5	4.015e-6	10	NC	1	NC	1
284			min	0	2	-.006	3	-.003	3	-7.784e-4	4	NC	1	NC	1
285		10	max	0	3	.002	2	.022	5	4.398e-6	10	NC	1	NC	1
286			min	-.001	2	-.007	3	-.003	3	-8.159e-4	4	NC	1	NC	1
287		11	max	.001	3	.002	2	.024	5	4.781e-6	10	NC	1	NC	1
288			min	-.001	2	-.007	3	-.003	3	-8.535e-4	4	NC	1	NC	1
289		12	max	.001	3	.003	2	.026	5	5.164e-6	10	NC	1	NC	1
290			min	-.001	2	-.007	3	-.003	3	-8.91e-4	4	NC	1	NC	1
291		13	max	.001	3	.003	2	.028	5	5.547e-6	10	NC	1	NC	1
292			min	-.001	2	-.008	3	-.003	3	-9.285e-4	4	NC	1	NC	1
293		14	max	.001	3	.004	2	.03	5	5.93e-6	10	NC	1	NC	1
294			min	-.001	2	-.008	3	-.003	3	-9.66e-4	4	NC	1	NC	1
295		15	max	.002	3	.005	2	.032	5	6.313e-6	10	NC	1	NC	1
296			min	-.002	2	-.008	3	-.003	3	-1.004e-3	4	9500.451	2	NC	1
297		16	max	.002	3	.006	2	.034	5	6.696e-6	10	NC	1	NC	1
298			min	-.002	2	-.008	3	-.003	3	-1.041e-3	4	8005.267	2	NC	1
299		17	max	.002	3	.007	2	.036	5	7.079e-6	10	NC	1	NC	1
300			min	-.002	2	-.008	3	-.003	3	-1.079e-3	4	6858.235	2	NC	1
301		18	max	.002	3	.008	2	.038	5	7.462e-6	10	NC	1	NC	1
302			min	-.002	2	-.008	3	-.003	3	-1.116e-3	4	5967.039	2	NC	1
303		19	max	.002	3	.009	2	.04	5	7.845e-6	10	NC	3	NC	1
304			min	-.002	2	-.008	3	-.002	3	-1.154e-3	4	5267.687	2	NC	1
305	M12	1	max	.001	1	.01	2	.002	1	3.493e-3	4	NC	1	NC	2
306			min	0	15	-.009	3	-.044	5	-9.493e-6	10	NC	1	439.803	5
307		2	max	.001	1	.01	2	.002	1	3.493e-3	4	NC	1	NC	1
308			min	0	15	-.009	3	-.04	5	-9.493e-6	10	NC	1	479.369	5
309		3	max	.001	1	.009	2	.002	1	3.493e-3	4	NC	1	NC	1
310			min	0	15	-.008	3	-.037	5	-9.493e-6	10	NC	1	526.451	5
311		4	max	.001	1	.009	2	.001	1	3.493e-3	4	NC	1	NC	1
312			min	0	15	-.008	3	-.033	5	-9.493e-6	10	NC	1	583.03	5
313		5	max	0	1	.008	2	.001	1	3.493e-3	4	NC	1	NC	1
314			min	0	15	-.007	3	-.03	5	-9.493e-6	10	NC	1	651.8	5
315		6	max	0	1	.008	2	.001	1	3.493e-3	4	NC	1	NC	1
316			min	0	15	-.007	3	-.026	5	-9.493e-6	10	NC	1	736.512	5
317		7	max	0	1	.007	2	.001	1	3.493e-3	4	NC	1	NC	1
318			min	0	15	-.006	3	-.023	5	-9.493e-6	10	NC	1	842.505	5
319		8	max	0	1	.006	2	0	1	3.493e-3	4	NC	1	NC	1
320			min	0	15	-.006	3	-.02	5	-9.493e-6	10	NC	1	977.597	5
321		9	max	0	1	.006	2	0	1	3.493e-3	4	NC	1	NC	1
322			min	0	15	-.005	3	-.017	5	-9.493e-6	10	NC	1	1153.61	5
323		10	max	0	1	.005	2	0	1	3.493e-3	4	NC	1	NC	1
324			min	0	15	-.005	3	-.014	5	-9.493e-6	10	NC	1	1389.129	5
325		11	max	0	1	.005	2	0	1	3.493e-3	4	NC	1	NC	1
326			min	0	15	-.004	3	-.011	5	-9.493e-6	10	NC	1	1714.76	5
327		12	max	0	1	.004	2	0	1	3.493e-3	4	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
328			min	0	15	-.004	3	-.009	5	-9.493e-6	10	NC	1	2183.884	5
329		13	max	0	1	.003	2	0	1	3.493e-3	4	NC	1	NC	1
330			min	0	15	-.003	3	-.007	5	-9.493e-6	10	NC	1	2896.62	5
331		14	max	0	1	.003	2	0	1	3.493e-3	4	NC	1	NC	1
332			min	0	15	-.003	3	-.005	5	-9.493e-6	10	NC	1	4059.473	5
333		15	max	0	1	.002	2	0	1	3.493e-3	4	NC	1	NC	1
334			min	0	15	-.002	3	-.003	5	-9.493e-6	10	NC	1	6157.545	5
335		16	max	0	1	.002	2	0	1	3.493e-3	4	NC	1	NC	1
336			min	0	15	-.002	3	-.002	5	-9.493e-6	10	NC	1	NC	1
337		17	max	0	1	.001	2	0	1	3.493e-3	4	NC	1	NC	1
338			min	0	15	-.001	3	0	5	-9.493e-6	10	NC	1	NC	1
339		18	max	0	1	0	2	0	1	3.493e-3	4	NC	1	NC	1
340			min	0	15	0	3	0	5	-9.493e-6	10	NC	1	NC	1
341		19	max	0	1	0	1	0	1	3.493e-3	4	NC	1	NC	1
342			min	0	1	0	1	0	1	-9.493e-6	10	NC	1	NC	1
343	M1	1	max	.008	3	.024	3	.006	5	5.216e-3	2	NC	1	NC	1
344			min	-.009	2	-.02	2	0	9	-7.616e-3	3	NC	1	NC	1
345		2	max	.008	3	.014	3	.007	5	2.575e-3	2	NC	4	NC	1
346			min	-.009	2	-.012	2	-.002	9	-3.748e-3	3	4868.141	3	NC	1
347		3	max	.008	3	.005	3	.009	5	2.674e-4	5	NC	4	NC	1
348			min	-.009	2	-.004	2	-.002	9	-1.13e-4	1	2521.594	3	NC	1
349		4	max	.008	3	.003	2	.012	5	2.68e-4	5	NC	4	NC	1
350			min	-.009	2	-.003	3	-.002	1	-9.337e-5	1	1796.545	3	8114.694	5
351		5	max	.008	3	.009	2	.014	5	2.685e-4	5	NC	4	NC	1
352			min	-.009	2	-.009	3	-.003	1	-7.377e-5	1	1450.784	3	5748.716	5
353		6	max	.008	3	.015	2	.016	5	2.691e-4	5	NC	4	NC	1
354			min	-.009	2	-.014	3	-.002	1	-5.72e-5	9	1257.795	3	4382.04	5
355		7	max	.008	3	.019	2	.019	5	2.696e-4	5	NC	4	NC	1
356			min	-.008	2	-.018	3	-.002	1	-4.179e-5	9	1143.548	3	3505.531	5
357		8	max	.008	3	.022	2	.022	5	2.702e-4	5	NC	4	NC	1
358			min	-.008	2	-.021	3	-.002	9	-2.638e-5	9	1057.31	2	2903.384	5
359		9	max	.008	3	.024	2	.025	5	2.708e-4	5	NC	4	NC	1
360			min	-.008	2	-.022	3	-.001	9	-1.098e-5	9	1003.529	2	2469.11	5
361		10	max	.008	3	.025	2	.028	5	2.752e-4	4	NC	4	NC	1
362			min	-.008	2	-.023	3	0	9	-9.6e-7	10	977.808	2	2129.171	4
363		11	max	.008	3	.024	2	.031	4	2.81e-4	4	NC	4	NC	1
364			min	-.008	2	-.022	3	0	9	-2.054e-6	10	977.197	2	1868.675	4
365		12	max	.008	3	.023	2	.034	4	2.868e-4	4	NC	4	NC	1
366			min	-.008	2	-.02	3	0	10	-3.147e-6	10	1002.711	2	1667.216	4
367		13	max	.008	3	.02	2	.037	4	2.926e-4	4	NC	4	NC	1
368			min	-.008	2	-.017	3	0	10	-4.241e-6	10	1059.928	2	1508.827	4
369		14	max	.008	3	.016	2	.039	4	2.983e-4	4	NC	4	NC	1
370			min	-.008	2	-.014	3	0	10	-5.335e-6	10	1161.845	2	1382.826	4
371		15	max	.008	3	.01	2	.042	4	3.041e-4	4	NC	4	NC	1
372			min	-.008	2	-.009	3	0	10	-6.428e-6	10	1337.12	2	1281.859	4
373		16	max	.008	3	.003	2	.045	4	4.733e-4	4	NC	4	NC	1
374			min	-.008	2	-.003	3	0	10	-7.238e-6	10	1656.156	2	1200.745	4
375		17	max	.008	3	.004	3	.047	4	4.53e-3	4	NC	4	NC	1
376			min	-.008	2	-.006	2	0	10	-4.303e-6	9	2346.669	2	1135.861	4
377		18	max	.008	3	.012	3	.049	4	3.74e-3	2	NC	4	NC	1
378			min	-.008	2	-.016	2	0	10	-2.006e-3	3	4548.509	2	1084.34	4
379		19	max	.008	3	.02	3	.05	4	7.544e-3	2	NC	1	NC	1
380			min	-.008	2	-.027	2	0	9	-4.124e-3	3	NC	1	1045.434	4
381	M5	1	max	.024	3	.074	3	.006	5	1.833e-5	4	NC	1	NC	1
382			min	-.027	2	-.062	2	0	9	0	1	NC	1	NC	1
383		2	max	.024	3	.044	3	.007	5	1.369e-4	3	NC	4	NC	1
384			min	-.027	2	-.036	2	0	9	-1.182e-5	9	1576.198	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
385		3	max	.024	3	.015	3	.009	5	2.615e-4	3	NC	5	NC	1
386			min	-.027	2	-.011	2	0	9	-2.352e-5	9	816.958	3	NC	1
387		4	max	.024	3	.01	2	.012	5	2.559e-4	5	NC	5	NC	1
388			min	-.027	2	-.009	3	0	9	-2.237e-5	9	582.924	3	NC	1
389		5	max	.024	3	.029	2	.014	5	2.65e-4	5	NC	5	NC	1
390			min	-.027	2	-.028	3	0	9	-2.122e-5	9	471.472	3	9416.324	3
391		6	max	.024	3	.046	2	.017	5	2.741e-4	5	NC	5	NC	1
392			min	-.027	2	-.044	3	0	9	-2.007e-5	9	409.402	3	8505.213	3
393		7	max	.024	3	.059	2	.02	5	2.833e-4	5	NC	5	NC	1
394			min	-.027	2	-.056	3	0	9	-1.891e-5	9	366.433	2	8090.186	3
395		8	max	.024	3	.068	2	.023	5	2.924e-4	5	NC	5	NC	1
396			min	-.027	2	-.064	3	0	9	-1.776e-5	9	337.663	2	8006.242	3
397		9	max	.024	3	.075	2	.026	5	3.015e-4	5	NC	5	NC	1
398			min	-.027	2	-.069	3	0	9	-1.661e-5	9	320.436	2	8191.875	3
399		10	max	.024	3	.077	2	.029	5	3.107e-4	5	NC	5	NC	1
400			min	-.027	2	-.07	3	0	9	-1.546e-5	9	312.189	2	8641.202	3
401		11	max	.023	3	.076	2	.032	4	3.198e-4	5	NC	5	NC	1
402			min	-.027	2	-.068	3	0	9	-1.431e-5	9	311.973	2	9392.391	3
403		12	max	.023	3	.071	2	.035	4	3.289e-4	5	NC	5	NC	1
404			min	-.027	2	-.062	3	0	9	-1.316e-5	9	320.113	2	NC	1
405		13	max	.023	3	.062	2	.038	4	3.381e-4	5	NC	5	NC	1
406			min	-.027	2	-.053	3	0	9	-1.201e-5	9	338.388	2	NC	1
407		14	max	.023	3	.049	2	.041	4	3.472e-4	5	NC	5	NC	1
408			min	-.027	2	-.041	3	0	9	-1.085e-5	9	370.952	2	NC	1
409		15	max	.023	3	.031	2	.043	4	3.566e-4	4	NC	5	NC	1
410			min	-.027	2	-.026	3	0	9	-9.704e-6	9	426.961	2	NC	1
411		16	max	.023	3	.009	2	.046	4	5.274e-4	4	NC	5	NC	1
412			min	-.027	2	-.008	3	0	9	-9.437e-6	9	528.917	2	NC	1
413		17	max	.023	3	.013	3	.048	4	4.531e-3	4	NC	5	NC	1
414			min	-.027	2	-.019	2	0	9	-3.023e-5	9	749.641	2	NC	1
415		18	max	.023	3	.036	3	.049	4	2.327e-3	4	NC	4	NC	1
416			min	-.027	2	-.05	2	0	9	-1.548e-5	9	1453.361	2	NC	1
417		19	max	.023	3	.06	3	.05	4	5.955e-6	5	NC	1	NC	1
418			min	-.027	2	-.083	2	0	9	-1.644e-6	3	NC	1	NC	1
419	M9	1	max	.008	3	.023	3	.005	5	7.635e-3	3	NC	1	NC	1
420			min	-.008	2	-.02	2	0	9	-5.216e-3	2	NC	1	NC	1
421		2	max	.008	3	.014	3	.005	4	3.754e-3	3	NC	4	NC	1
422			min	-.008	2	-.012	2	0	10	-2.575e-3	2	4870.486	3	NC	1
423		3	max	.008	3	.004	3	.005	4	8.846e-5	1	NC	4	NC	1
424			min	-.009	2	-.004	2	0	10	-5.465e-5	3	2522.828	3	NC	1
425		4	max	.008	3	.003	2	.006	4	7.011e-5	1	NC	4	NC	1
426			min	-.009	2	-.003	3	-.001	3	-5.984e-5	3	1797.396	3	NC	1
427		5	max	.008	3	.009	2	.007	4	5.176e-5	1	NC	4	NC	1
428			min	-.008	2	-.01	3	-.002	3	-6.503e-5	3	1451.415	3	9186.815	3
429		6	max	.008	3	.015	2	.008	4	3.341e-5	1	NC	4	NC	1
430			min	-.008	2	-.015	3	-.003	3	-7.022e-5	3	1258.282	3	7990.434	3
431		7	max	.008	3	.019	2	.01	4	1.507e-5	1	NC	4	NC	1
432			min	-.008	2	-.019	3	-.004	3	-7.541e-5	3	1143.93	3	7300.365	3
433		8	max	.008	3	.022	2	.013	4	4.06e-6	11	NC	4	NC	1
434			min	-.008	2	-.021	3	-.004	3	-8.06e-5	3	1057.592	2	5821.647	4
435		9	max	.008	3	.024	2	.016	4	0	10	NC	4	NC	1
436			min	-.008	2	-.023	3	-.005	3	-8.579e-5	3	1003.806	2	4324.998	4
437		10	max	.008	3	.025	2	.019	5	3.423e-6	5	NC	4	NC	1
438			min	-.008	2	-.023	3	-.005	3	-9.098e-5	3	978.087	2	3374.627	4
439		11	max	.008	3	.024	2	.022	5	9.96e-6	5	NC	4	NC	1
440			min	-.008	2	-.022	3	-.005	3	-9.617e-5	3	977.483	2	2731.787	4
441		12	max	.008	3	.023	2	.026	5	1.65e-5	5	NC	4	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
442			min	-.008	2	-.021	3	-.005	3	-1.014e-4	3	1003.012	2	2268.194	5
443		13	max	.008	3	.02	2	.029	5	2.303e-5	5	NC	4	NC	1
444			min	-.008	2	-.018	3	-.004	3	-1.065e-4	3	1060.252	2	1927.029	5
445		14	max	.008	3	.016	2	.033	5	2.957e-5	5	NC	4	NC	1
446			min	-.008	2	-.014	3	-.004	3	-1.134e-4	1	1162.206	2	1672.928	5
447		15	max	.008	3	.01	2	.037	5	3.611e-5	5	NC	4	NC	1
448			min	-.008	2	-.009	3	-.003	3	-1.317e-4	1	1337.538	2	1479.085	5
449		16	max	.008	3	.003	2	.04	5	2.172e-4	5	NC	4	NC	1
450			min	-.008	2	-.003	3	-.002	1	-1.453e-4	1	1656.668	2	1328.503	5
451		17	max	.008	3	.004	3	.044	5	4.559e-3	4	NC	4	NC	1
452			min	-.008	2	-.006	2	-.002	1	-5.632e-5	9	2347.344	2	1209.871	5
453		18	max	.008	3	.012	3	.047	5	2.26e-3	5	NC	4	NC	1
454			min	-.008	2	-.016	2	-.001	1	-3.74e-3	2	4549.776	2	1112.458	4
455		19	max	.008	3	.02	3	.05	4	4.121e-3	3	NC	1	NC	1
456			min	-.008	2	-.027	2	0	9	-7.544e-3	2	NC	1	1031.338	4
457	M13	1	max	0	9	.023	3	.008	3	3.709e-3	3	NC	1	NC	1
458			min	-.005	5	-.02	2	-.008	2	-3.17e-3	2	NC	1	NC	1
459		2	max	0	9	.06	3	.007	3	4.579e-3	3	NC	4	NC	1
460			min	-.005	5	-.045	2	-.008	2	-3.918e-3	2	2436.582	3	NC	1
461		3	max	0	9	.092	3	.007	3	5.449e-3	3	NC	4	NC	1
462			min	-.005	5	-.067	2	-.008	2	-4.666e-3	2	1318.981	3	NC	1
463		4	max	0	9	.113	3	.009	9	6.319e-3	3	NC	4	NC	2
464			min	-.005	5	-.082	2	-.008	2	-5.414e-3	2	999.614	3	8362.534	1
465		5	max	0	9	.124	3	.01	3	7.189e-3	3	NC	4	NC	2
466			min	-.005	5	-.091	2	-.01	2	-6.161e-3	2	896.2	3	8144.091	1
467		6	max	0	9	.123	3	.012	3	8.059e-3	3	NC	4	NC	1
468			min	-.005	5	-.091	2	-.014	2	-6.909e-3	2	905.132	3	NC	1
469		7	max	0	9	.113	3	.015	3	8.93e-3	3	NC	4	NC	1
470			min	-.005	5	-.086	2	-.017	2	-7.657e-3	2	1010.822	3	NC	1
471		8	max	0	9	.097	3	.018	3	9.8e-3	3	NC	4	NC	1
472			min	-.005	5	-.076	2	-.022	2	-8.405e-3	2	1230.292	3	6829.559	2
473		9	max	0	9	.081	3	.021	3	1.067e-2	3	NC	4	NC	4
474			min	-.006	5	-.067	2	-.025	2	-9.153e-3	2	1561.228	3	5406.966	2
475		10	max	0	9	.074	3	.024	3	1.154e-2	3	NC	4	NC	4
476			min	-.006	5	-.062	2	-.027	2	-9.901e-3	2	1788.391	3	4962.154	2
477		11	max	0	9	.081	3	.026	3	1.067e-2	3	NC	4	NC	4
478			min	-.006	5	-.067	2	-.025	2	-9.153e-3	2	1561.226	3	5160.063	3
479		12	max	0	9	.097	3	.026	3	9.805e-3	3	NC	4	NC	1
480			min	-.006	5	-.076	2	-.022	2	-8.405e-3	2	1230.29	3	5082.313	3
481		13	max	0	9	.113	3	.025	3	8.937e-3	3	NC	4	NC	1
482			min	-.006	5	-.086	2	-.017	2	-7.657e-3	2	1010.821	3	5383.581	3
483		14	max	0	9	.123	3	.023	3	8.07e-3	3	NC	4	NC	1
484			min	-.006	5	-.091	2	-.014	2	-6.91e-3	2	905.131	3	6125.547	3
485		15	max	0	9	.124	3	.02	3	7.203e-3	3	NC	4	NC	2
486			min	-.006	5	-.09	2	-.01	2	-6.162e-3	2	896.199	3	7561.815	3
487		16	max	0	9	.114	3	.017	3	6.335e-3	3	NC	4	NC	2
488			min	-.006	5	-.082	2	-.008	2	-5.414e-3	2	999.613	3	8365.544	1
489		17	max	0	9	.092	3	.014	3	5.468e-3	3	NC	4	NC	1
490			min	-.006	5	-.067	2	-.008	2	-4.666e-3	2	1318.98	3	NC	1
491		18	max	0	9	.061	3	.011	3	4.6e-3	3	NC	4	NC	1
492			min	-.006	5	-.045	2	-.008	2	-3.918e-3	2	2436.58	3	NC	1
493		19	max	0	9	.024	3	.008	3	3.733e-3	3	NC	1	NC	1
494			min	-.006	5	-.02	2	-.009	2	-3.17e-3	2	NC	1	NC	1
495	M16	1	max	0	9	.02	3	.008	3	4.047e-3	2	NC	1	NC	1
496			min	-.05	4	-.027	2	-.008	2	-3.045e-3	3	NC	1	NC	1
497		2	max	0	9	.04	3	.011	3	5.005e-3	2	NC	4	NC	1
498			min	-.05	4	-.063	2	-.008	2	-3.721e-3	3	2459.873	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
499		3	max	0	9	.057	3	.013	3	5.963e-3	2	NC	4	NC	1
500			min	-.05	4	-.094	2	-.008	2	-4.398e-3	3	1327.838	2	NC	1
501		4	max	0	9	.07	3	.016	3	6.921e-3	2	NC	4	NC	2
502			min	-.05	4	-.117	2	-.008	2	-5.074e-3	3	1001.403	2	8413.432	1
503		5	max	0	9	.077	3	.019	3	7.879e-3	2	NC	5	NC	2
504			min	-.05	4	-.128	2	-.01	2	-5.751e-3	3	890.949	2	8132.326	3
505		6	max	0	9	.079	3	.021	3	8.838e-3	2	NC	5	NC	1
506			min	-.05	4	-.128	2	-.013	2	-6.427e-3	3	889.353	2	6755.952	3
507		7	max	0	9	.076	3	.023	3	9.796e-3	2	NC	4	NC	1
508			min	-.05	4	-.119	2	-.017	2	-7.104e-3	3	975.531	2	6014.191	3
509		8	max	0	9	.07	3	.024	3	1.075e-2	2	NC	4	NC	1
510			min	-.05	4	-.105	2	-.022	2	-7.78e-3	3	1155.578	2	5670.974	3
511		9	max	0	9	.063	3	.024	3	1.171e-2	2	NC	4	NC	4
512			min	-.05	4	-.09	2	-.025	2	-8.457e-3	3	1414.915	2	5427.585	2
513		10	max	0	9	.06	3	.023	3	1.267e-2	2	NC	4	NC	4
514			min	-.05	4	-.083	2	-.027	2	-9.133e-3	3	1584.129	2	4980.074	2
515		11	max	0	9	.063	3	.022	3	1.171e-2	2	NC	4	NC	4
516			min	-.05	4	-.09	2	-.025	2	-8.454e-3	3	1414.915	2	5427.592	2
517		12	max	0	9	.07	3	.02	3	1.075e-2	2	NC	4	NC	1
518			min	-.05	4	-.105	2	-.022	2	-7.775e-3	3	1155.578	2	6859.653	2
519		13	max	0	9	.076	3	.019	3	9.796e-3	2	NC	4	NC	1
520			min	-.05	4	-.119	2	-.017	2	-7.096e-3	3	975.531	2	8404.868	3
521		14	max	0	9	.079	3	.017	3	8.838e-3	2	NC	5	NC	1
522			min	-.05	4	-.128	2	-.013	2	-6.417e-3	3	889.353	2	NC	1
523		15	max	0	9	.077	3	.015	3	7.88e-3	2	NC	5	NC	2
524			min	-.05	4	-.128	2	-.01	2	-5.738e-3	3	890.949	2	8210.927	1
525		16	max	0	9	.07	3	.013	3	6.922e-3	2	NC	4	NC	2
526			min	-.05	4	-.117	2	-.008	2	-5.059e-3	3	1001.403	2	8422.704	1
527		17	max	0	9	.057	3	.011	3	5.964e-3	2	NC	4	NC	1
528			min	-.05	4	-.094	2	-.008	2	-4.38e-3	3	1327.838	2	NC	1
529		18	max	0	9	.04	3	.009	3	5.006e-3	2	NC	4	NC	1
530			min	-.05	4	-.063	2	-.008	2	-3.701e-3	3	2459.873	2	NC	1
531		19	max	0	9	.02	3	.008	3	4.048e-3	2	NC	1	NC	1
532			min	-.05	4	-.027	2	-.008	2	-3.023e-3	3	NC	1	NC	1
533	M15	1	max	0	1	0	1	0	1	3.945e-4	3	NC	1	NC	1
534			min	0	1	0	1	0	1	-5.987e-4	5	NC	1	NC	1
535		2	max	0	3	0	5	.004	4	7.716e-4	3	NC	1	NC	1
536			min	0	4	-.002	1	0	3	-6.062e-4	5	NC	1	NC	1
537		3	max	0	3	.001	5	.008	4	1.149e-3	3	NC	1	NC	1
538			min	0	4	-.003	1	-.003	3	-7.803e-4	2	NC	1	7272.093	4
539		4	max	0	3	.002	5	.013	4	1.526e-3	3	NC	1	NC	9
540			min	-.001	4	-.005	1	-.007	3	-1.15e-3	2	NC	1	4603.415	4
541		5	max	0	3	.003	5	.018	4	1.903e-3	3	NC	3	NC	9
542			min	-.002	4	-.006	1	-.011	3	-1.52e-3	2	8969.765	2	3401.388	4
543		6	max	0	3	.003	5	.022	4	2.28e-3	3	NC	3	NC	9
544			min	-.002	4	-.007	1	-.016	3	-1.889e-3	2	7549.005	2	2504.189	3
545		7	max	0	3	.004	5	.025	4	2.657e-3	3	NC	4	8399.74	9
546			min	-.002	4	-.008	1	-.021	3	-2.259e-3	2	6694.605	2	1959.886	3
547		8	max	0	3	.004	5	.027	4	3.034e-3	3	NC	4	7009.53	9
548			min	-.003	4	-.009	1	-.026	3	-2.629e-3	2	6181.837	2	1617.39	3
549		9	max	0	3	.005	5	.028	4	3.411e-3	3	NC	5	6091.5	9
550			min	-.003	4	-.009	1	-.03	3	-2.999e-3	2	5905.835	2	1393.124	3
551		10	max	0	3	.005	5	.028	4	3.788e-3	3	NC	5	5483.765	9
552			min	-.004	4	-.009	9	-.033	3	-3.368e-3	2	5818.521	2	1245.068	3
553		11	max	.001	3	.005	5	.028	2	4.166e-3	3	NC	5	5100.814	9
554			min	-.004	4	-.009	9	-.036	3	-3.738e-3	2	5905.835	2	1151.151	3
555		12	max	.001	3	.005	5	.028	2	4.543e-3	3	NC	4	4901.011	9

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
556			min	-.005	4	-.009	9	-.036	3	-4.108e-3	2	6181.837	2	1100.433	3
557		13	max	.001	3	.006	5	.027	2	4.92e-3	3	NC	4	5481.737	15
558			min	-.005	4	-.008	9	-.035	3	-4.477e-3	2	6694.605	2	1089.773	3
559		14	max	.001	3	.006	5	.024	2	5.297e-3	3	NC	3	7222.673	15
560			min	-.005	4	-.007	9	-.032	3	-4.847e-3	2	7549.005	2	1123.967	3
561		15	max	.001	3	.006	5	.019	1	5.674e-3	3	NC	3	NC	15
562			min	-.006	4	-.006	9	-.026	3	-5.217e-3	2	8969.765	2	1220.516	3
563		16	max	.002	3	.006	5	.014	1	6.051e-3	3	NC	1	NC	5
564			min	-.006	4	-.005	9	-.017	3	-5.586e-3	2	NC	1	1426.894	3
565		17	max	.002	3	.006	5	.005	1	6.428e-3	3	NC	1	NC	4
566			min	-.007	4	-.004	9	-.006	3	-5.956e-3	2	NC	1	1892.005	3
567		18	max	.002	3	.006	5	.01	3	6.805e-3	3	NC	1	NC	4
568			min	-.007	4	-.002	9	-.012	2	-6.326e-3	2	NC	1	3369.064	3
569		19	max	.002	3	.007	2	.029	3	7.182e-3	3	NC	1	NC	1
570			min	-.007	4	0	9	-.028	2	-6.696e-3	2	NC	1	NC	1
571	M16A	1	max	.001	2	.002	2	.009	3	2.042e-3	3	NC	1	NC	1
572			min	-.003	4	-.004	4	-.009	2	-2.114e-3	2	NC	1	NC	1
573		2	max	0	2	0	2	.002	3	1.967e-3	3	NC	1	NC	1
574			min	-.003	4	-.007	4	-.004	2	-2.017e-3	2	NC	1	9360.123	3
575		3	max	0	2	-.002	10	.003	1	1.892e-3	3	NC	1	NC	4
576			min	-.002	4	-.01	4	-.005	5	-1.921e-3	2	8548.484	4	5301.72	3
577		4	max	0	2	-.003	10	.005	1	1.816e-3	3	NC	1	NC	6
578			min	-.002	4	-.013	4	-.009	5	-1.824e-3	2	5864.759	4	4037.362	3
579		5	max	0	2	-.004	12	.007	1	1.741e-3	3	NC	3	NC	9
580			min	-.002	4	-.016	4	-.013	5	-1.728e-3	2	4576.331	4	3491.832	3
581		6	max	0	2	-.005	12	.008	1	1.666e-3	3	NC	3	NC	9
582			min	-.002	4	-.018	4	-.018	5	-1.631e-3	2	3851.466	4	3256.826	3
583		7	max	0	2	-.005	12	.009	1	1.591e-3	3	NC	12	NC	9
584			min	-.002	4	-.02	4	-.022	5	-1.535e-3	2	3415.556	4	2932.925	5
585		8	max	0	2	-.006	12	.009	1	1.516e-3	3	NC	12	NC	9
586			min	-.002	4	-.021	4	-.025	5	-1.439e-3	2	3153.944	4	2507.759	5
587		9	max	0	2	-.006	12	.009	1	1.441e-3	3	NC	12	NC	9
588			min	-.001	4	-.022	4	-.027	5	-1.342e-3	2	3013.129	4	2266.753	5
589		10	max	0	2	-.006	12	.008	1	1.366e-3	3	NC	12	NC	9
590			min	-.001	4	-.022	4	-.029	5	-1.246e-3	2	2968.582	4	2149.768	5
591		11	max	0	2	-.006	12	.007	1	1.291e-3	3	NC	12	NC	9
592			min	-.001	4	-.022	4	-.029	5	-1.149e-3	2	3013.129	4	2131.784	5
593		12	max	0	2	-.005	12	.005	1	1.216e-3	3	NC	12	NC	9
594			min	-.001	4	-.02	4	-.028	5	-1.053e-3	2	3153.944	4	2209.8	5
595		13	max	0	2	-.005	12	.004	1	1.141e-3	3	NC	12	NC	2
596			min	0	4	-.019	4	-.026	5	-9.564e-4	2	3415.556	4	2401.708	5
597		14	max	0	2	-.004	12	.003	1	1.065e-3	3	NC	3	NC	1
598			min	0	4	-.017	4	-.022	5	-8.6e-4	2	3851.466	4	2756.422	5
599		15	max	0	2	-.004	12	.002	1	9.903e-4	3	NC	3	NC	1
600			min	0	4	-.014	4	-.018	5	-7.635e-4	2	4576.331	4	3386.935	5
601		16	max	0	2	-.003	12	.001	9	9.152e-4	3	NC	1	NC	1
602			min	0	4	-.011	4	-.013	5	-6.671e-4	2	5864.759	4	4576.348	5
603		17	max	0	2	-.002	12	0	9	8.401e-4	3	NC	1	NC	1
604			min	0	4	-.007	4	-.009	5	-5.707e-4	2	8548.484	4	7213.843	5
605		18	max	0	2	0	12	0	3	8.908e-4	4	NC	1	NC	1
606			min	0	4	-.004	4	-.004	5	-4.742e-4	2	NC	1	NC	1
607		19	max	0	1	0	1	0	1	9.517e-4	4	NC	1	NC	1
608			min	0	1	0	1	0	1	-3.778e-4	2	NC	1	NC	1

Anchor Designer™
Software
Version 2.4.5673.0

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

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

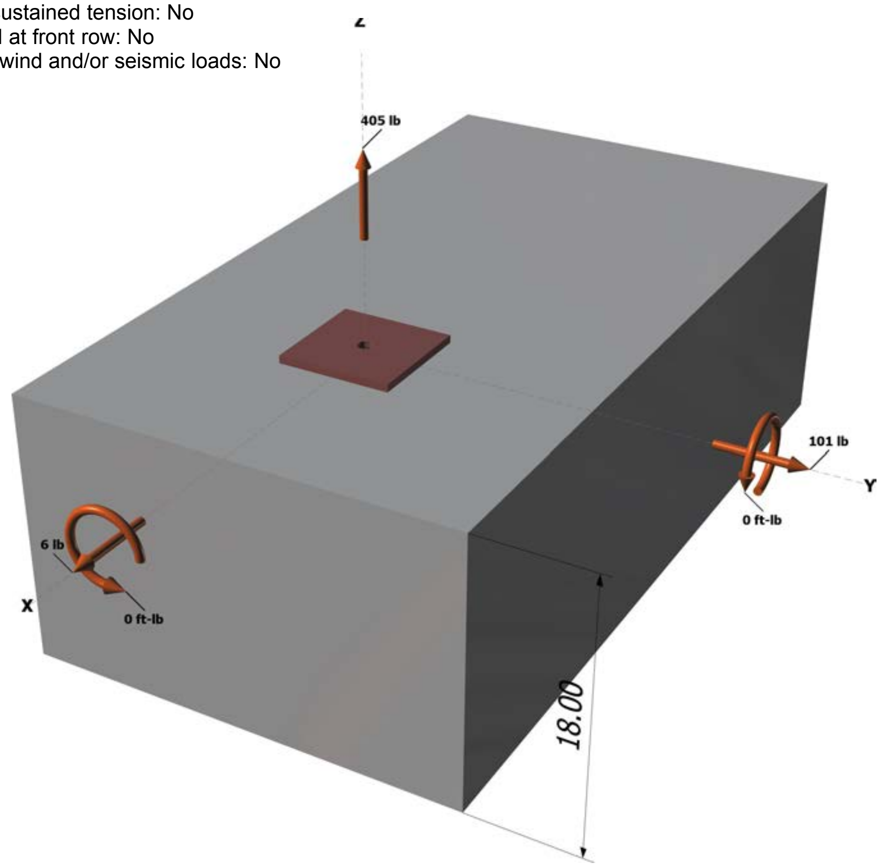
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

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

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

<Figure 1>



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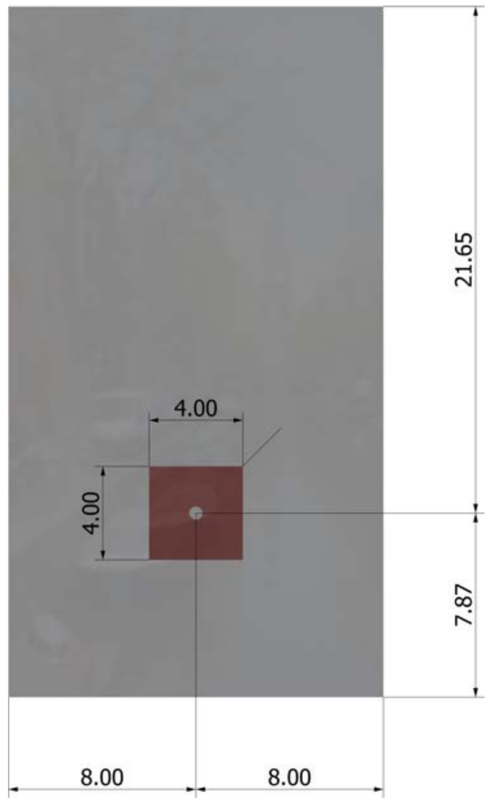


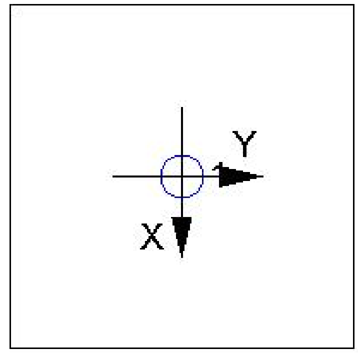
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

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

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

<Figure 3>



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in y-direction:

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

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

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

Shear parallel to edge in x-direction:

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

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

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

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

Shear parallel to edge in y-direction:

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

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

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

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

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

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

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

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

11. Results

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

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

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

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

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

12. Warnings

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

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

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

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

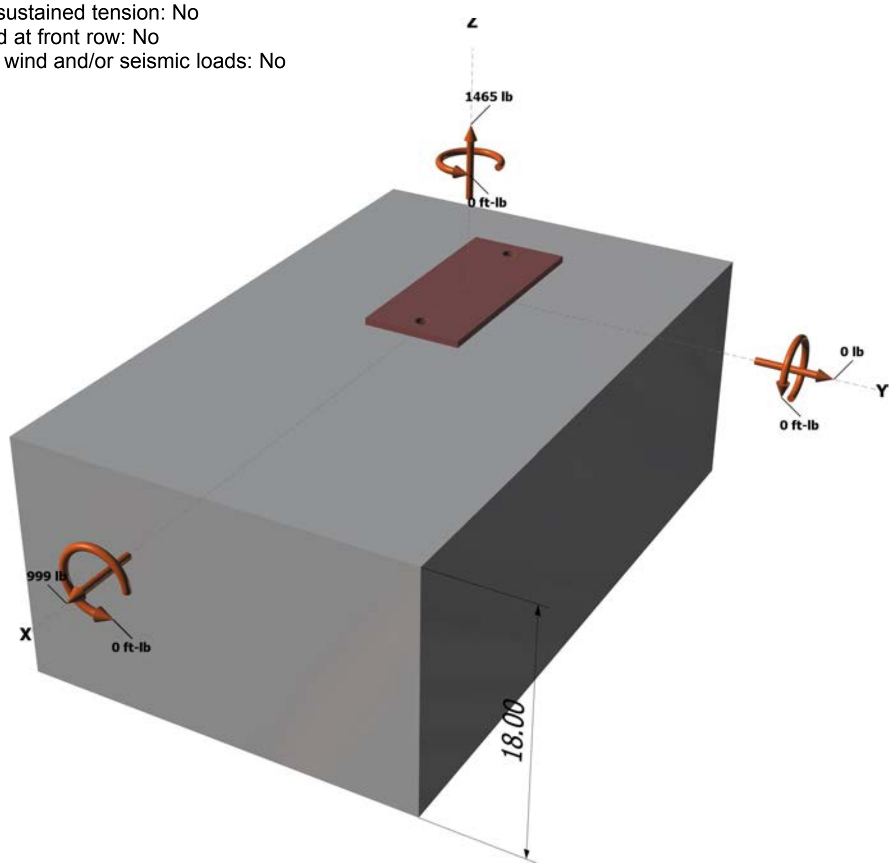
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

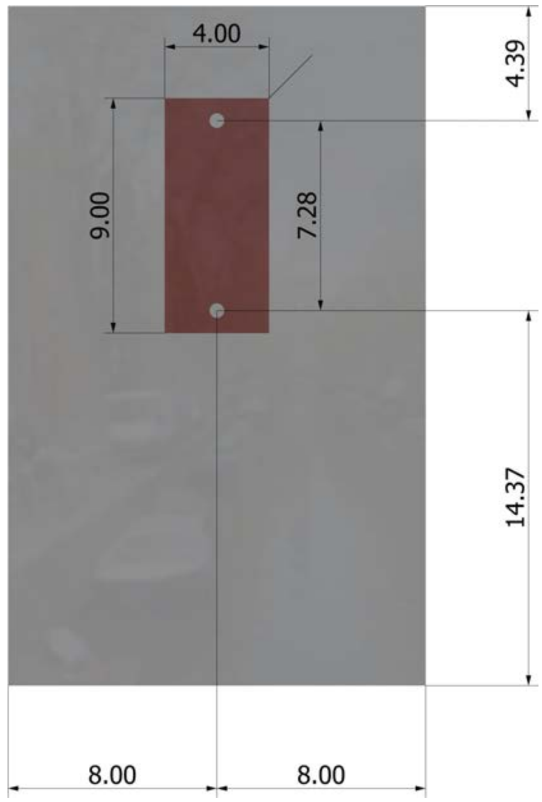
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout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



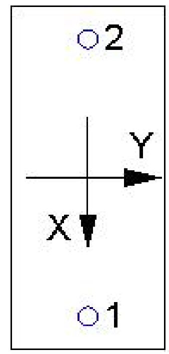
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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.