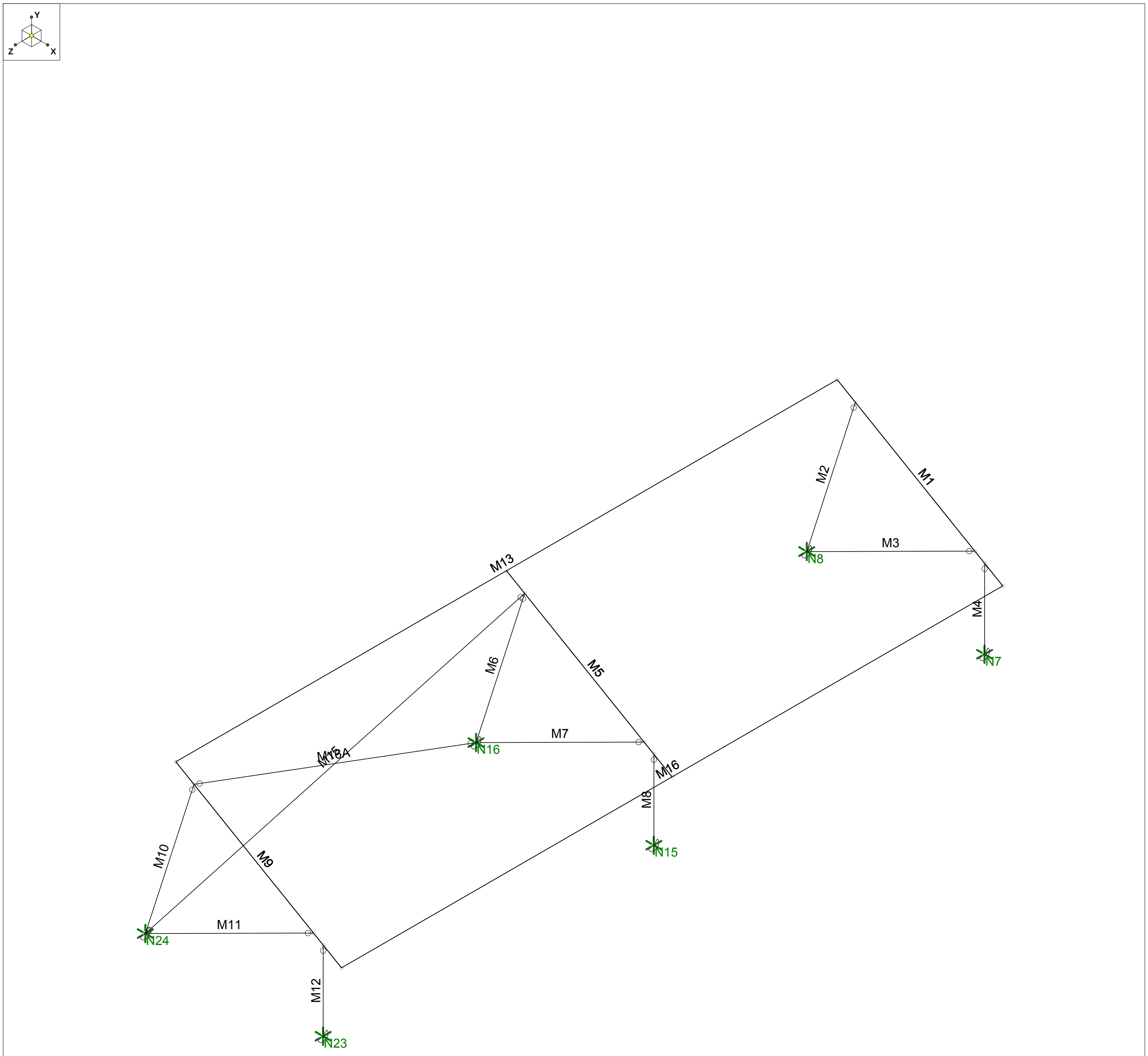


Schletter, Inc.		30° Tilt w/o Seismic Design
HCV	Standard PVMini Racking System	
	Representative Calculations - ASCE 7-05	

1. INTRODUCTION

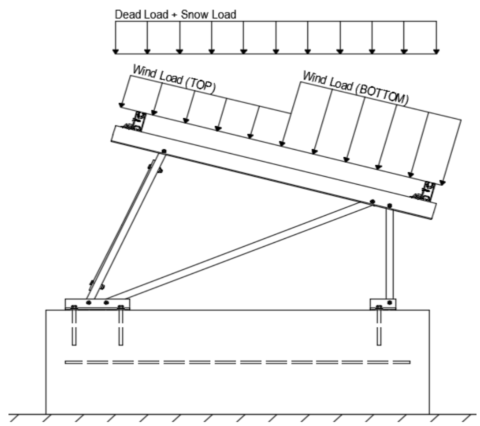
1.1 Project Description
The following sections will cover the determination of forces and structural design calculations for the Schletter, Inc. PVMini ground mount system.

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

PV modules are required to meet the following specifications:

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

Modules Per Row = 1
Module Tilt = 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 = 100 mph
Height ≤ 15 ft

Exposure Category = C
Importance Category = II

Peak Velocity Pressure, q_z = 15.70 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 - N/A

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

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

2.5 Combination of Loads

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

Strength Design, LRFD

Component stresses are checked using the following LRFD load combinations:

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

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

Allowable Stress Design, ASD

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

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

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

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

3. STRUCTURAL ANALYSIS

3.1 RISA Results

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

3.2 RISA Components

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

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

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

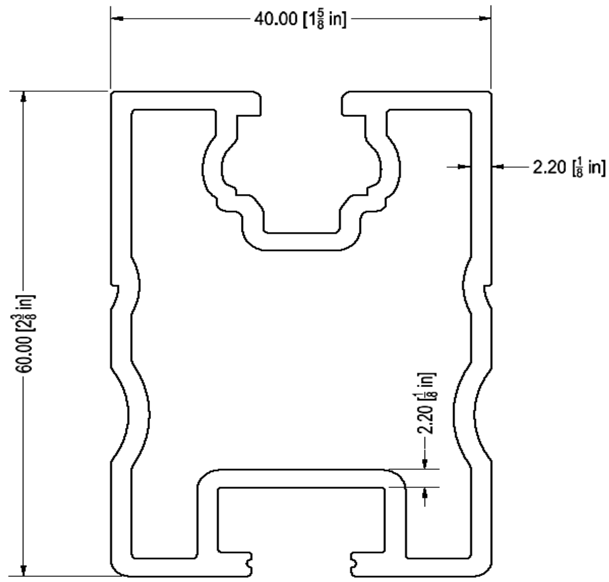
Front Struts	Location	**Bracing**
M4	Outer	M15
M8	Inner	M16A
M12	Outer	

4. MEMBER DESIGN CALCULATIONS

4.1 Purlin Design

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

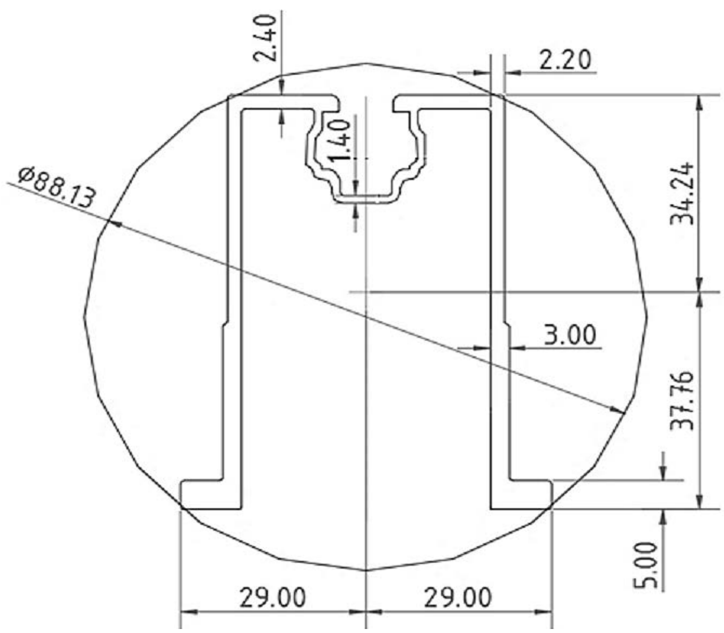
Purlin Type =	**ProfiPlus**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	69	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.01	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	28.47	ksi
S_y =	0.51	in^3
S_x =	0.37	in^3
E =	10100	ksi
I_y =	0.60	in^4
I_x =	0.29	in^4
A =	0.90	in^2
g =	1.08	lbs/ft
M_y =	0.553	k-ft
M_z =	0.134	k-ft
$M_{y\ allowable}$ =	1.234	k-ft
$M_{z\ allowable}$ =	0.871	k-ft
Utilization =	60%	



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).

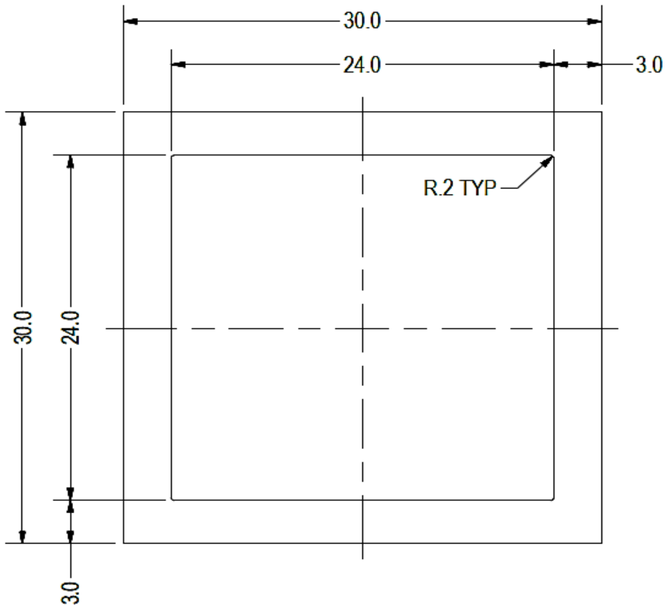
Girder Type =	**Flex Profi**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	33.78	in
$\Phi F_{ty\ AXIAL}$ =	14.29	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.41	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	13.46	ksi
S_y =	0.59	in^3
S_x =	0.46	in^3
E =	10100	ksi
I_y =	0.88	in^4
I_x =	0.52	in^4
A =	0.89	in^2
g =	1.07	lbs/ft
M_y =	0.584	k-ft
M_z =	0.000	k-ft
P_n =	0.301	k
$M_{y\ allowable}$ =	1.443	k-ft
$M_{z\ allowable}$ =	0.513	k-ft
$P_{n\ allowable}$ =	12.764	k
Utilization =	43%	



4.3 Front Strut Design

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

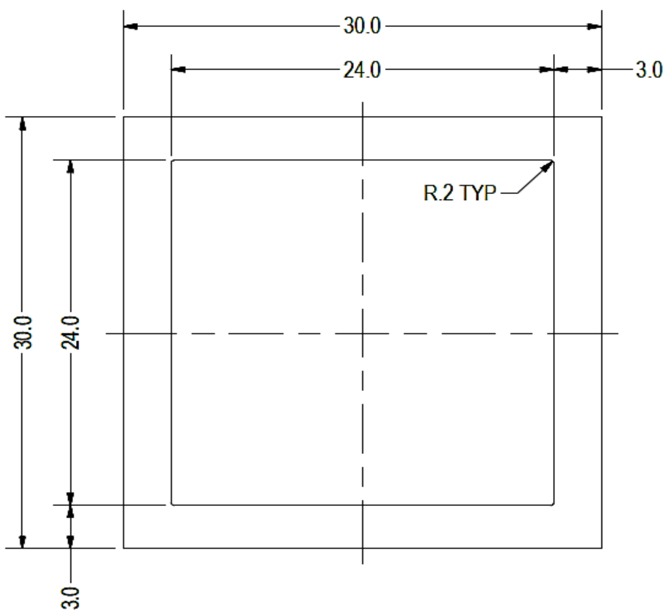
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	18.00	in
$\Phi F_{ty\ AXIAL}$ =	24.52	ksi
$\Phi F_{ty\ BENDING}$ =	31.19	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.001	k-ft
P_n =	0.962	k
$M_{y\ allowable}$ =	0.423	k-ft
$M_{z\ allowable}$ =	0.423	k-ft
$P_{n\ allowable}$ =	12.310	k
Utilization =	8%	



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).

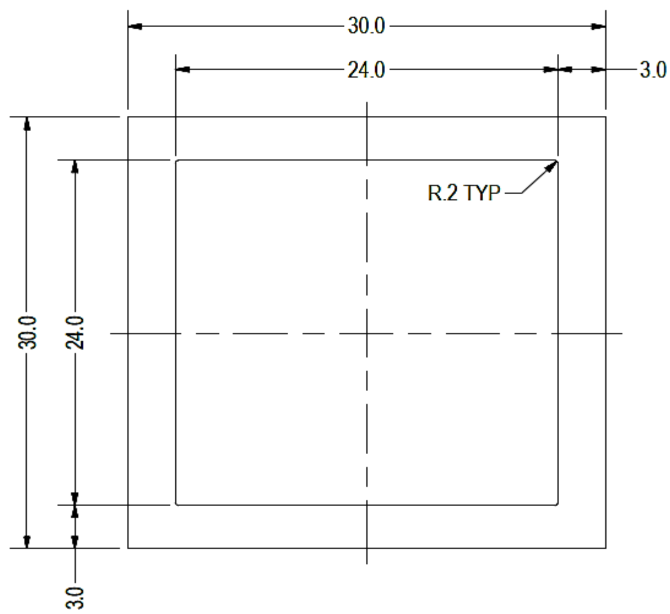
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	46.38	in
$\Phi F_{ty\ AXIAL}$ =	7.60	ksi
$\Phi F_{ty\ BENDING}$ =	29.80	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.628	k
$M_{y\ allowable}$ =	0.404	k-ft
$M_{z\ allowable}$ =	0.404	k-ft
$P_{n\ allowable}$ =	3.814	k
Utilization =	16%	



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).

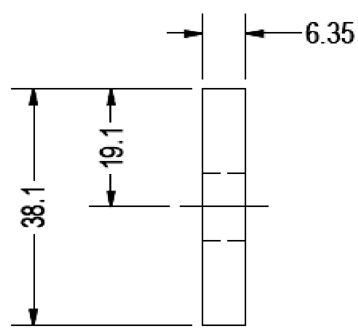
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	39.29	in
$\Phi F_{ty\ AXIAL}$ =	10.06	ksi
$\Phi F_{ty\ BENDING}$ =	30.09	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.799	k
$M_{y\ allowable}$ =	0.408	k-ft
$M_{z\ allowable}$ =	0.408	k-ft
$P_{n\ allowable}$ =	5.050	k
Utilization =	16%	



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 =	0.071	k
$M_{y\ allowable}$ =	0.046	k-ft
$P_{n\ allowable}$ =	11.813	k
Utilization =	7%	



A cross brace kit is required every 27 bays and is to be installed in centermost bays.

5. FOUNDATION DESIGN CALCULATIONS

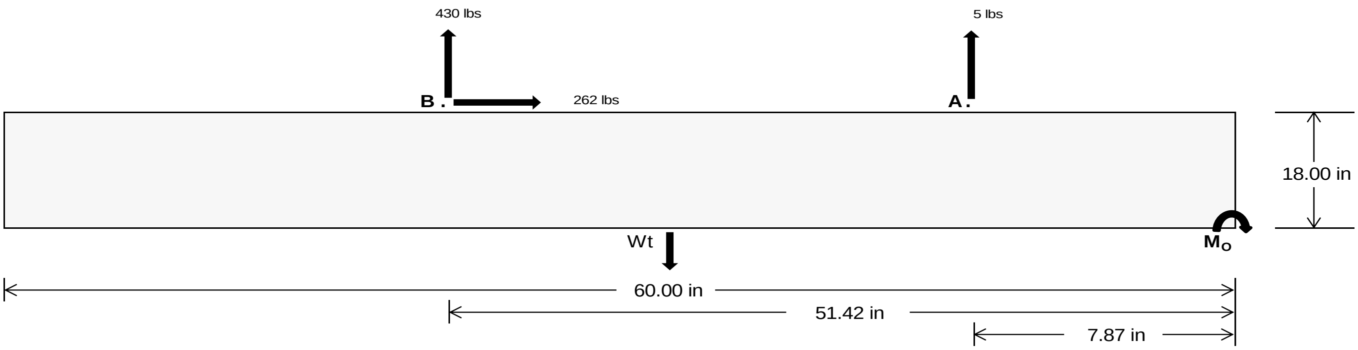
5.1 Helical Pile Foundations

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 =	25.41	1789.40	k
Compressive Load =	1250.56	1265.18	k
Lateral Load =	2.84	1090.59	k
Moment (Weak Axis) =	0.01	0.00	k

5.2 Design of Ballast Foundations

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



Concrete Properties

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

Footing Reinforcement

Use fiber reinforcing with (1) #5 rebar.

Overturning Check

M_O = 26843.1 in-lbs
Resisting Force Required = 894.77 lbs
S.F. = 1.67
Weight Required = 1491.28 lbs
Minimum Width = 22 in in
Weight Provided = 1993.75 lbs

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

Sliding

Force = 262.07 lbs
Friction = 0.4
Weight Required = 655.17 lbs
Resisting Weight = 1993.75 lbs
Additional Weight Required = 0 lbs

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

Cohesion

Sliding Force = 262.07 lbs
Cohesion = 130 psf
Area = 9.17 ft^2
Resisting = 996.88 lbs
Additional Weight Required = 0 lbs

Use a 60in long x 22in wide x 18in tall ballast foundation. Cohesion is OK.

Shear Key

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

Shear key is not required.

Bearing Pressure

	Ballast Width			
	22 in	23 in	24 in	25 in
P_{ftg} = (145 pcf)(5 ft)(1.5 ft)(1.83 ft) =	1994 lbs	2084 lbs	2175 lbs	2266 lbs

ASD LC	1.0D + 1.0S				1.0D + 1.0W				1.0D + 0.75L + 0.75W + 0.75S				0.6D + 1.0W			
Width	22 in	23 in	24 in	25 in	22 in	23 in	24 in	25 in	22 in	23 in	24 in	25 in	22 in	23 in	24 in	25 in
F_A	457 lbs	457 lbs	457 lbs	457 lbs	414 lbs	414 lbs	414 lbs	414 lbs	612 lbs	612 lbs	612 lbs	612 lbs	-10 lbs	-10 lbs	-10 lbs	-10 lbs
F_B	317 lbs	317 lbs	317 lbs	317 lbs	542 lbs	542 lbs	542 lbs	542 lbs	615 lbs	615 lbs	615 lbs	615 lbs	-859 lbs	-859 lbs	-859 lbs	-859 lbs
F_V	52 lbs	52 lbs	52 lbs	52 lbs	474 lbs	474 lbs	474 lbs	474 lbs	390 lbs	390 lbs	390 lbs	390 lbs	-524 lbs	-524 lbs	-524 lbs	-524 lbs
P_{total}	2768 lbs	2858 lbs	2949 lbs	3039 lbs	2950 lbs	3041 lbs	3131 lbs	3222 lbs	3220 lbs	3311 lbs	3401 lbs	3492 lbs	327 lbs	381 lbs	436 lbs	490 lbs
M	353 lbs-ft	353 lbs-ft	353 lbs-ft	353 lbs-ft	507 lbs-ft	507 lbs-ft	507 lbs-ft	507 lbs-ft	615 lbs-ft	615 lbs-ft	615 lbs-ft	615 lbs-ft	728 lbs-ft	728 lbs-ft	728 lbs-ft	728 lbs-ft
e	0.13 ft	0.12 ft	0.12 ft	0.12 ft	0.17 ft	0.17 ft	0.16 ft	0.16 ft	0.19 ft	0.19 ft	0.18 ft	0.18 ft	2.23 ft	1.91 ft	1.67 ft	1.49 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}	255.7 psf	254.1 psf	252.5 psf	251.1 psf	255.4 psf	253.8 psf	252.3 psf	250.9 psf	270.8 psf	268.4 psf	266.3 psf	264.4 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	348.1 psf	342.4 psf	337.2 psf	332.4 psf	388.2 psf	380.7 psf	373.9 psf	367.7 psf	431.8 psf	422.5 psf	414.0 psf	406.1 psf	436.1 psf	224.8 psf	175.3 psf	154.7 psf

Maximum Bearing Pressure = 436 psf
Allowable Bearing Pressure = 1500 psf

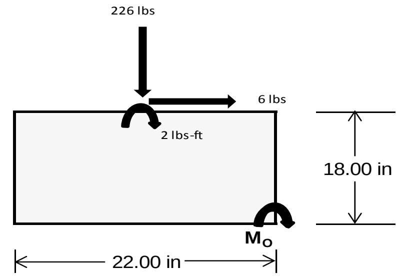
Use a 60in long x 22in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O = 196.1 ft-lbs
Resisting Force Required = 213.96 lbs
S.F. = 1.67
Weight Required = 356.61 lbs
Minimum Width = 22 in in
Weight Provided = 1993.75 lbs

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



Bearing Pressure

ASD LC	1.238D + 0.875E			1.1785D + 0.65625E + 0.75S			0.362D + 0.875E		
Width	22 in			22 in			22 in		
Support	Outer	Inner	Outer	Outer	Inner	Outer	Outer	Inner	Outer
F_Y	70 lbs	176 lbs	66 lbs	226 lbs	641 lbs	222 lbs	20 lbs	51 lbs	19 lbs
F_V	1 lbs	1 lbs	0 lbs	6 lbs	6 lbs	1 lbs	0 lbs	0 lbs	0 lbs
P_{total}	2538 lbs	2644 lbs	2534 lbs	2576 lbs	2991 lbs	2572 lbs	742 lbs	773 lbs	741 lbs
M	2 lbs-ft	2 lbs-ft	0 lbs-ft	11 lbs-ft	8 lbs-ft	1 lbs-ft	1 lbs-ft	1 lbs-ft	0 lbs-ft
e	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft
L/6	0.31 ft	1.83 ft	1.83 ft	1.82 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft
f_{min}	276.2 sqft	287.8 sqft	276.4 sqft	277.0 sqft	323.3 sqft	280.3 sqft	80.8 sqft	84.2 sqft	80.8 sqft
f_{max}	277.6 psf	289.1 psf	276.5 psf	285.0 psf	329.3 psf	280.9 psf	81.2 psf	84.5 psf	80.9 psf

Maximum Bearing Pressure = 329 psf
Allowable Bearing Pressure = 1500 psf

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

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

5.3 Foundation Anchors

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

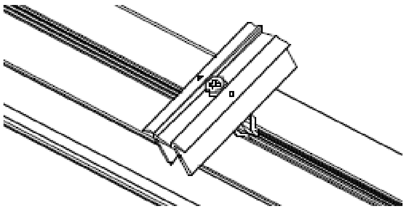
6. DESIGN OF JOINTS AND CONNECTIONS

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

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

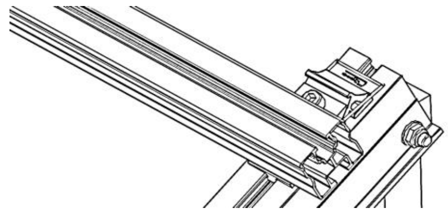
Fastening of Modules to Purlins

Maximum Uplifting Force =	0.540 k
Allowable Uplift =	1.214 k
Utilization =	44%



Fastening of Purlins to Girders

Maximum Uplifting Force =	1.103 k
Allowable Uplift =	1.116 k
Utilization =	99%



6.2 Bolted Connections

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

Front Strut

Maximum Axial Load =	0.962 k
M8 Bolt Capacity =	5.692 k
Strut Bearing Capacity =	7.952 k
Utilization =	17%

Rear Strut

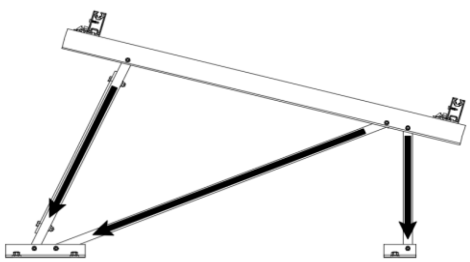
Maximum Axial Load =	1.163 k
M8 Bolt Capacity =	5.692 k
Strut Bearing Capacity =	7.952 k
Utilization =	20%

Diagonal Strut

Maximum Axial Load =	0.628 k
M8 Bolt Shear Capacity =	5.692 k
Strut Bearing Capacity =	7.952 k
Utilization =	11%

Bracing

Maximum Axial Load =	0.071 k
M10 Bolt Capacity =	8.894 k
Strut Bearing Capacity =	7.952 k
Utilization =	1%



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

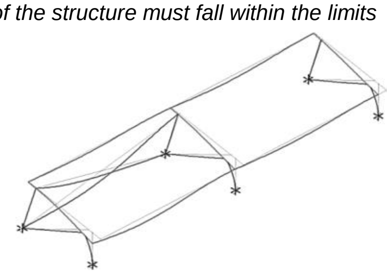
7. SEISMIC DESIGN

7.1 Seismic Drift - N/A

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

Mean Height, h_{sx} =	32.32 in
Allowable Story Drift for All Other Structures, Δ = {	$0.020h_{sx}$ 0.646 in
Max Drift, Δ_{MAX} =	0.023 in
N/A	

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



APPENDIX A

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

Purlin = **ProfiPlus**

Strong Axis:

3.4.14

L_b = 69.00 in

J = 0.255

179.672

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

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= 29.0 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 = 69.00 in

J = 0.255

186.579

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 28.9

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

$\varphi F_L St$= 29.0 ksi
Ix = 250988 mm^4
0.603 in^4
y = 30 mm
Sx = 0.511 in^3
$M_{max}St$ = 1.234 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 = 1.10

23.4092

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

S1 = 1.37733

$$S2 = 1.2C_c$$

S2 = 79.2

φF_L= φb[Bc-Dc*Lb/(1.2*ry*√(Cb))

φF_L= 29.4 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 = 1.10

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= 29.4 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= 29.4 ksi

Ix = 364470 mm^4

0.876 in^4

y = 37.77 mm

Sx = 0.589 in^3

M_{max}St = 1.443 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

λ = 0.77182

r = 0.437 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.83792

φF_L= φcc(Bc-Dc*λ)

φF_L= 24.5226 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

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= 24.52 ksi

A = 323.87 mm^2

0.50 in^2

P_{max} = 12.31 kips

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 46.38 in

J = 0.16

121.663

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.8 ksi

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 29.8 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

M_{max}St = 0.404 k-ft

Weak Axis:

3.4.14

L_b = 46.38 in

J = 0.16

121.663

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.8

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 33.3 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

M_{max}Wk = 0.450 k-ft

Compression

3.4.7

$\lambda =$ 1.98863

r = 0.437 in

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

$S1^* =$ 0.33515

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

$S2^* =$ 1.23671

$\varphi cc =$ 0.85841

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

$\varphi F_L =$ 7.59722 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.25 ksi

$\varphi F_L =$ 7.60 ksi

A = 323.87 mm^2

0.50 in^2

$P_{max} =$ 3.81 kips

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								

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	-50.353	-50.353	0	0
2	M16	y	-81.003	-81.003	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	100.707	100.707	0	0
2	M16	y	48.164	48.164	0	0

Load Combinations

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

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N8	max	216.382	2	290.816	2	0	15	0	15	0	1	0	1
2		min	-265.209	3	-421.617	3	-.119	3	0	3	0	1	0	1
3	N7	max	.002	3	360.991	1	-.045	15	0	15	0	1	0	1
4		min	-.152	2	3.994	12	-.955	1	-.002	1	0	1	0	1
5	N15	max	0	15	961.97	1	.537	1	.001	1	0	1	0	1
6		min	-1.562	2	-19.548	3	-.52	3	0	3	0	1	0	1
7	N16	max	777.375	2	973.216	2	0	10	0	1	0	1	0	1
8		min	-838.917	3	-1376.458	3	-60.441	3	0	3	0	1	0	1
9	N23	max	.002	3	360.745	1	2.182	1	.004	1	0	1	0	1
10		min	-.152	2	4.355	12	.096	15	0	15	0	1	0	1
11	N24	max	216.584	2	294.131	2	60.907	3	0	1	0	1	0	1
12		min	-265.462	3	-419.803	3	.008	10	0	3	0	1	0	1
13	Totals:	max	1208.475	2	3041.162	1	0	1						
14		min	-1369.613	3	-2226.929	3	0	3						

Envelope Member Section Forces

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
1	M2	1	max	248.626	1	.655	4	.345	1	0	15	0	15	0	1
2			min	-362.972	3	.154	15	-.053	3	0	1	0	1	0	1
3		2	max	248.752	1	.603	4	.345	1	0	15	0	15	0	15
4			min	-362.877	3	.142	15	-.053	3	0	1	0	1	0	4
5		3	max	248.878	1	.552	4	.345	1	0	15	0	15	0	15
6			min	-362.783	3	.13	15	-.053	3	0	1	0	3	0	4
7		4	max	249.004	1	.501	4	.345	1	0	15	0	1	0	15
8			min	-362.689	3	.118	15	-.053	3	0	1	0	3	0	4
9		5	max	249.13	1	.45	4	.345	1	0	15	0	1	0	15
10			min	-362.594	3	.106	15	-.053	3	0	1	0	3	0	4
11		6	max	249.255	1	.399	4	.345	1	0	15	0	1	0	15
12			min	-362.5	3	.094	15	-.053	3	0	1	0	3	0	4
13		7	max	249.381	1	.348	4	.345	1	0	15	0	1	0	15
14			min	-362.405	3	.082	15	-.053	3	0	1	0	3	0	4
15		8	max	249.507	1	.297	4	.345	1	0	15	0	1	0	15
16			min	-362.311	3	.07	15	-.053	3	0	1	0	3	0	4
17		9	max	249.633	1	.245	4	.345	1	0	15	0	1	0	15
18			min	-362.217	3	.058	15	-.053	3	0	1	0	3	0	4
19		10	max	249.759	1	.194	4	.345	1	0	15	0	1	0	15
20			min	-362.122	3	.046	15	-.053	3	0	1	0	3	0	4
21		11	max	249.885	1	.143	4	.345	1	0	15	0	1	0	15
22			min	-362.028	3	.033	12	-.053	3	0	1	0	3	0	4
23		12	max	250.011	1	.101	2	.345	1	0	15	0	1	0	15
24			min	-361.933	3	.013	12	-.053	3	0	1	0	3	0	4
25		13	max	250.137	1	.061	2	.345	1	0	15	0	1	0	15
26			min	-361.839	3	-.013	3	-.053	3	0	1	0	3	0	4
27		14	max	250.262	1	.021	2	.345	1	0	15	0	1	0	15
28			min	-361.745	3	-.043	3	-.053	3	0	1	0	3	0	4
29		15	max	250.388	1	-.014	15	.345	1	0	15	0	1	0	15
30			min	-361.65	3	-.073	3	-.053	3	0	1	0	3	0	4
31		16	max	250.514	1	-.026	15	.345	1	0	15	0	1	0	15
32			min	-361.556	3	-.113	4	-.053	3	0	1	0	3	0	4
33		17	max	250.64	1	-.038	15	.345	1	0	15	0	1	0	15
34			min	-361.461	3	-.164	4	-.053	3	0	1	0	3	0	4
35		18	max	250.766	1	-.05	15	.345	1	0	15	0	1	0	15
36			min	-361.367	3	-.215	4	-.053	3	0	1	0	3	0	4
37		19	max	250.892	1	-.062	15	.345	1	0	15	0	1	0	15

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
38			min	-361.273	3	-.266	4	-.053	3	0	1	0	3	0	4
39	M3	1	max	167.229	2	1.758	4	-.015	15	0	15	.001	1	0	4
40			min	-173.997	3	.413	15	-.353	1	0	1	0	15	0	15
41		2	max	167.159	2	1.581	4	-.015	15	0	15	.001	1	0	2
42			min	-174.049	3	.372	15	-.353	1	0	1	0	15	0	12
43		3	max	167.09	2	1.404	4	-.015	15	0	15	.001	1	0	2
44			min	-174.101	3	.33	15	-.353	1	0	1	0	15	0	3
45		4	max	167.021	2	1.227	4	-.015	15	0	15	0	1	0	15
46			min	-174.153	3	.289	15	-.353	1	0	1	0	15	0	4
47		5	max	166.952	2	1.051	4	-.015	15	0	15	0	1	0	15
48			min	-174.205	3	.247	15	-.353	1	0	1	0	15	0	4
49		6	max	166.882	2	.874	4	-.015	15	0	15	0	1	0	15
50			min	-174.257	3	.206	15	-.353	1	0	1	0	15	0	4
51		7	max	166.813	2	.697	4	-.015	15	0	15	0	1	0	15
52			min	-174.309	3	.164	15	-.353	1	0	1	0	15	0	4
53		8	max	166.744	2	.52	4	-.015	15	0	15	0	1	0	15
54			min	-174.361	3	.122	15	-.353	1	0	1	0	15	-.001	4
55		9	max	166.674	2	.343	4	-.015	15	0	15	0	1	0	15
56			min	-174.413	3	.081	15	-.353	1	0	1	0	15	-.001	4
57		10	max	166.605	2	.166	4	-.015	15	0	15	0	1	0	15
58			min	-174.465	3	.039	15	-.353	1	0	1	0	15	-.001	4
59		11	max	166.536	2	.017	2	-.015	15	0	15	0	1	0	15
60			min	-174.517	3	-.038	3	-.353	1	0	1	0	15	-.001	4
61		12	max	166.466	2	-.044	15	-.015	15	0	15	0	1	0	15
62			min	-174.569	3	-.187	4	-.353	1	0	1	0	15	-.001	4
63		13	max	166.397	2	-.085	15	-.015	15	0	15	0	1	0	15
64			min	-174.621	3	-.364	4	-.353	1	0	1	0	15	-.001	4
65		14	max	166.328	2	-.127	15	-.015	15	0	15	0	1	0	15
66			min	-174.673	3	-.541	4	-.353	1	0	1	0	15	-.001	4
67		15	max	166.258	2	-.169	15	-.015	15	0	15	0	1	0	15
68			min	-174.725	3	-.718	4	-.353	1	0	1	0	15	0	4
69		16	max	166.189	2	-.21	15	-.015	15	0	15	0	1	0	15
70			min	-174.777	3	-.895	4	-.353	1	0	1	0	3	0	4
71		17	max	166.12	2	-.252	15	-.015	15	0	15	0	15	0	15
72			min	-174.829	3	-1.071	4	-.353	1	0	1	0	1	0	4
73		18	max	166.05	2	-.293	15	-.015	15	0	15	0	15	0	15
74			min	-174.881	3	-1.248	4	-.353	1	0	1	0	1	0	4
75		19	max	165.981	2	-.335	15	-.015	15	0	15	0	15	0	1
76			min	-174.933	3	-1.425	4	-.353	1	0	1	0	1	0	1
77	M4	1	max	359.826	1	0	1	-.045	15	0	1	0	3	0	1
78			min	3.411	12	0	1	-1.016	1	0	1	0	2	0	1
79		2	max	359.891	1	0	1	-.045	15	0	1	0	15	0	1
80			min	3.444	12	0	1	-1.016	1	0	1	0	1	0	1
81		3	max	359.955	1	0	1	-.045	15	0	1	0	15	0	1
82			min	3.476	12	0	1	-1.016	1	0	1	0	1	0	1
83		4	max	360.02	1	0	1	-.045	15	0	1	0	15	0	1
84			min	3.508	12	0	1	-1.016	1	0	1	0	1	0	1
85		5	max	360.085	1	0	1	-.045	15	0	1	0	15	0	1
86			min	3.541	12	0	1	-1.016	1	0	1	0	1	0	1
87		6	max	360.149	1	0	1	-.045	15	0	1	0	15	0	1
88			min	3.573	12	0	1	-1.016	1	0	1	0	1	0	1
89		7	max	360.214	1	0	1	-.045	15	0	1	0	15	0	1
90			min	3.605	12	0	1	-1.016	1	0	1	0	1	0	1
91		8	max	360.279	1	0	1	-.045	15	0	1	0	15	0	1
92			min	3.638	12	0	1	-1.016	1	0	1	0	1	0	1
93		9	max	360.344	1	0	1	-.045	15	0	1	0	15	0	1
94			min	3.67	12	0	1	-1.016	1	0	1	0	1	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
95		10	max	360.408	1	0	1	-.045	15	0	1	0	15	0	1
96			min	3.702	12	0	1	-1.016	1	0	1	0	1	0	1
97		11	max	360.473	1	0	1	-.045	15	0	1	0	15	0	1
98			min	3.735	12	0	1	-1.016	1	0	1	0	1	0	1
99		12	max	360.538	1	0	1	-.045	15	0	1	0	15	0	1
100			min	3.767	12	0	1	-1.016	1	0	1	-.001	1	0	1
101		13	max	360.602	1	0	1	-.045	15	0	1	0	15	0	1
102			min	3.8	12	0	1	-1.016	1	0	1	-.001	1	0	1
103		14	max	360.667	1	0	1	-.045	15	0	1	0	15	0	1
104			min	3.832	12	0	1	-1.016	1	0	1	-.001	1	0	1
105		15	max	360.732	1	0	1	-.045	15	0	1	0	15	0	1
106			min	3.864	12	0	1	-1.016	1	0	1	-.001	1	0	1
107		16	max	360.797	1	0	1	-.045	15	0	1	0	15	0	1
108			min	3.897	12	0	1	-1.016	1	0	1	-.001	1	0	1
109		17	max	360.861	1	0	1	-.045	15	0	1	0	15	0	1
110			min	3.929	12	0	1	-1.016	1	0	1	-.001	1	0	1
111		18	max	360.926	1	0	1	-.045	15	0	1	0	15	0	1
112			min	3.961	12	0	1	-1.016	1	0	1	-.002	1	0	1
113		19	max	360.991	1	0	1	-.045	15	0	1	0	15	0	1
114			min	3.994	12	0	1	-1.016	1	0	1	-.002	1	0	1
115	M6	1	max	796.293	1	.656	4	.104	1	0	3	0	3	0	1
116			min	-1162.61	3	.154	15	-.189	3	0	10	0	9	0	1
117		2	max	796.419	1	.605	4	.104	1	0	3	0	3	0	15
118			min	-1162.516	3	.142	15	-.189	3	0	10	0	9	0	4
119		3	max	796.545	1	.554	4	.104	1	0	3	0	3	0	15
120			min	-1162.421	3	.13	15	-.189	3	0	10	0	10	0	4
121		4	max	796.671	1	.503	4	.104	1	0	3	0	3	0	15
122			min	-1162.327	3	.118	15	-.189	3	0	10	0	10	0	4
123		5	max	796.797	1	.452	4	.104	1	0	3	0	1	0	15
124			min	-1162.233	3	.103	12	-.189	3	0	10	0	10	0	4
125		6	max	796.923	1	.409	2	.104	1	0	3	0	1	0	15
126			min	-1162.138	3	.083	12	-.189	3	0	10	0	10	0	4
127		7	max	797.049	1	.37	2	.104	1	0	3	0	1	0	15
128			min	-1162.044	3	.063	12	-.189	3	0	10	0	3	0	4
129		8	max	797.175	1	.33	2	.104	1	0	3	0	1	0	15
130			min	-1161.949	3	.043	12	-.189	3	0	10	0	3	0	4
131		9	max	797.3	1	.29	2	.104	1	0	3	0	1	0	12
132			min	-1161.855	3	.023	12	-.189	3	0	10	0	3	0	4
133		10	max	797.426	1	.25	2	.104	1	0	3	0	1	0	12
134			min	-1161.761	3	-.003	3	-.189	3	0	10	0	3	0	2
135		11	max	797.552	1	.21	2	.104	1	0	3	0	1	0	12
136			min	-1161.666	3	-.033	3	-.189	3	0	10	0	3	0	2
137		12	max	797.678	1	.17	2	.104	1	0	3	0	1	0	12
138			min	-1161.572	3	-.063	3	-.189	3	0	10	0	3	0	2
139		13	max	797.804	1	.13	2	.104	1	0	3	0	1	0	12
140			min	-1161.477	3	-.093	3	-.189	3	0	10	0	3	0	2
141		14	max	797.93	1	.091	2	.104	1	0	3	0	1	0	12
142			min	-1161.383	3	-.122	3	-.189	3	0	10	0	3	0	2
143		15	max	798.056	1	.051	2	.104	1	0	3	0	1	0	12
144			min	-1161.289	3	-.152	3	-.189	3	0	10	0	3	0	2
145		16	max	798.181	1	.011	2	.104	1	0	3	0	1	0	12
146			min	-1161.194	3	-.182	3	-.189	3	0	10	0	3	0	2
147		17	max	798.307	1	-.029	2	.104	1	0	3	0	1	0	12
148			min	-1161.1	3	-.212	3	-.189	3	0	10	0	3	0	2
149		18	max	798.433	1	-.05	15	.104	1	0	3	0	1	0	3
150			min	-1161.005	3	-.242	3	-.189	3	0	10	0	3	0	2
151		19	max	798.559	1	-.062	15	.104	1	0	3	0	1	0	3

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
152			min	-1160.911	3	-.272	3	-.189	3	0	10	0	3	0	2
153	M7	1	max	628.404	2	1.761	4	.023	3	0	1	0	1	0	2
154			min	-533.426	3	.414	15	-.013	2	0	3	0	3	0	3
155		2	max	628.334	2	1.584	4	.023	3	0	1	0	1	0	2
156			min	-533.478	3	.372	15	-.013	2	0	3	0	3	0	3
157		3	max	628.265	2	1.408	4	.023	3	0	1	0	1	0	2
158			min	-533.53	3	.331	15	-.013	2	0	3	0	3	0	3
159		4	max	628.196	2	1.231	4	.023	3	0	1	0	1	0	2
160			min	-533.582	3	.289	15	-.013	2	0	3	0	3	0	3
161		5	max	628.126	2	1.054	4	.023	3	0	1	0	1	0	15
162			min	-533.634	3	.248	15	-.013	2	0	3	0	3	0	3
163		6	max	628.057	2	.877	4	.023	3	0	1	0	1	0	15
164			min	-533.686	3	.206	15	-.013	2	0	3	0	3	0	4
165		7	max	627.988	2	.7	4	.023	3	0	1	0	1	0	15
166			min	-533.738	3	.165	15	-.013	2	0	3	0	3	0	4
167		8	max	627.918	2	.523	4	.023	3	0	1	0	1	0	15
168			min	-533.79	3	.123	15	-.013	2	0	3	0	3	-.001	4
169		9	max	627.849	2	.357	2	.023	3	0	1	0	1	0	15
170			min	-533.842	3	.069	12	-.013	2	0	3	0	3	-.001	4
171		10	max	627.78	2	.22	2	.023	3	0	1	0	1	0	15
172			min	-533.894	3	-.007	3	-.013	2	0	3	0	3	-.001	4
173		11	max	627.71	2	.082	2	.023	3	0	1	0	1	0	15
174			min	-533.946	3	-.11	3	-.013	2	0	3	0	3	-.001	4
175		12	max	627.641	2	-.043	15	.023	3	0	1	0	1	0	15
176			min	-533.998	3	-.213	3	-.013	2	0	3	0	3	-.001	4
177		13	max	627.572	2	-.085	15	.023	3	0	1	0	1	0	15
178			min	-534.05	3	-.361	4	-.013	2	0	3	0	3	-.001	4
179		14	max	627.503	2	-.126	15	.023	3	0	1	0	1	0	15
180			min	-534.102	3	-.538	4	-.013	2	0	3	0	3	-.001	4
181		15	max	627.433	2	-.168	15	.023	3	0	1	0	1	0	15
182			min	-534.154	3	-.714	4	-.013	2	0	3	0	3	0	4
183		16	max	627.364	2	-.21	15	.023	3	0	1	0	1	0	15
184			min	-534.206	3	-.891	4	-.013	2	0	3	0	3	0	4
185		17	max	627.295	2	-.251	15	.023	3	0	1	0	1	0	15
186			min	-534.258	3	-1.068	4	-.013	2	0	3	0	3	0	4
187		18	max	627.225	2	-.293	15	.023	3	0	1	0	1	0	15
188			min	-534.31	3	-1.245	4	-.013	2	0	3	0	3	0	4
189		19	max	627.156	2	-.334	15	.023	3	0	1	0	1	0	1
190			min	-534.362	3	-1.422	4	-.013	2	0	3	0	3	0	1
191	M8	1	max	960.806	1	0	1	.636	1	0	1	0	10	0	1
192			min	-20.421	3	0	1	-.519	3	0	1	0	1	0	1
193		2	max	960.87	1	0	1	.636	1	0	1	0	1	0	1
194			min	-20.373	3	0	1	-.519	3	0	1	0	3	0	1
195		3	max	960.935	1	0	1	.636	1	0	1	0	1	0	1
196			min	-20.324	3	0	1	-.519	3	0	1	0	3	0	1
197		4	max	961	1	0	1	.636	1	0	1	0	1	0	1
198			min	-20.276	3	0	1	-.519	3	0	1	0	3	0	1
199		5	max	961.064	1	0	1	.636	1	0	1	0	1	0	1
200			min	-20.227	3	0	1	-.519	3	0	1	0	3	0	1
201		6	max	961.129	1	0	1	.636	1	0	1	0	1	0	1
202			min	-20.179	3	0	1	-.519	3	0	1	0	3	0	1
203		7	max	961.194	1	0	1	.636	1	0	1	0	1	0	1
204			min	-20.13	3	0	1	-.519	3	0	1	0	3	0	1
205		8	max	961.259	1	0	1	.636	1	0	1	0	1	0	1
206			min	-20.082	3	0	1	-.519	3	0	1	0	3	0	1
207		9	max	961.323	1	0	1	.636	1	0	1	0	1	0	1
208			min	-20.033	3	0	1	-.519	3	0	1	0	3	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
209		10	max	961.388	1	0	1	.636	1	0	1	0	1	0	1
210			min	-19.984	3	0	1	-.519	3	0	1	0	3	0	1
211		11	max	961.453	1	0	1	.636	1	0	1	0	1	0	1
212			min	-19.936	3	0	1	-.519	3	0	1	0	3	0	1
213		12	max	961.517	1	0	1	.636	1	0	1	0	1	0	1
214			min	-19.887	3	0	1	-.519	3	0	1	0	3	0	1
215		13	max	961.582	1	0	1	.636	1	0	1	0	1	0	1
216			min	-19.839	3	0	1	-.519	3	0	1	0	3	0	1
217		14	max	961.647	1	0	1	.636	1	0	1	0	1	0	1
218			min	-19.79	3	0	1	-.519	3	0	1	0	3	0	1
219		15	max	961.712	1	0	1	.636	1	0	1	0	1	0	1
220			min	-19.742	3	0	1	-.519	3	0	1	0	3	0	1
221		16	max	961.776	1	0	1	.636	1	0	1	0	1	0	1
222			min	-19.693	3	0	1	-.519	3	0	1	0	3	0	1
223		17	max	961.841	1	0	1	.636	1	0	1	0	1	0	1
224			min	-19.645	3	0	1	-.519	3	0	1	0	3	0	1
225		18	max	961.906	1	0	1	.636	1	0	1	0	1	0	1
226			min	-19.596	3	0	1	-.519	3	0	1	0	3	0	1
227		19	max	961.97	1	0	1	.636	1	0	1	.001	1	0	1
228			min	-19.548	3	0	1	-.519	3	0	1	0	3	0	1
229	M10	1	max	251.295	1	.65	4	-.005	15	0	1	0	1	0	1
230			min	-327.321	3	.153	15	-.145	1	0	3	0	3	0	1
231		2	max	251.421	1	.599	4	-.005	15	0	1	0	1	0	15
232			min	-327.227	3	.141	15	-.145	1	0	3	0	3	0	4
233		3	max	251.547	1	.548	4	-.005	15	0	1	0	1	0	15
234			min	-327.133	3	.129	15	-.145	1	0	3	0	3	0	4
235		4	max	251.673	1	.496	4	-.005	15	0	1	0	1	0	15
236			min	-327.038	3	.117	15	-.145	1	0	3	0	3	0	4
237		5	max	251.799	1	.445	4	-.005	15	0	1	0	1	0	15
238			min	-326.944	3	.105	15	-.145	1	0	3	0	3	0	4
239		6	max	251.925	1	.394	4	-.005	15	0	1	0	1	0	15
240			min	-326.849	3	.093	15	-.145	1	0	3	0	3	0	4
241		7	max	252.051	1	.343	4	-.005	15	0	1	0	1	0	15
242			min	-326.755	3	.081	15	-.145	1	0	3	0	3	0	4
243		8	max	252.177	1	.292	4	-.005	15	0	1	0	1	0	15
244			min	-326.661	3	.069	15	-.145	1	0	3	0	3	0	4
245		9	max	252.302	1	.241	4	-.005	15	0	1	0	1	0	15
246			min	-326.566	3	.057	15	-.145	1	0	3	0	3	0	4
247		10	max	252.428	1	.19	4	-.005	15	0	1	0	1	0	15
248			min	-326.472	3	.045	15	-.145	1	0	3	0	3	0	4
249		11	max	252.554	1	.141	2	-.005	15	0	1	0	15	0	15
250			min	-326.377	3	.033	15	-.145	1	0	3	0	3	0	4
251		12	max	252.68	1	.101	2	-.005	15	0	1	0	15	0	15
252			min	-326.283	3	.021	15	-.145	1	0	3	0	3	0	4
253		13	max	252.806	1	.061	2	-.005	15	0	1	0	15	0	15
254			min	-326.189	3	.009	12	-.145	1	0	3	0	3	0	4
255		14	max	252.932	1	.021	2	-.005	15	0	1	0	15	0	15
256			min	-326.094	3	-.021	9	-.145	1	0	3	0	3	0	4
257		15	max	253.058	1	-.015	15	-.005	15	0	1	0	15	0	15
258			min	-326	3	-.066	4	-.145	1	0	3	0	3	0	4
259		16	max	253.184	1	-.027	15	-.005	15	0	1	0	15	0	15
260			min	-325.905	3	-.117	4	-.145	1	0	3	0	3	0	4
261		17	max	253.309	1	-.039	15	-.005	15	0	1	0	15	0	15
262			min	-325.811	3	-.168	4	-.145	1	0	3	0	1	0	4
263		18	max	253.435	1	-.051	15	-.005	15	0	1	0	15	0	15
264			min	-325.717	3	-.22	4	-.145	1	0	3	0	1	0	4
265		19	max	253.561	1	-.063	15	-.005	15	0	1	0	15	0	15

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
266			min	-325.622	3	-.271	4	-.145	1	0	3	0	1	0	4
267	M11	1	max	166.854	2	1.761	4	.388	1	0	1	0	3	0	4
268			min	-174.65	3	.414	15	-.026	3	0	15	-.001	1	0	12
269		2	max	166.785	2	1.585	4	.388	1	0	1	0	3	0	2
270			min	-174.702	3	.372	15	-.026	3	0	15	-.001	1	0	3
271		3	max	166.715	2	1.408	4	.388	1	0	1	0	3	0	2
272			min	-174.754	3	.331	15	-.026	3	0	15	0	1	0	3
273		4	max	166.646	2	1.231	4	.388	1	0	1	0	3	0	15
274			min	-174.806	3	.289	15	-.026	3	0	15	0	1	0	3
275		5	max	166.577	2	1.054	4	.388	1	0	1	0	3	0	15
276			min	-174.858	3	.248	15	-.026	3	0	15	0	1	0	4
277		6	max	166.508	2	.877	4	.388	1	0	1	0	3	0	15
278			min	-174.91	3	.206	15	-.026	3	0	15	0	1	0	4
279		7	max	166.438	2	.7	4	.388	1	0	1	0	3	0	15
280			min	-174.962	3	.165	15	-.026	3	0	15	0	1	0	4
281		8	max	166.369	2	.524	4	.388	1	0	1	0	3	0	15
282			min	-175.014	3	.123	15	-.026	3	0	15	0	1	-.001	4
283		9	max	166.3	2	.347	4	.388	1	0	1	0	3	0	15
284			min	-175.066	3	.081	15	-.026	3	0	15	0	1	-.001	4
285		10	max	166.23	2	.17	4	.388	1	0	1	0	3	0	15
286			min	-175.118	3	.035	12	-.026	3	0	15	0	1	-.001	4
287		11	max	166.161	2	.017	2	.388	1	0	1	0	3	0	15
288			min	-175.17	3	-.054	3	-.026	3	0	15	0	1	-.001	4
289		12	max	166.092	2	-.043	15	.388	1	0	1	0	3	0	15
290			min	-175.222	3	-.184	4	-.026	3	0	15	0	1	-.001	4
291		13	max	166.022	2	-.085	15	.388	1	0	1	0	3	0	15
292			min	-175.274	3	-.361	4	-.026	3	0	15	0	1	-.001	4
293		14	max	165.953	2	-.126	15	.388	1	0	1	0	3	0	15
294			min	-175.326	3	-.537	4	-.026	3	0	15	0	1	-.001	4
295		15	max	165.884	2	-.168	15	.388	1	0	1	0	3	0	15
296			min	-175.378	3	-.714	4	-.026	3	0	15	0	2	0	4
297		16	max	165.814	2	-.209	15	.388	1	0	1	0	3	0	15
298			min	-175.43	3	-.891	4	-.026	3	0	15	0	10	0	4
299		17	max	165.745	2	-.251	15	.388	1	0	1	0	3	0	15
300			min	-175.482	3	-1.068	4	-.026	3	0	15	0	15	0	4
301		18	max	165.676	2	-.293	15	.388	1	0	1	0	1	0	15
302			min	-175.534	3	-1.245	4	-.026	3	0	15	0	15	0	4
303		19	max	165.606	2	-.334	15	.388	1	0	1	0	1	0	1
304			min	-175.586	3	-1.422	4	-.026	3	0	15	0	15	0	1
305	M12	1	max	359.58	1	0	1	2.319	1	0	1	0	2	0	1
306			min	3.772	12	0	1	.096	15	0	1	0	3	0	1
307		2	max	359.645	1	0	1	2.319	1	0	1	0	1	0	1
308			min	3.805	12	0	1	.096	15	0	1	0	15	0	1
309		3	max	359.71	1	0	1	2.319	1	0	1	0	1	0	1
310			min	3.837	12	0	1	.096	15	0	1	0	15	0	1
311		4	max	359.774	1	0	1	2.319	1	0	1	0	1	0	1
312			min	3.869	12	0	1	.096	15	0	1	0	15	0	1
313		5	max	359.839	1	0	1	2.319	1	0	1	0	1	0	1
314			min	3.902	12	0	1	.096	15	0	1	0	15	0	1
315		6	max	359.904	1	0	1	2.319	1	0	1	.001	1	0	1
316			min	3.934	12	0	1	.096	15	0	1	0	15	0	1
317		7	max	359.969	1	0	1	2.319	1	0	1	.001	1	0	1
318			min	3.966	12	0	1	.096	15	0	1	0	15	0	1
319		8	max	360.033	1	0	1	2.319	1	0	1	.001	1	0	1
320			min	3.999	12	0	1	.096	15	0	1	0	15	0	1
321		9	max	360.098	1	0	1	2.319	1	0	1	.002	1	0	1
322			min	4.031	12	0	1	.096	15	0	1	0	15	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
323		10	max	360.163	1	0	1	2.319	1	0	1	.002	1	0	1
324			min	4.063	12	0	1	.096	15	0	1	0	15	0	1
325		11	max	360.227	1	0	1	2.319	1	0	1	.002	1	0	1
326			min	4.096	12	0	1	.096	15	0	1	0	15	0	1
327		12	max	360.292	1	0	1	2.319	1	0	1	.002	1	0	1
328			min	4.128	12	0	1	.096	15	0	1	0	15	0	1
329		13	max	360.357	1	0	1	2.319	1	0	1	.003	1	0	1
330			min	4.16	12	0	1	.096	15	0	1	0	15	0	1
331		14	max	360.421	1	0	1	2.319	1	0	1	.003	1	0	1
332			min	4.193	12	0	1	.096	15	0	1	0	15	0	1
333		15	max	360.486	1	0	1	2.319	1	0	1	.003	1	0	1
334			min	4.225	12	0	1	.096	15	0	1	0	15	0	1
335		16	max	360.551	1	0	1	2.319	1	0	1	.003	1	0	1
336			min	4.257	12	0	1	.096	15	0	1	0	15	0	1
337		17	max	360.616	1	0	1	2.319	1	0	1	.003	1	0	1
338			min	4.29	12	0	1	.096	15	0	1	0	15	0	1
339		18	max	360.68	1	0	1	2.319	1	0	1	.004	1	0	1
340			min	4.322	12	0	1	.096	15	0	1	0	15	0	1
341		19	max	360.745	1	0	1	2.319	1	0	1	.004	1	0	1
342			min	4.355	12	0	1	.096	15	0	1	0	15	0	1
343	M1	1	max	114.735	1	341.407	3	-1.903	15	0	1	.09	1	0	2
344			min	4.659	15	-248.51	1	-45.888	1	0	3	.004	15	0	3
345		2	max	114.875	1	341.226	3	-1.903	15	0	1	.08	1	.054	1
346			min	4.701	15	-248.752	1	-45.888	1	0	3	.003	15	-.074	3
347		3	max	88.065	3	5.78	9	-1.89	15	0	12	.07	1	.107	1
348			min	-12.444	10	-23.789	2	-45.751	1	0	1	.003	15	-.147	3
349		4	max	88.17	3	5.579	9	-1.89	15	0	12	.06	1	.109	2
350			min	-12.328	10	-24.031	2	-45.751	1	0	1	.002	15	-.144	3
351		5	max	88.275	3	5.377	9	-1.89	15	0	12	.05	1	.114	2
352			min	-12.212	10	-24.273	2	-45.751	1	0	1	.002	15	-.141	3
353		6	max	88.379	3	5.175	9	-1.89	15	0	12	.04	1	.12	2
354			min	-12.095	10	-24.515	2	-45.751	1	0	1	.002	15	-.138	3
355		7	max	88.484	3	4.974	9	-1.89	15	0	12	.03	1	.125	2
356			min	-11.979	10	-24.757	2	-45.751	1	0	1	.001	15	-.135	3
357		8	max	88.589	3	4.772	9	-1.89	15	0	12	.02	1	.13	2
358			min	-11.863	10	-24.998	2	-45.751	1	0	1	0	15	-.132	3
359		9	max	88.693	3	4.571	9	-1.89	15	0	12	.01	1	.136	2
360			min	-11.746	10	-25.24	2	-45.751	1	0	1	0	15	-.129	3
361		10	max	88.798	3	4.369	9	-1.89	15	0	12	.001	3	.141	2
362			min	-11.63	10	-25.482	2	-45.751	1	0	1	0	10	-.126	3
363		11	max	88.903	3	4.168	9	-1.89	15	0	12	0	3	.147	2
364			min	-11.514	10	-25.724	2	-45.751	1	0	1	-.01	1	-.122	3
365		12	max	89.008	3	3.966	9	-1.89	15	0	12	0	12	.153	2
366			min	-11.397	10	-25.966	2	-45.751	1	0	1	-.02	1	-.119	3
367		13	max	89.112	3	3.765	9	-1.89	15	0	12	-.001	15	.158	2
368			min	-11.281	10	-26.208	2	-45.751	1	0	1	-.03	1	-.116	3
369		14	max	89.217	3	3.563	9	-1.89	15	0	12	-.002	15	.164	2
370			min	-11.165	10	-26.449	2	-45.751	1	0	1	-.04	1	-.113	3
371		15	max	89.322	3	3.362	9	-1.89	15	0	12	-.002	15	.17	2
372			min	-11.048	10	-26.691	2	-45.751	1	0	1	-.049	1	-.109	3
373		16	max	91.604	2	111.555	2	-1.904	15	0	1	-.002	15	.174	2
374			min	-5.904	3	-162.416	3	-46.053	1	0	12	-.06	1	-.105	3
375		17	max	91.744	2	111.313	2	-1.904	15	0	1	-.003	15	.15	2
376			min	-5.8	3	-162.598	3	-46.053	1	0	12	-.07	1	-.069	3
377		18	max	-4.692	15	347.504	2	-1.949	15	0	3	-.003	15	.076	2
378			min	-114.857	1	-159.22	3	-47.157	1	0	2	-.08	1	-.035	3
379		19	max	-4.65	15	347.262	2	-1.949	15	0	3	-.004	15	0	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
380			min	-114.718	1	-159.401	3	-47.157	1	0	2	-.09	1	0	3
381	M5	1	max	259.302	1	1120.889	3	0	10	0	1	.007	3	0	3
382			min	6.959	12	-815.531	1	-54.465	3	0	3	0	10	0	2
383		2	max	259.442	1	1120.708	3	0	10	0	1	.001	1	.176	1
384			min	7.028	12	-815.773	1	-54.465	3	0	3	-.005	3	-.243	3
385		3	max	268.247	3	5.626	9	6.162	3	0	3	0	1	.35	1
386			min	-48.197	10	-87.144	2	-.699	1	0	1	-.016	3	-.481	3
387		4	max	268.352	3	5.424	9	6.162	3	0	3	0	1	.358	1
388			min	-48.081	10	-87.386	2	-.699	1	0	1	-.015	3	-.47	3
389		5	max	268.457	3	5.223	9	6.162	3	0	3	0	1	.377	2
390			min	-47.965	10	-87.628	2	-.699	1	0	1	-.014	3	-.459	3
391		6	max	268.562	3	5.021	9	6.162	3	0	3	0	1	.396	2
392			min	-47.848	10	-87.869	2	-.699	1	0	1	-.012	3	-.448	3
393		7	max	268.666	3	4.82	9	6.162	3	0	3	0	1	.415	2
394			min	-47.732	10	-88.111	2	-.699	1	0	1	-.011	3	-.437	3
395		8	max	268.771	3	4.618	9	6.162	3	0	3	0	1	.434	2
396			min	-47.615	10	-88.353	2	-.699	1	0	1	-.01	3	-.426	3
397		9	max	268.876	3	4.416	9	6.162	3	0	3	0	1	.453	2
398			min	-47.499	10	-88.595	2	-.699	1	0	1	-.008	3	-.415	3
399		10	max	268.98	3	4.215	9	6.162	3	0	3	0	10	.472	2
400			min	-47.383	10	-88.837	2	-.699	1	0	1	-.007	3	-.404	3
401		11	max	269.085	3	4.013	9	6.162	3	0	3	0	10	.492	2
402			min	-47.266	10	-89.078	2	-.699	1	0	1	-.006	3	-.393	3
403		12	max	269.19	3	3.812	9	6.162	3	0	3	0	10	.511	2
404			min	-47.15	10	-89.32	2	-.699	1	0	1	-.004	3	-.381	3
405		13	max	269.295	3	3.61	9	6.162	3	0	3	0	10	.53	2
406			min	-47.034	10	-89.562	2	-.699	1	0	1	-.003	3	-.37	3
407		14	max	269.399	3	3.409	9	6.162	3	0	3	0	10	.55	2
408			min	-46.917	10	-89.804	2	-.699	1	0	1	-.002	3	-.359	3
409		15	max	269.504	3	3.207	9	6.162	3	0	3	0	10	.569	2
410			min	-46.801	10	-90.046	2	-.699	1	0	1	0	1	-.348	3
411		16	max	300.635	2	437.178	2	6.133	3	0	3	0	3	.584	2
412			min	-23.194	3	-499.379	3	-.713	1	0	10	0	1	-.332	3
413		17	max	300.775	2	436.936	2	6.133	3	0	3	.002	3	.49	2
414			min	-23.089	3	-499.56	3	-.713	1	0	10	-.001	1	-.224	3
415		18	max	-8.633	12	1136.165	2	5.615	3	0	3	.003	3	.246	2
416			min	-259.468	1	-517.52	3	-.161	1	0	1	-.001	1	-.112	3
417		19	max	-8.563	12	1135.923	2	5.615	3	0	3	.004	3	0	3
418			min	-259.328	1	-517.701	3	-.161	1	0	1	-.001	1	0	2
419	M9	1	max	114.313	1	341.361	3	59.305	3	0	3	-.004	15	0	2
420			min	4.638	15	-248.508	1	2.183	15	0	1	-.089	1	0	3
421		2	max	114.453	1	341.18	3	59.305	3	0	3	-.002	12	.054	1
422			min	4.68	15	-248.75	1	2.183	15	0	1	-.079	1	-.074	3
423		3	max	88.051	3	5.757	9	44.652	1	0	1	.01	3	.107	1
424			min	-11.991	10	-23.799	2	-.809	3	0	15	-.068	1	-.147	3
425		4	max	88.156	3	5.556	9	44.652	1	0	1	.01	3	.109	2
426			min	-11.874	10	-24.04	2	-.809	3	0	15	-.058	1	-.144	3
427		5	max	88.26	3	5.354	9	44.652	1	0	1	.01	3	.114	2
428			min	-11.758	10	-24.282	2	-.809	3	0	15	-.048	1	-.141	3
429		6	max	88.365	3	5.152	9	44.652	1	0	1	.01	3	.12	2
430			min	-11.642	10	-24.524	2	-.809	3	0	15	-.039	1	-.138	3
431		7	max	88.47	3	4.951	9	44.652	1	0	1	.009	3	.125	2
432			min	-11.525	10	-24.766	2	-.809	3	0	15	-.029	1	-.135	3
433		8	max	88.574	3	4.749	9	44.652	1	0	1	.009	3	.13	2
434			min	-11.409	10	-25.008	2	-.809	3	0	15	-.019	1	-.132	3
435		9	max	88.679	3	4.548	9	44.652	1	0	1	.009	3	.136	2
436			min	-11.292	10	-25.249	2	-.809	3	0	15	-.01	1	-.129	3

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
437		10	max	88.784	3	4.346	9	44.652	1	0	1	.009	3	.141	2
438			min	-11.176	10	-25.491	2	-.809	3	0	15	0	1	-.126	3
439		11	max	88.889	3	4.145	9	44.652	1	0	1	.01	1	.147	2
440			min	-11.06	10	-25.733	2	-.809	3	0	15	0	15	-.122	3
441		12	max	88.993	3	3.943	9	44.652	1	0	1	.019	1	.152	2
442			min	-10.943	10	-25.975	2	-.809	3	0	15	0	15	-.119	3
443		13	max	89.098	3	3.742	9	44.652	1	0	1	.029	1	.158	2
444			min	-10.827	10	-26.217	2	-.809	3	0	15	.001	15	-.116	3
445		14	max	89.203	3	3.54	9	44.652	1	0	1	.039	1	.164	2
446			min	-10.711	10	-26.459	2	-.809	3	0	15	.002	15	-.113	3
447		15	max	89.307	3	3.339	9	44.652	1	0	1	.048	1	.17	2
448			min	-10.594	10	-26.7	2	-.809	3	0	15	.002	15	-.109	3
449		16	max	91.861	2	111.233	2	44.988	1	0	15	.059	1	.174	2
450			min	-6.263	3	-162.888	3	-.831	3	0	1	.002	15	-.105	3
451		17	max	92.001	2	110.991	2	44.988	1	0	15	.068	1	.15	2
452			min	-6.159	3	-163.07	3	-.831	3	0	1	.003	15	-.069	3
453		18	max	-4.677	15	347.504	2	47.333	1	0	2	.079	1	.076	2
454			min	-114.445	1	-159.214	3	-.355	3	0	3	.003	15	-.035	3
455		19	max	-4.635	15	347.262	2	47.333	1	0	2	.089	1	0	2
456			min	-114.305	1	-159.396	3	-.355	3	0	3	.004	15	0	3
457	M13	1	max	59.301	3	248.184	1	-4.638	15	0	2	.089	1	0	1
458			min	2.183	15	-341.375	3	-114.303	1	0	3	.004	15	0	3
459		2	max	59.301	3	175.456	1	-3.546	15	0	2	.025	1	.186	3
460			min	2.183	15	-241.182	3	-87.172	1	0	3	0	10	-.135	1
461		3	max	59.301	3	102.729	1	-2.454	15	0	2	.006	3	.308	3
462			min	2.183	15	-140.99	3	-60.042	1	0	3	-.022	1	-.224	1
463		4	max	59.301	3	30.001	1	-1.362	15	0	2	.002	3	.366	3
464			min	2.183	15	-40.798	3	-32.911	1	0	3	-.052	1	-.267	1
465		5	max	59.301	3	59.395	3	.317	10	0	2	0	3	.36	3
466			min	2.183	15	-42.727	1	-5.78	1	0	3	-.065	1	-.263	1
467		6	max	59.301	3	159.587	3	21.35	1	0	2	0	12	.29	3
468			min	2.183	15	-115.454	1	-1.077	3	0	3	-.06	1	-.212	1
469		7	max	59.301	3	259.779	3	48.481	1	0	2	0	12	.156	3
470			min	2.183	15	-188.182	1	.436	12	0	3	-.037	1	-.115	1
471		8	max	59.301	3	359.972	3	75.612	1	0	2	.003	2	.028	1
472			min	2.183	15	-260.91	1	1.496	12	0	3	0	3	-.042	3
473		9	max	59.301	3	460.164	3	102.742	1	0	2	.059	1	.218	1
474			min	2.183	15	-333.637	1	2.555	12	0	3	.001	12	-.304	3
475		10	max	59.301	3	560.356	3	129.873	1	0	2	.134	1	.455	1
476			min	2.183	15	-406.365	1	3.615	12	0	3	.003	12	-.63	3
477		11	max	46.012	1	333.637	1	-2.277	12	0	3	.058	1	.218	1
478			min	1.903	15	-460.164	3	-102.32	1	0	2	-.005	3	-.304	3
479		12	max	46.012	1	260.909	1	-1.218	12	0	3	.003	2	.028	1
480			min	1.903	15	-359.972	3	-75.189	1	0	2	-.006	3	-.042	3
481		13	max	46.012	1	188.182	1	-.072	3	0	3	-.002	15	.156	3
482			min	1.903	15	-259.779	3	-48.059	1	0	2	-.038	1	-.115	1
483		14	max	46.012	1	115.454	1	1.517	3	0	3	-.002	15	.29	3
484			min	1.903	15	-159.587	3	-20.928	1	0	2	-.06	1	-.212	1
485		15	max	46.012	1	42.726	1	6.203	1	0	3	-.003	15	.36	3
486			min	1.903	15	-59.395	3	-.317	10	0	2	-.064	1	-.263	1
487		16	max	46.012	1	40.798	3	33.333	1	0	3	-.002	12	.366	3
488			min	1.903	15	-30.001	1	1.383	15	0	2	-.052	1	-.267	1
489		17	max	46.012	1	140.99	3	60.464	1	0	3	0	3	.308	3
490			min	1.903	15	-102.729	1	2.475	15	0	2	-.022	1	-.224	1
491		18	max	46.012	1	241.183	3	87.594	1	0	3	.026	1	.186	3
492			min	1.903	15	-175.457	1	3.567	15	0	2	0	10	-.135	1
493		19	max	46.012	1	341.375	3	114.725	1	0	3	.09	1	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
494			min	1.903	15	-248.184	1	4.659	15	0	2	.004	15	0	3
495	M16	1	max	.358	3	347.439	2	-4.635	15	0	3	.089	1	0	2
496			min	-47.202	1	-159.421	3	-114.316	1	0	2	.004	15	0	3
497		2	max	.358	3	245.64	2	-3.543	15	0	3	.025	1	.087	3
498			min	-47.202	1	-112.94	3	-87.186	1	0	2	0	10	-.189	2
499		3	max	.358	3	143.842	2	-2.451	15	0	3	0	12	.144	3
500			min	-47.202	1	-66.458	3	-60.055	1	0	2	-.022	1	-.314	2
501		4	max	.358	3	42.043	2	-1.359	15	0	3	-.002	15	.172	3
502			min	-47.202	1	-19.976	3	-32.924	1	0	2	-.052	1	-.373	2
503		5	max	.358	3	26.506	3	.305	10	0	3	-.003	15	.17	3
504			min	-47.202	1	-59.756	2	-5.794	1	0	2	-.065	1	-.368	2
505		6	max	.358	3	72.987	3	21.337	1	0	3	-.002	15	.138	3
506			min	-47.202	1	-161.554	2	-.326	3	0	2	-.06	1	-.297	2
507		7	max	.358	3	119.469	3	48.468	1	0	3	-.002	15	.077	3
508			min	-47.202	1	-263.353	2	.906	12	0	2	-.037	1	-.161	2
509		8	max	.358	3	165.951	3	75.598	1	0	3	.003	2	.04	2
510			min	-47.202	1	-365.152	2	1.965	12	0	2	-.004	3	-.015	3
511		9	max	.358	3	212.433	3	102.729	1	0	3	.059	1	.305	2
512			min	-47.202	1	-466.95	2	3.025	12	0	2	-.002	3	-.135	3
513		10	max	-1.949	15	-10.573	15	129.86	1	0	15	.134	1	.636	2
514			min	-47.202	1	-568.749	2	-6.666	3	0	2	.004	12	-.286	3
515		11	max	-1.949	15	466.95	2	-3.42	12	0	2	.059	1	.305	2
516			min	-47.034	1	-212.433	3	-102.317	1	0	3	.001	12	-.135	3
517		12	max	-1.949	15	365.152	2	-2.36	12	0	2	.003	2	.04	2
518			min	-47.034	1	-165.951	3	-75.186	1	0	3	0	3	-.015	3
519		13	max	-1.949	15	263.353	2	-1.301	12	0	2	-.002	15	.077	3
520			min	-47.034	1	-119.469	3	-48.056	1	0	3	-.038	1	-.161	2
521		14	max	-1.949	15	161.554	2	-.241	12	0	2	-.002	12	.138	3
522			min	-47.034	1	-72.987	3	-20.925	1	0	3	-.06	1	-.297	2
523		15	max	-1.949	15	59.756	2	6.206	1	0	2	-.002	12	.17	3
524			min	-47.034	1	-26.506	3	-.305	10	0	3	-.064	1	-.368	2
525		16	max	-1.949	15	19.976	3	33.336	1	0	2	-.001	12	.172	3
526			min	-47.034	1	-42.043	2	1.374	15	0	3	-.052	1	-.373	2
527		17	max	-1.949	15	66.458	3	60.467	1	0	2	0	3	.144	3
528			min	-47.034	1	-143.842	2	2.466	15	0	3	-.022	1	-.314	2
529		18	max	-1.949	15	112.94	3	87.598	1	0	2	.026	1	.087	3
530			min	-47.034	1	-245.64	2	3.558	15	0	3	0	10	-.189	2
531		19	max	-1.949	15	159.421	3	114.728	1	0	2	.09	1	0	2
532			min	-47.034	1	-347.439	2	4.65	15	0	3	.004	15	0	3
533	M15	1	max	0	1	2.022	4	.068	3	0	9	0	9	0	1
534			min	-69.539	3	0	1	-.021	9	0	3	0	3	0	1
535		2	max	0	1	1.797	4	.068	3	0	9	0	9	0	1
536			min	-69.61	3	0	1	-.021	9	0	3	0	3	0	4
537		3	max	0	1	1.573	4	.068	3	0	9	0	9	0	1
538			min	-69.68	3	0	1	-.021	9	0	3	0	3	-.001	4
539		4	max	0	1	1.348	4	.068	3	0	9	0	9	0	1
540			min	-69.751	3	0	1	-.021	9	0	3	0	3	-.002	4
541		5	max	0	1	1.123	4	.068	3	0	9	0	9	0	1
542			min	-69.821	3	0	1	-.021	9	0	3	0	3	-.002	4
543		6	max	0	1	.899	4	.068	3	0	9	0	9	0	1
544			min	-69.892	3	0	1	-.021	9	0	3	0	3	-.003	4
545		7	max	0	1	.674	4	.068	3	0	9	0	3	0	1
546			min	-69.962	3	0	1	-.021	9	0	3	0	9	-.003	4
547		8	max	0	1	.449	4	.068	3	0	9	0	3	0	1
548			min	-70.033	3	0	1	-.021	9	0	3	0	9	-.003	4
549		9	max	0	1	.225	4	.068	3	0	9	0	3	0	1
550			min	-70.103	3	0	1	-.021	9	0	3	0	9	-.003	4

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
551		10	max	0	1	0	1	.068	3	0	9	0	3	0	1
552			min	-70.174	3	0	1	-.021	9	0	3	0	9	-.003	4
553		11	max	0	1	0	1	.068	3	0	9	0	3	0	1
554			min	-70.244	3	-.225	4	-.021	9	0	3	0	9	-.003	4
555		12	max	0	1	0	1	.068	3	0	9	0	3	0	1
556			min	-70.315	3	-.449	4	-.021	9	0	3	0	9	-.003	4
557		13	max	0	1	0	1	.068	3	0	9	0	3	0	1
558			min	-70.385	3	-.674	4	-.021	9	0	3	0	9	-.003	4
559		14	max	0	1	0	1	.068	3	0	9	0	3	0	1
560			min	-70.456	3	-.899	4	-.021	9	0	3	0	9	-.003	4
561		15	max	0	1	0	1	.068	3	0	9	0	3	0	1
562			min	-70.526	3	-1.123	4	-.021	9	0	3	0	9	-.002	4
563		16	max	0	1	0	1	.068	3	0	9	0	3	0	1
564			min	-70.597	3	-1.348	4	-.021	9	0	3	0	9	-.002	4
565		17	max	0	1	0	1	.068	3	0	9	0	3	0	1
566			min	-70.667	3	-1.573	4	-.021	9	0	3	0	9	-.001	4
567		18	max	0	1	0	1	.068	3	0	9	0	3	0	1
568			min	-70.738	3	-1.797	4	-.021	9	0	3	0	9	0	4
569		19	max	0	1	0	1	.068	3	0	9	0	3	0	1
570			min	-70.808	3	-2.022	4	-.021	9	0	3	0	9	0	1
571	M16A	1	max	0	10	2.022	4	.028	1	0	3	0	3	0	1
572			min	-69.863	3	0	10	-.028	3	0	2	0	1	0	1
573		2	max	0	10	1.797	4	.028	1	0	3	0	3	0	10
574			min	-69.792	3	0	10	-.028	3	0	2	0	1	0	4
575		3	max	0	10	1.573	4	.028	1	0	3	0	3	0	10
576			min	-69.722	3	0	10	-.028	3	0	2	0	1	-.001	4
577		4	max	0	10	1.348	4	.028	1	0	3	0	3	0	10
578			min	-69.651	3	0	10	-.028	3	0	2	0	1	-.002	4
579		5	max	0	10	1.123	4	.028	1	0	3	0	3	0	10
580			min	-69.581	3	0	10	-.028	3	0	2	0	1	-.002	4
581		6	max	0	10	.899	4	.028	1	0	3	0	3	0	10
582			min	-69.51	3	0	10	-.028	3	0	2	0	1	-.003	4
583		7	max	0	10	.674	4	.028	1	0	3	0	3	0	10
584			min	-69.44	3	0	10	-.028	3	0	2	0	1	-.003	4
585		8	max	0	10	.449	4	.028	1	0	3	0	3	0	10
586			min	-69.369	3	0	10	-.028	3	0	2	0	1	-.003	4
587		9	max	0	10	.225	4	.028	1	0	3	0	3	0	10
588			min	-69.299	3	0	10	-.028	3	0	2	0	1	-.003	4
589		10	max	0	10	0	1	.028	1	0	3	0	3	0	10
590			min	-69.228	3	0	1	-.028	3	0	2	0	1	-.003	4
591		11	max	0	10	0	10	.028	1	0	3	0	3	0	10
592			min	-69.158	3	-.225	4	-.028	3	0	2	0	1	-.003	4
593		12	max	0	10	0	10	.028	1	0	3	0	3	0	10
594			min	-69.087	3	-.449	4	-.028	3	0	2	0	1	-.003	4
595		13	max	0	10	0	10	.028	1	0	3	0	2	0	10
596			min	-69.017	3	-.674	4	-.028	3	0	2	0	3	-.003	4
597		14	max	0	10	0	10	.028	1	0	3	0	2	0	10
598			min	-68.946	3	-.899	4	-.028	3	0	2	0	3	-.003	4
599		15	max	.088	2	0	10	.028	1	0	3	0	2	0	10
600			min	-68.876	3	-1.123	4	-.028	3	0	2	0	3	-.002	4
601		16	max	.182	2	0	10	.028	1	0	3	0	2	0	10
602			min	-68.805	3	-1.348	4	-.028	3	0	2	0	3	-.002	4
603		17	max	.276	2	0	10	.028	1	0	3	0	1	0	10
604			min	-68.735	3	-1.573	4	-.028	3	0	2	0	3	-.001	4
605		18	max	.37	2	0	10	.028	1	0	3	0	1	0	10
606			min	-68.664	3	-1.797	4	-.028	3	0	2	0	3	0	4
607		19	max	.464	2	0	10	.028	1	0	3	0	1	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
608			min	-68.594	3	-2.022	4	-.028	3	0	2	0	3	0	1

Envelope Member Section Deflections

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
1	M2	1	max	.002	1	.009	2	.009	1	-3.007e-5	15	NC	3	NC	2
2			min	-.004	3	-.009	3	-.001	3	-7.22e-4	1	4245.779	2	4239.015	1
3		2	max	.002	1	.009	2	.009	1	-2.878e-5	15	NC	3	NC	2
4			min	-.003	3	-.009	3	-.001	3	-6.911e-4	1	4634.521	2	4567.728	1
5		3	max	.002	1	.008	2	.008	1	-2.748e-5	15	NC	3	NC	2
6			min	-.003	3	-.009	3	-.001	3	-6.603e-4	1	5096.998	2	4956.086	1
7		4	max	.002	1	.007	2	.007	1	-2.618e-5	15	NC	1	NC	2
8			min	-.003	3	-.008	3	-.001	3	-6.294e-4	1	5651.025	2	5418.371	1
9		5	max	.002	1	.006	2	.007	1	-2.489e-5	15	NC	1	NC	2
10			min	-.003	3	-.008	3	0	3	-5.985e-4	1	6320.356	2	5973.656	1
11		6	max	.002	1	.006	2	.006	1	-2.359e-5	15	NC	1	NC	2
12			min	-.003	3	-.007	3	0	3	-5.677e-4	1	7137.176	2	6647.87	1
13		7	max	.002	1	.005	2	.005	1	-2.229e-5	15	NC	1	NC	2
14			min	-.002	3	-.007	3	0	3	-5.368e-4	1	8145.933	2	7477.002	1
15		8	max	.001	1	.004	2	.005	1	-2.1e-5	15	NC	1	NC	2
16			min	-.002	3	-.007	3	0	3	-5.06e-4	1	9409.379	2	8512.192	1
17		9	max	.001	1	.004	2	.004	1	-1.97e-5	15	NC	1	NC	2
18			min	-.002	3	-.006	3	0	3	-4.751e-4	1	NC	1	9828.174	1
19		10	max	.001	1	.003	2	.003	1	-1.84e-5	15	NC	1	NC	1
20			min	-.002	3	-.006	3	0	3	-4.442e-4	1	NC	1	NC	1
21		11	max	.001	1	.002	2	.003	1	-1.711e-5	15	NC	1	NC	1
22			min	-.002	3	-.005	3	0	3	-4.134e-4	1	NC	1	NC	1
23		12	max	0	1	.002	2	.002	1	-1.581e-5	15	NC	1	NC	1
24			min	-.001	3	-.005	3	0	3	-3.825e-4	1	NC	1	NC	1
25		13	max	0	1	.002	2	.002	1	-1.452e-5	15	NC	1	NC	1
26			min	-.001	3	-.004	3	0	3	-3.516e-4	1	NC	1	NC	1
27		14	max	0	1	.001	2	.001	1	-1.322e-5	15	NC	1	NC	1
28			min	0	3	-.003	3	0	3	-3.208e-4	1	NC	1	NC	1
29		15	max	0	1	0	2	0	1	-1.192e-5	15	NC	1	NC	1
30			min	0	3	-.003	3	0	3	-2.899e-4	1	NC	1	NC	1
31		16	max	0	1	0	2	0	1	-1.063e-5	15	NC	1	NC	1
32			min	0	3	-.002	3	0	3	-2.59e-4	1	NC	1	NC	1
33		17	max	0	1	0	2	0	1	-9.33e-6	15	NC	1	NC	1
34			min	0	3	-.001	3	0	3	-2.282e-4	1	NC	1	NC	1
35		18	max	0	1	0	2	0	1	-8.033e-6	15	NC	1	NC	1
36			min	0	3	0	3	0	3	-1.973e-4	1	NC	1	NC	1
37		19	max	0	1	0	1	0	1	-6.641e-6	12	NC	1	NC	1
38			min	0	1	0	1	0	1	-1.665e-4	1	NC	1	NC	1
39	M3	1	max	0	1	0	1	0	1	7.85e-5	1	NC	1	NC	1
40			min	0	1	0	1	0	1	3.178e-6	15	NC	1	NC	1
41		2	max	0	3	0	2	0	12	9.588e-5	1	NC	1	NC	1
42			min	0	2	0	3	0	1	3.9e-6	15	NC	1	NC	1
43		3	max	0	3	0	2	0	12	1.133e-4	1	NC	1	NC	1
44			min	0	2	-.002	3	0	1	4.621e-6	15	NC	1	NC	1
45		4	max	0	3	0	2	0	12	1.306e-4	1	NC	1	NC	1
46			min	0	2	-.003	3	0	1	5.342e-6	15	NC	1	NC	1
47		5	max	0	3	0	2	0	3	1.48e-4	1	NC	1	NC	1
48			min	0	2	-.003	3	0	1	6.064e-6	15	NC	1	NC	1
49		6	max	0	3	0	2	0	3	1.654e-4	1	NC	1	NC	1
50			min	0	2	-.004	3	0	1	6.785e-6	15	NC	1	NC	1
51		7	max	0	3	0	2	0	3	1.828e-4	1	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
52			min	0	2	-.005	3	0	1	7.507e-6	15	NC	1	NC	1
53		8	max	0	3	0	2	0	3	2.002e-4	1	NC	1	NC	1
54			min	0	2	-.006	3	0	1	8.228e-6	15	NC	1	NC	1
55		9	max	0	3	.001	2	0	3	2.175e-4	1	NC	1	NC	1
56			min	0	2	-.006	3	0	1	8.95e-6	15	NC	1	NC	1
57		10	max	0	3	.002	2	0	2	2.349e-4	1	NC	1	NC	1
58			min	0	2	-.007	3	0	15	9.671e-6	15	NC	1	NC	1
59		11	max	.001	3	.002	2	0	1	2.523e-4	1	NC	1	NC	1
60			min	-.001	2	-.007	3	0	15	1.039e-5	15	NC	1	NC	1
61		12	max	.001	3	.003	2	.001	1	2.697e-4	1	NC	1	NC	1
62			min	-.001	2	-.007	3	0	15	1.111e-5	15	NC	1	NC	1
63		13	max	.001	3	.003	2	.001	1	2.87e-4	1	NC	1	NC	1
64			min	-.001	2	-.008	3	0	15	1.184e-5	15	NC	1	NC	1
65		14	max	.001	3	.004	2	.002	1	3.044e-4	1	NC	1	NC	1
66			min	-.001	2	-.008	3	0	15	1.256e-5	15	NC	1	NC	1
67		15	max	.002	3	.005	2	.002	1	3.218e-4	1	NC	1	NC	1
68			min	-.001	2	-.008	3	0	15	1.328e-5	15	9079.889	2	NC	1
69		16	max	.002	3	.006	2	.003	1	3.392e-4	1	NC	1	NC	1
70			min	-.002	2	-.008	3	0	15	1.4e-5	15	7681.422	2	NC	1
71		17	max	.002	3	.007	2	.003	1	3.566e-4	1	NC	1	NC	1
72			min	-.002	2	-.008	3	0	15	1.472e-5	15	6601.978	2	NC	1
73		18	max	.002	3	.008	2	.004	1	3.739e-4	1	NC	3	NC	1
74			min	-.002	2	-.008	3	0	15	1.544e-5	15	5758.991	2	NC	1
75		19	max	.002	3	.009	2	.004	1	3.913e-4	1	NC	3	NC	1
76			min	-.002	2	-.008	3	0	15	1.616e-5	15	5094.604	2	NC	1
77	M4	1	max	.002	1	.011	2	0	15	-2.353e-5	12	NC	1	NC	2
78			min	0	12	-.009	3	-.003	1	-5.817e-4	1	NC	1	5883.298	1
79		2	max	.002	1	.01	2	0	15	-2.353e-5	12	NC	1	NC	2
80			min	0	12	-.009	3	-.003	1	-5.817e-4	1	NC	1	6418.537	1
81		3	max	.002	1	.01	2	0	15	-2.353e-5	12	NC	1	NC	2
82			min	0	12	-.008	3	-.003	1	-5.817e-4	1	NC	1	7055.54	1
83		4	max	.001	1	.009	2	0	15	-2.353e-5	12	NC	1	NC	2
84			min	0	12	-.008	3	-.002	1	-5.817e-4	1	NC	1	7821.15	1
85		5	max	.001	1	.008	2	0	15	-2.353e-5	12	NC	1	NC	2
86			min	0	12	-.007	3	-.002	1	-5.817e-4	1	NC	1	8751.939	1
87		6	max	.001	1	.008	2	0	15	-2.353e-5	12	NC	1	NC	2
88			min	0	12	-.007	3	-.002	1	-5.817e-4	1	NC	1	9898.774	1
89		7	max	.001	1	.007	2	0	15	-2.353e-5	12	NC	1	NC	1
90			min	0	12	-.006	3	-.002	1	-5.817e-4	1	NC	1	NC	1
91		8	max	.001	1	.007	2	0	15	-2.353e-5	12	NC	1	NC	1
92			min	0	12	-.006	3	-.001	1	-5.817e-4	1	NC	1	NC	1
93		9	max	0	1	.006	2	0	15	-2.353e-5	12	NC	1	NC	1
94			min	0	12	-.005	3	-.001	1	-5.817e-4	1	NC	1	NC	1
95		10	max	0	1	.005	2	0	15	-2.353e-5	12	NC	1	NC	1
96			min	0	12	-.005	3	-.001	1	-5.817e-4	1	NC	1	NC	1
97		11	max	0	1	.005	2	0	15	-2.353e-5	12	NC	1	NC	1
98			min	0	12	-.004	3	0	1	-5.817e-4	1	NC	1	NC	1
99		12	max	0	1	.004	2	0	15	-2.353e-5	12	NC	1	NC	1
100			min	0	12	-.004	3	0	1	-5.817e-4	1	NC	1	NC	1
101		13	max	0	1	.004	2	0	15	-2.353e-5	12	NC	1	NC	1
102			min	0	12	-.003	3	0	1	-5.817e-4	1	NC	1	NC	1
103		14	max	0	1	.003	2	0	15	-2.353e-5	12	NC	1	NC	1
104			min	0	12	-.003	3	0	1	-5.817e-4	1	NC	1	NC	1
105		15	max	0	1	.002	2	0	15	-2.353e-5	12	NC	1	NC	1
106			min	0	12	-.002	3	0	1	-5.817e-4	1	NC	1	NC	1
107		16	max	0	1	.002	2	0	15	-2.353e-5	12	NC	1	NC	1
108			min	0	12	-.002	3	0	1	-5.817e-4	1	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
109		17	max	0	1	.001	2	0	15	-2.353e-5	12	NC	1	NC	1
110			min	0	12	-.001	3	0	1	-5.817e-4	1	NC	1	NC	1
111		18	max	0	1	0	2	0	15	-2.353e-5	12	NC	1	NC	1
112			min	0	12	0	3	0	1	-5.817e-4	1	NC	1	NC	1
113		19	max	0	1	0	1	0	1	-2.353e-5	12	NC	1	NC	1
114			min	0	1	0	1	0	1	-5.817e-4	1	NC	1	NC	1
115	M6	1	max	.008	1	.032	2	.004	1	3.781e-4	3	NC	3	NC	1
116			min	-.011	3	-.029	3	-.005	3	-6.079e-8	10	1214.524	2	8290.745	3
117		2	max	.007	1	.03	2	.004	1	3.662e-4	3	NC	3	NC	1
118			min	-.011	3	-.028	3	-.004	3	-5.739e-8	10	1299.26	2	8811.458	3
119		3	max	.007	1	.028	2	.003	1	3.543e-4	3	NC	3	NC	1
120			min	-.01	3	-.026	3	-.004	3	-1.563e-6	2	1396.313	2	9428.284	3
121		4	max	.006	1	.026	2	.003	1	3.424e-4	3	NC	3	NC	1
122			min	-.009	3	-.025	3	-.004	3	-3.33e-6	1	1508.147	2	NC	1
123		5	max	.006	1	.024	2	.003	1	3.306e-4	3	NC	3	NC	1
124			min	-.009	3	-.023	3	-.004	3	-7.915e-6	1	1637.933	2	NC	1
125		6	max	.006	1	.022	2	.002	1	3.187e-4	3	NC	3	NC	1
126			min	-.008	3	-.022	3	-.003	3	-1.25e-5	1	1789.825	2	NC	1
127		7	max	.005	1	.02	2	.002	1	3.068e-4	3	NC	3	NC	1
128			min	-.008	3	-.02	3	-.003	3	-1.708e-5	1	1969.364	2	NC	1
129		8	max	.005	1	.018	2	.002	1	2.95e-4	3	NC	3	NC	1
130			min	-.007	3	-.018	3	-.003	3	-2.167e-5	1	2184.109	2	NC	1
131		9	max	.004	1	.016	2	.002	1	2.831e-4	3	NC	3	NC	1
132			min	-.006	3	-.017	3	-.002	3	-2.625e-5	1	2444.64	2	NC	1
133		10	max	.004	1	.014	2	.001	1	2.712e-4	3	NC	3	NC	1
134			min	-.006	3	-.015	3	-.002	3	-3.084e-5	1	2766.243	2	NC	1
135		11	max	.003	1	.012	2	.001	1	2.594e-4	3	NC	3	NC	1
136			min	-.005	3	-.014	3	-.002	3	-3.542e-5	1	3171.835	2	NC	1
137		12	max	.003	1	.011	2	0	1	2.475e-4	3	NC	3	NC	1
138			min	-.004	3	-.012	3	-.001	3	-4.001e-5	1	3697.424	2	NC	1
139		13	max	.003	1	.009	2	0	1	2.356e-4	3	NC	3	NC	1
140			min	-.004	3	-.01	3	-.001	3	-4.459e-5	1	4403.002	2	NC	1
141		14	max	.002	1	.007	2	0	1	2.238e-4	3	NC	3	NC	1
142			min	-.003	3	-.009	3	0	3	-4.918e-5	1	5396.528	2	NC	1
143		15	max	.002	1	.006	2	0	1	2.119e-4	3	NC	1	NC	1
144			min	-.003	3	-.007	3	0	3	-5.376e-5	1	6893.875	2	NC	1
145		16	max	.001	1	.004	2	0	1	2.e-4	3	NC	1	NC	1
146			min	-.002	3	-.005	3	0	3	-5.834e-5	1	9398.664	2	NC	1
147		17	max	0	1	.003	2	0	1	1.882e-4	3	NC	1	NC	1
148			min	-.001	3	-.003	3	0	3	-6.293e-5	1	NC	1	NC	1
149		18	max	0	1	.001	2	0	1	1.763e-4	3	NC	1	NC	1
150			min	0	3	-.002	3	0	3	-6.751e-5	1	NC	1	NC	1
151		19	max	0	1	0	1	0	1	1.644e-4	3	NC	1	NC	1
152			min	0	1	0	1	0	1	-7.21e-5	1	NC	1	NC	1
153	M7	1	max	0	1	0	1	0	1	3.37e-5	1	NC	1	NC	1
154			min	0	1	0	1	0	1	-7.717e-5	3	NC	1	NC	1
155		2	max	0	3	.001	2	0	3	2.826e-5	1	NC	1	NC	1
156			min	0	2	-.002	3	0	1	-5.72e-5	3	NC	1	NC	1
157		3	max	0	3	.003	2	0	3	2.282e-5	1	NC	1	NC	1
158			min	0	2	-.004	3	0	1	-3.723e-5	3	NC	1	NC	1
159		4	max	.001	3	.004	2	.001	3	1.739e-5	1	NC	1	NC	1
160			min	-.001	2	-.006	3	0	1	-1.725e-5	3	NC	1	NC	1
161		5	max	.001	3	.006	2	.001	3	1.195e-5	1	NC	1	NC	1
162			min	-.002	2	-.008	3	0	1	0	10	8058.164	2	NC	1
163		6	max	.002	3	.007	2	.002	3	2.269e-5	3	NC	1	NC	1
164			min	-.002	2	-.01	3	0	1	0	10	6459.907	2	NC	1
165		7	max	.002	3	.009	2	.002	3	4.266e-5	3	NC	3	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
166			min	-.002	2	-.011	3	0	1	0	10	5368.754	2	NC	1
167		8	max	.002	3	.01	2	.002	3	6.263e-5	3	NC	3	NC	1
168			min	-.003	2	-.013	3	-.001	1	-4.358e-6	1	4570.094	2	NC	1
169		9	max	.003	3	.012	2	.002	3	8.26e-5	3	NC	3	NC	1
170			min	-.003	2	-.015	3	-.001	1	-9.795e-6	1	3956.964	2	NC	1
171		10	max	.003	3	.013	2	.002	3	1.026e-4	3	NC	3	NC	1
172			min	-.004	2	-.016	3	-.001	1	-1.523e-5	1	3470.066	2	NC	1
173		11	max	.003	3	.015	2	.002	3	1.225e-4	3	NC	3	NC	1
174			min	-.004	2	-.018	3	-.001	1	-2.067e-5	1	3073.808	2	NC	1
175		12	max	.004	3	.017	2	.002	3	1.425e-4	3	NC	3	NC	1
176			min	-.004	2	-.019	3	-.002	1	-2.61e-5	1	2745.435	2	NC	1
177		13	max	.004	3	.019	2	.003	3	1.625e-4	3	NC	3	NC	1
178			min	-.005	2	-.02	3	-.002	1	-3.154e-5	1	2469.623	2	NC	1
179		14	max	.004	3	.021	2	.003	3	1.824e-4	3	NC	3	NC	1
180			min	-.005	2	-.021	3	-.002	1	-3.698e-5	1	2235.597	2	NC	1
181		15	max	.005	3	.023	2	.003	3	2.024e-4	3	NC	3	NC	1
182			min	-.006	2	-.022	3	-.002	1	-4.241e-5	1	2035.497	2	NC	1
183		16	max	.005	3	.025	2	.003	3	2.224e-4	3	NC	3	NC	1
184			min	-.006	2	-.023	3	-.002	1	-4.785e-5	1	1863.413	2	NC	1
185		17	max	.005	3	.027	2	.003	3	2.424e-4	3	NC	3	NC	1
186			min	-.006	2	-.024	3	-.002	1	-5.329e-5	1	1714.789	2	NC	1
187		18	max	.006	3	.029	2	.002	3	2.623e-4	3	NC	3	NC	1
188			min	-.007	2	-.025	3	-.002	1	-5.872e-5	1	1586.043	2	NC	1
189		19	max	.006	3	.031	2	.002	3	2.823e-4	3	NC	3	NC	1
190			min	-.007	2	-.026	3	-.002	1	-6.416e-5	1	1474.317	2	NC	1
191	M8	1	max	.005	1	.037	2	.002	1	-9.522e-8	10	NC	1	NC	2
192			min	0	3	-.029	3	-.002	3	-2.179e-4	3	NC	1	9622.542	1
193		2	max	.004	1	.035	2	.002	1	-9.522e-8	10	NC	1	NC	1
194			min	0	3	-.028	3	-.002	3	-2.179e-4	3	NC	1	NC	1
195		3	max	.004	1	.033	2	.002	1	-9.522e-8	10	NC	1	NC	1
196			min	0	3	-.026	3	-.001	3	-2.179e-4	3	NC	1	NC	1
197		4	max	.004	1	.031	2	.002	1	-9.522e-8	10	NC	1	NC	1
198			min	0	3	-.024	3	-.001	3	-2.179e-4	3	NC	1	NC	1
199		5	max	.004	1	.029	2	.001	1	-9.522e-8	10	NC	1	NC	1
200			min	0	3	-.023	3	-.001	3	-2.179e-4	3	NC	1	NC	1
201		6	max	.003	1	.027	2	.001	1	-9.522e-8	10	NC	1	NC	1
202			min	0	3	-.021	3	0	3	-2.179e-4	3	NC	1	NC	1
203		7	max	.003	1	.025	2	.001	1	-9.522e-8	10	NC	1	NC	1
204			min	0	3	-.019	3	0	3	-2.179e-4	3	NC	1	NC	1
205		8	max	.003	1	.023	2	0	1	-9.522e-8	10	NC	1	NC	1
206			min	0	3	-.018	3	0	3	-2.179e-4	3	NC	1	NC	1
207		9	max	.003	1	.021	2	0	1	-9.522e-8	10	NC	1	NC	1
208			min	0	3	-.016	3	0	3	-2.179e-4	3	NC	1	NC	1
209		10	max	.002	1	.019	2	0	1	-9.522e-8	10	NC	1	NC	1
210			min	0	3	-.015	3	0	3	-2.179e-4	3	NC	1	NC	1
211		11	max	.002	1	.016	2	0	1	-9.522e-8	10	NC	1	NC	1
212			min	0	3	-.013	3	0	3	-2.179e-4	3	NC	1	NC	1
213		12	max	.002	1	.014	2	0	1	-9.522e-8	10	NC	1	NC	1
214			min	0	3	-.011	3	0	3	-2.179e-4	3	NC	1	NC	1
215		13	max	.002	1	.012	2	0	1	-9.522e-8	10	NC	1	NC	1
216			min	0	3	-.01	3	0	3	-2.179e-4	3	NC	1	NC	1
217		14	max	.001	1	.01	2	0	1	-9.522e-8	10	NC	1	NC	1
218			min	0	3	-.008	3	0	3	-2.179e-4	3	NC	1	NC	1
219		15	max	.001	1	.008	2	0	1	-9.522e-8	10	NC	1	NC	1
220			min	0	3	-.006	3	0	3	-2.179e-4	3	NC	1	NC	1
221		16	max	0	1	.006	2	0	1	-9.522e-8	10	NC	1	NC	1
222			min	0	3	-.005	3	0	3	-2.179e-4	3	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
223		17	max	0	1	.004	2	0	1	-9.522e-8	10	NC	1	NC	1
224			min	0	3	-.003	3	0	3	-2.179e-4	3	NC	1	NC	1
225		18	max	0	1	.002	2	0	1	-9.522e-8	10	NC	1	NC	1
226			min	0	3	-.002	3	0	3	-2.179e-4	3	NC	1	NC	1
227		19	max	0	1	0	1	0	1	-9.522e-8	10	NC	1	NC	1
228			min	0	1	0	1	0	1	-2.179e-4	3	NC	1	NC	1
229	M10	1	max	.002	1	.009	2	0	3	7.343e-4	1	NC	3	NC	1
230			min	-.003	3	-.009	3	-.001	1	-4.218e-4	3	4250.127	2	NC	1
231		2	max	.002	1	.008	2	0	3	6.963e-4	1	NC	3	NC	1
232			min	-.003	3	-.009	3	-.001	1	-4.077e-4	3	4639.412	2	NC	1
233		3	max	.002	1	.008	2	0	3	6.584e-4	1	NC	3	NC	1
234			min	-.003	3	-.009	3	-.001	1	-3.936e-4	3	5102.562	2	NC	1
235		4	max	.002	1	.007	2	0	3	6.204e-4	1	NC	1	NC	1
236			min	-.003	3	-.008	3	-.001	1	-3.795e-4	3	5657.434	2	NC	1
237		5	max	.002	1	.006	2	0	3	5.824e-4	1	NC	1	NC	1
238			min	-.002	3	-.008	3	-.001	1	-3.654e-4	3	6327.834	2	NC	1
239		6	max	.002	1	.006	2	0	3	5.444e-4	1	NC	1	NC	1
240			min	-.002	3	-.007	3	-.001	1	-3.512e-4	3	7146.025	2	NC	1
241		7	max	.002	1	.005	2	0	3	5.064e-4	1	NC	1	NC	1
242			min	-.002	3	-.007	3	-.001	1	-3.371e-4	3	8156.565	2	NC	1
243		8	max	.001	1	.004	2	0	3	4.685e-4	1	NC	1	NC	1
244			min	-.002	3	-.007	3	0	1	-3.23e-4	3	9422.373	2	NC	1
245		9	max	.001	1	.004	2	0	3	4.305e-4	1	NC	1	NC	1
246			min	-.002	3	-.006	3	0	1	-3.089e-4	3	NC	1	NC	1
247		10	max	.001	1	.003	2	0	3	3.925e-4	1	NC	1	NC	1
248			min	-.002	3	-.006	3	0	1	-2.948e-4	3	NC	1	NC	1
249		11	max	.001	1	.002	2	0	3	3.545e-4	1	NC	1	NC	1
250			min	-.001	3	-.005	3	0	1	-2.807e-4	3	NC	1	NC	1
251		12	max	0	1	.002	2	0	3	3.165e-4	1	NC	1	NC	1
252			min	-.001	3	-.005	3	0	1	-2.666e-4	3	NC	1	NC	1
253		13	max	0	1	.002	2	0	3	2.785e-4	1	NC	1	NC	1
254			min	-.001	3	-.004	3	0	1	-2.525e-4	3	NC	1	NC	1
255		14	max	0	1	.001	2	0	3	2.406e-4	1	NC	1	NC	1
256			min	0	3	-.003	3	0	1	-2.383e-4	3	NC	1	NC	1
257		15	max	0	1	0	2	0	3	2.026e-4	1	NC	1	NC	1
258			min	0	3	-.003	3	0	1	-2.242e-4	3	NC	1	NC	1
259		16	max	0	1	0	2	0	3	1.646e-4	1	NC	1	NC	1
260			min	0	3	-.002	3	0	1	-2.101e-4	3	NC	1	NC	1
261		17	max	0	1	0	2	0	3	1.266e-4	1	NC	1	NC	1
262			min	0	3	-.001	3	0	1	-1.96e-4	3	NC	1	NC	1
263		18	max	0	1	0	2	0	3	8.863e-5	1	NC	1	NC	1
264			min	0	3	0	3	0	1	-1.819e-4	3	NC	1	NC	1
265		19	max	0	1	0	1	0	1	5.065e-5	1	NC	1	NC	1
266			min	0	1	0	1	0	1	-1.678e-4	3	NC	1	NC	1
267	M11	1	max	0	1	0	1	0	1	7.916e-5	3	NC	1	NC	1
268			min	0	1	0	1	0	1	-2.454e-5	1	NC	1	NC	1
269		2	max	0	3	0	2	0	1	5.881e-5	3	NC	1	NC	1
270			min	0	2	0	3	0	3	-5.331e-5	1	NC	1	NC	1
271		3	max	0	3	0	2	0	2	3.847e-5	3	NC	1	NC	1
272			min	0	2	-.002	3	0	3	-8.208e-5	1	NC	1	NC	1
273		4	max	0	3	0	2	0	2	1.812e-5	3	NC	1	NC	1
274			min	0	2	-.003	3	-.001	3	-1.109e-4	1	NC	1	NC	1
275		5	max	0	3	0	2	0	10	-1.84e-6	12	NC	1	NC	1
276			min	0	2	-.004	3	-.001	3	-1.396e-4	1	NC	1	NC	1
277		6	max	0	3	0	2	0	10	-7.443e-6	15	NC	1	NC	1
278			min	0	2	-.004	3	-.002	3	-1.684e-4	1	NC	1	NC	1
279		7	max	0	3	0	2	0	10	-8.705e-6	15	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
280			min	0	2	-.005	3	-.002	3	-1.972e-4	1	NC	1	NC	1
281		8	max	0	3	0	2	0	10	-9.967e-6	15	NC	1	NC	1
282			min	0	2	-.006	3	-.002	3	-2.259e-4	1	NC	1	NC	1
283		9	max	0	3	.001	2	0	10	-1.123e-5	15	NC	1	NC	1
284			min	0	2	-.006	3	-.002	3	-2.547e-4	1	NC	1	NC	1
285		10	max	0	3	.002	2	0	15	-1.249e-5	15	NC	1	NC	1
286			min	0	2	-.007	3	-.003	1	-2.835e-4	1	NC	1	NC	1
287		11	max	.001	3	.002	2	0	15	-1.375e-5	15	NC	1	NC	1
288			min	-.001	2	-.007	3	-.003	1	-3.123e-4	1	NC	1	NC	1
289		12	max	.001	3	.003	2	0	15	-1.502e-5	15	NC	1	NC	1
290			min	-.001	2	-.008	3	-.004	1	-3.41e-4	1	NC	1	NC	1
291		13	max	.001	3	.003	2	0	15	-1.628e-5	15	NC	1	NC	2
292			min	-.001	2	-.008	3	-.005	1	-3.698e-4	1	NC	1	9942.87	1
293		14	max	.001	3	.004	2	0	15	-1.754e-5	15	NC	1	NC	2
294			min	-.001	2	-.008	3	-.005	1	-3.986e-4	1	NC	1	8644.378	1
295		15	max	.002	3	.005	2	0	15	-1.88e-5	15	NC	1	NC	2
296			min	-.001	2	-.008	3	-.006	1	-4.273e-4	1	9094.829	2	7635.23	1
297		16	max	.002	3	.006	2	0	15	-2.006e-5	15	NC	1	NC	2
298			min	-.002	2	-.008	3	-.007	1	-4.561e-4	1	7692.868	2	6837.092	1
299		17	max	.002	3	.007	2	0	15	-2.133e-5	15	NC	1	NC	2
300			min	-.002	2	-.008	3	-.007	1	-4.849e-4	1	6610.989	2	6197.055	1
301		18	max	.002	3	.008	2	0	15	-2.259e-5	15	NC	3	NC	2
302			min	-.002	2	-.008	3	-.008	1	-5.136e-4	1	5766.271	2	5678.367	1
303		19	max	.002	3	.009	2	0	15	-2.385e-5	15	NC	3	NC	2
304			min	-.002	2	-.008	3	-.009	1	-5.424e-4	1	5100.632	2	5254.906	1
305	M12	1	max	.002	1	.011	2	.007	1	4.957e-4	1	NC	1	NC	3
306			min	0	12	-.009	3	0	15	2.196e-5	15	NC	1	2612.544	1
307		2	max	.002	1	.01	2	.007	1	4.957e-4	1	NC	1	NC	3
308			min	0	12	-.009	3	0	15	2.196e-5	15	NC	1	2849.213	1
309		3	max	.002	1	.01	2	.006	1	4.957e-4	1	NC	1	NC	3
310			min	0	12	-.008	3	0	15	2.196e-5	15	NC	1	3130.926	1
311		4	max	.001	1	.009	2	.006	1	4.957e-4	1	NC	1	NC	2
312			min	0	12	-.008	3	0	15	2.196e-5	15	NC	1	3469.558	1
313		5	max	.001	1	.008	2	.005	1	4.957e-4	1	NC	1	NC	2
314			min	0	12	-.007	3	0	15	2.196e-5	15	NC	1	3881.283	1
315		6	max	.001	1	.008	2	.004	1	4.957e-4	1	NC	1	NC	2
316			min	0	12	-.007	3	0	15	2.196e-5	15	NC	1	4388.6	1
317		7	max	.001	1	.007	2	.004	1	4.957e-4	1	NC	1	NC	2
318			min	0	12	-.006	3	0	15	2.196e-5	15	NC	1	5023.557	1
319		8	max	.001	1	.007	2	.003	1	4.957e-4	1	NC	1	NC	2
320			min	0	12	-.006	3	0	15	2.196e-5	15	NC	1	5833.081	1
321		9	max	0	1	.006	2	.003	1	4.957e-4	1	NC	1	NC	2
322			min	0	12	-.005	3	0	15	2.196e-5	15	NC	1	6888.161	1
323		10	max	0	1	.005	2	.002	1	4.957e-4	1	NC	1	NC	2
324			min	0	12	-.005	3	0	15	2.196e-5	15	NC	1	8300.405	1
325		11	max	0	1	.005	2	.002	1	4.957e-4	1	NC	1	NC	1
326			min	0	12	-.004	3	0	15	2.196e-5	15	NC	1	NC	1
327		12	max	0	1	.004	2	.001	1	4.957e-4	1	NC	1	NC	1
328			min	0	12	-.004	3	0	15	2.196e-5	15	NC	1	NC	1
329		13	max	0	1	.004	2	.001	1	4.957e-4	1	NC	1	NC	1
330			min	0	12	-.003	3	0	15	2.196e-5	15	NC	1	NC	1
331		14	max	0	1	.003	2	0	1	4.957e-4	1	NC	1	NC	1
332			min	0	12	-.003	3	0	15	2.196e-5	15	NC	1	NC	1
333		15	max	0	1	.002	2	0	1	4.957e-4	1	NC	1	NC	1
334			min	0	12	-.002	3	0	15	2.196e-5	15	NC	1	NC	1
335		16	max	0	1	.002	2	0	1	4.957e-4	1	NC	1	NC	1
336			min	0	12	-.002	3	0	15	2.196e-5	15	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
337		17	max	0	1	.001	2	0	1	4.957e-4	1	NC	1	NC	1
338			min	0	12	-.001	3	0	15	2.196e-5	15	NC	1	NC	1
339		18	max	0	1	0	2	0	1	4.957e-4	1	NC	1	NC	1
340			min	0	12	0	3	0	15	2.196e-5	15	NC	1	NC	1
341		19	max	0	1	0	1	0	1	4.957e-4	1	NC	1	NC	1
342			min	0	1	0	1	0	1	2.196e-5	15	NC	1	NC	1
343	M1	1	max	.008	3	.025	3	.003	3	1.17e-2	1	NC	1	NC	1
344			min	-.009	2	-.022	2	-.004	1	-1.591e-2	3	NC	1	NC	1
345		2	max	.008	3	.015	3	.002	3	5.601e-3	2	NC	4	NC	1
346			min	-.009	2	-.013	2	-.007	1	-7.871e-3	3	4749.362	3	NC	1
347		3	max	.008	3	.005	3	.001	3	2.282e-5	3	NC	4	NC	2
348			min	-.009	2	-.004	2	-.009	1	-4.501e-4	1	2460.601	3	8135.208	1
349		4	max	.008	3	.004	2	.001	3	2.56e-5	3	NC	4	NC	2
350			min	-.009	2	-.003	3	-.01	1	-3.868e-4	1	1753.935	3	6747.452	1
351		5	max	.008	3	.01	2	0	3	2.838e-5	3	NC	4	NC	2
352			min	-.009	2	-.009	3	-.011	1	-3.236e-4	1	1391.782	2	6500.182	1
353		6	max	.008	3	.016	2	0	3	3.116e-5	3	NC	5	NC	2
354			min	-.009	2	-.015	3	-.01	1	-2.603e-4	1	1182.263	2	6988.858	1
355		7	max	.008	3	.02	2	0	3	3.394e-5	3	NC	5	NC	2
356			min	-.009	2	-.019	3	-.009	1	-1.971e-4	1	1052.966	2	8387.564	1
357		8	max	.008	3	.024	2	0	3	3.672e-5	3	NC	5	NC	1
358			min	-.009	2	-.021	3	-.007	1	-1.338e-4	1	971.774	2	NC	1
359		9	max	.008	3	.026	2	0	3	3.95e-5	3	NC	5	NC	1
360			min	-.009	2	-.023	3	-.005	1	-7.061e-5	1	923.516	2	NC	1
361		10	max	.008	3	.027	2	0	3	4.228e-5	3	NC	5	NC	1
362			min	-.009	2	-.023	3	-.003	1	-7.363e-6	1	900.943	2	NC	1
363		11	max	.008	3	.026	2	0	3	5.588e-5	1	NC	5	NC	1
364			min	-.009	2	-.023	3	0	1	2.501e-6	15	901.423	2	NC	1
365		12	max	.008	3	.025	2	.001	1	1.191e-4	1	NC	5	NC	1
366			min	-.009	2	-.021	3	0	15	5.099e-6	15	925.963	2	NC	1
367		13	max	.008	3	.021	2	.003	1	1.824e-4	1	NC	5	NC	2
368			min	-.009	2	-.018	3	0	15	7.697e-6	15	979.772	2	8600.472	1
369		14	max	.008	3	.017	2	.004	1	2.456e-4	1	NC	4	NC	2
370			min	-.009	2	-.014	3	0	15	1.03e-5	15	1074.902	2	7120.67	1
371		15	max	.008	3	.011	2	.005	1	3.088e-4	1	NC	4	NC	2
372			min	-.009	2	-.009	3	0	15	1.289e-5	15	1237.852	2	6597.07	1
373		16	max	.008	3	.003	2	.004	1	3.528e-4	1	NC	4	NC	2
374			min	-.009	2	-.003	3	0	15	1.471e-5	15	1533.514	2	6826.541	1
375		17	max	.008	3	.004	3	.003	1	4.232e-5	3	NC	4	NC	2
376			min	-.009	2	-.006	2	0	15	-6.274e-5	1	2170.125	2	8214.344	1
377		18	max	.008	3	.012	3	.001	1	8.127e-3	2	NC	4	NC	1
378			min	-.009	2	-.017	2	0	15	-3.839e-3	3	4204.277	2	NC	1
379		19	max	.008	3	.02	3	0	3	1.64e-2	2	NC	1	NC	1
380			min	-.009	2	-.029	2	-.002	1	-7.794e-3	3	NC	1	NC	1
381	M5	1	max	.026	3	.08	3	.003	3	2.935e-6	3	NC	1	NC	1
382			min	-.03	2	-.073	2	-.004	1	4.217e-8	15	NC	1	NC	1
383		2	max	.026	3	.047	3	.004	3	1.042e-4	3	NC	4	NC	1
384			min	-.03	2	-.042	2	-.004	1	-6.786e-5	1	1466.127	3	NC	1
385		3	max	.026	3	.017	3	.005	3	2.034e-4	3	NC	5	NC	1
386			min	-.03	2	-.013	2	-.004	1	-1.345e-4	1	758.622	2	NC	1
387		4	max	.026	3	.012	2	.006	3	1.969e-4	3	NC	5	NC	1
388			min	-.03	2	-.009	3	-.004	1	-1.284e-4	1	529.802	2	NC	1
389		5	max	.026	3	.034	2	.006	3	1.905e-4	3	NC	5	NC	1
390			min	-.03	2	-.03	3	-.004	1	-1.223e-4	1	418.994	2	NC	1
391		6	max	.026	3	.053	2	.006	3	1.841e-4	3	NC	5	NC	1
392			min	-.03	2	-.047	3	-.004	1	-1.161e-4	1	355.635	2	NC	1
393		7	max	.026	3	.068	2	.006	3	1.777e-4	3	NC	5	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
394			min	-.03	2	-.06	3	-.003	1	-1.1e-4	1	316.508	2	NC	1
395		8	max	.026	3	.079	2	.006	3	1.712e-4	3	NC	5	NC	1
396			min	-.03	2	-.069	3	-.003	1	-1.039e-4	1	291.908	2	NC	1
397		9	max	.026	3	.086	2	.006	3	1.648e-4	3	NC	15	NC	1
398			min	-.03	2	-.074	3	-.003	1	-9.776e-5	1	277.247	2	NC	1
399		10	max	.026	3	.089	2	.006	3	1.584e-4	3	NC	15	NC	1
400			min	-.03	2	-.075	3	-.003	1	-9.163e-5	1	270.329	2	NC	1
401		11	max	.026	3	.088	2	.005	3	1.52e-4	3	NC	15	NC	1
402			min	-.03	2	-.073	3	-.003	1	-8.55e-5	1	270.354	2	NC	1
403		12	max	.026	3	.082	2	.005	3	1.455e-4	3	NC	5	NC	1
404			min	-.03	2	-.067	3	-.003	1	-7.937e-5	1	277.615	2	NC	1
405		13	max	.026	3	.072	2	.004	3	1.391e-4	3	NC	5	NC	1
406			min	-.03	2	-.057	3	-.002	1	-7.324e-5	1	293.673	2	NC	1
407		14	max	.025	3	.056	2	.004	3	1.327e-4	3	NC	5	NC	1
408			min	-.03	2	-.044	3	-.002	1	-6.711e-5	1	322.148	2	NC	1
409		15	max	.025	3	.036	2	.003	3	1.263e-4	3	NC	5	NC	1
410			min	-.03	2	-.028	3	-.002	1	-6.098e-5	1	371.007	2	NC	1
411		16	max	.025	3	.01	2	.002	3	1.155e-4	3	NC	5	NC	1
412			min	-.03	2	-.008	3	-.002	1	-5.902e-5	1	459.812	2	NC	1
413		17	max	.025	3	.014	3	.002	3	2.305e-6	3	NC	5	NC	1
414			min	-.03	2	-.021	2	-.002	1	-1.565e-4	1	651.721	2	NC	1
415		18	max	.025	3	.039	3	.001	3	4.151e-8	12	NC	4	NC	1
416			min	-.03	2	-.057	2	-.002	1	-7.988e-5	1	1263.565	2	NC	1
417		19	max	.025	3	.065	3	0	3	0	1	NC	1	NC	1
418			min	-.03	2	-.096	2	-.002	1	-5.249e-7	3	NC	1	NC	1
419	M9	1	max	.008	3	.024	3	.002	3	1.592e-2	3	NC	1	NC	1
420			min	-.009	2	-.022	2	-.004	1	-1.17e-2	1	NC	1	NC	1
421		2	max	.008	3	.014	3	.001	3	7.861e-3	3	NC	4	NC	1
422			min	-.009	2	-.013	2	0	1	-5.713e-3	1	4750.429	3	NC	1
423		3	max	.008	3	.005	3	.001	1	1.666e-4	1	NC	4	NC	1
424			min	-.009	2	-.004	2	0	3	-4.875e-5	3	2461.162	3	NC	1
425		4	max	.008	3	.004	2	.003	1	1.147e-4	1	NC	4	NC	1
426			min	-.009	2	-.003	3	-.001	3	-5.414e-5	3	1754.312	3	NC	1
427		5	max	.008	3	.01	2	.003	1	6.285e-5	1	NC	4	NC	2
428			min	-.009	2	-.01	3	-.002	3	-5.954e-5	3	1392.653	2	9939.013	1
429		6	max	.008	3	.016	2	.003	1	2.152e-5	2	NC	5	NC	1
430			min	-.009	2	-.015	3	-.003	3	-6.494e-5	3	1182.995	2	NC	1
431		7	max	.008	3	.02	2	.002	1	5.854e-6	10	NC	5	NC	1
432			min	-.009	2	-.019	3	-.003	3	-7.033e-5	3	1053.608	2	9543.098	3
433		8	max	.008	3	.024	2	0	2	1.199e-6	10	NC	5	NC	1
434			min	-.009	2	-.022	3	-.004	3	-9.283e-5	1	972.357	2	8953.606	3
435		9	max	.008	3	.026	2	0	2	-3.456e-6	10	NC	5	NC	1
436			min	-.009	2	-.023	3	-.004	3	-1.447e-4	1	924.06	2	8653.408	3
437		10	max	.008	3	.027	2	0	10	-8.111e-6	10	NC	5	NC	1
438			min	-.009	2	-.024	3	-.004	3	-1.966e-4	1	901.463	2	8585.959	3
439		11	max	.008	3	.026	2	0	10	-1.087e-5	15	NC	5	NC	1
440			min	-.009	2	-.023	3	-.005	1	-2.485e-4	1	901.933	2	8736.063	3
441		12	max	.008	3	.025	2	0	15	-1.305e-5	15	NC	5	NC	2
442			min	-.009	2	-.021	3	-.006	1	-3.004e-4	1	926.475	2	9122.788	3
443		13	max	.008	3	.021	2	0	15	-1.524e-5	15	NC	5	NC	2
444			min	-.009	2	-.018	3	-.008	1	-3.523e-4	1	980.3	2	7374.733	1
445		14	max	.008	3	.017	2	0	15	-1.743e-5	15	NC	4	NC	2
446			min	-.009	2	-.014	3	-.009	1	-4.042e-4	1	1075.467	2	6425.215	1
447		15	max	.008	3	.011	2	0	15	-1.961e-5	15	NC	4	NC	2
448			min	-.009	2	-.009	3	-.009	1	-4.561e-4	1	1238.484	2	6137.043	1
449		16	max	.008	3	.003	2	0	15	-2.124e-5	15	NC	4	NC	2
450			min	-.009	2	-.003	3	-.009	1	-4.96e-4	1	1534.268	2	6477.705	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
451		17	max	.008	3	.004	3	0	15	5.081e-5	3	NC	4	NC	2
452			min	-.009	2	-.006	2	-.007	1	-2.509e-4	1	2171.123	2	7901.676	1
453		18	max	.008	3	.012	3	0	15	3.887e-3	3	NC	4	NC	1
454			min	-.009	2	-.017	2	-.005	1	-8.157e-3	2	4206.147	2	NC	1
455		19	max	.008	3	.02	3	0	3	7.793e-3	3	NC	1	NC	1
456			min	-.009	2	-.029	2	-.002	1	-1.64e-2	2	NC	1	NC	1
457	M13	1	max	.004	1	.024	3	.008	3	3.82e-3	3	NC	1	NC	1
458			min	-.002	3	-.022	2	-.009	2	-3.484e-3	2	NC	1	NC	1
459		2	max	.004	1	.142	3	.016	1	4.775e-3	3	NC	5	NC	2
460			min	-.002	3	-.107	2	-.004	10	-4.379e-3	2	1170.586	3	6717.04	1
461		3	max	.004	1	.239	3	.043	1	5.73e-3	3	NC	5	NC	3
462			min	-.002	3	-.178	1	-.002	10	-5.274e-3	2	642.212	3	2912.862	1
463		4	max	.004	1	.301	3	.065	1	6.685e-3	3	NC	5	NC	3
464			min	-.002	3	-.224	1	0	10	-6.169e-3	2	498.442	3	1996.231	1
465		5	max	.004	1	.322	3	.074	1	7.64e-3	3	NC	5	NC	3
466			min	-.002	3	-.24	1	-.002	10	-7.064e-3	2	464.464	3	1755.007	1
467		6	max	.004	1	.301	3	.069	1	8.595e-3	3	NC	5	NC	3
468			min	-.002	3	-.225	1	-.004	10	-7.959e-3	2	499.401	3	1893.131	1
469		7	max	.004	1	.247	3	.049	1	9.549e-3	3	NC	5	NC	2
470			min	-.002	3	-.188	2	-.008	10	-8.854e-3	2	619.963	3	2597.841	1
471		8	max	.004	1	.176	3	.021	3	1.05e-2	3	NC	5	NC	2
472			min	-.003	3	-.139	2	-.012	10	-9.749e-3	2	911.531	3	5586.98	1
473		9	max	.004	1	.11	3	.024	3	1.146e-2	3	NC	4	NC	1
474			min	-.003	3	-.093	2	-.024	2	-1.064e-2	2	1611.75	3	8684.999	2
475		10	max	.004	1	.08	3	.026	3	1.241e-2	3	NC	4	NC	4
476			min	-.003	3	-.073	2	-.03	2	-1.154e-2	2	2483.469	3	6397.787	2
477		11	max	.004	1	.11	3	.029	3	1.146e-2	3	NC	4	NC	1
478			min	-.003	3	-.093	2	-.024	2	-1.064e-2	2	1611.749	3	6695.645	3
479		12	max	.004	1	.176	3	.031	3	1.051e-2	3	NC	5	NC	2
480			min	-.003	3	-.139	2	-.012	10	-9.749e-3	2	911.53	3	5506.03	1
481		13	max	.004	1	.247	3	.049	1	9.553e-3	3	NC	5	NC	2
482			min	-.003	3	-.188	2	-.008	10	-8.854e-3	2	619.963	3	2584.638	1
483		14	max	.004	1	.301	3	.069	1	8.599e-3	3	NC	5	NC	5
484			min	-.003	3	-.225	1	-.004	10	-7.959e-3	2	499.4	3	1890.946	1
485		15	max	.004	1	.322	3	.074	1	7.646e-3	3	NC	5	NC	5
486			min	-.003	3	-.239	1	-.002	10	-7.065e-3	2	464.463	3	1757.982	1
487		16	max	.004	1	.302	3	.064	1	6.692e-3	3	NC	5	NC	3
488			min	-.003	3	-.224	1	0	10	-6.17e-3	2	498.441	3	2005.377	1
489		17	max	.004	1	.24	3	.043	1	5.738e-3	3	NC	5	NC	3
490			min	-.003	3	-.178	1	-.002	10	-5.275e-3	2	642.211	3	2937.498	1
491		18	max	.004	1	.143	3	.016	1	4.785e-3	3	NC	5	NC	2
492			min	-.003	3	-.107	2	-.004	10	-4.38e-3	2	1170.585	3	6821.279	1
493		19	max	.004	1	.025	3	.008	3	3.831e-3	3	NC	1	NC	1
494			min	-.003	3	-.022	2	-.009	2	-3.486e-3	2	NC	1	NC	1
495	M16	1	max	.002	1	.02	3	.008	3	4.366e-3	2	NC	1	NC	1
496			min	0	3	-.029	2	-.009	2	-3.079e-3	3	NC	1	NC	1
497		2	max	.002	1	.078	3	.016	1	5.498e-3	2	NC	5	NC	2
498			min	0	3	-.15	2	-.004	10	-3.83e-3	3	1135.409	2	6721.157	1
499		3	max	.002	1	.126	3	.043	1	6.629e-3	2	NC	5	NC	3
500			min	0	3	-.25	2	-.002	10	-4.581e-3	3	622.158	2	2914.179	1
501		4	max	.002	1	.158	3	.065	1	7.761e-3	2	NC	5	NC	3
502			min	0	3	-.315	2	0	10	-5.333e-3	3	481.82	2	1997.055	1
503		5	max	.002	1	.17	3	.074	1	8.892e-3	2	NC	5	NC	5
504			min	0	3	-.337	2	-.001	10	-6.084e-3	3	447.336	2	1755.809	1
505		6	max	.002	1	.163	3	.068	1	1.002e-2	2	NC	5	NC	5
506			min	0	3	-.317	2	-.004	10	-6.836e-3	3	478.005	2	1894.319	1
507		7	max	.002	1	.14	3	.048	1	1.115e-2	2	NC	5	NC	2

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
508			min	0	3	-.264	2	-.008	10	-7.587e-3	3	586.714	2	2600.776	1
509		8	max	.002	1	.108	3	.028	3	1.229e-2	2	NC	5	NC	2
510			min	0	3	-.192	2	-.012	10	-8.339e-3	3	842.943	2	5605.274	1
511		9	max	.002	1	.079	3	.027	3	1.342e-2	2	NC	4	NC	1
512			min	0	3	-.126	2	-.024	2	-9.09e-3	3	1416.476	2	7293.782	3
513		10	max	.002	1	.065	3	.025	3	1.455e-2	2	NC	4	NC	4
514			min	0	3	-.096	2	-.03	2	-9.841e-3	3	2057.252	2	6427.842	2
515		11	max	.002	1	.079	3	.024	3	1.342e-2	2	NC	4	NC	1
516			min	0	3	-.126	2	-.024	2	-9.089e-3	3	1416.476	2	8564.522	3
517		12	max	.002	1	.108	3	.024	3	1.229e-2	2	NC	5	NC	2
518			min	0	3	-.192	2	-.012	10	-8.336e-3	3	842.943	2	5553.801	1
519		13	max	.002	1	.14	3	.049	1	1.116e-2	2	NC	5	NC	2
520			min	0	3	-.264	2	-.008	10	-7.584e-3	3	586.714	2	2595.765	1
521		14	max	.002	1	.163	3	.068	1	1.002e-2	2	NC	5	NC	3
522			min	0	3	-.317	2	-.004	10	-6.831e-3	3	478.005	2	1896.88	1
523		15	max	.002	1	.17	3	.074	1	8.893e-3	2	NC	5	NC	3
524			min	0	3	-.337	2	-.002	10	-6.078e-3	3	447.336	2	1762.773	1
525		16	max	.002	1	.158	3	.064	1	7.762e-3	2	NC	5	NC	3
526			min	0	3	-.315	2	0	10	-5.326e-3	3	481.82	2	2010.742	1
527		17	max	.002	1	.126	3	.042	1	6.631e-3	2	NC	5	NC	3
528			min	0	3	-.25	2	-.002	10	-4.573e-3	3	622.158	2	2946.179	1
529		18	max	.002	1	.078	3	.016	1	5.5e-3	2	NC	5	NC	2
530			min	0	3	-.15	2	-.004	10	-3.82e-3	3	1135.41	2	6847.479	1
531		19	max	.002	1	.02	3	.008	3	4.369e-3	2	NC	1	NC	1
532			min	0	3	-.029	2	-.009	2	-3.068e-3	3	NC	1	NC	1
533	M15	1	max	0	1	0	1	0	1	3.862e-4	3	NC	1	NC	1
534			min	0	1	0	1	0	1	-6.146e-5	2	NC	1	NC	1
535		2	max	0	3	-.002	15	.001	1	8.72e-4	3	NC	1	NC	1
536			min	0	2	-.008	4	0	3	-5.576e-4	2	9667.907	4	NC	1
537		3	max	0	3	-.004	15	.004	1	1.358e-3	3	NC	5	NC	1
538			min	0	2	-.016	4	-.004	3	-1.054e-3	2	4919.668	4	NC	1
539		4	max	0	3	-.006	15	.007	1	1.844e-3	3	NC	15	NC	4
540			min	0	2	-.024	4	-.007	3	-1.55e-3	2	3375.18	4	6246.073	3
541		5	max	0	3	-.007	15	.011	1	2.329e-3	3	NC	15	NC	4
542			min	0	2	-.03	4	-.012	3	-2.046e-3	2	2633.687	4	4114.517	3
543		6	max	0	3	-.008	15	.016	1	2.815e-3	3	9429.42	15	NC	4
544			min	0	2	-.036	4	-.018	3	-2.542e-3	2	2216.526	4	3003.472	3
545		7	max	0	3	-.01	15	.021	1	3.301e-3	3	8362.194	15	NC	4
546			min	0	2	-.041	4	-.023	3	-3.038e-3	2	1965.659	4	2352.247	3
547		8	max	0	3	-.01	15	.026	1	3.787e-3	3	7721.698	15	NC	4
548			min	-.001	2	-.044	4	-.029	3	-3.535e-3	2	1815.101	4	1942.197	3
549		9	max	0	3	-.011	15	.03	1	4.273e-3	3	7376.946	15	NC	4
550			min	-.001	2	-.046	4	-.033	3	-4.031e-3	2	1734.061	4	1673.583	3
551		10	max	0	3	-.011	15	.033	1	4.759e-3	3	7267.882	15	NC	4
552			min	-.001	2	-.047	4	-.037	3	-4.527e-3	2	1708.424	4	1496.22	3
553		11	max	0	3	-.011	15	.035	1	5.244e-3	3	7376.946	15	NC	5
554			min	-.002	2	-.046	4	-.04	3	-5.023e-3	2	1734.061	4	1383.74	3
555		12	max	0	3	-.01	15	.036	1	5.73e-3	3	7721.698	15	NC	5
556			min	-.002	2	-.044	4	-.041	3	-5.519e-3	2	1815.101	4	1323.081	3
557		13	max	0	3	-.01	15	.035	1	6.216e-3	3	8362.194	15	NC	5
558			min	-.002	2	-.041	4	-.039	3	-6.015e-3	2	1965.659	4	1310.523	3
559		14	max	.001	3	-.009	15	.032	1	6.702e-3	3	9429.42	15	NC	5
560			min	-.002	2	-.037	4	-.036	3	-6.512e-3	2	2216.526	4	1351.873	3
561		15	max	.001	3	-.007	15	.027	1	7.188e-3	3	NC	15	NC	4
562			min	-.002	2	-.031	4	-.029	3	-7.008e-3	2	2633.687	4	1468.218	3
563		16	max	.001	3	-.006	15	.019	1	7.673e-3	3	NC	15	NC	4
564			min	-.002	2	-.024	4	-.02	3	-7.504e-3	2	3375.18	4	1716.704	3

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
565		17	max	.001	3	-.004	15	.008	1	8.159e-3	3	NC	5	NC	4
566			min	-.003	2	-.017	4	-.007	3	-8.e-3	2	4919.668	4	2276.544	3
567		18	max	.001	3	-.002	2	.01	3	8.645e-3	3	NC	1	NC	4
568			min	-.003	2	-.009	4	-.013	2	-8.496e-3	2	9667.907	4	4054.225	3
569		19	max	.001	3	.005	2	.032	3	9.131e-3	3	NC	1	NC	1
570			min	-.003	2	-.002	9	-.033	2	-8.992e-3	2	NC	1	NC	1
571	M16A	1	max	0	10	0	10	.01	3	2.66e-3	3	NC	1	NC	1
572			min	-.001	3	-.001	9	-.01	2	-2.578e-3	2	NC	1	NC	1
573		2	max	0	10	-.002	15	.002	9	2.555e-3	3	NC	1	NC	1
574			min	-.001	3	-.009	4	-.003	2	-2.465e-3	2	9667.907	4	NC	1
575		3	max	0	10	-.004	15	.008	1	2.45e-3	3	NC	5	NC	4
576			min	-.001	3	-.017	4	-.003	3	-2.351e-3	2	4919.668	4	6245.676	1
577		4	max	0	10	-.006	15	.012	1	2.345e-3	3	NC	15	NC	4
578			min	-.001	3	-.024	4	-.008	3	-2.237e-3	2	3375.18	4	4743.901	1
579		5	max	0	10	-.007	15	.015	1	2.239e-3	3	NC	15	NC	4
580			min	-.001	3	-.031	4	-.011	3	-2.123e-3	2	2633.687	4	4090.709	1
581		6	max	0	10	-.008	15	.017	1	2.134e-3	3	9429.42	15	NC	4
582			min	-.001	3	-.036	4	-.013	3	-2.009e-3	2	2216.526	4	3802.23	1
583		7	max	0	10	-.01	15	.018	1	2.029e-3	3	8362.194	15	NC	4
584			min	0	3	-.041	4	-.014	3	-1.896e-3	2	1965.659	4	3726.436	1
585		8	max	0	10	-.01	15	.017	1	1.924e-3	3	7721.698	15	NC	4
586			min	0	3	-.044	4	-.014	3	-1.782e-3	2	1815.101	4	3810.699	1
587		9	max	0	10	-.011	15	.016	1	1.819e-3	3	7376.946	15	NC	4
588			min	0	3	-.046	4	-.013	3	-1.668e-3	2	1734.061	4	4046.675	1
589		10	max	0	10	-.011	15	.015	1	1.713e-3	3	7267.882	15	NC	4
590			min	0	3	-.047	4	-.012	3	-1.554e-3	2	1708.424	4	4457.131	1
591		11	max	0	10	-.011	15	.013	1	1.608e-3	3	7376.946	15	NC	4
592			min	0	3	-.046	4	-.01	3	-1.44e-3	2	1734.061	4	5100.403	1
593		12	max	0	10	-.01	15	.011	1	1.503e-3	3	7721.698	15	NC	4
594			min	0	3	-.044	4	-.008	3	-1.327e-3	2	1815.101	4	6092.32	1
595		13	max	0	10	-.01	15	.008	1	1.398e-3	3	8362.194	15	NC	2
596			min	0	3	-.041	4	-.006	3	-1.213e-3	2	1965.659	4	7662.336	1
597		14	max	0	10	-.008	15	.006	1	1.293e-3	3	9429.42	15	NC	1
598			min	0	3	-.036	4	-.004	3	-1.099e-3	2	2216.526	4	NC	1
599		15	max	0	10	-.007	15	.004	1	1.187e-3	3	NC	15	NC	1
600			min	0	3	-.03	4	-.002	3	-9.851e-4	2	2633.687	4	NC	1
601		16	max	0	10	-.006	15	.002	1	1.082e-3	3	NC	15	NC	1
602			min	0	3	-.024	4	0	3	-8.713e-4	2	3375.18	4	NC	1
603		17	max	0	10	-.004	15	0	9	9.768e-4	3	NC	5	NC	1
604			min	0	3	-.016	4	0	2	-7.575e-4	2	4919.668	4	NC	1
605		18	max	0	10	-.002	15	0	3	8.716e-4	3	NC	1	NC	1
606			min	0	3	-.008	4	0	2	-6.437e-4	2	9667.907	4	NC	1
607		19	max	0	1	0	1	0	1	7.664e-4	3	NC	1	NC	1
608			min	0	1	0	1	0	1	-5.299e-4	2	NC	1	NC	1

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

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

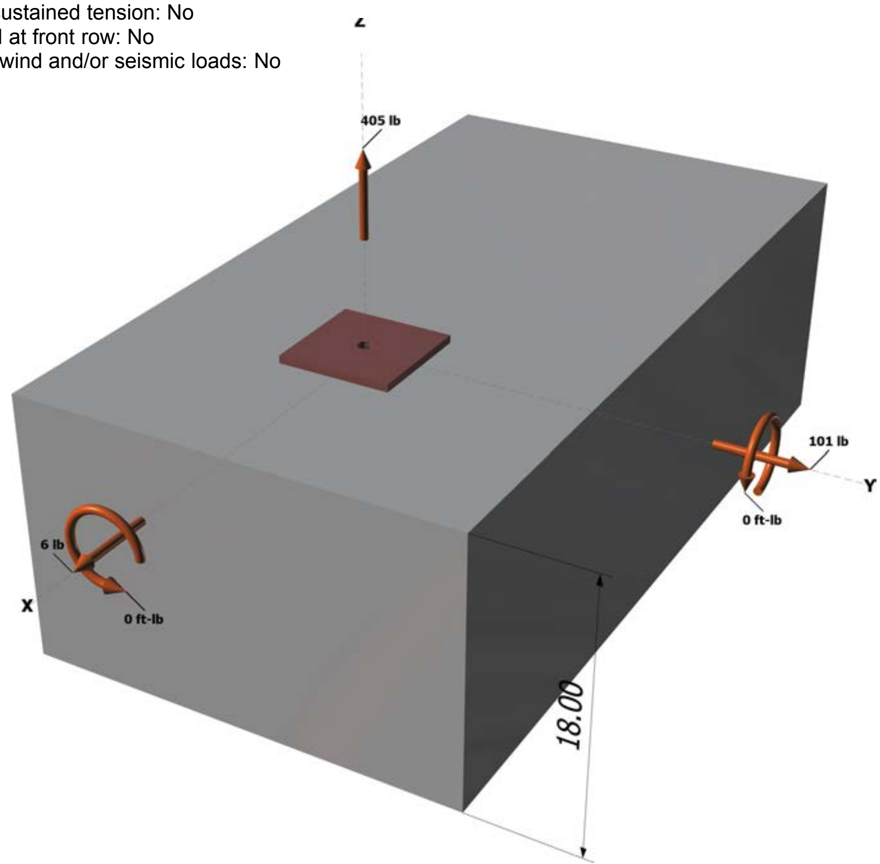
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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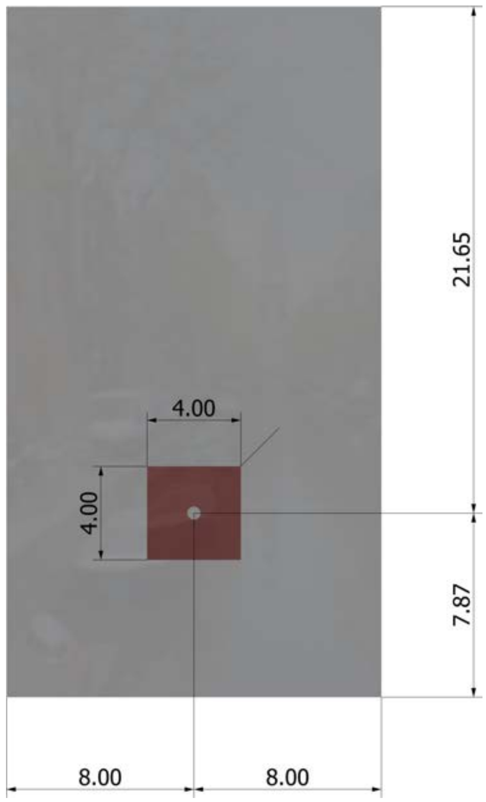


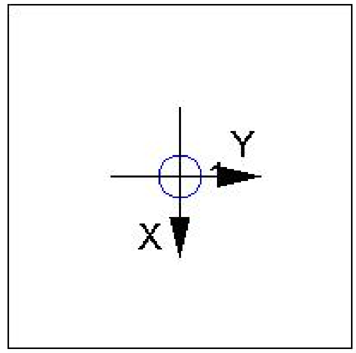
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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.

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

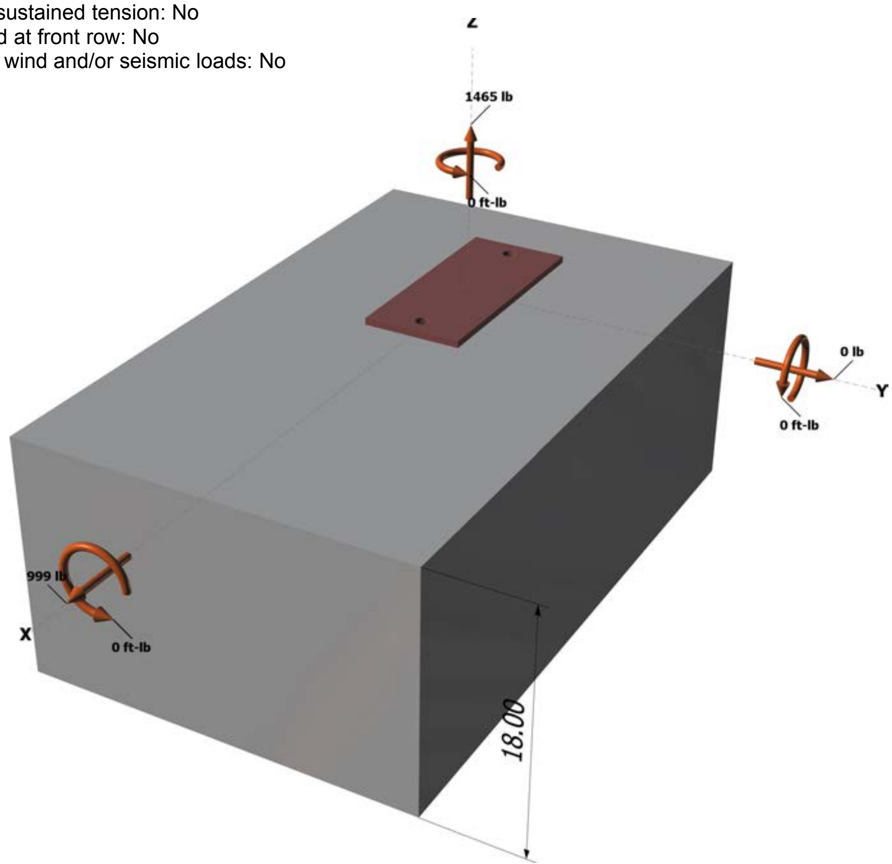
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

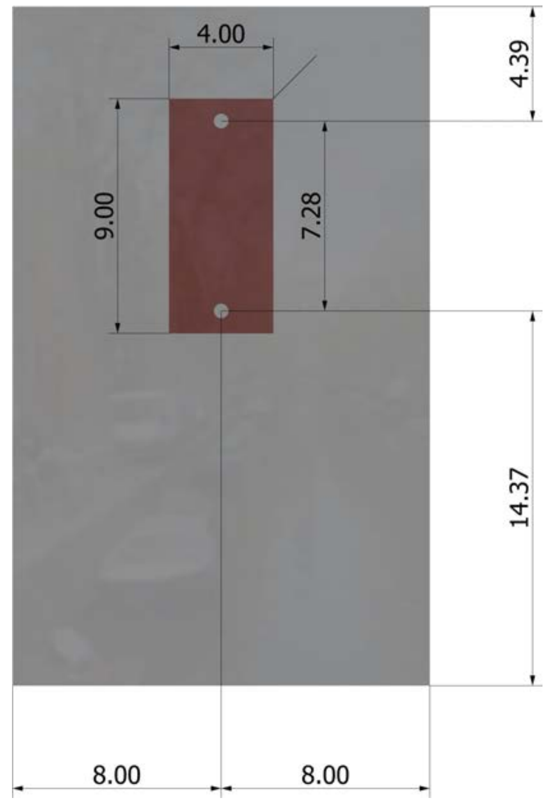
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout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



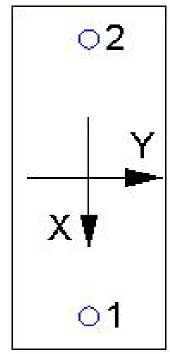
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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.