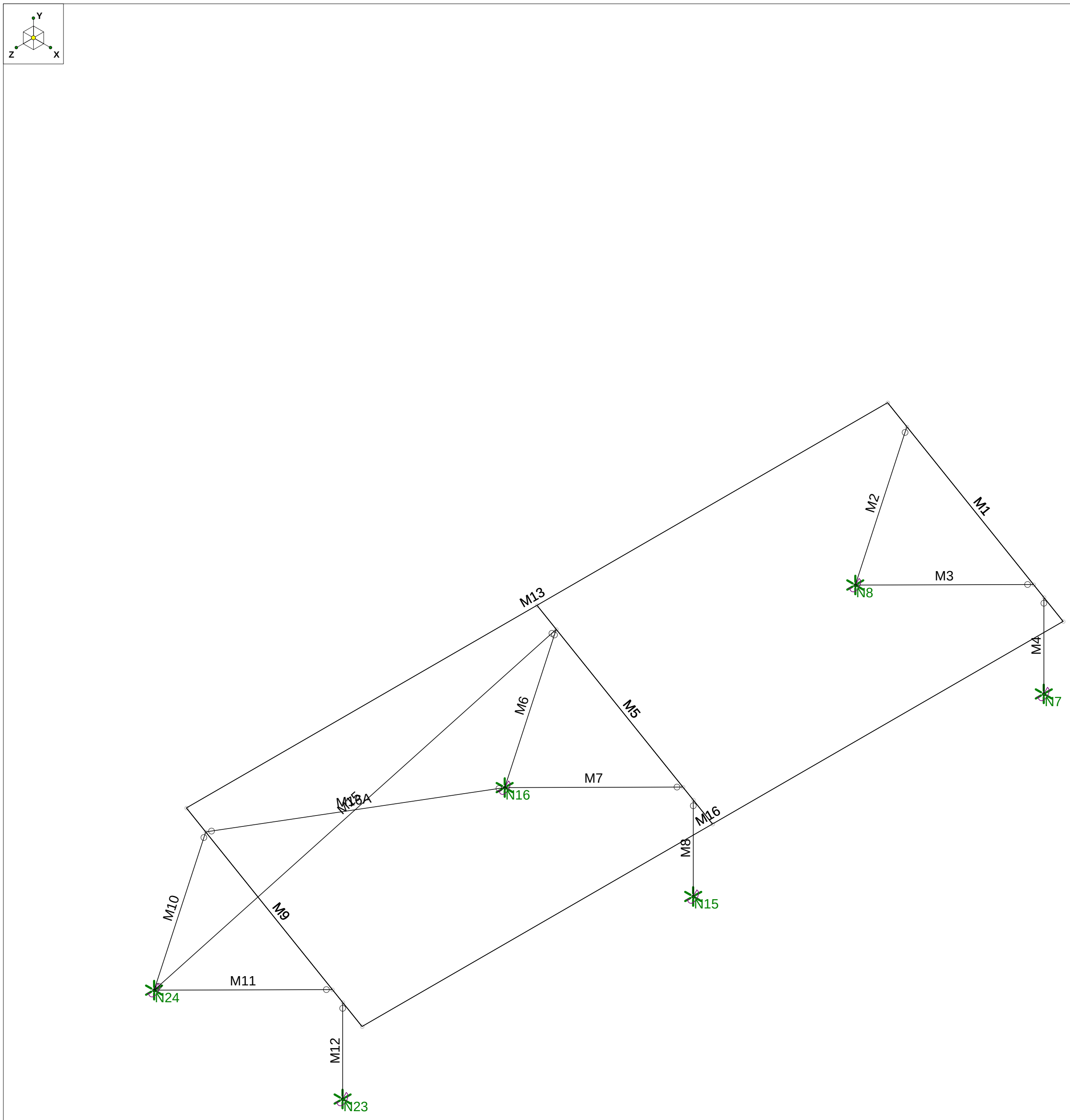


Schletter, Inc.		30ÁTilt w/o Seismic Design
HCV	Standard PVMini Racking System	
	Representative Calculations - ASCE 7-10	

1. INTRODUCTION

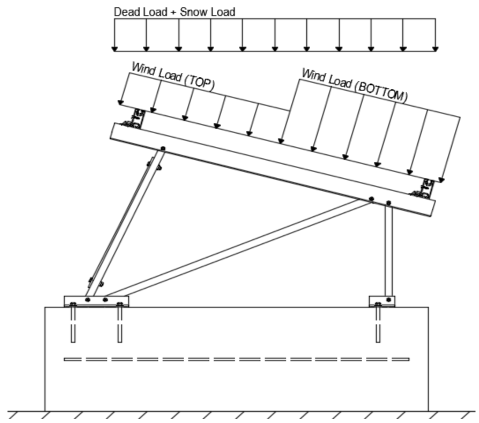
1.1 Project Description
The following sections will cover the determination of forces and structural design calculations for the Schletter, Inc. PVMini ground mount system.

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

PV modules are required to meet the following specifications:

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

Modules Per Row = 1
Module Tilt = 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 7-10 - Chapter 26-31, Wind Loads
- ASCE 7-10 - Chapter 7, Snow Loads
- ASCE 7-10 - Chapter 2, Combination of Loads
- International Building Code, IBC, 2012, 2015
- Aluminum Design Manual, Eighth Edition, 2005

2. LOAD ACTIONS

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

Self-weight of the PV modules.

2.2 Snow Loads
Ground Snow Load, P_g = 30.00 psf
Sloped Roof Snow Load, P_s = 16.49 psf *(ASCE 7-10, Eq. 7.4-1)*
I_s = 1.00
C_s = 0.73
C_e = 0.90
C_t = 1.20

2.3 Wind Loads
Design Wind Speed, V = 130 mph
Height ≤ 15 ft

Exposure Category = C
Importance Category = II

Peak Velocity Pressure, q_z = 26.53 psf *Including the gust factor, G=0.85. (ASCE 7-10, Eq. 27.3-1)*

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.

<u>Strength Design, LRFD</u>

Component stresses are checked using the following LRFD load combinations:

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

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

<u>Allowable Stress Design, ASD</u>

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

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

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

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

3. STRUCTURAL ANALYSIS

3.1 RISA Results

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

3.2 RISA Components

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

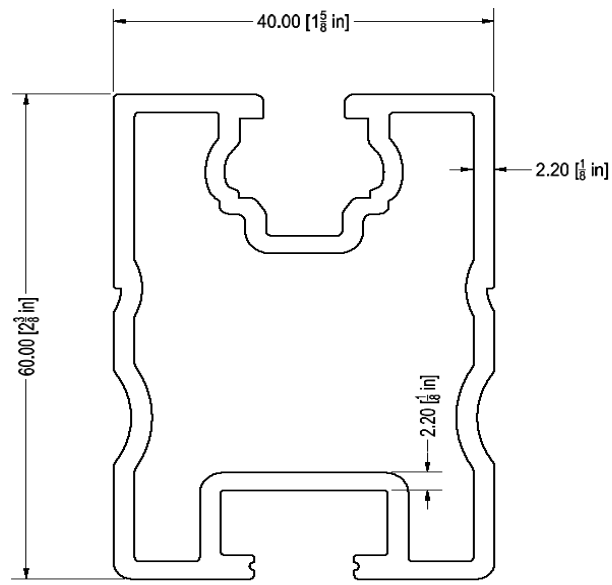
Purlins	Location	**Diagonal Struts**	Location	**Front Reactions**	Location
M13	Top	M3	Outer	N7	Outer
M16	Bottom	M7	Inner	N15	Inner
		M11	Outer	N23	Outer
Girders	Location	**Rear Struts**	Location	**Rear Reactions**	Location
M1	Outer	M2	Outer	N8	Outer
M5	Inner	M6	Inner	N16	Inner
M9	Outer	M10	Outer	N24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

4. MEMBER DESIGN CALCULATIONS

4.1 Purlin Design

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

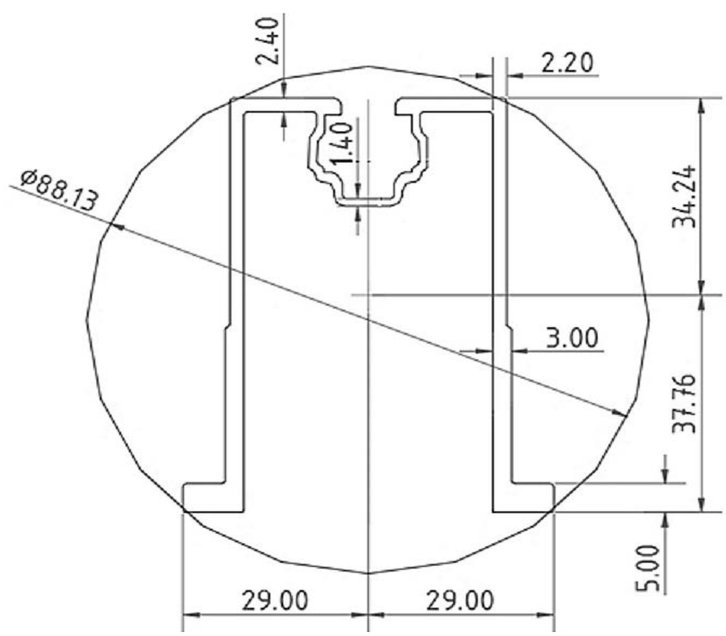
Purlin Type =	**ProfiPlus**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	63	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.20	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	28.47	ksi
S_y =	0.51	in^3
S_x =	0.37	in^3
E =	10100	ksi
I_y =	0.60	in^4
I_x =	0.29	in^4
A =	0.90	in^2
g =	1.08	lbs/ft
M_y =	0.468	k-ft
M_z =	0.113	k-ft
$M_{y\ allowable}$ =	1.243	k-ft
$M_{z\ allowable}$ =	0.871	k-ft
Utilization =	51%	



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).

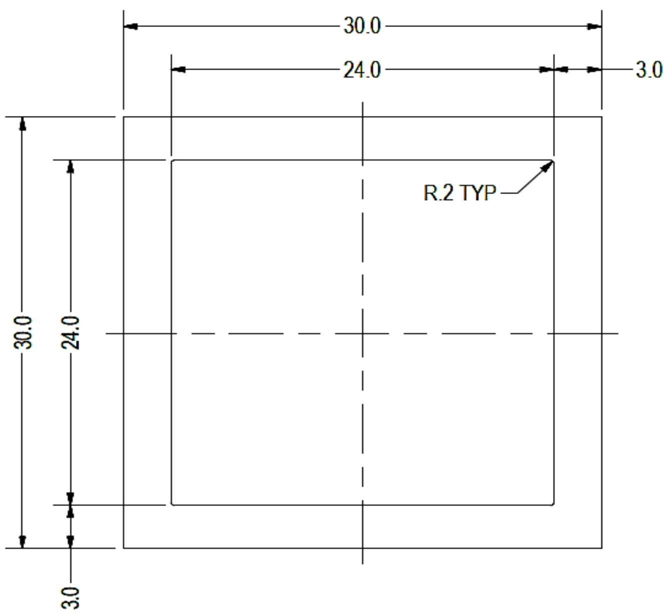
Girder Type =	**Flex Profi**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	33.78	in
$\Phi F_{ty\ AXIAL}$ =	14.29	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.41	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	13.46	ksi
S_y =	0.59	in^3
S_x =	0.46	in^3
E =	10100	ksi
I_y =	0.88	in^4
I_x =	0.52	in^4
A =	0.89	in^2
g =	1.07	lbs/ft
M_y =	0.557	k-ft
M_z =	0.000	k-ft
P_n =	0.287	k
$M_{y\ allowable}$ =	1.443	k-ft
$M_{z\ allowable}$ =	0.513	k-ft
$P_{n\ allowable}$ =	12.764	k
Utilization =	41%	



4.3 Front Strut Design

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

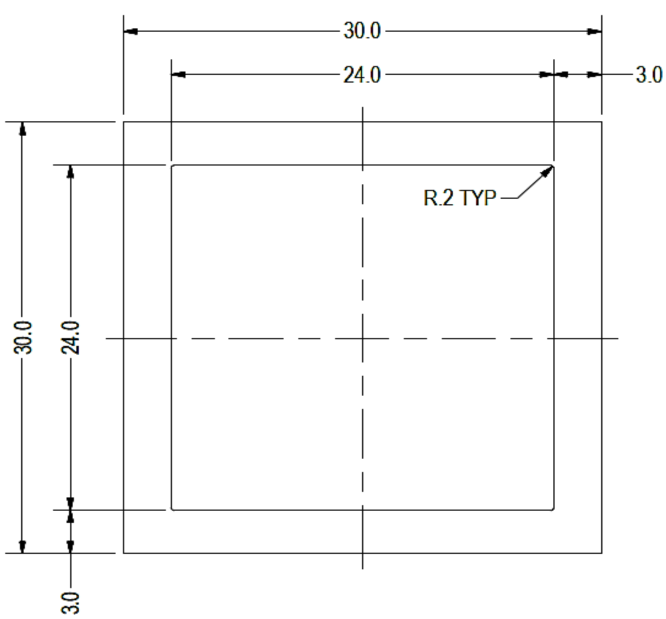
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	18.00	in
$\Phi F_{ty\ AXIAL}$ =	24.52	ksi
$\Phi F_{ty\ BENDING}$ =	31.19	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.894	k
$M_{y\ allowable}$ =	0.423	k-ft
$M_{z\ allowable}$ =	0.423	k-ft
$P_{n\ allowable}$ =	12.310	k
Utilization =	7%	



4.4 Diagonal Strut Design

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

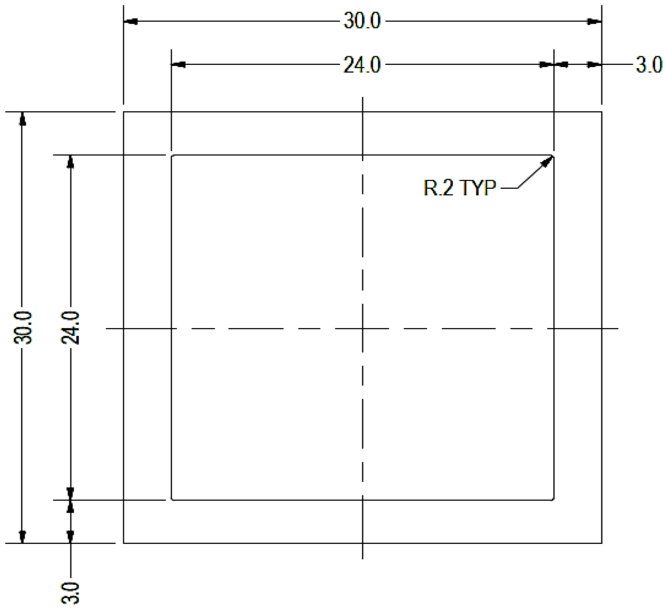
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	46.38	in
$\Phi F_{ty\ AXIAL}$ =	7.60	ksi
$\Phi F_{ty\ BENDING}$ =	29.80	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.603	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).

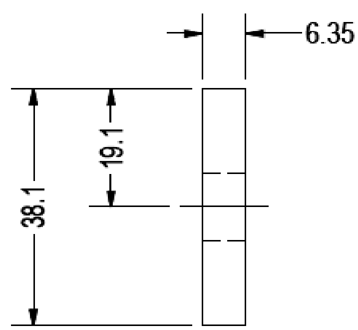
Strut Type =	**30x30x3**
Aluminum Type =	6105-T5
F_{ty} =	35 ksi
L_b =	39.29 in
$\Phi F_{ty\ AXIAL}$ =	10.06 ksi
$\Phi F_{ty\ BENDING}$ =	30.09 ksi
S_y =	0.16 in^3
S_x =	0.16 in^3
E =	10100 ksi
I_y =	0.10 in^4
I_x =	0.10 in^4
A =	0.50 in^2
g =	0.60 lbs/ft
M_y =	0.000 k-ft
M_z =	0.000 k-ft
P_n =	0.741 k
$M_{y\ allowable}$ =	0.408 k-ft
$M_{z\ allowable}$ =	0.408 k-ft
$P_{n\ allowable}$ =	5.050 k
Utilization =	15%



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 =	0.077 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

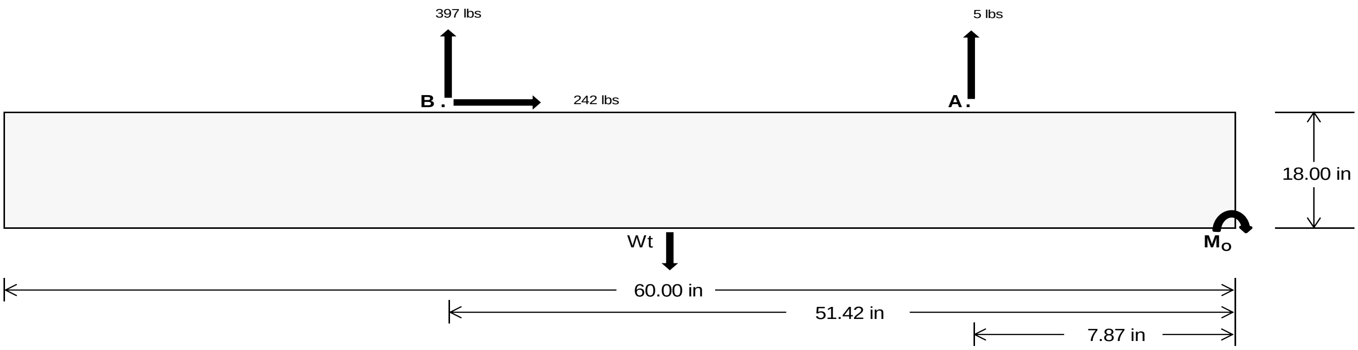
5.1 Helical Pile Foundations

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 =	28.47	1723.35	k
Compressive Load =	1162.78	1203.19	k
Lateral Load =	2.26	1047.71	k
Moment (Weak Axis) =	0.00	0.00	k

5.2 Design of Ballast Foundations

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



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

Footing Reinforcement
Use fiber reinforcing with (1) #5 rebar.

Overturning Check
M_O = 24789.7 in-lbs
Resisting Force Required = 826.32 lbs
S.F. = 1.67
Weight Required = 1377.21 lbs
Minimum Width = 20 in in
Weight Provided = 1812.50 lbs

A minimum 60in long x 20in wide x 18in tall ballast foundation is required to resist overturning.

Sliding
Force = 241.65 lbs
Friction = 0.4
Weight Required = 604.12 lbs
Resisting Weight = 1812.50 lbs
Additional Weight Required = 0 lbs

Use a 60in long x 20in wide x 18in tall ballast foundation to resist sliding. Friction is OK.

Cohesion
Sliding Force = 241.65 lbs
Cohesion = 130 psf
Area = 8.33 ft^2
Resisting = 906.25 lbs
Additional Weight Required = 0 lbs

Use a 60in long x 20in 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			
	20 in	21 in	22 in	23 in
P_{ftg} = (145 pcf)(5 ft)(1.5 ft)(1.67 ft) =	1813 lbs	1903 lbs	1994 lbs	2084 lbs

ASD LC	1.0D + 1.0S				1.0D + 0.6W				1.0D + 0.75L + 0.45W + 0.75S				0.6D + 0.6W			
Width	20 in	21 in	22 in	23 in	20 in	21 in	22 in	23 in	20 in	21 in	22 in	23 in	20 in	21 in	22 in	23 in
F_A	418 lbs	418 lbs	418 lbs	418 lbs	383 lbs	383 lbs	383 lbs	383 lbs	563 lbs	563 lbs	563 lbs	563 lbs	-10 lbs	-10 lbs	-10 lbs	-10 lbs
F_B	289 lbs	289 lbs	289 lbs	289 lbs	500 lbs	500 lbs	500 lbs	500 lbs	564 lbs	564 lbs	564 lbs	564 lbs	-794 lbs	-794 lbs	-794 lbs	-794 lbs
F_V	45 lbs	45 lbs	45 lbs	45 lbs	437 lbs	437 lbs	437 lbs	437 lbs	358 lbs	358 lbs	358 lbs	358 lbs	-483 lbs	-483 lbs	-483 lbs	-483 lbs
P_{total}	2520 lbs	2610 lbs	2701 lbs	2792 lbs	2696 lbs	2786 lbs	2877 lbs	2968 lbs	2940 lbs	3031 lbs	3121 lbs	3212 lbs	284 lbs	338 lbs	393 lbs	447 lbs
M	324 lbs-ft	324 lbs-ft	324 lbs-ft	324 lbs-ft	469 lbs-ft	469 lbs-ft	469 lbs-ft	469 lbs-ft	568 lbs-ft	568 lbs-ft	568 lbs-ft	568 lbs-ft	673 lbs-ft	673 lbs-ft	673 lbs-ft	673 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	2.37 ft	1.99 ft	1.71 ft	1.50 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	253.9 psf	252.3 psf	250.7 psf	255.9 psf	254.1 psf	252.4 psf	250.9 psf	271.1 psf	268.5 psf	266.2 psf	264.1 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	349.0 psf	342.7 psf	337.0 psf	331.8 psf	391.1 psf	382.8 psf	375.3 psf	368.4 psf	434.5 psf	424.2 psf	414.8 psf	406.2 psf	870.5 psf	252.0 psf	181.4 psf	156.2 psf

Maximum Bearing Pressure = 870 psf
Allowable Bearing Pressure = 1500 psf

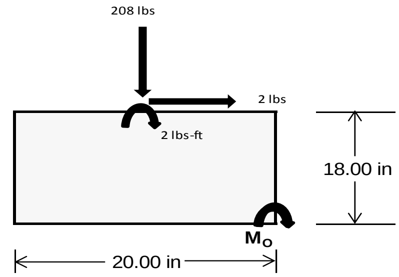
Use a 60in long x 20in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O = 167.5 ft-lbs
Resisting Force Required = 200.97 lbs
S.F. = 1.67
Weight Required = 334.96 lbs
Minimum Width = 20 in in
Weight Provided = 1812.50 lbs

A minimum 60in long x 20in 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	20 in			20 in			20 in		
Support	Outer	Inner	Outer	Outer	Inner	Outer	Outer	Inner	Outer
F_Y	65 lbs	162 lbs	61 lbs	208 lbs	586 lbs	204 lbs	19 lbs	47 lbs	18 lbs
F_V	0 lbs	0 lbs	0 lbs	2 lbs	2 lbs	0 lbs	0 lbs	0 lbs	0 lbs
P_{total}	2309 lbs	2406 lbs	2305 lbs	2344 lbs	2722 lbs	2340 lbs	675 lbs	703 lbs	674 lbs
M	0 lbs-ft	0 lbs-ft	0 lbs-ft	6 lbs-ft	3 lbs-ft	1 lbs-ft	0 lbs-ft	0 lbs-ft	0 lbs-ft
e	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft
L/6	0.28 ft	1.67 ft	1.67 ft	1.66 ft	1.66 ft	1.67 ft	1.67 ft	1.67 ft	1.67 ft
f_{min}	276.8 sqft	288.5 sqft	276.5 sqft	278.8 sqft	325.4 sqft	280.5 sqft	80.9 sqft	84.4 sqft	80.9 sqft
f_{max}	277.2 psf	288.8 psf	276.7 psf	283.7 psf	328.0 psf	281.1 psf	81.1 psf	84.4 psf	80.9 psf

Maximum Bearing Pressure = 328 psf
Allowable Bearing Pressure = 1500 psf

Use a 60in long x 20in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Foundation Requirements: 60in long x 20in wide x 18in tall ballast foundation and fiber reinforcing with (1) #5 rebar.

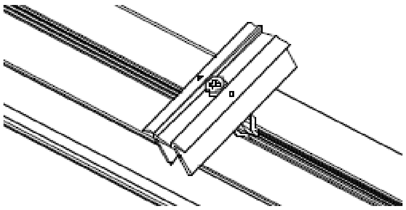
5.3 Foundation Anchors

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.

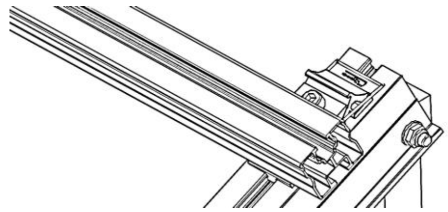
6. DESIGN OF JOINTS AND CONNECTIONS

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 =	0.571 k
Allowable Uplift =	1.214 k
Utilization =	47%



Fastening of Purlins to Girders	
Maximum Uplifting Force =	1.067 k
Allowable Uplift =	1.116 k
Utilization =	96%



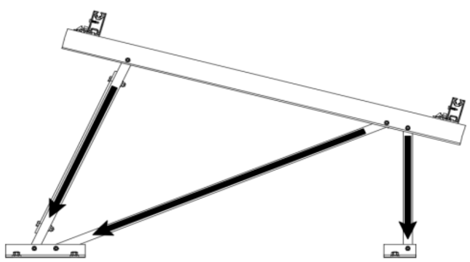
6.2 Bolted Connections
The aluminum struts connect the aluminum girder ends to custom brackets with mounting holes. Cross bracing is attached to rear struts to provide lateral stability. Single M8 bolts are used to attach each end of the strut to the girder and post. ASTM A193/A193M-86 equivalent stainless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

Front Strut	
Maximum Axial Load =	0.894 k
M8 Bolt Capacity =	5.692 k
Strut Bearing Capacity =	7.952 k
Utilization =	16%

Rear Strut	
Maximum Axial Load =	1.114 k
M8 Bolt Capacity =	5.692 k
Strut Bearing Capacity =	7.952 k
Utilization =	20%

Diagonal Strut	
Maximum Axial Load =	0.603 k
M8 Bolt Shear Capacity =	5.692 k
Strut Bearing Capacity =	7.952 k
Utilization =	11%

Bracing	
Maximum Axial Load =	0.077 k
M10 Bolt Capacity =	8.894 k
Strut Bearing Capacity =	7.952 k
Utilization =	1%



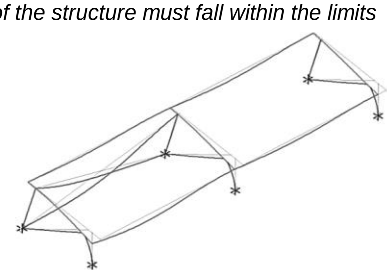
Bolt and bearing capacities are accounting for double shear (ASCE 8-02, Eq. 5.3.4-1). Struts under compression are shown to demonstrate the load transfer from the girder. Single M8 bolts are located at each end of the strut and are subjected to double shear.

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} =	0.016 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 = 63.00 in

J = 0.255

164.048

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

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= 29.2 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 = 63.00 in

J = 0.255

170.354

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

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= 29.1

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

$\varphi F_L St$= 29.2 ksi
Ix = 250988 mm^4
0.603 in^4
y = 30 mm
Sx = 0.511 in^3
$M_{max}St$ = 1.243 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

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

$\lambda =$ 0.77182

r = 0.437 in

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

$S1^* =$ 0.33515

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

$S2^* =$ 1.23671

$\varphi cc =$ 0.83792

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

$\varphi F_L =$ 24.5226 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.25 ksi

$\varphi F_L =$ 24.52 ksi

A = 323.87 mm^2

0.50 in^2

$P_{max} =$ 12.31 kips

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 46.38 in

J = 0.16

121.663

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.8 ksi

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 29.8 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

M_{max}St = 0.404 k-ft

Weak Axis:

3.4.14

L_b = 46.38 in

J = 0.16

121.663

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.8

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 33.3 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

M_{max}Wk = 0.450 k-ft

Compression

3.4.7

$\lambda =$ 1.98863

r = 0.437 in

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

$S1^* =$ 0.33515

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

$S2^* =$ 1.23671

$\varphi cc =$ 0.85841

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

$\varphi F_L =$ 7.59722 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.25 ksi

$\varphi F_L =$ 7.60 ksi

A = 323.87 mm^2

0.50 in^2

$P_{max} =$ 3.81 kips

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 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 in³

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 in³

M_{max}Wk = 0.450 k-ft

Compression

3.4.7

λ = 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

φcc = 0.81587

φF_L= (φccFcy)/(λ²)

φF_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)

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= 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	-85.097	-85.097	0	0
2	M16	y	-136.895	-136.895	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	170.194	170.194	0	0
2	M16	y	81.397	81.397	0	0

Load Combinations

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

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N8	max	211.714	2	279.876	2	0	15	0	15	0	1	0	1
2		min	-257.294	3	-408.359	3	-.121	3	0	3	0	1	0	1
3	N7	max	.002	3	333.204	1	-.035	15	0	15	0	1	0	1
4		min	-.139	2	4.114	12	-.812	1	-.001	1	0	1	0	1
5	N15	max	0	15	894.444	1	.409	1	0	1	0	1	0	1
6		min	-1.414	2	-21.897	3	-.544	3	0	3	0	1	0	1
7	N16	max	743.646	2	925.531	2	0	10	0	1	0	1	0	1
8		min	-805.932	3	-1325.653	3	-64.496	3	0	3	0	1	0	1
9	N23	max	.002	3	333.054	1	1.74	1	.003	1	0	1	0	1
10		min	-.139	2	4.472	12	.078	15	0	15	0	1	0	1
11	N24	max	211.79	2	282.823	2	65.004	3	0	1	0	1	0	1
12		min	-257.598	3	-406.781	3	.005	10	0	3	0	1	0	1
13	Totals:	max	1165.458	2	2833.583	1	0	1						
14		min	-1320.853	3	-2152.771	3	0	15						

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	231.703	1	.655	4	.271	1	0	15	0	15	0	1
2			min	-351.391	3	.154	15	-.056	3	0	1	0	1	0	1
3		2	max	231.829	1	.604	4	.271	1	0	15	0	15	0	15
4			min	-351.297	3	.142	15	-.056	3	0	1	0	1	0	4
5		3	max	231.955	1	.553	4	.271	1	0	15	0	15	0	15
6			min	-351.202	3	.13	15	-.056	3	0	1	0	3	0	4
7		4	max	232.08	1	.501	4	.271	1	0	15	0	1	0	15
8			min	-351.108	3	.118	15	-.056	3	0	1	0	3	0	4
9		5	max	232.206	1	.45	4	.271	1	0	15	0	1	0	15
10			min	-351.014	3	.106	15	-.056	3	0	1	0	3	0	4
11		6	max	232.332	1	.399	4	.271	1	0	15	0	1	0	15
12			min	-350.919	3	.094	15	-.056	3	0	1	0	3	0	4
13		7	max	232.458	1	.348	4	.271	1	0	15	0	1	0	15
14			min	-350.825	3	.082	15	-.056	3	0	1	0	3	0	4
15		8	max	232.584	1	.297	4	.271	1	0	15	0	1	0	15
16			min	-350.73	3	.07	15	-.056	3	0	1	0	3	0	4
17		9	max	232.71	1	.246	4	.271	1	0	15	0	1	0	15
18			min	-350.636	3	.058	15	-.056	3	0	1	0	3	0	4
19		10	max	232.836	1	.195	4	.271	1	0	15	0	1	0	15
20			min	-350.542	3	.046	15	-.056	3	0	1	0	3	0	4
21		11	max	232.961	1	.144	4	.271	1	0	15	0	1	0	15
22			min	-350.447	3	.034	15	-.056	3	0	1	0	3	0	4
23		12	max	233.087	1	.101	2	.271	1	0	15	0	1	0	15
24			min	-350.353	3	.014	12	-.056	3	0	1	0	3	0	4
25		13	max	233.213	1	.061	2	.271	1	0	15	0	1	0	15
26			min	-350.258	3	-.012	3	-.056	3	0	1	0	3	0	4
27		14	max	233.339	1	.021	2	.271	1	0	15	0	1	0	15
28			min	-350.164	3	-.042	3	-.056	3	0	1	0	3	0	4
29		15	max	233.465	1	-.014	15	.271	1	0	15	0	1	0	15
30			min	-350.07	3	-.072	3	-.056	3	0	1	0	3	0	4
31		16	max	233.591	1	-.026	15	.271	1	0	15	0	1	0	15
32			min	-349.975	3	-.112	4	-.056	3	0	1	0	3	0	4
33		17	max	233.717	1	-.038	15	.271	1	0	15	0	1	0	15
34			min	-349.881	3	-.163	4	-.056	3	0	1	0	3	0	4
35		18	max	233.843	1	-.05	15	.271	1	0	15	0	1	0	15
36			min	-349.786	3	-.214	4	-.056	3	0	1	0	3	0	4
37		19	max	233.968	1	-.062	15	.271	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	-349.692	3	-.266	4	-.056	3	0	1	0	3	0	4
39	M3	1	max	165.618	2	1.758	4	-.012	15	0	15	0	1	0	4
40			min	-169.057	3	.413	15	-.286	1	0	1	0	15	0	15
41		2	max	165.549	2	1.581	4	-.012	15	0	15	0	1	0	2
42			min	-169.109	3	.372	15	-.286	1	0	1	0	15	0	12
43		3	max	165.479	2	1.404	4	-.012	15	0	15	0	1	0	2
44			min	-169.161	3	.33	15	-.286	1	0	1	0	15	0	3
45		4	max	165.41	2	1.228	4	-.012	15	0	15	0	1	0	15
46			min	-169.213	3	.289	15	-.286	1	0	1	0	15	0	4
47		5	max	165.341	2	1.051	4	-.012	15	0	15	0	1	0	15
48			min	-169.265	3	.247	15	-.286	1	0	1	0	15	0	4
49		6	max	165.271	2	.874	4	-.012	15	0	15	0	1	0	15
50			min	-169.317	3	.206	15	-.286	1	0	1	0	15	0	4
51		7	max	165.202	2	.697	4	-.012	15	0	15	0	1	0	15
52			min	-169.369	3	.164	15	-.286	1	0	1	0	15	0	4
53		8	max	165.133	2	.52	4	-.012	15	0	15	0	1	0	15
54			min	-169.421	3	.122	15	-.286	1	0	1	0	15	-.001	4
55		9	max	165.063	2	.343	4	-.012	15	0	15	0	1	0	15
56			min	-169.473	3	.081	15	-.286	1	0	1	0	15	-.001	4
57		10	max	164.994	2	.167	4	-.012	15	0	15	0	1	0	15
58			min	-169.525	3	.039	15	-.286	1	0	1	0	15	-.001	4
59		11	max	164.925	2	.017	2	-.012	15	0	15	0	1	0	15
60			min	-169.577	3	-.037	3	-.286	1	0	1	0	15	-.001	4
61		12	max	164.855	2	-.044	15	-.012	15	0	15	0	1	0	15
62			min	-169.629	3	-.187	4	-.286	1	0	1	0	15	-.001	4
63		13	max	164.786	2	-.085	15	-.012	15	0	15	0	1	0	15
64			min	-169.681	3	-.364	4	-.286	1	0	1	0	15	-.001	4
65		14	max	164.717	2	-.127	15	-.012	15	0	15	0	1	0	15
66			min	-169.733	3	-.541	4	-.286	1	0	1	0	15	-.001	4
67		15	max	164.647	2	-.168	15	-.012	15	0	15	0	1	0	15
68			min	-169.785	3	-.718	4	-.286	1	0	1	0	10	0	4
69		16	max	164.578	2	-.21	15	-.012	15	0	15	0	1	0	15
70			min	-169.837	3	-.894	4	-.286	1	0	1	0	2	0	4
71		17	max	164.509	2	-.252	15	-.012	15	0	15	0	15	0	15
72			min	-169.889	3	-1.071	4	-.286	1	0	1	0	1	0	4
73		18	max	164.439	2	-.293	15	-.012	15	0	15	0	15	0	15
74			min	-169.941	3	-1.248	4	-.286	1	0	1	0	1	0	4
75		19	max	164.37	2	-.335	15	-.012	15	0	15	0	15	0	1
76			min	-169.993	3	-1.425	4	-.286	1	0	1	0	1	0	1
77	M4	1	max	332.039	1	0	1	-.036	15	0	1	0	3	0	1
78			min	3.531	12	0	1	-.86	1	0	1	0	2	0	1
79		2	max	332.104	1	0	1	-.036	15	0	1	0	15	0	1
80			min	3.564	12	0	1	-.86	1	0	1	0	1	0	1
81		3	max	332.168	1	0	1	-.036	15	0	1	0	15	0	1
82			min	3.596	12	0	1	-.86	1	0	1	0	1	0	1
83		4	max	332.233	1	0	1	-.036	15	0	1	0	15	0	1
84			min	3.628	12	0	1	-.86	1	0	1	0	1	0	1
85		5	max	332.298	1	0	1	-.036	15	0	1	0	15	0	1
86			min	3.661	12	0	1	-.86	1	0	1	0	1	0	1
87		6	max	332.362	1	0	1	-.036	15	0	1	0	15	0	1
88			min	3.693	12	0	1	-.86	1	0	1	0	1	0	1
89		7	max	332.427	1	0	1	-.036	15	0	1	0	15	0	1
90			min	3.725	12	0	1	-.86	1	0	1	0	1	0	1
91		8	max	332.492	1	0	1	-.036	15	0	1	0	15	0	1
92			min	3.758	12	0	1	-.86	1	0	1	0	1	0	1
93		9	max	332.556	1	0	1	-.036	15	0	1	0	15	0	1
94			min	3.79	12	0	1	-.86	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	332.621	1	0	1	-.036	15	0	1	0	15	0	1
96			min	3.822	12	0	1	-.86	1	0	1	0	1	0	1
97		11	max	332.686	1	0	1	-.036	15	0	1	0	15	0	1
98			min	3.855	12	0	1	-.86	1	0	1	0	1	0	1
99		12	max	332.751	1	0	1	-.036	15	0	1	0	15	0	1
100			min	3.887	12	0	1	-.86	1	0	1	0	1	0	1
101		13	max	332.815	1	0	1	-.036	15	0	1	0	15	0	1
102			min	3.919	12	0	1	-.86	1	0	1	0	1	0	1
103		14	max	332.88	1	0	1	-.036	15	0	1	0	15	0	1
104			min	3.952	12	0	1	-.86	1	0	1	-.001	1	0	1
105		15	max	332.945	1	0	1	-.036	15	0	1	0	15	0	1
106			min	3.984	12	0	1	-.86	1	0	1	-.001	1	0	1
107		16	max	333.009	1	0	1	-.036	15	0	1	0	15	0	1
108			min	4.017	12	0	1	-.86	1	0	1	-.001	1	0	1
109		17	max	333.074	1	0	1	-.036	15	0	1	0	15	0	1
110			min	4.049	12	0	1	-.86	1	0	1	-.001	1	0	1
111		18	max	333.139	1	0	1	-.036	15	0	1	0	15	0	1
112			min	4.081	12	0	1	-.86	1	0	1	-.001	1	0	1
113		19	max	333.204	1	0	1	-.036	15	0	1	0	15	0	1
114			min	4.114	12	0	1	-.86	1	0	1	-.001	1	0	1
115	M6	1	max	738.701	1	.656	4	.075	9	0	3	0	3	0	1
116			min	-1113.918	3	.154	15	-.202	3	0	10	0	9	0	1
117		2	max	738.827	1	.605	4	.075	9	0	3	0	3	0	15
118			min	-1113.823	3	.142	15	-.202	3	0	10	0	9	0	4
119		3	max	738.953	1	.554	4	.075	9	0	3	0	3	0	15
120			min	-1113.729	3	.13	15	-.202	3	0	10	0	9	0	4
121		4	max	739.079	1	.503	4	.075	9	0	3	0	3	0	15
122			min	-1113.635	3	.118	15	-.202	3	0	10	0	10	0	4
123		5	max	739.205	1	.452	4	.075	9	0	3	0	1	0	15
124			min	-1113.54	3	.106	15	-.202	3	0	10	0	10	0	4
125		6	max	739.331	1	.406	2	.075	9	0	3	0	1	0	15
126			min	-1113.446	3	.088	12	-.202	3	0	10	0	10	0	4
127		7	max	739.456	1	.366	2	.075	9	0	3	0	1	0	15
128			min	-1113.351	3	.068	12	-.202	3	0	10	0	3	0	4
129		8	max	739.582	1	.326	2	.075	9	0	3	0	1	0	15
130			min	-1113.257	3	.048	12	-.202	3	0	10	0	3	0	4
131		9	max	739.708	1	.286	2	.075	9	0	3	0	1	0	15
132			min	-1113.163	3	.028	12	-.202	3	0	10	0	3	0	4
133		10	max	739.834	1	.246	2	.075	9	0	3	0	1	0	12
134			min	-1113.068	3	.001	3	-.202	3	0	10	0	3	0	4
135		11	max	739.96	1	.207	2	.075	9	0	3	0	1	0	12
136			min	-1112.974	3	-.029	3	-.202	3	0	10	0	3	0	2
137		12	max	740.086	1	.167	2	.075	9	0	3	0	1	0	12
138			min	-1112.879	3	-.059	3	-.202	3	0	10	0	3	0	2
139		13	max	740.212	1	.127	2	.075	9	0	3	0	1	0	12
140			min	-1112.785	3	-.089	3	-.202	3	0	10	0	3	0	2
141		14	max	740.338	1	.087	2	.075	9	0	3	0	1	0	12
142			min	-1112.691	3	-.118	3	-.202	3	0	10	0	3	0	2
143		15	max	740.463	1	.047	2	.075	9	0	3	0	1	0	12
144			min	-1112.596	3	-.148	3	-.202	3	0	10	0	3	0	2
145		16	max	740.589	1	.007	2	.075	9	0	3	0	1	0	12
146			min	-1112.502	3	-.178	3	-.202	3	0	10	0	3	0	2
147		17	max	740.715	1	-.033	2	.075	9	0	3	0	1	0	12
148			min	-1112.407	3	-.208	3	-.202	3	0	10	0	3	0	2
149		18	max	740.841	1	-.05	15	.075	9	0	3	0	1	0	3
150			min	-1112.313	3	-.238	3	-.202	3	0	10	0	3	0	2
151		19	max	740.967	1	-.062	15	.075	9	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	-1112.219	3	-.268	3	-.202	3	0	10	0	3	0	2
153	M7	1	max	603.439	2	1.761	4	.026	3	0	1	0	2	0	2
154			min	-511.085	3	.414	15	-.015	2	0	3	0	3	0	3
155		2	max	603.369	2	1.584	4	.026	3	0	1	0	1	0	2
156			min	-511.137	3	.372	15	-.015	2	0	3	0	3	0	3
157		3	max	603.3	2	1.407	4	.026	3	0	1	0	1	0	2
158			min	-511.189	3	.331	15	-.015	2	0	3	0	3	0	3
159		4	max	603.231	2	1.231	4	.026	3	0	1	0	1	0	2
160			min	-511.241	3	.289	15	-.015	2	0	3	0	3	0	3
161		5	max	603.161	2	1.054	4	.026	3	0	1	0	1	0	15
162			min	-511.293	3	.248	15	-.015	2	0	3	0	3	0	3
163		6	max	603.092	2	.877	4	.026	3	0	1	0	1	0	15
164			min	-511.345	3	.206	15	-.015	2	0	3	0	3	0	4
165		7	max	603.023	2	.7	4	.026	3	0	1	0	1	0	15
166			min	-511.397	3	.165	15	-.015	2	0	3	0	3	0	4
167		8	max	602.953	2	.523	4	.026	3	0	1	0	1	0	15
168			min	-511.449	3	.123	15	-.015	2	0	3	0	3	-.001	4
169		9	max	602.884	2	.353	2	.026	3	0	1	0	1	0	15
170			min	-511.501	3	.075	12	-.015	2	0	3	0	3	-.001	4
171		10	max	602.815	2	.215	2	.026	3	0	1	0	1	0	15
172			min	-511.553	3	-.001	3	-.015	2	0	3	0	3	-.001	4
173		11	max	602.745	2	.078	2	.026	3	0	1	0	1	0	15
174			min	-511.605	3	-.105	3	-.015	2	0	3	0	3	-.001	4
175		12	max	602.676	2	-.043	15	.026	3	0	1	0	1	0	15
176			min	-511.657	3	-.208	3	-.015	2	0	3	0	3	-.001	4
177		13	max	602.607	2	-.085	15	.026	3	0	1	0	1	0	15
178			min	-511.709	3	-.361	4	-.015	2	0	3	0	3	-.001	4
179		14	max	602.537	2	-.126	15	.026	3	0	1	0	1	0	15
180			min	-511.761	3	-.538	4	-.015	2	0	3	0	3	-.001	4
181		15	max	602.468	2	-.168	15	.026	3	0	1	0	1	0	15
182			min	-511.813	3	-.715	4	-.015	2	0	3	0	3	0	4
183		16	max	602.399	2	-.21	15	.026	3	0	1	0	1	0	15
184			min	-511.865	3	-.891	4	-.015	2	0	3	0	3	0	4
185		17	max	602.33	2	-.251	15	.026	3	0	1	0	1	0	15
186			min	-511.917	3	-1.068	4	-.015	2	0	3	0	3	0	4
187		18	max	602.26	2	-.293	15	.026	3	0	1	0	1	0	15
188			min	-511.969	3	-1.245	4	-.015	2	0	3	0	3	0	4
189		19	max	602.191	2	-.334	15	.026	3	0	1	0	1	0	1
190			min	-512.021	3	-1.422	4	-.015	2	0	3	0	3	0	1
191	M8	1	max	893.279	1	0	1	.479	1	0	1	0	10	0	1
192			min	-22.77	3	0	1	-.542	3	0	1	0	1	0	1
193		2	max	893.344	1	0	1	.479	1	0	1	0	1	0	1
194			min	-22.722	3	0	1	-.542	3	0	1	0	3	0	1
195		3	max	893.409	1	0	1	.479	1	0	1	0	1	0	1
196			min	-22.673	3	0	1	-.542	3	0	1	0	3	0	1
197		4	max	893.474	1	0	1	.479	1	0	1	0	1	0	1
198			min	-22.625	3	0	1	-.542	3	0	1	0	3	0	1
199		5	max	893.538	1	0	1	.479	1	0	1	0	1	0	1
200			min	-22.576	3	0	1	-.542	3	0	1	0	3	0	1
201		6	max	893.603	1	0	1	.479	1	0	1	0	1	0	1
202			min	-22.527	3	0	1	-.542	3	0	1	0	3	0	1
203		7	max	893.668	1	0	1	.479	1	0	1	0	1	0	1
204			min	-22.479	3	0	1	-.542	3	0	1	0	3	0	1
205		8	max	893.732	1	0	1	.479	1	0	1	0	1	0	1
206			min	-22.43	3	0	1	-.542	3	0	1	0	3	0	1
207		9	max	893.797	1	0	1	.479	1	0	1	0	1	0	1
208			min	-22.382	3	0	1	-.542	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	893.862	1	0	1	.479	1	0	1	0	1	0	1
210			min	-22.333	3	0	1	-.542	3	0	1	0	3	0	1
211		11	max	893.926	1	0	1	.479	1	0	1	0	1	0	1
212			min	-22.285	3	0	1	-.542	3	0	1	0	3	0	1
213		12	max	893.991	1	0	1	.479	1	0	1	0	1	0	1
214			min	-22.236	3	0	1	-.542	3	0	1	0	3	0	1
215		13	max	894.056	1	0	1	.479	1	0	1	0	1	0	1
216			min	-22.188	3	0	1	-.542	3	0	1	0	3	0	1
217		14	max	894.121	1	0	1	.479	1	0	1	0	1	0	1
218			min	-22.139	3	0	1	-.542	3	0	1	0	3	0	1
219		15	max	894.185	1	0	1	.479	1	0	1	0	1	0	1
220			min	-22.091	3	0	1	-.542	3	0	1	0	3	0	1
221		16	max	894.25	1	0	1	.479	1	0	1	0	1	0	1
222			min	-22.042	3	0	1	-.542	3	0	1	0	3	0	1
223		17	max	894.315	1	0	1	.479	1	0	1	0	1	0	1
224			min	-21.994	3	0	1	-.542	3	0	1	0	3	0	1
225		18	max	894.379	1	0	1	.479	1	0	1	0	1	0	1
226			min	-21.945	3	0	1	-.542	3	0	1	0	3	0	1
227		19	max	894.444	1	0	1	.479	1	0	1	0	1	0	1
228			min	-21.897	3	0	1	-.542	3	0	1	0	3	0	1
229	M10	1	max	234.08	1	.651	4	-.004	15	0	1	0	1	0	1
230			min	-310.009	3	.153	15	-.131	1	0	3	0	3	0	1
231		2	max	234.205	1	.599	4	-.004	15	0	1	0	1	0	15
232			min	-309.914	3	.141	15	-.131	1	0	3	0	3	0	4
233		3	max	234.331	1	.548	4	-.004	15	0	1	0	1	0	15
234			min	-309.82	3	.129	15	-.131	1	0	3	0	3	0	4
235		4	max	234.457	1	.497	4	-.004	15	0	1	0	1	0	15
236			min	-309.725	3	.117	15	-.131	1	0	3	0	3	0	4
237		5	max	234.583	1	.446	4	-.004	15	0	1	0	1	0	15
238			min	-309.631	3	.105	15	-.131	1	0	3	0	3	0	4
239		6	max	234.709	1	.395	4	-.004	15	0	1	0	1	0	15
240			min	-309.537	3	.093	15	-.131	1	0	3	0	3	0	4
241		7	max	234.835	1	.344	4	-.004	15	0	1	0	1	0	15
242			min	-309.442	3	.081	15	-.131	1	0	3	0	3	0	4
243		8	max	234.961	1	.293	4	-.004	15	0	1	0	1	0	15
244			min	-309.348	3	.069	15	-.131	1	0	3	0	3	0	4
245		9	max	235.087	1	.241	4	-.004	15	0	1	0	9	0	15
246			min	-309.253	3	.057	15	-.131	1	0	3	0	3	0	4
247		10	max	235.212	1	.19	4	-.004	15	0	1	0	9	0	15
248			min	-309.159	3	.045	15	-.131	1	0	3	0	3	0	4
249		11	max	235.338	1	.14	2	-.004	15	0	1	0	9	0	15
250			min	-309.065	3	.033	15	-.131	1	0	3	0	3	0	4
251		12	max	235.464	1	.101	2	-.004	15	0	1	0	15	0	15
252			min	-308.97	3	.021	15	-.131	1	0	3	0	3	0	4
253		13	max	235.59	1	.061	2	-.004	15	0	1	0	15	0	15
254			min	-308.876	3	.008	12	-.131	1	0	3	0	3	0	4
255		14	max	235.716	1	.021	2	-.004	15	0	1	0	15	0	15
256			min	-308.781	3	-.019	3	-.131	1	0	3	0	3	0	4
257		15	max	235.842	1	-.015	15	-.004	15	0	1	0	15	0	15
258			min	-308.687	3	-.065	4	-.131	1	0	3	0	3	0	4
259		16	max	235.968	1	-.027	15	-.004	15	0	1	0	15	0	15
260			min	-308.593	3	-.117	4	-.131	1	0	3	0	3	0	4
261		17	max	236.093	1	-.039	15	-.004	15	0	1	0	15	0	15
262			min	-308.498	3	-.168	4	-.131	1	0	3	0	3	0	4
263		18	max	236.219	1	-.051	15	-.004	15	0	1	0	15	0	15
264			min	-308.404	3	-.219	4	-.131	1	0	3	0	1	0	4
265		19	max	236.345	1	-.063	15	-.004	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	-308.309	3	-.27	4	-.131	1	0	3	0	1	0	4
267	M11	1	max	165.183	2	1.761	4	.312	1	0	1	0	3	0	4
268			min	-169.723	3	.414	15	-.033	3	0	15	0	1	0	12
269		2	max	165.113	2	1.585	4	.312	1	0	1	0	3	0	2
270			min	-169.775	3	.372	15	-.033	3	0	15	0	1	0	3
271		3	max	165.044	2	1.408	4	.312	1	0	1	0	3	0	2
272			min	-169.827	3	.331	15	-.033	3	0	15	0	1	0	3
273		4	max	164.975	2	1.231	4	.312	1	0	1	0	3	0	15
274			min	-169.879	3	.289	15	-.033	3	0	15	0	1	0	3
275		5	max	164.905	2	1.054	4	.312	1	0	1	0	3	0	15
276			min	-169.931	3	.248	15	-.033	3	0	15	0	1	0	4
277		6	max	164.836	2	.877	4	.312	1	0	1	0	3	0	15
278			min	-169.983	3	.206	15	-.033	3	0	15	0	1	0	4
279		7	max	164.767	2	.7	4	.312	1	0	1	0	3	0	15
280			min	-170.035	3	.165	15	-.033	3	0	15	0	1	0	4
281		8	max	164.697	2	.524	4	.312	1	0	1	0	3	0	15
282			min	-170.087	3	.123	15	-.033	3	0	15	0	1	-.001	4
283		9	max	164.628	2	.347	4	.312	1	0	1	0	3	0	15
284			min	-170.139	3	.081	15	-.033	3	0	15	0	1	-.001	4
285		10	max	164.559	2	.17	4	.312	1	0	1	0	3	0	15
286			min	-170.191	3	.038	12	-.033	3	0	15	0	1	-.001	4
287		11	max	164.489	2	.017	2	.312	1	0	1	0	3	0	15
288			min	-170.243	3	-.051	3	-.033	3	0	15	0	1	-.001	4
289		12	max	164.42	2	-.043	15	.312	1	0	1	0	3	0	15
290			min	-170.295	3	-.184	4	-.033	3	0	15	0	1	-.001	4
291		13	max	164.351	2	-.085	15	.312	1	0	1	0	3	0	15
292			min	-170.347	3	-.361	4	-.033	3	0	15	0	1	-.001	4
293		14	max	164.282	2	-.126	15	.312	1	0	1	0	3	0	15
294			min	-170.399	3	-.537	4	-.033	3	0	15	0	1	-.001	4
295		15	max	164.212	2	-.168	15	.312	1	0	1	0	3	0	15
296			min	-170.451	3	-.714	4	-.033	3	0	15	0	2	0	4
297		16	max	164.143	2	-.209	15	.312	1	0	1	0	3	0	15
298			min	-170.503	3	-.891	4	-.033	3	0	15	0	10	0	4
299		17	max	164.074	2	-.251	15	.312	1	0	1	0	3	0	15
300			min	-170.555	3	-1.068	4	-.033	3	0	15	0	15	0	4
301		18	max	164.004	2	-.293	15	.312	1	0	1	0	3	0	15
302			min	-170.607	3	-1.245	4	-.033	3	0	15	0	15	0	4
303		19	max	163.935	2	-.334	15	.312	1	0	1	0	1	0	1
304			min	-170.659	3	-1.422	4	-.033	3	0	15	0	15	0	1
305	M12	1	max	331.889	1	0	1	1.841	1	0	1	0	2	0	1
306			min	3.89	12	0	1	.078	15	0	1	0	3	0	1
307		2	max	331.954	1	0	1	1.841	1	0	1	0	1	0	1
308			min	3.922	12	0	1	.078	15	0	1	0	15	0	1
309		3	max	332.019	1	0	1	1.841	1	0	1	0	1	0	1
310			min	3.955	12	0	1	.078	15	0	1	0	15	0	1
311		4	max	332.083	1	0	1	1.841	1	0	1	0	1	0	1
312			min	3.987	12	0	1	.078	15	0	1	0	15	0	1
313		5	max	332.148	1	0	1	1.841	1	0	1	0	1	0	1
314			min	4.019	12	0	1	.078	15	0	1	0	15	0	1
315		6	max	332.213	1	0	1	1.841	1	0	1	0	1	0	1
316			min	4.052	12	0	1	.078	15	0	1	0	15	0	1
317		7	max	332.277	1	0	1	1.841	1	0	1	.001	1	0	1
318			min	4.084	12	0	1	.078	15	0	1	0	15	0	1
319		8	max	332.342	1	0	1	1.841	1	0	1	.001	1	0	1
320			min	4.116	12	0	1	.078	15	0	1	0	15	0	1
321		9	max	332.407	1	0	1	1.841	1	0	1	.001	1	0	1
322			min	4.149	12	0	1	.078	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	332.472	1	0	1	1.841	1	0	1	.002	1	0	1
324			min	4.181	12	0	1	.078	15	0	1	0	15	0	1
325		11	max	332.536	1	0	1	1.841	1	0	1	.002	1	0	1
326			min	4.213	12	0	1	.078	15	0	1	0	15	0	1
327		12	max	332.601	1	0	1	1.841	1	0	1	.002	1	0	1
328			min	4.246	12	0	1	.078	15	0	1	0	15	0	1
329		13	max	332.666	1	0	1	1.841	1	0	1	.002	1	0	1
330			min	4.278	12	0	1	.078	15	0	1	0	15	0	1
331		14	max	332.73	1	0	1	1.841	1	0	1	.002	1	0	1
332			min	4.31	12	0	1	.078	15	0	1	0	15	0	1
333		15	max	332.795	1	0	1	1.841	1	0	1	.002	1	0	1
334			min	4.343	12	0	1	.078	15	0	1	0	15	0	1
335		16	max	332.86	1	0	1	1.841	1	0	1	.002	1	0	1
336			min	4.375	12	0	1	.078	15	0	1	0	15	0	1
337		17	max	332.925	1	0	1	1.841	1	0	1	.003	1	0	1
338			min	4.407	12	0	1	.078	15	0	1	0	15	0	1
339		18	max	332.989	1	0	1	1.841	1	0	1	.003	1	0	1
340			min	4.44	12	0	1	.078	15	0	1	0	15	0	1
341		19	max	333.054	1	0	1	1.841	1	0	1	.003	1	0	1
342			min	4.472	12	0	1	.078	15	0	1	0	15	0	1
343	M1	1	max	103.91	1	330.672	3	-1.551	15	0	1	.073	1	0	2
344			min	4.228	15	-232.168	1	-36.982	1	0	3	.003	15	0	3
345		2	max	104.05	1	330.49	3	-1.551	15	0	1	.065	1	.051	1
346			min	4.27	15	-232.41	1	-36.982	1	0	3	.003	15	-.072	3
347		3	max	85.587	3	5.349	9	-1.539	15	0	12	.056	1	.1	1
348			min	-12.036	10	-23.195	2	-36.863	1	0	1	.002	15	-.142	3
349		4	max	85.692	3	5.147	9	-1.539	15	0	12	.048	1	.104	2
350			min	-11.92	10	-23.437	2	-36.863	1	0	1	.002	15	-.139	3
351		5	max	85.797	3	4.946	9	-1.539	15	0	12	.04	1	.109	2
352			min	-11.803	10	-23.679	2	-36.863	1	0	1	.002	15	-.137	3
353		6	max	85.902	3	4.744	9	-1.539	15	0	12	.032	1	.115	2
354			min	-11.687	10	-23.921	2	-36.863	1	0	1	.001	15	-.134	3
355		7	max	86.006	3	4.543	9	-1.539	15	0	12	.024	1	.12	2
356			min	-11.571	10	-24.163	2	-36.863	1	0	1	.001	15	-.131	3
357		8	max	86.111	3	4.341	9	-1.539	15	0	12	.016	1	.125	2
358			min	-11.454	10	-24.404	2	-36.863	1	0	1	0	15	-.128	3
359		9	max	86.216	3	4.14	9	-1.539	15	0	12	.008	1	.13	2
360			min	-11.338	10	-24.646	2	-36.863	1	0	1	0	15	-.125	3
361		10	max	86.32	3	3.938	9	-1.539	15	0	12	.001	3	.136	2
362			min	-11.221	10	-24.888	2	-36.863	1	0	1	0	10	-.122	3
363		11	max	86.425	3	3.737	9	-1.539	15	0	12	0	3	.141	2
364			min	-11.105	10	-25.13	2	-36.863	1	0	1	-.008	1	-.119	3
365		12	max	86.53	3	3.535	9	-1.539	15	0	12	0	12	.147	2
366			min	-10.989	10	-25.372	2	-36.863	1	0	1	-.016	1	-.116	3
367		13	max	86.635	3	3.334	9	-1.539	15	0	12	0	15	.152	2
368			min	-10.872	10	-25.613	2	-36.863	1	0	1	-.024	1	-.113	3
369		14	max	86.739	3	3.132	9	-1.539	15	0	12	-.001	15	.158	2
370			min	-10.756	10	-25.855	2	-36.863	1	0	1	-.032	1	-.109	3
371		15	max	86.844	3	2.931	9	-1.539	15	0	12	-.002	15	.163	2
372			min	-10.64	10	-26.097	2	-36.863	1	0	1	-.04	1	-.106	3
373		16	max	88.314	2	110.777	2	-1.551	15	0	1	-.002	15	.168	2
374			min	-5.67	3	-157.712	3	-37.11	1	0	12	-.048	1	-.102	3
375		17	max	88.453	2	110.535	2	-1.551	15	0	1	-.002	15	.144	2
376			min	-5.565	3	-157.893	3	-37.11	1	0	12	-.056	1	-.067	3
377		18	max	-4.269	15	332.945	2	-1.587	15	0	3	-.003	15	.072	2
378			min	-104.035	1	-154.77	3	-38.033	1	0	2	-.064	1	-.034	3
379		19	max	-4.227	15	332.703	2	-1.587	15	0	3	-.003	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	-103.896	1	-154.952	3	-38.033	1	0	2	-.073	1	0	3
381	M5	1	max	238.413	1	1080.667	3	0	10	0	1	.007	3	0	3
382			min	5.54	12	-757.675	1	-58.2	3	0	3	0	10	0	2
383		2	max	238.552	1	1080.485	3	0	10	0	1	0	1	.164	1
384			min	5.61	12	-757.917	1	-58.2	3	0	3	-.005	3	-.234	3
385		3	max	256.634	3	5.379	9	6.518	3	0	3	0	1	.325	1
386			min	-45.508	2	-83.75	2	-.526	1	0	1	-.017	3	-.463	3
387		4	max	256.739	3	5.178	9	6.518	3	0	3	0	1	.339	2
388			min	-45.369	2	-83.992	2	-.526	1	0	1	-.016	3	-.453	3
389		5	max	256.843	3	4.976	9	6.518	3	0	3	0	1	.358	2
390			min	-45.229	2	-84.234	2	-.526	1	0	1	-.014	3	-.442	3
391		6	max	256.948	3	4.775	9	6.518	3	0	3	0	1	.376	2
392			min	-45.09	2	-84.476	2	-.526	1	0	1	-.013	3	-.432	3
393		7	max	257.053	3	4.573	9	6.518	3	0	3	0	1	.394	2
394			min	-44.95	2	-84.718	2	-.526	1	0	1	-.012	3	-.421	3
395		8	max	257.158	3	4.372	9	6.518	3	0	3	0	1	.413	2
396			min	-44.81	2	-84.959	2	-.526	1	0	1	-.01	3	-.41	3
397		9	max	257.262	3	4.17	9	6.518	3	0	3	0	1	.431	2
398			min	-44.671	2	-85.201	2	-.526	1	0	1	-.009	3	-.4	3
399		10	max	257.367	3	3.969	9	6.518	3	0	3	0	2	.45	2
400			min	-44.531	2	-85.443	2	-.526	1	0	1	-.007	3	-.389	3
401		11	max	257.472	3	3.767	9	6.518	3	0	3	0	10	.468	2
402			min	-44.391	2	-85.685	2	-.526	1	0	1	-.006	3	-.378	3
403		12	max	257.576	3	3.565	9	6.518	3	0	3	0	10	.487	2
404			min	-44.252	2	-85.927	2	-.526	1	0	1	-.005	3	-.367	3
405		13	max	257.681	3	3.364	9	6.518	3	0	3	0	10	.505	2
406			min	-44.112	2	-86.168	2	-.526	1	0	1	-.003	3	-.357	3
407		14	max	257.786	3	3.162	9	6.518	3	0	3	0	10	.524	2
408			min	-43.973	2	-86.41	2	-.526	1	0	1	-.002	3	-.346	3
409		15	max	257.891	3	2.961	9	6.518	3	0	3	0	10	.543	2
410			min	-43.833	2	-86.652	2	-.526	1	0	1	0	1	-.335	3
411		16	max	287.402	2	419.363	2	6.491	3	0	3	0	3	.557	2
412			min	-22.528	3	-479.019	3	-.54	1	0	10	0	1	-.32	3
413		17	max	287.542	2	419.121	2	6.491	3	0	3	.002	3	.466	2
414			min	-22.424	3	-479.2	3	-.54	1	0	10	0	1	-.216	3
415		18	max	-7.506	12	1082.726	2	5.95	3	0	3	.003	3	.234	2
416			min	-238.575	1	-499.203	3	-.12	1	0	1	0	1	-.108	3
417		19	max	-7.436	12	1082.484	2	5.95	3	0	3	.005	3	0	3
418			min	-238.435	1	-499.385	3	-.12	1	0	1	0	1	0	2
419	M9	1	max	103.563	1	330.62	3	62.807	3	0	3	-.003	15	0	2
420			min	4.21	15	-232.167	1	1.585	15	0	1	-.072	1	0	3
421		2	max	103.702	1	330.439	3	62.807	3	0	3	-.001	12	.051	1
422			min	4.252	15	-232.408	1	1.585	15	0	1	-.064	1	-.072	3
423		3	max	85.473	3	5.326	9	36.031	1	0	1	.011	3	.1	1
424			min	-11.611	10	-23.202	2	-1.351	3	0	15	-.055	1	-.142	3
425		4	max	85.577	3	5.125	9	36.031	1	0	1	.011	3	.104	2
426			min	-11.495	10	-23.444	2	-1.351	3	0	15	-.047	1	-.139	3
427		5	max	85.682	3	4.923	9	36.031	1	0	1	.011	3	.109	2
428			min	-11.379	10	-23.686	2	-1.351	3	0	15	-.039	1	-.137	3
429		6	max	85.787	3	4.722	9	36.031	1	0	1	.01	3	.114	2
430			min	-11.262	10	-23.928	2	-1.351	3	0	15	-.031	1	-.134	3
431		7	max	85.892	3	4.52	9	36.031	1	0	1	.01	3	.12	2
432			min	-11.146	10	-24.17	2	-1.351	3	0	15	-.023	1	-.131	3
433		8	max	85.996	3	4.319	9	36.031	1	0	1	.01	3	.125	2
434			min	-11.03	10	-24.412	2	-1.351	3	0	15	-.016	1	-.128	3
435		9	max	86.101	3	4.117	9	36.031	1	0	1	.009	3	.13	2
436			min	-10.913	10	-24.653	2	-1.351	3	0	15	-.008	1	-.125	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	86.206	3	3.916	9	36.031	1	0	1	.009	3	.136	2
438			min	-10.797	10	-24.895	2	-1.351	3	0	15	0	1	-.122	3
439		11	max	86.31	3	3.714	9	36.031	1	0	1	.009	3	.141	2
440			min	-10.681	10	-25.137	2	-1.351	3	0	15	0	15	-.119	3
441		12	max	86.415	3	3.513	9	36.031	1	0	1	.016	1	.147	2
442			min	-10.564	10	-25.379	2	-1.351	3	0	15	0	15	-.116	3
443		13	max	86.52	3	3.311	9	36.031	1	0	1	.023	1	.152	2
444			min	-10.448	10	-25.621	2	-1.351	3	0	15	0	15	-.113	3
445		14	max	86.625	3	3.109	9	36.031	1	0	1	.031	1	.158	2
446			min	-10.332	10	-25.862	2	-1.351	3	0	15	.001	15	-.109	3
447		15	max	86.729	3	2.908	9	36.031	1	0	1	.039	1	.163	2
448			min	-10.215	10	-26.104	2	-1.351	3	0	15	.002	15	-.106	3
449		16	max	88.55	2	110.406	2	36.303	1	0	15	.047	1	.168	2
450			min	-6.138	3	-158.19	3	-1.38	3	0	1	.002	15	-.102	3
451		17	max	88.689	2	110.165	2	36.303	1	0	15	.055	1	.144	2
452			min	-6.033	3	-158.371	3	-1.38	3	0	1	.002	15	-.067	3
453		18	max	-4.252	15	332.945	2	38.163	1	0	2	.063	1	.072	2
454			min	-103.694	1	-154.764	3	-.918	3	0	3	.003	15	-.034	3
455		19	max	-4.21	15	332.703	2	38.163	1	0	2	.072	1	0	2
456			min	-103.554	1	-154.945	3	-.918	3	0	3	.003	15	0	3
457	M13	1	max	62.803	3	231.89	1	-4.21	15	0	2	.072	1	0	1
458			min	1.585	15	-330.641	3	-103.554	1	0	3	.003	15	0	3
459		2	max	62.803	3	164.165	1	-3.213	15	0	2	.019	1	.165	3
460			min	1.585	15	-233.874	3	-78.783	1	0	3	0	10	-.116	1
461		3	max	62.803	3	96.439	1	-2.216	15	0	2	.007	3	.273	3
462			min	1.585	15	-137.107	3	-54.011	1	0	3	-.02	1	-.192	1
463		4	max	62.803	3	28.733	2	-1.219	15	0	2	.003	3	.325	3
464			min	1.585	15	-40.341	3	-29.24	1	0	3	-.044	1	-.228	1
465		5	max	62.803	3	56.426	3	.648	10	0	2	.001	3	.32	3
466			min	1.585	15	-39.012	1	-4.468	1	0	3	-.054	1	-.225	1
467		6	max	62.803	3	153.192	3	20.303	1	0	2	0	3	.259	3
468			min	1.585	15	-106.737	1	-1.705	3	0	3	-.05	1	-.183	1
469		7	max	62.803	3	249.959	3	45.075	1	0	2	0	12	.141	3
470			min	1.585	15	-174.462	1	-.254	3	0	3	-.031	1	-.101	2
471		8	max	62.803	3	346.726	3	69.846	1	0	2	.004	2	.021	1
472			min	1.585	15	-242.188	1	.987	12	0	3	0	3	-.033	3
473		9	max	62.803	3	443.492	3	94.618	1	0	2	.051	1	.182	1
474			min	1.585	15	-309.913	1	1.954	12	0	3	0	12	-.263	3
475		10	max	62.803	3	540.259	3	119.389	1	0	2	.113	1	.383	1
476			min	1.585	15	-377.639	1	2.922	12	0	3	-.005	3	-.55	3
477		11	max	37.073	1	309.913	1	-1.644	12	0	3	.05	1	.182	1
478			min	1.551	15	-443.492	3	-94.27	1	0	2	-.006	3	-.263	3
479		12	max	37.073	1	242.188	1	-.676	12	0	3	.004	2	.021	1
480			min	1.551	15	-346.726	3	-69.498	1	0	2	-.007	3	-.033	3
481		13	max	37.073	1	174.462	1	.766	3	0	3	-.001	15	.141	3
482			min	1.551	15	-249.959	3	-44.727	1	0	2	-.031	1	-.101	2
483		14	max	37.073	1	106.737	1	2.217	3	0	3	-.002	15	.259	3
484			min	1.551	15	-153.192	3	-19.955	1	0	2	-.05	1	-.183	1
485		15	max	37.073	1	39.012	1	4.816	1	0	3	-.002	15	.32	3
486			min	1.551	15	-56.426	3	-.647	10	0	2	-.054	1	-.225	1
487		16	max	37.073	1	40.341	3	29.588	1	0	3	-.001	12	.325	3
488			min	1.551	15	-28.733	2	1.236	15	0	2	-.044	1	-.228	1
489		17	max	37.073	1	137.107	3	54.359	1	0	3	.001	3	.273	3
490			min	1.551	15	-96.439	1	2.233	15	0	2	-.02	1	-.192	1
491		18	max	37.073	1	233.874	3	79.13	1	0	3	.019	1	.165	3
492			min	1.551	15	-164.165	1	3.231	15	0	2	0	10	-.116	1
493		19	max	37.073	1	330.641	3	103.902	1	0	3	.073	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	1.551	15	-231.89	1	4.228	15	0	2	.003	15	0	3
495	M16	1	max	.921	3	332.856	2	-4.21	15	0	3	.072	1	0	2
496			min	-38.068	1	-154.97	3	-103.563	1	0	2	.003	15	0	3
497		2	max	.921	3	235.657	2	-3.213	15	0	3	.019	1	.077	3
498			min	-38.068	1	-110.002	3	-78.792	1	0	2	0	10	-.166	2
499		3	max	.921	3	138.458	2	-2.216	15	0	3	0	12	.128	3
500			min	-38.068	1	-65.033	3	-54.021	1	0	2	-.02	1	-.275	2
501		4	max	.921	3	41.259	2	-1.219	15	0	3	-.002	15	.153	3
502			min	-38.068	1	-20.065	3	-29.249	1	0	2	-.044	1	-.327	2
503		5	max	.921	3	24.903	3	.636	10	0	3	-.002	15	.152	3
504			min	-38.068	1	-55.941	2	-4.478	1	0	2	-.054	1	-.323	2
505		6	max	.921	3	69.872	3	20.294	1	0	3	-.002	15	.124	3
506			min	-38.068	1	-153.14	2	-.749	3	0	2	-.05	1	-.262	2
507		7	max	.921	3	114.84	3	45.065	1	0	3	-.001	15	.07	3
508			min	-38.068	1	-250.339	2	.593	12	0	2	-.031	1	-.144	2
509		8	max	.921	3	159.809	3	69.837	1	0	3	.004	2	.03	2
510			min	-38.068	1	-347.538	2	1.56	12	0	2	-.005	3	-.01	3
511		9	max	.921	3	204.777	3	94.608	1	0	3	.051	1	.261	2
512			min	-38.068	1	-444.738	2	2.528	12	0	2	-.003	3	-.116	3
513		10	max	-1.591	15	-9.636	15	119.38	1	0	15	.113	1	.549	2
514			min	-38.068	1	-541.937	2	-5.803	3	0	2	.003	12	-.249	3
515		11	max	-1.587	15	444.738	2	-2.974	12	0	2	.05	1	.261	2
516			min	-37.943	1	-204.777	3	-94.267	1	0	3	0	12	-.116	3
517		12	max	-1.587	15	347.538	2	-2.007	12	0	2	.004	2	.03	2
518			min	-37.943	1	-159.809	3	-69.496	1	0	3	0	3	-.01	3
519		13	max	-1.587	15	250.339	2	-1.039	12	0	2	-.001	15	.07	3
520			min	-37.943	1	-114.84	3	-44.724	1	0	3	-.031	1	-.144	2
521		14	max	-1.587	15	153.14	2	0	3	0	2	-.002	12	.124	3
522			min	-37.943	1	-69.872	3	-19.953	1	0	3	-.05	1	-.262	2
523		15	max	-1.587	15	55.941	2	4.819	1	0	2	-.002	12	.152	3
524			min	-37.943	1	-24.903	3	-.636	10	0	3	-.054	1	-.323	2
525		16	max	-1.587	15	20.065	3	29.59	1	0	2	0	12	.153	3
526			min	-37.943	1	-41.259	2	1.235	15	0	3	-.044	1	-.327	2
527		17	max	-1.587	15	65.033	3	54.362	1	0	2	.001	3	.128	3
528			min	-37.943	1	-138.458	2	2.232	15	0	3	-.02	1	-.275	2
529		18	max	-1.587	15	110.002	3	79.133	1	0	2	.019	1	.077	3
530			min	-37.943	1	-235.657	2	3.229	15	0	3	0	10	-.166	2
531		19	max	-1.587	15	154.97	3	103.905	1	0	2	.073	1	0	2
532			min	-37.943	1	-332.856	2	4.227	15	0	3	.003	15	0	3
533	M15	1	max	.851	13	1.851	4	.08	3	0	9	0	9	0	1
534			min	-76.083	3	0	1	-.023	9	0	3	0	3	0	1
535		2	max	.754	13	1.646	4	.08	3	0	9	0	9	0	1
536			min	-76.153	3	0	1	-.023	9	0	3	0	3	0	4
537		3	max	.657	13	1.44	4	.08	3	0	9	0	9	0	1
538			min	-76.224	3	0	1	-.023	9	0	3	0	3	-.001	4
539		4	max	.56	13	1.234	4	.08	3	0	9	0	9	0	1
540			min	-76.294	3	0	1	-.023	9	0	3	0	3	-.002	4
541		5	max	.463	13	1.029	4	.08	3	0	9	0	9	0	1
542			min	-76.365	3	0	1	-.023	9	0	3	0	3	-.002	4
543		6	max	.366	13	.823	4	.08	3	0	9	0	9	0	1
544			min	-76.435	3	0	1	-.023	9	0	3	0	3	-.002	4
545		7	max	.269	13	.617	4	.08	3	0	9	0	3	0	1
546			min	-76.506	3	0	1	-.023	9	0	3	0	9	-.003	4
547		8	max	.172	13	.411	4	.08	3	0	9	0	3	0	1
548			min	-76.576	3	0	1	-.023	9	0	3	0	9	-.003	4
549		9	max	.075	13	.206	4	.08	3	0	9	0	3	0	1
550			min	-76.647	3	0	1	-.023	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	.08	3	0	9	0	3	0	1
552			min	-76.717	3	0	1	-.023	9	0	3	0	9	-.003	4
553		11	max	0	1	0	1	.08	3	0	9	0	3	0	1
554			min	-76.788	3	-.206	4	-.023	9	0	3	0	9	-.003	4
555		12	max	0	1	0	1	.08	3	0	9	0	3	0	1
556			min	-76.858	3	-.411	4	-.023	9	0	3	0	9	-.003	4
557		13	max	0	1	0	1	.08	3	0	9	0	3	0	1
558			min	-76.929	3	-.617	4	-.023	9	0	3	0	9	-.003	4
559		14	max	0	1	0	1	.08	3	0	9	0	3	0	1
560			min	-76.999	3	-.823	4	-.023	9	0	3	0	9	-.002	4
561		15	max	0	1	0	1	.08	3	0	9	0	3	0	1
562			min	-77.07	3	-1.029	4	-.023	9	0	3	0	9	-.002	4
563		16	max	0	1	0	1	.08	3	0	9	0	3	0	1
564			min	-77.14	3	-1.234	4	-.023	9	0	3	0	9	-.002	4
565		17	max	0	1	0	1	.08	3	0	9	0	3	0	1
566			min	-77.211	3	-1.44	4	-.023	9	0	3	0	9	-.001	4
567		18	max	0	1	0	1	.08	3	0	9	0	3	0	1
568			min	-77.281	3	-1.646	4	-.023	9	0	3	0	9	0	4
569		19	max	0	1	0	1	.08	3	0	9	0	3	0	1
570			min	-77.352	3	-1.851	4	-.023	9	0	3	0	9	0	1
571	M16A	1	max	0	10	1.851	4	.03	1	0	3	0	3	0	1
572			min	-76.311	3	0	10	-.033	3	0	2	0	1	0	1
573		2	max	0	10	1.646	4	.03	1	0	3	0	3	0	10
574			min	-76.24	3	0	10	-.033	3	0	2	0	1	0	4
575		3	max	0	10	1.44	4	.03	1	0	3	0	3	0	10
576			min	-76.17	3	0	10	-.033	3	0	2	0	1	-.001	4
577		4	max	0	10	1.234	4	.03	1	0	3	0	3	0	10
578			min	-76.099	3	0	10	-.033	3	0	2	0	1	-.002	4
579		5	max	0	10	1.029	4	.03	1	0	3	0	3	0	10
580			min	-76.029	3	0	10	-.033	3	0	2	0	1	-.002	4
581		6	max	0	10	.823	4	.03	1	0	3	0	3	0	10
582			min	-75.958	3	0	10	-.033	3	0	2	0	1	-.002	4
583		7	max	0	10	.617	4	.03	1	0	3	0	3	0	10
584			min	-75.888	3	0	10	-.033	3	0	2	0	1	-.003	4
585		8	max	0	10	.411	4	.03	1	0	3	0	3	0	10
586			min	-75.817	3	0	10	-.033	3	0	2	0	1	-.003	4
587		9	max	0	10	.206	4	.03	1	0	3	0	3	0	10
588			min	-75.747	3	0	10	-.033	3	0	2	0	1	-.003	4
589		10	max	0	10	0	1	.03	1	0	3	0	3	0	10
590			min	-75.676	3	0	1	-.033	3	0	2	0	1	-.003	4
591		11	max	0	10	0	10	.03	1	0	3	0	3	0	10
592			min	-75.606	3	-.206	4	-.033	3	0	2	0	1	-.003	4
593		12	max	.089	2	0	10	.03	1	0	3	0	3	0	10
594			min	-75.536	3	-.411	4	-.033	3	0	2	0	1	-.003	4
595		13	max	.183	2	0	10	.03	1	0	3	0	2	0	10
596			min	-75.465	3	-.617	4	-.033	3	0	2	0	4	-.003	4
597		14	max	.277	2	0	10	.03	1	0	3	0	2	0	10
598			min	-75.395	3	-.823	4	-.033	3	0	2	0	3	-.002	4
599		15	max	.371	2	0	10	.03	1	0	3	0	2	0	10
600			min	-75.324	3	-1.029	4	-.033	3	0	2	0	3	-.002	4
601		16	max	.465	2	0	10	.03	1	0	3	0	2	0	10
602			min	-75.254	3	-1.234	4	-.033	3	0	2	0	3	-.002	4
603		17	max	.559	2	0	10	.03	1	0	3	0	2	0	10
604			min	-75.183	3	-1.44	4	-.033	3	0	2	0	3	-.001	4
605		18	max	.653	2	0	10	.03	1	0	3	0	2	0	10
606			min	-75.113	3	-1.646	4	-.033	3	0	2	0	3	0	4
607		19	max	.747	2	0	10	.03	1	0	3	0	2	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	-75.042	3	-1.851	4	-.033	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	.007	1	-2.422e-5	15	NC	3	NC	2
2			min	-.003	3	-.009	3	-.002	3	-5.833e-4	1	4374.501	2	5441.972	1
3		2	max	.002	1	.008	2	.007	1	-2.318e-5	15	NC	3	NC	2
4			min	-.003	3	-.009	3	-.001	3	-5.581e-4	1	4779.331	2	5862.31	1
5		3	max	.002	1	.007	2	.006	1	-2.214e-5	15	NC	1	NC	2
6			min	-.003	3	-.008	3	-.001	3	-5.33e-4	1	5261.805	2	6359.016	1
7		4	max	.002	1	.007	2	.006	1	-2.11e-5	15	NC	1	NC	2
8			min	-.003	3	-.008	3	-.001	3	-5.079e-4	1	5840.906	2	6950.346	1
9		5	max	.002	1	.006	2	.005	1	-2.006e-5	15	NC	1	NC	2
10			min	-.003	3	-.008	3	-.001	3	-4.827e-4	1	6542.014	2	7660.691	1
11		6	max	.002	1	.005	2	.005	1	-1.903e-5	15	NC	1	NC	2
12			min	-.002	3	-.007	3	0	3	-4.576e-4	1	7399.625	2	8523.206	1
13		7	max	.002	1	.005	2	.004	1	-1.799e-5	15	NC	1	NC	2
14			min	-.002	3	-.007	3	0	3	-4.324e-4	1	8461.538	2	9583.901	1
15		8	max	.001	1	.004	2	.004	1	-1.695e-5	15	NC	1	NC	1
16			min	-.002	3	-.006	3	0	3	-4.073e-4	1	9795.482	2	NC	1
17		9	max	.001	1	.003	2	.003	1	-1.591e-5	15	NC	1	NC	1
18			min	-.002	3	-.006	3	0	3	-3.821e-4	1	NC	1	NC	1
19		10	max	.001	1	.003	2	.003	1	-1.487e-5	15	NC	1	NC	1
20			min	-.002	3	-.005	3	0	3	-3.57e-4	1	NC	1	NC	1
21		11	max	.001	1	.002	2	.002	1	-1.384e-5	15	NC	1	NC	1
22			min	-.002	3	-.005	3	0	3	-3.318e-4	1	NC	1	NC	1
23		12	max	0	1	.002	2	.002	1	-1.28e-5	15	NC	1	NC	1
24			min	-.001	3	-.004	3	0	3	-3.067e-4	1	NC	1	NC	1
25		13	max	0	1	.001	2	.001	1	-1.176e-5	15	NC	1	NC	1
26			min	-.001	3	-.004	3	0	3	-2.815e-4	1	NC	1	NC	1
27		14	max	0	1	.001	2	.001	1	-1.072e-5	15	NC	1	NC	1
28			min	0	3	-.003	3	0	3	-2.564e-4	1	NC	1	NC	1
29		15	max	0	1	0	2	0	1	-9.683e-6	15	NC	1	NC	1
30			min	0	3	-.003	3	0	3	-2.312e-4	1	NC	1	NC	1
31		16	max	0	1	0	2	0	1	-8.645e-6	15	NC	1	NC	1
32			min	0	3	-.002	3	0	3	-2.061e-4	1	NC	1	NC	1
33		17	max	0	1	0	2	0	1	-7.607e-6	15	NC	1	NC	1
34			min	0	3	-.001	3	0	3	-1.809e-4	1	NC	1	NC	1
35		18	max	0	1	0	2	0	1	-6.569e-6	15	NC	1	NC	1
36			min	0	3	0	3	0	3	-1.558e-4	1	NC	1	NC	1
37		19	max	0	1	0	1	0	1	-5.531e-6	15	NC	1	NC	1
38			min	0	1	0	1	0	1	-1.306e-4	1	NC	1	NC	1
39	M3	1	max	0	1	0	1	0	1	6.163e-5	1	NC	1	NC	1
40			min	0	1	0	1	0	1	2.608e-6	15	NC	1	NC	1
41		2	max	0	3	0	2	0	12	7.601e-5	1	NC	1	NC	1
42			min	0	2	0	3	0	1	3.192e-6	15	NC	1	NC	1
43		3	max	0	3	0	2	0	12	9.038e-5	1	NC	1	NC	1
44			min	0	2	-.002	3	0	1	3.775e-6	15	NC	1	NC	1
45		4	max	0	3	0	2	0	12	1.048e-4	1	NC	1	NC	1
46			min	0	2	-.003	3	0	1	4.358e-6	15	NC	1	NC	1
47		5	max	0	3	0	2	0	3	1.191e-4	1	NC	1	NC	1
48			min	0	2	-.003	3	0	1	4.942e-6	15	NC	1	NC	1
49		6	max	0	3	0	2	0	3	1.335e-4	1	NC	1	NC	1
50			min	0	2	-.004	3	0	1	5.525e-6	15	NC	1	NC	1
51		7	max	0	3	0	2	0	3	1.479e-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	6.108e-6	15	NC	1	NC	1
53		8	max	0	3	0	2	0	3	1.622e-4	1	NC	1	NC	1
54			min	0	2	-.005	3	0	1	6.692e-6	15	NC	1	NC	1
55		9	max	0	3	.001	2	0	2	1.766e-4	1	NC	1	NC	1
56			min	0	2	-.006	3	0	9	7.275e-6	15	NC	1	NC	1
57		10	max	0	3	.002	2	0	2	1.91e-4	1	NC	1	NC	1
58			min	0	2	-.007	3	0	15	7.858e-6	15	NC	1	NC	1
59		11	max	.001	3	.002	2	0	1	2.054e-4	1	NC	1	NC	1
60			min	-.001	2	-.007	3	0	15	8.442e-6	15	NC	1	NC	1
61		12	max	.001	3	.003	2	0	1	2.197e-4	1	NC	1	NC	1
62			min	-.001	2	-.007	3	0	15	9.025e-6	15	NC	1	NC	1
63		13	max	.001	3	.003	2	.001	1	2.341e-4	1	NC	1	NC	1
64			min	-.001	2	-.008	3	0	15	9.608e-6	15	NC	1	NC	1
65		14	max	.001	3	.004	2	.002	1	2.485e-4	1	NC	1	NC	1
66			min	-.001	2	-.008	3	0	15	1.019e-5	15	NC	1	NC	1
67		15	max	.001	3	.005	2	.002	1	2.629e-4	1	NC	1	NC	1
68			min	-.001	2	-.008	3	0	15	1.078e-5	15	9507.345	2	NC	1
69		16	max	.002	3	.006	2	.002	1	2.772e-4	1	NC	1	NC	1
70			min	-.002	2	-.008	3	0	15	1.136e-5	15	8007.085	2	NC	1
71		17	max	.002	3	.007	2	.003	1	2.916e-4	1	NC	1	NC	1
72			min	-.002	2	-.008	3	0	15	1.194e-5	15	6857.193	2	NC	1
73		18	max	.002	3	.008	2	.003	1	3.06e-4	1	NC	1	NC	1
74			min	-.002	2	-.008	3	0	15	1.252e-5	15	5964.391	2	NC	1
75		19	max	.002	3	.009	2	.004	1	3.204e-4	1	NC	3	NC	1
76			min	-.002	2	-.008	3	0	15	1.311e-5	15	5264.152	2	NC	1
77	M4	1	max	.002	1	.01	2	0	15	-1.891e-5	12	NC	1	NC	2
78			min	0	12	-.009	3	-.003	1	-4.665e-4	1	NC	1	6959.554	1
79		2	max	.001	1	.01	2	0	15	-1.891e-5	12	NC	1	NC	2
80			min	0	12	-.008	3	-.003	1	-4.665e-4	1	NC	1	7592.463	1
81		3	max	.001	1	.009	2	0	15	-1.891e-5	12	NC	1	NC	2
82			min	0	12	-.008	3	-.002	1	-4.665e-4	1	NC	1	8345.715	1
83		4	max	.001	1	.009	2	0	15	-1.891e-5	12	NC	1	NC	2
84			min	0	12	-.007	3	-.002	1	-4.665e-4	1	NC	1	9251.055	1
85		5	max	.001	1	.008	2	0	15	-1.891e-5	12	NC	1	NC	1
86			min	0	12	-.007	3	-.002	1	-4.665e-4	1	NC	1	NC	1
87		6	max	.001	1	.007	2	0	15	-1.891e-5	12	NC	1	NC	1
88			min	0	12	-.006	3	-.002	1	-4.665e-4	1	NC	1	NC	1
89		7	max	.001	1	.007	2	0	15	-1.891e-5	12	NC	1	NC	1
90			min	0	12	-.006	3	-.001	1	-4.665e-4	1	NC	1	NC	1
91		8	max	0	1	.006	2	0	15	-1.891e-5	12	NC	1	NC	1
92			min	0	12	-.005	3	-.001	1	-4.665e-4	1	NC	1	NC	1
93		9	max	0	1	.006	2	0	15	-1.891e-5	12	NC	1	NC	1
94			min	0	12	-.005	3	-.001	1	-4.665e-4	1	NC	1	NC	1
95		10	max	0	1	.005	2	0	15	-1.891e-5	12	NC	1	NC	1
96			min	0	12	-.004	3	0	1	-4.665e-4	1	NC	1	NC	1
97		11	max	0	1	.005	2	0	15	-1.891e-5	12	NC	1	NC	1
98			min	0	12	-.004	3	0	1	-4.665e-4	1	NC	1	NC	1
99		12	max	0	1	.004	2	0	15	-1.891e-5	12	NC	1	NC	1
100			min	0	12	-.003	3	0	1	-4.665e-4	1	NC	1	NC	1
101		13	max	0	1	.003	2	0	15	-1.891e-5	12	NC	1	NC	1
102			min	0	12	-.003	3	0	1	-4.665e-4	1	NC	1	NC	1
103		14	max	0	1	.003	2	0	15	-1.891e-5	12	NC	1	NC	1
104			min	0	12	-.002	3	0	1	-4.665e-4	1	NC	1	NC	1
105		15	max	0	1	.002	2	0	15	-1.891e-5	12	NC	1	NC	1
106			min	0	12	-.002	3	0	1	-4.665e-4	1	NC	1	NC	1
107		16	max	0	1	.002	2	0	15	-1.891e-5	12	NC	1	NC	1
108			min	0	12	-.001	3	0	1	-4.665e-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	-1.891e-5	12	NC	1	NC	1
110			min	0	12	0	3	0	1	-4.665e-4	1	NC	1	NC	1
111		18	max	0	1	0	2	0	15	-1.891e-5	12	NC	1	NC	1
112			min	0	12	0	3	0	1	-4.665e-4	1	NC	1	NC	1
113		19	max	0	1	0	1	0	1	-1.891e-5	12	NC	1	NC	1
114			min	0	1	0	1	0	1	-4.665e-4	1	NC	1	NC	1
115	M6	1	max	.007	1	.031	2	.003	1	3.929e-4	3	NC	3	NC	1
116			min	-.011	3	-.028	3	-.005	3	-6.264e-8	10	1271.928	2	7895.299	3
117		2	max	.007	1	.029	2	.003	1	3.806e-4	3	NC	3	NC	1
118			min	-.01	3	-.027	3	-.005	3	-9.945e-7	2	1361.211	2	8387.571	3
119		3	max	.006	1	.027	2	.002	1	3.683e-4	3	NC	3	NC	1
120			min	-.01	3	-.025	3	-.004	3	-2.106e-6	2	1463.546	2	8971.34	3
121		4	max	.006	1	.025	2	.002	1	3.561e-4	3	NC	3	NC	1
122			min	-.009	3	-.024	3	-.004	3	-4.196e-6	1	1581.547	2	9666.194	3
123		5	max	.006	1	.023	2	.002	1	3.438e-4	3	NC	3	NC	1
124			min	-.008	3	-.022	3	-.004	3	-7.78e-6	1	1718.58	2	NC	1
125		6	max	.005	1	.021	2	.002	1	3.316e-4	3	NC	3	NC	1
126			min	-.008	3	-.021	3	-.003	3	-1.136e-5	1	1879.056	2	NC	1
127		7	max	.005	1	.019	2	.002	1	3.193e-4	3	NC	3	NC	1
128			min	-.007	3	-.019	3	-.003	3	-1.495e-5	1	2068.858	2	NC	1
129		8	max	.004	1	.017	2	.001	1	3.07e-4	3	NC	3	NC	1
130			min	-.007	3	-.018	3	-.003	3	-1.853e-5	1	2296.012	2	NC	1
131		9	max	.004	1	.015	2	.001	1	2.948e-4	3	NC	3	NC	1
132			min	-.006	3	-.016	3	-.002	3	-2.212e-5	1	2571.755	2	NC	1
133		10	max	.004	1	.014	2	.001	1	2.825e-4	3	NC	3	NC	1
134			min	-.005	3	-.015	3	-.002	3	-2.57e-5	1	2912.32	2	NC	1
135		11	max	.003	1	.012	2	0	1	2.703e-4	3	NC	3	NC	1
136			min	-.005	3	-.013	3	-.002	3	-2.928e-5	1	3342.046	2	NC	1
137		12	max	.003	1	.01	2	0	1	2.58e-4	3	NC	3	NC	1
138			min	-.004	3	-.012	3	-.002	3	-3.287e-5	1	3899.175	2	NC	1
139		13	max	.002	1	.008	2	0	1	2.457e-4	3	NC	3	NC	1
140			min	-.004	3	-.01	3	-.001	3	-3.645e-5	1	4647.419	2	NC	1
141		14	max	.002	1	.007	2	0	1	2.335e-4	3	NC	3	NC	1
142			min	-.003	3	-.008	3	0	3	-4.004e-5	1	5701.433	2	NC	1
143		15	max	.002	1	.005	2	0	1	2.212e-4	3	NC	1	NC	1
144			min	-.002	3	-.007	3	0	3	-4.362e-5	1	7290.474	2	NC	1
145		16	max	.001	1	.004	2	0	1	2.09e-4	3	NC	1	NC	1
146			min	-.002	3	-.005	3	0	3	-4.721e-5	1	9949.387	2	NC	1
147		17	max	0	1	.003	2	0	1	1.967e-4	3	NC	1	NC	1
148			min	-.001	3	-.003	3	0	3	-5.079e-5	1	NC	1	NC	1
149		18	max	0	1	.001	2	0	1	1.844e-4	3	NC	1	NC	1
150			min	0	3	-.002	3	0	3	-5.437e-5	1	NC	1	NC	1
151		19	max	0	1	0	1	0	1	1.722e-4	3	NC	1	NC	1
152			min	0	1	0	1	0	1	-5.796e-5	1	NC	1	NC	1
153	M7	1	max	0	1	0	1	0	1	2.712e-5	1	NC	1	NC	1
154			min	0	1	0	1	0	1	-8.08e-5	3	NC	1	NC	1
155		2	max	0	3	.001	2	0	3	2.31e-5	1	NC	1	NC	1
156			min	0	2	-.002	3	0	1	-6.013e-5	3	NC	1	NC	1
157		3	max	0	3	.003	2	0	3	1.909e-5	1	NC	1	NC	1
158			min	0	2	-.004	3	0	1	-3.945e-5	3	NC	1	NC	1
159		4	max	0	3	.004	2	.001	3	1.507e-5	1	NC	1	NC	1
160			min	-.001	2	-.006	3	0	1	-1.878e-5	3	NC	1	NC	1
161		5	max	.001	3	.005	2	.001	3	1.106e-5	1	NC	1	NC	1
162			min	-.002	2	-.008	3	0	1	0	10	8574.094	2	NC	1
163		6	max	.002	3	.007	2	.002	3	2.257e-5	3	NC	1	NC	1
164			min	-.002	2	-.009	3	0	1	0	10	6870.991	2	NC	1
165		7	max	.002	3	.008	2	.002	3	4.325e-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	-2.968e-7	13	5706.709	2	NC	1
167		8	max	.002	3	.009	2	.002	3	6.393e-5	3	NC	3	NC	1
168			min	-.003	2	-.013	3	0	1	-1.402e-6	9	4853.487	2	NC	1
169		9	max	.003	3	.011	2	.002	3	8.46e-5	3	NC	3	NC	1
170			min	-.003	2	-.014	3	0	1	-4.998e-6	1	4197.835	2	NC	1
171		10	max	.003	3	.013	2	.002	3	1.053e-4	3	NC	3	NC	1
172			min	-.003	2	-.016	3	-.001	1	-9.012e-6	1	3676.838	2	NC	1
173		11	max	.003	3	.014	2	.003	3	1.26e-4	3	NC	3	NC	1
174			min	-.004	2	-.017	3	-.001	1	-1.303e-5	1	3252.715	2	NC	1
175		12	max	.004	3	.016	2	.003	3	1.466e-4	3	NC	3	NC	1
176			min	-.004	2	-.018	3	-.001	1	-1.704e-5	1	2901.285	2	NC	1
177		13	max	.004	3	.018	2	.003	3	1.673e-4	3	NC	3	NC	1
178			min	-.005	2	-.02	3	-.001	1	-2.106e-5	1	2606.235	2	NC	1
179		14	max	.004	3	.02	2	.003	3	1.88e-4	3	NC	3	NC	1
180			min	-.005	2	-.021	3	-.001	1	-2.507e-5	1	2356.068	2	NC	1
181		15	max	.005	3	.022	2	.003	3	2.087e-4	3	NC	3	NC	1
182			min	-.005	2	-.022	3	-.001	1	-2.908e-5	1	2142.377	2	NC	1
183		16	max	.005	3	.024	2	.003	3	2.293e-4	3	NC	3	NC	1
184			min	-.006	2	-.023	3	-.001	1	-3.31e-5	1	1958.823	2	NC	1
185		17	max	.005	3	.026	2	.003	3	2.5e-4	3	NC	3	NC	1
186			min	-.006	2	-.024	3	-.001	1	-3.711e-5	1	1800.506	2	NC	1
187		18	max	.005	3	.028	2	.003	3	2.707e-4	3	NC	3	NC	1
188			min	-.006	2	-.024	3	-.002	1	-4.113e-5	1	1663.569	2	NC	1
189		19	max	.006	3	.03	2	.002	3	2.914e-4	3	NC	3	NC	1
190			min	-.007	2	-.025	3	-.002	1	-4.514e-5	1	1544.928	2	NC	1
191	M8	1	max	.004	1	.035	2	.002	1	-9.802e-8	10	NC	1	NC	1
192			min	0	3	-.028	3	-.002	3	-2.227e-4	3	NC	1	NC	1
193		2	max	.004	1	.033	2	.001	1	-9.802e-8	10	NC	1	NC	1
194			min	0	3	-.027	3	-.002	3	-2.227e-4	3	NC	1	NC	1
195		3	max	.004	1	.031	2	.001	1	-9.802e-8	10	NC	1	NC	1
196			min	0	3	-.025	3	-.001	3	-2.227e-4	3	NC	1	NC	1
197		4	max	.004	1	.029	2	.001	1	-9.802e-8	10	NC	1	NC	1
198			min	0	3	-.023	3	-.001	3	-2.227e-4	3	NC	1	NC	1
199		5	max	.003	1	.027	2	.001	1	-9.802e-8	10	NC	1	NC	1
200			min	0	3	-.022	3	-.001	3	-2.227e-4	3	NC	1	NC	1
201		6	max	.003	1	.026	2	0	1	-9.802e-8	10	NC	1	NC	1
202			min	0	3	-.02	3	-.001	3	-2.227e-4	3	NC	1	NC	1
203		7	max	.003	1	.024	2	0	1	-9.802e-8	10	NC	1	NC	1
204			min	0	3	-.019	3	0	3	-2.227e-4	3	NC	1	NC	1
205		8	max	.003	1	.022	2	0	1	-9.802e-8	10	NC	1	NC	1
206			min	0	3	-.017	3	0	3	-2.227e-4	3	NC	1	NC	1
207		9	max	.002	1	.02	2	0	1	-9.802e-8	10	NC	1	NC	1
208			min	0	3	-.016	3	0	3	-2.227e-4	3	NC	1	NC	1
209		10	max	.002	1	.018	2	0	1	-9.802e-8	10	NC	1	NC	1
210			min	0	3	-.014	3	0	3	-2.227e-4	3	NC	1	NC	1
211		11	max	.002	1	.016	2	0	1	-9.802e-8	10	NC	1	NC	1
212			min	0	3	-.013	3	0	3	-2.227e-4	3	NC	1	NC	1
213		12	max	.002	1	.014	2	0	1	-9.802e-8	10	NC	1	NC	1
214			min	0	3	-.011	3	0	3	-2.227e-4	3	NC	1	NC	1
215		13	max	.001	1	.012	2	0	1	-9.802e-8	10	NC	1	NC	1
216			min	0	3	-.009	3	0	3	-2.227e-4	3	NC	1	NC	1
217		14	max	.001	1	.01	2	0	1	-9.802e-8	10	NC	1	NC	1
218			min	0	3	-.008	3	0	3	-2.227e-4	3	NC	1	NC	1
219		15	max	0	1	.008	2	0	1	-9.802e-8	10	NC	1	NC	1
220			min	0	3	-.006	3	0	3	-2.227e-4	3	NC	1	NC	1
221		16	max	0	1	.006	2	0	1	-9.802e-8	10	NC	1	NC	1
222			min	0	3	-.005	3	0	3	-2.227e-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	-9.802e-8	10	NC	1	NC	1
224			min	0	3	-.003	3	0	3	-2.227e-4	3	NC	1	NC	1
225		18	max	0	1	.002	2	0	1	-9.802e-8	10	NC	1	NC	1
226			min	0	3	-.002	3	0	3	-2.227e-4	3	NC	1	NC	1
227		19	max	0	1	0	1	0	1	-9.802e-8	10	NC	1	NC	1
228			min	0	1	0	1	0	1	-2.227e-4	3	NC	1	NC	1
229	M10	1	max	.002	1	.009	2	0	3	5.893e-4	1	NC	3	NC	1
230			min	-.003	3	-.009	3	-.001	1	-4.475e-4	3	4380.024	2	NC	1
231		2	max	.002	1	.008	2	0	3	5.59e-4	1	NC	3	NC	1
232			min	-.003	3	-.009	3	-.001	1	-4.324e-4	3	4785.548	2	NC	1
233		3	max	.002	1	.007	2	0	3	5.287e-4	1	NC	1	NC	1
234			min	-.003	3	-.008	3	-.001	1	-4.173e-4	3	5268.885	2	NC	1
235		4	max	.002	1	.007	2	0	3	4.984e-4	1	NC	1	NC	1
236			min	-.003	3	-.008	3	-.001	1	-4.022e-4	3	5849.07	2	NC	1
237		5	max	.002	1	.006	2	0	3	4.681e-4	1	NC	1	NC	1
238			min	-.002	3	-.008	3	-.001	1	-3.872e-4	3	6551.554	2	NC	1
239		6	max	.002	1	.005	2	0	3	4.378e-4	1	NC	1	NC	1
240			min	-.002	3	-.007	3	-.001	1	-3.721e-4	3	7410.935	2	NC	1
241		7	max	.002	1	.005	2	0	3	4.076e-4	1	NC	1	NC	1
242			min	-.002	3	-.007	3	-.001	1	-3.57e-4	3	8475.158	2	NC	1
243		8	max	.001	1	.004	2	0	3	3.773e-4	1	NC	1	NC	1
244			min	-.002	3	-.006	3	0	1	-3.42e-4	3	9812.172	2	NC	1
245		9	max	.001	1	.003	2	0	3	3.47e-4	1	NC	1	NC	1
246			min	-.002	3	-.006	3	0	1	-3.269e-4	3	NC	1	NC	1
247		10	max	.001	1	.003	2	0	3	3.167e-4	1	NC	1	NC	1
248			min	-.002	3	-.006	3	0	1	-3.118e-4	3	NC	1	NC	1
249		11	max	.001	1	.002	2	0	3	2.864e-4	1	NC	1	NC	1
250			min	-.001	3	-.005	3	0	1	-2.967e-4	3	NC	1	NC	1
251		12	max	0	1	.002	2	0	3	2.561e-4	1	NC	1	NC	1
252			min	-.001	3	-.005	3	0	1	-2.817e-4	3	NC	1	NC	1
253		13	max	0	1	.001	2	0	3	2.258e-4	1	NC	1	NC	1
254			min	-.001	3	-.004	3	0	1	-2.666e-4	3	NC	1	NC	1
255		14	max	0	1	.001	2	0	3	1.956e-4	1	NC	1	NC	1
256			min	0	3	-.003	3	0	1	-2.515e-4	3	NC	1	NC	1
257		15	max	0	1	0	2	0	3	1.653e-4	1	NC	1	NC	1
258			min	0	3	-.003	3	0	1	-2.364e-4	3	NC	1	NC	1
259		16	max	0	1	0	2	0	3	1.35e-4	1	NC	1	NC	1
260			min	0	3	-.002	3	0	1	-2.214e-4	3	NC	1	NC	1
261		17	max	0	1	0	2	0	3	1.047e-4	1	NC	1	NC	1
262			min	0	3	-.001	3	0	1	-2.063e-4	3	NC	1	NC	1
263		18	max	0	1	0	2	0	3	7.442e-5	1	NC	1	NC	1
264			min	0	3	0	3	0	1	-1.912e-4	3	NC	1	NC	1
265		19	max	0	1	0	1	0	1	4.413e-5	1	NC	1	NC	1
266			min	0	1	0	1	0	1	-1.761e-4	3	NC	1	NC	1
267	M11	1	max	0	1	0	1	0	1	8.312e-5	3	NC	1	NC	1
268			min	0	1	0	1	0	1	-2.131e-5	1	NC	1	NC	1
269		2	max	0	3	0	2	0	1	6.232e-5	3	NC	1	NC	1
270			min	0	2	0	3	0	3	-4.403e-5	1	NC	1	NC	1
271		3	max	0	3	0	2	0	2	4.152e-5	3	NC	1	NC	1
272			min	0	2	-.002	3	0	3	-6.675e-5	1	NC	1	NC	1
273		4	max	0	3	0	2	0	2	2.072e-5	3	NC	1	NC	1
274			min	0	2	-.003	3	-.001	3	-8.946e-5	1	NC	1	NC	1
275		5	max	0	3	0	2	0	2	-7.703e-8	3	NC	1	NC	1
276			min	0	2	-.003	3	-.001	3	-1.122e-4	1	NC	1	NC	1
277		6	max	0	3	0	2	0	10	-5.991e-6	15	NC	1	NC	1
278			min	0	2	-.004	3	-.002	3	-1.349e-4	1	NC	1	NC	1
279		7	max	0	3	0	2	0	10	-6.952e-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	-1.576e-4	1	NC	1	NC	1
281		8	max	0	3	0	2	0	10	-7.913e-6	15	NC	1	NC	1
282			min	0	2	-.006	3	-.002	3	-1.803e-4	1	NC	1	NC	1
283		9	max	0	3	.001	2	0	10	-8.874e-6	15	NC	1	NC	1
284			min	0	2	-.006	3	-.002	3	-2.03e-4	1	NC	1	NC	1
285		10	max	0	3	.002	2	0	15	-9.835e-6	15	NC	1	NC	1
286			min	0	2	-.007	3	-.002	3	-2.258e-4	1	NC	1	NC	1
287		11	max	.001	3	.002	2	0	15	-1.08e-5	15	NC	1	NC	1
288			min	-.001	2	-.007	3	-.003	1	-2.485e-4	1	NC	1	NC	1
289		12	max	.001	3	.003	2	0	15	-1.176e-5	15	NC	1	NC	1
290			min	-.001	2	-.007	3	-.003	1	-2.712e-4	1	NC	1	NC	1
291		13	max	.001	3	.003	2	0	15	-1.272e-5	15	NC	1	NC	1
292			min	-.001	2	-.008	3	-.004	1	-2.939e-4	1	NC	1	NC	1
293		14	max	.001	3	.004	2	0	15	-1.368e-5	15	NC	1	NC	1
294			min	-.001	2	-.008	3	-.004	1	-3.166e-4	1	NC	1	NC	1
295		15	max	.002	3	.005	2	0	15	-1.464e-5	15	NC	1	NC	2
296			min	-.001	2	-.008	3	-.005	1	-3.394e-4	1	9525.505	2	9653.768	1
297		16	max	.002	3	.006	2	0	15	-1.56e-5	15	NC	1	NC	2
298			min	-.002	2	-.008	3	-.005	1	-3.621e-4	1	8020.847	2	8633.802	1
299		17	max	.002	3	.007	2	0	15	-1.656e-5	15	NC	1	NC	2
300			min	-.002	2	-.008	3	-.006	1	-3.848e-4	1	6867.931	2	7817.154	1
301		18	max	.002	3	.008	2	0	15	-1.752e-5	15	NC	1	NC	2
302			min	-.002	2	-.008	3	-.006	1	-4.075e-4	1	5973.003	2	7156.164	1
303		19	max	.002	3	.009	2	0	15	-1.849e-5	15	NC	3	NC	2
304			min	-.002	2	-.008	3	-.007	1	-4.302e-4	1	5271.239	2	6617.05	1
305	M12	1	max	.002	1	.01	2	.006	1	3.976e-4	1	NC	1	NC	2
306			min	0	12	-.009	3	0	15	1.677e-5	15	NC	1	3290.756	1
307		2	max	.001	1	.01	2	.005	1	3.976e-4	1	NC	1	NC	2
308			min	0	12	-.009	3	0	15	1.677e-5	15	NC	1	3588.874	1
309		3	max	.001	1	.009	2	.005	1	3.976e-4	1	NC	1	NC	2
310			min	0	12	-.008	3	0	15	1.677e-5	15	NC	1	3943.732	1
311		4	max	.001	1	.009	2	.004	1	3.976e-4	1	NC	1	NC	2
312			min	0	12	-.008	3	0	15	1.677e-5	15	NC	1	4370.285	1
313		5	max	.001	1	.008	2	.004	1	3.976e-4	1	NC	1	NC	2
314			min	0	12	-.007	3	0	15	1.677e-5	15	NC	1	4888.91	1
315		6	max	.001	1	.007	2	.003	1	3.976e-4	1	NC	1	NC	2
316			min	0	12	-.007	3	0	15	1.677e-5	15	NC	1	5527.946	1
317		7	max	.001	1	.007	2	.003	1	3.976e-4	1	NC	1	NC	2
318			min	0	12	-.006	3	0	15	1.677e-5	15	NC	1	6327.761	1
319		8	max	0	1	.006	2	.003	1	3.976e-4	1	NC	1	NC	2
320			min	0	12	-.006	3	0	15	1.677e-5	15	NC	1	7347.468	1
321		9	max	0	1	.006	2	.002	1	3.976e-4	1	NC	1	NC	2
322			min	0	12	-.005	3	0	15	1.677e-5	15	NC	1	8676.488	1
323		10	max	0	1	.005	2	.002	1	3.976e-4	1	NC	1	NC	1
324			min	0	12	-.005	3	0	15	1.677e-5	15	NC	1	NC	1
325		11	max	0	1	.005	2	.001	1	3.976e-4	1	NC	1	NC	1
326			min	0	12	-.004	3	0	15	1.677e-5	15	NC	1	NC	1
327		12	max	0	1	.004	2	.001	1	3.976e-4	1	NC	1	NC	1
328			min	0	12	-.004	3	0	15	1.677e-5	15	NC	1	NC	1
329		13	max	0	1	.003	2	0	1	3.976e-4	1	NC	1	NC	1
330			min	0	12	-.003	3	0	15	1.677e-5	15	NC	1	NC	1
331		14	max	0	1	.003	2	0	1	3.976e-4	1	NC	1	NC	1
332			min	0	12	-.003	3	0	15	1.677e-5	15	NC	1	NC	1
333		15	max	0	1	.002	2	0	1	3.976e-4	1	NC	1	NC	1
334			min	0	12	-.002	3	0	15	1.677e-5	15	NC	1	NC	1
335		16	max	0	1	.002	2	0	1	3.976e-4	1	NC	1	NC	1
336			min	0	12	-.002	3	0	15	1.677e-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	3.976e-4	1	NC	1	NC	1
338			min	0	12	-.001	3	0	15	1.677e-5	15	NC	1	NC	1
339		18	max	0	1	0	2	0	1	3.976e-4	1	NC	1	NC	1
340			min	0	12	0	3	0	15	1.677e-5	15	NC	1	NC	1
341		19	max	0	1	0	1	0	1	3.976e-4	1	NC	1	NC	1
342			min	0	1	0	1	0	1	1.677e-5	15	NC	1	NC	1
343	M1	1	max	.008	3	.024	3	.003	3	9.345e-3	2	NC	1	NC	1
344			min	-.008	2	-.021	2	-.003	1	-1.312e-2	3	NC	1	NC	1
345		2	max	.008	3	.014	3	.002	3	4.582e-3	2	NC	4	NC	1
346			min	-.008	2	-.012	2	-.006	1	-6.483e-3	3	4897.869	3	NC	1
347		3	max	.008	3	.005	3	.002	3	2.839e-5	3	NC	4	NC	1
348			min	-.008	2	-.004	2	-.007	1	-3.541e-4	1	2537.459	3	NC	1
349		4	max	.008	3	.004	2	.001	3	3.06e-5	3	NC	4	NC	2
350			min	-.008	2	-.003	3	-.008	1	-3.035e-4	1	1808.585	3	8371.444	1
351		5	max	.008	3	.01	2	0	3	3.281e-5	3	NC	4	NC	2
352			min	-.008	2	-.009	3	-.008	1	-2.528e-4	1	1451.551	2	8064.196	1
353		6	max	.008	3	.015	2	0	3	3.502e-5	3	NC	4	NC	2
354			min	-.008	2	-.014	3	-.008	1	-2.022e-4	1	1232.757	2	8669.671	1
355		7	max	.008	3	.02	2	0	3	3.723e-5	3	NC	5	NC	1
356			min	-.008	2	-.018	3	-.007	1	-1.515e-4	1	1097.694	2	NC	1
357		8	max	.008	3	.023	2	0	3	3.944e-5	3	NC	5	NC	1
358			min	-.008	2	-.021	3	-.006	1	-1.009e-4	1	1012.833	2	NC	1
359		9	max	.008	3	.025	2	0	3	4.165e-5	3	NC	5	NC	1
360			min	-.008	2	-.022	3	-.004	1	-5.021e-5	1	962.332	2	NC	1
361		10	max	.008	3	.026	2	0	3	4.386e-5	3	NC	5	NC	1
362			min	-.008	2	-.023	3	-.002	1	-4.715e-6	9	938.618	2	NC	1
363		11	max	.008	3	.025	2	0	3	5.109e-5	1	NC	5	NC	1
364			min	-.008	2	-.022	3	0	1	1.881e-6	15	938.933	2	NC	1
365		12	max	.008	3	.024	2	.001	1	1.017e-4	1	NC	5	NC	1
366			min	-.008	2	-.02	3	0	15	4.013e-6	15	964.315	2	NC	1
367		13	max	.008	3	.021	2	.002	1	1.524e-4	1	NC	4	NC	1
368			min	-.008	2	-.017	3	0	15	6.145e-6	15	1020.175	2	NC	1
369		14	max	.008	3	.016	2	.003	1	2.03e-4	1	NC	4	NC	2
370			min	-.008	2	-.013	3	0	15	8.277e-6	15	1119.059	2	8841.282	1
371		15	max	.008	3	.01	2	.004	1	2.537e-4	1	NC	4	NC	2
372			min	-.008	2	-.008	3	0	15	1.041e-5	15	1288.552	2	8190.299	1
373		16	max	.008	3	.003	2	.004	1	2.89e-4	1	NC	4	NC	2
374			min	-.008	2	-.003	3	0	15	1.19e-5	15	1596.249	2	8474.505	1
375		17	max	.008	3	.004	3	.003	1	4.652e-5	3	NC	4	NC	1
376			min	-.008	2	-.006	2	0	15	-4.088e-5	1	2259.343	2	NC	1
377		18	max	.008	3	.012	3	.001	1	6.655e-3	2	NC	4	NC	1
378			min	-.008	2	-.016	2	0	15	-3.21e-3	3	4377.435	2	NC	1
379		19	max	.008	3	.02	3	0	3	1.342e-2	2	NC	1	NC	1
380			min	-.008	2	-.028	2	-.002	1	-6.527e-3	3	NC	1	NC	1
381	M5	1	max	.025	3	.077	3	.003	3	3.733e-6	3	NC	1	NC	1
382			min	-.029	2	-.069	2	-.003	1	0	2	NC	1	NC	1
383		2	max	.025	3	.046	3	.004	3	1.087e-4	3	NC	4	NC	1
384			min	-.029	2	-.04	2	-.003	1	-4.975e-5	1	1521.403	3	NC	1
385		3	max	.025	3	.016	3	.005	3	2.117e-4	3	NC	5	NC	1
386			min	-.029	2	-.013	2	-.003	1	-9.865e-5	1	788.479	3	NC	1
387		4	max	.025	3	.011	2	.006	3	2.048e-4	3	NC	5	NC	1
388			min	-.029	2	-.009	3	-.003	1	-9.4e-5	1	557.036	2	NC	1
389		5	max	.025	3	.032	2	.006	3	1.98e-4	3	NC	5	NC	1
390			min	-.029	2	-.029	3	-.003	1	-8.934e-5	1	440.466	2	NC	1
391		6	max	.025	3	.05	2	.007	3	1.912e-4	3	NC	5	NC	1
392			min	-.029	2	-.046	3	-.003	1	-8.469e-5	1	373.805	2	NC	1
393		7	max	.025	3	.064	2	.007	3	1.844e-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	-.029	2	-.058	3	-.003	1	-8.004e-5	1	332.631	2	9831.097	3
395		8	max	.025	3	.075	2	.007	3	1.776e-4	3	NC	5	NC	1
396			min	-.029	2	-.067	3	-.002	1	-7.538e-5	1	306.734	2	9689.752	3
397		9	max	.025	3	.082	2	.007	3	1.708e-4	3	NC	5	NC	1
398			min	-.029	2	-.071	3	-.002	1	-7.073e-5	1	291.288	2	9868.283	3
399		10	max	.025	3	.085	2	.006	3	1.64e-4	3	NC	5	NC	1
400			min	-.029	2	-.073	3	-.002	1	-6.607e-5	1	283.982	2	NC	1
401		11	max	.025	3	.084	2	.006	3	1.572e-4	3	NC	5	NC	1
402			min	-.029	2	-.07	3	-.002	1	-6.142e-5	1	283.97	2	NC	1
403		12	max	.025	3	.078	2	.005	3	1.504e-4	3	NC	5	NC	1
404			min	-.029	2	-.064	3	-.002	1	-5.676e-5	1	291.561	2	NC	1
405		13	max	.025	3	.068	2	.005	3	1.436e-4	3	NC	5	NC	1
406			min	-.029	2	-.055	3	-.002	1	-5.211e-5	1	308.389	2	NC	1
407		14	max	.024	3	.053	2	.004	3	1.368e-4	3	NC	5	NC	1
408			min	-.029	2	-.043	3	-.002	1	-4.745e-5	1	338.252	2	NC	1
409		15	max	.024	3	.034	2	.003	3	1.3e-4	3	NC	5	NC	1
410			min	-.029	2	-.027	3	-.002	1	-4.28e-5	1	389.515	2	NC	1
411		16	max	.024	3	.01	2	.002	3	1.189e-4	3	NC	5	NC	1
412			min	-.029	2	-.008	3	-.002	1	-4.145e-5	1	482.713	2	NC	1
413		17	max	.024	3	.014	3	.002	3	4.917e-6	3	NC	5	NC	1
414			min	-.029	2	-.02	2	-.002	1	-1.187e-4	1	684.175	2	NC	1
415		18	max	.024	3	.038	3	.001	3	1.094e-6	3	NC	4	NC	1
416			min	-.029	2	-.055	2	-.001	1	-6.067e-5	1	1326.479	2	NC	1
417		19	max	.024	3	.063	3	0	3	0	15	NC	1	NC	1
418			min	-.029	2	-.091	2	-.001	1	-6.541e-7	3	NC	1	NC	1
419	M9	1	max	.008	3	.024	3	.002	3	1.312e-2	3	NC	1	NC	1
420			min	-.008	2	-.021	2	-.003	1	-9.345e-3	2	NC	1	NC	1
421		2	max	.008	3	.014	3	.001	3	6.475e-3	3	NC	4	NC	1
422			min	-.008	2	-.012	2	0	9	-4.593e-3	2	4899.21	3	NC	1
423		3	max	.008	3	.005	3	.001	1	1.428e-4	1	NC	4	NC	1
424			min	-.008	2	-.004	2	0	3	-5.156e-5	3	2538.164	3	NC	1
425		4	max	.008	3	.003	2	.003	1	1.007e-4	1	NC	4	NC	1
426			min	-.008	2	-.003	3	-.001	3	-5.656e-5	3	1809.065	3	NC	1
427		5	max	.008	3	.01	2	.003	1	5.854e-5	1	NC	4	NC	1
428			min	-.008	2	-.009	3	-.002	3	-6.155e-5	3	1452.583	2	NC	1
429		6	max	.008	3	.015	2	.003	1	2.501e-5	2	NC	4	NC	1
430			min	-.008	2	-.014	3	-.003	3	-6.654e-5	3	1233.626	2	9986.386	3
431		7	max	.008	3	.02	2	.002	1	9.773e-6	2	NC	5	NC	1
432			min	-.008	2	-.018	3	-.003	3	-7.154e-5	3	1098.458	2	9069.658	3
433		8	max	.008	3	.023	2	0	2	7.691e-7	10	NC	5	NC	1
434			min	-.008	2	-.021	3	-.004	3	-7.653e-5	3	1013.528	2	8542.368	3
435		9	max	.008	3	.025	2	0	2	-2.527e-6	10	NC	5	NC	1
436			min	-.008	2	-.023	3	-.004	3	-1.1e-4	1	962.981	2	8288.424	3
437		10	max	.008	3	.026	2	0	10	-5.824e-6	10	NC	5	NC	1
438			min	-.008	2	-.023	3	-.004	3	-1.521e-4	1	939.239	2	8256.678	3
439		11	max	.008	3	.025	2	0	10	-8.562e-6	15	NC	5	NC	1
440			min	-.008	2	-.022	3	-.004	3	-1.942e-4	1	939.543	2	8435.141	3
441		12	max	.008	3	.024	2	0	15	-1.035e-5	15	NC	5	NC	1
442			min	-.008	2	-.02	3	-.005	1	-2.364e-4	1	964.928	2	8844.91	3
443		13	max	.008	3	.021	2	0	15	-1.213e-5	15	NC	4	NC	2
444			min	-.008	2	-.017	3	-.006	1	-2.785e-4	1	1020.81	2	9300.943	1
445		14	max	.008	3	.016	2	0	15	-1.392e-5	15	NC	4	NC	2
446			min	-.008	2	-.013	3	-.007	1	-3.206e-4	1	1119.738	2	8064.802	1
447		15	max	.008	3	.01	2	0	15	-1.57e-5	15	NC	4	NC	2
448			min	-.008	2	-.008	3	-.007	1	-3.628e-4	1	1289.313	2	7680.239	1
449		16	max	.008	3	.003	2	0	15	-1.706e-5	15	NC	4	NC	2
450			min	-.008	2	-.003	3	-.007	1	-3.952e-4	1	1597.158	2	8090.433	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	5.639e-5	3	NC	4	NC	2
452			min	-.008	2	-.006	2	-.006	1	-1.972e-4	1	2260.545	2	9855.07	1
453		18	max	.008	3	.012	3	0	15	3.262e-3	3	NC	4	NC	1
454			min	-.008	2	-.016	2	-.004	1	-6.666e-3	2	4379.691	2	NC	1
455		19	max	.008	3	.02	3	0	3	6.525e-3	3	NC	1	NC	1
456			min	-.008	2	-.028	2	-.001	1	-1.342e-2	2	NC	1	NC	1
457	M13	1	max	.003	1	.024	3	.008	3	3.701e-3	3	NC	1	NC	1
458			min	-.002	3	-.021	2	-.008	2	-3.337e-3	2	NC	1	NC	1
459		2	max	.003	1	.112	3	.01	1	4.619e-3	3	NC	4	NC	2
460			min	-.002	3	-.084	2	-.004	10	-4.185e-3	2	1419.585	3	8667.75	1
461		3	max	.003	1	.186	3	.029	1	5.537e-3	3	NC	5	NC	2
462			min	-.002	3	-.137	2	-.003	10	-5.032e-3	2	777.29	3	3812.011	1
463		4	max	.003	1	.233	3	.044	1	6.455e-3	3	NC	5	NC	3
464			min	-.002	3	-.171	2	-.003	10	-5.88e-3	2	601.142	3	2638.853	1
465		5	max	.003	1	.25	3	.049	1	7.373e-3	3	NC	5	NC	3
466			min	-.003	3	-.184	2	-.004	10	-6.728e-3	2	556.864	3	2345.102	1
467		6	max	.003	1	.236	3	.045	1	8.29e-3	3	NC	5	NC	2
468			min	-.003	3	-.176	2	-.006	10	-7.576e-3	2	592.793	3	2570.595	1
469		7	max	.003	1	.198	3	.03	1	9.208e-3	3	NC	5	NC	2
470			min	-.003	3	-.151	2	-.009	10	-8.424e-3	2	722.68	3	3648.046	1
471		8	max	.003	1	.147	3	.02	3	1.013e-2	3	NC	5	NC	2
472			min	-.003	3	-.116	2	-.016	2	-9.272e-3	2	1024.431	3	8768.464	9
473		9	max	.003	1	.099	3	.023	3	1.104e-2	3	NC	4	NC	1
474			min	-.003	3	-.084	2	-.025	2	-1.012e-2	2	1674.197	3	7724.052	2
475		10	max	.003	1	.077	3	.025	3	1.196e-2	3	NC	4	NC	4
476			min	-.003	3	-.069	2	-.029	2	-1.097e-2	2	2361.285	3	6156.608	2
477		11	max	.003	1	.099	3	.028	3	1.105e-2	3	NC	4	NC	1
478			min	-.003	3	-.084	2	-.025	2	-1.012e-2	2	1674.195	3	6460.015	3
479		12	max	.003	1	.147	3	.029	3	1.013e-2	3	NC	5	NC	2
480			min	-.003	3	-.116	2	-.015	2	-9.272e-3	2	1024.43	3	6117.822	3
481		13	max	.003	1	.198	3	.03	1	9.212e-3	3	NC	5	NC	2
482			min	-.003	3	-.151	2	-.009	10	-8.424e-3	2	722.679	3	3630.248	1
483		14	max	.003	1	.236	3	.045	1	8.296e-3	3	NC	5	NC	2
484			min	-.003	3	-.176	2	-.006	10	-7.577e-3	2	592.793	3	2567.875	1
485		15	max	.003	1	.25	3	.049	1	7.38e-3	3	NC	5	NC	5
486			min	-.003	3	-.184	2	-.004	10	-6.729e-3	2	556.863	3	2348.787	1
487		16	max	.003	1	.234	3	.043	1	6.463e-3	3	NC	5	NC	3
488			min	-.003	3	-.171	2	-.003	10	-5.882e-3	2	601.142	3	2649.868	1
489		17	max	.003	1	.186	3	.029	1	5.547e-3	3	NC	5	NC	2
490			min	-.003	3	-.137	2	-.003	10	-5.034e-3	2	777.289	3	3841.031	1
491		18	max	.003	1	.113	3	.011	3	4.63e-3	3	NC	4	NC	2
492			min	-.003	3	-.084	2	-.004	10	-4.186e-3	2	1419.585	3	8786.945	1
493		19	max	.003	1	.024	3	.008	3	3.714e-3	3	NC	1	NC	1
494			min	-.003	3	-.021	2	-.008	2	-3.339e-3	2	NC	1	NC	1
495	M16	1	max	.001	1	.02	3	.008	3	4.195e-3	2	NC	1	NC	1
496			min	0	3	-.028	2	-.008	2	-2.991e-3	3	NC	1	NC	1
497		2	max	.001	1	.064	3	.011	3	5.269e-3	2	NC	4	NC	2
498			min	0	3	-.118	2	-.004	10	-3.713e-3	3	1387.222	2	8676.481	1
499		3	max	.001	1	.101	3	.029	1	6.344e-3	2	NC	5	NC	2
500			min	0	3	-.194	2	-.003	10	-4.434e-3	3	758.429	2	3815.125	1
501		4	max	.001	1	.126	3	.043	1	7.418e-3	2	NC	5	NC	3
502			min	0	3	-.243	2	-.003	10	-5.155e-3	3	584.975	2	2640.963	1
503		5	max	.001	1	.136	3	.049	1	8.492e-3	2	NC	5	NC	5
504			min	0	3	-.261	2	-.004	10	-5.876e-3	3	539.476	2	2347.253	1
505		6	max	.001	1	.132	3	.044	1	9.566e-3	2	NC	5	NC	2
506			min	0	3	-.249	2	-.006	10	-6.598e-3	3	570.024	2	2573.814	1
507		7	max	.001	1	.116	3	.03	1	1.064e-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	-.211	2	-.009	10	-7.319e-3	3	685.816	2	3656.036	1
509		8	max	.001	1	.094	3	.026	3	1.171e-2	2	NC	5	NC	2
510			min	0	3	-.16	2	-.015	2	-8.04e-3	3	947.793	2	6757.46	3
511		9	max	.001	1	.072	3	.026	3	1.279e-2	2	NC	4	NC	1
512			min	0	3	-.113	2	-.025	2	-8.761e-3	3	1473.604	2	7047.264	3
513		10	max	.001	1	.063	3	.024	3	1.386e-2	2	NC	4	NC	4
514			min	0	3	-.091	2	-.029	2	-9.483e-3	3	1978.372	2	6184.787	2
515		11	max	.001	1	.072	3	.023	3	1.279e-2	2	NC	4	NC	1
516			min	0	3	-.113	2	-.025	2	-8.76e-3	3	1473.604	2	7770.614	2
517		12	max	.001	1	.094	3	.022	3	1.172e-2	2	NC	5	NC	2
518			min	0	3	-.16	2	-.015	2	-8.037e-3	3	947.793	2	8716.968	9
519		13	max	.001	1	.116	3	.03	1	1.064e-2	2	NC	5	NC	2
520			min	0	3	-.211	2	-.009	10	-7.315e-3	3	685.816	2	3650.115	1
521		14	max	.002	1	.132	3	.044	1	9.567e-3	2	NC	5	NC	2
522			min	0	3	-.249	2	-.006	10	-6.592e-3	3	570.024	2	2577.583	1
523		15	max	.002	1	.136	3	.049	1	8.493e-3	2	NC	5	NC	3
524			min	0	3	-.261	2	-.004	10	-5.87e-3	3	539.476	2	2356.263	1
525		16	max	.002	1	.126	3	.043	1	7.419e-3	2	NC	5	NC	3
526			min	0	3	-.243	2	-.003	10	-5.147e-3	3	584.975	2	2657.96	1
527		17	max	.002	1	.101	3	.028	1	6.346e-3	2	NC	5	NC	2
528			min	0	3	-.194	2	-.003	10	-4.424e-3	3	758.43	2	3853.733	1
529		18	max	.002	1	.064	3	.01	1	5.272e-3	2	NC	4	NC	2
530			min	0	3	-.118	2	-.004	10	-3.702e-3	3	1387.222	2	8823.856	1
531		19	max	.002	1	.02	3	.008	3	4.198e-3	2	NC	1	NC	1
532			min	0	3	-.028	2	-.008	2	-2.979e-3	3	NC	1	NC	1
533	M15	1	max	0	1	0	1	0	1	3.825e-4	3	NC	1	NC	1
534			min	0	1	0	1	0	1	-5.472e-5	2	NC	1	NC	1
535		2	max	0	3	-.001	15	0	1	8.366e-4	3	NC	1	NC	1
536			min	0	2	-.006	4	0	3	-5.154e-4	2	NC	1	NC	1
537		3	max	0	3	-.003	15	.003	1	1.291e-3	3	NC	3	NC	1
538			min	0	2	-.012	4	-.003	3	-9.76e-4	2	6143.049	4	NC	1
539		4	max	0	3	-.004	15	.006	1	1.745e-3	3	NC	5	NC	4
540			min	0	2	-.018	4	-.007	3	-1.437e-3	2	4214.49	4	6089.567	3
541		5	max	0	3	-.005	15	.01	1	2.199e-3	3	NC	15	NC	4
542			min	0	2	-.023	4	-.012	3	-1.897e-3	2	3288.61	4	4010.748	3
543		6	max	0	3	-.006	15	.015	1	2.653e-3	3	NC	15	NC	4
544			min	0	2	-.027	4	-.017	3	-2.358e-3	2	2767.713	4	2927.382	3
545		7	max	0	3	-.007	15	.019	1	3.107e-3	3	NC	15	NC	4
546			min	-.001	2	-.031	4	-.022	3	-2.819e-3	2	2454.462	4	2292.459	3
547		8	max	0	3	-.008	15	.024	1	3.561e-3	3	9641.864	15	NC	4
548			min	-.001	2	-.033	4	-.027	3	-3.279e-3	2	2266.464	4	1892.708	3
549		9	max	0	3	-.008	15	.027	1	4.016e-3	3	9211.381	15	NC	4
550			min	-.001	2	-.035	4	-.032	3	-3.74e-3	2	2165.273	4	1630.853	3
551		10	max	0	3	-.008	15	.031	1	4.47e-3	3	9075.197	15	NC	4
552			min	-.002	2	-.035	4	-.036	3	-4.201e-3	2	2133.261	4	1457.957	3
553		11	max	0	3	-.008	15	.033	1	4.924e-3	3	9211.381	15	NC	5
554			min	-.002	2	-.035	4	-.038	3	-4.661e-3	2	2165.273	4	1348.307	3
555		12	max	0	3	-.008	15	.033	1	5.378e-3	3	9641.864	15	NC	5
556			min	-.002	2	-.033	4	-.039	3	-5.122e-3	2	2266.464	4	1289.164	3
557		13	max	.001	3	-.007	15	.033	1	5.832e-3	3	NC	15	NC	5
558			min	-.002	2	-.031	4	-.038	3	-5.583e-3	2	2454.462	4	1276.895	3
559		14	max	.001	3	-.006	15	.03	1	6.286e-3	3	NC	15	NC	5
560			min	-.002	2	-.028	4	-.034	3	-6.043e-3	2	2767.713	4	1317.157	3
561		15	max	.001	3	-.005	15	.025	1	6.74e-3	3	NC	15	NC	4
562			min	-.003	2	-.023	4	-.028	3	-6.504e-3	2	3288.61	4	1430.486	3
563		16	max	.001	3	-.004	15	.018	1	7.195e-3	3	NC	5	NC	4
564			min	-.003	2	-.018	4	-.019	3	-6.965e-3	2	4214.49	4	1672.559	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	-.003	15	.007	1	7.649e-3	3	NC	3	NC	4
566			min	-.003	2	-.013	4	-.006	3	-7.425e-3	2	6143.049	4	2217.971	3
567		18	max	.001	3	0	2	.01	3	8.103e-3	3	NC	1	NC	4
568			min	-.003	2	-.007	4	-.013	2	-7.886e-3	2	NC	1	3949.863	3
569		19	max	.002	3	.005	2	.031	3	8.557e-3	3	NC	1	NC	1
570			min	-.003	2	-.002	9	-.031	2	-8.347e-3	2	NC	1	NC	1
571	M16A	1	max	0	10	0	10	.009	3	2.477e-3	3	NC	1	NC	1
572			min	-.001	3	-.001	9	-.009	2	-2.427e-3	2	NC	1	NC	1
573		2	max	0	10	-.002	15	.002	3	2.381e-3	3	NC	1	NC	1
574			min	-.001	3	-.007	4	-.003	2	-2.319e-3	2	NC	1	NC	1
575		3	max	0	10	-.003	15	.006	1	2.284e-3	3	NC	3	NC	4
576			min	-.001	3	-.013	4	-.003	3	-2.212e-3	2	6143.049	4	6352.551	3
577		4	max	0	10	-.004	15	.01	1	2.187e-3	3	NC	5	NC	4
578			min	-.001	3	-.018	4	-.008	3	-2.104e-3	2	4214.49	4	4838.182	3
579		5	max	0	10	-.005	15	.013	1	2.091e-3	3	NC	15	NC	4
580			min	-.001	3	-.023	4	-.01	3	-1.996e-3	2	3288.61	4	4185.036	3
581		6	max	0	10	-.006	15	.014	1	1.994e-3	3	NC	15	NC	4
582			min	-.001	3	-.027	4	-.012	3	-1.888e-3	2	2767.713	4	3904.019	3
583		7	max	0	10	-.007	15	.015	1	1.897e-3	3	NC	15	NC	4
584			min	0	3	-.031	4	-.013	3	-1.78e-3	2	2454.462	4	3842.524	3
585		8	max	0	10	-.008	15	.015	1	1.801e-3	3	9641.864	15	NC	4
586			min	0	3	-.033	4	-.013	3	-1.672e-3	2	2266.464	4	3949.423	3
587		9	max	0	10	-.008	15	.014	1	1.704e-3	3	9211.381	15	NC	4
588			min	0	3	-.035	4	-.012	3	-1.564e-3	2	2165.273	4	4219.921	3
589		10	max	0	10	-.008	15	.013	1	1.607e-3	3	9075.197	15	NC	4
590			min	0	3	-.035	4	-.011	3	-1.457e-3	2	2133.261	4	4683.578	3
591		11	max	0	10	-.008	15	.011	1	1.511e-3	3	9211.381	15	NC	4
592			min	0	3	-.035	4	-.01	3	-1.349e-3	2	2165.273	4	5411.817	3
593		12	max	0	10	-.008	15	.009	1	1.414e-3	3	9641.864	15	NC	4
594			min	0	3	-.033	4	-.008	3	-1.241e-3	2	2266.464	4	6547.293	3
595		13	max	0	10	-.007	15	.007	1	1.318e-3	3	NC	15	NC	2
596			min	0	3	-.03	4	-.006	3	-1.133e-3	2	2454.462	4	8333.846	1
597		14	max	0	10	-.006	15	.005	1	1.221e-3	3	NC	15	NC	1
598			min	0	3	-.027	4	-.004	3	-1.025e-3	2	2767.713	4	NC	1
599		15	max	0	10	-.005	15	.003	1	1.124e-3	3	NC	15	NC	1
600			min	0	3	-.023	4	-.002	3	-9.172e-4	2	3288.61	4	NC	1
601		16	max	0	10	-.004	15	.002	1	1.028e-3	3	NC	5	NC	1
602			min	0	3	-.018	4	0	3	-8.094e-4	2	4214.49	4	NC	1
603		17	max	0	10	-.003	15	0	14	9.309e-4	3	NC	3	NC	1
604			min	0	3	-.012	4	0	2	-7.015e-4	2	6143.049	4	NC	1
605		18	max	0	10	-.001	15	0	3	8.343e-4	3	NC	1	NC	1
606			min	0	3	-.006	4	0	2	-5.936e-4	2	NC	1	NC	1
607		19	max	0	1	0	1	0	1	7.376e-4	3	NC	1	NC	1
608			min	0	1	0	1	0	1	-4.858e-4	2	NC	1	NC	1

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

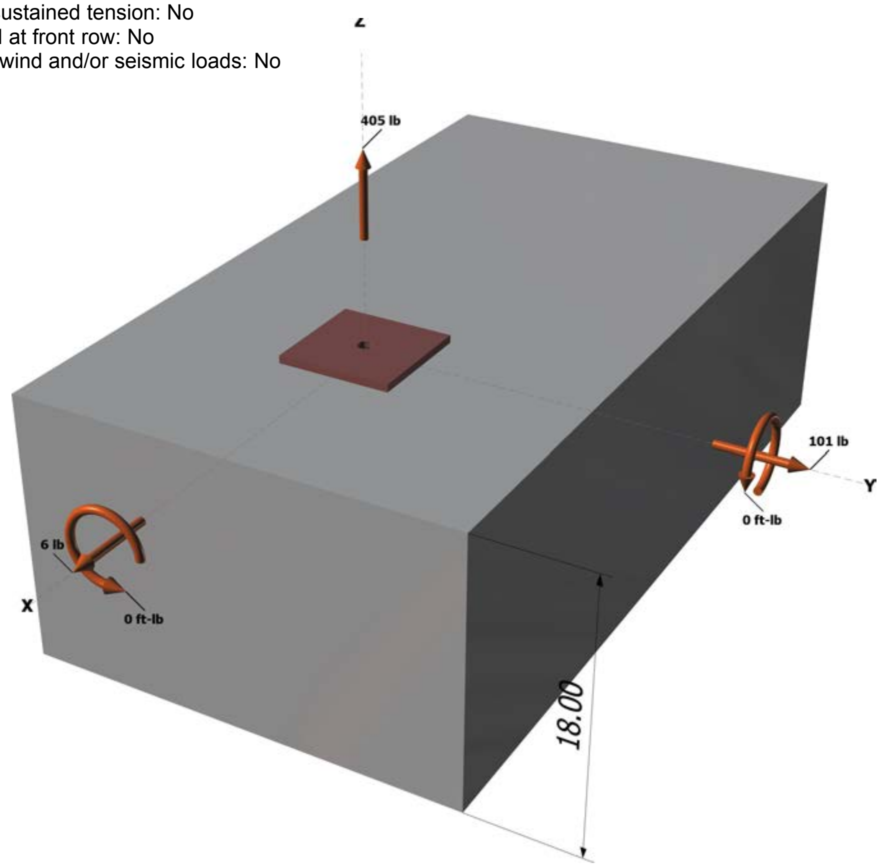
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

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

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

<Figure 1>



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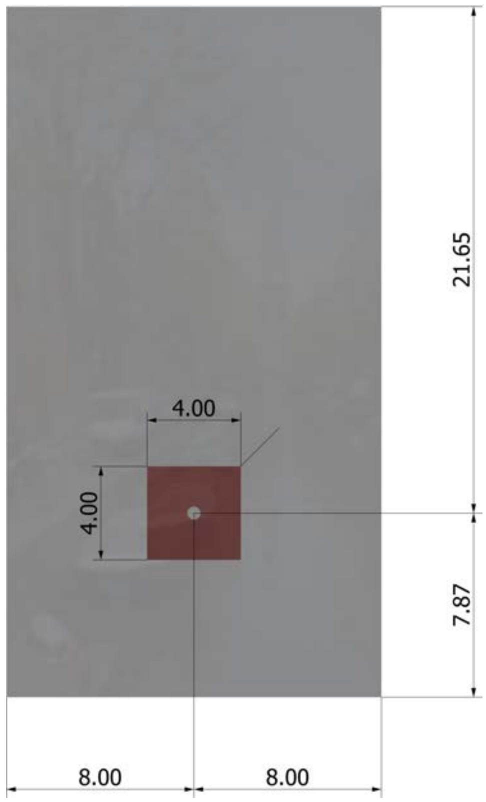


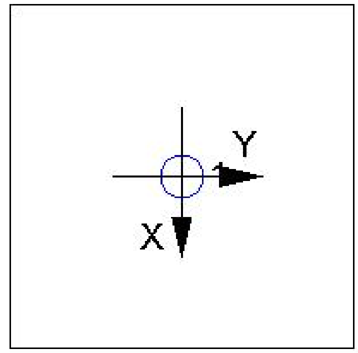
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

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

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

<Figure 3>



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in y-direction:

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

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

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

Shear parallel to edge in x-direction:

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

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

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

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

Shear parallel to edge in y-direction:

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

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

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

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

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

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

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

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

11. Results

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

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

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

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

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

12. Warnings

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

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

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

Anchor Designer™
Software
Version 2.4.5673.0

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

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

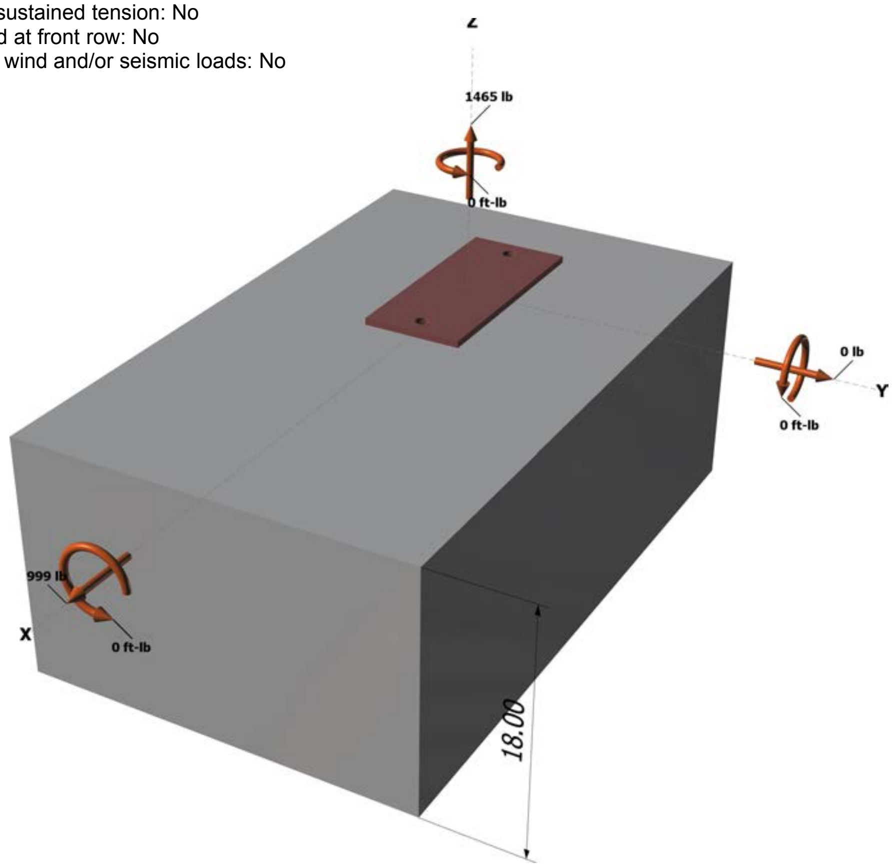
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

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

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

<Figure 1>



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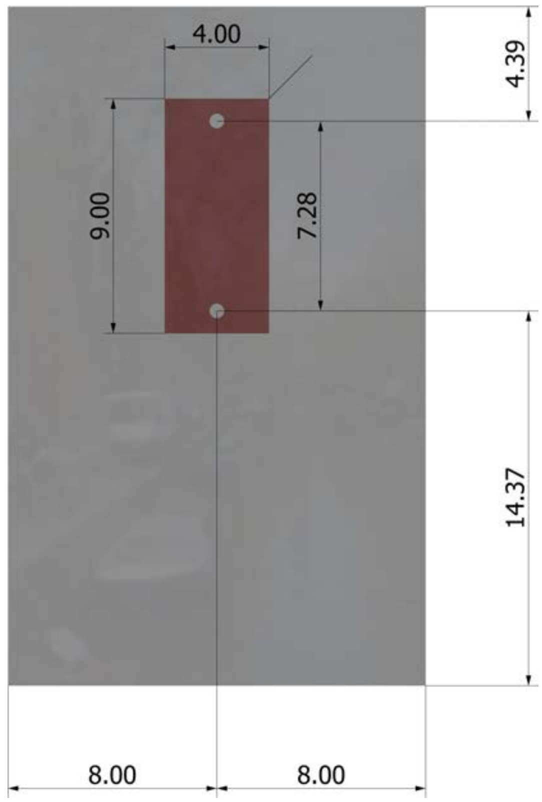


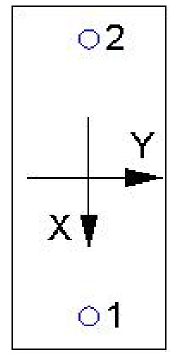
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

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

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

<Figure 3>



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

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

Shear parallel to edge in x-direction:

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

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

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

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

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

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

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

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

ϕV_{cpg} (lb)
15580

11. Results

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

Tension	Factored Load, N_{ua} (lb)	Design Strength, $øN_n$ (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, $øV_n$ (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.