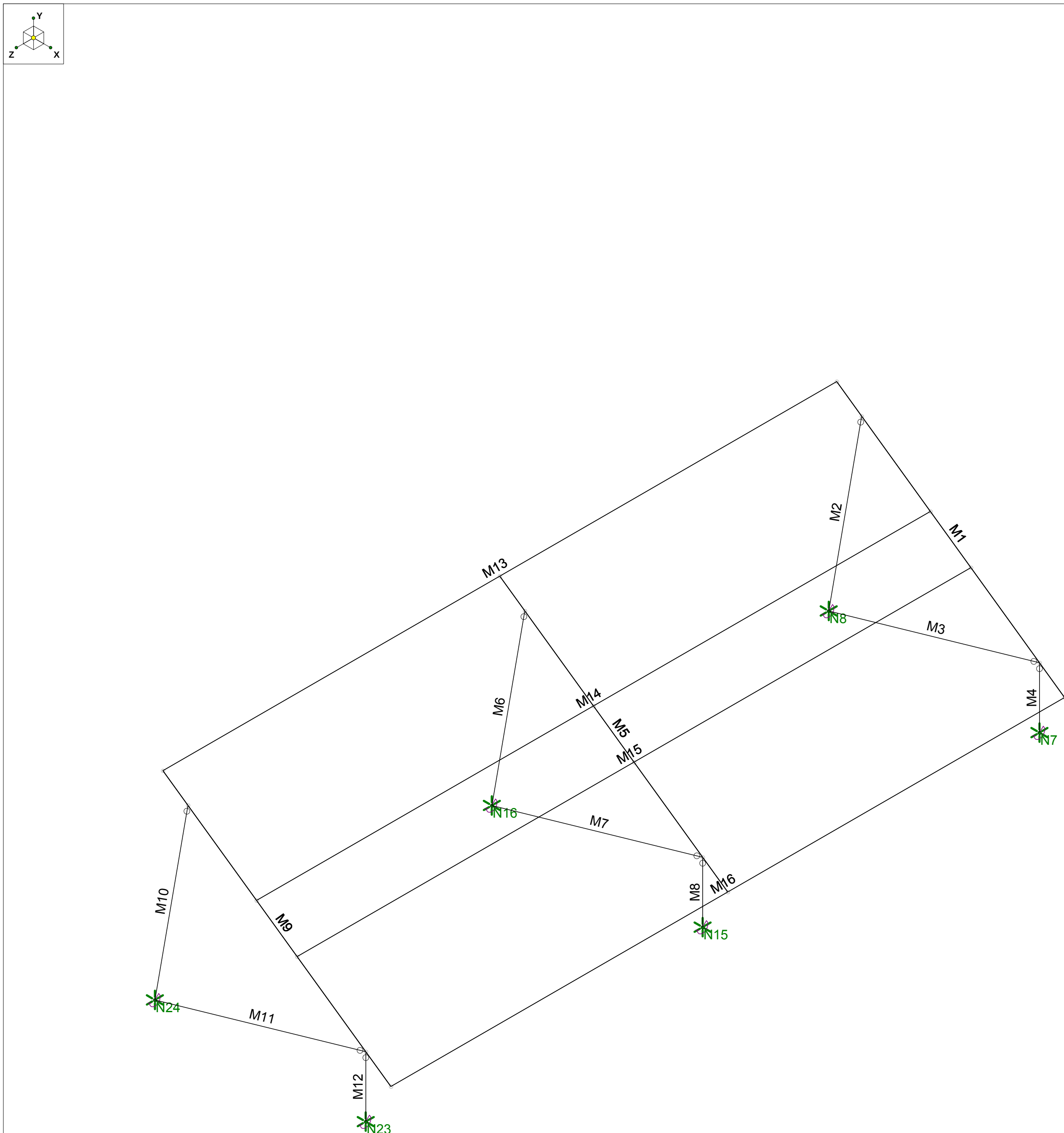


Schletter, Inc.	Standard PVMax Racking System	35° Tilt w/o Seismic Design
HCV	Representative Calculations - ASCE 7-05	

1. INTRODUCTION

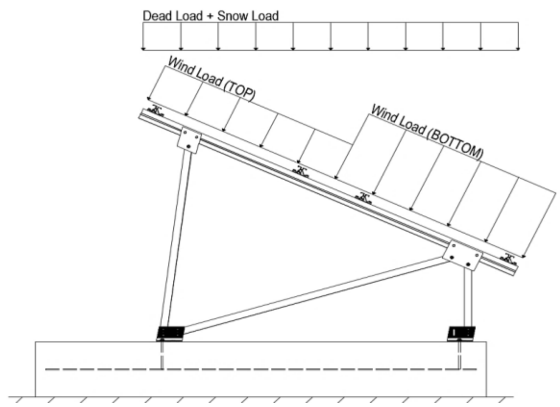
1.1 Project Description
The following sections will cover the determination of forces and structural design calculations for the Schletter, Inc. PVMax ground mount system.

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 = 2
Module Tilt = 35°
Maximum Height Above Grade = 3 ft



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

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

2. LOAD ACTIONS

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

Self-weight of the PV modules.

2.2 Snow Loads
Ground Snow Load, P_g = 30.00 psf
Sloped Roof Snow Load, P_s = 14.43 psf *(ASCE 7-05, Eq. 7-2)*
I_s = 1.00
C_s = 0.64
C_e = 0.90
C_t = 1.20

2.3 Wind Loads
Design Wind Speed, V = 120 mph
Height < 15 ft

Exposure Category = C
Importance Category = II

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

Pressure Coefficients

$Cf+_{TOP}$	=	1.200	*(Pressure)*
$Cf+_{BOTTOM}$	=	2.000	
$Cf-_{TOP, OUTER PURLIN}$	=	-2.700	
$Cf-_{TOP, INNER PURLIN}$	=	-2.100	*(Suction)*
$Cf-_{BOTTOM}$	=	-1.200	

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

2.4 Seismic Loads - N/A

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

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

2.5 Combination of Loads

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

Strength Design, LRFD

Component stresses are checked using the following LRFD load combinations:

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

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

Allowable Stress Design, ASD

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

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

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

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

3. STRUCTURAL ANALYSIS

3.1 RISA Results

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

3.2 RISA Components

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

Purlins	Location	**Diagonal Struts**	Location	**Front Reactions**	Location
M13	Top	M3	Outer	N7	Outer
M14	Mid-Top	M7	Inner	N15	Inner
M15	Mid-Bottom	M11	Outer	N23	Outer
M16	Bottom				

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

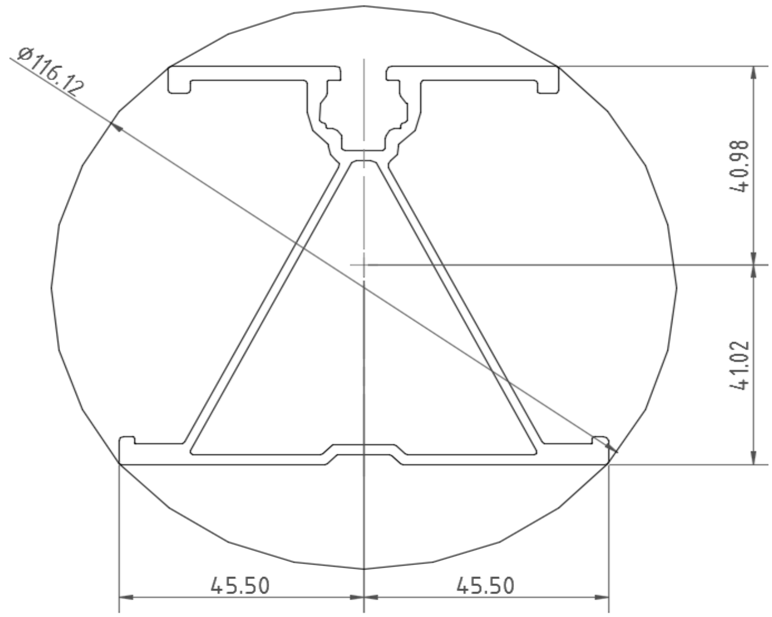
Front Struts	Location
M4	Outer
M8	Inner
M12	Outer

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 =	**S1.5**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	84	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	25.07	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	23.08	ksi
S_y =	1.33	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	2.16	in^4
I_x =	1.07	in^4
A =	1.25	in^2
g =	1.50	lbs/ft
M_y =	-1.617	k-ft
M_z =	0.000	k-ft
$M_{y\ allowable}$ =	2.779	k-ft
$M_{z\ allowable}$ =	1.154	k-ft
Utilization =	58%	

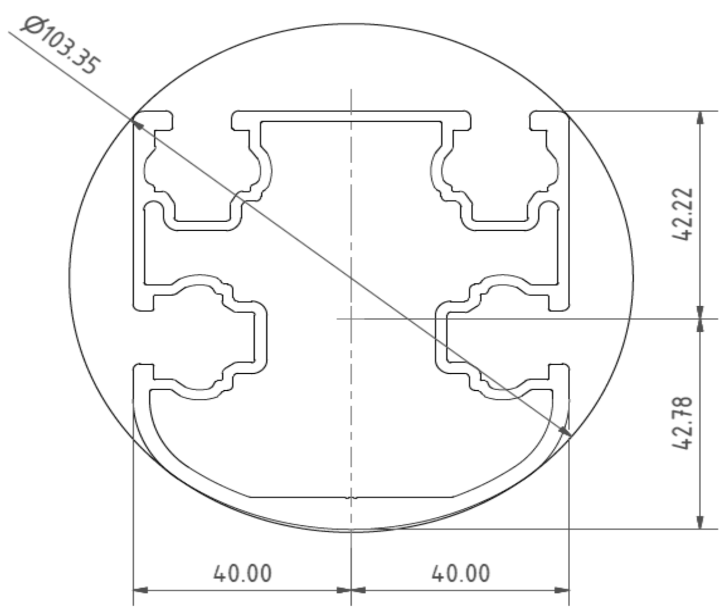


DETAIL VIEW

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).

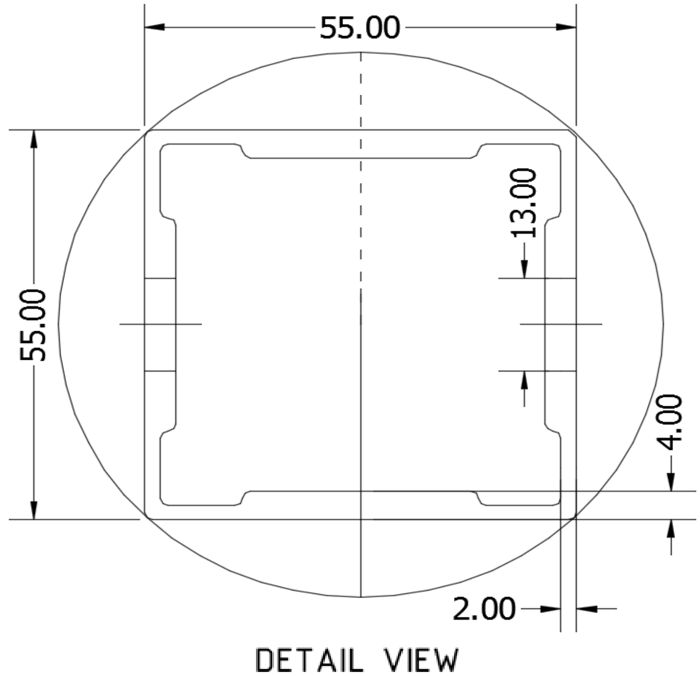
Girder Type =	**BF0**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	88.90	in
$\Phi F_{ty\ AXIAL}$ =	31.09	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.35	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	33.25	ksi
S_y =	1.42	in^3
S_x =	1.41	in^3
E =	10100	ksi
I_y =	2.39	in^4
I_x =	2.22	in^4
A =	1.88	in^2
g =	2.26	lbs/ft
M_y =	-2.633	k-ft
M_z =	0.000	k-ft
P_n =	-0.966	k
$M_{y\ allowable}$ =	3.464	k-ft
$M_{z\ allowable}$ =	3.907	k-ft
$P_{n\ allowable}$ =	58.535	k
Utilization =	78%	



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 M12 bolts at each end. See Appendix A.3 for detailed member calculations. Section units are in (mm).

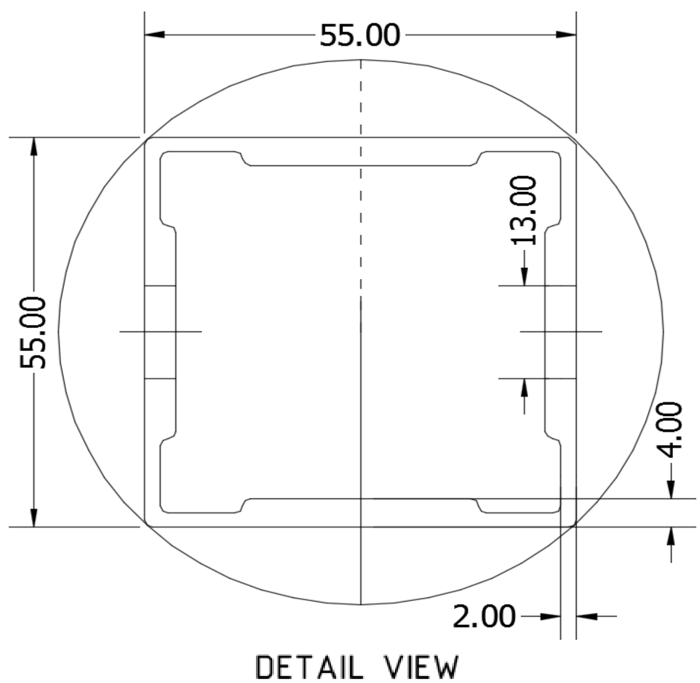
Strut Type =	<u>55x55</u>	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	<u>24.80</u>	in
$\Phi F_{ty\ AXIAL}$ =	28.03	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	1.838	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	27.532	k
Utilization =	<u>7%</u>	



4.4 Diagonal Strut Design

A diagonal aluminum strut braces the support structure. It connects at a front portion of the girder and transfers horizontal forces to the rear foundation connection. The strut is attached with single M12 bolts at each end. See Appendix A.4 for detailed member calculations. Section units are in (mm).

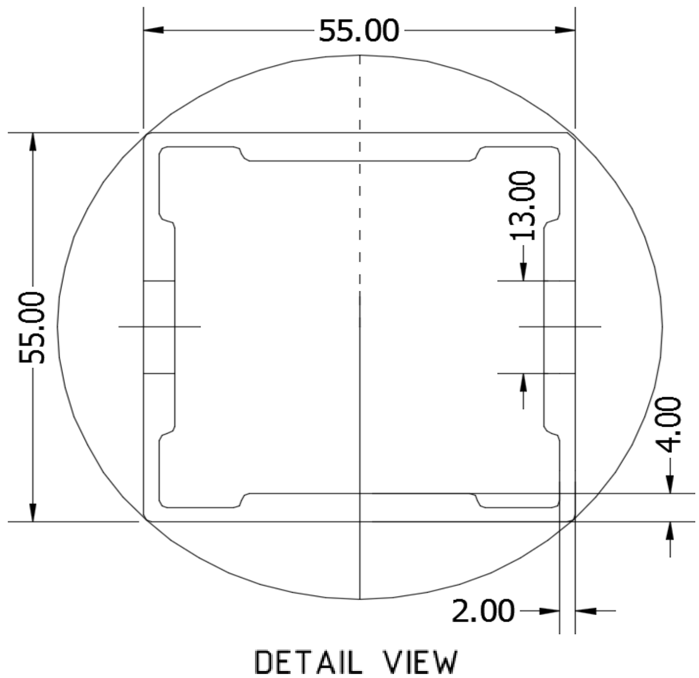
Strut Type =	<u>55x55</u>	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	<u>86.60</u>	in
$\Phi F_{ty\ AXIAL}$ =	7.50	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.009	k-ft
M_z =	0.000	k-ft
P_n =	2.811	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	7.371	k
Utilization =	<u>39%</u>	



4.5 Rear Strut Design

An aluminum strut connects the rear portion of the girder to the rear foundation connection. Both vertical and horizontal forces are transferred from the girder. The strut is attached with single M12 bolts at each end. See Appendix A.5 for detailed member calculations. Section units are in (mm).

Strut Type =	55x55	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	78.03	in
$\Phi F_{ty\ AXIAL}$ =	8.94	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	-0.009	k-ft
M_z =	0.000	k-ft
P_n =	2.908	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	8.786	k
Utilization =	34%	



5. FOUNDATION DESIGN CALCULATIONS

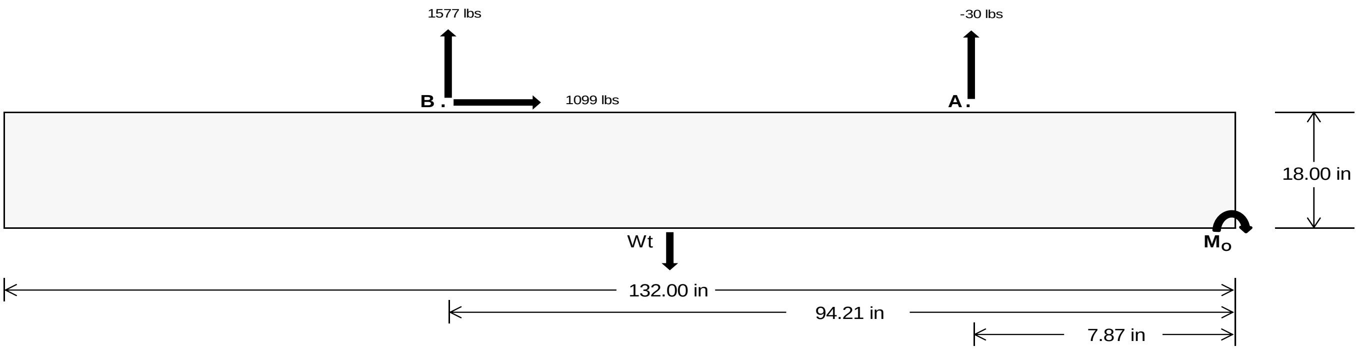
5.1 Helical Pile Foundations

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 =	68.97	6565.48	k
Compressive Load =	2389.05	4739.66	k
Lateral Load =	7.28	4573.21	k
Moment (Weak Axis) =	0.01	0.00	k

5.2 Design of Ballast Foundations

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



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

Footing Reinforcement
Use fiber reinforcing with (2) #5 rebar.

Overturning Check
M_O = 168101.3 in-lbs
Resisting Force Required = 2546.99 lbs
S.F. = 1.67
Weight Required = 4244.98 lbs
Minimum Width = 33 in in
Weight Provided = 6579.38 lbs

A minimum 132in long x 33in wide x 18in tall ballast foundation is required to resist overturning.

Sliding
Force = 1099.37 lbs
Friction = 0.4
Weight Required = 2748.44 lbs
Resisting Weight = 6579.38 lbs
Additional Weight Required = 0 lbs

Use a 132in long x 33in wide x 18in tall ballast foundation to resist sliding. Friction is OK.

Cohesion
Sliding Force = 1099.37 lbs
Cohesion = 130 psf
Area = 30.25 ft^2
Resisting = 3289.69 lbs
Additional Weight Required = 0 lbs

Use a 132in long x 33in 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			
	33 in	34 in	35 in	36 in
P_{ftg} = (145 pcf)(11 ft)(1.5 ft)(2.75 ft) =	6579 lbs	6779 lbs	6978 lbs	7178 lbs

ASD LC	1.0D + 1.0S				1.0D + 1.0W				1.0D + 0.75L + 0.75W + 0.75S				0.6D + 1.0W			
Width	33 in	34 in	35 in	36 in	33 in	34 in	35 in	36 in	33 in	34 in	35 in	36 in	33 in	34 in	35 in	36 in
F_A	760 lbs	760 lbs	760 lbs	760 lbs	1019 lbs	1019 lbs	1019 lbs	1019 lbs	1238 lbs	1238 lbs	1238 lbs	1238 lbs	61 lbs	61 lbs	61 lbs	61 lbs
F_B	667 lbs	667 lbs	667 lbs	667 lbs	2164 lbs	2164 lbs	2164 lbs	2164 lbs	2039 lbs	2039 lbs	2039 lbs	2039 lbs	-3154 lbs	-3154 lbs	-3154 lbs	-3154 lbs
F_V	106 lbs	106 lbs	106 lbs	106 lbs	1985 lbs	1985 lbs	1985 lbs	1985 lbs	1556 lbs	1556 lbs	1556 lbs	1556 lbs	-2199 lbs	-2199 lbs	-2199 lbs	-2199 lbs
P_{total}	8006 lbs	8206 lbs	8405 lbs	8605 lbs	9763 lbs	9962 lbs	10162 lbs	10361 lbs	9857 lbs	10056 lbs	10256 lbs	10455 lbs	855 lbs	974 lbs	1094 lbs	1214 lbs
M	2270 lbs-ft	2270 lbs-ft	2270 lbs-ft	2270 lbs-ft	2826 lbs-ft	2826 lbs-ft	2826 lbs-ft	2826 lbs-ft	3538 lbs-ft	3538 lbs-ft	3538 lbs-ft	3538 lbs-ft	4410 lbs-ft	4410 lbs-ft	4410 lbs-ft	4410 lbs-ft
e	0.28 ft	0.28 ft	0.27 ft	0.26 ft	0.29 ft	0.28 ft	0.28 ft	0.27 ft	0.36 ft	0.35 ft	0.34 ft	0.34 ft	5.16 ft	4.53 ft	4.03 ft	3.63 ft
L/6	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft
f_{min}	223.7 psf	223.6 psf	223.4 psf	223.2 psf	271.8 psf	270.2 psf	268.7 psf	267.3 psf	262.1 psf	260.7 psf	259.5 psf	258.3 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	305.6 psf	303.0 psf	300.6 psf	298.3 psf	373.7 psf	369.1 psf	364.8 psf	360.7 psf	389.6 psf	384.6 psf	379.8 psf	375.3 psf	608.2 psf	235.4 psf	170.3 psf	144.5 psf

Maximum Bearing Pressure = 608 psf
Allowable Bearing Pressure = 1500 psf

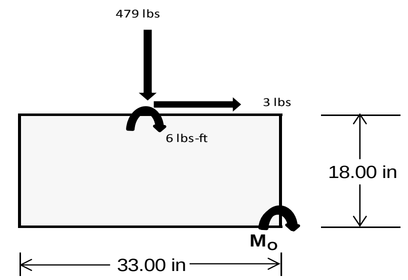
Use a 132in long x 33in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O =	647.5 ft-lbs
Resisting Force Required =	470.90 lbs
S.F. =	1.67
Weight Required =	784.84 lbs
Minimum Width =	33 in in
Weight Provided =	6579.38 lbs

A minimum 132in long x 33in 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	33 in			33 in			33 in		
Support	Outer	Inner	Outer	Outer	Inner	Outer	Outer	Inner	Outer
F_Y	196 lbs	446 lbs	196 lbs	479 lbs	1225 lbs	479 lbs	57 lbs	131 lbs	57 lbs
F_V	1 lbs	0 lbs	1 lbs	3 lbs	0 lbs	3 lbs	0 lbs	0 lbs	0 lbs
P_{total}	8341 lbs	6579 lbs	8341 lbs	8232 lbs	6579 lbs	8232 lbs	2439 lbs	6579 lbs	2439 lbs
M	4 lbs-ft	0 lbs-ft	4 lbs-ft	11 lbs-ft	0 lbs-ft	11 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	0.46 ft	0.46 ft	0.46 ft	0.46 ft	0.46 ft	0.46 ft	0.46 ft	0.46 ft	0.46 ft
f_{min}	275.5 psf	217.5 psf	275.5 psf	271.4 psf	217.5 psf	271.4 psf	80.6 psf	217.5 psf	80.6 psf
f_{max}	276.0 psf	217.5 psf	276.0 psf	272.9 psf	217.5 psf	272.9 psf	80.7 psf	217.5 psf	80.7 psf

Maximum Bearing Pressure = 276 psf
Allowable Bearing Pressure = 1500 psf

Use a 132in long x 33in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Foundation Requirements: 132in long x 33in wide x 18in tall ballast foundation and fiber reinforcing with (2) #5 rebar.

5.3 Foundation Anchors

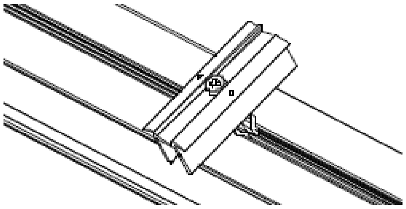
Threaded rods are anchored to the the ballast foundations using the Simpson AT-XP epoxy solution. LRFD load results are compared to the allowable strengths of the epoxy solution. Please see the supplementary calculations provided by the Simpson Anchor Designer software.

6. DESIGN OF JOINTS AND CONNECTIONS

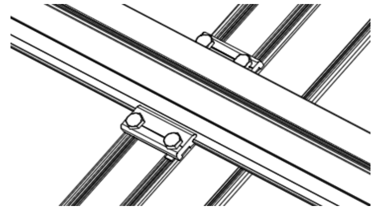
6.1 Anchorage of Modules to Purlins and Connection of Purlins to Girders

Modules are secured to the purlins with Schletter, Inc. Rapid2+ mounting clamps. Purlins are secured to the girders with the use of 80mm mounting clamps. The reliability of calculations is uncertain due to limited standards, therefore the strength of the clamp fasteners has been evaluated by load testing.

Fastening of Modules to Purlins		
Maximum Uplifting Force =	0.923	k
Allowable Uplift =	1.214	k
Utilization =	76%	



Fastening of Purlins to Girders		
Maximum Uplifting Force =	2.320	k
Allowable Uplift =	4.357	k
Utilization =	53%	



6.2 Strut Connections

The aluminum struts connect the aluminum girder ends to custom brackets with mounting holes. Single M12 bolts are used to attach each end of the strut to the girder and post. ASTM A193/A193M-86 equivalent stainless steel bolts are used.

Front Strut		
Maximum Axial Load =	1.838	k
M12 Bolt Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	25%	

Rear Strut		
Maximum Axial Load =	4.337	k
M12 Bolt Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	58%	

Diagonal Strut		
Maximum Axial Load =	2.869	k
M12 Bolt Shear Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	39%	

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 M12 bolts are located at each end of the strut and are subjected to double shear.

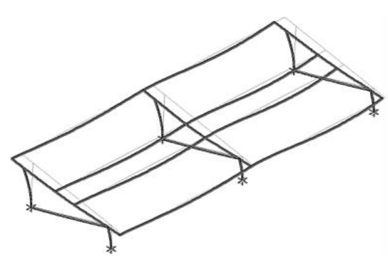
7. SEISMIC DESIGN

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} =	53.78	in
Allowable Story Drift for All Other Structures, Δ = {	$0.020h_{sx}$	
	1.076	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 = **S1.5**

Strong Axis:

3.4.14

L_b = 84 in

J = 0.432

232.383

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 28.4 ksi

3.4.16

b/t = 32.195

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 25.1 ksi

3.4.16.1 Not Used

Rb/t =

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 37.0588

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

S1 = 36.9

m = 0.65

C_0 = 40.985

Cc = 41.015

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

S2 = 77.2

φF_L= φb[Bbr-mDbr*h/t]

φF_L= 43.2 ksi

φF_LSt= 25.1 ksi

Ix = 897074 mm^4

2.155 in^4

y = 41.015 mm

Sx = 1.335 in³

M_{max}St = 2.788 k-ft

Weak Axis:

3.4.14

L_b = 84

J = 0.432

147.782

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

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= 29.4

3.4.16

b/t = 37.0588

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 23.1 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 32.195

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

S1 = 36.9

m = 0.65

C_0 = 45.5

Cc = 45.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 23.1 ksi

Iy = 446476 mm^4

1.073 in^4

x = 45.5 mm

Sy = 0.599 in³

M_{max}Wk = 1.152 k-ft

Compression

3.4.9

b/t = 32.195
S1 = 12.21 (See 3.4.16 above for formula)
S2 = 32.70 (See 3.4.16 above for formula)
φF_L= φc[Bp-1.6Dp*b/t]
φF_L= 25.1 ksi

b/t = 37.0588
S1 = 12.21
S2 = 32.70
φF_L= (φck2*√(BpE))/(1.6b/t)
φF_L= 21.9 ksi

3.4.10

Rb/t = 0.0

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

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

φF_L= 21.94 ksi
A = 1215.13 mm^2
1.88 in^2
P_{max} = 41.32 kips

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

Girder = **BF0**

Strong Axis:

3.4.14

L_b = 88.9 in
J = 1.08
152.913

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

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= 29.4 ksi

3.4.16

b/t = 16.2

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

S1 = 12.2

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

S2 = 46.7
φF_L= φb[Bp-1.6Dp*b/t]
φF_L= 31.6 ksi

Weak Axis:

3.4.14

L_b = 88.9
J = 1.08
161.829

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

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

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 Used

Rb/t = 18.1

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

$\varphi F_L = \varphi b[Bt-Dt^*\sqrt{(Rb/t)}]$

$\varphi F_L =$ 31.1 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.4

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

S1 = 35.2

m = 0.68

$C_0 =$ 41.067

Cc = 43.717

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

S2 = 73.8

$\varphi F_L = 1.3\varphi yFcy$

$\varphi F_L =$ 43.2 ksi

$\varphi F_L St =$ 29.4 ksi

Ix = 984962 mm^4

2.366 in^4

y = 43.717 mm

Sx = 1.375 in^3

$M_{max}St =$ 3.363 k-ft

3.4.18

h/t = 16.2

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

S1 = 36.9

m = 0.65

$C_0 =$ 40

Cc = 40

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

S2 = 77.3

$\varphi F_L = 1.3\varphi yFcy$

$\varphi F_L =$ 43.2 ksi

$\varphi F_L Wk =$ 33.3 ksi

Iy = 923544 mm^4

2.219 in^4

x = 40 mm

Sy = 1.409 in^3

$M_{max}Wk =$ 3.904 k-ft

Compression

3.4.9

b/t = 16.2

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

$\varphi F_L = \varphi c[Bp-1.6Dp^*b/t]$

$\varphi F_L =$ 31.6 ksi

b/t = 7.4

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

3.4.10

Rb/t = 18.1

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

S1 = 6.87

S2 = 131.3

$\varphi F_L = \varphi c[Bt-Dt^*\sqrt{(Rb/t)}]$

$\varphi F_L =$ 31.09 ksi

$\varphi F_L =$ 31.09 ksi

A = 1215.13 mm^2

1.88 in^2

$P_{max} =$ 58.55 kips

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

Strut = **55x55**

Strong Axis:		Weak Axis:	
3.4.14		**3.4.14**	
L_b =	24.8 in	L_b =	24.8
J =	0.942	J =	0.942
	38.7028		38.7028
$S1 = \left(\frac{Bc - \frac{\theta_y}{\theta_b}Fcy}{1.6Dc}\right)^2$		$S1 = \left(\frac{Bc - \frac{\theta_y}{\theta_b}Fcy}{1.6Dc}\right)^2$	
S1 =	0.51461	S1 =	0.51461
$S2 = \left(\frac{C_c}{1.6}\right)^2$		$S2 = \left(\frac{C_c}{1.6}\right)^2$	
S2 =	1701.56	S2 =	1701.56
φF_L=	φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]	φF_L=	φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
φF_L=	31.4 ksi	φF_L=	31.4
3.4.16		**3.4.16**	
b/t =	24.5	b/t =	24.5
$S1 = \frac{Bp - \frac{\theta_y}{\theta_b}Fcy}{1.6Dp}$		$S1 = \frac{Bp - \frac{\theta_y}{\theta_b}Fcy}{1.6Dp}$	
S1 =	12.2	S1 =	12.2
$S2 = \frac{k_1 Bp}{1.6Dp}$		$S2 = \frac{k_1 Bp}{1.6Dp}$	
S2 =	46.7	S2 =	46.7
φF_L=	φb[Bp-1.6Dp*b/t]	φF_L=	φb[Bp-1.6Dp*b/t]
φF_L=	28.2 ksi	φF_L=	28.2 ksi
3.4.16.1	Not Used	**3.4.16.1**	
Rb/t =	0.0	N/A for Weak Direction	
$S1 = \left(\frac{Bt - 1.17\frac{\theta_y}{\theta_b}Fcy}{1.6Dt}\right)^2$			
S1 =	1.1		
$S2 = C_t$			
S2 =	141.0		
φF_L=	1.17φyFcy		
φF_L=	38.9 ksi		
3.4.18		**3.4.18**	
h/t =	24.5	h/t =	24.5
$S1 = \frac{Bbr - \frac{\theta_y}{\theta_b}1.3Fcy}{mDbr}$		$S1 = \frac{Bbr - \frac{\theta_y}{\theta_b}1.3Fcy}{mDbr}$	
S1 =	36.9	S1 =	36.9
m =	0.65	m =	0.65
C_0 =	27.5	C_0 =	27.5
Cc =	27.5	Cc =	27.5
$S2 = \frac{k_1 Bbr}{mDbr}$		$S2 = \frac{k_1 Bbr}{mDbr}$	
S2 =	77.3	S2 =	77.3
φF_L=	1.3φyFcy	φF_L=	1.3φyFcy
φF_L=	43.2 ksi	φF_L=	43.2 ksi
φF_LSt=	28.2 ksi	φF_LWk=	28.2 ksi
Ix =	279836 mm^4	Iy =	279836 mm^4
	0.672 in^4		0.672 in^4
y =	27.5 mm	x =	27.5 mm
Sx =	0.621 in^3	Sy =	0.621 in^3
M_{max}St =	1.460 k-ft	M_{max}Wk =	1.460 k-ft

Compression

3.4.7

λ = 0.57371

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.87952

φF_L= φcc(Bc-Dc*λ)

φF_L= 28.0279 ksi

3.4.9

b/t = 24.5

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

b/t = 24.5

S1 = 12.21

S2 = 32.70

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 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= 28.03 ksi

A = 663.99 mm^2

1.03 in^2

P_{max} = 28.85 kips

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

Strut = **55x55**

Strong Axis:

3.4.14

L_b = 86.60 in

J = 0.942

135.148

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.6 ksi

Weak Axis:

3.4.14

L_b = 86.6

J = 0.942

135.148

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.6

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 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

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 28.2 ksi

Ix = 279836 mm^4

0.672 in^4

y = 27.5 mm

Sx = 0.621 in^3

M_{max}St = 1.460 k-ft

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 28.2 ksi

Iy = 279836 mm^4

0.672 in^4

x = 27.5 mm

Sy = 0.621 in^3

M_{max}Wk = 1.460 k-ft

<u>Compression</u>

3.4.7

λ = 2.00335

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.86047

φF_L= (φccFcy)/(λ²)

φF_L= 7.50396 ksi

3.4.9

b/t = 24.5
S1 = 12.21 (See 3.4.16 above for formula)
S2 = 32.70 (See 3.4.16 above for formula)
φF_L= φc[Bp-1.6Dp*b/t]
φF_L= 28.2 ksi

b/t = 24.5
S1 = 12.21
S2 = 32.70
φF_L= φc[Bp-1.6Dp*b/t]
φF_L= 28.2 ksi

3.4.10

Rb/t = 0.0

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

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

φF_L= 7.50 ksi
A = 663.99 mm^2
1.03 in^2
P_{max} = 7.72 kips

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

Strut = **<u>55x55</u>**

<u>Strong Axis:</u>

3.4.14

L_b = 78.03 in
J = 0.942
121.773

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

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 = 24.5

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

S1 = 12.2

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

S2 = 46.7
φF_L= φb[Bp-1.6Dp*b/t]
φF_L= 28.2 ksi

<u>Weak Axis:</u>

3.4.14

L_b = 78.03
J = 0.942
121.773

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

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 = 24.5

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

S1 = 12.2

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

S2 = 46.7
φF_L= φb[Bp-1.6Dp*b/t]
φF_L= 28.2 ksi

3.4.16.1	Not Used	3.4.16.1
Rb/t =	0.0	N/A for Weak Direction

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 28.2 ksi

Ix = 279836 mm^4

0.672 in^4

y = 27.5 mm

Sx = 0.621 in³

M_{max}St = 1.460 k-ft

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 28.2 ksi

Iy = 279836 mm^4

0.672 in^4

x = 27.5 mm

Sy = 0.621 in³

M_{max}Wk = 1.460 k-ft

Compression

3.4.7

λ = 1.80509

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.83271

φF_L= (φccFcy)/(λ²)

φF_L= 8.94465 ksi

3.4.9

b/t = 24.5

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

b/t = 24.5

S1 = 12.21

S2 = 32.70

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 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

$\varphi F_L = \varphi y Fcy$

$\varphi F_L =$ 33.25 ksi

$\varphi F_L =$ 8.94 ksi

A = 663.99 mm^2

1.03 in^2

$P_{max} =$ 9.21 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				4		
2	Dead Load, Min	DL		-1				4		
3	Snow Load	SL						4		
4	Wind Load - Pressure	WL						4		
5	Wind Load - Suction	WL						4		
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	M14	Y	-8.366	-8.366	0	0
3	M15	Y	-8.366	-8.366	0	0
4	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	M14	Y	-4.45	-4.45	0	0
3	M15	Y	-4.45	-4.45	0	0
4	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	-32.97	-32.97	0	0
2	M14	Y	-32.97	-32.97	0	0
3	M15	Y	-32.97	-32.97	0	0
4	M16	Y	-32.97	-32.97	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	-75.661	-75.661	0	0
2	M14	y	-75.661	-75.661	0	0
3	M15	y	-126.102	-126.102	0	0
4	M16	y	-126.102	-126.102	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	170.238	170.238	0	0
2	M14	y	132.407	132.407	0	0
3	M15	y	75.661	75.661	0	0
4	M16	y	75.661	75.661	0	0

Load Combinations

	Description	S...	P...	S...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	LRFD 1.2D + 1.6S + 0.8W	Yes	Y		1	1.2	3	1.6	4	.8														
2	LRFD 1.2D + 1.6W + 0.5S	Yes	Y		1	1.2	3	.5	4	1.6														
3	LRFD 0.9D + 1.6W	Yes	Y		2	.9					5	1.6												
4	LATERAL - LRFD 1.54D + 1.3E ...	Yes	Y		1	1.54	3	.2			6	1.3												
5	LATERAL - LRFD 0.56D + 1.3E	Yes	Y		1	.56					6	1.3												
6	LATERAL - LRFD 1.54D + 1.25...	Yes	Y		1	1.54	3	.2			6	1.25												
7	LATERAL - LRFD 0.56D + 1.25E	Yes	Y		1	.56					6	1.25												

Load Combinations (Continued)

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

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N8	max	989.175	2	1184.83	2	.311	1	0	1	0	1	0	1
2		min	-1157.502	3	-1612.516	3	.019	15	0	15	0	1	0	1
3	N7	max	.032	3	714.112	1	-.325	15	0	15	0	1	0	1
4		min	-.187	2	34.298	15	-5.601	1	-.01	1	0	1	0	1
5	N15	max	.177	3	1837.728	2	0	10	0	10	0	1	0	1
6		min	-1.777	2	69.03	15	0	2	0	2	0	1	0	1
7	N16	max	3208.349	2	3645.889	2	0	3	0	3	0	1	0	1
8		min	-3517.856	3	-5050.371	3	0	10	0	2	0	1	0	1
9	N23	max	.032	3	714.112	1	5.601	1	.01	1	0	1	0	1
10		min	-.187	2	34.298	15	.325	15	0	15	0	1	0	1
11	N24	max	989.175	2	1184.83	2	-.019	15	0	15	0	1	0	1
12		min	-1157.502	3	-1612.516	3	-.311	1	0	1	0	1	0	1
13	Totals:	max	5184.547	2	9139.159	2	0	10						
14		min	-5832.619	3	-7918.436	3	0	2						

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	M13	1	max	49.177	1	369.564	2	-6.821	15	0	15	.117	1	0	2
2			min	2.828	15	-707.023	3	-121.895	1	-.012	2	.007	15	0	3
3		2	max	49.177	1	257.359	2	-5.227	15	0	15	.033	1	.469	3
4			min	2.828	15	-498.585	3	-93.078	1	-.012	2	.001	10	-.244	2
5		3	max	49.177	1	145.154	2	-3.634	15	0	15	.004	3	.776	3
6			min	2.828	15	-290.148	3	-64.261	1	-.012	2	-.028	1	-.4	2
7		4	max	49.177	1	32.949	2	-2.04	15	0	15	-.001	12	.92	3
8			min	2.828	15	-81.71	3	-35.443	1	-.012	2	-.067	1	-.47	2
9		5	max	49.177	1	126.727	3	.552	10	0	15	-.004	12	.903	3
10			min	2.828	15	-79.256	2	-6.626	1	-.012	2	-.083	1	-.452	2
11		6	max	49.177	1	335.165	3	22.191	1	0	15	-.004	15	.723	3
12			min	2.828	15	-191.461	2	-1.993	3	-.012	2	-.077	1	-.346	2
13		7	max	49.177	1	543.603	3	51.009	1	0	15	-.003	15	.381	3
14			min	2.828	15	-303.666	2	.397	3	-.012	2	-.049	1	-.154	2
15		8	max	49.177	1	752.04	3	79.826	1	0	15	.006	2	.126	2
16			min	2.828	15	-415.871	2	2.011	12	-.012	2	-.008	3	-.123	3
17		9	max	49.177	1	960.478	3	108.643	1	0	15	.076	1	.493	2
18			min	2.828	15	-528.076	2	3.604	12	-.012	2	-.005	3	-.789	3
19		10	max	49.177	1	640.281	2	-5.198	12	.002	3	.171	1	.948	2
20			min	2.828	15	-1168.915	3	-137.461	1	-.012	2	0	3	-1.617	3
21		11	max	49.177	1	528.076	2	-3.604	12	.012	2	.076	1	.493	2
22			min	2.828	15	-960.478	3	-108.643	1	0	15	-.005	3	-.789	3
23		12	max	49.177	1	415.871	2	-2.011	12	.012	2	.006	2	.126	2
24			min	2.828	15	-752.04	3	-79.826	1	0	15	-.008	3	-.123	3
25		13	max	49.177	1	303.666	2	-.397	3	.012	2	-.003	15	.381	3
26			min	2.828	15	-543.603	3	-51.009	1	0	15	-.049	1	-.154	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
27		14	max	49.177	1	191.461	2	1.993	3	.012	2	-.004	15	.723	3
28			min	2.828	15	-335.165	3	-22.191	1	0	15	-.077	1	-.346	2
29		15	max	49.177	1	79.256	2	6.626	1	.012	2	-.004	12	.903	3
30			min	2.828	15	-126.727	3	-.552	10	0	15	-.083	1	-.452	2
31		16	max	49.177	1	81.71	3	35.443	1	.012	2	-.001	12	.92	3
32			min	2.828	15	-32.949	2	2.04	15	0	15	-.067	1	-.47	2
33		17	max	49.177	1	290.148	3	64.261	1	.012	2	.004	3	.776	3
34			min	2.828	15	-145.154	2	3.634	15	0	15	-.028	1	-.4	2
35		18	max	49.177	1	498.585	3	93.078	1	.012	2	.033	1	.469	3
36			min	2.828	15	-257.359	2	5.227	15	0	15	.001	10	-.244	2
37		19	max	49.177	1	707.023	3	121.895	1	.012	2	.117	1	0	2
38			min	2.828	15	-369.564	2	6.821	15	0	15	.007	15	0	3
39	M14	1	max	28.677	1	428.997	2	-7.102	15	.011	3	.14	1	0	2
40			min	1.636	15	-586.55	3	-126.899	1	-.012	2	.008	15	0	3
41		2	max	28.677	1	316.792	2	-5.508	15	.011	3	.052	1	.393	3
42			min	1.636	15	-425.191	3	-98.082	1	-.012	2	.003	15	-.29	2
43		3	max	28.677	1	204.587	2	-3.914	15	.011	3	.006	3	.661	3
44			min	1.636	15	-263.832	3	-69.265	1	-.012	2	-.013	1	-.493	2
45		4	max	28.677	1	92.382	2	-2.32	15	.011	3	0	3	.804	3
46			min	1.636	15	-102.473	3	-40.447	1	-.012	2	-.055	1	-.608	2
47		5	max	28.677	1	58.886	3	-.133	10	.011	3	-.003	12	.821	3
48			min	1.636	15	-19.823	2	-11.63	1	-.012	2	-.076	1	-.636	2
49		6	max	28.677	1	220.245	3	17.187	1	.011	3	-.004	15	.712	3
50			min	1.636	15	-132.028	2	-2.473	3	-.012	2	-.073	1	-.577	2
51		7	max	28.677	1	381.604	3	46.005	1	.011	3	-.003	15	.478	3
52			min	1.636	15	-244.233	2	-.082	3	-.012	2	-.049	1	-.431	2
53		8	max	28.677	1	542.963	3	74.822	1	.011	3	.004	2	.119	3
54			min	1.636	15	-356.437	2	1.693	12	-.012	2	-.008	3	-.198	2
55		9	max	28.677	1	704.322	3	103.639	1	.011	3	.068	1	.123	2
56			min	1.636	15	-468.642	2	3.287	12	-.012	2	-.005	3	-.366	3
57		10	max	28.677	1	580.847	2	-4.881	12	.011	3	.159	1	.531	2
58			min	1.636	15	-865.681	3	-132.457	1	-.012	2	0	3	-.977	3
59		11	max	28.677	1	468.642	2	-3.287	12	.012	2	.068	1	.123	2
60			min	1.636	15	-704.322	3	-103.639	1	-.011	3	-.005	3	-.366	3
61		12	max	28.677	1	356.437	2	-1.693	12	.012	2	.004	2	.119	3
62			min	1.636	15	-542.963	3	-74.822	1	-.011	3	-.008	3	-.198	2
63		13	max	28.677	1	244.233	2	.082	3	.012	2	-.003	15	.478	3
64			min	1.636	15	-381.604	3	-46.005	1	-.011	3	-.049	1	-.431	2
65		14	max	28.677	1	132.028	2	2.473	3	.012	2	-.004	15	.712	3
66			min	1.636	15	-220.245	3	-17.187	1	-.011	3	-.073	1	-.577	2
67		15	max	28.677	1	19.823	2	11.63	1	.012	2	-.003	12	.821	3
68			min	1.636	15	-58.886	3	.133	10	-.011	3	-.076	1	-.636	2
69		16	max	28.677	1	102.473	3	40.447	1	.012	2	0	3	.804	3
70			min	1.636	15	-92.382	2	2.32	15	-.011	3	-.055	1	-.608	2
71		17	max	28.677	1	263.832	3	69.265	1	.012	2	.006	3	.661	3
72			min	1.636	15	-204.587	2	3.914	15	-.011	3	-.013	1	-.493	2
73		18	max	28.677	1	425.191	3	98.082	1	.012	2	.052	1	.393	3
74			min	1.636	15	-316.792	2	5.508	15	-.011	3	.003	15	-.29	2
75		19	max	28.677	1	586.55	3	126.899	1	.012	2	.14	1	0	2
76			min	1.636	15	-428.997	2	7.102	15	-.011	3	.008	15	0	3
77	M15	1	max	-1.7	15	640.919	2	-7.1	15	.012	2	.14	1	0	2
78			min	-29.467	1	-348.553	3	-126.94	1	-.01	3	.008	15	0	3
79		2	max	-1.7	15	465.943	2	-5.506	15	.012	2	.053	1	.236	3
80			min	-29.467	1	-257.811	3	-98.123	1	-.01	3	.003	15	-.43	2
81		3	max	-1.7	15	290.967	2	-3.912	15	.012	2	.006	3	.401	3
82			min	-29.467	1	-167.069	3	-69.305	1	-.01	3	-.013	1	-.725	2
83		4	max	-1.7	15	115.991	2	-2.318	15	.012	2	0	12	.496	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
84			min	-29.467	1	-76.327	3	-40.488	1	-.01	3	-.055	1	-.883	2
85		5	max	-1.7	15	14.414	3	-.233	10	.012	2	-.003	12	.52	3
86			min	-29.467	1	-58.985	2	-11.671	1	-.01	3	-.076	1	-.905	2
87		6	max	-1.7	15	105.156	3	17.147	1	.012	2	-.004	15	.473	3
88			min	-29.467	1	-233.961	2	-2.159	3	-.01	3	-.073	1	-.791	2
89		7	max	-1.7	15	195.898	3	45.964	1	.012	2	-.003	15	.356	3
90			min	-29.467	1	-408.937	2	.231	3	-.01	3	-.049	1	-.541	2
91		8	max	-1.7	15	286.64	3	74.781	1	.012	2	.004	2	.169	3
92			min	-29.467	1	-583.913	2	1.89	12	-.01	3	-.007	3	-.155	2
93		9	max	-1.7	15	377.381	3	103.599	1	.012	2	.067	1	.367	2
94			min	-29.467	1	-758.889	2	3.483	12	-.01	3	-.004	3	-.09	3
95		10	max	-1.7	15	933.865	2	-5.077	12	.012	2	.159	1	1.025	2
96			min	-29.467	1	-468.123	3	-132.416	1	-.01	3	0	3	-.418	3
97		11	max	-1.7	15	758.889	2	-3.483	12	.01	3	.067	1	.367	2
98			min	-29.467	1	-377.381	3	-103.599	1	-.012	2	-.004	3	-.09	3
99		12	max	-1.7	15	583.913	2	-1.89	12	.01	3	.004	2	.169	3
100			min	-29.467	1	-286.64	3	-74.781	1	-.012	2	-.007	3	-.155	2
101		13	max	-1.7	15	408.937	2	-.231	3	.01	3	-.003	15	.356	3
102			min	-29.467	1	-195.898	3	-45.964	1	-.012	2	-.049	1	-.541	2
103		14	max	-1.7	15	233.961	2	2.159	3	.01	3	-.004	15	.473	3
104			min	-29.467	1	-105.156	3	-17.147	1	-.012	2	-.073	1	-.791	2
105		15	max	-1.7	15	58.985	2	11.671	1	.01	3	-.003	12	.52	3
106			min	-29.467	1	-14.414	3	.233	10	-.012	2	-.076	1	-.905	2
107		16	max	-1.7	15	76.327	3	40.488	1	.01	3	0	12	.496	3
108			min	-29.467	1	-115.991	2	2.318	15	-.012	2	-.055	1	-.883	2
109		17	max	-1.7	15	167.069	3	69.305	1	.01	3	.006	3	.401	3
110			min	-29.467	1	-290.967	2	3.912	15	-.012	2	-.013	1	-.725	2
111		18	max	-1.7	15	257.811	3	98.123	1	.01	3	.053	1	.236	3
112			min	-29.467	1	-465.943	2	5.506	15	-.012	2	.003	15	-.43	2
113		19	max	-1.7	15	348.553	3	126.94	1	.01	3	.14	1	0	2
114			min	-29.467	1	-640.919	2	7.1	15	-.012	2	.008	15	0	3
115	M16	1	max	-3.071	15	584.473	2	-6.829	15	.007	2	.118	1	0	2
116			min	-53.678	1	-296.753	3	-122.322	1	-.011	3	.007	15	0	3
117		2	max	-3.071	15	409.497	2	-5.235	15	.007	2	.034	1	.196	3
118			min	-53.678	1	-206.011	3	-93.505	1	-.011	3	.002	15	-.387	2
119		3	max	-3.071	15	234.521	2	-3.641	15	.007	2	.003	3	.32	3
120			min	-53.678	1	-115.269	3	-64.688	1	-.011	3	-.027	1	-.637	2
121		4	max	-3.071	15	59.545	2	-2.047	15	.007	2	-.002	12	.375	3
122			min	-53.678	1	-24.528	3	-35.87	1	-.011	3	-.066	1	-.751	2
123		5	max	-3.071	15	66.214	3	.175	10	.007	2	-.004	12	.359	3
124			min	-53.678	1	-115.431	2	-7.053	1	-.011	3	-.083	1	-.73	2
125		6	max	-3.071	15	156.956	3	21.764	1	.007	2	-.004	15	.272	3
126			min	-53.678	1	-290.407	2	-.958	3	-.011	3	-.077	1	-.572	2
127		7	max	-3.071	15	247.698	3	50.582	1	.007	2	-.003	15	.114	3
128			min	-53.678	1	-465.383	2	1.064	12	-.011	3	-.049	1	-.278	2
129		8	max	-3.071	15	338.439	3	79.399	1	.007	2	.005	2	.152	2
130			min	-53.678	1	-640.359	2	2.658	12	-.011	3	-.006	3	-.113	3
131		9	max	-3.071	15	429.181	3	108.216	1	.007	2	.075	1	.718	2
132			min	-53.678	1	-815.335	2	4.251	12	-.011	3	-.002	3	-.412	3
133		10	max	-3.071	15	990.311	2	-5.845	12	.007	2	.17	1	1.42	2
134			min	-53.678	1	-519.923	3	-137.034	1	-.011	3	.003	12	-.781	3
135		11	max	-3.071	15	815.335	2	-4.251	12	.011	3	.075	1	.718	2
136			min	-53.678	1	-429.181	3	-108.216	1	-.007	2	-.002	3	-.412	3
137		12	max	-3.071	15	640.359	2	-2.658	12	.011	3	.005	2	.152	2
138			min	-53.678	1	-338.439	3	-79.399	1	-.007	2	-.006	3	-.113	3
139		13	max	-3.071	15	465.383	2	-1.064	12	.011	3	-.003	15	.114	3
140			min	-53.678	1	-247.698	3	-50.582	1	-.007	2	-.049	1	-.278	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
141		14	max	-3.071	15	290.407	2	.958	3	.011	3	-.004	15	.272	3
142			min	-53.678	1	-156.956	3	-21.764	1	-.007	2	-.077	1	-.572	2
143		15	max	-3.071	15	115.431	2	7.053	1	.011	3	-.004	12	.359	3
144			min	-53.678	1	-66.214	3	-.175	10	-.007	2	-.083	1	-.73	2
145		16	max	-3.071	15	24.528	3	35.87	1	.011	3	-.002	12	.375	3
146			min	-53.678	1	-59.545	2	2.047	15	-.007	2	-.066	1	-.751	2
147		17	max	-3.071	15	115.269	3	64.688	1	.011	3	.003	3	.32	3
148			min	-53.678	1	-234.521	2	3.641	15	-.007	2	-.027	1	-.637	2
149		18	max	-3.071	15	206.011	3	93.505	1	.011	3	.034	1	.196	3
150			min	-53.678	1	-409.497	2	5.235	15	-.007	2	.002	15	-.387	2
151		19	max	-3.071	15	296.753	3	122.322	1	.011	3	.118	1	0	2
152			min	-53.678	1	-584.473	2	6.829	15	-.007	2	.007	15	0	3
153	M2	1	max	947.831	2	2.02	4	.165	1	0	3	0	3	0	1
154			min	-1382.186	3	.475	15	.009	15	0	1	0	2	0	1
155		2	max	948.352	2	1.901	4	.165	1	0	3	0	1	0	15
156			min	-1381.795	3	.447	15	.009	15	0	1	0	10	0	4
157		3	max	948.873	2	1.782	4	.165	1	0	3	0	1	0	15
158			min	-1381.405	3	.419	15	.009	15	0	1	0	15	-.001	4
159		4	max	949.393	2	1.663	4	.165	1	0	3	0	1	0	15
160			min	-1381.014	3	.391	15	.009	15	0	1	0	15	-.002	4
161		5	max	949.914	2	1.544	4	.165	1	0	3	0	1	0	15
162			min	-1380.624	3	.363	15	.009	15	0	1	0	15	-.003	4
163		6	max	950.435	2	1.425	4	.165	1	0	3	0	1	0	15
164			min	-1380.233	3	.335	15	.009	15	0	1	0	15	-.003	4
165		7	max	950.956	2	1.306	4	.165	1	0	3	0	1	0	15
166			min	-1379.843	3	.307	15	.009	15	0	1	0	15	-.004	4
167		8	max	951.476	2	1.187	4	.165	1	0	3	0	1	0	15
168			min	-1379.452	3	.279	15	.009	15	0	1	0	15	-.004	4
169		9	max	951.997	2	1.069	4	.165	1	0	3	0	1	-.001	15
170			min	-1379.062	3	.242	12	.009	15	0	1	0	15	-.004	4
171		10	max	952.518	2	.95	4	.165	1	0	3	0	1	-.001	15
172			min	-1378.671	3	.196	12	.009	15	0	1	0	15	-.005	4
173		11	max	953.038	2	.852	2	.165	1	0	3	0	1	-.001	15
174			min	-1378.28	3	.15	12	.009	15	0	1	0	15	-.005	4
175		12	max	953.559	2	.759	2	.165	1	0	3	0	1	-.001	15
176			min	-1377.89	3	.104	12	.009	15	0	1	0	15	-.005	4
177		13	max	954.08	2	.666	2	.165	1	0	3	0	1	-.001	15
178			min	-1377.499	3	.057	12	.009	15	0	1	0	15	-.006	4
179		14	max	954.6	2	.574	2	.165	1	0	3	0	1	-.001	15
180			min	-1377.109	3	-.001	3	.009	15	0	1	0	15	-.006	4
181		15	max	955.121	2	.481	2	.165	1	0	3	0	1	-.001	15
182			min	-1376.718	3	-.071	3	.009	15	0	1	0	15	-.006	4
183		16	max	955.642	2	.389	2	.165	1	0	3	0	1	-.001	15
184			min	-1376.328	3	-.14	3	.009	15	0	1	0	15	-.006	4
185		17	max	956.163	2	.296	2	.165	1	0	3	0	1	-.001	12
186			min	-1375.937	3	-.21	3	.009	15	0	1	0	15	-.006	4
187		18	max	956.683	2	.203	2	.165	1	0	3	0	1	-.001	12
188			min	-1375.547	3	-.279	3	.009	15	0	1	0	15	-.006	4
189		19	max	957.204	2	.111	2	.165	1	0	3	.001	1	-.001	12
190			min	-1375.156	3	-.348	3	.009	15	0	1	0	15	-.006	4
191	M3	1	max	856.557	2	7.663	4	.169	1	0	3	0	1	.006	4
192			min	-951.878	3	1.801	15	.01	15	0	1	0	15	.001	12
193		2	max	856.386	2	6.902	4	.169	1	0	3	0	1	.004	2
194			min	-952.006	3	1.623	15	.01	15	0	1	0	15	0	3
195		3	max	856.216	2	6.141	4	.169	1	0	3	0	1	.001	2
196			min	-952.134	3	1.444	15	.01	15	0	1	0	15	-.001	3
197		4	max	856.046	2	5.38	4	.169	1	0	3	0	1	0	15

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
198			min	-952.262	3	1.265	15	.01	15	0	1	0	15	-.003	3
199		5	max	855.875	2	4.619	4	.169	1	0	3	0	1	0	15
200			min	-952.389	3	1.086	15	.01	15	0	1	0	15	-.004	4
201		6	max	855.705	2	3.858	4	.169	1	0	3	0	1	-.001	15
202			min	-952.517	3	.907	15	.01	15	0	1	0	15	-.006	4
203		7	max	855.535	2	3.097	4	.169	1	0	3	0	1	-.002	15
204			min	-952.645	3	.728	15	.01	15	0	1	0	15	-.007	4
205		8	max	855.364	2	2.336	4	.169	1	0	3	0	1	-.002	15
206			min	-952.773	3	.549	15	.01	15	0	1	0	15	-.008	4
207		9	max	855.194	2	1.575	4	.169	1	0	3	0	1	-.002	15
208			min	-952.9	3	.37	15	.01	15	0	1	0	15	-.009	4
209		10	max	855.024	2	.814	4	.169	1	0	3	0	1	-.002	15
210			min	-953.028	3	.168	12	.01	15	0	1	0	15	-.01	4
211		11	max	854.853	2	.216	2	.169	1	0	3	0	1	-.002	15
212			min	-953.156	3	-.208	3	.01	15	0	1	0	15	-.01	4
213		12	max	854.683	2	-.166	15	.169	1	0	3	0	1	-.002	15
214			min	-953.284	3	-.708	4	.01	15	0	1	0	15	-.01	4
215		13	max	854.513	2	-.345	15	.169	1	0	3	.001	1	-.002	15
216			min	-953.412	3	-1.469	4	.01	15	0	1	0	15	-.009	4
217		14	max	854.342	2	-.524	15	.169	1	0	3	.001	1	-.002	15
218			min	-953.539	3	-2.23	4	.01	15	0	1	0	15	-.009	4
219		15	max	854.172	2	-.703	15	.169	1	0	3	.001	1	-.002	15
220			min	-953.667	3	-2.991	4	.01	15	0	1	0	15	-.008	4
221		16	max	854.002	2	-.882	15	.169	1	0	3	.001	1	-.001	15
222			min	-953.795	3	-3.752	4	.01	15	0	1	0	15	-.006	4
223		17	max	853.831	2	-1.061	15	.169	1	0	3	.001	1	-.001	15
224			min	-953.923	3	-4.513	4	.01	15	0	1	0	15	-.004	4
225		18	max	853.661	2	-1.239	15	.169	1	0	3	.001	1	0	15
226			min	-954.05	3	-5.274	4	.01	15	0	1	0	15	-.002	4
227		19	max	853.491	2	-1.418	15	.169	1	0	3	.001	1	0	1
228			min	-954.178	3	-6.035	4	.01	15	0	1	0	15	0	1
229	M4	1	max	711.046	1	0	1	-.325	15	0	1	.001	1	0	1
230			min	33.373	15	0	1	-5.707	1	0	1	0	15	0	1
231		2	max	711.216	1	0	1	-.325	15	0	1	0	1	0	1
232			min	33.425	15	0	1	-5.707	1	0	1	0	15	0	1
233		3	max	711.387	1	0	1	-.325	15	0	1	0	1	0	1
234			min	33.476	15	0	1	-5.707	1	0	1	0	10	0	1
235		4	max	711.557	1	0	1	-.325	15	0	1	0	15	0	1
236			min	33.527	15	0	1	-5.707	1	0	1	0	1	0	1
237		5	max	711.727	1	0	1	-.325	15	0	1	0	15	0	1
238			min	33.579	15	0	1	-5.707	1	0	1	-.001	1	0	1
239		6	max	711.898	1	0	1	-.325	15	0	1	0	15	0	1
240			min	33.63	15	0	1	-5.707	1	0	1	-.002	1	0	1
241		7	max	712.068	1	0	1	-.325	15	0	1	0	15	0	1
242			min	33.682	15	0	1	-5.707	1	0	1	-.003	1	0	1
243		8	max	712.238	1	0	1	-.325	15	0	1	0	15	0	1
244			min	33.733	15	0	1	-5.707	1	0	1	-.003	1	0	1
245		9	max	712.409	1	0	1	-.325	15	0	1	0	15	0	1
246			min	33.784	15	0	1	-5.707	1	0	1	-.004	1	0	1
247		10	max	712.579	1	0	1	-.325	15	0	1	0	15	0	1
248			min	33.836	15	0	1	-5.707	1	0	1	-.005	1	0	1
249		11	max	712.749	1	0	1	-.325	15	0	1	0	15	0	1
250			min	33.887	15	0	1	-5.707	1	0	1	-.005	1	0	1
251		12	max	712.92	1	0	1	-.325	15	0	1	0	15	0	1
252			min	33.939	15	0	1	-5.707	1	0	1	-.006	1	0	1
253		13	max	713.09	1	0	1	-.325	15	0	1	0	15	0	1
254			min	33.99	15	0	1	-5.707	1	0	1	-.006	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
255		14	max	713.261	1	0	1	-.325	15	0	1	0	15	0	1
256			min	34.041	15	0	1	-5.707	1	0	1	-.007	1	0	1
257		15	max	713.431	1	0	1	-.325	15	0	1	0	15	0	1
258			min	34.093	15	0	1	-5.707	1	0	1	-.008	1	0	1
259		16	max	713.601	1	0	1	-.325	15	0	1	0	15	0	1
260			min	34.144	15	0	1	-5.707	1	0	1	-.008	1	0	1
261		17	max	713.772	1	0	1	-.325	15	0	1	0	15	0	1
262			min	34.196	15	0	1	-5.707	1	0	1	-.009	1	0	1
263		18	max	713.942	1	0	1	-.325	15	0	1	0	15	0	1
264			min	34.247	15	0	1	-5.707	1	0	1	-.01	1	0	1
265		19	max	714.112	1	0	1	-.325	15	0	1	0	15	0	1
266			min	34.298	15	0	1	-5.707	1	0	1	-.01	1	0	1
267	M6	1	max	2898.884	2	2.228	2	0	1	0	1	0	1	0	1
268			min	-4337.392	3	.253	12	0	1	0	1	0	1	0	1
269		2	max	2899.405	2	2.135	2	0	1	0	1	0	1	0	12
270			min	-4337.002	3	.207	12	0	1	0	1	0	1	0	2
271		3	max	2899.926	2	2.042	2	0	1	0	1	0	1	0	12
272			min	-4336.611	3	.161	12	0	1	0	1	0	1	-.002	2
273		4	max	2900.446	2	1.95	2	0	1	0	1	0	1	0	12
274			min	-4336.221	3	.114	12	0	1	0	1	0	1	-.002	2
275		5	max	2900.967	2	1.857	2	0	1	0	1	0	1	0	12
276			min	-4335.83	3	.049	3	0	1	0	1	0	1	-.003	2
277		6	max	2901.488	2	1.765	2	0	1	0	1	0	1	0	12
278			min	-4335.44	3	-.021	3	0	1	0	1	0	1	-.004	2
279		7	max	2902.008	2	1.672	2	0	1	0	1	0	1	0	12
280			min	-4335.049	3	-.09	3	0	1	0	1	0	1	-.004	2
281		8	max	2902.529	2	1.579	2	0	1	0	1	0	1	0	3
282			min	-4334.659	3	-.16	3	0	1	0	1	0	1	-.005	2
283		9	max	2903.05	2	1.487	2	0	1	0	1	0	1	0	3
284			min	-4334.268	3	-.229	3	0	1	0	1	0	1	-.005	2
285		10	max	2903.571	2	1.394	2	0	1	0	1	0	1	0	3
286			min	-4333.878	3	-.299	3	0	1	0	1	0	1	-.006	2
287		11	max	2904.091	2	1.302	2	0	1	0	1	0	1	0	3
288			min	-4333.487	3	-.368	3	0	1	0	1	0	1	-.006	2
289		12	max	2904.612	2	1.209	2	0	1	0	1	0	1	0	3
290			min	-4333.097	3	-.438	3	0	1	0	1	0	1	-.007	2
291		13	max	2905.133	2	1.116	2	0	1	0	1	0	1	0	3
292			min	-4332.706	3	-.507	3	0	1	0	1	0	1	-.007	2
293		14	max	2905.653	2	1.024	2	0	1	0	1	0	1	0	3
294			min	-4332.316	3	-.576	3	0	1	0	1	0	1	-.008	2
295		15	max	2906.174	2	.931	2	0	1	0	1	0	1	0	3
296			min	-4331.925	3	-.646	3	0	1	0	1	0	1	-.008	2
297		16	max	2906.695	2	.838	2	0	1	0	1	0	1	.001	3
298			min	-4331.535	3	-.715	3	0	1	0	1	0	1	-.008	2
299		17	max	2907.215	2	.746	2	0	1	0	1	0	1	.001	3
300			min	-4331.144	3	-.785	3	0	1	0	1	0	1	-.008	2
301		18	max	2907.736	2	.653	2	0	1	0	1	0	1	.002	3
302			min	-4330.754	3	-.854	3	0	1	0	1	0	1	-.009	2
303		19	max	2908.257	2	.561	2	0	1	0	1	0	1	.002	3
304			min	-4330.363	3	-.924	3	0	1	0	1	0	1	-.009	2
305	M7	1	max	2810.836	2	7.681	4	0	1	0	1	0	1	.009	2
306			min	-2866.24	3	1.804	15	0	1	0	1	0	1	-.002	3
307		2	max	2810.666	2	6.92	4	0	1	0	1	0	1	.006	2
308			min	-2866.368	3	1.626	15	0	1	0	1	0	1	-.003	3
309		3	max	2810.496	2	6.159	4	0	1	0	1	0	1	.004	2
310			min	-2866.495	3	1.447	15	0	1	0	1	0	1	-.005	3
311		4	max	2810.325	2	5.398	4	0	1	0	1	0	1	.002	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
312			min	-2866.623	3	1.268	15	0	1	0	1	0	1	-.006	3
313		5	max	2810.155	2	4.637	4	0	1	0	1	0	1	0	2
314			min	-2866.751	3	1.089	15	0	1	0	1	0	1	-.007	3
315		6	max	2809.985	2	3.876	4	0	1	0	1	0	1	-.001	15
316			min	-2866.879	3	.91	15	0	1	0	1	0	1	-.007	3
317		7	max	2809.814	2	3.115	4	0	1	0	1	0	1	-.002	15
318			min	-2867.006	3	.731	15	0	1	0	1	0	1	-.008	3
319		8	max	2809.644	2	2.381	2	0	1	0	1	0	1	-.002	15
320			min	-2867.134	3	.453	12	0	1	0	1	0	1	-.008	4
321		9	max	2809.474	2	1.788	2	0	1	0	1	0	1	-.002	15
322			min	-2867.262	3	.156	12	0	1	0	1	0	1	-.009	4
323		10	max	2809.303	2	1.195	2	0	1	0	1	0	1	-.002	15
324			min	-2867.39	3	-.256	3	0	1	0	1	0	1	-.01	4
325		11	max	2809.133	2	.602	2	0	1	0	1	0	1	-.002	15
326			min	-2867.517	3	-.701	3	0	1	0	1	0	1	-.01	4
327		12	max	2808.963	2	.009	2	0	1	0	1	0	1	-.002	15
328			min	-2867.645	3	-1.145	3	0	1	0	1	0	1	-.01	4
329		13	max	2808.792	2	-.342	15	0	1	0	1	0	1	-.002	15
330			min	-2867.773	3	-1.59	3	0	1	0	1	0	1	-.009	4
331		14	max	2808.622	2	-.521	15	0	1	0	1	0	1	-.002	15
332			min	-2867.901	3	-2.211	4	0	1	0	1	0	1	-.009	4
333		15	max	2808.451	2	-.7	15	0	1	0	1	0	1	-.002	15
334			min	-2868.028	3	-2.972	4	0	1	0	1	0	1	-.007	4
335		16	max	2808.281	2	-.879	15	0	1	0	1	0	1	-.001	15
336			min	-2868.156	3	-3.733	4	0	1	0	1	0	1	-.006	4
337		17	max	2808.111	2	-1.058	15	0	1	0	1	0	1	-.001	15
338			min	-2868.284	3	-4.494	4	0	1	0	1	0	1	-.004	4
339		18	max	2807.94	2	-1.237	15	0	1	0	1	0	1	0	15
340			min	-2868.412	3	-5.255	4	0	1	0	1	0	1	-.002	4
341		19	max	2807.77	2	-1.415	15	0	1	0	1	0	1	0	1
342			min	-2868.54	3	-6.016	4	0	1	0	1	0	1	0	1
343	M8	1	max	1834.662	2	0	1	0	1	0	1	0	1	0	1
344			min	68.105	15	0	1	0	1	0	1	0	1	0	1
345		2	max	1834.832	2	0	1	0	1	0	1	0	1	0	1
346			min	68.157	15	0	1	0	1	0	1	0	1	0	1
347		3	max	1835.002	2	0	1	0	1	0	1	0	1	0	1
348			min	68.208	15	0	1	0	1	0	1	0	1	0	1
349		4	max	1835.173	2	0	1	0	1	0	1	0	1	0	1
350			min	68.26	15	0	1	0	1	0	1	0	1	0	1
351		5	max	1835.343	2	0	1	0	1	0	1	0	1	0	1
352			min	68.311	15	0	1	0	1	0	1	0	1	0	1
353		6	max	1835.513	2	0	1	0	1	0	1	0	1	0	1
354			min	68.362	15	0	1	0	1	0	1	0	1	0	1
355		7	max	1835.684	2	0	1	0	1	0	1	0	1	0	1
356			min	68.414	15	0	1	0	1	0	1	0	1	0	1
357		8	max	1835.854	2	0	1	0	1	0	1	0	1	0	1
358			min	68.465	15	0	1	0	1	0	1	0	1	0	1
359		9	max	1836.024	2	0	1	0	1	0	1	0	1	0	1
360			min	68.517	15	0	1	0	1	0	1	0	1	0	1
361		10	max	1836.195	2	0	1	0	1	0	1	0	1	0	1
362			min	68.568	15	0	1	0	1	0	1	0	1	0	1
363		11	max	1836.365	2	0	1	0	1	0	1	0	1	0	1
364			min	68.619	15	0	1	0	1	0	1	0	1	0	1
365		12	max	1836.535	2	0	1	0	1	0	1	0	1	0	1
366			min	68.671	15	0	1	0	1	0	1	0	1	0	1
367		13	max	1836.706	2	0	1	0	1	0	1	0	1	0	1
368			min	68.722	15	0	1	0	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
369		14	max	1836.876	2	0	1	0	1	0	1	0	1	0	1
370			min	68.773	15	0	1	0	1	0	1	0	1	0	1
371		15	max	1837.046	2	0	1	0	1	0	1	0	1	0	1
372			min	68.825	15	0	1	0	1	0	1	0	1	0	1
373		16	max	1837.217	2	0	1	0	1	0	1	0	1	0	1
374			min	68.876	15	0	1	0	1	0	1	0	1	0	1
375		17	max	1837.387	2	0	1	0	1	0	1	0	1	0	1
376			min	68.928	15	0	1	0	1	0	1	0	1	0	1
377		18	max	1837.557	2	0	1	0	1	0	1	0	1	0	1
378			min	68.979	15	0	1	0	1	0	1	0	1	0	1
379		19	max	1837.728	2	0	1	0	1	0	1	0	1	0	1
380			min	69.03	15	0	1	0	1	0	1	0	1	0	1
381	M10	1	max	947.831	2	2.02	4	-.009	15	0	1	0	2	0	1
382			min	-1382.186	3	.475	15	-.165	1	0	3	0	3	0	1
383		2	max	948.352	2	1.901	4	-.009	15	0	1	0	10	0	15
384			min	-1381.795	3	.447	15	-.165	1	0	3	0	1	0	4
385		3	max	948.873	2	1.782	4	-.009	15	0	1	0	15	0	15
386			min	-1381.405	3	.419	15	-.165	1	0	3	0	1	-.001	4
387		4	max	949.393	2	1.663	4	-.009	15	0	1	0	15	0	15
388			min	-1381.014	3	.391	15	-.165	1	0	3	0	1	-.002	4
389		5	max	949.914	2	1.544	4	-.009	15	0	1	0	15	0	15
390			min	-1380.624	3	.363	15	-.165	1	0	3	0	1	-.003	4
391		6	max	950.435	2	1.425	4	-.009	15	0	1	0	15	0	15
392			min	-1380.233	3	.335	15	-.165	1	0	3	0	1	-.003	4
393		7	max	950.956	2	1.306	4	-.009	15	0	1	0	15	0	15
394			min	-1379.843	3	.307	15	-.165	1	0	3	0	1	-.004	4
395		8	max	951.476	2	1.187	4	-.009	15	0	1	0	15	0	15
396			min	-1379.452	3	.279	15	-.165	1	0	3	0	1	-.004	4
397		9	max	951.997	2	1.069	4	-.009	15	0	1	0	15	-.001	15
398			min	-1379.062	3	.242	12	-.165	1	0	3	0	1	-.004	4
399		10	max	952.518	2	.95	4	-.009	15	0	1	0	15	-.001	15
400			min	-1378.671	3	.196	12	-.165	1	0	3	0	1	-.005	4
401		11	max	953.038	2	.852	2	-.009	15	0	1	0	15	-.001	15
402			min	-1378.28	3	.15	12	-.165	1	0	3	0	1	-.005	4
403		12	max	953.559	2	.759	2	-.009	15	0	1	0	15	-.001	15
404			min	-1377.89	3	.104	12	-.165	1	0	3	0	1	-.005	4
405		13	max	954.08	2	.666	2	-.009	15	0	1	0	15	-.001	15
406			min	-1377.499	3	.057	12	-.165	1	0	3	0	1	-.006	4
407		14	max	954.6	2	.574	2	-.009	15	0	1	0	15	-.001	15
408			min	-1377.109	3	-.001	3	-.165	1	0	3	0	1	-.006	4
409		15	max	955.121	2	.481	2	-.009	15	0	1	0	15	-.001	15
410			min	-1376.718	3	-.071	3	-.165	1	0	3	0	1	-.006	4
411		16	max	955.642	2	.389	2	-.009	15	0	1	0	15	-.001	15
412			min	-1376.328	3	-.14	3	-.165	1	0	3	0	1	-.006	4
413		17	max	956.163	2	.296	2	-.009	15	0	1	0	15	-.001	12
414			min	-1375.937	3	-.21	3	-.165	1	0	3	0	1	-.006	4
415		18	max	956.683	2	.203	2	-.009	15	0	1	0	15	-.001	12
416			min	-1375.547	3	-.279	3	-.165	1	0	3	0	1	-.006	4
417		19	max	957.204	2	.111	2	-.009	15	0	1	0	15	-.001	12
418			min	-1375.156	3	-.348	3	-.165	1	0	3	-.001	1	-.006	4
419	M11	1	max	856.557	2	7.663	4	-.01	15	0	1	0	15	.006	4
420			min	-951.878	3	1.801	15	-.169	1	0	3	0	1	.001	12
421		2	max	856.386	2	6.902	4	-.01	15	0	1	0	15	.004	2
422			min	-952.006	3	1.623	15	-.169	1	0	3	0	1	0	3
423		3	max	856.216	2	6.141	4	-.01	15	0	1	0	15	.001	2
424			min	-952.134	3	1.444	15	-.169	1	0	3	0	1	-.001	3
425		4	max	856.046	2	5.38	4	-.01	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
426			min	-952.262	3	1.265	15	-.169	1	0	3	0	1	-.003	3
427		5	max	855.875	2	4.619	4	-.01	15	0	1	0	15	0	15
428			min	-952.389	3	1.086	15	-.169	1	0	3	0	1	-.004	4
429		6	max	855.705	2	3.858	4	-.01	15	0	1	0	15	-.001	15
430			min	-952.517	3	.907	15	-.169	1	0	3	0	1	-.006	4
431		7	max	855.535	2	3.097	4	-.01	15	0	1	0	15	-.002	15
432			min	-952.645	3	.728	15	-.169	1	0	3	0	1	-.007	4
433		8	max	855.364	2	2.336	4	-.01	15	0	1	0	15	-.002	15
434			min	-952.773	3	.549	15	-.169	1	0	3	0	1	-.008	4
435		9	max	855.194	2	1.575	4	-.01	15	0	1	0	15	-.002	15
436			min	-952.9	3	.37	15	-.169	1	0	3	0	1	-.009	4
437		10	max	855.024	2	.814	4	-.01	15	0	1	0	15	-.002	15
438			min	-953.028	3	.168	12	-.169	1	0	3	0	1	-.01	4
439		11	max	854.853	2	.216	2	-.01	15	0	1	0	15	-.002	15
440			min	-953.156	3	-.208	3	-.169	1	0	3	0	1	-.01	4
441		12	max	854.683	2	-.166	15	-.01	15	0	1	0	15	-.002	15
442			min	-953.284	3	-.708	4	-.169	1	0	3	0	1	-.01	4
443		13	max	854.513	2	-.345	15	-.01	15	0	1	0	15	-.002	15
444			min	-953.412	3	-1.469	4	-.169	1	0	3	-.001	1	-.009	4
445		14	max	854.342	2	-.524	15	-.01	15	0	1	0	15	-.002	15
446			min	-953.539	3	-2.23	4	-.169	1	0	3	-.001	1	-.009	4
447		15	max	854.172	2	-.703	15	-.01	15	0	1	0	15	-.002	15
448			min	-953.667	3	-2.991	4	-.169	1	0	3	-.001	1	-.008	4
449		16	max	854.002	2	-.882	15	-.01	15	0	1	0	15	-.001	15
450			min	-953.795	3	-3.752	4	-.169	1	0	3	-.001	1	-.006	4
451		17	max	853.831	2	-1.061	15	-.01	15	0	1	0	15	-.001	15
452			min	-953.923	3	-4.513	4	-.169	1	0	3	-.001	1	-.004	4
453		18	max	853.661	2	-1.239	15	-.01	15	0	1	0	15	0	15
454			min	-954.05	3	-5.274	4	-.169	1	0	3	-.001	1	-.002	4
455		19	max	853.491	2	-1.418	15	-.01	15	0	1	0	15	0	1
456			min	-954.178	3	-6.035	4	-.169	1	0	3	-.001	1	0	1
457	M12	1	max	711.046	1	0	1	5.707	1	0	1	0	15	0	1
458			min	33.373	15	0	1	.325	15	0	1	-.001	1	0	1
459		2	max	711.216	1	0	1	5.707	1	0	1	0	15	0	1
460			min	33.425	15	0	1	.325	15	0	1	0	1	0	1
461		3	max	711.387	1	0	1	5.707	1	0	1	0	10	0	1
462			min	33.476	15	0	1	.325	15	0	1	0	1	0	1
463		4	max	711.557	1	0	1	5.707	1	0	1	0	1	0	1
464			min	33.527	15	0	1	.325	15	0	1	0	15	0	1
465		5	max	711.727	1	0	1	5.707	1	0	1	.001	1	0	1
466			min	33.579	15	0	1	.325	15	0	1	0	15	0	1
467		6	max	711.898	1	0	1	5.707	1	0	1	.002	1	0	1
468			min	33.63	15	0	1	.325	15	0	1	0	15	0	1
469		7	max	712.068	1	0	1	5.707	1	0	1	.003	1	0	1
470			min	33.682	15	0	1	.325	15	0	1	0	15	0	1
471		8	max	712.238	1	0	1	5.707	1	0	1	.003	1	0	1
472			min	33.733	15	0	1	.325	15	0	1	0	15	0	1
473		9	max	712.409	1	0	1	5.707	1	0	1	.004	1	0	1
474			min	33.784	15	0	1	.325	15	0	1	0	15	0	1
475		10	max	712.579	1	0	1	5.707	1	0	1	.005	1	0	1
476			min	33.836	15	0	1	.325	15	0	1	0	15	0	1
477		11	max	712.749	1	0	1	5.707	1	0	1	.005	1	0	1
478			min	33.887	15	0	1	.325	15	0	1	0	15	0	1
479		12	max	712.92	1	0	1	5.707	1	0	1	.006	1	0	1
480			min	33.939	15	0	1	.325	15	0	1	0	15	0	1
481		13	max	713.09	1	0	1	5.707	1	0	1	.006	1	0	1
482			min	33.99	15	0	1	.325	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
483		14	max	713.261	1	0	1	5.707	1	0	1	.007	1	0	1
484			min	34.041	15	0	1	.325	15	0	1	0	15	0	1
485		15	max	713.431	1	0	1	5.707	1	0	1	.008	1	0	1
486			min	34.093	15	0	1	.325	15	0	1	0	15	0	1
487		16	max	713.601	1	0	1	5.707	1	0	1	.008	1	0	1
488			min	34.144	15	0	1	.325	15	0	1	0	15	0	1
489		17	max	713.772	1	0	1	5.707	1	0	1	.009	1	0	1
490			min	34.196	15	0	1	.325	15	0	1	0	15	0	1
491		18	max	713.942	1	0	1	5.707	1	0	1	.01	1	0	1
492			min	34.247	15	0	1	.325	15	0	1	0	15	0	1
493		19	max	714.112	1	0	1	5.707	1	0	1	.01	1	0	1
494			min	34.298	15	0	1	.325	15	0	1	0	15	0	1
495	M1	1	max	121.899	1	706.966	3	-2.828	15	0	2	.117	1	0	15
496			min	6.821	15	-369.071	2	-49.136	1	0	3	.007	15	-.012	2
497		2	max	122.721	1	706.086	3	-2.828	15	0	2	.091	1	.183	2
498			min	7.069	15	-370.245	2	-49.136	1	0	3	.005	15	-.375	3
499		3	max	597.993	3	484.981	2	-2.818	15	0	3	.065	1	.368	2
500			min	-344.91	2	-552.387	3	-49.027	1	0	2	.004	15	-.732	3
501		4	max	598.609	3	483.808	2	-2.818	15	0	3	.039	1	.112	2
502			min	-344.089	2	-553.267	3	-49.027	1	0	2	.002	15	-.44	3
503		5	max	599.226	3	482.634	2	-2.818	15	0	3	.013	1	-.003	15
504			min	-343.267	2	-554.147	3	-49.027	1	0	2	0	15	-.148	3
505		6	max	599.842	3	481.461	2	-2.818	15	0	3	0	15	.145	3
506			min	-342.445	2	-555.027	3	-49.027	1	0	2	-.013	1	-.397	2
507		7	max	600.458	3	480.288	2	-2.818	15	0	3	-.002	15	.438	3
508			min	-341.624	2	-555.907	3	-49.027	1	0	2	-.039	1	-.651	2
509		8	max	601.074	3	479.114	2	-2.818	15	0	3	-.004	15	.731	3
510			min	-340.802	2	-556.787	3	-49.027	1	0	2	-.064	1	-.904	2
511		9	max	616.115	3	52.433	2	-4.455	15	0	9	.041	1	.849	3
512			min	-286.669	2	.359	15	-77.726	1	0	3	.002	15	-1.033	2
513		10	max	616.732	3	51.26	2	-4.455	15	0	9	0	10	.832	3
514			min	-285.848	2	.005	15	-77.726	1	0	3	0	1	-1.061	2
515		11	max	617.348	3	50.086	2	-4.455	15	0	9	-.002	15	.815	3
516			min	-285.026	2	-1.45	4	-77.726	1	0	3	-.041	1	-1.087	2
517		12	max	632.078	3	384.019	3	-2.755	15	0	2	.064	1	.715	3
518			min	-230.746	2	-589.775	2	-48.267	1	0	3	.004	15	-.966	2
519		13	max	632.694	3	383.139	3	-2.755	15	0	2	.038	1	.512	3
520			min	-229.924	2	-590.948	2	-48.267	1	0	3	.002	15	-.655	2
521		14	max	633.31	3	382.259	3	-2.755	15	0	2	.013	1	.31	3
522			min	-229.103	2	-592.122	2	-48.267	1	0	3	0	15	-.343	2
523		15	max	633.926	3	381.379	3	-2.755	15	0	2	0	15	.109	3
524			min	-228.281	2	-593.295	2	-48.267	1	0	3	-.013	1	-.039	1
525		16	max	634.543	3	380.499	3	-2.755	15	0	2	-.002	15	.283	2
526			min	-227.459	2	-594.469	2	-48.267	1	0	3	-.038	1	-.092	3
527		17	max	635.159	3	379.619	3	-2.755	15	0	2	-.004	15	.597	2
528			min	-226.638	2	-595.642	2	-48.267	1	0	3	-.063	1	-.293	3
529		18	max	-7.077	15	586.071	2	-3.071	15	0	3	-.005	15	.302	2
530			min	-123.14	1	-295.966	3	-53.717	1	0	2	-.09	1	-.145	3
531		19	max	-6.829	15	584.898	2	-3.071	15	0	3	-.007	15	.011	3
532			min	-122.319	1	-296.846	3	-53.717	1	0	2	-.118	1	-.007	2
533	M5	1	max	274.913	1	2337.771	3	0	1	0	1	0	1	.025	2
534			min	10.398	12	-1278.202	2	0	1	0	1	0	1	0	15
535		2	max	275.734	1	2336.891	3	0	1	0	1	0	1	.7	2
536			min	10.809	12	-1279.375	2	0	1	0	1	0	1	-1.23	3
537		3	max	1841.372	3	1322.053	2	0	1	0	1	0	1	1.344	2
538			min	-1093.649	2	-1630.552	3	0	1	0	1	0	1	-2.415	3
539		4	max	1841.988	3	1320.88	2	0	1	0	1	0	1	.646	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
540			min	-1092.827	2	-1631.432	3	0	1	0	1	0	1	-1.554	3
541		5	max	1842.604	3	1319.706	2	0	1	0	1	0	1	.015	9
542			min	-1092.006	2	-1632.312	3	0	1	0	1	0	1	-.693	3
543		6	max	1843.22	3	1318.533	2	0	1	0	1	0	1	.168	3
544			min	-1091.184	2	-1633.192	3	0	1	0	1	0	1	-.746	2
545		7	max	1843.837	3	1317.359	2	0	1	0	1	0	1	1.03	3
546			min	-1090.363	2	-1634.072	3	0	1	0	1	0	1	-1.442	2
547		8	max	1844.453	3	1316.186	2	0	1	0	1	0	1	1.893	3
548			min	-1089.541	2	-1634.952	3	0	1	0	1	0	1	-2.137	2
549		9	max	1859.25	3	177.875	2	0	1	0	1	0	1	2.175	3
550			min	-967.857	2	.35	15	0	1	0	1	0	1	-2.447	2
551		10	max	1859.866	3	176.701	2	0	1	0	1	0	1	2.108	3
552			min	-967.035	2	-.004	15	0	1	0	1	0	1	-2.54	2
553		11	max	1860.482	3	175.528	2	0	1	0	1	0	1	2.042	3
554			min	-966.213	2	-1.433	4	0	1	0	1	0	1	-2.633	2
555		12	max	1875.902	3	1095.813	3	0	1	0	1	0	1	1.791	3
556			min	-844.824	2	-1673.989	2	0	1	0	1	0	1	-2.361	2
557		13	max	1876.518	3	1094.933	3	0	1	0	1	0	1	1.213	3
558			min	-844.002	2	-1675.162	2	0	1	0	1	0	1	-1.478	2
559		14	max	1877.135	3	1094.053	3	0	1	0	1	0	1	.636	3
560			min	-843.181	2	-1676.335	2	0	1	0	1	0	1	-.593	2
561		15	max	1877.751	3	1093.172	3	0	1	0	1	0	1	.291	2
562			min	-842.359	2	-1677.509	2	0	1	0	1	0	1	0	13
563		16	max	1878.367	3	1092.292	3	0	1	0	1	0	1	1.177	2
564			min	-841.538	2	-1678.682	2	0	1	0	1	0	1	-.518	3
565		17	max	1878.983	3	1091.412	3	0	1	0	1	0	1	2.063	2
566			min	-840.716	2	-1679.856	2	0	1	0	1	0	1	-1.094	3
567		18	max	-12.1	12	1983.564	2	0	1	0	1	0	1	1.06	2
568			min	-274.896	1	-1039.258	3	0	1	0	1	0	1	-.571	3
569		19	max	-11.689	12	1982.391	2	0	1	0	1	0	1	.014	2
570			min	-274.075	1	-1040.138	3	0	1	0	1	0	1	-.023	3
571	M9	1	max	121.899	1	706.966	3	49.136	1	0	3	-.007	15	0	15
572			min	6.821	15	-369.071	2	2.828	15	0	2	-.117	1	-.012	2
573		2	max	122.721	1	706.086	3	49.136	1	0	3	-.005	15	.183	2
574			min	7.069	15	-370.245	2	2.828	15	0	2	-.091	1	-.375	3
575		3	max	597.993	3	484.981	2	49.027	1	0	2	-.004	15	.368	2
576			min	-344.91	2	-552.387	3	2.818	15	0	3	-.065	1	-.732	3
577		4	max	598.609	3	483.808	2	49.027	1	0	2	-.002	15	.112	2
578			min	-344.089	2	-553.267	3	2.818	15	0	3	-.039	1	-.44	3
579		5	max	599.226	3	482.634	2	49.027	1	0	2	0	15	-.003	15
580			min	-343.267	2	-554.147	3	2.818	15	0	3	-.013	1	-.148	3
581		6	max	599.842	3	481.461	2	49.027	1	0	2	.013	1	.145	3
582			min	-342.445	2	-555.027	3	2.818	15	0	3	0	15	-.397	2
583		7	max	600.458	3	480.288	2	49.027	1	0	2	.039	1	.438	3
584			min	-341.624	2	-555.907	3	2.818	15	0	3	.002	15	-.651	2
585		8	max	601.074	3	479.114	2	49.027	1	0	2	.064	1	.731	3
586			min	-340.802	2	-556.787	3	2.818	15	0	3	.004	15	-.904	2
587		9	max	616.115	3	52.433	2	77.726	1	0	3	-.002	15	.849	3
588			min	-286.669	2	.359	15	4.455	15	0	9	-.041	1	-1.033	2
589		10	max	616.732	3	51.26	2	77.726	1	0	3	0	1	.832	3
590			min	-285.848	2	.005	15	4.455	15	0	9	0	10	-1.061	2
591		11	max	617.348	3	50.086	2	77.726	1	0	3	.041	1	.815	3
592			min	-285.026	2	-1.45	4	4.455	15	0	9	.002	15	-1.087	2
593		12	max	632.078	3	384.019	3	48.267	1	0	3	-.004	15	.715	3
594			min	-230.746	2	-589.775	2	2.755	15	0	2	-.064	1	-.966	2
595		13	max	632.694	3	383.139	3	48.267	1	0	3	-.002	15	.512	3
596			min	-229.924	2	-590.948	2	2.755	15	0	2	-.038	1	-.655	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
597		14	max	633.31	3	382.259	3	48.267	1	0	3	0	15	.31	3
598			min	-229.103	2	-592.122	2	2.755	15	0	2	-.013	1	-.343	2
599		15	max	633.926	3	381.379	3	48.267	1	0	3	.013	1	.109	3
600			min	-228.281	2	-593.295	2	2.755	15	0	2	0	15	-.039	1
601		16	max	634.543	3	380.499	3	48.267	1	0	3	.038	1	.283	2
602			min	-227.459	2	-594.469	2	2.755	15	0	2	.002	15	-.092	3
603		17	max	635.159	3	379.619	3	48.267	1	0	3	.063	1	.597	2
604			min	-226.638	2	-595.642	2	2.755	15	0	2	.004	15	-.293	3
605		18	max	-7.077	15	586.071	2	53.717	1	0	2	.09	1	.302	2
606			min	-123.14	1	-295.966	3	3.071	15	0	3	.005	15	-.145	3
607		19	max	-6.829	15	584.898	2	53.717	1	0	2	.118	1	.011	3
608			min	-122.319	1	-296.846	3	3.071	15	0	3	.007	15	-.007	2

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	M13	1	max	0	1	.112	2	.01	3	9.512e-3	2	NC	1	NC	1
2			min	0	15	-.031	3	-.006	2	-3.06e-3	3	NC	1	NC	1
3		2	max	0	1	.088	3	.012	3	1.036e-2	2	NC	4	NC	1
4			min	0	15	.001	15	-.003	10	-2.939e-3	3	1411.468	3	NC	1
5		3	max	0	1	.185	3	.023	1	1.122e-2	2	NC	4	NC	2
6			min	0	15	0	9	-.002	10	-2.818e-3	3	777.087	3	6906.683	1
7		4	max	0	1	.246	3	.035	1	1.207e-2	2	NC	4	NC	2
8			min	0	15	-.005	9	-.001	10	-2.696e-3	3	606.988	3	4711.209	1
9		5	max	0	1	.263	3	.04	1	1.292e-2	2	NC	4	NC	2
10			min	0	15	-.005	9	-.002	10	-2.575e-3	3	571.747	3	4124.064	1
11		6	max	0	1	.237	3	.037	1	1.377e-2	2	NC	4	NC	2
12			min	0	15	0	15	-.004	10	-2.454e-3	3	626.37	3	4423.746	1
13		7	max	0	1	.178	3	.028	3	1.463e-2	2	NC	4	NC	2
14			min	0	15	.001	15	-.006	10	-2.332e-3	3	805.652	3	6007.605	1
15		8	max	0	1	.135	2	.03	3	1.548e-2	2	NC	1	NC	1
16			min	0	15	.002	15	-.011	2	-2.211e-3	3	1280.632	3	8652.928	3
17		9	max	0	1	.178	2	.03	3	1.633e-2	2	NC	4	NC	1
18			min	0	15	.003	15	-.018	2	-2.089e-3	3	2544.55	2	8411.001	3
19		10	max	0	1	.197	2	.03	3	1.718e-2	2	NC	4	NC	1
20			min	0	1	-.003	3	-.022	2	-1.968e-3	3	1971.306	2	8371.587	3
21		11	max	0	15	.178	2	.03	3	1.633e-2	2	NC	4	NC	1
22			min	0	1	.003	15	-.018	2	-2.089e-3	3	2544.55	2	8411.001	3
23		12	max	0	15	.135	2	.03	3	1.548e-2	2	NC	1	NC	1
24			min	0	1	.002	15	-.011	2	-2.211e-3	3	1280.632	3	8652.928	3
25		13	max	0	15	.178	3	.028	3	1.463e-2	2	NC	4	NC	2
26			min	0	1	.001	15	-.006	10	-2.332e-3	3	805.652	3	6007.605	1
27		14	max	0	15	.237	3	.037	1	1.377e-2	2	NC	4	NC	2
28			min	0	1	0	15	-.004	10	-2.454e-3	3	626.37	3	4423.746	1
29		15	max	0	15	.263	3	.04	1	1.292e-2	2	NC	4	NC	2
30			min	0	1	-.005	9	-.002	10	-2.575e-3	3	571.747	3	4124.064	1
31		16	max	0	15	.246	3	.035	1	1.207e-2	2	NC	4	NC	2
32			min	0	1	-.005	9	-.001	10	-2.696e-3	3	606.988	3	4711.209	1
33		17	max	0	15	.185	3	.023	1	1.122e-2	2	NC	4	NC	2
34			min	0	1	0	9	-.002	10	-2.818e-3	3	777.087	3	6906.683	1
35		18	max	0	15	.088	3	.012	3	1.036e-2	2	NC	4	NC	1
36			min	0	1	.001	15	-.003	10	-2.939e-3	3	1411.468	3	NC	1
37		19	max	0	15	.112	2	.01	3	9.512e-3	2	NC	1	NC	1
38			min	0	1	-.031	3	-.006	2	-3.06e-3	3	NC	1	NC	1
39	M14	1	max	0	1	.265	3	.009	3	5.217e-3	2	NC	1	NC	1
40			min	0	15	-.353	2	-.006	2	-4.447e-3	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
41		2	max	0	1	.416	3	.01	3	6.022e-3	2	NC	4	NC	1
42			min	0	15	-.49	2	-.003	2	-5.204e-3	3	1110.529	3	NC	1
43		3	max	0	1	.549	3	.018	1	6.827e-3	2	NC	5	NC	2
44			min	0	15	-.613	2	-.002	10	-5.961e-3	3	591.189	3	9091.094	1
45		4	max	0	1	.651	3	.028	1	7.632e-3	2	NC	5	NC	2
46			min	0	15	-.713	2	-.002	10	-6.717e-3	3	435.438	3	5732.263	1
47		5	max	0	1	.714	3	.034	1	8.437e-3	2	NC	5	NC	2
48			min	0	15	-.785	2	-.002	10	-7.474e-3	3	373.851	3	4801.781	1
49		6	max	0	1	.739	3	.033	1	9.242e-3	2	NC	5	NC	2
50			min	0	15	-.826	2	-.003	10	-8.231e-3	3	354.404	3	5005.389	1
51		7	max	0	1	.73	3	.025	3	1.005e-2	2	NC	5	NC	2
52			min	0	15	-.84	2	-.006	10	-8.988e-3	3	345.058	2	6654.344	1
53		8	max	0	1	.698	3	.026	3	1.085e-2	2	NC	5	NC	1
54			min	0	15	-.833	2	-.01	2	-9.745e-3	3	349.803	2	9817.861	3
55		9	max	0	1	.662	3	.027	3	1.166e-2	2	NC	5	NC	1
56			min	0	15	-.817	2	-.017	2	-1.05e-2	3	361.652	2	9487.506	3
57		10	max	0	1	.643	3	.027	3	1.246e-2	2	NC	5	NC	1
58			min	0	1	-.808	2	-.02	2	-1.126e-2	3	369.175	2	9426.223	3
59		11	max	0	15	.662	3	.027	3	1.166e-2	2	NC	5	NC	1
60			min	0	1	-.817	2	-.017	2	-1.05e-2	3	361.652	2	9487.506	3
61		12	max	0	15	.698	3	.026	3	1.085e-2	2	NC	5	NC	1
62			min	0	1	-.833	2	-.01	2	-9.745e-3	3	349.803	2	9817.861	3
63		13	max	0	15	.73	3	.025	3	1.005e-2	2	NC	5	NC	2
64			min	0	1	-.84	2	-.006	10	-8.988e-3	3	345.058	2	6654.344	1
65		14	max	0	15	.739	3	.033	1	9.242e-3	2	NC	5	NC	2
66			min	0	1	-.826	2	-.003	10	-8.231e-3	3	354.404	3	5005.389	1
67		15	max	0	15	.714	3	.034	1	8.437e-3	2	NC	5	NC	2
68			min	0	1	-.785	2	-.002	10	-7.474e-3	3	373.851	3	4801.781	1
69		16	max	0	15	.651	3	.028	1	7.632e-3	2	NC	5	NC	2
70			min	0	1	-.713	2	-.002	10	-6.717e-3	3	435.438	3	5732.263	1
71		17	max	0	15	.549	3	.018	1	6.827e-3	2	NC	5	NC	2
72			min	0	1	-.613	2	-.002	10	-5.961e-3	3	591.189	3	9091.094	1
73		18	max	0	15	.416	3	.01	3	6.022e-3	2	NC	4	NC	1
74			min	0	1	-.49	2	-.003	2	-5.204e-3	3	1110.529	3	NC	1
75		19	max	0	15	.265	3	.009	3	5.217e-3	2	NC	1	NC	1
76			min	0	1	-.353	2	-.006	2	-4.447e-3	3	NC	1	NC	1
77	M15	1	max	0	15	.269	3	.008	3	3.958e-3	3	NC	1	NC	1
78			min	0	1	-.352	2	-.005	2	-5.492e-3	2	NC	1	NC	1
79		2	max	0	15	.382	3	.01	3	4.633e-3	3	NC	4	NC	1
80			min	0	1	-.523	2	-.003	10	-6.347e-3	2	980.228	2	NC	1
81		3	max	0	15	.484	3	.018	1	5.308e-3	3	NC	5	NC	2
82			min	0	1	-.674	2	-.002	10	-7.203e-3	2	520.674	2	9045.016	1
83		4	max	0	15	.567	3	.029	1	5.984e-3	3	NC	5	NC	2
84			min	0	1	-.791	2	-.001	10	-8.058e-3	2	382.097	2	5703.551	1
85		5	max	0	15	.627	3	.034	1	6.659e-3	3	NC	5	NC	2
86			min	0	1	-.866	2	-.001	10	-8.914e-3	2	326.306	2	4774.341	1
87		6	max	0	15	.662	3	.033	1	7.335e-3	3	NC	5	NC	2
88			min	0	1	-.899	2	-.003	10	-9.769e-3	2	307.064	2	4968.127	1
89		7	max	0	15	.675	3	.025	1	8.01e-3	3	NC	5	NC	2
90			min	0	1	-.893	2	-.005	10	-1.062e-2	2	309.998	2	6577.113	1
91		8	max	0	15	.671	3	.024	3	8.685e-3	3	NC	5	NC	1
92			min	0	1	-.863	2	-.009	2	-1.148e-2	2	328.561	2	NC	1
93		9	max	0	15	.659	3	.025	3	9.361e-3	3	NC	5	NC	1
94			min	0	1	-.825	2	-.016	2	-1.234e-2	2	354.581	2	NC	1
95		10	max	0	1	.651	3	.025	3	1.004e-2	3	NC	5	NC	1
96			min	0	1	-.806	2	-.019	2	-1.319e-2	2	369.687	2	NC	1
97		11	max	0	1	.659	3	.025	3	9.361e-3	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
98			min	0	15	-.825	2	-.016	2	-1.234e-2	2	354.581	2	NC	1
99		12	max	0	1	.671	3	.024	3	8.685e-3	3	NC	5	NC	1
100			min	0	15	-.863	2	-.009	2	-1.148e-2	2	328.561	2	NC	1
101		13	max	0	1	.675	3	.025	1	8.01e-3	3	NC	5	NC	2
102			min	0	15	-.893	2	-.005	10	-1.062e-2	2	309.998	2	6577.113	1
103		14	max	0	1	.662	3	.033	1	7.335e-3	3	NC	5	NC	2
104			min	0	15	-.899	2	-.003	10	-9.769e-3	2	307.064	2	4968.127	1
105		15	max	0	1	.627	3	.034	1	6.659e-3	3	NC	5	NC	2
106			min	0	15	-.866	2	-.001	10	-8.914e-3	2	326.306	2	4774.341	1
107		16	max	0	1	.567	3	.029	1	5.984e-3	3	NC	5	NC	2
108			min	0	15	-.791	2	-.001	10	-8.058e-3	2	382.097	2	5703.551	1
109		17	max	0	1	.484	3	.018	1	5.308e-3	3	NC	5	NC	2
110			min	0	15	-.674	2	-.002	10	-7.203e-3	2	520.674	2	9045.016	1
111		18	max	0	1	.382	3	.01	3	4.633e-3	3	NC	4	NC	1
112			min	0	15	-.523	2	-.003	10	-6.347e-3	2	980.228	2	NC	1
113		19	max	0	1	.269	3	.008	3	3.958e-3	3	NC	1	NC	1
114			min	0	15	-.352	2	-.005	2	-5.492e-3	2	NC	1	NC	1
115	M16	1	max	0	15	.099	2	.007	3	7.304e-3	3	NC	1	NC	1
116			min	0	1	-.09	3	-.005	2	-7.811e-3	2	NC	1	NC	1
117		2	max	0	15	.02	1	.01	1	8.083e-3	3	NC	4	NC	1
118			min	0	1	-.055	3	-.002	10	-8.284e-3	2	1947.273	2	NC	1
119		3	max	0	15	.003	4	.024	1	8.862e-3	3	NC	4	NC	2
120			min	0	1	-.056	2	0	10	-8.757e-3	2	1087.113	2	6876.464	1
121		4	max	0	15	.001	13	.035	1	9.642e-3	3	NC	4	NC	2
122			min	0	1	-.094	2	0	10	-9.23e-3	2	871.519	2	4670.652	1
123		5	max	0	15	.001	13	.04	1	1.042e-2	3	NC	4	NC	2
124			min	0	1	-.096	2	0	10	-9.703e-3	2	859.458	2	4067.23	1
125		6	max	0	15	.004	9	.038	1	1.12e-2	3	NC	4	NC	2
126			min	0	1	-.065	2	-.002	10	-1.018e-2	2	1026.289	2	4326.498	1
127		7	max	0	15	.014	9	.028	1	1.198e-2	3	NC	3	NC	2
128			min	0	1	-.084	3	-.004	10	-1.065e-2	2	1599.742	2	5774.127	1
129		8	max	0	15	.065	2	.021	3	1.276e-2	3	NC	1	NC	1
130			min	0	1	-.126	3	-.007	10	-1.112e-2	2	4619.138	3	NC	1
131		9	max	0	15	.129	2	.022	3	1.354e-2	3	NC	4	NC	1
132			min	0	1	-.162	3	-.014	2	-1.16e-2	2	2323.511	3	NC	1
133		10	max	0	1	.158	2	.021	3	1.432e-2	3	NC	4	NC	1
134			min	0	1	-.178	3	-.017	2	-1.207e-2	2	1905.238	3	NC	1
135		11	max	0	1	.129	2	.022	3	1.354e-2	3	NC	4	NC	1
136			min	0	15	-.162	3	-.014	2	-1.16e-2	2	2323.511	3	NC	1
137		12	max	0	1	.065	2	.021	3	1.276e-2	3	NC	1	NC	1
138			min	0	15	-.126	3	-.007	10	-1.112e-2	2	4619.138	3	NC	1
139		13	max	0	1	.014	9	.028	1	1.198e-2	3	NC	3	NC	2
140			min	0	15	-.084	3	-.004	10	-1.065e-2	2	1599.742	2	5774.127	1
141		14	max	0	1	.004	9	.038	1	1.12e-2	3	NC	4	NC	2
142			min	0	15	-.065	2	-.002	10	-1.018e-2	2	1026.289	2	4326.498	1
143		15	max	0	1	.001	13	.04	1	1.042e-2	3	NC	4	NC	2
144			min	0	15	-.096	2	0	10	-9.703e-3	2	859.458	2	4067.23	1
145		16	max	0	1	.001	13	.035	1	9.642e-3	3	NC	4	NC	2
146			min	0	15	-.094	2	0	10	-9.23e-3	2	871.519	2	4670.652	1
147		17	max	0	1	.003	4	.024	1	8.862e-3	3	NC	4	NC	2
148			min	0	15	-.056	2	0	10	-8.757e-3	2	1087.113	2	6876.464	1
149		18	max	0	1	.02	1	.01	1	8.083e-3	3	NC	4	NC	1
150			min	0	15	-.055	3	-.002	10	-8.284e-3	2	1947.273	2	NC	1
151		19	max	0	1	.099	2	.007	3	7.304e-3	3	NC	1	NC	1
152			min	0	15	-.09	3	-.005	2	-7.811e-3	2	NC	1	NC	1
153	M2	1	max	.007	2	.01	2	.004	1	-5.942e-6	15	NC	1	NC	1
154			min	-.01	3	-.016	3	0	15	-1.029e-4	1	7453.502	2	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
155		2	max	.007	2	.009	2	.004	1	-5.637e-6	15	NC	1	NC	1
156			min	-.01	3	-.015	3	0	15	-9.758e-5	1	8642.116	2	NC	1
157		3	max	.006	2	.008	2	.003	1	-5.332e-6	15	NC	1	NC	1
158			min	-.009	3	-.015	3	0	15	-9.23e-5	1	NC	1	NC	1
159		4	max	.006	2	.006	2	.003	1	-5.028e-6	15	NC	1	NC	1
160			min	-.009	3	-.014	3	0	15	-8.702e-5	1	NC	1	NC	1
161		5	max	.005	2	.005	2	.003	1	-4.723e-6	15	NC	1	NC	1
162			min	-.008	3	-.014	3	0	15	-8.174e-5	1	NC	1	NC	1
163		6	max	.005	2	.004	2	.002	1	-4.418e-6	15	NC	1	NC	1
164			min	-.007	3	-.013	3	0	15	-7.646e-5	1	NC	1	NC	1
165		7	max	.005	2	.002	2	.002	1	-4.113e-6	15	NC	1	NC	1
166			min	-.007	3	-.012	3	0	15	-7.117e-5	1	NC	1	NC	1
167		8	max	.004	2	.001	2	.002	1	-3.809e-6	15	NC	1	NC	1
168			min	-.006	3	-.012	3	0	15	-6.589e-5	1	NC	1	NC	1
169		9	max	.004	2	0	2	.001	1	-3.504e-6	15	NC	1	NC	1
170			min	-.006	3	-.011	3	0	15	-6.061e-5	1	NC	1	NC	1
171		10	max	.004	2	0	2	.001	1	-3.199e-6	15	NC	1	NC	1
172			min	-.005	3	-.01	3	0	15	-5.533e-5	1	NC	1	NC	1
173		11	max	.003	2	0	2	0	1	-2.894e-6	15	NC	1	NC	1
174			min	-.005	3	-.009	3	0	15	-5.005e-5	1	NC	1	NC	1
175		12	max	.003	2	-.001	15	0	1	-2.59e-6	15	NC	1	NC	1
176			min	-.004	3	-.008	3	0	15	-4.476e-5	1	NC	1	NC	1
177		13	max	.002	2	-.001	15	0	1	-2.285e-6	15	NC	1	NC	1
178			min	-.003	3	-.007	3	0	15	-3.948e-5	1	NC	1	NC	1
179		14	max	.002	2	-.001	15	0	1	-1.98e-6	15	NC	1	NC	1
180			min	-.003	3	-.006	3	0	15	-3.42e-5	1	NC	1	NC	1
181		15	max	.002	2	-.001	15	0	1	-1.675e-6	15	NC	1	NC	1
182			min	-.002	3	-.005	3	0	15	-2.892e-5	1	NC	1	NC	1
183		16	max	.001	2	0	15	0	1	-1.371e-6	15	NC	1	NC	1
184			min	-.002	3	-.004	3	0	15	-2.364e-5	1	NC	1	NC	1
185		17	max	0	2	0	15	0	1	-1.066e-6	15	NC	1	NC	1
186			min	-.001	3	-.003	3	0	15	-1.835e-5	1	NC	1	NC	1
187		18	max	0	2	0	15	0	1	-7.61e-7	15	NC	1	NC	1
188			min	0	3	-.001	4	0	15	-1.307e-5	1	NC	1	NC	1
189		19	max	0	1	0	1	0	1	-4.563e-7	15	NC	1	NC	1
190			min	0	1	0	1	0	1	-7.791e-6	1	NC	1	NC	1
191	M3	1	max	0	1	0	1	0	1	1.782e-6	1	NC	1	NC	1
192			min	0	1	0	1	0	1	1.048e-7	15	NC	1	NC	1
193		2	max	0	3	0	15	0	15	1.148e-5	1	NC	1	NC	1
194			min	0	2	-.002	4	0	1	6.559e-7	15	NC	1	NC	1
195		3	max	0	3	0	15	0	15	2.117e-5	1	NC	1	NC	1
196			min	0	2	-.004	4	0	1	1.207e-6	15	NC	1	NC	1
197		4	max	.001	3	-.001	15	0	15	3.086e-5	1	NC	1	NC	1
198			min	-.001	2	-.006	4	0	1	1.758e-6	15	NC	1	NC	1
199		5	max	.002	3	-.002	15	0	10	4.056e-5	1	NC	1	NC	1
200			min	-.002	2	-.008	4	0	1	2.309e-6	15	NC	1	NC	1
201		6	max	.002	3	-.002	15	0	10	5.025e-5	1	NC	1	NC	1
202			min	-.002	2	-.01	4	0	1	2.861e-6	15	9257.483	4	NC	1
203		7	max	.003	3	-.003	15	0	1	5.995e-5	1	NC	1	NC	1
204			min	-.002	2	-.011	4	0	3	3.412e-6	15	8005.188	4	NC	1
205		8	max	.003	3	-.003	15	0	1	6.964e-5	1	NC	2	NC	1
206			min	-.003	2	-.013	4	0	3	3.963e-6	15	7234.508	4	NC	1
207		9	max	.004	3	-.003	15	0	1	7.933e-5	1	NC	5	NC	1
208			min	-.003	2	-.014	4	0	12	4.514e-6	15	6784.835	4	NC	1
209		10	max	.004	3	-.003	15	0	1	8.903e-5	1	NC	5	NC	1
210			min	-.004	2	-.014	4	0	15	5.065e-6	15	6578.843	4	NC	1
211		11	max	.005	3	-.003	15	0	1	9.872e-5	1	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
212			min	-.004	2	-.014	4	0	15	5.616e-6	15	6586.45	4	NC	1
213		12	max	.005	3	-.003	15	0	1	1.084e-4	1	NC	5	NC	1
214			min	-.005	2	-.014	4	0	15	6.167e-6	15	6813.281	4	NC	1
215		13	max	.005	3	-.003	15	.001	1	1.181e-4	1	NC	2	NC	1
216			min	-.005	2	-.013	4	0	15	6.719e-6	15	7304.322	4	NC	1
217		14	max	.006	3	-.003	15	.001	1	1.278e-4	1	NC	1	NC	1
218			min	-.005	2	-.011	4	0	15	7.27e-6	15	8166.69	4	NC	1
219		15	max	.006	3	-.002	15	.002	1	1.375e-4	1	NC	1	NC	1
220			min	-.006	2	-.01	4	0	15	7.821e-6	15	9635.729	4	NC	1
221		16	max	.007	3	-.002	15	.002	1	1.472e-4	1	NC	1	NC	1
222			min	-.006	2	-.008	4	0	15	8.372e-6	15	NC	1	NC	1
223		17	max	.007	3	-.001	15	.003	1	1.569e-4	1	NC	1	NC	1
224			min	-.007	2	-.006	3	0	15	8.923e-6	15	NC	1	NC	1
225		18	max	.008	3	0	15	.003	1	1.666e-4	1	NC	1	NC	1
226			min	-.007	2	-.004	3	0	15	9.474e-6	15	NC	1	NC	1
227		19	max	.008	3	0	2	.004	1	1.763e-4	1	NC	1	NC	1
228			min	-.007	2	-.003	3	0	15	1.003e-5	15	NC	1	NC	1
229	M4	1	max	.002	1	.007	2	0	15	7.021e-5	1	NC	1	NC	2
230			min	0	15	-.009	3	-.004	1	4.017e-6	15	NC	1	6719.427	1
231		2	max	.002	1	.007	2	0	15	7.021e-5	1	NC	1	NC	2
232			min	0	15	-.008	3	-.003	1	4.017e-6	15	NC	1	7280.522	1
233		3	max	.002	1	.006	2	0	15	7.021e-5	1	NC	1	NC	2
234			min	0	15	-.008	3	-.003	1	4.017e-6	15	NC	1	7950.041	1
235		4	max	.001	1	.006	2	0	15	7.021e-5	1	NC	1	NC	2
236			min	0	15	-.007	3	-.003	1	4.017e-6	15	NC	1	8755.85	1
237		5	max	.001	1	.006	2	0	15	7.021e-5	1	NC	1	NC	2
238			min	0	15	-.007	3	-.003	1	4.017e-6	15	NC	1	9735.839	1
239		6	max	.001	1	.005	2	0	15	7.021e-5	1	NC	1	NC	1
240			min	0	15	-.006	3	-.002	1	4.017e-6	15	NC	1	NC	1
241		7	max	.001	1	.005	2	0	15	7.021e-5	1	NC	1	NC	1
242			min	0	15	-.006	3	-.002	1	4.017e-6	15	NC	1	NC	1
243		8	max	.001	1	.004	2	0	15	7.021e-5	1	NC	1	NC	1
244			min	0	15	-.005	3	-.002	1	4.017e-6	15	NC	1	NC	1
245		9	max	0	1	.004	2	0	15	7.021e-5	1	NC	1	NC	1
246			min	0	15	-.005	3	-.001	1	4.017e-6	15	NC	1	NC	1
247		10	max	0	1	.004	2	0	15	7.021e-5	1	NC	1	NC	1
248			min	0	15	-.004	3	-.001	1	4.017e-6	15	NC	1	NC	1
249		11	max	0	1	.003	2	0	15	7.021e-5	1	NC	1	NC	1
250			min	0	15	-.004	3	-.001	1	4.017e-6	15	NC	1	NC	1
251		12	max	0	1	.003	2	0	15	7.021e-5	1	NC	1	NC	1
252			min	0	15	-.003	3	0	1	4.017e-6	15	NC	1	NC	1
253		13	max	0	1	.002	2	0	15	7.021e-5	1	NC	1	NC	1
254			min	0	15	-.003	3	0	1	4.017e-6	15	NC	1	NC	1
255		14	max	0	1	.002	2	0	15	7.021e-5	1	NC	1	NC	1
256			min	0	15	-.002	3	0	1	4.017e-6	15	NC	1	NC	1
257		15	max	0	1	.002	2	0	15	7.021e-5	1	NC	1	NC	1
258			min	0	15	-.002	3	0	1	4.017e-6	15	NC	1	NC	1
259		16	max	0	1	.001	2	0	15	7.021e-5	1	NC	1	NC	1
260			min	0	15	-.001	3	0	1	4.017e-6	15	NC	1	NC	1
261		17	max	0	1	0	2	0	15	7.021e-5	1	NC	1	NC	1
262			min	0	15	0	3	0	1	4.017e-6	15	NC	1	NC	1
263		18	max	0	1	0	2	0	15	7.021e-5	1	NC	1	NC	1
264			min	0	15	0	3	0	1	4.017e-6	15	NC	1	NC	1
265		19	max	0	1	0	1	0	1	7.021e-5	1	NC	1	NC	1
266			min	0	1	0	1	0	1	4.017e-6	15	NC	1	NC	1
267	M6	1	max	.022	2	.034	2	0	1	0	1	NC	4	NC	1
268			min	-.032	3	-.048	3	0	1	0	1	1599.027	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
269		2	max	.02	2	.031	2	0	1	0	1	NC	4	NC	1
270			min	-.03	3	-.045	3	0	1	0	1	1692.785	3	NC	1
271		3	max	.019	2	.028	2	0	1	0	1	NC	4	NC	1
272			min	-.029	3	-.043	3	0	1	0	1	1798.361	3	NC	1
273		4	max	.018	2	.025	2	0	1	0	1	NC	4	NC	1
274			min	-.027	3	-.04	3	0	1	0	1	1918.265	3	NC	1
275		5	max	.017	2	.022	2	0	1	0	1	NC	4	NC	1
276			min	-.025	3	-.037	3	0	1	0	1	2055.718	3	NC	1
277		6	max	.016	2	.019	2	0	1	0	1	NC	4	NC	1
278			min	-.023	3	-.035	3	0	1	0	1	2214.94	3	NC	1
279		7	max	.014	2	.017	2	0	1	0	1	NC	1	NC	1
280			min	-.021	3	-.032	3	0	1	0	1	2401.554	3	NC	1
281		8	max	.013	2	.014	2	0	1	0	1	NC	1	NC	1
282			min	-.02	3	-.029	3	0	1	0	1	2623.234	3	NC	1
283		9	max	.012	2	.012	2	0	1	0	1	NC	1	NC	1
284			min	-.018	3	-.027	3	0	1	0	1	2890.725	3	NC	1
285		10	max	.011	2	.01	2	0	1	0	1	NC	1	NC	1
286			min	-.016	3	-.024	3	0	1	0	1	3219.562	3	NC	1
287		11	max	.01	2	.008	2	0	1	0	1	NC	1	NC	1
288			min	-.014	3	-.021	3	0	1	0	1	3633.052	3	NC	1
289		12	max	.008	2	.006	2	0	1	0	1	NC	1	NC	1
290			min	-.012	3	-.018	3	0	1	0	1	4167.846	3	NC	1
291		13	max	.007	2	.004	2	0	1	0	1	NC	1	NC	1
292			min	-.011	3	-.016	3	0	1	0	1	4885.05	3	NC	1
293		14	max	.006	2	.003	2	0	1	0	1	NC	1	NC	1
294			min	-.009	3	-.013	3	0	1	0	1	5894.703	3	NC	1
295		15	max	.005	2	.002	2	0	1	0	1	NC	1	NC	1
296			min	-.007	3	-.01	3	0	1	0	1	7416.943	3	NC	1
297		16	max	.004	2	0	2	0	1	0	1	NC	1	NC	1
298			min	-.005	3	-.008	3	0	1	0	1	9965.532	3	NC	1
299		17	max	.002	2	0	2	0	1	0	1	NC	1	NC	1
300			min	-.004	3	-.005	3	0	1	0	1	NC	1	NC	1
301		18	max	.001	2	0	2	0	1	0	1	NC	1	NC	1
302			min	-.002	3	-.003	3	0	1	0	1	NC	1	NC	1
303		19	max	0	1	0	1	0	1	0	1	NC	1	NC	1
304			min	0	1	0	1	0	1	0	1	NC	1	NC	1
305	M7	1	max	0	1	0	1	0	1	0	1	NC	1	NC	1
306			min	0	1	0	1	0	1	0	1	NC	1	NC	1
307		2	max	.001	3	0	2	0	1	0	1	NC	1	NC	1
308			min	-.001	2	-.003	3	0	1	0	1	NC	1	NC	1
309		3	max	.003	3	0	2	0	1	0	1	NC	1	NC	1
310			min	-.003	2	-.006	3	0	1	0	1	NC	1	NC	1
311		4	max	.004	3	-.001	15	0	1	0	1	NC	1	NC	1
312			min	-.004	2	-.008	3	0	1	0	1	NC	1	NC	1
313		5	max	.006	3	-.002	15	0	1	0	1	NC	1	NC	1
314			min	-.005	2	-.01	3	0	1	0	1	NC	1	NC	1
315		6	max	.007	3	-.002	15	0	1	0	1	NC	1	NC	1
316			min	-.007	2	-.012	3	0	1	0	1	8819.79	3	NC	1
317		7	max	.008	3	-.003	15	0	1	0	1	NC	1	NC	1
318			min	-.008	2	-.014	3	0	1	0	1	7881.887	3	NC	1
319		8	max	.01	3	-.003	15	0	1	0	1	NC	1	NC	1
320			min	-.009	2	-.015	3	0	1	0	1	7308.054	4	NC	1
321		9	max	.011	3	-.003	15	0	1	0	1	NC	1	NC	1
322			min	-.011	2	-.016	3	0	1	0	1	6849.687	4	NC	1
323		10	max	.012	3	-.003	15	0	1	0	1	NC	1	NC	1
324			min	-.012	2	-.017	3	0	1	0	1	6638.343	4	NC	1
325		11	max	.014	3	-.003	15	0	1	0	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
326			min	-.013	2	-.017	3	0	1	0	1	6643.145	4	NC	1
327		12	max	.015	3	-.003	15	0	1	0	1	NC	1	NC	1
328			min	-.015	2	-.017	3	0	1	0	1	6869.407	4	NC	1
329		13	max	.017	3	-.003	15	0	1	0	1	NC	1	NC	1
330			min	-.016	2	-.016	3	0	1	0	1	7362.21	4	NC	1
331		14	max	.018	3	-.003	15	0	1	0	1	NC	1	NC	1
332			min	-.018	2	-.015	3	0	1	0	1	8229.281	4	NC	1
333		15	max	.019	3	-.002	15	0	1	0	1	NC	1	NC	1
334			min	-.019	2	-.014	3	0	1	0	1	9707.519	4	NC	1
335		16	max	.021	3	-.002	15	0	1	0	1	NC	1	NC	1
336			min	-.02	2	-.013	3	0	1	0	1	NC	1	NC	1
337		17	max	.022	3	0	2	0	1	0	1	NC	1	NC	1
338			min	-.022	2	-.011	3	0	1	0	1	NC	1	NC	1
339		18	max	.023	3	0	2	0	1	0	1	NC	1	NC	1
340			min	-.023	2	-.009	3	0	1	0	1	NC	1	NC	1
341		19	max	.025	3	.002	2	0	1	0	1	NC	1	NC	1
342			min	-.024	2	-.008	3	0	1	0	1	NC	1	NC	1
343	M8	1	max	.004	2	.024	2	0	1	0	1	NC	1	NC	1
344			min	0	15	-.026	3	0	1	0	1	NC	1	NC	1
345		2	max	.004	2	.023	2	0	1	0	1	NC	1	NC	1
346			min	0	15	-.024	3	0	1	0	1	NC	1	NC	1
347		3	max	.004	2	.021	2	0	1	0	1	NC	1	NC	1
348			min	0	15	-.023	3	0	1	0	1	NC	1	NC	1
349		4	max	.004	2	.02	2	0	1	0	1	NC	1	NC	1
350			min	0	15	-.022	3	0	1	0	1	NC	1	NC	1
351		5	max	.003	2	.019	2	0	1	0	1	NC	1	NC	1
352			min	0	15	-.02	3	0	1	0	1	NC	1	NC	1
353		6	max	.003	2	.017	2	0	1	0	1	NC	1	NC	1
354			min	0	15	-.019	3	0	1	0	1	NC	1	NC	1
355		7	max	.003	2	.016	2	0	1	0	1	NC	1	NC	1
356			min	0	15	-.017	3	0	1	0	1	NC	1	NC	1
357		8	max	.003	2	.015	2	0	1	0	1	NC	1	NC	1
358			min	0	15	-.016	3	0	1	0	1	NC	1	NC	1
359		9	max	.002	2	.013	2	0	1	0	1	NC	1	NC	1
360			min	0	15	-.014	3	0	1	0	1	NC	1	NC	1
361		10	max	.002	2	.012	2	0	1	0	1	NC	1	NC	1
362			min	0	15	-.013	3	0	1	0	1	NC	1	NC	1
363		11	max	.002	2	.011	2	0	1	0	1	NC	1	NC	1
364			min	0	15	-.012	3	0	1	0	1	NC	1	NC	1
365		12	max	.002	2	.009	2	0	1	0	1	NC	1	NC	1
366			min	0	15	-.01	3	0	1	0	1	NC	1	NC	1
367		13	max	.001	2	.008	2	0	1	0	1	NC	1	NC	1
368			min	0	15	-.009	3	0	1	0	1	NC	1	NC	1
369		14	max	.001	2	.007	2	0	1	0	1	NC	1	NC	1
370			min	0	15	-.007	3	0	1	0	1	NC	1	NC	1
371		15	max	0	2	.005	2	0	1	0	1	NC	1	NC	1
372			min	0	15	-.006	3	0	1	0	1	NC	1	NC	1
373		16	max	0	2	.004	2	0	1	0	1	NC	1	NC	1
374			min	0	15	-.004	3	0	1	0	1	NC	1	NC	1
375		17	max	0	2	.003	2	0	1	0	1	NC	1	NC	1
376			min	0	15	-.003	3	0	1	0	1	NC	1	NC	1
377		18	max	0	2	.001	2	0	1	0	1	NC	1	NC	1
378			min	0	15	-.001	3	0	1	0	1	NC	1	NC	1
379		19	max	0	1	0	1	0	1	0	1	NC	1	NC	1
380			min	0	1	0	1	0	1	0	1	NC	1	NC	1
381	M10	1	max	.007	2	.01	2	0	15	1.029e-4	1	NC	1	NC	1
382			min	-.01	3	-.016	3	-.004	1	5.942e-6	15	7453.502	2	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
383		2	max	.007	2	.009	2	0	15	9.758e-5	1	NC	1	NC	1
384			min	-.01	3	-.015	3	-.004	1	5.637e-6	15	8642.116	2	NC	1
385		3	max	.006	2	.008	2	0	15	9.23e-5	1	NC	1	NC	1
386			min	-.009	3	-.015	3	-.003	1	5.332e-6	15	NC	1	NC	1
387		4	max	.006	2	.006	2	0	15	8.702e-5	1	NC	1	NC	1
388			min	-.009	3	-.014	3	-.003	1	5.028e-6	15	NC	1	NC	1
389		5	max	.005	2	.005	2	0	15	8.174e-5	1	NC	1	NC	1
390			min	-.008	3	-.014	3	-.003	1	4.723e-6	15	NC	1	NC	1
391		6	max	.005	2	.004	2	0	15	7.646e-5	1	NC	1	NC	1
392			min	-.007	3	-.013	3	-.002	1	4.418e-6	15	NC	1	NC	1
393		7	max	.005	2	.002	2	0	15	7.117e-5	1	NC	1	NC	1
394			min	-.007	3	-.012	3	-.002	1	4.113e-6	15	NC	1	NC	1
395		8	max	.004	2	.001	2	0	15	6.589e-5	1	NC	1	NC	1
396			min	-.006	3	-.012	3	-.002	1	3.809e-6	15	NC	1	NC	1
397		9	max	.004	2	0	2	0	15	6.061e-5	1	NC	1	NC	1
398			min	-.006	3	-.011	3	-.001	1	3.504e-6	15	NC	1	NC	1
399		10	max	.004	2	0	2	0	15	5.533e-5	1	NC	1	NC	1
400			min	-.005	3	-.01	3	-.001	1	3.199e-6	15	NC	1	NC	1
401		11	max	.003	2	0	2	0	15	5.005e-5	1	NC	1	NC	1
402			min	-.005	3	-.009	3	0	1	2.894e-6	15	NC	1	NC	1
403		12	max	.003	2	-.001	15	0	15	4.476e-5	1	NC	1	NC	1
404			min	-.004	3	-.008	3	0	1	2.59e-6	15	NC	1	NC	1
405		13	max	.002	2	-.001	15	0	15	3.948e-5	1	NC	1	NC	1
406			min	-.003	3	-.007	3	0	1	2.285e-6	15	NC	1	NC	1
407		14	max	.002	2	-.001	15	0	15	3.42e-5	1	NC	1	NC	1
408			min	-.003	3	-.006	3	0	1	1.98e-6	15	NC	1	NC	1
409		15	max	.002	2	-.001	15	0	15	2.892e-5	1	NC	1	NC	1
410			min	-.002	3	-.005	3	0	1	1.675e-6	15	NC	1	NC	1
411		16	max	.001	2	0	15	0	15	2.364e-5	1	NC	1	NC	1
412			min	-.002	3	-.004	3	0	1	1.371e-6	15	NC	1	NC	1
413		17	max	0	2	0	15	0	15	1.835e-5	1	NC	1	NC	1
414			min	-.001	3	-.003	3	0	1	1.066e-6	15	NC	1	NC	1
415		18	max	0	2	0	15	0	15	1.307e-5	1	NC	1	NC	1
416			min	0	3	-.001	4	0	1	7.61e-7	15	NC	1	NC	1
417		19	max	0	1	0	1	0	1	7.791e-6	1	NC	1	NC	1
418			min	0	1	0	1	0	1	4.563e-7	15	NC	1	NC	1
419	M11	1	max	0	1	0	1	0	1	-1.048e-7	15	NC	1	NC	1
420			min	0	1	0	1	0	1	-1.782e-6	1	NC	1	NC	1
421		2	max	0	3	0	15	0	1	-6.559e-7	15	NC	1	NC	1
422			min	0	2	-.002	4	0	15	-1.148e-5	1	NC	1	NC	1
423		3	max	0	3	0	15	0	1	-1.207e-6	15	NC	1	NC	1
424			min	0	2	-.004	4	0	15	-2.117e-5	1	NC	1	NC	1
425		4	max	.001	3	-.001	15	0	1	-1.758e-6	15	NC	1	NC	1
426			min	-.001	2	-.006	4	0	15	-3.086e-5	1	NC	1	NC	1
427		5	max	.002	3	-.002	15	0	1	-2.309e-6	15	NC	1	NC	1
428			min	-.002	2	-.008	4	0	10	-4.056e-5	1	NC	1	NC	1
429		6	max	.002	3	-.002	15	0	1	-2.861e-6	15	NC	1	NC	1
430			min	-.002	2	-.01	4	0	10	-5.025e-5	1	9257.483	4	NC	1
431		7	max	.003	3	-.003	15	0	3	-3.412e-6	15	NC	1	NC	1
432			min	-.002	2	-.011	4	0	1	-5.995e-5	1	8005.188	4	NC	1
433		8	max	.003	3	-.003	15	0	3	-3.963e-6	15	NC	2	NC	1
434			min	-.003	2	-.013	4	0	1	-6.964e-5	1	7234.508	4	NC	1
435		9	max	.004	3	-.003	15	0	12	-4.514e-6	15	NC	5	NC	1
436			min	-.003	2	-.014	4	0	1	-7.933e-5	1	6784.835	4	NC	1
437		10	max	.004	3	-.003	15	0	15	-5.065e-6	15	NC	5	NC	1
438			min	-.004	2	-.014	4	0	1	-8.903e-5	1	6578.843	4	NC	1
439		11	max	.005	3	-.003	15	0	15	-5.616e-6	15	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
440			min	-.004	2	-.014	4	0	1	-9.872e-5	1	6586.45	4	NC	1
441		12	max	.005	3	-.003	15	0	15	-6.167e-6	15	NC	5	NC	1
442			min	-.005	2	-.014	4	0	1	-1.084e-4	1	6813.281	4	NC	1
443		13	max	.005	3	-.003	15	0	15	-6.719e-6	15	NC	2	NC	1
444			min	-.005	2	-.013	4	-.001	1	-1.181e-4	1	7304.322	4	NC	1
445		14	max	.006	3	-.003	15	0	15	-7.27e-6	15	NC	1	NC	1
446			min	-.005	2	-.011	4	-.001	1	-1.278e-4	1	8166.69	4	NC	1
447		15	max	.006	3	-.002	15	0	15	-7.821e-6	15	NC	1	NC	1
448			min	-.006	2	-.01	4	-.002	1	-1.375e-4	1	9635.729	4	NC	1
449		16	max	.007	3	-.002	15	0	15	-8.372e-6	15	NC	1	NC	1
450			min	-.006	2	-.008	4	-.002	1	-1.472e-4	1	NC	1	NC	1
451		17	max	.007	3	-.001	15	0	15	-8.923e-6	15	NC	1	NC	1
452			min	-.007	2	-.006	3	-.003	1	-1.569e-4	1	NC	1	NC	1
453		18	max	.008	3	0	15	0	15	-9.474e-6	15	NC	1	NC	1
454			min	-.007	2	-.004	3	-.003	1	-1.666e-4	1	NC	1	NC	1
455		19	max	.008	3	0	2	0	15	-1.003e-5	15	NC	1	NC	1
456			min	-.007	2	-.003	3	-.004	1	-1.763e-4	1	NC	1	NC	1
457	M12	1	max	.002	1	.007	2	.004	1	-4.017e-6	15	NC	1	NC	2
458			min	0	15	-.009	3	0	15	-7.021e-5	1	NC	1	6719.427	1
459		2	max	.002	1	.007	2	.003	1	-4.017e-6	15	NC	1	NC	2
460			min	0	15	-.008	3	0	15	-7.021e-5	1	NC	1	7280.522	1
461		3	max	.002	1	.006	2	.003	1	-4.017e-6	15	NC	1	NC	2
462			min	0	15	-.008	3	0	15	-7.021e-5	1	NC	1	7950.041	1
463		4	max	.001	1	.006	2	.003	1	-4.017e-6	15	NC	1	NC	2
464			min	0	15	-.007	3	0	15	-7.021e-5	1	NC	1	8755.85	1
465		5	max	.001	1	.006	2	.003	1	-4.017e-6	15	NC	1	NC	2
466			min	0	15	-.007	3	0	15	-7.021e-5	1	NC	1	9735.839	1
467		6	max	.001	1	.005	2	.002	1	-4.017e-6	15	NC	1	NC	1
468			min	0	15	-.006	3	0	15	-7.021e-5	1	NC	1	NC	1
469		7	max	.001	1	.005	2	.002	1	-4.017e-6	15	NC	1	NC	1
470			min	0	15	-.006	3	0	15	-7.021e-5	1	NC	1	NC	1
471		8	max	.001	1	.004	2	.002	1	-4.017e-6	15	NC	1	NC	1
472			min	0	15	-.005	3	0	15	-7.021e-5	1	NC	1	NC	1
473		9	max	0	1	.004	2	.001	1	-4.017e-6	15	NC	1	NC	1
474			min	0	15	-.005	3	0	15	-7.021e-5	1	NC	1	NC	1
475		10	max	0	1	.004	2	.001	1	-4.017e-6	15	NC	1	NC	1
476			min	0	15	-.004	3	0	15	-7.021e-5	1	NC	1	NC	1
477		11	max	0	1	.003	2	.001	1	-4.017e-6	15	NC	1	NC	1
478			min	0	15	-.004	3	0	15	-7.021e-5	1	NC	1	NC	1
479		12	max	0	1	.003	2	0	1	-4.017e-6	15	NC	1	NC	1
480			min	0	15	-.003	3	0	15	-7.021e-5	1	NC	1	NC	1
481		13	max	0	1	.002	2	0	1	-4.017e-6	15	NC	1	NC	1
482			min	0	15	-.003	3	0	15	-7.021e-5	1	NC	1	NC	1
483		14	max	0	1	.002	2	0	1	-4.017e-6	15	NC	1	NC	1
484			min	0	15	-.002	3	0	15	-7.021e-5	1	NC	1	NC	1
485		15	max	0	1	.002	2	0	1	-4.017e-6	15	NC	1	NC	1
486			min	0	15	-.002	3	0	15	-7.021e-5	1	NC	1	NC	1
487		16	max	0	1	.001	2	0	1	-4.017e-6	15	NC	1	NC	1
488			min	0	15	-.001	3	0	15	-7.021e-5	1	NC	1	NC	1
489		17	max	0	1	0	2	0	1	-4.017e-6	15	NC	1	NC	1
490			min	0	15	0	3	0	15	-7.021e-5	1	NC	1	NC	1
491		18	max	0	1	0	2	0	1	-4.017e-6	15	NC	1	NC	1
492			min	0	15	0	3	0	15	-7.021e-5	1	NC	1	NC	1
493		19	max	0	1	0	1	0	1	-4.017e-6	15	NC	1	NC	1
494			min	0	1	0	1	0	1	-7.021e-5	1	NC	1	NC	1
495	M1	1	max	.01	3	.112	2	0	1	5.338e-3	2	NC	1	NC	1
496			min	-.006	2	-.031	3	0	15	-1.324e-2	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
497		2	max	.01	3	.052	2	0	15	2.618e-3	2	NC	4	NC	1
498			min	-.006	2	-.011	3	-.003	1	-6.554e-3	3	1909.374	2	NC	1
499		3	max	.01	3	.017	3	0	15	2.566e-5	10	NC	5	NC	1
500			min	-.006	2	-.012	2	-.004	1	-9.236e-5	3	926.228	2	NC	1
501		4	max	.01	3	.058	3	0	15	2.791e-3	2	NC	5	NC	1
502			min	-.006	2	-.083	2	-.004	1	-3.15e-3	3	590.258	2	NC	1
503		5	max	.01	3	.108	3	0	15	5.559e-3	2	NC	5	NC	1
504			min	-.006	2	-.156	2	-.002	1	-6.208e-3	3	429.476	2	NC	1
505		6	max	.009	3	.161	3	0	15	8.327e-3	2	NC	5	NC	1
506			min	-.006	2	-.226	2	-.001	1	-9.266e-3	3	340.404	2	NC	1
507		7	max	.009	3	.211	3	0	1	1.109e-2	2	NC	15	NC	1
508			min	-.006	2	-.289	2	0	3	-1.232e-2	3	287.572	2	NC	1
509		8	max	.009	3	.252	3	0	1	1.386e-2	2	NC	15	NC	1
510			min	-.006	2	-.338	2	0	15	-1.538e-2	3	256.21	2	NC	1
511		9	max	.009	3	.279	3	0	15	1.569e-2	2	NC	15	NC	1
512			min	-.006	2	-.369	2	0	1	-1.581e-2	3	239.839	2	NC	1
513		10	max	.009	3	.288	3	0	1	1.688e-2	2	NC	15	NC	1
514			min	-.006	2	-.379	2	0	15	-1.448e-2	3	235.071	2	NC	1
515		11	max	.008	3	.281	3	0	1	1.807e-2	2	NC	15	NC	1
516			min	-.006	2	-.368	2	0	15	-1.316e-2	3	240.805	2	NC	1
517		12	max	.008	3	.257	3	0	15	1.742e-2	2	NC	15	NC	1
518			min	-.005	2	-.336	2	0	1	-1.145e-2	3	259.09	2	NC	1
519		13	max	.008	3	.219	3	0	15	1.396e-2	2	NC	15	NC	1
520			min	-.005	2	-.284	2	0	1	-9.167e-3	3	294.457	2	NC	1
521		14	max	.008	3	.171	3	0	1	1.051e-2	2	NC	5	NC	1
522			min	-.005	2	-.218	2	0	15	-6.88e-3	3	354.897	2	NC	1
523		15	max	.008	3	.117	3	.002	1	7.062e-3	2	NC	5	NC	1
524			min	-.005	2	-.146	2	0	15	-4.593e-3	3	458.865	2	NC	1
525		16	max	.007	3	.061	3	.003	1	3.611e-3	2	NC	5	NC	1
526			min	-.005	2	-.074	2	0	15	-2.307e-3	3	651.208	2	NC	1
527		17	max	.007	3	.006	3	.004	1	2.619e-4	1	NC	5	NC	1
528			min	-.005	2	-.007	2	0	15	-1.973e-5	3	1061.986	2	NC	1
529		18	max	.007	3	.049	2	.003	1	4.809e-3	2	NC	4	NC	1
530			min	-.005	2	-.043	3	0	15	-1.948e-3	3	2251.118	2	NC	1
531		19	max	.007	3	.099	2	0	15	9.647e-3	2	NC	1	NC	1
532			min	-.005	2	-.09	3	0	1	-3.974e-3	3	NC	1	NC	1
533	M5	1	max	.03	3	.197	2	0	1	0	1	NC	1	NC	1
534			min	-.022	2	-.003	3	0	1	0	1	NC	1	NC	1
535		2	max	.03	3	.087	2	0	1	0	1	NC	4	NC	1
536			min	-.022	2	.002	15	0	1	0	1	1055.709	2	NC	1
537		3	max	.03	3	.051	3	0	1	0	1	NC	5	NC	1
538			min	-.022	2	-.037	2	0	1	0	1	495.631	2	NC	1
539		4	max	.03	3	.135	3	0	1	0	1	NC	5	NC	1
540			min	-.021	2	-.186	2	0	1	0	1	302.509	2	NC	1
541		5	max	.029	3	.25	3	0	1	0	1	NC	15	NC	1
542			min	-.021	2	-.348	2	0	1	0	1	212.444	2	NC	1
543		6	max	.028	3	.38	3	0	1	0	1	8926.95	15	NC	1
544			min	-.021	2	-.509	2	0	1	0	1	163.941	2	NC	1
545		7	max	.028	3	.505	3	0	1	0	1	7369.716	15	NC	1
546			min	-.02	2	-.655	2	0	1	0	1	135.84	2	NC	1
547		8	max	.027	3	.611	3	0	1	0	1	6466.866	15	NC	1
548			min	-.02	2	-.772	2	0	1	0	1	119.463	2	NC	1
549		9	max	.026	3	.678	3	0	1	0	1	6004.862	15	NC	1
550			min	-.02	2	-.847	2	0	1	0	1	111.05	2	NC	1
551		10	max	.026	3	.701	3	0	1	0	1	5865.906	15	NC	1
552			min	-.019	2	-.872	2	0	1	0	1	108.606	2	NC	1
553		11	max	.025	3	.682	3	0	1	0	1	6005.449	15	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
554			min	-.019	2	-.846	2	0	1	0	1	111.545	2	NC	1
555		12	max	.025	3	.623	3	0	1	0	1	6468.209	15	NC	1
556			min	-.019	2	-.768	2	0	1	0	1	121.116	2	NC	1
557		13	max	.024	3	.527	3	0	1	0	1	7372.317	15	NC	1
558			min	-.018	2	-.642	2	0	1	0	1	140.196	2	NC	1
559		14	max	.023	3	.407	3	0	1	0	1	8931.828	15	NC	1
560			min	-.018	2	-.487	2	0	1	0	1	173.905	2	NC	1
561		15	max	.023	3	.274	3	0	1	0	1	NC	15	NC	1
562			min	-.018	2	-.319	2	0	1	0	1	234.541	2	NC	1
563		16	max	.022	3	.141	3	0	1	0	1	NC	5	NC	1
564			min	-.017	2	-.158	2	0	1	0	1	353.599	2	NC	1
565		17	max	.021	3	.017	3	0	1	0	1	NC	5	NC	1
566			min	-.017	2	-.02	2	0	1	0	1	625.428	2	NC	1
567		18	max	.021	3	.079	2	0	1	0	1	NC	4	NC	1
568			min	-.017	2	-.086	3	0	1	0	1	1388.956	3	NC	1
569		19	max	.021	3	.158	2	0	1	0	1	NC	1	NC	1
570			min	-.017	2	-.178	3	0	1	0	1	NC	1	NC	1
571	M9	1	max	.01	3	.112	2	0	15	1.324e-2	3	NC	1	NC	1
572			min	-.006	2	-.031	3	0	1	-5.338e-3	2	NC	1	NC	1
573		2	max	.01	3	.052	2	.003	1	6.554e-3	3	NC	4	NC	1
574			min	-.006	2	-.011	3	0	15	-2.618e-3	2	1909.374	2	NC	1
575		3	max	.01	3	.017	3	.004	1	9.236e-5	3	NC	5	NC	1
576			min	-.006	2	-.012	2	0	15	-2.566e-5	10	926.228	2	NC	1
577		4	max	.01	3	.058	3	.004	1	3.15e-3	3	NC	5	NC	1
578			min	-.006	2	-.083	2	0	15	-2.791e-3	2	590.258	2	NC	1
579		5	max	.01	3	.108	3	.002	1	6.208e-3	3	NC	5	NC	1
580			min	-.006	2	-.156	2	0	15	-5.559e-3	2	429.476	2	NC	1
581		6	max	.009	3	.161	3	.001	1	9.266e-3	3	NC	5	NC	1
582			min	-.006	2	-.226	2	0	15	-8.327e-3	2	340.404	2	NC	1
583		7	max	.009	3	.211	3	0	3	1.232e-2	3	NC	15	NC	1
584			min	-.006	2	-.289	2	0	1	-1.109e-2	2	287.572	2	NC	1
585		8	max	.009	3	.252	3	0	15	1.538e-2	3	NC	15	NC	1
586			min	-.006	2	-.338	2	0	1	-1.386e-2	2	256.21	2	NC	1
587		9	max	.009	3	.279	3	0	1	1.581e-2	3	NC	15	NC	1
588			min	-.006	2	-.369	2	0	15	-1.569e-2	2	239.839	2	NC	1
589		10	max	.009	3	.288	3	0	15	1.448e-2	3	NC	15	NC	1
590			min	-.006	2	-.379	2	0	1	-1.688e-2	2	235.071	2	NC	1
591		11	max	.008	3	.281	3	0	15	1.316e-2	3	NC	15	NC	1
592			min	-.006	2	-.368	2	0	1	-1.807e-2	2	240.805	2	NC	1
593		12	max	.008	3	.257	3	0	1	1.145e-2	3	NC	15	NC	1
594			min	-.005	2	-.336	2	0	15	-1.742e-2	2	259.09	2	NC	1
595		13	max	.008	3	.219	3	0	1	9.167e-3	3	NC	15	NC	1
596			min	-.005	2	-.284	2	0	15	-1.396e-2	2	294.457	2	NC	1
597		14	max	.008	3	.171	3	0	15	6.88e-3	3	NC	5	NC	1
598			min	-.005	2	-.218	2	0	1	-1.051e-2	2	354.897	2	NC	1
599		15	max	.008	3	.117	3	0	15	4.593e-3	3	NC	5	NC	1
600			min	-.005	2	-.146	2	-.002	1	-7.062e-3	2	458.865	2	NC	1
601		16	max	.007	3	.061	3	0	15	2.307e-3	3	NC	5	NC	1
602			min	-.005	2	-.074	2	-.003	1	-3.611e-3	2	651.208	2	NC	1
603		17	max	.007	3	.006	3	0	15	1.973e-5	3	NC	5	NC	1
604			min	-.005	2	-.007	2	-.004	1	-2.619e-4	1	1061.986	2	NC	1
605		18	max	.007	3	.049	2	0	15	1.948e-3	3	NC	4	NC	1
606			min	-.005	2	-.043	3	-.003	1	-4.809e-3	2	2251.118	2	NC	1
607		19	max	.007	3	.099	2	0	1	3.974e-3	3	NC	1	NC	1
608			min	-.005	2	-.09	3	0	15	-9.647e-3	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

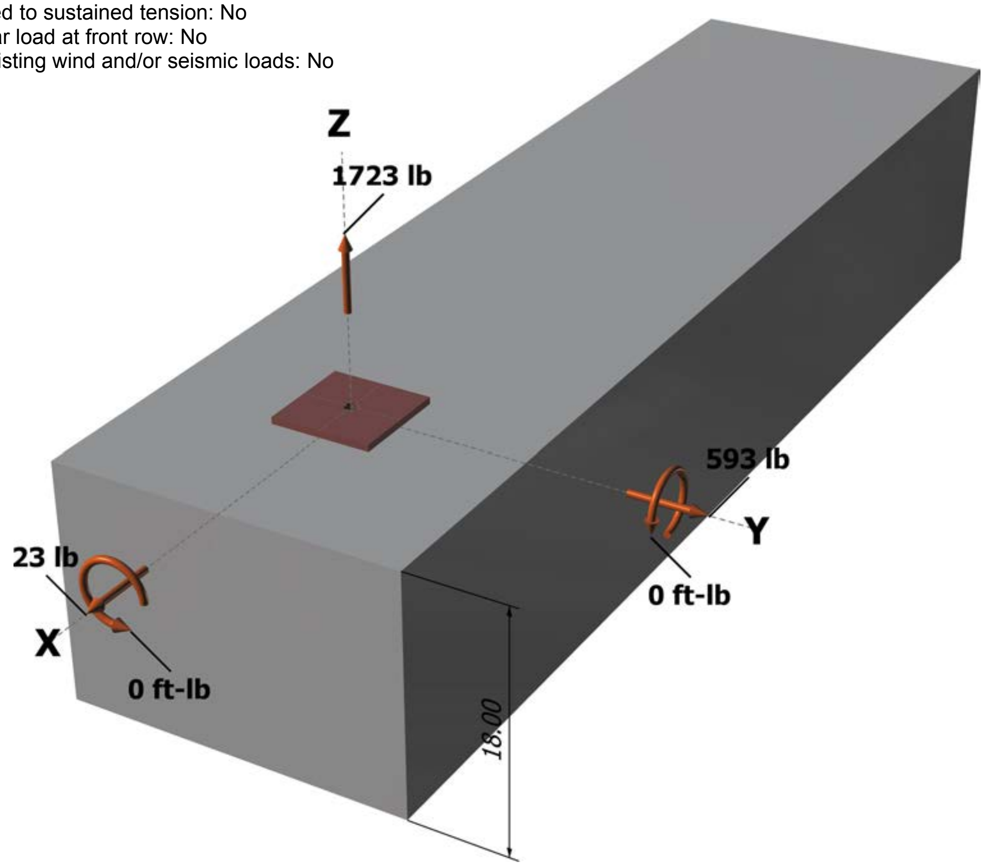
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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



<Figure 2>

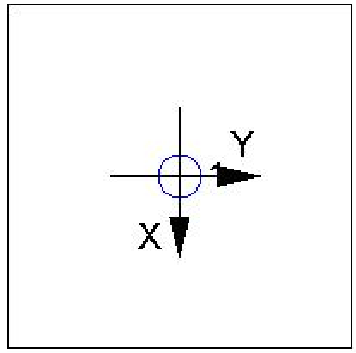
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	1723.0	23.0	593.0	593.4
Sum	1723.0	23.0	593.0	593.4

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 1723
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	5.247	10215

$\phi N_{cb} = \phi\, (A_{Nc} / A_{Nco})\, \Psi_{ed,N}\, \Psi_{c,N}\, \Psi_{cp,N} N_b$ (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)
220.36	247.75	0.967	1.00	1.000	10215	0.65	5710

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	7.00	6947

$\phi V_{cby} = \phi\, (A_{Vc} / A_{Vco})\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{by}$ (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)
192.89	220.50	0.925	1.000	1.000	6947	0.70	3934

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)
165.27	278.72	0.878	1.000	1.000	8282	0.70	3018

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	7.00	6947

$\phi V_{cbx} = \phi\, (2)(A_{Vc} / A_{Vco})\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{by}$ (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)
192.89	220.50	1.000	1.000	1.000	6947	0.70	8508

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)
165.27	278.72	1.000	1.000	1.000	8282	0.70	6875

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)
220.36	247.75	0.967	1.000	1.000	10215	8785	0.70	12298

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	1723	6071	0.28	Pass
Concrete breakout	1723	5710	0.30	Pass
Adhesive	**1723**	**5365**	**0.32**	**Pass (Governs)**

Shear	Factored Load, V_{ua} (lb)	Design Strength, $øV_n$ (lb)	Ratio	Status
Steel	**593**	**3156**	**0.19**	**Pass (Governs)**
T Concrete breakout y+	593	3934	0.15	Pass
T Concrete breakout x+	23	3018	0.01	Pass
|| Concrete breakout y+	23	8508	0.00	Pass
|| Concrete breakout x+	593	6875	0.09	Pass
Concrete breakout, combined	-	-	0.15	Pass
Pryout	593	12298	0.05	Pass

Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. D.7.1	0.32	0.00	32.1 %	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:	11/17/2015
Engineer:	HCV	Page:	1/5
Project:	Standard PVMax - Worst Case, 31-33 Inch Width		
Address:			
Phone:			
E-mail:			

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

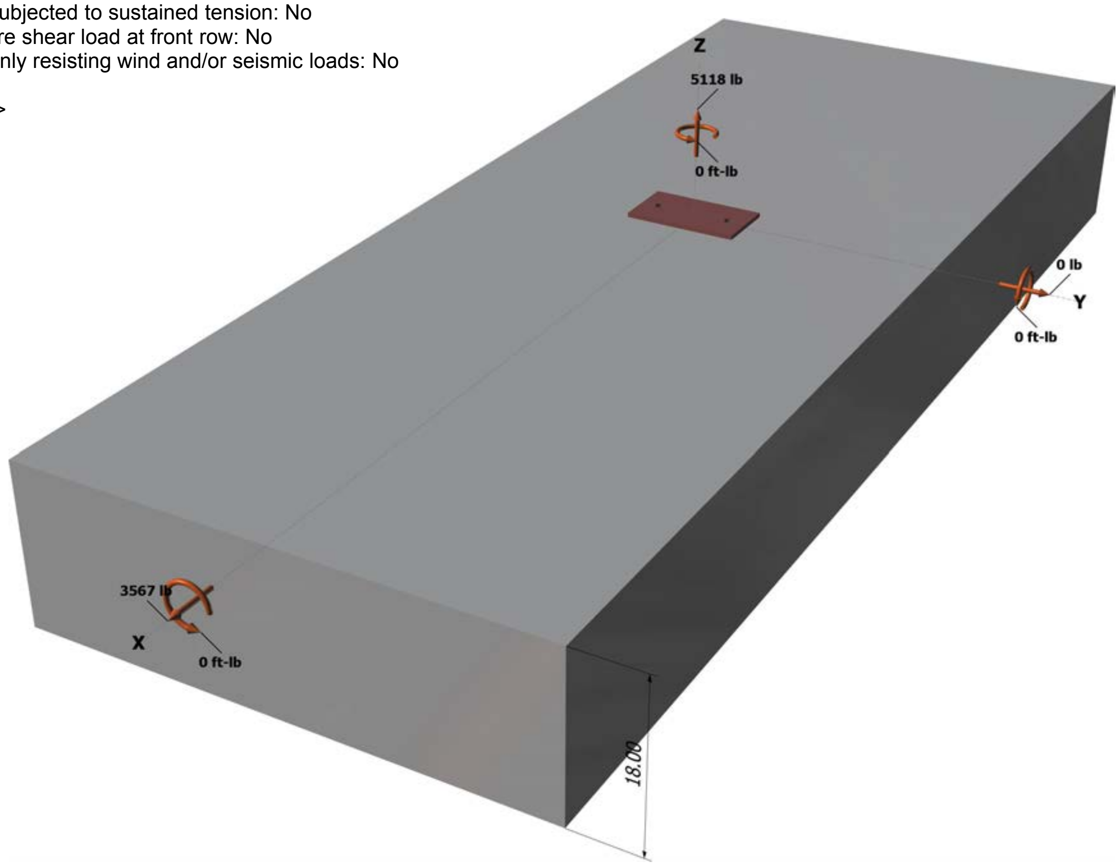
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

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

Base Plate
Length x Width x Thickness (inch): 4.00 x 7.00 x 0.28

<Figure 1>



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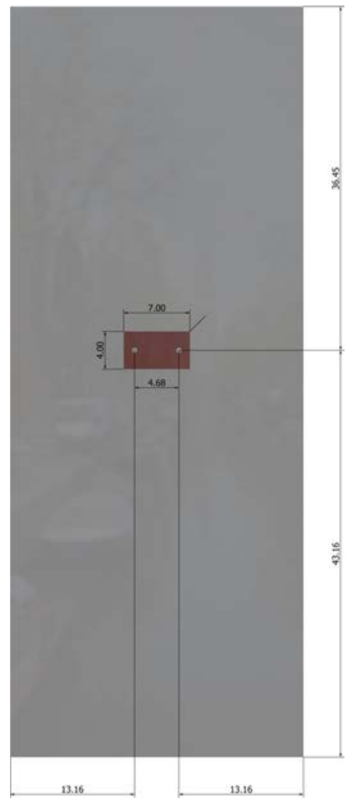


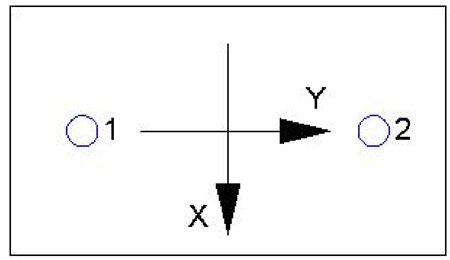
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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	2559.0	1783.5	0.0	1783.5
2	2559.0	1783.5	0.0	1783.5
Sum	5118.0	3567.0	0.0	3567.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 5118
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	6.000	12492

$\phi N_{cbg} = \phi\,(A_{Nc} / A_{Nco})\,\Psi_{ec,N}\,\Psi_{ed,N}\,\Psi_{c,N}\,\Psi_{cp,N} N_b$ (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)
408.24	324.00	1.000	1.000	1.00	1.000	12492	0.65	10231

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)
158.66	109.66	1.000	1.043	1.000	1.000	9755	0.55	8093

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

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

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbgx} (lb)
558.00	648.00	1.000	0.919	1.000	1.000	15593	0.70	8641

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	13.16	17908

$\phi V_{cbx} = \phi\,(2)(A_{Vc} / A_{Vco})\,\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{by}$ (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)
710.64	779.34	1.000	1.000	1.000	17908	0.70	22862

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	158.66	109.66	1.000	1.043	1.000	1.000	9755	14715

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
408.24	324.00	1.000	1.000	1.000	1.000	12492	15740	0.70

ϕV_{cpg} (lb)
20601

11. Results

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

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	2559	6071	0.42	Pass
Concrete breakout	5118	10231	0.50	Pass
Adhesive	**5118**	**8093**	**0.63**	**Pass (Governs)**

Shear	Factored Load, V_{ua} (lb)	Design Strength, ϕV_n (lb)	Ratio	Status
Steel	**1784**	**3156**	**0.57**	**Pass (Governs)**
T Concrete breakout x+	3567	8641	0.41	Pass
|| Concrete breakout y-	1784	22862	0.08	Pass
Pryout	3567	20601	0.17	Pass

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

Sec. D.7.3	0.63	0.57	119.8 %	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.