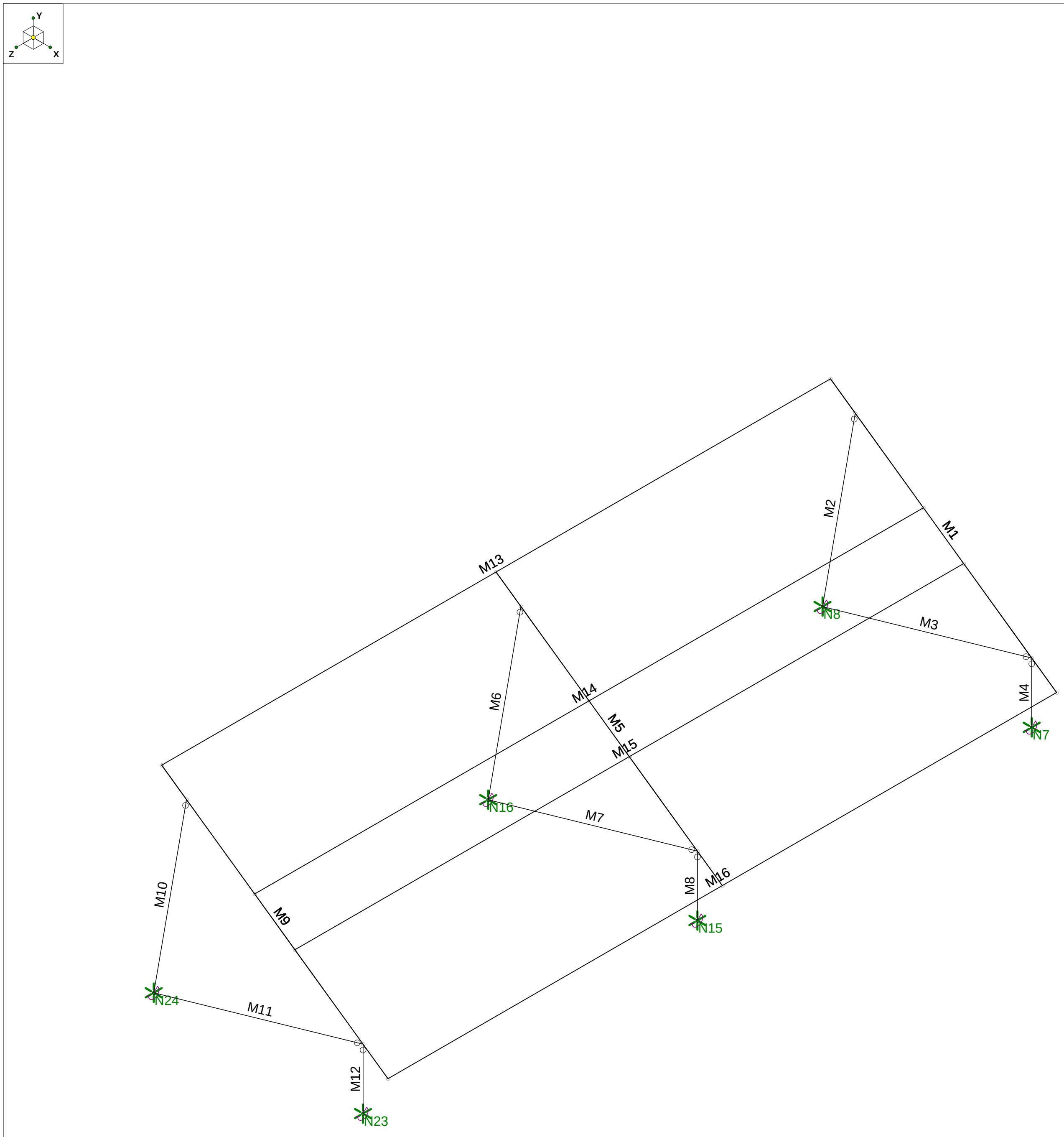


Schletter, Inc.		35ÁTilt w/o Seismic Design
HCV	Standard PVMax Racking System	
	Representative Calculations - ASCE 7-10	

1. INTRODUCTION

1.1 Project Description

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

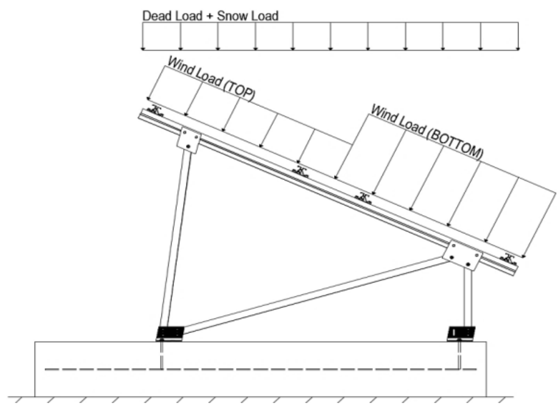
1.2 Construction

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 7-10 - Chapter 26-31, Wind Loads
- ASCE 7-10 - Chapter 7, Snow Loads
- ASCE 7-10 - Chapter 2, Combination of Loads
- International Building Code, IBC, 2012, 2015
- Aluminum Design Manual, Eighth Edition, 2005

2. LOAD ACTIONS

2.1 Permanent Loads

g_{MAX} = 3.00 psf
g_{MIN} = 1.75 psf

Self-weight of the PV modules.

2.2 Snow Loads

Ground Snow Load, P_g = 30.00 psf
Sloped Roof Snow Load, P_s = 14.43 psf *(ASCE 7-10, Eq. 7.4-1)*
I_s = 1.00
C_s = 0.64
C_e = 0.90
C_t = 1.20

2.3 Wind Loads

Design Wind Speed, V = 140 mph — Exposure Category = C
Height < 15 ft — Importance Category = II

Peak Velocity Pressure, q_z = 30.77 psf *Including the gust factor, G=0.85. (ASCE 7-10, Eq. 27.3-1)*

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 + 0.5W
1.2D + 1.0W + 0.5S
0.9D + 1.0W [M]
1.54D + 1.3E + 0.2S [R]
0.56D + 1.3E [R]
1.54D + 1.25E + 0.2S [O]
0.56D + 1.25E [O]

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

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 + 0.6W
1.0D + 0.75L + 0.45W + 0.75S
0.6D + 0.6W [M]
1.238D + 0.875E [O]
1.1785D + 0.65625E + 0.75S [O]
0.362D + 0.875E [O]

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

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

3. STRUCTURAL ANALYSIS

3.1 RISA Results

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

3.2 RISA Components

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

Purlins	Location	**Diagonal Struts**	Location	**Front Reactions**	Location
M13	Top	M3	Outer	N7	Outer
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

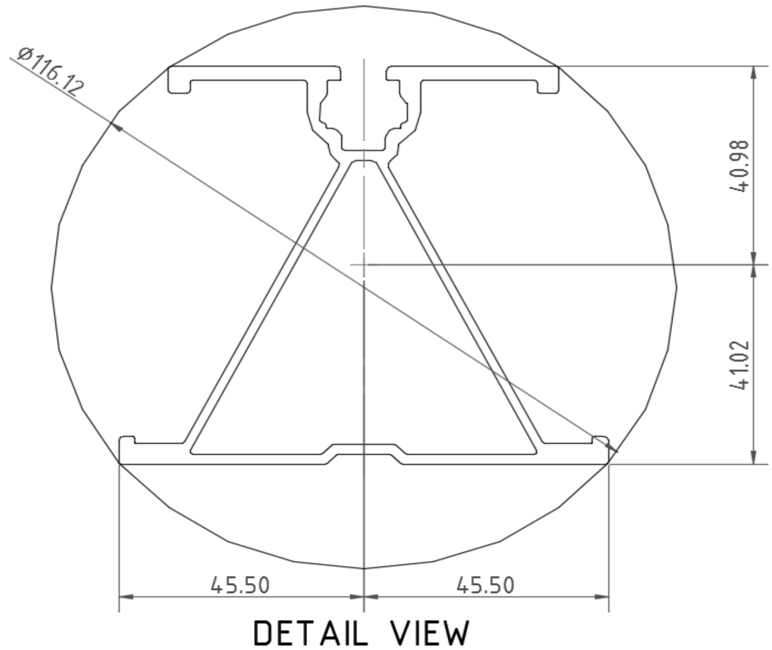
Front Struts	Location
M4	Outer
M8	Inner
M12	Outer

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).

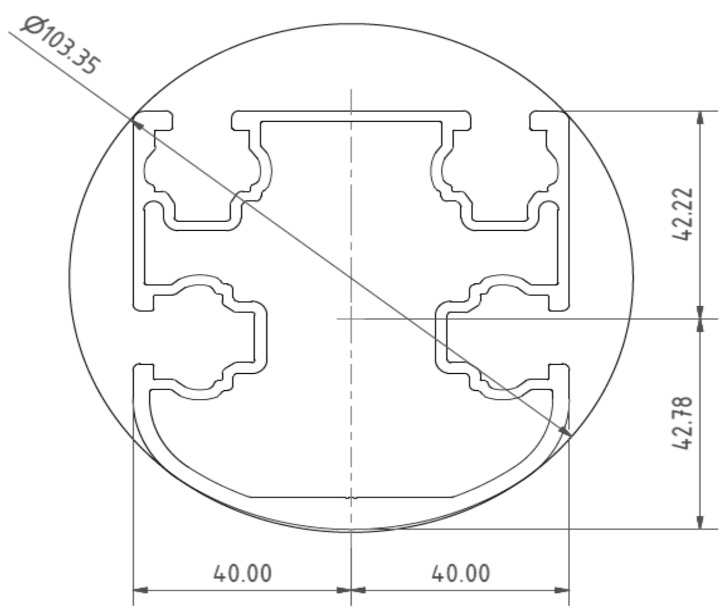
Purlin Type =	**S1.5**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	99	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	25.07	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	23.08	ksi
S_y =	1.33	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	2.16	in^4
I_x =	1.07	in^4
A =	1.25	in^2
g =	1.50	lbs/ft
M_y =	1.702	k-ft
M_z =	0.106	k-ft
$M_{y\ allowable}$ =	2.779	k-ft
$M_{z\ allowable}$ =	1.154	k-ft
Utilization =	70%	



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).

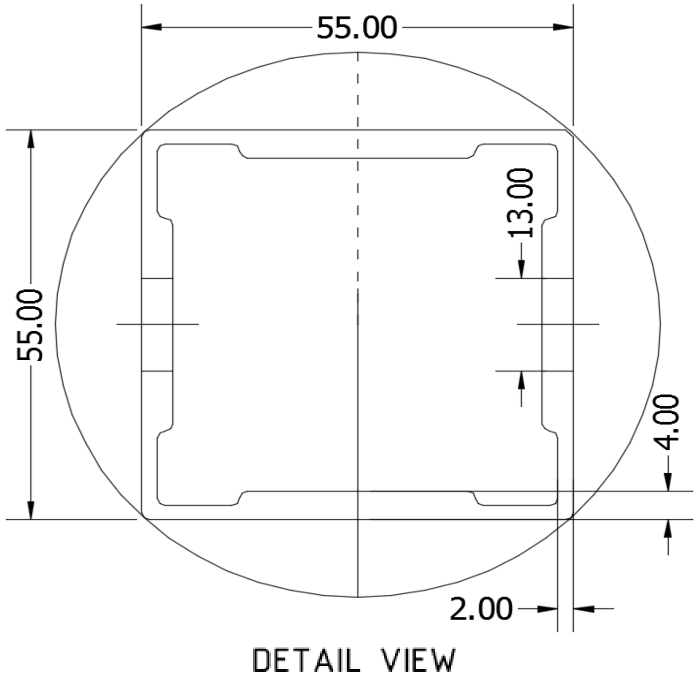
Girder Type =	**BF0**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	88.90	in
$\Phi F_{ty\ AXIAL}$ =	31.09	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.35	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	33.25	ksi
S_y =	1.42	in^3
S_x =	1.41	in^3
E =	10100	ksi
I_y =	2.39	in^4
I_x =	2.22	in^4
A =	1.88	in^2
g =	2.26	lbs/ft
M_y =	-2.789	k-ft
M_z =	0.000	k-ft
P_n =	-0.978	k
$M_{y\ allowable}$ =	3.464	k-ft
$M_{z\ allowable}$ =	3.907	k-ft
$P_{n\ allowable}$ =	58.535	k
Utilization =	82%	



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).

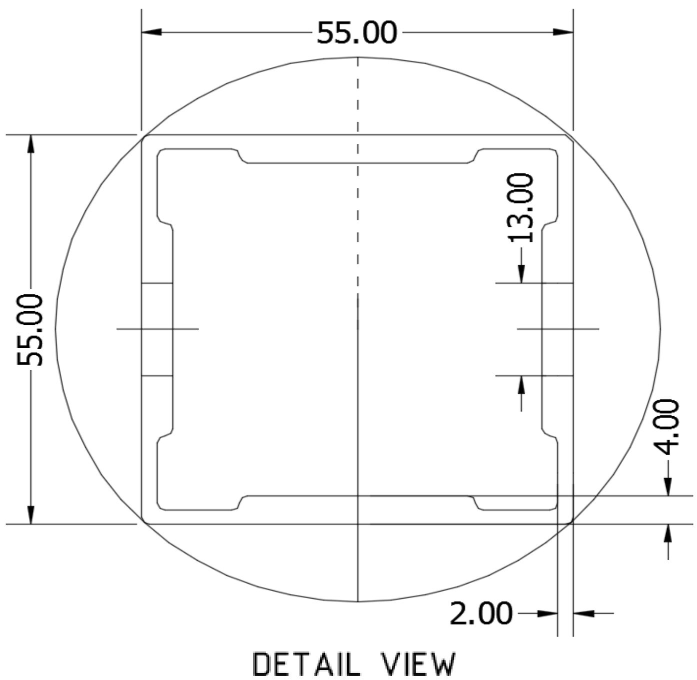
Strut Type =	**55x55**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	24.80	in
$\Phi F_{ty\ AXIAL}$ =	28.03	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	2.001	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	27.532	k
Utilization =	7%	



4.4 Diagonal Strut Design

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

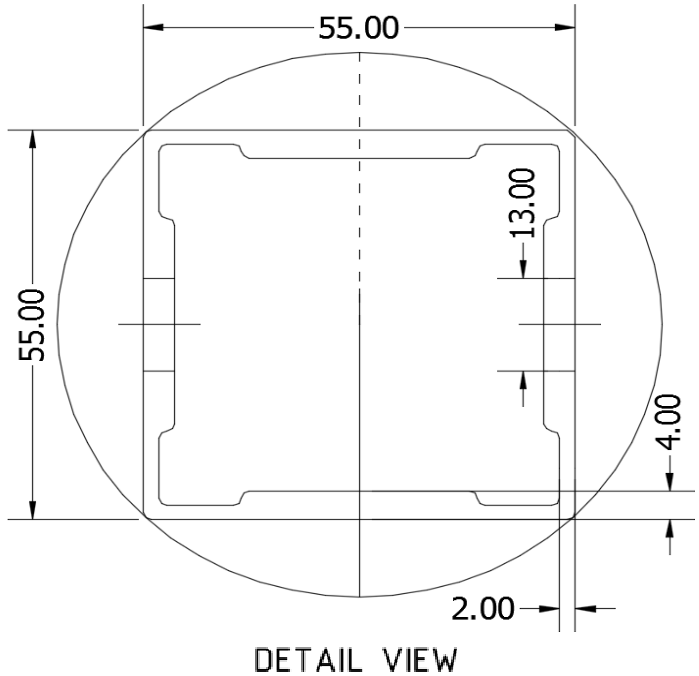
Strut Type =	**55x55**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	86.60	in
$\Phi F_{ty\ AXIAL}$ =	7.50	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.009	k-ft
M_z =	0.000	k-ft
P_n =	2.856	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	7.371	k
Utilization =	39%	



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 =	3.024	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	8.786	k
Utilization =	35%	



5. FOUNDATION DESIGN CALCULATIONS

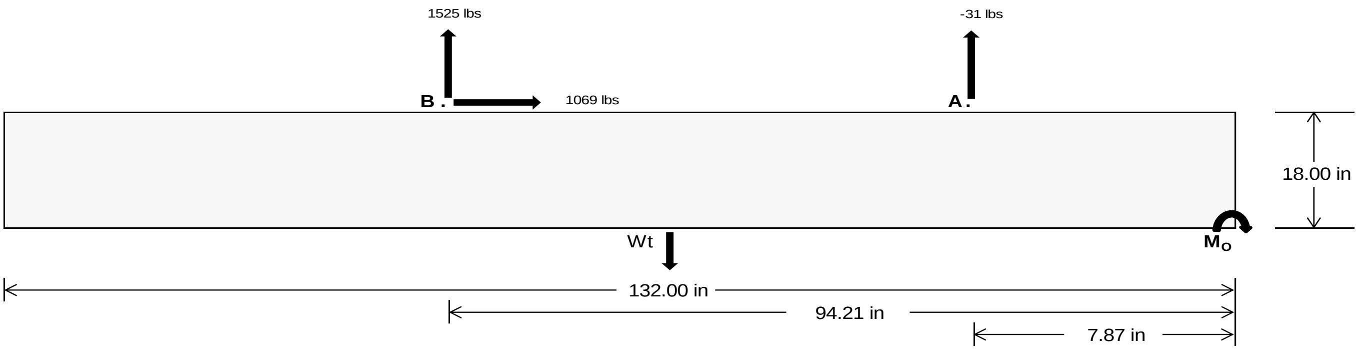
5.1 Helical Pile Foundations

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 =	78.71	6623.60	k
Compressive Load =	2601.18	4904.02	k
Lateral Load =	10.39	4632.49	k
Moment (Weak Axis) =	0.02	0.00	k

5.2 Design of Ballast Foundations

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



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

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

Overturning Check
M_O = 162682.4 in-lbs
Resisting Force Required = 2464.89 lbs
S.F. = 1.67
Weight Required = 4108.14 lbs
Minimum Width = 32 in in
Weight Provided = 6380.00 lbs

A minimum 132in long x 32in wide x 18in tall ballast foundation is required to resist overturning.

Sliding
Force = 1068.71 lbs
Friction = 0.4
Weight Required = 2671.78 lbs
Resisting Weight = 6380.00 lbs
Additional Weight Required = 0 lbs

Use a 132in long x 32in wide x 18in tall ballast foundation to resist sliding. Friction is OK.

Cohesion
Sliding Force = 1068.71 lbs
Cohesion = 130 psf
Area = 29.33 ft^2
Resisting = 3190.00 lbs
Additional Weight Required = 0 lbs

Use a 132in long x 32in 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			
	32 in	33 in	34 in	35 in
P_{ftg} = (145 pcf)(11 ft)(1.5 ft)(2.67 ft) =	6380 lbs	6579 lbs	6779 lbs	6978 lbs

ASD LC	1.0D + 1.0S				1.0D + 0.6W				1.0D + 0.75L + 0.45W + 0.75S				0.6D + 0.6W			
Width	32 in	33 in	34 in	35 in	32 in	33 in	34 in	35 in	32 in	33 in	34 in	35 in	32 in	33 in	34 in	35 in
F_A	891 lbs	891 lbs	891 lbs	891 lbs	1020 lbs	1020 lbs	1020 lbs	1020 lbs	1322 lbs	1322 lbs	1322 lbs	1322 lbs	63 lbs	63 lbs	63 lbs	63 lbs
F_B	793 lbs	793 lbs	793 lbs	793 lbs	2139 lbs	2139 lbs	2139 lbs	2139 lbs	2100 lbs	2100 lbs	2100 lbs	2100 lbs	-3050 lbs	-3050 lbs	-3050 lbs	-3050 lbs
F_V	134 lbs	134 lbs	134 lbs	134 lbs	1940 lbs	1940 lbs	1940 lbs	1940 lbs	1540 lbs	1540 lbs	1540 lbs	1540 lbs	-2137 lbs	-2137 lbs	-2137 lbs	-2137 lbs
P_{total}	8064 lbs	8263 lbs	8462 lbs	8662 lbs	9539 lbs	9739 lbs	9938 lbs	10137 lbs	9802 lbs	10002 lbs	10201 lbs	10400 lbs	840 lbs	960 lbs	1080 lbs	1199 lbs
M	2654 lbs-ft	2654 lbs-ft	2654 lbs-ft	2654 lbs-ft	2820 lbs-ft	2820 lbs-ft	2820 lbs-ft	2820 lbs-ft	3777 lbs-ft	3777 lbs-ft	3777 lbs-ft	3777 lbs-ft	4269 lbs-ft	4269 lbs-ft	4269 lbs-ft	4269 lbs-ft
e	0.33 ft	0.32 ft	0.31 ft	0.31 ft	0.30 ft	0.29 ft	0.28 ft	0.28 ft	0.39 ft	0.38 ft	0.37 ft	0.36 ft	5.08 ft	4.45 ft	3.95 ft	3.56 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}	225.5 psf	225.3 psf	225.1 psf	224.8 psf	272.8 psf	271.1 psf	269.5 psf	268.0 psf	263.9 psf	262.5 psf	261.2 psf	260.0 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	324.3 psf	321.0 psf	318.0 psf	315.1 psf	377.6 psf	372.8 psf	368.2 psf	363.9 psf	404.4 psf	398.7 psf	393.4 psf	388.4 psf	500.7 psf	221.1 psf	164.4 psf	141.3 psf

Maximum Bearing Pressure = 501 psf
Allowable Bearing Pressure = 1500 psf

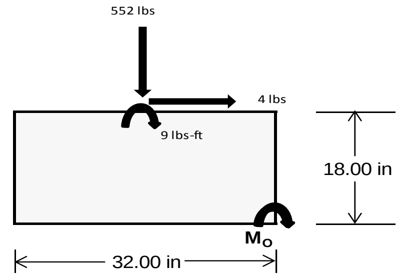
Use a 132in long x 32in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O = 719.9 ft-lbs
Resisting Force Required = 539.93 lbs
S.F. = 1.67
Weight Required = 899.89 lbs
Minimum Width = 32 in in
Weight Provided = 6380.00 lbs

A minimum 132in long x 32in 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	32 in			32 in			32 in		
Support	Outer	Inner	Outer	Outer	Inner	Outer	Outer	Inner	Outer
F_Y	220 lbs	519 lbs	220 lbs	552 lbs	1443 lbs	552 lbs	64 lbs	152 lbs	64 lbs
F_V	1 lbs	0 lbs	1 lbs	4 lbs	0 lbs	4 lbs	0 lbs	0 lbs	0 lbs
P_{total}	8118 lbs	6380 lbs	8118 lbs	8070 lbs	6380 lbs	8070 lbs	2374 lbs	6380 lbs	2374 lbs
M	5 lbs-ft	0 lbs-ft	5 lbs-ft	16 lbs-ft	0 lbs-ft	16 lbs-ft	1 lbs-ft	0 lbs-ft	1 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	0.44 ft	0.44 ft	0.44 ft	0.44 ft	0.44 ft	0.44 ft	0.44 ft	0.44 ft	0.44 ft
f_{min}	276.4 psf	217.5 psf	276.4 psf	273.9 psf	217.5 psf	273.9 psf	80.9 psf	217.5 psf	80.9 psf
f_{max}	277.2 psf	217.5 psf	277.2 psf	276.3 psf	217.5 psf	276.3 psf	81.0 psf	217.5 psf	81.0 psf

Maximum Bearing Pressure = 277 psf
Allowable Bearing Pressure = 1500 psf

Use a 132in long x 32in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Foundation Requirements: 132in long x 32in 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.

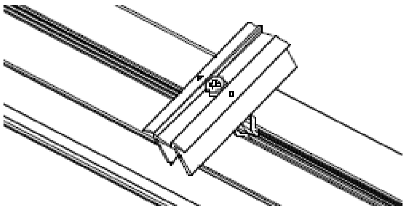
6. DESIGN OF JOINTS AND CONNECTIONS

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.

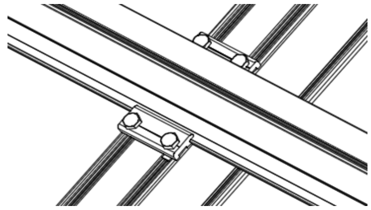
Fastening of Modules to Purlins

Maximum Uplifting Force =	0.783	k
Allowable Uplift =	1.214	k
Utilization =	65%	



Fastening of Purlins to Girders

Maximum Uplifting Force =	2.315	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 =	2.001	k
M12 Bolt Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	27%	

Rear Strut

Maximum Axial Load =	4.371	k
M12 Bolt Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	59%	

Diagonal Strut

Maximum Axial Load =	2.910	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.

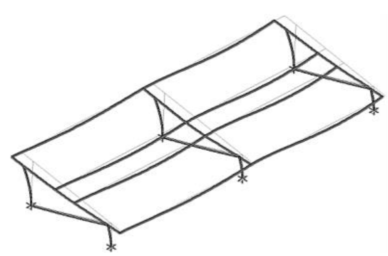
7. SEISMIC DESIGN

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} =	0.029	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 = 99 in

J = 0.432

273.88

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

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= 28.0 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 in^3

M_{max}St = 2.788 k-ft

Weak Axis:

3.4.14

L_b = 99

J = 0.432

174.171

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.1

3.4.16

b/t = 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 in^3

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:

3.4.14

L_b = 24.8 in

J = 0.942

38.7028

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.4 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

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

Weak Axis:

3.4.14

L_b = 24.8

J = 0.942

38.7028

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.4

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

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

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

Compression

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 = **55x55**

Strong Axis:

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

Weak Axis:

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

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

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

$\varphi F_L St$= 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

3.4.18

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

$\varphi F_L Wk$= 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

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	-102.983	-102.983	0	0
2	M14	y	-102.983	-102.983	0	0
3	M15	y	-171.639	-171.639	0	0
4	M16	y	-171.639	-171.639	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	231.713	231.713	0	0
2	M14	y	180.221	180.221	0	0
3	M15	y	102.983	102.983	0	0
4	M16	y	102.983	102.983	0	0

Load Combinations

	Description	S...	P...	S...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	LRFD 1.2D + 1.6S + 0.5W	Yes	Y		1	1.2	3	1.6	4	.5														
2	LRFD 1.2D + 1.0W + 0.5S	Yes	Y		1	1.2	3	.5	4	1														
3	LRFD 0.9D + 1.0W	Yes	Y		2	.9					5	1												
4	LATERAL - LRFD 1.54D + 1.3E ...	Yes	Y		1	1.54	3	.2			6	1.3												
5	LATERAL - LRFD 0.56D + 1.3E	Yes	Y		1	.56					6	1.3												
6	LATERAL - LRFD 1.54D + 1.25...	Yes	Y		1	1.54	3	.2			6	1.25												
7	LATERAL - LRFD 0.56D + 1.25E	Yes	Y		1	.56					6	1.25												

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 + 0.6W	Yes	Y		1	1			4	.6														
11	ASD 1.0D + 0.75L + 0.45W + 0....	Yes	Y		1	1	3	.75	4	.45														
12	ASD 0.6D + 0.6W	Yes	Y		2	.6					5	.6												
13	LATERAL - ASD 1.238D + 0.875E	Yes	Y		1	1.2...					6	.875												
14	LATERAL - ASD 1.1785D + 0.65..	Yes	Y		1	1.1...	3	.75			6	.656												
15	LATERAL - ASD 0.362D + 0.875E	Yes	Y		1	.362					6	.875												

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N8	max	964.362	2	1188.5	2	.433	1	.001	1	0	1	0	1
2		min	-1142.316	3	-1589.91	3	.026	15	0	15	0	1	0	1
3	N7	max	.033	3	801.409	1	-.458	15	0	15	0	1	0	1
4		min	-.191	2	39.141	15	-7.994	1	-.015	1	0	1	0	1
5	N15	max	.205	3	2000.905	1	0	1	0	12	0	1	0	1
6		min	-1.893	2	79.999	15	0	2	0	2	0	1	0	1
7	N16	max	3271.603	2	3772.326	2	0	11	0	12	0	1	0	1
8		min	-3563.452	3	-5095.074	3	0	9	0	2	0	1	0	1
9	N23	max	.033	3	801.409	1	7.994	1	.015	1	0	1	0	1
10		min	-.191	2	39.141	15	.458	15	0	15	0	1	0	1
11	N24	max	964.362	2	1188.5	2	-.026	15	0	15	0	1	0	1
12		min	-1142.316	3	-1589.91	3	-.433	1	-.001	1	0	1	0	1
13	Totals:	max	5198.051	2	9441.736	2	0	12						
14		min	-5847.813	3	-7886.548	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	71.335	1	383.145	2	-8.087	15	0	3	.17	1	0	2
2			min	4.028	15	-704.36	3	-145.284	1	-.013	2	.01	15	0	3
3		2	max	71.335	1	267.472	2	-6.209	15	0	3	.052	1	.55	3
4			min	4.028	15	-495.98	3	-111.32	1	-.013	2	.003	15	-.298	2
5		3	max	71.335	1	151.799	2	-4.33	15	0	3	.002	3	.909	3
6			min	4.028	15	-287.6	3	-77.357	1	-.013	2	-.034	1	-.49	2
7		4	max	71.335	1	36.126	2	-2.451	15	0	3	-.003	12	1.077	3
8			min	4.028	15	-79.22	3	-43.394	1	-.013	2	-.089	1	-.576	2
9		5	max	71.335	1	129.16	3	-.478	10	0	3	-.006	12	1.055	3
10			min	4.028	15	-79.547	2	-9.431	1	-.013	2	-.114	1	-.557	2
11		6	max	71.335	1	337.539	3	24.533	1	0	3	-.006	15	.841	3
12			min	4.028	15	-195.22	2	-.433	3	-.013	2	-.107	1	-.431	2
13		7	max	71.335	1	545.919	3	58.496	1	0	3	-.004	15	.436	3
14			min	4.028	15	-310.894	2	1.748	12	-.013	2	-.069	1	-.199	2
15		8	max	71.335	1	754.299	3	92.459	1	0	3	.004	2	.139	2
16			min	4.028	15	-426.567	2	3.626	12	-.013	2	-.006	3	-.16	3
17		9	max	71.335	1	962.679	3	126.423	1	0	3	.101	1	.583	2
18			min	4.028	15	-542.24	2	5.504	12	-.013	2	0	3	-.947	3
19		10	max	71.335	1	657.913	2	-7.383	12	0	3	.232	1	1.133	2
20			min	4.028	15	-1171.058	3	-160.386	1	-.013	2	.006	12	-1.925	3
21		11	max	71.335	1	542.24	2	-5.504	12	.013	2	.101	1	.583	2
22			min	4.028	15	-962.679	3	-126.423	1	0	3	0	3	-.947	3
23		12	max	71.335	1	426.567	2	-3.626	12	.013	2	.004	2	.139	2
24			min	4.028	15	-754.299	3	-92.459	1	0	3	-.006	3	-.16	3
25		13	max	71.335	1	310.894	2	-1.748	12	.013	2	-.004	15	.436	3
26			min	4.028	15	-545.919	3	-58.496	1	0	3	-.069	1	-.199	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	71.335	1	195.22	2	.433	3	.013	2	-.006	15	.841	3
28			min	4.028	15	-337.539	3	-24.533	1	0	3	-.107	1	-.431	2
29		15	max	71.335	1	79.547	2	9.431	1	.013	2	-.006	12	1.055	3
30			min	4.028	15	-129.16	3	.478	10	0	3	-.114	1	-.557	2
31		16	max	71.335	1	79.22	3	43.394	1	.013	2	-.003	12	1.077	3
32			min	4.028	15	-36.126	2	2.451	15	0	3	-.089	1	-.576	2
33		17	max	71.335	1	287.6	3	77.357	1	.013	2	.002	3	.909	3
34			min	4.028	15	-151.799	2	4.33	15	0	3	-.034	1	-.49	2
35		18	max	71.335	1	495.98	3	111.32	1	.013	2	.052	1	.55	3
36			min	4.028	15	-267.472	2	6.209	15	0	3	.003	15	-.298	2
37		19	max	71.335	1	704.36	3	145.284	1	.013	2	.17	1	0	2
38			min	4.028	15	-383.145	2	8.087	15	0	3	.01	15	0	3
39	M14	1	max	37.317	1	425.459	2	-8.38	15	.01	3	.199	1	0	1
40			min	2.101	15	-572.517	3	-150.547	1	-.011	2	.011	15	0	3
41		2	max	37.317	1	309.786	2	-6.501	15	.01	3	.076	1	.451	3
42			min	2.101	15	-411.338	3	-116.583	1	-.011	2	.004	15	-.337	2
43		3	max	37.317	1	194.113	2	-4.623	15	.01	3	.004	3	.754	3
44			min	2.101	15	-250.16	3	-82.62	1	-.011	2	-.015	1	-.568	2
45		4	max	37.317	1	78.439	2	-2.744	15	.01	3	-.002	12	.91	3
46			min	2.101	15	-88.981	3	-48.657	1	-.011	2	-.075	1	-.693	2
47		5	max	37.317	1	72.198	3	-.865	15	.01	3	-.005	12	.917	3
48			min	2.101	15	-37.234	2	-14.693	1	-.011	2	-.104	1	-.712	2
49		6	max	37.317	1	233.377	3	19.27	1	.01	3	-.006	15	.777	3
50			min	2.101	15	-152.907	2	-.871	3	-.011	2	-.102	1	-.625	2
51		7	max	37.317	1	394.556	3	53.233	1	.01	3	-.004	15	.489	3
52			min	2.101	15	-268.58	2	1.456	12	-.011	2	-.069	1	-.431	2
53		8	max	37.317	1	555.734	3	87.196	1	.01	3	.002	10	.054	3
54			min	2.101	15	-384.253	2	3.334	12	-.011	2	-.006	3	-.132	2
55		9	max	37.317	1	716.913	3	121.16	1	.01	3	.091	1	.273	2
56			min	2.101	15	-499.926	2	5.212	12	-.011	2	0	3	-.529	3
57		10	max	37.317	1	615.6	2	-7.091	12	.01	3	.218	1	.784	2
58			min	2.101	15	-878.092	3	-155.123	1	-.011	2	.006	12	-1.261	3
59		11	max	37.317	1	499.926	2	-5.212	12	.011	2	.091	1	.273	2
60			min	2.101	15	-716.913	3	-121.16	1	-.01	3	0	3	-.529	3
61		12	max	37.317	1	384.253	2	-3.334	12	.011	2	.002	10	.054	3
62			min	2.101	15	-555.734	3	-87.196	1	-.01	3	-.006	3	-.132	2
63		13	max	37.317	1	268.58	2	-1.456	12	.011	2	-.004	15	.489	3
64			min	2.101	15	-394.556	3	-53.233	1	-.01	3	-.069	1	-.431	2
65		14	max	37.317	1	152.907	2	.871	3	.011	2	-.006	15	.777	3
66			min	2.101	15	-233.377	3	-19.27	1	-.01	3	-.102	1	-.625	2
67		15	max	37.317	1	37.234	2	14.693	1	.011	2	-.005	12	.917	3
68			min	2.101	15	-72.198	3	.865	15	-.01	3	-.104	1	-.712	2
69		16	max	37.317	1	88.981	3	48.657	1	.011	2	-.002	12	.91	3
70			min	2.101	15	-78.439	2	2.744	15	-.01	3	-.075	1	-.693	2
71		17	max	37.317	1	250.16	3	82.62	1	.011	2	.004	3	.754	3
72			min	2.101	15	-194.113	2	4.623	15	-.01	3	-.015	1	-.568	2
73		18	max	37.317	1	411.338	3	116.583	1	.011	2	.076	1	.451	3
74			min	2.101	15	-309.786	2	6.501	15	-.01	3	.004	15	-.337	2
75		19	max	37.317	1	572.517	3	150.547	1	.011	2	.199	1	0	1
76			min	2.101	15	-425.459	2	8.38	15	-.01	3	.011	15	0	3
77	M15	1	max	-2.193	15	637.897	2	-8.377	15	.012	2	.199	1	0	2
78			min	-38.737	1	-333.795	3	-150.553	1	-.009	3	.011	15	0	3
79		2	max	-2.193	15	459.289	2	-6.499	15	.012	2	.076	1	.265	3
80			min	-38.737	1	-243.417	3	-116.59	1	-.009	3	.004	15	-.503	2
81		3	max	-2.193	15	280.682	2	-4.62	15	.012	2	.004	3	.446	3
82			min	-38.737	1	-153.04	3	-82.627	1	-.009	3	-.015	1	-.842	2
83		4	max	-2.193	15	102.074	2	-2.741	15	.012	2	-.002	12	.545	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	-38.737	1	-62.663	3	-48.664	1	-.009	3	-.075	1	-1.017	2
85		5	max	-2.193	15	27.715	3	-.863	15	.012	2	-.005	12	.561	3
86			min	-38.737	1	-76.534	2	-14.7	1	-.009	3	-.104	1	-1.029	2
87		6	max	-2.193	15	118.092	3	19.263	1	.012	2	-.006	15	.494	3
88			min	-38.737	1	-255.142	2	-.673	3	-.009	3	-.102	1	-.877	2
89		7	max	-2.193	15	208.469	3	53.226	1	.012	2	-.004	15	.345	3
90			min	-38.737	1	-433.75	2	1.575	12	-.009	3	-.069	1	-.561	2
91		8	max	-2.193	15	298.846	3	87.189	1	.012	2	.002	10	.112	3
92			min	-38.737	1	-612.357	2	3.453	12	-.009	3	-.006	3	-.082	2
93		9	max	-2.193	15	389.224	3	121.153	1	.012	2	.091	1	.561	2
94			min	-38.737	1	-790.965	2	5.332	12	-.009	3	0	3	-.203	3
95		10	max	-2.193	15	969.573	2	-7.21	12	.012	2	.218	1	1.368	2
96			min	-38.737	1	-479.601	3	-155.116	1	-.009	3	.006	12	-.601	3
97		11	max	-2.193	15	790.965	2	-5.332	12	.009	3	.091	1	.561	2
98			min	-38.737	1	-389.224	3	-121.153	1	-.012	2	0	3	-.203	3
99		12	max	-2.193	15	612.357	2	-3.453	12	.009	3	.002	10	.112	3
100			min	-38.737	1	-298.846	3	-87.189	1	-.012	2	-.006	3	-.082	2
101		13	max	-2.193	15	433.75	2	-1.575	12	.009	3	-.004	15	.345	3
102			min	-38.737	1	-208.469	3	-53.226	1	-.012	2	-.069	1	-.561	2
103		14	max	-2.193	15	255.142	2	.673	3	.009	3	-.006	15	.494	3
104			min	-38.737	1	-118.092	3	-19.263	1	-.012	2	-.102	1	-.877	2
105		15	max	-2.193	15	76.534	2	14.7	1	.009	3	-.005	12	.561	3
106			min	-38.737	1	-27.715	3	.863	15	-.012	2	-.104	1	-1.029	2
107		16	max	-2.193	15	62.663	3	48.664	1	.009	3	-.002	12	.545	3
108			min	-38.737	1	-102.074	2	2.741	15	-.012	2	-.075	1	-1.017	2
109		17	max	-2.193	15	153.04	3	82.627	1	.009	3	.004	3	.446	3
110			min	-38.737	1	-280.682	2	4.62	15	-.012	2	-.015	1	-.842	2
111		18	max	-2.193	15	243.417	3	116.59	1	.009	3	.076	1	.265	3
112			min	-38.737	1	-459.289	2	6.499	15	-.012	2	.004	15	-.503	2
113		19	max	-2.193	15	333.795	3	150.553	1	.009	3	.199	1	0	2
114			min	-38.737	1	-637.897	2	8.377	15	-.012	2	.011	15	0	3
115	M16	1	max	-4.367	15	597.441	2	-8.096	15	.009	2	.172	1	0	2
116			min	-77.475	1	-297.874	3	-145.624	1	-.012	3	.01	15	0	3
117		2	max	-4.367	15	418.833	2	-6.217	15	.009	2	.054	1	.232	3
118			min	-77.475	1	-207.497	3	-111.661	1	-.012	3	.003	15	-.466	2
119		3	max	-4.367	15	240.225	2	-4.339	15	.009	2	0	3	.38	3
120			min	-77.475	1	-117.119	3	-77.698	1	-.012	3	-.033	1	-.768	2
121		4	max	-4.367	15	61.617	2	-2.46	15	.009	2	-.004	12	.446	3
122			min	-77.475	1	-26.742	3	-43.734	1	-.012	3	-.089	1	-.906	2
123		5	max	-4.367	15	63.635	3	-.581	15	.009	2	-.006	12	.429	3
124			min	-77.475	1	-116.991	2	-9.771	1	-.012	3	-.113	1	-.881	2
125		6	max	-4.367	15	154.013	3	24.192	1	.009	2	-.006	15	.33	3
126			min	-77.475	1	-295.598	2	.229	3	-.012	3	-.107	1	-.692	2
127		7	max	-4.367	15	244.39	3	58.155	1	.009	2	-.004	15	.147	3
128			min	-77.475	1	-474.206	2	2.144	12	-.012	3	-.069	1	-.339	2
129		8	max	-4.367	15	334.767	3	92.119	1	.009	2	.003	2	.178	2
130			min	-77.475	1	-652.814	2	4.023	12	-.012	3	-.004	3	-.118	3
131		9	max	-4.367	15	425.144	3	126.082	1	.009	2	.1	1	.858	2
132			min	-77.475	1	-831.422	2	5.901	12	-.012	3	.002	12	-.467	3
133		10	max	-4.367	15	1010.03	2	-7.779	12	.009	2	.231	1	1.702	2
134			min	-77.475	1	-515.522	3	-160.045	1	-.012	3	.008	12	-.898	3
135		11	max	-4.367	15	831.422	2	-5.901	12	.012	3	.1	1	.858	2
136			min	-77.475	1	-425.144	3	-126.082	1	-.009	2	.002	12	-.467	3
137		12	max	-4.367	15	652.814	2	-4.023	12	.012	3	.003	2	.178	2
138			min	-77.475	1	-334.767	3	-92.119	1	-.009	2	-.004	3	-.118	3
139		13	max	-4.367	15	474.206	2	-2.144	12	.012	3	-.004	15	.147	3
140			min	-77.475	1	-244.39	3	-58.155	1	-.009	2	-.069	1	-.339	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	-4.367	15	295.598	2	-.229	3	.012	3	-.006	15	.33	3
142			min	-77.475	1	-154.013	3	-24.192	1	-.009	2	-.107	1	-.692	2
143		15	max	-4.367	15	116.991	2	9.771	1	.012	3	-.006	12	.429	3
144			min	-77.475	1	-63.635	3	.581	15	-.009	2	-.113	1	-.881	2
145		16	max	-4.367	15	26.742	3	43.734	1	.012	3	-.004	12	.446	3
146			min	-77.475	1	-61.617	2	2.46	15	-.009	2	-.089	1	-.906	2
147		17	max	-4.367	15	117.119	3	77.698	1	.012	3	0	3	.38	3
148			min	-77.475	1	-240.225	2	4.339	15	-.009	2	-.033	1	-.768	2
149		18	max	-4.367	15	207.497	3	111.661	1	.012	3	.054	1	.232	3
150			min	-77.475	1	-418.833	2	6.217	15	-.009	2	.003	15	-.466	2
151		19	max	-4.367	15	297.874	3	145.624	1	.012	3	.172	1	0	2
152			min	-77.475	1	-597.441	2	8.096	15	-.009	2	.01	15	0	3
153	M2	1	max	959.395	2	2.019	4	.241	1	0	3	0	3	0	1
154			min	-1362.655	3	.475	15	.014	15	0	1	0	2	0	1
155		2	max	959.916	2	1.9	4	.241	1	0	3	0	1	0	15
156			min	-1362.265	3	.447	15	.014	15	0	1	0	15	0	4
157		3	max	960.437	2	1.781	4	.241	1	0	3	0	1	0	15
158			min	-1361.874	3	.419	15	.014	15	0	1	0	15	-.001	4
159		4	max	960.957	2	1.662	4	.241	1	0	3	0	1	0	15
160			min	-1361.484	3	.391	15	.014	15	0	1	0	15	-.002	4
161		5	max	961.478	2	1.543	4	.241	1	0	3	0	1	0	15
162			min	-1361.093	3	.363	15	.014	15	0	1	0	15	-.003	4
163		6	max	961.999	2	1.424	4	.241	1	0	3	0	1	0	15
164			min	-1360.703	3	.335	15	.014	15	0	1	0	15	-.003	4
165		7	max	962.52	2	1.305	4	.241	1	0	3	0	1	0	15
166			min	-1360.312	3	.307	15	.014	15	0	1	0	15	-.004	4
167		8	max	963.04	2	1.187	4	.241	1	0	3	0	1	0	15
168			min	-1359.922	3	.279	15	.014	15	0	1	0	15	-.004	4
169		9	max	963.561	2	1.068	4	.241	1	0	3	0	1	-.001	15
170			min	-1359.531	3	.251	15	.014	15	0	1	0	15	-.004	4
171		10	max	964.082	2	.949	4	.241	1	0	3	0	1	-.001	15
172			min	-1359.141	3	.205	12	.014	15	0	1	0	15	-.005	4
173		11	max	964.602	2	.847	2	.241	1	0	3	0	1	-.001	15
174			min	-1358.75	3	.159	12	.014	15	0	1	0	15	-.005	4
175		12	max	965.123	2	.755	2	.241	1	0	3	0	1	-.001	15
176			min	-1358.36	3	.113	12	.014	15	0	1	0	15	-.005	4
177		13	max	965.644	2	.662	2	.241	1	0	3	.001	1	-.001	15
178			min	-1357.969	3	.066	12	.014	15	0	1	0	15	-.006	4
179		14	max	966.164	2	.569	2	.241	1	0	3	.001	1	-.001	15
180			min	-1357.579	3	.002	3	.014	15	0	1	0	15	-.006	4
181		15	max	966.685	2	.477	2	.241	1	0	3	.001	1	-.001	15
182			min	-1357.188	3	-.067	3	.014	15	0	1	0	15	-.006	4
183		16	max	967.206	2	.384	2	.241	1	0	3	.001	1	-.001	15
184			min	-1356.798	3	-.136	3	.014	15	0	1	0	15	-.006	4
185		17	max	967.726	2	.291	2	.241	1	0	3	.001	1	-.001	15
186			min	-1356.407	3	-.206	3	.014	15	0	1	0	15	-.006	4
187		18	max	968.247	2	.199	2	.241	1	0	3	.001	1	-.001	12
188			min	-1356.016	3	-.275	3	.014	15	0	1	0	15	-.006	4
189		19	max	968.768	2	.106	2	.241	1	0	3	.002	1	-.001	12
190			min	-1355.626	3	-.345	3	.014	15	0	1	0	15	-.006	4
191	M3	1	max	828.633	2	7.662	4	.232	1	0	3	0	1	.006	4
192			min	-939.647	3	1.801	15	.013	15	0	1	0	15	.001	12
193		2	max	828.462	2	6.901	4	.232	1	0	3	0	1	.004	2
194			min	-939.775	3	1.622	15	.013	15	0	1	0	15	0	3
195		3	max	828.292	2	6.14	4	.232	1	0	3	0	1	.001	2
196			min	-939.903	3	1.444	15	.013	15	0	1	0	15	-.001	3
197		4	max	828.122	2	5.379	4	.232	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	-940.031	3	1.265	15	.013	15	0	1	0	15	-.003	3
199		5	max	827.951	2	4.618	4	.232	1	0	3	0	1	0	15
200			min	-940.158	3	1.086	15	.013	15	0	1	0	15	-.004	4
201		6	max	827.781	2	3.857	4	.232	1	0	3	0	1	-.001	15
202			min	-940.286	3	.907	15	.013	15	0	1	0	15	-.006	4
203		7	max	827.611	2	3.096	4	.232	1	0	3	0	1	-.002	15
204			min	-940.414	3	.728	15	.013	15	0	1	0	15	-.007	4
205		8	max	827.44	2	2.335	4	.232	1	0	3	0	1	-.002	15
206			min	-940.542	3	.549	15	.013	15	0	1	0	15	-.008	4
207		9	max	827.27	2	1.574	4	.232	1	0	3	.001	1	-.002	15
208			min	-940.669	3	.37	15	.013	15	0	1	0	15	-.009	4
209		10	max	827.1	2	.813	4	.232	1	0	3	.001	1	-.002	15
210			min	-940.797	3	.176	12	.013	15	0	1	0	15	-.01	4
211		11	max	826.929	2	.213	2	.232	1	0	3	.001	1	-.002	15
212			min	-940.925	3	-.204	3	.013	15	0	1	0	15	-.01	4
213		12	max	826.759	2	-.166	15	.232	1	0	3	.001	1	-.002	15
214			min	-941.053	3	-.709	4	.013	15	0	1	0	15	-.01	4
215		13	max	826.589	2	-.345	15	.232	1	0	3	.001	1	-.002	15
216			min	-941.18	3	-1.47	4	.013	15	0	1	0	15	-.009	4
217		14	max	826.418	2	-.524	15	.232	1	0	3	.002	1	-.002	15
218			min	-941.308	3	-2.231	4	.013	15	0	1	0	15	-.009	4
219		15	max	826.248	2	-.703	15	.232	1	0	3	.002	1	-.002	15
220			min	-941.436	3	-2.992	4	.013	15	0	1	0	15	-.008	4
221		16	max	826.078	2	-.882	15	.232	1	0	3	.002	1	-.001	15
222			min	-941.564	3	-3.752	4	.013	15	0	1	0	15	-.006	4
223		17	max	825.907	2	-1.061	15	.232	1	0	3	.002	1	-.001	15
224			min	-941.691	3	-4.513	4	.013	15	0	1	0	15	-.004	4
225		18	max	825.737	2	-1.24	15	.232	1	0	3	.002	1	0	15
226			min	-941.819	3	-5.274	4	.013	15	0	1	0	15	-.002	4
227		19	max	825.567	2	-1.419	15	.232	1	0	3	.002	1	0	1
228			min	-941.947	3	-6.035	4	.013	15	0	1	0	15	0	1
229	M4	1	max	798.343	1	0	1	-.459	15	0	1	.002	1	0	1
230			min	38.216	15	0	1	-8.165	1	0	1	0	15	0	1
231		2	max	798.513	1	0	1	-.459	15	0	1	0	1	0	1
232			min	38.267	15	0	1	-8.165	1	0	1	0	15	0	1
233		3	max	798.684	1	0	1	-.459	15	0	1	0	1	0	1
234			min	38.319	15	0	1	-8.165	1	0	1	0	10	0	1
235		4	max	798.854	1	0	1	-.459	15	0	1	0	15	0	1
236			min	38.37	15	0	1	-8.165	1	0	1	0	1	0	1
237		5	max	799.025	1	0	1	-.459	15	0	1	0	15	0	1
238			min	38.421	15	0	1	-8.165	1	0	1	-.002	1	0	1
239		6	max	799.195	1	0	1	-.459	15	0	1	0	15	0	1
240			min	38.473	15	0	1	-8.165	1	0	1	-.003	1	0	1
241		7	max	799.365	1	0	1	-.459	15	0	1	0	15	0	1
242			min	38.524	15	0	1	-8.165	1	0	1	-.004	1	0	1
243		8	max	799.536	1	0	1	-.459	15	0	1	0	15	0	1
244			min	38.575	15	0	1	-8.165	1	0	1	-.005	1	0	1
245		9	max	799.706	1	0	1	-.459	15	0	1	0	15	0	1
246			min	38.627	15	0	1	-8.165	1	0	1	-.006	1	0	1
247		10	max	799.876	1	0	1	-.459	15	0	1	0	15	0	1
248			min	38.678	15	0	1	-8.165	1	0	1	-.007	1	0	1
249		11	max	800.047	1	0	1	-.459	15	0	1	0	15	0	1
250			min	38.73	15	0	1	-8.165	1	0	1	-.007	1	0	1
251		12	max	800.217	1	0	1	-.459	15	0	1	0	15	0	1
252			min	38.781	15	0	1	-8.165	1	0	1	-.008	1	0	1
253		13	max	800.387	1	0	1	-.459	15	0	1	0	15	0	1
254			min	38.832	15	0	1	-8.165	1	0	1	-.009	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	800.558	1	0	1	-.459	15	0	1	0	15	0	1
256			min	38.884	15	0	1	-8.165	1	0	1	-.01	1	0	1
257		15	max	800.728	1	0	1	-.459	15	0	1	0	15	0	1
258			min	38.935	15	0	1	-8.165	1	0	1	-.011	1	0	1
259		16	max	800.898	1	0	1	-.459	15	0	1	0	15	0	1
260			min	38.987	15	0	1	-8.165	1	0	1	-.012	1	0	1
261		17	max	801.069	1	0	1	-.459	15	0	1	0	15	0	1
262			min	39.038	15	0	1	-8.165	1	0	1	-.013	1	0	1
263		18	max	801.239	1	0	1	-.459	15	0	1	0	15	0	1
264			min	39.089	15	0	1	-8.165	1	0	1	-.014	1	0	1
265		19	max	801.409	1	0	1	-.459	15	0	1	0	15	0	1
266			min	39.141	15	0	1	-8.165	1	0	1	-.015	1	0	1
267	M6	1	max	3014.73	2	2.243	2	0	1	0	1	0	1	0	1
268			min	-4371.254	3	.269	12	0	1	0	1	0	1	0	1
269		2	max	3015.25	2	2.15	2	0	1	0	1	0	1	0	12
270			min	-4370.864	3	.222	12	0	1	0	1	0	1	0	2
271		3	max	3015.771	2	2.057	2	0	1	0	1	0	1	0	12
272			min	-4370.473	3	.176	12	0	1	0	1	0	1	-.002	2
273		4	max	3016.292	2	1.965	2	0	1	0	1	0	1	0	12
274			min	-4370.083	3	.108	3	0	1	0	1	0	1	-.002	2
275		5	max	3016.813	2	1.872	2	0	1	0	1	0	1	0	12
276			min	-4369.692	3	.038	3	0	1	0	1	0	1	-.003	2
277		6	max	3017.333	2	1.78	2	0	1	0	1	0	1	0	3
278			min	-4369.302	3	-.031	3	0	1	0	1	0	1	-.004	2
279		7	max	3017.854	2	1.687	2	0	1	0	1	0	1	0	3
280			min	-4368.911	3	-.101	3	0	1	0	1	0	1	-.004	2
281		8	max	3018.375	2	1.594	2	0	1	0	1	0	1	0	3
282			min	-4368.521	3	-.17	3	0	1	0	1	0	1	-.005	2
283		9	max	3018.895	2	1.502	2	0	1	0	1	0	1	0	3
284			min	-4368.13	3	-.24	3	0	1	0	1	0	1	-.005	2
285		10	max	3019.416	2	1.409	2	0	1	0	1	0	1	0	3
286			min	-4367.74	3	-.309	3	0	1	0	1	0	1	-.006	2
287		11	max	3019.937	2	1.317	2	0	1	0	1	0	1	0	3
288			min	-4367.349	3	-.378	3	0	1	0	1	0	1	-.006	2
289		12	max	3020.457	2	1.224	2	0	1	0	1	0	1	0	3
290			min	-4366.959	3	-.448	3	0	1	0	1	0	1	-.007	2
291		13	max	3020.978	2	1.131	2	0	1	0	1	0	1	0	3
292			min	-4366.568	3	-.517	3	0	1	0	1	0	1	-.007	2
293		14	max	3021.499	2	1.039	2	0	1	0	1	0	1	0	3
294			min	-4366.178	3	-.587	3	0	1	0	1	0	1	-.008	2
295		15	max	3022.019	2	.946	2	0	1	0	1	0	1	0	3
296			min	-4365.787	3	-.656	3	0	1	0	1	0	1	-.008	2
297		16	max	3022.54	2	.853	2	0	1	0	1	0	1	.001	3
298			min	-4365.397	3	-.726	3	0	1	0	1	0	1	-.008	2
299		17	max	3023.061	2	.761	2	0	1	0	1	0	1	.001	3
300			min	-4365.006	3	-.795	3	0	1	0	1	0	1	-.009	2
301		18	max	3023.582	2	.668	2	0	1	0	1	0	1	.002	3
302			min	-4364.616	3	-.865	3	0	1	0	1	0	1	-.009	2
303		19	max	3024.102	2	.576	2	0	1	0	1	0	1	.002	3
304			min	-4364.225	3	-.934	3	0	1	0	1	0	1	-.009	2
305	M7	1	max	2855.605	2	7.685	4	0	1	0	1	0	1	.009	2
306			min	-2907.44	3	1.805	15	0	1	0	1	0	1	-.002	3
307		2	max	2855.435	2	6.924	4	0	1	0	1	0	1	.006	2
308			min	-2907.568	3	1.626	15	0	1	0	1	0	1	-.003	3
309		3	max	2855.265	2	6.163	4	0	1	0	1	0	1	.004	2
310			min	-2907.696	3	1.447	15	0	1	0	1	0	1	-.005	3
311		4	max	2855.094	2	5.402	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	-2907.823	3	1.268	15	0	1	0	1	0	1	-.006	3
313		5	max	2854.924	2	4.641	4	0	1	0	1	0	1	0	2
314			min	-2907.951	3	1.09	15	0	1	0	1	0	1	-.007	3
315		6	max	2854.754	2	3.88	4	0	1	0	1	0	1	-.001	15
316			min	-2908.079	3	.911	15	0	1	0	1	0	1	-.007	3
317		7	max	2854.583	2	3.119	4	0	1	0	1	0	1	-.002	15
318			min	-2908.207	3	.732	15	0	1	0	1	0	1	-.008	3
319		8	max	2854.413	2	2.394	2	0	1	0	1	0	1	-.002	15
320			min	-2908.335	3	.466	12	0	1	0	1	0	1	-.008	4
321		9	max	2854.243	2	1.801	2	0	1	0	1	0	1	-.002	15
322			min	-2908.462	3	.169	12	0	1	0	1	0	1	-.009	4
323		10	max	2854.072	2	1.208	2	0	1	0	1	0	1	-.002	15
324			min	-2908.59	3	-.265	3	0	1	0	1	0	1	-.01	4
325		11	max	2853.902	2	.615	2	0	1	0	1	0	1	-.002	15
326			min	-2908.718	3	-.71	3	0	1	0	1	0	1	-.01	4
327		12	max	2853.731	2	.022	2	0	1	0	1	0	1	-.002	15
328			min	-2908.846	3	-1.154	3	0	1	0	1	0	1	-.01	4
329		13	max	2853.561	2	-.341	15	0	1	0	1	0	1	-.002	15
330			min	-2908.973	3	-1.599	3	0	1	0	1	0	1	-.009	4
331		14	max	2853.391	2	-.52	15	0	1	0	1	0	1	-.002	15
332			min	-2909.101	3	-2.208	4	0	1	0	1	0	1	-.009	4
333		15	max	2853.22	2	-.699	15	0	1	0	1	0	1	-.002	15
334			min	-2909.229	3	-2.969	4	0	1	0	1	0	1	-.007	4
335		16	max	2853.05	2	-.878	15	0	1	0	1	0	1	-.001	15
336			min	-2909.357	3	-3.73	4	0	1	0	1	0	1	-.006	4
337		17	max	2852.88	2	-1.057	15	0	1	0	1	0	1	-.001	15
338			min	-2909.484	3	-4.491	4	0	1	0	1	0	1	-.004	4
339		18	max	2852.709	2	-1.236	15	0	1	0	1	0	1	0	15
340			min	-2909.612	3	-5.252	4	0	1	0	1	0	1	-.002	4
341		19	max	2852.539	2	-1.415	15	0	1	0	1	0	1	0	1
342			min	-2909.74	3	-6.013	4	0	1	0	1	0	1	0	1
343	M8	1	max	1997.838	1	0	1	0	1	0	1	0	1	0	1
344			min	79.074	15	0	1	0	1	0	1	0	1	0	1
345		2	max	1998.009	1	0	1	0	1	0	1	0	1	0	1
346			min	79.125	15	0	1	0	1	0	1	0	1	0	1
347		3	max	1998.179	1	0	1	0	1	0	1	0	1	0	1
348			min	79.177	15	0	1	0	1	0	1	0	1	0	1
349		4	max	1998.349	1	0	1	0	1	0	1	0	1	0	1
350			min	79.228	15	0	1	0	1	0	1	0	1	0	1
351		5	max	1998.52	1	0	1	0	1	0	1	0	1	0	1
352			min	79.28	15	0	1	0	1	0	1	0	1	0	1
353		6	max	1998.69	1	0	1	0	1	0	1	0	1	0	1
354			min	79.331	15	0	1	0	1	0	1	0	1	0	1
355		7	max	1998.86	1	0	1	0	1	0	1	0	1	0	1
356			min	79.382	15	0	1	0	1	0	1	0	1	0	1
357		8	max	1999.031	1	0	1	0	1	0	1	0	1	0	1
358			min	79.434	15	0	1	0	1	0	1	0	1	0	1
359		9	max	1999.201	1	0	1	0	1	0	1	0	1	0	1
360			min	79.485	15	0	1	0	1	0	1	0	1	0	1
361		10	max	1999.371	1	0	1	0	1	0	1	0	1	0	1
362			min	79.537	15	0	1	0	1	0	1	0	1	0	1
363		11	max	1999.542	1	0	1	0	1	0	1	0	1	0	1
364			min	79.588	15	0	1	0	1	0	1	0	1	0	1
365		12	max	1999.712	1	0	1	0	1	0	1	0	1	0	1
366			min	79.639	15	0	1	0	1	0	1	0	1	0	1
367		13	max	1999.883	1	0	1	0	1	0	1	0	1	0	1
368			min	79.691	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	2000.053	1	0	1	0	1	0	1	0	1	0	1
370			min	79.742	15	0	1	0	1	0	1	0	1	0	1
371		15	max	2000.223	1	0	1	0	1	0	1	0	1	0	1
372			min	79.794	15	0	1	0	1	0	1	0	1	0	1
373		16	max	2000.394	1	0	1	0	1	0	1	0	1	0	1
374			min	79.845	15	0	1	0	1	0	1	0	1	0	1
375		17	max	2000.564	1	0	1	0	1	0	1	0	1	0	1
376			min	79.896	15	0	1	0	1	0	1	0	1	0	1
377		18	max	2000.734	1	0	1	0	1	0	1	0	1	0	1
378			min	79.948	15	0	1	0	1	0	1	0	1	0	1
379		19	max	2000.905	1	0	1	0	1	0	1	0	1	0	1
380			min	79.999	15	0	1	0	1	0	1	0	1	0	1
381	M10	1	max	959.395	2	2.019	4	-.014	15	0	1	0	2	0	1
382			min	-1362.655	3	.475	15	-.241	1	0	3	0	3	0	1
383		2	max	959.916	2	1.9	4	-.014	15	0	1	0	15	0	15
384			min	-1362.265	3	.447	15	-.241	1	0	3	0	1	0	4
385		3	max	960.437	2	1.781	4	-.014	15	0	1	0	15	0	15
386			min	-1361.874	3	.419	15	-.241	1	0	3	0	1	-.001	4
387		4	max	960.957	2	1.662	4	-.014	15	0	1	0	15	0	15
388			min	-1361.484	3	.391	15	-.241	1	0	3	0	1	-.002	4
389		5	max	961.478	2	1.543	4	-.014	15	0	1	0	15	0	15
390			min	-1361.093	3	.363	15	-.241	1	0	3	0	1	-.003	4
391		6	max	961.999	2	1.424	4	-.014	15	0	1	0	15	0	15
392			min	-1360.703	3	.335	15	-.241	1	0	3	0	1	-.003	4
393		7	max	962.52	2	1.305	4	-.014	15	0	1	0	15	0	15
394			min	-1360.312	3	.307	15	-.241	1	0	3	0	1	-.004	4
395		8	max	963.04	2	1.187	4	-.014	15	0	1	0	15	0	15
396			min	-1359.922	3	.279	15	-.241	1	0	3	0	1	-.004	4
397		9	max	963.561	2	1.068	4	-.014	15	0	1	0	15	-.001	15
398			min	-1359.531	3	.251	15	-.241	1	0	3	0	1	-.004	4
399		10	max	964.082	2	.949	4	-.014	15	0	1	0	15	-.001	15
400			min	-1359.141	3	.205	12	-.241	1	0	3	0	1	-.005	4
401		11	max	964.602	2	.847	2	-.014	15	0	1	0	15	-.001	15
402			min	-1358.75	3	.159	12	-.241	1	0	3	0	1	-.005	4
403		12	max	965.123	2	.755	2	-.014	15	0	1	0	15	-.001	15
404			min	-1358.36	3	.113	12	-.241	1	0	3	0	1	-.005	4
405		13	max	965.644	2	.662	2	-.014	15	0	1	0	15	-.001	15
406			min	-1357.969	3	.066	12	-.241	1	0	3	-.001	1	-.006	4
407		14	max	966.164	2	.569	2	-.014	15	0	1	0	15	-.001	15
408			min	-1357.579	3	.002	3	-.241	1	0	3	-.001	1	-.006	4
409		15	max	966.685	2	.477	2	-.014	15	0	1	0	15	-.001	15
410			min	-1357.188	3	-.067	3	-.241	1	0	3	-.001	1	-.006	4
411		16	max	967.206	2	.384	2	-.014	15	0	1	0	15	-.001	15
412			min	-1356.798	3	-.136	3	-.241	1	0	3	-.001	1	-.006	4
413		17	max	967.726	2	.291	2	-.014	15	0	1	0	15	-.001	15
414			min	-1356.407	3	-.206	3	-.241	1	0	3	-.001	1	-.006	4
415		18	max	968.247	2	.199	2	-.014	15	0	1	0	15	-.001	12
416			min	-1356.016	3	-.275	3	-.241	1	0	3	-.001	1	-.006	4
417		19	max	968.768	2	.106	2	-.014	15	0	1	0	15	-.001	12
418			min	-1355.626	3	-.345	3	-.241	1	0	3	-.002	1	-.006	4
419	M11	1	max	828.633	2	7.662	4	-.013	15	0	1	0	15	.006	4
420			min	-939.647	3	1.801	15	-.232	1	0	3	0	1	.001	12
421		2	max	828.462	2	6.901	4	-.013	15	0	1	0	15	.004	2
422			min	-939.775	3	1.622	15	-.232	1	0	3	0	1	0	3
423		3	max	828.292	2	6.14	4	-.013	15	0	1	0	15	.001	2
424			min	-939.903	3	1.444	15	-.232	1	0	3	0	1	-.001	3
425		4	max	828.122	2	5.379	4	-.013	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	-940.031	3	1.265	15	-.232	1	0	3	0	1	-.003	3
427		5	max	827.951	2	4.618	4	-.013	15	0	1	0	15	0	15
428			min	-940.158	3	1.086	15	-.232	1	0	3	0	1	-.004	4
429		6	max	827.781	2	3.857	4	-.013	15	0	1	0	15	-.001	15
430			min	-940.286	3	.907	15	-.232	1	0	3	0	1	-.006	4
431		7	max	827.611	2	3.096	4	-.013	15	0	1	0	15	-.002	15
432			min	-940.414	3	.728	15	-.232	1	0	3	0	1	-.007	4
433		8	max	827.44	2	2.335	4	-.013	15	0	1	0	15	-.002	15
434			min	-940.542	3	.549	15	-.232	1	0	3	0	1	-.008	4
435		9	max	827.27	2	1.574	4	-.013	15	0	1	0	15	-.002	15
436			min	-940.669	3	.37	15	-.232	1	0	3	-.001	1	-.009	4
437		10	max	827.1	2	.813	4	-.013	15	0	1	0	15	-.002	15
438			min	-940.797	3	.176	12	-.232	1	0	3	-.001	1	-.01	4
439		11	max	826.929	2	.213	2	-.013	15	0	1	0	15	-.002	15
440			min	-940.925	3	-.204	3	-.232	1	0	3	-.001	1	-.01	4
441		12	max	826.759	2	-.166	15	-.013	15	0	1	0	15	-.002	15
442			min	-941.053	3	-.709	4	-.232	1	0	3	-.001	1	-.01	4
443		13	max	826.589	2	-.345	15	-.013	15	0	1	0	15	-.002	15
444			min	-941.18	3	-1.47	4	-.232	1	0	3	-.001	1	-.009	4
445		14	max	826.418	2	-.524	15	-.013	15	0	1	0	15	-.002	15
446			min	-941.308	3	-2.231	4	-.232	1	0	3	-.002	1	-.009	4
447		15	max	826.248	2	-.703	15	-.013	15	0	1	0	15	-.002	15
448			min	-941.436	3	-2.992	4	-.232	1	0	3	-.002	1	-.008	4
449		16	max	826.078	2	-.882	15	-.013	15	0	1	0	15	-.001	15
450			min	-941.564	3	-3.752	4	-.232	1	0	3	-.002	1	-.006	4
451		17	max	825.907	2	-1.061	15	-.013	15	0	1	0	15	-.001	15
452			min	-941.691	3	-4.513	4	-.232	1	0	3	-.002	1	-.004	4
453		18	max	825.737	2	-1.24	15	-.013	15	0	1	0	15	0	15
454			min	-941.819	3	-5.274	4	-.232	1	0	3	-.002	1	-.002	4
455		19	max	825.567	2	-1.419	15	-.013	15	0	1	0	15	0	1
456			min	-941.947	3	-6.035	4	-.232	1	0	3	-.002	1	0	1
457	M12	1	max	798.343	1	0	1	8.165	1	0	1	0	15	0	1
458			min	38.216	15	0	1	.459	15	0	1	-.002	1	0	1
459		2	max	798.513	1	0	1	8.165	1	0	1	0	15	0	1
460			min	38.267	15	0	1	.459	15	0	1	0	1	0	1
461		3	max	798.684	1	0	1	8.165	1	0	1	0	10	0	1
462			min	38.319	15	0	1	.459	15	0	1	0	1	0	1
463		4	max	798.854	1	0	1	8.165	1	0	1	0	1	0	1
464			min	38.37	15	0	1	.459	15	0	1	0	15	0	1
465		5	max	799.025	1	0	1	8.165	1	0	1	.002	1	0	1
466			min	38.421	15	0	1	.459	15	0	1	0	15	0	1
467		6	max	799.195	1	0	1	8.165	1	0	1	.003	1	0	1
468			min	38.473	15	0	1	.459	15	0	1	0	15	0	1
469		7	max	799.365	1	0	1	8.165	1	0	1	.004	1	0	1
470			min	38.524	15	0	1	.459	15	0	1	0	15	0	1
471		8	max	799.536	1	0	1	8.165	1	0	1	.005	1	0	1
472			min	38.575	15	0	1	.459	15	0	1	0	15	0	1
473		9	max	799.706	1	0	1	8.165	1	0	1	.006	1	0	1
474			min	38.627	15	0	1	.459	15	0	1	0	15	0	1
475		10	max	799.876	1	0	1	8.165	1	0	1	.007	1	0	1
476			min	38.678	15	0	1	.459	15	0	1	0	15	0	1
477		11	max	800.047	1	0	1	8.165	1	0	1	.007	1	0	1
478			min	38.73	15	0	1	.459	15	0	1	0	15	0	1
479		12	max	800.217	1	0	1	8.165	1	0	1	.008	1	0	1
480			min	38.781	15	0	1	.459	15	0	1	0	15	0	1
481		13	max	800.387	1	0	1	8.165	1	0	1	.009	1	0	1
482			min	38.832	15	0	1	.459	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	800.558	1	0	1	8.165	1	0	1	.01	1	0	1
484			min	38.884	15	0	1	.459	15	0	1	0	15	0	1
485		15	max	800.728	1	0	1	8.165	1	0	1	.011	1	0	1
486			min	38.935	15	0	1	.459	15	0	1	0	15	0	1
487		16	max	800.898	1	0	1	8.165	1	0	1	.012	1	0	1
488			min	38.987	15	0	1	.459	15	0	1	0	15	0	1
489		17	max	801.069	1	0	1	8.165	1	0	1	.013	1	0	1
490			min	39.038	15	0	1	.459	15	0	1	0	15	0	1
491		18	max	801.239	1	0	1	8.165	1	0	1	.014	1	0	1
492			min	39.089	15	0	1	.459	15	0	1	0	15	0	1
493		19	max	801.409	1	0	1	8.165	1	0	1	.015	1	0	1
494			min	39.141	15	0	1	.459	15	0	1	0	15	0	1
495	M1	1	max	145.289	1	704.309	3	-4.028	15	0	2	.17	1	0	3
496			min	8.087	15	-382.585	2	-71.264	1	0	3	.01	15	-.013	2
497		2	max	146.111	1	703.429	3	-4.028	15	0	2	.132	1	.189	2
498			min	8.335	15	-383.759	2	-71.264	1	0	3	.007	15	-.371	3
499		3	max	590.35	3	482.024	2	-4.015	15	0	3	.095	1	.381	2
500			min	-338.733	2	-537.024	3	-71.12	1	0	2	.005	15	-.727	3
501		4	max	590.966	3	480.851	2	-4.015	15	0	3	.057	1	.127	2
502			min	-337.911	2	-537.904	3	-71.12	1	0	2	.003	15	-.443	3
503		5	max	591.582	3	479.678	2	-4.015	15	0	3	.02	1	-.003	15
504			min	-337.089	2	-538.784	3	-71.12	1	0	2	.001	15	-.159	3
505		6	max	592.198	3	478.504	2	-4.015	15	0	3	-.001	15	.125	3
506			min	-336.268	2	-539.664	3	-71.12	1	0	2	-.018	1	-.379	2
507		7	max	592.815	3	477.331	2	-4.015	15	0	3	-.003	15	.41	3
508			min	-335.446	2	-540.544	3	-71.12	1	0	2	-.055	1	-.631	2
509		8	max	593.431	3	476.158	2	-4.015	15	0	3	-.005	15	.696	3
510			min	-334.625	2	-541.425	3	-71.12	1	0	2	-.093	1	-.883	2
511		9	max	609.004	3	52.881	2	-6.115	15	0	9	.057	1	.809	3
512			min	-269.264	2	.359	15	-108.468	1	0	3	.003	15	-1.011	2
513		10	max	609.62	3	51.708	2	-6.115	15	0	9	0	15	.791	3
514			min	-268.443	2	.005	15	-108.468	1	0	3	0	1	-1.039	2
515		11	max	610.237	3	50.535	2	-6.115	15	0	9	-.003	15	.774	3
516			min	-267.621	2	-1.441	4	-108.468	1	0	3	-.058	1	-1.066	2
517		12	max	625.614	3	369.96	3	-3.922	15	0	2	.092	1	.677	3
518			min	-202.178	2	-586.667	2	-69.752	1	0	3	.005	15	-.946	2
519		13	max	626.23	3	369.08	3	-3.922	15	0	2	.055	1	.482	3
520			min	-201.356	2	-587.84	2	-69.752	1	0	3	.003	15	-.636	2
521		14	max	626.846	3	368.2	3	-3.922	15	0	2	.018	1	.287	3
522			min	-200.535	2	-589.013	2	-69.752	1	0	3	.001	15	-.326	2
523		15	max	627.463	3	367.32	3	-3.922	15	0	2	-.001	15	.093	3
524			min	-199.713	2	-590.187	2	-69.752	1	0	3	-.019	1	-.03	1
525		16	max	628.079	3	366.44	3	-3.922	15	0	2	-.003	15	.297	2
526			min	-198.891	2	-591.36	2	-69.752	1	0	3	-.055	1	-.101	3
527		17	max	628.695	3	365.56	3	-3.922	15	0	2	-.005	15	.609	2
528			min	-198.07	2	-592.534	2	-69.752	1	0	3	-.092	1	-.294	3
529		18	max	-8.344	15	599.09	2	-4.368	15	0	3	-.007	15	.307	2
530			min	-146.441	1	-297.084	3	-77.545	1	0	2	-.131	1	-.145	3
531		19	max	-8.096	15	597.917	2	-4.368	15	0	3	-.01	15	.012	3
532			min	-145.62	1	-297.964	3	-77.545	1	0	2	-.172	1	-.009	2
533	M5	1	max	320.761	1	2342.006	3	0	1	0	1	0	1	.027	2
534			min	14.767	12	-1312.855	2	0	1	0	1	0	1	0	3
535		2	max	321.582	1	2341.126	3	0	1	0	1	0	1	.72	2
536			min	15.178	12	-1314.028	2	0	1	0	1	0	1	-1.236	3
537		3	max	1862.111	3	1389.43	2	0	1	0	1	0	1	1.381	2
538			min	-1123.983	2	-1658.841	3	0	1	0	1	0	1	-2.423	3
539		4	max	1862.727	3	1388.256	2	0	1	0	1	0	1	.648	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	-1123.162	2	-1659.721	3	0	1	0	1	0	1	-1.548	3
541		5	max	1863.343	3	1387.083	2	0	1	0	1	0	1	.01	9
542			min	-1122.34	2	-1660.601	3	0	1	0	1	0	1	-.672	3
543		6	max	1863.96	3	1385.91	2	0	1	0	1	0	1	.205	3
544			min	-1121.518	2	-1661.481	3	0	1	0	1	0	1	-.816	2
545		7	max	1864.576	3	1384.736	2	0	1	0	1	0	1	1.082	3
546			min	-1120.697	2	-1662.361	3	0	1	0	1	0	1	-1.547	2
547		8	max	1865.192	3	1383.563	2	0	1	0	1	0	1	1.959	3
548			min	-1119.875	2	-1663.241	3	0	1	0	1	0	1	-2.277	2
549		9	max	1886.609	3	178.147	2	0	1	0	1	0	1	2.249	3
550			min	-980.023	2	.352	15	0	1	0	1	0	1	-2.602	2
551		10	max	1887.225	3	176.974	2	0	1	0	1	0	1	2.183	3
552			min	-979.202	2	-.002	15	0	1	0	1	0	1	-2.696	2
553		11	max	1887.841	3	175.801	2	0	1	0	1	0	1	2.118	3
554			min	-978.38	2	-1.382	4	0	1	0	1	0	1	-2.789	2
555		12	max	1909.65	3	1119.317	3	0	1	0	1	0	1	1.862	3
556			min	-838.694	2	-1743.934	2	0	1	0	1	0	1	-2.501	2
557		13	max	1910.266	3	1118.437	3	0	1	0	1	0	1	1.271	3
558			min	-837.872	2	-1745.108	2	0	1	0	1	0	1	-1.581	2
559		14	max	1910.883	3	1117.557	3	0	1	0	1	0	1	.681	3
560			min	-837.051	2	-1746.281	2	0	1	0	1	0	1	-.66	2
561		15	max	1911.499	3	1116.677	3	0	1	0	1	0	1	.262	2
562			min	-836.229	2	-1747.455	2	0	1	0	1	0	1	-.002	13
563		16	max	1912.115	3	1115.797	3	0	1	0	1	0	1	1.184	2
564			min	-835.408	2	-1748.628	2	0	1	0	1	0	1	-.497	3
565		17	max	1912.731	3	1114.917	3	0	1	0	1	0	1	2.107	2
566			min	-834.586	2	-1749.801	2	0	1	0	1	0	1	-1.086	3
567		18	max	-15.968	12	2023.526	2	0	1	0	1	0	1	1.085	2
568			min	-320.921	1	-1030.573	3	0	1	0	1	0	1	-.568	3
569		19	max	-15.557	12	2022.352	2	0	1	0	1	0	1	.017	2
570			min	-320.1	1	-1031.453	3	0	1	0	1	0	1	-.024	3
571	M9	1	max	145.289	1	704.309	3	71.264	1	0	3	-.01	15	0	3
572			min	8.087	15	-382.585	2	4.028	15	0	2	-.17	1	-.013	2
573		2	max	146.111	1	703.429	3	71.264	1	0	3	-.007	15	.189	2
574			min	8.335	15	-383.759	2	4.028	15	0	2	-.132	1	-.371	3
575		3	max	590.35	3	482.024	2	71.12	1	0	2	-.005	15	.381	2
576			min	-338.733	2	-537.024	3	4.015	15	0	3	-.095	1	-.727	3
577		4	max	590.966	3	480.851	2	71.12	1	0	2	-.003	15	.127	2
578			min	-337.911	2	-537.904	3	4.015	15	0	3	-.057	1	-.443	3
579		5	max	591.582	3	479.678	2	71.12	1	0	2	-.001	15	-.003	15
580			min	-337.089	2	-538.784	3	4.015	15	0	3	-.02	1	-.159	3
581		6	max	592.198	3	478.504	2	71.12	1	0	2	.018	1	.125	3
582			min	-336.268	2	-539.664	3	4.015	15	0	3	.001	15	-.379	2
583		7	max	592.815	3	477.331	2	71.12	1	0	2	.055	1	.41	3
584			min	-335.446	2	-540.544	3	4.015	15	0	3	.003	15	-.631	2
585		8	max	593.431	3	476.158	2	71.12	1	0	2	.093	1	.696	3
586			min	-334.625	2	-541.425	3	4.015	15	0	3	.005	15	-.883	2
587		9	max	609.004	3	52.881	2	108.468	1	0	3	-.003	15	.809	3
588			min	-269.264	2	.359	15	6.115	15	0	9	-.057	1	-1.011	2
589		10	max	609.62	3	51.708	2	108.468	1	0	3	0	1	.791	3
590			min	-268.443	2	.005	15	6.115	15	0	9	0	15	-1.039	2
591		11	max	610.237	3	50.535	2	108.468	1	0	3	.058	1	.774	3
592			min	-267.621	2	-1.441	4	6.115	15	0	9	.003	15	-1.066	2
593		12	max	625.614	3	369.96	3	69.752	1	0	3	-.005	15	.677	3
594			min	-202.178	2	-586.667	2	3.922	15	0	2	-.092	1	-.946	2
595		13	max	626.23	3	369.08	3	69.752	1	0	3	-.003	15	.482	3
596			min	-201.356	2	-587.84	2	3.922	15	0	2	-.055	1	-.636	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	626.846	3	368.2	3	69.752	1	0	3	-.001	15	.287	3
598			min	-200.535	2	-589.013	2	3.922	15	0	2	-.018	1	-.326	2
599		15	max	627.463	3	367.32	3	69.752	1	0	3	.019	1	.093	3
600			min	-199.713	2	-590.187	2	3.922	15	0	2	.001	15	-.03	1
601		16	max	628.079	3	366.44	3	69.752	1	0	3	.055	1	.297	2
602			min	-198.891	2	-591.36	2	3.922	15	0	2	.003	15	-.101	3
603		17	max	628.695	3	365.56	3	69.752	1	0	3	.092	1	.609	2
604			min	-198.07	2	-592.534	2	3.922	15	0	2	.005	15	-.294	3
605		18	max	-8.344	15	599.09	2	77.545	1	0	2	.131	1	.307	2
606			min	-146.441	1	-297.084	3	4.368	15	0	3	.007	15	-.145	3
607		19	max	-8.096	15	597.917	2	77.545	1	0	2	.172	1	.012	3
608			min	-145.62	1	-297.964	3	4.368	15	0	3	.01	15	-.009	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	.107	2	.01	3	9.07e-3	2	NC	1	NC	1
2			min	0	15	-.025	3	-.006	2	-2.578e-3	3	NC	1	NC	1
3		2	max	0	1	.164	3	.019	1	1.015e-2	2	NC	4	NC	1
4			min	0	15	0	9	-.001	10	-2.61e-3	3	1048.076	3	NC	1
5		3	max	0	1	.317	3	.046	1	1.124e-2	2	NC	5	NC	2
6			min	0	15	-.047	1	.002	10	-2.643e-3	3	578.587	3	4286.147	1
7		4	max	0	1	.411	3	.068	1	1.232e-2	2	NC	5	NC	3
8			min	0	15	-.079	2	.004	10	-2.675e-3	3	454.193	3	2879.641	1
9		5	max	0	1	.434	3	.079	1	1.341e-2	2	NC	5	NC	3
10			min	0	15	-.075	2	.004	10	-2.708e-3	3	431.483	3	2484.682	1
11		6	max	0	1	.388	3	.075	1	1.449e-2	2	NC	5	NC	3
12			min	0	15	-.042	1	.003	10	-2.74e-3	3	479.915	3	2614.185	1
13		7	max	0	1	.286	3	.057	1	1.558e-2	2	NC	4	NC	2
14			min	0	15	-.003	9	-.001	10	-2.773e-3	3	636.098	3	3423.058	1
15		8	max	0	1	.157	3	.031	3	1.666e-2	2	NC	1	NC	2
16			min	0	15	.002	15	-.007	10	-2.805e-3	3	1088.027	3	6367.77	1
17		9	max	0	1	.186	2	.031	3	1.774e-2	2	NC	4	NC	1
18			min	0	15	.004	15	-.016	2	-2.838e-3	3	2509.847	2	9416.512	3
19		10	max	0	1	.217	2	.031	3	1.883e-2	2	NC	3	NC	1
20			min	0	1	-.014	3	-.022	2	-2.87e-3	3	1790.42	2	9581.602	3
21		11	max	0	15	.186	2	.031	3	1.774e-2	2	NC	4	NC	1
22			min	0	1	.004	15	-.016	2	-2.838e-3	3	2509.847	2	9416.512	3
23		12	max	0	15	.157	3	.031	3	1.666e-2	2	NC	1	NC	2
24			min	0	1	.002	15	-.007	10	-2.805e-3	3	1088.027	3	6367.77	1
25		13	max	0	15	.286	3	.057	1	1.558e-2	2	NC	4	NC	2
26			min	0	1	-.003	9	-.001	10	-2.773e-3	3	636.098	3	3423.058	1
27		14	max	0	15	.388	3	.075	1	1.449e-2	2	NC	5	NC	3
28			min	0	1	-.042	1	.003	10	-2.74e-3	3	479.915	3	2614.185	1
29		15	max	0	15	.434	3	.079	1	1.341e-2	2	NC	5	NC	3
30			min	0	1	-.075	2	.004	10	-2.708e-3	3	431.483	3	2484.682	1
31		16	max	0	15	.411	3	.068	1	1.232e-2	2	NC	5	NC	3
32			min	0	1	-.079	2	.004	10	-2.675e-3	3	454.193	3	2879.641	1
33		17	max	0	15	.317	3	.046	1	1.124e-2	2	NC	5	NC	2
34			min	0	1	-.047	1	.002	10	-2.643e-3	3	578.587	3	4286.147	1
35		18	max	0	15	.164	3	.019	1	1.015e-2	2	NC	4	NC	1
36			min	0	1	0	9	-.001	10	-2.61e-3	3	1048.076	3	NC	1
37		19	max	0	15	.107	2	.01	3	9.07e-3	2	NC	1	NC	1
38			min	0	1	-.025	3	-.006	2	-2.578e-3	3	NC	1	NC	1
39	M14	1	max	0	1	.25	3	.009	3	5.11e-3	2	NC	1	NC	1
40			min	0	15	-.343	2	-.005	2	-4.233e-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	.464	3	.012	1	6.013e-3	2	NC	5	NC	1
42			min	0	15	-.533	2	-.002	10	-5.058e-3	3	923.112	3	NC	1
43		3	max	0	1	.65	3	.036	1	6.916e-3	2	NC	5	NC	2
44			min	0	15	-.701	2	0	10	-5.883e-3	3	495.326	3	5508.028	1
45		4	max	0	1	.786	3	.057	1	7.819e-3	2	NC	5	NC	3
46			min	0	15	-.832	2	.003	10	-6.708e-3	3	369.735	3	3439.797	1
47		5	max	0	1	.861	3	.069	1	8.722e-3	2	NC	5	NC	3
48			min	0	15	-.917	2	.004	10	-7.534e-3	3	323.809	3	2850.425	1
49		6	max	0	1	.877	3	.067	1	9.625e-3	2	NC	5	NC	3
50			min	0	15	-.956	2	.002	10	-8.359e-3	3	315.747	3	2921.963	1
51		7	max	0	1	.842	3	.052	1	1.053e-2	2	NC	5	NC	2
52			min	0	15	-.953	2	-.001	10	-9.184e-3	3	324.946	2	3754.225	1
53		8	max	0	1	.774	3	.029	1	1.143e-2	2	NC	5	NC	2
54			min	0	15	-.922	2	-.006	10	-1.001e-2	3	342.343	2	6863.236	1
55		9	max	0	1	.705	3	.028	3	1.233e-2	2	NC	5	NC	1
56			min	0	15	-.883	2	-.014	2	-1.083e-2	3	367.225	2	NC	1
57		10	max	0	1	.671	3	.027	3	1.324e-2	2	NC	5	NC	1
58			min	0	1	-.862	2	-.02	2	-1.166e-2	3	381.661	2	NC	1
59		11	max	0	15	.705	3	.028	3	1.233e-2	2	NC	5	NC	1
60			min	0	1	-.883	2	-.014	2	-1.083e-2	3	367.225	2	NC	1
61		12	max	0	15	.774	3	.029	1	1.143e-2	2	NC	5	NC	2
62			min	0	1	-.922	2	-.006	10	-1.001e-2	3	342.343	2	6863.236	1
63		13	max	0	15	.842	3	.052	1	1.053e-2	2	NC	5	NC	2
64			min	0	1	-.953	2	-.001	10	-9.184e-3	3	324.946	2	3754.225	1
65		14	max	0	15	.877	3	.067	1	9.625e-3	2	NC	5	NC	3
66			min	0	1	-.956	2	.002	10	-8.359e-3	3	315.747	3	2921.963	1
67		15	max	0	15	.861	3	.069	1	8.722e-3	2	NC	5	NC	3
68			min	0	1	-.917	2	.004	10	-7.534e-3	3	323.809	3	2850.425	1
69		16	max	0	15	.786	3	.057	1	7.819e-3	2	NC	5	NC	3
70			min	0	1	-.832	2	.003	10	-6.708e-3	3	369.735	3	3439.797	1
71		17	max	0	15	.65	3	.036	1	6.916e-3	2	NC	5	NC	2
72			min	0	1	-.701	2	0	10	-5.883e-3	3	495.326	3	5508.028	1
73		18	max	0	15	.464	3	.012	1	6.013e-3	2	NC	5	NC	1
74			min	0	1	-.533	2	-.002	10	-5.058e-3	3	923.112	3	NC	1
75		19	max	0	15	.25	3	.009	3	5.11e-3	2	NC	1	NC	1
76			min	0	1	-.343	2	-.005	2	-4.233e-3	3	NC	1	NC	1
77	M15	1	max	0	15	.254	3	.008	3	3.76e-3	3	NC	1	NC	1
78			min	0	1	-.342	2	-.005	2	-5.379e-3	2	NC	1	NC	1
79		2	max	0	15	.406	3	.013	1	4.497e-3	3	NC	5	NC	1
80			min	0	1	-.589	2	-.002	10	-6.336e-3	2	804.056	2	NC	1
81		3	max	0	15	.54	3	.036	1	5.235e-3	3	NC	5	NC	2
82			min	0	1	-.802	2	.001	10	-7.293e-3	2	430.546	2	5486.7	1
83		4	max	0	15	.645	3	.058	1	5.972e-3	3	NC	5	NC	3
84			min	0	1	-.961	2	.003	15	-8.25e-3	2	320.246	2	3427.841	1
85		5	max	0	15	.715	3	.069	1	6.709e-3	3	NC	5	NC	3
86			min	0	1	-1.052	2	.004	10	-9.208e-3	2	278.978	2	2840.009	1
87		6	max	0	15	.747	3	.068	1	7.447e-3	3	NC	5	NC	3
88			min	0	1	-1.076	2	.003	10	-1.016e-2	2	269.946	2	2909.047	1
89		7	max	0	15	.747	3	.053	1	8.184e-3	3	NC	5	NC	2
90			min	0	1	-1.042	2	0	10	-1.112e-2	2	283.001	2	3730.303	1
91		8	max	0	15	.725	3	.029	1	8.921e-3	3	NC	5	NC	2
92			min	0	1	-.972	2	-.005	10	-1.208e-2	2	314.642	2	6777.266	1
93		9	max	0	15	.695	3	.026	3	9.658e-3	3	NC	5	NC	1
94			min	0	1	-.897	2	-.013	2	-1.304e-2	2	357.159	2	NC	1
95		10	max	0	1	.68	3	.025	3	1.04e-2	3	NC	5	NC	1
96			min	0	1	-.86	2	-.019	2	-1.399e-2	2	382.388	2	NC	1
97		11	max	0	1	.695	3	.026	3	9.658e-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	-.897	2	-.013	2	-1.304e-2	2	357.159	2	NC	1
99		12	max	0	1	.725	3	.029	1	8.921e-3	3	NC	5	NC	2
100			min	0	15	-.972	2	-.005	10	-1.208e-2	2	314.642	2	6777.266	1
101		13	max	0	1	.747	3	.053	1	8.184e-3	3	NC	5	NC	2
102			min	0	15	-1.042	2	0	10	-1.112e-2	2	283.001	2	3730.303	1
103		14	max	0	1	.747	3	.068	1	7.447e-3	3	NC	5	NC	3
104			min	0	15	-1.076	2	.003	10	-1.016e-2	2	269.946	2	2909.047	1
105		15	max	0	1	.715	3	.069	1	6.709e-3	3	NC	5	NC	3
106			min	0	15	-1.052	2	.004	10	-9.208e-3	2	278.978	2	2840.009	1
107		16	max	0	1	.645	3	.058	1	5.972e-3	3	NC	5	NC	3
108			min	0	15	-.961	2	.003	15	-8.25e-3	2	320.246	2	3427.841	1
109		17	max	0	1	.54	3	.036	1	5.235e-3	3	NC	5	NC	2
110			min	0	15	-.802	2	.001	10	-7.293e-3	2	430.546	2	5486.7	1
111		18	max	0	1	.406	3	.013	1	4.497e-3	3	NC	5	NC	1
112			min	0	15	-.589	2	-.002	10	-6.336e-3	2	804.056	2	NC	1
113		19	max	0	1	.254	3	.008	3	3.76e-3	3	NC	1	NC	1
114			min	0	15	-.342	2	-.005	2	-5.379e-3	2	NC	1	NC	1
115	M16	1	max	0	15	.094	2	.007	3	6.751e-3	3	NC	1	NC	1
116			min	0	1	-.083	3	-.005	2	-7.388e-3	2	NC	1	NC	1
117		2	max	0	15	.003	4	.019	1	7.713e-3	3	NC	4	NC	1
118			min	0	1	-.053	2	0	10	-8.085e-3	2	1352.283	2	NC	1
119		3	max	0	15	.028	3	.046	1	8.676e-3	3	NC	5	NC	2
120			min	0	1	-.169	2	.003	15	-8.781e-3	2	753.742	2	4287.109	1
121		4	max	0	15	.052	3	.069	1	9.638e-3	3	NC	5	NC	3
122			min	0	1	-.235	2	.004	15	-9.478e-3	2	602.43	2	2871.562	1
123		5	max	0	15	.046	3	.08	1	1.06e-2	3	NC	5	NC	3
124			min	0	1	-.241	2	.005	15	-1.017e-2	2	590.811	2	2469.78	1
125		6	max	0	15	.011	3	.076	1	1.156e-2	3	NC	5	NC	3
126			min	0	1	-.19	2	.005	10	-1.087e-2	2	697.74	2	2586.528	1
127		7	max	0	15	.003	4	.059	1	1.252e-2	3	NC	4	NC	2
128			min	0	1	-.093	2	0	10	-1.157e-2	2	1057.69	2	3356.966	1
129		8	max	0	15	.041	1	.032	1	1.349e-2	3	NC	4	NC	2
130			min	0	1	-.109	3	-.004	10	-1.226e-2	2	2872.06	2	6088.582	1
131		9	max	0	15	.13	2	.022	3	1.445e-2	3	NC	4	NC	1
132			min	0	1	-.166	3	-.011	2	-1.296e-2	2	2376.699	3	NC	1
133		10	max	0	1	.178	2	.022	3	1.541e-2	3	NC	4	NC	1
134			min	0	1	-.191	3	-.017	2	-1.366e-2	2	1825.349	3	NC	1
135		11	max	0	1	.13	2	.022	3	1.445e-2	3	NC	4	NC	1
136			min	0	15	-.166	3	-.011	2	-1.296e-2	2	2376.699	3	NC	1
137		12	max	0	1	.041	1	.032	1	1.349e-2	3	NC	4	NC	2
138			min	0	15	-.109	3	-.004	10	-1.226e-2	2	2872.06	2	6088.582	1
139		13	max	0	1	.003	4	.059	1	1.252e-2	3	NC	4	NC	2
140			min	0	15	-.093	2	0	10	-1.157e-2	2	1057.69	2	3356.966	1
141		14	max	0	1	.011	3	.076	1	1.156e-2	3	NC	5	NC	3
142			min	0	15	-.19	2	.005	10	-1.087e-2	2	697.74	2	2586.528	1
143		15	max	0	1	.046	3	.08	1	1.06e-2	3	NC	5	NC	3
144			min	0	15	-.241	2	.005	15	-1.017e-2	2	590.811	2	2469.78	1
145		16	max	0	1	.052	3	.069	1	9.638e-3	3	NC	5	NC	3
146			min	0	15	-.235	2	.004	15	-9.478e-3	2	602.43	2	2871.562	1
147		17	max	0	1	.028	3	.046	1	8.676e-3	3	NC	5	NC	2
148			min	0	15	-.169	2	.003	15	-8.781e-3	2	753.742	2	4287.109	1
149		18	max	0	1	.003	4	.019	1	7.713e-3	3	NC	4	NC	1
150			min	0	15	-.053	2	0	10	-8.085e-3	2	1352.283	2	NC	1
151		19	max	0	1	.094	2	.007	3	6.751e-3	3	NC	1	NC	1
152			min	0	15	-.083	3	-.005	2	-7.388e-3	2	NC	1	NC	1
153	M2	1	max	.007	2	.01	2	.006	1	-8.747e-6	15	NC	1	NC	1
154			min	-.01	3	-.016	3	0	15	-1.546e-4	1	7720.862	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	.005	1	-8.29e-6	15	NC	1	NC	1
156			min	-.01	3	-.015	3	0	15	-1.465e-4	1	8979.835	2	NC	1
157		3	max	.006	2	.007	2	.005	1	-7.833e-6	15	NC	1	NC	1
158			min	-.009	3	-.015	3	0	15	-1.385e-4	1	NC	1	NC	1
159		4	max	.006	2	.006	2	.004	1	-7.376e-6	15	NC	1	NC	1
160			min	-.008	3	-.014	3	0	15	-1.304e-4	1	NC	1	NC	1
161		5	max	.006	2	.005	2	.004	1	-6.919e-6	15	NC	1	NC	1
162			min	-.008	3	-.014	3	0	15	-1.223e-4	1	NC	1	NC	1
163		6	max	.005	2	.003	2	.003	1	-6.463e-6	15	NC	1	NC	1
164			min	-.007	3	-.013	3	0	15	-1.142e-4	1	NC	1	NC	1
165		7	max	.005	2	.002	2	.003	1	-6.006e-6	15	NC	1	NC	1
166			min	-.007	3	-.012	3	0	15	-1.061e-4	1	NC	1	NC	1
167		8	max	.004	2	.001	2	.003	1	-5.549e-6	15	NC	1	NC	1
168			min	-.006	3	-.012	3	0	15	-9.806e-5	1	NC	1	NC	1
169		9	max	.004	2	0	2	.002	1	-5.092e-6	15	NC	1	NC	1
170			min	-.006	3	-.011	3	0	15	-8.998e-5	1	NC	1	NC	1
171		10	max	.004	2	0	2	.002	1	-4.635e-6	15	NC	1	NC	1
172			min	-.005	3	-.01	3	0	15	-8.19e-5	1	NC	1	NC	1
173		11	max	.003	2	-.001	2	.001	1	-4.179e-6	15	NC	1	NC	1
174			min	-.004	3	-.009	3	0	15	-7.381e-5	1	NC	1	NC	1
175		12	max	.003	2	-.001	15	.001	1	-3.722e-6	15	NC	1	NC	1
176			min	-.004	3	-.008	3	0	15	-6.573e-5	1	NC	1	NC	1
177		13	max	.002	2	-.001	15	0	1	-3.265e-6	15	NC	1	NC	1
178			min	-.003	3	-.007	3	0	15	-5.765e-5	1	NC	1	NC	1
179		14	max	.002	2	-.001	15	0	1	-2.808e-6	15	NC	1	NC	1
180			min	-.003	3	-.006	3	0	15	-4.957e-5	1	NC	1	NC	1
181		15	max	.002	2	-.001	15	0	1	-2.352e-6	15	NC	1	NC	1
182			min	-.002	3	-.005	3	0	15	-4.149e-5	1	NC	1	NC	1
183		16	max	.001	2	0	15	0	1	-1.895e-6	15	NC	1	NC	1
184			min	-.002	3	-.004	3	0	15	-3.341e-5	1	NC	1	NC	1
185		17	max	0	2	0	15	0	1	-1.438e-6	15	NC	1	NC	1
186			min	-.001	3	-.003	4	0	15	-2.533e-5	1	NC	1	NC	1
187		18	max	0	2	0	15	0	1	-9.812e-7	15	NC	1	NC	1
188			min	0	3	-.001	4	0	15	-1.724e-5	1	NC	1	NC	1
189		19	max	0	1	0	1	0	1	-5.244e-7	15	NC	1	NC	1
190			min	0	1	0	1	0	1	-9.163e-6	1	NC	1	NC	1
191	M3	1	max	0	1	0	1	0	1	1.982e-6	1	NC	1	NC	1
192			min	0	1	0	1	0	1	1.139e-7	15	NC	1	NC	1
193		2	max	0	3	0	15	0	15	1.61e-5	1	NC	1	NC	1
194			min	0	2	-.002	4	0	1	9.055e-7	15	NC	1	NC	1
195		3	max	0	3	0	15	0	15	3.021e-5	1	NC	1	NC	1
196			min	0	2	-.004	4	0	1	1.697e-6	15	NC	1	NC	1
197		4	max	.001	3	-.001	15	0	15	4.433e-5	1	NC	1	NC	1
198			min	-.001	2	-.006	4	0	1	2.489e-6	15	NC	1	NC	1
199		5	max	.002	3	-.002	15	0	15	5.844e-5	1	NC	1	NC	1
200			min	-.002	2	-.008	4	0	1	3.28e-6	15	NC	1	NC	1
201		6	max	.002	3	-.002	15	0	1	7.256e-5	1	NC	1	NC	1
202			min	-.002	2	-.01	4	0	3	4.072e-6	15	9252.673	4	NC	1
203		7	max	.003	3	-.003	15	0	1	8.667e-5	1	NC	1	NC	1
204			min	-.002	2	-.011	4	0	3	4.864e-6	15	8001.332	4	NC	1
205		8	max	.003	3	-.003	15	0	1	1.008e-4	1	NC	2	NC	1
206			min	-.003	2	-.013	4	0	12	5.655e-6	15	7231.252	4	NC	1
207		9	max	.004	3	-.003	15	0	1	1.149e-4	1	NC	5	NC	1
208			min	-.003	2	-.014	4	0	15	6.447e-6	15	6781.963	4	NC	1
209		10	max	.004	3	-.003	15	0	1	1.29e-4	1	NC	5	NC	1
210			min	-.004	2	-.014	4	0	15	7.239e-6	15	6576.206	4	NC	1
211		11	max	.005	3	-.003	15	0	1	1.431e-4	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	8.03e-6	15	6583.936	4	NC	1
213		12	max	.005	3	-.003	15	.001	1	1.572e-4	1	NC	5	NC	1
214			min	-.004	2	-.014	4	0	15	8.822e-6	15	6810.791	4	NC	1
215		13	max	.005	3	-.003	15	.002	1	1.714e-4	1	NC	2	NC	1
216			min	-.005	2	-.013	4	0	15	9.613e-6	15	7301.753	4	NC	1
217		14	max	.006	3	-.003	15	.002	1	1.855e-4	1	NC	1	NC	1
218			min	-.005	2	-.012	4	0	15	1.041e-5	15	8163.912	4	NC	1
219		15	max	.006	3	-.002	15	.003	1	1.996e-4	1	NC	1	NC	1
220			min	-.006	2	-.01	4	0	15	1.12e-5	15	9632.542	4	NC	1
221		16	max	.007	3	-.002	15	.003	1	2.137e-4	1	NC	1	NC	1
222			min	-.006	2	-.008	4	0	15	1.199e-5	15	NC	1	NC	1
223		17	max	.007	3	-.001	15	.004	1	2.278e-4	1	NC	1	NC	1
224			min	-.006	2	-.006	3	0	15	1.278e-5	15	NC	1	NC	1
225		18	max	.008	3	0	15	.004	1	2.419e-4	1	NC	1	NC	1
226			min	-.007	2	-.004	3	0	15	1.357e-5	15	NC	1	NC	1
227		19	max	.008	3	0	10	.005	1	2.561e-4	1	NC	1	NC	1
228			min	-.007	2	-.003	3	0	15	1.436e-5	15	NC	1	NC	1
229	M4	1	max	.002	1	.007	2	0	15	9.64e-5	1	NC	1	NC	2
230			min	0	15	-.009	3	-.005	1	5.428e-6	15	NC	1	4665.087	1
231		2	max	.002	1	.007	2	0	15	9.64e-5	1	NC	1	NC	2
232			min	0	15	-.008	3	-.005	1	5.428e-6	15	NC	1	5055.746	1
233		3	max	.002	1	.006	2	0	15	9.64e-5	1	NC	1	NC	2
234			min	0	15	-.008	3	-.004	1	5.428e-6	15	NC	1	5521.812	1
235		4	max	.002	1	.006	2	0	15	9.64e-5	1	NC	1	NC	2
236			min	0	15	-.007	3	-.004	1	5.428e-6	15	NC	1	6082.678	1
237		5	max	.001	1	.005	2	0	15	9.64e-5	1	NC	1	NC	2
238			min	0	15	-.007	3	-.004	1	5.428e-6	15	NC	1	6764.714	1
239		6	max	.001	1	.005	2	0	15	9.64e-5	1	NC	1	NC	2
240			min	0	15	-.006	3	-.003	1	5.428e-6	15	NC	1	7604.494	1
241		7	max	.001	1	.005	2	0	15	9.64e-5	1	NC	1	NC	2
242			min	0	15	-.006	3	-.003	1	5.428e-6	15	NC	1	8653.934	1
243		8	max	.001	1	.004	2	0	15	9.64e-5	1	NC	1	NC	2
244			min	0	15	-.005	3	-.002	1	5.428e-6	15	NC	1	9988.736	1
245		9	max	.001	1	.004	2	0	15	9.64e-5	1	NC	1	NC	1
246			min	0	15	-.005	3	-.002	1	5.428e-6	15	NC	1	NC	1
247		10	max	0	1	.003	2	0	15	9.64e-5	1	NC	1	NC	1
248			min	0	15	-.004	3	-.002	1	5.428e-6	15	NC	1	NC	1
249		11	max	0	1	.003	2	0	15	9.64e-5	1	NC	1	NC	1
250			min	0	15	-.004	3	-.001	1	5.428e-6	15	NC	1	NC	1
251		12	max	0	1	.003	2	0	15	9.64e-5	1	NC	1	NC	1
252			min	0	15	-.003	3	-.001	1	5.428e-6	15	NC	1	NC	1
253		13	max	0	1	.002	2	0	15	9.64e-5	1	NC	1	NC	1
254			min	0	15	-.003	3	0	1	5.428e-6	15	NC	1	NC	1
255		14	max	0	1	.002	2	0	15	9.64e-5	1	NC	1	NC	1
256			min	0	15	-.002	3	0	1	5.428e-6	15	NC	1	NC	1
257		15	max	0	1	.002	2	0	15	9.64e-5	1	NC	1	NC	1
258			min	0	15	-.002	3	0	1	5.428e-6	15	NC	1	NC	1
259		16	max	0	1	.001	2	0	15	9.64e-5	1	NC	1	NC	1
260			min	0	15	-.001	3	0	1	5.428e-6	15	NC	1	NC	1
261		17	max	0	1	0	2	0	15	9.64e-5	1	NC	1	NC	1
262			min	0	15	0	3	0	1	5.428e-6	15	NC	1	NC	1
263		18	max	0	1	0	2	0	15	9.64e-5	1	NC	1	NC	1
264			min	0	15	0	3	0	1	5.428e-6	15	NC	1	NC	1
265		19	max	0	1	0	1	0	1	9.64e-5	1	NC	1	NC	1
266			min	0	1	0	1	0	1	5.428e-6	15	NC	1	NC	1
267	M6	1	max	.022	2	.035	2	0	1	0	1	NC	4	NC	1
268			min	-.032	3	-.049	3	0	1	0	1	1577.976	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	.021	2	.031	2	0	1	0	1	NC	4	NC	1
270			min	-.031	3	-.046	3	0	1	0	1	1670.737	3	NC	1
271		3	max	.02	2	.028	2	0	1	0	1	NC	4	NC	1
272			min	-.029	3	-.043	3	0	1	0	1	1775.215	3	NC	1
273		4	max	.019	2	.025	2	0	1	0	1	NC	4	NC	1
274			min	-.027	3	-.041	3	0	1	0	1	1893.895	3	NC	1
275		5	max	.017	2	.023	2	0	1	0	1	NC	4	NC	1
276			min	-.025	3	-.038	3	0	1	0	1	2029.971	3	NC	1
277		6	max	.016	2	.02	2	0	1	0	1	NC	4	NC	1
278			min	-.023	3	-.035	3	0	1	0	1	2187.619	3	NC	1
279		7	max	.015	2	.017	2	0	1	0	1	NC	1	NC	1
280			min	-.022	3	-.032	3	0	1	0	1	2372.414	3	NC	1
281		8	max	.014	2	.014	2	0	1	0	1	NC	1	NC	1
282			min	-.02	3	-.03	3	0	1	0	1	2591.956	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	2856.894	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	3182.619	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	3592.228	3	NC	1
289		12	max	.009	2	.006	2	0	1	0	1	NC	1	NC	1
290			min	-.013	3	-.019	3	0	1	0	1	4122.036	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	4832.598	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	5832.954	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	7341.252	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	9866.608	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	8772.711	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	7841.574	3	NC	1
319		8	max	.01	3	-.003	15	0	1	0	1	NC	1	NC	1
320			min	-.01	2	-.015	3	0	1	0	1	7291.548	3	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	6863.316	4	NC	1
323		10	max	.013	3	-.003	15	0	1	0	1	NC	1	NC	1
324			min	-.012	2	-.017	3	0	1	0	1	6650.839	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	-.014	2	-.017	3	0	1	0	1	6655.047	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	6881.184	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	7374.352	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	8242.405	4	NC	1
333		15	max	.02	3	-.002	15	0	1	0	1	NC	1	NC	1
334			min	-.019	2	-.014	3	0	1	0	1	9722.568	4	NC	1
335		16	max	.021	3	-.002	15	0	1	0	1	NC	1	NC	1
336			min	-.021	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	.024	3	0	2	0	1	0	1	NC	1	NC	1
340			min	-.023	2	-.01	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	-.025	2	-.008	3	0	1	0	1	NC	1	NC	1
343	M8	1	max	.005	1	.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	.005	1	.023	2	0	1	0	1	NC	1	NC	1
346			min	0	15	-.025	3	0	1	0	1	NC	1	NC	1
347		3	max	.004	1	.022	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	1	.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	.004	1	.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	1	.018	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	1	.016	2	0	1	0	1	NC	1	NC	1
356			min	0	15	-.018	3	0	1	0	1	NC	1	NC	1
357		8	max	.003	1	.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	.003	1	.014	2	0	1	0	1	NC	1	NC	1
360			min	0	15	-.015	3	0	1	0	1	NC	1	NC	1
361		10	max	.002	1	.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	1	.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	1	.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	.002	1	.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	1	.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	.001	1	.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	1	.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	1	.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	1	.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	1.546e-4	1	NC	1	NC	1
382			min	-.01	3	-.016	3	-.006	1	8.747e-6	15	7720.862	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	1.465e-4	1	NC	1	NC	1
384			min	-.01	3	-.015	3	-.005	1	8.29e-6	15	8979.835	2	NC	1
385		3	max	.006	2	.007	2	0	15	1.385e-4	1	NC	1	NC	1
386			min	-.009	3	-.015	3	-.005	1	7.833e-6	15	NC	1	NC	1
387		4	max	.006	2	.006	2	0	15	1.304e-4	1	NC	1	NC	1
388			min	-.008	3	-.014	3	-.004	1	7.376e-6	15	NC	1	NC	1
389		5	max	.006	2	.005	2	0	15	1.223e-4	1	NC	1	NC	1
390			min	-.008	3	-.014	3	-.004	1	6.919e-6	15	NC	1	NC	1
391		6	max	.005	2	.003	2	0	15	1.142e-4	1	NC	1	NC	1
392			min	-.007	3	-.013	3	-.003	1	6.463e-6	15	NC	1	NC	1
393		7	max	.005	2	.002	2	0	15	1.061e-4	1	NC	1	NC	1
394			min	-.007	3	-.012	3	-.003	1	6.006e-6	15	NC	1	NC	1
395		8	max	.004	2	.001	2	0	15	9.806e-5	1	NC	1	NC	1
396			min	-.006	3	-.012	3	-.003	1	5.549e-6	15	NC	1	NC	1
397		9	max	.004	2	0	2	0	15	8.998e-5	1	NC	1	NC	1
398			min	-.006	3	-.011	3	-.002	1	5.092e-6	15	NC	1	NC	1
399		10	max	.004	2	0	2	0	15	8.19e-5	1	NC	1	NC	1
400			min	-.005	3	-.01	3	-.002	1	4.635e-6	15	NC	1	NC	1
401		11	max	.003	2	-.001	2	0	15	7.381e-5	1	NC	1	NC	1
402			min	-.004	3	-.009	3	-.001	1	4.179e-6	15	NC	1	NC	1
403		12	max	.003	2	-.001	15	0	15	6.573e-5	1	NC	1	NC	1
404			min	-.004	3	-.008	3	-.001	1	3.722e-6	15	NC	1	NC	1
405		13	max	.002	2	-.001	15	0	15	5.765e-5	1	NC	1	NC	1
406			min	-.003	3	-.007	3	0	1	3.265e-6	15	NC	1	NC	1
407		14	max	.002	2	-.001	15	0	15	4.957e-5	1	NC	1	NC	1
408			min	-.003	3	-.006	3	0	1	2.808e-6	15	NC	1	NC	1
409		15	max	.002	2	-.001	15	0	15	4.149e-5	1	NC	1	NC	1
410			min	-.002	3	-.005	3	0	1	2.352e-6	15	NC	1	NC	1
411		16	max	.001	2	0	15	0	15	3.341e-5	1	NC	1	NC	1
412			min	-.002	3	-.004	3	0	1	1.895e-6	15	NC	1	NC	1
413		17	max	0	2	0	15	0	15	2.533e-5	1	NC	1	NC	1
414			min	-.001	3	-.003	4	0	1	1.438e-6	15	NC	1	NC	1
415		18	max	0	2	0	15	0	15	1.724e-5	1	NC	1	NC	1
416			min	0	3	-.001	4	0	1	9.812e-7	15	NC	1	NC	1
417		19	max	0	1	0	1	0	1	9.163e-6	1	NC	1	NC	1
418			min	0	1	0	1	0	1	5.244e-7	15	NC	1	NC	1
419	M11	1	max	0	1	0	1	0	1	-1.139e-7	15	NC	1	NC	1
420			min	0	1	0	1	0	1	-1.982e-6	1	NC	1	NC	1
421		2	max	0	3	0	15	0	1	-9.055e-7	15	NC	1	NC	1
422			min	0	2	-.002	4	0	15	-1.61e-5	1	NC	1	NC	1
423		3	max	0	3	0	15	0	1	-1.697e-6	15	NC	1	NC	1
424			min	0	2	-.004	4	0	15	-3.021e-5	1	NC	1	NC	1
425		4	max	.001	3	-.001	15	0	1	-2.489e-6	15	NC	1	NC	1
426			min	-.001	2	-.006	4	0	15	-4.433e-5	1	NC	1	NC	1
427		5	max	.002	3	-.002	15	0	1	-3.28e-6	15	NC	1	NC	1
428			min	-.002	2	-.008	4	0	15	-5.844e-5	1	NC	1	NC	1
429		6	max	.002	3	-.002	15	0	3	-4.072e-6	15	NC	1	NC	1
430			min	-.002	2	-.01	4	0	1	-7.256e-5	1	9252.673	4	NC	1
431		7	max	.003	3	-.003	15	0	3	-4.864e-6	15	NC	1	NC	1
432			min	-.002	2	-.011	4	0	1	-8.667e-5	1	8001.332	4	NC	1
433		8	max	.003	3	-.003	15	0	12	-5.655e-6	15	NC	2	NC	1
434			min	-.003	2	-.013	4	0	1	-1.008e-4	1	7231.252	4	NC	1
435		9	max	.004	3	-.003	15	0	15	-6.447e-6	15	NC	5	NC	1
436			min	-.003	2	-.014	4	0	1	-1.149e-4	1	6781.963	4	NC	1
437		10	max	.004	3	-.003	15	0	15	-7.239e-6	15	NC	5	NC	1
438			min	-.004	2	-.014	4	0	1	-1.29e-4	1	6576.206	4	NC	1
439		11	max	.005	3	-.003	15	0	15	-8.03e-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	-1.431e-4	1	6583.936	4	NC	1
441		12	max	.005	3	-.003	15	0	15	-8.822e-6	15	NC	5	NC	1
442			min	-.004	2	-.014	4	-.001	1	-1.572e-4	1	6810.791	4	NC	1
443		13	max	.005	3	-.003	15	0	15	-9.613e-6	15	NC	2	NC	1
444			min	-.005	2	-.013	4	-.002	1	-1.714e-4	1	7301.753	4	NC	1
445		14	max	.006	3	-.003	15	0	15	-1.041e-5	15	NC	1	NC	1
446			min	-.005	2	-.012	4	-.002	1	-1.855e-4	1	8163.912	4	NC	1
447		15	max	.006	3	-.002	15	0	15	-1.12e-5	15	NC	1	NC	1
448			min	-.006	2	-.01	4	-.003	1	-1.996e-4	1	9632.542	4	NC	1
449		16	max	.007	3	-.002	15	0	15	-1.199e-5	15	NC	1	NC	1
450			min	-.006	2	-.008	4	-.003	1	-2.137e-4	1	NC	1	NC	1
451		17	max	.007	3	-.001	15	0	15	-1.278e-5	15	NC	1	NC	1
452			min	-.006	2	-.006	3	-.004	1	-2.278e-4	1	NC	1	NC	1
453		18	max	.008	3	0	15	0	15	-1.357e-5	15	NC	1	NC	1
454			min	-.007	2	-.004	3	-.004	1	-2.419e-4	1	NC	1	NC	1
455		19	max	.008	3	0	10	0	15	-1.436e-5	15	NC	1	NC	1
456			min	-.007	2	-.003	3	-.005	1	-2.561e-4	1	NC	1	NC	1
457	M12	1	max	.002	1	.007	2	.005	1	-5.428e-6	15	NC	1	NC	2
458			min	0	15	-.009	3	0	15	-9.64e-5	1	NC	1	4665.087	1
459		2	max	.002	1	.007	2	.005	1	-5.428e-6	15	NC	1	NC	2
460			min	0	15	-.008	3	0	15	-9.64e-5	1	NC	1	5055.746	1
461		3	max	.002	1	.006	2	.004	1	-5.428e-6	15	NC	1	NC	2
462			min	0	15	-.008	3	0	15	-9.64e-5	1	NC	1	5521.812	1
463		4	max	.002	1	.006	2	.004	1	-5.428e-6	15	NC	1	NC	2
464			min	0	15	-.007	3	0	15	-9.64e-5	1	NC	1	6082.678	1
465		5	max	.001	1	.005	2	.004	1	-5.428e-6	15	NC	1	NC	2
466			min	0	15	-.007	3	0	15	-9.64e-5	1	NC	1	6764.714	1
467		6	max	.001	1	.005	2	.003	1	-5.428e-6	15	NC	1	NC	2
468			min	0	15	-.006	3	0	15	-9.64e-5	1	NC	1	7604.494	1
469		7	max	.001	1	.005	2	.003	1	-5.428e-6	15	NC	1	NC	2
470			min	0	15	-.006	3	0	15	-9.64e-5	1	NC	1	8653.934	1
471		8	max	.001	1	.004	2	.002	1	-5.428e-6	15	NC	1	NC	2
472			min	0	15	-.005	3	0	15	-9.64e-5	1	NC	1	9988.736	1
473		9	max	.001	1	.004	2	.002	1	-5.428e-6	15	NC	1	NC	1
474			min	0	15	-.005	3	0	15	-9.64e-5	1	NC	1	NC	1
475		10	max	0	1	.003	2	.002	1	-5.428e-6	15	NC	1	NC	1
476			min	0	15	-.004	3	0	15	-9.64e-5	1	NC	1	NC	1
477		11	max	0	1	.003	2	.001	1	-5.428e-6	15	NC	1	NC	1
478			min	0	15	-.004	3	0	15	-9.64e-5	1	NC	1	NC	1
479		12	max	0	1	.003	2	.001	1	-5.428e-6	15	NC	1	NC	1
480			min	0	15	-.003	3	0	15	-9.64e-5	1	NC	1	NC	1
481		13	max	0	1	.002	2	0	1	-5.428e-6	15	NC	1	NC	1
482			min	0	15	-.003	3	0	15	-9.64e-5	1	NC	1	NC	1
483		14	max	0	1	.002	2	0	1	-5.428e-6	15	NC	1	NC	1
484			min	0	15	-.002	3	0	15	-9.64e-5	1	NC	1	NC	1
485		15	max	0	1	.002	2	0	1	-5.428e-6	15	NC	1	NC	1
486			min	0	15	-.002	3	0	15	-9.64e-5	1	NC	1	NC	1
487		16	max	0	1	.001	2	0	1	-5.428e-6	15	NC	1	NC	1
488			min	0	15	-.001	3	0	15	-9.64e-5	1	NC	1	NC	1
489		17	max	0	1	0	2	0	1	-5.428e-6	15	NC	1	NC	1
490			min	0	15	0	3	0	15	-9.64e-5	1	NC	1	NC	1
491		18	max	0	1	0	2	0	1	-5.428e-6	15	NC	1	NC	1
492			min	0	15	0	3	0	15	-9.64e-5	1	NC	1	NC	1
493		19	max	0	1	0	1	0	1	-5.428e-6	15	NC	1	NC	1
494			min	0	1	0	1	0	1	-9.64e-5	1	NC	1	NC	1
495	M1	1	max	.01	3	.107	2	0	1	8.13e-3	2	NC	1	NC	1
496			min	-.006	2	-.025	3	0	15	-1.783e-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	.049	2	0	15	3.985e-3	2	NC	4	NC	1
498			min	-.006	2	-.008	3	-.004	1	-8.823e-3	3	2002.705	2	NC	1
499		3	max	.01	3	.016	3	0	15	2.102e-5	10	NC	5	NC	1
500			min	-.006	2	-.012	2	-.006	1	-1.083e-4	3	969.074	2	NC	1
501		4	max	.01	3	.054	3	0	15	3.277e-3	2	NC	5	NC	1
502			min	-.006	2	-.081	2	-.005	1	-3.797e-3	3	615.255	2	NC	1
503		5	max	.01	3	.101	3	0	15	6.545e-3	2	NC	5	NC	1
504			min	-.006	2	-.151	2	-.004	1	-7.486e-3	3	446.215	2	NC	1
505		6	max	.009	3	.151	3	0	15	9.813e-3	2	NC	15	NC	1
506			min	-.006	2	-.22	2	-.002	1	-1.117e-2	3	352.775	2	NC	1
507		7	max	.009	3	.199	3	0	1	1.308e-2	2	NC	15	NC	1
508			min	-.006	2	-.281	2	0	3	-1.486e-2	3	297.457	2	NC	1
509		8	max	.009	3	.238	3	0	1	1.635e-2	2	NC	15	NC	1
510			min	-.005	2	-.329	2	0	15	-1.855e-2	3	264.666	2	NC	1
511		9	max	.009	3	.263	3	0	15	1.865e-2	2	NC	15	NC	1
512			min	-.005	2	-.359	2	0	1	-1.891e-2	3	247.567	2	NC	1
513		10	max	.009	3	.272	3	0	1	2.031e-2	2	NC	15	NC	1
514			min	-.005	2	-.369	2	0	15	-1.706e-2	3	242.585	2	NC	1
515		11	max	.008	3	.265	3	0	1	2.197e-2	2	NC	15	NC	1
516			min	-.005	2	-.359	2	0	15	-1.521e-2	3	248.559	2	NC	1
517		12	max	.008	3	.243	3	0	15	2.129e-2	2	NC	15	NC	1
518			min	-.005	2	-.327	2	0	1	-1.306e-2	3	267.658	2	NC	1
519		13	max	.008	3	.207	3	0	15	1.708e-2	2	NC	15	NC	1
520			min	-.005	2	-.276	2	0	1	-1.045e-2	3	304.687	2	NC	1
521		14	max	.008	3	.161	3	.001	1	1.286e-2	2	NC	15	NC	1
522			min	-.005	2	-.212	2	0	15	-7.846e-3	3	368.126	2	NC	1
523		15	max	.008	3	.11	3	.003	1	8.647e-3	2	NC	5	NC	1
524			min	-.005	2	-.142	2	0	15	-5.239e-3	3	477.612	2	NC	1
525		16	max	.007	3	.057	3	.005	1	4.433e-3	2	NC	5	NC	1
526			min	-.005	2	-.071	2	0	15	-2.631e-3	3	680.995	2	NC	1
527		17	max	.007	3	.006	3	.005	1	3.656e-4	1	NC	5	NC	1
528			min	-.005	2	-.007	2	0	15	-2.347e-5	3	1117.06	2	NC	1
529		18	max	.007	3	.047	2	.004	1	6.915e-3	2	NC	4	NC	1
530			min	-.005	2	-.04	3	0	15	-2.956e-3	3	2377.787	2	NC	1
531		19	max	.007	3	.094	2	0	15	1.387e-2	2	NC	1	NC	1
532			min	-.005	2	-.083	3	0	1	-6.018e-3	3	NC	1	NC	1
533	M5	1	max	.031	3	.217	2	0	1	0	1	NC	1	NC	1
534			min	-.022	2	-.014	3	0	1	0	1	NC	1	NC	1
535		2	max	.031	3	.097	2	0	1	0	1	NC	5	NC	1
536			min	-.022	2	.002	15	0	1	0	1	962.385	2	NC	1
537		3	max	.031	3	.051	3	0	1	0	1	NC	5	NC	1
538			min	-.022	2	-.038	2	0	1	0	1	453.533	2	NC	1
539		4	max	.03	3	.142	3	0	1	0	1	NC	15	NC	1
540			min	-.021	2	-.199	2	0	1	0	1	278.223	2	NC	1
541		5	max	.029	3	.263	3	0	1	0	1	9585.122	15	NC	1
542			min	-.021	2	-.372	2	0	1	0	1	196.184	2	NC	1
543		6	max	.029	3	.398	3	0	1	0	1	7368.557	15	NC	1
544			min	-.021	2	-.544	2	0	1	0	1	151.848	2	NC	1
545		7	max	.028	3	.528	3	0	1	0	1	6090.729	15	NC	1
546			min	-.02	2	-.7	2	0	1	0	1	126.089	2	NC	1
547		8	max	.028	3	.637	3	0	1	0	1	5348.716	15	NC	1
548			min	-.02	2	-.824	2	0	1	0	1	111.047	2	NC	1
549		9	max	.027	3	.707	3	0	1	0	1	4968.58	15	NC	1
550			min	-.02	2	-.903	2	0	1	0	1	103.308	2	NC	1
551		10	max	.026	3	.731	3	0	1	0	1	4854.149	15	NC	1
552			min	-.019	2	-.93	2	0	1	0	1	101.058	2	NC	1
553		11	max	.026	3	.712	3	0	1	0	1	4968.902	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	-.903	2	0	1	0	1	103.752	2	NC	1
555		12	max	.025	3	.65	3	0	1	0	1	5349.458	15	NC	1
556			min	-.019	2	-.82	2	0	1	0	1	112.511	2	NC	1
557		13	max	.024	3	.55	3	0	1	0	1	6092.194	15	NC	1
558			min	-.018	2	-.686	2	0	1	0	1	129.908	2	NC	1
559		14	max	.024	3	.426	3	0	1	0	1	7371.349	15	NC	1
560			min	-.018	2	-.521	2	0	1	0	1	160.503	2	NC	1
561		15	max	.023	3	.288	3	0	1	0	1	9590.539	15	NC	1
562			min	-.018	2	-.343	2	0	1	0	1	215.171	2	NC	1
563		16	max	.022	3	.148	3	0	1	0	1	NC	15	NC	1
564			min	-.018	2	-.17	2	0	1	0	1	321.505	2	NC	1
565		17	max	.022	3	.017	3	0	1	0	1	NC	5	NC	1
566			min	-.017	2	-.021	2	0	1	0	1	561.485	2	NC	1
567		18	max	.022	3	.089	2	0	1	0	1	NC	5	NC	1
568			min	-.017	2	-.093	3	0	1	0	1	1257.789	2	NC	1
569		19	max	.022	3	.178	2	0	1	0	1	NC	1	NC	1
570			min	-.017	2	-.191	3	0	1	0	1	NC	1	NC	1
571	M9	1	max	.01	3	.107	2	0	15	1.783e-2	3	NC	1	NC	1
572			min	-.006	2	-.025	3	0	1	-8.13e-3	2	NC	1	NC	1
573		2	max	.01	3	.049	2	.004	1	8.823e-3	3	NC	4	NC	1
574			min	-.006	2	-.008	3	0	15	-3.985e-3	2	2002.705	2	NC	1
575		3	max	.01	3	.016	3	.006	1	1.083e-4	3	NC	5	NC	1
576			min	-.006	2	-.012	2	0	15	-2.102e-5	10	969.074	2	NC	1
577		4	max	.01	3	.054	3	.005	1	3.797e-3	3	NC	5	NC	1
578			min	-.006	2	-.081	2	0	15	-3.277e-3	2	615.255	2	NC	1
579		5	max	.01	3	.101	3	.004	1	7.486e-3	3	NC	5	NC	1
580			min	-.006	2	-.151	2	0	15	-6.545e-3	2	446.215	2	NC	1
581		6	max	.009	3	.151	3	.002	1	1.117e-2	3	NC	15	NC	1
582			min	-.006	2	-.22	2	0	15	-9.813e-3	2	352.775	2	NC	1
583		7	max	.009	3	.199	3	0	3	1.486e-2	3	NC	15	NC	1
584			min	-.006	2	-.281	2	0	1	-1.308e-2	2	297.457	2	NC	1
585		8	max	.009	3	.238	3	0	15	1.855e-2	3	NC	15	NC	1
586			min	-.005	2	-.329	2	0	1	-1.635e-2	2	264.666	2	NC	1
587		9	max	.009	3	.263	3	0	1	1.891e-2	3	NC	15	NC	1
588			min	-.005	2	-.359	2	0	15	-1.865e-2	2	247.567	2	NC	1
589		10	max	.009	3	.272	3	0	15	1.706e-2	3	NC	15	NC	1
590			min	-.005	2	-.369	2	0	1	-2.031e-2	2	242.585	2	NC	1
591		11	max	.008	3	.265	3	0	15	1.521e-2	3	NC	15	NC	1
592			min	-.005	2	-.359	2	0	1	-2.197e-2	2	248.559	2	NC	1
593		12	max	.008	3	.243	3	0	1	1.306e-2	3	NC	15	NC	1
594			min	-.005	2	-.327	2	0	15	-2.129e-2	2	267.658	2	NC	1
595		13	max	.008	3	.207	3	0	1	1.045e-2	3	NC	15	NC	1
596			min	-.005	2	-.276	2	0	15	-1.708e-2	2	304.687	2	NC	1
597		14	max	.008	3	.161	3	0	15	7.846e-3	3	NC	15	NC	1
598			min	-.005	2	-.212	2	-.001	1	-1.286e-2	2	368.126	2	NC	1
599		15	max	.008	3	.11	3	0	15	5.239e-3	3	NC	5	NC	1
600			min	-.005	2	-.142	2	-.003	1	-8.647e-3	2	477.612	2	NC	1
601		16	max	.007	3	.057	3	0	15	2.631e-3	3	NC	5	NC	1
602			min	-.005	2	-.071	2	-.005	1	-4.433e-3	2	680.995	2	NC	1
603		17	max	.007	3	.006	3	0	15	2.347e-5	3	NC	5	NC	1
604			min	-.005	2	-.007	2	-.005	1	-3.656e-4	1	1117.06	2	NC	1
605		18	max	.007	3	.047	2	0	15	2.956e-3	3	NC	4	NC	1
606			min	-.005	2	-.04	3	-.004	1	-6.915e-3	2	2377.787	2	NC	1
607		19	max	.007	3	.094	2	0	1	6.018e-3	3	NC	1	NC	1
608			min	-.005	2	-.083	3	0	15	-1.387e-2	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

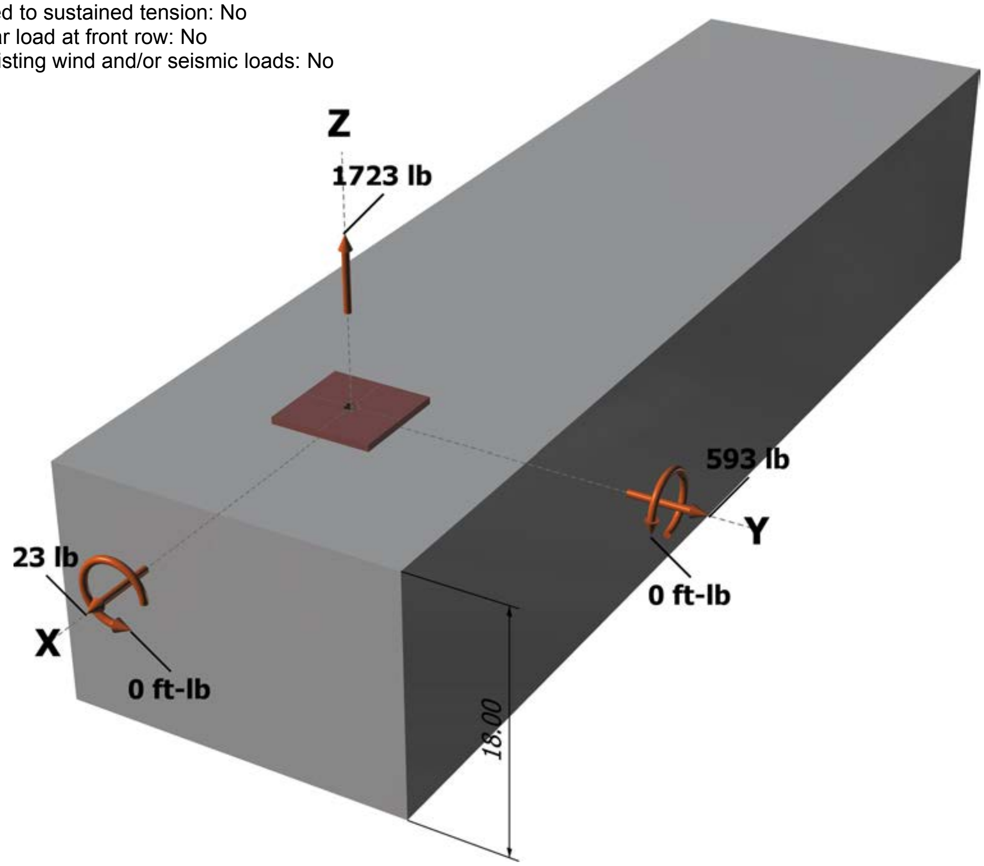
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

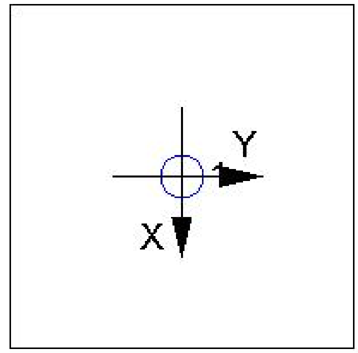
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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)

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

$\tau_{k,cr}$ (psi)	$f_{short-term}$	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.

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

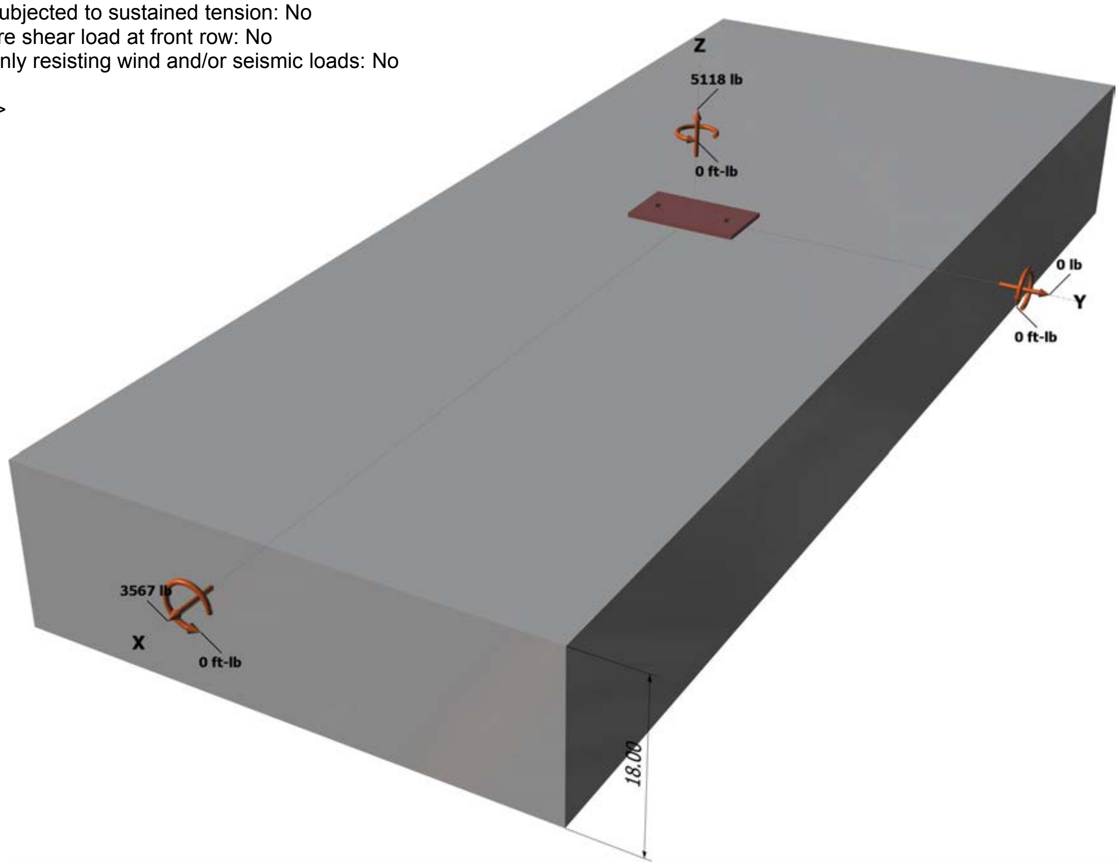
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

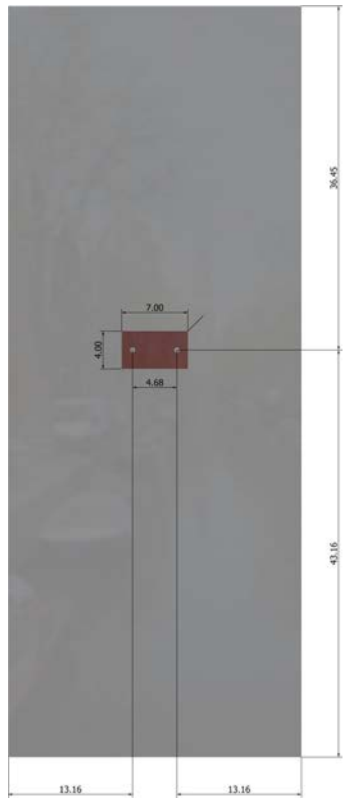
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout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



<Figure 2>



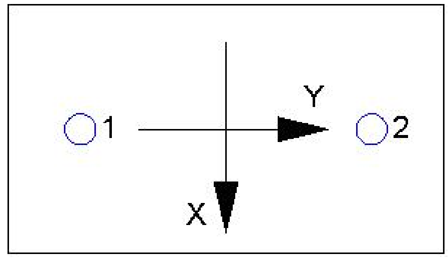
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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	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, $øN_n$ (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, $øV_n$ (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.