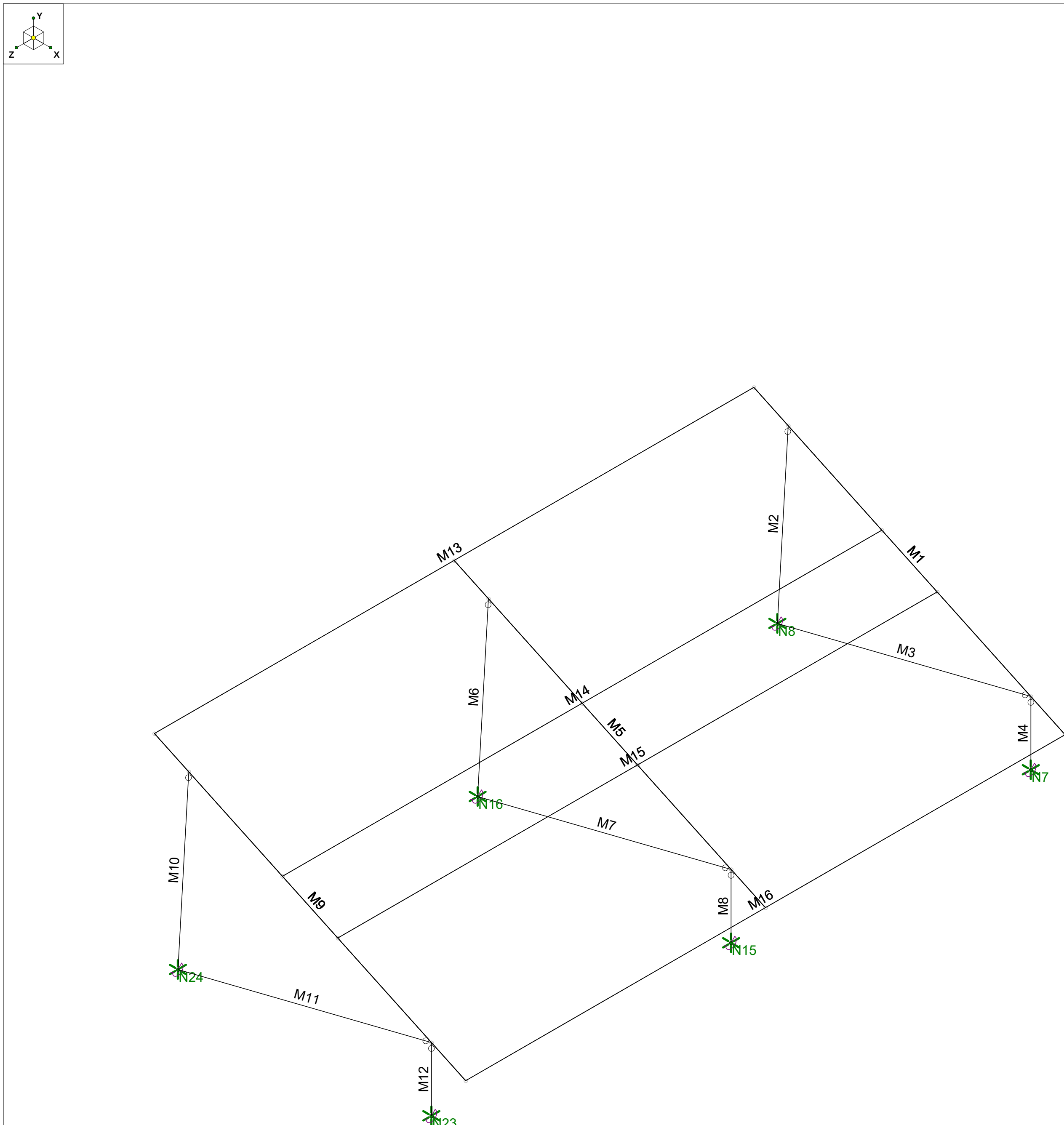


Schletter, Inc.		25° Tilt w/o Seismic Design
HCV	Standard PVMax Racking System	
	Representative Calculations - ASCE 7-10	

1. INTRODUCTION

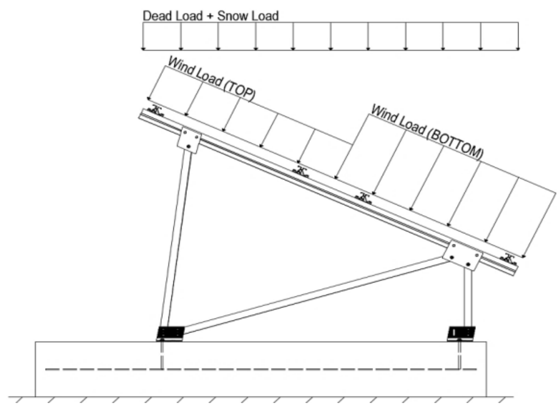
1.1 Project Description
The following sections will cover the determination of forces and structural design calculations for the Schletter, Inc. PVMax ground mount system.

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 =	2000	mm	Height =	1900	mm
Width =	1050	mm	Width =	970	mm
Dead Load =	3.00	psf	Dead Load =	1.75	psf

Modules Per Row =	2
Module Tilt =	25°
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	*Self-weight of the PV modules.*
g_{MIN} =	1.75	psf	

2.2 Snow Loads

Ground Snow Load, P_g =	30.00	psf	
Sloped Roof Snow Load, P_s =	18.56	psf	*(ASCE 7-10, Eq. 7.4-1)*
I_s =	1.00		
C_s =	0.82		
C_e =	0.90		
C_t =	1.20		

2.3 Wind Loads

Design Wind Speed, V =	130	mph	Exposure Category = C
Height <	15	ft	Importance Category = II

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

Pressure Coefficients

$Cf+_{TOP}$	=	1.100	*(Pressure)*
$Cf+_{BOTTOM}$	=	1.700	
$Cf-_{TOP, OUTER PURLIN}$	=	-2.500	
$Cf-_{TOP, INNER PURLIN}$	=	-1.900	*(Suction)*
$Cf-_{BOTTOM}$	=	-1.000	

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

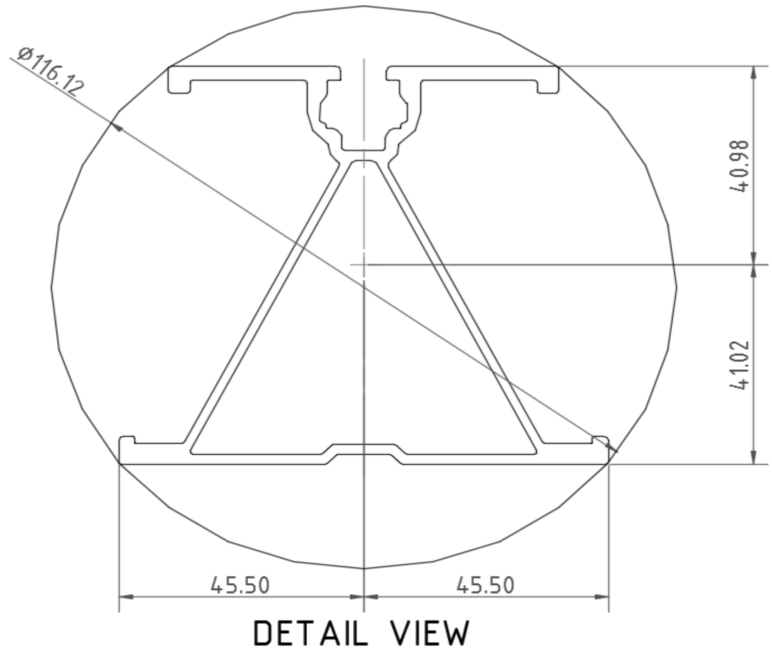
Front Struts	Location
M4	Outer
M8	Inner
M12	Outer

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).

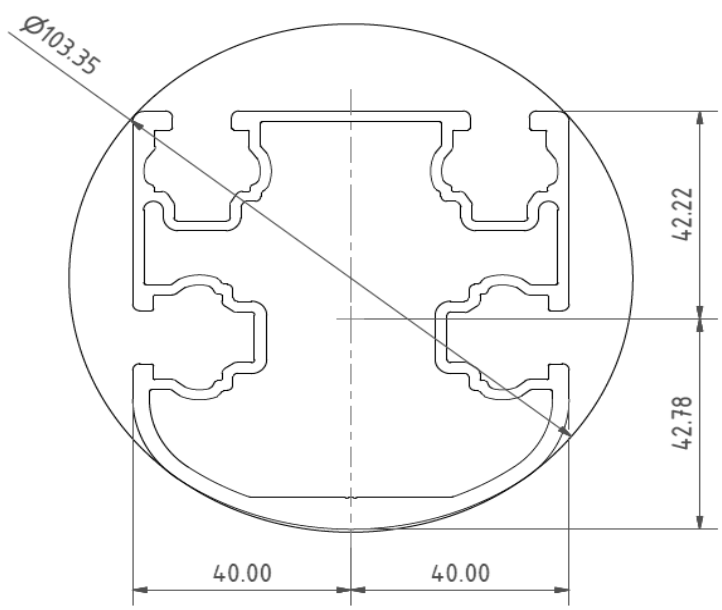
Purlin Type =	**S1.5**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	105	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	25.07	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	23.08	ksi
S_y =	1.33	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	2.16	in^4
I_x =	1.07	in^4
A =	1.25	in^2
g =	1.50	lbs/ft
M_y =	1.664	k-ft
M_z =	0.303	k-ft
$M_{y\ allowable}$ =	2.779	k-ft
$M_{z\ allowable}$ =	1.154	k-ft
Utilization =	86%	



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).

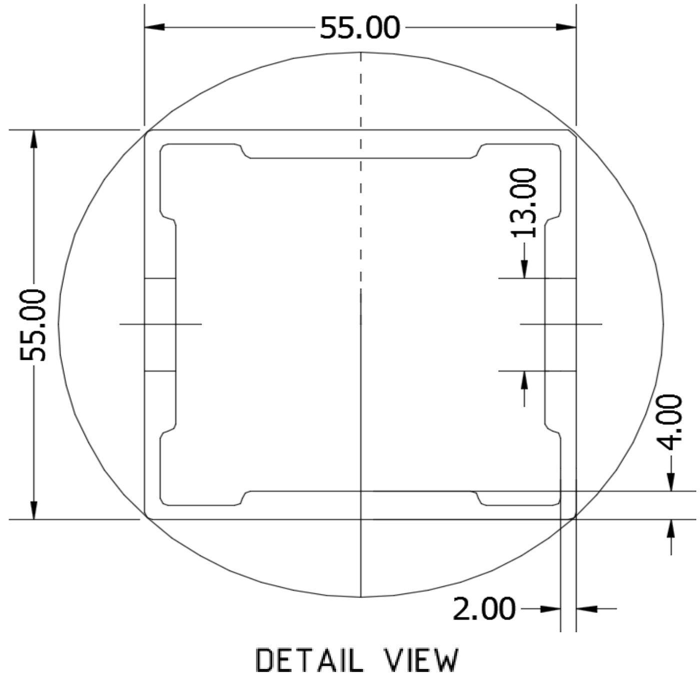
Girder Type =	**BF0**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	104.56	in
$\Phi F_{ty\ AXIAL}$ =	31.09	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.00	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	33.25	ksi
S_y =	1.42	in^3
S_x =	1.41	in^3
E =	10100	ksi
I_y =	2.39	in^4
I_x =	2.22	in^4
A =	1.88	in^2
g =	2.26	lbs/ft
M_y =	-3.342	k-ft
M_z =	0.000	k-ft
P_n =	-0.854	k
$M_{y\ allowable}$ =	3.422	k-ft
$M_{z\ allowable}$ =	3.907	k-ft
$P_{n\ allowable}$ =	58.535	k
Utilization =	99%	



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).

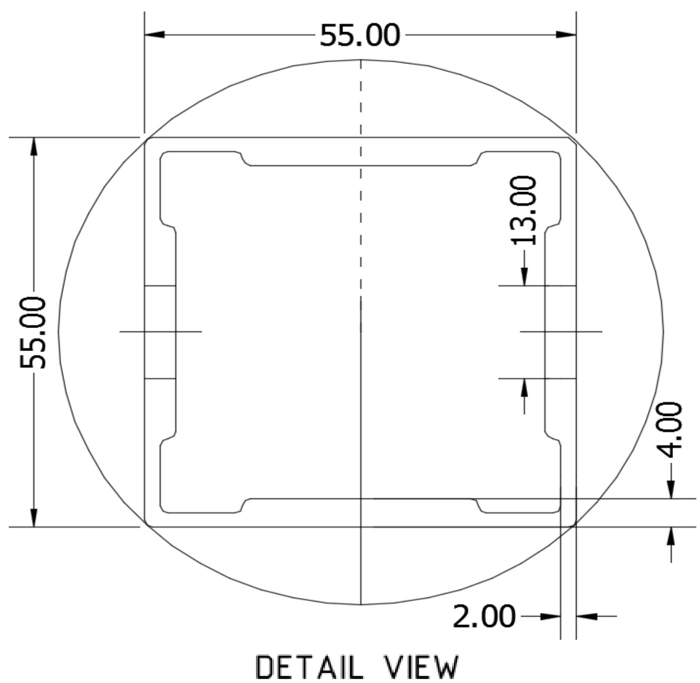
Strut Type =	**55x55**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	24.80	in
$\Phi F_{ty\ AXIAL}$ =	28.03	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	3.040	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	27.532	k
Utilization =	11%	



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).

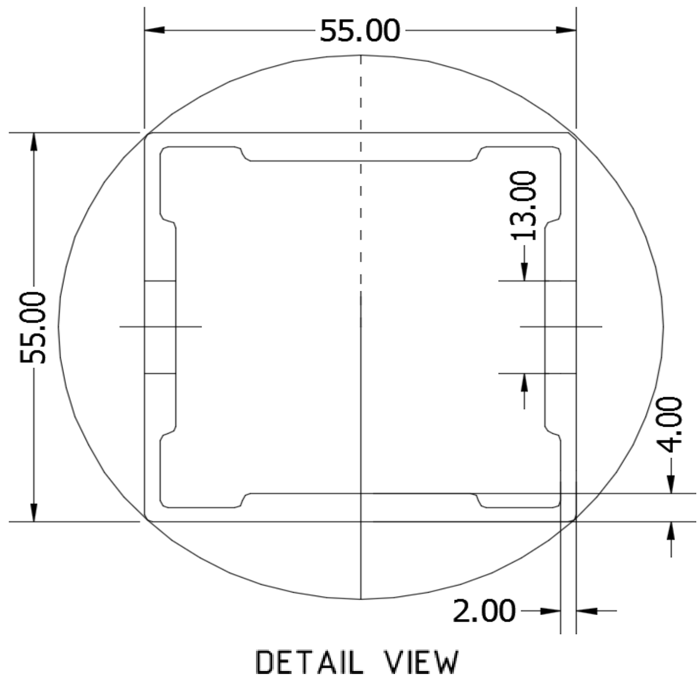
Strut Type =	**55x55**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	98.03	in
$\Phi F_{ty\ AXIAL}$ =	6.11	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.012	k-ft
M_z =	0.000	k-ft
P_n =	2.176	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	6.000	k
Utilization =	37%	



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 =	69.80	in
$\Phi F_{ty\ AXIAL}$ =	10.82	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 =	-0.011	k-ft
M_z =	0.000	k-ft
P_n =	3.327	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	10.629	k
Utilization =	32%	



5. FOUNDATION DESIGN CALCULATIONS

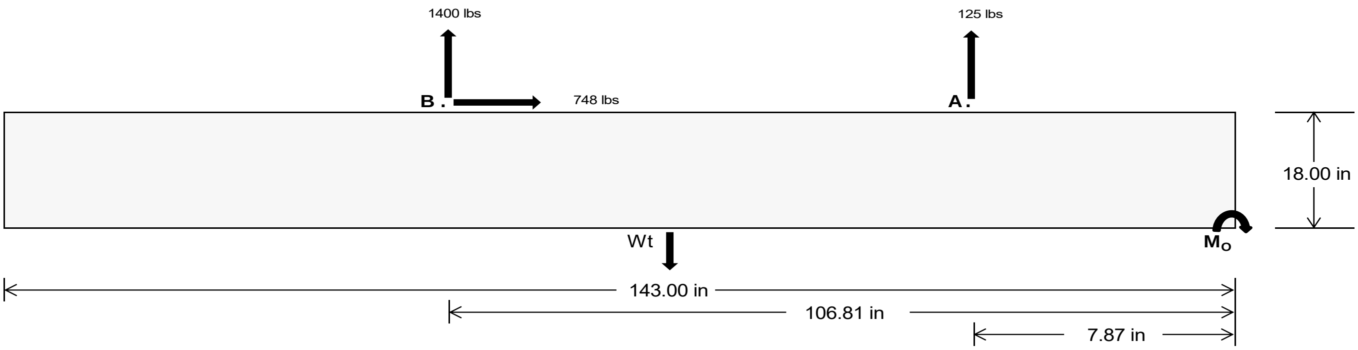
5.1 Helical Pile Foundations

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 =	564.73	6087.38	k
Compressive Load =	3951.75	4888.68	k
Lateral Load =	16.98	3243.22	k
Moment (Weak Axis) =	0.03	0.01	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 = 164007.6 in-lbs
Resisting Force Required = 2293.81 lbs
S.F. = 1.67
Weight Required = 3823.02 lbs
Minimum Width = 35 in in
Weight Provided = 7559.64 lbs

A minimum 143in long x 35in wide x 18in tall ballast foundation is required to resist overturning.

Sliding

Force = 748.19 lbs
Friction = 0.4
Weight Required = 1870.47 lbs
Resisting Weight = 7559.64 lbs
Additional Weight Required = 0 lbs

Use a 143in long x 35in wide x 18in tall ballast foundation to resist sliding. Friction is OK.

Cohesion

Sliding Force = 748.19 lbs
Cohesion = 130 psf
Area = 34.76 ft^2
Resisting = 3779.82 lbs
Additional Weight Required = 0 lbs

Use a 143in long x 35in 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			
	35 in	36 in	37 in	38 in
P_{ftg} = (145 pcf)(11.92 ft)(1.5 ft)(2.92 ft) =	7560 lbs	7776 lbs	7992 lbs	8208 lbs

ASD LC	1.0D + 1.0S				1.0D + 0.6W				1.0D + 0.75L + 0.45W + 0.75S				0.6D + 0.6W			
Width	35 in	36 in	37 in	38 in	35 in	36 in	37 in	38 in	35 in	36 in	37 in	38 in	35 in	36 in	37 in	38 in
F_A	1379 lbs	1379 lbs	1379 lbs	1379 lbs	1379 lbs	1379 lbs	1379 lbs	1379 lbs	1941 lbs	1941 lbs	1941 lbs	1941 lbs	-251 lbs	-251 lbs	-251 lbs	-251 lbs
F_B	1432 lbs	1432 lbs	1432 lbs	1432 lbs	1978 lbs	1978 lbs	1978 lbs	1978 lbs	2427 lbs	2427 lbs	2427 lbs	2427 lbs	-2800 lbs	-2800 lbs	-2800 lbs	-2800 lbs
F_V	173 lbs	173 lbs	173 lbs	173 lbs	1347 lbs	1347 lbs	1347 lbs	1347 lbs	1126 lbs	1126 lbs	1126 lbs	1126 lbs	-1496 lbs	-1496 lbs	-1496 lbs	-1496 lbs
P_{total}	10371 lbs	10587 lbs	10803 lbs	11019 lbs	10916 lbs	11132 lbs	11348 lbs	11564 lbs	11928 lbs	12144 lbs	12360 lbs	12576 lbs	1485 lbs	1614 lbs	1744 lbs	1873 lbs
M	3359 lbs-ft	3359 lbs-ft	3359 lbs-ft	3359 lbs-ft	3512 lbs-ft	3512 lbs-ft	3512 lbs-ft	3512 lbs-ft	4841 lbs-ft	4841 lbs-ft	4841 lbs-ft	4841 lbs-ft	4665 lbs-ft	4665 lbs-ft	4665 lbs-ft	4665 lbs-ft
e	0.32 ft	0.32 ft	0.31 ft	0.30 ft	0.32 ft	0.32 ft	0.31 ft	0.30 ft	0.41 ft	0.40 ft	0.39 ft	0.38 ft	3.14 ft	2.89 ft	2.68 ft	2.49 ft
L/6	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft
f_{min}	249.7 psf	248.8 psf	248.0 psf	247.2 psf	263.2 psf	261.9 psf	260.7 psf	259.6 psf	273.0 psf	271.5 psf	270.0 psf	268.7 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	347.1 psf	343.5 psf	340.1 psf	336.8 psf	364.9 psf	360.9 psf	357.0 psf	353.3 psf	413.3 psf	407.9 psf	402.7 psf	397.8 psf	120.5 psf	116.9 psf	114.8 psf	113.7 psf

Maximum Bearing Pressure = 413 psf
Allowable Bearing Pressure = 1500 psf

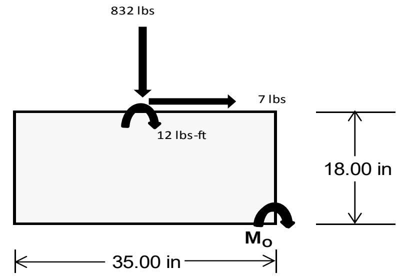
Use a 143in long x 35in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O = 1190.6 ft-lbs
Resisting Force Required = 816.44 lbs
S.F. = 1.67
Weight Required = 1360.73 lbs
Minimum Width = 35 in in
Weight Provided = 7559.64 lbs

A minimum 143in long x 35in 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	35 in			35 in			35 in		
Support	Outer	Inner	Outer	Outer	Inner	Outer	Outer	Inner	Outer
F_Y	256 lbs	640 lbs	256 lbs	832 lbs	2331 lbs	832 lbs	75 lbs	187 lbs	75 lbs
F_V	2 lbs	0 lbs	2 lbs	7 lbs	0 lbs	7 lbs	1 lbs	0 lbs	1 lbs
P_{total}	9615 lbs	7560 lbs	9615 lbs	9741 lbs	7560 lbs	9741 lbs	2811 lbs	7560 lbs	2811 lbs
M	7 lbs-ft	0 lbs-ft	7 lbs-ft	22 lbs-ft	0 lbs-ft	22 lbs-ft	2 lbs-ft	0 lbs-ft	2 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	0.49 ft	0.49 ft	0.49 ft	0.49 ft	0.49 ft	0.49 ft	0.49 ft	0.49 ft	0.49 ft
f_{min}	276.2 psf	217.5 psf	276.2 psf	278.9 psf	217.5 psf	278.9 psf	80.8 psf	217.5 psf	80.8 psf
f_{max}	277.0 psf	217.5 psf	277.0 psf	281.6 psf	217.5 psf	281.6 psf	81.0 psf	217.5 psf	81.0 psf

Maximum Bearing Pressure = 282 psf
Allowable Bearing Pressure = 1500 psf

Use a 143in long x 35in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Foundation Requirements: 143in long x 30in 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.

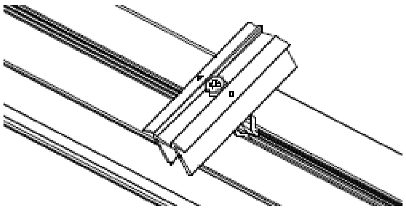
6. DESIGN OF JOINTS AND CONNECTIONS

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.

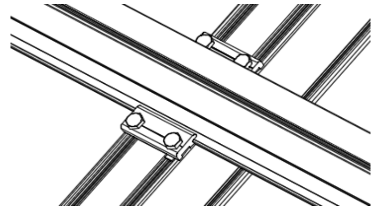
Fastening of Modules to Purlins

Maximum Uplifting Force =	0.732	k
Allowable Uplift =	1.214	k
Utilization =	60%	



Fastening of Purlins to Girders

Maximum Uplifting Force =	2.278	k
Allowable Uplift =	4.357	k
Utilization =	52%	



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 =	3.040	k
M12 Bolt Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	41%	

Rear Strut

Maximum Axial Load =	4.140	k
M12 Bolt Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	56%	

Diagonal Strut

Maximum Axial Load =	2.311	k
M12 Bolt Shear Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	31%	

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.

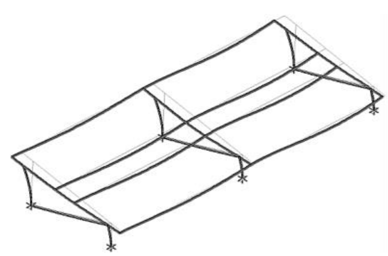
7. SEISMIC DESIGN

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} =	56.48	in
Allowable Story Drift for All Other Structures, Δ = {	$0.020h_{sx}$	
	1.130	in
Max Drift, Δ_{MAX} =	0.036	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 = 105 in

J = 0.432

290.479

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

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= 27.8 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

$\varphi F_L St$= 25.1 ksi

Ix = 897074 mm^4

2.155 in^4

y = 41.015 mm

Sx = 1.335 in³

$M_{max}St$ = 2.788 k-ft

Weak Axis:

3.4.14

L_b = 105

J = 0.432

184.727

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 28.9

3.4.16

b/t = 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

$\varphi F_L Wk$= 23.1 ksi

Iy = 446476 mm^4

1.073 in^4

x = 45.5 mm

Sy = 0.599 in³

$M_{max}Wk$ = 1.152 k-ft

Compression

3.4.9

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

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

3.4.10

Rb/t = 0.0

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

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

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

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

Girder = **BF0**

Strong Axis:

3.4.14

L_b = 104.56 in
J = 1.08
179.85

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

S1 = 0.51461

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

S2 = 1701.56
φF_L= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
φF_L= 29.0 ksi

3.4.16

b/t = 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 = 104.56
J = 1.08
190.335

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

S1 = 0.51461

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

S2 = 1701.56
φF_L= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
φF_L= 28.9

3.4.16

b/t = 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

$\varphi F_L St =$ 29.0 ksi

Ix = 984962 mm^4

2.366 in^4

y = 43.717 mm

Sx = 1.375 in^3

$M_{max}St$ = 3.323 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 = <u>**55x55**</u>

<u>Strong Axis:</u>

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 <u>Not Used</u>

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 in³

M_{max}St = 1.460 k-ft

<u>Weak Axis:</u>

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 in³

M_{max}Wk = 1.460 k-ft

Compression

3.4.7

λ = 0.57371

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.87952

φF_L= φcc(Bc-Dc*λ)

φF_L= 28.0279 ksi

3.4.9

b/t = 24.5

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

b/t = 24.5

S1 = 12.21

S2 = 32.70

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

φF_L= φyFcy

φF_L= 33.25 ksi

φF_L= 28.03 ksi

A = 663.99 mm^2

1.03 in^2

P_{max} = 28.85 kips

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

Strut = **55x55**

Strong Axis:

3.4.14

L_b = 98.03 in

J = 0.942

152.985

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

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

Weak Axis:

3.4.14

L_b = 98.03

J = 0.942

152.985

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.4

3.4.16

b/t = 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 in³

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 in³

M_{max}Wk = 1.460 k-ft

Compression

3.4.7

λ = 2.26776

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.89749

φF_L= (φccFcy)/(λ²)

φF_L= 6.10803 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 = 6.11 ksi
A = 663.99 mm^2
1.03 in^2
P_{max} = 6.29 kips

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

Strut = **55x55**

Strong Axis:
3.4.14

L_b = 69.80 in
J = 0.942
108.93

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

S1 = 0.51461

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

S2 = 1701.56
φF_L = φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
φF_L = 30.0 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 = 69.8
J = 0.942
108.93

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

S1 = 0.51461

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

S2 = 1701.56
φF_L = φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
φF_L = 30.0

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

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

3.4.18

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 = 1.61471

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.80606

φF_L= (φccFcy)/(λ²)

φF_L= 10.8205 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

$\varphi F_L =$ 10.82 ksi

A = 663.99 mm^2

1.03 in^2

$P_{max} =$ 11.14 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	-9.843	-9.843	0	0
2	M14	Y	-9.843	-9.843	0	0
3	M15	Y	-9.843	-9.843	0	0
4	M16	Y	-9.843	-9.843	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	-5.454	-5.454	0	0
2	M14	Y	-5.454	-5.454	0	0
3	M15	Y	-5.454	-5.454	0	0
4	M16	Y	-5.454	-5.454	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	-55.176	-55.176	0	0
2	M14	Y	-55.176	-55.176	0	0
3	M15	Y	-55.176	-55.176	0	0
4	M16	Y	-55.176	-55.176	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	-95.761	-95.761	0	0
2	M14	y	-95.761	-95.761	0	0
3	M15	y	-147.995	-147.995	0	0
4	M16	y	-147.995	-147.995	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	217.64	217.64	0	0
2	M14	y	165.406	165.406	0	0
3	M15	y	87.056	87.056	0	0
4	M16	y	87.056	87.056	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	651.422	2	1197.722	2	.76	1	.004	1	0	1	0	1
2		min	-812.692	3	-1468.723	3	.037	15	0	15	0	1	0	1
3	N7	max	.034	9	1134.062	1	-.548	15	-.001	15	0	1	0	1
4		min	-.211	2	-110.597	3	-13.06	1	-.026	1	0	1	0	1
5	N15	max	0	13	3039.804	1	0	12	0	12	0	1	0	1
6		min	-2.249	2	-434.408	3	0	10	0	10	0	1	0	1
7	N16	max	2305.378	2	3760.52	2	0	3	0	1	0	1	0	1
8		min	-2494.782	3	-4682.603	3	0	14	0	11	0	1	0	1
9	N23	max	.034	9	1134.062	1	13.06	1	.026	1	0	1	0	1
10		min	-.211	2	-110.597	3	.548	15	.001	15	0	1	0	1
11	N24	max	651.422	2	1197.722	2	-.037	15	0	15	0	1	0	1
12		min	-812.692	3	-1468.723	3	-.76	1	-.004	1	0	1	0	1
13	Totals:	max	3605.551	2	11162.57	1	0	12						
14		min	-4120.64	3	-8275.653	3	0	10						

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	78.392	1	451.115	1	-7.231	15	0	15	.219	1	0	1
2			min	3.202	15	-697.285	3	-178.676	1	-.015	2	.009	15	0	3
3		2	max	78.392	1	314.779	1	-5.543	15	0	15	.066	1	.578	3
4			min	3.202	15	-491.208	3	-136.809	1	-.015	2	.003	15	-.372	1
5		3	max	78.392	1	178.442	1	-3.855	15	0	15	.001	3	.955	3
6			min	3.202	15	-285.132	3	-94.941	1	-.015	2	-.047	1	-.612	1
7		4	max	78.392	1	42.106	1	-2.168	15	0	15	-.003	12	1.132	3
8			min	3.202	15	-79.055	3	-53.073	1	-.015	2	-.119	1	-.719	1
9		5	max	78.392	1	127.021	3	-.48	15	0	15	-.006	12	1.109	3
10			min	3.202	15	-94.23	1	-11.205	1	-.015	2	-.15	1	-.694	1
11		6	max	78.392	1	333.098	3	30.663	1	0	15	-.006	15	.885	3
12			min	3.202	15	-230.567	1	-.04	3	-.015	2	-.14	1	-.536	1
13		7	max	78.392	1	539.174	3	72.531	1	0	15	-.004	15	.461	3
14			min	3.202	15	-366.903	1	1.812	12	-.015	2	-.09	1	-.246	1
15		8	max	78.392	1	745.251	3	114.398	1	0	15	.003	2	.177	1
16			min	3.202	15	-503.239	1	3.528	12	-.015	2	-.005	3	-.163	3
17		9	max	78.392	1	951.327	3	156.266	1	0	15	.132	1	.733	1
18			min	3.202	15	-639.575	1	5.243	12	-.015	2	.001	3	-.988	3
19		10	max	78.392	1	1157.404	3	198.134	1	.003	3	.305	1	1.421	1
20			min	3.202	15	-775.912	1	6.959	12	-.015	2	.007	12	-2.013	3
21		11	max	78.392	1	639.575	1	-5.243	12	.015	2	.132	1	.733	1
22			min	3.202	15	-951.327	3	-156.266	1	0	15	.001	3	-.988	3
23		12	max	78.392	1	503.239	1	-3.528	12	.015	2	.003	2	.177	1
24			min	3.202	15	-745.251	3	-114.398	1	0	15	-.005	3	-.163	3
25		13	max	78.392	1	366.903	1	-1.812	12	.015	2	-.004	15	.461	3
26			min	3.202	15	-539.174	3	-72.531	1	0	15	-.09	1	-.246	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
27		14	max	78.392	1	230.567	1	.04	3	.015	2	-.006	15	.885	3
28			min	3.202	15	-333.098	3	-30.663	1	0	15	-.14	1	-.536	1
29		15	max	78.392	1	94.23	1	11.205	1	.015	2	-.006	12	1.109	3
30			min	3.202	15	-127.021	3	.48	15	0	15	-.15	1	-.694	1
31		16	max	78.392	1	79.055	3	53.073	1	.015	2	-.003	12	1.132	3
32			min	3.202	15	-42.106	1	2.168	15	0	15	-.119	1	-.719	1
33		17	max	78.392	1	285.132	3	94.941	1	.015	2	.001	3	.955	3
34			min	3.202	15	-178.442	1	3.855	15	0	15	-.047	1	-.612	1
35		18	max	78.392	1	491.208	3	136.809	1	.015	2	.066	1	.578	3
36			min	3.202	15	-314.779	1	5.543	15	0	15	.003	15	-.372	1
37		19	max	78.392	1	697.285	3	178.676	1	.015	2	.219	1	0	1
38			min	3.202	15	-451.115	1	7.231	15	0	15	.009	15	0	3
39	M14	1	max	46.225	1	504.936	1	-7.518	15	.012	3	.261	1	0	1
40			min	1.89	15	-556.281	3	-185.771	1	-.015	2	.011	15	0	3
41		2	max	46.225	1	368.6	1	-5.83	15	.012	3	.1	1	.465	3
42			min	1.89	15	-400.988	3	-143.903	1	-.015	2	.004	15	-.425	1
43		3	max	46.225	1	232.264	1	-4.142	15	.012	3	.003	3	.78	3
44			min	1.89	15	-245.694	3	-102.036	1	-.015	2	-.019	1	-.717	1
45		4	max	46.225	1	95.927	1	-2.454	15	.012	3	-.002	12	.943	3
46			min	1.89	15	-90.401	3	-60.168	1	-.015	2	-.098	1	-.876	1
47		5	max	46.225	1	64.893	3	-.767	15	.012	3	-.005	12	.955	3
48			min	1.89	15	-40.409	1	-18.3	1	-.015	2	-.136	1	-.903	1
49		6	max	46.225	1	220.186	3	23.568	1	.012	3	-.005	15	.817	3
50			min	1.89	15	-176.745	1	-.492	3	-.015	2	-.134	1	-.798	1
51		7	max	46.225	1	375.479	3	65.436	1	.012	3	-.004	15	.527	3
52			min	1.89	15	-313.081	1	1.512	12	-.015	2	-.09	1	-.56	1
53		8	max	46.225	1	530.773	3	107.303	1	.012	3	.001	10	.087	3
54			min	1.89	15	-449.418	1	3.227	12	-.015	2	-.006	1	-.202	2
55		9	max	46.225	1	686.066	3	149.171	1	.012	3	.118	1	.314	1
56			min	1.89	15	-585.754	1	4.943	12	-.015	2	0	3	-.505	3
57		10	max	46.225	1	841.36	3	191.039	1	.012	3	.284	1	.95	1
58			min	1.89	15	-722.09	1	6.658	12	-.015	2	.006	12	-1.247	3
59		11	max	46.225	1	585.754	1	-4.943	12	.015	2	.118	1	.314	1
60			min	1.89	15	-686.066	3	-149.171	1	-.012	3	0	3	-.505	3
61		12	max	46.225	1	449.418	1	-3.227	12	.015	2	.001	10	.087	3
62			min	1.89	15	-530.773	3	-107.303	1	-.012	3	-.006	1	-.202	2
63		13	max	46.225	1	313.081	1	-1.512	12	.015	2	-.004	15	.527	3
64			min	1.89	15	-375.479	3	-65.436	1	-.012	3	-.09	1	-.56	1
65		14	max	46.225	1	176.745	1	.492	3	.015	2	-.005	15	.817	3
66			min	1.89	15	-220.186	3	-23.568	1	-.012	3	-.134	1	-.798	1
67		15	max	46.225	1	40.409	1	18.3	1	.015	2	-.005	12	.955	3
68			min	1.89	15	-64.893	3	.767	15	-.012	3	-.136	1	-.903	1
69		16	max	46.225	1	90.401	3	60.168	1	.015	2	-.002	12	.943	3
70			min	1.89	15	-95.927	1	2.454	15	-.012	3	-.098	1	-.876	1
71		17	max	46.225	1	245.694	3	102.036	1	.015	2	.003	3	.78	3
72			min	1.89	15	-232.264	1	4.142	15	-.012	3	-.019	1	-.717	1
73		18	max	46.225	1	400.988	3	143.903	1	.015	2	.1	1	.465	3
74			min	1.89	15	-368.6	1	5.83	15	-.012	3	.004	15	-.425	1
75		19	max	46.225	1	556.281	3	185.771	1	.015	2	.261	1	0	1
76			min	1.89	15	-504.936	1	7.518	15	-.012	3	.011	15	0	3
77	M15	1	max	-2.014	15	653.992	2	-7.514	15	.015	2	.26	1	0	2
78			min	-49.141	1	-299.867	3	-185.727	1	-.01	3	.011	15	0	3
79		2	max	-2.014	15	473.802	2	-5.826	15	.015	2	.1	1	.253	3
80			min	-49.141	1	-220.747	3	-143.86	1	-.01	3	.004	15	-.548	2
81		3	max	-2.014	15	293.611	2	-4.139	15	.015	2	.003	3	.429	3
82			min	-49.141	1	-141.627	3	-101.992	1	-.01	3	-.019	1	-.921	2
83		4	max	-2.014	15	113.42	2	-2.451	15	.015	2	-.003	12	.528	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	-49.141	1	-62.507	3	-60.124	1	-.01	3	-.098	1	-1.119	2
85		5	max	-2.014	15	16.613	3	-.763	15	.015	2	-.005	12	.551	3
86			min	-49.141	1	-66.77	2	-18.256	1	-.01	3	-.136	1	-1.142	2
87		6	max	-2.014	15	95.732	3	23.612	1	.015	2	-.005	15	.496	3
88			min	-49.141	1	-246.961	2	-.327	3	-.01	3	-.134	1	-.989	2
89		7	max	-2.014	15	174.852	3	65.479	1	.015	2	-.004	15	.365	3
90			min	-49.141	1	-427.152	2	1.612	12	-.01	3	-.09	1	-.662	2
91		8	max	-2.014	15	253.972	3	107.347	1	.015	2	.001	10	.156	3
92			min	-49.141	1	-607.343	2	3.327	12	-.01	3	-.006	1	-.167	1
93		9	max	-2.014	15	333.092	3	149.215	1	.015	2	.118	1	.519	2
94			min	-49.141	1	-787.533	2	5.043	12	-.01	3	.001	3	-.129	3
95		10	max	-2.014	15	412.212	3	191.083	1	.015	2	.284	1	1.373	2
96			min	-49.141	1	-967.724	2	6.758	12	-.01	3	.007	12	-.492	3
97		11	max	-2.014	15	787.533	2	-5.043	12	.01	3	.118	1	.519	2
98			min	-49.141	1	-333.092	3	-149.215	1	-.015	2	.001	3	-.129	3
99		12	max	-2.014	15	607.343	2	-3.327	12	.01	3	.001	10	.156	3
100			min	-49.141	1	-253.972	3	-107.347	1	-.015	2	-.006	1	-.167	1
101		13	max	-2.014	15	427.152	2	-1.612	12	.01	3	-.004	15	.365	3
102			min	-49.141	1	-174.852	3	-65.479	1	-.015	2	-.09	1	-.662	2
103		14	max	-2.014	15	246.961	2	.327	3	.01	3	-.005	15	.496	3
104			min	-49.141	1	-95.732	3	-23.612	1	-.015	2	-.134	1	-.989	2
105		15	max	-2.014	15	66.77	2	18.256	1	.01	3	-.005	12	.551	3
106			min	-49.141	1	-16.613	3	.763	15	-.015	2	-.136	1	-1.142	2
107		16	max	-2.014	15	62.507	3	60.124	1	.01	3	-.003	12	.528	3
108			min	-49.141	1	-113.42	2	2.451	15	-.015	2	-.098	1	-1.119	2
109		17	max	-2.014	15	141.627	3	101.992	1	.01	3	.003	3	.429	3
110			min	-49.141	1	-293.611	2	4.139	15	-.015	2	-.019	1	-.921	2
111		18	max	-2.014	15	220.747	3	143.86	1	.01	3	.1	1	.253	3
112			min	-49.141	1	-473.802	2	5.826	15	-.015	2	.004	15	-.548	2
113		19	max	-2.014	15	299.867	3	185.727	1	.01	3	.26	1	0	2
114			min	-49.141	1	-653.992	2	7.514	15	-.015	2	.011	15	0	3
115	M16	1	max	-3.589	15	600.782	2	-7.246	15	.011	1	.222	1	0	2
116			min	-87.776	1	-258.474	3	-179.196	1	-.013	3	.009	15	0	3
117		2	max	-3.589	15	420.591	2	-5.558	15	.011	1	.068	1	.213	3
118			min	-87.776	1	-179.354	3	-137.328	1	-.013	3	.003	15	-.496	2
119		3	max	-3.589	15	240.4	2	-3.87	15	.011	1	0	3	.349	3
120			min	-87.776	1	-100.234	3	-95.46	1	-.013	3	-.045	1	-.818	2
121		4	max	-3.589	15	60.21	2	-2.183	15	.011	1	-.004	12	.408	3
122			min	-87.776	1	-21.114	3	-53.592	1	-.013	3	-.117	1	-.964	2
123		5	max	-3.589	15	58.006	3	-.495	15	.011	1	-.006	12	.39	3
124			min	-87.776	1	-119.981	2	-11.725	1	-.013	3	-.149	1	-.935	2
125		6	max	-3.589	15	137.125	3	30.143	1	.011	1	-.006	15	.295	3
126			min	-87.776	1	-300.172	2	.407	12	-.013	3	-.14	1	-.731	2
127		7	max	-3.589	15	216.245	3	72.011	1	.011	1	-.004	15	.123	3
128			min	-87.776	1	-480.362	2	2.122	12	-.013	3	-.091	1	-.351	2
129		8	max	-3.589	15	295.365	3	113.879	1	.011	1	.002	2	.203	2
130			min	-87.776	1	-660.553	2	3.838	12	-.013	3	-.004	3	-.126	3
131		9	max	-3.589	15	374.485	3	155.747	1	.011	1	.131	1	.933	2
132			min	-87.776	1	-840.744	2	5.553	12	-.013	3	.002	12	-.451	3
133		10	max	-3.589	15	453.605	3	197.614	1	.013	3	.303	1	1.838	2
134			min	-87.776	1	-1020.935	2	7.268	12	-.005	9	.009	12	-.854	3
135		11	max	-3.589	15	840.744	2	-5.553	12	.013	3	.131	1	.933	2
136			min	-87.776	1	-374.485	3	-155.747	1	-.011	1	.002	12	-.451	3
137		12	max	-3.589	15	660.553	2	-3.838	12	.013	3	.002	2	.203	2
138			min	-87.776	1	-295.365	3	-113.879	1	-.011	1	-.004	3	-.126	3
139		13	max	-3.589	15	480.362	2	-2.122	12	.013	3	-.004	15	.123	3
140			min	-87.776	1	-216.245	3	-72.011	1	-.011	1	-.091	1	-.351	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
141		14	max	-3.589	15	300.172	2	-.407	12	.013	3	-.006	15	.295	3
142			min	-87.776	1	-137.125	3	-30.143	1	-.011	1	-.14	1	-.731	2
143		15	max	-3.589	15	119.981	2	11.725	1	.013	3	-.006	12	.39	3
144			min	-87.776	1	-58.006	3	.495	15	-.011	1	-.149	1	-.935	2
145		16	max	-3.589	15	21.114	3	53.592	1	.013	3	-.004	12	.408	3
146			min	-87.776	1	-60.21	2	2.183	15	-.011	1	-.117	1	-.964	2
147		17	max	-3.589	15	100.234	3	95.46	1	.013	3	0	3	.349	3
148			min	-87.776	1	-240.4	2	3.87	15	-.011	1	-.045	1	-.818	2
149		18	max	-3.589	15	179.354	3	137.328	1	.013	3	.068	1	.213	3
150			min	-87.776	1	-420.591	2	5.558	15	-.011	1	.003	15	-.496	2
151		19	max	-3.589	15	258.474	3	179.196	1	.013	3	.222	1	0	2
152			min	-87.776	1	-600.782	2	7.246	15	-.011	1	.009	15	0	3
153	M2	1	max	1065.523	1	2.023	4	.626	1	0	3	0	3	0	1
154			min	-1298.617	3	.476	15	.025	15	0	1	0	1	0	1
155		2	max	1065.997	1	1.986	4	.626	1	0	3	0	1	0	15
156			min	-1298.262	3	.467	15	.025	15	0	1	0	15	0	4
157		3	max	1066.47	1	1.949	4	.626	1	0	3	0	1	0	15
158			min	-1297.906	3	.458	15	.025	15	0	1	0	15	-.001	4
159		4	max	1066.944	1	1.912	4	.626	1	0	3	0	1	0	15
160			min	-1297.551	3	.45	15	.025	15	0	1	0	15	-.002	4
161		5	max	1067.418	1	1.875	4	.626	1	0	3	0	1	0	15
162			min	-1297.196	3	.441	15	.025	15	0	1	0	15	-.002	4
163		6	max	1067.892	1	1.838	4	.626	1	0	3	0	1	0	15
164			min	-1296.841	3	.432	15	.025	15	0	1	0	15	-.003	4
165		7	max	1068.365	1	1.801	4	.626	1	0	3	.001	1	0	15
166			min	-1296.485	3	.424	15	.025	15	0	1	0	15	-.004	4
167		8	max	1068.839	1	1.764	4	.626	1	0	3	.001	1	0	15
168			min	-1296.13	3	.415	15	.025	15	0	1	0	15	-.004	4
169		9	max	1069.313	1	1.727	4	.626	1	0	3	.002	1	-.001	15
170			min	-1295.775	3	.406	15	.025	15	0	1	0	15	-.005	4
171		10	max	1069.787	1	1.69	4	.626	1	0	3	.002	1	-.001	15
172			min	-1295.419	3	.397	15	.025	15	0	1	0	15	-.005	4
173		11	max	1070.26	1	1.653	4	.626	1	0	3	.002	1	-.001	15
174			min	-1295.064	3	.389	15	.025	15	0	1	0	15	-.006	4
175		12	max	1070.734	1	1.616	4	.626	1	0	3	.002	1	-.002	15
176			min	-1294.709	3	.38	15	.025	15	0	1	0	15	-.006	4
177		13	max	1071.208	1	1.579	4	.626	1	0	3	.002	1	-.002	15
178			min	-1294.353	3	.371	15	.025	15	0	1	0	15	-.007	4
179		14	max	1071.682	1	1.542	4	.626	1	0	3	.003	1	-.002	15
180			min	-1293.998	3	.363	15	.025	15	0	1	0	15	-.007	4
181		15	max	1072.155	1	1.505	4	.626	1	0	3	.003	1	-.002	15
182			min	-1293.643	3	.354	15	.025	15	0	1	0	15	-.008	4
183		16	max	1072.629	1	1.468	4	.626	1	0	3	.003	1	-.002	15
184			min	-1293.287	3	.345	15	.025	15	0	1	0	15	-.008	4
185		17	max	1073.103	1	1.431	4	.626	1	0	3	.003	1	-.002	15
186			min	-1292.932	3	.337	15	.025	15	0	1	0	15	-.009	4
187		18	max	1073.576	1	1.394	4	.626	1	0	3	.003	1	-.002	15
188			min	-1292.577	3	.328	15	.025	15	0	1	0	15	-.009	4
189		19	max	1074.05	1	1.357	4	.626	1	0	3	.004	1	-.002	15
190			min	-1292.222	3	.319	15	.025	15	0	1	0	15	-.01	4
191	M3	1	max	606.648	2	8.993	4	.278	1	0	5	0	1	.01	4
192			min	-755.784	3	2.114	15	.011	15	0	1	0	15	.002	15
193		2	max	606.477	2	8.121	4	.278	1	0	5	0	1	.006	4
194			min	-755.911	3	1.909	15	.011	15	0	1	0	15	.001	12
195		3	max	606.307	2	7.249	4	.278	1	0	5	0	1	.003	2
196			min	-756.039	3	1.704	15	.011	15	0	1	0	15	0	3
197		4	max	606.137	2	6.377	4	.278	1	0	5	0	1	0	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
198			min	-756.167	3	1.499	15	.011	15	0	1	0	15	-.002	3
199		5	max	605.966	2	5.505	4	.278	1	0	5	0	1	0	15
200			min	-756.295	3	1.294	15	.011	15	0	1	0	15	-.004	4
201		6	max	605.796	2	4.633	4	.278	1	0	5	0	1	-.001	15
202			min	-756.422	3	1.089	15	.011	15	0	1	0	15	-.006	4
203		7	max	605.626	2	3.761	4	.278	1	0	5	.001	1	-.002	15
204			min	-756.55	3	.884	15	.011	15	0	1	0	15	-.008	4
205		8	max	605.455	2	2.889	4	.278	1	0	5	.001	1	-.002	15
206			min	-756.678	3	.679	15	.011	15	0	1	0	15	-.01	4
207		9	max	605.285	2	2.017	4	.278	1	0	5	.001	1	-.003	15
208			min	-756.806	3	.474	15	.011	15	0	1	0	15	-.011	4
209		10	max	605.115	2	1.145	4	.278	1	0	5	.001	1	-.003	15
210			min	-756.934	3	.269	15	.011	15	0	1	0	15	-.012	4
211		11	max	604.944	2	.366	2	.278	1	0	5	.002	1	-.003	15
212			min	-757.061	3	-.051	3	.011	15	0	1	0	15	-.012	4
213		12	max	604.774	2	-.141	15	.278	1	0	5	.002	1	-.003	15
214			min	-757.189	3	-.599	4	.011	15	0	1	0	15	-.012	4
215		13	max	604.604	2	-.346	15	.278	1	0	5	.002	1	-.003	15
216			min	-757.317	3	-1.471	4	.011	15	0	1	0	15	-.012	4
217		14	max	604.433	2	-.551	15	.278	1	0	5	.002	1	-.003	15
218			min	-757.445	3	-2.343	4	.011	15	0	1	0	15	-.011	4
219		15	max	604.263	2	-.756	15	.278	1	0	5	.002	1	-.002	15
220			min	-757.572	3	-3.215	4	.011	15	0	1	0	15	-.009	4
221		16	max	604.093	2	-.961	15	.278	1	0	5	.002	1	-.002	15
222			min	-757.7	3	-4.087	4	.011	15	0	1	0	15	-.008	4
223		17	max	603.922	2	-1.166	15	.278	1	0	5	.002	1	-.001	15
224			min	-757.828	3	-4.959	4	.011	15	0	1	0	15	-.006	4
225		18	max	603.752	2	-1.371	15	.278	1	0	5	.002	1	0	15
226			min	-757.956	3	-5.831	4	.011	15	0	1	0	15	-.003	4
227		19	max	603.582	2	-1.576	15	.278	1	0	5	.003	1	0	1
228			min	-758.083	3	-6.703	4	.011	15	0	1	0	15	0	1
229	M4	1	max	1130.995	1	0	1	-.548	15	0	1	.002	1	0	1
230			min	-112.897	3	0	1	-13.496	1	0	1	0	15	0	1
231		2	max	1131.166	1	0	1	-.548	15	0	1	0	1	0	1
232			min	-112.769	3	0	1	-13.496	1	0	1	0	15	0	1
233		3	max	1131.336	1	0	1	-.548	15	0	1	0	15	0	1
234			min	-112.641	3	0	1	-13.496	1	0	1	-.001	1	0	1
235		4	max	1131.506	1	0	1	-.548	15	0	1	0	15	0	1
236			min	-112.514	3	0	1	-13.496	1	0	1	-.003	1	0	1
237		5	max	1131.677	1	0	1	-.548	15	0	1	0	15	0	1
238			min	-112.386	3	0	1	-13.496	1	0	1	-.004	1	0	1
239		6	max	1131.847	1	0	1	-.548	15	0	1	0	15	0	1
240			min	-112.258	3	0	1	-13.496	1	0	1	-.006	1	0	1
241		7	max	1132.018	1	0	1	-.548	15	0	1	0	15	0	1
242			min	-112.13	3	0	1	-13.496	1	0	1	-.008	1	0	1
243		8	max	1132.188	1	0	1	-.548	15	0	1	0	15	0	1
244			min	-112.003	3	0	1	-13.496	1	0	1	-.009	1	0	1
245		9	max	1132.358	1	0	1	-.548	15	0	1	0	15	0	1
246			min	-111.875	3	0	1	-13.496	1	0	1	-.011	1	0	1
247		10	max	1132.529	1	0	1	-.548	15	0	1	0	15	0	1
248			min	-111.747	3	0	1	-13.496	1	0	1	-.012	1	0	1
249		11	max	1132.699	1	0	1	-.548	15	0	1	0	15	0	1
250			min	-111.619	3	0	1	-13.496	1	0	1	-.014	1	0	1
251		12	max	1132.869	1	0	1	-.548	15	0	1	0	15	0	1
252			min	-111.492	3	0	1	-13.496	1	0	1	-.015	1	0	1
253		13	max	1133.04	1	0	1	-.548	15	0	1	0	15	0	1
254			min	-111.364	3	0	1	-13.496	1	0	1	-.017	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	1133.21	1	0	1	-.548	15	0	1	0	15	0	1
256			min	-111.236	3	0	1	-13.496	1	0	1	-.018	1	0	1
257		15	max	1133.38	1	0	1	-.548	15	0	1	0	15	0	1
258			min	-111.108	3	0	1	-13.496	1	0	1	-.02	1	0	1
259		16	max	1133.551	1	0	1	-.548	15	0	1	0	15	0	1
260			min	-110.981	3	0	1	-13.496	1	0	1	-.021	1	0	1
261		17	max	1133.721	1	0	1	-.548	15	0	1	0	15	0	1
262			min	-110.853	3	0	1	-13.496	1	0	1	-.023	1	0	1
263		18	max	1133.891	1	0	1	-.548	15	0	1	0	15	0	1
264			min	-110.725	3	0	1	-13.496	1	0	1	-.025	1	0	1
265		19	max	1134.062	1	0	1	-.548	15	0	1	-.001	15	0	1
266			min	-110.597	3	0	1	-13.496	1	0	1	-.026	1	0	1
267	M6	1	max	3318.131	1	2.356	2	0	1	0	1	0	1	0	1
268			min	-4139.929	3	.209	12	0	1	0	1	0	1	0	1
269		2	max	3318.605	1	2.327	2	0	1	0	1	0	1	0	12
270			min	-4139.573	3	.194	3	0	1	0	1	0	1	0	2
271		3	max	3319.078	1	2.298	2	0	1	0	1	0	1	0	3
272			min	-4139.218	3	.173	3	0	1	0	1	0	1	-.001	2
273		4	max	3319.552	1	2.269	2	0	1	0	1	0	1	0	3
274			min	-4138.863	3	.151	3	0	1	0	1	0	1	-.002	2
275		5	max	3320.026	1	2.24	2	0	1	0	1	0	1	0	3
276			min	-4138.508	3	.129	3	0	1	0	1	0	1	-.003	2
277		6	max	3320.5	1	2.211	2	0	1	0	1	0	1	0	3
278			min	-4138.152	3	.108	3	0	1	0	1	0	1	-.004	2
279		7	max	3320.973	1	2.183	2	0	1	0	1	0	1	0	3
280			min	-4137.797	3	.086	3	0	1	0	1	0	1	-.004	2
281		8	max	3321.447	1	2.154	2	0	1	0	1	0	1	0	3
282			min	-4137.442	3	.064	3	0	1	0	1	0	1	-.005	2
283		9	max	3321.921	1	2.125	2	0	1	0	1	0	1	0	3
284			min	-4137.086	3	.043	3	0	1	0	1	0	1	-.006	2
285		10	max	3322.395	1	2.096	2	0	1	0	1	0	1	0	3
286			min	-4136.731	3	.021	3	0	1	0	1	0	1	-.006	2
287		11	max	3322.868	1	2.067	2	0	1	0	1	0	1	0	3
288			min	-4136.376	3	0	3	0	1	0	1	0	1	-.007	2
289		12	max	3323.342	1	2.038	2	0	1	0	1	0	1	0	3
290			min	-4136.02	3	-.022	3	0	1	0	1	0	1	-.008	2
291		13	max	3323.816	1	2.009	2	0	1	0	1	0	1	0	3
292			min	-4135.665	3	-.044	3	0	1	0	1	0	1	-.008	2
293		14	max	3324.29	1	1.98	2	0	1	0	1	0	1	0	3
294			min	-4135.31	3	-.065	3	0	1	0	1	0	1	-.009	2
295		15	max	3324.763	1	1.952	2	0	1	0	1	0	1	0	3
296			min	-4134.955	3	-.087	3	0	1	0	1	0	1	-.01	2
297		16	max	3325.237	1	1.923	2	0	1	0	1	0	1	0	3
298			min	-4134.599	3	-.109	3	0	1	0	1	0	1	-.01	2
299		17	max	3325.711	1	1.894	2	0	1	0	1	0	1	0	3
300			min	-4134.244	3	-.13	3	0	1	0	1	0	1	-.011	2
301		18	max	3326.185	1	1.865	2	0	1	0	1	0	1	0	3
302			min	-4133.889	3	-.152	3	0	1	0	1	0	1	-.011	2
303		19	max	3326.658	1	1.836	2	0	1	0	1	0	1	0	3
304			min	-4133.533	3	-.174	3	0	1	0	1	0	1	-.012	2
305	M7	1	max	2175.639	2	9.027	4	0	1	0	1	0	1	.012	2
306			min	-2308.862	3	2.119	15	0	1	0	1	0	1	0	3
307		2	max	2175.468	2	8.155	4	0	1	0	1	0	1	.009	2
308			min	-2308.99	3	1.914	15	0	1	0	1	0	1	-.002	3
309		3	max	2175.298	2	7.283	4	0	1	0	1	0	1	.006	2
310			min	-2309.117	3	1.709	15	0	1	0	1	0	1	-.004	3
311		4	max	2175.128	2	6.411	4	0	1	0	1	0	1	.003	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	-2309.245	3	1.504	15	0	1	0	1	0	1	-.005	3
313		5	max	2174.957	2	5.539	4	0	1	0	1	0	1	0	2
314			min	-2309.373	3	1.299	15	0	1	0	1	0	1	-.007	3
315		6	max	2174.787	2	4.667	4	0	1	0	1	0	1	-.001	15
316			min	-2309.501	3	1.094	15	0	1	0	1	0	1	-.008	3
317		7	max	2174.617	2	3.795	4	0	1	0	1	0	1	-.002	15
318			min	-2309.628	3	.889	15	0	1	0	1	0	1	-.009	3
319		8	max	2174.446	2	2.923	4	0	1	0	1	0	1	-.002	15
320			min	-2309.756	3	.684	15	0	1	0	1	0	1	-.01	4
321		9	max	2174.276	2	2.1	2	0	1	0	1	0	1	-.003	15
322			min	-2309.884	3	.393	12	0	1	0	1	0	1	-.011	4
323		10	max	2174.105	2	1.42	2	0	1	0	1	0	1	-.003	15
324			min	-2310.012	3	.014	3	0	1	0	1	0	1	-.012	4
325		11	max	2173.935	2	.741	2	0	1	0	1	0	1	-.003	15
326			min	-2310.139	3	-.495	3	0	1	0	1	0	1	-.012	4
327		12	max	2173.765	2	.061	2	0	1	0	1	0	1	-.003	15
328			min	-2310.267	3	-1.005	3	0	1	0	1	0	1	-.012	4
329		13	max	2173.594	2	-.341	15	0	1	0	1	0	1	-.003	15
330			min	-2310.395	3	-1.515	3	0	1	0	1	0	1	-.011	4
331		14	max	2173.424	2	-.546	15	0	1	0	1	0	1	-.002	15
332			min	-2310.523	3	-2.31	4	0	1	0	1	0	1	-.011	4
333		15	max	2173.254	2	-.751	15	0	1	0	1	0	1	-.002	15
334			min	-2310.651	3	-3.182	4	0	1	0	1	0	1	-.009	4
335		16	max	2173.083	2	-.956	15	0	1	0	1	0	1	-.002	15
336			min	-2310.778	3	-4.054	4	0	1	0	1	0	1	-.008	4
337		17	max	2172.913	2	-1.161	15	0	1	0	1	0	1	-.001	15
338			min	-2310.906	3	-4.926	4	0	1	0	1	0	1	-.005	4
339		18	max	2172.743	2	-1.366	15	0	1	0	1	0	1	0	15
340			min	-2311.034	3	-5.798	4	0	1	0	1	0	1	-.003	4
341		19	max	2172.572	2	-1.571	15	0	1	0	1	0	1	0	1
342			min	-2311.162	3	-6.67	4	0	1	0	1	0	1	0	1
343	M8	1	max	3036.737	1	0	1	0	1	0	1	0	1	0	1
344			min	-436.708	3	0	1	0	1	0	1	0	1	0	1
345		2	max	3036.908	1	0	1	0	1	0	1	0	1	0	1
346			min	-436.58	3	0	1	0	1	0	1	0	1	0	1
347		3	max	3037.078	1	0	1	0	1	0	1	0	1	0	1
348			min	-436.453	3	0	1	0	1	0	1	0	1	0	1
349		4	max	3037.248	1	0	1	0	1	0	1	0	1	0	1
350			min	-436.325	3	0	1	0	1	0	1	0	1	0	1
351		5	max	3037.419	1	0	1	0	1	0	1	0	1	0	1
352			min	-436.197	3	0	1	0	1	0	1	0	1	0	1
353		6	max	3037.589	1	0	1	0	1	0	1	0	1	0	1
354			min	-436.069	3	0	1	0	1	0	1	0	1	0	1
355		7	max	3037.76	1	0	1	0	1	0	1	0	1	0	1
356			min	-435.942	3	0	1	0	1	0	1	0	1	0	1
357		8	max	3037.93	1	0	1	0	1	0	1	0	1	0	1
358			min	-435.814	3	0	1	0	1	0	1	0	1	0	1
359		9	max	3038.1	1	0	1	0	1	0	1	0	1	0	1
360			min	-435.686	3	0	1	0	1	0	1	0	1	0	1
361		10	max	3038.271	1	0	1	0	1	0	1	0	1	0	1
362			min	-435.558	3	0	1	0	1	0	1	0	1	0	1
363		11	max	3038.441	1	0	1	0	1	0	1	0	1	0	1
364			min	-435.43	3	0	1	0	1	0	1	0	1	0	1
365		12	max	3038.611	1	0	1	0	1	0	1	0	1	0	1
366			min	-435.303	3	0	1	0	1	0	1	0	1	0	1
367		13	max	3038.782	1	0	1	0	1	0	1	0	1	0	1
368			min	-435.175	3	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	3038.952	1	0	1	0	1	0	1	0	1	0	1
370			min	-435.047	3	0	1	0	1	0	1	0	1	0	1
371		15	max	3039.122	1	0	1	0	1	0	1	0	1	0	1
372			min	-434.919	3	0	1	0	1	0	1	0	1	0	1
373		16	max	3039.293	1	0	1	0	1	0	1	0	1	0	1
374			min	-434.792	3	0	1	0	1	0	1	0	1	0	1
375		17	max	3039.463	1	0	1	0	1	0	1	0	1	0	1
376			min	-434.664	3	0	1	0	1	0	1	0	1	0	1
377		18	max	3039.633	1	0	1	0	1	0	1	0	1	0	1
378			min	-434.536	3	0	1	0	1	0	1	0	1	0	1
379		19	max	3039.804	1	0	1	0	1	0	1	0	1	0	1
380			min	-434.408	3	0	1	0	1	0	1	0	1	0	1
381	M10	1	max	1065.523	1	2.023	4	-.025	15	0	1	0	1	0	1
382			min	-1298.617	3	.476	15	-.626	1	0	3	0	3	0	1
383		2	max	1065.997	1	1.986	4	-.025	15	0	1	0	15	0	15
384			min	-1298.262	3	.467	15	-.626	1	0	3	0	1	0	4
385		3	max	1066.47	1	1.949	4	-.025	15	0	1	0	15	0	15
386			min	-1297.906	3	.458	15	-.626	1	0	3	0	1	-.001	4
387		4	max	1066.944	1	1.912	4	-.025	15	0	1	0	15	0	15
388			min	-1297.551	3	.45	15	-.626	1	0	3	0	1	-.002	4
389		5	max	1067.418	1	1.875	4	-.025	15	0	1	0	15	0	15
390			min	-1297.196	3	.441	15	-.626	1	0	3	0	1	-.002	4
391		6	max	1067.892	1	1.838	4	-.025	15	0	1	0	15	0	15
392			min	-1296.841	3	.432	15	-.626	1	0	3	0	1	-.003	4
393		7	max	1068.365	1	1.801	4	-.025	15	0	1	0	15	0	15
394			min	-1296.485	3	.424	15	-.626	1	0	3	-.001	1	-.004	4
395		8	max	1068.839	1	1.764	4	-.025	15	0	1	0	15	0	15
396			min	-1296.13	3	.415	15	-.626	1	0	3	-.001	1	-.004	4
397		9	max	1069.313	1	1.727	4	-.025	15	0	1	0	15	-.001	15
398			min	-1295.775	3	.406	15	-.626	1	0	3	-.002	1	-.005	4
399		10	max	1069.787	1	1.69	4	-.025	15	0	1	0	15	-.001	15
400			min	-1295.419	3	.397	15	-.626	1	0	3	-.002	1	-.005	4
401		11	max	1070.26	1	1.653	4	-.025	15	0	1	0	15	-.001	15
402			min	-1295.064	3	.389	15	-.626	1	0	3	-.002	1	-.006	4
403		12	max	1070.734	1	1.616	4	-.025	15	0	1	0	15	-.002	15
404			min	-1294.709	3	.38	15	-.626	1	0	3	-.002	1	-.006	4
405		13	max	1071.208	1	1.579	4	-.025	15	0	1	0	15	-.002	15
406			min	-1294.353	3	.371	15	-.626	1	0	3	-.002	1	-.007	4
407		14	max	1071.682	1	1.542	4	-.025	15	0	1	0	15	-.002	15
408			min	-1293.998	3	.363	15	-.626	1	0	3	-.003	1	-.007	4
409		15	max	1072.155	1	1.505	4	-.025	15	0	1	0	15	-.002	15
410			min	-1293.643	3	.354	15	-.626	1	0	3	-.003	1	-.008	4
411		16	max	1072.629	1	1.468	4	-.025	15	0	1	0	15	-.002	15
412			min	-1293.287	3	.345	15	-.626	1	0	3	-.003	1	-.008	4
413		17	max	1073.103	1	1.431	4	-.025	15	0	1	0	15	-.002	15
414			min	-1292.932	3	.337	15	-.626	1	0	3	-.003	1	-.009	4
415		18	max	1073.576	1	1.394	4	-.025	15	0	1	0	15	-.002	15
416			min	-1292.577	3	.328	15	-.626	1	0	3	-.003	1	-.009	4
417		19	max	1074.05	1	1.357	4	-.025	15	0	1	0	15	-.002	15
418			min	-1292.222	3	.319	15	-.626	1	0	3	-.004	1	-.01	4
419	M11	1	max	606.648	2	8.993	4	-.011	15	0	1	0	15	.01	4
420			min	-755.784	3	2.114	15	-.278	1	0	5	0	1	.002	15
421		2	max	606.477	2	8.121	4	-.011	15	0	1	0	15	.006	4
422			min	-755.911	3	1.909	15	-.278	1	0	5	0	1	.001	12
423		3	max	606.307	2	7.249	4	-.011	15	0	1	0	15	.003	2
424			min	-756.039	3	1.704	15	-.278	1	0	5	0	1	0	3
425		4	max	606.137	2	6.377	4	-.011	15	0	1	0	15	0	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
426			min	-756.167	3	1.499	15	-.278	1	0	5	0	1	-.002	3
427		5	max	605.966	2	5.505	4	-.011	15	0	1	0	15	0	15
428			min	-756.295	3	1.294	15	-.278	1	0	5	0	1	-.004	4
429		6	max	605.796	2	4.633	4	-.011	15	0	1	0	15	-.001	15
430			min	-756.422	3	1.089	15	-.278	1	0	5	0	1	-.006	4
431		7	max	605.626	2	3.761	4	-.011	15	0	1	0	15	-.002	15
432			min	-756.55	3	.884	15	-.278	1	0	5	-.001	1	-.008	4
433		8	max	605.455	2	2.889	4	-.011	15	0	1	0	15	-.002	15
434			min	-756.678	3	.679	15	-.278	1	0	5	-.001	1	-.01	4
435		9	max	605.285	2	2.017	4	-.011	15	0	1	0	15	-.003	15
436			min	-756.806	3	.474	15	-.278	1	0	5	-.001	1	-.011	4
437		10	max	605.115	2	1.145	4	-.011	15	0	1	0	15	-.003	15
438			min	-756.934	3	.269	15	-.278	1	0	5	-.001	1	-.012	4
439		11	max	604.944	2	.366	2	-.011	15	0	1	0	15	-.003	15
440			min	-757.061	3	-.051	3	-.278	1	0	5	-.002	1	-.012	4
441		12	max	604.774	2	-.141	15	-.011	15	0	1	0	15	-.003	15
442			min	-757.189	3	-.599	4	-.278	1	0	5	-.002	1	-.012	4
443		13	max	604.604	2	-.346	15	-.011	15	0	1	0	15	-.003	15
444			min	-757.317	3	-1.471	4	-.278	1	0	5	-.002	1	-.012	4
445		14	max	604.433	2	-.551	15	-.011	15	0	1	0	15	-.003	15
446			min	-757.445	3	-2.343	4	-.278	1	0	5	-.002	1	-.011	4
447		15	max	604.263	2	-.756	15	-.011	15	0	1	0	15	-.002	15
448			min	-757.572	3	-3.215	4	-.278	1	0	5	-.002	1	-.009	4
449		16	max	604.093	2	-.961	15	-.011	15	0	1	0	15	-.002	15
450			min	-757.7	3	-4.087	4	-.278	1	0	5	-.002	1	-.008	4
451		17	max	603.922	2	-1.166	15	-.011	15	0	1	0	15	-.001	15
452			min	-757.828	3	-4.959	4	-.278	1	0	5	-.002	1	-.006	4
453		18	max	603.752	2	-1.371	15	-.011	15	0	1	0	15	0	15
454			min	-757.956	3	-5.831	4	-.278	1	0	5	-.002	1	-.003	4
455		19	max	603.582	2	-1.576	15	-.011	15	0	1	0	15	0	1
456			min	-758.083	3	-6.703	4	-.278	1	0	5	-.003	1	0	1
457	M12	1	max	1130.995	1	0	1	13.496	1	0	1	0	15	0	1
458			min	-112.897	3	0	1	.548	15	0	1	-.002	1	0	1
459		2	max	1131.166	1	0	1	13.496	1	0	1	0	15	0	1
460			min	-112.769	3	0	1	.548	15	0	1	0	1	0	1
461		3	max	1131.336	1	0	1	13.496	1	0	1	.001	1	0	1
462			min	-112.641	3	0	1	.548	15	0	1	0	15	0	1
463		4	max	1131.506	1	0	1	13.496	1	0	1	.003	1	0	1
464			min	-112.514	3	0	1	.548	15	0	1	0	15	0	1
465		5	max	1131.677	1	0	1	13.496	1	0	1	.004	1	0	1
466			min	-112.386	3	0	1	.548	15	0	1	0	15	0	1
467		6	max	1131.847	1	0	1	13.496	1	0	1	.006	1	0	1
468			min	-112.258	3	0	1	.548	15	0	1	0	15	0	1
469		7	max	1132.018	1	0	1	13.496	1	0	1	.008	1	0	1
470			min	-112.13	3	0	1	.548	15	0	1	0	15	0	1
471		8	max	1132.188	1	0	1	13.496	1	0	1	.009	1	0	1
472			min	-112.003	3	0	1	.548	15	0	1	0	15	0	1
473		9	max	1132.358	1	0	1	13.496	1	0	1	.011	1	0	1
474			min	-111.875	3	0	1	.548	15	0	1	0	15	0	1
475		10	max	1132.529	1	0	1	13.496	1	0	1	.012	1	0	1
476			min	-111.747	3	0	1	.548	15	0	1	0	15	0	1
477		11	max	1132.699	1	0	1	13.496	1	0	1	.014	1	0	1
478			min	-111.619	3	0	1	.548	15	0	1	0	15	0	1
479		12	max	1132.869	1	0	1	13.496	1	0	1	.015	1	0	1
480			min	-111.492	3	0	1	.548	15	0	1	0	15	0	1
481		13	max	1133.04	1	0	1	13.496	1	0	1	.017	1	0	1
482			min	-111.364	3	0	1	.548	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	1133.21	1	0	1	13.496	1	0	1	.018	1	0	1
484			min	-111.236	3	0	1	.548	15	0	1	0	15	0	1
485		15	max	1133.38	1	0	1	13.496	1	0	1	.02	1	0	1
486			min	-111.108	3	0	1	.548	15	0	1	0	15	0	1
487		16	max	1133.551	1	0	1	13.496	1	0	1	.021	1	0	1
488			min	-110.981	3	0	1	.548	15	0	1	0	15	0	1
489		17	max	1133.721	1	0	1	13.496	1	0	1	.023	1	0	1
490			min	-110.853	3	0	1	.548	15	0	1	0	15	0	1
491		18	max	1133.891	1	0	1	13.496	1	0	1	.025	1	0	1
492			min	-110.725	3	0	1	.548	15	0	1	0	15	0	1
493		19	max	1134.062	1	0	1	13.496	1	0	1	.026	1	0	1
494			min	-110.597	3	0	1	.548	15	0	1	.001	15	0	1
495	M1	1	max	178.683	1	697.234	3	-3.202	15	0	1	.219	1	0	15
496			min	7.231	15	-448.857	1	-78.259	1	0	3	.009	15	-.015	2
497		2	max	179.395	1	696.088	3	-3.202	15	0	1	.171	1	.265	1
498			min	7.446	15	-450.384	1	-78.259	1	0	3	.007	15	-.435	3
499		3	max	490.769	3	534.673	1	-3.176	15	0	3	.122	1	.534	1
500			min	-306.051	2	-517.234	3	-77.87	1	0	1	.005	15	-.853	3
501		4	max	491.303	3	533.146	1	-3.176	15	0	3	.074	1	.203	1
502			min	-305.339	2	-518.379	3	-77.87	1	0	1	.003	15	-.532	3
503		5	max	491.837	3	531.619	1	-3.176	15	0	3	.026	1	-.005	15
504			min	-304.627	2	-519.524	3	-77.87	1	0	1	.001	15	-.21	3
505		6	max	492.371	3	530.092	1	-3.176	15	0	3	0	15	.113	3
506			min	-303.915	2	-520.669	3	-77.87	1	0	1	-.023	1	-.478	2
507		7	max	492.905	3	528.565	1	-3.176	15	0	3	-.003	15	.436	3
508			min	-303.203	2	-521.814	3	-77.87	1	0	1	-.071	1	-.804	2
509		8	max	493.439	3	527.038	1	-3.176	15	0	3	-.005	15	.76	3
510			min	-302.491	2	-522.96	3	-77.87	1	0	1	-.119	1	-1.129	2
511		9	max	507.33	3	43.382	2	-5.066	15	0	9	.076	1	.889	3
512			min	-227.801	2	.466	15	-124.15	1	0	3	.003	15	-1.29	2
513		10	max	507.864	3	41.855	2	-5.066	15	0	9	0	15	.867	3
514			min	-227.089	2	.005	15	-124.15	1	0	3	-.001	1	-1.317	2
515		11	max	508.398	3	40.328	2	-5.066	15	0	9	-.003	15	.846	3
516			min	-226.377	2	-1.846	4	-124.15	1	0	3	-.078	1	-1.342	2
517		12	max	522.124	3	337.741	3	-3.053	15	0	2	.117	1	.739	3
518			min	-151.638	2	-613.159	2	-75.051	1	0	3	.005	15	-1.189	2
519		13	max	522.658	3	336.595	3	-3.053	15	0	2	.07	1	.53	3
520			min	-150.926	2	-614.686	2	-75.051	1	0	3	.003	15	-.808	2
521		14	max	523.192	3	335.45	3	-3.053	15	0	2	.024	1	.321	3
522			min	-150.214	2	-616.213	2	-75.051	1	0	3	0	15	-.431	1
523		15	max	523.726	3	334.305	3	-3.053	15	0	2	0	15	.113	3
524			min	-149.502	2	-617.74	2	-75.051	1	0	3	-.023	1	-.072	1
525		16	max	524.26	3	333.16	3	-3.053	15	0	2	-.003	15	.34	2
526			min	-148.79	2	-619.267	2	-75.051	1	0	3	-.069	1	-.094	3
527		17	max	524.794	3	332.015	3	-3.053	15	0	2	-.005	15	.725	2
528			min	-148.078	2	-620.794	2	-75.051	1	0	3	-.116	1	-.3	3
529		18	max	-7.461	15	603.151	2	-3.589	15	0	3	-.007	15	.364	2
530			min	-179.902	1	-257.435	3	-87.901	1	0	2	-.167	1	-.147	3
531		19	max	-7.246	15	601.624	2	-3.589	15	0	3	-.009	15	.013	3
532			min	-179.19	1	-258.58	3	-87.901	1	0	2	-.222	1	-.011	1
533	M5	1	max	396.255	1	2314.732	3	0	1	0	1	0	1	.03	2
534			min	13.918	12	-1541.392	1	0	1	0	1	0	1	0	15
535		2	max	396.967	1	2313.586	3	0	1	0	1	0	1	.985	1
536			min	14.274	12	-1542.919	1	0	1	0	1	0	1	-1.431	3
537		3	max	1537.612	3	1505.639	1	0	1	0	1	0	1	1.91	1
538			min	-1016.712	2	-1573.845	3	0	1	0	1	0	1	-2.824	3
539		4	max	1538.146	3	1504.112	1	0	1	0	1	0	1	.976	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
540			min	-1016	2	-1574.99	3	0	1	0	1	0	1	-1.847	3
541		5	max	1538.68	3	1502.585	1	0	1	0	1	0	1	.043	1
542			min	-1015.288	2	-1576.135	3	0	1	0	1	0	1	-.869	3
543		6	max	1539.214	3	1501.058	1	0	1	0	1	0	1	.11	3
544			min	-1014.576	2	-1577.28	3	0	1	0	1	0	1	-.935	2
545		7	max	1539.748	3	1499.532	1	0	1	0	1	0	1	1.089	3
546			min	-1013.864	2	-1578.426	3	0	1	0	1	0	1	-1.853	2
547		8	max	1540.282	3	1498.005	1	0	1	0	1	0	1	2.069	3
548			min	-1013.152	2	-1579.571	3	0	1	0	1	0	1	-2.771	2
549		9	max	1560.417	3	145.81	2	0	1	0	1	0	1	2.388	3
550			min	-855.655	2	.462	15	0	1	0	1	0	1	-3.163	2
551		10	max	1560.951	3	144.283	2	0	1	0	1	0	1	2.304	3
552			min	-854.943	2	.002	15	0	1	0	1	0	1	-3.253	2
553		11	max	1561.485	3	142.756	2	0	1	0	1	0	1	2.222	3
554			min	-854.231	2	-1.657	4	0	1	0	1	0	1	-3.342	2
555		12	max	1581.949	3	994.065	3	0	1	0	1	0	1	1.946	3
556			min	-696.83	2	-1770.095	2	0	1	0	1	0	1	-2.985	2
557		13	max	1582.483	3	992.92	3	0	1	0	1	0	1	1.329	3
558			min	-696.118	2	-1771.622	2	0	1	0	1	0	1	-1.886	2
559		14	max	1583.017	3	991.775	3	0	1	0	1	0	1	.713	3
560			min	-695.406	2	-1773.149	2	0	1	0	1	0	1	-.812	1
561		15	max	1583.551	3	990.63	3	0	1	0	1	0	1	.314	2
562			min	-694.694	2	-1774.676	2	0	1	0	1	0	1	0	15
563		16	max	1584.085	3	989.485	3	0	1	0	1	0	1	1.416	2
564			min	-693.982	2	-1776.203	2	0	1	0	1	0	1	-.516	3
565		17	max	1584.619	3	988.339	3	0	1	0	1	0	1	2.519	2
566			min	-693.27	2	-1777.73	2	0	1	0	1	0	1	-1.13	3
567		18	max	-14.892	12	2047.063	2	0	1	0	1	0	1	1.29	2
568			min	-395.952	1	-906.528	3	0	1	0	1	0	1	-.589	3
569		19	max	-14.536	12	2045.537	2	0	1	0	1	0	1	.023	1
570			min	-395.24	1	-907.674	3	0	1	0	1	0	1	-.026	3
571	M9	1	max	178.683	1	697.234	3	78.259	1	0	3	-.009	15	0	15
572			min	7.231	15	-448.857	1	3.202	15	0	1	-.219	1	-.015	2
573		2	max	179.395	1	696.088	3	78.259	1	0	3	-.007	15	.265	1
574			min	7.446	15	-450.384	1	3.202	15	0	1	-.171	1	-.435	3
575		3	max	490.769	3	534.673	1	77.87	1	0	1	-.005	15	.534	1
576			min	-306.051	2	-517.234	3	3.176	15	0	3	-.122	1	-.853	3
577		4	max	491.303	3	533.146	1	77.87	1	0	1	-.003	15	.203	1
578			min	-305.339	2	-518.379	3	3.176	15	0	3	-.074	1	-.532	3
579		5	max	491.837	3	531.619	1	77.87	1	0	1	-.001	15	-.005	15
580			min	-304.627	2	-519.524	3	3.176	15	0	3	-.026	1	-.21	3
581		6	max	492.371	3	530.092	1	77.87	1	0	1	.023	1	.113	3
582			min	-303.915	2	-520.669	3	3.176	15	0	3	0	15	-.478	2
583		7	max	492.905	3	528.565	1	77.87	1	0	1	.071	1	.436	3
584			min	-303.203	2	-521.814	3	3.176	15	0	3	.003	15	-.804	2
585		8	max	493.439	3	527.038	1	77.87	1	0	1	.119	1	.76	3
586			min	-302.491	2	-522.96	3	3.176	15	0	3	.005	15	-1.129	2
587		9	max	507.33	3	43.382	2	124.15	1	0	3	-.003	15	.889	3
588			min	-227.801	2	.466	15	5.066	15	0	9	-.076	1	-1.29	2
589		10	max	507.864	3	41.855	2	124.15	1	0	3	.001	1	.867	3
590			min	-227.089	2	.005	15	5.066	15	0	9	0	15	-1.317	2
591		11	max	508.398	3	40.328	2	124.15	1	0	3	.078	1	.846	3
592			min	-226.377	2	-1.846	4	5.066	15	0	9	.003	15	-1.342	2
593		12	max	522.124	3	337.741	3	75.051	1	0	3	-.005	15	.739	3
594			min	-151.638	2	-613.159	2	3.053	15	0	2	-.117	1	-1.189	2
595		13	max	522.658	3	336.595	3	75.051	1	0	3	-.003	15	.53	3
596			min	-150.926	2	-614.686	2	3.053	15	0	2	-.07	1	-.808	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	523.192	3	335.45	3	75.051	1	0	3	0	15	.321	3
598			min	-150.214	2	-616.213	2	3.053	15	0	2	-.024	1	-.431	1
599		15	max	523.726	3	334.305	3	75.051	1	0	3	.023	1	.113	3
600			min	-149.502	2	-617.74	2	3.053	15	0	2	0	15	-.072	1
601		16	max	524.26	3	333.16	3	75.051	1	0	3	.069	1	.34	2
602			min	-148.79	2	-619.267	2	3.053	15	0	2	.003	15	-.094	3
603		17	max	524.794	3	332.015	3	75.051	1	0	3	.116	1	.725	2
604			min	-148.078	2	-620.794	2	3.053	15	0	2	.005	15	-.3	3
605		18	max	-7.461	15	603.151	2	87.901	1	0	2	.167	1	.364	2
606			min	-179.902	1	-257.435	3	3.589	15	0	3	.007	15	-.147	3
607		19	max	-7.246	15	601.624	2	87.901	1	0	2	.222	1	.013	3
608			min	-179.19	1	-258.58	3	3.589	15	0	3	.009	15	-.011	1

Envelope Member Section Deflections

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
1	M13	1	max	0	1	.196	2	.01	3	1.342e-2	2	NC	1	NC	1
2			min	0	15	-.041	3	-.005	2	-2.715e-3	3	NC	1	NC	1
3		2	max	0	1	.184	3	.03	1	1.472e-2	2	NC	5	NC	2
4			min	0	15	.003	15	0	10	-2.485e-3	3	933.074	3	7054.933	1
5		3	max	0	1	.367	3	.07	1	1.602e-2	2	NC	5	NC	3
6			min	0	15	-.022	1	.003	10	-2.254e-3	3	514.651	3	3000.179	1
7		4	max	0	1	.479	3	.104	1	1.732e-2	2	NC	5	NC	3
8			min	0	15	-.069	1	.004	15	-2.024e-3	3	403.353	3	2024.888	1
9		5	max	0	1	.508	3	.12	1	1.862e-2	2	NC	5	NC	3
10			min	0	15	-.063	1	.005	15	-1.794e-3	3	382.124	3	1749.079	1
11		6	max	0	1	.455	3	.115	1	1.992e-2	2	NC	5	NC	3
12			min	0	15	-.014	9	.004	10	-1.564e-3	3	422.904	3	1836.502	1
13		7	max	0	1	.337	3	.088	1	2.123e-2	2	NC	4	NC	3
14			min	0	15	.003	15	0	10	-1.334e-3	3	554.924	3	2386.664	1
15		8	max	0	1	.232	2	.049	1	2.253e-2	2	NC	1	NC	2
16			min	0	15	.006	15	-.005	10	-1.104e-3	3	925.284	3	4325.722	1
17		9	max	0	1	.328	2	.03	3	2.383e-2	2	NC	4	NC	1
18			min	0	15	.009	15	-.012	2	-8.736e-4	3	1589.873	2	NC	1
19		10	max	0	1	.371	2	.029	3	2.513e-2	2	NC	5	NC	1
20			min	0	1	-.015	3	-.02	2	-6.434e-4	3	1201.064	2	NC	1
21		11	max	0	15	.328	2	.03	3	2.383e-2	2	NC	4	NC	1
22			min	0	1	.009	15	-.012	2	-8.736e-4	3	1589.873	2	NC	1
23		12	max	0	15	.232	2	.049	1	2.253e-2	2	NC	1	NC	2
24			min	0	1	.006	15	-.005	10	-1.104e-3	3	925.284	3	4325.722	1
25		13	max	0	15	.337	3	.088	1	2.123e-2	2	NC	4	NC	3
26			min	0	1	.003	15	0	10	-1.334e-3	3	554.924	3	2386.664	1
27		14	max	0	15	.455	3	.115	1	1.992e-2	2	NC	5	NC	3
28			min	0	1	-.014	9	.004	10	-1.564e-3	3	422.904	3	1836.502	1
29		15	max	0	15	.508	3	.12	1	1.862e-2	2	NC	5	NC	3
30			min	0	1	-.063	1	.005	15	-1.794e-3	3	382.124	3	1749.079	1
31		16	max	0	15	.479	3	.104	1	1.732e-2	2	NC	5	NC	3
32			min	0	1	-.069	1	.004	15	-2.024e-3	3	403.353	3	2024.888	1
33		17	max	0	15	.367	3	.07	1	1.602e-2	2	NC	5	NC	3
34			min	0	1	-.022	1	.003	10	-2.254e-3	3	514.651	3	3000.179	1
35		18	max	0	15	.184	3	.03	1	1.472e-2	2	NC	5	NC	2
36			min	0	1	.003	15	0	10	-2.485e-3	3	933.074	3	7054.933	1
37		19	max	0	15	.196	2	.01	3	1.342e-2	2	NC	1	NC	1
38			min	0	1	-.041	3	-.005	2	-2.715e-3	3	NC	1	NC	1
39	M14	1	max	0	1	.366	3	.009	3	7.672e-3	2	NC	1	NC	1
40			min	0	15	-.595	2	-.005	2	-5.604e-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	.626	3	.02	1	8.923e-3	2	NC	5	NC	1
42			min	0	15	-.867	2	-.001	10	-6.639e-3	3	757.244	1	NC	1
43		3	max	0	1	.853	3	.054	1	1.017e-2	2	NC	5	NC	2
44			min	0	15	-1.111	2	.002	10	-7.674e-3	3	401.054	1	3930.209	1
45		4	max	0	1	1.022	3	.086	1	1.142e-2	2	NC	15	NC	3
46			min	0	15	-1.303	2	.004	15	-8.709e-3	3	292.891	1	2453.681	1
47		5	max	0	1	1.121	3	.104	1	1.268e-2	2	9734.879	15	NC	3
48			min	0	15	-1.433	2	.004	15	-9.744e-3	3	248.385	1	2029.491	1
49		6	max	0	1	1.149	3	.102	1	1.393e-2	2	9118.188	15	NC	3
50			min	0	15	-1.499	2	.004	10	-1.078e-2	3	231.53	1	2072.049	1
51		7	max	0	1	1.117	3	.08	1	1.518e-2	2	9149.417	15	NC	3
52			min	0	15	-1.507	2	0	10	-1.181e-2	3	230.056	2	2638.326	1
53		8	max	0	1	1.046	3	.045	1	1.643e-2	2	9625.966	15	NC	2
54			min	0	15	-1.475	2	-.005	10	-1.285e-2	3	238.417	2	4694.227	1
55		9	max	0	1	.97	3	.026	3	1.768e-2	2	NC	15	NC	1
56			min	0	15	-1.429	2	-.011	2	-1.388e-2	3	251.658	2	NC	1
57		10	max	0	1	.933	3	.026	3	1.893e-2	2	NC	15	NC	1
58			min	0	1	-1.404	2	-.018	2	-1.492e-2	3	259.461	2	NC	1
59		11	max	0	15	.97	3	.026	3	1.768e-2	2	NC	15	NC	1
60			min	0	1	-1.429	2	-.011	2	-1.388e-2	3	251.658	2	NC	1
61		12	max	0	15	1.046	3	.045	1	1.643e-2	2	9625.966	15	NC	2
62			min	0	1	-1.475	2	-.005	10	-1.285e-2	3	238.417	2	4694.227	1
63		13	max	0	15	1.117	3	.08	1	1.518e-2	2	9149.417	15	NC	3
64			min	0	1	-1.507	2	0	10	-1.181e-2	3	230.056	2	2638.326	1
65		14	max	0	15	1.149	3	.102	1	1.393e-2	2	9118.188	15	NC	3
66			min	0	1	-1.499	2	.004	10	-1.078e-2	3	231.53	1	2072.049	1
67		15	max	0	15	1.121	3	.104	1	1.268e-2	2	9734.879	15	NC	3
68			min	0	1	-1.433	2	.004	15	-9.744e-3	3	248.385	1	2029.491	1
69		16	max	0	15	1.022	3	.086	1	1.142e-2	2	NC	15	NC	3
70			min	0	1	-1.303	2	.004	15	-8.709e-3	3	292.891	1	2453.681	1
71		17	max	0	15	.853	3	.054	1	1.017e-2	2	NC	5	NC	2
72			min	0	1	-1.111	2	.002	10	-7.674e-3	3	401.054	1	3930.209	1
73		18	max	0	15	.626	3	.02	1	8.923e-3	2	NC	5	NC	1
74			min	0	1	-.867	2	-.001	10	-6.639e-3	3	757.244	1	NC	1
75		19	max	0	15	.366	3	.009	3	7.672e-3	2	NC	1	NC	1
76			min	0	1	-.595	2	-.005	2	-5.604e-3	3	NC	1	NC	1
77	M15	1	max	0	15	.375	3	.008	3	4.687e-3	3	NC	1	NC	1
78			min	0	1	-.593	2	-.004	2	-7.947e-3	2	NC	1	NC	1
79		2	max	0	15	.556	3	.02	1	5.547e-3	3	NC	5	NC	1
80			min	0	1	-.921	2	-.001	10	-9.249e-3	2	641.836	2	NC	1
81		3	max	0	15	.719	3	.054	1	6.407e-3	3	NC	5	NC	2
82			min	0	1	-1.208	2	.002	10	-1.055e-2	2	341.826	2	3907.615	1
83		4	max	0	15	.85	3	.087	1	7.267e-3	3	NC	15	NC	3
84			min	0	1	-1.427	2	.004	15	-1.185e-2	2	251.95	2	2442.193	1
85		5	max	0	15	.941	3	.105	1	8.127e-3	3	9754.233	15	NC	3
86			min	0	1	-1.563	2	.004	15	-1.316e-2	2	216.539	2	2020.426	1
87		6	max	0	15	.992	3	.103	1	8.988e-3	3	9138.577	15	NC	3
88			min	0	1	-1.615	2	.004	10	-1.446e-2	2	205.568	2	2061.87	1
89		7	max	0	15	1.006	3	.081	1	9.848e-3	3	9172.817	15	NC	3
90			min	0	1	-1.594	2	0	10	-1.576e-2	2	209.957	2	2621.294	1
91		8	max	0	15	.994	3	.046	1	1.071e-2	3	9654.299	15	NC	2
92			min	0	1	-1.524	2	-.004	10	-1.706e-2	2	225.73	2	4640.159	1
93		9	max	0	15	.97	3	.024	3	1.157e-2	3	NC	15	NC	1
94			min	0	1	-1.443	2	-.01	2	-1.837e-2	2	247.169	2	NC	1
95		10	max	0	1	.956	3	.024	3	1.243e-2	3	NC	15	NC	1
96			min	0	1	-1.402	2	-.017	2	-1.967e-2	2	259.589	2	NC	1
97		11	max	0	1	.97	3	.024	3	1.157e-2	3	NC	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
98			min	0	15	-1.443	2	-.01	2	-1.837e-2	2	247.169	2	NC	1
99		12	max	0	1	.994	3	.046	1	1.071e-2	3	9654.299	15	NC	2
100			min	0	15	-1.524	2	-.004	10	-1.706e-2	2	225.73	2	4640.159	1
101		13	max	0	1	1.006	3	.081	1	9.848e-3	3	9172.817	15	NC	3
102			min	0	15	-1.594	2	0	10	-1.576e-2	2	209.957	2	2621.294	1
103		14	max	0	1	.992	3	.103	1	8.988e-3	3	9138.577	15	NC	3
104			min	0	15	-1.615	2	.004	10	-1.446e-2	2	205.568	2	2061.87	1
105		15	max	0	1	.941	3	.105	1	8.127e-3	3	9754.233	15	NC	3
106			min	0	15	-1.563	2	.004	15	-1.316e-2	2	216.539	2	2020.426	1
107		16	max	0	1	.85	3	.087	1	7.267e-3	3	NC	15	NC	3
108			min	0	15	-1.427	2	.004	15	-1.185e-2	2	251.95	2	2442.193	1
109		17	max	0	1	.719	3	.054	1	6.407e-3	3	NC	5	NC	2
110			min	0	15	-1.208	2	.002	10	-1.055e-2	2	341.826	2	3907.615	1
111		18	max	0	1	.556	3	.02	1	5.547e-3	3	NC	5	NC	1
112			min	0	15	-.921	2	-.001	10	-9.249e-3	2	641.836	2	NC	1
113		19	max	0	1	.375	3	.008	3	4.687e-3	3	NC	1	NC	1
114			min	0	15	-.593	2	-.004	2	-7.947e-3	2	NC	1	NC	1
115	M16	1	max	0	15	.181	1	.007	3	8.797e-3	3	NC	1	NC	1
116			min	0	1	-.131	3	-.004	2	-1.174e-2	1	NC	1	NC	1
117		2	max	0	15	.032	1	.03	1	9.895e-3	3	NC	5	NC	2
118			min	0	1	-.072	3	0	10	-1.271e-2	1	1231.32	2	7135.816	1
119		3	max	0	15	.001	13	.07	1	1.099e-2	3	NC	5	NC	3
120			min	0	1	-.128	2	.003	15	-1.368e-2	1	688.634	2	3015.252	1
121		4	max	0	15	0	15	.104	1	1.209e-2	3	NC	5	NC	3
122			min	0	1	-.203	2	.004	15	-1.466e-2	1	553.932	2	2027.109	1
123		5	max	0	15	0	15	.121	1	1.319e-2	3	NC	5	NC	3
124			min	0	1	-.205	2	.005	15	-1.563e-2	1	549.657	2	1744.788	1
125		6	max	0	15	.003	13	.116	1	1.429e-2	3	NC	5	NC	3
126			min	0	1	-.139	2	.005	15	-1.66e-2	1	664.606	2	1823.73	1
127		7	max	0	15	.034	9	.09	1	1.538e-2	3	NC	3	NC	3
128			min	0	1	-.125	3	.003	10	-1.757e-2	1	1070.4	2	2351.211	1
129		8	max	0	15	.161	1	.051	1	1.648e-2	3	NC	1	NC	2
130			min	0	1	-.196	3	-.003	10	-1.854e-2	1	3206.619	3	4171.317	1
131		9	max	0	15	.278	1	.021	3	1.758e-2	3	NC	4	NC	1
132			min	0	1	-.258	3	-.008	2	-1.951e-2	1	1656.219	3	NC	1
133		10	max	0	1	.33	1	.021	3	1.868e-2	3	NC	5	NC	1
134			min	0	1	-.285	3	-.016	2	-2.049e-2	1	1365.595	3	NC	1
135		11	max	0	1	.278	1	.021	3	1.758e-2	3	NC	4	NC	1
136			min	0	15	-.258	3	-.008	2	-1.951e-2	1	1656.219	3	NC	1
137		12	max	0	1	.161	1	.051	1	1.648e-2	3	NC	1	NC	2
138			min	0	15	-.196	3	-.003	10	-1.854e-2	1	3206.619	3	4171.317	1
139		13	max	0	1	.034	9	.09	1	1.538e-2	3	NC	3	NC	3
140			min	0	15	-.125	3	.003	10	-1.757e-2	1	1070.4	2	2351.211	1
141		14	max	0	1	.003	13	.116	1	1.429e-2	3	NC	5	NC	3
142			min	0	15	-.139	2	.005	15	-1.66e-2	1	664.606	2	1823.73	1
143		15	max	0	1	0	15	.121	1	1.319e-2	3	NC	5	NC	3
144			min	0	15	-.205	2	.005	15	-1.563e-2	1	549.657	2	1744.788	1
145		16	max	0	1	0	15	.104	1	1.209e-2	3	NC	5	NC	3
146			min	0	15	-.203	2	.004	15	-1.466e-2	1	553.932	2	2027.109	1
147		17	max	0	1	.001	13	.07	1	1.099e-2	3	NC	5	NC	3
148			min	0	15	-.128	2	.003	15	-1.368e-2	1	688.634	2	3015.252	1
149		18	max	0	1	.032	1	.03	1	9.895e-3	3	NC	5	NC	2
150			min	0	15	-.072	3	0	10	-1.271e-2	1	1231.32	2	7135.816	1
151		19	max	0	1	.181	1	.007	3	8.797e-3	3	NC	1	NC	1
152			min	0	15	-.131	3	-.004	2	-1.174e-2	1	NC	1	NC	1
153	M2	1	max	.007	1	.008	2	.01	1	-9.457e-6	15	NC	1	NC	2
154			min	-.009	3	-.014	3	0	15	-2.319e-4	1	8161.083	2	6753.189	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	1	.007	2	.009	1	-8.927e-6	15	NC	1	NC	2
156			min	-.008	3	-.013	3	0	15	-2.189e-4	1	9539.056	2	7363.136	1
157		3	max	.006	1	.006	2	.009	1	-8.397e-6	15	NC	1	NC	2
158			min	-.008	3	-.013	3	0	15	-2.058e-4	1	NC	1	8089.519	1
159		4	max	.006	1	.005	2	.008	1	-7.866e-6	15	NC	1	NC	2
160			min	-.007	3	-.012	3	0	15	-1.928e-4	1	NC	1	8963.061	1
161		5	max	.006	1	.004	2	.007	1	-7.336e-6	15	NC	1	NC	1
162			min	-.007	3	-.012	3	0	15	-1.798e-4	1	NC	1	NC	1
163		6	max	.005	1	.003	2	.006	1	-6.805e-6	15	NC	1	NC	1
164			min	-.006	3	-.011	3	0	15	-1.668e-4	1	NC	1	NC	1
165		7	max	.005	1	.002	2	.005	1	-6.275e-6	15	NC	1	NC	1
166			min	-.006	3	-.011	3	0	15	-1.537e-4	1	NC	1	NC	1
167		8	max	.004	1	0	2	.005	1	-5.744e-6	15	NC	1	NC	1
168			min	-.005	3	-.01	3	0	15	-1.407e-4	1	NC	1	NC	1
169		9	max	.004	1	0	2	.004	1	-5.214e-6	15	NC	1	NC	1
170			min	-.005	3	-.01	3	0	15	-1.277e-4	1	NC	1	NC	1
171		10	max	.004	1	0	2	.003	1	-4.683e-6	15	NC	1	NC	1
172			min	-.004	3	-.009	3	0	15	-1.147e-4	1	NC	1	NC	1
173		11	max	.003	1	-.001	2	.003	1	-4.153e-6	15	NC	1	NC	1
174			min	-.004	3	-.008	3	0	15	-1.016e-4	1	NC	1	NC	1
175		12	max	.003	1	-.001	15	.002	1	-3.622e-6	15	NC	1	NC	1
176			min	-.003	3	-.008	3	0	15	-8.86e-5	1	NC	1	NC	1
177		13	max	.002	1	-.001	15	.002	1	-3.092e-6	15	NC	1	NC	1
178			min	-.003	3	-.007	3	0	15	-7.557e-5	1	NC	1	NC	1
179		14	max	.002	1	-.001	15	.001	1	-2.561e-6	15	NC	1	NC	1
180			min	-.002	3	-.006	3	0	15	-6.255e-5	1	NC	1	NC	1
181		15	max	.002	1	-.001	15	0	1	-2.031e-6	15	NC	1	NC	1
182			min	-.002	3	-.005	3	0	15	-4.952e-5	1	NC	1	NC	1
183		16	max	.001	1	0	15	0	1	-1.501e-6	15	NC	1	NC	1
184			min	-.001	3	-.004	4	0	15	-3.649e-5	1	NC	1	NC	1
185		17	max	0	1	0	15	0	1	-9.701e-7	15	NC	1	NC	1
186			min	0	3	-.003	4	0	15	-2.347e-5	1	NC	1	NC	1
187		18	max	0	1	0	15	0	1	-4.396e-7	15	NC	1	NC	1
188			min	0	3	-.002	4	0	15	-1.044e-5	1	NC	1	NC	1
189		19	max	0	1	0	1	0	1	2.584e-6	1	NC	1	NC	1
190			min	0	1	0	1	0	1	-2.766e-7	3	NC	1	NC	1
191	M3	1	max	0	1	0	1	0	1	-5.581e-8	12	NC	1	NC	1
192			min	0	1	0	1	0	1	-2.14e-6	1	NC	1	NC	1
193		2	max	0	3	0	15	0	1	2.571e-5	1	NC	1	NC	1
194			min	0	2	-.003	4	0	3	1.046e-6	15	NC	1	NC	1
195		3	max	0	3	-.001	15	0	1	5.356e-5	1	NC	1	NC	1
196			min	0	2	-.006	4	0	3	2.176e-6	15	NC	1	NC	1
197		4	max	.001	3	-.002	15	0	1	8.14e-5	1	NC	1	NC	1
198			min	0	2	-.009	4	0	12	3.306e-6	15	NC	1	NC	1
199		5	max	.002	3	-.003	15	0	1	1.093e-4	1	NC	1	NC	1
200			min	-.001	2	-.012	4	0	12	4.436e-6	15	8796.735	4	NC	1
201		6	max	.002	3	-.003	15	0	1	1.371e-4	1	NC	2	NC	1
202			min	-.002	2	-.015	4	0	12	5.566e-6	15	7101.193	4	NC	1
203		7	max	.002	3	-.004	15	0	1	1.649e-4	1	NC	5	NC	1
204			min	-.002	2	-.017	4	0	15	6.697e-6	15	6081.386	4	NC	1
205		8	max	.003	3	-.004	15	0	1	1.928e-4	1	NC	5	NC	1
206			min	-.002	2	-.019	4	0	15	7.827e-6	15	5452.072	4	NC	1
207		9	max	.003	3	-.005	15	.001	1	2.206e-4	1	NC	5	NC	1
208			min	-.003	2	-.02	4	0	15	8.957e-6	15	5079.087	4	NC	1
209		10	max	.004	3	-.005	15	.002	1	2.485e-4	1	NC	5	NC	1
210			min	-.003	2	-.021	4	0	15	1.009e-5	15	4897.222	4	NC	1
211		11	max	.004	3	-.005	15	.002	1	2.763e-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	-.003	2	-.021	4	0	15	1.122e-5	15	4879.606	4	NC	1
213		12	max	.005	3	-.005	15	.003	1	3.042e-4	1	NC	5	NC	1
214			min	-.004	2	-.021	4	0	15	1.235e-5	15	5027.388	4	NC	1
215		13	max	.005	3	-.005	15	.003	1	3.32e-4	1	NC	5	NC	1
216			min	-.004	2	-.02	4	0	15	1.348e-5	15	5371.493	4	NC	1
217		14	max	.005	3	-.004	15	.004	1	3.599e-4	1	NC	5	NC	1
218			min	-.004	2	-.018	4	0	15	1.461e-5	15	5988.74	4	NC	1
219		15	max	.006	3	-.003	15	.005	1	3.877e-4	1	NC	3	NC	1
220			min	-.005	2	-.015	4	0	15	1.574e-5	15	7049.732	4	NC	1
221		16	max	.006	3	-.003	15	.006	1	4.156e-4	1	NC	1	NC	1
222			min	-.005	2	-.012	4	0	15	1.687e-5	15	8967.919	4	NC	1
223		17	max	.007	3	-.002	15	.007	1	4.434e-4	1	NC	1	NC	1
224			min	-.005	2	-.009	4	0	15	1.8e-5	15	NC	1	NC	1
225		18	max	.007	3	-.001	15	.008	1	4.713e-4	1	NC	1	NC	1
226			min	-.006	2	-.005	1	0	15	1.913e-5	15	NC	1	NC	1
227		19	max	.007	3	0	15	.01	1	4.991e-4	1	NC	1	NC	1
228			min	-.006	2	-.002	1	0	15	2.026e-5	15	NC	1	NC	1
229	M4	1	max	.003	1	.006	2	0	15	1.274e-4	1	NC	1	NC	3
230			min	0	3	-.008	3	-.01	1	5.201e-6	15	NC	1	2598.693	1
231		2	max	.003	1	.005	2	0	15	1.274e-4	1	NC	1	NC	3
232			min	0	3	-.007	3	-.009	1	5.201e-6	15	NC	1	2823.518	1
233		3	max	.002	1	.005	2	0	15	1.274e-4	1	NC	1	NC	3
234			min	0	3	-.007	3	-.008	1	5.201e-6	15	NC	1	3091.236	1
235		4	max	.002	1	.005	2	0	15	1.274e-4	1	NC	1	NC	3
236			min	0	3	-.006	3	-.007	1	5.201e-6	15	NC	1	3412.966	1
237		5	max	.002	1	.004	2	0	15	1.274e-4	1	NC	1	NC	3
238			min	0	3	-.006	3	-.007	1	5.201e-6	15	NC	1	3803.817	1
239		6	max	.002	1	.004	2	0	15	1.274e-4	1	NC	1	NC	2
240			min	0	3	-.005	3	-.006	1	5.201e-6	15	NC	1	4284.744	1
241		7	max	.002	1	.004	2	0	15	1.274e-4	1	NC	1	NC	2
242			min	0	3	-.005	3	-.005	1	5.201e-6	15	NC	1	4885.491	1
243		8	max	.002	1	.003	2	0	15	1.274e-4	1	NC	1	NC	2
244			min	0	3	-.005	3	-.004	1	5.201e-6	15	NC	1	5649.435	1
245		9	max	.002	1	.003	2	0	15	1.274e-4	1	NC	1	NC	2
246			min	0	3	-.004	3	-.004	1	5.201e-6	15	NC	1	6641.874	1
247		10	max	.001	1	.003	2	0	15	1.274e-4	1	NC	1	NC	2
248			min	0	3	-.004	3	-.003	1	5.201e-6	15	NC	1	7964.871	1
249		11	max	.001	1	.002	2	0	15	1.274e-4	1	NC	1	NC	2
250			min	0	3	-.003	3	-.003	1	5.201e-6	15	NC	1	9785.368	1
251		12	max	.001	1	.002	2	0	15	1.274e-4	1	NC	1	NC	1
252			min	0	3	-.003	3	-.002	1	5.201e-6	15	NC	1	NC	1
253		13	max	0	1	.002	2	0	15	1.274e-4	1	NC	1	NC	1
254			min	0	3	-.003	3	-.002	1	5.201e-6	15	NC	1	NC	1
255		14	max	0	1	.002	2	0	15	1.274e-4	1	NC	1	NC	1
256			min	0	3	-.002	3	-.001	1	5.201e-6	15	NC	1	NC	1
257		15	max	0	1	.001	2	0	15	1.274e-4	1	NC	1	NC	1
258			min	0	3	-.002	3	0	1	5.201e-6	15	NC	1	NC	1
259		16	max	0	1	0	2	0	15	1.274e-4	1	NC	1	NC	1
260			min	0	3	-.001	3	0	1	5.201e-6	15	NC	1	NC	1
261		17	max	0	1	0	2	0	15	1.274e-4	1	NC	1	NC	1
262			min	0	3	0	3	0	1	5.201e-6	15	NC	1	NC	1
263		18	max	0	1	0	2	0	15	1.274e-4	1	NC	1	NC	1
264			min	0	3	0	3	0	1	5.201e-6	15	NC	1	NC	1
265		19	max	0	1	0	1	0	1	1.274e-4	1	NC	1	NC	1
266			min	0	1	0	1	0	1	5.201e-6	15	NC	1	NC	1
267	M6	1	max	.022	1	.03	2	0	1	0	1	NC	3	NC	1
268			min	-.028	3	-.042	3	0	1	0	1	2275.603	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
269		2	max	.021	1	.028	2	0	1	0	1	NC	3	NC	1
270			min	-.026	3	-.04	3	0	1	0	1	2496.673	2	NC	1
271		3	max	.02	1	.025	2	0	1	0	1	NC	3	NC	1
272			min	-.024	3	-.038	3	0	1	0	1	2763.155	2	NC	1
273		4	max	.018	1	.022	2	0	1	0	1	NC	3	NC	1
274			min	-.023	3	-.035	3	0	1	0	1	3087.944	2	NC	1
275		5	max	.017	1	.02	2	0	1	0	1	NC	3	NC	1
276			min	-.021	3	-.033	3	0	1	0	1	3489.01	2	NC	1
277		6	max	.016	1	.017	2	0	1	0	1	NC	3	NC	1
278			min	-.02	3	-.031	3	0	1	0	1	3992.009	2	NC	1
279		7	max	.015	1	.015	2	0	1	0	1	NC	3	NC	1
280			min	-.018	3	-.028	3	0	1	0	1	4634.607	2	NC	1
281		8	max	.014	1	.013	2	0	1	0	1	NC	1	NC	1
282			min	-.017	3	-.026	3	0	1	0	1	5473.969	2	NC	1
283		9	max	.012	1	.01	2	0	1	0	1	NC	1	NC	1
284			min	-.015	3	-.024	3	0	1	0	1	6600.347	2	NC	1
285		10	max	.011	1	.008	2	0	1	0	1	NC	1	NC	1
286			min	-.014	3	-.021	3	0	1	0	1	8163.264	2	NC	1
287		11	max	.01	1	.007	2	0	1	0	1	NC	1	NC	1
288			min	-.012	3	-.019	3	0	1	0	1	NC	1	NC	1
289		12	max	.009	1	.005	2	0	1	0	1	NC	1	NC	1
290			min	-.011	3	-.017	3	0	1	0	1	NC	1	NC	1
291		13	max	.007	1	.004	2	0	1	0	1	NC	1	NC	1
292			min	-.009	3	-.014	3	0	1	0	1	NC	1	NC	1
293		14	max	.006	1	.002	2	0	1	0	1	NC	1	NC	1
294			min	-.008	3	-.012	3	0	1	0	1	NC	1	NC	1
295		15	max	.005	1	.001	2	0	1	0	1	NC	1	NC	1
296			min	-.006	3	-.01	3	0	1	0	1	NC	1	NC	1
297		16	max	.004	1	0	2	0	1	0	1	NC	1	NC	1
298			min	-.005	3	-.007	3	0	1	0	1	NC	1	NC	1
299		17	max	.002	1	0	2	0	1	0	1	NC	1	NC	1
300			min	-.003	3	-.005	3	0	1	0	1	NC	1	NC	1
301		18	max	.001	1	0	2	0	1	0	1	NC	1	NC	1
302			min	-.002	3	-.002	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	15	0	1	0	1	NC	1	NC	1
308			min	-.001	2	-.004	3	0	1	0	1	NC	1	NC	1
309		3	max	.003	3	-.001	15	0	1	0	1	NC	1	NC	1
310			min	-.002	2	-.007	3	0	1	0	1	NC	1	NC	1
311		4	max	.004	3	-.002	15	0	1	0	1	NC	1	NC	1
312			min	-.004	2	-.01	3	0	1	0	1	NC	1	NC	1
313		5	max	.005	3	-.003	15	0	1	0	1	NC	1	NC	1
314			min	-.005	2	-.013	3	0	1	0	1	8475.34	3	NC	1
315		6	max	.006	3	-.003	15	0	1	0	1	NC	1	NC	1
316			min	-.006	2	-.016	3	0	1	0	1	7129.233	3	NC	1
317		7	max	.008	3	-.004	15	0	1	0	1	NC	1	NC	1
318			min	-.007	2	-.018	3	0	1	0	1	6201.449	4	NC	1
319		8	max	.009	3	-.004	15	0	1	0	1	NC	2	NC	1
320			min	-.008	2	-.019	3	0	1	0	1	5551.69	4	NC	1
321		9	max	.01	3	-.005	15	0	1	0	1	NC	5	NC	1
322			min	-.009	2	-.02	4	0	1	0	1	5165.708	4	NC	1
323		10	max	.011	3	-.005	15	0	1	0	1	NC	5	NC	1
324			min	-.011	2	-.021	4	0	1	0	1	4975.767	4	NC	1
325		11	max	.013	3	-.005	15	0	1	0	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
326			min	-.012	2	-.021	4	0	1	0	1	4953.71	4	NC	1
327		12	max	.014	3	-.005	15	0	1	0	1	NC	5	NC	1
328			min	-.013	2	-.021	4	0	1	0	1	5100.135	4	NC	1
329		13	max	.015	3	-.005	15	0	1	0	1	NC	5	NC	1
330			min	-.014	2	-.02	4	0	1	0	1	5445.997	4	NC	1
331		14	max	.016	3	-.004	15	0	1	0	1	NC	2	NC	1
332			min	-.015	2	-.018	4	0	1	0	1	6068.823	4	NC	1
333		15	max	.018	3	-.004	15	0	1	0	1	NC	1	NC	1
334			min	-.017	2	-.016	3	0	1	0	1	7141.146	4	NC	1
335		16	max	.019	3	-.003	15	0	1	0	1	NC	1	NC	1
336			min	-.018	2	-.013	3	0	1	0	1	9081.351	4	NC	1
337		17	max	.02	3	-.002	15	0	1	0	1	NC	1	NC	1
338			min	-.019	2	-.011	3	0	1	0	1	NC	1	NC	1
339		18	max	.021	3	-.001	15	0	1	0	1	NC	1	NC	1
340			min	-.02	2	-.008	3	0	1	0	1	NC	1	NC	1
341		19	max	.023	3	0	15	0	1	0	1	NC	1	NC	1
342			min	-.021	2	-.005	3	0	1	0	1	NC	1	NC	1
343	M8	1	max	.007	1	.02	2	0	1	0	1	NC	1	NC	1
344			min	-.001	3	-.023	3	0	1	0	1	NC	1	NC	1
345		2	max	.007	1	.019	2	0	1	0	1	NC	1	NC	1
346			min	0	3	-.022	3	0	1	0	1	NC	1	NC	1
347		3	max	.006	1	.018	2	0	1	0	1	NC	1	NC	1
348			min	0	3	-.021	3	0	1	0	1	NC	1	NC	1
349		4	max	.006	1	.017	2	0	1	0	1	NC	1	NC	1
350			min	0	3	-.019	3	0	1	0	1	NC	1	NC	1
351		5	max	.006	1	.016	2	0	1	0	1	NC	1	NC	1
352			min	0	3	-.018	3	0	1	0	1	NC	1	NC	1
353		6	max	.005	1	.015	2	0	1	0	1	NC	1	NC	1
354			min	0	3	-.017	3	0	1	0	1	NC	1	NC	1
355		7	max	.005	1	.014	2	0	1	0	1	NC	1	NC	1
356			min	0	3	-.015	3	0	1	0	1	NC	1	NC	1
357		8	max	.004	1	.012	2	0	1	0	1	NC	1	NC	1
358			min	0	3	-.014	3	0	1	0	1	NC	1	NC	1
359		9	max	.004	1	.011	2	0	1	0	1	NC	1	NC	1
360			min	0	3	-.013	3	0	1	0	1	NC	1	NC	1
361		10	max	.004	1	.01	2	0	1	0	1	NC	1	NC	1
362			min	0	3	-.012	3	0	1	0	1	NC	1	NC	1
363		11	max	.003	1	.009	2	0	1	0	1	NC	1	NC	1
364			min	0	3	-.01	3	0	1	0	1	NC	1	NC	1
365		12	max	.003	1	.008	2	0	1	0	1	NC	1	NC	1
366			min	0	3	-.009	3	0	1	0	1	NC	1	NC	1
367		13	max	.002	1	.007	2	0	1	0	1	NC	1	NC	1
368			min	0	3	-.008	3	0	1	0	1	NC	1	NC	1
369		14	max	.002	1	.006	2	0	1	0	1	NC	1	NC	1
370			min	0	3	-.006	3	0	1	0	1	NC	1	NC	1
371		15	max	.002	1	.005	2	0	1	0	1	NC	1	NC	1
372			min	0	3	-.005	3	0	1	0	1	NC	1	NC	1
373		16	max	.001	1	.003	2	0	1	0	1	NC	1	NC	1
374			min	0	3	-.004	3	0	1	0	1	NC	1	NC	1
375		17	max	0	1	.002	2	0	1	0	1	NC	1	NC	1
376			min	0	3	-.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	3	-.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	1	.008	2	0	15	2.319e-4	1	NC	1	NC	2
382			min	-.009	3	-.014	3	-.01	1	9.457e-6	15	8161.083	2	6753.189	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	1	.007	2	0	15	2.189e-4	1	NC	1	NC	2
384			min	-.008	3	-.013	3	-.009	1	8.927e-6	15	9539.056	2	7363.136	1
385		3	max	.006	1	.006	2	0	15	2.058e-4	1	NC	1	NC	2
386			min	-.008	3	-.013	3	-.009	1	8.397e-6	15	NC	1	8089.519	1
387		4	max	.006	1	.005	2	0	15	1.928e-4	1	NC	1	NC	2
388			min	-.007	3	-.012	3	-.008	1	7.866e-6	15	NC	1	8963.061	1
389		5	max	.006	1	.004	2	0	15	1.798e-4	1	NC	1	NC	1
390			min	-.007	3	-.012	3	-.007	1	7.336e-6	15	NC	1	NC	1
391		6	max	.005	1	.003	2	0	15	1.668e-4	1	NC	1	NC	1
392			min	-.006	3	-.011	3	-.006	1	6.805e-6	15	NC	1	NC	1
393		7	max	.005	1	.002	2	0	15	1.537e-4	1	NC	1	NC	1
394			min	-.006	3	-.011	3	-.005	1	6.275e-6	15	NC	1	NC	1
395		8	max	.004	1	0	2	0	15	1.407e-4	1	NC	1	NC	1
396			min	-.005	3	-.01	3	-.005	1	5.744e-6	15	NC	1	NC	1
397		9	max	.004	1	0	2	0	15	1.277e-4	1	NC	1	NC	1
398			min	-.005	3	-.01	3	-.004	1	5.214e-6	15	NC	1	NC	1
399		10	max	.004	1	0	2	0	15	1.147e-4	1	NC	1	NC	1
400			min	-.004	3	-.009	3	-.003	1	4.683e-6	15	NC	1	NC	1
401		11	max	.003	1	-.001	2	0	15	1.016e-4	1	NC	1	NC	1
402			min	-.004	3	-.008	3	-.003	1	4.153e-6	15	NC	1	NC	1
403		12	max	.003	1	-.001	15	0	15	8.86e-5	1	NC	1	NC	1
404			min	-.003	3	-.008	3	-.002	1	3.622e-6	15	NC	1	NC	1
405		13	max	.002	1	-.001	15	0	15	7.557e-5	1	NC	1	NC	1
406			min	-.003	3	-.007	3	-.002	1	3.092e-6	15	NC	1	NC	1
407		14	max	.002	1	-.001	15	0	15	6.255e-5	1	NC	1	NC	1
408			min	-.002	3	-.006	3	-.001	1	2.561e-6	15	NC	1	NC	1
409		15	max	.002	1	-.001	15	0	15	4.952e-5	1	NC	1	NC	1
410			min	-.002	3	-.005	3	0	1	2.031e-6	15	NC	1	NC	1
411		16	max	.001	1	0	15	0	15	3.649e-5	1	NC	1	NC	1
412			min	-.001	3	-.004	4	0	1	1.501e-6	15	NC	1	NC	1
413		17	max	0	1	0	15	0	15	2.347e-5	1	NC	1	NC	1
414			min	0	3	-.003	4	0	1	9.701e-7	15	NC	1	NC	1
415		18	max	0	1	0	15	0	15	1.044e-5	1	NC	1	NC	1
416			min	0	3	-.002	4	0	1	4.396e-7	15	NC	1	NC	1
417		19	max	0	1	0	1	0	1	2.766e-7	3	NC	1	NC	1
418			min	0	1	0	1	0	1	-2.584e-6	1	NC	1	NC	1
419	M11	1	max	0	1	0	1	0	1	2.14e-6	1	NC	1	NC	1
420			min	0	1	0	1	0	1	5.581e-8	12	NC	1	NC	1
421		2	max	0	3	0	15	0	3	-1.046e-6	15	NC	1	NC	1
422			min	0	2	-.003	4	0	1	-2.571e-5	1	NC	1	NC	1
423		3	max	0	3	-.001	15	0	3	-2.176e-6	15	NC	1	NC	1
424			min	0	2	-.006	4	0	1	-5.356e-5	1	NC	1	NC	1
425		4	max	.001	3	-.002	15	0	12	-3.306e-6	15	NC	1	NC	1
426			min	0	2	-.009	4	0	1	-8.14e-5	1	NC	1	NC	1
427		5	max	.002	3	-.003	15	0	12	-4.436e-6	15	NC	1	NC	1
428			min	-.001	2	-.012	4	0	1	-1.093e-4	1	8796.735	4	NC	1
429		6	max	.002	3	-.003	15	0	12	-5.566e-6	15	NC	2	NC	1
430			min	-.002	2	-.015	4	0	1	-1.371e-4	1	7101.193	4	NC	1
431		7	max	.002	3	-.004	15	0	15	-6.697e-6	15	NC	5	NC	1
432			min	-.002	2	-.017	4	0	1	-1.649e-4	1	6081.386	4	NC	1
433		8	max	.003	3	-.004	15	0	15	-7.827e-6	15	NC	5	NC	1
434			min	-.002	2	-.019	4	0	1	-1.928e-4	1	5452.072	4	NC	1
435		9	max	.003	3	-.005	15	0	15	-8.957e-6	15	NC	5	NC	1
436			min	-.003	2	-.02	4	-.001	1	-2.206e-4	1	5079.087	4	NC	1
437		10	max	.004	3	-.005	15	0	15	-1.009e-5	15	NC	5	NC	1
438			min	-.003	2	-.021	4	-.002	1	-2.485e-4	1	4897.222	4	NC	1
439		11	max	.004	3	-.005	15	0	15	-1.122e-5	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	-.003	2	-.021	4	-.002	1	-2.763e-4	1	4879.606	4	NC	1
441		12	max	.005	3	-.005	15	0	15	-1.235e-5	15	NC	5	NC	1
442			min	-.004	2	-.021	4	-.003	1	-3.042e-4	1	5027.388	4	NC	1
443		13	max	.005	3	-.005	15	0	15	-1.348e-5	15	NC	5	NC	1
444			min	-.004	2	-.02	4	-.003	1	-3.32e-4	1	5371.493	4	NC	1
445		14	max	.005	3	-.004	15	0	15	-1.461e-5	15	NC	5	NC	1
446			min	-.004	2	-.018	4	-.004	1	-3.599e-4	1	5988.74	4	NC	1
447		15	max	.006	3	-.003	15	0	15	-1.574e-5	15	NC	3	NC	1
448			min	-.005	2	-.015	4	-.005	1	-3.877e-4	1	7049.732	4	NC	1
449		16	max	.006	3	-.003	15	0	15	-1.687e-5	15	NC	1	NC	1
450			min	-.005	2	-.012	4	-.006	1	-4.156e-4	1	8967.919	4	NC	1
451		17	max	.007	3	-.002	15	0	15	-1.8e-5	15	NC	1	NC	1
452			min	-.005	2	-.009	4	-.007	1	-4.434e-4	1	NC	1	NC	1
453		18	max	.007	3	-.001	15	0	15	-1.913e-5	15	NC	1	NC	1
454			min	-.006	2	-.005	1	-.008	1	-4.713e-4	1	NC	1	NC	1
455		19	max	.007	3	0	15	0	15	-2.026e-5	15	NC	1	NC	1
456			min	-.006	2	-.002	1	-.01	1	-4.991e-4	1	NC	1	NC	1
457	M12	1	max	.003	1	.006	2	.01	1	-5.201e-6	15	NC	1	NC	3
458			min	0	3	-.008	3	0	15	-1.274e-4	1	NC	1	2598.693	1
459		2	max	.003	1	.005	2	.009	1	-5.201e-6	15	NC	1	NC	3
460			min	0	3	-.007	3	0	15	-1.274e-4	1	NC	1	2823.518	1
461		3	max	.002	1	.005	2	.008	1	-5.201e-6	15	NC	1	NC	3
462			min	0	3	-.007	3	0	15	-1.274e-4	1	NC	1	3091.236	1
463		4	max	.002	1	.005	2	.007	1	-5.201e-6	15	NC	1	NC	3
464			min	0	3	-.006	3	0	15	-1.274e-4	1	NC	1	3412.966	1
465		5	max	.002	1	.004	2	.007	1	-5.201e-6	15	NC	1	NC	3
466			min	0	3	-.006	3	0	15	-1.274e-4	1	NC	1	3803.817	1
467		6	max	.002	1	.004	2	.006	1	-5.201e-6	15	NC	1	NC	2
468			min	0	3	-.005	3	0	15	-1.274e-4	1	NC	1	4284.744	1
469		7	max	.002	1	.004	2	.005	1	-5.201e-6	15	NC	1	NC	2
470			min	0	3	-.005	3	0	15	-1.274e-4	1	NC	1	4885.491	1
471		8	max	.002	1	.003	2	.004	1	-5.201e-6	15	NC	1	NC	2
472			min	0	3	-.005	3	0	15	-1.274e-4	1	NC	1	5649.435	1
473		9	max	.002	1	.003	2	.004	1	-5.201e-6	15	NC	1	NC	2
474			min	0	3	-.004	3	0	15	-1.274e-4	1	NC	1	6641.874	1
475		10	max	.001	1	.003	2	.003	1	-5.201e-6	15	NC	1	NC	2
476			min	0	3	-.004	3	0	15	-1.274e-4	1	NC	1	7964.871	1
477		11	max	.001	1	.002	2	.003	1	-5.201e-6	15	NC	1	NC	2
478			min	0	3	-.003	3	0	15	-1.274e-4	1	NC	1	9785.368	1
479		12	max	.001	1	.002	2	.002	1	-5.201e-6	15	NC	1	NC	1
480			min	0	3	-.003	3	0	15	-1.274e-4	1	NC	1	NC	1
481		13	max	0	1	.002	2	.002	1	-5.201e-6	15	NC	1	NC	1
482			min	0	3	-.003	3	0	15	-1.274e-4	1	NC	1	NC	1
483		14	max	0	1	.002	2	.001	1	-5.201e-6	15	NC	1	NC	1
484			min	0	3	-.002	3	0	15	-1.274e-4	1	NC	1	NC	1
485		15	max	0	1	.001	2	0	1	-5.201e-6	15	NC	1	NC	1
486			min	0	3	-.002	3	0	15	-1.274e-4	1	NC	1	NC	1
487		16	max	0	1	0	2	0	1	-5.201e-6	15	NC	1	NC	1
488			min	0	3	-.001	3	0	15	-1.274e-4	1	NC	1	NC	1
489		17	max	0	1	0	2	0	1	-5.201e-6	15	NC	1	NC	1
490			min	0	3	0	3	0	15	-1.274e-4	1	NC	1	NC	1
491		18	max	0	1	0	2	0	1	-5.201e-6	15	NC	1	NC	1
492			min	0	3	0	3	0	15	-1.274e-4	1	NC	1	NC	1
493		19	max	0	1	0	1	0	1	-5.201e-6	15	NC	1	NC	1
494			min	0	1	0	1	0	1	-1.274e-4	1	NC	1	NC	1
495	M1	1	max	.01	3	.196	2	0	1	1.066e-2	1	NC	1	NC	1
496			min	-.005	2	-.041	3	0	15	-2.001e-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	.096	2	0	15	5.136e-3	1	NC	5	NC	1
498			min	-.005	2	-.02	3	-.007	1	-9.932e-3	3	1348.411	2	NC	1
499		3	max	.01	3	.014	3	0	15	1.265e-5	10	NC	5	NC	1
500			min	-.005	2	-.012	2	-.01	1	-2.106e-4	1	651.516	2	NC	1
501		4	max	.009	3	.069	3	0	15	4.395e-3	2	NC	15	NC	1
502			min	-.005	2	-.131	2	-.01	1	-4.322e-3	3	413.204	2	NC	1
503		5	max	.009	3	.139	3	0	15	8.86e-3	1	NC	15	NC	1
504			min	-.005	2	-.256	2	-.007	1	-8.54e-3	3	299.247	2	NC	1
505		6	max	.009	3	.214	3	0	15	1.34e-2	1	7947.931	15	NC	1
506			min	-.005	2	-.376	2	-.003	1	-1.276e-2	3	236.287	2	NC	1
507		7	max	.009	3	.287	3	0	1	1.793e-2	1	6708.425	15	NC	1
508			min	-.005	2	-.484	2	0	3	-1.698e-2	3	199.048	2	NC	1
509		8	max	.009	3	.347	3	0	1	2.247e-2	1	5974.575	15	NC	1
510			min	-.005	2	-.569	2	0	15	-2.119e-2	3	176.993	2	NC	1
511		9	max	.008	3	.387	3	0	15	2.478e-2	2	5590.497	15	NC	1
512			min	-.005	2	-.622	2	0	1	-2.156e-2	3	165.489	2	NC	1
513		10	max	.008	3	.401	3	0	1	2.63e-2	2	5473.07	15	NC	1
514			min	-.005	2	-.64	2	0	15	-1.935e-2	3	162.104	2	NC	1
515		11	max	.008	3	.392	3	0	1	2.781e-2	2	5590.235	15	NC	1
516			min	-.004	2	-.622	2	0	15	-1.715e-2	3	166.013	2	NC	1
517		12	max	.008	3	.359	3	0	15	2.66e-2	2	5974.018	15	NC	1
518			min	-.004	2	-.567	2	-.001	1	-1.465e-2	3	178.548	2	NC	1
519		13	max	.008	3	.306	3	0	15	2.134e-2	2	6707.448	15	NC	1
520			min	-.004	2	-.478	2	0	1	-1.172e-2	3	202.748	2	NC	1
521		14	max	.007	3	.238	3	.002	1	1.608e-2	2	7946.276	15	NC	1
522			min	-.004	2	-.367	2	0	15	-8.792e-3	3	244.075	2	NC	1
523		15	max	.007	3	.162	3	.006	1	1.083e-2	2	NC	15	NC	1
524			min	-.004	2	-.245	2	0	15	-5.863e-3	3	315.051	2	NC	1
525		16	max	.007	3	.082	3	.009	1	5.566e-3	2	NC	15	NC	1
526			min	-.004	2	-.121	2	0	15	-2.934e-3	3	446.004	2	NC	1
527		17	max	.007	3	.005	3	.01	1	6.342e-4	1	NC	5	NC	1
528			min	-.004	2	-.006	2	0	15	-4.67e-6	3	719.453	1	NC	1
529		18	max	.007	3	.093	1	.007	1	7.661e-3	2	NC	5	NC	1
530			min	-.004	2	-.065	3	0	15	-2.625e-3	3	1511.796	1	NC	1
531		19	max	.007	3	.181	1	0	15	1.524e-2	2	NC	1	NC	1
532			min	-.004	2	-.131	3	0	1	-5.345e-3	3	NC	1	NC	1
533	M5	1	max	.029	3	.371	2	0	1	0	1	NC	1	NC	1
534			min	-.02	2	-.015	3	0	1	0	1	NC	1	NC	1
535		2	max	.029	3	.181	2	0	1	0	1	NC	5	NC	1
536			min	-.02	2	-.006	3	0	1	0	1	717.195	2	NC	1
537		3	max	.029	3	.043	3	0	1	0	1	NC	15	NC	1
538			min	-.02	2	-.035	2	0	1	0	1	335.158	2	NC	1
539		4	max	.028	3	.163	3	0	1	0	1	7699.505	15	NC	1
540			min	-.02	2	-.297	2	0	1	0	1	203.59	2	NC	1
541		5	max	.028	3	.334	3	0	1	0	1	5358.667	15	NC	1
542			min	-.02	2	-.584	2	0	1	0	1	142.319	2	NC	1
543		6	max	.027	3	.529	3	0	1	0	1	4108.747	15	NC	1
544			min	-.019	2	-.87	2	0	1	0	1	109.435	2	NC	1
545		7	max	.027	3	.721	3	0	1	0	1	3389.858	15	NC	1
546			min	-.019	2	-1.131	2	0	1	0	1	90.445	2	NC	1
547		8	max	.026	3	.883	3	0	1	0	1	2973.278	15	NC	1
548			min	-.018	2	-1.34	2	0	1	0	1	79.409	2	NC	1
549		9	max	.025	3	.987	3	0	1	0	1	2759.925	15	NC	1
550			min	-.018	2	-1.473	2	0	1	0	1	73.748	2	NC	1
551		10	max	.025	3	1.026	3	0	1	0	1	2695.631	15	NC	1
552			min	-.018	2	-1.518	2	0	1	0	1	72.09	2	NC	1
553		11	max	.024	3	1.001	3	0	1	0	1	2760.054	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	-.017	2	-1.473	2	0	1	0	1	74.005	2	NC	1
555		12	max	.024	3	.914	3	0	1	0	1	2973.584	15	NC	1
556			min	-.017	2	-1.336	2	0	1	0	1	80.251	2	NC	1
557		13	max	.023	3	.773	3	0	1	0	1	3390.477	15	NC	1
558			min	-.017	2	-1.116	2	0	1	0	1	92.636	2	NC	1
559		14	max	.022	3	.596	3	0	1	0	1	4109.95	15	NC	1
560			min	-.017	2	-.843	2	0	1	0	1	114.413	2	NC	1
561		15	max	.022	3	.399	3	0	1	0	1	5361.038	15	NC	1
562			min	-.016	2	-.55	2	0	1	0	1	153.169	1	NC	1
563		16	max	.021	3	.199	3	0	1	0	1	7704.472	15	NC	1
564			min	-.016	2	-.264	2	0	1	0	1	225.681	1	NC	1
565		17	max	.021	3	.014	3	0	1	0	1	NC	15	NC	1
566			min	-.016	2	-.018	2	0	1	0	1	386.055	1	NC	1
567		18	max	.021	3	.174	1	0	1	0	1	NC	5	NC	1
568			min	-.016	2	-.144	3	0	1	0	1	851.482	1	NC	1
569		19	max	.021	3	.33	1	0	1	0	1	NC	1	NC	1
570			min	-.016	2	-.285	3	0	1	0	1	NC	1	NC	1
571	M9	1	max	.01	3	.196	2	0	15	2.001e-2	3	NC	1	NC	1
572			min	-.005	2	-.041	3	0	1	-1.066e-2	1	NC	1	NC	1
573		2	max	.01	3	.096	2	.007	1	9.932e-3	3	NC	5	NC	1
574			min	-.005	2	-.02	3	0	15	-5.136e-3	1	1348.411	2	NC	1
575		3	max	.01	3	.014	3	.01	1	2.106e-4	1	NC	5	NC	1
576			min	-.005	2	-.012	2	0	15	-1.265e-5	10	651.516	2	NC	1
577		4	max	.009	3	.069	3	.01	1	4.322e-3	3	NC	15	NC	1
578			min	-.005	2	-.131	2	0	15	-4.395e-3	2	413.204	2	NC	1
579		5	max	.009	3	.139	3	.007	1	8.54e-3	3	NC	15	NC	1
580			min	-.005	2	-.256	2	0	15	-8.86e-3	1	299.247	2	NC	1
581		6	max	.009	3	.214	3	.003	1	1.276e-2	3	7947.931	15	NC	1
582			min	-.005	2	-.376	2	0	15	-1.34e-2	1	236.287	2	NC	1
583		7	max	.009	3	.287	3	0	3	1.698e-2	3	6708.425	15	NC	1
584			min	-.005	2	-.484	2	0	1	-1.793e-2	1	199.048	2	NC	1
585		8	max	.009	3	.347	3	0	15	2.119e-2	3	5974.575	15	NC	1
586			min	-.005	2	-.569	2	0	1	-2.247e-2	1	176.993	2	NC	1
587		9	max	.008	3	.387	3	0	1	2.156e-2	3	5590.497	15	NC	1
588			min	-.005	2	-.622	2	0	15	-2.478e-2	2	165.489	2	NC	1
589		10	max	.008	3	.401	3	0	15	1.935e-2	3	5473.07	15	NC	1
590			min	-.005	2	-.64	2	0	1	-2.63e-2	2	162.104	2	NC	1
591		11	max	.008	3	.392	3	0	15	1.715e-2	3	5590.235	15	NC	1
592			min	-.004	2	-.622	2	0	1	-2.781e-2	2	166.013	2	NC	1
593		12	max	.008	3	.359	3	.001	1	1.465e-2	3	5974.018	15	NC	1
594			min	-.004	2	-.567	2	0	15	-2.66e-2	2	178.548	2	NC	1
595		13	max	.008	3	.306	3	0	1	1.172e-2	3	6707.448	15	NC	1
596			min	-.004	2	-.478	2	0	15	-2.134e-2	2	202.748	2	NC	1
597		14	max	.007	3	.238	3	0	15	8.792e-3	3	7946.276	15	NC	1
598			min	-.004	2	-.367	2	-.002	1	-1.608e-2	2	244.075	2	NC	1
599		15	max	.007	3	.162	3	0	15	5.863e-3	3	NC	15	NC	1
600			min	-.004	2	-.245	2	-.006	1	-1.083e-2	2	315.051	2	NC	1
601		16	max	.007	3	.082	3	0	15	2.934e-3	3	NC	15	NC	1
602			min	-.004	2	-.121	2	-.009	1	-5.566e-3	2	446.004	2	NC	1
603		17	max	.007	3	.005	3	0	15	4.67e-6	3	NC	5	NC	1
604			min	-.004	2	-.006	2	-.01	1	-6.342e-4	1	719.453	1	NC	1
605		18	max	.007	3	.093	1	0	15	2.625e-3	3	NC	5	NC	1
606			min	-.004	2	-.065	3	-.007	1	-7.661e-3	2	1511.796	1	NC	1
607		19	max	.007	3	.181	1	0	1	5.345e-3	3	NC	1	NC	1
608			min	-.004	2	-.131	3	0	15	-1.524e-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

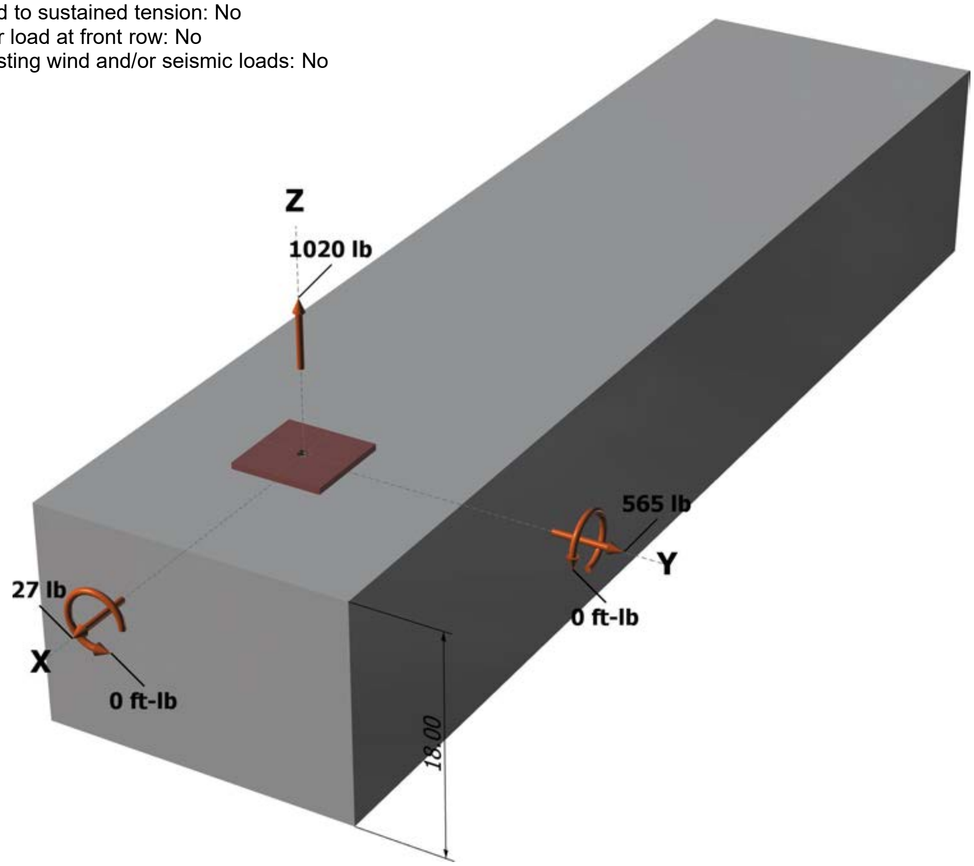
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

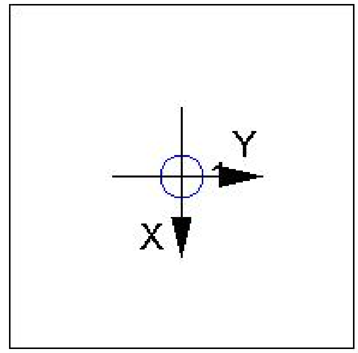
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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	1020.0	27.0	565.0	565.6
Sum	1020.0	27.0	565.0	565.6

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 1020
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



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

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

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

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

k_c	λ	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	2500	5.247	10215

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

A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cb} (lb)
220.36	247.75	0.967	1.00	1.000	10215	0.65	5710

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

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in y-direction:

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

l_e (in)	d_a (in)	λ	f'_c (psi)	c_{a1} (in)	V_{by} (lb)
4.00	0.50	1.00	2500	7.00	6947

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

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cby} (lb)
192.89	220.50	0.925	1.000	1.000	6947	0.70	3934

Shear perpendicular to edge in x-direction:

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

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

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

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbx} (lb)
165.27	278.72	0.878	1.000	1.000	8282	0.70	3018

Shear parallel to edge in x-direction:

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

l_e (in)	d_a (in)	λ	f'_c (psi)	c_{a1} (in)	V_{by} (lb)
4.00	0.50	1.00	2500	7.00	6947

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

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cbx} (lb)
192.89	220.50	1.000	1.000	1.000	6947	0.70	8508

Shear parallel to edge in y-direction:

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

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

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

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cby} (lb)
165.27	278.72	1.000	1.000	1.000	8282	0.70	6875

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

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

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

A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	N_{cb} (lb)	ϕ	ϕV_{cp} (lb)
220.36	247.75	0.967	1.000	1.000	10215	8785	0.70	12298

11. Results

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

Tension	Factored Load, N_{ua} (lb)	Design Strength, øN_n (lb)	Ratio	Status
Steel	1020	6071	0.17	Pass
Concrete breakout	1020	5710	0.18	Pass
Adhesive	**1020**	**5365**	**0.19**	**Pass (Governs)**

Shear	Factored Load, V_{ua} (lb)	Design Strength, øV_n (lb)	Ratio	Status
Steel	**566**	**3156**	**0.18**	**Pass (Governs)**
T Concrete breakout y+	565	3934	0.14	Pass
T Concrete breakout x+	27	3018	0.01	Pass
|| Concrete breakout y+	27	8508	0.00	Pass
|| Concrete breakout x+	565	6875	0.08	Pass
Concrete breakout, combined	-	-	0.14	Pass
Pryout	566	12298	0.05	Pass

Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. D.7.1	0.19	0.00	19.0 %	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

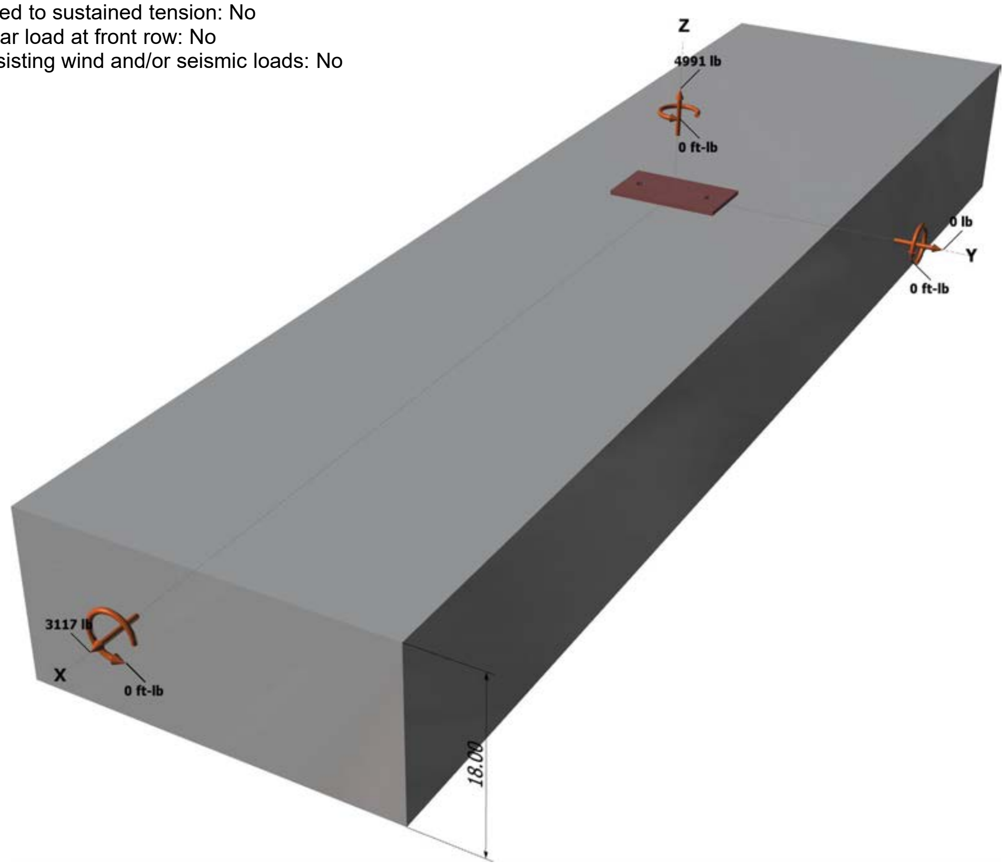
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

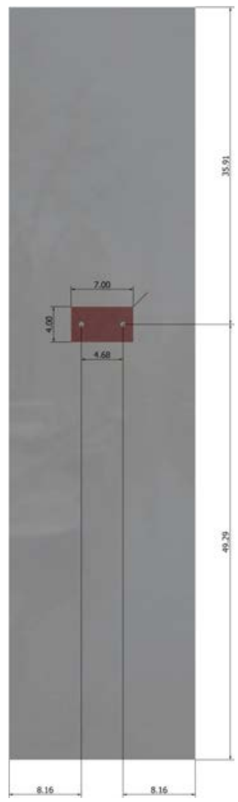
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout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



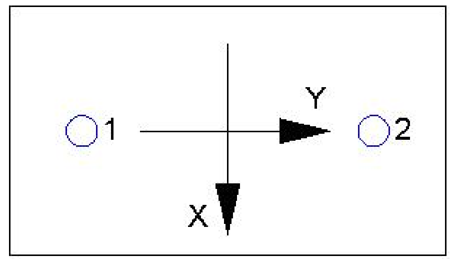
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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	2495.5	1558.5	0.0	1558.5
2	2495.5	1558.5	0.0	1558.5
Sum	4991.0	3117.0	0.0	3117.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 4991
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)
378.00	324.00	1.000	0.972	1.00	1.000	12492	0.65	9208

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} (in²)	A_{Vco} (in²)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbgx} (lb)
378.00	648.00	1.000	0.836	1.000	1.000	15593	0.70	5323

Shear parallel to edge in x-direction:

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

l_e (in)	d_a (in)	λ	f'_c (psi)	c_{a1} (in)	V_{by} (lb)
4.00	0.50	1.00	2500	8.16	8744

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

A_{Vc} (in²)	A_{Vco} (in²)	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cbx} (lb)
299.64	299.64	1.000	1.000	1.000	8744	0.70	12241

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} (in²)	A_{Na0} (in²)	$\Psi_{ed,Na}$	$\Psi_{g,Na}$	$\Psi_{ec,Na}$	$\Psi_{p,Na}$	N_{a0} (lb)	N_a (lb)
2.0	158.66	109.66	1.000	1.043	1.000	1.000	9755	14715

A_{Nc} (in²)	A_{Nco} (in²)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	N_{cb} (lb)	ϕ
378.00	324.00	1.000	0.972	1.000	1.000	12492	14166	0.70

ϕV_{cpg} (lb)
19833

11. Results

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

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	2496	6071	0.41	Pass
Concrete breakout	4991	9208	0.54	Pass
Adhesive	**4991**	**8093**	**0.62**	**Pass (Governs)**

Shear	Factored Load, V_{ua} (lb)	Design Strength, ϕV_n (lb)	Ratio	Status
Steel	1559	3156	0.49	Pass
T Concrete breakout x+	**3117**	**5323**	**0.59**	**Pass (Governs)**

|| Concrete breakout y-	**1559**	**12241**	**0.13**	**Pass (Governs)**
Pryout	3117	19833	0.16	Pass

Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. D.7.3	0.62	0.59	120.2 %	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.