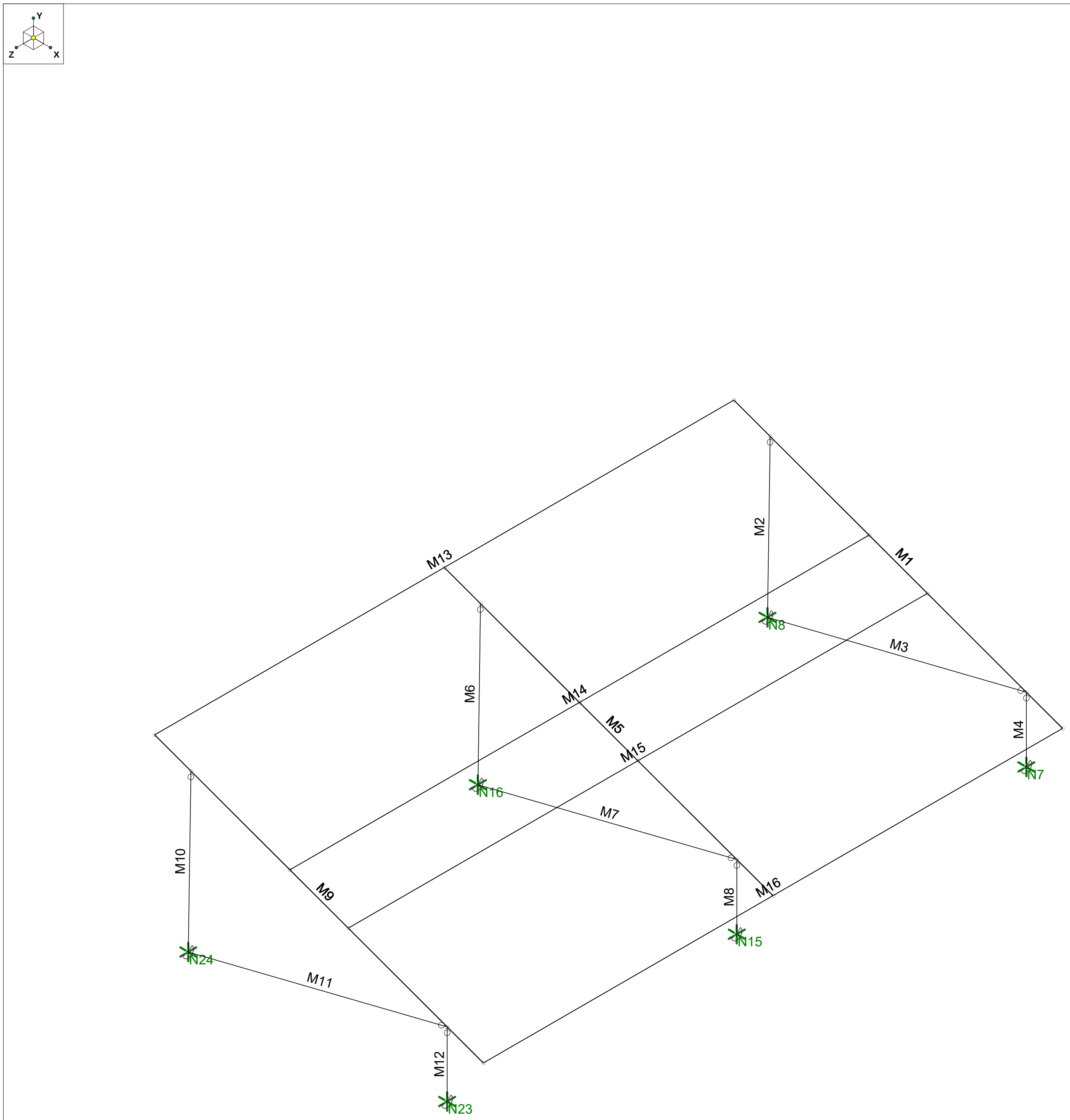


Schletter, Inc.		20° Tilt w/o Seismic Design
HCV	Standard PVMax Racking System	
	Representative Calculations - ASCE 7-10	

1. INTRODUCTION

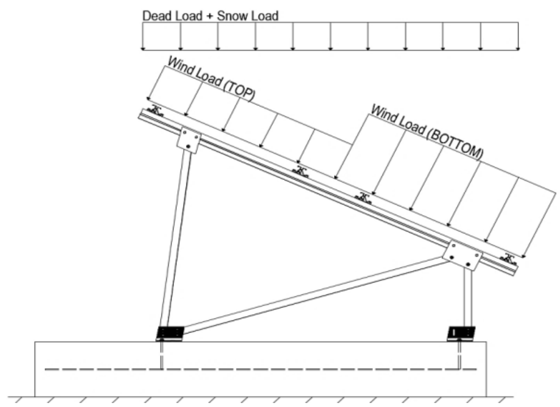
1.1 Project Description
The following sections will cover the determination of forces and structural design calculations for the Schletter, Inc. PVMax ground mount system.

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 = 20°
Maximum Height Above Grade = 3 ft



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

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

2. LOAD ACTIONS

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

Self-weight of the PV modules.

2.2 Snow Loads
Ground Snow Load, P_g = 30.00 psf
Sloped Roof Snow Load, P_s = 20.62 psf *(ASCE 7-10, Eq. 7.4-1)*
I_s = 1.00
C_s = 0.91
C_e = 0.90
C_t = 1.20

2.3 Wind Loads
Design Wind Speed, V = 150 mph
Height < 15 ft

Exposure Category = C
Importance Category = II

Peak Velocity Pressure, q_z = 35.33 psf *Including the gust factor, G=0.85. (ASCE 7-10, Eq. 27.3-1)*

Pressure Coefficients

$Cf+_{TOP}$	=	1.050	*(Pressure)*
$Cf+_{BOTTOM}$	=	1.650	
$Cf-_{TOP, OUTER PURLIN}$	=	-2.400	
$Cf-_{TOP, INNER PURLIN}$	=	-1.840	*(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

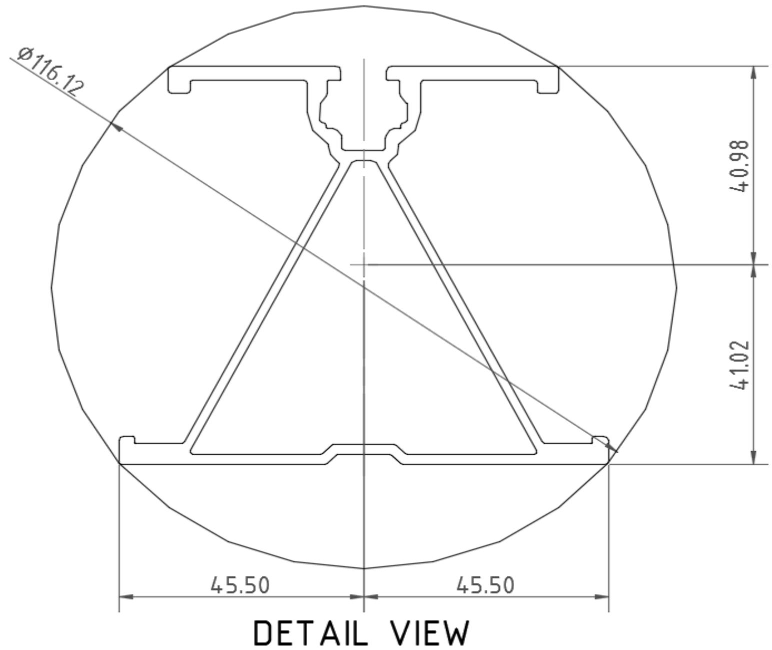
Front Struts	Location
M4	Outer
M8	Inner
M12	Outer

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).

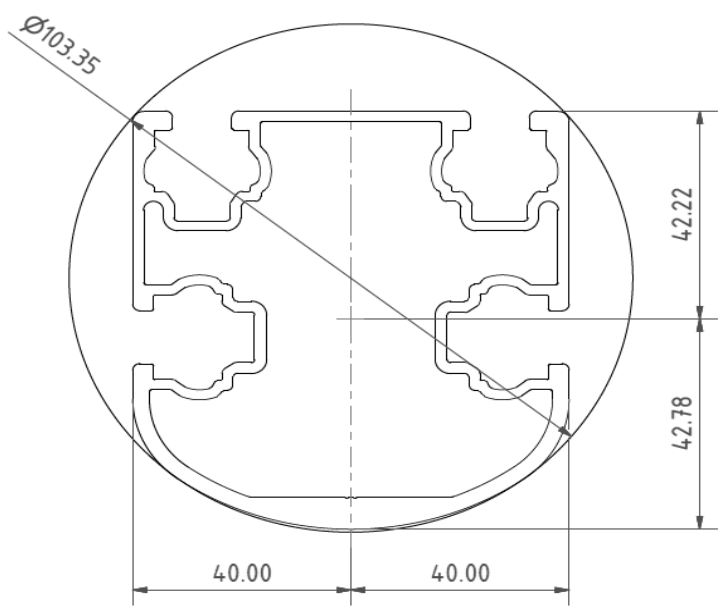
Purlin Type =	**S1.5**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	87	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	25.07	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	23.08	ksi
S_y =	1.33	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	2.16	in^4
I_x =	1.07	in^4
A =	1.25	in^2
g =	1.50	lbs/ft
M_y =	1.409	k-ft
M_z =	0.195	k-ft
$M_{y\ allowable}$ =	2.779	k-ft
$M_{z\ allowable}$ =	1.154	k-ft
Utilization =	68%	



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).

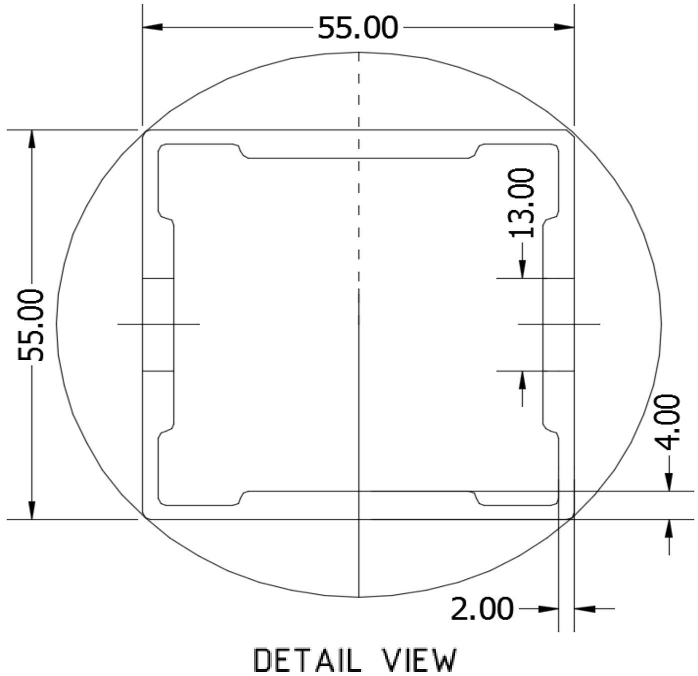
Girder Type =	**BF0**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	104.56	in
$\Phi F_{ty\ AXIAL}$ =	31.09	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.00	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	33.25	ksi
S_y =	1.42	in^3
S_x =	1.41	in^3
E =	10100	ksi
I_y =	2.39	in^4
I_x =	2.22	in^4
A =	1.88	in^2
g =	2.26	lbs/ft
M_y =	-3.319	k-ft
M_z =	0.000	k-ft
P_n =	-0.800	k
$M_{y\ allowable}$ =	3.422	k-ft
$M_{z\ allowable}$ =	3.907	k-ft
$P_{n\ allowable}$ =	58.535	k
Utilization =	98%	



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).

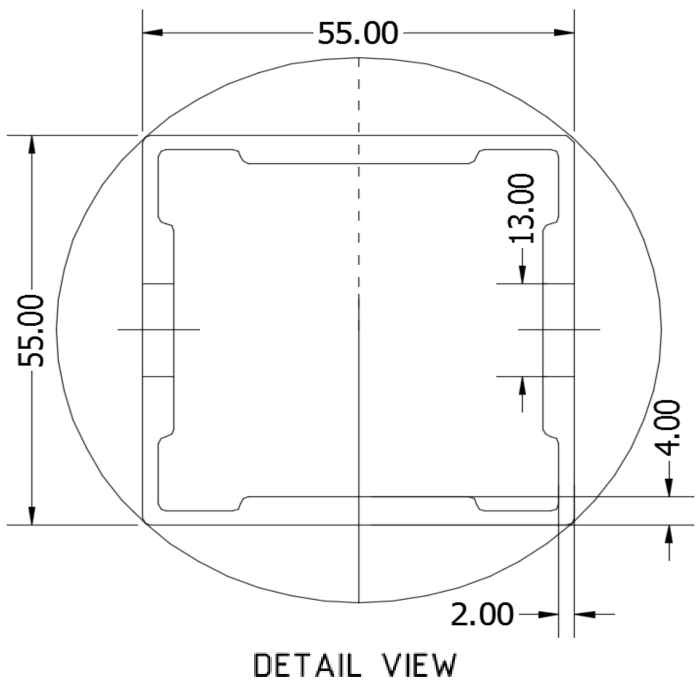
Strut Type =	**55x55**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	24.80	in
$\Phi F_{ty\ AXIAL}$ =	28.03	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	3.092	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).

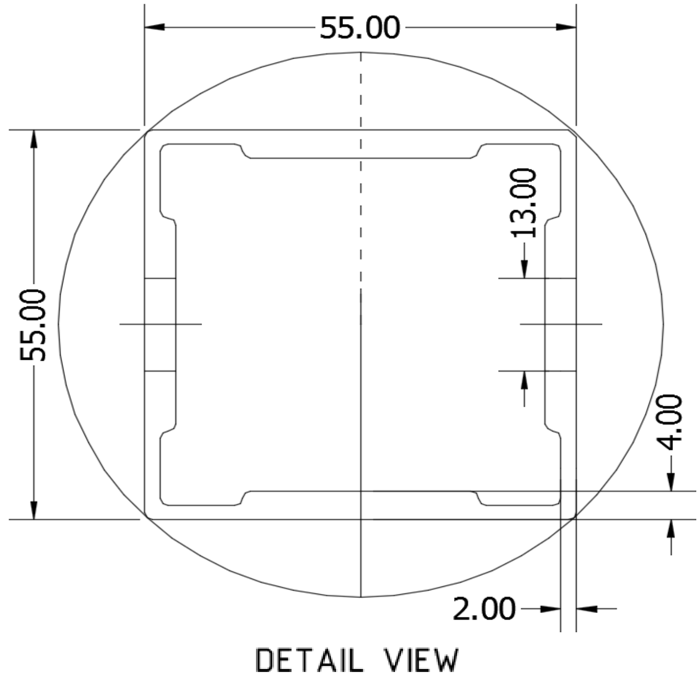
Strut Type =	**55x55**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	98.03	in
$\Phi F_{ty\ AXIAL}$ =	6.11	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.013	k-ft
M_z =	0.000	k-ft
P_n =	1.941	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	6.000	k
Utilization =	33%	



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 =	61.10	in
$\Phi F_{ty\ AXIAL}$ =	13.63	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 =	-0.013	k-ft
M_z =	0.000	k-ft
P_n =	3.219	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	13.386	k
Utilization =	25%	



5. FOUNDATION DESIGN CALCULATIONS

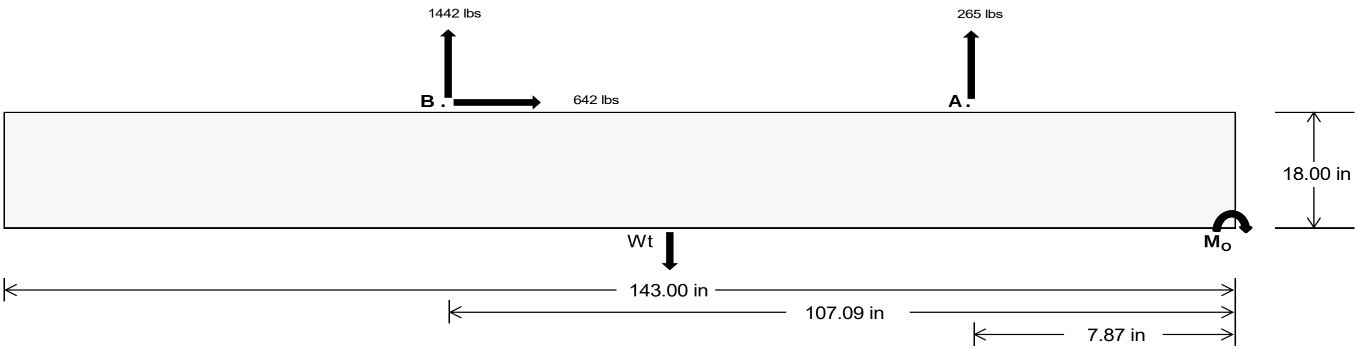
5.1 Helical Pile Foundations

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 =	1165.89	6265.08	k
Compressive Load =	4020.06	4805.34	k
Lateral Load =	9.87	2781.62	k
Moment (Weak Axis) =	0.02	0.00	k

5.2 Design of Ballast Foundations

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



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

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

Overturning Check
M_O = 168063.3 in-lbs
Resisting Force Required = 2350.54 lbs
S.F. = 1.67
Weight Required = 3917.56 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 = 641.93 lbs
Friction = 0.4
Weight Required = 1604.83 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 = 641.93 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	1270 lbs	1270 lbs	1270 lbs	1270 lbs	1587 lbs	1587 lbs	1587 lbs	1587 lbs	2037 lbs	2037 lbs	2037 lbs	2037 lbs	-530 lbs	-530 lbs	-530 lbs	-530 lbs
F_B	1353 lbs	1353 lbs	1353 lbs	1353 lbs	1940 lbs	1940 lbs	1940 lbs	1940 lbs	2359 lbs	2359 lbs	2359 lbs	2359 lbs	-2884 lbs	-2884 lbs	-2884 lbs	-2884 lbs
F_V	121 lbs	121 lbs	121 lbs	121 lbs	1134 lbs	1134 lbs	1134 lbs	1134 lbs	933 lbs	933 lbs	933 lbs	933 lbs	-1284 lbs	-1284 lbs	-1284 lbs	-1284 lbs
P_{total}	10183 lbs	10399 lbs	10615 lbs	10831 lbs	11087 lbs	11303 lbs	11519 lbs	11735 lbs	11955 lbs	12171 lbs	12387 lbs	12603 lbs	1122 lbs	1251 lbs	1381 lbs	1510 lbs
M	2902 lbs-ft	2902 lbs-ft	2902 lbs-ft	2902 lbs-ft	4362 lbs-ft	4362 lbs-ft	4362 lbs-ft	4362 lbs-ft	5205 lbs-ft	5205 lbs-ft	5205 lbs-ft	5205 lbs-ft	3816 lbs-ft	3816 lbs-ft	3816 lbs-ft	3816 lbs-ft
e	0.28 ft	0.28 ft	0.27 ft	0.27 ft	0.39 ft	0.39 ft	0.38 ft	0.37 ft	0.44 ft	0.43 ft	0.42 ft	0.41 ft	3.40 ft	3.05 ft	2.76 ft	2.53 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}	250.9 psf	250.0 psf	249.1 psf	248.3 psf	255.8 psf	254.7 psf	253.7 psf	252.8 psf	268.6 psf	267.2 psf	265.8 psf	264.5 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	335.0 psf	331.7 psf	328.7 psf	325.7 psf	382.2 psf	377.6 psf	373.3 psf	369.2 psf	419.4 psf	413.8 psf	408.5 psf	403.4 psf	100.3 psf	95.6 psf	93.5 psf	92.7 psf

Maximum Bearing Pressure = 419 psf
Allowable Bearing Pressure = 1500 psf

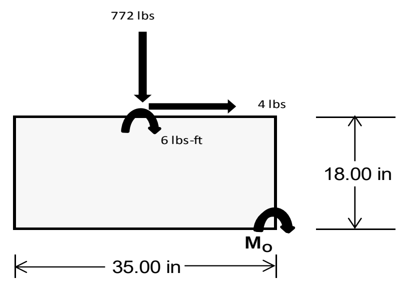
Use a 143in long x 35in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O = 1114.5 ft-lbs
Resisting Force Required = 764.26 lbs
S.F. = 1.67
Weight Required = 1273.77 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	221 lbs	539 lbs	221 lbs	772 lbs	2154 lbs	772 lbs	65 lbs	158 lbs	65 lbs
F_V	1 lbs	0 lbs	1 lbs	4 lbs	0 lbs	4 lbs	0 lbs	0 lbs	0 lbs
P_{total}	9580 lbs	7560 lbs	9580 lbs	9681 lbs	7560 lbs	9681 lbs	2801 lbs	7560 lbs	2801 lbs
M	3 lbs-ft	0 lbs-ft	3 lbs-ft	12 lbs-ft	0 lbs-ft	12 lbs-ft	0 lbs-ft	0 lbs-ft	0 lbs-ft
e	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft
L/6	0.49 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}	275.4 psf	217.5 psf	275.4 psf	277.8 psf	217.5 psf	277.8 psf	80.6 psf	217.5 psf	80.6 psf
f_{max}	275.8 psf	217.5 psf	275.8 psf	279.2 psf	217.5 psf	279.2 psf	80.6 psf	217.5 psf	80.6 psf

Maximum Bearing Pressure = 279 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 32in wide x 18in tall ballast foundation and fiber reinforcing with (2) #5 rebar.

5.3 Foundation Anchors

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

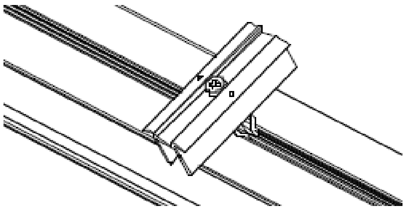
6. DESIGN OF JOINTS AND CONNECTIONS

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

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

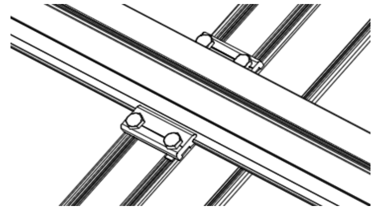
Fastening of Modules to Purlins

Maximum Uplifting Force =	0.940 k
Allowable Uplift =	1.214 k
Utilization =	77%



Fastening of Purlins to Girders

Maximum Uplifting Force =	2.433 k
Allowable Uplift =	4.357 k
Utilization =	56%



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 =	3.092 k
M12 Bolt Capacity =	12.808 k
Strut Bearing Capacity =	7.421 k
Utilization =	42%

Rear Strut

Maximum Axial Load =	4.314 k
M12 Bolt Capacity =	12.808 k
Strut Bearing Capacity =	7.421 k
Utilization =	58%

Diagonal Strut

Maximum Axial Load =	2.131 k
M12 Bolt Shear Capacity =	12.808 k
Strut Bearing Capacity =	7.421 k
Utilization =	29%

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.

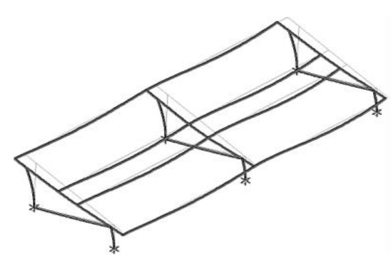
7. SEISMIC DESIGN

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} =	51.89 in
Allowable Story Drift for All Other Structures, Δ = {	$0.020h_{sx}$ 1.038 in
Max Drift, Δ_{MAX} =	0.015 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 = 87 in

J = 0.432

240.683

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

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= 28.3 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 = 87

J = 0.432

153.06

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.4

3.4.16

b/t = 37.0588

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 23.1 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 32.195

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

S1 = 36.9

m = 0.65

C_0 = 45.5

Cc = 45.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L Wk$= 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

φF_L= φb[Bt-Dt*√(Rb/t)]

φF_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

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 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

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 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)

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 31.6 ksi

b/t = 7.4

S1 = 12.21

S2 = 32.70

φF_L= φyFcy

φF_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

φF_L= φc[Bt-Dt*√(Rb/t)]

φF_L= 31.09 ksi

φF_L= 31.09 ksi

A = 1215.13 mm^2

1.88 in^2

P_{max} = 58.55 kips

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

Strut = **55x55**

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

Compression

3.4.7

λ = 0.57371

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.87952

φF_L= φcc(Bc-Dc*λ)

φF_L= 28.0279 ksi

3.4.9

b/t = 24.5

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

b/t = 24.5

S1 = 12.21

S2 = 32.70

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

φF_L= φyFcy

φF_L= 33.25 ksi

φF_L= 28.03 ksi

A = 663.99 mm^2

1.03 in^2

P_{max} = 28.85 kips

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

Strut = **55x55**

Strong Axis:

3.4.14

L_b = 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

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

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

φF_LWk= 28.2 ksi

Iy = 279836 mm^4

0.672 in^4

x = 27.5 mm

Sy = 0.621 in^3

M_{max}Wk = 1.460 k-ft

Compression

3.4.7

λ = 2.26776

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 = 61.10 in
J = 0.942
95.3524

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

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= 30.2 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 = 61.1
J = 0.942
95.3524

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

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= 30.2

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 = 1.41345

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.77788

φF_L= (φccFcy)/(λ²)

φF_L= 13.6277 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

$\varphi F_L =$ 13.63 ksi

A = 663.99 mm^2

1.03 in^2

$P_{max} =$ 14.03 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	-63.565	-63.565	0	0
2	M14	Y	-63.565	-63.565	0	0
3	M15	Y	-63.565	-63.565	0	0
4	M16	Y	-63.565	-63.565	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	-121.698	-121.698	0	0
2	M14	y	-121.698	-121.698	0	0
3	M15	y	-191.24	-191.24	0	0
4	M16	y	-191.24	-191.24	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	278.167	278.167	0	0
2	M14	y	213.261	213.261	0	0
3	M15	y	115.903	115.903	0	0
4	M16	y	115.903	115.903	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	585.625	2	1226.349	2	.593	1	.003	1	0	1	0	1
2		min	-723.052	3	-1557.37	3	.025	15	0	15	0	1	0	1
3	N7	max	.02	9	1118.737	1	-.285	15	0	15	0	1	0	1
4		min	-.224	2	-269.976	3	-7.596	1	-.016	1	0	1	0	1
5	N15	max	0	15	3092.354	1	0	3	0	12	0	1	0	1
6		min	-2.212	2	-896.836	3	0	1	0	1	0	1	0	1
7	N16	max	1935.31	2	3696.416	2	0	11	0	2	0	1	0	1
8		min	-2139.705	3	-4819.29	3	0	3	0	3	0	1	0	1
9	N23	max	.02	9	1118.737	1	7.596	1	.016	1	0	1	0	1
10		min	-.224	2	-269.976	3	.285	15	0	15	0	1	0	1
11	N24	max	585.625	2	1226.349	2	-.025	15	0	15	0	1	0	1
12		min	-723.052	3	-1557.37	3	-.593	1	-.003	1	0	1	0	1
13	Totals:	max	3103.902	2	11321.611	2	0	9						
14		min	-3586.729	3	-9370.818	3	0	11						

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	47.015	1	448.723	1	-4.807	15	0	15	.131	1	0	1
2			min	1.72	15	-745.725	3	-133.913	1	-.014	2	.005	15	0	3
3		2	max	47.015	1	312.411	1	-3.675	15	0	15	.036	1	.512	3
4			min	1.72	15	-526.386	3	-102.14	1	-.014	2	0	10	-.307	1
5		3	max	47.015	1	176.099	1	-2.544	15	0	15	.003	3	.848	3
6			min	1.72	15	-307.048	3	-70.367	1	-.014	2	-.034	1	-.503	1
7		4	max	47.015	1	39.787	1	-1.412	15	0	15	-.001	12	1.007	3
8			min	1.72	15	-87.709	3	-38.595	1	-.014	2	-.078	1	-.59	1
9		5	max	47.015	1	131.629	3	.464	10	0	15	-.003	12	.989	3
10			min	1.72	15	-96.525	1	-6.822	1	-.014	2	-.096	1	-.567	1
11		6	max	47.015	1	350.968	3	24.951	1	0	15	-.003	15	.795	3
12			min	1.72	15	-232.837	1	-1.631	3	-.014	2	-.089	1	-.435	1
13		7	max	47.015	1	570.306	3	56.723	1	0	15	-.002	15	.424	3
14			min	1.72	15	-369.149	1	.094	3	-.014	2	-.056	1	-.192	1
15		8	max	47.015	1	789.645	3	88.496	1	0	15	.005	2	.166	2
16			min	1.72	15	-505.461	1	1.405	12	-.014	2	-.007	3	-.124	3
17		9	max	47.015	1	1008.983	3	120.269	1	0	15	.087	1	.622	1
18			min	1.72	15	-641.773	1	2.556	12	-.014	2	-.004	3	-.848	3
19		10	max	47.015	1	1228.322	3	152.041	1	0	15	.196	1	1.194	1
20			min	1.72	15	-778.085	1	3.706	12	-.014	2	0	3	-1.749	3
21		11	max	47.015	1	641.773	1	-2.556	12	.014	2	.087	1	.622	1
22			min	1.72	15	-1008.983	3	-120.269	1	0	15	-.004	3	-.848	3
23		12	max	47.015	1	505.461	1	-1.405	12	.014	2	.005	2	.166	2
24			min	1.72	15	-789.645	3	-88.496	1	0	15	-.007	3	-.124	3
25		13	max	47.015	1	369.149	1	-.094	3	.014	2	-.002	15	.424	3
26			min	1.72	15	-570.306	3	-56.723	1	0	15	-.056	1	-.192	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	47.015	1	232.837	1	1.631	3	.014	2	-.003	15	.795	3
28			min	1.72	15	-350.968	3	-24.951	1	0	15	-.089	1	-.435	1
29		15	max	47.015	1	96.525	1	6.822	1	.014	2	-.003	12	.989	3
30			min	1.72	15	-131.629	3	-.464	10	0	15	-.096	1	-.567	1
31		16	max	47.015	1	87.709	3	38.595	1	.014	2	-.001	12	1.007	3
32			min	1.72	15	-39.787	1	1.412	15	0	15	-.078	1	-.59	1
33		17	max	47.015	1	307.048	3	70.367	1	.014	2	.003	3	.848	3
34			min	1.72	15	-176.099	1	2.544	15	0	15	-.034	1	-.503	1
35		18	max	47.015	1	526.386	3	102.14	1	.014	2	.036	1	.512	3
36			min	1.72	15	-312.411	1	3.675	15	0	15	0	10	-.307	1
37		19	max	47.015	1	745.725	3	133.913	1	.014	2	.131	1	0	1
38			min	1.72	15	-448.723	1	4.807	15	0	15	.005	15	0	3
39	M14	1	max	31.352	1	527.796	1	-5.027	15	.014	3	.16	1	0	1
40			min	1.143	15	-616.538	3	-140.03	1	-.016	2	.006	15	0	3
41		2	max	31.352	1	391.484	1	-3.895	15	.014	3	.06	1	.429	3
42			min	1.143	15	-449.485	3	-108.258	1	-.016	2	.002	15	-.37	1
43		3	max	31.352	1	255.172	1	-2.763	15	.014	3	.005	3	.724	3
44			min	1.143	15	-282.431	3	-76.485	1	-.016	2	-.014	1	-.631	1
45		4	max	31.352	1	121.044	2	-1.632	15	.014	3	0	3	.884	3
46			min	1.143	15	-115.378	3	-44.712	1	-.016	2	-.063	1	-.781	1
47		5	max	31.352	1	51.675	3	-.07	10	.014	3	-.002	12	.91	3
48			min	1.143	15	-17.452	1	-12.94	1	-.016	2	-.086	1	-.822	1
49		6	max	31.352	1	218.728	3	18.833	1	.014	3	-.003	15	.801	3
50			min	1.143	15	-153.764	1	-2.052	3	-.016	2	-.084	1	-.754	2
51		7	max	31.352	1	385.781	3	50.606	1	.014	3	-.002	15	.558	3
52			min	1.143	15	-290.076	1	-.326	3	-.016	2	-.056	1	-.585	2
53		8	max	31.352	1	552.834	3	82.378	1	.014	3	.003	2	.18	3
54			min	1.143	15	-426.388	1	1.13	12	-.016	2	-.006	3	-.309	2
55		9	max	31.352	1	719.887	3	114.151	1	.014	3	.077	1	.112	1
56			min	1.143	15	-562.7	1	2.281	12	-.016	2	-.005	3	-.333	3
57		10	max	31.352	1	886.941	3	145.924	1	.014	3	.181	1	.621	1
58			min	1.143	15	-699.012	1	3.431	12	-.016	2	-.001	3	-.98	3
59		11	max	31.352	1	562.7	1	-2.281	12	.016	2	.077	1	.112	1
60			min	1.143	15	-719.887	3	-114.151	1	-.014	3	-.005	3	-.333	3
61		12	max	31.352	1	426.388	1	-1.13	12	.016	2	.003	2	.18	3
62			min	1.143	15	-552.834	3	-82.378	1	-.014	3	-.006	3	-.309	2
63		13	max	31.352	1	290.076	1	.326	3	.016	2	-.002	15	.558	3
64			min	1.143	15	-385.781	3	-50.606	1	-.014	3	-.056	1	-.585	2
65		14	max	31.352	1	153.764	1	2.052	3	.016	2	-.003	15	.801	3
66			min	1.143	15	-218.728	3	-18.833	1	-.014	3	-.084	1	-.754	2
67		15	max	31.352	1	17.452	1	12.94	1	.016	2	-.002	12	.91	3
68			min	1.143	15	-51.675	3	.07	10	-.014	3	-.086	1	-.822	1
69		16	max	31.352	1	115.378	3	44.712	1	.016	2	0	3	.884	3
70			min	1.143	15	-121.044	2	1.632	15	-.014	3	-.063	1	-.781	1
71		17	max	31.352	1	282.431	3	76.485	1	.016	2	.005	3	.724	3
72			min	1.143	15	-255.172	1	2.763	15	-.014	3	-.014	1	-.631	1
73		18	max	31.352	1	449.485	3	108.258	1	.016	2	.06	1	.429	3
74			min	1.143	15	-391.484	1	3.895	15	-.014	3	.002	15	-.37	1
75		19	max	31.352	1	616.538	3	140.03	1	.016	2	.16	1	0	1
76			min	1.143	15	-527.796	1	5.027	15	-.014	3	.006	15	0	3
77	M15	1	max	-1.205	15	707.514	2	-5.025	15	.017	2	.16	1	0	2
78			min	-32.839	1	-352.991	3	-140.045	1	-.012	3	.006	15	0	3
79		2	max	-1.205	15	519.094	2	-3.893	15	.017	2	.06	1	.249	3
80			min	-32.839	1	-264.366	3	-108.272	1	-.012	3	.002	15	-.494	2
81		3	max	-1.205	15	330.673	2	-2.761	15	.017	2	.005	3	.426	3
82			min	-32.839	1	-175.74	3	-76.5	1	-.012	3	-.014	1	-.836	2
83		4	max	-1.205	15	142.253	2	-1.63	15	.017	2	0	3	.532	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	-32.839	1	-87.114	3	-44.727	1	-.012	3	-.063	1	-1.027	2
85		5	max	-1.205	15	1.564	12	-.147	10	.017	2	-.003	12	.566	3
86			min	-32.839	1	-46.167	2	-12.954	1	-.012	3	-.086	1	-1.065	2
87		6	max	-1.205	15	90.138	3	18.818	1	.017	2	-.003	15	.529	3
88			min	-32.839	1	-234.588	2	-1.794	3	-.012	3	-.084	1	-.952	2
89		7	max	-1.205	15	178.764	3	50.591	1	.017	2	-.002	15	.421	3
90			min	-32.839	1	-423.008	2	-.068	3	-.012	3	-.056	1	-.688	2
91		8	max	-1.205	15	267.39	3	82.364	1	.017	2	.002	2	.241	3
92			min	-32.839	1	-611.429	2	1.286	12	-.012	3	-.006	3	-.271	2
93		9	max	-1.205	15	356.016	3	114.136	1	.017	2	.077	1	.298	2
94			min	-32.839	1	-799.849	2	2.436	12	-.012	3	-.004	3	-.01	12
95		10	max	-1.205	15	444.642	3	145.909	1	.016	1	.181	1	1.018	2
96			min	-32.839	1	-988.269	2	3.586	12	-.017	2	0	3	-.332	3
97		11	max	-1.205	15	799.849	2	-2.436	12	.012	3	.077	1	.298	2
98			min	-32.839	1	-356.016	3	-114.136	1	-.017	2	-.004	3	-.01	12
99		12	max	-1.205	15	611.429	2	-1.286	12	.012	3	.002	2	.241	3
100			min	-32.839	1	-267.39	3	-82.364	1	-.017	2	-.006	3	-.271	2
101		13	max	-1.205	15	423.008	2	.068	3	.012	3	-.002	15	.421	3
102			min	-32.839	1	-178.764	3	-50.591	1	-.017	2	-.056	1	-.688	2
103		14	max	-1.205	15	234.588	2	1.794	3	.012	3	-.003	15	.529	3
104			min	-32.839	1	-90.138	3	-18.818	1	-.017	2	-.084	1	-.952	2
105		15	max	-1.205	15	46.167	2	12.954	1	.012	3	-.003	12	.566	3
106			min	-32.839	1	-1.564	12	.147	10	-.017	2	-.086	1	-1.065	2
107		16	max	-1.205	15	87.114	3	44.727	1	.012	3	0	3	.532	3
108			min	-32.839	1	-142.253	2	1.63	15	-.017	2	-.063	1	-1.027	2
109		17	max	-1.205	15	175.74	3	76.5	1	.012	3	.005	3	.426	3
110			min	-32.839	1	-330.673	2	2.761	15	-.017	2	-.014	1	-.836	2
111		18	max	-1.205	15	264.366	3	108.272	1	.012	3	.06	1	.249	3
112			min	-32.839	1	-519.094	2	3.893	15	-.017	2	.002	15	-.494	2
113		19	max	-1.205	15	352.991	3	140.045	1	.012	3	.16	1	0	2
114			min	-32.839	1	-707.514	2	5.025	15	-.017	2	.006	15	0	3
115	M16	1	max	-1.918	15	627.667	2	-4.82	15	.008	1	.133	1	0	2
116			min	-52.531	1	-286.939	3	-134.496	1	-.012	3	.005	15	0	3
117		2	max	-1.918	15	439.247	2	-3.688	15	.008	1	.038	1	.195	3
118			min	-52.531	1	-198.314	3	-102.723	1	-.012	3	.001	10	-.43	2
119		3	max	-1.918	15	250.826	2	-2.556	15	.008	1	.002	3	.32	3
120			min	-52.531	1	-109.688	3	-70.95	1	-.012	3	-.032	1	-.708	2
121		4	max	-1.918	15	62.406	2	-1.425	15	.008	1	-.002	12	.372	3
122			min	-52.531	1	-21.062	3	-39.178	1	-.012	3	-.077	1	-.834	2
123		5	max	-1.918	15	67.564	3	.164	10	.008	1	-.003	12	.353	3
124			min	-52.531	1	-126.014	2	-7.405	1	-.012	3	-.096	1	-.808	2
125		6	max	-1.918	15	156.19	3	24.368	1	.008	1	-.003	15	.263	3
126			min	-52.531	1	-314.435	2	-.818	3	-.012	3	-.089	1	-.631	2
127		7	max	-1.918	15	244.816	3	56.141	1	.008	1	-.002	15	.102	3
128			min	-52.531	1	-502.855	2	.742	12	-.012	3	-.056	1	-.302	2
129		8	max	-1.918	15	333.442	3	87.913	1	.008	1	.004	2	.179	2
130			min	-52.531	1	-691.275	2	1.892	12	-.012	3	-.005	3	-.131	3
131		9	max	-1.918	15	422.068	3	119.686	1	.008	1	.085	1	.812	2
132			min	-52.531	1	-879.696	2	3.043	12	-.012	3	-.002	3	-.435	3
133		10	max	-1.918	15	510.693	3	151.459	1	.008	1	.195	1	1.597	2
134			min	-52.531	1	-1068.116	2	4.193	12	-.012	3	.002	12	-.811	3
135		11	max	-1.918	15	879.696	2	-3.043	12	.012	3	.085	1	.812	2
136			min	-52.531	1	-422.068	3	-119.686	1	-.008	1	-.002	3	-.435	3
137		12	max	-1.918	15	691.275	2	-1.892	12	.012	3	.004	2	.179	2
138			min	-52.531	1	-333.442	3	-87.913	1	-.008	1	-.005	3	-.131	3
139		13	max	-1.918	15	502.855	2	-.742	12	.012	3	-.002	15	.102	3
140			min	-52.531	1	-244.816	3	-56.141	1	-.008	1	-.056	1	-.302	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	-1.918	15	314.435	2	.818	3	.012	3	-.003	15	.263	3
142			min	-52.531	1	-156.19	3	-24.368	1	-.008	1	-.089	1	-.631	2
143		15	max	-1.918	15	126.014	2	7.405	1	.012	3	-.003	12	.353	3
144			min	-52.531	1	-67.564	3	-.164	10	-.008	1	-.096	1	-.808	2
145		16	max	-1.918	15	21.062	3	39.178	1	.012	3	-.002	12	.372	3
146			min	-52.531	1	-62.406	2	1.425	15	-.008	1	-.077	1	-.834	2
147		17	max	-1.918	15	109.688	3	70.95	1	.012	3	.002	3	.32	3
148			min	-52.531	1	-250.826	2	2.556	15	-.008	1	-.032	1	-.708	2
149		18	max	-1.918	15	198.314	3	102.723	1	.012	3	.038	1	.195	3
150			min	-52.531	1	-439.247	2	3.688	15	-.008	1	.001	10	-.43	2
151		19	max	-1.918	15	286.939	3	134.496	1	.012	3	.133	1	0	2
152			min	-52.531	1	-627.667	2	4.82	15	-.008	1	.005	15	0	3
153	M2	1	max	1072.737	1	2.158	4	.552	1	0	3	0	3	0	1
154			min	-1393.187	3	.507	15	.02	15	0	1	0	1	0	1
155		2	max	1073.153	1	2.149	4	.552	1	0	3	0	1	0	15
156			min	-1392.875	3	.505	15	.02	15	0	1	0	15	0	4
157		3	max	1073.569	1	2.141	4	.552	1	0	3	0	1	0	15
158			min	-1392.564	3	.503	15	.02	15	0	1	0	15	-.001	4
159		4	max	1073.985	1	2.132	4	.552	1	0	3	0	1	0	15
160			min	-1392.252	3	.501	15	.02	15	0	1	0	15	-.002	4
161		5	max	1074.401	1	2.123	4	.552	1	0	3	0	1	0	15
162			min	-1391.94	3	.499	15	.02	15	0	1	0	15	-.002	4
163		6	max	1074.817	1	2.114	4	.552	1	0	3	0	1	0	15
164			min	-1391.628	3	.497	15	.02	15	0	1	0	15	-.003	4
165		7	max	1075.232	1	2.106	4	.552	1	0	3	0	1	0	15
166			min	-1391.316	3	.495	15	.02	15	0	1	0	15	-.004	4
167		8	max	1075.648	1	2.097	4	.552	1	0	3	.001	1	0	15
168			min	-1391.004	3	.493	15	.02	15	0	1	0	15	-.004	4
169		9	max	1076.064	1	2.088	4	.552	1	0	3	.001	1	-.001	15
170			min	-1390.692	3	.491	15	.02	15	0	1	0	15	-.005	4
171		10	max	1076.48	1	2.08	4	.552	1	0	3	.001	1	-.001	15
172			min	-1390.38	3	.489	15	.02	15	0	1	0	15	-.005	4
173		11	max	1076.896	1	2.071	4	.552	1	0	3	.002	1	-.001	15
174			min	-1390.068	3	.487	15	.02	15	0	1	0	15	-.006	4
175		12	max	1077.312	1	2.062	4	.552	1	0	3	.002	1	-.002	15
176			min	-1389.756	3	.485	15	.02	15	0	1	0	15	-.007	4
177		13	max	1077.728	1	2.053	4	.552	1	0	3	.002	1	-.002	15
178			min	-1389.444	3	.483	15	.02	15	0	1	0	15	-.007	4
179		14	max	1078.144	1	2.045	4	.552	1	0	3	.002	1	-.002	15
180			min	-1389.133	3	.481	15	.02	15	0	1	0	15	-.008	4
181		15	max	1078.56	1	2.036	4	.552	1	0	3	.002	1	-.002	15
182			min	-1388.821	3	.479	15	.02	15	0	1	0	15	-.008	4
183		16	max	1078.975	1	2.027	4	.552	1	0	3	.002	1	-.002	15
184			min	-1388.509	3	.476	15	.02	15	0	1	0	15	-.009	4
185		17	max	1079.391	1	2.019	4	.552	1	0	3	.002	1	-.002	15
186			min	-1388.197	3	.474	15	.02	15	0	1	0	15	-.009	4
187		18	max	1079.807	1	2.01	4	.552	1	0	3	.003	1	-.002	15
188			min	-1387.885	3	.472	15	.02	15	0	1	0	15	-.01	4
189		19	max	1080.223	1	2.001	4	.552	1	0	3	.003	1	-.002	15
190			min	-1387.573	3	.47	15	.02	15	0	1	0	15	-.01	4
191	M3	1	max	585.567	2	9.101	4	.137	1	0	3	0	1	.01	4
192			min	-721.176	3	2.139	15	.005	15	0	1	0	15	.002	15
193		2	max	585.397	2	8.227	4	.137	1	0	3	0	1	.006	4
194			min	-721.303	3	1.934	15	.005	15	0	1	0	15	.001	12
195		3	max	585.227	2	7.353	4	.137	1	0	3	0	1	.003	2
196			min	-721.431	3	1.728	15	.005	15	0	1	0	15	0	3
197		4	max	585.056	2	6.478	4	.137	1	0	3	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	-721.559	3	1.523	15	.005	15	0	1	0	15	-.002	3
199		5	max	584.886	2	5.604	4	.137	1	0	3	0	1	0	15
200			min	-721.687	3	1.317	15	.005	15	0	1	0	15	-.004	3
201		6	max	584.715	2	4.729	4	.137	1	0	3	0	1	-.001	15
202			min	-721.814	3	1.112	15	.005	15	0	1	0	15	-.006	4
203		7	max	584.545	2	3.855	4	.137	1	0	3	0	1	-.002	15
204			min	-721.942	3	.906	15	.005	15	0	1	0	15	-.008	4
205		8	max	584.375	2	2.98	4	.137	1	0	3	0	1	-.002	15
206			min	-722.07	3	.701	15	.005	15	0	1	0	15	-.01	4
207		9	max	584.204	2	2.106	4	.137	1	0	3	0	1	-.003	15
208			min	-722.198	3	.495	15	.005	15	0	1	0	15	-.011	4
209		10	max	584.034	2	1.231	4	.137	1	0	3	0	1	-.003	15
210			min	-722.325	3	.289	15	.005	15	0	1	0	15	-.012	4
211		11	max	583.864	2	.45	2	.137	1	0	3	0	1	-.003	15
212			min	-722.453	3	-.029	3	.005	15	0	1	0	15	-.012	4
213		12	max	583.693	2	-.122	15	.137	1	0	3	0	1	-.003	15
214			min	-722.581	3	-.541	3	.005	15	0	1	0	15	-.012	4
215		13	max	583.523	2	-.327	15	.137	1	0	3	0	1	-.003	15
216			min	-722.709	3	-1.392	4	.005	15	0	1	0	15	-.011	4
217		14	max	583.353	2	-.533	15	.137	1	0	3	0	1	-.002	15
218			min	-722.836	3	-2.266	4	.005	15	0	1	0	15	-.011	4
219		15	max	583.182	2	-.738	15	.137	1	0	3	0	1	-.002	15
220			min	-722.964	3	-3.141	4	.005	15	0	1	0	15	-.009	4
221		16	max	583.012	2	-.944	15	.137	1	0	3	.001	1	-.002	15
222			min	-723.092	3	-4.015	4	.005	15	0	1	0	15	-.008	4
223		17	max	582.842	2	-1.149	15	.137	1	0	3	.001	1	-.001	15
224			min	-723.22	3	-4.89	4	.005	15	0	1	0	15	-.005	4
225		18	max	582.671	2	-1.355	15	.137	1	0	3	.001	1	0	15
226			min	-723.348	3	-5.764	4	.005	15	0	1	0	15	-.003	4
227		19	max	582.501	2	-1.561	15	.137	1	0	3	.001	1	0	1
228			min	-723.475	3	-6.638	4	.005	15	0	1	0	15	0	1
229	M4	1	max	1115.671	1	0	1	-.285	15	0	1	0	1	0	1
230			min	-272.276	3	0	1	-7.854	1	0	1	0	15	0	1
231		2	max	1115.841	1	0	1	-.285	15	0	1	0	12	0	1
232			min	-272.148	3	0	1	-7.854	1	0	1	0	1	0	1
233		3	max	1116.011	1	0	1	-.285	15	0	1	0	15	0	1
234			min	-272.02	3	0	1	-7.854	1	0	1	-.001	1	0	1
235		4	max	1116.182	1	0	1	-.285	15	0	1	0	15	0	1
236			min	-271.892	3	0	1	-7.854	1	0	1	-.002	1	0	1
237		5	max	1116.352	1	0	1	-.285	15	0	1	0	15	0	1
238			min	-271.765	3	0	1	-7.854	1	0	1	-.003	1	0	1
239		6	max	1116.523	1	0	1	-.285	15	0	1	0	15	0	1
240			min	-271.637	3	0	1	-7.854	1	0	1	-.004	1	0	1
241		7	max	1116.693	1	0	1	-.285	15	0	1	0	15	0	1
242			min	-271.509	3	0	1	-7.854	1	0	1	-.005	1	0	1
243		8	max	1116.863	1	0	1	-.285	15	0	1	0	15	0	1
244			min	-271.381	3	0	1	-7.854	1	0	1	-.006	1	0	1
245		9	max	1117.034	1	0	1	-.285	15	0	1	0	15	0	1
246			min	-271.254	3	0	1	-7.854	1	0	1	-.006	1	0	1
247		10	max	1117.204	1	0	1	-.285	15	0	1	0	15	0	1
248			min	-271.126	3	0	1	-7.854	1	0	1	-.007	1	0	1
249		11	max	1117.374	1	0	1	-.285	15	0	1	0	15	0	1
250			min	-270.998	3	0	1	-7.854	1	0	1	-.008	1	0	1
251		12	max	1117.545	1	0	1	-.285	15	0	1	0	15	0	1
252			min	-270.87	3	0	1	-7.854	1	0	1	-.009	1	0	1
253		13	max	1117.715	1	0	1	-.285	15	0	1	0	15	0	1
254			min	-270.743	3	0	1	-7.854	1	0	1	-.01	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	1117.885	1	0	1	-.285	15	0	1	0	15	0	1
256			min	-270.615	3	0	1	-7.854	1	0	1	-.011	1	0	1
257		15	max	1118.056	1	0	1	-.285	15	0	1	0	15	0	1
258			min	-270.487	3	0	1	-7.854	1	0	1	-.012	1	0	1
259		16	max	1118.226	1	0	1	-.285	15	0	1	0	15	0	1
260			min	-270.359	3	0	1	-7.854	1	0	1	-.013	1	0	1
261		17	max	1118.396	1	0	1	-.285	15	0	1	0	15	0	1
262			min	-270.231	3	0	1	-7.854	1	0	1	-.014	1	0	1
263		18	max	1118.567	1	0	1	-.285	15	0	1	0	15	0	1
264			min	-270.104	3	0	1	-7.854	1	0	1	-.015	1	0	1
265		19	max	1118.737	1	0	1	-.285	15	0	1	0	15	0	1
266			min	-269.976	3	0	1	-7.854	1	0	1	-.016	1	0	1
267	M6	1	max	3228.595	1	2.627	2	0	1	0	1	0	1	0	1
268			min	-4313.665	3	.059	3	0	1	0	1	0	1	0	1
269		2	max	3229.011	1	2.621	2	0	1	0	1	0	1	0	3
270			min	-4313.353	3	.054	3	0	1	0	1	0	1	0	2
271		3	max	3229.427	1	2.614	2	0	1	0	1	0	1	0	3
272			min	-4313.041	3	.049	3	0	1	0	1	0	1	-.001	2
273		4	max	3229.843	1	2.607	2	0	1	0	1	0	1	0	3
274			min	-4312.729	3	.044	3	0	1	0	1	0	1	-.002	2
275		5	max	3230.259	1	2.6	2	0	1	0	1	0	1	0	3
276			min	-4312.417	3	.039	3	0	1	0	1	0	1	-.003	2
277		6	max	3230.675	1	2.593	2	0	1	0	1	0	1	0	3
278			min	-4312.105	3	.033	3	0	1	0	1	0	1	-.004	2
279		7	max	3231.091	1	2.587	2	0	1	0	1	0	1	0	3
280			min	-4311.793	3	.028	3	0	1	0	1	0	1	-.004	2
281		8	max	3231.507	1	2.58	2	0	1	0	1	0	1	0	3
282			min	-4311.481	3	.023	3	0	1	0	1	0	1	-.005	2
283		9	max	3231.922	1	2.573	2	0	1	0	1	0	1	0	3
284			min	-4311.17	3	.018	3	0	1	0	1	0	1	-.006	2
285		10	max	3232.338	1	2.566	2	0	1	0	1	0	1	0	3
286			min	-4310.858	3	.013	3	0	1	0	1	0	1	-.007	2
287		11	max	3232.754	1	2.56	2	0	1	0	1	0	1	0	3
288			min	-4310.546	3	.008	3	0	1	0	1	0	1	-.007	2
289		12	max	3233.17	1	2.553	2	0	1	0	1	0	1	0	3
290			min	-4310.234	3	.003	3	0	1	0	1	0	1	-.008	2
291		13	max	3233.586	1	2.546	2	0	1	0	1	0	1	0	3
292			min	-4309.922	3	-.002	3	0	1	0	1	0	1	-.009	2
293		14	max	3234.002	1	2.539	2	0	1	0	1	0	1	0	3
294			min	-4309.61	3	-.007	3	0	1	0	1	0	1	-.009	2
295		15	max	3234.418	1	2.532	2	0	1	0	1	0	1	0	3
296			min	-4309.298	3	-.012	3	0	1	0	1	0	1	-.01	2
297		16	max	3234.834	1	2.526	2	0	1	0	1	0	1	0	3
298			min	-4308.986	3	-.017	3	0	1	0	1	0	1	-.011	2
299		17	max	3235.249	1	2.519	2	0	1	0	1	0	1	0	3
300			min	-4308.674	3	-.023	3	0	1	0	1	0	1	-.012	2
301		18	max	3235.665	1	2.512	2	0	1	0	1	0	1	0	3
302			min	-4308.362	3	-.028	3	0	1	0	1	0	1	-.012	2
303		19	max	3236.081	1	2.505	2	0	1	0	1	0	1	0	3
304			min	-4308.05	3	-.033	3	0	1	0	1	0	1	-.013	2
305	M7	1	max	1941.455	2	9.132	4	0	1	0	1	0	1	.013	2
306			min	-2129.124	3	2.144	15	0	1	0	1	0	1	0	3
307		2	max	1941.285	2	8.257	4	0	1	0	1	0	1	.009	2
308			min	-2129.252	3	1.938	15	0	1	0	1	0	1	-.002	3
309		3	max	1941.114	2	7.383	4	0	1	0	1	0	1	.006	2
310			min	-2129.379	3	1.732	15	0	1	0	1	0	1	-.004	3
311		4	max	1940.944	2	6.508	4	0	1	0	1	0	1	.004	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	-2129.507	3	1.527	15	0	1	0	1	0	1	-.005	3
313		5	max	1940.774	2	5.634	4	0	1	0	1	0	1	.001	2
314			min	-2129.635	3	1.321	15	0	1	0	1	0	1	-.007	3
315		6	max	1940.603	2	4.759	4	0	1	0	1	0	1	-.001	2
316			min	-2129.763	3	1.116	15	0	1	0	1	0	1	-.008	3
317		7	max	1940.433	2	3.885	4	0	1	0	1	0	1	-.002	15
318			min	-2129.891	3	.91	15	0	1	0	1	0	1	-.009	3
319		8	max	1940.263	2	3.011	4	0	1	0	1	0	1	-.002	15
320			min	-2130.018	3	.705	15	0	1	0	1	0	1	-.009	4
321		9	max	1940.092	2	2.201	2	0	1	0	1	0	1	-.003	15
322			min	-2130.146	3	.393	12	0	1	0	1	0	1	-.011	4
323		10	max	1939.922	2	1.52	2	0	1	0	1	0	1	-.003	15
324			min	-2130.274	3	.008	3	0	1	0	1	0	1	-.011	4
325		11	max	1939.752	2	.838	2	0	1	0	1	0	1	-.003	15
326			min	-2130.402	3	-.503	3	0	1	0	1	0	1	-.012	4
327		12	max	1939.581	2	.157	2	0	1	0	1	0	1	-.003	15
328			min	-2130.529	3	-1.014	3	0	1	0	1	0	1	-.012	4
329		13	max	1939.411	2	-.323	15	0	1	0	1	0	1	-.003	15
330			min	-2130.657	3	-1.525	3	0	1	0	1	0	1	-.011	4
331		14	max	1939.241	2	-.529	15	0	1	0	1	0	1	-.002	15
332			min	-2130.785	3	-2.236	4	0	1	0	1	0	1	-.01	4
333		15	max	1939.07	2	-.734	15	0	1	0	1	0	1	-.002	15
334			min	-2130.913	3	-3.111	4	0	1	0	1	0	1	-.009	4
335		16	max	1938.9	2	-.94	15	0	1	0	1	0	1	-.002	15
336			min	-2131.04	3	-3.985	4	0	1	0	1	0	1	-.008	4
337		17	max	1938.729	2	-1.145	15	0	1	0	1	0	1	-.001	15
338			min	-2131.168	3	-4.859	4	0	1	0	1	0	1	-.005	4
339		18	max	1938.559	2	-1.351	15	0	1	0	1	0	1	0	15
340			min	-2131.296	3	-5.734	4	0	1	0	1	0	1	-.003	4
341		19	max	1938.389	2	-1.556	15	0	1	0	1	0	1	0	1
342			min	-2131.424	3	-6.608	4	0	1	0	1	0	1	0	1
343	M8	1	max	3089.288	1	0	1	0	1	0	1	0	1	0	1
344			min	-899.136	3	0	1	0	1	0	1	0	1	0	1
345		2	max	3089.458	1	0	1	0	1	0	1	0	1	0	1
346			min	-899.008	3	0	1	0	1	0	1	0	1	0	1
347		3	max	3089.628	1	0	1	0	1	0	1	0	1	0	1
348			min	-898.88	3	0	1	0	1	0	1	0	1	0	1
349		4	max	3089.799	1	0	1	0	1	0	1	0	1	0	1
350			min	-898.752	3	0	1	0	1	0	1	0	1	0	1
351		5	max	3089.969	1	0	1	0	1	0	1	0	1	0	1
352			min	-898.625	3	0	1	0	1	0	1	0	1	0	1
353		6	max	3090.139	1	0	1	0	1	0	1	0	1	0	1
354			min	-898.497	3	0	1	0	1	0	1	0	1	0	1
355		7	max	3090.31	1	0	1	0	1	0	1	0	1	0	1
356			min	-898.369	3	0	1	0	1	0	1	0	1	0	1
357		8	max	3090.48	1	0	1	0	1	0	1	0	1	0	1
358			min	-898.241	3	0	1	0	1	0	1	0	1	0	1
359		9	max	3090.65	1	0	1	0	1	0	1	0	1	0	1
360			min	-898.114	3	0	1	0	1	0	1	0	1	0	1
361		10	max	3090.821	1	0	1	0	1	0	1	0	1	0	1
362			min	-897.986	3	0	1	0	1	0	1	0	1	0	1
363		11	max	3090.991	1	0	1	0	1	0	1	0	1	0	1
364			min	-897.858	3	0	1	0	1	0	1	0	1	0	1
365		12	max	3091.161	1	0	1	0	1	0	1	0	1	0	1
366			min	-897.73	3	0	1	0	1	0	1	0	1	0	1
367		13	max	3091.332	1	0	1	0	1	0	1	0	1	0	1
368			min	-897.603	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	3091.502	1	0	1	0	1	0	1	0	1	0	1
370			min	-897.475	3	0	1	0	1	0	1	0	1	0	1
371		15	max	3091.672	1	0	1	0	1	0	1	0	1	0	1
372			min	-897.347	3	0	1	0	1	0	1	0	1	0	1
373		16	max	3091.843	1	0	1	0	1	0	1	0	1	0	1
374			min	-897.219	3	0	1	0	1	0	1	0	1	0	1
375		17	max	3092.013	1	0	1	0	1	0	1	0	1	0	1
376			min	-897.092	3	0	1	0	1	0	1	0	1	0	1
377		18	max	3092.183	1	0	1	0	1	0	1	0	1	0	1
378			min	-896.964	3	0	1	0	1	0	1	0	1	0	1
379		19	max	3092.354	1	0	1	0	1	0	1	0	1	0	1
380			min	-896.836	3	0	1	0	1	0	1	0	1	0	1
381	M10	1	max	1072.737	1	2.158	4	-.02	15	0	1	0	1	0	1
382			min	-1393.187	3	.507	15	-.552	1	0	3	0	3	0	1
383		2	max	1073.153	1	2.149	4	-.02	15	0	1	0	15	0	15
384			min	-1392.875	3	.505	15	-.552	1	0	3	0	1	0	4
385		3	max	1073.569	1	2.141	4	-.02	15	0	1	0	15	0	15
386			min	-1392.564	3	.503	15	-.552	1	0	3	0	1	-.001	4
387		4	max	1073.985	1	2.132	4	-.02	15	0	1	0	15	0	15
388			min	-1392.252	3	.501	15	-.552	1	0	3	0	1	-.002	4
389		5	max	1074.401	1	2.123	4	-.02	15	0	1	0	15	0	15
390			min	-1391.94	3	.499	15	-.552	1	0	3	0	1	-.002	4
391		6	max	1074.817	1	2.114	4	-.02	15	0	1	0	15	0	15
392			min	-1391.628	3	.497	15	-.552	1	0	3	0	1	-.003	4
393		7	max	1075.232	1	2.106	4	-.02	15	0	1	0	15	0	15
394			min	-1391.316	3	.495	15	-.552	1	0	3	0	1	-.004	4
395		8	max	1075.648	1	2.097	4	-.02	15	0	1	0	15	0	15
396			min	-1391.004	3	.493	15	-.552	1	0	3	-.001	1	-.004	4
397		9	max	1076.064	1	2.088	4	-.02	15	0	1	0	15	-.001	15
398			min	-1390.692	3	.491	15	-.552	1	0	3	-.001	1	-.005	4
399		10	max	1076.48	1	2.08	4	-.02	15	0	1	0	15	-.001	15
400			min	-1390.38	3	.489	15	-.552	1	0	3	-.001	1	-.005	4
401		11	max	1076.896	1	2.071	4	-.02	15	0	1	0	15	-.001	15
402			min	-1390.068	3	.487	15	-.552	1	0	3	-.002	1	-.006	4
403		12	max	1077.312	1	2.062	4	-.02	15	0	1	0	15	-.002	15
404			min	-1389.756	3	.485	15	-.552	1	0	3	-.002	1	-.007	4
405		13	max	1077.728	1	2.053	4	-.02	15	0	1	0	15	-.002	15
406			min	-1389.444	3	.483	15	-.552	1	0	3	-.002	1	-.007	4
407		14	max	1078.144	1	2.045	4	-.02	15	0	1	0	15	-.002	15
408			min	-1389.133	3	.481	15	-.552	1	0	3	-.002	1	-.008	4
409		15	max	1078.56	1	2.036	4	-.02	15	0	1	0	15	-.002	15
410			min	-1388.821	3	.479	15	-.552	1	0	3	-.002	1	-.008	4
411		16	max	1078.975	1	2.027	4	-.02	15	0	1	0	15	-.002	15
412			min	-1388.509	3	.476	15	-.552	1	0	3	-.002	1	-.009	4
413		17	max	1079.391	1	2.019	4	-.02	15	0	1	0	15	-.002	15
414			min	-1388.197	3	.474	15	-.552	1	0	3	-.002	1	-.009	4
415		18	max	1079.807	1	2.01	4	-.02	15	0	1	0	15	-.002	15
416			min	-1387.885	3	.472	15	-.552	1	0	3	-.003	1	-.01	4
417		19	max	1080.223	1	2.001	4	-.02	15	0	1	0	15	-.002	15
418			min	-1387.573	3	.47	15	-.552	1	0	3	-.003	1	-.01	4
419	M11	1	max	585.567	2	9.101	4	-.005	15	0	1	0	15	.01	4
420			min	-721.176	3	2.139	15	-.137	1	0	3	0	1	.002	15
421		2	max	585.397	2	8.227	4	-.005	15	0	1	0	15	.006	4
422			min	-721.303	3	1.934	15	-.137	1	0	3	0	1	.001	12
423		3	max	585.227	2	7.353	4	-.005	15	0	1	0	15	.003	2
424			min	-721.431	3	1.728	15	-.137	1	0	3	0	1	0	3
425		4	max	585.056	2	6.478	4	-.005	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	-721.559	3	1.523	15	-.137	1	0	3	0	1	-.002	3
427		5	max	584.886	2	5.604	4	-.005	15	0	1	0	15	0	15
428			min	-721.687	3	1.317	15	-.137	1	0	3	0	1	-.004	3
429		6	max	584.715	2	4.729	4	-.005	15	0	1	0	15	-.001	15
430			min	-721.814	3	1.112	15	-.137	1	0	3	0	1	-.006	4
431		7	max	584.545	2	3.855	4	-.005	15	0	1	0	15	-.002	15
432			min	-721.942	3	.906	15	-.137	1	0	3	0	1	-.008	4
433		8	max	584.375	2	2.98	4	-.005	15	0	1	0	15	-.002	15
434			min	-722.07	3	.701	15	-.137	1	0	3	0	1	-.01	4
435		9	max	584.204	2	2.106	4	-.005	15	0	1	0	15	-.003	15
436			min	-722.198	3	.495	15	-.137	1	0	3	0	1	-.011	4
437		10	max	584.034	2	1.231	4	-.005	15	0	1	0	15	-.003	15
438			min	-722.325	3	.289	15	-.137	1	0	3	0	1	-.012	4
439		11	max	583.864	2	.45	2	-.005	15	0	1	0	15	-.003	15
440			min	-722.453	3	-.029	3	-.137	1	0	3	0	1	-.012	4
441		12	max	583.693	2	-.122	15	-.005	15	0	1	0	15	-.003	15
442			min	-722.581	3	-.541	3	-.137	1	0	3	0	1	-.012	4
443		13	max	583.523	2	-.327	15	-.005	15	0	1	0	15	-.003	15
444			min	-722.709	3	-1.392	4	-.137	1	0	3	0	1	-.011	4
445		14	max	583.353	2	-.533	15	-.005	15	0	1	0	15	-.002	15
446			min	-722.836	3	-2.266	4	-.137	1	0	3	0	1	-.011	4
447		15	max	583.182	2	-.738	15	-.005	15	0	1	0	15	-.002	15
448			min	-722.964	3	-3.141	4	-.137	1	0	3	0	1	-.009	4
449		16	max	583.012	2	-.944	15	-.005	15	0	1	0	15	-.002	15
450			min	-723.092	3	-4.015	4	-.137	1	0	3	-.001	1	-.008	4
451		17	max	582.842	2	-1.149	15	-.005	15	0	1	0	15	-.001	15
452			min	-723.22	3	-4.89	4	-.137	1	0	3	-.001	1	-.005	4
453		18	max	582.671	2	-1.355	15	-.005	15	0	1	0	15	0	15
454			min	-723.348	3	-5.764	4	-.137	1	0	3	-.001	1	-.003	4
455		19	max	582.501	2	-1.561	15	-.005	15	0	1	0	15	0	1
456			min	-723.475	3	-6.638	4	-.137	1	0	3	-.001	1	0	1
457	M12	1	max	1115.671	1	0	1	7.854	1	0	1	0	15	0	1
458			min	-272.276	3	0	1	.285	15	0	1	0	1	0	1
459		2	max	1115.841	1	0	1	7.854	1	0	1	0	1	0	1
460			min	-272.148	3	0	1	.285	15	0	1	0	12	0	1
461		3	max	1116.011	1	0	1	7.854	1	0	1	.001	1	0	1
462			min	-272.02	3	0	1	.285	15	0	1	0	15	0	1
463		4	max	1116.182	1	0	1	7.854	1	0	1	.002	1	0	1
464			min	-271.892	3	0	1	.285	15	0	1	0	15	0	1
465		5	max	1116.352	1	0	1	7.854	1	0	1	.003	1	0	1
466			min	-271.765	3	0	1	.285	15	0	1	0	15	0	1
467		6	max	1116.523	1	0	1	7.854	1	0	1	.004	1	0	1
468			min	-271.637	3	0	1	.285	15	0	1	0	15	0	1
469		7	max	1116.693	1	0	1	7.854	1	0	1	.005	1	0	1
470			min	-271.509	3	0	1	.285	15	0	1	0	15	0	1
471		8	max	1116.863	1	0	1	7.854	1	0	1	.006	1	0	1
472			min	-271.381	3	0	1	.285	15	0	1	0	15	0	1
473		9	max	1117.034	1	0	1	7.854	1	0	1	.006	1	0	1
474			min	-271.254	3	0	1	.285	15	0	1	0	15	0	1
475		10	max	1117.204	1	0	1	7.854	1	0	1	.007	1	0	1
476			min	-271.126	3	0	1	.285	15	0	1	0	15	0	1
477		11	max	1117.374	1	0	1	7.854	1	0	1	.008	1	0	1
478			min	-270.998	3	0	1	.285	15	0	1	0	15	0	1
479		12	max	1117.545	1	0	1	7.854	1	0	1	.009	1	0	1
480			min	-270.87	3	0	1	.285	15	0	1	0	15	0	1
481		13	max	1117.715	1	0	1	7.854	1	0	1	.01	1	0	1
482			min	-270.743	3	0	1	.285	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	1117.885	1	0	1	7.854	1	0	1	.011	1	0	1
484			min	-270.615	3	0	1	.285	15	0	1	0	15	0	1
485		15	max	1118.056	1	0	1	7.854	1	0	1	.012	1	0	1
486			min	-270.487	3	0	1	.285	15	0	1	0	15	0	1
487		16	max	1118.226	1	0	1	7.854	1	0	1	.013	1	0	1
488			min	-270.359	3	0	1	.285	15	0	1	0	15	0	1
489		17	max	1118.396	1	0	1	7.854	1	0	1	.014	1	0	1
490			min	-270.231	3	0	1	.285	15	0	1	0	15	0	1
491		18	max	1118.567	1	0	1	7.854	1	0	1	.015	1	0	1
492			min	-270.104	3	0	1	.285	15	0	1	0	15	0	1
493		19	max	1118.737	1	0	1	7.854	1	0	1	.016	1	0	1
494			min	-269.976	3	0	1	.285	15	0	1	0	15	0	1
495	M1	1	max	133.917	1	745.666	3	-1.72	15	0	1	.131	1	0	15
496			min	4.807	15	-446.823	1	-46.956	1	0	3	.005	15	-.014	2
497		2	max	134.493	1	744.478	3	-1.72	15	0	1	.102	1	.266	1
498			min	4.981	15	-448.406	1	-46.956	1	0	3	.004	15	-.469	3
499		3	max	466.721	3	570.076	2	-1.7	15	0	3	.072	1	.534	1
500			min	-295.543	2	-578.105	3	-46.538	1	0	2	.003	15	-.916	3
501		4	max	467.153	3	568.493	2	-1.7	15	0	3	.044	1	.187	1
502			min	-294.966	2	-579.292	3	-46.538	1	0	2	.002	15	-.557	3
503		5	max	467.586	3	566.91	2	-1.7	15	0	3	.015	1	-.006	15
504			min	-294.39	2	-580.479	3	-46.538	1	0	2	0	15	-.197	3
505		6	max	468.018	3	565.327	2	-1.7	15	0	3	0	15	.164	3
506			min	-293.814	2	-581.667	3	-46.538	1	0	2	-.014	1	-.542	2
507		7	max	468.45	3	563.744	2	-1.7	15	0	3	-.002	15	.525	3
508			min	-293.238	2	-582.854	3	-46.538	1	0	2	-.043	1	-.892	2
509		8	max	468.882	3	562.161	2	-1.7	15	0	3	-.003	15	.887	3
510			min	-292.661	2	-584.041	3	-46.538	1	0	2	-.072	1	-1.242	2
511		9	max	479.992	3	47.15	2	-2.843	15	0	9	.048	1	1.033	3
512			min	-238.717	2	.482	15	-77.924	1	0	3	.002	15	-1.415	2
513		10	max	480.425	3	45.567	2	-2.843	15	0	9	0	10	1.011	3
514			min	-238.14	2	.004	15	-77.924	1	0	3	0	1	-1.444	2
515		11	max	480.857	3	43.984	2	-2.843	15	0	9	-.002	15	.99	3
516			min	-237.564	2	-1.948	4	-77.924	1	0	3	-.049	1	-1.472	2
517		12	max	491.71	3	390.965	3	-1.638	15	0	2	.071	1	.869	3
518			min	-183.505	2	-662.286	2	-45.095	1	0	3	.003	15	-1.307	2
519		13	max	492.142	3	389.777	3	-1.638	15	0	2	.043	1	.626	3
520			min	-182.929	2	-663.869	2	-45.095	1	0	3	.002	15	-.895	2
521		14	max	492.575	3	388.59	3	-1.638	15	0	2	.015	1	.385	3
522			min	-182.353	2	-665.453	2	-45.095	1	0	3	0	15	-.483	2
523		15	max	493.007	3	387.402	3	-1.638	15	0	2	0	15	.144	3
524			min	-181.777	2	-667.036	2	-45.095	1	0	3	-.013	1	-.096	1
525		16	max	493.439	3	386.215	3	-1.638	15	0	2	-.001	15	.345	2
526			min	-181.2	2	-668.619	2	-45.095	1	0	3	-.041	1	-.096	3
527		17	max	493.871	3	385.028	3	-1.638	15	0	2	-.003	15	.761	2
528			min	-180.624	2	-670.202	2	-45.095	1	0	3	-.069	1	-.335	3
529		18	max	-4.994	15	629.955	2	-1.918	15	0	3	-.004	15	.384	2
530			min	-135.068	1	-285.851	3	-52.587	1	0	2	-.1	1	-.166	3
531		19	max	-4.82	15	628.372	2	-1.918	15	0	3	-.005	15	.012	3
532			min	-134.492	1	-287.039	3	-52.587	1	0	2	-.133	1	-.008	1
533	M5	1	max	304.074	1	2456.614	3	0	1	0	1	0	1	.027	2
534			min	7.412	12	-1548.847	1	0	1	0	1	0	1	0	15
535		2	max	304.651	1	2455.426	3	0	1	0	1	0	1	.985	1
536			min	7.701	12	-1550.431	1	0	1	0	1	0	1	-1.512	3
537		3	max	1417.942	3	1486.128	2	0	1	0	1	0	1	1.915	1
538			min	-923.511	2	-1656.146	3	0	1	0	1	0	1	-2.99	3
539		4	max	1418.374	3	1484.545	2	0	1	0	1	0	1	1.003	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	-922.935	2	-1657.333	3	0	1	0	1	0	1	-1.962	3
541		5	max	1418.806	3	1482.962	2	0	1	0	1	0	1	.093	1
542			min	-922.358	2	-1658.52	3	0	1	0	1	0	1	-.933	3
543		6	max	1419.238	3	1481.379	2	0	1	0	1	0	1	.097	3
544			min	-921.782	2	-1659.708	3	0	1	0	1	0	1	-.889	2
545		7	max	1419.671	3	1479.796	2	0	1	0	1	0	1	1.127	3
546			min	-921.206	2	-1660.895	3	0	1	0	1	0	1	-1.808	2
547		8	max	1420.103	3	1478.212	2	0	1	0	1	0	1	2.158	3
548			min	-920.63	2	-1662.083	3	0	1	0	1	0	1	-2.726	2
549		9	max	1430.236	3	160.503	2	0	1	0	1	0	1	2.491	3
550			min	-801.644	2	.477	15	0	1	0	1	0	1	-3.121	2
551		10	max	1430.668	3	158.92	2	0	1	0	1	0	1	2.403	3
552			min	-801.067	2	0	15	0	1	0	1	0	1	-3.221	2
553		11	max	1431.1	3	157.336	2	0	1	0	1	0	1	2.316	3
554			min	-800.491	2	-1.854	4	0	1	0	1	0	1	-3.319	2
555		12	max	1441.746	3	1063.671	3	0	1	0	1	0	1	2.023	3
556			min	-681.733	2	-1797.679	2	0	1	0	1	0	1	-2.963	2
557		13	max	1442.178	3	1062.483	3	0	1	0	1	0	1	1.364	3
558			min	-681.156	2	-1799.262	2	0	1	0	1	0	1	-1.847	2
559		14	max	1442.61	3	1061.296	3	0	1	0	1	0	1	.705	3
560			min	-680.58	2	-1800.845	2	0	1	0	1	0	1	-.735	1
561		15	max	1443.042	3	1060.109	3	0	1	0	1	0	1	.388	2
562			min	-680.004	2	-1802.428	2	0	1	0	1	0	1	0	15
563		16	max	1443.475	3	1058.921	3	0	1	0	1	0	1	1.507	2
564			min	-679.428	2	-1804.012	2	0	1	0	1	0	1	-.611	3
565		17	max	1443.907	3	1057.734	3	0	1	0	1	0	1	2.627	2
566			min	-678.851	2	-1805.595	2	0	1	0	1	0	1	-1.268	3
567		18	max	-8.673	12	2140.344	2	0	1	0	1	0	1	1.342	2
568			min	-303.5	1	-1020.465	3	0	1	0	1	0	1	-.658	3
569		19	max	-8.385	12	2138.761	2	0	1	0	1	0	1	.016	1
570			min	-302.924	1	-1021.652	3	0	1	0	1	0	1	-.024	3
571	M9	1	max	133.917	1	745.666	3	46.956	1	0	3	-.005	15	0	15
572			min	4.807	15	-446.823	1	1.72	15	0	1	-.131	1	-.014	2
573		2	max	134.493	1	744.478	3	46.956	1	0	3	-.004	15	.266	1
574			min	4.981	15	-448.406	1	1.72	15	0	1	-.102	1	-.469	3
575		3	max	466.721	3	570.076	2	46.538	1	0	2	-.003	15	.534	1
576			min	-295.543	2	-578.105	3	1.7	15	0	3	-.072	1	-.916	3
577		4	max	467.153	3	568.493	2	46.538	1	0	2	-.002	15	.187	1
578			min	-294.966	2	-579.292	3	1.7	15	0	3	-.044	1	-.557	3
579		5	max	467.586	3	566.91	2	46.538	1	0	2	0	15	-.006	15
580			min	-294.39	2	-580.479	3	1.7	15	0	3	-.015	1	-.197	3
581		6	max	468.018	3	565.327	2	46.538	1	0	2	.014	1	.164	3
582			min	-293.814	2	-581.667	3	1.7	15	0	3	0	15	-.542	2
583		7	max	468.45	3	563.744	2	46.538	1	0	2	.043	1	.525	3
584			min	-293.238	2	-582.854	3	1.7	15	0	3	.002	15	-.892	2
585		8	max	468.882	3	562.161	2	46.538	1	0	2	.072	1	.887	3
586			min	-292.661	2	-584.041	3	1.7	15	0	3	.003	15	-1.242	2
587		9	max	479.992	3	47.15	2	77.924	1	0	3	-.002	15	1.033	3
588			min	-238.717	2	.482	15	2.843	15	0	9	-.048	1	-1.415	2
589		10	max	480.425	3	45.567	2	77.924	1	0	3	0	1	1.011	3
590			min	-238.14	2	.004	15	2.843	15	0	9	0	10	-1.444	2
591		11	max	480.857	3	43.984	2	77.924	1	0	3	.049	1	.99	3
592			min	-237.564	2	-1.948	4	2.843	15	0	9	.002	15	-1.472	2
593		12	max	491.71	3	390.965	3	45.095	1	0	3	-.003	15	.869	3
594			min	-183.505	2	-662.286	2	1.638	15	0	2	-.071	1	-1.307	2
595		13	max	492.142	3	389.777	3	45.095	1	0	3	-.002	15	.626	3
596			min	-182.929	2	-663.869	2	1.638	15	0	2	-.043	1	-.895	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	492.575	3	388.59	3	45.095	1	0	3	0	15	.385	3
598			min	-182.353	2	-665.453	2	1.638	15	0	2	-.015	1	-.483	2
599		15	max	493.007	3	387.402	3	45.095	1	0	3	.013	1	.144	3
600			min	-181.777	2	-667.036	2	1.638	15	0	2	0	15	-.096	1
601		16	max	493.439	3	386.215	3	45.095	1	0	3	.041	1	.345	2
602			min	-181.2	2	-668.619	2	1.638	15	0	2	.001	15	-.096	3
603		17	max	493.871	3	385.028	3	45.095	1	0	3	.069	1	.761	2
604			min	-180.624	2	-670.202	2	1.638	15	0	2	.003	15	-.335	3
605		18	max	-4.994	15	629.955	2	52.587	1	0	2	.1	1	.384	2
606			min	-135.068	1	-285.851	3	1.918	15	0	3	.004	15	-.166	3
607		19	max	-4.82	15	628.372	2	52.587	1	0	2	.133	1	.012	3
608			min	-134.492	1	-287.039	3	1.918	15	0	3	.005	15	-.008	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	.225	2	.009	3	1.525e-2	2	NC	1	NC	1
2			min	0	15	-.065	3	-.005	2	-4.161e-3	3	NC	1	NC	1
3		2	max	0	1	.166	2	.013	1	1.621e-2	2	NC	4	NC	1
4			min	0	15	.004	15	-.003	10	-3.71e-3	3	1224.647	3	NC	1
5		3	max	0	1	.193	3	.03	1	1.717e-2	2	NC	5	NC	2
6			min	0	15	.003	15	-.002	10	-3.259e-3	3	673.017	3	5624.487	1
7		4	max	0	1	.267	3	.044	1	1.812e-2	2	NC	5	NC	2
8			min	0	15	.002	15	-.001	10	-2.807e-3	3	523.97	3	3859.42	1
9		5	max	0	1	.289	3	.051	1	1.908e-2	2	NC	5	NC	2
10			min	0	15	.003	15	-.002	10	-2.356e-3	3	490.8	3	3384.192	1
11		6	max	0	1	.262	3	.047	1	2.004e-2	2	NC	5	NC	2
12			min	0	15	.003	15	-.003	10	-1.905e-3	3	532.474	3	3622.246	1
13		7	max	0	1	.208	2	.035	1	2.1e-2	2	NC	2	NC	2
14			min	0	15	.005	15	-.005	10	-1.454e-3	3	672.203	3	4873.554	1
15		8	max	0	1	.275	2	.026	3	2.195e-2	2	NC	4	NC	2
16			min	0	15	.006	15	-.008	10	-1.003e-3	3	1024.419	3	9765.119	1
17		9	max	0	1	.333	2	.027	3	2.291e-2	2	NC	4	NC	1
18			min	0	15	.007	15	-.015	2	-5.522e-4	3	1612.053	2	9851.075	3
19		10	max	0	1	.358	2	.027	3	2.387e-2	2	NC	4	NC	1
20			min	0	1	-.015	3	-.019	2	-1.011e-4	3	1303.581	2	9785.873	3
21		11	max	0	15	.333	2	.027	3	2.291e-2	2	NC	4	NC	1
22			min	0	1	.007	15	-.015	2	-5.522e-4	3	1612.053	2	9851.075	3
23		12	max	0	15	.275	2	.026	3	2.195e-2	2	NC	4	NC	2
24			min	0	1	.006	15	-.008	10	-1.003e-3	3	1024.419	3	9765.119	1
25		13	max	0	15	.208	2	.035	1	2.1e-2	2	NC	2	NC	2
26			min	0	1	.005	15	-.005	10	-1.454e-3	3	672.203	3	4873.554	1
27		14	max	0	15	.262	3	.047	1	2.004e-2	2	NC	5	NC	2
28			min	0	1	.003	15	-.003	10	-1.905e-3	3	532.474	3	3622.246	1
29		15	max	0	15	.289	3	.051	1	1.908e-2	2	NC	5	NC	2
30			min	0	1	.003	15	-.002	10	-2.356e-3	3	490.8	3	3384.192	1
31		16	max	0	15	.267	3	.044	1	1.812e-2	2	NC	5	NC	2
32			min	0	1	.002	15	-.001	10	-2.807e-3	3	523.97	3	3859.42	1
33		17	max	0	15	.193	3	.03	1	1.717e-2	2	NC	5	NC	2
34			min	0	1	.003	15	-.002	10	-3.259e-3	3	673.017	3	5624.487	1
35		18	max	0	15	.166	2	.013	1	1.621e-2	2	NC	4	NC	1
36			min	0	1	.004	15	-.003	10	-3.71e-3	3	1224.647	3	NC	1
37		19	max	0	15	.225	2	.009	3	1.525e-2	2	NC	1	NC	1
38			min	0	1	-.065	3	-.005	2	-4.161e-3	3	NC	1	NC	1
39	M14	1	max	0	1	.431	3	.008	3	8.42e-3	2	NC	1	NC	1
40			min	0	15	-.656	2	-.005	2	-6.506e-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	.621	3	.009	3	9.569e-3	2	NC	5	NC	1
42			min	0	15	-.855	2	-.003	10	-7.51e-3	3	870.686	2	NC	1
43		3	max	0	1	.789	3	.023	1	1.072e-2	2	NC	5	NC	2
44			min	0	15	-1.037	2	-.002	10	-8.514e-3	3	456.225	2	7570.462	1
45		4	max	0	1	.92	3	.036	1	1.187e-2	2	NC	15	NC	2
46			min	0	15	-1.187	2	-.001	10	-9.518e-3	3	327.445	2	4775.264	1
47		5	max	0	1	1.007	3	.043	1	1.301e-2	2	NC	15	NC	2
48			min	0	15	-1.298	2	-.002	10	-1.052e-2	3	271.002	2	3992.48	1
49		6	max	0	1	1.047	3	.042	1	1.416e-2	2	NC	15	NC	2
50			min	0	15	-1.367	2	-.003	10	-1.153e-2	3	244.678	2	4141.491	1
51		7	max	0	1	1.046	3	.032	1	1.531e-2	2	NC	15	NC	2
52			min	0	15	-1.397	2	-.005	10	-1.253e-2	3	234.552	2	5441.043	1
53		8	max	0	1	1.017	3	.023	3	1.646e-2	2	NC	15	NC	1
54			min	0	15	-1.398	2	-.007	10	-1.353e-2	3	234.226	2	NC	1
55		9	max	0	1	.98	3	.024	3	1.761e-2	2	NC	15	NC	1
56			min	0	15	-1.384	2	-.013	2	-1.454e-2	3	238.868	2	NC	1
57		10	max	0	1	.96	3	.024	3	1.876e-2	2	NC	15	NC	1
58			min	0	1	-1.374	2	-.017	2	-1.554e-2	3	242.263	2	NC	1
59		11	max	0	15	.98	3	.024	3	1.761e-2	2	NC	15	NC	1
60			min	0	1	-1.384	2	-.013	2	-1.454e-2	3	238.868	2	NC	1
61		12	max	0	15	1.017	3	.023	3	1.646e-2	2	NC	15	NC	1
62			min	0	1	-1.398	2	-.007	10	-1.353e-2	3	234.226	2	NC	1
63		13	max	0	15	1.046	3	.032	1	1.531e-2	2	NC	15	NC	2
64			min	0	1	-1.397	2	-.005	10	-1.253e-2	3	234.552	2	5441.043	1
65		14	max	0	15	1.047	3	.042	1	1.416e-2	2	NC	15	NC	2
66			min	0	1	-1.367	2	-.003	10	-1.153e-2	3	244.678	2	4141.491	1
67		15	max	0	15	1.007	3	.043	1	1.301e-2	2	NC	15	NC	2
68			min	0	1	-1.298	2	-.002	10	-1.052e-2	3	271.002	2	3992.48	1
69		16	max	0	15	.92	3	.036	1	1.187e-2	2	NC	15	NC	2
70			min	0	1	-1.187	2	-.001	10	-9.518e-3	3	327.445	2	4775.264	1
71		17	max	0	15	.789	3	.023	1	1.072e-2	2	NC	5	NC	2
72			min	0	1	-1.037	2	-.002	10	-8.514e-3	3	456.225	2	7570.462	1
73		18	max	0	15	.621	3	.009	3	9.569e-3	2	NC	5	NC	1
74			min	0	1	-.855	2	-.003	10	-7.51e-3	3	870.686	2	NC	1
75		19	max	0	15	.431	3	.008	3	8.42e-3	2	NC	1	NC	1
76			min	0	1	-.656	2	-.005	2	-6.506e-3	3	NC	1	NC	1
77	M15	1	max	0	15	.442	3	.008	3	5.497e-3	3	NC	1	NC	1
78			min	0	1	-.654	2	-.005	2	-8.71e-3	2	NC	1	NC	1
79		2	max	0	15	.586	3	.009	3	6.328e-3	3	NC	5	NC	1
80			min	0	1	-.889	2	-.002	10	-9.904e-3	2	743.165	2	NC	1
81		3	max	0	15	.717	3	.023	1	7.159e-3	3	NC	5	NC	2
82			min	0	1	-1.098	2	-.002	10	-1.11e-2	2	392.353	2	7515.153	1
83		4	max	0	15	.827	3	.036	1	7.99e-3	3	NC	15	NC	2
84			min	0	1	-1.265	2	-.001	10	-1.229e-2	2	285.056	2	4743.502	1
85		5	max	0	15	.91	3	.044	1	8.822e-3	3	NC	15	NC	2
86			min	0	1	-1.38	2	-.001	10	-1.348e-2	2	239.962	2	3964.222	1
87		6	max	0	15	.964	3	.042	1	9.653e-3	3	NC	15	NC	2
88			min	0	1	-1.44	2	-.002	10	-1.468e-2	2	221.486	2	4105.532	1
89		7	max	0	15	.991	3	.032	1	1.048e-2	3	NC	15	NC	2
90			min	0	1	-1.452	2	-.004	10	-1.587e-2	2	218.127	2	5371.387	1
91		8	max	0	15	.996	3	.022	3	1.132e-2	3	NC	15	NC	1
92			min	0	1	-1.429	2	-.007	10	-1.706e-2	2	224.504	2	NC	1
93		9	max	0	15	.99	3	.022	3	1.215e-2	3	NC	15	NC	1
94			min	0	1	-1.393	2	-.012	2	-1.826e-2	2	235.426	2	NC	1
95		10	max	0	1	.984	3	.022	3	1.298e-2	3	NC	15	NC	1
96			min	0	1	-1.373	2	-.016	2	-1.945e-2	2	241.968	2	NC	1
97		11	max	0	1	.99	3	.022	3	1.215e-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	-1.393	2	-.012	2	-1.826e-2	2	235.426	2	NC	1
99		12	max	0	1	.996	3	.022	3	1.132e-2	3	NC	15	NC	1
100			min	0	15	-1.429	2	-.007	10	-1.706e-2	2	224.504	2	NC	1
101		13	max	0	1	.991	3	.032	1	1.048e-2	3	NC	15	NC	2
102			min	0	15	-1.452	2	-.004	10	-1.587e-2	2	218.127	2	5371.387	1
103		14	max	0	1	.964	3	.042	1	9.653e-3	3	NC	15	NC	2
104			min	0	15	-1.44	2	-.002	10	-1.468e-2	2	221.486	2	4105.532	1
105		15	max	0	1	.91	3	.044	1	8.822e-3	3	NC	15	NC	2
106			min	0	15	-1.38	2	-.001	10	-1.348e-2	2	239.962	2	3964.222	1
107		16	max	0	1	.827	3	.036	1	7.99e-3	3	NC	15	NC	2
108			min	0	15	-1.265	2	-.001	10	-1.229e-2	2	285.056	2	4743.502	1
109		17	max	0	1	.717	3	.023	1	7.159e-3	3	NC	5	NC	2
110			min	0	15	-1.098	2	-.002	10	-1.11e-2	2	392.353	2	7515.153	1
111		18	max	0	1	.586	3	.009	3	6.328e-3	3	NC	5	NC	1
112			min	0	15	-.889	2	-.002	10	-9.904e-3	2	743.165	2	NC	1
113		19	max	0	1	.442	3	.008	3	5.497e-3	3	NC	1	NC	1
114			min	0	15	-.654	2	-.005	2	-8.71e-3	2	NC	1	NC	1
115	M16	1	max	0	15	.201	2	.007	3	1.055e-2	3	NC	1	NC	1
116			min	0	1	-.158	3	-.004	2	-1.303e-2	2	NC	1	NC	1
117		2	max	0	15	.115	1	.013	1	1.141e-2	3	NC	4	NC	1
118			min	0	1	-.125	3	-.002	10	-1.351e-2	2	1733.439	2	NC	1
119		3	max	0	15	.05	1	.031	1	1.227e-2	3	NC	5	NC	2
120			min	0	1	-.101	3	0	10	-1.41e-2	1	970.55	2	5618.164	1
121		4	max	0	15	.024	9	.045	1	1.313e-2	3	NC	5	NC	2
122			min	0	1	-.094	3	0	10	-1.468e-2	1	782.406	2	3834.709	1
123		5	max	0	15	.026	9	.052	1	1.399e-2	3	NC	5	NC	2
124			min	0	1	-.105	3	0	10	-1.526e-2	1	779.517	2	3342.563	1
125		6	max	0	15	.056	1	.049	1	1.484e-2	3	NC	4	NC	2
126			min	0	1	-.134	3	-.001	10	-1.585e-2	1	950.446	2	3545.798	1
127		7	max	0	15	.121	1	.037	1	1.57e-2	3	NC	4	NC	2
128			min	0	1	-.177	3	-.003	10	-1.643e-2	1	1566.206	2	4686.127	1
129		8	max	0	15	.198	1	.019	1	1.656e-2	3	NC	1	NC	2
130			min	0	1	-.224	3	-.006	10	-1.701e-2	1	2614.039	3	8883.356	1
131		9	max	0	15	.267	1	.019	3	1.742e-2	3	NC	4	NC	1
132			min	0	1	-.265	3	-.011	2	-1.76e-2	1	1625.77	3	NC	1
133		10	max	0	1	.297	1	.019	3	1.828e-2	3	NC	5	NC	1
134			min	0	1	-.283	3	-.014	2	-1.818e-2	1	1394.67	3	NC	1
135		11	max	0	1	.267	1	.019	3	1.742e-2	3	NC	4	NC	1
136			min	0	15	-.265	3	-.011	2	-1.76e-2	1	1625.77	3	NC	1
137		12	max	0	1	.198	1	.019	1	1.656e-2	3	NC	1	NC	2
138			min	0	15	-.224	3	-.006	10	-1.701e-2	1	2614.039	3	8883.356	1
139		13	max	0	1	.121	1	.037	1	1.57e-2	3	NC	4	NC	2
140			min	0	15	-.177	3	-.003	10	-1.643e-2	1	1566.206	2	4686.127	1
141		14	max	0	1	.056	1	.049	1	1.484e-2	3	NC	4	NC	2
142			min	0	15	-.134	3	-.001	10	-1.585e-2	1	950.446	2	3545.798	1
143		15	max	0	1	.026	9	.052	1	1.399e-2	3	NC	5	NC	2
144			min	0	15	-.105	3	0	10	-1.526e-2	1	779.517	2	3342.563	1
145		16	max	0	1	.024	9	.045	1	1.313e-2	3	NC	5	NC	2
146			min	0	15	-.094	3	0	10	-1.468e-2	1	782.406	2	3834.709	1
147		17	max	0	1	.05	1	.031	1	1.227e-2	3	NC	5	NC	2
148			min	0	15	-.101	3	0	10	-1.41e-2	1	970.55	2	5618.164	1
149		18	max	0	1	.115	1	.013	1	1.141e-2	3	NC	4	NC	1
150			min	0	15	-.125	3	-.002	10	-1.351e-2	2	1733.439	2	NC	1
151		19	max	0	1	.201	2	.007	3	1.055e-2	3	NC	1	NC	1
152			min	0	15	-.158	3	-.004	2	-1.303e-2	2	NC	1	NC	1
153	M2	1	max	.006	1	.008	2	.006	1	-4.817e-6	15	NC	1	NC	2
154			min	-.008	3	-.012	3	0	15	-1.316e-4	1	7654.891	2	9964.988	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	.006	1	.007	2	.006	1	-4.515e-6	15	NC	1	NC	1
156			min	-.008	3	-.012	3	0	15	-1.233e-4	1	8797.934	2	NC	1
157		3	max	.006	1	.006	2	.005	1	-4.213e-6	15	NC	1	NC	1
158			min	-.007	3	-.012	3	0	15	-1.151e-4	1	NC	1	NC	1
159		4	max	.005	1	.005	2	.005	1	-3.911e-6	15	NC	1	NC	1
160			min	-.007	3	-.011	3	0	15	-1.068e-4	1	NC	1	NC	1
161		5	max	.005	1	.004	2	.004	1	-3.609e-6	15	NC	1	NC	1
162			min	-.006	3	-.011	3	0	15	-9.852e-5	1	NC	1	NC	1
163		6	max	.005	1	.003	2	.004	1	-3.307e-6	15	NC	1	NC	1
164			min	-.006	3	-.01	3	0	15	-9.025e-5	1	NC	1	NC	1
165		7	max	.004	1	.002	2	.003	1	-3.005e-6	15	NC	1	NC	1
166			min	-.005	3	-.01	3	0	15	-8.197e-5	1	NC	1	NC	1
167		8	max	.004	1	.001	2	.003	1	-2.703e-6	15	NC	1	NC	1
168			min	-.005	3	-.009	3	0	15	-7.37e-5	1	NC	1	NC	1
169		9	max	.003	1	0	2	.002	1	-2.401e-6	15	NC	1	NC	1
170			min	-.005	3	-.009	3	0	15	-6.542e-5	1	NC	1	NC	1
171		10	max	.003	1	0	2	.002	1	-2.099e-6	15	NC	1	NC	1
172			min	-.004	3	-.008	3	0	15	-5.715e-5	1	NC	1	NC	1
173		11	max	.003	1	0	2	.002	1	-1.797e-6	15	NC	1	NC	1
174			min	-.004	3	-.007	3	0	15	-4.887e-5	1	NC	1	NC	1
175		12	max	.002	1	0	2	.001	1	-1.496e-6	15	NC	1	NC	1
176			min	-.003	3	-.007	3	0	15	-4.06e-5	1	NC	1	NC	1
177		13	max	.002	1	-.001	15	0	1	-1.194e-6	15	NC	1	NC	1
178			min	-.003	3	-.006	3	0	15	-3.232e-5	1	NC	1	NC	1
179		14	max	.002	1	0	15	0	1	-8.916e-7	15	NC	1	NC	1
180			min	-.002	3	-.005	3	0	15	-2.405e-5	1	NC	1	NC	1
181		15	max	.001	1	0	15	0	1	-5.897e-7	15	NC	1	NC	1
182			min	-.002	3	-.004	3	0	15	-1.577e-5	1	NC	1	NC	1
183		16	max	.001	1	0	15	0	1	-2.082e-7	10	NC	1	NC	1
184			min	-.001	3	-.003	3	0	15	-7.498e-6	1	NC	1	NC	1
185		17	max	0	1	0	15	0	1	7.767e-7	1	NC	1	NC	1
186			min	0	3	-.002	3	0	15	-9.617e-7	3	NC	1	NC	1
187		18	max	0	1	0	15	0	1	9.052e-6	1	NC	1	NC	1
188			min	0	3	-.001	4	0	15	1.305e-7	12	NC	1	NC	1
189		19	max	0	1	0	1	0	1	1.733e-5	1	NC	1	NC	1
190			min	0	1	0	1	0	1	6.182e-7	15	NC	1	NC	1
191	M3	1	max	0	1	0	1	0	1	-1.937e-7	15	NC	1	NC	1
192			min	0	1	0	1	0	1	-5.399e-6	1	NC	1	NC	1
193		2	max	0	3	0	15	0	1	1.212e-5	1	NC	1	NC	1
194			min	0	2	-.002	4	0	15	4.407e-7	15	NC	1	NC	1
195		3	max	0	3	-.001	15	0	1	2.964e-5	1	NC	1	NC	1
196			min	0	2	-.005	4	0	15	1.075e-6	15	NC	1	NC	1
197		4	max	.001	3	-.002	15	0	1	4.716e-5	1	NC	1	NC	1
198			min	0	2	-.008	4	0	15	1.709e-6	15	NC	1	NC	1
199		5	max	.002	3	-.003	15	0	1	6.467e-5	1	NC	1	NC	1
200			min	-.001	2	-.011	4	0	15	2.344e-6	15	9259.558	4	NC	1
201		6	max	.002	3	-.003	15	0	1	8.219e-5	1	NC	1	NC	1
202			min	-.002	2	-.014	4	0	15	2.978e-6	15	7432.904	4	NC	1
203		7	max	.002	3	-.004	15	0	1	9.971e-5	1	NC	5	NC	1
204			min	-.002	2	-.016	4	0	15	3.612e-6	15	6336.815	4	NC	1
205		8	max	.003	3	-.004	15	0	1	1.172e-4	1	NC	5	NC	1
206			min	-.002	2	-.018	4	0	15	4.247e-6	15	5660.197	4	NC	1
207		9	max	.003	3	-.005	15	.001	1	1.347e-4	1	NC	5	NC	1
208			min	-.003	2	-.02	4	0	15	4.881e-6	15	5256.954	4	NC	1
209		10	max	.004	3	-.005	15	.001	1	1.523e-4	1	NC	5	NC	1
210			min	-.003	2	-.021	4	0	15	5.516e-6	15	5055.872	4	NC	1
211		11	max	.004	3	-.005	15	.002	1	1.698e-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	6.15e-6	15	5026.974	4	NC	1
213		12	max	.004	3	-.005	15	.002	1	1.873e-4	1	NC	5	NC	1
214			min	-.004	2	-.02	4	0	15	6.784e-6	15	5169.967	4	NC	1
215		13	max	.005	3	-.004	15	.002	1	2.048e-4	1	NC	5	NC	1
216			min	-.004	2	-.019	4	0	15	7.419e-6	15	5515.567	4	NC	1
217		14	max	.005	3	-.004	15	.003	1	2.223e-4	1	NC	5	NC	1
218			min	-.004	2	-.017	4	0	15	8.053e-6	15	6141.737	4	NC	1
219		15	max	.006	3	-.003	15	.003	1	2.399e-4	1	NC	2	NC	1
220			min	-.004	2	-.015	4	0	15	8.687e-6	15	7222.529	4	NC	1
221		16	max	.006	3	-.003	15	.004	1	2.574e-4	1	NC	1	NC	1
222			min	-.005	2	-.012	4	0	15	9.322e-6	15	9180.442	4	NC	1
223		17	max	.006	3	-.002	15	.004	1	2.749e-4	1	NC	1	NC	1
224			min	-.005	2	-.008	4	0	15	9.956e-6	15	NC	1	NC	1
225		18	max	.007	3	-.001	15	.005	1	2.924e-4	1	NC	1	NC	1
226			min	-.005	2	-.005	1	0	15	1.059e-5	15	NC	1	NC	1
227		19	max	.007	3	0	15	.006	1	3.099e-4	1	NC	1	NC	1
228			min	-.006	2	-.002	1	0	15	1.122e-5	15	NC	1	NC	1
229	M4	1	max	.003	1	.005	2	0	15	5.205e-5	1	NC	1	NC	2
230			min	0	3	-.007	3	-.006	1	1.906e-6	15	NC	1	4324.651	1
231		2	max	.003	1	.005	2	0	15	5.205e-5	1	NC	1	NC	2
232			min	0	3	-.007	3	-.005	1	1.906e-6	15	NC	1	4703.196	1
233		3	max	.002	1	.005	2	0	15	5.205e-5	1	NC	1	NC	2
234			min	0	3	-.006	3	-.005	1	1.906e-6	15	NC	1	5153.697	1
235		4	max	.002	1	.004	2	0	15	5.205e-5	1	NC	1	NC	2
236			min	0	3	-.006	3	-.004	1	1.906e-6	15	NC	1	5694.85	1
237		5	max	.002	1	.004	2	0	15	5.205e-5	1	NC	1	NC	2
238			min	0	3	-.006	3	-.004	1	1.906e-6	15	NC	1	6352.066	1
239		6	max	.002	1	.004	2	0	15	5.205e-5	1	NC	1	NC	2
240			min	0	3	-.005	3	-.003	1	1.906e-6	15	NC	1	7160.579	1
241		7	max	.002	1	.004	2	0	15	5.205e-5	1	NC	1	NC	2
242			min	0	3	-.005	3	-.003	1	1.906e-6	15	NC	1	8170.409	1
243		8	max	.002	1	.003	2	0	15	5.205e-5	1	NC	1	NC	2
244			min	0	3	-.004	3	-.003	1	1.906e-6	15	NC	1	9454.505	1
245		9	max	.001	1	.003	2	0	15	5.205e-5	1	NC	1	NC	1
246			min	0	3	-.004	3	-.002	1	1.906e-6	15	NC	1	NC	1
247		10	max	.001	1	.003	2	0	15	5.205e-5	1	NC	1	NC	1
248			min	0	3	-.004	3	-.002	1	1.906e-6	15	NC	1	NC	1
249		11	max	.001	1	.002	2	0	15	5.205e-5	1	NC	1	NC	1
250			min	0	3	-.003	3	-.002	1	1.906e-6	15	NC	1	NC	1
251		12	max	.001	1	.002	2	0	15	5.205e-5	1	NC	1	NC	1
252			min	0	3	-.003	3	-.001	1	1.906e-6	15	NC	1	NC	1
253		13	max	0	1	.002	2	0	15	5.205e-5	1	NC	1	NC	1
254			min	0	3	-.002	3	0	1	1.906e-6	15	NC	1	NC	1
255		14	max	0	1	.001	2	0	15	5.205e-5	1	NC	1	NC	1
256			min	0	3	-.002	3	0	1	1.906e-6	15	NC	1	NC	1
257		15	max	0	1	.001	2	0	15	5.205e-5	1	NC	1	NC	1
258			min	0	3	-.002	3	0	1	1.906e-6	15	NC	1	NC	1
259		16	max	0	1	0	2	0	15	5.205e-5	1	NC	1	NC	1
260			min	0	3	-.001	3	0	1	1.906e-6	15	NC	1	NC	1
261		17	max	0	1	0	2	0	15	5.205e-5	1	NC	1	NC	1
262			min	0	3	0	3	0	1	1.906e-6	15	NC	1	NC	1
263		18	max	0	1	0	2	0	15	5.205e-5	1	NC	1	NC	1
264			min	0	3	0	3	0	1	1.906e-6	15	NC	1	NC	1
265		19	max	0	1	0	1	0	1	5.205e-5	1	NC	1	NC	1
266			min	0	1	0	1	0	1	1.906e-6	15	NC	1	NC	1
267	M6	1	max	.019	1	.026	2	0	1	0	1	NC	3	NC	1
268			min	-.025	3	-.037	3	0	1	0	1	2310.048	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	.018	1	.024	2	0	1	0	1	NC	3	NC	1
270			min	-.024	3	-.035	3	0	1	0	1	2526.208	2	NC	1
271		3	max	.017	1	.022	2	0	1	0	1	NC	3	NC	1
272			min	-.022	3	-.033	3	0	1	0	1	2785.106	2	NC	1
273		4	max	.016	1	.02	2	0	1	0	1	NC	3	NC	1
274			min	-.021	3	-.031	3	0	1	0	1	3098.446	2	NC	1
275		5	max	.015	1	.017	2	0	1	0	1	NC	3	NC	1
276			min	-.02	3	-.029	3	0	1	0	1	3482.359	2	NC	1
277		6	max	.014	1	.015	2	0	1	0	1	NC	3	NC	1
278			min	-.018	3	-.027	3	0	1	0	1	3959.572	2	NC	1
279		7	max	.013	1	.013	2	0	1	0	1	NC	3	NC	1
280			min	-.017	3	-.025	3	0	1	0	1	4562.951	2	NC	1
281		8	max	.012	1	.011	2	0	1	0	1	NC	1	NC	1
282			min	-.015	3	-.023	3	0	1	0	1	5341.483	2	NC	1
283		9	max	.01	1	.01	2	0	1	0	1	NC	1	NC	1
284			min	-.014	3	-.021	3	0	1	0	1	6370.839	2	NC	1
285		10	max	.009	1	.008	2	0	1	0	1	NC	1	NC	1
286			min	-.013	3	-.019	3	0	1	0	1	7773.048	2	NC	1
287		11	max	.008	1	.006	2	0	1	0	1	NC	1	NC	1
288			min	-.011	3	-.017	3	0	1	0	1	9755.513	2	NC	1
289		12	max	.007	1	.005	2	0	1	0	1	NC	1	NC	1
290			min	-.01	3	-.015	3	0	1	0	1	NC	1	NC	1
291		13	max	.006	1	.003	2	0	1	0	1	NC	1	NC	1
292			min	-.008	3	-.012	3	0	1	0	1	NC	1	NC	1
293		14	max	.005	1	.002	2	0	1	0	1	NC	1	NC	1
294			min	-.007	3	-.01	3	0	1	0	1	NC	1	NC	1
295		15	max	.004	1	.001	2	0	1	0	1	NC	1	NC	1
296			min	-.006	3	-.008	3	0	1	0	1	NC	1	NC	1
297		16	max	.003	1	0	2	0	1	0	1	NC	1	NC	1
298			min	-.004	3	-.006	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	-.004	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	-.001	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	2	0	1	0	1	NC	1	NC	1
308			min	-.001	2	-.003	3	0	1	0	1	NC	1	NC	1
309		3	max	.002	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	.003	3	-.002	15	0	1	0	1	NC	1	NC	1
312			min	-.003	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	-.004	2	-.013	3	0	1	0	1	8370.741	3	NC	1
315		6	max	.006	3	-.003	15	0	1	0	1	NC	1	NC	1
316			min	-.005	2	-.015	3	0	1	0	1	7042.922	3	NC	1
317		7	max	.007	3	-.004	15	0	1	0	1	NC	1	NC	1
318			min	-.006	2	-.017	3	0	1	0	1	6244.303	3	NC	1
319		8	max	.008	3	-.004	15	0	1	0	1	NC	2	NC	1
320			min	-.007	2	-.019	3	0	1	0	1	5757.025	4	NC	1
321		9	max	.009	3	-.005	15	0	1	0	1	NC	2	NC	1
322			min	-.008	2	-.02	3	0	1	0	1	5340.642	4	NC	1
323		10	max	.01	3	-.005	15	0	1	0	1	NC	5	NC	1
324			min	-.01	2	-.021	4	0	1	0	1	5131.375	4	NC	1
325		11	max	.012	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	-.011	2	-.021	4	0	1	0	1	5097.907	4	NC	1
327		12	max	.013	3	-.005	15	0	1	0	1	NC	5	NC	1
328			min	-.012	2	-.02	4	0	1	0	1	5239.355	4	NC	1
329		13	max	.014	3	-.004	15	0	1	0	1	NC	2	NC	1
330			min	-.013	2	-.019	4	0	1	0	1	5586.419	4	NC	1
331		14	max	.015	3	-.004	15	0	1	0	1	NC	2	NC	1
332			min	-.014	2	-.017	4	0	1	0	1	6217.708	4	NC	1
333		15	max	.016	3	-.003	15	0	1	0	1	NC	1	NC	1
334			min	-.015	2	-.015	4	0	1	0	1	7309.075	4	NC	1
335		16	max	.017	3	-.003	15	0	1	0	1	NC	1	NC	1
336			min	-.016	2	-.012	3	0	1	0	1	9287.664	4	NC	1
337		17	max	.019	3	-.002	15	0	1	0	1	NC	1	NC	1
338			min	-.017	2	-.009	1	0	1	0	1	NC	1	NC	1
339		18	max	.02	3	-.001	15	0	1	0	1	NC	1	NC	1
340			min	-.018	2	-.007	1	0	1	0	1	NC	1	NC	1
341		19	max	.021	3	0	15	0	1	0	1	NC	1	NC	1
342			min	-.019	2	-.005	1	0	1	0	1	NC	1	NC	1
343	M8	1	max	.007	1	.018	2	0	1	0	1	NC	1	NC	1
344			min	-.002	3	-.021	3	0	1	0	1	NC	1	NC	1
345		2	max	.007	1	.017	2	0	1	0	1	NC	1	NC	1
346			min	-.002	3	-.02	3	0	1	0	1	NC	1	NC	1
347		3	max	.007	1	.016	2	0	1	0	1	NC	1	NC	1
348			min	-.002	3	-.019	3	0	1	0	1	NC	1	NC	1
349		4	max	.006	1	.015	2	0	1	0	1	NC	1	NC	1
350			min	-.002	3	-.018	3	0	1	0	1	NC	1	NC	1
351		5	max	.006	1	.014	2	0	1	0	1	NC	1	NC	1
352			min	-.002	3	-.016	3	0	1	0	1	NC	1	NC	1
353		6	max	.005	1	.013	2	0	1	0	1	NC	1	NC	1
354			min	-.002	3	-.015	3	0	1	0	1	NC	1	NC	1
355		7	max	.005	1	.012	2	0	1	0	1	NC	1	NC	1
356			min	-.001	3	-.014	3	0	1	0	1	NC	1	NC	1
357		8	max	.005	1	.011	2	0	1	0	1	NC	1	NC	1
358			min	-.001	3	-.013	3	0	1	0	1	NC	1	NC	1
359		9	max	.004	1	.01	2	0	1	0	1	NC	1	NC	1
360			min	-.001	3	-.012	3	0	1	0	1	NC	1	NC	1
361		10	max	.004	1	.009	2	0	1	0	1	NC	1	NC	1
362			min	-.001	3	-.011	3	0	1	0	1	NC	1	NC	1
363		11	max	.003	1	.008	2	0	1	0	1	NC	1	NC	1
364			min	0	3	-.009	3	0	1	0	1	NC	1	NC	1
365		12	max	.003	1	.007	2	0	1	0	1	NC	1	NC	1
366			min	0	3	-.008	3	0	1	0	1	NC	1	NC	1
367		13	max	.002	1	.006	2	0	1	0	1	NC	1	NC	1
368			min	0	3	-.007	3	0	1	0	1	NC	1	NC	1
369		14	max	.002	1	.005	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	.004	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	-.002	3	0	1	0	1	NC	1	NC	1
377		18	max	0	1	0	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	.006	1	.008	2	0	15	1.316e-4	1	NC	1	NC	2
382			min	-.008	3	-.012	3	-.006	1	4.817e-6	15	7654.891	2	9964.988	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	.006	1	.007	2	0	15	1.233e-4	1	NC	1	NC	1
384			min	-.008	3	-.012	3	-.006	1	4.515e-6	15	8797.934	2	NC	1
385		3	max	.006	1	.006	2	0	15	1.151e-4	1	NC	1	NC	1
386			min	-.007	3	-.012	3	-.005	1	4.213e-6	15	NC	1	NC	1
387		4	max	.005	1	.005	2	0	15	1.068e-4	1	NC	1	NC	1
388			min	-.007	3	-.011	3	-.005	1	3.911e-6	15	NC	1	NC	1
389		5	max	.005	1	.004	2	0	15	9.852e-5	1	NC	1	NC	1
390			min	-.006	3	-.011	3	-.004	1	3.609e-6	15	NC	1	NC	1
391		6	max	.005	1	.003	2	0	15	9.025e-5	1	NC	1	NC	1
392			min	-.006	3	-.01	3	-.004	1	3.307e-6	15	NC	1	NC	1
393		7	max	.004	1	.002	2	0	15	8.197e-5	1	NC	1	NC	1
394			min	-.005	3	-.01	3	-.003	1	3.005e-6	15	NC	1	NC	1
395		8	max	.004	1	.001	2	0	15	7.37e-5	1	NC	1	NC	1
396			min	-.005	3	-.009	3	-.003	1	2.703e-6	15	NC	1	NC	1
397		9	max	.003	1	0	2	0	15	6.542e-5	1	NC	1	NC	1
398			min	-.005	3	-.009	3	-.002	1	2.401e-6	15	NC	1	NC	1
399		10	max	.003	1	0	2	0	15	5.715e-5	1	NC	1	NC	1
400			min	-.004	3	-.008	3	-.002	1	2.099e-6	15	NC	1	NC	1
401		11	max	.003	1	0	2	0	15	4.887e-5	1	NC	1	NC	1
402			min	-.004	3	-.007	3	-.002	1	1.797e-6	15	NC	1	NC	1
403		12	max	.002	1	0	2	0	15	4.06e-5	1	NC	1	NC	1
404			min	-.003	3	-.007	3	-.001	1	1.496e-6	15	NC	1	NC	1
405		13	max	.002	1	-.001	15	0	15	3.232e-5	1	NC	1	NC	1
406			min	-.003	3	-.006	3	0	1	1.194e-6	15	NC	1	NC	1
407		14	max	.002	1	0	15	0	15	2.405e-5	1	NC	1	NC	1
408			min	-.002	3	-.005	3	0	1	8.916e-7	15	NC	1	NC	1
409		15	max	.001	1	0	15	0	15	1.577e-5	1	NC	1	NC	1
410			min	-.002	3	-.004	3	0	1	5.897e-7	15	NC	1	NC	1
411		16	max	.001	1	0	15	0	15	7.498e-6	1	NC	1	NC	1
412			min	-.001	3	-.003	3	0	1	2.082e-7	10	NC	1	NC	1
413		17	max	0	1	0	15	0	15	9.617e-7	3	NC	1	NC	1
414			min	0	3	-.002	3	0	1	-7.767e-7	1	NC	1	NC	1
415		18	max	0	1	0	15	0	15	-1.305e-7	12	NC	1	NC	1
416			min	0	3	-.001	4	0	1	-9.052e-6	1	NC	1	NC	1
417		19	max	0	1	0	1	0	1	-6.182e-7	15	NC	1	NC	1
418			min	0	1	0	1	0	1	-1.733e-5	1	NC	1	NC	1
419	M11	1	max	0	1	0	1	0	1	5.399e-6	1	NC	1	NC	1
420			min	0	1	0	1	0	1	1.937e-7	15	NC	1	NC	1
421		2	max	0	3	0	15	0	15	-4.407e-7	15	NC	1	NC	1
422			min	0	2	-.002	4	0	1	-1.212e-5	1	NC	1	NC	1
423		3	max	0	3	-.001	15	0	15	-1.075e-6	15	NC	1	NC	1
424			min	0	2	-.005	4	0	1	-2.964e-5	1	NC	1	NC	1
425		4	max	.001	3	-.002	15	0	15	-1.709e-6	15	NC	1	NC	1
426			min	0	2	-.008	4	0	1	-4.716e-5	1	NC	1	NC	1
427		5	max	.002	3	-.003	15	0	15	-2.344e-6	15	NC	1	NC	1
428			min	-.001	2	-.011	4	0	1	-6.467e-5	1	9259.558	4	NC	1
429		6	max	.002	3	-.003	15	0	15	-2.978e-6	15	NC	1	NC	1
430			min	-.002	2	-.014	4	0	1	-8.219e-5	1	7432.904	4	NC	1
431		7	max	.002	3	-.004	15	0	15	-3.612e-6	15	NC	5	NC	1
432			min	-.002	2	-.016	4	0	1	-9.971e-5	1	6336.815	4	NC	1
433		8	max	.003	3	-.004	15	0	15	-4.247e-6	15	NC	5	NC	1
434			min	-.002	2	-.018	4	0	1	-1.172e-4	1	5660.197	4	NC	1
435		9	max	.003	3	-.005	15	0	15	-4.881e-6	15	NC	5	NC	1
436			min	-.003	2	-.02	4	-.001	1	-1.347e-4	1	5256.954	4	NC	1
437		10	max	.004	3	-.005	15	0	15	-5.516e-6	15	NC	5	NC	1
438			min	-.003	2	-.021	4	-.001	1	-1.523e-4	1	5055.872	4	NC	1
439		11	max	.004	3	-.005	15	0	15	-6.15e-6	15	NC	5	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
440			min	-.003	2	-.021	4	-.002	1	-1.698e-4	1	5026.974	4	NC	1
441		12	max	.004	3	-.005	15	0	15	-6.784e-6	15	NC	5	NC	1
442			min	-.004	2	-.02	4	-.002	1	-1.873e-4	1	5169.967	4	NC	1
443		13	max	.005	3	-.004	15	0	15	-7.419e-6	15	NC	5	NC	1
444			min	-.004	2	-.019	4	-.002	1	-2.048e-4	1	5515.567	4	NC	1
445		14	max	.005	3	-.004	15	0	15	-8.053e-6	15	NC	5	NC	1
446			min	-.004	2	-.017	4	-.003	1	-2.223e-4	1	6141.737	4	NC	1
447		15	max	.006	3	-.003	15	0	15	-8.687e-6	15	NC	2	NC	1
448			min	-.004	2	-.015	4	-.003	1	-2.399e-4	1	7222.529	4	NC	1
449		16	max	.006	3	-.003	15	0	15	-9.322e-6	15	NC	1	NC	1
450			min	-.005	2	-.012	4	-.004	1	-2.574e-4	1	9180.442	4	NC	1
451		17	max	.006	3	-.002	15	0	15	-9.956e-6	15	NC	1	NC	1
452			min	-.005	2	-.008	4	-.004	1	-2.749e-4	1	NC	1	NC	1
453		18	max	.007	3	-.001	15	0	15	-1.059e-5	15	NC	1	NC	1
454			min	-.005	2	-.005	1	-.005	1	-2.924e-4	1	NC	1	NC	1
455		19	max	.007	3	0	15	0	15	-1.122e-5	15	NC	1	NC	1
456			min	-.006	2	-.002	1	-.006	1	-3.099e-4	1	NC	1	NC	1
457	M12	1	max	.003	1	.005	2	.006	1	-1.906e-6	15	NC	1	NC	2
458			min	0	3	-.007	3	0	15	-5.205e-5	1	NC	1	4324.651	1
459		2	max	.003	1	.005	2	.005	1	-1.906e-6	15	NC	1	NC	2
460			min	0	3	-.007	3	0	15	-5.205e-5	1	NC	1	4703.196	1
461		3	max	.002	1	.005	2	.005	1	-1.906e-6	15	NC	1	NC	2
462			min	0	3	-.006	3	0	15	-5.205e-5	1	NC	1	5153.697	1
463		4	max	.002	1	.004	2	.004	1	-1.906e-6	15	NC	1	NC	2
464			min	0	3	-.006	3	0	15	-5.205e-5	1	NC	1	5694.85	1
465		5	max	.002	1	.004	2	.004	1	-1.906e-6	15	NC	1	NC	2
466			min	0	3	-.006	3	0	15	-5.205e-5	1	NC	1	6352.066	1
467		6	max	.002	1	.004	2	.003	1	-1.906e-6	15	NC	1	NC	2
468			min	0	3	-.005	3	0	15	-5.205e-5	1	NC	1	7160.579	1
469		7	max	.002	1	.004	2	.003	1	-1.906e-6	15	NC	1	NC	2
470			min	0	3	-.005	3	0	15	-5.205e-5	1	NC	1	8170.409	1
471		8	max	.002	1	.003	2	.003	1	-1.906e-6	15	NC	1	NC	2
472			min	0	3	-.004	3	0	15	-5.205e-5	1	NC	1	9454.505	1
473		9	max	.001	1	.003	2	.002	1	-1.906e-6	15	NC	1	NC	1
474			min	0	3	-.004	3	0	15	-5.205e-5	1	NC	1	NC	1
475		10	max	.001	1	.003	2	.002	1	-1.906e-6	15	NC	1	NC	1
476			min	0	3	-.004	3	0	15	-5.205e-5	1	NC	1	NC	1
477		11	max	.001	1	.002	2	.002	1	-1.906e-6	15	NC	1	NC	1
478			min	0	3	-.003	3	0	15	-5.205e-5	1	NC	1	NC	1
479		12	max	.001	1	.002	2	.001	1	-1.906e-6	15	NC	1	NC	1
480			min	0	3	-.003	3	0	15	-5.205e-5	1	NC	1	NC	1
481		13	max	0	1	.002	2	0	1	-1.906e-6	15	NC	1	NC	1
482			min	0	3	-.002	3	0	15	-5.205e-5	1	NC	1	NC	1
483		14	max	0	1	.001	2	0	1	-1.906e-6	15	NC	1	NC	1
484			min	0	3	-.002	3	0	15	-5.205e-5	1	NC	1	NC	1
485		15	max	0	1	.001	2	0	1	-1.906e-6	15	NC	1	NC	1
486			min	0	3	-.002	3	0	15	-5.205e-5	1	NC	1	NC	1
487		16	max	0	1	0	2	0	1	-1.906e-6	15	NC	1	NC	1
488			min	0	3	-.001	3	0	15	-5.205e-5	1	NC	1	NC	1
489		17	max	0	1	0	2	0	1	-1.906e-6	15	NC	1	NC	1
490			min	0	3	0	3	0	15	-5.205e-5	1	NC	1	NC	1
491		18	max	0	1	0	2	0	1	-1.906e-6	15	NC	1	NC	1
492			min	0	3	0	3	0	15	-5.205e-5	1	NC	1	NC	1
493		19	max	0	1	0	1	0	1	-1.906e-6	15	NC	1	NC	1
494			min	0	1	0	1	0	1	-5.205e-5	1	NC	1	NC	1
495	M1	1	max	.009	3	.225	2	0	1	6.915e-3	1	NC	1	NC	1
496			min	-.005	2	-.065	3	0	15	-1.524e-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	.009	3	.111	2	0	15	3.334e-3	1	NC	5	NC	1
498			min	-.005	2	-.033	3	-.004	1	-7.567e-3	3	1188.107	2	NC	1
499		3	max	.009	3	.013	3	0	15	2.349e-5	10	NC	5	NC	1
500			min	-.005	2	-.011	2	-.006	1	-1.166e-4	1	575.951	2	NC	1
501		4	max	.009	3	.081	3	0	15	3.899e-3	2	NC	15	NC	1
502			min	-.005	2	-.145	2	-.006	1	-3.787e-3	3	367.072	2	NC	1
503		5	max	.009	3	.165	3	0	15	7.793e-3	2	NC	15	NC	1
504			min	-.005	2	-.283	2	-.004	1	-7.483e-3	3	266.978	2	NC	1
505		6	max	.009	3	.254	3	0	15	1.169e-2	2	8339.099	15	NC	1
506			min	-.005	2	-.416	2	-.002	1	-1.118e-2	3	211.517	2	NC	1
507		7	max	.008	3	.339	3	0	1	1.558e-2	2	7057.992	15	NC	1
508			min	-.005	2	-.534	2	0	3	-1.487e-2	3	178.63	2	NC	1
509		8	max	.008	3	.409	3	0	1	1.948e-2	2	6298.1	15	NC	1
510			min	-.005	2	-.627	2	0	15	-1.857e-2	3	159.118	2	NC	1
511		9	max	.008	3	.455	3	0	15	2.173e-2	2	5899.6	15	NC	1
512			min	-.005	2	-.686	2	0	1	-1.913e-2	3	148.927	2	NC	1
513		10	max	.008	3	.472	3	0	1	2.288e-2	2	5777.543	15	NC	1
514			min	-.005	2	-.706	2	0	15	-1.76e-2	3	145.936	2	NC	1
515		11	max	.008	3	.461	3	0	1	2.403e-2	2	5899.285	15	NC	1
516			min	-.005	2	-.686	2	0	15	-1.606e-2	3	149.426	2	NC	1
517		12	max	.007	3	.423	3	0	15	2.29e-2	2	6297.419	15	NC	1
518			min	-.004	2	-.625	2	0	1	-1.402e-2	3	160.571	2	NC	1
519		13	max	.007	3	.361	3	0	15	1.836e-2	2	7056.78	15	NC	1
520			min	-.004	2	-.528	2	0	1	-1.122e-2	3	182.036	2	NC	1
521		14	max	.007	3	.281	3	.001	1	1.382e-2	2	8337.033	15	NC	1
522			min	-.004	2	-.406	2	0	15	-8.416e-3	3	218.598	2	NC	1
523		15	max	.007	3	.191	3	.004	1	9.281e-3	2	NC	15	NC	1
524			min	-.004	2	-.271	2	0	15	-5.616e-3	3	281.19	2	NC	1
525		16	max	.007	3	.096	3	.005	1	4.74e-3	2	NC	15	NC	1
526			min	-.004	2	-.134	2	0	15	-2.815e-3	3	396.227	2	NC	1
527		17	max	.007	3	.005	3	.006	1	4.023e-4	1	NC	5	NC	1
528			min	-.004	2	-.006	2	0	15	-1.446e-5	3	639.985	2	NC	1
529		18	max	.007	3	.102	2	.004	1	5.435e-3	2	NC	5	NC	1
530			min	-.004	2	-.079	3	0	15	-1.796e-3	3	1348.417	2	NC	1
531		19	max	.007	3	.201	2	0	15	1.085e-2	2	NC	1	NC	1
532			min	-.004	2	-.158	3	0	1	-3.66e-3	3	NC	1	NC	1
533	M5	1	max	.027	3	.358	2	0	1	0	1	NC	1	NC	1
534			min	-.019	2	-.015	3	0	1	0	1	NC	1	NC	1
535		2	max	.027	3	.177	2	0	1	0	1	NC	5	NC	1
536			min	-.019	2	-.009	3	0	1	0	1	757.482	2	NC	1
537		3	max	.027	3	.037	3	0	1	0	1	NC	5	NC	1
538			min	-.019	2	-.03	2	0	1	0	1	352.115	2	NC	1
539		4	max	.026	3	.16	3	0	1	0	1	9403.62	15	NC	1
540			min	-.018	2	-.285	2	0	1	0	1	212.409	2	NC	1
541		5	max	.026	3	.337	3	0	1	0	1	6518.263	15	NC	1
542			min	-.018	2	-.565	2	0	1	0	1	147.667	2	NC	1
543		6	max	.025	3	.539	3	0	1	0	1	4983.761	15	NC	1
544			min	-.018	2	-.847	2	0	1	0	1	113.092	2	NC	1
545		7	max	.025	3	.739	3	0	1	0	1	4103.948	15	NC	1
546			min	-.017	2	-1.104	2	0	1	0	1	93.203	2	NC	1
547		8	max	.024	3	.908	3	0	1	0	1	3595.271	15	NC	1
548			min	-.017	2	-1.311	2	0	1	0	1	81.675	2	NC	1
549		9	max	.024	3	1.017	3	0	1	0	1	3335.165	15	NC	1
550			min	-.017	2	-1.442	2	0	1	0	1	75.773	2	NC	1
551		10	max	.023	3	1.057	3	0	1	0	1	3256.848	15	NC	1
552			min	-.016	2	-1.487	2	0	1	0	1	74.049	2	NC	1
553		11	max	.022	3	1.031	3	0	1	0	1	3335.366	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	-.016	2	-1.444	2	0	1	0	1	76.057	2	NC	1
555		12	max	.022	3	.94	3	0	1	0	1	3595.738	15	NC	1
556			min	-.016	2	-1.307	2	0	1	0	1	82.621	2	NC	1
557		13	max	.021	3	.793	3	0	1	0	1	4104.866	15	NC	1
558			min	-.015	2	-1.09	2	0	1	0	1	95.7	2	NC	1
559		14	max	.021	3	.609	3	0	1	0	1	4985.506	15	NC	1
560			min	-.015	2	-.821	2	0	1	0	1	118.843	2	NC	1
561		15	max	.02	3	.405	3	0	1	0	1	6521.654	15	NC	1
562			min	-.015	2	-.532	2	0	1	0	1	160.538	2	NC	1
563		16	max	.02	3	.2	3	0	1	0	1	9410.672	15	NC	1
564			min	-.015	2	-.253	2	0	1	0	1	242.506	2	NC	1
565		17	max	.019	3	.012	3	0	1	0	1	NC	5	NC	1
566			min	-.014	2	-.017	2	0	1	0	1	426.995	1	NC	1
567		18	max	.019	3	.158	1	0	1	0	1	NC	5	NC	1
568			min	-.014	2	-.144	3	0	1	0	1	953.244	1	NC	1
569		19	max	.019	3	.297	1	0	1	0	1	NC	1	NC	1
570			min	-.014	2	-.283	3	0	1	0	1	NC	1	NC	1
571	M9	1	max	.009	3	.225	2	0	15	1.524e-2	3	NC	1	NC	1
572			min	-.005	2	-.065	3	0	1	-6.915e-3	1	NC	1	NC	1
573		2	max	.009	3	.111	2	.004	1	7.567e-3	3	NC	5	NC	1
574			min	-.005	2	-.033	3	0	15	-3.334e-3	1	1188.107	2	NC	1
575		3	max	.009	3	.013	3	.006	1	1.166e-4	1	NC	5	NC	1
576			min	-.005	2	-.011	2	0	15	-2.349e-5	10	575.951	2	NC	1
577		4	max	.009	3	.081	3	.006	1	3.787e-3	3	NC	15	NC	1
578			min	-.005	2	-.145	2	0	15	-3.899e-3	2	367.072	2	NC	1
579		5	max	.009	3	.165	3	.004	1	7.483e-3	3	NC	15	NC	1
580			min	-.005	2	-.283	2	0	15	-7.793e-3	2	266.978	2	NC	1
581		6	max	.009	3	.254	3	.002	1	1.118e-2	3	8339.099	15	NC	1
582			min	-.005	2	-.416	2	0	15	-1.169e-2	2	211.517	2	NC	1
583		7	max	.008	3	.339	3	0	3	1.487e-2	3	7057.992	15	NC	1
584			min	-.005	2	-.534	2	0	1	-1.558e-2	2	178.63	2	NC	1
585		8	max	.008	3	.409	3	0	15	1.857e-2	3	6298.1	15	NC	1
586			min	-.005	2	-.627	2	0	1	-1.948e-2	2	159.118	2	NC	1
587		9	max	.008	3	.455	3	0	1	1.913e-2	3	5899.6	15	NC	1
588			min	-.005	2	-.686	2	0	15	-2.173e-2	2	148.927	2	NC	1
589		10	max	.008	3	.472	3	0	15	1.76e-2	3	5777.543	15	NC	1
590			min	-.005	2	-.706	2	0	1	-2.288e-2	2	145.936	2	NC	1
591		11	max	.008	3	.461	3	0	15	1.606e-2	3	5899.285	15	NC	1
592			min	-.005	2	-.686	2	0	1	-2.403e-2	2	149.426	2	NC	1
593		12	max	.007	3	.423	3	0	1	1.402e-2	3	6297.419	15	NC	1
594			min	-.004	2	-.625	2	0	15	-2.29e-2	2	160.571	2	NC	1
595		13	max	.007	3	.361	3	0	1	1.122e-2	3	7056.78	15	NC	1
596			min	-.004	2	-.528	2	0	15	-1.836e-2	2	182.036	2	NC	1
597		14	max	.007	3	.281	3	0	15	8.416e-3	3	8337.033	15	NC	1
598			min	-.004	2	-.406	2	-.001	1	-1.382e-2	2	218.598	2	NC	1
599		15	max	.007	3	.191	3	0	15	5.616e-3	3	NC	15	NC	1
600			min	-.004	2	-.271	2	-.004	1	-9.281e-3	2	281.19	2	NC	1
601		16	max	.007	3	.096	3	0	15	2.815e-3	3	NC	15	NC	1
602			min	-.004	2	-.134	2	-.005	1	-4.74e-3	2	396.227	2	NC	1
603		17	max	.007	3	.005	3	0	15	1.446e-5	3	NC	5	NC	1
604			min	-.004	2	-.006	2	-.006	1	-4.023e-4	1	639.985	2	NC	1
605		18	max	.007	3	.102	2	0	15	1.796e-3	3	NC	5	NC	1
606			min	-.004	2	-.079	3	-.004	1	-5.435e-3	2	1348.417	2	NC	1
607		19	max	.007	3	.201	2	0	1	3.66e-3	3	NC	1	NC	1
608			min	-.004	2	-.158	3	0	15	-1.085e-2	2	NC	1	NC	1

Company:	Schletter, Inc.	Date:	8/1/2016
Engineer:	HCV	Page:	1/5
Project:	Standard PVMax - Worst Case, 14-40 Inch Width		
Address:			
Phone:			
E-mail:			

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

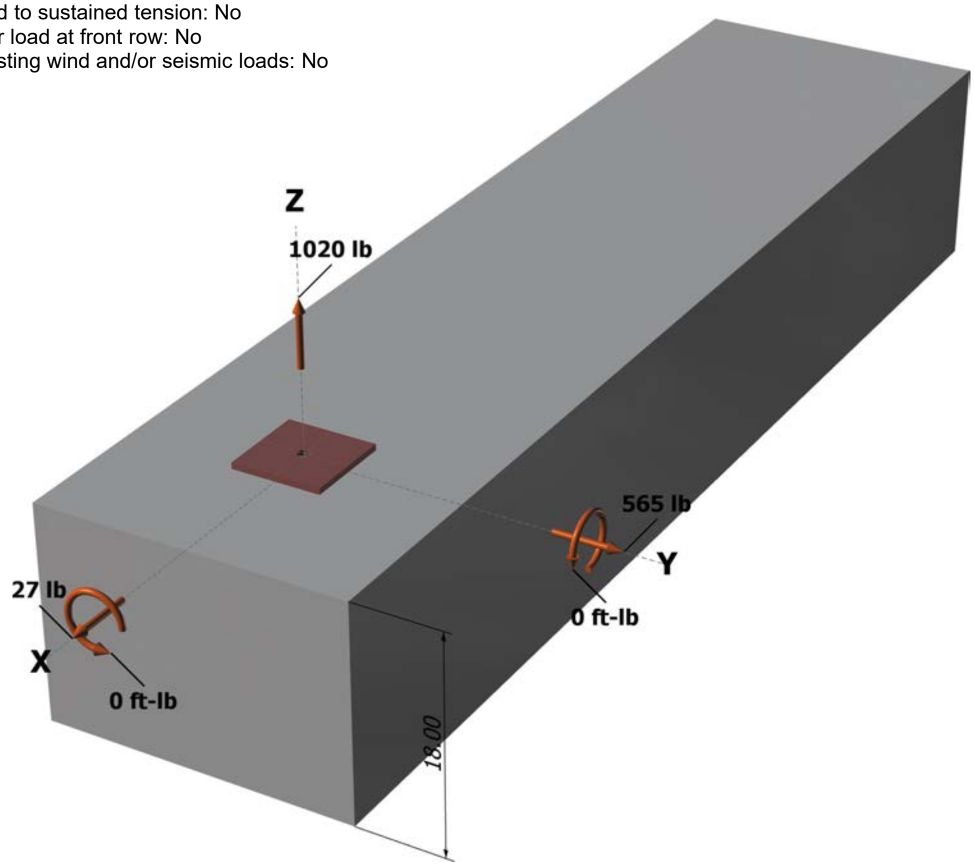
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

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

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

<Figure 1>



<Figure 2>

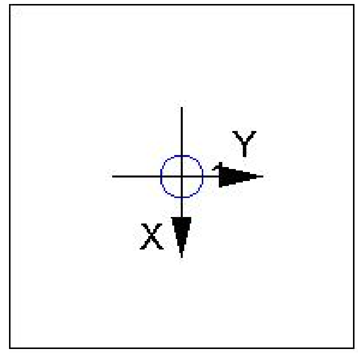
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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

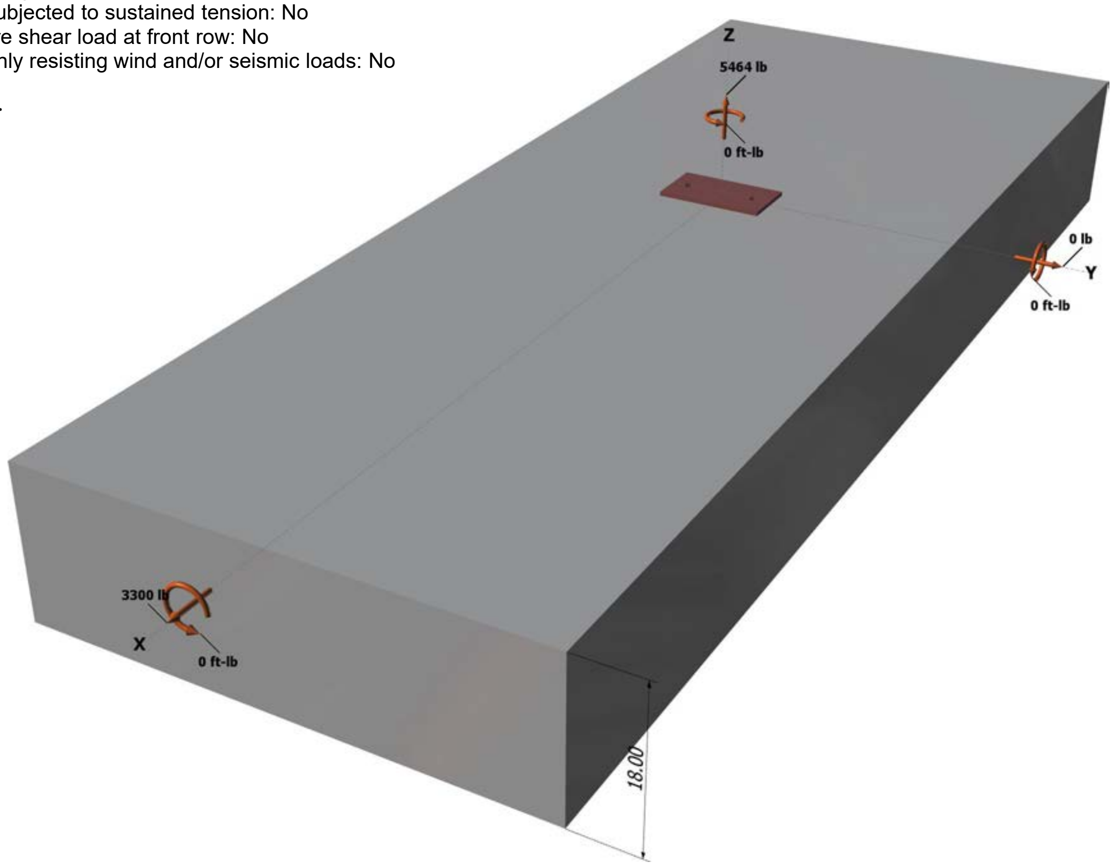
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

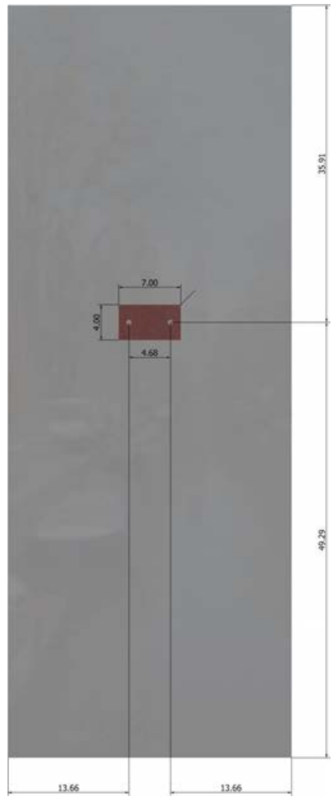
Load and Geometry
Load factor source: ACI 318 Section 9.2
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: No
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: No

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

<Figure 1>



<Figure 2>



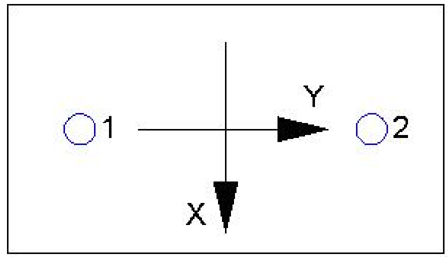
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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	2732.0	1650.0	0.0	1650.0
2	2732.0	1650.0	0.0	1650.0
Sum	5464.0	3300.0	0.0	3300.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 5464
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



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

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

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

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

k_c	λ	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	2500	6.000	12492

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

A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cbg} (lb)
408.24	324.00	1.000	1.000	1.00	1.000	12492	0.65	10231

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

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

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

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

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

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

A_{Na} (in^2)	A_{Na0} (in^2)	$\Psi_{ed,Na}$	$\Psi_{g,Na}$	$\Psi_{ec,Na}$	$\Psi_{p,Na}$	N_{a0}(lb)	ϕ	ϕN_{ag} (lb)
158.66	109.66	1.000	1.043	1.000	1.000	9755	0.55	8093

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbgx} (lb)
576.00	648.00	1.000	0.928	1.000	1.000	15593	0.70	9001

Shear parallel to edge in x-direction:

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

l_e (in)	d_a (in)	λ	f'_c (psi)	c_{a1} (in)	V_{by} (lb)
4.00	0.50	1.00	2500	13.66	18939

$\phi V_{cbx} = \phi\ (2)(A_{Vc} / A_{Vco})\ \Psi_{ed,V}\ \Psi_{c,V}\ \Psi_{h,V} V_{by}$ (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)
737.64	839.68	1.000	1.000	1.000	18939	0.70	23292

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

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

k_{cp}	A_{Na} (in^2)	A_{Na0} (in^2)	$\Psi_{ed,Na}$	$\Psi_{g,Na}$	$\Psi_{ec,Na}$	$\Psi_{p,Na}$	N_{a0} (lb)	N_a (lb)
2.0	158.66	109.66	1.000	1.043	1.000	1.000	9755	14715

A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	N_{cb} (lb)	ϕ
408.24	324.00	1.000	1.000	1.000	1.000	12492	15740	0.70

ϕV_{cpg} (lb)
20601

11. Results

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

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	2732	6071	0.45	Pass
Concrete breakout	5464	10231	0.53	Pass
Adhesive	**5464**	**8093**	**0.68**	**Pass (Governs)**

Shear	Factored Load, V_{ua} (lb)	Design Strength, ϕV_n (lb)	Ratio	Status
Steel	**1650**	**3156**	**0.52**	**Pass (Governs)**
T Concrete breakout x+	3300	9001	0.37	Pass

ǁ Concrete breakout y-	1650	23292	0.07	Pass
Pryout	3300	20601	0.16	Pass

Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. D.7.3	0.68	0.52	119.8 %	1.2	Pass

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

12. Warnings

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

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

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