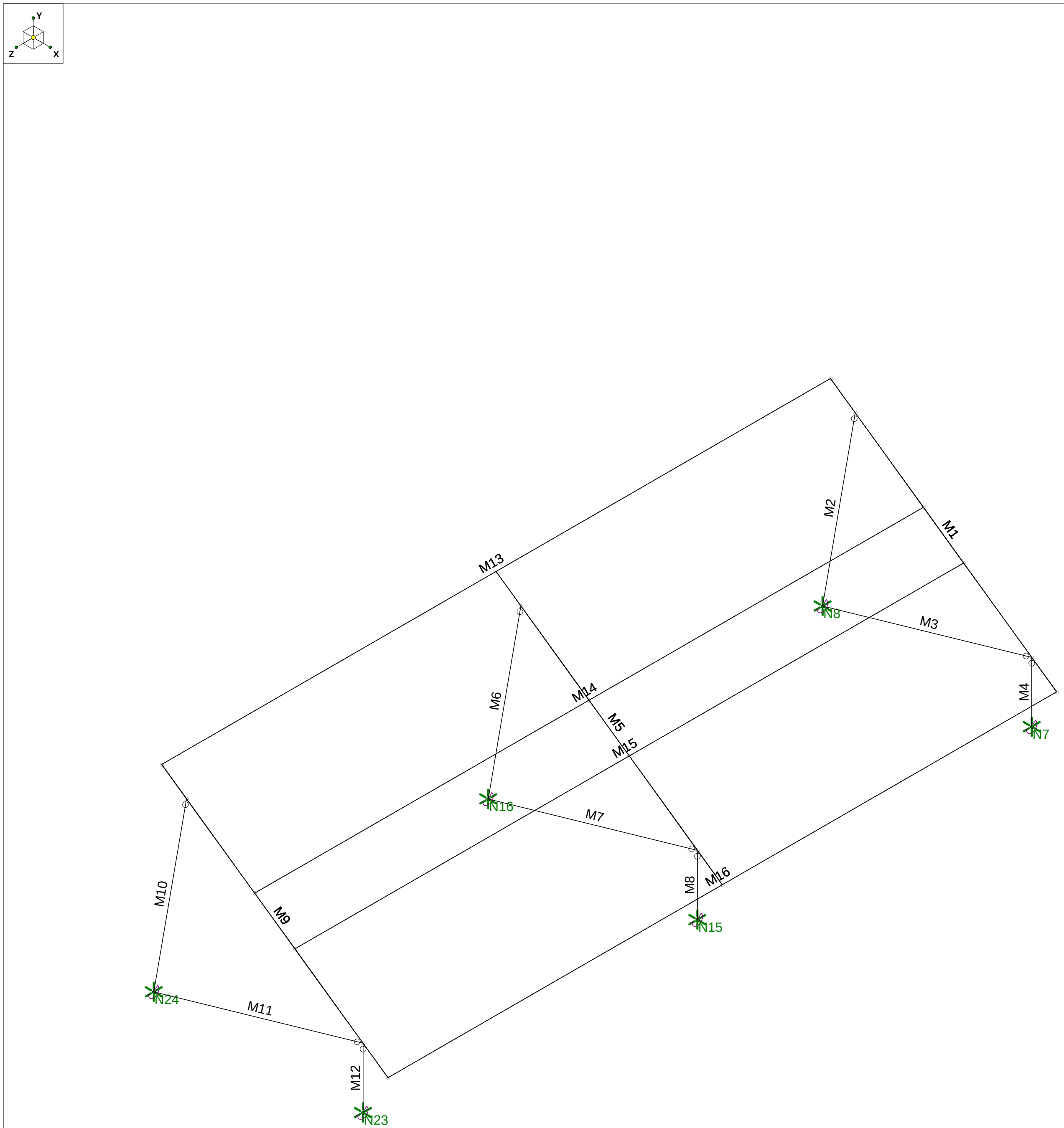


Schletter, Inc.		35ÁTilt w/o Seismic Design
HCV	Standard PVMax Racking System	
	Representative Calculations - ASCE 7-10	

1. INTRODUCTION

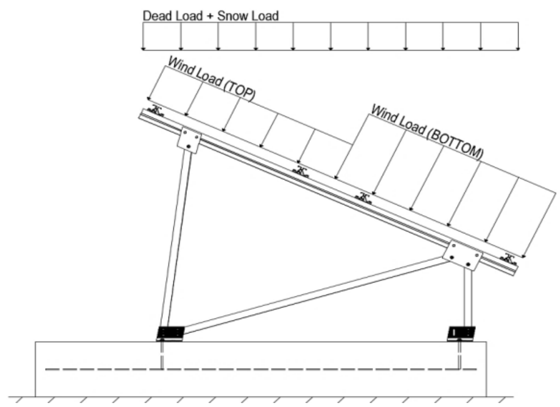
1.1 Project Description
The following sections will cover the determination of forces and structural design calculations for the Schletter, Inc. PVMax ground mount system.

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

PV modules are required to meet the following specifications:

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

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



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

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

2. LOAD ACTIONS

2.1 Permanent Loads

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

Self-weight of the PV modules.

2.2 Snow Loads

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

2.3 Wind Loads

Design Wind Speed, V = 130 mph
Height < 15 ft

Exposure Category = C
Importance Category = II

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

Pressure Coefficients

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

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

2.4 Seismic Loads - N/A

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

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

2.5 Combination of Loads

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

Strength Design, LRFD

Component stresses are checked using the following LRFD load combinations:

1.2D + 1.6S + 0.5W
1.2D + 1.0W + 0.5S
0.9D + 1.0W [M]
1.54D + 1.3E + 0.2S [R]
0.56D + 1.3E [R]
1.54D + 1.25E + 0.2S [O]
0.56D + 1.25E [O]

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

Allowable Stress Design, ASD

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

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

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

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

3. STRUCTURAL ANALYSIS

3.1 RISA Results

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

3.2 RISA Components

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

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

Girders	Location	Rear Struts	Location	Rear Reactions	Location
M1	Outer	M2	Outer	N8	Outer
M5	Inner	M6	Inner	N16	Inner
M9	Outer	M10	Outer	N24	Outer

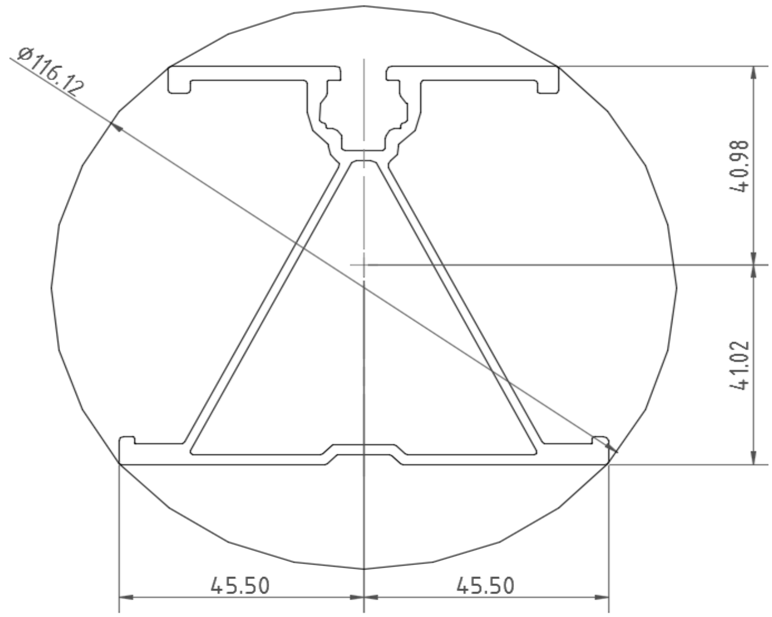
Front Struts	Location
M4	Outer
M8	Inner
M12	Outer

4. MEMBER DESIGN CALCULATIONS

4.1 Purlin Design

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

Purlin Type =	**S1.5**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	114	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 =	1.972	k-ft
M_z =	0.136	k-ft
$M_{y\ allowable}$ =	2.779	k-ft
$M_{z\ allowable}$ =	1.154	k-ft
Utilization =	83%	

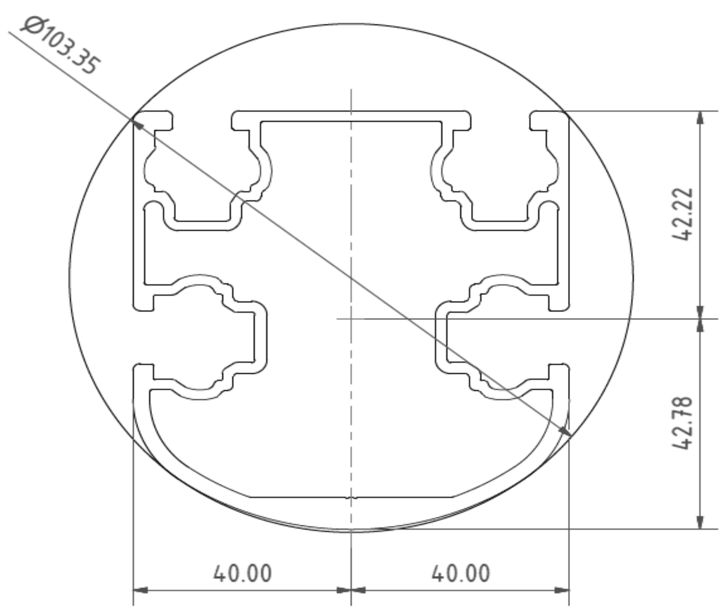


DETAIL VIEW

4.2 Girder Design

Loads from purlins are transferred using an inclined girder, which is connected to a set of aluminum struts. Loads on the girder result from the support reactions of the purlins. See Appendix A.2 for detailed member calculations. Section units are in (mm).

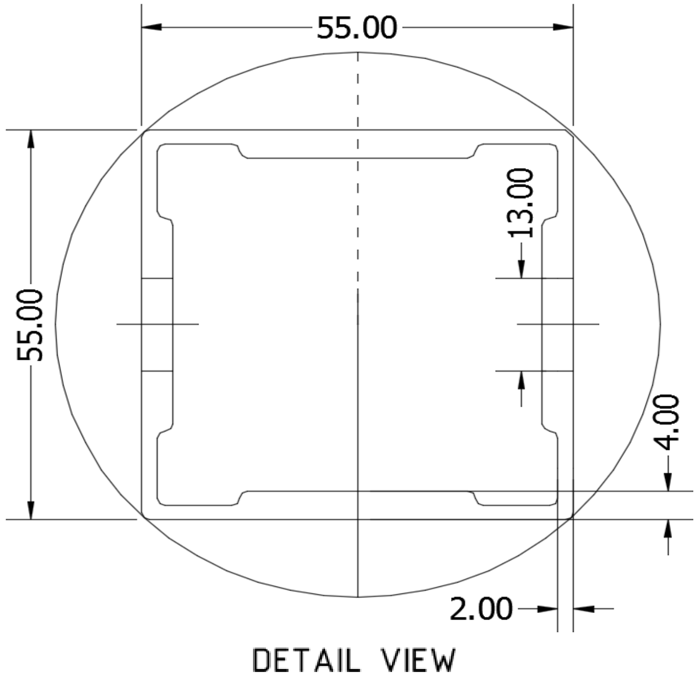
Girder Type =	**BF0**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	88.90	in
$\Phi F_{ty\ AXIAL}$ =	31.09	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.35	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	33.25	ksi
S_y =	1.42	in^3
S_x =	1.41	in^3
E =	10100	ksi
I_y =	2.39	in^4
I_x =	2.22	in^4
A =	1.88	in^2
g =	2.26	lbs/ft
M_y =	-2.895	k-ft
M_z =	0.000	k-ft
P_n =	-0.974	k
$M_{y\ allowable}$ =	3.464	k-ft
$M_{z\ allowable}$ =	3.907	k-ft
$P_{n\ allowable}$ =	58.535	k
Utilization =	85%	



4.3 Front Strut Design

The front aluminum strut connects a portion of the girder to the foundation. Vertical girder forces are then transferred down through the strut into the foundation. The strut is attached with single M12 bolts at each end. See Appendix A.3 for detailed member calculations. Section units are in (mm).

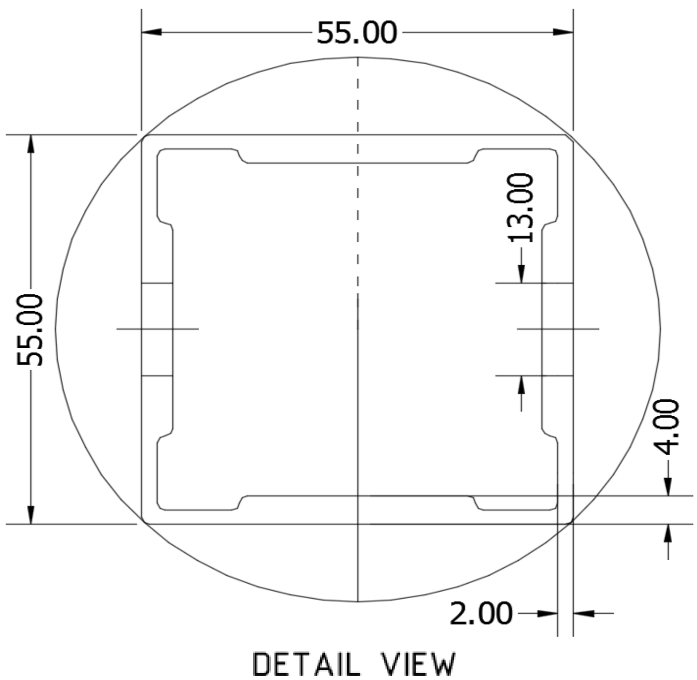
Strut Type =	**55x55**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	24.80	in
$\Phi F_{ty\ AXIAL}$ =	28.03	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	2.194	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	27.532	k
Utilization =	8%	



4.4 Diagonal Strut Design

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

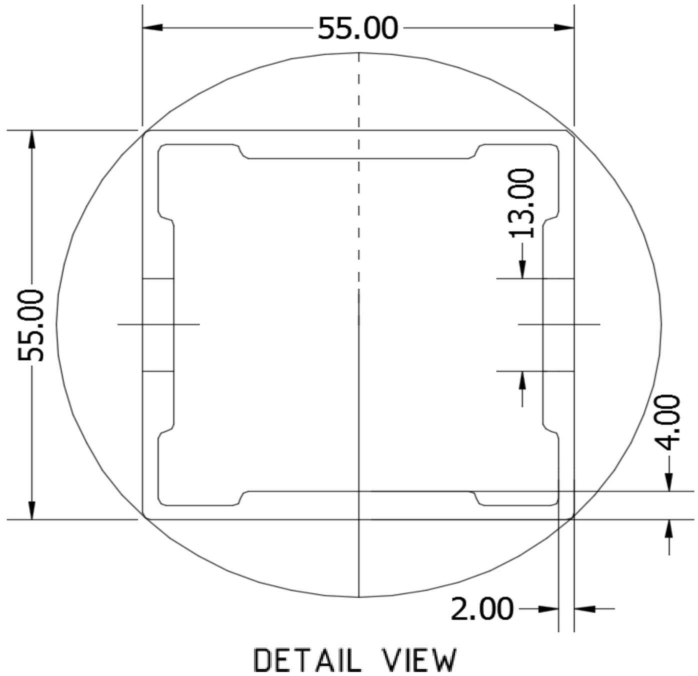
Strut Type =	**55x55**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	86.60	in
$\Phi F_{ty\ AXIAL}$ =	7.50	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.009	k-ft
M_z =	0.000	k-ft
P_n =	2.859	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	7.371	k
Utilization =	39%	



4.5 Rear Strut Design

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

Strut Type =	**55x55**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	78.03	in
$\Phi F_{ty\ AXIAL}$ =	8.94	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	-0.009	k-ft
M_z =	0.000	k-ft
P_n =	3.105	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	8.786	k
Utilization =	36%	



5. FOUNDATION DESIGN CALCULATIONS

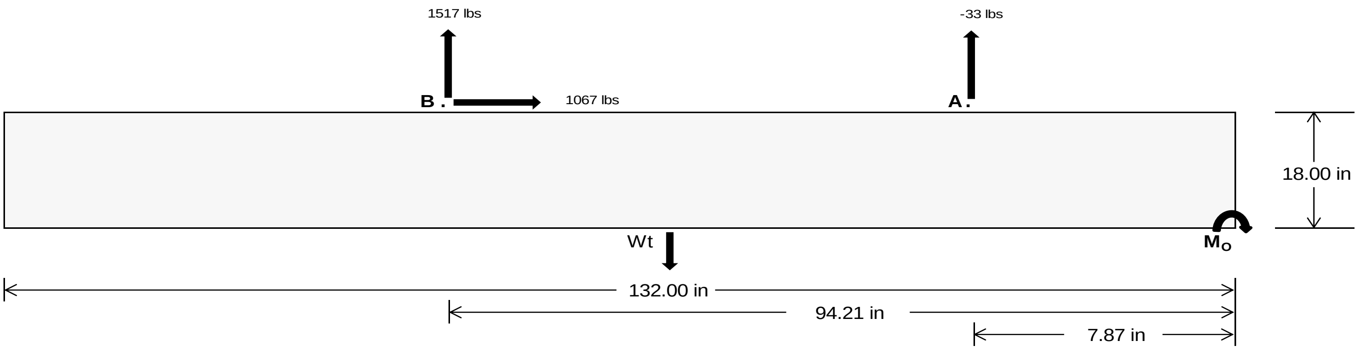
5.1 Helical Pile Foundations

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 =	88.49	6591.43	k
Compressive Load =	2851.99	5008.16	k
Lateral Load =	13.95	4625.59	k
Moment (Weak Axis) =	0.03	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 =	161879.6 in-lbs
Resisting Force Required =	2452.72 lbs
S.F. =	1.67
Weight Required =	4087.87 lbs
Minimum Width =	32 in in
Weight Provided =	6380.00 lbs

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

Sliding	
Force =	1066.93 lbs
Friction =	0.4
Weight Required =	2667.33 lbs
Resisting Weight =	6380.00 lbs
Additional Weight Required =	0 lbs

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

Cohesion	
Sliding Force =	1066.93 lbs
Cohesion =	130 psf
Area =	29.33 ft^2
Resisting =	3190.00 lbs
Additional Weight Required =	0 lbs

Use a 132in long x 32in wide x 18in tall ballast foundation. Cohesion is OK.

Shear Key	
Additional Force =	0 lbs
Lateral Bearing Pressure =	200 psf/ft
Required Depth =	0.00 ft
f'_c =	2500 psi
Length =	8 in

Shear key is not required.

Bearing Pressure

	Ballast Width			
	32 in	33 in	34 in	35 in
P_{ftg} = (145 pcf)(11 ft)(1.5 ft)(2.67 ft) =	6380 lbs	6579 lbs	6779 lbs	6978 lbs

ASD LC	1.0D + 1.0S				1.0D + 0.6W				1.0D + 0.75L + 0.45W + 0.75S				0.6D + 0.6W			
Width	32 in	33 in	34 in	35 in	32 in	33 in	34 in	35 in	32 in	33 in	34 in	35 in	32 in	33 in	34 in	35 in
F_A	1022 lbs	1022 lbs	1022 lbs	1022 lbs	1045 lbs	1045 lbs	1045 lbs	1045 lbs	1424 lbs	1424 lbs	1424 lbs	1424 lbs	66 lbs	66 lbs	66 lbs	66 lbs
F_B	916 lbs	916 lbs	916 lbs	916 lbs	2167 lbs	2167 lbs	2167 lbs	2167 lbs	2200 lbs	2200 lbs	2200 lbs	2200 lbs	-3034 lbs	-3034 lbs	-3034 lbs	-3034 lbs
F_V	162 lbs	162 lbs	162 lbs	162 lbs	1945 lbs	1945 lbs	1945 lbs	1945 lbs	1562 lbs	1562 lbs	1562 lbs	1562 lbs	-2134 lbs	-2134 lbs	-2134 lbs	-2134 lbs
P_{total}	8318 lbs	8518 lbs	8717 lbs	8916 lbs	9592 lbs	9792 lbs	9991 lbs	10190 lbs	10004 lbs	10203 lbs	10403 lbs	10602 lbs	860 lbs	980 lbs	1099 lbs	1219 lbs
M	3039 lbs-ft	3039 lbs-ft	3039 lbs-ft	3039 lbs-ft	2888 lbs-ft	2888 lbs-ft	2888 lbs-ft	2888 lbs-ft	4071 lbs-ft	4071 lbs-ft	4071 lbs-ft	4071 lbs-ft	4254 lbs-ft	4254 lbs-ft	4254 lbs-ft	4254 lbs-ft
e	0.37 ft	0.36 ft	0.35 ft	0.34 ft	0.30 ft	0.29 ft	0.29 ft	0.28 ft	0.41 ft	0.40 ft	0.39 ft	0.38 ft	4.95 ft	4.34 ft	3.87 ft	3.49 ft
L/6	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft
f_{min}	227.1 psf	226.8 psf	226.5 psf	226.3 psf	273.3 psf	271.6 psf	270.0 psf	268.5 psf	265.3 psf	263.9 psf	262.5 psf	261.2 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	340.1 psf	336.4 psf	332.9 psf	329.6 psf	380.7 psf	375.8 psf	371.1 psf	366.7 psf	416.7 psf	410.7 psf	405.0 psf	399.7 psf	388.6 psf	205.2 psf	158.7 psf	138.6 psf

Maximum Bearing Pressure = 417 psf
Allowable Bearing Pressure = 1500 psf

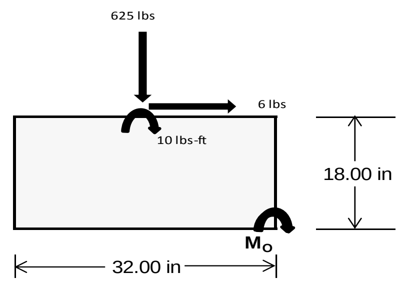
Use a 132in long x 32in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O = 815.0 ft-lbs
Resisting Force Required = 611.23 lbs
S.F. = 1.67
Weight Required = 1018.71 lbs
Minimum Width = 32 in in
Weight Provided = 6380.00 lbs

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



Bearing Pressure

ASD LC	1.238D + 0.875E			1.1785D + 0.65625E + 0.75S			0.362D + 0.875E		
Width	32 in			32 in			32 in		
Support	Outer	Inner	Outer	Outer	Inner	Outer	Outer	Inner	Outer
F_Y	245 lbs	592 lbs	245 lbs	625 lbs	1659 lbs	625 lbs	72 lbs	173 lbs	72 lbs
F_V	2 lbs	0 lbs	2 lbs	6 lbs	0 lbs	6 lbs	1 lbs	0 lbs	1 lbs
P_{total}	8143 lbs	6380 lbs	8143 lbs	8144 lbs	6380 lbs	8144 lbs	2381 lbs	6380 lbs	2381 lbs
M	7 lbs-ft	0 lbs-ft	7 lbs-ft	19 lbs-ft	0 lbs-ft	19 lbs-ft	2 lbs-ft	0 lbs-ft	2 lbs-ft
e	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft
L/6	0.44 ft	0.44 ft	0.44 ft	0.44 ft	0.44 ft	0.44 ft	0.44 ft	0.44 ft	0.44 ft
f_{min}	277.1 psf	217.5 psf	277.1 psf	276.2 psf	217.5 psf	276.2 psf	81.0 psf	217.5 psf	81.0 psf
f_{max}	278.1 psf	217.5 psf	278.1 psf	279.1 psf	217.5 psf	279.1 psf	81.3 psf	217.5 psf	81.3 psf

Maximum Bearing Pressure = 279 psf
Allowable Bearing Pressure = 1500 psf

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

Foundation Requirements: 132in long x 32in wide x 18in tall ballast foundation and fiber reinforcing with (2) #5 rebar.

5.3 Foundation Anchors

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

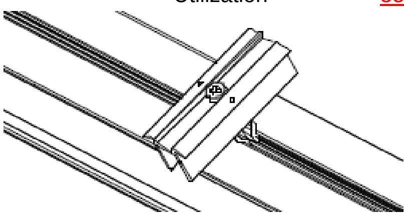
6. DESIGN OF JOINTS AND CONNECTIONS

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

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

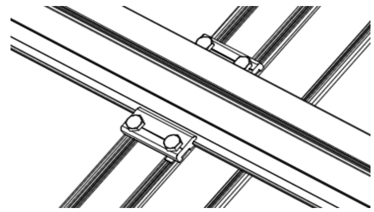
Fastening of Modules to Purlins

Maximum Uplifting Force =	0.673	k
Allowable Uplift =	1.214	k
Utilization =	55%	



Fastening of Purlins to Girders

Maximum Uplifting Force =	2.287	k
Allowable Uplift =	4.357	k
Utilization =	52%	



6.2 Strut Connections

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

Front Strut

Maximum Axial Load =	2.194	k
M12 Bolt Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	30%	

Rear Strut

Maximum Axial Load =	4.346	k
M12 Bolt Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	59%	

Diagonal Strut

Maximum Axial Load =	2.909	k
M12 Bolt Shear Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	39%	

Bolt and bearing capacities are accounting for double shear. (ASCE 8-02, Eq. 5.3.4-1)

Struts under compression are shown to demonstrate the load transfer from the girder. Single M12 bolts are located at each end of the strut and are subjected to double shear.

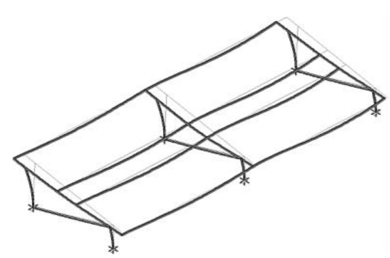
7. SEISMIC DESIGN

7.1 Seismic Drift - N/A

The racking structure has been analyzed under seismic loading. The allowable story drift of the structure must fall within the limits provided by (ASCE 7, Table 12.12-1).

Mean Height, h_{sx} =	53.78	in
Allowable Story Drift for All Other Structures, Δ = {	$0.020h_{sx}$	
	1.076	in
Max Drift, Δ_{MAX} =	0.05	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 = 114 in

J = 0.432

315.377

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 27.5 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 in^3

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

Weak Axis:

3.4.14

L_b = 114

J = 0.432

200.561

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

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= 28.8

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 in^3

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

Compression

3.4.9

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

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

3.4.10

Rb/t = 0.0

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

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

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

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

Girder = **BF0**

Strong Axis:

3.4.14

L_b = 88.9 in
J = 1.08
152.913

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

S1 = 0.51461

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

S2 = 1701.56
φF_L= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
φF_L= 29.4 ksi

3.4.16

b/t = 16.2

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

S1 = 12.2

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

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

Weak Axis:

3.4.14

L_b = 88.9
J = 1.08
161.829

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

S1 = 0.51461

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

S2 = 1701.56
φF_L= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
φF_L= 29.2

3.4.16

b/t = 7.4

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

S1 = 12.2

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

S2 = 46.7
φF_L= φyFcy
φF_L= 33.3 ksi

3.4.16.1 Used

Rb/t = 18.1

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

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= 29.4 ksi

Ix = 984962 mm^4

2.366 in^4

y = 43.717 mm

Sx = 1.375 in^3

M_{max}St = 3.363 k-ft

3.4.18

h/t = 16.2

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

S1 = 36.9

m = 0.65

C_0 = 40

Cc = 40

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

S2 = 77.3

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:

3.4.14

L_b = 24.8 in

J = 0.942

38.7028

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.4 ksi

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 28.2 ksi

Ix = 279836 mm^4

0.672 in^4

y = 27.5 mm

Sx = 0.621 in^3

M_{max}St = 1.460 k-ft

Weak Axis:

3.4.14

L_b = 24.8

J = 0.942

38.7028

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.4

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 28.2 ksi

Iy = 279836 mm^4

0.672 in^4

x = 27.5 mm

Sy = 0.621 in^3

M_{max}Wk = 1.460 k-ft

Compression

3.4.7

λ = 0.57371

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.87952

φF_L= φcc(Bc-Dc*λ)

φF_L= 28.0279 ksi

3.4.9

b/t = 24.5

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

b/t = 24.5

S1 = 12.21

S2 = 32.70

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

φF_L= φyFcy

φF_L= 33.25 ksi

φF_L= 28.03 ksi

A = 663.99 mm^2

1.03 in^2

P_{max} = 28.85 kips

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

Strut = **55x55**

Strong Axis:

3.4.14

L_b = 86.60 in

J = 0.942

135.148

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.6 ksi

Weak Axis:

3.4.14

L_b = 86.6

J = 0.942

135.148

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.6

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 28.2 ksi

Ix = 279836 mm^4

0.672 in^4

y = 27.5 mm

Sx = 0.621 in^3

M_{max}St = 1.460 k-ft

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 28.2 ksi

Iy = 279836 mm^4

0.672 in^4

x = 27.5 mm

Sy = 0.621 in^3

M_{max}Wk = 1.460 k-ft

Compression

3.4.7

λ = 2.00335

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.86047

φF_L= (φccFcy)/(λ²)

φF_L= 7.50396 ksi

3.4.9

b/t = 24.5
S1 = 12.21 (See 3.4.16 above for formula)
S2 = 32.70 (See 3.4.16 above for formula)
$\varphi F_L = \varphi c[Bp-1.6Dp*b/t]$
$\varphi F_L =$ 28.2 ksi

b/t = 24.5
S1 = 12.21
S2 = 32.70
$\varphi F_L = \varphi c[Bp-1.6Dp*b/t]$
$\varphi F_L =$ 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
$\varphi F_L = \varphi yFcy$
$\varphi F_L =$ 33.25 ksi

$\varphi F_L =$ 7.50 ksi
A = 663.99 mm^2
1.03 in^2
$P_{max} =$ 7.72 kips

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

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

Strong Axis:

3.4.14

$L_b =$ 78.03 in
J = 0.942
121.773

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

S1 = 0.51461

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

S2 = 1701.56
$\varphi F_L = \varphi b[Bc-1.6Dc*\sqrt{((LbSc)/(Cb*\sqrt{(IyJ)/2}))}]$
$\varphi F_L =$ 29.8 ksi

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7
$\varphi F_L = \varphi b[Bp-1.6Dp*b/t]$
$\varphi F_L =$ 28.2 ksi

Weak Axis:

3.4.14

$L_b =$ 78.03
J = 0.942
121.773

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

S1 = 0.51461

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

S2 = 1701.56
$\varphi F_L = \varphi b[Bc-1.6Dc*\sqrt{((LbSc)/(Cb*\sqrt{(IyJ)/2}))}]$
$\varphi F_L =$ 29.8

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7
$\varphi F_L = \varphi b[Bp-1.6Dp*b/t]$
$\varphi F_L =$ 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 = 1.80509

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.83271

φF_L= (φccFcy)/(λ²)

φF_L= 8.94465 ksi

3.4.9

b/t = 24.5

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

b/t = 24.5

S1 = 12.21

S2 = 32.70

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

$\varphi F_L = \varphi y Fcy$

$\varphi F_L =$ 33.25 ksi

$\varphi F_L =$ 8.94 ksi

A = 663.99 mm^2

1.03 in^2

$P_{max} =$ 9.21 kips

APPENDIX B

B.1

The following pages will contain the results from RISA. Please refer back to Section 2 for load information and Section 4-5 for member and foundation design.

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distribut...	Area(Me...	Surface(...
1	Dead Load, Max	DL		-1				4		
2	Dead Load, Min	DL		-1				4		
3	Snow Load	SL						4		
4	Wind Load - Pressure	WL						4		
5	Wind Load - Suction	WL						4		
6	Seismic - Lateral	EL								

Member Distributed Loads (BLC 1 : Dead Load, Max)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	Y	-8.366	-8.366	0	0
2	M14	Y	-8.366	-8.366	0	0
3	M15	Y	-8.366	-8.366	0	0
4	M16	Y	-8.366	-8.366	0	0

Member Distributed Loads (BLC 2 : Dead Load, Min)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	Y	-4.45	-4.45	0	0
2	M14	Y	-4.45	-4.45	0	0
3	M15	Y	-4.45	-4.45	0	0
4	M16	Y	-4.45	-4.45	0	0

Member Distributed Loads (BLC 3 : Snow Load)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	Y	-32.97	-32.97	0	0
2	M14	Y	-32.97	-32.97	0	0
3	M15	Y	-32.97	-32.97	0	0
4	M16	Y	-32.97	-32.97	0	0

Member Distributed Loads (BLC 4 : Wind Load - Pressure)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	y	-88.797	-88.797	0	0
2	M14	y	-88.797	-88.797	0	0
3	M15	y	-147.995	-147.995	0	0
4	M16	y	-147.995	-147.995	0	0

Member Distributed Loads (BLC 5 : Wind Load - Suction)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	y	199.793	199.793	0	0
2	M14	y	155.395	155.395	0	0
3	M15	y	88.797	88.797	0	0
4	M16	y	88.797	88.797	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	937.365	2	1189.692	2	.568	1	.002	1	0	1	0	1
2		min	-1124.19	3	-1560.862	3	.035	15	0	15	0	1	0	1
3	N7	max	.034	3	887.292	1	-.612	15	-.001	15	0	1	0	1
4		min	-.192	2	44.002	15	-10.731	1	-.02	1	0	1	0	1
5	N15	max	.226	3	2193.841	1	0	1	0	1	0	1	0	1
6		min	-1.968	2	90.931	15	0	2	0	2	0	1	0	1
7	N16	max	3288.719	2	3852.427	2	0	14	0	1	0	1	0	1
8		min	-3558.146	3	-5070.334	3	0	9	0	2	0	1	0	1
9	N23	max	.034	3	887.292	1	10.731	1	.02	1	0	1	0	1
10		min	-.192	2	44.002	15	.612	15	.001	15	0	1	0	1
11	N24	max	937.365	2	1189.692	2	-.035	15	0	15	0	1	0	1
12		min	-1124.19	3	-1560.862	3	-.568	1	-.002	1	0	1	0	1
13	Totals:	max	5161.096	2	9672.25	2	0	1						
14		min	-5806.233	3	-7773.578	3	0	2						

Envelope Member Section Forces

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
1	M13	1	max	97.327	1	393.491	2	-9.357	15	.001	3	.233	1	0	2
2			min	5.447	15	-696.355	3	-168.538	1	-.013	2	.013	15	0	3
3		2	max	97.327	1	275.265	2	-7.194	15	.001	3	.075	1	.626	3
4			min	5.447	15	-490.096	3	-129.429	1	-.013	2	.004	15	-.353	2
5		3	max	97.327	1	157.04	2	-5.03	15	.001	3	0	3	1.035	3
6			min	5.447	15	-283.837	3	-90.32	1	-.013	2	-.041	1	-.581	2
7		4	max	97.327	1	38.815	2	-2.867	15	.001	3	-.005	12	1.225	3
8			min	5.447	15	-77.578	3	-51.21	1	-.013	2	-.115	1	-.684	2
9		5	max	97.327	1	128.682	3	-.704	15	.001	3	-.008	12	1.198	3
10			min	5.447	15	-79.41	2	-12.101	1	-.013	2	-.149	1	-.663	2
11		6	max	97.327	1	334.941	3	27.008	1	.001	3	-.008	15	.954	3
12			min	5.447	15	-197.636	2	.494	12	-.013	2	-.141	1	-.517	2
13		7	max	97.327	1	541.2	3	66.117	1	.001	3	-.005	15	.491	3
14			min	5.447	15	-315.861	2	2.657	12	-.013	2	-.092	1	-.246	2
15		8	max	97.327	1	747.459	3	105.226	1	.001	3	.002	2	.15	2
16			min	5.447	15	-434.086	2	4.82	12	-.013	2	-.005	3	-.189	3
17		9	max	97.327	1	953.718	3	144.336	1	.001	3	.13	1	.671	2
18			min	5.447	15	-552.312	2	6.983	12	-.013	2	.003	12	-1.087	3
19		10	max	97.327	1	670.537	2	-9.146	12	.013	2	.303	1	1.316	2
20			min	5.447	15	-1159.977	3	-183.445	1	-.001	3	.012	12	-2.202	3
21		11	max	97.327	1	552.312	2	-6.983	12	.013	2	.13	1	.671	2
22			min	5.447	15	-953.718	3	-144.336	1	-.001	3	.003	12	-1.087	3
23		12	max	97.327	1	434.086	2	-4.82	12	.013	2	.002	2	.15	2
24			min	5.447	15	-747.459	3	-105.226	1	-.001	3	-.005	3	-.189	3
25		13	max	97.327	1	315.861	2	-2.657	12	.013	2	-.005	15	.491	3
26			min	5.447	15	-541.2	3	-66.117	1	-.001	3	-.092	1	-.246	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
27		14	max	97.327	1	197.636	2	-.494	12	.013	2	-.008	15	.954	3
28			min	5.447	15	-334.941	3	-27.008	1	-.001	3	-.141	1	-.517	2
29		15	max	97.327	1	79.41	2	12.101	1	.013	2	-.008	12	1.198	3
30			min	5.447	15	-128.682	3	.704	15	-.001	3	-.149	1	-.663	2
31		16	max	97.327	1	77.578	3	51.21	1	.013	2	-.005	12	1.225	3
32			min	5.447	15	-38.815	2	2.867	15	-.001	3	-.115	1	-.684	2
33		17	max	97.327	1	283.837	3	90.32	1	.013	2	0	3	1.035	3
34			min	5.447	15	-157.04	2	5.03	15	-.001	3	-.041	1	-.581	2
35		18	max	97.327	1	490.096	3	129.429	1	.013	2	.075	1	.626	3
36			min	5.447	15	-275.265	2	7.194	15	-.001	3	.004	15	-.353	2
37		19	max	97.327	1	696.355	3	168.538	1	.013	2	.233	1	0	2
38			min	5.447	15	-393.491	2	9.357	15	-.001	3	.013	15	0	3
39	M14	1	max	46.561	1	423.948	2	-9.659	15	.009	3	.267	1	0	1
40			min	2.605	15	-557.707	3	-173.992	1	-.01	2	.015	15	0	3
41		2	max	46.561	1	305.722	2	-7.496	15	.009	3	.104	1	.505	3
42			min	2.605	15	-398.313	3	-134.883	1	-.01	2	.006	15	-.385	2
43		3	max	46.561	1	187.497	2	-5.332	15	.009	3	.003	3	.841	3
44			min	2.605	15	-238.918	3	-95.774	1	-.01	2	-.018	1	-.645	2
45		4	max	46.561	1	69.272	2	-3.169	15	.009	3	-.004	12	1.009	3
46			min	2.605	15	-79.524	3	-56.665	1	-.01	2	-.098	1	-.781	2
47		5	max	46.561	1	79.871	3	-1.006	15	.009	3	-.007	12	1.009	3
48			min	2.605	15	-48.953	2	-17.556	1	-.01	2	-.137	1	-.792	2
49		6	max	46.561	1	239.266	3	21.554	1	.009	3	-.008	15	.84	3
50			min	2.605	15	-167.179	2	.15	3	-.01	2	-.135	1	-.678	2
51		7	max	46.561	1	398.66	3	60.663	1	.009	3	-.005	15	.504	3
52			min	2.605	15	-285.404	2	2.368	12	-.01	2	-.092	1	-.439	2
53		8	max	46.561	1	558.055	3	99.772	1	.009	3	0	10	-.001	15
54			min	2.605	15	-403.629	2	4.531	12	-.01	2	-.007	1	-.075	2
55		9	max	46.561	1	717.449	3	138.881	1	.009	3	.119	1	.413	2
56			min	2.605	15	-521.855	2	6.693	12	-.01	2	.003	12	-.674	3
57		10	max	46.561	1	640.08	2	-8.856	12	.01	2	.286	1	1.027	2
58			min	2.605	15	-876.844	3	-177.99	1	-.009	3	.011	12	-1.516	3
59		11	max	46.561	1	521.855	2	-6.693	12	.01	2	.119	1	.413	2
60			min	2.605	15	-717.449	3	-138.881	1	-.009	3	.003	12	-.674	3
61		12	max	46.561	1	403.629	2	-4.531	12	.01	2	0	10	-.001	15
62			min	2.605	15	-558.055	3	-99.772	1	-.009	3	-.007	1	-.075	2
63		13	max	46.561	1	285.404	2	-2.368	12	.01	2	-.005	15	.504	3
64			min	2.605	15	-398.66	3	-60.663	1	-.009	3	-.092	1	-.439	2
65		14	max	46.561	1	167.179	2	-.15	3	.01	2	-.008	15	.84	3
66			min	2.605	15	-239.266	3	-21.554	1	-.009	3	-.135	1	-.678	2
67		15	max	46.561	1	48.953	2	17.556	1	.01	2	-.007	12	1.009	3
68			min	2.605	15	-79.871	3	1.006	15	-.009	3	-.137	1	-.792	2
69		16	max	46.561	1	79.524	3	56.665	1	.01	2	-.004	12	1.009	3
70			min	2.605	15	-69.272	2	3.169	15	-.009	3	-.098	1	-.781	2
71		17	max	46.561	1	238.918	3	95.774	1	.01	2	.003	3	.841	3
72			min	2.605	15	-187.497	2	5.332	15	-.009	3	-.018	1	-.645	2
73		18	max	46.561	1	398.313	3	134.883	1	.01	2	.104	1	.505	3
74			min	2.605	15	-305.722	2	7.496	15	-.009	3	.006	15	-.385	2
75		19	max	46.561	1	557.707	3	173.992	1	.01	2	.267	1	0	1
76			min	2.605	15	-423.948	2	9.659	15	-.009	3	.015	15	0	3
77	M15	1	max	-2.733	15	634.862	2	-9.656	15	.011	2	.267	1	0	2
78			min	-48.705	1	-320.61	3	-173.979	1	-.008	3	.015	15	0	3
79		2	max	-2.733	15	454.15	2	-7.493	15	.011	2	.104	1	.291	3
80			min	-48.705	1	-231.513	3	-134.869	1	-.008	3	.006	15	-.575	2
81		3	max	-2.733	15	273.438	2	-5.33	15	.011	2	.002	3	.489	3
82			min	-48.705	1	-142.417	3	-95.76	1	-.008	3	-.018	1	-.959	2
83		4	max	-2.733	15	92.726	2	-3.166	15	.011	2	-.004	12	.592	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	-48.705	1	-53.32	3	-56.651	1	-.008	3	-.098	1	-1.152	2
85		5	max	-2.733	15	35.777	3	-1.003	15	.011	2	-.007	12	.601	3
86			min	-48.705	1	-87.987	2	-17.542	1	-.008	3	-.138	1	-1.155	2
87		6	max	-2.733	15	124.873	3	21.567	1	.011	2	-.008	15	.517	3
88			min	-48.705	1	-268.699	2	.281	3	-.008	3	-.135	1	-.966	2
89		7	max	-2.733	15	213.97	3	60.677	1	.011	2	-.005	15	.338	3
90			min	-48.705	1	-449.411	2	2.447	12	-.008	3	-.092	1	-.587	2
91		8	max	-2.733	15	303.067	3	99.786	1	.011	2	0	10	.065	3
92			min	-48.705	1	-630.123	2	4.61	12	-.008	3	-.007	1	-.024	1
93		9	max	-2.733	15	392.163	3	138.895	1	.011	2	.119	1	.743	2
94			min	-48.705	1	-810.835	2	6.773	12	-.008	3	.003	12	-.302	3
95		10	max	-2.733	15	991.547	2	-8.936	12	.008	3	.286	1	1.694	2
96			min	-48.705	1	-481.26	3	-178.004	1	-.011	2	.011	12	-.763	3
97		11	max	-2.733	15	810.835	2	-6.773	12	.008	3	.119	1	.743	2
98			min	-48.705	1	-392.163	3	-138.895	1	-.011	2	.003	12	-.302	3
99		12	max	-2.733	15	630.123	2	-4.61	12	.008	3	0	10	.065	3
100			min	-48.705	1	-303.067	3	-99.786	1	-.011	2	-.007	1	-.024	1
101		13	max	-2.733	15	449.411	2	-2.447	12	.008	3	-.005	15	.338	3
102			min	-48.705	1	-213.97	3	-60.677	1	-.011	2	-.092	1	-.587	2
103		14	max	-2.733	15	268.699	2	-.281	3	.008	3	-.008	15	.517	3
104			min	-48.705	1	-124.873	3	-21.567	1	-.011	2	-.135	1	-.966	2
105		15	max	-2.733	15	87.987	2	17.542	1	.008	3	-.007	12	.601	3
106			min	-48.705	1	-35.777	3	1.003	15	-.011	2	-.138	1	-1.155	2
107		16	max	-2.733	15	53.32	3	56.651	1	.008	3	-.004	12	.592	3
108			min	-48.705	1	-92.726	2	3.166	15	-.011	2	-.098	1	-1.152	2
109		17	max	-2.733	15	142.417	3	95.76	1	.008	3	.002	3	.489	3
110			min	-48.705	1	-273.438	2	5.33	15	-.011	2	-.018	1	-.959	2
111		18	max	-2.733	15	231.513	3	134.869	1	.008	3	.104	1	.291	3
112			min	-48.705	1	-454.15	2	7.493	15	-.011	2	.006	15	-.575	2
113		19	max	-2.733	15	320.61	3	173.979	1	.008	3	.267	1	0	2
114			min	-48.705	1	-634.862	2	9.656	15	-.011	2	.015	15	0	3
115	M16	1	max	-5.897	15	605.619	2	-9.366	15	.009	2	.234	1	0	2
116			min	-105.348	1	-295.48	3	-168.826	1	-.012	3	.013	15	0	3
117		2	max	-5.897	15	424.907	2	-7.203	15	.009	2	.077	1	.265	3
118			min	-105.348	1	-206.384	3	-129.717	1	-.012	3	.004	15	-.544	2
119		3	max	-5.897	15	244.195	2	-5.039	15	.009	2	0	3	.436	3
120			min	-105.348	1	-117.287	3	-90.608	1	-.012	3	-.04	1	-.897	2
121		4	max	-5.897	15	63.483	2	-2.876	15	.009	2	-.005	12	.512	3
122			min	-105.348	1	-28.19	3	-51.498	1	-.012	3	-.115	1	-1.059	2
123		5	max	-5.897	15	60.906	3	-.713	15	.009	2	-.008	12	.495	3
124			min	-105.348	1	-117.229	2	-12.389	1	-.012	3	-.148	1	-1.031	2
125		6	max	-5.897	15	150.003	3	26.72	1	.009	2	-.008	15	.384	3
126			min	-105.348	1	-297.941	2	.758	12	-.012	3	-.141	1	-.812	2
127		7	max	-5.897	15	239.1	3	65.829	1	.009	2	-.005	15	.179	3
128			min	-105.348	1	-478.653	2	2.921	12	-.012	3	-.092	1	-.402	2
129		8	max	-5.897	15	328.196	3	104.938	1	.009	2	.001	2	.199	2
130			min	-105.348	1	-659.365	2	5.084	12	-.012	3	-.004	3	-.121	3
131		9	max	-5.897	15	417.293	3	144.048	1	.009	2	.129	1	.99	2
132			min	-105.348	1	-840.077	2	7.247	12	-.012	3	.004	12	-.514	3
133		10	max	-5.897	15	1020.789	2	-9.41	12	.012	3	.302	1	1.972	2
134			min	-105.348	1	-506.39	3	-183.157	1	-.009	2	.013	12	-1.002	3
135		11	max	-5.897	15	840.077	2	-7.247	12	.012	3	.129	1	.99	2
136			min	-105.348	1	-417.293	3	-144.048	1	-.009	2	.004	12	-.514	3
137		12	max	-5.897	15	659.365	2	-5.084	12	.012	3	.001	2	.199	2
138			min	-105.348	1	-328.196	3	-104.938	1	-.009	2	-.004	3	-.121	3
139		13	max	-5.897	15	478.653	2	-2.921	12	.012	3	-.005	15	.179	3
140			min	-105.348	1	-239.1	3	-65.829	1	-.009	2	-.092	1	-.402	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	-5.897	15	297.941	2	-.758	12	.012	3	-.008	15	.384	3
142			min	-105.348	1	-150.003	3	-26.72	1	-.009	2	-.141	1	-.812	2
143		15	max	-5.897	15	117.229	2	12.389	1	.012	3	-.008	12	.495	3
144			min	-105.348	1	-60.906	3	.713	15	-.009	2	-.148	1	-1.031	2
145		16	max	-5.897	15	28.19	3	51.498	1	.012	3	-.005	12	.512	3
146			min	-105.348	1	-63.483	2	2.876	15	-.009	2	-.115	1	-1.059	2
147		17	max	-5.897	15	117.287	3	90.608	1	.012	3	0	3	.436	3
148			min	-105.348	1	-244.195	2	5.039	15	-.009	2	-.04	1	-.897	2
149		18	max	-5.897	15	206.384	3	129.717	1	.012	3	.077	1	.265	3
150			min	-105.348	1	-424.907	2	7.203	15	-.009	2	.004	15	-.544	2
151		19	max	-5.897	15	295.48	3	168.826	1	.012	3	.234	1	0	2
152			min	-105.348	1	-605.619	2	9.366	15	-.009	2	.013	15	0	3
153	M2	1	max	968.978	2	2.018	4	.33	1	0	3	0	3	0	1
154			min	-1337.133	3	.475	15	.018	15	0	1	0	2	0	1
155		2	max	969.498	2	1.899	4	.33	1	0	3	0	1	0	15
156			min	-1336.743	3	.447	15	.018	15	0	1	0	15	0	4
157		3	max	970.019	2	1.78	4	.33	1	0	3	0	1	0	15
158			min	-1336.352	3	.419	15	.018	15	0	1	0	15	-.001	4
159		4	max	970.54	2	1.661	4	.33	1	0	3	0	1	0	15
160			min	-1335.962	3	.391	15	.018	15	0	1	0	15	-.002	4
161		5	max	971.06	2	1.542	4	.33	1	0	3	0	1	0	15
162			min	-1335.571	3	.363	15	.018	15	0	1	0	15	-.003	4
163		6	max	971.581	2	1.423	4	.33	1	0	3	0	1	0	15
164			min	-1335.181	3	.335	15	.018	15	0	1	0	15	-.003	4
165		7	max	972.102	2	1.305	4	.33	1	0	3	0	1	0	15
166			min	-1334.79	3	.307	15	.018	15	0	1	0	15	-.004	4
167		8	max	972.622	2	1.186	4	.33	1	0	3	0	1	0	15
168			min	-1334.4	3	.279	15	.018	15	0	1	0	15	-.004	4
169		9	max	973.143	2	1.067	4	.33	1	0	3	0	1	-.001	15
170			min	-1334.009	3	.251	15	.018	15	0	1	0	15	-.004	4
171		10	max	973.664	2	.948	4	.33	1	0	3	.001	1	-.001	15
172			min	-1333.619	3	.208	12	.018	15	0	1	0	15	-.005	4
173		11	max	974.185	2	.842	2	.33	1	0	3	.001	1	-.001	15
174			min	-1333.228	3	.162	12	.018	15	0	1	0	15	-.005	4
175		12	max	974.705	2	.75	2	.33	1	0	3	.001	1	-.001	15
176			min	-1332.838	3	.115	12	.018	15	0	1	0	15	-.005	4
177		13	max	975.226	2	.657	2	.33	1	0	3	.001	1	-.001	15
178			min	-1332.447	3	.069	12	.018	15	0	1	0	15	-.006	4
179		14	max	975.747	2	.564	2	.33	1	0	3	.002	1	-.001	15
180			min	-1332.057	3	.007	3	.018	15	0	1	0	15	-.006	4
181		15	max	976.267	2	.472	2	.33	1	0	3	.002	1	-.001	15
182			min	-1331.666	3	-.063	3	.018	15	0	1	0	15	-.006	4
183		16	max	976.788	2	.379	2	.33	1	0	3	.002	1	-.001	15
184			min	-1331.276	3	-.132	3	.018	15	0	1	0	15	-.006	4
185		17	max	977.309	2	.287	2	.33	1	0	3	.002	1	-.001	15
186			min	-1330.885	3	-.201	3	.018	15	0	1	0	15	-.006	4
187		18	max	977.829	2	.194	2	.33	1	0	3	.002	1	-.001	12
188			min	-1330.495	3	-.271	3	.018	15	0	1	0	15	-.006	4
189		19	max	978.35	2	.101	2	.33	1	0	3	.002	1	-.001	12
190			min	-1330.104	3	-.34	3	.018	15	0	1	0	15	-.006	4
191	M3	1	max	798.798	2	7.661	4	.3	1	0	5	0	1	.006	4
192			min	-925.452	3	1.801	15	.017	15	0	1	0	15	.001	12
193		2	max	798.627	2	6.9	4	.3	1	0	5	0	1	.004	2
194			min	-925.58	3	1.622	15	.017	15	0	1	0	15	0	3
195		3	max	798.457	2	6.139	4	.3	1	0	5	0	1	.001	2
196			min	-925.708	3	1.443	15	.017	15	0	1	0	15	-.001	3
197		4	max	798.287	2	5.378	4	.3	1	0	5	0	1	0	15

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
198			min	-925.836	3	1.265	15	.017	15	0	1	0	15	-.003	3
199		5	max	798.116	2	4.617	4	.3	1	0	5	0	1	0	15
200			min	-925.963	3	1.086	15	.017	15	0	1	0	15	-.004	4
201		6	max	797.946	2	3.856	4	.3	1	0	5	.001	1	-.001	15
202			min	-926.091	3	.907	15	.017	15	0	1	0	15	-.006	4
203		7	max	797.776	2	3.096	4	.3	1	0	5	.001	1	-.002	15
204			min	-926.219	3	.728	15	.017	15	0	1	0	15	-.007	4
205		8	max	797.605	2	2.335	4	.3	1	0	5	.001	1	-.002	15
206			min	-926.347	3	.549	15	.017	15	0	1	0	15	-.008	4
207		9	max	797.435	2	1.574	4	.3	1	0	5	.001	1	-.002	15
208			min	-926.474	3	.37	15	.017	15	0	1	0	15	-.009	4
209		10	max	797.264	2	.813	4	.3	1	0	5	.002	1	-.002	15
210			min	-926.602	3	.178	12	.017	15	0	1	0	15	-.01	4
211		11	max	797.094	2	.209	2	.3	1	0	5	.002	1	-.002	15
212			min	-926.73	3	-.201	3	.017	15	0	1	0	15	-.01	4
213		12	max	796.924	2	-.166	15	.3	1	0	5	.002	1	-.002	15
214			min	-926.858	3	-.709	4	.017	15	0	1	0	15	-.01	4
215		13	max	796.753	2	-.345	15	.3	1	0	5	.002	1	-.002	15
216			min	-926.985	3	-1.47	4	.017	15	0	1	0	15	-.009	4
217		14	max	796.583	2	-.524	15	.3	1	0	5	.002	1	-.002	15
218			min	-927.113	3	-2.231	4	.017	15	0	1	0	15	-.009	4
219		15	max	796.413	2	-.703	15	.3	1	0	5	.002	1	-.002	15
220			min	-927.241	3	-2.992	4	.017	15	0	1	0	15	-.008	4
221		16	max	796.242	2	-.882	15	.3	1	0	5	.002	1	-.001	15
222			min	-927.369	3	-3.753	4	.017	15	0	1	0	15	-.006	4
223		17	max	796.072	2	-1.061	15	.3	1	0	5	.002	1	-.001	15
224			min	-927.497	3	-4.514	4	.017	15	0	1	0	15	-.004	4
225		18	max	795.902	2	-1.24	15	.3	1	0	5	.003	1	0	15
226			min	-927.624	3	-5.275	4	.017	15	0	1	0	15	-.002	4
227		19	max	795.731	2	-1.419	15	.3	1	0	5	.003	1	0	1
228			min	-927.752	3	-6.036	4	.017	15	0	1	0	15	0	1
229	M4	1	max	884.225	1	0	1	-.613	15	0	1	.002	1	0	1
230			min	43.077	15	0	1	-10.989	1	0	1	0	15	0	1
231		2	max	884.396	1	0	1	-.613	15	0	1	.001	1	0	1
232			min	43.128	15	0	1	-10.989	1	0	1	0	15	0	1
233		3	max	884.566	1	0	1	-.613	15	0	1	0	3	0	1
234			min	43.179	15	0	1	-10.989	1	0	1	0	1	0	1
235		4	max	884.736	1	0	1	-.613	15	0	1	0	15	0	1
236			min	43.231	15	0	1	-10.989	1	0	1	-.001	1	0	1
237		5	max	884.907	1	0	1	-.613	15	0	1	0	15	0	1
238			min	43.282	15	0	1	-10.989	1	0	1	-.003	1	0	1
239		6	max	885.077	1	0	1	-.613	15	0	1	0	15	0	1
240			min	43.333	15	0	1	-10.989	1	0	1	-.004	1	0	1
241		7	max	885.247	1	0	1	-.613	15	0	1	0	15	0	1
242			min	43.385	15	0	1	-10.989	1	0	1	-.005	1	0	1
243		8	max	885.418	1	0	1	-.613	15	0	1	0	15	0	1
244			min	43.436	15	0	1	-10.989	1	0	1	-.006	1	0	1
245		9	max	885.588	1	0	1	-.613	15	0	1	0	15	0	1
246			min	43.488	15	0	1	-10.989	1	0	1	-.008	1	0	1
247		10	max	885.758	1	0	1	-.613	15	0	1	0	15	0	1
248			min	43.539	15	0	1	-10.989	1	0	1	-.009	1	0	1
249		11	max	885.929	1	0	1	-.613	15	0	1	0	15	0	1
250			min	43.59	15	0	1	-10.989	1	0	1	-.01	1	0	1
251		12	max	886.099	1	0	1	-.613	15	0	1	0	15	0	1
252			min	43.642	15	0	1	-10.989	1	0	1	-.011	1	0	1
253		13	max	886.27	1	0	1	-.613	15	0	1	0	15	0	1
254			min	43.693	15	0	1	-10.989	1	0	1	-.013	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	886.44	1	0	1	-.613	15	0	1	0	15	0	1
256			min	43.745	15	0	1	-10.989	1	0	1	-.014	1	0	1
257		15	max	886.61	1	0	1	-.613	15	0	1	0	15	0	1
258			min	43.796	15	0	1	-10.989	1	0	1	-.015	1	0	1
259		16	max	886.781	1	0	1	-.613	15	0	1	0	15	0	1
260			min	43.847	15	0	1	-10.989	1	0	1	-.016	1	0	1
261		17	max	886.951	1	0	1	-.613	15	0	1	0	15	0	1
262			min	43.899	15	0	1	-10.989	1	0	1	-.018	1	0	1
263		18	max	887.121	1	0	1	-.613	15	0	1	-.001	15	0	1
264			min	43.95	15	0	1	-10.989	1	0	1	-.019	1	0	1
265		19	max	887.292	1	0	1	-.613	15	0	1	-.001	15	0	1
266			min	44.002	15	0	1	-10.989	1	0	1	-.02	1	0	1
267	M6	1	max	3095.19	2	2.248	2	0	1	0	1	0	1	0	1
268			min	-4346.398	3	.27	12	0	1	0	1	0	1	0	1
269		2	max	3095.711	2	2.156	2	0	1	0	1	0	1	0	12
270			min	-4346.008	3	.224	12	0	1	0	1	0	1	0	2
271		3	max	3096.231	2	2.063	2	0	1	0	1	0	1	0	12
272			min	-4345.617	3	.177	12	0	1	0	1	0	1	-.002	2
273		4	max	3096.752	2	1.97	2	0	1	0	1	0	1	0	12
274			min	-4345.227	3	.11	3	0	1	0	1	0	1	-.002	2
275		5	max	3097.273	2	1.878	2	0	1	0	1	0	1	0	12
276			min	-4344.836	3	.04	3	0	1	0	1	0	1	-.003	2
277		6	max	3097.793	2	1.785	2	0	1	0	1	0	1	0	3
278			min	-4344.446	3	-.029	3	0	1	0	1	0	1	-.004	2
279		7	max	3098.314	2	1.693	2	0	1	0	1	0	1	0	3
280			min	-4344.055	3	-.099	3	0	1	0	1	0	1	-.004	2
281		8	max	3098.835	2	1.6	2	0	1	0	1	0	1	0	3
282			min	-4343.665	3	-.168	3	0	1	0	1	0	1	-.005	2
283		9	max	3099.356	2	1.507	2	0	1	0	1	0	1	0	3
284			min	-4343.274	3	-.238	3	0	1	0	1	0	1	-.005	2
285		10	max	3099.876	2	1.415	2	0	1	0	1	0	1	0	3
286			min	-4342.884	3	-.307	3	0	1	0	1	0	1	-.006	2
287		11	max	3100.397	2	1.322	2	0	1	0	1	0	1	0	3
288			min	-4342.493	3	-.377	3	0	1	0	1	0	1	-.006	2
289		12	max	3100.918	2	1.229	2	0	1	0	1	0	1	0	3
290			min	-4342.102	3	-.446	3	0	1	0	1	0	1	-.007	2
291		13	max	3101.438	2	1.137	2	0	1	0	1	0	1	0	3
292			min	-4341.712	3	-.516	3	0	1	0	1	0	1	-.007	2
293		14	max	3101.959	2	1.044	2	0	1	0	1	0	1	0	3
294			min	-4341.321	3	-.585	3	0	1	0	1	0	1	-.008	2
295		15	max	3102.48	2	.952	2	0	1	0	1	0	1	0	3
296			min	-4340.931	3	-.654	3	0	1	0	1	0	1	-.008	2
297		16	max	3103	2	.859	2	0	1	0	1	0	1	.001	3
298			min	-4340.54	3	-.724	3	0	1	0	1	0	1	-.008	2
299		17	max	3103.521	2	.766	2	0	1	0	1	0	1	.001	3
300			min	-4340.15	3	-.793	3	0	1	0	1	0	1	-.009	2
301		18	max	3104.042	2	.674	2	0	1	0	1	0	1	.002	3
302			min	-4339.759	3	-.863	3	0	1	0	1	0	1	-.009	2
303		19	max	3104.562	2	.581	2	0	1	0	1	0	1	.002	3
304			min	-4339.369	3	-.932	3	0	1	0	1	0	1	-.009	2
305	M7	1	max	2858.789	2	7.689	4	0	1	0	1	0	1	.009	2
306			min	-2906.469	3	1.806	15	0	1	0	1	0	1	-.002	3
307		2	max	2858.618	2	6.928	4	0	1	0	1	0	1	.006	2
308			min	-2906.597	3	1.627	15	0	1	0	1	0	1	-.003	3
309		3	max	2858.448	2	6.167	4	0	1	0	1	0	1	.004	2
310			min	-2906.725	3	1.448	15	0	1	0	1	0	1	-.005	3
311		4	max	2858.278	2	5.406	4	0	1	0	1	0	1	.002	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
312			min	-2906.852	3	1.269	15	0	1	0	1	0	1	-.006	3
313		5	max	2858.107	2	4.645	4	0	1	0	1	0	1	0	2
314			min	-2906.98	3	1.09	15	0	1	0	1	0	1	-.007	3
315		6	max	2857.937	2	3.884	4	0	1	0	1	0	1	-.001	15
316			min	-2907.108	3	.911	15	0	1	0	1	0	1	-.007	3
317		7	max	2857.767	2	3.123	4	0	1	0	1	0	1	-.002	15
318			min	-2907.236	3	.732	15	0	1	0	1	0	1	-.008	3
319		8	max	2857.596	2	2.399	2	0	1	0	1	0	1	-.002	15
320			min	-2907.363	3	.467	12	0	1	0	1	0	1	-.008	4
321		9	max	2857.426	2	1.806	2	0	1	0	1	0	1	-.002	15
322			min	-2907.491	3	.171	12	0	1	0	1	0	1	-.009	4
323		10	max	2857.256	2	1.213	2	0	1	0	1	0	1	-.002	15
324			min	-2907.619	3	-.263	3	0	1	0	1	0	1	-.01	4
325		11	max	2857.085	2	.62	2	0	1	0	1	0	1	-.002	15
326			min	-2907.747	3	-.708	3	0	1	0	1	0	1	-.01	4
327		12	max	2856.915	2	.027	2	0	1	0	1	0	1	-.002	15
328			min	-2907.874	3	-1.153	3	0	1	0	1	0	1	-.01	4
329		13	max	2856.745	2	-.341	15	0	1	0	1	0	1	-.002	15
330			min	-2908.002	3	-1.597	3	0	1	0	1	0	1	-.009	4
331		14	max	2856.574	2	-.52	15	0	1	0	1	0	1	-.002	15
332			min	-2908.13	3	-2.204	4	0	1	0	1	0	1	-.009	4
333		15	max	2856.404	2	-.699	15	0	1	0	1	0	1	-.002	15
334			min	-2908.258	3	-2.965	4	0	1	0	1	0	1	-.007	4
335		16	max	2856.234	2	-.878	15	0	1	0	1	0	1	-.001	15
336			min	-2908.385	3	-3.726	4	0	1	0	1	0	1	-.006	4
337		17	max	2856.063	2	-1.056	15	0	1	0	1	0	1	-.001	15
338			min	-2908.513	3	-4.487	4	0	1	0	1	0	1	-.004	4
339		18	max	2855.893	2	-1.235	15	0	1	0	1	0	1	0	15
340			min	-2908.641	3	-5.248	4	0	1	0	1	0	1	-.002	4
341		19	max	2855.723	2	-1.414	15	0	1	0	1	0	1	0	1
342			min	-2908.769	3	-6.009	4	0	1	0	1	0	1	0	1
343	M8	1	max	2190.775	1	0	1	0	1	0	1	0	1	0	1
344			min	90.006	15	0	1	0	1	0	1	0	1	0	1
345		2	max	2190.946	1	0	1	0	1	0	1	0	1	0	1
346			min	90.057	15	0	1	0	1	0	1	0	1	0	1
347		3	max	2191.116	1	0	1	0	1	0	1	0	1	0	1
348			min	90.108	15	0	1	0	1	0	1	0	1	0	1
349		4	max	2191.286	1	0	1	0	1	0	1	0	1	0	1
350			min	90.16	15	0	1	0	1	0	1	0	1	0	1
351		5	max	2191.457	1	0	1	0	1	0	1	0	1	0	1
352			min	90.211	15	0	1	0	1	0	1	0	1	0	1
353		6	max	2191.627	1	0	1	0	1	0	1	0	1	0	1
354			min	90.263	15	0	1	0	1	0	1	0	1	0	1
355		7	max	2191.797	1	0	1	0	1	0	1	0	1	0	1
356			min	90.314	15	0	1	0	1	0	1	0	1	0	1
357		8	max	2191.968	1	0	1	0	1	0	1	0	1	0	1
358			min	90.365	15	0	1	0	1	0	1	0	1	0	1
359		9	max	2192.138	1	0	1	0	1	0	1	0	1	0	1
360			min	90.417	15	0	1	0	1	0	1	0	1	0	1
361		10	max	2192.308	1	0	1	0	1	0	1	0	1	0	1
362			min	90.468	15	0	1	0	1	0	1	0	1	0	1
363		11	max	2192.479	1	0	1	0	1	0	1	0	1	0	1
364			min	90.52	15	0	1	0	1	0	1	0	1	0	1
365		12	max	2192.649	1	0	1	0	1	0	1	0	1	0	1
366			min	90.571	15	0	1	0	1	0	1	0	1	0	1
367		13	max	2192.819	1	0	1	0	1	0	1	0	1	0	1
368			min	90.622	15	0	1	0	1	0	1	0	1	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
369		14	max	2192.99	1	0	1	0	1	0	1	0	1	0	1
370			min	90.674	15	0	1	0	1	0	1	0	1	0	1
371		15	max	2193.16	1	0	1	0	1	0	1	0	1	0	1
372			min	90.725	15	0	1	0	1	0	1	0	1	0	1
373		16	max	2193.33	1	0	1	0	1	0	1	0	1	0	1
374			min	90.776	15	0	1	0	1	0	1	0	1	0	1
375		17	max	2193.501	1	0	1	0	1	0	1	0	1	0	1
376			min	90.828	15	0	1	0	1	0	1	0	1	0	1
377		18	max	2193.671	1	0	1	0	1	0	1	0	1	0	1
378			min	90.879	15	0	1	0	1	0	1	0	1	0	1
379		19	max	2193.841	1	0	1	0	1	0	1	0	1	0	1
380			min	90.931	15	0	1	0	1	0	1	0	1	0	1
381	M10	1	max	968.978	2	2.018	4	-.018	15	0	1	0	2	0	1
382			min	-1337.133	3	.475	15	-.33	1	0	3	0	3	0	1
383		2	max	969.498	2	1.899	4	-.018	15	0	1	0	15	0	15
384			min	-1336.743	3	.447	15	-.33	1	0	3	0	1	0	4
385		3	max	970.019	2	1.78	4	-.018	15	0	1	0	15	0	15
386			min	-1336.352	3	.419	15	-.33	1	0	3	0	1	-.001	4
387		4	max	970.54	2	1.661	4	-.018	15	0	1	0	15	0	15
388			min	-1335.962	3	.391	15	-.33	1	0	3	0	1	-.002	4
389		5	max	971.06	2	1.542	4	-.018	15	0	1	0	15	0	15
390			min	-1335.571	3	.363	15	-.33	1	0	3	0	1	-.003	4
391		6	max	971.581	2	1.423	4	-.018	15	0	1	0	15	0	15
392			min	-1335.181	3	.335	15	-.33	1	0	3	0	1	-.003	4
393		7	max	972.102	2	1.305	4	-.018	15	0	1	0	15	0	15
394			min	-1334.79	3	.307	15	-.33	1	0	3	0	1	-.004	4
395		8	max	972.622	2	1.186	4	-.018	15	0	1	0	15	0	15
396			min	-1334.4	3	.279	15	-.33	1	0	3	0	1	-.004	4
397		9	max	973.143	2	1.067	4	-.018	15	0	1	0	15	-.001	15
398			min	-1334.009	3	.251	15	-.33	1	0	3	0	1	-.004	4
399		10	max	973.664	2	.948	4	-.018	15	0	1	0	15	-.001	15
400			min	-1333.619	3	.208	12	-.33	1	0	3	-.001	1	-.005	4
401		11	max	974.185	2	.842	2	-.018	15	0	1	0	15	-.001	15
402			min	-1333.228	3	.162	12	-.33	1	0	3	-.001	1	-.005	4
403		12	max	974.705	2	.75	2	-.018	15	0	1	0	15	-.001	15
404			min	-1332.838	3	.115	12	-.33	1	0	3	-.001	1	-.005	4
405		13	max	975.226	2	.657	2	-.018	15	0	1	0	15	-.001	15
406			min	-1332.447	3	.069	12	-.33	1	0	3	-.001	1	-.006	4
407		14	max	975.747	2	.564	2	-.018	15	0	1	0	15	-.001	15
408			min	-1332.057	3	.007	3	-.33	1	0	3	-.002	1	-.006	4
409		15	max	976.267	2	.472	2	-.018	15	0	1	0	15	-.001	15
410			min	-1331.666	3	-.063	3	-.33	1	0	3	-.002	1	-.006	4
411		16	max	976.788	2	.379	2	-.018	15	0	1	0	15	-.001	15
412			min	-1331.276	3	-.132	3	-.33	1	0	3	-.002	1	-.006	4
413		17	max	977.309	2	.287	2	-.018	15	0	1	0	15	-.001	15
414			min	-1330.885	3	-.201	3	-.33	1	0	3	-.002	1	-.006	4
415		18	max	977.829	2	.194	2	-.018	15	0	1	0	15	-.001	12
416			min	-1330.495	3	-.271	3	-.33	1	0	3	-.002	1	-.006	4
417		19	max	978.35	2	.101	2	-.018	15	0	1	0	15	-.001	12
418			min	-1330.104	3	-.34	3	-.33	1	0	3	-.002	1	-.006	4
419	M11	1	max	798.798	2	7.661	4	-.017	15	0	1	0	15	.006	4
420			min	-925.452	3	1.801	15	-.3	1	0	5	0	1	.001	12
421		2	max	798.627	2	6.9	4	-.017	15	0	1	0	15	.004	2
422			min	-925.58	3	1.622	15	-.3	1	0	5	0	1	0	3
423		3	max	798.457	2	6.139	4	-.017	15	0	1	0	15	.001	2
424			min	-925.708	3	1.443	15	-.3	1	0	5	0	1	-.001	3
425		4	max	798.287	2	5.378	4	-.017	15	0	1	0	15	0	15

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
426			min	-925.836	3	1.265	15	-.3	1	0	5	0	1	-.003	3
427		5	max	798.116	2	4.617	4	-.017	15	0	1	0	15	0	15
428			min	-925.963	3	1.086	15	-.3	1	0	5	0	1	-.004	4
429		6	max	797.946	2	3.856	4	-.017	15	0	1	0	15	-.001	15
430			min	-926.091	3	.907	15	-.3	1	0	5	-.001	1	-.006	4
431		7	max	797.776	2	3.096	4	-.017	15	0	1	0	15	-.002	15
432			min	-926.219	3	.728	15	-.3	1	0	5	-.001	1	-.007	4
433		8	max	797.605	2	2.335	4	-.017	15	0	1	0	15	-.002	15
434			min	-926.347	3	.549	15	-.3	1	0	5	-.001	1	-.008	4
435		9	max	797.435	2	1.574	4	-.017	15	0	1	0	15	-.002	15
436			min	-926.474	3	.37	15	-.3	1	0	5	-.001	1	-.009	4
437		10	max	797.264	2	.813	4	-.017	15	0	1	0	15	-.002	15
438			min	-926.602	3	.178	12	-.3	1	0	5	-.002	1	-.01	4
439		11	max	797.094	2	.209	2	-.017	15	0	1	0	15	-.002	15
440			min	-926.73	3	-.201	3	-.3	1	0	5	-.002	1	-.01	4
441		12	max	796.924	2	-.166	15	-.017	15	0	1	0	15	-.002	15
442			min	-926.858	3	-.709	4	-.3	1	0	5	-.002	1	-.01	4
443		13	max	796.753	2	-.345	15	-.017	15	0	1	0	15	-.002	15
444			min	-926.985	3	-1.47	4	-.3	1	0	5	-.002	1	-.009	4
445		14	max	796.583	2	-.524	15	-.017	15	0	1	0	15	-.002	15
446			min	-927.113	3	-2.231	4	-.3	1	0	5	-.002	1	-.009	4
447		15	max	796.413	2	-.703	15	-.017	15	0	1	0	15	-.002	15
448			min	-927.241	3	-2.992	4	-.3	1	0	5	-.002	1	-.008	4
449		16	max	796.242	2	-.882	15	-.017	15	0	1	0	15	-.001	15
450			min	-927.369	3	-3.753	4	-.3	1	0	5	-.002	1	-.006	4
451		17	max	796.072	2	-1.061	15	-.017	15	0	1	0	15	-.001	15
452			min	-927.497	3	-4.514	4	-.3	1	0	5	-.002	1	-.004	4
453		18	max	795.902	2	-1.24	15	-.017	15	0	1	0	15	0	15
454			min	-927.624	3	-5.275	4	-.3	1	0	5	-.003	1	-.002	4
455		19	max	795.731	2	-1.419	15	-.017	15	0	1	0	15	0	1
456			min	-927.752	3	-6.036	4	-.3	1	0	5	-.003	1	0	1
457	M12	1	max	884.225	1	0	1	10.989	1	0	1	0	15	0	1
458			min	43.077	15	0	1	.613	15	0	1	-.002	1	0	1
459		2	max	884.396	1	0	1	10.989	1	0	1	0	15	0	1
460			min	43.128	15	0	1	.613	15	0	1	-.001	1	0	1
461		3	max	884.566	1	0	1	10.989	1	0	1	0	1	0	1
462			min	43.179	15	0	1	.613	15	0	1	0	3	0	1
463		4	max	884.736	1	0	1	10.989	1	0	1	.001	1	0	1
464			min	43.231	15	0	1	.613	15	0	1	0	15	0	1
465		5	max	884.907	1	0	1	10.989	1	0	1	.003	1	0	1
466			min	43.282	15	0	1	.613	15	0	1	0	15	0	1
467		6	max	885.077	1	0	1	10.989	1	0	1	.004	1	0	1
468			min	43.333	15	0	1	.613	15	0	1	0	15	0	1
469		7	max	885.247	1	0	1	10.989	1	0	1	.005	1	0	1
470			min	43.385	15	0	1	.613	15	0	1	0	15	0	1
471		8	max	885.418	1	0	1	10.989	1	0	1	.006	1	0	1
472			min	43.436	15	0	1	.613	15	0	1	0	15	0	1
473		9	max	885.588	1	0	1	10.989	1	0	1	.008	1	0	1
474			min	43.488	15	0	1	.613	15	0	1	0	15	0	1
475		10	max	885.758	1	0	1	10.989	1	0	1	.009	1	0	1
476			min	43.539	15	0	1	.613	15	0	1	0	15	0	1
477		11	max	885.929	1	0	1	10.989	1	0	1	.01	1	0	1
478			min	43.59	15	0	1	.613	15	0	1	0	15	0	1
479		12	max	886.099	1	0	1	10.989	1	0	1	.011	1	0	1
480			min	43.642	15	0	1	.613	15	0	1	0	15	0	1
481		13	max	886.27	1	0	1	10.989	1	0	1	.013	1	0	1
482			min	43.693	15	0	1	.613	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	886.44	1	0	1	10.989	1	0	1	.014	1	0	1
484			min	43.745	15	0	1	.613	15	0	1	0	15	0	1
485		15	max	886.61	1	0	1	10.989	1	0	1	.015	1	0	1
486			min	43.796	15	0	1	.613	15	0	1	0	15	0	1
487		16	max	886.781	1	0	1	10.989	1	0	1	.016	1	0	1
488			min	43.847	15	0	1	.613	15	0	1	0	15	0	1
489		17	max	886.951	1	0	1	10.989	1	0	1	.018	1	0	1
490			min	43.899	15	0	1	.613	15	0	1	0	15	0	1
491		18	max	887.121	1	0	1	10.989	1	0	1	.019	1	0	1
492			min	43.95	15	0	1	.613	15	0	1	.001	15	0	1
493		19	max	887.292	1	0	1	10.989	1	0	1	.02	1	0	1
494			min	44.002	15	0	1	.613	15	0	1	.001	15	0	1
495	M1	1	max	168.545	1	696.309	3	-5.447	15	0	2	.233	1	.001	3
496			min	9.357	15	-392.868	2	-97.213	1	0	3	.013	15	-.013	2
497		2	max	169.366	1	695.429	3	-5.447	15	0	2	.181	1	.194	2
498			min	9.605	15	-394.041	2	-97.213	1	0	3	.01	15	-.366	3
499		3	max	580.731	3	480.484	2	-5.429	15	0	3	.13	1	.392	2
500			min	-332.1	2	-521.599	3	-97.039	1	0	2	.007	15	-.718	3
501		4	max	581.347	3	479.311	2	-5.429	15	0	3	.079	1	.139	2
502			min	-331.278	2	-522.479	3	-97.039	1	0	2	.004	15	-.442	3
503		5	max	581.963	3	478.137	2	-5.429	15	0	3	.028	1	-.003	15
504			min	-330.457	2	-523.359	3	-97.039	1	0	2	.002	15	-.166	3
505		6	max	582.579	3	476.964	2	-5.429	15	0	3	-.001	15	.11	3
506			min	-329.635	2	-524.239	3	-97.039	1	0	2	-.024	1	-.366	2
507		7	max	583.195	3	475.79	2	-5.429	15	0	3	-.004	15	.387	3
508			min	-328.814	2	-525.119	3	-97.039	1	0	2	-.075	1	-.617	2
509		8	max	583.812	3	474.617	2	-5.429	15	0	3	-.007	15	.664	3
510			min	-327.992	2	-525.999	3	-97.039	1	0	2	-.126	1	-.868	2
511		9	max	600.499	3	52.739	2	-8.034	15	0	9	.075	1	.773	3
512			min	-251.85	2	.359	15	-143.64	1	0	3	.004	15	-.995	2
513		10	max	601.116	3	51.565	2	-8.034	15	0	9	0	15	.755	3
514			min	-251.028	2	.005	15	-143.64	1	0	3	0	1	-1.023	2
515		11	max	601.732	3	50.392	2	-8.034	15	0	9	-.004	15	.738	3
516			min	-250.207	2	-1.431	4	-143.64	1	0	3	-.077	1	-1.05	2
517		12	max	618.289	3	356.83	3	-5.302	15	0	2	.125	1	.644	3
518			min	-174.02	2	-584.101	2	-94.976	1	0	3	.007	15	-.932	2
519		13	max	618.906	3	355.95	3	-5.302	15	0	2	.074	1	.456	3
520			min	-173.198	2	-585.274	2	-94.976	1	0	3	.004	15	-.623	2
521		14	max	619.522	3	355.07	3	-5.302	15	0	2	.024	1	.268	3
522			min	-172.377	2	-586.447	2	-94.976	1	0	3	.001	15	-.314	2
523		15	max	620.138	3	354.19	3	-5.302	15	0	2	-.001	15	.081	3
524			min	-171.555	2	-587.621	2	-94.976	1	0	3	-.026	1	-.023	1
525		16	max	620.754	3	353.31	3	-5.302	15	0	2	-.004	15	.306	2
526			min	-170.733	2	-588.794	2	-94.976	1	0	3	-.076	1	-.105	3
527		17	max	621.37	3	352.43	3	-5.302	15	0	2	-.007	15	.617	2
528			min	-169.912	2	-589.967	2	-94.976	1	0	3	-.126	1	-.292	3
529		18	max	-9.614	15	607.317	2	-5.897	15	0	3	-.01	15	.311	2
530			min	-169.642	1	-294.692	3	-105.458	1	0	2	-.178	1	-.144	3
531		19	max	-9.366	15	606.144	2	-5.897	15	0	3	-.013	15	.012	3
532			min	-168.82	1	-295.572	3	-105.458	1	0	2	-.234	1	-.009	2
533	M5	1	max	366.876	1	2319.798	3	0	1	0	1	0	1	.027	2
534			min	18.293	12	-1337.496	2	0	1	0	1	0	1	-.003	3
535		2	max	367.698	1	2318.918	3	0	1	0	1	0	1	.733	2
536			min	18.704	12	-1338.67	2	0	1	0	1	0	1	-1.227	3
537		3	max	1857.103	3	1435.599	2	0	1	0	1	0	1	1.406	2
538			min	-1138.628	2	-1658.951	3	0	1	0	1	0	1	-2.402	3
539		4	max	1857.72	3	1434.426	2	0	1	0	1	0	1	.649	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
540			min	-1137.806	2	-1659.831	3	0	1	0	1	0	1	-1.527	3
541		5	max	1858.336	3	1433.253	2	0	1	0	1	0	1	.006	9
542			min	-1136.985	2	-1660.711	3	0	1	0	1	0	1	-.651	3
543		6	max	1858.952	3	1432.079	2	0	1	0	1	0	1	.226	3
544			min	-1136.163	2	-1661.591	3	0	1	0	1	0	1	-.864	2
545		7	max	1859.568	3	1430.906	2	0	1	0	1	0	1	1.103	3
546			min	-1135.342	2	-1662.471	3	0	1	0	1	0	1	-1.619	2
547		8	max	1860.184	3	1429.732	2	0	1	0	1	0	1	1.98	3
548			min	-1134.52	2	-1663.351	3	0	1	0	1	0	1	-2.374	2
549		9	max	1887.057	3	176.9	2	0	1	0	1	0	1	2.273	3
550			min	-975.61	2	.354	15	0	1	0	1	0	1	-2.71	2
551		10	max	1887.673	3	175.727	2	0	1	0	1	0	1	2.208	3
552			min	-974.788	2	0	15	0	1	0	1	0	1	-2.803	2
553		11	max	1888.289	3	174.554	2	0	1	0	1	0	1	2.144	3
554			min	-973.966	2	-1.325	4	0	1	0	1	0	1	-2.895	2
555		12	max	1915.422	3	1121.251	3	0	1	0	1	0	1	1.886	3
556			min	-815.145	2	-1788.803	2	0	1	0	1	0	1	-2.596	2
557		13	max	1916.038	3	1120.371	3	0	1	0	1	0	1	1.295	3
558			min	-814.323	2	-1789.976	2	0	1	0	1	0	1	-1.652	2
559		14	max	1916.654	3	1119.491	3	0	1	0	1	0	1	.704	3
560			min	-813.502	2	-1791.149	2	0	1	0	1	0	1	-.707	2
561		15	max	1917.27	3	1118.611	3	0	1	0	1	0	1	.238	2
562			min	-812.68	2	-1792.323	2	0	1	0	1	0	1	-.003	13
563		16	max	1917.887	3	1117.731	3	0	1	0	1	0	1	1.184	2
564			min	-811.859	2	-1793.496	2	0	1	0	1	0	1	-.476	3
565		17	max	1918.503	3	1116.851	3	0	1	0	1	0	1	2.131	2
566			min	-811.037	2	-1794.67	2	0	1	0	1	0	1	-1.066	3
567		18	max	-19.229	12	2045.567	2	0	1	0	1	0	1	1.098	2
568			min	-367.147	1	-1012.41	3	0	1	0	1	0	1	-.558	3
569		19	max	-18.818	12	2044.394	2	0	1	0	1	0	1	.018	2
570			min	-366.325	1	-1013.29	3	0	1	0	1	0	1	-.023	3
571	M9	1	max	168.545	1	696.309	3	97.213	1	0	3	-.013	15	.001	3
572			min	9.357	15	-392.868	2	5.447	15	0	2	-.233	1	-.013	2
573		2	max	169.366	1	695.429	3	97.213	1	0	3	-.01	15	.194	2
574			min	9.605	15	-394.041	2	5.447	15	0	2	-.181	1	-.366	3
575		3	max	580.731	3	480.484	2	97.039	1	0	2	-.007	15	.392	2
576			min	-332.1	2	-521.599	3	5.429	15	0	3	-.13	1	-.718	3
577		4	max	581.347	3	479.311	2	97.039	1	0	2	-.004	15	.139	2
578			min	-331.278	2	-522.479	3	5.429	15	0	3	-.079	1	-.442	3
579		5	max	581.963	3	478.137	2	97.039	1	0	2	-.002	15	-.003	15
580			min	-330.457	2	-523.359	3	5.429	15	0	3	-.028	1	-.166	3
581		6	max	582.579	3	476.964	2	97.039	1	0	2	.024	1	.11	3
582			min	-329.635	2	-524.239	3	5.429	15	0	3	.001	15	-.366	2
583		7	max	583.195	3	475.79	2	97.039	1	0	2	.075	1	.387	3
584			min	-328.814	2	-525.119	3	5.429	15	0	3	.004	15	-.617	2
585		8	max	583.812	3	474.617	2	97.039	1	0	2	.126	1	.664	3
586			min	-327.992	2	-525.999	3	5.429	15	0	3	.007	15	-.868	2
587		9	max	600.499	3	52.739	2	143.64	1	0	3	-.004	15	.773	3
588			min	-251.85	2	.359	15	8.034	15	0	9	-.075	1	-.995	2
589		10	max	601.116	3	51.565	2	143.64	1	0	3	0	1	.755	3
590			min	-251.028	2	.005	15	8.034	15	0	9	0	15	-1.023	2
591		11	max	601.732	3	50.392	2	143.64	1	0	3	.077	1	.738	3
592			min	-250.207	2	-1.431	4	8.034	15	0	9	.004	15	-1.05	2
593		12	max	618.289	3	356.83	3	94.976	1	0	3	-.007	15	.644	3
594			min	-174.02	2	-584.101	2	5.302	15	0	2	-.125	1	-.932	2
595		13	max	618.906	3	355.95	3	94.976	1	0	3	-.004	15	.456	3
596			min	-173.198	2	-585.274	2	5.302	15	0	2	-.074	1	-.623	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	619.522	3	355.07	3	94.976	1	0	3	-.001	15	.268	3
598			min	-172.377	2	-586.447	2	5.302	15	0	2	-.024	1	-.314	2
599		15	max	620.138	3	354.19	3	94.976	1	0	3	.026	1	.081	3
600			min	-171.555	2	-587.621	2	5.302	15	0	2	.001	15	-.023	1
601		16	max	620.754	3	353.31	3	94.976	1	0	3	.076	1	.306	2
602			min	-170.733	2	-588.794	2	5.302	15	0	2	.004	15	-.105	3
603		17	max	621.37	3	352.43	3	94.976	1	0	3	.126	1	.617	2
604			min	-169.912	2	-589.967	2	5.302	15	0	2	.007	15	-.292	3
605		18	max	-9.614	15	607.317	2	105.458	1	0	2	.178	1	.311	2
606			min	-169.642	1	-294.692	3	5.897	15	0	3	.01	15	-.144	3
607		19	max	-9.366	15	606.144	2	105.458	1	0	2	.234	1	.012	3
608			min	-168.82	1	-295.572	3	5.897	15	0	3	.013	15	-.009	2

Envelope Member Section Deflections

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
1	M13	1	max	0	1	.103	2	.01	3	8.738e-3	2	NC	1	NC	1
2			min	0	15	-.02	3	-.006	2	-2.205e-3	3	NC	1	NC	1
3		2	max	0	1	.262	3	.033	1	9.986e-3	2	NC	5	NC	2
4			min	0	15	-.042	1	0	10	-2.341e-3	3	806.878	3	6945.989	1
5		3	max	0	1	.491	3	.08	1	1.123e-2	2	NC	5	NC	3
6			min	0	15	-.148	2	.005	15	-2.476e-3	3	445.851	3	2863.19	1
7		4	max	0	1	.63	3	.12	1	1.248e-2	2	NC	5	NC	3
8			min	0	15	-.208	2	.007	15	-2.612e-3	3	350.598	3	1902.921	1
9		5	max	0	1	.662	3	.14	1	1.373e-2	2	NC	5	NC	3
10			min	0	15	-.208	2	.008	15	-2.748e-3	3	334.059	3	1627.324	1
11		6	max	0	1	.59	3	.135	1	1.498e-2	2	NC	5	NC	5
12			min	0	15	-.151	2	.008	15	-2.884e-3	3	373.554	3	1694.29	1
13		7	max	0	1	.435	3	.105	1	1.623e-2	2	NC	5	NC	5
14			min	0	15	-.059	1	.006	10	-3.019e-3	3	500.579	3	2179.722	1
15		8	max	0	1	.238	3	.059	1	1.747e-2	2	NC	4	NC	2
16			min	0	15	.001	15	-.002	10	-3.155e-3	3	881.138	3	3868.887	1
17		9	max	0	1	.183	2	.032	3	1.872e-2	2	NC	4	NC	1
18			min	0	15	.004	15	-.012	2	-3.291e-3	3	2837.996	3	NC	1
19		10	max	0	1	.231	2	.031	3	1.997e-2	2	NC	3	NC	1
20			min	0	1	-.021	3	-.022	2	-3.426e-3	3	1773.83	2	NC	1
21		11	max	0	15	.183	2	.032	3	1.872e-2	2	NC	4	NC	1
22			min	0	1	.004	15	-.012	2	-3.291e-3	3	2837.996	3	NC	1
23		12	max	0	15	.238	3	.059	1	1.747e-2	2	NC	4	NC	2
24			min	0	1	.001	15	-.002	10	-3.155e-3	3	881.138	3	3868.887	1
25		13	max	0	15	.435	3	.105	1	1.623e-2	2	NC	5	NC	5
26			min	0	1	-.059	1	.006	10	-3.019e-3	3	500.579	3	2179.722	1
27		14	max	0	15	.59	3	.135	1	1.498e-2	2	NC	5	NC	5
28			min	0	1	-.151	2	.008	15	-2.884e-3	3	373.554	3	1694.29	1
29		15	max	0	15	.662	3	.14	1	1.373e-2	2	NC	5	NC	3
30			min	0	1	-.208	2	.008	15	-2.748e-3	3	334.059	3	1627.324	1
31		16	max	0	15	.63	3	.12	1	1.248e-2	2	NC	5	NC	3
32			min	0	1	-.208	2	.007	15	-2.612e-3	3	350.598	3	1902.921	1
33		17	max	0	15	.491	3	.08	1	1.123e-2	2	NC	5	NC	3
34			min	0	1	-.148	2	.005	15	-2.476e-3	3	445.851	3	2863.19	1
35		18	max	0	15	.262	3	.033	1	9.986e-3	2	NC	5	NC	2
36			min	0	1	-.042	1	0	10	-2.341e-3	3	806.878	3	6945.989	1
37		19	max	0	15	.103	2	.01	3	8.738e-3	2	NC	1	NC	1
38			min	0	1	-.02	3	-.006	2	-2.205e-3	3	NC	1	NC	1
39	M14	1	max	0	1	.237	3	.009	3	5.032e-3	2	NC	1	NC	1
40			min	0	15	-.337	2	-.005	2	-4.044e-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	.529	3	.022	1	6.003e-3	2	NC	5	NC	1
42			min	0	15	-.592	2	0	10	-4.905e-3	3	780.561	3	NC	1
43		3	max	0	1	.778	3	.064	1	6.973e-3	2	NC	5	NC	3
44			min	0	15	-.814	2	.004	15	-5.766e-3	3	421.579	3	3604.694	1
45		4	max	0	1	.954	3	.102	1	7.944e-3	2	NC	15	NC	3
46			min	0	15	-.98	2	.006	15	-6.627e-3	3	318.24	3	2238.243	1
47		5	max	0	1	1.041	3	.124	1	8.914e-3	2	NC	15	NC	3
48			min	0	15	-1.078	2	.007	15	-7.489e-3	3	283.55	3	1844.1	1
49		6	max	0	1	1.041	3	.122	1	9.885e-3	2	NC	15	NC	3
50			min	0	15	-1.107	2	.007	15	-8.35e-3	3	283.656	3	1874.885	1
51		7	max	0	1	.968	3	.096	1	1.086e-2	2	NC	15	NC	3
52			min	0	15	-1.077	2	.006	10	-9.211e-3	3	307.815	2	2371.289	1
53		8	max	0	1	.851	3	.055	1	1.183e-2	2	NC	15	NC	2
54			min	0	15	-1.009	2	-.002	10	-1.007e-2	3	338.895	2	4147.357	1
55		9	max	0	1	.736	3	.028	3	1.28e-2	2	NC	5	NC	1
56			min	0	15	-.936	2	-.01	2	-1.093e-2	3	380.554	2	NC	1
57		10	max	0	1	.681	3	.027	3	1.377e-2	2	NC	5	NC	1
58			min	0	1	-.9	2	-.02	2	-1.179e-2	3	405.01	2	NC	1
59		11	max	0	15	.736	3	.028	3	1.28e-2	2	NC	5	NC	1
60			min	0	1	-.936	2	-.01	2	-1.093e-2	3	380.554	2	NC	1
61		12	max	0	15	.851	3	.055	1	1.183e-2	2	NC	15	NC	2
62			min	0	1	-1.009	2	-.002	10	-1.007e-2	3	338.895	2	4147.357	1
63		13	max	0	15	.968	3	.096	1	1.086e-2	2	NC	15	NC	3
64			min	0	1	-1.077	2	.006	10	-9.211e-3	3	307.815	2	2371.289	1
65		14	max	0	15	1.041	3	.122	1	9.885e-3	2	NC	15	NC	3
66			min	0	1	-1.107	2	.007	15	-8.35e-3	3	283.656	3	1874.885	1
67		15	max	0	15	1.041	3	.124	1	8.914e-3	2	NC	15	NC	3
68			min	0	1	-1.078	2	.007	15	-7.489e-3	3	283.55	3	1844.1	1
69		16	max	0	15	.954	3	.102	1	7.944e-3	2	NC	15	NC	3
70			min	0	1	-.98	2	.006	15	-6.627e-3	3	318.24	3	2238.243	1
71		17	max	0	15	.778	3	.064	1	6.973e-3	2	NC	5	NC	3
72			min	0	1	-.814	2	.004	15	-5.766e-3	3	421.579	3	3604.694	1
73		18	max	0	15	.529	3	.022	1	6.003e-3	2	NC	5	NC	1
74			min	0	1	-.592	2	0	10	-4.905e-3	3	780.561	3	NC	1
75		19	max	0	15	.237	3	.009	3	5.032e-3	2	NC	1	NC	1
76			min	0	1	-.337	2	-.005	2	-4.044e-3	3	NC	1	NC	1
77	M15	1	max	0	15	.241	3	.008	3	3.586e-3	3	NC	1	NC	1
78			min	0	1	-.336	2	-.005	2	-5.295e-3	2	NC	1	NC	1
79		2	max	0	15	.438	3	.022	1	4.356e-3	3	NC	5	NC	1
80			min	0	1	-.676	2	0	10	-6.323e-3	2	668.953	2	NC	1
81		3	max	0	15	.609	3	.064	1	5.125e-3	3	NC	5	NC	3
82			min	0	1	-.968	2	.004	15	-7.35e-3	2	360.617	2	3593.212	1
83		4	max	0	15	.738	3	.102	1	5.895e-3	3	NC	15	NC	3
84			min	0	1	-1.176	2	.006	15	-8.377e-3	2	271.33	2	2232.296	1
85		5	max	0	15	.816	3	.124	1	6.665e-3	3	NC	15	NC	3
86			min	0	1	-1.283	2	.007	15	-9.405e-3	2	240.53	2	1839.297	1
87		6	max	0	15	.841	3	.122	1	7.435e-3	3	NC	15	NC	3
88			min	0	1	-1.29	2	.007	15	-1.043e-2	2	238.784	2	1869.364	1
89		7	max	0	15	.821	3	.097	1	8.205e-3	3	NC	15	NC	3
90			min	0	1	-1.213	2	.006	15	-1.146e-2	2	259.757	2	2361.884	1
91		8	max	0	15	.771	3	.056	1	8.975e-3	3	NC	15	NC	2
92			min	0	1	-1.086	2	-.001	10	-1.249e-2	2	303.948	2	4117.653	1
93		9	max	0	15	.717	3	.026	3	9.744e-3	3	NC	5	NC	1
94			min	0	1	-.958	2	-.009	2	-1.351e-2	2	366.341	2	NC	1
95		10	max	0	1	.69	3	.025	3	1.051e-2	3	NC	5	NC	1
96			min	0	1	-.897	2	-.019	2	-1.454e-2	2	405.9	2	NC	1
97		11	max	0	1	.717	3	.026	3	9.744e-3	3	NC	5	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
98			min	0	15	-.958	2	-.009	2	-1.351e-2	2	366.341	2	NC	1
99		12	max	0	1	.771	3	.056	1	8.975e-3	3	NC	15	NC	2
100			min	0	15	-1.086	2	-.001	10	-1.249e-2	2	303.948	2	4117.653	1
101		13	max	0	1	.821	3	.097	1	8.205e-3	3	NC	15	NC	3
102			min	0	15	-1.213	2	.006	15	-1.146e-2	2	259.757	2	2361.884	1
103		14	max	0	1	.841	3	.122	1	7.435e-3	3	NC	15	NC	3
104			min	0	15	-1.29	2	.007	15	-1.043e-2	2	238.784	2	1869.364	1
105		15	max	0	1	.816	3	.124	1	6.665e-3	3	NC	15	NC	3
106			min	0	15	-1.283	2	.007	15	-9.405e-3	2	240.53	2	1839.297	1
107		16	max	0	1	.738	3	.102	1	5.895e-3	3	NC	15	NC	3
108			min	0	15	-1.176	2	.006	15	-8.377e-3	2	271.33	2	2232.296	1
109		17	max	0	1	.609	3	.064	1	5.125e-3	3	NC	5	NC	3
110			min	0	15	-.968	2	.004	15	-7.35e-3	2	360.617	2	3593.212	1
111		18	max	0	1	.438	3	.022	1	4.356e-3	3	NC	5	NC	1
112			min	0	15	-.676	2	0	10	-6.323e-3	2	668.953	2	NC	1
113		19	max	0	1	.241	3	.008	3	3.586e-3	3	NC	1	NC	1
114			min	0	15	-.336	2	-.005	2	-5.295e-3	2	NC	1	NC	1
115	M16	1	max	0	15	.09	2	.007	3	6.298e-3	3	NC	1	NC	1
116			min	0	1	-.077	3	-.004	2	-7.082e-3	2	NC	1	NC	1
117		2	max	0	15	.025	3	.033	1	7.373e-3	3	NC	5	NC	2
118			min	0	1	-.14	2	.002	10	-7.941e-3	2	988.41	2	6989.594	1
119		3	max	0	15	.104	3	.08	1	8.449e-3	3	NC	5	NC	3
120			min	0	1	-.324	2	.005	15	-8.8e-3	2	549.842	2	2869.787	1
121		4	max	0	15	.146	3	.12	1	9.524e-3	3	NC	5	NC	3
122			min	0	1	-.431	2	.007	15	-9.658e-3	2	437.83	2	1902.744	1
123		5	max	0	15	.142	3	.141	1	1.06e-2	3	NC	5	NC	3
124			min	0	1	-.444	2	.008	15	-1.052e-2	2	426.51	2	1623.572	1
125		6	max	0	15	.096	3	.135	1	1.167e-2	3	NC	5	NC	3
126			min	0	1	-.368	2	.008	15	-1.138e-2	2	497.124	2	1685.511	1
127		7	max	0	15	.017	3	.106	1	1.275e-2	3	NC	5	NC	3
128			min	0	1	-.222	2	.006	15	-1.223e-2	2	730.015	2	2157.274	1
129		8	max	0	15	.013	9	.06	1	1.382e-2	3	NC	3	NC	2
130			min	0	1	-.078	3	0	10	-1.309e-2	2	1729.045	2	3777.084	1
131		9	max	0	15	.12	2	.023	3	1.49e-2	3	NC	4	NC	1
132			min	0	1	-.161	3	-.007	2	-1.395e-2	2	2716.942	3	NC	1
133		10	max	0	1	.192	2	.022	3	1.598e-2	3	NC	4	NC	1
134			min	0	1	-.198	3	-.017	2	-1.481e-2	2	1884.946	3	NC	1
135		11	max	0	1	.12	2	.023	3	1.49e-2	3	NC	4	NC	1
136			min	0	15	-.161	3	-.007	2	-1.395e-2	2	2716.942	3	NC	1
137		12	max	0	1	.013	9	.06	1	1.382e-2	3	NC	3	NC	2
138			min	0	15	-.078	3	0	10	-1.309e-2	2	1729.045	2	3777.084	1
139		13	max	0	1	.017	3	.106	1	1.275e-2	3	NC	5	NC	3
140			min	0	15	-.222	2	.006	15	-1.223e-2	2	730.015	2	2157.274	1
141		14	max	0	1	.096	3	.135	1	1.167e-2	3	NC	5	NC	3
142			min	0	15	-.368	2	.008	15	-1.138e-2	2	497.124	2	1685.511	1
143		15	max	0	1	.142	3	.141	1	1.06e-2	3	NC	5	NC	3
144			min	0	15	-.444	2	.008	15	-1.052e-2	2	426.51	2	1623.572	1
145		16	max	0	1	.146	3	.12	1	9.524e-3	3	NC	5	NC	3
146			min	0	15	-.431	2	.007	15	-9.658e-3	2	437.83	2	1902.744	1
147		17	max	0	1	.104	3	.08	1	8.449e-3	3	NC	5	NC	3
148			min	0	15	-.324	2	.005	15	-8.8e-3	2	549.842	2	2869.787	1
149		18	max	0	1	.025	3	.033	1	7.373e-3	3	NC	5	NC	2
150			min	0	15	-.14	2	.002	10	-7.941e-3	2	988.41	2	6989.594	1
151		19	max	0	1	.09	2	.007	3	6.298e-3	3	NC	1	NC	1
152			min	0	15	-.077	3	-.004	2	-7.082e-3	2	NC	1	NC	1
153	M2	1	max	.007	2	.01	2	.008	1	-1.214e-5	15	NC	1	NC	1
154			min	-.01	3	-.015	3	0	15	-2.168e-4	1	8020.918	2	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
155		2	max	.007	2	.008	2	.007	1	-1.15e-5	15	NC	1	NC	1
156			min	-.009	3	-.015	3	0	15	-2.053e-4	1	9361.221	2	NC	1
157		3	max	.006	2	.007	2	.006	1	-1.085e-5	15	NC	1	NC	1
158			min	-.009	3	-.014	3	0	15	-1.938e-4	1	NC	1	NC	1
159		4	max	.006	2	.006	2	.006	1	-1.021e-5	15	NC	1	NC	1
160			min	-.008	3	-.014	3	0	15	-1.823e-4	1	NC	1	NC	1
161		5	max	.006	2	.004	2	.005	1	-9.566e-6	15	NC	1	NC	1
162			min	-.008	3	-.013	3	0	15	-1.708e-4	1	NC	1	NC	1
163		6	max	.005	2	.003	2	.005	1	-8.922e-6	15	NC	1	NC	1
164			min	-.007	3	-.013	3	0	15	-1.593e-4	1	NC	1	NC	1
165		7	max	.005	2	.002	2	.004	1	-8.278e-6	15	NC	1	NC	1
166			min	-.007	3	-.012	3	0	15	-1.478e-4	1	NC	1	NC	1
167		8	max	.004	2	.001	2	.003	1	-7.635e-6	15	NC	1	NC	1
168			min	-.006	3	-.012	3	0	15	-1.363e-4	1	NC	1	NC	1
169		9	max	.004	2	0	2	.003	1	-6.991e-6	15	NC	1	NC	1
170			min	-.005	3	-.011	3	0	15	-1.248e-4	1	NC	1	NC	1
171		10	max	.004	2	0	2	.002	1	-6.347e-6	15	NC	1	NC	1
172			min	-.005	3	-.01	3	0	15	-1.133e-4	1	NC	1	NC	1
173		11	max	.003	2	-.001	2	.002	1	-5.704e-6	15	NC	1	NC	1
174			min	-.004	3	-.009	3	0	15	-1.018e-4	1	NC	1	NC	1
175		12	max	.003	2	-.001	15	.002	1	-5.06e-6	15	NC	1	NC	1
176			min	-.004	3	-.008	3	0	15	-9.032e-5	1	NC	1	NC	1
177		13	max	.002	2	-.001	15	.001	1	-4.416e-6	15	NC	1	NC	1
178			min	-.003	3	-.007	3	0	15	-7.881e-5	1	NC	1	NC	1
179		14	max	.002	2	-.001	15	0	1	-3.773e-6	15	NC	1	NC	1
180			min	-.003	3	-.006	3	0	15	-6.731e-5	1	NC	1	NC	1
181		15	max	.002	2	-.001	15	0	1	-3.129e-6	15	NC	1	NC	1
182			min	-.002	3	-.005	3	0	15	-5.581e-5	1	NC	1	NC	1
183		16	max	.001	2	0	15	0	1	-2.485e-6	15	NC	1	NC	1
184			min	-.002	3	-.004	3	0	15	-4.431e-5	1	NC	1	NC	1
185		17	max	0	2	0	15	0	1	-1.842e-6	15	NC	1	NC	1
186			min	-.001	3	-.003	4	0	15	-3.28e-5	1	NC	1	NC	1
187		18	max	0	2	0	15	0	1	-1.198e-6	15	NC	1	NC	1
188			min	0	3	-.001	4	0	15	-2.13e-5	1	NC	1	NC	1
189		19	max	0	1	0	1	0	1	-5.544e-7	15	NC	1	NC	1
190			min	0	1	0	1	0	1	-9.8e-6	1	NC	1	NC	1
191	M3	1	max	0	1	0	1	0	1	1.945e-6	1	NC	1	NC	1
192			min	0	1	0	1	0	1	1.106e-7	15	NC	1	NC	1
193		2	max	0	3	0	15	0	15	2.125e-5	1	NC	1	NC	1
194			min	0	2	-.002	4	0	1	1.186e-6	15	NC	1	NC	1
195		3	max	0	3	0	15	0	15	4.056e-5	1	NC	1	NC	1
196			min	0	2	-.004	4	0	1	2.262e-6	15	NC	1	NC	1
197		4	max	.001	3	-.001	15	0	15	5.987e-5	1	NC	1	NC	1
198			min	-.001	2	-.006	4	0	1	3.337e-6	15	NC	1	NC	1
199		5	max	.002	3	-.002	15	0	10	7.918e-5	1	NC	1	NC	1
200			min	-.002	2	-.008	4	0	3	4.413e-6	15	NC	1	NC	1
201		6	max	.002	3	-.002	15	0	1	9.848e-5	1	NC	1	NC	1
202			min	-.002	2	-.01	4	0	3	5.489e-6	15	9248.133	4	NC	1
203		7	max	.003	3	-.003	15	0	1	1.178e-4	1	NC	1	NC	1
204			min	-.002	2	-.012	4	0	12	6.564e-6	15	7997.693	4	NC	1
205		8	max	.003	3	-.003	15	0	1	1.371e-4	1	NC	2	NC	1
206			min	-.003	2	-.013	4	0	12	7.64e-6	15	7228.179	4	NC	1
207		9	max	.004	3	-.003	15	0	1	1.564e-4	1	NC	5	NC	1
208			min	-.003	2	-.014	4	0	15	8.716e-6	15	6779.251	4	NC	1
209		10	max	.004	3	-.003	15	0	1	1.757e-4	1	NC	5	NC	1
210			min	-.003	2	-.014	4	0	15	9.791e-6	15	6573.716	4	NC	1
211		11	max	.004	3	-.003	15	.001	1	1.95e-4	1	NC	5	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
212			min	-.004	2	-.014	4	0	15	1.087e-5	15	6581.563	4	NC	1
213		12	max	.005	3	-.003	15	.002	1	2.143e-4	1	NC	5	NC	1
214			min	-.004	2	-.014	4	0	15	1.194e-5	15	6808.441	4	NC	1
215		13	max	.005	3	-.003	15	.002	1	2.336e-4	1	NC	2	NC	1
216			min	-.005	2	-.013	4	0	15	1.302e-5	15	7299.328	4	NC	1
217		14	max	.006	3	-.003	15	.003	1	2.529e-4	1	NC	1	NC	1
218			min	-.005	2	-.012	4	0	15	1.409e-5	15	8161.29	4	NC	1
219		15	max	.006	3	-.002	15	.003	1	2.723e-4	1	NC	1	NC	1
220			min	-.005	2	-.01	4	0	15	1.517e-5	15	9629.533	4	NC	1
221		16	max	.007	3	-.002	15	.004	1	2.916e-4	1	NC	1	NC	1
222			min	-.006	2	-.008	4	0	15	1.624e-5	15	NC	1	NC	1
223		17	max	.007	3	-.001	15	.005	1	3.109e-4	1	NC	1	NC	1
224			min	-.006	2	-.006	4	0	15	1.732e-5	15	NC	1	NC	1
225		18	max	.008	3	0	15	.006	1	3.302e-4	1	NC	1	NC	1
226			min	-.007	2	-.004	3	0	15	1.84e-5	15	NC	1	NC	1
227		19	max	.008	3	0	10	.007	1	3.495e-4	1	NC	1	NC	1
228			min	-.007	2	-.003	3	0	15	1.947e-5	15	NC	1	NC	1
229	M4	1	max	.002	1	.007	2	0	15	1.246e-4	1	NC	1	NC	3
230			min	0	15	-.008	3	-.007	1	6.963e-6	15	NC	1	3444.569	1
231		2	max	.002	1	.006	2	0	15	1.246e-4	1	NC	1	NC	3
232			min	0	15	-.008	3	-.007	1	6.963e-6	15	NC	1	3733.779	1
233		3	max	.002	1	.006	2	0	15	1.246e-4	1	NC	1	NC	3
234			min	0	15	-.007	3	-.006	1	6.963e-6	15	NC	1	4078.758	1
235		4	max	.002	1	.006	2	0	15	1.246e-4	1	NC	1	NC	2
236			min	0	15	-.007	3	-.006	1	6.963e-6	15	NC	1	4493.856	1
237		5	max	.002	1	.005	2	0	15	1.246e-4	1	NC	1	NC	2
238			min	0	15	-.007	3	-.005	1	6.963e-6	15	NC	1	4998.589	1
239		6	max	.002	1	.005	2	0	15	1.246e-4	1	NC	1	NC	2
240			min	0	15	-.006	3	-.004	1	6.963e-6	15	NC	1	5620.022	1
241		7	max	.001	1	.004	2	0	15	1.246e-4	1	NC	1	NC	2
242			min	0	15	-.006	3	-.004	1	6.963e-6	15	NC	1	6396.573	1
243		8	max	.001	1	.004	2	0	15	1.246e-4	1	NC	1	NC	2
244			min	0	15	-.005	3	-.003	1	6.963e-6	15	NC	1	7384.263	1
245		9	max	.001	1	.004	2	0	15	1.246e-4	1	NC	1	NC	2
246			min	0	15	-.005	3	-.003	1	6.963e-6	15	NC	1	8667.403	1
247		10	max	.001	1	.003	2	0	15	1.246e-4	1	NC	1	NC	1
248			min	0	15	-.004	3	-.002	1	6.963e-6	15	NC	1	NC	1
249		11	max	0	1	.003	2	0	15	1.246e-4	1	NC	1	NC	1
250			min	0	15	-.004	3	-.002	1	6.963e-6	15	NC	1	NC	1
251		12	max	0	1	.003	2	0	15	1.246e-4	1	NC	1	NC	1
252			min	0	15	-.003	3	-.002	1	6.963e-6	15	NC	1	NC	1
253		13	max	0	1	.002	2	0	15	1.246e-4	1	NC	1	NC	1
254			min	0	15	-.003	3	-.001	1	6.963e-6	15	NC	1	NC	1
255		14	max	0	1	.002	2	0	15	1.246e-4	1	NC	1	NC	1
256			min	0	15	-.002	3	0	1	6.963e-6	15	NC	1	NC	1
257		15	max	0	1	.001	2	0	15	1.246e-4	1	NC	1	NC	1
258			min	0	15	-.002	3	0	1	6.963e-6	15	NC	1	NC	1
259		16	max	0	1	.001	2	0	15	1.246e-4	1	NC	1	NC	1
260			min	0	15	-.001	3	0	1	6.963e-6	15	NC	1	NC	1
261		17	max	0	1	0	2	0	15	1.246e-4	1	NC	1	NC	1
262			min	0	15	0	3	0	1	6.963e-6	15	NC	1	NC	1
263		18	max	0	1	0	2	0	15	1.246e-4	1	NC	1	NC	1
264			min	0	15	0	3	0	1	6.963e-6	15	NC	1	NC	1
265		19	max	0	1	0	1	0	1	1.246e-4	1	NC	1	NC	1
266			min	0	1	0	1	0	1	6.963e-6	15	NC	1	NC	1
267	M6	1	max	.023	2	.035	2	0	1	0	1	NC	4	NC	1
268			min	-.032	3	-.049	3	0	1	0	1	1579.564	3	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
269		2	max	.022	2	.032	2	0	1	0	1	NC	4	NC	1
270			min	-.03	3	-.046	3	0	1	0	1	1672.377	3	NC	1
271		3	max	.02	2	.029	2	0	1	0	1	NC	4	NC	1
272			min	-.029	3	-.043	3	0	1	0	1	1776.91	3	NC	1
273		4	max	.019	2	.026	2	0	1	0	1	NC	4	NC	1
274			min	-.027	3	-.041	3	0	1	0	1	1895.646	3	NC	1
275		5	max	.018	2	.023	2	0	1	0	1	NC	4	NC	1
276			min	-.025	3	-.038	3	0	1	0	1	2031.782	3	NC	1
277		6	max	.017	2	.02	2	0	1	0	1	NC	4	NC	1
278			min	-.023	3	-.035	3	0	1	0	1	2189.496	3	NC	1
279		7	max	.015	2	.017	2	0	1	0	1	NC	1	NC	1
280			min	-.021	3	-.032	3	0	1	0	1	2374.361	3	NC	1
281		8	max	.014	2	.015	2	0	1	0	1	NC	1	NC	1
282			min	-.02	3	-.03	3	0	1	0	1	2593.981	3	NC	1
283		9	max	.013	2	.012	2	0	1	0	1	NC	1	NC	1
284			min	-.018	3	-.027	3	0	1	0	1	2859.007	3	NC	1
285		10	max	.011	2	.01	2	0	1	0	1	NC	1	NC	1
286			min	-.016	3	-.024	3	0	1	0	1	3184.832	3	NC	1
287		11	max	.01	2	.008	2	0	1	0	1	NC	1	NC	1
288			min	-.014	3	-.021	3	0	1	0	1	3594.559	3	NC	1
289		12	max	.009	2	.006	2	0	1	0	1	NC	1	NC	1
290			min	-.013	3	-.019	3	0	1	0	1	4124.509	3	NC	1
291		13	max	.008	2	.004	2	0	1	0	1	NC	1	NC	1
292			min	-.011	3	-.016	3	0	1	0	1	4835.248	3	NC	1
293		14	max	.006	2	.003	2	0	1	0	1	NC	1	NC	1
294			min	-.009	3	-.013	3	0	1	0	1	5835.835	3	NC	1
295		15	max	.005	2	.002	2	0	1	0	1	NC	1	NC	1
296			min	-.007	3	-.01	3	0	1	0	1	7344.457	3	NC	1
297		16	max	.004	2	0	2	0	1	0	1	NC	1	NC	1
298			min	-.005	3	-.008	3	0	1	0	1	9870.32	3	NC	1
299		17	max	.003	2	0	2	0	1	0	1	NC	1	NC	1
300			min	-.004	3	-.005	3	0	1	0	1	NC	1	NC	1
301		18	max	.001	2	0	2	0	1	0	1	NC	1	NC	1
302			min	-.002	3	-.003	3	0	1	0	1	NC	1	NC	1
303		19	max	0	1	0	1	0	1	0	1	NC	1	NC	1
304			min	0	1	0	1	0	1	0	1	NC	1	NC	1
305	M7	1	max	0	1	0	1	0	1	0	1	NC	1	NC	1
306			min	0	1	0	1	0	1	0	1	NC	1	NC	1
307		2	max	.001	3	0	2	0	1	0	1	NC	1	NC	1
308			min	-.001	2	-.003	3	0	1	0	1	NC	1	NC	1
309		3	max	.003	3	0	2	0	1	0	1	NC	1	NC	1
310			min	-.003	2	-.006	3	0	1	0	1	NC	1	NC	1
311		4	max	.004	3	-.001	15	0	1	0	1	NC	1	NC	1
312			min	-.004	2	-.008	3	0	1	0	1	NC	1	NC	1
313		5	max	.006	3	-.002	15	0	1	0	1	NC	1	NC	1
314			min	-.005	2	-.01	3	0	1	0	1	NC	1	NC	1
315		6	max	.007	3	-.002	15	0	1	0	1	NC	1	NC	1
316			min	-.007	2	-.012	3	0	1	0	1	8781.016	3	NC	1
317		7	max	.008	3	-.003	15	0	1	0	1	NC	1	NC	1
318			min	-.008	2	-.014	3	0	1	0	1	7848.687	3	NC	1
319		8	max	.01	3	-.003	15	0	1	0	1	NC	1	NC	1
320			min	-.01	2	-.015	3	0	1	0	1	7297.906	3	NC	1
321		9	max	.011	3	-.003	15	0	1	0	1	NC	1	NC	1
322			min	-.011	2	-.016	3	0	1	0	1	6876.676	4	NC	1
323		10	max	.013	3	-.003	15	0	1	0	1	NC	1	NC	1
324			min	-.012	2	-.017	3	0	1	0	1	6663.087	4	NC	1
325		11	max	.014	3	-.003	15	0	1	0	1	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
326			min	-.014	2	-.017	3	0	1	0	1	6666.709	4	NC	1
327		12	max	.015	3	-.003	15	0	1	0	1	NC	1	NC	1
328			min	-.015	2	-.017	3	0	1	0	1	6892.722	4	NC	1
329		13	max	.017	3	-.003	15	0	1	0	1	NC	1	NC	1
330			min	-.016	2	-.016	3	0	1	0	1	7386.247	4	NC	1
331		14	max	.018	3	-.003	15	0	1	0	1	NC	1	NC	1
332			min	-.018	2	-.015	3	0	1	0	1	8255.26	4	NC	1
333		15	max	.02	3	-.002	15	0	1	0	1	NC	1	NC	1
334			min	-.019	2	-.014	3	0	1	0	1	9737.307	4	NC	1
335		16	max	.021	3	-.002	15	0	1	0	1	NC	1	NC	1
336			min	-.021	2	-.013	3	0	1	0	1	NC	1	NC	1
337		17	max	.022	3	0	2	0	1	0	1	NC	1	NC	1
338			min	-.022	2	-.011	3	0	1	0	1	NC	1	NC	1
339		18	max	.024	3	0	2	0	1	0	1	NC	1	NC	1
340			min	-.023	2	-.01	3	0	1	0	1	NC	1	NC	1
341		19	max	.025	3	.002	2	0	1	0	1	NC	1	NC	1
342			min	-.025	2	-.008	3	0	1	0	1	NC	1	NC	1
343	M8	1	max	.005	1	.024	2	0	1	0	1	NC	1	NC	1
344			min	0	15	-.026	3	0	1	0	1	NC	1	NC	1
345		2	max	.005	1	.023	2	0	1	0	1	NC	1	NC	1
346			min	0	15	-.025	3	0	1	0	1	NC	1	NC	1
347		3	max	.005	1	.022	2	0	1	0	1	NC	1	NC	1
348			min	0	15	-.023	3	0	1	0	1	NC	1	NC	1
349		4	max	.004	1	.02	2	0	1	0	1	NC	1	NC	1
350			min	0	15	-.022	3	0	1	0	1	NC	1	NC	1
351		5	max	.004	1	.019	2	0	1	0	1	NC	1	NC	1
352			min	0	15	-.02	3	0	1	0	1	NC	1	NC	1
353		6	max	.004	1	.018	2	0	1	0	1	NC	1	NC	1
354			min	0	15	-.019	3	0	1	0	1	NC	1	NC	1
355		7	max	.003	1	.016	2	0	1	0	1	NC	1	NC	1
356			min	0	15	-.018	3	0	1	0	1	NC	1	NC	1
357		8	max	.003	1	.015	2	0	1	0	1	NC	1	NC	1
358			min	0	15	-.016	3	0	1	0	1	NC	1	NC	1
359		9	max	.003	1	.014	2	0	1	0	1	NC	1	NC	1
360			min	0	15	-.015	3	0	1	0	1	NC	1	NC	1
361		10	max	.003	1	.012	2	0	1	0	1	NC	1	NC	1
362			min	0	15	-.013	3	0	1	0	1	NC	1	NC	1
363		11	max	.002	1	.011	2	0	1	0	1	NC	1	NC	1
364			min	0	15	-.012	3	0	1	0	1	NC	1	NC	1
365		12	max	.002	1	.009	2	0	1	0	1	NC	1	NC	1
366			min	0	15	-.01	3	0	1	0	1	NC	1	NC	1
367		13	max	.002	1	.008	2	0	1	0	1	NC	1	NC	1
368			min	0	15	-.009	3	0	1	0	1	NC	1	NC	1
369		14	max	.001	1	.007	2	0	1	0	1	NC	1	NC	1
370			min	0	15	-.007	3	0	1	0	1	NC	1	NC	1
371		15	max	.001	1	.005	2	0	1	0	1	NC	1	NC	1
372			min	0	15	-.006	3	0	1	0	1	NC	1	NC	1
373		16	max	0	1	.004	2	0	1	0	1	NC	1	NC	1
374			min	0	15	-.004	3	0	1	0	1	NC	1	NC	1
375		17	max	0	1	.003	2	0	1	0	1	NC	1	NC	1
376			min	0	15	-.003	3	0	1	0	1	NC	1	NC	1
377		18	max	0	1	.001	2	0	1	0	1	NC	1	NC	1
378			min	0	15	-.001	3	0	1	0	1	NC	1	NC	1
379		19	max	0	1	0	1	0	1	0	1	NC	1	NC	1
380			min	0	1	0	1	0	1	0	1	NC	1	NC	1
381	M10	1	max	.007	2	.01	2	0	15	2.168e-4	1	NC	1	NC	1
382			min	-.01	3	-.015	3	-.008	1	1.214e-5	15	8020.918	2	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
383		2	max	.007	2	.008	2	0	15	2.053e-4	1	NC	1	NC	1
384			min	-.009	3	-.015	3	-.007	1	1.15e-5	15	9361.221	2	NC	1
385		3	max	.006	2	.007	2	0	15	1.938e-4	1	NC	1	NC	1
386			min	-.009	3	-.014	3	-.006	1	1.085e-5	15	NC	1	NC	1
387		4	max	.006	2	.006	2	0	15	1.823e-4	1	NC	1	NC	1
388			min	-.008	3	-.014	3	-.006	1	1.021e-5	15	NC	1	NC	1
389		5	max	.006	2	.004	2	0	15	1.708e-4	1	NC	1	NC	1
390			min	-.008	3	-.013	3	-.005	1	9.566e-6	15	NC	1	NC	1
391		6	max	.005	2	.003	2	0	15	1.593e-4	1	NC	1	NC	1
392			min	-.007	3	-.013	3	-.005	1	8.922e-6	15	NC	1	NC	1
393		7	max	.005	2	.002	2	0	15	1.478e-4	1	NC	1	NC	1
394			min	-.007	3	-.012	3	-.004	1	8.278e-6	15	NC	1	NC	1
395		8	max	.004	2	.001	2	0	15	1.363e-4	1	NC	1	NC	1
396			min	-.006	3	-.012	3	-.003	1	7.635e-6	15	NC	1	NC	1
397		9	max	.004	2	0	2	0	15	1.248e-4	1	NC	1	NC	1
398			min	-.005	3	-.011	3	-.003	1	6.991e-6	15	NC	1	NC	1
399		10	max	.004	2	0	2	0	15	1.133e-4	1	NC	1	NC	1
400			min	-.005	3	-.01	3	-.002	1	6.347e-6	15	NC	1	NC	1
401		11	max	.003	2	-.001	2	0	15	1.018e-4	1	NC	1	NC	1
402			min	-.004	3	-.009	3	-.002	1	5.704e-6	15	NC	1	NC	1
403		12	max	.003	2	-.001	15	0	15	9.032e-5	1	NC	1	NC	1
404			min	-.004	3	-.008	3	-.002	1	5.06e-6	15	NC	1	NC	1
405		13	max	.002	2	-.001	15	0	15	7.881e-5	1	NC	1	NC	1
406			min	-.003	3	-.007	3	-.001	1	4.416e-6	15	NC	1	NC	1
407		14	max	.002	2	-.001	15	0	15	6.731e-5	1	NC	1	NC	1
408			min	-.003	3	-.006	3	0	1	3.773e-6	15	NC	1	NC	1
409		15	max	.002	2	-.001	15	0	15	5.581e-5	1	NC	1	NC	1
410			min	-.002	3	-.005	3	0	1	3.129e-6	15	NC	1	NC	1
411		16	max	.001	2	0	15	0	15	4.431e-5	1	NC	1	NC	1
412			min	-.002	3	-.004	3	0	1	2.485e-6	15	NC	1	NC	1
413		17	max	0	2	0	15	0	15	3.28e-5	1	NC	1	NC	1
414			min	-.001	3	-.003	4	0	1	1.842e-6	15	NC	1	NC	1
415		18	max	0	2	0	15	0	15	2.13e-5	1	NC	1	NC	1
416			min	0	3	-.001	4	0	1	1.198e-6	15	NC	1	NC	1
417		19	max	0	1	0	1	0	1	9.8e-6	1	NC	1	NC	1
418			min	0	1	0	1	0	1	5.544e-7	15	NC	1	NC	1
419	M11	1	max	0	1	0	1	0	1	-1.106e-7	15	NC	1	NC	1
420			min	0	1	0	1	0	1	-1.945e-6	1	NC	1	NC	1
421		2	max	0	3	0	15	0	1	-1.186e-6	15	NC	1	NC	1
422			min	0	2	-.002	4	0	15	-2.125e-5	1	NC	1	NC	1
423		3	max	0	3	0	15	0	1	-2.262e-6	15	NC	1	NC	1
424			min	0	2	-.004	4	0	15	-4.056e-5	1	NC	1	NC	1
425		4	max	.001	3	-.001	15	0	1	-3.337e-6	15	NC	1	NC	1
426			min	-.001	2	-.006	4	0	15	-5.987e-5	1	NC	1	NC	1
427		5	max	.002	3	-.002	15	0	3	-4.413e-6	15	NC	1	NC	1
428			min	-.002	2	-.008	4	0	10	-7.918e-5	1	NC	1	NC	1
429		6	max	.002	3	-.002	15	0	3	-5.489e-6	15	NC	1	NC	1
430			min	-.002	2	-.01	4	0	1	-9.848e-5	1	9248.133	4	NC	1
431		7	max	.003	3	-.003	15	0	12	-6.564e-6	15	NC	1	NC	1
432			min	-.002	2	-.012	4	0	1	-1.178e-4	1	7997.693	4	NC	1
433		8	max	.003	3	-.003	15	0	12	-7.64e-6	15	NC	2	NC	1
434			min	-.003	2	-.013	4	0	1	-1.371e-4	1	7228.179	4	NC	1
435		9	max	.004	3	-.003	15	0	15	-8.716e-6	15	NC	5	NC	1
436			min	-.003	2	-.014	4	0	1	-1.564e-4	1	6779.251	4	NC	1
437		10	max	.004	3	-.003	15	0	15	-9.791e-6	15	NC	5	NC	1
438			min	-.003	2	-.014	4	0	1	-1.757e-4	1	6573.716	4	NC	1
439		11	max	.004	3	-.003	15	0	15	-1.087e-5	15	NC	5	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
440			min	-.004	2	-.014	4	-.001	1	-1.95e-4	1	6581.563	4	NC	1
441		12	max	.005	3	-.003	15	0	15	-1.194e-5	15	NC	5	NC	1
442			min	-.004	2	-.014	4	-.002	1	-2.143e-4	1	6808.441	4	NC	1
443		13	max	.005	3	-.003	15	0	15	-1.302e-5	15	NC	2	NC	1
444			min	-.005	2	-.013	4	-.002	1	-2.336e-4	1	7299.328	4	NC	1
445		14	max	.006	3	-.003	15	0	15	-1.409e-5	15	NC	1	NC	1
446			min	-.005	2	-.012	4	-.003	1	-2.529e-4	1	8161.29	4	NC	1
447		15	max	.006	3	-.002	15	0	15	-1.517e-5	15	NC	1	NC	1
448			min	-.005	2	-.01	4	-.003	1	-2.723e-4	1	9629.533	4	NC	1
449		16	max	.007	3	-.002	15	0	15	-1.624e-5	15	NC	1	NC	1
450			min	-.006	2	-.008	4	-.004	1	-2.916e-4	1	NC	1	NC	1
451		17	max	.007	3	-.001	15	0	15	-1.732e-5	15	NC	1	NC	1
452			min	-.006	2	-.006	4	-.005	1	-3.109e-4	1	NC	1	NC	1
453		18	max	.008	3	0	15	0	15	-1.84e-5	15	NC	1	NC	1
454			min	-.007	2	-.004	3	-.006	1	-3.302e-4	1	NC	1	NC	1
455		19	max	.008	3	0	10	0	15	-1.947e-5	15	NC	1	NC	1
456			min	-.007	2	-.003	3	-.007	1	-3.495e-4	1	NC	1	NC	1
457	M12	1	max	.002	1	.007	2	.007	1	-6.963e-6	15	NC	1	NC	3
458			min	0	15	-.008	3	0	15	-1.246e-4	1	NC	1	3444.569	1
459		2	max	.002	1	.006	2	.007	1	-6.963e-6	15	NC	1	NC	3
460			min	0	15	-.008	3	0	15	-1.246e-4	1	NC	1	3733.779	1
461		3	max	.002	1	.006	2	.006	1	-6.963e-6	15	NC	1	NC	3
462			min	0	15	-.007	3	0	15	-1.246e-4	1	NC	1	4078.758	1
463		4	max	.002	1	.006	2	.006	1	-6.963e-6	15	NC	1	NC	2
464			min	0	15	-.007	3	0	15	-1.246e-4	1	NC	1	4493.856	1
465		5	max	.002	1	.005	2	.005	1	-6.963e-6	15	NC	1	NC	2
466			min	0	15	-.007	3	0	15	-1.246e-4	1	NC	1	4998.589	1
467		6	max	.002	1	.005	2	.004	1	-6.963e-6	15	NC	1	NC	2
468			min	0	15	-.006	3	0	15	-1.246e-4	1	NC	1	5620.022	1
469		7	max	.001	1	.004	2	.004	1	-6.963e-6	15	NC	1	NC	2
470			min	0	15	-.006	3	0	15	-1.246e-4	1	NC	1	6396.573	1
471		8	max	.001	1	.004	2	.003	1	-6.963e-6	15	NC	1	NC	2
472			min	0	15	-.005	3	0	15	-1.246e-4	1	NC	1	7384.263	1
473		9	max	.001	1	.004	2	.003	1	-6.963e-6	15	NC	1	NC	2
474			min	0	15	-.005	3	0	15	-1.246e-4	1	NC	1	8667.403	1
475		10	max	.001	1	.003	2	.002	1	-6.963e-6	15	NC	1	NC	1
476			min	0	15	-.004	3	0	15	-1.246e-4	1	NC	1	NC	1
477		11	max	0	1	.003	2	.002	1	-6.963e-6	15	NC	1	NC	1
478			min	0	15	-.004	3	0	15	-1.246e-4	1	NC	1	NC	1
479		12	max	0	1	.003	2	.002	1	-6.963e-6	15	NC	1	NC	1
480			min	0	15	-.003	3	0	15	-1.246e-4	1	NC	1	NC	1
481		13	max	0	1	.002	2	.001	1	-6.963e-6	15	NC	1	NC	1
482			min	0	15	-.003	3	0	15	-1.246e-4	1	NC	1	NC	1
483		14	max	0	1	.002	2	0	1	-6.963e-6	15	NC	1	NC	1
484			min	0	15	-.002	3	0	15	-1.246e-4	1	NC	1	NC	1
485		15	max	0	1	.001	2	0	1	-6.963e-6	15	NC	1	NC	1
486			min	0	15	-.002	3	0	15	-1.246e-4	1	NC	1	NC	1
487		16	max	0	1	.001	2	0	1	-6.963e-6	15	NC	1	NC	1
488			min	0	15	-.001	3	0	15	-1.246e-4	1	NC	1	NC	1
489		17	max	0	1	0	2	0	1	-6.963e-6	15	NC	1	NC	1
490			min	0	15	0	3	0	15	-1.246e-4	1	NC	1	NC	1
491		18	max	0	1	0	2	0	1	-6.963e-6	15	NC	1	NC	1
492			min	0	15	0	3	0	15	-1.246e-4	1	NC	1	NC	1
493		19	max	0	1	0	1	0	1	-6.963e-6	15	NC	1	NC	1
494			min	0	1	0	1	0	1	-1.246e-4	1	NC	1	NC	1
495	M1	1	max	.01	3	.103	2	0	1	1.158e-2	2	NC	1	NC	1
496			min	-.006	2	-.02	3	0	15	-2.315e-2	3	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
497		2	max	.01	3	.047	2	0	15	5.677e-3	2	NC	4	NC	1
498			min	-.006	2	-.006	3	-.005	1	-1.145e-2	3	2078.781	2	NC	1
499		3	max	.01	3	.016	3	0	15	1.746e-5	10	NC	5	NC	1
500			min	-.006	2	-.012	2	-.008	1	-1.489e-4	1	1003.694	2	NC	1
501		4	max	.01	3	.051	3	0	15	3.824e-3	2	NC	5	NC	1
502			min	-.006	2	-.079	2	-.007	1	-4.499e-3	3	635.221	2	NC	1
503		5	max	.009	3	.096	3	0	15	7.654e-3	2	NC	5	NC	1
504			min	-.005	2	-.148	2	-.005	1	-8.87e-3	3	459.45	2	NC	1
505		6	max	.009	3	.143	3	0	15	1.148e-2	2	NC	15	NC	1
506			min	-.005	2	-.215	2	-.002	1	-1.324e-2	3	362.475	2	NC	1
507		7	max	.009	3	.188	3	0	1	1.531e-2	2	NC	15	NC	1
508			min	-.005	2	-.275	2	0	12	-1.761e-2	3	305.158	2	NC	1
509		8	max	.009	3	.226	3	0	1	1.914e-2	2	NC	15	NC	1
510			min	-.005	2	-.322	2	0	15	-2.199e-2	3	271.225	2	NC	1
511		9	max	.009	3	.25	3	0	15	2.198e-2	2	9780.533	15	NC	1
512			min	-.005	2	-.352	2	0	1	-2.226e-2	3	253.549	2	NC	1
513		10	max	.008	3	.258	3	0	1	2.417e-2	2	9572.742	15	NC	1
514			min	-.005	2	-.362	2	0	15	-1.982e-2	3	248.395	2	NC	1
515		11	max	.008	3	.252	3	0	1	2.636e-2	2	9780.018	15	NC	1
516			min	-.005	2	-.352	2	0	15	-1.738e-2	3	254.553	2	NC	1
517		12	max	.008	3	.231	3	0	15	2.565e-2	2	NC	15	NC	1
518			min	-.005	2	-.32	2	0	1	-1.474e-2	3	274.284	2	NC	1
519		13	max	.008	3	.196	3	0	15	2.057e-2	2	NC	15	NC	1
520			min	-.005	2	-.27	2	0	1	-1.179e-2	3	312.607	2	NC	1
521		14	max	.008	3	.153	3	.002	1	1.55e-2	2	NC	15	NC	1
522			min	-.005	2	-.207	2	0	15	-8.852e-3	3	378.391	2	NC	1
523		15	max	.007	3	.104	3	.005	1	1.043e-2	2	NC	5	NC	1
524			min	-.005	2	-.138	2	0	15	-5.91e-3	3	492.214	2	NC	1
525		16	max	.007	3	.054	3	.007	1	5.357e-3	2	NC	5	NC	1
526			min	-.005	2	-.069	2	0	15	-2.968e-3	3	704.337	2	NC	1
527		17	max	.007	3	.006	3	.007	1	4.852e-4	1	NC	5	NC	1
528			min	-.004	2	-.007	2	0	15	-2.534e-5	3	1160.582	2	NC	1
529		18	max	.007	3	.045	2	.005	1	9.448e-3	2	NC	4	NC	1
530			min	-.004	2	-.037	3	0	15	-4.136e-3	3	2478.647	2	NC	1
531		19	max	.007	3	.09	2	0	15	1.894e-2	2	NC	1	NC	1
532			min	-.004	2	-.077	3	0	1	-8.412e-3	3	NC	1	NC	1
533	M5	1	max	.031	3	.231	2	0	1	0	1	NC	1	NC	1
534			min	-.022	2	-.021	3	0	1	0	1	NC	1	NC	1
535		2	max	.031	3	.104	2	0	1	0	1	NC	5	NC	1
536			min	-.022	2	.002	15	0	1	0	1	906.641	2	NC	1
537		3	max	.031	3	.051	3	0	1	0	1	NC	5	NC	1
538			min	-.022	2	-.039	2	0	1	0	1	428.27	2	NC	1
539		4	max	.03	3	.145	3	0	1	0	1	NC	15	NC	1
540			min	-.021	2	-.208	2	0	1	0	1	263.546	2	NC	1
541		5	max	.029	3	.268	3	0	1	0	1	8171.67	15	NC	1
542			min	-.021	2	-.389	2	0	1	0	1	186.301	2	NC	1
543		6	max	.029	3	.405	3	0	1	0	1	6289.654	15	NC	1
544			min	-.021	2	-.568	2	0	1	0	1	144.466	2	NC	1
545		7	max	.028	3	.537	3	0	1	0	1	5203.16	15	NC	1
546			min	-.02	2	-.73	2	0	1	0	1	120.118	2	NC	1
547		8	max	.028	3	.647	3	0	1	0	1	4571.586	15	NC	1
548			min	-.02	2	-.86	2	0	1	0	1	105.882	2	NC	1
549		9	max	.027	3	.718	3	0	1	0	1	4247.771	15	NC	1
550			min	-.019	2	-.942	2	0	1	0	1	98.551	2	NC	1
551		10	max	.026	3	.742	3	0	1	0	1	4150.244	15	NC	1
552			min	-.019	2	-.97	2	0	1	0	1	96.417	2	NC	1
553		11	max	.026	3	.723	3	0	1	0	1	4247.967	15	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
554			min	-.019	2	-.942	2	0	1	0	1	98.961	2	NC	1
555		12	max	.025	3	.66	3	0	1	0	1	4572.043	15	NC	1
556			min	-.019	2	-.855	2	0	1	0	1	107.223	2	NC	1
557		13	max	.024	3	.56	3	0	1	0	1	5204.085	15	NC	1
558			min	-.018	2	-.717	2	0	1	0	1	123.593	2	NC	1
559		14	max	.024	3	.434	3	0	1	0	1	6291.452	15	NC	1
560			min	-.018	2	-.545	2	0	1	0	1	152.294	2	NC	1
561		15	max	.023	3	.293	3	0	1	0	1	8175.209	15	NC	1
562			min	-.018	2	-.359	2	0	1	0	1	203.354	2	NC	1
563		16	max	.022	3	.151	3	0	1	0	1	NC	15	NC	1
564			min	-.017	2	-.178	2	0	1	0	1	302.069	2	NC	1
565		17	max	.022	3	.018	3	0	1	0	1	NC	5	NC	1
566			min	-.017	2	-.021	2	0	1	0	1	523.232	2	NC	1
567		18	max	.022	3	.097	2	0	1	0	1	NC	5	NC	1
568			min	-.017	2	-.096	3	0	1	0	1	1164.122	2	NC	1
569		19	max	.022	3	.192	2	0	1	0	1	NC	1	NC	1
570			min	-.017	2	-.198	3	0	1	0	1	NC	1	NC	1
571	M9	1	max	.01	3	.103	2	0	15	2.315e-2	3	NC	1	NC	1
572			min	-.006	2	-.02	3	0	1	-1.158e-2	2	NC	1	NC	1
573		2	max	.01	3	.047	2	.005	1	1.145e-2	3	NC	4	NC	1
574			min	-.006	2	-.006	3	0	15	-5.677e-3	2	2078.781	2	NC	1
575		3	max	.01	3	.016	3	.008	1	1.489e-4	1	NC	5	NC	1
576			min	-.006	2	-.012	2	0	15	-1.746e-5	10	1003.694	2	NC	1
577		4	max	.01	3	.051	3	.007	1	4.499e-3	3	NC	5	NC	1
578			min	-.006	2	-.079	2	0	15	-3.824e-3	2	635.221	2	NC	1
579		5	max	.009	3	.096	3	.005	1	8.87e-3	3	NC	5	NC	1
580			min	-.005	2	-.148	2	0	15	-7.654e-3	2	459.45	2	NC	1
581		6	max	.009	3	.143	3	.002	1	1.324e-2	3	NC	15	NC	1
582			min	-.005	2	-.215	2	0	15	-1.148e-2	2	362.475	2	NC	1
583		7	max	.009	3	.188	3	0	12	1.761e-2	3	NC	15	NC	1
584			min	-.005	2	-.275	2	0	1	-1.531e-2	2	305.158	2	NC	1
585		8	max	.009	3	.226	3	0	15	2.199e-2	3	NC	15	NC	1
586			min	-.005	2	-.322	2	0	1	-1.914e-2	2	271.225	2	NC	1
587		9	max	.009	3	.25	3	0	1	2.226e-2	3	9780.533	15	NC	1
588			min	-.005	2	-.352	2	0	15	-2.198e-2	2	253.549	2	NC	1
589		10	max	.008	3	.258	3	0	15	1.982e-2	3	9572.742	15	NC	1
590			min	-.005	2	-.362	2	0	1	-2.417e-2	2	248.395	2	NC	1
591		11	max	.008	3	.252	3	0	15	1.738e-2	3	9780.018	15	NC	1
592			min	-.005	2	-.352	2	0	1	-2.636e-2	2	254.553	2	NC	1
593		12	max	.008	3	.231	3	0	1	1.474e-2	3	NC	15	NC	1
594			min	-.005	2	-.32	2	0	15	-2.565e-2	2	274.284	2	NC	1
595		13	max	.008	3	.196	3	0	1	1.179e-2	3	NC	15	NC	1
596			min	-.005	2	-.27	2	0	15	-2.057e-2	2	312.607	2	NC	1
597		14	max	.008	3	.153	3	0	15	8.852e-3	3	NC	15	NC	1
598			min	-.005	2	-.207	2	-.002	1	-1.55e-2	2	378.391	2	NC	1
599		15	max	.007	3	.104	3	0	15	5.91e-3	3	NC	5	NC	1
600			min	-.005	2	-.138	2	-.005	1	-1.043e-2	2	492.214	2	NC	1
601		16	max	.007	3	.054	3	0	15	2.968e-3	3	NC	5	NC	1
602			min	-.005	2	-.069	2	-.007	1	-5.357e-3	2	704.337	2	NC	1
603		17	max	.007	3	.006	3	0	15	2.534e-5	3	NC	5	NC	1
604			min	-.004	2	-.007	2	-.007	1	-4.852e-4	1	1160.582	2	NC	1
605		18	max	.007	3	.045	2	0	15	4.136e-3	3	NC	4	NC	1
606			min	-.004	2	-.037	3	-.005	1	-9.448e-3	2	2478.647	2	NC	1
607		19	max	.007	3	.09	2	0	1	8.412e-3	3	NC	1	NC	1
608			min	-.004	2	-.077	3	0	15	-1.894e-2	2	NC	1	NC	1

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

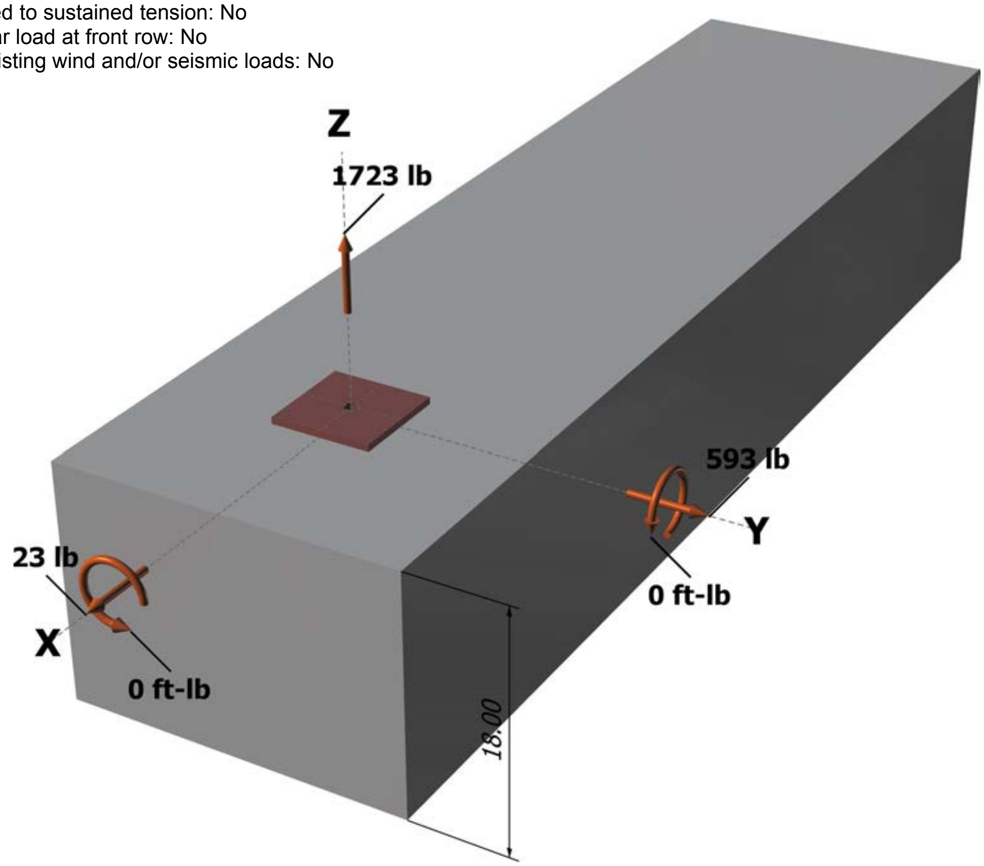
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

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

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

<Figure 1>



<Figure 2>

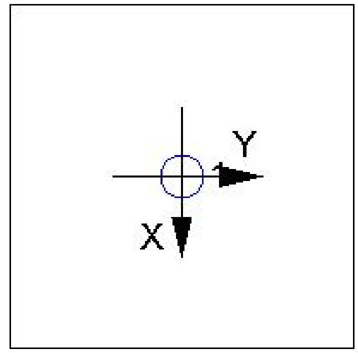
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

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

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 1723
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in y-direction:

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

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

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

Shear parallel to edge in x-direction:

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

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

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

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

Shear parallel to edge in y-direction:

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

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

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

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

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

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

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

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

11. Results

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

Tension	Factored Load, N_{ua} (lb)	Design Strength, $øN_n$ (lb)	Ratio	Status
Steel	1723	6071	0.28	Pass
Concrete breakout	1723	5710	0.30	Pass
Adhesive	**1723**	**5365**	**0.32**	**Pass (Governs)**

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

Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. D.7.1	0.32	0.00	32.1 %	1.0	Pass

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

12. Warnings

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

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

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

Anchor Designer™
Software
Version 2.4.5673.0

Company:	Schletter, Inc.	Date:	11/17/2015
Engineer:	HCV	Page:	1/5
Project:	Standard PVMax - Worst Case, 31-33 Inch Width		
Address:			
Phone:			
E-mail:			

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

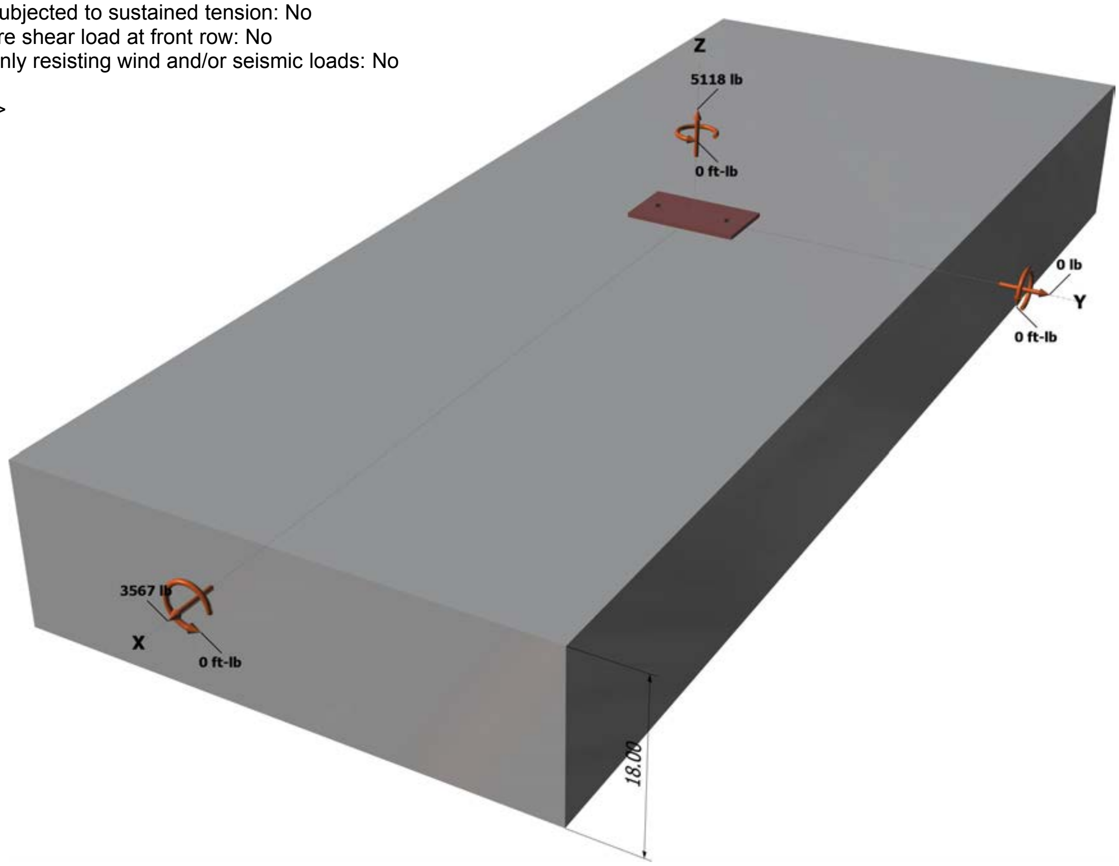
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

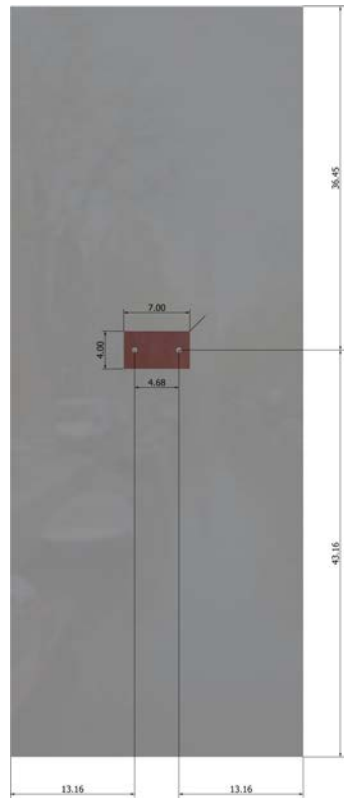
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'$_c$ (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout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

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

<Figure 1>



<Figure 2>



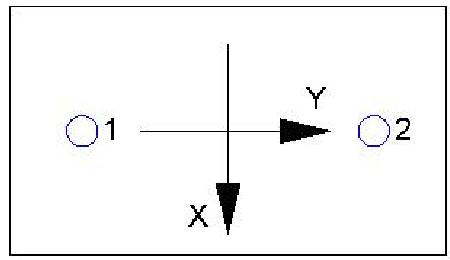
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	2559.0	1783.5	0.0	1783.5
2	2559.0	1783.5	0.0	1783.5
Sum	5118.0	3567.0	0.0	3567.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 5118
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

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

Shear parallel to edge in x-direction:

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

l_e (in)	d_a (in)	λ	f'_c (psi)	c_{a1} (in)	V_{by} (lb)
4.00	0.50	1.00	2500	13.16	17908

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

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cbx} (lb)
710.64	779.34	1.000	1.000	1.000	17908	0.70	22862

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

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

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

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

ϕV_{cpg} (lb)
20601

11. Results

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

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

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

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

Sec. D.7.3	0.63	0.57	119.8 %	1.2	Pass

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

12. Warnings

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

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

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