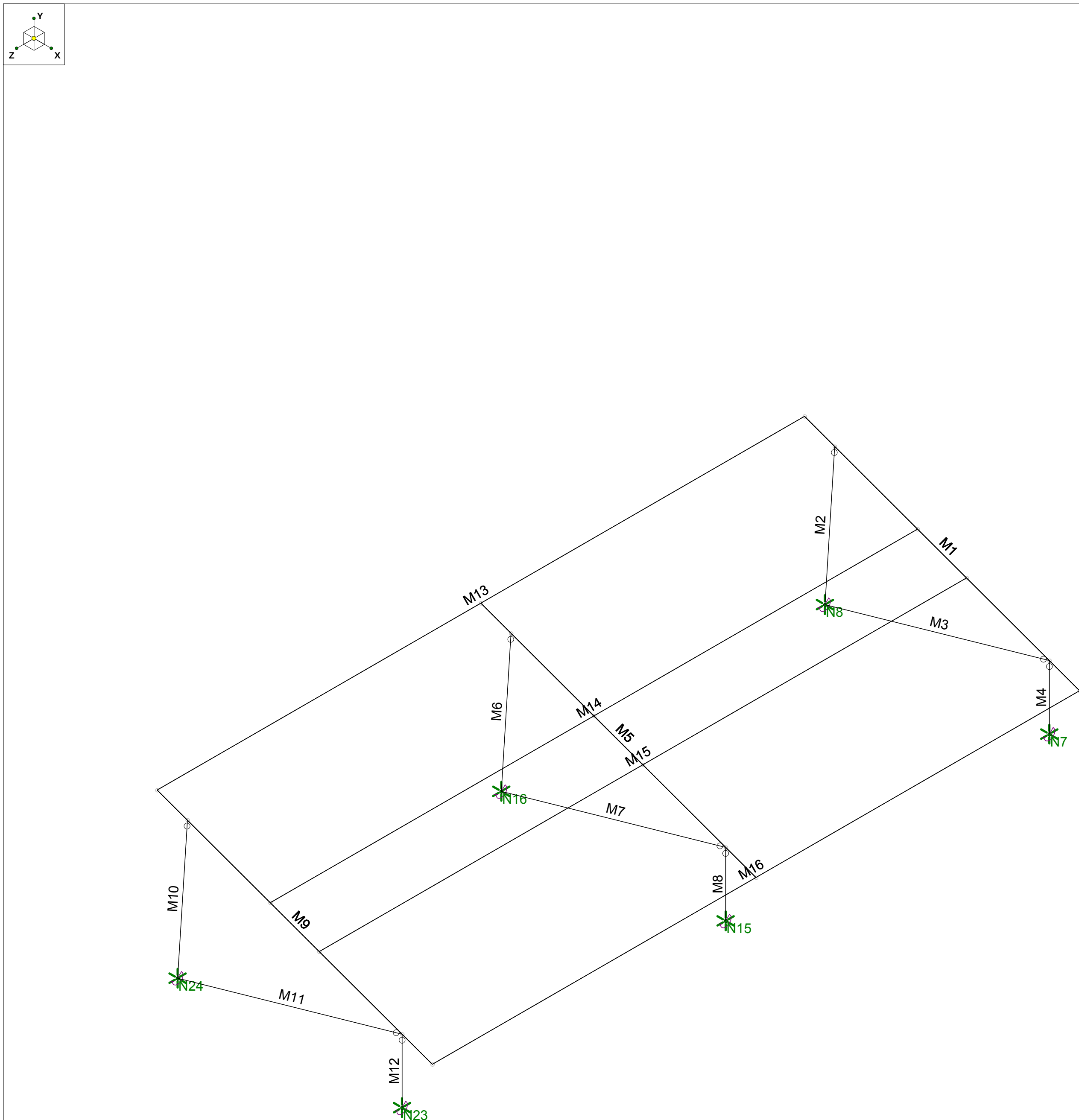


Schletter, Inc.		20° Tilt w/o Seismic Design
HCV	Standard PVMax Racking System	
	Representative Calculations - ASCE 7-05	

1. INTRODUCTION

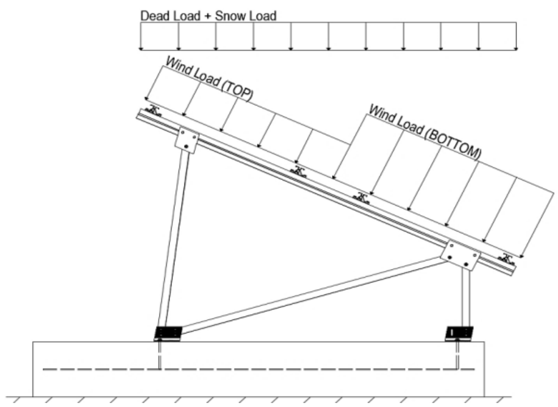
1.1 Project Description
The following sections will cover the determination of forces and structural design calculations for the Schletter, Inc. PVMax ground mount system.

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

PV modules are required to meet the following specifications:

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

Modules Per Row = 2
Module Tilt = 20°
Maximum Height Above Grade = 3 ft



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

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

2. LOAD ACTIONS

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

Self-weight of the PV modules.

2.2 Snow Loads
Ground Snow Load, P_g = 30.00 psf
Sloped Roof Snow Load, P_s = 20.62 psf *(ASCE 7-05, Eq. 7-2)*
I_s = 1.00
C_s = 0.91
C_e = 0.90
C_t = 1.20

2.3 Wind Loads
Design Wind Speed, V = 100 mph
Height < 15 ft

Exposure Category = C
Importance Category = II

Peak Velocity Pressure, q_z = 15.70 psf *Including the gust factor, G=0.85. (ASCE 7-05, Eq. 6-15)*

Pressure Coefficients

$Cf+_{TOP}$	=	1.050	*(Pressure)*
$Cf+_{BOTTOM}$	=	1.650	
$Cf-_{TOP, OUTER PURLIN}$	=	-2.400	
$Cf-_{TOP, INNER PURLIN}$	=	-1.840	*(Suction)*
$Cf-_{BOTTOM}$	=	-1.000	

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

2.4 Seismic Loads - N/A

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

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

2.5 Combination of Loads

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

Strength Design, LRFD

Component stresses are checked using the following LRFD load combinations:

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

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

Allowable Stress Design, ASD

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

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

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

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

3. STRUCTURAL ANALYSIS

3.1 RISA Results

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

3.2 RISA Components

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

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

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

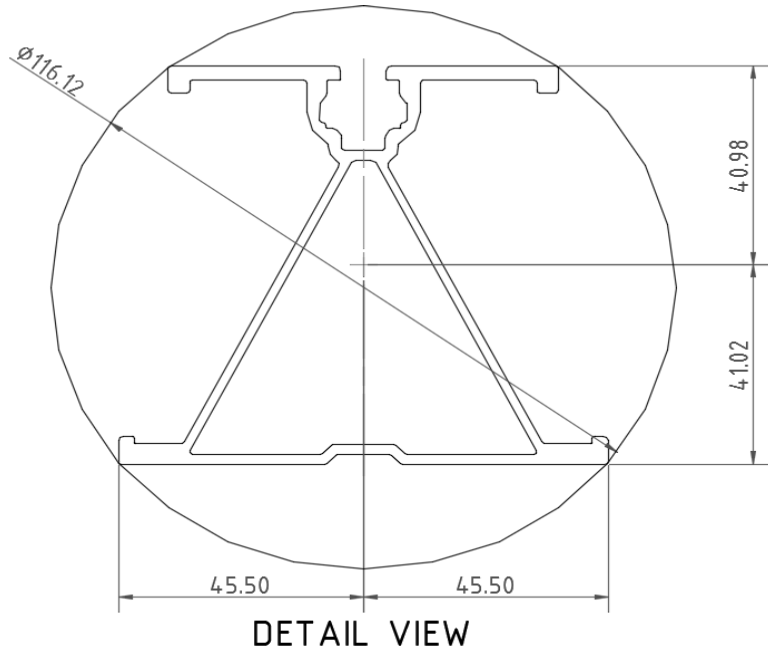
Front Struts	Location
M4	Outer
M8	Inner
M12	Outer

4. MEMBER DESIGN CALCULATIONS

4.1 Purlin Design

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

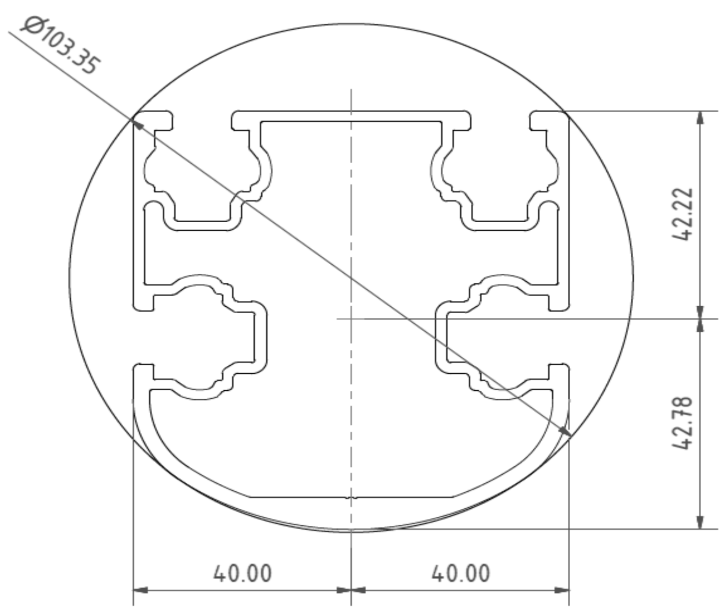
Purlin Type =	**S1.5**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	123	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	25.07	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	23.08	ksi
S_y =	1.33	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	2.16	in^4
I_x =	1.07	in^4
A =	1.25	in^2
g =	1.50	lbs/ft
M_y =	2.022	k-ft
M_z =	0.317	k-ft
$M_{y\ allowable}$ =	2.779	k-ft
$M_{z\ allowable}$ =	1.154	k-ft
Utilization =	100%	



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).

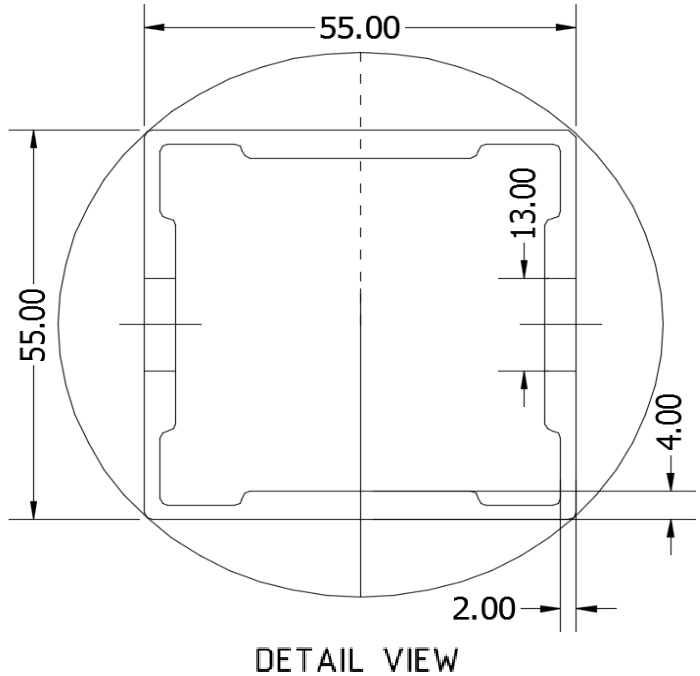
Girder Type =	**BF0**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	88.90	in
$\Phi F_{ty\ AXIAL}$ =	31.09	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.35	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	33.25	ksi
S_y =	1.42	in^3
S_x =	1.41	in^3
E =	10100	ksi
I_y =	2.39	in^4
I_x =	2.22	in^4
A =	1.88	in^2
g =	2.26	lbs/ft
M_y =	-3.103	k-ft
M_z =	0.000	k-ft
P_n =	-0.256	k
$M_{y\ allowable}$ =	3.464	k-ft
$M_{z\ allowable}$ =	3.907	k-ft
$P_{n\ allowable}$ =	58.535	k
Utilization =	90%	



4.3 Front Strut Design

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

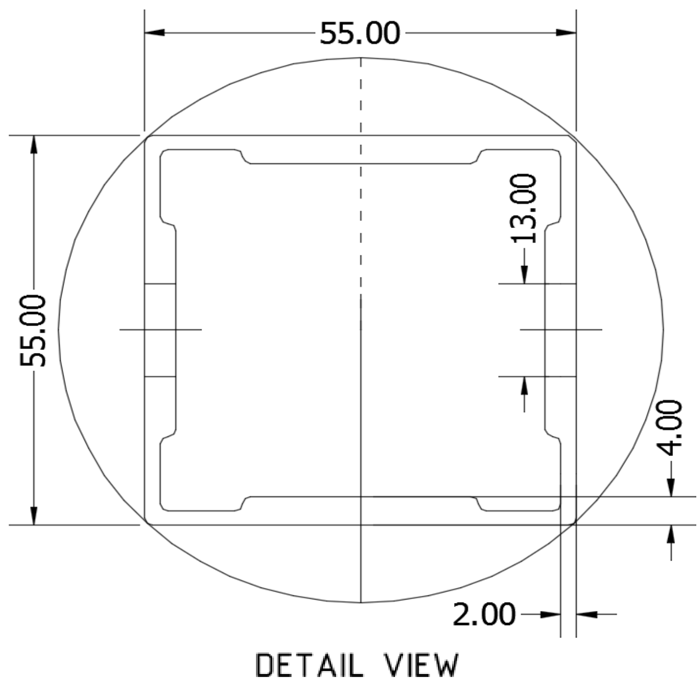
Strut Type =	55x55	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	24.80	in
$\Phi F_{ty\ AXIAL}$ =	28.03	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	3.446	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	27.532	k
Utilization =	13%	



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).

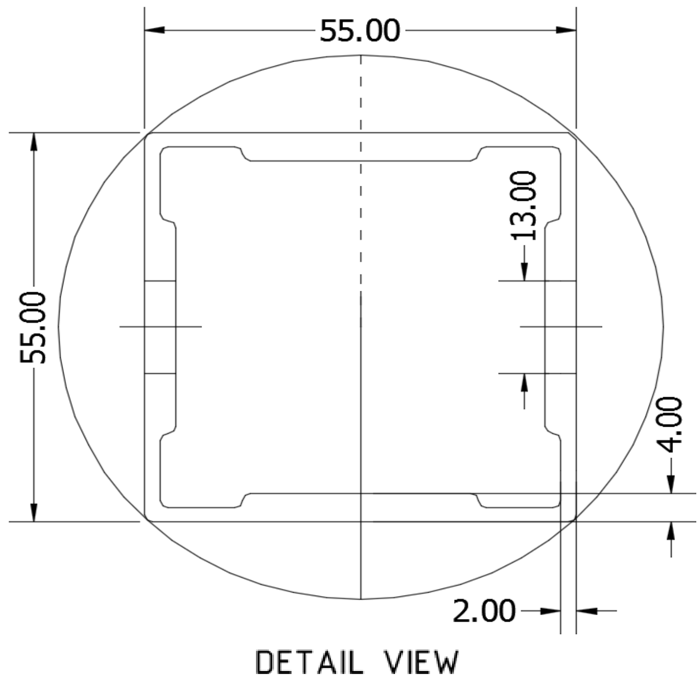
Strut Type =	55x55	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	86.60	in
$\Phi F_{ty\ AXIAL}$ =	7.50	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.010	k-ft
M_z =	0.000	k-ft
P_n =	1.602	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	7.371	k
Utilization =	22%	



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 =	55.91	in
$\Phi F_{ty\ AXIAL}$ =	15.92	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 =	3.502	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	15.642	k
Utilization =	23%	



5. FOUNDATION DESIGN CALCULATIONS

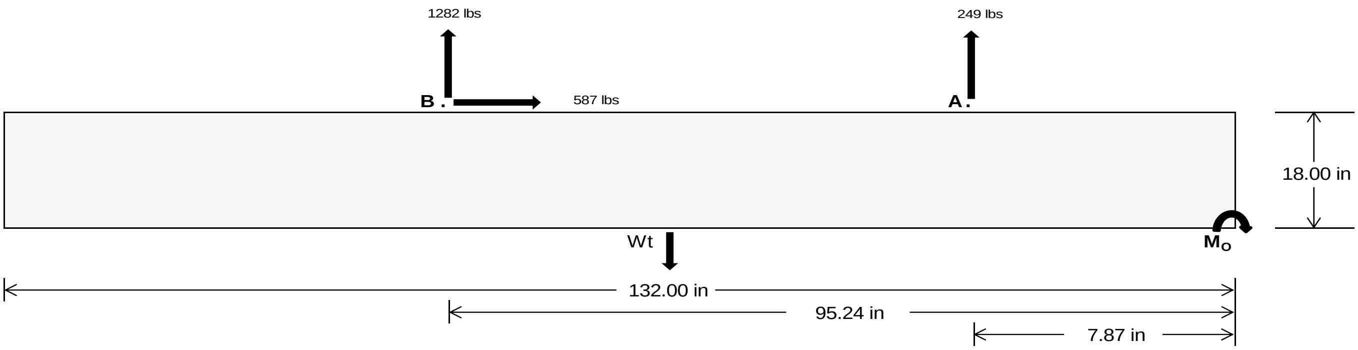
5.1 Helical Pile Foundations

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 =	1049.84	5344.35	k
Compressive Load =	4480.39	4868.18	k
Lateral Load =	12.83	2441.83	k
Moment (Weak Axis) =	0.03	0.01	k

5.2 Design of Ballast Foundations

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



Concrete Properties		**Footing Reinforcement**
Weight of Concrete =	145 pcf	*Use fiber reinforcing with (2) #5 rebar.*
Compressive Strength =	2500 psi	
Yield Strength =	60000 psi	
Overturning Check		
M_O =	134586.6 in-lbs	
Resisting Force Required =	2039.19 lbs	*A minimum 132in long x 29in wide x 18in tall ballast foundation is required to resist overturning.*
S.F. =	1.67	
Weight Required =	3398.65 lbs	
Minimum Width =	29 in in	
Weight Provided =	5781.88 lbs	
Sliding		
Force =	586.76 lbs	
Friction =	0.4	*Use a 132in long x 29in wide x 18in tall ballast foundation to resist sliding. Friction is OK.*
Weight Required =	1466.90 lbs	
Resisting Weight =	5781.88 lbs	
Additional Weight Required =	0 lbs	
Cohesion		
Sliding Force =	586.76 lbs	
Cohesion =	130 psf	
Area =	26.58 ft^2	*Use a 132in long x 29in wide x 18in tall ballast foundation. Cohesion is OK.*
Resisting =	2890.94 lbs	
Additional Weight Required =	0 lbs	
Shear Key		
Additional Force =	0 lbs	
Lateral Bearing Pressure =	200 psf/ft	
Required Depth =	0.00 ft	*Shear key is not required.*
f'_c =	2500 psi	
Length =	8 in	

Bearing Pressure

	Ballast Width			
	29 in	30 in	31 in	32 in
P_{ftg} = (145 pcf)(11 ft)(1.5 ft)(2.42 ft) =	5782 lbs	5981 lbs	6181 lbs	6380 lbs

ASD LC	1.0D + 1.0S				1.0D + 1.0W				1.0D + 0.75L + 0.75W + 0.75S				0.6D + 1.0W			
Width	29 in	30 in	31 in	32 in	29 in	30 in	31 in	32 in	29 in	30 in	31 in	32 in	29 in	30 in	31 in	32 in
F_A	1592 lbs	1592 lbs	1592 lbs	1592 lbs	1521 lbs	1521 lbs	1521 lbs	1521 lbs	2203 lbs	2203 lbs	2203 lbs	2203 lbs	-498 lbs	-498 lbs	-498 lbs	-498 lbs
F_B	1625 lbs	1625 lbs	1625 lbs	1625 lbs	1829 lbs	1829 lbs	1829 lbs	1829 lbs	2457 lbs	2457 lbs	2457 lbs	2457 lbs	-2563 lbs	-2563 lbs	-2563 lbs	-2563 lbs
F_V	182 lbs	182 lbs	182 lbs	182 lbs	1052 lbs	1052 lbs	1052 lbs	1052 lbs	912 lbs	912 lbs	912 lbs	912 lbs	-1174 lbs	-1174 lbs	-1174 lbs	-1174 lbs
P_{total}	8998 lbs	9198 lbs	9397 lbs	9597 lbs	9132 lbs	9332 lbs	9531 lbs	9730 lbs	10442 lbs	10642 lbs	10841 lbs	11040 lbs	407 lbs	527 lbs	647 lbs	766 lbs
M	4024 lbs-ft	4024 lbs-ft	4024 lbs-ft	4024 lbs-ft	4489 lbs-ft	4489 lbs-ft	4489 lbs-ft	4489 lbs-ft	6053 lbs-ft	6053 lbs-ft	6053 lbs-ft	6053 lbs-ft	2071 lbs-ft	2071 lbs-ft	2071 lbs-ft	2071 lbs-ft
e	0.45 ft	0.44 ft	0.43 ft	0.42 ft	0.49 ft	0.48 ft	0.47 ft	0.46 ft	0.58 ft	0.57 ft	0.56 ft	0.55 ft	5.08 ft	3.93 ft	3.20 ft	2.70 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}	255.9 psf	254.7 psf	253.5 psf	252.3 psf	251.4 psf	250.3 psf	249.2 psf	248.2 psf	268.6 psf	266.9 psf	265.3 psf	263.8 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	421.1 psf	414.3 psf	407.9 psf	402.0 psf	435.7 psf	428.4 psf	421.6 psf	415.2 psf	517.0 psf	507.0 psf	497.7 psf	488.9 psf	269.8 psf	89.5 psf	72.6 psf	68.5 psf

Maximum Bearing Pressure = 517 psf
Allowable Bearing Pressure = 1500 psf

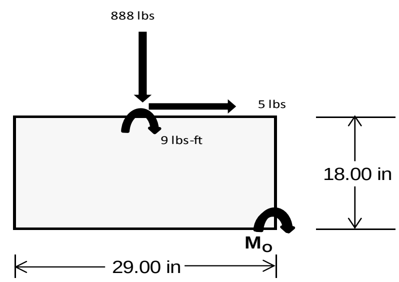
Use a 132in long x 29in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O = 1056.5 ft-lbs
Resisting Force Required = 874.37 lbs
S.F. = 1.67
Weight Required = 1457.28 lbs
Minimum Width = 29 in in
Weight Provided = 5781.88 lbs

A minimum 132in long x 29in 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	29 in			29 in			29 in		
Support	Outer	Inner	Outer	Outer	Inner	Outer	Outer	Inner	Outer
F_Y	246 lbs	656 lbs	246 lbs	888 lbs	2640 lbs	888 lbs	72 lbs	192 lbs	72 lbs
F_V	1 lbs	0 lbs	1 lbs	5 lbs	0 lbs	5 lbs	0 lbs	0 lbs	0 lbs
P_{total}	7404 lbs	5782 lbs	7404 lbs	7702 lbs	5782 lbs	7702 lbs	2165 lbs	5782 lbs	2165 lbs
M	5 lbs-ft	0 lbs-ft	5 lbs-ft	16 lbs-ft	0 lbs-ft	16 lbs-ft	1 lbs-ft	0 lbs-ft	1 lbs-ft
e	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft
L/6	0.40 ft	0.40 ft	0.40 ft	0.40 ft	0.40 ft	0.40 ft	0.40 ft	0.40 ft	0.40 ft
f_{min}	278.1 psf	217.5 psf	278.1 psf	288.2 psf	217.5 psf	288.2 psf	81.4 psf	217.5 psf	81.4 psf
f_{max}	278.9 psf	217.5 psf	278.9 psf	291.2 psf	217.5 psf	291.2 psf	81.5 psf	217.5 psf	81.5 psf

Maximum Bearing Pressure = 291 psf
Allowable Bearing Pressure = 1500 psf

Use a 132in long x 29in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Foundation Requirements: 132in long x 29in wide x 18in tall ballast foundation and fiber reinforcing with (2) #5 rebar.

5.3 Foundation Anchors

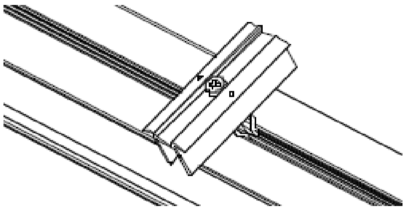
Threaded rods are anchored to the the ballast foundations using the Simpson AT-XP epoxy solution. LRFD load results are compared to the allowable strengths of the epoxy solution. Please see the supplementary calculations provided by the Simpson Anchor Designer software.

6. DESIGN OF JOINTS AND CONNECTIONS

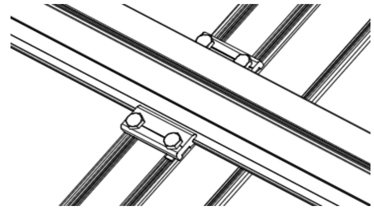
6.1 Anchorage of Modules to Purlins and Connection of Purlins to Girders

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 =	0.564	k
Allowable Uplift =	1.214	k
Utilization =	46%	



Fastening of Purlins to Girders		
Maximum Uplifting Force =	2.048	k
Allowable Uplift =	4.357	k
Utilization =	47%	



6.2 Strut Connections

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

Front Strut		
Maximum Axial Load =	3.446	k
M12 Bolt Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	46%	

Rear Strut		
Maximum Axial Load =	3.668	k
M12 Bolt Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	49%	

Diagonal Strut		
Maximum Axial Load =	1.691	k
M12 Bolt Shear Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	23%	

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.

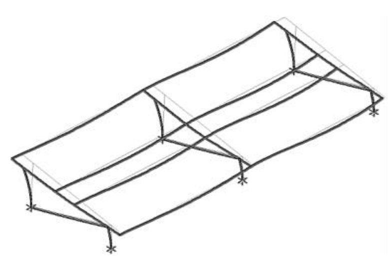
7. SEISMIC DESIGN

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} =	40.12	in
Allowable Story Drift for All Other Structures, Δ = {	$0.020h_{sx}$	
	0.802	in
Max Drift, Δ_{MAX} =	0.047	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 = 123 in

J = 0.432

340.276

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

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= 27.3 ksi

3.4.16

b/t = 32.195

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 25.1 ksi

3.4.16.1 Not Used

Rb/t =

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 37.0588

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

S1 = 36.9

m = 0.65

C_0 = 40.985

Cc = 41.015

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

S2 = 77.2

φF_L= φb[Bbr-mDbr*h/t]

φF_L= 43.2 ksi

φF_LSt= 25.1 ksi

Ix = 897074 mm^4

2.155 in^4

y = 41.015 mm

Sx = 1.335 in^3

M_{max}St = 2.788 k-ft

Weak Axis:

3.4.14

L_b = 123

J = 0.432

216.395

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

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= 28.6

3.4.16

b/t = 37.0588

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 23.1 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 32.195

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

S1 = 36.9

m = 0.65

C_0 = 45.5

Cc = 45.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 23.1 ksi

Iy = 446476 mm^4

1.073 in^4

x = 45.5 mm

Sy = 0.599 in^3

M_{max}Wk = 1.152 k-ft

Compression

3.4.9

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

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

3.4.10

Rb/t = 0.0

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

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

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

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

Girder = **BF0**

Strong Axis:

3.4.14

L_b = 88.9 in
J = 1.08
152.913

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

S1 = 0.51461

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

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

3.4.16

b/t = 16.2

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

S1 = 12.2

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

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

Weak Axis:

3.4.14

L_b = 88.9
J = 1.08
161.829

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

S1 = 0.51461

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

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

3.4.16

b/t = 7.4

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

S1 = 12.2

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

S2 = 46.7
φF_L= φyFcy
φF_L= 33.3 ksi

3.4.16.1 Used

Rb/t = 18.1

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

S1 = 1.1

$S2 = C_t$

S2 = 141.0

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

$\varphi F_L =$ 31.1 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.4

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

S1 = 35.2

m = 0.68

C_0 = 41.067

Cc = 43.717

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

S2 = 73.8

$\varphi F_L = 1.3\varphi yFcy$

$\varphi F_L =$ 43.2 ksi

$\varphi F_L St =$ 29.4 ksi

Ix = 984962 mm^4

2.366 in^4

y = 43.717 mm

Sx = 1.375 in^3

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

3.4.18

h/t = 16.2

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

S1 = 36.9

m = 0.65

C_0 = 40

Cc = 40

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

S2 = 77.3

$\varphi F_L = 1.3\varphi yFcy$

$\varphi F_L =$ 43.2 ksi

$\varphi F_L Wk =$ 33.3 ksi

Iy = 923544 mm^4

2.219 in^4

x = 40 mm

Sy = 1.409 in^3

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

Compression

3.4.9

b/t = 16.2

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

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

$\varphi F_L =$ 31.6 ksi

b/t = 7.4

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

3.4.10

Rb/t = 18.1

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

S1 = 6.87

S2 = 131.3

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

$\varphi F_L =$ 31.09 ksi

$\varphi F_L =$ 31.09 ksi

A = 1215.13 mm^2

1.88 in^2

$P_{max} =$ 58.55 kips

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

Strut = **55x55**

Strong Axis:

3.4.14

L_b = 24.8 in

J = 0.942

38.7028

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.4 ksi

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 28.2 ksi

Ix = 279836 mm^4

0.672 in^4

y = 27.5 mm

Sx = 0.621 in^3

M_{max}St = 1.460 k-ft

Weak Axis:

3.4.14

L_b = 24.8

J = 0.942

38.7028

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.4

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 28.2 ksi

Iy = 279836 mm^4

0.672 in^4

x = 27.5 mm

Sy = 0.621 in^3

M_{max}Wk = 1.460 k-ft

Compression

3.4.7

λ = 0.57371

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.87952

φF_L = φcc(Bc-Dc*λ)

φF_L = 28.0279 ksi

3.4.9

b/t = 24.5

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L = φc[Bp-1.6Dp*b/t]

φF_L = 28.2 ksi

b/t = 24.5

S1 = 12.21

S2 = 32.70

φF_L = φc[Bp-1.6Dp*b/t]

φF_L = 28.2 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

φF_L = φyFcy

φF_L = 33.25 ksi

φF_L = 28.03 ksi

A = 663.99 mm^2

1.03 in^2

P_{max} = 28.85 kips

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

Strut = **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 (weak)

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 28.2 ksi

Ix = 279836 mm^4

0.672 in^4

y = 27.5 mm

Sx = 0.621 in^3

M_{max}St = 1.460 k-ft

φF_LWk= 28.2 ksi

Iy = 279836 mm^4

0.672 in^4

x = 27.5 mm

Sy = 0.621 in^3

M_{max}Wk = 1.460 k-ft

Compression

3.4.7

λ = 2.00335

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.86047

φF_L= (φccFcy)/(λ²)

φF_L= 7.50396 ksi

3.4.9

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

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

3.4.10

Rb/t = 0.0

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

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

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

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

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

Strong Axis:

3.4.14

L_b = 55.91 in
J = 0.942
87.2529

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

S1 = 0.51461

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

S2 = 1701.56
φF_L= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
φF_L= 30.4 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

Weak Axis:

3.4.14

L_b = 55.91
J = 0.942
87.2529

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

S1 = 0.51461

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

S2 = 1701.56
φF_L= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
φF_L= 30.4

3.4.16

b/t = 24.5

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

S1 = 12.2

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

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

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.16.1

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 = 1.29339

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.76107

φF_L= (φccFcy)/(λ^2)

φF_L= 15.9235 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

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.25 ksi

$\varphi F_L =$ 15.92 ksi

A = 663.99 mm^2

1.03 in^2

$P_{max} =$ 16.39 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	-54.031	-54.031	0	0
2	M14	Y	-54.031	-54.031	0	0
3	M15	Y	-54.031	-54.031	0	0
4	M16	Y	-54.031	-54.031	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	-45.975	-45.975	0	0
2	M14	y	-45.975	-45.975	0	0
3	M15	y	-72.246	-72.246	0	0
4	M16	y	-72.246	-72.246	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	105.085	105.085	0	0
2	M14	y	80.565	80.565	0	0
3	M15	y	43.785	43.785	0	0
4	M16	y	43.785	43.785	0	0

Load Combinations

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

Load Combinations (Continued)

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

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N8	max	451.93	2	1105.791	1	.902	1	.004	1	0	1	0	1
2		min	-593.076	3	-1252.901	3	.038	15	0	15	0	1	0	1
3	N7	max	.038	9	1220.93	1	-.373	15	0	15	0	1	0	1
4		min	-.118	2	-225.889	3	-9.871	1	-.021	1	0	1	0	1
5	N15	max	.026	9	3446.451	1	0	10	0	10	0	1	0	1
6		min	-1.509	2	-807.566	3	0	11	0	11	0	1	0	1
7	N16	max	1750.355	2	3744.752	1	0	2	0	2	0	1	0	1
8		min	-1878.332	3	-4111.035	3	0	3	0	3	0	1	0	1
9	N23	max	.038	9	1220.93	1	9.871	1	.021	1	0	1	0	1
10		min	-.118	2	-225.889	3	.373	15	0	15	0	1	0	1
11	N24	max	451.93	2	1105.791	1	-.038	15	0	15	0	1	0	1
12		min	-593.076	3	-1252.901	3	-.902	1	-.004	1	0	1	0	1
13	Totals:	max	2652.468	2	11844.645	1	0	10						
14		min	-3065.053	3	-7876.18	3	0	11						

Envelope Member Section Forces

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
1	M13	1	max	104.755	1	491.305	1	-6.033	15	0	3	.25	1	0	1
2			min	3.83	15	-626.94	3	-165.679	1	-.013	1	.009	15	0	3
3		2	max	104.755	1	344.222	1	-4.641	15	0	3	.083	1	.608	3
4			min	3.83	15	-441.187	3	-127.391	1	-.013	1	.003	15	-.476	1
5		3	max	104.755	1	197.139	1	-3.249	15	0	3	0	3	1.005	3
6			min	3.83	15	-255.434	3	-89.103	1	-.013	1	-.04	1	-.784	1
7		4	max	104.755	1	50.057	1	-1.857	15	0	3	-.004	12	1.19	3
8			min	3.83	15	-69.68	3	-50.816	1	-.013	1	-.12	1	-.925	1
9		5	max	104.755	1	116.073	3	-.466	15	0	3	-.006	12	1.164	3
10			min	3.83	15	-97.026	1	-12.528	1	-.013	1	-.156	1	-.898	1
11		6	max	104.755	1	301.826	3	25.76	1	0	3	-.005	15	.926	3
12			min	3.83	15	-244.109	1	.445	12	-.013	1	-.149	1	-.704	1
13		7	max	104.755	1	487.58	3	64.047	1	0	3	-.004	15	.476	3
14			min	3.83	15	-391.192	1	1.837	12	-.013	1	-.097	1	-.342	1
15		8	max	104.755	1	673.333	3	102.335	1	0	3	0	10	.187	1
16			min	3.83	15	-538.275	1	3.228	12	-.013	1	-.003	1	-.185	3
17		9	max	104.755	1	859.086	3	140.623	1	0	3	.136	1	.884	1
18			min	3.83	15	-685.358	1	4.62	12	-.013	1	.003	12	-1.058	3
19		10	max	104.755	1	832.441	1	-6.011	12	0	3	.318	1	1.748	1
20			min	3.83	15	-1044.839	3	-178.91	1	-.013	1	.009	12	-2.142	3
21		11	max	104.755	1	685.358	1	-4.62	12	.013	1	.136	1	.884	1
22			min	3.83	15	-859.086	3	-140.623	1	0	3	.003	12	-1.058	3
23		12	max	104.755	1	538.275	1	-3.228	12	.013	1	0	10	.187	1
24			min	3.83	15	-673.333	3	-102.335	1	0	3	-.003	1	-.185	3
25		13	max	104.755	1	391.192	1	-1.837	12	.013	1	-.004	15	.476	3
26			min	3.83	15	-487.58	3	-64.047	1	0	3	-.097	1	-.342	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
27		14	max	104.755	1	244.109	1	-.445	12	.013	1	-.005	15	.926	3
28			min	3.83	15	-301.826	3	-25.76	1	0	3	-.149	1	-.704	1
29		15	max	104.755	1	97.026	1	12.528	1	.013	1	-.006	12	1.164	3
30			min	3.83	15	-116.073	3	.466	15	0	3	-.156	1	-.898	1
31		16	max	104.755	1	69.68	3	50.816	1	.013	1	-.004	12	1.19	3
32			min	3.83	15	-50.057	1	1.857	15	0	3	-.12	1	-.925	1
33		17	max	104.755	1	255.434	3	89.103	1	.013	1	0	3	1.005	3
34			min	3.83	15	-197.139	1	3.249	15	0	3	-.04	1	-.784	1
35		18	max	104.755	1	441.187	3	127.391	1	.013	1	.083	1	.608	3
36			min	3.83	15	-344.222	1	4.641	15	0	3	.003	15	-.476	1
37		19	max	104.755	1	626.94	3	165.679	1	.013	1	.25	1	0	1
38			min	3.83	15	-491.305	1	6.033	15	0	3	.009	15	0	3
39	M14	1	max	47.989	1	518.364	1	-6.215	15	.008	3	.284	1	0	1
40			min	1.758	15	-489.184	3	-170.707	1	-.011	1	.01	15	0	3
41		2	max	47.989	1	371.282	1	-4.824	15	.008	3	.111	1	.477	3
42			min	1.758	15	-348.112	3	-132.419	1	-.011	1	.004	15	-.507	1
43		3	max	47.989	1	224.199	1	-3.432	15	.008	3	.001	3	.793	3
44			min	1.758	15	-207.04	3	-94.132	1	-.011	1	-.018	1	-.846	1
45		4	max	47.989	1	77.116	1	-2.04	15	.008	3	-.003	12	.948	3
46			min	1.758	15	-65.967	3	-55.844	1	-.011	1	-.103	1	-1.017	1
47		5	max	47.989	1	75.105	3	-.648	15	.008	3	-.005	12	.943	3
48			min	1.758	15	-69.967	1	-17.556	1	-.011	1	-.145	1	-1.021	1
49		6	max	47.989	1	216.178	3	20.731	1	.008	3	-.005	15	.777	3
50			min	1.758	15	-217.05	1	.269	12	-.011	1	-.143	1	-.858	1
51		7	max	47.989	1	357.25	3	59.019	1	.008	3	-.004	15	.451	3
52			min	1.758	15	-364.133	1	1.66	12	-.011	1	-.098	1	-.527	1
53		8	max	47.989	1	498.322	3	97.307	1	.008	3	0	10	0	15
54			min	1.758	15	-511.216	1	3.052	12	-.011	1	-.009	1	-.038	2
55		9	max	47.989	1	639.395	3	135.594	1	.008	3	.124	1	.637	1
56			min	1.758	15	-658.298	1	4.443	12	-.011	1	.003	12	-.684	3
57		10	max	47.989	1	805.381	1	-5.835	12	.008	3	.3	1	1.471	1
58			min	1.758	15	-780.467	3	-173.882	1	-.011	1	.008	12	-1.493	3
59		11	max	47.989	1	658.298	1	-4.443	12	.011	1	.124	1	.637	1
60			min	1.758	15	-639.395	3	-135.594	1	-.008	3	.003	12	-.684	3
61		12	max	47.989	1	511.216	1	-3.052	12	.011	1	0	10	0	15
62			min	1.758	15	-498.322	3	-97.307	1	-.008	3	-.009	1	-.038	2
63		13	max	47.989	1	364.133	1	-1.66	12	.011	1	-.004	15	.451	3
64			min	1.758	15	-357.25	3	-59.019	1	-.008	3	-.098	1	-.527	1
65		14	max	47.989	1	217.05	1	-.269	12	.011	1	-.005	15	.777	3
66			min	1.758	15	-216.178	3	-20.731	1	-.008	3	-.143	1	-.858	1
67		15	max	47.989	1	69.967	1	17.556	1	.011	1	-.005	12	.943	3
68			min	1.758	15	-75.105	3	.648	15	-.008	3	-.145	1	-1.021	1
69		16	max	47.989	1	65.967	3	55.844	1	.011	1	-.003	12	.948	3
70			min	1.758	15	-77.116	1	2.04	15	-.008	3	-.103	1	-1.017	1
71		17	max	47.989	1	207.04	3	94.132	1	.011	1	.001	3	.793	3
72			min	1.758	15	-224.199	1	3.432	15	-.008	3	-.018	1	-.846	1
73		18	max	47.989	1	348.112	3	132.419	1	.011	1	.111	1	.477	3
74			min	1.758	15	-371.282	1	4.824	15	-.008	3	.004	15	-.507	1
75		19	max	47.989	1	489.184	3	170.707	1	.011	1	.284	1	0	1
76			min	1.758	15	-518.364	1	6.215	15	-.008	3	.01	15	0	3
77	M15	1	max	-1.851	15	605.126	2	-6.214	15	.011	1	.284	1	0	2
78			min	-50.501	1	-263.189	3	-170.683	1	-.006	3	.01	15	0	12
79		2	max	-1.851	15	431.89	2	-4.822	15	.011	1	.111	1	.258	3
80			min	-50.501	1	-189.138	3	-132.395	1	-.006	3	.004	15	-.591	2
81		3	max	-1.851	15	258.654	2	-3.431	15	.011	1	.001	3	.431	3
82			min	-50.501	1	-115.087	3	-94.107	1	-.006	3	-.018	1	-.984	2
83		4	max	-1.851	15	86.076	1	-2.039	15	.011	1	-.003	12	.52	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	-50.501	1	-41.036	3	-55.82	1	-.006	3	-.103	1	-1.18	2
85		5	max	-1.851	15	33.015	3	-.647	15	.011	1	-.005	12	.524	3
86			min	-50.501	1	-87.819	2	-17.532	1	-.006	3	-.145	1	-1.178	2
87		6	max	-1.851	15	107.066	3	20.756	1	.011	1	-.005	15	.445	3
88			min	-50.501	1	-261.055	2	.306	12	-.006	3	-.143	1	-.98	2
89		7	max	-1.851	15	181.117	3	59.043	1	.011	1	-.004	15	.28	3
90			min	-50.501	1	-434.291	2	1.697	12	-.006	3	-.098	1	-.588	1
91		8	max	-1.851	15	255.168	3	97.331	1	.011	1	0	10	.032	3
92			min	-50.501	1	-607.527	2	3.089	12	-.006	3	-.009	1	-.008	9
93		9	max	-1.851	15	329.219	3	135.619	1	.011	1	.124	1	.8	2
94			min	-50.501	1	-780.763	2	4.48	12	-.006	3	.003	12	-.301	3
95		10	max	-1.851	15	953.999	2	-5.872	12	.011	1	.3	1	1.788	2
96			min	-50.501	1	-403.27	3	-173.906	1	-.006	3	.009	12	-.718	3
97		11	max	-1.851	15	780.763	2	-4.48	12	.006	3	.124	1	.8	2
98			min	-50.501	1	-329.219	3	-135.619	1	-.011	1	.003	12	-.301	3
99		12	max	-1.851	15	607.527	2	-3.089	12	.006	3	0	10	.032	3
100			min	-50.501	1	-255.168	3	-97.331	1	-.011	1	-.009	1	-.008	9
101		13	max	-1.851	15	434.291	2	-1.697	12	.006	3	-.004	15	.28	3
102			min	-50.501	1	-181.117	3	-59.043	1	-.011	1	-.098	1	-.588	1
103		14	max	-1.851	15	261.055	2	-.306	12	.006	3	-.005	15	.445	3
104			min	-50.501	1	-107.066	3	-20.756	1	-.011	1	-.143	1	-.98	2
105		15	max	-1.851	15	87.819	2	17.532	1	.006	3	-.005	12	.524	3
106			min	-50.501	1	-33.015	3	.647	15	-.011	1	-.145	1	-1.178	2
107		16	max	-1.851	15	41.036	3	55.82	1	.006	3	-.003	12	.52	3
108			min	-50.501	1	-86.076	1	2.039	15	-.011	1	-.103	1	-1.18	2
109		17	max	-1.851	15	115.087	3	94.107	1	.006	3	.001	3	.431	3
110			min	-50.501	1	-258.654	2	3.431	15	-.011	1	-.018	1	-.984	2
111		18	max	-1.851	15	189.138	3	132.395	1	.006	3	.111	1	.258	3
112			min	-50.501	1	-431.89	2	4.822	15	-.011	1	.004	15	-.591	2
113		19	max	-1.851	15	263.189	3	170.683	1	.006	3	.284	1	0	2
114			min	-50.501	1	-605.126	2	6.214	15	-.011	1	.01	15	0	12
115	M16	1	max	-4.072	15	580.568	2	-6.039	15	.012	1	.251	1	0	2
116			min	-111.213	1	-246.225	3	-165.893	1	-.009	3	.009	15	0	3
117		2	max	-4.072	15	407.332	2	-4.647	15	.012	1	.084	1	.238	3
118			min	-111.213	1	-172.174	3	-127.605	1	-.009	3	.003	15	-.563	2
119		3	max	-4.072	15	234.096	2	-3.255	15	.012	1	0	12	.392	3
120			min	-111.213	1	-98.123	3	-89.318	1	-.009	3	-.04	1	-.928	2
121		4	max	-4.072	15	60.86	2	-1.863	15	.012	1	-.004	12	.462	3
122			min	-111.213	1	-24.072	3	-51.03	1	-.009	3	-.12	1	-1.096	2
123		5	max	-4.072	15	49.979	3	-.471	15	.012	1	-.006	12	.447	3
124			min	-111.213	1	-112.376	2	-12.742	1	-.009	3	-.156	1	-1.066	2
125		6	max	-4.072	15	124.03	3	25.545	1	.012	1	-.005	15	.348	3
126			min	-111.213	1	-285.612	2	.568	12	-.009	3	-.149	1	-.84	2
127		7	max	-4.072	15	198.082	3	63.833	1	.012	1	-.004	15	.164	3
128			min	-111.213	1	-458.848	2	1.959	12	-.009	3	-.098	1	-.416	2
129		8	max	-4.072	15	272.133	3	102.121	1	.012	1	0	10	.209	1
130			min	-111.213	1	-632.085	2	3.351	12	-.009	3	-.003	1	-.103	3
131		9	max	-4.072	15	346.184	3	140.408	1	.012	1	.135	1	1.024	2
132			min	-111.213	1	-805.321	2	4.742	12	-.009	3	.003	12	-.455	3
133		10	max	-4.072	15	978.557	2	-6.134	12	.012	1	.317	1	2.04	2
134			min	-111.213	1	-420.235	3	-178.696	1	-.009	3	.01	12	-.892	3
135		11	max	-4.072	15	805.321	2	-4.742	12	.009	3	.135	1	1.024	2
136			min	-111.213	1	-346.184	3	-140.408	1	-.012	1	.003	12	-.455	3
137		12	max	-4.072	15	632.085	2	-3.351	12	.009	3	0	10	.209	1
138			min	-111.213	1	-272.133	3	-102.121	1	-.012	1	-.003	1	-.103	3
139		13	max	-4.072	15	458.848	2	-1.959	12	.009	3	-.004	15	.164	3
140			min	-111.213	1	-198.082	3	-63.833	1	-.012	1	-.098	1	-.416	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
141		14	max	-4.072	15	285.612	2	-.568	12	.009	3	-.005	15	.348	3
142			min	-111.213	1	-124.03	3	-25.545	1	-.012	1	-.149	1	-.84	2
143		15	max	-4.072	15	112.376	2	12.742	1	.009	3	-.006	12	.447	3
144			min	-111.213	1	-49.979	3	.471	15	-.012	1	-.156	1	-1.066	2
145		16	max	-4.072	15	24.072	3	51.03	1	.009	3	-.004	12	.462	3
146			min	-111.213	1	-60.86	2	1.863	15	-.012	1	-.12	1	-1.096	2
147		17	max	-4.072	15	98.123	3	89.318	1	.009	3	0	12	.392	3
148			min	-111.213	1	-234.096	2	3.255	15	-.012	1	-.04	1	-.928	2
149		18	max	-4.072	15	172.174	3	127.605	1	.009	3	.084	1	.238	3
150			min	-111.213	1	-407.332	2	4.647	15	-.012	1	.003	15	-.563	2
151		19	max	-4.072	15	246.225	3	165.893	1	.009	3	.251	1	0	2
152			min	-111.213	1	-580.568	2	6.039	15	-.012	1	.009	15	0	3
153	M2	1	max	1084.378	1	2.026	4	.977	1	0	3	0	3	0	1
154			min	-1118.411	3	.477	15	.036	15	0	1	0	1	0	1
155		2	max	1084.757	1	1.992	4	.977	1	0	3	0	1	0	15
156			min	-1118.126	3	.469	15	.036	15	0	1	0	15	0	4
157		3	max	1085.136	1	1.959	4	.977	1	0	3	0	1	0	15
158			min	-1117.842	3	.462	15	.036	15	0	1	0	15	-.001	4
159		4	max	1085.515	1	1.926	4	.977	1	0	3	0	1	0	15
160			min	-1117.557	3	.454	15	.036	15	0	1	0	15	-.002	4
161		5	max	1085.895	1	1.892	4	.977	1	0	3	0	1	0	15
162			min	-1117.273	3	.446	15	.036	15	0	1	0	15	-.002	4
163		6	max	1086.274	1	1.859	4	.977	1	0	3	.001	1	0	15
164			min	-1116.988	3	.438	15	.036	15	0	1	0	15	-.002	4
165		7	max	1086.653	1	1.825	4	.977	1	0	3	.001	1	0	15
166			min	-1116.704	3	.43	15	.036	15	0	1	0	15	-.003	4
167		8	max	1087.032	1	1.792	4	.977	1	0	3	.002	1	0	15
168			min	-1116.419	3	.422	15	.036	15	0	1	0	15	-.003	4
169		9	max	1087.412	1	1.759	4	.977	1	0	3	.002	1	0	15
170			min	-1116.135	3	.415	15	.036	15	0	1	0	15	-.004	4
171		10	max	1087.791	1	1.725	4	.977	1	0	3	.002	1	-.001	15
172			min	-1115.851	3	.407	15	.036	15	0	1	0	15	-.004	4
173		11	max	1088.17	1	1.692	4	.977	1	0	3	.002	1	-.001	15
174			min	-1115.566	3	.399	15	.036	15	0	1	0	15	-.005	4
175		12	max	1088.549	1	1.659	4	.977	1	0	3	.003	1	-.001	15
176			min	-1115.282	3	.391	15	.036	15	0	1	0	15	-.005	4
177		13	max	1088.929	1	1.625	4	.977	1	0	3	.003	1	-.001	15
178			min	-1114.997	3	.383	15	.036	15	0	1	0	15	-.006	4
179		14	max	1089.308	1	1.592	4	.977	1	0	3	.003	1	-.001	15
180			min	-1114.713	3	.375	15	.036	15	0	1	0	15	-.006	4
181		15	max	1089.687	1	1.558	4	.977	1	0	3	.003	1	-.002	15
182			min	-1114.428	3	.367	15	.036	15	0	1	0	15	-.006	4
183		16	max	1090.066	1	1.525	4	.977	1	0	3	.004	1	-.002	15
184			min	-1114.144	3	.36	15	.036	15	0	1	0	15	-.007	4
185		17	max	1090.446	1	1.492	4	.977	1	0	3	.004	1	-.002	15
186			min	-1113.859	3	.352	15	.036	15	0	1	0	15	-.007	4
187		18	max	1090.825	1	1.458	4	.977	1	0	3	.004	1	-.002	15
188			min	-1113.575	3	.344	15	.036	15	0	1	0	15	-.008	4
189		19	max	1091.204	1	1.425	4	.977	1	0	3	.004	1	-.002	15
190			min	-1113.291	3	.336	15	.036	15	0	1	0	15	-.008	4
191	M3	1	max	402.193	2	7.982	4	.08	1	0	3	0	1	.008	4
192			min	-536.396	3	1.877	15	.003	15	0	1	0	15	.002	15
193		2	max	402.023	2	7.212	4	.08	1	0	3	0	1	.005	4
194			min	-536.524	3	1.696	15	.003	15	0	1	0	15	0	12
195		3	max	401.853	2	6.442	4	.08	1	0	3	0	1	.002	2
196			min	-536.651	3	1.515	15	.003	15	0	1	0	15	0	3
197		4	max	401.682	2	5.672	4	.08	1	0	3	0	1	0	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
198			min	-536.779	3	1.334	15	.003	15	0	1	0	15	-.002	3
199		5	max	401.512	2	4.902	4	.08	1	0	3	0	1	0	15
200			min	-536.907	3	1.153	15	.003	15	0	1	0	15	-.003	4
201		6	max	401.342	2	4.132	4	.08	1	0	3	0	1	-.001	15
202			min	-537.035	3	.972	15	.003	15	0	1	0	15	-.005	4
203		7	max	401.171	2	3.362	4	.08	1	0	3	0	1	-.001	15
204			min	-537.162	3	.791	15	.003	15	0	1	0	15	-.006	4
205		8	max	401.001	2	2.592	4	.08	1	0	3	0	1	-.002	15
206			min	-537.29	3	.61	15	.003	15	0	1	0	15	-.008	4
207		9	max	400.831	2	1.822	4	.08	1	0	3	0	1	-.002	15
208			min	-537.418	3	.429	15	.003	15	0	1	0	15	-.009	4
209		10	max	400.66	2	1.052	4	.08	1	0	3	0	1	-.002	15
210			min	-537.546	3	.248	15	.003	15	0	1	0	15	-.009	4
211		11	max	400.49	2	.364	2	.08	1	0	3	0	1	-.002	15
212			min	-537.673	3	-.033	3	.003	15	0	1	0	15	-.009	4
213		12	max	400.32	2	-.114	15	.08	1	0	3	0	1	-.002	15
214			min	-537.801	3	-.488	4	.003	15	0	1	0	15	-.009	4
215		13	max	400.149	2	-.295	15	.08	1	0	3	0	1	-.002	15
216			min	-537.929	3	-1.258	4	.003	15	0	1	0	15	-.009	4
217		14	max	399.979	2	-.476	15	.08	1	0	3	0	1	-.002	15
218			min	-538.057	3	-2.028	4	.003	15	0	1	0	15	-.008	4
219		15	max	399.809	2	-.657	15	.08	1	0	3	0	1	-.002	15
220			min	-538.184	3	-2.798	4	.003	15	0	1	0	15	-.007	4
221		16	max	399.638	2	-.838	15	.08	1	0	3	0	1	-.001	15
222			min	-538.312	3	-3.568	4	.003	15	0	1	0	15	-.006	4
223		17	max	399.468	2	-1.019	15	.08	1	0	3	0	1	-.001	15
224			min	-538.44	3	-4.338	4	.003	15	0	1	0	15	-.004	4
225		18	max	399.298	2	-1.2	15	.08	1	0	3	0	1	0	15
226			min	-538.568	3	-5.108	4	.003	15	0	1	0	15	-.002	4
227		19	max	399.127	2	-1.381	15	.08	1	0	3	0	1	0	1
228			min	-538.695	3	-5.878	4	.003	15	0	1	0	15	0	1
229	M4	1	max	1217.864	1	0	1	-.374	15	0	1	0	1	0	1
230			min	-228.189	3	0	1	-10.25	1	0	1	0	15	0	1
231		2	max	1218.034	1	0	1	-.374	15	0	1	0	12	0	1
232			min	-228.061	3	0	1	-10.25	1	0	1	0	1	0	1
233		3	max	1218.205	1	0	1	-.374	15	0	1	0	15	0	1
234			min	-227.933	3	0	1	-10.25	1	0	1	-.002	1	0	1
235		4	max	1218.375	1	0	1	-.374	15	0	1	0	15	0	1
236			min	-227.805	3	0	1	-10.25	1	0	1	-.003	1	0	1
237		5	max	1218.545	1	0	1	-.374	15	0	1	0	15	0	1
238			min	-227.678	3	0	1	-10.25	1	0	1	-.004	1	0	1
239		6	max	1218.716	1	0	1	-.374	15	0	1	0	15	0	1
240			min	-227.55	3	0	1	-10.25	1	0	1	-.005	1	0	1
241		7	max	1218.886	1	0	1	-.374	15	0	1	0	15	0	1
242			min	-227.422	3	0	1	-10.25	1	0	1	-.007	1	0	1
243		8	max	1219.056	1	0	1	-.374	15	0	1	0	15	0	1
244			min	-227.294	3	0	1	-10.25	1	0	1	-.008	1	0	1
245		9	max	1219.227	1	0	1	-.374	15	0	1	0	15	0	1
246			min	-227.167	3	0	1	-10.25	1	0	1	-.009	1	0	1
247		10	max	1219.397	1	0	1	-.374	15	0	1	0	15	0	1
248			min	-227.039	3	0	1	-10.25	1	0	1	-.01	1	0	1
249		11	max	1219.567	1	0	1	-.374	15	0	1	0	15	0	1
250			min	-226.911	3	0	1	-10.25	1	0	1	-.011	1	0	1
251		12	max	1219.738	1	0	1	-.374	15	0	1	0	15	0	1
252			min	-226.783	3	0	1	-10.25	1	0	1	-.012	1	0	1
253		13	max	1219.908	1	0	1	-.374	15	0	1	0	15	0	1
254			min	-226.656	3	0	1	-10.25	1	0	1	-.014	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	1220.078	1	0	1	-.374	15	0	1	0	15	0	1
256			min	-226.528	3	0	1	-10.25	1	0	1	-.015	1	0	1
257		15	max	1220.249	1	0	1	-.374	15	0	1	0	15	0	1
258			min	-226.4	3	0	1	-10.25	1	0	1	-.016	1	0	1
259		16	max	1220.419	1	0	1	-.374	15	0	1	0	15	0	1
260			min	-226.272	3	0	1	-10.25	1	0	1	-.017	1	0	1
261		17	max	1220.589	1	0	1	-.374	15	0	1	0	15	0	1
262			min	-226.144	3	0	1	-10.25	1	0	1	-.018	1	0	1
263		18	max	1220.76	1	0	1	-.374	15	0	1	0	15	0	1
264			min	-226.017	3	0	1	-10.25	1	0	1	-.019	1	0	1
265		19	max	1220.93	1	0	1	-.374	15	0	1	0	15	0	1
266			min	-225.889	3	0	1	-10.25	1	0	1	-.021	1	0	1
267	M6	1	max	3495.575	1	2.458	2	0	1	0	1	0	1	0	1
268			min	-3667.513	3	.137	12	0	1	0	1	0	1	0	1
269		2	max	3495.954	1	2.432	2	0	1	0	1	0	1	0	3
270			min	-3667.229	3	.12	3	0	1	0	1	0	1	0	2
271		3	max	3496.333	1	2.406	2	0	1	0	1	0	1	0	3
272			min	-3666.944	3	.101	3	0	1	0	1	0	1	-.001	2
273		4	max	3496.713	1	2.38	2	0	1	0	1	0	1	0	3
274			min	-3666.66	3	.081	3	0	1	0	1	0	1	-.002	2
275		5	max	3497.092	1	2.354	2	0	1	0	1	0	1	0	3
276			min	-3666.375	3	.062	3	0	1	0	1	0	1	-.002	2
277		6	max	3497.471	1	2.328	2	0	1	0	1	0	1	0	3
278			min	-3666.091	3	.042	3	0	1	0	1	0	1	-.003	2
279		7	max	3497.85	1	2.302	2	0	1	0	1	0	1	0	3
280			min	-3665.806	3	.023	3	0	1	0	1	0	1	-.004	2
281		8	max	3498.23	1	2.276	2	0	1	0	1	0	1	0	3
282			min	-3665.522	3	.003	3	0	1	0	1	0	1	-.004	2
283		9	max	3498.609	1	2.25	2	0	1	0	1	0	1	0	3
284			min	-3665.237	3	-.016	3	0	1	0	1	0	1	-.005	2
285		10	max	3498.988	1	2.224	2	0	1	0	1	0	1	0	3
286			min	-3664.953	3	-.036	3	0	1	0	1	0	1	-.005	2
287		11	max	3499.367	1	2.198	2	0	1	0	1	0	1	0	3
288			min	-3664.669	3	-.055	3	0	1	0	1	0	1	-.006	2
289		12	max	3499.747	1	2.172	2	0	1	0	1	0	1	0	3
290			min	-3664.384	3	-.075	3	0	1	0	1	0	1	-.007	2
291		13	max	3500.126	1	2.146	2	0	1	0	1	0	1	0	3
292			min	-3664.1	3	-.094	3	0	1	0	1	0	1	-.007	2
293		14	max	3500.505	1	2.12	2	0	1	0	1	0	1	0	3
294			min	-3663.815	3	-.114	3	0	1	0	1	0	1	-.008	2
295		15	max	3500.884	1	2.094	2	0	1	0	1	0	1	0	3
296			min	-3663.531	3	-.133	3	0	1	0	1	0	1	-.008	2
297		16	max	3501.264	1	2.068	2	0	1	0	1	0	1	0	3
298			min	-3663.246	3	-.153	3	0	1	0	1	0	1	-.009	2
299		17	max	3501.643	1	2.042	2	0	1	0	1	0	1	0	3
300			min	-3662.962	3	-.172	3	0	1	0	1	0	1	-.009	2
301		18	max	3502.022	1	2.016	2	0	1	0	1	0	1	0	3
302			min	-3662.677	3	-.192	3	0	1	0	1	0	1	-.01	2
303		19	max	3502.401	1	1.99	2	0	1	0	1	0	1	0	3
304			min	-3662.393	3	-.211	3	0	1	0	1	0	1	-.01	2
305	M7	1	max	1602.421	2	8.021	4	0	1	0	1	0	1	.01	2
306			min	-1688.911	3	1.882	15	0	1	0	1	0	1	0	3
307		2	max	1602.251	2	7.251	4	0	1	0	1	0	1	.008	2
308			min	-1689.039	3	1.701	15	0	1	0	1	0	1	-.002	3
309		3	max	1602.081	2	6.481	4	0	1	0	1	0	1	.005	2
310			min	-1689.167	3	1.52	15	0	1	0	1	0	1	-.003	3
311		4	max	1601.91	2	5.711	4	0	1	0	1	0	1	.003	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
312			min	-1689.295	3	1.339	15	0	1	0	1	0	1	-.004	3
313		5	max	1601.74	2	4.941	4	0	1	0	1	0	1	0	2
314			min	-1689.422	3	1.158	15	0	1	0	1	0	1	-.005	3
315		6	max	1601.57	2	4.171	4	0	1	0	1	0	1	0	2
316			min	-1689.55	3	.977	15	0	1	0	1	0	1	-.006	3
317		7	max	1601.399	2	3.401	4	0	1	0	1	0	1	-.001	15
318			min	-1689.678	3	.796	15	0	1	0	1	0	1	-.007	3
319		8	max	1601.229	2	2.631	4	0	1	0	1	0	1	-.002	15
320			min	-1689.806	3	.612	12	0	1	0	1	0	1	-.007	4
321		9	max	1601.059	2	1.955	2	0	1	0	1	0	1	-.002	15
322			min	-1689.933	3	.312	12	0	1	0	1	0	1	-.008	4
323		10	max	1600.888	2	1.355	2	0	1	0	1	0	1	-.002	15
324			min	-1690.061	3	-.022	3	0	1	0	1	0	1	-.009	4
325		11	max	1600.718	2	.755	2	0	1	0	1	0	1	-.002	15
326			min	-1690.189	3	-.472	3	0	1	0	1	0	1	-.009	4
327		12	max	1600.548	2	.155	2	0	1	0	1	0	1	-.002	15
328			min	-1690.317	3	-.922	3	0	1	0	1	0	1	-.009	4
329		13	max	1600.377	2	-.29	15	0	1	0	1	0	1	-.002	15
330			min	-1690.444	3	-1.372	3	0	1	0	1	0	1	-.009	4
331		14	max	1600.207	2	-.471	15	0	1	0	1	0	1	-.002	15
332			min	-1690.572	3	-1.989	4	0	1	0	1	0	1	-.008	4
333		15	max	1600.036	2	-.652	15	0	1	0	1	0	1	-.002	15
334			min	-1690.7	3	-2.759	4	0	1	0	1	0	1	-.007	4
335		16	max	1599.866	2	-.833	15	0	1	0	1	0	1	-.001	15
336			min	-1690.828	3	-3.529	4	0	1	0	1	0	1	-.006	4
337		17	max	1599.696	2	-1.014	15	0	1	0	1	0	1	-.001	15
338			min	-1690.955	3	-4.299	4	0	1	0	1	0	1	-.004	4
339		18	max	1599.525	2	-1.195	15	0	1	0	1	0	1	0	15
340			min	-1691.083	3	-5.069	4	0	1	0	1	0	1	-.002	4
341		19	max	1599.355	2	-1.376	15	0	1	0	1	0	1	0	1
342			min	-1691.211	3	-5.839	4	0	1	0	1	0	1	0	1
343	M8	1	max	3443.385	1	0	1	0	1	0	1	0	1	0	1
344			min	-809.865	3	0	1	0	1	0	1	0	1	0	1
345		2	max	3443.556	1	0	1	0	1	0	1	0	1	0	1
346			min	-809.738	3	0	1	0	1	0	1	0	1	0	1
347		3	max	3443.726	1	0	1	0	1	0	1	0	1	0	1
348			min	-809.61	3	0	1	0	1	0	1	0	1	0	1
349		4	max	3443.896	1	0	1	0	1	0	1	0	1	0	1
350			min	-809.482	3	0	1	0	1	0	1	0	1	0	1
351		5	max	3444.067	1	0	1	0	1	0	1	0	1	0	1
352			min	-809.354	3	0	1	0	1	0	1	0	1	0	1
353		6	max	3444.237	1	0	1	0	1	0	1	0	1	0	1
354			min	-809.227	3	0	1	0	1	0	1	0	1	0	1
355		7	max	3444.407	1	0	1	0	1	0	1	0	1	0	1
356			min	-809.099	3	0	1	0	1	0	1	0	1	0	1
357		8	max	3444.578	1	0	1	0	1	0	1	0	1	0	1
358			min	-808.971	3	0	1	0	1	0	1	0	1	0	1
359		9	max	3444.748	1	0	1	0	1	0	1	0	1	0	1
360			min	-808.843	3	0	1	0	1	0	1	0	1	0	1
361		10	max	3444.918	1	0	1	0	1	0	1	0	1	0	1
362			min	-808.715	3	0	1	0	1	0	1	0	1	0	1
363		11	max	3445.089	1	0	1	0	1	0	1	0	1	0	1
364			min	-808.588	3	0	1	0	1	0	1	0	1	0	1
365		12	max	3445.259	1	0	1	0	1	0	1	0	1	0	1
366			min	-808.46	3	0	1	0	1	0	1	0	1	0	1
367		13	max	3445.429	1	0	1	0	1	0	1	0	1	0	1
368			min	-808.332	3	0	1	0	1	0	1	0	1	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
369		14	max	3445.6	1	0	1	0	1	0	1	0	1	0	1
370			min	-808.204	3	0	1	0	1	0	1	0	1	0	1
371		15	max	3445.77	1	0	1	0	1	0	1	0	1	0	1
372			min	-808.077	3	0	1	0	1	0	1	0	1	0	1
373		16	max	3445.94	1	0	1	0	1	0	1	0	1	0	1
374			min	-807.949	3	0	1	0	1	0	1	0	1	0	1
375		17	max	3446.111	1	0	1	0	1	0	1	0	1	0	1
376			min	-807.821	3	0	1	0	1	0	1	0	1	0	1
377		18	max	3446.281	1	0	1	0	1	0	1	0	1	0	1
378			min	-807.693	3	0	1	0	1	0	1	0	1	0	1
379		19	max	3446.451	1	0	1	0	1	0	1	0	1	0	1
380			min	-807.566	3	0	1	0	1	0	1	0	1	0	1
381	M10	1	max	1084.378	1	2.026	4	-.036	15	0	1	0	1	0	1
382			min	-1118.411	3	.477	15	-.977	1	0	3	0	3	0	1
383		2	max	1084.757	1	1.992	4	-.036	15	0	1	0	15	0	15
384			min	-1118.126	3	.469	15	-.977	1	0	3	0	1	0	4
385		3	max	1085.136	1	1.959	4	-.036	15	0	1	0	15	0	15
386			min	-1117.842	3	.462	15	-.977	1	0	3	0	1	-.001	4
387		4	max	1085.515	1	1.926	4	-.036	15	0	1	0	15	0	15
388			min	-1117.557	3	.454	15	-.977	1	0	3	0	1	-.002	4
389		5	max	1085.895	1	1.892	4	-.036	15	0	1	0	15	0	15
390			min	-1117.273	3	.446	15	-.977	1	0	3	0	1	-.002	4
391		6	max	1086.274	1	1.859	4	-.036	15	0	1	0	15	0	15
392			min	-1116.988	3	.438	15	-.977	1	0	3	-.001	1	-.002	4
393		7	max	1086.653	1	1.825	4	-.036	15	0	1	0	15	0	15
394			min	-1116.704	3	.43	15	-.977	1	0	3	-.001	1	-.003	4
395		8	max	1087.032	1	1.792	4	-.036	15	0	1	0	15	0	15
396			min	-1116.419	3	.422	15	-.977	1	0	3	-.002	1	-.003	4
397		9	max	1087.412	1	1.759	4	-.036	15	0	1	0	15	0	15
398			min	-1116.135	3	.415	15	-.977	1	0	3	-.002	1	-.004	4
399		10	max	1087.791	1	1.725	4	-.036	15	0	1	0	15	-.001	15
400			min	-1115.851	3	.407	15	-.977	1	0	3	-.002	1	-.004	4
401		11	max	1088.17	1	1.692	4	-.036	15	0	1	0	15	-.001	15
402			min	-1115.566	3	.399	15	-.977	1	0	3	-.002	1	-.005	4
403		12	max	1088.549	1	1.659	4	-.036	15	0	1	0	15	-.001	15
404			min	-1115.282	3	.391	15	-.977	1	0	3	-.003	1	-.005	4
405		13	max	1088.929	1	1.625	4	-.036	15	0	1	0	15	-.001	15
406			min	-1114.997	3	.383	15	-.977	1	0	3	-.003	1	-.006	4
407		14	max	1089.308	1	1.592	4	-.036	15	0	1	0	15	-.001	15
408			min	-1114.713	3	.375	15	-.977	1	0	3	-.003	1	-.006	4
409		15	max	1089.687	1	1.558	4	-.036	15	0	1	0	15	-.002	15
410			min	-1114.428	3	.367	15	-.977	1	0	3	-.003	1	-.006	4
411		16	max	1090.066	1	1.525	4	-.036	15	0	1	0	15	-.002	15
412			min	-1114.144	3	.36	15	-.977	1	0	3	-.004	1	-.007	4
413		17	max	1090.446	1	1.492	4	-.036	15	0	1	0	15	-.002	15
414			min	-1113.859	3	.352	15	-.977	1	0	3	-.004	1	-.007	4
415		18	max	1090.825	1	1.458	4	-.036	15	0	1	0	15	-.002	15
416			min	-1113.575	3	.344	15	-.977	1	0	3	-.004	1	-.008	4
417		19	max	1091.204	1	1.425	4	-.036	15	0	1	0	15	-.002	15
418			min	-1113.291	3	.336	15	-.977	1	0	3	-.004	1	-.008	4
419	M11	1	max	402.193	2	7.982	4	-.003	15	0	1	0	15	.008	4
420			min	-536.396	3	1.877	15	-.08	1	0	3	0	1	.002	15
421		2	max	402.023	2	7.212	4	-.003	15	0	1	0	15	.005	4
422			min	-536.524	3	1.696	15	-.08	1	0	3	0	1	0	12
423		3	max	401.853	2	6.442	4	-.003	15	0	1	0	15	.002	2
424			min	-536.651	3	1.515	15	-.08	1	0	3	0	1	0	3
425		4	max	401.682	2	5.672	4	-.003	15	0	1	0	15	0	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
426			min	-536.779	3	1.334	15	-.08	1	0	3	0	1	-.002	3
427		5	max	401.512	2	4.902	4	-.003	15	0	1	0	15	0	15
428			min	-536.907	3	1.153	15	-.08	1	0	3	0	1	-.003	4
429		6	max	401.342	2	4.132	4	-.003	15	0	1	0	15	-.001	15
430			min	-537.035	3	.972	15	-.08	1	0	3	0	1	-.005	4
431		7	max	401.171	2	3.362	4	-.003	15	0	1	0	15	-.001	15
432			min	-537.162	3	.791	15	-.08	1	0	3	0	1	-.006	4
433		8	max	401.001	2	2.592	4	-.003	15	0	1	0	15	-.002	15
434			min	-537.29	3	.61	15	-.08	1	0	3	0	1	-.008	4
435		9	max	400.831	2	1.822	4	-.003	15	0	1	0	15	-.002	15
436			min	-537.418	3	.429	15	-.08	1	0	3	0	1	-.009	4
437		10	max	400.66	2	1.052	4	-.003	15	0	1	0	15	-.002	15
438			min	-537.546	3	.248	15	-.08	1	0	3	0	1	-.009	4
439		11	max	400.49	2	.364	2	-.003	15	0	1	0	15	-.002	15
440			min	-537.673	3	-.033	3	-.08	1	0	3	0	1	-.009	4
441		12	max	400.32	2	-.114	15	-.003	15	0	1	0	15	-.002	15
442			min	-537.801	3	-.488	4	-.08	1	0	3	0	1	-.009	4
443		13	max	400.149	2	-.295	15	-.003	15	0	1	0	15	-.002	15
444			min	-537.929	3	-1.258	4	-.08	1	0	3	0	1	-.009	4
445		14	max	399.979	2	-.476	15	-.003	15	0	1	0	15	-.002	15
446			min	-538.057	3	-2.028	4	-.08	1	0	3	0	1	-.008	4
447		15	max	399.809	2	-.657	15	-.003	15	0	1	0	15	-.002	15
448			min	-538.184	3	-2.798	4	-.08	1	0	3	0	1	-.007	4
449		16	max	399.638	2	-.838	15	-.003	15	0	1	0	15	-.001	15
450			min	-538.312	3	-3.568	4	-.08	1	0	3	0	1	-.006	4
451		17	max	399.468	2	-1.019	15	-.003	15	0	1	0	15	-.001	15
452			min	-538.44	3	-4.338	4	-.08	1	0	3	0	1	-.004	4
453		18	max	399.298	2	-1.2	15	-.003	15	0	1	0	15	0	15
454			min	-538.568	3	-5.108	4	-.08	1	0	3	0	1	-.002	4
455		19	max	399.127	2	-1.381	15	-.003	15	0	1	0	15	0	1
456			min	-538.695	3	-5.878	4	-.08	1	0	3	0	1	0	1
457	M12	1	max	1217.864	1	0	1	10.25	1	0	1	0	15	0	1
458			min	-228.189	3	0	1	.374	15	0	1	0	1	0	1
459		2	max	1218.034	1	0	1	10.25	1	0	1	0	1	0	1
460			min	-228.061	3	0	1	.374	15	0	1	0	12	0	1
461		3	max	1218.205	1	0	1	10.25	1	0	1	.002	1	0	1
462			min	-227.933	3	0	1	.374	15	0	1	0	15	0	1
463		4	max	1218.375	1	0	1	10.25	1	0	1	.003	1	0	1
464			min	-227.805	3	0	1	.374	15	0	1	0	15	0	1
465		5	max	1218.545	1	0	1	10.25	1	0	1	.004	1	0	1
466			min	-227.678	3	0	1	.374	15	0	1	0	15	0	1
467		6	max	1218.716	1	0	1	10.25	1	0	1	.005	1	0	1
468			min	-227.55	3	0	1	.374	15	0	1	0	15	0	1
469		7	max	1218.886	1	0	1	10.25	1	0	1	.007	1	0	1
470			min	-227.422	3	0	1	.374	15	0	1	0	15	0	1
471		8	max	1219.056	1	0	1	10.25	1	0	1	.008	1	0	1
472			min	-227.294	3	0	1	.374	15	0	1	0	15	0	1
473		9	max	1219.227	1	0	1	10.25	1	0	1	.009	1	0	1
474			min	-227.167	3	0	1	.374	15	0	1	0	15	0	1
475		10	max	1219.397	1	0	1	10.25	1	0	1	.01	1	0	1
476			min	-227.039	3	0	1	.374	15	0	1	0	15	0	1
477		11	max	1219.567	1	0	1	10.25	1	0	1	.011	1	0	1
478			min	-226.911	3	0	1	.374	15	0	1	0	15	0	1
479		12	max	1219.738	1	0	1	10.25	1	0	1	.012	1	0	1
480			min	-226.783	3	0	1	.374	15	0	1	0	15	0	1
481		13	max	1219.908	1	0	1	10.25	1	0	1	.014	1	0	1
482			min	-226.656	3	0	1	.374	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	1220.078	1	0	1	10.25	1	0	1	.015	1	0	1
484			min	-226.528	3	0	1	.374	15	0	1	0	15	0	1
485		15	max	1220.249	1	0	1	10.25	1	0	1	.016	1	0	1
486			min	-226.4	3	0	1	.374	15	0	1	0	15	0	1
487		16	max	1220.419	1	0	1	10.25	1	0	1	.017	1	0	1
488			min	-226.272	3	0	1	.374	15	0	1	0	15	0	1
489		17	max	1220.589	1	0	1	10.25	1	0	1	.018	1	0	1
490			min	-226.144	3	0	1	.374	15	0	1	0	15	0	1
491		18	max	1220.76	1	0	1	10.25	1	0	1	.019	1	0	1
492			min	-226.017	3	0	1	.374	15	0	1	0	15	0	1
493		19	max	1220.93	1	0	1	10.25	1	0	1	.021	1	0	1
494			min	-225.889	3	0	1	.374	15	0	1	0	15	0	1
495	M1	1	max	165.683	1	626.921	3	-3.83	15	0	1	.25	1	0	3
496			min	6.033	15	-489.919	1	-104.634	1	0	3	.009	15	-.013	1
497		2	max	166.173	1	625.911	3	-3.83	15	0	1	.195	1	.246	1
498			min	6.181	15	-491.265	1	-104.634	1	0	3	.007	15	-.33	3
499		3	max	320.911	3	546.995	1	-3.795	15	0	3	.139	1	.493	1
500			min	-195.327	2	-451.272	3	-103.904	1	0	1	.005	15	-.647	3
501		4	max	321.278	3	545.649	1	-3.795	15	0	3	.084	1	.204	1
502			min	-194.837	2	-452.281	3	-103.904	1	0	1	.003	15	-.409	3
503		5	max	321.646	3	544.303	1	-3.795	15	0	3	.03	1	-.003	15
504			min	-194.347	2	-453.291	3	-103.904	1	0	1	.001	15	-.17	3
505		6	max	322.013	3	542.957	1	-3.795	15	0	3	0	15	.07	3
506			min	-193.857	2	-454.3	3	-103.904	1	0	1	-.025	1	-.37	1
507		7	max	322.381	3	541.611	1	-3.795	15	0	3	-.003	15	.31	3
508			min	-193.367	2	-455.31	3	-103.904	1	0	1	-.08	1	-.656	1
509		8	max	322.748	3	540.265	1	-3.795	15	0	3	-.005	15	.55	3
510			min	-192.877	2	-456.319	3	-103.904	1	0	1	-.135	1	-.942	1
511		9	max	333.196	3	40.93	2	-5.553	15	0	9	.079	1	.643	3
512			min	-125.353	2	.409	15	-151.924	1	0	3	.003	15	-1.073	1
513		10	max	333.563	3	39.584	2	-5.553	15	0	9	0	15	.626	3
514			min	-124.863	2	.003	15	-151.924	1	0	3	0	1	-1.085	1
515		11	max	333.931	3	38.238	2	-5.553	15	0	9	-.003	15	.609	3
516			min	-124.373	2	-1.653	4	-151.924	1	0	3	-.081	1	-1.095	1
517		12	max	344.32	3	295.658	3	-3.702	15	0	2	.133	1	.53	3
518			min	-78.721	10	-583.494	1	-101.476	1	0	3	.005	15	-.967	1
519		13	max	344.687	3	294.648	3	-3.702	15	0	2	.08	1	.374	3
520			min	-78.313	10	-584.84	1	-101.476	1	0	3	.003	15	-.659	1
521		14	max	345.055	3	293.639	3	-3.702	15	0	2	.026	1	.219	3
522			min	-77.905	10	-586.187	1	-101.476	1	0	3	0	15	-.35	1
523		15	max	345.422	3	292.629	3	-3.702	15	0	2	-.001	15	.065	3
524			min	-77.497	10	-587.533	1	-101.476	1	0	3	-.028	1	-.04	1
525		16	max	345.79	3	291.62	3	-3.702	15	0	2	-.003	15	.288	2
526			min	-77.088	10	-588.879	1	-101.476	1	0	3	-.081	1	-.09	3
527		17	max	346.157	3	290.61	3	-3.702	15	0	2	-.005	15	.591	2
528			min	-76.68	10	-590.225	1	-101.476	1	0	3	-.135	1	-.243	3
529		18	max	-6.186	15	582.375	2	-4.072	15	0	3	-.007	15	.297	2
530			min	-166.379	1	-245.262	3	-111.33	1	0	2	-.192	1	-.12	3
531		19	max	-6.039	15	581.029	2	-4.072	15	0	3	-.009	15	.009	3
532			min	-165.889	1	-246.271	3	-111.33	1	0	2	-.251	1	-.012	1
533	M5	1	max	357.812	1	2089.61	3	0	1	0	1	0	1	.026	1
534			min	12.023	12	-1656.65	1	0	1	0	1	0	1	0	3
535		2	max	358.302	1	2088.601	3	0	1	0	1	0	1	.901	1
536			min	12.268	12	-1657.996	1	0	1	0	1	0	1	-1.103	3
537		3	max	1032.77	3	1675.18	1	0	1	0	1	0	1	1.736	1
538			min	-701.396	2	-1452.906	3	0	1	0	1	0	1	-2.162	3
539		4	max	1033.138	3	1673.834	1	0	1	0	1	0	1	.852	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
540			min	-700.906	2	-1453.915	3	0	1	0	1	0	1	-1.396	3
541		5	max	1033.505	3	1672.488	1	0	1	0	1	0	1	.01	9
542			min	-700.416	2	-1454.925	3	0	1	0	1	0	1	-.628	3
543		6	max	1033.873	3	1671.142	1	0	1	0	1	0	1	.14	3
544			min	-699.926	2	-1455.935	3	0	1	0	1	0	1	-.913	1
545		7	max	1034.24	3	1669.796	1	0	1	0	1	0	1	.908	3
546			min	-699.436	2	-1456.944	3	0	1	0	1	0	1	-1.794	1
547		8	max	1034.608	3	1668.45	1	0	1	0	1	0	1	1.677	3
548			min	-698.946	2	-1457.954	3	0	1	0	1	0	1	-2.675	1
549		9	max	1052.387	3	136.191	2	0	1	0	1	0	1	1.932	3
550			min	-560.065	2	.407	15	0	1	0	1	0	1	-3.027	1
551		10	max	1052.754	3	134.845	2	0	1	0	1	0	1	1.87	3
552			min	-559.575	2	.001	15	0	1	0	1	0	1	-3.065	1
553		11	max	1053.121	3	133.499	2	0	1	0	1	0	1	1.809	3
554			min	-559.085	2	-1.51	4	0	1	0	1	0	1	-3.103	1
555		12	max	1071.018	3	939.116	3	0	1	0	1	0	1	1.588	3
556			min	-420.23	2	-1813.526	1	0	1	0	1	0	1	-2.765	1
557		13	max	1071.385	3	938.107	3	0	1	0	1	0	1	1.092	3
558			min	-419.74	2	-1814.872	1	0	1	0	1	0	1	-1.808	1
559		14	max	1071.753	3	937.097	3	0	1	0	1	0	1	.598	3
560			min	-419.251	2	-1816.218	1	0	1	0	1	0	1	-.85	1
561		15	max	1072.12	3	936.088	3	0	1	0	1	0	1	.177	2
562			min	-418.761	2	-1817.564	1	0	1	0	1	0	1	-.004	13
563		16	max	1072.488	3	935.078	3	0	1	0	1	0	1	1.11	2
564			min	-418.271	2	-1818.91	1	0	1	0	1	0	1	-.39	3
565		17	max	1072.855	3	934.069	3	0	1	0	1	0	1	2.045	2
566			min	-417.781	2	-1820.256	1	0	1	0	1	0	1	-.883	3
567		18	max	-12.512	12	1961.115	2	0	1	0	1	0	1	1.054	2
568			min	-357.889	1	-839.74	3	0	1	0	1	0	1	-.462	3
569		19	max	-12.267	12	1959.769	2	0	1	0	1	0	1	.023	1
570			min	-357.399	1	-840.749	3	0	1	0	1	0	1	-.018	3
571	M9	1	max	165.683	1	626.921	3	104.634	1	0	3	-.009	15	0	3
572			min	6.033	15	-489.919	1	3.83	15	0	1	-.25	1	-.013	1
573		2	max	166.173	1	625.911	3	104.634	1	0	3	-.007	15	.246	1
574			min	6.181	15	-491.265	1	3.83	15	0	1	-.195	1	-.33	3
575		3	max	320.911	3	546.995	1	103.904	1	0	1	-.005	15	.493	1
576			min	-195.327	2	-451.272	3	3.795	15	0	3	-.139	1	-.647	3
577		4	max	321.278	3	545.649	1	103.904	1	0	1	-.003	15	.204	1
578			min	-194.837	2	-452.281	3	3.795	15	0	3	-.084	1	-.409	3
579		5	max	321.646	3	544.303	1	103.904	1	0	1	-.001	15	-.003	15
580			min	-194.347	2	-453.291	3	3.795	15	0	3	-.03	1	-.17	3
581		6	max	322.013	3	542.957	1	103.904	1	0	1	.025	1	.07	3
582			min	-193.857	2	-454.3	3	3.795	15	0	3	0	15	-.37	1
583		7	max	322.381	3	541.611	1	103.904	1	0	1	.08	1	.31	3
584			min	-193.367	2	-455.31	3	3.795	15	0	3	.003	15	-.656	1
585		8	max	322.748	3	540.265	1	103.904	1	0	1	.135	1	.55	3
586			min	-192.877	2	-456.319	3	3.795	15	0	3	.005	15	-.942	1
587		9	max	333.196	3	40.93	2	151.924	1	0	3	-.003	15	.643	3
588			min	-125.353	2	.409	15	5.553	15	0	9	-.079	1	-1.073	1
589		10	max	333.563	3	39.584	2	151.924	1	0	3	0	1	.626	3
590			min	-124.863	2	.003	15	5.553	15	0	9	0	15	-1.085	1
591		11	max	333.931	3	38.238	2	151.924	1	0	3	.081	1	.609	3
592			min	-124.373	2	-1.653	4	5.553	15	0	9	.003	15	-1.095	1
593		12	max	344.32	3	295.658	3	101.476	1	0	3	-.005	15	.53	3
594			min	-78.721	10	-583.494	1	3.702	15	0	2	-.133	1	-.967	1
595		13	max	344.687	3	294.648	3	101.476	1	0	3	-.003	15	.374	3
596			min	-78.313	10	-584.84	1	3.702	15	0	2	-.08	1	-.659	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
597		14	max	345.055	3	293.639	3	101.476	1	0	3	0	15	.219	3
598			min	-77.905	10	-586.187	1	3.702	15	0	2	-.026	1	-.35	1
599		15	max	345.422	3	292.629	3	101.476	1	0	3	.028	1	.065	3
600			min	-77.497	10	-587.533	1	3.702	15	0	2	.001	15	-.04	1
601		16	max	345.79	3	291.62	3	101.476	1	0	3	.081	1	.288	2
602			min	-77.088	10	-588.879	1	3.702	15	0	2	.003	15	-.09	3
603		17	max	346.157	3	290.61	3	101.476	1	0	3	.135	1	.591	2
604			min	-76.68	10	-590.225	1	3.702	15	0	2	.005	15	-.243	3
605		18	max	-6.186	15	582.375	2	111.33	1	0	2	.192	1	.297	2
606			min	-166.379	1	-245.262	3	4.072	15	0	3	.007	15	-.12	3
607		19	max	-6.039	15	581.029	2	111.33	1	0	2	.251	1	.009	3
608			min	-165.889	1	-246.271	3	4.072	15	0	3	.009	15	-.012	1

Envelope Member Section Deflections

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
1	M13	1	max	.001	1	.108	1	.006	3	8.686e-3	1	NC	1	NC	1
2			min	0	15	-.016	3	-.003	2	-1.316e-3	3	NC	1	NC	1
3		2	max	0	1	.303	3	.041	1	1.001e-2	1	NC	5	NC	2
4			min	0	15	-.12	1	.002	10	-1.362e-3	3	771.507	3	6216.76	1
5		3	max	0	1	.561	3	.099	1	1.134e-2	1	NC	5	NC	3
6			min	0	15	-.301	1	.004	15	-1.408e-3	3	426.399	3	2535.337	1
7		4	max	0	1	.717	3	.149	1	1.266e-2	1	NC	5	NC	3
8			min	0	15	-.402	1	.006	15	-1.454e-3	3	335.437	3	1674.864	1
9		5	max	0	1	.753	3	.174	1	1.399e-2	1	NC	5	NC	3
10			min	0	15	-.41	1	.007	15	-1.5e-3	3	319.836	3	1424.937	1
11		6	max	0	1	.671	3	.169	1	1.531e-2	1	NC	5	NC	3
12			min	0	15	-.326	1	.006	15	-1.546e-3	3	358.099	3	1474.348	1
13		7	max	0	1	.495	3	.133	1	1.664e-2	1	NC	5	NC	3
14			min	0	15	-.172	1	.005	15	-1.592e-3	3	481.112	3	1876.738	1
15		8	max	0	1	.272	3	.078	1	1.796e-2	1	NC	4	NC	2
16			min	0	15	-.003	9	0	10	-1.638e-3	3	852.754	3	3241.486	1
17		9	max	0	1	.186	2	.023	1	1.929e-2	1	NC	4	NC	1
18			min	0	15	.005	15	-.005	10	-1.684e-3	3	2844.3	3	NC	1
19		10	max	0	1	.258	1	.018	3	2.061e-2	1	NC	3	NC	1
20			min	0	1	-.021	3	-.012	2	-1.73e-3	3	1642.944	1	NC	1
21		11	max	0	15	.186	2	.023	1	1.929e-2	1	NC	4	NC	1
22			min	0	1	.005	15	-.005	10	-1.684e-3	3	2844.3	3	NC	1
23		12	max	0	15	.272	3	.078	1	1.796e-2	1	NC	4	NC	2
24			min	0	1	-.003	9	0	10	-1.638e-3	3	852.754	3	3241.486	1
25		13	max	0	15	.495	3	.133	1	1.664e-2	1	NC	5	NC	3
26			min	0	1	-.172	1	.005	15	-1.592e-3	3	481.112	3	1876.738	1
27		14	max	0	15	.671	3	.169	1	1.531e-2	1	NC	5	NC	3
28			min	0	1	-.326	1	.006	15	-1.546e-3	3	358.099	3	1474.348	1
29		15	max	0	15	.753	3	.174	1	1.399e-2	1	NC	5	NC	3
30			min	0	1	-.41	1	.007	15	-1.5e-3	3	319.836	3	1424.937	1
31		16	max	0	15	.717	3	.149	1	1.266e-2	1	NC	5	NC	3
32			min	0	1	-.402	1	.006	15	-1.454e-3	3	335.437	3	1674.864	1
33		17	max	0	15	.561	3	.099	1	1.134e-2	1	NC	5	NC	3
34			min	0	1	-.301	1	.004	15	-1.408e-3	3	426.399	3	2535.337	1
35		18	max	0	15	.303	3	.041	1	1.001e-2	1	NC	5	NC	2
36			min	0	1	-.12	1	.002	10	-1.362e-3	3	771.507	3	6216.76	1
37		19	max	0	15	.108	1	.006	3	8.686e-3	1	NC	1	NC	1
38			min	-.001	1	-.016	3	-.003	2	-1.316e-3	3	NC	1	NC	1
39	M14	1	max	0	1	.19	3	.005	3	5.416e-3	1	NC	1	NC	1
40			min	0	15	-.352	1	-.002	2	-3.428e-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	.494	3	.029	1	6.513e-3	1	NC	5	NC	2
42			min	0	15	-.709	1	0	10	-4.183e-3	3	690.454	1	9084.99	1
43		3	max	0	1	.75	3	.08	1	7.609e-3	1	NC	15	NC	3
44			min	0	15	-1.014	1	.003	15	-4.939e-3	3	371.676	1	3155.868	1
45		4	max	0	1	.926	3	.128	1	8.705e-3	1	NC	15	NC	3
46			min	0	15	-1.234	1	.005	15	-5.694e-3	3	278.963	1	1953.372	1
47		5	max	0	1	1.006	3	.155	1	9.802e-3	1	9724.312	15	NC	3
48			min	0	15	-1.351	1	.006	15	-6.449e-3	3	246.36	1	1603.932	1
49		6	max	0	1	.99	3	.153	1	1.09e-2	1	9645.955	15	NC	3
50			min	0	15	-1.364	1	.006	15	-7.205e-3	3	243.191	1	1622.513	1
51		7	max	0	1	.895	3	.123	1	1.199e-2	1	NC	15	NC	3
52			min	0	15	-1.29	1	.005	15	-7.96e-3	3	262.344	1	2032.375	1
53		8	max	0	1	.755	3	.073	1	1.309e-2	1	NC	15	NC	2
54			min	0	15	-1.163	1	.001	10	-8.716e-3	3	303.313	1	3462.971	1
55		9	max	0	1	.621	3	.022	1	1.419e-2	1	NC	15	NC	1
56			min	0	15	-1.035	1	-.004	10	-9.471e-3	3	360.233	1	NC	1
57		10	max	0	1	.558	3	.016	3	1.528e-2	1	NC	5	NC	1
58			min	0	1	-.974	1	-.011	2	-1.023e-2	3	395.63	1	NC	1
59		11	max	0	15	.621	3	.022	1	1.419e-2	1	NC	15	NC	1
60			min	0	1	-1.035	1	-.004	10	-9.471e-3	3	360.233	1	NC	1
61		12	max	0	15	.755	3	.073	1	1.309e-2	1	NC	15	NC	2
62			min	0	1	-1.163	1	.001	10	-8.716e-3	3	303.313	1	3462.971	1
63		13	max	0	15	.895	3	.123	1	1.199e-2	1	NC	15	NC	3
64			min	0	1	-1.29	1	.005	15	-7.96e-3	3	262.344	1	2032.375	1
65		14	max	0	15	.99	3	.153	1	1.09e-2	1	9645.955	15	NC	3
66			min	0	1	-1.364	1	.006	15	-7.205e-3	3	243.191	1	1622.513	1
67		15	max	0	15	1.006	3	.155	1	9.802e-3	1	9724.312	15	NC	3
68			min	0	1	-1.351	1	.006	15	-6.449e-3	3	246.36	1	1603.932	1
69		16	max	0	15	.926	3	.128	1	8.705e-3	1	NC	15	NC	3
70			min	0	1	-1.234	1	.005	15	-5.694e-3	3	278.963	1	1953.372	1
71		17	max	0	15	.75	3	.08	1	7.609e-3	1	NC	15	NC	3
72			min	0	1	-1.014	1	.003	15	-4.939e-3	3	371.676	1	3155.868	1
73		18	max	0	15	.494	3	.029	1	6.513e-3	1	NC	5	NC	2
74			min	0	1	-.709	1	0	10	-4.183e-3	3	690.454	1	9084.99	1
75		19	max	0	15	.19	3	.005	3	5.416e-3	1	NC	1	NC	1
76			min	0	1	-.352	1	-.002	2	-3.428e-3	3	NC	1	NC	1
77	M15	1	max	0	15	.194	3	.005	3	2.894e-3	3	NC	1	NC	1
78			min	0	1	-.352	1	-.002	2	-5.536e-3	1	NC	1	NC	1
79		2	max	0	15	.384	3	.029	1	3.535e-3	3	NC	5	NC	2
80			min	0	1	-.749	1	0	10	-6.662e-3	1	619.2	1	9042.273	1
81		3	max	0	15	.548	3	.08	1	4.177e-3	3	NC	15	NC	3
82			min	0	1	-1.088	1	.003	15	-7.789e-3	1	334.223	1	3147.013	1
83		4	max	0	15	.669	3	.128	1	4.818e-3	3	NC	15	NC	3
84			min	0	1	-1.328	1	.005	15	-8.915e-3	1	252.027	1	1949.038	1
85		5	max	0	15	.736	3	.156	1	5.46e-3	3	9735.543	15	NC	3
86			min	0	1	-1.449	1	.006	15	-1.004e-2	1	224.182	1	1600.638	1
87		6	max	0	15	.751	3	.154	1	6.101e-3	3	9659.224	15	NC	3
88			min	0	1	-1.451	1	.006	15	-1.117e-2	1	223.702	1	1618.969	1
89		7	max	0	15	.72	3	.123	1	6.743e-3	3	NC	15	NC	3
90			min	0	1	-1.355	1	.005	15	-1.229e-2	1	245.231	1	2026.773	1
91		8	max	0	15	.661	3	.073	1	7.384e-3	3	NC	15	NC	2
92			min	0	1	-1.199	1	.001	10	-1.342e-2	1	290.188	1	3446.988	1
93		9	max	0	15	.6	3	.022	1	8.025e-3	3	NC	15	NC	1
94			min	0	1	-1.045	1	-.004	10	-1.455e-2	1	354.712	1	NC	1
95		10	max	0	1	.57	3	.015	3	8.667e-3	3	NC	5	NC	1
96			min	0	1	-.972	1	-.01	2	-1.567e-2	1	396.362	1	NC	1
97		11	max	0	1	.6	3	.022	1	8.025e-3	3	NC	15	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
98			min	0	15	-1.045	1	-.004	10	-1.455e-2	1	354.712	1	NC	1
99		12	max	0	1	.661	3	.073	1	7.384e-3	3	NC	15	NC	2
100			min	0	15	-1.199	1	.001	10	-1.342e-2	1	290.188	1	3446.988	1
101		13	max	0	1	.72	3	.123	1	6.743e-3	3	NC	15	NC	3
102			min	0	15	-1.355	1	.005	15	-1.229e-2	1	245.231	1	2026.773	1
103		14	max	0	1	.751	3	.154	1	6.101e-3	3	9659.224	15	NC	3
104			min	0	15	-1.451	1	.006	15	-1.117e-2	1	223.702	1	1618.969	1
105		15	max	0	1	.736	3	.156	1	5.46e-3	3	9735.543	15	NC	3
106			min	0	15	-1.449	1	.006	15	-1.004e-2	1	224.182	1	1600.638	1
107		16	max	0	1	.669	3	.128	1	4.818e-3	3	NC	15	NC	3
108			min	0	15	-1.328	1	.005	15	-8.915e-3	1	252.027	1	1949.038	1
109		17	max	0	1	.548	3	.08	1	4.177e-3	3	NC	15	NC	3
110			min	0	15	-1.088	1	.003	15	-7.789e-3	1	334.223	1	3147.013	1
111		18	max	0	1	.384	3	.029	1	3.535e-3	3	NC	5	NC	2
112			min	0	15	-.749	1	0	10	-6.662e-3	1	619.2	1	9042.273	1
113		19	max	0	1	.194	3	.005	3	2.894e-3	3	NC	1	NC	1
114			min	0	15	-.352	1	-.002	2	-5.536e-3	1	NC	1	NC	1
115	M16	1	max	0	15	.105	1	.004	3	5.088e-3	3	NC	1	NC	1
116			min	-.001	1	-.064	3	-.002	2	-8.061e-3	1	NC	1	NC	1
117		2	max	0	15	.045	3	.041	1	6.013e-3	3	NC	5	NC	2
118			min	0	1	-.185	2	.002	15	-9.234e-3	1	885.351	2	6255.628	1
119		3	max	0	15	.131	3	.098	1	6.938e-3	3	NC	5	NC	3
120			min	0	1	-.407	2	.004	15	-1.041e-2	1	492.49	2	2542.51	1
121		4	max	0	15	.177	3	.148	1	7.863e-3	3	NC	5	NC	3
122			min	0	1	-.535	2	.005	15	-1.158e-2	1	392.129	2	1676.396	1
123		5	max	0	15	.177	3	.174	1	8.788e-3	3	NC	5	NC	3
124			min	0	1	-.551	2	.006	15	-1.275e-2	1	381.932	2	1423.927	1
125		6	max	0	15	.131	3	.169	1	9.713e-3	3	NC	5	NC	3
126			min	0	1	-.46	2	.006	15	-1.393e-2	1	445.032	2	1470.42	1
127		7	max	0	15	.05	3	.133	1	1.064e-2	3	NC	5	NC	3
128			min	0	1	-.284	2	.005	15	-1.51e-2	1	653.043	2	1865.563	1
129		8	max	0	15	.004	4	.079	1	1.156e-2	3	NC	3	NC	3
130			min	0	1	-.067	2	.002	10	-1.627e-2	1	1542.173	2	3195.58	1
131		9	max	0	15	.161	1	.024	1	1.249e-2	3	NC	4	NC	1
132			min	0	1	-.133	3	-.003	10	-1.745e-2	1	3549.508	3	NC	1
133		10	max	0	1	.247	1	.013	3	1.341e-2	3	NC	5	NC	1
134			min	0	1	-.172	3	-.009	2	-1.862e-2	1	1724.941	1	NC	1
135		11	max	0	1	.161	1	.024	1	1.249e-2	3	NC	4	NC	1
136			min	0	15	-.133	3	-.003	10	-1.745e-2	1	3549.508	3	NC	1
137		12	max	0	1	.004	4	.079	1	1.156e-2	3	NC	3	NC	3
138			min	0	15	-.067	2	.002	10	-1.627e-2	1	1542.173	2	3195.58	1
139		13	max	0	1	.05	3	.133	1	1.064e-2	3	NC	5	NC	3
140			min	0	15	-.284	2	.005	15	-1.51e-2	1	653.043	2	1865.563	1
141		14	max	0	1	.131	3	.169	1	9.713e-3	3	NC	5	NC	3
142			min	0	15	-.46	2	.006	15	-1.393e-2	1	445.032	2	1470.42	1
143		15	max	0	1	.177	3	.174	1	8.788e-3	3	NC	5	NC	3
144			min	0	15	-.551	2	.006	15	-1.275e-2	1	381.932	2	1423.927	1
145		16	max	0	1	.177	3	.148	1	7.863e-3	3	NC	5	NC	3
146			min	0	15	-.535	2	.005	15	-1.158e-2	1	392.129	2	1676.396	1
147		17	max	0	1	.131	3	.098	1	6.938e-3	3	NC	5	NC	3
148			min	0	15	-.407	2	.004	15	-1.041e-2	1	492.49	2	2542.51	1
149		18	max	0	1	.045	3	.041	1	6.013e-3	3	NC	5	NC	2
150			min	0	15	-.185	2	.002	15	-9.234e-3	1	885.351	2	6255.628	1
151		19	max	.001	1	.105	1	.004	3	5.088e-3	3	NC	1	NC	1
152			min	0	15	-.064	3	-.002	2	-8.061e-3	1	NC	1	NC	1
153	M2	1	max	.006	1	.004	2	.008	1	-7.889e-6	15	NC	1	NC	2
154			min	-.006	3	-.008	3	0	15	-2.162e-4	1	NC	1	6861.191	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	.005	1	.004	2	.007	1	-7.36e-6	15	NC	1	NC	2
156			min	-.006	3	-.008	3	0	15	-2.017e-4	1	NC	1	7484.405	1
157		3	max	.005	1	.003	2	.007	1	-6.831e-6	15	NC	1	NC	2
158			min	-.005	3	-.007	3	0	15	-1.872e-4	1	NC	1	8227.363	1
159		4	max	.005	1	.002	2	.006	1	-6.301e-6	15	NC	1	NC	2
160			min	-.005	3	-.007	3	0	15	-1.727e-4	1	NC	1	9121.877	1
161		5	max	.005	1	.002	2	.005	1	-5.772e-6	15	NC	1	NC	1
162			min	-.005	3	-.007	3	0	15	-1.581e-4	1	NC	1	NC	1
163		6	max	.004	1	.001	2	.005	1	-5.243e-6	15	NC	1	NC	1
164			min	-.004	3	-.006	3	0	15	-1.436e-4	1	NC	1	NC	1
165		7	max	.004	1	0	2	.004	1	-4.714e-6	15	NC	1	NC	1
166			min	-.004	3	-.006	3	0	15	-1.291e-4	1	NC	1	NC	1
167		8	max	.004	1	0	2	.004	1	-4.184e-6	15	NC	1	NC	1
168			min	-.004	3	-.006	3	0	15	-1.146e-4	1	NC	1	NC	1
169		9	max	.003	1	0	2	.003	1	-3.655e-6	15	NC	1	NC	1
170			min	-.003	3	-.005	3	0	15	-1.001e-4	1	NC	1	NC	1
171		10	max	.003	1	0	2	.003	1	-3.126e-6	15	NC	1	NC	1
172			min	-.003	3	-.005	3	0	15	-8.557e-5	1	NC	1	NC	1
173		11	max	.003	1	0	15	.002	1	-2.597e-6	15	NC	1	NC	1
174			min	-.003	3	-.005	3	0	15	-7.105e-5	1	NC	1	NC	1
175		12	max	.002	1	0	15	.002	1	-2.067e-6	15	NC	1	NC	1
176			min	-.002	3	-.004	3	0	15	-5.653e-5	1	NC	1	NC	1
177		13	max	.002	1	0	15	.001	1	-1.538e-6	15	NC	1	NC	1
178			min	-.002	3	-.004	3	0	15	-4.202e-5	1	NC	1	NC	1
179		14	max	.002	1	0	15	0	1	-1.009e-6	15	NC	1	NC	1
180			min	-.002	3	-.003	3	0	15	-2.75e-5	1	NC	1	NC	1
181		15	max	.001	1	0	15	0	1	-4.795e-7	15	NC	1	NC	1
182			min	-.001	3	-.003	3	0	15	-1.299e-5	1	NC	1	NC	1
183		16	max	0	1	0	15	0	1	1.53e-6	1	NC	1	NC	1
184			min	0	3	-.002	3	0	15	-3.245e-7	3	NC	1	NC	1
185		17	max	0	1	0	15	0	1	1.605e-5	1	NC	1	NC	1
186			min	0	3	-.001	4	0	15	4.761e-7	12	NC	1	NC	1
187		18	max	0	1	0	15	0	1	3.056e-5	1	NC	1	NC	1
188			min	0	3	0	4	0	15	1.108e-6	15	NC	1	NC	1
189		19	max	0	1	0	1	0	1	4.508e-5	1	NC	1	NC	1
190			min	0	1	0	1	0	1	1.637e-6	15	NC	1	NC	1
191	M3	1	max	0	1	0	1	0	1	-5.16e-7	15	NC	1	NC	1
192			min	0	1	0	1	0	1	-1.42e-5	1	NC	1	NC	1
193		2	max	0	3	0	15	0	1	1.037e-5	1	NC	1	NC	1
194			min	0	2	-.002	4	0	15	3.785e-7	15	NC	1	NC	1
195		3	max	0	3	0	15	0	1	3.493e-5	1	NC	1	NC	1
196			min	0	2	-.003	4	0	15	1.273e-6	15	NC	1	NC	1
197		4	max	0	3	-.001	15	0	1	5.949e-5	1	NC	1	NC	1
198			min	0	2	-.005	4	0	15	2.167e-6	15	NC	1	NC	1
199		5	max	.001	3	-.002	15	0	1	8.405e-5	1	NC	1	NC	1
200			min	0	2	-.007	4	0	15	3.062e-6	15	NC	1	NC	1
201		6	max	.001	3	-.002	15	.001	1	1.086e-4	1	NC	1	NC	1
202			min	0	2	-.009	4	0	15	3.956e-6	15	NC	1	NC	1
203		7	max	.002	3	-.002	15	.002	1	1.332e-4	1	NC	1	NC	1
204			min	-.001	2	-.01	4	0	15	4.851e-6	15	8924.453	4	NC	1
205		8	max	.002	3	-.003	15	.002	1	1.577e-4	1	NC	1	NC	1
206			min	-.001	2	-.012	4	0	15	5.745e-6	15	7985.018	4	NC	1
207		9	max	.002	3	-.003	15	.002	1	1.823e-4	1	NC	2	NC	1
208			min	-.002	2	-.013	4	0	15	6.64e-6	15	7426.498	4	NC	1
209		10	max	.002	3	-.003	15	.003	1	2.069e-4	1	NC	2	NC	1
210			min	-.002	2	-.013	4	0	15	7.534e-6	15	7150.729	4	NC	1
211		11	max	.003	3	-.003	15	.003	1	2.314e-4	1	NC	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
212			min	-.002	2	-.013	4	0	15	8.429e-6	15	7116.776	4	NC	1
213		12	max	.003	3	-.003	15	.004	1	2.56e-4	1	NC	2	NC	1
214			min	-.002	2	-.013	4	0	15	9.323e-6	15	7325.19	4	NC	1
215		13	max	.003	3	-.003	15	.004	1	2.805e-4	1	NC	1	NC	1
216			min	-.002	2	-.012	4	0	15	1.022e-5	15	7820.199	4	NC	1
217		14	max	.003	3	-.003	15	.005	1	3.051e-4	1	NC	1	NC	1
218			min	-.003	2	-.011	4	0	15	1.111e-5	15	8712.939	4	NC	1
219		15	max	.004	3	-.002	15	.005	1	3.297e-4	1	NC	1	NC	1
220			min	-.003	2	-.009	4	0	15	1.201e-5	15	NC	1	NC	1
221		16	max	.004	3	-.002	15	.006	1	3.542e-4	1	NC	1	NC	1
222			min	-.003	2	-.008	1	0	15	1.29e-5	15	NC	1	NC	1
223		17	max	.004	3	-.001	15	.006	1	3.788e-4	1	NC	1	NC	1
224			min	-.003	2	-.006	1	0	15	1.38e-5	15	NC	1	NC	1
225		18	max	.004	3	0	15	.007	1	4.034e-4	1	NC	1	NC	1
226			min	-.003	2	-.005	1	0	15	1.469e-5	15	NC	1	NC	1
227		19	max	.005	3	0	15	.008	1	4.279e-4	1	NC	1	NC	1
228			min	-.004	2	-.003	1	0	15	1.558e-5	15	NC	1	NC	1
229	M4	1	max	.003	1	.003	2	0	15	2.062e-5	1	NC	1	NC	3
230			min	0	3	-.005	3	-.008	1	7.614e-7	15	NC	1	3223.312	1
231		2	max	.003	1	.003	2	0	15	2.062e-5	1	NC	1	NC	3
232			min	0	3	-.004	3	-.007	1	7.614e-7	15	NC	1	3508.22	1
233		3	max	.003	1	.003	2	0	15	2.062e-5	1	NC	1	NC	3
234			min	0	3	-.004	3	-.006	1	7.614e-7	15	NC	1	3847.13	1
235		4	max	.002	1	.002	2	0	15	2.062e-5	1	NC	1	NC	2
236			min	0	3	-.004	3	-.006	1	7.614e-7	15	NC	1	4254.102	1
237		5	max	.002	1	.002	2	0	15	2.062e-5	1	NC	1	NC	2
238			min	0	3	-.004	3	-.005	1	7.614e-7	15	NC	1	4748.24	1
239		6	max	.002	1	.002	2	0	15	2.062e-5	1	NC	1	NC	2
240			min	0	3	-.003	3	-.005	1	7.614e-7	15	NC	1	5356.042	1
241		7	max	.002	1	.002	2	0	15	2.062e-5	1	NC	1	NC	2
242			min	0	3	-.003	3	-.004	1	7.614e-7	15	NC	1	6115.118	1
243		8	max	.002	1	.002	2	0	15	2.062e-5	1	NC	1	NC	2
244			min	0	3	-.003	3	-.004	1	7.614e-7	15	NC	1	7080.328	1
245		9	max	.002	1	.002	2	0	15	2.062e-5	1	NC	1	NC	2
246			min	0	3	-.003	3	-.003	1	7.614e-7	15	NC	1	8334.265	1
247		10	max	.001	1	.001	2	0	15	2.062e-5	1	NC	1	NC	1
248			min	0	3	-.002	3	-.002	1	7.614e-7	15	NC	1	NC	1
249		11	max	.001	1	.001	2	0	15	2.062e-5	1	NC	1	NC	1
250			min	0	3	-.002	3	-.002	1	7.614e-7	15	NC	1	NC	1
251		12	max	.001	1	.001	2	0	15	2.062e-5	1	NC	1	NC	1
252			min	0	3	-.002	3	-.002	1	7.614e-7	15	NC	1	NC	1
253		13	max	0	1	0	2	0	15	2.062e-5	1	NC	1	NC	1
254			min	0	3	-.002	3	-.001	1	7.614e-7	15	NC	1	NC	1
255		14	max	0	1	0	2	0	15	2.062e-5	1	NC	1	NC	1
256			min	0	3	-.001	3	0	1	7.614e-7	15	NC	1	NC	1
257		15	max	0	1	0	2	0	15	2.062e-5	1	NC	1	NC	1
258			min	0	3	-.001	3	0	1	7.614e-7	15	NC	1	NC	1
259		16	max	0	1	0	2	0	15	2.062e-5	1	NC	1	NC	1
260			min	0	3	0	3	0	1	7.614e-7	15	NC	1	NC	1
261		17	max	0	1	0	2	0	15	2.062e-5	1	NC	1	NC	1
262			min	0	3	0	3	0	1	7.614e-7	15	NC	1	NC	1
263		18	max	0	1	0	2	0	15	2.062e-5	1	NC	1	NC	1
264			min	0	3	0	3	0	1	7.614e-7	15	NC	1	NC	1
265		19	max	0	1	0	1	0	1	2.062e-5	1	NC	1	NC	1
266			min	0	1	0	1	0	1	7.614e-7	15	NC	1	NC	1
267	M6	1	max	.019	1	.017	2	0	1	0	1	NC	3	NC	1
268			min	-.02	3	-.025	3	0	1	0	1	3233.84	2	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
269		2	max	.018	1	.016	2	0	1	0	1	NC	3	NC	1
270			min	-.018	3	-.023	3	0	1	0	1	3542.72	2	NC	1
271		3	max	.017	1	.014	2	0	1	0	1	NC	3	NC	1
272			min	-.017	3	-.022	3	0	1	0	1	3913.929	2	NC	1
273		4	max	.016	1	.013	2	0	1	0	1	NC	3	NC	1
274			min	-.016	3	-.02	3	0	1	0	1	4364.832	2	NC	1
275		5	max	.014	1	.011	2	0	1	0	1	NC	1	NC	1
276			min	-.015	3	-.019	3	0	1	0	1	4919.486	2	NC	1
277		6	max	.013	1	.01	2	0	1	0	1	NC	1	NC	1
278			min	-.014	3	-.018	3	0	1	0	1	5612.002	2	NC	1
279		7	max	.012	1	.009	2	0	1	0	1	NC	1	NC	1
280			min	-.013	3	-.016	3	0	1	0	1	6492.053	2	NC	1
281		8	max	.011	1	.007	2	0	1	0	1	NC	1	NC	1
282			min	-.012	3	-.015	3	0	1	0	1	7634.299	2	NC	1
283		9	max	.01	1	.006	2	0	1	0	1	NC	1	NC	1
284			min	-.011	3	-.014	3	0	1	0	1	9155.232	2	NC	1
285		10	max	.009	1	.005	2	0	1	0	1	NC	1	NC	1
286			min	-.01	3	-.012	3	0	1	0	1	NC	1	NC	1
287		11	max	.008	1	.004	2	0	1	0	1	NC	1	NC	1
288			min	-.009	3	-.011	3	0	1	0	1	NC	1	NC	1
289		12	max	.007	1	.003	2	0	1	0	1	NC	1	NC	1
290			min	-.008	3	-.01	3	0	1	0	1	NC	1	NC	1
291		13	max	.006	1	.002	2	0	1	0	1	NC	1	NC	1
292			min	-.007	3	-.008	3	0	1	0	1	NC	1	NC	1
293		14	max	.005	1	.001	2	0	1	0	1	NC	1	NC	1
294			min	-.005	3	-.007	3	0	1	0	1	NC	1	NC	1
295		15	max	.004	1	0	2	0	1	0	1	NC	1	NC	1
296			min	-.004	3	-.005	3	0	1	0	1	NC	1	NC	1
297		16	max	.003	1	0	2	0	1	0	1	NC	1	NC	1
298			min	-.003	3	-.004	3	0	1	0	1	NC	1	NC	1
299		17	max	.002	1	0	2	0	1	0	1	NC	1	NC	1
300			min	-.002	3	-.003	3	0	1	0	1	NC	1	NC	1
301		18	max	.001	1	0	2	0	1	0	1	NC	1	NC	1
302			min	-.001	3	-.001	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	0	3	0	15	0	1	0	1	NC	1	NC	1
308			min	0	2	-.002	3	0	1	0	1	NC	1	NC	1
309		3	max	.002	3	0	15	0	1	0	1	NC	1	NC	1
310			min	-.002	2	-.004	3	0	1	0	1	NC	1	NC	1
311		4	max	.002	3	-.001	15	0	1	0	1	NC	1	NC	1
312			min	-.002	2	-.006	3	0	1	0	1	NC	1	NC	1
313		5	max	.003	3	-.002	15	0	1	0	1	NC	1	NC	1
314			min	-.003	2	-.008	3	0	1	0	1	NC	1	NC	1
315		6	max	.004	3	-.002	15	0	1	0	1	NC	1	NC	1
316			min	-.004	2	-.01	3	0	1	0	1	9939.655	3	NC	1
317		7	max	.005	3	-.002	15	0	1	0	1	NC	1	NC	1
318			min	-.005	2	-.011	3	0	1	0	1	8821.315	3	NC	1
319		8	max	.006	3	-.003	15	0	1	0	1	NC	1	NC	1
320			min	-.005	2	-.012	3	0	1	0	1	8151.015	3	NC	1
321		9	max	.007	3	-.003	15	0	1	0	1	NC	1	NC	1
322			min	-.006	2	-.013	4	0	1	0	1	7600.421	4	NC	1
323		10	max	.007	3	-.003	15	0	1	0	1	NC	1	NC	1
324			min	-.007	2	-.013	4	0	1	0	1	7307.939	4	NC	1
325		11	max	.008	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	-.008	2	-.013	4	0	1	0	1	7264.704	4	NC	1
327		12	max	.009	3	-.003	15	0	1	0	1	NC	1	NC	1
328			min	-.009	2	-.013	4	0	1	0	1	7470.087	4	NC	1
329		13	max	.01	3	-.003	15	0	1	0	1	NC	1	NC	1
330			min	-.009	2	-.012	4	0	1	0	1	7968.319	4	NC	1
331		14	max	.011	3	-.003	15	0	1	0	1	NC	1	NC	1
332			min	-.01	2	-.011	4	0	1	0	1	8871.906	4	NC	1
333		15	max	.011	3	-.002	15	0	1	0	1	NC	1	NC	1
334			min	-.011	2	-.01	1	0	1	0	1	NC	1	NC	1
335		16	max	.012	3	-.002	15	0	1	0	1	NC	1	NC	1
336			min	-.012	2	-.01	1	0	1	0	1	NC	1	NC	1
337		17	max	.013	3	-.001	15	0	1	0	1	NC	1	NC	1
338			min	-.012	2	-.009	1	0	1	0	1	NC	1	NC	1
339		18	max	.014	3	0	15	0	1	0	1	NC	1	NC	1
340			min	-.013	2	-.008	1	0	1	0	1	NC	1	NC	1
341		19	max	.015	3	0	15	0	1	0	1	NC	1	NC	1
342			min	-.014	2	-.006	1	0	1	0	1	NC	1	NC	1
343	M8	1	max	.008	1	.013	2	0	1	0	1	NC	1	NC	1
344			min	-.002	3	-.015	3	0	1	0	1	NC	1	NC	1
345		2	max	.008	1	.012	2	0	1	0	1	NC	1	NC	1
346			min	-.002	3	-.014	3	0	1	0	1	NC	1	NC	1
347		3	max	.007	1	.011	2	0	1	0	1	NC	1	NC	1
348			min	-.002	3	-.013	3	0	1	0	1	NC	1	NC	1
349		4	max	.007	1	.01	2	0	1	0	1	NC	1	NC	1
350			min	-.002	3	-.012	3	0	1	0	1	NC	1	NC	1
351		5	max	.006	1	.01	2	0	1	0	1	NC	1	NC	1
352			min	-.002	3	-.012	3	0	1	0	1	NC	1	NC	1
353		6	max	.006	1	.009	2	0	1	0	1	NC	1	NC	1
354			min	-.001	3	-.011	3	0	1	0	1	NC	1	NC	1
355		7	max	.005	1	.008	2	0	1	0	1	NC	1	NC	1
356			min	-.001	3	-.01	3	0	1	0	1	NC	1	NC	1
357		8	max	.005	1	.008	2	0	1	0	1	NC	1	NC	1
358			min	-.001	3	-.009	3	0	1	0	1	NC	1	NC	1
359		9	max	.005	1	.007	2	0	1	0	1	NC	1	NC	1
360			min	-.001	3	-.008	3	0	1	0	1	NC	1	NC	1
361		10	max	.004	1	.006	2	0	1	0	1	NC	1	NC	1
362			min	0	3	-.007	3	0	1	0	1	NC	1	NC	1
363		11	max	.004	1	.006	2	0	1	0	1	NC	1	NC	1
364			min	0	3	-.007	3	0	1	0	1	NC	1	NC	1
365		12	max	.003	1	.005	2	0	1	0	1	NC	1	NC	1
366			min	0	3	-.006	3	0	1	0	1	NC	1	NC	1
367		13	max	.003	1	.004	2	0	1	0	1	NC	1	NC	1
368			min	0	3	-.005	3	0	1	0	1	NC	1	NC	1
369		14	max	.002	1	.003	2	0	1	0	1	NC	1	NC	1
370			min	0	3	-.004	3	0	1	0	1	NC	1	NC	1
371		15	max	.002	1	.003	2	0	1	0	1	NC	1	NC	1
372			min	0	3	-.003	3	0	1	0	1	NC	1	NC	1
373		16	max	.001	1	.002	2	0	1	0	1	NC	1	NC	1
374			min	0	3	-.002	3	0	1	0	1	NC	1	NC	1
375		17	max	0	1	.001	2	0	1	0	1	NC	1	NC	1
376			min	0	3	-.002	3	0	1	0	1	NC	1	NC	1
377		18	max	0	1	0	2	0	1	0	1	NC	1	NC	1
378			min	0	3	0	3	0	1	0	1	NC	1	NC	1
379		19	max	0	1	0	1	0	1	0	1	NC	1	NC	1
380			min	0	1	0	1	0	1	0	1	NC	1	NC	1
381	M10	1	max	.006	1	.004	2	0	15	2.162e-4	1	NC	1	NC	2
382			min	-.006	3	-.008	3	-.008	1	7.889e-6	15	NC	1	6861.191	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	.005	1	.004	2	0	15	2.017e-4	1	NC	1	NC	2
384			min	-.006	3	-.008	3	-.007	1	7.36e-6	15	NC	1	7484.405	1
385		3	max	.005	1	.003	2	0	15	1.872e-4	1	NC	1	NC	2
386			min	-.005	3	-.007	3	-.007	1	6.831e-6	15	NC	1	8227.363	1
387		4	max	.005	1	.002	2	0	15	1.727e-4	1	NC	1	NC	2
388			min	-.005	3	-.007	3	-.006	1	6.301e-6	15	NC	1	9121.877	1
389		5	max	.005	1	.002	2	0	15	1.581e-4	1	NC	1	NC	1
390			min	-.005	3	-.007	3	-.005	1	5.772e-6	15	NC	1	NC	1
391		6	max	.004	1	.001	2	0	15	1.436e-4	1	NC	1	NC	1
392			min	-.004	3	-.006	3	-.005	1	5.243e-6	15	NC	1	NC	1
393		7	max	.004	1	0	2	0	15	1.291e-4	1	NC	1	NC	1
394			min	-.004	3	-.006	3	-.004	1	4.714e-6	15	NC	1	NC	1
395		8	max	.004	1	0	2	0	15	1.146e-4	1	NC	1	NC	1
396			min	-.004	3	-.006	3	-.004	1	4.184e-6	15	NC	1	NC	1
397		9	max	.003	1	0	2	0	15	1.001e-4	1	NC	1	NC	1
398			min	-.003	3	-.005	3	-.003	1	3.655e-6	15	NC	1	NC	1
399		10	max	.003	1	0	2	0	15	8.557e-5	1	NC	1	NC	1
400			min	-.003	3	-.005	3	-.003	1	3.126e-6	15	NC	1	NC	1
401		11	max	.003	1	0	15	0	15	7.105e-5	1	NC	1	NC	1
402			min	-.003	3	-.005	3	-.002	1	2.597e-6	15	NC	1	NC	1
403		12	max	.002	1	0	15	0	15	5.653e-5	1	NC	1	NC	1
404			min	-.002	3	-.004	3	-.002	1	2.067e-6	15	NC	1	NC	1
405		13	max	.002	1	0	15	0	15	4.202e-5	1	NC	1	NC	1
406			min	-.002	3	-.004	3	-.001	1	1.538e-6	15	NC	1	NC	1
407		14	max	.002	1	0	15	0	15	2.75e-5	1	NC	1	NC	1
408			min	-.002	3	-.003	3	0	1	1.009e-6	15	NC	1	NC	1
409		15	max	.001	1	0	15	0	15	1.299e-5	1	NC	1	NC	1
410			min	-.001	3	-.003	3	0	1	4.795e-7	15	NC	1	NC	1
411		16	max	0	1	0	15	0	15	3.245e-7	3	NC	1	NC	1
412			min	0	3	-.002	3	0	1	-1.53e-6	1	NC	1	NC	1
413		17	max	0	1	0	15	0	15	-4.761e-7	12	NC	1	NC	1
414			min	0	3	-.001	4	0	1	-1.605e-5	1	NC	1	NC	1
415		18	max	0	1	0	15	0	15	-1.108e-6	15	NC	1	NC	1
416			min	0	3	0	4	0	1	-3.056e-5	1	NC	1	NC	1
417		19	max	0	1	0	1	0	1	-1.637e-6	15	NC	1	NC	1
418			min	0	1	0	1	0	1	-4.508e-5	1	NC	1	NC	1
419	M11	1	max	0	1	0	1	0	1	1.42e-5	1	NC	1	NC	1
420			min	0	1	0	1	0	1	5.16e-7	15	NC	1	NC	1
421		2	max	0	3	0	15	0	15	-3.785e-7	15	NC	1	NC	1
422			min	0	2	-.002	4	0	1	-1.037e-5	1	NC	1	NC	1
423		3	max	0	3	0	15	0	15	-1.273e-6	15	NC	1	NC	1
424			min	0	2	-.003	4	0	1	-3.493e-5	1	NC	1	NC	1
425		4	max	0	3	-.001	15	0	15	-2.167e-6	15	NC	1	NC	1
426			min	0	2	-.005	4	0	1	-5.949e-5	1	NC	1	NC	1
427		5	max	.001	3	-.002	15	0	15	-3.062e-6	15	NC	1	NC	1
428			min	0	2	-.007	4	0	1	-8.405e-5	1	NC	1	NC	1
429		6	max	.001	3	-.002	15	0	15	-3.956e-6	15	NC	1	NC	1
430			min	0	2	-.009	4	-.001	1	-1.086e-4	1	NC	1	NC	1
431		7	max	.002	3	-.002	15	0	15	-4.851e-6	15	NC	1	NC	1
432			min	-.001	2	-.01	4	-.002	1	-1.332e-4	1	8924.453	4	NC	1
433		8	max	.002	3	-.003	15	0	15	-5.745e-6	15	NC	1	NC	1
434			min	-.001	2	-.012	4	-.002	1	-1.577e-4	1	7985.018	4	NC	1
435		9	max	.002	3	-.003	15	0	15	-6.64e-6	15	NC	2	NC	1
436			min	-.002	2	-.013	4	-.002	1	-1.823e-4	1	7426.498	4	NC	1
437		10	max	.002	3	-.003	15	0	15	-7.534e-6	15	NC	2	NC	1
438			min	-.002	2	-.013	4	-.003	1	-2.069e-4	1	7150.729	4	NC	1
439		11	max	.003	3	-.003	15	0	15	-8.429e-6	15	NC	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
440			min	-.002	2	-.013	4	-.003	1	-2.314e-4	1	7116.776	4	NC	1
441		12	max	.003	3	-.003	15	0	15	-9.323e-6	15	NC	2	NC	1
442			min	-.002	2	-.013	4	-.004	1	-2.56e-4	1	7325.19	4	NC	1
443		13	max	.003	3	-.003	15	0	15	-1.022e-5	15	NC	1	NC	1
444			min	-.002	2	-.012	4	-.004	1	-2.805e-4	1	7820.199	4	NC	1
445		14	max	.003	3	-.003	15	0	15	-1.111e-5	15	NC	1	NC	1
446			min	-.003	2	-.011	4	-.005	1	-3.051e-4	1	8712.939	4	NC	1
447		15	max	.004	3	-.002	15	0	15	-1.201e-5	15	NC	1	NC	1
448			min	-.003	2	-.009	4	-.005	1	-3.297e-4	1	NC	1	NC	1
449		16	max	.004	3	-.002	15	0	15	-1.29e-5	15	NC	1	NC	1
450			min	-.003	2	-.008	1	-.006	1	-3.542e-4	1	NC	1	NC	1
451		17	max	.004	3	-.001	15	0	15	-1.38e-5	15	NC	1	NC	1
452			min	-.003	2	-.006	1	-.006	1	-3.788e-4	1	NC	1	NC	1
453		18	max	.004	3	0	15	0	15	-1.469e-5	15	NC	1	NC	1
454			min	-.003	2	-.005	1	-.007	1	-4.034e-4	1	NC	1	NC	1
455		19	max	.005	3	0	15	0	15	-1.558e-5	15	NC	1	NC	1
456			min	-.004	2	-.003	1	-.008	1	-4.279e-4	1	NC	1	NC	1
457	M12	1	max	.003	1	.003	2	.008	1	-7.614e-7	15	NC	1	NC	3
458			min	0	3	-.005	3	0	15	-2.062e-5	1	NC	1	3223.312	1
459		2	max	.003	1	.003	2	.007	1	-7.614e-7	15	NC	1	NC	3
460			min	0	3	-.004	3	0	15	-2.062e-5	1	NC	1	3508.22	1
461		3	max	.003	1	.003	2	.006	1	-7.614e-7	15	NC	1	NC	3
462			min	0	3	-.004	3	0	15	-2.062e-5	1	NC	1	3847.13	1
463		4	max	.002	1	.002	2	.006	1	-7.614e-7	15	NC	1	NC	2
464			min	0	3	-.004	3	0	15	-2.062e-5	1	NC	1	4254.102	1
465		5	max	.002	1	.002	2	.005	1	-7.614e-7	15	NC	1	NC	2
466			min	0	3	-.004	3	0	15	-2.062e-5	1	NC	1	4748.24	1
467		6	max	.002	1	.002	2	.005	1	-7.614e-7	15	NC	1	NC	2
468			min	0	3	-.003	3	0	15	-2.062e-5	1	NC	1	5356.042	1
469		7	max	.002	1	.002	2	.004	1	-7.614e-7	15	NC	1	NC	2
470			min	0	3	-.003	3	0	15	-2.062e-5	1	NC	1	6115.118	1
471		8	max	.002	1	.002	2	.004	1	-7.614e-7	15	NC	1	NC	2
472			min	0	3	-.003	3	0	15	-2.062e-5	1	NC	1	7080.328	1
473		9	max	.002	1	.002	2	.003	1	-7.614e-7	15	NC	1	NC	2
474			min	0	3	-.003	3	0	15	-2.062e-5	1	NC	1	8334.265	1
475		10	max	.001	1	.001	2	.002	1	-7.614e-7	15	NC	1	NC	1
476			min	0	3	-.002	3	0	15	-2.062e-5	1	NC	1	NC	1
477		11	max	.001	1	.001	2	.002	1	-7.614e-7	15	NC	1	NC	1
478			min	0	3	-.002	3	0	15	-2.062e-5	1	NC	1	NC	1
479		12	max	.001	1	.001	2	.002	1	-7.614e-7	15	NC	1	NC	1
480			min	0	3	-.002	3	0	15	-2.062e-5	1	NC	1	NC	1
481		13	max	0	1	0	2	.001	1	-7.614e-7	15	NC	1	NC	1
482			min	0	3	-.002	3	0	15	-2.062e-5	1	NC	1	NC	1
483		14	max	0	1	0	2	0	1	-7.614e-7	15	NC	1	NC	1
484			min	0	3	-.001	3	0	15	-2.062e-5	1	NC	1	NC	1
485		15	max	0	1	0	2	0	1	-7.614e-7	15	NC	1	NC	1
486			min	0	3	-.001	3	0	15	-2.062e-5	1	NC	1	NC	1
487		16	max	0	1	0	2	0	1	-7.614e-7	15	NC	1	NC	1
488			min	0	3	0	3	0	15	-2.062e-5	1	NC	1	NC	1
489		17	max	0	1	0	2	0	1	-7.614e-7	15	NC	1	NC	1
490			min	0	3	0	3	0	15	-2.062e-5	1	NC	1	NC	1
491		18	max	0	1	0	2	0	1	-7.614e-7	15	NC	1	NC	1
492			min	0	3	0	3	0	15	-2.062e-5	1	NC	1	NC	1
493		19	max	0	1	0	1	0	1	-7.614e-7	15	NC	1	NC	1
494			min	0	1	0	1	0	1	-2.062e-5	1	NC	1	NC	1
495	M1	1	max	.006	3	.108	1	.001	1	1.739e-2	1	NC	1	NC	1
496			min	-.003	2	-.016	3	0	15	-2.42e-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	.006	3	.053	1	0	15	8.457e-3	1	NC	4	NC	1
498			min	-.003	2	-.007	3	-.006	1	-1.197e-2	3	2069.283	1	NC	1
499		3	max	.006	3	.008	3	0	15	2.513e-5	10	NC	5	NC	1
500			min	-.003	2	-.007	2	-.008	1	-1.559e-4	1	990.303	1	NC	1
501		4	max	.006	3	.036	3	0	15	4.835e-3	1	NC	5	NC	1
502			min	-.003	2	-.076	1	-.008	1	-4.339e-3	3	618.99	1	NC	1
503		5	max	.006	3	.072	3	0	15	9.825e-3	1	NC	15	NC	1
504			min	-.002	2	-.15	1	-.005	1	-8.562e-3	3	443.037	1	NC	1
505		6	max	.005	3	.111	3	0	15	1.482e-2	1	NC	15	NC	1
506			min	-.002	2	-.221	1	-.002	1	-1.278e-2	3	346.717	1	NC	1
507		7	max	.005	3	.149	3	0	1	1.981e-2	1	9817.115	15	NC	1
508			min	-.002	2	-.286	1	0	12	-1.701e-2	3	290.157	1	NC	1
509		8	max	.005	3	.18	3	0	1	2.48e-2	1	8720.769	15	NC	1
510			min	-.002	2	-.337	1	0	15	-2.123e-2	3	256.829	1	NC	1
511		9	max	.005	3	.201	3	0	15	2.737e-2	1	8149.305	15	NC	1
512			min	-.002	2	-.369	1	0	1	-2.129e-2	3	239.526	1	NC	1
513		10	max	.005	3	.208	3	0	1	2.834e-2	1	7975.293	15	NC	1
514			min	-.002	2	-.38	1	0	12	-1.859e-2	3	234.352	1	NC	1
515		11	max	.005	3	.203	3	0	1	2.932e-2	1	8149.099	15	NC	1
516			min	-.002	2	-.369	1	0	15	-1.588e-2	3	239.855	1	NC	1
517		12	max	.005	3	.186	3	0	15	2.773e-2	1	8720.338	15	NC	1
518			min	-.002	2	-.336	1	0	1	-1.32e-2	3	257.855	1	NC	1
519		13	max	.005	3	.158	3	0	15	2.23e-2	1	9816.354	15	NC	1
520			min	-.002	2	-.283	1	0	1	-1.057e-2	3	292.693	1	NC	1
521		14	max	.005	3	.123	3	.002	1	1.686e-2	1	NC	15	NC	1
522			min	-.002	2	-.218	1	0	15	-7.935e-3	3	352.181	1	NC	1
523		15	max	.004	3	.083	3	.005	1	1.143e-2	1	NC	15	NC	1
524			min	-.002	2	-.145	1	0	15	-5.301e-3	3	454.337	1	NC	1
525		16	max	.004	3	.042	3	.007	1	5.99e-3	1	NC	5	NC	1
526			min	-.002	2	-.072	1	0	15	-2.667e-3	3	642.883	1	NC	1
527		17	max	.004	3	.003	3	.008	1	5.545e-4	1	NC	5	NC	1
528			min	-.002	2	-.005	2	0	15	-3.218e-5	3	1044.558	1	NC	1
529		18	max	.004	3	.053	1	.005	1	1.053e-2	2	NC	4	NC	1
530			min	-.002	2	-.032	3	0	15	-4.119e-3	3	2207.428	1	NC	1
531		19	max	.004	3	.105	1	0	15	2.114e-2	2	NC	1	NC	1
532			min	-.002	2	-.064	3	-.001	1	-8.362e-3	3	NC	1	NC	1
533	M5	1	max	.018	3	.258	1	0	1	0	1	NC	1	NC	1
534			min	-.012	2	-.021	3	0	1	0	1	NC	1	NC	1
535		2	max	.018	3	.126	1	0	1	0	1	NC	5	NC	1
536			min	-.012	2	-.008	3	0	1	0	1	865.961	1	NC	1
537		3	max	.018	3	.027	3	0	1	0	1	NC	15	NC	1
538			min	-.012	2	-.024	1	0	1	0	1	405.159	1	NC	1
539		4	max	.018	3	.102	3	0	1	0	1	9364.558	15	NC	1
540			min	-.012	2	-.207	1	0	1	0	1	246.127	1	NC	1
541		5	max	.017	3	.205	3	0	1	0	1	6554.987	15	NC	1
542			min	-.011	2	-.406	1	0	1	0	1	172.199	1	NC	1
543		6	max	.017	3	.321	3	0	1	0	1	5047.642	15	NC	1
544			min	-.011	2	-.605	1	0	1	0	1	132.517	1	NC	1
545		7	max	.017	3	.434	3	0	1	0	1	4176.96	15	NC	1
546			min	-.011	2	-.785	1	0	1	0	1	109.587	1	NC	1
547		8	max	.016	3	.529	3	0	1	0	1	3670.62	15	NC	1
548			min	-.011	2	-.93	1	0	1	0	1	96.248	1	NC	1
549		9	max	.016	3	.59	3	0	1	0	1	3410.923	15	NC	1
550			min	-.011	2	-1.021	1	0	1	0	1	89.409	1	NC	1
551		10	max	.016	3	.612	3	0	1	0	1	3332.674	15	NC	1
552			min	-.01	2	-1.052	1	0	1	0	1	87.376	1	NC	1
553		11	max	.015	3	.597	3	0	1	0	1	3410.996	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	-.01	2	-1.021	1	0	1	0	1	89.542	1	NC	1
555		12	max	.015	3	.545	3	0	1	0	1	3670.793	15	NC	1
556			min	-.01	2	-.927	1	0	1	0	1	96.684	1	NC	1
557		13	max	.015	3	.462	3	0	1	0	1	4177.319	15	NC	1
558			min	-.01	2	-.778	1	0	1	0	1	110.721	1	NC	1
559		14	max	.014	3	.357	3	0	1	0	1	5048.353	15	NC	1
560			min	-.01	2	-.594	1	0	1	0	1	135.069	1	NC	1
561		15	max	.014	3	.24	3	0	1	0	1	6556.401	15	NC	1
562			min	-.01	2	-.392	1	0	1	0	1	177.728	1	NC	1
563		16	max	.014	3	.121	3	0	1	0	1	9367.532	15	NC	1
564			min	-.009	2	-.192	1	0	1	0	1	258.498	1	NC	1
565		17	max	.013	3	.009	3	0	1	0	1	NC	15	NC	1
566			min	-.009	2	-.014	2	0	1	0	1	435.208	1	NC	1
567		18	max	.013	3	.127	1	0	1	0	1	NC	5	NC	1
568			min	-.009	2	-.086	3	0	1	0	1	946.397	1	NC	1
569		19	max	.013	3	.247	1	0	1	0	1	NC	1	NC	1
570			min	-.009	2	-.172	3	0	1	0	1	NC	1	NC	1
571	M9	1	max	.006	3	.108	1	0	15	2.42e-2	3	NC	1	NC	1
572			min	-.003	2	-.016	3	-.001	1	-1.739e-2	1	NC	1	NC	1
573		2	max	.006	3	.053	1	.006	1	1.197e-2	3	NC	4	NC	1
574			min	-.003	2	-.007	3	0	15	-8.457e-3	1	2069.283	1	NC	1
575		3	max	.006	3	.008	3	.008	1	1.559e-4	1	NC	5	NC	1
576			min	-.003	2	-.007	2	0	15	-2.513e-5	10	990.303	1	NC	1
577		4	max	.006	3	.036	3	.008	1	4.339e-3	3	NC	5	NC	1
578			min	-.003	2	-.076	1	0	15	-4.835e-3	1	618.99	1	NC	1
579		5	max	.006	3	.072	3	.005	1	8.562e-3	3	NC	15	NC	1
580			min	-.002	2	-.15	1	0	15	-9.825e-3	1	443.037	1	NC	1
581		6	max	.005	3	.111	3	.002	1	1.278e-2	3	NC	15	NC	1
582			min	-.002	2	-.221	1	0	15	-1.482e-2	1	346.717	1	NC	1
583		7	max	.005	3	.149	3	0	12	1.701e-2	3	9817.115	15	NC	1
584			min	-.002	2	-.286	1	0	1	-1.981e-2	1	290.157	1	NC	1
585		8	max	.005	3	.18	3	0	15	2.123e-2	3	8720.769	15	NC	1
586			min	-.002	2	-.337	1	0	1	-2.48e-2	1	256.829	1	NC	1
587		9	max	.005	3	.201	3	0	1	2.129e-2	3	8149.305	15	NC	1
588			min	-.002	2	-.369	1	0	15	-2.737e-2	1	239.526	1	NC	1
589		10	max	.005	3	.208	3	0	12	1.859e-2	3	7975.293	15	NC	1
590			min	-.002	2	-.38	1	0	1	-2.834e-2	1	234.352	1	NC	1
591		11	max	.005	3	.203	3	0	15	1.588e-2	3	8149.099	15	NC	1
592			min	-.002	2	-.369	1	0	1	-2.932e-2	1	239.855	1	NC	1
593		12	max	.005	3	.186	3	0	1	1.32e-2	3	8720.338	15	NC	1
594			min	-.002	2	-.336	1	0	15	-2.773e-2	1	257.855	1	NC	1
595		13	max	.005	3	.158	3	0	1	1.057e-2	3	9816.354	15	NC	1
596			min	-.002	2	-.283	1	0	15	-2.23e-2	1	292.693	1	NC	1
597		14	max	.005	3	.123	3	0	15	7.935e-3	3	NC	15	NC	1
598			min	-.002	2	-.218	1	-.002	1	-1.686e-2	1	352.181	1	NC	1
599		15	max	.004	3	.083	3	0	15	5.301e-3	3	NC	15	NC	1
600			min	-.002	2	-.145	1	-.005	1	-1.143e-2	1	454.337	1	NC	1
601		16	max	.004	3	.042	3	0	15	2.667e-3	3	NC	5	NC	1
602			min	-.002	2	-.072	1	-.007	1	-5.99e-3	1	642.883	1	NC	1
603		17	max	.004	3	.003	3	0	15	3.218e-5	3	NC	5	NC	1
604			min	-.002	2	-.005	2	-.008	1	-5.545e-4	1	1044.558	1	NC	1
605		18	max	.004	3	.053	1	0	15	4.119e-3	3	NC	4	NC	1
606			min	-.002	2	-.032	3	-.005	1	-1.053e-2	2	2207.428	1	NC	1
607		19	max	.004	3	.105	1	.001	1	8.362e-3	3	NC	1	NC	1
608			min	-.002	2	-.064	3	0	15	-2.114e-2	2	NC	1	NC	1

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, 14-42 Inch Width		
Address:			
Phone:			
E-mail:			

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

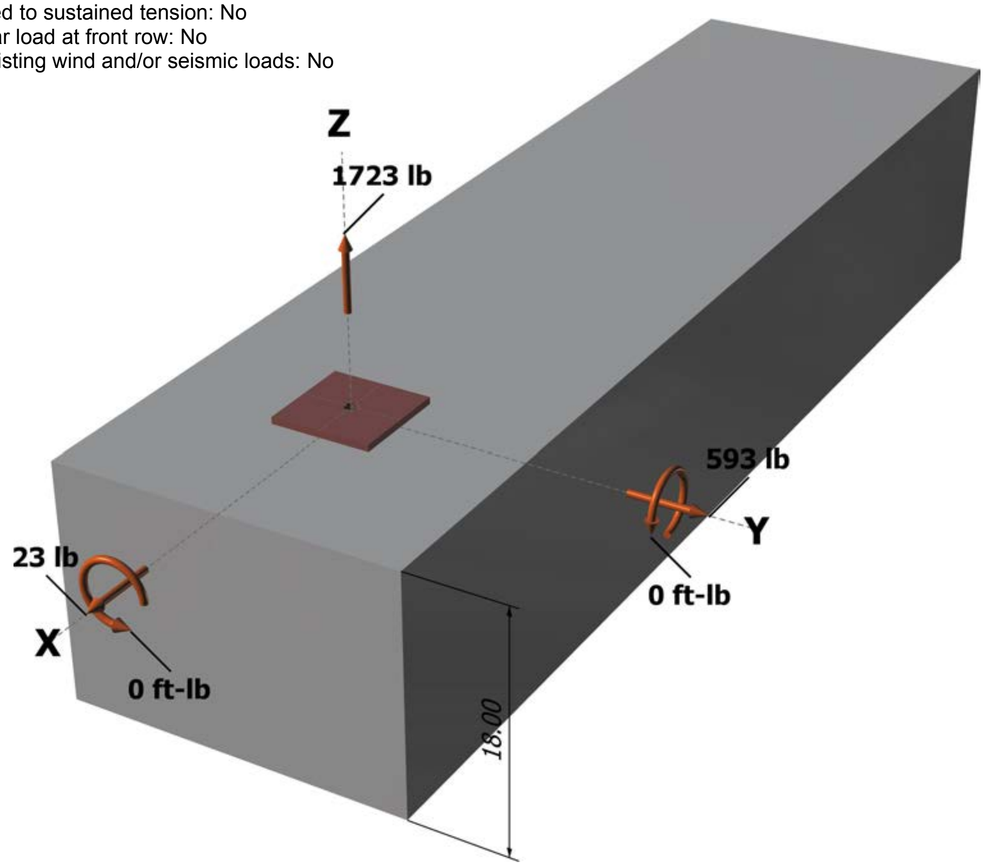
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

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

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

<Figure 1>



<Figure 2>

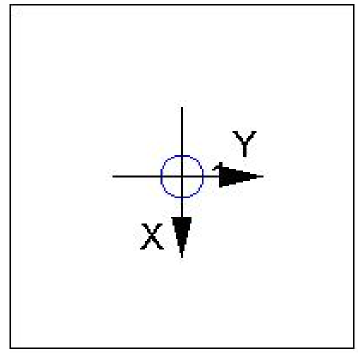
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

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

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

<Figure 3>



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in y-direction:

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

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

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

Shear parallel to edge in x-direction:

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

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

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

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

Shear parallel to edge in y-direction:

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

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

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

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

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

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

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

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

11. Results

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

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_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, ϕV_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.

Company:	Schletter, Inc.	Date:	11/17/2015
Engineer:	HCV	Page:	1/5
Project:	Standard PVMax - Worst Case, 21-30 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

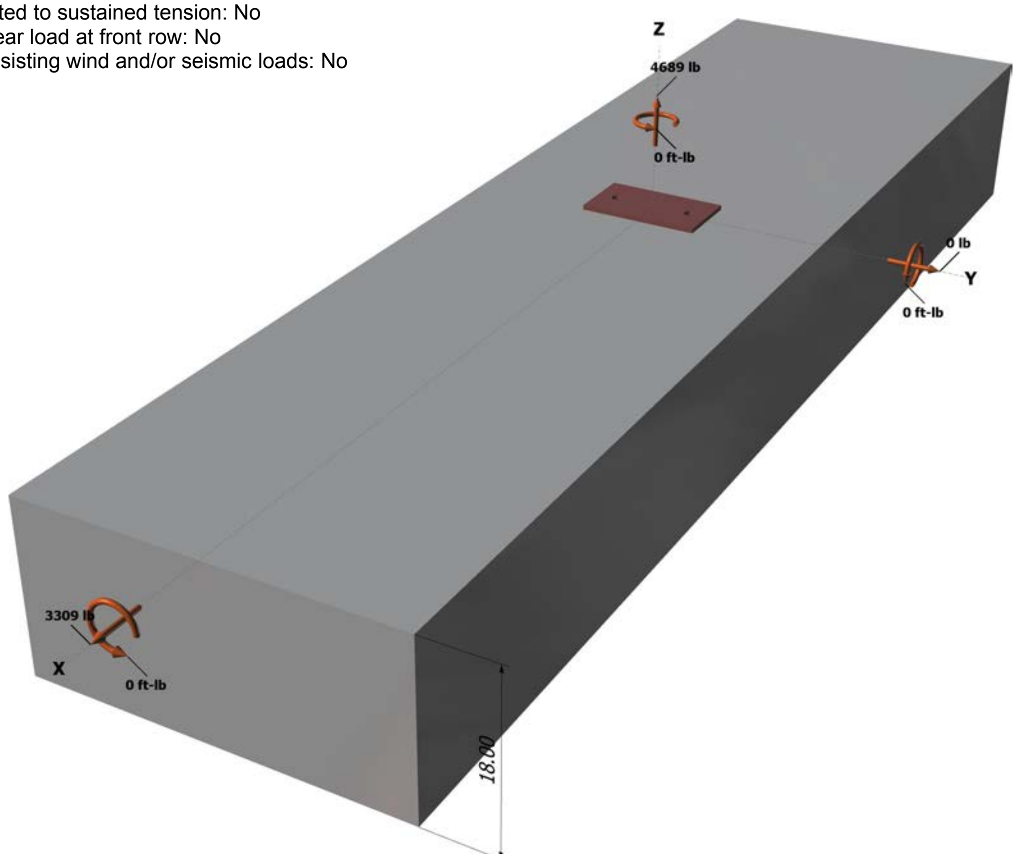
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

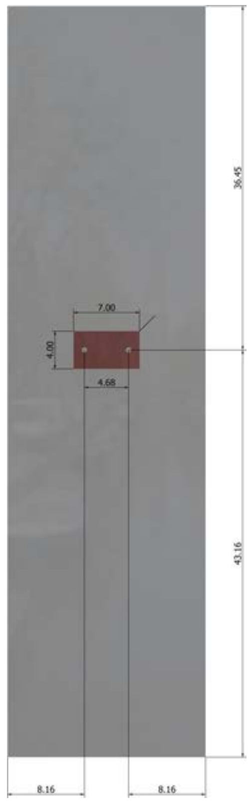
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout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



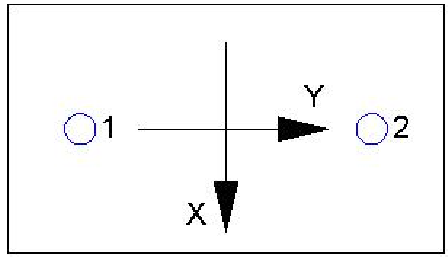
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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	2344.5	1654.5	0.0	1654.5
2	2344.5	1654.5	0.0	1654.5
Sum	4689.0	3309.0	0.0	3309.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 4689
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



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

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

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

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

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

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

A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cbg} (lb)
378.00	324.00	1.000	0.972	1.00	1.000	12492	0.65	9208

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

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

A_{Vc} (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)
378.00	648.00	1.000	0.836	1.000	1.000	15593	0.70	5323

Shear parallel to edge in x-direction:

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

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

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

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cbx} (lb)
299.64	299.64	1.000	1.000	1.000	8744	0.70	12241

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

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

k_{cp}	A_{Na} (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
378.00	324.00	1.000	0.972	1.000	1.000	12492	14166	0.70

ϕV_{cpg} (lb)
19833

11. Results

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

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	2345	6071	0.39	Pass
Concrete breakout	4689	9208	0.51	Pass
Adhesive	**4689**	**8093**	**0.58**	**Pass (Governs)**

Shear	Factored Load, V_{ua} (lb)	Design Strength, ϕV_n (lb)	Ratio	Status
Steel	1655	3156	0.52	Pass
T Concrete breakout x+	**3309**	**5323**	**0.62**	**Pass (Governs)**
|| Concrete breakout y-	**1655**	**12241**	**0.14**	**Pass (Governs)**
Pryout	3309	19833	0.17	Pass

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

Sec. D.7.3	0.58	0.62	120.1 %	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.