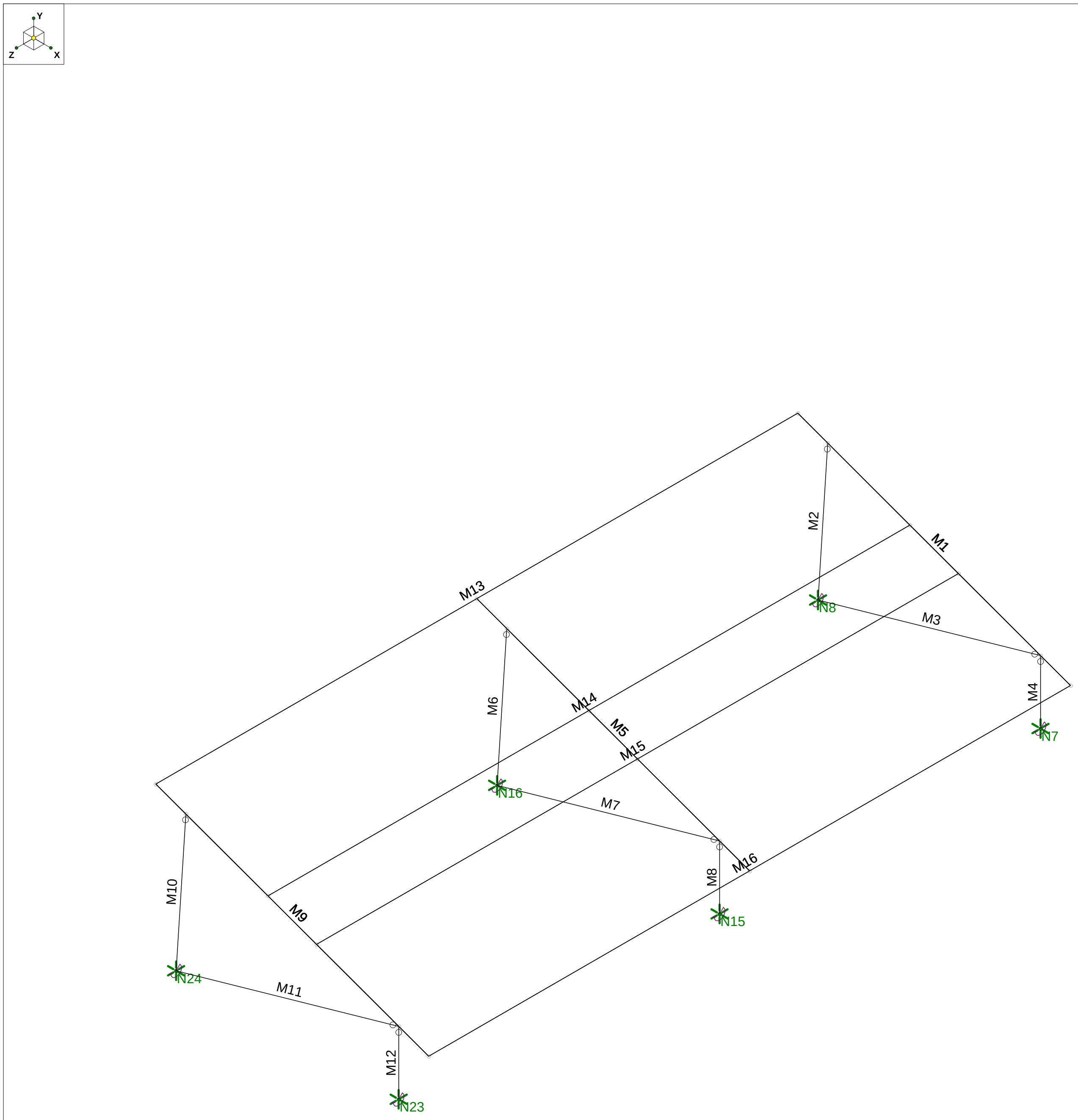


Schletter, Inc.		20ÁTilt w/o Seismic Design
HCV	Standard PVMax Racking System	
	Representative Calculations - ASCE 7-10	

1. INTRODUCTION

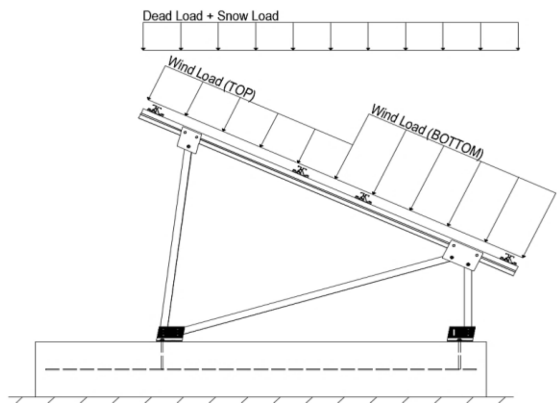
1.1 Project Description
The following sections will cover the determination of forces and structural design calculations for the Schletter, Inc. PVMax ground mount system.

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

PV modules are required to meet the following specifications:

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

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



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

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

2. LOAD ACTIONS

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

Self-weight of the PV modules.

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

2.3 Wind Loads
Design Wind Speed, V = 110 mph
Height < 15 ft

Exposure Category = C
Importance Category = II

Peak Velocity Pressure, q_z = 19.00 psf *Including the gust factor, G=0.85. (ASCE 7-10, Eq. 27.3-1)*

Pressure Coefficients

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

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

2.4 Seismic Loads - N/A

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

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

2.5 Combination of Loads

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

Strength Design, LRFD

Component stresses are checked using the following LRFD load combinations:

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

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

Allowable Stress Design, ASD

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

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

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

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

3. STRUCTURAL ANALYSIS

3.1 RISA Results

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

3.2 RISA Components

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

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

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

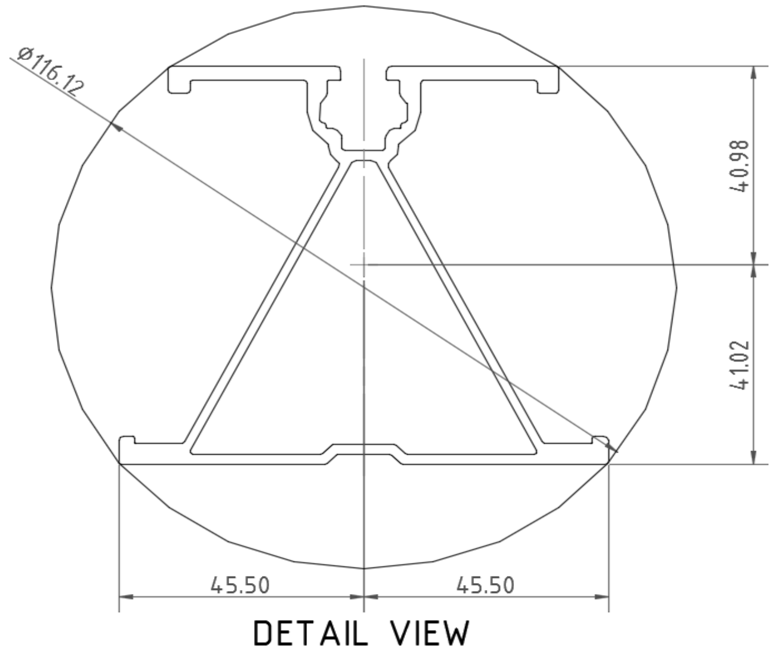
Front Struts	Location
M4	Outer
M8	Inner
M12	Outer

4. MEMBER DESIGN CALCULATIONS

4.1 Purlin Design

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

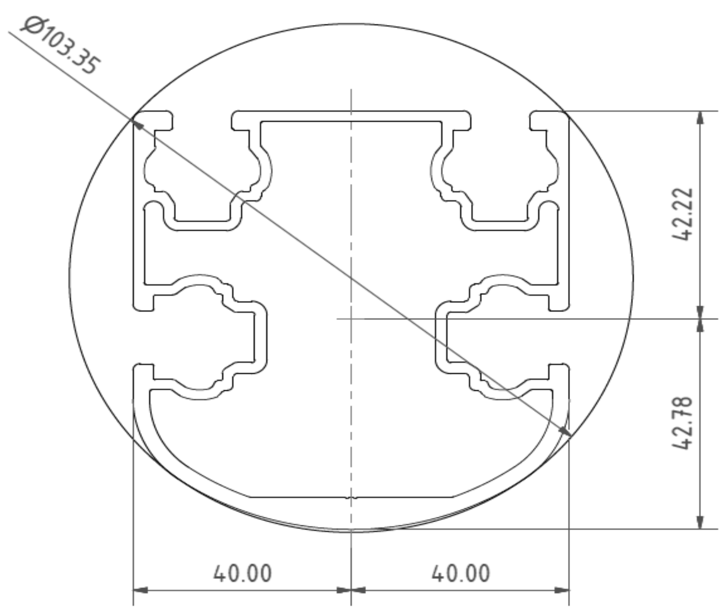
Purlin Type =	**S1.5**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	126	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	25.07	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	23.08	ksi
S_y =	1.33	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	2.16	in^4
I_x =	1.07	in^4
A =	1.25	in^2
g =	1.50	lbs/ft
M_y =	1.921	k-ft
M_z =	0.331	k-ft
$M_{y\ allowable}$ =	2.779	k-ft
$M_{z\ allowable}$ =	1.154	k-ft
Utilization =	98%	



4.2 Girder Design

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

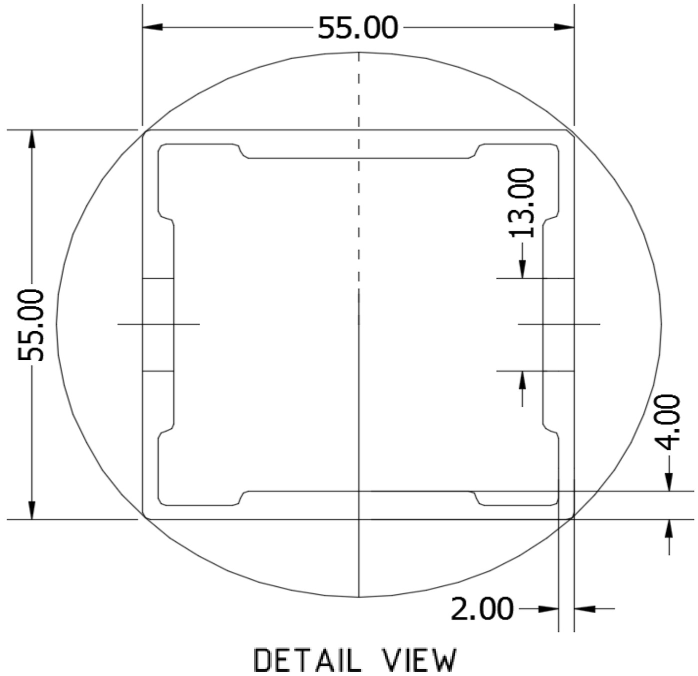
Girder Type =	**BF0**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	88.90	in
$\Phi F_{ty\ AXIAL}$ =	31.09	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.35	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	33.25	ksi
S_y =	1.42	in^3
S_x =	1.41	in^3
E =	10100	ksi
I_y =	2.39	in^4
I_x =	2.22	in^4
A =	1.88	in^2
g =	2.26	lbs/ft
M_y =	-2.924	k-ft
M_z =	0.000	k-ft
P_n =	-0.192	k
$M_{y\ allowable}$ =	3.464	k-ft
$M_{z\ allowable}$ =	3.907	k-ft
$P_{n\ allowable}$ =	58.535	k
Utilization =	85%	



4.3 Front Strut Design

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

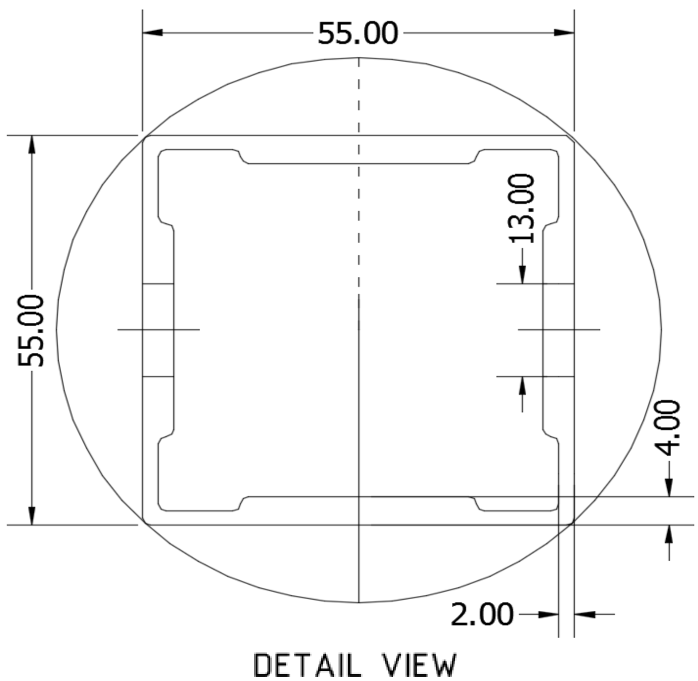
Strut Type =	55x55	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	24.80	in
$\Phi F_{ty\ AXIAL}$ =	28.03	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	3.280	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	27.532	k
Utilization =	12%	



4.4 Diagonal Strut Design

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

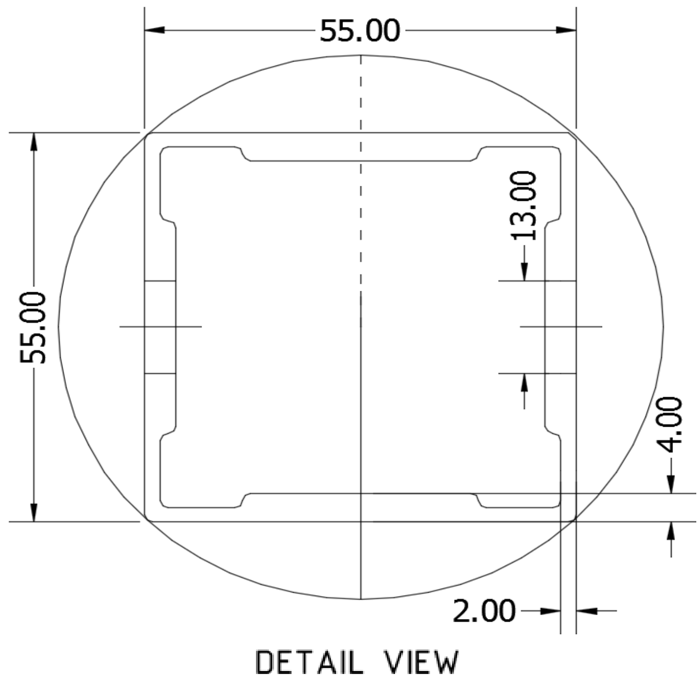
Strut Type =	55x55	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	86.60	in
$\Phi F_{ty\ AXIAL}$ =	7.50	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.009	k-ft
M_z =	0.000	k-ft
P_n =	1.254	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	7.371	k
Utilization =	18%	



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 =	3.330	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	15.642	k
Utilization =	22%	



5. FOUNDATION DESIGN CALCULATIONS

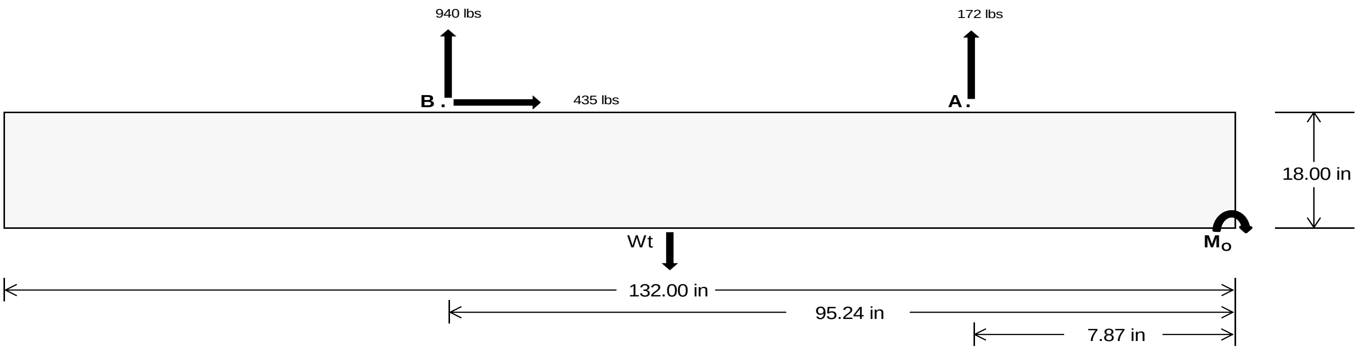
5.1 Helical Pile Foundations

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 =	765.79	4093.81	k
Compressive Load =	4263.58	4583.65	k
Lateral Load =	13.51	1888.24	k
Moment (Weak Axis) =	0.03	0.01	k

5.2 Design of Ballast Foundations

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



Concrete Properties

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

Footing Reinforcement

Use fiber reinforcing with (1) #5 rebar.

Overturning Check

M_O = 98671.6 in-lbs
Resisting Force Required = 1495.02 lbs
S.F. = 1.67
Weight Required = 2491.71 lbs
Minimum Width = 22 in in
Weight Provided = 4386.25 lbs

A minimum 132in long x 22in wide x 18in tall ballast foundation is required to resist overturning.

Sliding

Force = 435.28 lbs
Friction = 0.4
Weight Required = 1088.20 lbs
Resisting Weight = 4386.25 lbs
Additional Weight Required = 0 lbs

Use a 132in long x 22in wide x 18in tall ballast foundation to resist sliding. Friction is OK.

Cohesion

Sliding Force = 435.28 lbs
Cohesion = 130 psf
Area = 20.17 ft^2
Resisting = 2193.13 lbs
Additional Weight Required = 0 lbs

Use a 132in long x 22in wide x 18in tall ballast foundation. Cohesion is OK.

Shear Key

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

Shear key is not required.

Bearing Pressure

	Ballast Width			
	22 in	23 in	24 in	25 in
P_{ftg} = (145 pcf)(11 ft)(1.5 ft)(1.83 ft) =	4386 lbs	4586 lbs	4785 lbs	4984 lbs

ASD LC	1.0D + 1.0S				1.0D + 0.6W				1.0D + 0.75L + 0.45W + 0.75S				0.6D + 0.6W			
Width	22 in	23 in	24 in	25 in	22 in	23 in	24 in	25 in	22 in	23 in	24 in	25 in	22 in	23 in	24 in	25 in
F_A	1630 lbs	1630 lbs	1630 lbs	1630 lbs	1205 lbs	1205 lbs	1205 lbs	1205 lbs	1992 lbs	1992 lbs	1992 lbs	1992 lbs	-343 lbs	-343 lbs	-343 lbs	-343 lbs
F_B	1665 lbs	1665 lbs	1665 lbs	1665 lbs	1436 lbs	1436 lbs	1436 lbs	1436 lbs	2189 lbs	2189 lbs	2189 lbs	2189 lbs	-1879 lbs	-1879 lbs	-1879 lbs	-1879 lbs
F_V	187 lbs	187 lbs	187 lbs	187 lbs	791 lbs	791 lbs	791 lbs	791 lbs	720 lbs	720 lbs	720 lbs	720 lbs	-871 lbs	-871 lbs	-871 lbs	-871 lbs
P_{total}	7682 lbs	7881 lbs	8081 lbs	8280 lbs	7027 lbs	7227 lbs	7426 lbs	7625 lbs	8568 lbs	8767 lbs	8967 lbs	9166 lbs	409 lbs	529 lbs	649 lbs	768 lbs
M	4121 lbs-ft	4121 lbs-ft	4121 lbs-ft	4121 lbs-ft	3523 lbs-ft	3523 lbs-ft	3523 lbs-ft	3523 lbs-ft	5395 lbs-ft	5395 lbs-ft	5395 lbs-ft	5395 lbs-ft	1610 lbs-ft	1610 lbs-ft	1610 lbs-ft	1610 lbs-ft
e	0.54 ft	0.52 ft	0.51 ft	0.50 ft	0.50 ft	0.49 ft	0.47 ft	0.46 ft	0.63 ft	0.62 ft	0.60 ft	0.59 ft	3.93 ft	3.04 ft	2.48 ft	2.10 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}	269.5 psf	267.2 psf	265.1 psf	263.2 psf	253.2 psf	251.6 psf	250.2 psf	248.9 psf	278.9 psf	276.3 psf	273.8 psf	271.6 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	492.4 psf	480.4 psf	469.5 psf	459.4 psf	443.8 psf	433.9 psf	424.9 psf	416.6 psf	570.8 psf	555.4 psf	541.3 psf	528.4 psf	95.0 psf	74.9 psf	71.6 psf	72.2 psf

Maximum Bearing Pressure = 571 psf
Allowable Bearing Pressure = 1500 psf

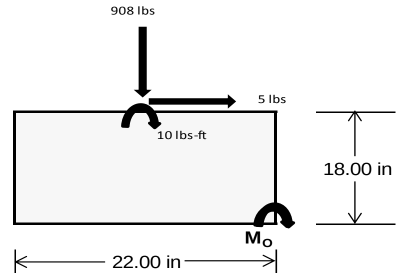
Use a 132in long x 22in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O = 814.4 ft-lbs
Resisting Force Required = 888.44 lbs
S.F. = 1.67
Weight Required = 1480.73 lbs
Minimum Width = 22 in in
Weight Provided = 4386.25 lbs

A minimum 132in long x 22in 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	22 in			22 in			22 in		
Support	Outer	Inner	Outer	Outer	Inner	Outer	Outer	Inner	Outer
F_Y	250 lbs	671 lbs	250 lbs	908 lbs	2704 lbs	908 lbs	73 lbs	196 lbs	73 lbs
F_V	1 lbs	0 lbs	1 lbs	5 lbs	0 lbs	5 lbs	0 lbs	0 lbs	0 lbs
P_{total}	5680 lbs	4386 lbs	5680 lbs	6077 lbs	4386 lbs	6077 lbs	1661 lbs	4386 lbs	1661 lbs
M	5 lbs-ft	0 lbs-ft	5 lbs-ft	18 lbs-ft	0 lbs-ft	18 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	0.31 ft	0.31 ft	0.31 ft	0.31 ft	0.31 ft	0.31 ft	0.31 ft	0.31 ft	0.31 ft
f_{min}	280.9 psf	217.5 psf	280.9 psf	298.5 psf	217.5 psf	298.5 psf	82.3 psf	217.5 psf	82.3 psf
f_{max}	282.5 psf	217.5 psf	282.5 psf	304.2 psf	217.5 psf	304.2 psf	82.4 psf	217.5 psf	82.4 psf

Maximum Bearing Pressure = 304 psf
Allowable Bearing Pressure = 1500 psf

Use a 132in long x 22in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Foundation Requirements: 132in long x 22in wide x 18in tall ballast foundation and fiber reinforcing with (1) #5 rebar.

5.3 Foundation Anchors

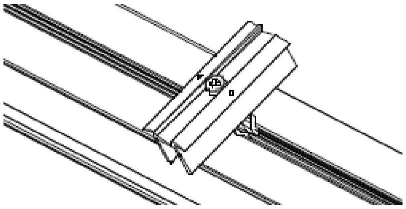
Threaded rods are anchored to the the ballast foundations using the Simpson AT-XP epoxy solution. LRFD load results are compared to the allowable strengths of the epoxy solution. Please see the supplementary calculations provided by the Simpson Anchor Designer software.

6. DESIGN OF JOINTS AND CONNECTIONS

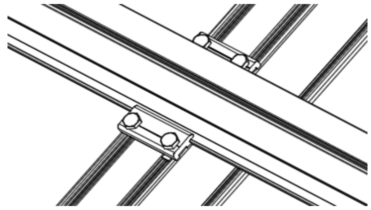
6.1 Anchorage of Modules to Purlins and Connection of Purlins to Girders

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 =	0.423	k
Allowable Uplift =	1.214	k
Utilization =	35%	



Fastening of Purlins to Girders		
Maximum Uplifting Force =	1.561	k
Allowable Uplift =	4.357	k
Utilization =	36%	



6.2 Strut Connections

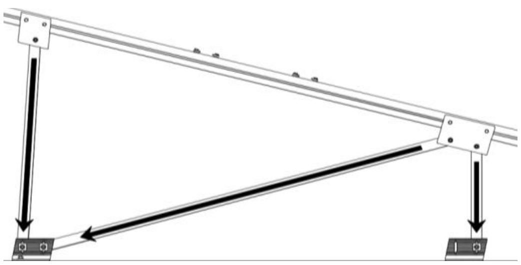
The aluminum struts connect the aluminum girder ends to custom brackets with mounting holes. Single M12 bolts are used to attach each end of the strut to the girder and post. ASTM A193/A193M-86 equivalent stainless steel bolts are used.

Front Strut		
Maximum Axial Load =	3.280	k
M12 Bolt Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	44%	

Rear Strut		
Maximum Axial Load =	3.330	k
M12 Bolt Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	45%	

Diagonal Strut		
Maximum Axial Load =	1.311	k
M12 Bolt Shear Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	18%	

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.

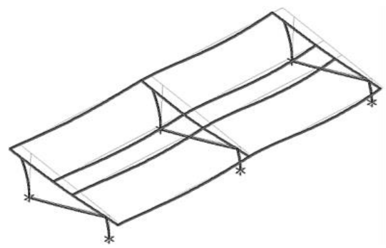
7. SEISMIC DESIGN

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} =	0.052	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 = 126 in

J = 0.432

348.575

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

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= 27.2 ksi

3.4.16

b/t = 32.195

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 25.1 ksi

3.4.16.1 Not Used

Rb/t =

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 37.0588

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

S1 = 36.9

m = 0.65

C_0 = 40.985

Cc = 41.015

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

S2 = 77.2

φF_L= φb[Bbr-mDbr*h/t]

φF_L= 43.2 ksi

$\varphi F_L St$= 25.1 ksi

Ix = 897074 mm^4

2.155 in^4

y = 41.015 mm

Sx = 1.335 in³

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

Weak Axis:

3.4.14

L_b = 126

J = 0.432

221.673

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

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= 28.5

3.4.16

b/t = 37.0588

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 23.1 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 32.195

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

S1 = 36.9

m = 0.65

C_0 = 45.5

Cc = 45.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L Wk$= 23.1 ksi

Iy = 446476 mm^4

1.073 in^4

x = 45.5 mm

Sy = 0.599 in³

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

Compression

3.4.9

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

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

3.4.10

Rb/t = 0.0

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

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

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

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

Girder = **BF0**

Strong Axis:
3.4.14

L_b = 88.9 in
J = 1.08
152.913

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

S1 = 0.51461

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

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

3.4.16

b/t = 16.2

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

S1 = 12.2

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

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

Weak Axis:
3.4.14

L_b = 88.9
J = 1.08
161.829

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

S1 = 0.51461

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

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

3.4.16

b/t = 7.4

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

S1 = 12.2

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

S2 = 46.7
φF_L= φyFcy
φF_L= 33.3 ksi

3.4.16.1 Used

Rb/t = 18.1

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

S1 = 1.1

$S2 = C_t$

S2 = 141.0

φF_L= φb[Bt-Dt*√(Rb/t)]

φF_L= 31.1 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.4

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

S1 = 35.2

m = 0.68

C_0 = 41.067

Cc = 43.717

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

S2 = 73.8

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

3.4.18

h/t = 16.2

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

S1 = 36.9

m = 0.65

C_0 = 40

Cc = 40

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 29.4 ksi

Ix = 984962 mm^4

2.366 in^4

y = 43.717 mm

Sx = 1.375 in^3

M_{max}St = 3.363 k-ft

φF_LWk= 33.3 ksi

Iy = 923544 mm^4

2.219 in^4

x = 40 mm

Sy = 1.409 in^3

M_{max}Wk = 3.904 k-ft

Compression

3.4.9

b/t = 16.2

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 31.6 ksi

b/t = 7.4

S1 = 12.21

S2 = 32.70

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.10

Rb/t = 18.1

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

S1 = 6.87

S2 = 131.3

φF_L= φc[Bt-Dt*√(Rb/t)]

φF_L= 31.09 ksi

φF_L= 31.09 ksi

A = 1215.13 mm^2

1.88 in^2

P_{max} = 58.55 kips

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

Strut = **55x55**

Strong Axis:

3.4.14

L_b = 24.8 in

J = 0.942

38.7028

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.4 ksi

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 28.2 ksi

Ix = 279836 mm^4

0.672 in^4

y = 27.5 mm

Sx = 0.621 in^3

M_{max}St = 1.460 k-ft

Weak Axis:

3.4.14

L_b = 24.8

J = 0.942

38.7028

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.4

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 28.2 ksi

Iy = 279836 mm^4

0.672 in^4

x = 27.5 mm

Sy = 0.621 in^3

M_{max}Wk = 1.460 k-ft

Compression

3.4.7

λ = 0.57371

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.87952

φF_L= φcc(Bc-Dc*λ)

φF_L= 28.0279 ksi

3.4.9

b/t = 24.5

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

b/t = 24.5

S1 = 12.21

S2 = 32.70

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

φF_L= φyFcy

φF_L= 33.25 ksi

φF_L= 28.03 ksi

A = 663.99 mm^2

1.03 in^2

P_{max} = 28.85 kips

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

Strut = **55x55**

Strong Axis:

3.4.14

L_b = 86.60 in

J = 0.942

135.148

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.6 ksi

Weak Axis:

3.4.14

L_b = 86.6

J = 0.942

135.148

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.6

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 28.2 ksi

Ix = 279836 mm^4

0.672 in^4

y = 27.5 mm

Sx = 0.621 in³

M_{max}St = 1.460 k-ft

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 28.2 ksi

Iy = 279836 mm^4

0.672 in^4

x = 27.5 mm

Sy = 0.621 in³

M_{max}Wk = 1.460 k-ft

Compression

3.4.7

λ = 2.00335

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.86047

φF_L= (φccFcy)/(λ²)

φF_L= 7.50396 ksi

3.4.9

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

b/t = 24.5
S1 = 12.21
S2 = 32.70
$\varphi F_L = \varphi c[Bp-1.6Dp*b/t]$
$\varphi F_L =$ 28.2 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87
S2 = 131.3
$\varphi F_L = \varphi yFcy$
$\varphi F_L =$ 33.25 ksi

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

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

Strut = **55x55**

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
$\varphi F_L = \varphi b[Bc-1.6Dc*\sqrt{((LbSc)/(Cb*\sqrt{(IyJ)/2}))}]$
$\varphi F_L =$ 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
$\varphi F_L = \varphi b[Bp-1.6Dp*b/t]$
$\varphi F_L =$ 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
$\varphi F_L = \varphi b[Bc-1.6Dc*\sqrt{((LbSc)/(Cb*\sqrt{(IyJ)/2}))}]$
$\varphi F_L =$ 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
$\varphi F_L = \varphi b[Bp-1.6Dp*b/t]$
$\varphi F_L =$ 28.2 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 28.2 ksi

Ix = 279836 mm^4

0.672 in^4

y = 27.5 mm

Sx = 0.621 in^3

M_{max}St = 1.460 k-ft

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 28.2 ksi

Iy = 279836 mm^4

0.672 in^4

x = 27.5 mm

Sy = 0.621 in^3

M_{max}Wk = 1.460 k-ft

Compression

3.4.7

λ = 1.29339

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)/(λ²)

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

$\varphi F_L = \varphi y Fcy$

$\varphi F_L =$ 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	-55.629	-55.629	0	0
2	M14	y	-55.629	-55.629	0	0
3	M15	y	-87.418	-87.418	0	0
4	M16	y	-87.418	-87.418	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	127.153	127.153	0	0
2	M14	y	97.484	97.484	0	0
3	M15	y	52.98	52.98	0	0
4	M16	y	52.98	52.98	0	0

Load Combinations

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

Load Combinations (Continued)

	Description	S...	P...	S...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
8																								
9	ASD 1.0D + 1.0S	Yes	Y		1	1	3	1																
10	ASD 1.0D + 0.6W	Yes	Y		1	1			4	.6														
11	ASD 1.0D + 0.75L + 0.45W + 0....	Yes	Y		1	1	3	.75	4	.45														
12	ASD 0.6D + 0.6W	Yes	Y		2	.6					5	.6												
13	LATERAL - ASD 1.238D + 0.875E	Yes	Y		1	1.2...					6	.875												
14	LATERAL - ASD 1.1785D + 0.65..	Yes	Y		1	1.1...	3	.75			6	.656												
15	LATERAL - ASD 0.362D + 0.875E	Yes	Y		1	.362					6	.875												

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N8	max	335.479	2	1034.548	1	.95	1	.005	1	0	1	0	1
2		min	-460.837	3	-956.103	3	.04	15	0	15	0	1	0	1
3	N7	max	.046	1	1172.799	1	-.392	15	0	15	0	1	0	1
4		min	-.071	2	-158.897	3	-10.395	1	-.022	1	0	1	0	1
5	N15	max	.027	9	3279.677	1	0	2	0	2	0	1	0	1
6		min	-.996	2	-589.068	3	0	1	0	1	0	1	0	1
7	N16	max	1385.028	2	3525.888	1	0	5	0	5	0	1	0	1
8		min	-1452.492	3	-3149.082	3	0	9	0	1	0	1	0	1
9	N23	max	.046	1	1172.799	1	10.395	1	.022	1	0	1	0	1
10		min	-.071	2	-158.897	3	.392	15	0	15	0	1	0	1
11	N24	max	335.479	2	1034.548	1	-.04	15	0	15	0	1	0	1
12		min	-460.837	3	-956.103	3	-.95	1	-.005	1	0	1	0	1
13	Totals:	max	2054.848	2	11220.259	1	0	2						
14		min	-2374.487	3	-5968.149	3	0	1						

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	110.443	1	468.707	1	-6.185	15	0	3	.263	1	0	1
2			min	4.032	15	-480.905	3	-169.933	1	-.012	1	.01	15	0	3
3		2	max	110.443	1	328.497	1	-4.759	15	0	3	.088	1	.478	3
4			min	4.032	15	-338.435	3	-130.711	1	-.012	1	.003	15	-.465	1
5		3	max	110.443	1	188.286	1	-3.333	15	0	3	0	12	.79	3
6			min	4.032	15	-195.965	3	-91.49	1	-.012	1	-.042	1	-.766	1
7		4	max	110.443	1	48.076	1	-1.907	15	0	3	-.004	12	.935	3
8			min	4.032	15	-53.494	3	-52.268	1	-.012	1	-.125	1	-.904	1
9		5	max	110.443	1	88.976	3	-.482	15	0	3	-.006	12	.914	3
10			min	4.032	15	-92.135	1	-13.047	1	-.012	1	-.164	1	-.879	1
11		6	max	110.443	1	231.446	3	26.175	1	0	3	-.006	15	.728	3
12			min	4.032	15	-232.345	1	.61	12	-.012	1	-.156	1	-.689	1
13		7	max	110.443	1	373.917	3	65.396	1	0	3	-.004	15	.374	3
14			min	4.032	15	-372.556	1	2.035	12	-.012	1	-.102	1	-.337	1
15		8	max	110.443	1	516.387	3	104.618	1	0	3	0	10	.18	1
16			min	4.032	15	-512.766	1	3.461	12	-.012	1	-.003	1	-.145	3
17		9	max	110.443	1	658.857	3	143.839	1	0	3	.142	1	.86	1
18			min	4.032	15	-652.977	1	4.886	12	-.012	1	.004	12	-.83	3
19		10	max	110.443	1	801.328	3	183.061	1	0	3	.332	1	1.704	1
20			min	4.032	15	-793.187	1	6.312	12	-.012	1	.01	12	-1.682	3
21		11	max	110.443	1	652.977	1	-4.886	12	.012	1	.142	1	.86	1
22			min	4.032	15	-658.857	3	-143.839	1	0	3	.004	12	-.83	3
23		12	max	110.443	1	512.766	1	-3.461	12	.012	1	0	10	.18	1
24			min	4.032	15	-516.387	3	-104.618	1	0	3	-.003	1	-.145	3
25		13	max	110.443	1	372.556	1	-2.035	12	.012	1	-.004	15	.374	3
26			min	4.032	15	-373.917	3	-65.396	1	0	3	-.102	1	-.337	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	110.443	1	232.345	1	-.61	12	.012	1	-.006	15	.728	3
28			min	4.032	15	-231.446	3	-26.175	1	0	3	-.156	1	-.689	1
29		15	max	110.443	1	92.135	1	13.047	1	.012	1	-.006	12	.914	3
30			min	4.032	15	-88.976	3	.482	15	0	3	-.164	1	-.879	1
31		16	max	110.443	1	53.494	3	52.268	1	.012	1	-.004	12	.935	3
32			min	4.032	15	-48.076	1	1.907	15	0	3	-.125	1	-.904	1
33		17	max	110.443	1	195.965	3	91.49	1	.012	1	0	12	.79	3
34			min	4.032	15	-188.286	1	3.333	15	0	3	-.042	1	-.766	1
35		18	max	110.443	1	338.435	3	130.711	1	.012	1	.088	1	.478	3
36			min	4.032	15	-328.497	1	4.759	15	0	3	.003	15	-.465	1
37		19	max	110.443	1	480.905	3	169.933	1	.012	1	.263	1	0	1
38			min	4.032	15	-468.707	1	6.185	15	0	3	.01	15	0	3
39	M14	1	max	49.863	1	492.609	1	-6.368	15	.006	3	.299	1	0	1
40			min	1.824	15	-373.235	3	-174.987	1	-.01	1	.011	15	0	3
41		2	max	49.863	1	352.398	1	-4.943	15	.006	3	.117	1	.373	3
42			min	1.824	15	-265.379	3	-135.765	1	-.01	1	.004	15	-.493	1
43		3	max	49.863	1	212.188	1	-3.517	15	.006	3	0	3	.619	3
44			min	1.824	15	-157.522	3	-96.544	1	-.01	1	-.018	1	-.822	1
45		4	max	49.863	1	71.977	1	-2.091	15	.006	3	-.003	12	.74	3
46			min	1.824	15	-49.666	3	-57.322	1	-.01	1	-.108	1	-.988	1
47		5	max	49.863	1	58.191	3	-.665	15	.006	3	-.005	12	.735	3
48			min	1.824	15	-68.233	1	-18.101	1	-.01	1	-.152	1	-.99	1
49		6	max	49.863	1	166.047	3	21.121	1	.006	3	-.005	15	.604	3
50			min	1.824	15	-208.444	1	.431	12	-.01	1	-.15	1	-.829	1
51		7	max	49.863	1	273.904	3	60.342	1	.006	3	-.004	15	.348	3
52			min	1.824	15	-348.654	1	1.856	12	-.01	1	-.103	1	-.504	1
53		8	max	49.863	1	381.76	3	99.564	1	.006	3	0	10	0	15
54			min	1.824	15	-488.865	1	3.282	12	-.01	1	-.009	1	-.035	3
55		9	max	49.863	1	489.617	3	138.785	1	.006	3	.13	1	.637	1
56			min	1.824	15	-629.075	1	4.707	12	-.01	1	.003	12	-.543	3
57		10	max	49.863	1	597.473	3	178.007	1	.006	3	.315	1	1.453	1
58			min	1.824	15	-769.286	1	6.133	12	-.01	1	.01	12	-1.177	3
59		11	max	49.863	1	629.075	1	-4.707	12	.01	1	.13	1	.637	1
60			min	1.824	15	-489.617	3	-138.785	1	-.006	3	.003	12	-.543	3
61		12	max	49.863	1	488.865	1	-3.282	12	.01	1	0	10	0	15
62			min	1.824	15	-381.76	3	-99.564	1	-.006	3	-.009	1	-.035	3
63		13	max	49.863	1	348.654	1	-1.856	12	.01	1	-.004	15	.348	3
64			min	1.824	15	-273.904	3	-60.342	1	-.006	3	-.103	1	-.504	1
65		14	max	49.863	1	208.444	1	-.431	12	.01	1	-.005	15	.604	3
66			min	1.824	15	-166.047	3	-21.121	1	-.006	3	-.15	1	-.829	1
67		15	max	49.863	1	68.233	1	18.101	1	.01	1	-.005	12	.735	3
68			min	1.824	15	-58.191	3	.665	15	-.006	3	-.152	1	-.99	1
69		16	max	49.863	1	49.666	3	57.322	1	.01	1	-.003	12	.74	3
70			min	1.824	15	-71.977	1	2.091	15	-.006	3	-.108	1	-.988	1
71		17	max	49.863	1	157.522	3	96.544	1	.01	1	0	3	.619	3
72			min	1.824	15	-212.188	1	3.517	15	-.006	3	-.018	1	-.822	1
73		18	max	49.863	1	265.379	3	135.765	1	.01	1	.117	1	.373	3
74			min	1.824	15	-352.398	1	4.943	15	-.006	3	.004	15	-.493	1
75		19	max	49.863	1	373.235	3	174.987	1	.01	1	.299	1	0	1
76			min	1.824	15	-492.609	1	6.368	15	-.006	3	.011	15	0	3
77	M15	1	max	-1.923	15	555.172	1	-6.367	15	.01	1	.298	1	0	2
78			min	-52.556	1	-198.146	3	-174.958	1	-.005	3	.011	15	0	12
79		2	max	-1.923	15	396.418	1	-4.941	15	.01	1	.117	1	.199	3
80			min	-52.556	1	-142.211	3	-135.736	1	-.005	3	.004	15	-.555	1
81		3	max	-1.923	15	237.664	1	-3.515	15	.01	1	0	3	.332	3
82			min	-52.556	1	-86.276	3	-96.515	1	-.005	3	-.018	1	-.925	1
83		4	max	-1.923	15	78.91	1	-2.09	15	.01	1	-.003	12	.4	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	-52.556	1	-30.341	3	-57.293	1	-.005	3	-.108	1	-1.11	1
85		5	max	-1.923	15	25.594	3	-.664	15	.01	1	-.005	12	.403	3
86			min	-52.556	1	-79.844	1	-18.071	1	-.005	3	-.152	1	-1.109	1
87		6	max	-1.923	15	81.529	3	21.15	1	.01	1	-.005	15	.34	3
88			min	-52.556	1	-238.598	1	.457	12	-.005	3	-.15	1	-.923	1
89		7	max	-1.923	15	137.465	3	60.372	1	.01	1	-.004	15	.212	3
90			min	-52.556	1	-397.352	1	1.883	12	-.005	3	-.103	1	-.552	1
91		8	max	-1.923	15	193.4	3	99.593	1	.01	1	0	10	.019	3
92			min	-52.556	1	-556.106	1	3.308	12	-.005	3	-.009	1	-.003	9
93		9	max	-1.923	15	249.335	3	138.815	1	.01	1	.13	1	.745	1
94			min	-52.556	1	-714.86	1	4.734	12	-.005	3	.003	12	-.239	3
95		10	max	-1.923	15	305.27	3	178.036	1	.01	1	.315	1	1.672	1
96			min	-52.556	1	-873.615	1	6.159	12	-.005	3	.01	12	-.562	3
97		11	max	-1.923	15	714.86	1	-4.734	12	.005	3	.13	1	.745	1
98			min	-52.556	1	-249.335	3	-138.815	1	-.01	1	.003	12	-.239	3
99		12	max	-1.923	15	556.106	1	-3.308	12	.005	3	0	10	.019	3
100			min	-52.556	1	-193.4	3	-99.593	1	-.01	1	-.009	1	-.003	9
101		13	max	-1.923	15	397.352	1	-1.883	12	.005	3	-.004	15	.212	3
102			min	-52.556	1	-137.465	3	-60.372	1	-.01	1	-.103	1	-.552	1
103		14	max	-1.923	15	238.598	1	-.457	12	.005	3	-.005	15	.34	3
104			min	-52.556	1	-81.529	3	-21.15	1	-.01	1	-.15	1	-.923	1
105		15	max	-1.923	15	79.844	1	18.071	1	.005	3	-.005	12	.403	3
106			min	-52.556	1	-25.594	3	.664	15	-.01	1	-.152	1	-1.109	1
107		16	max	-1.923	15	30.341	3	57.293	1	.005	3	-.003	12	.4	3
108			min	-52.556	1	-78.91	1	2.09	15	-.01	1	-.108	1	-1.11	1
109		17	max	-1.923	15	86.276	3	96.515	1	.005	3	0	3	.332	3
110			min	-52.556	1	-237.664	1	3.515	15	-.01	1	-.018	1	-.925	1
111		18	max	-1.923	15	142.211	3	135.736	1	.005	3	.117	1	.199	3
112			min	-52.556	1	-396.418	1	4.941	15	-.01	1	.004	15	-.555	1
113		19	max	-1.923	15	198.146	3	174.958	1	.005	3	.298	1	0	2
114			min	-52.556	1	-555.172	1	6.367	15	-.01	1	.011	15	0	12
115	M16	1	max	-4.285	15	531.44	1	-6.19	15	.011	1	.265	1	0	1
116			min	-117.194	1	-186.164	3	-170.132	1	-.007	3	.01	15	0	3
117		2	max	-4.285	15	372.686	1	-4.765	15	.011	1	.089	1	.185	3
118			min	-117.194	1	-130.229	3	-130.91	1	-.007	3	.003	15	-.527	1
119		3	max	-4.285	15	213.931	1	-3.339	15	.011	1	0	12	.304	3
120			min	-117.194	1	-74.294	3	-91.689	1	-.007	3	-.041	1	-.87	1
121		4	max	-4.285	15	55.177	1	-1.913	15	.011	1	-.004	12	.358	3
122			min	-117.194	1	-18.359	3	-52.467	1	-.007	3	-.125	1	-1.027	1
123		5	max	-4.285	15	37.576	3	-.487	15	.011	1	-.006	12	.347	3
124			min	-117.194	1	-103.577	1	-13.246	1	-.007	3	-.163	1	-.998	1
125		6	max	-4.285	15	93.512	3	25.976	1	.011	1	-.006	15	.27	3
126			min	-117.194	1	-262.331	1	.693	12	-.007	3	-.156	1	-.785	1
127		7	max	-4.285	15	149.447	3	65.198	1	.011	1	-.004	15	.129	3
128			min	-117.194	1	-421.085	1	2.119	12	-.007	3	-.103	1	-.386	1
129		8	max	-4.285	15	205.382	3	104.419	1	.011	1	0	10	.198	1
130			min	-117.194	1	-579.839	1	3.544	12	-.007	3	-.004	1	-.078	3
131		9	max	-4.285	15	261.317	3	143.641	1	.011	1	.141	1	.967	1
132			min	-117.194	1	-738.593	1	4.97	12	-.007	3	.004	12	-.351	3
133		10	max	-4.285	15	317.252	3	182.862	1	.011	1	.331	1	1.921	1
134			min	-117.194	1	-897.347	1	6.395	12	-.007	3	.011	12	-.688	3
135		11	max	-4.285	15	738.593	1	-4.97	12	.007	3	.141	1	.967	1
136			min	-117.194	1	-261.317	3	-143.641	1	-.011	1	.004	12	-.351	3
137		12	max	-4.285	15	579.839	1	-3.544	12	.007	3	0	10	.198	1
138			min	-117.194	1	-205.382	3	-104.419	1	-.011	1	-.004	1	-.078	3
139		13	max	-4.285	15	421.085	1	-2.119	12	.007	3	-.004	15	.129	3
140			min	-117.194	1	-149.447	3	-65.198	1	-.011	1	-.103	1	-.386	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
141		14	max	-4.285	15	262.331	1	-.693	12	.007	3	-.006	15	.27	3
142			min	-117.194	1	-93.512	3	-25.976	1	-.011	1	-.156	1	-.785	1
143		15	max	-4.285	15	103.577	1	13.246	1	.007	3	-.006	12	.347	3
144			min	-117.194	1	-37.576	3	.487	15	-.011	1	-.163	1	-.998	1
145		16	max	-4.285	15	18.359	3	52.467	1	.007	3	-.004	12	.358	3
146			min	-117.194	1	-55.177	1	1.913	15	-.011	1	-.125	1	-1.027	1
147		17	max	-4.285	15	74.294	3	91.689	1	.007	3	0	12	.304	3
148			min	-117.194	1	-213.931	1	3.339	15	-.011	1	-.041	1	-.87	1
149		18	max	-4.285	15	130.229	3	130.91	1	.007	3	.089	1	.185	3
150			min	-117.194	1	-372.686	1	4.765	15	-.011	1	.003	15	-.527	1
151		19	max	-4.285	15	186.164	3	170.132	1	.007	3	.265	1	0	1
152			min	-117.194	1	-531.44	1	6.19	15	-.011	1	.01	15	0	3
153	M2	1	max	1029.442	1	2.025	4	1.029	1	0	3	0	3	0	1
154			min	-853.381	3	.477	15	.037	15	0	1	0	1	0	1
155		2	max	1029.821	1	1.992	4	1.029	1	0	3	0	1	0	15
156			min	-853.097	3	.469	15	.037	15	0	1	0	15	0	4
157		3	max	1030.2	1	1.959	4	1.029	1	0	3	0	1	0	15
158			min	-852.813	3	.462	15	.037	15	0	1	0	15	-.001	4
159		4	max	1030.58	1	1.925	4	1.029	1	0	3	0	1	0	15
160			min	-852.528	3	.454	15	.037	15	0	1	0	15	-.002	4
161		5	max	1030.959	1	1.892	4	1.029	1	0	3	.001	1	0	15
162			min	-852.244	3	.446	15	.037	15	0	1	0	15	-.002	4
163		6	max	1031.338	1	1.859	4	1.029	1	0	3	.001	1	0	15
164			min	-851.959	3	.438	15	.037	15	0	1	0	15	-.002	4
165		7	max	1031.717	1	1.825	4	1.029	1	0	3	.002	1	0	15
166			min	-851.675	3	.43	15	.037	15	0	1	0	15	-.003	4
167		8	max	1032.097	1	1.792	4	1.029	1	0	3	.002	1	0	15
168			min	-851.39	3	.422	15	.037	15	0	1	0	15	-.003	4
169		9	max	1032.476	1	1.758	4	1.029	1	0	3	.002	1	0	15
170			min	-851.106	3	.414	15	.037	15	0	1	0	15	-.004	4
171		10	max	1032.855	1	1.725	4	1.029	1	0	3	.002	1	-.001	15
172			min	-850.821	3	.407	15	.037	15	0	1	0	15	-.004	4
173		11	max	1033.234	1	1.692	4	1.029	1	0	3	.003	1	-.001	15
174			min	-850.537	3	.399	15	.037	15	0	1	0	15	-.005	4
175		12	max	1033.614	1	1.658	4	1.029	1	0	3	.003	1	-.001	15
176			min	-850.253	3	.391	15	.037	15	0	1	0	15	-.005	4
177		13	max	1033.993	1	1.625	4	1.029	1	0	3	.003	1	-.001	15
178			min	-849.968	3	.383	15	.037	15	0	1	0	15	-.006	4
179		14	max	1034.372	1	1.591	4	1.029	1	0	3	.003	1	-.001	15
180			min	-849.684	3	.375	15	.037	15	0	1	0	15	-.006	4
181		15	max	1034.751	1	1.558	4	1.029	1	0	3	.004	1	-.002	15
182			min	-849.399	3	.367	15	.037	15	0	1	0	15	-.006	4
183		16	max	1035.131	1	1.525	4	1.029	1	0	3	.004	1	-.002	15
184			min	-849.115	3	.36	15	.037	15	0	1	0	15	-.007	4
185		17	max	1035.51	1	1.491	4	1.029	1	0	3	.004	1	-.002	15
186			min	-848.83	3	.352	15	.037	15	0	1	0	15	-.007	4
187		18	max	1035.889	1	1.458	4	1.029	1	0	3	.004	1	-.002	15
188			min	-848.546	3	.344	15	.037	15	0	1	0	15	-.008	4
189		19	max	1036.268	1	1.424	4	1.029	1	0	3	.005	1	-.002	15
190			min	-848.261	3	.336	15	.037	15	0	1	0	15	-.008	4
191	M3	1	max	290.977	2	7.981	4	.081	1	0	3	0	1	.008	4
192			min	-417.919	3	1.877	15	.003	15	0	1	0	15	.002	15
193		2	max	290.807	2	7.211	4	.081	1	0	3	0	1	.005	4
194			min	-418.046	3	1.696	15	.003	15	0	1	0	15	.001	15
195		3	max	290.637	2	6.441	4	.081	1	0	3	0	1	.002	2
196			min	-418.174	3	1.515	15	.003	15	0	1	0	15	0	3
197		4	max	290.466	2	5.671	4	.081	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	-418.302	3	1.334	15	.003	15	0	1	0	15	-.001	3
199		5	max	290.296	2	4.901	4	.081	1	0	3	0	1	0	15
200			min	-418.43	3	1.153	15	.003	15	0	1	0	15	-.003	4
201		6	max	290.126	2	4.131	4	.081	1	0	3	0	1	-.001	15
202			min	-418.557	3	.972	15	.003	15	0	1	0	15	-.005	4
203		7	max	289.955	2	3.361	4	.081	1	0	3	0	1	-.001	15
204			min	-418.685	3	.791	15	.003	15	0	1	0	15	-.006	4
205		8	max	289.785	2	2.591	4	.081	1	0	3	0	1	-.002	15
206			min	-418.813	3	.61	15	.003	15	0	1	0	15	-.008	4
207		9	max	289.614	2	1.821	4	.081	1	0	3	0	1	-.002	15
208			min	-418.941	3	.429	15	.003	15	0	1	0	15	-.009	4
209		10	max	289.444	2	1.051	4	.081	1	0	3	0	1	-.002	15
210			min	-419.068	3	.248	15	.003	15	0	1	0	15	-.009	4
211		11	max	289.274	2	.329	2	.081	1	0	3	0	1	-.002	15
212			min	-419.196	3	.012	3	.003	15	0	1	0	15	-.009	4
213		12	max	289.103	2	-.114	15	.081	1	0	3	0	1	-.002	15
214			min	-419.324	3	-.489	4	.003	15	0	1	0	15	-.009	4
215		13	max	288.933	2	-.295	15	.081	1	0	3	0	1	-.002	15
216			min	-419.452	3	-1.259	4	.003	15	0	1	0	15	-.009	4
217		14	max	288.763	2	-.476	15	.081	1	0	3	0	1	-.002	15
218			min	-419.58	3	-2.029	4	.003	15	0	1	0	15	-.008	4
219		15	max	288.592	2	-.657	15	.081	1	0	3	0	1	-.002	15
220			min	-419.707	3	-2.799	4	.003	15	0	1	0	15	-.007	4
221		16	max	288.422	2	-.838	15	.081	1	0	3	0	1	-.001	15
222			min	-419.835	3	-3.569	4	.003	15	0	1	0	15	-.006	4
223		17	max	288.252	2	-1.019	15	.081	1	0	3	0	1	-.001	15
224			min	-419.963	3	-4.339	4	.003	15	0	1	0	15	-.004	4
225		18	max	288.081	2	-1.2	15	.081	1	0	3	0	1	0	15
226			min	-420.091	3	-5.109	4	.003	15	0	1	0	15	-.002	4
227		19	max	287.911	2	-1.381	15	.081	1	0	3	0	1	0	1
228			min	-420.218	3	-5.879	4	.003	15	0	1	0	15	0	1
229	M4	1	max	1169.733	1	0	1	-.392	15	0	1	0	1	0	1
230			min	-161.197	3	0	1	-10.777	1	0	1	0	15	0	1
231		2	max	1169.903	1	0	1	-.392	15	0	1	0	12	0	1
232			min	-161.069	3	0	1	-10.777	1	0	1	0	1	0	1
233		3	max	1170.073	1	0	1	-.392	15	0	1	0	15	0	1
234			min	-160.941	3	0	1	-10.777	1	0	1	-.002	1	0	1
235		4	max	1170.244	1	0	1	-.392	15	0	1	0	15	0	1
236			min	-160.813	3	0	1	-10.777	1	0	1	-.003	1	0	1
237		5	max	1170.414	1	0	1	-.392	15	0	1	0	15	0	1
238			min	-160.686	3	0	1	-10.777	1	0	1	-.004	1	0	1
239		6	max	1170.584	1	0	1	-.392	15	0	1	0	15	0	1
240			min	-160.558	3	0	1	-10.777	1	0	1	-.006	1	0	1
241		7	max	1170.755	1	0	1	-.392	15	0	1	0	15	0	1
242			min	-160.43	3	0	1	-10.777	1	0	1	-.007	1	0	1
243		8	max	1170.925	1	0	1	-.392	15	0	1	0	15	0	1
244			min	-160.302	3	0	1	-10.777	1	0	1	-.008	1	0	1
245		9	max	1171.095	1	0	1	-.392	15	0	1	0	15	0	1
246			min	-160.175	3	0	1	-10.777	1	0	1	-.009	1	0	1
247		10	max	1171.266	1	0	1	-.392	15	0	1	0	15	0	1
248			min	-160.047	3	0	1	-10.777	1	0	1	-.011	1	0	1
249		11	max	1171.436	1	0	1	-.392	15	0	1	0	15	0	1
250			min	-159.919	3	0	1	-10.777	1	0	1	-.012	1	0	1
251		12	max	1171.606	1	0	1	-.392	15	0	1	0	15	0	1
252			min	-159.791	3	0	1	-10.777	1	0	1	-.013	1	0	1
253		13	max	1171.777	1	0	1	-.392	15	0	1	0	15	0	1
254			min	-159.664	3	0	1	-10.777	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	1171.947	1	0	1	-.392	15	0	1	0	15	0	1
256			min	-159.536	3	0	1	-10.777	1	0	1	-.016	1	0	1
257		15	max	1172.117	1	0	1	-.392	15	0	1	0	15	0	1
258			min	-159.408	3	0	1	-10.777	1	0	1	-.017	1	0	1
259		16	max	1172.288	1	0	1	-.392	15	0	1	0	15	0	1
260			min	-159.28	3	0	1	-10.777	1	0	1	-.018	1	0	1
261		17	max	1172.458	1	0	1	-.392	15	0	1	0	15	0	1
262			min	-159.152	3	0	1	-10.777	1	0	1	-.019	1	0	1
263		18	max	1172.629	1	0	1	-.392	15	0	1	0	15	0	1
264			min	-159.025	3	0	1	-10.777	1	0	1	-.02	1	0	1
265		19	max	1172.799	1	0	1	-.392	15	0	1	0	15	0	1
266			min	-158.897	3	0	1	-10.777	1	0	1	-.022	1	0	1
267	M6	1	max	3322.94	1	2.282	2	0	1	0	1	0	1	0	1
268			min	-2807.551	3	.307	12	0	1	0	1	0	1	0	1
269		2	max	3323.319	1	2.256	2	0	1	0	1	0	1	0	12
270			min	-2807.267	3	.294	12	0	1	0	1	0	1	0	2
271		3	max	3323.698	1	2.23	2	0	1	0	1	0	1	0	12
272			min	-2806.982	3	.281	12	0	1	0	1	0	1	-.001	2
273		4	max	3324.078	1	2.204	2	0	1	0	1	0	1	0	12
274			min	-2806.698	3	.268	12	0	1	0	1	0	1	-.002	2
275		5	max	3324.457	1	2.178	2	0	1	0	1	0	1	0	12
276			min	-2806.413	3	.255	12	0	1	0	1	0	1	-.002	2
277		6	max	3324.836	1	2.152	2	0	1	0	1	0	1	0	12
278			min	-2806.129	3	.242	12	0	1	0	1	0	1	-.003	2
279		7	max	3325.215	1	2.126	2	0	1	0	1	0	1	0	12
280			min	-2805.844	3	.229	12	0	1	0	1	0	1	-.003	2
281		8	max	3325.595	1	2.1	2	0	1	0	1	0	1	0	12
282			min	-2805.56	3	.216	12	0	1	0	1	0	1	-.004	2
283		9	max	3325.974	1	2.074	2	0	1	0	1	0	1	0	12
284			min	-2805.276	3	.203	12	0	1	0	1	0	1	-.004	2
285		10	max	3326.353	1	2.048	2	0	1	0	1	0	1	0	12
286			min	-2804.991	3	.19	12	0	1	0	1	0	1	-.005	2
287		11	max	3326.733	1	2.022	2	0	1	0	1	0	1	0	12
288			min	-2804.707	3	.177	12	0	1	0	1	0	1	-.006	2
289		12	max	3327.112	1	1.996	2	0	1	0	1	0	1	0	12
290			min	-2804.422	3	.164	3	0	1	0	1	0	1	-.006	2
291		13	max	3327.491	1	1.97	2	0	1	0	1	0	1	0	12
292			min	-2804.138	3	.144	3	0	1	0	1	0	1	-.007	2
293		14	max	3327.87	1	1.944	2	0	1	0	1	0	1	0	12
294			min	-2803.853	3	.125	3	0	1	0	1	0	1	-.007	2
295		15	max	3328.25	1	1.918	2	0	1	0	1	0	1	0	12
296			min	-2803.569	3	.105	3	0	1	0	1	0	1	-.008	2
297		16	max	3328.629	1	1.892	2	0	1	0	1	0	1	0	12
298			min	-2803.284	3	.086	3	0	1	0	1	0	1	-.008	2
299		17	max	3329.008	1	1.866	2	0	1	0	1	0	1	0	12
300			min	-2803	3	.066	3	0	1	0	1	0	1	-.009	2
301		18	max	3329.387	1	1.84	2	0	1	0	1	0	1	0	12
302			min	-2802.716	3	.047	3	0	1	0	1	0	1	-.009	2
303		19	max	3329.767	1	1.814	2	0	1	0	1	0	1	0	12
304			min	-2802.431	3	.027	3	0	1	0	1	0	1	-.009	2
305	M7	1	max	1254.02	2	8.022	4	0	1	0	1	0	1	.009	2
306			min	-1308.328	3	1.882	15	0	1	0	1	0	1	0	12
307		2	max	1253.85	2	7.252	4	0	1	0	1	0	1	.007	2
308			min	-1308.456	3	1.701	15	0	1	0	1	0	1	0	3
309		3	max	1253.679	2	6.482	4	0	1	0	1	0	1	.004	2
310			min	-1308.584	3	1.52	15	0	1	0	1	0	1	-.002	3
311		4	max	1253.509	2	5.712	4	0	1	0	1	0	1	.002	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
312			min	-1308.711	3	1.339	15	0	1	0	1	0	1	-.003	3
313		5	max	1253.338	2	4.942	4	0	1	0	1	0	1	0	2
314			min	-1308.839	3	1.158	15	0	1	0	1	0	1	-.005	3
315		6	max	1253.168	2	4.172	4	0	1	0	1	0	1	-.001	15
316			min	-1308.967	3	.977	15	0	1	0	1	0	1	-.005	3
317		7	max	1252.998	2	3.402	4	0	1	0	1	0	1	-.001	15
318			min	-1309.095	3	.796	15	0	1	0	1	0	1	-.006	3
319		8	max	1252.827	2	2.632	4	0	1	0	1	0	1	-.002	15
320			min	-1309.222	3	.615	15	0	1	0	1	0	1	-.007	4
321		9	max	1252.657	2	1.862	4	0	1	0	1	0	1	-.002	15
322			min	-1309.35	3	.416	12	0	1	0	1	0	1	-.008	4
323		10	max	1252.487	2	1.248	2	0	1	0	1	0	1	-.002	15
324			min	-1309.478	3	.116	12	0	1	0	1	0	1	-.009	4
325		11	max	1252.316	2	.648	2	0	1	0	1	0	1	-.002	15
326			min	-1309.606	3	-.326	3	0	1	0	1	0	1	-.009	4
327		12	max	1252.146	2	.048	2	0	1	0	1	0	1	-.002	15
328			min	-1309.733	3	-.776	3	0	1	0	1	0	1	-.009	4
329		13	max	1251.976	2	-.29	15	0	1	0	1	0	1	-.002	15
330			min	-1309.861	3	-1.226	3	0	1	0	1	0	1	-.009	4
331		14	max	1251.805	2	-.471	15	0	1	0	1	0	1	-.002	15
332			min	-1309.989	3	-1.988	4	0	1	0	1	0	1	-.008	4
333		15	max	1251.635	2	-.652	15	0	1	0	1	0	1	-.002	15
334			min	-1310.117	3	-2.758	4	0	1	0	1	0	1	-.007	4
335		16	max	1251.465	2	-.833	15	0	1	0	1	0	1	-.001	15
336			min	-1310.244	3	-3.528	4	0	1	0	1	0	1	-.006	4
337		17	max	1251.294	2	-1.014	15	0	1	0	1	0	1	-.001	15
338			min	-1310.372	3	-4.298	4	0	1	0	1	0	1	-.004	4
339		18	max	1251.124	2	-1.195	15	0	1	0	1	0	1	0	15
340			min	-1310.5	3	-5.068	4	0	1	0	1	0	1	-.002	4
341		19	max	1250.954	2	-1.376	15	0	1	0	1	0	1	0	1
342			min	-1310.628	3	-5.838	4	0	1	0	1	0	1	0	1
343	M8	1	max	3276.611	1	0	1	0	1	0	1	0	1	0	1
344			min	-591.367	3	0	1	0	1	0	1	0	1	0	1
345		2	max	3276.781	1	0	1	0	1	0	1	0	1	0	1
346			min	-591.24	3	0	1	0	1	0	1	0	1	0	1
347		3	max	3276.951	1	0	1	0	1	0	1	0	1	0	1
348			min	-591.112	3	0	1	0	1	0	1	0	1	0	1
349		4	max	3277.122	1	0	1	0	1	0	1	0	1	0	1
350			min	-590.984	3	0	1	0	1	0	1	0	1	0	1
351		5	max	3277.292	1	0	1	0	1	0	1	0	1	0	1
352			min	-590.856	3	0	1	0	1	0	1	0	1	0	1
353		6	max	3277.462	1	0	1	0	1	0	1	0	1	0	1
354			min	-590.729	3	0	1	0	1	0	1	0	1	0	1
355		7	max	3277.633	1	0	1	0	1	0	1	0	1	0	1
356			min	-590.601	3	0	1	0	1	0	1	0	1	0	1
357		8	max	3277.803	1	0	1	0	1	0	1	0	1	0	1
358			min	-590.473	3	0	1	0	1	0	1	0	1	0	1
359		9	max	3277.973	1	0	1	0	1	0	1	0	1	0	1
360			min	-590.345	3	0	1	0	1	0	1	0	1	0	1
361		10	max	3278.144	1	0	1	0	1	0	1	0	1	0	1
362			min	-590.218	3	0	1	0	1	0	1	0	1	0	1
363		11	max	3278.314	1	0	1	0	1	0	1	0	1	0	1
364			min	-590.09	3	0	1	0	1	0	1	0	1	0	1
365		12	max	3278.484	1	0	1	0	1	0	1	0	1	0	1
366			min	-589.962	3	0	1	0	1	0	1	0	1	0	1
367		13	max	3278.655	1	0	1	0	1	0	1	0	1	0	1
368			min	-589.834	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	3278.825	1	0	1	0	1	0	1	0	1	0	1
370			min	-589.707	3	0	1	0	1	0	1	0	1	0	1
371		15	max	3278.995	1	0	1	0	1	0	1	0	1	0	1
372			min	-589.579	3	0	1	0	1	0	1	0	1	0	1
373		16	max	3279.166	1	0	1	0	1	0	1	0	1	0	1
374			min	-589.451	3	0	1	0	1	0	1	0	1	0	1
375		17	max	3279.336	1	0	1	0	1	0	1	0	1	0	1
376			min	-589.323	3	0	1	0	1	0	1	0	1	0	1
377		18	max	3279.506	1	0	1	0	1	0	1	0	1	0	1
378			min	-589.196	3	0	1	0	1	0	1	0	1	0	1
379		19	max	3279.677	1	0	1	0	1	0	1	0	1	0	1
380			min	-589.068	3	0	1	0	1	0	1	0	1	0	1
381	M10	1	max	1029.442	1	2.025	4	-.037	15	0	1	0	1	0	1
382			min	-853.381	3	.477	15	-1.029	1	0	3	0	3	0	1
383		2	max	1029.821	1	1.992	4	-.037	15	0	1	0	15	0	15
384			min	-853.097	3	.469	15	-1.029	1	0	3	0	1	0	4
385		3	max	1030.2	1	1.959	4	-.037	15	0	1	0	15	0	15
386			min	-852.813	3	.462	15	-1.029	1	0	3	0	1	-.001	4
387		4	max	1030.58	1	1.925	4	-.037	15	0	1	0	15	0	15
388			min	-852.528	3	.454	15	-1.029	1	0	3	0	1	-.002	4
389		5	max	1030.959	1	1.892	4	-.037	15	0	1	0	15	0	15
390			min	-852.244	3	.446	15	-1.029	1	0	3	-.001	1	-.002	4
391		6	max	1031.338	1	1.859	4	-.037	15	0	1	0	15	0	15
392			min	-851.959	3	.438	15	-1.029	1	0	3	-.001	1	-.002	4
393		7	max	1031.717	1	1.825	4	-.037	15	0	1	0	15	0	15
394			min	-851.675	3	.43	15	-1.029	1	0	3	-.002	1	-.003	4
395		8	max	1032.097	1	1.792	4	-.037	15	0	1	0	15	0	15
396			min	-851.39	3	.422	15	-1.029	1	0	3	-.002	1	-.003	4
397		9	max	1032.476	1	1.758	4	-.037	15	0	1	0	15	0	15
398			min	-851.106	3	.414	15	-1.029	1	0	3	-.002	1	-.004	4
399		10	max	1032.855	1	1.725	4	-.037	15	0	1	0	15	-.001	15
400			min	-850.821	3	.407	15	-1.029	1	0	3	-.002	1	-.004	4
401		11	max	1033.234	1	1.692	4	-.037	15	0	1	0	15	-.001	15
402			min	-850.537	3	.399	15	-1.029	1	0	3	-.003	1	-.005	4
403		12	max	1033.614	1	1.658	4	-.037	15	0	1	0	15	-.001	15
404			min	-850.253	3	.391	15	-1.029	1	0	3	-.003	1	-.005	4
405		13	max	1033.993	1	1.625	4	-.037	15	0	1	0	15	-.001	15
406			min	-849.968	3	.383	15	-1.029	1	0	3	-.003	1	-.006	4
407		14	max	1034.372	1	1.591	4	-.037	15	0	1	0	15	-.001	15
408			min	-849.684	3	.375	15	-1.029	1	0	3	-.003	1	-.006	4
409		15	max	1034.751	1	1.558	4	-.037	15	0	1	0	15	-.002	15
410			min	-849.399	3	.367	15	-1.029	1	0	3	-.004	1	-.006	4
411		16	max	1035.131	1	1.525	4	-.037	15	0	1	0	15	-.002	15
412			min	-849.115	3	.36	15	-1.029	1	0	3	-.004	1	-.007	4
413		17	max	1035.51	1	1.491	4	-.037	15	0	1	0	15	-.002	15
414			min	-848.83	3	.352	15	-1.029	1	0	3	-.004	1	-.007	4
415		18	max	1035.889	1	1.458	4	-.037	15	0	1	0	15	-.002	15
416			min	-848.546	3	.344	15	-1.029	1	0	3	-.004	1	-.008	4
417		19	max	1036.268	1	1.424	4	-.037	15	0	1	0	15	-.002	15
418			min	-848.261	3	.336	15	-1.029	1	0	3	-.005	1	-.008	4
419	M11	1	max	290.977	2	7.981	4	-.003	15	0	1	0	15	.008	4
420			min	-417.919	3	1.877	15	-.081	1	0	3	0	1	.002	15
421		2	max	290.807	2	7.211	4	-.003	15	0	1	0	15	.005	4
422			min	-418.046	3	1.696	15	-.081	1	0	3	0	1	.001	15
423		3	max	290.637	2	6.441	4	-.003	15	0	1	0	15	.002	2
424			min	-418.174	3	1.515	15	-.081	1	0	3	0	1	0	3
425		4	max	290.466	2	5.671	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	-418.302	3	1.334	15	-.081	1	0	3	0	1	-.001	3
427		5	max	290.296	2	4.901	4	-.003	15	0	1	0	15	0	15
428			min	-418.43	3	1.153	15	-.081	1	0	3	0	1	-.003	4
429		6	max	290.126	2	4.131	4	-.003	15	0	1	0	15	-.001	15
430			min	-418.557	3	.972	15	-.081	1	0	3	0	1	-.005	4
431		7	max	289.955	2	3.361	4	-.003	15	0	1	0	15	-.001	15
432			min	-418.685	3	.791	15	-.081	1	0	3	0	1	-.006	4
433		8	max	289.785	2	2.591	4	-.003	15	0	1	0	15	-.002	15
434			min	-418.813	3	.61	15	-.081	1	0	3	0	1	-.008	4
435		9	max	289.614	2	1.821	4	-.003	15	0	1	0	15	-.002	15
436			min	-418.941	3	.429	15	-.081	1	0	3	0	1	-.009	4
437		10	max	289.444	2	1.051	4	-.003	15	0	1	0	15	-.002	15
438			min	-419.068	3	.248	15	-.081	1	0	3	0	1	-.009	4
439		11	max	289.274	2	.329	2	-.003	15	0	1	0	15	-.002	15
440			min	-419.196	3	.012	3	-.081	1	0	3	0	1	-.009	4
441		12	max	289.103	2	-.114	15	-.003	15	0	1	0	15	-.002	15
442			min	-419.324	3	-.489	4	-.081	1	0	3	0	1	-.009	4
443		13	max	288.933	2	-.295	15	-.003	15	0	1	0	15	-.002	15
444			min	-419.452	3	-1.259	4	-.081	1	0	3	0	1	-.009	4
445		14	max	288.763	2	-.476	15	-.003	15	0	1	0	15	-.002	15
446			min	-419.58	3	-2.029	4	-.081	1	0	3	0	1	-.008	4
447		15	max	288.592	2	-.657	15	-.003	15	0	1	0	15	-.002	15
448			min	-419.707	3	-2.799	4	-.081	1	0	3	0	1	-.007	4
449		16	max	288.422	2	-.838	15	-.003	15	0	1	0	15	-.001	15
450			min	-419.835	3	-3.569	4	-.081	1	0	3	0	1	-.006	4
451		17	max	288.252	2	-1.019	15	-.003	15	0	1	0	15	-.001	15
452			min	-419.963	3	-4.339	4	-.081	1	0	3	0	1	-.004	4
453		18	max	288.081	2	-1.2	15	-.003	15	0	1	0	15	0	15
454			min	-420.091	3	-5.109	4	-.081	1	0	3	0	1	-.002	4
455		19	max	287.911	2	-1.381	15	-.003	15	0	1	0	15	0	1
456			min	-420.218	3	-5.879	4	-.081	1	0	3	0	1	0	1
457	M12	1	max	1169.733	1	0	1	10.777	1	0	1	0	15	0	1
458			min	-161.197	3	0	1	.392	15	0	1	0	1	0	1
459		2	max	1169.903	1	0	1	10.777	1	0	1	0	1	0	1
460			min	-161.069	3	0	1	.392	15	0	1	0	12	0	1
461		3	max	1170.073	1	0	1	10.777	1	0	1	.002	1	0	1
462			min	-160.941	3	0	1	.392	15	0	1	0	15	0	1
463		4	max	1170.244	1	0	1	10.777	1	0	1	.003	1	0	1
464			min	-160.813	3	0	1	.392	15	0	1	0	15	0	1
465		5	max	1170.414	1	0	1	10.777	1	0	1	.004	1	0	1
466			min	-160.686	3	0	1	.392	15	0	1	0	15	0	1
467		6	max	1170.584	1	0	1	10.777	1	0	1	.006	1	0	1
468			min	-160.558	3	0	1	.392	15	0	1	0	15	0	1
469		7	max	1170.755	1	0	1	10.777	1	0	1	.007	1	0	1
470			min	-160.43	3	0	1	.392	15	0	1	0	15	0	1
471		8	max	1170.925	1	0	1	10.777	1	0	1	.008	1	0	1
472			min	-160.302	3	0	1	.392	15	0	1	0	15	0	1
473		9	max	1171.095	1	0	1	10.777	1	0	1	.009	1	0	1
474			min	-160.175	3	0	1	.392	15	0	1	0	15	0	1
475		10	max	1171.266	1	0	1	10.777	1	0	1	.011	1	0	1
476			min	-160.047	3	0	1	.392	15	0	1	0	15	0	1
477		11	max	1171.436	1	0	1	10.777	1	0	1	.012	1	0	1
478			min	-159.919	3	0	1	.392	15	0	1	0	15	0	1
479		12	max	1171.606	1	0	1	10.777	1	0	1	.013	1	0	1
480			min	-159.791	3	0	1	.392	15	0	1	0	15	0	1
481		13	max	1171.777	1	0	1	10.777	1	0	1	.014	1	0	1
482			min	-159.664	3	0	1	.392	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	1171.947	1	0	1	10.777	1	0	1	.016	1	0	1
484			min	-159.536	3	0	1	.392	15	0	1	0	15	0	1
485		15	max	1172.117	1	0	1	10.777	1	0	1	.017	1	0	1
486			min	-159.408	3	0	1	.392	15	0	1	0	15	0	1
487		16	max	1172.288	1	0	1	10.777	1	0	1	.018	1	0	1
488			min	-159.28	3	0	1	.392	15	0	1	0	15	0	1
489		17	max	1172.458	1	0	1	10.777	1	0	1	.019	1	0	1
490			min	-159.152	3	0	1	.392	15	0	1	0	15	0	1
491		18	max	1172.629	1	0	1	10.777	1	0	1	.02	1	0	1
492			min	-159.025	3	0	1	.392	15	0	1	0	15	0	1
493		19	max	1172.799	1	0	1	10.777	1	0	1	.022	1	0	1
494			min	-158.897	3	0	1	.392	15	0	1	0	15	0	1
495	M1	1	max	169.937	1	480.892	3	-4.031	15	0	1	.263	1	0	3
496			min	6.185	15	-467.388	1	-110.313	1	0	3	.01	15	-.012	1
497		2	max	170.427	1	479.883	3	-4.031	15	0	1	.205	1	.235	1
498			min	6.332	15	-468.734	1	-110.313	1	0	3	.007	15	-.253	3
499		3	max	247.673	3	517.07	1	-3.994	15	0	3	.147	1	.471	1
500			min	-155.346	2	-341.878	3	-109.544	1	0	1	.005	15	-.496	3
501		4	max	248.041	3	515.724	1	-3.994	15	0	3	.089	1	.198	1
502			min	-154.856	2	-342.887	3	-109.544	1	0	1	.003	15	-.316	3
503		5	max	248.408	3	514.378	1	-3.994	15	0	3	.031	1	-.003	15
504			min	-154.366	2	-343.897	3	-109.544	1	0	1	.001	15	-.134	3
505		6	max	248.776	3	513.032	1	-3.994	15	0	3	0	15	.047	3
506			min	-153.876	2	-344.906	3	-109.544	1	0	1	-.026	1	-.345	1
507		7	max	249.143	3	511.686	1	-3.994	15	0	3	-.003	15	.23	3
508			min	-153.386	2	-345.916	3	-109.544	1	0	1	-.084	1	-.615	1
509		8	max	249.511	3	510.34	1	-3.994	15	0	3	-.005	15	.412	3
510			min	-152.896	2	-346.925	3	-109.544	1	0	1	-.142	1	-.885	1
511		9	max	259.977	3	32.07	2	-5.819	15	0	9	.083	1	.483	3
512			min	-83.553	2	.409	15	-159.432	1	0	3	.003	15	-1.008	1
513		10	max	260.345	3	30.724	2	-5.819	15	0	9	0	15	.469	3
514			min	-83.063	2	.003	15	-159.432	1	0	3	-.001	1	-1.017	1
515		11	max	260.712	3	29.378	2	-5.819	15	0	9	-.003	15	.456	3
516			min	-82.573	2	-1.651	4	-159.432	1	0	3	-.085	1	-1.025	1
517		12	max	271.136	3	222.54	3	-3.896	15	0	1	.14	1	.397	3
518			min	-49.148	10	-544.1	1	-106.94	1	0	3	.005	15	-.905	1
519		13	max	271.503	3	221.53	3	-3.896	15	0	1	.084	1	.28	3
520			min	-48.74	10	-545.446	1	-106.94	1	0	3	.003	15	-.618	1
521		14	max	271.871	3	220.521	3	-3.896	15	0	1	.027	1	.163	3
522			min	-48.331	10	-546.792	1	-106.94	1	0	3	0	15	-.329	1
523		15	max	272.238	3	219.511	3	-3.896	15	0	1	-.001	15	.047	3
524			min	-47.923	10	-548.138	1	-106.94	1	0	3	-.029	1	-.04	1
525		16	max	272.605	3	218.502	3	-3.896	15	0	1	-.003	15	.249	1
526			min	-47.515	10	-549.484	1	-106.94	1	0	3	-.086	1	-.069	3
527		17	max	272.973	3	217.492	3	-3.896	15	0	1	-.005	15	.539	1
528			min	-47.106	10	-550.83	1	-106.94	1	0	3	-.142	1	-.184	3
529		18	max	-6.338	15	534.033	1	-4.285	15	0	3	-.007	15	.27	1
530			min	-170.619	1	-185.19	3	-117.321	1	0	1	-.203	1	-.091	3
531		19	max	-6.19	15	532.687	1	-4.285	15	0	3	-.01	15	.007	3
532			min	-170.129	1	-186.199	3	-117.321	1	0	1	-.265	1	-.011	1
533	M5	1	max	366.114	1	1602.606	3	0	1	0	1	0	1	.024	1
534			min	12.624	12	-1578.442	1	0	1	0	1	0	1	0	3
535		2	max	366.604	1	1601.596	3	0	1	0	1	0	1	.858	1
536			min	12.869	12	-1579.788	1	0	1	0	1	0	1	-.846	3
537		3	max	796.399	3	1590.21	1	0	1	0	1	0	1	1.654	1
538			min	-575.514	2	-1106.625	3	0	1	0	1	0	1	-1.658	3
539		4	max	796.766	3	1588.864	1	0	1	0	1	0	1	.815	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	-575.024	2	-1107.635	3	0	1	0	1	0	1	-1.074	3
541		5	max	797.134	3	1587.518	1	0	1	0	1	0	1	.009	9
542			min	-574.534	2	-1108.644	3	0	1	0	1	0	1	-.489	3
543		6	max	797.501	3	1586.172	1	0	1	0	1	0	1	.096	3
544			min	-574.044	2	-1109.654	3	0	1	0	1	0	1	-.861	1
545		7	max	797.869	3	1584.826	1	0	1	0	1	0	1	.682	3
546			min	-573.554	2	-1110.663	3	0	1	0	1	0	1	-1.697	1
547		8	max	798.236	3	1583.48	1	0	1	0	1	0	1	1.268	3
548			min	-573.065	2	-1111.673	3	0	1	0	1	0	1	-2.533	1
549		9	max	816.894	3	105.958	2	0	1	0	1	0	1	1.462	3
550			min	-431.174	2	.407	15	0	1	0	1	0	1	-2.865	1
551		10	max	817.261	3	104.612	2	0	1	0	1	0	1	1.414	3
552			min	-430.684	2	.001	15	0	1	0	1	0	1	-2.895	1
553		11	max	817.629	3	103.266	2	0	1	0	1	0	1	1.367	3
554			min	-430.194	2	-1.497	4	0	1	0	1	0	1	-2.924	1
555		12	max	836.373	3	709.468	3	0	1	0	1	0	1	1.199	3
556			min	-288.312	2	-1697.643	1	0	1	0	1	0	1	-2.605	1
557		13	max	836.74	3	708.459	3	0	1	0	1	0	1	.825	3
558			min	-287.822	2	-1698.989	1	0	1	0	1	0	1	-1.708	1
559		14	max	837.108	3	707.449	3	0	1	0	1	0	1	.451	3
560			min	-287.333	2	-1700.335	1	0	1	0	1	0	1	-.812	1
561		15	max	837.475	3	706.44	3	0	1	0	1	0	1	.133	2
562			min	-286.843	2	-1701.681	1	0	1	0	1	0	1	-.004	13
563		16	max	837.842	3	705.43	3	0	1	0	1	0	1	.984	1
564			min	-286.353	2	-1703.027	1	0	1	0	1	0	1	-.294	3
565		17	max	838.21	3	704.421	3	0	1	0	1	0	1	1.883	1
566			min	-285.863	2	-1704.373	1	0	1	0	1	0	1	-.666	3
567		18	max	-13.035	12	1803.488	1	0	1	0	1	0	1	.974	1
568			min	-366.22	1	-633.714	3	0	1	0	1	0	1	-.348	3
569		19	max	-12.79	12	1802.142	1	0	1	0	1	0	1	.022	1
570			min	-365.73	1	-634.724	3	0	1	0	1	0	1	-.014	3
571	M9	1	max	169.937	1	480.892	3	110.313	1	0	3	-.01	15	0	3
572			min	6.185	15	-467.388	1	4.031	15	0	1	-.263	1	-.012	1
573		2	max	170.427	1	479.883	3	110.313	1	0	3	-.007	15	.235	1
574			min	6.332	15	-468.734	1	4.031	15	0	1	-.205	1	-.253	3
575		3	max	247.673	3	517.07	1	109.544	1	0	1	-.005	15	.471	1
576			min	-155.346	2	-341.878	3	3.994	15	0	3	-.147	1	-.496	3
577		4	max	248.041	3	515.724	1	109.544	1	0	1	-.003	15	.198	1
578			min	-154.856	2	-342.887	3	3.994	15	0	3	-.089	1	-.316	3
579		5	max	248.408	3	514.378	1	109.544	1	0	1	-.001	15	-.003	15
580			min	-154.366	2	-343.897	3	3.994	15	0	3	-.031	1	-.134	3
581		6	max	248.776	3	513.032	1	109.544	1	0	1	.026	1	.047	3
582			min	-153.876	2	-344.906	3	3.994	15	0	3	0	15	-.345	1
583		7	max	249.143	3	511.686	1	109.544	1	0	1	.084	1	.23	3
584			min	-153.386	2	-345.916	3	3.994	15	0	3	.003	15	-.615	1
585		8	max	249.511	3	510.34	1	109.544	1	0	1	.142	1	.412	3
586			min	-152.896	2	-346.925	3	3.994	15	0	3	.005	15	-.885	1
587		9	max	259.977	3	32.07	2	159.432	1	0	3	-.003	15	.483	3
588			min	-83.553	2	.409	15	5.819	15	0	9	-.083	1	-1.008	1
589		10	max	260.345	3	30.724	2	159.432	1	0	3	.001	1	.469	3
590			min	-83.063	2	.003	15	5.819	15	0	9	0	15	-1.017	1
591		11	max	260.712	3	29.378	2	159.432	1	0	3	.085	1	.456	3
592			min	-82.573	2	-1.651	4	5.819	15	0	9	.003	15	-1.025	1
593		12	max	271.136	3	222.54	3	106.94	1	0	3	-.005	15	.397	3
594			min	-49.148	10	-544.1	1	3.896	15	0	1	-.14	1	-.905	1
595		13	max	271.503	3	221.53	3	106.94	1	0	3	-.003	15	.28	3
596			min	-48.74	10	-545.446	1	3.896	15	0	1	-.084	1	-.618	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	271.871	3	220.521	3	106.94	1	0	3	0	15	.163	3
598			min	-48.331	10	-546.792	1	3.896	15	0	1	-.027	1	-.329	1
599		15	max	272.238	3	219.511	3	106.94	1	0	3	.029	1	.047	3
600			min	-47.923	10	-548.138	1	3.896	15	0	1	.001	15	-.04	1
601		16	max	272.605	3	218.502	3	106.94	1	0	3	.086	1	.249	1
602			min	-47.515	10	-549.484	1	3.896	15	0	1	.003	15	-.069	3
603		17	max	272.973	3	217.492	3	106.94	1	0	3	.142	1	.539	1
604			min	-47.106	10	-550.83	1	3.896	15	0	1	.005	15	-.184	3
605		18	max	-6.338	15	534.033	1	117.321	1	0	1	.203	1	.27	1
606			min	-170.619	1	-185.19	3	4.285	15	0	3	.007	15	-.091	3
607		19	max	-6.19	15	532.687	1	117.321	1	0	1	.265	1	.007	3
608			min	-170.129	1	-186.199	3	4.285	15	0	3	.01	15	-.011	1

Envelope Member Section Deflections

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
1	M13	1	max	.001	1	.101	1	.005	3	8.073e-3	1	NC	1	NC	1
2			min	0	15	-.01	3	-.002	2	-8.638e-4	3	NC	1	NC	1
3		2	max	0	1	.253	3	.046	1	9.33e-3	1	NC	5	NC	2
4			min	0	15	-.135	1	.002	15	-8.863e-4	3	957.545	3	5818.144	1
5		3	max	0	1	.466	3	.109	1	1.059e-2	1	NC	5	NC	3
6			min	0	15	-.322	1	.004	15	-9.088e-4	3	529.168	3	2364.947	1
7		4	max	0	1	.595	3	.164	1	1.184e-2	1	NC	5	NC	3
8			min	0	15	-.427	1	.006	15	-9.313e-4	3	416.206	3	1559.407	1
9		5	max	0	1	.625	3	.193	1	1.31e-2	1	NC	5	NC	3
10			min	0	15	-.437	1	.007	15	-9.538e-4	3	396.722	3	1324.615	1
11		6	max	0	1	.557	3	.187	1	1.436e-2	1	NC	5	NC	3
12			min	0	15	-.353	1	.007	15	-9.763e-4	3	443.926	3	1367.934	1
13		7	max	0	1	.413	3	.147	1	1.562e-2	1	NC	5	NC	3
14			min	0	15	-.196	1	.006	15	-9.988e-4	3	595.704	3	1735.674	1
15		8	max	0	1	.229	3	.087	1	1.687e-2	1	NC	4	NC	3
16			min	0	15	-.011	9	.003	15	-1.021e-3	3	1052.425	3	2973.66	1
17		9	max	0	1	.167	1	.027	1	1.813e-2	1	NC	4	NC	1
18			min	0	15	.005	15	-.003	10	-1.044e-3	3	3451.492	3	NC	1
19		10	max	0	1	.243	1	.014	3	1.939e-2	1	NC	3	NC	1
20			min	0	1	-.013	3	-.009	2	-1.066e-3	3	1771.588	1	NC	1
21		11	max	0	15	.167	1	.027	1	1.813e-2	1	NC	4	NC	1
22			min	0	1	.005	15	-.003	10	-1.044e-3	3	3451.492	3	NC	1
23		12	max	0	15	.229	3	.087	1	1.687e-2	1	NC	4	NC	3
24			min	0	1	-.011	9	.003	15	-1.021e-3	3	1052.425	3	2973.66	1
25		13	max	0	15	.413	3	.147	1	1.562e-2	1	NC	5	NC	3
26			min	0	1	-.196	1	.006	15	-9.988e-4	3	595.704	3	1735.674	1
27		14	max	0	15	.557	3	.187	1	1.436e-2	1	NC	5	NC	3
28			min	0	1	-.353	1	.007	15	-9.763e-4	3	443.926	3	1367.934	1
29		15	max	0	15	.625	3	.193	1	1.31e-2	1	NC	5	NC	3
30			min	0	1	-.437	1	.007	15	-9.538e-4	3	396.722	3	1324.615	1
31		16	max	0	15	.595	3	.164	1	1.184e-2	1	NC	5	NC	3
32			min	0	1	-.427	1	.006	15	-9.313e-4	3	416.206	3	1559.407	1
33		17	max	0	15	.466	3	.109	1	1.059e-2	1	NC	5	NC	3
34			min	0	1	-.322	1	.004	15	-9.088e-4	3	529.168	3	2364.947	1
35		18	max	0	15	.253	3	.046	1	9.33e-3	1	NC	5	NC	2
36			min	0	1	-.135	1	.002	15	-8.863e-4	3	957.545	3	5818.144	1
37		19	max	0	15	.101	1	.005	3	8.073e-3	1	NC	1	NC	1
38			min	-.001	1	-.01	3	-.002	2	-8.638e-4	3	NC	1	NC	1
39	M14	1	max	0	1	.142	3	.004	3	5.083e-3	1	NC	1	NC	1
40			min	0	15	-.33	1	-.001	2	-2.576e-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	.388	3	.032	1	6.123e-3	1	NC	5	NC	2
42			min	0	15	-.687	1	.001	15	-3.151e-3	3	705.264	1	8459.67	1
43		3	max	0	1	.594	3	.088	1	7.163e-3	1	NC	15	NC	3
44			min	0	15	-.993	1	.003	15	-3.726e-3	3	380.172	1	2933.882	1
45		4	max	0	1	.735	3	.141	1	8.203e-3	1	NC	15	NC	3
46			min	0	15	-1.211	1	.005	15	-4.3e-3	3	286.018	1	1814.208	1
47		5	max	0	1	.798	3	.172	1	9.243e-3	1	9260.77	15	NC	3
48			min	0	15	-1.324	1	.006	15	-4.875e-3	3	253.515	1	1488.125	1
49		6	max	0	1	.782	3	.17	1	1.028e-2	1	9227.888	15	NC	3
50			min	0	15	-1.332	1	.006	15	-5.45e-3	3	251.622	1	1503.082	1
51		7	max	0	1	.701	3	.137	1	1.132e-2	1	NC	15	NC	3
52			min	0	15	-1.251	1	.005	15	-6.025e-3	3	273.635	1	1877.365	1
53		8	max	0	1	.585	3	.082	1	1.236e-2	1	NC	15	NC	3
54			min	0	15	-1.118	1	.003	15	-6.6e-3	3	320.032	1	3174.636	1
55		9	max	0	1	.473	3	.026	1	1.34e-2	1	NC	15	NC	1
56			min	0	15	-.984	1	-.002	10	-7.174e-3	3	385.481	1	NC	1
57		10	max	0	1	.421	3	.013	3	1.444e-2	1	NC	5	NC	1
58			min	0	1	-.92	1	-.008	2	-7.749e-3	3	426.906	1	NC	1
59		11	max	0	15	.473	3	.026	1	1.34e-2	1	NC	15	NC	1
60			min	0	1	-.984	1	-.002	10	-7.174e-3	3	385.481	1	NC	1
61		12	max	0	15	.585	3	.082	1	1.236e-2	1	NC	15	NC	3
62			min	0	1	-1.118	1	.003	15	-6.6e-3	3	320.032	1	3174.636	1
63		13	max	0	15	.701	3	.137	1	1.132e-2	1	NC	15	NC	3
64			min	0	1	-1.251	1	.005	15	-6.025e-3	3	273.635	1	1877.365	1
65		14	max	0	15	.782	3	.17	1	1.028e-2	1	9227.888	15	NC	3
66			min	0	1	-1.332	1	.006	15	-5.45e-3	3	251.622	1	1503.082	1
67		15	max	0	15	.798	3	.172	1	9.243e-3	1	9260.77	15	NC	3
68			min	0	1	-1.324	1	.006	15	-4.875e-3	3	253.515	1	1488.125	1
69		16	max	0	15	.735	3	.141	1	8.203e-3	1	NC	15	NC	3
70			min	0	1	-1.211	1	.005	15	-4.3e-3	3	286.018	1	1814.208	1
71		17	max	0	15	.594	3	.088	1	7.163e-3	1	NC	15	NC	3
72			min	0	1	-.993	1	.003	15	-3.726e-3	3	380.172	1	2933.882	1
73		18	max	0	15	.388	3	.032	1	6.123e-3	1	NC	5	NC	2
74			min	0	1	-.687	1	.001	15	-3.151e-3	3	705.264	1	8459.67	1
75		19	max	0	15	.142	3	.004	3	5.083e-3	1	NC	1	NC	1
76			min	0	1	-.33	1	-.001	2	-2.576e-3	3	NC	1	NC	1
77	M15	1	max	0	15	.145	3	.004	3	2.163e-3	3	NC	1	NC	1
78			min	0	1	-.33	1	-.001	2	-5.186e-3	1	NC	1	NC	1
79		2	max	0	15	.296	3	.032	1	2.649e-3	3	NC	5	NC	2
80			min	0	1	-.721	1	.001	15	-6.253e-3	1	643.818	1	8420.883	1
81		3	max	0	15	.426	3	.088	1	3.135e-3	3	NC	15	NC	3
82			min	0	1	-1.054	1	.003	15	-7.32e-3	1	347.806	1	2926.034	1
83		4	max	0	15	.521	3	.142	1	3.621e-3	3	NC	15	NC	3
84			min	0	1	-1.289	1	.005	15	-8.387e-3	1	262.656	1	1810.468	1
85		5	max	0	15	.573	3	.172	1	4.107e-3	3	9270.963	15	NC	3
86			min	0	1	-1.406	1	.006	15	-9.454e-3	1	234.172	1	1485.368	1
87		6	max	0	15	.582	3	.17	1	4.593e-3	3	9240.041	15	NC	3
88			min	0	1	-1.404	1	.006	15	-1.052e-2	1	234.483	1	1500.218	1
89		7	max	0	15	.555	3	.137	1	5.079e-3	3	NC	15	NC	3
90			min	0	1	-1.305	1	.005	15	-1.159e-2	1	258.404	1	1873.018	1
91		8	max	0	15	.506	3	.082	1	5.565e-3	3	NC	15	NC	3
92			min	0	1	-1.147	1	.003	15	-1.266e-2	1	308.169	1	3162.833	1
93		9	max	0	15	.455	3	.026	1	6.051e-3	3	NC	15	NC	1
94			min	0	1	-.992	1	-.002	10	-1.372e-2	1	380.474	1	NC	1
95		10	max	0	1	.431	3	.012	3	6.537e-3	3	NC	5	NC	1
96			min	0	1	-.919	1	-.007	2	-1.479e-2	1	427.78	1	NC	1
97		11	max	0	1	.455	3	.026	1	6.051e-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	-.992	1	-.002	10	-1.372e-2	1	380.474	1	NC	1
99		12	max	0	1	.506	3	.082	1	5.565e-3	3	NC	15	NC	3
100			min	0	15	-1.147	1	.003	15	-1.266e-2	1	308.169	1	3162.833	1
101		13	max	0	1	.555	3	.137	1	5.079e-3	3	NC	15	NC	3
102			min	0	15	-1.305	1	.005	15	-1.159e-2	1	258.404	1	1873.018	1
103		14	max	0	1	.582	3	.17	1	4.593e-3	3	9240.041	15	NC	3
104			min	0	15	-1.404	1	.006	15	-1.052e-2	1	234.483	1	1500.218	1
105		15	max	0	1	.573	3	.172	1	4.107e-3	3	9270.963	15	NC	3
106			min	0	15	-1.406	1	.006	15	-9.454e-3	1	234.172	1	1485.368	1
107		16	max	0	1	.521	3	.142	1	3.621e-3	3	NC	15	NC	3
108			min	0	15	-1.289	1	.005	15	-8.387e-3	1	262.656	1	1810.468	1
109		17	max	0	1	.426	3	.088	1	3.135e-3	3	NC	15	NC	3
110			min	0	15	-1.054	1	.003	15	-7.32e-3	1	347.806	1	2926.034	1
111		18	max	0	1	.296	3	.032	1	2.649e-3	3	NC	5	NC	2
112			min	0	15	-.721	1	.001	15	-6.253e-3	1	643.818	1	8420.883	1
113		19	max	0	1	.145	3	.004	3	2.163e-3	3	NC	1	NC	1
114			min	0	15	-.33	1	-.001	2	-5.186e-3	1	NC	1	NC	1
115	M16	1	max	0	15	.099	1	.003	3	3.78e-3	3	NC	1	NC	1
116			min	-.001	1	-.048	3	-.001	2	-7.598e-3	1	NC	1	NC	1
117		2	max	0	15	.042	3	.045	1	4.485e-3	3	NC	5	NC	2
118			min	-.001	1	-.172	1	.002	15	-8.738e-3	1	930.853	1	5856.623	1
119		3	max	0	15	.113	3	.108	1	5.19e-3	3	NC	5	NC	3
120			min	0	1	-.387	1	.004	15	-9.879e-3	1	518.367	1	2372.675	1
121		4	max	0	15	.151	3	.163	1	5.894e-3	3	NC	5	NC	3
122			min	0	1	-.511	1	.006	15	-1.102e-2	1	413.585	1	1561.705	1
123		5	max	0	15	.151	3	.192	1	6.599e-3	3	NC	5	NC	3
124			min	0	1	-.525	1	.007	15	-1.216e-2	1	404.327	1	1324.665	1
125		6	max	0	15	.115	3	.187	1	7.304e-3	3	NC	5	NC	3
126			min	0	1	-.432	1	.007	15	-1.33e-2	1	474.536	1	1365.749	1
127		7	max	0	15	.049	3	.148	1	8.009e-3	3	NC	5	NC	3
128			min	0	1	-.261	2	.006	15	-1.444e-2	1	708.417	1	1728.328	1
129		8	max	0	15	.001	13	.088	1	8.714e-3	3	NC	3	NC	3
130			min	0	1	-.066	2	.003	15	-1.558e-2	1	1733.789	2	2942.07	1
131		9	max	0	15	.151	1	.028	1	9.418e-3	3	NC	4	NC	2
132			min	0	1	-.099	3	-.002	10	-1.672e-2	1	4845.526	1	9869.748	1
133		10	max	0	1	.237	1	.01	3	1.012e-2	3	NC	5	NC	1
134			min	0	1	-.13	3	-.007	2	-1.786e-2	1	1822.389	1	NC	1
135		11	max	0	1	.151	1	.028	1	9.418e-3	3	NC	4	NC	2
136			min	0	15	-.099	3	-.002	10	-1.672e-2	1	4845.526	1	9869.748	1
137		12	max	0	1	.001	13	.088	1	8.714e-3	3	NC	3	NC	3
138			min	0	15	-.066	2	.003	15	-1.558e-2	1	1733.789	2	2942.07	1
139		13	max	0	1	.049	3	.148	1	8.009e-3	3	NC	5	NC	3
140			min	0	15	-.261	2	.006	15	-1.444e-2	1	708.417	1	1728.328	1
141		14	max	0	1	.115	3	.187	1	7.304e-3	3	NC	5	NC	3
142			min	0	15	-.432	1	.007	15	-1.33e-2	1	474.536	1	1365.749	1
143		15	max	0	1	.151	3	.192	1	6.599e-3	3	NC	5	NC	3
144			min	0	15	-.525	1	.007	15	-1.216e-2	1	404.327	1	1324.665	1
145		16	max	0	1	.151	3	.163	1	5.894e-3	3	NC	5	NC	3
146			min	0	15	-.511	1	.006	15	-1.102e-2	1	413.585	1	1561.705	1
147		17	max	0	1	.113	3	.108	1	5.19e-3	3	NC	5	NC	3
148			min	0	15	-.387	1	.004	15	-9.879e-3	1	518.367	1	2372.675	1
149		18	max	.001	1	.042	3	.045	1	4.485e-3	3	NC	5	NC	2
150			min	0	15	-.172	1	.002	15	-8.738e-3	1	930.853	1	5856.623	1
151		19	max	.001	1	.099	1	.003	3	3.78e-3	3	NC	1	NC	1
152			min	0	15	-.048	3	-.001	2	-7.598e-3	1	NC	1	NC	1
153	M2	1	max	.006	1	.003	2	.008	1	-8.339e-6	15	NC	1	NC	2
154			min	-.005	3	-.006	3	0	15	-2.29e-4	1	NC	1	6514.932	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	.002	2	.008	1	-7.779e-6	15	NC	1	NC	2
156			min	-.004	3	-.006	3	0	15	-2.136e-4	1	NC	1	7106.8	1
157		3	max	.005	1	.002	2	.007	1	-7.219e-6	15	NC	1	NC	2
158			min	-.004	3	-.006	3	0	15	-1.982e-4	1	NC	1	7812.396	1
159		4	max	.005	1	.001	2	.006	1	-6.659e-6	15	NC	1	NC	2
160			min	-.004	3	-.006	3	0	15	-1.828e-4	1	NC	1	8661.936	1
161		5	max	.004	1	0	2	.006	1	-6.099e-6	15	NC	1	NC	2
162			min	-.004	3	-.005	3	0	15	-1.674e-4	1	NC	1	9696.692	1
163		6	max	.004	1	0	2	.005	1	-5.539e-6	15	NC	1	NC	1
164			min	-.003	3	-.005	3	0	15	-1.52e-4	1	NC	1	NC	1
165		7	max	.004	1	0	2	.004	1	-4.979e-6	15	NC	1	NC	1
166			min	-.003	3	-.005	3	0	15	-1.367e-4	1	NC	1	NC	1
167		8	max	.003	1	0	2	.004	1	-4.419e-6	15	NC	1	NC	1
168			min	-.003	3	-.005	3	0	15	-1.213e-4	1	NC	1	NC	1
169		9	max	.003	1	0	15	.003	1	-3.859e-6	15	NC	1	NC	1
170			min	-.003	3	-.005	3	0	15	-1.059e-4	1	NC	1	NC	1
171		10	max	.003	1	0	15	.003	1	-3.299e-6	15	NC	1	NC	1
172			min	-.002	3	-.004	3	0	15	-9.05e-5	1	NC	1	NC	1
173		11	max	.002	1	0	15	.002	1	-2.739e-6	15	NC	1	NC	1
174			min	-.002	3	-.004	3	0	15	-7.511e-5	1	NC	1	NC	1
175		12	max	.002	1	0	15	.002	1	-2.179e-6	15	NC	1	NC	1
176			min	-.002	3	-.004	3	0	15	-5.973e-5	1	NC	1	NC	1
177		13	max	.002	1	0	15	.001	1	-1.619e-6	15	NC	1	NC	1
178			min	-.002	3	-.003	3	0	15	-4.434e-5	1	NC	1	NC	1
179		14	max	.002	1	0	15	0	1	-1.059e-6	15	NC	1	NC	1
180			min	-.001	3	-.003	3	0	15	-2.896e-5	1	NC	1	NC	1
181		15	max	.001	1	0	15	0	1	-4.988e-7	15	NC	1	NC	1
182			min	-.001	3	-.003	4	0	15	-1.357e-5	1	NC	1	NC	1
183		16	max	0	1	0	15	0	1	1.813e-6	1	NC	1	NC	1
184			min	0	3	-.002	4	0	15	-2.023e-7	3	NC	1	NC	1
185		17	max	0	1	0	15	0	1	1.72e-5	1	NC	1	NC	1
186			min	0	3	-.001	4	0	15	5.503e-7	12	NC	1	NC	1
187		18	max	0	1	0	15	0	1	3.258e-5	1	NC	1	NC	1
188			min	0	3	0	4	0	15	1.181e-6	15	NC	1	NC	1
189		19	max	0	1	0	1	0	1	4.797e-5	1	NC	1	NC	1
190			min	0	1	0	1	0	1	1.741e-6	15	NC	1	NC	1
191	M3	1	max	0	1	0	1	0	1	-5.479e-7	15	NC	1	NC	1
192			min	0	1	0	1	0	1	-1.509e-5	1	NC	1	NC	1
193		2	max	0	3	0	15	0	1	1.079e-5	1	NC	1	NC	1
194			min	0	2	-.002	4	0	15	3.935e-7	15	NC	1	NC	1
195		3	max	0	3	0	15	0	1	3.667e-5	1	NC	1	NC	1
196			min	0	2	-.003	4	0	15	1.335e-6	15	NC	1	NC	1
197		4	max	0	3	-.001	15	0	1	6.254e-5	1	NC	1	NC	1
198			min	0	2	-.005	4	0	15	2.276e-6	15	NC	1	NC	1
199		5	max	0	3	-.002	15	.001	1	8.842e-5	1	NC	1	NC	1
200			min	0	2	-.007	4	0	15	3.218e-6	15	NC	1	NC	1
201		6	max	.001	3	-.002	15	.001	1	1.143e-4	1	NC	1	NC	1
202			min	0	2	-.009	4	0	15	4.159e-6	15	NC	1	NC	1
203		7	max	.001	3	-.002	15	.002	1	1.402e-4	1	NC	1	NC	1
204			min	0	2	-.01	4	0	15	5.1e-6	15	8923.064	4	NC	1
205		8	max	.001	3	-.003	15	.002	1	1.66e-4	1	NC	1	NC	1
206			min	0	2	-.012	4	0	15	6.042e-6	15	7983.869	4	NC	1
207		9	max	.002	3	-.003	15	.002	1	1.919e-4	1	NC	2	NC	1
208			min	-.001	2	-.013	4	0	15	6.983e-6	15	7425.501	4	NC	1
209		10	max	.002	3	-.003	15	.003	1	2.178e-4	1	NC	3	NC	1
210			min	-.001	2	-.013	4	0	15	7.924e-6	15	7149.826	4	NC	1
211		11	max	.002	3	-.003	15	.003	1	2.437e-4	1	NC	3	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
212			min	-.001	2	-.013	4	0	15	8.866e-6	15	7115.925	4	NC	1
213		12	max	.002	3	-.003	15	.004	1	2.696e-4	1	NC	2	NC	1
214			min	-.002	2	-.013	4	0	15	9.807e-6	15	7324.356	4	NC	1
215		13	max	.002	3	-.003	15	.004	1	2.954e-4	1	NC	1	NC	1
216			min	-.002	2	-.012	4	0	15	1.075e-5	15	7819.346	4	NC	1
217		14	max	.003	3	-.003	15	.005	1	3.213e-4	1	NC	1	NC	1
218			min	-.002	2	-.011	4	0	15	1.169e-5	15	8712.023	4	NC	1
219		15	max	.003	3	-.002	15	.005	1	3.472e-4	1	NC	1	NC	1
220			min	-.002	2	-.009	4	0	15	1.263e-5	15	NC	1	NC	1
221		16	max	.003	3	-.002	15	.006	1	3.731e-4	1	NC	1	NC	1
222			min	-.002	2	-.008	1	0	15	1.357e-5	15	NC	1	NC	1
223		17	max	.003	3	-.001	15	.007	1	3.989e-4	1	NC	1	NC	1
224			min	-.002	2	-.006	1	0	15	1.451e-5	15	NC	1	NC	1
225		18	max	.003	3	0	15	.007	1	4.248e-4	1	NC	1	NC	1
226			min	-.002	2	-.005	1	0	15	1.546e-5	15	NC	1	NC	1
227		19	max	.004	3	0	15	.008	1	4.507e-4	1	NC	1	NC	1
228			min	-.003	2	-.003	1	0	15	1.64e-5	15	NC	1	NC	1
229	M4	1	max	.003	1	.002	2	0	15	2.056e-5	1	NC	1	NC	3
230			min	0	3	-.004	3	-.008	1	7.573e-7	15	NC	1	3063.347	1
231		2	max	.003	1	.002	2	0	15	2.056e-5	1	NC	1	NC	3
232			min	0	3	-.003	3	-.007	1	7.573e-7	15	NC	1	3334.183	1
233		3	max	.002	1	.002	2	0	15	2.056e-5	1	NC	1	NC	3
234			min	0	3	-.003	3	-.007	1	7.573e-7	15	NC	1	3656.349	1
235		4	max	.002	1	.002	2	0	15	2.056e-5	1	NC	1	NC	2
236			min	0	3	-.003	3	-.006	1	7.573e-7	15	NC	1	4043.211	1
237		5	max	.002	1	.002	2	0	15	2.056e-5	1	NC	1	NC	2
238			min	0	3	-.003	3	-.005	1	7.573e-7	15	NC	1	4512.931	1
239		6	max	.002	1	.001	2	0	15	2.056e-5	1	NC	1	NC	2
240			min	0	3	-.003	3	-.005	1	7.573e-7	15	NC	1	5090.694	1
241		7	max	.002	1	.001	2	0	15	2.056e-5	1	NC	1	NC	2
242			min	0	3	-.002	3	-.004	1	7.573e-7	15	NC	1	5812.255	1
243		8	max	.002	1	.001	2	0	15	2.056e-5	1	NC	1	NC	2
244			min	0	3	-.002	3	-.004	1	7.573e-7	15	NC	1	6729.761	1
245		9	max	.002	1	.001	2	0	15	2.056e-5	1	NC	1	NC	2
246			min	0	3	-.002	3	-.003	1	7.573e-7	15	NC	1	7921.725	1
247		10	max	.001	1	.001	2	0	15	2.056e-5	1	NC	1	NC	2
248			min	0	3	-.002	3	-.003	1	7.573e-7	15	NC	1	9510.893	1
249		11	max	.001	1	0	2	0	15	2.056e-5	1	NC	1	NC	1
250			min	0	3	-.002	3	-.002	1	7.573e-7	15	NC	1	NC	1
251		12	max	.001	1	0	2	0	15	2.056e-5	1	NC	1	NC	1
252			min	0	3	-.001	3	-.002	1	7.573e-7	15	NC	1	NC	1
253		13	max	0	1	0	2	0	15	2.056e-5	1	NC	1	NC	1
254			min	0	3	-.001	3	-.001	1	7.573e-7	15	NC	1	NC	1
255		14	max	0	1	0	2	0	15	2.056e-5	1	NC	1	NC	1
256			min	0	3	-.001	3	0	1	7.573e-7	15	NC	1	NC	1
257		15	max	0	1	0	2	0	15	2.056e-5	1	NC	1	NC	1
258			min	0	3	0	3	0	1	7.573e-7	15	NC	1	NC	1
259		16	max	0	1	0	2	0	15	2.056e-5	1	NC	1	NC	1
260			min	0	3	0	3	0	1	7.573e-7	15	NC	1	NC	1
261		17	max	0	1	0	2	0	15	2.056e-5	1	NC	1	NC	1
262			min	0	3	0	3	0	1	7.573e-7	15	NC	1	NC	1
263		18	max	0	1	0	2	0	15	2.056e-5	1	NC	1	NC	1
264			min	0	3	0	3	0	1	7.573e-7	15	NC	1	NC	1
265		19	max	0	1	0	1	0	1	2.056e-5	1	NC	1	NC	1
266			min	0	1	0	1	0	1	7.573e-7	15	NC	1	NC	1
267	M6	1	max	.018	1	.013	2	0	1	0	1	NC	3	NC	1
268			min	-.015	3	-.019	3	0	1	0	1	4142.076	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	.017	1	.012	2	0	1	0	1	NC	3	NC	1
270			min	-.014	3	-.018	3	0	1	0	1	4566.953	2	NC	1
271		3	max	.016	1	.011	2	0	1	0	1	NC	3	NC	1
272			min	-.013	3	-.017	3	0	1	0	1	5084.403	2	NC	1
273		4	max	.015	1	.01	2	0	1	0	1	NC	1	NC	1
274			min	-.012	3	-.016	3	0	1	0	1	5722.603	2	NC	1
275		5	max	.014	1	.008	2	0	1	0	1	NC	1	NC	1
276			min	-.012	3	-.015	3	0	1	0	1	6521.725	2	NC	1
277		6	max	.013	1	.007	2	0	1	0	1	NC	1	NC	1
278			min	-.011	3	-.014	3	0	1	0	1	7540.675	2	NC	1
279		7	max	.012	1	.006	2	0	1	0	1	NC	1	NC	1
280			min	-.01	3	-.013	3	0	1	0	1	8868.776	2	NC	1
281		8	max	.011	1	.005	2	0	1	0	1	NC	1	NC	1
282			min	-.009	3	-.012	3	0	1	0	1	NC	1	NC	1
283		9	max	.01	1	.004	2	0	1	0	1	NC	1	NC	1
284			min	-.008	3	-.011	3	0	1	0	1	NC	1	NC	1
285		10	max	.009	1	.003	2	0	1	0	1	NC	1	NC	1
286			min	-.007	3	-.01	3	0	1	0	1	NC	1	NC	1
287		11	max	.008	1	.003	2	0	1	0	1	NC	1	NC	1
288			min	-.007	3	-.009	3	0	1	0	1	NC	1	NC	1
289		12	max	.007	1	.002	2	0	1	0	1	NC	1	NC	1
290			min	-.006	3	-.008	3	0	1	0	1	NC	1	NC	1
291		13	max	.006	1	.001	2	0	1	0	1	NC	1	NC	1
292			min	-.005	3	-.007	3	0	1	0	1	NC	1	NC	1
293		14	max	.005	1	0	2	0	1	0	1	NC	1	NC	1
294			min	-.004	3	-.006	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	-.003	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	-.002	3	-.003	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	-.002	3	0	1	0	1	NC	1	NC	1
301		18	max	0	1	0	2	0	1	0	1	NC	1	NC	1
302			min	0	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	.001	3	0	15	0	1	0	1	NC	1	NC	1
310			min	-.001	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	-.002	2	-.007	3	0	1	0	1	NC	1	NC	1
315		6	max	.003	3	-.002	15	0	1	0	1	NC	1	NC	1
316			min	-.003	2	-.009	4	0	1	0	1	NC	1	NC	1
317		7	max	.004	3	-.002	15	0	1	0	1	NC	1	NC	1
318			min	-.004	2	-.01	4	0	1	0	1	9173.396	4	NC	1
319		8	max	.004	3	-.003	15	0	1	0	1	NC	1	NC	1
320			min	-.004	2	-.012	4	0	1	0	1	8190.615	4	NC	1
321		9	max	.005	3	-.003	15	0	1	0	1	NC	1	NC	1
322			min	-.005	2	-.013	4	0	1	0	1	7604.59	4	NC	1
323		10	max	.006	3	-.003	15	0	1	0	1	NC	1	NC	1
324			min	-.005	2	-.013	4	0	1	0	1	7311.702	4	NC	1
325		11	max	.006	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	-.006	2	-.013	4	0	1	0	1	7268.24	4	NC	1
327		12	max	.007	3	-.003	15	0	1	0	1	NC	1	NC	1
328			min	-.007	2	-.013	4	0	1	0	1	7473.548	4	NC	1
329		13	max	.008	3	-.003	15	0	1	0	1	NC	1	NC	1
330			min	-.007	2	-.012	4	0	1	0	1	7971.854	4	NC	1
331		14	max	.008	3	-.003	15	0	1	0	1	NC	1	NC	1
332			min	-.008	2	-.011	4	0	1	0	1	8875.697	4	NC	1
333		15	max	.009	3	-.002	15	0	1	0	1	NC	1	NC	1
334			min	-.009	2	-.011	1	0	1	0	1	NC	1	NC	1
335		16	max	.01	3	-.002	15	0	1	0	1	NC	1	NC	1
336			min	-.009	2	-.01	1	0	1	0	1	NC	1	NC	1
337		17	max	.01	3	-.001	15	0	1	0	1	NC	1	NC	1
338			min	-.01	2	-.009	1	0	1	0	1	NC	1	NC	1
339		18	max	.011	3	0	15	0	1	0	1	NC	1	NC	1
340			min	-.01	2	-.008	1	0	1	0	1	NC	1	NC	1
341		19	max	.011	3	0	15	0	1	0	1	NC	1	NC	1
342			min	-.011	2	-.006	1	0	1	0	1	NC	1	NC	1
343	M8	1	max	.008	1	.01	2	0	1	0	1	NC	1	NC	1
344			min	-.001	3	-.011	3	0	1	0	1	NC	1	NC	1
345		2	max	.007	1	.009	2	0	1	0	1	NC	1	NC	1
346			min	-.001	3	-.011	3	0	1	0	1	NC	1	NC	1
347		3	max	.007	1	.009	2	0	1	0	1	NC	1	NC	1
348			min	-.001	3	-.01	3	0	1	0	1	NC	1	NC	1
349		4	max	.007	1	.008	2	0	1	0	1	NC	1	NC	1
350			min	-.001	3	-.01	3	0	1	0	1	NC	1	NC	1
351		5	max	.006	1	.007	2	0	1	0	1	NC	1	NC	1
352			min	-.001	3	-.009	3	0	1	0	1	NC	1	NC	1
353		6	max	.006	1	.007	2	0	1	0	1	NC	1	NC	1
354			min	-.001	3	-.008	3	0	1	0	1	NC	1	NC	1
355		7	max	.005	1	.006	2	0	1	0	1	NC	1	NC	1
356			min	0	3	-.008	3	0	1	0	1	NC	1	NC	1
357		8	max	.005	1	.006	2	0	1	0	1	NC	1	NC	1
358			min	0	3	-.007	3	0	1	0	1	NC	1	NC	1
359		9	max	.004	1	.005	2	0	1	0	1	NC	1	NC	1
360			min	0	3	-.006	3	0	1	0	1	NC	1	NC	1
361		10	max	.004	1	.005	2	0	1	0	1	NC	1	NC	1
362			min	0	3	-.006	3	0	1	0	1	NC	1	NC	1
363		11	max	.003	1	.004	2	0	1	0	1	NC	1	NC	1
364			min	0	3	-.005	3	0	1	0	1	NC	1	NC	1
365		12	max	.003	1	.004	2	0	1	0	1	NC	1	NC	1
366			min	0	3	-.004	3	0	1	0	1	NC	1	NC	1
367		13	max	.003	1	.003	2	0	1	0	1	NC	1	NC	1
368			min	0	3	-.004	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	-.003	3	0	1	0	1	NC	1	NC	1
371		15	max	.002	1	.002	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	-.001	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	.003	2	0	15	2.29e-4	1	NC	1	NC	2
382			min	-.005	3	-.006	3	-.008	1	8.339e-6	15	NC	1	6514.932	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	.002	2	0	15	2.136e-4	1	NC	1	NC	2
384			min	-.004	3	-.006	3	-.008	1	7.779e-6	15	NC	1	7106.8	1
385		3	max	.005	1	.002	2	0	15	1.982e-4	1	NC	1	NC	2
386			min	-.004	3	-.006	3	-.007	1	7.219e-6	15	NC	1	7812.396	1
387		4	max	.005	1	.001	2	0	15	1.828e-4	1	NC	1	NC	2
388			min	-.004	3	-.006	3	-.006	1	6.659e-6	15	NC	1	8661.936	1
389		5	max	.004	1	0	2	0	15	1.674e-4	1	NC	1	NC	2
390			min	-.004	3	-.005	3	-.006	1	6.099e-6	15	NC	1	9696.692	1
391		6	max	.004	1	0	2	0	15	1.52e-4	1	NC	1	NC	1
392			min	-.003	3	-.005	3	-.005	1	5.539e-6	15	NC	1	NC	1
393		7	max	.004	1	0	2	0	15	1.367e-4	1	NC	1	NC	1
394			min	-.003	3	-.005	3	-.004	1	4.979e-6	15	NC	1	NC	1
395		8	max	.003	1	0	2	0	15	1.213e-4	1	NC	1	NC	1
396			min	-.003	3	-.005	3	-.004	1	4.419e-6	15	NC	1	NC	1
397		9	max	.003	1	0	15	0	15	1.059e-4	1	NC	1	NC	1
398			min	-.003	3	-.005	3	-.003	1	3.859e-6	15	NC	1	NC	1
399		10	max	.003	1	0	15	0	15	9.05e-5	1	NC	1	NC	1
400			min	-.002	3	-.004	3	-.003	1	3.299e-6	15	NC	1	NC	1
401		11	max	.002	1	0	15	0	15	7.511e-5	1	NC	1	NC	1
402			min	-.002	3	-.004	3	-.002	1	2.739e-6	15	NC	1	NC	1
403		12	max	.002	1	0	15	0	15	5.973e-5	1	NC	1	NC	1
404			min	-.002	3	-.004	3	-.002	1	2.179e-6	15	NC	1	NC	1
405		13	max	.002	1	0	15	0	15	4.434e-5	1	NC	1	NC	1
406			min	-.002	3	-.003	3	-.001	1	1.619e-6	15	NC	1	NC	1
407		14	max	.002	1	0	15	0	15	2.896e-5	1	NC	1	NC	1
408			min	-.001	3	-.003	3	0	1	1.059e-6	15	NC	1	NC	1
409		15	max	.001	1	0	15	0	15	1.357e-5	1	NC	1	NC	1
410			min	-.001	3	-.003	4	0	1	4.988e-7	15	NC	1	NC	1
411		16	max	0	1	0	15	0	15	2.023e-7	3	NC	1	NC	1
412			min	0	3	-.002	4	0	1	-1.813e-6	1	NC	1	NC	1
413		17	max	0	1	0	15	0	15	-5.503e-7	12	NC	1	NC	1
414			min	0	3	-.001	4	0	1	-1.72e-5	1	NC	1	NC	1
415		18	max	0	1	0	15	0	15	-1.181e-6	15	NC	1	NC	1
416			min	0	3	0	4	0	1	-3.258e-5	1	NC	1	NC	1
417		19	max	0	1	0	1	0	1	-1.741e-6	15	NC	1	NC	1
418			min	0	1	0	1	0	1	-4.797e-5	1	NC	1	NC	1
419	M11	1	max	0	1	0	1	0	1	1.509e-5	1	NC	1	NC	1
420			min	0	1	0	1	0	1	5.479e-7	15	NC	1	NC	1
421		2	max	0	3	0	15	0	15	-3.935e-7	15	NC	1	NC	1
422			min	0	2	-.002	4	0	1	-1.079e-5	1	NC	1	NC	1
423		3	max	0	3	0	15	0	15	-1.335e-6	15	NC	1	NC	1
424			min	0	2	-.003	4	0	1	-3.667e-5	1	NC	1	NC	1
425		4	max	0	3	-.001	15	0	15	-2.276e-6	15	NC	1	NC	1
426			min	0	2	-.005	4	0	1	-6.254e-5	1	NC	1	NC	1
427		5	max	0	3	-.002	15	0	15	-3.218e-6	15	NC	1	NC	1
428			min	0	2	-.007	4	-.001	1	-8.842e-5	1	NC	1	NC	1
429		6	max	.001	3	-.002	15	0	15	-4.159e-6	15	NC	1	NC	1
430			min	0	2	-.009	4	-.001	1	-1.143e-4	1	NC	1	NC	1
431		7	max	.001	3	-.002	15	0	15	-5.1e-6	15	NC	1	NC	1
432			min	0	2	-.01	4	-.002	1	-1.402e-4	1	8923.064	4	NC	1
433		8	max	.001	3	-.003	15	0	15	-6.042e-6	15	NC	1	NC	1
434			min	0	2	-.012	4	-.002	1	-1.66e-4	1	7983.869	4	NC	1
435		9	max	.002	3	-.003	15	0	15	-6.983e-6	15	NC	2	NC	1
436			min	-.001	2	-.013	4	-.002	1	-1.919e-4	1	7425.501	4	NC	1
437		10	max	.002	3	-.003	15	0	15	-7.924e-6	15	NC	3	NC	1
438			min	-.001	2	-.013	4	-.003	1	-2.178e-4	1	7149.826	4	NC	1
439		11	max	.002	3	-.003	15	0	15	-8.866e-6	15	NC	3	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
440			min	-.001	2	-.013	4	-.003	1	-2.437e-4	1	7115.925	4	NC	1
441		12	max	.002	3	-.003	15	0	15	-9.807e-6	15	NC	2	NC	1
442			min	-.002	2	-.013	4	-.004	1	-2.696e-4	1	7324.356	4	NC	1
443		13	max	.002	3	-.003	15	0	15	-1.075e-5	15	NC	1	NC	1
444			min	-.002	2	-.012	4	-.004	1	-2.954e-4	1	7819.346	4	NC	1
445		14	max	.003	3	-.003	15	0	15	-1.169e-5	15	NC	1	NC	1
446			min	-.002	2	-.011	4	-.005	1	-3.213e-4	1	8712.023	4	NC	1
447		15	max	.003	3	-.002	15	0	15	-1.263e-5	15	NC	1	NC	1
448			min	-.002	2	-.009	4	-.005	1	-3.472e-4	1	NC	1	NC	1
449		16	max	.003	3	-.002	15	0	15	-1.357e-5	15	NC	1	NC	1
450			min	-.002	2	-.008	1	-.006	1	-3.731e-4	1	NC	1	NC	1
451		17	max	.003	3	-.001	15	0	15	-1.451e-5	15	NC	1	NC	1
452			min	-.002	2	-.006	1	-.007	1	-3.989e-4	1	NC	1	NC	1
453		18	max	.003	3	0	15	0	15	-1.546e-5	15	NC	1	NC	1
454			min	-.002	2	-.005	1	-.007	1	-4.248e-4	1	NC	1	NC	1
455		19	max	.004	3	0	15	0	15	-1.64e-5	15	NC	1	NC	1
456			min	-.003	2	-.003	1	-.008	1	-4.507e-4	1	NC	1	NC	1
457	M12	1	max	.003	1	.002	2	.008	1	-7.573e-7	15	NC	1	NC	3
458			min	0	3	-.004	3	0	15	-2.056e-5	1	NC	1	3063.347	1
459		2	max	.003	1	.002	2	.007	1	-7.573e-7	15	NC	1	NC	3
460			min	0	3	-.003	3	0	15	-2.056e-5	1	NC	1	3334.183	1
461		3	max	.002	1	.002	2	.007	1	-7.573e-7	15	NC	1	NC	3
462			min	0	3	-.003	3	0	15	-2.056e-5	1	NC	1	3656.349	1
463		4	max	.002	1	.002	2	.006	1	-7.573e-7	15	NC	1	NC	2
464			min	0	3	-.003	3	0	15	-2.056e-5	1	NC	1	4043.211	1
465		5	max	.002	1	.002	2	.005	1	-7.573e-7	15	NC	1	NC	2
466			min	0	3	-.003	3	0	15	-2.056e-5	1	NC	1	4512.931	1
467		6	max	.002	1	.001	2	.005	1	-7.573e-7	15	NC	1	NC	2
468			min	0	3	-.003	3	0	15	-2.056e-5	1	NC	1	5090.694	1
469		7	max	.002	1	.001	2	.004	1	-7.573e-7	15	NC	1	NC	2
470			min	0	3	-.002	3	0	15	-2.056e-5	1	NC	1	5812.255	1
471		8	max	.002	1	.001	2	.004	1	-7.573e-7	15	NC	1	NC	2
472			min	0	3	-.002	3	0	15	-2.056e-5	1	NC	1	6729.761	1
473		9	max	.002	1	.001	2	.003	1	-7.573e-7	15	NC	1	NC	2
474			min	0	3	-.002	3	0	15	-2.056e-5	1	NC	1	7921.725	1
475		10	max	.001	1	.001	2	.003	1	-7.573e-7	15	NC	1	NC	2
476			min	0	3	-.002	3	0	15	-2.056e-5	1	NC	1	9510.893	1
477		11	max	.001	1	0	2	.002	1	-7.573e-7	15	NC	1	NC	1
478			min	0	3	-.002	3	0	15	-2.056e-5	1	NC	1	NC	1
479		12	max	.001	1	0	2	.002	1	-7.573e-7	15	NC	1	NC	1
480			min	0	3	-.001	3	0	15	-2.056e-5	1	NC	1	NC	1
481		13	max	0	1	0	2	.001	1	-7.573e-7	15	NC	1	NC	1
482			min	0	3	-.001	3	0	15	-2.056e-5	1	NC	1	NC	1
483		14	max	0	1	0	2	0	1	-7.573e-7	15	NC	1	NC	1
484			min	0	3	-.001	3	0	15	-2.056e-5	1	NC	1	NC	1
485		15	max	0	1	0	2	0	1	-7.573e-7	15	NC	1	NC	1
486			min	0	3	0	3	0	15	-2.056e-5	1	NC	1	NC	1
487		16	max	0	1	0	2	0	1	-7.573e-7	15	NC	1	NC	1
488			min	0	3	0	3	0	15	-2.056e-5	1	NC	1	NC	1
489		17	max	0	1	0	2	0	1	-7.573e-7	15	NC	1	NC	1
490			min	0	3	0	3	0	15	-2.056e-5	1	NC	1	NC	1
491		18	max	0	1	0	2	0	1	-7.573e-7	15	NC	1	NC	1
492			min	0	3	0	3	0	15	-2.056e-5	1	NC	1	NC	1
493		19	max	0	1	0	1	0	1	-7.573e-7	15	NC	1	NC	1
494			min	0	1	0	1	0	1	-2.056e-5	1	NC	1	NC	1
495	M1	1	max	.005	3	.101	1	.001	1	1.752e-2	1	NC	1	NC	1
496			min	-.002	2	-.01	3	0	15	-1.95e-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	.005	3	.05	1	0	15	8.517e-3	1	NC	3	NC	1
498			min	-.002	2	-.005	3	-.006	1	-9.647e-3	3	2223.036	1	NC	1
499		3	max	.005	3	.006	3	0	15	1.367e-5	10	NC	5	NC	1
500			min	-.002	2	-.006	1	-.009	1	-1.729e-4	1	1062.676	1	NC	1
501		4	max	.004	3	.027	3	0	15	4.719e-3	1	NC	5	NC	1
502			min	-.002	2	-.071	1	-.008	1	-3.431e-3	3	663.178	1	NC	1
503		5	max	.004	3	.053	3	0	15	9.611e-3	1	NC	15	NC	1
504			min	-.002	2	-.14	1	-.005	1	-6.767e-3	3	474.044	1	NC	1
505		6	max	.004	3	.082	3	0	15	1.45e-2	1	NC	15	NC	1
506			min	-.001	2	-.207	1	-.002	1	-1.01e-2	3	370.616	1	NC	1
507		7	max	.004	3	.111	3	0	1	1.939e-2	1	9674.843	15	NC	1
508			min	-.001	2	-.267	1	0	12	-1.344e-2	3	309.933	1	NC	1
509		8	max	.004	3	.134	3	0	1	2.429e-2	1	8592.37	15	NC	1
510			min	-.001	2	-.316	1	0	15	-1.677e-2	3	274.199	1	NC	1
511		9	max	.004	3	.15	3	0	15	2.671e-2	1	8028.295	15	NC	1
512			min	-.001	2	-.346	1	0	1	-1.678e-2	3	255.655	1	NC	1
513		10	max	.004	3	.155	3	0	1	2.75e-2	1	7856.573	15	NC	1
514			min	-.001	2	-.356	1	0	12	-1.458e-2	3	250.097	1	NC	1
515		11	max	.004	3	.152	3	0	1	2.829e-2	1	8028.101	15	NC	1
516			min	-.001	2	-.346	1	0	15	-1.238e-2	3	255.942	1	NC	1
517		12	max	.004	3	.139	3	0	15	2.668e-2	1	8591.965	15	NC	1
518			min	-.001	2	-.315	1	-.001	1	-1.024e-2	3	275.098	1	NC	1
519		13	max	.004	3	.118	3	0	15	2.146e-2	1	9674.131	15	NC	1
520			min	-.001	2	-.266	1	0	1	-8.199e-3	3	312.168	1	NC	1
521		14	max	.004	3	.092	3	.002	1	1.624e-2	1	NC	15	NC	1
522			min	-.001	2	-.204	1	0	15	-6.154e-3	3	375.444	1	NC	1
523		15	max	.004	3	.062	3	.005	1	1.102e-2	1	NC	15	NC	1
524			min	-.001	2	-.136	1	0	15	-4.109e-3	3	484.047	1	NC	1
525		16	max	.003	3	.031	3	.008	1	5.794e-3	1	NC	5	NC	1
526			min	-.001	2	-.067	1	0	15	-2.064e-3	3	684.357	1	NC	1
527		17	max	.003	3	.002	3	.008	1	5.718e-4	1	NC	5	NC	1
528			min	-.001	2	-.004	2	0	15	-1.87e-5	3	1110.824	1	NC	1
529		18	max	.003	3	.05	1	.006	1	1.017e-2	1	NC	4	NC	1
530			min	-.001	2	-.024	3	0	15	-3.293e-3	3	2345.703	1	NC	1
531		19	max	.003	3	.099	1	0	15	2.011e-2	1	NC	1	NC	1
532			min	-.001	2	-.048	3	-.001	1	-6.692e-3	3	NC	1	NC	1
533	M5	1	max	.014	3	.243	1	0	1	0	1	NC	1	NC	1
534			min	-.009	2	-.013	3	0	1	0	1	NC	1	NC	1
535		2	max	.014	3	.119	1	0	1	0	1	NC	5	NC	1
536			min	-.009	2	-.005	3	0	1	0	1	918.862	1	NC	1
537		3	max	.014	3	.021	3	0	1	0	1	NC	15	NC	1
538			min	-.009	2	-.023	1	0	1	0	1	429.628	1	NC	1
539		4	max	.014	3	.077	3	0	1	0	1	9121.384	15	NC	1
540			min	-.009	2	-.195	1	0	1	0	1	260.761	1	NC	1
541		5	max	.014	3	.154	3	0	1	0	1	6386.094	15	NC	1
542			min	-.009	2	-.383	1	0	1	0	1	182.309	1	NC	1
543		6	max	.013	3	.242	3	0	1	0	1	4918.287	15	NC	1
544			min	-.008	2	-.571	1	0	1	0	1	140.226	1	NC	1
545		7	max	.013	3	.327	3	0	1	0	1	4070.299	15	NC	1
546			min	-.008	2	-.742	1	0	1	0	1	115.919	1	NC	1
547		8	max	.013	3	.399	3	0	1	0	1	3577.092	15	NC	1
548			min	-.008	2	-.879	1	0	1	0	1	101.786	1	NC	1
549		9	max	.013	3	.445	3	0	1	0	1	3324.107	15	NC	1
550			min	-.008	2	-.965	1	0	1	0	1	94.541	1	NC	1
551		10	max	.012	3	.462	3	0	1	0	1	3247.877	15	NC	1
552			min	-.008	2	-.994	1	0	1	0	1	92.382	1	NC	1
553		11	max	.012	3	.451	3	0	1	0	1	3324.174	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	-.008	2	-.964	1	0	1	0	1	94.657	1	NC	1
555		12	max	.012	3	.412	3	0	1	0	1	3577.253	15	NC	1
556			min	-.007	2	-.876	1	0	1	0	1	102.168	1	NC	1
557		13	max	.011	3	.349	3	0	1	0	1	4070.634	15	NC	1
558			min	-.007	2	-.736	1	0	1	0	1	116.914	1	NC	1
559		14	max	.011	3	.269	3	0	1	0	1	4918.953	15	NC	1
560			min	-.007	2	-.561	1	0	1	0	1	142.463	1	NC	1
561		15	max	.011	3	.181	3	0	1	0	1	6387.424	15	NC	1
562			min	-.007	2	-.371	1	0	1	0	1	187.153	1	NC	1
563		16	max	.011	3	.091	3	0	1	0	1	9124.188	15	NC	1
564			min	-.007	2	-.182	1	0	1	0	1	271.584	1	NC	1
565		17	max	.01	3	.007	3	0	1	0	1	NC	15	NC	1
566			min	-.007	2	-.012	1	0	1	0	1	455.866	1	NC	1
567		18	max	.01	3	.122	1	0	1	0	1	NC	5	NC	1
568			min	-.007	2	-.065	3	0	1	0	1	988.984	1	NC	1
569		19	max	.01	3	.237	1	0	1	0	1	NC	1	NC	1
570			min	-.007	2	-.13	3	0	1	0	1	NC	1	NC	1
571	M9	1	max	.005	3	.101	1	0	15	1.95e-2	3	NC	1	NC	1
572			min	-.002	2	-.01	3	-.001	1	-1.752e-2	1	NC	1	NC	1
573		2	max	.005	3	.05	1	.006	1	9.647e-3	3	NC	3	NC	1
574			min	-.002	2	-.005	3	0	15	-8.517e-3	1	2223.036	1	NC	1
575		3	max	.005	3	.006	3	.009	1	1.729e-4	1	NC	5	NC	1
576			min	-.002	2	-.006	1	0	15	-1.367e-5	10	1062.676	1	NC	1
577		4	max	.004	3	.027	3	.008	1	3.431e-3	3	NC	5	NC	1
578			min	-.002	2	-.071	1	0	15	-4.719e-3	1	663.178	1	NC	1
579		5	max	.004	3	.053	3	.005	1	6.767e-3	3	NC	15	NC	1
580			min	-.002	2	-.14	1	0	15	-9.611e-3	1	474.044	1	NC	1
581		6	max	.004	3	.082	3	.002	1	1.01e-2	3	NC	15	NC	1
582			min	-.001	2	-.207	1	0	15	-1.45e-2	1	370.616	1	NC	1
583		7	max	.004	3	.111	3	0	12	1.344e-2	3	9674.843	15	NC	1
584			min	-.001	2	-.267	1	0	1	-1.939e-2	1	309.933	1	NC	1
585		8	max	.004	3	.134	3	0	15	1.677e-2	3	8592.37	15	NC	1
586			min	-.001	2	-.316	1	0	1	-2.429e-2	1	274.199	1	NC	1
587		9	max	.004	3	.15	3	0	1	1.678e-2	3	8028.295	15	NC	1
588			min	-.001	2	-.346	1	0	15	-2.671e-2	1	255.655	1	NC	1
589		10	max	.004	3	.155	3	0	12	1.458e-2	3	7856.573	15	NC	1
590			min	-.001	2	-.356	1	0	1	-2.75e-2	1	250.097	1	NC	1
591		11	max	.004	3	.152	3	0	15	1.238e-2	3	8028.101	15	NC	1
592			min	-.001	2	-.346	1	0	1	-2.829e-2	1	255.942	1	NC	1
593		12	max	.004	3	.139	3	.001	1	1.024e-2	3	8591.965	15	NC	1
594			min	-.001	2	-.315	1	0	15	-2.668e-2	1	275.098	1	NC	1
595		13	max	.004	3	.118	3	0	1	8.199e-3	3	9674.131	15	NC	1
596			min	-.001	2	-.266	1	0	15	-2.146e-2	1	312.168	1	NC	1
597		14	max	.004	3	.092	3	0	15	6.154e-3	3	NC	15	NC	1
598			min	-.001	2	-.204	1	-.002	1	-1.624e-2	1	375.444	1	NC	1
599		15	max	.004	3	.062	3	0	15	4.109e-3	3	NC	15	NC	1
600			min	-.001	2	-.136	1	-.005	1	-1.102e-2	1	484.047	1	NC	1
601		16	max	.003	3	.031	3	0	15	2.064e-3	3	NC	5	NC	1
602			min	-.001	2	-.067	1	-.008	1	-5.794e-3	1	684.357	1	NC	1
603		17	max	.003	3	.002	3	0	15	1.87e-5	3	NC	5	NC	1
604			min	-.001	2	-.004	2	-.008	1	-5.718e-4	1	1110.824	1	NC	1
605		18	max	.003	3	.05	1	0	15	3.293e-3	3	NC	4	NC	1
606			min	-.001	2	-.024	3	-.006	1	-1.017e-2	1	2345.703	1	NC	1
607		19	max	.003	3	.099	1	.001	1	6.692e-3	3	NC	1	NC	1
608			min	-.001	2	-.048	3	0	15	-2.011e-2	1	NC	1	NC	1

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

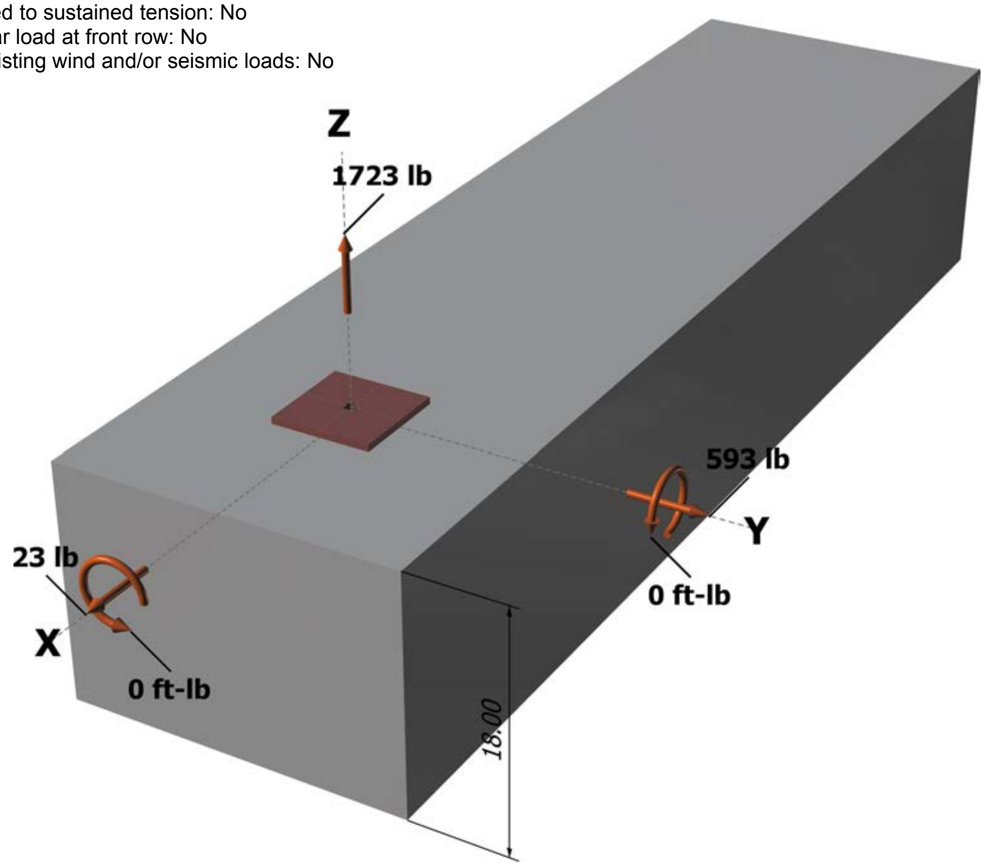
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

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

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

<Figure 1>



<Figure 2>

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

SIMPSON Strong-Tie

Anchor Designer™ Software
Version 2.4.5673.0

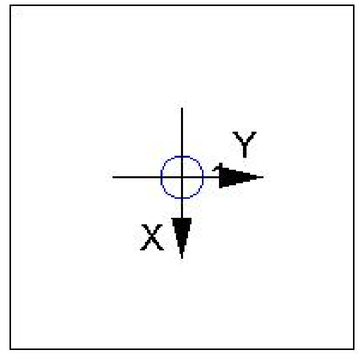
Company:	Schletter, Inc.	Date:	11/17/2015
Engineer:	HCV	Page:	3/5
Project:	Standard PVMax - Worst Case, 14-42 Inch Width		
Address:			
Phone:			
E-mail:			

3. Resulting Anchor Forces

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

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

<Figure 3>



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in y-direction:

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

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

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

Shear parallel to edge in x-direction:

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

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

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

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

Shear parallel to edge in y-direction:

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

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

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

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

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

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

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

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

11. Results

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

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

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

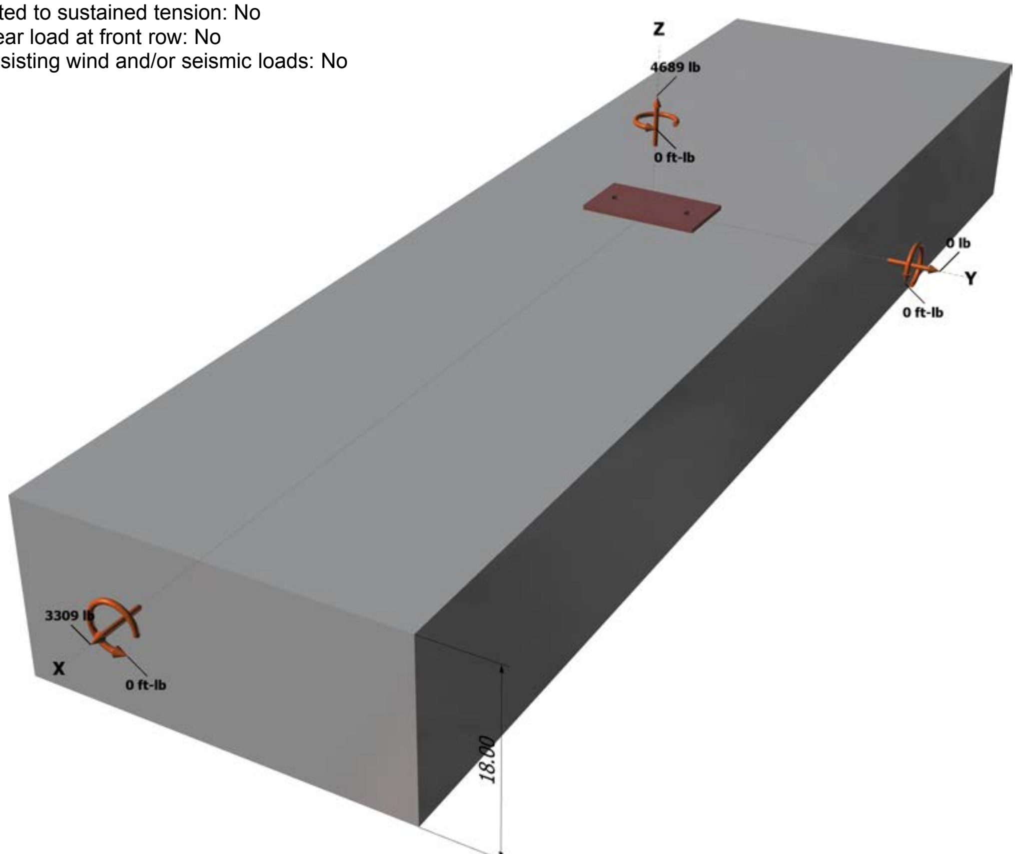
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

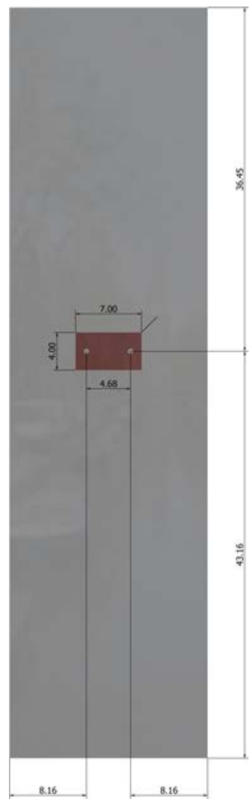
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout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



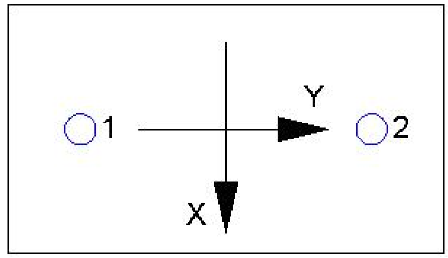
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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, $øN_n$ (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, $øV_n$ (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.