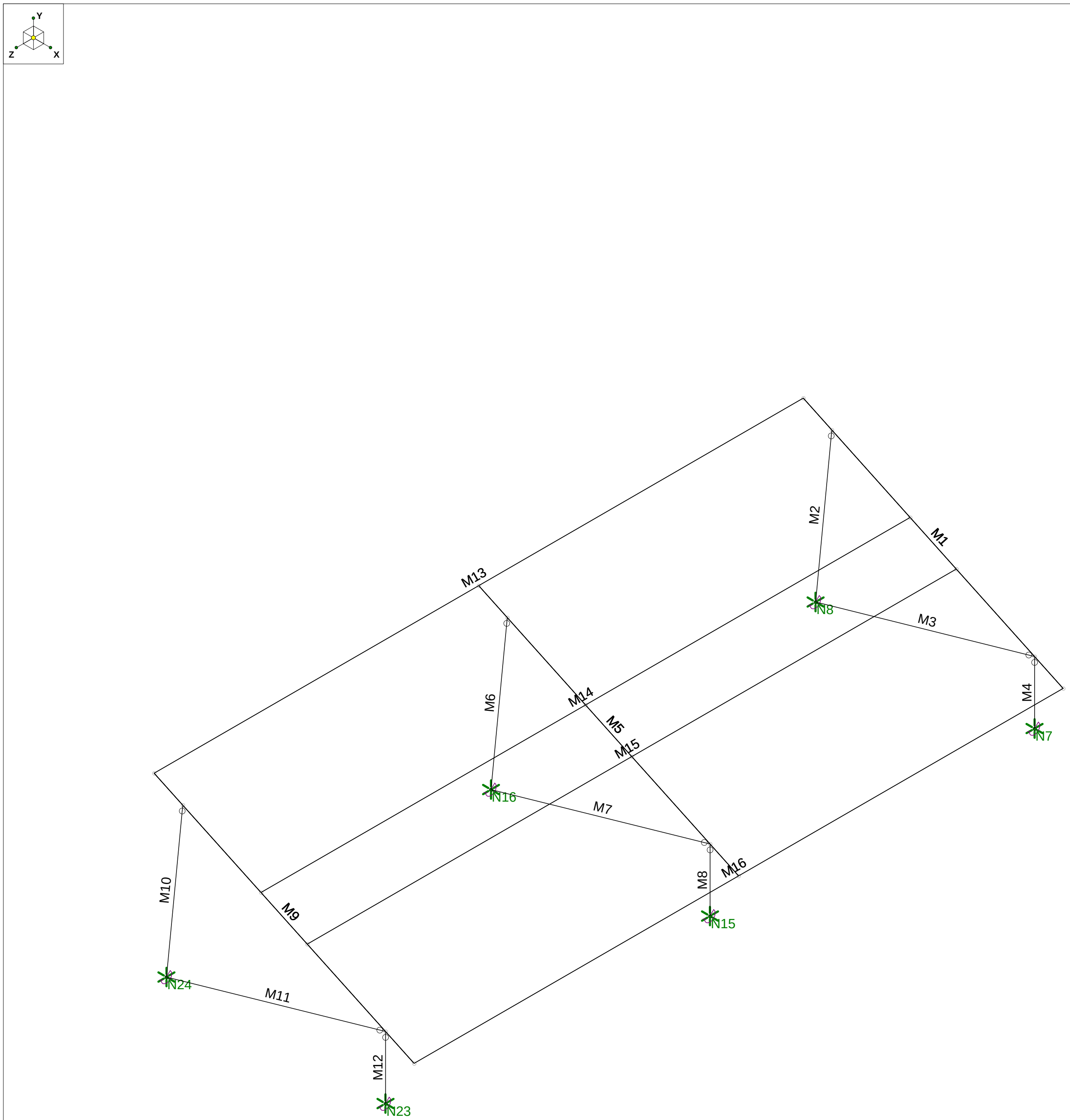


Schletter, Inc.		25ÁTilt w/o Seismic Design
HCV	Standard PVMax Racking System	
	Representative Calculations - ASCE 7-10	

1. INTRODUCTION

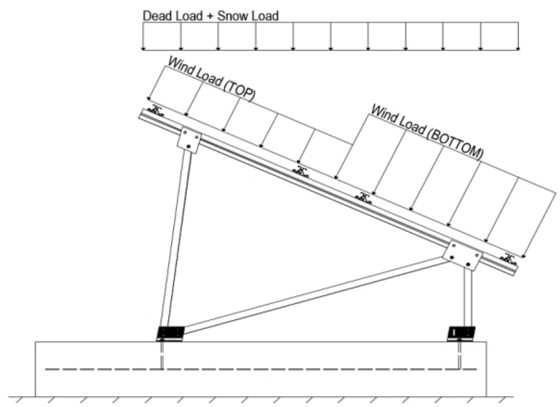
1.1 Project Description
The following sections will cover the determination of forces and structural design calculations for the Schletter, Inc. PVMax ground mount system.

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 = 25°
Maximum Height Above Grade = 3 ft



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

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

2. LOAD ACTIONS

2.1 Permanent Loads
g_{MAX} = 3.00 psf
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 = 18.56 psf *(ASCE 7-10, Eq. 7.4-1)*
I_s = 1.00
C_s = 0.82
C_e = 0.90
C_t = 1.20

2.3 Wind Loads
Design Wind Speed, V = 115 mph
Height < 15 ft

Exposure Category = C
Importance Category = II

Peak Velocity Pressure, q_z = 20.76 psf *Including the gust factor, G=0.85. (ASCE 7-10, Eq. 27.3-1)*

Pressure Coefficients

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

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

2.4 Seismic Loads - N/A

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

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

2.5 Combination of Loads

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

Strength Design, LRFD

Component stresses are checked using the following LRFD load combinations:

1.2D + 1.6S + 0.5W
1.2D + 1.0W + 0.5S
0.9D + 1.0W ^{M}
1.54D + 1.3E + 0.2S ^{R}
0.56D + 1.3E ^{R}
1.54D + 1.25E + 0.2S ^{O}
0.56D + 1.25E ^{O}

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

Allowable Stress Design, ASD

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

1.0D + 1.0S
1.0D + 0.6W
1.0D + 0.75L + 0.45W + 0.75S
0.6D + 0.6W ^{M}
1.238D + 0.875E ^{O}
1.1785D + 0.65625E + 0.75S ^{O}
0.362D + 0.875E ^{O}

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

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

3. STRUCTURAL ANALYSIS

3.1 RISA Results

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

3.2 RISA Components

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

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

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

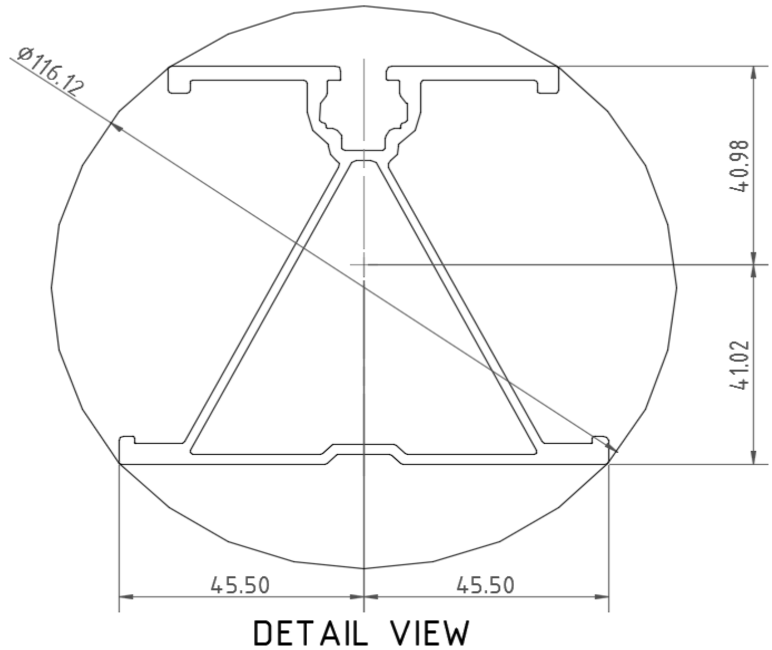
Front Struts	Location
M4	Outer
M8	Inner
M12	Outer

4. MEMBER DESIGN CALCULATIONS

4.1 Purlin Design

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

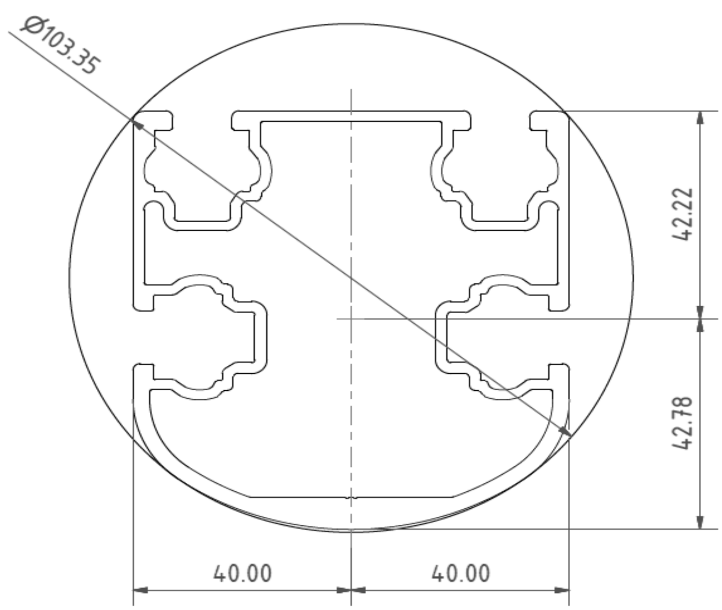
Purlin Type =	**S1.5**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	126	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	25.07	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	23.08	ksi
S_y =	1.33	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	2.16	in^4
I_x =	1.07	in^4
A =	1.25	in^2
g =	1.50	lbs/ft
M_y =	1.805	k-ft
M_z =	0.362	k-ft
$M_{y\ allowable}$ =	2.779	k-ft
$M_{z\ allowable}$ =	1.154	k-ft
Utilization =	96%	



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).

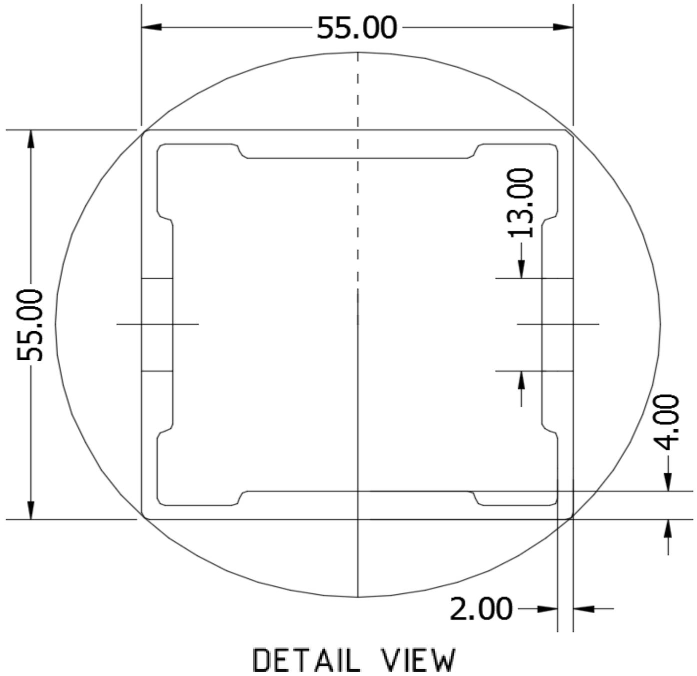
Girder Type =	**BF0**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	88.90	in
$\Phi F_{ty\ AXIAL}$ =	31.09	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.35	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	33.25	ksi
S_y =	1.42	in^3
S_x =	1.41	in^3
E =	10100	ksi
I_y =	2.39	in^4
I_x =	2.22	in^4
A =	1.88	in^2
g =	2.26	lbs/ft
M_y =	-2.725	k-ft
M_z =	0.000	k-ft
P_n =	-0.225	k
$M_{y\ allowable}$ =	3.464	k-ft
$M_{z\ allowable}$ =	3.907	k-ft
$P_{n\ allowable}$ =	58.535	k
Utilization =	79%	



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).

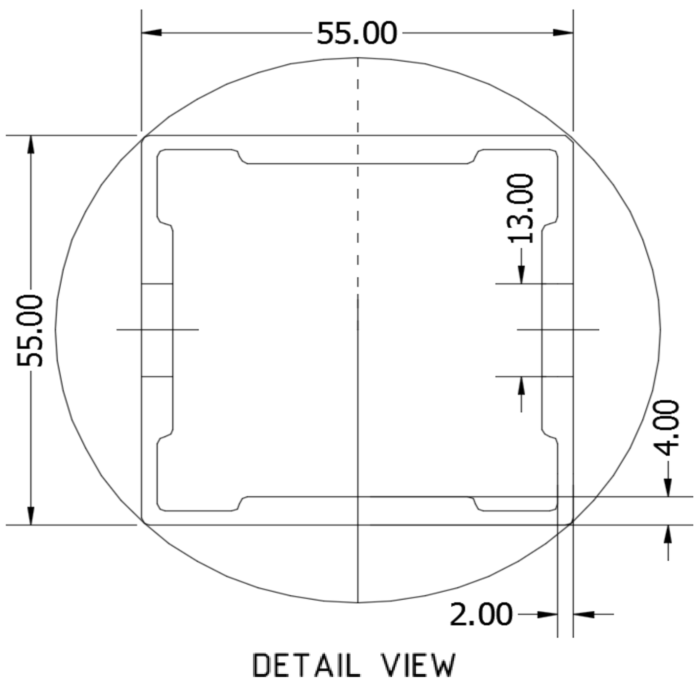
Strut Type =	**<u>55x55</u>**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	<u>24.80</u>	in
$\Phi F_{ty\ AXIAL}$ =	28.03	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	2.973	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	27.532	k
Utilization =	<u>11%</u>	



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).

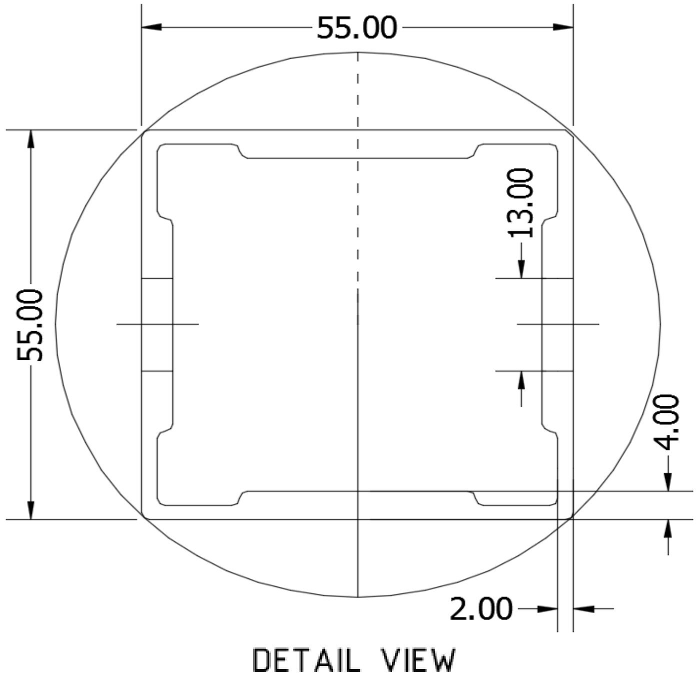
Strut Type =	**<u>55x55</u>**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	<u>86.60</u>	in
$\Phi F_{ty\ AXIAL}$ =	7.50	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.009	k-ft
M_z =	0.000	k-ft
P_n =	1.685	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	7.371	k
Utilization =	<u>23%</u>	



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 =	63.42	in
$\Phi F_{ty\ AXIAL}$ =	12.77	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 =	-0.008	k-ft
M_z =	0.000	k-ft
P_n =	3.127	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	12.545	k
Utilization =	25%	



5. FOUNDATION DESIGN CALCULATIONS

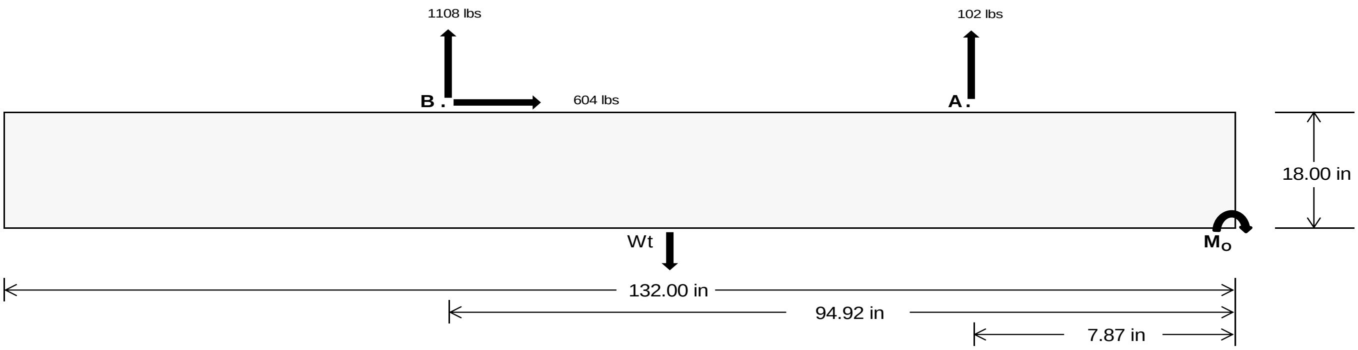
5.1 Helical Pile Foundations

The following LRFD loads include a safety factor of 1.3, and are to be used in conjunction with a Schletter, Inc. Geotechnical Investigation Report. The forces below should fall within the guidelines provided in the Geotechnical Investigation Report. If a Geotechnical Investigation Report is not present, please proceed to Section 5.2 for a concrete foundation design.

Maximum	Front	Rear	
Tensile Load =	466.32	4823.75	k
Compressive Load =	3865.38	4375.31	k
Lateral Load =	15.34	2619.84	k
Moment (Weak Axis) =	0.03	0.01	k

5.2 Design of Ballast Foundations

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



Concrete Properties

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

Footing Reinforcement

Use fiber reinforcing with (2) #5 rebar.

Overturning Check

M_O = 116873.0 in-lbs
Resisting Force Required = 1770.80 lbs
S.F. = 1.67
Weight Required = 2951.34 lbs
Minimum Width = 25 in in
Weight Provided = 4984.38 lbs

A minimum 132in long x 25in wide x 18in tall ballast foundation is required to resist overturning.

Sliding

Force = 604.03 lbs
Friction = 0.4
Weight Required = 1510.07 lbs
Resisting Weight = 4984.38 lbs
Additional Weight Required = 0 lbs

Use a 132in long x 25in wide x 18in tall ballast foundation to resist sliding. Friction is OK.

Cohesion

Sliding Force = 604.03 lbs
Cohesion = 130 psf
Area = 22.92 ft^2
Resisting = 2492.19 lbs
Additional Weight Required = 0 lbs

Use a 132in long x 25in 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			
	25 in	26 in	27 in	28 in
P_{ftg} = (145 pcf)(11 ft)(1.5 ft)(2.08 ft) =	4984 lbs	5184 lbs	5383 lbs	5583 lbs

ASD LC	1.0D + 1.0S				1.0D + 0.6W				1.0D + 0.75L + 0.45W + 0.75S				0.6D + 0.6W			
Width	25 in	26 in	27 in	28 in	25 in	26 in	27 in	28 in	25 in	26 in	27 in	28 in	25 in	26 in	27 in	28 in
F_A	1455 lbs	1455 lbs	1455 lbs	1455 lbs	1176 lbs	1176 lbs	1176 lbs	1176 lbs	1838 lbs	1838 lbs	1838 lbs	1838 lbs	-205 lbs	-205 lbs	-205 lbs	-205 lbs
F_B	1446 lbs	1446 lbs	1446 lbs	1446 lbs	1656 lbs	1656 lbs	1656 lbs	1656 lbs	2193 lbs	2193 lbs	2193 lbs	2193 lbs	-2216 lbs	-2216 lbs	-2216 lbs	-2216 lbs
F_V	198 lbs	198 lbs	198 lbs	198 lbs	1102 lbs	1102 lbs	1102 lbs	1102 lbs	958 lbs	958 lbs	958 lbs	958 lbs	-1208 lbs	-1208 lbs	-1208 lbs	-1208 lbs
P_{total}	7885 lbs	8085 lbs	8284 lbs	8483 lbs	7816 lbs	8016 lbs	8215 lbs	8414 lbs	9015 lbs	9215 lbs	9414 lbs	9614 lbs	569 lbs	689 lbs	809 lbs	928 lbs
M	3859 lbs-ft	3859 lbs-ft	3859 lbs-ft	3859 lbs-ft	3360 lbs-ft	3360 lbs-ft	3360 lbs-ft	3360 lbs-ft	5057 lbs-ft	5057 lbs-ft	5057 lbs-ft	5057 lbs-ft	2537 lbs-ft	2537 lbs-ft	2537 lbs-ft	2537 lbs-ft
e	0.49 ft	0.48 ft	0.47 ft	0.45 ft	0.43 ft	0.42 ft	0.41 ft	0.40 ft	0.56 ft	0.55 ft	0.54 ft	0.53 ft	4.46 ft	3.68 ft	3.14 ft	2.73 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}	252.2 psf	250.9 psf	249.7 psf	248.5 psf	261.1 psf	259.4 psf	257.9 psf	256.4 psf	273.0 psf	270.9 psf	268.9 psf	267.1 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	435.9 psf	427.5 psf	419.8 psf	412.5 psf	421.0 psf	413.2 psf	406.0 psf	399.2 psf	513.8 psf	502.4 psf	491.8 psf	482.0 psf	174.6 psf	116.7 psf	101.4 psf	95.9 psf

Maximum Bearing Pressure = 514 psf
Allowable Bearing Pressure = 1500 psf

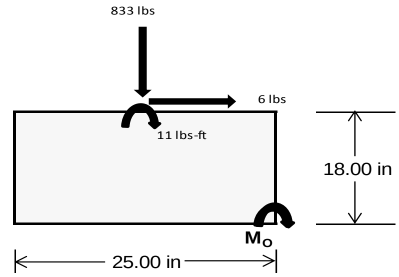
Use a 132in long x 25in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O = 848.1 ft-lbs
Resisting Force Required = 814.20 lbs
S.F. = 1.67
Weight Required = 1357.00 lbs
Minimum Width = 25 in in
Weight Provided = 4984.38 lbs

A minimum 132in long x 25in 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	25 in			25 in			25 in		
Support	Outer	Inner	Outer	Outer	Inner	Outer	Outer	Inner	Outer
F_Y	255 lbs	665 lbs	255 lbs	833 lbs	2406 lbs	833 lbs	74 lbs	194 lbs	74 lbs
F_V	2 lbs	0 lbs	2 lbs	6 lbs	0 lbs	6 lbs	0 lbs	0 lbs	0 lbs
P_{total}	6425 lbs	4984 lbs	6425 lbs	6708 lbs	4984 lbs	6708 lbs	1879 lbs	4984 lbs	1879 lbs
M	5 lbs-ft	0 lbs-ft	5 lbs-ft	20 lbs-ft	0 lbs-ft	20 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	0.35 ft	0.35 ft	0.35 ft	0.35 ft	0.35 ft	0.35 ft	0.35 ft	0.35 ft	0.35 ft
f_{min}	279.7 psf	217.5 psf	279.7 psf	290.2 psf	217.5 psf	290.2 psf	81.9 psf	217.5 psf	81.9 psf
f_{max}	281.0 psf	217.5 psf	281.0 psf	295.2 psf	217.5 psf	295.2 psf	82.1 psf	217.5 psf	82.1 psf

Maximum Bearing Pressure = 295 psf
Allowable Bearing Pressure = 1500 psf

Use a 132in long x 25in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Foundation Requirements: 132in long x 25in wide x 18in tall ballast foundation and fiber reinforcing with (2) #5 rebar.

5.3 Foundation Anchors

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

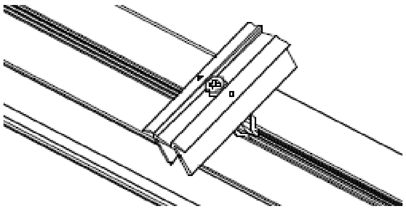
6. DESIGN OF JOINTS AND CONNECTIONS

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

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

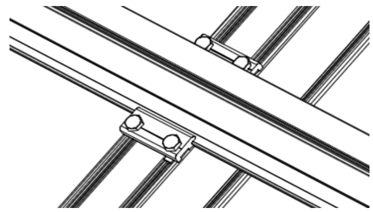
Fastening of Modules to Purlins

Maximum Uplifting Force =	0.484	k
Allowable Uplift =	1.214	k
Utilization =	40%	



Fastening of Purlins to Girders

Maximum Uplifting Force =	1.796	k
Allowable Uplift =	4.357	k
Utilization =	41%	



6.2 Strut Connections

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

Front Strut

Maximum Axial Load =	2.973	k
M12 Bolt Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	40%	

Rear Strut

Maximum Axial Load =	3.260	k
M12 Bolt Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	44%	

Diagonal Strut

Maximum Axial Load =	1.747	k
M12 Bolt Shear Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	24%	

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.

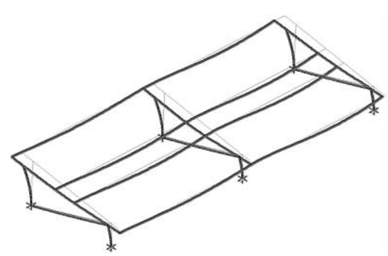
7. SEISMIC DESIGN

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} =	46.89	in
Allowable Story Drift for All Other Structures, Δ = {	$0.020h_{sx}$	
	0.938	in
Max Drift, Δ_{MAX} =	0.061	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

φF_LSt= 25.1 ksi

Ix = 897074 mm^4

2.155 in^4

y = 41.015 mm

Sx = 1.335 in^3

M_{max}St = 2.788 k-ft

Weak Axis:

3.4.14

L_b = 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

φF_LWk= 23.1 ksi

Iy = 446476 mm^4

1.073 in^4

x = 45.5 mm

Sy = 0.599 in^3

M_{max}Wk = 1.152 k-ft

Compression

3.4.9

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

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

3.4.10

Rb/t = 0.0

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

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

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

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

Girder = **BF0**

Strong Axis:

3.4.14

L_b = 88.9 in
J = 1.08
152.913

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

S1 = 0.51461

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

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

3.4.16

b/t = 16.2

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

S1 = 12.2

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

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

Weak Axis:

3.4.14

L_b = 88.9
J = 1.08
161.829

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

S1 = 0.51461

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

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

3.4.16

b/t = 7.4

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

S1 = 12.2

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

S2 = 46.7
φF_L= φyFcy
φF_L= 33.3 ksi

3.4.16.1 Used

Rb/t = 18.1

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

S1 = 1.1

$S2 = C_t$

S2 = 141.0

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

$\varphi F_L =$ 31.1 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.4

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

S1 = 35.2

m = 0.68

$C_0 =$ 41.067

Cc = 43.717

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

S2 = 73.8

$\varphi F_L = 1.3\varphi yFcy$

$\varphi F_L =$ 43.2 ksi

$\varphi F_L St =$ 29.4 ksi

Ix = 984962 mm^4

2.366 in^4

y = 43.717 mm

Sx = 1.375 in^3

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

3.4.18

h/t = 16.2

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

S1 = 36.9

m = 0.65

$C_0 =$ 40

Cc = 40

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

S2 = 77.3

$\varphi F_L = 1.3\varphi yFcy$

$\varphi F_L =$ 43.2 ksi

$\varphi F_L Wk =$ 33.3 ksi

Iy = 923544 mm^4

2.219 in^4

x = 40 mm

Sy = 1.409 in^3

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

Compression

3.4.9

b/t = 16.2

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

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

$\varphi F_L =$ 31.6 ksi

b/t = 7.4

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

3.4.10

Rb/t = 18.1

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

S1 = 6.87

S2 = 131.3

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

$\varphi F_L =$ 31.09 ksi

$\varphi F_L =$ 31.09 ksi

A = 1215.13 mm^2

1.88 in^2

$P_{max} =$ 58.55 kips

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

Strut = **55x55**

Strong Axis:

3.4.14

L_b = 24.8 in

J = 0.942

38.7028

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.4 ksi

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 28.2 ksi

Ix = 279836 mm^4

0.672 in^4

y = 27.5 mm

Sx = 0.621 in^3

M_{max}St = 1.460 k-ft

Weak Axis:

3.4.14

L_b = 24.8

J = 0.942

38.7028

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.4

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 28.2 ksi

Iy = 279836 mm^4

0.672 in^4

x = 27.5 mm

Sy = 0.621 in^3

M_{max}Wk = 1.460 k-ft

Compression

3.4.7

$\lambda =$ 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

$\varphi cc =$ 0.87952

$\varphi F_L = \varphi cc(Bc\text{-}Dc^*\lambda)$

$\varphi F_L =$ 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)

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

$\varphi F_L =$ 28.2 ksi

b/t = 24.5

S1 = 12.21

S2 = 32.70

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

$\varphi F_L =$ 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

$\varphi F_L =$ 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

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

$\varphi F_L =$ 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

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

$\varphi F_L =$ 29.6

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 28.2 ksi

Ix = 279836 mm^4

0.672 in^4

y = 27.5 mm

Sx = 0.621 in^3

M_{max}St = 1.460 k-ft

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 28.2 ksi

Iy = 279836 mm^4

0.672 in^4

x = 27.5 mm

Sy = 0.621 in^3

M_{max}Wk = 1.460 k-ft

Compression

3.4.7

λ = 2.00335

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.86047

φF_L= (φccFcy)/(λ²)

φF_L= 7.50396 ksi

3.4.9

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

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

3.4.10

Rb/t = 0.0

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

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

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

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

Strut = **55x55**

Strong Axis:

3.4.14

L_b = 63.42 in
J = 0.942
98.9729

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

S1 = 0.51461

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

S2 = 1701.56
φF_L= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
φF_L= 30.2 ksi

3.4.16

b/t = 24.5

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

S1 = 12.2

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

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

Weak Axis:

3.4.14

L_b = 63.42
J = 0.942
98.9729

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

S1 = 0.51461

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

S2 = 1701.56
φF_L= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
φF_L= 30.2

3.4.16

b/t = 24.5

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

S1 = 12.2

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

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

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 28.2 ksi

Ix = 279836 mm^4

0.672 in^4

y = 27.5 mm

Sx = 0.621 in^3

M_{max}St = 1.460 k-ft

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 28.2 ksi

Iy = 279836 mm^4

0.672 in^4

x = 27.5 mm

Sy = 0.621 in^3

M_{max}Wk = 1.460 k-ft

Compression

3.4.7

λ = 1.46712

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.7854

φF_L= (φccFcy)/(λ²)

φF_L= 12.7711 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

$\varphi F_L =$ 12.77 ksi

A = 663.99 mm^2

1.03 in^2

$P_{max} =$ 13.14 kips

APPENDIX B

B.1

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

Basic Load Cases

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

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

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	Y	-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	-46.9	-46.9	0	0
2	M14	Y	-46.9	-46.9	0	0
3	M15	Y	-46.9	-46.9	0	0
4	M16	Y	-46.9	-46.9	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	-63.697	-63.697	0	0
2	M14	y	-63.697	-63.697	0	0
3	M15	y	-98.441	-98.441	0	0
4	M16	y	-98.441	-98.441	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	144.766	144.766	0	0
2	M14	y	110.022	110.022	0	0
3	M15	y	57.906	57.906	0	0
4	M16	y	57.906	57.906	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	487.955	2	982.147	1	.806	1	.004	1	0	1	0	1
2		min	-636.772	3	-1129.308	3	.039	15	0	15	0	1	0	1
3	N7	max	.041	9	1112.124	1	-.502	15	0	15	0	1	0	1
4		min	-.107	2	-83.933	3	-11.799	1	-.024	1	0	1	0	1
5	N15	max	.03	9	2973.373	1	0	10	0	10	0	1	0	1
6		min	-1.329	2	-358.708	3	0	11	0	11	0	1	0	1
7	N16	max	1903.577	2	3365.62	1	0	14	0	2	0	1	0	1
8		min	-2015.265	3	-3710.574	3	0	3	0	12	0	1	0	1
9	N23	max	.041	9	1112.124	1	11.799	1	.024	1	0	1	0	1
10		min	-.107	2	-83.933	3	.502	15	0	15	0	1	0	1
11	N24	max	487.955	2	982.147	1	-.039	15	0	15	0	1	0	1
12		min	-636.772	3	-1129.308	3	-.806	1	-.004	1	0	1	0	1
13	Totals:	max	2877.944	2	10527.535	1	0	10						
14		min	-3289.069	3	-6495.763	3	0	11						

Envelope Member Section Forces

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
1	M13	1	max	120.333	1	431.335	1	-7.643	15	0	3	.287	1	0	1
2			min	4.973	15	-551.157	3	-185.56	1	-.011	1	.012	15	0	3
3		2	max	120.333	1	302.31	1	-5.881	15	0	3	.096	1	.548	3
4			min	4.973	15	-387.929	3	-142.721	1	-.011	1	.004	15	-.428	1
5		3	max	120.333	1	173.286	1	-4.119	15	0	3	0	12	.905	3
6			min	4.973	15	-224.701	3	-99.882	1	-.011	1	-.046	1	-.705	1
7		4	max	120.333	1	44.262	1	-2.357	15	0	3	-.005	12	1.072	3
8			min	4.973	15	-61.474	3	-57.044	1	-.011	1	-.137	1	-.832	1
9		5	max	120.333	1	101.754	3	-.596	15	0	3	-.007	12	1.049	3
10			min	4.973	15	-84.763	1	-14.205	1	-.011	1	-.179	1	-.809	1
11		6	max	120.333	1	264.981	3	28.634	1	0	3	-.007	15	.835	3
12			min	4.973	15	-213.787	1	.717	12	-.011	1	-.17	1	-.635	1
13		7	max	120.333	1	428.209	3	71.472	1	0	3	-.005	15	.43	3
14			min	4.973	15	-342.811	1	2.479	12	-.011	1	-.112	1	-.31	1
15		8	max	120.333	1	591.436	3	114.311	1	0	3	0	10	.165	1
16			min	4.973	15	-471.836	1	4.24	12	-.011	1	-.003	1	-.164	3
17		9	max	120.333	1	754.664	3	157.15	1	0	3	.155	1	.791	1
18			min	4.973	15	-600.86	1	6.002	12	-.011	1	.004	12	-.95	3
19		10	max	120.333	1	917.892	3	199.988	1	.005	9	.363	1	1.567	1
20			min	4.973	15	-729.884	1	7.763	12	-.011	1	.012	12	-1.925	3
21		11	max	120.333	1	600.86	1	-6.002	12	.011	1	.155	1	.791	1
22			min	4.973	15	-754.664	3	-157.15	1	0	3	.004	12	-.95	3
23		12	max	120.333	1	471.836	1	-4.24	12	.011	1	0	10	.165	1
24			min	4.973	15	-591.436	3	-114.311	1	0	3	-.003	1	-.164	3
25		13	max	120.333	1	342.811	1	-2.479	12	.011	1	-.005	15	.43	3
26			min	4.973	15	-428.209	3	-71.472	1	0	3	-.112	1	-.31	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	120.333	1	213.787	1	-.717	12	.011	1	-.007	15	.835	3
28			min	4.973	15	-264.981	3	-28.634	1	0	3	-.17	1	-.635	1
29		15	max	120.333	1	84.763	1	14.205	1	.011	1	-.007	12	1.049	3
30			min	4.973	15	-101.754	3	.596	15	0	3	-.179	1	-.809	1
31		16	max	120.333	1	61.474	3	57.044	1	.011	1	-.005	12	1.072	3
32			min	4.973	15	-44.262	1	2.357	15	0	3	-.137	1	-.832	1
33		17	max	120.333	1	224.701	3	99.882	1	.011	1	0	12	.905	3
34			min	4.973	15	-173.286	1	4.119	15	0	3	-.046	1	-.705	1
35		18	max	120.333	1	387.929	3	142.721	1	.011	1	.096	1	.548	3
36			min	4.973	15	-302.31	1	5.881	15	0	3	.004	15	-.428	1
37		19	max	120.333	1	551.157	3	185.56	1	.011	1	.287	1	0	1
38			min	4.973	15	-431.335	1	7.643	15	0	3	.012	15	0	3
39	M14	1	max	54.232	1	453.55	1	-7.87	15	.006	3	.326	1	0	1
40			min	2.246	15	-424.583	3	-191.084	1	-.009	1	.013	15	0	3
41		2	max	54.232	1	324.526	1	-6.108	15	.006	3	.128	1	.424	3
42			min	2.246	15	-301.89	3	-148.245	1	-.009	1	.005	15	-.454	1
43		3	max	54.232	1	195.501	1	-4.346	15	.006	3	0	3	.704	3
44			min	2.246	15	-179.197	3	-105.406	1	-.009	1	-.02	1	-.757	1
45		4	max	54.232	1	66.477	1	-2.585	15	.006	3	-.004	12	.842	3
46			min	2.246	15	-56.504	3	-62.568	1	-.009	1	-.118	1	-.91	1
47		5	max	54.232	1	66.189	3	-.823	15	.006	3	-.007	12	.836	3
48			min	2.246	15	-62.547	1	-19.729	1	-.009	1	-.166	1	-.912	1
49		6	max	54.232	1	188.882	3	23.11	1	.006	3	-.007	15	.687	3
50			min	2.246	15	-191.572	1	.498	12	-.009	1	-.164	1	-.764	1
51		7	max	54.232	1	311.575	3	65.948	1	.006	3	-.005	15	.396	3
52			min	2.246	15	-320.596	1	2.259	12	-.009	1	-.112	1	-.465	1
53		8	max	54.232	1	434.268	3	108.787	1	.006	3	0	10	0	15
54			min	2.246	15	-449.62	1	4.021	12	-.009	1	-.01	1	-.04	3
55		9	max	54.232	1	556.96	3	151.626	1	.006	3	.142	1	.584	1
56			min	2.246	15	-578.645	1	5.782	12	-.009	1	.004	12	-.618	3
57		10	max	54.232	1	679.653	3	194.464	1	.009	1	.344	1	1.334	1
58			min	2.246	15	-707.669	1	7.543	12	-.006	3	.012	12	-1.339	3
59		11	max	54.232	1	578.645	1	-5.782	12	.009	1	.142	1	.584	1
60			min	2.246	15	-556.96	3	-151.626	1	-.006	3	.004	12	-.618	3
61		12	max	54.232	1	449.62	1	-4.021	12	.009	1	0	10	0	15
62			min	2.246	15	-434.268	3	-108.787	1	-.006	3	-.01	1	-.04	3
63		13	max	54.232	1	320.596	1	-2.259	12	.009	1	-.005	15	.396	3
64			min	2.246	15	-311.575	3	-65.948	1	-.006	3	-.112	1	-.465	1
65		14	max	54.232	1	191.572	1	-.498	12	.009	1	-.007	15	.687	3
66			min	2.246	15	-188.882	3	-23.11	1	-.006	3	-.164	1	-.764	1
67		15	max	54.232	1	62.547	1	19.729	1	.009	1	-.007	12	.836	3
68			min	2.246	15	-66.189	3	.823	15	-.006	3	-.166	1	-.912	1
69		16	max	54.232	1	56.504	3	62.568	1	.009	1	-.004	12	.842	3
70			min	2.246	15	-66.477	1	2.585	15	-.006	3	-.118	1	-.91	1
71		17	max	54.232	1	179.197	3	105.406	1	.009	1	0	3	.704	3
72			min	2.246	15	-195.501	1	4.346	15	-.006	3	-.02	1	-.757	1
73		18	max	54.232	1	301.89	3	148.245	1	.009	1	.128	1	.424	3
74			min	2.246	15	-324.526	1	6.108	15	-.006	3	.005	15	-.454	1
75		19	max	54.232	1	424.583	3	191.084	1	.009	1	.326	1	0	1
76			min	2.246	15	-453.55	1	7.87	15	-.006	3	.013	15	0	3
77	M15	1	max	-2.368	15	530.548	2	-7.868	15	.01	1	.326	1	0	2
78			min	-57.162	1	-219.53	3	-191.052	1	-.005	3	.013	15	0	15
79		2	max	-2.368	15	378.382	2	-6.106	15	.01	1	.128	1	.22	3
80			min	-57.162	1	-157.64	3	-148.213	1	-.005	3	.005	15	-.53	2
81		3	max	-2.368	15	226.215	2	-4.344	15	.01	1	0	3	.368	3
82			min	-57.162	1	-95.749	3	-105.374	1	-.005	3	-.02	1	-.883	2
83		4	max	-2.368	15	74.049	1	-2.583	15	.01	1	-.004	12	.443	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	-57.162	1	-33.858	3	-62.536	1	-.005	3	-.118	1	-1.058	2
85		5	max	-2.368	15	28.033	3	-.821	15	.01	1	-.007	12	.447	3
86			min	-57.162	1	-78.118	2	-19.697	1	-.005	3	-.166	1	-1.056	2
87		6	max	-2.368	15	89.924	3	23.141	1	.01	1	-.007	15	.378	3
88			min	-57.162	1	-230.284	2	.533	12	-.005	3	-.164	1	-.876	2
89		7	max	-2.368	15	151.815	3	65.98	1	.01	1	-.005	15	.237	3
90			min	-57.162	1	-382.451	2	2.295	12	-.005	3	-.112	1	-.518	1
91		8	max	-2.368	15	213.706	3	108.819	1	.01	1	0	10	.024	3
92			min	-57.162	1	-534.617	2	4.056	12	-.005	3	-.01	1	-.003	9
93		9	max	-2.368	15	275.597	3	151.657	1	.01	1	.142	1	.729	2
94			min	-57.162	1	-686.784	2	5.818	12	-.005	3	.004	12	-.262	3
95		10	max	-2.368	15	337.488	3	194.496	1	.01	1	.344	1	1.619	2
96			min	-57.162	1	-838.95	2	7.579	12	-.005	3	.012	12	-.619	3
97		11	max	-2.368	15	686.784	2	-5.818	12	.005	3	.142	1	.729	2
98			min	-57.162	1	-275.597	3	-151.657	1	-.01	1	.004	12	-.262	3
99		12	max	-2.368	15	534.617	2	-4.056	12	.005	3	0	10	.024	3
100			min	-57.162	1	-213.706	3	-108.819	1	-.01	1	-.01	1	-.003	9
101		13	max	-2.368	15	382.451	2	-2.295	12	.005	3	-.005	15	.237	3
102			min	-57.162	1	-151.815	3	-65.98	1	-.01	1	-.112	1	-.518	1
103		14	max	-2.368	15	230.284	2	-.533	12	.005	3	-.007	15	.378	3
104			min	-57.162	1	-89.924	3	-23.141	1	-.01	1	-.164	1	-.876	2
105		15	max	-2.368	15	78.118	2	19.697	1	.005	3	-.007	12	.447	3
106			min	-57.162	1	-28.033	3	.821	15	-.01	1	-.166	1	-1.056	2
107		16	max	-2.368	15	33.858	3	62.536	1	.005	3	-.004	12	.443	3
108			min	-57.162	1	-74.049	1	2.583	15	-.01	1	-.118	1	-1.058	2
109		17	max	-2.368	15	95.749	3	105.374	1	.005	3	0	3	.368	3
110			min	-57.162	1	-226.215	2	4.344	15	-.01	1	-.02	1	-.883	2
111		18	max	-2.368	15	157.64	3	148.213	1	.005	3	.128	1	.22	3
112			min	-57.162	1	-378.382	2	6.106	15	-.01	1	.005	15	-.53	2
113		19	max	-2.368	15	219.53	3	191.052	1	.005	3	.326	1	0	2
114			min	-57.162	1	-530.548	2	7.868	15	-.01	1	.013	15	0	15
115	M16	1	max	-5.315	15	510.141	2	-7.649	15	.01	1	.289	1	0	2
116			min	-128.396	1	-205.91	3	-185.785	1	-.008	3	.012	15	0	3
117		2	max	-5.315	15	357.975	2	-5.888	15	.01	1	.097	1	.204	3
118			min	-128.396	1	-144.019	3	-142.946	1	-.008	3	.004	15	-.506	2
119		3	max	-5.315	15	205.809	2	-4.126	15	.01	1	0	12	.336	3
120			min	-128.396	1	-82.128	3	-100.108	1	-.008	3	-.045	1	-.835	2
121		4	max	-5.315	15	53.642	2	-2.364	15	.01	1	-.005	12	.396	3
122			min	-128.396	1	-20.237	3	-57.269	1	-.008	3	-.136	1	-.987	2
123		5	max	-5.315	15	41.654	3	-.603	15	.01	1	-.007	12	.383	3
124			min	-128.396	1	-98.524	2	-14.43	1	-.008	3	-.178	1	-.96	2
125		6	max	-5.315	15	103.544	3	28.408	1	.01	1	-.007	15	.299	3
126			min	-128.396	1	-250.691	2	.832	12	-.008	3	-.17	1	-.757	2
127		7	max	-5.315	15	165.435	3	71.247	1	.01	1	-.005	15	.142	3
128			min	-128.396	1	-402.857	2	2.593	12	-.008	3	-.112	1	-.375	2
129		8	max	-5.315	15	227.326	3	114.086	1	.01	1	0	10	.185	1
130			min	-128.396	1	-555.024	2	4.355	12	-.008	3	-.004	1	-.087	3
131		9	max	-5.315	15	289.217	3	156.924	1	.01	1	.154	1	.92	2
132			min	-128.396	1	-707.19	2	6.116	12	-.008	3	.005	12	-.389	3
133		10	max	-5.315	15	351.108	3	199.763	1	.008	3	.362	1	1.833	2
134			min	-128.396	1	-859.357	2	7.878	12	-.01	1	.013	12	-.762	3
135		11	max	-5.315	15	707.19	2	-6.116	12	.008	3	.154	1	.92	2
136			min	-128.396	1	-289.217	3	-156.924	1	-.01	1	.005	12	-.389	3
137		12	max	-5.315	15	555.024	2	-4.355	12	.008	3	0	10	.185	1
138			min	-128.396	1	-227.326	3	-114.086	1	-.01	1	-.004	1	-.087	3
139		13	max	-5.315	15	402.857	2	-2.593	12	.008	3	-.005	15	.142	3
140			min	-128.396	1	-165.435	3	-71.247	1	-.01	1	-.112	1	-.375	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
141		14	max	-5.315	15	250.691	2	-.832	12	.008	3	-.007	15	.299	3
142			min	-128.396	1	-103.544	3	-28.408	1	-.01	1	-.17	1	-.757	2
143		15	max	-5.315	15	98.524	2	14.43	1	.008	3	-.007	12	.383	3
144			min	-128.396	1	-41.654	3	.603	15	-.01	1	-.178	1	-.96	2
145		16	max	-5.315	15	20.237	3	57.269	1	.008	3	-.005	12	.396	3
146			min	-128.396	1	-53.642	2	2.364	15	-.01	1	-.136	1	-.987	2
147		17	max	-5.315	15	82.128	3	100.108	1	.008	3	0	12	.336	3
148			min	-128.396	1	-205.809	2	4.126	15	-.01	1	-.045	1	-.835	2
149		18	max	-5.315	15	144.019	3	142.946	1	.008	3	.097	1	.204	3
150			min	-128.396	1	-357.975	2	5.888	15	-.01	1	.004	15	-.506	2
151		19	max	-5.315	15	205.91	3	185.785	1	.008	3	.289	1	0	2
152			min	-128.396	1	-510.141	2	7.649	15	-.01	1	.012	15	0	3
153	M2	1	max	966.965	1	1.92	4	.775	1	0	5	0	3	0	1
154			min	-992.307	3	.452	15	.032	15	0	1	0	1	0	1
155		2	max	967.394	1	1.864	4	.775	1	0	5	0	1	0	15
156			min	-991.985	3	.439	15	.032	15	0	1	0	15	0	4
157		3	max	967.822	1	1.807	4	.775	1	0	5	0	1	0	15
158			min	-991.664	3	.426	15	.032	15	0	1	0	15	-.001	4
159		4	max	968.25	1	1.75	4	.775	1	0	5	0	1	0	15
160			min	-991.342	3	.412	15	.032	15	0	1	0	15	-.002	4
161		5	max	968.679	1	1.693	4	.775	1	0	5	0	1	0	15
162			min	-991.021	3	.399	15	.032	15	0	1	0	15	-.002	4
163		6	max	969.107	1	1.636	4	.775	1	0	5	.001	1	0	15
164			min	-990.7	3	.386	15	.032	15	0	1	0	15	-.003	4
165		7	max	969.536	1	1.58	4	.775	1	0	5	.001	1	0	15
166			min	-990.378	3	.372	15	.032	15	0	1	0	15	-.003	4
167		8	max	969.964	1	1.523	4	.775	1	0	5	.002	1	0	15
168			min	-990.057	3	.359	15	.032	15	0	1	0	15	-.003	4
169		9	max	970.393	1	1.466	4	.775	1	0	5	.002	1	0	15
170			min	-989.736	3	.345	15	.032	15	0	1	0	15	-.004	4
171		10	max	970.821	1	1.409	4	.775	1	0	5	.002	1	-.001	15
172			min	-989.414	3	.332	15	.032	15	0	1	0	15	-.004	4
173		11	max	971.25	1	1.353	4	.775	1	0	5	.002	1	-.001	15
174			min	-989.093	3	.319	15	.032	15	0	1	0	15	-.005	4
175		12	max	971.678	1	1.296	4	.775	1	0	5	.002	1	-.001	15
176			min	-988.771	3	.305	15	.032	15	0	1	0	15	-.005	4
177		13	max	972.107	1	1.239	4	.775	1	0	5	.003	1	-.001	15
178			min	-988.45	3	.292	15	.032	15	0	1	0	15	-.006	4
179		14	max	972.535	1	1.182	4	.775	1	0	5	.003	1	-.001	15
180			min	-988.129	3	.279	15	.032	15	0	1	0	15	-.006	4
181		15	max	972.964	1	1.125	4	.775	1	0	5	.003	1	-.001	15
182			min	-987.807	3	.265	15	.032	15	0	1	0	15	-.006	4
183		16	max	973.392	1	1.069	4	.775	1	0	5	.003	1	-.002	15
184			min	-987.486	3	.252	15	.032	15	0	1	0	15	-.007	4
185		17	max	973.821	1	1.012	4	.775	1	0	5	.004	1	-.002	15
186			min	-987.165	3	.239	15	.032	15	0	1	0	15	-.007	4
187		18	max	974.249	1	.955	4	.775	1	0	5	.004	1	-.002	15
188			min	-986.843	3	.22	12	.032	15	0	1	0	15	-.007	4
189		19	max	974.678	1	.898	4	.775	1	0	5	.004	1	-.002	15
190			min	-986.522	3	.198	12	.032	15	0	1	0	15	-.007	4
191	M3	1	max	415.793	2	7.882	4	.173	1	0	5	0	1	.007	4
192			min	-555.622	3	1.853	15	.007	15	0	1	0	15	.002	15
193		2	max	415.623	2	7.114	4	.173	1	0	5	0	1	.004	4
194			min	-555.75	3	1.673	15	.007	15	0	1	0	15	0	12
195		3	max	415.453	2	6.347	4	.173	1	0	5	0	1	.002	2
196			min	-555.878	3	1.493	15	.007	15	0	1	0	15	0	3
197		4	max	415.282	2	5.58	4	.173	1	0	5	0	1	0	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
198			min	-556.006	3	1.312	15	.007	15	0	1	0	15	-.002	3
199		5	max	415.112	2	4.813	4	.173	1	0	5	0	1	0	15
200			min	-556.133	3	1.132	15	.007	15	0	1	0	15	-.003	4
201		6	max	414.942	2	4.045	4	.173	1	0	5	0	1	-.001	15
202			min	-556.261	3	.952	15	.007	15	0	1	0	15	-.005	4
203		7	max	414.771	2	3.278	4	.173	1	0	5	0	1	-.002	15
204			min	-556.389	3	.771	15	.007	15	0	1	0	15	-.007	4
205		8	max	414.601	2	2.511	4	.173	1	0	5	0	1	-.002	15
206			min	-556.517	3	.591	15	.007	15	0	1	0	15	-.008	4
207		9	max	414.43	2	1.744	4	.173	1	0	5	.001	1	-.002	15
208			min	-556.644	3	.41	15	.007	15	0	1	0	15	-.009	4
209		10	max	414.26	2	.977	4	.173	1	0	5	.001	1	-.002	15
210			min	-556.772	3	.23	15	.007	15	0	1	0	15	-.009	4
211		11	max	414.09	2	.292	2	.173	1	0	5	.001	1	-.002	15
212			min	-556.9	3	-.053	3	.007	15	0	1	0	15	-.01	4
213		12	max	413.919	2	-.131	15	.173	1	0	5	.001	1	-.002	15
214			min	-557.028	3	-.558	4	.007	15	0	1	0	15	-.01	4
215		13	max	413.749	2	-.311	15	.173	1	0	5	.001	1	-.002	15
216			min	-557.156	3	-1.325	4	.007	15	0	1	0	15	-.009	4
217		14	max	413.579	2	-.491	15	.173	1	0	5	.001	1	-.002	15
218			min	-557.283	3	-2.092	4	.007	15	0	1	0	15	-.008	4
219		15	max	413.408	2	-.672	15	.173	1	0	5	.001	1	-.002	15
220			min	-557.411	3	-2.86	4	.007	15	0	1	0	15	-.007	4
221		16	max	413.238	2	-.852	15	.173	1	0	5	.002	1	-.001	15
222			min	-557.539	3	-3.627	4	.007	15	0	1	0	15	-.006	4
223		17	max	413.068	2	-1.032	15	.173	1	0	5	.002	1	-.001	15
224			min	-557.667	3	-4.394	4	.007	15	0	1	0	15	-.004	4
225		18	max	412.897	2	-1.213	15	.173	1	0	5	.002	1	0	15
226			min	-557.794	3	-5.161	4	.007	15	0	1	0	15	-.002	4
227		19	max	412.727	2	-1.393	15	.173	1	0	5	.002	1	0	1
228			min	-557.922	3	-5.928	4	.007	15	0	1	0	15	0	1
229	M4	1	max	1109.058	1	0	1	-.503	15	0	1	.001	1	0	1
230			min	-86.233	3	0	1	-12.195	1	0	1	0	15	0	1
231		2	max	1109.228	1	0	1	-.503	15	0	1	0	3	0	1
232			min	-86.105	3	0	1	-12.195	1	0	1	0	1	0	1
233		3	max	1109.398	1	0	1	-.503	15	0	1	0	15	0	1
234			min	-85.977	3	0	1	-12.195	1	0	1	-.002	1	0	1
235		4	max	1109.569	1	0	1	-.503	15	0	1	0	15	0	1
236			min	-85.849	3	0	1	-12.195	1	0	1	-.003	1	0	1
237		5	max	1109.739	1	0	1	-.503	15	0	1	0	15	0	1
238			min	-85.721	3	0	1	-12.195	1	0	1	-.004	1	0	1
239		6	max	1109.909	1	0	1	-.503	15	0	1	0	15	0	1
240			min	-85.594	3	0	1	-12.195	1	0	1	-.006	1	0	1
241		7	max	1110.08	1	0	1	-.503	15	0	1	0	15	0	1
242			min	-85.466	3	0	1	-12.195	1	0	1	-.007	1	0	1
243		8	max	1110.25	1	0	1	-.503	15	0	1	0	15	0	1
244			min	-85.338	3	0	1	-12.195	1	0	1	-.009	1	0	1
245		9	max	1110.42	1	0	1	-.503	15	0	1	0	15	0	1
246			min	-85.21	3	0	1	-12.195	1	0	1	-.01	1	0	1
247		10	max	1110.591	1	0	1	-.503	15	0	1	0	15	0	1
248			min	-85.083	3	0	1	-12.195	1	0	1	-.011	1	0	1
249		11	max	1110.761	1	0	1	-.503	15	0	1	0	15	0	1
250			min	-84.955	3	0	1	-12.195	1	0	1	-.013	1	0	1
251		12	max	1110.931	1	0	1	-.503	15	0	1	0	15	0	1
252			min	-84.827	3	0	1	-12.195	1	0	1	-.014	1	0	1
253		13	max	1111.102	1	0	1	-.503	15	0	1	0	15	0	1
254			min	-84.699	3	0	1	-12.195	1	0	1	-.016	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	1111.272	1	0	1	-.503	15	0	1	0	15	0	1
256			min	-84.572	3	0	1	-12.195	1	0	1	-.017	1	0	1
257		15	max	1111.443	1	0	1	-.503	15	0	1	0	15	0	1
258			min	-84.444	3	0	1	-12.195	1	0	1	-.018	1	0	1
259		16	max	1111.613	1	0	1	-.503	15	0	1	0	15	0	1
260			min	-84.316	3	0	1	-12.195	1	0	1	-.02	1	0	1
261		17	max	1111.783	1	0	1	-.503	15	0	1	0	15	0	1
262			min	-84.188	3	0	1	-12.195	1	0	1	-.021	1	0	1
263		18	max	1111.954	1	0	1	-.503	15	0	1	0	15	0	1
264			min	-84.061	3	0	1	-12.195	1	0	1	-.023	1	0	1
265		19	max	1112.124	1	0	1	-.503	15	0	1	0	15	0	1
266			min	-83.933	3	0	1	-12.195	1	0	1	-.024	1	0	1
267	M6	1	max	3119.372	1	2.189	2	0	1	0	1	0	1	0	1
268			min	-3259.5	3	.258	12	0	1	0	1	0	1	0	1
269		2	max	3119.801	1	2.144	2	0	1	0	1	0	1	0	12
270			min	-3259.179	3	.236	12	0	1	0	1	0	1	0	2
271		3	max	3120.229	1	2.1	2	0	1	0	1	0	1	0	12
272			min	-3258.858	3	.214	12	0	1	0	1	0	1	-.001	2
273		4	max	3120.658	1	2.056	2	0	1	0	1	0	1	0	12
274			min	-3258.536	3	.192	12	0	1	0	1	0	1	-.002	2
275		5	max	3121.086	1	2.012	2	0	1	0	1	0	1	0	12
276			min	-3258.215	3	.169	12	0	1	0	1	0	1	-.002	2
277		6	max	3121.515	1	1.967	2	0	1	0	1	0	1	0	12
278			min	-3257.893	3	.138	3	0	1	0	1	0	1	-.003	2
279		7	max	3121.943	1	1.923	2	0	1	0	1	0	1	0	12
280			min	-3257.572	3	.105	3	0	1	0	1	0	1	-.004	2
281		8	max	3122.371	1	1.879	2	0	1	0	1	0	1	0	12
282			min	-3257.251	3	.071	3	0	1	0	1	0	1	-.004	2
283		9	max	3122.8	1	1.835	2	0	1	0	1	0	1	0	12
284			min	-3256.929	3	.038	3	0	1	0	1	0	1	-.005	2
285		10	max	3123.228	1	1.79	2	0	1	0	1	0	1	0	3
286			min	-3256.608	3	.005	3	0	1	0	1	0	1	-.005	2
287		11	max	3123.657	1	1.746	2	0	1	0	1	0	1	0	3
288			min	-3256.287	3	-.028	3	0	1	0	1	0	1	-.006	2
289		12	max	3124.085	1	1.702	2	0	1	0	1	0	1	0	3
290			min	-3255.965	3	-.061	3	0	1	0	1	0	1	-.006	2
291		13	max	3124.514	1	1.658	2	0	1	0	1	0	1	0	3
292			min	-3255.644	3	-.094	3	0	1	0	1	0	1	-.007	2
293		14	max	3124.942	1	1.613	2	0	1	0	1	0	1	0	3
294			min	-3255.323	3	-.128	3	0	1	0	1	0	1	-.007	2
295		15	max	3125.371	1	1.569	2	0	1	0	1	0	1	0	3
296			min	-3255.001	3	-.161	3	0	1	0	1	0	1	-.008	2
297		16	max	3125.799	1	1.525	2	0	1	0	1	0	1	0	3
298			min	-3254.68	3	-.194	3	0	1	0	1	0	1	-.008	2
299		17	max	3126.228	1	1.481	2	0	1	0	1	0	1	0	3
300			min	-3254.358	3	-.227	3	0	1	0	1	0	1	-.009	2
301		18	max	3126.656	1	1.436	2	0	1	0	1	0	1	0	3
302			min	-3254.037	3	-.26	3	0	1	0	1	0	1	-.009	2
303		19	max	3127.085	1	1.392	2	0	1	0	1	0	1	0	3
304			min	-3253.716	3	-.294	3	0	1	0	1	0	1	-.009	2
305	M7	1	max	1684.626	2	7.919	4	0	1	0	1	0	1	.009	2
306			min	-1745.026	3	1.859	15	0	1	0	1	0	1	0	3
307		2	max	1684.456	2	7.152	4	0	1	0	1	0	1	.007	2
308			min	-1745.154	3	1.678	15	0	1	0	1	0	1	-.002	3
309		3	max	1684.285	2	6.385	4	0	1	0	1	0	1	.004	2
310			min	-1745.281	3	1.498	15	0	1	0	1	0	1	-.003	3
311		4	max	1684.115	2	5.618	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	-1745.409	3	1.318	15	0	1	0	1	0	1	-.004	3
313		5	max	1683.944	2	4.85	4	0	1	0	1	0	1	0	2
314			min	-1745.537	3	1.137	15	0	1	0	1	0	1	-.005	3
315		6	max	1683.774	2	4.083	4	0	1	0	1	0	1	-.001	15
316			min	-1745.665	3	.957	15	0	1	0	1	0	1	-.006	3
317		7	max	1683.604	2	3.316	4	0	1	0	1	0	1	-.002	15
318			min	-1745.793	3	.777	15	0	1	0	1	0	1	-.007	3
319		8	max	1683.433	2	2.549	4	0	1	0	1	0	1	-.002	15
320			min	-1745.92	3	.596	15	0	1	0	1	0	1	-.008	4
321		9	max	1683.263	2	1.839	2	0	1	0	1	0	1	-.002	15
322			min	-1746.048	3	.34	12	0	1	0	1	0	1	-.009	4
323		10	max	1683.093	2	1.241	2	0	1	0	1	0	1	-.002	15
324			min	-1746.176	3	.004	3	0	1	0	1	0	1	-.009	4
325		11	max	1682.922	2	.643	2	0	1	0	1	0	1	-.002	15
326			min	-1746.304	3	-.445	3	0	1	0	1	0	1	-.009	4
327		12	max	1682.752	2	.045	2	0	1	0	1	0	1	-.002	15
328			min	-1746.431	3	-.893	3	0	1	0	1	0	1	-.009	4
329		13	max	1682.582	2	-.305	15	0	1	0	1	0	1	-.002	15
330			min	-1746.559	3	-1.342	3	0	1	0	1	0	1	-.009	4
331		14	max	1682.411	2	-.486	15	0	1	0	1	0	1	-.002	15
332			min	-1746.687	3	-2.055	4	0	1	0	1	0	1	-.008	4
333		15	max	1682.241	2	-.666	15	0	1	0	1	0	1	-.002	15
334			min	-1746.815	3	-2.822	4	0	1	0	1	0	1	-.007	4
335		16	max	1682.071	2	-.846	15	0	1	0	1	0	1	-.001	15
336			min	-1746.942	3	-3.589	4	0	1	0	1	0	1	-.006	4
337		17	max	1681.9	2	-1.027	15	0	1	0	1	0	1	-.001	15
338			min	-1747.07	3	-4.356	4	0	1	0	1	0	1	-.004	4
339		18	max	1681.73	2	-1.207	15	0	1	0	1	0	1	0	15
340			min	-1747.198	3	-5.123	4	0	1	0	1	0	1	-.002	4
341		19	max	1681.56	2	-1.387	15	0	1	0	1	0	1	0	1
342			min	-1747.326	3	-5.891	4	0	1	0	1	0	1	0	1
343	M8	1	max	2970.307	1	0	1	0	1	0	1	0	1	0	1
344			min	-361.008	3	0	1	0	1	0	1	0	1	0	1
345		2	max	2970.477	1	0	1	0	1	0	1	0	1	0	1
346			min	-360.88	3	0	1	0	1	0	1	0	1	0	1
347		3	max	2970.647	1	0	1	0	1	0	1	0	1	0	1
348			min	-360.752	3	0	1	0	1	0	1	0	1	0	1
349		4	max	2970.818	1	0	1	0	1	0	1	0	1	0	1
350			min	-360.624	3	0	1	0	1	0	1	0	1	0	1
351		5	max	2970.988	1	0	1	0	1	0	1	0	1	0	1
352			min	-360.497	3	0	1	0	1	0	1	0	1	0	1
353		6	max	2971.158	1	0	1	0	1	0	1	0	1	0	1
354			min	-360.369	3	0	1	0	1	0	1	0	1	0	1
355		7	max	2971.329	1	0	1	0	1	0	1	0	1	0	1
356			min	-360.241	3	0	1	0	1	0	1	0	1	0	1
357		8	max	2971.499	1	0	1	0	1	0	1	0	1	0	1
358			min	-360.113	3	0	1	0	1	0	1	0	1	0	1
359		9	max	2971.67	1	0	1	0	1	0	1	0	1	0	1
360			min	-359.986	3	0	1	0	1	0	1	0	1	0	1
361		10	max	2971.84	1	0	1	0	1	0	1	0	1	0	1
362			min	-359.858	3	0	1	0	1	0	1	0	1	0	1
363		11	max	2972.01	1	0	1	0	1	0	1	0	1	0	1
364			min	-359.73	3	0	1	0	1	0	1	0	1	0	1
365		12	max	2972.181	1	0	1	0	1	0	1	0	1	0	1
366			min	-359.602	3	0	1	0	1	0	1	0	1	0	1
367		13	max	2972.351	1	0	1	0	1	0	1	0	1	0	1
368			min	-359.475	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	2972.521	1	0	1	0	1	0	1	0	1	0	1
370			min	-359.347	3	0	1	0	1	0	1	0	1	0	1
371		15	max	2972.692	1	0	1	0	1	0	1	0	1	0	1
372			min	-359.219	3	0	1	0	1	0	1	0	1	0	1
373		16	max	2972.862	1	0	1	0	1	0	1	0	1	0	1
374			min	-359.091	3	0	1	0	1	0	1	0	1	0	1
375		17	max	2973.032	1	0	1	0	1	0	1	0	1	0	1
376			min	-358.964	3	0	1	0	1	0	1	0	1	0	1
377		18	max	2973.203	1	0	1	0	1	0	1	0	1	0	1
378			min	-358.836	3	0	1	0	1	0	1	0	1	0	1
379		19	max	2973.373	1	0	1	0	1	0	1	0	1	0	1
380			min	-358.708	3	0	1	0	1	0	1	0	1	0	1
381	M10	1	max	966.965	1	1.92	4	-.032	15	0	1	0	1	0	1
382			min	-992.307	3	.452	15	-.775	1	0	5	0	3	0	1
383		2	max	967.394	1	1.864	4	-.032	15	0	1	0	15	0	15
384			min	-991.985	3	.439	15	-.775	1	0	5	0	1	0	4
385		3	max	967.822	1	1.807	4	-.032	15	0	1	0	15	0	15
386			min	-991.664	3	.426	15	-.775	1	0	5	0	1	-.001	4
387		4	max	968.25	1	1.75	4	-.032	15	0	1	0	15	0	15
388			min	-991.342	3	.412	15	-.775	1	0	5	0	1	-.002	4
389		5	max	968.679	1	1.693	4	-.032	15	0	1	0	15	0	15
390			min	-991.021	3	.399	15	-.775	1	0	5	0	1	-.002	4
391		6	max	969.107	1	1.636	4	-.032	15	0	1	0	15	0	15
392			min	-990.7	3	.386	15	-.775	1	0	5	-.001	1	-.003	4
393		7	max	969.536	1	1.58	4	-.032	15	0	1	0	15	0	15
394			min	-990.378	3	.372	15	-.775	1	0	5	-.001	1	-.003	4
395		8	max	969.964	1	1.523	4	-.032	15	0	1	0	15	0	15
396			min	-990.057	3	.359	15	-.775	1	0	5	-.002	1	-.003	4
397		9	max	970.393	1	1.466	4	-.032	15	0	1	0	15	0	15
398			min	-989.736	3	.345	15	-.775	1	0	5	-.002	1	-.004	4
399		10	max	970.821	1	1.409	4	-.032	15	0	1	0	15	-.001	15
400			min	-989.414	3	.332	15	-.775	1	0	5	-.002	1	-.004	4
401		11	max	971.25	1	1.353	4	-.032	15	0	1	0	15	-.001	15
402			min	-989.093	3	.319	15	-.775	1	0	5	-.002	1	-.005	4
403		12	max	971.678	1	1.296	4	-.032	15	0	1	0	15	-.001	15
404			min	-988.771	3	.305	15	-.775	1	0	5	-.002	1	-.005	4
405		13	max	972.107	1	1.239	4	-.032	15	0	1	0	15	-.001	15
406			min	-988.45	3	.292	15	-.775	1	0	5	-.003	1	-.006	4
407		14	max	972.535	1	1.182	4	-.032	15	0	1	0	15	-.001	15
408			min	-988.129	3	.279	15	-.775	1	0	5	-.003	1	-.006	4
409		15	max	972.964	1	1.125	4	-.032	15	0	1	0	15	-.001	15
410			min	-987.807	3	.265	15	-.775	1	0	5	-.003	1	-.006	4
411		16	max	973.392	1	1.069	4	-.032	15	0	1	0	15	-.002	15
412			min	-987.486	3	.252	15	-.775	1	0	5	-.003	1	-.007	4
413		17	max	973.821	1	1.012	4	-.032	15	0	1	0	15	-.002	15
414			min	-987.165	3	.239	15	-.775	1	0	5	-.004	1	-.007	4
415		18	max	974.249	1	.955	4	-.032	15	0	1	0	15	-.002	15
416			min	-986.843	3	.22	12	-.775	1	0	5	-.004	1	-.007	4
417		19	max	974.678	1	.898	4	-.032	15	0	1	0	15	-.002	15
418			min	-986.522	3	.198	12	-.775	1	0	5	-.004	1	-.007	4
419	M11	1	max	415.793	2	7.882	4	-.007	15	0	1	0	15	.007	4
420			min	-555.622	3	1.853	15	-.173	1	0	5	0	1	.002	15
421		2	max	415.623	2	7.114	4	-.007	15	0	1	0	15	.004	4
422			min	-555.75	3	1.673	15	-.173	1	0	5	0	1	0	12
423		3	max	415.453	2	6.347	4	-.007	15	0	1	0	15	.002	2
424			min	-555.878	3	1.493	15	-.173	1	0	5	0	1	0	3
425		4	max	415.282	2	5.58	4	-.007	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	-556.006	3	1.312	15	-.173	1	0	5	0	1	-.002	3
427		5	max	415.112	2	4.813	4	-.007	15	0	1	0	15	0	15
428			min	-556.133	3	1.132	15	-.173	1	0	5	0	1	-.003	4
429		6	max	414.942	2	4.045	4	-.007	15	0	1	0	15	-.001	15
430			min	-556.261	3	.952	15	-.173	1	0	5	0	1	-.005	4
431		7	max	414.771	2	3.278	4	-.007	15	0	1	0	15	-.002	15
432			min	-556.389	3	.771	15	-.173	1	0	5	0	1	-.007	4
433		8	max	414.601	2	2.511	4	-.007	15	0	1	0	15	-.002	15
434			min	-556.517	3	.591	15	-.173	1	0	5	0	1	-.008	4
435		9	max	414.43	2	1.744	4	-.007	15	0	1	0	15	-.002	15
436			min	-556.644	3	.41	15	-.173	1	0	5	-.001	1	-.009	4
437		10	max	414.26	2	.977	4	-.007	15	0	1	0	15	-.002	15
438			min	-556.772	3	.23	15	-.173	1	0	5	-.001	1	-.009	4
439		11	max	414.09	2	.292	2	-.007	15	0	1	0	15	-.002	15
440			min	-556.9	3	-.053	3	-.173	1	0	5	-.001	1	-.01	4
441		12	max	413.919	2	-.131	15	-.007	15	0	1	0	15	-.002	15
442			min	-557.028	3	-.558	4	-.173	1	0	5	-.001	1	-.01	4
443		13	max	413.749	2	-.311	15	-.007	15	0	1	0	15	-.002	15
444			min	-557.156	3	-1.325	4	-.173	1	0	5	-.001	1	-.009	4
445		14	max	413.579	2	-.491	15	-.007	15	0	1	0	15	-.002	15
446			min	-557.283	3	-2.092	4	-.173	1	0	5	-.001	1	-.008	4
447		15	max	413.408	2	-.672	15	-.007	15	0	1	0	15	-.002	15
448			min	-557.411	3	-2.86	4	-.173	1	0	5	-.001	1	-.007	4
449		16	max	413.238	2	-.852	15	-.007	15	0	1	0	15	-.001	15
450			min	-557.539	3	-3.627	4	-.173	1	0	5	-.002	1	-.006	4
451		17	max	413.068	2	-1.032	15	-.007	15	0	1	0	15	-.001	15
452			min	-557.667	3	-4.394	4	-.173	1	0	5	-.002	1	-.004	4
453		18	max	412.897	2	-1.213	15	-.007	15	0	1	0	15	0	15
454			min	-557.794	3	-5.161	4	-.173	1	0	5	-.002	1	-.002	4
455		19	max	412.727	2	-1.393	15	-.007	15	0	1	0	15	0	1
456			min	-557.922	3	-5.928	4	-.173	1	0	5	-.002	1	0	1
457	M12	1	max	1109.058	1	0	1	12.195	1	0	1	0	15	0	1
458			min	-86.233	3	0	1	.503	15	0	1	-.001	1	0	1
459		2	max	1109.228	1	0	1	12.195	1	0	1	0	1	0	1
460			min	-86.105	3	0	1	.503	15	0	1	0	3	0	1
461		3	max	1109.398	1	0	1	12.195	1	0	1	.002	1	0	1
462			min	-85.977	3	0	1	.503	15	0	1	0	15	0	1
463		4	max	1109.569	1	0	1	12.195	1	0	1	.003	1	0	1
464			min	-85.849	3	0	1	.503	15	0	1	0	15	0	1
465		5	max	1109.739	1	0	1	12.195	1	0	1	.004	1	0	1
466			min	-85.721	3	0	1	.503	15	0	1	0	15	0	1
467		6	max	1109.909	1	0	1	12.195	1	0	1	.006	1	0	1
468			min	-85.594	3	0	1	.503	15	0	1	0	15	0	1
469		7	max	1110.08	1	0	1	12.195	1	0	1	.007	1	0	1
470			min	-85.466	3	0	1	.503	15	0	1	0	15	0	1
471		8	max	1110.25	1	0	1	12.195	1	0	1	.009	1	0	1
472			min	-85.338	3	0	1	.503	15	0	1	0	15	0	1
473		9	max	1110.42	1	0	1	12.195	1	0	1	.01	1	0	1
474			min	-85.21	3	0	1	.503	15	0	1	0	15	0	1
475		10	max	1110.591	1	0	1	12.195	1	0	1	.011	1	0	1
476			min	-85.083	3	0	1	.503	15	0	1	0	15	0	1
477		11	max	1110.761	1	0	1	12.195	1	0	1	.013	1	0	1
478			min	-84.955	3	0	1	.503	15	0	1	0	15	0	1
479		12	max	1110.931	1	0	1	12.195	1	0	1	.014	1	0	1
480			min	-84.827	3	0	1	.503	15	0	1	0	15	0	1
481		13	max	1111.102	1	0	1	12.195	1	0	1	.016	1	0	1
482			min	-84.699	3	0	1	.503	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	1111.272	1	0	1	12.195	1	0	1	.017	1	0	1
484			min	-84.572	3	0	1	.503	15	0	1	0	15	0	1
485		15	max	1111.443	1	0	1	12.195	1	0	1	.018	1	0	1
486			min	-84.444	3	0	1	.503	15	0	1	0	15	0	1
487		16	max	1111.613	1	0	1	12.195	1	0	1	.02	1	0	1
488			min	-84.316	3	0	1	.503	15	0	1	0	15	0	1
489		17	max	1111.783	1	0	1	12.195	1	0	1	.021	1	0	1
490			min	-84.188	3	0	1	.503	15	0	1	0	15	0	1
491		18	max	1111.954	1	0	1	12.195	1	0	1	.023	1	0	1
492			min	-84.061	3	0	1	.503	15	0	1	0	15	0	1
493		19	max	1112.124	1	0	1	12.195	1	0	1	.024	1	0	1
494			min	-83.933	3	0	1	.503	15	0	1	0	15	0	1
495	M1	1	max	185.565	1	551.139	3	-4.973	15	0	1	.287	1	0	3
496			min	7.643	15	-429.983	1	-120.177	1	0	3	.012	15	-.011	1
497		2	max	186.17	1	550.165	3	-4.973	15	0	1	.224	1	.216	1
498			min	7.825	15	-431.282	1	-120.177	1	0	3	.009	15	-.291	3
499		3	max	338.576	3	479.052	1	-4.942	15	0	3	.161	1	.433	1
500			min	-203.282	2	-389.716	3	-119.666	1	0	1	.007	15	-.569	3
501		4	max	339.03	3	477.754	1	-4.942	15	0	3	.097	1	.18	1
502			min	-202.677	2	-390.689	3	-119.666	1	0	1	.004	15	-.363	3
503		5	max	339.484	3	476.456	1	-4.942	15	0	3	.034	1	-.003	15
504			min	-202.071	2	-391.663	3	-119.666	1	0	1	.001	15	-.157	3
505		6	max	339.938	3	475.158	1	-4.942	15	0	3	-.001	15	.05	3
506			min	-201.466	2	-392.637	3	-119.666	1	0	1	-.029	1	-.323	1
507		7	max	340.392	3	473.859	1	-4.942	15	0	3	-.004	15	.257	3
508			min	-200.861	2	-393.61	3	-119.666	1	0	1	-.092	1	-.573	1
509		8	max	340.846	3	472.561	1	-4.942	15	0	3	-.006	15	.465	3
510			min	-200.255	2	-394.584	3	-119.666	1	0	1	-.155	1	-.823	1
511		9	max	353.837	3	34.922	2	-7.188	15	0	9	.091	1	.545	3
512			min	-122.476	2	.396	15	-173.93	1	0	3	.004	15	-.938	1
513		10	max	354.291	3	33.623	2	-7.188	15	0	9	0	15	.529	3
514			min	-121.87	2	.004	15	-173.93	1	0	3	-.001	1	-.947	1
515		11	max	354.745	3	32.325	2	-7.188	15	0	9	-.004	15	.514	3
516			min	-121.265	2	-1.583	4	-173.93	1	0	3	-.093	1	-.956	1
517		12	max	367.677	3	248.888	3	-4.82	15	0	2	.153	1	.447	3
518			min	-70.649	10	-509.321	1	-116.844	1	0	3	.006	15	-.845	1
519		13	max	368.131	3	247.915	3	-4.82	15	0	2	.091	1	.316	3
520			min	-70.145	10	-510.619	1	-116.844	1	0	3	.004	15	-.575	1
521		14	max	368.585	3	246.941	3	-4.82	15	0	2	.03	1	.186	3
522			min	-69.64	10	-511.917	1	-116.844	1	0	3	.001	15	-.306	1
523		15	max	369.039	3	245.967	3	-4.82	15	0	2	-.001	15	.055	3
524			min	-69.136	10	-513.216	1	-116.844	1	0	3	-.032	1	-.035	1
525		16	max	369.493	3	244.994	3	-4.82	15	0	2	-.004	15	.253	2
526			min	-68.631	10	-514.514	1	-116.844	1	0	3	-.094	1	-.074	3
527		17	max	369.947	3	244.02	3	-4.82	15	0	2	-.006	15	.519	2
528			min	-68.127	10	-515.812	1	-116.844	1	0	3	-.155	1	-.203	3
529		18	max	-7.832	15	511.908	2	-5.315	15	0	3	-.009	15	.261	2
530			min	-186.386	1	-204.985	3	-128.547	1	0	2	-.221	1	-.101	3
531		19	max	-7.649	15	510.609	2	-5.315	15	0	3	-.012	15	.008	3
532			min	-185.781	1	-205.959	3	-128.547	1	0	2	-.289	1	-.01	1
533	M5	1	max	399.966	1	1835.721	3	0	1	0	1	0	1	.023	1
534			min	15.527	12	-1451.675	1	0	1	0	1	0	1	0	3
535		2	max	400.571	1	1834.747	3	0	1	0	1	0	1	.789	1
536			min	15.83	12	-1452.973	1	0	1	0	1	0	1	-.968	3
537		3	max	1089.801	3	1470.892	1	0	1	0	1	0	1	1.521	1
538			min	-738.695	2	-1260.853	3	0	1	0	1	0	1	-1.899	3
539		4	max	1090.255	3	1469.594	1	0	1	0	1	0	1	.745	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	-738.09	2	-1261.827	3	0	1	0	1	0	1	-1.234	3
541		5	max	1090.709	3	1468.295	1	0	1	0	1	0	1	.006	9
542			min	-737.485	2	-1262.8	3	0	1	0	1	0	1	-.568	3
543		6	max	1091.163	3	1466.997	1	0	1	0	1	0	1	.099	3
544			min	-736.879	2	-1263.774	3	0	1	0	1	0	1	-.804	1
545		7	max	1091.617	3	1465.699	1	0	1	0	1	0	1	.766	3
546			min	-736.274	2	-1264.748	3	0	1	0	1	0	1	-1.578	1
547		8	max	1092.071	3	1464.401	1	0	1	0	1	0	1	1.434	3
548			min	-735.669	2	-1265.722	3	0	1	0	1	0	1	-2.351	1
549		9	max	1115.01	3	115.731	2	0	1	0	1	0	1	1.654	3
550			min	-576.176	2	.393	15	0	1	0	1	0	1	-2.66	1
551		10	max	1115.464	3	114.433	2	0	1	0	1	0	1	1.598	3
552			min	-575.571	2	.001	15	0	1	0	1	0	1	-2.693	1
553		11	max	1115.918	3	113.135	2	0	1	0	1	0	1	1.543	3
554			min	-574.965	2	-1.422	4	0	1	0	1	0	1	-2.725	1
555		12	max	1138.974	3	795.005	3	0	1	0	1	0	1	1.353	3
556			min	-415.491	2	-1588.571	1	0	1	0	1	0	1	-2.429	1
557		13	max	1139.428	3	794.031	3	0	1	0	1	0	1	.934	3
558			min	-414.885	2	-1589.87	1	0	1	0	1	0	1	-1.59	1
559		14	max	1139.882	3	793.057	3	0	1	0	1	0	1	.515	3
560			min	-414.28	2	-1591.168	1	0	1	0	1	0	1	-.751	1
561		15	max	1140.336	3	792.084	3	0	1	0	1	0	1	.148	2
562			min	-413.675	2	-1592.466	1	0	1	0	1	0	1	-.004	13
563		16	max	1140.79	3	791.11	3	0	1	0	1	0	1	.972	2
564			min	-413.069	2	-1593.764	1	0	1	0	1	0	1	-.321	3
565		17	max	1141.244	3	790.136	3	0	1	0	1	0	1	1.796	2
566			min	-412.464	2	-1595.063	1	0	1	0	1	0	1	-.738	3
567		18	max	-16.057	12	1722.74	2	0	1	0	1	0	1	.926	2
568			min	-400.139	1	-701.551	3	0	1	0	1	0	1	-.386	3
569		19	max	-15.755	12	1721.442	2	0	1	0	1	0	1	.02	1
570			min	-399.534	1	-702.525	3	0	1	0	1	0	1	-.016	3
571	M9	1	max	185.565	1	551.139	3	120.177	1	0	3	-.012	15	0	3
572			min	7.643	15	-429.983	1	4.973	15	0	1	-.287	1	-.011	1
573		2	max	186.17	1	550.165	3	120.177	1	0	3	-.009	15	.216	1
574			min	7.825	15	-431.282	1	4.973	15	0	1	-.224	1	-.291	3
575		3	max	338.576	3	479.052	1	119.666	1	0	1	-.007	15	.433	1
576			min	-203.282	2	-389.716	3	4.942	15	0	3	-.161	1	-.569	3
577		4	max	339.03	3	477.754	1	119.666	1	0	1	-.004	15	.18	1
578			min	-202.677	2	-390.689	3	4.942	15	0	3	-.097	1	-.363	3
579		5	max	339.484	3	476.456	1	119.666	1	0	1	-.001	15	-.003	15
580			min	-202.071	2	-391.663	3	4.942	15	0	3	-.034	1	-.157	3
581		6	max	339.938	3	475.158	1	119.666	1	0	1	.029	1	.05	3
582			min	-201.466	2	-392.637	3	4.942	15	0	3	.001	15	-.323	1
583		7	max	340.392	3	473.859	1	119.666	1	0	1	.092	1	.257	3
584			min	-200.861	2	-393.61	3	4.942	15	0	3	.004	15	-.573	1
585		8	max	340.846	3	472.561	1	119.666	1	0	1	.155	1	.465	3
586			min	-200.255	2	-394.584	3	4.942	15	0	3	.006	15	-.823	1
587		9	max	353.837	3	34.922	2	173.93	1	0	3	-.004	15	.545	3
588			min	-122.476	2	.396	15	7.188	15	0	9	-.091	1	-.938	1
589		10	max	354.291	3	33.623	2	173.93	1	0	3	.001	1	.529	3
590			min	-121.87	2	.004	15	7.188	15	0	9	0	15	-.947	1
591		11	max	354.745	3	32.325	2	173.93	1	0	3	.093	1	.514	3
592			min	-121.265	2	-1.583	4	7.188	15	0	9	.004	15	-.956	1
593		12	max	367.677	3	248.888	3	116.844	1	0	3	-.006	15	.447	3
594			min	-70.649	10	-509.321	1	4.82	15	0	2	-.153	1	-.845	1
595		13	max	368.131	3	247.915	3	116.844	1	0	3	-.004	15	.316	3
596			min	-70.145	10	-510.619	1	4.82	15	0	2	-.091	1	-.575	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	368.585	3	246.941	3	116.844	1	0	3	-.001	15	.186	3
598			min	-69.64	10	-511.917	1	4.82	15	0	2	-.03	1	-.306	1
599		15	max	369.039	3	245.967	3	116.844	1	0	3	.032	1	.055	3
600			min	-69.136	10	-513.216	1	4.82	15	0	2	.001	15	-.035	1
601		16	max	369.493	3	244.994	3	116.844	1	0	3	.094	1	.253	2
602			min	-68.631	10	-514.514	1	4.82	15	0	2	.004	15	-.074	3
603		17	max	369.947	3	244.02	3	116.844	1	0	3	.155	1	.519	2
604			min	-68.127	10	-515.812	1	4.82	15	0	2	.006	15	-.203	3
605		18	max	-7.832	15	511.908	2	128.547	1	0	2	.221	1	.261	2
606			min	-186.386	1	-204.985	3	5.315	15	0	3	.009	15	-.101	3
607		19	max	-7.649	15	510.609	2	128.547	1	0	2	.289	1	.008	3
608			min	-185.781	1	-205.959	3	5.315	15	0	3	.012	15	-.01	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	.094	1	.006	3	7.556e-3	1	NC	1	NC	1
2			min	0	15	-.009	3	-.003	2	-8.747e-4	3	NC	1	NC	1
3		2	max	.001	1	.293	3	.049	1	8.732e-3	1	NC	5	NC	2
4			min	0	15	-.123	1	.002	15	-8.801e-4	3	833.167	3	5329.631	1
5		3	max	0	1	.538	3	.118	1	9.908e-3	1	NC	5	NC	3
6			min	0	15	-.296	1	.005	15	-8.855e-4	3	460.301	3	2166.908	1
7		4	max	0	1	.687	3	.178	1	1.108e-2	1	NC	5	NC	3
8			min	0	15	-.393	1	.007	15	-8.909e-4	3	361.849	3	1429.201	1
9		5	max	0	1	.722	3	.21	1	1.226e-2	1	NC	5	NC	3
10			min	0	15	-.402	1	.009	15	-8.963e-4	3	344.594	3	1214.467	1
11		6	max	0	1	.646	3	.203	1	1.344e-2	1	NC	5	NC	3
12			min	0	15	-.325	1	.009	15	-9.017e-4	3	384.955	3	1254.958	1
13		7	max	0	1	.48	3	.16	1	1.461e-2	1	NC	5	NC	3
14			min	0	15	-.18	1	.007	15	-9.071e-4	3	514.8	3	1594.293	1
15		8	max	0	1	.271	3	.094	1	1.579e-2	1	NC	4	NC	3
16			min	0	15	-.01	9	.004	10	-9.125e-4	3	901.175	3	2740.534	1
17		9	max	0	1	.156	2	.028	1	1.696e-2	1	NC	4	NC	2
18			min	0	15	.005	15	-.004	10	-9.179e-4	3	2823.844	3	9695.748	1
19		10	max	0	1	.224	1	.019	3	1.814e-2	1	NC	3	NC	1
20			min	0	1	-.006	3	-.012	2	-9.233e-4	3	1934.873	1	NC	1
21		11	max	0	15	.156	2	.028	1	1.696e-2	1	NC	4	NC	2
22			min	0	1	.005	15	-.004	10	-9.179e-4	3	2823.844	3	9695.748	1
23		12	max	0	15	.271	3	.094	1	1.579e-2	1	NC	4	NC	3
24			min	0	1	-.01	9	.004	10	-9.125e-4	3	901.175	3	2740.534	1
25		13	max	0	15	.48	3	.16	1	1.461e-2	1	NC	5	NC	3
26			min	0	1	-.18	1	.007	15	-9.071e-4	3	514.8	3	1594.293	1
27		14	max	0	15	.646	3	.203	1	1.344e-2	1	NC	5	NC	3
28			min	0	1	-.325	1	.009	15	-9.017e-4	3	384.955	3	1254.958	1
29		15	max	0	15	.722	3	.21	1	1.226e-2	1	NC	5	NC	3
30			min	0	1	-.402	1	.009	15	-8.963e-4	3	344.594	3	1214.467	1
31		16	max	0	15	.687	3	.178	1	1.108e-2	1	NC	5	NC	3
32			min	0	1	-.393	1	.007	15	-8.909e-4	3	361.849	3	1429.201	1
33		17	max	0	15	.538	3	.118	1	9.908e-3	1	NC	5	NC	3
34			min	0	1	-.296	1	.005	15	-8.855e-4	3	460.301	3	2166.908	1
35		18	max	0	15	.293	3	.049	1	8.732e-3	1	NC	5	NC	2
36			min	-.001	1	-.123	1	.002	15	-8.801e-4	3	833.167	3	5329.631	1
37		19	max	0	15	.094	1	.006	3	7.556e-3	1	NC	1	NC	1
38			min	-.001	1	-.009	3	-.003	2	-8.747e-4	3	NC	1	NC	1
39	M14	1	max	0	1	.161	3	.005	3	4.723e-3	1	NC	1	NC	1
40			min	0	15	-.308	1	-.002	2	-2.905e-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	.441	3	.035	1	5.687e-3	1	NC	5	NC	2
42			min	0	15	-.638	1	.002	15	-3.554e-3	3	763.547	1	7752.541	1
43		3	max	0	1	.676	3	.096	1	6.651e-3	1	NC	15	NC	3
44			min	0	15	-.92	1	.004	15	-4.203e-3	3	411.49	1	2688.902	1
45		4	max	0	1	.836	3	.154	1	7.615e-3	1	NC	15	NC	3
46			min	0	15	-1.122	1	.006	15	-4.852e-3	3	309.451	1	1663.069	1
47		5	max	0	1	.907	3	.187	1	8.579e-3	1	9593.234	15	NC	3
48			min	0	15	-1.227	1	.008	15	-5.501e-3	3	274.109	1	1364.629	1
49		6	max	0	1	.889	3	.185	1	9.543e-3	1	9557.478	15	NC	3
50			min	0	15	-1.235	1	.008	15	-6.15e-3	3	271.8	1	1379.195	1
51		7	max	0	1	.798	3	.148	1	1.051e-2	1	NC	15	NC	3
52			min	0	15	-1.162	1	.006	15	-6.799e-3	3	295.155	1	1724.794	1
53		8	max	0	1	.665	3	.088	1	1.147e-2	1	NC	15	NC	3
54			min	0	15	-1.04	1	.004	10	-7.448e-3	3	344.49	1	2926.578	1
55		9	max	0	1	.538	3	.027	1	1.243e-2	1	NC	15	NC	1
56			min	0	15	-.917	1	-.004	10	-8.097e-3	3	413.884	1	NC	1
57		10	max	0	1	.479	3	.017	3	1.34e-2	1	NC	5	NC	1
58			min	0	1	-.859	1	-.011	2	-8.746e-3	3	457.661	1	NC	1
59		11	max	0	15	.538	3	.027	1	1.243e-2	1	NC	15	NC	1
60			min	0	1	-.917	1	-.004	10	-8.097e-3	3	413.884	1	NC	1
61		12	max	0	15	.665	3	.088	1	1.147e-2	1	NC	15	NC	3
62			min	0	1	-1.04	1	.004	10	-7.448e-3	3	344.49	1	2926.578	1
63		13	max	0	15	.798	3	.148	1	1.051e-2	1	NC	15	NC	3
64			min	0	1	-1.162	1	.006	15	-6.799e-3	3	295.155	1	1724.794	1
65		14	max	0	15	.889	3	.185	1	9.543e-3	1	9557.478	15	NC	3
66			min	0	1	-1.235	1	.008	15	-6.15e-3	3	271.8	1	1379.195	1
67		15	max	0	15	.907	3	.187	1	8.579e-3	1	9593.234	15	NC	3
68			min	0	1	-1.227	1	.008	15	-5.501e-3	3	274.109	1	1364.629	1
69		16	max	0	15	.836	3	.154	1	7.615e-3	1	NC	15	NC	3
70			min	0	1	-1.122	1	.006	15	-4.852e-3	3	309.451	1	1663.069	1
71		17	max	0	15	.676	3	.096	1	6.651e-3	1	NC	15	NC	3
72			min	0	1	-.92	1	.004	15	-4.203e-3	3	411.49	1	2688.902	1
73		18	max	0	15	.441	3	.035	1	5.687e-3	1	NC	5	NC	2
74			min	0	1	-.638	1	.002	15	-3.554e-3	3	763.547	1	7752.541	1
75		19	max	0	15	.161	3	.005	3	4.723e-3	1	NC	1	NC	1
76			min	0	1	-.308	1	-.002	2	-2.905e-3	3	NC	1	NC	1
77	M15	1	max	0	15	.165	3	.005	3	2.443e-3	3	NC	1	NC	1
78			min	0	1	-.307	1	-.002	2	-4.842e-3	1	NC	1	NC	1
79		2	max	0	15	.333	3	.035	1	2.993e-3	3	NC	5	NC	2
80			min	0	1	-.675	1	.002	15	-5.838e-3	1	686.117	1	7716.62	1
81		3	max	0	15	.478	3	.096	1	3.544e-3	3	NC	15	NC	3
82			min	0	1	-.987	1	.004	15	-6.833e-3	1	370.711	1	2681.615	1
83		4	max	0	15	.584	3	.154	1	4.094e-3	3	NC	15	NC	3
84			min	0	1	-1.207	1	.006	15	-7.828e-3	1	280.025	1	1659.585	1
85		5	max	0	15	.643	3	.187	1	4.645e-3	3	9606.535	15	NC	3
86			min	0	1	-1.316	1	.008	15	-8.823e-3	1	249.756	1	1362.049	1
87		6	max	0	15	.654	3	.185	1	5.195e-3	3	9573.332	15	NC	3
88			min	0	1	-1.314	1	.008	15	-9.818e-3	1	250.238	1	1376.501	1
89		7	max	0	15	.626	3	.149	1	5.745e-3	3	NC	15	NC	3
90			min	0	1	-1.22	1	.006	15	-1.081e-2	1	276.02	1	1720.677	1
91		8	max	0	15	.572	3	.089	1	6.296e-3	3	NC	15	NC	3
92			min	0	1	-1.072	1	.004	15	-1.181e-2	1	329.628	1	2915.272	1
93		9	max	0	15	.516	3	.027	1	6.846e-3	3	NC	15	NC	1
94			min	0	1	-.925	1	-.003	10	-1.28e-2	1	407.692	1	NC	1
95		10	max	0	1	.489	3	.016	3	7.397e-3	3	NC	5	NC	1
96			min	0	1	-.857	1	-.011	2	-1.38e-2	1	458.892	1	NC	1
97		11	max	0	1	.516	3	.027	1	6.846e-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	-.925	1	-.003	10	-1.28e-2	1	407.692	1	NC	1
99		12	max	0	1	.572	3	.089	1	6.296e-3	3	NC	15	NC	3
100			min	0	15	-1.072	1	.004	15	-1.181e-2	1	329.628	1	2915.272	1
101		13	max	0	1	.626	3	.149	1	5.745e-3	3	NC	15	NC	3
102			min	0	15	-1.22	1	.006	15	-1.081e-2	1	276.02	1	1720.677	1
103		14	max	0	1	.654	3	.185	1	5.195e-3	3	9573.332	15	NC	3
104			min	0	15	-1.314	1	.008	15	-9.818e-3	1	250.238	1	1376.501	1
105		15	max	0	1	.643	3	.187	1	4.645e-3	3	9606.535	15	NC	3
106			min	0	15	-1.316	1	.008	15	-8.823e-3	1	249.756	1	1362.049	1
107		16	max	0	1	.584	3	.154	1	4.094e-3	3	NC	15	NC	3
108			min	0	15	-1.207	1	.006	15	-7.828e-3	1	280.025	1	1659.585	1
109		17	max	0	1	.478	3	.096	1	3.544e-3	3	NC	15	NC	3
110			min	0	15	-.987	1	.004	15	-6.833e-3	1	370.711	1	2681.615	1
111		18	max	0	1	.333	3	.035	1	2.993e-3	3	NC	5	NC	2
112			min	0	15	-.675	1	.002	15	-5.838e-3	1	686.117	1	7716.62	1
113		19	max	0	1	.165	3	.005	3	2.443e-3	3	NC	1	NC	1
114			min	0	15	-.307	1	-.002	2	-4.842e-3	1	NC	1	NC	1
115	M16	1	max	0	15	.092	1	.004	3	4.313e-3	3	NC	1	NC	1
116			min	-.001	1	-.054	3	-.002	2	-7.046e-3	1	NC	1	NC	1
117		2	max	0	15	.045	3	.049	1	5.123e-3	3	NC	5	NC	2
118			min	-.001	1	-.182	2	.002	15	-8.096e-3	1	957.004	2	5366.209	1
119		3	max	0	15	.123	3	.118	1	5.932e-3	3	NC	5	NC	3
120			min	0	1	-.392	2	.005	15	-9.147e-3	1	532.155	2	2174.255	1
121		4	max	0	15	.165	3	.178	1	6.742e-3	3	NC	5	NC	3
122			min	0	1	-.514	2	.007	15	-1.02e-2	1	423.422	2	1431.385	1
123		5	max	0	15	.165	3	.209	1	7.552e-3	3	NC	5	NC	3
124			min	0	1	-.53	2	.009	15	-1.125e-2	1	411.907	2	1214.511	1
125		6	max	0	15	.124	3	.203	1	8.361e-3	3	NC	5	NC	3
126			min	0	1	-.445	2	.009	15	-1.23e-2	1	478.825	2	1252.872	1
127		7	max	0	15	.052	3	.161	1	9.171e-3	3	NC	5	NC	3
128			min	0	1	-.279	2	.007	15	-1.335e-2	1	698.736	2	1587.265	1
129		8	max	0	15	.001	13	.095	1	9.98e-3	3	NC	3	NC	3
130			min	0	1	-.074	2	.004	15	-1.44e-2	1	1614.802	2	2710.129	1
131		9	max	0	15	.137	1	.029	1	1.079e-2	3	NC	4	NC	2
132			min	0	1	-.112	3	-.003	10	-1.545e-2	1	4299.317	3	9243.092	1
133		10	max	0	1	.218	1	.014	3	1.16e-2	3	NC	5	NC	1
134			min	0	1	-.147	3	-.01	2	-1.65e-2	1	1987.07	1	NC	1
135		11	max	0	1	.137	1	.029	1	1.079e-2	3	NC	4	NC	2
136			min	0	15	-.112	3	-.003	10	-1.545e-2	1	4299.317	3	9243.092	1
137		12	max	0	1	.001	13	.095	1	9.98e-3	3	NC	3	NC	3
138			min	0	15	-.074	2	.004	15	-1.44e-2	1	1614.802	2	2710.129	1
139		13	max	0	1	.052	3	.161	1	9.171e-3	3	NC	5	NC	3
140			min	0	15	-.279	2	.007	15	-1.335e-2	1	698.736	2	1587.265	1
141		14	max	0	1	.124	3	.203	1	8.361e-3	3	NC	5	NC	3
142			min	0	15	-.445	2	.009	15	-1.23e-2	1	478.825	2	1252.872	1
143		15	max	0	1	.165	3	.209	1	7.552e-3	3	NC	5	NC	3
144			min	0	15	-.53	2	.009	15	-1.125e-2	1	411.907	2	1214.511	1
145		16	max	0	1	.165	3	.178	1	6.742e-3	3	NC	5	NC	3
146			min	0	15	-.514	2	.007	15	-1.02e-2	1	423.422	2	1431.385	1
147		17	max	0	1	.123	3	.118	1	5.932e-3	3	NC	5	NC	3
148			min	0	15	-.392	2	.005	15	-9.147e-3	1	532.155	2	2174.255	1
149		18	max	.001	1	.045	3	.049	1	5.123e-3	3	NC	5	NC	2
150			min	0	15	-.182	2	.002	15	-8.096e-3	1	957.004	2	5366.209	1
151		19	max	.001	1	.092	1	.004	3	4.313e-3	3	NC	1	NC	1
152			min	0	15	-.054	3	-.002	2	-7.046e-3	1	NC	1	NC	1
153	M2	1	max	.006	1	.005	2	.009	1	-1.065e-5	15	NC	1	NC	2
154			min	-.006	3	-.009	3	0	15	-2.581e-4	1	NC	1	6753.038	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
155		2	max	.006	1	.004	2	.009	1	-9.988e-6	15	NC	1	NC	2
156			min	-.006	3	-.008	3	0	15	-2.421e-4	1	NC	1	7366.755	1
157		3	max	.005	1	.003	2	.008	1	-9.328e-6	15	NC	1	NC	2
158			min	-.005	3	-.008	3	0	15	-2.261e-4	1	NC	1	8098.472	1
159		4	max	.005	1	.002	2	.007	1	-8.669e-6	15	NC	1	NC	2
160			min	-.005	3	-.008	3	0	15	-2.101e-4	1	NC	1	8979.558	1
161		5	max	.005	1	.002	2	.006	1	-8.009e-6	15	NC	1	NC	1
162			min	-.005	3	-.008	3	0	15	-1.941e-4	1	NC	1	NC	1
163		6	max	.004	1	.001	2	.006	1	-7.349e-6	15	NC	1	NC	1
164			min	-.004	3	-.007	3	0	15	-1.781e-4	1	NC	1	NC	1
165		7	max	.004	1	0	2	.005	1	-6.689e-6	15	NC	1	NC	1
166			min	-.004	3	-.007	3	0	15	-1.621e-4	1	NC	1	NC	1
167		8	max	.004	1	0	2	.004	1	-6.03e-6	15	NC	1	NC	1
168			min	-.004	3	-.007	3	0	15	-1.461e-4	1	NC	1	NC	1
169		9	max	.003	1	0	2	.003	1	-5.37e-6	15	NC	1	NC	1
170			min	-.003	3	-.006	3	0	15	-1.301e-4	1	NC	1	NC	1
171		10	max	.003	1	0	15	.003	1	-4.71e-6	15	NC	1	NC	1
172			min	-.003	3	-.006	3	0	15	-1.141e-4	1	NC	1	NC	1
173		11	max	.003	1	0	15	.002	1	-4.05e-6	15	NC	1	NC	1
174			min	-.003	3	-.005	3	0	15	-9.808e-5	1	NC	1	NC	1
175		12	max	.002	1	0	15	.002	1	-3.391e-6	15	NC	1	NC	1
176			min	-.002	3	-.005	3	0	15	-8.208e-5	1	NC	1	NC	1
177		13	max	.002	1	0	15	.001	1	-2.731e-6	15	NC	1	NC	1
178			min	-.002	3	-.004	3	0	15	-6.608e-5	1	NC	1	NC	1
179		14	max	.002	1	0	15	0	1	-2.071e-6	15	NC	1	NC	1
180			min	-.002	3	-.004	3	0	15	-5.008e-5	1	NC	1	NC	1
181		15	max	.001	1	0	15	0	1	-1.411e-6	15	NC	1	NC	1
182			min	-.001	3	-.003	3	0	15	-3.408e-5	1	NC	1	NC	1
183		16	max	0	1	0	15	0	1	-7.517e-7	15	NC	1	NC	1
184			min	0	3	-.003	4	0	15	-1.808e-5	1	NC	1	NC	1
185		17	max	0	1	0	15	0	1	-9.195e-8	15	NC	1	NC	1
186			min	0	3	-.002	4	0	15	-2.083e-6	1	NC	1	NC	1
187		18	max	0	1	0	15	0	1	1.392e-5	1	NC	1	NC	1
188			min	0	3	-.001	4	0	15	4.923e-7	12	NC	1	NC	1
189		19	max	0	1	0	1	0	1	2.992e-5	1	NC	1	NC	1
190			min	0	1	0	1	0	1	1.228e-6	15	NC	1	NC	1
191	M3	1	max	0	1	0	1	0	1	-4.053e-7	15	NC	1	NC	1
192			min	0	1	0	1	0	1	-9.869e-6	1	NC	1	NC	1
193		2	max	0	3	0	15	0	1	1.699e-5	1	NC	1	NC	1
194			min	0	2	-.002	4	0	15	7.011e-7	15	NC	1	NC	1
195		3	max	0	3	0	15	0	1	4.385e-5	1	NC	1	NC	1
196			min	0	2	-.004	4	0	15	1.807e-6	15	NC	1	NC	1
197		4	max	0	3	-.001	15	0	1	7.071e-5	1	NC	1	NC	1
198			min	0	2	-.006	4	0	15	2.914e-6	15	NC	1	NC	1
199		5	max	.001	3	-.002	15	0	1	9.757e-5	1	NC	1	NC	1
200			min	0	2	-.007	4	0	15	4.02e-6	15	NC	1	NC	1
201		6	max	.001	3	-.002	15	.001	1	1.244e-4	1	NC	1	NC	1
202			min	-.001	2	-.009	4	0	15	5.127e-6	15	NC	1	NC	1
203		7	max	.002	3	-.003	15	.001	1	1.513e-4	1	NC	1	NC	1
204			min	-.001	2	-.011	4	0	15	6.233e-6	15	8604.047	4	NC	1
205		8	max	.002	3	-.003	15	.002	1	1.781e-4	1	NC	1	NC	1
206			min	-.001	2	-.012	4	0	15	7.34e-6	15	7724.871	4	NC	1
207		9	max	.002	3	-.003	15	.002	1	2.05e-4	1	NC	2	NC	1
208			min	-.002	2	-.013	4	0	15	8.446e-6	15	7205.067	4	NC	1
209		10	max	.002	3	-.003	15	.002	1	2.319e-4	1	NC	3	NC	1
210			min	-.002	2	-.013	4	0	15	9.552e-6	15	6954.083	4	NC	1
211		11	max	.003	3	-.003	15	.003	1	2.587e-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	-.002	2	-.014	4	0	15	1.066e-5	15	6934.947	4	NC	1
213		12	max	.003	3	-.003	15	.003	1	2.856e-4	1	NC	3	NC	1
214			min	-.002	2	-.013	4	0	15	1.177e-5	15	7150.082	4	NC	1
215		13	max	.003	3	-.003	15	.004	1	3.124e-4	1	NC	1	NC	1
216			min	-.002	2	-.012	4	0	15	1.287e-5	15	7644.059	4	NC	1
217		14	max	.004	3	-.003	15	.005	1	3.393e-4	1	NC	1	NC	1
218			min	-.003	2	-.011	4	0	15	1.398e-5	15	8526.697	4	NC	1
219		15	max	.004	3	-.002	15	.005	1	3.662e-4	1	NC	1	NC	1
220			min	-.003	2	-.01	4	0	15	1.508e-5	15	NC	1	NC	1
221		16	max	.004	3	-.002	15	.006	1	3.93e-4	1	NC	1	NC	1
222			min	-.003	2	-.008	4	0	15	1.619e-5	15	NC	1	NC	1
223		17	max	.004	3	-.001	15	.007	1	4.199e-4	1	NC	1	NC	1
224			min	-.003	2	-.006	1	0	15	1.73e-5	15	NC	1	NC	1
225		18	max	.005	3	0	15	.008	1	4.467e-4	1	NC	1	NC	1
226			min	-.003	2	-.004	1	0	15	1.84e-5	15	NC	1	NC	1
227		19	max	.005	3	0	15	.009	1	4.736e-4	1	NC	1	NC	1
228			min	-.004	2	-.003	1	0	15	1.951e-5	15	NC	1	NC	1
229	M4	1	max	.003	1	.003	2	0	15	6.44e-5	1	NC	1	NC	3
230			min	0	3	-.005	3	-.009	1	2.664e-6	15	NC	1	2806.748	1
231		2	max	.003	1	.003	2	0	15	6.44e-5	1	NC	1	NC	3
232			min	0	3	-.005	3	-.008	1	2.664e-6	15	NC	1	3051.755	1
233		3	max	.002	1	.003	2	0	15	6.44e-5	1	NC	1	NC	3
234			min	0	3	-.004	3	-.007	1	2.664e-6	15	NC	1	3343.374	1
235		4	max	.002	1	.003	2	0	15	6.44e-5	1	NC	1	NC	3
236			min	0	3	-.004	3	-.007	1	2.664e-6	15	NC	1	3693.709	1
237		5	max	.002	1	.002	2	0	15	6.44e-5	1	NC	1	NC	2
238			min	0	3	-.004	3	-.006	1	2.664e-6	15	NC	1	4119.209	1
239		6	max	.002	1	.002	2	0	15	6.44e-5	1	NC	1	NC	2
240			min	0	3	-.004	3	-.005	1	2.664e-6	15	NC	1	4642.689	1
241		7	max	.002	1	.002	2	0	15	6.44e-5	1	NC	1	NC	2
242			min	0	3	-.003	3	-.005	1	2.664e-6	15	NC	1	5296.53	1
243		8	max	.002	1	.002	2	0	15	6.44e-5	1	NC	1	NC	2
244			min	0	3	-.003	3	-.004	1	2.664e-6	15	NC	1	6127.96	1
245		9	max	.001	1	.002	2	0	15	6.44e-5	1	NC	1	NC	2
246			min	0	3	-.003	3	-.003	1	2.664e-6	15	NC	1	7208.077	1
247		10	max	.001	1	.002	2	0	15	6.44e-5	1	NC	1	NC	2
248			min	0	3	-.002	3	-.003	1	2.664e-6	15	NC	1	8648.02	1
249		11	max	.001	1	.001	2	0	15	6.44e-5	1	NC	1	NC	1
250			min	0	3	-.002	3	-.002	1	2.664e-6	15	NC	1	NC	1
251		12	max	.001	1	.001	2	0	15	6.44e-5	1	NC	1	NC	1
252			min	0	3	-.002	3	-.002	1	2.664e-6	15	NC	1	NC	1
253		13	max	0	1	.001	2	0	15	6.44e-5	1	NC	1	NC	1
254			min	0	3	-.002	3	-.001	1	2.664e-6	15	NC	1	NC	1
255		14	max	0	1	0	2	0	15	6.44e-5	1	NC	1	NC	1
256			min	0	3	-.001	3	-.001	1	2.664e-6	15	NC	1	NC	1
257		15	max	0	1	0	2	0	15	6.44e-5	1	NC	1	NC	1
258			min	0	3	-.001	3	0	1	2.664e-6	15	NC	1	NC	1
259		16	max	0	1	0	2	0	15	6.44e-5	1	NC	1	NC	1
260			min	0	3	0	3	0	1	2.664e-6	15	NC	1	NC	1
261		17	max	0	1	0	2	0	15	6.44e-5	1	NC	1	NC	1
262			min	0	3	0	3	0	1	2.664e-6	15	NC	1	NC	1
263		18	max	0	1	0	2	0	15	6.44e-5	1	NC	1	NC	1
264			min	0	3	0	3	0	1	2.664e-6	15	NC	1	NC	1
265		19	max	0	1	0	1	0	1	6.44e-5	1	NC	1	NC	1
266			min	0	1	0	1	0	1	2.664e-6	15	NC	1	NC	1
267	M6	1	max	.019	1	.019	2	0	1	0	1	NC	3	NC	1
268			min	-.02	3	-.027	3	0	1	0	1	3286.919	2	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
269		2	max	.018	1	.017	2	0	1	0	1	NC	3	NC	1
270			min	-.019	3	-.025	3	0	1	0	1	3614.534	2	NC	1
271		3	max	.017	1	.016	2	0	1	0	1	NC	3	NC	1
272			min	-.017	3	-.024	3	0	1	0	1	4011.215	2	NC	1
273		4	max	.016	1	.014	2	0	1	0	1	NC	3	NC	1
274			min	-.016	3	-.023	3	0	1	0	1	4497.042	2	NC	1
275		5	max	.015	1	.012	2	0	1	0	1	NC	1	NC	1
276			min	-.015	3	-.021	3	0	1	0	1	5100.218	2	NC	1
277		6	max	.014	1	.011	2	0	1	0	1	NC	1	NC	1
278			min	-.014	3	-.02	3	0	1	0	1	5861.364	2	NC	1
279		7	max	.013	1	.009	2	0	1	0	1	NC	1	NC	1
280			min	-.013	3	-.018	3	0	1	0	1	6840.748	2	NC	1
281		8	max	.012	1	.008	2	0	1	0	1	NC	1	NC	1
282			min	-.012	3	-.017	3	0	1	0	1	8130.994	2	NC	1
283		9	max	.01	1	.006	2	0	1	0	1	NC	1	NC	1
284			min	-.011	3	-.015	3	0	1	0	1	9880.61	2	NC	1
285		10	max	.009	1	.005	2	0	1	0	1	NC	1	NC	1
286			min	-.01	3	-.014	3	0	1	0	1	NC	1	NC	1
287		11	max	.008	1	.004	2	0	1	0	1	NC	1	NC	1
288			min	-.009	3	-.012	3	0	1	0	1	NC	1	NC	1
289		12	max	.007	1	.003	2	0	1	0	1	NC	1	NC	1
290			min	-.008	3	-.011	3	0	1	0	1	NC	1	NC	1
291		13	max	.006	1	.002	2	0	1	0	1	NC	1	NC	1
292			min	-.007	3	-.009	3	0	1	0	1	NC	1	NC	1
293		14	max	.005	1	.001	2	0	1	0	1	NC	1	NC	1
294			min	-.005	3	-.008	3	0	1	0	1	NC	1	NC	1
295		15	max	.004	1	0	2	0	1	0	1	NC	1	NC	1
296			min	-.004	3	-.006	3	0	1	0	1	NC	1	NC	1
297		16	max	.003	1	0	2	0	1	0	1	NC	1	NC	1
298			min	-.003	3	-.005	3	0	1	0	1	NC	1	NC	1
299		17	max	.002	1	0	2	0	1	0	1	NC	1	NC	1
300			min	-.002	3	-.003	3	0	1	0	1	NC	1	NC	1
301		18	max	.001	1	0	2	0	1	0	1	NC	1	NC	1
302			min	-.001	3	-.002	3	0	1	0	1	NC	1	NC	1
303		19	max	0	1	0	1	0	1	0	1	NC	1	NC	1
304			min	0	1	0	1	0	1	0	1	NC	1	NC	1
305	M7	1	max	0	1	0	1	0	1	0	1	NC	1	NC	1
306			min	0	1	0	1	0	1	0	1	NC	1	NC	1
307		2	max	0	3	0	15	0	1	0	1	NC	1	NC	1
308			min	0	2	-.002	3	0	1	0	1	NC	1	NC	1
309		3	max	.002	3	0	15	0	1	0	1	NC	1	NC	1
310			min	-.002	2	-.004	3	0	1	0	1	NC	1	NC	1
311		4	max	.003	3	-.001	15	0	1	0	1	NC	1	NC	1
312			min	-.002	2	-.006	3	0	1	0	1	NC	1	NC	1
313		5	max	.003	3	-.002	15	0	1	0	1	NC	1	NC	1
314			min	-.003	2	-.008	3	0	1	0	1	NC	1	NC	1
315		6	max	.004	3	-.002	15	0	1	0	1	NC	1	NC	1
316			min	-.004	2	-.01	3	0	1	0	1	NC	1	NC	1
317		7	max	.005	3	-.003	15	0	1	0	1	NC	1	NC	1
318			min	-.005	2	-.011	3	0	1	0	1	8817.992	4	NC	1
319		8	max	.006	3	-.003	15	0	1	0	1	NC	1	NC	1
320			min	-.006	2	-.012	3	0	1	0	1	7902.837	4	NC	1
321		9	max	.007	3	-.003	15	0	1	0	1	NC	1	NC	1
322			min	-.007	2	-.013	4	0	1	0	1	7360.144	4	NC	1
323		10	max	.008	3	-.003	15	0	1	0	1	NC	1	NC	1
324			min	-.007	2	-.014	4	0	1	0	1	7094.951	4	NC	1
325		11	max	.008	3	-.003	15	0	1	0	1	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
326			min	-.008	2	-.014	4	0	1	0	1	7068.048	4	NC	1
327		12	max	.009	3	-.003	15	0	1	0	1	NC	1	NC	1
328			min	-.009	2	-.013	4	0	1	0	1	7280.91	4	NC	1
329		13	max	.01	3	-.003	15	0	1	0	1	NC	1	NC	1
330			min	-.01	2	-.013	4	0	1	0	1	7778.187	4	NC	1
331		14	max	.011	3	-.003	15	0	1	0	1	NC	1	NC	1
332			min	-.011	2	-.012	4	0	1	0	1	8670.997	4	NC	1
333		15	max	.012	3	-.002	15	0	1	0	1	NC	1	NC	1
334			min	-.011	2	-.01	3	0	1	0	1	NC	1	NC	1
335		16	max	.013	3	-.002	15	0	1	0	1	NC	1	NC	1
336			min	-.012	2	-.009	1	0	1	0	1	NC	1	NC	1
337		17	max	.014	3	-.001	15	0	1	0	1	NC	1	NC	1
338			min	-.013	2	-.008	1	0	1	0	1	NC	1	NC	1
339		18	max	.014	3	0	15	0	1	0	1	NC	1	NC	1
340			min	-.014	2	-.006	1	0	1	0	1	NC	1	NC	1
341		19	max	.015	3	0	15	0	1	0	1	NC	1	NC	1
342			min	-.015	2	-.005	1	0	1	0	1	NC	1	NC	1
343	M8	1	max	.007	1	.014	2	0	1	0	1	NC	1	NC	1
344			min	0	3	-.016	3	0	1	0	1	NC	1	NC	1
345		2	max	.007	1	.013	2	0	1	0	1	NC	1	NC	1
346			min	0	3	-.015	3	0	1	0	1	NC	1	NC	1
347		3	max	.006	1	.012	2	0	1	0	1	NC	1	NC	1
348			min	0	3	-.014	3	0	1	0	1	NC	1	NC	1
349		4	max	.006	1	.011	2	0	1	0	1	NC	1	NC	1
350			min	0	3	-.013	3	0	1	0	1	NC	1	NC	1
351		5	max	.006	1	.011	2	0	1	0	1	NC	1	NC	1
352			min	0	3	-.012	3	0	1	0	1	NC	1	NC	1
353		6	max	.005	1	.01	2	0	1	0	1	NC	1	NC	1
354			min	0	3	-.011	3	0	1	0	1	NC	1	NC	1
355		7	max	.005	1	.009	2	0	1	0	1	NC	1	NC	1
356			min	0	3	-.01	3	0	1	0	1	NC	1	NC	1
357		8	max	.004	1	.008	2	0	1	0	1	NC	1	NC	1
358			min	0	3	-.01	3	0	1	0	1	NC	1	NC	1
359		9	max	.004	1	.008	2	0	1	0	1	NC	1	NC	1
360			min	0	3	-.009	3	0	1	0	1	NC	1	NC	1
361		10	max	.004	1	.007	2	0	1	0	1	NC	1	NC	1
362			min	0	3	-.008	3	0	1	0	1	NC	1	NC	1
363		11	max	.003	1	.006	2	0	1	0	1	NC	1	NC	1
364			min	0	3	-.007	3	0	1	0	1	NC	1	NC	1
365		12	max	.003	1	.005	2	0	1	0	1	NC	1	NC	1
366			min	0	3	-.006	3	0	1	0	1	NC	1	NC	1
367		13	max	.002	1	.005	2	0	1	0	1	NC	1	NC	1
368			min	0	3	-.005	3	0	1	0	1	NC	1	NC	1
369		14	max	.002	1	.004	2	0	1	0	1	NC	1	NC	1
370			min	0	3	-.004	3	0	1	0	1	NC	1	NC	1
371		15	max	.002	1	.003	2	0	1	0	1	NC	1	NC	1
372			min	0	3	-.003	3	0	1	0	1	NC	1	NC	1
373		16	max	.001	1	.002	2	0	1	0	1	NC	1	NC	1
374			min	0	3	-.003	3	0	1	0	1	NC	1	NC	1
375		17	max	0	1	.002	2	0	1	0	1	NC	1	NC	1
376			min	0	3	-.002	3	0	1	0	1	NC	1	NC	1
377		18	max	0	1	0	2	0	1	0	1	NC	1	NC	1
378			min	0	3	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	.005	2	0	15	2.581e-4	1	NC	1	NC	2
382			min	-.006	3	-.009	3	-.009	1	1.065e-5	15	NC	1	6753.038	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
383		2	max	.006	1	.004	2	0	15	2.421e-4	1	NC	1	NC	2
384			min	-.006	3	-.008	3	-.009	1	9.988e-6	15	NC	1	7366.755	1
385		3	max	.005	1	.003	2	0	15	2.261e-4	1	NC	1	NC	2
386			min	-.005	3	-.008	3	-.008	1	9.328e-6	15	NC	1	8098.472	1
387		4	max	.005	1	.002	2	0	15	2.101e-4	1	NC	1	NC	2
388			min	-.005	3	-.008	3	-.007	1	8.669e-6	15	NC	1	8979.558	1
389		5	max	.005	1	.002	2	0	15	1.941e-4	1	NC	1	NC	1
390			min	-.005	3	-.008	3	-.006	1	8.009e-6	15	NC	1	NC	1
391		6	max	.004	1	.001	2	0	15	1.781e-4	1	NC	1	NC	1
392			min	-.004	3	-.007	3	-.006	1	7.349e-6	15	NC	1	NC	1
393		7	max	.004	1	0	2	0	15	1.621e-4	1	NC	1	NC	1
394			min	-.004	3	-.007	3	-.005	1	6.689e-6	15	NC	1	NC	1
395		8	max	.004	1	0	2	0	15	1.461e-4	1	NC	1	NC	1
396			min	-.004	3	-.007	3	-.004	1	6.03e-6	15	NC	1	NC	1
397		9	max	.003	1	0	2	0	15	1.301e-4	1	NC	1	NC	1
398			min	-.003	3	-.006	3	-.003	1	5.37e-6	15	NC	1	NC	1
399		10	max	.003	1	0	15	0	15	1.141e-4	1	NC	1	NC	1
400			min	-.003	3	-.006	3	-.003	1	4.71e-6	15	NC	1	NC	1
401		11	max	.003	1	0	15	0	15	9.808e-5	1	NC	1	NC	1
402			min	-.003	3	-.005	3	-.002	1	4.05e-6	15	NC	1	NC	1
403		12	max	.002	1	0	15	0	15	8.208e-5	1	NC	1	NC	1
404			min	-.002	3	-.005	3	-.002	1	3.391e-6	15	NC	1	NC	1
405		13	max	.002	1	0	15	0	15	6.608e-5	1	NC	1	NC	1
406			min	-.002	3	-.004	3	-.001	1	2.731e-6	15	NC	1	NC	1
407		14	max	.002	1	0	15	0	15	5.008e-5	1	NC	1	NC	1
408			min	-.002	3	-.004	3	0	1	2.071e-6	15	NC	1	NC	1
409		15	max	.001	1	0	15	0	15	3.408e-5	1	NC	1	NC	1
410			min	-.001	3	-.003	3	0	1	1.411e-6	15	NC	1	NC	1
411		16	max	0	1	0	15	0	15	1.808e-5	1	NC	1	NC	1
412			min	0	3	-.003	4	0	1	7.517e-7	15	NC	1	NC	1
413		17	max	0	1	0	15	0	15	2.083e-6	1	NC	1	NC	1
414			min	0	3	-.002	4	0	1	9.195e-8	15	NC	1	NC	1
415		18	max	0	1	0	15	0	15	-4.923e-7	12	NC	1	NC	1
416			min	0	3	-.001	4	0	1	-1.392e-5	1	NC	1	NC	1
417		19	max	0	1	0	1	0	1	-1.228e-6	15	NC	1	NC	1
418			min	0	1	0	1	0	1	-2.992e-5	1	NC	1	NC	1
419	M11	1	max	0	1	0	1	0	1	9.869e-6	1	NC	1	NC	1
420			min	0	1	0	1	0	1	4.053e-7	15	NC	1	NC	1
421		2	max	0	3	0	15	0	15	-7.011e-7	15	NC	1	NC	1
422			min	0	2	-.002	4	0	1	-1.699e-5	1	NC	1	NC	1
423		3	max	0	3	0	15	0	15	-1.807e-6	15	NC	1	NC	1
424			min	0	2	-.004	4	0	1	-4.385e-5	1	NC	1	NC	1
425		4	max	0	3	-.001	15	0	15	-2.914e-6	15	NC	1	NC	1
426			min	0	2	-.006	4	0	1	-7.071e-5	1	NC	1	NC	1
427		5	max	.001	3	-.002	15	0	15	-4.02e-6	15	NC	1	NC	1
428			min	0	2	-.007	4	0	1	-9.757e-5	1	NC	1	NC	1
429		6	max	.001	3	-.002	15	0	15	-5.127e-6	15	NC	1	NC	1
430			min	-.001	2	-.009	4	-.001	1	-1.244e-4	1	NC	1	NC	1
431		7	max	.002	3	-.003	15	0	15	-6.233e-6	15	NC	1	NC	1
432			min	-.001	2	-.011	4	-.001	1	-1.513e-4	1	8604.047	4	NC	1
433		8	max	.002	3	-.003	15	0	15	-7.34e-6	15	NC	1	NC	1
434			min	-.001	2	-.012	4	-.002	1	-1.781e-4	1	7724.871	4	NC	1
435		9	max	.002	3	-.003	15	0	15	-8.446e-6	15	NC	2	NC	1
436			min	-.002	2	-.013	4	-.002	1	-2.05e-4	1	7205.067	4	NC	1
437		10	max	.002	3	-.003	15	0	15	-9.552e-6	15	NC	3	NC	1
438			min	-.002	2	-.013	4	-.002	1	-2.319e-4	1	6954.083	4	NC	1
439		11	max	.003	3	-.003	15	0	15	-1.066e-5	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	-.002	2	-.014	4	-.003	1	-2.587e-4	1	6934.947	4	NC	1
441		12	max	.003	3	-.003	15	0	15	-1.177e-5	15	NC	3	NC	1
442			min	-.002	2	-.013	4	-.003	1	-2.856e-4	1	7150.082	4	NC	1
443		13	max	.003	3	-.003	15	0	15	-1.287e-5	15	NC	1	NC	1
444			min	-.002	2	-.012	4	-.004	1	-3.124e-4	1	7644.059	4	NC	1
445		14	max	.004	3	-.003	15	0	15	-1.398e-5	15	NC	1	NC	1
446			min	-.003	2	-.011	4	-.005	1	-3.393e-4	1	8526.697	4	NC	1
447		15	max	.004	3	-.002	15	0	15	-1.508e-5	15	NC	1	NC	1
448			min	-.003	2	-.01	4	-.005	1	-3.662e-4	1	NC	1	NC	1
449		16	max	.004	3	-.002	15	0	15	-1.619e-5	15	NC	1	NC	1
450			min	-.003	2	-.008	4	-.006	1	-3.93e-4	1	NC	1	NC	1
451		17	max	.004	3	-.001	15	0	15	-1.73e-5	15	NC	1	NC	1
452			min	-.003	2	-.006	1	-.007	1	-4.199e-4	1	NC	1	NC	1
453		18	max	.005	3	0	15	0	15	-1.84e-5	15	NC	1	NC	1
454			min	-.003	2	-.004	1	-.008	1	-4.467e-4	1	NC	1	NC	1
455		19	max	.005	3	0	15	0	15	-1.951e-5	15	NC	1	NC	1
456			min	-.004	2	-.003	1	-.009	1	-4.736e-4	1	NC	1	NC	1
457	M12	1	max	.003	1	.003	2	.009	1	-2.664e-6	15	NC	1	NC	3
458			min	0	3	-.005	3	0	15	-6.44e-5	1	NC	1	2806.748	1
459		2	max	.003	1	.003	2	.008	1	-2.664e-6	15	NC	1	NC	3
460			min	0	3	-.005	3	0	15	-6.44e-5	1	NC	1	3051.755	1
461		3	max	.002	1	.003	2	.007	1	-2.664e-6	15	NC	1	NC	3
462			min	0	3	-.004	3	0	15	-6.44e-5	1	NC	1	3343.374	1
463		4	max	.002	1	.003	2	.007	1	-2.664e-6	15	NC	1	NC	3
464			min	0	3	-.004	3	0	15	-6.44e-5	1	NC	1	3693.709	1
465		5	max	.002	1	.002	2	.006	1	-2.664e-6	15	NC	1	NC	2
466			min	0	3	-.004	3	0	15	-6.44e-5	1	NC	1	4119.209	1
467		6	max	.002	1	.002	2	.005	1	-2.664e-6	15	NC	1	NC	2
468			min	0	3	-.004	3	0	15	-6.44e-5	1	NC	1	4642.689	1
469		7	max	.002	1	.002	2	.005	1	-2.664e-6	15	NC	1	NC	2
470			min	0	3	-.003	3	0	15	-6.44e-5	1	NC	1	5296.53	1
471		8	max	.002	1	.002	2	.004	1	-2.664e-6	15	NC	1	NC	2
472			min	0	3	-.003	3	0	15	-6.44e-5	1	NC	1	6127.96	1
473		9	max	.001	1	.002	2	.003	1	-2.664e-6	15	NC	1	NC	2
474			min	0	3	-.003	3	0	15	-6.44e-5	1	NC	1	7208.077	1
475		10	max	.001	1	.002	2	.003	1	-2.664e-6	15	NC	1	NC	2
476			min	0	3	-.002	3	0	15	-6.44e-5	1	NC	1	8648.02	1
477		11	max	.001	1	.001	2	.002	1	-2.664e-6	15	NC	1	NC	1
478			min	0	3	-.002	3	0	15	-6.44e-5	1	NC	1	NC	1
479		12	max	.001	1	.001	2	.002	1	-2.664e-6	15	NC	1	NC	1
480			min	0	3	-.002	3	0	15	-6.44e-5	1	NC	1	NC	1
481		13	max	0	1	.001	2	.001	1	-2.664e-6	15	NC	1	NC	1
482			min	0	3	-.002	3	0	15	-6.44e-5	1	NC	1	NC	1
483		14	max	0	1	0	2	.001	1	-2.664e-6	15	NC	1	NC	1
484			min	0	3	-.001	3	0	15	-6.44e-5	1	NC	1	NC	1
485		15	max	0	1	0	2	0	1	-2.664e-6	15	NC	1	NC	1
486			min	0	3	-.001	3	0	15	-6.44e-5	1	NC	1	NC	1
487		16	max	0	1	0	2	0	1	-2.664e-6	15	NC	1	NC	1
488			min	0	3	0	3	0	15	-6.44e-5	1	NC	1	NC	1
489		17	max	0	1	0	2	0	1	-2.664e-6	15	NC	1	NC	1
490			min	0	3	0	3	0	15	-6.44e-5	1	NC	1	NC	1
491		18	max	0	1	0	2	0	1	-2.664e-6	15	NC	1	NC	1
492			min	0	3	0	3	0	15	-6.44e-5	1	NC	1	NC	1
493		19	max	0	1	0	1	0	1	-2.664e-6	15	NC	1	NC	1
494			min	0	1	0	1	0	1	-6.44e-5	1	NC	1	NC	1
495	M1	1	max	.006	3	.094	1	.001	1	1.613e-2	1	NC	1	NC	1
496			min	-.003	2	-.009	3	0	15	-2.241e-2	3	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
497		2	max	.006	3	.046	1	0	15	7.825e-3	1	NC	3	NC	1
498			min	-.003	2	-.003	3	-.006	1	-1.109e-2	3	2375.192	1	NC	1
499		3	max	.006	3	.009	3	0	15	1.353e-5	10	NC	5	NC	1
500			min	-.003	2	-.008	2	-.009	1	-1.911e-4	1	1136.3	1	NC	1
501		4	max	.006	3	.031	3	0	15	4.333e-3	1	NC	5	NC	1
502			min	-.003	2	-.067	1	-.009	1	-3.904e-3	3	709.898	1	NC	1
503		5	max	.006	3	.061	3	0	15	8.857e-3	1	NC	15	NC	1
504			min	-.002	2	-.131	1	-.006	1	-7.699e-3	3	507.901	1	NC	1
505		6	max	.006	3	.094	3	0	15	1.338e-2	1	NC	15	NC	1
506			min	-.002	2	-.194	1	-.003	1	-1.149e-2	3	397.361	1	NC	1
507		7	max	.006	3	.126	3	0	1	1.79e-2	1	NC	15	NC	1
508			min	-.002	2	-.25	1	0	12	-1.529e-2	3	332.469	1	NC	1
509		8	max	.006	3	.153	3	.001	1	2.243e-2	1	8907.858	15	NC	1
510			min	-.002	2	-.294	1	0	15	-1.908e-2	3	294.239	1	NC	1
511		9	max	.005	3	.17	3	0	15	2.475e-2	1	8323.05	15	NC	1
512			min	-.002	2	-.323	1	0	1	-1.905e-2	3	274.394	1	NC	1
513		10	max	.005	3	.176	3	0	1	2.561e-2	1	8145	15	NC	1
514			min	-.002	2	-.332	1	0	12	-1.647e-2	3	268.455	1	NC	1
515		11	max	.005	3	.172	3	0	1	2.648e-2	1	8322.798	15	NC	1
516			min	-.002	2	-.322	1	0	15	-1.389e-2	3	274.755	1	NC	1
517		12	max	.005	3	.158	3	0	15	2.504e-2	1	8907.329	15	NC	1
518			min	-.002	2	-.293	1	-.001	1	-1.143e-2	3	295.371	1	NC	1
519		13	max	.005	3	.134	3	0	15	2.015e-2	1	NC	15	NC	1
520			min	-.002	2	-.248	1	0	1	-9.149e-3	3	335.278	1	NC	1
521		14	max	.005	3	.104	3	.002	1	1.527e-2	1	NC	15	NC	1
522			min	-.002	2	-.19	1	0	15	-6.866e-3	3	403.426	1	NC	1
523		15	max	.005	3	.071	3	.006	1	1.038e-2	1	NC	15	NC	1
524			min	-.002	2	-.127	1	0	15	-4.583e-3	3	520.462	1	NC	1
525		16	max	.005	3	.036	3	.008	1	5.49e-3	1	NC	5	NC	1
526			min	-.002	2	-.063	1	0	15	-2.3e-3	3	736.489	1	NC	1
527		17	max	.004	3	.003	3	.009	1	6.016e-4	1	NC	5	NC	1
528			min	-.002	2	-.004	2	0	15	-1.745e-5	3	1196.744	1	NC	1
529		18	max	.004	3	.047	1	.006	1	9.763e-3	2	NC	4	NC	1
530			min	-.002	2	-.026	3	0	15	-3.628e-3	3	2529.177	1	NC	1
531		19	max	.004	3	.092	1	0	15	1.955e-2	2	NC	1	NC	1
532			min	-.002	2	-.054	3	-.001	1	-7.377e-3	3	NC	1	NC	1
533	M5	1	max	.019	3	.224	1	0	1	0	1	NC	1	NC	1
534			min	-.012	2	-.006	3	0	1	0	1	NC	1	NC	1
535		2	max	.019	3	.108	1	0	1	0	1	NC	5	NC	1
536			min	-.013	2	.002	3	0	1	0	1	982.175	1	NC	1
537		3	max	.019	3	.028	3	0	1	0	1	NC	5	NC	1
538			min	-.013	2	-.025	2	0	1	0	1	459.721	1	NC	1
539		4	max	.019	3	.091	3	0	1	0	1	9456.506	15	NC	1
540			min	-.012	2	-.185	1	0	1	0	1	279.42	1	NC	1
541		5	max	.018	3	.178	3	0	1	0	1	6620.855	15	NC	1
542			min	-.012	2	-.36	1	0	1	0	1	195.574	1	NC	1
543		6	max	.018	3	.276	3	0	1	0	1	5099.166	15	NC	1
544			min	-.012	2	-.535	1	0	1	0	1	150.552	1	NC	1
545		7	max	.018	3	.373	3	0	1	0	1	4220.037	15	NC	1
546			min	-.012	2	-.693	1	0	1	0	1	124.527	1	NC	1
547		8	max	.017	3	.454	3	0	1	0	1	3708.713	15	NC	1
548			min	-.011	2	-.82	1	0	1	0	1	109.386	1	NC	1
549		9	max	.017	3	.506	3	0	1	0	1	3446.435	15	NC	1
550			min	-.011	2	-.9	1	0	1	0	1	101.621	1	NC	1
551		10	max	.016	3	.525	3	0	1	0	1	3367.41	15	NC	1
552			min	-.011	2	-.926	1	0	1	0	1	99.311	1	NC	1
553		11	max	.016	3	.512	3	0	1	0	1	3446.523	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	-.011	2	-.899	1	0	1	0	1	101.767	1	NC	1
555		12	max	.016	3	.468	3	0	1	0	1	3708.923	15	NC	1
556			min	-.011	2	-.817	1	0	1	0	1	109.868	1	NC	1
557		13	max	.015	3	.397	3	0	1	0	1	4220.473	15	NC	1
558			min	-.01	2	-.686	1	0	1	0	1	125.78	1	NC	1
559		14	max	.015	3	.307	3	0	1	0	1	5100.032	15	NC	1
560			min	-.01	2	-.523	1	0	1	0	1	153.367	1	NC	1
561		15	max	.015	3	.207	3	0	1	0	1	6622.584	15	NC	1
562			min	-.01	2	-.346	1	0	1	0	1	201.67	1	NC	1
563		16	max	.014	3	.105	3	0	1	0	1	9460.148	15	NC	1
564			min	-.01	2	-.17	1	0	1	0	1	293.043	1	NC	1
565		17	max	.014	3	.009	3	0	1	0	1	NC	5	NC	1
566			min	-.01	2	-.014	2	0	1	0	1	492.753	1	NC	1
567		18	max	.014	3	.112	1	0	1	0	1	NC	5	NC	1
568			min	-.01	2	-.073	3	0	1	0	1	1070.48	1	NC	1
569		19	max	.014	3	.218	1	0	1	0	1	NC	1	NC	1
570			min	-.01	2	-.147	3	0	1	0	1	NC	1	NC	1
571	M9	1	max	.006	3	.094	1	0	15	2.241e-2	3	NC	1	NC	1
572			min	-.003	2	-.009	3	-.001	1	-1.613e-2	1	NC	1	NC	1
573		2	max	.006	3	.046	1	.006	1	1.109e-2	3	NC	3	NC	1
574			min	-.003	2	-.003	3	0	15	-7.825e-3	1	2375.192	1	NC	1
575		3	max	.006	3	.009	3	.009	1	1.911e-4	1	NC	5	NC	1
576			min	-.003	2	-.008	2	0	15	-1.353e-5	10	1136.3	1	NC	1
577		4	max	.006	3	.031	3	.009	1	3.904e-3	3	NC	5	NC	1
578			min	-.003	2	-.067	1	0	15	-4.333e-3	1	709.898	1	NC	1
579		5	max	.006	3	.061	3	.006	1	7.699e-3	3	NC	15	NC	1
580			min	-.002	2	-.131	1	0	15	-8.857e-3	1	507.901	1	NC	1
581		6	max	.006	3	.094	3	.003	1	1.149e-2	3	NC	15	NC	1
582			min	-.002	2	-.194	1	0	15	-1.338e-2	1	397.361	1	NC	1
583		7	max	.006	3	.126	3	0	12	1.529e-2	3	NC	15	NC	1
584			min	-.002	2	-.25	1	0	1	-1.79e-2	1	332.469	1	NC	1
585		8	max	.006	3	.153	3	0	15	1.908e-2	3	8907.858	15	NC	1
586			min	-.002	2	-.294	1	-.001	1	-2.243e-2	1	294.239	1	NC	1
587		9	max	.005	3	.17	3	0	1	1.905e-2	3	8323.05	15	NC	1
588			min	-.002	2	-.323	1	0	15	-2.475e-2	1	274.394	1	NC	1
589		10	max	.005	3	.176	3	0	12	1.647e-2	3	8145	15	NC	1
590			min	-.002	2	-.332	1	0	1	-2.561e-2	1	268.455	1	NC	1
591		11	max	.005	3	.172	3	0	15	1.389e-2	3	8322.798	15	NC	1
592			min	-.002	2	-.322	1	0	1	-2.648e-2	1	274.755	1	NC	1
593		12	max	.005	3	.158	3	.001	1	1.143e-2	3	8907.329	15	NC	1
594			min	-.002	2	-.293	1	0	15	-2.504e-2	1	295.371	1	NC	1
595		13	max	.005	3	.134	3	0	1	9.149e-3	3	NC	15	NC	1
596			min	-.002	2	-.248	1	0	15	-2.015e-2	1	335.278	1	NC	1
597		14	max	.005	3	.104	3	0	15	6.866e-3	3	NC	15	NC	1
598			min	-.002	2	-.19	1	-.002	1	-1.527e-2	1	403.426	1	NC	1
599		15	max	.005	3	.071	3	0	15	4.583e-3	3	NC	15	NC	1
600			min	-.002	2	-.127	1	-.006	1	-1.038e-2	1	520.462	1	NC	1
601		16	max	.005	3	.036	3	0	15	2.3e-3	3	NC	5	NC	1
602			min	-.002	2	-.063	1	-.008	1	-5.49e-3	1	736.489	1	NC	1
603		17	max	.004	3	.003	3	0	15	1.745e-5	3	NC	5	NC	1
604			min	-.002	2	-.004	2	-.009	1	-6.016e-4	1	1196.744	1	NC	1
605		18	max	.004	3	.047	1	0	15	3.628e-3	3	NC	4	NC	1
606			min	-.002	2	-.026	3	-.006	1	-9.763e-3	2	2529.177	1	NC	1
607		19	max	.004	3	.092	1	.001	1	7.377e-3	3	NC	1	NC	1
608			min	-.002	2	-.054	3	0	15	-1.955e-2	2	NC	1	NC	1

Company:	Schletter, Inc.	Date:	11/17/2015
Engineer:	HCV	Page:	1/5
Project:	Standard PVMax - Worst Case, 14-42 Inch Width		
Address:			
Phone:			
E-mail:			

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

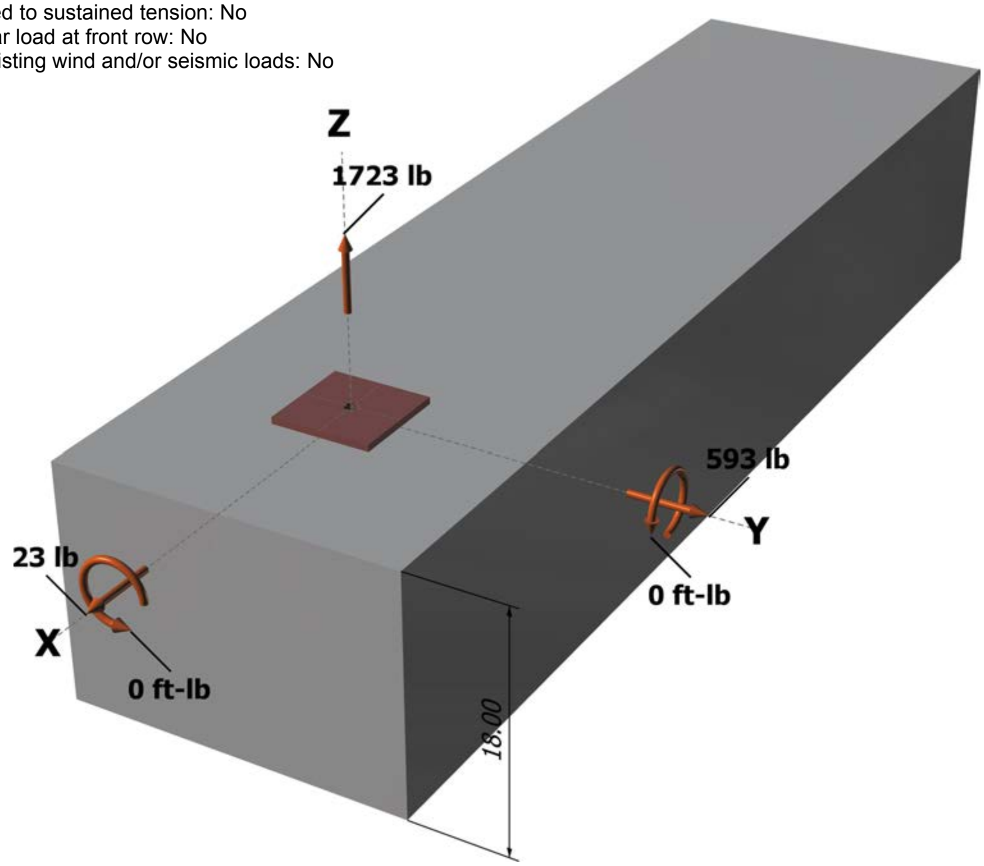
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

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

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

<Figure 1>



<Figure 2>

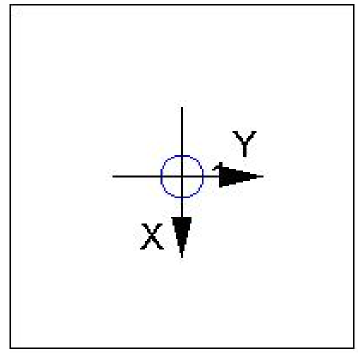
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

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

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

<Figure 3>



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in y-direction:

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

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

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

Shear parallel to edge in x-direction:

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

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

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

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

Shear parallel to edge in y-direction:

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

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

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

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

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

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

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

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

11. Results

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

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

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

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

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

12. Warnings

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

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

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

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

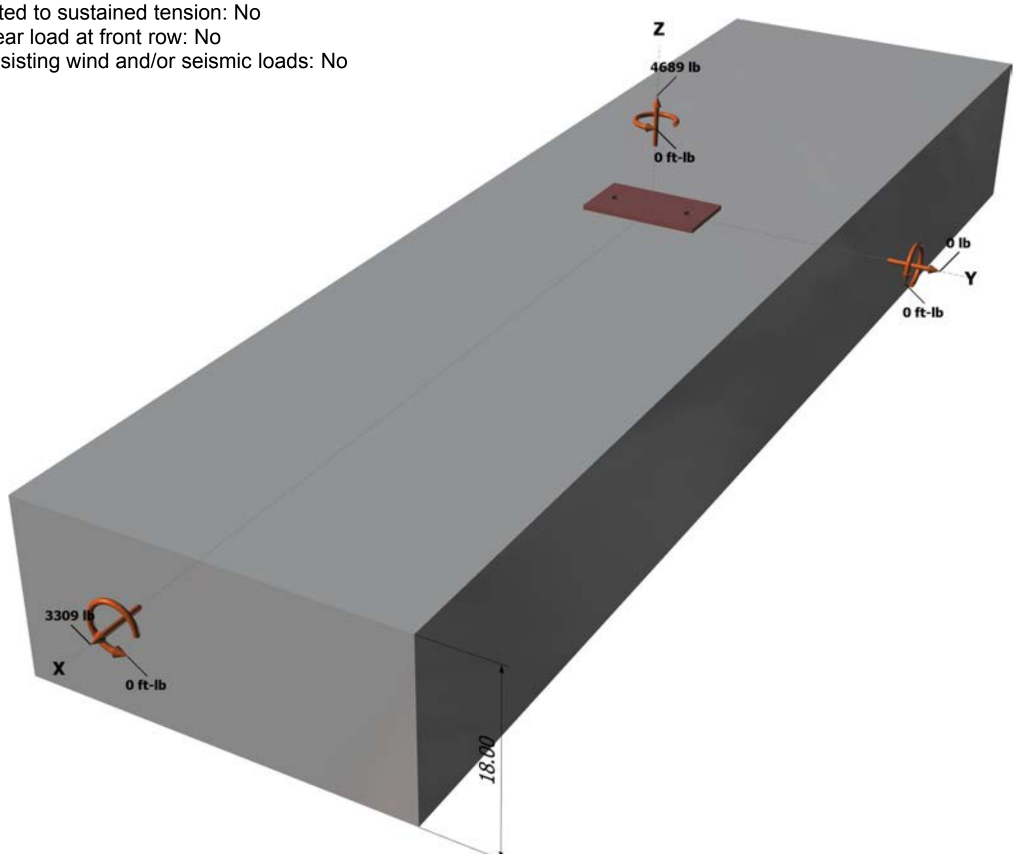
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

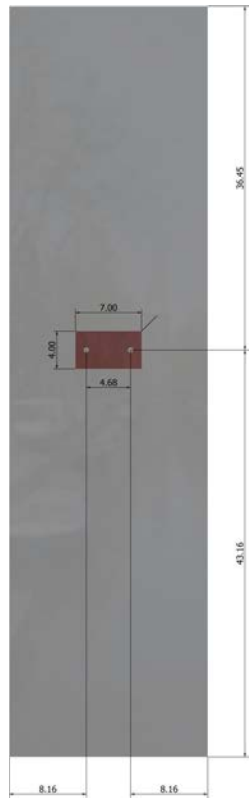
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout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



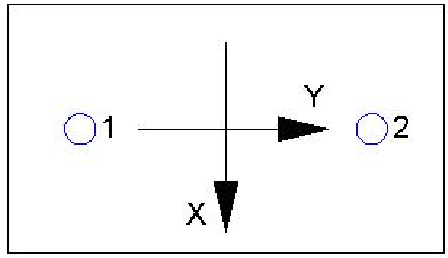
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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.