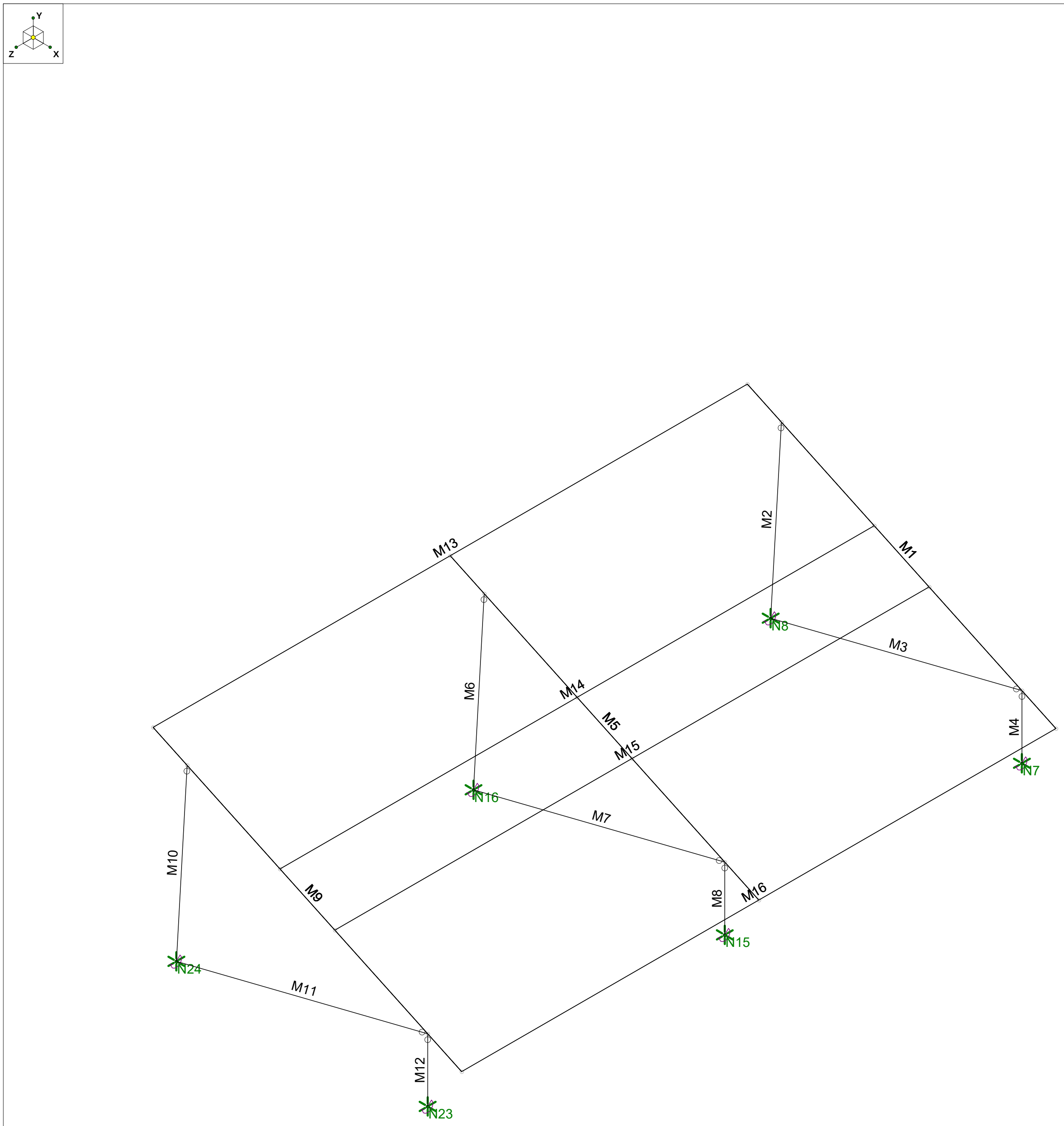


Schletter, Inc.	Standard PVMax Racking System Representative Calculations - ASCE 7-05	25° Tilt w/ Seismic Design
HCV		

1. INTRODUCTION

1.1 Project Description

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

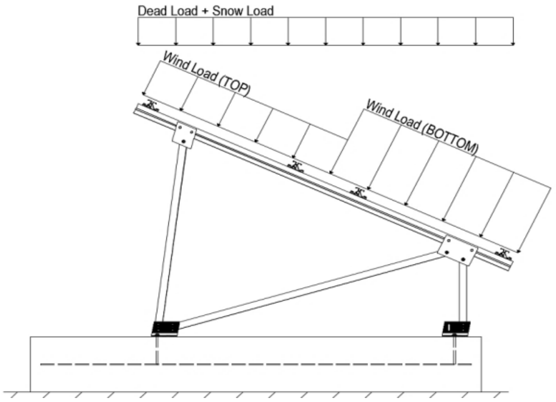
1.2 Construction

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

PV modules are required to meet the following specifications:

	Maximum			Minimum	
Height =	2000	mm	Height =	1900	mm
Width =	1050	mm	Width =	970	mm
Dead Load =	3.00	psf	Dead Load =	1.75	psf

Modules Per Row = 2
Module Tilt = 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 7-05 - Chapter 6, Wind Loads
- ASCE 7-05 - Chapter 7, Snow Loads
- ASCE 7-05 - Chapter 2, Combination of Loads
- International Building Code, IBC, 2003, 2006, 2009
- Aluminum Design Manual, Eighth Edition, 2005

2. LOAD ACTIONS

2.1 Permanent Loads

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

Self-weight of the PV modules.

2.2 Snow Loads

Ground Snow Load, P_g = 30.00 psf
Sloped Roof Snow Load, P_s = 18.56 psf *(ASCE 7-05, Eq. 7-2)*
I_s = 1.00
C_s = 0.82
C_e = 0.90
C_t = 1.20

2.3 Wind Loads

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

Exposure Category = C
Importance Category = II

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

Pressure Coefficients

$Cf+_{TOP}$ = 1.100
$Cf+_{BOTTOM}$ = 1.700 *(Pressure)*
$Cf-_{TOP, OUTER PURLIN}$ = -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

S_S =	2.50	R =	1.25
S_{DS} =	1.67	C_S =	0.8
S_1 =	1.00	ρ =	1.3
S_{D1} =	1.00	Ω =	1.25
T_a =	0.06	C_d =	1.25

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

2.5 Combination of Loads

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

Strength Design, LRFD

Component stresses are checked using the following LRFD load combinations:

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

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

Allowable Stress Design, ASD

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

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

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

[M] *Uses the minimum allowable module dead load.*

[R] *Include redundancy factor of 1.3.*

[O] *Includes overstrength factor of 1.25. Used to check seismic drift.*

3. STRUCTURAL ANALYSIS

3.1 RISA Results

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

3.2 RISA Components

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

Purlins	Location
M13	Top
M14	Mid-Top
M15	Mid-Bottom
M16	Bottom

Diagonal Struts	Location
M3	Outer
M7	Inner
M11	Outer

Front Reactions	Location
N7	Outer
N15	Inner
N23	Outer

Girders	Location
M1	Outer
M5	Inner
M9	Outer

Rear Struts	Location
M2	Outer
M6	Inner
M10	Outer

Rear Reactions	Location
N8	Outer
N16	Inner
N24	Outer

Front Struts	Location
M4	Outer
M8	Inner
M12	Outer

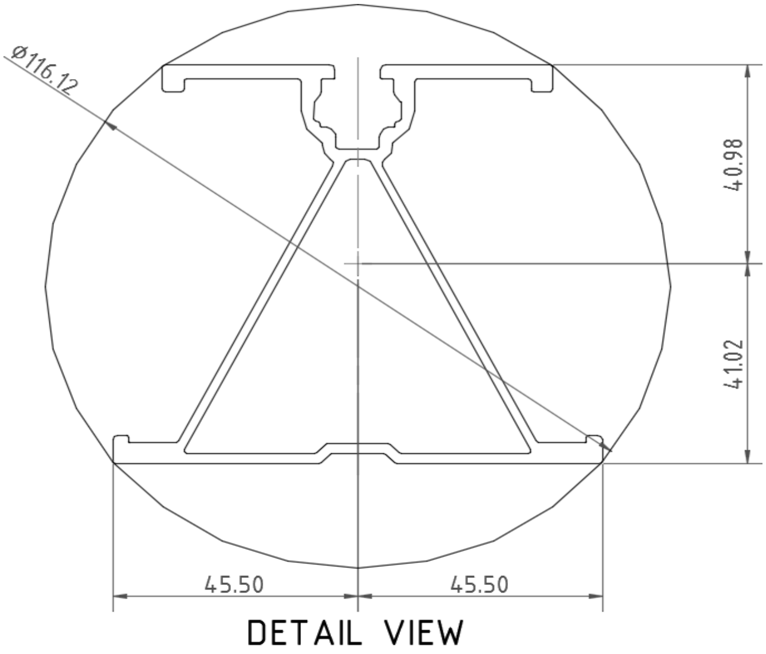
4. MEMBER DESIGN CALCULATIONS

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 = 108 in
$\Phi F_{ty\ \mathrm{STRONG\text{-}AXIS}}$ = 25.07 ksi
$\Phi F_{ty\ \mathrm{WEAK\text{-}AXIS}}$ = 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 = 1.716 k-ft
M_z = 0.319 k-ft
$M_{y\ \mathrm{allowable}}$ = 2.779 k-ft
$M_{z\ \mathrm{allowable}}$ = 1.154 k-ft
Utilization = 89%

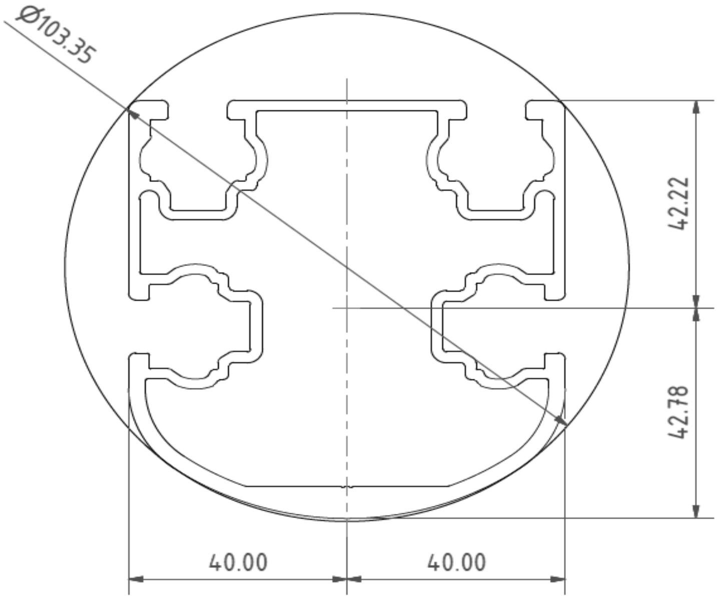


4.2 Girder Design

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

Girder Type = **BF0**
Aluminum Type = 6105-T5
F_{ty} = 35 ksi
L_b = 104.56 in
$\Phi F_{ty\ \mathrm{AXIAL}}$ = 31.09 ksi
$\Phi F_{ty\ \mathrm{STRONG\text{-}AXIS}}$ = 29.00 ksi
$\Phi F_{ty\ \mathrm{WEAK\text{-}AXIS}}$ = 33.25 ksi
S_y = 1.42 in^3
S_x = 1.41 in^3
E = 10100 ksi
I_y = 2.39 in^4
I_x = 2.22 in^4
A = 1.88 in^2
g = 2.26 lbs/ft

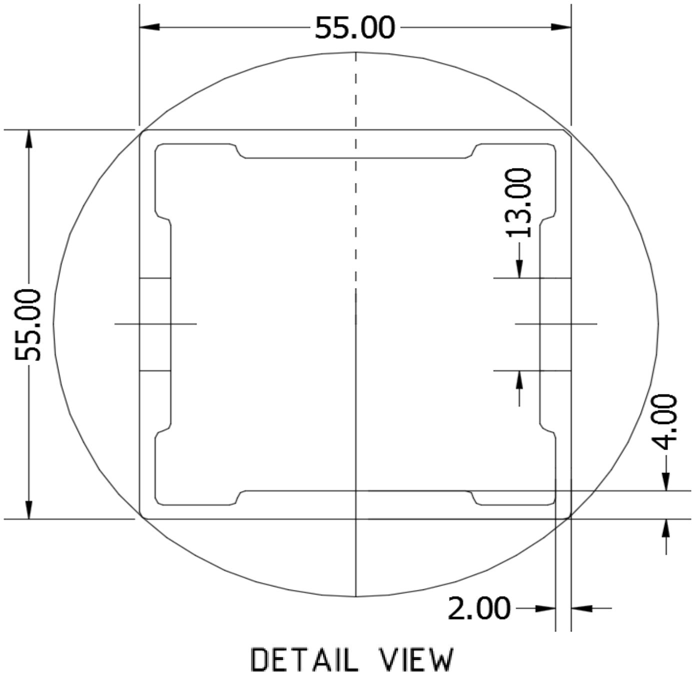
M_y = -3.318 k-ft
M_z = 0.000 k-ft
P_n = -0.834 k
$M_{y\ \mathrm{allowable}}$ = 3.422 k-ft
$M_{z\ \mathrm{allowable}}$ = 3.907 k-ft
$P_{n\ \mathrm{allowable}}$ = 58.535 k
Utilization = 98%



4.3 Front Strut Design

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

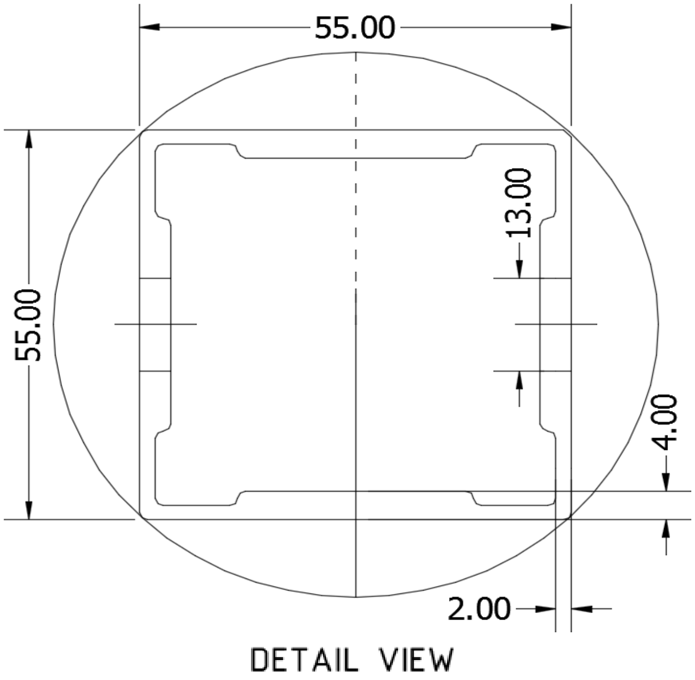
Strut Type =	55x55	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	24.80	in
$\Phi F_{ty\ AXIAL}$ =	28.03	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.000	k-ft
M_z =	-0.562	k-ft
P_n =	0.632	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	27.532	k
Utilization =	42%	



4.4 Diagonal Strut Design

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

Strut Type =	55x55	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	98.03	in
$\Phi F_{ty\ AXIAL}$ =	6.11	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.012	k-ft
M_z =	0.000	k-ft
P_n =	2.127	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	6.000	k
Utilization =	36%	

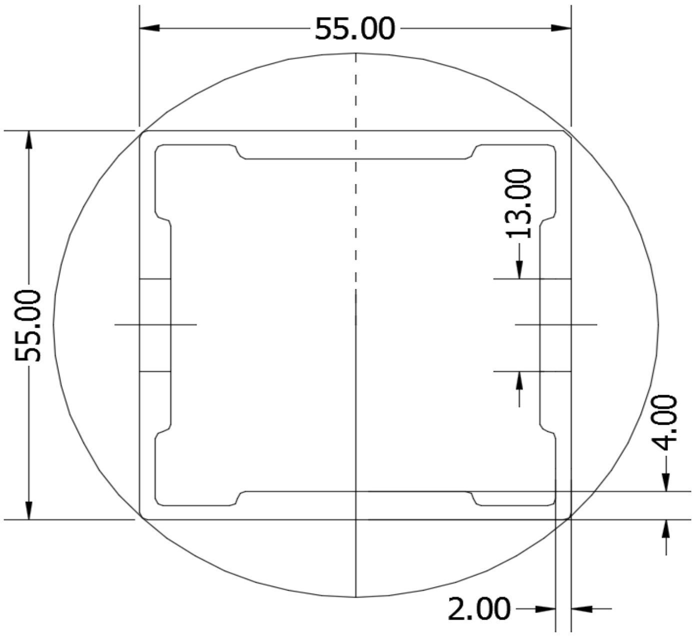


4.5 Rear Strut Design

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 = 69.80 in
$\Phi F_{ty\ AXIAL}$ = 10.82 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 = -0.011 k-ft
M_z = 0.000 k-ft
P_n = 3.362 k
$M_{y\ allowable}$ = 1.408 k-ft
$M_{z\ allowable}$ = 1.408 k-ft
$P_{n\ allowable}$ = 10.629 k
Utilization = 32%



DETAIL VIEW

5. FOUNDATION DESIGN CALCULATIONS

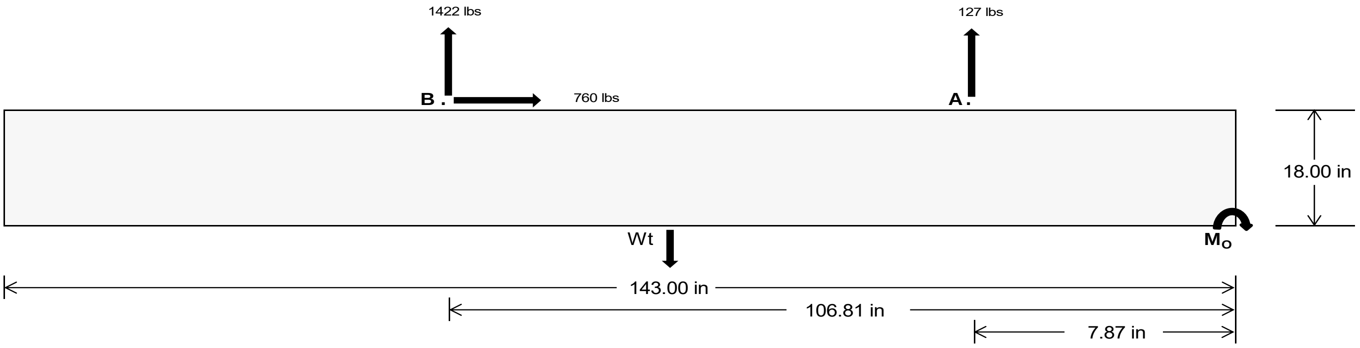
5.1 Helical Pile Foundations

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 =	540.69	5926.09	k
Compressive Load =	3999.27	4832.17	k
Lateral Load =	379.03	3162.59	k
Moment (Weak Axis) =	0.76	0.35	k

5.2 Design of Ballast Foundations

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



Concrete Properties

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 = 166534.5 in-lbs
Resisting Force Required = 2329.15 lbs
S.F. = 1.67
Weight Required = 3881.92 lbs
Minimum Width = 35 in in
Weight Provided = 7559.64 lbs

A minimum 143in long x 35in wide x 18in tall ballast foundation is required to resist overturning.

Sliding

Force = 760.14 lbs
Friction = 0.4
Weight Required = 1900.36 lbs
Resisting Weight = 7559.64 lbs
Additional Weight Required = 0 lbs

Use a 143in long x 35in wide x 18in tall ballast foundation to resist sliding. Friction is OK.

Cohesion

Sliding Force = 760.14 lbs
Cohesion = 130 psf
Area = 34.76 ft^2
Resisting = 3779.82 lbs
Additional Weight Required = 0 lbs

Use a 143in long x 35in wide x 18in tall ballast foundation. Cohesion is OK.

Shear Key

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

Shear key is not required.

Bearing Pressure

	Ballast Width			
	35 in	36 in	37 in	38 in
P_{ftg} = (145 pcf)(11.92 ft)(1.5 ft)(2.92 ft) =	7560 lbs	7776 lbs	7992 lbs	8208 lbs

ASD LC	1.0D + 1.0S				1.0D + 1.0W				1.0D + 0.75L + 0.75W + 0.75S				0.6D + 1.0W			
Width	35 in	36 in	37 in	38 in	35 in	36 in	37 in	38 in	35 in	36 in	37 in	38 in	35 in	36 in	37 in	38 in
F_A	1419 lbs	1419 lbs	1419 lbs	1419 lbs	1403 lbs	1403 lbs	1403 lbs	1403 lbs	1985 lbs	1985 lbs	1985 lbs	1985 lbs	-254 lbs	-254 lbs	-254 lbs	-254 lbs
F_B	1475 lbs	1475 lbs	1475 lbs	1475 lbs	2013 lbs	2013 lbs	2013 lbs	2013 lbs	2482 lbs	2482 lbs	2482 lbs	2482 lbs	-2843 lbs	-2843 lbs	-2843 lbs	-2843 lbs
F_V	180 lbs	180 lbs	180 lbs	180 lbs	1370 lbs	1370 lbs	1370 lbs	1370 lbs	1148 lbs	1148 lbs	1148 lbs	1148 lbs	-1520 lbs	-1520 lbs	-1520 lbs	-1520 lbs
P_{total}	10454 lbs	10670 lbs	10886 lbs	11102 lbs	10975 lbs	11191 lbs	11407 lbs	11623 lbs	12027 lbs	12243 lbs	12459 lbs	12675 lbs	1439 lbs	1568 lbs	1698 lbs	1827 lbs
M	3452 lbs-ft	3452 lbs-ft	3452 lbs-ft	3452 lbs-ft	3570 lbs-ft	3570 lbs-ft	3570 lbs-ft	3570 lbs-ft	4947 lbs-ft	4947 lbs-ft	4947 lbs-ft	4947 lbs-ft	4741 lbs-ft	4741 lbs-ft	4741 lbs-ft	4741 lbs-ft
e	0.33 ft	0.32 ft	0.32 ft	0.31 ft	0.33 ft	0.32 ft	0.31 ft	0.31 ft	0.41 ft	0.40 ft	0.40 ft	0.39 ft	3.30 ft	3.02 ft	2.79 ft	2.59 ft
L/6	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft	1.99 ft
f_{min}	250.8 psf	249.8 psf	249.0 psf	248.1 psf	264.1 psf	262.8 psf	261.5 psf	260.4 psf	274.4 psf	272.8 psf	271.3 psf	269.9 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	350.8 psf	347.1 psf	343.6 psf	340.3 psf	367.5 psf	363.3 psf	359.4 psf	355.7 psf	417.7 psf	412.1 psf	406.9 psf	401.9 psf	123.5 psf	118.7 psf	116.0 psf	114.4 psf

Maximum Bearing Pressure = 418 psf
Allowable Bearing Pressure = 1500 psf

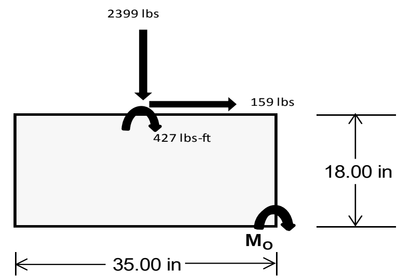
Use a 143in long x 35in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Seismic Design

Overturning Check

M_O = 2832.5 ft-lbs
Resisting Force Required = 1942.30 lbs
S.F. = 1.67
Weight Required = 3237.16 lbs
Minimum Width = 35 in in
Weight Provided = 7559.64 lbs

A minimum 143in long x 35in wide x 18in tall ballast foundation is required to resist overturning.



Bearing Pressure

ASD LC	1.238D + 0.875E			1.1785D + 0.65625E + 0.75S			0.362D + 0.875E		
Width	35 in			35 in			35 in		
Support	Outer	Inner	Outer	Outer	Inner	Outer	Outer	Inner	Outer
F_Y	309 lbs	658 lbs	213 lbs	890 lbs	2399 lbs	815 lbs	124 lbs	192 lbs	29 lbs
F_V	223 lbs	217 lbs	227 lbs	163 lbs	159 lbs	178 lbs	224 lbs	219 lbs	225 lbs
P_{total}	9668 lbs	10017 lbs	9572 lbs	9799 lbs	11308 lbs	9724 lbs	2861 lbs	2929 lbs	2765 lbs
M	893 lbs-ft	879 lbs-ft	906 lbs-ft	667 lbs-ft	665 lbs-ft	715 lbs-ft	891 lbs-ft	876 lbs-ft	897 lbs-ft
e	0.09 ft	0.09 ft	0.09 ft	0.07 ft	0.06 ft	0.07 ft	0.31 ft	0.30 ft	0.32 ft
L/6	0.49 ft	0.49 ft	0.49 ft	0.49 ft	0.49 ft	0.49 ft	0.49 ft	0.49 ft	0.49 ft
f_{min}	225.3 psf	236.2 psf	221.8 psf	242.5 psf	285.9 psf	237.5 psf	29.5 psf	32.4 psf	26.5 psf
f_{max}	331.0 psf	340.2 psf	329.0 psf	321.4 psf	364.7 psf	322.1 psf	135.1 psf	136.1 psf	132.6 psf

Maximum Bearing Pressure = 365 psf
Allowable Bearing Pressure = 1500 psf

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

Foundation Requirements: 143in long x 31in 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

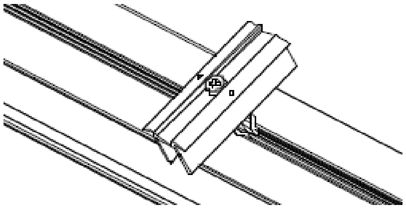
Modules are secured to the purlins with Schletter, Inc. Rapid2+ mounting clamps. Purlins are secured to the girders with the use of 80mm mounting clamps. The reliability of calculations is uncertain due to limited standards, therefore the strength of the clamp fasteners has been evaluated by load testing.

Fastening of Modules to Purlins

Maximum Uplifting Force = 0.692 k

Allowable Uplift = 1.214 k

Utilization = 57%

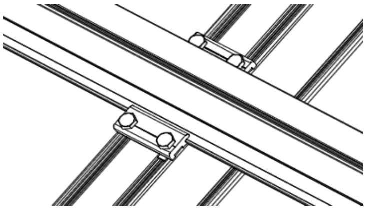


Fastening of Purlins to Girders

Maximum Uplifting Force = 2.213 k

Allowable Uplift = 4.357 k

Utilization = 51%



6.2 Strut Connections

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

Front Strut

Maximum Axial Load = 3.076 k

M12 Bolt Capacity = 12.808 k

Strut Bearing Capacity = 7.421 k

Utilization = 41%

Rear Strut

Maximum Axial Load = 4.029 k

M12 Bolt Capacity = 12.808 k

Strut Bearing Capacity = 7.421 k

Utilization = 54%

Diagonal Strut

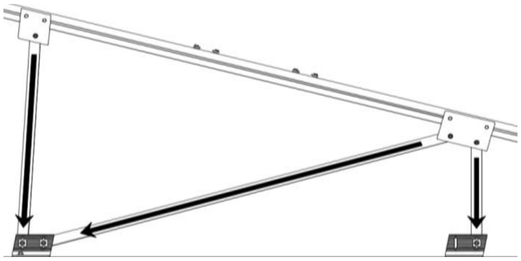
Maximum Axial Load = 2.254 k

M12 Bolt Shear Capacity = 12.808 k

Strut Bearing Capacity = 7.421 k

Utilization = 30%

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

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).

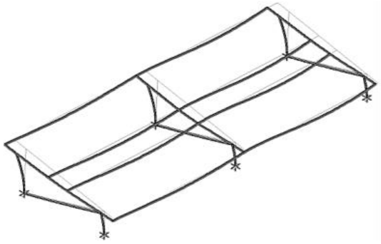
Mean Height, h_{sx} = 56.48 in

Allowable Story Drift for All Other Structures, Δ = { $0.020h_{sx}$ 1.130 in

Max Drift, Δ_{MAX} = 0.792 in

0.792 ≤ 1.13, OK.

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 = 108 in

J = 0.432

298.779

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

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= 27.7 ksi

3.4.16

b/t = 32.195

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 25.1 ksi

3.4.16.1 Not Used

Rb/t =

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 37.0588

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

S1 = 36.9

m = 0.65

C_0 = 40.985

Cc = 41.015

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

S2 = 77.2

φF_L= φb[Bbr-mDbr*h/t]

φF_L= 43.2 ksi

$\varphi F_L St$= 25.1 ksi

Ix = 897074 mm^4

2.155 in^4

y = 41.015 mm

Sx = 1.335 in^3

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

Weak Axis:

3.4.14

L_b = 108

J = 0.432

190.005

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 28.9

3.4.16

b/t = 37.0588

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 23.1 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 32.195

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

S1 = 36.9

m = 0.65

C_0 = 45.5

Cc = 45.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L Wk$= 23.1 ksi

Iy = 446476 mm^4

1.073 in^4

x = 45.5 mm

Sy = 0.599 in^3

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

Compression

3.4.9

b/t = 32.195

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 25.1 ksi

b/t = 37.0588

S1 = 12.21

S2 = 32.70

φF_L= (φck2*√(BpE))/(1.6b/t)

φF_L= 21.9 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

φF_L= φyFcy

φF_L= 33.25 ksi

φF_L= 21.94 ksi

A = 1215.13 mm^2

1.88 in^2

P_{max} = 41.32 kips

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

Girder = **BF0**

Strong Axis:

3.4.14

L_b = 104.56 in

J = 1.08

179.85

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.0 ksi

3.4.16

b/t = 16.2

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 31.6 ksi

Weak Axis:

3.4.14

L_b = 104.56

J = 1.08

190.335

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 28.9

3.4.16

b/t = 7.4

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1 Used

Rb/t = 18.1

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= φb[Bt-Dt*√(Rb/t)]

φF_L= 31.1 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.4

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

S1 = 35.2

m = 0.68

C_0 = 41.067

Cc = 43.717

$$S2 = \frac{k_1Bbr}{mDbr}$$

S2 = 73.8

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

3.4.18

h/t = 16.2

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

S1 = 36.9

m = 0.65

C_0 = 40

Cc = 40

$$S2 = \frac{k_1Bbr}{mDbr}$$

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 29.0 ksi

Ix = 984962 mm^4

2.366 in^4

y = 43.717 mm

Sx = 1.375 in³

M_{max}St = 3.323 k-ft

φF_LWk= 33.3 ksi

Iy = 923544 mm^4

2.219 in^4

x = 40 mm

Sy = 1.409 in³

M_{max}Wk = 3.904 k-ft

<u>Compression</u>

3.4.9

b/t = 16.2

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 31.6 ksi

b/t = 7.4

S1 = 12.21

S2 = 32.70

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.10

Rb/t = 18.1

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

S1 = 6.87

S2 = 131.3

φF_L= φc[Bt-Dt*√(Rb/t)]

φF_L= 31.09 ksi

φF_L= 31.09 ksi

A = 1215.13 mm^2

1.88 in^2

P_{max} = 58.55 kips

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

Strut = **55x55**

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

Compression

3.4.7

$\lambda =$ 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

φcc = 0.87952

$\varphi F_L =$ φcc(Bc-Dc*λ)

$\varphi F_L =$ 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)

$\varphi F_L =$ φc[Bp-1.6Dp*b/t]

$\varphi F_L =$ 28.2 ksi

b/t = 24.5

S1 = 12.21

S2 = 32.70

$\varphi F_L =$ φc[Bp-1.6Dp*b/t]

$\varphi F_L =$ 28.2 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

$\varphi F_L =$ φyFcy

$\varphi F_L =$ 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

$L_b =$ 98.03 in

J = 0.942

152.985

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

S1 = 0.51461

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

S2 = 1701.56

$\varphi F_L =$ φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]

$\varphi F_L =$ 29.4 ksi

Weak Axis:

3.4.14

$L_b =$ 98.03

J = 0.942

152.985

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

S1 = 0.51461

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

S2 = 1701.56

$\varphi F_L =$ φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]

$\varphi F_L =$ 29.4

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1 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 = 2.26776

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.89749

φF_L= (φccFcy)/(λ²)

φF_L= 6.10803 ksi

3.4.9

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

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

3.4.10

Rb/t = 0.0

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

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

φF_L= 6.11 ksi
A = 663.99 mm^2
1.03 in^2
P_{max} = 6.29 kips

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

Strut = **55x55**

Strong Axis:

3.4.14

L_b = 69.80 in
J = 0.942
108.93

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

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= 30.0 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 = 69.8
J = 0.942
108.93

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

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= 30.0

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

$$S2=\frac{k_1Bbr}{mDbr}$$

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

$$S2=\frac{k_1Bbr}{mDbr}$$

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 = 1.61471

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.80606

φF_L= (φccFcy)/(λ^2)

φF_L= 10.8205 ksi

3.4.9

b/t = 24.5

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

b/t = 24.5

S1 = 12.21

S2 = 32.70

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.25 ksi

$\varphi F_L =$ 10.82 ksi

A = 663.99 mm^2

1.03 in^2

$P_{max} =$ 11.14 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			.8			8		

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

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	Y	-9.843	-9.843	0	0
2	M14	Y	-9.843	-9.843	0	0
3	M15	Y	-9.843	-9.843	0	0
4	M16	Y	-9.843	-9.843	0	0

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

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	Y	-5.454	-5.454	0	0
2	M14	Y	-5.454	-5.454	0	0
3	M15	Y	-5.454	-5.454	0	0
4	M16	Y	-5.454	-5.454	0	0

Member Distributed Loads (BLC 3 : Snow Load)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	Y	-55.176	-55.176	0	0
2	M14	Y	-55.176	-55.176	0	0
3	M15	Y	-55.176	-55.176	0	0
4	M16	Y	-55.176	-55.176	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	-56.664	-56.664	0	0
2	M14	y	-56.664	-56.664	0	0
3	M15	y	-87.571	-87.571	0	0
4	M16	y	-87.571	-87.571	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	128.781	128.781	0	0
2	M14	y	97.873	97.873	0	0
3	M15	y	51.512	51.512	0	0
4	M16	y	51.512	51.512	0	0

Member Distributed Loads (BLC 6 : Seismic - Lateral)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	Z	7.874	7.874	0	0
2	M14	Z	7.874	7.874	0	0
3	M15	Z	7.874	7.874	0	0
4	M16	Z	7.874	7.874	0	0
5	M13	Z	0	0	0	0
6	M14	Z	0	0	0	0
7	M15	Z	0	0	0	0
8	M16	Z	0	0	0	0

Load Combinations

	Description	S...	P...	S...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	LRFD 1.2D + 1.6S + 0.8W	Yes	Y		1	1.2	3	1.6	4	.8														
2	LRFD 1.2D + 1.6W + 0.5S	Yes	Y		1	1.2	3	.5	4	1.6														
3	LRFD 0.9D + 1.6W	Yes	Y		2	.9					5	1.6												
4	LATERAL - LRFD 1.54D + 1.3E ...	Yes	Y		1	1.54	3	.2			6	1.3												
5	LATERAL - LRFD 0.56D + 1.3E	Yes	Y		1	.56					6	1.3												
6	LATERAL - LRFD 1.54D + 1.25...	Yes	Y		1	1.54	3	.2			6	1.25												
7	LATERAL - LRFD 0.56D + 1.25E	Yes	Y		1	.56					6	1.25												
8																								
9	ASD 1.0D + 1.0S	Yes	Y		1	1	3	1																
10	ASD 1.0D + 1.0W	Yes	Y		1	1			4	1														
11	ASD 1.0D + 0.75L + 0.75W + 0....	Yes	Y		1	1	3	.75	4	.75														
12	ASD 0.6D + 1.0W	Yes	Y		2	.6					5	1												
13	LATERAL - ASD 1.238D + 0.875E	Yes	Y		1	1.2...					6	.875												
14	LATERAL - ASD 1.1785D + 0.65...	Yes	Y		1	1.1...	3	.75			6	.656												
15	LATERAL - ASD 0.362D + 0.875E	Yes	Y		1	.362					6	.875												

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N8	max	628.731	2	1177.874	2	.805	1	.004	1	0	1	0	1
2		min	-789.72	3	-1424.335	3	-49.692	5	-.266	4	0	1	0	1
3	N7	max	.036	9	1148.716	1	-.782	12	-.002	12	0	1	0	1
4		min	-.201	2	-104.21	3	-291.562	4	-.585	4	0	1	0	1
5	N15	max	0	13	3076.364	1	0	12	0	12	0	1	0	1
6		min	-2.178	2	-415.912	3	-275.308	4	-.562	4	0	1	0	1
7	N16	max	2256.203	2	3717.05	2	0	2	0	2	0	1	0	1
8		min	-2432.763	3	-4558.53	3	-49.56	5	-.269	4	0	1	0	1
9	N23	max	.047	14	1148.716	1	13.882	1	.028	1	0	1	0	1
10		min	-.201	2	-104.21	3	-281.678	5	-.569	4	0	1	0	1
11	N24	max	628.731	2	1177.874	2	-.06	12	0	12	0	1	0	1
12		min	-789.72	3	-1424.335	3	-50.462	5	-.268	4	0	1	0	1
13	Totals:	max	3511.085	2	11265.076	1	0	12						
14		min	-4012.645	3	-8031.531	3	-991.453	4						

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	83.459	1	455.992	1	-8.63	12	0	15	.234	1	0	4
2			min	5.043	12	-677.677	3	-184.075	1	-.015	2	.014	12	0	3
3		2	max	83.459	1	318.31	1	-6.865	12	0	15	.125	4	.577	3
4			min	5.043	12	-477.303	3	-141.011	1	-.015	2	.006	10	-.387	1
5		3	max	83.459	1	180.627	1	-5.101	12	0	15	.072	5	.955	3
6			min	5.043	12	-276.929	3	-97.947	1	-.015	2	-.048	1	-.637	1
7		4	max	83.459	1	42.945	1	-3.337	12	0	15	.039	5	1.131	3
8			min	5.043	12	-76.555	3	-54.882	1	-.015	2	-.125	1	-.748	1
9		5	max	83.459	1	123.819	3	-.61	10	0	15	.01	5	1.108	3
10			min	5.043	12	-94.737	1	-31.693	4	-.015	2	-.158	1	-.723	1
11		6	max	83.459	1	324.193	3	31.246	1	0	15	-.007	12	.884	3
12			min	2.434	15	-232.42	1	-25.678	5	-.015	2	-.148	1	-.559	1
13		7	max	83.459	1	524.567	3	74.31	1	0	15	-.006	12	.459	3
14			min	-7.963	5	-370.102	1	-22.992	5	-.015	2	-.096	1	-.258	1
15		8	max	83.459	1	724.941	3	117.374	1	0	15	.003	2	.181	1
16			min	-19.764	5	-507.784	1	-20.307	5	-.015	2	-.065	4	-.165	3
17		9	max	83.459	1	925.315	3	160.438	1	0	15	.139	1	.758	1
18			min	-31.564	5	-645.467	1	-17.621	5	-.015	2	-.082	5	-.991	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
19		10	max	83.459	1	1125.689	3	203.502	1	.015	2	.321	1	1.472	1
20			min	5.043	12	-783.149	1	-123.622	14	-.002	3	.008	12	-2.016	3
21		11	max	83.459	1	645.467	1	-5.485	12	.015	2	.139	1	.758	1
22			min	5.043	12	-925.315	3	-160.438	1	0	15	.002	12	-.991	3
23		12	max	83.459	1	507.784	1	-3.721	12	.015	2	.064	4	.181	1
24			min	5.043	12	-724.941	3	-117.374	1	0	15	-.005	3	-.165	3
25		13	max	83.459	1	370.102	1	-1.956	12	.015	2	.03	5	.459	3
26			min	5.043	12	-524.567	3	-74.31	1	0	15	-.096	1	-.258	1
27		14	max	83.459	1	232.42	1	-.184	3	.015	2	0	15	.884	3
28			min	4.282	15	-324.193	3	-36.778	4	0	15	-.148	1	-.559	1
29		15	max	83.459	1	94.737	1	11.818	1	.015	2	-.006	12	1.108	3
30			min	-5.308	5	-123.819	3	-26.811	5	0	15	-.158	1	-.723	1
31		16	max	83.459	1	76.555	3	54.882	1	.015	2	-.004	12	1.131	3
32			min	-17.108	5	-42.945	1	-24.125	5	0	15	-.125	1	-.748	1
33		17	max	83.459	1	276.929	3	97.947	1	.015	2	0	3	.955	3
34			min	-28.909	5	-180.627	1	-21.44	5	0	15	-.09	4	-.637	1
35		18	max	83.459	1	477.303	3	141.011	1	.015	2	.071	1	.577	3
36			min	-40.709	5	-318.31	1	-18.754	5	0	15	-.098	5	-.387	1
37		19	max	83.459	1	677.677	3	184.075	1	.015	2	.234	1	0	1
38			min	-52.51	5	-455.992	1	-16.069	5	0	15	-.115	5	0	3
39	M14	1	max	54.586	4	506.93	1	-8.929	12	.012	3	.281	4	0	1
40			min	2.599	12	-538.554	3	-191.226	1	-.014	1	.016	12	0	3
41		2	max	48.346	1	369.248	1	-7.164	12	.012	3	.188	4	.463	3
42			min	2.599	12	-387.632	3	-148.162	1	-.014	1	.008	12	-.438	1
43		3	max	48.346	1	231.566	1	-5.4	12	.012	3	.11	5	.775	3
44			min	2.599	12	-236.711	3	-105.098	1	-.014	1	-.02	1	-.738	1
45		4	max	48.346	1	93.883	1	-3.636	12	.012	3	.061	5	.937	3
46			min	2.599	12	-85.79	3	-62.116	4	-.014	1	-.103	1	-.901	1
47		5	max	48.346	1	65.131	3	-1.379	10	.012	3	.015	5	.947	3
48			min	-3.132	5	-43.799	1	-50.068	4	-.014	1	-.144	1	-.926	1
49		6	max	48.346	1	216.052	3	24.094	1	.012	3	-.006	12	.806	3
50			min	-14.933	5	-181.481	1	-42.093	5	-.014	1	-.141	1	-.814	1
51		7	max	48.346	1	366.974	3	67.158	1	.012	3	-.006	12	.515	3
52			min	-26.733	5	-319.163	1	-39.408	5	-.014	1	-.096	1	-.563	1
53		8	max	48.346	1	517.895	3	110.222	1	.012	3	.001	10	.072	3
54			min	-38.534	5	-456.846	1	-36.722	5	-.014	1	-.112	4	-.184	2
55		9	max	48.346	1	668.816	3	153.286	1	.012	3	.125	1	.35	1
56			min	-50.334	5	-594.528	1	-34.037	5	-.014	1	-.143	5	-.521	3
57		10	max	78.305	4	819.737	3	196.35	1	.014	1	.3	1	1.014	1
58			min	2.599	12	-732.21	1	-128.26	14	-.012	3	.007	12	-1.265	3
59		11	max	66.504	4	594.528	1	-5.186	12	.014	1	.188	4	.35	1
60			min	2.599	12	-668.816	3	-153.286	1	-.012	3	.001	12	-.521	3
61		12	max	54.704	4	456.846	1	-3.422	12	.014	1	.107	4	.072	3
62			min	2.599	12	-517.895	3	-110.222	1	-.012	3	-.007	1	-.184	2
63		13	max	48.346	1	319.163	1	-1.658	12	.014	1	.057	5	.515	3
64			min	2.599	12	-366.974	3	-67.158	1	-.012	3	-.096	1	-.563	1
65		14	max	48.346	1	181.481	1	.265	3	.014	1	.011	5	.806	3
66			min	2.599	12	-216.052	3	-51.142	4	-.012	3	-.141	1	-.814	1
67		15	max	48.346	1	43.799	1	18.97	1	.014	1	-.005	12	.947	3
68			min	2.599	12	-65.131	3	-42.334	5	-.012	3	-.144	1	-.926	1
69		16	max	48.346	1	85.79	3	62.034	1	.014	1	-.003	12	.937	3
70			min	-3.228	5	-93.883	1	-39.649	5	-.012	3	-.103	1	-.901	1
71		17	max	48.346	1	236.711	3	105.098	1	.014	1	.003	3	.775	3
72			min	-15.028	5	-231.566	1	-36.963	5	-.012	3	-.118	4	-.738	1
73		18	max	48.346	1	387.632	3	148.162	1	.014	1	.107	1	.463	3
74			min	-26.829	5	-369.248	1	-34.278	5	-.012	3	-.148	5	-.438	1
75		19	max	48.346	1	538.554	3	191.226	1	.014	1	.276	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
76			min	-38.629	5	-506.93	1	-31.592	5	-.012	3	-.18	5	0	3
77	M15	1	max	91.505	5	641.303	2	-8.835	12	.015	2	.348	4	0	2
78			min	-51.497	1	-288.812	3	-191.176	1	-.01	3	.016	12	0	3
79		2	max	79.704	5	463.845	2	-7.071	12	.015	2	.241	4	.25	3
80			min	-51.497	1	-212.069	3	-148.112	1	-.01	3	.008	12	-.553	2
81		3	max	67.904	5	286.388	2	-5.306	12	.015	2	.148	5	.424	3
82			min	-51.497	1	-135.325	3	-105.048	1	-.01	3	-.02	1	-.928	2
83		4	max	56.103	5	108.93	2	-3.542	12	.015	2	.084	5	.521	3
84			min	-51.497	1	-58.582	3	-76.861	4	-.01	3	-.104	1	-1.125	2
85		5	max	44.303	5	18.162	3	-1.419	10	.015	2	.023	5	.541	3
86			min	-51.497	1	-68.527	2	-64.813	4	-.01	3	-.144	1	-1.146	2
87		6	max	32.502	5	94.906	3	24.144	1	.015	2	-.006	12	.485	3
88			min	-51.497	1	-245.985	2	-56.799	5	-.01	3	-.141	1	-.988	2
89		7	max	20.702	5	171.649	3	67.208	1	.015	2	-.005	12	.351	3
90			min	-51.497	1	-423.443	2	-54.113	5	-.01	3	-.113	4	-.654	2
91		8	max	8.901	5	248.393	3	110.272	1	.015	2	0	10	.141	3
92			min	-51.497	1	-600.9	2	-51.428	5	-.01	3	-.147	4	-.153	1
93		9	max	-1.851	15	325.136	3	153.336	1	.015	2	.125	1	.548	2
94			min	-51.497	1	-778.358	2	-48.742	5	-.01	3	-.193	5	-.145	3
95		10	max	-3.178	12	401.88	3	196.4	1	.01	3	.347	4	1.415	2
96			min	-51.497	1	-955.816	2	-135.793	14	-.015	2	.008	12	-.509	3
97		11	max	-2.636	15	778.358	2	-5.28	12	.01	3	.239	4	.548	2
98			min	-51.497	1	-325.136	3	-153.336	1	-.015	2	.002	12	-.145	3
99		12	max	-3.178	12	600.9	2	-3.516	12	.01	3	.143	4	.141	3
100			min	-51.497	1	-248.393	3	-110.272	1	-.015	2	-.007	1	-.153	1
101		13	max	-3.178	12	423.443	2	-1.751	12	.01	3	.078	5	.351	3
102			min	-51.497	1	-171.649	3	-77.978	4	-.015	2	-.096	1	-.654	2
103		14	max	-3.178	12	245.985	2	.115	3	.01	3	.017	5	.485	3
104			min	-51.753	4	-94.906	3	-65.929	4	-.015	2	-.141	1	-.988	2
105		15	max	-3.178	12	68.527	2	18.92	1	.01	3	-.005	12	.541	3
106			min	-63.553	4	-18.162	3	-57.043	5	-.015	2	-.144	1	-1.146	2
107		16	max	-3.178	12	58.582	3	61.984	1	.01	3	-.003	12	.521	3
108			min	-75.354	4	-108.93	2	-54.357	5	-.015	2	-.121	4	-1.125	2
109		17	max	-3.178	12	135.325	3	105.048	1	.01	3	.003	3	.424	3
110			min	-87.154	4	-286.388	2	-51.672	5	-.015	2	-.157	4	-.928	2
111		18	max	-3.178	12	212.069	3	148.112	1	.01	3	.106	1	.25	3
112			min	-98.955	4	-463.845	2	-48.986	5	-.015	2	-.2	5	-.553	2
113		19	max	-3.178	12	288.812	3	191.176	1	.01	3	.276	1	0	2
114			min	-110.755	4	-641.303	2	-46.301	5	-.015	2	-.248	5	0	5
115	M16	1	max	86.454	5	591.865	2	-8.34	12	.012	1	.253	4	0	2
116			min	-93.386	1	-251.136	3	-184.581	1	-.013	3	.013	12	0	3
117		2	max	74.653	5	414.407	2	-6.575	12	.012	1	.167	4	.213	3
118			min	-93.386	1	-174.392	3	-141.517	1	-.013	3	.006	12	-.503	2
119		3	max	62.853	5	236.95	2	-4.811	12	.012	1	.102	5	.349	3
120			min	-93.386	1	-97.648	3	-98.453	1	-.013	3	-.047	1	-.829	2
121		4	max	51.052	5	59.492	2	-3.046	12	.012	1	.058	5	.408	3
122			min	-93.386	1	-20.905	3	-55.389	1	-.013	3	-.124	1	-.977	2
123		5	max	39.252	5	55.839	3	-.816	10	.012	1	.017	5	.391	3
124			min	-93.386	1	-117.965	2	-43.194	4	-.013	3	-.157	1	-.948	2
125		6	max	27.451	5	132.583	3	30.739	1	.012	1	-.007	12	.296	3
126			min	-93.386	1	-295.423	2	-36.993	5	-.013	3	-.148	1	-.741	2
127		7	max	15.651	5	209.326	3	73.803	1	.012	1	-.005	12	.125	3
128			min	-93.386	1	-472.881	2	-34.307	5	-.013	3	-.096	1	-.357	2
129		8	max	3.85	5	286.07	3	116.867	1	.012	1	.002	2	.205	2
130			min	-93.386	1	-650.338	2	-31.622	5	-.013	3	-.092	4	-.122	3
131		9	max	-5.186	12	362.813	3	159.931	1	.012	1	.138	1	.944	2
132			min	-93.386	1	-827.796	2	-28.936	5	-.013	3	-.12	5	-.447	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
133		10	max	-5.186	12	439.557	3	202.995	1	.013	3	.319	1	1.86	2
134			min	-93.386	1	-1005.253	2	-129.237	14	-.012	1	.009	12	-.848	3
135		11	max	-2.257	15	827.796	2	-5.776	12	.013	3	.169	4	.944	2
136			min	-93.386	1	-362.813	3	-159.931	1	-.012	1	.003	12	-.447	3
137		12	max	-5.186	12	650.338	2	-4.011	12	.013	3	.091	4	.205	2
138			min	-93.386	1	-286.07	3	-116.867	1	-.012	1	-.003	3	-.122	3
139		13	max	-5.186	12	472.881	2	-2.247	12	.013	3	.045	5	.125	3
140			min	-93.386	1	-209.326	3	-73.803	1	-.012	1	-.096	1	-.357	2
141		14	max	-5.186	12	295.423	2	-.482	12	.013	3	.003	5	.296	3
142			min	-93.386	1	-132.583	3	-48.088	4	-.012	1	-.148	1	-.741	2
143		15	max	-5.186	12	117.965	2	12.325	1	.013	3	-.006	12	.391	3
144			min	-93.386	1	-55.839	3	-38.098	5	-.012	1	-.157	1	-.948	2
145		16	max	-5.186	12	20.905	3	55.389	1	.013	3	-.004	12	.408	3
146			min	-93.386	1	-59.492	2	-35.413	5	-.012	1	-.124	1	-.977	2
147		17	max	-5.186	12	97.648	3	98.453	1	.013	3	0	3	.349	3
148			min	-95.929	4	-236.95	2	-32.727	5	-.012	1	-.119	4	-.829	2
149		18	max	-5.186	12	174.392	3	141.517	1	.013	3	.073	1	.213	3
150			min	-107.729	4	-414.407	2	-30.042	5	-.012	1	-.139	5	-.503	2
151		19	max	-5.186	12	251.136	3	184.581	1	.013	3	.236	1	0	2
152			min	-119.53	4	-591.865	2	-27.356	5	-.012	1	-.168	5	0	5
153	M2	1	max	1072.402	1	2.067	4	.666	1	0	12	0	3	0	1
154			min	-1259.314	3	.505	15	-43.254	4	0	4	0	1	0	1
155		2	max	1072.875	1	2.03	4	.666	1	0	12	0	1	0	15
156			min	-1258.959	3	.496	15	-43.666	4	0	4	-.014	4	0	4
157		3	max	1073.349	1	1.993	4	.666	1	0	12	0	1	0	15
158			min	-1258.603	3	.487	15	-44.077	4	0	4	-.028	4	-.001	4
159		4	max	1073.823	1	1.956	4	.666	1	0	12	0	1	0	15
160			min	-1258.248	3	.479	15	-44.488	4	0	4	-.042	4	-.002	4
161		5	max	1074.297	1	1.919	4	.666	1	0	12	0	1	0	15
162			min	-1257.893	3	.47	15	-44.9	4	0	4	-.056	4	-.003	4
163		6	max	1074.77	1	1.882	4	.666	1	0	12	.001	1	0	15
164			min	-1257.537	3	.461	15	-45.311	4	0	4	-.071	4	-.003	4
165		7	max	1075.244	1	1.845	4	.666	1	0	12	.001	1	0	15
166			min	-1257.182	3	.453	15	-45.722	4	0	4	-.085	4	-.004	4
167		8	max	1075.718	1	1.808	4	.666	1	0	12	.001	1	-.001	15
168			min	-1256.827	3	.444	15	-46.134	4	0	4	-.1	4	-.004	4
169		9	max	1076.191	1	1.771	4	.666	1	0	12	.002	1	-.001	15
170			min	-1256.471	3	.435	15	-46.545	4	0	4	-.115	4	-.005	4
171		10	max	1076.665	1	1.734	4	.666	1	0	12	.002	1	-.001	15
172			min	-1256.116	3	.426	15	-46.956	4	0	4	-.13	4	-.005	4
173		11	max	1077.139	1	1.697	4	.666	1	0	12	.002	1	-.001	15
174			min	-1255.761	3	.418	15	-47.368	4	0	4	-.145	4	-.006	4
175		12	max	1077.613	1	1.66	4	.666	1	0	12	.002	1	-.002	15
176			min	-1255.406	3	.409	15	-47.779	4	0	4	-.16	4	-.007	4
177		13	max	1078.086	1	1.623	4	.666	1	0	12	.003	1	-.002	15
178			min	-1255.05	3	.4	15	-48.19	4	0	4	-.176	4	-.007	4
179		14	max	1078.56	1	1.586	4	.666	1	0	12	.003	1	-.002	15
180			min	-1254.695	3	.392	15	-48.602	4	0	4	-.191	4	-.008	4
181		15	max	1079.034	1	1.549	4	.666	1	0	12	.003	1	-.002	15
182			min	-1254.34	3	.383	15	-49.013	4	0	4	-.207	4	-.008	4
183		16	max	1079.508	1	1.512	4	.666	1	0	12	.003	1	-.002	15
184			min	-1253.984	3	.374	15	-49.424	4	0	4	-.222	4	-.009	4
185		17	max	1079.981	1	1.474	4	.666	1	0	12	.003	1	-.002	15
186			min	-1253.629	3	.366	15	-49.836	4	0	4	-.238	4	-.009	4
187		18	max	1080.455	1	1.437	4	.666	1	0	12	.004	1	-.002	15
188			min	-1253.274	3	.354	12	-50.247	4	0	4	-.254	4	-.01	4
189		19	max	1080.929	1	1.4	4	.666	1	0	12	.004	1	-.002	15

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
190			min	-1252.918	3	.34	12	-50.658	4	0	4	-.27	4	-.01	4
191	M3	1	max	584.157	2	9.023	4	.294	1	0	12	0	1	.01	4
192			min	-734.588	3	2.134	15	-.65	5	0	4	-.017	4	.002	15
193		2	max	583.987	2	8.151	4	.294	1	0	12	0	1	.006	4
194			min	-734.716	3	1.929	15	-.043	5	0	4	-.017	4	.001	12
195		3	max	583.816	2	7.279	4	.694	4	0	12	0	1	.003	2
196			min	-734.843	3	1.724	15	.016	12	0	4	-.017	4	0	3
197		4	max	583.646	2	6.407	4	1.302	4	0	12	0	1	0	2
198			min	-734.971	3	1.519	15	.016	12	0	4	-.016	4	-.002	3
199		5	max	583.476	2	5.535	4	1.909	4	0	12	0	1	0	15
200			min	-735.099	3	1.314	15	.016	12	0	4	-.016	4	-.004	6
201		6	max	583.305	2	4.663	4	2.516	4	0	12	0	1	-.001	15
202			min	-735.227	3	1.109	15	.016	12	0	4	-.015	5	-.006	6
203		7	max	583.135	2	3.791	4	3.123	4	0	12	.001	1	-.002	15
204			min	-735.354	3	.904	15	.016	12	0	4	-.013	5	-.008	6
205		8	max	582.965	2	2.919	4	3.73	4	0	12	.001	1	-.002	15
206			min	-735.482	3	.699	15	.016	12	0	4	-.012	5	-.01	6
207		9	max	582.794	2	2.047	4	4.337	4	0	12	.001	1	-.003	15
208			min	-735.61	3	.494	15	.016	12	0	4	-.01	5	-.011	6
209		10	max	582.624	2	1.175	4	4.944	4	0	12	.001	1	-.003	15
210			min	-735.738	3	.289	15	.016	12	0	4	-.008	5	-.012	6
211		11	max	582.454	2	.361	2	5.551	4	0	12	.002	1	-.003	15
212			min	-735.865	3	-.045	3	.016	12	0	4	-.005	5	-.012	6
213		12	max	582.283	2	-.121	15	6.158	4	0	12	.002	1	-.003	15
214			min	-735.993	3	-.57	6	.016	12	0	4	-.003	5	-.012	6
215		13	max	582.113	2	-.326	15	6.766	4	0	12	.002	1	-.003	15
216			min	-736.121	3	-1.443	6	.016	12	0	4	0	12	-.011	6
217		14	max	581.943	2	-.531	15	7.373	4	0	12	.004	4	-.002	15
218			min	-736.249	3	-2.315	6	.016	12	0	4	0	12	-.011	6
219		15	max	581.772	2	-.736	15	7.98	4	0	12	.008	4	-.002	15
220			min	-736.376	3	-3.187	6	.016	12	0	4	0	12	-.009	6
221		16	max	581.602	2	-.941	15	8.587	4	0	12	.012	4	-.002	15
222			min	-736.504	3	-4.059	6	.016	12	0	4	0	12	-.008	6
223		17	max	581.431	2	-1.146	15	9.194	4	0	12	.016	4	-.001	15
224			min	-736.632	3	-4.931	6	.016	12	0	4	0	12	-.005	6
225		18	max	581.261	2	-1.351	15	9.801	4	0	12	.02	4	0	15
226			min	-736.76	3	-5.803	6	.016	12	0	4	0	12	-.003	6
227		19	max	581.091	2	-1.556	15	10.408	4	0	12	.025	4	0	1
228			min	-736.888	3	-6.675	6	.016	12	0	4	0	12	0	1
229	M4	1	max	1145.65	1	0	1	-.78	12	0	1	.017	4	0	1
230			min	-106.509	3	0	1	-290.256	4	0	1	0	12	0	1
231		2	max	1145.82	1	0	1	-.78	12	0	1	0	1	0	1
232			min	-106.382	3	0	1	-290.404	4	0	1	-.016	4	0	1
233		3	max	1145.991	1	0	1	-.78	12	0	1	0	12	0	1
234			min	-106.254	3	0	1	-290.552	4	0	1	-.049	4	0	1
235		4	max	1146.161	1	0	1	-.78	12	0	1	0	12	0	1
236			min	-106.126	3	0	1	-290.699	4	0	1	-.083	4	0	1
237		5	max	1146.331	1	0	1	-.78	12	0	1	0	12	0	1
238			min	-105.998	3	0	1	-290.847	4	0	1	-.116	4	0	1
239		6	max	1146.502	1	0	1	-.78	12	0	1	0	12	0	1
240			min	-105.871	3	0	1	-290.994	4	0	1	-.149	4	0	1
241		7	max	1146.672	1	0	1	-.78	12	0	1	0	12	0	1
242			min	-105.743	3	0	1	-291.142	4	0	1	-.183	4	0	1
243		8	max	1146.842	1	0	1	-.78	12	0	1	0	12	0	1
244			min	-105.615	3	0	1	-291.29	4	0	1	-.216	4	0	1
245		9	max	1147.013	1	0	1	-.78	12	0	1	0	12	0	1
246			min	-105.487	3	0	1	-291.437	4	0	1	-.25	4	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
247		10	max	1147.183	1	0	1	-.78	12	0	1	0	12	0	1
248			min	-105.36	3	0	1	-291.585	4	0	1	-.283	4	0	1
249		11	max	1147.353	1	0	1	-.78	12	0	1	0	12	0	1
250			min	-105.232	3	0	1	-291.733	4	0	1	-.317	4	0	1
251		12	max	1147.524	1	0	1	-.78	12	0	1	0	12	0	1
252			min	-105.104	3	0	1	-291.88	4	0	1	-.35	4	0	1
253		13	max	1147.694	1	0	1	-.78	12	0	1	0	12	0	1
254			min	-104.976	3	0	1	-292.028	4	0	1	-.384	4	0	1
255		14	max	1147.865	1	0	1	-.78	12	0	1	-.001	12	0	1
256			min	-104.849	3	0	1	-292.176	4	0	1	-.417	4	0	1
257		15	max	1148.035	1	0	1	-.78	12	0	1	-.001	12	0	1
258			min	-104.721	3	0	1	-292.323	4	0	1	-.451	4	0	1
259		16	max	1148.205	1	0	1	-.78	12	0	1	-.001	12	0	1
260			min	-104.593	3	0	1	-292.471	4	0	1	-.484	4	0	1
261		17	max	1148.376	1	0	1	-.78	12	0	1	-.001	12	0	1
262			min	-104.465	3	0	1	-292.618	4	0	1	-.518	4	0	1
263		18	max	1148.546	1	0	1	-.78	12	0	1	-.001	12	0	1
264			min	-104.338	3	0	1	-292.766	4	0	1	-.552	4	0	1
265		19	max	1148.716	1	0	1	-.78	12	0	1	-.002	12	0	1
266			min	-104.21	3	0	1	-292.914	4	0	1	-.585	4	0	1
267	M6	1	max	3353.707	1	2.341	2	0	1	0	1	0	4	0	1
268			min	-4029.48	3	.2	12	-43.744	4	0	4	0	1	0	1
269		2	max	3354.181	1	2.312	2	0	1	0	1	0	1	0	12
270			min	-4029.125	3	.185	12	-44.156	4	0	4	-.014	4	0	2
271		3	max	3354.655	1	2.283	2	0	1	0	1	0	1	0	12
272			min	-4028.769	3	.171	12	-44.567	4	0	4	-.028	4	-.001	2
273		4	max	3355.128	1	2.254	2	0	1	0	1	0	1	0	12
274			min	-4028.414	3	.156	12	-44.978	4	0	4	-.043	4	-.002	2
275		5	max	3355.602	1	2.225	2	0	1	0	1	0	1	0	12
276			min	-4028.059	3	.142	12	-45.39	4	0	4	-.057	4	-.003	2
277		6	max	3356.076	1	2.197	2	0	1	0	1	0	1	0	12
278			min	-4027.703	3	.127	12	-45.801	4	0	4	-.072	4	-.004	2
279		7	max	3356.55	1	2.168	2	0	1	0	1	0	1	0	12
280			min	-4027.348	3	.11	3	-46.212	4	0	4	-.086	4	-.004	2
281		8	max	3357.023	1	2.139	2	0	1	0	1	0	1	0	12
282			min	-4026.993	3	.089	3	-46.624	4	0	4	-.101	4	-.005	2
283		9	max	3357.497	1	2.11	2	0	1	0	1	0	1	0	12
284			min	-4026.637	3	.067	3	-47.035	4	0	4	-.116	4	-.006	2
285		10	max	3357.971	1	2.081	2	0	1	0	1	0	1	0	12
286			min	-4026.282	3	.046	3	-47.446	4	0	4	-.131	4	-.006	2
287		11	max	3358.445	1	2.052	2	0	1	0	1	0	1	0	12
288			min	-4025.927	3	.024	3	-47.858	4	0	4	-.147	4	-.007	2
289		12	max	3358.918	1	2.023	2	0	1	0	1	0	1	0	12
290			min	-4025.571	3	.002	3	-48.269	4	0	4	-.162	4	-.008	2
291		13	max	3359.392	1	1.994	2	0	1	0	1	0	1	0	3
292			min	-4025.216	3	-.019	3	-48.68	4	0	4	-.177	4	-.008	2
293		14	max	3359.866	1	1.966	2	0	1	0	1	0	1	0	3
294			min	-4024.861	3	-.041	3	-49.092	4	0	4	-.193	4	-.009	2
295		15	max	3360.34	1	1.937	2	0	1	0	1	0	1	0	3
296			min	-4024.506	3	-.063	3	-49.503	4	0	4	-.209	4	-.01	2
297		16	max	3360.813	1	1.908	2	0	1	0	1	0	1	0	3
298			min	-4024.15	3	-.084	3	-49.914	4	0	4	-.225	4	-.01	2
299		17	max	3361.287	1	1.879	2	0	1	0	1	0	1	0	3
300			min	-4023.795	3	-.106	3	-50.326	4	0	4	-.241	4	-.011	2
301		18	max	3361.761	1	1.85	2	0	1	0	1	0	1	0	3
302			min	-4023.44	3	-.128	3	-50.737	4	0	4	-.257	4	-.011	2
303		19	max	3362.235	1	1.821	2	0	1	0	1	0	1	0	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
304			min	-4023.084	3	-.149	3	-51.148	4	0	4	-.273	4	-.012	2
305	M7	1	max	2126.895	2	9.028	6	0	1	0	1	0	1	.012	2
306			min	-2252.003	3	2.119	15	-.943	5	0	4	-.017	4	0	3
307		2	max	2126.725	2	8.156	6	0	1	0	1	0	1	.009	2
308			min	-2252.131	3	1.914	15	-.336	5	0	4	-.017	4	-.002	3
309		3	max	2126.555	2	7.284	6	.331	4	0	1	0	1	.006	2
310			min	-2252.259	3	1.709	15	0	1	0	4	-.017	4	-.004	3
311		4	max	2126.384	2	6.412	6	.938	4	0	1	0	1	.003	2
312			min	-2252.387	3	1.504	15	0	1	0	4	-.017	4	-.005	3
313		5	max	2126.214	2	5.54	6	1.545	4	0	1	0	1	0	2
314			min	-2252.514	3	1.299	15	0	1	0	4	-.017	4	-.007	3
315		6	max	2126.043	2	4.668	6	2.152	4	0	1	0	1	-.001	15
316			min	-2252.642	3	1.094	15	0	1	0	4	-.016	4	-.008	3
317		7	max	2125.873	2	3.796	6	2.759	4	0	1	0	1	-.002	15
318			min	-2252.77	3	.889	15	0	1	0	4	-.014	4	-.008	3
319		8	max	2125.703	2	2.924	6	3.366	4	0	1	0	1	-.002	15
320			min	-2252.898	3	.684	15	0	1	0	4	-.013	4	-.01	4
321		9	max	2125.532	2	2.089	2	3.974	4	0	1	0	1	-.003	15
322			min	-2253.026	3	.387	12	0	1	0	4	-.011	4	-.011	4
323		10	max	2125.362	2	1.41	2	4.581	4	0	1	0	1	-.003	15
324			min	-2253.153	3	.031	3	0	1	0	4	-.009	4	-.012	4
325		11	max	2125.192	2	.73	2	5.188	4	0	1	0	1	-.003	15
326			min	-2253.281	3	-.479	3	0	1	0	4	-.007	4	-.012	4
327		12	max	2125.021	2	.051	2	5.795	4	0	1	0	1	-.003	15
328			min	-2253.409	3	-.988	3	0	1	0	4	-.004	4	-.012	4
329		13	max	2124.851	2	-.341	15	6.402	4	0	1	0	1	-.003	15
330			min	-2253.537	3	-1.498	3	0	1	0	4	-.002	5	-.011	4
331		14	max	2124.681	2	-.546	15	7.009	4	0	1	.002	4	-.002	15
332			min	-2253.664	3	-2.308	4	0	1	0	4	0	1	-.011	4
333		15	max	2124.51	2	-.751	15	7.616	4	0	1	.005	4	-.002	15
334			min	-2253.792	3	-3.18	4	0	1	0	4	0	1	-.009	4
335		16	max	2124.34	2	-.956	15	8.223	4	0	1	.009	4	-.002	15
336			min	-2253.92	3	-4.052	4	0	1	0	4	0	1	-.008	4
337		17	max	2124.17	2	-1.161	15	8.83	4	0	1	.013	4	-.001	15
338			min	-2254.048	3	-4.924	4	0	1	0	4	0	1	-.005	4
339		18	max	2123.999	2	-1.366	15	9.438	4	0	1	.017	4	0	15
340			min	-2254.175	3	-5.796	4	0	1	0	4	0	1	-.003	4
341		19	max	2123.829	2	-1.571	15	10.045	4	0	1	.022	4	0	1
342			min	-2254.303	3	-6.669	4	0	1	0	4	0	1	0	1
343	M8	1	max	3073.298	1	0	1	0	1	0	1	.015	4	0	1
344			min	-418.212	3	0	1	-277.968	4	0	1	0	1	0	1
345		2	max	3073.468	1	0	1	0	1	0	1	0	1	0	1
346			min	-418.084	3	0	1	-278.116	4	0	1	-.017	4	0	1
347		3	max	3073.639	1	0	1	0	1	0	1	0	1	0	1
348			min	-417.956	3	0	1	-278.264	4	0	1	-.049	4	0	1
349		4	max	3073.809	1	0	1	0	1	0	1	0	1	0	1
350			min	-417.829	3	0	1	-278.411	4	0	1	-.081	4	0	1
351		5	max	3073.979	1	0	1	0	1	0	1	0	1	0	1
352			min	-417.701	3	0	1	-278.559	4	0	1	-.113	4	0	1
353		6	max	3074.15	1	0	1	0	1	0	1	0	1	0	1
354			min	-417.573	3	0	1	-278.707	4	0	1	-.145	4	0	1
355		7	max	3074.32	1	0	1	0	1	0	1	0	1	0	1
356			min	-417.445	3	0	1	-278.854	4	0	1	-.177	4	0	1
357		8	max	3074.49	1	0	1	0	1	0	1	0	1	0	1
358			min	-417.318	3	0	1	-279.002	4	0	1	-.209	4	0	1
359		9	max	3074.661	1	0	1	0	1	0	1	0	1	0	1
360			min	-417.19	3	0	1	-279.15	4	0	1	-.241	4	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
361		10	max	3074.831	1	0	1	0	1	0	1	0	1	0	1
362			min	-417.062	3	0	1	-279.297	4	0	1	-.273	4	0	1
363		11	max	3075.001	1	0	1	0	1	0	1	0	1	0	1
364			min	-416.934	3	0	1	-279.445	4	0	1	-.305	4	0	1
365		12	max	3075.172	1	0	1	0	1	0	1	0	1	0	1
366			min	-416.806	3	0	1	-279.592	4	0	1	-.337	4	0	1
367		13	max	3075.342	1	0	1	0	1	0	1	0	1	0	1
368			min	-416.679	3	0	1	-279.74	4	0	1	-.369	4	0	1
369		14	max	3075.512	1	0	1	0	1	0	1	0	1	0	1
370			min	-416.551	3	0	1	-279.888	4	0	1	-.401	4	0	1
371		15	max	3075.683	1	0	1	0	1	0	1	0	1	0	1
372			min	-416.423	3	0	1	-280.035	4	0	1	-.433	4	0	1
373		16	max	3075.853	1	0	1	0	1	0	1	0	1	0	1
374			min	-416.295	3	0	1	-280.183	4	0	1	-.466	4	0	1
375		17	max	3076.023	1	0	1	0	1	0	1	0	1	0	1
376			min	-416.168	3	0	1	-280.331	4	0	1	-.498	4	0	1
377		18	max	3076.194	1	0	1	0	1	0	1	0	1	0	1
378			min	-416.04	3	0	1	-280.478	4	0	1	-.53	4	0	1
379		19	max	3076.364	1	0	1	0	1	0	1	0	1	0	1
380			min	-415.912	3	0	1	-280.626	4	0	1	-.562	4	0	1
381	M10	1	max	1072.402	1	1.981	6	-.038	12	0	1	0	4	0	1
382			min	-1259.314	3	.447	15	-43.631	4	0	5	0	3	0	1
383		2	max	1072.875	1	1.944	6	-.038	12	0	1	0	10	0	15
384			min	-1258.959	3	.438	15	-44.042	4	0	5	-.014	4	0	6
385		3	max	1073.349	1	1.907	6	-.038	12	0	1	0	12	0	15
386			min	-1258.603	3	.429	15	-44.454	4	0	5	-.028	4	-.001	6
387		4	max	1073.823	1	1.87	6	-.038	12	0	1	0	12	0	15
388			min	-1258.248	3	.421	15	-44.865	4	0	5	-.042	4	-.002	6
389		5	max	1074.297	1	1.832	6	-.038	12	0	1	0	12	0	15
390			min	-1257.893	3	.412	15	-45.276	4	0	5	-.057	4	-.002	6
391		6	max	1074.77	1	1.795	6	-.038	12	0	1	0	12	0	15
392			min	-1257.537	3	.403	15	-45.688	4	0	5	-.071	4	-.003	6
393		7	max	1075.244	1	1.758	6	-.038	12	0	1	0	12	0	15
394			min	-1257.182	3	.395	15	-46.099	4	0	5	-.086	4	-.004	6
395		8	max	1075.718	1	1.721	6	-.038	12	0	1	0	12	0	15
396			min	-1256.827	3	.386	15	-46.51	4	0	5	-.101	4	-.004	6
397		9	max	1076.191	1	1.684	6	-.038	12	0	1	0	12	-.001	15
398			min	-1256.471	3	.377	15	-46.922	4	0	5	-.116	4	-.005	6
399		10	max	1076.665	1	1.647	6	-.038	12	0	1	0	12	-.001	15
400			min	-1256.116	3	.368	15	-47.333	4	0	5	-.131	4	-.005	6
401		11	max	1077.139	1	1.61	6	-.038	12	0	1	0	12	-.001	15
402			min	-1255.761	3	.36	15	-47.744	4	0	5	-.146	4	-.006	6
403		12	max	1077.613	1	1.573	6	-.038	12	0	1	0	12	-.001	15
404			min	-1255.406	3	.351	15	-48.156	4	0	5	-.161	4	-.006	6
405		13	max	1078.086	1	1.536	6	-.038	12	0	1	0	12	-.002	15
406			min	-1255.05	3	.342	15	-48.567	4	0	5	-.177	4	-.007	6
407		14	max	1078.56	1	1.499	6	-.038	12	0	1	0	12	-.002	15
408			min	-1254.695	3	.334	15	-48.978	4	0	5	-.193	4	-.007	6
409		15	max	1079.034	1	1.462	6	-.038	12	0	1	0	12	-.002	15
410			min	-1254.34	3	.325	15	-49.39	4	0	5	-.208	4	-.008	6
411		16	max	1079.508	1	1.425	6	-.038	12	0	1	0	12	-.002	15
412			min	-1253.984	3	.316	15	-49.801	4	0	5	-.224	4	-.008	6
413		17	max	1079.981	1	1.388	6	-.038	12	0	1	0	12	-.002	15
414			min	-1253.629	3	.307	15	-50.212	4	0	5	-.24	4	-.009	6
415		18	max	1080.455	1	1.351	6	-.038	12	0	1	0	12	-.002	15
416			min	-1253.274	3	.299	15	-50.624	4	0	5	-.256	4	-.009	6
417		19	max	1080.929	1	1.314	6	-.038	12	0	1	0	12	-.002	15

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
418			min	-1252.918	3	.29	15	-51.035	4	0	5	-.273	4	-.009	6
419	M11	1	max	584.157	2	8.964	6	-.016	12	0	1	0	12	.009	6
420			min	-734.588	3	2.094	15	-.687	5	0	4	-.017	4	.002	15
421		2	max	583.987	2	8.092	6	-.016	12	0	1	0	12	.006	2
422			min	-734.716	3	1.889	15	-.294	1	0	4	-.017	4	.001	15
423		3	max	583.816	2	7.22	6	.529	4	0	1	0	12	.003	2
424			min	-734.843	3	1.684	15	-.294	1	0	4	-.017	4	0	3
425		4	max	583.646	2	6.348	6	1.136	4	0	1	0	12	0	2
426			min	-734.971	3	1.479	15	-.294	1	0	4	-.017	4	-.002	3
427		5	max	583.476	2	5.476	6	1.743	4	0	1	0	12	-.001	15
428			min	-735.099	3	1.275	15	-.294	1	0	4	-.016	4	-.004	4
429		6	max	583.305	2	4.604	6	2.35	4	0	1	0	12	-.002	15
430			min	-735.227	3	1.07	15	-.294	1	0	4	-.015	4	-.007	4
431		7	max	583.135	2	3.732	6	2.957	4	0	1	0	12	-.002	15
432			min	-735.354	3	.865	15	-.294	1	0	4	-.014	4	-.009	4
433		8	max	582.965	2	2.86	6	3.565	4	0	1	0	12	-.002	15
434			min	-735.482	3	.66	15	-.294	1	0	4	-.012	4	-.01	4
435		9	max	582.794	2	1.988	6	4.172	4	0	1	0	12	-.003	15
436			min	-735.61	3	.455	15	-.294	1	0	4	-.011	4	-.011	4
437		10	max	582.624	2	1.116	6	4.779	4	0	1	0	12	-.003	15
438			min	-735.738	3	.25	15	-.294	1	0	4	-.008	4	-.012	4
439		11	max	582.454	2	.361	2	5.386	4	0	1	0	12	-.003	15
440			min	-735.865	3	-.045	3	-.294	1	0	4	-.006	4	-.012	4
441		12	max	582.283	2	-.16	15	5.993	4	0	1	0	12	-.003	15
442			min	-735.993	3	-.629	4	-.294	1	0	4	-.003	4	-.012	4
443		13	max	582.113	2	-.365	15	6.6	4	0	1	0	5	-.003	15
444			min	-736.121	3	-1.501	4	-.294	1	0	4	-.002	1	-.012	4
445		14	max	581.943	2	-.57	15	7.207	4	0	1	.003	5	-.003	15
446			min	-736.249	3	-2.373	4	-.294	1	0	4	-.002	1	-.011	4
447		15	max	581.772	2	-.775	15	7.814	4	0	1	.007	5	-.002	15
448			min	-736.376	3	-3.245	4	-.294	1	0	4	-.002	1	-.009	4
449		16	max	581.602	2	-.98	15	8.422	4	0	1	.011	5	-.002	15
450			min	-736.504	3	-4.117	4	-.294	1	0	4	-.002	1	-.008	4
451		17	max	581.431	2	-1.185	15	9.029	4	0	1	.015	5	-.001	15
452			min	-736.632	3	-4.989	4	-.294	1	0	4	-.002	1	-.006	4
453		18	max	581.261	2	-1.39	15	9.636	4	0	1	.019	5	0	15
454			min	-736.76	3	-5.861	4	-.294	1	0	4	-.003	1	-.003	4
455		19	max	581.091	2	-1.595	15	10.243	4	0	1	.024	5	0	1
456			min	-736.888	3	-6.733	4	-.294	1	0	4	-.003	1	0	1
457	M12	1	max	1145.65	1	0	1	14.352	1	0	1	.017	5	0	1
458			min	-106.509	3	0	1	-282.105	4	0	1	-.002	1	0	1
459		2	max	1145.82	1	0	1	14.352	1	0	1	0	10	0	1
460			min	-106.382	3	0	1	-282.253	4	0	1	-.016	4	0	1
461		3	max	1145.991	1	0	1	14.352	1	0	1	.001	1	0	1
462			min	-106.254	3	0	1	-282.4	4	0	1	-.048	4	0	1
463		4	max	1146.161	1	0	1	14.352	1	0	1	.003	1	0	1
464			min	-106.126	3	0	1	-282.548	4	0	1	-.081	4	0	1
465		5	max	1146.331	1	0	1	14.352	1	0	1	.005	1	0	1
466			min	-105.998	3	0	1	-282.695	4	0	1	-.113	4	0	1
467		6	max	1146.502	1	0	1	14.352	1	0	1	.006	1	0	1
468			min	-105.871	3	0	1	-282.843	4	0	1	-.146	4	0	1
469		7	max	1146.672	1	0	1	14.352	1	0	1	.008	1	0	1
470			min	-105.743	3	0	1	-282.991	4	0	1	-.178	4	0	1
471		8	max	1146.842	1	0	1	14.352	1	0	1	.01	1	0	1
472			min	-105.615	3	0	1	-283.138	4	0	1	-.211	4	0	1
473		9	max	1147.013	1	0	1	14.352	1	0	1	.011	1	0	1
474			min	-105.487	3	0	1	-283.286	4	0	1	-.243	4	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
475		10	max	1147.183	1	0	1	14.352	1	0	1	.013	1	0	1
476			min	-105.36	3	0	1	-283.434	4	0	1	-.276	4	0	1
477		11	max	1147.353	1	0	1	14.352	1	0	1	.015	1	0	1
478			min	-105.232	3	0	1	-283.581	4	0	1	-.308	4	0	1
479		12	max	1147.524	1	0	1	14.352	1	0	1	.016	1	0	1
480			min	-105.104	3	0	1	-283.729	4	0	1	-.341	4	0	1
481		13	max	1147.694	1	0	1	14.352	1	0	1	.018	1	0	1
482			min	-104.976	3	0	1	-283.877	4	0	1	-.374	4	0	1
483		14	max	1147.865	1	0	1	14.352	1	0	1	.02	1	0	1
484			min	-104.849	3	0	1	-284.024	4	0	1	-.406	4	0	1
485		15	max	1148.035	1	0	1	14.352	1	0	1	.021	1	0	1
486			min	-104.721	3	0	1	-284.172	4	0	1	-.439	4	0	1
487		16	max	1148.205	1	0	1	14.352	1	0	1	.023	1	0	1
488			min	-104.593	3	0	1	-284.319	4	0	1	-.471	4	0	1
489		17	max	1148.376	1	0	1	14.352	1	0	1	.024	1	0	1
490			min	-104.465	3	0	1	-284.467	4	0	1	-.504	4	0	1
491		18	max	1148.546	1	0	1	14.352	1	0	1	.026	1	0	1
492			min	-104.338	3	0	1	-284.615	4	0	1	-.537	4	0	1
493		19	max	1148.716	1	0	1	14.352	1	0	1	.028	1	0	1
494			min	-104.21	3	0	1	-284.762	4	0	1	-.569	4	0	1
495	M1	1	max	184.081	1	677.629	3	52.458	5	0	1	.234	1	0	15
496			min	-16.069	5	-453.687	1	-83.314	1	0	3	-.115	5	-.015	2
497		2	max	184.793	1	676.484	3	53.918	5	0	1	.182	1	.268	1
498			min	-15.737	5	-455.214	1	-83.314	1	0	3	-.082	5	-.422	3
499		3	max	476.521	3	536.231	1	13.366	5	0	3	.13	1	.54	1
500			min	-298.48	2	-499.973	3	-82.905	1	0	1	-.049	5	-.829	3
501		4	max	477.055	3	534.704	1	14.826	5	0	3	.079	1	.208	1
502			min	-297.768	2	-501.118	3	-82.905	1	0	1	-.04	5	-.518	3
503		5	max	477.589	3	533.177	1	16.286	5	0	3	.027	1	-.005	15
504			min	-297.056	2	-502.263	3	-82.905	1	0	1	-.03	5	-.207	3
505		6	max	478.123	3	531.65	1	17.746	5	0	3	-.001	12	.105	3
506			min	-296.344	2	-503.408	3	-82.905	1	0	1	-.025	4	-.467	2
507		7	max	478.657	3	530.123	1	19.206	5	0	3	-.004	12	.418	3
508			min	-295.632	2	-504.554	3	-82.905	1	0	1	-.076	1	-.787	2
509		8	max	479.191	3	528.596	1	20.666	5	0	3	.004	5	.731	3
510			min	-294.92	2	-505.699	3	-82.905	1	0	1	-.127	1	-1.112	1
511		9	max	493.222	3	42.349	2	60.576	5	0	9	.08	1	.855	3
512			min	-217.909	2	.458	15	-131.309	1	0	3	-.149	5	-1.267	1
513		10	max	493.756	3	40.822	2	62.037	5	0	9	0	10	.834	3
514			min	-217.197	2	-.006	5	-131.309	1	0	3	-.112	4	-1.29	2
515		11	max	494.29	3	39.295	2	63.497	5	0	9	-.005	12	.813	3
516			min	-216.485	2	-1.9	4	-131.309	1	0	3	-.09	4	-1.315	2
517		12	max	508.173	3	325.607	3	163.173	5	0	2	.124	1	.71	3
518			min	-139.436	2	-601.727	2	-79.86	1	0	3	-.256	5	-1.165	2
519		13	max	508.707	3	324.462	3	164.633	5	0	2	.075	1	.508	3
520			min	-138.724	2	-603.254	2	-79.86	1	0	3	-.154	5	-.791	2
521		14	max	509.241	3	323.317	3	166.093	5	0	2	.025	1	.307	3
522			min	-138.012	2	-604.781	2	-79.86	1	0	3	-.051	5	-.429	1
523		15	max	509.775	3	322.171	3	167.553	5	0	2	.052	5	.107	3
524			min	-137.3	2	-606.308	2	-79.86	1	0	3	-.024	1	-.07	1
525		16	max	510.309	3	321.026	3	169.013	5	0	2	.157	5	.336	2
526			min	-136.588	2	-607.835	2	-79.86	1	0	3	-.074	1	-.093	3
527		17	max	510.843	3	319.881	3	170.473	5	0	2	.262	5	.714	2
528			min	-135.876	2	-609.362	2	-79.86	1	0	3	-.123	1	-.292	3
529		18	max	27.024	5	594.236	2	-5.187	12	0	5	.229	5	.358	2
530			min	-185.288	1	-250.093	3	-121.057	4	0	2	-.178	1	-.143	3
531		19	max	27.356	5	592.709	2	-5.187	12	0	5	.168	5	.013	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
532			min	-184.576	1	-251.238	3	-119.596	4	0	2	-.236	1	-.012	1
533	M5	1	max	406.99	1	2251.298	3	97.135	5	0	1	0	1	.03	2
534			min	14.5	12	-1555.382	1	0	1	0	4	-.242	4	0	15
535		2	max	407.702	1	2250.152	3	98.595	5	0	1	0	1	.994	1
536			min	14.856	12	-1556.909	1	0	1	0	4	-.182	4	-1.392	3
537		3	max	1498.287	3	1523.81	1	61.986	4	0	4	0	1	1.927	1
538			min	-1000.948	2	-1532.824	3	0	1	0	1	-.121	4	-2.747	3
539		4	max	1498.821	3	1522.284	1	63.446	4	0	4	0	1	.982	1
540			min	-1000.236	2	-1533.969	3	0	1	0	1	-.082	4	-1.795	3
541		5	max	1499.355	3	1520.757	1	64.906	4	0	4	0	1	.038	9
542			min	-999.524	2	-1535.115	3	0	1	0	1	-.042	4	-.843	3
543		6	max	1499.889	3	1519.23	1	66.366	4	0	4	0	1	.11	3
544			min	-998.812	2	-1536.26	3	0	1	0	1	-.002	5	-.934	2
545		7	max	1500.423	3	1517.703	1	67.827	4	0	4	.04	4	1.064	3
546			min	-998.1	2	-1537.405	3	0	1	0	1	0	1	-1.848	1
547		8	max	1500.957	3	1516.176	1	69.287	4	0	4	.083	4	2.018	3
548			min	-997.388	2	-1538.55	3	0	1	0	1	0	1	-2.789	1
549		9	max	1522.135	3	142.077	2	201.146	4	0	1	0	1	2.329	3
550			min	-835.825	2	.463	15	0	1	0	1	-.223	4	-3.167	1
551		10	max	1522.669	3	140.55	2	202.606	4	0	1	0	1	2.248	3
552			min	-835.113	2	.002	15	0	1	0	1	-.097	4	-3.231	2
553		11	max	1523.203	3	139.023	2	204.066	4	0	1	.029	4	2.168	3
554			min	-834.401	2	-1.636	6	0	1	0	1	0	1	-3.318	2
555		12	max	1544.677	3	967.822	3	227.078	4	0	1	0	1	1.899	3
556			min	-672.916	2	-1750.95	2	0	1	0	4	-.366	4	-2.964	2
557		13	max	1545.211	3	966.677	3	228.538	4	0	1	0	1	1.299	3
558			min	-672.204	2	-1752.477	2	0	1	0	4	-.225	4	-1.877	2
559		14	max	1545.745	3	965.532	3	229.998	4	0	1	0	1	.699	3
560			min	-671.492	2	-1754.004	2	0	1	0	4	-.082	4	-.83	1
561		15	max	1546.279	3	964.386	3	231.458	4	0	1	.061	4	.3	2
562			min	-670.78	2	-1755.53	2	0	1	0	4	0	1	0	15
563		16	max	1546.813	3	963.241	3	232.919	4	0	1	.205	4	1.39	2
564			min	-670.068	2	-1757.057	2	0	1	0	4	0	1	-.498	3
565		17	max	1547.347	3	962.096	3	234.379	4	0	1	.35	4	2.481	2
566			min	-669.356	2	-1758.584	2	0	1	0	4	0	1	-1.095	3
567		18	max	-15.435	12	2015.814	2	0	1	0	4	.358	4	1.271	2
568			min	-406.713	1	-878.442	3	-29.476	5	0	1	0	1	-.571	3
569		19	max	-15.079	12	2014.287	2	0	1	0	4	.341	4	.024	1
570			min	-406.001	1	-879.588	3	-28.016	5	0	1	0	1	-.025	3
571	M9	1	max	184.081	1	677.629	3	83.314	1	0	3	-.014	12	0	15
572			min	8.629	12	-453.687	1	5.043	12	0	4	-.234	1	-.015	2
573		2	max	184.793	1	676.484	3	83.375	4	0	3	-.011	12	.268	1
574			min	8.985	12	-455.214	1	5.043	12	0	4	-.182	1	-.422	3
575		3	max	476.521	3	536.231	1	82.905	1	0	1	-.008	12	.54	1
576			min	-298.48	2	-499.973	3	5.002	12	0	3	-.13	1	-.829	3
577		4	max	477.055	3	534.704	1	82.905	1	0	1	-.005	12	.208	1
578			min	-297.768	2	-501.118	3	5.002	12	0	3	-.079	1	-.518	3
579		5	max	477.589	3	533.177	1	82.905	1	0	1	-.002	12	-.005	15
580			min	-297.056	2	-502.263	3	5.002	12	0	3	-.04	4	-.207	3
581		6	max	478.123	3	531.65	1	82.905	1	0	1	.024	1	.105	3
582			min	-296.344	2	-503.408	3	5.002	12	0	3	-.017	5	-.467	2
583		7	max	478.657	3	530.123	1	82.905	1	0	1	.076	1	.418	3
584			min	-295.632	2	-504.554	3	5.002	12	0	3	0	15	-.787	2
585		8	max	479.191	3	528.596	1	82.905	1	0	1	.127	1	.731	3
586			min	-294.92	2	-505.699	3	5.002	12	0	3	.008	12	-1.112	1
587		9	max	493.222	3	42.349	2	131.309	1	0	3	-.005	12	.855	3
588			min	-217.909	2	.473	15	7.596	12	0	9	-.178	4	-1.267	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
589		10	max	493.756	3	40.822	2	131.309	1	0	3	.001	1	.834	3
590			min	-217.197	2	.012	15	7.596	12	0	9	-.111	4	-1.29	2
591		11	max	494.29	3	39.295	2	131.309	1	0	3	.083	1	.813	3
592			min	-216.485	2	-1.784	6	7.596	12	0	9	-.061	5	-1.315	2
593		12	max	508.173	3	325.607	3	193.593	4	0	3	-.007	12	.71	3
594			min	-139.436	2	-601.727	2	4.423	12	0	2	-.302	4	-1.165	2
595		13	max	508.707	3	324.462	3	195.053	4	0	3	-.004	12	.508	3
596			min	-138.724	2	-603.254	2	4.423	12	0	2	-.182	4	-.791	2
597		14	max	509.241	3	323.317	3	196.513	4	0	3	-.001	12	.307	3
598			min	-138.012	2	-604.781	2	4.423	12	0	2	-.06	4	-.429	1
599		15	max	509.775	3	322.171	3	197.973	4	0	3	.062	4	.107	3
600			min	-137.3	2	-606.308	2	4.423	12	0	2	.001	12	-.07	1
601		16	max	510.309	3	321.026	3	199.433	4	0	3	.185	4	.336	2
602			min	-136.588	2	-607.835	2	4.423	12	0	2	.004	12	-.093	3
603		17	max	510.843	3	319.881	3	200.894	4	0	3	.31	4	.714	2
604			min	-135.876	2	-609.362	2	4.423	12	0	2	.007	12	-.292	3
605		18	max	-8.696	12	594.236	2	93.524	1	0	2	.295	4	.358	2
606			min	-185.288	1	-250.093	3	-88.156	5	0	3	.01	12	-.143	3
607		19	max	-8.34	12	592.709	2	93.524	1	0	2	.253	4	.013	3
608			min	-184.576	1	-251.238	3	-86.696	5	0	3	.013	12	-.012	1

Envelope Member Section Deflections

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
1	M13	1	max	0	1	.192	2	.009	3	1.308e-2	2	NC	1	NC	1
2			min	-.823	4	-.038	3	-.005	2	-2.506e-3	3	NC	1	NC	1
3		2	max	0	1	.199	3	.034	1	1.442e-2	2	NC	5	NC	2
4			min	-.823	4	.003	15	-.02	5	-2.308e-3	3	910.763	3	6536.651	1
5		3	max	0	1	.392	3	.079	1	1.575e-2	2	NC	5	NC	3
6			min	-.823	4	-.047	1	-.025	5	-2.111e-3	3	502.528	3	2768.971	1
7		4	max	0	1	.51	3	.116	1	1.709e-2	2	NC	5	NC	3
8			min	-.823	4	-.1	1	-.019	5	-1.913e-3	3	394.115	3	1864.676	1
9		5	max	0	1	.54	3	.135	1	1.842e-2	2	NC	5	NC	3
10			min	-.823	4	-.094	1	-.006	5	-1.716e-3	3	373.801	3	1607.72	1
11		6	max	0	1	.483	3	.129	1	1.976e-2	2	NC	5	NC	3
12			min	-.823	4	-.032	1	.005	15	-1.518e-3	3	414.544	3	1684.455	1
13		7	max	0	1	.357	3	.1	1	2.109e-2	2	NC	5	NC	3
14			min	-.823	4	.003	15	.001	10	-1.321e-3	3	546.197	3	2181.255	1
15		8	max	0	1	.222	2	.056	1	2.243e-2	2	NC	1	NC	2
16			min	-.823	4	.006	15	-.005	10	-1.123e-3	3	920.152	3	3916.62	1
17		9	max	0	1	.325	2	.029	3	2.377e-2	2	NC	4	NC	1
18			min	-.823	4	.009	15	-.011	2	-9.258e-4	3	1617.345	2	8729.881	4
19		10	max	0	1	.371	2	.028	3	2.51e-2	2	NC	5	NC	1
20			min	-.823	4	-.016	3	-.02	2	-7.284e-4	3	1204.004	2	NC	1
21		11	max	0	12	.325	2	.029	3	2.377e-2	2	NC	4	NC	1
22			min	-.823	4	.009	15	-.016	5	-9.258e-4	3	1617.345	2	NC	1
23		12	max	0	12	.222	2	.056	1	2.243e-2	2	NC	1	NC	2
24			min	-.823	4	.006	15	-.016	5	-1.123e-3	3	920.152	3	3916.62	1
25		13	max	0	12	.357	3	.1	1	2.109e-2	2	NC	5	NC	3
26			min	-.823	4	.002	15	-.005	5	-1.321e-3	3	546.197	3	2181.255	1
27		14	max	0	12	.483	3	.129	1	1.976e-2	2	NC	5	NC	3
28			min	-.823	4	-.032	1	.006	10	-1.518e-3	3	414.544	3	1684.455	1
29		15	max	0	12	.54	3	.135	1	1.842e-2	2	NC	5	NC	3
30			min	-.823	4	-.094	1	.008	10	-1.716e-3	3	373.801	3	1607.72	1
31		16	max	0	12	.51	3	.116	1	1.709e-2	2	NC	5	NC	3
32			min	-.823	4	-.1	1	.007	10	-1.913e-3	3	394.115	3	1864.676	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
33		17	max	0	12	.392	3	.079	1	1.575e-2	2	NC	5	NC	3
34			min	-.823	4	-.047	1	.004	10	-2.111e-3	3	502.528	3	2768.971	1
35		18	max	0	12	.199	3	.034	1	1.442e-2	2	NC	5	NC	2
36			min	-.823	4	.002	15	0	10	-2.308e-3	3	910.763	3	6278.746	4
37		19	max	0	12	.192	2	.009	3	1.308e-2	2	NC	1	NC	1
38			min	-.823	4	-.038	3	-.005	2	-2.506e-3	3	NC	1	NC	1
39	M14	1	max	0	1	.351	3	.008	3	7.518e-3	2	NC	1	NC	1
40			min	-.61	4	-.582	2	-.004	2	-5.392e-3	3	NC	1	NC	1
41		2	max	0	1	.62	3	.022	1	8.773e-3	2	NC	5	NC	1
42			min	-.61	4	-.872	1	-.03	5	-6.411e-3	3	731.727	1	7568.848	5
43		3	max	0	1	.853	3	.061	1	1.003e-2	2	NC	15	NC	3
44			min	-.61	4	-1.134	1	-.037	5	-7.429e-3	3	388.119	1	3612.061	1
45		4	max	0	1	1.026	3	.097	1	1.128e-2	2	NC	15	NC	3
46			min	-.61	4	-1.337	1	-.026	5	-8.448e-3	3	284.144	1	2252.279	1
47		5	max	0	1	1.125	3	.117	1	1.254e-2	2	9279.292	15	NC	3
48			min	-.61	4	-1.47	1	-.006	5	-9.466e-3	3	241.822	1	1860.678	1
49		6	max	0	1	1.15	3	.115	1	1.379e-2	2	8731.852	15	NC	3
50			min	-.61	4	-1.531	1	.005	10	-1.048e-2	3	226.495	1	1896.515	1
51		7	max	0	1	1.112	3	.091	1	1.504e-2	2	8814.844	15	NC	3
52			min	-.61	4	-1.527	1	.001	10	-1.15e-2	3	227.259	1	2407.208	1
53		8	max	0	1	1.034	3	.057	4	1.63e-2	2	9341.835	15	NC	2
54			min	-.61	4	-1.481	1	-.004	10	-1.252e-2	3	239.08	1	3746.71	4
55		9	max	0	1	.951	3	.038	4	1.755e-2	2	NC	15	NC	1
56			min	-.61	4	-1.424	2	-.01	2	-1.354e-2	3	256.086	1	5514.881	4
57		10	max	0	1	.911	3	.025	3	1.881e-2	1	NC	15	NC	1
58			min	-.61	4	-1.396	2	-.018	2	-1.456e-2	3	265.299	2	NC	1
59		11	max	0	12	.951	3	.026	3	1.755e-2	2	NC	15	NC	1
60			min	-.61	4	-1.424	2	-.03	5	-1.354e-2	3	256.086	1	7616.395	5
61		12	max	0	12	1.034	3	.052	1	1.63e-2	2	9341.737	15	NC	2
62			min	-.61	4	-1.481	1	-.035	5	-1.252e-2	3	239.08	1	4245.794	1
63		13	max	0	12	1.112	3	.091	1	1.504e-2	2	8814.673	15	NC	3
64			min	-.61	4	-1.527	1	-.023	5	-1.15e-2	3	227.259	1	2407.208	1
65		14	max	0	12	1.15	3	.115	1	1.379e-2	2	8731.603	15	NC	3
66			min	-.61	4	-1.531	1	-.002	5	-1.048e-2	3	226.495	1	1896.515	1
67		15	max	0	12	1.125	3	.117	1	1.254e-2	2	9278.939	15	NC	3
68			min	-.61	4	-1.47	1	.007	10	-9.466e-3	3	241.822	1	1860.678	1
69		16	max	0	12	1.026	3	.097	1	1.128e-2	2	NC	15	NC	3
70			min	-.61	4	-1.337	1	.005	10	-8.448e-3	3	284.144	1	2252.279	1
71		17	max	0	12	.853	3	.061	1	1.003e-2	2	NC	15	NC	3
72			min	-.61	4	-1.134	1	.002	10	-7.429e-3	3	388.119	1	3542.139	4
73		18	max	0	12	.62	3	.04	4	8.773e-3	2	NC	5	NC	1
74			min	-.61	4	-.872	1	-.001	10	-6.411e-3	3	731.727	1	5324.399	4
75		19	max	0	12	.351	3	.008	3	7.518e-3	2	NC	1	NC	1
76			min	-.61	4	-.582	2	-.004	2	-5.392e-3	3	NC	1	NC	1
77	M15	1	max	0	12	.36	3	.008	3	4.504e-3	3	NC	1	NC	1
78			min	-.491	4	-.581	2	-.004	2	-7.785e-3	2	NC	1	NC	1
79		2	max	0	12	.545	3	.022	1	5.351e-3	3	NC	5	NC	1
80			min	-.491	4	-.923	2	-.042	5	-9.09e-3	2	631.967	2	5326.72	5
81		3	max	0	12	.71	3	.061	1	6.197e-3	3	NC	15	NC	3
82			min	-.491	4	-1.222	2	-.052	5	-1.04e-2	2	337.024	2	3591.934	1
83		4	max	0	12	.842	3	.097	1	7.044e-3	3	NC	15	NC	3
84			min	-.491	4	-1.448	2	-.039	5	-1.17e-2	2	248.969	2	2242.192	1
85		5	max	0	12	.933	3	.117	1	7.891e-3	3	9296.849	15	NC	3
86			min	-.491	4	-1.587	2	-.012	5	-1.301e-2	2	214.686	2	1852.842	1
87		6	max	0	12	.982	3	.115	1	8.737e-3	3	8750.54	15	NC	3
88			min	-.491	4	-1.636	2	.006	10	-1.431e-2	2	204.752	2	1887.868	1
89		7	max	0	12	.993	3	.091	1	9.584e-3	3	8836.571	15	NC	3

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
90			min	-.491	4	-1.607	2	.002	10	-1.562e-2	2	210.425	2	2393.03	1
91		8	max	0	12	.976	3	.069	4	1.043e-2	3	9368.547	15	NC	2
92			min	-.491	4	-1.528	2	-.003	10	-1.692e-2	2	228.001	2	3101.021	4
93		9	max	0	12	.949	3	.048	4	1.128e-2	3	NC	15	NC	1
94			min	-.491	4	-1.439	2	-.009	2	-1.823e-2	2	251.693	2	4395.32	4
95		10	max	0	1	.934	3	.023	3	1.212e-2	3	NC	15	NC	1
96			min	-.491	4	-1.395	2	-.017	2	-1.953e-2	2	265.458	2	NC	1
97		11	max	0	1	.949	3	.024	3	1.128e-2	3	NC	15	NC	1
98			min	-.491	4	-1.439	2	-.04	5	-1.823e-2	2	251.693	2	5615.25	5
99		12	max	0	1	.976	3	.052	1	1.043e-2	3	9368.473	15	NC	2
100			min	-.491	4	-1.528	2	-.047	5	-1.692e-2	2	228.001	2	4202.118	1
101		13	max	0	1	.993	3	.091	1	9.584e-3	3	8836.447	15	NC	3
102			min	-.491	4	-1.607	2	-.032	5	-1.562e-2	2	210.425	2	2393.03	1
103		14	max	0	1	.982	3	.115	1	8.737e-3	3	8750.362	15	NC	3
104			min	-.491	4	-1.636	2	-.003	5	-1.431e-2	2	204.752	2	1887.868	1
105		15	max	0	1	.933	3	.117	1	7.891e-3	3	9296.6	15	NC	3
106			min	-.491	4	-1.587	2	.007	10	-1.301e-2	2	214.686	2	1852.842	1
107		16	max	0	1	.842	3	.097	1	7.044e-3	3	NC	15	NC	3
108			min	-.491	4	-1.448	2	.006	10	-1.17e-2	2	248.969	2	2242.192	1
109		17	max	0	1	.71	3	.076	4	6.197e-3	3	NC	15	NC	3
110			min	-.491	4	-1.222	2	.003	10	-1.04e-2	2	337.024	2	2825.551	4
111		18	max	0	1	.545	3	.052	4	5.351e-3	3	NC	5	NC	1
112			min	-.491	4	-.923	2	-.001	10	-9.09e-3	2	631.967	2	4110.39	4
113		19	max	0	1	.36	3	.008	3	4.504e-3	3	NC	1	NC	1
114			min	-.491	4	-.581	2	-.004	2	-7.785e-3	2	NC	1	NC	1
115	M16	1	max	0	12	.18	1	.007	3	8.41e-3	3	NC	1	NC	1
116			min	-.143	4	-.125	3	-.004	2	-1.168e-2	1	NC	1	NC	1
117		2	max	0	12	.02	9	.033	1	9.512e-3	3	NC	5	NC	2
118			min	-.143	4	-.061	3	-.03	5	-1.272e-2	1	1177.555	2	6614.188	1
119		3	max	0	12	0	15	.078	1	1.061e-2	3	NC	5	NC	3
120			min	-.143	4	-.156	2	-.038	5	-1.375e-2	1	658.317	2	2784.191	1
121		4	max	0	12	.007	12	.116	1	1.171e-2	3	NC	5	NC	3
122			min	-.143	4	-.236	2	-.03	5	-1.479e-2	1	529.163	2	1867.868	1
123		5	max	0	12	0	12	.135	1	1.282e-2	3	NC	5	NC	3
124			min	-.143	4	-.24	2	-.013	5	-1.582e-2	1	524.379	2	1605.124	1
125		6	max	0	12	0	13	.13	1	1.392e-2	3	NC	5	NC	3
126			min	-.143	4	-.169	2	.005	15	-1.686e-2	1	632.316	2	1674.811	1
127		7	max	0	12	.027	9	.101	1	1.502e-2	3	NC	3	NC	3
128			min	-.143	4	-.112	3	.004	10	-1.789e-2	1	1010.996	2	2153.32	1
129		8	max	0	12	.153	1	.058	1	1.612e-2	3	NC	4	NC	2
130			min	-.143	4	-.187	3	-.002	10	-1.892e-2	1	3518.183	3	3794.478	1
131		9	max	0	12	.281	1	.031	4	1.722e-2	3	NC	5	NC	1
132			min	-.143	4	-.251	3	-.007	10	-1.996e-2	1	1718.748	3	6769.283	4
133		10	max	0	1	.338	1	.02	3	1.832e-2	3	NC	5	NC	1
134			min	-.143	4	-.279	3	-.015	2	-2.099e-2	1	1369.446	1	NC	1
135		11	max	0	1	.281	1	.021	3	1.722e-2	3	NC	5	NC	1
136			min	-.143	4	-.251	3	-.023	5	-1.996e-2	1	1718.748	3	NC	1
137		12	max	0	1	.153	1	.058	1	1.612e-2	3	NC	4	NC	2
138			min	-.143	4	-.187	3	-.024	5	-1.892e-2	1	3518.183	3	3794.478	1
139		13	max	0	1	.027	9	.101	1	1.502e-2	3	NC	3	NC	3
140			min	-.143	4	-.112	3	-.011	5	-1.789e-2	1	1010.996	2	2153.32	1
141		14	max	0	1	0	13	.13	1	1.392e-2	3	NC	5	NC	3
142			min	-.143	4	-.169	2	.006	15	-1.686e-2	1	632.316	2	1674.811	1
143		15	max	0	1	0	12	.135	1	1.282e-2	3	NC	5	NC	3
144			min	-.142	4	-.24	2	.009	10	-1.582e-2	1	524.379	2	1605.124	1
145		16	max	0	1	.007	12	.116	1	1.171e-2	3	NC	5	NC	3
146			min	-.142	4	-.236	2	.008	10	-1.479e-2	1	529.163	2	1867.868	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
147		17	max	0	1	0	15	.078	1	1.061e-2	3	NC	5	NC	3
148			min	-.142	4	-.156	2	.005	10	-1.375e-2	1	658.317	2	2784.191	1
149		18	max	0	1	.02	9	.043	4	9.512e-3	3	NC	5	NC	2
150			min	-.142	4	-.061	3	0	10	-1.272e-2	1	1177.555	2	4937.66	4
151		19	max	0	1	.18	1	.007	3	8.41e-3	3	NC	1	NC	1
152			min	-.142	4	-.125	3	-.004	2	-1.168e-2	1	NC	1	NC	1
153	M2	1	max	.007	1	.008	2	.011	1	2.515e-3	5	NC	1	NC	2
154			min	-.008	3	-.013	3	-.771	4	-2.482e-4	1	8467.137	2	89.675	4
155		2	max	.007	1	.007	2	.01	1	2.548e-3	5	NC	1	NC	2
156			min	-.008	3	-.013	3	-.708	4	-2.342e-4	1	9931.03	2	97.675	4
157		3	max	.006	1	.006	2	.009	1	2.581e-3	5	NC	1	NC	2
158			min	-.007	3	-.013	3	-.645	4	-2.203e-4	1	NC	1	107.182	4
159		4	max	.006	1	.005	2	.008	1	2.613e-3	5	NC	1	NC	2
160			min	-.007	3	-.012	3	-.583	4	-2.063e-4	1	NC	1	118.59	4
161		5	max	.006	1	.003	2	.007	1	2.646e-3	5	NC	1	NC	2
162			min	-.006	3	-.012	3	-.522	4	-1.923e-4	1	NC	1	132.436	4
163		6	max	.005	1	.002	2	.006	1	2.679e-3	5	NC	1	NC	1
164			min	-.006	3	-.011	3	-.462	4	-1.784e-4	1	NC	1	149.465	4
165		7	max	.005	1	.001	2	.006	1	2.712e-3	5	NC	1	NC	1
166			min	-.006	3	-.011	3	-.405	4	-1.644e-4	1	NC	1	170.734	4
167		8	max	.004	1	0	2	.005	1	2.747e-3	4	NC	1	NC	1
168			min	-.005	3	-.01	3	-.349	4	-1.504e-4	1	NC	1	197.789	4
169		9	max	.004	1	0	2	.004	1	2.784e-3	4	NC	1	NC	1
170			min	-.005	3	-.01	3	-.297	4	-1.365e-4	1	NC	1	232.96	4
171		10	max	.004	1	0	15	.003	1	2.821e-3	4	NC	1	NC	1
172			min	-.004	3	-.009	3	-.247	4	-1.225e-4	1	NC	1	279.898	4
173		11	max	.003	1	0	15	.003	1	2.858e-3	4	NC	1	NC	1
174			min	-.004	3	-.008	3	-.201	4	-1.085e-4	1	NC	1	344.589	4
175		12	max	.003	1	0	15	.002	1	2.895e-3	4	NC	1	NC	1
176			min	-.003	3	-.008	3	-.158	4	-9.454e-5	1	NC	1	437.423	4
177		13	max	.002	1	0	15	.002	1	2.933e-3	4	NC	1	NC	1
178			min	-.003	3	-.007	3	-.12	4	-8.057e-5	1	NC	1	577.763	4
179		14	max	.002	1	0	15	.001	1	2.97e-3	4	NC	1	NC	1
180			min	-.002	3	-.006	3	-.086	4	-6.66e-5	1	NC	1	805.214	4
181		15	max	.002	1	0	15	0	1	3.007e-3	4	NC	1	NC	1
182			min	-.002	3	-.005	3	-.057	4	-5.263e-5	1	NC	1	1211.755	4
183		16	max	.001	1	0	15	0	1	3.044e-3	4	NC	1	NC	1
184			min	-.001	3	-.004	3	-.034	4	-3.867e-5	1	NC	1	2054.446	4
185		17	max	0	1	0	15	0	1	3.081e-3	4	NC	1	NC	1
186			min	0	3	-.003	6	-.016	4	-2.47e-5	1	NC	1	4303.625	4
187		18	max	0	1	0	15	0	1	3.118e-3	4	NC	1	NC	1
188			min	0	3	-.001	6	-.005	4	-1.073e-5	1	NC	1	NC	1
189		19	max	0	1	0	1	0	1	3.156e-3	4	NC	1	NC	1
190			min	0	1	0	1	0	1	-1.926e-7	3	NC	1	NC	1
191	M3	1	max	0	1	0	1	0	1	-6.928e-8	12	NC	1	NC	1
192			min	0	1	0	1	0	1	-6.551e-4	4	NC	1	NC	1
193		2	max	0	3	0	15	.017	4	7.64e-5	4	NC	1	NC	1
194			min	0	2	-.003	6	0	3	1.514e-6	12	NC	1	NC	1
195		3	max	0	3	-.001	15	.033	4	8.079e-4	4	NC	1	NC	1
196			min	0	2	-.005	6	0	12	3.098e-6	12	NC	1	NC	1
197		4	max	.001	3	-.002	15	.048	4	1.539e-3	4	NC	1	NC	1
198			min	0	2	-.008	6	0	12	4.681e-6	12	NC	1	8304.06	5
199		5	max	.002	3	-.002	15	.063	4	2.271e-3	4	NC	1	NC	1
200			min	-.001	2	-.011	6	0	12	6.265e-6	12	8974.381	6	7036.136	5
201		6	max	.002	3	-.003	15	.076	4	3.002e-3	4	NC	2	NC	1
202			min	-.002	2	-.014	6	0	12	7.848e-6	12	7231.121	6	6446.698	5
203		7	max	.002	3	-.004	15	.088	4	3.734e-3	4	NC	5	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
204			min	-.002	2	-.017	6	0	12	9.432e-6	12	6183.38	6	6251.72	5
205		8	max	.003	3	-.004	15	.1	4	4.465e-3	4	NC	5	NC	1
206			min	-.002	2	-.018	6	0	12	1.102e-5	12	5536.716	6	6355.432	5
207		9	max	.003	3	-.004	15	.111	4	5.197e-3	4	NC	5	NC	1
208			min	-.003	2	-.02	6	0	12	1.26e-5	12	5152.701	6	6749.628	5
209		10	max	.004	3	-.005	15	.122	4	5.928e-3	4	NC	5	NC	1
210			min	-.003	2	-.021	6	0	12	1.418e-5	12	4963.983	6	7495.314	5
211		11	max	.004	3	-.005	15	.132	4	6.66e-3	4	NC	5	NC	1
212			min	-.003	2	-.021	6	0	12	1.577e-5	12	4942.6	6	8747.693	5
213		12	max	.004	3	-.004	15	.142	4	7.391e-3	4	NC	5	NC	1
214			min	-.003	2	-.02	6	0	12	1.735e-5	12	5089.235	6	NC	1
215		13	max	.005	3	-.004	15	.151	4	8.123e-3	4	NC	5	NC	1
216			min	-.004	2	-.019	6	0	12	1.893e-5	12	5434.839	6	NC	1
217		14	max	.005	3	-.004	15	.161	4	8.854e-3	4	NC	5	NC	1
218			min	-.004	2	-.017	6	0	12	2.052e-5	12	6056.835	6	NC	1
219		15	max	.006	3	-.003	15	.171	4	9.586e-3	4	NC	3	NC	1
220			min	-.004	2	-.014	6	0	12	2.21e-5	12	7127.466	6	NC	1
221		16	max	.006	3	-.002	15	.182	4	1.032e-2	4	NC	1	NC	1
222			min	-.005	2	-.011	6	0	12	2.368e-5	12	9064.381	6	NC	1
223		17	max	.006	3	-.002	15	.193	4	1.105e-2	4	NC	1	NC	1
224			min	-.005	2	-.008	1	0	12	2.527e-5	12	NC	1	NC	1
225		18	max	.007	3	0	15	.205	4	1.178e-2	4	NC	1	NC	1
226			min	-.005	2	-.005	1	0	12	2.685e-5	12	NC	1	NC	1
227		19	max	.007	3	0	5	.218	4	1.251e-2	4	NC	1	NC	1
228			min	-.006	2	-.002	1	0	12	2.843e-5	12	NC	1	NC	1
229	M4	1	max	.003	1	.005	2	0	12	1.345e-4	1	NC	1	NC	3
230			min	0	3	-.007	3	-.218	4	-6.965e-4	5	NC	1	113.904	4
231		2	max	.003	1	.005	2	0	12	1.345e-4	1	NC	1	NC	3
232			min	0	3	-.007	3	-.2	4	-6.965e-4	5	NC	1	123.953	4
233		3	max	.002	1	.005	2	0	12	1.345e-4	1	NC	1	NC	3
234			min	0	3	-.007	3	-.183	4	-6.965e-4	5	NC	1	135.907	4
235		4	max	.002	1	.004	2	0	12	1.345e-4	1	NC	1	NC	3
236			min	0	3	-.006	3	-.165	4	-6.965e-4	5	NC	1	150.262	4
237		5	max	.002	1	.004	2	0	12	1.345e-4	1	NC	1	NC	3
238			min	0	3	-.006	3	-.148	4	-6.965e-4	5	NC	1	167.69	4
239		6	max	.002	1	.004	2	0	12	1.345e-4	1	NC	1	NC	2
240			min	0	3	-.005	3	-.131	4	-6.965e-4	5	NC	1	189.127	4
241		7	max	.002	1	.004	2	0	12	1.345e-4	1	NC	1	NC	2
242			min	0	3	-.005	3	-.115	4	-6.965e-4	5	NC	1	215.899	4
243		8	max	.002	1	.003	2	0	12	1.345e-4	1	NC	1	NC	2
244			min	0	3	-.005	3	-.099	4	-6.965e-4	5	NC	1	249.94	4
245		9	max	.002	1	.003	2	0	12	1.345e-4	1	NC	1	NC	2
246			min	0	3	-.004	3	-.084	4	-6.965e-4	5	NC	1	294.161	4
247		10	max	.001	1	.003	2	0	12	1.345e-4	1	NC	1	NC	2
248			min	0	3	-.004	3	-.07	4	-6.965e-4	5	NC	1	353.116	4
249		11	max	.001	1	.002	2	0	12	1.345e-4	1	NC	1	NC	2
250			min	0	3	-.003	3	-.057	4	-6.965e-4	5	NC	1	434.251	4
251		12	max	.001	1	.002	2	0	12	1.345e-4	1	NC	1	NC	1
252			min	0	3	-.003	3	-.045	4	-6.965e-4	5	NC	1	550.452	4
253		13	max	0	1	.002	2	0	12	1.345e-4	1	NC	1	NC	1
254			min	0	3	-.002	3	-.034	4	-6.965e-4	5	NC	1	725.635	4
255		14	max	0	1	.001	2	0	12	1.345e-4	1	NC	1	NC	1
256			min	0	3	-.002	3	-.025	4	-6.965e-4	5	NC	1	1008.459	4
257		15	max	0	1	.001	2	0	12	1.345e-4	1	NC	1	NC	1
258			min	0	3	-.002	3	-.016	4	-6.965e-4	5	NC	1	1511.104	4
259		16	max	0	1	0	2	0	12	1.345e-4	1	NC	1	NC	1
260			min	0	3	-.001	3	-.01	4	-6.965e-4	5	NC	1	2543.72	4

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
261		17	max	0	1	0	2	0	12	1.345e-4	1	NC	1	NC	1
262			min	0	3	0	3	-.005	4	-6.965e-4	5	NC	1	5256.457	4
263		18	max	0	1	0	2	0	12	1.345e-4	1	NC	1	NC	1
264			min	0	3	0	3	-.001	4	-6.965e-4	5	NC	1	NC	1
265		19	max	0	1	0	1	0	1	1.345e-4	1	NC	1	NC	1
266			min	0	1	0	1	0	1	-6.965e-4	5	NC	1	NC	1
267	M6	1	max	.022	1	.03	2	0	1	2.642e-3	4	NC	3	NC	1
268			min	-.027	3	-.041	3	-.779	4	0	1	2324.787	2	88.735	4
269		2	max	.021	1	.027	2	0	1	2.672e-3	4	NC	3	NC	1
270			min	-.025	3	-.039	3	-.715	4	0	1	2552	2	96.652	4
271		3	max	.02	1	.024	2	0	1	2.702e-3	4	NC	3	NC	1
272			min	-.024	3	-.037	3	-.652	4	0	1	2826.19	2	106.06	4
273		4	max	.019	1	.022	2	0	1	2.732e-3	4	NC	3	NC	1
274			min	-.022	3	-.034	3	-.589	4	0	1	3160.793	2	117.35	4
275		5	max	.017	1	.019	2	0	1	2.762e-3	4	NC	3	NC	1
276			min	-.021	3	-.032	3	-.527	4	0	1	3574.581	2	131.052	4
277		6	max	.016	1	.017	2	0	1	2.793e-3	4	NC	3	NC	1
278			min	-.019	3	-.03	3	-.467	4	0	1	4094.422	2	147.904	4
279		7	max	.015	1	.015	2	0	1	2.823e-3	4	NC	3	NC	1
280			min	-.018	3	-.028	3	-.409	4	0	1	4759.895	2	168.953	4
281		8	max	.014	1	.012	2	0	1	2.853e-3	4	NC	1	NC	1
282			min	-.016	3	-.025	3	-.353	4	0	1	5631.294	2	195.729	4
283		9	max	.012	1	.01	2	0	1	2.883e-3	4	NC	1	NC	1
284			min	-.015	3	-.023	3	-.3	4	0	1	6804.274	2	230.537	4
285		10	max	.011	1	.008	2	0	1	2.913e-3	4	NC	1	NC	1
286			min	-.013	3	-.021	3	-.249	4	0	1	8438.256	2	276.99	4
287		11	max	.01	1	.006	2	0	1	2.943e-3	4	NC	1	NC	1
288			min	-.012	3	-.019	3	-.203	4	0	1	NC	1	341.015	4
289		12	max	.009	1	.005	2	0	1	2.973e-3	4	NC	1	NC	1
290			min	-.01	3	-.016	3	-.16	4	0	1	NC	1	432.893	4
291		13	max	.007	1	.003	2	0	1	3.003e-3	4	NC	1	NC	1
292			min	-.009	3	-.014	3	-.121	4	0	1	NC	1	571.791	4
293		14	max	.006	1	.002	2	0	1	3.033e-3	4	NC	1	NC	1
294			min	-.007	3	-.012	3	-.087	4	0	1	NC	1	796.909	4
295		15	max	.005	1	.001	2	0	1	3.063e-3	4	NC	1	NC	1
296			min	-.006	3	-.009	3	-.058	4	0	1	NC	1	1199.291	4
297		16	max	.004	1	0	2	0	1	3.093e-3	4	NC	1	NC	1
298			min	-.004	3	-.007	3	-.034	4	0	1	NC	1	2033.387	4
299		17	max	.002	1	0	2	0	1	3.123e-3	4	NC	1	NC	1
300			min	-.003	3	-.005	3	-.016	4	0	1	NC	1	4259.75	4
301		18	max	.001	1	0	2	0	1	3.153e-3	4	NC	1	NC	1
302			min	-.001	3	-.002	3	-.005	4	0	1	NC	1	NC	1
303		19	max	0	1	0	1	0	1	3.183e-3	4	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	-6.607e-4	4	NC	1	NC	1
307		2	max	.001	3	0	15	.017	4	4.823e-5	4	NC	1	NC	1
308			min	-.001	2	-.003	3	0	1	0	1	NC	1	NC	1
309		3	max	.002	3	-.001	15	.033	4	7.571e-4	4	NC	1	NC	1
310			min	-.002	2	-.007	3	0	1	0	1	NC	1	9982.265	4
311		4	max	.004	3	-.002	15	.049	4	1.466e-3	4	NC	1	NC	1
312			min	-.003	2	-.01	3	0	1	0	1	NC	1	7368.14	4
313		5	max	.005	3	-.003	15	.063	4	2.175e-3	4	NC	1	NC	1
314			min	-.005	2	-.013	3	0	1	0	1	8569.734	3	6183.035	4
315		6	max	.006	3	-.003	15	.076	4	2.884e-3	4	NC	1	NC	1
316			min	-.006	2	-.015	3	0	1	0	1	7204.29	3	5600.824	4
317		7	max	.007	3	-.004	15	.089	4	3.593e-3	4	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
318			min	-.007	2	-.017	3	0	1	0	1	6205.574	4	5357.803	4
319		8	max	.009	3	-.004	15	.1	4	4.302e-3	4	NC	2	NC	1
320			min	-.008	2	-.019	3	0	1	0	1	5555.107	4	5356.882	4
321		9	max	.01	3	-.005	15	.111	4	5.011e-3	4	NC	5	NC	1
322			min	-.009	2	-.02	4	0	1	0	1	5168.676	4	5572.619	4
323		10	max	.011	3	-.005	15	.122	4	5.719e-3	4	NC	5	NC	1
324			min	-.01	2	-.021	4	0	1	0	1	4978.456	4	6026.623	4
325		11	max	.012	3	-.005	15	.131	4	6.428e-3	4	NC	5	NC	1
326			min	-.012	2	-.021	4	0	1	0	1	4956.244	4	6791.267	4
327		12	max	.014	3	-.005	15	.141	4	7.137e-3	4	NC	5	NC	1
328			min	-.013	2	-.021	4	0	1	0	1	5102.621	4	8019.954	4
329		13	max	.015	3	-.005	15	.15	4	7.846e-3	4	NC	5	NC	1
330			min	-.014	2	-.02	4	0	1	0	1	5448.541	4	NC	1
331		14	max	.016	3	-.004	15	.159	4	8.555e-3	4	NC	2	NC	1
332			min	-.015	2	-.018	4	0	1	0	1	6071.557	4	NC	1
333		15	max	.017	3	-.004	15	.168	4	9.264e-3	4	NC	1	NC	1
334			min	-.016	2	-.015	3	0	1	0	1	7144.265	4	NC	1
335		16	max	.018	3	-.003	15	.177	4	9.973e-3	4	NC	1	NC	1
336			min	-.017	2	-.013	3	0	1	0	1	9085.22	4	NC	1
337		17	max	.02	3	-.002	15	.187	4	1.068e-2	4	NC	1	NC	1
338			min	-.019	2	-.01	3	0	1	0	1	NC	1	NC	1
339		18	max	.021	3	-.001	15	.198	4	1.139e-2	4	NC	1	NC	1
340			min	-.02	2	-.008	3	0	1	0	1	NC	1	NC	1
341		19	max	.022	3	0	15	.209	4	1.21e-2	4	NC	1	NC	1
342			min	-.021	2	-.005	1	0	1	0	1	NC	1	NC	1
343	M8	1	max	.007	1	.02	2	0	1	0	1	NC	1	NC	1
344			min	0	3	-.023	3	-.209	4	-8.544e-4	4	NC	1	118.436	4
345		2	max	.007	1	.019	2	0	1	0	1	NC	1	NC	1
346			min	0	3	-.021	3	-.192	4	-8.544e-4	4	NC	1	128.9	4
347		3	max	.007	1	.018	2	0	1	0	1	NC	1	NC	1
348			min	0	3	-.02	3	-.175	4	-8.544e-4	4	NC	1	141.346	4
349		4	max	.006	1	.017	2	0	1	0	1	NC	1	NC	1
350			min	0	3	-.019	3	-.159	4	-8.544e-4	4	NC	1	156.29	4
351		5	max	.006	1	.015	2	0	1	0	1	NC	1	NC	1
352			min	0	3	-.018	3	-.142	4	-8.544e-4	4	NC	1	174.435	4
353		6	max	.005	1	.014	2	0	1	0	1	NC	1	NC	1
354			min	0	3	-.016	3	-.126	4	-8.544e-4	4	NC	1	196.752	4
355		7	max	.005	1	.013	2	0	1	0	1	NC	1	NC	1
356			min	0	3	-.015	3	-.11	4	-8.544e-4	4	NC	1	224.623	4
357		8	max	.004	1	.012	2	0	1	0	1	NC	1	NC	1
358			min	0	3	-.014	3	-.095	4	-8.544e-4	4	NC	1	260.061	4
359		9	max	.004	1	.011	2	0	1	0	1	NC	1	NC	1
360			min	0	3	-.013	3	-.081	4	-8.544e-4	4	NC	1	306.097	4
361		10	max	.004	1	.01	2	0	1	0	1	NC	1	NC	1
362			min	0	3	-.011	3	-.067	4	-8.544e-4	4	NC	1	367.472	4
363		11	max	.003	1	.009	2	0	1	0	1	NC	1	NC	1
364			min	0	3	-.01	3	-.055	4	-8.544e-4	4	NC	1	451.939	4
365		12	max	.003	1	.008	2	0	1	0	1	NC	1	NC	1
366			min	0	3	-.009	3	-.043	4	-8.544e-4	4	NC	1	572.914	4
367		13	max	.002	1	.007	2	0	1	0	1	NC	1	NC	1
368			min	0	3	-.008	3	-.033	4	-8.544e-4	4	NC	1	755.297	4
369		14	max	.002	1	.006	2	0	1	0	1	NC	1	NC	1
370			min	0	3	-.006	3	-.024	4	-8.544e-4	4	NC	1	1049.753	4
371		15	max	.002	1	.004	2	0	1	0	1	NC	1	NC	1
372			min	0	3	-.005	3	-.016	4	-8.544e-4	4	NC	1	1573.089	4
373		16	max	.001	1	.003	2	0	1	0	1	NC	1	NC	1
374			min	0	3	-.004	3	-.009	4	-8.544e-4	4	NC	1	2648.256	4

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
375		17	max	0	1	.002	2	0	1	0	1	NC	1	NC	1
376			min	0	3	-.003	3	-.005	4	-8.544e-4	4	NC	1	5472.936	4
377		18	max	0	1	.001	2	0	1	0	1	NC	1	NC	1
378			min	0	3	-.001	3	-.001	4	-8.544e-4	4	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	-8.544e-4	4	NC	1	NC	1
381	M10	1	max	.007	1	.008	2	0	12	2.627e-3	4	NC	1	NC	2
382			min	-.008	3	-.013	3	-.777	4	1.591e-5	12	8467.137	2	88.963	4
383		2	max	.007	1	.007	2	0	12	2.656e-3	4	NC	1	NC	2
384			min	-.008	3	-.013	3	-.713	4	1.504e-5	12	9931.03	2	96.9	4
385		3	max	.006	1	.006	2	0	12	2.686e-3	4	NC	1	NC	2
386			min	-.007	3	-.013	3	-.65	4	1.416e-5	12	NC	1	106.333	4
387		4	max	.006	1	.005	2	0	12	2.715e-3	4	NC	1	NC	2
388			min	-.007	3	-.012	3	-.587	4	1.328e-5	12	NC	1	117.652	4
389		5	max	.006	1	.003	2	0	12	2.744e-3	4	NC	1	NC	2
390			min	-.006	3	-.012	3	-.526	4	1.24e-5	12	NC	1	131.39	4
391		6	max	.005	1	.002	2	0	12	2.773e-3	4	NC	1	NC	1
392			min	-.006	3	-.011	3	-.466	4	1.152e-5	12	NC	1	148.287	4
393		7	max	.005	1	.001	2	0	12	2.803e-3	4	NC	1	NC	1
394			min	-.006	3	-.011	3	-.408	4	1.065e-5	12	NC	1	169.391	4
395		8	max	.004	1	0	2	0	12	2.832e-3	4	NC	1	NC	1
396			min	-.005	3	-.01	3	-.352	4	9.768e-6	12	NC	1	196.237	4
397		9	max	.004	1	0	2	0	12	2.861e-3	4	NC	1	NC	1
398			min	-.005	3	-.01	3	-.299	4	8.891e-6	12	NC	1	231.138	4
399		10	max	.004	1	0	2	0	12	2.89e-3	4	NC	1	NC	1
400			min	-.004	3	-.009	3	-.249	4	8.013e-6	12	NC	1	277.715	4
401		11	max	.003	1	-.001	2	0	12	2.919e-3	4	NC	1	NC	1
402			min	-.004	3	-.008	3	-.202	4	7.135e-6	12	NC	1	341.912	4
403		12	max	.003	1	-.002	15	0	12	2.949e-3	4	NC	1	NC	1
404			min	-.003	3	-.008	3	-.159	4	6.257e-6	12	NC	1	434.042	4
405		13	max	.002	1	-.002	15	0	12	2.978e-3	4	NC	1	NC	1
406			min	-.003	3	-.007	3	-.121	4	5.38e-6	12	NC	1	573.323	4
407		14	max	.002	1	-.002	15	0	12	3.007e-3	4	NC	1	NC	1
408			min	-.002	3	-.006	3	-.086	4	4.502e-6	12	NC	1	799.076	4
409		15	max	.002	1	-.001	15	0	12	3.036e-3	4	NC	1	NC	1
410			min	-.002	3	-.005	4	-.057	4	3.624e-6	12	NC	1	1202.623	4
411		16	max	.001	1	-.001	15	0	12	3.066e-3	4	NC	1	NC	1
412			min	-.001	3	-.004	4	-.034	4	2.746e-6	12	NC	1	2039.232	4
413		17	max	0	1	0	15	0	12	3.095e-3	4	NC	1	NC	1
414			min	0	3	-.003	4	-.016	4	1.869e-6	12	NC	1	4272.768	4
415		18	max	0	1	0	15	0	12	3.124e-3	4	NC	1	NC	1
416			min	0	3	-.002	4	-.005	4	9.2e-7	10	NC	1	NC	1
417		19	max	0	1	0	1	0	1	3.153e-3	4	NC	1	NC	1
418			min	0	1	0	1	0	1	-3.243e-6	1	NC	1	NC	1
419	M11	1	max	0	1	0	1	0	1	2.399e-6	1	NC	1	NC	1
420			min	0	1	0	1	0	1	-6.536e-4	4	NC	1	NC	1
421		2	max	0	3	0	15	.017	4	6.444e-5	5	NC	1	NC	1
422			min	0	2	-.003	4	0	1	-2.726e-5	1	NC	1	NC	1
423		3	max	0	3	-.001	15	.033	4	7.756e-4	4	NC	1	NC	1
424			min	0	2	-.006	4	0	1	-5.692e-5	1	NC	1	NC	1
425		4	max	.001	3	-.002	15	.048	4	1.49e-3	4	NC	1	NC	1
426			min	0	2	-.009	4	0	1	-8.658e-5	1	NC	1	7875.505	4
427		5	max	.002	3	-.003	15	.062	4	2.205e-3	4	NC	1	NC	1
428			min	-.001	2	-.012	4	0	1	-1.162e-4	1	8617.323	4	6650.507	4
429		6	max	.002	3	-.004	15	.076	4	2.919e-3	4	NC	2	NC	1
430			min	-.002	2	-.015	4	0	1	-1.459e-4	1	6969.481	4	6068.561	4
431		7	max	.002	3	-.004	15	.088	4	3.634e-3	4	NC	5	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
432			min	-.002	2	-.018	4	0	1	-1.756e-4	1	5977.679	4	5855.717	4
433		8	max	.003	3	-.005	15	.1	4	4.349e-3	4	NC	5	NC	1
434			min	-.002	2	-.02	4	0	1	-2.052e-4	1	5365.794	4	5916.013	4
435		9	max	.003	3	-.005	15	.111	4	5.063e-3	4	NC	5	NC	1
436			min	-.003	2	-.021	4	-.001	1	-2.349e-4	1	5003.897	4	6233.564	4
437		10	max	.004	3	-.005	15	.121	4	5.778e-3	4	NC	5	NC	1
438			min	-.003	2	-.022	4	-.002	1	-2.645e-4	1	4828.915	4	6851.18	4
439		11	max	.004	3	-.005	15	.131	4	6.493e-3	4	NC	5	NC	1
440			min	-.003	2	-.022	4	-.002	1	-2.942e-4	1	4815.06	4	7884.71	4
441		12	max	.004	3	-.005	15	.14	4	7.207e-3	4	NC	5	NC	1
442			min	-.003	2	-.021	4	-.003	1	-3.239e-4	1	4963.94	4	9581.84	4
443		13	max	.005	3	-.005	15	.149	4	7.922e-3	4	NC	5	NC	1
444			min	-.004	2	-.02	4	-.003	1	-3.535e-4	1	5306.441	4	NC	1
445		14	max	.005	3	-.005	15	.159	4	8.636e-3	4	NC	5	NC	1
446			min	-.004	2	-.018	4	-.004	1	-3.832e-4	1	5918.752	4	NC	1
447		15	max	.006	3	-.004	15	.168	4	9.351e-3	4	NC	3	NC	1
448			min	-.004	2	-.016	4	-.005	1	-4.128e-4	1	6969.782	4	NC	1
449		16	max	.006	3	-.003	15	.178	4	1.007e-2	4	NC	1	NC	1
450			min	-.005	2	-.013	4	-.006	1	-4.425e-4	1	8868.654	4	NC	1
451		17	max	.006	3	-.002	15	.188	4	1.078e-2	4	NC	1	NC	1
452			min	-.005	2	-.009	4	-.007	1	-4.722e-4	1	NC	1	NC	1
453		18	max	.007	3	-.002	15	.2	4	1.149e-2	4	NC	1	NC	1
454			min	-.005	2	-.005	4	-.009	1	-5.018e-4	1	NC	1	NC	1
455		19	max	.007	3	0	10	.212	4	1.221e-2	4	NC	1	NC	1
456			min	-.006	2	-.002	1	-.01	1	-5.315e-4	1	NC	1	NC	1
457	M12	1	max	.003	1	.005	2	.01	1	-7.722e-6	12	NC	1	NC	3
458			min	0	3	-.007	3	-.212	4	-7.546e-4	4	NC	1	117.005	4
459		2	max	.003	1	.005	2	.009	1	-7.722e-6	12	NC	1	NC	3
460			min	0	3	-.007	3	-.195	4	-7.546e-4	4	NC	1	127.333	4
461		3	max	.002	1	.005	2	.009	1	-7.722e-6	12	NC	1	NC	3
462			min	0	3	-.007	3	-.178	4	-7.546e-4	4	NC	1	139.619	4
463		4	max	.002	1	.004	2	.008	1	-7.722e-6	12	NC	1	NC	3
464			min	0	3	-.006	3	-.161	4	-7.546e-4	4	NC	1	154.371	4
465		5	max	.002	1	.004	2	.007	1	-7.722e-6	12	NC	1	NC	3
466			min	0	3	-.006	3	-.144	4	-7.546e-4	4	NC	1	172.282	4
467		6	max	.002	1	.004	2	.006	1	-7.722e-6	12	NC	1	NC	2
468			min	0	3	-.005	3	-.128	4	-7.546e-4	4	NC	1	194.313	4
469		7	max	.002	1	.004	2	.005	1	-7.722e-6	12	NC	1	NC	2
470			min	0	3	-.005	3	-.112	4	-7.546e-4	4	NC	1	221.825	4
471		8	max	.002	1	.003	2	.005	1	-7.722e-6	12	NC	1	NC	2
472			min	0	3	-.005	3	-.097	4	-7.546e-4	4	NC	1	256.808	4
473		9	max	.002	1	.003	2	.004	1	-7.722e-6	12	NC	1	NC	2
474			min	0	3	-.004	3	-.082	4	-7.546e-4	4	NC	1	302.254	4
475		10	max	.001	1	.003	2	.003	1	-7.722e-6	12	NC	1	NC	2
476			min	0	3	-.004	3	-.068	4	-7.546e-4	4	NC	1	362.84	4
477		11	max	.001	1	.002	2	.003	1	-7.722e-6	12	NC	1	NC	2
478			min	0	3	-.003	3	-.056	4	-7.546e-4	4	NC	1	446.222	4
479		12	max	.001	1	.002	2	.002	1	-7.722e-6	12	NC	1	NC	1
480			min	0	3	-.003	3	-.044	4	-7.546e-4	4	NC	1	565.641	4
481		13	max	0	1	.002	2	.002	1	-7.722e-6	12	NC	1	NC	1
482			min	0	3	-.002	3	-.033	4	-7.546e-4	4	NC	1	745.676	4
483		14	max	0	1	.001	2	.001	1	-7.722e-6	12	NC	1	NC	1
484			min	0	3	-.002	3	-.024	4	-7.546e-4	4	NC	1	1036.336	4
485		15	max	0	1	.001	2	0	1	-7.722e-6	12	NC	1	NC	1
486			min	0	3	-.002	3	-.016	4	-7.546e-4	4	NC	1	1552.915	4
487		16	max	0	1	0	2	0	1	-7.722e-6	12	NC	1	NC	1
488			min	0	3	-.001	3	-.009	4	-7.546e-4	4	NC	1	2614.17	4

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
489		17	max	0	1	0	2	0	1	-7.722e-6	12	NC	1	NC	1
490			min	0	3	0	3	-.005	4	-7.546e-4	4	NC	1	5402.203	4
491		18	max	0	1	0	2	0	1	-7.722e-6	12	NC	1	NC	1
492			min	0	3	0	3	-.001	4	-7.546e-4	4	NC	1	NC	1
493		19	max	0	1	0	1	0	1	-7.722e-6	12	NC	1	NC	1
494			min	0	1	0	1	0	1	-7.546e-4	4	NC	1	NC	1
495	M1	1	max	.009	3	.192	2	.823	4	1.15e-2	1	NC	1	NC	1
496			min	-.005	2	-.038	3	0	12	-2.05e-2	3	NC	1	NC	1
497		2	max	.009	3	.094	2	.797	4	9.267e-3	4	NC	5	NC	1
498			min	-.005	2	-.018	3	-.008	1	-1.018e-2	3	1382.986	2	9895.08	5
499		3	max	.009	3	.013	3	.77	4	1.617e-2	4	NC	5	NC	1
500			min	-.005	2	-.011	2	-.011	1	-2.271e-4	1	667.882	2	5436.32	5
501		4	max	.009	3	.066	3	.742	4	1.403e-2	4	NC	15	NC	1
502			min	-.005	2	-.128	2	-.01	1	-4.339e-3	3	423.269	2	3914.736	5
503		5	max	.009	3	.133	3	.713	4	1.188e-2	4	9939.684	15	NC	1
504			min	-.005	2	-.25	2	-.007	1	-8.574e-3	3	306.339	2	3143.539	5
505		6	max	.009	3	.205	3	.684	4	1.387e-2	1	7858.838	15	NC	1
506			min	-.005	2	-.368	2	-.003	1	-1.281e-2	3	241.767	2	2673.097	5
507		7	max	.009	3	.275	3	.654	4	1.856e-2	1	6629.961	15	NC	1
508			min	-.005	2	-.473	2	0	3	-1.704e-2	3	203.588	2	2338.459	4
509		8	max	.008	3	.333	3	.623	4	2.326e-2	1	5902.666	15	NC	1
510			min	-.005	2	-.557	2	0	12	-2.128e-2	3	180.983	2	2086.311	4
511		9	max	.008	3	.371	3	.591	4	2.561e-2	1	5522.166	15	NC	1
512			min	-.004	2	-.609	2	0	1	-2.161e-2	3	169.195	2	1918.549	4
513		10	max	.008	3	.385	3	.555	4	2.668e-2	2	5405.882	15	NC	1
514			min	-.004	2	-.627	2	0	12	-1.933e-2	3	165.725	2	1866.133	4
515		11	max	.008	3	.376	3	.515	4	2.824e-2	2	5521.927	15	NC	1
516			min	-.004	2	-.609	2	0	12	-1.705e-2	3	169.725	2	1902.052	4
517		12	max	.008	3	.345	3	.473	4	2.703e-2	2	5902.098	15	NC	1
518			min	-.004	2	-.555	2	-.001	1	-1.453e-2	3	182.557	2	2032.131	4
519		13	max	.007	3	.294	3	.425	4	2.169e-2	2	6628.85	15	NC	1
520			min	-.004	2	-.468	2	0	1	-1.162e-2	3	207.164	1	2410.965	4
521		14	max	.007	3	.229	3	.373	4	1.635e-2	2	7856.795	15	NC	1
522			min	-.004	2	-.359	2	0	12	-8.716e-3	3	248.467	1	3261.732	4
523		15	max	.007	3	.155	3	.319	4	1.101e-2	2	9935.935	15	NC	1
524			min	-.004	2	-.239	2	0	12	-5.812e-3	3	319.09	1	5312.867	4
525		16	max	.007	3	.079	3	.267	4	9.995e-3	4	NC	15	NC	1
526			min	-.004	2	-.118	2	0	12	-2.907e-3	3	448.674	1	NC	1
527		17	max	.007	3	.005	3	.219	4	1.123e-2	4	NC	5	NC	1
528			min	-.004	2	-.006	2	0	12	-3.067e-6	3	722.802	1	NC	1
529		18	max	.007	3	.092	1	.178	4	8.011e-3	2	NC	5	NC	1
530			min	-.004	2	-.062	3	0	12	-2.75e-3	3	1519.477	1	NC	1
531		19	max	.007	3	.18	1	.142	4	1.593e-2	2	NC	1	NC	1
532			min	-.004	2	-.125	3	0	1	-5.599e-3	3	NC	1	NC	1
533	M5	1	max	.028	3	.371	2	.823	4	0	1	NC	1	NC	1
534			min	-.02	2	-.016	3	0	1	-9.451e-6	4	NC	1	NC	1
535		2	max	.028	3	.181	2	.803	4	8.284e-3	4	NC	5	NC	1
536			min	-.02	2	-.007	3	0	1	0	1	717.713	2	7432.451	4
537		3	max	.028	3	.041	3	.778	4	1.638e-2	4	NC	15	NC	1
538			min	-.02	2	-.035	2	0	1	0	1	335.63	2	4369.255	4
539		4	max	.028	3	.159	3	.749	4	1.334e-2	4	7439.136	15	NC	1
540			min	-.019	2	-.296	2	0	1	0	1	204.061	2	3379.501	4
541		5	max	.027	3	.326	3	.718	4	1.031e-2	4	5180.224	15	NC	1
542			min	-.019	2	-.581	2	0	1	0	1	142.75	2	2900.217	4
543		6	max	.027	3	.517	3	.686	4	7.278e-3	4	3973.414	15	NC	1
544			min	-.019	2	-.866	2	0	1	0	1	109.824	2	2601.391	4
545		7	max	.026	3	.704	3	.653	4	4.245e-3	4	3279.032	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
546			min	-.018	2	-1.125	2	0	1	0	1	90.801	2	2359.919	4
547		8	max	.025	3	.862	3	.622	4	1.212e-3	4	2876.532	15	NC	1
548			min	-.018	2	-1.333	2	0	1	0	1	79.741	2	2118.509	4
549		9	max	.025	3	.964	3	.591	4	0	1	2670.344	15	NC	1
550			min	-.018	2	-1.465	2	0	1	-5.376e-6	5	74.066	2	1912.485	4
551		10	max	.024	3	1.002	3	.554	4	0	1	2608.201	15	NC	1
552			min	-.017	2	-1.509	2	0	1	-5.151e-6	5	72.403	2	1882.255	4
553		11	max	.024	3	.977	3	.515	4	0	1	2670.46	15	NC	1
554			min	-.017	2	-1.465	2	0	1	-4.927e-6	5	74.32	2	1930.057	4
555		12	max	.023	3	.892	3	.475	4	7.929e-4	4	2876.809	15	NC	1
556			min	-.017	2	-1.328	2	0	1	0	1	80.413	1	1992.475	4
557		13	max	.022	3	.755	3	.427	4	2.777e-3	4	3279.597	15	NC	1
558			min	-.016	2	-1.11	2	0	1	0	1	92.422	1	2349.788	4
559		14	max	.022	3	.582	3	.372	4	4.762e-3	4	3974.516	15	NC	1
560			min	-.016	2	-.839	2	0	1	0	1	113.387	1	3338.984	4
561		15	max	.021	3	.39	3	.315	4	6.746e-3	4	5182.406	15	NC	1
562			min	-.016	2	-.549	1	0	1	0	1	150.428	1	6443.607	5
563		16	max	.021	3	.195	3	.259	4	8.731e-3	4	7443.717	15	NC	1
564			min	-.016	2	-.265	1	0	1	0	1	221.29	1	NC	1
565		17	max	.02	3	.013	3	.21	4	1.072e-2	4	NC	15	NC	1
566			min	-.015	2	-.018	2	0	1	0	1	377.735	1	NC	1
567		18	max	.02	3	.178	1	.171	4	5.42e-3	4	NC	5	NC	1
568			min	-.015	2	-.141	3	0	1	0	1	831.688	1	NC	1
569		19	max	.02	3	.338	1	.143	4	0	1	NC	1	NC	1
570			min	-.015	2	-.279	3	0	1	-5.144e-6	4	NC	1	NC	1
571	M9	1	max	.009	3	.192	2	.823	4	2.05e-2	3	NC	1	NC	1
572			min	-.005	2	-.038	3	0	1	-1.15e-2	1	NC	1	NC	1
573		2	max	.009	3	.094	2	.802	4	1.018e-2	3	NC	5	NC	1
574			min	-.005	2	-.018	3	0	12	-5.543e-3	1	1382.986	2	8051.014	4
575		3	max	.009	3	.013	3	.776	4	1.632e-2	4	NC	5	NC	1
576			min	-.005	2	-.011	2	0	12	-1.206e-5	10	667.882	2	4636.162	4
577		4	max	.009	3	.066	3	.748	4	1.281e-2	5	NC	15	NC	1
578			min	-.005	2	-.128	2	0	12	-4.47e-3	1	423.269	2	3504.914	4
579		5	max	.009	3	.133	3	.717	4	9.666e-3	5	9895.394	15	NC	1
580			min	-.005	2	-.25	2	0	12	-9.168e-3	1	306.339	2	2943.429	4
581		6	max	.009	3	.205	3	.686	4	1.281e-2	3	7825.217	15	NC	1
582			min	-.005	2	-.368	2	0	12	-1.387e-2	1	241.767	2	2595.658	4
583		7	max	.009	3	.275	3	.654	4	1.704e-2	3	6602.461	15	NC	1
584			min	-.005	2	-.473	2	0	1	-1.856e-2	1	203.588	2	2334.611	4
585		8	max	.008	3	.333	3	.622	4	2.128e-2	3	5878.706	15	NC	1
586			min	-.005	2	-.557	2	-.001	1	-2.326e-2	1	180.983	2	2102.382	4
587		9	max	.008	3	.371	3	.591	4	2.161e-2	3	5500.011	15	NC	1
588			min	-.004	2	-.609	2	0	12	-2.561e-2	1	169.195	2	1912.443	4
589		10	max	.008	3	.385	3	.555	4	1.933e-2	3	5384.251	15	NC	1
590			min	-.004	2	-.627	2	0	1	-2.668e-2	2	165.725	2	1867.131	4
591		11	max	.008	3	.376	3	.515	4	1.705e-2	3	5499.76	15	NC	1
592			min	-.004	2	-.609	2	0	1	-2.824e-2	2	169.725	2	1909.588	4
593		12	max	.008	3	.345	3	.474	4	1.453e-2	3	5878.236	15	NC	1
594			min	-.004	2	-.555	2	0	12	-2.703e-2	2	182.557	2	2016.774	4
595		13	max	.007	3	.294	3	.425	4	1.162e-2	3	6601.755	15	NC	1
596			min	-.004	2	-.468	2	0	10	-2.169e-2	2	207.164	1	2410.05	4
597		14	max	.007	3	.229	3	.371	4	8.716e-3	3	7824.187	15	NC	1
598			min	-.004	2	-.359	2	-.003	1	-1.635e-2	2	248.467	1	3355.907	5
599		15	max	.007	3	.155	3	.315	4	6.433e-3	5	9893.845	15	NC	1
600			min	-.004	2	-.239	2	-.006	1	-1.101e-2	2	319.09	1	5847.937	5
601		16	max	.007	3	.079	3	.261	4	8.626e-3	5	NC	15	NC	1
602			min	-.004	2	-.118	2	-.009	1	-5.664e-3	2	448.674	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
603		17	max	.007	3	.005	3	.213	4	1.087e-2	4	NC	5	NC	1
604			min	-.004	2	-.006	2	-.01	1	-6.719e-4	1	722.802	1	NC	1
605		18	max	.007	3	.092	1	.173	4	5.235e-3	5	NC	5	NC	1
606			min	-.004	2	-.062	3	-.007	1	-8.011e-3	2	1519.477	1	NC	1
607		19	max	.007	3	.18	1	.143	4	5.599e-3	3	NC	1	NC	1
608			min	-.004	2	-.125	3	0	12	-1.593e-2	2	NC	1	NC	1

SIMPSON Strong-Tie

Anchor Designer™
Software
Version 2.4.6025.0

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

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

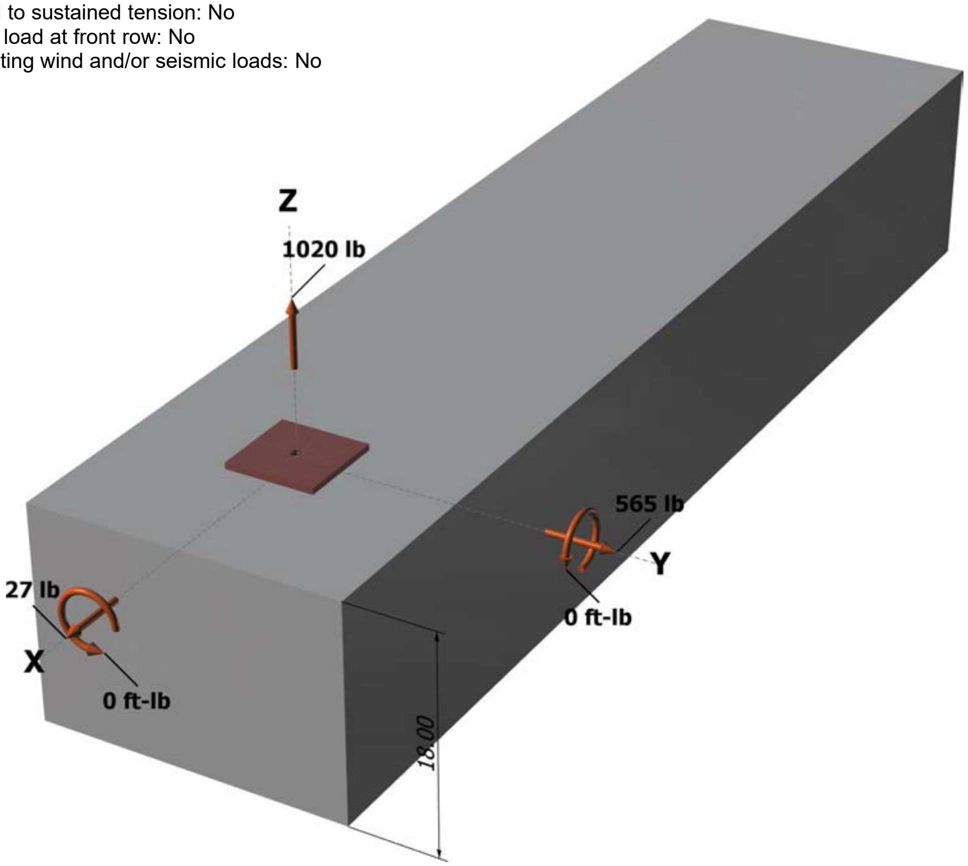
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

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

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

<Figure 1>



<Figure 2>

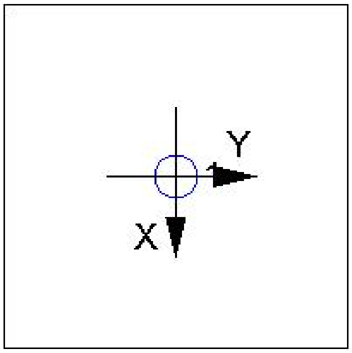
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	1020.0	27.0	565.0	565.6
Sum	1020.0	27.0	565.0	565.6

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 1020
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in y-direction:

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

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

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

Shear parallel to edge in x-direction:

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

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

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

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

Shear parallel to edge in y-direction:

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

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

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

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

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

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

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

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

11. Results

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

Tension	Factored Load, N_{ua} (lb)	Design Strength, øN_n (lb)	Ratio	Status
Steel	1020	6071	0.17	Pass
Concrete breakout	1020	5710	0.18	Pass
Adhesive	**1020**	**5365**	**0.19**	**Pass (Governs)**

Shear	Factored Load, V_{ua} (lb)	Design Strength, øV_n (lb)	Ratio	Status
Steel	**566**	**3156**	**0.18**	**Pass (Governs)**
T Concrete breakout y+	565	3934	0.14	Pass
T Concrete breakout x+	27	3018	0.01	Pass
|| Concrete breakout y+	27	8508	0.00	Pass
|| Concrete breakout x+	565	6875	0.08	Pass
Concrete breakout, combined	-	-	0.14	Pass
Pryout	566	12298	0.05	Pass

Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. D.7.1	0.19	0.00	19.0 %	1.0	Pass

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

12. Warnings

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

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

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

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

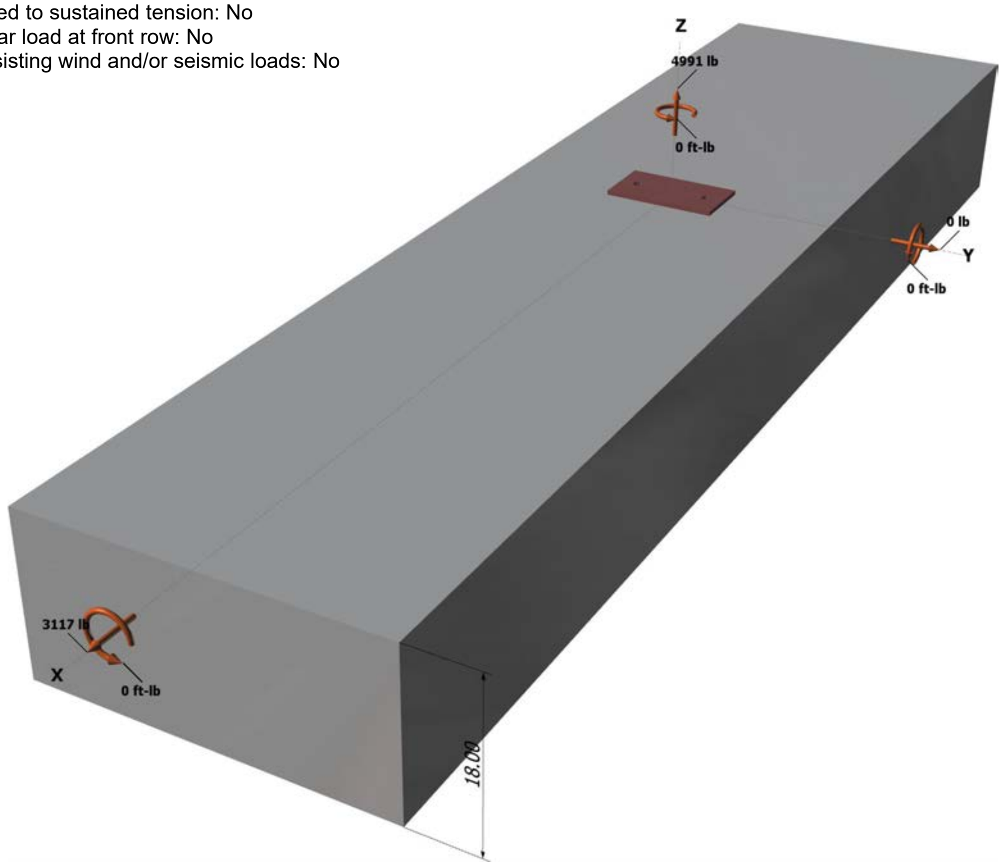
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

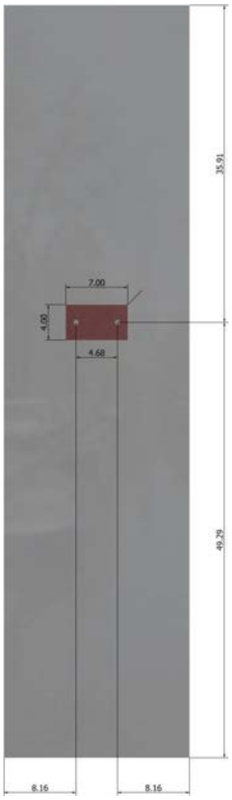
Base Plate
Length x Width x Thickness (inch): 4.00 x 7.00 x 0.28

<Figure 1>



Company:	Schletter, Inc.	Date:	8/1/2016
Engineer:	HCV	Page:	2/5
Project:	Standard PVMax - Worst Case, 21-31 Inch Width		
Address:			
Phone:			
E-mail:			

<Figure 2>



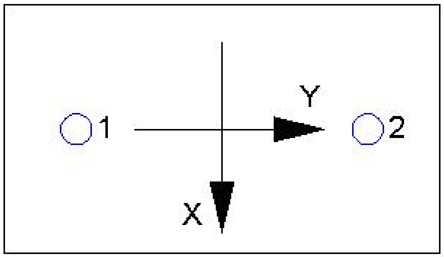
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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	2495.5	1558.5	0.0	1558.5
2	2495.5	1558.5	0.0	1558.5
Sum	4991.0	3117.0	0.0	3117.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 4991
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)

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

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

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

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

$\phi N_{ag} = \phi (A_{Na} / A_{Na0}) \Psi_{ed,Na} \Psi_{g,Na} \Psi_{ec,Na} \Psi_{p,Na} N_{a0}$ (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	2496	6071	0.41	Pass
Concrete breakout	4991	9208	0.54	Pass
Adhesive	**4991**	**8093**	**0.62**	**Pass (Governs)**

Shear	Factored Load, V_{ua} (lb)	Design Strength, $øV_n$ (lb)	Ratio	Status
Steel	1559	3156	0.49	Pass
T Concrete breakout x+	**3117**	**5323**	**0.59**	**Pass (Governs)**

|| Concrete breakout y-	**1559**	**12241**	**0.13**	**Pass (Governs)**
Pryout	3117	19833	0.16	Pass

Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. D.7.3	0.62	0.59	120.2 %	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.