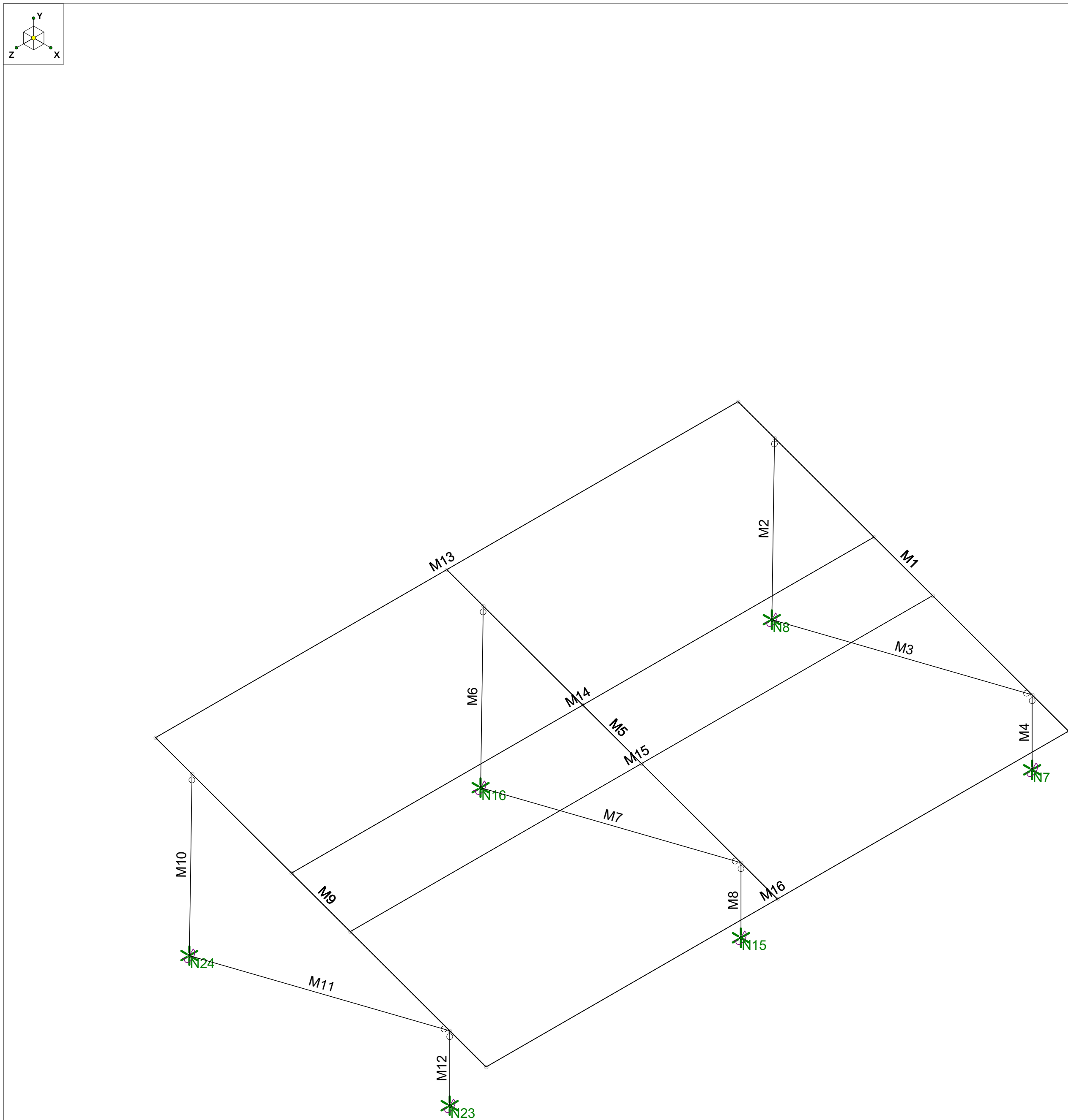


Schletter, Inc.		20° Tilt w/o Seismic Design
HCV	Standard PVMax Racking System	
	Representative Calculations - ASCE 7-10	

1. INTRODUCTION

1.1 Project Description

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

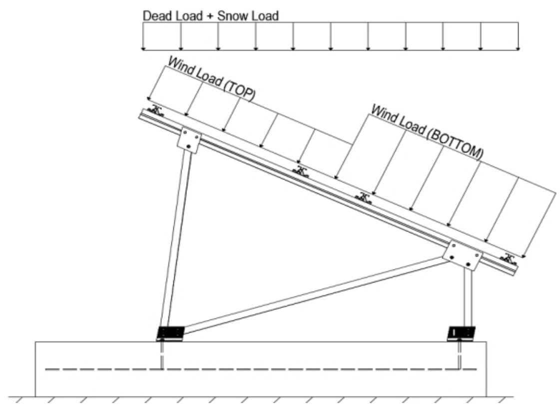
1.2 Construction

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

PV modules are required to meet the following specifications:

	Maximum		Minimum
Height =	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 = 20°
Maximum Height Above Grade = 3 ft



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

1.3 Technical Codes

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

2. LOAD ACTIONS

2.1 Permanent Loads

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

Self-weight of the PV modules.

2.2 Snow Loads

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

2.3 Wind Loads

Design Wind Speed, V = 130 mph — Exposure Category = C
Height < 15 ft — Importance Category = II

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

Pressure Coefficients

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

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

2.4 Seismic Loads - N/A

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

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

2.5 Combination of Loads

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

<u>Strength Design, LRFD</u>

Component stresses are checked using the following LRFD load combinations:

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

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

<u>Allowable Stress Design, ASD</u>

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

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

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

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

3. STRUCTURAL ANALYSIS

3.1 RISA Results

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

3.2 RISA Components

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

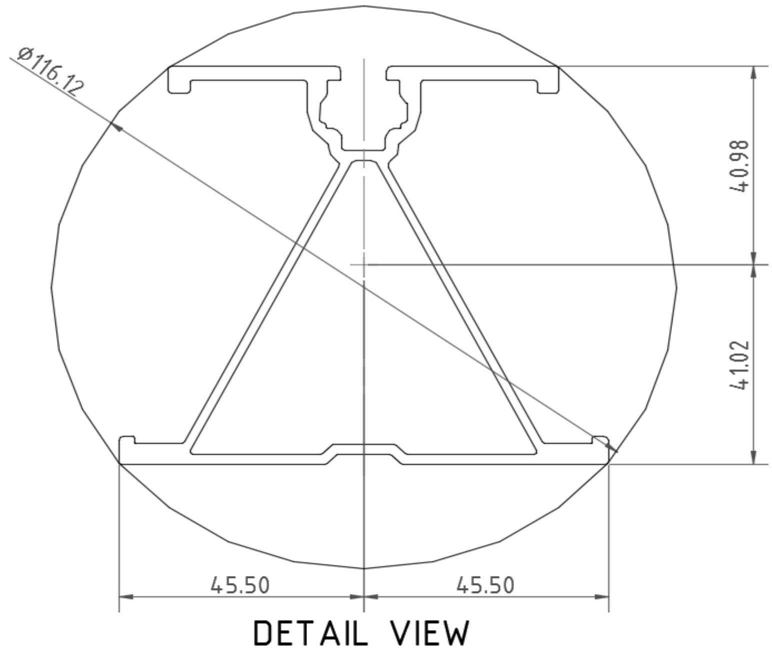
Purlins	Location	**Diagonal Struts**	Location	**Front Reactions**	Location
M13	Top	M3	Outer	N7	Outer
M14	Mid-Top	M7	Inner	N15	Inner
M15	Mid-Bottom	M11	Outer	N23	Outer
M16	Bottom				
Girders	Location	**Rear Struts**	Location	**Rear Reactions**	Location
M1	Outer	M2	Outer	N8	Outer
M5	Inner	M6	Inner	N16	Inner
M9	Outer	M10	Outer	N24	Outer
Front Struts	Location				
M4	Outer				
M8	Inner				
M12	Outer				

4. MEMBER DESIGN CALCULATIONS

4.1 Purlin Design

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

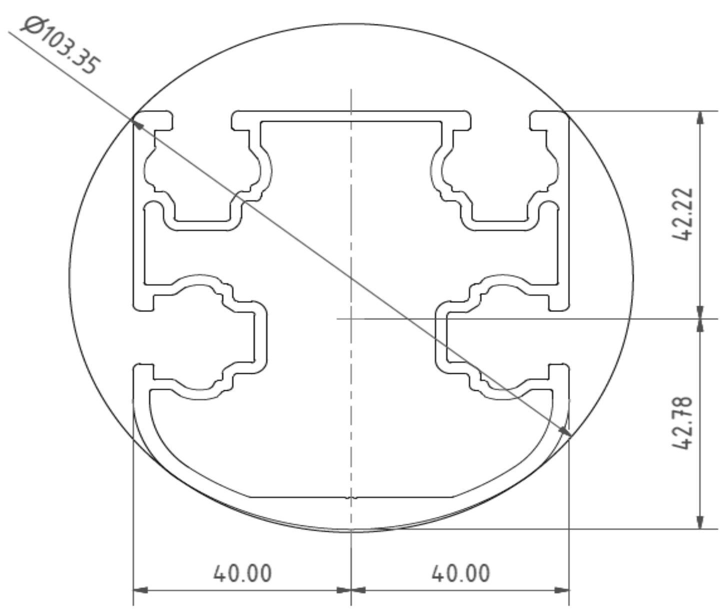
Purlin Type =	**S1.5**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	102	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	25.07	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	23.08	ksi
S_y =	1.33	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	2.16	in^4
I_x =	1.07	in^4
A =	1.25	in^2
g =	1.50	lbs/ft
M_y =	1.705	k-ft
M_z =	0.262	k-ft
$M_{y\ allowable}$ =	2.779	k-ft
$M_{z\ allowable}$ =	1.154	k-ft
Utilization =	84%	



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).

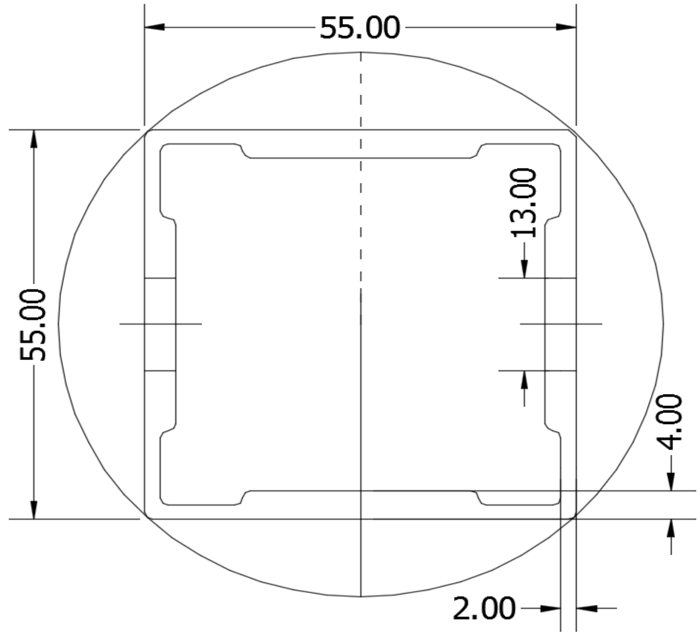
Girder Type =	**BF0**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	104.56	in
$\Phi F_{ty\ AXIAL}$ =	31.09	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.00	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	33.25	ksi
S_y =	1.42	in^3
S_x =	1.41	in^3
E =	10100	ksi
I_y =	2.39	in^4
I_x =	2.22	in^4
A =	1.88	in^2
g =	2.26	lbs/ft
M_y =	-3.383	k-ft
M_z =	0.000	k-ft
P_n =	-0.434	k
$M_{y\ allowable}$ =	3.422	k-ft
$M_{z\ allowable}$ =	3.907	k-ft
$P_{n\ allowable}$ =	58.535	k
Utilization =	100%	



4.3 Front Strut Design

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

Strut Type =	**55x55**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	24.80	in
$\Phi F_{ty\ AXIAL}$ =	28.03	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	3.307	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	27.532	k
Utilization =	12%	

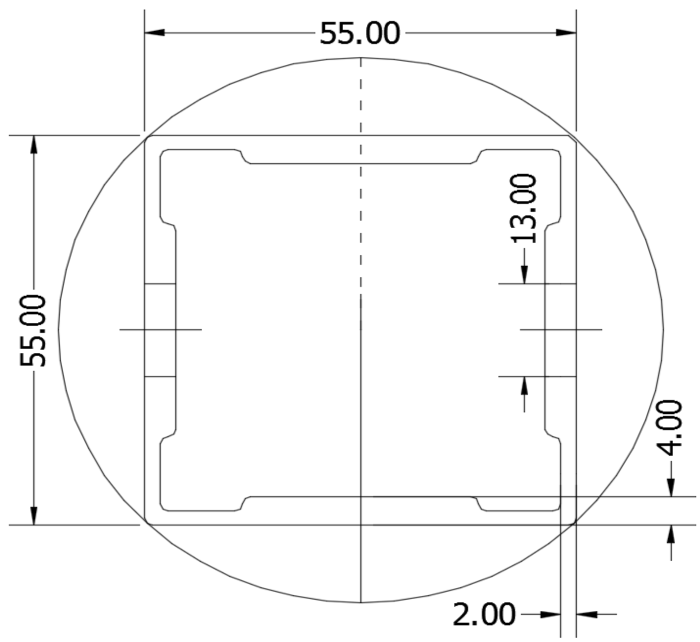


DETAIL VIEW

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 =	0.013	k-ft
M_z =	0.000	k-ft
P_n =	1.760	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	6.000	k
Utilization =	30%	

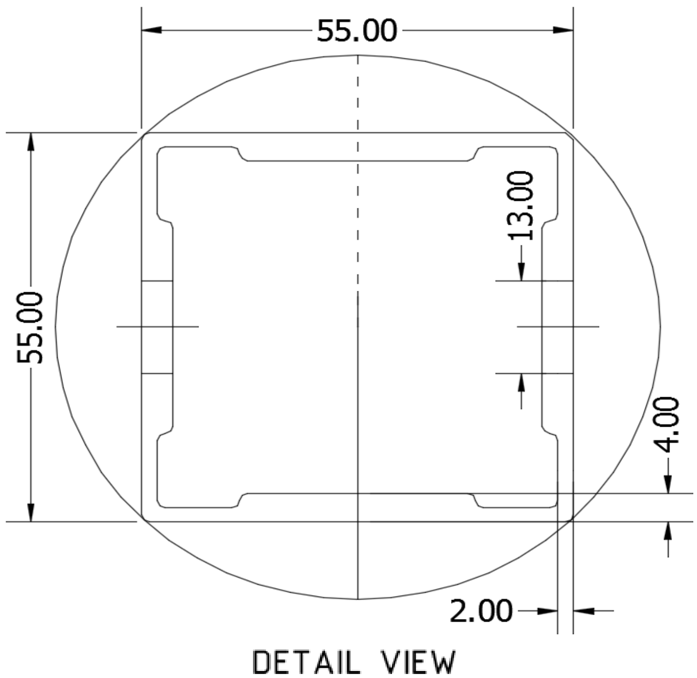


DETAIL VIEW

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 =	61.10	in
$\Phi F_{ty\ AXIAL}$ =	13.63	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 =	3.480	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	13.386	k
Utilization =	27%	



5. FOUNDATION DESIGN CALCULATIONS

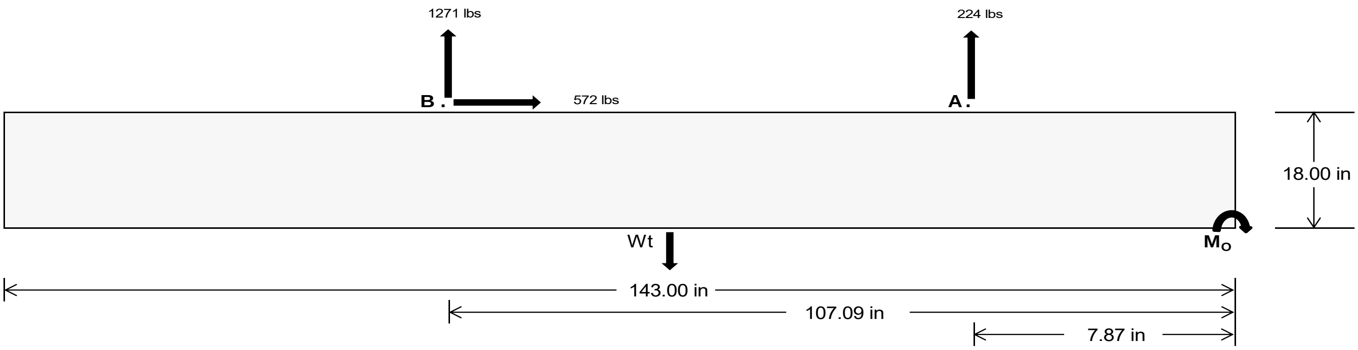
5.1 Helical Pile Foundations

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 =	993.13	5529.35	k
Compressive Load =	4299.45	4863.00	k
Lateral Load =	14.06	2478.87	k
Moment (Weak Axis) =	0.03	0.01	k

5.2 Design of Ballast Foundations

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



Concrete Properties

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

Footing Reinforcement

Use fiber reinforcing with (2) #5 rebar.

Overturning Check

M_O = 148199.9 in-lbs
Resisting Force Required = 2072.73 lbs
S.F. = 1.67
Weight Required = 3454.54 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 = 571.84 lbs
Friction = 0.4
Weight Required = 1429.60 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 = 571.84 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 + 0.6W				1.0D + 0.75L + 0.45W + 0.75S				0.6D + 0.6W			
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	1493 lbs	1493 lbs	1493 lbs	1493 lbs	1467 lbs	1467 lbs	1467 lbs	1467 lbs	2098 lbs	2098 lbs	2098 lbs	2098 lbs	-449 lbs	-449 lbs	-449 lbs	-449 lbs
F_B	1604 lbs	1604 lbs	1604 lbs	1604 lbs	1793 lbs	1793 lbs	1793 lbs	1793 lbs	2417 lbs	2417 lbs	2417 lbs	2417 lbs	-2543 lbs	-2543 lbs	-2543 lbs	-2543 lbs
F_V	156 lbs	156 lbs	156 lbs	156 lbs	1020 lbs	1020 lbs	1020 lbs	1020 lbs	871 lbs	871 lbs	871 lbs	871 lbs	-1144 lbs	-1144 lbs	-1144 lbs	-1144 lbs
P_{total}	10657 lbs	10873 lbs	11089 lbs	11305 lbs	10819 lbs	11035 lbs	11251 lbs	11467 lbs	12074 lbs	12290 lbs	12506 lbs	12722 lbs	1544 lbs	1674 lbs	1803 lbs	1933 lbs
M	3396 lbs-ft	3396 lbs-ft	3396 lbs-ft	3396 lbs-ft	3992 lbs-ft	3992 lbs-ft	3992 lbs-ft	3992 lbs-ft	5261 lbs-ft	5261 lbs-ft	5261 lbs-ft	5261 lbs-ft	3444 lbs-ft	3444 lbs-ft	3444 lbs-ft	3444 lbs-ft
e	0.32 ft	0.31 ft	0.31 ft	0.30 ft	0.37 ft	0.36 ft	0.35 ft	0.35 ft	0.44 ft	0.43 ft	0.42 ft	0.41 ft	2.23 ft	2.06 ft	1.91 ft	1.78 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}	257.4 psf	256.3 psf	255.3 psf	254.3 psf	253.5 psf	252.5 psf	251.5 psf	250.6 psf	271.2 psf	269.7 psf	268.3 psf	266.9 psf	0.0 psf	0.0 psf	1.9 psf	5.3 psf
f_{max}	355.8 psf	352.0 psf	348.3 psf	344.9 psf	369.1 psf	364.9 psf	360.9 psf	357.1 psf	423.6 psf	417.9 psf	412.5 psf	407.3 psf	94.7 psf	95.4 psf	96.3 psf	97.2 psf

Maximum Bearing Pressure = 424 psf
Allowable Bearing Pressure = 1500 psf

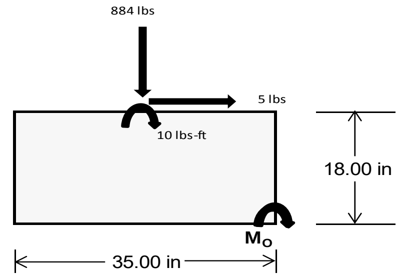
Use a 143in long x 35in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O = 1271.6 ft-lbs
Resisting Force Required = 871.99 lbs
S.F. = 1.67
Weight Required = 1453.31 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	247 lbs	628 lbs	247 lbs	884 lbs	2540 lbs	884 lbs	72 lbs	184 lbs	72 lbs
F_V	1 lbs	0 lbs	1 lbs	5 lbs	0 lbs	5 lbs	0 lbs	0 lbs	0 lbs
P_{total}	9605 lbs	7560 lbs	9605 lbs	9793 lbs	7560 lbs	9793 lbs	2809 lbs	7560 lbs	2809 lbs
M	5 lbs-ft	0 lbs-ft	5 lbs-ft	18 lbs-ft	0 lbs-ft	18 lbs-ft	1 lbs-ft	0 lbs-ft	1 lbs-ft
e	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft
L/6	0.49 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}	276.1 psf	217.5 psf	276.1 psf	280.7 psf	217.5 psf	280.7 psf	80.8 psf	217.5 psf	80.8 psf
f_{max}	276.6 psf	217.5 psf	276.6 psf	282.8 psf	217.5 psf	282.8 psf	80.8 psf	217.5 psf	80.8 psf

Maximum Bearing Pressure = 283 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 28in 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.

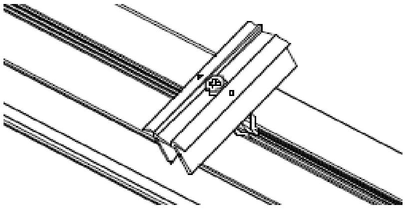
6. DESIGN OF JOINTS AND CONNECTIONS

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.

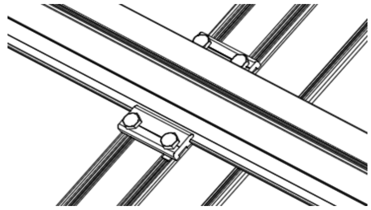
Fastening of Modules to Purlins

Maximum Uplifting Force =	0.702	k
Allowable Uplift =	1.214	k
Utilization =	58%	



Fastening of Purlins to Girders

Maximum Uplifting Force =	2.117	k
Allowable Uplift =	4.357	k
Utilization =	49%	



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 =	3.307	k
M12 Bolt Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	45%	

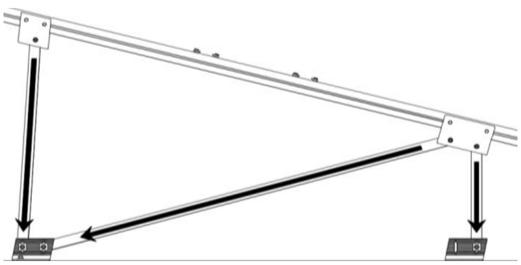
Rear Strut

Maximum Axial Load =	3.804	k
M12 Bolt Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	51%	

Diagonal Strut

Maximum Axial Load =	1.901	k
M12 Bolt Shear Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	26%	

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



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

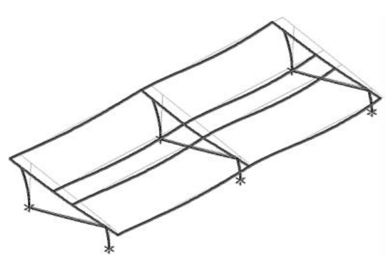
7. SEISMIC DESIGN

7.1 Seismic Drift - N/A

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

Mean Height, h_{sx} =	51.89	in
Allowable Story Drift for All Other Structures, Δ = {	$0.020h_{sx}$	
	1.038	in
Max Drift, Δ_{MAX} =	0.027	in
N/A		

The racking structure's reaction to seismic loads is shown to the right. The deflections have been magnified to provide a clear portrayal of potential story drift.



APPENDIX A

A.1 Design of Aluminum Purlins - Aluminum Design Manual, 2005 Edition

Purlin = **S1.5**

Strong Axis:

3.4.14

L_b = 102 in

J = 0.432

282.18

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

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= 27.9 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 = 102

J = 0.432

179.449

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

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

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

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

$\varphi F_L =$ 31.1 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.4

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

S1 = 35.2

m = 0.68

C_0 = 41.067

Cc = 43.717

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

S2 = 73.8

$\varphi F_L = 1.3\varphi yFcy$

$\varphi F_L =$ 43.2 ksi

3.4.18

h/t = 16.2

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

S1 = 36.9

m = 0.65

C_0 = 40

Cc = 40

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

S2 = 77.3

$\varphi F_L = 1.3\varphi yFcy$

$\varphi F_L =$ 43.2 ksi

$\varphi F_L St$=	29.0	ksi	$\varphi F_L Wk$=	33.3	ksi
Ix =	984962	mm^4	Iy =	923544	mm^4
	2.366	in^4		2.219	in^4
y =	43.717	mm	x =	40	mm
Sx =	1.375	in^3	Sy =	1.409	in^3
$M_{max}St$ =	3.323	k-ft	$M_{max}Wk$ =	3.904	k-ft

Compression

3.4.9

b/t = 16.2

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

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

$\varphi F_L =$ 31.6 ksi

b/t = 7.4

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

3.4.10

Rb/t = 18.1

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

S1 = 6.87

S2 = 131.3

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

$\varphi F_L =$ 31.09 ksi

$\varphi F_L =$ 31.09 ksi

A = 1215.13 mm^2

1.88 in^2

P_{max} = 58.55 kips

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

Strut = **55x55**

Strong Axis:

3.4.14

L_b = 24.8 in

J = 0.942

38.7028

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.4 ksi

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L St$= 28.2 ksi

Ix = 279836 mm^4

0.672 in^4

y = 27.5 mm

Sx = 0.621 in^3

$M_{max}St$ = 1.460 k-ft

Weak Axis:

3.4.14

L_b = 24.8

J = 0.942

38.7028

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.4

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L Wk$= 28.2 ksi

Iy = 279836 mm^4

0.672 in^4

x = 27.5 mm

Sy = 0.621 in^3

$M_{max}Wk$ = 1.460 k-ft

Compression

3.4.7

λ = 0.57371

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.87952

φF_L= φcc(Bc-Dc*λ)

φF_L= 28.0279 ksi

3.4.9

b/t = 24.5

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

b/t = 24.5

S1 = 12.21

S2 = 32.70

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

φF_L= φyFcy

φF_L= 33.25 ksi

φF_L= 28.03 ksi

A = 663.99 mm^2

1.03 in^2

P_{max} = 28.85 kips

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

Strut = **55x55**

Strong Axis:

3.4.14

L_b = 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

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

φF_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

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

φF_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

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 28.2 ksi

Ix = 279836 mm^4

0.672 in^4

y = 27.5 mm

Sx = 0.621 in^3

M_{max}St = 1.460 k-ft

φF_LWk= 28.2 ksi

Iy = 279836 mm^4

0.672 in^4

x = 27.5 mm

Sy = 0.621 in^3

M_{max}Wk = 1.460 k-ft

Compression

3.4.7

λ = 2.26776

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 = 61.10 in
J = 0.942
95.3524

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

S1 = 0.51461

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

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

3.4.16

b/t = 24.5

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

S1 = 12.2

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

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

Weak Axis:

3.4.14

L_b = 61.1
J = 0.942
95.3524

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

S1 = 0.51461

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

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

3.4.16

b/t = 24.5

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

S1 = 12.2

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

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

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 28.2 ksi

Ix = 279836 mm^4

0.672 in^4

y = 27.5 mm

Sx = 0.621 in^3

M_{max}St = 1.460 k-ft

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 28.2 ksi

Iy = 279836 mm^4

0.672 in^4

x = 27.5 mm

Sy = 0.621 in^3

M_{max}Wk = 1.460 k-ft

Compression

3.4.7

λ = 1.41345

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.77788

φF_L= (φccFcy)/(λ²)

φF_L= 13.6277 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

$\varphi F_L =$ 13.63 ksi

A = 663.99 mm^2

1.03 in^2

$P_{max} =$ 14.03 kips

APPENDIX B

B.1

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

Basic Load Cases

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

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

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	Y	-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	-63.565	-63.565	0	0
2	M14	Y	-63.565	-63.565	0	0
3	M15	Y	-63.565	-63.565	0	0
4	M16	Y	-63.565	-63.565	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	-91.409	-91.409	0	0
2	M14	y	-91.409	-91.409	0	0
3	M15	y	-143.642	-143.642	0	0
4	M16	y	-143.642	-143.642	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	208.934	208.934	0	0
2	M14	y	160.183	160.183	0	0
3	M15	y	87.056	87.056	0	0
4	M16	y	87.056	87.056	0	0

Load Combinations

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

Load Combinations (Continued)

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

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N8	max	489.067	2	1165.741	1	.832	1	.004	1	0	1	0	1
2		min	-625.503	3	-1336.76	3	.035	15	0	15	0	1	0	1
3	N7	max	.029	9	1188.865	1	-.402	15	0	15	0	1	0	1
4		min	-.174	2	-220.442	3	-10.819	1	-.022	1	0	1	0	1
5	N15	max	0	15	3307.269	1	0	3	0	2	0	1	0	1
6		min	-1.914	2	-763.947	3	0	1	0	1	0	1	0	1
7	N16	max	1757.462	2	3740.769	1	0	2	0	1	0	1	0	1
8		min	-1906.822	3	-4253.348	3	0	3	0	3	0	1	0	1
9	N23	max	.029	9	1188.865	1	10.819	1	.022	1	0	1	0	1
10		min	-.174	2	-220.442	3	.402	15	0	15	0	1	0	1
11	N24	max	489.067	2	1165.741	1	-.035	15	0	15	0	1	0	1
12		min	-625.503	3	-1336.76	3	-.832	1	-.004	1	0	1	0	1
13	Totals:	max	2733.334	2	11757.25	1	0	2						
14		min	-3158.519	3	-8131.699	3	0	1						

Envelope Member Section Forces

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
1	M13	1	max	67.474	1	481.002	1	-5.675	15	0	15	.188	1	0	1
2			min	2.435	15	-648.771	3	-158.721	1	-.015	2	.007	15	0	3
3		2	max	67.474	1	335.491	1	-4.348	15	0	15	.056	1	.522	3
4			min	2.435	15	-457.003	3	-121.47	1	-.015	2	.002	15	-.386	1
5		3	max	67.474	1	189.98	1	-3.021	15	0	15	.001	3	.863	3
6			min	2.435	15	-265.234	3	-84.219	1	-.015	2	-.041	1	-.634	1
7		4	max	67.474	1	44.469	1	-1.695	15	0	15	-.003	12	1.023	3
8			min	2.435	15	-73.465	3	-46.969	1	-.015	2	-.103	1	-.744	1
9		5	max	67.474	1	118.304	3	-.299	10	0	15	-.004	12	1.002	3
10			min	2.435	15	-101.042	1	-9.718	1	-.015	2	-.13	1	-.718	1
11		6	max	67.474	1	310.073	3	27.533	1	0	15	-.004	15	.8	3
12			min	2.435	15	-246.553	1	-.23	3	-.015	2	-.121	1	-.554	1
13		7	max	67.474	1	501.842	3	64.783	1	0	15	-.003	15	.416	3
14			min	2.435	15	-392.064	1	1.307	12	-.015	2	-.078	1	-.252	1
15		8	max	67.474	1	693.61	3	102.034	1	0	15	.003	2	.187	1
16			min	2.435	15	-537.575	1	2.655	12	-.015	2	-.004	3	-.148	3
17		9	max	67.474	1	885.379	3	139.285	1	0	15	.115	1	.763	1
18			min	2.435	15	-683.085	1	4.004	12	-.015	2	0	3	-.894	3
19		10	max	67.474	1	1077.148	3	176.536	1	.003	3	.264	1	1.477	1
20			min	2.435	15	-828.596	1	5.353	12	-.015	2	.005	12	-1.821	3
21		11	max	67.474	1	683.085	1	-4.004	12	.015	2	.115	1	.763	1
22			min	2.435	15	-885.379	3	-139.285	1	0	15	0	3	-.894	3
23		12	max	67.474	1	537.575	1	-2.655	12	.015	2	.003	2	.187	1
24			min	2.435	15	-693.61	3	-102.034	1	0	15	-.004	3	-.148	3
25		13	max	67.474	1	392.064	1	-1.307	12	.015	2	-.003	15	.416	3
26			min	2.435	15	-501.842	3	-64.783	1	0	15	-.078	1	-.252	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
27		14	max	67.474	1	246.553	1	.23	3	.015	2	-.004	15	.8	3
28			min	2.435	15	-310.073	3	-27.533	1	0	15	-.121	1	-.554	1
29		15	max	67.474	1	101.042	1	9.718	1	.015	2	-.004	12	1.002	3
30			min	2.435	15	-118.304	3	.299	10	0	15	-.13	1	-.718	1
31		16	max	67.474	1	73.465	3	46.969	1	.015	2	-.003	12	1.023	3
32			min	2.435	15	-44.469	1	1.695	15	0	15	-.103	1	-.744	1
33		17	max	67.474	1	265.234	3	84.219	1	.015	2	.001	3	.863	3
34			min	2.435	15	-189.98	1	3.021	15	0	15	-.041	1	-.634	1
35		18	max	67.474	1	457.003	3	121.47	1	.015	2	.056	1	.522	3
36			min	2.435	15	-335.491	1	4.348	15	0	15	.002	15	-.386	1
37		19	max	67.474	1	648.771	3	158.721	1	.015	2	.188	1	0	1
38			min	2.435	15	-481.002	1	5.675	15	0	15	.007	15	0	3
39	M14	1	max	40.58	1	541.678	1	-5.905	15	.012	3	.225	1	0	1
40			min	1.466	15	-524.14	3	-165.163	1	-.015	1	.008	15	0	3
41		2	max	40.58	1	396.167	1	-4.578	15	.012	3	.086	1	.426	3
42			min	1.466	15	-378.414	3	-127.912	1	-.015	1	.003	15	-.443	1
43		3	max	40.58	1	250.657	1	-3.252	15	.012	3	.003	3	.715	3
44			min	1.466	15	-232.688	3	-90.661	1	-.015	1	-.017	1	-.748	1
45		4	max	40.58	1	105.146	1	-1.925	15	.012	3	-.002	12	.866	3
46			min	1.466	15	-86.961	3	-53.411	1	-.015	1	-.085	1	-.916	1
47		5	max	40.58	1	58.765	3	-.598	15	.012	3	-.004	12	.879	3
48			min	1.466	15	-40.365	1	-16.16	1	-.015	1	-.118	1	-.947	1
49		6	max	40.58	1	204.491	3	21.091	1	.012	3	-.004	15	.755	3
50			min	1.466	15	-185.876	1	-.601	3	-.015	1	-.116	1	-.84	1
51		7	max	40.58	1	350.217	3	58.342	1	.012	3	-.003	15	.493	3
52			min	1.466	15	-331.387	1	1.061	12	-.015	1	-.078	1	-.596	1
53		8	max	40.58	1	495.943	3	95.592	1	.012	3	.001	10	.093	3
54			min	1.466	15	-476.898	1	2.409	12	-.015	1	-.005	1	-.214	1
55		9	max	40.58	1	641.67	3	132.843	1	.012	3	.103	1	.305	1
56			min	1.466	15	-622.409	1	3.758	12	-.015	1	0	3	-.444	3
57		10	max	40.58	1	787.396	3	170.094	1	.012	3	.246	1	.962	1
58			min	1.466	15	-767.92	1	5.107	12	-.015	1	.004	12	-1.119	3
59		11	max	40.58	1	622.409	1	-3.758	12	.015	1	.103	1	.305	1
60			min	1.466	15	-641.67	3	-132.843	1	-.012	3	0	3	-.444	3
61		12	max	40.58	1	476.898	1	-2.409	12	.015	1	.001	10	.093	3
62			min	1.466	15	-495.943	3	-95.592	1	-.012	3	-.005	1	-.214	1
63		13	max	40.58	1	331.387	1	-1.061	12	.015	1	-.003	15	.493	3
64			min	1.466	15	-350.217	3	-58.342	1	-.012	3	-.078	1	-.596	1
65		14	max	40.58	1	185.876	1	.601	3	.015	1	-.004	15	.755	3
66			min	1.466	15	-204.491	3	-21.091	1	-.012	3	-.116	1	-.84	1
67		15	max	40.58	1	40.365	1	16.16	1	.015	1	-.004	12	.879	3
68			min	1.466	15	-58.765	3	.598	15	-.012	3	-.118	1	-.947	1
69		16	max	40.58	1	86.961	3	53.411	1	.015	1	-.002	12	.866	3
70			min	1.466	15	-105.146	1	1.925	15	-.012	3	-.085	1	-.916	1
71		17	max	40.58	1	232.688	3	90.661	1	.015	1	.003	3	.715	3
72			min	1.466	15	-250.657	1	3.252	15	-.012	3	-.017	1	-.748	1
73		18	max	40.58	1	378.414	3	127.912	1	.015	1	.086	1	.426	3
74			min	1.466	15	-396.167	1	4.578	15	-.012	3	.003	15	-.443	1
75		19	max	40.58	1	524.14	3	165.163	1	.015	1	.225	1	0	1
76			min	1.466	15	-541.678	1	5.905	15	-.012	3	.008	15	0	3
77	M15	1	max	-1.558	15	641.87	2	-5.903	15	.016	1	.224	1	0	2
78			min	-43.01	1	-291.739	3	-165.134	1	-.01	3	.008	15	0	3
79		2	max	-1.558	15	465.917	2	-4.576	15	.016	1	.086	1	.239	3
80			min	-43.01	1	-215.077	3	-127.883	1	-.01	3	.003	15	-.523	2
81		3	max	-1.558	15	289.964	2	-3.249	15	.016	1	.003	3	.406	3
82			min	-43.01	1	-138.415	3	-90.633	1	-.01	3	-.017	1	-.88	2
83		4	max	-1.558	15	114.371	1	-1.922	15	.016	1	-.002	12	.501	3

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
84			min	-43.01	1	-61.753	3	-53.382	1	-.01	3	-.085	1	-1.071	2
85		5	max	-1.558	15	14.909	3	-.595	15	.016	1	-.004	12	.523	3
86			min	-43.01	1	-61.942	2	-16.131	1	-.01	3	-.118	1	-1.095	2
87		6	max	-1.558	15	91.57	3	21.12	1	.016	1	-.004	15	.473	3
88			min	-43.01	1	-237.895	2	-.454	3	-.01	3	-.116	1	-.954	2
89		7	max	-1.558	15	168.232	3	58.37	1	.016	1	-.003	15	.35	3
90			min	-43.01	1	-413.848	2	1.149	12	-.01	3	-.078	1	-.648	1
91		8	max	-1.558	15	244.894	3	95.621	1	.016	1	.001	10	.155	3
92			min	-43.01	1	-589.801	2	2.498	12	-.01	3	-.005	1	-.194	1
93		9	max	-1.558	15	321.556	3	132.872	1	.016	1	.103	1	.468	2
94			min	-43.01	1	-765.754	2	3.846	12	-.01	3	0	3	-.113	3
95		10	max	-1.558	15	398.218	3	170.123	1	.016	1	.246	1	1.274	2
96			min	-43.01	1	-941.707	2	5.195	12	0	15	.005	12	-.453	3
97		11	max	-1.558	15	765.754	2	-3.846	12	.01	3	.103	1	.468	2
98			min	-43.01	1	-321.556	3	-132.872	1	-.016	1	0	3	-.113	3
99		12	max	-1.558	15	589.801	2	-2.498	12	.01	3	.001	10	.155	3
100			min	-43.01	1	-244.894	3	-95.621	1	-.016	1	-.005	1	-.194	1
101		13	max	-1.558	15	413.848	2	-1.149	12	.01	3	-.003	15	.35	3
102			min	-43.01	1	-168.232	3	-58.37	1	-.016	1	-.078	1	-.648	1
103		14	max	-1.558	15	237.895	2	.454	3	.01	3	-.004	15	.473	3
104			min	-43.01	1	-91.57	3	-21.12	1	-.016	1	-.116	1	-.954	2
105		15	max	-1.558	15	61.942	2	16.131	1	.01	3	-.004	12	.523	3
106			min	-43.01	1	-14.909	3	.595	15	-.016	1	-.118	1	-1.095	2
107		16	max	-1.558	15	61.753	3	53.382	1	.01	3	-.002	12	.501	3
108			min	-43.01	1	-114.371	1	1.922	15	-.016	1	-.085	1	-1.071	2
109		17	max	-1.558	15	138.415	3	90.633	1	.01	3	.003	3	.406	3
110			min	-43.01	1	-289.964	2	3.249	15	-.016	1	-.017	1	-.88	2
111		18	max	-1.558	15	215.077	3	127.883	1	.01	3	.086	1	.239	3
112			min	-43.01	1	-465.917	2	4.576	15	-.016	1	.003	15	-.523	2
113		19	max	-1.558	15	291.739	3	165.134	1	.01	3	.224	1	0	2
114			min	-43.01	1	-641.87	2	5.903	15	-.016	1	.008	15	0	3
115	M16	1	max	-2.71	15	586.223	2	-5.688	15	.012	1	.191	1	0	2
116			min	-75.03	1	-250.321	3	-159.211	1	-.012	3	.007	15	0	3
117		2	max	-2.71	15	410.27	2	-4.361	15	.012	1	.058	1	.2	3
118			min	-75.03	1	-173.659	3	-121.961	1	-.012	3	.002	15	-.471	2
119		3	max	-2.71	15	234.317	2	-3.034	15	.012	1	0	3	.328	3
120			min	-75.03	1	-96.997	3	-84.71	1	-.012	3	-.04	1	-.775	2
121		4	max	-2.71	15	58.364	2	-1.708	15	.012	1	-.003	12	.383	3
122			min	-75.03	1	-20.335	3	-47.459	1	-.012	3	-.102	1	-.913	2
123		5	max	-2.71	15	56.327	3	-.381	15	.012	1	-.004	12	.366	3
124			min	-75.03	1	-117.589	2	-10.209	1	-.012	3	-.129	1	-.885	2
125		6	max	-2.71	15	132.988	3	27.042	1	.012	1	-.004	15	.277	3
126			min	-75.03	1	-293.542	2	.232	3	-.012	3	-.121	1	-.691	2
127		7	max	-2.71	15	209.65	3	64.293	1	.012	1	-.003	15	.115	3
128			min	-75.03	1	-469.495	2	1.583	12	-.012	3	-.078	1	-.331	2
129		8	max	-2.71	15	286.312	3	101.544	1	.012	1	.002	2	.201	1
130			min	-75.03	1	-645.448	2	2.931	12	-.012	3	-.003	3	-.119	3
131		9	max	-2.71	15	362.974	3	138.794	1	.012	1	.114	1	.888	2
132			min	-75.03	1	-821.401	2	4.28	12	-.012	3	.001	12	-.426	3
133		10	max	-2.71	15	439.636	3	176.045	1	.012	1	.262	1	1.747	2
134			min	-75.03	1	-997.354	2	5.628	12	-.012	3	.006	12	-.805	3
135		11	max	-2.71	15	821.401	2	-4.28	12	.012	3	.114	1	.888	2
136			min	-75.03	1	-362.974	3	-138.794	1	-.012	1	.001	12	-.426	3
137		12	max	-2.71	15	645.448	2	-2.931	12	.012	3	.002	2	.201	1
138			min	-75.03	1	-286.312	3	-101.544	1	-.012	1	-.003	3	-.119	3
139		13	max	-2.71	15	469.495	2	-1.583	12	.012	3	-.003	15	.115	3
140			min	-75.03	1	-209.65	3	-64.293	1	-.012	1	-.078	1	-.331	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
141		14	max	-2.71	15	293.542	2	-.232	3	.012	3	-.004	15	.277	3
142			min	-75.03	1	-132.988	3	-27.042	1	-.012	1	-.121	1	-.691	2
143		15	max	-2.71	15	117.589	2	10.209	1	.012	3	-.004	12	.366	3
144			min	-75.03	1	-56.327	3	.381	15	-.012	1	-.129	1	-.885	2
145		16	max	-2.71	15	20.335	3	47.459	1	.012	3	-.003	12	.383	3
146			min	-75.03	1	-58.364	2	1.708	15	-.012	1	-.102	1	-.913	2
147		17	max	-2.71	15	96.997	3	84.71	1	.012	3	0	3	.328	3
148			min	-75.03	1	-234.317	2	3.034	15	-.012	1	-.04	1	-.775	2
149		18	max	-2.71	15	173.659	3	121.961	1	.012	3	.058	1	.2	3
150			min	-75.03	1	-410.27	2	4.361	15	-.012	1	.002	15	-.471	2
151		19	max	-2.71	15	250.321	3	159.211	1	.012	3	.191	1	0	2
152			min	-75.03	1	-586.223	2	5.688	15	-.012	1	.007	15	0	3
153	M2	1	max	1119.129	1	2.157	4	.796	1	0	3	0	3	0	1
154			min	-1196.132	3	.507	15	.029	15	0	1	0	1	0	1
155		2	max	1119.545	1	2.148	4	.796	1	0	3	0	1	0	15
156			min	-1195.82	3	.505	15	.029	15	0	1	0	15	0	4
157		3	max	1119.961	1	2.139	4	.796	1	0	3	0	1	0	15
158			min	-1195.508	3	.503	15	.029	15	0	1	0	15	-.001	4
159		4	max	1120.377	1	2.13	4	.796	1	0	3	0	1	0	15
160			min	-1195.196	3	.501	15	.029	15	0	1	0	15	-.002	4
161		5	max	1120.793	1	2.122	4	.796	1	0	3	0	1	0	15
162			min	-1194.884	3	.499	15	.029	15	0	1	0	15	-.002	4
163		6	max	1121.209	1	2.113	4	.796	1	0	3	.001	1	0	15
164			min	-1194.572	3	.497	15	.029	15	0	1	0	15	-.003	4
165		7	max	1121.625	1	2.104	4	.796	1	0	3	.001	1	0	15
166			min	-1194.26	3	.495	15	.029	15	0	1	0	15	-.004	4
167		8	max	1122.04	1	2.096	4	.796	1	0	3	.002	1	0	15
168			min	-1193.948	3	.493	15	.029	15	0	1	0	15	-.004	4
169		9	max	1122.456	1	2.087	4	.796	1	0	3	.002	1	-.001	15
170			min	-1193.637	3	.491	15	.029	15	0	1	0	15	-.005	4
171		10	max	1122.872	1	2.078	4	.796	1	0	3	.002	1	-.001	15
172			min	-1193.325	3	.489	15	.029	15	0	1	0	15	-.005	4
173		11	max	1123.288	1	2.069	4	.796	1	0	3	.002	1	-.001	15
174			min	-1193.013	3	.487	15	.029	15	0	1	0	15	-.006	4
175		12	max	1123.704	1	2.061	4	.796	1	0	3	.002	1	-.002	15
176			min	-1192.701	3	.485	15	.029	15	0	1	0	15	-.007	4
177		13	max	1124.12	1	2.052	4	.796	1	0	3	.003	1	-.002	15
178			min	-1192.389	3	.482	15	.029	15	0	1	0	15	-.007	4
179		14	max	1124.536	1	2.043	4	.796	1	0	3	.003	1	-.002	15
180			min	-1192.077	3	.48	15	.029	15	0	1	0	15	-.008	4
181		15	max	1124.952	1	2.035	4	.796	1	0	3	.003	1	-.002	15
182			min	-1191.765	3	.478	15	.029	15	0	1	0	15	-.008	4
183		16	max	1125.367	1	2.026	4	.796	1	0	3	.003	1	-.002	15
184			min	-1191.453	3	.476	15	.029	15	0	1	0	15	-.009	4
185		17	max	1125.783	1	2.017	4	.796	1	0	3	.004	1	-.002	15
186			min	-1191.141	3	.474	15	.029	15	0	1	0	15	-.009	4
187		18	max	1126.199	1	2.008	4	.796	1	0	3	.004	1	-.002	15
188			min	-1190.829	3	.472	15	.029	15	0	1	0	15	-.01	4
189		19	max	1126.615	1	2	4	.796	1	0	3	.004	1	-.002	15
190			min	-1190.517	3	.47	15	.029	15	0	1	0	15	-.01	4
191	M3	1	max	487.197	2	9.101	4	.188	1	0	3	0	1	.01	4
192			min	-624.065	3	2.139	15	.007	15	0	1	0	15	.002	15
193		2	max	487.026	2	8.226	4	.188	1	0	3	0	1	.006	4
194			min	-624.193	3	1.934	15	.007	15	0	1	0	15	.001	12
195		3	max	486.856	2	7.352	4	.188	1	0	3	0	1	.003	2
196			min	-624.321	3	1.728	15	.007	15	0	1	0	15	0	3
197		4	max	486.685	2	6.477	4	.188	1	0	3	0	1	0	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
198			min	-624.449	3	1.523	15	.007	15	0	1	0	15	-.002	3
199		5	max	486.515	2	5.603	4	.188	1	0	3	0	1	0	15
200			min	-624.576	3	1.317	15	.007	15	0	1	0	15	-.003	4
201		6	max	486.345	2	4.728	4	.188	1	0	3	0	1	-.001	15
202			min	-624.704	3	1.112	15	.007	15	0	1	0	15	-.006	4
203		7	max	486.174	2	3.854	4	.188	1	0	3	0	1	-.002	15
204			min	-624.832	3	.906	15	.007	15	0	1	0	15	-.008	4
205		8	max	486.004	2	2.98	4	.188	1	0	3	0	1	-.002	15
206			min	-624.96	3	.7	15	.007	15	0	1	0	15	-.01	4
207		9	max	485.834	2	2.105	4	.188	1	0	3	0	1	-.003	15
208			min	-625.087	3	.495	15	.007	15	0	1	0	15	-.011	4
209		10	max	485.663	2	1.231	4	.188	1	0	3	0	1	-.003	15
210			min	-625.215	3	.289	15	.007	15	0	1	0	15	-.012	4
211		11	max	485.493	2	.426	2	.188	1	0	3	0	1	-.003	15
212			min	-625.343	3	.003	3	.007	15	0	1	0	15	-.012	4
213		12	max	485.323	2	-.122	15	.188	1	0	3	.001	1	-.003	15
214			min	-625.471	3	-.518	4	.007	15	0	1	0	15	-.012	4
215		13	max	485.152	2	-.327	15	.188	1	0	3	.001	1	-.003	15
216			min	-625.599	3	-1.393	4	.007	15	0	1	0	15	-.011	4
217		14	max	484.982	2	-.533	15	.188	1	0	3	.001	1	-.002	15
218			min	-625.726	3	-2.267	4	.007	15	0	1	0	15	-.011	4
219		15	max	484.812	2	-.738	15	.188	1	0	3	.001	1	-.002	15
220			min	-625.854	3	-3.142	4	.007	15	0	1	0	15	-.009	4
221		16	max	484.641	2	-.944	15	.188	1	0	3	.001	1	-.002	15
222			min	-625.982	3	-4.016	4	.007	15	0	1	0	15	-.008	4
223		17	max	484.471	2	-1.15	15	.188	1	0	3	.001	1	-.001	15
224			min	-626.11	3	-4.89	4	.007	15	0	1	0	15	-.005	4
225		18	max	484.301	2	-1.355	15	.188	1	0	3	.002	1	0	15
226			min	-626.237	3	-5.765	4	.007	15	0	1	0	15	-.003	4
227		19	max	484.13	2	-1.561	15	.188	1	0	3	.002	1	0	1
228			min	-626.365	3	-6.639	4	.007	15	0	1	0	15	0	1
229	M4	1	max	1185.799	1	0	1	-.402	15	0	1	0	1	0	1
230			min	-222.742	3	0	1	-11.212	1	0	1	0	15	0	1
231		2	max	1185.969	1	0	1	-.402	15	0	1	0	12	0	1
232			min	-222.614	3	0	1	-11.212	1	0	1	0	1	0	1
233		3	max	1186.139	1	0	1	-.402	15	0	1	0	15	0	1
234			min	-222.486	3	0	1	-11.212	1	0	1	-.002	1	0	1
235		4	max	1186.31	1	0	1	-.402	15	0	1	0	15	0	1
236			min	-222.358	3	0	1	-11.212	1	0	1	-.003	1	0	1
237		5	max	1186.48	1	0	1	-.402	15	0	1	0	15	0	1
238			min	-222.231	3	0	1	-11.212	1	0	1	-.004	1	0	1
239		6	max	1186.65	1	0	1	-.402	15	0	1	0	15	0	1
240			min	-222.103	3	0	1	-11.212	1	0	1	-.005	1	0	1
241		7	max	1186.821	1	0	1	-.402	15	0	1	0	15	0	1
242			min	-221.975	3	0	1	-11.212	1	0	1	-.007	1	0	1
243		8	max	1186.991	1	0	1	-.402	15	0	1	0	15	0	1
244			min	-221.847	3	0	1	-11.212	1	0	1	-.008	1	0	1
245		9	max	1187.161	1	0	1	-.402	15	0	1	0	15	0	1
246			min	-221.72	3	0	1	-11.212	1	0	1	-.009	1	0	1
247		10	max	1187.332	1	0	1	-.402	15	0	1	0	15	0	1
248			min	-221.592	3	0	1	-11.212	1	0	1	-.011	1	0	1
249		11	max	1187.502	1	0	1	-.402	15	0	1	0	15	0	1
250			min	-221.464	3	0	1	-11.212	1	0	1	-.012	1	0	1
251		12	max	1187.672	1	0	1	-.402	15	0	1	0	15	0	1
252			min	-221.336	3	0	1	-11.212	1	0	1	-.013	1	0	1
253		13	max	1187.843	1	0	1	-.402	15	0	1	0	15	0	1
254			min	-221.209	3	0	1	-11.212	1	0	1	-.014	1	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
255		14	max	1188.013	1	0	1	-.402	15	0	1	0	15	0	1
256			min	-221.081	3	0	1	-11.212	1	0	1	-.016	1	0	1
257		15	max	1188.183	1	0	1	-.402	15	0	1	0	15	0	1
258			min	-220.953	3	0	1	-11.212	1	0	1	-.017	1	0	1
259		16	max	1188.354	1	0	1	-.402	15	0	1	0	15	0	1
260			min	-220.825	3	0	1	-11.212	1	0	1	-.018	1	0	1
261		17	max	1188.524	1	0	1	-.402	15	0	1	0	15	0	1
262			min	-220.698	3	0	1	-11.212	1	0	1	-.02	1	0	1
263		18	max	1188.695	1	0	1	-.402	15	0	1	0	15	0	1
264			min	-220.57	3	0	1	-11.212	1	0	1	-.021	1	0	1
265		19	max	1188.865	1	0	1	-.402	15	0	1	0	15	0	1
266			min	-220.442	3	0	1	-11.212	1	0	1	-.022	1	0	1
267	M6	1	max	3472.558	1	2.552	2	0	1	0	1	0	1	0	1
268			min	-3803.676	3	.192	3	0	1	0	1	0	1	0	1
269		2	max	3472.974	1	2.545	2	0	1	0	1	0	1	0	3
270			min	-3803.365	3	.187	3	0	1	0	1	0	1	0	2
271		3	max	3473.39	1	2.539	2	0	1	0	1	0	1	0	3
272			min	-3803.053	3	.182	3	0	1	0	1	0	1	-.001	2
273		4	max	3473.806	1	2.532	2	0	1	0	1	0	1	0	3
274			min	-3802.741	3	.177	3	0	1	0	1	0	1	-.002	2
275		5	max	3474.222	1	2.525	2	0	1	0	1	0	1	0	3
276			min	-3802.429	3	.172	3	0	1	0	1	0	1	-.003	2
277		6	max	3474.638	1	2.518	2	0	1	0	1	0	1	0	3
278			min	-3802.117	3	.167	3	0	1	0	1	0	1	-.004	2
279		7	max	3475.054	1	2.511	2	0	1	0	1	0	1	0	3
280			min	-3801.805	3	.162	3	0	1	0	1	0	1	-.004	2
281		8	max	3475.469	1	2.505	2	0	1	0	1	0	1	0	3
282			min	-3801.493	3	.157	3	0	1	0	1	0	1	-.005	2
283		9	max	3475.885	1	2.498	2	0	1	0	1	0	1	0	3
284			min	-3801.181	3	.151	3	0	1	0	1	0	1	-.006	2
285		10	max	3476.301	1	2.491	2	0	1	0	1	0	1	0	3
286			min	-3800.869	3	.146	3	0	1	0	1	0	1	-.006	2
287		11	max	3476.717	1	2.484	2	0	1	0	1	0	1	0	3
288			min	-3800.557	3	.141	3	0	1	0	1	0	1	-.007	2
289		12	max	3477.133	1	2.477	2	0	1	0	1	0	1	0	3
290			min	-3800.245	3	.136	3	0	1	0	1	0	1	-.008	2
291		13	max	3477.549	1	2.471	2	0	1	0	1	0	1	0	3
292			min	-3799.934	3	.131	3	0	1	0	1	0	1	-.008	2
293		14	max	3477.965	1	2.464	2	0	1	0	1	0	1	0	3
294			min	-3799.622	3	.126	3	0	1	0	1	0	1	-.009	2
295		15	max	3478.381	1	2.457	2	0	1	0	1	0	1	0	3
296			min	-3799.31	3	.121	3	0	1	0	1	0	1	-.01	2
297		16	max	3478.796	1	2.45	2	0	1	0	1	0	1	0	3
298			min	-3798.998	3	.116	3	0	1	0	1	0	1	-.011	2
299		17	max	3479.212	1	2.443	2	0	1	0	1	0	1	0	3
300			min	-3798.686	3	.111	3	0	1	0	1	0	1	-.011	2
301		18	max	3479.628	1	2.437	2	0	1	0	1	0	1	0	3
302			min	-3798.374	3	.106	3	0	1	0	1	0	1	-.012	2
303		19	max	3480.044	1	2.43	2	0	1	0	1	0	1	0	3
304			min	-3798.062	3	.1	3	0	1	0	1	0	1	-.013	2
305	M7	1	max	1759.943	2	9.139	4	0	1	0	1	0	1	.013	2
306			min	-1898.363	3	2.144	15	0	1	0	1	0	1	0	3
307		2	max	1759.773	2	8.264	4	0	1	0	1	0	1	.009	2
308			min	-1898.491	3	1.939	15	0	1	0	1	0	1	-.001	3
309		3	max	1759.603	2	7.39	4	0	1	0	1	0	1	.006	2
310			min	-1898.618	3	1.733	15	0	1	0	1	0	1	-.003	3
311		4	max	1759.432	2	6.515	4	0	1	0	1	0	1	.003	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
312			min	-1898.746	3	1.528	15	0	1	0	1	0	1	-.005	3
313		5	max	1759.262	2	5.641	4	0	1	0	1	0	1	0	2
314			min	-1898.874	3	1.322	15	0	1	0	1	0	1	-.006	3
315		6	max	1759.092	2	4.766	4	0	1	0	1	0	1	-.001	15
316			min	-1899.002	3	1.117	15	0	1	0	1	0	1	-.007	3
317		7	max	1758.921	2	3.892	4	0	1	0	1	0	1	-.002	15
318			min	-1899.129	3	.911	15	0	1	0	1	0	1	-.008	3
319		8	max	1758.751	2	3.017	4	0	1	0	1	0	1	-.002	15
320			min	-1899.257	3	.706	15	0	1	0	1	0	1	-.009	4
321		9	max	1758.581	2	2.157	2	0	1	0	1	0	1	-.002	15
322			min	-1899.385	3	.441	12	0	1	0	1	0	1	-.011	4
323		10	max	1758.41	2	1.475	2	0	1	0	1	0	1	-.003	15
324			min	-1899.513	3	.087	3	0	1	0	1	0	1	-.011	4
325		11	max	1758.24	2	.794	2	0	1	0	1	0	1	-.003	15
326			min	-1899.64	3	-.424	3	0	1	0	1	0	1	-.012	4
327		12	max	1758.07	2	.112	2	0	1	0	1	0	1	-.003	15
328			min	-1899.768	3	-.935	3	0	1	0	1	0	1	-.012	4
329		13	max	1757.899	2	-.322	15	0	1	0	1	0	1	-.003	15
330			min	-1899.896	3	-1.446	3	0	1	0	1	0	1	-.011	4
331		14	max	1757.729	2	-.528	15	0	1	0	1	0	1	-.002	15
332			min	-1900.024	3	-2.229	4	0	1	0	1	0	1	-.01	4
333		15	max	1757.559	2	-.733	15	0	1	0	1	0	1	-.002	15
334			min	-1900.151	3	-3.104	4	0	1	0	1	0	1	-.009	4
335		16	max	1757.388	2	-.939	15	0	1	0	1	0	1	-.002	15
336			min	-1900.279	3	-3.978	4	0	1	0	1	0	1	-.008	4
337		17	max	1757.218	2	-1.144	15	0	1	0	1	0	1	-.001	15
338			min	-1900.407	3	-4.853	4	0	1	0	1	0	1	-.005	4
339		18	max	1757.048	2	-1.35	15	0	1	0	1	0	1	0	15
340			min	-1900.535	3	-5.727	4	0	1	0	1	0	1	-.003	4
341		19	max	1756.877	2	-1.555	15	0	1	0	1	0	1	0	1
342			min	-1900.662	3	-6.601	4	0	1	0	1	0	1	0	1
343	M8	1	max	3304.203	1	0	1	0	1	0	1	0	1	0	1
344			min	-766.246	3	0	1	0	1	0	1	0	1	0	1
345		2	max	3304.374	1	0	1	0	1	0	1	0	1	0	1
346			min	-766.119	3	0	1	0	1	0	1	0	1	0	1
347		3	max	3304.544	1	0	1	0	1	0	1	0	1	0	1
348			min	-765.991	3	0	1	0	1	0	1	0	1	0	1
349		4	max	3304.714	1	0	1	0	1	0	1	0	1	0	1
350			min	-765.863	3	0	1	0	1	0	1	0	1	0	1
351		5	max	3304.885	1	0	1	0	1	0	1	0	1	0	1
352			min	-765.735	3	0	1	0	1	0	1	0	1	0	1
353		6	max	3305.055	1	0	1	0	1	0	1	0	1	0	1
354			min	-765.608	3	0	1	0	1	0	1	0	1	0	1
355		7	max	3305.225	1	0	1	0	1	0	1	0	1	0	1
356			min	-765.48	3	0	1	0	1	0	1	0	1	0	1
357		8	max	3305.396	1	0	1	0	1	0	1	0	1	0	1
358			min	-765.352	3	0	1	0	1	0	1	0	1	0	1
359		9	max	3305.566	1	0	1	0	1	0	1	0	1	0	1
360			min	-765.224	3	0	1	0	1	0	1	0	1	0	1
361		10	max	3305.736	1	0	1	0	1	0	1	0	1	0	1
362			min	-765.096	3	0	1	0	1	0	1	0	1	0	1
363		11	max	3305.907	1	0	1	0	1	0	1	0	1	0	1
364			min	-764.969	3	0	1	0	1	0	1	0	1	0	1
365		12	max	3306.077	1	0	1	0	1	0	1	0	1	0	1
366			min	-764.841	3	0	1	0	1	0	1	0	1	0	1
367		13	max	3306.247	1	0	1	0	1	0	1	0	1	0	1
368			min	-764.713	3	0	1	0	1	0	1	0	1	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
369		14	max	3306.418	1	0	1	0	1	0	1	0	1	0	1
370			min	-764.585	3	0	1	0	1	0	1	0	1	0	1
371		15	max	3306.588	1	0	1	0	1	0	1	0	1	0	1
372			min	-764.458	3	0	1	0	1	0	1	0	1	0	1
373		16	max	3306.758	1	0	1	0	1	0	1	0	1	0	1
374			min	-764.33	3	0	1	0	1	0	1	0	1	0	1
375		17	max	3306.929	1	0	1	0	1	0	1	0	1	0	1
376			min	-764.202	3	0	1	0	1	0	1	0	1	0	1
377		18	max	3307.099	1	0	1	0	1	0	1	0	1	0	1
378			min	-764.074	3	0	1	0	1	0	1	0	1	0	1
379		19	max	3307.269	1	0	1	0	1	0	1	0	1	0	1
380			min	-763.947	3	0	1	0	1	0	1	0	1	0	1
381	M10	1	max	1119.129	1	2.157	4	-.029	15	0	1	0	1	0	1
382			min	-1196.132	3	.507	15	-.796	1	0	3	0	3	0	1
383		2	max	1119.545	1	2.148	4	-.029	15	0	1	0	15	0	15
384			min	-1195.82	3	.505	15	-.796	1	0	3	0	1	0	4
385		3	max	1119.961	1	2.139	4	-.029	15	0	1	0	15	0	15
386			min	-1195.508	3	.503	15	-.796	1	0	3	0	1	-.001	4
387		4	max	1120.377	1	2.13	4	-.029	15	0	1	0	15	0	15
388			min	-1195.196	3	.501	15	-.796	1	0	3	0	1	-.002	4
389		5	max	1120.793	1	2.122	4	-.029	15	0	1	0	15	0	15
390			min	-1194.884	3	.499	15	-.796	1	0	3	0	1	-.002	4
391		6	max	1121.209	1	2.113	4	-.029	15	0	1	0	15	0	15
392			min	-1194.572	3	.497	15	-.796	1	0	3	-.001	1	-.003	4
393		7	max	1121.625	1	2.104	4	-.029	15	0	1	0	15	0	15
394			min	-1194.26	3	.495	15	-.796	1	0	3	-.001	1	-.004	4
395		8	max	1122.04	1	2.096	4	-.029	15	0	1	0	15	0	15
396			min	-1193.948	3	.493	15	-.796	1	0	3	-.002	1	-.004	4
397		9	max	1122.456	1	2.087	4	-.029	15	0	1	0	15	-.001	15
398			min	-1193.637	3	.491	15	-.796	1	0	3	-.002	1	-.005	4
399		10	max	1122.872	1	2.078	4	-.029	15	0	1	0	15	-.001	15
400			min	-1193.325	3	.489	15	-.796	1	0	3	-.002	1	-.005	4
401		11	max	1123.288	1	2.069	4	-.029	15	0	1	0	15	-.001	15
402			min	-1193.013	3	.487	15	-.796	1	0	3	-.002	1	-.006	4
403		12	max	1123.704	1	2.061	4	-.029	15	0	1	0	15	-.002	15
404			min	-1192.701	3	.485	15	-.796	1	0	3	-.002	1	-.007	4
405		13	max	1124.12	1	2.052	4	-.029	15	0	1	0	15	-.002	15
406			min	-1192.389	3	.482	15	-.796	1	0	3	-.003	1	-.007	4
407		14	max	1124.536	1	2.043	4	-.029	15	0	1	0	15	-.002	15
408			min	-1192.077	3	.48	15	-.796	1	0	3	-.003	1	-.008	4
409		15	max	1124.952	1	2.035	4	-.029	15	0	1	0	15	-.002	15
410			min	-1191.765	3	.478	15	-.796	1	0	3	-.003	1	-.008	4
411		16	max	1125.367	1	2.026	4	-.029	15	0	1	0	15	-.002	15
412			min	-1191.453	3	.476	15	-.796	1	0	3	-.003	1	-.009	4
413		17	max	1125.783	1	2.017	4	-.029	15	0	1	0	15	-.002	15
414			min	-1191.141	3	.474	15	-.796	1	0	3	-.004	1	-.009	4
415		18	max	1126.199	1	2.008	4	-.029	15	0	1	0	15	-.002	15
416			min	-1190.829	3	.472	15	-.796	1	0	3	-.004	1	-.01	4
417		19	max	1126.615	1	2	4	-.029	15	0	1	0	15	-.002	15
418			min	-1190.517	3	.47	15	-.796	1	0	3	-.004	1	-.01	4
419	M11	1	max	487.197	2	9.101	4	-.007	15	0	1	0	15	.01	4
420			min	-624.065	3	2.139	15	-.188	1	0	3	0	1	.002	15
421		2	max	487.026	2	8.226	4	-.007	15	0	1	0	15	.006	4
422			min	-624.193	3	1.934	15	-.188	1	0	3	0	1	.001	12
423		3	max	486.856	2	7.352	4	-.007	15	0	1	0	15	.003	2
424			min	-624.321	3	1.728	15	-.188	1	0	3	0	1	0	3
425		4	max	486.685	2	6.477	4	-.007	15	0	1	0	15	0	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
426			min	-624.449	3	1.523	15	-.188	1	0	3	0	1	-.002	3
427		5	max	486.515	2	5.603	4	-.007	15	0	1	0	15	0	15
428			min	-624.576	3	1.317	15	-.188	1	0	3	0	1	-.003	4
429		6	max	486.345	2	4.728	4	-.007	15	0	1	0	15	-.001	15
430			min	-624.704	3	1.112	15	-.188	1	0	3	0	1	-.006	4
431		7	max	486.174	2	3.854	4	-.007	15	0	1	0	15	-.002	15
432			min	-624.832	3	.906	15	-.188	1	0	3	0	1	-.008	4
433		8	max	486.004	2	2.98	4	-.007	15	0	1	0	15	-.002	15
434			min	-624.96	3	.7	15	-.188	1	0	3	0	1	-.01	4
435		9	max	485.834	2	2.105	4	-.007	15	0	1	0	15	-.003	15
436			min	-625.087	3	.495	15	-.188	1	0	3	0	1	-.011	4
437		10	max	485.663	2	1.231	4	-.007	15	0	1	0	15	-.003	15
438			min	-625.215	3	.289	15	-.188	1	0	3	0	1	-.012	4
439		11	max	485.493	2	.426	2	-.007	15	0	1	0	15	-.003	15
440			min	-625.343	3	.003	3	-.188	1	0	3	0	1	-.012	4
441		12	max	485.323	2	-.122	15	-.007	15	0	1	0	15	-.003	15
442			min	-625.471	3	-.518	4	-.188	1	0	3	-.001	1	-.012	4
443		13	max	485.152	2	-.327	15	-.007	15	0	1	0	15	-.003	15
444			min	-625.599	3	-1.393	4	-.188	1	0	3	-.001	1	-.011	4
445		14	max	484.982	2	-.533	15	-.007	15	0	1	0	15	-.002	15
446			min	-625.726	3	-2.267	4	-.188	1	0	3	-.001	1	-.011	4
447		15	max	484.812	2	-.738	15	-.007	15	0	1	0	15	-.002	15
448			min	-625.854	3	-3.142	4	-.188	1	0	3	-.001	1	-.009	4
449		16	max	484.641	2	-.944	15	-.007	15	0	1	0	15	-.002	15
450			min	-625.982	3	-4.016	4	-.188	1	0	3	-.001	1	-.008	4
451		17	max	484.471	2	-1.15	15	-.007	15	0	1	0	15	-.001	15
452			min	-626.11	3	-4.89	4	-.188	1	0	3	-.001	1	-.005	4
453		18	max	484.301	2	-1.355	15	-.007	15	0	1	0	15	0	15
454			min	-626.237	3	-5.765	4	-.188	1	0	3	-.002	1	-.003	4
455		19	max	484.13	2	-1.561	15	-.007	15	0	1	0	15	0	1
456			min	-626.365	3	-6.639	4	-.188	1	0	3	-.002	1	0	1
457	M12	1	max	1185.799	1	0	1	11.212	1	0	1	0	15	0	1
458			min	-222.742	3	0	1	.402	15	0	1	0	1	0	1
459		2	max	1185.969	1	0	1	11.212	1	0	1	0	1	0	1
460			min	-222.614	3	0	1	.402	15	0	1	0	12	0	1
461		3	max	1186.139	1	0	1	11.212	1	0	1	.002	1	0	1
462			min	-222.486	3	0	1	.402	15	0	1	0	15	0	1
463		4	max	1186.31	1	0	1	11.212	1	0	1	.003	1	0	1
464			min	-222.358	3	0	1	.402	15	0	1	0	15	0	1
465		5	max	1186.48	1	0	1	11.212	1	0	1	.004	1	0	1
466			min	-222.231	3	0	1	.402	15	0	1	0	15	0	1
467		6	max	1186.65	1	0	1	11.212	1	0	1	.005	1	0	1
468			min	-222.103	3	0	1	.402	15	0	1	0	15	0	1
469		7	max	1186.821	1	0	1	11.212	1	0	1	.007	1	0	1
470			min	-221.975	3	0	1	.402	15	0	1	0	15	0	1
471		8	max	1186.991	1	0	1	11.212	1	0	1	.008	1	0	1
472			min	-221.847	3	0	1	.402	15	0	1	0	15	0	1
473		9	max	1187.161	1	0	1	11.212	1	0	1	.009	1	0	1
474			min	-221.72	3	0	1	.402	15	0	1	0	15	0	1
475		10	max	1187.332	1	0	1	11.212	1	0	1	.011	1	0	1
476			min	-221.592	3	0	1	.402	15	0	1	0	15	0	1
477		11	max	1187.502	1	0	1	11.212	1	0	1	.012	1	0	1
478			min	-221.464	3	0	1	.402	15	0	1	0	15	0	1
479		12	max	1187.672	1	0	1	11.212	1	0	1	.013	1	0	1
480			min	-221.336	3	0	1	.402	15	0	1	0	15	0	1
481		13	max	1187.843	1	0	1	11.212	1	0	1	.014	1	0	1
482			min	-221.209	3	0	1	.402	15	0	1	0	15	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
483		14	max	1188.013	1	0	1	11.212	1	0	1	.016	1	0	1
484			min	-221.081	3	0	1	.402	15	0	1	0	15	0	1
485		15	max	1188.183	1	0	1	11.212	1	0	1	.017	1	0	1
486			min	-220.953	3	0	1	.402	15	0	1	0	15	0	1
487		16	max	1188.354	1	0	1	11.212	1	0	1	.018	1	0	1
488			min	-220.825	3	0	1	.402	15	0	1	0	15	0	1
489		17	max	1188.524	1	0	1	11.212	1	0	1	.02	1	0	1
490			min	-220.698	3	0	1	.402	15	0	1	0	15	0	1
491		18	max	1188.695	1	0	1	11.212	1	0	1	.021	1	0	1
492			min	-220.57	3	0	1	.402	15	0	1	0	15	0	1
493		19	max	1188.865	1	0	1	11.212	1	0	1	.022	1	0	1
494			min	-220.442	3	0	1	.402	15	0	1	0	15	0	1
495	M1	1	max	158.726	1	648.729	3	-2.435	15	0	1	.188	1	0	15
496			min	5.675	15	-478.854	1	-67.373	1	0	3	.007	15	-.015	2
497		2	max	159.302	1	647.542	3	-2.435	15	0	1	.147	1	.283	1
498			min	5.849	15	-480.437	1	-67.373	1	0	3	.005	15	-.405	3
499		3	max	402.564	3	570.986	1	-2.407	15	0	3	.105	1	.57	1
500			min	-262.698	2	-487.301	3	-66.795	1	0	1	.004	15	-.794	3
501		4	max	402.996	3	569.403	1	-2.407	15	0	3	.063	1	.217	1
502			min	-262.122	2	-488.489	3	-66.795	1	0	1	.002	15	-.491	3
503		5	max	403.429	3	567.82	1	-2.407	15	0	3	.022	1	-.005	15
504			min	-261.546	2	-489.676	3	-66.795	1	0	1	0	15	-.188	3
505		6	max	403.861	3	566.236	1	-2.407	15	0	3	0	15	.117	3
506			min	-260.969	2	-490.863	3	-66.795	1	0	1	-.02	1	-.488	1
507		7	max	404.293	3	564.653	1	-2.407	15	0	3	-.002	15	.422	3
508			min	-260.393	2	-492.051	3	-66.795	1	0	1	-.061	1	-.839	1
509		8	max	404.725	3	563.07	1	-2.407	15	0	3	-.004	15	.727	3
510			min	-259.817	2	-493.238	3	-66.795	1	0	1	-.103	1	-1.189	1
511		9	max	415.872	3	42.094	2	-3.873	15	0	9	.066	1	.849	3
512			min	-195.22	2	.482	15	-107.421	1	0	3	.002	15	-1.353	1
513		10	max	416.304	3	40.511	2	-3.873	15	0	9	0	15	.829	3
514			min	-194.643	2	.004	15	-107.421	1	0	3	-.001	1	-1.367	1
515		11	max	416.736	3	38.928	2	-3.873	15	0	9	-.002	15	.81	3
516			min	-194.067	2	-1.93	4	-107.421	1	0	3	-.068	1	-1.38	1
517		12	max	427.737	3	325.076	3	-2.315	15	0	2	.101	1	.708	3
518			min	-129.422	2	-608.819	1	-64.438	1	0	3	.004	15	-1.22	1
519		13	max	428.169	3	323.889	3	-2.315	15	0	2	.061	1	.507	3
520			min	-128.846	2	-610.403	1	-64.438	1	0	3	.002	15	-.842	1
521		14	max	428.601	3	322.701	3	-2.315	15	0	2	.021	1	.306	3
522			min	-128.269	2	-611.986	1	-64.438	1	0	3	0	15	-.463	1
523		15	max	429.033	3	321.514	3	-2.315	15	0	2	0	15	.106	3
524			min	-127.693	2	-613.569	1	-64.438	1	0	3	-.019	1	-.082	1
525		16	max	429.466	3	320.326	3	-2.315	15	0	2	-.002	15	.329	2
526			min	-127.117	2	-615.152	1	-64.438	1	0	3	-.059	1	-.093	3
527		17	max	429.898	3	319.139	3	-2.315	15	0	2	-.004	15	.708	2
528			min	-126.541	2	-616.735	1	-64.438	1	0	3	-.099	1	-.291	3
529		18	max	-5.862	15	588.533	2	-2.71	15	0	3	-.005	15	.355	2
530			min	-159.784	1	-249.214	3	-75.125	1	0	2	-.144	1	-.143	3
531		19	max	-5.688	15	586.95	2	-2.71	15	0	3	-.007	15	.012	3
532			min	-159.207	1	-250.402	3	-75.125	1	0	2	-.191	1	-.012	1
533	M5	1	max	353.061	1	2154.237	3	0	1	0	1	0	1	.03	2
534			min	10.706	12	-1647.525	1	0	1	0	1	0	1	0	15
535		2	max	353.637	1	2153.049	3	0	1	0	1	0	1	1.052	1
536			min	10.994	12	-1649.108	1	0	1	0	1	0	1	-1.331	3
537		3	max	1257.208	3	1595.244	1	0	1	0	1	0	1	2.04	1
538			min	-868.356	2	-1469.942	3	0	1	0	1	0	1	-2.628	3
539		4	max	1257.641	3	1593.661	1	0	1	0	1	0	1	1.051	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
540			min	-867.78	2	-1471.13	3	0	1	0	1	0	1	-1.715	3
541		5	max	1258.073	3	1592.078	1	0	1	0	1	0	1	.062	1
542			min	-867.204	2	-1472.317	3	0	1	0	1	0	1	-.802	3
543		6	max	1258.505	3	1590.495	1	0	1	0	1	0	1	.113	3
544			min	-866.628	2	-1473.505	3	0	1	0	1	0	1	-.925	1
545		7	max	1258.937	3	1588.912	1	0	1	0	1	0	1	1.027	3
546			min	-866.051	2	-1474.692	3	0	1	0	1	0	1	-1.912	1
547		8	max	1259.369	3	1587.329	1	0	1	0	1	0	1	1.943	3
548			min	-865.475	2	-1475.879	3	0	1	0	1	0	1	-2.898	1
549		9	max	1274.784	3	141.51	2	0	1	0	1	0	1	2.241	3
550			min	-728.975	2	.479	15	0	1	0	1	0	1	-3.29	1
551		10	max	1275.216	3	139.927	2	0	1	0	1	0	1	2.165	3
552			min	-728.399	2	.001	15	0	1	0	1	0	1	-3.337	1
553		11	max	1275.648	3	138.344	2	0	1	0	1	0	1	2.09	3
554			min	-727.823	2	-1.766	4	0	1	0	1	0	1	-3.383	1
555		12	max	1291.354	3	945.14	3	0	1	0	1	0	1	1.83	3
556			min	-591.419	2	-1737.764	1	0	1	0	1	0	1	-3.01	1
557		13	max	1291.787	3	943.953	3	0	1	0	1	0	1	1.244	3
558			min	-590.843	2	-1739.347	1	0	1	0	1	0	1	-1.931	1
559		14	max	1292.219	3	942.766	3	0	1	0	1	0	1	.658	3
560			min	-590.267	2	-1740.93	1	0	1	0	1	0	1	-.851	1
561		15	max	1292.651	3	941.578	3	0	1	0	1	0	1	.309	2
562			min	-589.691	2	-1742.513	1	0	1	0	1	0	1	0	15
563		16	max	1293.083	3	940.391	3	0	1	0	1	0	1	1.384	2
564			min	-589.114	2	-1744.097	1	0	1	0	1	0	1	-.511	3
565		17	max	1293.515	3	939.204	3	0	1	0	1	0	1	2.46	2
566			min	-588.538	2	-1745.68	1	0	1	0	1	0	1	-1.094	3
567		18	max	-11.545	12	1999.379	2	0	1	0	1	0	1	1.26	2
568			min	-352.675	1	-878.416	3	0	1	0	1	0	1	-.569	3
569		19	max	-11.256	12	1997.795	2	0	1	0	1	0	1	.024	1
570			min	-352.099	1	-879.603	3	0	1	0	1	0	1	-.023	3
571	M9	1	max	158.726	1	648.729	3	67.373	1	0	3	-.007	15	0	15
572			min	5.675	15	-478.854	1	2.435	15	0	1	-.188	1	-.015	2
573		2	max	159.302	1	647.542	3	67.373	1	0	3	-.005	15	.283	1
574			min	5.849	15	-480.437	1	2.435	15	0	1	-.147	1	-.405	3
575		3	max	402.564	3	570.986	1	66.795	1	0	1	-.004	15	.57	1
576			min	-262.698	2	-487.301	3	2.407	15	0	3	-.105	1	-.794	3
577		4	max	402.996	3	569.403	1	66.795	1	0	1	-.002	15	.217	1
578			min	-262.122	2	-488.489	3	2.407	15	0	3	-.063	1	-.491	3
579		5	max	403.429	3	567.82	1	66.795	1	0	1	0	15	-.005	15
580			min	-261.546	2	-489.676	3	2.407	15	0	3	-.022	1	-.188	3
581		6	max	403.861	3	566.236	1	66.795	1	0	1	.02	1	.117	3
582			min	-260.969	2	-490.863	3	2.407	15	0	3	0	15	-.488	1
583		7	max	404.293	3	564.653	1	66.795	1	0	1	.061	1	.422	3
584			min	-260.393	2	-492.051	3	2.407	15	0	3	.002	15	-.839	1
585		8	max	404.725	3	563.07	1	66.795	1	0	1	.103	1	.727	3
586			min	-259.817	2	-493.238	3	2.407	15	0	3	.004	15	-1.189	1
587		9	max	415.872	3	42.094	2	107.421	1	0	3	-.002	15	.849	3
588			min	-195.22	2	.482	15	3.873	15	0	9	-.066	1	-1.353	1
589		10	max	416.304	3	40.511	2	107.421	1	0	3	.001	1	.829	3
590			min	-194.643	2	.004	15	3.873	15	0	9	0	15	-1.367	1
591		11	max	416.736	3	38.928	2	107.421	1	0	3	.068	1	.81	3
592			min	-194.067	2	-1.93	4	3.873	15	0	9	.002	15	-1.38	1
593		12	max	427.737	3	325.076	3	64.438	1	0	3	-.004	15	.708	3
594			min	-129.422	2	-608.819	1	2.315	15	0	2	-.101	1	-1.22	1
595		13	max	428.169	3	323.889	3	64.438	1	0	3	-.002	15	.507	3
596			min	-128.846	2	-610.403	1	2.315	15	0	2	-.061	1	-.842	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
597		14	max	428.601	3	322.701	3	64.438	1	0	3	0	15	.306	3
598			min	-128.269	2	-611.986	1	2.315	15	0	2	-.021	1	-.463	1
599		15	max	429.033	3	321.514	3	64.438	1	0	3	.019	1	.106	3
600			min	-127.693	2	-613.569	1	2.315	15	0	2	0	15	-.082	1
601		16	max	429.466	3	320.326	3	64.438	1	0	3	.059	1	.329	2
602			min	-127.117	2	-615.152	1	2.315	15	0	2	.002	15	-.093	3
603		17	max	429.898	3	319.139	3	64.438	1	0	3	.099	1	.708	2
604			min	-126.541	2	-616.735	1	2.315	15	0	2	.004	15	-.291	3
605		18	max	-5.862	15	588.533	2	75.125	1	0	2	.144	1	.355	2
606			min	-159.784	1	-249.214	3	2.71	15	0	3	.005	15	-.143	3
607		19	max	-5.688	15	586.95	2	75.125	1	0	2	.191	1	.012	3
608			min	-159.207	1	-250.402	3	2.71	15	0	3	.007	15	-.012	1

Envelope Member Section Deflections

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
1	M13	1	max	0	1	.202	1	.008	3	1.358e-2	1	NC	1	NC	1
2			min	0	15	-.046	3	-.004	2	-2.875e-3	3	NC	1	NC	1
3		2	max	0	1	.146	3	.025	1	1.477e-2	1	NC	5	NC	2
4			min	0	15	.003	15	0	10	-2.657e-3	3	1064.22	3	8333.689	1
5		3	max	0	1	.302	3	.058	1	1.597e-2	1	NC	5	NC	3
6			min	0	15	-.01	9	.002	10	-2.44e-3	3	587.071	3	3557.639	1
7		4	max	0	1	.398	3	.085	1	1.717e-2	1	NC	5	NC	3
8			min	0	15	-.046	1	.003	15	-2.222e-3	3	460.233	3	2406.43	1
9		5	max	0	1	.422	3	.098	1	1.837e-2	1	NC	5	NC	3
10			min	0	15	-.038	1	.004	15	-2.005e-3	3	436.209	3	2082.429	1
11		6	max	0	1	.377	3	.093	1	1.956e-2	1	NC	5	NC	3
12			min	0	15	-.004	9	.002	10	-1.787e-3	3	483.158	3	2191.116	1
13		7	max	0	1	.276	3	.072	1	2.076e-2	1	NC	4	NC	3
14			min	0	15	.003	15	0	10	-1.57e-3	3	635.032	3	2857.488	1
15		8	max	0	1	.241	2	.039	1	2.197e-2	2	NC	4	NC	2
16			min	0	15	.006	15	-.005	10	-1.352e-3	3	1063.238	3	5227.129	1
17		9	max	0	1	.328	2	.024	3	2.32e-2	2	NC	4	NC	1
18			min	0	15	.009	15	-.01	2	-1.135e-3	3	1560.766	2	NC	1
19		10	max	0	1	.37	1	.024	3	2.443e-2	2	NC	5	NC	1
20			min	0	1	-.025	3	-.017	2	-9.173e-4	3	1204.962	2	NC	1
21		11	max	0	15	.328	2	.024	3	2.32e-2	2	NC	4	NC	1
22			min	0	1	.009	15	-.01	2	-1.135e-3	3	1560.766	2	NC	1
23		12	max	0	15	.241	2	.039	1	2.197e-2	2	NC	4	NC	2
24			min	0	1	.006	15	-.005	10	-1.352e-3	3	1063.238	3	5227.129	1
25		13	max	0	15	.276	3	.072	1	2.076e-2	1	NC	4	NC	3
26			min	0	1	.003	15	0	10	-1.57e-3	3	635.032	3	2857.488	1
27		14	max	0	15	.377	3	.093	1	1.956e-2	1	NC	5	NC	3
28			min	0	1	-.004	9	.002	10	-1.787e-3	3	483.158	3	2191.116	1
29		15	max	0	15	.422	3	.098	1	1.837e-2	1	NC	5	NC	3
30			min	0	1	-.038	1	.004	15	-2.005e-3	3	436.209	3	2082.429	1
31		16	max	0	15	.398	3	.085	1	1.717e-2	1	NC	5	NC	3
32			min	0	1	-.046	1	.003	15	-2.222e-3	3	460.233	3	2406.43	1
33		17	max	0	15	.302	3	.058	1	1.597e-2	1	NC	5	NC	3
34			min	0	1	-.01	9	.002	10	-2.44e-3	3	587.071	3	3557.639	1
35		18	max	0	15	.146	3	.025	1	1.477e-2	1	NC	5	NC	2
36			min	0	1	.003	15	0	10	-2.657e-3	3	1064.22	3	8333.689	1
37		19	max	0	15	.202	1	.008	3	1.358e-2	1	NC	1	NC	1
38			min	0	1	-.046	3	-.004	2	-2.875e-3	3	NC	1	NC	1
39	M14	1	max	0	1	.35	3	.007	3	8.029e-3	1	NC	1	NC	1
40			min	0	15	-.617	1	-.004	2	-5.351e-3	3	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
41		2	max	0	1	.58	3	.016	1	9.311e-3	1	NC	5	NC	1
42			min	0	15	-.895	1	-.001	10	-6.313e-3	3	731.781	1	NC	1
43		3	max	0	1	.78	3	.044	1	1.059e-2	1	NC	5	NC	2
44			min	0	15	-1.144	1	0	10	-7.275e-3	3	387.091	1	4678.196	1
45		4	max	0	1	.93	3	.07	1	1.187e-2	1	NC	15	NC	3
46			min	0	15	-1.34	1	.003	10	-8.237e-3	3	282.124	1	2924.29	1
47		5	max	0	1	1.021	3	.085	1	1.316e-2	1	9871.161	15	NC	3
48			min	0	15	-1.472	1	.003	10	-9.199e-3	3	238.564	1	2421.492	1
49		6	max	0	1	1.049	3	.083	1	1.444e-2	1	9204.39	15	NC	3
50			min	0	15	-1.537	1	.002	10	-1.016e-2	3	221.515	1	2476.05	1
51		7	max	0	1	1.025	3	.065	1	1.572e-2	1	9182.585	15	NC	2
52			min	0	15	-1.545	1	0	10	-1.112e-2	3	219.806	1	3161.673	1
53		8	max	0	1	.967	3	.037	1	1.7e-2	1	9594.443	15	NC	2
54			min	0	15	-1.51	1	-.004	10	-1.209e-2	3	228.216	1	5669.664	1
55		9	max	0	1	.904	3	.022	3	1.828e-2	1	NC	15	NC	1
56			min	0	15	-1.462	1	-.009	2	-1.305e-2	3	241.323	1	NC	1
57		10	max	0	1	.872	3	.021	3	1.956e-2	1	NC	15	NC	1
58			min	0	1	-1.436	1	-.015	2	-1.401e-2	3	249.026	1	NC	1
59		11	max	0	15	.904	3	.022	3	1.828e-2	1	NC	15	NC	1
60			min	0	1	-1.462	1	-.009	2	-1.305e-2	3	241.323	1	NC	1
61		12	max	0	15	.967	3	.037	1	1.7e-2	1	9594.443	15	NC	2
62			min	0	1	-1.51	1	-.004	10	-1.209e-2	3	228.216	1	5669.664	1
63		13	max	0	15	1.025	3	.065	1	1.572e-2	1	9182.585	15	NC	2
64			min	0	1	-1.545	1	0	10	-1.112e-2	3	219.806	1	3161.673	1
65		14	max	0	15	1.049	3	.083	1	1.444e-2	1	9204.39	15	NC	3
66			min	0	1	-1.537	1	.002	10	-1.016e-2	3	221.515	1	2476.05	1
67		15	max	0	15	1.021	3	.085	1	1.316e-2	1	9871.161	15	NC	3
68			min	0	1	-1.472	1	.003	10	-9.199e-3	3	238.564	1	2421.492	1
69		16	max	0	15	.93	3	.07	1	1.187e-2	1	NC	15	NC	3
70			min	0	1	-1.34	1	.003	10	-8.237e-3	3	282.124	1	2924.29	1
71		17	max	0	15	.78	3	.044	1	1.059e-2	1	NC	5	NC	2
72			min	0	1	-1.144	1	0	10	-7.275e-3	3	387.091	1	4678.196	1
73		18	max	0	15	.58	3	.016	1	9.311e-3	1	NC	5	NC	1
74			min	0	1	-.895	1	-.001	10	-6.313e-3	3	731.781	1	NC	1
75		19	max	0	15	.35	3	.007	3	8.029e-3	1	NC	1	NC	1
76			min	0	1	-.617	1	-.004	2	-5.351e-3	3	NC	1	NC	1
77	M15	1	max	0	15	.359	3	.007	3	4.493e-3	3	NC	1	NC	1
78			min	0	1	-.616	1	-.004	2	-8.189e-3	1	NC	1	NC	1
79		2	max	0	15	.523	3	.016	1	5.292e-3	3	NC	5	NC	1
80			min	0	1	-.919	1	-.001	10	-9.505e-3	1	673.659	1	NC	1
81		3	max	0	15	.67	3	.045	1	6.092e-3	3	NC	5	NC	2
82			min	0	1	-1.186	1	.001	10	-1.082e-2	1	357.575	1	4650.381	1
83		4	max	0	15	.789	3	.071	1	6.891e-3	3	NC	15	NC	3
84			min	0	1	-1.394	1	.003	15	-1.214e-2	1	262.094	1	2909.791	1
85		5	max	0	15	.873	3	.085	1	7.691e-3	3	9887.908	15	NC	3
86			min	0	1	-1.529	1	.003	15	-1.345e-2	1	223.439	1	2409.751	1
87		6	max	0	15	.921	3	.084	1	8.491e-3	3	9221.875	15	NC	3
88			min	0	1	-1.588	1	.002	10	-1.477e-2	1	209.765	1	2462.503	1
89		7	max	0	15	.936	3	.066	1	9.29e-3	3	9202.42	15	NC	2
90			min	0	1	-1.582	1	0	10	-1.608e-2	1	211.112	1	3138.337	1
91		8	max	0	15	.926	3	.037	1	1.009e-2	3	9618.129	15	NC	2
92			min	0	1	-1.531	1	-.004	10	-1.74e-2	1	222.907	1	5592.888	1
93		9	max	0	15	.905	3	.02	3	1.089e-2	3	NC	15	NC	1
94			min	0	1	-1.467	1	-.008	2	-1.872e-2	1	239.636	1	NC	1
95		10	max	0	1	.894	3	.02	3	1.169e-2	3	NC	15	NC	1
96			min	0	1	-1.434	1	-.014	2	-2.003e-2	1	249.328	1	NC	1
97		11	max	0	1	.905	3	.02	3	1.089e-2	3	NC	15	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
98			min	0	15	-1.467	1	-.008	2	-1.872e-2	1	239.636	1	NC	1
99		12	max	0	1	.926	3	.037	1	1.009e-2	3	9618.129	15	NC	2
100			min	0	15	-1.531	1	-.004	10	-1.74e-2	1	222.907	1	5592.888	1
101		13	max	0	1	.936	3	.066	1	9.29e-3	3	9202.42	15	NC	2
102			min	0	15	-1.582	1	0	10	-1.608e-2	1	211.112	1	3138.337	1
103		14	max	0	1	.921	3	.084	1	8.491e-3	3	9221.875	15	NC	3
104			min	0	15	-1.588	1	.002	10	-1.477e-2	1	209.765	1	2462.503	1
105		15	max	0	1	.873	3	.085	1	7.691e-3	3	9887.908	15	NC	3
106			min	0	15	-1.529	1	.003	15	-1.345e-2	1	223.439	1	2409.751	1
107		16	max	0	1	.789	3	.071	1	6.891e-3	3	NC	15	NC	3
108			min	0	15	-1.394	1	.003	15	-1.214e-2	1	262.094	1	2909.791	1
109		17	max	0	1	.67	3	.045	1	6.092e-3	3	NC	5	NC	2
110			min	0	15	-1.186	1	.001	10	-1.082e-2	1	357.575	1	4650.381	1
111		18	max	0	1	.523	3	.016	1	5.292e-3	3	NC	5	NC	1
112			min	0	15	-.919	1	-.001	10	-9.505e-3	1	673.659	1	NC	1
113		19	max	0	1	.359	3	.007	3	4.493e-3	3	NC	1	NC	1
114			min	0	15	-.616	1	-.004	2	-8.189e-3	1	NC	1	NC	1
115	M16	1	max	0	15	.194	1	.006	3	8.381e-3	3	NC	1	NC	1
116			min	0	1	-.126	3	-.003	2	-1.262e-2	1	NC	1	NC	1
117		2	max	0	15	.053	1	.025	1	9.356e-3	3	NC	5	NC	2
118			min	0	1	-.073	3	0	10	-1.36e-2	1	1346.722	2	8417.309	1
119		3	max	0	15	.004	13	.058	1	1.033e-2	3	NC	5	NC	3
120			min	0	1	-.094	2	.002	15	-1.459e-2	1	753.795	2	3570.768	1
121		4	max	0	15	0	15	.085	1	1.131e-2	3	NC	5	NC	3
122			min	0	1	-.159	2	.003	15	-1.557e-2	1	607.306	2	2405.546	1
123		5	max	0	15	0	13	.099	1	1.228e-2	3	NC	5	NC	3
124			min	0	1	-.161	2	.004	15	-1.655e-2	1	604.384	2	2073.605	1
125		6	max	0	15	.006	4	.094	1	1.326e-2	3	NC	5	NC	3
126			min	0	1	-.101	2	.004	15	-1.753e-2	1	735.183	2	2170.59	1
127		7	max	0	15	.055	1	.073	1	1.423e-2	3	NC	3	NC	3
128			min	0	1	-.122	3	.001	10	-1.851e-2	1	1203.566	2	2804.226	1
129		8	max	0	15	.183	1	.041	1	1.521e-2	3	NC	1	NC	2
130			min	0	1	-.186	3	-.003	10	-1.949e-2	1	3392.938	3	4999.424	1
131		9	max	0	15	.296	1	.018	3	1.618e-2	3	NC	5	NC	1
132			min	0	1	-.24	3	-.006	2	-2.047e-2	1	1778.665	3	NC	1
133		10	max	0	1	.347	1	.017	3	1.716e-2	3	NC	5	NC	1
134			min	0	1	-.264	3	-.013	2	-2.145e-2	1	1338.07	1	NC	1
135		11	max	0	1	.296	1	.018	3	1.618e-2	3	NC	5	NC	1
136			min	0	15	-.24	3	-.006	2	-2.047e-2	1	1778.665	3	NC	1
137		12	max	0	1	.183	1	.041	1	1.521e-2	3	NC	1	NC	2
138			min	0	15	-.186	3	-.003	10	-1.949e-2	1	3392.938	3	4999.424	1
139		13	max	0	1	.055	1	.073	1	1.423e-2	3	NC	3	NC	3
140			min	0	15	-.122	3	.001	10	-1.851e-2	1	1203.566	2	2804.226	1
141		14	max	0	1	.006	4	.094	1	1.326e-2	3	NC	5	NC	3
142			min	0	15	-.101	2	.004	15	-1.753e-2	1	735.183	2	2170.59	1
143		15	max	0	1	0	13	.099	1	1.228e-2	3	NC	5	NC	3
144			min	0	15	-.161	2	.004	15	-1.655e-2	1	604.384	2	2073.605	1
145		16	max	0	1	0	15	.085	1	1.131e-2	3	NC	5	NC	3
146			min	0	15	-.159	2	.003	15	-1.557e-2	1	607.306	2	2405.546	1
147		17	max	0	1	.004	13	.058	1	1.033e-2	3	NC	5	NC	3
148			min	0	15	-.094	2	.002	15	-1.459e-2	1	753.795	2	3570.768	1
149		18	max	0	1	.053	1	.025	1	9.356e-3	3	NC	5	NC	2
150			min	0	15	-.073	3	0	10	-1.36e-2	1	1346.722	2	8417.309	1
151		19	max	0	1	.194	1	.006	3	8.381e-3	3	NC	1	NC	1
152			min	0	15	-.126	3	-.003	2	-1.262e-2	1	NC	1	NC	1
153	M2	1	max	.007	1	.007	2	.009	1	-7.038e-6	15	NC	1	NC	2
154			min	-.007	3	-.011	3	0	15	-1.954e-4	1	9173.939	2	6908.31	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
155		2	max	.006	1	.006	2	.008	1	-6.593e-6	15	NC	1	NC	2
156			min	-.007	3	-.01	3	0	15	-1.83e-4	1	NC	1	7532.369	1
157		3	max	.006	1	.005	2	.007	1	-6.149e-6	15	NC	1	NC	2
158			min	-.006	3	-.01	3	0	15	-1.707e-4	1	NC	1	8275.554	1
159		4	max	.005	1	.004	2	.007	1	-5.705e-6	15	NC	1	NC	2
160			min	-.006	3	-.01	3	0	15	-1.583e-4	1	NC	1	9169.297	1
161		5	max	.005	1	.003	2	.006	1	-5.261e-6	15	NC	1	NC	1
162			min	-.005	3	-.009	3	0	15	-1.46e-4	1	NC	1	NC	1
163		6	max	.005	1	.002	2	.005	1	-4.817e-6	15	NC	1	NC	1
164			min	-.005	3	-.009	3	0	15	-1.336e-4	1	NC	1	NC	1
165		7	max	.004	1	.001	2	.005	1	-4.372e-6	15	NC	1	NC	1
166			min	-.005	3	-.009	3	0	15	-1.213e-4	1	NC	1	NC	1
167		8	max	.004	1	0	2	.004	1	-3.928e-6	15	NC	1	NC	1
168			min	-.004	3	-.008	3	0	15	-1.089e-4	1	NC	1	NC	1
169		9	max	.004	1	0	2	.003	1	-3.484e-6	15	NC	1	NC	1
170			min	-.004	3	-.008	3	0	15	-9.654e-5	1	NC	1	NC	1
171		10	max	.003	1	0	2	.003	1	-3.04e-6	15	NC	1	NC	1
172			min	-.003	3	-.007	3	0	15	-8.419e-5	1	NC	1	NC	1
173		11	max	.003	1	-.001	2	.002	1	-2.595e-6	15	NC	1	NC	1
174			min	-.003	3	-.007	3	0	15	-7.183e-5	1	NC	1	NC	1
175		12	max	.003	1	-.001	15	.002	1	-2.151e-6	15	NC	1	NC	1
176			min	-.003	3	-.006	3	0	15	-5.948e-5	1	NC	1	NC	1
177		13	max	.002	1	-.001	15	.001	1	-1.707e-6	15	NC	1	NC	1
178			min	-.002	3	-.005	3	0	15	-4.712e-5	1	NC	1	NC	1
179		14	max	.002	1	0	15	0	1	-1.263e-6	15	NC	1	NC	1
180			min	-.002	3	-.005	3	0	15	-3.477e-5	1	NC	1	NC	1
181		15	max	.001	1	0	15	0	1	-8.186e-7	15	NC	1	NC	1
182			min	-.002	3	-.004	3	0	15	-2.241e-5	1	NC	1	NC	1
183		16	max	.001	1	0	15	0	1	-3.744e-7	15	NC	1	NC	1
184			min	-.001	3	-.003	3	0	15	-1.006e-5	1	NC	1	NC	1
185		17	max	0	1	0	15	0	1	2.296e-6	1	NC	1	NC	1
186			min	0	3	-.002	4	0	15	-5.402e-7	3	NC	1	NC	1
187		18	max	0	1	0	15	0	1	1.465e-5	1	NC	1	NC	1
188			min	0	3	-.001	4	0	15	4.181e-7	12	NC	1	NC	1
189		19	max	0	1	0	1	0	1	2.701e-5	1	NC	1	NC	1
190			min	0	1	0	1	0	1	9.583e-7	15	NC	1	NC	1
191	M3	1	max	0	1	0	1	0	1	-2.946e-7	15	NC	1	NC	1
192			min	0	1	0	1	0	1	-8.276e-6	1	NC	1	NC	1
193		2	max	0	3	0	15	0	1	1.691e-5	1	NC	1	NC	1
194			min	0	2	-.002	4	0	15	6.083e-7	15	NC	1	NC	1
195		3	max	0	3	-.001	15	0	1	4.21e-5	1	NC	1	NC	1
196			min	0	2	-.005	4	0	15	1.511e-6	15	NC	1	NC	1
197		4	max	.001	3	-.002	15	0	1	6.73e-5	1	NC	1	NC	1
198			min	0	2	-.008	4	0	15	2.414e-6	15	NC	1	NC	1
199		5	max	.001	3	-.003	15	0	1	9.249e-5	1	NC	1	NC	1
200			min	-.001	2	-.011	4	0	15	3.317e-6	15	9254.207	4	NC	1
201		6	max	.002	3	-.003	15	0	1	1.177e-4	1	NC	1	NC	1
202			min	-.001	2	-.014	4	0	15	4.22e-6	15	7429.027	4	NC	1
203		7	max	.002	3	-.004	15	.001	1	1.429e-4	1	NC	5	NC	1
204			min	-.002	2	-.016	4	0	15	5.123e-6	15	6333.795	4	NC	1
205		8	max	.002	3	-.004	15	.001	1	1.681e-4	1	NC	5	NC	1
206			min	-.002	2	-.018	4	0	15	6.026e-6	15	5657.705	4	NC	1
207		9	max	.003	3	-.005	15	.002	1	1.932e-4	1	NC	5	NC	1
208			min	-.002	2	-.02	4	0	15	6.929e-6	15	5254.798	4	NC	1
209		10	max	.003	3	-.005	15	.002	1	2.184e-4	1	NC	5	NC	1
210			min	-.002	2	-.021	4	0	15	7.832e-6	15	5053.925	4	NC	1
211		11	max	.003	3	-.005	15	.003	1	2.436e-4	1	NC	5	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
212			min	-.003	2	-.021	4	0	15	8.735e-6	15	5025.143	4	NC	1
213		12	max	.004	3	-.005	15	.003	1	2.688e-4	1	NC	5	NC	1
214			min	-.003	2	-.02	4	0	15	9.638e-6	15	5168.175	4	NC	1
215		13	max	.004	3	-.004	15	.003	1	2.94e-4	1	NC	5	NC	1
216			min	-.003	2	-.019	4	0	15	1.054e-5	15	5513.736	4	NC	1
217		14	max	.004	3	-.004	15	.004	1	3.192e-4	1	NC	5	NC	1
218			min	-.003	2	-.017	4	0	15	1.144e-5	15	6139.772	4	NC	1
219		15	max	.005	3	-.003	15	.005	1	3.444e-4	1	NC	2	NC	1
220			min	-.004	2	-.015	4	0	15	1.235e-5	15	7220.29	4	NC	1
221		16	max	.005	3	-.003	15	.005	1	3.696e-4	1	NC	1	NC	1
222			min	-.004	2	-.012	4	0	15	1.325e-5	15	9177.667	4	NC	1
223		17	max	.005	3	-.002	15	.006	1	3.948e-4	1	NC	1	NC	1
224			min	-.004	2	-.008	4	0	15	1.415e-5	15	NC	1	NC	1
225		18	max	.006	3	-.001	15	.007	1	4.2e-4	1	NC	1	NC	1
226			min	-.005	2	-.005	1	0	15	1.506e-5	15	NC	1	NC	1
227		19	max	.006	3	0	15	.008	1	4.452e-4	1	NC	1	NC	1
228			min	-.005	2	-.003	1	0	15	1.596e-5	15	NC	1	NC	1
229	M4	1	max	.003	1	.004	2	0	15	6.991e-5	1	NC	1	NC	3
230			min	0	3	-.006	3	-.008	1	2.529e-6	15	NC	1	3021.623	1
231		2	max	.003	1	.004	2	0	15	6.991e-5	1	NC	1	NC	3
232			min	0	3	-.006	3	-.008	1	2.529e-6	15	NC	1	3286.363	1
233		3	max	.003	1	.004	2	0	15	6.991e-5	1	NC	1	NC	3
234			min	0	3	-.006	3	-.007	1	2.529e-6	15	NC	1	3601.411	1
235		4	max	.002	1	.004	2	0	15	6.991e-5	1	NC	1	NC	2
236			min	0	3	-.005	3	-.006	1	2.529e-6	15	NC	1	3979.843	1
237		5	max	.002	1	.003	2	0	15	6.991e-5	1	NC	1	NC	2
238			min	0	3	-.005	3	-.006	1	2.529e-6	15	NC	1	4439.427	1
239		6	max	.002	1	.003	2	0	15	6.991e-5	1	NC	1	NC	2
240			min	0	3	-.004	3	-.005	1	2.529e-6	15	NC	1	5004.803	1
241		7	max	.002	1	.003	2	0	15	6.991e-5	1	NC	1	NC	2
242			min	0	3	-.004	3	-.004	1	2.529e-6	15	NC	1	5710.949	1
243		8	max	.002	1	.003	2	0	15	6.991e-5	1	NC	1	NC	2
244			min	0	3	-.004	3	-.004	1	2.529e-6	15	NC	1	6608.879	1
245		9	max	.002	1	.002	2	0	15	6.991e-5	1	NC	1	NC	2
246			min	0	3	-.003	3	-.003	1	2.529e-6	15	NC	1	7775.391	1
247		10	max	.001	1	.002	2	0	15	6.991e-5	1	NC	1	NC	2
248			min	0	3	-.003	3	-.003	1	2.529e-6	15	NC	1	9330.542	1
249		11	max	.001	1	.002	2	0	15	6.991e-5	1	NC	1	NC	1
250			min	0	3	-.003	3	-.002	1	2.529e-6	15	NC	1	NC	1
251		12	max	.001	1	.002	2	0	15	6.991e-5	1	NC	1	NC	1
252			min	0	3	-.002	3	-.002	1	2.529e-6	15	NC	1	NC	1
253		13	max	0	1	.001	2	0	15	6.991e-5	1	NC	1	NC	1
254			min	0	3	-.002	3	-.001	1	2.529e-6	15	NC	1	NC	1
255		14	max	0	1	.001	2	0	15	6.991e-5	1	NC	1	NC	1
256			min	0	3	-.002	3	0	1	2.529e-6	15	NC	1	NC	1
257		15	max	0	1	0	2	0	15	6.991e-5	1	NC	1	NC	1
258			min	0	3	-.001	3	0	1	2.529e-6	15	NC	1	NC	1
259		16	max	0	1	0	2	0	15	6.991e-5	1	NC	1	NC	1
260			min	0	3	-.001	3	0	1	2.529e-6	15	NC	1	NC	1
261		17	max	0	1	0	2	0	15	6.991e-5	1	NC	1	NC	1
262			min	0	3	0	3	0	1	2.529e-6	15	NC	1	NC	1
263		18	max	0	1	0	2	0	15	6.991e-5	1	NC	1	NC	1
264			min	0	3	0	3	0	1	2.529e-6	15	NC	1	NC	1
265		19	max	0	1	0	1	0	1	6.991e-5	1	NC	1	NC	1
266			min	0	1	0	1	0	1	2.529e-6	15	NC	1	NC	1
267	M6	1	max	.02	1	.024	2	0	1	0	1	NC	3	NC	1
268			min	-.022	3	-.033	3	0	1	0	1	2532.789	2	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
269		2	max	.019	1	.022	2	0	1	0	1	NC	3	NC	1
270			min	-.021	3	-.031	3	0	1	0	1	2775.678	2	NC	1
271		3	max	.018	1	.02	2	0	1	0	1	NC	3	NC	1
272			min	-.02	3	-.03	3	0	1	0	1	3067.863	2	NC	1
273		4	max	.017	1	.018	2	0	1	0	1	NC	3	NC	1
274			min	-.018	3	-.028	3	0	1	0	1	3423.247	2	NC	1
275		5	max	.016	1	.016	2	0	1	0	1	NC	3	NC	1
276			min	-.017	3	-.026	3	0	1	0	1	3861.161	2	NC	1
277		6	max	.015	1	.014	2	0	1	0	1	NC	3	NC	1
278			min	-.016	3	-.024	3	0	1	0	1	4409.128	2	NC	1
279		7	max	.014	1	.012	2	0	1	0	1	NC	3	NC	1
280			min	-.015	3	-.022	3	0	1	0	1	5107.436	2	NC	1
281		8	max	.012	1	.01	2	0	1	0	1	NC	1	NC	1
282			min	-.014	3	-.021	3	0	1	0	1	6017.016	2	NC	1
283		9	max	.011	1	.008	2	0	1	0	1	NC	1	NC	1
284			min	-.012	3	-.019	3	0	1	0	1	7233.667	2	NC	1
285		10	max	.01	1	.007	2	0	1	0	1	NC	1	NC	1
286			min	-.011	3	-.017	3	0	1	0	1	8915.295	2	NC	1
287		11	max	.009	1	.005	2	0	1	0	1	NC	1	NC	1
288			min	-.01	3	-.015	3	0	1	0	1	NC	1	NC	1
289		12	max	.008	1	.004	2	0	1	0	1	NC	1	NC	1
290			min	-.009	3	-.013	3	0	1	0	1	NC	1	NC	1
291		13	max	.007	1	.003	2	0	1	0	1	NC	1	NC	1
292			min	-.007	3	-.011	3	0	1	0	1	NC	1	NC	1
293		14	max	.006	1	.002	2	0	1	0	1	NC	1	NC	1
294			min	-.006	3	-.01	3	0	1	0	1	NC	1	NC	1
295		15	max	.005	1	.001	2	0	1	0	1	NC	1	NC	1
296			min	-.005	3	-.008	3	0	1	0	1	NC	1	NC	1
297		16	max	.003	1	0	2	0	1	0	1	NC	1	NC	1
298			min	-.004	3	-.006	3	0	1	0	1	NC	1	NC	1
299		17	max	.002	1	0	2	0	1	0	1	NC	1	NC	1
300			min	-.002	3	-.004	3	0	1	0	1	NC	1	NC	1
301		18	max	.001	1	0	2	0	1	0	1	NC	1	NC	1
302			min	-.001	3	-.002	3	0	1	0	1	NC	1	NC	1
303		19	max	0	1	0	1	0	1	0	1	NC	1	NC	1
304			min	0	1	0	1	0	1	0	1	NC	1	NC	1
305	M7	1	max	0	1	0	1	0	1	0	1	NC	1	NC	1
306			min	0	1	0	1	0	1	0	1	NC	1	NC	1
307		2	max	.001	3	0	15	0	1	0	1	NC	1	NC	1
308			min	0	2	-.003	3	0	1	0	1	NC	1	NC	1
309		3	max	.002	3	-.001	15	0	1	0	1	NC	1	NC	1
310			min	-.002	2	-.006	3	0	1	0	1	NC	1	NC	1
311		4	max	.003	3	-.002	15	0	1	0	1	NC	1	NC	1
312			min	-.003	2	-.009	3	0	1	0	1	NC	1	NC	1
313		5	max	.004	3	-.003	15	0	1	0	1	NC	1	NC	1
314			min	-.004	2	-.012	3	0	1	0	1	8832.398	3	NC	1
315		6	max	.005	3	-.003	15	0	1	0	1	NC	1	NC	1
316			min	-.005	2	-.015	3	0	1	0	1	7409.313	3	NC	1
317		7	max	.006	3	-.004	15	0	1	0	1	NC	1	NC	1
318			min	-.006	2	-.017	3	0	1	0	1	6482.001	4	NC	1
319		8	max	.007	3	-.004	15	0	1	0	1	NC	2	NC	1
320			min	-.007	2	-.018	4	0	1	0	1	5779.738	4	NC	1
321		9	max	.008	3	-.005	15	0	1	0	1	NC	2	NC	1
322			min	-.008	2	-.02	4	0	1	0	1	5360.244	4	NC	1
323		10	max	.009	3	-.005	15	0	1	0	1	NC	5	NC	1
324			min	-.009	2	-.021	4	0	1	0	1	5149.039	4	NC	1
325		11	max	.01	3	-.005	15	0	1	0	1	NC	5	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
326			min	-.01	2	-.021	4	0	1	0	1	5114.485	4	NC	1
327		12	max	.011	3	-.005	15	0	1	0	1	NC	5	NC	1
328			min	-.011	2	-.02	4	0	1	0	1	5255.558	4	NC	1
329		13	max	.012	3	-.004	15	0	1	0	1	NC	5	NC	1
330			min	-.012	2	-.019	4	0	1	0	1	5602.953	4	NC	1
331		14	max	.013	3	-.004	15	0	1	0	1	NC	2	NC	1
332			min	-.012	2	-.017	4	0	1	0	1	6235.426	4	NC	1
333		15	max	.015	3	-.003	15	0	1	0	1	NC	1	NC	1
334			min	-.013	2	-.015	4	0	1	0	1	7329.25	4	NC	1
335		16	max	.016	3	-.003	15	0	1	0	1	NC	1	NC	1
336			min	-.014	2	-.012	4	0	1	0	1	9312.65	4	NC	1
337		17	max	.017	3	-.002	15	0	1	0	1	NC	1	NC	1
338			min	-.015	2	-.01	1	0	1	0	1	NC	1	NC	1
339		18	max	.018	3	-.001	15	0	1	0	1	NC	1	NC	1
340			min	-.016	2	-.008	1	0	1	0	1	NC	1	NC	1
341		19	max	.019	3	0	15	0	1	0	1	NC	1	NC	1
342			min	-.017	2	-.006	1	0	1	0	1	NC	1	NC	1
343	M8	1	max	.008	1	.016	2	0	1	0	1	NC	1	NC	1
344			min	-.002	3	-.019	3	0	1	0	1	NC	1	NC	1
345		2	max	.007	1	.015	2	0	1	0	1	NC	1	NC	1
346			min	-.002	3	-.018	3	0	1	0	1	NC	1	NC	1
347		3	max	.007	1	.014	2	0	1	0	1	NC	1	NC	1
348			min	-.002	3	-.017	3	0	1	0	1	NC	1	NC	1
349		4	max	.007	1	.013	2	0	1	0	1	NC	1	NC	1
350			min	-.002	3	-.016	3	0	1	0	1	NC	1	NC	1
351		5	max	.006	1	.013	2	0	1	0	1	NC	1	NC	1
352			min	-.001	3	-.015	3	0	1	0	1	NC	1	NC	1
353		6	max	.006	1	.012	2	0	1	0	1	NC	1	NC	1
354			min	-.001	3	-.014	3	0	1	0	1	NC	1	NC	1
355		7	max	.005	1	.011	2	0	1	0	1	NC	1	NC	1
356			min	-.001	3	-.013	3	0	1	0	1	NC	1	NC	1
357		8	max	.005	1	.01	2	0	1	0	1	NC	1	NC	1
358			min	-.001	3	-.011	3	0	1	0	1	NC	1	NC	1
359		9	max	.004	1	.009	2	0	1	0	1	NC	1	NC	1
360			min	-.001	3	-.01	3	0	1	0	1	NC	1	NC	1
361		10	max	.004	1	.008	2	0	1	0	1	NC	1	NC	1
362			min	0	3	-.009	3	0	1	0	1	NC	1	NC	1
363		11	max	.004	1	.007	2	0	1	0	1	NC	1	NC	1
364			min	0	3	-.008	3	0	1	0	1	NC	1	NC	1
365		12	max	.003	1	.006	2	0	1	0	1	NC	1	NC	1
366			min	0	3	-.007	3	0	1	0	1	NC	1	NC	1
367		13	max	.003	1	.005	2	0	1	0	1	NC	1	NC	1
368			min	0	3	-.006	3	0	1	0	1	NC	1	NC	1
369		14	max	.002	1	.004	2	0	1	0	1	NC	1	NC	1
370			min	0	3	-.005	3	0	1	0	1	NC	1	NC	1
371		15	max	.002	1	.004	2	0	1	0	1	NC	1	NC	1
372			min	0	3	-.004	3	0	1	0	1	NC	1	NC	1
373		16	max	.001	1	.003	2	0	1	0	1	NC	1	NC	1
374			min	0	3	-.003	3	0	1	0	1	NC	1	NC	1
375		17	max	0	1	.002	2	0	1	0	1	NC	1	NC	1
376			min	0	3	-.002	3	0	1	0	1	NC	1	NC	1
377		18	max	0	1	0	2	0	1	0	1	NC	1	NC	1
378			min	0	3	-.001	3	0	1	0	1	NC	1	NC	1
379		19	max	0	1	0	1	0	1	0	1	NC	1	NC	1
380			min	0	1	0	1	0	1	0	1	NC	1	NC	1
381	M10	1	max	.007	1	.007	2	0	15	1.954e-4	1	NC	1	NC	2
382			min	-.007	3	-.011	3	-.009	1	7.038e-6	15	9173.939	2	6908.31	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
383		2	max	.006	1	.006	2	0	15	1.83e-4	1	NC	1	NC	2
384			min	-.007	3	-.01	3	-.008	1	6.593e-6	15	NC	1	7532.369	1
385		3	max	.006	1	.005	2	0	15	1.707e-4	1	NC	1	NC	2
386			min	-.006	3	-.01	3	-.007	1	6.149e-6	15	NC	1	8275.554	1
387		4	max	.005	1	.004	2	0	15	1.583e-4	1	NC	1	NC	2
388			min	-.006	3	-.01	3	-.007	1	5.705e-6	15	NC	1	9169.297	1
389		5	max	.005	1	.003	2	0	15	1.46e-4	1	NC	1	NC	1
390			min	-.005	3	-.009	3	-.006	1	5.261e-6	15	NC	1	NC	1
391		6	max	.005	1	.002	2	0	15	1.336e-4	1	NC	1	NC	1
392			min	-.005	3	-.009	3	-.005	1	4.817e-6	15	NC	1	NC	1
393		7	max	.004	1	.001	2	0	15	1.213e-4	1	NC	1	NC	1
394			min	-.005	3	-.009	3	-.005	1	4.372e-6	15	NC	1	NC	1
395		8	max	.004	1	0	2	0	15	1.089e-4	1	NC	1	NC	1
396			min	-.004	3	-.008	3	-.004	1	3.928e-6	15	NC	1	NC	1
397		9	max	.004	1	0	2	0	15	9.654e-5	1	NC	1	NC	1
398			min	-.004	3	-.008	3	-.003	1	3.484e-6	15	NC	1	NC	1
399		10	max	.003	1	0	2	0	15	8.419e-5	1	NC	1	NC	1
400			min	-.003	3	-.007	3	-.003	1	3.04e-6	15	NC	1	NC	1
401		11	max	.003	1	-.001	2	0	15	7.183e-5	1	NC	1	NC	1
402			min	-.003	3	-.007	3	-.002	1	2.595e-6	15	NC	1	NC	1
403		12	max	.003	1	-.001	15	0	15	5.948e-5	1	NC	1	NC	1
404			min	-.003	3	-.006	3	-.002	1	2.151e-6	15	NC	1	NC	1
405		13	max	.002	1	-.001	15	0	15	4.712e-5	1	NC	1	NC	1
406			min	-.002	3	-.005	3	-.001	1	1.707e-6	15	NC	1	NC	1
407		14	max	.002	1	0	15	0	15	3.477e-5	1	NC	1	NC	1
408			min	-.002	3	-.005	3	0	1	1.263e-6	15	NC	1	NC	1
409		15	max	.001	1	0	15	0	15	2.241e-5	1	NC	1	NC	1
410			min	-.002	3	-.004	3	0	1	8.186e-7	15	NC	1	NC	1
411		16	max	.001	1	0	15	0	15	1.006e-5	1	NC	1	NC	1
412			min	-.001	3	-.003	3	0	1	3.744e-7	15	NC	1	NC	1
413		17	max	0	1	0	15	0	15	5.402e-7	3	NC	1	NC	1
414			min	0	3	-.002	4	0	1	-2.296e-6	1	NC	1	NC	1
415		18	max	0	1	0	15	0	15	-4.181e-7	12	NC	1	NC	1
416			min	0	3	-.001	4	0	1	-1.465e-5	1	NC	1	NC	1
417		19	max	0	1	0	1	0	1	-9.583e-7	15	NC	1	NC	1
418			min	0	1	0	1	0	1	-2.701e-5	1	NC	1	NC	1
419	M11	1	max	0	1	0	1	0	1	8.276e-6	1	NC	1	NC	1
420			min	0	1	0	1	0	1	2.946e-7	15	NC	1	NC	1
421		2	max	0	3	0	15	0	15	-6.083e-7	15	NC	1	NC	1
422			min	0	2	-.002	4	0	1	-1.691e-5	1	NC	1	NC	1
423		3	max	0	3	-.001	15	0	15	-1.511e-6	15	NC	1	NC	1
424			min	0	2	-.005	4	0	1	-4.21e-5	1	NC	1	NC	1
425		4	max	.001	3	-.002	15	0	15	-2.414e-6	15	NC	1	NC	1
426			min	0	2	-.008	4	0	1	-6.73e-5	1	NC	1	NC	1
427		5	max	.001	3	-.003	15	0	15	-3.317e-6	15	NC	1	NC	1
428			min	-.001	2	-.011	4	0	1	-9.249e-5	1	9254.207	4	NC	1
429		6	max	.002	3	-.003	15	0	15	-4.22e-6	15	NC	1	NC	1
430			min	-.001	2	-.014	4	0	1	-1.177e-4	1	7429.027	4	NC	1
431		7	max	.002	3	-.004	15	0	15	-5.123e-6	15	NC	5	NC	1
432			min	-.002	2	-.016	4	-.001	1	-1.429e-4	1	6333.795	4	NC	1
433		8	max	.002	3	-.004	15	0	15	-6.026e-6	15	NC	5	NC	1
434			min	-.002	2	-.018	4	-.001	1	-1.681e-4	1	5657.705	4	NC	1
435		9	max	.003	3	-.005	15	0	15	-6.929e-6	15	NC	5	NC	1
436			min	-.002	2	-.02	4	-.002	1	-1.932e-4	1	5254.798	4	NC	1
437		10	max	.003	3	-.005	15	0	15	-7.832e-6	15	NC	5	NC	1
438			min	-.002	2	-.021	4	-.002	1	-2.184e-4	1	5053.925	4	NC	1
439		11	max	.003	3	-.005	15	0	15	-8.735e-6	15	NC	5	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
440			min	-.003	2	-.021	4	-.003	1	-2.436e-4	1	5025.143	4	NC	1
441		12	max	.004	3	-.005	15	0	15	-9.638e-6	15	NC	5	NC	1
442			min	-.003	2	-.02	4	-.003	1	-2.688e-4	1	5168.175	4	NC	1
443		13	max	.004	3	-.004	15	0	15	-1.054e-5	15	NC	5	NC	1
444			min	-.003	2	-.019	4	-.003	1	-2.94e-4	1	5513.736	4	NC	1
445		14	max	.004	3	-.004	15	0	15	-1.144e-5	15	NC	5	NC	1
446			min	-.003	2	-.017	4	-.004	1	-3.192e-4	1	6139.772	4	NC	1
447		15	max	.005	3	-.003	15	0	15	-1.235e-5	15	NC	2	NC	1
448			min	-.004	2	-.015	4	-.005	1	-3.444e-4	1	7220.29	4	NC	1
449		16	max	.005	3	-.003	15	0	15	-1.325e-5	15	NC	1	NC	1
450			min	-.004	2	-.012	4	-.005	1	-3.696e-4	1	9177.667	4	NC	1
451		17	max	.005	3	-.002	15	0	15	-1.415e-5	15	NC	1	NC	1
452			min	-.004	2	-.008	4	-.006	1	-3.948e-4	1	NC	1	NC	1
453		18	max	.006	3	-.001	15	0	15	-1.506e-5	15	NC	1	NC	1
454			min	-.005	2	-.005	1	-.007	1	-4.2e-4	1	NC	1	NC	1
455		19	max	.006	3	0	15	0	15	-1.596e-5	15	NC	1	NC	1
456			min	-.005	2	-.003	1	-.008	1	-4.452e-4	1	NC	1	NC	1
457	M12	1	max	.003	1	.004	2	.008	1	-2.529e-6	15	NC	1	NC	3
458			min	0	3	-.006	3	0	15	-6.991e-5	1	NC	1	3021.623	1
459		2	max	.003	1	.004	2	.008	1	-2.529e-6	15	NC	1	NC	3
460			min	0	3	-.006	3	0	15	-6.991e-5	1	NC	1	3286.363	1
461		3	max	.003	1	.004	2	.007	1	-2.529e-6	15	NC	1	NC	3
462			min	0	3	-.006	3	0	15	-6.991e-5	1	NC	1	3601.411	1
463		4	max	.002	1	.004	2	.006	1	-2.529e-6	15	NC	1	NC	2
464			min	0	3	-.005	3	0	15	-6.991e-5	1	NC	1	3979.843	1
465		5	max	.002	1	.003	2	.006	1	-2.529e-6	15	NC	1	NC	2
466			min	0	3	-.005	3	0	15	-6.991e-5	1	NC	1	4439.427	1
467		6	max	.002	1	.003	2	.005	1	-2.529e-6	15	NC	1	NC	2
468			min	0	3	-.004	3	0	15	-6.991e-5	1	NC	1	5004.803	1
469		7	max	.002	1	.003	2	.004	1	-2.529e-6	15	NC	1	NC	2
470			min	0	3	-.004	3	0	15	-6.991e-5	1	NC	1	5710.949	1
471		8	max	.002	1	.003	2	.004	1	-2.529e-6	15	NC	1	NC	2
472			min	0	3	-.004	3	0	15	-6.991e-5	1	NC	1	6608.879	1
473		9	max	.002	1	.002	2	.003	1	-2.529e-6	15	NC	1	NC	2
474			min	0	3	-.003	3	0	15	-6.991e-5	1	NC	1	7775.391	1
475		10	max	.001	1	.002	2	.003	1	-2.529e-6	15	NC	1	NC	2
476			min	0	3	-.003	3	0	15	-6.991e-5	1	NC	1	9330.542	1
477		11	max	.001	1	.002	2	.002	1	-2.529e-6	15	NC	1	NC	1
478			min	0	3	-.003	3	0	15	-6.991e-5	1	NC	1	NC	1
479		12	max	.001	1	.002	2	.002	1	-2.529e-6	15	NC	1	NC	1
480			min	0	3	-.002	3	0	15	-6.991e-5	1	NC	1	NC	1
481		13	max	0	1	.001	2	.001	1	-2.529e-6	15	NC	1	NC	1
482			min	0	3	-.002	3	0	15	-6.991e-5	1	NC	1	NC	1
483		14	max	0	1	.001	2	0	1	-2.529e-6	15	NC	1	NC	1
484			min	0	3	-.002	3	0	15	-6.991e-5	1	NC	1	NC	1
485		15	max	0	1	0	2	0	1	-2.529e-6	15	NC	1	NC	1
486			min	0	3	-.001	3	0	15	-6.991e-5	1	NC	1	NC	1
487		16	max	0	1	0	2	0	1	-2.529e-6	15	NC	1	NC	1
488			min	0	3	-.001	3	0	15	-6.991e-5	1	NC	1	NC	1
489		17	max	0	1	0	2	0	1	-2.529e-6	15	NC	1	NC	1
490			min	0	3	0	3	0	15	-6.991e-5	1	NC	1	NC	1
491		18	max	0	1	0	2	0	1	-2.529e-6	15	NC	1	NC	1
492			min	0	3	0	3	0	15	-6.991e-5	1	NC	1	NC	1
493		19	max	0	1	0	1	0	1	-2.529e-6	15	NC	1	NC	1
494			min	0	1	0	1	0	1	-6.991e-5	1	NC	1	NC	1
495	M1	1	max	.008	3	.202	1	0	1	1.062e-2	1	NC	1	NC	1
496			min	-.004	2	-.046	3	0	15	-1.755e-2	3	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
497		2	max	.008	3	.101	1	0	15	5.129e-3	1	NC	5	NC	1
498			min	-.004	2	-.023	3	-.006	1	-8.71e-3	3	1323.041	1	NC	1
499		3	max	.008	3	.011	3	0	15	1.497e-5	10	NC	5	NC	1
500			min	-.004	2	-.01	2	-.009	1	-1.853e-4	1	636.84	1	NC	1
501		4	max	.008	3	.065	3	0	15	4.5e-3	1	NC	15	NC	1
502			min	-.004	2	-.133	1	-.008	1	-3.922e-3	3	401.782	1	NC	1
503		5	max	.008	3	.132	3	0	15	9.185e-3	1	9816.902	15	NC	1
504			min	-.004	2	-.262	1	-.006	1	-7.751e-3	3	289.667	1	NC	1
505		6	max	.007	3	.205	3	0	15	1.387e-2	1	7771.344	15	NC	1
506			min	-.004	2	-.388	1	-.003	1	-1.158e-2	3	227.921	1	NC	1
507		7	max	.007	3	.274	3	0	1	1.855e-2	1	6562.284	15	NC	1
508			min	-.004	2	-.5	1	0	3	-1.541e-2	3	191.494	1	NC	1
509		8	max	.007	3	.332	3	0	1	2.324e-2	1	5846.242	15	NC	1
510			min	-.004	2	-.589	1	0	15	-1.924e-2	3	169.96	1	NC	1
511		9	max	.007	3	.369	3	0	15	2.553e-2	1	5471.367	15	NC	1
512			min	-.004	2	-.646	1	0	1	-1.965e-2	3	158.736	1	NC	1
513		10	max	.007	3	.384	3	0	1	2.622e-2	1	5356.735	15	NC	1
514			min	-.004	2	-.664	1	0	15	-1.776e-2	3	155.373	1	NC	1
515		11	max	.007	3	.375	3	0	1	2.691e-2	1	5471.147	15	NC	1
516			min	-.004	2	-.645	1	0	15	-1.588e-2	3	158.967	1	NC	1
517		12	max	.006	3	.343	3	0	15	2.534e-2	1	5845.772	15	NC	1
518			min	-.004	2	-.588	1	0	1	-1.366e-2	3	170.656	1	NC	1
519		13	max	.006	3	.292	3	0	15	2.038e-2	1	6561.458	15	NC	1
520			min	-.003	2	-.497	1	0	1	-1.093e-2	3	193.169	1	NC	1
521		14	max	.006	3	.227	3	.002	1	1.542e-2	1	7769.943	15	NC	1
522			min	-.003	2	-.383	1	0	15	-8.199e-3	3	231.46	1	NC	1
523		15	max	.006	3	.154	3	.005	1	1.047e-2	1	9814.484	15	NC	1
524			min	-.003	2	-.255	1	0	15	-5.47e-3	3	296.858	1	NC	1
525		16	max	.006	3	.078	3	.008	1	5.514e-3	1	NC	15	NC	1
526			min	-.003	2	-.126	1	0	15	-2.74e-3	3	416.685	1	NC	1
527		17	max	.006	3	.004	3	.008	1	5.588e-4	1	NC	5	NC	1
528			min	-.003	2	-.006	2	0	15	-1.103e-5	3	669.861	1	NC	1
529		18	max	.006	3	.099	1	.006	1	6.999e-3	2	NC	5	NC	1
530			min	-.003	2	-.063	3	0	15	-2.389e-3	3	1406.082	1	NC	1
531		19	max	.006	3	.194	1	0	15	1.394e-2	2	NC	1	NC	1
532			min	-.003	2	-.126	3	0	1	-4.858e-3	3	NC	1	NC	1
533	M5	1	max	.024	3	.37	1	0	1	0	1	NC	1	NC	1
534			min	-.017	2	-.025	3	0	1	0	1	NC	1	NC	1
535		2	max	.024	3	.186	1	0	1	0	1	NC	5	NC	1
536			min	-.017	2	-.014	3	0	1	0	1	730.741	1	NC	1
537		3	max	.024	3	.033	3	0	1	0	1	NC	15	NC	1
538			min	-.017	2	-.029	2	0	1	0	1	338.486	1	NC	1
539		4	max	.024	3	.147	3	0	1	0	1	7697.116	15	NC	1
540			min	-.016	2	-.293	1	0	1	0	1	203.266	1	NC	1
541		5	max	.023	3	.309	3	0	1	0	1	5353.745	15	NC	1
542			min	-.016	2	-.587	1	0	1	0	1	140.812	1	NC	1
543		6	max	.023	3	.492	3	0	1	0	1	4103.22	15	NC	1
544			min	-.016	2	-.882	1	0	1	0	1	107.568	1	NC	1
545		7	max	.022	3	.673	3	0	1	0	1	3384.316	15	NC	1
546			min	-.015	2	-1.152	1	0	1	0	1	88.492	1	NC	1
547		8	max	.022	3	.825	3	0	1	0	1	2967.87	15	NC	1
548			min	-.015	2	-1.37	1	0	1	0	1	77.457	1	NC	1
549		9	max	.021	3	.923	3	0	1	0	1	2754.634	15	NC	1
550			min	-.015	2	-1.507	1	0	1	0	1	71.816	1	NC	1
551		10	max	.021	3	.959	3	0	1	0	1	2690.377	15	NC	1
552			min	-.014	2	-1.553	1	0	1	0	1	70.142	1	NC	1
553		11	max	.02	3	.936	3	0	1	0	1	2754.746	15	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
554			min	-.014	2	-1.506	1	0	1	0	1	71.935	1	NC	1
555		12	max	.02	3	.854	3	0	1	0	1	2968.135	15	NC	1
556			min	-.014	2	-1.366	1	0	1	0	1	77.852	1	NC	1
557		13	max	.019	3	.722	3	0	1	0	1	3384.85	15	NC	1
558			min	-.014	2	-1.143	1	0	1	0	1	89.532	1	NC	1
559		14	max	.019	3	.555	3	0	1	0	1	4104.252	15	NC	1
560			min	-.013	2	-.866	1	0	1	0	1	109.944	1	NC	1
561		15	max	.018	3	.37	3	0	1	0	1	5355.774	15	NC	1
562			min	-.013	2	-.566	1	0	1	0	1	146.059	1	NC	1
563		16	max	.018	3	.184	3	0	1	0	1	7701.36	15	NC	1
564			min	-.013	2	-.272	1	0	1	0	1	215.285	1	NC	1
565		17	max	.017	3	.011	3	0	1	0	1	NC	15	NC	1
566			min	-.013	2	-.016	2	0	1	0	1	368.457	1	NC	1
567		18	max	.017	3	.183	1	0	1	0	1	NC	5	NC	1
568			min	-.013	2	-.135	3	0	1	0	1	812.999	1	NC	1
569		19	max	.017	3	.347	1	0	1	0	1	NC	1	NC	1
570			min	-.013	2	-.264	3	0	1	0	1	NC	1	NC	1
571	M9	1	max	.008	3	.202	1	0	15	1.755e-2	3	NC	1	NC	1
572			min	-.004	2	-.046	3	0	1	-1.062e-2	1	NC	1	NC	1
573		2	max	.008	3	.101	1	.006	1	8.71e-3	3	NC	5	NC	1
574			min	-.004	2	-.023	3	0	15	-5.129e-3	1	1323.041	1	NC	1
575		3	max	.008	3	.011	3	.009	1	1.853e-4	1	NC	5	NC	1
576			min	-.004	2	-.01	2	0	15	-1.497e-5	10	636.84	1	NC	1
577		4	max	.008	3	.065	3	.008	1	3.922e-3	3	NC	15	NC	1
578			min	-.004	2	-.133	1	0	15	-4.5e-3	1	401.782	1	NC	1
579		5	max	.008	3	.132	3	.006	1	7.751e-3	3	9816.902	15	NC	1
580			min	-.004	2	-.262	1	0	15	-9.185e-3	1	289.667	1	NC	1
581		6	max	.007	3	.205	3	.003	1	1.158e-2	3	7771.344	15	NC	1
582			min	-.004	2	-.388	1	0	15	-1.387e-2	1	227.921	1	NC	1
583		7	max	.007	3	.274	3	0	3	1.541e-2	3	6562.284	15	NC	1
584			min	-.004	2	-.5	1	0	1	-1.855e-2	1	191.494	1	NC	1
585		8	max	.007	3	.332	3	0	15	1.924e-2	3	5846.242	15	NC	1
586			min	-.004	2	-.589	1	0	1	-2.324e-2	1	169.96	1	NC	1
587		9	max	.007	3	.369	3	0	1	1.965e-2	3	5471.367	15	NC	1
588			min	-.004	2	-.646	1	0	15	-2.553e-2	1	158.736	1	NC	1
589		10	max	.007	3	.384	3	0	15	1.776e-2	3	5356.735	15	NC	1
590			min	-.004	2	-.664	1	0	1	-2.622e-2	1	155.373	1	NC	1
591		11	max	.007	3	.375	3	0	15	1.588e-2	3	5471.147	15	NC	1
592			min	-.004	2	-.645	1	0	1	-2.691e-2	1	158.967	1	NC	1
593		12	max	.006	3	.343	3	0	1	1.366e-2	3	5845.772	15	NC	1
594			min	-.004	2	-.588	1	0	15	-2.534e-2	1	170.656	1	NC	1
595		13	max	.006	3	.292	3	0	1	1.093e-2	3	6561.458	15	NC	1
596			min	-.003	2	-.497	1	0	15	-2.038e-2	1	193.169	1	NC	1
597		14	max	.006	3	.227	3	0	15	8.199e-3	3	7769.943	15	NC	1
598			min	-.003	2	-.383	1	-.002	1	-1.542e-2	1	231.46	1	NC	1
599		15	max	.006	3	.154	3	0	15	5.47e-3	3	9814.484	15	NC	1
600			min	-.003	2	-.255	1	-.005	1	-1.047e-2	1	296.858	1	NC	1
601		16	max	.006	3	.078	3	0	15	2.74e-3	3	NC	15	NC	1
602			min	-.003	2	-.126	1	-.008	1	-5.514e-3	1	416.685	1	NC	1
603		17	max	.006	3	.004	3	0	15	1.103e-5	3	NC	5	NC	1
604			min	-.003	2	-.006	2	-.008	1	-5.588e-4	1	669.861	1	NC	1
605		18	max	.006	3	.099	1	0	15	2.389e-3	3	NC	5	NC	1
606			min	-.003	2	-.063	3	-.006	1	-6.999e-3	2	1406.082	1	NC	1
607		19	max	.006	3	.194	1	0	1	4.858e-3	3	NC	1	NC	1
608			min	-.003	2	-.126	3	0	15	-1.394e-2	2	NC	1	NC	1

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

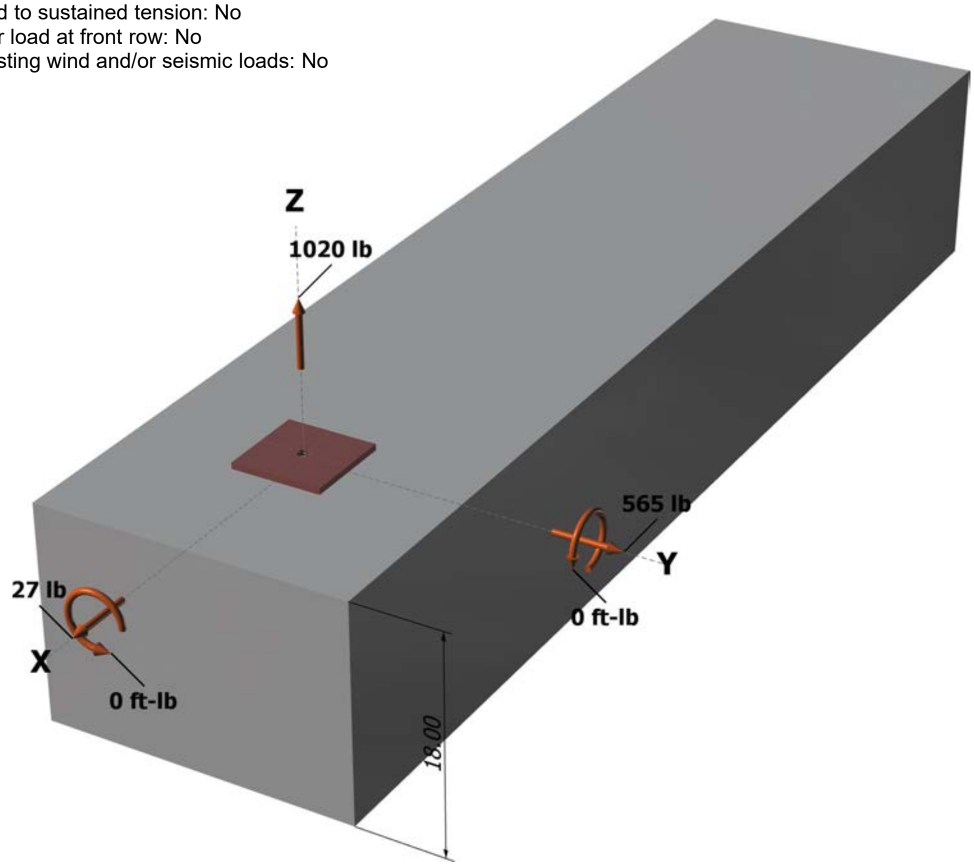
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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



Anchor Designer™
Software
Version 2.4.6025.0

Company:	Schletter, Inc.	Date:	8/1/2016
Engineer:	HCV	Page:	2/5
Project:	Standard PVMax - Worst Case, 14-40 Inch Width		
Address:			
Phone:			
E-mail:			

<Figure 2>

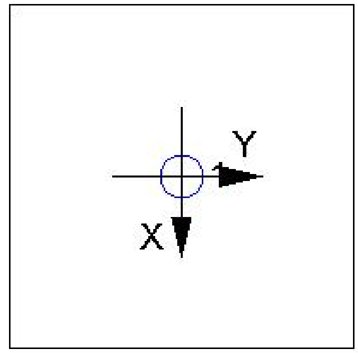
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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	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, ϕN_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, ϕV_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

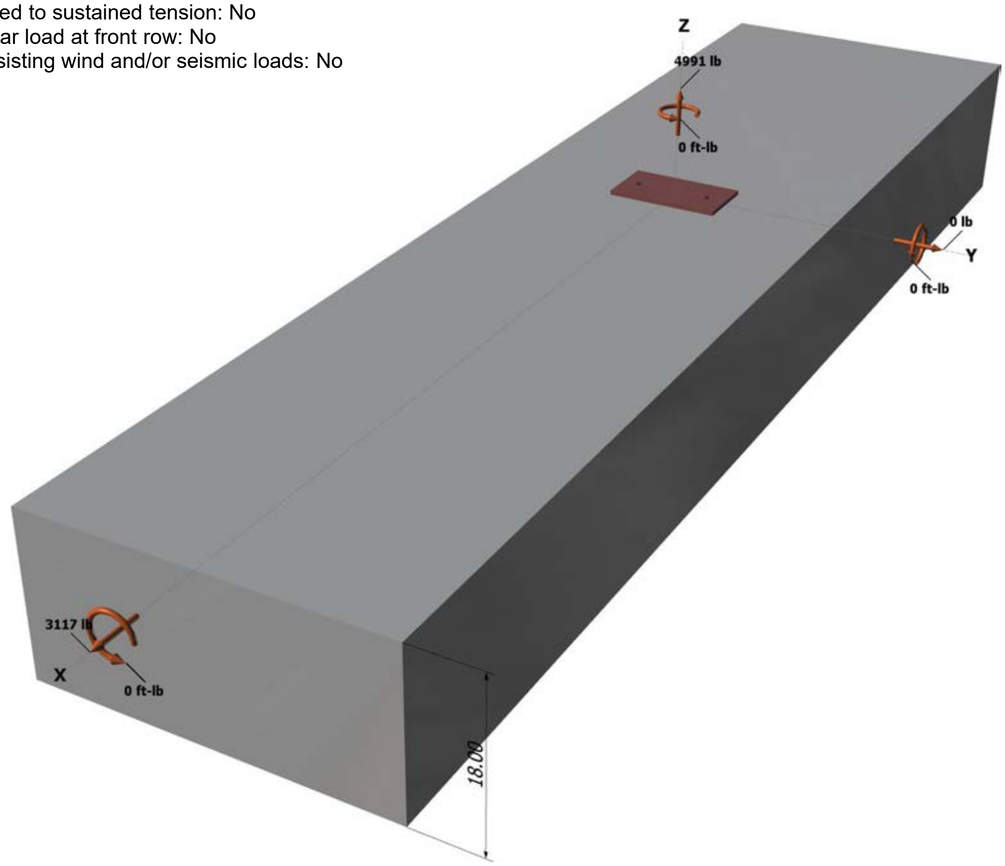
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

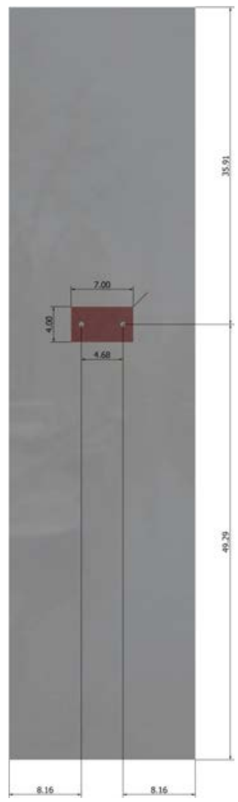
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout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



<Figure 2>



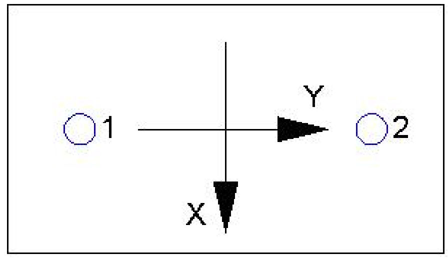
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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)

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbgx} (lb)
378.00	648.00	1.000	0.836	1.000	1.000	15593	0.70	5323

Shear parallel to edge in x-direction:

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

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

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

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

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

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

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

A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	N_{cb} (lb)	ϕ
378.00	324.00	1.000	0.972	1.000	1.000	12492	14166	0.70

ϕV_{cpg} (lb)
19833

11. Results

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

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	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, ϕV_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.