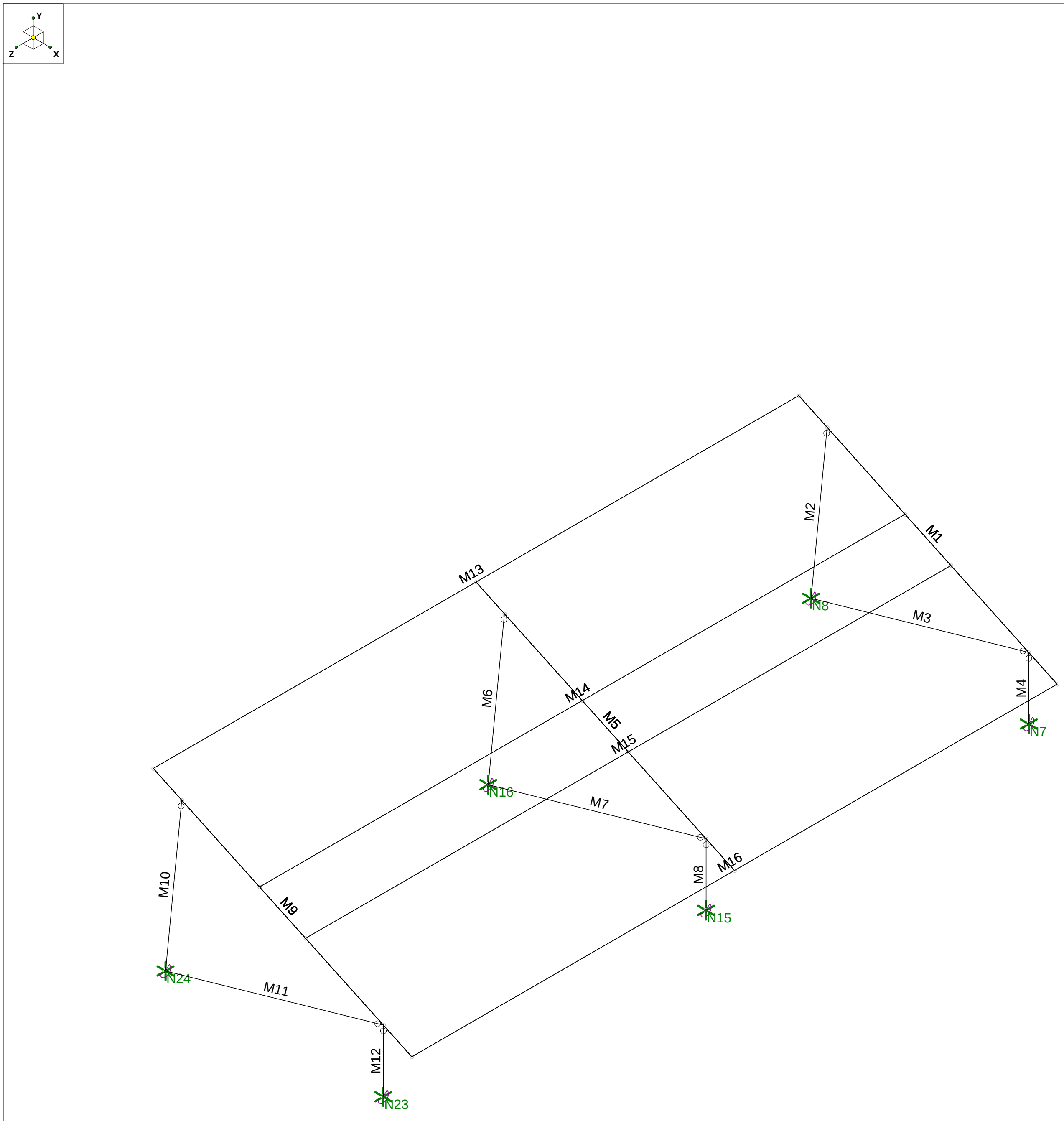


Schletter, Inc.		25ÁTilt w/o Seismic Design
HCV	Standard PVMax Racking System	
	Representative Calculations - ASCE 7-10	

SCHLETTER

1. INTRODUCTION

1.1 Project Description

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

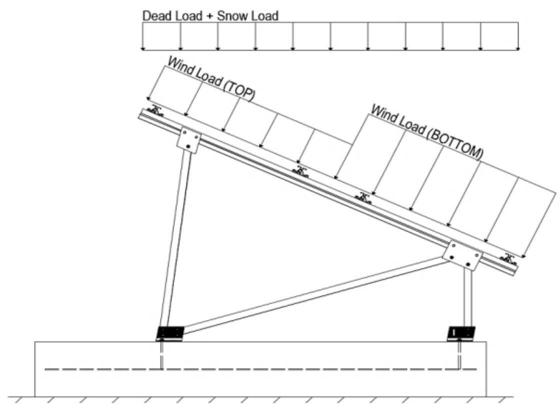
1.2 Construction

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

PV modules are required to meet the following specifications:

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

Modules Per Row =	2
Module Tilt =	25°
Maximum Height Above Grade =	3 ft



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

1.3 Technical Codes

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

2. LOAD ACTIONS

2.1 Permanent Loads

g_{MAX} = 3.00 psf

g_{MIN} = 1.75 psf

Self-weight of the PV modules.

2.2 Snow Loads

Ground Snow Load, P_g =	30.00 psf	
Sloped Roof Snow Load, P_s =	18.56 psf	*(ASCE 7-10, Eq. 7.4-1)*
I_s =	1.00	
C_s =	0.82	
C_e =	0.90	
C_t =	1.20	

2.3 Wind Loads

Design Wind Speed, V =	110 mph	Exposure Category = C
Height <	15 ft	Importance Category = II

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

Pressure Coefficients

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

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

2.4 Seismic Loads - N/A

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

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

2.5 Combination of Loads

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

Strength Design, LRFD

Component stresses are checked using the following LRFD load combinations:

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

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

Allowable Stress Design, ASD

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

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

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

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

3. STRUCTURAL ANALYSIS

3.1 RISA Results

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

3.2 RISA Components

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

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

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

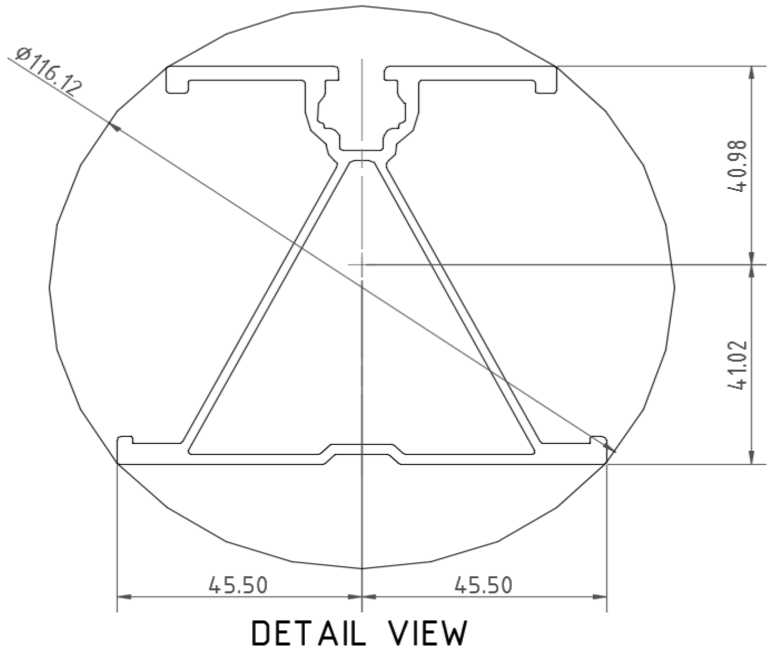
Front Struts	Location
M4	Outer
M8	Inner
M12	Outer

4. MEMBER DESIGN CALCULATIONS

4.1 Purlin Design

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

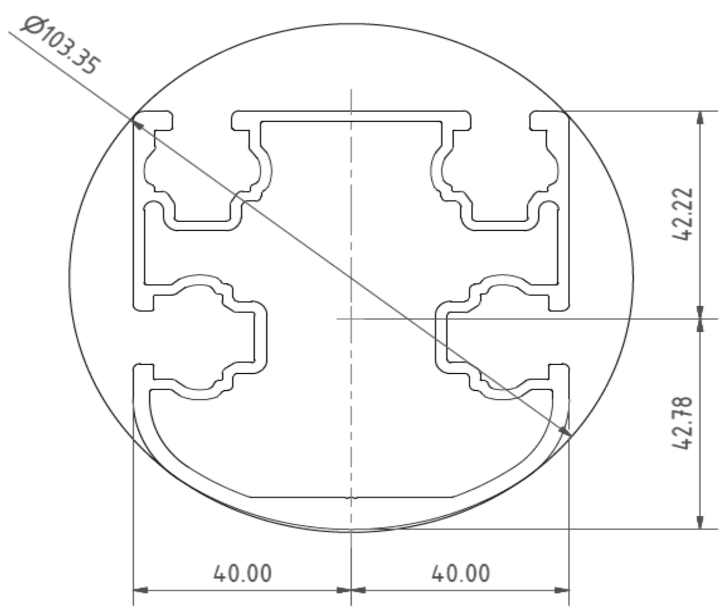
Purlin Type =	**S1.5**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	129	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	25.07	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	23.08	ksi
S_y =	1.33	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	2.16	in^4
I_x =	1.07	in^4
A =	1.25	in^2
g =	1.50	lbs/ft
M_y =	1.829	k-ft
M_z =	0.379	k-ft
$M_{y\ allowable}$ =	2.779	k-ft
$M_{z\ allowable}$ =	1.154	k-ft
Utilization =	99%	



4.2 Girder Design

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

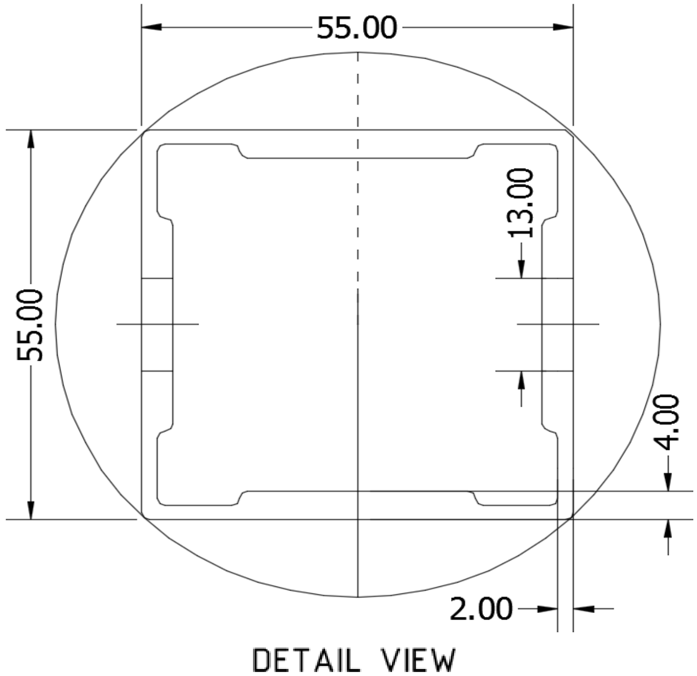
Girder Type =	**BF0**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	88.90	in
$\Phi F_{ty\ AXIAL}$ =	31.09	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.35	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	33.25	ksi
S_y =	1.42	in^3
S_x =	1.41	in^3
E =	10100	ksi
I_y =	2.39	in^4
I_x =	2.22	in^4
A =	1.88	in^2
g =	2.26	lbs/ft
M_y =	-2.716	k-ft
M_z =	0.000	k-ft
P_n =	-0.204	k
$M_{y\ allowable}$ =	3.464	k-ft
$M_{z\ allowable}$ =	3.907	k-ft
$P_{n\ allowable}$ =	58.535	k
Utilization =	79%	



4.3 Front Strut Design

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

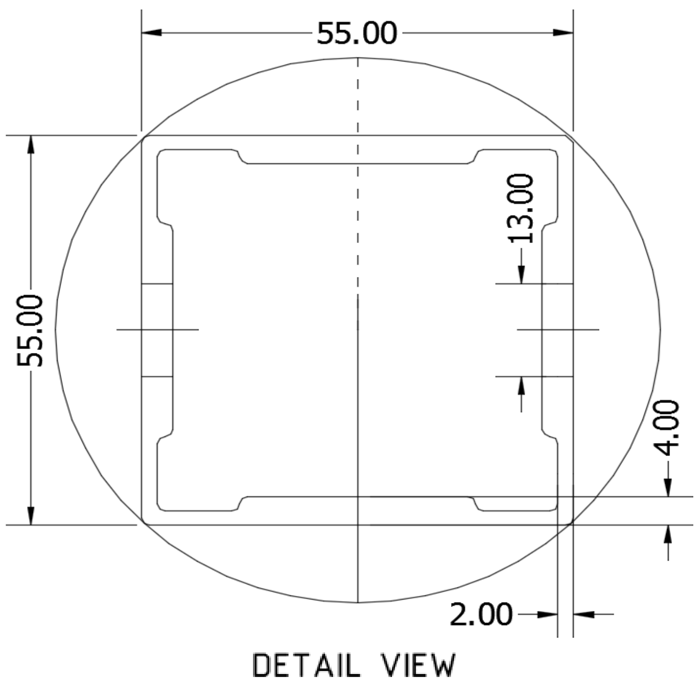
Strut Type =	**<u>55x55</u>**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	<u>24.80</u>	in
$\Phi F_{ty\ AXIAL}$ =	28.03	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	2.978	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	27.532	k
Utilization =	<u>11%</u>	



4.4 Diagonal Strut Design

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

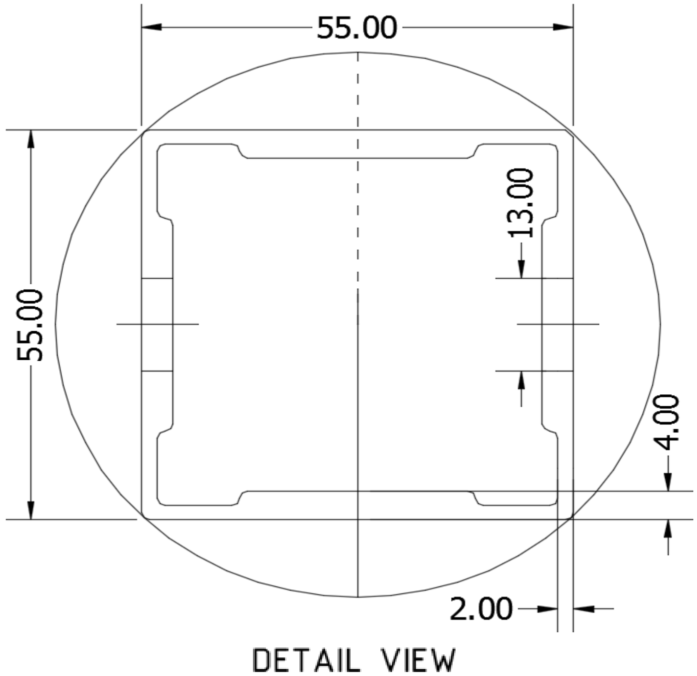
Strut Type =	**<u>55x55</u>**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	<u>86.60</u>	in
$\Phi F_{ty\ AXIAL}$ =	7.50	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.009	k-ft
M_z =	0.000	k-ft
P_n =	1.583	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	7.371	k
Utilization =	<u>22%</u>	



4.5 Rear Strut Design

An aluminum strut connects the rear portion of the girder to the rear foundation connection. Both vertical and horizontal forces are transferred from the girder. The strut is attached with single M12 bolts at each end. See Appendix A.5 for detailed member calculations. Section units are in (mm).

Strut Type =	**55x55**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	63.42	in
$\Phi F_{ty\ AXIAL}$ =	12.77	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	-0.008	k-ft
M_z =	0.000	k-ft
P_n =	3.121	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	12.545	k
Utilization =	25%	



5. FOUNDATION DESIGN CALCULATIONS

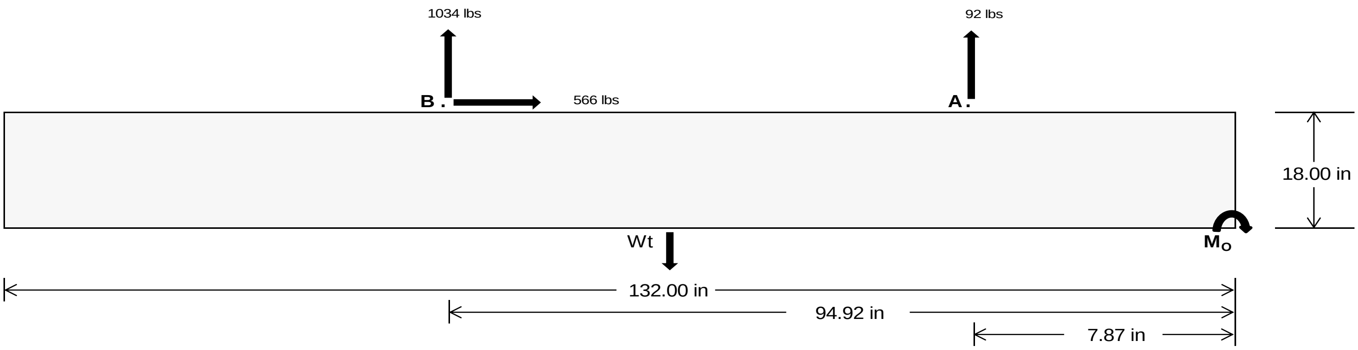
5.1 Helical Pile Foundations

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

Maximum	Front	Rear	
Tensile Load =	420.12	4504.12	k
Compressive Load =	3871.71	4350.88	k
Lateral Load =	16.09	2453.53	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).



<u>Concrete Properties</u>

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

<u>Footing Reinforcement</u>

Use fiber reinforcing with (1) #5 rebar.

<u>Overturning Check</u>

M_O = 109082.7 in-lbs
Resisting Force Required = 1652.77 lbs
S.F. = 1.67
Weight Required = 2754.61 lbs
Minimum Width = <u>23 in</u> in
Weight Provided = 4585.63 lbs

A minimum 132in long x 23in wide x 18in tall ballast foundation is required to resist overturning.

<u>Sliding</u>

Force = 565.62 lbs
Friction = 0.4
Weight Required = 1414.04 lbs
Resisting Weight = 4585.63 lbs
Additional Weight Required = 0 lbs

Use a 132in long x 23in wide x 18in tall ballast foundation to resist sliding. Friction is OK.

<u>Cohesion</u>

Sliding Force = 565.62 lbs
Cohesion = 130 psf
Area = 21.08 ft^2
Resisting = 2292.81 lbs
Additional Weight Required = 0 lbs

Use a 132in long x 23in wide x 18in tall ballast foundation. Cohesion is OK.

<u>Shear Key</u>

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.

<u>Bearing Pressure</u>

	Ballast Width			
	23 in	24 in	25 in	26 in
P_{ftg} = (145 pcf)(11 ft)(1.5 ft)(1.92 ft) =	4586 lbs	4785 lbs	4984 lbs	5184 lbs

ASD LC	1.0D + 1.0S				1.0D + 0.6W				1.0D + 0.75L + 0.45W + 0.75S				0.6D + 0.6W			
Width	23 in	24 in	25 in	26 in	23 in	24 in	25 in	26 in	23 in	24 in	25 in	26 in	23 in	24 in	25 in	26 in
F_A	1489 lbs	1489 lbs	1489 lbs	1489 lbs	1125 lbs	1125 lbs	1125 lbs	1125 lbs	1823 lbs	1823 lbs	1823 lbs	1823 lbs	-183 lbs	-183 lbs	-183 lbs	-183 lbs
F_B	1481 lbs	1481 lbs	1481 lbs	1481 lbs	1575 lbs	1575 lbs	1575 lbs	1575 lbs	2155 lbs	2155 lbs	2155 lbs	2155 lbs	-2069 lbs	-2069 lbs	-2069 lbs	-2069 lbs
F_V	204 lbs	204 lbs	204 lbs	204 lbs	1036 lbs	1036 lbs	1036 lbs	1036 lbs	913 lbs	913 lbs	913 lbs	913 lbs	-1131 lbs	-1131 lbs	-1131 lbs	-1131 lbs
P_{total}	7556 lbs	7755 lbs	7955 lbs	8154 lbs	7286 lbs	7485 lbs	7684 lbs	7884 lbs	8564 lbs	8763 lbs	8962 lbs	9162 lbs	499 lbs	619 lbs	739 lbs	858 lbs
M	3949 lbs-ft	3949 lbs-ft	3949 lbs-ft	3949 lbs-ft	3208 lbs-ft	3208 lbs-ft	3208 lbs-ft	3208 lbs-ft	5003 lbs-ft	5003 lbs-ft	5003 lbs-ft	5003 lbs-ft	2400 lbs-ft	2400 lbs-ft	2400 lbs-ft	2400 lbs-ft
e	0.52 ft	0.51 ft	0.50 ft	0.48 ft	0.44 ft	0.43 ft	0.42 ft	0.41 ft	0.58 ft	0.57 ft	0.56 ft	0.55 ft	4.81 ft	3.88 ft	3.25 ft	2.80 ft
L/6	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft
f_{min}	256.2 psf	254.6 psf	253.1 psf	251.7 psf	262.6 psf	260.7 psf	259.0 psf	257.4 psf	276.7 psf	274.3 psf	272.0 psf	269.9 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	460.6 psf	450.4 psf	441.1 psf	432.5 psf	428.6 psf	419.8 psf	411.7 psf	404.2 psf	535.6 psf	522.4 psf	510.2 psf	498.9 psf	250.8 psf	127.2 psf	105.0 psf	97.7 psf

Maximum Bearing Pressure = 536 psf
Allowable Bearing Pressure = 1500 psf

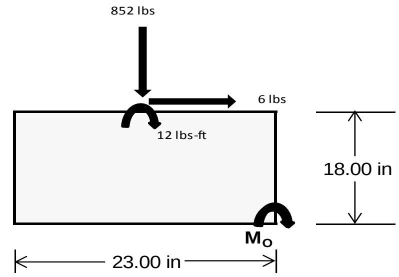
Use a 132in long x 23in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O = 794.7 ft-lbs
Resisting Force Required = 829.24 lbs
S.F. = 1.67
Weight Required = 1382.07 lbs
Minimum Width = 23 in in
Weight Provided = 4585.63 lbs

A minimum 132in long x 23in 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	23 in			23 in			23 in		
Support	Outer	Inner	Outer	Outer	Inner	Outer	Outer	Inner	Outer
F_Y	259 lbs	680 lbs	259 lbs	852 lbs	2463 lbs	852 lbs	76 lbs	199 lbs	76 lbs
F_V	2 lbs	0 lbs	2 lbs	6 lbs	0 lbs	6 lbs	0 lbs	0 lbs	0 lbs
P_{total}	5936 lbs	4586 lbs	5936 lbs	6256 lbs	4586 lbs	6256 lbs	1736 lbs	4586 lbs	1736 lbs
M	6 lbs-ft	0 lbs-ft	6 lbs-ft	21 lbs-ft	0 lbs-ft	21 lbs-ft	2 lbs-ft	0 lbs-ft	2 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	0.32 ft	0.32 ft	0.32 ft	0.32 ft	0.32 ft	0.32 ft	0.32 ft	0.32 ft	0.32 ft
f_{min}	280.6 psf	217.5 psf	280.6 psf	293.5 psf	217.5 psf	293.5 psf	82.1 psf	217.5 psf	82.1 psf
f_{max}	282.5 psf	217.5 psf	282.5 psf	299.9 psf	217.5 psf	299.9 psf	82.6 psf	217.5 psf	82.6 psf

Maximum Bearing Pressure = 300 psf
Allowable Bearing Pressure = 1500 psf

Use a 132in long x 23in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Foundation Requirements: 132in long x 23in wide x 18in tall ballast foundation and fiber reinforcing with (1) #5 rebar.

5.3 Foundation Anchors

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

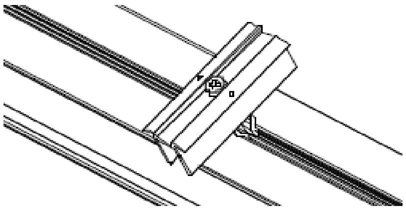
6. DESIGN OF JOINTS AND CONNECTIONS

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

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

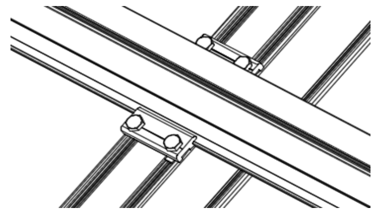
Fastening of Modules to Purlins

Maximum Uplifting Force =	0.441	k
Allowable Uplift =	1.214	k
Utilization =	36%	



Fastening of Purlins to Girders

Maximum Uplifting Force =	1.673	k
Allowable Uplift =	4.357	k
Utilization =	38%	



6.2 Strut Connections

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

Front Strut

Maximum Axial Load =	2.978	k
M12 Bolt Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	40%	

Rear Strut

Maximum Axial Load =	3.121	k
M12 Bolt Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	42%	

Diagonal Strut

Maximum Axial Load =	1.638	k
M12 Bolt Shear Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	22%	

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

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

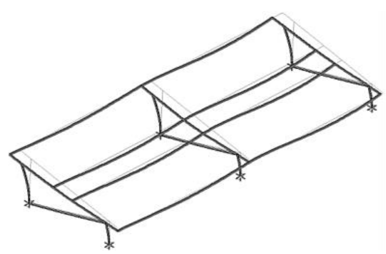
7. SEISMIC DESIGN

7.1 Seismic Drift - N/A

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

Mean Height, h_{sx} =	46.89	in
Allowable Story Drift for All Other Structures, Δ = {	$0.020h_{sx}$	
	0.938	in
Max Drift, Δ_{MAX} =	0.066	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 = 129 in

J = 0.432

356.874

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 27.2 ksi

3.4.16

b/t = 32.195

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 25.1 ksi

3.4.16.1 Not Used

Rb/t =

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 37.0588

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

S1 = 36.9

m = 0.65

C_0 = 40.985

Cc = 41.015

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

S2 = 77.2

φF_L= φb[Bbr-mDbr*h/t]

φF_L= 43.2 ksi

φF_LSt= 25.1 ksi

Ix = 897074 mm^4

2.155 in^4

y = 41.015 mm

Sx = 1.335 in^3

M_{max}St = 2.788 k-ft

Weak Axis:

3.4.14

L_b = 129

J = 0.432

226.951

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

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= 28.4

3.4.16

b/t = 37.0588

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 23.1 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 32.195

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

S1 = 36.9

m = 0.65

C_0 = 45.5

Cc = 45.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 23.1 ksi

Iy = 446476 mm^4

1.073 in^4

x = 45.5 mm

Sy = 0.599 in^3

M_{max}Wk = 1.152 k-ft

Compression

3.4.9

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

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

3.4.10

Rb/t = 0.0

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

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

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

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

Girder = **BF0**

Strong Axis:
3.4.14

L_b = 88.9 in
J = 1.08
152.913

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

S1 = 0.51461

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

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

3.4.16

b/t = 16.2

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

S1 = 12.2

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

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

Weak Axis:
3.4.14

L_b = 88.9
J = 1.08
161.829

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

S1 = 0.51461

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

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

3.4.16

b/t = 7.4

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

S1 = 12.2

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

S2 = 46.7
φF_L= φyFcy
φF_L= 33.3 ksi

3.4.16.1 Used

Rb/t = 18.1

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

S1 = 1.1

$S2 = C_t$

S2 = 141.0

φF_L= φb[Bt-Dt*√(Rb/t)]

φF_L= 31.1 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.4

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

S1 = 35.2

m = 0.68

C_0 = 41.067

Cc = 43.717

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

S2 = 73.8

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 29.4 ksi

Ix = 984962 mm^4

2.366 in^4

y = 43.717 mm

Sx = 1.375 in^3

M_{max}St = 3.363 k-ft

3.4.18

h/t = 16.2

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

S1 = 36.9

m = 0.65

C_0 = 40

Cc = 40

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 33.3 ksi

Iy = 923544 mm^4

2.219 in^4

x = 40 mm

Sy = 1.409 in^3

M_{max}Wk = 3.904 k-ft

Compression

3.4.9

b/t = 16.2

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 31.6 ksi

b/t = 7.4

S1 = 12.21

S2 = 32.70

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.10

Rb/t = 18.1

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

S1 = 6.87

S2 = 131.3

φF_L= φc[Bt-Dt*√(Rb/t)]

φF_L= 31.09 ksi

φF_L= 31.09 ksi

A = 1215.13 mm^2

1.88 in^2

P_{max} = 58.55 kips

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

Strut = **55x55**

Strong Axis:

3.4.14

L_b = 24.8 in

J = 0.942

38.7028

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.4 ksi

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 28.2 ksi

Ix = 279836 mm^4

0.672 in^4

y = 27.5 mm

Sx = 0.621 in^3

M_{max}St = 1.460 k-ft

Weak Axis:

3.4.14

L_b = 24.8

J = 0.942

38.7028

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.4

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 28.2 ksi

Iy = 279836 mm^4

0.672 in^4

x = 27.5 mm

Sy = 0.621 in^3

M_{max}Wk = 1.460 k-ft

Compression

3.4.7

λ = 0.57371

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.87952

φF_L= φcc(Bc-Dc*λ)

φF_L= 28.0279 ksi

3.4.9

b/t = 24.5

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

b/t = 24.5

S1 = 12.21

S2 = 32.70

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

φF_L= φyFcy

φF_L= 33.25 ksi

φF_L= 28.03 ksi

A = 663.99 mm^2

1.03 in^2

P_{max} = 28.85 kips

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

Strut = **55x55**

Strong Axis:

3.4.14

L_b = 86.60 in

J = 0.942

135.148

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.6 ksi

Weak Axis:

3.4.14

L_b = 86.6

J = 0.942

135.148

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.6

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 28.2 ksi

Ix = 279836 mm^4

0.672 in^4

y = 27.5 mm

Sx = 0.621 in^3

M_{max}St = 1.460 k-ft

Compression

3.4.7

λ = 2.00335

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.86047

φF_L= (φccFcy)/(λ²)

φF_L= 7.50396 ksi

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 28.2 ksi

Iy = 279836 mm^4

0.672 in^4

x = 27.5 mm

Sy = 0.621 in^3

M_{max}Wk = 1.460 k-ft

3.4.9

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

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

3.4.10

Rb/t = 0.0

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

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

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

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

Strut = **55x55**

Strong Axis:

3.4.14

L_b = 63.42 in
J = 0.942
98.9729

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

S1 = 0.51461

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

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

3.4.16

b/t = 24.5

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

S1 = 12.2

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

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

Weak Axis:

3.4.14

L_b = 63.42
J = 0.942
98.9729

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

S1 = 0.51461

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

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

3.4.16

b/t = 24.5

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

S1 = 12.2

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

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

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$S2 = C_t$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 28.2 ksi

Ix = 279836 mm^4

0.672 in^4

y = 27.5 mm

Sx = 0.621 in^3

M_{max}St = 1.460 k-ft

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 28.2 ksi

Iy = 279836 mm^4

0.672 in^4

x = 27.5 mm

Sy = 0.621 in^3

M_{max}Wk = 1.460 k-ft

Compression

3.4.7

λ = 1.46712

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.7854

φF_L= (φccFcy)/(λ²)

φF_L= 12.7711 ksi

3.4.9

b/t = 24.5

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

b/t = 24.5

S1 = 12.21

S2 = 32.70

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

$\varphi F_L = \varphi y Fcy$

$\varphi F_L =$ 33.25 ksi

$\varphi F_L =$ 12.77 ksi

A = 663.99 mm^2

1.03 in^2

$P_{max} =$ 13.14 kips

APPENDIX B

B.1

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

Basic Load Cases

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

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

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	Y	-8.366	-8.366	0	0
2	M14	Y	-8.366	-8.366	0	0
3	M15	Y	-8.366	-8.366	0	0
4	M16	Y	-8.366	-8.366	0	0

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

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	Y	-4.45	-4.45	0	0
2	M14	Y	-4.45	-4.45	0	0
3	M15	Y	-4.45	-4.45	0	0
4	M16	Y	-4.45	-4.45	0	0

Member Distributed Loads (BLC 3 : Snow Load)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	Y	-46.9	-46.9	0	0
2	M14	Y	-46.9	-46.9	0	0
3	M15	Y	-46.9	-46.9	0	0
4	M16	Y	-46.9	-46.9	0	0

Member Distributed Loads (BLC 4 : Wind Load - Pressure)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	y	-58.278	-58.278	0	0
2	M14	y	-58.278	-58.278	0	0
3	M15	y	-90.067	-90.067	0	0
4	M16	y	-90.067	-90.067	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	132.451	132.451	0	0
2	M14	y	100.663	100.663	0	0
3	M15	y	52.98	52.98	0	0
4	M16	y	52.98	52.98	0	0

Load Combinations

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

Load Combinations (Continued)

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

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N8	max	450.782	2	972.701	1	.842	1	.004	1	0	1	0	1
2		min	-596.689	3	-1052.546	3	.041	15	0	15	0	1	0	1
3	N7	max	.043	9	1117.769	1	-.527	15	-.001	15	0	1	0	1
4		min	-.094	2	-72.855	3	-12.377	1	-.025	1	0	1	0	1
5	N15	max	.031	9	2978.238	1	0	2	0	2	0	1	0	1
6		min	-1.206	2	-323.17	3	0	1	0	1	0	1	0	1
7	N16	max	1795.643	2	3346.833	1	0	2	0	2	0	1	0	1
8		min	-1887.328	3	-3464.71	3	0	3	0	3	0	1	0	1
9	N23	max	.043	9	1117.769	1	12.377	1	.025	1	0	1	0	1
10		min	-.094	2	-72.855	3	.527	15	.001	15	0	1	0	1
11	N24	max	450.782	2	972.701	1	-.041	15	0	15	0	1	0	1
12		min	-596.689	3	-1052.546	3	-.842	1	-.004	1	0	1	0	1
13	Totals:	max	2695.812	2	10506.012	1	0	2						
14		min	-3080.926	3	-6038.681	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	126.589	1	431.034	1	-7.83	15	0	3	.303	1	0	1
2			min	5.228	15	-514.595	3	-190.156	1	-.011	1	.012	15	0	3
3		2	max	126.589	1	302.174	1	-6.027	15	0	3	.102	1	.524	3
4			min	5.228	15	-362.191	3	-146.298	1	-.011	1	.004	15	-.438	1
5		3	max	126.589	1	173.314	1	-4.223	15	0	3	0	12	.865	3
6			min	5.228	15	-209.787	3	-102.439	1	-.011	1	-.047	1	-.722	1
7		4	max	126.589	1	44.454	1	-2.419	15	0	3	-.005	12	1.025	3
8			min	5.228	15	-57.382	3	-58.581	1	-.011	1	-.143	1	-.852	1
9		5	max	126.589	1	95.022	3	-.616	15	0	3	-.008	12	1.002	3
10			min	5.228	15	-84.406	1	-14.722	1	-.011	1	-.187	1	-.828	1
11		6	max	126.589	1	247.427	3	29.137	1	0	3	-.007	15	.798	3
12			min	5.228	15	-213.266	1	.795	12	-.011	1	-.178	1	-.65	1
13		7	max	126.589	1	399.831	3	72.995	1	0	3	-.005	15	.411	3
14			min	5.228	15	-342.126	1	2.598	12	-.011	1	-.117	1	-.319	1
15		8	max	126.589	1	552.235	3	116.854	1	0	3	0	10	.167	1
16			min	5.228	15	-470.986	1	4.402	12	-.011	1	-.004	1	-.157	3
17		9	max	126.589	1	704.64	3	160.712	1	0	3	.162	1	.807	1
18			min	5.228	15	-599.846	1	6.205	12	-.011	1	.005	12	-.908	3
19		10	max	126.589	1	857.044	3	204.571	1	.011	1	.38	1	1.6	1
20			min	5.228	15	-728.706	1	8.008	12	0	12	.013	12	-1.841	3
21		11	max	126.589	1	599.846	1	-6.205	12	.011	1	.162	1	.807	1
22			min	5.228	15	-704.64	3	-160.712	1	0	3	.005	12	-.908	3
23		12	max	126.589	1	470.986	1	-4.402	12	.011	1	0	10	.167	1
24			min	5.228	15	-552.235	3	-116.854	1	0	3	-.004	1	-.157	3
25		13	max	126.589	1	342.126	1	-2.598	12	.011	1	-.005	15	.411	3
26			min	5.228	15	-399.831	3	-72.995	1	0	3	-.117	1	-.319	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	126.589	1	213.266	1	-.795	12	.011	1	-.007	15	.798	3
28			min	5.228	15	-247.427	3	-29.137	1	0	3	-.178	1	-.65	1
29		15	max	126.589	1	84.406	1	14.722	1	.011	1	-.008	12	1.002	3
30			min	5.228	15	-95.022	3	.616	15	0	3	-.187	1	-.828	1
31		16	max	126.589	1	57.382	3	58.581	1	.011	1	-.005	12	1.025	3
32			min	5.228	15	-44.454	1	2.419	15	0	3	-.143	1	-.852	1
33		17	max	126.589	1	209.787	3	102.439	1	.011	1	0	12	.865	3
34			min	5.228	15	-173.314	1	4.223	15	0	3	-.047	1	-.722	1
35		18	max	126.589	1	362.191	3	146.298	1	.011	1	.102	1	.524	3
36			min	5.228	15	-302.174	1	6.027	15	0	3	.004	15	-.438	1
37		19	max	126.589	1	514.595	3	190.156	1	.011	1	.303	1	0	1
38			min	5.228	15	-431.034	1	7.83	15	0	3	.012	15	0	3
39	M14	1	max	56.253	1	451.801	1	-8.058	15	.006	3	.342	1	0	1
40			min	2.329	15	-395.361	3	-195.707	1	-.009	1	.014	15	0	3
41		2	max	56.253	1	322.941	1	-6.255	15	.006	3	.135	1	.404	3
42			min	2.329	15	-280.926	3	-151.848	1	-.009	1	.006	15	-.463	1
43		3	max	56.253	1	194.081	1	-4.451	15	.006	3	0	3	.671	3
44			min	2.329	15	-166.491	3	-107.99	1	-.009	1	-.021	1	-.771	1
45		4	max	56.253	1	65.221	1	-2.647	15	.006	3	-.004	12	.802	3
46			min	2.329	15	-52.055	3	-64.131	1	-.009	1	-.123	1	-.926	1
47		5	max	56.253	1	62.38	3	-.844	15	.006	3	-.007	12	.795	3
48			min	2.329	15	-63.639	1	-20.273	1	-.009	1	-.174	1	-.927	1
49		6	max	56.253	1	176.815	3	23.586	1	.006	3	-.007	15	.653	3
50			min	2.329	15	-192.499	1	.574	12	-.009	1	-.172	1	-.774	1
51		7	max	56.253	1	291.251	3	67.445	1	.006	3	-.005	15	.373	3
52			min	2.329	15	-321.359	1	2.377	12	-.009	1	-.117	1	-.467	1
53		8	max	56.253	1	405.686	3	111.303	1	.006	3	0	10	0	9
54			min	2.329	15	-450.219	1	4.181	12	-.009	1	-.011	1	-.043	3
55		9	max	56.253	1	520.121	3	155.162	1	.006	3	.149	1	.608	1
56			min	2.329	15	-579.079	1	5.984	12	-.009	1	.004	12	-.596	3
57		10	max	56.253	1	634.557	3	199.021	1	.009	1	.36	1	1.377	1
58			min	2.329	15	-707.939	1	7.787	12	-.006	3	.013	12	-1.286	3
59		11	max	56.253	1	579.079	1	-5.984	12	.009	1	.149	1	.608	1
60			min	2.329	15	-520.121	3	-155.162	1	-.006	3	.004	12	-.596	3
61		12	max	56.253	1	450.219	1	-4.181	12	.009	1	0	10	0	9
62			min	2.329	15	-405.686	3	-111.303	1	-.006	3	-.011	1	-.043	3
63		13	max	56.253	1	321.359	1	-2.377	12	.009	1	-.005	15	.373	3
64			min	2.329	15	-291.251	3	-67.445	1	-.006	3	-.117	1	-.467	1
65		14	max	56.253	1	192.499	1	-.574	12	.009	1	-.007	15	.653	3
66			min	2.329	15	-176.815	3	-23.586	1	-.006	3	-.172	1	-.774	1
67		15	max	56.253	1	63.639	1	20.273	1	.009	1	-.007	12	.795	3
68			min	2.329	15	-62.38	3	.844	15	-.006	3	-.174	1	-.927	1
69		16	max	56.253	1	52.055	3	64.131	1	.009	1	-.004	12	.802	3
70			min	2.329	15	-65.221	1	2.647	15	-.006	3	-.123	1	-.926	1
71		17	max	56.253	1	166.491	3	107.99	1	.009	1	0	3	.671	3
72			min	2.329	15	-194.081	1	4.451	15	-.006	3	-.021	1	-.771	1
73		18	max	56.253	1	280.926	3	151.848	1	.009	1	.135	1	.404	3
74			min	2.329	15	-322.941	1	6.255	15	-.006	3	.006	15	-.463	1
75		19	max	56.253	1	395.361	3	195.707	1	.009	1	.342	1	0	1
76			min	2.329	15	-451.801	1	8.058	15	-.006	3	.014	15	0	3
77	M15	1	max	-2.457	15	515.848	1	-8.056	15	.009	1	.342	1	0	2
78			min	-59.364	1	-203.274	3	-195.673	1	-.005	3	.014	15	0	15
79		2	max	-2.457	15	368.003	1	-6.253	15	.009	1	.134	1	.208	3
80			min	-59.364	1	-145.793	3	-151.814	1	-.005	3	.006	15	-.528	1
81		3	max	-2.457	15	220.158	1	-4.449	15	.009	1	0	3	.348	3
82			min	-59.364	1	-88.313	3	-107.955	1	-.005	3	-.021	1	-.879	1
83		4	max	-2.457	15	72.312	1	-2.645	15	.009	1	-.004	12	.419	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	-59.364	1	-30.832	3	-64.097	1	-.005	3	-.123	1	-1.054	1
85		5	max	-2.457	15	26.649	3	-.842	15	.009	1	-.007	12	.422	3
86			min	-59.364	1	-75.769	2	-20.238	1	-.005	3	-.174	1	-1.052	1
87		6	max	-2.457	15	84.129	3	23.62	1	.009	1	-.007	15	.356	3
88			min	-59.364	1	-223.378	1	.605	12	-.005	3	-.172	1	-.873	1
89		7	max	-2.457	15	141.61	3	67.479	1	.009	1	-.005	15	.221	3
90			min	-59.364	1	-371.223	1	2.409	12	-.005	3	-.117	1	-.518	1
91		8	max	-2.457	15	199.091	3	111.338	1	.009	1	0	10	.024	2
92			min	-59.364	1	-519.068	1	4.212	12	-.005	3	-.011	1	0	15
93		9	max	-2.457	15	256.571	3	155.196	1	.009	1	.149	1	.724	2
94			min	-59.364	1	-666.913	1	6.015	12	-.005	3	.005	12	-.255	3
95		10	max	-2.457	15	314.052	3	199.055	1	.005	3	.36	1	1.607	1
96			min	-59.364	1	-814.758	1	7.819	12	-.009	1	.013	12	-.595	3
97		11	max	-2.457	15	666.913	1	-6.015	12	.005	3	.149	1	.724	2
98			min	-59.364	1	-256.571	3	-155.196	1	-.009	1	.005	12	-.255	3
99		12	max	-2.457	15	519.068	1	-4.212	12	.005	3	0	10	.024	2
100			min	-59.364	1	-199.091	3	-111.338	1	-.009	1	-.011	1	0	15
101		13	max	-2.457	15	371.223	1	-2.409	12	.005	3	-.005	15	.221	3
102			min	-59.364	1	-141.61	3	-67.479	1	-.009	1	-.117	1	-.518	1
103		14	max	-2.457	15	223.378	1	-.605	12	.005	3	-.007	15	.356	3
104			min	-59.364	1	-84.129	3	-23.62	1	-.009	1	-.172	1	-.873	1
105		15	max	-2.457	15	75.769	2	20.238	1	.005	3	-.007	12	.422	3
106			min	-59.364	1	-26.649	3	.842	15	-.009	1	-.174	1	-1.052	1
107		16	max	-2.457	15	30.832	3	64.097	1	.005	3	-.004	12	.419	3
108			min	-59.364	1	-72.312	1	2.645	15	-.009	1	-.123	1	-1.054	1
109		17	max	-2.457	15	88.313	3	107.955	1	.005	3	0	3	.348	3
110			min	-59.364	1	-220.158	1	4.449	15	-.009	1	-.021	1	-.879	1
111		18	max	-2.457	15	145.793	3	151.814	1	.005	3	.134	1	.208	3
112			min	-59.364	1	-368.003	1	6.253	15	-.009	1	.006	15	-.528	1
113		19	max	-2.457	15	203.274	3	195.673	1	.005	3	.342	1	0	2
114			min	-59.364	1	-515.848	1	8.056	15	-.009	1	.014	15	0	15
115	M16	1	max	-5.586	15	495.206	1	-7.837	15	.01	1	.304	1	0	2
116			min	-135.014	1	-191.398	3	-190.375	1	-.007	3	.013	15	0	3
117		2	max	-5.586	15	347.361	1	-6.033	15	.01	1	.103	1	.194	3
118			min	-135.014	1	-133.917	3	-146.517	1	-.007	3	.004	15	-.503	1
119		3	max	-5.586	15	199.516	1	-4.23	15	.01	1	-.001	12	.32	3
120			min	-135.014	1	-76.437	3	-102.658	1	-.007	3	-.046	1	-.83	1
121		4	max	-5.586	15	51.671	1	-2.426	15	.01	1	-.005	12	.377	3
122			min	-135.014	1	-18.956	3	-58.799	1	-.007	3	-.143	1	-.98	1
123		5	max	-5.586	15	38.525	3	-.623	15	.01	1	-.008	12	.365	3
124			min	-135.014	1	-96.174	1	-14.941	1	-.007	3	-.187	1	-.953	1
125		6	max	-5.586	15	96.005	3	28.918	1	.01	1	-.007	15	.285	3
126			min	-135.014	1	-244.019	1	.894	12	-.007	3	-.178	1	-.75	1
127		7	max	-5.586	15	153.486	3	72.777	1	.01	1	-.005	15	.136	3
128			min	-135.014	1	-391.864	1	2.698	12	-.007	3	-.117	1	-.37	1
129		8	max	-5.586	15	210.967	3	116.635	1	.01	1	0	10	.186	1
130			min	-135.014	1	-539.709	1	4.501	12	-.007	3	-.004	1	-.082	3
131		9	max	-5.586	15	268.447	3	160.494	1	.01	1	.161	1	.919	1
132			min	-135.014	1	-687.554	1	6.305	12	-.007	3	.005	12	-.368	3
133		10	max	-5.586	15	325.928	3	204.352	1	.007	3	.379	1	1.829	1
134			min	-135.014	1	-835.4	1	8.108	12	-.01	1	.014	12	-.723	3
135		11	max	-5.586	15	687.554	1	-6.305	12	.007	3	.161	1	.919	1
136			min	-135.014	1	-268.447	3	-160.494	1	-.01	1	.005	12	-.368	3
137		12	max	-5.586	15	539.709	1	-4.501	12	.007	3	0	10	.186	1
138			min	-135.014	1	-210.967	3	-116.635	1	-.01	1	-.004	1	-.082	3
139		13	max	-5.586	15	391.864	1	-2.698	12	.007	3	-.005	15	.136	3
140			min	-135.014	1	-153.486	3	-72.777	1	-.01	1	-.117	1	-.37	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
141		14	max	-5.586	15	244.019	1	-.894	12	.007	3	-.007	15	.285	3
142			min	-135.014	1	-96.005	3	-28.918	1	-.01	1	-.178	1	-.75	1
143		15	max	-5.586	15	96.174	1	14.941	1	.007	3	-.008	12	.365	3
144			min	-135.014	1	-38.525	3	.623	15	-.01	1	-.187	1	-.953	1
145		16	max	-5.586	15	18.956	3	58.799	1	.007	3	-.005	12	.377	3
146			min	-135.014	1	-51.671	1	2.426	15	-.01	1	-.143	1	-.98	1
147		17	max	-5.586	15	76.437	3	102.658	1	.007	3	-.001	12	.32	3
148			min	-135.014	1	-199.516	1	4.23	15	-.01	1	-.046	1	-.83	1
149		18	max	-5.586	15	133.917	3	146.517	1	.007	3	.103	1	.194	3
150			min	-135.014	1	-347.361	1	6.033	15	-.01	1	.004	15	-.503	1
151		19	max	-5.586	15	191.398	3	190.375	1	.007	3	.304	1	0	2
152			min	-135.014	1	-495.206	1	7.837	15	-.01	1	.013	15	0	3
153	M2	1	max	963.712	1	1.92	4	.814	1	0	5	0	3	0	1
154			min	-924.625	3	.452	15	.034	15	0	1	0	1	0	1
155		2	max	964.141	1	1.863	4	.814	1	0	5	0	1	0	15
156			min	-924.303	3	.439	15	.034	15	0	1	0	15	0	4
157		3	max	964.569	1	1.806	4	.814	1	0	5	0	1	0	15
158			min	-923.982	3	.426	15	.034	15	0	1	0	15	-.001	4
159		4	max	964.998	1	1.75	4	.814	1	0	5	0	1	0	15
160			min	-923.661	3	.412	15	.034	15	0	1	0	15	-.002	4
161		5	max	965.426	1	1.693	4	.814	1	0	5	0	1	0	15
162			min	-923.339	3	.399	15	.034	15	0	1	0	15	-.002	4
163		6	max	965.855	1	1.636	4	.814	1	0	5	.001	1	0	15
164			min	-923.018	3	.385	15	.034	15	0	1	0	15	-.003	4
165		7	max	966.283	1	1.579	4	.814	1	0	5	.001	1	0	15
166			min	-922.697	3	.372	15	.034	15	0	1	0	15	-.003	4
167		8	max	966.712	1	1.523	4	.814	1	0	5	.002	1	0	15
168			min	-922.375	3	.359	15	.034	15	0	1	0	15	-.003	4
169		9	max	967.14	1	1.466	4	.814	1	0	5	.002	1	0	15
170			min	-922.054	3	.345	15	.034	15	0	1	0	15	-.004	4
171		10	max	967.569	1	1.409	4	.814	1	0	5	.002	1	-.001	15
172			min	-921.732	3	.332	15	.034	15	0	1	0	15	-.004	4
173		11	max	967.997	1	1.352	4	.814	1	0	5	.002	1	-.001	15
174			min	-921.411	3	.319	15	.034	15	0	1	0	15	-.005	4
175		12	max	968.426	1	1.295	4	.814	1	0	5	.003	1	-.001	15
176			min	-921.09	3	.305	15	.034	15	0	1	0	15	-.005	4
177		13	max	968.854	1	1.239	4	.814	1	0	5	.003	1	-.001	15
178			min	-920.768	3	.292	15	.034	15	0	1	0	15	-.006	4
179		14	max	969.283	1	1.182	4	.814	1	0	5	.003	1	-.001	15
180			min	-920.447	3	.279	15	.034	15	0	1	0	15	-.006	4
181		15	max	969.711	1	1.125	4	.814	1	0	5	.003	1	-.001	15
182			min	-920.126	3	.265	15	.034	15	0	1	0	15	-.006	4
183		16	max	970.14	1	1.068	4	.814	1	0	5	.004	1	-.002	15
184			min	-919.804	3	.252	15	.034	15	0	1	0	15	-.007	4
185		17	max	970.568	1	1.011	4	.814	1	0	5	.004	1	-.002	15
186			min	-919.483	3	.239	15	.034	15	0	1	0	15	-.007	4
187		18	max	970.997	1	.955	4	.814	1	0	5	.004	1	-.002	15
188			min	-919.162	3	.225	15	.034	15	0	1	0	15	-.007	4
189		19	max	971.425	1	.898	4	.814	1	0	5	.004	1	-.002	15
190			min	-918.84	3	.208	12	.034	15	0	1	0	15	-.007	4
191	M3	1	max	380.433	2	7.881	4	.178	1	0	12	0	1	.007	4
192			min	-521.205	3	1.853	15	.007	15	0	1	0	15	.002	15
193		2	max	380.263	2	7.114	4	.178	1	0	12	0	1	.004	4
194			min	-521.333	3	1.673	15	.007	15	0	1	0	15	0	12
195		3	max	380.093	2	6.347	4	.178	1	0	12	0	1	.002	2
196			min	-521.461	3	1.493	15	.007	15	0	1	0	15	0	3
197		4	max	379.922	2	5.58	4	.178	1	0	12	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	-521.588	3	1.312	15	.007	15	0	1	0	15	-.002	3
199		5	max	379.752	2	4.812	4	.178	1	0	12	0	1	0	15
200			min	-521.716	3	1.132	15	.007	15	0	1	0	15	-.003	4
201		6	max	379.582	2	4.045	4	.178	1	0	12	0	1	-.001	15
202			min	-521.844	3	.952	15	.007	15	0	1	0	15	-.005	4
203		7	max	379.411	2	3.278	4	.178	1	0	12	0	1	-.002	15
204			min	-521.972	3	.771	15	.007	15	0	1	0	15	-.007	4
205		8	max	379.241	2	2.511	4	.178	1	0	12	0	1	-.002	15
206			min	-522.099	3	.591	15	.007	15	0	1	0	15	-.008	4
207		9	max	379.071	2	1.744	4	.178	1	0	12	.001	1	-.002	15
208			min	-522.227	3	.41	15	.007	15	0	1	0	15	-.009	4
209		10	max	378.9	2	.976	4	.178	1	0	12	.001	1	-.002	15
210			min	-522.355	3	.23	15	.007	15	0	1	0	15	-.009	4
211		11	max	378.73	2	.283	2	.178	1	0	12	.001	1	-.002	15
212			min	-522.483	3	-.042	3	.007	15	0	1	0	15	-.01	4
213		12	max	378.559	2	-.131	15	.178	1	0	12	.001	1	-.002	15
214			min	-522.61	3	-.558	4	.007	15	0	1	0	15	-.01	4
215		13	max	378.389	2	-.311	15	.178	1	0	12	.001	1	-.002	15
216			min	-522.738	3	-1.325	4	.007	15	0	1	0	15	-.009	4
217		14	max	378.219	2	-.491	15	.178	1	0	12	.001	1	-.002	15
218			min	-522.866	3	-2.093	4	.007	15	0	1	0	15	-.008	4
219		15	max	378.048	2	-.672	15	.178	1	0	12	.001	1	-.002	15
220			min	-522.994	3	-2.86	4	.007	15	0	1	0	15	-.007	4
221		16	max	377.878	2	-.852	15	.178	1	0	12	.002	1	-.001	15
222			min	-523.121	3	-3.627	4	.007	15	0	1	0	15	-.006	4
223		17	max	377.708	2	-1.032	15	.178	1	0	12	.002	1	-.001	15
224			min	-523.249	3	-4.394	4	.007	15	0	1	0	15	-.004	4
225		18	max	377.537	2	-1.213	15	.178	1	0	12	.002	1	0	15
226			min	-523.377	3	-5.161	4	.007	15	0	1	0	15	-.002	4
227		19	max	377.367	2	-1.393	15	.178	1	0	12	.002	1	0	1
228			min	-523.505	3	-5.929	4	.007	15	0	1	0	15	0	1
229	M4	1	max	1114.703	1	0	1	-.527	15	0	1	.001	1	0	1
230			min	-75.155	3	0	1	-12.795	1	0	1	0	15	0	1
231		2	max	1114.873	1	0	1	-.527	15	0	1	0	12	0	1
232			min	-75.027	3	0	1	-12.795	1	0	1	0	1	0	1
233		3	max	1115.043	1	0	1	-.527	15	0	1	0	15	0	1
234			min	-74.899	3	0	1	-12.795	1	0	1	-.002	1	0	1
235		4	max	1115.214	1	0	1	-.527	15	0	1	0	15	0	1
236			min	-74.771	3	0	1	-12.795	1	0	1	-.003	1	0	1
237		5	max	1115.384	1	0	1	-.527	15	0	1	0	15	0	1
238			min	-74.644	3	0	1	-12.795	1	0	1	-.005	1	0	1
239		6	max	1115.554	1	0	1	-.527	15	0	1	0	15	0	1
240			min	-74.516	3	0	1	-12.795	1	0	1	-.006	1	0	1
241		7	max	1115.725	1	0	1	-.527	15	0	1	0	15	0	1
242			min	-74.388	3	0	1	-12.795	1	0	1	-.008	1	0	1
243		8	max	1115.895	1	0	1	-.527	15	0	1	0	15	0	1
244			min	-74.26	3	0	1	-12.795	1	0	1	-.009	1	0	1
245		9	max	1116.065	1	0	1	-.527	15	0	1	0	15	0	1
246			min	-74.133	3	0	1	-12.795	1	0	1	-.01	1	0	1
247		10	max	1116.236	1	0	1	-.527	15	0	1	0	15	0	1
248			min	-74.005	3	0	1	-12.795	1	0	1	-.012	1	0	1
249		11	max	1116.406	1	0	1	-.527	15	0	1	0	15	0	1
250			min	-73.877	3	0	1	-12.795	1	0	1	-.013	1	0	1
251		12	max	1116.576	1	0	1	-.527	15	0	1	0	15	0	1
252			min	-73.749	3	0	1	-12.795	1	0	1	-.015	1	0	1
253		13	max	1116.747	1	0	1	-.527	15	0	1	0	15	0	1
254			min	-73.622	3	0	1	-12.795	1	0	1	-.016	1	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
255		14	max	1116.917	1	0	1	-.527	15	0	1	0	15	0	1
256			min	-73.494	3	0	1	-12.795	1	0	1	-.018	1	0	1
257		15	max	1117.088	1	0	1	-.527	15	0	1	0	15	0	1
258			min	-73.366	3	0	1	-12.795	1	0	1	-.019	1	0	1
259		16	max	1117.258	1	0	1	-.527	15	0	1	0	15	0	1
260			min	-73.238	3	0	1	-12.795	1	0	1	-.021	1	0	1
261		17	max	1117.428	1	0	1	-.527	15	0	1	0	15	0	1
262			min	-73.111	3	0	1	-12.795	1	0	1	-.022	1	0	1
263		18	max	1117.599	1	0	1	-.527	15	0	1	0	15	0	1
264			min	-72.983	3	0	1	-12.795	1	0	1	-.024	1	0	1
265		19	max	1117.769	1	0	1	-.527	15	0	1	-.001	15	0	1
266			min	-72.855	3	0	1	-12.795	1	0	1	-.025	1	0	1
267	M6	1	max	3113.77	1	2.152	2	0	1	0	1	0	1	0	1
268			min	-3042.534	3	.289	12	0	1	0	1	0	1	0	1
269		2	max	3114.198	1	2.107	2	0	1	0	1	0	1	0	12
270			min	-3042.213	3	.267	12	0	1	0	1	0	1	0	2
271		3	max	3114.627	1	2.063	2	0	1	0	1	0	1	0	12
272			min	-3041.891	3	.245	12	0	1	0	1	0	1	-.001	2
273		4	max	3115.055	1	2.019	2	0	1	0	1	0	1	0	12
274			min	-3041.57	3	.223	12	0	1	0	1	0	1	-.002	2
275		5	max	3115.484	1	1.975	2	0	1	0	1	0	1	0	12
276			min	-3041.248	3	.201	12	0	1	0	1	0	1	-.002	2
277		6	max	3115.912	1	1.93	2	0	1	0	1	0	1	0	12
278			min	-3040.927	3	.179	12	0	1	0	1	0	1	-.003	2
279		7	max	3116.341	1	1.886	2	0	1	0	1	0	1	0	12
280			min	-3040.606	3	.157	12	0	1	0	1	0	1	-.004	2
281		8	max	3116.769	1	1.842	2	0	1	0	1	0	1	0	12
282			min	-3040.284	3	.124	3	0	1	0	1	0	1	-.004	2
283		9	max	3117.198	1	1.798	2	0	1	0	1	0	1	0	12
284			min	-3039.963	3	.091	3	0	1	0	1	0	1	-.005	2
285		10	max	3117.626	1	1.753	2	0	1	0	1	0	1	0	12
286			min	-3039.642	3	.058	3	0	1	0	1	0	1	-.005	2
287		11	max	3118.054	1	1.709	2	0	1	0	1	0	1	0	12
288			min	-3039.32	3	.024	3	0	1	0	1	0	1	-.006	2
289		12	max	3118.483	1	1.665	2	0	1	0	1	0	1	0	12
290			min	-3038.999	3	-.009	3	0	1	0	1	0	1	-.006	2
291		13	max	3118.911	1	1.621	2	0	1	0	1	0	1	0	12
292			min	-3038.678	3	-.042	3	0	1	0	1	0	1	-.007	2
293		14	max	3119.34	1	1.576	2	0	1	0	1	0	1	0	3
294			min	-3038.356	3	-.075	3	0	1	0	1	0	1	-.007	2
295		15	max	3119.768	1	1.532	2	0	1	0	1	0	1	0	3
296			min	-3038.035	3	-.108	3	0	1	0	1	0	1	-.007	2
297		16	max	3120.197	1	1.488	2	0	1	0	1	0	1	0	3
298			min	-3037.713	3	-.142	3	0	1	0	1	0	1	-.008	2
299		17	max	3120.625	1	1.444	2	0	1	0	1	0	1	0	3
300			min	-3037.392	3	-.175	3	0	1	0	1	0	1	-.008	2
301		18	max	3121.054	1	1.399	2	0	1	0	1	0	1	0	3
302			min	-3037.071	3	-.208	3	0	1	0	1	0	1	-.009	2
303		19	max	3121.482	1	1.355	2	0	1	0	1	0	1	0	3
304			min	-3036.749	3	-.241	3	0	1	0	1	0	1	-.009	2
305	M7	1	max	1582.574	2	7.92	4	0	1	0	1	0	1	.009	2
306			min	-1635.399	3	1.859	15	0	1	0	1	0	1	0	3
307		2	max	1582.404	2	7.153	4	0	1	0	1	0	1	.007	2
308			min	-1635.526	3	1.679	15	0	1	0	1	0	1	-.001	3
309		3	max	1582.234	2	6.386	4	0	1	0	1	0	1	.004	2
310			min	-1635.654	3	1.498	15	0	1	0	1	0	1	-.003	3
311		4	max	1582.063	2	5.618	4	0	1	0	1	0	1	.002	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
312			min	-1635.782	3	1.318	15	0	1	0	1	0	1	-.004	3
313		5	max	1581.893	2	4.851	4	0	1	0	1	0	1	0	2
314			min	-1635.91	3	1.137	15	0	1	0	1	0	1	-.005	3
315		6	max	1581.723	2	4.084	4	0	1	0	1	0	1	-.001	15
316			min	-1636.037	3	.957	15	0	1	0	1	0	1	-.006	3
317		7	max	1581.552	2	3.317	4	0	1	0	1	0	1	-.002	15
318			min	-1636.165	3	.777	15	0	1	0	1	0	1	-.007	3
319		8	max	1581.382	2	2.55	4	0	1	0	1	0	1	-.002	15
320			min	-1636.293	3	.596	15	0	1	0	1	0	1	-.008	4
321		9	max	1581.211	2	1.813	2	0	1	0	1	0	1	-.002	15
322			min	-1636.421	3	.362	12	0	1	0	1	0	1	-.009	4
323		10	max	1581.041	2	1.215	2	0	1	0	1	0	1	-.002	15
324			min	-1636.548	3	.04	3	0	1	0	1	0	1	-.009	4
325		11	max	1580.871	2	.617	2	0	1	0	1	0	1	-.002	15
326			min	-1636.676	3	-.408	3	0	1	0	1	0	1	-.009	4
327		12	max	1580.7	2	.019	2	0	1	0	1	0	1	-.002	15
328			min	-1636.804	3	-.857	3	0	1	0	1	0	1	-.009	4
329		13	max	1580.53	2	-.305	15	0	1	0	1	0	1	-.002	15
330			min	-1636.932	3	-1.305	3	0	1	0	1	0	1	-.009	4
331		14	max	1580.36	2	-.486	15	0	1	0	1	0	1	-.002	15
332			min	-1637.059	3	-2.054	4	0	1	0	1	0	1	-.008	4
333		15	max	1580.189	2	-.666	15	0	1	0	1	0	1	-.002	15
334			min	-1637.187	3	-2.821	4	0	1	0	1	0	1	-.007	4
335		16	max	1580.019	2	-.846	15	0	1	0	1	0	1	-.001	15
336			min	-1637.315	3	-3.588	4	0	1	0	1	0	1	-.006	4
337		17	max	1579.849	2	-1.027	15	0	1	0	1	0	1	-.001	15
338			min	-1637.443	3	-4.355	4	0	1	0	1	0	1	-.004	4
339		18	max	1579.678	2	-1.207	15	0	1	0	1	0	1	0	15
340			min	-1637.57	3	-5.123	4	0	1	0	1	0	1	-.002	4
341		19	max	1579.508	2	-1.387	15	0	1	0	1	0	1	0	1
342			min	-1637.698	3	-5.89	4	0	1	0	1	0	1	0	1
343	M8	1	max	2975.172	1	0	1	0	1	0	1	0	1	0	1
344			min	-325.469	3	0	1	0	1	0	1	0	1	0	1
345		2	max	2975.342	1	0	1	0	1	0	1	0	1	0	1
346			min	-325.342	3	0	1	0	1	0	1	0	1	0	1
347		3	max	2975.513	1	0	1	0	1	0	1	0	1	0	1
348			min	-325.214	3	0	1	0	1	0	1	0	1	0	1
349		4	max	2975.683	1	0	1	0	1	0	1	0	1	0	1
350			min	-325.086	3	0	1	0	1	0	1	0	1	0	1
351		5	max	2975.853	1	0	1	0	1	0	1	0	1	0	1
352			min	-324.958	3	0	1	0	1	0	1	0	1	0	1
353		6	max	2976.024	1	0	1	0	1	0	1	0	1	0	1
354			min	-324.831	3	0	1	0	1	0	1	0	1	0	1
355		7	max	2976.194	1	0	1	0	1	0	1	0	1	0	1
356			min	-324.703	3	0	1	0	1	0	1	0	1	0	1
357		8	max	2976.364	1	0	1	0	1	0	1	0	1	0	1
358			min	-324.575	3	0	1	0	1	0	1	0	1	0	1
359		9	max	2976.535	1	0	1	0	1	0	1	0	1	0	1
360			min	-324.447	3	0	1	0	1	0	1	0	1	0	1
361		10	max	2976.705	1	0	1	0	1	0	1	0	1	0	1
362			min	-324.32	3	0	1	0	1	0	1	0	1	0	1
363		11	max	2976.875	1	0	1	0	1	0	1	0	1	0	1
364			min	-324.192	3	0	1	0	1	0	1	0	1	0	1
365		12	max	2977.046	1	0	1	0	1	0	1	0	1	0	1
366			min	-324.064	3	0	1	0	1	0	1	0	1	0	1
367		13	max	2977.216	1	0	1	0	1	0	1	0	1	0	1
368			min	-323.936	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	2977.386	1	0	1	0	1	0	1	0	1	0	1
370			min	-323.809	3	0	1	0	1	0	1	0	1	0	1
371		15	max	2977.557	1	0	1	0	1	0	1	0	1	0	1
372			min	-323.681	3	0	1	0	1	0	1	0	1	0	1
373		16	max	2977.727	1	0	1	0	1	0	1	0	1	0	1
374			min	-323.553	3	0	1	0	1	0	1	0	1	0	1
375		17	max	2977.897	1	0	1	0	1	0	1	0	1	0	1
376			min	-323.425	3	0	1	0	1	0	1	0	1	0	1
377		18	max	2978.068	1	0	1	0	1	0	1	0	1	0	1
378			min	-323.298	3	0	1	0	1	0	1	0	1	0	1
379		19	max	2978.238	1	0	1	0	1	0	1	0	1	0	1
380			min	-323.17	3	0	1	0	1	0	1	0	1	0	1
381	M10	1	max	963.712	1	1.92	4	-.034	15	0	1	0	1	0	1
382			min	-924.625	3	.452	15	-.814	1	0	5	0	3	0	1
383		2	max	964.141	1	1.863	4	-.034	15	0	1	0	15	0	15
384			min	-924.303	3	.439	15	-.814	1	0	5	0	1	0	4
385		3	max	964.569	1	1.806	4	-.034	15	0	1	0	15	0	15
386			min	-923.982	3	.426	15	-.814	1	0	5	0	1	-.001	4
387		4	max	964.998	1	1.75	4	-.034	15	0	1	0	15	0	15
388			min	-923.661	3	.412	15	-.814	1	0	5	0	1	-.002	4
389		5	max	965.426	1	1.693	4	-.034	15	0	1	0	15	0	15
390			min	-923.339	3	.399	15	-.814	1	0	5	0	1	-.002	4
391		6	max	965.855	1	1.636	4	-.034	15	0	1	0	15	0	15
392			min	-923.018	3	.385	15	-.814	1	0	5	-.001	1	-.003	4
393		7	max	966.283	1	1.579	4	-.034	15	0	1	0	15	0	15
394			min	-922.697	3	.372	15	-.814	1	0	5	-.001	1	-.003	4
395		8	max	966.712	1	1.523	4	-.034	15	0	1	0	15	0	15
396			min	-922.375	3	.359	15	-.814	1	0	5	-.002	1	-.003	4
397		9	max	967.14	1	1.466	4	-.034	15	0	1	0	15	0	15
398			min	-922.054	3	.345	15	-.814	1	0	5	-.002	1	-.004	4
399		10	max	967.569	1	1.409	4	-.034	15	0	1	0	15	-.001	15
400			min	-921.732	3	.332	15	-.814	1	0	5	-.002	1	-.004	4
401		11	max	967.997	1	1.352	4	-.034	15	0	1	0	15	-.001	15
402			min	-921.411	3	.319	15	-.814	1	0	5	-.002	1	-.005	4
403		12	max	968.426	1	1.295	4	-.034	15	0	1	0	15	-.001	15
404			min	-921.09	3	.305	15	-.814	1	0	5	-.003	1	-.005	4
405		13	max	968.854	1	1.239	4	-.034	15	0	1	0	15	-.001	15
406			min	-920.768	3	.292	15	-.814	1	0	5	-.003	1	-.006	4
407		14	max	969.283	1	1.182	4	-.034	15	0	1	0	15	-.001	15
408			min	-920.447	3	.279	15	-.814	1	0	5	-.003	1	-.006	4
409		15	max	969.711	1	1.125	4	-.034	15	0	1	0	15	-.001	15
410			min	-920.126	3	.265	15	-.814	1	0	5	-.003	1	-.006	4
411		16	max	970.14	1	1.068	4	-.034	15	0	1	0	15	-.002	15
412			min	-919.804	3	.252	15	-.814	1	0	5	-.004	1	-.007	4
413		17	max	970.568	1	1.011	4	-.034	15	0	1	0	15	-.002	15
414			min	-919.483	3	.239	15	-.814	1	0	5	-.004	1	-.007	4
415		18	max	970.997	1	.955	4	-.034	15	0	1	0	15	-.002	15
416			min	-919.162	3	.225	15	-.814	1	0	5	-.004	1	-.007	4
417		19	max	971.425	1	.898	4	-.034	15	0	1	0	15	-.002	15
418			min	-918.84	3	.208	12	-.814	1	0	5	-.004	1	-.007	4
419	M11	1	max	380.433	2	7.881	4	-.007	15	0	1	0	15	.007	4
420			min	-521.205	3	1.853	15	-.178	1	0	12	0	1	.002	15
421		2	max	380.263	2	7.114	4	-.007	15	0	1	0	15	.004	4
422			min	-521.333	3	1.673	15	-.178	1	0	12	0	1	0	12
423		3	max	380.093	2	6.347	4	-.007	15	0	1	0	15	.002	2
424			min	-521.461	3	1.493	15	-.178	1	0	12	0	1	0	3
425		4	max	379.922	2	5.58	4	-.007	15	0	1	0	15	0	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
426			min	-521.588	3	1.312	15	-.178	1	0	12	0	1	-.002	3
427		5	max	379.752	2	4.812	4	-.007	15	0	1	0	15	0	15
428			min	-521.716	3	1.132	15	-.178	1	0	12	0	1	-.003	4
429		6	max	379.582	2	4.045	4	-.007	15	0	1	0	15	-.001	15
430			min	-521.844	3	.952	15	-.178	1	0	12	0	1	-.005	4
431		7	max	379.411	2	3.278	4	-.007	15	0	1	0	15	-.002	15
432			min	-521.972	3	.771	15	-.178	1	0	12	0	1	-.007	4
433		8	max	379.241	2	2.511	4	-.007	15	0	1	0	15	-.002	15
434			min	-522.099	3	.591	15	-.178	1	0	12	0	1	-.008	4
435		9	max	379.071	2	1.744	4	-.007	15	0	1	0	15	-.002	15
436			min	-522.227	3	.41	15	-.178	1	0	12	-.001	1	-.009	4
437		10	max	378.9	2	.976	4	-.007	15	0	1	0	15	-.002	15
438			min	-522.355	3	.23	15	-.178	1	0	12	-.001	1	-.009	4
439		11	max	378.73	2	.283	2	-.007	15	0	1	0	15	-.002	15
440			min	-522.483	3	-.042	3	-.178	1	0	12	-.001	1	-.01	4
441		12	max	378.559	2	-.131	15	-.007	15	0	1	0	15	-.002	15
442			min	-522.61	3	-.558	4	-.178	1	0	12	-.001	1	-.01	4
443		13	max	378.389	2	-.311	15	-.007	15	0	1	0	15	-.002	15
444			min	-522.738	3	-1.325	4	-.178	1	0	12	-.001	1	-.009	4
445		14	max	378.219	2	-.491	15	-.007	15	0	1	0	15	-.002	15
446			min	-522.866	3	-2.093	4	-.178	1	0	12	-.001	1	-.008	4
447		15	max	378.048	2	-.672	15	-.007	15	0	1	0	15	-.002	15
448			min	-522.994	3	-2.86	4	-.178	1	0	12	-.001	1	-.007	4
449		16	max	377.878	2	-.852	15	-.007	15	0	1	0	15	-.001	15
450			min	-523.121	3	-3.627	4	-.178	1	0	12	-.002	1	-.006	4
451		17	max	377.708	2	-1.032	15	-.007	15	0	1	0	15	-.001	15
452			min	-523.249	3	-4.394	4	-.178	1	0	12	-.002	1	-.004	4
453		18	max	377.537	2	-1.213	15	-.007	15	0	1	0	15	0	15
454			min	-523.377	3	-5.161	4	-.178	1	0	12	-.002	1	-.002	4
455		19	max	377.367	2	-1.393	15	-.007	15	0	1	0	15	0	1
456			min	-523.505	3	-5.929	4	-.178	1	0	12	-.002	1	0	1
457	M12	1	max	1114.703	1	0	1	12.795	1	0	1	0	15	0	1
458			min	-75.155	3	0	1	.527	15	0	1	-.001	1	0	1
459		2	max	1114.873	1	0	1	12.795	1	0	1	0	1	0	1
460			min	-75.027	3	0	1	.527	15	0	1	0	12	0	1
461		3	max	1115.043	1	0	1	12.795	1	0	1	.002	1	0	1
462			min	-74.899	3	0	1	.527	15	0	1	0	15	0	1
463		4	max	1115.214	1	0	1	12.795	1	0	1	.003	1	0	1
464			min	-74.771	3	0	1	.527	15	0	1	0	15	0	1
465		5	max	1115.384	1	0	1	12.795	1	0	1	.005	1	0	1
466			min	-74.644	3	0	1	.527	15	0	1	0	15	0	1
467		6	max	1115.554	1	0	1	12.795	1	0	1	.006	1	0	1
468			min	-74.516	3	0	1	.527	15	0	1	0	15	0	1
469		7	max	1115.725	1	0	1	12.795	1	0	1	.008	1	0	1
470			min	-74.388	3	0	1	.527	15	0	1	0	15	0	1
471		8	max	1115.895	1	0	1	12.795	1	0	1	.009	1	0	1
472			min	-74.26	3	0	1	.527	15	0	1	0	15	0	1
473		9	max	1116.065	1	0	1	12.795	1	0	1	.01	1	0	1
474			min	-74.133	3	0	1	.527	15	0	1	0	15	0	1
475		10	max	1116.236	1	0	1	12.795	1	0	1	.012	1	0	1
476			min	-74.005	3	0	1	.527	15	0	1	0	15	0	1
477		11	max	1116.406	1	0	1	12.795	1	0	1	.013	1	0	1
478			min	-73.877	3	0	1	.527	15	0	1	0	15	0	1
479		12	max	1116.576	1	0	1	12.795	1	0	1	.015	1	0	1
480			min	-73.749	3	0	1	.527	15	0	1	0	15	0	1
481		13	max	1116.747	1	0	1	12.795	1	0	1	.016	1	0	1
482			min	-73.622	3	0	1	.527	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	1116.917	1	0	1	12.795	1	0	1	.018	1	0	1
484			min	-73.494	3	0	1	.527	15	0	1	0	15	0	1
485		15	max	1117.088	1	0	1	12.795	1	0	1	.019	1	0	1
486			min	-73.366	3	0	1	.527	15	0	1	0	15	0	1
487		16	max	1117.258	1	0	1	12.795	1	0	1	.021	1	0	1
488			min	-73.238	3	0	1	.527	15	0	1	0	15	0	1
489		17	max	1117.428	1	0	1	12.795	1	0	1	.022	1	0	1
490			min	-73.111	3	0	1	.527	15	0	1	0	15	0	1
491		18	max	1117.599	1	0	1	12.795	1	0	1	.024	1	0	1
492			min	-72.983	3	0	1	.527	15	0	1	0	15	0	1
493		19	max	1117.769	1	0	1	12.795	1	0	1	.025	1	0	1
494			min	-72.855	3	0	1	.527	15	0	1	.001	15	0	1
495	M1	1	max	190.162	1	514.579	3	-5.228	15	0	1	.303	1	0	3
496			min	7.83	15	-429.671	1	-126.421	1	0	3	.012	15	-.011	1
497		2	max	190.767	1	513.605	3	-5.228	15	0	1	.236	1	.216	1
498			min	8.013	15	-430.969	1	-126.421	1	0	3	.01	15	-.271	3
499		3	max	316.645	3	476.334	1	-5.195	15	0	3	.169	1	.433	1
500			min	-191.284	2	-362.105	3	-125.889	1	0	1	.007	15	-.531	3
501		4	max	317.099	3	475.036	1	-5.195	15	0	3	.103	1	.182	1
502			min	-190.679	2	-363.079	3	-125.889	1	0	1	.004	15	-.34	3
503		5	max	317.553	3	473.738	1	-5.195	15	0	3	.036	1	-.003	15
504			min	-190.074	2	-364.052	3	-125.889	1	0	1	.001	15	-.148	3
505		6	max	318.008	3	472.439	1	-5.195	15	0	3	-.001	15	.044	3
506			min	-189.468	2	-365.026	3	-125.889	1	0	1	-.03	1	-.318	1
507		7	max	318.462	3	471.141	1	-5.195	15	0	3	-.004	15	.237	3
508			min	-188.863	2	-366	3	-125.889	1	0	1	-.097	1	-.567	1
509		8	max	318.916	3	469.843	1	-5.195	15	0	3	-.007	15	.43	3
510			min	-188.258	2	-366.973	3	-125.889	1	0	1	-.163	1	-.816	1
511		9	max	332.097	3	32.828	2	-7.524	15	0	9	.095	1	.504	3
512			min	-108.544	2	.396	15	-182.174	1	0	3	.004	15	-.929	1
513		10	max	332.551	3	31.529	2	-7.524	15	0	9	0	15	.489	3
514			min	-107.938	2	.004	15	-182.174	1	0	3	-.001	1	-.939	1
515		11	max	333.005	3	30.231	2	-7.524	15	0	9	-.004	15	.475	3
516			min	-107.333	2	-1.58	4	-182.174	1	0	3	-.097	1	-.947	1
517		12	max	346.136	3	230.586	3	-5.067	15	0	1	.161	1	.413	3
518			min	-62.271	10	-504.383	1	-122.894	1	0	3	.007	15	-.836	1
519		13	max	346.59	3	229.612	3	-5.067	15	0	1	.096	1	.292	3
520			min	-61.767	10	-505.681	1	-122.894	1	0	3	.004	15	-.57	1
521		14	max	347.044	3	228.639	3	-5.067	15	0	1	.031	1	.171	3
522			min	-61.262	10	-506.979	1	-122.894	1	0	3	.001	15	-.303	1
523		15	max	347.498	3	227.665	3	-5.067	15	0	1	-.001	15	.05	3
524			min	-60.758	10	-508.278	1	-122.894	1	0	3	-.034	1	-.035	1
525		16	max	347.952	3	226.691	3	-5.067	15	0	1	-.004	15	.242	2
526			min	-60.253	10	-509.576	1	-122.894	1	0	3	-.098	1	-.069	3
527		17	max	348.406	3	225.718	3	-5.067	15	0	1	-.007	15	.503	1
528			min	-59.749	10	-510.874	1	-122.894	1	0	3	-.163	1	-.189	3
529		18	max	-8.02	15	497.786	1	-5.586	15	0	3	-.01	15	.252	1
530			min	-190.976	1	-190.47	3	-135.176	1	0	2	-.233	1	-.094	3
531		19	max	-7.837	15	496.487	1	-5.586	15	0	3	-.013	15	.007	3
532			min	-190.371	1	-191.444	3	-135.176	1	0	2	-.304	1	-.01	1
533	M5	1	max	409.132	1	1714.029	3	0	1	0	1	0	1	.023	1
534			min	16.017	12	-1449.145	1	0	1	0	1	0	1	0	3
535		2	max	409.737	1	1713.056	3	0	1	0	1	0	1	.788	1
536			min	16.32	12	-1450.443	1	0	1	0	1	0	1	-.904	3
537		3	max	1019.76	3	1468.266	1	0	1	0	1	0	1	1.518	1
538			min	-703.702	2	-1175.603	3	0	1	0	1	0	1	-1.773	3
539		4	max	1020.214	3	1466.968	1	0	1	0	1	0	1	.744	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	-703.096	2	-1176.576	3	0	1	0	1	0	1	-1.153	3
541		5	max	1020.668	3	1465.67	1	0	1	0	1	0	1	.005	9
542			min	-702.491	2	-1177.55	3	0	1	0	1	0	1	-.532	3
543		6	max	1021.122	3	1464.371	1	0	1	0	1	0	1	.09	3
544			min	-701.885	2	-1178.524	3	0	1	0	1	0	1	-.803	1
545		7	max	1021.576	3	1463.073	1	0	1	0	1	0	1	.712	3
546			min	-701.28	2	-1179.497	3	0	1	0	1	0	1	-1.575	1
547		8	max	1022.03	3	1461.775	1	0	1	0	1	0	1	1.335	3
548			min	-700.675	2	-1180.471	3	0	1	0	1	0	1	-2.347	1
549		9	max	1045.719	3	108.561	2	0	1	0	1	0	1	1.54	3
550			min	-537.593	2	.393	15	0	1	0	1	0	1	-2.655	1
551		10	max	1046.173	3	107.263	2	0	1	0	1	0	1	1.488	3
552			min	-536.988	2	.002	15	0	1	0	1	0	1	-2.686	1
553		11	max	1046.627	3	105.964	2	0	1	0	1	0	1	1.436	3
554			min	-536.382	2	-1.408	4	0	1	0	1	0	1	-2.716	1
555		12	max	1070.419	3	739.335	3	0	1	0	1	0	1	1.259	3
556			min	-373.31	2	-1578.861	1	0	1	0	1	0	1	-2.42	1
557		13	max	1070.873	3	738.361	3	0	1	0	1	0	1	.869	3
558			min	-372.705	2	-1580.159	1	0	1	0	1	0	1	-1.587	1
559		14	max	1071.327	3	737.388	3	0	1	0	1	0	1	.48	3
560			min	-372.099	2	-1581.457	1	0	1	0	1	0	1	-.753	1
561		15	max	1071.781	3	736.414	3	0	1	0	1	0	1	.136	2
562			min	-371.494	2	-1582.756	1	0	1	0	1	0	1	-.004	13
563		16	max	1072.235	3	735.44	3	0	1	0	1	0	1	.928	2
564			min	-370.889	2	-1584.054	1	0	1	0	1	0	1	-.297	3
565		17	max	1072.689	3	734.467	3	0	1	0	1	0	1	1.754	1
566			min	-370.283	2	-1585.352	1	0	1	0	1	0	1	-.685	3
567		18	max	-16.518	12	1679.826	1	0	1	0	1	0	1	.906	1
568			min	-409.318	1	-651.178	3	0	1	0	1	0	1	-.358	3
569		19	max	-16.215	12	1678.528	1	0	1	0	1	0	1	.02	1
570			min	-408.713	1	-652.152	3	0	1	0	1	0	1	-.014	3
571	M9	1	max	190.162	1	514.579	3	126.421	1	0	3	-.012	15	0	3
572			min	7.83	15	-429.671	1	5.228	15	0	1	-.303	1	-.011	1
573		2	max	190.767	1	513.605	3	126.421	1	0	3	-.01	15	.216	1
574			min	8.013	15	-430.969	1	5.228	15	0	1	-.236	1	-.271	3
575		3	max	316.645	3	476.334	1	125.889	1	0	1	-.007	15	.433	1
576			min	-191.284	2	-362.105	3	5.195	15	0	3	-.169	1	-.531	3
577		4	max	317.099	3	475.036	1	125.889	1	0	1	-.004	15	.182	1
578			min	-190.679	2	-363.079	3	5.195	15	0	3	-.103	1	-.34	3
579		5	max	317.553	3	473.738	1	125.889	1	0	1	-.001	15	-.003	15
580			min	-190.074	2	-364.052	3	5.195	15	0	3	-.036	1	-.148	3
581		6	max	318.008	3	472.439	1	125.889	1	0	1	.03	1	.044	3
582			min	-189.468	2	-365.026	3	5.195	15	0	3	.001	15	-.318	1
583		7	max	318.462	3	471.141	1	125.889	1	0	1	.097	1	.237	3
584			min	-188.863	2	-366	3	5.195	15	0	3	.004	15	-.567	1
585		8	max	318.916	3	469.843	1	125.889	1	0	1	.163	1	.43	3
586			min	-188.258	2	-366.973	3	5.195	15	0	3	.007	15	-.816	1
587		9	max	332.097	3	32.828	2	182.174	1	0	3	-.004	15	.504	3
588			min	-108.544	2	.396	15	7.524	15	0	9	-.095	1	-.929	1
589		10	max	332.551	3	31.529	2	182.174	1	0	3	.001	1	.489	3
590			min	-107.938	2	.004	15	7.524	15	0	9	0	15	-.939	1
591		11	max	333.005	3	30.231	2	182.174	1	0	3	.097	1	.475	3
592			min	-107.333	2	-1.58	4	7.524	15	0	9	.004	15	-.947	1
593		12	max	346.136	3	230.586	3	122.894	1	0	3	-.007	15	.413	3
594			min	-62.271	10	-504.383	1	5.067	15	0	1	-.161	1	-.836	1
595		13	max	346.59	3	229.612	3	122.894	1	0	3	-.004	15	.292	3
596			min	-61.767	10	-505.681	1	5.067	15	0	1	-.096	1	-.57	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	347.044	3	228.639	3	122.894	1	0	3	-.001	15	.171	3
598			min	-61.262	10	-506.979	1	5.067	15	0	1	-.031	1	-.303	1
599		15	max	347.498	3	227.665	3	122.894	1	0	3	.034	1	.05	3
600			min	-60.758	10	-508.278	1	5.067	15	0	1	.001	15	-.035	1
601		16	max	347.952	3	226.691	3	122.894	1	0	3	.098	1	.242	2
602			min	-60.253	10	-509.576	1	5.067	15	0	1	.004	15	-.069	3
603		17	max	348.406	3	225.718	3	122.894	1	0	3	.163	1	.503	1
604			min	-59.749	10	-510.874	1	5.067	15	0	1	.007	15	-.189	3
605		18	max	-8.02	15	497.786	1	135.176	1	0	2	.233	1	.252	1
606			min	-190.976	1	-190.47	3	5.586	15	0	3	.01	15	-.094	3
607		19	max	-7.837	15	496.487	1	135.176	1	0	2	.304	1	.007	3
608			min	-190.371	1	-191.444	3	5.586	15	0	3	.013	15	-.01	1

Envelope Member Section Deflections

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
1	M13	1	max	.001	1	.092	1	.006	3	7.45e-3	1	NC	1	NC	1
2			min	0	15	-.008	3	-.002	2	-7.542e-4	3	NC	1	NC	1
3		2	max	.001	1	.295	3	.054	1	8.634e-3	1	NC	5	NC	2
4			min	0	15	-.142	1	.002	15	-7.601e-4	3	851.483	3	5000.31	1
5		3	max	.001	1	.541	3	.13	1	9.818e-3	1	NC	5	NC	3
6			min	0	15	-.327	1	.005	15	-7.66e-4	3	470.428	3	2026.855	1
7		4	max	0	1	.69	3	.196	1	1.1e-2	1	NC	5	NC	3
8			min	0	15	-.433	1	.008	15	-7.719e-4	3	369.821	3	1334.791	1
9		5	max	0	1	.725	3	.23	1	1.219e-2	1	NC	5	NC	3
10			min	0	15	-.444	1	.01	15	-7.778e-4	3	352.205	3	1132.998	1
11		6	max	0	1	.648	3	.223	1	1.337e-2	1	NC	5	NC	3
12			min	0	15	-.362	1	.009	15	-7.837e-4	3	393.494	3	1169.49	1
13		7	max	0	1	.483	3	.176	1	1.455e-2	1	NC	5	NC	3
14			min	0	15	-.208	1	.007	15	-7.896e-4	3	526.32	3	1483.349	1
15		8	max	0	1	.272	3	.104	1	1.574e-2	1	NC	4	NC	3
16			min	0	15	-.02	1	.005	15	-7.955e-4	3	921.797	3	2540.487	1
17		9	max	0	1	.148	1	.032	1	1.692e-2	1	NC	4	NC	2
18			min	0	15	.005	15	-.003	10	-8.014e-4	3	2895.158	3	8812.784	1
19		10	max	0	1	.224	1	.018	3	1.811e-2	1	NC	3	NC	1
20			min	0	1	-.005	3	-.012	2	-8.073e-4	3	1966.304	1	NC	1
21		11	max	0	15	.148	1	.032	1	1.692e-2	1	NC	4	NC	2
22			min	0	1	.005	15	-.003	10	-8.014e-4	3	2895.158	3	8812.784	1
23		12	max	0	15	.272	3	.104	1	1.574e-2	1	NC	4	NC	3
24			min	0	1	-.02	1	.005	15	-7.955e-4	3	921.797	3	2540.487	1
25		13	max	0	15	.483	3	.176	1	1.455e-2	1	NC	5	NC	3
26			min	0	1	-.208	1	.007	15	-7.896e-4	3	526.32	3	1483.349	1
27		14	max	0	15	.648	3	.223	1	1.337e-2	1	NC	5	NC	3
28			min	0	1	-.362	1	.009	15	-7.837e-4	3	393.494	3	1169.49	1
29		15	max	0	15	.725	3	.23	1	1.219e-2	1	NC	5	NC	3
30			min	0	1	-.444	1	.01	15	-7.778e-4	3	352.205	3	1132.998	1
31		16	max	0	15	.69	3	.196	1	1.1e-2	1	NC	5	NC	3
32			min	0	1	-.433	1	.008	15	-7.719e-4	3	369.821	3	1334.791	1
33		17	max	0	15	.541	3	.13	1	9.818e-3	1	NC	5	NC	3
34			min	-.001	1	-.327	1	.005	15	-7.66e-4	3	470.428	3	2026.855	1
35		18	max	0	15	.295	3	.054	1	8.634e-3	1	NC	5	NC	2
36			min	-.001	1	-.142	1	.002	15	-7.601e-4	3	851.483	3	5000.31	1
37		19	max	0	15	.092	1	.006	3	7.45e-3	1	NC	1	NC	1
38			min	-.001	1	-.008	3	-.002	2	-7.542e-4	3	NC	1	NC	1
39	M14	1	max	0	1	.148	3	.005	3	4.681e-3	1	NC	1	NC	1
40			min	0	15	-.305	1	-.002	2	-2.688e-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	.425	3	.038	1	5.646e-3	1	NC	5	NC	2
42			min	0	15	-.652	1	.002	15	-3.295e-3	3	742.759	1	7237.42	1
43		3	max	0	1	.657	3	.105	1	6.611e-3	1	NC	15	NC	3
44			min	0	15	-.949	1	.004	15	-3.902e-3	3	400.761	1	2506.804	1
45		4	max	0	1	.814	3	.169	1	7.576e-3	1	NC	15	NC	3
46			min	0	15	-1.159	1	.007	15	-4.508e-3	3	301.999	1	1549.419	1
47		5	max	0	1	.882	3	.205	1	8.541e-3	1	9139.766	15	NC	3
48			min	0	15	-1.266	1	.009	15	-5.115e-3	3	268.354	1	1270.647	1
49		6	max	0	1	.861	3	.203	1	9.507e-3	1	9145.846	15	NC	3
50			min	0	15	-1.27	1	.009	15	-5.722e-3	3	267.358	1	1283.268	1
51		7	max	0	1	.768	3	.163	1	1.047e-2	1	NC	15	NC	3
52			min	0	15	-1.187	1	.007	15	-6.328e-3	3	292.394	1	1602.75	1
53		8	max	0	1	.633	3	.098	1	1.144e-2	1	NC	15	NC	3
54			min	0	15	-1.053	1	.004	15	-6.935e-3	3	344.793	1	2710.484	1
55		9	max	0	1	.505	3	.03	1	1.24e-2	1	NC	15	NC	2
56			min	0	15	-.92	1	-.003	10	-7.542e-3	3	419.592	1	9223.578	1
57		10	max	0	1	.446	3	.016	3	1.337e-2	1	NC	5	NC	1
58			min	0	1	-.857	1	-.01	2	-8.148e-3	3	467.569	1	NC	1
59		11	max	0	15	.505	3	.03	1	1.24e-2	1	NC	15	NC	2
60			min	0	1	-.92	1	-.003	10	-7.542e-3	3	419.592	1	9223.578	1
61		12	max	0	15	.633	3	.098	1	1.144e-2	1	NC	15	NC	3
62			min	0	1	-1.053	1	.004	15	-6.935e-3	3	344.793	1	2710.484	1
63		13	max	0	15	.768	3	.163	1	1.047e-2	1	NC	15	NC	3
64			min	0	1	-1.187	1	.007	15	-6.328e-3	3	292.394	1	1602.75	1
65		14	max	0	15	.861	3	.203	1	9.507e-3	1	9145.846	15	NC	3
66			min	0	1	-1.27	1	.009	15	-5.722e-3	3	267.358	1	1283.268	1
67		15	max	0	15	.882	3	.205	1	8.541e-3	1	9139.766	15	NC	3
68			min	0	1	-1.266	1	.009	15	-5.115e-3	3	268.354	1	1270.647	1
69		16	max	0	15	.814	3	.169	1	7.576e-3	1	NC	15	NC	3
70			min	0	1	-1.159	1	.007	15	-4.508e-3	3	301.999	1	1549.419	1
71		17	max	0	15	.657	3	.105	1	6.611e-3	1	NC	15	NC	3
72			min	0	1	-.949	1	.004	15	-3.902e-3	3	400.761	1	2506.804	1
73		18	max	0	15	.425	3	.038	1	5.646e-3	1	NC	5	NC	2
74			min	0	1	-.652	1	.002	15	-3.295e-3	3	742.759	1	7237.42	1
75		19	max	0	15	.148	3	.005	3	4.681e-3	1	NC	1	NC	1
76			min	0	1	-.305	1	-.002	2	-2.688e-3	3	NC	1	NC	1
77	M15	1	max	0	15	.152	3	.005	3	2.257e-3	3	NC	1	NC	1
78			min	0	1	-.304	1	-.002	2	-4.797e-3	1	NC	1	NC	1
79		2	max	0	15	.316	3	.038	1	2.77e-3	3	NC	5	NC	2
80			min	0	1	-.689	1	.002	15	-5.792e-3	1	670.498	1	7204.507	1
81		3	max	0	15	.458	3	.105	1	3.284e-3	3	NC	15	NC	3
82			min	0	1	-1.016	1	.004	15	-6.788e-3	1	362.623	1	2500.206	1
83		4	max	0	15	.561	3	.169	1	3.798e-3	3	NC	15	NC	3
84			min	0	1	-1.245	1	.007	15	-7.784e-3	1	274.376	1	1546.303	1
85		5	max	0	15	.616	3	.206	1	4.312e-3	3	9151.848	15	NC	3
86			min	0	1	-1.356	1	.009	15	-8.78e-3	1	245.362	1	1268.374	1
87		6	max	0	15	.625	3	.204	1	4.826e-3	3	9160.374	15	NC	3
88			min	0	1	-1.35	1	.009	15	-9.776e-3	1	246.823	1	1280.934	1
89		7	max	0	15	.594	3	.164	1	5.34e-3	3	NC	15	NC	3
90			min	0	1	-1.246	1	.007	15	-1.077e-2	1	273.93	1	1599.254	1
91		8	max	0	15	.539	3	.098	1	5.854e-3	3	NC	15	NC	3
92			min	0	1	-1.086	1	.004	15	-1.177e-2	1	330.175	1	2701.12	1
93		9	max	0	15	.482	3	.031	1	6.368e-3	3	NC	15	NC	2
94			min	0	1	-.928	1	-.003	10	-1.276e-2	1	413.361	1	9122.49	1
95		10	max	0	1	.455	3	.015	3	6.882e-3	3	NC	5	NC	1
96			min	0	1	-.855	1	-.01	2	-1.376e-2	1	468.851	1	NC	1
97		11	max	0	1	.482	3	.031	1	6.368e-3	3	NC	15	NC	2

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	-.928	1	-.003	10	-1.276e-2	1	413.361	1	9122.49	1
99		12	max	0	1	.539	3	.098	1	5.854e-3	3	NC	15	NC	3
100			min	0	15	-1.086	1	.004	15	-1.177e-2	1	330.175	1	2701.12	1
101		13	max	0	1	.594	3	.164	1	5.34e-3	3	NC	15	NC	3
102			min	0	15	-1.246	1	.007	15	-1.077e-2	1	273.93	1	1599.254	1
103		14	max	0	1	.625	3	.204	1	4.826e-3	3	9160.374	15	NC	3
104			min	0	15	-1.35	1	.009	15	-9.776e-3	1	246.823	1	1280.934	1
105		15	max	0	1	.616	3	.206	1	4.312e-3	3	9151.848	15	NC	3
106			min	0	15	-1.356	1	.009	15	-8.78e-3	1	245.362	1	1268.374	1
107		16	max	0	1	.561	3	.169	1	3.798e-3	3	NC	15	NC	3
108			min	0	15	-1.245	1	.007	15	-7.784e-3	1	274.376	1	1546.303	1
109		17	max	0	1	.458	3	.105	1	3.284e-3	3	NC	15	NC	3
110			min	0	15	-1.016	1	.004	15	-6.788e-3	1	362.623	1	2500.206	1
111		18	max	0	1	.316	3	.038	1	2.77e-3	3	NC	5	NC	2
112			min	0	15	-.689	1	.002	15	-5.792e-3	1	670.498	1	7204.507	1
113		19	max	0	1	.152	3	.005	3	2.257e-3	3	NC	1	NC	1
114			min	0	15	-.304	1	-.002	2	-4.797e-3	1	NC	1	NC	1
115	M16	1	max	0	15	.091	1	.004	3	3.97e-3	3	NC	1	NC	1
116			min	-.001	1	-.05	3	-.002	2	-6.975e-3	1	NC	1	NC	1
117		2	max	0	15	.05	3	.053	1	4.731e-3	3	NC	5	NC	2
118			min	-.001	1	-.193	2	.002	15	-8.042e-3	1	948.047	1	5035.175	1
119		3	max	0	15	.128	3	.129	1	5.492e-3	3	NC	5	NC	3
120			min	-.001	1	-.41	2	.005	15	-9.109e-3	1	527.635	1	2034.044	1
121		4	max	0	15	.171	3	.195	1	6.252e-3	3	NC	5	NC	3
122			min	0	1	-.536	2	.008	15	-1.018e-2	1	420.028	2	1337.124	1
123		5	max	0	15	.172	3	.23	1	7.013e-3	3	NC	5	NC	3
124			min	0	1	-.554	2	.01	15	-1.124e-2	1	408.202	2	1133.391	1
125		6	max	0	15	.132	3	.223	1	7.773e-3	3	NC	5	NC	3
126			min	0	1	-.466	2	.009	15	-1.231e-2	1	473.617	2	1168.083	1
127		7	max	0	15	.06	3	.177	1	8.534e-3	3	NC	5	NC	3
128			min	0	1	-.297	2	.007	15	-1.338e-2	1	688.075	2	1477.932	1
129		8	max	0	15	0	15	.104	1	9.294e-3	3	NC	3	NC	3
130			min	0	1	-.087	2	.005	15	-1.444e-2	1	1563.606	2	2516.284	1
131		9	max	0	15	.133	1	.032	1	1.005e-2	3	NC	2	NC	2
132			min	0	1	-.103	3	-.002	10	-1.551e-2	1	4854.603	3	8459.055	1
133		10	max	0	1	.219	1	.013	3	1.082e-2	3	NC	5	NC	1
134			min	0	1	-.137	3	-.009	2	-1.658e-2	1	2006.311	1	NC	1
135		11	max	0	1	.133	1	.032	1	1.005e-2	3	NC	2	NC	2
136			min	0	15	-.103	3	-.002	10	-1.551e-2	1	4854.603	3	8459.055	1
137		12	max	0	1	0	15	.104	1	9.294e-3	3	NC	3	NC	3
138			min	0	15	-.087	2	.005	15	-1.444e-2	1	1563.606	2	2516.284	1
139		13	max	0	1	.06	3	.177	1	8.534e-3	3	NC	5	NC	3
140			min	0	15	-.297	2	.007	15	-1.338e-2	1	688.075	2	1477.932	1
141		14	max	0	1	.132	3	.223	1	7.773e-3	3	NC	5	NC	3
142			min	0	15	-.466	2	.009	15	-1.231e-2	1	473.617	2	1168.083	1
143		15	max	0	1	.172	3	.23	1	7.013e-3	3	NC	5	NC	3
144			min	0	15	-.554	2	.01	15	-1.124e-2	1	408.202	2	1133.391	1
145		16	max	0	1	.171	3	.195	1	6.252e-3	3	NC	5	NC	3
146			min	0	15	-.536	2	.008	15	-1.018e-2	1	420.028	2	1337.124	1
147		17	max	.001	1	.128	3	.129	1	5.492e-3	3	NC	5	NC	3
148			min	0	15	-.41	2	.005	15	-9.109e-3	1	527.635	1	2034.044	1
149		18	max	.001	1	.05	3	.053	1	4.731e-3	3	NC	5	NC	2
150			min	0	15	-.193	2	.002	15	-8.042e-3	1	948.047	1	5035.175	1
151		19	max	.001	1	.091	1	.004	3	3.97e-3	3	NC	1	NC	1
152			min	0	15	-.05	3	-.002	2	-6.975e-3	1	NC	1	NC	1
153	M2	1	max	.006	1	.004	2	.01	1	-1.124e-5	15	NC	1	NC	2
154			min	-.006	3	-.008	3	0	15	-2.726e-4	1	NC	1	6426.661	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	.003	2	.009	1	-1.054e-5	15	NC	1	NC	2
156			min	-.005	3	-.008	3	0	15	-2.557e-4	1	NC	1	7010.809	1
157		3	max	.005	1	.003	2	.008	1	-9.844e-6	15	NC	1	NC	2
158			min	-.005	3	-.008	3	0	15	-2.388e-4	1	NC	1	7707.288	1
159		4	max	.005	1	.002	2	.007	1	-9.147e-6	15	NC	1	NC	2
160			min	-.005	3	-.007	3	0	15	-2.218e-4	1	NC	1	8545.965	1
161		5	max	.005	1	.001	2	.007	1	-8.449e-6	15	NC	1	NC	2
162			min	-.004	3	-.007	3	0	15	-2.049e-4	1	NC	1	9567.644	1
163		6	max	.004	1	0	2	.006	1	-7.752e-6	15	NC	1	NC	1
164			min	-.004	3	-.007	3	0	15	-1.88e-4	1	NC	1	NC	1
165		7	max	.004	1	0	2	.005	1	-7.054e-6	15	NC	1	NC	1
166			min	-.004	3	-.007	3	0	15	-1.711e-4	1	NC	1	NC	1
167		8	max	.004	1	0	2	.004	1	-6.357e-6	15	NC	1	NC	1
168			min	-.003	3	-.006	3	0	15	-1.541e-4	1	NC	1	NC	1
169		9	max	.003	1	0	2	.004	1	-5.659e-6	15	NC	1	NC	1
170			min	-.003	3	-.006	3	0	15	-1.372e-4	1	NC	1	NC	1
171		10	max	.003	1	0	15	.003	1	-4.962e-6	15	NC	1	NC	1
172			min	-.003	3	-.006	3	0	15	-1.203e-4	1	NC	1	NC	1
173		11	max	.003	1	0	15	.002	1	-4.265e-6	15	NC	1	NC	1
174			min	-.002	3	-.005	3	0	15	-1.034e-4	1	NC	1	NC	1
175		12	max	.002	1	0	15	.002	1	-3.567e-6	15	NC	1	NC	1
176			min	-.002	3	-.005	3	0	15	-8.644e-5	1	NC	1	NC	1
177		13	max	.002	1	0	15	.001	1	-2.87e-6	15	NC	1	NC	1
178			min	-.002	3	-.004	3	0	15	-6.951e-5	1	NC	1	NC	1
179		14	max	.002	1	0	15	.001	1	-2.172e-6	15	NC	1	NC	1
180			min	-.002	3	-.004	3	0	15	-5.259e-5	1	NC	1	NC	1
181		15	max	.001	1	0	15	0	1	-1.475e-6	15	NC	1	NC	1
182			min	-.001	3	-.003	4	0	15	-3.566e-5	1	NC	1	NC	1
183		16	max	0	1	0	15	0	1	-7.776e-7	15	NC	1	NC	1
184			min	0	3	-.003	4	0	15	-1.873e-5	1	NC	1	NC	1
185		17	max	0	1	0	15	0	1	-8.013e-8	15	NC	1	NC	1
186			min	0	3	-.002	4	0	15	-1.808e-6	1	NC	1	NC	1
187		18	max	0	1	0	15	0	1	1.512e-5	1	NC	1	NC	1
188			min	0	3	-.001	4	0	15	5.542e-7	12	NC	1	NC	1
189		19	max	0	1	0	1	0	1	3.204e-5	1	NC	1	NC	1
190			min	0	1	0	1	0	1	1.315e-6	15	NC	1	NC	1
191	M3	1	max	0	1	0	1	0	1	-4.327e-7	15	NC	1	NC	1
192			min	0	1	0	1	0	1	-1.054e-5	1	NC	1	NC	1
193		2	max	0	3	0	15	0	1	1.771e-5	1	NC	1	NC	1
194			min	0	2	-.002	4	0	15	7.303e-7	15	NC	1	NC	1
195		3	max	0	3	0	15	0	1	4.596e-5	1	NC	1	NC	1
196			min	0	2	-.004	4	0	15	1.893e-6	15	NC	1	NC	1
197		4	max	0	3	-.001	15	0	1	7.421e-5	1	NC	1	NC	1
198			min	0	2	-.006	4	0	15	3.056e-6	15	NC	1	NC	1
199		5	max	.001	3	-.002	15	0	1	1.025e-4	1	NC	1	NC	1
200			min	0	2	-.007	4	0	15	4.219e-6	15	NC	1	NC	1
201		6	max	.001	3	-.002	15	.001	1	1.307e-4	1	NC	1	NC	1
202			min	0	2	-.009	4	0	15	5.382e-6	15	NC	1	NC	1
203		7	max	.002	3	-.003	15	.001	1	1.59e-4	1	NC	1	NC	1
204			min	-.001	2	-.011	4	0	15	6.545e-6	15	8602.873	4	NC	1
205		8	max	.002	3	-.003	15	.002	1	1.872e-4	1	NC	1	NC	1
206			min	-.001	2	-.012	4	0	15	7.708e-6	15	7723.893	4	NC	1
207		9	max	.002	3	-.003	15	.002	1	2.155e-4	1	NC	2	NC	1
208			min	-.001	2	-.013	4	0	15	8.872e-6	15	7204.213	4	NC	1
209		10	max	.002	3	-.003	15	.003	1	2.437e-4	1	NC	3	NC	1
210			min	-.002	2	-.013	4	0	15	1.003e-5	15	6953.307	4	NC	1
211		11	max	.003	3	-.003	15	.003	1	2.719e-4	1	NC	3	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
212			min	-.002	2	-.014	4	0	15	1.12e-5	15	6934.212	4	NC	1
213		12	max	.003	3	-.003	15	.004	1	3.002e-4	1	NC	3	NC	1
214			min	-.002	2	-.013	4	0	15	1.236e-5	15	7149.359	4	NC	1
215		13	max	.003	3	-.003	15	.004	1	3.284e-4	1	NC	1	NC	1
216			min	-.002	2	-.012	4	0	15	1.352e-5	15	7643.317	4	NC	1
217		14	max	.003	3	-.003	15	.005	1	3.567e-4	1	NC	1	NC	1
218			min	-.002	2	-.011	4	0	15	1.469e-5	15	8525.899	4	NC	1
219		15	max	.004	3	-.002	15	.006	1	3.849e-4	1	NC	1	NC	1
220			min	-.003	2	-.01	4	0	15	1.585e-5	15	NC	1	NC	1
221		16	max	.004	3	-.002	15	.006	1	4.132e-4	1	NC	1	NC	1
222			min	-.003	2	-.008	4	0	15	1.701e-5	15	NC	1	NC	1
223		17	max	.004	3	-.001	15	.007	1	4.414e-4	1	NC	1	NC	1
224			min	-.003	2	-.006	1	0	15	1.818e-5	15	NC	1	NC	1
225		18	max	.004	3	0	15	.008	1	4.697e-4	1	NC	1	NC	1
226			min	-.003	2	-.005	1	0	15	1.934e-5	15	NC	1	NC	1
227		19	max	.005	3	0	15	.009	1	4.979e-4	1	NC	1	NC	2
228			min	-.003	2	-.003	1	0	15	2.05e-5	15	NC	1	9752.687	1
229	M4	1	max	.003	1	.003	2	0	15	6.629e-5	1	NC	1	NC	3
230			min	0	3	-.005	3	-.009	1	2.74e-6	15	NC	1	2672.545	1
231		2	max	.003	1	.003	2	0	15	6.629e-5	1	NC	1	NC	3
232			min	0	3	-.004	3	-.009	1	2.74e-6	15	NC	1	2905.916	1
233		3	max	.002	1	.003	2	0	15	6.629e-5	1	NC	1	NC	3
234			min	0	3	-.004	3	-.008	1	2.74e-6	15	NC	1	3183.679	1
235		4	max	.002	1	.002	2	0	15	6.629e-5	1	NC	1	NC	3
236			min	0	3	-.004	3	-.007	1	2.74e-6	15	NC	1	3517.365	1
237		5	max	.002	1	.002	2	0	15	6.629e-5	1	NC	1	NC	3
238			min	0	3	-.004	3	-.006	1	2.74e-6	15	NC	1	3922.641	1
239		6	max	.002	1	.002	2	0	15	6.629e-5	1	NC	1	NC	2
240			min	0	3	-.003	3	-.006	1	2.74e-6	15	NC	1	4421.237	1
241		7	max	.002	1	.002	2	0	15	6.629e-5	1	NC	1	NC	2
242			min	0	3	-.003	3	-.005	1	2.74e-6	15	NC	1	5043.995	1
243		8	max	.002	1	.002	2	0	15	6.629e-5	1	NC	1	NC	2
244			min	0	3	-.003	3	-.004	1	2.74e-6	15	NC	1	5835.899	1
245		9	max	.001	1	.002	2	0	15	6.629e-5	1	NC	1	NC	2
246			min	0	3	-.003	3	-.004	1	2.74e-6	15	NC	1	6864.667	1
247		10	max	.001	1	.001	2	0	15	6.629e-5	1	NC	1	NC	2
248			min	0	3	-.002	3	-.003	1	2.74e-6	15	NC	1	8236.157	1
249		11	max	.001	1	.001	2	0	15	6.629e-5	1	NC	1	NC	1
250			min	0	3	-.002	3	-.002	1	2.74e-6	15	NC	1	NC	1
251		12	max	.001	1	.001	2	0	15	6.629e-5	1	NC	1	NC	1
252			min	0	3	-.002	3	-.002	1	2.74e-6	15	NC	1	NC	1
253		13	max	0	1	0	2	0	15	6.629e-5	1	NC	1	NC	1
254			min	0	3	-.002	3	-.001	1	2.74e-6	15	NC	1	NC	1
255		14	max	0	1	0	2	0	15	6.629e-5	1	NC	1	NC	1
256			min	0	3	-.001	3	-.001	1	2.74e-6	15	NC	1	NC	1
257		15	max	0	1	0	2	0	15	6.629e-5	1	NC	1	NC	1
258			min	0	3	-.001	3	0	1	2.74e-6	15	NC	1	NC	1
259		16	max	0	1	0	2	0	15	6.629e-5	1	NC	1	NC	1
260			min	0	3	0	3	0	1	2.74e-6	15	NC	1	NC	1
261		17	max	0	1	0	2	0	15	6.629e-5	1	NC	1	NC	1
262			min	0	3	0	3	0	1	2.74e-6	15	NC	1	NC	1
263		18	max	0	1	0	2	0	15	6.629e-5	1	NC	1	NC	1
264			min	0	3	0	3	0	1	2.74e-6	15	NC	1	NC	1
265		19	max	0	1	0	1	0	1	6.629e-5	1	NC	1	NC	1
266			min	0	1	0	1	0	1	2.74e-6	15	NC	1	NC	1
267	M6	1	max	.019	1	.018	2	0	1	0	1	NC	3	NC	1
268			min	-.018	3	-.025	3	0	1	0	1	3497.834	2	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
269		2	max	.018	1	.016	2	0	1	0	1	NC	3	NC	1
270			min	-.017	3	-.024	3	0	1	0	1	3853.061	2	NC	1
271		3	max	.017	1	.015	2	0	1	0	1	NC	3	NC	1
272			min	-.016	3	-.023	3	0	1	0	1	4284.7	2	NC	1
273		4	max	.016	1	.013	2	0	1	0	1	NC	3	NC	1
274			min	-.015	3	-.021	3	0	1	0	1	4815.495	2	NC	1
275		5	max	.015	1	.011	2	0	1	0	1	NC	1	NC	1
276			min	-.014	3	-.02	3	0	1	0	1	5477.633	2	NC	1
277		6	max	.014	1	.01	2	0	1	0	1	NC	1	NC	1
278			min	-.013	3	-.018	3	0	1	0	1	6317.898	2	NC	1
279		7	max	.013	1	.008	2	0	1	0	1	NC	1	NC	1
280			min	-.012	3	-.017	3	0	1	0	1	7406.461	2	NC	1
281		8	max	.011	1	.007	2	0	1	0	1	NC	1	NC	1
282			min	-.011	3	-.016	3	0	1	0	1	8852.603	2	NC	1
283		9	max	.01	1	.006	2	0	1	0	1	NC	1	NC	1
284			min	-.01	3	-.014	3	0	1	0	1	NC	1	NC	1
285		10	max	.009	1	.005	2	0	1	0	1	NC	1	NC	1
286			min	-.009	3	-.013	3	0	1	0	1	NC	1	NC	1
287		11	max	.008	1	.004	2	0	1	0	1	NC	1	NC	1
288			min	-.008	3	-.012	3	0	1	0	1	NC	1	NC	1
289		12	max	.007	1	.003	2	0	1	0	1	NC	1	NC	1
290			min	-.007	3	-.01	3	0	1	0	1	NC	1	NC	1
291		13	max	.006	1	.002	2	0	1	0	1	NC	1	NC	1
292			min	-.006	3	-.009	3	0	1	0	1	NC	1	NC	1
293		14	max	.005	1	.001	2	0	1	0	1	NC	1	NC	1
294			min	-.005	3	-.007	3	0	1	0	1	NC	1	NC	1
295		15	max	.004	1	0	2	0	1	0	1	NC	1	NC	1
296			min	-.004	3	-.006	3	0	1	0	1	NC	1	NC	1
297		16	max	.003	1	0	2	0	1	0	1	NC	1	NC	1
298			min	-.003	3	-.004	3	0	1	0	1	NC	1	NC	1
299		17	max	.002	1	0	2	0	1	0	1	NC	1	NC	1
300			min	-.002	3	-.003	3	0	1	0	1	NC	1	NC	1
301		18	max	.001	1	0	2	0	1	0	1	NC	1	NC	1
302			min	-.001	3	-.001	3	0	1	0	1	NC	1	NC	1
303		19	max	0	1	0	1	0	1	0	1	NC	1	NC	1
304			min	0	1	0	1	0	1	0	1	NC	1	NC	1
305	M7	1	max	0	1	0	1	0	1	0	1	NC	1	NC	1
306			min	0	1	0	1	0	1	0	1	NC	1	NC	1
307		2	max	0	3	0	15	0	1	0	1	NC	1	NC	1
308			min	0	2	-.002	3	0	1	0	1	NC	1	NC	1
309		3	max	.002	3	0	15	0	1	0	1	NC	1	NC	1
310			min	-.002	2	-.004	3	0	1	0	1	NC	1	NC	1
311		4	max	.002	3	-.001	15	0	1	0	1	NC	1	NC	1
312			min	-.002	2	-.006	3	0	1	0	1	NC	1	NC	1
313		5	max	.003	3	-.002	15	0	1	0	1	NC	1	NC	1
314			min	-.003	2	-.008	3	0	1	0	1	NC	1	NC	1
315		6	max	.004	3	-.002	15	0	1	0	1	NC	1	NC	1
316			min	-.004	2	-.01	3	0	1	0	1	NC	1	NC	1
317		7	max	.005	3	-.003	15	0	1	0	1	NC	1	NC	1
318			min	-.005	2	-.011	3	0	1	0	1	8822.976	4	NC	1
319		8	max	.006	3	-.003	15	0	1	0	1	NC	1	NC	1
320			min	-.005	2	-.012	4	0	1	0	1	7906.975	4	NC	1
321		9	max	.006	3	-.003	15	0	1	0	1	NC	1	NC	1
322			min	-.006	2	-.013	4	0	1	0	1	7363.744	4	NC	1
323		10	max	.007	3	-.003	15	0	1	0	1	NC	1	NC	1
324			min	-.007	2	-.014	4	0	1	0	1	7098.218	4	NC	1
325		11	max	.008	3	-.003	15	0	1	0	1	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
326			min	-.008	2	-.014	4	0	1	0	1	7071.131	4	NC	1
327		12	max	.009	3	-.003	15	0	1	0	1	NC	1	NC	1
328			min	-.008	2	-.013	4	0	1	0	1	7283.938	4	NC	1
329		13	max	.01	3	-.003	15	0	1	0	1	NC	1	NC	1
330			min	-.009	2	-.013	4	0	1	0	1	7781.289	4	NC	1
331		14	max	.01	3	-.003	15	0	1	0	1	NC	1	NC	1
332			min	-.01	2	-.012	4	0	1	0	1	8674.332	4	NC	1
333		15	max	.011	3	-.002	15	0	1	0	1	NC	1	NC	1
334			min	-.011	2	-.01	4	0	1	0	1	NC	1	NC	1
335		16	max	.012	3	-.002	15	0	1	0	1	NC	1	NC	1
336			min	-.011	2	-.009	1	0	1	0	1	NC	1	NC	1
337		17	max	.013	3	-.001	15	0	1	0	1	NC	1	NC	1
338			min	-.012	2	-.008	1	0	1	0	1	NC	1	NC	1
339		18	max	.013	3	0	15	0	1	0	1	NC	1	NC	1
340			min	-.013	2	-.007	1	0	1	0	1	NC	1	NC	1
341		19	max	.014	3	0	15	0	1	0	1	NC	1	NC	1
342			min	-.014	2	-.005	1	0	1	0	1	NC	1	NC	1
343	M8	1	max	.007	1	.013	2	0	1	0	1	NC	1	NC	1
344			min	0	3	-.015	3	0	1	0	1	NC	1	NC	1
345		2	max	.007	1	.012	2	0	1	0	1	NC	1	NC	1
346			min	0	3	-.014	3	0	1	0	1	NC	1	NC	1
347		3	max	.006	1	.011	2	0	1	0	1	NC	1	NC	1
348			min	0	3	-.013	3	0	1	0	1	NC	1	NC	1
349		4	max	.006	1	.011	2	0	1	0	1	NC	1	NC	1
350			min	0	3	-.012	3	0	1	0	1	NC	1	NC	1
351		5	max	.006	1	.01	2	0	1	0	1	NC	1	NC	1
352			min	0	3	-.011	3	0	1	0	1	NC	1	NC	1
353		6	max	.005	1	.009	2	0	1	0	1	NC	1	NC	1
354			min	0	3	-.011	3	0	1	0	1	NC	1	NC	1
355		7	max	.005	1	.008	2	0	1	0	1	NC	1	NC	1
356			min	0	3	-.01	3	0	1	0	1	NC	1	NC	1
357		8	max	.004	1	.008	2	0	1	0	1	NC	1	NC	1
358			min	0	3	-.009	3	0	1	0	1	NC	1	NC	1
359		9	max	.004	1	.007	2	0	1	0	1	NC	1	NC	1
360			min	0	3	-.008	3	0	1	0	1	NC	1	NC	1
361		10	max	.004	1	.006	2	0	1	0	1	NC	1	NC	1
362			min	0	3	-.007	3	0	1	0	1	NC	1	NC	1
363		11	max	.003	1	.006	2	0	1	0	1	NC	1	NC	1
364			min	0	3	-.006	3	0	1	0	1	NC	1	NC	1
365		12	max	.003	1	.005	2	0	1	0	1	NC	1	NC	1
366			min	0	3	-.006	3	0	1	0	1	NC	1	NC	1
367		13	max	.002	1	.004	2	0	1	0	1	NC	1	NC	1
368			min	0	3	-.005	3	0	1	0	1	NC	1	NC	1
369		14	max	.002	1	.004	2	0	1	0	1	NC	1	NC	1
370			min	0	3	-.004	3	0	1	0	1	NC	1	NC	1
371		15	max	.002	1	.003	2	0	1	0	1	NC	1	NC	1
372			min	0	3	-.003	3	0	1	0	1	NC	1	NC	1
373		16	max	.001	1	.002	2	0	1	0	1	NC	1	NC	1
374			min	0	3	-.002	3	0	1	0	1	NC	1	NC	1
375		17	max	0	1	.001	2	0	1	0	1	NC	1	NC	1
376			min	0	3	-.002	3	0	1	0	1	NC	1	NC	1
377		18	max	0	1	0	2	0	1	0	1	NC	1	NC	1
378			min	0	3	0	3	0	1	0	1	NC	1	NC	1
379		19	max	0	1	0	1	0	1	0	1	NC	1	NC	1
380			min	0	1	0	1	0	1	0	1	NC	1	NC	1
381	M10	1	max	.006	1	.004	2	0	15	2.726e-4	1	NC	1	NC	2
382			min	-.006	3	-.008	3	-.01	1	1.124e-5	15	NC	1	6426.661	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	.003	2	0	15	2.557e-4	1	NC	1	NC	2
384			min	-.005	3	-.008	3	-.009	1	1.054e-5	15	NC	1	7010.809	1
385		3	max	.005	1	.003	2	0	15	2.388e-4	1	NC	1	NC	2
386			min	-.005	3	-.008	3	-.008	1	9.844e-6	15	NC	1	7707.288	1
387		4	max	.005	1	.002	2	0	15	2.218e-4	1	NC	1	NC	2
388			min	-.005	3	-.007	3	-.007	1	9.147e-6	15	NC	1	8545.965	1
389		5	max	.005	1	.001	2	0	15	2.049e-4	1	NC	1	NC	2
390			min	-.004	3	-.007	3	-.007	1	8.449e-6	15	NC	1	9567.644	1
391		6	max	.004	1	0	2	0	15	1.88e-4	1	NC	1	NC	1
392			min	-.004	3	-.007	3	-.006	1	7.752e-6	15	NC	1	NC	1
393		7	max	.004	1	0	2	0	15	1.711e-4	1	NC	1	NC	1
394			min	-.004	3	-.007	3	-.005	1	7.054e-6	15	NC	1	NC	1
395		8	max	.004	1	0	2	0	15	1.541e-4	1	NC	1	NC	1
396			min	-.003	3	-.006	3	-.004	1	6.357e-6	15	NC	1	NC	1
397		9	max	.003	1	0	2	0	15	1.372e-4	1	NC	1	NC	1
398			min	-.003	3	-.006	3	-.004	1	5.659e-6	15	NC	1	NC	1
399		10	max	.003	1	0	15	0	15	1.203e-4	1	NC	1	NC	1
400			min	-.003	3	-.006	3	-.003	1	4.962e-6	15	NC	1	NC	1
401		11	max	.003	1	0	15	0	15	1.034e-4	1	NC	1	NC	1
402			min	-.002	3	-.005	3	-.002	1	4.265e-6	15	NC	1	NC	1
403		12	max	.002	1	0	15	0	15	8.644e-5	1	NC	1	NC	1
404			min	-.002	3	-.005	3	-.002	1	3.567e-6	15	NC	1	NC	1
405		13	max	.002	1	0	15	0	15	6.951e-5	1	NC	1	NC	1
406			min	-.002	3	-.004	3	-.001	1	2.87e-6	15	NC	1	NC	1
407		14	max	.002	1	0	15	0	15	5.259e-5	1	NC	1	NC	1
408			min	-.002	3	-.004	3	-.001	1	2.172e-6	15	NC	1	NC	1
409		15	max	.001	1	0	15	0	15	3.566e-5	1	NC	1	NC	1
410			min	-.001	3	-.003	4	0	1	1.475e-6	15	NC	1	NC	1
411		16	max	0	1	0	15	0	15	1.873e-5	1	NC	1	NC	1
412			min	0	3	-.003	4	0	1	7.776e-7	15	NC	1	NC	1
413		17	max	0	1	0	15	0	15	1.808e-6	1	NC	1	NC	1
414			min	0	3	-.002	4	0	1	8.013e-8	15	NC	1	NC	1
415		18	max	0	1	0	15	0	15	-5.542e-7	12	NC	1	NC	1
416			min	0	3	-.001	4	0	1	-1.512e-5	1	NC	1	NC	1
417		19	max	0	1	0	1	0	1	-1.315e-6	15	NC	1	NC	1
418			min	0	1	0	1	0	1	-3.204e-5	1	NC	1	NC	1
419	M11	1	max	0	1	0	1	0	1	1.054e-5	1	NC	1	NC	1
420			min	0	1	0	1	0	1	4.327e-7	15	NC	1	NC	1
421		2	max	0	3	0	15	0	15	-7.303e-7	15	NC	1	NC	1
422			min	0	2	-.002	4	0	1	-1.771e-5	1	NC	1	NC	1
423		3	max	0	3	0	15	0	15	-1.893e-6	15	NC	1	NC	1
424			min	0	2	-.004	4	0	1	-4.596e-5	1	NC	1	NC	1
425		4	max	0	3	-.001	15	0	15	-3.056e-6	15	NC	1	NC	1
426			min	0	2	-.006	4	0	1	-7.421e-5	1	NC	1	NC	1
427		5	max	.001	3	-.002	15	0	15	-4.219e-6	15	NC	1	NC	1
428			min	0	2	-.007	4	0	1	-1.025e-4	1	NC	1	NC	1
429		6	max	.001	3	-.002	15	0	15	-5.382e-6	15	NC	1	NC	1
430			min	0	2	-.009	4	-.001	1	-1.307e-4	1	NC	1	NC	1
431		7	max	.002	3	-.003	15	0	15	-6.545e-6	15	NC	1	NC	1
432			min	-.001	2	-.011	4	-.001	1	-1.59e-4	1	8602.873	4	NC	1
433		8	max	.002	3	-.003	15	0	15	-7.708e-6	15	NC	1	NC	1
434			min	-.001	2	-.012	4	-.002	1	-1.872e-4	1	7723.893	4	NC	1
435		9	max	.002	3	-.003	15	0	15	-8.872e-6	15	NC	2	NC	1
436			min	-.001	2	-.013	4	-.002	1	-2.155e-4	1	7204.213	4	NC	1
437		10	max	.002	3	-.003	15	0	15	-1.003e-5	15	NC	3	NC	1
438			min	-.002	2	-.013	4	-.003	1	-2.437e-4	1	6953.307	4	NC	1
439		11	max	.003	3	-.003	15	0	15	-1.12e-5	15	NC	3	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
440			min	-.002	2	-.014	4	-.003	1	-2.719e-4	1	6934.212	4	NC	1
441		12	max	.003	3	-.003	15	0	15	-1.236e-5	15	NC	3	NC	1
442			min	-.002	2	-.013	4	-.004	1	-3.002e-4	1	7149.359	4	NC	1
443		13	max	.003	3	-.003	15	0	15	-1.352e-5	15	NC	1	NC	1
444			min	-.002	2	-.012	4	-.004	1	-3.284e-4	1	7643.317	4	NC	1
445		14	max	.003	3	-.003	15	0	15	-1.469e-5	15	NC	1	NC	1
446			min	-.002	2	-.011	4	-.005	1	-3.567e-4	1	8525.899	4	NC	1
447		15	max	.004	3	-.002	15	0	15	-1.585e-5	15	NC	1	NC	1
448			min	-.003	2	-.01	4	-.006	1	-3.849e-4	1	NC	1	NC	1
449		16	max	.004	3	-.002	15	0	15	-1.701e-5	15	NC	1	NC	1
450			min	-.003	2	-.008	4	-.006	1	-4.132e-4	1	NC	1	NC	1
451		17	max	.004	3	-.001	15	0	15	-1.818e-5	15	NC	1	NC	1
452			min	-.003	2	-.006	1	-.007	1	-4.414e-4	1	NC	1	NC	1
453		18	max	.004	3	0	15	0	15	-1.934e-5	15	NC	1	NC	1
454			min	-.003	2	-.005	1	-.008	1	-4.697e-4	1	NC	1	NC	1
455		19	max	.005	3	0	15	0	15	-2.05e-5	15	NC	1	NC	2
456			min	-.003	2	-.003	1	-.009	1	-4.979e-4	1	NC	1	9752.687	1
457	M12	1	max	.003	1	.003	2	.009	1	-2.74e-6	15	NC	1	NC	3
458			min	0	3	-.005	3	0	15	-6.629e-5	1	NC	1	2672.545	1
459		2	max	.003	1	.003	2	.009	1	-2.74e-6	15	NC	1	NC	3
460			min	0	3	-.004	3	0	15	-6.629e-5	1	NC	1	2905.916	1
461		3	max	.002	1	.003	2	.008	1	-2.74e-6	15	NC	1	NC	3
462			min	0	3	-.004	3	0	15	-6.629e-5	1	NC	1	3183.679	1
463		4	max	.002	1	.002	2	.007	1	-2.74e-6	15	NC	1	NC	3
464			min	0	3	-.004	3	0	15	-6.629e-5	1	NC	1	3517.365	1
465		5	max	.002	1	.002	2	.006	1	-2.74e-6	15	NC	1	NC	3
466			min	0	3	-.004	3	0	15	-6.629e-5	1	NC	1	3922.641	1
467		6	max	.002	1	.002	2	.006	1	-2.74e-6	15	NC	1	NC	2
468			min	0	3	-.003	3	0	15	-6.629e-5	1	NC	1	4421.237	1
469		7	max	.002	1	.002	2	.005	1	-2.74e-6	15	NC	1	NC	2
470			min	0	3	-.003	3	0	15	-6.629e-5	1	NC	1	5043.995	1
471		8	max	.002	1	.002	2	.004	1	-2.74e-6	15	NC	1	NC	2
472			min	0	3	-.003	3	0	15	-6.629e-5	1	NC	1	5835.899	1
473		9	max	.001	1	.002	2	.004	1	-2.74e-6	15	NC	1	NC	2
474			min	0	3	-.003	3	0	15	-6.629e-5	1	NC	1	6864.667	1
475		10	max	.001	1	.001	2	.003	1	-2.74e-6	15	NC	1	NC	2
476			min	0	3	-.002	3	0	15	-6.629e-5	1	NC	1	8236.157	1
477		11	max	.001	1	.001	2	.002	1	-2.74e-6	15	NC	1	NC	1
478			min	0	3	-.002	3	0	15	-6.629e-5	1	NC	1	NC	1
479		12	max	.001	1	.001	2	.002	1	-2.74e-6	15	NC	1	NC	1
480			min	0	3	-.002	3	0	15	-6.629e-5	1	NC	1	NC	1
481		13	max	0	1	0	2	.001	1	-2.74e-6	15	NC	1	NC	1
482			min	0	3	-.002	3	0	15	-6.629e-5	1	NC	1	NC	1
483		14	max	0	1	0	2	.001	1	-2.74e-6	15	NC	1	NC	1
484			min	0	3	-.001	3	0	15	-6.629e-5	1	NC	1	NC	1
485		15	max	0	1	0	2	0	1	-2.74e-6	15	NC	1	NC	1
486			min	0	3	-.001	3	0	15	-6.629e-5	1	NC	1	NC	1
487		16	max	0	1	0	2	0	1	-2.74e-6	15	NC	1	NC	1
488			min	0	3	0	3	0	15	-6.629e-5	1	NC	1	NC	1
489		17	max	0	1	0	2	0	1	-2.74e-6	15	NC	1	NC	1
490			min	0	3	0	3	0	15	-6.629e-5	1	NC	1	NC	1
491		18	max	0	1	0	2	0	1	-2.74e-6	15	NC	1	NC	1
492			min	0	3	0	3	0	15	-6.629e-5	1	NC	1	NC	1
493		19	max	0	1	0	1	0	1	-2.74e-6	15	NC	1	NC	1
494			min	0	1	0	1	0	1	-6.629e-5	1	NC	1	NC	1
495	M1	1	max	.006	3	.092	1	.001	1	1.699e-2	1	NC	1	NC	1
496			min	-.002	2	-.008	3	0	15	-2.192e-2	3	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
497		2	max	.006	3	.045	1	0	15	8.238e-3	1	NC	3	NC	1
498			min	-.002	2	-.002	3	-.007	1	-1.085e-2	3	2407.919	1	NC	1
499		3	max	.006	3	.008	3	0	15	1.074e-5	10	NC	5	NC	1
500			min	-.002	2	-.007	2	-.01	1	-2.036e-4	1	1151.267	1	NC	1
501		4	max	.006	3	.029	3	0	15	4.45e-3	1	NC	5	NC	1
502			min	-.002	2	-.066	1	-.009	1	-3.771e-3	3	718.651	1	NC	1
503		5	max	.006	3	.056	3	0	15	9.103e-3	1	NC	15	NC	1
504			min	-.002	2	-.13	1	-.006	1	-7.435e-3	3	513.809	1	NC	1
505		6	max	.005	3	.087	3	0	15	1.376e-2	1	NC	15	NC	1
506			min	-.002	2	-.192	1	-.003	1	-1.11e-2	3	401.773	1	NC	1
507		7	max	.005	3	.116	3	0	1	1.841e-2	1	9885.775	15	NC	1
508			min	-.002	2	-.247	1	0	12	-1.476e-2	3	336.033	1	NC	1
509		8	max	.005	3	.141	3	.001	1	2.306e-2	1	8777.697	15	NC	1
510			min	-.002	2	-.292	1	0	15	-1.843e-2	3	297.316	1	NC	1
511		9	max	.005	3	.157	3	0	15	2.543e-2	1	8200.43	15	NC	1
512			min	-.002	2	-.319	1	0	1	-1.837e-2	3	277.224	1	NC	1
513		10	max	.005	3	.163	3	0	1	2.628e-2	1	8024.715	15	NC	1
514			min	-.002	2	-.329	1	0	12	-1.584e-2	3	271.207	1	NC	1
515		11	max	.005	3	.159	3	0	1	2.712e-2	1	8200.192	15	NC	1
516			min	-.002	2	-.319	1	0	15	-1.33e-2	3	277.567	1	NC	1
517		12	max	.005	3	.145	3	0	15	2.563e-2	1	8777.201	15	NC	1
518			min	-.002	2	-.291	1	-.001	1	-1.091e-2	3	298.394	1	NC	1
519		13	max	.005	3	.124	3	0	15	2.063e-2	1	9884.903	15	NC	1
520			min	-.002	2	-.245	1	0	1	-8.732e-3	3	338.715	1	NC	1
521		14	max	.005	3	.096	3	.002	1	1.563e-2	1	NC	15	NC	1
522			min	-.002	2	-.188	1	0	15	-6.553e-3	3	407.575	1	NC	1
523		15	max	.004	3	.065	3	.006	1	1.063e-2	1	NC	15	NC	1
524			min	-.002	2	-.126	1	0	15	-4.373e-3	3	525.84	1	NC	1
525		16	max	.004	3	.033	3	.009	1	5.63e-3	1	NC	5	NC	1
526			min	-.002	2	-.062	1	0	15	-2.194e-3	3	744.149	1	NC	1
527		17	max	.004	3	.003	3	.009	1	6.284e-4	1	NC	5	NC	1
528			min	-.002	2	-.004	2	0	15	-1.408e-5	3	1209.295	1	NC	1
529		18	max	.004	3	.046	1	.006	1	1.002e-2	1	NC	4	NC	1
530			min	-.002	2	-.024	3	0	15	-3.562e-3	3	2555.858	1	NC	1
531		19	max	.004	3	.091	1	0	15	1.974e-2	1	NC	1	NC	1
532			min	-.002	2	-.05	3	-.001	1	-7.243e-3	3	NC	1	NC	1
533	M5	1	max	.018	3	.224	1	0	1	0	1	NC	1	NC	1
534			min	-.012	2	-.005	3	0	1	0	1	NC	1	NC	1
535		2	max	.018	3	.108	1	0	1	0	1	NC	5	NC	1
536			min	-.012	2	.002	3	0	1	0	1	983.466	1	NC	1
537		3	max	.018	3	.027	3	0	1	0	1	NC	15	NC	1
538			min	-.012	2	-.024	1	0	1	0	1	460.351	1	NC	1
539		4	max	.017	3	.084	3	0	1	0	1	9218.093	15	NC	1
540			min	-.011	2	-.184	1	0	1	0	1	279.819	1	NC	1
541		5	max	.017	3	.165	3	0	1	0	1	6455.156	15	NC	1
542			min	-.011	2	-.359	1	0	1	0	1	195.862	1	NC	1
543		6	max	.017	3	.257	3	0	1	0	1	4972.195	15	NC	1
544			min	-.011	2	-.533	1	0	1	0	1	150.778	1	NC	1
545		7	max	.016	3	.347	3	0	1	0	1	4115.307	15	NC	1
546			min	-.011	2	-.692	1	0	1	0	1	124.717	1	NC	1
547		8	max	.016	3	.422	3	0	1	0	1	3616.86	15	NC	1
548			min	-.01	2	-.818	1	0	1	0	1	109.554	1	NC	1
549		9	max	.016	3	.471	3	0	1	0	1	3361.163	15	NC	1
550			min	-.01	2	-.898	1	0	1	0	1	101.778	1	NC	1
551		10	max	.015	3	.489	3	0	1	0	1	3284.117	15	NC	1
552			min	-.01	2	-.924	1	0	1	0	1	99.462	1	NC	1
553		11	max	.015	3	.476	3	0	1	0	1	3361.244	15	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
554			min	-.01	2	-.897	1	0	1	0	1	101.916	1	NC	1
555		12	max	.015	3	.435	3	0	1	0	1	3617.055	15	NC	1
556			min	-.01	2	-.815	1	0	1	0	1	110.009	1	NC	1
557		13	max	.014	3	.369	3	0	1	0	1	4115.715	15	NC	1
558			min	-.01	2	-.685	1	0	1	0	1	125.9	1	NC	1
559		14	max	.014	3	.286	3	0	1	0	1	4973.01	15	NC	1
560			min	-.01	2	-.522	1	0	1	0	1	153.437	1	NC	1
561		15	max	.014	3	.193	3	0	1	0	1	6456.787	15	NC	1
562			min	-.009	2	-.345	1	0	1	0	1	201.615	1	NC	1
563		16	max	.013	3	.098	3	0	1	0	1	9221.538	15	NC	1
564			min	-.009	2	-.169	1	0	1	0	1	292.663	1	NC	1
565		17	max	.013	3	.009	3	0	1	0	1	NC	15	NC	1
566			min	-.009	2	-.013	2	0	1	0	1	491.452	1	NC	1
567		18	max	.013	3	.113	1	0	1	0	1	NC	5	NC	1
568			min	-.009	2	-.068	3	0	1	0	1	1066.522	1	NC	1
569		19	max	.013	3	.219	1	0	1	0	1	NC	1	NC	1
570			min	-.009	2	-.137	3	0	1	0	1	NC	1	NC	1
571	M9	1	max	.006	3	.092	1	0	15	2.192e-2	3	NC	1	NC	1
572			min	-.002	2	-.008	3	-.001	1	-1.699e-2	1	NC	1	NC	1
573		2	max	.006	3	.045	1	.007	1	1.085e-2	3	NC	3	NC	1
574			min	-.002	2	-.002	3	0	15	-8.238e-3	1	2407.919	1	NC	1
575		3	max	.006	3	.008	3	.01	1	2.036e-4	1	NC	5	NC	1
576			min	-.002	2	-.007	2	0	15	-1.074e-5	10	1151.267	1	NC	1
577		4	max	.006	3	.029	3	.009	1	3.771e-3	3	NC	5	NC	1
578			min	-.002	2	-.066	1	0	15	-4.45e-3	1	718.651	1	NC	1
579		5	max	.006	3	.056	3	.006	1	7.435e-3	3	NC	15	NC	1
580			min	-.002	2	-.13	1	0	15	-9.103e-3	1	513.809	1	NC	1
581		6	max	.005	3	.087	3	.003	1	1.11e-2	3	NC	15	NC	1
582			min	-.002	2	-.192	1	0	15	-1.376e-2	1	401.773	1	NC	1
583		7	max	.005	3	.116	3	0	12	1.476e-2	3	9885.775	15	NC	1
584			min	-.002	2	-.247	1	0	1	-1.841e-2	1	336.033	1	NC	1
585		8	max	.005	3	.141	3	0	15	1.843e-2	3	8777.697	15	NC	1
586			min	-.002	2	-.292	1	-.001	1	-2.306e-2	1	297.316	1	NC	1
587		9	max	.005	3	.157	3	0	1	1.837e-2	3	8200.43	15	NC	1
588			min	-.002	2	-.319	1	0	15	-2.543e-2	1	277.224	1	NC	1
589		10	max	.005	3	.163	3	0	12	1.584e-2	3	8024.715	15	NC	1
590			min	-.002	2	-.329	1	0	1	-2.628e-2	1	271.207	1	NC	1
591		11	max	.005	3	.159	3	0	15	1.33e-2	3	8200.192	15	NC	1
592			min	-.002	2	-.319	1	0	1	-2.712e-2	1	277.567	1	NC	1
593		12	max	.005	3	.145	3	.001	1	1.091e-2	3	8777.201	15	NC	1
594			min	-.002	2	-.291	1	0	15	-2.563e-2	1	298.394	1	NC	1
595		13	max	.005	3	.124	3	0	1	8.732e-3	3	9884.903	15	NC	1
596			min	-.002	2	-.245	1	0	15	-2.063e-2	1	338.715	1	NC	1
597		14	max	.005	3	.096	3	0	15	6.553e-3	3	NC	15	NC	1
598			min	-.002	2	-.188	1	-.002	1	-1.563e-2	1	407.575	1	NC	1
599		15	max	.004	3	.065	3	0	15	4.373e-3	3	NC	15	NC	1
600			min	-.002	2	-.126	1	-.006	1	-1.063e-2	1	525.84	1	NC	1
601		16	max	.004	3	.033	3	0	15	2.194e-3	3	NC	5	NC	1
602			min	-.002	2	-.062	1	-.009	1	-5.63e-3	1	744.149	1	NC	1
603		17	max	.004	3	.003	3	0	15	1.408e-5	3	NC	5	NC	1
604			min	-.002	2	-.004	2	-.009	1	-6.284e-4	1	1209.295	1	NC	1
605		18	max	.004	3	.046	1	0	15	3.562e-3	3	NC	4	NC	1
606			min	-.002	2	-.024	3	-.006	1	-1.002e-2	1	2555.858	1	NC	1
607		19	max	.004	3	.091	1	.001	1	7.243e-3	3	NC	1	NC	1
608			min	-.002	2	-.05	3	0	15	-1.974e-2	1	NC	1	NC	1

SIMPSON Strong-Tie

Anchor Designer™ Software
Version 2.4.5673.0

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

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

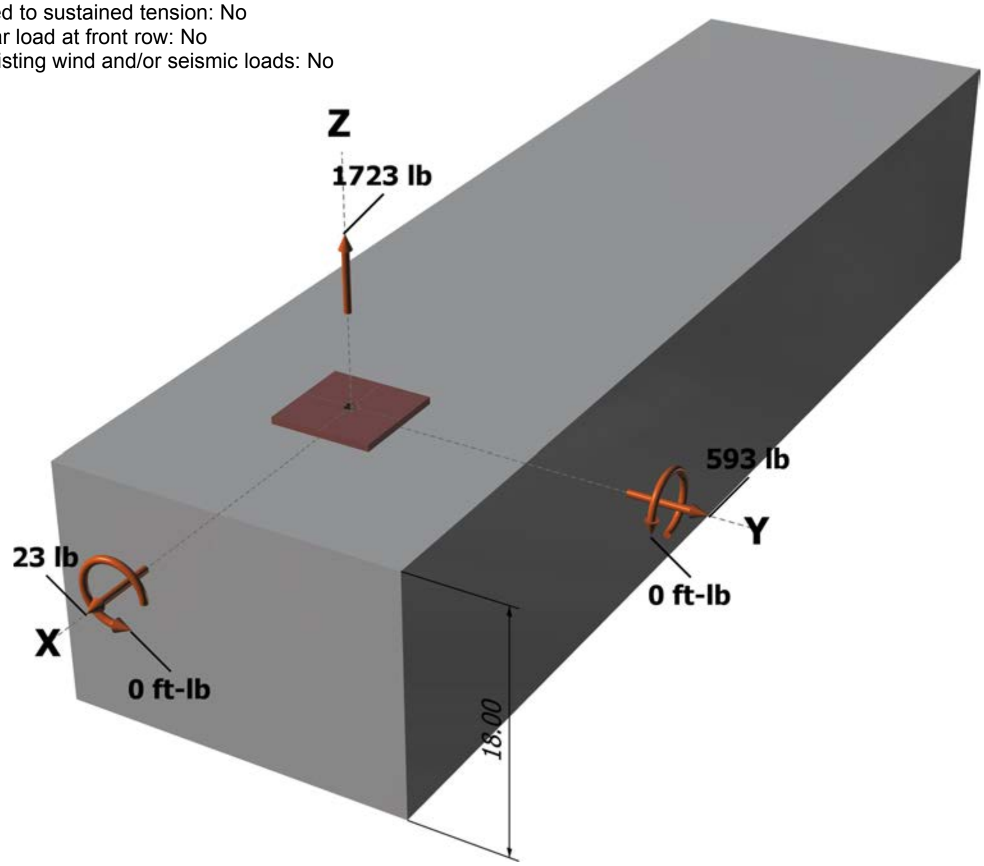
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

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

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

<Figure 1>



<Figure 2>

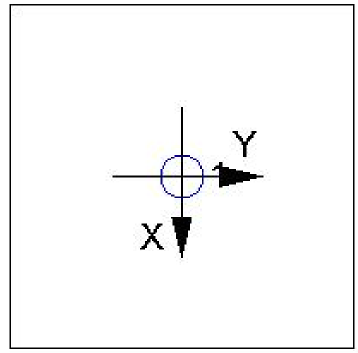
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

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

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

<Figure 3>



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in y-direction:

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

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

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

Shear parallel to edge in x-direction:

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

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

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

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

Shear parallel to edge in y-direction:

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

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

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

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

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

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

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

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

11. Results

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

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

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

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

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

12. Warnings

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

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

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

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

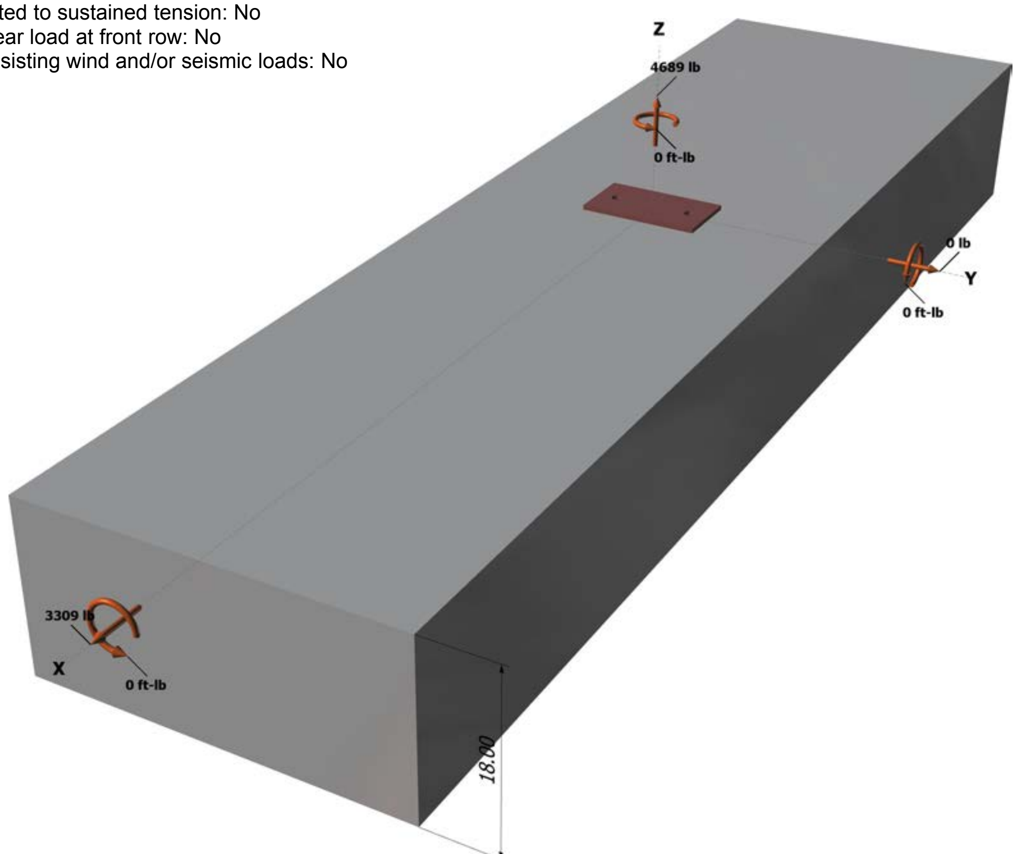
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

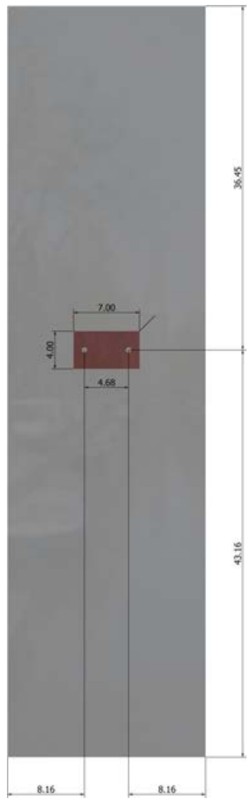
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout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

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

<Figure 1>



<Figure 2>



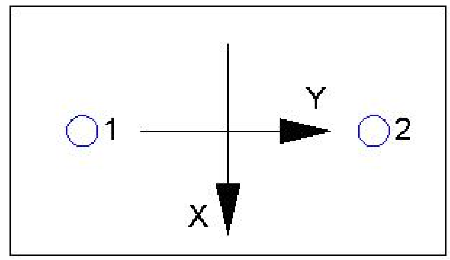
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	2344.5	1654.5	0.0	1654.5
2	2344.5	1654.5	0.0	1654.5
Sum	4689.0	3309.0	0.0	3309.0

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

<Figure 3>



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

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

Shear parallel to edge in x-direction:

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

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

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

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

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

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

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

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

ϕV_{cpg} (lb)
19833

11. Results

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

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

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

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

Sec. D.7.3	0.58	0.62	120.1 %	1.2	Pass

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

12. Warnings

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

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

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