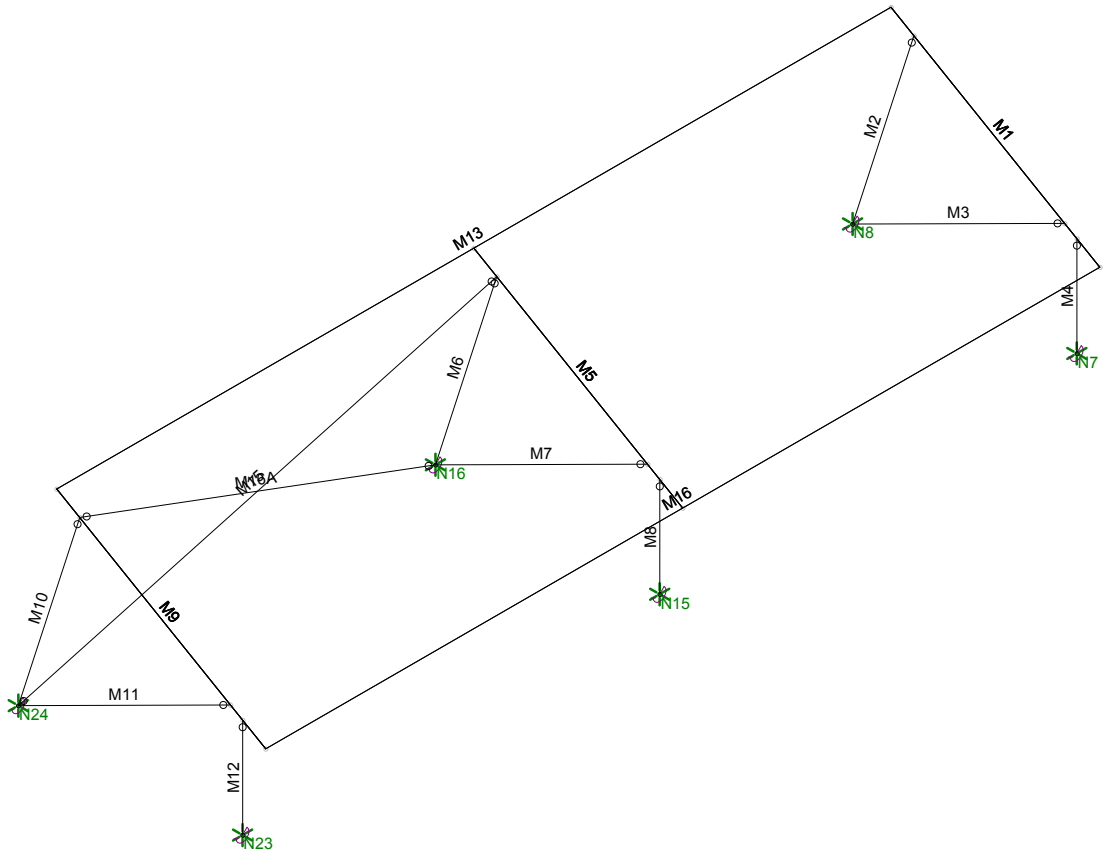


Schletter, Inc.		30° Tilt w/ Seismic Design
HCV	Standard PVMini Racking System	
	Representative Calculations - ASCE 7-05	

1. INTRODUCTION

1.1 Project Description

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

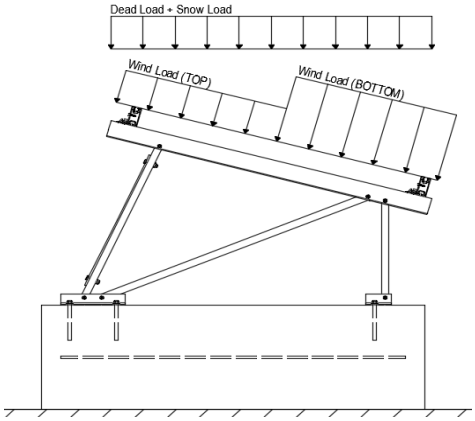
1.2 Construction

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	1550	mm
Width =	1050	mm	970	mm
Dead Load =	3.00	psf	1.75	psf

Modules Per Row =	1
Module Tilt =	30°
Maximum Height Above Grade =	3 ft



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

1.3 Technical Codes

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

2. LOAD ACTIONS

2.1 Permanent Loads

g_{MAX} =	3.00	psf	*Self-weight of the PV modules.*
g_{MIN} =	1.75	psf	

2.2 Snow Loads

Ground Snow Load, P_g =	30.00	psf	
Sloped Roof Snow Load, P_s =	16.49	psf	*(ASCE 7-05, Eq. 7-2)*
I_s =	1.00		
C_s =	0.73		
C_e =	0.90		
C_t =	1.20		

2.3 Wind Loads

Design Wind Speed, V =	100	mph	Exposure Category = C
Height ≤	15	ft	Importance Category = II
Peak Velocity Pressure, q_z =	15.70	psf	*Including the gust factor, G=0.85. (ASCE 7-05, Eq. 6-15)*

Pressure Coefficients

$Cf+_{TOP}$ =	1.15	*(Pressure)*	*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.*
$Cf+_{BOTTOM}$ =	1.85		
$Cf-_{TOP}$ =	-2.3	*(Suction)*	
$Cf-_{BOTTOM}$ =	-1.1		

2.4 Seismic Loads

S_S =	2.50	R =	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.*
S_{DS} =	1.67	C_S =	0.8	
S_1 =	1.00	ρ =	1.3	
S_{D1} =	1.00	Ω =	1.25	
T_a =	0.04	C_d =	1.25	

2.5 Combination of Loads

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

Strength Design, LRFD

Component stresses are checked using the following LRFD load combinations:

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

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

Allowable Stress Design, ASD

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

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

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

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

3. STRUCTURAL ANALYSIS

3.1 RISA Results

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

3.2 RISA Components

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

Purlins	Location
M13	Top
M16	Bottom

Girders	Location
M1	Outer
M5	Inner
M9	Outer

Front Struts	Location
M4	Outer
M8	Inner
M12	Outer

Diagonal Struts	Location
M3	Outer
M7	Inner
M11	Outer

Rear Struts	Location
M2	Outer
M6	Inner
M10	Outer

Bracing
M15
M16A

Front Reactions	Location
N7	Outer
N15	Inner
N23	Outer

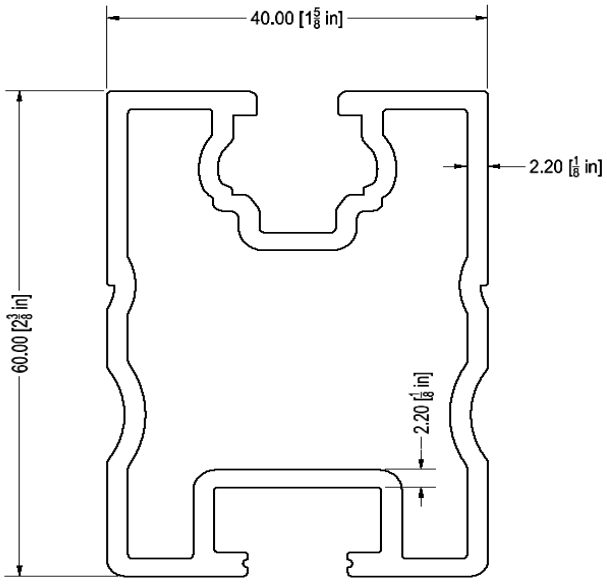
Rear Reactions	Location
N8	Outer
N16	Inner
N24	Outer

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).

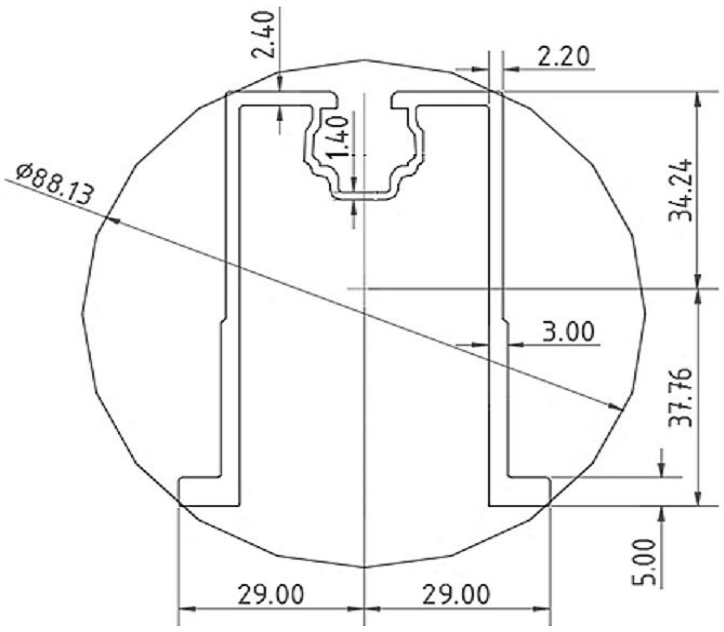
Purlin Type =	**ProfiPlus**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	69	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.01	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	28.47	ksi
S_y =	0.51	in^3
S_x =	0.37	in^3
E =	10100	ksi
I_y =	0.60	in^4
I_x =	0.29	in^4
A =	0.90	in^2
g =	1.08	lbs/ft
M_y =	0.553	k-ft
M_z =	0.134	k-ft
$M_{y\ allowable}$ =	1.234	k-ft
$M_{z\ allowable}$ =	0.871	k-ft
Utilization =	60%	



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).

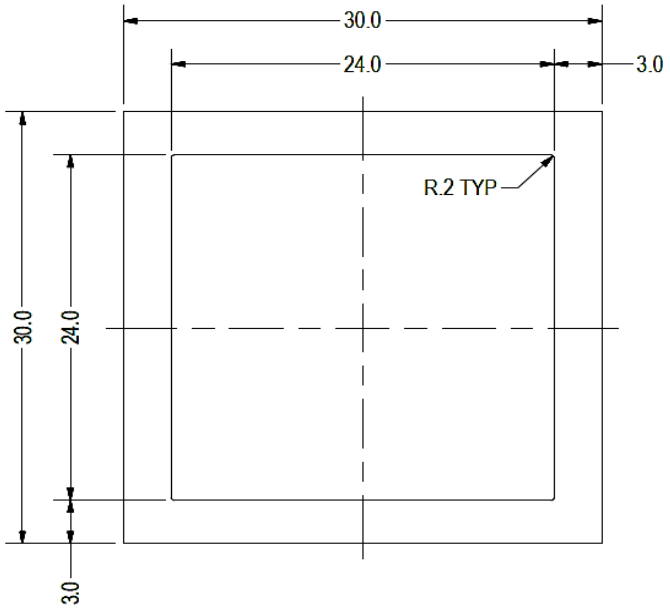
Girder Type =	**Flex Profi**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	33.78	in
$\Phi F_{ty\ AXIAL}$ =	14.29	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.41	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	13.46	ksi
S_y =	0.59	in^3
S_x =	0.46	in^3
E =	10100	ksi
I_y =	0.88	in^4
I_x =	0.52	in^4
A =	0.89	in^2
g =	1.07	lbs/ft
M_y =	0.584	k-ft
M_z =	0.000	k-ft
P_n =	0.301	k
$M_{y\ allowable}$ =	1.443	k-ft
$M_{z\ allowable}$ =	0.513	k-ft
$P_{n\ allowable}$ =	12.764	k
Utilization =	43%	



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 M8 bolts at each end. See Appendix A.3 for detailed member calculations. Section units are in (mm).

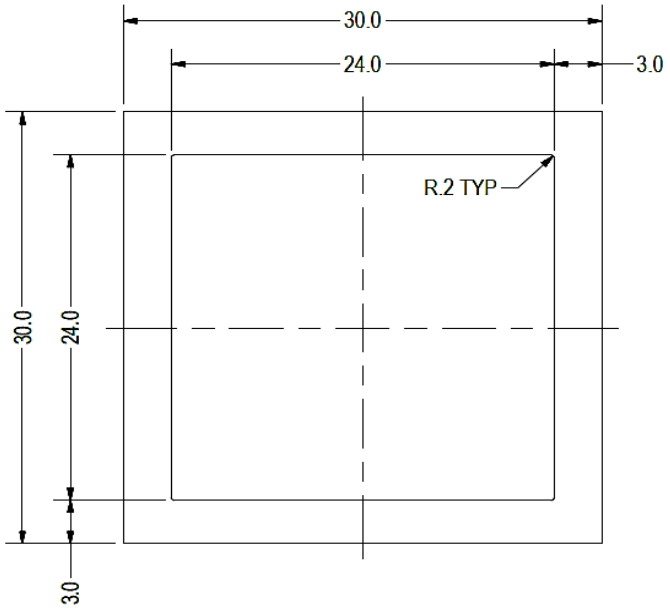
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	18.00	in
$\Phi F_{ty\ AXIAL}$ =	24.52	ksi
$\Phi F_{ty\ BENDING}$ =	31.19	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	-0.039	k-ft
P_n =	0.199	k
$M_{y\ allowable}$ =	0.423	k-ft
$M_{z\ allowable}$ =	0.423	k-ft
$P_{n\ allowable}$ =	12.310	k
Utilization =	11%	



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 M8 bolts at each end. See Appendix A.4 for detailed member calculations. Section units are in (mm).

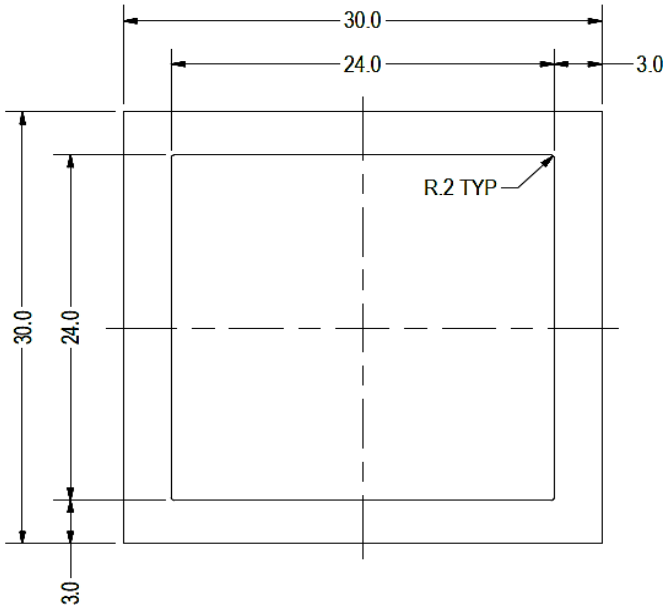
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	46.38	in
$\Phi F_{ty\ AXIAL}$ =	7.60	ksi
$\Phi F_{ty\ BENDING}$ =	29.80	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.628	k
$M_{y\ allowable}$ =	0.404	k-ft
$M_{z\ allowable}$ =	0.404	k-ft
$P_{n\ allowable}$ =	3.814	k
Utilization =	16%	



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 M8 bolts at each end. See Appendix A.5 for detailed member calculations. Section units are in (mm).

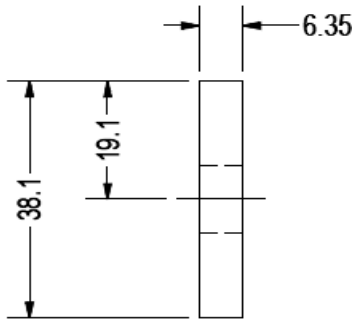
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	39.29	in
$\Phi F_{ty\ AXIAL}$ =	10.06	ksi
$\Phi F_{ty\ BENDING}$ =	30.09	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.799	k
$M_{y\ allowable}$ =	0.408	k-ft
$M_{z\ allowable}$ =	0.408	k-ft
$P_{n\ allowable}$ =	5.050	k
Utilization =	16%	



4.6 Cross Brace Design

In order to resist weak side loading, aluminum cross bracing kits are provided. The cross bracing is attached at one end of a rear aluminum strut diagonally down to the bottom end of an adjacent strut. Single M10 bolts are provided at each of the cross bracing. Section units are in (mm).

Brace Type =	**1.5x0.25**	
Aluminum Type =	6061-T6	
F_{ty} =	35	ksi
Φ =	0.90	
S_y =	0.02	in^3
E =	10100	ksi
I_y =	33.25	in^4
A =	0.38	in^2
g =	0.45	lbs/ft
M_y =	0.005	k-ft
P_n =	0.209	k
$M_{y\ allowable}$ =	0.046	k-ft
$P_{n\ allowable}$ =	11.813	k
Utilization =	13%	



A cross brace kit is required every 15 bays and is to be installed in centermost bays.

5. FOUNDATION DESIGN CALCULATIONS

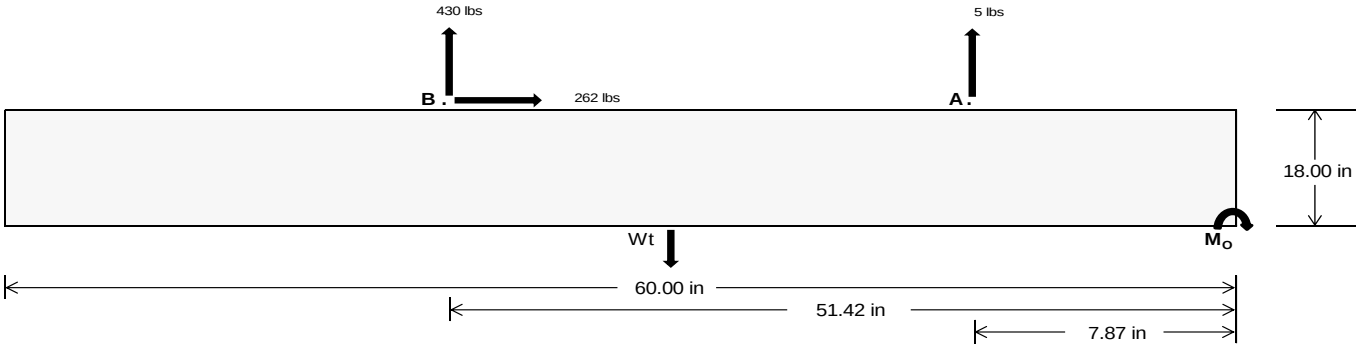
5.1 Helical Pile Foundations

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 =	25.41	1789.40	k
Compressive Load =	1250.56	1265.18	k
Lateral Load =	31.93	1090.59	k
Moment (Weak Axis) =	0.05	0.00	k

5.2 Design of Ballast Foundations

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



Concrete Properties

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

Overturning Check

M_O =	26843.1 in-lbs
Resisting Force Required =	894.77 lbs
S.F. =	1.67
Weight Required =	1491.28 lbs
Minimum Width =	22 in in
Weight Provided =	1993.75 lbs

Sliding

Force =	262.07 lbs
Friction =	0.4
Weight Required =	655.17 lbs
Resisting Weight =	1993.75 lbs
Additional Weight Required =	0 lbs

Cohesion

Sliding Force =	262.07 lbs
Cohesion =	130 psf
Area =	9.17 ft^2
Resisting =	996.88 lbs
Additional Weight Required =	0 lbs

Shear Key

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

Footing Reinforcement

Use fiber reinforcing with (1) #5 rebar.

A minimum 60in long x 22in wide x 18in tall ballast foundation is required to resist overturning.

Use a 60in long x 22in wide x 18in tall ballast foundation to resist sliding. Friction is OK.

Use a 60in long x 22in wide x 18in tall ballast foundation. Cohesion is OK.

Shear key is not required.

Bearing Pressure

	Ballast Width			
	22 in	23 in	24 in	25 in
P_{ftg} = (145 pcf)(5 ft)(1.5 ft)(1.83 ft) =	1994 lbs	2084 lbs	2175 lbs	2266 lbs

ASD LC	1.0D + 1.0S				1.0D + 1.0W				1.0D + 0.75L + 0.75W + 0.75S				0.6D + 1.0W			
Width	22 in	23 in	24 in	25 in	22 in	23 in	24 in	25 in	22 in	23 in	24 in	25 in	22 in	23 in	24 in	25 in
F_A	457 lbs	457 lbs	457 lbs	457 lbs	414 lbs	414 lbs	414 lbs	414 lbs	612 lbs	612 lbs	612 lbs	612 lbs	-10 lbs	-10 lbs	-10 lbs	-10 lbs
F_B	317 lbs	317 lbs	317 lbs	317 lbs	542 lbs	542 lbs	542 lbs	542 lbs	615 lbs	615 lbs	615 lbs	615 lbs	-859 lbs	-859 lbs	-859 lbs	-859 lbs
F_V	52 lbs	52 lbs	52 lbs	52 lbs	474 lbs	474 lbs	474 lbs	474 lbs	390 lbs	390 lbs	390 lbs	390 lbs	-524 lbs	-524 lbs	-524 lbs	-524 lbs
P_{total}	2768 lbs	2858 lbs	2949 lbs	3039 lbs	2950 lbs	3041 lbs	3131 lbs	3222 lbs	3220 lbs	3311 lbs	3401 lbs	3492 lbs	327 lbs	381 lbs	436 lbs	490 lbs
M	353 lbs-ft	353 lbs-ft	353 lbs-ft	353 lbs-ft	507 lbs-ft	507 lbs-ft	507 lbs-ft	507 lbs-ft	615 lbs-ft	615 lbs-ft	615 lbs-ft	615 lbs-ft	728 lbs-ft	728 lbs-ft	728 lbs-ft	728 lbs-ft
e	0.13 ft	0.12 ft	0.12 ft	0.12 ft	0.17 ft	0.17 ft	0.16 ft	0.16 ft	0.19 ft	0.19 ft	0.18 ft	0.18 ft	2.23 ft	1.91 ft	1.67 ft	1.49 ft
L/6	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft	0.83 ft
f_{min}	255.7 psf	254.1 psf	252.5 psf	251.1 psf	255.4 psf	253.8 psf	252.3 psf	250.9 psf	270.8 psf	268.4 psf	266.3 psf	264.4 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	348.1 psf	342.4 psf	337.2 psf	332.4 psf	388.2 psf	380.7 psf	373.9 psf	367.7 psf	431.8 psf	422.5 psf	414.0 psf	406.1 psf	436.1 psf	224.8 psf	175.3 psf	154.7 psf

Maximum Bearing Pressure = 436 psf
Allowable Bearing Pressure = 1500 psf

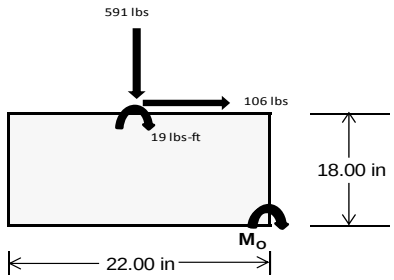
Use a 60in long x 22in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Seismic Design

Overturning Check

M_O =	363.0 ft-lbs
Resisting Force Required =	396.05 lbs
S.F. =	1.67
Weight Required =	660.08 lbs
Minimum Width =	22 in in
Weight Provided =	1993.75 lbs

A minimum 60in long x 22in wide x 18in tall ballast foundation is required to resist overturning.



Bearing Pressure

ASD LC	1.238D + 0.875E			1.1785D + 0.65625E + 0.75S			0.362D + 0.875E		
Width	22 in			22 in			22 in		
Support	Outer	Inner	Outer	Outer	Inner	Outer	Outer	Inner	Outer
F_Y	131 lbs	109 lbs	71 lbs	273 lbs	591 lbs	226 lbs	82 lbs	-16 lbs	24 lbs
F_V	17 lbs	141 lbs	18 lbs	12 lbs	106 lbs	14 lbs	18 lbs	141 lbs	18 lbs
P_{total}	2600 lbs	2577 lbs	2539 lbs	2622 lbs	2940 lbs	2576 lbs	804 lbs	706 lbs	746 lbs
M	50 lbs-ft	237 lbs-ft	53 lbs-ft	33 lbs-ft	179 lbs-ft	41 lbs-ft	51 lbs-ft	237 lbs-ft	53 lbs-ft
e	0.02 ft	0.09 ft	0.02 ft	0.01 ft	0.06 ft	0.02 ft	0.06 ft	0.34 ft	0.07 ft
L/6	0.31 ft	1.65 ft	1.79 ft	1.81 ft	1.71 ft	1.80 ft	1.71 ft	1.16 ft	1.69 ft
f_{min}	265.7 sqft	196.4 sqft	258.2 sqft	274.4 sqft	257.0 sqft	266.5 sqft	69.6 sqft	-7.6 sqft	62.6 sqft
f_{max}	301.5 psf	365.9 psf	295.8 psf	297.8 psf	384.5 psf	295.5 psf	105.7 psf	161.7 psf	100.2 psf

Maximum Bearing Pressure = 385 psf
Allowable Bearing Pressure = 1500 psf

Use a 60in long x 22in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Foundation Requirements: 60in long x 22in wide x 18in tall ballast foundation and fiber reinforcing with (1) #5 rebar.

5.3 Foundation Anchors

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

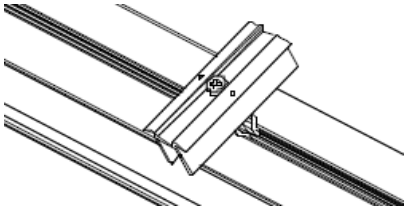
6. DESIGN OF JOINTS AND CONNECTIONS

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

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

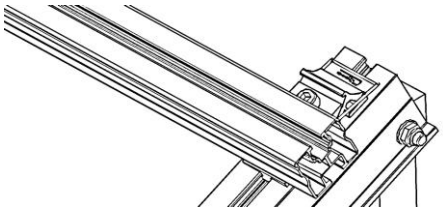
Fastening of Modules to Purlins

Maximum Uplifting Force	=	0.540 k
Allowable Uplift	=	1.214 k
Utilization	=	44%



Fastening of Purlins to Girders

Maximum Uplifting Force	=	1.103 k
Allowable Uplift	=	1.116 k
Utilization	=	99%



6.2 Bolted Connections

The aluminum struts connect the aluminum girder ends to custom brackets with mounting holes. Cross bracing is attached to rear struts to provide lateral stability. Single M8 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	=	0.962 k
M8 Bolt Capacity	=	5.692 k
Strut Bearing Capacity	=	7.952 k
Utilization	=	17%

Rear Strut

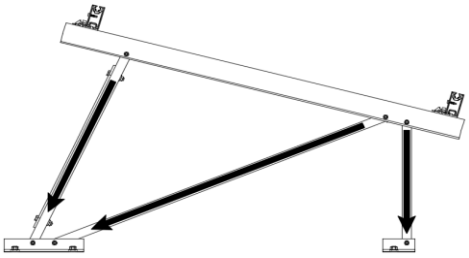
Maximum Axial Load	=	1.163 k
M8 Bolt Capacity	=	5.692 k
Strut Bearing Capacity	=	7.952 k
Utilization	=	20%

Diagonal Strut

Maximum Axial Load	=	0.628 k
M8 Bolt Shear Capacity	=	5.692 k
Strut Bearing Capacity	=	7.952 k
Utilization	=	11%

Bracing

Maximum Axial Load	=	0.209 k
M10 Bolt Capacity	=	8.894 k
Strut Bearing Capacity	=	7.952 k
Utilization	=	3%



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 M8 bolts are located at each end of the strut and are subjected to double shear.

7. SEISMIC DESIGN

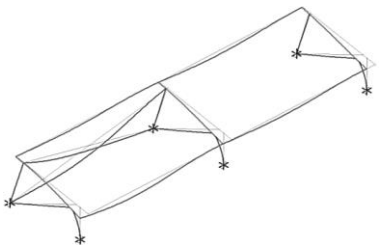
7.1 Seismic Drift

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

Mean Height, h_{sx}	=	32.32 in
Allowable Story Drift for All Other Structures, Δ	= {	$0.020h_{sx}$
		0.646 in
Max Drift, Δ_{MAX}	=	0.082 in

0.082 ≤ 0.646, OK.

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



APPENDIX A

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

Purlin = **ProfiPlus**

Strong Axis:

3.4.14

L_b = 69.00 in

J = 0.255

179.672

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.0 ksi

3.4.16

b/t = 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 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

Weak Axis:

3.4.14

L_b = 69.00 in

J = 0.255

186.579

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 28.9

3.4.16

b/t = 23.9

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.5 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 23.9

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

S1 = 36.9
m = 0.65
C_0 = 30
Cc = 30

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

S2 = 77.3
φF_L = 1.3φyFcy
φF_L = 43.2 ksi

$\varphi F_L St$ = 29.0 ksi
Ix = 250988 mm^4
0.603 in^4
y = 30 mm
Sx = 0.511 in^3
$M_{max} St$ = 1.234 k-ft

3.4.18

h/t = 7.4

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

S1 = 36.9
m = 0.65
C_0 = 20
Cc = 20

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

S2 = 77.3
φF_L = 1.3φyFcy
φF_L = 43.2 ksi

$\varphi F_L Wk$ = 28.5 ksi
Iy = 120291 mm^4
0.289 in^4
x = 20 mm
Sy = 0.367 in^3
$M_{max} Wk$ = 0.871 k-ft

Compression

3.4.9

b/t = 7.4
S1 = 12.21 (See 3.4.16 above for formula)
S2 = 32.70 (See 3.4.16 above for formula)
φF_L = φyFcy
φF_L = 33.3 ksi

b/t = 23.9
S1 = 12.21
S2 = 32.70
φF_L = φc[Bp-1.6Dp*b/t]
φF_L = 28.5 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 = 28.47 ksi
A = 578.06 mm^2
0.90 in^2
P_{max} = 25.51 kips

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

Girder = **Flex Profi**

Strong Axis:

3.4.11

L_b = 33.78 in
ry = 1.374
Cb = 1.10
23.4092

$$S1 = \frac{1.2(Bc - \frac{\theta_y}{\theta_b} Fcy)}{Dc}$$

S1 = 1.37733

$$S2 = 1.2C_c$$

S2 = 79.2
φF_L= φb[Bc-Dc*Lb/(1.2*ry*√(Cb))
φF_L= 29.4 ksi

3.4.15

N/A for Strong Direction

3.4.16

b/t = 4.29

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

S1 = 12.2

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

S2 = 46.7
φF_L= φyFcy
φF_L= 33.3 ksi

3.4.16

N/A for Strong Direction

Weak Axis:

3.4.11

L_b = 33.78 in
ry = 1.374
Cb = 1.10
24.5845

$$S1 = \frac{1.2(Bc - \frac{\theta_y}{\theta_b} Fcy)}{Dc}$$

S1 = 1.37733

$$S2 = 1.2C_c$$

S2 = 79.2
φF_L= φb[Bc-Dc*Lb/(1.2*ry*√(Cb))
φF_L= 29.4 ksi

3.4.15

b/t = 24.46

$$S1 = \frac{Bp - \frac{\theta_y}{\theta_b} Fcy}{5.1Dp}$$

S1 = 3.8

$$S2 = \frac{k_1 Bp}{5.1Dp}$$

S2 = 14.7
F_{UT}= (φbk2*√(BpE))/(5.1b/t)
F_{UT}= 9.4 ksi

3.4.16

N/A for Weak Direction

3.4.16

b/t = 24.46

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

S1 = 12.2

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

S2 = 46.7
F_{ST}= φb[Bp-1.6Dp*b/t]
F_{ST}= 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

3.4.16.2

N/A for Strong Direction

3.4.16.2

b/t = 24.46

t = 2.6

ds = 6.05

rs = 3.49

S = 21.70

ρst = 0.22

F_{UT}= 9.37

F_{ST}= 28.24

φF_L= Fut + (Fst - Fut)ρst < Fst

φF_L= 13.5 ksi

3.4.18

h/t = 24.46

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

S1 = 34.4

m = 0.70

C_0 = 34.23

Cc = 37.77

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

S2 = 72.1

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L St$= 29.4 ksi

Ix = 364470 mm^4

0.876 in^4

y = 37.77 mm

Sx = 0.589 in^3

$M_{max}St$ = 1.443 k-ft

3.4.18

h/t = 4.29

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

S1 = 36.9

m = 0.65

C_0 = 29

Cc = 29

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L Wk$= 13.5 ksi

Iy = 217168 mm^4

0.522 in^4

x = 29 mm

Sy = 0.457 in^3

$M_{max}Wk$ = 0.513 k-ft

Compression

3.4.7

λ = 0.46067

r = 1.374 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.90326

φF_L= φcc(Bc-Dc*λ)

φF_L= 30.1251 ksi

3.4.8

b/t = 24.46
S1 = 3.83
S2 = 10.30
φF_L = (φck2*√(BpE))/(5.1b/t)
φF_L = 10.4 ksi

3.4.9

b/t = 4.29
S1 = 12.21 (See 3.4.16 above for formula)
S2 = 32.70 (See 3.4.16 above for formula)
φF_L = φyFcy
φF_L = 33.3 ksi

b/t = 24.46
S1 = 12.21
S2 = 32.70
φF_L = φc[Bp-1.6Dp*b/t]
φF_L = 28.2 ksi

3.4.9.1

b/t = 24.46
t = 2.6
ds = 6.05
rs = 3.49
S = 21.70
ρst = 0.22
F_{UT} = 10.43
F_{ST} = 28.24
φF_L = Fut + (Fst - Fut)ρst < Fst
φF_L = 14.3 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 = 14.29 ksi
A = 576.21 mm^2
0.89 in^2
P_{max} = 12.76 kips

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 18.00 in

J = 0.16

47.2194

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

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= 31.2 ksi

3.4.16

b/t = 7.75

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

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 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 = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 31.2 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

M_{max}St = 0.423 k-ft

Weak Axis:

3.4.14

L_b = 18.00 in

J = 0.16

47.2194

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

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= 31.2

3.4.16

b/t = 7.75

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

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

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 31.2 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

M_{max}Wk = 0.423 k-ft

Compression

3.4.7

λ = 0.77182

r = 0.437 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.83792

φF_L = φcc(Bc-Dc*λ)

φF_L = 24.5226 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L = φyFcy

φF_L = 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

φF_L = φyFcy

φF_L = 33.3 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 = 24.52 ksi

A = 323.87 mm^2

0.50 in^2

P_{max} = 12.31 kips

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 46.38 in

J = 0.16

121.663

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

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= 29.8 ksi

3.4.16

b/t = 7.75

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

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 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 = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L St$= 29.8 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

$M_{max}St$ = 0.404 k-ft

Weak Axis:

3.4.14

L_b = 46.38 in

J = 0.16

121.663

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

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= 29.8

3.4.16

b/t = 7.75

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

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

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L Wk$= 33.3 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

$M_{max}Wk$ = 0.450 k-ft

Compression

3.4.7

λ = 1.98863

r = 0.437 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.85841

$\varphi F_L = (\varphi ccFcy)/(\lambda^2)$

φF_L = 7.59722 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

$\varphi F_L = \varphi yFcy$

φF_L = 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

φF_L = 33.3 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

$\varphi F_L = \varphi yFcy$

φF_L = 33.25 ksi

φF_L = 7.60 ksi

A = 323.87 mm^2

0.50 in^2

P_{max} = 3.81 kips

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 39.29 in

J = 0.16

103.073

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

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= 30.1 ksi

3.4.16

b/t = 7.75

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

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 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 = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L St$= 30.1 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

$M_{max}St$ = 0.408 k-ft

Weak Axis:

3.4.14

L_b = 39.29 in

J = 0.16

103.073

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

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= 30.1

3.4.16

b/t = 7.75

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

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

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L Wk$= 33.3 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

$M_{max}Wk$ = 0.450 k-ft

Compression

3.4.7

λ = 1.68476

r = 0.437 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.81587

$\varphi F_L = (\varphi ccFcy)/(\lambda^2)$

φF_L = 10.0603 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

$\varphi F_L = \varphi yFcy$

φF_L = 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

φF_L = 33.3 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

$\varphi F_L = \varphi yFcy$

φF_L = 33.25 ksi

φF_L = 10.06 ksi

A = 323.87 mm^2

0.50 in^2

P_{max} = 5.05 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				2		
2	Dead Load, Min	DL		-1				2		
3	Snow Load	SL						2		
4	Wind Load - Pressure	WL						2		
5	Wind Load - Suction	WL						2		
6	Seismic - Lateral	EL			.8			4		

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	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	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	-45.999	-45.999	0	0
2	M16	Y	-45.999	-45.999	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	-50.353	-50.353	0	0
2	M16	y	-81.003	-81.003	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	100.707	100.707	0	0
2	M16	y	48.164	48.164	0	0

Member Distributed Loads (BLC 6 : Seismic - Lateral)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	Z	6.693	6.693	0	0
2	M16	Z	6.693	6.693	0	0
3	M13	Z	0	0	0	0
4	M16	Z	0	0	0	0

Load Combinations

	Description	S...	P...	S...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	LRFD 1.2D + 1.6S + 0.8W	Yes	Y		1	1.2	3	1.6	4	.8																
2	LRFD 1.2D + 1.6W + 0.5S	Yes	Y		1	1.2	3	.5	4	1.6																
3	LRFD 0.9D + 1.6W	Yes	Y		2	.9					5	1.6														
4	LATERAL - LRFD 1.54D + 1.3E ...	Yes	Y		1	1.54	3	.2			6	1.3														
5	LATERAL - LRFD 0.56D + 1.3E	Yes	Y		1	.56					6	1.3														
6	LATERAL - LRFD 1.54D + 1.25...	Yes	Y		1	1.54	3	.2			6	1.25														
7	LATERAL - LRFD 0.56D + 1.25E	Yes	Y		1	.56					6	1.25														
8																										
9	ASD 1.0D + 1.0S	Yes	Y		1	1	3	1																		

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

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N8	max	216.382	2	290.816	2	-.008	10	0	4	0	1	0	1
2		min	-265.209	3	-421.617	3	-2.26	4	0	3	0	1	0	1
3	N7	max	.002	3	360.991	1	-.121	10	0	10	0	1	0	1
4		min	-.152	2	3.994	12	-24.224	4	-.039	4	0	1	0	1
5	N15	max	0	15	961.97	1	.537	1	.001	1	0	1	0	1
6		min	-1.562	2	-19.548	3	-24.565	5	-.039	4	0	1	0	1
7	N16	max	777.375	2	973.216	2	0	10	0	1	0	1	0	1
8		min	-838.917	3	-1376.458	3	-185.407	4	0	3	0	1	0	1
9	N23	max	.002	3	360.745	1	2.182	1	.004	1	0	1	0	1
10		min	-.152	2	4.355	12	-22.765	5	-.036	5	0	1	0	1
11	N24	max	216.584	2	294.131	2	60.907	3	.001	4	0	1	0	1
12		min	-265.462	3	-419.803	3	-3.52	5	0	3	0	1	0	1
13	Totals:	max	1208.475	2	3041.162	1	0	1						
14		min	-1369.613	3	-2226.929	3	-261.591	5						

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	M2	1	max	248.626	1	.652	6	1.231	4	0	10	0	12	0	1
2			min	-362.972	3	.153	15	-.053	3	0	1	0	1	0	1
3		2	max	248.752	1	.601	6	1.116	4	0	10	0	5	0	15
4			min	-362.877	3	.141	15	-.053	3	0	1	0	1	0	6
5		3	max	248.878	1	.55	6	1.002	4	0	10	0	5	0	15
6			min	-362.783	3	.129	15	-.053	3	0	1	0	3	0	6
7		4	max	249.004	1	.499	6	.887	4	0	10	0	4	0	15
8			min	-362.689	3	.117	15	-.053	3	0	1	0	3	0	6
9		5	max	249.13	1	.448	6	.773	4	0	10	0	4	0	15
10			min	-362.594	3	.105	15	-.053	3	0	1	0	3	0	6
11		6	max	249.255	1	.397	6	.658	4	0	10	0	4	0	15
12			min	-362.5	3	.093	15	-.053	3	0	1	0	3	0	6
13		7	max	249.381	1	.346	6	.544	4	0	10	0	4	0	15
14			min	-362.405	3	.081	15	-.053	3	0	1	0	3	0	6
15		8	max	249.507	1	.294	6	.43	4	0	10	0	4	0	15
16			min	-362.311	3	.069	15	-.053	3	0	1	0	3	0	6
17		9	max	249.633	1	.243	6	.345	1	0	10	0	4	0	15
18			min	-362.217	3	.056	15	-.053	3	0	1	0	3	0	6
19		10	max	249.759	1	.192	6	.345	1	0	10	.001	4	0	15
20			min	-362.122	3	.044	15	-.053	3	0	1	0	3	0	6
21		11	max	249.885	1	.141	6	.345	1	0	10	.001	4	0	15
22			min	-362.028	3	.032	15	-.053	3	0	1	0	3	0	6
23		12	max	250.011	1	.101	2	.345	1	0	10	.001	4	0	15
24			min	-361.933	3	.013	12	-.111	5	0	1	0	3	0	6
25		13	max	250.137	1	.061	2	.345	1	0	10	.001	4	0	15
26			min	-361.839	3	-.013	3	-.225	5	0	1	0	3	0	6
27		14	max	250.262	1	.021	2	.345	1	0	10	.001	4	0	15
28			min	-361.745	3	-.043	3	-.34	5	0	1	0	3	0	6

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
29		15	max	250.388	1	-.016	15	.345	1	0	10	0	4	0	15
30			min	-361.65	3	-.073	3	-.454	5	0	1	0	3	0	6
31		16	max	250.514	1	-.028	15	.345	1	0	10	0	4	0	15
32			min	-361.556	3	-.115	4	-.569	5	0	1	0	3	0	6
33		17	max	250.64	1	-.04	15	.345	1	0	10	0	1	0	15
34			min	-361.461	3	-.166	4	-.683	5	0	1	0	3	0	6
35		18	max	250.766	1	-.052	15	.345	1	0	10	0	1	0	15
36			min	-361.367	3	-.217	4	-.798	5	0	1	0	3	0	6
37		19	max	250.892	1	-.064	15	.345	1	0	10	0	1	0	15
38			min	-361.273	3	-.268	4	-.912	5	0	1	0	3	0	6
39	M3	1	max	167.229	2	1.756	6	-.03	10	0	5	.001	1	0	6
40			min	-173.997	3	.412	15	-1.375	4	0	1	0	10	0	15
41		2	max	167.159	2	1.579	6	-.03	10	0	5	.001	1	0	2
42			min	-174.049	3	.371	15	-1.242	4	0	1	0	10	0	12
43		3	max	167.09	2	1.402	6	-.03	10	0	5	.001	1	0	2
44			min	-174.101	3	.329	15	-1.108	4	0	1	0	5	0	3
45		4	max	167.021	2	1.226	6	-.03	10	0	5	0	1	0	15
46			min	-174.153	3	.287	15	-.974	4	0	1	0	5	0	4
47		5	max	166.952	2	1.049	6	-.03	10	0	5	0	1	0	15
48			min	-174.205	3	.246	15	-.841	4	0	1	0	5	0	4
49		6	max	166.882	2	.872	6	-.03	10	0	5	0	1	0	15
50			min	-174.257	3	.204	15	-.707	4	0	1	0	5	0	4
51		7	max	166.813	2	.695	6	-.03	10	0	5	0	1	0	15
52			min	-174.309	3	.163	15	-.573	4	0	1	0	5	0	4
53		8	max	166.744	2	.518	6	-.03	10	0	5	0	1	0	15
54			min	-174.361	3	.121	15	-.44	4	0	1	0	5	-.001	4
55		9	max	166.674	2	.341	6	-.03	10	0	5	0	1	0	15
56			min	-174.413	3	.08	15	-.353	1	0	1	0	5	-.001	4
57		10	max	166.605	2	.165	6	-.03	10	0	5	0	1	0	15
58			min	-174.465	3	.038	15	-.353	1	0	1	0	5	-.001	4
59		11	max	166.536	2	.017	2	.04	5	0	5	0	1	0	15
60			min	-174.517	3	-.038	3	-.353	1	0	1	0	5	-.001	4
61		12	max	166.466	2	-.045	15	.174	5	0	5	0	1	0	15
62			min	-174.569	3	-.189	4	-.353	1	0	1	0	5	-.001	4
63		13	max	166.397	2	-.087	15	.307	5	0	5	0	1	0	15
64			min	-174.621	3	-.366	4	-.353	1	0	1	0	5	-.001	4
65		14	max	166.328	2	-.128	15	.441	5	0	5	0	1	0	15
66			min	-174.673	3	-.543	4	-.353	1	0	1	0	5	-.001	4
67		15	max	166.258	2	-.17	15	.575	5	0	5	0	1	0	15
68			min	-174.725	3	-.72	4	-.353	1	0	1	0	5	0	4
69		16	max	166.189	2	-.211	15	.708	5	0	5	0	1	0	15
70			min	-174.777	3	-.897	4	-.353	1	0	1	0	5	0	4
71		17	max	166.12	2	-.253	15	.842	5	0	5	0	12	0	15
72			min	-174.829	3	-1.073	4	-.353	1	0	1	0	4	0	4
73		18	max	166.05	2	-.294	15	.976	5	0	5	0	12	0	15
74			min	-174.881	3	-1.25	4	-.353	1	0	1	0	1	0	4
75		19	max	165.981	2	-.336	15	1.109	5	0	5	0	5	0	1
76			min	-174.933	3	-1.427	4	-.353	1	0	1	0	1	0	1
77	M4	1	max	359.826	1	0	1	-.124	10	0	1	0	5	0	1
78			min	3.411	12	0	1	-23.599	4	0	1	0	2	0	1
79		2	max	359.891	1	0	1	-.124	10	0	1	0	12	0	1
80			min	3.444	12	0	1	-23.655	4	0	1	-.002	4	0	1
81		3	max	359.955	1	0	1	-.124	10	0	1	0	12	0	1
82			min	3.476	12	0	1	-23.711	4	0	1	-.004	4	0	1
83		4	max	360.02	1	0	1	-.124	10	0	1	0	12	0	1
84			min	3.508	12	0	1	-23.767	4	0	1	-.006	4	0	1
85		5	max	360.085	1	0	1	-.124	10	0	1	0	10	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
86			min	3.541	12	0	1	-23.823	4	0	1	-.008	4	0	1
87		6	max	360.149	1	0	1	-.124	10	0	1	0	10	0	1
88			min	3.573	12	0	1	-23.879	4	0	1	-.011	4	0	1
89		7	max	360.214	1	0	1	-.124	10	0	1	0	10	0	1
90			min	3.605	12	0	1	-23.935	4	0	1	-.013	4	0	1
91		8	max	360.279	1	0	1	-.124	10	0	1	0	10	0	1
92			min	3.638	12	0	1	-23.991	4	0	1	-.015	4	0	1
93		9	max	360.344	1	0	1	-.124	10	0	1	0	10	0	1
94			min	3.67	12	0	1	-24.048	4	0	1	-.017	4	0	1
95		10	max	360.408	1	0	1	-.124	10	0	1	0	10	0	1
96			min	3.702	12	0	1	-24.104	4	0	1	-.019	4	0	1
97		11	max	360.473	1	0	1	-.124	10	0	1	0	10	0	1
98			min	3.735	12	0	1	-24.16	4	0	1	-.021	4	0	1
99		12	max	360.538	1	0	1	-.124	10	0	1	0	10	0	1
100			min	3.767	12	0	1	-24.216	4	0	1	-.023	4	0	1
101		13	max	360.602	1	0	1	-.124	10	0	1	0	10	0	1
102			min	3.8	12	0	1	-24.272	4	0	1	-.026	4	0	1
103		14	max	360.667	1	0	1	-.124	10	0	1	0	10	0	1
104			min	3.832	12	0	1	-24.328	4	0	1	-.028	4	0	1
105		15	max	360.732	1	0	1	-.124	10	0	1	0	10	0	1
106			min	3.864	12	0	1	-24.384	4	0	1	-.03	4	0	1
107		16	max	360.797	1	0	1	-.124	10	0	1	0	10	0	1
108			min	3.897	12	0	1	-24.44	4	0	1	-.032	4	0	1
109		17	max	360.861	1	0	1	-.124	10	0	1	0	10	0	1
110			min	3.929	12	0	1	-24.496	4	0	1	-.034	4	0	1
111		18	max	360.926	1	0	1	-.124	10	0	1	0	10	0	1
112			min	3.961	12	0	1	-24.552	4	0	1	-.037	4	0	1
113		19	max	360.991	1	0	1	-.124	10	0	1	0	10	0	1
114			min	3.994	12	0	1	-24.608	4	0	1	-.039	4	0	1
115	M6	1	max	796.293	1	.641	6	1.145	4	0	3	0	3	0	1
116			min	-1162.61	3	.143	15	-.189	3	0	5	0	9	0	1
117		2	max	796.419	1	.59	6	1.03	4	0	3	0	4	0	15
118			min	-1162.516	3	.131	15	-.189	3	0	5	0	9	0	6
119		3	max	796.545	1	.539	6	.916	4	0	3	0	4	0	15
120			min	-1162.421	3	.119	15	-.189	3	0	5	0	10	0	6
121		4	max	796.671	1	.489	2	.802	4	0	3	0	4	0	15
122			min	-1162.327	3	.107	15	-.189	3	0	5	0	10	0	6
123		5	max	796.797	1	.449	2	.687	4	0	3	0	4	0	15
124			min	-1162.233	3	.095	15	-.189	3	0	5	0	10	0	6
125		6	max	796.923	1	.409	2	.573	4	0	3	0	4	0	15
126			min	-1162.138	3	.083	12	-.189	3	0	5	0	10	0	6
127		7	max	797.049	1	.37	2	.458	4	0	3	0	4	0	15
128			min	-1162.044	3	.063	12	-.189	3	0	5	0	3	0	2
129		8	max	797.175	1	.33	2	.344	4	0	3	.001	4	0	15
130			min	-1161.949	3	.043	12	-.189	3	0	5	0	3	0	2
131		9	max	797.3	1	.29	2	.229	4	0	3	.001	4	0	15
132			min	-1161.855	3	.023	12	-.189	3	0	5	0	3	0	2
133		10	max	797.426	1	.25	2	.115	4	0	3	.001	4	0	15
134			min	-1161.761	3	-.003	3	-.189	3	0	5	0	3	0	2
135		11	max	797.552	1	.21	2	.104	1	0	3	.001	4	0	12
136			min	-1161.666	3	-.033	3	-.189	3	0	5	0	3	0	2
137		12	max	797.678	1	.17	2	.104	1	0	3	.001	4	0	12
138			min	-1161.572	3	-.063	3	-.189	3	0	5	0	3	0	2
139		13	max	797.804	1	.13	2	.104	1	0	3	.001	4	0	12
140			min	-1161.477	3	-.093	3	-.259	5	0	5	0	3	0	2
141		14	max	797.93	1	.091	2	.104	1	0	3	.001	4	0	12
142			min	-1161.383	3	-.122	3	-.374	5	0	5	0	3	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
143		15	max	798.056	1	.051	2	.104	1	0	3	0	4	0	12
144			min	-1161.289	3	-.152	3	-.488	5	0	5	0	3	0	2
145		16	max	798.181	1	.011	2	.104	1	0	3	0	4	0	12
146			min	-1161.194	3	-.182	3	-.603	5	0	5	0	3	0	2
147		17	max	798.307	1	-.029	2	.104	1	0	3	0	4	0	12
148			min	-1161.1	3	-.212	3	-.717	5	0	5	0	3	0	2
149		18	max	798.433	1	-.061	15	.104	1	0	3	0	4	0	3
150			min	-1161.005	3	-.242	3	-.832	5	0	5	0	3	0	2
151		19	max	798.559	1	-.073	15	.104	1	0	3	0	4	0	3
152			min	-1160.911	3	-.28	4	-.946	5	0	5	0	3	0	2
153	M7	1	max	628.404	2	1.774	4	.023	3	0	1	0	4	0	2
154			min	-533.426	3	.423	15	-1.329	5	0	3	0	3	0	3
155		2	max	628.334	2	1.597	4	.023	3	0	1	0	4	0	2
156			min	-533.478	3	.381	15	-1.195	5	0	3	0	3	0	3
157		3	max	628.265	2	1.42	4	.023	3	0	1	0	1	0	2
158			min	-533.53	3	.339	15	-1.062	5	0	3	0	3	0	3
159		4	max	628.196	2	1.243	4	.023	3	0	1	0	1	0	2
160			min	-533.582	3	.298	15	-.928	5	0	3	0	3	0	3
161		5	max	628.126	2	1.067	4	.023	3	0	1	0	1	0	15
162			min	-533.634	3	.256	15	-.794	5	0	3	0	5	0	3
163		6	max	628.057	2	.89	4	.023	3	0	1	0	1	0	15
164			min	-533.686	3	.215	15	-.661	5	0	3	0	5	0	3
165		7	max	627.988	2	.713	4	.023	3	0	1	0	1	0	15
166			min	-533.738	3	.173	15	-.527	5	0	3	0	5	0	6
167		8	max	627.918	2	.536	4	.023	3	0	1	0	1	0	15
168			min	-533.79	3	.132	15	-.393	5	0	3	0	5	-.001	6
169		9	max	627.849	2	.359	4	.023	3	0	1	0	1	0	15
170			min	-533.842	3	.069	12	-.259	5	0	3	0	5	-.001	6
171		10	max	627.78	2	.22	2	.023	3	0	1	0	1	0	15
172			min	-533.894	3	-.007	3	-.126	5	0	3	0	5	-.001	6
173		11	max	627.71	2	.082	2	.023	3	0	1	0	1	0	15
174			min	-533.946	3	-.11	3	-.013	2	0	3	0	5	-.001	6
175		12	max	627.641	2	-.035	15	.142	4	0	1	0	1	0	15
176			min	-533.998	3	-.213	3	-.013	2	0	3	0	5	-.001	6
177		13	max	627.572	2	-.076	15	.276	4	0	1	0	1	0	15
178			min	-534.05	3	-.349	6	-.013	2	0	3	0	5	-.001	6
179		14	max	627.503	2	-.118	15	.409	4	0	1	0	1	0	15
180			min	-534.102	3	-.525	6	-.013	2	0	3	0	5	-.001	6
181		15	max	627.433	2	-.159	15	.543	4	0	1	0	1	0	15
182			min	-534.154	3	-.702	6	-.013	2	0	3	0	5	0	6
183		16	max	627.364	2	-.201	15	.677	4	0	1	0	1	0	15
184			min	-534.206	3	-.879	6	-.013	2	0	3	0	5	0	6
185		17	max	627.295	2	-.242	15	.81	4	0	1	0	1	0	15
186			min	-534.258	3	-1.056	6	-.013	2	0	3	0	5	0	6
187		18	max	627.225	2	-.284	15	.944	4	0	1	0	1	0	15
188			min	-534.31	3	-1.233	6	-.013	2	0	3	0	5	0	6
189		19	max	627.156	2	-.326	15	1.078	4	0	1	0	1	0	1
190			min	-534.362	3	-1.41	6	-.013	2	0	3	0	3	0	1
191	M8	1	max	960.806	1	0	1	.636	1	0	1	0	4	0	1
192			min	-20.421	3	0	1	-23.787	4	0	1	0	1	0	1
193		2	max	960.87	1	0	1	.636	1	0	1	0	1	0	1
194			min	-20.373	3	0	1	-23.843	4	0	1	-.002	4	0	1
195		3	max	960.935	1	0	1	.636	1	0	1	0	1	0	1
196			min	-20.324	3	0	1	-23.899	4	0	1	-.004	4	0	1
197		4	max	961	1	0	1	.636	1	0	1	0	1	0	1
198			min	-20.276	3	0	1	-23.955	4	0	1	-.006	4	0	1
199		5	max	961.064	1	0	1	.636	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
200			min	-20.227	3	0	1	-24.011	4	0	1	-.009	4	0	1
201		6	max	961.129	1	0	1	.636	1	0	1	0	1	0	1
202			min	-20.179	3	0	1	-24.068	4	0	1	-.011	4	0	1
203		7	max	961.194	1	0	1	.636	1	0	1	0	1	0	1
204			min	-20.13	3	0	1	-24.124	4	0	1	-.013	4	0	1
205		8	max	961.259	1	0	1	.636	1	0	1	0	1	0	1
206			min	-20.082	3	0	1	-24.18	4	0	1	-.015	4	0	1
207		9	max	961.323	1	0	1	.636	1	0	1	0	1	0	1
208			min	-20.033	3	0	1	-24.236	4	0	1	-.017	4	0	1
209		10	max	961.388	1	0	1	.636	1	0	1	0	1	0	1
210			min	-19.984	3	0	1	-24.292	4	0	1	-.019	4	0	1
211		11	max	961.453	1	0	1	.636	1	0	1	0	1	0	1
212			min	-19.936	3	0	1	-24.348	4	0	1	-.022	4	0	1
213		12	max	961.517	1	0	1	.636	1	0	1	0	1	0	1
214			min	-19.887	3	0	1	-24.404	4	0	1	-.024	4	0	1
215		13	max	961.582	1	0	1	.636	1	0	1	0	1	0	1
216			min	-19.839	3	0	1	-24.46	4	0	1	-.026	4	0	1
217		14	max	961.647	1	0	1	.636	1	0	1	0	1	0	1
218			min	-19.79	3	0	1	-24.516	4	0	1	-.028	4	0	1
219		15	max	961.712	1	0	1	.636	1	0	1	0	1	0	1
220			min	-19.742	3	0	1	-24.572	4	0	1	-.03	4	0	1
221		16	max	961.776	1	0	1	.636	1	0	1	0	1	0	1
222			min	-19.693	3	0	1	-24.628	4	0	1	-.032	4	0	1
223		17	max	961.841	1	0	1	.636	1	0	1	0	1	0	1
224			min	-19.645	3	0	1	-24.684	4	0	1	-.035	4	0	1
225		18	max	961.906	1	0	1	.636	1	0	1	0	1	0	1
226			min	-19.596	3	0	1	-24.741	4	0	1	-.037	4	0	1
227		19	max	961.97	1	0	1	.636	1	0	1	.001	1	0	1
228			min	-19.548	3	0	1	-24.797	4	0	1	-.039	4	0	1
229	M10	1	max	251.295	1	.682	4	1.295	5	0	1	0	1	0	1
230			min	-327.321	3	.173	15	-.145	1	-.001	5	0	3	0	1
231		2	max	251.421	1	.631	4	1.18	5	0	1	0	1	0	15
232			min	-327.227	3	.161	15	-.145	1	-.001	5	0	3	0	4
233		3	max	251.547	1	.58	4	1.066	5	0	1	0	4	0	15
234			min	-327.133	3	.149	15	-.145	1	-.001	5	0	3	0	4
235		4	max	251.673	1	.529	4	.951	5	0	1	0	4	0	15
236			min	-327.038	3	.137	15	-.145	1	-.001	5	0	3	0	4
237		5	max	251.799	1	.478	4	.837	5	0	1	0	4	0	15
238			min	-326.944	3	.125	15	-.145	1	-.001	5	0	3	0	4
239		6	max	251.925	1	.427	4	.722	5	0	1	0	4	0	15
240			min	-326.849	3	.113	15	-.145	1	-.001	5	0	3	0	4
241		7	max	252.051	1	.375	4	.608	5	0	1	0	4	0	15
242			min	-326.755	3	.101	15	-.145	1	-.001	5	0	3	0	4
243		8	max	252.177	1	.324	4	.494	5	0	1	.001	4	0	15
244			min	-326.661	3	.089	15	-.145	1	-.001	5	0	3	0	4
245		9	max	252.302	1	.273	4	.379	5	0	1	.001	4	0	15
246			min	-326.566	3	.077	15	-.145	1	-.001	5	0	3	0	4
247		10	max	252.428	1	.222	4	.265	5	0	1	.001	4	0	15
248			min	-326.472	3	.065	15	-.145	1	-.001	5	0	3	0	4
249		11	max	252.554	1	.171	4	.15	5	0	1	.001	4	0	15
250			min	-326.377	3	.048	12	-.145	1	-.001	5	0	3	0	4
251		12	max	252.68	1	.12	4	.036	5	0	1	.001	4	0	15
252			min	-326.283	3	.028	12	-.145	1	-.001	5	0	3	0	4
253		13	max	252.806	1	.069	4	-.005	12	0	1	.001	4	0	15
254			min	-326.189	3	.009	12	-.145	1	-.001	5	0	3	0	4
255		14	max	252.932	1	.024	5	-.005	12	0	1	.001	5	0	15
256			min	-326.094	3	-.021	9	-.215	4	-.001	5	0	3	0	4

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
257		15	max	253.058	1	.006	5	-.005	12	0	1	.001	5	0	15
258			min	-326	3	-.054	9	-.33	4	-.001	5	0	3	0	4
259		16	max	253.184	1	-.008	15	-.005	12	0	1	.001	5	0	15
260			min	-325.905	3	-.087	9	-.444	4	-.001	5	0	3	0	4
261		17	max	253.309	1	-.02	15	-.005	12	0	1	0	5	0	15
262			min	-325.811	3	-.137	6	-.558	4	-.001	5	0	1	0	4
263		18	max	253.435	1	-.032	15	-.005	12	0	1	0	5	0	15
264			min	-325.717	3	-.188	6	-.673	4	-.001	5	0	1	0	4
265		19	max	253.561	1	-.044	15	-.005	12	0	1	0	5	0	15
266			min	-325.622	3	-.239	6	-.787	4	-.001	5	0	1	0	4
267	M11	1	max	166.854	2	1.747	6	.388	1	.001	4	0	5	0	6
268			min	-174.65	3	.406	15	-1.23	5	0	10	-.001	1	0	15
269		2	max	166.785	2	1.57	6	.388	1	.001	4	0	5	0	2
270			min	-174.702	3	.364	15	-1.096	5	0	10	-.001	1	0	3
271		3	max	166.715	2	1.393	6	.388	1	.001	4	0	5	0	2
272			min	-174.754	3	.322	15	-.963	5	0	10	0	1	0	3
273		4	max	166.646	2	1.216	6	.388	1	.001	4	0	3	0	15
274			min	-174.806	3	.281	15	-.829	5	0	10	0	1	0	4
275		5	max	166.577	2	1.039	6	.388	1	.001	4	0	3	0	15
276			min	-174.858	3	.239	15	-.695	5	0	10	0	1	0	4
277		6	max	166.508	2	.863	6	.388	1	.001	4	0	3	0	15
278			min	-174.91	3	.198	15	-.562	5	0	10	0	1	0	4
279		7	max	166.438	2	.686	6	.388	1	.001	4	0	3	0	15
280			min	-174.962	3	.156	15	-.428	5	0	10	0	1	0	4
281		8	max	166.369	2	.509	6	.388	1	.001	4	0	3	0	15
282			min	-175.014	3	.115	15	-.294	5	0	10	0	1	-.001	4
283		9	max	166.3	2	.332	6	.388	1	.001	4	0	3	0	15
284			min	-175.066	3	.073	15	-.161	5	0	10	0	1	-.001	4
285		10	max	166.23	2	.155	6	.388	1	.001	4	0	3	0	15
286			min	-175.118	3	.031	15	-.027	5	0	10	0	1	-.001	4
287		11	max	166.161	2	.017	2	.388	1	.001	4	0	3	0	15
288			min	-175.17	3	-.054	3	-.026	3	0	10	0	4	-.001	4
289		12	max	166.092	2	-.052	15	.388	1	.001	4	0	3	0	15
290			min	-175.222	3	-.199	4	-.026	3	0	10	0	4	-.001	4
291		13	max	166.022	2	-.093	15	.461	4	.001	4	0	3	0	15
292			min	-175.274	3	-.376	4	-.026	3	0	10	0	4	-.001	4
293		14	max	165.953	2	-.135	15	.594	4	.001	4	0	3	0	15
294			min	-175.326	3	-.553	4	-.026	3	0	10	0	4	-.001	4
295		15	max	165.884	2	-.176	15	.728	4	.001	4	0	3	0	15
296			min	-175.378	3	-.729	4	-.026	3	0	10	0	2	0	4
297		16	max	165.814	2	-.218	15	.862	4	.001	4	0	3	0	15
298			min	-175.43	3	-.906	4	-.026	3	0	10	0	10	0	4
299		17	max	165.745	2	-.259	15	.995	4	.001	4	0	4	0	15
300			min	-175.482	3	-1.083	4	-.026	3	0	10	0	10	0	4
301		18	max	165.676	2	-.301	15	1.129	4	.001	4	0	4	0	15
302			min	-175.534	3	-1.26	4	-.026	3	0	10	0	10	0	4
303		19	max	165.606	2	-.343	15	1.263	4	.001	4	0	4	0	1
304			min	-175.586	3	-1.437	4	-.026	3	0	10	0	10	0	1
305	M12	1	max	359.58	1	0	1	2.319	1	0	1	0	4	0	1
306			min	3.772	12	0	1	-21.786	5	0	1	0	3	0	1
307		2	max	359.645	1	0	1	2.319	1	0	1	0	1	0	1
308			min	3.805	12	0	1	-21.842	5	0	1	-.002	5	0	1
309		3	max	359.71	1	0	1	2.319	1	0	1	0	1	0	1
310			min	3.837	12	0	1	-21.898	5	0	1	-.004	5	0	1
311		4	max	359.774	1	0	1	2.319	1	0	1	0	1	0	1
312			min	3.869	12	0	1	-21.954	5	0	1	-.006	5	0	1
313		5	max	359.839	1	0	1	2.319	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
314			min	3.902	12	0	1	-22.01	5	0	1	-.008	5	0	1
315		6	max	359.904	1	0	1	2.319	1	0	1	.001	1	0	1
316			min	3.934	12	0	1	-22.067	5	0	1	-.01	5	0	1
317		7	max	359.969	1	0	1	2.319	1	0	1	.001	1	0	1
318			min	3.966	12	0	1	-22.123	5	0	1	-.012	5	0	1
319		8	max	360.033	1	0	1	2.319	1	0	1	.001	1	0	1
320			min	3.999	12	0	1	-22.179	5	0	1	-.014	5	0	1
321		9	max	360.098	1	0	1	2.319	1	0	1	.002	1	0	1
322			min	4.031	12	0	1	-22.235	5	0	1	-.016	5	0	1
323		10	max	360.163	1	0	1	2.319	1	0	1	.002	1	0	1
324			min	4.063	12	0	1	-22.291	5	0	1	-.018	5	0	1
325		11	max	360.227	1	0	1	2.319	1	0	1	.002	1	0	1
326			min	4.096	12	0	1	-22.347	5	0	1	-.02	5	0	1
327		12	max	360.292	1	0	1	2.319	1	0	1	.002	1	0	1
328			min	4.128	12	0	1	-22.403	5	0	1	-.022	5	0	1
329		13	max	360.357	1	0	1	2.319	1	0	1	.003	1	0	1
330			min	4.16	12	0	1	-22.459	5	0	1	-.024	5	0	1
331		14	max	360.421	1	0	1	2.319	1	0	1	.003	1	0	1
332			min	4.193	12	0	1	-22.515	5	0	1	-.026	5	0	1
333		15	max	360.486	1	0	1	2.319	1	0	1	.003	1	0	1
334			min	4.225	12	0	1	-22.571	5	0	1	-.028	5	0	1
335		16	max	360.551	1	0	1	2.319	1	0	1	.003	1	0	1
336			min	4.257	12	0	1	-22.627	5	0	1	-.03	5	0	1
337		17	max	360.616	1	0	1	2.319	1	0	1	.003	1	0	1
338			min	4.29	12	0	1	-22.683	5	0	1	-.032	5	0	1
339		18	max	360.68	1	0	1	2.319	1	0	1	.004	1	0	1
340			min	4.322	12	0	1	-22.739	5	0	1	-.034	5	0	1
341		19	max	360.745	1	0	1	2.319	1	0	1	.004	1	0	1
342			min	4.355	12	0	1	-22.796	5	0	1	-.036	5	0	1
343	M1	1	max	114.735	1	341.407	3	-3.144	12	0	1	.09	1	0	2
344			min	6.198	12	-248.51	1	-45.888	1	0	3	.007	12	0	3
345		2	max	114.875	1	341.226	3	-3.144	12	0	1	.08	1	.054	1
346			min	6.268	12	-248.752	1	-45.888	1	0	3	.006	12	-.074	3
347		3	max	88.065	3	5.805	14	-3.182	12	0	12	.07	1	.107	1
348			min	-12.444	10	-23.789	2	-45.751	1	0	1	.006	10	-.147	3
349		4	max	88.17	3	5.579	9	-3.182	12	0	12	.06	1	.109	2
350			min	-12.328	10	-24.031	2	-45.751	1	0	1	.005	10	-.144	3
351		5	max	88.275	3	5.377	9	-3.182	12	0	12	.05	1	.114	2
352			min	-12.212	10	-24.273	2	-45.751	1	0	1	.004	10	-.141	3
353		6	max	88.379	3	5.175	9	-3.182	12	0	12	.04	1	.12	2
354			min	-12.095	10	-24.515	2	-45.751	1	0	1	.003	10	-.138	3
355		7	max	88.484	3	4.974	9	-3.182	12	0	12	.03	1	.125	2
356			min	-11.979	10	-24.757	2	-45.751	1	0	1	.002	10	-.135	3
357		8	max	88.589	3	4.772	9	-3.182	12	0	12	.02	1	.13	2
358			min	-11.863	10	-24.998	2	-45.751	1	0	1	.002	10	-.132	3
359		9	max	88.693	3	4.571	9	-3.182	12	0	12	.01	1	.136	2
360			min	-11.746	10	-25.24	2	-45.751	1	0	1	0	10	-.129	3
361		10	max	88.798	3	4.369	9	-3.182	12	0	12	.001	4	.141	2
362			min	-11.63	10	-25.482	2	-45.751	1	0	1	0	10	-.126	3
363		11	max	88.903	3	4.168	9	-3.182	12	0	12	0	3	.147	2
364			min	-11.514	10	-25.724	2	-45.751	1	0	1	-.01	1	-.122	3
365		12	max	89.008	3	3.966	9	-3.182	12	0	12	0	12	.153	2
366			min	-11.397	10	-25.966	2	-45.751	1	0	1	-.02	1	-.119	3
367		13	max	89.112	3	3.765	9	-3.182	12	0	12	-.001	12	.158	2
368			min	-11.281	10	-26.208	2	-45.751	1	0	1	-.03	1	-.116	3
369		14	max	89.217	3	3.563	9	-3.182	12	0	12	-.002	12	.164	2
370			min	-11.165	10	-26.449	2	-45.751	1	0	1	-.04	1	-.113	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
371		15	max	89.322	3	3.362	9	-3.182	12	0	12	-.003	12	.17	2
372			min	-11.048	10	-26.691	2	-45.751	1	0	1	-.049	1	-.109	3
373		16	max	91.604	2	111.555	2	-3.215	12	0	1	-.003	12	.174	2
374			min	-5.904	3	-162.416	3	-46.053	1	0	5	-.06	1	-.105	3
375		17	max	91.744	2	111.313	2	-3.215	12	0	1	-.004	12	.15	2
376			min	-5.8	3	-162.598	3	-46.053	1	0	5	-.07	1	-.069	3
377		18	max	-5.126	12	347.504	2	-3.409	12	0	3	-.005	12	.076	2
378			min	-114.857	1	-159.22	3	-47.157	1	0	2	-.08	1	-.035	3
379		19	max	-5.057	12	347.262	2	-3.409	12	0	3	-.006	12	0	2
380			min	-114.718	1	-159.401	3	-47.157	1	0	2	-.09	1	0	3
381	M5	1	max	259.302	1	1120.889	3	0	10	0	1	.037	4	0	3
382			min	6.959	12	-815.531	1	-54.465	3	0	5	0	10	0	2
383		2	max	259.442	1	1120.708	3	0	10	0	1	.032	4	.176	1
384			min	7.028	12	-815.773	1	-54.465	3	0	5	-.005	3	-.243	3
385		3	max	268.247	3	5.626	9	6.162	3	0	3	.026	4	.35	1
386			min	-48.197	10	-87.144	2	-20.11	4	0	4	-.016	3	-.481	3
387		4	max	268.352	3	5.424	9	6.162	3	0	3	.022	4	.358	1
388			min	-48.081	10	-87.386	2	-19.868	4	0	4	-.015	3	-.47	3
389		5	max	268.457	3	5.223	9	6.162	3	0	3	.018	4	.377	2
390			min	-47.965	10	-87.628	2	-19.626	4	0	4	-.014	3	-.459	3
391		6	max	268.562	3	5.021	9	6.162	3	0	3	.014	4	.396	2
392			min	-47.848	10	-87.869	2	-19.384	4	0	4	-.012	3	-.448	3
393		7	max	268.666	3	4.82	9	6.162	3	0	3	.009	4	.415	2
394			min	-47.732	10	-88.111	2	-19.142	4	0	4	-.011	3	-.437	3
395		8	max	268.771	3	4.618	9	6.162	3	0	3	.005	4	.434	2
396			min	-47.615	10	-88.353	2	-18.9	4	0	4	-.01	3	-.426	3
397		9	max	268.876	3	4.416	9	6.162	3	0	3	.001	4	.453	2
398			min	-47.499	10	-88.595	2	-18.658	4	0	4	-.008	3	-.415	3
399		10	max	268.98	3	4.215	9	6.162	3	0	3	0	10	.472	2
400			min	-47.383	10	-88.837	2	-18.416	4	0	4	-.007	3	-.404	3
401		11	max	269.085	3	4.013	9	6.162	3	0	3	0	10	.492	2
402			min	-47.266	10	-89.078	2	-18.174	4	0	4	-.007	4	-.393	3
403		12	max	269.19	3	3.812	9	6.162	3	0	3	0	10	.511	2
404			min	-47.15	10	-89.32	2	-17.932	4	0	4	-.011	4	-.381	3
405		13	max	269.295	3	3.61	9	6.162	3	0	3	0	10	.53	2
406			min	-47.034	10	-89.562	2	-17.69	4	0	4	-.015	4	-.37	3
407		14	max	269.399	3	3.409	9	6.162	3	0	3	0	10	.55	2
408			min	-46.917	10	-89.804	2	-17.448	4	0	4	-.018	4	-.359	3
409		15	max	269.504	3	3.207	9	6.162	3	0	3	0	10	.569	2
410			min	-46.801	10	-90.046	2	-17.206	4	0	4	-.022	4	-.348	3
411		16	max	300.635	2	437.178	2	6.133	3	0	3	0	3	.584	2
412			min	-23.194	3	-499.379	3	-15.895	4	0	4	-.026	4	-.332	3
413		17	max	300.775	2	436.936	2	6.133	3	0	3	.002	3	.49	2
414			min	-23.089	3	-499.56	3	-15.653	4	0	4	-.029	4	-.224	3
415		18	max	-8.633	12	1136.165	2	5.615	3	0	4	.003	3	.246	2
416			min	-259.468	1	-517.52	3	-38.527	5	0	1	-.038	4	-.112	3
417		19	max	-8.563	12	1135.923	2	5.615	3	0	4	.004	3	0	3
418			min	-259.328	1	-517.701	3	-38.285	5	0	1	-.046	4	0	2
419	M9	1	max	114.313	1	341.361	3	162.382	4	0	3	-.001	15	0	2
420			min	2.659	15	-248.508	1	3.719	10	0	1	-.089	1	0	3
421		2	max	114.453	1	341.18	3	162.624	4	0	3	.031	5	.054	1
422			min	2.702	15	-248.75	1	3.719	10	0	1	-.079	1	-.074	3
423		3	max	88.051	3	5.757	9	44.652	1	0	1	.062	5	.107	1
424			min	-11.991	10	-23.799	2	-25.708	5	0	5	-.068	1	-.147	3
425		4	max	88.156	3	5.556	9	44.652	1	0	1	.057	5	.109	2
426			min	-11.874	10	-24.04	2	-25.466	5	0	5	-.058	1	-.144	3
427		5	max	88.26	3	5.354	9	44.652	1	0	1	.051	5	.114	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
428			min	-11.758	10	-24.282	2	-25.224	5	0	5	-.048	1	-.141	3
429		6	max	88.365	3	5.152	9	44.652	1	0	1	.046	5	.12	2
430			min	-11.642	10	-24.524	2	-24.982	5	0	5	-.039	1	-.138	3
431		7	max	88.47	3	4.951	9	44.652	1	0	1	.04	5	.125	2
432			min	-11.525	10	-24.766	2	-24.74	5	0	5	-.029	1	-.135	3
433		8	max	88.574	3	4.749	9	44.652	1	0	1	.035	5	.13	2
434			min	-11.409	10	-25.008	2	-24.498	5	0	5	-.019	1	-.132	3
435		9	max	88.679	3	4.548	9	44.652	1	0	1	.03	5	.136	2
436			min	-11.292	10	-25.249	2	-24.256	5	0	5	-.01	1	-.129	3
437		10	max	88.784	3	4.346	9	44.652	1	0	1	.024	4	.141	2
438			min	-11.176	10	-25.491	2	-24.014	5	0	5	0	1	-.126	3
439		11	max	88.889	3	4.145	9	44.652	1	0	1	.021	4	.147	2
440			min	-11.06	10	-25.733	2	-23.772	5	0	5	0	10	-.122	3
441		12	max	88.993	3	3.943	9	44.652	1	0	1	.019	1	.152	2
442			min	-10.943	10	-25.975	2	-23.53	5	0	5	.002	10	-.119	3
443		13	max	89.098	3	3.742	9	44.652	1	0	1	.029	1	.158	2
444			min	-10.827	10	-26.217	2	-23.288	5	0	5	.002	10	-.116	3
445		14	max	89.203	3	3.54	9	44.652	1	0	1	.039	1	.164	2
446			min	-10.711	10	-26.459	2	-23.046	5	0	5	.003	15	-.113	3
447		15	max	89.307	3	3.339	9	44.652	1	0	1	.048	1	.17	2
448			min	-10.594	10	-26.7	2	-22.804	5	0	5	0	5	-.109	3
449		16	max	91.861	2	111.233	2	44.988	1	0	10	.059	1	.174	2
450			min	-6.263	3	-162.888	3	-21.388	5	0	4	-.005	5	-.105	3
451		17	max	92.001	2	110.991	2	44.988	1	0	10	.068	1	.15	2
452			min	-6.159	3	-163.07	3	-21.146	5	0	4	-.009	5	-.069	3
453		18	max	2.874	5	347.504	2	47.333	1	0	2	.079	1	.076	2
454			min	-114.445	1	-159.214	3	-42.65	5	0	3	-.018	5	-.035	3
455		19	max	2.939	5	347.262	2	47.333	1	0	2	.089	1	0	2
456			min	-114.305	1	-159.396	3	-42.408	5	0	3	-.028	5	0	3
457	M13	1	max	162.387	4	248.184	1	-2.659	15	0	2	.089	1	0	1
458			min	3.721	10	-341.375	3	-114.303	1	0	3	.001	15	0	3
459		2	max	156.112	4	175.456	1	-1.567	15	0	2	.025	1	.186	3
460			min	3.721	10	-241.182	3	-87.172	1	0	3	0	5	-.135	1
461		3	max	149.837	4	102.729	1	-.475	15	0	2	.006	3	.308	3
462			min	3.721	10	-140.99	3	-60.042	1	0	3	-.022	1	-.224	1
463		4	max	143.563	4	30.001	1	.84	5	0	2	.002	3	.366	3
464			min	3.721	10	-40.798	3	-32.911	1	0	3	-.052	1	-.267	1
465		5	max	137.288	4	59.395	3	2.529	5	0	2	0	3	.36	3
466			min	3.721	10	-42.727	1	-5.78	1	0	3	-.065	1	-.263	1
467		6	max	131.013	4	159.587	3	21.35	1	0	2	.002	5	.29	3
468			min	3.721	10	-115.454	1	-1.077	3	0	3	-.06	1	-.212	1
469		7	max	124.738	4	259.779	3	48.481	1	0	2	.005	5	.156	3
470			min	3.721	10	-188.182	1	.436	12	0	3	-.037	1	-.115	1
471		8	max	118.463	4	359.972	3	75.612	1	0	2	.01	4	.028	1
472			min	3.721	10	-260.91	1	1.496	12	0	3	0	3	-.042	3
473		9	max	112.188	4	460.164	3	102.742	1	0	2	.059	1	.218	1
474			min	3.721	10	-333.637	1	2.555	12	0	3	.001	12	-.304	3
475		10	max	105.913	4	560.356	3	129.873	1	0	2	.134	1	.455	1
476			min	3.721	10	-406.365	1	3.615	12	0	3	.003	12	-.63	3
477		11	max	76.363	4	333.637	1	1.645	5	0	3	.058	1	.218	1
478			min	3.145	12	-460.164	3	-102.32	1	0	2	-.014	5	-.304	3
479		12	max	70.088	4	260.909	1	3.334	5	0	3	.003	2	.028	1
480			min	3.145	12	-359.972	3	-75.189	1	0	2	-.013	4	-.042	3
481		13	max	63.813	4	188.182	1	5.024	5	0	3	-.003	10	.156	3
482			min	3.145	12	-259.779	3	-48.059	1	0	2	-.038	1	-.115	1
483		14	max	57.538	4	115.454	1	6.713	5	0	3	-.004	15	.29	3
484			min	3.145	12	-159.587	3	-20.928	1	0	2	-.06	1	-.212	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
485		15	max	51.263	4	42.726	1	10.027	4	0	3	0	15	.36	3
486			min	3.145	12	-59.395	3	-.317	10	0	2	-.064	1	-.263	1
487		16	max	46.012	1	40.798	3	33.333	1	0	3	.005	5	.366	3
488			min	3.145	12	-30.001	1	2.7	10	0	2	-.052	1	-.267	1
489		17	max	46.012	1	140.99	3	60.464	1	0	3	.012	5	.308	3
490			min	3.145	12	-102.729	1	4.079	12	0	2	-.022	1	-.224	1
491		18	max	46.012	1	241.183	3	87.594	1	0	3	.026	4	.186	3
492			min	3.145	12	-175.457	1	5.139	12	0	2	0	10	-.135	1
493		19	max	46.012	1	341.375	3	114.725	1	0	3	.09	1	0	1
494			min	3.145	12	-248.184	1	6.198	12	0	2	.007	12	0	3
495	M16	1	max	42.402	5	347.439	2	2.939	5	0	3	.089	1	0	2
496			min	-47.202	1	-159.421	3	-114.316	1	0	2	-.028	5	0	3
497		2	max	36.127	5	245.64	2	4.628	5	0	3	.025	1	.087	3
498			min	-47.202	1	-112.94	3	-87.186	1	0	2	-.025	5	-.189	2
499		3	max	29.852	5	143.842	2	6.317	5	0	3	0	12	.144	3
500			min	-47.202	1	-66.458	3	-60.055	1	0	2	-.026	4	-.314	2
501		4	max	23.577	5	42.043	2	8.007	5	0	3	-.002	12	.172	3
502			min	-47.202	1	-19.976	3	-32.924	1	0	2	-.052	1	-.373	2
503		5	max	17.302	5	26.506	3	9.696	5	0	3	-.003	12	.17	3
504			min	-47.202	1	-59.756	2	-5.794	1	0	2	-.065	1	-.368	2
505		6	max	11.027	5	72.987	3	21.337	1	0	3	-.003	15	.138	3
506			min	-47.202	1	-161.554	2	-.326	3	0	2	-.06	1	-.297	2
507		7	max	4.752	5	119.469	3	48.468	1	0	3	.003	5	.077	3
508			min	-47.202	1	-263.353	2	.906	12	0	2	-.037	1	-.161	2
509		8	max	.358	3	165.951	3	75.598	1	0	3	.012	4	.04	2
510			min	-47.202	1	-365.152	2	1.965	12	0	2	-.004	3	-.015	3
511		9	max	.358	3	212.433	3	102.729	1	0	3	.059	1	.305	2
512			min	-47.202	1	-466.95	2	3.025	12	0	2	-.002	3	-.135	3
513		10	max	24.232	5	-10.564	15	129.86	1	0	14	.134	1	.636	2
514			min	-47.202	1	-568.749	2	-6.666	3	0	2	.004	12	-.286	3
515		11	max	17.957	5	466.95	2	1.374	5	0	2	.059	1	.305	2
516			min	-47.034	1	-212.433	3	-102.317	1	0	3	-.012	5	-.135	3
517		12	max	11.682	5	365.152	2	3.063	5	0	2	.003	2	.04	2
518			min	-47.034	1	-165.951	3	-75.186	1	0	3	-.01	4	-.015	3
519		13	max	5.407	5	263.353	2	4.752	5	0	2	-.002	12	.077	3
520			min	-47.034	1	-119.469	3	-48.056	1	0	3	-.038	1	-.161	2
521		14	max	-.507	15	161.554	2	6.442	5	0	2	-.002	12	.138	3
522			min	-47.034	1	-72.987	3	-20.925	1	0	3	-.06	1	-.297	2
523		15	max	-3.408	12	59.756	2	9.733	4	0	2	0	15	.17	3
524			min	-47.034	1	-26.506	3	-.305	10	0	3	-.064	1	-.368	2
525		16	max	-3.408	12	19.976	3	33.336	1	0	2	.006	5	.172	3
526			min	-47.034	1	-42.043	2	1.878	12	0	3	-.052	1	-.373	2
527		17	max	-3.408	12	66.458	3	60.467	1	0	2	.013	5	.144	3
528			min	-47.034	1	-143.842	2	2.937	12	0	3	-.022	1	-.314	2
529		18	max	-3.408	12	112.94	3	87.598	1	0	2	.027	4	.087	3
530			min	-47.034	1	-245.64	2	3.997	12	0	3	0	10	-.189	2
531		19	max	-3.408	12	159.421	3	114.728	1	0	2	.09	1	0	2
532			min	-47.034	1	-347.439	2	5.056	12	0	3	.006	12	0	3
533	M15	1	max	0	1	1.313	9	.068	3	0	9	0	9	0	1
534			min	-69.539	3	0	1	-.021	9	0	3	0	3	0	1
535		2	max	0	1	1.167	9	.068	3	0	9	0	9	0	1
536			min	-69.61	3	0	1	-.021	9	0	3	0	3	0	9
537		3	max	0	1	1.021	9	.068	3	0	9	0	9	0	1
538			min	-69.68	3	0	1	-.021	9	0	3	0	3	0	9
539		4	max	0	1	.875	9	.068	3	0	9	0	9	0	1
540			min	-69.751	3	0	1	-.021	9	0	3	0	3	-.001	9
541		5	max	0	1	.729	9	.068	3	0	9	0	9	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
542			min	-69.821	3	0	1	-.021	9	0	3	0	3	-.002	9
543		6	max	0	1	.583	9	.068	3	0	9	0	9	0	1
544			min	-69.892	3	0	1	-.021	9	0	3	0	3	-.002	9
545		7	max	0	1	.438	9	.068	3	0	9	0	3	0	1
546			min	-69.962	3	0	1	-.021	9	0	3	0	9	-.002	9
547		8	max	0	1	.292	9	.068	3	0	9	0	3	0	1
548			min	-70.033	3	0	1	-.021	9	0	3	0	9	-.002	9
549		9	max	0	1	.146	9	.068	3	0	9	0	3	0	1
550			min	-70.103	3	0	1	-.021	9	0	3	0	9	-.002	9
551		10	max	0	1	0	1	.068	3	0	9	0	3	0	1
552			min	-70.174	3	0	1	-.021	9	0	3	0	9	-.002	9
553		11	max	0	1	0	1	.068	3	0	9	0	3	0	1
554			min	-70.244	3	-.146	9	-.021	9	0	3	0	9	-.002	9
555		12	max	0	1	0	1	.068	3	0	9	0	3	0	1
556			min	-70.315	3	-.292	9	-.021	9	0	3	0	9	-.002	9
557		13	max	0	1	0	1	.068	3	0	9	0	3	0	1
558			min	-70.385	3	-.438	9	-.021	9	0	3	0	9	-.002	9
559		14	max	0	1	0	1	.068	3	0	9	0	3	0	1
560			min	-70.456	3	-.583	9	-.021	9	0	3	0	9	-.002	9
561		15	max	0	1	0	1	.068	3	0	9	0	3	0	1
562			min	-70.526	3	-.729	9	-.021	9	0	3	0	9	-.002	9
563		16	max	0	1	0	1	.068	3	0	9	0	3	0	1
564			min	-70.597	3	-.875	9	-.021	9	0	3	0	9	-.001	9
565		17	max	0	1	0	1	.068	3	0	9	0	3	0	1
566			min	-70.667	3	-1.021	9	-.021	9	0	3	0	9	0	9
567		18	max	0	1	0	1	.068	3	0	9	0	3	0	1
568			min	-70.738	3	-1.167	9	-.021	9	0	3	0	9	0	9
569		19	max	0	1	0	1	.068	3	0	9	0	3	0	1
570			min	-70.808	3	-1.313	9	-.021	9	0	3	0	9	0	1
571	M16A	1	max	0	10	2.744	4	.295	4	0	3	0	3	0	1
572			min	-208.932	4	0	10	-.028	3	0	2	0	4	0	1
573		2	max	0	10	2.439	4	.265	4	0	3	0	3	0	10
574			min	-208.961	4	0	10	-.028	3	0	2	0	4	0	4
575		3	max	0	10	2.134	4	.236	4	0	3	0	3	0	10
576			min	-208.99	4	0	10	-.028	3	0	2	0	4	-.002	4
577		4	max	0	10	1.829	4	.207	4	0	3	0	3	0	10
578			min	-209.019	4	0	10	-.028	3	0	2	0	4	-.003	4
579		5	max	0	10	1.525	4	.178	4	0	3	0	3	0	10
580			min	-209.047	4	0	10	-.028	3	0	2	0	1	-.003	4
581		6	max	0	10	1.22	4	.148	4	0	3	0	3	0	10
582			min	-209.076	4	0	10	-.028	3	0	2	0	1	-.004	4
583		7	max	0	10	.915	4	.119	4	0	3	0	5	0	10
584			min	-209.105	4	0	10	-.028	3	0	2	0	1	-.004	4
585		8	max	0	10	.61	4	.09	4	0	3	0	5	0	10
586			min	-209.134	4	0	10	-.028	3	0	2	0	1	-.004	4
587		9	max	0	10	.305	4	.061	4	0	3	0	5	0	10
588			min	-209.163	4	0	10	-.028	3	0	2	0	1	-.004	4
589		10	max	0	10	0	1	.031	4	0	3	0	5	0	10
590			min	-209.192	4	0	1	-.028	3	0	2	0	1	-.005	4
591		11	max	0	10	0	10	.028	1	0	3	0	5	0	10
592			min	-209.221	4	-.305	4	-.028	3	0	2	0	1	-.004	4
593		12	max	0	10	0	10	.028	1	0	3	0	5	0	10
594			min	-209.25	4	-.61	4	-.031	5	0	2	0	1	-.004	4
595		13	max	0	10	0	10	.028	1	0	3	0	5	0	10
596			min	-209.278	4	-.915	4	-.06	5	0	2	0	3	-.004	4
597		14	max	0	10	0	10	.028	1	0	3	0	5	0	10
598			min	-209.307	4	-1.22	4	-.089	5	0	2	0	3	-.004	4

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
599		15	max	.088	2	0	10	.028	1	0	3	0	4	0	10
600			min	-209.336	4	-1.525	4	-.119	5	0	2	0	3	-.003	4
601		16	max	.182	2	0	10	.028	1	0	3	0	4	0	10
602			min	-209.365	4	-1.829	4	-.148	5	0	2	0	3	-.003	4
603		17	max	.276	2	0	10	.028	1	0	3	0	1	0	10
604			min	-209.394	4	-2.134	4	-.177	5	0	2	0	3	-.002	4
605		18	max	.37	2	0	10	.028	1	0	3	0	1	0	10
606			min	-209.423	4	-2.439	4	-.206	5	0	2	0	5	0	4
607		19	max	.464	2	0	10	.028	1	0	3	0	1	0	1
608			min	-209.452	4	-2.744	4	-.236	5	0	2	0	5	0	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	M2	1	max	.002	1	.009	2	.009	1	1.388e-3	5	NC	3	NC	2
2			min	-.004	3	-.009	3	-.013	5	-7.22e-4	1	4245.779	2	4239.015	1
3		2	max	.002	1	.009	2	.009	1	1.409e-3	5	NC	3	NC	2
4			min	-.003	3	-.009	3	-.013	5	-6.911e-4	1	4634.521	2	4567.728	1
5		3	max	.002	1	.008	2	.008	1	1.431e-3	5	NC	3	NC	2
6			min	-.003	3	-.009	3	-.013	5	-6.603e-4	1	5096.998	2	4956.086	1
7		4	max	.002	1	.007	2	.007	1	1.453e-3	5	NC	1	NC	2
8			min	-.003	3	-.008	3	-.012	5	-6.294e-4	1	5651.025	2	5418.371	1
9		5	max	.002	1	.006	2	.007	1	1.474e-3	5	NC	1	NC	2
10			min	-.003	3	-.008	3	-.012	5	-5.985e-4	1	6320.356	2	5973.656	1
11		6	max	.002	1	.006	2	.006	1	1.496e-3	5	NC	1	NC	2
12			min	-.003	3	-.007	3	-.012	5	-5.677e-4	1	7137.176	2	6647.87	1
13		7	max	.002	1	.005	2	.005	1	1.517e-3	5	NC	1	NC	2
14			min	-.002	3	-.007	3	-.011	5	-5.368e-4	1	8145.933	2	7477.002	1
15		8	max	.001	1	.004	2	.005	1	1.539e-3	5	NC	1	NC	2
16			min	-.002	3	-.007	3	-.01	5	-5.06e-4	1	9409.379	2	8512.192	1
17		9	max	.001	1	.004	2	.004	1	1.561e-3	5	NC	1	NC	2
18			min	-.002	3	-.006	3	-.01	5	-4.751e-4	1	NC	1	9828.174	1
19		10	max	.001	1	.003	2	.003	1	1.582e-3	5	NC	1	NC	1
20			min	-.002	3	-.006	3	-.009	5	-4.442e-4	1	NC	1	NC	1
21		11	max	.001	1	.002	2	.003	1	1.604e-3	5	NC	1	NC	1
22			min	-.002	3	-.005	3	-.008	5	-4.134e-4	1	NC	1	NC	1
23		12	max	0	1	.002	2	.002	1	1.625e-3	5	NC	1	NC	1
24			min	-.001	3	-.005	3	-.008	5	-3.825e-4	1	NC	1	NC	1
25		13	max	0	1	.002	2	.002	1	1.647e-3	5	NC	1	NC	1
26			min	-.001	3	-.004	3	-.007	5	-3.516e-4	1	NC	1	NC	1
27		14	max	0	1	.001	2	.001	1	1.669e-3	5	NC	1	NC	1
28			min	0	3	-.003	3	-.006	5	-3.208e-4	1	NC	1	NC	1
29		15	max	0	1	0	2	0	1	1.69e-3	5	NC	1	NC	1
30			min	0	3	-.003	3	-.005	5	-2.899e-4	1	NC	1	NC	1
31		16	max	0	1	0	2	0	1	1.712e-3	5	NC	1	NC	1
32			min	0	3	-.002	3	-.004	5	-2.59e-4	1	NC	1	NC	1
33		17	max	0	1	0	2	0	1	1.734e-3	5	NC	1	NC	1
34			min	0	3	-.001	3	-.002	5	-2.282e-4	1	NC	1	NC	1
35		18	max	0	1	0	2	0	1	1.755e-3	5	NC	1	NC	1
36			min	0	3	0	3	-.001	5	-1.973e-4	1	NC	1	NC	1
37		19	max	0	1	0	1	0	1	1.777e-3	5	NC	1	NC	1
38			min	0	1	0	1	0	1	-1.665e-4	1	NC	1	NC	1
39	M3	1	max	0	1	0	1	0	1	7.85e-5	1	NC	1	NC	1
40			min	0	1	0	1	0	1	-8.376e-4	5	NC	1	NC	1
41		2	max	0	3	0	2	.004	5	9.588e-5	1	NC	1	NC	1
42			min	0	2	0	3	0	1	-8.469e-4	5	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
43		3	max	0	3	0	2	.009	5	1.133e-4	1	NC	1	NC	1
44			min	0	2	-.002	3	0	1	-8.561e-4	5	NC	1	NC	1
45		4	max	0	3	0	2	.013	5	1.306e-4	1	NC	1	NC	1
46			min	0	2	-.003	3	0	1	-8.654e-4	5	NC	1	NC	1
47		5	max	0	3	0	2	.017	5	1.48e-4	1	NC	1	NC	1
48			min	0	2	-.003	3	0	1	-8.746e-4	5	NC	1	NC	1
49		6	max	0	3	0	2	.021	5	1.654e-4	1	NC	1	NC	1
50			min	0	2	-.004	3	0	1	-8.838e-4	5	NC	1	NC	1
51		7	max	0	3	0	2	.026	4	1.828e-4	1	NC	1	NC	1
52			min	0	2	-.005	3	0	1	-8.931e-4	5	NC	1	NC	1
53		8	max	0	3	0	2	.03	4	2.002e-4	1	NC	1	NC	1
54			min	0	2	-.006	3	0	1	-9.023e-4	5	NC	1	NC	1
55		9	max	0	3	.001	2	.034	4	2.175e-4	1	NC	1	NC	1
56			min	0	2	-.006	3	0	1	-9.115e-4	5	NC	1	NC	1
57		10	max	0	3	.002	2	.038	4	2.349e-4	1	NC	1	NC	1
58			min	0	2	-.007	3	0	10	-9.208e-4	5	NC	1	NC	1
59		11	max	.001	3	.002	2	.042	4	2.523e-4	1	NC	1	NC	1
60			min	-.001	2	-.007	3	0	10	-9.3e-4	5	NC	1	NC	1
61		12	max	.001	3	.003	2	.046	4	2.697e-4	1	NC	1	NC	1
62			min	-.001	2	-.007	3	0	10	-9.393e-4	5	NC	1	NC	1
63		13	max	.001	3	.003	2	.05	4	2.87e-4	1	NC	1	NC	1
64			min	-.001	2	-.008	3	0	10	-9.485e-4	5	NC	1	NC	1
65		14	max	.001	3	.004	2	.054	4	3.044e-4	1	NC	1	NC	1
66			min	-.001	2	-.008	3	0	10	-9.577e-4	5	NC	1	NC	1
67		15	max	.002	3	.005	2	.057	4	3.218e-4	1	NC	1	NC	1
68			min	-.001	2	-.008	3	0	10	-9.67e-4	5	9079.889	2	NC	1
69		16	max	.002	3	.006	2	.061	4	3.392e-4	1	NC	1	NC	1
70			min	-.002	2	-.008	3	0	10	-9.762e-4	5	7681.422	2	NC	1
71		17	max	.002	3	.007	2	.065	4	3.566e-4	1	NC	1	NC	1
72			min	-.002	2	-.008	3	0	10	-9.854e-4	5	6601.978	2	NC	1
73		18	max	.002	3	.008	2	.068	4	3.739e-4	1	NC	3	NC	1
74			min	-.002	2	-.008	3	0	10	-9.947e-4	5	5758.991	2	NC	1
75		19	max	.002	3	.009	2	.072	4	3.913e-4	1	NC	3	NC	1
76			min	-.002	2	-.008	3	0	10	-1.004e-3	5	5094.604	2	NC	1
77	M4	1	max	.002	1	.011	2	0	10	5.001e-3	5	NC	1	NC	2
78			min	0	12	-.009	3	-.076	4	-5.817e-4	1	NC	1	255.453	4
79		2	max	.002	1	.01	2	0	10	5.001e-3	5	NC	1	NC	2
80			min	0	12	-.009	3	-.069	4	-5.817e-4	1	NC	1	278.469	4
81		3	max	.002	1	.01	2	0	10	5.001e-3	5	NC	1	NC	2
82			min	0	12	-.008	3	-.063	4	-5.817e-4	1	NC	1	305.861	4
83		4	max	.001	1	.009	2	0	10	5.001e-3	5	NC	1	NC	2
84			min	0	12	-.008	3	-.057	4	-5.817e-4	1	NC	1	338.784	4
85		5	max	.001	1	.008	2	0	10	5.001e-3	5	NC	1	NC	2
86			min	0	12	-.007	3	-.051	4	-5.817e-4	1	NC	1	378.808	4
87		6	max	.001	1	.008	2	0	10	5.001e-3	5	NC	1	NC	2
88			min	0	12	-.007	3	-.045	4	-5.817e-4	1	NC	1	428.117	4
89		7	max	.001	1	.007	2	0	10	5.001e-3	5	NC	1	NC	1
90			min	0	12	-.006	3	-.039	4	-5.817e-4	1	NC	1	489.821	4
91		8	max	.001	1	.007	2	0	10	5.001e-3	5	NC	1	NC	1
92			min	0	12	-.006	3	-.034	4	-5.817e-4	1	NC	1	568.475	4
93		9	max	0	1	.006	2	0	10	5.001e-3	5	NC	1	NC	1
94			min	0	12	-.005	3	-.029	4	-5.817e-4	1	NC	1	670.968	4
95		10	max	0	1	.005	2	0	10	5.001e-3	5	NC	1	NC	1
96			min	0	12	-.005	3	-.024	4	-5.817e-4	1	NC	1	808.129	4
97		11	max	0	1	.005	2	0	10	5.001e-3	5	NC	1	NC	1
98			min	0	12	-.004	3	-.019	4	-5.817e-4	1	NC	1	997.793	4
99		12	max	0	1	.004	2	0	10	5.001e-3	5	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
100			min	0	12	-.004	3	-.015	4	-5.817e-4	1	NC	1	1271.068	4
101		13	max	0	1	.004	2	0	10	5.001e-3	5	NC	1	NC	1
102			min	0	12	-.003	3	-.011	4	-5.817e-4	1	NC	1	1686.306	4
103		14	max	0	1	.003	2	0	10	5.001e-3	5	NC	1	NC	1
104			min	0	12	-.003	3	-.008	4	-5.817e-4	1	NC	1	2363.868	4
105		15	max	0	1	.002	2	0	10	5.001e-3	5	NC	1	NC	1
106			min	0	12	-.002	3	-.005	4	-5.817e-4	1	NC	1	3586.515	4
107		16	max	0	1	.002	2	0	10	5.001e-3	5	NC	1	NC	1
108			min	0	12	-.002	3	-.003	4	-5.817e-4	1	NC	1	6158.068	4
109		17	max	0	1	.001	2	0	10	5.001e-3	5	NC	1	NC	1
110			min	0	12	-.001	3	-.001	4	-5.817e-4	1	NC	1	NC	1
111		18	max	0	1	0	2	0	10	5.001e-3	5	NC	1	NC	1
112			min	0	12	0	3	0	4	-5.817e-4	1	NC	1	NC	1
113		19	max	0	1	0	1	0	1	5.001e-3	5	NC	1	NC	1
114			min	0	1	0	1	0	1	-5.817e-4	1	NC	1	NC	1
115	M6	1	max	.008	1	.032	2	.004	1	1.504e-3	4	NC	3	NC	1
116			min	-.011	3	-.029	3	-.013	5	-6.079e-8	10	1214.524	2	8290.745	3
117		2	max	.007	1	.03	2	.004	1	1.524e-3	4	NC	3	NC	1
118			min	-.011	3	-.028	3	-.013	5	-5.739e-8	10	1299.26	2	8811.458	3
119		3	max	.007	1	.028	2	.003	1	1.543e-3	4	NC	3	NC	1
120			min	-.01	3	-.026	3	-.013	5	-1.563e-6	2	1396.313	2	9428.284	3
121		4	max	.006	1	.026	2	.003	1	1.563e-3	4	NC	3	NC	1
122			min	-.009	3	-.025	3	-.013	5	-3.33e-6	1	1508.147	2	NC	1
123		5	max	.006	1	.024	2	.003	1	1.583e-3	4	NC	3	NC	1
124			min	-.009	3	-.023	3	-.012	5	-7.915e-6	1	1637.933	2	NC	1
125		6	max	.006	1	.022	2	.002	1	1.603e-3	4	NC	3	NC	1
126			min	-.008	3	-.022	3	-.012	5	-1.25e-5	1	1789.825	2	NC	1
127		7	max	.005	1	.02	2	.002	1	1.622e-3	4	NC	3	NC	1
128			min	-.008	3	-.02	3	-.011	5	-1.708e-5	1	1969.364	2	NC	1
129		8	max	.005	1	.018	2	.002	1	1.642e-3	4	NC	3	NC	1
130			min	-.007	3	-.018	3	-.011	5	-2.167e-5	1	2184.109	2	NC	1
131		9	max	.004	1	.016	2	.002	1	1.662e-3	4	NC	3	NC	1
132			min	-.006	3	-.017	3	-.01	5	-2.625e-5	1	2444.64	2	NC	1
133		10	max	.004	1	.014	2	.001	1	1.681e-3	4	NC	3	NC	1
134			min	-.006	3	-.015	3	-.009	5	-3.084e-5	1	2766.243	2	NC	1
135		11	max	.003	1	.012	2	.001	1	1.701e-3	4	NC	3	NC	1
136			min	-.005	3	-.014	3	-.009	5	-3.542e-5	1	3171.835	2	NC	1
137		12	max	.003	1	.011	2	0	1	1.721e-3	4	NC	3	NC	1
138			min	-.004	3	-.012	3	-.008	5	-4.001e-5	1	3697.424	2	NC	1
139		13	max	.003	1	.009	2	0	1	1.74e-3	4	NC	3	NC	1
140			min	-.004	3	-.01	3	-.007	5	-4.459e-5	1	4403.002	2	NC	1
141		14	max	.002	1	.007	2	0	1	1.76e-3	4	NC	3	NC	1
142			min	-.003	3	-.009	3	-.006	5	-4.918e-5	1	5396.528	2	NC	1
143		15	max	.002	1	.006	2	0	1	1.78e-3	4	NC	1	NC	1
144			min	-.003	3	-.007	3	-.005	5	-5.376e-5	1	6893.875	2	NC	1
145		16	max	.001	1	.004	2	0	1	1.8e-3	4	NC	1	NC	1
146			min	-.002	3	-.005	3	-.004	5	-5.834e-5	1	9398.664	2	NC	1
147		17	max	0	1	.003	2	0	1	1.819e-3	4	NC	1	NC	1
148			min	-.001	3	-.003	3	-.003	5	-6.293e-5	1	NC	1	NC	1
149		18	max	0	1	.001	2	0	1	1.84e-3	5	NC	1	NC	1
150			min	0	3	-.002	3	-.001	5	-6.751e-5	1	NC	1	NC	1
151		19	max	0	1	0	1	0	1	1.86e-3	5	NC	1	NC	1
152			min	0	1	0	1	0	1	-7.21e-5	1	NC	1	NC	1
153	M7	1	max	0	1	0	1	0	1	3.37e-5	1	NC	1	NC	1
154			min	0	1	0	1	0	1	-8.769e-4	5	NC	1	NC	1
155		2	max	0	3	.001	2	.004	5	2.826e-5	1	NC	1	NC	1
156			min	0	2	-.002	3	0	1	-8.726e-4	4	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
157		3	max	0	3	.003	2	.009	5	2.282e-5	1	NC	1	NC	1
158			min	0	2	-.004	3	0	1	-8.691e-4	4	NC	1	NC	1
159		4	max	.001	3	.004	2	.013	5	1.739e-5	1	NC	1	NC	1
160			min	-.001	2	-.006	3	0	1	-8.656e-4	4	NC	1	NC	1
161		5	max	.001	3	.006	2	.018	5	1.195e-5	1	NC	1	NC	1
162			min	-.002	2	-.008	3	0	1	-8.621e-4	4	8058.164	2	NC	1
163		6	max	.002	3	.007	2	.022	5	2.269e-5	3	NC	1	NC	1
164			min	-.002	2	-.01	3	0	1	-8.585e-4	4	6459.907	2	NC	1
165		7	max	.002	3	.009	2	.027	5	4.266e-5	3	NC	3	NC	1
166			min	-.002	2	-.011	3	0	1	-8.55e-4	4	5368.754	2	NC	1
167		8	max	.002	3	.01	2	.031	4	6.263e-5	3	NC	3	NC	1
168			min	-.003	2	-.013	3	-.001	1	-8.515e-4	4	4570.094	2	NC	1
169		9	max	.003	3	.012	2	.035	4	8.26e-5	3	NC	3	NC	1
170			min	-.003	2	-.015	3	-.001	1	-8.48e-4	4	3956.964	2	NC	1
171		10	max	.003	3	.013	2	.039	4	1.026e-4	3	NC	3	NC	1
172			min	-.004	2	-.016	3	-.001	1	-8.444e-4	4	3470.066	2	NC	1
173		11	max	.003	3	.015	2	.043	4	1.225e-4	3	NC	3	NC	1
174			min	-.004	2	-.018	3	-.001	1	-8.409e-4	4	3073.808	2	NC	1
175		12	max	.004	3	.017	2	.047	4	1.425e-4	3	NC	3	NC	1
176			min	-.004	2	-.019	3	-.002	1	-8.374e-4	4	2745.435	2	NC	1
177		13	max	.004	3	.019	2	.051	4	1.625e-4	3	NC	3	NC	1
178			min	-.005	2	-.02	3	-.002	1	-8.339e-4	4	2469.623	2	NC	1
179		14	max	.004	3	.021	2	.055	4	1.824e-4	3	NC	3	NC	1
180			min	-.005	2	-.021	3	-.002	1	-8.303e-4	4	2235.597	2	NC	1
181		15	max	.005	3	.023	2	.058	4	2.024e-4	3	NC	3	NC	1
182			min	-.006	2	-.022	3	-.002	1	-8.268e-4	4	2035.497	2	NC	1
183		16	max	.005	3	.025	2	.062	4	2.224e-4	3	NC	3	NC	1
184			min	-.006	2	-.023	3	-.002	1	-8.233e-4	4	1863.413	2	NC	1
185		17	max	.005	3	.027	2	.066	4	2.424e-4	3	NC	3	NC	1
186			min	-.006	2	-.024	3	-.002	1	-8.198e-4	4	1714.789	2	NC	1
187		18	max	.006	3	.029	2	.069	4	2.623e-4	3	NC	3	NC	1
188			min	-.007	2	-.025	3	-.002	1	-8.162e-4	4	1586.043	2	NC	1
189		19	max	.006	3	.031	2	.073	4	2.823e-4	3	NC	3	NC	1
190			min	-.007	2	-.026	3	-.002	1	-8.127e-4	4	1474.317	2	NC	1
191	M8	1	max	.005	1	.037	2	.002	1	4.817e-3	4	NC	1	NC	2
192			min	0	3	-.029	3	-.076	4	-2.179e-4	3	NC	1	253.494	4
193		2	max	.004	1	.035	2	.002	1	4.817e-3	4	NC	1	NC	1
194			min	0	3	-.028	3	-.07	4	-2.179e-4	3	NC	1	276.333	4
195		3	max	.004	1	.033	2	.002	1	4.817e-3	4	NC	1	NC	1
196			min	0	3	-.026	3	-.064	4	-2.179e-4	3	NC	1	303.515	4
197		4	max	.004	1	.031	2	.002	1	4.817e-3	4	NC	1	NC	1
198			min	0	3	-.024	3	-.057	4	-2.179e-4	3	NC	1	336.185	4
199		5	max	.004	1	.029	2	.001	1	4.817e-3	4	NC	1	NC	1
200			min	0	3	-.023	3	-.051	4	-2.179e-4	3	NC	1	375.901	4
201		6	max	.003	1	.027	2	.001	1	4.817e-3	4	NC	1	NC	1
202			min	0	3	-.021	3	-.045	4	-2.179e-4	3	NC	1	424.831	4
203		7	max	.003	1	.025	2	.001	1	4.817e-3	4	NC	1	NC	1
204			min	0	3	-.019	3	-.04	4	-2.179e-4	3	NC	1	486.061	4
205		8	max	.003	1	.023	2	0	1	4.817e-3	4	NC	1	NC	1
206			min	0	3	-.018	3	-.034	4	-2.179e-4	3	NC	1	564.111	4
207		9	max	.003	1	.021	2	0	1	4.817e-3	4	NC	1	NC	1
208			min	0	3	-.016	3	-.029	4	-2.179e-4	3	NC	1	665.817	4
209		10	max	.002	1	.019	2	0	1	4.817e-3	4	NC	1	NC	1
210			min	0	3	-.015	3	-.024	4	-2.179e-4	3	NC	1	801.925	4
211		11	max	.002	1	.016	2	0	1	4.817e-3	4	NC	1	NC	1
212			min	0	3	-.013	3	-.02	4	-2.179e-4	3	NC	1	990.133	4
213		12	max	.002	1	.014	2	0	1	4.817e-3	4	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
214			min	0	3	-.011	3	-.015	4	-2.179e-4	3	NC	1	1261.311	4
215		13	max	.002	1	.012	2	0	1	4.817e-3	4	NC	1	NC	1
216			min	0	3	-.01	3	-.012	4	-2.179e-4	3	NC	1	1673.363	4
217		14	max	.001	1	.01	2	0	1	4.817e-3	4	NC	1	NC	1
218			min	0	3	-.008	3	-.008	4	-2.179e-4	3	NC	1	2345.725	4
219		15	max	.001	1	.008	2	0	1	4.817e-3	4	NC	1	NC	1
220			min	0	3	-.006	3	-.005	4	-2.179e-4	3	NC	1	3558.99	4
221		16	max	0	1	.006	2	0	1	4.817e-3	4	NC	1	NC	1
222			min	0	3	-.005	3	-.003	4	-2.179e-4	3	NC	1	6110.811	4
223		17	max	0	1	.004	2	0	1	4.817e-3	4	NC	1	NC	1
224			min	0	3	-.003	3	-.001	4	-2.179e-4	3	NC	1	NC	1
225		18	max	0	1	.002	2	0	1	4.817e-3	4	NC	1	NC	1
226			min	0	3	-.002	3	0	4	-2.179e-4	3	NC	1	NC	1
227		19	max	0	1	0	1	0	1	4.817e-3	4	NC	1	NC	1
228			min	0	1	0	1	0	1	-2.179e-4	3	NC	1	NC	1
229	M10	1	max	.002	1	.009	2	0	3	7.343e-4	1	NC	3	NC	1
230			min	-.003	3	-.009	3	-.006	4	-4.218e-4	3	4250.127	2	NC	1
231		2	max	.002	1	.008	2	0	3	6.963e-4	1	NC	3	NC	1
232			min	-.003	3	-.009	3	-.006	4	-4.077e-4	3	4639.412	2	NC	1
233		3	max	.002	1	.008	2	0	3	6.584e-4	1	NC	3	NC	1
234			min	-.003	3	-.009	3	-.006	4	-3.936e-4	3	5102.562	2	NC	1
235		4	max	.002	1	.007	2	0	3	6.204e-4	1	NC	1	NC	1
236			min	-.003	3	-.008	3	-.006	4	-3.795e-4	3	5657.434	2	NC	1
237		5	max	.002	1	.006	2	0	3	6.163e-4	4	NC	1	NC	1
238			min	-.002	3	-.008	3	-.007	4	-3.654e-4	3	6327.834	2	NC	1
239		6	max	.002	1	.006	2	0	3	6.767e-4	4	NC	1	NC	1
240			min	-.002	3	-.007	3	-.007	4	-3.512e-4	3	7146.025	2	NC	1
241		7	max	.002	1	.005	2	0	3	7.372e-4	4	NC	1	NC	1
242			min	-.002	3	-.007	3	-.007	4	-3.371e-4	3	8156.565	2	NC	1
243		8	max	.001	1	.004	2	0	3	7.977e-4	4	NC	1	NC	1
244			min	-.002	3	-.007	3	-.006	4	-3.23e-4	3	9422.373	2	NC	1
245		9	max	.001	1	.004	2	0	3	8.581e-4	4	NC	1	NC	1
246			min	-.002	3	-.006	3	-.006	4	-3.089e-4	3	NC	1	NC	1
247		10	max	.001	1	.003	2	0	3	9.186e-4	4	NC	1	NC	1
248			min	-.002	3	-.006	3	-.006	4	-2.948e-4	3	NC	1	NC	1
249		11	max	.001	1	.002	2	0	3	9.79e-4	4	NC	1	NC	1
250			min	-.001	3	-.005	3	-.006	4	-2.807e-4	3	NC	1	NC	1
251		12	max	0	1	.002	2	0	3	1.04e-3	4	NC	1	NC	1
252			min	-.001	3	-.005	3	-.005	4	-2.666e-4	3	NC	1	NC	1
253		13	max	0	1	.002	2	0	3	1.1e-3	4	NC	1	NC	1
254			min	-.001	3	-.004	3	-.005	4	-2.525e-4	3	NC	1	NC	1
255		14	max	0	1	.001	2	0	3	1.16e-3	4	NC	1	NC	1
256			min	0	3	-.003	3	-.004	4	-2.383e-4	3	NC	1	NC	1
257		15	max	0	1	0	2	0	3	1.221e-3	4	NC	1	NC	1
258			min	0	3	-.003	3	-.004	4	-2.242e-4	3	NC	1	NC	1
259		16	max	0	1	0	2	0	3	1.281e-3	4	NC	1	NC	1
260			min	0	3	-.002	3	-.003	4	-2.101e-4	3	NC	1	NC	1
261		17	max	0	1	0	2	0	3	1.342e-3	4	NC	1	NC	1
262			min	0	3	-.001	3	-.002	4	-1.96e-4	3	NC	1	NC	1
263		18	max	0	1	0	2	0	3	1.402e-3	4	NC	1	NC	1
264			min	0	3	0	3	0	4	-1.819e-4	3	NC	1	NC	1
265		19	max	0	1	0	1	0	1	1.463e-3	4	NC	1	NC	1
266			min	0	1	0	1	0	1	-1.678e-4	3	NC	1	NC	1
267	M11	1	max	0	1	0	1	0	1	7.916e-5	3	NC	1	NC	1
268			min	0	1	0	1	0	1	-6.903e-4	4	NC	1	NC	1
269		2	max	0	3	0	2	.004	4	5.881e-5	3	NC	1	NC	1
270			min	0	2	0	3	0	3	-7.632e-4	4	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
271		3	max	0	3	0	2	.007	4	3.847e-5	3	NC	1	NC	1
272			min	0	2	-.002	3	0	3	-8.361e-4	4	NC	1	NC	1
273		4	max	0	3	0	2	.011	4	1.812e-5	3	NC	1	NC	1
274			min	0	2	-.003	3	-.001	3	-9.09e-4	4	NC	1	NC	1
275		5	max	0	3	0	2	.014	4	-1.84e-6	12	NC	1	NC	1
276			min	0	2	-.004	3	-.001	3	-9.819e-4	4	NC	1	NC	1
277		6	max	0	3	0	2	.018	5	-1.368e-5	10	NC	1	NC	1
278			min	0	2	-.004	3	-.002	3	-1.055e-3	4	NC	1	NC	1
279		7	max	0	3	0	2	.022	5	-1.556e-5	10	NC	1	NC	1
280			min	0	2	-.005	3	-.002	3	-1.128e-3	4	NC	1	NC	1
281		8	max	0	3	0	2	.025	5	-1.745e-5	10	NC	1	NC	1
282			min	0	2	-.006	3	-.002	3	-1.201e-3	4	NC	1	NC	1
283		9	max	0	3	.001	2	.029	5	-1.933e-5	10	NC	1	NC	1
284			min	0	2	-.006	3	-.002	3	-1.274e-3	4	NC	1	NC	1
285		10	max	0	3	.002	2	.032	5	-2.121e-5	10	NC	1	NC	1
286			min	0	2	-.007	3	-.003	1	-1.346e-3	4	NC	1	NC	1
287		11	max	.001	3	.002	2	.036	5	-2.31e-5	10	NC	1	NC	1
288			min	-.001	2	-.007	3	-.003	1	-1.419e-3	4	NC	1	NC	1
289		12	max	.001	3	.003	2	.039	5	-2.498e-5	10	NC	1	NC	1
290			min	-.001	2	-.008	3	-.004	1	-1.492e-3	4	NC	1	NC	1
291		13	max	.001	3	.003	2	.043	5	-2.686e-5	10	NC	1	NC	2
292			min	-.001	2	-.008	3	-.005	1	-1.565e-3	4	NC	1	9942.87	1
293		14	max	.001	3	.004	2	.046	5	-2.874e-5	10	NC	1	NC	2
294			min	-.001	2	-.008	3	-.005	1	-1.638e-3	4	NC	1	8644.378	1
295		15	max	.002	3	.005	2	.05	5	-3.063e-5	10	NC	1	NC	2
296			min	-.001	2	-.008	3	-.006	1	-1.711e-3	4	9094.829	2	7635.23	1
297		16	max	.002	3	.006	2	.053	5	-3.251e-5	10	NC	1	NC	2
298			min	-.002	2	-.008	3	-.007	1	-1.784e-3	4	7692.868	2	6837.092	1
299		17	max	.002	3	.007	2	.057	5	-3.439e-5	10	NC	1	NC	2
300			min	-.002	2	-.008	3	-.007	1	-1.857e-3	4	6610.989	2	6197.055	1
301		18	max	.002	3	.008	2	.06	5	-3.628e-5	10	NC	3	NC	2
302			min	-.002	2	-.008	3	-.008	1	-1.93e-3	4	5766.271	2	5678.367	1
303		19	max	.002	3	.009	2	.064	5	-3.816e-5	10	NC	3	NC	2
304			min	-.002	2	-.008	3	-.009	1	-2.003e-3	4	5100.632	2	5254.906	1
305	M12	1	max	.002	1	.011	2	.007	1	5.892e-3	4	NC	1	NC	3
306			min	0	12	-.009	3	-.07	5	4.337e-5	10	NC	1	276.442	5
307		2	max	.002	1	.01	2	.007	1	5.892e-3	4	NC	1	NC	3
308			min	0	12	-.009	3	-.064	5	4.337e-5	10	NC	1	301.341	5
309		3	max	.002	1	.01	2	.006	1	5.892e-3	4	NC	1	NC	3
310			min	0	12	-.008	3	-.058	5	4.337e-5	10	NC	1	330.976	5
311		4	max	.001	1	.009	2	.006	1	5.892e-3	4	NC	1	NC	2
312			min	0	12	-.008	3	-.053	5	4.337e-5	10	NC	1	366.593	5
313		5	max	.001	1	.008	2	.005	1	5.892e-3	4	NC	1	NC	2
314			min	0	12	-.007	3	-.047	5	4.337e-5	10	NC	1	409.891	5
315		6	max	.001	1	.008	2	.004	1	5.892e-3	4	NC	1	NC	2
316			min	0	12	-.007	3	-.042	5	4.337e-5	10	NC	1	463.233	5
317		7	max	.001	1	.007	2	.004	1	5.892e-3	4	NC	1	NC	2
318			min	0	12	-.006	3	-.036	5	4.337e-5	10	NC	1	529.984	5
319		8	max	.001	1	.007	2	.003	1	5.892e-3	4	NC	1	NC	2
320			min	0	12	-.006	3	-.031	5	4.337e-5	10	NC	1	615.069	5
321		9	max	0	1	.006	2	.003	1	5.892e-3	4	NC	1	NC	2
322			min	0	12	-.005	3	-.027	5	4.337e-5	10	NC	1	725.941	5
323		10	max	0	1	.005	2	.002	1	5.892e-3	4	NC	1	NC	2
324			min	0	12	-.005	3	-.022	5	4.337e-5	10	NC	1	874.313	5
325		11	max	0	1	.005	2	.002	1	5.892e-3	4	NC	1	NC	1
326			min	0	12	-.004	3	-.018	5	4.337e-5	10	NC	1	1079.476	5
327		12	max	0	1	.004	2	.001	1	5.892e-3	4	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
328			min	0	12	-.004	3	-.014	5	4.337e-5	10	NC	1	1375.078	5
329		13	max	0	1	.004	2	.001	1	5.892e-3	4	NC	1	NC	1
330			min	0	12	-.003	3	-.011	5	4.337e-5	10	NC	1	1824.234	5
331		14	max	0	1	.003	2	0	1	5.892e-3	4	NC	1	NC	1
332			min	0	12	-.003	3	-.008	5	4.337e-5	10	NC	1	2557.129	5
333		15	max	0	1	.002	2	0	1	5.892e-3	4	NC	1	NC	1
334			min	0	12	-.002	3	-.005	5	4.337e-5	10	NC	1	3879.6	5
335		16	max	0	1	.002	2	0	1	5.892e-3	4	NC	1	NC	1
336			min	0	12	-.002	3	-.003	5	4.337e-5	10	NC	1	6661.059	5
337		17	max	0	1	.001	2	0	1	5.892e-3	4	NC	1	NC	1
338			min	0	12	-.001	3	-.001	5	4.337e-5	10	NC	1	NC	1
339		18	max	0	1	0	2	0	1	5.892e-3	4	NC	1	NC	1
340			min	0	12	0	3	0	5	4.337e-5	10	NC	1	NC	1
341		19	max	0	1	0	1	0	1	5.892e-3	4	NC	1	NC	1
342			min	0	1	0	1	0	1	4.337e-5	10	NC	1	NC	1
343	M1	1	max	.008	3	.025	3	.007	5	1.17e-2	1	NC	1	NC	1
344			min	-.009	2	-.022	2	-.004	1	-1.591e-2	3	NC	1	NC	1
345		2	max	.008	3	.015	3	.01	5	5.601e-3	2	NC	4	NC	1
346			min	-.009	2	-.013	2	-.007	1	-7.871e-3	3	4749.362	3	NC	1
347		3	max	.008	3	.005	3	.014	5	4.539e-4	5	NC	4	NC	2
348			min	-.009	2	-.004	2	-.009	1	-4.501e-4	1	2460.601	3	7603.186	5
349		4	max	.008	3	.004	2	.017	5	4.625e-4	5	NC	4	NC	2
350			min	-.009	2	-.003	3	-.01	1	-3.868e-4	1	1753.935	3	4792.892	5
351		5	max	.008	3	.01	2	.021	5	4.71e-4	5	NC	4	NC	2
352			min	-.009	2	-.009	3	-.011	1	-3.236e-4	1	1391.782	2	3425.886	5
353		6	max	.008	3	.016	2	.025	5	4.796e-4	5	NC	4	NC	2
354			min	-.009	2	-.015	3	-.01	1	-2.603e-4	1	1182.263	2	2629.482	5
355		7	max	.008	3	.02	2	.029	5	4.882e-4	5	NC	5	NC	2
356			min	-.009	2	-.019	3	-.009	1	-1.971e-4	1	1052.966	2	2114.658	5
357		8	max	.008	3	.024	2	.034	5	4.967e-4	5	NC	5	NC	1
358			min	-.009	2	-.021	3	-.007	1	-1.338e-4	1	971.774	2	1758.38	5
359		9	max	.008	3	.026	2	.039	5	5.053e-4	5	NC	5	NC	1
360			min	-.009	2	-.023	3	-.005	1	-7.061e-5	1	923.516	2	1498.477	4
361		10	max	.008	3	.027	2	.043	5	5.15e-4	4	NC	5	NC	1
362			min	-.009	2	-.023	3	-.003	1	-7.363e-6	1	900.943	2	1285.337	4
363		11	max	.008	3	.026	2	.048	4	5.381e-4	4	NC	5	NC	1
364			min	-.009	2	-.023	3	0	1	1.287e-5	10	901.423	2	1124.661	4
365		12	max	.008	3	.025	2	.053	4	5.612e-4	4	NC	5	NC	1
366			min	-.009	2	-.021	3	0	10	1.752e-5	10	925.963	2	1000.821	4
367		13	max	.008	3	.021	2	.058	4	5.844e-4	4	NC	4	NC	2
368			min	-.009	2	-.018	3	0	10	2.216e-5	10	979.772	2	903.774	4
369		14	max	.008	3	.017	2	.063	4	6.075e-4	4	NC	4	NC	2
370			min	-.009	2	-.014	3	0	10	2.681e-5	10	1074.902	2	826.822	4
371		15	max	.008	3	.011	2	.068	4	6.306e-4	4	NC	4	NC	2
372			min	-.009	2	-.009	3	0	10	3.146e-5	10	1237.852	2	765.375	4
373		16	max	.008	3	.003	2	.072	4	9.129e-4	4	NC	4	NC	2
374			min	-.009	2	-.003	3	0	10	3.487e-5	10	1533.514	2	716.212	4
375		17	max	.008	3	.004	3	.076	4	7.365e-3	4	NC	4	NC	2
376			min	-.009	2	-.006	2	0	10	-6.274e-5	1	2170.125	2	677.077	4
377		18	max	.008	3	.012	3	.079	4	8.127e-3	2	NC	4	NC	1
378			min	-.009	2	-.017	2	0	10	-3.839e-3	3	4204.277	2	646.252	4
379		19	max	.008	3	.02	3	.082	4	1.64e-2	2	NC	1	NC	1
380			min	-.009	2	-.029	2	-.002	1	-7.794e-3	3	NC	1	623.271	4
381	M5	1	max	.026	3	.08	3	.007	5	1.098e-5	4	NC	1	NC	1
382			min	-.03	2	-.073	2	-.004	1	4.357e-8	2	NC	1	NC	1
383		2	max	.026	3	.047	3	.01	5	2.279e-4	5	NC	4	NC	1
384			min	-.03	2	-.042	2	-.004	1	-6.786e-5	1	1466.127	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
385		3	max	.026	3	.017	3	.014	5	4.412e-4	5	NC	5	NC	1
386			min	-.03	2	-.013	2	-.004	1	-1.345e-4	1	758.622	2	NC	1
387		4	max	.026	3	.012	2	.017	5	4.602e-4	5	NC	5	NC	1
388			min	-.03	2	-.009	3	-.004	1	-1.284e-4	1	529.802	2	NC	1
389		5	max	.026	3	.034	2	.022	5	4.793e-4	5	NC	5	NC	1
390			min	-.03	2	-.03	3	-.004	1	-1.223e-4	1	418.994	2	NC	1
391		6	max	.026	3	.053	2	.026	5	4.983e-4	5	NC	5	NC	1
392			min	-.03	2	-.047	3	-.004	1	-1.161e-4	1	355.635	2	NC	1
393		7	max	.026	3	.068	2	.031	5	5.173e-4	5	NC	5	NC	1
394			min	-.03	2	-.06	3	-.003	1	-1.1e-4	1	316.508	2	NC	1
395		8	max	.026	3	.079	2	.036	5	5.363e-4	5	NC	7	NC	1
396			min	-.03	2	-.069	3	-.003	1	-1.039e-4	1	291.908	2	NC	1
397		9	max	.026	3	.086	2	.041	5	5.553e-4	5	NC	15	NC	1
398			min	-.03	2	-.074	3	-.003	1	-9.776e-5	1	277.247	2	NC	1
399		10	max	.026	3	.089	2	.046	5	5.743e-4	5	NC	15	NC	1
400			min	-.03	2	-.075	3	-.003	1	-9.163e-5	1	270.329	2	NC	1
401		11	max	.026	3	.088	2	.051	5	5.934e-4	5	NC	15	NC	1
402			min	-.03	2	-.073	3	-.003	1	-8.55e-5	1	270.354	2	NC	1
403		12	max	.026	3	.082	2	.055	5	6.124e-4	5	NC	5	NC	1
404			min	-.03	2	-.067	3	-.003	1	-7.937e-5	1	277.615	2	NC	1
405		13	max	.026	3	.072	2	.06	5	6.314e-4	5	NC	5	NC	1
406			min	-.03	2	-.057	3	-.002	1	-7.324e-5	1	293.673	2	NC	1
407		14	max	.025	3	.056	2	.065	4	6.504e-4	5	NC	5	NC	1
408			min	-.03	2	-.044	3	-.002	1	-6.711e-5	1	322.148	2	NC	1
409		15	max	.025	3	.036	2	.069	4	6.694e-4	5	NC	5	NC	1
410			min	-.03	2	-.028	3	-.002	1	-6.098e-5	1	371.007	2	NC	1
411		16	max	.025	3	.01	2	.073	4	9.451e-4	5	NC	5	NC	1
412			min	-.03	2	-.008	3	-.002	1	-5.902e-5	1	459.812	2	NC	1
413		17	max	.025	3	.014	3	.076	4	7.355e-3	4	NC	5	NC	1
414			min	-.03	2	-.021	2	-.002	1	-1.565e-4	1	651.721	2	NC	1
415		18	max	.025	3	.039	3	.079	4	3.773e-3	4	NC	4	NC	1
416			min	-.03	2	-.057	2	-.002	1	-7.988e-5	1	1263.565	2	NC	1
417		19	max	.025	3	.065	3	.082	4	3.218e-6	5	NC	1	NC	1
418			min	-.03	2	-.096	2	-.002	1	-5.249e-7	3	NC	1	NC	1
419	M9	1	max	.008	3	.024	3	.006	5	1.592e-2	3	NC	1	NC	1
420			min	-.009	2	-.022	2	-.004	1	-1.17e-2	1	NC	1	NC	1
421		2	max	.008	3	.014	3	.006	5	7.861e-3	3	NC	4	NC	1
422			min	-.009	2	-.013	2	0	1	-5.713e-3	1	4750.429	3	NC	1
423		3	max	.008	3	.005	3	.006	4	1.666e-4	1	NC	4	NC	1
424			min	-.009	2	-.004	2	0	3	-4.875e-5	3	2461.162	3	NC	1
425		4	max	.008	3	.004	2	.007	4	1.147e-4	1	NC	4	NC	1
426			min	-.009	2	-.003	3	-.001	3	-5.414e-5	3	1754.312	3	NC	1
427		5	max	.008	3	.01	2	.009	4	6.285e-5	1	NC	4	NC	2
428			min	-.009	2	-.01	3	-.002	3	-5.954e-5	3	1392.653	2	8637.291	14
429		6	max	.008	3	.016	2	.012	4	2.152e-5	2	NC	4	NC	1
430			min	-.009	2	-.015	3	-.003	3	-6.494e-5	3	1182.995	2	6600.517	4
431		7	max	.008	3	.02	2	.015	4	2.037e-5	5	NC	4	NC	1
432			min	-.009	2	-.019	3	-.003	3	-7.033e-5	3	1053.608	2	4525.451	4
433		8	max	.008	3	.024	2	.019	4	3.383e-5	5	NC	5	NC	1
434			min	-.009	2	-.022	3	-.004	3	-9.283e-5	1	972.357	2	3315.458	4
435		9	max	.008	3	.026	2	.023	5	4.729e-5	5	NC	5	NC	1
436			min	-.009	2	-.023	3	-.004	3	-1.447e-4	1	924.06	2	2548.561	4
437		10	max	.008	3	.027	2	.028	5	6.075e-5	5	NC	5	NC	1
438			min	-.009	2	-.024	3	-.004	3	-1.966e-4	1	901.463	2	2031.644	4
439		11	max	.008	3	.026	2	.034	5	7.42e-5	5	NC	5	NC	1
440			min	-.009	2	-.023	3	-.005	1	-2.485e-4	1	901.933	2	1666.406	4
441		12	max	.008	3	.025	2	.04	5	8.766e-5	5	NC	5	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
442			min	-.009	2	-.021	3	-.006	1	-3.004e-4	1	926.475	2	1398.572	4
443		13	max	.008	3	.021	2	.045	5	1.011e-4	5	NC	5	NC	2
444			min	-.009	2	-.018	3	-.008	1	-3.523e-4	1	980.3	2	1188.628	5
445		14	max	.008	3	.017	2	.052	5	1.146e-4	5	NC	4	NC	2
446			min	-.009	2	-.014	3	-.009	1	-4.042e-4	1	1075.467	2	1030.181	5
447		15	max	.008	3	.011	2	.058	5	1.28e-4	5	NC	4	NC	2
448			min	-.009	2	-.009	3	-.009	1	-4.561e-4	1	1238.484	2	907.926	5
449		16	max	.008	3	.003	2	.064	5	4.217e-4	5	NC	4	NC	2
450			min	-.009	2	-.003	3	-.009	1	-4.96e-4	1	1534.268	2	811.823	5
451		17	max	.008	3	.004	3	.07	5	7.389e-3	4	NC	4	NC	2
452			min	-.009	2	-.006	2	-.007	1	-2.509e-4	1	2171.123	2	734.553	4
453		18	max	.008	3	.012	3	.076	5	3.887e-3	3	NC	4	NC	1
454			min	-.009	2	-.017	2	-.005	1	-8.157e-3	2	4206.147	2	666.992	4
455		19	max	.008	3	.02	3	.082	4	7.793e-3	3	NC	1	NC	1
456			min	-.009	2	-.029	2	-.002	1	-1.64e-2	2	NC	1	610.93	4
457	M13	1	max	.004	1	.024	3	.008	3	3.82e-3	3	NC	1	NC	1
458			min	-.006	5	-.022	2	-.009	2	-3.484e-3	2	NC	1	NC	1
459		2	max	.004	1	.142	3	.016	1	4.775e-3	3	NC	5	NC	2
460			min	-.006	5	-.107	2	-.004	10	-4.379e-3	2	1170.586	3	6717.04	1
461		3	max	.004	1	.239	3	.043	1	5.73e-3	3	NC	5	NC	3
462			min	-.006	5	-.178	1	-.002	5	-5.274e-3	2	642.212	3	2912.862	1
463		4	max	.004	1	.301	3	.065	1	6.685e-3	3	NC	5	NC	3
464			min	-.006	5	-.224	1	-.004	5	-6.169e-3	2	498.442	3	1996.231	1
465		5	max	.004	1	.322	3	.074	1	7.64e-3	3	NC	5	NC	3
466			min	-.006	5	-.24	1	-.005	5	-7.064e-3	2	464.464	3	1755.007	1
467		6	max	.004	1	.301	3	.069	1	8.595e-3	3	NC	5	NC	3
468			min	-.007	5	-.225	1	-.007	5	-7.959e-3	2	499.401	3	1893.131	1
469		7	max	.004	1	.247	3	.049	1	9.549e-3	3	NC	5	NC	2
470			min	-.007	5	-.188	2	-.008	5	-8.854e-3	2	619.963	3	2597.841	1
471		8	max	.004	1	.176	3	.021	3	1.05e-2	3	NC	5	NC	2
472			min	-.007	5	-.139	2	-.012	10	-9.749e-3	2	911.531	3	5586.98	1
473		9	max	.004	1	.11	3	.024	3	1.146e-2	3	NC	4	NC	1
474			min	-.007	5	-.093	2	-.024	2	-1.064e-2	2	1611.75	3	8684.999	2
475		10	max	.004	1	.08	3	.026	3	1.241e-2	3	NC	4	NC	4
476			min	-.007	5	-.073	2	-.03	2	-1.154e-2	2	2483.469	3	6397.787	2
477		11	max	.004	1	.11	3	.029	3	1.146e-2	3	NC	4	NC	1
478			min	-.007	5	-.093	2	-.024	2	-1.064e-2	2	1611.749	3	6695.645	3
479		12	max	.004	1	.176	3	.031	3	1.051e-2	3	NC	5	NC	2
480			min	-.007	5	-.139	2	-.012	10	-9.749e-3	2	911.53	3	5506.03	1
481		13	max	.004	1	.247	3	.049	1	9.553e-3	3	NC	5	NC	2
482			min	-.007	5	-.188	2	-.008	10	-8.854e-3	2	619.963	3	2584.638	1
483		14	max	.004	1	.301	3	.069	1	8.599e-3	3	NC	5	NC	5
484			min	-.007	5	-.225	1	-.004	10	-7.959e-3	2	499.4	3	1890.946	1
485		15	max	.004	1	.322	3	.074	1	7.646e-3	3	NC	5	NC	5
486			min	-.007	5	-.239	1	-.002	10	-7.065e-3	2	464.463	3	1757.982	1
487		16	max	.004	1	.302	3	.064	1	6.692e-3	3	NC	5	NC	3
488			min	-.007	5	-.224	1	-.001	5	-6.17e-3	2	498.441	3	2005.377	1
489		17	max	.004	1	.24	3	.043	1	5.738e-3	3	NC	5	NC	3
490			min	-.007	5	-.178	1	-.004	5	-5.275e-3	2	642.211	3	2937.498	1
491		18	max	.004	1	.143	3	.016	1	4.785e-3	3	NC	5	NC	2
492			min	-.007	5	-.107	2	-.004	5	-4.38e-3	2	1170.585	3	6821.279	1
493		19	max	.004	1	.025	3	.008	3	3.831e-3	3	NC	1	NC	1
494			min	-.007	5	-.022	2	-.009	2	-3.486e-3	2	NC	1	NC	1
495	M16	1	max	.002	1	.02	3	.008	3	4.366e-3	2	NC	1	NC	1
496			min	-.082	4	-.029	2	-.009	2	-3.079e-3	3	NC	1	NC	1
497		2	max	.002	1	.078	3	.017	4	5.498e-3	2	NC	5	NC	2
498			min	-.082	4	-.15	2	-.004	10	-3.83e-3	3	1135.409	2	6721.157	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
499		3	max	.002	1	.126	3	.043	1	6.629e-3	2	NC	5	NC	3
500			min	-.082	4	-.25	2	-.002	10	-4.581e-3	3	622.158	2	2914.179	1
501		4	max	.002	1	.158	3	.065	1	7.761e-3	2	NC	5	NC	3
502			min	-.082	4	-.315	2	0	10	-5.333e-3	3	481.82	2	1997.055	1
503		5	max	.002	1	.17	3	.074	1	8.892e-3	2	NC	5	NC	10
504			min	-.082	4	-.337	2	-.001	10	-6.084e-3	3	447.336	2	1755.809	1
505		6	max	.002	1	.163	3	.068	1	1.002e-2	2	NC	5	NC	5
506			min	-.082	4	-.317	2	-.004	10	-6.836e-3	3	478.005	2	1894.319	1
507		7	max	.002	1	.14	3	.048	1	1.115e-2	2	NC	5	NC	2
508			min	-.082	4	-.264	2	-.008	10	-7.587e-3	3	586.714	2	2600.776	1
509		8	max	.002	1	.108	3	.028	3	1.229e-2	2	NC	5	NC	2
510			min	-.082	4	-.192	2	-.012	10	-8.339e-3	3	842.943	2	5605.274	1
511		9	max	.002	1	.079	3	.027	3	1.342e-2	2	NC	4	NC	1
512			min	-.082	4	-.126	2	-.024	2	-9.09e-3	3	1416.476	2	7293.782	3
513		10	max	.002	1	.065	3	.025	3	1.455e-2	2	NC	4	NC	4
514			min	-.082	4	-.096	2	-.03	2	-9.841e-3	3	2057.252	2	6427.842	2
515		11	max	.002	1	.079	3	.024	3	1.342e-2	2	NC	4	NC	1
516			min	-.082	4	-.126	2	-.024	2	-9.089e-3	3	1416.476	2	8564.522	3
517		12	max	.002	1	.108	3	.024	3	1.229e-2	2	NC	5	NC	2
518			min	-.082	4	-.192	2	-.012	10	-8.336e-3	3	842.943	2	5553.801	1
519		13	max	.002	1	.14	3	.049	1	1.116e-2	2	NC	5	NC	2
520			min	-.082	4	-.264	2	-.008	10	-7.584e-3	3	586.714	2	2595.765	1
521		14	max	.002	1	.163	3	.068	1	1.002e-2	2	NC	5	NC	3
522			min	-.082	4	-.317	2	-.004	10	-6.831e-3	3	478.005	2	1896.88	1
523		15	max	.002	1	.17	3	.074	1	8.893e-3	2	NC	5	NC	3
524			min	-.082	4	-.337	2	-.002	10	-6.078e-3	3	447.336	2	1762.773	1
525		16	max	.002	1	.158	3	.064	1	7.762e-3	2	NC	5	NC	3
526			min	-.082	4	-.315	2	-.005	5	-5.326e-3	3	481.82	2	2010.742	1
527		17	max	.002	1	.126	3	.042	1	6.631e-3	2	NC	5	NC	3
528			min	-.082	4	-.25	2	-.007	5	-4.573e-3	3	622.158	2	2946.179	1
529		18	max	.002	1	.078	3	.016	1	5.5e-3	2	NC	5	NC	2
530			min	-.082	4	-.15	2	-.006	5	-3.82e-3	3	1135.41	2	6847.479	1
531		19	max	.002	1	.02	3	.008	3	4.369e-3	2	NC	1	NC	1
532			min	-.082	4	-.029	2	-.009	2	-3.068e-3	3	NC	1	NC	1
533	M15	1	max	0	1	0	1	0	1	3.862e-4	3	NC	1	NC	1
534			min	0	1	0	1	0	1	-6.425e-4	5	NC	1	NC	1
535		2	max	0	3	0	5	.008	4	8.72e-4	3	NC	1	NC	1
536			min	0	5	-.006	1	0	3	-6.639e-4	5	NC	1	NC	1
537		3	max	0	3	0	5	.016	4	1.358e-3	3	NC	5	NC	1
538			min	-.001	5	-.013	1	-.004	3	-1.054e-3	2	6313.574	1	4826.05	4
539		4	max	0	3	0	5	.026	4	1.844e-3	3	NC	5	NC	9
540			min	-.002	5	-.018	1	-.007	3	-1.55e-3	2	4331.481	1	3079.093	4
541		5	max	0	3	.001	5	.035	4	2.329e-3	3	NC	5	NC	9
542			min	-.003	5	-.024	1	-.012	3	-2.046e-3	2	3379.898	1	2291.85	4
543		6	max	0	3	.001	5	.042	4	2.815e-3	3	NC	5	9079.056	9
544			min	-.003	5	-.028	1	-.018	3	-2.542e-3	2	2844.542	1	1876.486	4
545		7	max	0	3	.002	5	.048	4	3.301e-3	3	NC	5	7188.196	9
546			min	-.004	5	-.032	1	-.023	3	-3.038e-3	2	2522.595	1	1645.941	4
547		8	max	0	3	.002	5	.052	4	3.787e-3	3	NC	5	5985.232	9
548			min	-.005	5	-.034	1	-.029	3	-3.535e-3	2	2329.379	1	1525.999	4
549		9	max	0	3	.002	5	.053	4	4.273e-3	3	NC	5	5192.095	9
550			min	-.005	5	-.036	1	-.033	3	-4.031e-3	2	2225.379	1	1485.386	4
551		10	max	0	3	.003	5	.052	4	4.759e-3	3	NC	5	4667.255	9
552			min	-.006	5	-.037	1	-.037	3	-4.527e-3	2	2192.478	1	1496.22	3
553		11	max	0	3	.003	5	.049	4	5.244e-3	3	NC	5	4336.014	9
554			min	-.007	5	-.036	1	-.04	3	-5.023e-3	2	2225.379	1	1383.74	3
555		12	max	0	3	.003	5	.043	4	5.73e-3	3	NC	5	4161.844	9

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
556			min	-.007	5	-.034	1	-.041	3	-5.519e-3	2	2329.379	1	1323.081	3
557		13	max	0	3	.004	5	.036	4	6.216e-3	3	NC	5	4135.865	9
558			min	-.008	5	-.032	1	-.039	3	-6.015e-3	2	2522.595	1	1310.523	3
559		14	max	.001	3	.004	5	.032	1	6.702e-3	3	NC	5	5466.02	15
560			min	-.009	5	-.028	1	-.036	3	-6.512e-3	2	2844.542	1	1351.873	3
561		15	max	.001	3	.005	5	.027	1	7.188e-3	3	NC	5	8808.176	15
562			min	-.009	5	-.024	1	-.029	3	-7.008e-3	2	3379.898	1	1468.218	3
563		16	max	.001	3	.005	5	.019	1	7.673e-3	3	NC	5	NC	5
564			min	-.01	5	-.019	1	-.02	3	-7.504e-3	2	4331.481	1	1716.704	3
565		17	max	.001	3	.005	5	.008	1	8.159e-3	3	NC	5	NC	4
566			min	-.011	5	-.013	1	-.007	3	-8.e-3	2	6313.574	1	2276.544	3
567		18	max	.001	3	.006	5	.01	3	8.645e-3	3	NC	1	NC	4
568			min	-.011	5	-.007	9	-.013	2	-8.496e-3	2	NC	1	4054.225	3
569		19	max	.001	3	.006	5	.032	3	9.131e-3	3	NC	1	NC	1
570			min	-.012	5	-.002	9	-.033	2	-8.992e-3	2	NC	1	NC	1
571	M16A	1	max	0	10	0	10	.01	3	2.66e-3	3	NC	1	NC	1
572			min	-.004	4	-.004	4	-.01	2	-2.578e-3	2	NC	1	NC	1
573		2	max	0	10	-.004	12	.002	9	2.555e-3	3	NC	1	NC	1
574			min	-.004	4	-.015	4	-.003	5	-2.465e-3	2	7122.805	4	NC	1
575		3	max	0	10	-.007	12	.008	1	2.45e-3	3	NC	12	NC	4
576			min	-.004	4	-.025	4	-.009	5	-2.351e-3	2	3624.552	4	6245.676	1
577		4	max	0	10	-.009	12	.012	1	2.345e-3	3	8662.961	12	NC	9
578			min	-.004	4	-.035	4	-.016	5	-2.237e-3	2	2486.655	4	4743.901	1
579		5	max	0	10	-.012	12	.015	1	2.239e-3	3	6759.797	12	NC	14
580			min	-.003	4	-.044	4	-.025	5	-2.123e-3	2	1940.362	4	3298.643	5
581		6	max	0	10	-.014	12	.017	1	2.134e-3	3	5689.083	12	9108.392	10
582			min	-.003	4	-.051	4	-.035	5	-2.009e-3	2	1633.02	4	2372.758	5
583		7	max	0	10	-.016	12	.018	1	2.029e-3	3	5045.19	12	9005.74	10
584			min	-.003	4	-.057	4	-.043	5	-1.896e-3	2	1448.194	4	1880.226	5
585		8	max	0	10	-.017	12	.017	1	1.924e-3	3	4658.758	12	9307.063	10
586			min	-.003	4	-.062	4	-.051	5	-1.782e-3	2	1337.27	4	1598.918	5
587		9	max	0	10	-.018	12	.016	1	1.819e-3	3	4450.757	12	NC	10
588			min	-.002	4	-.064	4	-.056	5	-1.668e-3	2	1277.565	4	1438.347	5
589		10	max	0	10	-.018	12	.015	1	1.713e-3	3	4384.956	12	NC	10
590			min	-.002	4	-.065	4	-.059	5	-1.554e-3	2	1258.677	4	1357.97	5
591		11	max	0	10	-.018	12	.013	1	1.608e-3	3	4450.757	12	NC	9
592			min	-.002	4	-.064	4	-.06	5	-1.44e-3	2	1277.565	4	1340.538	5
593		12	max	0	10	-.017	12	.011	1	1.503e-3	3	4658.758	12	NC	9
594			min	-.002	4	-.061	4	-.058	5	-1.327e-3	2	1337.27	4	1382.989	5
595		13	max	0	10	-.016	12	.008	1	1.398e-3	3	5045.19	12	NC	2
596			min	-.001	4	-.056	4	-.054	5	-1.213e-3	2	1448.194	4	1495.187	5
597		14	max	0	10	-.014	12	.006	1	1.293e-3	3	5689.083	12	NC	1
598			min	-.001	4	-.05	4	-.047	5	-1.099e-3	2	1633.02	4	1705.577	5
599		15	max	0	10	-.012	12	.004	1	1.187e-3	3	6759.797	12	NC	1
600			min	0	4	-.042	4	-.039	5	-9.851e-4	2	1940.362	4	2080.308	5
601		16	max	0	10	-.009	12	.002	1	1.082e-3	3	8662.961	12	NC	1
602			min	0	4	-.033	4	-.029	5	-8.713e-4	2	2486.655	4	2784.671	5
603		17	max	0	10	-.006	12	0	9	9.768e-4	3	NC	12	NC	1
604			min	0	4	-.022	4	-.019	5	-7.575e-4	2	3624.552	4	4334.803	5
605		18	max	0	10	-.003	12	0	3	9.791e-4	4	NC	1	NC	1
606			min	0	4	-.011	4	-.009	5	-6.437e-4	2	7122.805	4	9380.871	5
607		19	max	0	1	0	1	0	1	1.049e-3	4	NC	1	NC	1
608			min	0	1	0	1	0	1	-5.299e-4	2	NC	1	NC	1

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

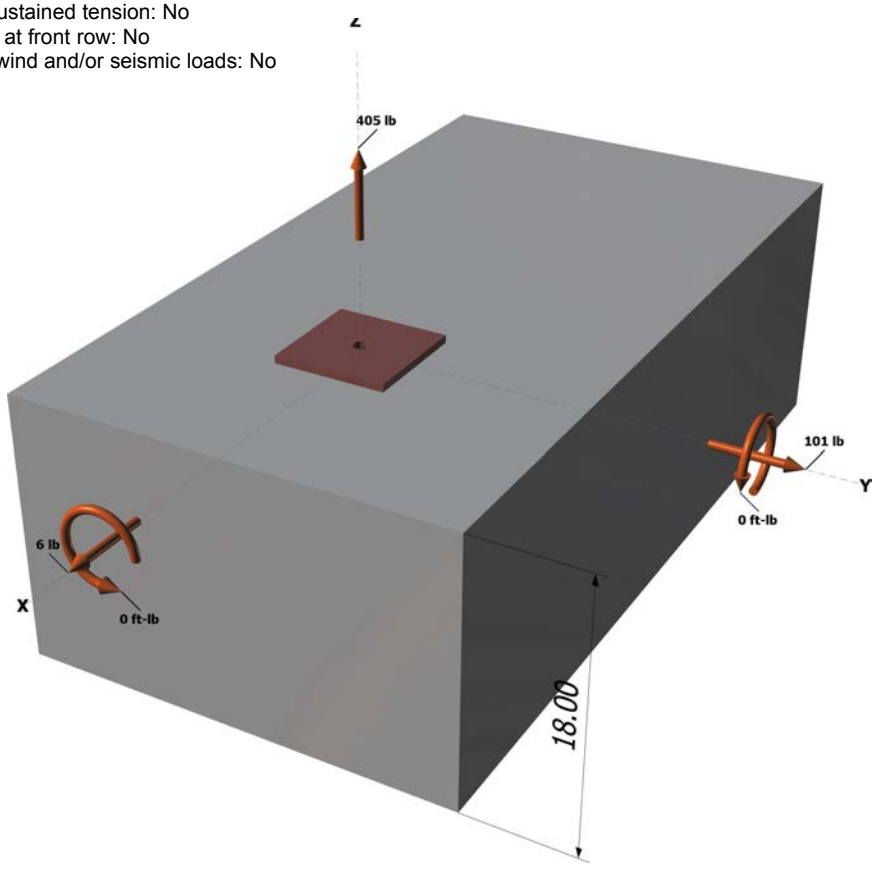
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

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

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

<Figure 1>



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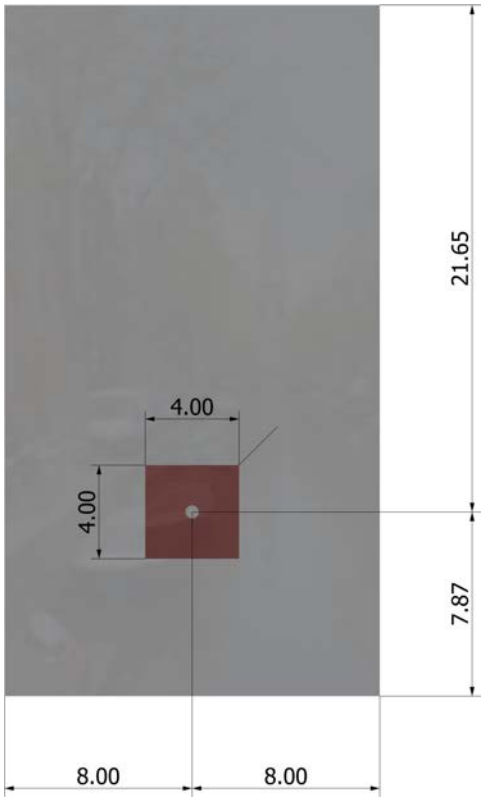


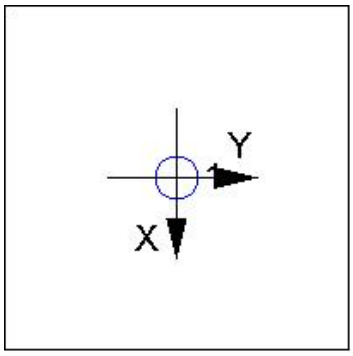
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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	405.0	6.0	101.0	101.2
Sum	405.0	6.0	101.0	101.2

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 405
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	5.333	10469

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

A_{Nc} (in²)	A_{Nco} (in²)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cb} (lb)
253.92	256.00	0.995	1.00	1.000	10469	0.65	6717

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} (in²)	A_{Na0} (in²)	$\Psi_{ed,Na}$	$\Psi_{p,Na}$	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	8.00	8488

$\phi V_{cby} = \phi\,(A_{Vc} / A_{Vco})\,\Psi_{ed,V}\,\Psi_{c,V}\,\Psi_{h,V}V_{by}$ (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)
238.44	288.00	0.897	1.000	1.000	8488	0.70	4411

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)
188.88	278.72	0.903	1.000	1.000	8282	0.70	3549

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	8.00	8488

$\phi V_{cbx} = \phi\,(2)(A_{Vc} / A_{Vco})\,\Psi_{ed,V}\,\Psi_{c,V}\,\Psi_{h,V}V_{by}$ (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)
238.44	288.00	1.000	1.000	1.000	8488	0.70	9838

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)
188.88	278.72	1.000	1.000	1.000	8282	0.70	7858

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)
253.92	256.00	0.995	1.000	1.000	10469	10334	0.70	13657

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	405	6071	0.07	Pass
Concrete breakout	405	6717	0.06	Pass
Adhesive	**405**	**5365**	**0.08**	**Pass (Governs)**

Shear	Factored Load, V_{ua} (lb)	Design Strength, ϕV_n (lb)	Ratio	Status
Steel	**101**	**3156**	**0.03**	**Pass (Governs)**
T Concrete breakout y+	101	4411	0.02	Pass
T Concrete breakout x+	6	3549	0.00	Pass
|| Concrete breakout y+	6	9838	0.00	Pass
|| Concrete breakout x+	101	7858	0.01	Pass
Concrete breakout, combined	-	-	0.02	Pass
Pryout	101	13657	0.01	Pass

Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. D.7.1	0.08	0.00	7.5 %	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

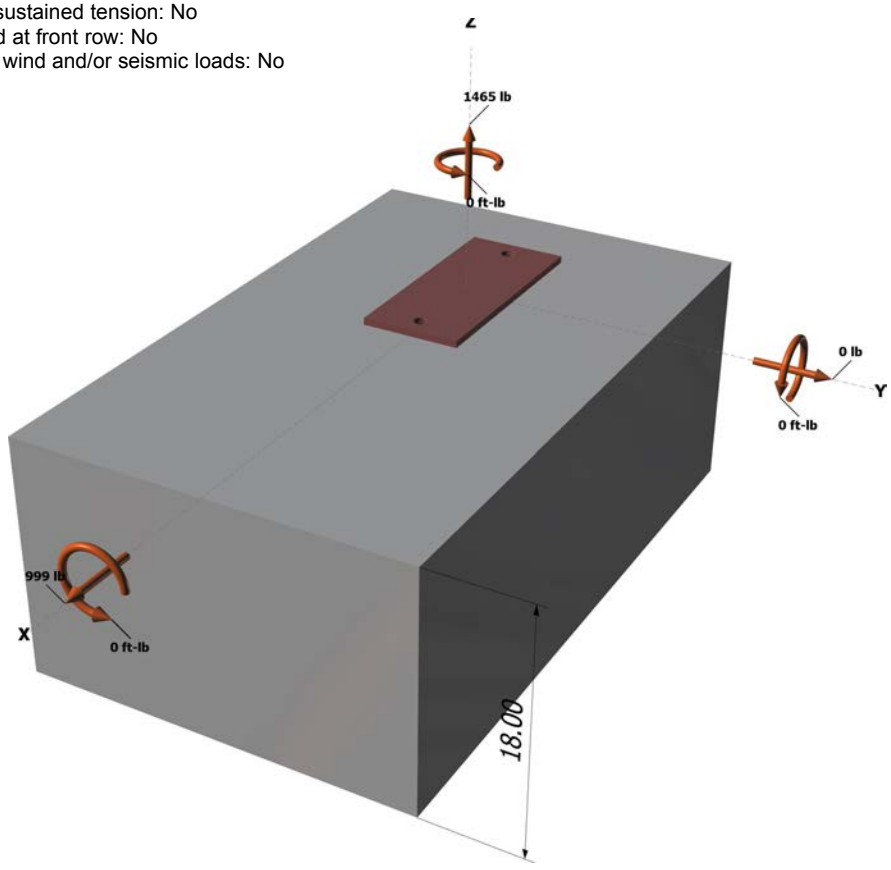
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

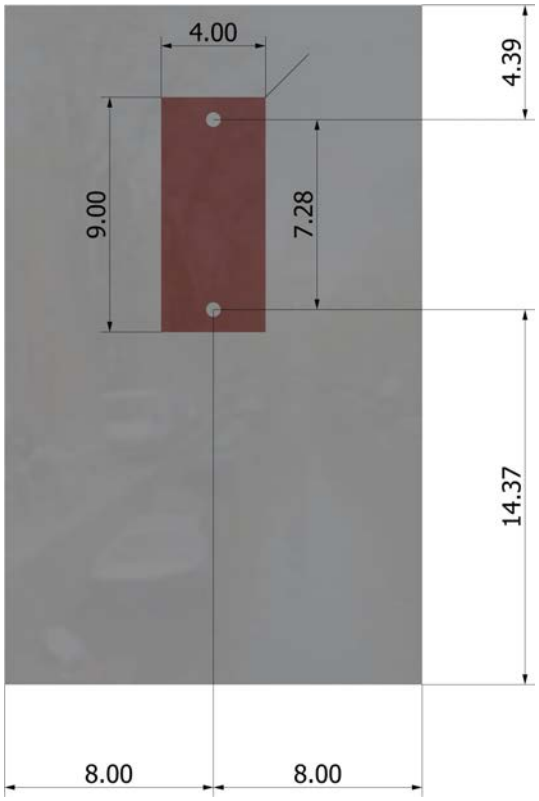
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout 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): 9.00 x 4.00 x 0.28

<Figure 1>



<Figure 2>



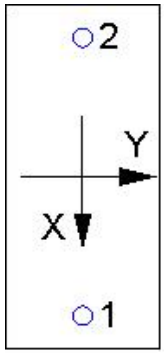
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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	732.5	499.5	0.0	499.5
2	732.5	499.5	0.0	499.5
Sum	1465.0	999.0	0.0	999.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 1465
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	5.333	10469

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

A_{Nc} (in²)	A_{Nco} (in²)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cbg} (lb)
314.72	256.00	1.000	0.865	1.00	1.000	10469	0.65	7233

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

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

A_{Na} (in²)	A_{Na0} (in²)	$\Psi_{ed,Na}$	$\Psi_{g,Na}$	$\Psi_{ec,Na}$	$\Psi_{p,Na}$	N_{a0}(lb)	ϕ	ϕN_{ag} (lb)
177.03	109.66	0.952	1.021	1.000	1.000	9755	0.55	8418

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

$\phi V_{cbx} = \phi\,(A_{Vc} / A_{Vco})\,\Psi_{ed,V}\,\Psi_{c,V}\,\Psi_{h,V}V_{bx}$ (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)
288.00	648.00	0.833	1.000	1.000	15593	0.70	4043

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	8.00	8488

$\phi V_{cbgx} = \phi\,(2)(A_{Vc} / A_{Vco})\,\Psi_{ec,V}\,\Psi_{ed,V}\,\Psi_{c,V}\,\Psi_{h,V}V_{by}$ (Sec. D.4.1, D.6.2.1(c) & Eq. D-22)

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cbgx} (lb)
284.04	288.00	1.000	1.000	1.000	1.000	8488	0.70	11720

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	177.03	109.66	0.952	1.021	1.000	1.000	9755	15305

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
314.72	256.00	1.000	0.865	1.000	1.000	10469	11128	0.70

ϕV_{cpg} (lb)
15580

11. Results

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

Tension	Factored Load, N_{ua} (lb)	Design Strength, øN_n (lb)	Ratio	Status
Steel	733	6071	0.12	Pass
Concrete breakout	**1465**	**7233**	**0.20**	**Pass (Governs)**
Adhesive	1465	8418	0.17	Pass

Shear	Factored Load, V_{ua} (lb)	Design Strength, øV_n (lb)	Ratio	Status
Steel	500	3156	0.16	Pass
T Concrete breakout x+	**999**	**4043**	**0.25**	**Pass (Governs)**
|| Concrete breakout y-	**999**	**11720**	**0.09**	**Pass (Governs)**
Pryout	999	15580	0.06	Pass

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

Sec. D.7.3	0.20	0.25	45.0 %	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.