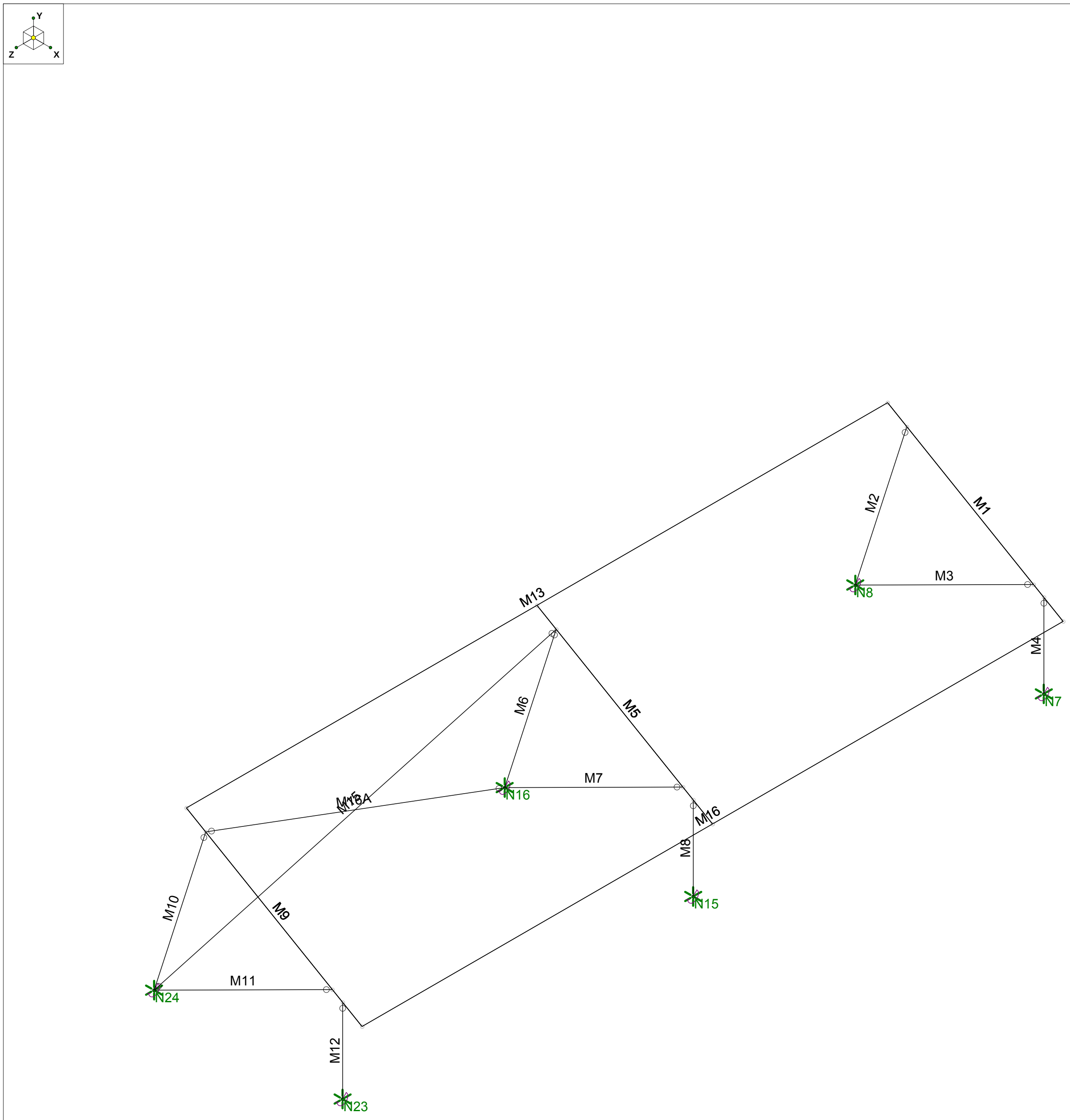


Schletter, Inc.	Standard PVMini Racking System	30° Tilt w/ Seismic Design
HCV	Representative Calculations - ASCE 7-10	

1. INTRODUCTION

1.1 Project Description

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

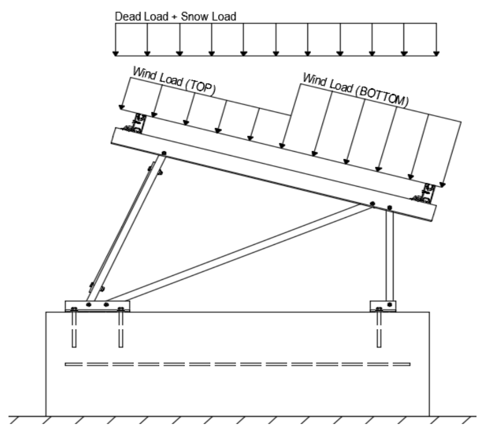
1.2 Construction

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	Height =	1550	mm
Width =	1050	mm	Width =	970	mm
Dead Load =	3.00	psf	Dead Load =	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 7-10 - Chapter 26-31, Wind Loads
- ASCE 7-10 - Chapter 7, Snow Loads
- ASCE 7-10 - Chapter 2, Combination of Loads
- International Building Code, IBC, 2012, 2015
- Aluminum Design Manual, Eighth Edition, 2005

2. LOAD ACTIONS

2.1 Permanent Loads

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

Self-weight of the PV modules.

2.2 Snow Loads

Ground Snow Load, P_g = 30.00 psf
Sloped Roof Snow Load, P_s = 16.49 psf *(ASCE 7-10, Eq. 7.4-1)*
I_s = 1.00
C_s = 0.73
C_e = 0.90
C_t = 1.20

2.3 Wind Loads

Design Wind Speed, V = 140 mph
Height ≤ 15 ft

Exposure Category = C
Importance Category = II

Peak Velocity Pressure, q_z = 30.77 psf *Including the gust factor, G=0.85. (ASCE 7-10, Eq. 27.3-1)*

Pressure Coefficients

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

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

2.4 Seismic Loads

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

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

2.5 Combination of Loads

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

<u>Strength Design, LRFD</u>

Component stresses are checked using the following LRFD load combinations:

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

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

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

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

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

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

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

3. STRUCTURAL ANALYSIS

3.1 RISA Results

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

3.2 RISA Components

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

Purlins	Location	**Diagonal Struts**	Location	**Front Reactions**	Location
M13	Top	M3	Outer	N7	Outer
M16	Bottom	M7	Inner	N15	Inner
		M11	Outer	N23	Outer

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

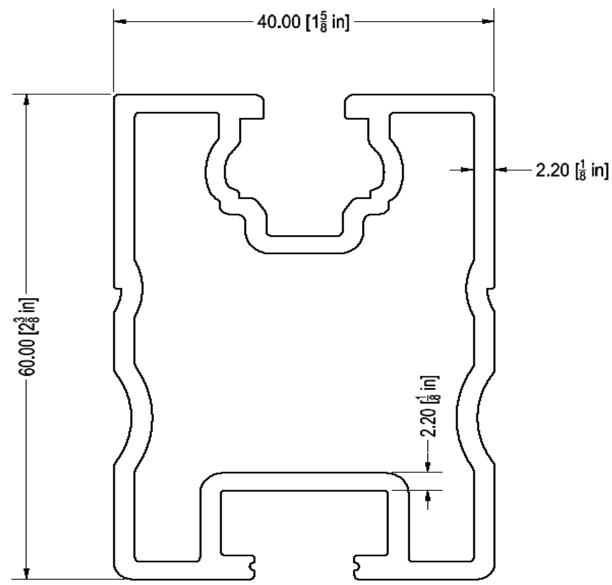
Front Struts	Location	**Bracing**
M4	Outer	M15
M8	Inner	M16A
M12	Outer	

4. MEMBER DESIGN CALCULATIONS

4.1 Purlin Design

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

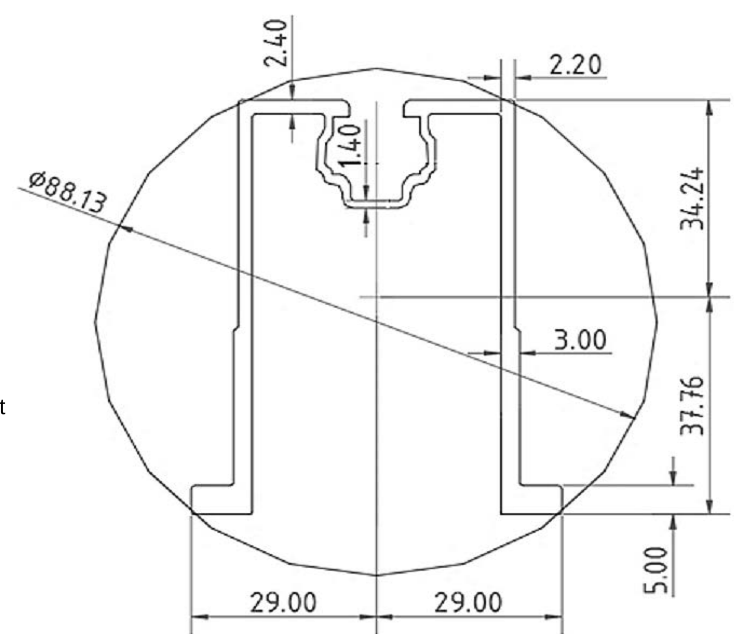
Purlin Type =	**ProfiPlus**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	54	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.52	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	28.47	ksi
S_y =	0.51	in^3
S_x =	0.37	in^3
E =	10100	ksi
I_y =	0.60	in^4
I_x =	0.29	in^4
A =	0.90	in^2
g =	1.08	lbs/ft
M_y =	0.444	k-ft
M_z =	0.041	k-ft
$M_{y\ allowable}$ =	1.256	k-ft
$M_{z\ allowable}$ =	0.871	k-ft
Utilization =	40%	



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).

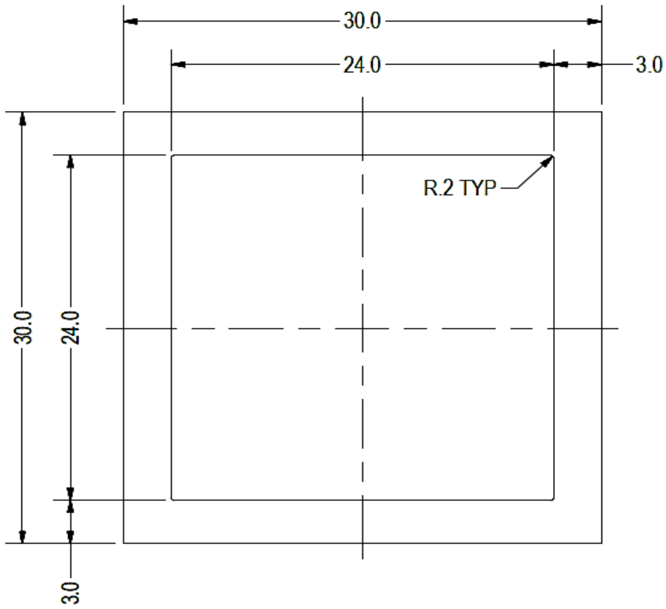
Girder Type =	**Flex Profi**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	33.78	in
$\Phi F_{ty\ AXIAL}$ =	14.29	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.66	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	13.46	ksi
S_y =	0.59	in^3
S_x =	0.46	in^3
E =	10100	ksi
I_y =	0.88	in^4
I_x =	0.52	in^4
A =	0.89	in^2
g =	1.07	lbs/ft
M_y =	0.540	k-ft
M_z =	0.000	k-ft
P_n =	0.280	k
$M_{y\ allowable}$ =	1.455	k-ft
$M_{z\ allowable}$ =	0.513	k-ft
$P_{n\ allowable}$ =	12.764	k
Utilization =	39%	



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).

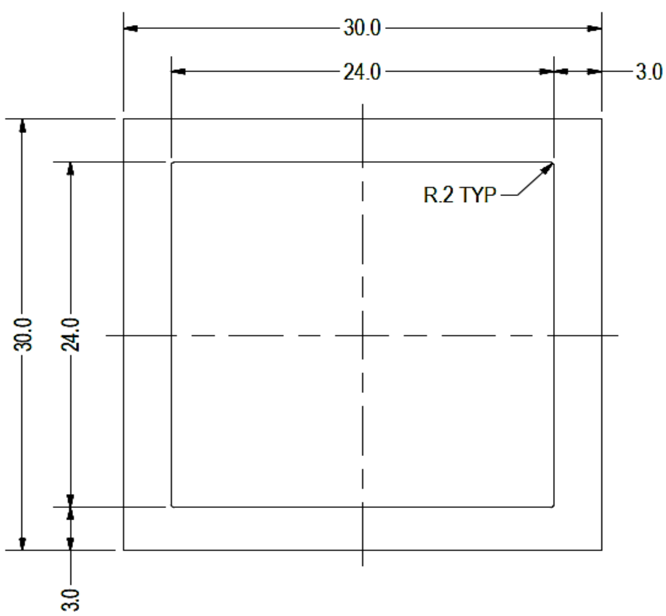
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	18.00	in
$\Phi F_{ty\ AXIAL}$ =	24.52	ksi
$\Phi F_{ty\ BENDING}$ =	31.19	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	-0.030	k-ft
P_n =	0.157	k
$M_{y\ allowable}$ =	0.423	k-ft
$M_{z\ allowable}$ =	0.423	k-ft
$P_{n\ allowable}$ =	12.310	k
Utilization =	8%	



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).

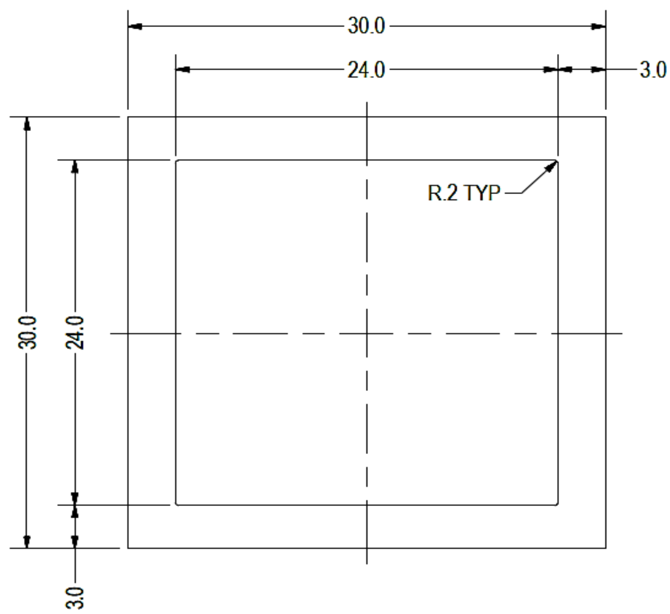
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	46.38	in
$\Phi F_{ty\ AXIAL}$ =	7.60	ksi
$\Phi F_{ty\ BENDING}$ =	29.80	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.595	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).

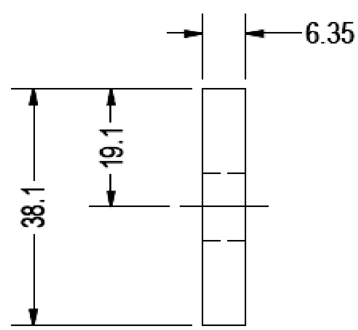
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	39.29	in
$\Phi F_{ty\ AXIAL}$ =	10.06	ksi
$\Phi F_{ty\ BENDING}$ =	30.09	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.666	k
$M_{y\ allowable}$ =	0.408	k-ft
$M_{z\ allowable}$ =	0.408	k-ft
$P_{n\ allowable}$ =	5.050	k
Utilization =	13%	



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 =	0.003	k-ft
P_n =	0.183	k
$M_{y\ allowable}$ =	0.046	k-ft
$P_{n\ allowable}$ =	11.813	k
Utilization =	8%	



A cross brace kit is required every 24 bays and is to be installed in centermost bays.

5. FOUNDATION DESIGN CALCULATIONS

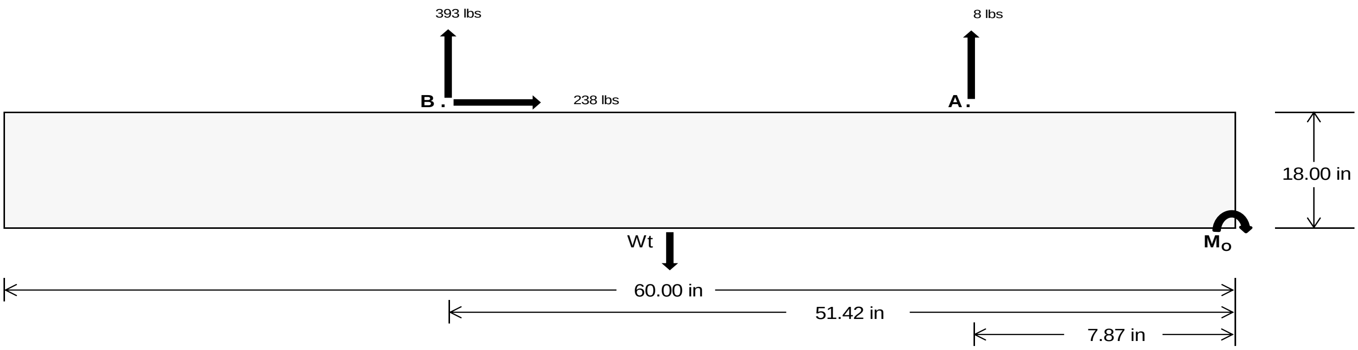
5.1 Helical Pile Foundations

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 =	38.39	1708.01	k
Compressive Load =	1047.57	1154.93	k
Lateral Load =	24.50	1031.85	k
Moment (Weak Axis) =	0.04	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 table 1806.2 (2012, 2015).



<u>Concrete Properties</u>

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

<u>Footing Reinforcement</u>

Use fiber reinforcing with (1) #5 rebar.

<u>Overturning Check</u>

M_O = 24568.8 in-lbs
Resisting Force Required = 818.96 lbs
S.F. = 1.67
Weight Required = 1364.93 lbs
Minimum Width = <u>20 in</u> in
Weight Provided = 1812.50 lbs

A minimum 60in long x 20in wide x 18in tall ballast foundation is required to resist overturning.

<u>Sliding</u>

Force = 238.02 lbs
Friction = 0.4
Weight Required = 595.05 lbs
Resisting Weight = 1812.50 lbs
Additional Weight Required = 0 lbs

Use a 60in long x 20in wide x 18in tall ballast foundation to resist sliding. Friction is OK.

<u>Cohesion</u>

Sliding Force = 238.02 lbs
Cohesion = 130 psf
Area = 8.33 ft^2
Resisting = 906.25 lbs
Additional Weight Required = 0 lbs

Use a 60in long x 20in wide x 18in tall ballast foundation. Cohesion is OK.

<u>Shear Key</u>

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

Shear key is not required.

<u>Bearing Pressure</u>

	Ballast Width			
	<u>20 in</u>	<u>21 in</u>	<u>22 in</u>	<u>23 in</u>
P_{ftg} = (145 pcf)(5 ft)(1.5 ft)(1.67 ft) =	<u>1813 lbs</u>	<u>1903 lbs</u>	<u>1994 lbs</u>	<u>2084 lbs</u>

ASD LC	1.0D + 1.0S				1.0D + 0.6W				1.0D + 0.75L + 0.45W + 0.75S				0.6D + 0.6W			
Width	20 in	21 in	22 in	23 in	20 in	21 in	22 in	23 in	20 in	21 in	22 in	23 in	20 in	21 in	22 in	23 in
F_A	361 lbs	361 lbs	361 lbs	361 lbs	372 lbs	372 lbs	372 lbs	372 lbs	517 lbs	517 lbs	517 lbs	517 lbs	-15 lbs	-15 lbs	-15 lbs	-15 lbs
F_B	246 lbs	246 lbs	246 lbs	246 lbs	486 lbs	486 lbs	486 lbs	486 lbs	526 lbs	526 lbs	526 lbs	526 lbs	-787 lbs	-787 lbs	-787 lbs	-787 lbs
F_V	36 lbs	36 lbs	36 lbs	36 lbs	428 lbs	428 lbs	428 lbs	428 lbs	345 lbs	345 lbs	345 lbs	345 lbs	-476 lbs	-476 lbs	-476 lbs	-476 lbs
P_{total}	2419 lbs	2510 lbs	2601 lbs	2691 lbs	2671 lbs	2762 lbs	2852 lbs	2943 lbs	2855 lbs	2946 lbs	3036 lbs	3127 lbs	286 lbs	340 lbs	394 lbs	449 lbs
M	280 lbs-ft	280 lbs-ft	280 lbs-ft	280 lbs-ft	461 lbs-ft	461 lbs-ft	461 lbs-ft	461 lbs-ft	532 lbs-ft	532 lbs-ft	532 lbs-ft	532 lbs-ft	662 lbs-ft	662 lbs-ft	662 lbs-ft	662 lbs-ft
e	0.12 ft	0.11 ft	0.11 ft	0.10 ft	0.17 ft	0.17 ft	0.16 ft	0.16 ft	0.19 ft	0.18 ft	0.18 ft	0.17 ft	2.32 ft	1.95 ft	1.68 ft	1.48 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}	250.0 psf	248.5 psf	247.1 psf	245.8 psf	254.2 psf	252.4 psf	250.8 psf	249.4 psf	266.0 psf	263.7 psf	261.6 psf	259.7 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	330.6 psf	325.2 psf	320.3 psf	315.9 psf	386.9 psf	378.8 psf	371.5 psf	364.8 psf	419.2 psf	409.6 psf	400.9 psf	392.9 psf	627.1 psf	234.4 psf	174.7 psf	152.4 psf

Maximum Bearing Pressure = 627 psf
Allowable Bearing Pressure = 1500 psf

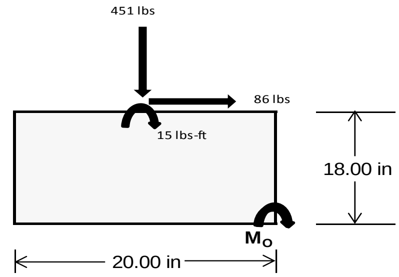
Use a 60in long x 20in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Seismic Design

Overturning Check

M_O =	231.5 ft-lbs
Resisting Force Required =	277.78 lbs
S.F. =	1.67
Weight Required =	462.96 lbs
Minimum Width =	20 in in
Weight Provided =	1812.50 lbs

A minimum 60in long x 20in 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	20 in			20 in			20 in		
Support	Outer	Inner	Outer	Outer	Inner	Outer	Outer	Inner	Outer
F_Y	122 lbs	70 lbs	60 lbs	228 lbs	451 lbs	181 lbs	81 lbs	-29 lbs	22 lbs
F_V	14 lbs	114 lbs	14 lbs	10 lbs	86 lbs	11 lbs	14 lbs	114 lbs	14 lbs
P_{total}	2366 lbs	2314 lbs	2304 lbs	2365 lbs	2587 lbs	2317 lbs	737 lbs	627 lbs	678 lbs
M	39 lbs-ft	192 lbs-ft	41 lbs-ft	28 lbs-ft	144 lbs-ft	31 lbs-ft	39 lbs-ft	192 lbs-ft	40 lbs-ft
e	0.02 ft	0.08 ft	0.02 ft	0.01 ft	0.06 ft	0.01 ft	0.05 ft	0.31 ft	0.06 ft
L/6	0.28 ft	1.50 ft	1.63 ft	1.64 ft	1.56 ft	1.64 ft	1.56 ft	1.06 ft	1.55 ft
f_{min}	267.1 sqft	194.9 sqft	258.8 sqft	271.8 sqft	248.1 sqft	264.6 sqft	71.6 sqft	-7.5 sqft	64.1 sqft
f_{max}	300.7 psf	360.5 psf	294.2 psf	295.7 psf	372.8 psf	291.5 psf	105.4 psf	158.0 psf	98.6 psf

Maximum Bearing Pressure = 373 psf
Allowable Bearing Pressure = 1500 psf

Use a 60in long x 20in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Foundation Requirements: 60in long x 20in wide x 18in tall ballast foundation and fiber reinforcing with (1) #5 rebar.

5.3 Foundation Anchors

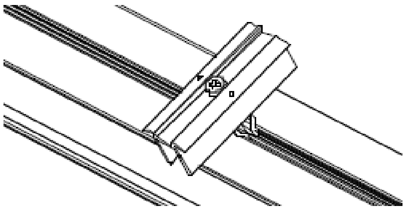
Threaded rods are anchored to the the ballast foundations using the Simpson AT-XP epoxy solution. LRFD load results are compared to the allowable strengths of the epoxy solution. Please see the supplementary calculations provided by the Simpson Anchor Designer software.

6. DESIGN OF JOINTS AND CONNECTIONS

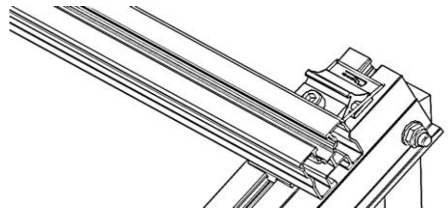
6.1 Anchorage of Modules to Purlins and Connection of Purlins to Girders

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 =	0.665	k
Allowable Uplift =	1.214	k
Utilization =	55%	



Fastening of Purlins to Girders		
Maximum Uplifting Force =	1.067	k
Allowable Uplift =	1.116	k
Utilization =	96%	



6.2 Bolted Connections

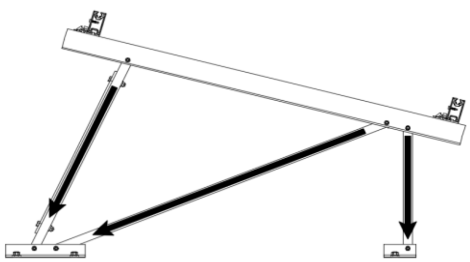
The aluminum struts connect the aluminum girder ends to custom brackets with mounting holes. Cross bracing is attached to rear struts to provide lateral stability. Single M8 bolts are used to attach each end of the strut to the girder and post. ASTM A193/A193M-86 equivalent stainless steel bolts are used.

Front Strut		
Maximum Axial Load =	0.806	k
M8 Bolt Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	14%	

Rear Strut		
Maximum Axial Load =	1.092	k
M8 Bolt Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	19%	

Diagonal Strut		
Maximum Axial Load =	0.595	k
M8 Bolt Shear Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	10%	

Bracing		
Maximum Axial Load =	0.183	k
M10 Bolt Capacity =	8.894	k
Strut Bearing Capacity =	7.952	k
Utilization =	2%	



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

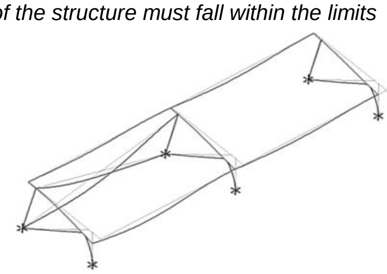
7.1 Seismic Drift

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} =	0.062	in

$0.062 \leq 0.646$, 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 = 54.00 in

J = 0.255

140.613

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

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= 29.5 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 = 54.00 in

J = 0.255

146.018

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.4

3.4.16

b/t = 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

$\varphi F_L St$= 29.5 ksi

Ix = 250988 mm^4

0.603 in^4

y = 30 mm

Sx = 0.511 in^3

$M_{max}St$ = 1.256 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 = 1.25

21.9891

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

S1 = 1.37733

$$S2 = 1.2C_c$$

S2 = 79.2

φF_L= φb[Bc-Dc*Lb/(1.2*ry*√(Cb))

φF_L= 29.7 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 = 1.25

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= 29.7 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

φF_LSt= 29.7 ksi

Ix = 364470 mm^4

0.876 in^4

y = 37.77 mm

Sx = 0.589 in^3

M_{max}St = 1.455 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

φF_LWk= 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

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

φF_LSt= 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

φF_LWk= 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

φF_L= (φccFcy)/(λ²)

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)

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= 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

φF_LSt= 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

φF_LWk= 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

$\lambda =$ 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

$\varphi cc =$ 0.81587

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

$\varphi F_L =$ 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)

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 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

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.25 ksi

$\varphi F_L =$ 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	-98.692	-98.692	0	0
2	M16	y	-158.766	-158.766	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	197.385	197.385	0	0
2	M16	y	94.402	94.402	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...
1	LRFD 1.2D + 1.6S + 0.5W	Yes	Y		1	1.2	3	1.6	4	.5														
2	LRFD 1.2D + 1.0W + 0.5S	Yes	Y		1	1.2	3	.5	4	1														
3	LRFD 0.9D + 1.0W	Yes	Y		2	.9					5	1												
4	LATERAL - LRFD 1.54D + 1.3E ...	Yes	Y		1	1.54	3	.2			6	1.3												
5	LATERAL - LRFD 0.56D + 1.3E	Yes	Y		1	.56					6	1.3												
6	LATERAL - LRFD 1.54D + 1.25...	Yes	Y		1	1.54	3	.2			6	1.25												
7	LATERAL - LRFD 0.56D + 1.25E	Yes	Y		1	.56					6	1.25												
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...
10	ASD 1.0D + 0.6W	Yes	Y		1	1			4	.6														
11	ASD 1.0D + 0.75L + 0.45W + 0....	Yes	Y		1	1	3	.75	4	.45														
12	ASD 0.6D + 0.6W	Yes	Y		2	.6					5	.6												
13	LATERAL - ASD 1.238D + 0.875E	Yes	Y		1	1.2...					6	.875												
14	LATERAL - ASD 1.1785D + 0.65...	Yes	Y		1	1.1...	3	.75			6	.656												
15	LATERAL - ASD 0.362D + 0.875E	Yes	Y		1	.362					6	.875												

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N8	max	217.196	2	275.976	2	0	10	0	10	0	1	0	1
2		min	-259.414	3	-410.47	3	-2.316	4	0	3	0	1	0	1
3	N7	max	.002	3	295.208	1	-.026	10	0	10	0	1	0	1
4		min	-.13	2	3.536	12	-18.485	4	-.029	4	0	1	0	1
5	N15	max	0	15	805.821	1	.22	9	0	1	0	1	0	1
6		min	-1.307	2	-29.53	3	-18.843	5	-.03	4	0	1	0	1
7	N16	max	725.737	2	888.406	2	0	2	0	9	0	1	0	1
8		min	-793.732	3	-1313.854	3	-151.604	4	0	3	0	1	0	1
9	N23	max	.002	3	295.252	1	1.125	1	.002	1	0	1	0	1
10		min	-.13	2	2.238	15	-17.502	5	-.027	5	0	1	0	1
11	N24	max	217.196	2	278.574	2	76.07	3	0	4	0	1	0	1
12		min	-259.856	3	-409.334	3	-3.415	5	0	3	0	1	0	1
13	Totals:	max	1158.561	2	2664.71	2	0	2						
14		min	-1313.042	3	-2154.67	3	-211.499	4						

Envelope Member Section Forces

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
1	M2	1	max	210.341	1	.653	6	1.121	4	0	10	0	10	0	1
2			min	-352.696	3	.153	15	-.065	3	0	4	0	4	0	1
3		2	max	210.466	1	.602	6	1.006	4	0	10	0	5	0	15
4			min	-352.602	3	.141	15	-.065	3	0	4	0	1	0	6
5		3	max	210.592	1	.551	6	.892	4	0	10	0	5	0	15
6			min	-352.507	3	.129	15	-.065	3	0	4	0	3	0	6
7		4	max	210.718	1	.5	6	.777	4	0	10	0	4	0	15
8			min	-352.413	3	.117	15	-.065	3	0	4	0	3	0	6
9		5	max	210.844	1	.448	6	.663	4	0	10	0	4	0	15
10			min	-352.319	3	.105	15	-.065	3	0	4	0	3	0	6
11		6	max	210.97	1	.397	6	.549	4	0	10	0	4	0	15
12			min	-352.224	3	.092	15	-.065	3	0	4	0	3	0	6
13		7	max	211.096	1	.346	6	.434	4	0	10	0	4	0	15
14			min	-352.13	3	.08	15	-.065	3	0	4	0	3	0	6
15		8	max	211.222	1	.295	6	.32	4	0	10	0	4	0	15
16			min	-352.035	3	.068	15	-.065	3	0	4	0	3	0	6
17		9	max	211.348	1	.244	6	.205	4	0	10	0	4	0	15
18			min	-351.941	3	.056	15	-.065	3	0	4	0	3	0	6
19		10	max	211.473	1	.193	6	.171	1	0	10	0	4	0	15
20			min	-351.847	3	.044	15	-.065	3	0	4	0	3	0	6
21		11	max	211.599	1	.142	6	.171	1	0	10	0	4	0	15
22			min	-351.752	3	.032	15	-.068	5	0	4	0	3	0	6
23		12	max	211.725	1	.102	2	.171	1	0	10	0	4	0	15
24			min	-351.658	3	.014	12	-.183	5	0	4	0	3	0	6
25		13	max	211.851	1	.062	2	.171	1	0	10	0	4	0	15
26			min	-351.563	3	-.012	3	-.297	5	0	4	0	3	0	6
27		14	max	211.977	1	.022	2	.171	1	0	10	0	4	0	15
28			min	-351.469	3	-.042	3	-.412	5	0	4	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	212.103	1	-.016	15	.171	1	0	10	0	4	0	15
30			min	-351.375	3	-.072	3	-.526	5	0	4	0	3	0	6
31		16	max	212.229	1	-.028	15	.171	1	0	10	0	4	0	15
32			min	-351.28	3	-.114	4	-.64	5	0	4	0	3	0	6
33		17	max	212.354	1	-.04	15	.171	1	0	10	0	4	0	15
34			min	-351.186	3	-.165	4	-.755	5	0	4	0	3	0	6
35		18	max	212.48	1	-.052	15	.171	1	0	10	0	1	0	15
36			min	-351.091	3	-.216	4	-.869	5	0	4	0	3	0	6
37		19	max	212.606	1	-.064	15	.171	1	0	10	0	1	0	15
38			min	-350.997	3	-.268	4	-.984	5	0	4	0	3	0	6
39	M3	1	max	174.56	2	1.756	6	-.008	10	0	5	0	1	0	6
40			min	-170.988	3	.412	15	-1.341	4	0	1	0	10	0	15
41		2	max	174.491	2	1.58	6	-.008	10	0	5	0	1	0	2
42			min	-171.04	3	.371	15	-1.207	4	0	1	0	10	0	12
43		3	max	174.422	2	1.403	6	-.008	10	0	5	0	1	0	2
44			min	-171.092	3	.329	15	-1.073	4	0	1	0	5	0	3
45		4	max	174.352	2	1.226	6	-.008	10	0	5	0	1	0	15
46			min	-171.144	3	.287	15	-.94	4	0	1	0	5	0	4
47		5	max	174.283	2	1.049	6	-.008	10	0	5	0	1	0	15
48			min	-171.196	3	.246	15	-.806	4	0	1	0	5	0	4
49		6	max	174.214	2	.872	6	-.008	10	0	5	0	1	0	15
50			min	-171.248	3	.204	15	-.672	4	0	1	0	5	0	4
51		7	max	174.144	2	.695	6	-.008	10	0	5	0	1	0	15
52			min	-171.3	3	.163	15	-.539	4	0	1	0	5	0	4
53		8	max	174.075	2	.519	6	-.008	10	0	5	0	1	0	15
54			min	-171.352	3	.121	15	-.405	4	0	1	0	5	-.001	4
55		9	max	174.006	2	.342	6	-.008	10	0	5	0	1	0	15
56			min	-171.404	3	.08	15	-.271	4	0	1	0	5	-.001	4
57		10	max	173.936	2	.165	6	-.008	10	0	5	0	1	0	15
58			min	-171.456	3	.038	15	-.197	1	0	1	0	5	-.001	4
59		11	max	173.867	2	.017	2	.042	5	0	5	0	1	0	15
60			min	-171.508	3	-.037	3	-.197	1	0	1	0	5	-.001	4
61		12	max	173.798	2	-.045	15	.175	5	0	5	0	1	0	15
62			min	-171.56	3	-.189	4	-.197	1	0	1	0	5	-.001	4
63		13	max	173.728	2	-.087	15	.309	5	0	5	0	1	0	15
64			min	-171.612	3	-.366	4	-.197	1	0	1	0	5	-.001	4
65		14	max	173.659	2	-.128	15	.443	5	0	5	0	1	0	15
66			min	-171.664	3	-.542	4	-.197	1	0	1	0	5	-.001	4
67		15	max	173.59	2	-.17	15	.576	5	0	5	0	1	0	15
68			min	-171.716	3	-.719	4	-.197	1	0	1	0	5	0	4
69		16	max	173.52	2	-.211	15	.71	5	0	5	0	9	0	15
70			min	-171.768	3	-.896	4	-.197	1	0	1	0	5	0	4
71		17	max	173.451	2	-.253	15	.844	5	0	5	0	10	0	15
72			min	-171.819	3	-1.073	4	-.197	1	0	1	0	4	0	4
73		18	max	173.382	2	-.295	15	.977	5	0	5	0	10	0	15
74			min	-171.871	3	-1.25	4	-.197	1	0	1	0	4	0	4
75		19	max	173.312	2	-.336	15	1.111	5	0	5	0	5	0	1
76			min	-171.923	3	-1.427	4	-.197	1	0	1	0	1	0	1
77	M4	1	max	294.043	1	0	1	-.027	10	0	1	0	5	0	1
78			min	2.953	12	0	1	-17.719	4	0	1	0	2	0	1
79		2	max	294.108	1	0	1	-.027	10	0	1	0	10	0	1
80			min	2.986	12	0	1	-17.775	4	0	1	-.002	4	0	1
81		3	max	294.173	1	0	1	-.027	10	0	1	0	10	0	1
82			min	3.018	12	0	1	-17.831	4	0	1	-.003	4	0	1
83		4	max	294.237	1	0	1	-.027	10	0	1	0	10	0	1
84			min	3.051	12	0	1	-17.887	4	0	1	-.005	4	0	1
85		5	max	294.302	1	0	1	-.027	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	3.083	12	0	1	-17.944	4	0	1	-.006	4	0	1
87		6	max	294.367	1	0	1	-.027	10	0	1	0	10	0	1
88			min	3.115	12	0	1	-18	4	0	1	-.008	4	0	1
89		7	max	294.431	1	0	1	-.027	10	0	1	0	10	0	1
90			min	3.148	12	0	1	-18.056	4	0	1	-.01	4	0	1
91		8	max	294.496	1	0	1	-.027	10	0	1	0	10	0	1
92			min	3.18	12	0	1	-18.112	4	0	1	-.011	4	0	1
93		9	max	294.561	1	0	1	-.027	10	0	1	0	10	0	1
94			min	3.212	12	0	1	-18.168	4	0	1	-.013	4	0	1
95		10	max	294.626	1	0	1	-.027	10	0	1	0	10	0	1
96			min	3.245	12	0	1	-18.224	4	0	1	-.014	4	0	1
97		11	max	294.69	1	0	1	-.027	10	0	1	0	10	0	1
98			min	3.277	12	0	1	-18.28	4	0	1	-.016	4	0	1
99		12	max	294.755	1	0	1	-.027	10	0	1	0	10	0	1
100			min	3.309	12	0	1	-18.336	4	0	1	-.018	4	0	1
101		13	max	294.82	1	0	1	-.027	10	0	1	0	10	0	1
102			min	3.342	12	0	1	-18.392	4	0	1	-.019	4	0	1
103		14	max	294.884	1	0	1	-.027	10	0	1	0	10	0	1
104			min	3.374	12	0	1	-18.448	4	0	1	-.021	4	0	1
105		15	max	294.949	1	0	1	-.027	10	0	1	0	10	0	1
106			min	3.406	12	0	1	-18.504	4	0	1	-.023	4	0	1
107		16	max	295.014	1	0	1	-.027	10	0	1	0	10	0	1
108			min	3.439	12	0	1	-18.56	4	0	1	-.024	4	0	1
109		17	max	295.078	1	0	1	-.027	10	0	1	0	10	0	1
110			min	3.471	12	0	1	-18.616	4	0	1	-.026	4	0	1
111		18	max	295.143	1	0	1	-.027	10	0	1	0	10	0	1
112			min	3.503	12	0	1	-18.673	4	0	1	-.028	4	0	1
113		19	max	295.208	1	0	1	-.027	10	0	1	0	10	0	1
114			min	3.536	12	0	1	-18.729	4	0	1	-.029	4	0	1
115	M6	1	max	663.302	1	.639	6	1.059	4	0	3	0	3	0	1
116			min	-1092.007	3	.143	15	-.237	3	0	5	0	2	0	1
117		2	max	663.428	1	.588	6	.945	4	0	3	0	4	0	15
118			min	-1091.913	3	.13	15	-.237	3	0	5	0	2	0	6
119		3	max	663.554	1	.537	6	.831	4	0	3	0	4	0	15
120			min	-1091.818	3	.118	15	-.237	3	0	5	0	2	0	6
121		4	max	663.68	1	.486	2	.716	4	0	3	0	4	0	15
122			min	-1091.724	3	.106	15	-.237	3	0	5	0	2	0	6
123		5	max	663.806	1	.447	2	.602	4	0	3	0	4	0	15
124			min	-1091.63	3	.094	15	-.237	3	0	5	0	2	0	6
125		6	max	663.932	1	.407	2	.487	4	0	3	0	4	0	15
126			min	-1091.535	3	.082	15	-.237	3	0	5	0	2	0	6
127		7	max	664.057	1	.367	2	.373	4	0	3	0	4	0	15
128			min	-1091.441	3	.068	12	-.237	3	0	5	0	3	0	2
129		8	max	664.183	1	.327	2	.258	4	0	3	0	4	0	15
130			min	-1091.346	3	.048	12	-.237	3	0	5	0	3	0	2
131		9	max	664.309	1	.287	2	.144	4	0	3	0	4	0	15
132			min	-1091.252	3	.028	12	-.237	3	0	5	0	3	0	2
133		10	max	664.435	1	.247	2	.039	14	0	3	0	4	0	15
134			min	-1091.158	3	.001	3	-.237	3	0	5	0	3	0	2
135		11	max	664.561	1	.207	2	.037	9	0	3	0	4	0	15
136			min	-1091.063	3	-.029	3	-.237	3	0	5	0	3	0	2
137		12	max	664.687	1	.168	2	.037	9	0	3	0	4	0	15
138			min	-1090.969	3	-.059	3	-.237	3	0	5	0	3	0	2
139		13	max	664.813	1	.128	2	.037	9	0	3	0	4	0	12
140			min	-1090.874	3	-.088	3	-.328	5	0	5	0	3	0	2
141		14	max	664.939	1	.088	2	.037	9	0	3	0	4	0	12
142			min	-1090.78	3	-.118	3	-.443	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	665.064	1	.048	2	.037	9	0	3	0	4	0	12
144			min	-1090.686	3	-.148	3	-.557	5	0	5	0	3	0	2
145		16	max	665.19	1	.008	2	.037	9	0	3	0	4	0	12
146			min	-1090.591	3	-.178	3	-.672	5	0	5	0	3	0	2
147		17	max	665.316	1	-.032	2	.037	9	0	3	0	4	0	12
148			min	-1090.497	3	-.208	3	-.786	5	0	5	0	3	0	2
149		18	max	665.442	1	-.062	15	.037	9	0	3	0	4	0	3
150			min	-1090.402	3	-.238	3	-.901	5	0	5	0	3	0	2
151		19	max	665.568	1	-.074	15	.037	9	0	3	0	14	0	3
152			min	-1090.308	3	-.282	4	-1.015	5	0	5	0	3	0	2
153	M7	1	max	595.055	2	1.775	4	.031	3	0	1	0	4	0	2
154			min	-499.921	3	.423	15	-1.327	4	0	3	0	3	0	3
155		2	max	594.986	2	1.598	4	.031	3	0	1	0	4	0	2
156			min	-499.973	3	.382	15	-1.194	4	0	3	0	3	0	3
157		3	max	594.917	2	1.421	4	.031	3	0	1	0	1	0	2
158			min	-500.025	3	.34	15	-1.06	4	0	3	0	3	0	3
159		4	max	594.847	2	1.244	4	.031	3	0	1	0	1	0	2
160			min	-500.077	3	.299	15	-.926	4	0	3	0	3	0	3
161		5	max	594.778	2	1.068	4	.031	3	0	1	0	1	0	15
162			min	-500.129	3	.257	15	-.793	4	0	3	0	5	0	3
163		6	max	594.709	2	.891	4	.031	3	0	1	0	1	0	15
164			min	-500.181	3	.216	15	-.659	4	0	3	0	5	0	6
165		7	max	594.639	2	.714	4	.031	3	0	1	0	1	0	15
166			min	-500.233	3	.174	15	-.525	4	0	3	0	5	0	6
167		8	max	594.57	2	.537	4	.031	3	0	1	0	1	0	15
168			min	-500.285	3	.132	15	-.392	4	0	3	0	5	-.001	6
169		9	max	594.501	2	.36	4	.031	3	0	1	0	1	0	15
170			min	-500.337	3	.077	12	-.258	4	0	3	0	5	-.001	6
171		10	max	594.431	2	.212	2	.031	3	0	1	0	1	0	15
172			min	-500.389	3	.003	3	-.124	4	0	3	0	5	-.001	6
173		11	max	594.362	2	.074	2	.031	3	0	1	0	1	0	15
174			min	-500.441	3	-.101	3	-.01	1	0	3	0	5	-.001	6
175		12	max	594.293	2	-.034	15	.144	5	0	1	0	1	0	15
176			min	-500.493	3	-.204	3	-.01	1	0	3	0	5	-.001	6
177		13	max	594.223	2	-.075	15	.277	5	0	1	0	1	0	15
178			min	-500.545	3	-.348	6	-.01	1	0	3	0	5	-.001	6
179		14	max	594.154	2	-.117	15	.411	5	0	1	0	1	0	15
180			min	-500.597	3	-.525	6	-.01	1	0	3	0	5	-.001	6
181		15	max	594.085	2	-.159	15	.545	5	0	1	0	1	0	15
182			min	-500.649	3	-.701	6	-.01	1	0	3	0	5	0	6
183		16	max	594.015	2	-.2	15	.679	5	0	1	0	1	0	15
184			min	-500.701	3	-.878	6	-.01	1	0	3	0	5	0	6
185		17	max	593.946	2	-.242	15	.812	5	0	1	0	1	0	15
186			min	-500.753	3	-1.055	6	-.01	1	0	3	0	5	0	6
187		18	max	593.877	2	-.283	15	.946	5	0	1	0	1	0	15
188			min	-500.805	3	-1.232	6	-.01	1	0	3	0	5	0	6
189		19	max	593.807	2	-.325	15	1.08	5	0	1	0	1	0	1
190			min	-500.857	3	-1.409	6	-.01	1	0	3	0	3	0	1
191	M8	1	max	804.656	1	0	1	.253	1	0	1	0	4	0	1
192			min	-30.404	3	0	1	-17.977	4	0	1	0	3	0	1
193		2	max	804.721	1	0	1	.253	1	0	1	0	1	0	1
194			min	-30.355	3	0	1	-18.034	4	0	1	-.002	4	0	1
195		3	max	804.786	1	0	1	.253	1	0	1	0	1	0	1
196			min	-30.307	3	0	1	-18.09	4	0	1	-.003	4	0	1
197		4	max	804.851	1	0	1	.253	1	0	1	0	1	0	1
198			min	-30.258	3	0	1	-18.146	4	0	1	-.005	4	0	1
199		5	max	804.915	1	0	1	.253	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	-30.21	3	0	1	-18.202	4	0	1	-.006	4	0	1
201		6	max	804.98	1	0	1	.253	1	0	1	0	1	0	1
202			min	-30.161	3	0	1	-18.258	4	0	1	-.008	4	0	1
203		7	max	805.045	1	0	1	.253	1	0	1	0	1	0	1
204			min	-30.113	3	0	1	-18.314	4	0	1	-.01	4	0	1
205		8	max	805.109	1	0	1	.253	1	0	1	0	1	0	1
206			min	-30.064	3	0	1	-18.37	4	0	1	-.011	4	0	1
207		9	max	805.174	1	0	1	.253	1	0	1	0	1	0	1
208			min	-30.016	3	0	1	-18.426	4	0	1	-.013	4	0	1
209		10	max	805.239	1	0	1	.253	1	0	1	0	1	0	1
210			min	-29.967	3	0	1	-18.482	4	0	1	-.015	4	0	1
211		11	max	805.304	1	0	1	.253	1	0	1	0	1	0	1
212			min	-29.918	3	0	1	-18.538	4	0	1	-.016	4	0	1
213		12	max	805.368	1	0	1	.253	1	0	1	0	1	0	1
214			min	-29.87	3	0	1	-18.594	4	0	1	-.018	4	0	1
215		13	max	805.433	1	0	1	.253	1	0	1	0	1	0	1
216			min	-29.821	3	0	1	-18.65	4	0	1	-.02	4	0	1
217		14	max	805.498	1	0	1	.253	1	0	1	0	1	0	1
218			min	-29.773	3	0	1	-18.707	4	0	1	-.021	4	0	1
219		15	max	805.562	1	0	1	.253	1	0	1	0	1	0	1
220			min	-29.724	3	0	1	-18.763	4	0	1	-.023	4	0	1
221		16	max	805.627	1	0	1	.253	1	0	1	0	1	0	1
222			min	-29.676	3	0	1	-18.819	4	0	1	-.025	4	0	1
223		17	max	805.692	1	0	1	.253	1	0	1	0	1	0	1
224			min	-29.627	3	0	1	-18.875	4	0	1	-.026	4	0	1
225		18	max	805.756	1	0	1	.253	1	0	1	0	1	0	1
226			min	-29.579	3	0	1	-18.931	4	0	1	-.028	4	0	1
227		19	max	805.821	1	0	1	.253	1	0	1	0	1	0	1
228			min	-29.53	3	0	1	-18.987	4	0	1	-.03	4	0	1
229	M10	1	max	212.214	1	.685	4	1.181	5	0	1	0	1	0	1
230			min	-296.745	3	.174	15	-.114	1	-.001	5	0	3	0	1
231		2	max	212.34	1	.633	4	1.067	5	0	1	0	1	0	15
232			min	-296.651	3	.162	15	-.114	1	-.001	5	0	3	0	4
233		3	max	212.466	1	.582	4	.952	5	0	1	0	4	0	15
234			min	-296.557	3	.15	15	-.114	1	-.001	5	0	3	0	4
235		4	max	212.592	1	.531	4	.838	5	0	1	0	4	0	15
236			min	-296.462	3	.138	15	-.114	1	-.001	5	0	3	0	4
237		5	max	212.718	1	.48	4	.723	5	0	1	0	4	0	15
238			min	-296.368	3	.126	15	-.114	1	-.001	5	0	3	0	4
239		6	max	212.844	1	.429	4	.609	5	0	1	0	4	0	15
240			min	-296.273	3	.114	15	-.114	1	-.001	5	0	3	0	4
241		7	max	212.97	1	.378	4	.495	5	0	1	0	4	0	15
242			min	-296.179	3	.102	15	-.114	1	-.001	5	0	3	0	4
243		8	max	213.096	1	.327	4	.38	5	0	1	0	4	0	15
244			min	-296.085	3	.09	15	-.114	1	-.001	5	0	3	0	4
245		9	max	213.221	1	.275	4	.266	5	0	1	0	4	0	15
246			min	-295.99	3	.078	15	-.114	1	-.001	5	0	3	0	4
247		10	max	213.347	1	.224	4	.151	5	0	1	0	4	0	15
248			min	-295.896	3	.065	12	-.114	1	-.001	5	0	3	0	4
249		11	max	213.473	1	.173	4	.037	5	0	1	.001	5	0	15
250			min	-295.801	3	.045	12	-.114	1	-.001	5	0	3	0	4
251		12	max	213.599	1	.122	4	-.007	10	0	1	.001	5	0	15
252			min	-295.707	3	.025	12	-.114	1	-.001	5	0	3	0	4
253		13	max	213.725	1	.071	4	-.007	10	0	1	0	5	0	15
254			min	-295.613	3	.005	12	-.209	4	-.001	5	0	3	0	4
255		14	max	213.851	1	.026	5	-.007	10	0	1	0	5	0	15
256			min	-295.518	3	-.023	3	-.323	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	213.977	1	.007	5	-.007	10	0	1	0	5	0	15
258			min	-295.424	3	-.053	3	-.437	4	-.001	5	0	3	0	4
259		16	max	214.102	1	-.006	15	-.007	10	0	1	0	5	0	15
260			min	-295.329	3	-.084	6	-.552	4	-.001	5	0	3	0	4
261		17	max	214.228	1	-.018	15	-.007	10	0	1	0	5	0	15
262			min	-295.235	3	-.135	6	-.666	4	-.001	5	0	3	0	4
263		18	max	214.354	1	-.03	15	-.007	10	0	1	0	5	0	15
264			min	-295.141	3	-.186	6	-.781	4	-.001	5	0	3	0	4
265		19	max	214.48	1	-.043	15	-.007	10	0	1	0	5	0	12
266			min	-295.046	3	-.237	6	-.895	4	-.001	5	0	1	0	4
267	M11	1	max	174.1	2	1.747	6	.21	1	0	4	0	5	0	2
268			min	-171.72	3	.405	15	-1.255	5	0	10	0	1	0	15
269		2	max	174.031	2	1.57	6	.21	1	0	4	0	5	0	2
270			min	-171.772	3	.364	15	-1.122	5	0	10	0	1	0	3
271		3	max	173.961	2	1.393	6	.21	1	0	4	0	3	0	2
272			min	-171.824	3	.322	15	-.988	5	0	10	0	1	0	3
273		4	max	173.892	2	1.216	6	.21	1	0	4	0	3	0	15
274			min	-171.876	3	.281	15	-.854	5	0	10	0	1	0	4
275		5	max	173.823	2	1.039	6	.21	1	0	4	0	3	0	15
276			min	-171.928	3	.239	15	-.721	5	0	10	0	1	0	4
277		6	max	173.753	2	.863	6	.21	1	0	4	0	3	0	15
278			min	-171.98	3	.197	15	-.587	5	0	10	0	1	0	4
279		7	max	173.684	2	.686	6	.21	1	0	4	0	3	0	15
280			min	-172.032	3	.156	15	-.453	5	0	10	0	4	0	4
281		8	max	173.615	2	.509	6	.21	1	0	4	0	3	0	15
282			min	-172.084	3	.114	15	-.32	5	0	10	0	4	-.001	4
283		9	max	173.545	2	.332	6	.21	1	0	4	0	3	0	15
284			min	-172.136	3	.073	15	-.186	5	0	10	0	4	-.001	4
285		10	max	173.476	2	.155	2	.21	1	0	4	0	3	0	15
286			min	-172.188	3	.031	15	-.052	5	0	10	0	4	-.001	4
287		11	max	173.407	2	.017	2	.21	1	0	4	0	3	0	15
288			min	-172.24	3	-.048	3	-.046	3	0	10	0	4	-.001	4
289		12	max	173.337	2	-.052	15	.264	4	0	4	0	3	0	15
290			min	-172.292	3	-.199	4	-.046	3	0	10	0	4	-.001	4
291		13	max	173.268	2	-.094	15	.398	4	0	4	0	3	0	15
292			min	-172.344	3	-.376	4	-.046	3	0	10	0	4	-.001	4
293		14	max	173.199	2	-.135	15	.531	4	0	4	0	3	0	15
294			min	-172.396	3	-.553	4	-.046	3	0	10	0	4	-.001	4
295		15	max	173.129	2	-.177	15	.665	4	0	4	0	3	0	15
296			min	-172.448	3	-.729	4	-.046	3	0	10	0	5	0	4
297		16	max	173.06	2	-.218	15	.799	4	0	4	0	3	0	15
298			min	-172.5	3	-.906	4	-.046	3	0	10	0	5	0	4
299		17	max	172.991	2	-.26	15	.932	4	0	4	0	3	0	15
300			min	-172.552	3	-1.083	4	-.046	3	0	10	0	10	0	4
301		18	max	172.921	2	-.301	15	1.066	4	0	4	0	4	0	15
302			min	-172.604	3	-1.26	4	-.046	3	0	10	0	10	0	4
303		19	max	172.852	2	-.343	15	1.2	4	0	4	0	4	0	1
304			min	-172.656	3	-1.437	4	-.046	3	0	10	0	10	0	1
305	M12	1	max	294.087	1	0	1	1.183	1	0	1	0	4	0	1
306			min	1.887	15	0	1	-16.502	5	0	1	0	3	0	1
307		2	max	294.152	1	0	1	1.183	1	0	1	0	1	0	1
308			min	1.906	15	0	1	-16.558	5	0	1	-.001	5	0	1
309		3	max	294.216	1	0	1	1.183	1	0	1	0	1	0	1
310			min	1.926	15	0	1	-16.615	5	0	1	-.003	5	0	1
311		4	max	294.281	1	0	1	1.183	1	0	1	0	1	0	1
312			min	1.945	15	0	1	-16.671	5	0	1	-.004	5	0	1
313		5	max	294.346	1	0	1	1.183	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	1.965	15	0	1	-16.727	5	0	1	-.006	5	0	1
315		6	max	294.411	1	0	1	1.183	1	0	1	0	1	0	1
316			min	1.985	15	0	1	-16.783	5	0	1	-.007	5	0	1
317		7	max	294.475	1	0	1	1.183	1	0	1	0	1	0	1
318			min	2.004	15	0	1	-16.839	5	0	1	-.009	5	0	1
319		8	max	294.54	1	0	1	1.183	1	0	1	0	1	0	1
320			min	2.024	15	0	1	-16.895	5	0	1	-.01	5	0	1
321		9	max	294.605	1	0	1	1.183	1	0	1	0	1	0	1
322			min	2.043	15	0	1	-16.951	5	0	1	-.012	5	0	1
323		10	max	294.669	1	0	1	1.183	1	0	1	0	1	0	1
324			min	2.063	15	0	1	-17.007	5	0	1	-.013	5	0	1
325		11	max	294.734	1	0	1	1.183	1	0	1	.001	1	0	1
326			min	2.082	15	0	1	-17.063	5	0	1	-.015	5	0	1
327		12	max	294.799	1	0	1	1.183	1	0	1	.001	1	0	1
328			min	2.102	15	0	1	-17.119	5	0	1	-.017	5	0	1
329		13	max	294.863	1	0	1	1.183	1	0	1	.001	1	0	1
330			min	2.121	15	0	1	-17.175	5	0	1	-.018	5	0	1
331		14	max	294.928	1	0	1	1.183	1	0	1	.001	1	0	1
332			min	2.141	15	0	1	-17.231	5	0	1	-.02	5	0	1
333		15	max	294.993	1	0	1	1.183	1	0	1	.001	1	0	1
334			min	2.16	15	0	1	-17.287	5	0	1	-.021	5	0	1
335		16	max	295.058	1	0	1	1.183	1	0	1	.002	1	0	1
336			min	2.18	15	0	1	-17.344	5	0	1	-.023	5	0	1
337		17	max	295.122	1	0	1	1.183	1	0	1	.002	1	0	1
338			min	2.199	15	0	1	-17.4	5	0	1	-.024	5	0	1
339		18	max	295.187	1	0	1	1.183	1	0	1	.002	1	0	1
340			min	2.219	15	0	1	-17.456	5	0	1	-.026	5	0	1
341		19	max	295.252	1	0	1	1.183	1	0	1	.002	1	0	1
342			min	2.238	15	0	1	-17.512	5	0	1	-.027	5	0	1
343	M1	1	max	87.423	1	332.148	3	-.932	10	0	2	.049	1	0	2
344			min	6.456	12	-222.248	2	-25.129	1	0	3	.002	10	0	3
345		2	max	87.563	1	331.966	3	-.932	10	0	2	.044	1	.048	2
346			min	6.526	12	-222.49	2	-25.129	1	0	3	.002	10	-.072	3
347		3	max	86.573	3	4.963	14	-.926	10	0	12	.038	1	.096	2
348			min	-13.986	10	-23.775	2	-25.045	1	0	1	.001	10	-.143	3
349		4	max	86.677	3	4.725	14	-.926	10	0	12	.033	1	.101	2
350			min	-13.87	10	-24.016	2	-25.045	1	0	1	.001	10	-.14	3
351		5	max	86.782	3	4.487	14	-.926	10	0	12	.027	1	.106	2
352			min	-13.754	10	-24.258	2	-25.045	1	0	1	0	10	-.137	3
353		6	max	86.887	3	4.25	14	-.926	10	0	12	.022	1	.112	2
354			min	-13.637	10	-24.5	2	-25.045	1	0	1	0	10	-.135	3
355		7	max	86.992	3	4.012	14	-.926	10	0	12	.016	1	.117	2
356			min	-13.521	10	-24.742	2	-25.045	1	0	1	0	10	-.132	3
357		8	max	87.096	3	3.775	14	-.926	10	0	12	.011	1	.122	2
358			min	-13.405	10	-24.984	2	-25.045	1	0	1	0	10	-.129	3
359		9	max	87.201	3	3.537	14	-.926	10	0	12	.006	1	.128	2
360			min	-13.288	10	-25.226	2	-25.045	1	0	1	0	10	-.126	3
361		10	max	87.306	3	3.3	14	-.926	10	0	12	.002	3	.133	2
362			min	-13.172	10	-25.467	2	-25.045	1	0	1	0	10	-.123	3
363		11	max	87.41	3	3.083	9	-.926	10	0	12	0	3	.139	2
364			min	-13.056	10	-25.709	2	-25.045	1	0	1	-.005	1	-.12	3
365		12	max	87.515	3	2.882	9	-.926	10	0	12	0	12	.145	2
366			min	-12.939	10	-25.951	2	-25.045	1	0	1	-.011	1	-.117	3
367		13	max	87.62	3	2.68	9	-.926	10	0	12	0	10	.15	2
368			min	-12.823	10	-26.193	2	-25.045	1	0	1	-.016	1	-.114	3
369		14	max	87.725	3	2.479	9	-.926	10	0	12	0	10	.156	2
370			min	-12.707	10	-26.435	2	-25.045	1	0	1	-.022	1	-.11	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	87.829	3	2.277	9	-.926	10	0	12	-.001	10	.162	2
372			min	-12.59	10	-26.676	2	-25.045	1	0	1	-.027	1	-.107	3
373		16	max	87.501	2	117.665	2	-.933	10	0	1	-.001	10	.166	2
374			min	-5.744	3	-159.127	3	-25.217	1	0	5	-.033	1	-.103	3
375		17	max	87.64	2	117.424	2	-.933	10	0	1	-.001	10	.141	2
376			min	-5.64	3	-159.308	3	-25.217	1	0	5	-.038	1	-.068	3
377		18	max	-4.602	12	325.48	2	-.959	10	0	5	-.002	10	.071	2
378			min	-87.555	1	-156.813	3	-30.678	4	0	2	-.044	1	-.034	3
379		19	max	-4.532	12	325.238	2	-.959	10	0	5	-.002	10	0	2
380			min	-87.415	1	-156.994	3	-30.436	4	0	2	-.049	1	0	3
381	M5	1	max	207.549	1	1073.569	3	0	2	0	1	.032	4	0	3
382			min	2.436	12	-712.459	2	-68.246	3	0	5	0	10	0	2
383		2	max	207.689	1	1073.388	3	0	2	0	1	.027	4	.154	2
384			min	2.505	12	-712.701	2	-68.246	3	0	5	-.005	3	-.232	3
385		3	max	250.132	3	5.066	9	7.502	3	0	3	.023	4	.306	2
386			min	-48.795	2	-82.786	2	-17.491	4	0	4	-.02	3	-.46	3
387		4	max	250.237	3	4.864	9	7.502	3	0	3	.019	4	.324	2
388			min	-48.655	2	-83.027	2	-17.249	4	0	4	-.018	3	-.45	3
389		5	max	250.342	3	4.663	9	7.502	3	0	3	.015	4	.342	2
390			min	-48.516	2	-83.269	2	-17.007	4	0	4	-.016	3	-.439	3
391		6	max	250.446	3	4.461	9	7.502	3	0	3	.011	4	.36	2
392			min	-48.376	2	-83.511	2	-16.765	4	0	4	-.015	3	-.428	3
393		7	max	250.551	3	4.26	9	7.502	3	0	3	.008	4	.378	2
394			min	-48.236	2	-83.753	2	-16.523	4	0	4	-.013	3	-.418	3
395		8	max	250.656	3	4.058	9	7.502	3	0	3	.004	4	.397	2
396			min	-48.097	2	-83.995	2	-16.281	4	0	4	-.011	3	-.407	3
397		9	max	250.76	3	3.857	9	7.502	3	0	3	0	4	.415	2
398			min	-47.957	2	-84.237	2	-16.039	4	0	4	-.01	3	-.396	3
399		10	max	250.865	3	3.655	9	7.502	3	0	3	0	2	.433	2
400			min	-47.818	2	-84.478	2	-15.797	4	0	4	-.008	3	-.386	3
401		11	max	250.97	3	3.454	9	7.502	3	0	3	0	2	.451	2
402			min	-47.678	2	-84.72	2	-15.555	4	0	4	-.007	3	-.375	3
403		12	max	251.075	3	3.252	9	7.502	3	0	3	0	2	.47	2
404			min	-47.538	2	-84.962	2	-15.313	4	0	4	-.009	4	-.364	3
405		13	max	251.179	3	3.051	9	7.502	3	0	3	0	2	.488	2
406			min	-47.399	2	-85.204	2	-15.071	4	0	4	-.013	4	-.353	3
407		14	max	251.284	3	2.849	9	7.502	3	0	3	0	2	.507	2
408			min	-47.259	2	-85.446	2	-14.829	4	0	4	-.016	4	-.342	3
409		15	max	251.389	3	2.647	9	7.502	3	0	3	0	2	.525	2
410			min	-47.12	2	-85.687	2	-14.587	4	0	4	-.019	4	-.331	3
411		16	max	279.531	2	413.107	2	7.475	3	0	3	.001	3	.54	2
412			min	-22.897	3	-469.732	3	-13.272	4	0	4	-.022	4	-.317	3
413		17	max	279.671	2	412.866	2	7.475	3	0	3	.003	3	.45	2
414			min	-22.793	3	-469.913	3	-13.03	4	0	4	-.025	4	-.215	3
415		18	max	-5.317	12	1044.81	2	6.864	3	0	4	.004	3	.226	2
416			min	-207.706	1	-496.567	3	-30.369	5	0	1	-.032	4	-.107	3
417		19	max	-5.247	12	1044.568	2	6.864	3	0	4	.006	3	0	3
418			min	-207.566	1	-496.748	3	-30.127	5	0	1	-.038	4	0	2
419	M9	1	max	87.215	1	332.078	3	128.223	4	0	3	0	15	0	2
420			min	1.584	15	-222.248	2	.932	10	0	2	-.049	1	0	3
421		2	max	87.355	1	331.897	3	128.465	4	0	3	.026	5	.048	2
422			min	1.626	15	-222.49	2	.932	10	0	2	-.043	1	-.072	3
423		3	max	86.241	3	4.679	9	24.605	1	0	1	.051	5	.096	2
424			min	-13.605	10	-23.746	2	-22.385	5	0	5	-.037	1	-.143	3
425		4	max	86.346	3	4.478	9	24.605	1	0	1	.046	5	.101	2
426			min	-13.488	10	-23.987	2	-22.143	5	0	5	-.032	1	-.14	3
427		5	max	86.451	3	4.276	9	24.605	1	0	1	.041	5	.106	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	-13.372	10	-24.229	2	-21.901	5	0	5	-.027	1	-.137	3
429		6	max	86.555	3	4.075	9	24.605	1	0	1	.036	5	.112	2
430			min	-13.256	10	-24.471	2	-21.659	5	0	5	-.021	1	-.134	3
431		7	max	86.66	3	3.873	9	24.605	1	0	1	.032	5	.117	2
432			min	-13.139	10	-24.713	2	-21.417	5	0	5	-.016	1	-.132	3
433		8	max	86.765	3	3.672	9	24.605	1	0	1	.027	5	.122	2
434			min	-13.023	10	-24.955	2	-21.174	5	0	5	-.011	1	-.129	3
435		9	max	86.87	3	3.47	9	24.605	1	0	1	.022	5	.128	2
436			min	-12.906	10	-25.197	2	-20.932	5	0	5	-.005	1	-.126	3
437		10	max	86.974	3	3.269	9	24.605	1	0	1	.018	4	.133	2
438			min	-12.79	10	-25.438	2	-20.69	5	0	5	0	1	-.123	3
439		11	max	87.079	3	3.067	9	24.605	1	0	1	.015	4	.139	2
440			min	-12.674	10	-25.68	2	-20.448	5	0	5	0	10	-.12	3
441		12	max	87.184	3	2.866	9	24.605	1	0	1	.011	4	.144	2
442			min	-12.557	10	-25.922	2	-20.206	5	0	5	0	10	-.117	3
443		13	max	87.288	3	2.664	9	24.605	1	0	1	.016	1	.15	2
444			min	-12.441	10	-26.164	2	-19.964	5	0	5	0	10	-.114	3
445		14	max	87.393	3	2.463	9	24.605	1	0	1	.021	1	.156	2
446			min	-12.325	10	-26.406	2	-19.722	5	0	5	0	15	-.111	3
447		15	max	87.498	3	2.261	9	24.605	1	0	1	.027	1	.162	2
448			min	-12.208	10	-26.648	2	-19.48	5	0	5	-.004	5	-.107	3
449		16	max	87.706	2	117.31	2	24.789	1	0	10	.032	1	.166	2
450			min	-6.469	3	-159.644	3	-18.088	5	0	4	-.007	5	-.103	3
451		17	max	87.846	2	117.068	2	24.789	1	0	10	.038	1	.141	2
452			min	-6.365	3	-159.825	3	-17.846	5	0	4	-.011	5	-.068	3
453		18	max	5.541	5	325.48	2	25.984	1	0	2	.043	1	.071	2
454			min	-87.346	1	-156.804	3	-34.093	5	0	3	-.018	5	-.034	3
455		19	max	5.606	5	325.238	2	25.984	1	0	2	.049	1	0	2
456			min	-87.207	1	-156.985	3	-33.851	5	0	3	-.026	5	0	3
457	M13	1	max	128.223	4	222.149	2	-1.584	15	0	2	.049	1	0	2
458			min	.932	10	-332.115	3	-87.209	1	0	3	0	15	0	3
459		2	max	123.312	4	157.936	2	-.729	15	0	2	.013	3	.142	3
460			min	.932	10	-235.576	3	-65.977	1	0	3	-.002	10	-.095	2
461		3	max	118.402	4	93.724	2	.125	15	0	2	.009	3	.236	3
462			min	.932	10	-139.038	3	-44.744	1	0	3	-.017	1	-.158	2
463		4	max	113.491	4	29.512	2	1.399	5	0	2	.006	3	.281	3
464			min	.932	10	-42.5	3	-23.511	1	0	3	-.034	1	-.189	2
465		5	max	108.58	4	54.039	3	2.722	5	0	2	.003	3	.278	3
466			min	.932	10	-34.7	2	-4.518	3	0	3	-.041	1	-.187	2
467		6	max	103.669	4	150.577	3	18.954	1	0	2	.003	5	.227	3
468			min	.932	10	-98.912	2	-3.274	3	0	3	-.036	1	-.154	2
469		7	max	98.758	4	247.115	3	40.187	1	0	2	.005	5	.127	3
470			min	.932	10	-163.124	2	-2.031	3	0	3	-.022	1	-.089	2
471		8	max	93.848	4	343.654	3	61.42	1	0	2	.009	4	.01	1
472			min	.932	10	-227.336	2	-.787	3	0	3	0	3	-.02	3
473		9	max	88.937	4	440.192	3	82.652	1	0	2	.04	1	.139	2
474			min	.932	10	-291.549	2	.457	3	0	3	0	3	-.216	3
475		10	max	84.026	4	536.73	3	103.885	1	0	2	.086	1	.301	2
476			min	.932	10	-355.761	2	1.421	12	0	3	-.01	3	-.46	3
477		11	max	58.781	4	291.549	2	3.993	5	0	3	.039	1	.139	2
478			min	.932	10	-440.192	3	-82.444	1	0	2	-.013	5	-.216	3
479		12	max	53.87	4	227.336	2	5.315	5	0	3	.005	2	.01	1
480			min	.932	10	-343.654	3	-61.212	1	0	2	-.011	5	-.02	3
481		13	max	48.96	4	163.124	2	6.637	5	0	3	0	10	.127	3
482			min	.932	10	-247.115	3	-39.979	1	0	2	-.022	1	-.089	2
483		14	max	44.049	4	98.912	2	7.959	5	0	3	-.003	15	.227	3
484			min	.932	10	-150.577	3	-18.746	1	0	2	-.036	1	-.154	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
485		15	max	39.138	4	34.7	2	10.252	4	0	3	0	15	.278	3
486			min	.932	10	-54.039	3	-1.614	2	0	2	-.041	1	-.187	2
487		16	max	34.227	4	42.5	3	23.719	1	0	3	.005	5	.281	3
488			min	.932	10	-29.512	2	.873	10	0	2	-.034	1	-.189	2
489		17	max	29.316	4	139.038	3	44.952	1	0	3	.011	5	.236	3
490			min	.932	10	-93.724	2	3.234	10	0	2	-.017	1	-.158	2
491		18	max	25.182	1	235.576	3	66.185	1	0	3	.02	4	.142	3
492			min	.932	10	-157.936	2	5.595	10	0	2	-.002	10	-.095	2
493		19	max	25.182	1	332.115	3	87.417	1	0	3	.049	1	0	2
494			min	.932	10	-222.149	2	6.456	12	0	2	.002	10	0	3
495	M16	1	max	33.843	5	325.363	2	5.606	5	0	3	.049	1	0	2
496			min	-25.93	1	-157.011	3	-87.213	1	0	2	-.026	5	0	3
497		2	max	28.932	5	231.114	2	6.928	5	0	3	.011	1	.067	3
498			min	-25.93	1	-111.964	3	-65.98	1	0	2	-.023	5	-.139	2
499		3	max	24.021	5	136.864	2	8.25	5	0	3	0	3	.112	3
500			min	-25.93	1	-66.917	3	-44.748	1	0	2	-.022	4	-.231	2
501		4	max	19.11	5	42.615	2	9.573	5	0	3	-.002	12	.134	3
502			min	-25.93	1	-21.87	3	-23.515	1	0	2	-.034	1	-.276	2
503		5	max	14.199	5	23.176	3	10.895	5	0	3	-.003	12	.134	3
504			min	-25.93	1	-51.634	2	-3.024	3	0	2	-.041	1	-.274	2
505		6	max	9.288	5	68.223	3	18.95	1	0	3	-.002	15	.111	3
506			min	-25.93	1	-145.883	2	-1.78	3	0	2	-.036	1	-.224	2
507		7	max	4.378	5	113.27	3	40.183	1	0	3	.003	5	.066	3
508			min	-25.93	1	-240.132	2	-.536	3	0	2	-.022	1	-.128	2
509		8	max	1.777	3	158.317	3	61.416	1	0	3	.01	4	.016	2
510			min	-25.93	1	-334.381	2	.658	12	0	2	-.006	3	-.002	3
511		9	max	1.777	3	203.364	3	82.648	1	0	3	.04	1	.207	2
512			min	-25.93	1	-428.63	2	1.487	12	0	2	-.005	3	-.093	3
513		10	max	19.783	5	-8.203	15	103.881	1	0	14	.086	1	.444	2
514			min	-25.93	1	-522.88	2	-4.224	3	0	2	-.004	3	-.206	3
515		11	max	14.873	5	428.63	2	3.298	5	0	2	.039	1	.207	2
516			min	-25.864	1	-203.364	3	-82.44	1	0	3	-.01	5	-.093	3
517		12	max	9.962	5	334.381	2	4.62	5	0	2	.005	2	.016	2
518			min	-25.864	1	-158.317	3	-61.207	1	0	3	-.008	5	-.002	3
519		13	max	5.051	5	240.132	2	5.942	5	0	2	0	10	.066	3
520			min	-25.864	1	-113.27	3	-39.975	1	0	3	-.022	1	-.128	2
521		14	max	.14	5	145.883	2	7.264	5	0	2	-.001	12	.111	3
522			min	-25.864	1	-68.223	3	-18.742	1	0	3	-.036	1	-.224	2
523		15	max	-.959	10	51.634	2	9.536	4	0	2	.001	5	.134	3
524			min	-25.864	1	-23.176	3	-1.588	2	0	3	-.04	1	-.274	2
525		16	max	-.959	10	21.871	3	23.723	1	0	2	.006	5	.134	3
526			min	-25.864	1	-42.615	2	.886	10	0	3	-.034	1	-.276	2
527		17	max	-.959	10	66.917	3	44.956	1	0	2	.011	5	.112	3
528			min	-25.864	1	-136.864	2	2.873	12	0	3	-.017	1	-.231	2
529		18	max	-.959	10	111.964	3	66.189	1	0	2	.02	4	.067	3
530			min	-25.864	1	-231.114	2	3.702	12	0	3	-.002	10	-.139	2
531		19	max	-.959	10	157.011	3	87.422	1	0	2	.049	1	0	2
532			min	-30.465	4	-325.363	2	4.532	12	0	3	.002	10	0	5
533	M15	1	max	0	1	.933	3	.108	3	0	1	0	1	0	1
534			min	-93.603	3	0	1	0	1	0	3	0	3	0	1
535		2	max	0	1	.829	3	.108	3	0	1	0	1	0	1
536			min	-93.674	3	0	1	0	1	0	3	0	3	0	3
537		3	max	0	1	.726	3	.108	3	0	1	0	1	0	1
538			min	-93.744	3	0	1	0	1	0	3	0	3	0	3
539		4	max	0	1	.622	3	.108	3	0	1	0	1	0	1
540			min	-93.815	3	0	1	0	1	0	3	0	3	0	3
541		5	max	0	1	.518	3	.108	3	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
542			min	-93.885	3	0	1	0	1	0	3	0	3	0	3
543		6	max	0	1	.415	3	.108	3	0	1	0	1	0	1
544			min	-93.956	3	0	1	0	1	0	3	0	3	-.001	3
545		7	max	0	1	.311	3	.108	3	0	1	0	3	0	1
546			min	-94.026	3	0	1	0	1	0	3	0	1	-.001	3
547		8	max	0	1	.207	3	.108	3	0	1	0	3	0	1
548			min	-94.097	3	0	1	0	1	0	3	0	1	-.001	3
549		9	max	0	1	.104	3	.108	3	0	1	0	3	0	1
550			min	-94.167	3	0	1	0	1	0	3	0	1	-.001	3
551		10	max	0	1	0	1	.108	3	0	1	0	3	0	1
552			min	-94.238	3	0	1	0	1	0	3	0	1	-.001	3
553		11	max	0	1	0	1	.108	3	0	1	0	3	0	1
554			min	-94.308	3	-.104	3	0	1	0	3	0	1	-.001	3
555		12	max	0	1	0	1	.108	3	0	1	0	3	0	1
556			min	-94.379	3	-.207	3	0	1	0	3	0	1	-.001	3
557		13	max	0	1	0	1	.108	3	0	1	0	3	0	1
558			min	-94.449	3	-.311	3	0	1	0	3	0	1	-.001	3
559		14	max	0	1	0	1	.108	3	0	1	0	3	0	1
560			min	-94.52	3	-.415	3	0	1	0	3	0	1	-.001	3
561		15	max	0	1	0	1	.108	3	0	1	0	3	0	1
562			min	-94.59	3	-.518	3	0	1	0	3	0	1	0	3
563		16	max	0	1	0	1	.108	3	0	1	0	3	0	1
564			min	-94.661	3	-.622	3	0	1	0	3	0	1	0	3
565		17	max	0	1	0	1	.108	3	0	1	0	3	0	1
566			min	-94.731	3	-.726	3	0	1	0	3	0	1	0	3
567		18	max	0	1	0	1	.108	3	0	1	0	3	0	1
568			min	-94.802	3	-.829	3	0	1	0	3	0	1	0	3
569		19	max	0	1	0	1	.108	3	0	1	0	3	0	1
570			min	-94.872	3	-.933	3	0	1	0	3	0	1	0	1
571	M16A	1	max	0	2	2.313	4	.312	4	0	3	0	3	0	1
572			min	-183.268	4	0	2	-.044	3	0	1	0	4	0	1
573		2	max	0	2	2.056	4	.28	4	0	3	0	3	0	2
574			min	-183.264	4	0	2	-.044	3	0	1	0	4	0	4
575		3	max	0	2	1.799	4	.249	4	0	3	0	3	0	2
576			min	-183.261	4	0	2	-.044	3	0	1	0	4	-.001	4
577		4	max	0	2	1.542	4	.218	4	0	3	0	3	0	2
578			min	-183.257	4	0	2	-.044	3	0	1	0	1	-.002	4
579		5	max	0	2	1.285	4	.187	4	0	3	0	3	0	2
580			min	-183.253	4	0	2	-.044	3	0	1	0	1	-.002	4
581		6	max	0	2	1.028	4	.156	4	0	3	0	3	0	2
582			min	-183.25	4	0	2	-.044	3	0	1	0	1	-.003	4
583		7	max	0	2	.771	4	.125	4	0	3	0	5	0	2
584			min	-183.246	4	0	2	-.044	3	0	1	0	1	-.003	4
585		8	max	0	2	.514	4	.093	4	0	3	0	5	0	2
586			min	-183.243	4	0	2	-.044	3	0	1	0	1	-.003	4
587		9	max	0	2	.257	4	.062	4	0	3	0	5	0	2
588			min	-183.239	4	0	2	-.044	3	0	1	0	1	-.003	4
589		10	max	0	2	0	1	.034	1	0	3	0	5	0	2
590			min	-183.235	4	0	1	-.044	3	0	1	0	1	-.003	4
591		11	max	0	2	0	2	.034	1	0	3	0	5	0	2
592			min	-183.232	4	-.257	4	-.044	3	0	1	0	1	-.003	4
593		12	max	0	2	0	2	.034	1	0	3	0	5	0	2
594			min	-183.228	4	-.514	4	-.044	3	0	1	0	1	-.003	4
595		13	max	0	2	0	2	.034	1	0	3	0	5	0	2
596			min	-183.224	4	-.771	4	-.066	5	0	1	0	3	-.003	4
597		14	max	.007	11	0	2	.034	1	0	3	0	5	0	2
598			min	-183.221	4	-1.028	4	-.097	5	0	1	0	3	-.003	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	.085	11	0	2	.034	1	0	3	0	5	0	2
600			min	-183.217	4	-1.285	4	-.128	5	0	1	0	3	-.002	4
601		16	max	.163	11	0	2	.034	1	0	3	0	1	0	2
602			min	-183.214	4	-1.542	4	-.159	5	0	1	0	3	-.002	4
603		17	max	.242	11	0	2	.034	1	0	3	0	1	0	2
604			min	-183.21	4	-1.799	4	-.19	5	0	1	0	3	-.001	4
605		18	max	.32	11	0	2	.034	1	0	3	0	1	0	2
606			min	-183.206	4	-2.056	4	-.222	5	0	1	0	5	0	4
607		19	max	.398	11	0	2	.034	1	0	3	0	1	0	1
608			min	-183.203	4	-2.313	4	-.253	5	0	1	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	.004	1	1.029e-3	5	NC	3	NC	2
2			min	-.003	3	-.009	3	-.011	5	-3.99e-4	1	4338.682	2	8860.739	1
3		2	max	.002	1	.008	2	.004	1	1.05e-3	5	NC	3	NC	2
4			min	-.003	3	-.009	3	-.01	5	-3.814e-4	1	4739.406	2	9536.247	1
5		3	max	.002	1	.008	2	.004	1	1.071e-3	5	NC	1	NC	1
6			min	-.003	3	-.008	3	-.01	5	-3.637e-4	1	5216.833	2	NC	1
7		4	max	.002	1	.007	2	.003	1	1.092e-3	5	NC	1	NC	1
8			min	-.003	3	-.008	3	-.01	5	-3.461e-4	1	5789.68	2	NC	1
9		5	max	.002	1	.006	2	.003	1	1.113e-3	5	NC	1	NC	1
10			min	-.003	3	-.008	3	-.01	5	-3.285e-4	1	6482.961	2	NC	1
11		6	max	.001	1	.005	2	.003	1	1.134e-3	5	NC	1	NC	1
12			min	-.002	3	-.007	3	-.009	5	-3.109e-4	1	7330.659	2	NC	1
13		7	max	.001	1	.005	2	.003	1	1.155e-3	5	NC	1	NC	1
14			min	-.002	3	-.007	3	-.009	5	-2.933e-4	1	8379.835	2	NC	1
15		8	max	.001	1	.004	2	.002	1	1.176e-3	5	NC	1	NC	1
16			min	-.002	3	-.006	3	-.008	5	-2.757e-4	1	9697.136	2	NC	1
17		9	max	.001	1	.003	2	.002	1	1.197e-3	5	NC	1	NC	1
18			min	-.002	3	-.006	3	-.008	5	-2.581e-4	1	NC	1	NC	1
19		10	max	.001	1	.003	2	.002	1	1.218e-3	5	NC	1	NC	1
20			min	-.002	3	-.006	3	-.007	5	-2.404e-4	1	NC	1	NC	1
21		11	max	0	1	.002	2	.001	1	1.239e-3	5	NC	1	NC	1
22			min	-.002	3	-.005	3	-.007	5	-2.228e-4	1	NC	1	NC	1
23		12	max	0	1	.002	2	.001	1	1.26e-3	5	NC	1	NC	1
24			min	-.001	3	-.004	3	-.006	5	-2.052e-4	1	NC	1	NC	1
25		13	max	0	1	.001	2	0	1	1.281e-3	5	NC	1	NC	1
26			min	-.001	3	-.004	3	-.005	5	-1.876e-4	1	NC	1	NC	1
27		14	max	0	1	.001	2	0	1	1.302e-3	5	NC	1	NC	1
28			min	0	3	-.003	3	-.005	5	-1.7e-4	1	NC	1	NC	1
29		15	max	0	1	0	2	0	1	1.323e-3	5	NC	1	NC	1
30			min	0	3	-.003	3	-.004	5	-1.524e-4	1	NC	1	NC	1
31		16	max	0	1	0	2	0	1	1.344e-3	5	NC	1	NC	1
32			min	0	3	-.002	3	-.003	5	-1.348e-4	1	NC	1	NC	1
33		17	max	0	1	0	2	0	1	1.365e-3	5	NC	1	NC	1
34			min	0	3	-.001	3	-.002	5	-1.172e-4	1	NC	1	NC	1
35		18	max	0	1	0	2	0	1	1.386e-3	5	NC	1	NC	1
36			min	0	3	0	3	0	5	-9.954e-5	1	NC	1	NC	1
37		19	max	0	1	0	1	0	1	1.407e-3	5	NC	1	NC	1
38			min	0	1	0	1	0	1	-8.193e-5	1	NC	1	NC	1
39	M3	1	max	0	1	0	1	0	1	3.869e-5	1	NC	1	NC	1
40			min	0	1	0	1	0	1	-6.63e-4	5	NC	1	NC	1
41		2	max	0	3	0	2	.003	5	4.915e-5	1	NC	1	NC	1
42			min	0	2	0	3	0	1	-6.683e-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	.007	5	5.961e-5	1	NC	1	NC	1
44			min	0	2	-.002	3	0	1	-6.735e-4	5	NC	1	NC	1
45		4	max	0	3	0	2	.01	5	7.006e-5	1	NC	1	NC	1
46			min	0	2	-.003	3	0	1	-6.787e-4	5	NC	1	NC	1
47		5	max	0	3	0	2	.014	5	8.052e-5	1	NC	1	NC	1
48			min	0	2	-.003	3	0	1	-6.84e-4	5	NC	1	NC	1
49		6	max	0	3	0	2	.017	4	9.097e-5	1	NC	1	NC	1
50			min	0	2	-.004	3	0	1	-6.892e-4	5	NC	1	NC	1
51		7	max	0	3	0	2	.02	4	1.014e-4	1	NC	1	NC	1
52			min	0	2	-.005	3	0	9	-6.944e-4	5	NC	1	NC	1
53		8	max	0	3	0	2	.023	4	1.119e-4	1	NC	1	NC	1
54			min	0	2	-.006	3	0	9	-6.997e-4	5	NC	1	NC	1
55		9	max	0	3	.001	2	.027	4	1.223e-4	1	NC	1	NC	1
56			min	0	2	-.006	3	0	9	-7.049e-4	5	NC	1	NC	1
57		10	max	0	3	.002	2	.03	4	1.328e-4	1	NC	1	NC	1
58			min	0	2	-.007	3	0	10	-7.101e-4	5	NC	1	NC	1
59		11	max	.001	3	.002	2	.033	4	1.433e-4	1	NC	1	NC	1
60			min	-.001	2	-.007	3	0	10	-7.153e-4	5	NC	1	NC	1
61		12	max	.001	3	.003	2	.036	4	1.537e-4	1	NC	1	NC	1
62			min	-.001	2	-.007	3	0	10	-7.206e-4	5	NC	1	NC	1
63		13	max	.001	3	.003	2	.038	4	1.642e-4	1	NC	1	NC	1
64			min	-.001	2	-.008	3	0	10	-7.258e-4	5	NC	1	NC	1
65		14	max	.001	3	.004	2	.041	4	1.746e-4	1	NC	1	NC	1
66			min	-.001	2	-.008	3	0	10	-7.31e-4	5	NC	1	NC	1
67		15	max	.002	3	.005	2	.044	4	1.851e-4	1	NC	1	NC	1
68			min	-.002	2	-.008	3	0	10	-7.363e-4	5	9475.919	2	NC	1
69		16	max	.002	3	.006	2	.047	4	1.955e-4	1	NC	1	NC	1
70			min	-.002	2	-.008	3	0	10	-7.415e-4	5	7984.906	2	NC	1
71		17	max	.002	3	.007	2	.049	4	2.06e-4	1	NC	1	NC	1
72			min	-.002	2	-.008	3	0	10	-7.467e-4	5	6841.071	2	NC	1
73		18	max	.002	3	.008	2	.052	4	2.164e-4	1	NC	1	NC	1
74			min	-.002	2	-.008	3	0	10	-7.52e-4	5	5952.335	2	NC	1
75		19	max	.002	3	.009	2	.054	4	2.269e-4	1	NC	3	NC	1
76			min	-.002	2	-.008	3	0	10	-7.572e-4	5	5254.883	2	NC	1
77	M4	1	max	.001	1	.01	2	0	10	3.734e-3	5	NC	1	NC	2
78			min	0	12	-.009	3	-.057	4	-3.116e-4	1	NC	1	338.454	4
79		2	max	.001	1	.01	2	0	10	3.734e-3	5	NC	1	NC	2
80			min	0	12	-.009	3	-.052	4	-3.116e-4	1	NC	1	368.928	4
81		3	max	.001	1	.009	2	0	10	3.734e-3	5	NC	1	NC	1
82			min	0	12	-.008	3	-.048	4	-3.116e-4	1	NC	1	405.195	4
83		4	max	.001	1	.009	2	0	10	3.734e-3	5	NC	1	NC	1
84			min	0	12	-.008	3	-.043	4	-3.116e-4	1	NC	1	448.781	4
85		5	max	.001	1	.008	2	0	10	3.734e-3	5	NC	1	NC	1
86			min	0	12	-.007	3	-.039	4	-3.116e-4	1	NC	1	501.763	4
87		6	max	.001	1	.008	2	0	10	3.734e-3	5	NC	1	NC	1
88			min	0	12	-.007	3	-.034	4	-3.116e-4	1	NC	1	567.032	4
89		7	max	0	1	.007	2	0	10	3.734e-3	5	NC	1	NC	1
90			min	0	12	-.006	3	-.03	4	-3.116e-4	1	NC	1	648.704	4
91		8	max	0	1	.006	2	0	10	3.734e-3	5	NC	1	NC	1
92			min	0	12	-.006	3	-.026	4	-3.116e-4	1	NC	1	752.805	4
93		9	max	0	1	.006	2	0	10	3.734e-3	5	NC	1	NC	1
94			min	0	12	-.005	3	-.022	4	-3.116e-4	1	NC	1	888.449	4
95		10	max	0	1	.005	2	0	10	3.734e-3	5	NC	1	NC	1
96			min	0	12	-.005	3	-.018	4	-3.116e-4	1	NC	1	1069.964	4
97		11	max	0	1	.005	2	0	10	3.734e-3	5	NC	1	NC	1
98			min	0	12	-.004	3	-.015	4	-3.116e-4	1	NC	1	1320.946	4
99		12	max	0	1	.004	2	0	10	3.734e-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	-.011	4	-3.116e-4	1	NC	1	1682.551	4
101		13	max	0	1	.003	2	0	10	3.734e-3	5	NC	1	NC	1
102			min	0	12	-.003	3	-.009	4	-3.116e-4	1	NC	1	2231.973	4
103		14	max	0	1	.003	2	0	10	3.734e-3	5	NC	1	NC	1
104			min	0	12	-.003	3	-.006	4	-3.116e-4	1	NC	1	3128.436	4
105		15	max	0	1	.002	2	0	10	3.734e-3	5	NC	1	NC	1
106			min	0	12	-.002	3	-.004	4	-3.116e-4	1	NC	1	4745.994	4
107		16	max	0	1	.002	2	0	10	3.734e-3	5	NC	1	NC	1
108			min	0	12	-.002	3	-.002	4	-3.116e-4	1	NC	1	8147.949	4
109		17	max	0	1	.001	2	0	10	3.734e-3	5	NC	1	NC	1
110			min	0	12	-.001	3	-.001	4	-3.116e-4	1	NC	1	NC	1
111		18	max	0	1	0	2	0	10	3.734e-3	5	NC	1	NC	1
112			min	0	12	0	3	0	4	-3.116e-4	1	NC	1	NC	1
113		19	max	0	1	0	1	0	1	3.734e-3	5	NC	1	NC	1
114			min	0	1	0	1	0	1	-3.116e-4	1	NC	1	NC	1
115	M6	1	max	.006	1	.03	2	.001	1	1.101e-3	4	NC	3	NC	1
116			min	-.011	3	-.028	3	-.011	5	-8.019e-8	2	1309.377	2	6938.294	3
117		2	max	.006	1	.028	2	.001	1	1.121e-3	4	NC	3	NC	1
118			min	-.01	3	-.026	3	-.01	5	-3.452e-7	11	1401.762	2	7365.676	3
119		3	max	.006	1	.026	2	.001	1	1.142e-3	4	NC	3	NC	1
120			min	-.009	3	-.025	3	-.01	5	-2.194e-6	1	1507.717	2	7873.49	3
121		4	max	.005	1	.024	2	.001	1	1.163e-3	4	NC	3	NC	1
122			min	-.009	3	-.024	3	-.01	5	-4.442e-6	1	1629.965	2	8478.875	3
123		5	max	.005	1	.022	2	.001	1	1.183e-3	4	NC	3	NC	1
124			min	-.008	3	-.022	3	-.01	5	-6.69e-6	1	1772.015	2	9204.58	3
125		6	max	.005	1	.02	2	0	1	1.204e-3	4	NC	3	NC	1
126			min	-.008	3	-.021	3	-.01	5	-8.937e-6	1	1938.462	2	NC	1
127		7	max	.004	1	.018	2	0	1	1.224e-3	4	NC	3	NC	1
128			min	-.007	3	-.019	3	-.009	5	-1.119e-5	1	2135.438	2	NC	1
129		8	max	.004	1	.017	2	0	1	1.245e-3	4	NC	3	NC	1
130			min	-.006	3	-.018	3	-.009	5	-1.343e-5	1	2371.312	2	NC	1
131		9	max	.004	1	.015	2	0	1	1.266e-3	4	NC	3	NC	1
132			min	-.006	3	-.016	3	-.008	5	-1.568e-5	1	2657.799	2	NC	1
133		10	max	.003	1	.013	2	0	1	1.286e-3	4	NC	3	NC	1
134			min	-.005	3	-.014	3	-.008	5	-1.793e-5	1	3011.823	2	NC	1
135		11	max	.003	1	.011	2	0	1	1.307e-3	4	NC	3	NC	1
136			min	-.005	3	-.013	3	-.007	5	-2.018e-5	1	3458.764	2	NC	1
137		12	max	.003	1	.01	2	0	1	1.327e-3	4	NC	3	NC	1
138			min	-.004	3	-.011	3	-.006	5	-2.242e-5	1	4038.497	2	NC	1
139		13	max	.002	1	.008	2	0	1	1.348e-3	4	NC	3	NC	1
140			min	-.004	3	-.01	3	-.006	5	-2.467e-5	1	4817.462	2	NC	1
141		14	max	.002	1	.007	2	0	1	1.369e-3	4	NC	3	NC	1
142			min	-.003	3	-.008	3	-.005	5	-2.692e-5	1	5915.221	2	NC	1
143		15	max	.001	1	.005	2	0	1	1.389e-3	4	NC	1	NC	1
144			min	-.002	3	-.007	3	-.004	5	-2.917e-5	1	7570.842	2	NC	1
145		16	max	.001	1	.004	2	0	1	1.41e-3	4	NC	1	NC	1
146			min	-.002	3	-.005	3	-.003	5	-3.141e-5	1	NC	1	NC	1
147		17	max	0	1	.002	2	0	1	1.43e-3	4	NC	1	NC	1
148			min	-.001	3	-.003	3	-.002	5	-3.366e-5	1	NC	1	NC	1
149		18	max	0	1	.001	2	0	1	1.451e-3	4	NC	1	NC	1
150			min	0	3	-.002	3	-.001	5	-3.591e-5	1	NC	1	NC	1
151		19	max	0	1	0	1	0	1	1.472e-3	5	NC	1	NC	1
152			min	0	1	0	1	0	1	-3.816e-5	1	NC	1	NC	1
153	M7	1	max	0	1	0	1	0	1	1.79e-5	1	NC	1	NC	1
154			min	0	1	0	1	0	1	-6.937e-4	5	NC	1	NC	1
155		2	max	0	3	.001	2	.004	5	1.582e-5	1	NC	1	NC	1
156			min	0	2	-.002	3	0	1	-6.878e-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	.007	5	1.374e-5	1	NC	1	NC	1
158			min	0	2	-.004	3	0	1	-6.82e-4	4	NC	1	NC	1
159		4	max	0	3	.004	2	.011	4	1.166e-5	1	NC	1	NC	1
160			min	-.001	2	-.006	3	0	1	-6.762e-4	4	NC	1	NC	1
161		5	max	.001	3	.005	2	.014	4	9.578e-6	1	NC	1	NC	1
162			min	-.001	2	-.008	3	0	1	-6.704e-4	4	8948.368	2	NC	1
163		6	max	.002	3	.006	2	.018	4	2.338e-5	3	NC	1	NC	1
164			min	-.002	2	-.009	3	0	1	-6.646e-4	4	7168.021	2	NC	1
165		7	max	.002	3	.008	2	.021	4	4.631e-5	3	NC	1	NC	1
166			min	-.002	2	-.011	3	0	1	-6.588e-4	4	5949.835	2	NC	1
167		8	max	.002	3	.009	2	.024	4	6.924e-5	3	NC	3	NC	1
168			min	-.003	2	-.013	3	0	1	-6.53e-4	4	5056.41	2	NC	1
169		9	max	.003	3	.011	2	.028	4	9.217e-5	3	NC	3	NC	1
170			min	-.003	2	-.014	3	0	1	-6.472e-4	4	4369.467	2	NC	1
171		10	max	.003	3	.012	2	.031	4	1.151e-4	3	NC	3	NC	1
172			min	-.003	2	-.016	3	0	1	-6.414e-4	4	3823.436	2	NC	1
173		11	max	.003	3	.014	2	.034	4	1.38e-4	3	NC	3	NC	1
174			min	-.004	2	-.017	3	0	1	-6.356e-4	4	3378.917	2	NC	1
175		12	max	.003	3	.015	2	.037	4	1.61e-4	3	NC	3	NC	1
176			min	-.004	2	-.018	3	0	1	-6.298e-4	4	3010.672	2	NC	1
177		13	max	.004	3	.017	2	.04	4	1.839e-4	3	NC	3	NC	1
178			min	-.004	2	-.019	3	0	1	-6.24e-4	4	2701.65	2	NC	1
179		14	max	.004	3	.019	2	.042	4	2.068e-4	3	NC	3	NC	1
180			min	-.005	2	-.02	3	0	1	-6.182e-4	4	2439.813	2	NC	1
181		15	max	.004	3	.021	2	.045	4	2.298e-4	3	NC	3	NC	1
182			min	-.005	2	-.021	3	0	1	-6.124e-4	4	2216.339	2	NC	1
183		16	max	.005	3	.023	2	.048	4	2.527e-4	3	NC	3	NC	1
184			min	-.006	2	-.022	3	0	1	-6.066e-4	4	2024.567	2	NC	1
185		17	max	.005	3	.025	2	.05	4	2.756e-4	3	NC	3	NC	1
186			min	-.006	2	-.023	3	0	1	-6.008e-4	4	1859.339	2	NC	1
187		18	max	.005	3	.027	2	.053	4	2.986e-4	3	NC	3	NC	1
188			min	-.006	2	-.024	3	0	1	-5.95e-4	4	1716.588	2	NC	1
189		19	max	.006	3	.029	2	.055	4	3.215e-4	3	NC	3	NC	1
190			min	-.007	2	-.025	3	0	1	-5.892e-4	4	1593.061	2	NC	1
191	M8	1	max	.004	1	.034	2	0	1	3.571e-3	4	NC	1	NC	1
192			min	0	3	-.028	3	-.058	4	-2.414e-4	3	NC	1	333.715	4
193		2	max	.004	1	.032	2	0	1	3.571e-3	4	NC	1	NC	1
194			min	0	3	-.026	3	-.053	4	-2.414e-4	3	NC	1	363.763	4
195		3	max	.003	1	.031	2	0	1	3.571e-3	4	NC	1	NC	1
196			min	0	3	-.025	3	-.048	4	-2.414e-4	3	NC	1	399.523	4
197		4	max	.003	1	.029	2	0	1	3.571e-3	4	NC	1	NC	1
198			min	0	3	-.023	3	-.044	4	-2.414e-4	3	NC	1	442.499	4
199		5	max	.003	1	.027	2	0	1	3.571e-3	4	NC	1	NC	1
200			min	0	3	-.022	3	-.039	4	-2.414e-4	3	NC	1	494.741	4
201		6	max	.003	1	.025	2	0	1	3.571e-3	4	NC	1	NC	1
202			min	0	3	-.02	3	-.035	4	-2.414e-4	3	NC	1	559.098	4
203		7	max	.003	1	.023	2	0	1	3.571e-3	4	NC	1	NC	1
204			min	0	3	-.019	3	-.03	4	-2.414e-4	3	NC	1	639.629	4
205		8	max	.002	1	.021	2	0	1	3.571e-3	4	NC	1	NC	1
206			min	0	3	-.017	3	-.026	4	-2.414e-4	3	NC	1	742.276	4
207		9	max	.002	1	.019	2	0	1	3.571e-3	4	NC	1	NC	1
208			min	0	3	-.015	3	-.022	4	-2.414e-4	3	NC	1	876.027	4
209		10	max	.002	1	.017	2	0	1	3.571e-3	4	NC	1	NC	1
210			min	0	3	-.014	3	-.018	4	-2.414e-4	3	NC	1	1055.009	4
211		11	max	.002	1	.015	2	0	1	3.571e-3	4	NC	1	NC	1
212			min	0	3	-.012	3	-.015	4	-2.414e-4	3	NC	1	1302.488	4
213		12	max	.001	1	.013	2	0	1	3.571e-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	-.012	4	-2.414e-4	3	NC	1	1659.047	4
215		13	max	.001	1	.011	2	0	1	3.571e-3	4	NC	1	NC	1
216			min	0	3	-.009	3	-.009	4	-2.414e-4	3	NC	1	2200.806	4
217		14	max	.001	1	.01	2	0	1	3.571e-3	4	NC	1	NC	1
218			min	0	3	-.008	3	-.006	4	-2.414e-4	3	NC	1	3084.767	4
219		15	max	0	1	.008	2	0	1	3.571e-3	4	NC	1	NC	1
220			min	0	3	-.006	3	-.004	4	-2.414e-4	3	NC	1	4679.771	4
221		16	max	0	1	.006	2	0	1	3.571e-3	4	NC	1	NC	1
222			min	0	3	-.005	3	-.002	4	-2.414e-4	3	NC	1	8034.3	4
223		17	max	0	1	.004	2	0	1	3.571e-3	4	NC	1	NC	1
224			min	0	3	-.003	3	-.001	4	-2.414e-4	3	NC	1	NC	1
225		18	max	0	1	.002	2	0	1	3.571e-3	4	NC	1	NC	1
226			min	0	3	-.002	3	0	4	-2.414e-4	3	NC	1	NC	1
227		19	max	0	1	0	1	0	1	3.571e-3	4	NC	1	NC	1
228			min	0	1	0	1	0	1	-2.414e-4	3	NC	1	NC	1
229	M10	1	max	.002	1	.009	2	0	3	3.984e-4	1	NC	3	NC	1
230			min	-.003	3	-.009	3	-.005	4	-5.114e-4	3	4343.431	2	NC	1
231		2	max	.002	1	.008	2	0	3	3.783e-4	1	NC	3	NC	1
232			min	-.003	3	-.009	3	-.005	4	-4.94e-4	3	4744.745	2	NC	1
233		3	max	.002	1	.008	2	0	3	3.582e-4	1	NC	1	NC	1
234			min	-.003	3	-.008	3	-.005	4	-4.766e-4	3	5222.905	2	NC	1
235		4	max	.002	1	.007	2	0	3	3.694e-4	4	NC	1	NC	1
236			min	-.002	3	-.008	3	-.005	4	-4.592e-4	3	5796.672	2	NC	1
237		5	max	.002	1	.006	2	0	3	4.229e-4	4	NC	1	NC	1
238			min	-.002	3	-.008	3	-.006	4	-4.418e-4	3	6491.118	2	NC	1
239		6	max	.001	1	.005	2	0	3	4.763e-4	4	NC	1	NC	1
240			min	-.002	3	-.007	3	-.006	4	-4.244e-4	3	7340.31	2	NC	1
241		7	max	.001	1	.005	2	0	3	5.298e-4	4	NC	1	NC	1
242			min	-.002	3	-.007	3	-.006	4	-4.07e-4	3	8391.434	2	NC	1
243		8	max	.001	1	.004	2	0	3	5.833e-4	4	NC	1	NC	1
244			min	-.002	3	-.006	3	-.005	4	-3.896e-4	3	9711.318	2	NC	1
245		9	max	.001	1	.003	2	0	3	6.367e-4	4	NC	1	NC	1
246			min	-.002	3	-.006	3	-.005	4	-3.722e-4	3	NC	1	NC	1
247		10	max	.001	1	.003	2	0	3	6.902e-4	4	NC	1	NC	1
248			min	-.001	3	-.006	3	-.005	4	-3.548e-4	3	NC	1	NC	1
249		11	max	0	1	.002	2	0	3	7.437e-4	4	NC	1	NC	1
250			min	-.001	3	-.005	3	-.005	4	-3.375e-4	3	NC	1	NC	1
251		12	max	0	1	.002	2	0	3	7.971e-4	4	NC	1	NC	1
252			min	-.001	3	-.005	3	-.004	4	-3.201e-4	3	NC	1	NC	1
253		13	max	0	1	.001	2	0	3	8.506e-4	4	NC	1	NC	1
254			min	0	3	-.004	3	-.004	4	-3.027e-4	3	NC	1	NC	1
255		14	max	0	1	.001	2	0	3	9.041e-4	4	NC	1	NC	1
256			min	0	3	-.003	3	-.003	4	-2.853e-4	3	NC	1	NC	1
257		15	max	0	1	0	2	0	3	9.575e-4	4	NC	1	NC	1
258			min	0	3	-.003	3	-.003	4	-2.679e-4	3	NC	1	NC	1
259		16	max	0	1	0	2	0	3	1.011e-3	4	NC	1	NC	1
260			min	0	3	-.002	3	-.002	4	-2.505e-4	3	NC	1	NC	1
261		17	max	0	1	0	2	0	3	1.064e-3	4	NC	1	NC	1
262			min	0	3	-.001	3	-.002	4	-2.331e-4	3	NC	1	NC	1
263		18	max	0	1	0	2	0	3	1.118e-3	4	NC	1	NC	1
264			min	0	3	0	3	0	4	-2.157e-4	3	NC	1	NC	1
265		19	max	0	1	0	1	0	1	1.171e-3	4	NC	1	NC	1
266			min	0	1	0	1	0	1	-1.983e-4	3	NC	1	NC	1
267	M11	1	max	0	1	0	1	0	1	9.359e-5	3	NC	1	NC	1
268			min	0	1	0	1	0	1	-5.525e-4	4	NC	1	NC	1
269		2	max	0	3	0	2	.003	4	7.095e-5	3	NC	1	NC	1
270			min	0	2	0	3	0	3	-6.028e-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	.006	4	4.831e-5	3	NC	1	NC	1
272			min	0	2	-.002	3	0	3	-6.53e-4	4	NC	1	NC	1
273		4	max	0	3	0	2	.009	4	2.567e-5	3	NC	1	NC	1
274			min	0	2	-.003	3	-.001	3	-7.032e-4	4	NC	1	NC	1
275		5	max	0	3	0	2	.011	4	3.027e-6	3	NC	1	NC	1
276			min	0	2	-.003	3	-.002	3	-7.534e-4	4	NC	1	NC	1
277		6	max	0	3	0	2	.014	5	-3.459e-6	10	NC	1	NC	1
278			min	0	2	-.004	3	-.002	3	-8.037e-4	4	NC	1	NC	1
279		7	max	0	3	0	2	.017	5	-3.945e-6	10	NC	1	NC	1
280			min	0	2	-.005	3	-.002	3	-8.539e-4	4	NC	1	NC	1
281		8	max	0	3	0	2	.02	5	-4.43e-6	10	NC	1	NC	1
282			min	0	2	-.006	3	-.002	3	-9.041e-4	4	NC	1	NC	1
283		9	max	0	3	.001	2	.023	5	-4.916e-6	10	NC	1	NC	1
284			min	0	2	-.006	3	-.002	3	-9.543e-4	4	NC	1	NC	1
285		10	max	0	3	.002	2	.026	5	-5.402e-6	10	NC	1	NC	1
286			min	0	2	-.007	3	-.003	3	-1.005e-3	4	NC	1	NC	1
287		11	max	.001	3	.002	2	.028	5	-5.887e-6	10	NC	1	NC	1
288			min	-.001	2	-.007	3	-.003	3	-1.055e-3	4	NC	1	NC	1
289		12	max	.001	3	.003	2	.031	5	-6.373e-6	10	NC	1	NC	1
290			min	-.001	2	-.007	3	-.003	3	-1.105e-3	4	NC	1	NC	1
291		13	max	.001	3	.003	2	.033	5	-6.859e-6	10	NC	1	NC	1
292			min	-.001	2	-.008	3	-.003	3	-1.155e-3	4	NC	1	NC	1
293		14	max	.001	3	.004	2	.036	5	-7.345e-6	10	NC	1	NC	1
294			min	-.001	2	-.008	3	-.003	3	-1.205e-3	4	NC	1	NC	1
295		15	max	.002	3	.005	2	.039	5	-7.83e-6	10	NC	1	NC	1
296			min	-.002	2	-.008	3	-.003	1	-1.256e-3	4	9490.633	2	NC	1
297		16	max	.002	3	.006	2	.041	5	-8.316e-6	10	NC	1	NC	1
298			min	-.002	2	-.008	3	-.003	1	-1.306e-3	4	7996.049	2	NC	1
299		17	max	.002	3	.007	2	.044	5	-8.802e-6	10	NC	1	NC	1
300			min	-.002	2	-.008	3	-.004	1	-1.356e-3	4	6849.759	2	NC	1
301		18	max	.002	3	.008	2	.046	5	-9.287e-6	10	NC	1	NC	1
302			min	-.002	2	-.008	3	-.004	1	-1.406e-3	4	5959.296	2	NC	1
303		19	max	.002	3	.009	2	.049	5	-9.773e-6	10	NC	3	NC	1
304			min	-.002	2	-.008	3	-.004	1	-1.457e-3	4	5260.607	2	NC	1
305	M12	1	max	.001	1	.01	2	.004	1	4.348e-3	4	NC	1	NC	2
306			min	0	15	-.009	3	-.053	5	1.068e-5	10	NC	1	362.951	5
307		2	max	.001	1	.01	2	.003	1	4.348e-3	4	NC	1	NC	2
308			min	0	15	-.009	3	-.049	5	1.068e-5	10	NC	1	395.622	5
309		3	max	.001	1	.009	2	.003	1	4.348e-3	4	NC	1	NC	2
310			min	0	15	-.008	3	-.044	5	1.068e-5	10	NC	1	434.502	5
311		4	max	.001	1	.009	2	.003	1	4.348e-3	4	NC	1	NC	2
312			min	0	15	-.008	3	-.04	5	1.068e-5	10	NC	1	481.228	5
313		5	max	.001	1	.008	2	.003	1	4.348e-3	4	NC	1	NC	2
314			min	0	15	-.007	3	-.036	5	1.068e-5	10	NC	1	538.026	5
315		6	max	.001	1	.008	2	.002	1	4.348e-3	4	NC	1	NC	2
316			min	0	15	-.007	3	-.032	5	1.068e-5	10	NC	1	607.994	5
317		7	max	0	1	.007	2	.002	1	4.348e-3	4	NC	1	NC	2
318			min	0	15	-.006	3	-.028	5	1.068e-5	10	NC	1	695.545	5
319		8	max	0	1	.006	2	.002	1	4.348e-3	4	NC	1	NC	1
320			min	0	15	-.006	3	-.024	5	1.068e-5	10	NC	1	807.137	5
321		9	max	0	1	.006	2	.001	1	4.348e-3	4	NC	1	NC	1
322			min	0	15	-.005	3	-.02	5	1.068e-5	10	NC	1	952.54	5
323		10	max	0	1	.005	2	.001	1	4.348e-3	4	NC	1	NC	1
324			min	0	15	-.005	3	-.017	5	1.068e-5	10	NC	1	1147.111	5
325		11	max	0	1	.005	2	0	1	4.348e-3	4	NC	1	NC	1
326			min	0	15	-.004	3	-.014	5	1.068e-5	10	NC	1	1416.14	5
327		12	max	0	1	.004	2	0	1	4.348e-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	15	-.004	3	-.011	5	1.068e-5	10	NC	1	1803.739	5
329		13	max	0	1	.003	2	0	1	4.348e-3	4	NC	1	NC	1
330			min	0	15	-.003	3	-.008	5	1.068e-5	10	NC	1	2392.647	5
331		14	max	0	1	.003	2	0	1	4.348e-3	4	NC	1	NC	1
332			min	0	15	-.003	3	-.006	5	1.068e-5	10	NC	1	3353.52	5
333		15	max	0	1	.002	2	0	1	4.348e-3	4	NC	1	NC	1
334			min	0	15	-.002	3	-.004	5	1.068e-5	10	NC	1	5087.263	5
335		16	max	0	1	.002	2	0	1	4.348e-3	4	NC	1	NC	1
336			min	0	15	-.002	3	-.002	5	1.068e-5	10	NC	1	8733.498	5
337		17	max	0	1	.001	2	0	1	4.348e-3	4	NC	1	NC	1
338			min	0	15	-.001	3	-.001	5	1.068e-5	10	NC	1	NC	1
339		18	max	0	1	0	2	0	1	4.348e-3	4	NC	1	NC	1
340			min	0	15	0	3	0	5	1.068e-5	10	NC	1	NC	1
341		19	max	0	1	0	1	0	1	4.348e-3	4	NC	1	NC	1
342			min	0	1	0	1	0	1	1.068e-5	10	NC	1	NC	1
343	M1	1	max	.008	3	.024	3	.006	5	7.052e-3	2	NC	1	NC	1
344			min	-.008	2	-.02	2	-.001	1	-1.015e-2	3	NC	1	NC	1
345		2	max	.008	3	.014	3	.008	5	3.468e-3	2	NC	4	NC	1
346			min	-.008	2	-.012	2	-.003	1	-5.008e-3	3	4865.011	3	NC	1
347		3	max	.008	3	.005	3	.011	5	3.31e-4	5	NC	4	NC	1
348			min	-.008	2	-.004	2	-.004	1	-2.243e-4	1	2520.273	3	NC	1
349		4	max	.008	3	.003	2	.013	5	3.346e-4	5	NC	4	NC	1
350			min	-.008	2	-.003	3	-.005	1	-1.905e-4	1	1796.072	3	6491.174	5
351		5	max	.008	3	.01	2	.016	5	3.383e-4	5	NC	4	NC	1
352			min	-.008	2	-.009	3	-.005	1	-1.566e-4	1	1450.807	3	4617.746	5
353		6	max	.008	3	.015	2	.019	5	3.419e-4	5	NC	4	NC	1
354			min	-.008	2	-.014	3	-.005	1	-1.228e-4	1	1257.687	2	3531.208	5
355		7	max	.008	3	.019	2	.023	5	3.456e-4	5	NC	4	NC	1
356			min	-.008	2	-.018	3	-.004	1	-8.9e-5	1	1119.268	2	2831.78	5
357		8	max	.008	3	.022	2	.026	5	3.492e-4	5	NC	4	NC	1
358			min	-.008	2	-.021	3	-.003	1	-5.518e-5	1	1032.181	2	2349.647	5
359		9	max	.008	3	.024	2	.03	5	3.528e-4	5	NC	4	NC	1
360			min	-.008	2	-.022	3	-.002	1	-2.535e-5	9	980.204	2	2000.829	5
361		10	max	.008	3	.025	2	.033	5	3.593e-4	4	NC	4	NC	1
362			min	-.008	2	-.023	3	-.001	1	-1.203e-6	9	955.571	2	1721.498	4
363		11	max	.008	3	.025	2	.037	4	3.711e-4	4	NC	4	NC	1
364			min	-.008	2	-.022	3	0	9	3.621e-6	10	955.437	2	1509.2	4
365		12	max	.008	3	.023	2	.041	4	3.83e-4	4	NC	4	NC	1
366			min	-.008	2	-.02	3	0	10	4.75e-6	10	980.827	2	1345.167	4
367		13	max	.008	3	.02	2	.044	4	3.948e-4	4	NC	4	NC	1
368			min	-.008	2	-.017	3	0	10	5.879e-6	10	1037.222	2	1216.316	4
369		14	max	.008	3	.016	2	.048	4	4.066e-4	4	NC	4	NC	1
370			min	-.008	2	-.013	3	0	10	7.008e-6	10	1137.356	2	1113.899	4
371		15	max	.008	3	.01	2	.051	4	4.185e-4	4	NC	4	NC	1
372			min	-.008	2	-.009	3	0	10	8.137e-6	10	1309.271	2	1031.904	4
373		16	max	.008	3	.003	2	.054	4	6.281e-4	4	NC	4	NC	1
374			min	-.008	2	-.003	3	0	10	8.971e-6	10	1621.765	2	966.098	4
375		17	max	.008	3	.004	3	.057	4	5.543e-3	4	NC	4	NC	1
376			min	-.008	2	-.006	2	0	10	-2.001e-5	9	2296.587	2	913.517	4
377		18	max	.008	3	.012	3	.06	4	5.053e-3	2	NC	4	NC	1
378			min	-.008	2	-.016	2	0	10	-2.56e-3	3	4450.423	2	871.852	4
379		19	max	.008	3	.02	3	.062	4	1.018e-2	2	NC	1	NC	1
380			min	-.008	2	-.027	2	0	1	-5.227e-3	3	NC	1	840.488	4
381	M5	1	max	.025	3	.076	3	.006	5	1.473e-5	4	NC	1	NC	1
382			min	-.028	2	-.066	2	-.002	1	4.494e-8	11	NC	1	NC	1
383		2	max	.025	3	.045	3	.008	5	1.652e-4	5	NC	4	NC	1
384			min	-.028	2	-.038	2	-.001	1	-2.468e-5	1	1533.258	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	.025	3	.016	3	.011	5	3.133e-4	5	NC	5	NC	1
386			min	-.028	2	-.012	2	-.001	1	-4.895e-5	1	794.647	3	NC	1
387		4	max	.025	3	.011	2	.014	5	3.264e-4	5	NC	5	NC	1
388			min	-.028	2	-.009	3	-.001	1	-4.632e-5	1	566.919	3	NC	1
389		5	max	.025	3	.031	2	.017	5	3.396e-4	5	NC	5	NC	1
390			min	-.028	2	-.029	3	-.001	1	-4.39e-5	9	458.225	2	NC	1
391		6	max	.025	3	.048	2	.02	5	3.527e-4	5	NC	5	NC	1
392			min	-.028	2	-.045	3	-.001	1	-4.169e-5	9	388.724	2	9306.49	3
393		7	max	.025	3	.062	2	.024	5	3.658e-4	5	NC	5	NC	1
394			min	-.028	2	-.058	3	-.001	1	-3.949e-5	9	345.774	2	8835.295	3
395		8	max	.025	3	.072	2	.028	5	3.79e-4	5	NC	5	NC	1
396			min	-.028	2	-.066	3	-.001	1	-3.729e-5	9	318.736	2	8723.941	3
397		9	max	.024	3	.079	2	.031	5	3.921e-4	5	NC	5	NC	1
398			min	-.028	2	-.071	3	-.001	1	-3.509e-5	9	302.576	2	8903.027	3
399		10	max	.024	3	.082	2	.035	5	4.052e-4	5	NC	5	NC	1
400			min	-.028	2	-.072	3	-.001	1	-3.288e-5	9	294.884	2	9363.246	3
401		11	max	.024	3	.081	2	.039	5	4.183e-4	5	NC	5	NC	1
402			min	-.028	2	-.07	3	-.001	1	-3.068e-5	9	294.773	2	NC	1
403		12	max	.024	3	.075	2	.043	5	4.315e-4	5	NC	5	NC	1
404			min	-.028	2	-.064	3	-.001	1	-2.848e-5	9	302.556	2	NC	1
405		13	max	.024	3	.066	2	.046	4	4.446e-4	5	NC	5	NC	1
406			min	-.028	2	-.055	3	0	1	-2.628e-5	9	319.921	2	NC	1
407		14	max	.024	3	.052	2	.049	4	4.577e-4	5	NC	5	NC	1
408			min	-.028	2	-.042	3	0	1	-2.407e-5	9	350.802	2	NC	1
409		15	max	.024	3	.033	2	.053	4	4.709e-4	5	NC	5	NC	1
410			min	-.028	2	-.027	3	0	1	-2.187e-5	9	403.869	2	NC	1
411		16	max	.024	3	.009	2	.055	4	6.788e-4	5	NC	5	NC	1
412			min	-.028	2	-.008	3	0	1	-2.125e-5	9	500.41	2	NC	1
413		17	max	.024	3	.014	3	.058	4	5.541e-3	4	NC	5	NC	1
414			min	-.028	2	-.02	2	0	1	-6.341e-5	1	709.278	2	NC	1
415		18	max	.024	3	.037	3	.06	4	2.844e-3	4	NC	4	NC	1
416			min	-.028	2	-.053	2	0	1	-3.248e-5	1	1375.15	2	NC	1
417		19	max	.024	3	.062	3	.062	4	4.611e-6	5	NC	1	NC	1
418			min	-.028	2	-.088	2	0	1	-1.003e-6	3	NC	1	NC	1
419	M9	1	max	.008	3	.024	3	.005	5	1.016e-2	3	NC	1	NC	1
420			min	-.008	2	-.02	2	-.002	1	-7.052e-3	2	NC	1	NC	1
421		2	max	.008	3	.014	3	.005	5	5.005e-3	3	NC	4	NC	1
422			min	-.008	2	-.012	2	0	9	-3.468e-3	2	4866.837	3	NC	1
423		3	max	.008	3	.005	3	.005	4	1.125e-4	1	NC	4	NC	1
424			min	-.008	2	-.004	2	0	3	-5.643e-5	3	2521.234	3	NC	1
425		4	max	.008	3	.003	2	.006	4	8.331e-5	1	NC	4	NC	1
426			min	-.008	2	-.003	3	-.001	3	-6.126e-5	3	1796.734	3	NC	1
427		5	max	.008	3	.01	2	.007	4	5.412e-5	1	NC	4	NC	1
428			min	-.008	2	-.009	3	-.002	3	-6.608e-5	3	1451.294	3	NC	1
429		6	max	.008	3	.015	2	.01	4	2.493e-5	1	NC	4	NC	1
430			min	-.008	2	-.015	3	-.003	3	-7.091e-5	3	1258.026	2	8789.948	3
431		7	max	.008	3	.019	2	.012	4	1.275e-5	2	NC	4	NC	1
432			min	-.008	2	-.019	3	-.004	3	-7.574e-5	3	1119.582	2	6533.924	4
433		8	max	.008	3	.022	2	.015	4	3.396e-6	2	NC	4	NC	1
434			min	-.008	2	-.021	3	-.004	3	-8.057e-5	3	1032.482	2	4627.307	4
435		9	max	.008	3	.024	2	.018	4	1.175e-5	5	NC	4	NC	1
436			min	-.008	2	-.023	3	-.005	3	-8.54e-5	3	980.5	2	3481.417	4
437		10	max	.008	3	.025	2	.022	5	2.122e-5	5	NC	4	NC	1
438			min	-.008	2	-.023	3	-.005	3	-9.184e-5	1	955.868	2	2737.207	4
439		11	max	.008	3	.025	2	.026	5	3.068e-5	5	NC	4	NC	1
440			min	-.008	2	-.022	3	-.005	3	-1.21e-4	1	955.743	2	2225.629	4
441		12	max	.008	3	.023	2	.031	5	4.014e-5	5	NC	4	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
442			min	-.008	2	-.02	3	-.004	3	-1.502e-4	1	981.149	2	1854.143	5
443		13	max	.008	3	.02	2	.035	5	4.961e-5	5	NC	4	NC	1
444			min	-.008	2	-.018	3	-.004	3	-1.794e-4	1	1037.569	2	1574.495	5
445		14	max	.008	3	.016	2	.04	5	5.907e-5	5	NC	4	NC	1
446			min	-.008	2	-.014	3	-.004	1	-2.086e-4	1	1137.743	2	1365.313	5
447		15	max	.008	3	.01	2	.044	5	6.853e-5	5	NC	4	NC	1
448			min	-.008	2	-.009	3	-.005	1	-2.378e-4	1	1309.719	2	1205.049	5
449		16	max	.008	3	.003	2	.049	5	2.904e-4	5	NC	4	NC	1
450			min	-.008	2	-.003	3	-.004	1	-2.601e-4	1	1622.314	2	1079.964	5
451		17	max	.008	3	.004	3	.053	5	5.571e-3	4	NC	4	NC	1
452			min	-.008	2	-.006	2	-.004	1	-1.193e-4	1	2297.31	2	980.842	5
453		18	max	.008	3	.012	3	.057	5	2.737e-3	5	NC	4	NC	1
454			min	-.008	2	-.016	2	-.003	1	-5.053e-3	2	4451.779	2	896.95	4
455		19	max	.008	3	.02	3	.062	4	5.225e-3	3	NC	1	NC	1
456			min	-.008	2	-.027	2	0	1	-1.018e-2	2	NC	1	827.194	4
457	M13	1	max	.002	1	.024	3	.008	3	3.72e-3	3	NC	1	NC	1
458			min	-.005	5	-.02	2	-.008	2	-3.261e-3	2	NC	1	NC	1
459		2	max	.002	1	.083	3	.006	3	4.625e-3	3	NC	4	NC	1
460			min	-.005	5	-.061	2	-.006	2	-4.068e-3	2	1832.453	3	NC	1
461		3	max	.002	1	.132	3	.013	1	5.531e-3	3	NC	5	NC	2
462			min	-.006	5	-.096	2	-.005	10	-4.875e-3	2	998.978	3	6132.838	1
463		4	max	.002	1	.165	3	.021	1	6.436e-3	3	NC	5	NC	2
464			min	-.006	5	-.119	2	-.005	10	-5.681e-3	2	766.571	3	4342.193	1
465		5	max	.002	1	.178	3	.023	1	7.341e-3	3	NC	5	NC	2
466			min	-.006	5	-.13	2	-.006	10	-6.488e-3	2	701.055	3	3968.445	1
467		6	max	.002	1	.172	3	.019	1	8.246e-3	3	NC	5	NC	2
468			min	-.006	5	-.127	2	-.008	10	-7.294e-3	2	730.649	3	4560.177	1
469		7	max	.002	1	.15	3	.016	3	9.151e-3	3	NC	5	NC	2
470			min	-.006	5	-.113	2	-.013	2	-8.101e-3	2	858.571	3	7250.734	1
471		8	max	.002	1	.119	3	.019	3	1.006e-2	3	NC	4	NC	1
472			min	-.006	5	-.094	2	-.02	2	-8.908e-3	2	1136.552	3	9495.324	2
473		9	max	.002	1	.09	3	.022	3	1.096e-2	3	NC	4	NC	1
474			min	-.006	5	-.075	2	-.025	2	-9.714e-3	2	1637.009	3	6331.985	2
475		10	max	.002	1	.076	3	.025	3	1.187e-2	3	NC	4	NC	4
476			min	-.006	5	-.066	2	-.028	2	-1.052e-2	2	2056.49	3	5514.799	2
477		11	max	.001	1	.09	3	.027	3	1.096e-2	3	NC	4	NC	1
478			min	-.006	5	-.075	2	-.025	2	-9.714e-3	2	1637.007	3	5762.991	3
479		12	max	.001	1	.119	3	.028	3	1.006e-2	3	NC	4	NC	1
480			min	-.006	5	-.094	2	-.02	2	-8.908e-3	2	1136.551	3	5586.61	3
481		13	max	.001	1	.15	3	.027	3	9.157e-3	3	NC	5	NC	2
482			min	-.006	5	-.113	2	-.013	2	-8.101e-3	2	858.57	3	5823.58	3
483		14	max	.001	1	.172	3	.025	3	8.254e-3	3	NC	5	NC	2
484			min	-.006	5	-.127	2	-.008	10	-7.294e-3	2	730.649	3	4556.447	1
485		15	max	.001	1	.178	3	.023	1	7.35e-3	3	NC	5	NC	2
486			min	-.006	5	-.13	2	-.007	10	-6.488e-3	2	701.055	3	3973.11	1
487		16	max	.001	1	.165	3	.02	1	6.447e-3	3	NC	5	NC	2
488			min	-.006	5	-.119	2	-.005	10	-5.681e-3	2	766.571	3	4355.32	1
489		17	max	.001	1	.132	3	.014	3	5.544e-3	3	NC	5	NC	2
490			min	-.006	5	-.096	2	-.005	10	-4.875e-3	2	998.977	3	6165.837	1
491		18	max	.001	1	.083	3	.011	3	4.641e-3	3	NC	4	NC	1
492			min	-.006	5	-.061	2	-.006	2	-4.068e-3	2	1832.451	3	NC	1
493		19	max	.001	1	.024	3	.008	3	3.738e-3	3	NC	1	NC	1
494			min	-.006	5	-.02	2	-.008	2	-3.262e-3	2	NC	1	NC	1
495	M16	1	max	0	1	.02	3	.008	3	4.131e-3	2	NC	1	NC	1
496			min	-.062	4	-.027	2	-.008	2	-3.025e-3	3	NC	1	NC	1
497		2	max	0	1	.05	3	.011	3	5.159e-3	2	NC	4	NC	1
498			min	-.062	4	-.086	2	-.006	2	-3.734e-3	3	1825.988	2	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
499		3	max	0	1	.076	3	.015	14	6.187e-3	2	NC	5	NC	2
500			min	-.062	4	-.136	2	-.005	10	-4.443e-3	3	993.381	2	6145.598	1
501		4	max	0	1	.094	3	.02	1	7.215e-3	2	NC	5	NC	2
502			min	-.062	4	-.169	2	-.005	10	-5.152e-3	3	759.462	2	4351.329	1
503		5	max	0	1	.103	3	.023	1	8.243e-3	2	NC	5	NC	2
504			min	-.062	4	-.184	2	-.006	10	-5.861e-3	3	690.415	2	3978.168	1
505		6	max	0	1	.102	3	.023	3	9.271e-3	2	NC	5	NC	2
506			min	-.062	4	-.179	2	-.008	10	-6.57e-3	3	712.662	2	4575.58	1
507		7	max	0	1	.094	3	.025	3	1.03e-2	2	NC	5	NC	2
508			min	-.062	4	-.158	2	-.013	2	-7.278e-3	3	824.094	2	6449.812	3
509		8	max	0	1	.081	3	.025	3	1.133e-2	2	NC	4	NC	1
510			min	-.062	4	-.129	2	-.02	2	-7.987e-3	3	1061.036	2	6207.41	3
511		9	max	0	1	.068	3	.025	3	1.235e-2	2	NC	4	NC	1
512			min	-.062	4	-.101	2	-.025	2	-8.696e-3	3	1461.07	2	6296.645	3
513		10	max	0	1	.062	3	.024	3	1.338e-2	2	NC	4	NC	4
514			min	-.062	4	-.088	2	-.028	2	-9.405e-3	3	1771.813	2	5539.192	2
515		11	max	0	1	.068	3	.023	3	1.235e-2	2	NC	4	NC	1
516			min	-.062	4	-.101	2	-.025	2	-8.694e-3	3	1461.07	2	6362.824	2
517		12	max	0	1	.081	3	.021	3	1.133e-2	2	NC	4	NC	1
518			min	-.062	4	-.129	2	-.02	2	-7.984e-3	3	1061.036	2	8055.4	3
519		13	max	0	1	.094	3	.02	3	1.03e-2	2	NC	5	NC	2
520			min	-.062	4	-.158	2	-.013	2	-7.273e-3	3	824.094	2	7288.115	1
521		14	max	0	1	.102	3	.019	1	9.271e-3	2	NC	5	NC	2
522			min	-.062	4	-.179	2	-.008	10	-6.562e-3	3	712.662	2	4582.163	1
523		15	max	0	1	.103	3	.023	1	8.244e-3	2	NC	5	NC	2
524			min	-.062	4	-.184	2	-.006	10	-5.852e-3	3	690.415	2	3990.71	1
525		16	max	0	1	.094	3	.02	1	7.216e-3	2	NC	5	NC	2
526			min	-.062	4	-.169	2	-.005	10	-5.141e-3	3	759.462	2	4373.012	1
527		17	max	0	1	.076	3	.013	1	6.188e-3	2	NC	5	NC	2
528			min	-.062	4	-.136	2	-.005	10	-4.43e-3	3	993.381	2	6192.006	1
529		18	max	0	1	.05	3	.009	3	5.161e-3	2	NC	4	NC	1
530			min	-.062	4	-.086	2	-.006	2	-3.719e-3	3	1825.988	2	NC	1
531		19	max	0	1	.02	3	.008	3	4.133e-3	2	NC	1	NC	1
532			min	-.062	4	-.027	2	-.008	2	-3.009e-3	3	NC	1	NC	1
533	M15	1	max	0	1	0	1	0	1	3.912e-4	3	NC	1	NC	1
534			min	0	1	0	1	0	1	-6.152e-4	5	NC	1	NC	1
535		2	max	0	3	0	5	.005	4	8.152e-4	3	NC	1	NC	1
536			min	0	4	-.003	1	0	3	-6.285e-4	5	NC	1	NC	1
537		3	max	0	3	.001	5	.011	4	1.239e-3	3	NC	1	NC	1
538			min	0	4	-.006	1	-.003	3	-8.922e-4	2	NC	1	6197.623	4
539		4	max	0	3	.002	5	.017	4	1.663e-3	3	NC	3	NC	9
540			min	-.001	4	-.008	1	-.007	3	-1.314e-3	2	7748.078	2	3944.895	4
541		5	max	0	3	.002	5	.023	4	2.087e-3	3	NC	5	NC	9
542			min	-.002	4	-.011	1	-.011	3	-1.735e-3	2	6045.904	2	2928.451	4
543		6	max	0	3	.003	5	.028	4	2.512e-3	3	NC	5	9736.981	9
544			min	-.002	4	-.013	1	-.017	3	-2.156e-3	2	5088.267	2	2390.322	4
545		7	max	0	3	.004	5	.032	4	2.936e-3	3	NC	5	7710.638	9
546			min	-.003	4	-.014	1	-.022	3	-2.578e-3	2	4512.375	2	2089.07	4
547		8	max	0	3	.004	5	.035	4	3.36e-3	3	NC	5	6421.243	9
548			min	-.003	4	-.015	1	-.027	3	-2.999e-3	2	4166.753	2	1731.032	3
549		9	max	0	3	.004	5	.036	4	3.784e-3	3	NC	5	5571.026	9
550			min	-.004	4	-.016	1	-.031	3	-3.42e-3	2	3980.719	2	1491.49	3
551		10	max	0	3	.005	5	.036	4	4.208e-3	3	NC	5	5008.396	9
552			min	-.004	4	-.016	1	-.035	3	-3.842e-3	2	3921.867	2	1333.329	3
553		11	max	0	3	.005	5	.034	4	4.632e-3	3	NC	5	4653.343	9
554			min	-.005	4	-.016	1	-.037	3	-4.263e-3	2	3980.719	2	1233.021	3
555		12	max	.001	3	.005	5	.03	2	5.056e-3	3	NC	5	4466.751	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	-.005	4	-.015	1	-.038	3	-4.685e-3	2	4166.753	2	1178.911	3
557		13	max	.001	3	.005	5	.029	2	5.48e-3	3	NC	5	4930.646	15
558			min	-.006	4	-.014	1	-.037	3	-5.106e-3	2	4512.375	2	1167.671	3
559		14	max	.001	3	.006	5	.027	1	5.904e-3	3	NC	5	6623.835	15
560			min	-.006	4	-.012	1	-.034	3	-5.527e-3	2	5088.267	2	1204.47	3
561		15	max	.001	3	.006	5	.022	1	6.328e-3	3	NC	5	NC	15
562			min	-.007	4	-.01	9	-.028	3	-5.949e-3	2	6045.904	2	1308.087	3
563		16	max	.001	3	.006	5	.016	1	6.752e-3	3	NC	3	NC	5
564			min	-.007	4	-.008	9	-.018	3	-6.37e-3	2	7748.078	2	1529.429	3
565		17	max	.001	3	.006	5	.006	1	7.176e-3	3	NC	1	NC	4
566			min	-.008	4	-.006	9	-.006	3	-6.791e-3	2	NC	1	2028.146	3
567		18	max	.002	3	.006	5	.01	3	7.6e-3	3	NC	1	NC	4
568			min	-.008	4	-.004	9	-.012	2	-7.213e-3	2	NC	1	3611.781	3
569		19	max	.002	3	.006	2	.03	3	8.025e-3	3	NC	1	NC	1
570			min	-.009	4	-.001	9	-.03	2	-7.634e-3	2	NC	1	NC	1
571	M16A	1	max	0	10	.001	2	.009	3	2.298e-3	3	NC	1	NC	1
572			min	-.003	4	-.004	4	-.009	2	-2.293e-3	2	NC	1	NC	1
573		2	max	0	10	-.001	10	.002	3	2.211e-3	3	NC	1	NC	1
574			min	-.003	4	-.009	4	-.004	2	-2.19e-3	2	NC	1	NC	1
575		3	max	0	10	-.004	12	.004	1	2.123e-3	3	NC	1	NC	4
576			min	-.003	4	-.014	4	-.006	5	-2.086e-3	2	6075.928	4	5753.566	3
577		4	max	0	10	-.005	12	.007	1	2.036e-3	3	NC	3	NC	9
578			min	-.003	4	-.019	4	-.011	5	-1.983e-3	2	4168.441	4	4381.621	3
579		5	max	0	10	-.006	12	.01	1	1.948e-3	3	NC	12	NC	9
580			min	-.003	4	-.023	4	-.017	5	-1.88e-3	2	3252.677	4	3789.744	3
581		6	max	0	10	-.007	12	.011	1	1.861e-3	3	NC	12	NC	9
582			min	-.002	4	-.027	4	-.023	5	-1.777e-3	2	2737.472	4	3112.338	5
583		7	max	0	10	-.008	12	.012	1	1.773e-3	3	9024.75	12	NC	9
584			min	-.002	4	-.03	4	-.028	5	-1.673e-3	2	2427.643	4	2475.67	5
585		8	max	0	10	-.008	12	.011	1	1.685e-3	3	8333.506	12	NC	9
586			min	-.002	4	-.032	4	-.033	5	-1.57e-3	2	2241.7	4	2111.384	5
587		9	max	0	10	-.009	12	.011	1	1.598e-3	3	7961.438	12	NC	9
588			min	-.002	4	-.033	4	-.036	5	-1.467e-3	2	2141.614	4	1903.894	5
589		10	max	0	10	-.009	12	.01	1	1.51e-3	3	7843.733	12	NC	9
590			min	-.002	4	-.034	4	-.038	5	-1.364e-3	2	2109.952	4	1801.295	5
591		11	max	0	10	-.009	12	.009	1	1.423e-3	3	7961.438	12	NC	9
592			min	-.001	4	-.033	4	-.038	5	-1.26e-3	2	2141.614	4	1781.688	5
593		12	max	0	10	-.008	12	.007	1	1.335e-3	3	8333.506	12	NC	9
594			min	-.001	4	-.031	4	-.037	5	-1.157e-3	2	2241.7	4	1841.71	5
595		13	max	0	10	-.008	12	.005	1	1.248e-3	3	9024.75	12	NC	2
596			min	-.001	4	-.029	4	-.034	5	-1.054e-3	2	2427.643	4	1995.204	5
597		14	max	0	10	-.007	12	.004	1	1.16e-3	3	NC	12	NC	1
598			min	0	4	-.025	4	-.03	5	-9.505e-4	2	2737.472	4	2281.088	5
599		15	max	0	10	-.006	12	.002	1	1.073e-3	3	NC	12	NC	1
600			min	0	4	-.021	4	-.024	5	-8.472e-4	2	3252.677	4	2789.547	5
601		16	max	0	10	-.004	12	.001	9	9.85e-4	3	NC	3	NC	1
602			min	0	4	-.017	4	-.018	5	-7.44e-4	2	4168.441	4	3746.018	5
603		17	max	0	10	-.003	12	0	9	8.975e-4	3	NC	1	NC	1
604			min	0	4	-.011	4	-.012	5	-6.407e-4	2	6075.928	4	5855.623	5
605		18	max	0	10	-.002	12	0	3	9.303e-4	4	NC	1	NC	1
606			min	0	4	-.006	4	-.005	5	-5.374e-4	2	NC	1	NC	1
607		19	max	0	1	0	1	0	1	9.95e-4	4	NC	1	NC	1
608			min	0	1	0	1	0	1	-4.342e-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

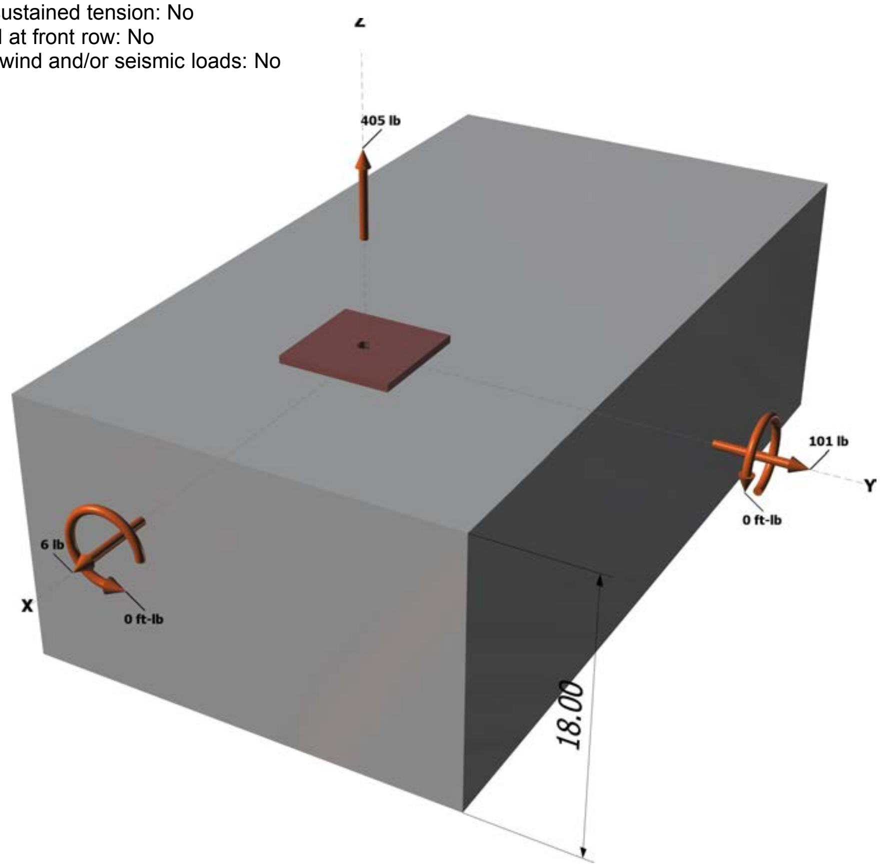
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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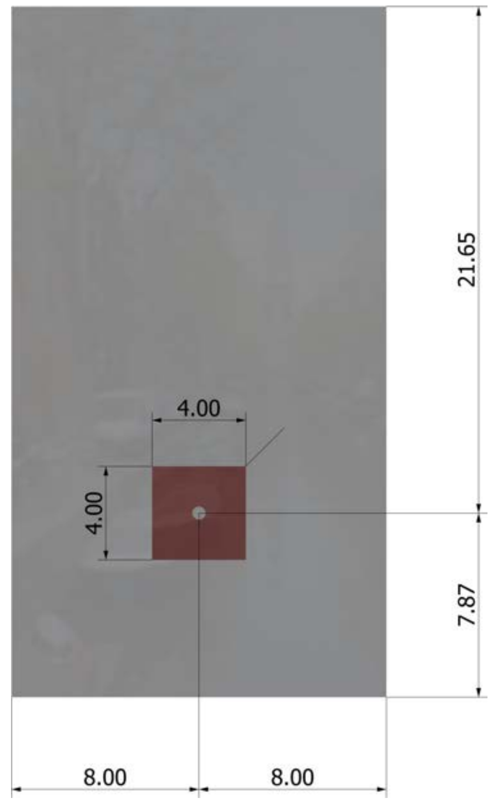


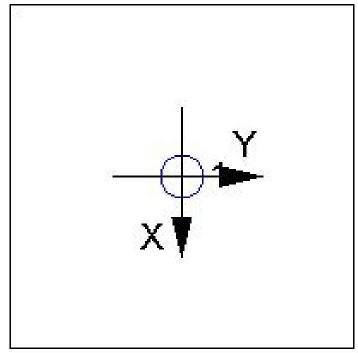
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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} (in^2)	A_{Nco} (in^2)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	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)

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in y-direction:

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

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

Company:	Schletter, Inc.	Date:	12/10/2015
Engineer:	HCV	Page:	1/5
Project:	Standard PVMini - Worst Case		
Address:			
Phone:			
E-mail:			

SIMPSON Strong-Tie
Anchor Designer™ Software
Version 2.4.5673.0

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

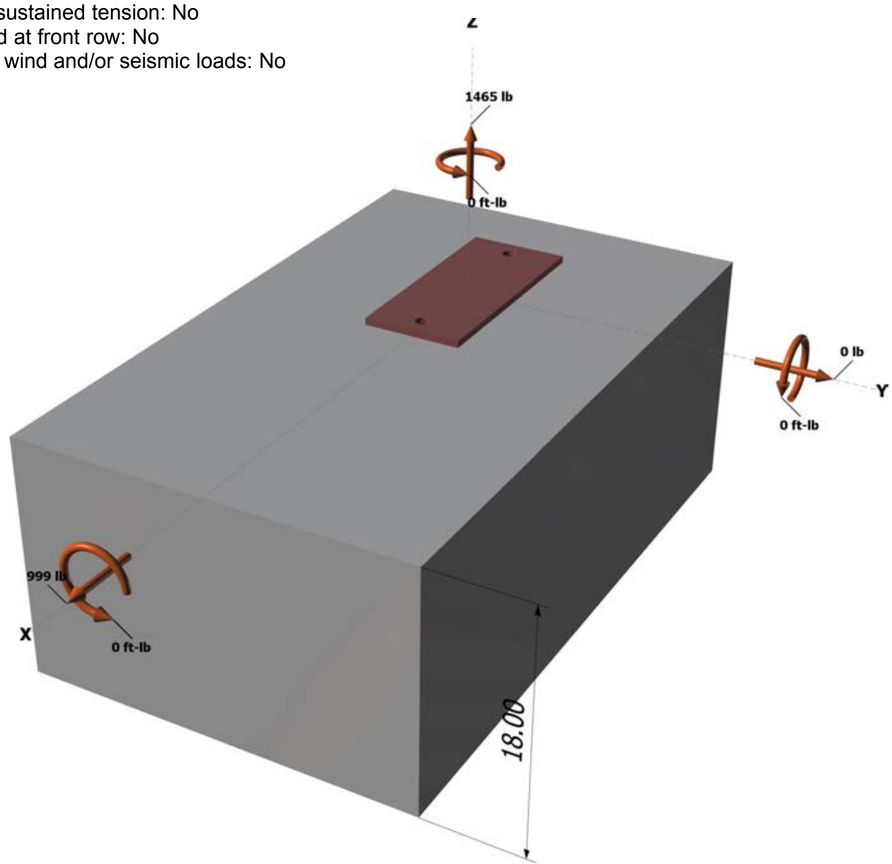
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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



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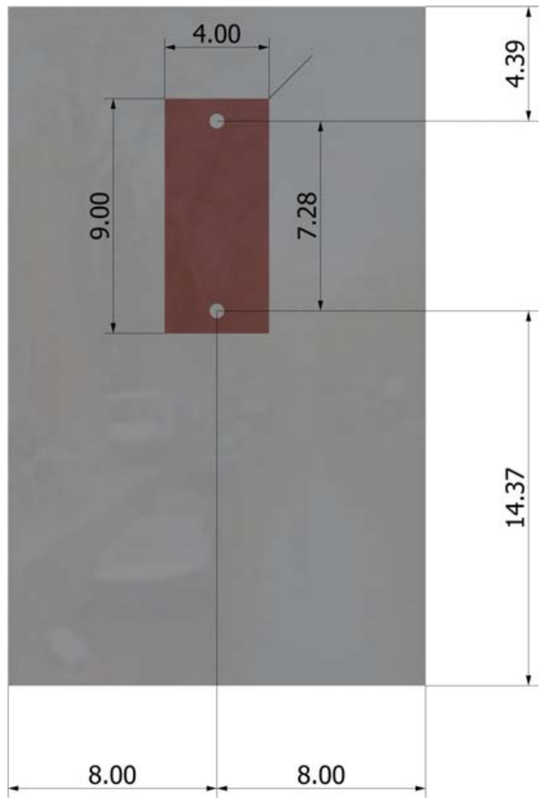


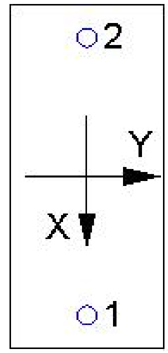
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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	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

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

A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cbg} (lb)
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

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

A_{Na} (in^2)	A_{Na0} (in^2)	$\Psi_{ed,Na}$	$\Psi_{g,Na}$	$\Psi_{ec,Na}$	$\Psi_{p,Na}$	N_{a0}(lb)	ϕ	ϕN_{ag} (lb)
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.