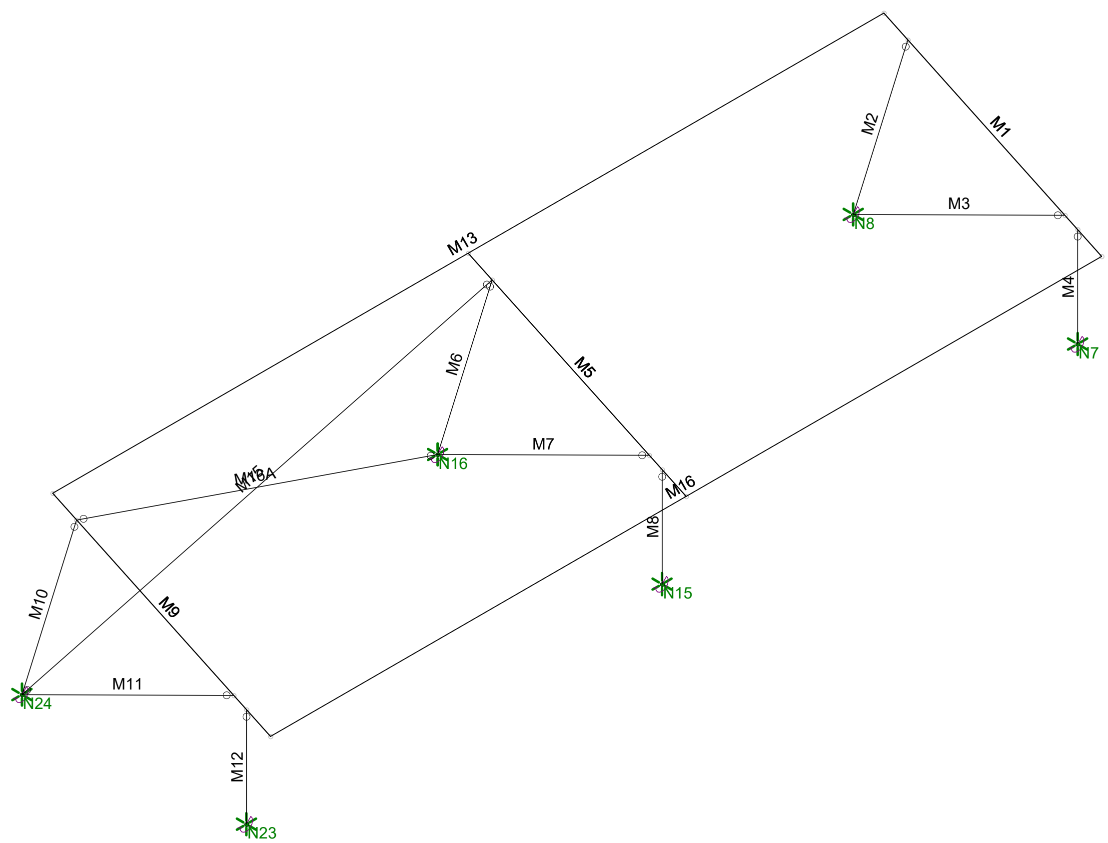


Schletter, Inc.		25° Tilt w/o Seismic Design
HCV	Standard PVMini Racking System	
	Representative Calculations - ASCE 7-05	

1. INTRODUCTION

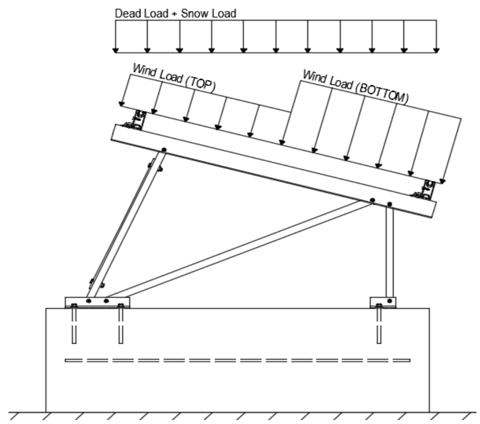
1.1 Project Description
The following sections will cover the determination of forces and structural design calculations for the Schletter, Inc. PVMini ground mount system.

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

PV modules are required to meet the following specifications:

	Maximum		Minimum
Height =	1700 mm	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 = 25°
Maximum Height Above Grade = 3 ft



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

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

2. LOAD ACTIONS

2.1 Permanent Loads
g_{MAX} = 3.00 psf
g_{MIN} = 1.75 psf

Self-weight of the PV modules.

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

2.3 Wind Loads
Design Wind Speed, V = 90 mph — Exposure Category = C
Height ≤ 15 ft — Importance Category = II

Peak Velocity Pressure, q_z = 12.72 psf *Including the gust factor, G=0.85. (ASCE 7-05, Eq. 6-15)*

Pressure Coefficients

$Cf+_{TOP}$	=	1.1	*(Pressure)*
$Cf+_{BOTTOM}$	=	1.7	
$Cf-_{TOP}$	=	-2.2	*(Suction)*
$Cf-_{BOTTOM}$	=	-1	

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

2.4 Seismic Loads - N/A

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

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

2.5 Combination of Loads

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

Strength Design, LRFD

Component stresses are checked using the following LRFD load combinations:

1.2D + 1.6S + 0.8W
1.2D + 1.6W + 0.5S
0.9D + 1.6W ^{M}
1.54D + 1.3E + 0.2S ^{R}
0.56D + 1.3E ^{R}
1.54D + 1.25E + 0.2S ^{O}
0.56D + 1.25E ^{O}

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

Allowable Stress Design, ASD

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

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

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

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

3. STRUCTURAL ANALYSIS

3.1 RISA Results

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

3.2 RISA Components

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

Purlins	Location	**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

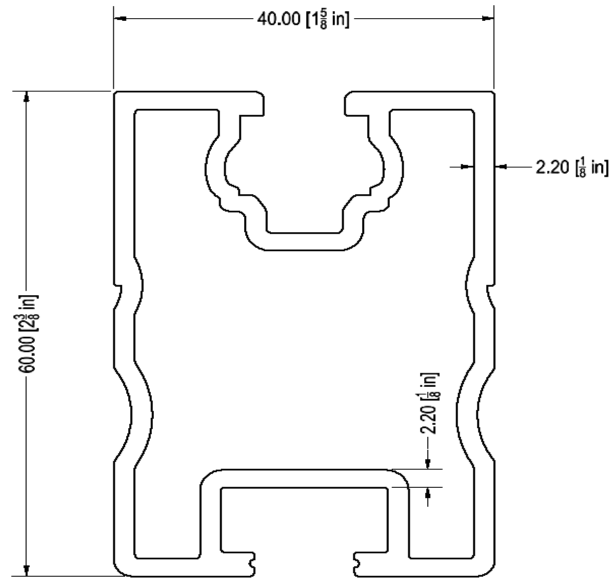
Front Struts	Location	**Bracing**
M4	Outer	M15
M8	Inner	M16A
M12	Outer	

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).

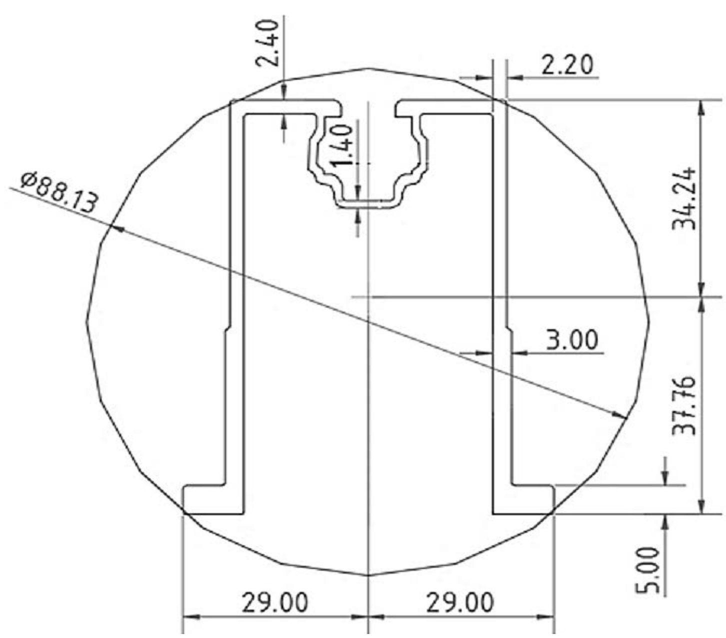
Purlin Type =	**ProfiPlus**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	90	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	28.37	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	28.47	ksi
S_y =	0.51	in^3
S_x =	0.37	in^3
E =	10100	ksi
I_y =	0.60	in^4
I_x =	0.29	in^4
A =	0.90	in^2
g =	1.08	lbs/ft
M_y =	0.926	k-ft
M_z =	0.205	k-ft
$M_{y\ allowable}$ =	1.207	k-ft
$M_{z\ allowable}$ =	0.871	k-ft
Utilization =	100%	



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).

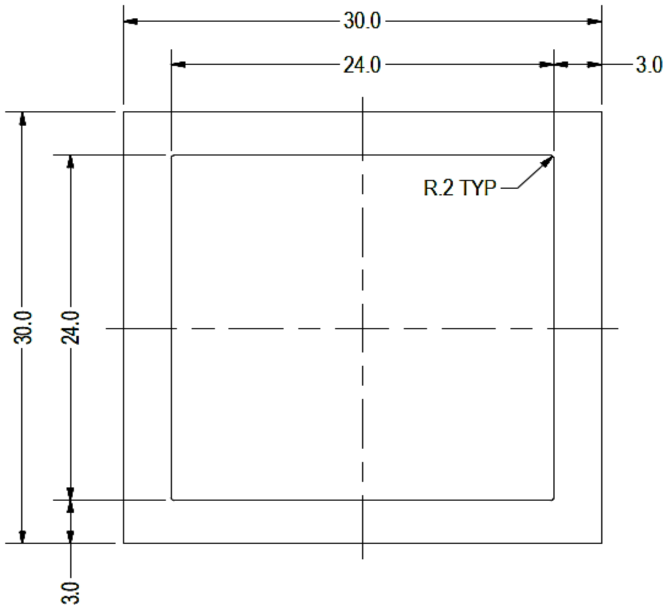
Girder Type =	**Flex Profi**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	33.78	in
$\Phi F_{ty\ AXIAL}$ =	14.29	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.81	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	13.46	ksi
S_y =	0.59	in^3
S_x =	0.46	in^3
E =	10100	ksi
I_y =	0.88	in^4
I_x =	0.52	in^4
A =	0.89	in^2
g =	1.07	lbs/ft
M_y =	0.588	k-ft
M_z =	0.000	k-ft
P_n =	0.307	k
$M_{y\ allowable}$ =	1.463	k-ft
$M_{z\ allowable}$ =	0.513	k-ft
$P_{n\ allowable}$ =	12.764	k
Utilization =	43%	



4.3 Front Strut Design

The front aluminum strut connects a portion of the girder to the foundation. Vertical girder forces are then transferred down through the strut into the foundation. The strut is attached with single M8 bolts at each end. See Appendix A.3 for detailed member calculations. Section units are in (mm).

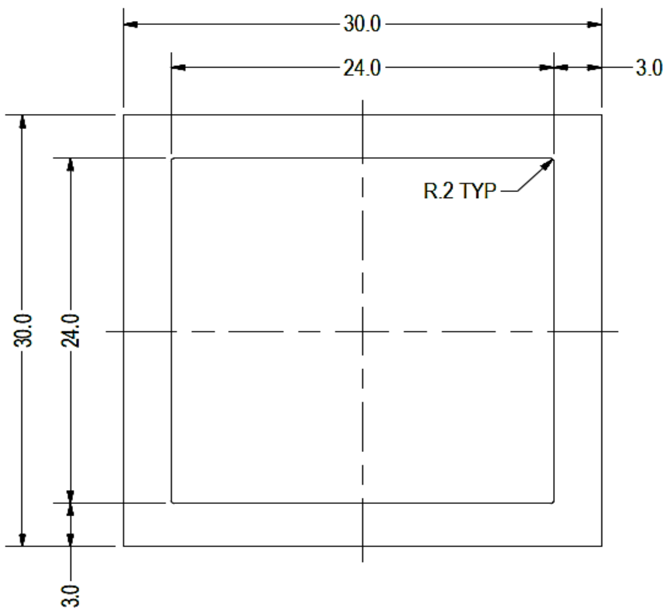
Strut Type =	30x30x3	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	18.00	in
$\Phi F_{ty\ AXIAL}$ =	24.52	ksi
$\Phi F_{ty\ BENDING}$ =	31.19	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.001	k-ft
P_n =	1.308	k
$M_{y\ allowable}$ =	0.423	k-ft
$M_{z\ allowable}$ =	0.423	k-ft
$P_{n\ allowable}$ =	12.310	k
Utilization =	11%	



4.4 Diagonal Strut Design

A diagonal aluminum strut braces the support structure. It connects at a front portion of the girder and transfers horizontal forces to the rear foundation connection. The strut is attached with single M8 bolts at each end. See Appendix A.4 for detailed member calculations. Section units are in (mm).

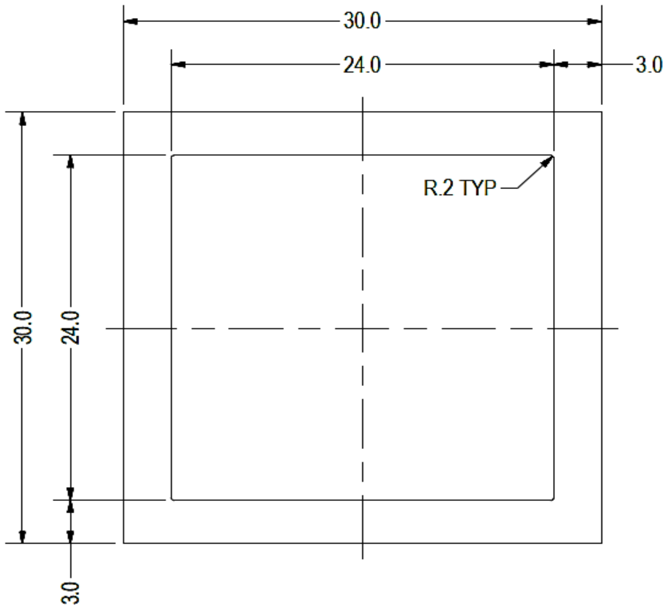
Strut Type =	30x30x3	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	46.38	in
$\Phi F_{ty\ AXIAL}$ =	7.60	ksi
$\Phi F_{ty\ BENDING}$ =	29.80	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.476	k
$M_{y\ allowable}$ =	0.404	k-ft
$M_{z\ allowable}$ =	0.404	k-ft
$P_{n\ allowable}$ =	3.814	k
Utilization =	12%	



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).

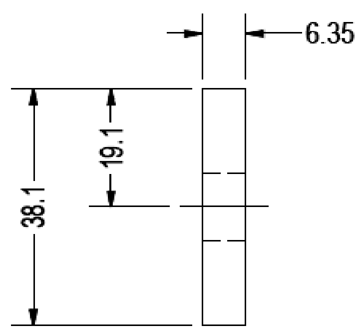
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	36.18	in
$\Phi F_{ty\ AXIAL}$ =	11.59	ksi
$\Phi F_{ty\ BENDING}$ =	30.23	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	1.087	k
$M_{y\ allowable}$ =	0.410	k-ft
$M_{z\ allowable}$ =	0.410	k-ft
$P_{n\ allowable}$ =	5.820	k
Utilization =	19%	



4.6 Cross Brace Design

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

Brace Type =	**1.5x0.25**	
Aluminum Type =	6061-T6	
F_{ty} =	35	ksi
Φ =	0.90	
S_y =	0.02	in^3
E =	10100	ksi
I_y =	33.25	in^4
A =	0.38	in^2
g =	0.45	lbs/ft
M_y =	0.005	k-ft
P_n =	0.043	k
$M_{y\ allowable}$ =	0.046	k-ft
$P_{n\ allowable}$ =	11.813	k
Utilization =	11%	



A cross brace kit is required every 17 bays and is to be installed in centermost bays.

5. FOUNDATION DESIGN CALCULATIONS

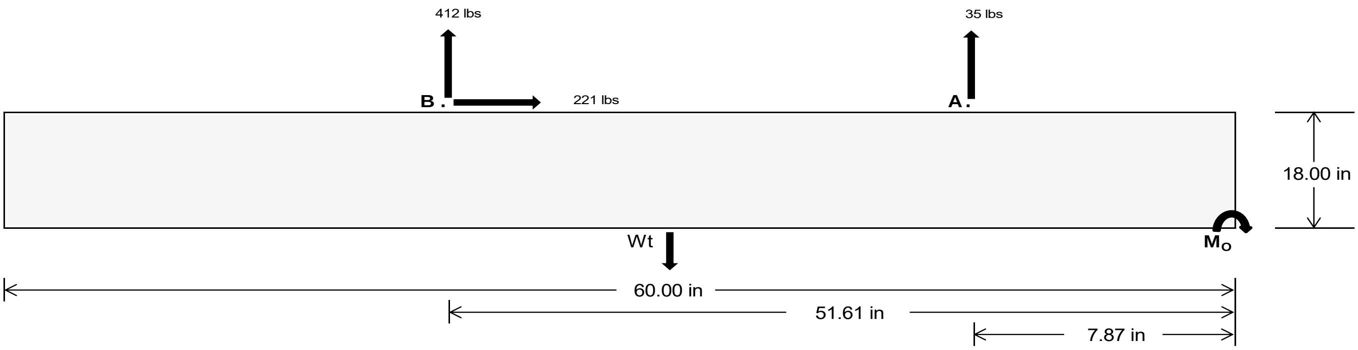
5.1 Helical Pile Foundations

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 =	151.95	1716.66	k
Compressive Load =	1700.79	1414.78	k
Lateral Load =	4.73	921.21	k
Moment (Weak Axis) =	0.01	0.00	k

5.2 Design of Ballast Foundations

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



<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 = 25517.5 in-lbs
Resisting Force Required = 850.58 lbs
S.F. = 1.67
Weight Required = 1417.64 lbs
Minimum Width = <u>22 in</u> in
Weight Provided = 1993.75 lbs

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

<u>Sliding</u>

Force = 221.34 lbs
Friction = 0.4
Weight Required = 553.36 lbs
Resisting Weight = 1993.75 lbs
Additional Weight Required = 0 lbs

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

<u>Cohesion</u>

Sliding Force = 221.34 lbs
Cohesion = 130 psf
Area = 9.17 ft^2
Resisting = 996.88 lbs
Additional Weight Required = 0 lbs

Use a 60in long x 22in 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>22 in</u>	<u>23 in</u>	<u>24 in</u>	<u>25 in</u>
P_{ftg} = (145 pcf)(5 ft)(1.5 ft)(1.83 ft) =	<u>1994 lbs</u>	<u>2084 lbs</u>	<u>2175 lbs</u>	<u>2266 lbs</u>

ASD LC	1.0D + 1.0S				1.0D + 1.0W				1.0D + 0.75L + 0.75W + 0.75S				0.6D + 1.0W			
Width	22 in	23 in	24 in	25 in	22 in	23 in	24 in	25 in	22 in	23 in	24 in	25 in	22 in	23 in	24 in	25 in
F_A	651 lbs	651 lbs	651 lbs	651 lbs	493 lbs	493 lbs	493 lbs	493 lbs	805 lbs	805 lbs	805 lbs	805 lbs	-70 lbs	-70 lbs	-70 lbs	-70 lbs
F_B	472 lbs	472 lbs	472 lbs	472 lbs	533 lbs	533 lbs	533 lbs	533 lbs	715 lbs	715 lbs	715 lbs	715 lbs	-824 lbs	-824 lbs	-824 lbs	-824 lbs
F_V	72 lbs	72 lbs	72 lbs	72 lbs	402 lbs	402 lbs	402 lbs	402 lbs	350 lbs	350 lbs	350 lbs	350 lbs	-443 lbs	-443 lbs	-443 lbs	-443 lbs
P_{total}	3117 lbs	3207 lbs	3298 lbs	3389 lbs	3020 lbs	3111 lbs	3201 lbs	3292 lbs	3513 lbs	3604 lbs	3695 lbs	3785 lbs	302 lbs	356 lbs	411 lbs	465 lbs
M	457 lbs-ft	457 lbs-ft	457 lbs-ft	457 lbs-ft	551 lbs-ft	551 lbs-ft	551 lbs-ft	551 lbs-ft	722 lbs-ft	722 lbs-ft	722 lbs-ft	722 lbs-ft	690 lbs-ft	690 lbs-ft	690 lbs-ft	690 lbs-ft
e	0.15 ft	0.14 ft	0.14 ft	0.13 ft	0.18 ft	0.18 ft	0.17 ft	0.17 ft	0.21 ft	0.20 ft	0.20 ft	0.19 ft	2.28 ft	1.93 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}	280.1 psf	277.4 psf	274.9 psf	272.6 psf	257.3 psf	255.6 psf	254.0 psf	252.5 psf	288.8 psf	285.7 psf	282.8 psf	280.2 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	399.9 psf	391.9 psf	384.7 psf	378.0 psf	401.6 psf	393.6 psf	386.3 psf	379.5 psf	477.8 psf	466.5 psf	456.1 psf	446.6 psf	504.8 psf	219.2 psf	166.7 psf	146.3 psf

Maximum Bearing Pressure = 505 psf
Allowable Bearing Pressure = 1500 psf

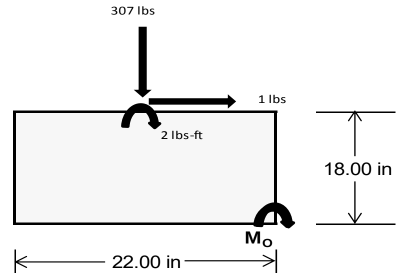
Use a 60in long x 22in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O = 277.8 ft-lbs
Resisting Force Required = 303.04 lbs
S.F. = 1.67
Weight Required = 505.07 lbs
Minimum Width = 22 in in
Weight Provided = 1993.75 lbs

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



Bearing Pressure

ASD LC	1.238D + 0.875E			1.1785D + 0.65625E + 0.75S			0.362D + 0.875E		
Width	22 in			22 in			22 in		
Support	Outer	Inner	Outer	Outer	Inner	Outer	Outer	Inner	Outer
F_Y	85 lbs	228 lbs	81 lbs	312 lbs	921 lbs	307 lbs	25 lbs	67 lbs	24 lbs
F_V	4 lbs	4 lbs	0 lbs	19 lbs	18 lbs	1 lbs	1 lbs	1 lbs	0 lbs
P_{total}	2554 lbs	2696 lbs	2549 lbs	2661 lbs	3271 lbs	2657 lbs	747 lbs	788 lbs	745 lbs
M	6 lbs-ft	6 lbs-ft	0 lbs-ft	33 lbs-ft	27 lbs-ft	4 lbs-ft	2 lbs-ft	2 lbs-ft	0 lbs-ft
e	0.00 ft	0.00 ft	0.00 ft	0.01 ft	0.01 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft
L/6	0.31 ft	1.83 ft	1.83 ft	1.81 ft	1.82 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft
f_{min}	276.3 sqft	292.0 sqft	277.9 sqft	278.6 sqft	347.1 sqft	288.5 sqft	80.8 sqft	85.4 sqft	81.3 sqft
f_{max}	280.9 psf	296.3 psf	278.2 psf	302.0 psf	366.5 psf	291.1 psf	82.1 psf	86.6 psf	81.4 psf

Maximum Bearing Pressure = 367 psf
Allowable Bearing Pressure = 1500 psf

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

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

5.3 Foundation Anchors

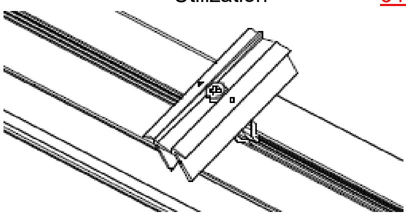
Threaded rods are anchored to the the ballast foundations using the Simpson AT-XP epoxy solution. LRFD load results are compared to the allowable strengths of the epoxy solution. Please see the supplementary calculations provided by the Simpson Anchor Designer software.

6. DESIGN OF JOINTS AND CONNECTIONS

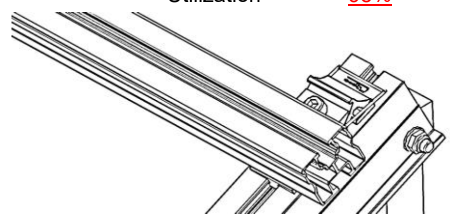
6.1 Anchorage of Modules to Purlins and Connection of Purlins to Girders

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

Fastening of Modules to Purlins		
Maximum Uplifting Force =	0.415	k
Allowable Uplift =	1.214	k
Utilization =	34%	



Fastening of Purlins to Girders		
Maximum Uplifting Force =	1.096	k
Allowable Uplift =	1.116	k
Utilization =	98%	



6.2 Bolted Connections

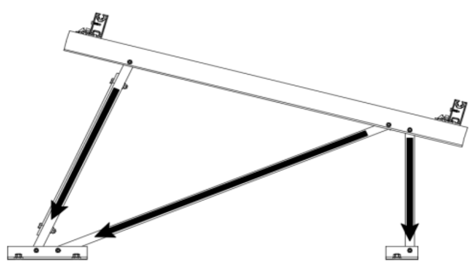
The aluminum struts connect the aluminum girder ends to custom brackets with mounting holes. Cross bracing is attached to rear struts to provide lateral stability. Single M8 bolts are used to attach each end of the strut to the girder and post. ASTM A193/A193M-86 equivalent stainless steel bolts are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

Front Strut		
Maximum Axial Load =	1.308	k
M8 Bolt Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	23%	

Rear Strut		
Maximum Axial Load =	1.184	k
M8 Bolt Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	21%	

Diagonal Strut		
Maximum Axial Load =	0.476	k
M8 Bolt Shear Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	8%	

Bracing		
Maximum Axial Load =	0.043	k
M10 Bolt Capacity =	8.894	k
Strut Bearing Capacity =	7.952	k
Utilization =	1%	



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.

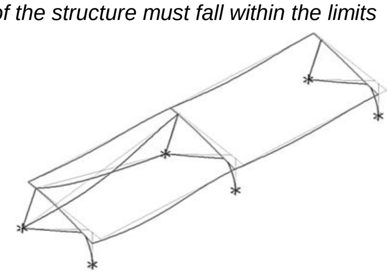
7. SEISMIC DESIGN

7.1 Seismic Drift - N/A

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

Mean Height, h_{sx} =	30.83	in
Allowable Story Drift for All Other Structures, Δ = {	$0.020h_{sx}$	
	0.617	in
Max Drift, Δ_{MAX} =	0.059	in
N/A		

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



APPENDIX A

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

Purlin = **ProfiPlus**

Strong Axis:

3.4.14

$L_b =$ 90.00 in

J = 0.255

234.355

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

S1 = 0.51461

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

S2 = 1701.56

$\varphi F_L = \varphi b[Bc-1.6Dc*\sqrt{((LbSc)/(Cb*\sqrt{(IyJ)/2}))}]$

$\varphi F_L =$ 28.4 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

$\varphi F_L = \varphi y Fcy$

$\varphi F_L =$ 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

$\varphi F_L = 1.17\varphi y Fcy$

$\varphi F_L =$ 38.9 ksi

Weak Axis:

3.4.14

$L_b =$ 90.00 in

J = 0.255

243.363

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

S1 = 0.51461

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

S2 = 1701.56

$\varphi F_L = \varphi b[Bc-1.6Dc*\sqrt{((LbSc)/(Cb*\sqrt{(IyJ)/2}))}]$

$\varphi F_L =$ 28.3

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

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

$\varphi F_L =$ 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

$\varphi F_L St$= 28.4 ksi
Ix = 250988 mm^4
0.603 in^4
y = 30 mm
Sx = 0.511 in^3
$M_{max}St$ = 1.207 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 = 1.36

21.0912

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

S1 = 1.37733

$$S2 = 1.2C_c$$

S2 = 79.2

φF_L= φb[Bc-Dc*Lb/(1.2*ry*√(Cb))

φF_L= 29.8 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 = 1.36

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= 29.8 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

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_LSt= 29.8 ksi

Ix = 364470 mm^4

0.876 in^4

y = 37.77 mm

Sx = 0.589 in³

M_{max}St = 1.463 k-ft

φF_LWk= 13.5 ksi

Iy = 217168 mm^4

0.522 in^4

x = 29 mm

Sy = 0.457 in³

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:		Weak Axis:	
3.4.14		**3.4.14**	
L_b =	18.00 in	L_b =	18.00 in
J =	0.16	J =	0.16
	47.2194		47.2194
$S1 = \left(\frac{Bc - \frac{\theta_y}{\theta_b}Fcy}{1.6Dc}\right)^2$		$S1 = \left(\frac{Bc - \frac{\theta_y}{\theta_b}Fcy}{1.6Dc}\right)^2$	
S1 =	0.51461	S1 =	0.51461
$S2 = \left(\frac{C_c}{1.6}\right)^2$		$S2 = \left(\frac{C_c}{1.6}\right)^2$	
S2 =	1701.56	S2 =	1701.56
φF_L=	φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]	φF_L=	φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
φF_L=	31.2 ksi	φF_L=	31.2
3.4.16		**3.4.16**	
b/t =	7.75	b/t =	7.75
$S1 = \frac{Bp - \frac{\theta_y}{\theta_b}Fcy}{1.6Dp}$		$S1 = \frac{Bp - \frac{\theta_y}{\theta_b}Fcy}{1.6Dp}$	
S1 =	12.2	S1 =	12.2
$S2 = \frac{k_1 Bp}{1.6Dp}$		$S2 = \frac{k_1 Bp}{1.6Dp}$	
S2 =	46.7	S2 =	46.7
φF_L=	φyFcy	φF_L=	φyFcy
φF_L=	33.3 ksi	φF_L=	33.3 ksi
3.4.16.1	Not Used	**3.4.16.1**	
Rb/t =	0.0	N/A for Weak Direction	
$S1 = \left(\frac{Bt - 1.17\frac{\theta_y}{\theta_b}Fcy}{1.6Dt}\right)^2$			
S1 =	1.1		
$S2 = C_t$			
S2 =	141.0		
φF_L=	1.17φyFcy		
φF_L=	38.9 ksi		
3.4.18		**3.4.18**	
h/t =	7.75	h/t =	7.75
$S1 = \frac{Bbr - \frac{\theta_y}{\theta_b}1.3Fcy}{mDbr}$		$S1 = \frac{Bbr - \frac{\theta_y}{\theta_b}1.3Fcy}{mDbr}$	
S1 =	36.9	S1 =	36.9
m =	0.65	m =	0.65
C_0 =	15	C_0 =	15
Cc =	15	Cc =	15
$S2 = \frac{k_1 Bbr}{mDbr}$		$S2 = \frac{k_1 Bbr}{mDbr}$	
S2 =	77.3	S2 =	77.3
φF_L=	1.3φyFcy	φF_L=	1.3φyFcy
φF_L=	43.2 ksi	φF_L=	43.2 ksi
φF_LSt=	31.2 ksi	φF_LWk=	31.2 ksi
Ix =	39958.2 mm^4	Iy =	39958.2 mm^4
	0.096 in^4		0.096 in^4
y =	15 mm	x =	15 mm
Sx =	0.163 in^3	Sy =	0.163 in^3
M_{max}St =	0.423 k-ft	M_{max}Wk =	0.423 k-ft

Compression

3.4.7

$\lambda =$ 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

$\varphi cc =$ 0.83792

$\varphi F_L = \varphi cc(Bc\text{-}Dc^*\lambda)$

$\varphi F_L =$ 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)

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 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

$\varphi F_L =$ 24.52 ksi

A = 323.87 mm^2

0.50 in^2

$P_{max} =$ 12.31 kips

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 46.38 in

J = 0.16

121.663

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.8 ksi

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 29.8 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in³

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 in³

M_{max}Wk = 0.450 k-ft

Compression

3.4.7

$\lambda =$ 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

$\varphi cc =$ 0.85841

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

$\varphi F_L =$ 7.59722 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 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

$\varphi F_L =$ 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 = 36.18 in

J = 0.16

94.9139

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 30.2 ksi

3.4.16

b/t = 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= 30.2 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in³

M_{max}St = 0.410 k-ft

Weak Axis:

3.4.14

L_b = 36.18 in

J = 0.16

94.9139

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 30.2

3.4.16

b/t = 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 in³

M_{max}Wk = 0.450 k-ft

Compression

3.4.7

$\lambda =$ 1.5514

$r =$ 0.437 in

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

$S1^* =$ 0.33515

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

$S2^* =$ 1.23671

$\varphi cc =$ 0.7972

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

$\varphi F_L =$ 11.5927 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

$\varphi F_L =$ 11.59 ksi

$A =$ 323.87 mm^2

0.50 in^2

$P_{max} =$ 5.82 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								

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	-51.748	-51.748	0	0
2	M16	Y	-51.748	-51.748	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	-39.013	-39.013	0	0
2	M16	y	-60.293	-60.293	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	78.026	78.026	0	0
2	M16	y	35.466	35.466	0	0

Load Combinations

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

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N8	max	169.386	2	295.899	2	-.001	15	0	2	0	1	0	1
2		min	-221.123	3	-400.159	3	-.158	1	0	3	0	1	0	1
3	N7	max	0	15	479.645	1	-.071	15	0	15	0	1	0	1
4		min	-.163	2	-26.56	3	-1.685	1	-.003	1	0	1	0	1
5	N15	max	0	15	1308.301	1	.602	1	.001	1	0	1	0	1
6		min	-1.878	1	-116.887	3	-.349	3	0	3	0	1	0	1
7	N16	max	670.061	2	1088.29	1	-.184	10	0	1	0	1	0	1
8		min	-708.622	3	-1320.504	3	-38.983	3	0	3	0	1	0	1
9	N23	max	0	15	479.342	1	3.635	1	.006	1	0	1	0	1
10		min	-.163	2	-26.077	3	.143	15	0	15	0	1	0	1
11	N24	max	169.879	2	300.352	2	39.259	3	.002	1	0	1	0	1
12		min	-221.218	3	-397.52	3	.027	10	0	3	0	1	0	1
13	Totals:	max	1007.245	2	3946.105	1	0	1						
14		min	-1151.131	3	-2287.706	3	0	3						

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	331.882	1	.641	4	.659	1	0	15	0	3	0	1
2			min	-361.109	3	.151	15	-.046	3	-.001	1	0	1	0	1
3		2	max	331.998	1	.596	4	.659	1	0	15	0	3	0	15
4			min	-361.021	3	.141	15	-.046	3	-.001	1	0	1	0	4
5		3	max	332.115	1	.55	4	.659	1	0	15	0	1	0	15
6			min	-360.934	3	.13	15	-.046	3	-.001	1	0	10	0	4
7		4	max	332.231	1	.504	4	.659	1	0	15	0	1	0	15
8			min	-360.847	3	.119	15	-.046	3	-.001	1	0	3	0	4
9		5	max	332.347	1	.459	4	.659	1	0	15	0	1	0	15
10			min	-360.759	3	.108	15	-.046	3	-.001	1	0	3	0	4
11		6	max	332.464	1	.413	4	.659	1	0	15	0	1	0	15
12			min	-360.672	3	.098	15	-.046	3	-.001	1	0	3	0	4
13		7	max	332.58	1	.367	4	.659	1	0	15	0	1	0	15
14			min	-360.585	3	.087	15	-.046	3	-.001	1	0	3	0	4
15		8	max	332.697	1	.322	4	.659	1	0	15	0	1	0	15
16			min	-360.498	3	.076	15	-.046	3	-.001	1	0	3	0	4
17		9	max	332.813	1	.276	4	.659	1	0	15	0	1	0	15
18			min	-360.41	3	.065	15	-.046	3	-.001	1	0	3	0	4
19		10	max	332.929	1	.23	4	.659	1	0	15	0	1	0	15
20			min	-360.323	3	.055	15	-.046	3	-.001	1	0	3	0	4
21		11	max	333.046	1	.185	4	.659	1	0	15	0	1	0	15
22			min	-360.236	3	.044	15	-.046	3	-.001	1	0	3	0	4
23		12	max	333.162	1	.139	4	.659	1	0	15	.001	1	0	15
24			min	-360.148	3	.033	15	-.046	3	-.001	1	0	3	0	4
25		13	max	333.279	1	.099	2	.659	1	0	15	.001	1	0	15
26			min	-360.061	3	.017	12	-.046	3	-.001	1	0	3	0	4
27		14	max	333.395	1	.063	2	.659	1	0	15	.001	1	0	15
28			min	-359.974	3	-.002	3	-.046	3	-.001	1	0	3	0	4
29		15	max	333.511	1	.028	2	.659	1	0	15	.001	1	0	15
30			min	-359.886	3	-.029	3	-.046	3	-.001	1	0	3	0	4
31		16	max	333.628	1	-.007	10	.659	1	0	15	.001	1	0	15
32			min	-359.799	3	-.056	3	-.046	3	-.001	1	0	3	0	4
33		17	max	333.744	1	-.02	15	.659	1	0	15	.002	1	0	15
34			min	-359.712	3	-.089	4	-.046	3	-.001	1	0	3	0	4
35		18	max	333.861	1	-.031	15	.659	1	0	15	.002	1	0	15
36			min	-359.625	3	-.135	4	-.046	3	-.001	1	0	3	0	4
37		19	max	333.977	1	-.042	15	.659	1	0	15	.002	1	0	15

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
38			min	-359.537	3	-.181	4	-.046	3	-.001	1	0	3	0	4
39	M3	1	max	105.51	2	1.777	4	-.025	15	0	15	.002	1	0	4
40			min	-128.812	3	.418	15	-.671	1	0	1	0	15	0	15
41		2	max	105.441	2	1.599	4	-.025	15	0	15	.002	1	0	2
42			min	-128.863	3	.376	15	-.671	1	0	1	0	15	0	12
43		3	max	105.372	2	1.422	4	-.025	15	0	15	.002	1	0	2
44			min	-128.915	3	.335	15	-.671	1	0	1	0	15	0	3
45		4	max	105.304	2	1.245	4	-.025	15	0	15	.002	1	0	15
46			min	-128.966	3	.293	15	-.671	1	0	1	0	15	0	4
47		5	max	105.235	2	1.068	4	-.025	15	0	15	.002	1	0	15
48			min	-129.018	3	.251	15	-.671	1	0	1	0	15	0	4
49		6	max	105.167	2	.891	4	-.025	15	0	15	.001	1	0	15
50			min	-129.069	3	.21	15	-.671	1	0	1	0	15	0	4
51		7	max	105.098	2	.713	4	-.025	15	0	15	.001	1	0	15
52			min	-129.121	3	.168	15	-.671	1	0	1	0	15	0	4
53		8	max	105.029	2	.536	4	-.025	15	0	15	.001	1	0	15
54			min	-129.172	3	.127	15	-.671	1	0	1	0	15	-.001	4
55		9	max	104.961	2	.359	4	-.025	15	0	15	0	1	0	15
56			min	-129.223	3	.085	15	-.671	1	0	1	0	15	-.001	4
57		10	max	104.892	2	.182	4	-.025	15	0	15	0	1	0	15
58			min	-129.275	3	.043	15	-.671	1	0	1	0	15	-.001	4
59		11	max	104.824	2	.024	2	-.025	15	0	15	0	1	0	15
60			min	-129.326	3	-.021	3	-.671	1	0	1	0	15	-.001	4
61		12	max	104.755	2	-.04	15	-.025	15	0	15	0	1	0	15
62			min	-129.378	3	-.173	4	-.671	1	0	1	0	15	-.001	4
63		13	max	104.686	2	-.082	15	-.025	15	0	15	0	1	0	15
64			min	-129.429	3	-.35	4	-.671	1	0	1	0	15	-.001	4
65		14	max	104.618	2	-.123	15	-.025	15	0	15	0	1	0	15
66			min	-129.481	3	-.527	4	-.671	1	0	1	0	12	-.001	4
67		15	max	104.549	2	-.165	15	-.025	15	0	15	0	1	0	15
68			min	-129.532	3	-.704	4	-.671	1	0	1	0	3	0	4
69		16	max	104.481	2	-.207	15	-.025	15	0	15	0	15	0	15
70			min	-129.584	3	-.881	4	-.671	1	0	1	0	1	0	4
71		17	max	104.412	2	-.248	15	-.025	15	0	15	0	15	0	15
72			min	-129.635	3	-1.059	4	-.671	1	0	1	0	1	0	4
73		18	max	104.343	2	-.29	15	-.025	15	0	15	0	15	0	15
74			min	-129.687	3	-1.236	4	-.671	1	0	1	0	1	0	4
75		19	max	104.275	2	-.332	15	-.025	15	0	15	0	15	0	1
76			min	-129.738	3	-1.413	4	-.671	1	0	1	0	1	0	1
77	M4	1	max	478.48	1	0	1	-.071	15	0	1	0	3	0	1
78			min	-27.433	3	0	1	-1.832	1	0	1	0	1	0	1
79		2	max	478.545	1	0	1	-.071	15	0	1	0	12	0	1
80			min	-27.385	3	0	1	-1.832	1	0	1	0	1	0	1
81		3	max	478.61	1	0	1	-.071	15	0	1	0	15	0	1
82			min	-27.336	3	0	1	-1.832	1	0	1	0	1	0	1
83		4	max	478.675	1	0	1	-.071	15	0	1	0	15	0	1
84			min	-27.287	3	0	1	-1.832	1	0	1	0	1	0	1
85		5	max	478.739	1	0	1	-.071	15	0	1	0	15	0	1
86			min	-27.239	3	0	1	-1.832	1	0	1	0	1	0	1
87		6	max	478.804	1	0	1	-.071	15	0	1	0	15	0	1
88			min	-27.19	3	0	1	-1.832	1	0	1	0	1	0	1
89		7	max	478.869	1	0	1	-.071	15	0	1	0	15	0	1
90			min	-27.142	3	0	1	-1.832	1	0	1	-.001	1	0	1
91		8	max	478.933	1	0	1	-.071	15	0	1	0	15	0	1
92			min	-27.093	3	0	1	-1.832	1	0	1	-.001	1	0	1
93		9	max	478.998	1	0	1	-.071	15	0	1	0	15	0	1
94			min	-27.045	3	0	1	-1.832	1	0	1	-.001	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
95		10	max	479.063	1	0	1	-.071	15	0	1	0	15	0	1
96			min	-26.996	3	0	1	-1.832	1	0	1	-.002	1	0	1
97		11	max	479.127	1	0	1	-.071	15	0	1	0	15	0	1
98			min	-26.948	3	0	1	-1.832	1	0	1	-.002	1	0	1
99		12	max	479.192	1	0	1	-.071	15	0	1	0	15	0	1
100			min	-26.899	3	0	1	-1.832	1	0	1	-.002	1	0	1
101		13	max	479.257	1	0	1	-.071	15	0	1	0	15	0	1
102			min	-26.851	3	0	1	-1.832	1	0	1	-.002	1	0	1
103		14	max	479.322	1	0	1	-.071	15	0	1	0	15	0	1
104			min	-26.802	3	0	1	-1.832	1	0	1	-.002	1	0	1
105		15	max	479.386	1	0	1	-.071	15	0	1	0	15	0	1
106			min	-26.754	3	0	1	-1.832	1	0	1	-.002	1	0	1
107		16	max	479.451	1	0	1	-.071	15	0	1	0	15	0	1
108			min	-26.705	3	0	1	-1.832	1	0	1	-.003	1	0	1
109		17	max	479.516	1	0	1	-.071	15	0	1	0	15	0	1
110			min	-26.657	3	0	1	-1.832	1	0	1	-.003	1	0	1
111		18	max	479.58	1	0	1	-.071	15	0	1	0	15	0	1
112			min	-26.608	3	0	1	-1.832	1	0	1	-.003	1	0	1
113		19	max	479.645	1	0	1	-.071	15	0	1	0	15	0	1
114			min	-26.56	3	0	1	-1.832	1	0	1	-.003	1	0	1
115	M6	1	max	1085.263	1	.642	4	.216	1	0	1	0	3	0	1
116			min	-1184.471	3	.151	15	-.135	3	0	15	0	1	0	1
117		2	max	1085.379	1	.596	4	.216	1	0	1	0	3	0	15
118			min	-1184.383	3	.141	15	-.135	3	0	15	0	11	0	4
119		3	max	1085.496	1	.55	4	.216	1	0	1	0	3	0	15
120			min	-1184.296	3	.13	15	-.135	3	0	15	0	15	0	4
121		4	max	1085.612	1	.505	4	.216	1	0	1	0	1	0	15
122			min	-1184.209	3	.119	15	-.135	3	0	15	0	15	0	4
123		5	max	1085.729	1	.459	4	.216	1	0	1	0	1	0	15
124			min	-1184.121	3	.108	15	-.135	3	0	15	0	12	0	4
125		6	max	1085.845	1	.415	2	.216	1	0	1	0	1	0	15
126			min	-1184.034	3	.098	15	-.135	3	0	15	0	3	0	4
127		7	max	1085.961	1	.379	2	.216	1	0	1	0	1	0	15
128			min	-1183.947	3	.082	12	-.135	3	0	15	0	3	0	4
129		8	max	1086.078	1	.344	2	.216	1	0	1	0	1	0	15
130			min	-1183.86	3	.064	12	-.135	3	0	15	0	3	0	4
131		9	max	1086.194	1	.308	2	.216	1	0	1	0	1	0	15
132			min	-1183.772	3	.047	12	-.135	3	0	15	0	3	0	4
133		10	max	1086.311	1	.272	2	.216	1	0	1	0	1	0	15
134			min	-1183.685	3	.029	12	-.135	3	0	15	0	3	0	4
135		11	max	1086.427	1	.237	2	.216	1	0	1	0	1	0	15
136			min	-1183.598	3	.011	3	-.135	3	0	15	0	3	0	2
137		12	max	1086.543	1	.201	2	.216	1	0	1	0	1	0	12
138			min	-1183.51	3	-.016	3	-.135	3	0	15	0	3	0	2
139		13	max	1086.66	1	.166	2	.216	1	0	1	0	1	0	12
140			min	-1183.423	3	-.043	3	-.135	3	0	15	0	3	0	2
141		14	max	1086.776	1	.13	2	.216	1	0	1	0	1	0	12
142			min	-1183.336	3	-.07	3	-.135	3	0	15	0	3	0	2
143		15	max	1086.893	1	.095	2	.216	1	0	1	0	1	0	12
144			min	-1183.248	3	-.096	3	-.135	3	0	15	0	3	0	2
145		16	max	1087.009	1	.059	2	.216	1	0	1	0	1	0	12
146			min	-1183.161	3	-.123	3	-.135	3	0	15	0	3	0	2
147		17	max	1087.125	1	.023	2	.216	1	0	1	0	1	0	12
148			min	-1183.074	3	-.15	3	-.135	3	0	15	0	3	0	2
149		18	max	1087.242	1	-.012	2	.216	1	0	1	0	1	0	12
150			min	-1182.987	3	-.176	3	-.135	3	0	15	0	3	0	2
151		19	max	1087.358	1	-.042	15	.216	1	0	1	0	1	0	12

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
152			min	-1182.899	3	-.203	3	-.135	3	0	15	0	3	0	2
153	M7	1	max	475.718	2	1.779	4	.014	1	0	2	0	2	0	2
154			min	-398.415	3	.419	15	-.004	10	0	3	0	3	0	12
155		2	max	475.649	2	1.602	4	.014	1	0	2	0	2	0	2
156			min	-398.466	3	.377	15	-.004	10	0	3	0	3	0	3
157		3	max	475.581	2	1.425	4	.014	1	0	2	0	2	0	2
158			min	-398.518	3	.335	15	-.004	10	0	3	0	3	0	3
159		4	max	475.512	2	1.248	4	.014	1	0	2	0	2	0	2
160			min	-398.569	3	.294	15	-.004	10	0	3	0	3	0	3
161		5	max	475.443	2	1.07	4	.014	1	0	2	0	2	0	15
162			min	-398.621	3	.252	15	-.004	10	0	3	0	3	0	3
163		6	max	475.375	2	.893	4	.014	1	0	2	0	2	0	15
164			min	-398.672	3	.21	15	-.004	10	0	3	0	3	0	4
165		7	max	475.306	2	.716	4	.014	1	0	2	0	2	0	15
166			min	-398.724	3	.169	15	-.004	10	0	3	0	3	0	4
167		8	max	475.238	2	.539	4	.014	1	0	2	0	2	0	15
168			min	-398.775	3	.127	15	-.004	10	0	3	0	3	-.001	4
169		9	max	475.169	2	.362	2	.014	1	0	2	0	2	0	15
170			min	-398.827	3	.085	15	-.004	10	0	3	0	3	-.001	4
171		10	max	475.1	2	.224	2	.014	1	0	2	0	2	0	15
172			min	-398.878	3	.018	12	-.004	10	0	3	0	3	-.001	4
173		11	max	475.032	2	.086	2	.014	1	0	2	0	2	0	15
174			min	-398.93	3	-.082	3	-.004	10	0	3	0	3	-.001	4
175		12	max	474.963	2	-.04	15	.014	1	0	2	0	2	0	15
176			min	-398.981	3	-.186	3	-.004	10	0	3	0	3	-.001	4
177		13	max	474.895	2	-.081	15	.014	1	0	2	0	2	0	15
178			min	-399.032	3	-.347	4	-.004	10	0	3	0	3	-.001	4
179		14	max	474.826	2	-.123	15	.014	1	0	2	0	2	0	15
180			min	-399.084	3	-.524	4	-.004	10	0	3	0	3	-.001	4
181		15	max	474.757	2	-.165	15	.014	1	0	2	0	2	0	15
182			min	-399.135	3	-.702	4	-.004	10	0	3	0	3	0	4
183		16	max	474.689	2	-.206	15	.014	1	0	2	0	2	0	15
184			min	-399.187	3	-.879	4	-.004	10	0	3	0	3	0	4
185		17	max	474.62	2	-.248	15	.014	1	0	2	0	2	0	15
186			min	-399.238	3	-1.056	4	-.004	10	0	3	0	3	0	4
187		18	max	474.552	2	-.29	15	.014	1	0	2	0	2	0	15
188			min	-399.29	3	-1.233	4	-.004	10	0	3	0	3	0	4
189		19	max	474.483	2	-.331	15	.014	1	0	2	0	2	0	1
190			min	-399.341	3	-1.41	4	-.004	10	0	3	0	3	0	1
191	M8	1	max	1307.136	1	0	1	.766	1	0	1	0	15	0	1
192			min	-117.761	3	0	1	-.342	3	0	1	0	1	0	1
193		2	max	1307.201	1	0	1	.766	1	0	1	0	1	0	1
194			min	-117.712	3	0	1	-.342	3	0	1	0	3	0	1
195		3	max	1307.266	1	0	1	.766	1	0	1	0	1	0	1
196			min	-117.664	3	0	1	-.342	3	0	1	0	3	0	1
197		4	max	1307.33	1	0	1	.766	1	0	1	0	1	0	1
198			min	-117.615	3	0	1	-.342	3	0	1	0	3	0	1
199		5	max	1307.395	1	0	1	.766	1	0	1	0	1	0	1
200			min	-117.566	3	0	1	-.342	3	0	1	0	3	0	1
201		6	max	1307.46	1	0	1	.766	1	0	1	0	1	0	1
202			min	-117.518	3	0	1	-.342	3	0	1	0	3	0	1
203		7	max	1307.525	1	0	1	.766	1	0	1	0	1	0	1
204			min	-117.469	3	0	1	-.342	3	0	1	0	3	0	1
205		8	max	1307.589	1	0	1	.766	1	0	1	0	1	0	1
206			min	-117.421	3	0	1	-.342	3	0	1	0	3	0	1
207		9	max	1307.654	1	0	1	.766	1	0	1	0	1	0	1
208			min	-117.372	3	0	1	-.342	3	0	1	0	3	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
209		10	max	1307.719	1	0	1	.766	1	0	1	0	1	0	1
210			min	-117.324	3	0	1	-.342	3	0	1	0	3	0	1
211		11	max	1307.783	1	0	1	.766	1	0	1	0	1	0	1
212			min	-117.275	3	0	1	-.342	3	0	1	0	3	0	1
213		12	max	1307.848	1	0	1	.766	1	0	1	0	1	0	1
214			min	-117.227	3	0	1	-.342	3	0	1	0	3	0	1
215		13	max	1307.913	1	0	1	.766	1	0	1	0	1	0	1
216			min	-117.178	3	0	1	-.342	3	0	1	0	3	0	1
217		14	max	1307.977	1	0	1	.766	1	0	1	0	1	0	1
218			min	-117.13	3	0	1	-.342	3	0	1	0	3	0	1
219		15	max	1308.042	1	0	1	.766	1	0	1	0	1	0	1
220			min	-117.081	3	0	1	-.342	3	0	1	0	3	0	1
221		16	max	1308.107	1	0	1	.766	1	0	1	.001	1	0	1
222			min	-117.033	3	0	1	-.342	3	0	1	0	3	0	1
223		17	max	1308.172	1	0	1	.766	1	0	1	.001	1	0	1
224			min	-116.984	3	0	1	-.342	3	0	1	0	3	0	1
225		18	max	1308.236	1	0	1	.766	1	0	1	.001	1	0	1
226			min	-116.936	3	0	1	-.342	3	0	1	0	3	0	1
227		19	max	1308.301	1	0	1	.766	1	0	1	.001	1	0	1
228			min	-116.887	3	0	1	-.342	3	0	1	0	3	0	1
229	M10	1	max	344.749	1	.634	4	-.007	15	.001	1	0	1	0	1
230			min	-343.886	3	.15	15	-.188	1	0	3	0	3	0	1
231		2	max	344.865	1	.588	4	-.007	15	.001	1	0	1	0	15
232			min	-343.799	3	.139	15	-.188	1	0	3	0	3	0	4
233		3	max	344.981	1	.542	4	-.007	15	.001	1	0	1	0	15
234			min	-343.711	3	.129	15	-.188	1	0	3	0	3	0	4
235		4	max	345.098	1	.497	4	-.007	15	.001	1	0	1	0	15
236			min	-343.624	3	.118	15	-.188	1	0	3	0	3	0	4
237		5	max	345.214	1	.451	4	-.007	15	.001	1	0	1	0	15
238			min	-343.537	3	.107	15	-.188	1	0	3	0	3	0	4
239		6	max	345.331	1	.405	4	-.007	15	.001	1	0	1	0	15
240			min	-343.45	3	.097	15	-.188	1	0	3	0	3	0	4
241		7	max	345.447	1	.36	4	-.007	15	.001	1	0	1	0	15
242			min	-343.362	3	.086	15	-.188	1	0	3	0	3	0	4
243		8	max	345.563	1	.314	4	-.007	15	.001	1	0	1	0	15
244			min	-343.275	3	.075	15	-.188	1	0	3	0	3	0	4
245		9	max	345.68	1	.268	4	-.007	15	.001	1	0	11	0	15
246			min	-343.188	3	.064	15	-.188	1	0	3	0	3	0	4
247		10	max	345.796	1	.223	4	-.007	15	.001	1	0	15	0	15
248			min	-343.1	3	.054	15	-.188	1	0	3	0	3	0	4
249		11	max	345.913	1	.177	4	-.007	15	.001	1	0	15	0	15
250			min	-343.013	3	.043	15	-.188	1	0	3	0	3	0	4
251		12	max	346.029	1	.134	2	-.007	15	.001	1	0	15	0	15
252			min	-342.926	3	.032	15	-.188	1	0	3	0	3	0	4
253		13	max	346.145	1	.099	2	-.007	15	.001	1	0	15	0	15
254			min	-342.838	3	.021	15	-.188	1	0	3	0	1	0	4
255		14	max	346.262	1	.063	2	-.007	15	.001	1	0	15	0	15
256			min	-342.751	3	-.004	1	-.188	1	0	3	0	1	0	4
257		15	max	346.378	1	.028	2	-.007	15	.001	1	0	15	0	15
258			min	-342.664	3	-.04	1	-.188	1	0	3	0	1	0	4
259		16	max	346.495	1	-.008	10	-.007	15	.001	1	0	15	0	15
260			min	-342.577	3	-.076	1	-.188	1	0	3	0	1	0	4
261		17	max	346.611	1	-.022	15	-.007	15	.001	1	0	15	0	15
262			min	-342.489	3	-.111	1	-.188	1	0	3	0	1	0	4
263		18	max	346.727	1	-.032	15	-.007	15	.001	1	0	15	0	15
264			min	-342.402	3	-.147	1	-.188	1	0	3	0	1	0	4
265		19	max	346.844	1	-.043	15	-.007	15	.001	1	0	15	0	15

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
266			min	-342.315	3	-.188	4	-.188	1	0	3	0	1	0	4
267	M11	1	max	105.247	2	1.781	4	.775	1	.001	1	0	3	0	4
268			min	-129.436	3	.419	15	.01	12	0	15	-.002	1	0	15
269		2	max	105.178	2	1.604	4	.775	1	.001	1	0	3	0	4
270			min	-129.487	3	.377	15	.01	12	0	15	-.002	1	0	12
271		3	max	105.109	2	1.427	4	.775	1	.001	1	0	3	0	1
272			min	-129.539	3	.335	15	.01	12	0	15	-.002	1	0	3
273		4	max	105.041	2	1.25	4	.775	1	.001	1	0	3	0	15
274			min	-129.59	3	.294	15	.01	12	0	15	-.002	1	0	3
275		5	max	104.972	2	1.073	4	.775	1	.001	1	0	3	0	15
276			min	-129.642	3	.252	15	.01	12	0	15	-.001	1	0	4
277		6	max	104.904	2	.895	4	.775	1	.001	1	0	3	0	15
278			min	-129.693	3	.211	15	.01	12	0	15	-.001	1	0	4
279		7	max	104.835	2	.718	4	.775	1	.001	1	0	3	0	15
280			min	-129.745	3	.169	15	.01	12	0	15	-.001	1	0	4
281		8	max	104.766	2	.541	4	.775	1	.001	1	0	3	0	15
282			min	-129.796	3	.127	15	.01	12	0	15	0	1	-.001	4
283		9	max	104.698	2	.364	4	.775	1	.001	1	0	3	0	15
284			min	-129.847	3	.086	15	.01	12	0	15	0	1	-.001	4
285		10	max	104.629	2	.187	4	.775	1	.001	1	0	3	0	15
286			min	-129.899	3	.044	15	.01	12	0	15	0	1	-.001	4
287		11	max	104.561	2	.025	1	.775	1	.001	1	0	3	0	15
288			min	-129.95	3	-.04	3	.01	12	0	15	0	1	-.001	4
289		12	max	104.492	2	-.039	15	.775	1	.001	1	0	3	0	15
290			min	-130.002	3	-.168	4	.01	12	0	15	0	1	-.001	4
291		13	max	104.423	2	-.081	15	.775	1	.001	1	0	3	0	15
292			min	-130.053	3	-.345	4	.01	12	0	15	0	1	-.001	4
293		14	max	104.355	2	-.123	15	.775	1	.001	1	0	3	0	15
294			min	-130.105	3	-.522	4	.01	12	0	15	0	2	-.001	4
295		15	max	104.286	2	-.164	15	.775	1	.001	1	0	3	0	15
296			min	-130.156	3	-.699	4	.01	12	0	15	0	10	0	4
297		16	max	104.218	2	-.206	15	.775	1	.001	1	0	1	0	15
298			min	-130.208	3	-.877	4	.01	12	0	15	0	15	0	4
299		17	max	104.149	2	-.248	15	.775	1	.001	1	0	1	0	15
300			min	-130.259	3	-1.054	4	.01	12	0	15	0	15	0	4
301		18	max	104.08	2	-.289	15	.775	1	.001	1	0	1	0	15
302			min	-130.311	3	-1.231	4	.01	12	0	15	0	15	0	4
303		19	max	104.012	2	-.331	15	.775	1	.001	1	0	1	0	1
304			min	-130.362	3	-1.408	4	.01	12	0	15	0	15	0	1
305	M12	1	max	478.177	1	0	1	3.947	1	0	1	0	1	0	1
306			min	-26.95	3	0	1	.144	15	0	1	0	3	0	1
307		2	max	478.242	1	0	1	3.947	1	0	1	0	1	0	1
308			min	-26.902	3	0	1	.144	15	0	1	0	15	0	1
309		3	max	478.307	1	0	1	3.947	1	0	1	0	1	0	1
310			min	-26.853	3	0	1	.144	15	0	1	0	15	0	1
311		4	max	478.371	1	0	1	3.947	1	0	1	.001	1	0	1
312			min	-26.805	3	0	1	.144	15	0	1	0	15	0	1
313		5	max	478.436	1	0	1	3.947	1	0	1	.001	1	0	1
314			min	-26.756	3	0	1	.144	15	0	1	0	15	0	1
315		6	max	478.501	1	0	1	3.947	1	0	1	.002	1	0	1
316			min	-26.708	3	0	1	.144	15	0	1	0	15	0	1
317		7	max	478.565	1	0	1	3.947	1	0	1	.002	1	0	1
318			min	-26.659	3	0	1	.144	15	0	1	0	15	0	1
319		8	max	478.63	1	0	1	3.947	1	0	1	.003	1	0	1
320			min	-26.611	3	0	1	.144	15	0	1	0	15	0	1
321		9	max	478.695	1	0	1	3.947	1	0	1	.003	1	0	1
322			min	-26.562	3	0	1	.144	15	0	1	0	15	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
323		10	max	478.76	1	0	1	3.947	1	0	1	.003	1	0	1
324			min	-26.514	3	0	1	.144	15	0	1	0	15	0	1
325		11	max	478.824	1	0	1	3.947	1	0	1	.004	1	0	1
326			min	-26.465	3	0	1	.144	15	0	1	0	15	0	1
327		12	max	478.889	1	0	1	3.947	1	0	1	.004	1	0	1
328			min	-26.417	3	0	1	.144	15	0	1	0	15	0	1
329		13	max	478.954	1	0	1	3.947	1	0	1	.004	1	0	1
330			min	-26.368	3	0	1	.144	15	0	1	0	15	0	1
331		14	max	479.018	1	0	1	3.947	1	0	1	.005	1	0	1
332			min	-26.319	3	0	1	.144	15	0	1	0	15	0	1
333		15	max	479.083	1	0	1	3.947	1	0	1	.005	1	0	1
334			min	-26.271	3	0	1	.144	15	0	1	0	15	0	1
335		16	max	479.148	1	0	1	3.947	1	0	1	.005	1	0	1
336			min	-26.222	3	0	1	.144	15	0	1	0	15	0	1
337		17	max	479.213	1	0	1	3.947	1	0	1	.006	1	0	1
338			min	-26.174	3	0	1	.144	15	0	1	0	15	0	1
339		18	max	479.277	1	0	1	3.947	1	0	1	.006	1	0	1
340			min	-26.125	3	0	1	.144	15	0	1	0	15	0	1
341		19	max	479.342	1	0	1	3.947	1	0	1	.006	1	0	1
342			min	-26.077	3	0	1	.144	15	0	1	0	15	0	1
343	M1	1	max	142.908	1	339.859	3	-2.888	15	0	1	.155	1	0	1
344			min	5.206	15	-329.79	1	-78.462	1	0	3	.006	15	0	3
345		2	max	143.026	1	339.669	3	-2.888	15	0	1	.138	1	.072	1
346			min	5.241	15	-330.043	1	-78.462	1	0	3	.005	15	-.074	3
347		3	max	97.388	1	7.174	9	-2.865	15	0	12	.12	1	.142	1
348			min	-2.767	10	-18.093	3	-78.276	1	0	1	.004	15	-.146	3
349		4	max	97.506	1	6.964	9	-2.865	15	0	12	.103	1	.142	1
350			min	-2.668	10	-18.283	3	-78.276	1	0	1	.004	15	-.142	3
351		5	max	97.625	1	6.753	9	-2.865	15	0	12	.086	1	.143	1
352			min	-2.57	10	-18.473	3	-78.276	1	0	1	.003	15	-.138	3
353		6	max	97.743	1	6.542	9	-2.865	15	0	12	.069	1	.143	1
354			min	-2.472	10	-18.662	3	-78.276	1	0	1	.003	15	-.134	3
355		7	max	97.861	1	6.331	9	-2.865	15	0	12	.052	1	.143	1
356			min	-2.373	10	-18.89	2	-78.276	1	0	1	.002	15	-.13	3
357		8	max	97.979	1	6.12	9	-2.865	15	0	12	.035	1	.144	1
358			min	-2.275	10	-19.144	2	-78.276	1	0	1	.001	15	-.126	3
359		9	max	98.097	1	5.909	9	-2.865	15	0	12	.018	1	.144	1
360			min	-2.177	10	-19.397	2	-78.276	1	0	1	0	15	-.122	3
361		10	max	98.215	1	5.698	9	-2.865	15	0	12	0	3	.146	2
362			min	-2.078	10	-19.65	2	-78.276	1	0	1	0	10	-.118	3
363		11	max	98.333	1	5.487	9	-2.865	15	0	12	0	12	.15	2
364			min	-1.98	10	-19.903	2	-78.276	1	0	1	-.016	1	-.113	3
365		12	max	98.451	1	5.276	9	-2.865	15	0	12	-.001	12	.154	2
366			min	-1.882	10	-20.156	2	-78.276	1	0	1	-.033	1	-.109	3
367		13	max	98.569	1	5.065	9	-2.865	15	0	12	-.002	12	.159	2
368			min	-1.783	10	-20.409	2	-78.276	1	0	1	-.05	1	-.105	3
369		14	max	98.687	1	4.855	9	-2.865	15	0	12	-.002	15	.163	2
370			min	-1.685	10	-20.662	2	-78.276	1	0	1	-.067	1	-.1	3
371		15	max	98.805	1	4.644	9	-2.865	15	0	12	-.003	15	.168	2
372			min	-1.587	10	-20.915	2	-78.276	1	0	1	-.084	1	-.096	3
373		16	max	88.132	2	60.01	2	-2.889	15	0	1	-.004	15	.172	2
374			min	-19.725	3	-122.464	3	-78.849	1	0	12	-.102	1	-.091	3
375		17	max	88.25	2	59.757	2	-2.889	15	0	1	-.004	15	.162	1
376			min	-19.636	3	-122.654	3	-78.849	1	0	12	-.119	1	-.064	3
377		18	max	-5.219	15	377.089	1	-2.96	15	0	3	-.005	15	.082	1
378			min	-142.525	1	-147.738	3	-80.836	1	0	1	-.136	1	-.032	3
379		19	max	-5.184	15	376.836	1	-2.96	15	0	3	-.006	15	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
380			min	-142.407	1	-147.928	3	-80.836	1	0	1	-.154	1	0	3
381	M5	1	max	311.542	1	1125.53	3	-.067	10	0	1	.004	1	0	3
382			min	9.706	12	-1093.621	1	-34.981	3	0	3	0	10	0	1
383		2	max	311.66	1	1125.341	3	-.067	10	0	1	0	2	.237	1
384			min	9.765	12	-1093.874	1	-34.981	3	0	3	-.004	3	-.244	3
385		3	max	181.933	3	7.375	9	4.05	3	0	3	0	2	.47	1
386			min	-23.057	10	-70.898	2	-.41	2	0	1	-.011	3	-.483	3
387		4	max	182.021	3	7.165	9	4.05	3	0	3	0	2	.475	1
388			min	-22.958	10	-71.151	2	-.41	2	0	1	-.01	3	-.469	3
389		5	max	182.11	3	6.954	9	4.05	3	0	3	0	2	.481	1
390			min	-22.86	10	-71.405	2	-.41	2	0	1	-.009	3	-.454	3
391		6	max	182.198	3	6.743	9	4.05	3	0	3	0	2	.487	1
392			min	-22.761	10	-71.658	2	-.41	2	0	1	-.008	3	-.44	3
393		7	max	182.287	3	6.532	9	4.05	3	0	3	0	2	.493	1
394			min	-22.663	10	-71.911	2	-.41	2	0	1	-.008	3	-.426	3
395		8	max	182.375	3	6.321	9	4.05	3	0	3	0	2	.499	1
396			min	-22.565	10	-72.164	2	-.41	2	0	1	-.007	3	-.412	3
397		9	max	182.464	3	6.11	9	4.05	3	0	3	0	2	.506	1
398			min	-22.466	10	-72.417	2	-.41	2	0	1	-.006	3	-.397	3
399		10	max	182.552	3	5.899	9	4.05	3	0	3	0	10	.512	1
400			min	-22.368	10	-72.67	2	-.41	2	0	1	-.005	3	-.383	3
401		11	max	182.641	3	5.688	9	4.05	3	0	3	0	10	.518	1
402			min	-22.27	10	-72.923	2	-.41	2	0	1	-.004	3	-.369	3
403		12	max	182.729	3	5.477	9	4.05	3	0	3	0	10	.528	2
404			min	-22.171	10	-73.176	2	-.41	2	0	1	-.003	3	-.354	3
405		13	max	182.818	3	5.266	9	4.05	3	0	3	0	10	.543	2
406			min	-22.073	10	-73.429	2	-.41	2	0	1	-.002	3	-.34	3
407		14	max	182.906	3	5.056	9	4.05	3	0	3	0	10	.559	2
408			min	-21.975	10	-73.682	2	-.41	2	0	1	-.002	1	-.325	3
409		15	max	182.995	3	4.845	9	4.05	3	0	3	0	15	.575	2
410			min	-21.876	10	-73.935	2	-.41	2	0	1	-.002	1	-.31	3
411		16	max	306.77	2	300.095	2	4.021	3	0	1	0	12	.588	2
412			min	-65.395	3	-379.768	3	-.43	2	0	15	-.001	1	-.293	3
413		17	max	306.888	2	299.842	2	4.021	3	0	1	0	3	.534	1
414			min	-65.307	3	-379.958	3	-.43	2	0	15	-.001	1	-.211	3
415		18	max	-10.429	12	1243.951	1	3.682	3	0	3	.002	3	.269	1
416			min	-312.322	1	-487.323	3	-.102	2	0	1	0	1	-.105	3
417		19	max	-10.37	12	1243.698	1	3.682	3	0	3	.002	3	0	3
418			min	-312.204	1	-487.513	3	-.102	2	0	1	0	2	0	1
419	M9	1	max	142.26	1	339.838	3	101.093	1	0	3	-.006	15	0	1
420			min	5.18	15	-329.773	1	3.909	15	0	1	-.154	1	0	3
421		2	max	142.378	1	339.648	3	101.093	1	0	3	-.003	12	.072	1
422			min	5.216	15	-330.026	1	3.909	15	0	1	-.132	1	-.074	3
423		3	max	97.336	1	7.151	9	74.174	1	0	1	.004	3	.142	1
424			min	-2.265	10	-18.03	3	1.09	12	0	15	-.109	1	-.146	3
425		4	max	97.454	1	6.94	9	74.174	1	0	1	.004	3	.142	1
426			min	-2.167	10	-18.22	3	1.09	12	0	15	-.093	1	-.142	3
427		5	max	97.572	1	6.729	9	74.174	1	0	1	.004	3	.143	1
428			min	-2.068	10	-18.409	3	1.09	12	0	15	-.077	1	-.138	3
429		6	max	97.69	1	6.518	9	74.174	1	0	1	.005	3	.143	1
430			min	-1.97	10	-18.648	2	1.09	12	0	15	-.061	1	-.134	3
431		7	max	97.808	1	6.307	9	74.174	1	0	1	.005	3	.143	1
432			min	-1.872	10	-18.901	2	1.09	12	0	15	-.045	1	-.13	3
433		8	max	97.926	1	6.096	9	74.174	1	0	1	.005	3	.144	1
434			min	-1.773	10	-19.154	2	1.09	12	0	15	-.029	1	-.126	3
435		9	max	98.044	1	5.885	9	74.174	1	0	1	.006	3	.144	1
436			min	-1.675	10	-19.407	2	1.09	12	0	15	-.013	1	-.122	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
437		10	max	98.162	1	5.674	9	74.174	1	0	1	.006	3	.146	2
438			min	-1.577	10	-19.66	2	1.09	12	0	15	0	2	-.118	3
439		11	max	98.28	1	5.463	9	74.174	1	0	1	.02	1	.15	2
440			min	-1.478	10	-19.914	2	1.09	12	0	15	0	15	-.113	3
441		12	max	98.398	1	5.253	9	74.174	1	0	1	.036	1	.154	2
442			min	-1.38	10	-20.167	2	1.09	12	0	15	.001	15	-.109	3
443		13	max	98.516	1	5.042	9	74.174	1	0	1	.052	1	.159	2
444			min	-1.282	10	-20.42	2	1.09	12	0	15	.002	15	-.105	3
445		14	max	98.634	1	4.831	9	74.174	1	0	1	.068	1	.163	2
446			min	-1.183	10	-20.673	2	1.09	12	0	15	.003	15	-.101	3
447		15	max	98.752	1	4.62	9	74.174	1	0	1	.084	1	.168	2
448			min	-1.085	10	-20.926	2	1.09	12	0	15	.003	15	-.096	3
449		16	max	88.415	2	59.795	2	74.861	1	0	15	.101	1	.172	2
450			min	-19.813	3	-122.9	3	1.103	12	0	1	.004	15	-.091	3
451		17	max	88.533	2	59.542	2	74.861	1	0	15	.118	1	.162	1
452			min	-19.724	3	-123.09	3	1.103	12	0	1	.004	15	-.064	3
453		18	max	-5.209	15	377.089	1	78.85	1	0	1	.135	1	.082	1
454			min	-142.216	1	-147.736	3	1.387	12	0	3	.005	15	-.032	3
455		19	max	-5.174	15	376.836	1	78.85	1	0	1	.152	1	0	1
456			min	-142.098	1	-147.925	3	1.387	12	0	3	.006	15	0	3
457	M13	1	max	101.341	1	329.274	1	-5.18	15	0	1	.154	1	0	1
458			min	3.909	15	-339.831	3	-142.241	1	0	3	.006	15	0	3
459		2	max	101.341	1	232.174	1	-3.976	15	0	1	.049	1	.241	3
460			min	3.909	15	-239.553	3	-109.09	1	0	3	.002	15	-.234	1
461		3	max	101.341	1	135.073	1	-2.772	15	0	1	.002	3	.399	3
462			min	3.909	15	-139.276	3	-75.94	1	0	3	-.028	1	-.387	1
463		4	max	101.341	1	37.973	1	-1.568	15	0	1	0	12	.473	3
464			min	3.909	15	-38.998	3	-42.789	1	0	3	-.077	1	-.459	1
465		5	max	101.341	1	61.279	3	-.364	15	0	1	-.002	12	.464	3
466			min	3.909	15	-59.127	1	-9.638	1	0	3	-.099	1	-.45	1
467		6	max	101.341	1	161.556	3	23.512	1	0	1	-.002	12	.371	3
468			min	3.909	15	-156.228	1	.25	12	0	3	-.093	1	-.36	1
469		7	max	101.341	1	261.834	3	56.663	1	0	1	-.002	12	.195	3
470			min	3.909	15	-253.328	1	1.418	12	0	3	-.06	1	-.19	1
471		8	max	101.341	1	362.111	3	89.813	1	0	1	.001	2	.062	1
472			min	3.909	15	-350.429	1	2.586	12	0	3	0	3	-.065	3
473		9	max	101.341	1	462.388	3	122.964	1	0	1	.09	1	.394	1
474			min	3.909	15	-447.529	1	3.754	12	0	3	.003	12	-.409	3
475		10	max	101.341	1	562.666	3	156.115	1	0	2	.206	1	.808	1
476			min	3.909	15	-544.629	1	4.922	12	0	1	.006	12	-.836	3
477		11	max	78.733	1	447.529	1	-3.612	12	0	3	.086	1	.394	1
478			min	2.888	15	-462.388	3	-122.312	1	0	1	0	3	-.409	3
479		12	max	78.733	1	350.428	1	-2.444	12	0	3	.001	2	.062	1
480			min	2.888	15	-362.111	3	-89.162	1	0	1	-.003	3	-.065	3
481		13	max	78.733	1	253.328	1	-1.276	12	0	3	-.002	15	.195	3
482			min	2.888	15	-261.834	3	-56.011	1	0	1	-.062	1	-.19	1
483		14	max	78.733	1	156.228	1	-.095	3	0	3	-.003	15	.371	3
484			min	2.888	15	-161.556	3	-22.861	1	0	1	-.095	1	-.36	1
485		15	max	78.733	1	59.127	1	10.29	1	0	3	-.004	15	.464	3
486			min	2.888	15	-61.279	3	.39	15	0	1	-.1	1	-.45	1
487		16	max	78.733	1	38.999	3	43.441	1	0	3	-.003	12	.473	3
488			min	2.888	15	-37.973	1	1.594	15	0	1	-.078	1	-.459	1
489		17	max	78.733	1	139.276	3	76.591	1	0	3	0	12	.399	3
490			min	2.888	15	-135.073	1	2.798	15	0	1	-.028	1	-.387	1
491		18	max	78.733	1	239.553	3	109.742	1	0	3	.05	1	.241	3
492			min	2.888	15	-232.174	1	4.002	15	0	1	.002	15	-.234	1
493		19	max	78.733	1	339.831	3	142.892	1	0	3	.155	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
494			min	2.888	15	-329.274	1	5.206	15	0	1	.006	15	0	3
495	M16	1	max	-1.386	12	377.371	1	-5.174	15	0	3	.152	1	0	1
496			min	-78.554	1	-147.947	3	-142.114	1	0	1	.006	15	0	3
497		2	max	-1.386	12	266.084	1	-3.97	15	0	3	.047	1	.105	3
498			min	-78.554	1	-104.417	3	-108.963	1	0	1	.002	15	-.268	1
499		3	max	-1.386	12	154.797	1	-2.766	15	0	3	0	12	.174	3
500			min	-78.554	1	-60.886	3	-75.813	1	0	1	-.03	1	-.443	1
501		4	max	-1.386	12	43.51	1	-1.562	15	0	3	-.003	15	.207	3
502			min	-78.554	1	-17.355	3	-42.662	1	0	1	-.079	1	-.526	1
503		5	max	-1.386	12	26.175	3	-.358	15	0	3	-.004	15	.203	3
504			min	-78.554	1	-67.777	1	-9.512	1	0	1	-.101	1	-.516	1
505		6	max	-1.386	12	69.706	3	23.639	1	0	3	-.003	15	.163	3
506			min	-78.554	1	-179.064	1	.422	12	0	1	-.095	1	-.413	1
507		7	max	-1.386	12	113.237	3	56.79	1	0	3	-.002	15	.087	3
508			min	-78.554	1	-290.351	1	1.59	12	0	1	-.061	1	-.218	1
509		8	max	-1.386	12	156.767	3	89.94	1	0	3	.001	2	.071	1
510			min	-78.554	1	-401.638	1	2.758	12	0	1	-.002	3	-.026	3
511		9	max	-1.386	12	200.298	3	123.091	1	0	3	.089	1	.452	1
512			min	-78.554	1	-512.925	1	3.926	12	0	1	.001	12	-.175	3
513		10	max	-2.96	15	-14.483	15	156.241	1	0	15	.205	1	.926	1
514			min	-80.576	1	-624.212	1	-7.894	3	0	1	.007	12	-.36	3
515		11	max	-2.96	15	512.925	1	-4.108	12	0	1	.089	1	.452	1
516			min	-80.576	1	-200.298	3	-122.782	1	0	3	.003	12	-.175	3
517		12	max	-2.96	15	401.638	1	-2.94	12	0	1	.001	2	.071	1
518			min	-80.576	1	-156.767	3	-89.631	1	0	3	0	3	-.026	3
519		13	max	-2.96	15	290.351	1	-1.772	12	0	1	-.002	12	.087	3
520			min	-80.576	1	-113.237	3	-56.48	1	0	3	-.061	1	-.218	1
521		14	max	-2.96	15	179.064	1	-.604	12	0	1	-.003	12	.163	3
522			min	-80.576	1	-69.706	3	-23.33	1	0	3	-.094	1	-.413	1
523		15	max	-2.96	15	67.777	1	9.821	1	0	1	-.003	12	.203	3
524			min	-80.576	1	-26.175	3	.368	15	0	3	-.1	1	-.516	1
525		16	max	-2.96	15	17.355	3	42.971	1	0	1	-.002	12	.207	3
526			min	-80.576	1	-43.51	1	1.572	15	0	3	-.078	1	-.526	1
527		17	max	-2.96	15	60.886	3	76.122	1	0	1	0	12	.174	3
528			min	-80.576	1	-154.797	1	2.776	15	0	3	-.028	1	-.443	1
529		18	max	-2.96	15	104.417	3	109.273	1	0	1	.049	1	.105	3
530			min	-80.576	1	-266.084	1	3.98	15	0	3	.002	15	-.268	1
531		19	max	-2.96	15	147.947	3	142.423	1	0	1	.154	1	0	1
532			min	-80.576	1	-377.371	1	5.184	15	0	3	.006	15	0	3
533	M15	1	max	0	2	2.617	4	.034	3	0	1	0	1	0	1
534			min	-41.747	3	0	2	-.036	1	0	3	0	3	0	1
535		2	max	0	2	2.326	4	.034	3	0	1	0	1	0	2
536			min	-41.812	3	0	2	-.036	1	0	3	0	3	-.001	4
537		3	max	0	2	2.035	4	.034	3	0	1	0	1	0	2
538			min	-41.877	3	0	2	-.036	1	0	3	0	3	-.002	4
539		4	max	0	2	1.745	4	.034	3	0	1	0	1	0	2
540			min	-41.942	3	0	2	-.036	1	0	3	0	3	-.003	4
541		5	max	0	2	1.454	4	.034	3	0	1	0	1	0	2
542			min	-42.007	3	0	2	-.036	1	0	3	0	3	-.004	4
543		6	max	0	2	1.163	4	.034	3	0	1	0	1	0	2
544			min	-42.073	3	0	2	-.036	1	0	3	0	3	-.004	4
545		7	max	0	2	.872	4	.034	3	0	1	0	3	0	2
546			min	-42.138	3	0	2	-.036	1	0	3	0	1	-.005	4
547		8	max	0	2	.582	4	.034	3	0	1	0	3	0	2
548			min	-42.203	3	0	2	-.036	1	0	3	0	1	-.005	4
549		9	max	0	2	.291	4	.034	3	0	1	0	3	0	2
550			min	-42.268	3	0	2	-.036	1	0	3	0	1	-.005	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
551		10	max	0	2	0	1	.034	3	0	1	0	3	0	2
552			min	-42.333	3	0	1	-.036	1	0	3	0	1	-.005	4
553		11	max	0	2	0	2	.034	3	0	1	0	3	0	2
554			min	-42.399	3	-.291	4	-.036	1	0	3	0	1	-.005	4
555		12	max	0	2	0	2	.034	3	0	1	0	3	0	2
556			min	-42.464	3	-.582	4	-.036	1	0	3	0	1	-.005	4
557		13	max	0	2	0	2	.034	3	0	1	0	3	0	2
558			min	-42.529	3	-.872	4	-.036	1	0	3	0	1	-.005	4
559		14	max	0	2	0	2	.034	3	0	1	0	3	0	2
560			min	-42.594	3	-1.163	4	-.036	1	0	3	0	1	-.004	4
561		15	max	0	2	0	2	.034	3	0	1	0	3	0	2
562			min	-42.659	3	-1.454	4	-.036	1	0	3	0	1	-.004	4
563		16	max	0	2	0	2	.034	3	0	1	0	3	0	2
564			min	-42.725	3	-1.745	4	-.036	1	0	3	0	1	-.003	4
565		17	max	0	2	0	2	.034	3	0	1	0	3	0	2
566			min	-42.79	3	-2.035	4	-.036	1	0	3	0	1	-.002	4
567		18	max	0	2	0	2	.034	3	0	1	0	3	0	2
568			min	-42.855	3	-2.326	4	-.036	1	0	3	0	1	-.001	4
569		19	max	0	2	0	2	.034	3	0	1	0	3	0	1
570			min	-42.92	3	-2.617	4	-.036	1	0	3	0	1	0	1
571	M16A	1	max	-.853	10	2.617	4	.022	1	0	3	0	3	0	1
572			min	-42.365	3	.615	15	-.013	3	0	1	0	1	0	1
573		2	max	-.78	10	2.326	4	.022	1	0	3	0	3	0	15
574			min	-42.299	3	.547	15	-.013	3	0	1	0	1	-.001	4
575		3	max	-.708	10	2.035	4	.022	1	0	3	0	3	0	15
576			min	-42.234	3	.478	15	-.013	3	0	1	0	1	-.002	4
577		4	max	-.636	10	1.745	4	.022	1	0	3	0	3	0	15
578			min	-42.169	3	.41	15	-.013	3	0	1	0	1	-.003	4
579		5	max	-.563	10	1.454	4	.022	1	0	3	0	3	0	15
580			min	-42.104	3	.342	15	-.013	3	0	1	0	1	-.004	4
581		6	max	-.491	10	1.163	4	.022	1	0	3	0	3	0	15
582			min	-42.039	3	.273	15	-.013	3	0	1	0	1	-.004	4
583		7	max	-.418	10	.872	4	.022	1	0	3	0	3	-.001	15
584			min	-41.973	3	.205	15	-.013	3	0	1	0	1	-.005	4
585		8	max	-.346	10	.582	4	.022	1	0	3	0	3	-.001	15
586			min	-41.908	3	.137	15	-.013	3	0	1	0	1	-.005	4
587		9	max	-.273	10	.291	4	.022	1	0	3	0	3	-.001	15
588			min	-41.843	3	.068	15	-.013	3	0	1	0	1	-.005	4
589		10	max	-.201	10	0	1	.022	1	0	3	0	3	-.001	15
590			min	-41.778	3	0	1	-.013	3	0	1	0	1	-.005	4
591		11	max	-.129	10	-.068	15	.022	1	0	3	0	3	-.001	15
592			min	-41.713	3	-.291	4	-.013	3	0	1	0	1	-.005	4
593		12	max	-.056	10	-.137	15	.022	1	0	3	0	3	-.001	15
594			min	-41.648	3	-.582	4	-.013	3	0	1	0	1	-.005	4
595		13	max	.016	10	-.205	15	.022	1	0	3	0	2	-.001	15
596			min	-41.582	3	-.872	4	-.013	3	0	1	0	3	-.005	4
597		14	max	.089	10	-.273	15	.022	1	0	3	0	1	0	15
598			min	-41.517	3	-1.163	4	-.013	3	0	1	0	3	-.004	4
599		15	max	.161	10	-.342	15	.022	1	0	3	0	1	0	15
600			min	-41.452	3	-1.454	4	-.013	3	0	1	0	3	-.004	4
601		16	max	.234	10	-.41	15	.022	1	0	3	0	1	0	15
602			min	-41.387	3	-1.745	4	-.013	3	0	1	0	3	-.003	4
603		17	max	.306	10	-.478	15	.022	1	0	3	0	1	0	15
604			min	-41.322	3	-2.035	4	-.013	3	0	1	0	3	-.002	4
605		18	max	.378	10	-.547	15	.022	1	0	3	0	1	0	15
606			min	-41.256	3	-2.326	4	-.013	3	0	1	0	3	-.001	4
607		19	max	.451	10	-.615	15	.022	1	0	3	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
608			min	-41.191	3	-2.617	4	-.013	3	0	1	0	3	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	.003	1	.008	2	.015	1	-4.494e-5	15	NC	3	NC	3
2			min	-.003	3	-.008	3	0	3	-1.224e-3	1	4569.43	2	2442.744	1
3		2	max	.003	1	.007	2	.014	1	-4.303e-5	15	NC	3	NC	3
4			min	-.003	3	-.007	3	0	3	-1.172e-3	1	4976.945	2	2637.177	1
5		3	max	.003	1	.007	2	.013	1	-4.112e-5	15	NC	3	NC	3
6			min	-.003	3	-.007	3	0	3	-1.121e-3	1	5459.85	2	2866.512	1
7		4	max	.002	1	.006	2	.012	1	-3.92e-5	15	NC	1	NC	3
8			min	-.003	3	-.007	3	0	3	-1.069e-3	1	6036.081	2	3139.155	1
9		5	max	.002	1	.005	2	.01	1	-3.729e-5	15	NC	1	NC	3
10			min	-.003	3	-.006	3	0	3	-1.017e-3	1	6729.476	2	3466.33	1
11		6	max	.002	1	.005	2	.009	1	-3.538e-5	15	NC	1	NC	3
12			min	-.002	3	-.006	3	0	3	-9.656e-4	1	7572.227	2	3863.291	1
13		7	max	.002	1	.004	2	.008	1	-3.346e-5	15	NC	1	NC	2
14			min	-.002	3	-.006	3	0	3	-9.139e-4	1	8608.649	2	4351.204	1
15		8	max	.002	1	.004	2	.007	1	-3.155e-5	15	NC	1	NC	2
16			min	-.002	3	-.005	3	0	3	-8.622e-4	1	9901.104	2	4960.144	1
17		9	max	.002	1	.003	2	.006	1	-2.963e-5	15	NC	1	NC	2
18			min	-.002	3	-.005	3	0	3	-8.105e-4	1	NC	1	5734.056	1
19		10	max	.001	1	.003	2	.005	1	-2.772e-5	15	NC	1	NC	2
20			min	-.002	3	-.005	3	0	3	-7.588e-4	1	NC	1	6739.302	1
21		11	max	.001	1	.002	2	.004	1	-2.581e-5	15	NC	1	NC	2
22			min	-.001	3	-.004	3	0	3	-7.071e-4	1	NC	1	8080.139	1
23		12	max	.001	1	.002	2	.004	1	-2.389e-5	15	NC	1	NC	2
24			min	-.001	3	-.004	3	0	3	-6.553e-4	1	NC	1	9928.461	1
25		13	max	0	1	.001	2	.003	1	-2.198e-5	15	NC	1	NC	1
26			min	-.001	3	-.003	3	0	3	-6.036e-4	1	NC	1	NC	1
27		14	max	0	1	.001	2	.002	1	-2.007e-5	15	NC	1	NC	1
28			min	0	3	-.003	3	0	3	-5.519e-4	1	NC	1	NC	1
29		15	max	0	1	0	2	.002	1	-1.815e-5	15	NC	1	NC	1
30			min	0	3	-.002	3	0	3	-5.002e-4	1	NC	1	NC	1
31		16	max	0	1	0	2	.001	1	-1.624e-5	15	NC	1	NC	1
32			min	0	3	-.002	3	0	3	-4.485e-4	1	NC	1	NC	1
33		17	max	0	1	0	2	0	1	-1.432e-5	15	NC	1	NC	1
34			min	0	3	-.001	3	0	3	-3.968e-4	1	NC	1	NC	1
35		18	max	0	1	0	2	0	1	-1.241e-5	15	NC	1	NC	1
36			min	0	3	0	3	0	12	-3.451e-4	1	NC	1	NC	1
37		19	max	0	1	0	1	0	1	-8.664e-6	12	NC	1	NC	1
38			min	0	1	0	1	0	1	-2.934e-4	1	NC	1	NC	1
39	M3	1	max	0	1	0	1	0	1	1.366e-4	1	NC	1	NC	1
40			min	0	1	0	1	0	1	4.154e-6	12	NC	1	NC	1
41		2	max	0	3	0	2	0	12	1.701e-4	1	NC	1	NC	1
42			min	0	2	0	3	0	1	6.13e-6	15	NC	1	NC	1
43		3	max	0	3	0	2	0	12	2.036e-4	1	NC	1	NC	1
44			min	0	2	-.002	3	0	1	7.372e-6	15	NC	1	NC	1
45		4	max	0	3	0	2	0	12	2.371e-4	1	NC	1	NC	1
46			min	0	2	-.002	3	-.001	1	8.614e-6	15	NC	1	NC	1
47		5	max	0	3	0	2	0	12	2.707e-4	1	NC	1	NC	1
48			min	0	2	-.003	3	-.001	1	9.857e-6	15	NC	1	NC	1
49		6	max	0	3	0	2	0	3	3.042e-4	1	NC	1	NC	1
50			min	0	2	-.004	3	-.001	1	1.11e-5	15	NC	1	NC	1
51		7	max	0	3	0	2	0	3	3.377e-4	1	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
52			min	0	2	-.005	3	0	1	1.234e-5	15	NC	1	NC	1
53		8	max	0	3	0	2	0	3	3.712e-4	1	NC	1	NC	1
54			min	0	2	-.005	3	0	1	1.358e-5	15	NC	1	NC	1
55		9	max	0	3	.001	2	0	3	4.048e-4	1	NC	1	NC	1
56			min	0	2	-.006	3	0	2	1.483e-5	15	NC	1	NC	1
57		10	max	0	3	.002	2	0	1	4.383e-4	1	NC	1	NC	1
58			min	0	2	-.006	3	0	15	1.607e-5	15	NC	1	NC	1
59		11	max	0	3	.002	2	.001	1	4.718e-4	1	NC	1	NC	1
60			min	0	2	-.007	3	0	15	1.731e-5	15	NC	1	NC	1
61		12	max	0	3	.003	2	.002	1	5.054e-4	1	NC	1	NC	1
62			min	0	2	-.007	3	0	15	1.855e-5	15	NC	1	NC	1
63		13	max	0	3	.003	2	.003	1	5.389e-4	1	NC	1	NC	1
64			min	0	2	-.007	3	0	15	1.98e-5	15	NC	1	NC	1
65		14	max	.001	3	.004	2	.004	1	5.724e-4	1	NC	1	NC	1
66			min	0	2	-.007	3	0	15	2.104e-5	15	NC	1	NC	1
67		15	max	.001	3	.005	2	.004	1	6.059e-4	1	NC	1	NC	1
68			min	0	2	-.007	3	0	15	2.228e-5	15	9338.298	2	NC	1
69		16	max	.001	3	.006	2	.005	1	6.395e-4	1	NC	1	NC	2
70			min	0	2	-.008	3	0	15	2.352e-5	15	7891.463	2	8630.278	1
71		17	max	.001	3	.007	2	.006	1	6.73e-4	1	NC	3	NC	2
72			min	-.001	2	-.008	3	0	15	2.476e-5	15	6776.051	2	7428.196	1
73		18	max	.001	3	.008	2	.007	1	7.065e-4	1	NC	3	NC	2
74			min	-.001	2	-.008	3	0	15	2.601e-5	15	5906.032	2	6537.428	1
75		19	max	.001	3	.009	2	.008	1	7.401e-4	1	NC	3	NC	2
76			min	-.001	2	-.008	3	0	15	2.725e-5	15	5221.162	2	5862.164	1
77	M4	1	max	.002	1	.009	2	0	15	-3.536e-5	15	NC	1	NC	3
78			min	0	3	-.008	3	-.006	1	-9.749e-4	1	NC	1	3259.909	1
79		2	max	.002	1	.009	2	0	15	-3.536e-5	15	NC	1	NC	3
80			min	0	3	-.007	3	-.005	1	-9.749e-4	1	NC	1	3556.611	1
81		3	max	.002	1	.008	2	0	15	-3.536e-5	15	NC	1	NC	2
82			min	0	3	-.007	3	-.005	1	-9.749e-4	1	NC	1	3909.719	1
83		4	max	.002	1	.008	2	0	15	-3.536e-5	15	NC	1	NC	2
84			min	0	3	-.006	3	-.004	1	-9.749e-4	1	NC	1	4334.111	1
85		5	max	.002	1	.007	2	0	15	-3.536e-5	15	NC	1	NC	2
86			min	0	3	-.006	3	-.004	1	-9.749e-4	1	NC	1	4850.061	1
87		6	max	.002	1	.007	2	0	15	-3.536e-5	15	NC	1	NC	2
88			min	0	3	-.005	3	-.004	1	-9.749e-4	1	NC	1	5485.766	1
89		7	max	.002	1	.006	2	0	15	-3.536e-5	15	NC	1	NC	2
90			min	0	3	-.005	3	-.003	1	-9.749e-4	1	NC	1	6281.389	1
91		8	max	.001	1	.006	2	0	15	-3.536e-5	15	NC	1	NC	2
92			min	0	3	-.005	3	-.003	1	-9.749e-4	1	NC	1	7295.751	1
93		9	max	.001	1	.005	2	0	15	-3.536e-5	15	NC	1	NC	2
94			min	0	3	-.004	3	-.002	1	-9.749e-4	1	NC	1	8617.827	1
95		10	max	.001	1	.005	2	0	15	-3.536e-5	15	NC	1	NC	1
96			min	0	3	-.004	3	-.002	1	-9.749e-4	1	NC	1	NC	1
97		11	max	.001	1	.004	2	0	15	-3.536e-5	15	NC	1	NC	1
98			min	0	3	-.003	3	-.002	1	-9.749e-4	1	NC	1	NC	1
99		12	max	0	1	.004	2	0	15	-3.536e-5	15	NC	1	NC	1
100			min	0	3	-.003	3	-.001	1	-9.749e-4	1	NC	1	NC	1
101		13	max	0	1	.003	2	0	15	-3.536e-5	15	NC	1	NC	1
102			min	0	3	-.003	3	0	1	-9.749e-4	1	NC	1	NC	1
103		14	max	0	1	.003	2	0	15	-3.536e-5	15	NC	1	NC	1
104			min	0	3	-.002	3	0	1	-9.749e-4	1	NC	1	NC	1
105		15	max	0	1	.002	2	0	15	-3.536e-5	15	NC	1	NC	1
106			min	0	3	-.002	3	0	1	-9.749e-4	1	NC	1	NC	1
107		16	max	0	1	.002	2	0	15	-3.536e-5	15	NC	1	NC	1
108			min	0	3	-.001	3	0	1	-9.749e-4	1	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
109		17	max	0	1	.001	2	0	15	-3.536e-5	15	NC	1	NC	1
110			min	0	3	0	3	0	1	-9.749e-4	1	NC	1	NC	1
111		18	max	0	1	0	2	0	15	-3.536e-5	15	NC	1	NC	1
112			min	0	3	0	3	0	1	-9.749e-4	1	NC	1	NC	1
113		19	max	0	1	0	1	0	1	-3.536e-5	15	NC	1	NC	1
114			min	0	1	0	1	0	1	-9.749e-4	1	NC	1	NC	1
115	M6	1	max	.01	1	.029	2	.005	1	2.54e-4	3	NC	3	NC	2
116			min	-.011	3	-.024	3	-.003	3	2.138e-6	10	1238.073	2	7826.214	1
117		2	max	.009	1	.027	2	.004	1	2.464e-4	3	NC	3	NC	2
118			min	-.01	3	-.023	3	-.003	3	1.417e-6	10	1322.718	2	8491.276	1
119		3	max	.009	1	.026	2	.004	1	2.388e-4	3	NC	3	NC	2
120			min	-.009	3	-.022	3	-.003	3	6.95e-7	10	1419.449	2	9279.462	1
121		4	max	.008	1	.024	2	.004	1	2.312e-4	3	NC	3	NC	1
122			min	-.009	3	-.02	3	-.003	3	0	10	1530.681	2	NC	1
123		5	max	.008	1	.022	2	.003	1	2.236e-4	3	NC	3	NC	1
124			min	-.008	3	-.019	3	-.002	3	-7.483e-7	10	1659.524	2	NC	1
125		6	max	.007	1	.02	2	.003	1	2.159e-4	3	NC	3	NC	1
126			min	-.008	3	-.018	3	-.002	3	-2.437e-6	2	1810.049	2	NC	1
127		7	max	.006	1	.018	2	.003	1	2.083e-4	3	NC	3	NC	1
128			min	-.007	3	-.017	3	-.002	3	-5.897e-6	2	1987.688	2	NC	1
129		8	max	.006	1	.017	2	.002	1	2.007e-4	3	NC	3	NC	1
130			min	-.006	3	-.015	3	-.002	3	-9.356e-6	2	2199.851	2	NC	1
131		9	max	.005	1	.015	2	.002	1	1.931e-4	3	NC	3	NC	1
132			min	-.006	3	-.014	3	-.001	3	-1.282e-5	2	2456.914	2	NC	1
133		10	max	.005	1	.013	2	.002	1	1.854e-4	3	NC	3	NC	1
134			min	-.005	3	-.013	3	-.001	3	-1.628e-5	2	2773.865	2	NC	1
135		11	max	.004	1	.011	2	.001	1	1.778e-4	3	NC	3	NC	1
136			min	-.005	3	-.011	3	-.001	3	-1.974e-5	2	3173.186	2	NC	1
137		12	max	.004	1	.01	2	.001	1	1.702e-4	3	NC	3	NC	1
138			min	-.004	3	-.01	3	0	3	-2.32e-5	2	3690.201	2	NC	1
139		13	max	.003	1	.008	2	0	1	1.626e-4	3	NC	3	NC	1
140			min	-.004	3	-.009	3	0	3	-2.666e-5	2	4383.778	2	NC	1
141		14	max	.003	1	.007	2	0	1	1.55e-4	3	NC	3	NC	1
142			min	-.003	3	-.007	3	0	3	-3.011e-5	2	5359.864	2	NC	1
143		15	max	.002	1	.005	2	0	1	1.473e-4	3	NC	3	NC	1
144			min	-.002	3	-.006	3	0	3	-3.357e-5	2	6830.333	2	NC	1
145		16	max	.002	1	.004	2	0	1	1.397e-4	3	NC	1	NC	1
146			min	-.002	3	-.004	3	0	3	-3.703e-5	2	9289.519	2	NC	1
147		17	max	.001	1	.003	2	0	1	1.321e-4	3	NC	1	NC	1
148			min	-.001	3	-.003	3	0	3	-4.049e-5	2	NC	1	NC	1
149		18	max	0	1	.001	2	0	1	1.245e-4	3	NC	1	NC	1
150			min	0	3	-.001	3	0	3	-4.395e-5	2	NC	1	NC	1
151		19	max	0	1	0	1	0	1	1.169e-4	3	NC	1	NC	1
152			min	0	1	0	1	0	1	-4.741e-5	2	NC	1	NC	1
153	M7	1	max	0	1	0	1	0	1	2.184e-5	2	NC	1	NC	1
154			min	0	1	0	1	0	1	-5.412e-5	3	NC	1	NC	1
155		2	max	0	3	.002	2	0	3	1.893e-5	1	NC	1	NC	1
156			min	0	2	-.002	3	0	2	-4.e-5	3	NC	1	NC	1
157		3	max	0	3	.003	2	0	3	1.805e-5	1	NC	1	NC	1
158			min	0	2	-.004	3	0	1	-2.587e-5	3	NC	1	NC	1
159		4	max	0	3	.004	2	0	3	1.717e-5	1	NC	1	NC	1
160			min	0	2	-.005	3	0	1	-1.175e-5	3	NC	1	NC	1
161		5	max	.001	3	.006	2	0	3	1.629e-5	1	NC	3	NC	1
162			min	-.001	2	-.007	3	0	1	4.616e-7	15	7915.461	2	NC	1
163		6	max	.001	3	.007	2	.001	3	1.649e-5	3	NC	3	NC	1
164			min	-.001	2	-.009	3	0	1	5.16e-7	15	6347.85	2	NC	1
165		7	max	.002	3	.009	2	.001	3	3.061e-5	3	NC	3	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
166			min	-.002	2	-.011	3	0	1	-6.413e-8	2	5277.881	2	NC	1
167		8	max	.002	3	.01	2	.001	3	4.474e-5	3	NC	3	NC	1
168			min	-.002	2	-.012	3	0	1	-3.715e-6	2	4494.862	2	NC	1
169		9	max	.002	3	.012	2	.002	3	5.886e-5	3	NC	3	NC	1
170			min	-.002	2	-.014	3	0	1	-7.366e-6	2	3893.779	2	NC	1
171		10	max	.002	3	.013	2	.002	3	7.298e-5	3	NC	3	NC	1
172			min	-.003	2	-.015	3	-.001	1	-1.102e-5	2	3416.428	2	NC	1
173		11	max	.003	3	.015	2	.002	3	8.71e-5	3	NC	3	NC	1
174			min	-.003	2	-.016	3	-.001	1	-1.467e-5	2	3027.879	2	NC	1
175		12	max	.003	3	.017	2	.002	3	1.012e-4	3	NC	3	NC	1
176			min	-.003	2	-.017	3	-.001	1	-1.832e-5	2	2705.811	2	NC	1
177		13	max	.003	3	.019	2	.002	3	1.153e-4	3	NC	3	NC	1
178			min	-.004	2	-.019	3	-.001	1	-2.197e-5	2	2435.202	2	NC	1
179		14	max	.003	3	.021	2	.002	3	1.295e-4	3	NC	3	NC	1
180			min	-.004	2	-.02	3	-.002	1	-2.562e-5	2	2205.495	2	NC	1
181		15	max	.004	3	.023	2	.002	3	1.436e-4	3	NC	3	NC	1
182			min	-.004	2	-.021	3	-.002	1	-2.927e-5	2	2008.998	2	NC	1
183		16	max	.004	3	.025	2	.002	3	1.577e-4	3	NC	3	NC	1
184			min	-.004	2	-.022	3	-.002	1	-3.292e-5	2	1839.926	2	NC	1
185		17	max	.004	3	.027	2	.002	3	1.718e-4	3	NC	3	NC	1
186			min	-.005	2	-.022	3	-.002	1	-3.657e-5	2	1693.827	2	NC	1
187		18	max	.004	3	.029	2	.002	3	1.86e-4	3	NC	3	NC	1
188			min	-.005	2	-.023	3	-.002	1	-4.022e-5	2	1567.199	2	NC	1
189		19	max	.005	3	.032	2	.002	3	2.001e-4	3	NC	3	NC	1
190			min	-.005	2	-.024	3	-.002	1	-4.388e-5	2	1457.25	2	NC	1
191	M8	1	max	.006	1	.033	2	.002	1	-2.39e-6	10	NC	1	NC	2
192			min	0	3	-.024	3	-.001	3	-1.576e-4	3	NC	1	7999.19	1
193		2	max	.006	1	.031	2	.002	1	-2.39e-6	10	NC	1	NC	2
194			min	0	3	-.023	3	0	3	-1.576e-4	3	NC	1	8721.282	1
195		3	max	.006	1	.03	2	.002	1	-2.39e-6	10	NC	1	NC	2
196			min	0	3	-.022	3	0	3	-1.576e-4	3	NC	1	9580.933	1
197		4	max	.005	1	.028	2	.002	1	-2.39e-6	10	NC	1	NC	1
198			min	0	3	-.02	3	0	3	-1.576e-4	3	NC	1	NC	1
199		5	max	.005	1	.026	2	.002	1	-2.39e-6	10	NC	1	NC	1
200			min	0	3	-.019	3	0	3	-1.576e-4	3	NC	1	NC	1
201		6	max	.004	1	.024	2	.001	1	-2.39e-6	10	NC	1	NC	1
202			min	0	3	-.017	3	0	3	-1.576e-4	3	NC	1	NC	1
203		7	max	.004	1	.022	2	.001	1	-2.39e-6	10	NC	1	NC	1
204			min	0	3	-.016	3	0	3	-1.576e-4	3	NC	1	NC	1
205		8	max	.004	1	.02	2	.001	1	-2.39e-6	10	NC	1	NC	1
206			min	0	3	-.015	3	0	3	-1.576e-4	3	NC	1	NC	1
207		9	max	.003	1	.019	2	0	1	-2.39e-6	10	NC	1	NC	1
208			min	0	3	-.013	3	0	3	-1.576e-4	3	NC	1	NC	1
209		10	max	.003	1	.017	2	0	1	-2.39e-6	10	NC	1	NC	1
210			min	0	3	-.012	3	0	3	-1.576e-4	3	NC	1	NC	1
211		11	max	.003	1	.015	2	0	1	-2.39e-6	10	NC	1	NC	1
212			min	0	3	-.011	3	0	3	-1.576e-4	3	NC	1	NC	1
213		12	max	.002	1	.013	2	0	1	-2.39e-6	10	NC	1	NC	1
214			min	0	3	-.009	3	0	3	-1.576e-4	3	NC	1	NC	1
215		13	max	.002	1	.011	2	0	1	-2.39e-6	10	NC	1	NC	1
216			min	0	3	-.008	3	0	3	-1.576e-4	3	NC	1	NC	1
217		14	max	.002	1	.009	2	0	1	-2.39e-6	10	NC	1	NC	1
218			min	0	3	-.007	3	0	3	-1.576e-4	3	NC	1	NC	1
219		15	max	.001	1	.007	2	0	1	-2.39e-6	10	NC	1	NC	1
220			min	0	3	-.005	3	0	3	-1.576e-4	3	NC	1	NC	1
221		16	max	.001	1	.006	2	0	1	-2.39e-6	10	NC	1	NC	1
222			min	0	3	-.004	3	0	3	-1.576e-4	3	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
223		17	max	0	1	.004	2	0	1	-2.39e-6	10	NC	1	NC	1
224			min	0	3	-.003	3	0	3	-1.576e-4	3	NC	1	NC	1
225		18	max	0	1	.002	2	0	1	-2.39e-6	10	NC	1	NC	1
226			min	0	3	-.001	3	0	3	-1.576e-4	3	NC	1	NC	1
227		19	max	0	1	0	1	0	1	-2.39e-6	10	NC	1	NC	1
228			min	0	1	0	1	0	1	-1.576e-4	3	NC	1	NC	1
229	M10	1	max	.003	1	.008	2	0	3	1.052e-3	1	NC	3	NC	1
230			min	-.003	3	-.008	3	-.002	1	-2.541e-4	3	4573.492	2	NC	1
231		2	max	.003	1	.007	2	0	3	9.978e-4	1	NC	3	NC	1
232			min	-.003	3	-.007	3	-.002	1	-2.465e-4	3	4981.493	2	NC	1
233		3	max	.003	1	.007	2	0	3	9.436e-4	1	NC	3	NC	1
234			min	-.003	3	-.007	3	-.002	1	-2.389e-4	3	5464.997	2	NC	1
235		4	max	.003	1	.006	2	0	3	8.894e-4	1	NC	1	NC	1
236			min	-.003	3	-.007	3	-.002	1	-2.313e-4	3	6041.974	2	NC	1
237		5	max	.002	1	.005	2	0	3	8.352e-4	1	NC	1	NC	1
238			min	-.002	3	-.006	3	-.002	1	-2.237e-4	3	6736.305	2	NC	1
239		6	max	.002	1	.005	2	0	3	7.81e-4	1	NC	1	NC	1
240			min	-.002	3	-.006	3	-.002	1	-2.161e-4	3	7580.248	2	NC	1
241		7	max	.002	1	.004	2	0	3	7.268e-4	1	NC	1	NC	1
242			min	-.002	3	-.006	3	-.001	1	-2.085e-4	3	8618.206	2	NC	1
243		8	max	.002	1	.004	2	0	3	6.726e-4	1	NC	1	NC	1
244			min	-.002	3	-.005	3	-.001	1	-2.009e-4	3	9912.68	2	NC	1
245		9	max	.002	1	.003	2	0	3	6.184e-4	1	NC	1	NC	1
246			min	-.002	3	-.005	3	-.001	1	-1.933e-4	3	NC	1	NC	1
247		10	max	.002	1	.003	2	0	3	5.642e-4	1	NC	1	NC	1
248			min	-.002	3	-.005	3	0	1	-1.857e-4	3	NC	1	NC	1
249		11	max	.001	1	.002	2	0	3	5.1e-4	1	NC	1	NC	1
250			min	-.001	3	-.004	3	0	1	-1.782e-4	3	NC	1	NC	1
251		12	max	.001	1	.002	2	0	3	4.558e-4	1	NC	1	NC	1
252			min	-.001	3	-.004	3	0	1	-1.706e-4	3	NC	1	NC	1
253		13	max	.001	1	.001	2	0	3	4.017e-4	1	NC	1	NC	1
254			min	-.001	3	-.003	3	0	1	-1.63e-4	3	NC	1	NC	1
255		14	max	0	1	.001	2	0	3	3.475e-4	1	NC	1	NC	1
256			min	0	3	-.003	3	0	1	-1.554e-4	3	NC	1	NC	1
257		15	max	0	1	0	2	0	3	2.933e-4	1	NC	1	NC	1
258			min	0	3	-.002	3	0	1	-1.478e-4	3	NC	1	NC	1
259		16	max	0	1	0	2	0	3	2.391e-4	1	NC	1	NC	1
260			min	0	3	-.002	3	0	1	-1.402e-4	3	NC	1	NC	1
261		17	max	0	1	0	2	0	3	1.849e-4	1	NC	1	NC	1
262			min	0	3	-.001	3	0	1	-1.326e-4	3	NC	1	NC	1
263		18	max	0	1	0	2	0	3	1.307e-4	1	NC	1	NC	1
264			min	0	3	0	3	0	1	-1.25e-4	3	NC	1	NC	1
265		19	max	0	1	0	1	0	1	7.649e-5	1	NC	1	NC	1
266			min	0	1	0	1	0	1	-1.174e-4	3	NC	1	NC	1
267	M11	1	max	0	1	0	1	0	1	5.464e-5	3	NC	1	NC	1
268			min	0	1	0	1	0	1	-3.694e-5	1	NC	1	NC	1
269		2	max	0	3	0	2	0	1	3.885e-5	3	NC	1	NC	1
270			min	0	2	0	3	0	3	-9.831e-5	1	NC	1	NC	1
271		3	max	0	3	0	2	0	2	2.306e-5	3	NC	1	NC	1
272			min	0	2	-.002	3	0	3	-1.597e-4	1	NC	1	NC	1
273		4	max	0	3	0	2	0	10	7.268e-6	3	NC	1	NC	1
274			min	0	2	-.002	3	0	3	-2.21e-4	1	NC	1	NC	1
275		5	max	0	3	0	2	0	10	-5.986e-6	12	NC	1	NC	1
276			min	0	2	-.003	3	0	3	-2.824e-4	1	NC	1	NC	1
277		6	max	0	3	0	2	0	10	-1.251e-5	15	NC	1	NC	1
278			min	0	2	-.004	3	-.001	1	-3.438e-4	1	NC	1	NC	1
279		7	max	0	3	0	2	0	15	-1.483e-5	15	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
280			min	0	2	-.005	3	-.002	1	-4.051e-4	1	NC	1	NC	1
281		8	max	0	3	0	2	0	15	-1.714e-5	15	NC	1	NC	1
282			min	0	2	-.005	3	-.003	1	-4.665e-4	1	NC	1	NC	1
283		9	max	0	3	.001	2	0	15	-1.946e-5	15	NC	1	NC	1
284			min	0	2	-.006	3	-.004	1	-5.279e-4	1	NC	1	NC	1
285		10	max	0	3	.002	2	0	15	-2.178e-5	15	NC	1	NC	2
286			min	0	2	-.006	3	-.005	1	-5.892e-4	1	NC	1	9106.767	1
287		11	max	0	3	.002	2	0	15	-2.409e-5	15	NC	1	NC	2
288			min	0	2	-.007	3	-.006	1	-6.506e-4	1	NC	1	7474.524	1
289		12	max	0	3	.003	2	0	15	-2.641e-5	15	NC	1	NC	2
290			min	0	2	-.007	3	-.007	1	-7.119e-4	1	NC	1	6297.736	1
291		13	max	0	3	.003	2	0	15	-2.873e-5	15	NC	1	NC	2
292			min	0	2	-.007	3	-.008	1	-7.733e-4	1	NC	1	5421.744	1
293		14	max	.001	3	.004	2	0	15	-3.104e-5	15	NC	1	NC	2
294			min	0	2	-.007	3	-.01	1	-8.347e-4	1	NC	1	4753.091	1
295		15	max	.001	3	.005	2	0	15	-3.336e-5	15	NC	1	NC	2
296			min	0	2	-.008	3	-.011	1	-8.96e-4	1	9350.766	2	4232.559	1
297		16	max	.001	3	.006	2	0	15	-3.568e-5	15	NC	1	NC	2
298			min	0	2	-.008	3	-.012	1	-9.574e-4	1	7900.989	2	3821.154	1
299		17	max	.001	3	.007	2	0	15	-3.799e-5	15	NC	3	NC	3
300			min	-.001	2	-.008	3	-.013	1	-1.019e-3	1	6783.532	2	3492.385	1
301		18	max	.001	3	.008	2	0	15	-4.031e-5	15	NC	3	NC	3
302			min	-.001	2	-.008	3	-.014	1	-1.08e-3	1	5912.063	2	3227.804	1
303		19	max	.001	3	.009	2	0	15	-4.263e-5	15	NC	3	NC	3
304			min	-.001	2	-.008	3	-.015	1	-1.141e-3	1	5226.147	2	3014.323	1
305	M12	1	max	.002	1	.009	2	.013	1	1.028e-3	1	NC	1	NC	3
306			min	0	3	-.008	3	0	15	3.902e-5	15	NC	1	1532.841	1
307		2	max	.002	1	.009	2	.012	1	1.028e-3	1	NC	1	NC	3
308			min	0	3	-.007	3	0	15	3.902e-5	15	NC	1	1671.763	1
309		3	max	.002	1	.008	2	.011	1	1.028e-3	1	NC	1	NC	3
310			min	0	3	-.007	3	0	15	3.902e-5	15	NC	1	1837.123	1
311		4	max	.002	1	.008	2	.009	1	1.028e-3	1	NC	1	NC	3
312			min	0	3	-.006	3	0	15	3.902e-5	15	NC	1	2035.89	1
313		5	max	.002	1	.007	2	.008	1	1.028e-3	1	NC	1	NC	3
314			min	0	3	-.006	3	0	15	3.902e-5	15	NC	1	2277.559	1
315		6	max	.002	1	.007	2	.008	1	1.028e-3	1	NC	1	NC	3
316			min	0	3	-.005	3	0	15	3.902e-5	15	NC	1	2575.336	1
317		7	max	.002	1	.006	2	.007	1	1.028e-3	1	NC	1	NC	3
318			min	0	3	-.005	3	0	15	3.902e-5	15	NC	1	2948.031	1
319		8	max	.001	1	.006	2	.006	1	1.028e-3	1	NC	1	NC	3
320			min	0	3	-.005	3	0	15	3.902e-5	15	NC	1	3423.191	1
321		9	max	.001	1	.005	2	.005	1	1.028e-3	1	NC	1	NC	2
322			min	0	3	-.004	3	0	15	3.902e-5	15	NC	1	4042.483	1
323		10	max	.001	1	.005	2	.004	1	1.028e-3	1	NC	1	NC	2
324			min	0	3	-.004	3	0	15	3.902e-5	15	NC	1	4871.42	1
325		11	max	.001	1	.004	2	.003	1	1.028e-3	1	NC	1	NC	2
326			min	0	3	-.003	3	0	15	3.902e-5	15	NC	1	6017.909	1
327		12	max	0	1	.004	2	.003	1	1.028e-3	1	NC	1	NC	2
328			min	0	3	-.003	3	0	15	3.902e-5	15	NC	1	7670.197	1
329		13	max	0	1	.003	2	.002	1	1.028e-3	1	NC	1	NC	1
330			min	0	3	-.003	3	0	15	3.902e-5	15	NC	1	NC	1
331		14	max	0	1	.003	2	.001	1	1.028e-3	1	NC	1	NC	1
332			min	0	3	-.002	3	0	15	3.902e-5	15	NC	1	NC	1
333		15	max	0	1	.002	2	0	1	1.028e-3	1	NC	1	NC	1
334			min	0	3	-.002	3	0	15	3.902e-5	15	NC	1	NC	1
335		16	max	0	1	.002	2	0	1	1.028e-3	1	NC	1	NC	1
336			min	0	3	-.001	3	0	15	3.902e-5	15	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
337		17	max	0	1	.001	2	0	1	1.028e-3	1	NC	1	NC	1
338			min	0	3	0	3	0	15	3.902e-5	15	NC	1	NC	1
339		18	max	0	1	0	2	0	1	1.028e-3	1	NC	1	NC	1
340			min	0	3	0	3	0	15	3.902e-5	15	NC	1	NC	1
341		19	max	0	1	0	1	0	1	1.028e-3	1	NC	1	NC	1
342			min	0	1	0	1	0	1	3.902e-5	15	NC	1	NC	1
343	M1	1	max	.007	3	.023	3	.002	3	2.52e-2	1	NC	1	NC	1
344			min	-.008	2	-.024	1	-.005	1	-2.588e-2	3	NC	1	NC	1
345		2	max	.007	3	.013	3	.001	3	1.213e-2	1	NC	4	NC	2
346			min	-.008	2	-.013	1	-.011	1	-1.282e-2	3	4351.718	1	7735.211	1
347		3	max	.007	3	.004	3	0	3	6.808e-6	3	NC	4	NC	2
348			min	-.008	2	-.003	1	-.015	1	-7.032e-4	1	2245.258	1	4691.215	1
349		4	max	.007	3	.005	1	0	3	1.115e-5	3	NC	5	NC	2
350			min	-.008	2	-.003	3	-.017	1	-5.947e-4	1	1587.083	1	3882.524	1
351		5	max	.007	3	.012	1	0	3	1.55e-5	3	NC	5	NC	3
352			min	-.008	2	-.01	3	-.017	1	-4.863e-4	1	1270.841	1	3728.876	1
353		6	max	.007	3	.018	1	0	3	1.985e-5	3	NC	5	NC	2
354			min	-.008	2	-.015	3	-.016	1	-3.778e-4	1	1092.098	1	3991.027	1
355		7	max	.007	3	.023	1	0	3	2.42e-5	3	NC	5	NC	2
356			min	-.008	2	-.019	3	-.014	1	-2.694e-4	1	983.848	1	4754.003	1
357		8	max	.007	3	.026	1	0	3	2.854e-5	3	NC	5	NC	2
358			min	-.008	2	-.021	3	-.012	1	-1.609e-4	1	918.238	1	6530.623	1
359		9	max	.007	3	.028	1	0	3	3.289e-5	3	NC	5	NC	1
360			min	-.008	2	-.023	3	-.008	1	-5.248e-5	1	882.259	1	NC	1
361		10	max	.007	3	.029	1	0	3	5.597e-5	1	NC	5	NC	1
362			min	-.008	2	-.023	3	-.005	1	2.388e-6	15	869.908	1	NC	1
363		11	max	.007	3	.028	2	0	3	1.644e-4	1	NC	5	NC	1
364			min	-.008	2	-.022	3	-.001	1	6.34e-6	15	874.035	2	NC	1
365		12	max	.007	3	.026	2	.002	1	2.729e-4	1	NC	5	NC	2
366			min	-.008	2	-.02	3	0	15	1.029e-5	15	900.254	2	7453.825	1
367		13	max	.007	3	.023	2	.005	1	3.813e-4	1	NC	5	NC	2
368			min	-.008	2	-.017	3	0	15	1.424e-5	15	954.927	2	5190.886	1
369		14	max	.007	3	.018	2	.007	1	4.898e-4	1	NC	5	NC	2
370			min	-.008	2	-.014	3	0	15	1.82e-5	15	1049.908	2	4262.126	1
371		15	max	.007	3	.012	2	.008	1	5.982e-4	1	NC	5	NC	2
372			min	-.008	2	-.009	3	0	15	2.215e-5	15	1211.067	2	3929.102	1
373		16	max	.007	3	.004	1	.008	1	6.757e-4	1	NC	4	NC	2
374			min	-.008	2	-.003	3	0	15	2.499e-5	15	1501.291	2	4052.066	1
375		17	max	.007	3	.003	3	.006	1	2.92e-5	3	NC	4	NC	2
376			min	-.008	2	-.005	2	0	15	1.383e-6	15	2118.668	2	4863.924	1
377		18	max	.007	3	.01	3	.002	1	1.431e-2	1	NC	4	NC	2
378			min	-.008	2	-.016	2	0	15	-5.691e-3	3	4100.219	2	7983.559	1
379		19	max	.007	3	.018	3	0	3	2.888e-2	1	NC	1	NC	1
380			min	-.008	2	-.028	2	-.003	1	-1.152e-2	3	NC	1	NC	1
381	M5	1	max	.022	3	.075	3	.002	3	9.913e-7	3	NC	1	NC	1
382			min	-.028	2	-.083	1	-.006	1	5.172e-8	10	NC	1	NC	1
383		2	max	.022	3	.043	3	.002	3	6.659e-5	3	NC	5	NC	1
384			min	-.028	2	-.047	1	-.005	1	-7.516e-5	1	1263.538	1	NC	1
385		3	max	.022	3	.013	3	.003	3	1.309e-4	3	NC	5	NC	1
386			min	-.028	2	-.012	1	-.005	1	-1.495e-4	1	651.047	1	NC	1
387		4	max	.022	3	.017	1	.004	3	1.281e-4	3	NC	5	NC	1
388			min	-.028	2	-.011	3	-.004	1	-1.409e-4	1	459.018	1	NC	1
389		5	max	.022	3	.042	1	.004	3	1.253e-4	3	NC	5	NC	1
390			min	-.028	2	-.032	3	-.004	1	-1.323e-4	1	366.58	1	NC	1
391		6	max	.022	3	.063	1	.004	3	1.225e-4	3	NC	15	NC	1
392			min	-.028	2	-.048	3	-.003	1	-1.238e-4	1	314.193	1	NC	1
393		7	max	.022	3	.079	1	.004	3	1.197e-4	3	NC	15	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
394			min	-.028	2	-.061	3	-.003	1	-1.152e-4	1	282.323	1	NC	1
395		8	max	.022	3	.091	1	.004	3	1.169e-4	3	NC	15	NC	1
396			min	-.028	2	-.069	3	-.003	1	-1.066e-4	1	262.841	1	NC	1
397		9	max	.022	3	.098	1	.004	3	1.141e-4	3	NC	15	NC	1
398			min	-.028	2	-.073	3	-.002	1	-9.806e-5	1	251.941	1	NC	1
399		10	max	.022	3	.101	1	.004	3	1.113e-4	3	NC	15	NC	1
400			min	-.028	2	-.074	3	-.002	1	-8.95e-5	1	247.853	1	NC	1
401		11	max	.022	3	.099	1	.004	3	1.085e-4	3	NC	15	NC	1
402			min	-.028	2	-.072	3	-.002	1	-8.093e-5	1	250.016	1	NC	1
403		12	max	.022	3	.092	1	.003	3	1.057e-4	3	NC	15	NC	1
404			min	-.028	2	-.066	3	-.002	1	-7.236e-5	1	258.847	1	NC	1
405		13	max	.022	3	.08	1	.003	3	1.029e-4	3	NC	15	NC	1
406			min	-.028	2	-.057	3	-.002	1	-6.379e-5	1	275.939	1	NC	1
407		14	max	.022	3	.063	1	.002	3	1.001e-4	3	NC	15	NC	1
408			min	-.028	2	-.044	3	-.002	1	-5.523e-5	1	304.819	1	NC	1
409		15	max	.022	3	.042	1	.002	3	9.726e-5	3	NC	5	NC	1
410			min	-.028	2	-.029	3	-.002	1	-4.666e-5	1	353.111	1	NC	1
411		16	max	.022	3	.015	1	.002	3	9.13e-5	3	NC	5	NC	1
412			min	-.028	2	-.011	3	-.002	1	-4.555e-5	1	439.2	1	NC	1
413		17	max	.022	3	.01	3	.001	3	1.023e-5	3	NC	5	NC	1
414			min	-.028	2	-.018	2	-.002	1	-2.219e-4	1	620.002	1	NC	1
415		18	max	.022	3	.033	3	0	3	4.307e-6	3	NC	5	NC	1
416			min	-.028	2	-.055	2	-.003	1	-1.137e-4	1	1200.428	1	NC	1
417		19	max	.022	3	.057	3	0	3	0	15	NC	1	NC	1
418			min	-.028	2	-.095	2	-.003	1	-1.955e-7	3	NC	1	NC	1
419	M9	1	max	.007	3	.023	3	.001	3	2.589e-2	3	NC	1	NC	1
420			min	-.008	2	-.024	1	-.007	1	-2.52e-2	1	NC	1	NC	1
421		2	max	.007	3	.013	3	0	3	1.282e-2	3	NC	4	NC	2
422			min	-.008	2	-.014	1	-.001	1	-1.239e-2	1	4352.688	1	8919.145	1
423		3	max	.007	3	.004	3	.002	1	1.822e-4	1	NC	4	NC	2
424			min	-.008	2	-.004	1	0	3	-8.777e-6	3	2245.771	1	5533.703	1
425		4	max	.007	3	.005	1	.004	1	9.044e-5	1	NC	5	NC	2
426			min	-.008	2	-.004	3	0	3	-1.732e-5	3	1587.437	1	4685.998	1
427		5	max	.007	3	.012	1	.004	1	1.274e-5	2	NC	5	NC	2
428			min	-.008	2	-.01	3	-.001	3	-2.586e-5	3	1271.103	1	4640.487	1
429		6	max	.007	3	.018	1	.003	1	1.057e-6	10	NC	5	NC	2
430			min	-.008	2	-.015	3	-.002	3	-9.317e-5	1	1092.3	1	5201.321	1
431		7	max	.007	3	.023	1	.002	1	-6.706e-6	15	NC	5	NC	2
432			min	-.008	2	-.019	3	-.002	3	-1.85e-4	1	984.007	1	6710.149	1
433		8	max	.007	3	.026	1	0	2	-1.008e-5	15	NC	5	NC	1
434			min	-.008	2	-.021	3	-.003	3	-2.768e-4	1	918.363	1	NC	1
435		9	max	.007	3	.028	1	0	10	-1.345e-5	15	NC	5	NC	1
436			min	-.008	2	-.023	3	-.004	1	-3.686e-4	1	882.357	1	NC	1
437		10	max	.007	3	.029	2	0	15	-1.682e-5	15	NC	5	NC	1
438			min	-.008	2	-.023	3	-.007	1	-4.604e-4	1	869.983	1	NC	1
439		11	max	.007	3	.028	2	0	15	-2.019e-5	15	NC	5	NC	2
440			min	-.008	2	-.022	3	-.01	1	-5.522e-4	1	874.386	2	8476.382	1
441		12	max	.007	3	.026	2	0	15	-2.356e-5	15	NC	5	NC	2
442			min	-.008	2	-.02	3	-.012	1	-6.44e-4	1	900.607	2	5501.227	1
443		13	max	.007	3	.023	2	0	15	-2.693e-5	15	NC	5	NC	2
444			min	-.008	2	-.017	3	-.015	1	-7.358e-4	1	955.293	2	4276.903	1
445		14	max	.007	3	.018	2	0	15	-3.03e-5	15	NC	5	NC	3
446			min	-.008	2	-.014	3	-.016	1	-8.276e-4	1	1050.298	2	3720.368	1
447		15	max	.007	3	.012	2	0	15	-3.367e-5	15	NC	5	NC	3
448			min	-.008	2	-.009	3	-.016	1	-9.194e-4	1	1211.504	2	3553.486	1
449		16	max	.007	3	.004	1	0	15	-3.609e-5	15	NC	4	NC	3
450			min	-.008	2	-.003	3	-.015	1	-9.861e-4	1	1501.811	2	3752.927	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
451		17	max	.007	3	.003	3	0	15	2.432e-6	3	NC	4	NC	2
452			min	-.008	2	-.005	2	-.013	1	-4.572e-4	1	2119.352	2	4581.908	1
453		18	max	.007	3	.01	3	0	15	5.708e-3	3	NC	4	NC	2
454			min	-.008	2	-.016	2	-.008	1	-1.453e-2	1	4101.499	2	7615.583	1
455		19	max	.007	3	.018	3	0	3	1.152e-2	3	NC	1	NC	1
456			min	-.008	2	-.028	2	-.002	1	-2.888e-2	1	NC	1	NC	1
457	M13	1	max	.007	1	.023	3	.007	3	3.689e-3	3	NC	1	NC	1
458			min	-.001	3	-.024	1	-.008	2	-4.037e-3	1	NC	1	NC	1
459		2	max	.007	1	.273	3	.046	1	4.625e-3	3	NC	5	NC	3
460			min	-.001	3	-.268	1	0	10	-5.126e-3	1	720.241	3	3606.614	1
461		3	max	.007	1	.477	3	.117	1	5.561e-3	3	NC	15	NC	3
462			min	-.001	3	-.466	1	.004	15	-6.215e-3	1	396.718	3	1486.874	1
463		4	max	.007	1	.603	3	.178	1	6.497e-3	3	NC	15	NC	3
464			min	-.001	3	-.59	1	.007	15	-7.305e-3	1	310.147	3	990.328	1
465		5	max	.006	1	.638	3	.207	1	7.433e-3	3	NC	15	NC	3
466			min	-.001	3	-.625	1	.008	15	-8.394e-3	1	292.566	3	850.394	1
467		6	max	.006	1	.583	3	.198	1	8.369e-3	3	NC	15	NC	3
468			min	-.001	3	-.573	1	.007	15	-9.483e-3	1	321.328	3	891.954	1
469		7	max	.006	1	.456	3	.15	1	9.305e-3	3	NC	5	NC	3
470			min	-.002	3	-.451	1	.004	10	-1.057e-2	1	415.297	3	1164.692	1
471		8	max	.006	1	.293	3	.079	1	1.024e-2	3	NC	5	NC	3
472			min	-.002	3	-.293	1	-.004	10	-1.166e-2	1	667.421	3	2152.338	1
473		9	max	.006	1	.143	3	.021	3	1.118e-2	3	NC	5	NC	1
474			min	-.002	3	-.149	1	-.014	2	-1.275e-2	1	1445.402	1	NC	1
475		10	max	.006	1	.075	3	.022	3	1.211e-2	3	NC	4	NC	1
476			min	-.002	3	-.083	1	-.028	2	-1.384e-2	1	3050.876	1	8806.139	2
477		11	max	.006	1	.143	3	.026	3	1.118e-2	3	NC	5	NC	2
478			min	-.002	3	-.149	1	-.014	2	-1.275e-2	1	1445.403	1	9513.455	3
479		12	max	.006	1	.293	3	.086	1	1.024e-2	3	NC	5	NC	5
480			min	-.002	3	-.293	1	-.004	10	-1.166e-2	1	667.42	3	2002.984	1
481		13	max	.006	1	.456	3	.158	1	9.307e-3	3	NC	5	NC	5
482			min	-.002	3	-.451	1	.004	10	-1.057e-2	1	415.296	3	1111.831	1
483		14	max	.006	1	.583	3	.205	1	8.371e-3	3	NC	15	NC	5
484			min	-.002	3	-.573	1	.008	15	-9.483e-3	1	321.328	3	860.322	1
485		15	max	.005	1	.638	3	.214	1	7.436e-3	3	NC	15	NC	5
486			min	-.002	3	-.625	1	.008	15	-8.393e-3	1	292.566	3	824.394	1
487		16	max	.005	1	.603	3	.183	1	6.501e-3	3	NC	15	NC	3
488			min	-.002	3	-.59	1	.007	15	-7.303e-3	1	310.147	3	962.071	1
489		17	max	.005	1	.477	3	.121	1	5.565e-3	3	NC	15	NC	3
490			min	-.002	3	-.466	1	.005	15	-6.214e-3	1	396.718	3	1443.575	1
491		18	max	.005	1	.273	3	.047	1	4.63e-3	3	NC	5	NC	3
492			min	-.002	3	-.267	1	0	10	-5.124e-3	1	720.24	3	3482.602	1
493		19	max	.005	1	.023	3	.007	3	3.694e-3	3	NC	1	NC	1
494			min	-.002	3	-.024	1	-.008	2	-4.035e-3	1	NC	1	NC	1
495	M16	1	max	.002	1	.018	3	.007	3	4.446e-3	2	NC	1	NC	1
496			min	0	3	-.028	2	-.008	2	-2.814e-3	3	NC	1	NC	1
497		2	max	.002	1	.129	3	.048	1	5.628e-3	2	NC	5	NC	3
498			min	0	3	-.305	1	0	10	-3.516e-3	3	645.445	1	3406.246	1
499		3	max	.002	1	.22	3	.122	1	6.809e-3	2	NC	15	NC	3
500			min	0	3	-.533	1	.005	15	-4.218e-3	3	355.349	1	1427.582	1
501		4	max	.002	1	.278	3	.184	1	7.991e-3	2	NC	15	NC	3
502			min	0	3	-.675	1	.007	15	-4.92e-3	3	277.561	1	957.05	1
503		5	max	.002	1	.295	3	.214	1	9.173e-3	2	NC	15	NC	5
504			min	0	3	-.715	1	.008	15	-5.623e-3	3	261.436	1	823.717	1
505		6	max	.002	1	.274	3	.204	1	1.035e-2	2	NC	15	NC	5
506			min	0	3	-.655	1	.008	15	-6.325e-3	3	286.38	1	863.387	1
507		7	max	.002	1	.22	3	.156	1	1.154e-2	2	NC	5	NC	5

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
508			min	0	3	-.515	1	.004	10	-7.027e-3	3	368.231	1	1122.36	1
509		8	max	.002	1	.151	3	.083	1	1.272e-2	2	NC	5	NC	5
510			min	0	3	-.334	1	-.004	10	-7.729e-3	3	584.706	1	2045.812	1
511		9	max	.003	1	.086	3	.024	3	1.39e-2	2	NC	5	NC	1
512			min	0	3	-.169	1	-.014	2	-8.432e-3	3	1264.742	1	NC	1
513		10	max	.003	1	.057	3	.022	3	1.508e-2	2	NC	4	NC	1
514			min	0	3	-.095	2	-.028	2	-9.134e-3	3	2678.328	1	8797.012	2
515		11	max	.003	1	.086	3	.022	3	1.39e-2	2	NC	5	NC	1
516			min	0	3	-.169	1	-.014	2	-8.431e-3	3	1264.742	1	NC	1
517		12	max	.003	1	.151	3	.081	1	1.272e-2	2	NC	5	NC	3
518			min	0	3	-.334	1	-.004	10	-7.728e-3	3	584.706	1	2095.539	1
519		13	max	.003	1	.22	3	.153	1	1.154e-2	2	NC	5	NC	5
520			min	0	3	-.515	1	.004	10	-7.025e-3	3	368.231	1	1143.77	1
521		14	max	.003	1	.274	3	.2	1	1.036e-2	2	NC	15	NC	5
522			min	0	3	-.655	1	.008	15	-6.323e-3	3	286.381	1	878.939	1
523		15	max	.003	1	.295	3	.21	1	9.174e-3	2	NC	15	NC	3
524			min	0	3	-.715	1	.008	15	-5.62e-3	3	261.436	1	839.24	1
525		16	max	.003	1	.278	3	.18	1	7.992e-3	2	NC	15	NC	3
526			min	0	3	-.675	1	.007	15	-4.917e-3	3	277.562	1	977.609	1
527		17	max	.003	1	.22	3	.118	1	6.811e-3	2	NC	15	NC	3
528			min	0	3	-.533	1	.004	15	-4.214e-3	3	355.349	1	1466.231	1
529		18	max	.003	1	.129	3	.046	1	5.629e-3	2	NC	5	NC	3
530			min	0	3	-.305	1	0	10	-3.511e-3	3	645.445	1	3543.049	1
531		19	max	.003	1	.018	3	.007	3	4.448e-3	2	NC	1	NC	1
532			min	0	3	-.028	2	-.008	2	-2.808e-3	3	NC	1	NC	1
533	M15	1	max	0	1	0	1	0	1	3.393e-4	3	NC	1	NC	1
534			min	0	1	0	1	0	1	-6.648e-5	2	NC	1	NC	1
535		2	max	0	3	-.005	15	.001	1	8.521e-4	3	NC	5	NC	1
536			min	0	10	-.019	4	0	3	-6.651e-4	1	5007.408	4	NC	1
537		3	max	0	3	-.009	15	.004	1	1.365e-3	3	NC	15	NC	1
538			min	0	10	-.038	4	-.003	3	-1.296e-3	1	2548.099	4	NC	1
539		4	max	0	3	-.013	15	.008	1	1.878e-3	3	7436.859	15	NC	4
540			min	0	10	-.056	4	-.007	3	-1.927e-3	1	1748.145	4	7670.11	1
541		5	max	0	3	-.017	15	.013	1	2.391e-3	3	5803.057	15	NC	4
542			min	0	10	-.071	4	-.011	3	-2.557e-3	1	1364.095	4	5076.532	1
543		6	max	0	3	-.02	15	.019	1	2.903e-3	3	4883.886	15	NC	4
544			min	0	10	-.085	4	-.016	3	-3.188e-3	1	1148.03	4	3717.954	1
545		7	max	0	3	-.022	15	.025	1	3.416e-3	3	4331.126	15	NC	4
546			min	0	10	-.096	4	-.022	3	-3.819e-3	1	1018.096	4	2918.899	1
547		8	max	0	3	-.024	15	.03	1	3.929e-3	3	3999.386	15	NC	4
548			min	0	10	-.104	4	-.027	3	-4.449e-3	1	940.115	4	2414.571	1
549		9	max	0	3	-.025	15	.035	1	4.442e-3	3	3820.825	15	NC	4
550			min	0	10	-.109	4	-.031	3	-5.08e-3	1	898.142	4	2083.702	1
551		10	max	0	3	-.026	15	.039	1	4.955e-3	3	3764.336	15	NC	4
552			min	0	10	-.11	4	-.035	3	-5.711e-3	1	884.863	4	1865.11	1
553		11	max	0	3	-.026	15	.042	1	5.467e-3	3	3820.825	15	NC	5
554			min	0	10	-.109	4	-.037	3	-6.342e-3	1	898.142	4	1726.611	1
555		12	max	0	3	-.024	15	.043	1	5.98e-3	3	3999.386	15	NC	5
556			min	0	10	-.104	4	-.038	3	-6.972e-3	1	940.115	4	1652.302	1
557		13	max	0	3	-.023	15	.042	1	6.493e-3	3	4331.126	15	NC	5
558			min	0	10	-.096	4	-.037	3	-7.603e-3	1	1018.096	4	1637.785	1
559		14	max	0	3	-.02	15	.039	1	7.006e-3	3	4883.886	15	NC	5
560			min	0	10	-.085	4	-.034	3	-8.234e-3	1	1148.03	4	1690.501	1
561		15	max	0	3	-.017	15	.033	1	7.519e-3	3	5803.057	15	NC	4
562			min	0	10	-.072	4	-.029	3	-8.865e-3	1	1364.095	4	1836.972	1
563		16	max	0	3	-.013	15	.024	1	8.031e-3	3	7436.859	15	NC	4
564			min	0	10	-.057	4	-.02	3	-9.495e-3	1	1748.145	4	2148.88	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
565		17	max	0	3	-.009	15	.011	1	8.544e-3	3	NC	15	NC	4
566			min	0	10	-.039	4	-.008	3	-1.013e-2	1	2548.099	4	2850.851	1
567		18	max	.001	3	-.005	15	.007	3	9.057e-3	3	NC	5	NC	4
568			min	0	10	-.021	4	-.011	2	-1.076e-2	1	5007.408	4	5078.884	1
569		19	max	.001	3	.003	3	.026	3	9.57e-3	3	NC	1	NC	1
570			min	-.001	10	-.003	9	-.03	2	-1.139e-2	1	NC	1	NC	1
571	M16A	1	max	0	10	0	3	.008	3	2.851e-3	3	NC	1	NC	1
572			min	-.001	3	-.002	1	-.008	2	-2.895e-3	2	NC	1	NC	1
573		2	max	0	10	-.005	15	.005	1	2.732e-3	3	NC	5	NC	2
574			min	-.001	3	-.02	4	-.001	10	-2.766e-3	2	5007.408	4	9452.216	1
575		3	max	0	10	-.009	15	.013	1	2.613e-3	3	NC	15	NC	4
576			min	0	3	-.039	4	-.004	3	-2.637e-3	2	2548.099	4	5346.673	1
577		4	max	0	10	-.013	15	.019	1	2.494e-3	3	7436.859	15	NC	4
578			min	0	3	-.056	4	-.007	3	-2.509e-3	2	1748.145	4	4065.344	1
579		5	max	0	10	-.017	15	.023	1	2.375e-3	3	5803.057	15	NC	4
580			min	0	3	-.072	4	-.01	3	-2.38e-3	2	1364.095	4	3509.822	1
581		6	max	0	10	-.02	15	.026	1	2.256e-3	3	4883.886	15	NC	4
582			min	0	3	-.085	4	-.012	3	-2.252e-3	2	1148.03	4	3266.882	1
583		7	max	0	10	-.022	15	.027	1	2.137e-3	3	4331.126	15	NC	4
584			min	0	3	-.096	4	-.012	3	-2.123e-3	2	1018.096	4	3207.026	1
585		8	max	0	10	-.024	15	.026	1	2.018e-3	3	3999.386	15	NC	4
586			min	0	3	-.104	4	-.012	3	-1.995e-3	2	940.115	4	3285.961	1
587		9	max	0	10	-.025	15	.025	1	1.899e-3	3	3820.825	15	NC	4
588			min	0	3	-.108	4	-.012	3	-1.866e-3	2	898.142	4	3497.702	1
589		10	max	0	10	-.026	15	.022	1	1.78e-3	3	3764.336	15	NC	4
590			min	0	3	-.11	4	-.011	3	-1.737e-3	2	884.863	4	3863.725	1
591		11	max	0	10	-.025	15	.019	1	1.661e-3	3	3820.825	15	NC	4
592			min	0	3	-.108	4	-.009	3	-1.609e-3	2	898.142	4	4437.688	1
593		12	max	0	10	-.024	15	.016	1	1.542e-3	3	3999.386	15	NC	4
594			min	0	3	-.104	4	-.007	3	-1.48e-3	2	940.115	4	5326.29	1
595		13	max	0	10	-.022	15	.013	1	1.423e-3	3	4331.126	15	NC	3
596			min	0	3	-.096	4	-.006	3	-1.352e-3	2	1018.096	4	6742.872	1
597		14	max	0	10	-.02	15	.009	1	1.304e-3	3	4883.886	15	NC	2
598			min	0	3	-.085	4	-.004	3	-1.223e-3	2	1148.03	4	9150.474	1
599		15	max	0	10	-.017	15	.006	1	1.185e-3	3	5803.057	15	NC	1
600			min	0	3	-.071	4	-.002	3	-1.094e-3	2	1364.095	4	NC	1
601		16	max	0	10	-.013	15	.003	1	1.066e-3	3	7436.859	15	NC	1
602			min	0	3	-.056	4	0	3	-9.659e-4	2	1748.145	4	NC	1
603		17	max	0	10	-.009	15	.001	1	9.472e-4	3	NC	15	NC	1
604			min	0	3	-.038	4	0	10	-8.373e-4	2	2548.099	4	NC	1
605		18	max	0	10	-.005	15	0	3	8.282e-4	3	NC	5	NC	1
606			min	0	3	-.019	4	0	2	-7.087e-4	2	5007.408	4	NC	1
607		19	max	0	1	0	1	0	1	7.092e-4	3	NC	1	NC	1
608			min	0	1	0	1	0	1	-5.802e-4	2	NC	1	NC	1

Anchor Designer™
Software
Version 2.4.5673.0

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

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

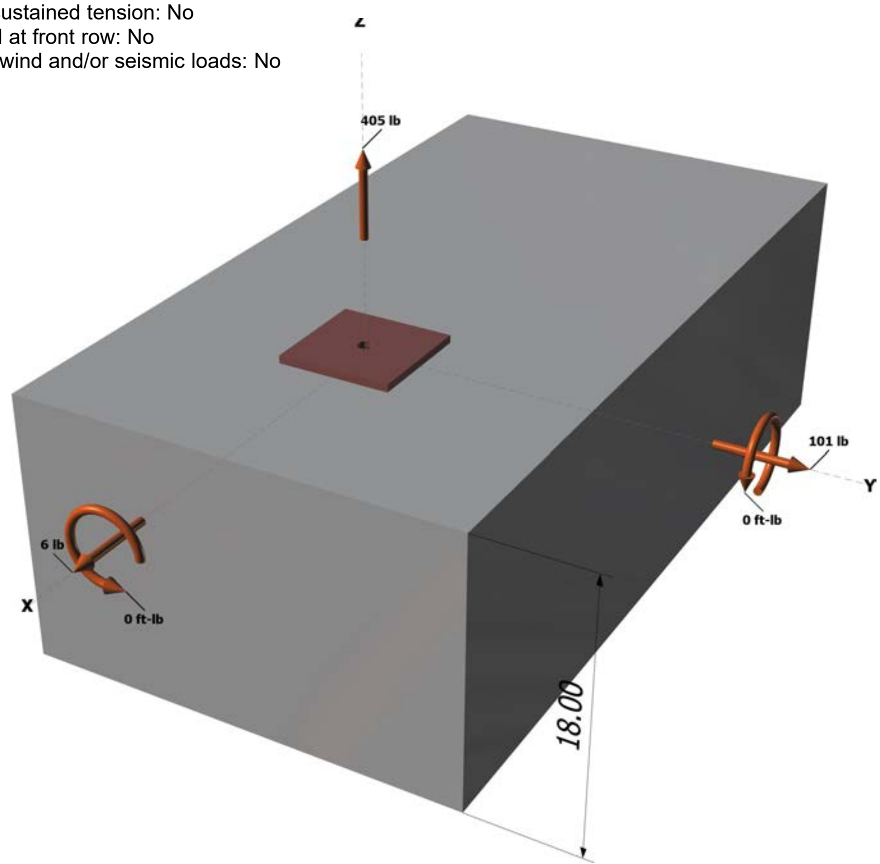
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

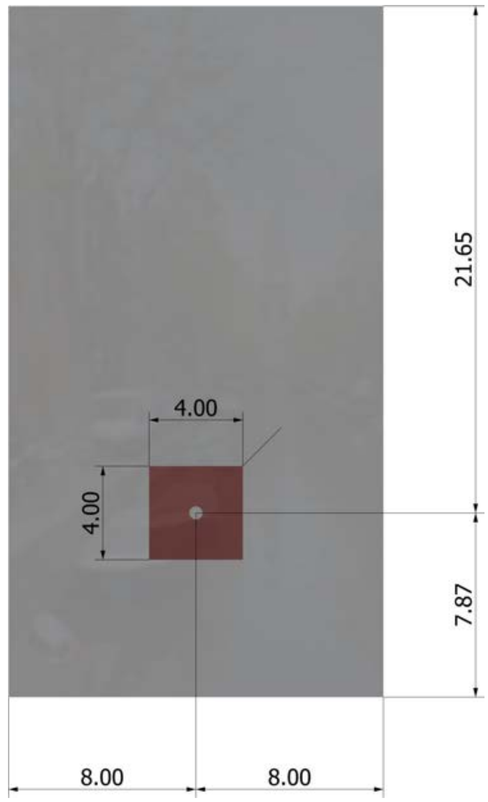
Load and Geometry
Load factor source: ACI 318 Section 9.2
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: No
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: No

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

<Figure 1>



<Figure 2>



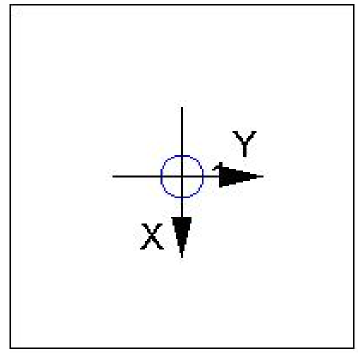
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

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

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in y-direction:

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

l_e (in)	d_a (in)	λ	f'_c (psi)	c_{a1} (in)	V_{by} (lb)
4.00	0.50	1.00	2500	8.00	8488

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

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cby} (lb)
238.44	288.00	0.897	1.000	1.000	8488	0.70	4411

Shear perpendicular to edge in x-direction:

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

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

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

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbx} (lb)
188.88	278.72	0.903	1.000	1.000	8282	0.70	3549

Shear parallel to edge in x-direction:

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

l_e (in)	d_a (in)	λ	f'_c (psi)	c_{a1} (in)	V_{by} (lb)
4.00	0.50	1.00	2500	8.00	8488

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

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cbx} (lb)
238.44	288.00	1.000	1.000	1.000	8488	0.70	9838

Shear parallel to edge in y-direction:

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

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

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

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cby} (lb)
188.88	278.72	1.000	1.000	1.000	8282	0.70	7858

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

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

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

A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	N_{cb} (lb)	ϕ	ϕV_{cp} (lb)
253.92	256.00	0.995	1.000	1.000	10469	10334	0.70	13657

11. Results

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

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	405	6071	0.07	Pass
Concrete breakout	405	6717	0.06	Pass
Adhesive	**405**	**5365**	**0.08**	**Pass (Governs)**

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

Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. D.7.1	0.08	0.00	7.5 %	1.0	Pass

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

12. Warnings

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

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

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

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

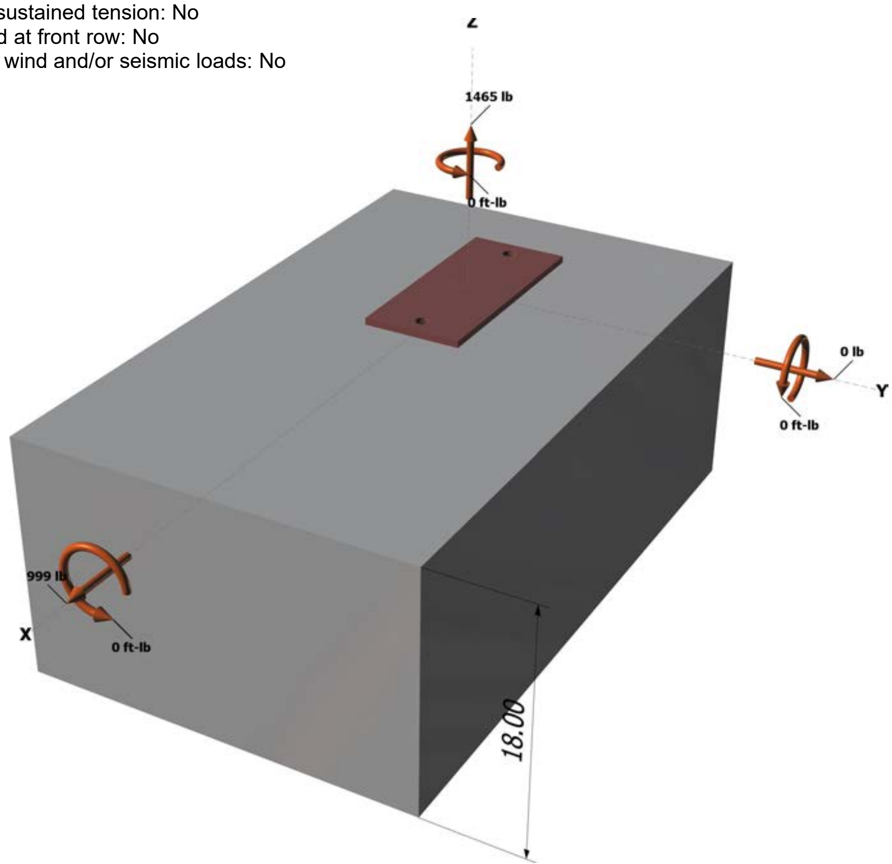
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

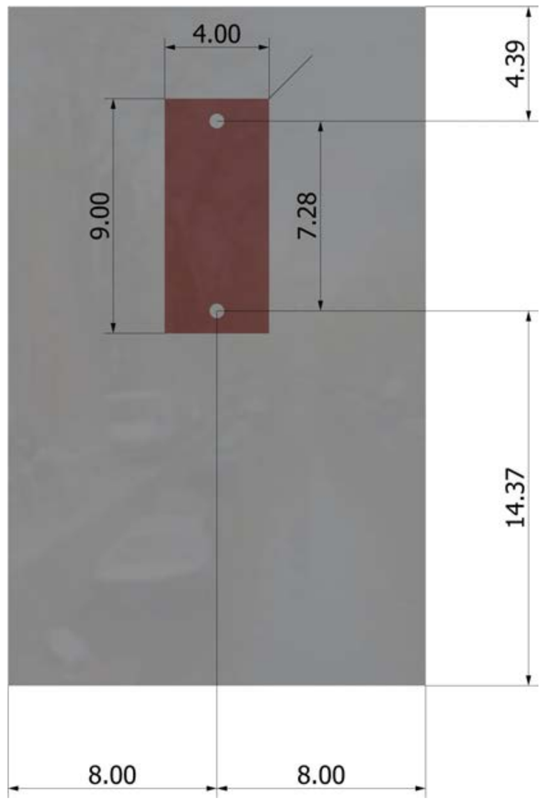
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout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

Base Plate
Length x Width x Thickness (inch): 9.00 x 4.00 x 0.28

<Figure 1>



<Figure 2>



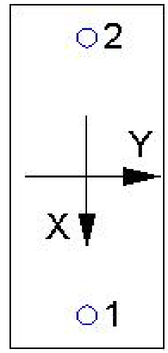
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	732.5	499.5	0.0	499.5
2	732.5	499.5	0.0	499.5
Sum	1465.0	999.0	0.0	999.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 1465
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



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

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

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

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

k_c	λ	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	2500	5.333	10469

$\phi N_{cbg} = \phi\,(A_{Nc} / A_{Nco})\,\Psi_{ec,N}\,\Psi_{ed,N}\,\Psi_{c,N}\,\Psi_{cp,N} N_b$ (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, ϕN_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, ϕV_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.