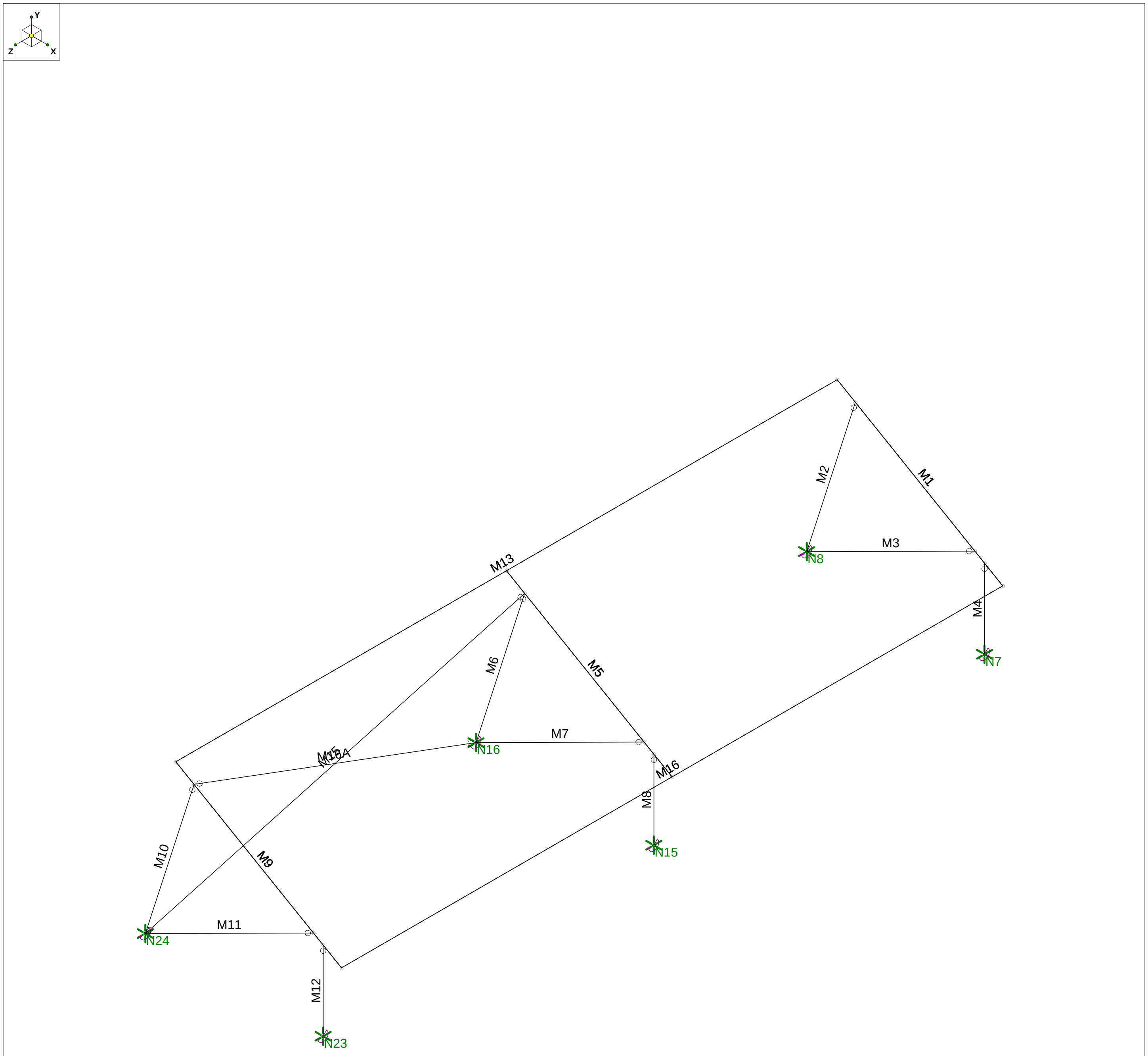


Schletter, Inc.		30ÁTilt w/o Seismic Design
HCV	Standard PVMini Racking System	
	Representative Calculations - ASCE 7-10	

1. INTRODUCTION

1.1 Project Description

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

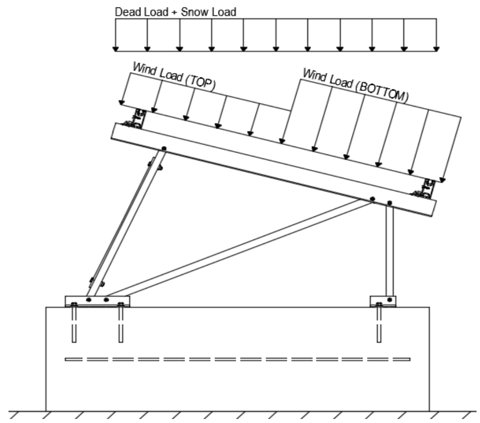
1.2 Construction

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

PV modules are required to meet the following specifications:

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

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



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

1.3 Technical Codes

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

2. LOAD ACTIONS

2.1 Permanent Loads

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

Self-weight of the PV modules.

2.2 Snow Loads

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

2.3 Wind Loads

Design Wind Speed, V = 160 mph
Height ≤ 15 ft

Exposure Category = C
Importance Category = II

Peak Velocity Pressure, q_z = 40.19 psf *Including the gust factor, G=0.85. (ASCE 7-10, Eq. 27.3-1)*

Pressure Coefficients

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

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

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

Allowable Stress Design, ASD

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

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

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

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

3. STRUCTURAL ANALYSIS

3.1 RISA Results

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

3.2 RISA Components

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

Purlins	Location	**Diagonal Struts**	Location	**Front Reactions**	Location
M13	Top	M3	Outer	N7	Outer
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

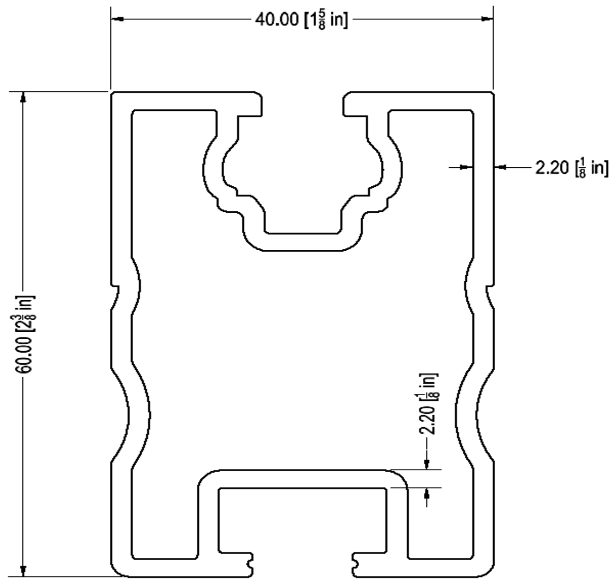
Front Struts	Location	**Bracing**
M4	Outer	M15
M8	Inner	M16A
M12	Outer	

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).

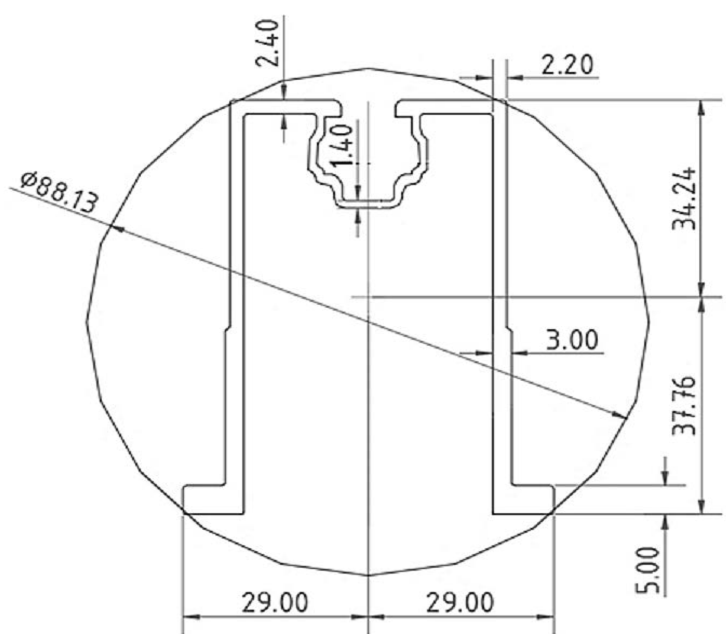
Purlin Type =	**ProfiPlus**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	42	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.99	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	28.47	ksi
S_y =	0.51	in^3
S_x =	0.37	in^3
E =	10100	ksi
I_y =	0.60	in^4
I_x =	0.29	in^4
A =	0.90	in^2
g =	1.08	lbs/ft
M_y =	-0.343	k-ft
M_z =	-0.018	k-ft
$M_{y\ allowable}$ =	1.276	k-ft
$M_{z\ allowable}$ =	0.871	k-ft
Utilization =	29%	



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).

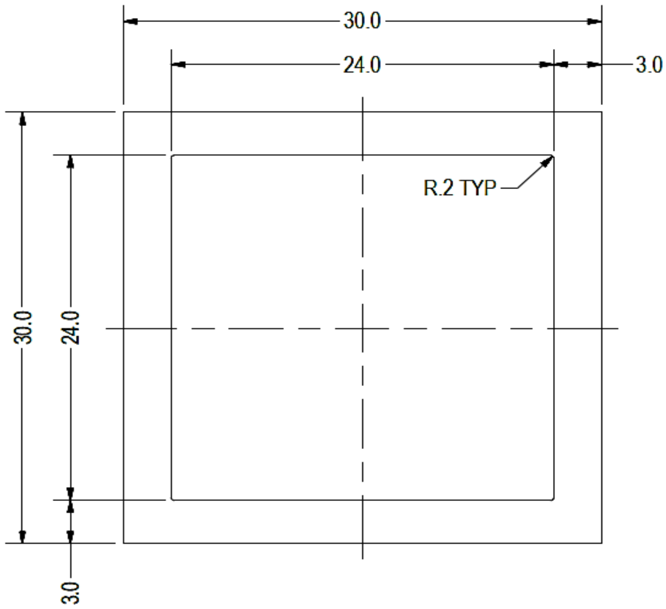
Girder Type =	**Flex Profi**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	33.78	in
$\Phi F_{ty\ AXIAL}$ =	14.29	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.76	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	13.46	ksi
S_y =	0.59	in^3
S_x =	0.46	in^3
E =	10100	ksi
I_y =	0.88	in^4
I_x =	0.52	in^4
A =	0.89	in^2
g =	1.07	lbs/ft
M_y =	-0.464	k-ft
M_z =	-0.024	k-ft
P_n =	0.242	k
$M_{y\ allowable}$ =	1.460	k-ft
$M_{z\ allowable}$ =	0.513	k-ft
$P_{n\ allowable}$ =	12.764	k
Utilization =	38%	



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).

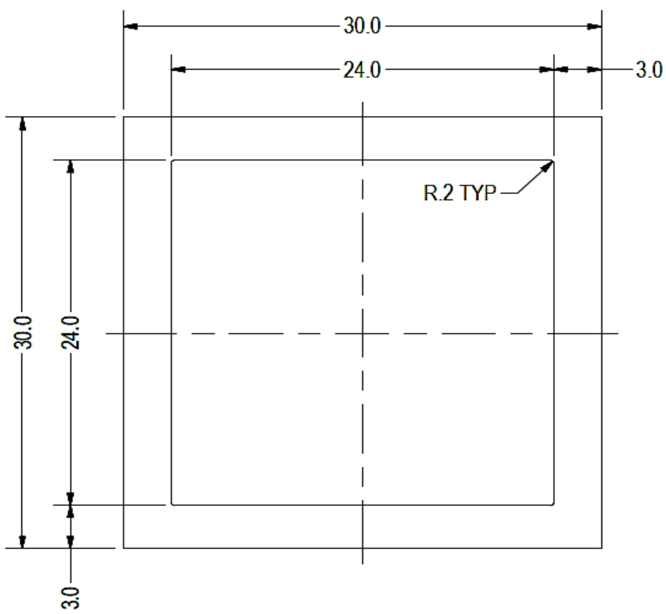
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	18.00	in
$\Phi F_{ty\ AXIAL}$ =	24.52	ksi
$\Phi F_{ty\ BENDING}$ =	31.19	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.701	k
$M_{y\ allowable}$ =	0.423	k-ft
$M_{z\ allowable}$ =	0.423	k-ft
$P_{n\ allowable}$ =	12.310	k
Utilization =	6%	



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).

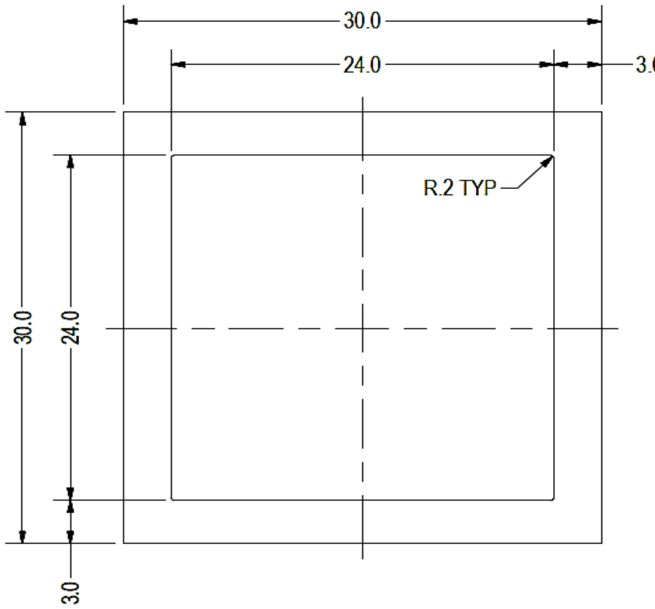
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	46.38	in
$\Phi F_{ty\ AXIAL}$ =	7.60	ksi
$\Phi F_{ty\ BENDING}$ =	29.80	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.587	k
$M_{y\ allowable}$ =	0.404	k-ft
$M_{z\ allowable}$ =	0.404	k-ft
$P_{n\ allowable}$ =	3.814	k
Utilization =	15%	



4.5 Rear Strut Design

An aluminum strut connects the rear portion of the girder to the rear foundation connection. Both vertical and horizontal forces are transferred from the girder. The strut is attached with single M8 bolts at each end. See Appendix A.5 for detailed member calculations. Section units are in (mm).

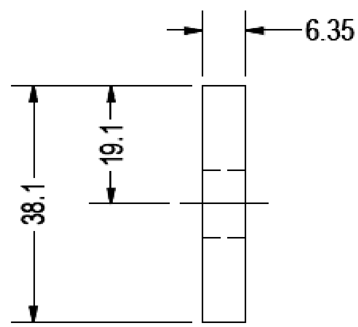
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	39.29	in
$\Phi F_{ty\ AXIAL}$ =	10.06	ksi
$\Phi F_{ty\ BENDING}$ =	30.09	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.608	k
$M_{y\ allowable}$ =	0.408	k-ft
$M_{z\ allowable}$ =	0.408	k-ft
$P_{n\ allowable}$ =	5.050	k
Utilization =	12%	



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 =	0.002	k-ft
P_n =	0.134	k
$M_{y\ allowable}$ =	0.046	k-ft
$P_{n\ allowable}$ =	11.813	k
Utilization =	6%	



A cross brace kit is required every 36 bays and is to be installed in centermost bays.

5. FOUNDATION DESIGN CALCULATIONS

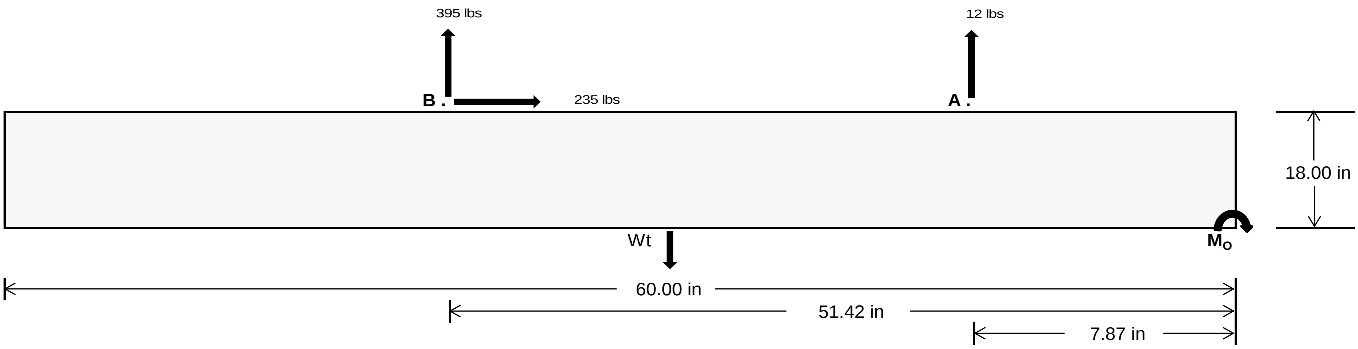
5.1 Helical Pile Foundations

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 =	58.42	1713.73	k
Compressive Load =	911.11	1100.84	k
Lateral Load =	1.57	1019.73	k
Moment (Weak Axis) =	0.00	0.00	k

5.2 Design of Ballast Foundations

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



Concrete Properties

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

Footing Reinforcement

Use fiber reinforcing with (1) #5 rebar.

Overturning Check

M_O = 24634.9 in-lbs
Resisting Force Required = 821.16 lbs
S.F. = 1.67
Weight Required = 1368.61 lbs
Minimum Width = 20 in in
Weight Provided = 1812.50 lbs

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

Sliding

Force = 235.26 lbs
Friction = 0.4
Weight Required = 588.16 lbs
Resisting Weight = 1812.50 lbs
Additional Weight Required = 0 lbs

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

Cohesion

Sliding Force = 235.26 lbs
Cohesion = 130 psf
Area = 8.33 ft^2
Resisting = 906.25 lbs
Additional Weight Required = 0 lbs

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

Shear Key

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

Shear key is not required.

Bearing Pressure

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

ASD LC	1.0D + 1.0S				1.0D + 0.6W				1.0D + 0.75L + 0.45W + 0.75S				0.6D + 0.6W			
Width	20 in	21 in	22 in	23 in	20 in	21 in	22 in	23 in	20 in	21 in	22 in	23 in	20 in	21 in	22 in	23 in
F_A	284 lbs	284 lbs	284 lbs	284 lbs	366 lbs	366 lbs	366 lbs	366 lbs	461 lbs	461 lbs	461 lbs	461 lbs	-25 lbs	-25 lbs	-25 lbs	-25 lbs
F_B	188 lbs	188 lbs	188 lbs	188 lbs	473 lbs	473 lbs	473 lbs	473 lbs	477 lbs	477 lbs	477 lbs	477 lbs	-790 lbs	-790 lbs	-790 lbs	-790 lbs
F_V	22 lbs	22 lbs	22 lbs	22 lbs	419 lbs	419 lbs	419 lbs	419 lbs	329 lbs	329 lbs	329 lbs	329 lbs	-471 lbs	-471 lbs	-471 lbs	-471 lbs
P_{total}	2284 lbs	2375 lbs	2465 lbs	2556 lbs	2652 lbs	2742 lbs	2833 lbs	2924 lbs	2751 lbs	2841 lbs	2932 lbs	3023 lbs	273 lbs	327 lbs	382 lbs	436 lbs
M	221 lbs-ft	221 lbs-ft	221 lbs-ft	221 lbs-ft	460 lbs-ft	460 lbs-ft	460 lbs-ft	460 lbs-ft	492 lbs-ft	492 lbs-ft	492 lbs-ft	492 lbs-ft	658 lbs-ft	658 lbs-ft	658 lbs-ft	658 lbs-ft
e	0.10 ft	0.09 ft	0.09 ft	0.09 ft	0.17 ft	0.17 ft	0.16 ft	0.16 ft	0.18 ft	0.17 ft	0.17 ft	0.16 ft	2.41 ft	2.01 ft	1.72 ft	1.51 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}	242.3 psf	241.1 psf	240.0 psf	239.0 psf	251.9 psf	250.3 psf	248.8 psf	247.4 psf	259.2 psf	257.2 psf	255.4 psf	253.8 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	305.9 psf	301.7 psf	297.9 psf	294.4 psf	384.5 psf	376.6 psf	369.3 psf	362.7 psf	401.0 psf	392.3 psf	384.3 psf	377.1 psf	1215.8 psf	254.4 psf	178.8 psf	153.0 psf

Maximum Bearing Pressure = 1216 psf
Allowable Bearing Pressure = 1500 psf

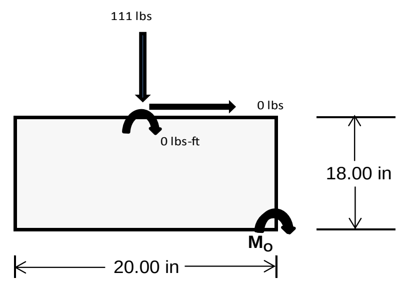
Use a 60in long x 20in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O =	0.0	ft-lbs
Resisting Force Required =	0.00	lbs
S.F. =	1.67	
Weight Required =	0.00	lbs
Minimum Width =	20 in	in
Weight Provided =	1812.50	lbs

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



Bearing Pressure

ASD LC	1.238D + 0.875E			1.1785D + 0.65625E + 0.75S			0.362D + 0.875E		
Width	20 in			20 in			20 in		
Support	Outer	Inner	Outer	Outer	Inner	Outer	Outer	Inner	Outer
F_Y	48 lbs	111 lbs	45 lbs	144 lbs	392 lbs	141 lbs	14 lbs	33 lbs	13 lbs
F_V	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs	0 lbs
P_{total}	2292 lbs	2355 lbs	2289 lbs	2280 lbs	2528 lbs	2277 lbs	670 lbs	689 lbs	669 lbs
M	0 lbs-ft	0 lbs-ft	0 lbs-ft	1 lbs-ft	0 lbs-ft	0 lbs-ft	0 lbs-ft	0 lbs-ft	0 lbs-ft
e	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft	0.00 ft
L/6	0.28 ft	1.67 ft	1.67 ft	1.67 ft	1.67 ft	1.67 ft	1.67 ft	1.67 ft	1.67 ft
f_{min}	274.9 sqft	282.6 sqft	274.6 sqft	273.3 sqft	303.3 sqft	273.1 sqft	80.4 sqft	82.6 sqft	80.3 sqft
f_{max}	275.1 psf	282.7 psf	274.7 psf	273.8 psf	303.5 psf	273.4 psf	80.4 psf	82.6 psf	80.3 psf

Maximum Bearing Pressure = 304 psf
Allowable Bearing Pressure = 1500 psf

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

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

5.3 Foundation Anchors

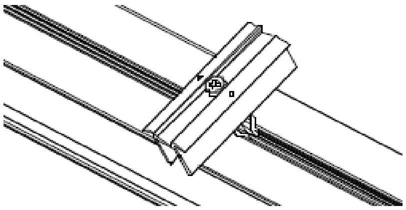
Threaded rods are anchored to the the ballast foundations using the Simpson AT-XP epoxy solution. LRFD load results are compared to the allowable strengths of the epoxy solution. Please see the supplementary calculations provided by the Simpson Anchor Designer software.

6. DESIGN OF JOINTS AND CONNECTIONS

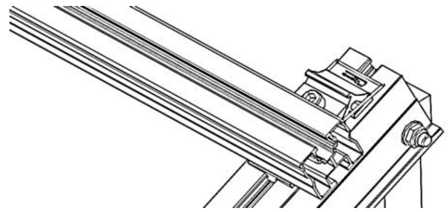
6.1 Anchorage of Modules to Purlins and Connection of Purlins to Girders

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

Fastening of Modules to Purlins		
Maximum Uplifting Force =	0.873	k
Allowable Uplift =	1.214	k
Utilization =	72%	



Fastening of Purlins to Girders		
Maximum Uplifting Force =	1.095	k
Allowable Uplift =	1.116	k
Utilization =	98%	



6.2 Bolted Connections

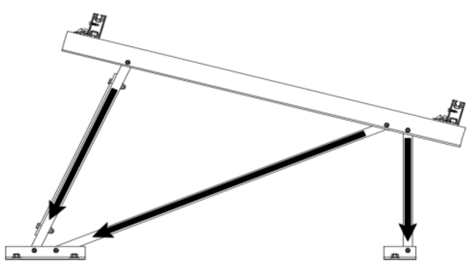
The aluminum struts connect the aluminum girder ends to custom brackets with mounting holes. Cross bracing is attached to rear struts to provide lateral stability. Single M8 bolts are used to attach each end of the strut to the girder and post. ASTM A193/A193M-86 equivalent stainless steel bolts are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

Front Strut		
Maximum Axial Load =	0.701	k
M8 Bolt Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	12%	

Rear Strut		
Maximum Axial Load =	1.068	k
M8 Bolt Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	19%	

Diagonal Strut		
Maximum Axial Load =	0.587	k
M8 Bolt Shear Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	10%	

Bracing		
Maximum Axial Load =	0.134	k
M10 Bolt Capacity =	8.894	k
Strut Bearing Capacity =	7.952	k
Utilization =	2%	



Bolt and bearing capacities are accounting for double shear (ASCE 8-02, Eq. 5.3.4-1). Struts under compression are shown to demonstrate the load transfer from the girder. Single M8 bolts are located at each end of the strut and are subjected to double shear.

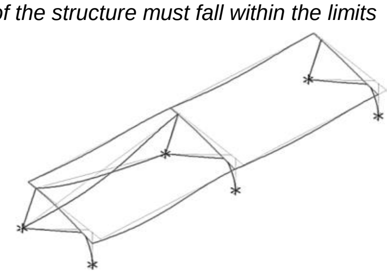
7. SEISMIC DESIGN

7.1 Seismic Drift - 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} =	32.32	in
Allowable Story Drift for All Other Structures, Δ = {	$0.020h_{sx}$	
	0.646	in
Max Drift, Δ_{MAX} =	0.003	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 = 42.00 in

J = 0.255

109.366

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

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= 30.0 ksi

3.4.16

b/t = 7.4

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

Weak Axis:

3.4.14

L_b = 42.00 in

J = 0.255

113.57

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

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= 29.9

3.4.16

b/t = 23.9

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.5 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 23.9

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

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

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

S2 = 77.3
φF_L= 1.3φyFcy
φF_L= 43.2 ksi

$\varphi F_L St$= 30.0 ksi
Ix = 250988 mm^4
0.603 in^4
y = 30 mm
Sx = 0.511 in^3
$M_{max}St$ = 1.276 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 = 1.32

21.4323

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

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 = 1.32

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	**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

3.4.16.2

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 (Strong)

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 (Weak)

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	φF_LWk=	13.5 ksi
Ix =	364470 mm^4	Iy =	217168 mm^4
	0.876 in^4		0.522 in^4
y =	37.77 mm	x =	29 mm
Sx =	0.589 in^3	Sy =	0.457 in^3
M_{max}St =	1.460 k-ft	M_{max}Wk =	0.513 k-ft

Compression

3.4.7

λ =	0.46067
r =	1.374 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.90326

φF_L= φcc(Bc-Dc*λ)

φF_L= 30.1251 ksi

3.4.8

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

3.4.9

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

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

3.4.9.1

b/t = 24.46
t = 2.6
ds = 6.05
rs = 3.49
S = 21.70
ρst = 0.22
F_{UT}= 10.43
F_{ST}= 28.24
φF_L= Fut + (Fst - Fut)ρst < Fst
φF_L= 14.3 ksi

3.4.10

Rb/t = 0.0

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

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

φF_L= 14.29 ksi
A = 576.21 mm^2
0.89 in^2
P_{max} = 12.76 kips

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 18.00 in

J = 0.16

47.2194

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.2 ksi

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L St$= 31.2 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

$M_{max}St$ = 0.423 k-ft

Weak Axis:

3.4.14

L_b = 18.00 in

J = 0.16

47.2194

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.2

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L Wk$= 31.2 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

$M_{max}Wk$ = 0.423 k-ft

Compression

3.4.7

λ = 0.77182

r = 0.437 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.83792

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

φF_L = 24.5226 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

$\varphi F_L = \varphi yFcy$

φF_L = 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

φF_L = 33.3 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

$\varphi F_L = \varphi yFcy$

φF_L = 33.25 ksi

φF_L = 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 in^3

M_{max}St = 0.404 k-ft

Weak Axis:

3.4.14

L_b = 46.38 in

J = 0.16

121.663

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.8

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 33.3 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

M_{max}Wk = 0.450 k-ft

Compression

3.4.7

λ = 1.98863

r = 0.437 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.85841

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

φF_L = 7.59722 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

$\varphi F_L = \varphi yFcy$

φF_L = 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

φF_L = 33.3 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

$\varphi F_L = \varphi yFcy$

φF_L = 33.25 ksi

φF_L = 7.60 ksi

A = 323.87 mm^2

0.50 in^2

P_{max} = 3.81 kips

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

Strut = **<u>30x30x3</u>**

<u>Strong Axis:</u>

3.4.14

L_b = 39.29 in

J = 0.16

103.073

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 30.1 ksi

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1 <u>Not Used</u>

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 30.1 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

M_{max}St = 0.408 k-ft

<u>Weak Axis:</u>

3.4.14

L_b = 39.29 in

J = 0.16

103.073

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 30.1

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 33.3 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

M_{max}Wk = 0.450 k-ft

Compression

3.4.7

λ = 1.68476

r = 0.437 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.81587

φF_L= (φccFcy)/(λ²)

φF_L= 10.0603 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φyFcy

φF_L= 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

φF_L= φyFcy

φF_L= 33.25 ksi

φF_L= 10.06 ksi

A = 323.87 mm^2

0.50 in^2

P_{max} = 5.05 kips

APPENDIX B

B.1

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

Basic Load Cases

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

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

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

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

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

Member Distributed Loads (BLC 3 : Snow Load)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	Y	-45.999	-45.999	0	0
2	M16	Y	-45.999	-45.999	0	0

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

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	y	-128.904	-128.904	0	0
2	M16	y	-207.368	-207.368	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	257.809	257.809	0	0
2	M16	y	123.3	123.3	0	0

Load Combinations

	Description	S...	P...	S...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	LRFD 1.2D + 1.6S + 0.5W	Yes	Y		1	1.2	3	1.6	4	.5														
2	LRFD 1.2D + 1.0W + 0.5S	Yes	Y		1	1.2	3	.5	4	1														
3	LRFD 0.9D + 1.0W	Yes	Y		2	.9					5	1												
4	LATERAL - LRFD 1.54D + 1.3E ...	Yes	Y		1	1.54	3	.2			6	1.3												
5	LATERAL - LRFD 0.56D + 1.3E	Yes	Y		1	.56					6	1.3												
6	LATERAL - LRFD 1.54D + 1.25...	Yes	Y		1	1.54	3	.2			6	1.25												
7	LATERAL - LRFD 0.56D + 1.25E	Yes	Y		1	.56					6	1.25												
8																								
9	ASD 1.0D + 1.0S	Yes	Y		1	1	3	1																
10	ASD 1.0D + 0.6W	Yes	Y		1	1			4	.6														
11	ASD 1.0D + 0.75L + 0.45W + 0....	Yes	Y		1	1	3	.75	4	.45														
12	ASD 0.6D + 0.6W	Yes	Y		2	.6					5	.6												
13	LATERAL - ASD 1.238D + 0.875E	Yes	Y		1	1.2...					6	.875												
14	LATERAL - ASD 1.1785D + 0.65...	Yes	Y		1	1.1...	3	.75			6	.656												
15	LATERAL - ASD 0.362D + 0.875E	Yes	Y		1	.362					6	.875												

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N8	max	235.754	2	281.067	2	.006	10	0	10	0	1	0	1
2		min	-274.298	3	-429.03	3	-.165	3	0	3	0	1	0	1
3	N7	max	.002	3	246.199	1	.057	10	0	10	0	1	0	1
4		min	-.125	2	3.643	12	-.432	1	0	1	0	1	0	1
5	N15	max	0	15	700.85	2	.081	9	0	9	0	1	0	1
6		min	-1.205	2	-44.94	3	-.75	3	-.001	3	0	1	0	1
7	N16	max	706.901	2	846.801	2	0	2	0	9	0	1	0	1
8		min	-784.405	3	-1318.253	3	-96.325	3	0	3	0	1	0	1
9	N23	max	.002	3	246.553	1	.464	3	0	3	0	1	0	1
10		min	-.126	2	4.14	12	-.056	10	0	10	0	1	0	1
11	N24	max	235.754	2	283.306	2	97.205	3	0	9	0	1	0	1
12		min	-275.117	3	-428.755	3	-.006	10	0	3	0	1	0	1
13	Totals:	max	1176.952	2	2558.404	2	0	1						
14		min	-1333.881	3	-2211.29	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	198.209	2	.656	4	.064	1	0	10	0	10	0	1
2			min	-366.522	3	.154	15	-.079	3	0	3	0	1	0	1
3		2	max	198.335	2	.605	4	.064	1	0	10	0	10	0	15
4			min	-366.428	3	.142	15	-.079	3	0	3	0	3	0	4
5		3	max	198.461	2	.554	4	.064	1	0	10	0	15	0	15
6			min	-366.334	3	.13	15	-.079	3	0	3	0	3	0	4
7		4	max	198.587	2	.503	4	.064	1	0	10	0	9	0	15
8			min	-366.239	3	.118	15	-.079	3	0	3	0	3	0	4
9		5	max	198.713	2	.451	4	.064	1	0	10	0	9	0	15
10			min	-366.145	3	.106	15	-.079	3	0	3	0	3	0	4
11		6	max	198.839	2	.4	4	.064	1	0	10	0	9	0	15
12			min	-366.05	3	.094	15	-.079	3	0	3	0	3	0	4
13		7	max	198.964	2	.349	4	.064	1	0	10	0	9	0	15
14			min	-365.956	3	.082	15	-.079	3	0	3	0	3	0	4
15		8	max	199.09	2	.298	4	.064	1	0	10	0	9	0	15
16			min	-365.862	3	.07	15	-.079	3	0	3	0	3	0	4
17		9	max	199.216	2	.247	4	.064	1	0	10	0	9	0	15
18			min	-365.767	3	.058	15	-.079	3	0	3	0	3	0	4
19		10	max	199.342	2	.196	4	.064	1	0	10	0	9	0	15
20			min	-365.673	3	.046	15	-.079	3	0	3	0	3	0	4
21		11	max	199.468	2	.145	4	.064	1	0	10	0	9	0	15
22			min	-365.578	3	.033	12	-.079	3	0	3	0	3	0	4
23		12	max	199.594	2	.105	2	.064	1	0	10	0	9	0	15
24			min	-365.484	3	.013	12	-.079	3	0	3	0	3	0	4
25		13	max	199.72	2	.065	2	.064	1	0	10	0	9	0	15
26			min	-365.39	3	-.015	3	-.079	3	0	3	0	3	0	4
27		14	max	199.845	2	.025	2	.064	1	0	10	0	9	0	15
28			min	-365.295	3	-.045	3	-.079	3	0	3	0	3	0	4
29		15	max	199.971	2	-.014	15	.064	1	0	10	0	9	0	15
30			min	-365.201	3	-.074	3	-.079	3	0	3	0	3	0	4
31		16	max	200.097	2	-.026	15	.064	1	0	10	0	9	0	15
32			min	-365.106	3	-.111	4	-.079	3	0	3	0	3	0	4
33		17	max	200.223	2	-.038	15	.064	1	0	10	0	9	0	15
34			min	-365.012	3	-.162	4	-.079	3	0	3	0	3	0	4
35		18	max	200.349	2	-.05	15	.064	1	0	10	0	9	0	15
36			min	-364.918	3	-.213	4	-.079	3	0	3	0	3	0	4
37		19	max	200.475	2	-.062	15	.064	1	0	10	0	9	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	-364.823	3	-.264	4	-.079	3	0	3	0	3	0	4
39	M3	1	max	197.13	2	1.759	4	.011	10	0	10	0	1	0	4
40			min	-182.966	3	.414	15	-.099	1	0	1	0	10	0	15
41		2	max	197.06	2	1.582	4	.011	10	0	10	0	1	0	2
42			min	-183.018	3	.372	15	-.099	1	0	1	0	10	0	12
43		3	max	196.991	2	1.405	4	.011	10	0	10	0	1	0	2
44			min	-183.07	3	.33	15	-.099	1	0	1	0	10	0	3
45		4	max	196.922	2	1.229	4	.011	10	0	10	0	1	0	15
46			min	-183.122	3	.289	15	-.099	1	0	1	0	10	0	4
47		5	max	196.852	2	1.052	4	.011	10	0	10	0	1	0	15
48			min	-183.174	3	.247	15	-.099	1	0	1	0	10	0	4
49		6	max	196.783	2	.875	4	.011	10	0	10	0	1	0	15
50			min	-183.226	3	.206	15	-.099	1	0	1	0	10	0	4
51		7	max	196.714	2	.698	4	.011	10	0	10	0	1	0	15
52			min	-183.278	3	.164	15	-.099	1	0	1	0	10	0	4
53		8	max	196.644	2	.521	4	.011	10	0	10	0	1	0	15
54			min	-183.33	3	.123	15	-.099	1	0	1	0	10	-.001	4
55		9	max	196.575	2	.344	4	.011	10	0	10	0	1	0	15
56			min	-183.382	3	.081	15	-.099	1	0	1	0	10	-.001	4
57		10	max	196.506	2	.168	4	.011	10	0	10	0	1	0	15
58			min	-183.434	3	.04	15	-.099	1	0	1	0	10	-.001	4
59		11	max	196.436	2	.02	2	.011	10	0	10	0	1	0	15
60			min	-183.486	3	-.039	3	-.099	1	0	1	0	10	-.001	4
61		12	max	196.367	2	-.044	15	.011	10	0	10	0	1	0	15
62			min	-183.538	3	-.186	4	-.099	1	0	1	0	10	-.001	4
63		13	max	196.298	2	-.085	15	.011	10	0	10	0	1	0	15
64			min	-183.59	3	-.363	4	-.099	1	0	1	0	10	-.001	4
65		14	max	196.228	2	-.127	15	.011	10	0	10	0	1	0	15
66			min	-183.642	3	-.54	4	-.099	1	0	1	0	10	-.001	4
67		15	max	196.159	2	-.168	15	.011	10	0	10	0	9	0	15
68			min	-183.694	3	-.717	4	-.099	1	0	1	0	10	0	4
69		16	max	196.09	2	-.21	15	.011	10	0	10	0	9	0	15
70			min	-183.746	3	-.893	4	-.099	1	0	1	0	1	0	4
71		17	max	196.02	2	-.251	15	.011	10	0	10	0	10	0	15
72			min	-183.798	3	-1.07	4	-.099	1	0	1	0	1	0	4
73		18	max	195.951	2	-.293	15	.011	10	0	10	0	10	0	15
74			min	-183.85	3	-1.247	4	-.099	1	0	1	0	1	0	4
75		19	max	195.882	2	-.335	15	.011	10	0	10	0	10	0	1
76			min	-183.902	3	-1.424	4	-.099	1	0	1	0	1	0	1
77	M4	1	max	245.034	1	0	1	.058	10	0	1	0	3	0	1
78			min	3.061	12	0	1	-.45	1	0	1	0	2	0	1
79		2	max	245.099	1	0	1	.058	10	0	1	0	10	0	1
80			min	3.093	12	0	1	-.45	1	0	1	0	1	0	1
81		3	max	245.163	1	0	1	.058	10	0	1	0	10	0	1
82			min	3.125	12	0	1	-.45	1	0	1	0	1	0	1
83		4	max	245.228	1	0	1	.058	10	0	1	0	10	0	1
84			min	3.158	12	0	1	-.45	1	0	1	0	1	0	1
85		5	max	245.293	1	0	1	.058	10	0	1	0	10	0	1
86			min	3.19	12	0	1	-.45	1	0	1	0	1	0	1
87		6	max	245.357	1	0	1	.058	10	0	1	0	10	0	1
88			min	3.223	12	0	1	-.45	1	0	1	0	1	0	1
89		7	max	245.422	1	0	1	.058	10	0	1	0	10	0	1
90			min	3.255	12	0	1	-.45	1	0	1	0	1	0	1
91		8	max	245.487	1	0	1	.058	10	0	1	0	10	0	1
92			min	3.287	12	0	1	-.45	1	0	1	0	1	0	1
93		9	max	245.552	1	0	1	.058	10	0	1	0	10	0	1
94			min	3.32	12	0	1	-.45	1	0	1	0	1	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
95		10	max	245.616	1	0	1	.058	10	0	1	0	10	0	1
96			min	3.352	12	0	1	-.45	1	0	1	0	1	0	1
97		11	max	245.681	1	0	1	.058	10	0	1	0	10	0	1
98			min	3.384	12	0	1	-.45	1	0	1	0	1	0	1
99		12	max	245.746	1	0	1	.058	10	0	1	0	10	0	1
100			min	3.417	12	0	1	-.45	1	0	1	0	1	0	1
101		13	max	245.81	1	0	1	.058	10	0	1	0	10	0	1
102			min	3.449	12	0	1	-.45	1	0	1	0	1	0	1
103		14	max	245.875	1	0	1	.058	10	0	1	0	10	0	1
104			min	3.481	12	0	1	-.45	1	0	1	0	1	0	1
105		15	max	245.94	1	0	1	.058	10	0	1	0	10	0	1
106			min	3.514	12	0	1	-.45	1	0	1	0	1	0	1
107		16	max	246.005	1	0	1	.058	10	0	1	0	10	0	1
108			min	3.546	12	0	1	-.45	1	0	1	0	1	0	1
109		17	max	246.069	1	0	1	.058	10	0	1	0	10	0	1
110			min	3.578	12	0	1	-.45	1	0	1	0	1	0	1
111		18	max	246.134	1	0	1	.058	10	0	1	0	10	0	1
112			min	3.611	12	0	1	-.45	1	0	1	0	1	0	1
113		19	max	246.199	1	0	1	.058	10	0	1	0	10	0	1
114			min	3.643	12	0	1	-.45	1	0	1	0	1	0	1
115	M6	1	max	605.858	2	.655	4	.011	9	0	3	0	3	0	1
116			min	-1067.959	3	.154	15	-.305	3	0	1	0	1	0	1
117		2	max	605.984	2	.604	4	.011	9	0	3	0	3	0	15
118			min	-1067.864	3	.142	15	-.305	3	0	1	0	1	0	4
119		3	max	606.11	2	.553	4	.011	9	0	3	0	3	0	15
120			min	-1067.77	3	.13	15	-.305	3	0	1	0	1	0	4
121		4	max	606.236	2	.502	4	.011	9	0	3	0	3	0	15
122			min	-1067.676	3	.118	15	-.305	3	0	1	0	1	0	4
123		5	max	606.362	2	.451	4	.011	9	0	3	0	3	0	15
124			min	-1067.581	3	.106	15	-.305	3	0	1	0	1	0	4
125		6	max	606.487	2	.404	2	.011	9	0	3	0	3	0	15
126			min	-1067.487	3	.087	12	-.305	3	0	1	0	1	0	4
127		7	max	606.613	2	.365	2	.011	9	0	3	0	9	0	15
128			min	-1067.392	3	.067	12	-.305	3	0	1	0	1	0	4
129		8	max	606.739	2	.325	2	.011	9	0	3	0	9	0	15
130			min	-1067.298	3	.047	12	-.305	3	0	1	0	3	0	4
131		9	max	606.865	2	.285	2	.011	9	0	3	0	9	0	15
132			min	-1067.204	3	.027	12	-.305	3	0	1	0	3	0	4
133		10	max	606.991	2	.245	2	.011	9	0	3	0	9	0	12
134			min	-1067.109	3	0	3	-.305	3	0	1	0	3	0	4
135		11	max	607.117	2	.205	2	.011	9	0	3	0	9	0	12
136			min	-1067.015	3	-.031	3	-.305	3	0	1	0	3	0	2
137		12	max	607.243	2	.165	2	.011	9	0	3	0	9	0	12
138			min	-1066.92	3	-.06	3	-.305	3	0	1	0	3	0	2
139		13	max	607.369	2	.126	2	.011	9	0	3	0	9	0	12
140			min	-1066.826	3	-.09	3	-.305	3	0	1	0	3	0	2
141		14	max	607.494	2	.086	2	.011	9	0	3	0	9	0	12
142			min	-1066.732	3	-.12	3	-.305	3	0	1	0	3	0	2
143		15	max	607.62	2	.046	2	.011	9	0	3	0	9	0	12
144			min	-1066.637	3	-.15	3	-.305	3	0	1	0	3	0	2
145		16	max	607.746	2	.006	2	.011	9	0	3	0	9	0	12
146			min	-1066.543	3	-.18	3	-.305	3	0	1	0	3	0	2
147		17	max	607.872	2	-.034	2	.011	9	0	3	0	9	0	12
148			min	-1066.448	3	-.21	3	-.305	3	0	1	0	3	0	2
149		18	max	607.998	2	-.05	15	.011	9	0	3	0	9	0	3
150			min	-1066.354	3	-.24	3	-.305	3	0	1	0	3	0	2
151		19	max	608.124	2	-.062	15	.011	9	0	3	0	9	0	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
152			min	-1066.26	3	-.27	3	-.305	3	0	1	0	3	0	2
153	M7	1	max	587.349	2	1.761	4	.042	3	0	9	0	9	0	2
154			min	-485.767	3	.414	15	-.003	9	0	3	0	3	0	3
155		2	max	587.28	2	1.584	4	.042	3	0	9	0	9	0	2
156			min	-485.819	3	.372	15	-.003	9	0	3	0	3	0	3
157		3	max	587.21	2	1.407	4	.042	3	0	9	0	9	0	2
158			min	-485.871	3	.331	15	-.003	9	0	3	0	3	0	3
159		4	max	587.141	2	1.23	4	.042	3	0	9	0	9	0	2
160			min	-485.923	3	.289	15	-.003	9	0	3	0	3	0	3
161		5	max	587.072	2	1.054	4	.042	3	0	9	0	9	0	15
162			min	-485.975	3	.248	15	-.003	9	0	3	0	3	0	3
163		6	max	587.002	2	.877	4	.042	3	0	9	0	9	0	15
164			min	-486.027	3	.206	15	-.003	9	0	3	0	3	0	4
165		7	max	586.933	2	.7	4	.042	3	0	9	0	9	0	15
166			min	-486.079	3	.165	15	-.003	9	0	3	0	3	0	4
167		8	max	586.864	2	.523	4	.042	3	0	9	0	9	0	15
168			min	-486.131	3	.123	15	-.003	9	0	3	0	3	-.001	4
169		9	max	586.794	2	.348	2	.042	3	0	9	0	9	0	15
170			min	-486.183	3	.081	12	-.003	9	0	3	0	3	-.001	4
171		10	max	586.725	2	.21	2	.042	3	0	9	0	9	0	15
172			min	-486.235	3	.009	3	-.003	9	0	3	0	3	-.001	4
173		11	max	586.656	2	.072	2	.042	3	0	9	0	9	0	15
174			min	-486.287	3	-.095	3	-.003	9	0	3	0	3	-.001	4
175		12	max	586.587	2	-.043	15	.042	3	0	9	0	9	0	15
176			min	-486.339	3	-.198	3	-.003	9	0	3	0	3	-.001	4
177		13	max	586.517	2	-.085	15	.042	3	0	9	0	9	0	15
178			min	-486.391	3	-.361	4	-.003	9	0	3	0	3	-.001	4
179		14	max	586.448	2	-.126	15	.042	3	0	9	0	9	0	15
180			min	-486.443	3	-.538	4	-.003	9	0	3	0	3	-.001	4
181		15	max	586.379	2	-.168	15	.042	3	0	9	0	9	0	15
182			min	-486.495	3	-.715	4	-.003	9	0	3	0	3	0	4
183		16	max	586.309	2	-.21	15	.042	3	0	9	0	9	0	15
184			min	-486.547	3	-.892	4	-.003	9	0	3	0	3	0	4
185		17	max	586.24	2	-.251	15	.042	3	0	9	0	9	0	15
186			min	-486.599	3	-1.068	4	-.003	9	0	3	0	3	0	4
187		18	max	586.171	2	-.293	15	.042	3	0	9	0	9	0	15
188			min	-486.651	3	-1.245	4	-.003	9	0	3	0	3	0	4
189		19	max	586.101	2	-.334	15	.042	3	0	9	0	9	0	1
190			min	-486.703	3	-1.422	4	-.003	9	0	3	0	3	0	1
191	M8	1	max	699.686	2	0	1	.085	9	0	1	0	1	0	1
192			min	-45.814	3	0	1	-.744	3	0	1	0	3	0	1
193		2	max	699.75	2	0	1	.085	9	0	1	0	9	0	1
194			min	-45.765	3	0	1	-.744	3	0	1	0	3	0	1
195		3	max	699.815	2	0	1	.085	9	0	1	0	9	0	1
196			min	-45.717	3	0	1	-.744	3	0	1	0	3	0	1
197		4	max	699.88	2	0	1	.085	9	0	1	0	9	0	1
198			min	-45.668	3	0	1	-.744	3	0	1	0	3	0	1
199		5	max	699.944	2	0	1	.085	9	0	1	0	9	0	1
200			min	-45.62	3	0	1	-.744	3	0	1	0	3	0	1
201		6	max	700.009	2	0	1	.085	9	0	1	0	9	0	1
202			min	-45.571	3	0	1	-.744	3	0	1	0	3	0	1
203		7	max	700.074	2	0	1	.085	9	0	1	0	9	0	1
204			min	-45.523	3	0	1	-.744	3	0	1	0	3	0	1
205		8	max	700.139	2	0	1	.085	9	0	1	0	9	0	1
206			min	-45.474	3	0	1	-.744	3	0	1	0	3	0	1
207		9	max	700.203	2	0	1	.085	9	0	1	0	9	0	1
208			min	-45.425	3	0	1	-.744	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	700.268	2	0	1	.085	9	0	1	0	9	0	1
210			min	-45.377	3	0	1	-.744	3	0	1	0	3	0	1
211		11	max	700.333	2	0	1	.085	9	0	1	0	9	0	1
212			min	-45.328	3	0	1	-.744	3	0	1	0	3	0	1
213		12	max	700.397	2	0	1	.085	9	0	1	0	9	0	1
214			min	-45.28	3	0	1	-.744	3	0	1	0	3	0	1
215		13	max	700.462	2	0	1	.085	9	0	1	0	9	0	1
216			min	-45.231	3	0	1	-.744	3	0	1	0	3	0	1
217		14	max	700.527	2	0	1	.085	9	0	1	0	9	0	1
218			min	-45.183	3	0	1	-.744	3	0	1	0	3	0	1
219		15	max	700.592	2	0	1	.085	9	0	1	0	9	0	1
220			min	-45.134	3	0	1	-.744	3	0	1	0	3	0	1
221		16	max	700.656	2	0	1	.085	9	0	1	0	9	0	1
222			min	-45.086	3	0	1	-.744	3	0	1	0	3	0	1
223		17	max	700.721	2	0	1	.085	9	0	1	0	9	0	1
224			min	-45.037	3	0	1	-.744	3	0	1	-.001	3	0	1
225		18	max	700.786	2	0	1	.085	9	0	1	0	9	0	1
226			min	-44.989	3	0	1	-.744	3	0	1	-.001	3	0	1
227		19	max	700.85	2	0	1	.085	9	0	1	0	9	0	1
228			min	-44.94	3	0	1	-.744	3	0	1	-.001	3	0	1
229	M10	1	max	199.384	2	.656	4	.005	10	0	1	0	9	0	1
230			min	-275.478	3	.154	15	-.065	1	0	3	0	3	0	1
231		2	max	199.51	2	.605	4	.005	10	0	1	0	9	0	15
232			min	-275.384	3	.142	15	-.065	1	0	3	0	3	0	4
233		3	max	199.636	2	.554	4	.005	10	0	1	0	9	0	15
234			min	-275.289	3	.13	15	-.065	1	0	3	0	3	0	4
235		4	max	199.762	2	.503	4	.005	10	0	1	0	9	0	15
236			min	-275.195	3	.118	15	-.065	1	0	3	0	3	0	4
237		5	max	199.888	2	.451	4	.005	10	0	1	0	9	0	15
238			min	-275.1	3	.106	15	-.065	1	0	3	0	3	0	4
239		6	max	200.014	2	.4	4	.005	10	0	1	0	9	0	15
240			min	-275.006	3	.094	15	-.065	1	0	3	0	3	0	4
241		7	max	200.14	2	.349	4	.005	10	0	1	0	9	0	15
242			min	-274.912	3	.082	15	-.065	1	0	3	0	3	0	4
243		8	max	200.265	2	.298	4	.005	10	0	1	0	10	0	15
244			min	-274.817	3	.07	15	-.065	1	0	3	0	3	0	4
245		9	max	200.391	2	.247	4	.005	10	0	1	0	10	0	15
246			min	-274.723	3	.058	15	-.065	1	0	3	0	3	0	4
247		10	max	200.517	2	.196	4	.005	10	0	1	0	10	0	15
248			min	-274.628	3	.046	15	-.065	1	0	3	0	3	0	4
249		11	max	200.643	2	.145	4	.005	10	0	1	0	10	0	15
250			min	-274.534	3	.034	15	-.065	1	0	3	0	3	0	4
251		12	max	200.769	2	.105	2	.005	10	0	1	0	10	0	15
252			min	-274.44	3	.018	12	-.065	1	0	3	0	3	0	4
253		13	max	200.895	2	.065	2	.005	10	0	1	0	10	0	15
254			min	-274.345	3	-.006	3	-.065	1	0	3	0	3	0	4
255		14	max	201.021	2	.025	2	.005	10	0	1	0	10	0	15
256			min	-274.251	3	-.036	3	-.065	1	0	3	0	3	0	4
257		15	max	201.147	2	-.014	15	.005	10	0	1	0	10	0	15
258			min	-274.156	3	-.065	3	-.065	1	0	3	0	3	0	4
259		16	max	201.272	2	-.026	15	.005	10	0	1	0	10	0	15
260			min	-274.062	3	-.111	4	-.065	1	0	3	0	3	0	4
261		17	max	201.398	2	-.038	15	.005	10	0	1	0	10	0	15
262			min	-273.968	3	-.162	4	-.065	1	0	3	0	3	0	4
263		18	max	201.524	2	-.05	15	.005	10	0	1	0	10	0	15
264			min	-273.873	3	-.213	4	-.065	1	0	3	0	3	0	4
265		19	max	201.65	2	-.062	15	.005	10	0	1	0	10	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	-273.779	3	-.265	4	-.065	1	0	3	0	3	0	4
267	M11	1	max	196.733	2	1.759	4	.099	1	0	3	0	3	0	4
268			min	-183.933	3	.414	15	-.061	3	0	10	0	1	0	15
269		2	max	196.664	2	1.582	4	.099	1	0	3	0	3	0	2
270			min	-183.985	3	.372	15	-.061	3	0	10	0	1	0	12
271		3	max	196.595	2	1.405	4	.099	1	0	3	0	3	0	2
272			min	-184.037	3	.33	15	-.061	3	0	10	0	1	0	3
273		4	max	196.525	2	1.229	4	.099	1	0	3	0	3	0	15
274			min	-184.089	3	.289	15	-.061	3	0	10	0	1	0	4
275		5	max	196.456	2	1.052	4	.099	1	0	3	0	3	0	15
276			min	-184.141	3	.247	15	-.061	3	0	10	0	1	0	4
277		6	max	196.387	2	.875	4	.099	1	0	3	0	3	0	15
278			min	-184.193	3	.206	15	-.061	3	0	10	0	1	0	4
279		7	max	196.317	2	.698	4	.099	1	0	3	0	3	0	15
280			min	-184.245	3	.164	15	-.061	3	0	10	0	1	0	4
281		8	max	196.248	2	.521	4	.099	1	0	3	0	3	0	15
282			min	-184.297	3	.123	15	-.061	3	0	10	0	1	-.001	4
283		9	max	196.179	2	.344	4	.099	1	0	3	0	3	0	15
284			min	-184.349	3	.081	15	-.061	3	0	10	0	1	-.001	4
285		10	max	196.109	2	.168	4	.099	1	0	3	0	3	0	15
286			min	-184.401	3	.039	15	-.061	3	0	10	0	1	-.001	4
287		11	max	196.04	2	.02	2	.099	1	0	3	0	3	0	15
288			min	-184.453	3	-.04	3	-.061	3	0	10	0	1	-.001	4
289		12	max	195.971	2	-.044	15	.099	1	0	3	0	3	0	15
290			min	-184.505	3	-.186	4	-.061	3	0	10	0	1	-.001	4
291		13	max	195.901	2	-.085	15	.099	1	0	3	0	3	0	15
292			min	-184.557	3	-.363	4	-.061	3	0	10	0	1	-.001	4
293		14	max	195.832	2	-.127	15	.099	1	0	3	0	3	0	15
294			min	-184.609	3	-.54	4	-.061	3	0	10	0	1	-.001	4
295		15	max	195.763	2	-.168	15	.099	1	0	3	0	3	0	15
296			min	-184.661	3	-.717	4	-.061	3	0	10	0	1	0	4
297		16	max	195.693	2	-.21	15	.099	1	0	3	0	3	0	15
298			min	-184.713	3	-.893	4	-.061	3	0	10	0	10	0	4
299		17	max	195.624	2	-.251	15	.099	1	0	3	0	3	0	15
300			min	-184.765	3	-1.07	4	-.061	3	0	10	0	10	0	4
301		18	max	195.555	2	-.293	15	.099	1	0	3	0	3	0	15
302			min	-184.817	3	-1.247	4	-.061	3	0	10	0	10	0	4
303		19	max	195.485	2	-.335	15	.099	1	0	3	0	3	0	1
304			min	-184.869	3	-1.424	4	-.061	3	0	10	0	10	0	1
305	M12	1	max	245.388	1	0	1	.464	3	0	1	0	2	0	1
306			min	3.558	12	0	1	-.057	10	0	1	0	3	0	1
307		2	max	245.453	1	0	1	.464	3	0	1	0	1	0	1
308			min	3.59	12	0	1	-.057	10	0	1	0	10	0	1
309		3	max	245.517	1	0	1	.464	3	0	1	0	1	0	1
310			min	3.623	12	0	1	-.057	10	0	1	0	10	0	1
311		4	max	245.582	1	0	1	.464	3	0	1	0	1	0	1
312			min	3.655	12	0	1	-.057	10	0	1	0	10	0	1
313		5	max	245.647	1	0	1	.464	3	0	1	0	1	0	1
314			min	3.687	12	0	1	-.057	10	0	1	0	10	0	1
315		6	max	245.711	1	0	1	.464	3	0	1	0	1	0	1
316			min	3.72	12	0	1	-.057	10	0	1	0	10	0	1
317		7	max	245.776	1	0	1	.464	3	0	1	0	1	0	1
318			min	3.752	12	0	1	-.057	10	0	1	0	10	0	1
319		8	max	245.841	1	0	1	.464	3	0	1	0	1	0	1
320			min	3.784	12	0	1	-.057	10	0	1	0	10	0	1
321		9	max	245.906	1	0	1	.464	3	0	1	0	1	0	1
322			min	3.817	12	0	1	-.057	10	0	1	0	10	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
323		10	max	245.97	1	0	1	.464	3	0	1	0	1	0	1
324			min	3.849	12	0	1	-.057	10	0	1	0	10	0	1
325		11	max	246.035	1	0	1	.464	3	0	1	0	1	0	1
326			min	3.881	12	0	1	-.057	10	0	1	0	10	0	1
327		12	max	246.1	1	0	1	.464	3	0	1	0	1	0	1
328			min	3.914	12	0	1	-.057	10	0	1	0	10	0	1
329		13	max	246.164	1	0	1	.464	3	0	1	0	1	0	1
330			min	3.946	12	0	1	-.057	10	0	1	0	10	0	1
331		14	max	246.229	1	0	1	.464	3	0	1	0	3	0	1
332			min	3.979	12	0	1	-.057	10	0	1	0	10	0	1
333		15	max	246.294	1	0	1	.464	3	0	1	0	3	0	1
334			min	4.011	12	0	1	-.057	10	0	1	0	10	0	1
335		16	max	246.358	1	0	1	.464	3	0	1	0	3	0	1
336			min	4.043	12	0	1	-.057	10	0	1	0	10	0	1
337		17	max	246.423	1	0	1	.464	3	0	1	0	3	0	1
338			min	4.076	12	0	1	-.057	10	0	1	0	10	0	1
339		18	max	246.488	1	0	1	.464	3	0	1	0	3	0	1
340			min	4.108	12	0	1	-.057	10	0	1	0	10	0	1
341		19	max	246.553	1	0	1	.464	3	0	1	0	3	0	1
342			min	4.14	12	0	1	-.057	10	0	1	0	10	0	1
343	M1	1	max	64.647	1	345.815	3	1.378	10	0	2	.024	1	0	2
344			min	2.731	15	-218.968	2	-12.148	1	0	3	-.003	10	0	3
345		2	max	64.787	1	345.633	3	1.378	10	0	2	.021	1	.048	2
346			min	2.773	15	-219.21	2	-12.148	1	0	3	-.002	10	-.075	3
347		3	max	92.725	3	3.806	9	1.373	10	0	10	.018	1	.095	2
348			min	-20.763	2	-25.711	2	-12.113	1	0	1	-.002	10	-.149	3
349		4	max	92.829	3	3.605	9	1.373	10	0	10	.016	1	.1	2
350			min	-20.623	2	-25.953	2	-12.113	1	0	1	-.002	10	-.146	3
351		5	max	92.934	3	3.403	9	1.373	10	0	10	.013	1	.106	2
352			min	-20.484	2	-26.195	2	-12.113	1	0	1	-.002	10	-.143	3
353		6	max	93.039	3	3.202	9	1.373	10	0	10	.011	1	.112	2
354			min	-20.344	2	-26.437	2	-12.113	1	0	1	-.001	10	-.141	3
355		7	max	93.143	3	3	9	1.373	10	0	10	.008	1	.117	2
356			min	-20.205	2	-26.678	2	-12.113	1	0	1	0	10	-.138	3
357		8	max	93.248	3	2.799	9	1.373	10	0	10	.005	1	.123	2
358			min	-20.065	2	-26.92	2	-12.113	1	0	1	0	10	-.135	3
359		9	max	93.353	3	2.597	9	1.373	10	0	10	.003	3	.129	2
360			min	-19.925	2	-27.162	2	-12.113	1	0	1	0	10	-.132	3
361		10	max	93.458	3	2.396	9	1.373	10	0	10	.002	3	.135	2
362			min	-19.786	2	-27.404	2	-12.113	1	0	1	0	10	-.129	3
363		11	max	93.562	3	2.194	9	1.373	10	0	10	0	3	.141	2
364			min	-19.646	2	-27.646	2	-12.113	1	0	1	-.003	1	-.126	3
365		12	max	93.667	3	1.992	9	1.373	10	0	10	0	10	.147	2
366			min	-19.507	2	-27.888	2	-12.113	1	0	1	-.005	1	-.123	3
367		13	max	93.772	3	1.791	9	1.373	10	0	10	0	10	.153	2
368			min	-19.367	2	-28.129	2	-12.113	1	0	1	-.008	1	-.12	3
369		14	max	93.876	3	1.589	9	1.373	10	0	10	.001	10	.159	2
370			min	-19.227	2	-28.371	2	-12.113	1	0	1	-.01	1	-.117	3
371		15	max	93.981	3	1.388	9	1.373	10	0	10	.001	10	.165	2
372			min	-19.088	2	-28.613	2	-12.113	1	0	1	-.013	1	-.114	3
373		16	max	89.451	2	134.608	2	1.383	10	0	1	.002	10	.17	2
374			min	-6.169	3	-168.987	3	-12.2	1	0	3	-.016	1	-.109	3
375		17	max	89.59	2	134.366	2	1.383	10	0	1	.002	10	.141	2
376			min	-6.065	3	-169.168	3	-12.2	1	0	3	-.018	1	-.072	3
377		18	max	-2.772	15	325.79	2	1.441	10	0	3	.002	10	.071	2
378			min	-64.781	1	-166.245	3	-12.658	1	0	2	-.021	1	-.036	3
379		19	max	-2.73	15	325.548	2	1.441	10	0	3	.003	10	0	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
380			min	-64.641	1	-166.426	3	-12.658	1	0	2	-.024	1	0	3
381	M5	1	max	167.963	1	1082.992	3	0	1	0	9	.013	3	0	3
382			min	-8.229	3	-673.427	2	-87.508	3	0	3	0	11	0	2
383		2	max	168.103	1	1082.811	3	0	1	0	9	0	9	.145	2
384			min	-8.124	3	-673.669	2	-87.508	3	0	3	-.006	3	-.234	3
385		3	max	241.647	3	4.636	9	9.297	3	0	3	0	9	.289	2
386			min	-51.479	2	-82.542	2	-.098	9	0	1	-.024	3	-.464	3
387		4	max	241.751	3	4.434	9	9.297	3	0	3	0	9	.307	2
388			min	-51.34	2	-82.784	2	-.098	9	0	1	-.022	3	-.453	3
389		5	max	241.856	3	4.233	9	9.297	3	0	3	0	9	.325	2
390			min	-51.2	2	-83.026	2	-.098	9	0	1	-.02	3	-.442	3
391		6	max	241.961	3	4.031	9	9.297	3	0	3	0	9	.343	2
392			min	-51.06	2	-83.268	2	-.098	9	0	1	-.018	3	-.431	3
393		7	max	242.066	3	3.829	9	9.297	3	0	3	0	9	.361	2
394			min	-50.921	2	-83.51	2	-.098	9	0	1	-.015	3	-.42	3
395		8	max	242.17	3	3.628	9	9.297	3	0	3	0	9	.379	2
396			min	-50.781	2	-83.752	2	-.098	9	0	1	-.013	3	-.409	3
397		9	max	242.275	3	3.426	9	9.297	3	0	3	0	9	.398	2
398			min	-50.641	2	-83.993	2	-.098	9	0	1	-.011	3	-.398	3
399		10	max	242.38	3	3.225	9	9.297	3	0	3	0	1	.416	2
400			min	-50.502	2	-84.235	2	-.098	9	0	1	-.009	3	-.387	3
401		11	max	242.484	3	3.023	9	9.297	3	0	3	0	1	.434	2
402			min	-50.362	2	-84.477	2	-.098	9	0	1	-.007	3	-.376	3
403		12	max	242.589	3	2.822	9	9.297	3	0	3	0	1	.453	2
404			min	-50.223	2	-84.719	2	-.098	9	0	1	-.005	3	-.365	3
405		13	max	242.694	3	2.62	9	9.297	3	0	3	0	1	.471	2
406			min	-50.083	2	-84.961	2	-.098	9	0	1	-.003	3	-.353	3
407		14	max	242.799	3	2.419	9	9.297	3	0	3	0	1	.489	2
408			min	-49.943	2	-85.202	2	-.098	9	0	1	-.001	3	-.342	3
409		15	max	242.903	3	2.217	9	9.297	3	0	3	0	3	.508	2
410			min	-49.804	2	-85.444	2	-.098	9	0	1	0	9	-.331	3
411		16	max	272.632	2	406.713	2	9.27	3	0	3	.002	3	.522	2
412			min	-23.61	3	-459.599	3	-.1	9	0	1	0	9	-.316	3
413		17	max	272.772	2	406.471	2	9.27	3	0	3	.004	3	.434	2
414			min	-23.506	3	-459.781	3	-.1	9	0	1	0	9	-.216	3
415		18	max	-.55	3	1007.682	2	8.528	3	0	3	.006	3	.218	2
416			min	-168.114	1	-499.862	3	-.018	9	0	9	0	9	-.108	3
417		19	max	-.446	3	1007.44	2	8.528	3	0	3	.008	3	0	3
418			min	-167.974	1	-500.043	3	-.018	9	0	9	0	9	0	2
419	M9	1	max	64.647	1	345.701	3	92.914	3	0	3	.003	10	0	2
420			min	2.726	15	-218.968	2	-1.378	10	0	2	-.024	1	0	3
421		2	max	64.786	1	345.52	3	92.914	3	0	3	.002	10	.048	2
422			min	2.768	15	-219.21	2	-1.378	10	0	2	-.021	1	-.075	3
423		3	max	91.965	3	3.802	9	12.112	1	0	1	.017	3	.095	2
424			min	-20.369	2	-25.686	2	-2.945	3	0	10	-.018	1	-.149	3
425		4	max	92.07	3	3.6	9	12.112	1	0	1	.016	3	.1	2
426			min	-20.229	2	-25.928	2	-2.945	3	0	10	-.016	1	-.146	3
427		5	max	92.175	3	3.398	9	12.112	1	0	1	.015	3	.106	2
428			min	-20.089	2	-26.17	2	-2.945	3	0	10	-.013	1	-.143	3
429		6	max	92.279	3	3.197	9	12.112	1	0	1	.015	3	.112	2
430			min	-19.95	2	-26.412	2	-2.945	3	0	10	-.011	1	-.14	3
431		7	max	92.384	3	2.995	9	12.112	1	0	1	.014	3	.117	2
432			min	-19.81	2	-26.654	2	-2.945	3	0	10	-.008	1	-.138	3
433		8	max	92.489	3	2.794	9	12.112	1	0	1	.013	3	.123	2
434			min	-19.67	2	-26.895	2	-2.945	3	0	10	-.005	1	-.135	3
435		9	max	92.594	3	2.592	9	12.112	1	0	1	.013	3	.129	2
436			min	-19.531	2	-27.137	2	-2.945	3	0	10	-.003	1	-.132	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	92.698	3	2.391	9	12.112	1	0	1	.012	3	.135	2
438			min	-19.391	2	-27.379	2	-2.945	3	0	10	0	1	-.129	3
439		11	max	92.803	3	2.189	9	12.112	1	0	1	.011	3	.141	2
440			min	-19.252	2	-27.621	2	-2.945	3	0	10	0	10	-.126	3
441		12	max	92.908	3	1.988	9	12.112	1	0	1	.011	3	.147	2
442			min	-19.112	2	-27.863	2	-2.945	3	0	10	0	10	-.123	3
443		13	max	93.012	3	1.786	9	12.112	1	0	1	.01	3	.153	2
444			min	-18.972	2	-28.104	2	-2.945	3	0	10	0	10	-.12	3
445		14	max	93.117	3	1.585	9	12.112	1	0	1	.01	1	.159	2
446			min	-18.833	2	-28.346	2	-2.945	3	0	10	-.001	10	-.117	3
447		15	max	93.222	3	1.383	9	12.112	1	0	1	.013	1	.165	2
448			min	-18.693	2	-28.588	2	-2.945	3	0	10	-.001	10	-.114	3
449		16	max	89.628	2	134.302	2	12.2	1	0	10	.016	1	.17	2
450			min	-7.459	3	-169.659	3	-3.001	3	0	3	-.002	10	-.109	3
451		17	max	89.768	2	134.061	2	12.2	1	0	10	.018	1	.141	2
452			min	-7.354	3	-169.84	3	-3.001	3	0	3	-.002	10	-.072	3
453		18	max	-2.768	15	325.79	2	12.658	1	0	2	.021	1	.071	2
454			min	-64.781	1	-166.231	3	-2.537	3	0	3	-.002	10	-.036	3
455		19	max	-2.725	15	325.548	2	12.658	1	0	2	.024	1	0	2
456			min	-64.641	1	-166.412	3	-2.537	3	0	3	-.003	10	0	3
457	M13	1	max	92.906	3	218.901	2	-2.726	15	0	2	.024	1	0	2
458			min	-1.378	10	-345.769	3	-64.644	1	0	3	-.003	10	0	3
459		2	max	92.906	3	157.209	2	-1.954	10	0	2	.018	3	.115	3
460			min	-1.378	10	-247.186	3	-48.129	1	0	3	-.005	2	-.073	2
461		3	max	92.906	3	95.517	2	-.118	10	0	2	.014	3	.192	3
462			min	-1.378	10	-148.602	3	-31.615	1	0	3	-.014	1	-.122	2
463		4	max	92.906	3	33.825	2	1.718	10	0	2	.01	3	.231	3
464			min	-1.378	10	-50.019	3	-15.101	1	0	3	-.023	1	-.147	2
465		5	max	92.906	3	48.565	3	5.558	2	0	2	.007	3	.231	3
466			min	-1.378	10	-27.867	2	-8.446	3	0	3	-.025	1	-.149	2
467		6	max	92.906	3	147.148	3	17.928	1	0	2	.004	3	.193	3
468			min	-1.378	10	-89.559	2	-7.478	3	0	3	-.021	1	-.126	2
469		7	max	92.906	3	245.732	3	34.442	1	0	2	.001	10	.117	3
470			min	-1.378	10	-151.251	2	-6.511	3	0	3	-.011	1	-.079	2
471		8	max	92.906	3	344.316	3	50.957	1	0	2	.008	2	.002	3
472			min	-1.378	10	-212.942	2	-5.544	3	0	3	-.001	3	-.008	2
473		9	max	92.906	3	442.899	3	67.471	1	0	2	.028	1	.087	2
474			min	-1.378	10	-274.634	2	-4.576	3	0	3	-.003	3	-.151	3
475		10	max	92.906	3	-6.316	15	83.985	1	0	2	.058	1	.206	2
476			min	-1.378	10	-541.483	3	2.481	12	0	3	-.018	3	-.343	3
477		11	max	12.167	1	274.634	2	5.625	3	0	3	.028	1	.087	2
478			min	-1.378	10	-442.899	3	-67.471	1	0	2	-.016	3	-.151	3
479		12	max	12.167	1	212.942	2	6.593	3	0	3	.008	2	.002	3
480			min	-1.378	10	-344.315	3	-50.956	1	0	2	-.014	3	-.008	2
481		13	max	12.167	1	151.251	2	7.56	3	0	3	.001	10	.117	3
482			min	-1.378	10	-245.732	3	-34.442	1	0	2	-.011	3	-.079	2
483		14	max	12.167	1	89.559	2	8.527	3	0	3	0	15	.193	3
484			min	-1.378	10	-147.148	3	-17.928	1	0	2	-.021	1	-.126	2
485		15	max	12.167	1	27.867	2	9.495	3	0	3	-.001	15	.231	3
486			min	-1.378	10	-48.565	3	-5.558	2	0	2	-.025	1	-.149	2
487		16	max	12.167	1	50.019	3	15.101	1	0	3	0	12	.231	3
488			min	-1.378	10	-33.825	2	-1.718	10	0	2	-.023	1	-.147	2
489		17	max	12.167	1	148.602	3	31.615	1	0	3	.003	3	.192	3
490			min	-1.378	10	-95.517	2	.118	10	0	2	-.014	1	-.122	2
491		18	max	12.167	1	247.186	3	48.13	1	0	3	.008	3	.115	3
492			min	-1.378	10	-157.209	2	1.955	10	0	2	-.005	2	-.073	2
493		19	max	12.167	1	345.77	3	64.644	1	0	3	.024	1	0	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
494			min	-1.378	10	-218.901	2	2.731	15	0	2	-.003	10	0	3
495	M16	1	max	2.541	3	325.635	2	-2.725	15	0	3	.024	1	0	2
496			min	-12.639	1	-166.445	3	-64.645	1	0	2	-.003	10	0	3
497		2	max	2.541	3	233.429	2	-1.967	10	0	3	.004	9	.056	3
498			min	-12.639	1	-120.17	3	-48.131	1	0	2	-.005	2	-.109	2
499		3	max	2.541	3	141.224	2	-.131	10	0	3	0	3	.093	3
500			min	-12.639	1	-73.896	3	-31.616	1	0	2	-.013	1	-.182	2
501		4	max	2.541	3	49.018	2	1.705	10	0	3	0	15	.113	3
502			min	-12.639	1	-27.621	3	-15.102	1	0	2	-.023	1	-.219	2
503		5	max	2.541	3	18.653	3	5.539	2	0	3	-.001	15	.115	3
504			min	-12.639	1	-43.188	2	-5.457	3	0	2	-.025	1	-.22	2
505		6	max	2.541	3	64.928	3	17.927	1	0	3	0	15	.099	3
506			min	-12.639	1	-135.393	2	-4.49	3	0	2	-.021	1	-.185	2
507		7	max	2.541	3	111.202	3	34.441	1	0	3	.001	10	.064	3
508			min	-12.639	1	-227.599	2	-3.522	3	0	2	-.011	1	-.114	2
509		8	max	2.541	3	157.477	3	50.955	1	0	3	.008	2	.012	3
510			min	-12.639	1	-319.805	2	-2.555	3	0	2	-.009	3	-.008	2
511		9	max	2.541	3	203.751	3	67.47	1	0	3	.028	1	.134	2
512			min	-12.639	1	-412.01	2	-1.588	3	0	2	-.01	3	-.058	3
513		10	max	1.441	10	-6.312	15	83.984	1	0	15	.058	1	.313	2
514			min	-12.639	1	-504.216	2	-1.067	3	0	2	-.01	3	-.146	3
515		11	max	1.441	10	412.01	2	-.1	3	0	2	.028	1	.134	2
516			min	-12.639	1	-203.751	3	-67.47	1	0	3	-.003	3	-.058	3
517		12	max	1.441	10	319.805	2	.868	3	0	2	.008	2	.012	3
518			min	-12.639	1	-157.477	3	-50.955	1	0	3	-.003	3	-.008	2
519		13	max	1.441	10	227.599	2	1.835	3	0	2	.001	10	.064	3
520			min	-12.639	1	-111.202	3	-34.441	1	0	3	-.011	1	-.114	2
521		14	max	1.441	10	135.393	2	2.802	3	0	2	0	12	.099	3
522			min	-12.639	1	-64.928	3	-17.927	1	0	3	-.021	1	-.185	2
523		15	max	1.441	10	43.188	2	3.77	3	0	2	0	3	.115	3
524			min	-12.639	1	-18.653	3	-5.539	2	0	3	-.025	1	-.22	2
525		16	max	1.441	10	27.621	3	15.102	1	0	2	.002	3	.113	3
526			min	-12.639	1	-49.018	2	-1.705	10	0	3	-.023	1	-.219	2
527		17	max	1.441	10	73.896	3	31.616	1	0	2	.004	3	.093	3
528			min	-12.639	1	-141.224	2	.131	10	0	3	-.013	1	-.182	2
529		18	max	1.441	10	120.17	3	48.131	1	0	2	.006	3	.056	3
530			min	-12.639	1	-233.429	2	1.968	10	0	3	-.005	2	-.109	2
531		19	max	1.441	10	166.445	3	64.645	1	0	2	.024	1	0	2
532			min	-12.639	1	-325.635	2	2.73	15	0	3	-.003	10	0	3
533	M15	1	max	0	1	.737	3	.167	3	0	1	0	1	0	1
534			min	-132.763	3	0	1	0	1	0	3	0	3	0	1
535		2	max	0	1	.655	3	.167	3	0	1	0	1	0	1
536			min	-132.833	3	0	1	0	1	0	3	0	3	0	3
537		3	max	0	1	.573	3	.167	3	0	1	0	1	0	1
538			min	-132.904	3	0	1	0	1	0	3	0	3	0	3
539		4	max	0	1	.491	3	.167	3	0	1	0	1	0	1
540			min	-132.974	3	0	1	0	1	0	3	0	3	0	3
541		5	max	0	1	.409	3	.167	3	0	1	0	1	0	1
542			min	-133.045	3	0	1	0	1	0	3	0	3	0	3
543		6	max	0	1	.327	3	.167	3	0	1	0	1	0	1
544			min	-133.115	3	0	1	0	1	0	3	0	3	0	3
545		7	max	0	1	.246	3	.167	3	0	1	0	3	0	1
546			min	-133.186	3	0	1	0	1	0	3	0	1	0	3
547		8	max	0	1	.164	3	.167	3	0	1	0	3	0	1
548			min	-133.256	3	0	1	0	1	0	3	0	1	0	3
549		9	max	0	1	.082	3	.167	3	0	1	0	3	0	1
550			min	-133.327	3	0	1	0	1	0	3	0	1	0	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
551		10	max	0	1	0	1	.167	3	0	1	0	3	0	1
552			min	-133.397	3	0	1	0	1	0	3	0	1	0	3
553		11	max	0	1	0	1	.167	3	0	1	0	3	0	1
554			min	-133.468	3	-.082	3	0	1	0	3	0	1	0	3
555		12	max	0	1	0	1	.167	3	0	1	0	3	0	1
556			min	-133.538	3	-.164	3	0	1	0	3	0	1	0	3
557		13	max	0	1	0	1	.167	3	0	1	0	3	0	1
558			min	-133.609	3	-.246	3	0	1	0	3	0	1	0	3
559		14	max	0	1	0	1	.167	3	0	1	0	3	0	1
560			min	-133.679	3	-.327	3	0	1	0	3	0	1	0	3
561		15	max	0	1	0	1	.167	3	0	1	0	3	0	1
562			min	-133.75	3	-.409	3	0	1	0	3	0	1	0	3
563		16	max	0	1	0	1	.167	3	0	1	0	3	0	1
564			min	-133.82	3	-.491	3	0	1	0	3	0	1	0	3
565		17	max	0	1	0	1	.167	3	0	1	0	3	0	1
566			min	-133.891	3	-.573	3	0	1	0	3	0	1	0	3
567		18	max	0	1	0	1	.167	3	0	1	0	3	0	1
568			min	-133.961	3	-.655	3	0	1	0	3	0	1	0	3
569		19	max	0	1	0	1	.167	3	0	1	0	3	0	1
570			min	-134.032	3	-.737	3	0	1	0	3	0	1	0	1
571	M16A	1	max	0	1	1.261	4	.012	9	0	3	0	3	0	1
572			min	-132.073	3	0	1	-.07	3	0	9	0	9	0	1
573		2	max	0	1	1.12	4	.012	9	0	3	0	3	0	1
574			min	-132.003	3	0	1	-.07	3	0	9	0	9	0	4
575		3	max	0	1	.98	4	.012	9	0	3	0	3	0	1
576			min	-131.932	3	0	1	-.07	3	0	9	0	9	0	4
577		4	max	0	1	.84	4	.012	9	0	3	0	3	0	1
578			min	-131.862	3	0	1	-.07	3	0	9	0	9	0	4
579		5	max	0	1	.7	4	.012	9	0	3	0	3	0	1
580			min	-131.791	3	0	1	-.07	3	0	9	0	9	-.001	4
581		6	max	0	1	.56	4	.012	9	0	3	0	3	0	1
582			min	-131.721	3	0	1	-.07	3	0	9	0	9	-.001	4
583		7	max	0	1	.42	4	.012	9	0	3	0	3	0	1
584			min	-131.65	3	0	1	-.07	3	0	9	0	9	-.001	4
585		8	max	0	1	.28	4	.012	9	0	3	0	3	0	1
586			min	-131.58	3	0	1	-.07	3	0	9	0	9	-.001	4
587		9	max	0	1	.14	4	.012	9	0	3	0	3	0	1
588			min	-131.509	3	0	1	-.07	3	0	9	0	9	-.001	4
589		10	max	0	1	0	1	.012	9	0	3	0	3	0	1
590			min	-131.439	3	0	1	-.07	3	0	9	0	9	-.002	4
591		11	max	.039	13	0	1	.012	9	0	3	0	3	0	1
592			min	-131.368	3	-.14	4	-.07	3	0	9	0	9	-.001	4
593		12	max	.136	13	0	1	.012	9	0	3	0	3	0	1
594			min	-131.298	3	-.28	4	-.07	3	0	9	0	14	-.001	4
595		13	max	.233	13	0	1	.012	9	0	3	0	1	0	1
596			min	-131.227	3	-.42	4	-.07	3	0	9	0	4	-.001	4
597		14	max	.341	4	0	1	.012	9	0	3	0	9	0	1
598			min	-131.157	3	-.56	4	-.07	3	0	9	0	3	-.001	4
599		15	max	.461	4	0	1	.012	9	0	3	0	9	0	1
600			min	-131.086	3	-.7	4	-.07	3	0	9	0	3	-.001	4
601		16	max	.582	4	0	1	.012	9	0	3	0	9	0	1
602			min	-131.016	3	-.84	4	-.07	3	0	9	0	3	0	4
603		17	max	.703	4	0	1	.012	9	0	3	0	9	0	1
604			min	-130.945	3	-.98	4	-.07	3	0	9	0	3	0	4
605		18	max	.823	4	0	1	.012	9	0	3	0	9	0	1
606			min	-130.875	3	-1.12	4	-.07	3	0	9	0	3	0	4
607		19	max	.944	4	0	1	.012	9	0	3	0	9	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
608			min	-130.804	3	-1.261	4	-.07	3	0	9	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	.002	2	.01	2	.002	9	2.265e-5	10	NC	3	NC	1
2			min	-.004	3	-.01	3	-.003	3	-2.216e-4	3	4108.037	2	NC	1
3		2	max	.002	2	.009	2	.002	9	2.158e-5	10	NC	3	NC	1
4			min	-.003	3	-.009	3	-.002	3	-2.098e-4	3	4481.036	2	NC	1
5		3	max	.002	2	.008	2	.001	9	2.05e-5	10	NC	3	NC	1
6			min	-.003	3	-.009	3	-.002	3	-1.98e-4	3	4924.187	2	NC	1
7		4	max	.002	2	.007	2	.001	9	1.943e-5	10	NC	1	NC	1
8			min	-.003	3	-.008	3	-.002	3	-1.861e-4	3	5454.303	2	NC	1
9		5	max	.002	2	.006	2	.001	9	1.836e-5	10	NC	1	NC	1
10			min	-.003	3	-.008	3	-.002	3	-1.743e-4	3	6093.759	2	NC	1
11		6	max	.001	2	.006	2	.001	9	1.728e-5	10	NC	1	NC	1
12			min	-.003	3	-.008	3	-.001	3	-1.625e-4	3	6872.814	2	NC	1
13		7	max	.001	2	.005	2	0	9	1.621e-5	10	NC	1	NC	1
14			min	-.002	3	-.007	3	-.001	3	-1.507e-4	3	7833.166	2	NC	1
15		8	max	.001	2	.004	2	0	9	1.514e-5	10	NC	1	NC	1
16			min	-.002	3	-.007	3	-.001	3	-1.389e-4	3	9033.549	2	NC	1
17		9	max	.001	2	.004	2	0	9	1.406e-5	10	NC	1	NC	1
18			min	-.002	3	-.006	3	0	3	-1.27e-4	3	NC	1	NC	1
19		10	max	0	2	.003	2	0	9	1.299e-5	10	NC	1	NC	1
20			min	-.002	3	-.006	3	0	3	-1.152e-4	3	NC	1	NC	1
21		11	max	0	2	.003	2	0	9	1.192e-5	10	NC	1	NC	1
22			min	-.002	3	-.005	3	0	3	-1.034e-4	3	NC	1	NC	1
23		12	max	0	2	.002	2	0	9	1.084e-5	10	NC	1	NC	1
24			min	-.001	3	-.005	3	0	3	-9.401e-5	1	NC	1	NC	1
25		13	max	0	2	.002	2	0	9	9.768e-6	10	NC	1	NC	1
26			min	-.001	3	-.004	3	0	3	-8.474e-5	1	NC	1	NC	1
27		14	max	0	2	.001	2	0	9	8.695e-6	10	NC	1	NC	1
28			min	0	3	-.003	3	0	3	-7.547e-5	1	NC	1	NC	1
29		15	max	0	2	0	2	0	9	7.621e-6	10	NC	1	NC	1
30			min	0	3	-.003	3	0	3	-6.62e-5	1	NC	1	NC	1
31		16	max	0	2	0	2	0	9	6.548e-6	10	NC	1	NC	1
32			min	0	3	-.002	3	0	3	-5.693e-5	1	NC	1	NC	1
33		17	max	0	2	0	2	0	9	5.474e-6	10	NC	1	NC	1
34			min	0	3	-.001	3	0	3	-4.765e-5	1	NC	1	NC	1
35		18	max	0	2	0	2	0	9	4.401e-6	10	NC	1	NC	1
36			min	0	3	0	3	0	3	-3.838e-5	1	NC	1	NC	1
37		19	max	0	1	0	1	0	1	3.327e-6	10	NC	1	NC	1
38			min	0	1	0	1	0	1	-3.038e-5	9	NC	1	NC	1
39	M3	1	max	0	1	0	1	0	1	1.436e-5	9	NC	1	NC	1
40			min	0	1	0	1	0	1	-1.579e-6	10	NC	1	NC	1
41		2	max	0	3	0	2	0	10	1.982e-5	1	NC	1	NC	1
42			min	0	2	0	3	0	9	-2.234e-6	10	NC	1	NC	1
43		3	max	0	3	0	2	0	10	2.583e-5	1	NC	1	NC	1
44			min	0	2	-.002	3	0	9	-2.888e-6	10	NC	1	NC	1
45		4	max	0	3	0	2	0	3	3.183e-5	1	NC	1	NC	1
46			min	0	2	-.003	3	0	9	-3.542e-6	10	NC	1	NC	1
47		5	max	0	3	0	2	0	3	3.784e-5	1	NC	1	NC	1
48			min	0	2	-.003	3	0	9	-4.197e-6	10	NC	1	NC	1
49		6	max	0	3	0	2	0	3	4.385e-5	1	NC	1	NC	1
50			min	0	2	-.004	3	0	9	-4.851e-6	10	NC	1	NC	1
51		7	max	0	3	0	2	0	3	4.985e-5	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	9	-5.505e-6	10	NC	1	NC	1
53		8	max	0	3	0	2	0	3	5.586e-5	1	NC	1	NC	1
54			min	0	2	-.006	3	0	10	-6.159e-6	10	NC	1	NC	1
55		9	max	0	3	.001	2	0	3	6.186e-5	1	NC	1	NC	1
56			min	0	2	-.006	3	0	10	-6.814e-6	10	NC	1	NC	1
57		10	max	.001	3	.002	2	0	3	6.787e-5	1	NC	1	NC	1
58			min	-.001	2	-.007	3	0	10	-7.468e-6	10	NC	1	NC	1
59		11	max	.001	3	.002	2	0	1	7.387e-5	1	NC	1	NC	1
60			min	-.001	2	-.007	3	0	10	-8.122e-6	10	NC	1	NC	1
61		12	max	.001	3	.003	2	0	1	7.988e-5	1	NC	1	NC	1
62			min	-.001	2	-.008	3	0	10	-8.776e-6	10	NC	1	NC	1
63		13	max	.001	3	.004	2	0	1	8.589e-5	1	NC	1	NC	1
64			min	-.001	2	-.008	3	0	10	-9.431e-6	10	NC	1	NC	1
65		14	max	.002	3	.004	2	0	1	9.189e-5	1	NC	1	NC	1
66			min	-.002	2	-.008	3	0	10	-1.009e-5	10	NC	1	NC	1
67		15	max	.002	3	.005	2	.001	1	9.79e-5	1	NC	1	NC	1
68			min	-.002	2	-.008	3	0	10	-1.074e-5	10	8893.752	2	NC	1
69		16	max	.002	3	.006	2	.001	1	1.039e-4	1	NC	1	NC	1
70			min	-.002	2	-.008	3	0	10	-1.139e-5	10	7543.653	2	NC	1
71		17	max	.002	3	.007	2	.001	1	1.099e-4	1	NC	1	NC	1
72			min	-.002	2	-.009	3	0	10	-1.205e-5	10	6497.074	2	NC	1
73		18	max	.002	3	.008	2	.002	1	1.159e-4	1	NC	1	NC	1
74			min	-.002	2	-.009	3	0	10	-1.27e-5	10	5676.903	2	NC	1
75		19	max	.002	3	.009	2	.002	1	1.219e-4	1	NC	3	NC	1
76			min	-.002	2	-.009	3	0	10	-1.336e-5	10	5028.646	2	NC	1
77	M4	1	max	.001	1	.011	2	0	10	1.575e-5	10	NC	1	NC	1
78			min	0	12	-.01	3	-.001	1	-1.396e-4	1	NC	1	NC	1
79		2	max	.001	1	.01	2	0	10	1.575e-5	10	NC	1	NC	1
80			min	0	12	-.009	3	-.001	1	-1.396e-4	1	NC	1	NC	1
81		3	max	.001	1	.01	2	0	10	1.575e-5	10	NC	1	NC	1
82			min	0	12	-.009	3	-.001	1	-1.396e-4	1	NC	1	NC	1
83		4	max	0	1	.009	2	0	10	1.575e-5	10	NC	1	NC	1
84			min	0	12	-.008	3	-.001	1	-1.396e-4	1	NC	1	NC	1
85		5	max	0	1	.008	2	0	10	1.575e-5	10	NC	1	NC	1
86			min	0	12	-.007	3	0	1	-1.396e-4	1	NC	1	NC	1
87		6	max	0	1	.008	2	0	10	1.575e-5	10	NC	1	NC	1
88			min	0	12	-.007	3	0	1	-1.396e-4	1	NC	1	NC	1
89		7	max	0	1	.007	2	0	10	1.575e-5	10	NC	1	NC	1
90			min	0	12	-.006	3	0	1	-1.396e-4	1	NC	1	NC	1
91		8	max	0	1	.007	2	0	10	1.575e-5	10	NC	1	NC	1
92			min	0	12	-.006	3	0	1	-1.396e-4	1	NC	1	NC	1
93		9	max	0	1	.006	2	0	10	1.575e-5	10	NC	1	NC	1
94			min	0	12	-.005	3	0	1	-1.396e-4	1	NC	1	NC	1
95		10	max	0	1	.005	2	0	10	1.575e-5	10	NC	1	NC	1
96			min	0	12	-.005	3	0	1	-1.396e-4	1	NC	1	NC	1
97		11	max	0	1	.005	2	0	10	1.575e-5	10	NC	1	NC	1
98			min	0	12	-.004	3	0	1	-1.396e-4	1	NC	1	NC	1
99		12	max	0	1	.004	2	0	10	1.575e-5	10	NC	1	NC	1
100			min	0	12	-.004	3	0	1	-1.396e-4	1	NC	1	NC	1
101		13	max	0	1	.004	2	0	10	1.575e-5	10	NC	1	NC	1
102			min	0	12	-.003	3	0	1	-1.396e-4	1	NC	1	NC	1
103		14	max	0	1	.003	2	0	10	1.575e-5	10	NC	1	NC	1
104			min	0	12	-.003	3	0	1	-1.396e-4	1	NC	1	NC	1
105		15	max	0	1	.002	2	0	10	1.575e-5	10	NC	1	NC	1
106			min	0	12	-.002	3	0	1	-1.396e-4	1	NC	1	NC	1
107		16	max	0	1	.002	2	0	10	1.575e-5	10	NC	1	NC	1
108			min	0	12	-.002	3	0	1	-1.396e-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	10	1.575e-5	10	NC	1	NC	1
110			min	0	12	-.001	3	0	1	-1.396e-4	1	NC	1	NC	1
111		18	max	0	1	0	2	0	10	1.575e-5	10	NC	1	NC	1
112			min	0	12	0	3	0	1	-1.396e-4	1	NC	1	NC	1
113		19	max	0	1	0	1	0	1	1.575e-5	10	NC	1	NC	1
114			min	0	1	0	1	0	1	-1.396e-4	1	NC	1	NC	1
115	M6	1	max	.006	2	.029	2	0	9	5.157e-4	3	NC	3	NC	1
116			min	-.01	3	-.028	3	-.007	3	-9.045e-8	1	1350.35	2	5671.195	3
117		2	max	.006	2	.027	2	0	9	5.e-4	3	NC	3	NC	1
118			min	-.01	3	-.026	3	-.007	3	-2.062e-7	9	1446.044	2	6014.061	3
119		3	max	.005	2	.025	2	0	9	4.844e-4	3	NC	3	NC	1
120			min	-.009	3	-.025	3	-.006	3	-8.919e-7	9	1555.85	2	6422.858	3
121		4	max	.005	2	.023	2	0	9	4.687e-4	3	NC	3	NC	1
122			min	-.009	3	-.023	3	-.006	3	-1.578e-6	9	1682.605	2	6911.536	3
123		5	max	.005	2	.022	2	0	9	4.53e-4	3	NC	3	NC	1
124			min	-.008	3	-.022	3	-.005	3	-2.263e-6	9	1829.964	2	7498.659	3
125		6	max	.004	2	.02	2	0	9	4.373e-4	3	NC	3	NC	1
126			min	-.007	3	-.02	3	-.005	3	-2.949e-6	9	2002.714	2	8209.259	3
127		7	max	.004	2	.018	2	0	9	4.216e-4	3	NC	3	NC	1
128			min	-.007	3	-.019	3	-.004	3	-3.635e-6	9	2207.243	2	9077.687	3
129		8	max	.004	2	.016	2	0	9	4.06e-4	3	NC	3	NC	1
130			min	-.006	3	-.017	3	-.004	3	-4.32e-6	9	2452.272	2	NC	1
131		9	max	.003	2	.014	2	0	9	3.903e-4	3	NC	3	NC	1
132			min	-.006	3	-.016	3	-.003	3	-5.006e-6	9	2750.006	2	NC	1
133		10	max	.003	2	.013	2	0	9	3.746e-4	3	NC	3	NC	1
134			min	-.005	3	-.014	3	-.003	3	-5.692e-6	9	3118.082	2	NC	1
135		11	max	.003	2	.011	2	0	9	3.589e-4	3	NC	3	NC	1
136			min	-.005	3	-.013	3	-.003	3	-6.377e-6	9	3582.949	2	NC	1
137		12	max	.002	2	.009	2	0	9	3.432e-4	3	NC	3	NC	1
138			min	-.004	3	-.011	3	-.002	3	-7.063e-6	9	4186.159	2	NC	1
139		13	max	.002	2	.008	2	0	9	3.276e-4	3	NC	3	NC	1
140			min	-.003	3	-.01	3	-.002	3	-7.749e-6	9	4996.949	2	NC	1
141		14	max	.002	2	.006	2	0	9	3.119e-4	3	NC	1	NC	1
142			min	-.003	3	-.008	3	-.001	3	-8.435e-6	9	6139.915	2	NC	1
143		15	max	.001	2	.005	2	0	9	2.962e-4	3	NC	1	NC	1
144			min	-.002	3	-.006	3	-.001	3	-9.12e-6	9	7864.187	2	NC	1
145		16	max	0	2	.004	2	0	9	2.805e-4	3	NC	1	NC	1
146			min	-.002	3	-.005	3	0	3	-9.806e-6	9	NC	1	NC	1
147		17	max	0	2	.002	2	0	9	2.648e-4	3	NC	1	NC	1
148			min	-.001	3	-.003	3	0	3	-1.049e-5	9	NC	1	NC	1
149		18	max	0	2	.001	2	0	9	2.492e-4	3	NC	1	NC	1
150			min	0	3	-.002	3	0	3	-1.118e-5	9	NC	1	NC	1
151		19	max	0	1	0	1	0	1	2.335e-4	3	NC	1	NC	1
152			min	0	1	0	1	0	1	-1.186e-5	9	NC	1	NC	1
153	M7	1	max	0	1	0	1	0	1	5.562e-6	9	NC	1	NC	1
154			min	0	1	0	1	0	1	-1.096e-4	3	NC	1	NC	1
155		2	max	0	3	.001	2	0	3	4.893e-6	9	NC	1	NC	1
156			min	0	2	-.002	3	0	9	-8.281e-5	3	NC	1	NC	1
157		3	max	0	3	.003	2	.001	3	4.224e-6	9	NC	1	NC	1
158			min	0	2	-.004	3	0	9	-5.606e-5	3	NC	1	NC	1
159		4	max	0	3	.004	2	.001	3	3.555e-6	9	NC	1	NC	1
160			min	-.001	2	-.006	3	0	9	-2.932e-5	3	NC	1	NC	1
161		5	max	.001	3	.005	2	.002	3	2.885e-6	9	NC	1	NC	1
162			min	-.001	2	-.007	3	0	9	-2.576e-6	3	9342.157	2	NC	1
163		6	max	.002	3	.006	2	.002	3	2.417e-5	3	NC	1	NC	1
164			min	-.002	2	-.009	3	0	9	0	2	7482.063	2	NC	1
165		7	max	.002	3	.007	2	.003	3	5.091e-5	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
166			min	-.002	2	-.011	3	0	9	0	5	6207.992	2	NC	1
167		8	max	.002	3	.009	2	.003	3	7.766e-5	3	NC	1	NC	1
168			min	-.003	2	-.012	3	0	9	-5.327e-8	13	5272.694	2	NC	1
169		9	max	.002	3	.01	2	.003	3	1.044e-4	3	NC	3	NC	1
170			min	-.003	2	-.014	3	0	9	-1.41e-7	13	4553.012	2	NC	1
171		10	max	.003	3	.012	2	.003	3	1.311e-4	3	NC	3	NC	1
172			min	-.003	2	-.015	3	0	9	-4.605e-7	9	3980.672	2	NC	1
173		11	max	.003	3	.013	2	.003	3	1.579e-4	3	NC	3	NC	1
174			min	-.004	2	-.017	3	0	9	-1.13e-6	9	3514.633	2	NC	1
175		12	max	.003	3	.015	2	.003	3	1.846e-4	3	NC	3	NC	1
176			min	-.004	2	-.018	3	0	9	-1.799e-6	9	3128.582	2	NC	1
177		13	max	.004	3	.016	2	.004	3	2.114e-4	3	NC	3	NC	1
178			min	-.004	2	-.019	3	0	9	-2.468e-6	9	2804.718	2	NC	1
179		14	max	.004	3	.018	2	.004	3	2.381e-4	3	NC	3	NC	1
180			min	-.005	2	-.02	3	0	9	-3.137e-6	9	2530.451	2	NC	1
181		15	max	.004	3	.02	2	.004	3	2.649e-4	3	NC	3	NC	1
182			min	-.005	2	-.021	3	0	9	-3.806e-6	9	2296.533	2	NC	1
183		16	max	.005	3	.022	2	.004	3	2.916e-4	3	NC	3	NC	1
184			min	-.006	2	-.022	3	0	9	-4.476e-6	9	2095.969	2	NC	1
185		17	max	.005	3	.024	2	.004	3	3.184e-4	3	NC	3	NC	1
186			min	-.006	2	-.023	3	0	9	-5.145e-6	9	1923.333	2	NC	1
187		18	max	.005	3	.026	2	.003	3	3.451e-4	3	NC	3	NC	1
188			min	-.006	2	-.024	3	0	9	-5.814e-6	9	1774.341	2	NC	1
189		19	max	.006	3	.028	2	.003	3	3.718e-4	3	NC	3	NC	1
190			min	-.007	2	-.025	3	0	9	-6.483e-6	9	1645.561	2	NC	1
191	M8	1	max	.003	2	.033	2	0	9	-1.161e-7	10	NC	1	NC	1
192			min	0	3	-.028	3	-.002	3	-2.688e-4	3	NC	1	8216.779	3
193		2	max	.003	2	.031	2	0	9	-1.161e-7	10	NC	1	NC	1
194			min	0	3	-.026	3	-.002	3	-2.688e-4	3	NC	1	8958.9	3
195		3	max	.003	2	.03	2	0	9	-1.161e-7	10	NC	1	NC	1
196			min	0	3	-.025	3	-.002	3	-2.688e-4	3	NC	1	9842.378	3
197		4	max	.003	2	.028	2	0	9	-1.161e-7	10	NC	1	NC	1
198			min	0	3	-.023	3	-.002	3	-2.688e-4	3	NC	1	NC	1
199		5	max	.003	2	.026	2	0	9	-1.161e-7	10	NC	1	NC	1
200			min	0	3	-.021	3	-.002	3	-2.688e-4	3	NC	1	NC	1
201		6	max	.002	2	.024	2	0	9	-1.161e-7	10	NC	1	NC	1
202			min	0	3	-.02	3	-.001	3	-2.688e-4	3	NC	1	NC	1
203		7	max	.002	2	.022	2	0	9	-1.161e-7	10	NC	1	NC	1
204			min	0	3	-.018	3	-.001	3	-2.688e-4	3	NC	1	NC	1
205		8	max	.002	2	.02	2	0	9	-1.161e-7	10	NC	1	NC	1
206			min	0	3	-.017	3	-.001	3	-2.688e-4	3	NC	1	NC	1
207		9	max	.002	2	.018	2	0	9	-1.161e-7	10	NC	1	NC	1
208			min	0	3	-.015	3	0	3	-2.688e-4	3	NC	1	NC	1
209		10	max	.002	2	.017	2	0	9	-1.161e-7	10	NC	1	NC	1
210			min	0	3	-.014	3	0	3	-2.688e-4	3	NC	1	NC	1
211		11	max	.001	2	.015	2	0	9	-1.161e-7	10	NC	1	NC	1
212			min	0	3	-.012	3	0	3	-2.688e-4	3	NC	1	NC	1
213		12	max	.001	2	.013	2	0	9	-1.161e-7	10	NC	1	NC	1
214			min	0	3	-.011	3	0	3	-2.688e-4	3	NC	1	NC	1
215		13	max	.001	2	.011	2	0	9	-1.161e-7	10	NC	1	NC	1
216			min	0	3	-.009	3	0	3	-2.688e-4	3	NC	1	NC	1
217		14	max	0	2	.009	2	0	9	-1.161e-7	10	NC	1	NC	1
218			min	0	3	-.008	3	0	3	-2.688e-4	3	NC	1	NC	1
219		15	max	0	2	.007	2	0	9	-1.161e-7	10	NC	1	NC	1
220			min	0	3	-.006	3	0	3	-2.688e-4	3	NC	1	NC	1
221		16	max	0	2	.006	2	0	9	-1.161e-7	10	NC	1	NC	1
222			min	0	3	-.005	3	0	3	-2.688e-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	2	.004	2	0	9	-1.161e-7	10	NC	1	NC	1
224			min	0	3	-.003	3	0	3	-2.688e-4	3	NC	1	NC	1
225		18	max	0	2	.002	2	0	9	-1.161e-7	10	NC	1	NC	1
226			min	0	3	-.002	3	0	3	-2.688e-4	3	NC	1	NC	1
227		19	max	0	1	0	1	0	1	-1.161e-7	10	NC	1	NC	1
228			min	0	1	0	1	0	1	-2.688e-4	3	NC	1	NC	1
229	M10	1	max	.002	2	.01	2	0	10	1.958e-4	1	NC	3	NC	1
230			min	-.003	3	-.01	3	-.001	1	-6.069e-4	3	4111.702	2	NC	1
231		2	max	.002	2	.009	2	0	10	1.866e-4	1	NC	3	NC	1
232			min	-.003	3	-.009	3	-.001	1	-5.859e-4	3	4485.145	2	NC	1
233		3	max	.002	2	.008	2	0	10	1.773e-4	1	NC	3	NC	1
234			min	-.002	3	-.009	3	-.001	1	-5.65e-4	3	4928.844	2	NC	1
235		4	max	.002	2	.007	2	0	3	1.68e-4	1	NC	1	NC	1
236			min	-.002	3	-.008	3	-.001	1	-5.441e-4	3	5459.644	2	NC	1
237		5	max	.002	2	.006	2	0	3	1.588e-4	1	NC	1	NC	1
238			min	-.002	3	-.008	3	-.001	1	-5.232e-4	3	6099.962	2	NC	1
239		6	max	.001	2	.006	2	0	3	1.495e-4	1	NC	1	NC	1
240			min	-.002	3	-.008	3	0	1	-5.023e-4	3	6880.116	2	NC	1
241		7	max	.001	2	.005	2	0	3	1.402e-4	1	NC	1	NC	1
242			min	-.002	3	-.007	3	0	1	-4.814e-4	3	7841.889	2	NC	1
243		8	max	.001	2	.004	2	0	3	1.31e-4	1	NC	1	NC	1
244			min	-.002	3	-.007	3	0	1	-4.605e-4	3	9044.142	2	NC	1
245		9	max	.001	2	.004	2	0	3	1.217e-4	1	NC	1	NC	1
246			min	-.001	3	-.006	3	0	1	-4.395e-4	3	NC	1	NC	1
247		10	max	0	2	.003	2	0	3	1.125e-4	1	NC	1	NC	1
248			min	-.001	3	-.006	3	0	1	-4.186e-4	3	NC	1	NC	1
249		11	max	0	2	.003	2	0	3	1.032e-4	1	NC	1	NC	1
250			min	-.001	3	-.005	3	0	1	-3.977e-4	3	NC	1	NC	1
251		12	max	0	2	.002	2	0	3	9.394e-5	1	NC	1	NC	1
252			min	-.001	3	-.005	3	0	1	-3.768e-4	3	NC	1	NC	1
253		13	max	0	2	.002	2	0	3	8.468e-5	1	NC	1	NC	1
254			min	0	3	-.004	3	0	1	-3.559e-4	3	NC	1	NC	1
255		14	max	0	2	.001	2	0	3	7.542e-5	1	NC	1	NC	1
256			min	0	3	-.003	3	0	1	-3.35e-4	3	NC	1	NC	1
257		15	max	0	2	0	2	0	3	6.616e-5	1	NC	1	NC	1
258			min	0	3	-.003	3	0	1	-3.141e-4	3	NC	1	NC	1
259		16	max	0	2	0	2	0	3	5.69e-5	1	NC	1	NC	1
260			min	0	3	-.002	3	0	1	-2.931e-4	3	NC	1	NC	1
261		17	max	0	2	0	2	0	3	4.764e-5	1	NC	1	NC	1
262			min	0	3	-.001	3	0	1	-2.722e-4	3	NC	1	NC	1
263		18	max	0	2	0	2	0	3	3.838e-5	1	NC	1	NC	1
264			min	0	3	0	3	0	1	-2.513e-4	3	NC	1	NC	1
265		19	max	0	1	0	1	0	1	2.912e-5	1	NC	1	NC	1
266			min	0	1	0	1	0	1	-2.304e-4	3	NC	1	NC	1
267	M11	1	max	0	1	0	1	0	1	1.088e-4	3	NC	1	NC	1
268			min	0	1	0	1	0	1	-1.382e-5	1	NC	1	NC	1
269		2	max	0	3	0	2	0	1	8.297e-5	3	NC	1	NC	1
270			min	0	2	0	3	0	3	-1.981e-5	1	NC	1	NC	1
271		3	max	0	3	0	2	0	1	5.717e-5	3	NC	1	NC	1
272			min	0	2	-.002	3	0	3	-2.58e-5	1	NC	1	NC	1
273		4	max	0	3	0	2	0	1	3.137e-5	3	NC	1	NC	1
274			min	0	2	-.003	3	-.001	3	-3.18e-5	1	NC	1	NC	1
275		5	max	0	3	0	2	0	1	5.566e-6	3	NC	1	NC	1
276			min	0	2	-.004	3	-.002	3	-3.779e-5	1	NC	1	NC	1
277		6	max	0	3	0	2	0	10	4.903e-6	10	NC	1	NC	1
278			min	0	2	-.004	3	-.002	3	-4.378e-5	1	NC	1	NC	1
279		7	max	0	3	0	2	0	10	5.568e-6	10	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	3	-4.977e-5	1	NC	1	NC	1
281		8	max	0	3	0	2	0	10	6.232e-6	10	NC	1	NC	1
282			min	0	2	-.006	3	-.003	3	-7.184e-5	3	NC	1	NC	1
283		9	max	0	3	.001	2	0	10	6.897e-6	10	NC	1	NC	1
284			min	0	2	-.006	3	-.003	3	-9.764e-5	3	NC	1	NC	1
285		10	max	.001	3	.002	2	0	10	7.562e-6	10	NC	1	NC	1
286			min	-.001	2	-.007	3	-.003	3	-1.234e-4	3	NC	1	NC	1
287		11	max	.001	3	.002	2	0	10	8.226e-6	10	NC	1	NC	1
288			min	-.001	2	-.007	3	-.003	3	-1.492e-4	3	NC	1	NC	1
289		12	max	.001	3	.003	2	0	10	8.891e-6	10	NC	1	NC	1
290			min	-.001	2	-.008	3	-.003	3	-1.75e-4	3	NC	1	NC	1
291		13	max	.001	3	.004	2	0	10	9.556e-6	10	NC	1	NC	1
292			min	-.001	2	-.008	3	-.003	3	-2.008e-4	3	NC	1	NC	1
293		14	max	.002	3	.004	2	0	10	1.022e-5	10	NC	1	NC	1
294			min	-.002	2	-.008	3	-.003	3	-2.266e-4	3	NC	1	NC	1
295		15	max	.002	3	.005	2	0	10	1.089e-5	10	NC	1	NC	1
296			min	-.002	2	-.008	3	-.003	3	-2.524e-4	3	8904.909	2	NC	1
297		16	max	.002	3	.006	2	0	10	1.155e-5	10	NC	1	NC	1
298			min	-.002	2	-.009	3	-.003	3	-2.782e-4	3	7552.214	2	NC	1
299		17	max	.002	3	.007	2	0	10	1.221e-5	10	NC	1	NC	1
300			min	-.002	2	-.009	3	-.003	3	-3.04e-4	3	6503.82	2	NC	1
301		18	max	.002	3	.008	2	0	10	1.288e-5	10	NC	1	NC	1
302			min	-.002	2	-.009	3	-.003	3	-3.298e-4	3	5682.354	2	NC	1
303		19	max	.002	3	.009	2	0	10	1.354e-5	10	NC	3	NC	1
304			min	-.002	2	-.009	3	-.002	3	-3.556e-4	3	5033.159	2	NC	1
305	M12	1	max	.001	1	.011	2	.001	1	3.913e-4	3	NC	1	NC	1
306			min	0	12	-.01	3	0	10	-1.598e-5	10	NC	1	NC	1
307		2	max	.001	1	.01	2	.001	1	3.913e-4	3	NC	1	NC	1
308			min	0	12	-.009	3	0	10	-1.598e-5	10	NC	1	NC	1
309		3	max	.001	1	.01	2	.001	3	3.913e-4	3	NC	1	NC	1
310			min	0	12	-.009	3	0	10	-1.598e-5	10	NC	1	NC	1
311		4	max	0	1	.009	2	.001	3	3.913e-4	3	NC	1	NC	1
312			min	0	12	-.008	3	0	10	-1.598e-5	10	NC	1	NC	1
313		5	max	0	1	.008	2	0	3	3.913e-4	3	NC	1	NC	1
314			min	0	12	-.008	3	0	10	-1.598e-5	10	NC	1	NC	1
315		6	max	0	1	.008	2	0	3	3.913e-4	3	NC	1	NC	1
316			min	0	12	-.007	3	0	10	-1.598e-5	10	NC	1	NC	1
317		7	max	0	1	.007	2	0	3	3.913e-4	3	NC	1	NC	1
318			min	0	12	-.006	3	0	10	-1.598e-5	10	NC	1	NC	1
319		8	max	0	1	.007	2	0	3	3.913e-4	3	NC	1	NC	1
320			min	0	12	-.006	3	0	10	-1.598e-5	10	NC	1	NC	1
321		9	max	0	1	.006	2	0	3	3.913e-4	3	NC	1	NC	1
322			min	0	12	-.005	3	0	10	-1.598e-5	10	NC	1	NC	1
323		10	max	0	1	.005	2	0	3	3.913e-4	3	NC	1	NC	1
324			min	0	12	-.005	3	0	10	-1.598e-5	10	NC	1	NC	1
325		11	max	0	1	.005	2	0	3	3.913e-4	3	NC	1	NC	1
326			min	0	12	-.004	3	0	10	-1.598e-5	10	NC	1	NC	1
327		12	max	0	1	.004	2	0	3	3.913e-4	3	NC	1	NC	1
328			min	0	12	-.004	3	0	10	-1.598e-5	10	NC	1	NC	1
329		13	max	0	1	.004	2	0	3	3.913e-4	3	NC	1	NC	1
330			min	0	12	-.003	3	0	10	-1.598e-5	10	NC	1	NC	1
331		14	max	0	1	.003	2	0	3	3.913e-4	3	NC	1	NC	1
332			min	0	12	-.003	3	0	10	-1.598e-5	10	NC	1	NC	1
333		15	max	0	1	.002	2	0	3	3.913e-4	3	NC	1	NC	1
334			min	0	12	-.002	3	0	10	-1.598e-5	10	NC	1	NC	1
335		16	max	0	1	.002	2	0	3	3.913e-4	3	NC	1	NC	1
336			min	0	12	-.002	3	0	10	-1.598e-5	10	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	3	3.913e-4	3	NC	1	NC	1
338			min	0	12	-.001	3	0	10	-1.598e-5	10	NC	1	NC	1
339		18	max	0	1	0	2	0	3	3.913e-4	3	NC	1	NC	1
340			min	0	12	0	3	0	10	-1.598e-5	10	NC	1	NC	1
341		19	max	0	1	0	1	0	1	3.913e-4	3	NC	1	NC	1
342			min	0	1	0	1	0	1	-1.598e-5	10	NC	1	NC	1
343	M1	1	max	.009	3	.025	3	.004	3	4.89e-3	2	NC	1	NC	1
344			min	-.009	2	-.021	2	0	9	-7.219e-3	3	NC	1	NC	1
345		2	max	.009	3	.015	3	.003	3	2.42e-3	2	NC	4	NC	1
346			min	-.009	2	-.012	2	-.001	9	-3.549e-3	3	4646.666	3	NC	1
347		3	max	.009	3	.005	3	.003	3	5.326e-5	3	NC	4	NC	1
348			min	-.009	2	-.004	2	-.002	9	-8.507e-5	1	2406.75	3	NC	1
349		4	max	.009	3	.003	2	.002	3	5.46e-5	3	NC	4	NC	1
350			min	-.009	2	-.003	3	-.002	9	-7.129e-5	9	1714.528	3	NC	1
351		5	max	.009	3	.01	2	.002	3	5.593e-5	3	NC	4	NC	1
352			min	-.009	2	-.009	3	-.002	9	-5.838e-5	9	1384.384	3	NC	1
353		6	max	.009	3	.015	2	.001	3	5.727e-5	3	NC	4	NC	1
354			min	-.009	2	-.015	3	-.002	9	-4.547e-5	9	1200.074	3	NC	1
355		7	max	.009	3	.019	2	.001	3	5.861e-5	3	NC	4	NC	1
356			min	-.009	2	-.019	3	-.002	9	-3.257e-5	9	1090.926	3	NC	1
357		8	max	.009	3	.022	2	.001	3	5.995e-5	3	NC	4	NC	1
358			min	-.009	2	-.022	3	-.001	9	-1.966e-5	9	1022.673	2	NC	1
359		9	max	.009	3	.025	2	.001	3	6.129e-5	3	NC	4	NC	1
360			min	-.009	2	-.024	3	0	9	-6.755e-6	9	970.361	2	NC	1
361		10	max	.008	3	.025	2	.001	3	6.262e-5	3	NC	4	NC	1
362			min	-.009	2	-.024	3	0	9	-2.078e-6	10	945.219	2	NC	1
363		11	max	.008	3	.025	2	.001	3	6.396e-5	3	NC	4	NC	1
364			min	-.009	2	-.023	3	0	10	-3.892e-6	10	944.374	2	NC	1
365		12	max	.008	3	.023	2	.001	3	6.53e-5	3	NC	4	NC	1
366			min	-.009	2	-.021	3	0	10	-5.706e-6	10	968.792	2	NC	1
367		13	max	.008	3	.02	2	.001	1	7.017e-5	1	NC	4	NC	1
368			min	-.009	2	-.018	3	0	10	-7.52e-6	10	1023.846	2	NC	1
369		14	max	.008	3	.016	2	.002	1	8.569e-5	1	NC	4	NC	1
370			min	-.009	2	-.014	3	0	10	-9.333e-6	10	1122.084	2	NC	1
371		15	max	.008	3	.01	2	.002	1	1.012e-4	1	NC	4	NC	1
372			min	-.009	2	-.009	3	0	10	-1.115e-5	10	1291.189	2	NC	1
373		16	max	.008	3	.003	2	.002	1	1.127e-4	1	NC	4	NC	1
374			min	-.009	2	-.003	3	0	10	-1.249e-5	10	1599.223	2	NC	1
375		17	max	.008	3	.005	3	.001	1	8.187e-5	3	NC	4	NC	1
376			min	-.009	2	-.006	2	0	10	-2.691e-6	10	2266.745	2	NC	1
377		18	max	.008	3	.013	3	.001	3	3.511e-3	2	NC	4	NC	1
378			min	-.009	2	-.017	2	0	10	-1.937e-3	3	4394.162	2	NC	1
379		19	max	.008	3	.021	3	0	3	7.086e-3	2	NC	1	NC	1
380			min	-.009	2	-.028	2	0	9	-3.995e-3	3	NC	1	NC	1
381	M5	1	max	.025	3	.076	3	.004	3	1.231e-5	3	NC	1	NC	1
382			min	-.027	2	-.063	2	0	9	0	15	NC	1	NC	1
383		2	max	.025	3	.045	3	.006	3	1.485e-4	3	NC	4	NC	1
384			min	-.027	2	-.037	2	0	9	-8.196e-6	9	1525.317	3	NC	1
385		3	max	.025	3	.016	3	.007	3	2.82e-4	3	NC	5	NC	1
386			min	-.027	2	-.012	2	0	9	-1.633e-5	9	790.617	3	NC	1
387		4	max	.025	3	.011	2	.008	3	2.722e-4	3	NC	5	NC	1
388			min	-.027	2	-.009	3	0	9	-1.548e-5	9	564.175	3	NC	1
389		5	max	.025	3	.03	2	.009	3	2.625e-4	3	NC	5	NC	1
390			min	-.027	2	-.029	3	0	9	-1.464e-5	9	456.347	3	8773.676	3
391		6	max	.024	3	.046	2	.009	3	2.528e-4	3	NC	5	NC	1
392			min	-.027	2	-.046	3	0	9	-1.379e-5	9	396.303	3	7929.802	3
393		7	max	.024	3	.059	2	.009	3	2.43e-4	3	NC	5	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
394			min	-.027	2	-.058	3	0	9	-1.295e-5	9	360.775	2	7548.703	3
395		8	max	.024	3	.069	2	.009	3	2.333e-4	3	NC	5	NC	1
396			min	-.027	2	-.067	3	0	9	-1.21e-5	9	332.378	2	7477.17	3
397		9	max	.024	3	.076	2	.009	3	2.236e-4	3	NC	5	NC	1
398			min	-.027	2	-.071	3	0	9	-1.126e-5	9	315.355	2	7658.6	3
399		10	max	.024	3	.078	2	.008	3	2.138e-4	3	NC	5	NC	1
400			min	-.027	2	-.073	3	0	9	-1.041e-5	9	307.176	2	8088.534	3
401		11	max	.024	3	.077	2	.008	3	2.041e-4	3	NC	5	NC	1
402			min	-.027	2	-.07	3	0	9	-9.567e-6	9	306.906	2	8804.146	3
403		12	max	.024	3	.072	2	.007	3	1.944e-4	3	NC	5	NC	1
404			min	-.027	2	-.064	3	0	9	-8.722e-6	9	314.855	2	9892.287	3
405		13	max	.024	3	.063	2	.006	3	1.846e-4	3	NC	5	NC	1
406			min	-.027	2	-.055	3	0	9	-7.877e-6	9	332.773	2	NC	1
407		14	max	.024	3	.05	2	.005	3	1.749e-4	3	NC	5	NC	1
408			min	-.027	2	-.043	3	0	9	-7.033e-6	9	364.738	2	NC	1
409		15	max	.024	3	.031	2	.004	3	1.652e-4	3	NC	5	NC	1
410			min	-.027	2	-.027	3	0	9	-6.188e-6	9	419.75	2	NC	1
411		16	max	.024	3	.009	2	.003	3	1.508e-4	3	NC	5	NC	1
412			min	-.027	2	-.008	3	0	9	-6.007e-6	9	519.928	2	NC	1
413		17	max	.024	3	.014	3	.002	3	2.458e-5	3	NC	5	NC	1
414			min	-.027	2	-.019	2	0	9	-2.164e-5	9	736.901	2	NC	1
415		18	max	.024	3	.037	3	.002	3	1.021e-5	3	NC	4	NC	1
416			min	-.027	2	-.051	2	0	9	-1.111e-5	9	1428.653	2	NC	1
417		19	max	.024	3	.062	3	0	3	-3.859e-8	15	NC	1	NC	1
418			min	-.027	2	-.085	2	0	9	-2.06e-6	3	NC	1	NC	1
419	M9	1	max	.009	3	.024	3	.004	3	7.243e-3	3	NC	1	NC	1
420			min	-.009	2	-.021	2	0	9	-4.89e-3	2	NC	1	NC	1
421		2	max	.009	3	.014	3	.002	3	3.56e-3	3	NC	4	NC	1
422			min	-.009	2	-.012	2	0	10	-2.419e-3	2	4649.132	3	NC	1
423		3	max	.009	3	.005	3	.001	1	8.53e-5	1	NC	4	NC	1
424			min	-.009	2	-.004	2	0	10	-5.422e-5	3	2408.046	3	NC	1
425		4	max	.009	3	.003	2	.002	1	6.977e-5	1	NC	4	NC	1
426			min	-.009	2	-.004	3	-.001	3	-5.991e-5	3	1715.423	3	NC	1
427		5	max	.009	3	.01	2	.002	1	5.424e-5	1	NC	4	NC	1
428			min	-.009	2	-.01	3	-.002	3	-6.559e-5	3	1385.049	3	8571.177	3
429		6	max	.009	3	.015	2	.002	1	3.87e-5	1	NC	4	NC	1
430			min	-.009	2	-.016	3	-.003	3	-7.127e-5	3	1200.589	3	7455.423	3
431		7	max	.009	3	.019	2	.001	1	2.317e-5	1	NC	4	NC	1
432			min	-.009	2	-.02	3	-.004	3	-7.695e-5	3	1091.332	3	6812.408	3
433		8	max	.009	3	.022	2	.001	1	7.632e-6	1	NC	4	NC	1
434			min	-.009	2	-.022	3	-.005	3	-8.264e-5	3	1022.927	2	6457.38	3
435		9	max	.009	3	.025	2	0	1	4.024e-7	10	NC	4	NC	1
436			min	-.009	2	-.024	3	-.005	3	-8.832e-5	3	970.61	2	6307.057	3
437		10	max	.009	3	.025	2	0	1	2.208e-6	10	NC	4	NC	1
438			min	-.009	2	-.024	3	-.005	3	-9.4e-5	3	945.47	2	6326.145	3
439		11	max	.009	3	.025	2	0	10	4.013e-6	10	NC	4	NC	1
440			min	-.009	2	-.024	3	-.005	3	-9.968e-5	3	944.632	2	6508.867	3
441		12	max	.008	3	.023	2	0	10	5.818e-6	10	NC	4	NC	1
442			min	-.009	2	-.022	3	-.005	3	-1.054e-4	3	969.062	2	6875.214	3
443		13	max	.008	3	.02	2	0	10	7.623e-6	10	NC	4	NC	1
444			min	-.009	2	-.019	3	-.005	3	-1.11e-4	3	1024.137	2	7478.051	3
445		14	max	.008	3	.016	2	0	10	9.428e-6	10	NC	4	NC	1
446			min	-.009	2	-.014	3	-.004	3	-1.167e-4	3	1122.408	2	8426.672	3
447		15	max	.008	3	.01	2	0	10	1.123e-5	10	NC	4	NC	1
448			min	-.009	2	-.009	3	-.003	3	-1.224e-4	3	1291.564	2	9950.389	3
449		16	max	.008	3	.003	2	0	10	1.256e-5	10	NC	4	NC	1
450			min	-.009	2	-.003	3	-.002	3	-1.192e-4	3	1599.682	2	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
451		17	max	.008	3	.005	3	0	10	9.564e-5	3	NC	4	NC	1
452			min	-.009	2	-.006	2	-.001	3	-4.405e-5	9	2267.351	2	NC	1
453		18	max	.008	3	.013	3	0	10	2.027e-3	3	NC	4	NC	1
454			min	-.009	2	-.017	2	0	9	-3.512e-3	2	4395.299	2	NC	1
455		19	max	.008	3	.021	3	0	3	3.991e-3	3	NC	1	NC	1
456			min	-.009	2	-.028	2	0	9	-7.086e-3	2	NC	1	NC	1
457	M13	1	max	0	9	.024	3	.009	3	3.882e-3	3	NC	1	NC	1
458			min	-.004	3	-.021	2	-.009	2	-3.269e-3	2	NC	1	NC	1
459		2	max	0	9	.057	3	.007	3	4.775e-3	3	NC	4	NC	1
460			min	-.004	3	-.043	2	-.009	2	-4.021e-3	2	2567.378	3	NC	1
461		3	max	0	9	.085	3	.007	3	5.669e-3	3	NC	4	NC	1
462			min	-.004	3	-.062	2	-.009	2	-4.773e-3	2	1385.349	3	NC	1
463		4	max	0	9	.105	3	.008	3	6.562e-3	3	NC	4	NC	1
464			min	-.004	3	-.076	2	-.01	2	-5.526e-3	2	1044.098	3	NC	1
465		5	max	0	9	.115	3	.01	3	7.456e-3	3	NC	4	NC	1
466			min	-.004	3	-.084	2	-.013	2	-6.278e-3	2	928.004	3	NC	1
467		6	max	0	9	.115	3	.013	3	8.349e-3	3	NC	4	NC	1
468			min	-.004	3	-.085	2	-.016	2	-7.03e-3	2	924.946	3	NC	1
469		7	max	0	9	.108	3	.016	3	9.243e-3	3	NC	4	NC	1
470			min	-.004	3	-.081	2	-.019	2	-7.783e-3	2	1012.286	3	8167.43	2
471		8	max	0	9	.095	3	.019	3	1.014e-2	3	NC	4	NC	1
472			min	-.004	3	-.074	2	-.023	2	-8.535e-3	2	1195.178	3	6000.252	2
473		9	max	0	9	.082	3	.022	3	1.103e-2	3	NC	4	NC	4
474			min	-.004	3	-.067	2	-.026	2	-9.287e-3	2	1457.401	3	4942.683	2
475		10	max	0	9	.076	3	.025	3	1.192e-2	3	NC	4	NC	4
476			min	-.004	3	-.063	2	-.027	2	-1.004e-2	2	1627.869	3	4599.226	2
477		11	max	0	9	.083	3	.026	3	1.103e-2	3	NC	4	NC	4
478			min	-.004	3	-.067	2	-.026	2	-9.287e-3	2	1457.399	3	4760.791	3
479		12	max	0	9	.095	3	.027	3	1.014e-2	3	NC	4	NC	1
480			min	-.004	3	-.074	2	-.023	2	-8.535e-3	2	1195.177	3	4711.238	3
481		13	max	0	9	.108	3	.025	3	9.252e-3	3	NC	4	NC	1
482			min	-.004	3	-.081	2	-.019	2	-7.783e-3	2	1012.285	3	5013.384	3
483		14	max	0	9	.116	3	.023	3	8.362e-3	3	NC	4	NC	1
484			min	-.004	3	-.085	2	-.016	2	-7.03e-3	2	924.945	3	5727.208	3
485		15	max	0	9	.116	3	.021	3	7.471e-3	3	NC	4	NC	1
486			min	-.004	3	-.084	2	-.013	2	-6.278e-3	2	928.003	3	7091.706	3
487		16	max	0	9	.106	3	.017	3	6.581e-3	3	NC	4	NC	1
488			min	-.004	3	-.076	2	-.01	2	-5.526e-3	2	1044.097	3	9764.185	3
489		17	max	0	9	.086	3	.014	3	5.69e-3	3	NC	4	NC	1
490			min	-.004	3	-.062	2	-.009	2	-4.774e-3	2	1385.347	3	NC	1
491		18	max	0	9	.058	3	.011	3	4.8e-3	3	NC	4	NC	1
492			min	-.004	3	-.043	2	-.009	2	-4.021e-3	2	2567.376	3	NC	1
493		19	max	0	9	.025	3	.009	3	3.91e-3	3	NC	1	NC	1
494			min	-.004	3	-.021	2	-.009	2	-3.269e-3	2	NC	1	NC	1
495	M16	1	max	0	9	.021	3	.008	3	4.192e-3	2	NC	1	NC	1
496			min	0	3	-.028	2	-.009	2	-3.201e-3	3	NC	1	NC	1
497		2	max	0	9	.039	3	.011	3	5.159e-3	2	NC	4	NC	1
498			min	0	3	-.06	2	-.009	2	-3.893e-3	3	2616.303	2	NC	1
499		3	max	0	9	.055	3	.014	3	6.126e-3	2	NC	4	NC	1
500			min	0	3	-.087	2	-.009	2	-4.585e-3	3	1407.405	2	NC	1
501		4	max	0	9	.067	3	.017	3	7.093e-3	2	NC	4	NC	1
502			min	0	3	-.107	2	-.01	2	-5.277e-3	3	1055.103	2	NC	1
503		5	max	0	9	.074	3	.019	3	8.06e-3	2	NC	4	NC	1
504			min	0	3	-.118	2	-.012	2	-5.969e-3	3	930.15	2	7671.455	3
505		6	max	0	9	.076	3	.022	3	9.027e-3	2	NC	4	NC	1
506			min	0	3	-.119	2	-.015	2	-6.661e-3	3	915.825	2	6343.288	3
507		7	max	0	9	.074	3	.023	3	9.994e-3	2	NC	4	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
508			min	0	3	-.113	2	-.019	2	-7.353e-3	3	984.319	2	5614.877	3
509		8	max	0	9	.07	3	.024	3	1.096e-2	2	NC	4	NC	1
510			min	0	3	-.102	2	-.023	2	-8.045e-3	3	1132.311	2	5261.858	3
511		9	max	0	9	.065	3	.025	3	1.193e-2	2	NC	4	NC	4
512			min	0	3	-.09	2	-.026	2	-8.737e-3	3	1337.165	2	4959.663	2
513		10	max	0	9	.062	3	.024	3	1.289e-2	2	NC	4	NC	4
514			min	0	3	-.085	2	-.027	2	-9.429e-3	3	1464.98	2	4614.337	2
515		11	max	0	9	.065	3	.022	3	1.193e-2	2	NC	4	NC	4
516			min	0	3	-.09	2	-.026	2	-8.734e-3	3	1337.165	2	4959.669	2
517		12	max	0	9	.07	3	.021	3	1.096e-2	2	NC	4	NC	1
518			min	0	3	-.102	2	-.023	2	-8.039e-3	3	1132.311	2	6023.398	2
519		13	max	0	9	.074	3	.019	3	9.994e-3	2	NC	4	NC	1
520			min	0	3	-.113	2	-.019	2	-7.344e-3	3	984.319	2	7788.193	3
521		14	max	0	9	.076	3	.017	3	9.027e-3	2	NC	4	NC	1
522			min	0	3	-.119	2	-.015	2	-6.649e-3	3	915.825	2	9545.872	3
523		15	max	0	9	.074	3	.015	3	8.061e-3	2	NC	4	NC	1
524			min	0	3	-.118	2	-.012	2	-5.954e-3	3	930.15	2	NC	1
525		16	max	0	9	.067	3	.013	3	7.094e-3	2	NC	4	NC	1
526			min	0	3	-.107	2	-.01	2	-5.259e-3	3	1055.103	2	NC	1
527		17	max	0	9	.055	3	.011	3	6.127e-3	2	NC	4	NC	1
528			min	0	3	-.087	2	-.009	2	-4.564e-3	3	1407.405	2	NC	1
529		18	max	0	9	.039	3	.009	3	5.16e-3	2	NC	4	NC	1
530			min	0	3	-.06	2	-.009	2	-3.869e-3	3	2616.303	2	NC	1
531		19	max	0	9	.021	3	.008	3	4.193e-3	2	NC	1	NC	1
532			min	0	3	-.028	2	-.009	2	-3.175e-3	3	NC	1	NC	1
533	M15	1	max	0	1	0	1	0	1	4.08e-4	3	NC	1	NC	1
534			min	0	1	0	1	0	1	-4.469e-5	2	NC	1	NC	1
535		2	max	0	3	0	15	0	1	7.83e-4	3	NC	1	NC	1
536			min	0	2	-.002	4	0	3	-4.08e-4	2	NC	1	NC	1
537		3	max	0	3	0	15	.002	2	1.158e-3	3	NC	1	NC	1
538			min	0	2	-.004	4	-.003	3	-7.713e-4	2	NC	1	8853.526	3
539		4	max	0	3	-.001	15	.005	2	1.533e-3	3	NC	1	NC	4
540			min	0	2	-.006	4	-.007	3	-1.135e-3	2	NC	1	4899.738	3
541		5	max	0	3	-.002	15	.009	2	1.908e-3	3	NC	1	NC	4
542			min	0	2	-.007	4	-.011	3	-1.498e-3	2	8038.769	4	3222.664	3
543		6	max	0	3	-.002	15	.013	2	2.283e-3	3	NC	3	NC	4
544			min	-.001	2	-.009	4	-.016	3	-1.861e-3	2	6765.474	4	2349.932	3
545		7	max	0	3	-.002	15	.017	2	2.658e-3	3	NC	3	NC	4
546			min	-.001	2	-.01	4	-.021	3	-2.224e-3	2	5999.755	4	1838.965	3
547		8	max	0	3	-.002	15	.02	2	3.032e-3	3	NC	5	NC	4
548			min	-.002	2	-.011	4	-.026	3	-2.588e-3	2	5540.208	4	1517.479	3
549		9	max	0	3	-.003	15	.024	2	3.407e-3	3	NC	5	NC	4
550			min	-.002	2	-.011	4	-.031	3	-2.951e-3	2	5292.853	4	1306.984	3
551		10	max	.001	3	-.003	15	.026	2	3.782e-3	3	NC	5	NC	4
552			min	-.002	2	-.011	4	-.034	3	-3.314e-3	2	5214.602	4	1168.023	3
553		11	max	.001	3	-.003	15	.028	2	4.157e-3	3	NC	5	NC	4
554			min	-.002	2	-.011	4	-.037	3	-3.678e-3	2	5292.853	4	1079.872	3
555		12	max	.001	3	-.002	15	.028	2	4.532e-3	3	NC	5	NC	4
556			min	-.002	2	-.011	4	-.037	3	-4.041e-3	2	5540.208	4	1032.258	3
557		13	max	.001	3	-.002	15	.027	2	4.907e-3	3	NC	3	NC	4
558			min	-.003	2	-.01	4	-.036	3	-4.404e-3	2	5999.755	4	1022.227	3
559		14	max	.001	3	-.001	2	.024	2	5.282e-3	3	NC	3	NC	4
560			min	-.003	2	-.009	4	-.033	3	-4.768e-3	2	6765.474	4	1054.274	3
561		15	max	.002	3	0	2	.019	2	5.657e-3	3	NC	1	NC	4
562			min	-.003	2	-.007	4	-.027	3	-5.131e-3	2	8038.769	4	1144.81	3
563		16	max	.002	3	.002	2	.013	1	6.032e-3	3	NC	1	NC	4
564			min	-.003	2	-.006	4	-.018	3	-5.494e-3	2	NC	1	1338.36	3

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	.002	3	.004	2	.005	1	6.407e-3	3	NC	1	NC	4
566			min	-.004	2	-.004	4	-.006	3	-5.857e-3	2	NC	1	1774.581	3
567		18	max	.002	3	.006	2	.01	3	6.782e-3	3	NC	1	NC	4
568			min	-.004	2	-.002	4	-.012	2	-6.221e-3	2	NC	1	3159.921	3
569		19	max	.002	3	.008	2	.03	3	7.156e-3	3	NC	1	NC	1
570			min	-.004	2	0	9	-.028	2	-6.584e-3	2	NC	1	NC	1
571	M16A	1	max	.001	2	.002	2	.009	3	2.034e-3	3	NC	1	NC	1
572			min	-.002	3	-.002	3	-.009	2	-2.132e-3	2	NC	1	NC	1
573		2	max	.001	2	0	2	.002	3	1.96e-3	3	NC	1	NC	1
574			min	-.002	3	-.003	3	-.004	2	-2.034e-3	2	NC	1	8725.343	3
575		3	max	.001	2	0	2	.002	1	1.886e-3	3	NC	1	NC	4
576			min	-.002	3	-.004	4	-.003	3	-1.937e-3	2	NC	1	4941.598	3
577		4	max	.001	2	-.001	15	.005	1	1.812e-3	3	NC	1	NC	4
578			min	-.002	3	-.006	4	-.007	3	-1.839e-3	2	NC	1	3762.625	3
579		5	max	0	2	-.002	15	.007	1	1.738e-3	3	NC	1	NC	4
580			min	-.002	3	-.007	4	-.01	3	-1.742e-3	2	8038.769	4	3253.722	3
581		6	max	0	2	-.002	15	.008	1	1.664e-3	3	NC	3	NC	4
582			min	-.001	3	-.009	4	-.012	3	-1.644e-3	2	6765.474	4	3034.203	3
583		7	max	0	2	-.002	15	.008	1	1.59e-3	3	NC	3	NC	4
584			min	-.001	3	-.01	4	-.013	3	-1.547e-3	2	5999.755	4	2985.204	3
585		8	max	0	2	-.002	15	.008	1	1.516e-3	3	NC	5	NC	4
586			min	-.001	3	-.011	4	-.013	3	-1.449e-3	2	5540.208	4	3066.769	3
587		9	max	0	2	-.003	15	.008	1	1.442e-3	3	NC	5	NC	4
588			min	-.001	3	-.011	4	-.012	3	-1.352e-3	2	5292.853	4	3274.882	3
589		10	max	0	2	-.003	15	.007	1	1.368e-3	3	NC	5	NC	4
590			min	0	3	-.011	4	-.011	3	-1.254e-3	2	5214.602	4	3632.033	3
591		11	max	0	2	-.003	15	.006	1	1.294e-3	3	NC	5	NC	4
592			min	0	3	-.011	4	-.01	3	-1.156e-3	2	5292.853	4	4192.82	3
593		12	max	0	2	-.002	15	.005	1	1.22e-3	3	NC	5	NC	4
594			min	0	3	-.011	4	-.008	3	-1.059e-3	2	5540.208	4	5066.195	3
595		13	max	0	2	-.002	15	.004	1	1.146e-3	3	NC	3	NC	1
596			min	0	3	-.01	4	-.006	3	-9.614e-4	2	5999.755	4	6473.066	3
597		14	max	0	2	-.002	15	.003	1	1.072e-3	3	NC	3	NC	1
598			min	0	3	-.009	4	-.004	3	-8.638e-4	2	6765.474	4	8904.058	3
599		15	max	0	2	-.002	15	.001	1	9.982e-4	3	NC	1	NC	1
600			min	0	3	-.007	4	-.002	3	-7.663e-4	2	8038.769	4	NC	1
601		16	max	0	2	-.001	15	.001	4	9.242e-4	3	NC	1	NC	1
602			min	0	3	-.006	4	0	3	-6.687e-4	2	NC	1	NC	1
603		17	max	0	2	0	15	0	4	8.503e-4	3	NC	1	NC	1
604			min	0	3	-.004	4	0	2	-5.712e-4	2	NC	1	NC	1
605		18	max	0	2	0	15	0	3	7.763e-4	3	NC	1	NC	1
606			min	0	3	-.002	4	0	2	-4.736e-4	2	NC	1	NC	1
607		19	max	0	1	0	1	0	1	7.023e-4	3	NC	1	NC	1
608			min	0	1	0	1	0	1	-3.761e-4	2	NC	1	NC	1

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

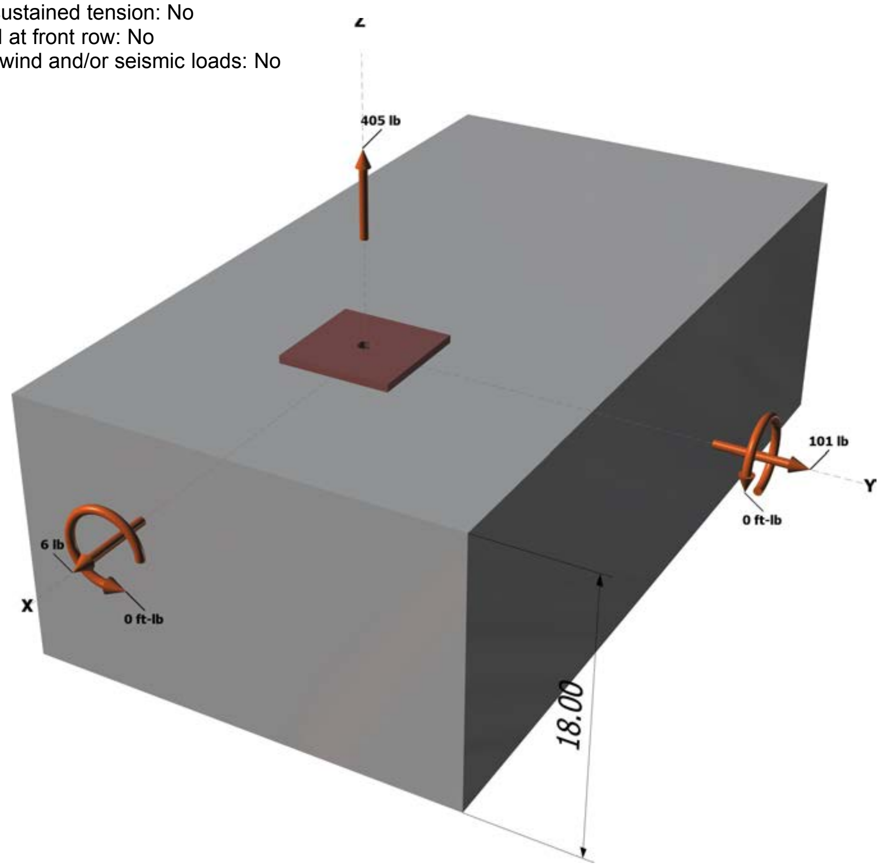
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

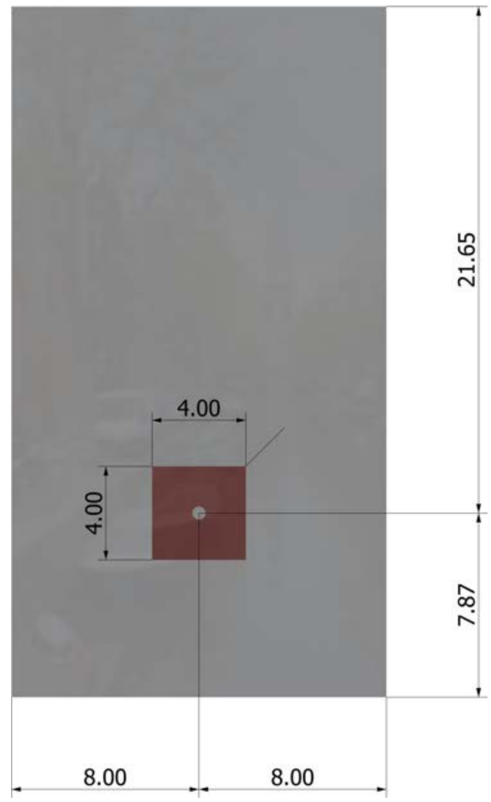
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'$_c$ (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout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

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

<Figure 1>



<Figure 2>



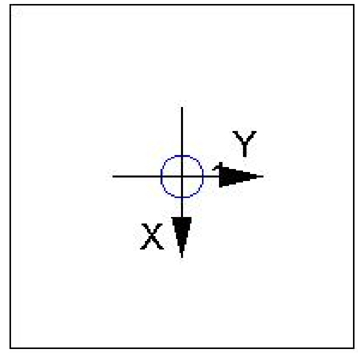
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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

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

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

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

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

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

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

A_{Na} (in²)	A_{Na0} (in²)	$\Psi_{ed,Na}$	$\Psi_{p,Na}$	N_{a0} (lb)	ϕ	ϕN_a (lb)
109.66	109.66	1.000	1.000	9755	0.55	5365

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

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

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

Shear perpendicular to edge in y-direction:

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

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

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

Shear parallel to edge in x-direction:

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

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

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

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

Shear parallel to edge in y-direction:

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

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

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

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

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

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

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

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

11. Results

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

Tension	Factored Load, N_{ua} (lb)	Design Strength, øN_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, øV_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

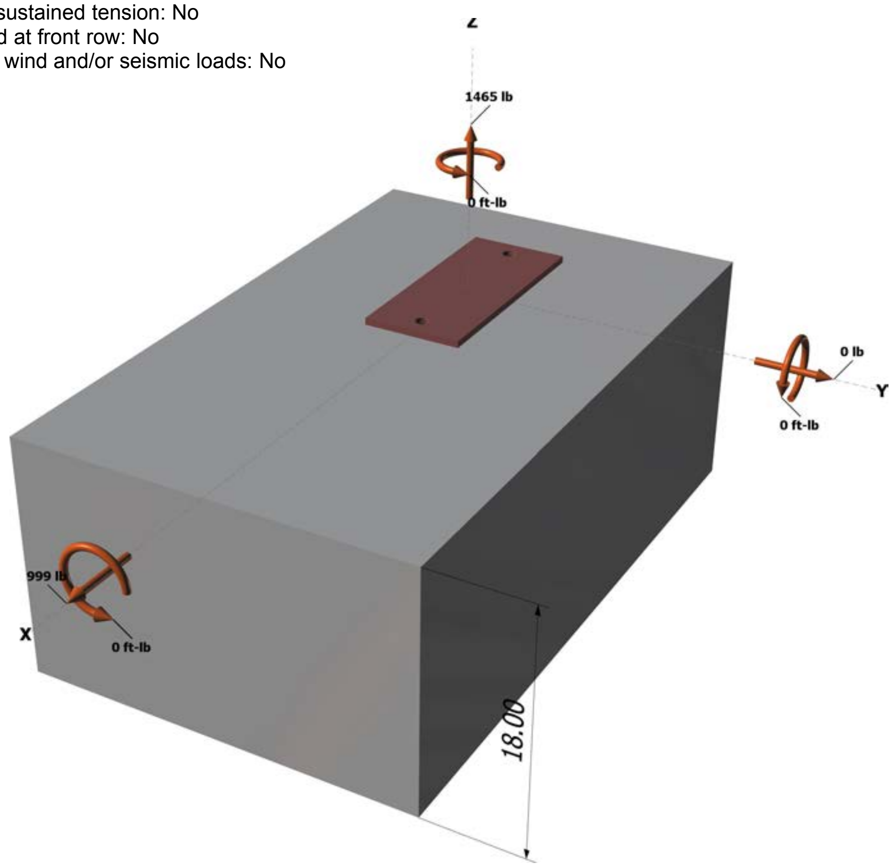
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

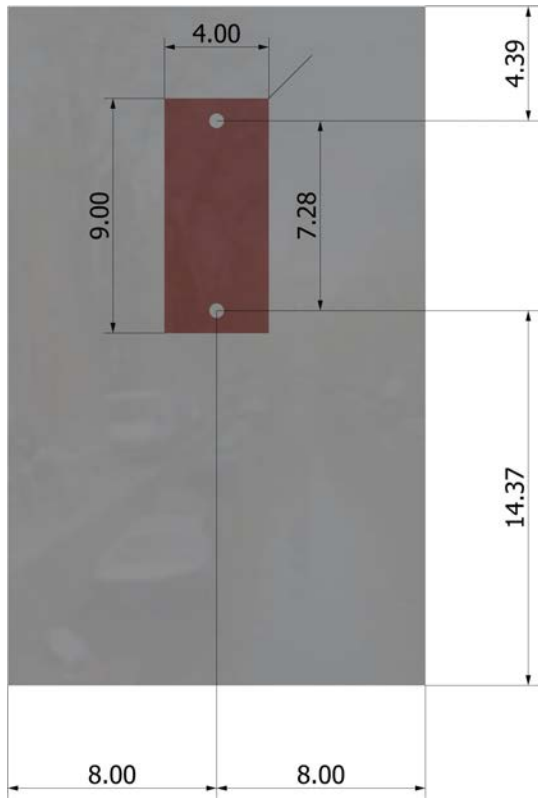
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout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



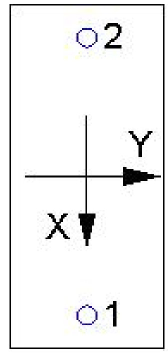
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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, $øN_n$ (lb)	Ratio	Status
Steel	733	6071	0.12	Pass
Concrete breakout	**1465**	**7233**	**0.20**	**Pass (Governs)**
Adhesive	1465	8418	0.17	Pass

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

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

Sec. D.7.3	0.20	0.25	45.0 %	1.2	Pass

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

12. Warnings

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

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

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