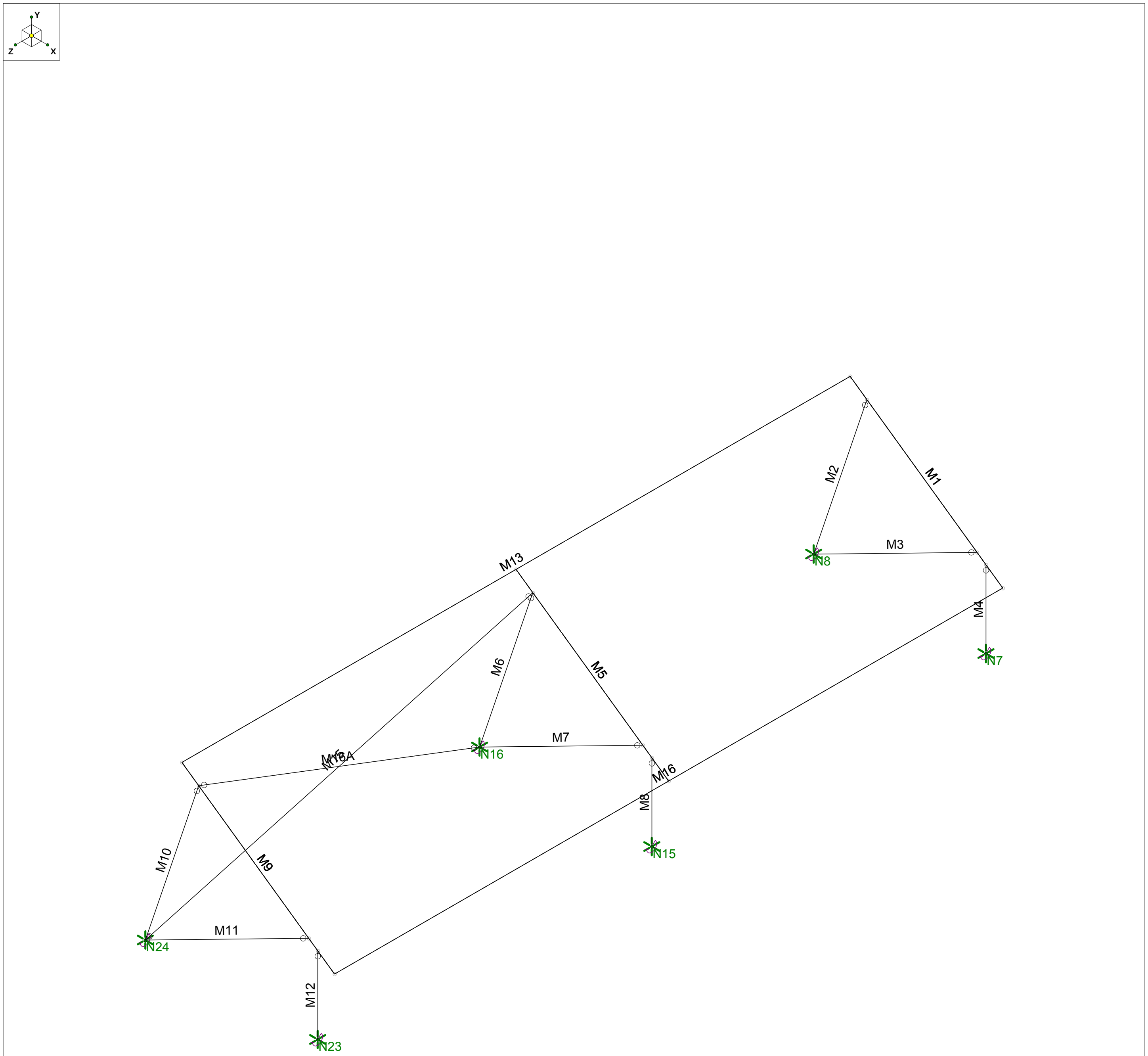


Schletter, Inc.		35° Tilt w/o Seismic Design
HCV	Standard PVMini Racking System	
	Representative Calculations - ASCE 7-05	

1. INTRODUCTION

1.1 Project Description

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

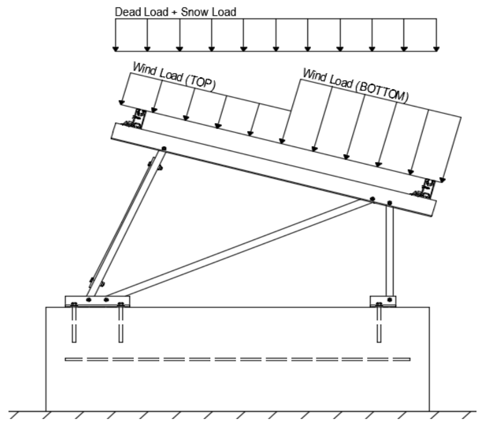
1.2 Construction

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

PV modules are required to meet the following specifications:

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

Modules Per Row = 1
Module Tilt = 35°
Maximum Height Above Grade = 3 ft



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

1.3 Technical Codes

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

2. LOAD ACTIONS

2.1 Permanent Loads

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

Self-weight of the PV modules.

2.2 Snow Loads

Ground Snow Load, P_g = 30.00 psf
Sloped Roof Snow Load, P_s = 14.43 psf *(ASCE 7-05, Eq. 7-2)*
I_s = 1.00
C_s = 0.64
C_e = 0.90
C_t = 1.20

2.3 Wind Loads

Design Wind Speed, V = 100 mph
Height ≤ 15 ft

Exposure Category = C
Importance Category = II

Peak Velocity Pressure, q_z = 15.70 psf *Including the gust factor, G=0.85. (ASCE 7-05, Eq. 6-15)*

Pressure Coefficients

$Cf+_{TOP}$	=	1.2	*(Pressure)*
$Cf+_{BOTTOM}$	=	2	
$Cf-_{TOP}$	=	-2.4	*(Suction)*
$Cf-_{BOTTOM}$	=	-1.2	

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

2.4 Seismic Loads - N/A

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

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

2.5 Combination of Loads

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

Strength Design, LRFD

Component stresses are checked using the following LRFD load combinations:

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

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

Allowable Stress Design, ASD

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

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

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

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

3. STRUCTURAL ANALYSIS

3.1 RISA Results

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

3.2 RISA Components

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

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

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

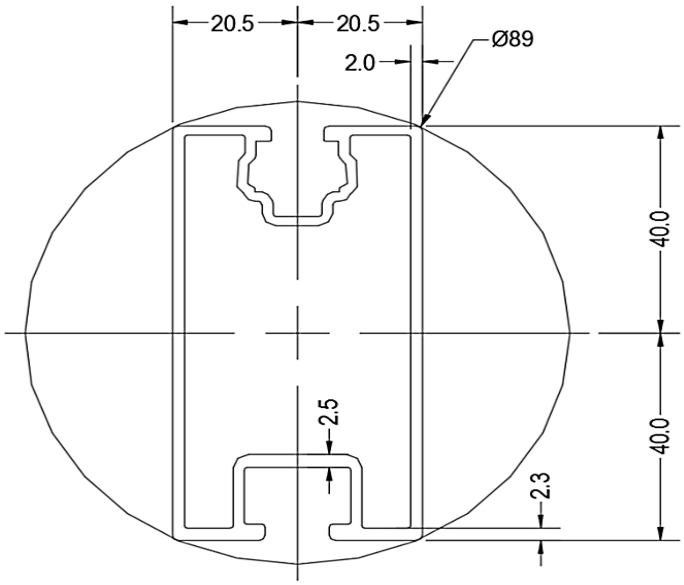
Front Struts	Location	**Bracing**
M4	Outer	M15
M8	Inner	M16A
M12	Outer	

4. MEMBER DESIGN CALCULATIONS

4.1 Purlin Design

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

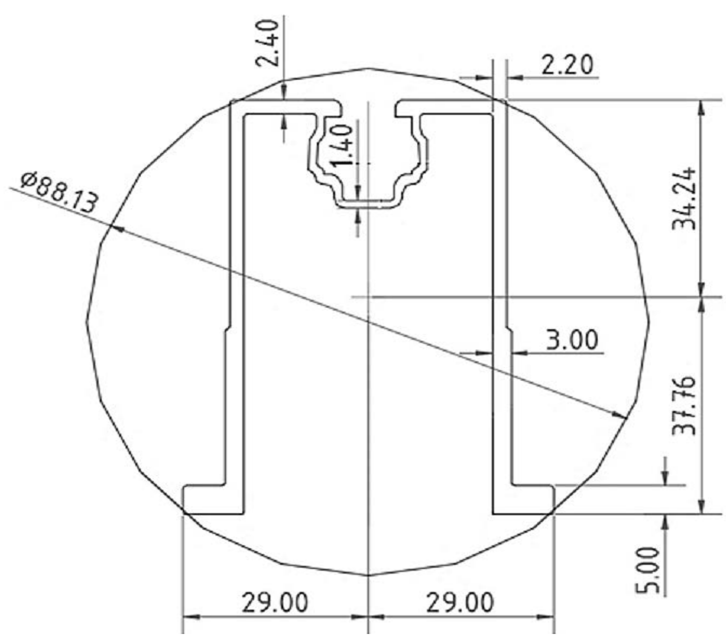
Purlin Type =	**ProfiPlusXT**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	66	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.56	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	22.71	ksi
S_y =	0.75	in^3
S_x =	0.44	in^3
E =	10100	ksi
I_y =	1.20	in^4
I_x =	0.36	in^4
A =	0.96	in^2
g =	1.15	lbs/ft
M_y =	0.466	k-ft
M_z =	0.128	k-ft
$M_{y\ allowable}$ =	1.837	k-ft
$M_{z\ allowable}$ =	0.838	k-ft
Utilization =	41%	



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).

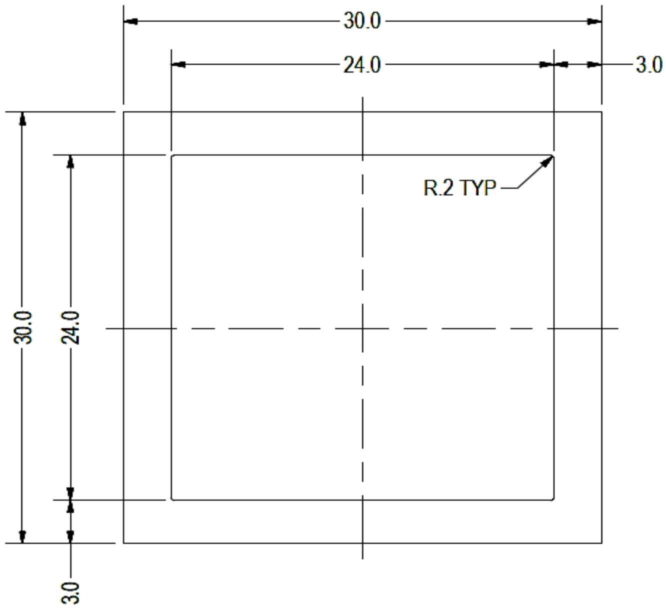
Girder Type =	**Flex Profi**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	33.78	in
$\Phi F_{ty\ AXIAL}$ =	14.29	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.38	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	13.46	ksi
S_y =	0.59	in^3
S_x =	0.46	in^3
E =	10100	ksi
I_y =	0.88	in^4
I_x =	0.52	in^4
A =	0.89	in^2
g =	1.07	lbs/ft
M_y =	0.574	k-ft
M_z =	0.000	k-ft
P_n =	0.280	k
$M_{y\ allowable}$ =	1.442	k-ft
$M_{z\ allowable}$ =	0.513	k-ft
$P_{n\ allowable}$ =	12.764	k
Utilization =	42%	



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).

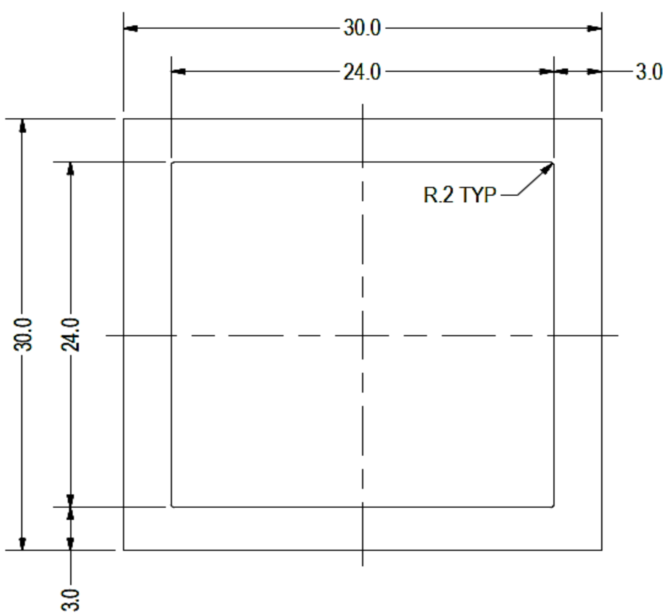
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	18.00	in
$\Phi F_{ty\ AXIAL}$ =	24.52	ksi
$\Phi F_{ty\ BENDING}$ =	31.19	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.816	k
$M_{y\ allowable}$ =	0.423	k-ft
$M_{z\ allowable}$ =	0.423	k-ft
$P_{n\ allowable}$ =	12.310	k
Utilization =	7%	



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).

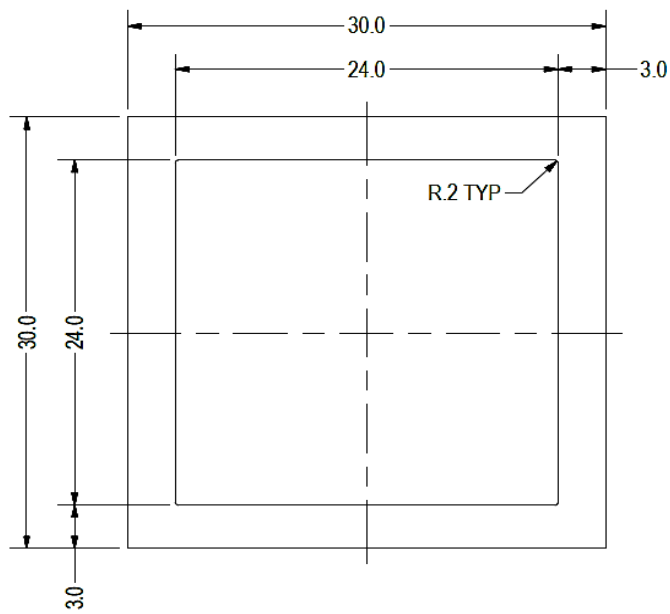
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	46.38	in
$\Phi F_{ty\ AXIAL}$ =	7.60	ksi
$\Phi F_{ty\ BENDING}$ =	29.80	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.764	k
$M_{y\ allowable}$ =	0.404	k-ft
$M_{z\ allowable}$ =	0.404	k-ft
$P_{n\ allowable}$ =	3.814	k
Utilization =	20%	



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).

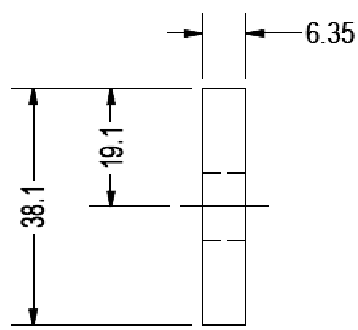
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	42.32	in
$\Phi F_{ty\ AXIAL}$ =	8.86	ksi
$\Phi F_{ty\ BENDING}$ =	29.96	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.695	k
$M_{y\ allowable}$ =	0.406	k-ft
$M_{z\ allowable}$ =	0.406	k-ft
$P_{n\ allowable}$ =	4.450	k
Utilization =	16%	



4.6 Cross Brace Design

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

Brace Type =	**1.5x0.25**	
Aluminum Type =	6061-T6	
F_{ty} =	35	ksi
Φ =	0.90	
S_y =	0.02	in^3
E =	10100	ksi
I_y =	33.25	in^4
A =	0.38	in^2
g =	0.45	lbs/ft
M_y =	0.003	k-ft
P_n =	0.089	k
$M_{y\ allowable}$ =	0.046	k-ft
$P_{n\ allowable}$ =	11.813	k
Utilization =	7%	



A cross brace kit is required every 27 bays and is to be installed in centermost bays.

5. FOUNDATION DESIGN CALCULATIONS

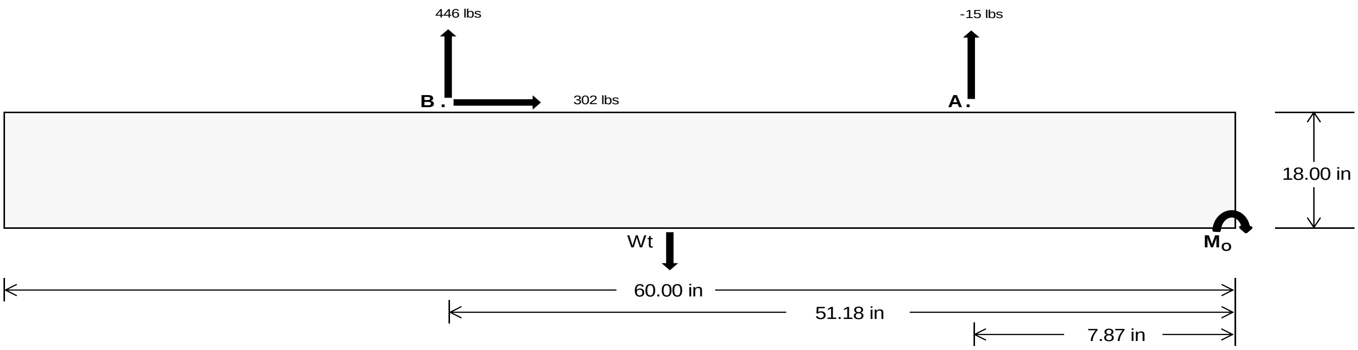
5.1 Helical Pile Foundations

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 =	26.36	1859.55	k
Compressive Load =	1061.28	1289.94	k
Lateral Load =	2.52	1257.60	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 tables 1804.2 (2003, 2006) & 1806.2 (2009).



<u>Concrete Properties</u>

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

<u>Footing Reinforcement</u>

Use fiber reinforcing with (1) #5 rebar.

<u>Overturning Check</u>

M_O = 28174.5 in-lbs
Resisting Force Required = 939.15 lbs
S.F. = 1.67
Weight Required = 1565.25 lbs
Minimum Width = <u>22 in</u> in
Weight Provided = 1993.75 lbs

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

<u>Sliding</u>

Force = 302.20 lbs
Friction = 0.4
Weight Required = 755.49 lbs
Resisting Weight = 1993.75 lbs
Additional Weight Required = 0 lbs

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

<u>Cohesion</u>

Sliding Force = 302.20 lbs
Cohesion = 130 psf
Area = 9.17 ft^2
Resisting = 996.88 lbs
Additional Weight Required = 0 lbs

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

<u>Shear Key</u>

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

Shear key is not required.

<u>Bearing Pressure</u>

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

ASD LC	1.0D + 1.0S				1.0D + 1.0W				1.0D + 0.75L + 0.75W + 0.75S				0.6D + 1.0W			
Width	22 in	23 in	24 in	25 in	22 in	23 in	24 in	25 in	22 in	23 in	24 in	25 in	22 in	23 in	24 in	25 in
F_A	398 lbs	398 lbs	398 lbs	398 lbs	347 lbs	347 lbs	347 lbs	347 lbs	518 lbs	518 lbs	518 lbs	518 lbs	29 lbs	29 lbs	29 lbs	29 lbs
F_B	259 lbs	259 lbs	259 lbs	259 lbs	570 lbs	570 lbs	570 lbs	570 lbs	594 lbs	594 lbs	594 lbs	594 lbs	-893 lbs	-893 lbs	-893 lbs	-893 lbs
F_V	43 lbs	43 lbs	43 lbs	43 lbs	548 lbs	548 lbs	548 lbs	548 lbs	440 lbs	440 lbs	440 lbs	440 lbs	-604 lbs	-604 lbs	-604 lbs	-604 lbs
P_{total}	2651 lbs	2742 lbs	2832 lbs	2923 lbs	2910 lbs	3001 lbs	3091 lbs	3182 lbs	3106 lbs	3197 lbs	3287 lbs	3378 lbs	333 lbs	387 lbs	441 lbs	496 lbs
M	341 lbs-ft	341 lbs-ft	341 lbs-ft	341 lbs-ft	457 lbs-ft	457 lbs-ft	457 lbs-ft	457 lbs-ft	565 lbs-ft	565 lbs-ft	565 lbs-ft	565 lbs-ft	724 lbs-ft	724 lbs-ft	724 lbs-ft	724 lbs-ft
e	0.13 ft	0.12 ft	0.12 ft	0.12 ft	0.16 ft	0.15 ft	0.15 ft	0.14 ft	0.18 ft	0.18 ft	0.17 ft	0.17 ft	2.18 ft	1.87 ft	1.64 ft	1.46 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}	244.6 psf	243.4 psf	242.3 psf	241.4 psf	257.7 psf	256.0 psf	254.4 psf	252.9 psf	264.8 psf	262.8 psf	260.9 psf	259.1 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	333.8 psf	328.7 psf	324.1 psf	319.8 psf	377.2 psf	370.3 psf	363.9 psf	358.1 psf	412.9 psf	404.4 psf	396.6 psf	389.4 psf	372.5 psf	213.6 psf	171.0 psf	152.5 psf

Maximum Bearing Pressure = 413 psf
Allowable Bearing Pressure = 1500 psf

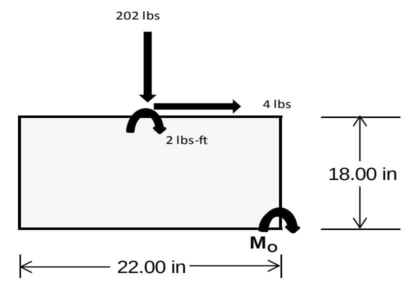
Use a 60in long x 22in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O = 177.4 ft-lbs
Resisting Force Required = 193.57 lbs
S.F. = 1.67
Weight Required = 322.62 lbs
Minimum Width = 22 in in
Weight Provided = 1993.75 lbs

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



Bearing Pressure

ASD LC	1.238D + 0.875E			1.1785D + 0.65625E + 0.75S			0.362D + 0.875E		
Width	22 in			22 in			22 in		
Support	Outer	Inner	Outer	Outer	Inner	Outer	Outer	Inner	Outer
F_Y	69 lbs	168 lbs	65 lbs	202 lbs	551 lbs	198 lbs	20 lbs	49 lbs	19 lbs
F_V	1 lbs	1 lbs	0 lbs	4 lbs	3 lbs	1 lbs	0 lbs	0 lbs	0 lbs
P_{total}	2537 lbs	2636 lbs	2533 lbs	2552 lbs	2901 lbs	2548 lbs	742 lbs	771 lbs	741 lbs
M	1 lbs-ft	1 lbs-ft	0 lbs-ft	8 lbs-ft	5 lbs-ft	1 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	0.31 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft
f_{min}	276.3 sqft	287.3 sqft	276.3 sqft	275.5 sqft	314.6 sqft	277.7 sqft	80.8 sqft	84.0 sqft	80.8 sqft
f_{max}	277.2 psf	288.0 psf	276.5 psf	281.3 psf	318.3 psf	278.3 psf	81.1 psf	84.2 psf	80.8 psf

Maximum Bearing Pressure = 318 psf
Allowable Bearing Pressure = 1500 psf

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

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

5.3 Foundation Anchors

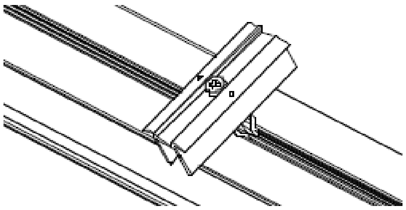
Threaded rods are anchored to the the ballast foundations using the Simpson AT-XP epoxy solution. LRFD load results are compared to the allowable strengths of the epoxy solution. Please see the supplementary calculations provided by the Simpson Anchor Designer software.

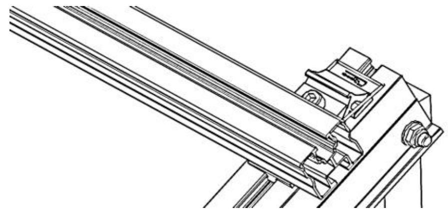
6. DESIGN OF JOINTS AND CONNECTIONS

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

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

Fastening of Modules to Purlins		Fastening of Purlins to Girders	
Maximum Uplifting Force =	0.564 k	Maximum Uplifting Force =	1.106 k
Allowable Uplift =	1.214 k	Allowable Uplift =	1.116 k
Utilization =	46%	Utilization =	99%



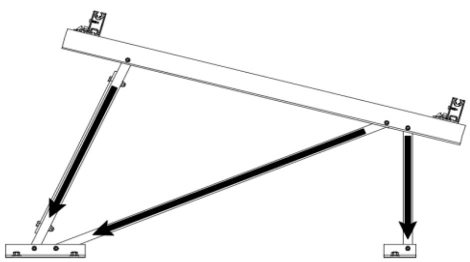


6.2 Bolted Connections

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

Front Strut		Rear Strut	
Maximum Axial Load =	0.816 k	Maximum Axial Load =	1.149 k
M8 Bolt Capacity =	5.692 k	M8 Bolt Capacity =	5.692 k
Strut Bearing Capacity =	7.952 k	Strut Bearing Capacity =	7.952 k
Utilization =	14%	Utilization =	20%

Diagonal Strut		Bracing	
Maximum Axial Load =	0.764 k	Maximum Axial Load =	0.089 k
M8 Bolt Shear Capacity =	5.692 k	M10 Bolt Capacity =	8.894 k
Strut Bearing Capacity =	7.952 k	Strut Bearing Capacity =	7.952 k
Utilization =	13%	Utilization =	1%



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

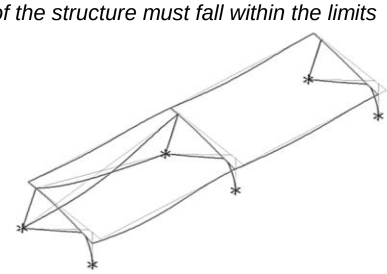
7. SEISMIC DESIGN

7.1 Seismic Drift - N/A

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

Mean Height, h_{sx} =		33.11 in
Allowable Story Drift for All Other Structures, Δ	= {	$0.020h_{sx}$
		0.662 in
Max Drift, Δ_{MAX} =		0.018 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 XT**

Strong Axis:

3.4.14

L_b = 66.00 in

J = 0.427

137.652

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.6 ksi

3.4.16

b/t = 6.6

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

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 = 66.00 in

J = 0.427

149.579

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.4

3.4.16

b/t = 37.95

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 22.7 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 37.95

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

S1 = 38.1
m = 0.63
C_0 = 40.784
Cc = 39.216

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

S2 = 79.7
φF_L= 1.3φyFcy
φF_L= 43.2 ksi

$\varphi F_L St$= 29.6 ksi
Ix = 498305 mm^4
1.197 in^4
y = 40.784 mm
Sx = 0.746 in^3
$M_{max}St$ = 1.837 k-ft

3.4.18

h/t = 6.6

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

S1 = 36.9
m = 0.65
C_0 = 20.5
Cc = 20.5

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

S2 = 77.3
φF_L= 1.3φyFcy
φF_L= 43.2 ksi

$\varphi F_L Wk$= 22.7 ksi
Iy = 148662 mm^4
0.357 in^4
x = 20.5 mm
Sy = 0.443 in^3
$M_{max}Wk$ = 0.838 k-ft

Compression

3.4.9

b/t = 6.6
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 = 37.95
S1 = 12.21
S2 = 32.70
φF_L= (φck2*√(BpE))/(1.6b/t)
φF_L= 21.4 ksi

3.4.10

Rb/t = 0.0

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

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

φF_L= 21.42 ksi
A = 620.02 mm^2
0.96 in^2
P_{max} = 20.59 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 = 1.09

23.5807

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

S1 = 1.37733

$$S2 = 1.2C_c$$

S2 = 79.2

φF_L= φb[Bc-Dc*Lb/(1.2*ry*√(Cb))

φF_L= 29.4 ksi

3.4.15

N/A for Strong Direction

3.4.16

b/t = 4.29

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16

N/A for Strong Direction

Weak Axis:

3.4.11

L_b = 33.78 in

ry = 1.374

Cb = 1.09

24.5845

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

S1 = 1.37733

$$S2 = 1.2C_c$$

S2 = 79.2

φF_L= φb[Bc-Dc*Lb/(1.2*ry*√(Cb))

φF_L= 29.4 ksi

3.4.15

b/t = 24.46

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

S1 = 3.8

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

S2 = 14.7

F_{UT}= (φbk2*√(BpE))/(5.1b/t)

F_{UT}= 9.4 ksi

3.4.16

N/A for Weak Direction

3.4.16

b/t = 24.46

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

S1 = 12.2

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

S2 = 46.7

F_{ST}= φb[Bp-1.6Dp*b/t]

F_{ST}= 28.2 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L = 1.17φyFcy

φF_L = 38.9 ksi

3.4.16.1

N/A for Weak Direction

3.4.16.2

N/A for Strong Direction

3.4.16.2

b/t = 24.46

t = 2.6

ds = 6.05

rs = 3.49

S = 21.70

ρst = 0.22

F_{UT} = 9.37

F_{ST} = 28.24

φF_L = Fut + (Fst - Fut)ρst < Fst

φF_L = 13.5 ksi

3.4.18

h/t = 24.46

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

S1 = 34.4

m = 0.70

C_0 = 34.23

Cc = 37.77

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

S2 = 72.1

φF_L = 1.3φyFcy

φF_L = 43.2 ksi

3.4.18

h/t = 4.29

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

S1 = 36.9

m = 0.65

C_0 = 29

Cc = 29

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

S2 = 77.3

φF_L = 1.3φyFcy

φF_L = 43.2 ksi

φF_LSt = 29.4 ksi

Ix = 364470 mm^4

0.876 in^4

y = 37.77 mm

Sx = 0.589 in^3

M_{max}St = 1.442 k-ft

φF_LWk = 13.5 ksi

Iy = 217168 mm^4

0.522 in^4

x = 29 mm

Sy = 0.457 in^3

M_{max}Wk = 0.513 k-ft

Compression

3.4.7

λ = 0.46067

r = 1.374 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.90326

φF_L = φcc(Bc-Dc*λ)

φF_L = 30.1251 ksi

3.4.8

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

3.4.9

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

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

3.4.9.1

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

3.4.10

Rb/t = 0.0

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

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

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

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 18.00 in
J = 0.16
47.2194

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

S1 = 0.51461

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

S2 = 1701.56
φF_L= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
φF_L= 31.2 ksi

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7
φF_L= φyFcy
φF_L= 33.3 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0
φF_L= 1.17φyFcy
φF_L= 38.9 ksi

3.4.18

h/t = 7.75

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

S1 = 36.9
m = 0.65
C_0 = 15
Cc = 15

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

S2 = 77.3
φF_L= 1.3φyFcy
φF_L= 43.2 ksi

φF_LSt= 31.2 ksi
Ix = 39958.2 mm^4
0.096 in^4
y = 15 mm
Sx = 0.163 in^3
M_{max}St = 0.423 k-ft

Weak Axis:

3.4.14

L_b = 18.00 in
J = 0.16
47.2194

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

S1 = 0.51461

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

S2 = 1701.56
φF_L= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
φF_L= 31.2

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7
φF_L= φyFcy
φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9
m = 0.65
C_0 = 15
Cc = 15

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

S2 = 77.3
φF_L= 1.3φyFcy
φF_L= 43.2 ksi

φF_LWk= 31.2 ksi
Iy = 39958.2 mm^4
0.096 in^4
x = 15 mm
Sy = 0.163 in^3
M_{max}Wk = 0.423 k-ft

Compression

3.4.7

λ = 0.77182

r = 0.437 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.83792

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

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:		Weak Axis:	
3.4.14		**3.4.14**	
L_b =	46.38 in	L_b =	46.38 in
J =	0.16	J =	0.16
	121.663		121.663
$S1 = \left(\frac{Bc - \frac{\theta_y}{\theta_b}Fcy}{1.6Dc}\right)^2$		$S1 = \left(\frac{Bc - \frac{\theta_y}{\theta_b}Fcy}{1.6Dc}\right)^2$	
S1 =	0.51461	S1 =	0.51461
$S2 = \left(\frac{C_c}{1.6}\right)^2$		$S2 = \left(\frac{C_c}{1.6}\right)^2$	
S2 =	1701.56	S2 =	1701.56
φF_L=	φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]	φF_L=	φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
φF_L=	29.8 ksi	φF_L=	29.8
3.4.16		**3.4.16**	
b/t =	7.75	b/t =	7.75
$S1 = \frac{Bp - \frac{\theta_y}{\theta_b}Fcy}{1.6Dp}$		$S1 = \frac{Bp - \frac{\theta_y}{\theta_b}Fcy}{1.6Dp}$	
S1 =	12.2	S1 =	12.2
$S2 = \frac{k_1 Bp}{1.6Dp}$		$S2 = \frac{k_1 Bp}{1.6Dp}$	
S2 =	46.7	S2 =	46.7
φF_L=	φyFcy	φF_L=	φyFcy
φF_L=	33.3 ksi	φF_L=	33.3 ksi
3.4.16.1	Not Used	**3.4.16.1**	
Rb/t =	0.0	N/A for Weak Direction	
$S1 = \left(\frac{Bt - 1.17\frac{\theta_y}{\theta_b}Fcy}{1.6Dt}\right)^2$			
S1 =	1.1		
$S2 = C_t$			
S2 =	141.0		
φF_L=	1.17φyFcy		
φF_L=	38.9 ksi		
3.4.18		**3.4.18**	
h/t =	7.75	h/t =	7.75
$S1 = \frac{Bbr - \frac{\theta_y}{\theta_b}1.3Fcy}{mDbr}$		$S1 = \frac{Bbr - \frac{\theta_y}{\theta_b}1.3Fcy}{mDbr}$	
S1 =	36.9	S1 =	36.9
m =	0.65	m =	0.65
C_0 =	15	C_0 =	15
Cc =	15	Cc =	15
$S2 = \frac{k_1 Bbr}{mDbr}$		$S2 = \frac{k_1 Bbr}{mDbr}$	
S2 =	77.3	S2 =	77.3
φF_L=	1.3φyFcy	φF_L=	1.3φyFcy
φF_L=	43.2 ksi	φF_L=	43.2 ksi
φF_LSt=	29.8 ksi	φF_LWk=	33.3 ksi
Ix =	39958.2 mm^4	Iy =	39958.2 mm^4
	0.096 in^4		0.096 in^4
y =	15 mm	x =	15 mm
Sx =	0.163 in^3	Sy =	0.163 in^3
M_{max}St =	0.404 k-ft	M_{max}Wk =	0.450 k-ft

Compression

3.4.7

$\lambda =$ 1.98863

r = 0.437 in

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

$S1^{*} =$ 0.33515

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

$S2^{*} =$ 1.23671

$\varphi cc =$ 0.85841

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

$\varphi F_L =$ 7.59722 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.25 ksi

$\varphi F_L =$ 7.60 ksi

A = 323.87 mm^2

0.50 in^2

$P_{max} =$ 3.81 kips

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 42.32 in

J = 0.16

111.025

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

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 = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 30.0 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

M_{max}St = 0.406 k-ft

Weak Axis:

3.4.14

L_b = 42.32 in

J = 0.16

111.025

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

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

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 33.3 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

M_{max}Wk = 0.450 k-ft

Compression

3.4.7

$\lambda =$ 1.81475

r = 0.437 in

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

$S1^* =$ 0.33515

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

$S2^* =$ 1.23671

$\varphi cc =$ 0.83406

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

$\varphi F_L =$ 8.86409 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.25 ksi

$\varphi F_L =$ 8.86 ksi

A = 323.87 mm^2

0.50 in^2

$P_{max} =$ 4.45 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	-40.249	-40.249	0	0
2	M16	Y	-40.249	-40.249	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	-52.543	-52.543	0	0
2	M16	y	-87.571	-87.571	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	105.085	105.085	0	0
2	M16	y	52.543	52.543	0	0

Load Combinations

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

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N8	max	262.028	2	303.349	2	-.001	15	0	15	0	1	0	1
2		min	-311.868	3	-447.814	3	-.11	3	0	3	0	1	0	1
3	N7	max	.028	3	317.158	1	-.043	15	0	15	0	1	0	1
4		min	-.166	2	13.107	15	-.873	1	-.001	1	0	1	0	1
5	N15	max	.171	3	816.368	1	.476	1	0	1	0	1	0	1
6		min	-1.398	2	29.191	15	-.587	3	0	3	0	1	0	1
7	N16	max	892.026	2	992.261	2	0	10	0	1	0	1	0	1
8		min	-967.385	3	-1430.422	3	-73.765	3	0	3	0	1	0	1
9	N23	max	.028	3	316.987	1	1.937	1	.003	1	0	1	0	1
10		min	-.166	2	13.232	15	.097	15	0	15	0	1	0	1
11	N24	max	262.119	2	306.411	2	74.335	3	0	1	0	1	0	1
12		min	-312.22	3	-446.219	3	.007	10	0	3	0	1	0	1
13	Totals:	max	1414.443	2	2755.753	2	0	3						
14		min	-1591.246	3	-2130.337	3	0	9						

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	219.357	1	.678	4	.255	1	0	15	0	15	0	1
2			min	-370.122	3	.159	15	-.039	3	0	1	0	1	0	1
3		2	max	219.492	1	.621	4	.255	1	0	15	0	15	0	15
4			min	-370.02	3	.146	15	-.039	3	0	1	0	1	0	4
5		3	max	219.627	1	.563	4	.255	1	0	15	0	15	0	15
6			min	-369.919	3	.132	15	-.039	3	0	1	0	1	0	4
7		4	max	219.761	1	.506	4	.255	1	0	15	0	15	0	15
8			min	-369.818	3	.119	15	-.039	3	0	1	0	3	0	4
9		5	max	219.896	1	.448	4	.255	1	0	15	0	1	0	15
10			min	-369.717	3	.105	15	-.039	3	0	1	0	3	0	4
11		6	max	220.031	1	.391	4	.255	1	0	15	0	1	0	15
12			min	-369.616	3	.092	15	-.039	3	0	1	0	3	0	4
13		7	max	220.166	1	.333	4	.255	1	0	15	0	1	0	15
14			min	-369.515	3	.078	15	-.039	3	0	1	0	3	0	4
15		8	max	220.301	1	.276	4	.255	1	0	15	0	1	0	15
16			min	-369.413	3	.065	15	-.039	3	0	1	0	3	0	4
17		9	max	220.436	1	.218	4	.255	1	0	15	0	1	0	15
18			min	-369.312	3	.051	15	-.039	3	0	1	0	3	0	4
19		10	max	220.571	1	.161	4	.255	1	0	15	0	1	0	15
20			min	-369.211	3	.037	12	-.039	3	0	1	0	3	0	4
21		11	max	220.705	1	.11	2	.255	1	0	15	0	1	0	15
22			min	-369.11	3	.015	12	-.039	3	0	1	0	3	0	4
23		12	max	220.84	1	.065	2	.255	1	0	15	0	1	0	15
24			min	-369.009	3	-.014	3	-.039	3	0	1	0	3	0	4
25		13	max	220.975	1	.02	2	.255	1	0	15	0	1	0	15
26			min	-368.908	3	-.047	3	-.039	3	0	1	0	3	0	4
27		14	max	221.11	1	-.016	15	.255	1	0	15	0	1	0	15
28			min	-368.807	3	-.081	3	-.039	3	0	1	0	3	0	4
29		15	max	221.245	1	-.03	15	.255	1	0	15	0	1	0	15
30			min	-368.705	3	-.127	4	-.039	3	0	1	0	3	0	4
31		16	max	221.38	1	-.043	15	.255	1	0	15	0	1	0	15
32			min	-368.604	3	-.184	4	-.039	3	0	1	0	3	0	4
33		17	max	221.515	1	-.057	15	.255	1	0	15	0	1	0	15
34			min	-368.503	3	-.242	4	-.039	3	0	1	0	3	0	4
35		18	max	221.65	1	-.07	15	.255	1	0	15	0	1	0	15
36			min	-368.402	3	-.299	4	-.039	3	0	1	0	3	0	4
37		19	max	221.784	1	-.084	15	.255	1	0	15	0	1	0	12

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
38			min	-368.301	3	-.357	4	-.039	3	0	1	0	3	0	4
39	M3	1	max	219.726	2	1.735	4	-.014	15	0	15	0	1	0	4
40			min	-218.816	3	.408	15	-.287	1	0	1	0	15	0	12
41		2	max	219.656	2	1.559	4	-.014	15	0	15	0	1	0	2
42			min	-218.868	3	.367	15	-.287	1	0	1	0	15	0	3
43		3	max	219.586	2	1.383	4	-.014	15	0	15	0	1	0	2
44			min	-218.921	3	.325	15	-.287	1	0	1	0	15	0	3
45		4	max	219.516	2	1.206	4	-.014	15	0	15	0	1	0	15
46			min	-218.973	3	.284	15	-.287	1	0	1	0	15	0	4
47		5	max	219.446	2	1.03	4	-.014	15	0	15	0	1	0	15
48			min	-219.026	3	.242	15	-.287	1	0	1	0	15	0	4
49		6	max	219.376	2	.854	4	-.014	15	0	15	0	1	0	15
50			min	-219.078	3	.201	15	-.287	1	0	1	0	15	0	4
51		7	max	219.306	2	.677	4	-.014	15	0	15	0	1	0	15
52			min	-219.131	3	.159	15	-.287	1	0	1	0	15	0	4
53		8	max	219.236	2	.501	4	-.014	15	0	15	0	1	0	15
54			min	-219.183	3	.118	15	-.287	1	0	1	0	15	-.001	4
55		9	max	219.166	2	.324	4	-.014	15	0	15	0	1	0	15
56			min	-219.236	3	.076	15	-.287	1	0	1	0	15	-.001	4
57		10	max	219.096	2	.148	4	-.014	15	0	15	0	1	0	15
58			min	-219.288	3	.034	12	-.287	1	0	1	0	15	-.001	4
59		11	max	219.026	2	.005	2	-.014	15	0	15	0	1	0	15
60			min	-219.341	3	-.054	3	-.287	1	0	1	0	15	-.001	4
61		12	max	218.956	2	-.048	15	-.014	15	0	15	0	1	0	15
62			min	-219.393	3	-.205	4	-.287	1	0	1	0	15	-.001	4
63		13	max	218.886	2	-.089	15	-.014	15	0	15	0	1	0	15
64			min	-219.446	3	-.381	4	-.287	1	0	1	0	15	-.001	4
65		14	max	218.816	2	-.131	15	-.014	15	0	15	0	1	0	15
66			min	-219.498	3	-.557	4	-.287	1	0	1	0	15	-.001	4
67		15	max	218.746	2	-.172	15	-.014	15	0	15	0	1	0	15
68			min	-219.551	3	-.734	4	-.287	1	0	1	0	15	0	4
69		16	max	218.676	2	-.214	15	-.014	15	0	15	0	1	0	15
70			min	-219.603	3	-.91	4	-.287	1	0	1	0	10	0	4
71		17	max	218.606	2	-.255	15	-.014	15	0	15	0	15	0	15
72			min	-219.656	3	-1.087	4	-.287	1	0	1	0	2	0	4
73		18	max	218.536	2	-.297	15	-.014	15	0	15	0	15	0	15
74			min	-219.708	3	-1.263	4	-.287	1	0	1	0	1	0	4
75		19	max	218.466	2	-.338	15	-.014	15	0	15	0	15	0	1
76			min	-219.761	3	-1.439	4	-.287	1	0	1	0	1	0	1
77	M4	1	max	315.993	1	0	1	-.043	15	0	1	0	3	0	1
78			min	12.755	15	0	1	-.921	1	0	1	0	2	0	1
79		2	max	316.058	1	0	1	-.043	15	0	1	0	15	0	1
80			min	12.775	15	0	1	-.921	1	0	1	0	1	0	1
81		3	max	316.122	1	0	1	-.043	15	0	1	0	15	0	1
82			min	12.794	15	0	1	-.921	1	0	1	0	1	0	1
83		4	max	316.187	1	0	1	-.043	15	0	1	0	15	0	1
84			min	12.814	15	0	1	-.921	1	0	1	0	1	0	1
85		5	max	316.252	1	0	1	-.043	15	0	1	0	15	0	1
86			min	12.833	15	0	1	-.921	1	0	1	0	1	0	1
87		6	max	316.316	1	0	1	-.043	15	0	1	0	15	0	1
88			min	12.853	15	0	1	-.921	1	0	1	0	1	0	1
89		7	max	316.381	1	0	1	-.043	15	0	1	0	15	0	1
90			min	12.872	15	0	1	-.921	1	0	1	0	1	0	1
91		8	max	316.446	1	0	1	-.043	15	0	1	0	15	0	1
92			min	12.892	15	0	1	-.921	1	0	1	0	1	0	1
93		9	max	316.511	1	0	1	-.043	15	0	1	0	15	0	1
94			min	12.911	15	0	1	-.921	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	316.575	1	0	1	-.043	15	0	1	0	15	0	1
96			min	12.931	15	0	1	-.921	1	0	1	0	1	0	1
97		11	max	316.64	1	0	1	-.043	15	0	1	0	15	0	1
98			min	12.951	15	0	1	-.921	1	0	1	0	1	0	1
99		12	max	316.705	1	0	1	-.043	15	0	1	0	15	0	1
100			min	12.97	15	0	1	-.921	1	0	1	0	1	0	1
101		13	max	316.769	1	0	1	-.043	15	0	1	0	15	0	1
102			min	12.99	15	0	1	-.921	1	0	1	-.001	1	0	1
103		14	max	316.834	1	0	1	-.043	15	0	1	0	15	0	1
104			min	13.009	15	0	1	-.921	1	0	1	-.001	1	0	1
105		15	max	316.899	1	0	1	-.043	15	0	1	0	15	0	1
106			min	13.029	15	0	1	-.921	1	0	1	-.001	1	0	1
107		16	max	316.964	1	0	1	-.043	15	0	1	0	15	0	1
108			min	13.048	15	0	1	-.921	1	0	1	-.001	1	0	1
109		17	max	317.028	1	0	1	-.043	15	0	1	0	15	0	1
110			min	13.068	15	0	1	-.921	1	0	1	-.001	1	0	1
111		18	max	317.093	1	0	1	-.043	15	0	1	0	15	0	1
112			min	13.087	15	0	1	-.921	1	0	1	-.001	1	0	1
113		19	max	317.158	1	0	1	-.043	15	0	1	0	15	0	1
114			min	13.107	15	0	1	-.921	1	0	1	-.001	1	0	1
115	M6	1	max	692.789	1	.68	4	.061	1	0	3	0	3	0	1
116			min	-1148.578	3	.16	15	-.194	3	0	10	0	9	0	1
117		2	max	692.924	1	.623	4	.061	1	0	3	0	3	0	15
118			min	-1148.477	3	.146	15	-.194	3	0	10	0	9	0	4
119		3	max	693.059	1	.565	4	.061	1	0	3	0	3	0	15
120			min	-1148.376	3	.133	15	-.194	3	0	10	0	10	0	4
121		4	max	693.194	1	.508	4	.061	1	0	3	0	3	0	15
122			min	-1148.275	3	.119	15	-.194	3	0	10	0	10	0	4
123		5	max	693.329	1	.45	4	.061	1	0	3	0	3	0	15
124			min	-1148.174	3	.098	12	-.194	3	0	10	0	10	0	4
125		6	max	693.464	1	.399	2	.061	1	0	3	0	1	0	15
126			min	-1148.073	3	.075	12	-.194	3	0	10	0	10	0	4
127		7	max	693.599	1	.354	2	.061	1	0	3	0	1	0	15
128			min	-1147.971	3	.053	12	-.194	3	0	10	0	10	0	4
129		8	max	693.733	1	.31	2	.061	1	0	3	0	1	0	12
130			min	-1147.87	3	.03	12	-.194	3	0	10	0	3	0	4
131		9	max	693.868	1	.265	2	.061	1	0	3	0	1	0	12
132			min	-1147.769	3	.004	3	-.194	3	0	10	0	3	0	4
133		10	max	694.003	1	.22	2	.061	1	0	3	0	1	0	12
134			min	-1147.668	3	-.029	3	-.194	3	0	10	0	3	0	4
135		11	max	694.138	1	.175	2	.061	1	0	3	0	1	0	12
136			min	-1147.567	3	-.063	3	-.194	3	0	10	0	3	0	2
137		12	max	694.273	1	.13	2	.061	1	0	3	0	1	0	12
138			min	-1147.466	3	-.096	3	-.194	3	0	10	0	3	0	2
139		13	max	694.408	1	.086	2	.061	1	0	3	0	1	0	12
140			min	-1147.365	3	-.13	3	-.194	3	0	10	0	3	0	2
141		14	max	694.543	1	.041	2	.061	1	0	3	0	1	0	12
142			min	-1147.263	3	-.164	3	-.194	3	0	10	0	3	0	2
143		15	max	694.678	1	-.004	2	.061	1	0	3	0	1	0	12
144			min	-1147.162	3	-.197	3	-.194	3	0	10	0	3	0	2
145		16	max	694.812	1	-.043	15	.061	1	0	3	0	1	0	12
146			min	-1147.061	3	-.231	3	-.194	3	0	10	0	3	0	2
147		17	max	694.947	1	-.056	15	.061	1	0	3	0	1	0	3
148			min	-1146.96	3	-.264	3	-.194	3	0	10	0	3	0	2
149		18	max	695.082	1	-.07	15	.061	1	0	3	0	1	0	3
150			min	-1146.859	3	-.298	3	-.194	3	0	10	0	3	0	2
151		19	max	695.217	1	-.083	15	.061	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
152			min	-1146.758	3	-.354	4	-.194	3	0	10	0	3	0	2
153	M7	1	max	763.581	2	1.739	4	.042	3	0	1	0	2	0	2
154			min	-661.362	3	.409	15	-.017	2	0	3	0	3	0	3
155		2	max	763.511	2	1.563	4	.042	3	0	1	0	2	0	2
156			min	-661.414	3	.367	15	-.017	2	0	3	0	3	0	3
157		3	max	763.441	2	1.387	4	.042	3	0	1	0	2	0	2
158			min	-661.467	3	.326	15	-.017	2	0	3	0	3	0	3
159		4	max	763.371	2	1.21	4	.042	3	0	1	0	1	0	2
160			min	-661.519	3	.284	15	-.017	2	0	3	0	3	0	3
161		5	max	763.301	2	1.034	4	.042	3	0	1	0	1	0	15
162			min	-661.572	3	.243	15	-.017	2	0	3	0	3	0	3
163		6	max	763.231	2	.857	4	.042	3	0	1	0	1	0	15
164			min	-661.624	3	.201	15	-.017	2	0	3	0	3	0	4
165		7	max	763.161	2	.681	4	.042	3	0	1	0	1	0	15
166			min	-661.677	3	.16	15	-.017	2	0	3	0	3	0	4
167		8	max	763.091	2	.505	4	.042	3	0	1	0	1	0	15
168			min	-661.729	3	.119	15	-.017	2	0	3	0	3	-.001	4
169		9	max	763.021	2	.346	2	.042	3	0	1	0	1	0	15
170			min	-661.782	3	.054	12	-.017	2	0	3	0	3	-.001	4
171		10	max	762.951	2	.208	2	.042	3	0	1	0	1	0	15
172			min	-661.834	3	-.03	3	-.017	2	0	3	0	3	-.001	4
173		11	max	762.881	2	.071	2	.042	3	0	1	0	1	0	15
174			min	-661.887	3	-.133	3	-.017	2	0	3	0	3	-.001	4
175		12	max	762.811	2	-.047	15	.042	3	0	1	0	1	0	15
176			min	-661.939	3	-.236	3	-.017	2	0	3	0	3	-.001	4
177		13	max	762.741	2	-.089	15	.042	3	0	1	0	1	0	15
178			min	-661.992	3	-.377	4	-.017	2	0	3	0	3	-.001	4
179		14	max	762.671	2	-.13	15	.042	3	0	1	0	1	0	15
180			min	-662.044	3	-.554	4	-.017	2	0	3	0	3	-.001	4
181		15	max	762.601	2	-.172	15	.042	3	0	1	0	1	0	15
182			min	-662.097	3	-.73	4	-.017	2	0	3	0	3	0	4
183		16	max	762.531	2	-.213	15	.042	3	0	1	0	1	0	15
184			min	-662.149	3	-.906	4	-.017	2	0	3	0	3	0	4
185		17	max	762.461	2	-.255	15	.042	3	0	1	0	1	0	15
186			min	-662.202	3	-1.083	4	-.017	2	0	3	0	3	0	4
187		18	max	762.391	2	-.296	15	.042	3	0	1	0	1	0	15
188			min	-662.254	3	-1.259	4	-.017	2	0	3	0	3	0	4
189		19	max	762.321	2	-.338	15	.042	3	0	1	0	1	0	1
190			min	-662.307	3	-1.435	4	-.017	2	0	3	0	3	0	1
191	M8	1	max	815.203	1	0	1	.549	1	0	1	0	10	0	1
192			min	28.84	15	0	1	-.597	3	0	1	0	1	0	1
193		2	max	815.268	1	0	1	.549	1	0	1	0	1	0	1
194			min	28.86	15	0	1	-.597	3	0	1	0	3	0	1
195		3	max	815.332	1	0	1	.549	1	0	1	0	1	0	1
196			min	28.879	15	0	1	-.597	3	0	1	0	3	0	1
197		4	max	815.397	1	0	1	.549	1	0	1	0	1	0	1
198			min	28.899	15	0	1	-.597	3	0	1	0	3	0	1
199		5	max	815.462	1	0	1	.549	1	0	1	0	1	0	1
200			min	28.918	15	0	1	-.597	3	0	1	0	3	0	1
201		6	max	815.526	1	0	1	.549	1	0	1	0	1	0	1
202			min	28.938	15	0	1	-.597	3	0	1	0	3	0	1
203		7	max	815.591	1	0	1	.549	1	0	1	0	1	0	1
204			min	28.957	15	0	1	-.597	3	0	1	0	3	0	1
205		8	max	815.656	1	0	1	.549	1	0	1	0	1	0	1
206			min	28.977	15	0	1	-.597	3	0	1	0	3	0	1
207		9	max	815.721	1	0	1	.549	1	0	1	0	1	0	1
208			min	28.996	15	0	1	-.597	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	815.785	1	0	1	.549	1	0	1	0	1	0	1
210			min	29.016	15	0	1	-.597	3	0	1	0	3	0	1
211		11	max	815.85	1	0	1	.549	1	0	1	0	1	0	1
212			min	29.035	15	0	1	-.597	3	0	1	0	3	0	1
213		12	max	815.915	1	0	1	.549	1	0	1	0	1	0	1
214			min	29.055	15	0	1	-.597	3	0	1	0	3	0	1
215		13	max	815.979	1	0	1	.549	1	0	1	0	1	0	1
216			min	29.074	15	0	1	-.597	3	0	1	0	3	0	1
217		14	max	816.044	1	0	1	.549	1	0	1	0	1	0	1
218			min	29.094	15	0	1	-.597	3	0	1	0	3	0	1
219		15	max	816.109	1	0	1	.549	1	0	1	0	1	0	1
220			min	29.113	15	0	1	-.597	3	0	1	0	3	0	1
221		16	max	816.174	1	0	1	.549	1	0	1	0	1	0	1
222			min	29.133	15	0	1	-.597	3	0	1	0	3	0	1
223		17	max	816.238	1	0	1	.549	1	0	1	0	1	0	1
224			min	29.152	15	0	1	-.597	3	0	1	0	3	0	1
225		18	max	816.303	1	0	1	.549	1	0	1	0	1	0	1
226			min	29.172	15	0	1	-.597	3	0	1	0	3	0	1
227		19	max	816.368	1	0	1	.549	1	0	1	0	1	0	1
228			min	29.191	15	0	1	-.597	3	0	1	0	3	0	1
229	M10	1	max	221.881	1	.675	4	.006	3	0	1	0	1	0	1
230			min	-321.661	3	.159	15	-.143	1	0	3	0	3	0	1
231		2	max	222.016	1	.617	4	.006	3	0	1	0	1	0	15
232			min	-321.56	3	.145	15	-.143	1	0	3	0	3	0	4
233		3	max	222.151	1	.56	4	.006	3	0	1	0	1	0	15
234			min	-321.459	3	.132	15	-.143	1	0	3	0	3	0	4
235		4	max	222.286	1	.502	4	.006	3	0	1	0	1	0	15
236			min	-321.358	3	.118	15	-.143	1	0	3	0	3	0	4
237		5	max	222.421	1	.445	4	.006	3	0	1	0	1	0	15
238			min	-321.257	3	.105	15	-.143	1	0	3	0	3	0	4
239		6	max	222.555	1	.387	4	.006	3	0	1	0	1	0	15
240			min	-321.156	3	.091	15	-.143	1	0	3	0	3	0	4
241		7	max	222.69	1	.33	4	.006	3	0	1	0	1	0	15
242			min	-321.055	3	.078	15	-.143	1	0	3	0	3	0	4
243		8	max	222.825	1	.272	4	.006	3	0	1	0	1	0	15
244			min	-320.953	3	.064	15	-.143	1	0	3	0	3	0	4
245		9	max	222.96	1	.215	4	.006	3	0	1	0	1	0	15
246			min	-320.852	3	.051	15	-.143	1	0	3	0	3	0	4
247		10	max	223.095	1	.157	4	.006	3	0	1	0	9	0	15
248			min	-320.751	3	.037	15	-.143	1	0	3	0	3	0	4
249		11	max	223.23	1	.11	2	.006	3	0	1	0	9	0	15
250			min	-320.65	3	.024	15	-.143	1	0	3	0	3	0	4
251		12	max	223.365	1	.065	2	.006	3	0	1	0	15	0	15
252			min	-320.549	3	.005	12	-.143	1	0	3	0	3	0	4
253		13	max	223.499	1	.02	2	.006	3	0	1	0	15	0	15
254			min	-320.448	3	-.028	3	-.143	1	0	3	0	3	0	4
255		14	max	223.634	1	-.017	15	.006	3	0	1	0	15	0	15
256			min	-320.346	3	-.073	4	-.143	1	0	3	0	3	0	4
257		15	max	223.769	1	-.03	15	.006	3	0	1	0	15	0	15
258			min	-320.245	3	-.13	4	-.143	1	0	3	0	3	0	4
259		16	max	223.904	1	-.044	15	.006	3	0	1	0	15	0	15
260			min	-320.144	3	-.188	4	-.143	1	0	3	0	3	0	4
261		17	max	224.039	1	-.057	15	.006	3	0	1	0	15	0	15
262			min	-320.043	3	-.245	4	-.143	1	0	3	0	1	0	4
263		18	max	224.174	1	-.071	15	.006	3	0	1	0	15	0	15
264			min	-319.942	3	-.303	4	-.143	1	0	3	0	1	0	4
265		19	max	224.309	1	-.084	15	.006	3	0	1	0	15	0	15

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
266			min	-319.841	3	-.36	4	-.143	1	0	3	0	1	0	4
267	M11	1	max	219.268	2	1.738	4	.308	1	0	1	0	3	0	4
268			min	-219.516	3	.409	15	-.041	3	0	15	0	1	0	12
269		2	max	219.198	2	1.562	4	.308	1	0	1	0	3	0	2
270			min	-219.568	3	.367	15	-.041	3	0	15	0	1	0	3
271		3	max	219.128	2	1.386	4	.308	1	0	1	0	3	0	2
272			min	-219.621	3	.326	15	-.041	3	0	15	0	1	0	3
273		4	max	219.058	2	1.209	4	.308	1	0	1	0	3	0	15
274			min	-219.673	3	.284	15	-.041	3	0	15	0	1	0	3
275		5	max	218.988	2	1.033	4	.308	1	0	1	0	3	0	15
276			min	-219.726	3	.243	15	-.041	3	0	15	0	1	0	4
277		6	max	218.918	2	.857	4	.308	1	0	1	0	3	0	15
278			min	-219.778	3	.201	15	-.041	3	0	15	0	1	0	4
279		7	max	218.848	2	.68	4	.308	1	0	1	0	3	0	15
280			min	-219.831	3	.16	15	-.041	3	0	15	0	1	0	4
281		8	max	218.778	2	.504	4	.308	1	0	1	0	3	0	15
282			min	-219.883	3	.118	15	-.041	3	0	15	0	1	-.001	4
283		9	max	218.708	2	.327	4	.308	1	0	1	0	3	0	15
284			min	-219.936	3	.077	15	-.041	3	0	15	0	1	-.001	4
285		10	max	218.638	2	.151	4	.308	1	0	1	0	3	0	15
286			min	-219.988	3	.027	12	-.041	3	0	15	0	1	-.001	4
287		11	max	218.568	2	.005	2	.308	1	0	1	0	3	0	15
288			min	-220.041	3	-.066	3	-.041	3	0	15	0	1	-.001	4
289		12	max	218.498	2	-.047	15	.308	1	0	1	0	3	0	15
290			min	-220.093	3	-.202	4	-.041	3	0	15	0	1	-.001	4
291		13	max	218.428	2	-.089	15	.308	1	0	1	0	3	0	15
292			min	-220.146	3	-.378	4	-.041	3	0	15	0	1	-.001	4
293		14	max	218.358	2	-.13	15	.308	1	0	1	0	3	0	15
294			min	-220.198	3	-.554	4	-.041	3	0	15	0	1	-.001	4
295		15	max	218.288	2	-.172	15	.308	1	0	1	0	3	0	15
296			min	-220.251	3	-.731	4	-.041	3	0	15	0	1	0	4
297		16	max	218.218	2	-.213	15	.308	1	0	1	0	3	0	15
298			min	-220.303	3	-.907	4	-.041	3	0	15	0	2	0	4
299		17	max	218.148	2	-.255	15	.308	1	0	1	0	3	0	15
300			min	-220.356	3	-1.084	4	-.041	3	0	15	0	10	0	4
301		18	max	218.078	2	-.296	15	.308	1	0	1	0	3	0	15
302			min	-220.408	3	-1.26	4	-.041	3	0	15	0	15	0	4
303		19	max	218.008	2	-.338	15	.308	1	0	1	0	1	0	1
304			min	-220.461	3	-1.436	4	-.041	3	0	15	0	15	0	1
305	M12	1	max	315.822	1	0	1	2.043	1	0	1	0	2	0	1
306			min	12.881	15	0	1	.098	15	0	1	0	3	0	1
307		2	max	315.887	1	0	1	2.043	1	0	1	0	1	0	1
308			min	12.9	15	0	1	.098	15	0	1	0	15	0	1
309		3	max	315.952	1	0	1	2.043	1	0	1	0	1	0	1
310			min	12.92	15	0	1	.098	15	0	1	0	15	0	1
311		4	max	316.016	1	0	1	2.043	1	0	1	0	1	0	1
312			min	12.939	15	0	1	.098	15	0	1	0	15	0	1
313		5	max	316.081	1	0	1	2.043	1	0	1	0	1	0	1
314			min	12.959	15	0	1	.098	15	0	1	0	15	0	1
315		6	max	316.146	1	0	1	2.043	1	0	1	0	1	0	1
316			min	12.978	15	0	1	.098	15	0	1	0	15	0	1
317		7	max	316.21	1	0	1	2.043	1	0	1	.001	1	0	1
318			min	12.998	15	0	1	.098	15	0	1	0	15	0	1
319		8	max	316.275	1	0	1	2.043	1	0	1	.001	1	0	1
320			min	13.017	15	0	1	.098	15	0	1	0	15	0	1
321		9	max	316.34	1	0	1	2.043	1	0	1	.001	1	0	1
322			min	13.037	15	0	1	.098	15	0	1	0	15	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
323		10	max	316.404	1	0	1	2.043	1	0	1	.002	1	0	1
324			min	13.056	15	0	1	.098	15	0	1	0	15	0	1
325		11	max	316.469	1	0	1	2.043	1	0	1	.002	1	0	1
326			min	13.076	15	0	1	.098	15	0	1	0	15	0	1
327		12	max	316.534	1	0	1	2.043	1	0	1	.002	1	0	1
328			min	13.095	15	0	1	.098	15	0	1	0	15	0	1
329		13	max	316.599	1	0	1	2.043	1	0	1	.002	1	0	1
330			min	13.115	15	0	1	.098	15	0	1	0	15	0	1
331		14	max	316.663	1	0	1	2.043	1	0	1	.002	1	0	1
332			min	13.135	15	0	1	.098	15	0	1	0	15	0	1
333		15	max	316.728	1	0	1	2.043	1	0	1	.003	1	0	1
334			min	13.154	15	0	1	.098	15	0	1	0	15	0	1
335		16	max	316.793	1	0	1	2.043	1	0	1	.003	1	0	1
336			min	13.174	15	0	1	.098	15	0	1	0	15	0	1
337		17	max	316.857	1	0	1	2.043	1	0	1	.003	1	0	1
338			min	13.193	15	0	1	.098	15	0	1	0	15	0	1
339		18	max	316.922	1	0	1	2.043	1	0	1	.003	1	0	1
340			min	13.213	15	0	1	.098	15	0	1	0	15	0	1
341		19	max	316.987	1	0	1	2.043	1	0	1	.003	1	0	1
342			min	13.232	15	0	1	.098	15	0	1	0	15	0	1
343	M1	1	max	110.844	1	345.146	3	-1.907	15	0	2	.079	1	.013	2
344			min	5.096	15	-232.706	2	-40.253	1	0	3	.004	15	-.015	3
345		2	max	111.004	1	344.975	3	-1.907	15	0	2	.07	1	.064	2
346			min	5.144	15	-232.934	2	-40.253	1	0	3	.003	15	-.09	3
347		3	max	117.574	3	5.331	9	-1.895	15	0	12	.061	1	.114	2
348			min	-19.038	10	-30.964	2	-40.162	1	0	1	.003	15	-.163	3
349		4	max	117.694	3	5.14	9	-1.895	15	0	12	.052	1	.12	2
350			min	-18.904	10	-31.192	2	-40.162	1	0	1	.002	15	-.161	3
351		5	max	117.814	3	4.949	9	-1.895	15	0	12	.044	1	.127	2
352			min	-18.771	10	-31.421	2	-40.162	1	0	1	.002	15	-.159	3
353		6	max	117.934	3	4.759	9	-1.895	15	0	12	.035	1	.134	2
354			min	-18.637	10	-31.65	2	-40.162	1	0	1	.002	15	-.157	3
355		7	max	118.054	3	4.568	9	-1.895	15	0	12	.026	1	.141	2
356			min	-18.504	10	-31.878	2	-40.162	1	0	1	.001	15	-.154	3
357		8	max	118.174	3	4.378	9	-1.895	15	0	12	.018	1	.148	2
358			min	-18.37	10	-32.107	2	-40.162	1	0	1	0	15	-.152	3
359		9	max	118.294	3	4.187	9	-1.895	15	0	12	.009	1	.155	2
360			min	-18.237	10	-32.336	2	-40.162	1	0	1	0	15	-.15	3
361		10	max	118.414	3	3.996	9	-1.895	15	0	12	.002	3	.162	2
362			min	-18.103	10	-32.565	2	-40.162	1	0	1	0	10	-.148	3
363		11	max	118.535	3	3.806	9	-1.895	15	0	12	0	3	.169	2
364			min	-17.97	10	-32.793	2	-40.162	1	0	1	-.009	1	-.145	3
365		12	max	118.655	3	3.615	9	-1.895	15	0	12	0	12	.176	2
366			min	-17.836	10	-33.022	2	-40.162	1	0	1	-.017	1	-.143	3
367		13	max	118.775	3	3.425	9	-1.895	15	0	12	-.001	15	.183	2
368			min	-17.703	10	-33.251	2	-40.162	1	0	1	-.026	1	-.14	3
369		14	max	118.895	3	3.234	9	-1.895	15	0	12	-.002	15	.19	2
370			min	-17.569	10	-33.48	2	-40.162	1	0	1	-.035	1	-.138	3
371		15	max	119.015	3	3.043	9	-1.895	15	0	12	-.002	15	.198	2
372			min	-17.436	10	-33.708	2	-40.162	1	0	1	-.043	1	-.135	3
373		16	max	90.328	2	158.822	2	-1.909	15	0	1	-.002	15	.203	2
374			min	2.081	15	-206.515	3	-40.403	1	0	12	-.052	1	-.131	3
375		17	max	90.488	2	158.593	2	-1.909	15	0	1	-.003	15	.169	2
376			min	2.13	15	-206.687	3	-40.403	1	0	12	-.061	1	-.086	3
377		18	max	-5.138	15	350.356	2	-1.952	15	0	3	-.003	15	.094	2
378			min	-110.993	1	-170.138	3	-41.405	1	0	2	-.07	1	-.049	3
379		19	max	-5.09	15	350.128	2	-1.952	15	0	3	-.004	15	.018	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	-110.833	1	-170.31	3	-41.405	1	0	2	-.079	1	-.012	3
381	M5	1	max	257.092	1	1114.022	3	0	10	0	1	.009	3	.03	3
382			min	6.967	12	-745.122	2	-66.732	3	0	3	0	10	-.027	2
383		2	max	257.253	1	1113.85	3	0	10	0	1	0	1	.135	2
384			min	7.047	12	-745.35	2	-66.732	3	0	3	-.005	3	-.211	3
385		3	max	352.801	3	5.255	9	7.318	3	0	3	0	1	.294	2
386			min	-80.847	2	-99.877	2	-.6	1	0	1	-.019	3	-.448	3
387		4	max	352.922	3	5.065	9	7.318	3	0	3	0	1	.316	2
388			min	-80.687	2	-100.105	2	-.6	1	0	1	-.017	3	-.441	3
389		5	max	353.042	3	4.874	9	7.318	3	0	3	0	1	.338	2
390			min	-80.527	2	-100.334	2	-.6	1	0	1	-.016	3	-.433	3
391		6	max	353.162	3	4.684	9	7.318	3	0	3	0	1	.359	2
392			min	-80.367	2	-100.563	2	-.6	1	0	1	-.014	3	-.426	3
393		7	max	353.282	3	4.493	9	7.318	3	0	3	0	1	.381	2
394			min	-80.207	2	-100.792	2	-.6	1	0	1	-.013	3	-.419	3
395		8	max	353.402	3	4.302	9	7.318	3	0	3	0	1	.403	2
396			min	-80.047	2	-101.02	2	-.6	1	0	1	-.011	3	-.411	3
397		9	max	353.522	3	4.112	9	7.318	3	0	3	0	1	.425	2
398			min	-79.886	2	-101.249	2	-.6	1	0	1	-.01	3	-.403	3
399		10	max	353.642	3	3.921	9	7.318	3	0	3	0	2	.447	2
400			min	-79.726	2	-101.478	2	-.6	1	0	1	-.008	3	-.396	3
401		11	max	353.762	3	3.731	9	7.318	3	0	3	0	10	.469	2
402			min	-79.566	2	-101.707	2	-.6	1	0	1	-.006	3	-.388	3
403		12	max	353.883	3	3.54	9	7.318	3	0	3	0	10	.491	2
404			min	-79.406	2	-101.935	2	-.6	1	0	1	-.005	3	-.381	3
405		13	max	354.003	3	3.349	9	7.318	3	0	3	0	10	.513	2
406			min	-79.246	2	-102.164	2	-.6	1	0	1	-.003	3	-.373	3
407		14	max	354.123	3	3.159	9	7.318	3	0	3	0	10	.535	2
408			min	-79.086	2	-102.393	2	-.6	1	0	1	-.002	3	-.365	3
409		15	max	354.243	3	2.968	9	7.318	3	0	3	0	10	.558	2
410			min	-78.925	2	-102.622	2	-.6	1	0	1	0	1	-.358	3
411		16	max	279.697	2	573.12	2	7.303	3	0	3	.001	3	.574	2
412			min	4.813	15	-621.672	3	-.623	1	0	10	0	1	-.345	3
413		17	max	279.858	2	572.892	2	7.303	3	0	3	.003	3	.45	2
414			min	4.862	15	-621.844	3	-.623	1	0	10	0	1	-.21	3
415		18	max	-9.427	12	1123.548	2	6.7	3	0	10	.004	3	.208	2
416			min	-257.267	1	-538.321	3	-.136	1	0	1	0	1	-.093	3
417		19	max	-9.347	12	1123.319	2	6.7	3	0	10	.006	3	.024	3
418			min	-257.107	1	-538.493	3	-.136	1	0	1	0	1	-.035	2
419	M9	1	max	110.457	1	345.091	3	72.185	3	0	3	-.004	15	.013	2
420			min	5.073	15	-232.705	2	2.061	15	0	2	-.078	1	-.015	3
421		2	max	110.617	1	344.919	3	72.185	3	0	3	-.002	12	.064	2
422			min	5.122	15	-232.934	2	2.061	15	0	2	-.069	1	-.09	3
423		3	max	117.456	3	5.308	9	39.218	1	0	1	.012	3	.113	2
424			min	-18.563	10	-30.972	2	-1.23	3	0	12	-.06	1	-.163	3
425		4	max	117.577	3	5.118	9	39.218	1	0	1	.012	3	.12	2
426			min	-18.429	10	-31.201	2	-1.23	3	0	12	-.051	1	-.161	3
427		5	max	117.697	3	4.927	9	39.218	1	0	1	.011	3	.127	2
428			min	-18.296	10	-31.43	2	-1.23	3	0	12	-.043	1	-.159	3
429		6	max	117.817	3	4.736	9	39.218	1	0	1	.011	3	.134	2
430			min	-18.162	10	-31.659	2	-1.23	3	0	12	-.034	1	-.157	3
431		7	max	117.937	3	4.546	9	39.218	1	0	1	.011	3	.141	2
432			min	-18.029	10	-31.887	2	-1.23	3	0	12	-.026	1	-.154	3
433		8	max	118.057	3	4.355	9	39.218	1	0	1	.011	3	.148	2
434			min	-17.895	10	-32.116	2	-1.23	3	0	12	-.017	1	-.152	3
435		9	max	118.177	3	4.165	9	39.218	1	0	1	.01	3	.155	2
436			min	-17.762	10	-32.345	2	-1.23	3	0	12	-.009	1	-.15	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	118.297	3	3.974	9	39.218	1	0	1	.01	3	.162	2
438			min	-17.628	10	-32.574	2	-1.23	3	0	12	0	1	-.148	3
439		11	max	118.417	3	3.783	9	39.218	1	0	1	.01	3	.169	2
440			min	-17.495	10	-32.802	2	-1.23	3	0	12	0	15	-.145	3
441		12	max	118.538	3	3.593	9	39.218	1	0	1	.017	1	.176	2
442			min	-17.361	10	-33.031	2	-1.23	3	0	12	0	15	-.143	3
443		13	max	118.658	3	3.402	9	39.218	1	0	1	.025	1	.183	2
444			min	-17.228	10	-33.26	2	-1.23	3	0	12	.001	15	-.14	3
445		14	max	118.778	3	3.211	9	39.218	1	0	1	.034	1	.19	2
446			min	-17.095	10	-33.489	2	-1.23	3	0	12	.002	15	-.138	3
447		15	max	118.898	3	3.021	9	39.218	1	0	1	.043	1	.198	2
448			min	-16.961	10	-33.717	2	-1.23	3	0	12	.002	15	-.135	3
449		16	max	90.646	2	158.41	2	39.475	1	0	15	.051	1	.203	2
450			min	2.172	15	-207.062	3	-1.273	3	0	1	.002	15	-.131	3
451		17	max	90.806	2	158.181	2	39.475	1	0	15	.06	1	.169	2
452			min	2.221	15	-207.234	3	-1.273	3	0	1	.003	15	-.086	3
453		18	max	-5.119	15	350.357	2	41.552	1	0	2	.069	1	.094	2
454			min	-110.614	1	-170.131	3	-.784	3	0	3	.003	15	-.049	3
455		19	max	-5.071	15	350.128	2	41.552	1	0	2	.078	1	.018	2
456			min	-110.453	1	-170.302	3	-.784	3	0	3	.004	15	-.012	3
457	M13	1	max	72.18	3	232.544	2	-5.073	15	.013	2	.078	1	0	2
458			min	2.061	15	-345.102	3	-110.449	1	-.015	3	.004	15	0	3
459		2	max	72.18	3	165.375	2	-3.865	15	.013	2	.019	1	.18	3
460			min	2.061	15	-244.877	3	-83.871	1	-.015	3	0	10	-.122	2
461		3	max	72.18	3	98.207	2	-2.657	15	.013	2	.008	3	.299	3
462			min	2.061	15	-144.652	3	-57.294	1	-.015	3	-.024	1	-.202	2
463		4	max	72.18	3	31.038	2	-1.449	15	.013	2	.004	3	.357	3
464			min	2.061	15	-44.428	3	-30.716	1	-.015	3	-.051	1	-.242	2
465		5	max	72.18	3	55.797	3	.754	10	.013	2	.001	3	.354	3
466			min	2.061	15	-36.131	2	-4.139	1	-.015	3	-.062	1	-.24	2
467		6	max	72.18	3	156.022	3	22.438	1	.013	2	0	3	.289	3
468			min	2.061	15	-103.299	2	-1.794	3	-.015	3	-.056	1	-.197	2
469		7	max	72.18	3	256.247	3	49.016	1	.013	2	0	12	.163	3
470			min	2.061	15	-170.468	2	-.025	3	-.015	3	-.035	1	-.114	2
471		8	max	72.18	3	356.471	3	75.593	1	.013	2	.005	2	.013	1
472			min	2.061	15	-237.637	2	1.296	12	-.015	3	0	3	-.024	3
473		9	max	72.18	3	456.696	3	102.171	1	.013	2	.058	1	.177	2
474			min	2.061	15	-304.805	2	2.474	12	-.015	3	0	12	-.273	3
475		10	max	72.18	3	556.921	3	128.748	1	.013	2	.128	1	.383	2
476			min	2.061	15	-371.974	2	3.653	12	-.015	3	-.005	3	-.583	3
477		11	max	40.359	1	304.805	2	-2.127	12	.015	3	.057	1	.177	2
478			min	1.907	15	-456.696	3	-101.783	1	-.013	2	-.008	3	-.273	3
479		12	max	40.359	1	237.637	2	-.948	12	.015	3	.004	2	.013	1
480			min	1.907	15	-356.471	3	-75.206	1	-.013	2	-.009	3	-.024	3
481		13	max	40.359	1	170.468	2	.576	3	.015	3	-.002	15	.163	3
482			min	1.907	15	-256.247	3	-48.629	1	-.013	2	-.035	1	-.114	2
483		14	max	40.359	1	103.299	2	2.344	3	.015	3	-.003	15	.289	3
484			min	1.907	15	-156.022	3	-22.051	1	-.013	2	-.057	1	-.197	2
485		15	max	40.359	1	36.131	2	4.526	1	.015	3	-.003	15	.354	3
486			min	1.907	15	-55.797	3	-.754	10	-.013	2	-.062	1	-.24	2
487		16	max	40.359	1	44.428	3	31.104	1	.015	3	-.002	12	.357	3
488			min	1.907	15	-31.038	2	1.471	15	-.013	2	-.051	1	-.242	2
489		17	max	40.359	1	144.652	3	57.681	1	.015	3	.001	3	.299	3
490			min	1.907	15	-98.207	2	2.679	15	-.013	2	-.024	1	-.202	2
491		18	max	40.359	1	244.877	3	84.258	1	.015	3	.019	1	.18	3
492			min	1.907	15	-165.375	2	3.887	15	-.013	2	0	10	-.122	2
493		19	max	40.359	1	345.102	3	110.836	1	.015	3	.079	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	1.907	15	-232.544	2	5.096	15	-.013	2	.004	15	0	3
495	M16	1	max	.788	3	350.334	2	-5.071	15	.012	3	.078	1	0	2
496			min	-41.442	1	-170.338	3	-110.462	1	-.018	2	.004	15	0	3
497		2	max	.788	3	248.916	2	-3.863	15	.012	3	.019	1	.089	3
498			min	-41.442	1	-121.487	3	-83.884	1	-.018	2	0	10	-.183	2
499		3	max	.788	3	147.498	2	-2.655	15	.012	3	0	12	.148	3
500			min	-41.442	1	-72.637	3	-57.307	1	-.018	2	-.024	1	-.304	2
501		4	max	.788	3	46.079	2	-1.447	15	.012	3	-.002	15	.178	3
502			min	-41.442	1	-23.787	3	-30.73	1	-.018	2	-.051	1	-.363	2
503		5	max	.788	3	25.064	3	.735	10	.012	3	-.003	15	.178	3
504			min	-41.442	1	-55.339	2	-4.152	1	-.018	2	-.062	1	-.361	2
505		6	max	.788	3	73.914	3	22.425	1	.012	3	-.003	15	.147	3
506			min	-41.442	1	-156.757	2	-.571	3	-.018	2	-.056	1	-.296	2
507		7	max	.788	3	122.764	3	49.003	1	.012	3	-.002	15	.087	3
508			min	-41.442	1	-258.176	2	.882	12	-.018	2	-.035	1	-.169	2
509		8	max	.788	3	171.615	3	75.58	1	.012	3	.004	2	.02	2
510			min	-41.442	1	-359.594	2	2.06	12	-.018	2	-.006	3	-.003	3
511		9	max	.788	3	220.465	3	102.157	1	.012	3	.058	1	.271	2
512			min	-41.442	1	-461.012	2	3.239	12	-.018	2	-.003	3	-.123	3
513		10	max	-1.952	15	-9.585	15	128.735	1	0	15	.128	1	.583	2
514			min	-41.442	1	-562.43	2	-7.325	3	-.018	2	.004	12	-.272	3
515		11	max	-1.952	15	461.012	2	-3.751	12	.018	2	.057	1	.271	2
516			min	-41.301	1	-220.465	3	-101.778	1	-.012	3	.001	12	-.123	3
517		12	max	-1.952	15	359.594	2	-2.572	12	.018	2	.004	2	.02	2
518			min	-41.301	1	-171.615	3	-75.201	1	-.012	3	0	3	-.003	3
519		13	max	-1.952	15	258.175	2	-1.393	12	.018	2	-.002	15	.087	3
520			min	-41.301	1	-122.764	3	-48.624	1	-.012	3	-.035	1	-.169	2
521		14	max	-1.952	15	156.757	2	-.215	12	.018	2	-.002	12	.147	3
522			min	-41.301	1	-73.914	3	-22.046	1	-.012	3	-.056	1	-.296	2
523		15	max	-1.952	15	55.339	2	4.531	1	.018	2	-.002	12	.178	3
524			min	-41.301	1	-25.064	3	-.735	10	-.012	3	-.062	1	-.361	2
525		16	max	-1.952	15	23.787	3	31.109	1	.018	2	-.001	12	.178	3
526			min	-41.301	1	-46.079	2	1.466	15	-.012	3	-.051	1	-.363	2
527		17	max	-1.952	15	72.637	3	57.686	1	.018	2	0	3	.148	3
528			min	-41.301	1	-147.498	2	2.674	15	-.012	3	-.024	1	-.304	2
529		18	max	-1.952	15	121.487	3	84.264	1	.018	2	.02	1	.089	3
530			min	-41.301	1	-248.916	2	3.882	15	-.012	3	0	10	-.183	2
531		19	max	-1.952	15	170.338	3	110.841	1	.018	2	.079	1	0	2
532			min	-41.301	1	-350.334	2	5.09	15	-.012	3	.004	15	0	3
533	M15	1	max	.399	13	1.945	4	.073	3	0	9	0	9	0	1
534			min	-87.721	3	0	1	-.017	9	0	3	0	3	0	1
535		2	max	.295	13	1.728	4	.073	3	0	9	0	9	0	1
536			min	-87.797	3	0	1	-.017	9	0	3	0	3	0	4
537		3	max	.191	13	1.512	4	.073	3	0	9	0	9	0	1
538			min	-87.873	3	0	1	-.017	9	0	3	0	3	-.001	4
539		4	max	.087	13	1.296	4	.073	3	0	9	0	9	0	1
540			min	-87.948	3	0	1	-.017	9	0	3	0	3	-.002	4
541		5	max	0	1	1.08	4	.073	3	0	9	0	9	0	1
542			min	-88.024	3	0	1	-.017	9	0	3	0	3	-.002	4
543		6	max	0	1	.864	4	.073	3	0	9	0	9	0	1
544			min	-88.099	3	0	1	-.017	9	0	3	0	3	-.003	4
545		7	max	0	1	.648	4	.073	3	0	9	0	3	0	1
546			min	-88.175	3	0	1	-.017	9	0	3	0	9	-.003	4
547		8	max	0	1	.432	4	.073	3	0	9	0	3	0	1
548			min	-88.25	3	0	1	-.017	9	0	3	0	9	-.003	4
549		9	max	0	1	.216	4	.073	3	0	9	0	3	0	1
550			min	-88.326	3	0	1	-.017	9	0	3	0	9	-.003	4

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
551		10	max	0	1	0	1	.073	3	0	9	0	3	0	1
552			min	-88.401	3	0	1	-.017	9	0	3	0	9	-.003	4
553		11	max	0	1	0	1	.073	3	0	9	0	3	0	1
554			min	-88.477	3	-.216	4	-.017	9	0	3	0	9	-.003	4
555		12	max	0	1	0	1	.073	3	0	9	0	3	0	1
556			min	-88.552	3	-.432	4	-.017	9	0	3	0	9	-.003	4
557		13	max	0	1	0	1	.073	3	0	9	0	3	0	1
558			min	-88.628	3	-.648	4	-.017	9	0	3	0	9	-.003	4
559		14	max	0	1	0	1	.073	3	0	9	0	3	0	1
560			min	-88.703	3	-.864	4	-.017	9	0	3	0	9	-.003	4
561		15	max	0	1	0	1	.073	3	0	9	0	3	0	1
562			min	-88.779	3	-1.08	4	-.017	9	0	3	0	9	-.002	4
563		16	max	0	1	0	1	.073	3	0	9	0	3	0	1
564			min	-88.854	3	-1.296	4	-.017	9	0	3	0	9	-.002	4
565		17	max	0	1	0	1	.073	3	0	9	0	3	0	1
566			min	-88.93	3	-1.512	4	-.017	9	0	3	0	9	-.001	4
567		18	max	0	1	0	1	.073	3	0	9	0	3	0	1
568			min	-89.006	3	-1.728	4	-.017	9	0	3	0	9	0	4
569		19	max	0	1	0	1	.073	3	0	9	0	3	0	1
570			min	-89.081	3	-1.945	4	-.017	9	0	3	0	9	0	1
571	M16A	1	max	0	10	1.945	4	.029	2	0	3	0	3	0	1
572			min	-87.971	3	0	10	-.034	3	0	2	0	2	0	1
573		2	max	0	10	1.728	4	.029	2	0	3	0	3	0	10
574			min	-87.896	3	0	10	-.034	3	0	2	0	2	0	4
575		3	max	0	10	1.512	4	.029	2	0	3	0	3	0	10
576			min	-87.82	3	0	10	-.034	3	0	2	0	1	-.001	4
577		4	max	0	10	1.296	4	.029	2	0	3	0	3	0	10
578			min	-87.745	3	0	10	-.034	3	0	2	0	1	-.002	4
579		5	max	0	10	1.08	4	.029	2	0	3	0	3	0	10
580			min	-87.669	3	0	10	-.034	3	0	2	0	1	-.002	4
581		6	max	0	10	.864	4	.029	2	0	3	0	3	0	10
582			min	-87.594	3	0	10	-.034	3	0	2	0	1	-.003	4
583		7	max	0	10	.648	4	.029	2	0	3	0	3	0	10
584			min	-87.518	3	0	10	-.034	3	0	2	0	1	-.003	4
585		8	max	0	10	.432	4	.029	2	0	3	0	3	0	10
586			min	-87.443	3	0	10	-.034	3	0	2	0	1	-.003	4
587		9	max	0	10	.216	4	.029	2	0	3	0	3	0	10
588			min	-87.367	3	0	10	-.034	3	0	2	0	1	-.003	4
589		10	max	0	10	0	1	.029	2	0	3	0	3	0	10
590			min	-87.291	3	0	1	-.034	3	0	2	0	1	-.003	4
591		11	max	0	10	0	10	.029	2	0	3	0	3	0	10
592			min	-87.216	3	-.216	4	-.034	3	0	2	0	1	-.003	4
593		12	max	.076	2	0	10	.029	2	0	3	0	3	0	10
594			min	-87.14	3	-.432	4	-.034	3	0	2	0	1	-.003	4
595		13	max	.177	2	0	10	.029	2	0	3	0	2	0	10
596			min	-87.065	3	-.648	4	-.034	3	0	2	0	4	-.003	4
597		14	max	.277	2	0	10	.029	2	0	3	0	2	0	10
598			min	-86.989	3	-.864	4	-.034	3	0	2	0	3	-.003	4
599		15	max	.378	2	0	10	.029	2	0	3	0	2	0	10
600			min	-86.914	3	-1.08	4	-.034	3	0	2	0	3	-.002	4
601		16	max	.479	2	0	10	.029	2	0	3	0	2	0	10
602			min	-86.838	3	-1.296	4	-.034	3	0	2	0	3	-.002	4
603		17	max	.579	2	0	10	.029	2	0	3	0	2	0	10
604			min	-86.763	3	-1.512	4	-.034	3	0	2	0	3	-.001	4
605		18	max	.68	2	0	10	.029	2	0	3	0	2	0	10
606			min	-86.687	3	-1.728	4	-.034	3	0	2	0	3	0	4
607		19	max	.781	2	0	10	.029	2	0	3	0	2	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	-86.612	3	-1.945	4	-.034	3	0	2	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	1	.012	2	.008	1	-3.11e-5	15	NC	3	NC	2
2			min	-.004	3	-.012	3	-.002	3	-6.582e-4	1	3653.922	2	5345.344	1
3		2	max	.002	1	.011	2	.007	1	-2.974e-5	15	NC	3	NC	2
4			min	-.004	3	-.011	3	-.002	3	-6.293e-4	1	3986.715	2	5741.029	1
5		3	max	.002	1	.01	2	.007	1	-2.838e-5	15	NC	3	NC	2
6			min	-.003	3	-.011	3	-.001	3	-6.004e-4	1	4382.124	2	6209.563	1
7		4	max	.002	1	.009	2	.006	1	-2.701e-5	15	NC	3	NC	2
8			min	-.003	3	-.01	3	-.001	3	-5.715e-4	1	4854.966	2	6768.102	1
9		5	max	.002	1	.008	2	.006	1	-2.565e-5	15	NC	1	NC	2
10			min	-.003	3	-.01	3	-.001	3	-5.426e-4	1	5424.891	2	7439.558	1
11		6	max	.002	1	.007	2	.005	1	-2.429e-5	15	NC	1	NC	2
12			min	-.003	3	-.009	3	-.001	3	-5.136e-4	1	6118.362	2	8255.06	1
13		7	max	.002	1	.006	2	.005	1	-2.292e-5	15	NC	1	NC	2
14			min	-.003	3	-.009	3	0	3	-4.847e-4	1	6971.671	2	9257.763	1
15		8	max	.001	1	.005	2	.004	1	-2.156e-5	15	NC	1	NC	1
16			min	-.002	3	-.008	3	0	3	-4.558e-4	1	8035.654	2	NC	1
17		9	max	.001	1	.005	2	.004	1	-2.02e-5	15	NC	1	NC	1
18			min	-.002	3	-.008	3	0	3	-4.269e-4	1	9383.322	2	NC	1
19		10	max	.001	1	.004	2	.003	1	-1.883e-5	15	NC	1	NC	1
20			min	-.002	3	-.007	3	0	3	-3.98e-4	1	NC	1	NC	1
21		11	max	.001	1	.003	2	.003	1	-1.747e-5	15	NC	1	NC	1
22			min	-.002	3	-.006	3	0	3	-3.691e-4	1	NC	1	NC	1
23		12	max	0	1	.003	2	.002	1	-1.61e-5	15	NC	1	NC	1
24			min	-.002	3	-.006	3	0	3	-3.402e-4	1	NC	1	NC	1
25		13	max	0	1	.002	2	.002	1	-1.474e-5	15	NC	1	NC	1
26			min	-.001	3	-.005	3	0	3	-3.113e-4	1	NC	1	NC	1
27		14	max	0	1	.002	2	.001	1	-1.338e-5	15	NC	1	NC	1
28			min	-.001	3	-.004	3	0	3	-2.824e-4	1	NC	1	NC	1
29		15	max	0	1	.001	2	0	1	-1.201e-5	15	NC	1	NC	1
30			min	0	3	-.003	3	0	3	-2.535e-4	1	NC	1	NC	1
31		16	max	0	1	0	2	0	1	-1.065e-5	15	NC	1	NC	1
32			min	0	3	-.003	3	0	3	-2.246e-4	1	NC	1	NC	1
33		17	max	0	1	0	2	0	1	-9.287e-6	15	NC	1	NC	1
34			min	0	3	-.002	3	0	3	-1.957e-4	1	NC	1	NC	1
35		18	max	0	1	0	2	0	1	-7.924e-6	15	NC	1	NC	1
36			min	0	3	0	3	0	3	-1.668e-4	1	NC	1	NC	1
37		19	max	0	1	0	1	0	1	-6.56e-6	15	NC	1	NC	1
38			min	0	1	0	1	0	1	-1.379e-4	1	NC	1	NC	1
39	M3	1	max	0	1	0	1	0	1	6.603e-5	1	NC	1	NC	1
40			min	0	1	0	1	0	1	3.141e-6	15	NC	1	NC	1
41		2	max	0	3	0	2	0	12	8.014e-5	1	NC	1	NC	1
42			min	0	2	0	3	0	1	3.792e-6	15	NC	1	NC	1
43		3	max	0	3	0	2	0	12	9.426e-5	1	NC	1	NC	1
44			min	0	2	-.002	3	0	1	4.443e-6	15	NC	1	NC	1
45		4	max	0	3	0	2	0	12	1.084e-4	1	NC	1	NC	1
46			min	0	2	-.003	3	0	1	5.095e-6	15	NC	1	NC	1
47		5	max	0	3	0	2	0	3	1.225e-4	1	NC	1	NC	1
48			min	0	2	-.004	3	0	1	5.746e-6	15	NC	1	NC	1
49		6	max	0	3	0	2	0	3	1.366e-4	1	NC	1	NC	1
50			min	0	2	-.005	3	0	1	6.397e-6	15	NC	1	NC	1
51		7	max	0	3	.001	2	0	3	1.507e-4	1	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
52			min	0	2	-.006	3	0	1	7.048e-6	15	NC	1	NC	1
53		8	max	0	3	.001	2	0	3	1.648e-4	1	NC	1	NC	1
54			min	0	2	-.006	3	0	1	7.699e-6	15	NC	1	NC	1
55		9	max	.001	3	.002	2	0	3	1.79e-4	1	NC	1	NC	1
56			min	-.001	2	-.007	3	0	9	8.35e-6	15	NC	1	NC	1
57		10	max	.001	3	.002	2	0	2	1.931e-4	1	NC	1	NC	1
58			min	-.001	2	-.008	3	0	15	9.002e-6	15	NC	1	NC	1
59		11	max	.001	3	.003	2	0	1	2.072e-4	1	NC	1	NC	1
60			min	-.001	2	-.008	3	0	15	9.653e-6	15	NC	1	NC	1
61		12	max	.002	3	.004	2	0	1	2.213e-4	1	NC	1	NC	1
62			min	-.002	2	-.009	3	0	15	1.03e-5	15	NC	1	NC	1
63		13	max	.002	3	.004	2	.001	1	2.354e-4	1	NC	1	NC	1
64			min	-.002	2	-.009	3	0	15	1.096e-5	15	NC	1	NC	1
65		14	max	.002	3	.005	2	.002	1	2.495e-4	1	NC	1	NC	1
66			min	-.002	2	-.009	3	0	15	1.161e-5	15	8827.768	2	NC	1
67		15	max	.002	3	.006	2	.002	1	2.637e-4	1	NC	1	NC	1
68			min	-.002	2	-.009	3	0	15	1.226e-5	15	7473.745	2	NC	1
69		16	max	.002	3	.007	2	.003	1	2.778e-4	1	NC	1	NC	1
70			min	-.002	2	-.01	3	0	15	1.291e-5	15	6415.955	2	NC	1
71		17	max	.002	3	.008	2	.003	1	2.919e-4	1	NC	1	NC	1
72			min	-.002	2	-.01	3	0	15	1.356e-5	15	5581.309	2	NC	1
73		18	max	.002	3	.009	2	.004	1	3.06e-4	1	NC	3	NC	1
74			min	-.002	2	-.01	3	0	15	1.421e-5	15	4917.086	2	NC	1
75		19	max	.002	3	.011	2	.004	1	3.201e-4	1	NC	3	NC	1
76			min	-.002	2	-.01	3	0	15	1.486e-5	15	4384.952	2	NC	1
77	M4	1	max	.002	1	.014	2	0	15	-1.615e-5	12	NC	1	NC	2
78			min	0	15	-.012	3	-.003	1	-5.231e-4	1	NC	1	6556.287	1
79		2	max	.001	1	.013	2	0	15	-1.615e-5	12	NC	1	NC	2
80			min	0	15	-.011	3	-.003	1	-5.231e-4	1	NC	1	7150.899	1
81		3	max	.001	1	.012	2	0	15	-1.615e-5	12	NC	1	NC	2
82			min	0	15	-.011	3	-.002	1	-5.231e-4	1	NC	1	7858.65	1
83		4	max	.001	1	.011	2	0	15	-1.615e-5	12	NC	1	NC	2
84			min	0	15	-.01	3	-.002	1	-5.231e-4	1	NC	1	8709.369	1
85		5	max	.001	1	.011	2	0	15	-1.615e-5	12	NC	1	NC	2
86			min	0	15	-.009	3	-.002	1	-5.231e-4	1	NC	1	9743.692	1
87		6	max	.001	1	.01	2	0	15	-1.615e-5	12	NC	1	NC	1
88			min	0	15	-.009	3	-.002	1	-5.231e-4	1	NC	1	NC	1
89		7	max	.001	1	.009	2	0	15	-1.615e-5	12	NC	1	NC	1
90			min	0	15	-.008	3	-.002	1	-5.231e-4	1	NC	1	NC	1
91		8	max	0	1	.008	2	0	15	-1.615e-5	12	NC	1	NC	1
92			min	0	15	-.007	3	-.001	1	-5.231e-4	1	NC	1	NC	1
93		9	max	0	1	.008	2	0	15	-1.615e-5	12	NC	1	NC	1
94			min	0	15	-.007	3	-.001	1	-5.231e-4	1	NC	1	NC	1
95		10	max	0	1	.007	2	0	15	-1.615e-5	12	NC	1	NC	1
96			min	0	15	-.006	3	0	1	-5.231e-4	1	NC	1	NC	1
97		11	max	0	1	.006	2	0	15	-1.615e-5	12	NC	1	NC	1
98			min	0	15	-.005	3	0	1	-5.231e-4	1	NC	1	NC	1
99		12	max	0	1	.005	2	0	15	-1.615e-5	12	NC	1	NC	1
100			min	0	15	-.005	3	0	1	-5.231e-4	1	NC	1	NC	1
101		13	max	0	1	.005	2	0	15	-1.615e-5	12	NC	1	NC	1
102			min	0	15	-.004	3	0	1	-5.231e-4	1	NC	1	NC	1
103		14	max	0	1	.004	2	0	15	-1.615e-5	12	NC	1	NC	1
104			min	0	15	-.003	3	0	1	-5.231e-4	1	NC	1	NC	1
105		15	max	0	1	.003	2	0	15	-1.615e-5	12	NC	1	NC	1
106			min	0	15	-.003	3	0	1	-5.231e-4	1	NC	1	NC	1
107		16	max	0	1	.002	2	0	15	-1.615e-5	12	NC	1	NC	1
108			min	0	15	-.002	3	0	1	-5.231e-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	.002	2	0	15	-1.615e-5	12	NC	1	NC	1
110			min	0	15	-.001	3	0	1	-5.231e-4	1	NC	1	NC	1
111		18	max	0	1	0	2	0	15	-1.615e-5	12	NC	1	NC	1
112			min	0	15	0	3	0	1	-5.231e-4	1	NC	1	NC	1
113		19	max	0	1	0	1	0	1	-1.615e-5	12	NC	1	NC	1
114			min	0	1	0	1	0	1	-5.231e-4	1	NC	1	NC	1
115	M6	1	max	.007	1	.034	2	.003	1	4.412e-4	3	NC	3	NC	1
116			min	-.012	3	-.033	3	-.006	3	-6.38e-7	1	1234.752	2	7657.329	3
117		2	max	.007	1	.032	2	.003	1	4.267e-4	3	NC	3	NC	1
118			min	-.011	3	-.031	3	-.005	3	-4.097e-6	1	1323.041	2	8104.268	3
119		3	max	.006	1	.03	2	.003	1	4.121e-4	3	NC	3	NC	1
120			min	-.011	3	-.03	3	-.005	3	-7.555e-6	1	1424.446	2	8637.841	3
121		4	max	.006	1	.028	2	.002	1	3.976e-4	3	NC	3	NC	1
122			min	-.01	3	-.028	3	-.005	3	-1.101e-5	1	1541.589	2	9275.999	3
123		5	max	.006	1	.025	2	.002	1	3.831e-4	3	NC	3	NC	1
124			min	-.009	3	-.026	3	-.004	3	-1.447e-5	1	1677.853	2	NC	1
125		6	max	.005	1	.023	2	.002	1	3.686e-4	3	NC	3	NC	1
126			min	-.009	3	-.024	3	-.004	3	-1.793e-5	1	1837.664	2	NC	1
127		7	max	.005	1	.021	2	.002	1	3.54e-4	3	NC	3	NC	1
128			min	-.008	3	-.023	3	-.004	3	-2.139e-5	1	2026.926	2	NC	1
129		8	max	.004	1	.019	2	.002	1	3.395e-4	3	NC	3	NC	1
130			min	-.007	3	-.021	3	-.003	3	-2.485e-5	1	2253.692	2	NC	1
131		9	max	.004	1	.017	2	.001	1	3.25e-4	3	NC	3	NC	1
132			min	-.007	3	-.019	3	-.003	3	-2.831e-5	1	2529.231	2	NC	1
133		10	max	.004	1	.015	2	.001	1	3.105e-4	3	NC	3	NC	1
134			min	-.006	3	-.017	3	-.002	3	-3.177e-5	1	2869.81	2	NC	1
135		11	max	.003	1	.013	2	0	1	2.959e-4	3	NC	3	NC	1
136			min	-.005	3	-.015	3	-.002	3	-3.523e-5	1	3299.819	2	NC	1
137		12	max	.003	1	.011	2	0	1	2.814e-4	3	NC	3	NC	1
138			min	-.005	3	-.013	3	-.002	3	-3.868e-5	1	3857.554	2	NC	1
139		13	max	.002	1	.009	2	0	1	2.669e-4	3	NC	3	NC	1
140			min	-.004	3	-.012	3	-.001	3	-4.214e-5	1	4606.803	2	NC	1
141		14	max	.002	1	.007	2	0	1	2.524e-4	3	NC	1	NC	1
142			min	-.003	3	-.01	3	-.001	3	-4.56e-5	1	5662.321	2	NC	1
143		15	max	.002	1	.006	2	0	1	2.378e-4	3	NC	1	NC	1
144			min	-.003	3	-.008	3	0	3	-4.906e-5	1	7253.518	2	NC	1
145		16	max	.001	1	.004	2	0	1	2.233e-4	3	NC	1	NC	1
146			min	-.002	3	-.006	3	0	3	-5.252e-5	1	9915.516	2	NC	1
147		17	max	0	1	.003	2	0	1	2.088e-4	3	NC	1	NC	1
148			min	-.001	3	-.004	3	0	3	-5.598e-5	1	NC	1	NC	1
149		18	max	0	1	.001	2	0	1	1.943e-4	3	NC	1	NC	1
150			min	0	3	-.002	3	0	3	-5.944e-5	1	NC	1	NC	1
151		19	max	0	1	0	1	0	1	1.797e-4	3	NC	1	NC	1
152			min	0	1	0	1	0	1	-6.29e-5	1	NC	1	NC	1
153	M7	1	max	0	1	0	1	0	1	2.989e-5	1	NC	1	NC	1
154			min	0	1	0	1	0	1	-8.562e-5	3	NC	1	NC	1
155		2	max	0	3	.001	2	0	3	2.567e-5	1	NC	1	NC	1
156			min	0	2	-.002	3	0	1	-6.372e-5	3	NC	1	NC	1
157		3	max	0	3	.003	2	0	3	2.144e-5	1	NC	1	NC	1
158			min	0	2	-.004	3	0	1	-4.181e-5	3	NC	1	NC	1
159		4	max	.001	3	.004	2	.001	3	1.722e-5	1	NC	1	NC	1
160			min	-.001	2	-.006	3	0	1	-1.99e-5	3	NC	1	NC	1
161		5	max	.002	3	.005	2	.001	3	1.3e-5	1	NC	1	NC	1
162			min	-.002	2	-.008	3	0	1	0	10	8545.612	2	NC	1
163		6	max	.002	3	.007	2	.002	3	2.391e-5	3	NC	1	NC	1
164			min	-.002	2	-.01	3	0	1	0	10	6842.696	2	NC	1
165		7	max	.003	3	.008	2	.002	3	4.582e-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	-.003	2	-.012	3	0	1	0	10	5679.074	2	NC	1
167		8	max	.003	3	.01	2	.002	3	6.773e-5	3	NC	3	NC	1
168			min	-.003	2	-.013	3	0	1	-3.381e-7	13	4826.842	2	NC	1
169		9	max	.003	3	.011	2	.002	3	8.964e-5	3	NC	3	NC	1
170			min	-.004	2	-.015	3	-.001	1	-3.901e-6	1	4172.403	2	NC	1
171		10	max	.004	3	.013	2	.003	3	1.115e-4	3	NC	3	NC	1
172			min	-.004	2	-.017	3	-.001	1	-8.125e-6	1	3652.757	2	NC	1
173		11	max	.004	3	.014	2	.003	3	1.335e-4	3	NC	3	NC	1
174			min	-.005	2	-.018	3	-.001	1	-1.235e-5	1	3230.053	2	NC	1
175		12	max	.005	3	.016	2	.003	3	1.554e-4	3	NC	3	NC	1
176			min	-.005	2	-.019	3	-.001	1	-1.657e-5	1	2880.056	2	NC	1
177		13	max	.005	3	.018	2	.003	3	1.773e-4	3	NC	3	NC	1
178			min	-.006	2	-.02	3	-.001	1	-2.08e-5	1	2586.412	2	NC	1
179		14	max	.005	3	.02	2	.003	3	1.992e-4	3	NC	3	NC	1
180			min	-.006	2	-.022	3	-.001	1	-2.502e-5	1	2337.593	2	NC	1
181		15	max	.006	3	.022	2	.003	3	2.211e-4	3	NC	3	NC	1
182			min	-.007	2	-.023	3	-.002	1	-2.925e-5	1	2125.17	2	NC	1
183		16	max	.006	3	.024	2	.003	3	2.43e-4	3	NC	3	NC	1
184			min	-.007	2	-.024	3	-.002	1	-3.347e-5	1	1942.791	2	NC	1
185		17	max	.007	3	.026	2	.003	3	2.649e-4	3	NC	3	NC	1
186			min	-.008	2	-.025	3	-.002	1	-3.769e-5	1	1785.551	2	NC	1
187		18	max	.007	3	.028	2	.003	3	2.868e-4	3	NC	3	NC	1
188			min	-.008	2	-.026	3	-.002	1	-4.192e-5	1	1649.587	2	NC	1
189		19	max	.008	3	.03	2	.003	3	3.087e-4	3	NC	3	NC	1
190			min	-.009	2	-.026	3	-.002	1	-4.614e-5	1	1531.818	2	NC	1
191	M8	1	max	.004	1	.04	2	.002	1	-1.085e-7	10	NC	1	NC	1
192			min	0	15	-.033	3	-.002	3	-2.358e-4	3	NC	1	NC	1
193		2	max	.004	1	.038	2	.002	1	-1.085e-7	10	NC	1	NC	1
194			min	0	15	-.031	3	-.002	3	-2.358e-4	3	NC	1	NC	1
195		3	max	.003	1	.035	2	.001	1	-1.085e-7	10	NC	1	NC	1
196			min	0	15	-.029	3	-.002	3	-2.358e-4	3	NC	1	NC	1
197		4	max	.003	1	.033	2	.001	1	-1.085e-7	10	NC	1	NC	1
198			min	0	15	-.027	3	-.001	3	-2.358e-4	3	NC	1	NC	1
199		5	max	.003	1	.031	2	.001	1	-1.085e-7	10	NC	1	NC	1
200			min	0	15	-.025	3	-.001	3	-2.358e-4	3	NC	1	NC	1
201		6	max	.003	1	.029	2	.001	1	-1.085e-7	10	NC	1	NC	1
202			min	0	15	-.023	3	-.001	3	-2.358e-4	3	NC	1	NC	1
203		7	max	.003	1	.027	2	0	1	-1.085e-7	10	NC	1	NC	1
204			min	0	15	-.022	3	0	3	-2.358e-4	3	NC	1	NC	1
205		8	max	.002	1	.024	2	0	1	-1.085e-7	10	NC	1	NC	1
206			min	0	15	-.02	3	0	3	-2.358e-4	3	NC	1	NC	1
207		9	max	.002	1	.022	2	0	1	-1.085e-7	10	NC	1	NC	1
208			min	0	15	-.018	3	0	3	-2.358e-4	3	NC	1	NC	1
209		10	max	.002	1	.02	2	0	1	-1.085e-7	10	NC	1	NC	1
210			min	0	15	-.016	3	0	3	-2.358e-4	3	NC	1	NC	1
211		11	max	.002	1	.018	2	0	1	-1.085e-7	10	NC	1	NC	1
212			min	0	15	-.014	3	0	3	-2.358e-4	3	NC	1	NC	1
213		12	max	.002	1	.015	2	0	1	-1.085e-7	10	NC	1	NC	1
214			min	0	15	-.013	3	0	3	-2.358e-4	3	NC	1	NC	1
215		13	max	.001	1	.013	2	0	1	-1.085e-7	10	NC	1	NC	1
216			min	0	15	-.011	3	0	3	-2.358e-4	3	NC	1	NC	1
217		14	max	.001	1	.011	2	0	1	-1.085e-7	10	NC	1	NC	1
218			min	0	15	-.009	3	0	3	-2.358e-4	3	NC	1	NC	1
219		15	max	0	1	.009	2	0	1	-1.085e-7	10	NC	1	NC	1
220			min	0	15	-.007	3	0	3	-2.358e-4	3	NC	1	NC	1
221		16	max	0	1	.007	2	0	1	-1.085e-7	10	NC	1	NC	1
222			min	0	15	-.005	3	0	3	-2.358e-4	3	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
223		17	max	0	1	.004	2	0	1	-1.085e-7	10	NC	1	NC	1
224			min	0	15	-.004	3	0	3	-2.358e-4	3	NC	1	NC	1
225		18	max	0	1	.002	2	0	1	-1.085e-7	10	NC	1	NC	1
226			min	0	15	-.002	3	0	3	-2.358e-4	3	NC	1	NC	1
227		19	max	0	1	0	1	0	1	-1.085e-7	10	NC	1	NC	1
228			min	0	1	0	1	0	1	-2.358e-4	3	NC	1	NC	1
229	M10	1	max	.002	1	.012	2	0	3	6.484e-4	1	NC	3	NC	1
230			min	-.003	3	-.012	3	-.002	1	-4.865e-4	3	3657.447	2	NC	1
231		2	max	.002	1	.011	2	0	3	6.147e-4	1	NC	3	NC	1
232			min	-.003	3	-.011	3	-.002	1	-4.691e-4	3	3990.681	2	NC	1
233		3	max	.002	1	.01	2	0	3	5.81e-4	1	NC	3	NC	1
234			min	-.003	3	-.011	3	-.001	1	-4.518e-4	3	4386.636	2	NC	1
235		4	max	.002	1	.009	2	0	3	5.473e-4	1	NC	3	NC	1
236			min	-.003	3	-.01	3	-.001	1	-4.344e-4	3	4860.16	2	NC	1
237		5	max	.002	1	.008	2	0	3	5.136e-4	1	NC	1	NC	1
238			min	-.003	3	-.01	3	-.001	1	-4.171e-4	3	5430.947	2	NC	1
239		6	max	.002	1	.007	2	0	3	4.8e-4	1	NC	1	NC	1
240			min	-.002	3	-.009	3	-.001	1	-3.997e-4	3	6125.52	2	NC	1
241		7	max	.002	1	.006	2	0	3	4.463e-4	1	NC	1	NC	1
242			min	-.002	3	-.009	3	-.001	1	-3.823e-4	3	6980.256	2	NC	1
243		8	max	.001	1	.005	2	0	3	4.126e-4	1	NC	1	NC	1
244			min	-.002	3	-.008	3	-.001	1	-3.65e-4	3	8046.116	2	NC	1
245		9	max	.001	1	.005	2	0	3	3.789e-4	1	NC	1	NC	1
246			min	-.002	3	-.008	3	0	1	-3.476e-4	3	9396.301	2	NC	1
247		10	max	.001	1	.004	2	0	3	3.452e-4	1	NC	1	NC	1
248			min	-.002	3	-.007	3	0	1	-3.303e-4	3	NC	1	NC	1
249		11	max	.001	1	.003	2	0	3	3.116e-4	1	NC	1	NC	1
250			min	-.001	3	-.006	3	0	1	-3.129e-4	3	NC	1	NC	1
251		12	max	0	1	.003	2	0	3	2.779e-4	1	NC	1	NC	1
252			min	-.001	3	-.006	3	0	1	-2.956e-4	3	NC	1	NC	1
253		13	max	0	1	.002	2	0	3	2.442e-4	1	NC	1	NC	1
254			min	-.001	3	-.005	3	0	1	-2.782e-4	3	NC	1	NC	1
255		14	max	0	1	.002	2	0	3	2.105e-4	1	NC	1	NC	1
256			min	0	3	-.004	3	0	1	-2.609e-4	3	NC	1	NC	1
257		15	max	0	1	.001	2	0	3	1.769e-4	1	NC	1	NC	1
258			min	0	3	-.003	3	0	1	-2.435e-4	3	NC	1	NC	1
259		16	max	0	1	0	2	0	3	1.432e-4	1	NC	1	NC	1
260			min	0	3	-.003	3	0	1	-2.262e-4	3	NC	1	NC	1
261		17	max	0	1	0	2	0	3	1.095e-4	1	NC	1	NC	1
262			min	0	3	-.002	3	0	1	-2.088e-4	3	NC	1	NC	1
263		18	max	0	1	0	2	0	3	7.581e-5	1	NC	1	NC	1
264			min	0	3	0	3	0	1	-1.914e-4	3	NC	1	NC	1
265		19	max	0	1	0	1	0	1	4.214e-5	1	NC	1	NC	1
266			min	0	1	0	1	0	1	-1.741e-4	3	NC	1	NC	1
267	M11	1	max	0	1	0	1	0	1	8.332e-5	3	NC	1	NC	1
268			min	0	1	0	1	0	1	-2.066e-5	1	NC	1	NC	1
269		2	max	0	3	0	2	0	2	6.124e-5	3	NC	1	NC	1
270			min	0	2	-.001	3	0	3	-4.344e-5	1	NC	1	NC	1
271		3	max	0	3	0	2	0	2	3.915e-5	3	NC	1	NC	1
272			min	0	2	-.002	3	0	3	-6.621e-5	1	NC	1	NC	1
273		4	max	0	3	0	2	0	2	1.706e-5	3	NC	1	NC	1
274			min	0	2	-.003	3	-.001	3	-8.899e-5	1	NC	1	NC	1
275		5	max	0	3	0	2	0	2	-3.568e-6	12	NC	1	NC	1
276			min	0	2	-.004	3	-.001	3	-1.118e-4	1	NC	1	NC	1
277		6	max	0	3	0	2	0	10	-6.699e-6	15	NC	1	NC	1
278			min	0	2	-.005	3	-.002	3	-1.345e-4	1	NC	1	NC	1
279		7	max	0	3	.001	2	0	10	-7.816e-6	15	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
280			min	0	2	-.006	3	-.002	3	-1.573e-4	1	NC	1	NC	1
281		8	max	0	3	.001	2	0	10	-8.932e-6	15	NC	1	NC	1
282			min	0	2	-.006	3	-.002	3	-1.801e-4	1	NC	1	NC	1
283		9	max	.001	3	.002	2	0	10	-1.005e-5	15	NC	1	NC	1
284			min	-.001	2	-.007	3	-.002	3	-2.029e-4	1	NC	1	NC	1
285		10	max	.001	3	.002	2	0	15	-1.117e-5	15	NC	1	NC	1
286			min	-.001	2	-.008	3	-.002	3	-2.256e-4	1	NC	1	NC	1
287		11	max	.001	3	.003	2	0	15	-1.228e-5	15	NC	1	NC	1
288			min	-.001	2	-.008	3	-.003	1	-2.484e-4	1	NC	1	NC	1
289		12	max	.002	3	.004	2	0	15	-1.34e-5	15	NC	1	NC	1
290			min	-.002	2	-.009	3	-.003	1	-2.712e-4	1	NC	1	NC	1
291		13	max	.002	3	.004	2	0	15	-1.451e-5	15	NC	1	NC	1
292			min	-.002	2	-.009	3	-.004	1	-2.94e-4	1	NC	1	NC	1
293		14	max	.002	3	.005	2	0	15	-1.563e-5	15	NC	1	NC	1
294			min	-.002	2	-.009	3	-.005	1	-3.167e-4	1	8843.027	2	NC	1
295		15	max	.002	3	.006	2	0	15	-1.675e-5	15	NC	1	NC	2
296			min	-.002	2	-.009	3	-.005	1	-3.395e-4	1	7485.529	2	8851.214	1
297		16	max	.002	3	.007	2	0	15	-1.786e-5	15	NC	1	NC	2
298			min	-.002	2	-.01	3	-.006	1	-3.623e-4	1	6425.264	2	7900.567	1
299		17	max	.002	3	.008	2	0	15	-1.898e-5	15	NC	1	NC	2
300			min	-.002	2	-.01	3	-.006	1	-3.851e-4	1	5588.826	2	7136.111	1
301		18	max	.002	3	.009	2	0	15	-2.01e-5	15	NC	3	NC	2
302			min	-.002	2	-.01	3	-.007	1	-4.078e-4	1	4923.287	2	6514.167	1
303		19	max	.002	3	.01	2	0	15	-2.121e-5	15	NC	3	NC	2
304			min	-.002	2	-.01	3	-.008	1	-4.306e-4	1	4390.176	2	6003.62	1
305	M12	1	max	.002	1	.014	2	.006	1	4.079e-4	1	NC	1	NC	2
306			min	0	15	-.012	3	0	15	1.992e-5	15	NC	1	2978.617	1
307		2	max	.001	1	.013	2	.006	1	4.079e-4	1	NC	1	NC	2
308			min	0	15	-.011	3	0	15	1.992e-5	15	NC	1	3248.08	1
309		3	max	.001	1	.012	2	.005	1	4.079e-4	1	NC	1	NC	2
310			min	0	15	-.011	3	0	15	1.992e-5	15	NC	1	3568.847	1
311		4	max	.001	1	.011	2	.005	1	4.079e-4	1	NC	1	NC	2
312			min	0	15	-.01	3	0	15	1.992e-5	15	NC	1	3954.439	1
313		5	max	.001	1	.011	2	.004	1	4.079e-4	1	NC	1	NC	2
314			min	0	15	-.009	3	0	15	1.992e-5	15	NC	1	4423.273	1
315		6	max	.001	1	.01	2	.004	1	4.079e-4	1	NC	1	NC	2
316			min	0	15	-.009	3	0	15	1.992e-5	15	NC	1	5000.969	1
317		7	max	.001	1	.009	2	.003	1	4.079e-4	1	NC	1	NC	2
318			min	0	15	-.008	3	0	15	1.992e-5	15	NC	1	5724.017	1
319		8	max	0	1	.008	2	.003	1	4.079e-4	1	NC	1	NC	2
320			min	0	15	-.007	3	0	15	1.992e-5	15	NC	1	6645.853	1
321		9	max	0	1	.008	2	.002	1	4.079e-4	1	NC	1	NC	2
322			min	0	15	-.007	3	0	15	1.992e-5	15	NC	1	7847.308	1
323		10	max	0	1	.007	2	.002	1	4.079e-4	1	NC	1	NC	2
324			min	0	15	-.006	3	0	15	1.992e-5	15	NC	1	9455.459	1
325		11	max	0	1	.006	2	.002	1	4.079e-4	1	NC	1	NC	1
326			min	0	15	-.005	3	0	15	1.992e-5	15	NC	1	NC	1
327		12	max	0	1	.005	2	.001	1	4.079e-4	1	NC	1	NC	1
328			min	0	15	-.005	3	0	15	1.992e-5	15	NC	1	NC	1
329		13	max	0	1	.005	2	0	1	4.079e-4	1	NC	1	NC	1
330			min	0	15	-.004	3	0	15	1.992e-5	15	NC	1	NC	1
331		14	max	0	1	.004	2	0	1	4.079e-4	1	NC	1	NC	1
332			min	0	15	-.003	3	0	15	1.992e-5	15	NC	1	NC	1
333		15	max	0	1	.003	2	0	1	4.079e-4	1	NC	1	NC	1
334			min	0	15	-.003	3	0	15	1.992e-5	15	NC	1	NC	1
335		16	max	0	1	.002	2	0	1	4.079e-4	1	NC	1	NC	1
336			min	0	15	-.002	3	0	15	1.992e-5	15	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
337		17	max	0	1	.002	2	0	1	4.079e-4	1	NC	1	NC	1
338			min	0	15	-.001	3	0	15	1.992e-5	15	NC	1	NC	1
339		18	max	0	1	0	2	0	1	4.079e-4	1	NC	1	NC	1
340			min	0	15	0	3	0	15	1.992e-5	15	NC	1	NC	1
341		19	max	0	1	0	1	0	1	4.079e-4	1	NC	1	NC	1
342			min	0	1	0	1	0	1	1.992e-5	15	NC	1	NC	1
343	M1	1	max	.01	3	.029	3	.003	3	5.577e-3	2	NC	1	NC	1
344			min	-.01	2	-.025	2	-.003	1	-7.978e-3	3	NC	1	NC	1
345		2	max	.01	3	.018	3	.002	3	2.704e-3	2	NC	4	NC	1
346			min	-.01	2	-.015	2	-.006	1	-3.945e-3	3	4532.425	2	NC	1
347		3	max	.01	3	.007	3	.002	3	1.409e-5	3	NC	4	NC	2
348			min	-.01	2	-.005	2	-.008	1	-4.067e-4	1	2332.835	2	9277.164	1
349		4	max	.01	3	.003	2	.001	3	1.771e-5	3	NC	4	NC	2
350			min	-.01	2	-.002	3	-.009	1	-3.522e-4	1	1632.434	2	7695.966	1
351		5	max	.01	3	.011	2	.001	3	2.134e-5	3	NC	4	NC	2
352			min	-.01	2	-.01	3	-.009	1	-2.977e-4	1	1293.81	2	7415.737	1
353		6	max	.01	3	.017	2	0	3	2.497e-5	3	NC	4	NC	2
354			min	-.01	2	-.016	3	-.009	1	-2.432e-4	1	1100.977	2	7976.117	1
355		7	max	.01	3	.022	2	0	3	2.859e-5	3	NC	5	NC	2
356			min	-.01	2	-.021	3	-.008	1	-1.887e-4	1	982.906	2	9578.098	1
357		8	max	.01	3	.026	2	0	3	3.222e-5	3	NC	5	NC	1
358			min	-.01	2	-.024	3	-.006	1	-1.342e-4	1	910.015	2	NC	1
359		9	max	.01	3	.029	2	0	3	3.585e-5	3	NC	5	NC	1
360			min	-.01	2	-.026	3	-.004	1	-7.967e-5	1	868.51	2	NC	1
361		10	max	.01	3	.03	2	0	3	3.948e-5	3	NC	5	NC	1
362			min	-.01	2	-.027	3	-.003	1	-2.516e-5	1	852.105	2	NC	1
363		11	max	.01	3	.029	2	0	3	4.31e-5	3	NC	5	NC	1
364			min	-.01	2	-.026	3	0	1	1.232e-6	15	859.104	2	NC	1
365		12	max	.01	3	.027	2	.001	1	8.386e-5	1	NC	5	NC	1
366			min	-.01	2	-.024	3	0	15	3.812e-6	15	891.802	2	NC	1
367		13	max	.01	3	.024	2	.003	1	1.384e-4	1	NC	5	NC	2
368			min	-.01	2	-.02	3	0	15	6.392e-6	15	957.734	2	9774.936	1
369		14	max	.01	3	.018	2	.004	1	1.929e-4	1	NC	4	NC	2
370			min	-.01	2	-.015	3	0	15	8.972e-6	15	1074.101	2	8098.248	1
371		15	max	.01	3	.011	2	.004	1	2.474e-4	1	NC	4	NC	2
372			min	-.01	2	-.009	3	0	15	1.155e-5	15	1281.153	2	7505.839	1
373		16	max	.01	3	.002	2	.004	1	2.84e-4	1	NC	4	NC	2
374			min	-.01	2	-.002	3	0	15	1.329e-5	15	1691.286	2	7769.378	1
375		17	max	.01	3	.006	3	.003	1	5.475e-5	3	NC	4	NC	2
376			min	-.01	2	-.008	2	0	15	-1.063e-4	1	2453.569	3	9351.227	1
377		18	max	.01	3	.016	3	.001	1	4.1e-3	2	NC	2	NC	1
378			min	-.01	2	-.021	2	0	15	-2.09e-3	3	4794.256	3	NC	1
379		19	max	.01	3	.026	3	0	3	8.28e-3	2	NC	1	NC	1
380			min	-.01	2	-.034	2	-.002	1	-4.275e-3	3	5256.823	2	NC	1
381	M5	1	max	.028	3	.081	3	.003	3	4.53e-6	3	NC	1	NC	1
382			min	-.031	2	-.07	2	-.003	1	0	2	3539.221	3	NC	1
383		2	max	.028	3	.05	3	.004	3	1.265e-4	3	NC	4	NC	1
384			min	-.031	2	-.043	2	-.003	1	-5.089e-5	1	1690.11	2	NC	1
385		3	max	.028	3	.02	3	.006	3	2.46e-4	3	NC	5	NC	1
386			min	-.031	2	-.016	2	-.003	1	-1.009e-4	1	864.59	2	NC	1
387		4	max	.028	3	.007	2	.006	3	2.359e-4	3	NC	5	NC	1
388			min	-.031	2	-.004	3	-.003	1	-9.634e-5	1	603.166	2	NC	1
389		5	max	.028	3	.028	2	.007	3	2.258e-4	3	NC	5	NC	1
390			min	-.031	2	-.025	3	-.003	1	-9.175e-5	1	476.805	2	NC	1
391		6	max	.028	3	.045	2	.007	3	2.157e-4	3	NC	5	NC	1
392			min	-.031	2	-.042	3	-.003	1	-8.715e-5	1	404.794	2	9542.642	3
393		7	max	.028	3	.06	2	.007	3	2.056e-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	-.031	2	-.054	3	-.003	1	-8.255e-5	1	360.618	2	9059.483	3
395		8	max	.028	3	.07	2	.007	3	1.955e-4	3	NC	5	NC	1
396			min	-.031	2	-.063	3	-.003	1	-7.796e-5	1	333.234	2	8945.378	3
397		9	max	.028	3	.077	2	.007	3	1.854e-4	3	NC	5	NC	1
398			min	-.031	2	-.069	3	-.003	1	-7.336e-5	1	317.487	2	9129.169	3
399		10	max	.028	3	.08	2	.007	3	1.753e-4	3	NC	5	NC	1
400			min	-.031	2	-.07	3	-.002	1	-6.876e-5	1	311.02	2	9601.345	3
401		11	max	.027	3	.079	2	.006	3	1.652e-4	3	NC	5	NC	1
402			min	-.031	2	-.068	3	-.002	1	-6.417e-5	1	313.178	2	NC	1
403		12	max	.027	3	.074	2	.006	3	1.551e-4	3	NC	5	NC	1
404			min	-.031	2	-.062	3	-.002	1	-5.957e-5	1	324.788	2	NC	1
405		13	max	.027	3	.064	2	.005	3	1.45e-4	3	NC	5	NC	1
406			min	-.031	2	-.053	3	-.002	1	-5.497e-5	1	348.614	2	NC	1
407		14	max	.027	3	.049	2	.004	3	1.349e-4	3	NC	5	NC	1
408			min	-.031	2	-.04	3	-.002	1	-5.038e-5	1	391.019	2	NC	1
409		15	max	.027	3	.03	2	.003	3	1.248e-4	3	NC	5	NC	1
410			min	-.031	2	-.024	3	-.002	1	-4.578e-5	1	466.996	2	NC	1
411		16	max	.027	3	.005	2	.003	3	1.101e-4	3	NC	5	NC	1
412			min	-.031	2	-.005	3	-.002	1	-4.531e-5	1	618.923	2	NC	1
413		17	max	.027	3	.018	3	.002	3	-7.542e-8	10	NC	5	NC	1
414			min	-.031	2	-.025	2	-.002	1	-1.431e-4	1	934.635	3	NC	1
415		18	max	.027	3	.042	3	.001	3	-9.038e-8	10	NC	4	NC	1
416			min	-.031	2	-.059	2	-.002	1	-7.314e-5	1	1838.096	3	NC	1
417		19	max	.027	3	.068	3	0	3	-3.334e-8	15	NC	3	NC	1
418			min	-.031	2	-.096	2	-.002	1	-8.123e-7	3	1829.376	2	NC	1
419	M9	1	max	.01	3	.029	3	.003	3	7.988e-3	3	NC	1	NC	1
420			min	-.01	2	-.025	2	-.004	1	-5.577e-3	2	NC	1	NC	1
421		2	max	.01	3	.017	3	.001	3	3.915e-3	3	NC	4	NC	1
422			min	-.01	2	-.015	2	0	9	-2.718e-3	2	4534.784	2	NC	1
423		3	max	.01	3	.006	3	.002	1	1.886e-4	1	NC	4	NC	1
424			min	-.01	2	-.005	2	0	3	-8.219e-5	3	2334.089	2	NC	1
425		4	max	.01	3	.003	2	.003	1	1.427e-4	1	NC	4	NC	1
426			min	-.01	2	-.003	3	-.001	3	-8.449e-5	3	1633.326	2	NC	1
427		5	max	.01	3	.011	2	.003	1	9.683e-5	1	NC	4	NC	1
428			min	-.01	2	-.01	3	-.002	3	-8.679e-5	3	1294.509	2	NC	1
429		6	max	.01	3	.017	2	.003	1	5.094e-5	1	NC	4	NC	1
430			min	-.01	2	-.016	3	-.003	3	-8.909e-5	3	1101.557	2	9263.123	3
431		7	max	.01	3	.022	2	.002	1	2.02e-5	2	NC	5	NC	1
432			min	-.01	2	-.021	3	-.004	3	-9.139e-5	3	983.406	2	8396.759	3
433		8	max	.01	3	.026	2	0	2	3.699e-6	10	NC	5	NC	1
434			min	-.01	2	-.024	3	-.004	3	-9.369e-5	3	910.459	2	7893.992	3
435		9	max	.01	3	.029	2	0	2	-5.079e-7	10	NC	5	NC	1
436			min	-.01	2	-.026	3	-.004	3	-9.599e-5	3	868.913	2	7645.385	3
437		10	max	.01	3	.03	2	0	10	-4.715e-6	10	NC	5	NC	1
438			min	-.01	2	-.027	3	-.005	3	-1.326e-4	1	852.477	2	7602.305	3
439		11	max	.01	3	.029	2	0	10	-8.923e-6	10	NC	5	NC	1
440			min	-.01	2	-.026	3	-.005	3	-1.785e-4	1	859.451	2	7752.541	3
441		12	max	.01	3	.027	2	0	15	-1.111e-5	15	NC	5	NC	1
442			min	-.01	2	-.024	3	-.006	1	-2.244e-4	1	892.127	2	8114.357	3
443		13	max	.01	3	.024	2	0	15	-1.33e-5	15	NC	5	NC	2
444			min	-.01	2	-.02	3	-.007	1	-2.702e-4	1	958.036	2	8559.5	1
445		14	max	.01	3	.018	2	0	15	-1.549e-5	15	NC	4	NC	2
446			min	-.01	2	-.015	3	-.008	1	-3.161e-4	1	1074.366	2	7418.304	1
447		15	max	.01	3	.011	2	0	15	-1.767e-5	15	NC	4	NC	2
448			min	-.01	2	-.009	3	-.008	1	-3.62e-4	1	1281.339	2	7062.829	1
449		16	max	.01	3	.002	2	0	15	-1.933e-5	15	NC	4	NC	2
450			min	-.01	2	-.002	3	-.008	1	-3.973e-4	1	1687.483	3	7439.406	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	.01	3	.006	3	0	15	1.011e-4	3	NC	4	NC	2
452			min	-.01	2	-.008	2	-.007	1	-1.795e-4	1	2443.348	3	9061.972	1
453		18	max	.01	3	.016	3	0	15	2.17e-3	3	NC	2	NC	1
454			min	-.01	2	-.021	2	-.004	1	-4.114e-3	2	4774.816	3	NC	1
455		19	max	.01	3	.026	3	0	3	4.273e-3	3	NC	1	NC	1
456			min	-.01	2	-.034	2	-.001	1	-8.28e-3	2	5270.056	2	NC	1
457	M13	1	max	.004	1	.029	3	.01	3	4.412e-3	3	NC	1	NC	1
458			min	-.003	3	-.025	2	-.01	2	-3.954e-3	2	NC	1	NC	1
459		2	max	.004	1	.085	3	.01	9	5.232e-3	3	NC	4	NC	2
460			min	-.003	3	-.065	2	-.005	10	-4.679e-3	2	2332.428	3	8471.879	1
461		3	max	.004	1	.133	3	.029	1	6.053e-3	3	NC	4	NC	2
462			min	-.003	3	-.098	2	-.004	10	-5.404e-3	2	1270.935	3	3799.317	1
463		4	max	.004	1	.164	3	.044	1	6.874e-3	3	NC	5	NC	3
464			min	-.003	3	-.121	2	-.004	10	-6.128e-3	2	974.428	3	2652.387	1
465		5	max	.003	1	.177	3	.051	1	7.694e-3	3	NC	5	NC	3
466			min	-.003	3	-.131	2	-.004	10	-6.853e-3	2	889.921	3	2363.976	1
467		6	max	.003	1	.172	3	.046	1	8.515e-3	3	NC	5	NC	2
468			min	-.003	3	-.128	2	-.007	10	-7.578e-3	2	925.428	3	2585.604	1
469		7	max	.003	1	.151	3	.031	1	9.335e-3	3	NC	5	NC	2
470			min	-.003	3	-.116	2	-.01	10	-8.303e-3	2	1083.416	3	3625.524	1
471		8	max	.003	1	.122	3	.022	3	1.016e-2	3	NC	4	NC	2
472			min	-.003	3	-.097	2	-.017	2	-9.028e-3	2	1424.938	3	8346.171	1
473		9	max	.003	1	.094	3	.025	3	1.098e-2	3	NC	4	NC	1
474			min	-.003	3	-.079	2	-.027	2	-9.753e-3	2	2030.72	3	8199.451	2
475		10	max	.003	1	.081	3	.028	3	1.18e-2	3	NC	4	NC	1
476			min	-.003	3	-.07	2	-.031	2	-1.048e-2	2	2530.455	3	6473.521	2
477		11	max	.003	1	.094	3	.031	3	1.098e-2	3	NC	4	NC	1
478			min	-.003	3	-.079	2	-.027	2	-9.753e-3	2	2030.718	3	6385.685	3
479		12	max	.003	1	.122	3	.032	3	1.016e-2	3	NC	4	NC	2
480			min	-.003	3	-.097	2	-.017	2	-9.029e-3	2	1424.937	3	5978.394	3
481		13	max	.003	1	.151	3	.032	3	9.34e-3	3	NC	5	NC	2
482			min	-.003	3	-.116	2	-.01	10	-8.304e-3	2	1083.415	3	3609.027	1
483		14	max	.003	1	.172	3	.046	1	8.522e-3	3	NC	5	NC	2
484			min	-.003	3	-.128	2	-.007	10	-7.579e-3	2	925.427	3	2583.39	1
485		15	max	.003	1	.177	3	.05	1	7.703e-3	3	NC	5	NC	5
486			min	-.003	3	-.131	2	-.004	10	-6.854e-3	2	889.92	3	2368.108	1
487		16	max	.003	1	.165	3	.044	1	6.884e-3	3	NC	5	NC	3
488			min	-.003	3	-.121	2	-.004	10	-6.13e-3	2	974.427	3	2663.883	1
489		17	max	.003	1	.133	3	.029	1	6.065e-3	3	NC	4	NC	2
490			min	-.003	3	-.098	2	-.004	10	-5.405e-3	2	1270.934	3	3828.614	1
491		18	max	.003	1	.086	3	.014	3	5.246e-3	3	NC	4	NC	2
492			min	-.003	3	-.065	2	-.005	10	-4.68e-3	2	2332.426	3	8586.727	1
493		19	max	.003	1	.029	3	.01	3	4.428e-3	3	NC	1	NC	1
494			min	-.003	3	-.025	2	-.01	2	-3.956e-3	2	NC	1	NC	1
495	M16	1	max	.001	1	.026	3	.01	3	5.09e-3	2	NC	1	NC	1
496			min	0	3	-.034	2	-.01	2	-3.762e-3	3	NC	1	NC	1
497		2	max	.001	1	.056	3	.014	3	6.055e-3	2	NC	4	NC	2
498			min	0	3	-.093	2	-.005	10	-4.418e-3	3	2247.088	2	8474.18	1
499		3	max	.001	1	.082	3	.029	1	7.02e-3	2	NC	4	NC	2
500			min	0	3	-.142	2	-.004	10	-5.073e-3	3	1222.091	2	3800.018	1
501		4	max	.001	1	.1	3	.044	1	7.985e-3	2	NC	5	NC	3
502			min	0	3	-.176	2	-.003	10	-5.728e-3	3	933.804	2	2652.813	1
503		5	max	.001	1	.108	3	.05	1	8.95e-3	2	NC	5	NC	5
504			min	0	3	-.19	2	-.004	10	-6.383e-3	3	848.163	2	2364.417	1
505		6	max	.002	1	.108	3	.046	1	9.915e-3	2	NC	5	NC	2
506			min	0	3	-.185	2	-.007	10	-7.039e-3	3	874.279	2	2586.371	1
507		7	max	.002	1	.099	3	.031	1	1.088e-2	2	NC	5	NC	2

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
508			min	0	3	-.165	2	-.01	10	-7.694e-3	3	1008.699	2	3627.874	1
509		8	max	.002	1	.087	3	.029	3	1.184e-2	2	NC	4	NC	2
510			min	0	3	-.136	2	-.017	2	-8.349e-3	3	1293.851	2	6726.222	3
511		9	max	.002	1	.074	3	.028	3	1.281e-2	2	NC	4	NC	1
512			min	0	3	-.109	2	-.026	2	-9.004e-3	3	1771.559	2	7090.714	3
513		10	max	.002	1	.068	3	.027	3	1.377e-2	2	NC	4	NC	1
514			min	0	3	-.096	2	-.031	2	-9.66e-3	3	2140.035	2	6534.006	2
515		11	max	.002	1	.074	3	.026	3	1.281e-2	2	NC	4	NC	1
516			min	0	3	-.109	2	-.026	2	-9.003e-3	3	1771.559	2	8298.638	2
517		12	max	.002	1	.086	3	.025	3	1.185e-2	2	NC	4	NC	2
518			min	0	3	-.136	2	-.017	2	-8.346e-3	3	1293.851	2	8297.402	1
519		13	max	.002	1	.099	3	.031	1	1.088e-2	2	NC	5	NC	2
520			min	0	3	-.165	2	-.01	10	-7.689e-3	3	1008.699	2	3623.595	1
521		14	max	.002	1	.108	3	.045	1	9.916e-3	2	NC	5	NC	2
522			min	0	3	-.185	2	-.007	10	-7.032e-3	3	874.279	2	2590.963	1
523		15	max	.002	1	.108	3	.05	1	8.951e-3	2	NC	5	NC	3
524			min	0	3	-.19	2	-.004	10	-6.375e-3	3	848.163	2	2374.142	1
525		16	max	.002	1	.1	3	.044	1	7.986e-3	2	NC	5	NC	3
526			min	0	3	-.176	2	-.003	10	-5.718e-3	3	933.804	2	2670.536	1
527		17	max	.002	1	.082	3	.029	1	7.022e-3	2	NC	4	NC	2
528			min	0	3	-.142	2	-.004	10	-5.061e-3	3	1222.091	2	3839.096	1
529		18	max	.002	1	.056	3	.012	3	6.057e-3	2	NC	4	NC	2
530			min	0	3	-.093	2	-.005	10	-4.404e-3	3	2247.088	2	8616.529	1
531		19	max	.002	1	.026	3	.01	3	5.092e-3	2	NC	1	NC	1
532			min	0	3	-.034	2	-.01	2	-3.747e-3	3	NC	1	NC	1
533	M15	1	max	0	1	0	1	0	1	4.247e-4	3	NC	1	NC	1
534			min	0	1	0	1	0	1	-7.87e-5	2	NC	1	NC	1
535		2	max	0	3	-.002	15	0	1	8.706e-4	3	NC	1	NC	1
536			min	0	2	-.008	4	0	3	-5.203e-4	2	NC	1	NC	1
537		3	max	0	3	-.004	15	.003	1	1.317e-3	3	NC	5	NC	1
538			min	0	2	-.015	4	-.003	3	-9.619e-4	2	5246.74	4	NC	1
539		4	max	0	3	-.005	15	.006	1	1.763e-3	3	NC	15	NC	4
540			min	0	2	-.022	4	-.007	3	-1.403e-3	2	3599.57	4	5999.32	3
541		5	max	0	3	-.007	15	.01	2	2.209e-3	3	NC	15	NC	4
542			min	0	2	-.028	4	-.012	3	-1.845e-3	2	2808.781	4	3955.867	3
543		6	max	0	3	-.008	15	.014	2	2.655e-3	3	NC	15	NC	4
544			min	-.001	2	-.033	4	-.017	3	-2.287e-3	2	2363.886	4	2889.641	3
545		7	max	0	3	-.009	15	.019	2	3.1e-3	3	8918.133	15	NC	4
546			min	-.001	2	-.038	4	-.023	3	-2.728e-3	2	2096.34	4	2264.237	3
547		8	max	0	3	-.01	15	.023	2	3.546e-3	3	8235.056	15	NC	4
548			min	-.001	2	-.041	4	-.028	3	-3.17e-3	2	1935.773	4	1870.251	3
549		9	max	0	3	-.01	15	.027	2	3.992e-3	3	7867.383	15	NC	4
550			min	-.002	2	-.043	4	-.033	3	-3.611e-3	2	1849.346	4	1612.079	3
551		10	max	0	3	-.01	15	.03	2	4.438e-3	3	7751.069	15	NC	4
552			min	-.002	2	-.044	4	-.037	3	-4.053e-3	2	1822.005	4	1441.591	3
553		11	max	.001	3	-.01	15	.032	2	4.884e-3	3	7867.383	15	NC	4
554			min	-.002	2	-.043	4	-.039	3	-4.494e-3	2	1849.346	4	1333.49	3
555		12	max	.001	3	-.01	15	.032	2	5.33e-3	3	8235.056	15	NC	4
556			min	-.002	2	-.041	4	-.04	3	-4.936e-3	2	1935.773	4	1275.254	3
557		13	max	.001	3	-.009	15	.03	2	5.776e-3	3	8918.133	15	NC	4
558			min	-.002	2	-.038	4	-.038	3	-5.378e-3	2	2096.34	4	1263.335	3
559		14	max	.001	3	-.008	15	.028	1	6.222e-3	3	NC	15	NC	4
560			min	-.003	2	-.034	4	-.035	3	-5.819e-3	2	2363.886	4	1303.362	3
561		15	max	.001	3	-.007	15	.023	1	6.668e-3	3	NC	15	NC	4
562			min	-.003	2	-.029	4	-.028	3	-6.261e-3	2	2808.781	4	1415.687	3
563		16	max	.002	3	-.005	15	.016	1	7.114e-3	3	NC	15	NC	4
564			min	-.003	2	-.023	4	-.018	3	-6.702e-3	2	3599.57	4	1655.443	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	15	.006	1	7.56e-3	3	NC	5	NC	4
566			min	-.003	2	-.016	4	-.004	3	-7.144e-3	2	5246.74	4	2195.494	3
567		18	max	.002	3	0	2	.014	3	8.006e-3	3	NC	1	NC	4
568			min	-.003	2	-.009	4	-.015	2	-7.585e-3	2	NC	1	3910.186	3
569		19	max	.002	3	.007	2	.036	3	8.452e-3	3	NC	1	NC	1
570			min	-.004	2	-.002	9	-.034	2	-8.027e-3	2	NC	1	NC	1
571	M16A	1	max	0	10	.002	2	.012	3	2.923e-3	3	NC	1	NC	1
572			min	-.002	3	-.002	3	-.012	2	-2.828e-3	2	NC	1	NC	1
573		2	max	0	10	-.002	15	.003	3	2.804e-3	3	NC	1	NC	1
574			min	-.002	3	-.008	4	-.004	2	-2.698e-3	2	NC	1	9582.077	3
575		3	max	0	10	-.004	15	.007	1	2.685e-3	3	NC	5	NC	4
576			min	-.002	3	-.015	4	-.004	3	-2.568e-3	2	5246.74	4	5424.713	3
577		4	max	0	10	-.005	15	.011	1	2.566e-3	3	NC	15	NC	4
578			min	-.002	3	-.022	4	-.009	3	-2.438e-3	2	3599.57	4	4128.657	3
579		5	max	0	10	-.007	15	.014	1	2.447e-3	3	NC	15	NC	4
580			min	-.001	3	-.028	4	-.013	3	-2.307e-3	2	2808.781	4	3568.435	3
581		6	max	0	10	-.008	15	.016	1	2.328e-3	3	NC	15	NC	4
582			min	-.001	3	-.034	4	-.015	3	-2.177e-3	2	2363.886	4	3325.716	3
583		7	max	0	10	-.009	15	.017	1	2.209e-3	3	8918.133	15	NC	4
584			min	-.001	3	-.038	4	-.016	3	-2.047e-3	2	2096.34	4	3269.73	3
585		8	max	0	10	-.01	15	.017	1	2.09e-3	3	8235.056	15	NC	4
586			min	-.001	3	-.041	4	-.016	3	-1.917e-3	2	1935.773	4	3356.27	3
587		9	max	0	10	-.01	15	.016	1	1.972e-3	3	7867.383	15	NC	4
588			min	-.001	3	-.043	4	-.015	3	-1.786e-3	2	1849.346	4	3580.391	3
589		10	max	0	10	-.01	15	.015	1	1.853e-3	3	7751.069	15	NC	4
590			min	0	3	-.043	4	-.014	3	-1.656e-3	2	1822.005	4	3965.847	3
591		11	max	0	10	-.01	15	.013	1	1.734e-3	3	7867.383	15	NC	4
592			min	0	3	-.043	4	-.012	3	-1.526e-3	2	1849.346	4	4570.784	3
593		12	max	0	10	-.01	15	.011	1	1.615e-3	3	8235.056	15	NC	4
594			min	0	3	-.041	4	-.01	3	-1.395e-3	2	1935.773	4	5511.095	3
595		13	max	0	10	-.009	15	.008	1	1.496e-3	3	8918.133	15	NC	4
596			min	0	3	-.038	4	-.007	3	-1.265e-3	2	2096.34	4	7020.682	3
597		14	max	0	10	-.008	15	.006	1	1.377e-3	3	NC	15	NC	2
598			min	0	3	-.033	4	-.005	3	-1.135e-3	2	2363.886	4	9615.127	3
599		15	max	0	10	-.007	15	.004	1	1.258e-3	3	NC	15	NC	1
600			min	0	3	-.028	4	-.003	3	-1.005e-3	2	2808.781	4	NC	1
601		16	max	0	10	-.005	15	.002	1	1.139e-3	3	NC	15	NC	1
602			min	0	3	-.022	4	0	3	-8.743e-4	2	3599.57	4	NC	1
603		17	max	0	10	-.004	15	.001	9	1.02e-3	3	NC	5	NC	1
604			min	0	3	-.015	4	0	2	-7.44e-4	2	5246.74	4	NC	1
605		18	max	0	10	-.002	15	0	3	9.014e-4	3	NC	1	NC	1
606			min	0	3	-.008	4	0	2	-6.138e-4	2	NC	1	NC	1
607		19	max	0	1	0	1	0	1	7.825e-4	3	NC	1	NC	1
608			min	0	1	0	1	0	1	-4.835e-4	2	NC	1	NC	1

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

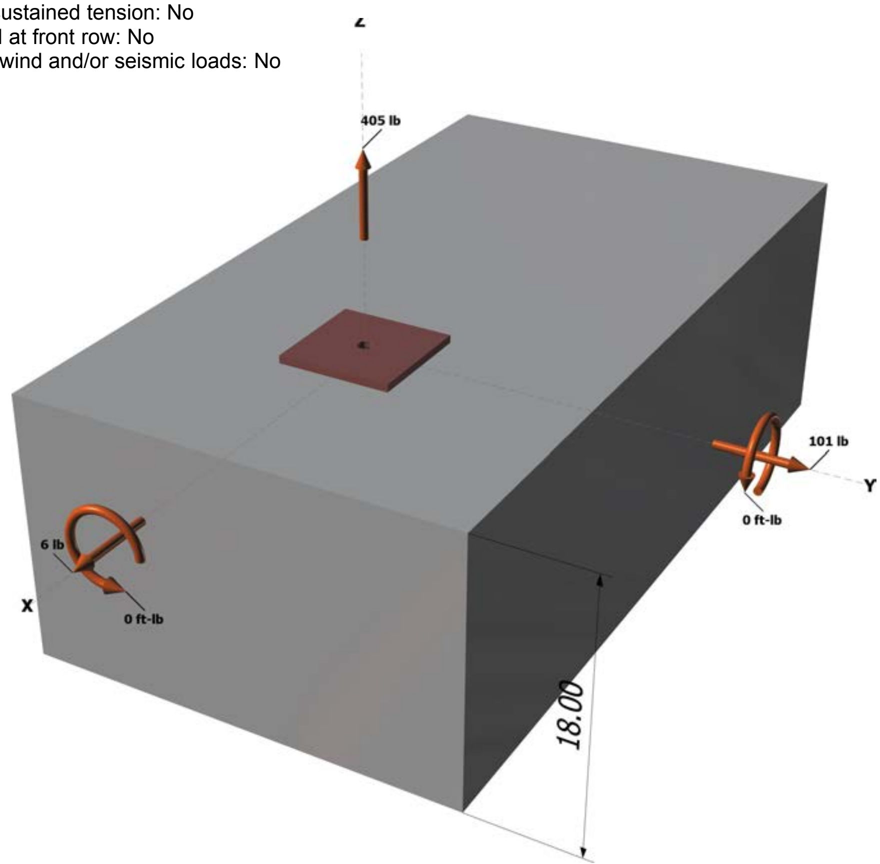
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

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

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

<Figure 1>



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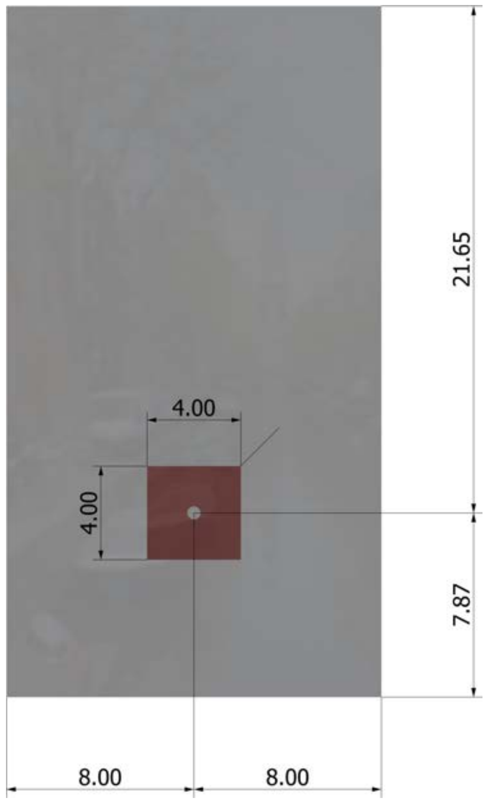


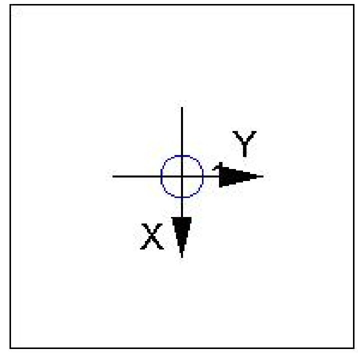
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	405.0	6.0	101.0	101.2
Sum	405.0	6.0	101.0	101.2

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 405
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in y-direction:

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

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

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

Shear parallel to edge in x-direction:

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

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

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

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

Shear parallel to edge in y-direction:

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

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

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

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

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

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

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

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

11. Results

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

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

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

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

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

12. Warnings

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

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

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

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

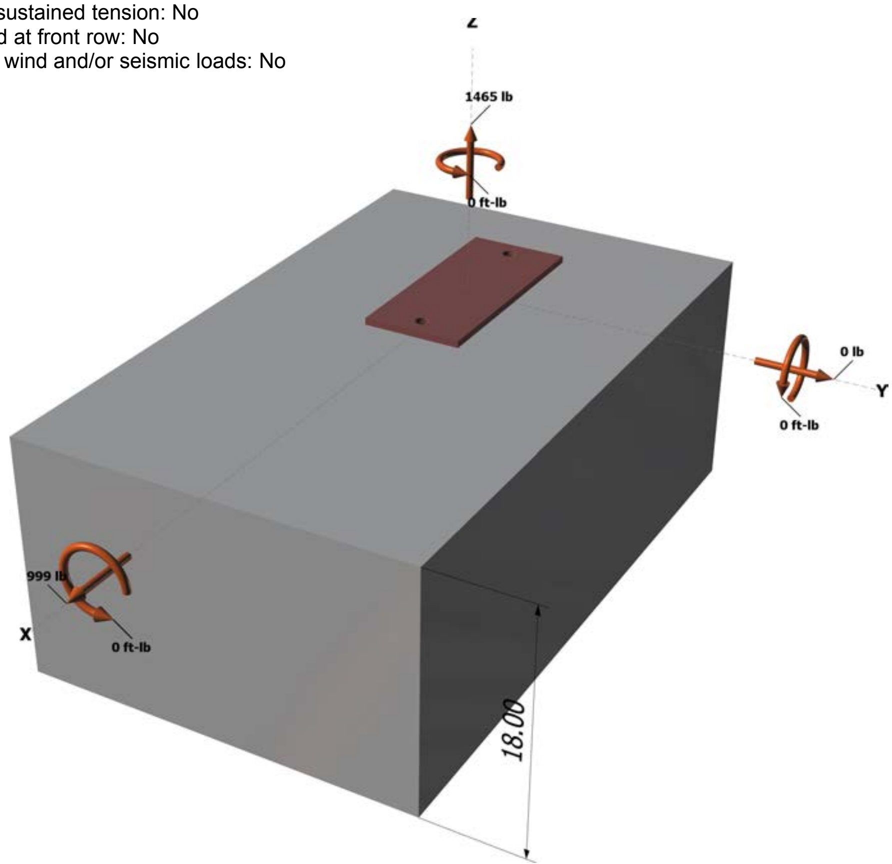
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

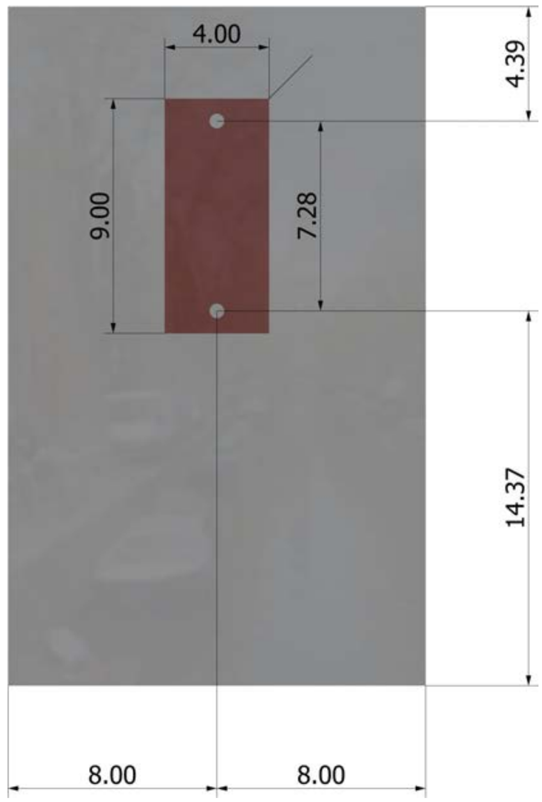
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout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

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

<Figure 1>



<Figure 2>



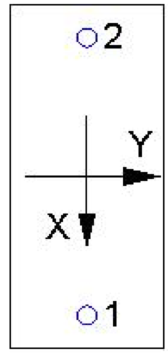
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

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

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

<Figure 3>



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

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

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

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

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

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

A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cbg} (lb)
314.72	256.00	1.000	0.865	1.00	1.000	10469	0.65	7233

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

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

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

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

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

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

A_{Na} (in^2)	A_{Na0} (in^2)	$\Psi_{ed,Na}$	$\Psi_{g,Na}$	$\Psi_{ec,Na}$	$\Psi_{p,Na}$	N_{a0}(lb)	ϕ	ϕN_{ag} (lb)
177.03	109.66	0.952	1.021	1.000	1.000	9755	0.55	8418

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbx} (lb)
288.00	648.00	0.833	1.000	1.000	15593	0.70	4043

Shear parallel to edge in x-direction:

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

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

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

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

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

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

k_{cp}	A_{Na} (in^2)	A_{Na0} (in^2)	$\Psi_{ed,Na}$	$\Psi_{g,Na}$	$\Psi_{ec,Na}$	$\Psi_{p,Na}$	N_{a0} (lb)	N_a (lb)
2.0	177.03	109.66	0.952	1.021	1.000	1.000	9755	15305

A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	N_{cb} (lb)	ϕ
314.72	256.00	1.000	0.865	1.000	1.000	10469	11128	0.70

ϕV_{cpg} (lb)
15580

11. Results

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

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

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

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

Sec. D.7.3	0.20	0.25	45.0 %	1.2	Pass

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

12. Warnings

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

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

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