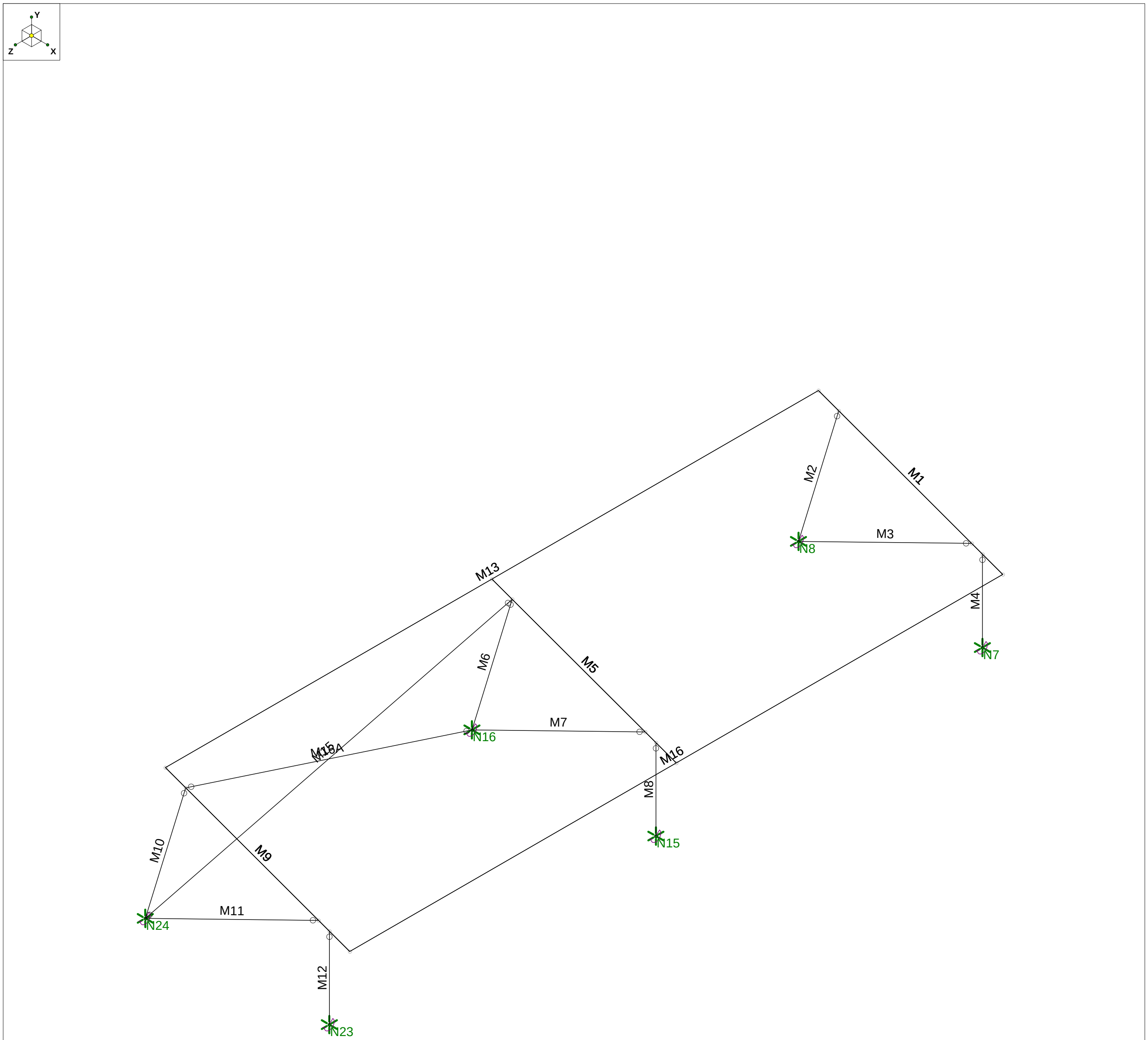


Schletter, Inc.		20ÁTilt w/o Seismic Design
HCV	Standard PVMini Racking System	
	Representative Calculations - ASCE 7-10	

1. INTRODUCTION

1.1 Project Description

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

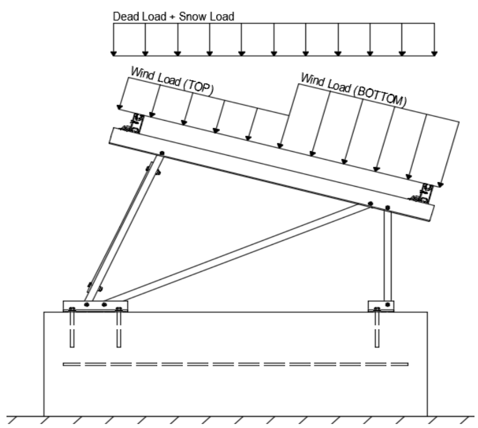
1.2 Construction

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

PV modules are required to meet the following specifications:

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

Modules Per Row =	1
Module Tilt =	20°
Maximum Height Above Grade =	3 ft



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

1.3 Technical Codes

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

2. LOAD ACTIONS

2.1 Permanent Loads

g_{MAX} = 3.00 psf

g_{MIN} = 1.75 psf

Self-weight of the PV modules.

2.2 Snow Loads

Ground Snow Load, P_g =	30.00	psf	
Sloped Roof Snow Load, P_s =	20.62	psf	*(ASCE 7-10, Eq. 7.4-1)*
I_s =	1.00		
C_s =	0.91		
C_e =	0.90		
C_t =	1.20		

2.3 Wind Loads

Design Wind Speed, V =	130	mph	Exposure Category = C
Height ≤	15	ft	Importance Category = II

Peak Velocity Pressure, q_z = 26.53 psf *Including the gust factor, G=0.85. (ASCE 7-10, Eq. 27.3-1)*

Pressure Coefficients

$Cf+_{TOP}$	=	1.05	*(Pressure)*
$Cf+_{BOTTOM}$	=	1.65	
$Cf-_{TOP}$	=	-2.12	*(Suction)*
$Cf-_{BOTTOM}$	=	-1	

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

2.4 Seismic Loads - N/A

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

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

2.5 Combination of Loads

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

Strength Design, LRFD

Component stresses are checked using the following LRFD load combinations:

1.2D + 1.6S + 0.5W
1.2D + 1.0W + 0.5S
0.9D + 1.0W [M]
1.54D + 1.3E + 0.2S [R]
0.56D + 1.3E [R]
1.54D + 1.25E + 0.2S [O]
0.56D + 1.25E [O]

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

Allowable Stress Design, ASD

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

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

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

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

3. STRUCTURAL ANALYSIS

3.1 RISA Results

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

3.2 RISA Components

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

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

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

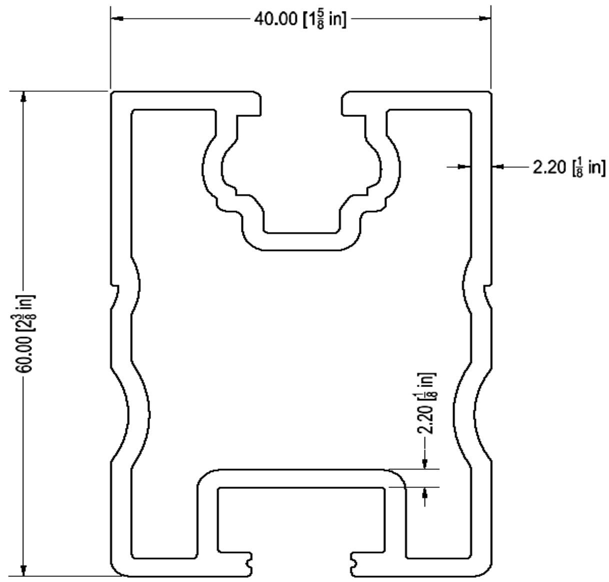
Front Struts	Location	**Bracing**
M4	Outer	M15
M8	Inner	M16A
M12	Outer	

4. MEMBER DESIGN CALCULATIONS

4.1 Purlin Design

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

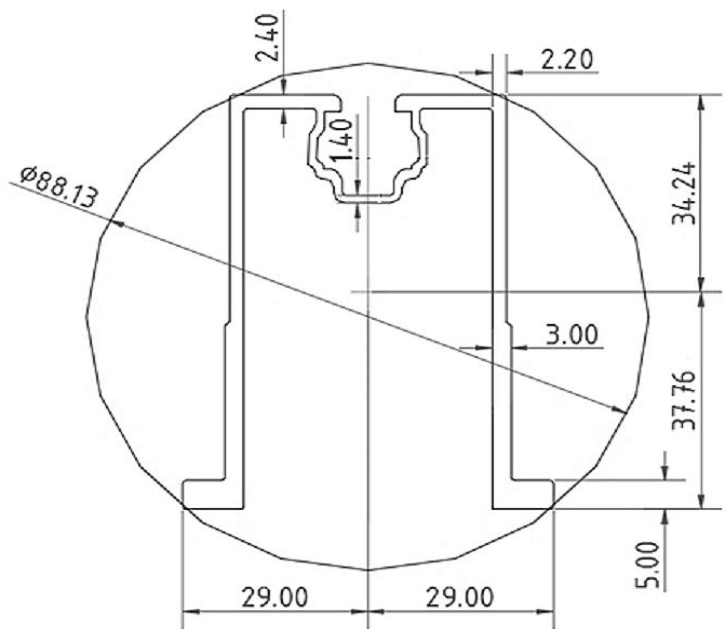
Purlin Type =	**ProfiPlus**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	72	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	28.91	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	28.47	ksi
S_y =	0.51	in^3
S_x =	0.37	in^3
E =	10100	ksi
I_y =	0.60	in^4
I_x =	0.29	in^4
A =	0.90	in^2
g =	1.08	lbs/ft
M_y =	0.693	k-ft
M_z =	0.121	k-ft
$M_{y\ allowable}$ =	1.230	k-ft
$M_{z\ allowable}$ =	0.871	k-ft
Utilization =	70%	



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).

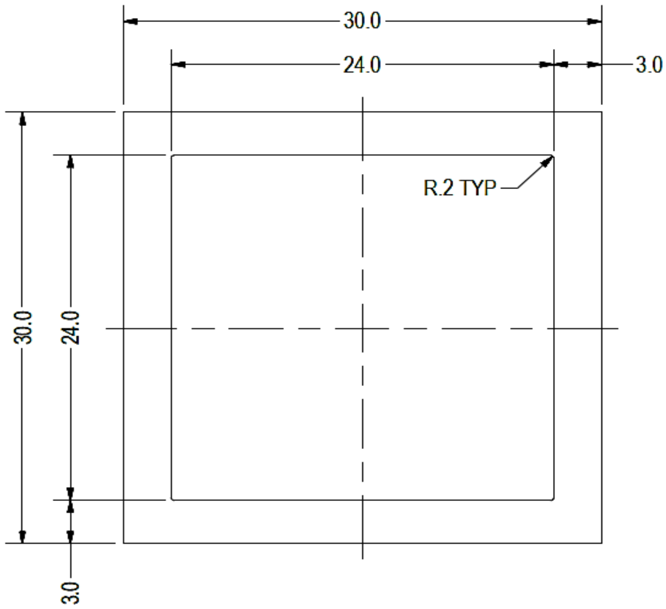
Girder Type =	**Flex Profi**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	33.78	in
$\Phi F_{ty\ AXIAL}$ =	14.29	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.38	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	13.46	ksi
S_y =	0.59	in^3
S_x =	0.46	in^3
E =	10100	ksi
I_y =	0.88	in^4
I_x =	0.52	in^4
A =	0.89	in^2
g =	1.07	lbs/ft
M_y =	0.551	k-ft
M_z =	0.000	k-ft
P_n =	0.282	k
$M_{y\ allowable}$ =	1.442	k-ft
$M_{z\ allowable}$ =	0.513	k-ft
$P_{n\ allowable}$ =	12.764	k
Utilization =	40%	



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).

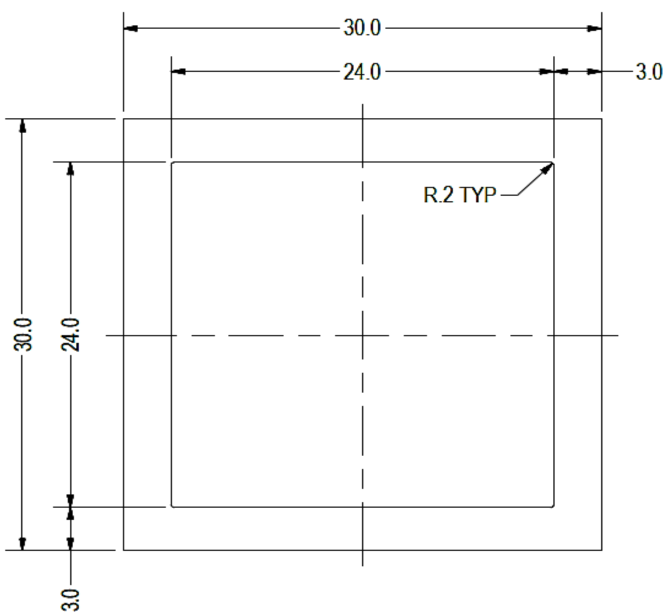
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	18.00	in
$\Phi F_{ty\ AXIAL}$ =	24.52	ksi
$\Phi F_{ty\ BENDING}$ =	31.19	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	1.252	k
$M_{y\ allowable}$ =	0.423	k-ft
$M_{z\ allowable}$ =	0.423	k-ft
$P_{n\ allowable}$ =	12.310	k
Utilization =	10%	



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).

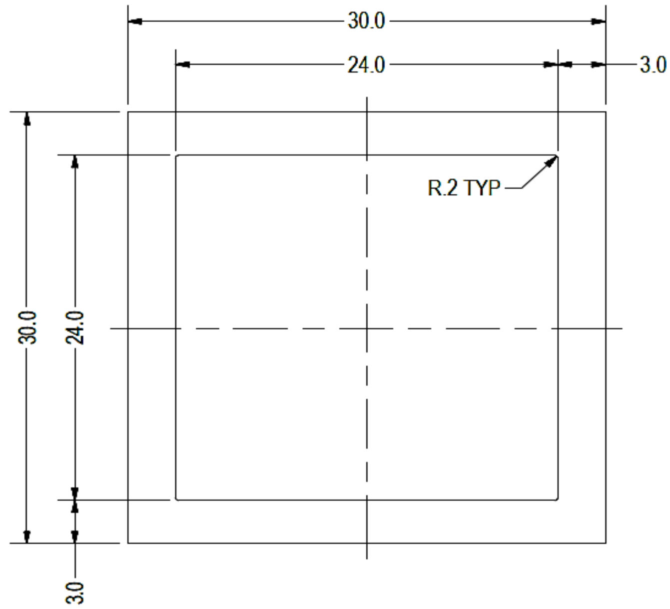
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	46.38	in
$\Phi F_{ty\ AXIAL}$ =	7.60	ksi
$\Phi F_{ty\ BENDING}$ =	29.80	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.340	k
$M_{y\ allowable}$ =	0.404	k-ft
$M_{z\ allowable}$ =	0.404	k-ft
$P_{n\ allowable}$ =	3.814	k
Utilization =	9%	



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).

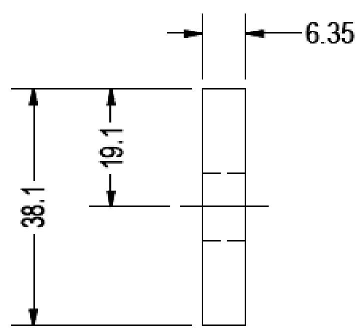
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	33.07	in
$\Phi F_{ty\ AXIAL}$ =	13.55	ksi
$\Phi F_{ty\ BENDING}$ =	30.37	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.997	k
$M_{y\ allowable}$ =	0.411	k-ft
$M_{z\ allowable}$ =	0.411	k-ft
$P_{n\ allowable}$ =	6.803	k
Utilization =	15%	



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 =	0.049	k
$M_{y\ allowable}$ =	0.046	k-ft
$P_{n\ allowable}$ =	11.813	k
Utilization =	7%	



A cross brace kit is required every 28 bays and is to be installed in centermost bays.

5. FOUNDATION DESIGN CALCULATIONS

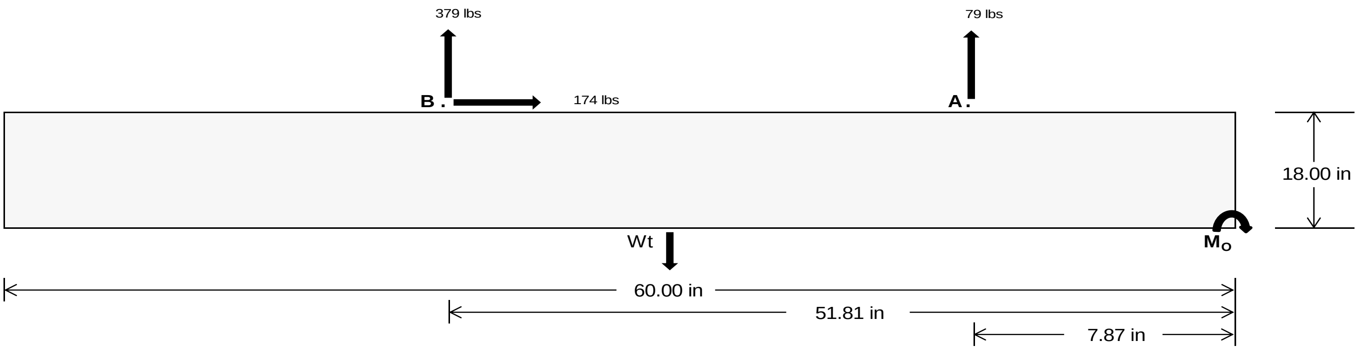
5.1 Helical Pile Foundations

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 =	350.94	1645.78	k
Compressive Load =	1627.09	1270.92	k
Lateral Load =	2.58	754.83	k
Moment (Weak Axis) =	0.00	0.00	k

5.2 Design of Ballast Foundations

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



Concrete Properties

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

Footing Reinforcement

Use fiber reinforcing with (1) #5 rebar.

Overturning Check

M_O =	23376.9 in-lbs
Resisting Force Required =	779.23 lbs
S.F. =	1.67
Weight Required =	1298.72 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.

Sliding

Force =	174.11 lbs
Friction =	0.4
Weight Required =	435.26 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.

Cohesion

Sliding Force =	174.11 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.

Shear Key

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

Shear key is not required.

Bearing Pressure

	Ballast Width			
	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 + 0.6W				1.0D + 0.75L + 0.45W + 0.75S				0.6D + 0.6W			
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	574 lbs	574 lbs	574 lbs	574 lbs	527 lbs	527 lbs	527 lbs	527 lbs	783 lbs	783 lbs	783 lbs	783 lbs	-159 lbs	-159 lbs	-159 lbs	-159 lbs
F_B	419 lbs	419 lbs	419 lbs	419 lbs	465 lbs	465 lbs	465 lbs	465 lbs	630 lbs	630 lbs	630 lbs	630 lbs	-757 lbs	-757 lbs	-757 lbs	-757 lbs
F_V	49 lbs	49 lbs	49 lbs	49 lbs	311 lbs	311 lbs	311 lbs	311 lbs	266 lbs	266 lbs	266 lbs	266 lbs	-348 lbs	-348 lbs	-348 lbs	-348 lbs
P_{total}	2986 lbs	3077 lbs	3168 lbs	3258 lbs	2985 lbs	3076 lbs	3167 lbs	3257 lbs	3407 lbs	3497 lbs	3588 lbs	3679 lbs	280 lbs	335 lbs	389 lbs	443 lbs
M	371 lbs-ft	371 lbs-ft	371 lbs-ft	371 lbs-ft	594 lbs-ft	594 lbs-ft	594 lbs-ft	594 lbs-ft	698 lbs-ft	698 lbs-ft	698 lbs-ft	698 lbs-ft	562 lbs-ft	562 lbs-ft	562 lbs-ft	562 lbs-ft
e	0.12 ft	0.12 ft	0.12 ft	0.11 ft	0.20 ft	0.19 ft	0.19 ft	0.18 ft	0.20 ft	0.20 ft	0.19 ft	0.19 ft	2.00 ft	1.68 ft	1.44 ft	1.27 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}	277.2 psf	274.6 psf	272.2 psf	270.0 psf	248.0 psf	246.7 psf	245.4 psf	244.3 psf	280.2 psf	277.5 psf	275.0 psf	272.7 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	374.4 psf	367.6 psf	361.3 psf	355.6 psf	403.4 psf	395.3 psf	387.9 psf	381.1 psf	463.1 psf	452.4 psf	442.6 psf	433.6 psf	205.3 psf	141.6 psf	122.7 psf	115.0 psf

Maximum Bearing Pressure = 463 psf
Allowable Bearing Pressure = 1500 psf

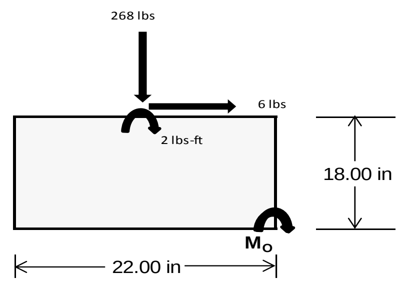
Use a 60in long x 22in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O = 235.2 ft-lbs
Resisting Force Required = 256.62 lbs
S.F. = 1.67
Weight Required = 427.70 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	70 lbs	186 lbs	66 lbs	268 lbs	809 lbs	264 lbs	20 lbs	54 lbs	19 lbs
F_V	1 lbs	1 lbs	0 lbs	6 lbs	5 lbs	0 lbs	0 lbs	0 lbs	0 lbs
P_{total}	2538 lbs	2655 lbs	2534 lbs	2618 lbs	3159 lbs	2614 lbs	742 lbs	776 lbs	741 lbs
M	2 lbs-ft	1 lbs-ft	0 lbs-ft	11 lbs-ft	8 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	289.1 sqft	276.4 sqft	281.8 sqft	341.8 sqft	284.9 sqft	80.8 sqft	84.5 sqft	80.8 sqft
f_{max}	277.4 psf	290.1 psf	276.5 psf	289.4 psf	347.4 psf	285.4 psf	81.1 psf	84.8 psf	80.9 psf

Maximum Bearing Pressure = 347 psf
Allowable Bearing Pressure = 1500 psf

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

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

5.3 Foundation Anchors

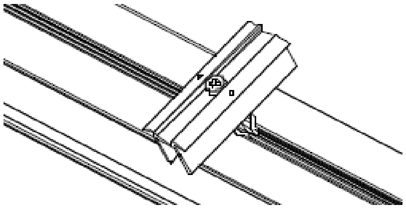
Threaded rods are anchored to the the ballast foundations using the Simpson AT-XP epoxy solution. LRFD load results are compared to the allowable strengths of the epoxy solution. Please see the supplementary calculations provided by the Simpson Anchor Designer software.

6. DESIGN OF JOINTS AND CONNECTIONS

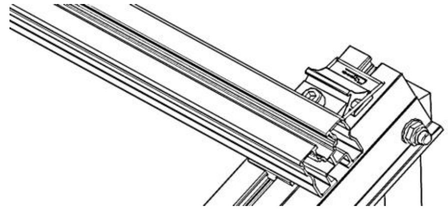
6.1 Anchorage of Modules to Purlins and Connection of Purlins to Girders

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

Fastening of Modules to Purlins		
Maximum Uplifting Force =	0.525	k
Allowable Uplift =	1.214	k
Utilization =	43%	



Fastening of Purlins to Girders		
Maximum Uplifting Force =	1.115	k
Allowable Uplift =	1.116	k
Utilization =	100%	



6.2 Bolted Connections

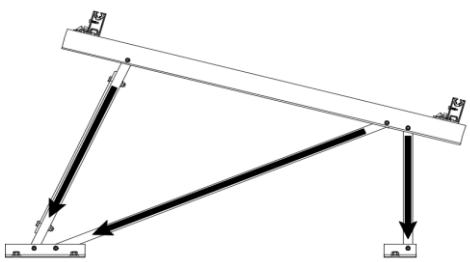
The aluminum struts connect the aluminum girder ends to custom brackets with mounting holes. Cross bracing is attached to rear struts to provide lateral stability. Single M8 bolts are used to attach each end of the strut to the girder and post. ASTM A193/A193M-86 equivalent stainless steel bolts are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

Front Strut		
Maximum Axial Load =	1.252	k
M8 Bolt Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	22%	

Rear Strut		
Maximum Axial Load =	1.188	k
M8 Bolt Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	21%	

Diagonal Strut		
Maximum Axial Load =	0.340	k
M8 Bolt Shear Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	6%	

Bracing		
Maximum Axial Load =	0.049	k
M10 Bolt Capacity =	8.894	k
Strut Bearing Capacity =	7.952	k
Utilization =	1%	



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

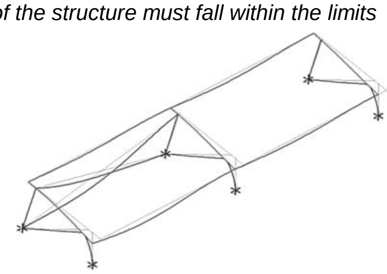
7. SEISMIC DESIGN

7.1 Seismic Drift - N/A

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

Mean Height, h_{sx} =	29.57	in
Allowable Story Drift for All Other Structures, Δ = {	$0.020h_{sx}$	
	0.591	in
Max Drift, Δ_{MAX} =	0.02	in
N/A		

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



APPENDIX A

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

Purlin = **ProfiPlus**

Strong Axis:

3.4.14

L_b = 72.00 in

J = 0.255

187.484

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 28.9 ksi

3.4.16

b/t = 7.4

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

Weak Axis:

3.4.14

L_b = 72.00 in

J = 0.255

194.691

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 28.8

3.4.16

b/t = 23.9

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.5 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 23.9

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

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

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

S2 = 77.3
φF_L= 1.3φyFcy
φF_L= 43.2 ksi

$\varphi F_L St$= 28.9 ksi
Ix = 250988 mm^4
0.603 in^4
y = 30 mm
Sx = 0.511 in^3
$M_{max}St$ = 1.230 k-ft

3.4.18

h/t = 7.4

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

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

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

S2 = 77.3
φF_L= 1.3φyFcy
φF_L= 43.2 ksi

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

Compression

3.4.9

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

b/t = 23.9
S1 = 12.21
S2 = 32.70
φF_L= φc[Bp-1.6Dp*b/t]
φF_L= 28.5 ksi

3.4.10

Rb/t = 0.0

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

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

φF_L= 28.47 ksi
A = 578.06 mm^2
0.90 in^2
P_{max} = 25.51 kips

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

φF_LSt= 29.4 ksi

Ix = 364470 mm^4

0.876 in^4

y = 37.77 mm

Sx = 0.589 in³

M_{max}St = 1.442 k-ft

3.4.18

h/t = 4.29

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

S1 = 36.9

m = 0.65

C_0 = 29

Cc = 29

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

S2 = 77.3

φF_L = 1.3φyFcy

φF_L = 43.2 ksi

φF_LWk= 13.5 ksi

Iy = 217168 mm^4

0.522 in^4

x = 29 mm

Sy = 0.457 in³

M_{max}Wk = 0.513 k-ft

Compression

3.4.7

λ = 0.46067

r = 1.374 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.90326

φF_L = φcc(Bc-Dc*λ)

φF_L = 30.1251 ksi

3.4.8

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

3.4.9

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

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

3.4.9.1

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

3.4.10

Rb/t = 0.0

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

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

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

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

Strut = **30x30x3**

Strong Axis:

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

$\lambda =$ 0.77182

r = 0.437 in

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

$S1^* =$ 0.33515

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

$S2^* =$ 1.23671

$\varphi cc =$ 0.83792

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

$\varphi F_L =$ 24.5226 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.25 ksi

$\varphi F_L =$ 24.52 ksi

A = 323.87 mm^2

0.50 in^2

$P_{max} =$ 12.31 kips

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 46.38 in

J = 0.16

121.663

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.8 ksi

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 29.8 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

M_{max}St = 0.404 k-ft

Weak Axis:

3.4.14

L_b = 46.38 in

J = 0.16

121.663

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.8

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 33.3 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

M_{max}Wk = 0.450 k-ft

Compression

3.4.7

$\lambda =$ 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 = 33.07 in

J = 0.16

86.7548

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

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= 30.4 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= 30.4 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

M_{max}St = 0.411 k-ft

Weak Axis:

3.4.14

L_b = 33.07 in

J = 0.16

86.7548

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

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= 30.4

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

$\lambda =$ 1.41804

r = 0.437 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.77853

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

$\varphi F_L =$ 13.5508 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

$\varphi F_L =$ 13.55 ksi

A = 323.87 mm^2

0.50 in^2

$P_{max} =$ 6.80 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	-57.498	-57.498	0	0
2	M16	Y	-57.498	-57.498	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	-77.697	-77.697	0	0
2	M16	y	-122.096	-122.096	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	156.875	156.875	0	0
2	M16	y	73.997	73.997	0	0

Load Combinations

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

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N8	max	142.735	2	274.108	2	.007	4	0	1	0	1	0	1
2		min	-183.214	3	-385.506	3	-.133	3	0	3	0	1	0	1
3	N7	max	0	15	432.611	1	-.033	15	0	15	0	1	0	1
4		min	-.141	2	-74.717	3	-.832	1	-.001	1	0	1	0	1
5	N15	max	0	15	1251.607	1	.48	1	0	1	0	1	0	1
6		min	-1.535	2	-269.95	3	-.384	3	0	3	0	1	0	1
7	N16	max	536.126	2	977.632	1	0	10	0	1	0	1	0	1
8		min	-580.639	3	-1265.981	3	-43.521	3	0	3	0	1	0	1
9	N23	max	0	15	432.467	1	1.981	1	.003	1	0	1	0	1
10		min	-.141	2	-74.307	3	.071	15	0	15	0	1	0	1
11	N24	max	142.957	2	278.234	1	43.888	3	.001	1	0	1	0	1
12		min	-183.372	3	-383.492	3	.007	10	0	3	0	1	0	1
13	Totals:	max	819.999	2	3646.409	1	0	1						
14		min	-947.554	3	-2453.954	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	307.359	1	.646	4	.466	1	0	15	0	3	0	1
2			min	-365.506	3	.153	15	-.078	3	0	1	0	1	0	1
3		2	max	307.465	1	.605	4	.466	1	0	15	0	1	0	15
4			min	-365.426	3	.143	15	-.078	3	0	1	0	2	0	4
5		3	max	307.572	1	.563	4	.466	1	0	15	0	1	0	15
6			min	-365.346	3	.133	15	-.078	3	0	1	0	3	0	4
7		4	max	307.678	1	.522	4	.466	1	0	15	0	1	0	15
8			min	-365.266	3	.124	15	-.078	3	0	1	0	3	0	4
9		5	max	307.785	1	.481	4	.466	1	0	15	0	1	0	15
10			min	-365.186	3	.114	15	-.078	3	0	1	0	3	0	4
11		6	max	307.891	1	.44	4	.466	1	0	15	0	1	0	15
12			min	-365.106	3	.104	15	-.078	3	0	1	0	3	0	4
13		7	max	307.998	1	.398	4	.466	1	0	15	0	1	0	15
14			min	-365.026	3	.094	15	-.078	3	0	1	0	3	0	4
15		8	max	308.105	1	.357	4	.466	1	0	15	0	1	0	15
16			min	-364.946	3	.085	15	-.078	3	0	1	0	3	0	4
17		9	max	308.211	1	.316	4	.466	1	0	15	0	1	0	15
18			min	-364.866	3	.075	15	-.078	3	0	1	0	3	0	4
19		10	max	308.318	1	.274	4	.466	1	0	15	0	1	0	15
20			min	-364.786	3	.065	15	-.078	3	0	1	0	3	0	4
21		11	max	308.424	1	.233	4	.466	1	0	15	0	1	0	15
22			min	-364.707	3	.056	15	-.078	3	0	1	0	3	0	4
23		12	max	308.531	1	.192	4	.466	1	0	15	0	1	0	15
24			min	-364.627	3	.046	15	-.078	3	0	1	0	3	0	4
25		13	max	308.637	1	.151	4	.466	1	0	15	0	1	0	15
26			min	-364.547	3	.036	15	-.078	3	0	1	0	3	0	4
27		14	max	308.744	1	.109	4	.466	1	0	15	0	1	0	15
28			min	-364.467	3	.027	15	-.078	3	0	1	0	3	0	4
29		15	max	308.85	1	.076	2	.466	1	0	15	0	1	0	15
30			min	-364.387	3	.014	12	-.078	3	0	1	0	3	0	4
31		16	max	308.957	1	.044	2	.466	1	0	15	.001	1	0	15
32			min	-364.307	3	-.005	3	-.078	3	0	1	0	3	0	4
33		17	max	309.063	1	.012	2	.466	1	0	15	.001	1	0	15
34			min	-364.227	3	-.029	3	-.078	3	0	1	0	3	0	4
35		18	max	309.17	1	-.012	15	.466	1	0	15	.001	1	0	15
36			min	-364.147	3	-.056	4	-.078	3	0	1	0	3	0	4
37		19	max	309.277	1	-.022	15	.466	1	0	15	.001	1	0	15

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
38			min	-364.067	3	-.097	4	-.078	3	0	1	0	3	0	4
39	M3	1	max	79.9	2	1.797	4	-.013	15	0	15	.001	1	0	4
40			min	-86.219	3	.423	15	-.396	1	0	1	0	15	0	15
41		2	max	79.832	2	1.619	4	-.013	15	0	15	.001	1	0	4
42			min	-86.27	3	.381	15	-.396	1	0	1	0	15	0	15
43		3	max	79.764	2	1.442	4	-.013	15	0	15	.001	1	0	2
44			min	-86.321	3	.339	15	-.396	1	0	1	0	15	0	3
45		4	max	79.696	2	1.264	4	-.013	15	0	15	0	1	0	15
46			min	-86.372	3	.298	15	-.396	1	0	1	0	15	0	4
47		5	max	79.629	2	1.086	4	-.013	15	0	15	0	1	0	15
48			min	-86.423	3	.256	15	-.396	1	0	1	0	15	0	4
49		6	max	79.561	2	.909	4	-.013	15	0	15	0	1	0	15
50			min	-86.474	3	.214	15	-.396	1	0	1	0	15	0	4
51		7	max	79.493	2	.731	4	-.013	15	0	15	0	1	0	15
52			min	-86.525	3	.172	15	-.396	1	0	1	0	15	0	4
53		8	max	79.425	2	.553	4	-.013	15	0	15	0	1	0	15
54			min	-86.576	3	.131	15	-.396	1	0	1	0	15	0	4
55		9	max	79.357	2	.376	4	-.013	15	0	15	0	1	0	15
56			min	-86.627	3	.089	15	-.396	1	0	1	0	15	-.001	4
57		10	max	79.289	2	.198	4	-.013	15	0	15	0	1	0	15
58			min	-86.677	3	.047	15	-.396	1	0	1	0	15	-.001	4
59		11	max	79.221	2	.033	2	-.013	15	0	15	0	1	0	15
60			min	-86.728	3	-.003	3	-.396	1	0	1	0	15	-.001	4
61		12	max	79.154	2	-.036	15	-.013	15	0	15	0	1	0	15
62			min	-86.779	3	-.157	4	-.396	1	0	1	0	15	-.001	4
63		13	max	79.086	2	-.078	15	-.013	15	0	15	0	1	0	15
64			min	-86.83	3	-.335	4	-.396	1	0	1	0	15	-.001	4
65		14	max	79.018	2	-.12	15	-.013	15	0	15	0	1	0	15
66			min	-86.881	3	-.512	4	-.396	1	0	1	0	12	-.001	4
67		15	max	78.95	2	-.162	15	-.013	15	0	15	0	1	0	15
68			min	-86.932	3	-.69	4	-.396	1	0	1	0	3	0	4
69		16	max	78.882	2	-.203	15	-.013	15	0	15	0	15	0	15
70			min	-86.983	3	-.868	4	-.396	1	0	1	0	1	0	4
71		17	max	78.814	2	-.245	15	-.013	15	0	15	0	15	0	15
72			min	-87.034	3	-1.045	4	-.396	1	0	1	0	1	0	4
73		18	max	78.746	2	-.287	15	-.013	15	0	15	0	15	0	15
74			min	-87.085	3	-1.223	4	-.396	1	0	1	0	1	0	4
75		19	max	78.679	2	-.329	15	-.013	15	0	15	0	15	0	1
76			min	-87.135	3	-1.401	4	-.396	1	0	1	0	1	0	1
77	M4	1	max	431.447	1	0	1	-.033	15	0	1	0	3	0	1
78			min	-75.59	3	0	1	-.897	1	0	1	0	1	0	1
79		2	max	431.511	1	0	1	-.033	15	0	1	0	15	0	1
80			min	-75.542	3	0	1	-.897	1	0	1	0	1	0	1
81		3	max	431.576	1	0	1	-.033	15	0	1	0	15	0	1
82			min	-75.493	3	0	1	-.897	1	0	1	0	1	0	1
83		4	max	431.641	1	0	1	-.033	15	0	1	0	15	0	1
84			min	-75.445	3	0	1	-.897	1	0	1	0	1	0	1
85		5	max	431.705	1	0	1	-.033	15	0	1	0	15	0	1
86			min	-75.396	3	0	1	-.897	1	0	1	0	1	0	1
87		6	max	431.77	1	0	1	-.033	15	0	1	0	15	0	1
88			min	-75.348	3	0	1	-.897	1	0	1	0	1	0	1
89		7	max	431.835	1	0	1	-.033	15	0	1	0	15	0	1
90			min	-75.299	3	0	1	-.897	1	0	1	0	1	0	1
91		8	max	431.9	1	0	1	-.033	15	0	1	0	15	0	1
92			min	-75.251	3	0	1	-.897	1	0	1	0	1	0	1
93		9	max	431.964	1	0	1	-.033	15	0	1	0	15	0	1
94			min	-75.202	3	0	1	-.897	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	432.029	1	0	1	-.033	15	0	1	0	15	0	1
96			min	-75.154	3	0	1	-.897	1	0	1	0	1	0	1
97		11	max	432.094	1	0	1	-.033	15	0	1	0	15	0	1
98			min	-75.105	3	0	1	-.897	1	0	1	0	1	0	1
99		12	max	432.158	1	0	1	-.033	15	0	1	0	15	0	1
100			min	-75.057	3	0	1	-.897	1	0	1	0	1	0	1
101		13	max	432.223	1	0	1	-.033	15	0	1	0	15	0	1
102			min	-75.008	3	0	1	-.897	1	0	1	0	1	0	1
103		14	max	432.288	1	0	1	-.033	15	0	1	0	15	0	1
104			min	-74.96	3	0	1	-.897	1	0	1	-.001	1	0	1
105		15	max	432.353	1	0	1	-.033	15	0	1	0	15	0	1
106			min	-74.911	3	0	1	-.897	1	0	1	-.001	1	0	1
107		16	max	432.417	1	0	1	-.033	15	0	1	0	15	0	1
108			min	-74.862	3	0	1	-.897	1	0	1	-.001	1	0	1
109		17	max	432.482	1	0	1	-.033	15	0	1	0	15	0	1
110			min	-74.814	3	0	1	-.897	1	0	1	-.001	1	0	1
111		18	max	432.547	1	0	1	-.033	15	0	1	0	15	0	1
112			min	-74.765	3	0	1	-.897	1	0	1	-.001	1	0	1
113		19	max	432.611	1	0	1	-.033	15	0	1	0	15	0	1
114			min	-74.717	3	0	1	-.897	1	0	1	-.001	1	0	1
115	M6	1	max	994.863	1	.641	4	.18	1	0	3	0	3	0	1
116			min	-1188.472	3	.152	15	-.18	3	0	10	0	9	0	1
117		2	max	994.969	1	.6	4	.18	1	0	3	0	3	0	15
118			min	-1188.392	3	.142	15	-.18	3	0	10	0	9	0	4
119		3	max	995.076	1	.558	4	.18	1	0	3	0	1	0	15
120			min	-1188.312	3	.132	15	-.18	3	0	10	0	10	0	4
121		4	max	995.182	1	.517	4	.18	1	0	3	0	1	0	15
122			min	-1188.232	3	.123	15	-.18	3	0	10	0	10	0	4
123		5	max	995.289	1	.476	4	.18	1	0	3	0	1	0	15
124			min	-1188.152	3	.113	15	-.18	3	0	10	0	3	0	4
125		6	max	995.395	1	.435	4	.18	1	0	3	0	1	0	15
126			min	-1188.072	3	.103	15	-.18	3	0	10	0	3	0	4
127		7	max	995.502	1	.393	4	.18	1	0	3	0	1	0	15
128			min	-1187.993	3	.094	15	-.18	3	0	10	0	3	0	4
129		8	max	995.609	1	.353	2	.18	1	0	3	0	1	0	15
130			min	-1187.913	3	.084	15	-.18	3	0	10	0	3	0	4
131		9	max	995.715	1	.321	2	.18	1	0	3	0	1	0	15
132			min	-1187.833	3	.074	15	-.18	3	0	10	0	3	0	4
133		10	max	995.822	1	.288	2	.18	1	0	3	0	1	0	15
134			min	-1187.753	3	.065	15	-.18	3	0	10	0	3	0	4
135		11	max	995.928	1	.256	2	.18	1	0	3	0	1	0	15
136			min	-1187.673	3	.053	12	-.18	3	0	10	0	3	0	4
137		12	max	996.035	1	.224	2	.18	1	0	3	0	1	0	15
138			min	-1187.593	3	.036	12	-.18	3	0	10	0	3	0	4
139		13	max	996.141	1	.192	2	.18	1	0	3	0	1	0	15
140			min	-1187.513	3	.02	12	-.18	3	0	10	0	3	0	4
141		14	max	996.248	1	.16	2	.18	1	0	3	0	1	0	15
142			min	-1187.433	3	0	3	-.18	3	0	10	0	3	0	4
143		15	max	996.354	1	.128	2	.18	1	0	3	0	1	0	15
144			min	-1187.353	3	-.024	3	-.18	3	0	10	0	3	0	2
145		16	max	996.461	1	.096	2	.18	1	0	3	0	1	0	15
146			min	-1187.273	3	-.048	3	-.18	3	0	10	0	3	0	2
147		17	max	996.567	1	.063	2	.18	1	0	3	0	1	0	15
148			min	-1187.193	3	-.072	3	-.18	3	0	10	0	3	0	2
149		18	max	996.674	1	.031	2	.18	1	0	3	0	1	0	15
150			min	-1187.114	3	-.096	3	-.18	3	0	10	0	3	0	2
151		19	max	996.781	1	0	2	.18	1	0	3	0	1	0	15

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
152			min	-1187.034	3	-.121	3	-.18	3	0	10	0	3	0	2
153	M7	1	max	340.368	2	1.796	4	.008	1	0	1	0	1	0	2
154			min	-256.856	3	.423	15	-.009	2	0	3	0	3	0	12
155		2	max	340.3	2	1.618	4	.008	1	0	1	0	1	0	2
156			min	-256.906	3	.381	15	-.009	2	0	3	0	3	0	3
157		3	max	340.232	2	1.441	4	.008	1	0	1	0	1	0	2
158			min	-256.957	3	.339	15	-.009	2	0	3	0	3	0	3
159		4	max	340.164	2	1.263	4	.008	1	0	1	0	1	0	2
160			min	-257.008	3	.298	15	-.009	2	0	3	0	3	0	3
161		5	max	340.096	2	1.085	4	.008	1	0	1	0	1	0	15
162			min	-257.059	3	.256	15	-.009	2	0	3	0	3	0	4
163		6	max	340.029	2	.908	4	.008	1	0	1	0	1	0	15
164			min	-257.11	3	.214	15	-.009	2	0	3	0	3	0	4
165		7	max	339.961	2	.73	4	.008	1	0	1	0	1	0	15
166			min	-257.161	3	.172	15	-.009	2	0	3	0	3	0	4
167		8	max	339.893	2	.552	4	.008	1	0	1	0	1	0	15
168			min	-257.212	3	.131	15	-.009	2	0	3	0	3	0	4
169		9	max	339.825	2	.375	4	.008	1	0	1	0	1	0	15
170			min	-257.263	3	.089	15	-.009	2	0	3	0	3	-.001	4
171		10	max	339.757	2	.218	2	.008	1	0	1	0	1	0	15
172			min	-257.314	3	.044	12	-.009	2	0	3	0	3	-.001	4
173		11	max	339.689	2	.079	2	.008	1	0	1	0	1	0	15
174			min	-257.364	3	-.043	3	-.009	2	0	3	0	3	-.001	4
175		12	max	339.621	2	-.036	15	.008	1	0	1	0	1	0	15
176			min	-257.415	3	-.158	4	-.009	2	0	3	0	3	-.001	4
177		13	max	339.554	2	-.078	15	.008	1	0	1	0	1	0	15
178			min	-257.466	3	-.336	4	-.009	2	0	3	0	3	-.001	4
179		14	max	339.486	2	-.12	15	.008	1	0	1	0	1	0	15
180			min	-257.517	3	-.513	4	-.009	2	0	3	0	3	-.001	4
181		15	max	339.418	2	-.162	15	.008	1	0	1	0	1	0	15
182			min	-257.568	3	-.691	4	-.009	2	0	3	0	3	0	4
183		16	max	339.35	2	-.204	15	.008	1	0	1	0	1	0	15
184			min	-257.619	3	-.869	4	-.009	2	0	3	0	3	0	4
185		17	max	339.282	2	-.245	15	.008	1	0	1	0	1	0	15
186			min	-257.67	3	-1.046	4	-.009	2	0	3	0	3	0	4
187		18	max	339.214	2	-.287	15	.008	1	0	1	0	1	0	15
188			min	-257.721	3	-1.224	4	-.009	2	0	3	0	3	0	4
189		19	max	339.146	2	-.329	15	.008	1	0	1	0	1	0	1
190			min	-257.772	3	-1.402	4	-.009	2	0	3	0	3	0	1
191	M8	1	max	1250.442	1	0	1	.604	1	0	1	0	10	0	1
192			min	-270.824	3	0	1	-.367	3	0	1	0	1	0	1
193		2	max	1250.507	1	0	1	.604	1	0	1	0	1	0	1
194			min	-270.775	3	0	1	-.367	3	0	1	0	3	0	1
195		3	max	1250.572	1	0	1	.604	1	0	1	0	1	0	1
196			min	-270.727	3	0	1	-.367	3	0	1	0	3	0	1
197		4	max	1250.637	1	0	1	.604	1	0	1	0	1	0	1
198			min	-270.678	3	0	1	-.367	3	0	1	0	3	0	1
199		5	max	1250.701	1	0	1	.604	1	0	1	0	1	0	1
200			min	-270.63	3	0	1	-.367	3	0	1	0	3	0	1
201		6	max	1250.766	1	0	1	.604	1	0	1	0	1	0	1
202			min	-270.581	3	0	1	-.367	3	0	1	0	3	0	1
203		7	max	1250.831	1	0	1	.604	1	0	1	0	1	0	1
204			min	-270.533	3	0	1	-.367	3	0	1	0	3	0	1
205		8	max	1250.895	1	0	1	.604	1	0	1	0	1	0	1
206			min	-270.484	3	0	1	-.367	3	0	1	0	3	0	1
207		9	max	1250.96	1	0	1	.604	1	0	1	0	1	0	1
208			min	-270.436	3	0	1	-.367	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	1251.025	1	0	1	.604	1	0	1	0	1	0	1
210			min	-270.387	3	0	1	-.367	3	0	1	0	3	0	1
211		11	max	1251.09	1	0	1	.604	1	0	1	0	1	0	1
212			min	-270.338	3	0	1	-.367	3	0	1	0	3	0	1
213		12	max	1251.154	1	0	1	.604	1	0	1	0	1	0	1
214			min	-270.29	3	0	1	-.367	3	0	1	0	3	0	1
215		13	max	1251.219	1	0	1	.604	1	0	1	0	1	0	1
216			min	-270.241	3	0	1	-.367	3	0	1	0	3	0	1
217		14	max	1251.284	1	0	1	.604	1	0	1	0	1	0	1
218			min	-270.193	3	0	1	-.367	3	0	1	0	3	0	1
219		15	max	1251.348	1	0	1	.604	1	0	1	0	1	0	1
220			min	-270.144	3	0	1	-.367	3	0	1	0	3	0	1
221		16	max	1251.413	1	0	1	.604	1	0	1	0	1	0	1
222			min	-270.096	3	0	1	-.367	3	0	1	0	3	0	1
223		17	max	1251.478	1	0	1	.604	1	0	1	0	1	0	1
224			min	-270.047	3	0	1	-.367	3	0	1	0	3	0	1
225		18	max	1251.542	1	0	1	.604	1	0	1	0	1	0	1
226			min	-269.999	3	0	1	-.367	3	0	1	0	3	0	1
227		19	max	1251.607	1	0	1	.604	1	0	1	0	1	0	1
228			min	-269.95	3	0	1	-.367	3	0	1	0	3	0	1
229	M10	1	max	309.947	1	.637	4	-.003	15	0	1	0	1	0	1
230			min	-344.211	3	.151	15	-.107	1	0	3	0	3	0	1
231		2	max	310.053	1	.596	4	-.003	15	0	1	0	1	0	15
232			min	-344.131	3	.142	15	-.107	1	0	3	0	3	0	4
233		3	max	310.16	1	.555	4	-.003	15	0	1	0	1	0	15
234			min	-344.051	3	.132	15	-.107	1	0	3	0	3	0	4
235		4	max	310.266	1	.514	4	-.003	15	0	1	0	1	0	15
236			min	-343.971	3	.122	15	-.107	1	0	3	0	3	0	4
237		5	max	310.373	1	.472	4	-.003	15	0	1	0	1	0	15
238			min	-343.891	3	.113	15	-.107	1	0	3	0	3	0	4
239		6	max	310.479	1	.431	4	-.003	15	0	1	0	1	0	15
240			min	-343.811	3	.103	15	-.107	1	0	3	0	3	0	4
241		7	max	310.586	1	.39	4	-.003	15	0	1	0	1	0	15
242			min	-343.731	3	.093	15	-.107	1	0	3	0	3	0	4
243		8	max	310.692	1	.349	4	-.003	15	0	1	0	15	0	15
244			min	-343.651	3	.083	15	-.107	1	0	3	0	3	0	4
245		9	max	310.799	1	.307	4	-.003	15	0	1	0	15	0	15
246			min	-343.572	3	.074	15	-.107	1	0	3	0	3	0	4
247		10	max	310.905	1	.266	4	-.003	15	0	1	0	15	0	15
248			min	-343.492	3	.064	15	-.107	1	0	3	0	3	0	4
249		11	max	311.012	1	.225	4	-.003	15	0	1	0	15	0	15
250			min	-343.412	3	.054	15	-.107	1	0	3	0	3	0	4
251		12	max	311.118	1	.183	4	-.003	15	0	1	0	15	0	15
252			min	-343.332	3	.045	15	-.107	1	0	3	0	3	0	4
253		13	max	311.225	1	.142	4	-.003	15	0	1	0	15	0	15
254			min	-343.252	3	.035	15	-.107	1	0	3	0	3	0	4
255		14	max	311.332	1	.108	2	-.003	15	0	1	0	15	0	15
256			min	-343.172	3	.025	15	-.107	1	0	3	0	3	0	4
257		15	max	311.438	1	.076	2	-.003	15	0	1	0	15	0	15
258			min	-343.092	3	.01	9	-.107	1	0	3	0	3	0	4
259		16	max	311.545	1	.044	2	-.003	15	0	1	0	15	0	15
260			min	-343.012	3	-.016	9	-.107	1	0	3	0	3	0	4
261		17	max	311.651	1	.012	2	-.003	15	0	1	0	15	0	15
262			min	-342.932	3	-.043	9	-.107	1	0	3	0	3	0	4
263		18	max	311.758	1	-.011	12	-.003	15	0	1	0	15	0	15
264			min	-342.852	3	-.07	9	-.107	1	0	3	0	3	0	4
265		19	max	311.864	1	-.023	15	-.003	15	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	-342.772	3	-.105	4	-.107	1	0	3	0	1	0	4
267	M11	1	max	79.543	2	1.801	4	.45	1	0	1	0	3	0	4
268			min	-86.826	3	.424	15	-.004	3	0	15	-.001	1	0	15
269		2	max	79.475	2	1.624	4	.45	1	0	1	0	3	0	4
270			min	-86.877	3	.382	15	-.004	3	0	15	-.001	1	0	12
271		3	max	79.407	2	1.446	4	.45	1	0	1	0	3	0	2
272			min	-86.928	3	.34	15	-.004	3	0	15	-.001	1	0	3
273		4	max	79.339	2	1.268	4	.45	1	0	1	0	3	0	15
274			min	-86.979	3	.298	15	-.004	3	0	15	0	1	0	3
275		5	max	79.271	2	1.091	4	.45	1	0	1	0	3	0	15
276			min	-87.03	3	.257	15	-.004	3	0	15	0	1	0	4
277		6	max	79.204	2	.913	4	.45	1	0	1	0	3	0	15
278			min	-87.081	3	.215	15	-.004	3	0	15	0	1	0	4
279		7	max	79.136	2	.735	4	.45	1	0	1	0	3	0	15
280			min	-87.132	3	.173	15	-.004	3	0	15	0	1	0	4
281		8	max	79.068	2	.558	4	.45	1	0	1	0	3	0	15
282			min	-87.182	3	.131	15	-.004	3	0	15	0	1	0	4
283		9	max	79	2	.38	4	.45	1	0	1	0	3	0	15
284			min	-87.233	3	.09	15	-.004	3	0	15	0	1	-.001	4
285		10	max	78.932	2	.202	4	.45	1	0	1	0	3	0	15
286			min	-87.284	3	.048	15	-.004	3	0	15	0	1	-.001	4
287		11	max	78.864	2	.033	2	.45	1	0	1	0	3	0	15
288			min	-87.335	3	-.022	3	-.004	3	0	15	0	1	-.001	4
289		12	max	78.796	2	-.036	15	.45	1	0	1	0	3	0	15
290			min	-87.386	3	-.153	4	-.004	3	0	15	0	1	-.001	4
291		13	max	78.729	2	-.078	15	.45	1	0	1	0	3	0	15
292			min	-87.437	3	-.331	4	-.004	3	0	15	0	1	-.001	4
293		14	max	78.661	2	-.119	15	.45	1	0	1	0	3	0	15
294			min	-87.488	3	-.508	4	-.004	3	0	15	0	10	-.001	4
295		15	max	78.593	2	-.161	15	.45	1	0	1	0	3	0	15
296			min	-87.539	3	-.686	4	-.004	3	0	15	0	10	0	4
297		16	max	78.525	2	-.203	15	.45	1	0	1	0	3	0	15
298			min	-87.59	3	-.863	4	-.004	3	0	15	0	15	0	4
299		17	max	78.457	2	-.245	15	.45	1	0	1	0	1	0	15
300			min	-87.64	3	-1.041	4	-.004	3	0	15	0	15	0	4
301		18	max	78.389	2	-.286	15	.45	1	0	1	0	1	0	15
302			min	-87.691	3	-1.219	4	-.004	3	0	15	0	15	0	4
303		19	max	78.321	2	-.328	15	.45	1	0	1	0	1	0	1
304			min	-87.742	3	-1.396	4	-.004	3	0	15	0	15	0	1
305	M12	1	max	431.302	1	0	1	2.133	1	0	1	0	2	0	1
306			min	-75.18	3	0	1	.071	15	0	1	0	3	0	1
307		2	max	431.367	1	0	1	2.133	1	0	1	0	1	0	1
308			min	-75.132	3	0	1	.071	15	0	1	0	15	0	1
309		3	max	431.431	1	0	1	2.133	1	0	1	0	1	0	1
310			min	-75.083	3	0	1	.071	15	0	1	0	15	0	1
311		4	max	431.496	1	0	1	2.133	1	0	1	0	1	0	1
312			min	-75.035	3	0	1	.071	15	0	1	0	15	0	1
313		5	max	431.561	1	0	1	2.133	1	0	1	0	1	0	1
314			min	-74.986	3	0	1	.071	15	0	1	0	15	0	1
315		6	max	431.625	1	0	1	2.133	1	0	1	0	1	0	1
316			min	-74.938	3	0	1	.071	15	0	1	0	15	0	1
317		7	max	431.69	1	0	1	2.133	1	0	1	.001	1	0	1
318			min	-74.889	3	0	1	.071	15	0	1	0	15	0	1
319		8	max	431.755	1	0	1	2.133	1	0	1	.001	1	0	1
320			min	-74.841	3	0	1	.071	15	0	1	0	15	0	1
321		9	max	431.819	1	0	1	2.133	1	0	1	.002	1	0	1
322			min	-74.792	3	0	1	.071	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	431.884	1	0	1	2.133	1	0	1	.002	1	0	1
324			min	-74.744	3	0	1	.071	15	0	1	0	15	0	1
325		11	max	431.949	1	0	1	2.133	1	0	1	.002	1	0	1
326			min	-74.695	3	0	1	.071	15	0	1	0	15	0	1
327		12	max	432.014	1	0	1	2.133	1	0	1	.002	1	0	1
328			min	-74.647	3	0	1	.071	15	0	1	0	15	0	1
329		13	max	432.078	1	0	1	2.133	1	0	1	.002	1	0	1
330			min	-74.598	3	0	1	.071	15	0	1	0	15	0	1
331		14	max	432.143	1	0	1	2.133	1	0	1	.003	1	0	1
332			min	-74.55	3	0	1	.071	15	0	1	0	15	0	1
333		15	max	432.208	1	0	1	2.133	1	0	1	.003	1	0	1
334			min	-74.501	3	0	1	.071	15	0	1	0	15	0	1
335		16	max	432.272	1	0	1	2.133	1	0	1	.003	1	0	1
336			min	-74.452	3	0	1	.071	15	0	1	0	15	0	1
337		17	max	432.337	1	0	1	2.133	1	0	1	.003	1	0	1
338			min	-74.404	3	0	1	.071	15	0	1	0	15	0	1
339		18	max	432.402	1	0	1	2.133	1	0	1	.003	1	0	1
340			min	-74.355	3	0	1	.071	15	0	1	0	15	0	1
341		19	max	432.467	1	0	1	2.133	1	0	1	.003	1	0	1
342			min	-74.307	3	0	1	.071	15	0	1	0	15	0	1
343	M1	1	max	99.89	1	345.038	3	-1.427	15	0	1	.083	1	0	1
344			min	3.328	15	-308.894	1	-42.119	1	0	3	.003	15	0	3
345		2	max	99.985	1	344.841	3	-1.427	15	0	1	.073	1	.067	1
346			min	3.357	15	-309.157	1	-42.119	1	0	3	.002	15	-.075	3
347		3	max	83.351	1	5.752	9	-1.412	15	0	3	.064	1	.133	1
348			min	2.562	10	-20.291	3	-41.863	1	0	1	.002	15	-.148	3
349		4	max	83.447	1	5.533	9	-1.412	15	0	3	.055	1	.134	1
350			min	2.642	10	-20.488	3	-41.863	1	0	1	.002	15	-.144	3
351		5	max	83.542	1	5.314	9	-1.412	15	0	3	.046	1	.134	1
352			min	2.721	10	-20.685	3	-41.863	1	0	1	.002	15	-.139	3
353		6	max	83.638	1	5.096	9	-1.412	15	0	3	.037	1	.135	1
354			min	2.801	10	-20.882	3	-41.863	1	0	1	.001	15	-.135	3
355		7	max	83.733	1	4.877	9	-1.412	15	0	3	.027	1	.135	1
356			min	2.881	10	-21.079	3	-41.863	1	0	1	0	15	-.13	3
357		8	max	83.829	1	4.658	9	-1.412	15	0	3	.018	1	.136	1
358			min	2.96	10	-21.275	3	-41.863	1	0	1	0	15	-.126	3
359		9	max	83.924	1	4.44	9	-1.412	15	0	3	.009	1	.137	1
360			min	3.04	10	-21.472	3	-41.863	1	0	1	0	15	-.121	3
361		10	max	84.02	1	4.221	9	-1.412	15	0	3	0	3	.14	2
362			min	3.119	10	-21.669	3	-41.863	1	0	1	0	15	-.116	3
363		11	max	84.115	1	4.002	9	-1.412	15	0	3	0	3	.144	2
364			min	3.199	10	-21.866	3	-41.863	1	0	1	-.009	1	-.112	3
365		12	max	84.211	1	3.784	9	-1.412	15	0	3	0	12	.148	2
366			min	3.278	10	-22.063	3	-41.863	1	0	1	-.018	1	-.107	3
367		13	max	84.306	1	3.565	9	-1.412	15	0	3	0	12	.152	2
368			min	3.358	10	-22.259	3	-41.863	1	0	1	-.027	1	-.102	3
369		14	max	84.402	1	3.346	9	-1.412	15	0	3	-.001	15	.156	2
370			min	3.393	15	-22.456	3	-41.863	1	0	1	-.036	1	-.097	3
371		15	max	84.497	1	3.128	9	-1.412	15	0	3	-.002	15	.16	2
372			min	3.422	15	-22.653	3	-41.863	1	0	1	-.045	1	-.092	3
373		16	max	81.235	2	36.266	2	-1.426	15	0	1	-.002	15	.164	2
374			min	-31.425	3	-86.15	3	-42.215	1	0	12	-.055	1	-.087	3
375		17	max	81.33	2	36.003	2	-1.426	15	0	1	-.002	15	.156	2
376			min	-31.354	3	-86.347	3	-42.215	1	0	12	-.064	1	-.068	3
377		18	max	-3.35	15	362.682	2	-1.459	15	0	3	-.002	15	.079	2
378			min	-99.961	1	-157.645	3	-43.162	1	0	2	-.073	1	-.034	3
379		19	max	-3.321	15	362.42	2	-1.459	15	0	3	-.003	15	0	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
380			min	-99.866	1	-157.842	3	-43.162	1	0	2	-.083	1	0	3
381	M5	1	max	224.671	1	1136.492	3	0	10	0	1	.005	3	0	3
382			min	5.251	12	-1017.155	1	-39.177	3	0	3	0	10	0	1
383		2	max	224.766	1	1136.295	3	0	10	0	1	0	1	.22	1
384			min	5.298	12	-1017.417	1	-39.177	3	0	3	-.004	3	-.246	3
385		3	max	169.794	1	7.192	9	4.452	3	0	3	0	1	.437	1
386			min	1.688	10	-72.061	3	-.651	1	0	1	-.012	3	-.487	3
387		4	max	169.889	1	6.973	9	4.452	3	0	3	0	1	.442	1
388			min	1.768	10	-72.257	3	-.651	1	0	1	-.011	3	-.472	3
389		5	max	169.985	1	6.754	9	4.452	3	0	3	0	1	.447	1
390			min	1.847	10	-72.454	3	-.651	1	0	1	-.01	3	-.456	3
391		6	max	170.08	1	6.536	9	4.452	3	0	3	0	1	.452	1
392			min	1.927	10	-72.651	3	-.651	1	0	1	-.009	3	-.44	3
393		7	max	170.176	1	6.317	9	4.452	3	0	3	0	1	.458	1
394			min	2.006	10	-72.848	3	-.651	1	0	1	-.008	3	-.424	3
395		8	max	170.271	1	6.098	9	4.452	3	0	3	0	1	.463	1
396			min	2.086	10	-73.045	3	-.651	1	0	1	-.007	3	-.409	3
397		9	max	170.367	1	5.88	9	4.452	3	0	3	0	1	.468	1
398			min	2.166	10	-73.241	3	-.651	1	0	1	-.006	3	-.393	3
399		10	max	170.462	1	5.661	9	4.452	3	0	3	0	10	.474	1
400			min	2.245	10	-73.438	3	-.651	1	0	1	-.005	3	-.377	3
401		11	max	170.558	1	5.442	9	4.452	3	0	3	0	10	.482	2
402			min	2.325	10	-73.635	3	-.651	1	0	1	-.004	3	-.361	3
403		12	max	170.653	1	5.224	9	4.452	3	0	3	0	10	.496	2
404			min	2.404	10	-73.832	3	-.651	1	0	1	-.003	3	-.345	3
405		13	max	170.749	1	5.005	9	4.452	3	0	3	0	10	.51	2
406			min	2.484	10	-74.029	3	-.651	1	0	1	-.002	3	-.329	3
407		14	max	170.844	1	4.786	9	4.452	3	0	3	0	10	.525	2
408			min	2.564	10	-74.225	3	-.651	1	0	1	-.001	3	-.313	3
409		15	max	170.94	1	4.568	9	4.452	3	0	3	0	10	.539	2
410			min	2.643	10	-74.422	3	-.651	1	0	1	0	1	-.297	3
411		16	max	281.958	2	180.496	2	4.421	3	0	1	0	3	.551	2
412			min	-101.811	3	-260.178	3	-.644	1	0	10	0	1	-.279	3
413		17	max	282.054	2	180.233	2	4.421	3	0	1	.001	3	.512	2
414			min	-101.74	3	-260.374	3	-.644	1	0	10	0	1	-.222	3
415		18	max	-6.304	12	1190.976	2	4.054	3	0	3	.002	3	.258	2
416			min	-224.808	1	-515.875	3	-.151	1	0	1	0	1	-.112	3
417		19	max	-6.257	12	1190.713	2	4.054	3	0	3	.003	3	0	3
418			min	-224.713	1	-516.071	3	-.151	1	0	1	0	1	0	2
419	M9	1	max	99.527	1	345.009	3	42.826	1	0	3	-.003	15	0	1
420			min	3.313	15	-308.892	1	1.645	15	0	1	-.082	1	0	3
421		2	max	99.622	1	344.813	3	42.826	1	0	3	-.001	12	.067	1
422			min	3.342	15	-309.155	1	1.645	15	0	1	-.072	1	-.075	3
423		3	max	83.48	1	5.729	9	40.804	1	0	1	.007	3	.133	1
424			min	2.991	10	-20.224	3	-.66	3	0	15	-.062	1	-.148	3
425		4	max	83.576	1	5.51	9	40.804	1	0	1	.007	3	.134	1
426			min	3.07	10	-20.421	3	-.66	3	0	15	-.053	1	-.144	3
427		5	max	83.671	1	5.291	9	40.804	1	0	1	.007	3	.134	1
428			min	3.15	10	-20.618	3	-.66	3	0	15	-.044	1	-.139	3
429		6	max	83.767	1	5.073	9	40.804	1	0	1	.007	3	.135	1
430			min	3.229	10	-20.814	3	-.66	3	0	15	-.035	1	-.135	3
431		7	max	83.862	1	4.854	9	40.804	1	0	1	.007	3	.135	1
432			min	3.309	10	-21.011	3	-.66	3	0	15	-.027	1	-.13	3
433		8	max	83.958	1	4.635	9	40.804	1	0	1	.007	3	.136	1
434			min	3.359	15	-21.208	3	-.66	3	0	15	-.018	1	-.126	3
435		9	max	84.053	1	4.417	9	40.804	1	0	1	.007	3	.137	1
436			min	3.388	15	-21.405	3	-.66	3	0	15	-.009	1	-.121	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	84.149	1	4.198	9	40.804	1	0	1	.006	3	.14	2
438			min	3.417	15	-21.602	3	-.66	3	0	15	0	1	-.116	3
439		11	max	84.244	1	3.979	9	40.804	1	0	1	.009	1	.144	2
440			min	3.446	15	-21.798	3	-.66	3	0	15	0	15	-.112	3
441		12	max	84.34	1	3.761	9	40.804	1	0	1	.018	1	.148	2
442			min	3.474	15	-21.995	3	-.66	3	0	15	0	15	-.107	3
443		13	max	84.435	1	3.542	9	40.804	1	0	1	.026	1	.152	2
444			min	3.503	15	-22.192	3	-.66	3	0	15	0	15	-.102	3
445		14	max	84.531	1	3.323	9	40.804	1	0	1	.035	1	.156	2
446			min	3.532	15	-22.389	3	-.66	3	0	15	.001	15	-.097	3
447		15	max	84.626	1	3.105	9	40.804	1	0	1	.044	1	.16	2
448			min	3.561	15	-22.586	3	-.66	3	0	15	.001	15	-.093	3
449		16	max	81.409	2	35.997	2	41.218	1	0	15	.054	1	.164	2
450			min	-31.711	3	-86.532	3	-.655	3	0	1	.002	15	-.087	3
451		17	max	81.505	2	35.734	2	41.218	1	0	15	.063	1	.156	2
452			min	-31.639	3	-86.729	3	-.655	3	0	1	.002	15	-.068	3
453		18	max	-3.34	15	362.682	2	43.325	1	0	2	.072	1	.079	2
454			min	-99.604	1	-157.642	3	-.297	3	0	3	.002	15	-.034	3
455		19	max	-3.311	15	362.42	2	43.325	1	0	2	.082	1	0	2
456			min	-99.508	1	-157.838	3	-.297	3	0	3	.003	15	0	3
457	M13	1	max	42.93	1	308.55	1	-3.313	15	0	1	.082	1	0	1
458			min	1.645	15	-345.016	3	-99.518	1	0	3	.003	15	0	3
459		2	max	42.93	1	217.919	1	-2.534	15	0	1	.023	1	.196	3
460			min	1.645	15	-243.549	3	-75.958	1	0	3	0	10	-.175	1
461		3	max	42.93	1	127.289	1	-1.754	15	0	1	.004	3	.325	3
462			min	1.645	15	-142.082	3	-52.397	1	0	3	-.02	1	-.291	1
463		4	max	42.93	1	36.658	1	-.975	15	0	1	.001	3	.386	3
464			min	1.645	15	-40.616	3	-28.837	1	0	3	-.047	1	-.345	1
465		5	max	42.93	1	60.851	3	.134	10	0	1	0	3	.379	3
466			min	1.645	15	-53.973	1	-5.277	1	0	3	-.058	1	-.339	1
467		6	max	42.93	1	162.318	3	18.284	1	0	1	0	12	.304	3
468			min	1.645	15	-144.604	1	-.604	3	0	3	-.054	1	-.273	1
469		7	max	42.93	1	263.785	3	41.844	1	0	1	0	12	.162	3
470			min	1.645	15	-235.235	1	.45	12	0	3	-.034	1	-.147	1
471		8	max	42.93	1	365.251	3	65.405	1	0	1	.002	2	.04	1
472			min	1.645	15	-325.865	1	1.206	12	0	3	0	3	-.047	3
473		9	max	42.93	1	466.718	3	88.965	1	0	1	.053	1	.288	1
474			min	1.645	15	-416.496	1	1.962	12	0	3	0	12	-.325	3
475		10	max	42.93	1	568.185	3	112.526	1	0	1	.121	1	.596	1
476			min	1.645	15	-507.127	1	2.719	12	0	3	.003	12	-.67	3
477		11	max	42.218	1	416.496	1	-1.772	12	0	3	.053	1	.288	1
478			min	1.427	15	-466.718	3	-88.602	1	0	1	-.003	3	-.325	3
479		12	max	42.218	1	325.865	1	-1.016	12	0	3	.002	2	.04	1
480			min	1.427	15	-365.251	3	-65.042	1	0	1	-.004	3	-.047	3
481		13	max	42.218	1	235.234	1	-.217	3	0	3	-.001	15	.162	3
482			min	1.427	15	-263.785	3	-41.481	1	0	1	-.034	1	-.147	1
483		14	max	42.218	1	144.604	1	.917	3	0	3	-.002	15	.304	3
484			min	1.427	15	-162.318	3	-17.921	1	0	1	-.054	1	-.273	1
485		15	max	42.218	1	53.973	1	5.64	1	0	3	-.002	15	.379	3
486			min	1.427	15	-60.851	3	-.134	10	0	1	-.058	1	-.339	1
487		16	max	42.218	1	40.616	3	29.2	1	0	3	-.001	12	.386	3
488			min	1.427	15	-36.658	1	.989	15	0	1	-.046	1	-.345	1
489		17	max	42.218	1	142.083	3	52.761	1	0	3	0	3	.325	3
490			min	1.427	15	-127.289	1	1.769	15	0	1	-.019	1	-.291	1
491		18	max	42.218	1	243.549	3	76.321	1	0	3	.024	1	.196	3
492			min	1.427	15	-217.919	1	2.548	15	0	1	0	10	-.175	1
493		19	max	42.218	1	345.016	3	99.881	1	0	3	.083	1	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
494			min	1.427	15	-308.55	1	3.328	15	0	1	.003	15	0	3
495	M16	1	max	.298	3	362.566	2	-3.311	15	0	3	.082	1	0	2
496			min	-43.221	1	-157.855	3	-99.517	1	0	2	.003	15	0	3
497		2	max	.298	3	256.059	2	-2.531	15	0	3	.023	1	.09	3
498			min	-43.221	1	-111.64	3	-75.957	1	0	2	0	10	-.206	2
499		3	max	.298	3	149.552	2	-1.752	15	0	3	0	12	.149	3
500			min	-43.221	1	-65.425	3	-52.396	1	0	2	-.02	1	-.341	2
501		4	max	.298	3	43.046	2	-.972	15	0	3	-.002	15	.177	3
502			min	-43.221	1	-19.211	3	-28.836	1	0	2	-.047	1	-.406	2
503		5	max	.298	3	27.004	3	.133	10	0	3	-.002	15	.174	3
504			min	-43.221	1	-63.461	2	-5.275	1	0	2	-.058	1	-.399	2
505		6	max	.298	3	73.219	3	18.285	1	0	3	-.002	15	.141	3
506			min	-43.221	1	-169.968	2	-.134	3	0	2	-.054	1	-.321	2
507		7	max	.298	3	119.434	3	41.846	1	0	3	-.001	15	.077	3
508			min	-43.221	1	-276.475	2	.733	12	0	2	-.034	1	-.172	2
509		8	max	.298	3	165.648	3	65.406	1	0	3	.002	2	.048	2
510			min	-43.221	1	-382.982	2	1.489	12	0	2	-.003	3	-.018	3
511		9	max	.298	3	211.863	3	88.966	1	0	3	.053	1	.338	2
512			min	-43.221	1	-489.488	2	2.245	12	0	2	-.001	3	-.144	3
513		10	max	-1.458	15	-11.985	15	112.527	1	0	15	.121	1	.7	2
514			min	-43.221	1	-595.995	2	-4.83	3	0	2	.003	12	-.301	3
515		11	max	-1.458	15	489.488	2	-2.499	12	0	2	.053	1	.338	2
516			min	-43.064	1	-211.863	3	-88.609	1	0	3	.001	12	-.144	3
517		12	max	-1.458	15	382.982	2	-1.743	12	0	2	.002	2	.048	2
518			min	-43.064	1	-165.648	3	-65.048	1	0	3	0	3	-.018	3
519		13	max	-1.458	15	276.475	2	-.987	12	0	2	-.001	15	.077	3
520			min	-43.064	1	-119.434	3	-41.488	1	0	3	-.034	1	-.172	2
521		14	max	-1.458	15	169.968	2	-.231	12	0	2	-.002	12	.141	3
522			min	-43.064	1	-73.219	3	-17.927	1	0	3	-.054	1	-.321	2
523		15	max	-1.458	15	63.461	2	5.633	1	0	2	-.002	12	.174	3
524			min	-43.064	1	-27.004	3	-.133	10	0	3	-.058	1	-.399	2
525		16	max	-1.458	15	19.211	3	29.194	1	0	2	0	12	.177	3
526			min	-43.064	1	-43.046	2	.983	15	0	3	-.046	1	-.406	2
527		17	max	-1.458	15	65.425	3	52.754	1	0	2	0	3	.149	3
528			min	-43.064	1	-149.552	2	1.762	15	0	3	-.019	1	-.341	2
529		18	max	-1.458	15	111.64	3	76.314	1	0	2	.024	1	.09	3
530			min	-43.064	1	-256.059	2	2.542	15	0	3	0	10	-.206	2
531		19	max	-1.458	15	157.855	3	99.875	1	0	2	.083	1	0	2
532			min	-43.064	1	-362.566	2	3.321	15	0	3	.003	15	0	3
533	M15	1	max	0	1	2.097	4	.057	3	0	9	0	9	0	1
534			min	-47.837	3	0	1	-.025	9	0	3	0	3	0	1
535		2	max	0	1	1.864	4	.057	3	0	9	0	9	0	1
536			min	-47.897	3	0	1	-.025	9	0	3	0	3	0	4
537		3	max	0	1	1.631	4	.057	3	0	9	0	9	0	1
538			min	-47.957	3	0	1	-.025	9	0	3	0	3	-.001	4
539		4	max	0	1	1.398	4	.057	3	0	9	0	9	0	1
540			min	-48.016	3	0	1	-.025	9	0	3	0	3	-.002	4
541		5	max	0	1	1.165	4	.057	3	0	9	0	9	0	1
542			min	-48.076	3	0	1	-.025	9	0	3	0	3	-.002	4
543		6	max	0	1	.932	4	.057	3	0	9	0	9	0	1
544			min	-48.136	3	0	1	-.025	9	0	3	0	3	-.003	4
545		7	max	0	1	.699	4	.057	3	0	9	0	3	0	1
546			min	-48.195	3	0	1	-.025	9	0	3	0	9	-.003	4
547		8	max	0	1	.466	4	.057	3	0	9	0	3	0	1
548			min	-48.255	3	0	1	-.025	9	0	3	0	9	-.003	4
549		9	max	0	1	.233	4	.057	3	0	9	0	3	0	1
550			min	-48.315	3	0	1	-.025	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	.057	3	0	9	0	3	0	1
552			min	-48.374	3	0	1	-.025	9	0	3	0	9	-.003	4
553		11	max	0	1	0	1	.057	3	0	9	0	3	0	1
554			min	-48.434	3	-.233	4	-.025	9	0	3	0	9	-.003	4
555		12	max	0	1	0	1	.057	3	0	9	0	3	0	1
556			min	-48.494	3	-.466	4	-.025	9	0	3	0	9	-.003	4
557		13	max	0	1	0	1	.057	3	0	9	0	3	0	1
558			min	-48.553	3	-.699	4	-.025	9	0	3	0	9	-.003	4
559		14	max	0	1	0	1	.057	3	0	9	0	3	0	1
560			min	-48.613	3	-.932	4	-.025	9	0	3	0	9	-.003	4
561		15	max	0	1	0	1	.057	3	0	9	0	3	0	1
562			min	-48.673	3	-1.165	4	-.025	9	0	3	0	9	-.002	4
563		16	max	0	1	0	1	.057	3	0	9	0	3	0	1
564			min	-48.732	3	-1.398	4	-.025	9	0	3	0	9	-.002	4
565		17	max	0	1	0	1	.057	3	0	9	0	3	0	1
566			min	-48.792	3	-1.631	4	-.025	9	0	3	0	9	-.001	4
567		18	max	0	1	0	1	.057	3	0	9	0	3	0	1
568			min	-48.852	3	-1.864	4	-.025	9	0	3	0	9	0	4
569		19	max	0	1	0	1	.057	3	0	9	0	3	0	1
570			min	-48.911	3	-2.097	4	-.025	9	0	3	0	9	0	1
571	M16A	1	max	0	10	2.097	4	.028	1	0	3	0	3	0	1
572			min	-48.129	3	0	10	-.022	3	0	1	0	1	0	1
573		2	max	0	10	1.864	4	.028	1	0	3	0	3	0	10
574			min	-48.069	3	0	10	-.022	3	0	1	0	1	0	4
575		3	max	0	10	1.631	4	.028	1	0	3	0	3	0	10
576			min	-48.009	3	0	10	-.022	3	0	1	0	1	-.001	4
577		4	max	0	10	1.398	4	.028	1	0	3	0	3	0	10
578			min	-47.95	3	0	10	-.022	3	0	1	0	1	-.002	4
579		5	max	0	10	1.165	4	.028	1	0	3	0	3	0	10
580			min	-47.89	3	0	10	-.022	3	0	1	0	1	-.002	4
581		6	max	0	10	.932	4	.028	1	0	3	0	3	0	10
582			min	-47.83	3	0	10	-.022	3	0	1	0	1	-.003	4
583		7	max	0	10	.699	4	.028	1	0	3	0	3	0	10
584			min	-47.771	3	0	10	-.022	3	0	1	0	1	-.003	4
585		8	max	0	10	.466	4	.028	1	0	3	0	3	0	10
586			min	-47.711	3	0	10	-.022	3	0	1	0	1	-.003	4
587		9	max	0	10	.233	4	.028	1	0	3	0	3	0	10
588			min	-47.651	3	0	10	-.022	3	0	1	0	1	-.003	4
589		10	max	0	10	0	1	.028	1	0	3	0	3	0	10
590			min	-47.592	3	0	1	-.022	3	0	1	0	1	-.003	4
591		11	max	0	10	0	10	.028	1	0	3	0	3	0	10
592			min	-47.532	3	-.233	4	-.022	3	0	1	0	1	-.003	4
593		12	max	0	10	0	10	.028	1	0	3	0	3	0	10
594			min	-47.472	3	-.466	4	-.022	3	0	1	0	1	-.003	4
595		13	max	0	10	0	10	.028	1	0	3	0	2	0	10
596			min	-47.413	3	-.699	4	-.022	3	0	1	0	4	-.003	4
597		14	max	0	10	0	10	.028	1	0	3	0	1	0	10
598			min	-47.353	3	-.932	4	-.022	3	0	1	0	3	-.003	4
599		15	max	0	10	0	10	.028	1	0	3	0	1	0	10
600			min	-47.293	3	-1.165	4	-.022	3	0	1	0	3	-.002	4
601		16	max	0	10	0	10	.028	1	0	3	0	1	0	10
602			min	-47.234	3	-1.398	4	-.022	3	0	1	0	3	-.002	4
603		17	max	.071	2	0	10	.028	1	0	3	0	1	0	10
604			min	-47.174	3	-1.631	4	-.022	3	0	1	0	3	-.001	4
605		18	max	.15	2	0	10	.028	1	0	3	0	1	0	10
606			min	-47.114	3	-1.864	4	-.022	3	0	1	0	3	0	4
607		19	max	.23	2	0	10	.028	1	0	3	0	1	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
608			min	-47.055	3	-2.097	4	-.022	3	0	1	0	3	0	1

Envelope Member Section Deflections

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
1	M2	1	max	.003	1	.007	2	.009	1	-2.076e-5	15	NC	3	NC	2
2			min	-.003	3	-.006	3	-.001	3	-6.083e-4	1	4891.923	2	3859.492	1
3		2	max	.002	1	.006	2	.008	1	-1.992e-5	15	NC	3	NC	2
4			min	-.003	3	-.006	3	0	3	-5.84e-4	1	5318.205	2	4178.259	1
5		3	max	.002	1	.006	2	.007	1	-1.907e-5	15	NC	3	NC	2
6			min	-.003	3	-.006	3	0	3	-5.597e-4	1	5821.655	2	4553.928	1
7		4	max	.002	1	.005	2	.007	1	-1.823e-5	15	NC	1	NC	2
8			min	-.002	3	-.005	3	0	3	-5.353e-4	1	6420.418	2	5000.375	1
9		5	max	.002	1	.005	2	.006	1	-1.739e-5	15	NC	1	NC	2
10			min	-.002	3	-.005	3	0	3	-5.11e-4	1	7138.549	2	5536.139	1
11		6	max	.002	1	.004	2	.005	1	-1.654e-5	15	NC	1	NC	2
12			min	-.002	3	-.005	3	0	3	-4.866e-4	1	8008.455	2	6186.452	1
13		7	max	.002	1	.004	2	.005	1	-1.57e-5	15	NC	1	NC	2
14			min	-.002	3	-.005	3	0	3	-4.623e-4	1	9074.637	2	6986.373	1
15		8	max	.002	1	.003	2	.004	1	-1.486e-5	15	NC	1	NC	2
16			min	-.002	3	-.004	3	0	3	-4.379e-4	1	NC	1	7985.81	1
17		9	max	.001	1	.003	2	.004	1	-1.401e-5	15	NC	1	NC	2
18			min	-.002	3	-.004	3	0	3	-4.136e-4	1	NC	1	9257.838	1
19		10	max	.001	1	.002	2	.003	1	-1.317e-5	15	NC	1	NC	1
20			min	-.001	3	-.004	3	0	3	-3.892e-4	1	NC	1	NC	1
21		11	max	.001	1	.002	2	.003	1	-1.232e-5	15	NC	1	NC	1
22			min	-.001	3	-.003	3	0	3	-3.649e-4	1	NC	1	NC	1
23		12	max	0	1	.002	2	.002	1	-1.148e-5	15	NC	1	NC	1
24			min	-.001	3	-.003	3	0	3	-3.405e-4	1	NC	1	NC	1
25		13	max	0	1	.001	2	.002	1	-1.064e-5	15	NC	1	NC	1
26			min	0	3	-.003	3	0	3	-3.162e-4	1	NC	1	NC	1
27		14	max	0	1	0	2	.001	1	-9.793e-6	15	NC	1	NC	1
28			min	0	3	-.002	3	0	3	-2.918e-4	1	NC	1	NC	1
29		15	max	0	1	0	2	0	1	-8.95e-6	15	NC	1	NC	1
30			min	0	3	-.002	3	0	3	-2.675e-4	1	NC	1	NC	1
31		16	max	0	1	0	2	0	1	-8.106e-6	15	NC	1	NC	1
32			min	0	3	-.001	3	0	3	-2.431e-4	1	NC	1	NC	1
33		17	max	0	1	0	2	0	1	-7.262e-6	15	NC	1	NC	1
34			min	0	3	0	3	0	3	-2.188e-4	1	NC	1	NC	1
35		18	max	0	1	0	2	0	1	-6.419e-6	15	NC	1	NC	1
36			min	0	3	0	3	0	3	-1.945e-4	1	NC	1	NC	1
37		19	max	0	1	0	1	0	1	-5.572e-6	12	NC	1	NC	1
38			min	0	1	0	1	0	1	-1.701e-4	1	NC	1	NC	1
39	M3	1	max	0	1	0	1	0	1	7.809e-5	1	NC	1	NC	1
40			min	0	1	0	1	0	1	2.56e-6	15	NC	1	NC	1
41		2	max	0	3	0	2	0	12	9.743e-5	1	NC	1	NC	1
42			min	0	2	0	3	0	1	3.221e-6	15	NC	1	NC	1
43		3	max	0	3	0	2	0	12	1.168e-4	1	NC	1	NC	1
44			min	0	2	-.001	3	0	1	3.882e-6	15	NC	1	NC	1
45		4	max	0	3	0	2	0	12	1.361e-4	1	NC	1	NC	1
46			min	0	2	-.002	3	0	1	4.542e-6	15	NC	1	NC	1
47		5	max	0	3	0	2	0	3	1.555e-4	1	NC	1	NC	1
48			min	0	2	-.003	3	0	1	5.203e-6	15	NC	1	NC	1
49		6	max	0	3	0	2	0	3	1.748e-4	1	NC	1	NC	1
50			min	0	2	-.004	3	0	1	5.864e-6	15	NC	1	NC	1
51		7	max	0	3	0	2	0	3	1.942e-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	-.004	3	0	1	6.524e-6	15	NC	1	NC	1
53		8	max	0	3	0	2	0	3	2.135e-4	1	NC	1	NC	1
54			min	0	2	-.005	3	0	1	7.185e-6	15	NC	1	NC	1
55		9	max	0	3	.001	2	0	3	2.328e-4	1	NC	1	NC	1
56			min	0	2	-.005	3	0	1	7.846e-6	15	NC	1	NC	1
57		10	max	0	3	.002	2	0	2	2.522e-4	1	NC	1	NC	1
58			min	0	2	-.006	3	0	15	8.506e-6	15	NC	1	NC	1
59		11	max	0	3	.002	2	0	1	2.715e-4	1	NC	1	NC	1
60			min	0	2	-.006	3	0	15	9.167e-6	15	NC	1	NC	1
61		12	max	0	3	.003	2	0	1	2.909e-4	1	NC	1	NC	1
62			min	0	2	-.007	3	0	15	9.828e-6	15	NC	1	NC	1
63		13	max	0	3	.003	2	.001	1	3.102e-4	1	NC	1	NC	1
64			min	0	2	-.007	3	0	15	1.049e-5	15	NC	1	NC	1
65		14	max	0	3	.004	2	.002	1	3.296e-4	1	NC	1	NC	1
66			min	0	2	-.007	3	0	15	1.115e-5	15	NC	1	NC	1
67		15	max	0	3	.005	2	.002	1	3.489e-4	1	NC	1	NC	1
68			min	0	2	-.007	3	0	15	1.181e-5	15	9729.974	2	NC	1
69		16	max	0	3	.006	2	.003	1	3.682e-4	1	NC	1	NC	1
70			min	0	2	-.007	3	0	15	1.247e-5	15	8204.679	2	NC	1
71		17	max	0	3	.007	2	.003	1	3.876e-4	1	NC	3	NC	1
72			min	0	2	-.007	3	0	15	1.313e-5	15	7032.09	2	NC	1
73		18	max	0	3	.008	2	.004	1	4.069e-4	1	NC	3	NC	1
74			min	0	2	-.007	3	0	15	1.379e-5	15	6119.823	2	NC	1
75		19	max	0	3	.009	2	.004	1	4.263e-4	1	NC	3	NC	1
76			min	0	2	-.007	3	0	15	1.445e-5	15	5403.397	2	NC	1
77	M4	1	max	.002	1	.008	2	0	15	-1.76e-5	15	NC	1	NC	2
78			min	0	3	-.006	3	-.003	1	-5.298e-4	1	NC	1	6620.609	1
79		2	max	.002	1	.007	2	0	15	-1.76e-5	15	NC	1	NC	2
80			min	0	3	-.006	3	-.003	1	-5.298e-4	1	NC	1	7224.211	1
81		3	max	.002	1	.007	2	0	15	-1.76e-5	15	NC	1	NC	2
82			min	0	3	-.006	3	-.002	1	-5.298e-4	1	NC	1	7942.514	1
83		4	max	.002	1	.007	2	0	15	-1.76e-5	15	NC	1	NC	2
84			min	0	3	-.005	3	-.002	1	-5.298e-4	1	NC	1	8805.787	1
85		5	max	.002	1	.006	2	0	15	-1.76e-5	15	NC	1	NC	2
86			min	0	3	-.005	3	-.002	1	-5.298e-4	1	NC	1	9855.267	1
87		6	max	.001	1	.006	2	0	15	-1.76e-5	15	NC	1	NC	1
88			min	0	3	-.005	3	-.002	1	-5.298e-4	1	NC	1	NC	1
89		7	max	.001	1	.005	2	0	15	-1.76e-5	15	NC	1	NC	1
90			min	0	3	-.004	3	-.002	1	-5.298e-4	1	NC	1	NC	1
91		8	max	.001	1	.005	2	0	15	-1.76e-5	15	NC	1	NC	1
92			min	0	3	-.004	3	-.001	1	-5.298e-4	1	NC	1	NC	1
93		9	max	.001	1	.004	2	0	15	-1.76e-5	15	NC	1	NC	1
94			min	0	3	-.004	3	-.001	1	-5.298e-4	1	NC	1	NC	1
95		10	max	.001	1	.004	2	0	15	-1.76e-5	15	NC	1	NC	1
96			min	0	3	-.003	3	0	1	-5.298e-4	1	NC	1	NC	1
97		11	max	0	1	.003	2	0	15	-1.76e-5	15	NC	1	NC	1
98			min	0	3	-.003	3	0	1	-5.298e-4	1	NC	1	NC	1
99		12	max	0	1	.003	2	0	15	-1.76e-5	15	NC	1	NC	1
100			min	0	3	-.002	3	0	1	-5.298e-4	1	NC	1	NC	1
101		13	max	0	1	.003	2	0	15	-1.76e-5	15	NC	1	NC	1
102			min	0	3	-.002	3	0	1	-5.298e-4	1	NC	1	NC	1
103		14	max	0	1	.002	2	0	15	-1.76e-5	15	NC	1	NC	1
104			min	0	3	-.002	3	0	1	-5.298e-4	1	NC	1	NC	1
105		15	max	0	1	.002	2	0	15	-1.76e-5	15	NC	1	NC	1
106			min	0	3	-.001	3	0	1	-5.298e-4	1	NC	1	NC	1
107		16	max	0	1	.001	2	0	15	-1.76e-5	15	NC	1	NC	1
108			min	0	3	-.001	3	0	1	-5.298e-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	0	2	0	15	-1.76e-5	15	NC	1	NC	1
110			min	0	3	0	3	0	1	-5.298e-4	1	NC	1	NC	1
111		18	max	0	1	0	2	0	15	-1.76e-5	15	NC	1	NC	1
112			min	0	3	0	3	0	1	-5.298e-4	1	NC	1	NC	1
113		19	max	0	1	0	1	0	1	-1.76e-5	15	NC	1	NC	1
114			min	0	1	0	1	0	1	-5.298e-4	1	NC	1	NC	1
115	M6	1	max	.008	1	.024	2	.004	1	2.566e-4	3	NC	3	NC	2
116			min	-.01	3	-.019	3	-.003	3	-6.183e-8	10	1375.8	2	9037.84	1
117		2	max	.008	1	.023	2	.003	1	2.499e-4	3	NC	3	NC	2
118			min	-.009	3	-.018	3	-.003	3	-5.849e-8	10	1468.938	2	9801.785	1
119		3	max	.007	1	.021	2	.003	1	2.431e-4	3	NC	3	NC	1
120			min	-.009	3	-.017	3	-.003	3	-5.516e-8	10	1575.262	2	NC	1
121		4	max	.007	1	.02	2	.003	1	2.363e-4	3	NC	3	NC	1
122			min	-.008	3	-.016	3	-.003	3	-5.182e-8	10	1697.41	2	NC	1
123		5	max	.006	1	.018	2	.003	1	2.296e-4	3	NC	3	NC	1
124			min	-.008	3	-.015	3	-.002	3	-1.409e-6	2	1838.78	2	NC	1
125		6	max	.006	1	.017	2	.002	1	2.228e-4	3	NC	3	NC	1
126			min	-.007	3	-.014	3	-.002	3	-3.218e-6	2	2003.818	2	NC	1
127		7	max	.005	1	.015	2	.002	1	2.16e-4	3	NC	3	NC	1
128			min	-.006	3	-.013	3	-.002	3	-5.15e-6	1	2198.457	2	NC	1
129		8	max	.005	1	.014	2	.002	1	2.092e-4	3	NC	3	NC	1
130			min	-.006	3	-.012	3	-.002	3	-1.085e-5	1	2430.793	2	NC	1
131		9	max	.005	1	.012	2	.002	1	2.025e-4	3	NC	3	NC	1
132			min	-.005	3	-.011	3	-.002	3	-1.655e-5	1	2712.164	2	NC	1
133		10	max	.004	1	.011	2	.001	1	1.957e-4	3	NC	3	NC	1
134			min	-.005	3	-.01	3	-.001	3	-2.225e-5	1	3058.949	2	NC	1
135		11	max	.004	1	.01	2	.001	1	1.889e-4	3	NC	3	NC	1
136			min	-.004	3	-.009	3	-.001	3	-2.796e-5	1	3495.719	2	NC	1
137		12	max	.003	1	.008	2	0	1	1.822e-4	3	NC	3	NC	1
138			min	-.004	3	-.008	3	0	3	-3.366e-5	1	4061.086	2	NC	1
139		13	max	.003	1	.007	2	0	1	1.754e-4	3	NC	3	NC	1
140			min	-.003	3	-.007	3	0	3	-3.936e-5	1	4819.403	2	NC	1
141		14	max	.002	1	.006	2	0	1	1.686e-4	3	NC	3	NC	1
142			min	-.003	3	-.006	3	0	3	-4.506e-5	1	5886.499	2	NC	1
143		15	max	.002	1	.004	2	0	1	1.619e-4	3	NC	3	NC	1
144			min	-.002	3	-.005	3	0	3	-5.076e-5	1	7494.027	2	NC	1
145		16	max	.001	1	.003	2	0	1	1.551e-4	3	NC	1	NC	1
146			min	-.002	3	-.004	3	0	3	-5.646e-5	1	NC	1	NC	1
147		17	max	0	1	.002	2	0	1	1.483e-4	3	NC	1	NC	1
148			min	-.001	3	-.002	3	0	3	-6.216e-5	1	NC	1	NC	1
149		18	max	0	1	.001	2	0	1	1.416e-4	3	NC	1	NC	1
150			min	0	3	-.001	3	0	3	-6.786e-5	1	NC	1	NC	1
151		19	max	0	1	0	1	0	1	1.348e-4	3	NC	1	NC	1
152			min	0	1	0	1	0	1	-7.357e-5	1	NC	1	NC	1
153	M7	1	max	0	1	0	1	0	1	3.343e-5	1	NC	1	NC	1
154			min	0	1	0	1	0	1	-6.166e-5	3	NC	1	NC	1
155		2	max	0	3	.001	2	0	3	2.792e-5	1	NC	1	NC	1
156			min	0	2	-.002	3	0	1	-4.669e-5	3	NC	1	NC	1
157		3	max	0	3	.003	2	0	3	2.241e-5	1	NC	1	NC	1
158			min	0	2	-.003	3	0	1	-3.172e-5	3	NC	1	NC	1
159		4	max	0	3	.004	2	0	3	1.69e-5	1	NC	1	NC	1
160			min	0	2	-.005	3	0	1	-1.675e-5	3	NC	1	NC	1
161		5	max	0	3	.005	2	.001	3	1.14e-5	1	NC	1	NC	1
162			min	0	2	-.007	3	0	1	-1.78e-6	3	8681.146	2	NC	1
163		6	max	0	3	.007	2	.001	3	1.319e-5	3	NC	3	NC	1
164			min	-.001	2	-.008	3	0	1	0	10	6958.11	2	NC	1
165		7	max	0	3	.008	2	.001	3	2.816e-5	3	NC	3	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
166			min	-.001	2	-.01	3	0	1	0	10	5779.651	2	NC	1
167		8	max	.001	3	.009	2	.002	3	4.313e-5	3	NC	3	NC	1
168			min	-.001	2	-.011	3	-.001	1	-5.125e-6	1	4915.621	2	NC	1
169		9	max	.001	3	.011	2	.002	3	5.81e-5	3	NC	3	NC	1
170			min	-.002	2	-.013	3	-.001	1	-1.063e-5	1	4251.357	2	NC	1
171		10	max	.001	3	.012	2	.002	3	7.307e-5	3	NC	3	NC	1
172			min	-.002	2	-.014	3	-.001	1	-1.614e-5	1	3723.306	2	NC	1
173		11	max	.002	3	.014	2	.002	3	8.804e-5	3	NC	3	NC	1
174			min	-.002	2	-.015	3	-.001	1	-2.165e-5	1	3293.303	2	NC	1
175		12	max	.002	3	.016	2	.002	3	1.03e-4	3	NC	3	NC	1
176			min	-.002	2	-.016	3	-.002	1	-2.715e-5	1	2936.92	2	NC	1
177		13	max	.002	3	.017	2	.002	3	1.18e-4	3	NC	3	NC	1
178			min	-.003	2	-.017	3	-.002	1	-3.266e-5	1	2637.673	2	NC	1
179		14	max	.002	3	.019	2	.002	3	1.329e-4	3	NC	3	NC	1
180			min	-.003	2	-.018	3	-.002	1	-3.817e-5	1	2383.938	2	NC	1
181		15	max	.002	3	.021	2	.002	3	1.479e-4	3	NC	3	NC	1
182			min	-.003	2	-.019	3	-.002	1	-4.368e-5	1	2167.208	2	NC	1
183		16	max	.002	3	.023	2	.002	3	1.629e-4	3	NC	3	NC	1
184			min	-.003	2	-.02	3	-.002	1	-4.918e-5	1	1981.064	2	NC	1
185		17	max	.003	3	.025	2	.002	3	1.779e-4	3	NC	3	NC	1
186			min	-.003	2	-.021	3	-.002	1	-5.469e-5	1	1820.542	2	NC	1
187		18	max	.003	3	.027	2	.002	3	1.928e-4	3	NC	3	NC	1
188			min	-.004	2	-.022	3	-.002	1	-6.02e-5	1	1681.731	2	NC	1
189		19	max	.003	3	.029	2	.002	3	2.078e-4	3	NC	3	NC	1
190			min	-.004	2	-.023	3	-.002	1	-6.57e-5	1	1561.502	2	NC	1
191	M8	1	max	.006	1	.027	2	.002	1	-7.433e-8	10	NC	1	NC	1
192			min	-.001	3	-.02	3	-.001	3	-1.617e-4	3	NC	1	NC	1
193		2	max	.006	1	.026	2	.002	1	-7.433e-8	10	NC	1	NC	1
194			min	-.001	3	-.019	3	-.001	3	-1.617e-4	3	NC	1	NC	1
195		3	max	.005	1	.024	2	.002	1	-7.433e-8	10	NC	1	NC	1
196			min	-.001	3	-.018	3	0	3	-1.617e-4	3	NC	1	NC	1
197		4	max	.005	1	.023	2	.001	1	-7.433e-8	10	NC	1	NC	1
198			min	-.001	3	-.017	3	0	3	-1.617e-4	3	NC	1	NC	1
199		5	max	.005	1	.021	2	.001	1	-7.433e-8	10	NC	1	NC	1
200			min	-.001	3	-.016	3	0	3	-1.617e-4	3	NC	1	NC	1
201		6	max	.004	1	.02	2	.001	1	-7.433e-8	10	NC	1	NC	1
202			min	0	3	-.014	3	0	3	-1.617e-4	3	NC	1	NC	1
203		7	max	.004	1	.018	2	0	1	-7.433e-8	10	NC	1	NC	1
204			min	0	3	-.013	3	0	3	-1.617e-4	3	NC	1	NC	1
205		8	max	.004	1	.017	2	0	1	-7.433e-8	10	NC	1	NC	1
206			min	0	3	-.012	3	0	3	-1.617e-4	3	NC	1	NC	1
207		9	max	.003	1	.015	2	0	1	-7.433e-8	10	NC	1	NC	1
208			min	0	3	-.011	3	0	3	-1.617e-4	3	NC	1	NC	1
209		10	max	.003	1	.014	2	0	1	-7.433e-8	10	NC	1	NC	1
210			min	0	3	-.01	3	0	3	-1.617e-4	3	NC	1	NC	1
211		11	max	.003	1	.012	2	0	1	-7.433e-8	10	NC	1	NC	1
212			min	0	3	-.009	3	0	3	-1.617e-4	3	NC	1	NC	1
213		12	max	.002	1	.011	2	0	1	-7.433e-8	10	NC	1	NC	1
214			min	0	3	-.008	3	0	3	-1.617e-4	3	NC	1	NC	1
215		13	max	.002	1	.009	2	0	1	-7.433e-8	10	NC	1	NC	1
216			min	0	3	-.007	3	0	3	-1.617e-4	3	NC	1	NC	1
217		14	max	.002	1	.008	2	0	1	-7.433e-8	10	NC	1	NC	1
218			min	0	3	-.006	3	0	3	-1.617e-4	3	NC	1	NC	1
219		15	max	.001	1	.006	2	0	1	-7.433e-8	10	NC	1	NC	1
220			min	0	3	-.004	3	0	3	-1.617e-4	3	NC	1	NC	1
221		16	max	0	1	.005	2	0	1	-7.433e-8	10	NC	1	NC	1
222			min	0	3	-.003	3	0	3	-1.617e-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	.003	2	0	1	-7.433e-8	10	NC	1	NC	1
224			min	0	3	-.002	3	0	3	-1.617e-4	3	NC	1	NC	1
225		18	max	0	1	.002	2	0	1	-7.433e-8	10	NC	1	NC	1
226			min	0	3	-.001	3	0	3	-1.617e-4	3	NC	1	NC	1
227		19	max	0	1	0	1	0	1	-7.433e-8	10	NC	1	NC	1
228			min	0	1	0	1	0	1	-1.617e-4	3	NC	1	NC	1
229	M10	1	max	.003	1	.007	2	0	3	6.593e-4	1	NC	3	NC	1
230			min	-.003	3	-.006	3	-.001	1	-3.053e-4	3	4899.532	2	NC	1
231		2	max	.002	1	.006	2	0	3	6.255e-4	1	NC	3	NC	1
232			min	-.003	3	-.006	3	-.001	1	-2.962e-4	3	5326.664	2	NC	1
233		3	max	.002	1	.006	2	0	3	5.918e-4	1	NC	3	NC	1
234			min	-.003	3	-.006	3	-.001	1	-2.872e-4	3	5831.151	2	NC	1
235		4	max	.002	1	.005	2	0	3	5.581e-4	1	NC	1	NC	1
236			min	-.002	3	-.005	3	-.001	1	-2.781e-4	3	6431.193	2	NC	1
237		5	max	.002	1	.005	2	0	3	5.243e-4	1	NC	1	NC	1
238			min	-.002	3	-.005	3	0	1	-2.69e-4	3	7150.914	2	NC	1
239		6	max	.002	1	.004	2	0	3	4.906e-4	1	NC	1	NC	1
240			min	-.002	3	-.005	3	0	1	-2.6e-4	3	8022.82	2	NC	1
241		7	max	.002	1	.004	2	0	3	4.568e-4	1	NC	1	NC	1
242			min	-.002	3	-.005	3	0	1	-2.509e-4	3	9091.554	2	NC	1
243		8	max	.002	1	.003	2	0	3	4.231e-4	1	NC	1	NC	1
244			min	-.002	3	-.004	3	0	1	-2.418e-4	3	NC	1	NC	1
245		9	max	.001	1	.003	2	0	3	3.894e-4	1	NC	1	NC	1
246			min	-.002	3	-.004	3	0	1	-2.328e-4	3	NC	1	NC	1
247		10	max	.001	1	.002	2	0	3	3.556e-4	1	NC	1	NC	1
248			min	-.001	3	-.004	3	0	1	-2.237e-4	3	NC	1	NC	1
249		11	max	.001	1	.002	2	0	3	3.219e-4	1	NC	1	NC	1
250			min	-.001	3	-.004	3	0	1	-2.146e-4	3	NC	1	NC	1
251		12	max	0	1	.002	2	0	3	2.882e-4	1	NC	1	NC	1
252			min	-.001	3	-.003	3	0	1	-2.056e-4	3	NC	1	NC	1
253		13	max	0	1	.001	2	0	3	2.544e-4	1	NC	1	NC	1
254			min	0	3	-.003	3	0	1	-1.965e-4	3	NC	1	NC	1
255		14	max	0	1	0	2	0	3	2.207e-4	1	NC	1	NC	1
256			min	0	3	-.002	3	0	1	-1.874e-4	3	NC	1	NC	1
257		15	max	0	1	0	2	0	3	1.869e-4	1	NC	1	NC	1
258			min	0	3	-.002	3	0	1	-1.784e-4	3	NC	1	NC	1
259		16	max	0	1	0	2	0	3	1.532e-4	1	NC	1	NC	1
260			min	0	3	-.002	3	0	1	-1.693e-4	3	NC	1	NC	1
261		17	max	0	1	0	2	0	3	1.195e-4	1	NC	1	NC	1
262			min	0	3	-.001	3	0	1	-1.602e-4	3	NC	1	NC	1
263		18	max	0	1	0	2	0	3	8.574e-5	1	NC	1	NC	1
264			min	0	3	0	3	0	1	-1.512e-4	3	NC	1	NC	1
265		19	max	0	1	0	1	0	1	5.2e-5	1	NC	1	NC	1
266			min	0	1	0	1	0	1	-1.421e-4	3	NC	1	NC	1
267	M11	1	max	0	1	0	1	0	1	6.543e-5	3	NC	1	NC	1
268			min	0	1	0	1	0	1	-2.465e-5	1	NC	1	NC	1
269		2	max	0	3	0	2	0	1	4.996e-5	3	NC	1	NC	1
270			min	0	2	0	3	0	3	-5.583e-5	1	NC	1	NC	1
271		3	max	0	3	0	2	0	2	3.449e-5	3	NC	1	NC	1
272			min	0	2	-.002	3	0	3	-8.701e-5	1	NC	1	NC	1
273		4	max	0	3	0	2	0	10	1.901e-5	3	NC	1	NC	1
274			min	0	2	-.002	3	0	3	-1.182e-4	1	NC	1	NC	1
275		5	max	0	3	0	2	0	10	3.538e-6	3	NC	1	NC	1
276			min	0	2	-.003	3	-.001	3	-1.494e-4	1	NC	1	NC	1
277		6	max	0	3	0	2	0	10	-6.565e-6	15	NC	1	NC	1
278			min	0	2	-.004	3	-.001	3	-1.806e-4	1	NC	1	NC	1
279		7	max	0	3	0	2	0	10	-7.678e-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	-.004	3	-.002	3	-2.117e-4	1	NC	1	NC	1
281		8	max	0	3	0	2	0	10	-8.79e-6	15	NC	1	NC	1
282			min	0	2	-.005	3	-.002	3	-2.429e-4	1	NC	1	NC	1
283		9	max	0	3	.001	2	0	10	-9.902e-6	15	NC	1	NC	1
284			min	0	2	-.006	3	-.002	1	-2.741e-4	1	NC	1	NC	1
285		10	max	0	3	.002	2	0	15	-1.101e-5	15	NC	1	NC	1
286			min	0	2	-.006	3	-.003	1	-3.053e-4	1	NC	1	NC	1
287		11	max	0	3	.002	2	0	15	-1.213e-5	15	NC	1	NC	1
288			min	0	2	-.006	3	-.003	1	-3.365e-4	1	NC	1	NC	1
289		12	max	0	3	.003	2	0	15	-1.324e-5	15	NC	1	NC	1
290			min	0	2	-.007	3	-.004	1	-3.677e-4	1	NC	1	NC	1
291		13	max	0	3	.003	2	0	15	-1.435e-5	15	NC	1	NC	1
292			min	0	2	-.007	3	-.005	1	-3.988e-4	1	NC	1	NC	1
293		14	max	0	3	.004	2	0	15	-1.546e-5	15	NC	1	NC	2
294			min	0	2	-.007	3	-.005	1	-4.3e-4	1	NC	1	8956.484	1
295		15	max	0	3	.005	2	0	15	-1.658e-5	15	NC	1	NC	2
296			min	0	2	-.007	3	-.006	1	-4.612e-4	1	9746.163	2	7972.274	1
297		16	max	0	3	.006	2	0	15	-1.769e-5	15	NC	1	NC	2
298			min	0	2	-.007	3	-.006	1	-4.924e-4	1	8216.876	2	7199.209	1
299		17	max	0	3	.007	2	0	15	-1.88e-5	15	NC	3	NC	2
300			min	0	2	-.007	3	-.007	1	-5.236e-4	1	7041.55	2	6585.536	1
301		18	max	0	3	.008	2	0	15	-1.991e-5	15	NC	3	NC	2
302			min	0	2	-.007	3	-.008	1	-5.547e-4	1	6127.363	2	6095.524	1
303		19	max	0	3	.009	2	0	15	-2.103e-5	15	NC	3	NC	2
304			min	0	2	-.007	3	-.008	1	-5.859e-4	1	5409.568	2	5704.07	1
305	M12	1	max	.002	1	.008	2	.007	1	5.039e-4	1	NC	1	NC	3
306			min	0	3	-.006	3	0	15	1.81e-5	15	NC	1	2833.328	1
307		2	max	.002	1	.007	2	.006	1	5.039e-4	1	NC	1	NC	3
308			min	0	3	-.006	3	0	15	1.81e-5	15	NC	1	3090.206	1
309		3	max	.002	1	.007	2	.006	1	5.039e-4	1	NC	1	NC	2
310			min	0	3	-.006	3	0	15	1.81e-5	15	NC	1	3395.966	1
311		4	max	.002	1	.007	2	.005	1	5.039e-4	1	NC	1	NC	2
312			min	0	3	-.005	3	0	15	1.81e-5	15	NC	1	3763.493	1
313		5	max	.002	1	.006	2	.005	1	5.039e-4	1	NC	1	NC	2
314			min	0	3	-.005	3	0	15	1.81e-5	15	NC	1	4210.344	1
315		6	max	.001	1	.006	2	.004	1	5.039e-4	1	NC	1	NC	2
316			min	0	3	-.005	3	0	15	1.81e-5	15	NC	1	4760.937	1
317		7	max	.001	1	.005	2	.004	1	5.039e-4	1	NC	1	NC	2
318			min	0	3	-.004	3	0	15	1.81e-5	15	NC	1	5450.054	1
319		8	max	.001	1	.005	2	.003	1	5.039e-4	1	NC	1	NC	2
320			min	0	3	-.004	3	0	15	1.81e-5	15	NC	1	6328.627	1
321		9	max	.001	1	.004	2	.003	1	5.039e-4	1	NC	1	NC	2
322			min	0	3	-.004	3	0	15	1.81e-5	15	NC	1	7473.706	1
323		10	max	.001	1	.004	2	.002	1	5.039e-4	1	NC	1	NC	2
324			min	0	3	-.003	3	0	15	1.81e-5	15	NC	1	9006.424	1
325		11	max	0	1	.003	2	.002	1	5.039e-4	1	NC	1	NC	1
326			min	0	3	-.003	3	0	15	1.81e-5	15	NC	1	NC	1
327		12	max	0	1	.003	2	.001	1	5.039e-4	1	NC	1	NC	1
328			min	0	3	-.002	3	0	15	1.81e-5	15	NC	1	NC	1
329		13	max	0	1	.003	2	.001	1	5.039e-4	1	NC	1	NC	1
330			min	0	3	-.002	3	0	15	1.81e-5	15	NC	1	NC	1
331		14	max	0	1	.002	2	0	1	5.039e-4	1	NC	1	NC	1
332			min	0	3	-.002	3	0	15	1.81e-5	15	NC	1	NC	1
333		15	max	0	1	.002	2	0	1	5.039e-4	1	NC	1	NC	1
334			min	0	3	-.001	3	0	15	1.81e-5	15	NC	1	NC	1
335		16	max	0	1	.001	2	0	1	5.039e-4	1	NC	1	NC	1
336			min	0	3	-.001	3	0	15	1.81e-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	0	2	0	1	5.039e-4	1	NC	1	NC	1
338			min	0	3	0	3	0	15	1.81e-5	15	NC	1	NC	1
339		18	max	0	1	0	2	0	1	5.039e-4	1	NC	1	NC	1
340			min	0	3	0	3	0	15	1.81e-5	15	NC	1	NC	1
341		19	max	0	1	0	1	0	1	5.039e-4	1	NC	1	NC	1
342			min	0	1	0	1	0	1	1.81e-5	15	NC	1	NC	1
343	M1	1	max	.006	3	.022	3	.002	3	1.557e-2	1	NC	1	NC	1
344			min	-.007	2	-.022	1	-.004	1	-1.725e-2	3	NC	1	NC	1
345		2	max	.006	3	.012	3	.001	3	7.518e-3	1	NC	4	NC	1
346			min	-.007	2	-.012	1	-.007	1	-8.527e-3	3	4601.369	1	NC	1
347		3	max	.006	3	.003	3	.001	3	3.781e-5	3	NC	4	NC	2
348			min	-.007	2	-.003	1	-.009	1	-3.872e-4	1	2373.387	1	8867.357	1
349		4	max	.006	3	.006	2	0	3	3.864e-5	3	NC	4	NC	2
350			min	-.007	2	-.004	3	-.01	1	-3.262e-4	1	1676.657	1	7351.752	1
351		5	max	.006	3	.012	1	0	3	3.948e-5	3	NC	5	NC	2
352			min	-.007	2	-.011	3	-.01	1	-2.652e-4	1	1341.73	1	7078.312	1
353		6	max	.006	3	.018	1	0	3	4.031e-5	3	NC	5	NC	2
354			min	-.007	2	-.016	3	-.009	1	-2.042e-4	1	1152.284	1	7603.981	1
355		7	max	.006	3	.022	1	0	3	4.115e-5	3	NC	5	NC	2
356			min	-.007	2	-.019	3	-.008	1	-1.433e-4	1	1037.403	1	9112.986	1
357		8	max	.006	3	.025	2	0	3	4.198e-5	3	NC	5	NC	1
358			min	-.007	2	-.022	3	-.007	1	-8.229e-5	1	967.598	1	NC	1
359		9	max	.006	3	.028	2	0	3	4.281e-5	3	NC	5	NC	1
360			min	-.007	2	-.023	3	-.005	1	-2.131e-5	1	927.941	2	NC	1
361		10	max	.006	3	.028	2	0	3	4.365e-5	3	NC	5	NC	1
362			min	-.007	2	-.023	3	-.003	1	1.618e-6	15	908.09	2	NC	1
363		11	max	.006	3	.028	2	0	3	1.006e-4	1	NC	5	NC	1
364			min	-.007	2	-.023	3	0	1	3.653e-6	15	911.254	2	NC	1
365		12	max	.006	3	.026	2	0	1	1.616e-4	1	NC	5	NC	1
366			min	-.007	2	-.021	3	0	15	5.688e-6	15	938.619	2	NC	1
367		13	max	.006	3	.023	2	.002	1	2.226e-4	1	NC	5	NC	2
368			min	-.007	2	-.018	3	0	15	7.723e-6	15	995.588	2	9449.416	1
369		14	max	.006	3	.018	2	.003	1	2.836e-4	1	NC	5	NC	2
370			min	-.007	2	-.014	3	0	15	9.758e-6	15	1094.466	2	7811.354	1
371		15	max	.006	3	.012	2	.004	1	3.446e-4	1	NC	5	NC	2
372			min	-.007	2	-.009	3	0	15	1.179e-5	15	1262.086	2	7229.629	1
373		16	max	.006	3	.005	2	.004	1	3.889e-4	1	NC	4	NC	2
374			min	-.007	2	-.004	3	0	15	1.329e-5	15	1563.514	2	7475.01	1
375		17	max	.006	3	.002	3	.003	1	3.829e-5	1	NC	4	NC	2
376			min	-.007	2	-.004	2	0	15	1.889e-6	15	2202.334	2	8988.684	1
377		18	max	.006	3	.009	3	0	1	9.074e-3	2	NC	4	NC	1
378			min	-.007	2	-.015	2	0	15	-4.026e-3	3	4258.612	2	NC	1
379		19	max	.006	3	.017	3	0	3	1.829e-2	2	NC	1	NC	1
380			min	-.007	2	-.026	2	-.002	1	-8.161e-3	3	NC	1	NC	1
381	M5	1	max	.019	3	.072	3	.002	3	1.418e-6	3	NC	1	NC	1
382			min	-.024	2	-.074	1	-.004	1	3.265e-8	15	NC	1	NC	1
383		2	max	.019	3	.04	3	.003	3	6.778e-5	3	NC	5	NC	1
384			min	-.024	2	-.04	1	-.004	1	-7.736e-5	1	1362.033	1	NC	1
385		3	max	.019	3	.01	3	.003	3	1.329e-4	3	NC	5	NC	1
386			min	-.024	2	-.009	1	-.004	1	-1.533e-4	1	701.845	1	NC	1
387		4	max	.019	3	.019	1	.004	3	1.307e-4	3	NC	5	NC	1
388			min	-.024	2	-.014	3	-.004	1	-1.457e-4	1	494.912	1	NC	1
389		5	max	.019	3	.042	1	.004	3	1.286e-4	3	NC	5	NC	1
390			min	-.024	2	-.035	3	-.003	1	-1.382e-4	1	395.315	1	NC	1
391		6	max	.019	3	.061	1	.005	3	1.265e-4	3	NC	5	NC	1
392			min	-.024	2	-.051	3	-.003	1	-1.307e-4	1	338.881	1	NC	1
393		7	max	.019	3	.076	1	.005	3	1.243e-4	3	NC	15	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
394			min	-.024	2	-.063	3	-.003	1	-1.231e-4	1	304.558	1	NC	1
395		8	max	.019	3	.087	1	.005	3	1.222e-4	3	NC	15	NC	1
396			min	-.024	2	-.071	3	-.003	1	-1.156e-4	1	283.586	1	NC	1
397		9	max	.018	3	.094	1	.004	3	1.201e-4	3	NC	15	NC	1
398			min	-.024	2	-.075	3	-.003	1	-1.081e-4	1	271.864	1	NC	1
399		10	max	.018	3	.096	1	.004	3	1.18e-4	3	NC	15	NC	1
400			min	-.024	2	-.076	3	-.003	1	-1.006e-4	1	267.487	1	NC	1
401		11	max	.018	3	.094	1	.004	3	1.158e-4	3	NC	15	NC	1
402			min	-.024	2	-.073	3	-.003	1	-9.302e-5	1	269.847	1	NC	1
403		12	max	.018	3	.087	1	.004	3	1.137e-4	3	NC	15	NC	1
404			min	-.024	2	-.067	3	-.002	1	-8.549e-5	1	279.399	1	NC	1
405		13	max	.018	3	.077	2	.003	3	1.116e-4	3	NC	15	NC	1
406			min	-.024	2	-.058	3	-.002	1	-7.796e-5	1	297.804	2	NC	1
407		14	max	.018	3	.062	2	.003	3	1.094e-4	3	NC	5	NC	1
408			min	-.024	2	-.046	3	-.002	1	-7.043e-5	1	327.348	2	NC	1
409		15	max	.018	3	.042	2	.002	3	1.073e-4	3	NC	5	NC	1
410			min	-.024	2	-.031	3	-.002	1	-6.29e-5	1	377.512	2	NC	1
411		16	max	.018	3	.017	2	.002	3	1.023e-4	3	NC	5	NC	1
412			min	-.024	2	-.013	3	-.002	1	-5.904e-5	1	467.863	2	NC	1
413		17	max	.018	3	.008	3	.001	3	2.99e-5	3	NC	5	NC	1
414			min	-.024	2	-.014	2	-.002	1	-1.426e-4	1	659.994	2	NC	1
415		18	max	.018	3	.03	3	0	3	1.43e-5	3	NC	5	NC	1
416			min	-.024	2	-.049	2	-.002	1	-7.276e-5	1	1277.121	2	NC	1
417		19	max	.018	3	.054	3	0	3	0	1	NC	1	NC	1
418			min	-.024	2	-.087	2	-.002	1	-2.351e-7	3	NC	1	NC	1
419	M9	1	max	.006	3	.022	3	.001	3	1.726e-2	3	NC	1	NC	1
420			min	-.007	2	-.022	1	-.004	1	-1.557e-2	1	NC	1	NC	1
421		2	max	.006	3	.012	3	0	3	8.549e-3	3	NC	4	NC	1
422			min	-.007	2	-.012	1	0	1	-7.678e-3	1	4602.927	1	NC	1
423		3	max	.006	3	.003	3	.001	1	6.934e-5	1	NC	4	NC	1
424			min	-.007	2	-.003	1	0	3	2.352e-6	15	2374.215	1	NC	1
425		4	max	.006	3	.005	2	.002	1	2.511e-5	2	NC	4	NC	1
426			min	-.007	2	-.005	3	0	3	-4.299e-6	3	1677.245	1	NC	1
427		5	max	.006	3	.012	1	.003	1	7.829e-6	10	NC	5	NC	1
428			min	-.007	2	-.011	3	-.002	3	-2.544e-5	1	1342.183	1	NC	1
429		6	max	.006	3	.018	1	.003	1	4.111e-6	10	NC	5	NC	1
430			min	-.007	2	-.016	3	-.002	3	-7.283e-5	1	1152.652	1	NC	1
431		7	max	.006	3	.022	1	.002	1	3.931e-7	10	NC	5	NC	1
432			min	-.007	2	-.019	3	-.002	3	-1.202e-4	1	1037.713	1	NC	1
433		8	max	.006	3	.025	2	0	2	-3.325e-6	10	NC	5	NC	1
434			min	-.007	2	-.022	3	-.003	3	-1.676e-4	1	967.866	1	NC	1
435		9	max	.006	3	.028	2	0	10	-7.042e-6	10	NC	5	NC	1
436			min	-.007	2	-.023	3	-.003	3	-2.15e-4	1	928.439	2	NC	1
437		10	max	.006	3	.028	2	0	10	-9.308e-6	15	NC	5	NC	1
438			min	-.007	2	-.024	3	-.003	3	-2.624e-4	1	908.567	2	NC	1
439		11	max	.006	3	.028	2	0	10	-1.097e-5	15	NC	5	NC	1
440			min	-.007	2	-.023	3	-.004	1	-3.098e-4	1	911.723	2	NC	1
441		12	max	.006	3	.026	2	0	15	-1.264e-5	15	NC	5	NC	1
442			min	-.007	2	-.021	3	-.006	1	-3.572e-4	1	939.091	2	NC	1
443		13	max	.006	3	.023	2	0	15	-1.431e-5	15	NC	5	NC	2
444			min	-.007	2	-.018	3	-.007	1	-4.046e-4	1	996.076	2	8058.332	1
445		14	max	.006	3	.018	2	0	15	-1.597e-5	15	NC	5	NC	2
446			min	-.007	2	-.014	3	-.008	1	-4.52e-4	1	1094.989	2	7022.599	1
447		15	max	.006	3	.012	2	0	15	-1.764e-5	15	NC	5	NC	2
448			min	-.007	2	-.01	3	-.008	1	-4.993e-4	1	1262.67	2	6707.776	1
449		16	max	.006	3	.005	2	0	15	-1.889e-5	15	NC	4	NC	2
450			min	-.007	2	-.004	3	-.008	1	-5.364e-4	1	1564.209	2	7078.674	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	.006	3	.002	3	0	15	-4.684e-6	12	NC	4	NC	2
452			min	-.007	2	-.004	2	-.007	1	-3.264e-4	1	2203.245	2	8632.296	1
453		18	max	.006	3	.009	3	0	15	4.04e-3	3	NC	4	NC	1
454			min	-.007	2	-.015	2	-.005	1	-9.123e-3	1	4260.316	2	NC	1
455		19	max	.006	3	.017	3	0	3	8.16e-3	3	NC	1	NC	1
456			min	-.007	2	-.026	2	-.001	1	-1.829e-2	2	NC	1	NC	1
457	M13	1	max	.004	1	.022	3	.006	3	3.694e-3	3	NC	1	NC	1
458			min	-.001	3	-.022	1	-.007	2	-3.811e-3	1	NC	1	NC	1
459		2	max	.004	1	.155	3	.016	1	4.623e-3	3	NC	5	NC	2
460			min	-.002	3	-.142	1	-.002	10	-4.814e-3	1	1080.297	3	7195.18	1
461		3	max	.004	1	.264	3	.042	1	5.552e-3	3	NC	5	NC	3
462			min	-.002	3	-.241	1	0	10	-5.817e-3	1	593.552	3	3101.501	1
463		4	max	.004	1	.334	3	.064	1	6.481e-3	3	NC	5	NC	3
464			min	-.002	3	-.304	1	0	10	-6.82e-3	1	461.91	3	2117.962	1
465		5	max	.004	1	.355	3	.074	1	7.41e-3	3	NC	5	NC	3
466			min	-.002	3	-.324	1	0	10	-7.823e-3	1	432.36	3	1856.362	1
467		6	max	.004	1	.329	3	.068	1	8.339e-3	3	NC	5	NC	3
468			min	-.002	3	-.302	1	-.002	10	-8.826e-3	1	468.483	3	1994.992	1
469		7	max	.004	1	.266	3	.049	1	9.268e-3	3	NC	5	NC	2
470			min	-.002	3	-.247	1	-.005	10	-9.829e-3	1	589.985	3	2719.05	1
471		8	max	.004	1	.183	3	.021	1	1.02e-2	3	NC	5	NC	2
472			min	-.002	3	-.173	1	-.008	10	-1.083e-2	1	894.231	3	5718.509	1
473		9	max	.004	1	.107	3	.017	3	1.113e-2	3	NC	5	NC	1
474			min	-.002	3	-.105	1	-.018	2	-1.184e-2	1	1701.173	3	NC	1
475		10	max	.004	1	.072	3	.019	3	1.206e-2	3	NC	4	NC	1
476			min	-.002	3	-.074	1	-.024	2	-1.284e-2	1	2755.574	1	8440.14	2
477		11	max	.004	1	.107	3	.021	3	1.113e-2	3	NC	5	NC	1
478			min	-.002	3	-.105	1	-.018	2	-1.184e-2	1	1701.172	3	9713.525	3
479		12	max	.004	1	.183	3	.022	3	1.02e-2	3	NC	5	NC	2
480			min	-.002	3	-.173	1	-.008	10	-1.083e-2	1	894.231	3	5636.349	1
481		13	max	.004	1	.266	3	.049	1	9.27e-3	3	NC	5	NC	2
482			min	-.002	3	-.247	1	-.005	10	-9.83e-3	1	589.985	3	2704.704	1
483		14	max	.004	1	.329	3	.068	1	8.342e-3	3	NC	5	NC	5
484			min	-.002	3	-.302	1	-.002	10	-8.827e-3	1	468.483	3	1992.237	1
485		15	max	.004	1	.355	3	.073	1	7.413e-3	3	NC	5	NC	3
486			min	-.002	3	-.324	1	0	10	-7.824e-3	1	432.36	3	1859.056	1
487		16	max	.004	1	.334	3	.064	1	6.485e-3	3	NC	5	NC	3
488			min	-.002	3	-.304	1	0	10	-6.821e-3	1	461.91	3	2127.104	1
489		17	max	.004	1	.265	3	.042	1	5.557e-3	3	NC	5	NC	3
490			min	-.002	3	-.241	1	0	10	-5.818e-3	1	593.552	3	3126.814	1
491		18	max	.004	1	.155	3	.016	1	4.628e-3	3	NC	5	NC	2
492			min	-.002	3	-.142	1	-.002	10	-4.814e-3	1	1080.297	3	7304.56	1
493		19	max	.004	1	.022	3	.006	3	3.7e-3	3	NC	1	NC	1
494			min	-.002	3	-.022	1	-.007	2	-3.811e-3	1	NC	1	NC	1
495	M16	1	max	.001	1	.017	3	.006	3	4.278e-3	2	NC	1	NC	1
496			min	0	3	-.026	2	-.007	2	-2.792e-3	3	NC	1	NC	1
497		2	max	.001	1	.08	3	.016	1	5.39e-3	2	NC	5	NC	2
498			min	0	3	-.167	2	-.003	10	-3.482e-3	3	1019.004	2	7207.426	1
499		3	max	.002	1	.132	3	.042	1	6.502e-3	2	NC	5	NC	3
500			min	0	3	-.283	2	0	10	-4.172e-3	3	559.404	2	3106.206	1
501		4	max	.002	1	.166	3	.064	1	7.614e-3	2	NC	5	NC	3
502			min	0	3	-.357	2	0	10	-4.861e-3	3	434.67	2	2121.355	1
503		5	max	.002	1	.177	3	.073	1	8.726e-3	2	NC	5	NC	3
504			min	0	3	-.381	2	0	10	-5.551e-3	3	405.817	2	1859.936	1
505		6	max	.002	1	.168	3	.068	1	9.838e-3	2	NC	5	NC	5
506			min	0	3	-.355	2	-.002	10	-6.241e-3	3	437.777	2	2000.286	1
507		7	max	.002	1	.14	3	.048	1	1.095e-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	-.289	2	-.005	10	-6.931e-3	3	546.767	2	2731.141	1
509		8	max	.002	1	.104	3	.021	3	1.206e-2	2	NC	5	NC	2
510			min	0	3	-.203	2	-.009	10	-7.621e-3	3	814.157	2	5782.606	1
511		9	max	.002	1	.07	3	.02	3	1.317e-2	2	NC	5	NC	1
512			min	0	3	-.123	2	-.019	2	-8.31e-3	3	1482.717	2	NC	1
513		10	max	.002	1	.054	3	.018	3	1.429e-2	2	NC	4	NC	3
514			min	0	3	-.087	2	-.024	2	-9.e-3	3	2371.303	2	8373.057	2
515		11	max	.002	1	.07	3	.018	3	1.317e-2	2	NC	5	NC	1
516			min	0	3	-.123	2	-.019	2	-8.31e-3	3	1482.717	2	NC	1
517		12	max	.002	1	.104	3	.021	1	1.206e-2	2	NC	5	NC	2
518			min	0	3	-.203	2	-.009	10	-7.619e-3	3	814.157	2	5730.62	1
519		13	max	.002	1	.14	3	.048	1	1.095e-2	2	NC	5	NC	2
520			min	0	3	-.289	2	-.005	10	-6.929e-3	3	546.767	2	2725.857	1
521		14	max	.002	1	.168	3	.068	1	9.839e-3	2	NC	5	NC	3
522			min	0	3	-.355	2	-.002	10	-6.238e-3	3	437.777	2	2002.946	1
523		15	max	.002	1	.177	3	.073	1	8.727e-3	2	NC	5	NC	3
524			min	0	3	-.381	2	0	10	-5.548e-3	3	405.817	2	1867.286	1
525		16	max	.002	1	.166	3	.063	1	7.615e-3	2	NC	5	NC	3
526			min	0	3	-.357	2	0	10	-4.858e-3	3	434.67	2	2135.908	1
527		17	max	.002	1	.132	3	.041	1	6.504e-3	2	NC	5	NC	3
528			min	0	3	-.283	2	0	10	-4.167e-3	3	559.404	2	3140.492	1
529		18	max	.002	1	.08	3	.015	1	5.392e-3	2	NC	5	NC	2
530			min	0	3	-.167	2	-.003	10	-3.477e-3	3	1019.004	2	7344.496	1
531		19	max	.002	1	.017	3	.006	3	4.28e-3	2	NC	1	NC	1
532			min	0	3	-.026	2	-.007	2	-2.786e-3	3	NC	1	NC	1
533	M15	1	max	0	1	0	1	0	1	3.264e-4	3	NC	1	NC	1
534			min	0	1	0	1	0	1	-6.271e-5	2	NC	1	NC	1
535		2	max	0	3	-.002	15	.001	1	8.244e-4	3	NC	1	NC	1
536			min	0	2	-.009	4	0	3	-5.935e-4	2	9359.498	4	NC	1
537		3	max	0	3	-.004	15	.004	1	1.322e-3	3	NC	5	NC	1
538			min	0	2	-.017	4	-.003	3	-1.159e-3	1	4762.729	4	NC	1
539		4	max	0	3	-.006	15	.007	1	1.82e-3	3	NC	15	NC	4
540			min	0	2	-.024	4	-.007	3	-1.729e-3	1	3267.51	4	7411.626	1
541		5	max	0	3	-.007	15	.012	1	2.318e-3	3	NC	15	NC	4
542			min	0	2	-.031	4	-.011	3	-2.299e-3	1	2549.671	4	4858.769	1
543		6	max	0	3	-.009	15	.017	1	2.816e-3	3	9128.618	15	NC	4
544			min	0	2	-.037	4	-.016	3	-2.869e-3	1	2145.818	4	3534.915	1
545		7	max	0	3	-.01	15	.022	1	3.314e-3	3	8095.437	15	NC	4
546			min	0	2	-.042	4	-.02	3	-3.44e-3	1	1902.953	4	2761.685	1
547		8	max	0	3	-.011	15	.027	1	3.812e-3	3	7475.374	15	NC	4
548			min	0	2	-.046	4	-.025	3	-4.01e-3	1	1757.198	4	2275.995	1
549		9	max	0	3	-.011	15	.031	1	4.31e-3	3	7141.618	15	NC	4
550			min	0	2	-.048	4	-.029	3	-4.58e-3	1	1678.744	4	1958.318	1
551		10	max	0	3	-.011	15	.035	1	4.808e-3	3	7036.034	15	NC	5
552			min	-.001	2	-.048	4	-.033	3	-5.151e-3	1	1653.925	4	1748.685	1
553		11	max	0	3	-.011	15	.038	1	5.306e-3	3	7141.618	15	NC	5
554			min	-.001	2	-.048	4	-.035	3	-5.721e-3	1	1678.744	4	1615.629	1
555		12	max	0	3	-.011	15	.039	1	5.804e-3	3	7475.374	15	NC	5
556			min	-.001	2	-.046	4	-.036	3	-6.291e-3	1	1757.198	4	1543.524	1
557		13	max	0	3	-.01	15	.038	1	6.302e-3	3	8095.437	15	NC	5
558			min	-.001	2	-.042	4	-.036	3	-6.862e-3	1	1902.953	4	1527.793	1
559		14	max	0	3	-.009	15	.035	1	6.8e-3	3	9128.618	15	NC	5
560			min	-.001	2	-.038	4	-.033	3	-7.432e-3	1	2145.818	4	1575.039	1
561		15	max	0	3	-.007	15	.03	1	7.298e-3	3	NC	15	NC	4
562			min	-.002	2	-.032	4	-.028	3	-8.002e-3	1	2549.671	4	1709.682	1
563		16	max	0	3	-.006	15	.022	1	7.796e-3	3	NC	15	NC	4
564			min	-.002	2	-.025	4	-.02	3	-8.572e-3	1	3267.51	4	1998.103	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
565		17	max	0	3	-.004	15	.011	1	8.294e-3	3	NC	5	NC	4
566			min	-.002	2	-.018	4	-.01	3	-9.143e-3	1	4762.729	4	2648.617	1
567		18	max	0	3	-.001	12	.004	3	8.792e-3	3	NC	1	NC	4
568			min	-.002	2	-.009	4	-.008	2	-9.713e-3	1	9359.498	4	4715.102	1
569		19	max	.001	3	.004	3	.021	3	9.29e-3	3	NC	1	NC	1
570			min	-.002	2	-.003	1	-.025	2	-1.028e-2	1	NC	1	NC	1
571	M16A	1	max	0	10	0	3	.007	3	2.754e-3	3	NC	1	NC	1
572			min	0	3	-.001	1	-.007	2	-2.793e-3	2	NC	1	NC	1
573		2	max	0	10	-.002	15	.003	1	2.637e-3	3	NC	1	NC	1
574			min	0	3	-.009	4	-.001	10	-2.666e-3	2	9359.498	4	NC	1
575		3	max	0	10	-.004	15	.008	1	2.52e-3	3	NC	5	NC	4
576			min	0	3	-.017	4	-.004	3	-2.54e-3	2	4762.729	4	6184.553	1
577		4	max	0	10	-.006	15	.013	1	2.403e-3	3	NC	15	NC	4
578			min	0	3	-.025	4	-.008	3	-2.413e-3	2	3267.51	4	4698.544	1
579		5	max	0	10	-.007	15	.016	1	2.285e-3	3	NC	15	NC	4
580			min	0	3	-.032	4	-.01	3	-2.287e-3	2	2549.671	4	4052.654	1
581		6	max	0	10	-.009	15	.017	1	2.168e-3	3	9128.618	15	NC	4
582			min	0	3	-.037	4	-.012	3	-2.16e-3	2	2145.818	4	3767.997	1
583		7	max	0	10	-.01	15	.018	1	2.051e-3	3	8095.437	15	NC	4
584			min	0	3	-.042	4	-.012	3	-2.033e-3	2	1902.953	4	3694.192	1
585		8	max	0	10	-.011	15	.018	1	1.934e-3	3	7475.374	15	NC	4
586			min	0	3	-.045	4	-.012	3	-1.907e-3	2	1757.198	4	3779.314	1
587		9	max	0	10	-.011	15	.017	1	1.817e-3	3	7141.618	15	NC	4
588			min	0	3	-.048	4	-.012	3	-1.78e-3	2	1678.744	4	4015.385	1
589		10	max	0	10	-.011	15	.015	1	1.7e-3	3	7036.034	15	NC	4
590			min	0	3	-.048	4	-.01	3	-1.654e-3	2	1653.925	4	4425.43	1
591		11	max	0	10	-.011	15	.013	1	1.583e-3	3	7141.618	15	NC	4
592			min	0	3	-.047	4	-.009	3	-1.527e-3	2	1678.744	4	5068.119	1
593		12	max	0	10	-.011	15	.011	1	1.466e-3	3	7475.374	15	NC	4
594			min	0	3	-.045	4	-.007	3	-1.401e-3	2	1757.198	4	6059.964	1
595		13	max	0	10	-.01	15	.009	1	1.349e-3	3	8095.437	15	NC	2
596			min	0	3	-.042	4	-.006	3	-1.274e-3	2	1902.953	4	7632.222	1
597		14	max	0	10	-.009	15	.006	1	1.232e-3	3	9128.618	15	NC	1
598			min	0	3	-.037	4	-.004	3	-1.148e-3	2	2145.818	4	NC	1
599		15	max	0	10	-.007	15	.004	1	1.114e-3	3	NC	15	NC	1
600			min	0	3	-.031	4	-.002	3	-1.021e-3	2	2549.671	4	NC	1
601		16	max	0	10	-.006	15	.002	1	9.974e-4	3	NC	15	NC	1
602			min	0	3	-.024	4	-.001	3	-8.945e-4	2	3267.51	4	NC	1
603		17	max	0	10	-.004	15	0	1	8.803e-4	3	NC	5	NC	1
604			min	0	3	-.017	4	0	2	-7.679e-4	2	4762.729	4	NC	1
605		18	max	0	10	-.002	15	0	4	7.632e-4	3	NC	1	NC	1
606			min	0	3	-.009	4	0	2	-6.414e-4	2	9359.498	4	NC	1
607		19	max	0	1	0	1	0	1	6.461e-4	3	NC	1	NC	1
608			min	0	1	0	1	0	1	-5.148e-4	2	NC	1	NC	1

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

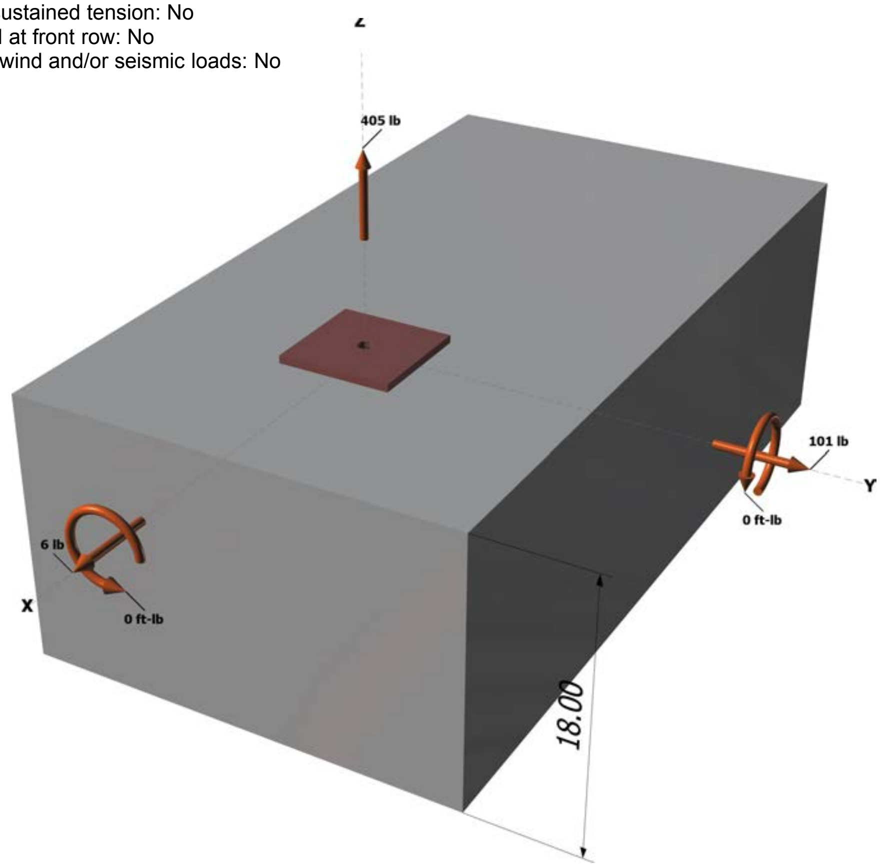
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

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

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

<Figure 1>



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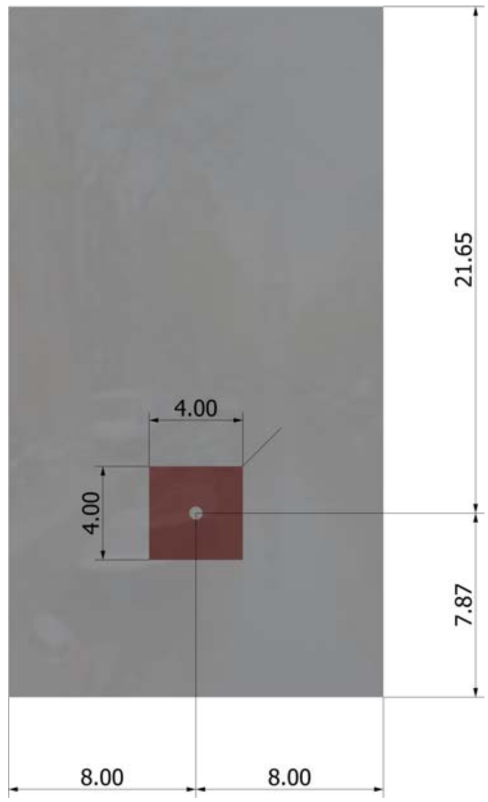


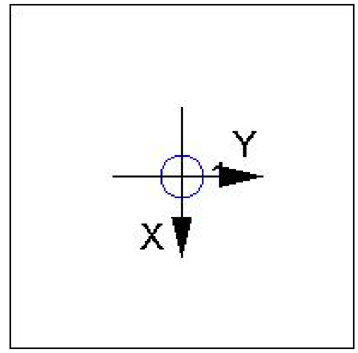
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

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

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

<Figure 3>



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

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

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

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

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

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

A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cb} (lb)
253.92	256.00	0.995	1.00	1.000	10469	0.65	6717

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

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in y-direction:

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

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

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

Shear parallel to edge in x-direction:

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

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

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

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

Shear parallel to edge in y-direction:

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

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

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

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

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

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

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

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

11. Results

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

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

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

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

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

12. Warnings

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

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

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

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

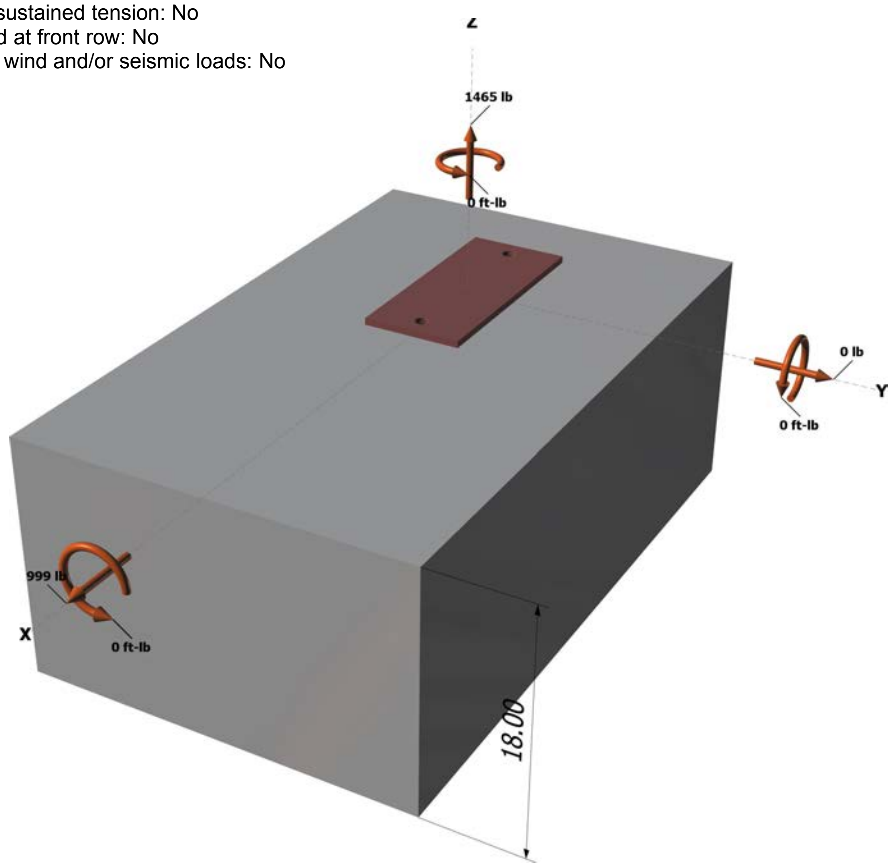
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

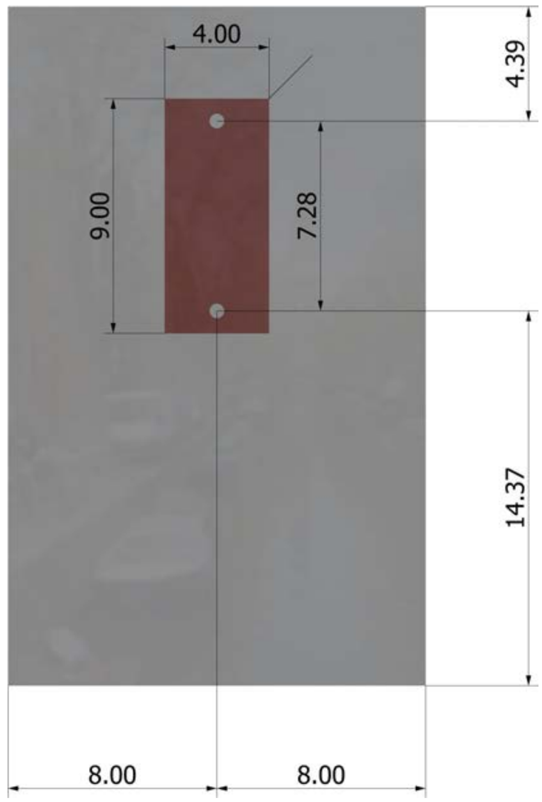
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout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

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

<Figure 1>



<Figure 2>



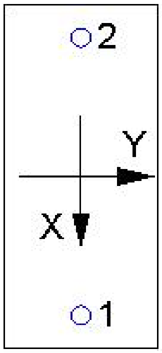
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

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

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

<Figure 3>



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

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

Shear parallel to edge in x-direction:

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

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

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

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

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

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

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

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

ϕV_{cpg} (lb)
15580

11. Results

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

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

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

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

Sec. D.7.3	0.20	0.25	45.0 %	1.2	Pass

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

12. Warnings

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

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

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