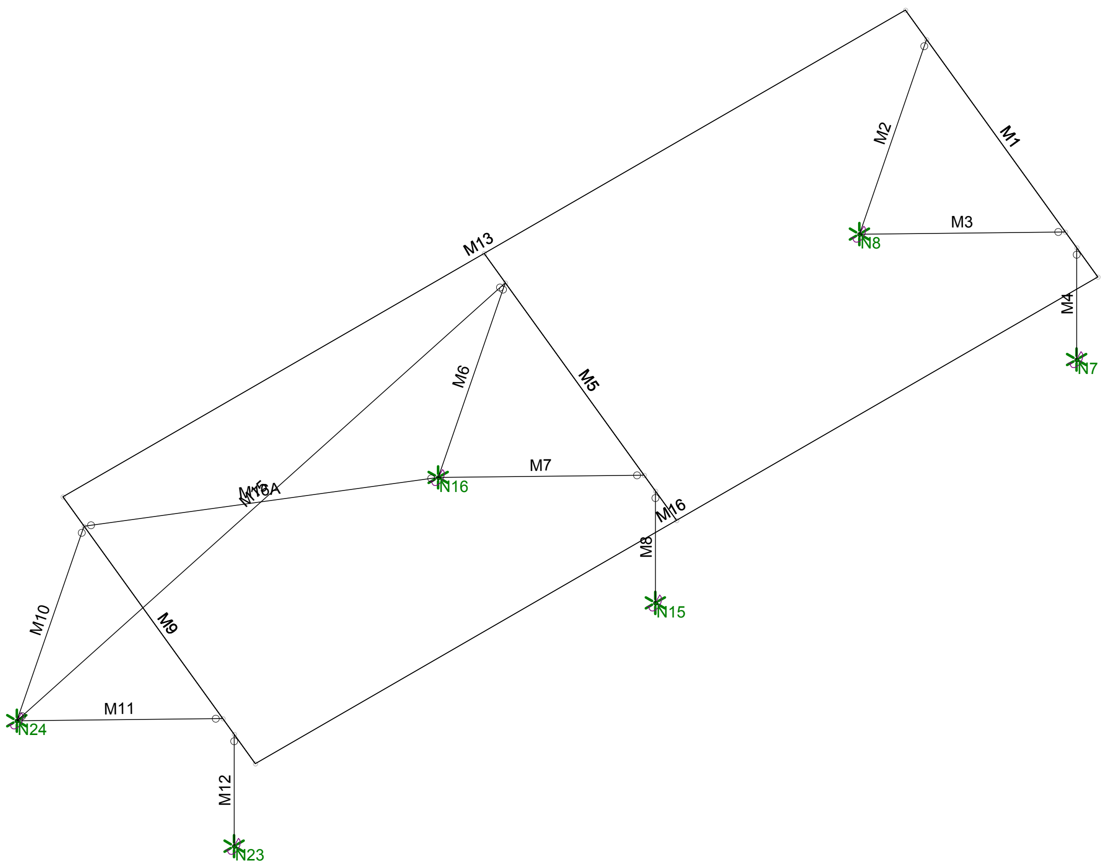


Schletter, Inc.		35° Tilt w/o Seismic Design
HCV	Standard PVMini Racking System	
	Representative Calculations - ASCE 7-10	

1. INTRODUCTION

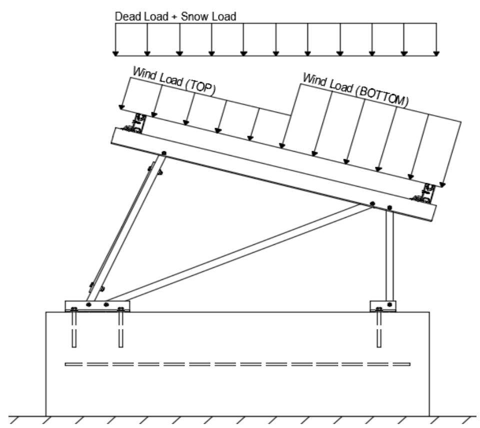
1.1 Project Description
The following sections will cover the determination of forces and structural design calculations for the Schletter, Inc. PVMini ground mount system.

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 =	35°
Maximum Height Above Grade =	3 ft



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

1.3 Technical Codes
- ASCE 7-10 - 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 =	14.43	psf	*(ASCE 7-10, Eq. 7.4-1)*
I_s =	1.00		
C_s =	0.64		
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

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

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

2.4 Seismic Loads - N/A

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

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

2.5 Combination of Loads

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

Strength Design, LRFD

Component stresses are checked using the following LRFD load combinations:

1.2D + 1.6S + 0.5W
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

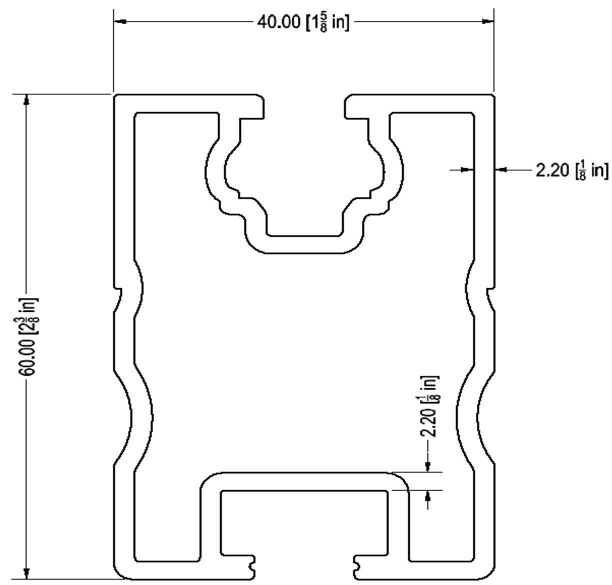
Front Struts	Location	**Bracing**
M4	Outer	M15
M8	Inner	M16A
M12	Outer	

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).

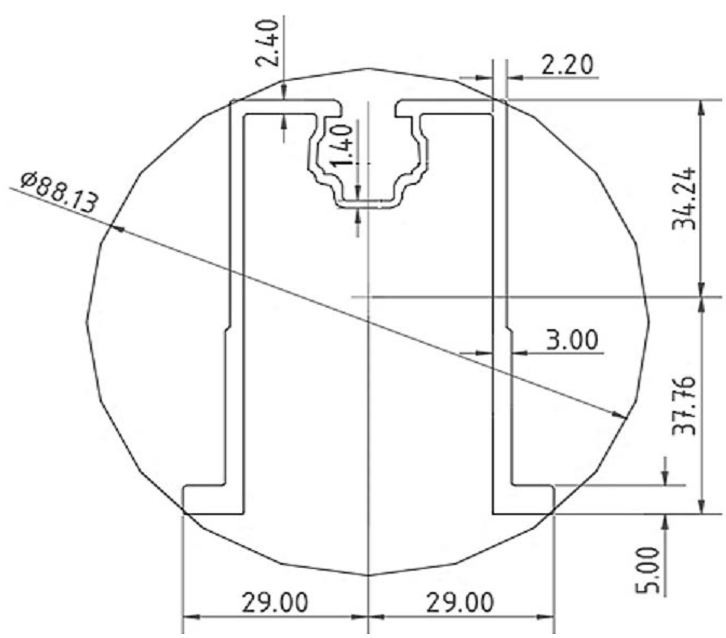
Purlin Type =	**ProfiPlus**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	63	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.20	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	28.47	ksi
S_y =	0.51	in^3
S_x =	0.37	in^3
E =	10100	ksi
I_y =	0.60	in^4
I_x =	0.29	in^4
A =	0.90	in^2
g =	1.08	lbs/ft
M_y =	0.570	k-ft
M_z =	0.053	k-ft
$M_{y\ allowable}$ =	1.243	k-ft
$M_{z\ allowable}$ =	0.871	k-ft
Utilization =	52%	



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).

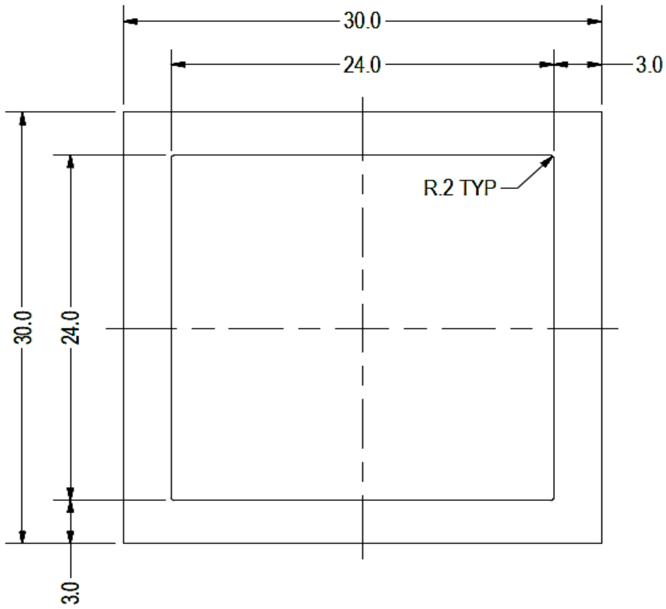
Girder Type =	**Flex Profi**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	33.78	in
$\Phi F_{ty\ AXIAL}$ =	14.29	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.59	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	13.46	ksi
S_y =	0.59	in^3
S_x =	0.46	in^3
E =	10100	ksi
I_y =	0.88	in^4
I_x =	0.52	in^4
A =	0.89	in^2
g =	1.07	lbs/ft
M_y =	0.613	k-ft
M_z =	0.000	k-ft
P_n =	0.282	k
$M_{y\ allowable}$ =	1.452	k-ft
$M_{z\ allowable}$ =	0.513	k-ft
$P_{n\ allowable}$ =	12.764	k
Utilization =	44%	



4.3 Front Strut Design

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

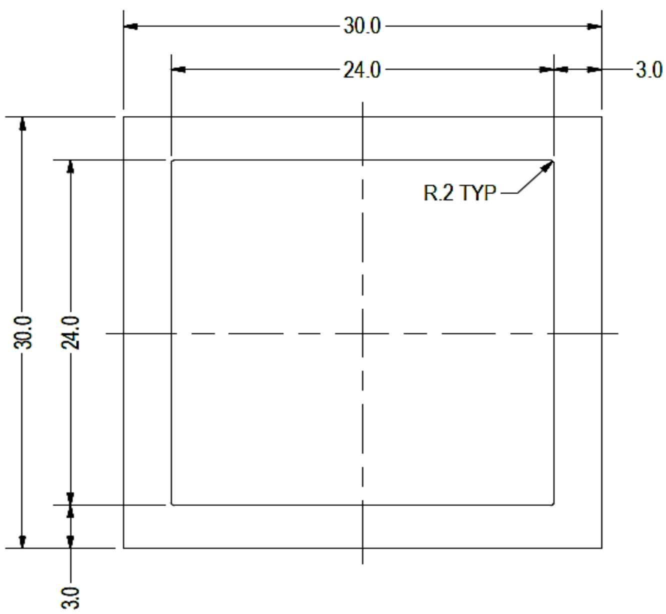
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	18.00	in
$\Phi F_{ty\ AXIAL}$ =	24.52	ksi
$\Phi F_{ty\ BENDING}$ =	31.19	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.790	k
$M_{y\ allowable}$ =	0.423	k-ft
$M_{z\ allowable}$ =	0.423	k-ft
$P_{n\ allowable}$ =	12.310	k
Utilization =	6%	



4.4 Diagonal Strut Design

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

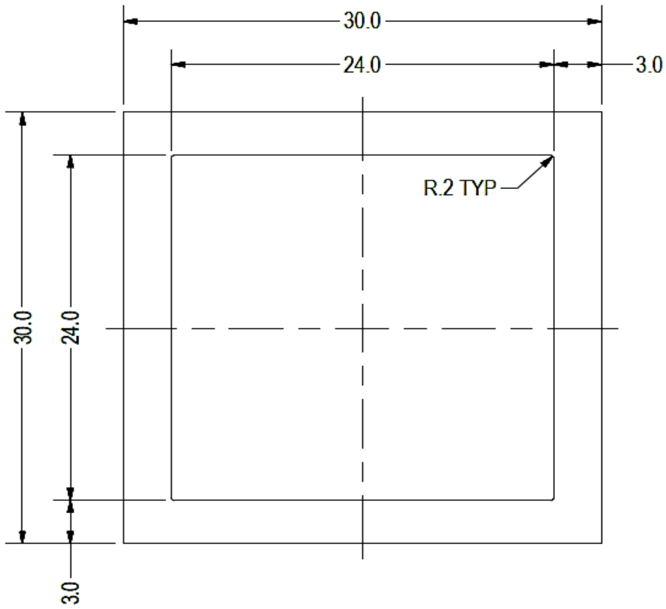
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	46.38	in
$\Phi F_{ty\ AXIAL}$ =	7.60	ksi
$\Phi F_{ty\ BENDING}$ =	29.80	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.778	k
$M_{y\ allowable}$ =	0.404	k-ft
$M_{z\ allowable}$ =	0.404	k-ft
$P_{n\ allowable}$ =	3.814	k
Utilization =	20%	



4.5 Rear Strut Design

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

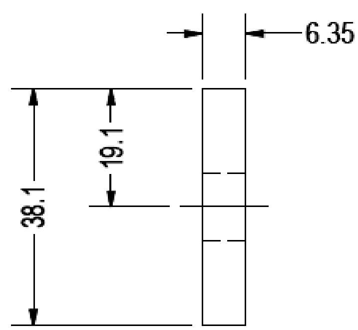
Strut Type =	**30x30x3**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	42.32	in
$\Phi F_{ty\ AXIAL}$ =	8.86	ksi
$\Phi F_{ty\ BENDING}$ =	29.96	ksi
S_y =	0.16	in^3
S_x =	0.16	in^3
E =	10100	ksi
I_y =	0.10	in^4
I_x =	0.10	in^4
A =	0.50	in^2
g =	0.60	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	0.678	k
$M_{y\ allowable}$ =	0.406	k-ft
$M_{z\ allowable}$ =	0.406	k-ft
$P_{n\ allowable}$ =	4.450	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 =	0.093	k
$M_{y\ allowable}$ =	0.046	k-ft
$P_{n\ allowable}$ =	11.813	k
Utilization =	7%	



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

5. FOUNDATION DESIGN CALCULATIONS

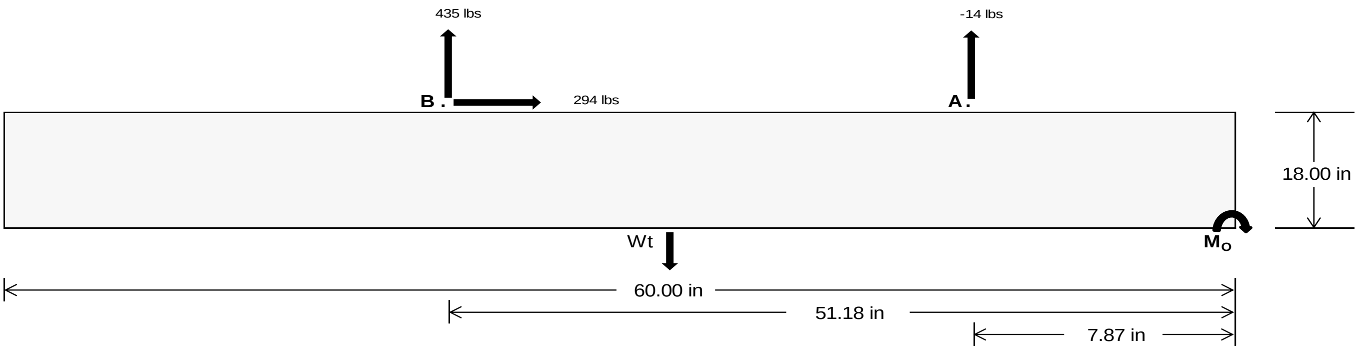
5.1 Helical Pile Foundations

The following LRFD loads include a safety factor of 1.3, and are to be used in conjunction with a Schletter, Inc. Geotechnical Investigation Report. The forces below should fall within the guidelines provided in the Geotechnical Investigation Report. If a Geotechnical Investigation Report is not present, please proceed to Section 5.2 for a concrete foundation design.

Maximum	Front	Rear	
Tensile Load =	25.26	1886.98	k
Compressive Load =	1027.54	1292.84	k
Lateral Load =	2.31	1273.65	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		Footing Reinforcement
Weight of Concrete =	145 pcf	*Use fiber reinforcing with (1) #5 rebar.*
Compressive Strength =	2500 psi	
Yield Strength =	60000 psi	

Overturning Check		
M_O =	27418.9 in-lbs	
Resisting Force Required =	913.96 lbs	*A minimum 60in long x 21in wide x 18in tall ballast foundation is required to resist overturning.*
S.F. =	1.67	
Weight Required =	1523.27 lbs	
Minimum Width =	21 in in	
Weight Provided =	1903.13 lbs	

Sliding		
Force =	293.75 lbs	
Friction =	0.4	*Use a 60in long x 21in wide x 18in tall ballast foundation to resist sliding. Friction is OK.*
Weight Required =	734.38 lbs	
Resisting Weight =	1903.13 lbs	
Additional Weight Required =	0 lbs	

Cohesion		
Sliding Force =	293.75 lbs	
Cohesion =	130 psf	
Area =	8.75 ft^2	*Use a 60in long x 21in wide x 18in tall ballast foundation. Cohesion is OK.*
Resisting =	951.56 lbs	
Additional Weight Required =	0 lbs	

Shear Key		
Additional Force =	0 lbs	
Lateral Bearing Pressure =	200 psf/ft	
Required Depth =	0.00 ft	*Shear key is not required.*
f'_c =	2500 psi	
Length =	8 in	

Bearing Pressure

	Ballast Width			
	21 in	22 in	23 in	24 in
P_{ftg} = (145 pcf)(5 ft)(1.5 ft)(1.75 ft) =	1903 lbs	1994 lbs	2084 lbs	2175 lbs

ASD LC	1.0D + 1.0S				1.0D + 0.6W				1.0D + 0.75L + 0.45W + 0.75S				0.6D + 0.6W			
Width	21 in	22 in	23 in	24 in	21 in	22 in	23 in	24 in	21 in	22 in	23 in	24 in	21 in	22 in	23 in	24 in
F_A	378 lbs	378 lbs	378 lbs	378 lbs	337 lbs	337 lbs	337 lbs	337 lbs	498 lbs	498 lbs	498 lbs	498 lbs	28 lbs	28 lbs	28 lbs	28 lbs
F_B	250 lbs	250 lbs	250 lbs	250 lbs	552 lbs	552 lbs	552 lbs	552 lbs	575 lbs	575 lbs	575 lbs	575 lbs	-869 lbs	-869 lbs	-869 lbs	-869 lbs
F_V	44 lbs	44 lbs	44 lbs	44 lbs	533 lbs	533 lbs	533 lbs	533 lbs	429 lbs	429 lbs	429 lbs	429 lbs	-588 lbs	-588 lbs	-588 lbs	-588 lbs
P_{total}	2531 lbs	2621 lbs	2712 lbs	2802 lbs	2792 lbs	2883 lbs	2973 lbs	3064 lbs	2976 lbs	3066 lbs	3157 lbs	3248 lbs	301 lbs	355 lbs	410 lbs	464 lbs
M	322 lbs-ft	322 lbs-ft	322 lbs-ft	322 lbs-ft	447 lbs-ft	447 lbs-ft	447 lbs-ft	447 lbs-ft	547 lbs-ft	547 lbs-ft	547 lbs-ft	547 lbs-ft	705 lbs-ft	705 lbs-ft	705 lbs-ft	705 lbs-ft
e	0.13 ft	0.12 ft	0.12 ft	0.12 ft	0.16 ft	0.16 ft	0.15 ft	0.15 ft	0.18 ft	0.18 ft	0.17 ft	0.17 ft	2.34 ft	1.98 ft	1.72 ft	1.52 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}	245.0 psf	243.8 psf	242.6 psf	241.6 psf	257.7 psf	255.9 psf	254.2 psf	252.7 psf	265.1 psf	263.0 psf	261.0 psf	259.2 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	333.4 psf	328.1 psf	323.3 psf	318.9 psf	380.4 psf	373.0 psf	366.3 psf	360.1 psf	415.1 psf	406.1 psf	397.9 psf	390.4 psf	727.8 psf	250.3 psf	182.8 psf	157.7 psf

Maximum Bearing Pressure = 728 psf
Allowable Bearing Pressure = 1500 psf

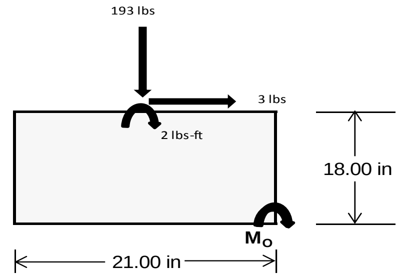
Use a 60in long x 21in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O = 162.6 ft-lbs
Resisting Force Required = 185.88 lbs
S.F. = 1.67
Weight Required = 309.80 lbs
Minimum Width = 21 in in
Weight Provided = 1903.13 lbs

A minimum 60in long x 21in 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	21 in			21 in			21 in		
Support	Outer	Inner	Outer	Outer	Inner	Outer	Outer	Inner	Outer
F_Y	66 lbs	160 lbs	62 lbs	193 lbs	526 lbs	189 lbs	19 lbs	47 lbs	18 lbs
F_V	0 lbs	0 lbs	0 lbs	3 lbs	2 lbs	1 lbs	0 lbs	0 lbs	0 lbs
P_{total}	2422 lbs	2516 lbs	2418 lbs	2436 lbs	2769 lbs	2432 lbs	708 lbs	736 lbs	707 lbs
M	1 lbs-ft	0 lbs-ft	0 lbs-ft	6 lbs-ft	4 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	0.29 ft	1.75 ft	1.75 ft	1.74 ft	1.75 ft	1.75 ft	1.75 ft	1.75 ft	1.75 ft
f_{min}	276.5 sqft	287.4 sqft	276.3 sqft	275.9 sqft	315.1 sqft	277.7 sqft	80.9 sqft	84.0 sqft	80.8 sqft
f_{max}	277.1 psf	287.8 psf	276.5 psf	280.8 psf	317.8 psf	278.3 psf	81.0 psf	84.1 psf	80.8 psf

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

Use a 60in long x 21in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Foundation Requirements: 60in long x 21in wide x 18in tall ballast foundation and fiber reinforcing with (1) #5 rebar.

5.3 Foundation Anchors

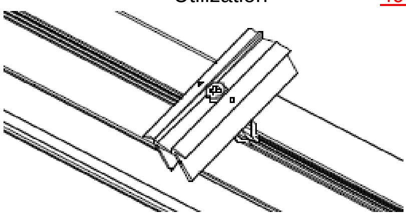
Threaded rods are anchored to the the ballast foundations using the Simpson AT-XP epoxy solution. LRFD load results are compared to the allowable strengths of the epoxy solution. Please see the supplementary calculations provided by the Simpson Anchor Designer software.

6. DESIGN OF JOINTS AND CONNECTIONS

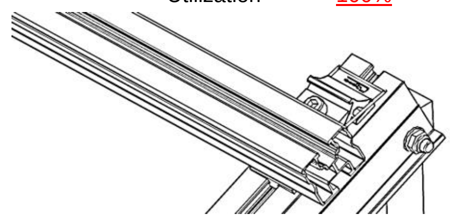
6.1 Anchorage of Modules to Purlins and Connection of Purlins to Girders

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 =	0.597	k
Allowable Uplift =	1.214	k
Utilization =	49%	



Fastening of Purlins to Girders		
Maximum Uplifting Force =	1.118	k
Allowable Uplift =	1.116	k
Utilization =	100%	



6.2 Bolted Connections

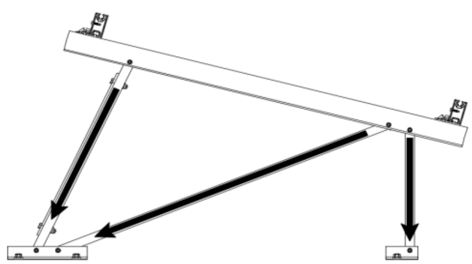
The aluminum struts connect the aluminum girder ends to custom brackets with mounting holes. Cross bracing is attached to rear struts to provide lateral stability. Single M8 bolts are used to attach each end of the strut to the girder and post. ASTM A193/A193M-86 equivalent stainless steel bolts are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

Front Strut		
Maximum Axial Load =	0.790	k
M8 Bolt Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	14%	

Rear Strut		
Maximum Axial Load =	1.164	k
M8 Bolt Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	20%	

Diagonal Strut		
Maximum Axial Load =	0.778	k
M8 Bolt Shear Capacity =	5.692	k
Strut Bearing Capacity =	7.952	k
Utilization =	14%	

Bracing		
Maximum Axial Load =	0.093	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.

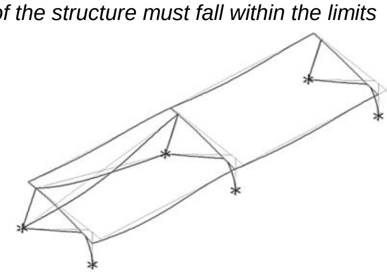
7. SEISMIC DESIGN

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} =	33.11	in
Allowable Story Drift for All Other Structures, Δ = {	$0.020h_{sx}$	
	0.662	in
Max Drift, Δ_{MAX} =	0.018	in
N/A		

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



APPENDIX A

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

Purlin = **ProfiPlus**

Strong Axis:

3.4.14

L_b = 63.00 in

J = 0.255

164.048

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

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= 29.2 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 = 63.00 in

J = 0.255

170.354

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

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= 29.1

3.4.16

b/t = 23.9

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.5 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 23.9

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

S1 = 36.9

m = 0.65

C_0 = 30

Cc = 30

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

$\varphi F_L St$= 29.2 ksi

Ix = 250988 mm^4

0.603 in^4

y = 30 mm

Sx = 0.511 in^3

$M_{max}St$ = 1.243 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 = 1.20

22.3976

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

S1 = 1.37733

$$S2 = 1.2C_c$$

S2 = 79.2

φF_L= φb[Bc-Dc*Lb/(1.2*ry*√(Cb))

φF_L= 29.6 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 = 1.20

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= 29.6 ksi

3.4.15

b/t = 24.46

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

S1 = 3.8

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

S2 = 14.7

F_{UT}= (φbk2*√(BpE))/(5.1b/t)

F_{UT}= 9.4 ksi

3.4.16

N/A for Weak Direction

3.4.16

b/t = 24.46

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

S1 = 12.2

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

S2 = 46.7

F_{ST}= φb[Bp-1.6Dp*b/t]

F_{ST}= 28.2 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.16.1

N/A for Weak Direction

3.4.16.2

N/A for Strong Direction

3.4.16.2

b/t = 24.46

t = 2.6

ds = 6.05

rs = 3.49

S = 21.70

ρst = 0.22

F_{UT}= 9.37

F_{ST}= 28.24

φF_L= Fut + (Fst - Fut)ρst < Fst

φF_L= 13.5 ksi

3.4.18

h/t = 24.46

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

S1 = 34.4

m = 0.70

C_0 = 34.23

Cc = 37.77

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

S2 = 72.1

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

3.4.18

h/t = 4.29

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

S1 = 36.9

m = 0.65

C_0 = 29

Cc = 29

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 29.6 ksi

Ix = 364470 mm^4

0.876 in^4

y = 37.77 mm

Sx = 0.589 in^3

M_{max}St = 1.452 k-ft

φF_LWk= 13.5 ksi

Iy = 217168 mm^4

0.522 in^4

x = 29 mm

Sy = 0.457 in^3

M_{max}Wk = 0.513 k-ft

Compression

3.4.7

λ = 0.46067

r = 1.374 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.90326

φF_L= φcc(Bc-Dc*λ)

φF_L= 30.1251 ksi

3.4.8

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

3.4.9

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

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

3.4.9.1

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

3.4.10

Rb/t = 0.0

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

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

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

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 18.00 in

J = 0.16

47.2194

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.2 ksi

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 31.2 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

M_{max}St = 0.423 k-ft

Weak Axis:

3.4.14

L_b = 18.00 in

J = 0.16

47.2194

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 31.2

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 31.2 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

M_{max}Wk = 0.423 k-ft

Compression

3.4.7

$\lambda =$ 0.77182

r = 0.437 in

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

$S1^* =$ 0.33515

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

$S2^* =$ 1.23671

$\varphi cc =$ 0.83792

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

$\varphi F_L =$ 24.5226 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.25 ksi

$\varphi F_L =$ 24.52 ksi

A = 323.87 mm^2

0.50 in^2

$P_{max} =$ 12.31 kips

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

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 46.38 in

J = 0.16

121.663

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.8 ksi

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 29.8 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

M_{max}St = 0.404 k-ft

Weak Axis:

3.4.14

L_b = 46.38 in

J = 0.16

121.663

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.8

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 33.3 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

M_{max}Wk = 0.450 k-ft

Compression

3.4.7

λ = 1.98863

r = 0.437 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.85841

φF_L= (φccFcy)/(λ²)

φF_L= 7.59722 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φyFcy

φF_L= 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

φF_L= φyFcy

φF_L= 33.25 ksi

φF_L= 7.60 ksi

A = 323.87 mm^2

0.50 in^2

P_{max} = 3.81 kips

Strut = **30x30x3**

Strong Axis:

3.4.14

L_b = 42.32 in

J = 0.16

111.025

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 30.0 ksi

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 30.0 ksi

Ix = 39958.2 mm^4

0.096 in^4

y = 15 mm

Sx = 0.163 in^3

M_{max}St = 0.406 k-ft

Weak Axis:

3.4.14

L_b = 42.32 in

J = 0.16

111.025

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 30.0

3.4.16

b/t = 7.75

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

S1 = 12.2

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

S2 = 46.7

φF_L= φyFcy

φF_L= 33.3 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.75

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

S1 = 36.9

m = 0.65

C_0 = 15

Cc = 15

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 33.3 ksi

Iy = 39958.2 mm^4

0.096 in^4

x = 15 mm

Sy = 0.163 in^3

M_{max}Wk = 0.450 k-ft

Compression

3.4.7

λ = 1.81475

r = 0.437 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.83406

φF_L = (φccFcy)/(λ²)

φF_L = 8.86409 ksi

3.4.9

b/t = 7.75

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L = φyFcy

φF_L = 33.3 ksi

b/t = 7.75

S1 = 12.21

S2 = 32.70

φF_L = φyFcy

φF_L = 33.3 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87

S2 = 131.3

φF_L = φyFcy

φF_L = 33.25 ksi

φF_L = 8.86 ksi

A = 323.87 mm^2

0.50 in^2

P_{max} = 4.45 kips

APPENDIX B

B.1

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

Basic Load Cases

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

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

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

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

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

Member Distributed Loads (BLC 3 : Snow Load)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	Y	-40.249	-40.249	0	0
2	M16	Y	-40.249	-40.249	0	0

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

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M13	y	-88.797	-88.797	0	0
2	M16	y	-147.995	-147.995	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	177.594	177.594	0	0
2	M16	y	88.797	88.797	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	262.137	2	301.972	2	-.001	15	0	15	0	1	0	1
2		min	-312.232	3	-448.159	3	-.122	3	0	3	0	1	0	1
3	N7	max	.025	3	306.059	1	-.041	15	0	15	0	1	0	1
4		min	-.149	2	12.559	15	-.848	1	-.001	1	0	1	0	1
5	N15	max	.18	3	790.416	1	.415	1	0	1	0	1	0	1
6		min	-1.475	2	27.641	15	-.642	3	-.001	3	0	1	0	1
7	N16	max	903.556	2	994.492	2	0	10	0	1	0	1	0	1
8		min	-979.73	3	-1451.526	3	-75.632	3	0	3	0	1	0	1
9	N23	max	.026	3	305.936	1	1.775	1	.003	1	0	1	0	1
10		min	-.149	2	12.681	15	.09	15	0	15	0	1	0	1
11	N24	max	262.171	2	304.866	2	76.243	3	0	1	0	1	0	1
12		min	-312.623	3	-446.7	3	.005	10	0	3	0	1	0	1
13	Totals:	max	1426.092	2	2738.678	2	0	3						
14		min	-1604.354	3	-2155.723	3	0	1						

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	212.663	1	.678	4	.24	1	0	15	0	15	0	1
2			min	-370.314	3	.159	15	-.048	3	0	1	0	1	0	1
3		2	max	212.798	1	.621	4	.24	1	0	15	0	15	0	15
4			min	-370.213	3	.146	15	-.048	3	0	1	0	1	0	4
5		3	max	212.933	1	.563	4	.24	1	0	15	0	15	0	15
6			min	-370.111	3	.132	15	-.048	3	0	1	0	1	0	4
7		4	max	213.068	1	.506	4	.24	1	0	15	0	15	0	15
8			min	-370.01	3	.119	15	-.048	3	0	1	0	3	0	4
9		5	max	213.203	1	.448	4	.24	1	0	15	0	9	0	15
10			min	-369.909	3	.105	15	-.048	3	0	1	0	3	0	4
11		6	max	213.337	1	.391	4	.24	1	0	15	0	1	0	15
12			min	-369.808	3	.092	15	-.048	3	0	1	0	3	0	4
13		7	max	213.472	1	.333	4	.24	1	0	15	0	1	0	15
14			min	-369.707	3	.078	15	-.048	3	0	1	0	3	0	4
15		8	max	213.607	1	.276	4	.24	1	0	15	0	1	0	15
16			min	-369.606	3	.065	15	-.048	3	0	1	0	3	0	4
17		9	max	213.742	1	.218	4	.24	1	0	15	0	1	0	15
18			min	-369.505	3	.051	15	-.048	3	0	1	0	3	0	4
19		10	max	213.877	1	.161	4	.24	1	0	15	0	1	0	15
20			min	-369.403	3	.038	15	-.048	3	0	1	0	3	0	4
21		11	max	214.012	1	.11	2	.24	1	0	15	0	1	0	15
22			min	-369.302	3	.016	12	-.048	3	0	1	0	3	0	4
23		12	max	214.147	1	.065	2	.24	1	0	15	0	1	0	15
24			min	-369.201	3	-.014	3	-.048	3	0	1	0	3	0	4
25		13	max	214.281	1	.02	2	.24	1	0	15	0	1	0	15
26			min	-369.1	3	-.047	3	-.048	3	0	1	0	3	0	4
27		14	max	214.416	1	-.016	15	.24	1	0	15	0	1	0	15
28			min	-368.999	3	-.081	3	-.048	3	0	1	0	3	0	4
29		15	max	214.551	1	-.03	15	.24	1	0	15	0	1	0	15
30			min	-368.898	3	-.127	4	-.048	3	0	1	0	3	0	4
31		16	max	214.686	1	-.043	15	.24	1	0	15	0	1	0	15
32			min	-368.796	3	-.184	4	-.048	3	0	1	0	3	0	4
33		17	max	214.821	1	-.057	15	.24	1	0	15	0	1	0	15
34			min	-368.695	3	-.242	4	-.048	3	0	1	0	3	0	4
35		18	max	214.956	1	-.07	15	.24	1	0	15	0	1	0	15
36			min	-368.594	3	-.299	4	-.048	3	0	1	0	3	0	4
37		19	max	215.091	1	-.084	15	.24	1	0	15	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
38			min	-368.493	3	-.357	4	-.048	3	0	1	0	3	0	4
39	M3	1	max	220.48	2	1.735	4	-.013	15	0	15	0	1	0	4
40			min	-219.164	3	.408	15	-.27	1	0	1	0	15	0	15
41		2	max	220.41	2	1.559	4	-.013	15	0	15	0	1	0	2
42			min	-219.217	3	.367	15	-.27	1	0	1	0	15	0	3
43		3	max	220.34	2	1.383	4	-.013	15	0	15	0	1	0	2
44			min	-219.269	3	.325	15	-.27	1	0	1	0	15	0	3
45		4	max	220.27	2	1.206	4	-.013	15	0	15	0	1	0	15
46			min	-219.322	3	.284	15	-.27	1	0	1	0	15	0	4
47		5	max	220.2	2	1.03	4	-.013	15	0	15	0	1	0	15
48			min	-219.374	3	.242	15	-.27	1	0	1	0	15	0	4
49		6	max	220.13	2	.854	4	-.013	15	0	15	0	1	0	15
50			min	-219.427	3	.201	15	-.27	1	0	1	0	15	0	4
51		7	max	220.06	2	.677	4	-.013	15	0	15	0	1	0	15
52			min	-219.479	3	.159	15	-.27	1	0	1	0	15	0	4
53		8	max	219.99	2	.501	4	-.013	15	0	15	0	1	0	15
54			min	-219.532	3	.118	15	-.27	1	0	1	0	15	-.001	4
55		9	max	219.92	2	.324	4	-.013	15	0	15	0	1	0	15
56			min	-219.584	3	.076	15	-.27	1	0	1	0	15	-.001	4
57		10	max	219.85	2	.148	4	-.013	15	0	15	0	1	0	15
58			min	-219.637	3	.035	15	-.27	1	0	1	0	15	-.001	4
59		11	max	219.78	2	.005	2	-.013	15	0	15	0	1	0	15
60			min	-219.689	3	-.054	3	-.27	1	0	1	0	15	-.001	4
61		12	max	219.71	2	-.048	15	-.013	15	0	15	0	1	0	15
62			min	-219.742	3	-.205	4	-.27	1	0	1	0	15	-.001	4
63		13	max	219.64	2	-.089	15	-.013	15	0	15	0	1	0	15
64			min	-219.794	3	-.381	4	-.27	1	0	1	0	15	-.001	4
65		14	max	219.57	2	-.131	15	-.013	15	0	15	0	1	0	15
66			min	-219.847	3	-.557	4	-.27	1	0	1	0	15	-.001	4
67		15	max	219.5	2	-.172	15	-.013	15	0	15	0	1	0	15
68			min	-219.899	3	-.734	4	-.27	1	0	1	0	15	0	4
69		16	max	219.43	2	-.214	15	-.013	15	0	15	0	1	0	15
70			min	-219.952	3	-.91	4	-.27	1	0	1	0	10	0	4
71		17	max	219.36	2	-.255	15	-.013	15	0	15	0	15	0	15
72			min	-220.004	3	-1.087	4	-.27	1	0	1	0	2	0	4
73		18	max	219.29	2	-.297	15	-.013	15	0	15	0	15	0	15
74			min	-220.057	3	-1.263	4	-.27	1	0	1	0	1	0	4
75		19	max	219.22	2	-.338	15	-.013	15	0	15	0	15	0	1
76			min	-220.109	3	-1.439	4	-.27	1	0	1	0	1	0	1
77	M4	1	max	304.895	1	0	1	-.041	15	0	1	0	3	0	1
78			min	12.208	15	0	1	-.893	1	0	1	0	2	0	1
79		2	max	304.959	1	0	1	-.041	15	0	1	0	15	0	1
80			min	12.227	15	0	1	-.893	1	0	1	0	1	0	1
81		3	max	305.024	1	0	1	-.041	15	0	1	0	15	0	1
82			min	12.247	15	0	1	-.893	1	0	1	0	1	0	1
83		4	max	305.089	1	0	1	-.041	15	0	1	0	15	0	1
84			min	12.267	15	0	1	-.893	1	0	1	0	1	0	1
85		5	max	305.153	1	0	1	-.041	15	0	1	0	15	0	1
86			min	12.286	15	0	1	-.893	1	0	1	0	1	0	1
87		6	max	305.218	1	0	1	-.041	15	0	1	0	15	0	1
88			min	12.306	15	0	1	-.893	1	0	1	0	1	0	1
89		7	max	305.283	1	0	1	-.041	15	0	1	0	15	0	1
90			min	12.325	15	0	1	-.893	1	0	1	0	1	0	1
91		8	max	305.348	1	0	1	-.041	15	0	1	0	15	0	1
92			min	12.345	15	0	1	-.893	1	0	1	0	1	0	1
93		9	max	305.412	1	0	1	-.041	15	0	1	0	15	0	1
94			min	12.364	15	0	1	-.893	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	305.477	1	0	1	-.041	15	0	1	0	15	0	1
96			min	12.384	15	0	1	-.893	1	0	1	0	1	0	1
97		11	max	305.542	1	0	1	-.041	15	0	1	0	15	0	1
98			min	12.403	15	0	1	-.893	1	0	1	0	1	0	1
99		12	max	305.606	1	0	1	-.041	15	0	1	0	15	0	1
100			min	12.423	15	0	1	-.893	1	0	1	0	1	0	1
101		13	max	305.671	1	0	1	-.041	15	0	1	0	15	0	1
102			min	12.442	15	0	1	-.893	1	0	1	0	1	0	1
103		14	max	305.736	1	0	1	-.041	15	0	1	0	15	0	1
104			min	12.462	15	0	1	-.893	1	0	1	-.001	1	0	1
105		15	max	305.801	1	0	1	-.041	15	0	1	0	15	0	1
106			min	12.481	15	0	1	-.893	1	0	1	-.001	1	0	1
107		16	max	305.865	1	0	1	-.041	15	0	1	0	15	0	1
108			min	12.501	15	0	1	-.893	1	0	1	-.001	1	0	1
109		17	max	305.93	1	0	1	-.041	15	0	1	0	15	0	1
110			min	12.52	15	0	1	-.893	1	0	1	-.001	1	0	1
111		18	max	305.995	1	0	1	-.041	15	0	1	0	15	0	1
112			min	12.54	15	0	1	-.893	1	0	1	-.001	1	0	1
113		19	max	306.059	1	0	1	-.041	15	0	1	0	15	0	1
114			min	12.559	15	0	1	-.893	1	0	1	-.001	1	0	1
115	M6	1	max	675.227	1	.681	4	.06	9	0	3	0	3	0	1
116			min	-1163.949	3	.16	15	-.215	3	0	10	0	9	0	1
117		2	max	675.362	1	.623	4	.06	9	0	3	0	3	0	15
118			min	-1163.847	3	.146	15	-.215	3	0	10	0	9	0	4
119		3	max	675.497	1	.566	4	.06	9	0	3	0	3	0	15
120			min	-1163.746	3	.133	15	-.215	3	0	10	0	9	0	4
121		4	max	675.631	1	.508	4	.06	9	0	3	0	3	0	15
122			min	-1163.645	3	.119	15	-.215	3	0	10	0	10	0	4
123		5	max	675.766	1	.451	4	.06	9	0	3	0	3	0	15
124			min	-1163.544	3	.099	12	-.215	3	0	10	0	2	0	4
125		6	max	675.901	1	.402	2	.06	9	0	3	0	1	0	15
126			min	-1163.443	3	.076	12	-.215	3	0	10	0	2	0	4
127		7	max	676.036	1	.357	2	.06	9	0	3	0	1	0	15
128			min	-1163.342	3	.054	12	-.215	3	0	10	0	2	0	4
129		8	max	676.171	1	.312	2	.06	9	0	3	0	1	0	12
130			min	-1163.241	3	.032	12	-.215	3	0	10	0	3	0	4
131		9	max	676.306	1	.267	2	.06	9	0	3	0	1	0	12
132			min	-1163.139	3	.001	3	-.215	3	0	10	0	3	0	4
133		10	max	676.441	1	.223	2	.06	9	0	3	0	1	0	12
134			min	-1163.038	3	-.032	3	-.215	3	0	10	0	3	0	2
135		11	max	676.576	1	.178	2	.06	9	0	3	0	1	0	12
136			min	-1162.937	3	-.066	3	-.215	3	0	10	0	3	0	2
137		12	max	676.71	1	.133	2	.06	9	0	3	0	1	0	12
138			min	-1162.836	3	-.099	3	-.215	3	0	10	0	3	0	2
139		13	max	676.845	1	.088	2	.06	9	0	3	0	1	0	12
140			min	-1162.735	3	-.133	3	-.215	3	0	10	0	3	0	2
141		14	max	676.98	1	.043	2	.06	9	0	3	0	1	0	12
142			min	-1162.634	3	-.167	3	-.215	3	0	10	0	3	0	2
143		15	max	677.115	1	-.001	2	.06	9	0	3	0	1	0	12
144			min	-1162.532	3	-.2	3	-.215	3	0	10	0	3	0	2
145		16	max	677.25	1	-.043	15	.06	9	0	3	0	1	0	3
146			min	-1162.431	3	-.234	3	-.215	3	0	10	0	3	0	2
147		17	max	677.385	1	-.056	15	.06	9	0	3	0	1	0	3
148			min	-1162.33	3	-.267	3	-.215	3	0	10	0	3	0	2
149		18	max	677.52	1	-.07	15	.06	9	0	3	0	1	0	3
150			min	-1162.229	3	-.301	3	-.215	3	0	10	0	3	0	2
151		19	max	677.654	1	-.083	15	.06	9	0	3	0	1	0	3

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
152			min	-1162.128	3	-.354	4	-.215	3	0	10	0	3	0	2
153	M7	1	max	778.215	2	1.739	4	.041	3	0	1	0	2	0	2
154			min	-668.462	3	.409	15	-.017	2	0	3	0	3	0	3
155		2	max	778.145	2	1.563	4	.041	3	0	1	0	2	0	2
156			min	-668.514	3	.367	15	-.017	2	0	3	0	3	0	3
157		3	max	778.075	2	1.387	4	.041	3	0	1	0	2	0	2
158			min	-668.567	3	.326	15	-.017	2	0	3	0	3	0	3
159		4	max	778.005	2	1.21	4	.041	3	0	1	0	2	0	2
160			min	-668.619	3	.284	15	-.017	2	0	3	0	3	0	3
161		5	max	777.935	2	1.034	4	.041	3	0	1	0	1	0	15
162			min	-668.672	3	.243	15	-.017	2	0	3	0	3	0	3
163		6	max	777.865	2	.857	4	.041	3	0	1	0	1	0	15
164			min	-668.724	3	.201	15	-.017	2	0	3	0	3	0	4
165		7	max	777.795	2	.681	4	.041	3	0	1	0	1	0	15
166			min	-668.777	3	.16	15	-.017	2	0	3	0	3	0	4
167		8	max	777.725	2	.505	4	.041	3	0	1	0	1	0	15
168			min	-668.829	3	.118	15	-.017	2	0	3	0	3	-.001	4
169		9	max	777.655	2	.346	2	.041	3	0	1	0	1	0	15
170			min	-668.882	3	.057	12	-.017	2	0	3	0	3	-.001	4
171		10	max	777.585	2	.208	2	.041	3	0	1	0	1	0	15
172			min	-668.934	3	-.03	3	-.017	2	0	3	0	3	-.001	4
173		11	max	777.515	2	.071	2	.041	3	0	1	0	1	0	15
174			min	-668.987	3	-.133	3	-.017	2	0	3	0	3	-.001	4
175		12	max	777.445	2	-.047	15	.041	3	0	1	0	1	0	15
176			min	-669.039	3	-.236	3	-.017	2	0	3	0	3	-.001	4
177		13	max	777.375	2	-.089	15	.041	3	0	1	0	1	0	15
178			min	-669.092	3	-.377	4	-.017	2	0	3	0	3	-.001	4
179		14	max	777.305	2	-.13	15	.041	3	0	1	0	1	0	15
180			min	-669.144	3	-.554	4	-.017	2	0	3	0	3	-.001	4
181		15	max	777.235	2	-.172	15	.041	3	0	1	0	1	0	15
182			min	-669.197	3	-.73	4	-.017	2	0	3	0	3	0	4
183		16	max	777.165	2	-.213	15	.041	3	0	1	0	1	0	15
184			min	-669.249	3	-.906	4	-.017	2	0	3	0	3	0	4
185		17	max	777.095	2	-.255	15	.041	3	0	1	0	1	0	15
186			min	-669.302	3	-1.083	4	-.017	2	0	3	0	3	0	4
187		18	max	777.025	2	-.296	15	.041	3	0	1	0	1	0	15
188			min	-669.354	3	-1.259	4	-.017	2	0	3	0	3	0	4
189		19	max	776.955	2	-.338	15	.041	3	0	1	0	1	0	1
190			min	-669.407	3	-1.435	4	-.017	2	0	3	0	3	0	1
191	M8	1	max	789.251	1	0	1	.476	1	0	1	0	10	0	1
192			min	27.29	15	0	1	-.653	3	0	1	0	3	0	1
193		2	max	789.316	1	0	1	.476	1	0	1	0	1	0	1
194			min	27.309	15	0	1	-.653	3	0	1	0	3	0	1
195		3	max	789.38	1	0	1	.476	1	0	1	0	1	0	1
196			min	27.329	15	0	1	-.653	3	0	1	0	3	0	1
197		4	max	789.445	1	0	1	.476	1	0	1	0	1	0	1
198			min	27.348	15	0	1	-.653	3	0	1	0	3	0	1
199		5	max	789.51	1	0	1	.476	1	0	1	0	1	0	1
200			min	27.368	15	0	1	-.653	3	0	1	0	3	0	1
201		6	max	789.575	1	0	1	.476	1	0	1	0	1	0	1
202			min	27.387	15	0	1	-.653	3	0	1	0	3	0	1
203		7	max	789.639	1	0	1	.476	1	0	1	0	1	0	1
204			min	27.407	15	0	1	-.653	3	0	1	0	3	0	1
205		8	max	789.704	1	0	1	.476	1	0	1	0	1	0	1
206			min	27.426	15	0	1	-.653	3	0	1	0	3	0	1
207		9	max	789.769	1	0	1	.476	1	0	1	0	1	0	1
208			min	27.446	15	0	1	-.653	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	789.833	1	0	1	.476	1	0	1	0	1	0	1
210			min	27.465	15	0	1	-.653	3	0	1	0	3	0	1
211		11	max	789.898	1	0	1	.476	1	0	1	0	1	0	1
212			min	27.485	15	0	1	-.653	3	0	1	0	3	0	1
213		12	max	789.963	1	0	1	.476	1	0	1	0	1	0	1
214			min	27.504	15	0	1	-.653	3	0	1	0	3	0	1
215		13	max	790.027	1	0	1	.476	1	0	1	0	1	0	1
216			min	27.524	15	0	1	-.653	3	0	1	0	3	0	1
217		14	max	790.092	1	0	1	.476	1	0	1	0	1	0	1
218			min	27.544	15	0	1	-.653	3	0	1	0	3	0	1
219		15	max	790.157	1	0	1	.476	1	0	1	0	1	0	1
220			min	27.563	15	0	1	-.653	3	0	1	0	3	0	1
221		16	max	790.222	1	0	1	.476	1	0	1	0	1	0	1
222			min	27.583	15	0	1	-.653	3	0	1	0	3	0	1
223		17	max	790.286	1	0	1	.476	1	0	1	0	1	0	1
224			min	27.602	15	0	1	-.653	3	0	1	0	3	0	1
225		18	max	790.351	1	0	1	.476	1	0	1	0	1	0	1
226			min	27.622	15	0	1	-.653	3	0	1	0	3	0	1
227		19	max	790.416	1	0	1	.476	1	0	1	0	1	0	1
228			min	27.641	15	0	1	-.653	3	0	1	-.001	3	0	1
229	M10	1	max	215.058	1	.675	4	.007	3	0	1	0	1	0	1
230			min	-318.376	3	.159	15	-.139	1	0	3	0	3	0	1
231		2	max	215.193	1	.617	4	.007	3	0	1	0	1	0	15
232			min	-318.274	3	.145	15	-.139	1	0	3	0	3	0	4
233		3	max	215.328	1	.56	4	.007	3	0	1	0	1	0	15
234			min	-318.173	3	.132	15	-.139	1	0	3	0	3	0	4
235		4	max	215.463	1	.502	4	.007	3	0	1	0	1	0	15
236			min	-318.072	3	.118	15	-.139	1	0	3	0	3	0	4
237		5	max	215.598	1	.445	4	.007	3	0	1	0	1	0	15
238			min	-317.971	3	.105	15	-.139	1	0	3	0	3	0	4
239		6	max	215.733	1	.387	4	.007	3	0	1	0	1	0	15
240			min	-317.87	3	.091	15	-.139	1	0	3	0	3	0	4
241		7	max	215.867	1	.33	4	.007	3	0	1	0	1	0	15
242			min	-317.769	3	.078	15	-.139	1	0	3	0	3	0	4
243		8	max	216.002	1	.272	4	.007	3	0	1	0	1	0	15
244			min	-317.668	3	.064	15	-.139	1	0	3	0	3	0	4
245		9	max	216.137	1	.215	4	.007	3	0	1	0	1	0	15
246			min	-317.566	3	.051	15	-.139	1	0	3	0	3	0	4
247		10	max	216.272	1	.157	4	.007	3	0	1	0	9	0	15
248			min	-317.465	3	.037	15	-.139	1	0	3	0	3	0	4
249		11	max	216.407	1	.11	2	.007	3	0	1	0	9	0	15
250			min	-317.364	3	.024	15	-.139	1	0	3	0	3	0	4
251		12	max	216.542	1	.065	2	.007	3	0	1	0	15	0	15
252			min	-317.263	3	.006	12	-.139	1	0	3	0	3	0	4
253		13	max	216.677	1	.02	2	.007	3	0	1	0	15	0	15
254			min	-317.162	3	-.027	3	-.139	1	0	3	0	3	0	4
255		14	max	216.811	1	-.017	15	.007	3	0	1	0	15	0	15
256			min	-317.061	3	-.073	4	-.139	1	0	3	0	3	0	4
257		15	max	216.946	1	-.03	15	.007	3	0	1	0	15	0	15
258			min	-316.96	3	-.13	4	-.139	1	0	3	0	3	0	4
259		16	max	217.081	1	-.044	15	.007	3	0	1	0	15	0	15
260			min	-316.858	3	-.188	4	-.139	1	0	3	0	3	0	4
261		17	max	217.216	1	-.057	15	.007	3	0	1	0	15	0	15
262			min	-316.757	3	-.245	4	-.139	1	0	3	0	3	0	4
263		18	max	217.351	1	-.071	15	.007	3	0	1	0	15	0	15
264			min	-316.656	3	-.303	4	-.139	1	0	3	0	1	0	4
265		19	max	217.486	1	-.084	15	.007	3	0	1	0	15	0	15

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
266			min	-316.555	3	-.36	4	-.139	1	0	3	0	1	0	4
267	M11	1	max	219.995	2	1.738	4	.289	1	0	3	0	3	0	4
268			min	-219.887	3	.409	15	-.049	3	0	15	0	1	0	12
269		2	max	219.925	2	1.562	4	.289	1	0	3	0	3	0	2
270			min	-219.94	3	.367	15	-.049	3	0	15	0	1	0	3
271		3	max	219.855	2	1.386	4	.289	1	0	3	0	3	0	2
272			min	-219.992	3	.326	15	-.049	3	0	15	0	1	0	3
273		4	max	219.785	2	1.209	4	.289	1	0	3	0	3	0	15
274			min	-220.045	3	.284	15	-.049	3	0	15	0	1	0	3
275		5	max	219.715	2	1.033	4	.289	1	0	3	0	3	0	15
276			min	-220.097	3	.243	15	-.049	3	0	15	0	1	0	4
277		6	max	219.645	2	.856	4	.289	1	0	3	0	3	0	15
278			min	-220.15	3	.201	15	-.049	3	0	15	0	1	0	4
279		7	max	219.575	2	.68	4	.289	1	0	3	0	3	0	15
280			min	-220.202	3	.16	15	-.049	3	0	15	0	1	0	4
281		8	max	219.505	2	.504	4	.289	1	0	3	0	3	0	15
282			min	-220.255	3	.118	15	-.049	3	0	15	0	1	-.001	4
283		9	max	219.435	2	.327	4	.289	1	0	3	0	3	0	15
284			min	-220.307	3	.077	15	-.049	3	0	15	0	1	-.001	4
285		10	max	219.365	2	.151	4	.289	1	0	3	0	3	0	15
286			min	-220.36	3	.028	12	-.049	3	0	15	0	1	-.001	4
287		11	max	219.295	2	.005	2	.289	1	0	3	0	3	0	15
288			min	-220.412	3	-.067	3	-.049	3	0	15	0	1	-.001	4
289		12	max	219.225	2	-.047	15	.289	1	0	3	0	3	0	15
290			min	-220.465	3	-.202	4	-.049	3	0	15	0	1	-.001	4
291		13	max	219.155	2	-.089	15	.289	1	0	3	0	3	0	15
292			min	-220.517	3	-.378	4	-.049	3	0	15	0	1	-.001	4
293		14	max	219.085	2	-.13	15	.289	1	0	3	0	3	0	15
294			min	-220.57	3	-.554	4	-.049	3	0	15	0	1	-.001	4
295		15	max	219.015	2	-.172	15	.289	1	0	3	0	3	0	15
296			min	-220.622	3	-.731	4	-.049	3	0	15	0	1	0	4
297		16	max	218.945	2	-.213	15	.289	1	0	3	0	3	0	15
298			min	-220.675	3	-.907	4	-.049	3	0	15	0	2	0	4
299		17	max	218.875	2	-.255	15	.289	1	0	3	0	3	0	15
300			min	-220.727	3	-1.084	4	-.049	3	0	15	0	15	0	4
301		18	max	218.805	2	-.296	15	.289	1	0	3	0	3	0	15
302			min	-220.78	3	-1.26	4	-.049	3	0	15	0	15	0	4
303		19	max	218.735	2	-.338	15	.289	1	0	3	0	3	0	1
304			min	-220.832	3	-1.436	4	-.049	3	0	15	0	15	0	1
305	M12	1	max	304.771	1	0	1	1.869	1	0	1	0	2	0	1
306			min	12.33	15	0	1	.09	15	0	1	0	3	0	1
307		2	max	304.836	1	0	1	1.869	1	0	1	0	1	0	1
308			min	12.349	15	0	1	.09	15	0	1	0	15	0	1
309		3	max	304.9	1	0	1	1.869	1	0	1	0	1	0	1
310			min	12.369	15	0	1	.09	15	0	1	0	15	0	1
311		4	max	304.965	1	0	1	1.869	1	0	1	0	1	0	1
312			min	12.388	15	0	1	.09	15	0	1	0	15	0	1
313		5	max	305.03	1	0	1	1.869	1	0	1	0	1	0	1
314			min	12.408	15	0	1	.09	15	0	1	0	15	0	1
315		6	max	305.095	1	0	1	1.869	1	0	1	0	1	0	1
316			min	12.427	15	0	1	.09	15	0	1	0	15	0	1
317		7	max	305.159	1	0	1	1.869	1	0	1	.001	1	0	1
318			min	12.447	15	0	1	.09	15	0	1	0	15	0	1
319		8	max	305.224	1	0	1	1.869	1	0	1	.001	1	0	1
320			min	12.466	15	0	1	.09	15	0	1	0	15	0	1
321		9	max	305.289	1	0	1	1.869	1	0	1	.001	1	0	1
322			min	12.486	15	0	1	.09	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	305.353	1	0	1	1.869	1	0	1	.002	1	0	1
324			min	12.506	15	0	1	.09	15	0	1	0	15	0	1
325		11	max	305.418	1	0	1	1.869	1	0	1	.002	1	0	1
326			min	12.525	15	0	1	.09	15	0	1	0	15	0	1
327		12	max	305.483	1	0	1	1.869	1	0	1	.002	1	0	1
328			min	12.545	15	0	1	.09	15	0	1	0	15	0	1
329		13	max	305.548	1	0	1	1.869	1	0	1	.002	1	0	1
330			min	12.564	15	0	1	.09	15	0	1	0	15	0	1
331		14	max	305.612	1	0	1	1.869	1	0	1	.002	1	0	1
332			min	12.584	15	0	1	.09	15	0	1	0	15	0	1
333		15	max	305.677	1	0	1	1.869	1	0	1	.002	1	0	1
334			min	12.603	15	0	1	.09	15	0	1	0	15	0	1
335		16	max	305.742	1	0	1	1.869	1	0	1	.003	1	0	1
336			min	12.623	15	0	1	.09	15	0	1	0	15	0	1
337		17	max	305.806	1	0	1	1.869	1	0	1	.003	1	0	1
338			min	12.642	15	0	1	.09	15	0	1	0	15	0	1
339		18	max	305.871	1	0	1	1.869	1	0	1	.003	1	0	1
340			min	12.662	15	0	1	.09	15	0	1	0	15	0	1
341		19	max	305.936	1	0	1	1.869	1	0	1	.003	1	0	1
342			min	12.681	15	0	1	.09	15	0	1	0	15	0	1
343	M1	1	max	106.242	1	346.194	3	-1.784	15	0	2	.074	1	0	2
344			min	4.855	15	-229.612	2	-37.758	1	0	3	.003	15	0	3
345		2	max	106.402	1	346.023	3	-1.784	15	0	2	.066	1	.05	2
346			min	4.904	15	-229.841	2	-37.758	1	0	3	.003	15	-.075	3
347		3	max	117.421	3	5.243	9	-1.773	15	0	12	.057	1	.099	2
348			min	-18.617	10	-29.625	2	-37.666	1	0	1	.003	15	-.149	3
349		4	max	117.541	3	5.053	9	-1.773	15	0	12	.049	1	.106	2
350			min	-18.484	10	-29.854	2	-37.666	1	0	1	.002	15	-.147	3
351		5	max	117.661	3	4.862	9	-1.773	15	0	12	.041	1	.112	2
352			min	-18.35	10	-30.083	2	-37.666	1	0	1	.002	15	-.145	3
353		6	max	117.781	3	4.671	9	-1.773	15	0	12	.033	1	.119	2
354			min	-18.217	10	-30.311	2	-37.666	1	0	1	.002	15	-.143	3
355		7	max	117.901	3	4.481	9	-1.773	15	0	12	.025	1	.125	2
356			min	-18.083	10	-30.54	2	-37.666	1	0	1	.001	15	-.141	3
357		8	max	118.021	3	4.29	9	-1.773	15	0	12	.016	1	.132	2
358			min	-17.95	10	-30.769	2	-37.666	1	0	1	0	15	-.139	3
359		9	max	118.141	3	4.099	9	-1.773	15	0	12	.008	1	.139	2
360			min	-17.816	10	-30.997	2	-37.666	1	0	1	0	15	-.137	3
361		10	max	118.261	3	3.909	9	-1.773	15	0	12	.002	3	.145	2
362			min	-17.683	10	-31.226	2	-37.666	1	0	1	0	10	-.134	3
363		11	max	118.382	3	3.718	9	-1.773	15	0	12	0	3	.152	2
364			min	-17.549	10	-31.455	2	-37.666	1	0	1	-.008	1	-.132	3
365		12	max	118.502	3	3.528	9	-1.773	15	0	12	0	12	.159	2
366			min	-17.416	10	-31.684	2	-37.666	1	0	1	-.016	1	-.13	3
367		13	max	118.622	3	3.337	9	-1.773	15	0	12	-.001	15	.166	2
368			min	-17.282	10	-31.912	2	-37.666	1	0	1	-.024	1	-.128	3
369		14	max	118.742	3	3.146	9	-1.773	15	0	12	-.002	15	.173	2
370			min	-17.149	10	-32.141	2	-37.666	1	0	1	-.033	1	-.125	3
371		15	max	118.862	3	2.956	9	-1.773	15	0	12	-.002	15	.18	2
372			min	-17.015	10	-32.37	2	-37.666	1	0	1	-.041	1	-.123	3
373		16	max	89.06	2	160.783	2	-1.786	15	0	1	-.002	15	.185	2
374			min	2.004	15	-205.948	3	-37.893	1	0	12	-.049	1	-.119	3
375		17	max	89.22	2	160.554	2	-1.786	15	0	1	-.003	15	.15	2
376			min	2.052	15	-206.12	3	-37.893	1	0	12	-.057	1	-.074	3
377		18	max	-4.901	15	347.542	2	-1.827	15	0	3	-.003	15	.076	2
378			min	-106.392	1	-170.367	3	-38.858	1	0	2	-.066	1	-.037	3
379		19	max	-4.853	15	347.313	2	-1.827	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	-106.232	1	-170.539	3	-38.858	1	0	2	-.074	1	0	3
381	M5	1	max	243.958	1	1129.822	3	0	2	0	1	.009	3	0	3
382			min	6.228	12	-745.183	2	-68.269	3	0	3	0	2	0	2
383		2	max	244.118	1	1129.651	3	0	2	0	1	0	1	.161	2
384			min	6.308	12	-745.412	2	-68.269	3	0	3	-.006	3	-.245	3
385		3	max	356.74	3	4.883	9	7.661	3	0	3	0	1	.32	2
386			min	-84.892	2	-104.369	2	-.525	1	0	1	-.02	3	-.484	3
387		4	max	356.861	3	4.693	9	7.661	3	0	3	0	1	.343	2
388			min	-84.732	2	-104.597	2	-.525	1	0	1	-.019	3	-.477	3
389		5	max	356.981	3	4.502	9	7.661	3	0	3	0	1	.366	2
390			min	-84.572	2	-104.826	2	-.525	1	0	1	-.017	3	-.469	3
391		6	max	357.101	3	4.311	9	7.661	3	0	3	0	1	.388	2
392			min	-84.411	2	-105.055	2	-.525	1	0	1	-.015	3	-.461	3
393		7	max	357.221	3	4.121	9	7.661	3	0	3	0	1	.411	2
394			min	-84.251	2	-105.284	2	-.525	1	0	1	-.014	3	-.453	3
395		8	max	357.341	3	3.93	9	7.661	3	0	3	0	1	.434	2
396			min	-84.091	2	-105.512	2	-.525	1	0	1	-.012	3	-.445	3
397		9	max	357.461	3	3.739	9	7.661	3	0	3	0	1	.457	2
398			min	-83.931	2	-105.741	2	-.525	1	0	1	-.01	3	-.437	3
399		10	max	357.581	3	3.549	9	7.661	3	0	3	0	2	.48	2
400			min	-83.771	2	-105.97	2	-.525	1	0	1	-.009	3	-.429	3
401		11	max	357.701	3	3.358	9	7.661	3	0	3	0	2	.503	2
402			min	-83.611	2	-106.199	2	-.525	1	0	1	-.007	3	-.421	3
403		12	max	357.822	3	3.168	9	7.661	3	0	3	0	2	.526	2
404			min	-83.45	2	-106.427	2	-.525	1	0	1	-.005	3	-.413	3
405		13	max	357.942	3	2.977	9	7.661	3	0	3	0	10	.549	2
406			min	-83.29	2	-106.656	2	-.525	1	0	1	-.004	3	-.404	3
407		14	max	358.062	3	2.786	9	7.661	3	0	3	0	10	.572	2
408			min	-83.13	2	-106.885	2	-.525	1	0	1	-.002	3	-.396	3
409		15	max	358.182	3	2.596	9	7.661	3	0	3	0	10	.596	2
410			min	-82.97	2	-107.114	2	-.525	1	0	1	0	1	-.388	3
411		16	max	282.484	2	581.829	2	7.641	3	0	3	0	3	.613	2
412			min	4.607	15	-630.278	3	-.546	1	0	10	0	1	-.374	3
413		17	max	282.644	2	581.601	2	7.641	3	0	3	.003	3	.487	2
414			min	4.655	15	-630.449	3	-.546	1	0	10	0	1	-.238	3
415		18	max	-8.552	12	1128.189	2	6.982	3	0	10	.004	3	.244	2
416			min	-244.133	1	-548.148	3	-.12	1	0	1	0	1	-.118	3
417		19	max	-8.472	12	1127.96	2	6.982	3	0	10	.006	3	0	3
418			min	-243.973	1	-548.319	3	-.12	1	0	1	0	1	0	2
419	M9	1	max	105.891	1	346.126	3	73.648	3	0	3	-.003	15	0	2
420			min	4.835	15	-229.612	2	1.852	15	0	2	-.073	1	0	3
421		2	max	106.051	1	345.955	3	73.648	3	0	3	-.001	12	.05	2
422			min	4.883	15	-229.841	2	1.852	15	0	2	-.065	1	-.075	3
423		3	max	117.243	3	5.224	9	36.844	1	0	1	.013	3	.099	2
424			min	-18.158	10	-29.629	2	-1.593	3	0	12	-.056	1	-.149	3
425		4	max	117.363	3	5.033	9	36.844	1	0	1	.013	3	.105	2
426			min	-18.024	10	-29.858	2	-1.593	3	0	12	-.048	1	-.147	3
427		5	max	117.483	3	4.843	9	36.844	1	0	1	.013	3	.112	2
428			min	-17.891	10	-30.086	2	-1.593	3	0	12	-.04	1	-.145	3
429		6	max	117.603	3	4.652	9	36.844	1	0	1	.012	3	.119	2
430			min	-17.757	10	-30.315	2	-1.593	3	0	12	-.032	1	-.143	3
431		7	max	117.723	3	4.462	9	36.844	1	0	1	.012	3	.125	2
432			min	-17.624	10	-30.544	2	-1.593	3	0	12	-.024	1	-.141	3
433		8	max	117.844	3	4.271	9	36.844	1	0	1	.011	3	.132	2
434			min	-17.49	10	-30.772	2	-1.593	3	0	12	-.016	1	-.139	3
435		9	max	117.964	3	4.08	9	36.844	1	0	1	.011	3	.138	2
436			min	-17.357	10	-31.001	2	-1.593	3	0	12	-.008	1	-.137	3

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
437		10	max	118.084	3	3.89	9	36.844	1	0	1	.011	3	.145	2
438			min	-17.223	10	-31.23	2	-1.593	3	0	12	0	1	-.134	3
439		11	max	118.204	3	3.699	9	36.844	1	0	1	.01	3	.152	2
440			min	-17.09	10	-31.459	2	-1.593	3	0	12	0	15	-.132	3
441		12	max	118.324	3	3.509	9	36.844	1	0	1	.016	1	.159	2
442			min	-16.956	10	-31.687	2	-1.593	3	0	12	0	15	-.13	3
443		13	max	118.444	3	3.318	9	36.844	1	0	1	.024	1	.166	2
444			min	-16.823	10	-31.916	2	-1.593	3	0	12	.001	15	-.128	3
445		14	max	118.564	3	3.127	9	36.844	1	0	1	.032	1	.173	2
446			min	-16.689	10	-32.145	2	-1.593	3	0	12	.002	15	-.126	3
447		15	max	118.684	3	2.937	9	36.844	1	0	1	.04	1	.18	2
448			min	-16.556	10	-32.374	2	-1.593	3	0	12	.002	15	-.123	3
449		16	max	89.368	2	160.352	2	37.087	1	0	15	.048	1	.185	2
450			min	2.093	15	-206.494	3	-1.644	3	0	3	.002	15	-.119	3
451		17	max	89.528	2	160.123	2	37.087	1	0	15	.056	1	.15	2
452			min	2.141	15	-206.666	3	-1.644	3	0	3	.003	15	-.074	3
453		18	max	-4.883	15	347.542	2	38.988	1	0	2	.065	1	.076	2
454			min	-106.048	1	-170.359	3	-1.115	3	0	3	.003	15	-.037	3
455		19	max	-4.834	15	347.313	2	38.988	1	0	2	.073	1	0	2
456			min	-105.888	1	-170.53	3	-1.115	3	0	3	.003	15	0	3
457	M13	1	max	73.642	3	229.478	2	-4.835	15	0	2	.073	1	0	2
458			min	1.852	15	-346.156	3	-105.882	1	0	3	.003	15	0	3
459		2	max	73.642	3	162.649	2	-3.691	15	0	2	.019	1	.172	3
460			min	1.852	15	-244.936	3	-80.544	1	0	3	0	10	-.114	2
461		3	max	73.642	3	95.819	2	-2.547	15	0	2	.008	3	.286	3
462			min	1.852	15	-143.717	3	-55.205	1	0	3	-.021	1	-.19	2
463		4	max	73.642	3	28.99	2	-1.404	15	0	2	.004	3	.34	3
464			min	1.852	15	-42.498	3	-29.867	1	0	3	-.046	1	-.226	2
465		5	max	73.642	3	58.722	3	.757	10	0	2	.002	3	.335	3
466			min	1.852	15	-37.84	2	-4.528	1	0	3	-.056	1	-.224	2
467		6	max	73.642	3	159.941	3	20.81	1	0	2	0	3	.272	3
468			min	1.852	15	-104.669	2	-2.063	3	0	3	-.051	1	-.182	2
469		7	max	73.642	3	261.16	3	46.149	1	0	2	0	12	.149	3
470			min	1.852	15	-171.499	2	-.399	3	0	3	-.031	1	-.101	2
471		8	max	73.642	3	362.38	3	71.487	1	0	2	.004	2	.018	1
472			min	1.852	15	-238.329	2	1.068	12	0	3	0	3	-.033	3
473		9	max	73.642	3	463.599	3	96.826	1	0	2	.052	1	.177	2
474			min	1.852	15	-305.158	2	2.177	12	0	3	0	12	-.274	3
475		10	max	73.642	3	564.818	3	122.164	1	0	2	.116	1	.374	2
476			min	1.852	15	-345.962	1	-52.658	2	0	3	-.006	3	-.574	3
477		11	max	37.853	1	305.158	2	-1.822	12	0	3	.051	1	.177	2
478			min	1.784	15	-463.599	3	-96.475	1	0	2	-.008	3	-.274	3
479		12	max	37.853	1	238.329	2	-.681	3	0	3	.004	2	.018	1
480			min	1.784	15	-362.379	3	-71.136	1	0	2	-.009	3	-.033	3
481		13	max	37.853	1	171.499	2	.984	3	0	3	-.001	15	.149	3
482			min	1.784	15	-261.16	3	-45.798	1	0	2	-.032	1	-.101	2
483		14	max	37.853	1	104.669	2	2.648	3	0	3	-.002	15	.272	3
484			min	1.784	15	-159.941	3	-20.459	1	0	2	-.051	1	-.182	2
485		15	max	37.853	1	37.84	2	4.879	1	0	3	-.002	15	.335	3
486			min	1.784	15	-58.722	3	-.757	10	0	2	-.055	1	-.224	2
487		16	max	37.853	1	42.498	3	30.218	1	0	3	-.002	12	.34	3
488			min	1.784	15	-28.99	2	1.424	15	0	2	-.045	1	-.226	2
489		17	max	37.853	1	143.717	3	55.556	1	0	3	.002	3	.286	3
490			min	1.784	15	-95.819	2	2.568	15	0	2	-.02	1	-.19	2
491		18	max	37.853	1	244.936	3	80.895	1	0	3	.02	1	.172	3
492			min	1.784	15	-162.649	2	3.712	15	0	2	0	10	-.114	2
493		19	max	37.853	1	346.156	3	106.233	1	0	3	.074	1	0	2

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
494			min	1.784	15	-229.478	2	4.855	15	0	2	.003	15	0	3
495	M16	1	max	1.119	3	347.486	2	-4.834	15	0	3	.073	1	0	2
496			min	-38.889	1	-170.562	3	-105.897	1	0	2	.003	15	0	3
497		2	max	1.119	3	246.124	2	-3.691	15	0	3	.019	1	.085	3
498			min	-38.889	1	-121.141	3	-80.559	1	0	2	0	10	-.173	2
499		3	max	1.119	3	144.762	2	-2.547	15	0	3	0	12	.141	3
500			min	-38.889	1	-71.72	3	-55.22	1	0	2	-.021	1	-.287	2
501		4	max	1.119	3	43.401	2	-1.403	15	0	3	-.002	15	.169	3
502			min	-38.889	1	-22.299	3	-29.882	1	0	2	-.046	1	-.342	2
503		5	max	1.119	3	27.122	3	.74	10	0	3	-.003	15	.167	3
504			min	-38.889	1	-57.961	2	-4.543	1	0	2	-.056	1	-.338	2
505		6	max	1.119	3	76.543	3	20.795	1	0	3	-.002	15	.137	3
506			min	-38.889	1	-159.323	2	-.925	3	0	2	-.051	1	-.274	2
507		7	max	1.119	3	125.964	3	46.134	1	0	3	-.001	15	.078	3
508			min	-38.889	1	-260.685	2	.641	12	0	2	-.031	1	-.152	2
509		8	max	1.119	3	175.385	3	71.472	1	0	3	.004	2	.03	2
510			min	-38.889	1	-362.046	2	1.75	12	0	2	-.006	3	-.01	3
511		9	max	1.119	3	224.806	3	96.811	1	0	3	.052	1	.271	2
512			min	-38.889	1	-463.408	2	2.86	12	0	2	-.004	3	-.127	3
513		10	max	-1.828	15	-9.111	15	122.149	1	0	15	.116	1	.57	2
514			min	-38.889	1	-564.77	2	-6.627	3	0	2	.003	12	-.272	3
515		11	max	-1.827	15	463.408	2	-3.393	12	0	2	.051	1	.271	2
516			min	-38.764	1	-224.806	3	-96.467	1	0	3	0	12	-.127	3
517		12	max	-1.827	15	362.046	2	-2.284	12	0	2	.004	2	.03	2
518			min	-38.764	1	-175.385	3	-71.128	1	0	3	-.001	3	-.01	3
519		13	max	-1.827	15	260.685	2	-1.174	12	0	2	-.001	15	.078	3
520			min	-38.764	1	-125.964	3	-45.79	1	0	3	-.032	1	-.152	2
521		14	max	-1.827	15	159.323	2	.031	3	0	2	-.002	12	.137	3
522			min	-38.764	1	-76.543	3	-20.451	1	0	3	-.051	1	-.274	2
523		15	max	-1.827	15	57.961	2	4.887	1	0	2	-.002	12	.167	3
524			min	-38.764	1	-27.122	3	-.74	10	0	3	-.055	1	-.338	2
525		16	max	-1.827	15	22.299	3	30.226	1	0	2	0	12	.169	3
526			min	-38.764	1	-43.401	2	1.422	15	0	3	-.045	1	-.342	2
527		17	max	-1.827	15	71.72	3	55.564	1	0	2	.001	3	.141	3
528			min	-38.764	1	-144.762	2	2.565	15	0	3	-.02	1	-.287	2
529		18	max	-1.827	15	121.141	3	80.903	1	0	2	.02	1	.085	3
530			min	-38.764	1	-246.124	2	3.709	15	0	3	0	10	-.173	2
531		19	max	-1.827	15	170.562	3	106.241	1	0	2	.074	1	0	2
532			min	-38.764	1	-347.486	2	4.853	15	0	3	.003	15	0	3
533	M15	1	max	.771	13	1.86	4	.086	3	0	9	0	9	0	1
534			min	-91.278	3	0	1	-.019	9	0	3	0	3	0	1
535		2	max	.668	13	1.653	4	.086	3	0	9	0	9	0	1
536			min	-91.354	3	0	1	-.019	9	0	3	0	3	0	4
537		3	max	.564	13	1.446	4	.086	3	0	9	0	9	0	1
538			min	-91.429	3	0	1	-.019	9	0	3	0	3	-.001	4
539		4	max	.46	13	1.24	4	.086	3	0	9	0	9	0	1
540			min	-91.505	3	0	1	-.019	9	0	3	0	3	-.002	4
541		5	max	.356	13	1.033	4	.086	3	0	9	0	9	0	1
542			min	-91.58	3	0	1	-.019	9	0	3	0	3	-.002	4
543		6	max	.252	13	.827	4	.086	3	0	9	0	9	0	1
544			min	-91.656	3	0	1	-.019	9	0	3	0	3	-.002	4
545		7	max	.148	13	.62	4	.086	3	0	9	0	3	0	1
546			min	-91.731	3	0	1	-.019	9	0	3	0	9	-.003	4
547		8	max	.044	13	.413	4	.086	3	0	9	0	3	0	1
548			min	-91.807	3	0	1	-.019	9	0	3	0	9	-.003	4
549		9	max	0	1	.207	4	.086	3	0	9	0	3	0	1
550			min	-91.882	3	0	1	-.019	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	.086	3	0	9	0	3	0	1
552			min	-91.958	3	0	1	-.019	9	0	3	0	9	-.003	4
553		11	max	0	1	0	1	.086	3	0	9	0	3	0	1
554			min	-92.034	3	-.207	4	-.019	9	0	3	0	9	-.003	4
555		12	max	0	1	0	1	.086	3	0	9	0	3	0	1
556			min	-92.109	3	-.413	4	-.019	9	0	3	0	9	-.003	4
557		13	max	0	1	0	1	.086	3	0	9	0	3	0	1
558			min	-92.185	3	-.62	4	-.019	9	0	3	0	9	-.003	4
559		14	max	0	1	0	1	.086	3	0	9	0	3	0	1
560			min	-92.26	3	-.827	4	-.019	9	0	3	0	9	-.002	4
561		15	max	0	1	0	1	.086	3	0	9	0	3	0	1
562			min	-92.336	3	-1.033	4	-.019	9	0	3	0	9	-.002	4
563		16	max	0	1	0	1	.086	3	0	9	0	3	0	1
564			min	-92.411	3	-1.24	4	-.019	9	0	3	0	9	-.002	4
565		17	max	0	1	0	1	.086	3	0	9	0	3	0	1
566			min	-92.487	3	-1.446	4	-.019	9	0	3	0	9	-.001	4
567		18	max	0	1	0	1	.086	3	0	9	0	3	0	1
568			min	-92.562	3	-1.653	4	-.019	9	0	3	0	9	0	4
569		19	max	0	1	0	1	.086	3	0	9	0	3	0	1
570			min	-92.638	3	-1.86	4	-.019	9	0	3	0	9	0	1
571	M16A	1	max	0	10	1.86	4	.03	2	0	3	0	3	0	1
572			min	-91.411	3	0	10	-.035	3	0	2	0	2	0	1
573		2	max	0	10	1.653	4	.03	2	0	3	0	3	0	10
574			min	-91.336	3	0	10	-.035	3	0	2	0	2	0	4
575		3	max	0	10	1.446	4	.03	2	0	3	0	3	0	10
576			min	-91.26	3	0	10	-.035	3	0	2	0	2	-.001	4
577		4	max	0	10	1.24	4	.03	2	0	3	0	3	0	10
578			min	-91.185	3	0	10	-.035	3	0	2	0	2	-.002	4
579		5	max	0	10	1.033	4	.03	2	0	3	0	3	0	10
580			min	-91.109	3	0	10	-.035	3	0	2	0	1	-.002	4
581		6	max	0	10	.827	4	.03	2	0	3	0	3	0	10
582			min	-91.033	3	0	10	-.035	3	0	2	0	1	-.002	4
583		7	max	0	10	.62	4	.03	2	0	3	0	3	0	10
584			min	-90.958	3	0	10	-.035	3	0	2	0	1	-.003	4
585		8	max	0	10	.413	4	.03	2	0	3	0	3	0	10
586			min	-90.882	3	0	10	-.035	3	0	2	0	1	-.003	4
587		9	max	0	10	.207	4	.03	2	0	3	0	3	0	10
588			min	-90.807	3	0	10	-.035	3	0	2	0	1	-.003	4
589		10	max	0	10	0	1	.03	2	0	3	0	3	0	10
590			min	-90.731	3	0	1	-.035	3	0	2	0	1	-.003	4
591		11	max	.091	2	0	10	.03	2	0	3	0	3	0	10
592			min	-90.656	3	-.207	4	-.035	3	0	2	0	1	-.003	4
593		12	max	.191	2	0	10	.03	2	0	3	0	3	0	10
594			min	-90.58	3	-.413	4	-.035	3	0	2	0	1	-.003	4
595		13	max	.292	2	0	10	.03	2	0	3	0	2	0	10
596			min	-90.505	3	-.62	4	-.035	3	0	2	0	3	-.003	4
597		14	max	.393	2	0	10	.03	2	0	3	0	2	0	10
598			min	-90.429	3	-.827	4	-.035	3	0	2	0	3	-.002	4
599		15	max	.493	2	0	10	.03	2	0	3	0	2	0	10
600			min	-90.354	3	-1.033	4	-.035	3	0	2	0	3	-.002	4
601		16	max	.594	2	0	10	.03	2	0	3	0	2	0	10
602			min	-90.278	3	-1.24	4	-.035	3	0	2	0	3	-.002	4
603		17	max	.695	2	0	10	.03	2	0	3	0	2	0	10
604			min	-90.203	3	-1.446	4	-.035	3	0	2	0	3	-.001	4
605		18	max	.795	2	0	10	.03	2	0	3	0	2	0	10
606			min	-90.127	3	-1.653	4	-.035	3	0	2	0	3	0	4
607		19	max	.896	2	0	10	.03	2	0	3	0	2	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[k-ft]	LC	y-y Mome...	LC	z-z Mome...	LC
608			min	-90.052	3	-1.86	4	-.035	3	0	2	0	3	0	1

Envelope Member Section Deflections

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
1	M2	1	max	.002	1	.011	2	.007	1	-2.891e-5	15	NC	3	NC	2
2			min	-.004	3	-.011	3	-.002	3	-6.159e-4	1	3958.882	2	5786.387	1
3		2	max	.002	1	.01	2	.007	1	-2.764e-5	15	NC	3	NC	2
4			min	-.004	3	-.011	3	-.002	3	-5.888e-4	1	4330.489	2	6212.26	1
5		3	max	.002	1	.009	2	.006	1	-2.637e-5	15	NC	3	NC	2
6			min	-.003	3	-.01	3	-.002	3	-5.616e-4	1	4774.244	2	6716.88	1
7		4	max	.002	1	.008	2	.006	1	-2.51e-5	15	NC	1	NC	2
8			min	-.003	3	-.01	3	-.001	3	-5.344e-4	1	5307.803	2	7318.769	1
9		5	max	.002	1	.007	2	.005	1	-2.383e-5	15	NC	1	NC	2
10			min	-.003	3	-.009	3	-.001	3	-5.072e-4	1	5954.771	2	8042.676	1
11		6	max	.002	1	.006	2	.005	1	-2.257e-5	15	NC	1	NC	2
12			min	-.003	3	-.009	3	-.001	3	-4.8e-4	1	6747.208	2	8922.238	1
13		7	max	.001	1	.005	2	.004	1	-2.13e-5	15	NC	1	NC	1
14			min	-.003	3	-.008	3	0	3	-4.528e-4	1	7729.482	2	NC	1
15		8	max	.001	1	.005	2	.004	1	-2.003e-5	15	NC	1	NC	1
16			min	-.002	3	-.008	3	0	3	-4.257e-4	1	8964.365	2	NC	1
17		9	max	.001	1	.004	2	.003	1	-1.876e-5	15	NC	1	NC	1
18			min	-.002	3	-.007	3	0	3	-3.985e-4	1	NC	1	NC	1
19		10	max	.001	1	.003	2	.003	1	-1.75e-5	15	NC	1	NC	1
20			min	-.002	3	-.007	3	0	3	-3.713e-4	1	NC	1	NC	1
21		11	max	0	1	.003	2	.002	1	-1.623e-5	15	NC	1	NC	1
22			min	-.002	3	-.006	3	0	3	-3.441e-4	1	NC	1	NC	1
23		12	max	0	1	.002	2	.002	1	-1.496e-5	15	NC	1	NC	1
24			min	-.002	3	-.005	3	0	3	-3.169e-4	1	NC	1	NC	1
25		13	max	0	1	.002	2	.002	1	-1.369e-5	15	NC	1	NC	1
26			min	-.001	3	-.005	3	0	3	-2.897e-4	1	NC	1	NC	1
27		14	max	0	1	.001	2	.001	1	-1.242e-5	15	NC	1	NC	1
28			min	-.001	3	-.004	3	0	3	-2.626e-4	1	NC	1	NC	1
29		15	max	0	1	0	2	0	1	-1.116e-5	15	NC	1	NC	1
30			min	0	3	-.003	3	0	3	-2.354e-4	1	NC	1	NC	1
31		16	max	0	1	0	2	0	1	-9.888e-6	15	NC	1	NC	1
32			min	0	3	-.002	3	0	3	-2.082e-4	1	NC	1	NC	1
33		17	max	0	1	0	2	0	1	-8.62e-6	15	NC	1	NC	1
34			min	0	3	-.002	3	0	3	-1.81e-4	1	NC	1	NC	1
35		18	max	0	1	0	2	0	1	-7.353e-6	15	NC	1	NC	1
36			min	0	3	0	3	0	3	-1.538e-4	1	NC	1	NC	1
37		19	max	0	1	0	1	0	1	-5.807e-6	12	NC	1	NC	1
38			min	0	1	0	1	0	1	-1.267e-4	1	NC	1	NC	1
39	M3	1	max	0	1	0	1	0	1	6.066e-5	1	NC	1	NC	1
40			min	0	1	0	1	0	1	2.913e-6	15	NC	1	NC	1
41		2	max	0	3	0	2	0	12	7.401e-5	1	NC	1	NC	1
42			min	0	2	0	3	0	1	3.52e-6	15	NC	1	NC	1
43		3	max	0	3	0	2	0	12	8.737e-5	1	NC	1	NC	1
44			min	0	2	-.002	3	0	1	4.126e-6	15	NC	1	NC	1
45		4	max	0	3	0	2	0	3	1.007e-4	1	NC	1	NC	1
46			min	0	2	-.003	3	0	1	4.733e-6	15	NC	1	NC	1
47		5	max	0	3	0	2	0	3	1.141e-4	1	NC	1	NC	1
48			min	0	2	-.004	3	0	1	5.339e-6	15	NC	1	NC	1
49		6	max	0	3	0	2	0	3	1.274e-4	1	NC	1	NC	1
50			min	0	2	-.005	3	0	1	5.946e-6	15	NC	1	NC	1
51		7	max	0	3	0	2	0	3	1.408e-4	1	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
52			min	0	2	-.005	3	0	1	6.553e-6	15	NC	1	NC	1
53		8	max	0	3	.001	2	0	3	1.541e-4	1	NC	1	NC	1
54			min	0	2	-.006	3	0	1	7.159e-6	15	NC	1	NC	1
55		9	max	.001	3	.001	2	0	3	1.675e-4	1	NC	1	NC	1
56			min	-.001	2	-.007	3	0	9	7.766e-6	15	NC	1	NC	1
57		10	max	.001	3	.002	2	0	2	1.809e-4	1	NC	1	NC	1
58			min	-.001	2	-.007	3	0	15	8.372e-6	15	NC	1	NC	1
59		11	max	.001	3	.002	2	0	1	1.942e-4	1	NC	1	NC	1
60			min	-.001	2	-.008	3	0	15	8.979e-6	15	NC	1	NC	1
61		12	max	.002	3	.003	2	0	1	2.076e-4	1	NC	1	NC	1
62			min	-.002	2	-.008	3	0	15	9.585e-6	15	NC	1	NC	1
63		13	max	.002	3	.004	2	.001	1	2.209e-4	1	NC	1	NC	1
64			min	-.002	2	-.008	3	0	15	1.019e-5	15	NC	1	NC	1
65		14	max	.002	3	.005	2	.002	1	2.343e-4	1	NC	1	NC	1
66			min	-.002	2	-.009	3	0	15	1.08e-5	15	NC	1	NC	1
67		15	max	.002	3	.005	2	.002	1	2.476e-4	1	NC	1	NC	1
68			min	-.002	2	-.009	3	0	15	1.14e-5	15	8523.619	2	NC	1
69		16	max	.002	3	.006	2	.003	1	2.61e-4	1	NC	1	NC	1
70			min	-.002	2	-.009	3	0	15	1.201e-5	15	7235.804	2	NC	1
71		17	max	.002	3	.007	2	.003	1	2.743e-4	1	NC	1	NC	1
72			min	-.002	2	-.009	3	0	15	1.262e-5	15	6237.12	2	NC	1
73		18	max	.002	3	.008	2	.003	1	2.877e-4	1	NC	1	NC	1
74			min	-.002	2	-.009	3	0	15	1.322e-5	15	5453.925	2	NC	1
75		19	max	.002	3	.01	2	.004	1	3.01e-4	1	NC	3	NC	1
76			min	-.002	2	-.009	3	0	15	1.383e-5	15	4834.303	2	NC	1
77	M4	1	max	.001	1	.013	2	0	15	-1.746e-5	12	NC	1	NC	2
78			min	0	15	-.011	3	-.003	1	-4.832e-4	1	NC	1	6701.921	1
79		2	max	.001	1	.012	2	0	15	-1.746e-5	12	NC	1	NC	2
80			min	0	15	-.01	3	-.003	1	-4.832e-4	1	NC	1	7311.371	1
81		3	max	.001	1	.011	2	0	15	-1.746e-5	12	NC	1	NC	2
82			min	0	15	-.01	3	-.002	1	-4.832e-4	1	NC	1	8036.706	1
83		4	max	.001	1	.01	2	0	15	-1.746e-5	12	NC	1	NC	2
84			min	0	15	-.009	3	-.002	1	-4.832e-4	1	NC	1	8908.493	1
85		5	max	.001	1	.01	2	0	15	-1.746e-5	12	NC	1	NC	2
86			min	0	15	-.009	3	-.002	1	-4.832e-4	1	NC	1	9968.375	1
87		6	max	.001	1	.009	2	0	15	-1.746e-5	12	NC	1	NC	1
88			min	0	15	-.008	3	-.002	1	-4.832e-4	1	NC	1	NC	1
89		7	max	0	1	.008	2	0	15	-1.746e-5	12	NC	1	NC	1
90			min	0	15	-.007	3	-.001	1	-4.832e-4	1	NC	1	NC	1
91		8	max	0	1	.008	2	0	15	-1.746e-5	12	NC	1	NC	1
92			min	0	15	-.007	3	-.001	1	-4.832e-4	1	NC	1	NC	1
93		9	max	0	1	.007	2	0	15	-1.746e-5	12	NC	1	NC	1
94			min	0	15	-.006	3	-.001	1	-4.832e-4	1	NC	1	NC	1
95		10	max	0	1	.006	2	0	15	-1.746e-5	12	NC	1	NC	1
96			min	0	15	-.006	3	0	1	-4.832e-4	1	NC	1	NC	1
97		11	max	0	1	.006	2	0	15	-1.746e-5	12	NC	1	NC	1
98			min	0	15	-.005	3	0	1	-4.832e-4	1	NC	1	NC	1
99		12	max	0	1	.005	2	0	15	-1.746e-5	12	NC	1	NC	1
100			min	0	15	-.004	3	0	1	-4.832e-4	1	NC	1	NC	1
101		13	max	0	1	.004	2	0	15	-1.746e-5	12	NC	1	NC	1
102			min	0	15	-.004	3	0	1	-4.832e-4	1	NC	1	NC	1
103		14	max	0	1	.003	2	0	15	-1.746e-5	12	NC	1	NC	1
104			min	0	15	-.003	3	0	1	-4.832e-4	1	NC	1	NC	1
105		15	max	0	1	.003	2	0	15	-1.746e-5	12	NC	1	NC	1
106			min	0	15	-.002	3	0	1	-4.832e-4	1	NC	1	NC	1
107		16	max	0	1	.002	2	0	15	-1.746e-5	12	NC	1	NC	1
108			min	0	15	-.002	3	0	1	-4.832e-4	1	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
109		17	max	0	1	.001	2	0	15	-1.746e-5	12	NC	1	NC	1
110			min	0	15	-.001	3	0	1	-4.832e-4	1	NC	1	NC	1
111		18	max	0	1	0	2	0	15	-1.746e-5	12	NC	1	NC	1
112			min	0	15	0	3	0	1	-4.832e-4	1	NC	1	NC	1
113		19	max	0	1	0	1	0	1	-1.746e-5	12	NC	1	NC	1
114			min	0	1	0	1	0	1	-4.832e-4	1	NC	1	NC	1
115	M6	1	max	.007	1	.036	2	.003	1	4.743e-4	3	NC	3	NC	1
116			min	-.012	3	-.035	3	-.006	3	-2.028e-7	2	1163.36	2	7106.513	3
117		2	max	.007	1	.034	2	.003	1	4.586e-4	3	NC	3	NC	1
118			min	-.011	3	-.033	3	-.006	3	-1.694e-6	1	1245.767	2	7516.469	3
119		3	max	.006	1	.032	2	.002	1	4.429e-4	3	NC	3	NC	1
120			min	-.011	3	-.031	3	-.005	3	-4.88e-6	1	1340.309	2	8006.948	3
121		4	max	.006	1	.029	2	.002	1	4.273e-4	3	NC	3	NC	1
122			min	-.01	3	-.029	3	-.005	3	-8.067e-6	1	1449.406	2	8594.546	3
123		5	max	.006	1	.027	2	.002	1	4.116e-4	3	NC	3	NC	1
124			min	-.009	3	-.028	3	-.005	3	-1.125e-5	1	1576.177	2	9301.366	3
125		6	max	.005	1	.025	2	.002	1	3.959e-4	3	NC	3	NC	1
126			min	-.009	3	-.026	3	-.004	3	-1.444e-5	1	1724.703	2	NC	1
127		7	max	.005	1	.022	2	.002	1	3.802e-4	3	NC	3	NC	1
128			min	-.008	3	-.024	3	-.004	3	-1.763e-5	1	1900.426	2	NC	1
129		8	max	.004	1	.02	2	.001	1	3.646e-4	3	NC	3	NC	1
130			min	-.007	3	-.022	3	-.003	3	-2.081e-5	1	2110.766	2	NC	1
131		9	max	.004	1	.018	2	.001	1	3.489e-4	3	NC	3	NC	1
132			min	-.007	3	-.02	3	-.003	3	-2.4e-5	1	2366.107	2	NC	1
133		10	max	.004	1	.016	2	.001	1	3.332e-4	3	NC	3	NC	1
134			min	-.006	3	-.018	3	-.003	3	-2.719e-5	1	2681.442	2	NC	1
135		11	max	.003	1	.014	2	0	1	3.176e-4	3	NC	3	NC	1
136			min	-.005	3	-.016	3	-.002	3	-3.037e-5	1	3079.24	2	NC	1
137		12	max	.003	1	.012	2	0	1	3.019e-4	3	NC	3	NC	1
138			min	-.005	3	-.014	3	-.002	3	-3.356e-5	1	3594.792	2	NC	1
139		13	max	.002	1	.01	2	0	1	2.862e-4	3	NC	3	NC	1
140			min	-.004	3	-.012	3	-.002	3	-3.675e-5	1	4286.875	2	NC	1
141		14	max	.002	1	.008	2	0	1	2.705e-4	3	NC	3	NC	1
142			min	-.003	3	-.01	3	-.001	3	-3.993e-5	1	5261.237	2	NC	1
143		15	max	.002	1	.006	2	0	1	2.549e-4	3	NC	1	NC	1
144			min	-.003	3	-.008	3	0	3	-4.312e-5	1	6729.282	2	NC	1
145		16	max	.001	1	.005	2	0	1	2.392e-4	3	NC	1	NC	1
146			min	-.002	3	-.006	3	0	3	-4.631e-5	1	9184.155	2	NC	1
147		17	max	0	1	.003	2	0	1	2.235e-4	3	NC	1	NC	1
148			min	-.001	3	-.004	3	0	3	-4.949e-5	1	NC	1	NC	1
149		18	max	0	1	.001	2	0	1	2.078e-4	3	NC	1	NC	1
150			min	0	3	-.002	3	0	3	-5.268e-5	1	NC	1	NC	1
151		19	max	0	1	0	1	0	1	1.922e-4	3	NC	1	NC	1
152			min	0	1	0	1	0	1	-5.587e-5	1	NC	1	NC	1
153	M7	1	max	0	1	0	1	0	1	2.655e-5	1	NC	1	NC	1
154			min	0	1	0	1	0	1	-9.153e-5	3	NC	1	NC	1
155		2	max	0	3	.002	2	0	3	2.269e-5	1	NC	1	NC	1
156			min	0	2	-.002	3	0	1	-6.76e-5	3	NC	1	NC	1
157		3	max	0	3	.003	2	0	3	1.883e-5	1	NC	1	NC	1
158			min	0	2	-.004	3	0	1	-4.367e-5	3	NC	1	NC	1
159		4	max	.001	3	.004	2	.001	3	1.497e-5	1	NC	1	NC	1
160			min	-.001	2	-.006	3	0	1	-1.975e-5	3	NC	1	NC	1
161		5	max	.002	3	.006	2	.002	3	1.112e-5	1	NC	1	NC	1
162			min	-.002	2	-.008	3	0	1	0	10	7835.427	2	NC	1
163		6	max	.002	3	.007	2	.002	3	2.81e-5	3	NC	1	NC	1
164			min	-.002	2	-.01	3	0	1	0	10	6273.529	2	NC	1
165		7	max	.003	3	.009	2	.002	3	5.203e-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	-.003	2	-.012	3	0	1	-1.938e-7	13	5208.433	2	NC	1
167		8	max	.003	3	.01	2	.002	3	7.595e-5	3	NC	3	NC	1
168			min	-.003	2	-.014	3	0	1	-1.043e-6	4	4429.897	2	NC	1
169		9	max	.003	3	.012	2	.003	3	9.988e-5	3	NC	3	NC	1
170			min	-.004	2	-.016	3	0	1	-4.315e-6	1	3833.073	2	NC	1
171		10	max	.004	3	.014	2	.003	3	1.238e-4	3	NC	3	NC	1
172			min	-.004	2	-.017	3	0	1	-8.173e-6	1	3359.805	2	NC	1
173		11	max	.004	3	.015	2	.003	3	1.477e-4	3	NC	3	NC	1
174			min	-.005	2	-.019	3	-.001	1	-1.203e-5	1	2975.16	2	NC	1
175		12	max	.005	3	.017	2	.003	3	1.717e-4	3	NC	3	NC	1
176			min	-.005	2	-.02	3	-.001	1	-1.589e-5	1	2656.797	2	NC	1
177		13	max	.005	3	.019	2	.003	3	1.956e-4	3	NC	3	NC	1
178			min	-.006	2	-.022	3	-.001	1	-1.975e-5	1	2389.673	2	NC	1
179		14	max	.005	3	.021	2	.003	3	2.195e-4	3	NC	3	NC	1
180			min	-.006	2	-.023	3	-.001	1	-2.36e-5	1	2163.211	2	NC	1
181		15	max	.006	3	.023	2	.003	3	2.434e-4	3	NC	3	NC	1
182			min	-.007	2	-.024	3	-.001	1	-2.746e-5	1	1969.707	2	NC	1
183		16	max	.006	3	.026	2	.003	3	2.674e-4	3	NC	3	NC	1
184			min	-.007	2	-.025	3	-.001	1	-3.132e-5	1	1803.373	2	NC	1
185		17	max	.007	3	.028	2	.003	3	2.913e-4	3	NC	3	NC	1
186			min	-.008	2	-.026	3	-.001	1	-3.518e-5	1	1659.755	2	NC	1
187		18	max	.007	3	.03	2	.003	3	3.152e-4	3	NC	3	NC	1
188			min	-.008	2	-.027	3	-.002	1	-3.904e-5	1	1535.359	2	NC	1
189		19	max	.008	3	.032	2	.003	3	3.391e-4	3	NC	3	NC	1
190			min	-.009	2	-.028	3	-.002	1	-4.289e-5	1	1427.399	2	NC	1
191	M8	1	max	.004	1	.042	2	.002	1	-1.104e-7	10	NC	1	NC	1
192			min	0	15	-.035	3	-.002	3	-2.617e-4	3	NC	1	9368.236	3
193		2	max	.004	1	.04	2	.001	1	-1.104e-7	10	NC	1	NC	1
194			min	0	15	-.033	3	-.002	3	-2.617e-4	3	NC	1	NC	1
195		3	max	.003	1	.038	2	.001	1	-1.104e-7	10	NC	1	NC	1
196			min	0	15	-.031	3	-.002	3	-2.617e-4	3	NC	1	NC	1
197		4	max	.003	1	.035	2	.001	1	-1.104e-7	10	NC	1	NC	1
198			min	0	15	-.029	3	-.002	3	-2.617e-4	3	NC	1	NC	1
199		5	max	.003	1	.033	2	.001	1	-1.104e-7	10	NC	1	NC	1
200			min	0	15	-.027	3	-.001	3	-2.617e-4	3	NC	1	NC	1
201		6	max	.003	1	.03	2	0	1	-1.104e-7	10	NC	1	NC	1
202			min	0	15	-.025	3	-.001	3	-2.617e-4	3	NC	1	NC	1
203		7	max	.003	1	.028	2	0	1	-1.104e-7	10	NC	1	NC	1
204			min	0	15	-.023	3	-.001	3	-2.617e-4	3	NC	1	NC	1
205		8	max	.002	1	.026	2	0	1	-1.104e-7	10	NC	1	NC	1
206			min	0	15	-.021	3	0	3	-2.617e-4	3	NC	1	NC	1
207		9	max	.002	1	.023	2	0	1	-1.104e-7	10	NC	1	NC	1
208			min	0	15	-.019	3	0	3	-2.617e-4	3	NC	1	NC	1
209		10	max	.002	1	.021	2	0	1	-1.104e-7	10	NC	1	NC	1
210			min	0	15	-.017	3	0	3	-2.617e-4	3	NC	1	NC	1
211		11	max	.002	1	.019	2	0	1	-1.104e-7	10	NC	1	NC	1
212			min	0	15	-.015	3	0	3	-2.617e-4	3	NC	1	NC	1
213		12	max	.001	1	.016	2	0	1	-1.104e-7	10	NC	1	NC	1
214			min	0	15	-.013	3	0	3	-2.617e-4	3	NC	1	NC	1
215		13	max	.001	1	.014	2	0	1	-1.104e-7	10	NC	1	NC	1
216			min	0	15	-.012	3	0	3	-2.617e-4	3	NC	1	NC	1
217		14	max	.001	1	.012	2	0	1	-1.104e-7	10	NC	1	NC	1
218			min	0	15	-.01	3	0	3	-2.617e-4	3	NC	1	NC	1
219		15	max	0	1	.009	2	0	1	-1.104e-7	10	NC	1	NC	1
220			min	0	15	-.008	3	0	3	-2.617e-4	3	NC	1	NC	1
221		16	max	0	1	.007	2	0	1	-1.104e-7	10	NC	1	NC	1
222			min	0	15	-.006	3	0	3	-2.617e-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	.005	2	0	1	-1.104e-7	10	NC	1	NC	1
224			min	0	15	-.004	3	0	3	-2.617e-4	3	NC	1	NC	1
225		18	max	0	1	.002	2	0	1	-1.104e-7	10	NC	1	NC	1
226			min	0	15	-.002	3	0	3	-2.617e-4	3	NC	1	NC	1
227		19	max	0	1	0	1	0	1	-1.104e-7	10	NC	1	NC	1
228			min	0	1	0	1	0	1	-2.617e-4	3	NC	1	NC	1
229	M10	1	max	.002	1	.011	2	0	3	6.107e-4	1	NC	3	NC	1
230			min	-.003	3	-.011	3	-.002	1	-5.297e-4	3	3963.376	2	NC	1
231		2	max	.002	1	.01	2	0	3	5.792e-4	1	NC	3	NC	1
232			min	-.003	3	-.011	3	-.002	1	-5.109e-4	3	4335.568	2	NC	1
233		3	max	.002	1	.009	2	0	3	5.476e-4	1	NC	3	NC	1
234			min	-.003	3	-.01	3	-.001	1	-4.922e-4	3	4780.052	2	NC	1
235		4	max	.002	1	.008	2	0	3	5.161e-4	1	NC	1	NC	1
236			min	-.003	3	-.01	3	-.001	1	-4.734e-4	3	5314.533	2	NC	1
237		5	max	.002	1	.007	2	0	3	4.845e-4	1	NC	1	NC	1
238			min	-.003	3	-.009	3	-.001	1	-4.546e-4	3	5962.675	2	NC	1
239		6	max	.002	1	.006	2	0	3	4.53e-4	1	NC	1	NC	1
240			min	-.002	3	-.009	3	-.001	1	-4.358e-4	3	6756.628	2	NC	1
241		7	max	.002	1	.005	2	0	3	4.215e-4	1	NC	1	NC	1
242			min	-.002	3	-.008	3	-.001	1	-4.17e-4	3	7740.891	2	NC	1
243		8	max	.001	1	.005	2	0	3	3.899e-4	1	NC	1	NC	1
244			min	-.002	3	-.008	3	-.001	1	-3.982e-4	3	8978.429	2	NC	1
245		9	max	.001	1	.004	2	0	3	3.584e-4	1	NC	1	NC	1
246			min	-.002	3	-.007	3	0	1	-3.795e-4	3	NC	1	NC	1
247		10	max	.001	1	.003	2	0	3	3.268e-4	1	NC	1	NC	1
248			min	-.002	3	-.007	3	0	1	-3.607e-4	3	NC	1	NC	1
249		11	max	.001	1	.003	2	0	3	2.953e-4	1	NC	1	NC	1
250			min	-.001	3	-.006	3	0	1	-3.419e-4	3	NC	1	NC	1
251		12	max	0	1	.002	2	0	3	2.637e-4	1	NC	1	NC	1
252			min	-.001	3	-.006	3	0	1	-3.231e-4	3	NC	1	NC	1
253		13	max	0	1	.002	2	0	3	2.322e-4	1	NC	1	NC	1
254			min	-.001	3	-.005	3	0	1	-3.043e-4	3	NC	1	NC	1
255		14	max	0	1	.001	2	0	3	2.006e-4	1	NC	1	NC	1
256			min	0	3	-.004	3	0	1	-2.855e-4	3	NC	1	NC	1
257		15	max	0	1	0	2	0	3	1.691e-4	1	NC	1	NC	1
258			min	0	3	-.003	3	0	1	-2.668e-4	3	NC	1	NC	1
259		16	max	0	1	0	2	0	3	1.375e-4	1	NC	1	NC	1
260			min	0	3	-.003	3	0	1	-2.48e-4	3	NC	1	NC	1
261		17	max	0	1	0	2	0	3	1.06e-4	1	NC	1	NC	1
262			min	0	3	-.002	3	0	1	-2.292e-4	3	NC	1	NC	1
263		18	max	0	1	0	2	0	3	7.446e-5	1	NC	1	NC	1
264			min	0	3	0	3	0	1	-2.104e-4	3	NC	1	NC	1
265		19	max	0	1	0	1	0	1	4.291e-5	1	NC	1	NC	1
266			min	0	1	0	1	0	1	-1.916e-4	3	NC	1	NC	1
267	M11	1	max	0	1	0	1	0	1	9.173e-5	3	NC	1	NC	1
268			min	0	1	0	1	0	1	-2.1e-5	1	NC	1	NC	1
269		2	max	0	3	0	2	0	1	6.799e-5	3	NC	1	NC	1
270			min	0	2	0	3	0	3	-4.226e-5	1	NC	1	NC	1
271		3	max	0	3	0	2	0	2	4.424e-5	3	NC	1	NC	1
272			min	0	2	-.002	3	0	3	-6.351e-5	1	NC	1	NC	1
273		4	max	0	3	0	2	0	2	2.05e-5	3	NC	1	NC	1
274			min	0	2	-.003	3	-.001	3	-8.477e-5	1	NC	1	NC	1
275		5	max	0	3	0	2	0	2	-2.553e-6	12	NC	1	NC	1
276			min	0	2	-.004	3	-.002	3	-1.06e-4	1	NC	1	NC	1
277		6	max	0	3	0	2	0	10	-6.327e-6	15	NC	1	NC	1
278			min	0	2	-.005	3	-.002	3	-1.273e-4	1	NC	1	NC	1
279		7	max	0	3	0	2	0	10	-7.352e-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	-.005	3	-.002	3	-1.486e-4	1	NC	1	NC	1
281		8	max	0	3	.001	2	0	10	-8.378e-6	15	NC	1	NC	1
282			min	0	2	-.006	3	-.002	3	-1.698e-4	1	NC	1	NC	1
283		9	max	.001	3	.001	2	0	10	-9.403e-6	15	NC	1	NC	1
284			min	-.001	2	-.007	3	-.002	3	-1.911e-4	1	NC	1	NC	1
285		10	max	.001	3	.002	2	0	15	-1.043e-5	15	NC	1	NC	1
286			min	-.001	2	-.007	3	-.003	3	-2.123e-4	1	NC	1	NC	1
287		11	max	.001	3	.002	2	0	15	-1.145e-5	15	NC	1	NC	1
288			min	-.001	2	-.008	3	-.003	3	-2.336e-4	1	NC	1	NC	1
289		12	max	.002	3	.003	2	0	15	-1.248e-5	15	NC	1	NC	1
290			min	-.002	2	-.008	3	-.003	1	-2.548e-4	1	NC	1	NC	1
291		13	max	.002	3	.004	2	0	15	-1.351e-5	15	NC	1	NC	1
292			min	-.002	2	-.009	3	-.004	1	-2.761e-4	1	NC	1	NC	1
293		14	max	.002	3	.005	2	0	15	-1.453e-5	15	NC	1	NC	1
294			min	-.002	2	-.009	3	-.004	1	-2.974e-4	1	NC	1	NC	1
295		15	max	.002	3	.005	2	0	15	-1.556e-5	15	NC	1	NC	2
296			min	-.002	2	-.009	3	-.005	1	-3.186e-4	1	8539.629	2	9630.367	1
297		16	max	.002	3	.006	2	0	15	-1.658e-5	15	NC	1	NC	2
298			min	-.002	2	-.009	3	-.005	1	-3.399e-4	1	7248.16	2	8586.68	1
299		17	max	.002	3	.007	2	0	15	-1.761e-5	15	NC	1	NC	2
300			min	-.002	2	-.009	3	-.006	1	-3.611e-4	1	6246.908	2	7748.932	1
301		18	max	.002	3	.008	2	0	15	-1.863e-5	15	NC	1	NC	2
302			min	-.002	2	-.009	3	-.007	1	-3.824e-4	1	5461.875	2	7068.429	1
303		19	max	.003	3	.01	2	0	15	-1.966e-5	15	NC	3	NC	2
304			min	-.002	2	-.009	3	-.007	1	-4.037e-4	1	4840.914	2	6510.59	1
305	M12	1	max	.001	1	.012	2	.006	1	3.904e-4	1	NC	1	NC	2
306			min	0	15	-.011	3	0	15	1.863e-5	15	NC	1	3241.864	1
307		2	max	.001	1	.012	2	.005	1	3.904e-4	1	NC	1	NC	2
308			min	0	15	-.01	3	0	15	1.863e-5	15	NC	1	3535.564	1
309		3	max	.001	1	.011	2	.005	1	3.904e-4	1	NC	1	NC	2
310			min	0	15	-.01	3	0	15	1.863e-5	15	NC	1	3885.162	1
311		4	max	.001	1	.01	2	.004	1	3.904e-4	1	NC	1	NC	2
312			min	0	15	-.009	3	0	15	1.863e-5	15	NC	1	4305.394	1
313		5	max	.001	1	.01	2	.004	1	3.904e-4	1	NC	1	NC	2
314			min	0	15	-.009	3	0	15	1.863e-5	15	NC	1	4816.331	1
315		6	max	.001	1	.009	2	.004	1	3.904e-4	1	NC	1	NC	2
316			min	0	15	-.008	3	0	15	1.863e-5	15	NC	1	5445.895	1
317		7	max	0	1	.008	2	.003	1	3.904e-4	1	NC	1	NC	2
318			min	0	15	-.007	3	0	15	1.863e-5	15	NC	1	6233.854	1
319		8	max	0	1	.008	2	.003	1	3.904e-4	1	NC	1	NC	2
320			min	0	15	-.007	3	0	15	1.863e-5	15	NC	1	7238.446	1
321		9	max	0	1	.007	2	.002	1	3.904e-4	1	NC	1	NC	2
322			min	0	15	-.006	3	0	15	1.863e-5	15	NC	1	8547.766	1
323		10	max	0	1	.006	2	.002	1	3.904e-4	1	NC	1	NC	1
324			min	0	15	-.006	3	0	15	1.863e-5	15	NC	1	NC	1
325		11	max	0	1	.006	2	.002	1	3.904e-4	1	NC	1	NC	1
326			min	0	15	-.005	3	0	15	1.863e-5	15	NC	1	NC	1
327		12	max	0	1	.005	2	.001	1	3.904e-4	1	NC	1	NC	1
328			min	0	15	-.004	3	0	15	1.863e-5	15	NC	1	NC	1
329		13	max	0	1	.004	2	0	1	3.904e-4	1	NC	1	NC	1
330			min	0	15	-.004	3	0	15	1.863e-5	15	NC	1	NC	1
331		14	max	0	1	.003	2	0	1	3.904e-4	1	NC	1	NC	1
332			min	0	15	-.003	3	0	15	1.863e-5	15	NC	1	NC	1
333		15	max	0	1	.003	2	0	1	3.904e-4	1	NC	1	NC	1
334			min	0	15	-.002	3	0	15	1.863e-5	15	NC	1	NC	1
335		16	max	0	1	.002	2	0	1	3.904e-4	1	NC	1	NC	1
336			min	0	15	-.002	3	0	15	1.863e-5	15	NC	1	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
337		17	max	0	1	.001	2	0	1	3.904e-4	1	NC	1	NC	1
338			min	0	15	-.001	3	0	15	1.863e-5	15	NC	1	NC	1
339		18	max	0	1	0	2	0	1	3.904e-4	1	NC	1	NC	1
340			min	0	15	0	3	0	15	1.863e-5	15	NC	1	NC	1
341		19	max	0	1	0	1	0	1	3.904e-4	1	NC	1	NC	1
342			min	0	1	0	1	0	1	1.863e-5	15	NC	1	NC	1
343	M1	1	max	.01	3	.027	3	.003	3	9.429e-3	2	NC	1	NC	1
344			min	-.01	2	-.023	2	-.003	1	-1.382e-2	3	NC	1	NC	1
345		2	max	.01	3	.017	3	.003	3	4.62e-3	2	NC	4	NC	1
346			min	-.01	2	-.014	2	-.006	1	-6.834e-3	3	5117.376	2	NC	1
347		3	max	.01	3	.007	3	.002	3	1.924e-5	3	NC	4	NC	2
348			min	-.01	2	-.005	2	-.007	1	-3.767e-4	1	2625.197	2	9889.011	1
349		4	max	.01	3	.003	2	.002	3	2.263e-5	3	NC	4	NC	2
350			min	-.01	2	-.002	3	-.008	1	-3.258e-4	1	1834.315	2	8203.18	1
351		5	max	.01	3	.009	2	.001	3	2.602e-5	3	NC	4	NC	2
352			min	-.01	2	-.009	3	-.008	1	-2.748e-4	1	1452.023	2	7903.973	1
353		6	max	.01	3	.015	2	0	3	2.94e-5	3	NC	4	NC	2
354			min	-.01	2	-.014	3	-.008	1	-2.239e-4	1	1234.239	2	8500.411	1
355		7	max	.009	3	.02	2	0	3	3.279e-5	3	NC	4	NC	1
356			min	-.01	2	-.019	3	-.007	1	-1.729e-4	1	1100.753	2	NC	1
357		8	max	.009	3	.023	2	0	3	3.617e-5	3	NC	4	NC	1
358			min	-.01	2	-.022	3	-.006	1	-1.22e-4	1	1018.164	2	NC	1
359		9	max	.009	3	.025	2	0	3	3.956e-5	3	NC	4	NC	1
360			min	-.01	2	-.023	3	-.004	1	-7.103e-5	1	970.887	2	NC	1
361		10	max	.009	3	.026	2	0	3	4.295e-5	3	NC	4	NC	1
362			min	-.01	2	-.024	3	-.002	1	-2.007e-5	1	951.807	2	NC	1
363		11	max	.009	3	.026	2	.001	3	4.633e-5	3	NC	4	NC	1
364			min	-.01	2	-.023	3	0	1	1.144e-6	15	958.976	2	NC	1
365		12	max	.009	3	.024	2	.001	3	8.183e-5	1	NC	4	NC	1
366			min	-.01	2	-.021	3	0	15	3.562e-6	15	994.937	2	NC	1
367		13	max	.009	3	.021	2	.002	1	1.328e-4	1	NC	4	NC	1
368			min	-.01	2	-.018	3	0	15	5.979e-6	15	1068.123	2	NC	1
369		14	max	.009	3	.016	2	.003	1	1.837e-4	1	NC	4	NC	2
370			min	-.01	2	-.014	3	0	15	8.396e-6	15	1197.855	2	8639.183	1
371		15	max	.009	3	.01	2	.004	1	2.347e-4	1	NC	4	NC	2
372			min	-.01	2	-.008	3	0	15	1.081e-5	15	1429.516	2	8006.336	1
373		16	max	.009	3	.002	2	.004	1	2.692e-4	1	NC	4	NC	2
374			min	-.01	2	-.002	3	0	15	1.245e-5	15	1874.033	3	8286.803	1
375		17	max	.009	3	.006	3	.003	1	5.511e-5	3	NC	4	NC	2
376			min	-.01	2	-.008	2	0	15	-8.76e-5	1	2719.951	3	9973.358	1
377		18	max	.009	3	.014	3	.001	1	6.995e-3	2	NC	2	NC	1
378			min	-.01	2	-.019	2	0	15	-3.565e-3	3	5334.252	3	NC	1
379		19	max	.009	3	.023	3	0	3	1.412e-2	2	NC	1	NC	1
380			min	-.01	2	-.031	2	-.002	1	-7.254e-3	3	5718.141	2	NC	1
381	M5	1	max	.03	3	.087	3	.003	3	5.103e-6	3	NC	1	NC	1
382			min	-.033	2	-.075	2	-.003	1	0	2	3598.275	3	NC	1
383		2	max	.03	3	.053	3	.005	3	1.354e-4	3	NC	4	NC	1
384			min	-.033	2	-.045	2	-.003	1	-4.572e-5	1	1561.816	2	NC	1
385		3	max	.03	3	.021	3	.006	3	2.631e-4	3	NC	5	NC	1
386			min	-.033	2	-.017	2	-.003	1	-9.069e-5	1	800.842	2	NC	1
387		4	max	.03	3	.009	2	.007	3	2.527e-4	3	NC	5	NC	1
388			min	-.033	2	-.006	3	-.003	1	-8.652e-5	1	559.171	2	NC	1
389		5	max	.03	3	.031	2	.008	3	2.423e-4	3	NC	5	NC	1
390			min	-.033	2	-.028	3	-.003	1	-8.235e-5	1	442.325	2	9800.915	3
391		6	max	.03	3	.05	2	.008	3	2.319e-4	3	NC	5	NC	1
392			min	-.033	2	-.046	3	-.003	1	-7.818e-5	1	375.743	2	8827.321	3
393		7	max	.03	3	.065	2	.008	3	2.215e-4	3	NC	5	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
394			min	-.033	2	-.06	3	-.003	1	-7.402e-5	1	334.916	2	8367.71	3
395		8	max	.029	3	.076	2	.008	3	2.112e-4	3	NC	5	NC	1
396			min	-.033	2	-.069	3	-.002	1	-6.985e-5	1	309.636	2	8247.756	3
397		9	max	.029	3	.084	2	.008	3	2.008e-4	3	NC	5	NC	1
398			min	-.033	2	-.075	3	-.002	1	-6.568e-5	1	295.139	2	8400.139	3
399		10	max	.029	3	.087	2	.007	3	1.904e-4	3	NC	5	NC	1
400			min	-.033	2	-.077	3	-.002	1	-6.151e-5	1	289.247	2	8814.036	3
401		11	max	.029	3	.086	2	.007	3	1.8e-4	3	NC	5	NC	1
402			min	-.033	2	-.074	3	-.002	1	-5.734e-5	1	291.364	2	9521.898	3
403		12	max	.029	3	.08	2	.006	3	1.696e-4	3	NC	5	NC	1
404			min	-.033	2	-.068	3	-.002	1	-5.317e-5	1	302.264	2	NC	1
405		13	max	.029	3	.069	2	.005	3	1.592e-4	3	NC	5	NC	1
406			min	-.033	2	-.058	3	-.002	1	-4.9e-5	1	324.523	2	NC	1
407		14	max	.029	3	.054	2	.005	3	1.488e-4	3	NC	5	NC	1
408			min	-.033	2	-.044	3	-.002	1	-4.484e-5	1	364.057	2	NC	1
409		15	max	.029	3	.033	2	.004	3	1.384e-4	3	NC	5	NC	1
410			min	-.033	2	-.027	3	-.002	1	-4.067e-5	1	434.788	2	NC	1
411		16	max	.029	3	.006	2	.003	3	1.228e-4	3	NC	5	NC	1
412			min	-.033	2	-.006	3	-.002	1	-3.999e-5	1	575.994	2	NC	1
413		17	max	.029	3	.019	3	.002	3	-7.685e-8	10	NC	5	NC	1
414			min	-.033	2	-.026	2	-.002	1	-1.223e-4	1	855.501	3	NC	1
415		18	max	.029	3	.046	3	.001	3	-9.371e-8	10	NC	4	NC	1
416			min	-.033	2	-.063	2	-.001	1	-6.253e-5	1	1677.693	3	NC	1
417		19	max	.029	3	.074	3	0	3	-3.417e-8	15	NC	3	NC	1
418			min	-.033	2	-.103	2	-.001	1	-9.318e-7	3	1708.002	2	NC	1
419	M9	1	max	.01	3	.027	3	.003	3	1.383e-2	3	NC	1	NC	1
420			min	-.01	2	-.023	2	-.003	1	-9.429e-3	2	NC	1	NC	1
421		2	max	.01	3	.016	3	.001	3	6.804e-3	3	NC	4	NC	1
422			min	-.01	2	-.014	2	0	9	-4.628e-3	2	5120.472	2	NC	1
423		3	max	.01	3	.006	3	.002	1	1.798e-4	1	NC	4	NC	1
424			min	-.01	2	-.005	2	0	3	-9.007e-5	3	2626.827	2	NC	1
425		4	max	.01	3	.003	2	.003	1	1.367e-4	1	NC	4	NC	1
426			min	-.01	2	-.002	3	-.001	3	-9.217e-5	3	1835.471	2	NC	1
427		5	max	.01	3	.009	2	.003	1	9.361e-5	1	NC	4	NC	1
428			min	-.01	2	-.009	3	-.002	3	-9.427e-5	3	1445.796	3	9839.376	3
429		6	max	.01	3	.015	2	.003	1	5.05e-5	1	NC	4	NC	1
430			min	-.01	2	-.015	3	-.003	3	-9.637e-5	3	1232.392	3	8510.118	3
431		7	max	.01	3	.02	2	.002	1	2.201e-5	2	NC	4	NC	1
432			min	-.01	2	-.019	3	-.004	3	-9.847e-5	3	1101.404	2	7729.411	3
433		8	max	.009	3	.023	2	.001	2	6.375e-6	2	NC	4	NC	1
434			min	-.01	2	-.022	3	-.004	3	-1.006e-4	3	1018.744	2	7280.537	3
435		9	max	.009	3	.025	2	0	2	-7.932e-7	10	NC	4	NC	1
436			min	-.01	2	-.024	3	-.005	3	-1.027e-4	3	971.417	2	7064.615	3
437		10	max	.009	3	.026	2	0	10	-4.527e-6	10	NC	4	NC	1
438			min	-.01	2	-.024	3	-.005	3	-1.219e-4	1	952.299	2	7038.104	3
439		11	max	.009	3	.026	2	0	10	-8.254e-6	15	NC	4	NC	1
440			min	-.01	2	-.023	3	-.005	3	-1.65e-4	1	959.441	2	7190.841	3
441		12	max	.009	3	.024	2	0	15	-1.031e-5	15	NC	4	NC	1
442			min	-.01	2	-.021	3	-.005	1	-2.081e-4	1	995.379	2	7540.883	3
443		13	max	.009	3	.021	2	0	15	-1.236e-5	15	NC	4	NC	2
444			min	-.01	2	-.018	3	-.006	1	-2.512e-4	1	1068.542	2	8141.24	3
445		14	max	.009	3	.016	2	0	15	-1.441e-5	15	NC	4	NC	2
446			min	-.01	2	-.014	3	-.007	1	-2.943e-4	1	1198.241	2	7889.496	1
447		15	max	.009	3	.01	2	0	15	-1.647e-5	15	NC	4	NC	2
448			min	-.01	2	-.008	3	-.007	1	-3.374e-4	1	1429.824	2	7513.236	1
449		16	max	.009	3	.002	2	0	15	-1.801e-5	15	NC	4	NC	2
450			min	-.01	2	-.002	3	-.007	1	-3.702e-4	1	1864.206	3	7915.095	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	.009	3	.006	3	0	15	1.074e-4	3	NC	4	NC	2
452			min	-.01	2	-.008	2	-.006	1	-1.567e-4	1	2706.177	3	9642.487	1
453		18	max	.009	3	.015	3	0	15	3.648e-3	3	NC	2	NC	1
454			min	-.01	2	-.019	2	-.004	1	-7.001e-3	2	5307.77	3	NC	1
455		19	max	.009	3	.023	3	0	3	7.252e-3	3	NC	1	NC	1
456			min	-.01	2	-.031	2	-.001	1	-1.412e-2	2	5733.322	2	NC	1
457	M13	1	max	.003	1	.027	3	.01	3	3.982e-3	3	NC	1	NC	1
458			min	-.003	3	-.023	2	-.01	2	-3.477e-3	2	NC	1	NC	1
459		2	max	.003	1	.12	3	.01	9	4.968e-3	3	NC	4	NC	2
460			min	-.003	3	-.087	2	-.005	10	-4.357e-3	2	1347.235	3	8488.804	1
461		3	max	.003	1	.197	3	.029	1	5.954e-3	3	NC	5	NC	2
462			min	-.003	3	-.14	2	-.004	10	-5.238e-3	2	737.236	3	3734.267	1
463		4	max	.003	1	.248	3	.044	1	6.94e-3	3	NC	5	NC	3
464			min	-.003	3	-.175	2	-.003	10	-6.118e-3	2	569.555	3	2586.233	1
465		5	max	.003	1	.266	3	.05	1	7.926e-3	3	NC	5	NC	3
466			min	-.003	3	-.189	2	-.004	10	-6.998e-3	2	526.669	3	2300.171	1
467		6	max	.003	1	.252	3	.045	1	8.912e-3	3	NC	5	NC	2
468			min	-.003	3	-.181	2	-.007	10	-7.878e-3	2	558.988	3	2525.164	1
469		7	max	.003	1	.213	3	.03	1	9.898e-3	3	NC	5	NC	2
470			min	-.003	3	-.156	2	-.01	10	-8.758e-3	2	677.869	3	3596.525	1
471		8	max	.003	1	.159	3	.024	3	1.088e-2	3	NC	5	NC	2
472			min	-.003	3	-.122	2	-.019	2	-9.639e-3	2	951.05	3	8237.139	9
473		9	max	.003	1	.11	3	.027	3	1.187e-2	3	NC	4	NC	1
474			min	-.003	3	-.09	2	-.028	2	-1.052e-2	2	1522.428	3	6682.299	2
475		10	max	.003	1	.087	3	.03	3	1.286e-2	3	NC	4	NC	4
476			min	-.003	3	-.075	2	-.033	2	-1.14e-2	2	2102.47	3	5412.282	2
477		11	max	.003	1	.11	3	.033	3	1.187e-2	3	NC	4	NC	1
478			min	-.003	3	-.09	2	-.028	2	-1.052e-2	2	1522.426	3	5454.063	3
479		12	max	.003	1	.159	3	.034	3	1.089e-2	3	NC	5	NC	2
480			min	-.003	3	-.122	2	-.019	2	-9.639e-3	2	951.049	3	5177.655	3
481		13	max	.003	1	.213	3	.034	3	9.904e-3	3	NC	5	NC	2
482			min	-.003	3	-.156	2	-.01	10	-8.759e-3	2	677.868	3	3579.345	1
483		14	max	.003	1	.252	3	.045	1	8.92e-3	3	NC	5	NC	2
484			min	-.003	3	-.181	2	-.007	10	-7.879e-3	2	558.987	3	2522.671	1
485		15	max	.003	1	.266	3	.05	1	7.936e-3	3	NC	5	NC	5
486			min	-.003	3	-.189	2	-.004	10	-6.999e-3	2	526.668	3	2303.882	1
487		16	max	.003	1	.248	3	.044	1	6.952e-3	3	NC	5	NC	5
488			min	-.003	3	-.175	2	-.003	10	-6.119e-3	2	569.555	3	2597.064	1
489		17	max	.003	1	.198	3	.029	1	5.968e-3	3	NC	5	NC	2
490			min	-.003	3	-.14	2	-.004	10	-5.239e-3	2	737.235	3	3762.627	1
491		18	max	.003	1	.121	3	.013	3	4.984e-3	3	NC	4	NC	2
492			min	-.003	3	-.087	2	-.005	10	-4.359e-3	2	1347.234	3	8604.946	1
493		19	max	.003	1	.027	3	.01	3	4.e-3	3	NC	1	NC	1
494			min	-.003	3	-.023	2	-.01	2	-3.479e-3	2	NC	1	NC	1
495	M16	1	max	.001	1	.023	3	.009	3	4.528e-3	2	NC	1	NC	1
496			min	0	3	-.031	2	-.01	2	-3.363e-3	3	NC	1	NC	1
497		2	max	.001	1	.073	3	.013	3	5.683e-3	2	NC	4	NC	2
498			min	0	3	-.127	2	-.005	10	-4.171e-3	3	1318.405	2	8492.395	1
499		3	max	.001	1	.114	3	.029	1	6.837e-3	2	NC	5	NC	2
500			min	0	3	-.206	2	-.003	10	-4.979e-3	3	720.293	2	3735.225	1
501		4	max	.001	1	.142	3	.044	1	7.992e-3	2	NC	5	NC	5
502			min	0	3	-.258	2	-.003	10	-5.787e-3	3	554.852	2	2586.706	1
503		5	max	.001	1	.153	3	.05	1	9.146e-3	2	NC	5	NC	5
504			min	0	3	-.278	2	-.004	10	-6.596e-3	3	510.625	2	2300.542	1
505		6	max	.001	1	.149	3	.045	1	1.03e-2	2	NC	5	NC	2
506			min	0	3	-.265	2	-.007	10	-7.404e-3	3	537.67	2	2525.678	1
507		7	max	.001	1	.132	3	.031	3	1.146e-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	-.227	2	-.01	10	-8.212e-3	3	642.986	2	3598.037	1
509		8	max	.001	1	.108	3	.031	3	1.261e-2	2	NC	5	NC	2
510			min	0	3	-.174	2	-.019	2	-9.02e-3	3	878.587	2	5749.648	3
511		9	max	.001	1	.085	3	.03	3	1.376e-2	2	NC	4	NC	1
512			min	0	3	-.125	2	-.028	2	-9.828e-3	3	1337.496	2	5986.39	3
513		10	max	.001	1	.074	3	.029	3	1.492e-2	2	NC	4	NC	4
514			min	0	3	-.103	2	-.033	2	-1.064e-2	3	1761.059	2	5458.373	2
515		11	max	.001	1	.085	3	.027	3	1.376e-2	2	NC	4	NC	1
516			min	0	3	-.125	2	-.028	2	-9.826e-3	3	1337.496	2	6750.477	2
517		12	max	.001	1	.108	3	.026	3	1.261e-2	2	NC	5	NC	2
518			min	0	3	-.174	2	-.019	2	-9.016e-3	3	878.587	2	7500.344	3
519		13	max	.001	1	.132	3	.03	1	1.146e-2	2	NC	5	NC	2
520			min	0	3	-.227	2	-.01	10	-8.206e-3	3	642.986	2	3592.176	1
521		14	max	.002	1	.149	3	.045	1	1.03e-2	2	NC	5	NC	2
522			min	0	3	-.265	2	-.007	10	-7.396e-3	3	537.67	2	2529.289	1
523		15	max	.002	1	.153	3	.05	1	9.148e-3	2	NC	5	NC	3
524			min	0	3	-.278	2	-.004	10	-6.586e-3	3	510.625	2	2309.224	1
525		16	max	.002	1	.141	3	.044	1	7.994e-3	2	NC	5	NC	3
526			min	0	3	-.258	2	-.003	10	-5.776e-3	3	554.852	2	2603.088	1
527		17	max	.002	1	.114	3	.029	1	6.84e-3	2	NC	5	NC	2
528			min	0	3	-.206	2	-.003	10	-4.966e-3	3	720.293	2	3772.435	1
529		18	max	.002	1	.072	3	.011	3	5.685e-3	2	NC	4	NC	2
530			min	0	3	-.127	2	-.005	10	-4.156e-3	3	1318.405	2	8634.397	1
531		19	max	.002	1	.023	3	.009	3	4.531e-3	2	NC	1	NC	1
532			min	0	3	-.031	2	-.01	2	-3.346e-3	3	NC	1	NC	1
533	M15	1	max	0	1	0	1	0	1	4.197e-4	3	NC	1	NC	1
534			min	0	1	0	1	0	1	-6.106e-5	2	NC	1	NC	1
535		2	max	0	3	-.002	15	.001	1	8.959e-4	3	NC	1	NC	1
536			min	0	2	-.007	4	0	3	-5.314e-4	2	NC	1	NC	1
537		3	max	0	3	-.003	15	.003	1	1.372e-3	3	NC	3	NC	1
538			min	0	2	-.013	4	-.004	3	-1.002e-3	2	5853.948	4	9634.994	3
539		4	max	0	3	-.004	15	.007	2	1.848e-3	3	NC	5	NC	4
540			min	0	2	-.019	4	-.008	3	-1.472e-3	2	4016.15	4	5364.485	3
541		5	max	0	3	-.006	15	.011	2	2.325e-3	3	NC	15	NC	4
542			min	0	2	-.024	4	-.013	3	-1.942e-3	2	3133.843	4	3541.991	3
543		6	max	0	3	-.007	15	.016	2	2.801e-3	3	NC	15	NC	4
544			min	-.001	2	-.029	4	-.019	3	-2.413e-3	2	2637.46	4	2589.723	3
545		7	max	0	3	-.008	15	.021	2	3.277e-3	3	9950.234	15	NC	4
546			min	-.001	2	-.033	4	-.025	3	-2.883e-3	2	2338.951	4	2030.621	3
547		8	max	0	3	-.008	15	.025	2	3.753e-3	3	9188.103	15	NC	4
548			min	-.002	2	-.036	4	-.031	3	-3.353e-3	2	2159.801	4	1678.166	3
549		9	max	0	3	-.009	15	.029	2	4.229e-3	3	8777.88	15	NC	4
550			min	-.002	2	-.037	4	-.036	3	-3.824e-3	2	2063.372	4	1447.112	3
551		10	max	0	3	-.009	15	.033	2	4.706e-3	3	8648.105	15	NC	4
552			min	-.002	2	-.038	4	-.04	3	-4.294e-3	2	2032.866	4	1294.506	3
553		11	max	.001	3	-.009	15	.035	2	5.182e-3	3	8777.88	15	NC	5
554			min	-.002	2	-.037	4	-.043	3	-4.764e-3	2	2063.372	4	1197.769	3
555		12	max	.001	3	-.008	15	.035	2	5.658e-3	3	9188.103	15	NC	5
556			min	-.002	2	-.036	4	-.043	3	-5.235e-3	2	2159.801	4	1145.729	3
557		13	max	.001	3	-.008	15	.033	2	6.134e-3	3	9950.234	15	NC	5
558			min	-.003	2	-.033	4	-.042	3	-5.705e-3	2	2338.951	4	1135.248	3
559		14	max	.001	3	-.007	15	.029	2	6.611e-3	3	NC	15	NC	4
560			min	-.003	2	-.029	4	-.038	3	-6.175e-3	2	2637.46	4	1171.418	3
561		15	max	.001	3	-.006	15	.024	1	7.087e-3	3	NC	15	NC	4
562			min	-.003	2	-.025	4	-.031	3	-6.646e-3	2	3133.843	4	1272.564	3
563		16	max	.002	3	-.005	15	.017	1	7.563e-3	3	NC	5	NC	4
564			min	-.003	2	-.02	4	-.02	3	-7.116e-3	2	4016.15	4	1488.279	3

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
565		17	max	.002	3	-.003	2	.006	1	8.039e-3	3	NC	3	NC	4
566			min	-.003	2	-.014	4	-.005	3	-7.586e-3	2	5853.948	4	1974.028	3
567		18	max	.002	3	.003	2	.014	3	8.515e-3	3	NC	1	NC	4
568			min	-.004	2	-.008	4	-.016	2	-8.057e-3	2	NC	1	3516.122	3
569		19	max	.002	3	.008	2	.037	3	8.992e-3	3	NC	1	NC	1
570			min	-.004	2	-.002	9	-.036	2	-8.527e-3	2	NC	1	NC	1
571	M16A	1	max	0	10	.002	2	.011	3	2.574e-3	3	NC	1	NC	1
572			min	-.002	3	-.002	3	-.011	2	-2.478e-3	2	NC	1	NC	1
573		2	max	0	10	-.002	15	.003	3	2.476e-3	3	NC	1	NC	1
574			min	-.002	3	-.007	4	-.004	2	-2.369e-3	2	NC	1	9977.315	3
575		3	max	0	10	-.003	15	.006	1	2.379e-3	3	NC	3	NC	4
576			min	-.002	3	-.014	4	-.003	3	-2.26e-3	2	5853.948	4	5654.56	3
577		4	max	0	10	-.005	15	.01	1	2.281e-3	3	NC	5	NC	4
578			min	-.002	3	-.019	4	-.008	3	-2.151e-3	2	4016.15	4	4308.888	3
579		5	max	0	10	-.006	15	.012	1	2.184e-3	3	NC	15	NC	4
580			min	-.001	3	-.025	4	-.012	3	-2.042e-3	2	3133.843	4	3729.496	3
581		6	max	0	10	-.007	15	.014	1	2.086e-3	3	NC	15	NC	4
582			min	-.001	3	-.029	4	-.014	3	-1.933e-3	2	2637.46	4	3481.572	3
583		7	max	0	10	-.008	15	.015	1	1.988e-3	3	9950.234	15	NC	4
584			min	-.001	3	-.033	4	-.015	3	-1.824e-3	2	2338.951	4	3429.646	3
585		8	max	0	10	-.008	15	.015	1	1.891e-3	3	9188.103	15	NC	4
586			min	-.001	3	-.036	4	-.015	3	-1.715e-3	2	2159.801	4	3528.655	3
587		9	max	0	10	-.009	15	.014	1	1.793e-3	3	8777.88	15	NC	4
588			min	-.001	3	-.037	4	-.014	3	-1.606e-3	2	2063.372	4	3775.034	3
589		10	max	0	10	-.009	15	.013	1	1.696e-3	3	8648.105	15	NC	4
590			min	0	3	-.038	4	-.012	3	-1.496e-3	2	2032.866	4	4196.335	3
591		11	max	0	10	-.009	15	.011	1	1.598e-3	3	8777.88	15	NC	4
592			min	0	3	-.037	4	-.011	3	-1.387e-3	2	2063.372	4	4858.519	3
593		12	max	0	10	-.008	15	.009	1	1.501e-3	3	9188.103	15	NC	4
594			min	0	3	-.035	4	-.008	3	-1.278e-3	2	2159.801	4	5893.581	3
595		13	max	0	10	-.008	15	.007	1	1.403e-3	3	9950.234	15	NC	2
596			min	0	3	-.033	4	-.006	3	-1.169e-3	2	2338.951	4	7571.468	3
597		14	max	0	10	-.007	15	.005	1	1.306e-3	3	NC	15	NC	1
598			min	0	3	-.029	4	-.004	3	-1.06e-3	2	2637.46	4	NC	1
599		15	max	0	10	-.006	15	.003	1	1.208e-3	3	NC	15	NC	1
600			min	0	3	-.024	4	-.002	3	-9.511e-4	2	3133.843	4	NC	1
601		16	max	0	10	-.004	15	.002	9	1.11e-3	3	NC	5	NC	1
602			min	0	3	-.019	4	0	3	-8.42e-4	2	4016.15	4	NC	1
603		17	max	0	10	-.003	15	0	4	1.013e-3	3	NC	3	NC	1
604			min	0	3	-.013	4	0	2	-7.33e-4	2	5853.948	4	NC	1
605		18	max	0	10	-.002	15	0	3	9.153e-4	3	NC	1	NC	1
606			min	0	3	-.007	4	0	2	-6.239e-4	2	NC	1	NC	1
607		19	max	0	1	0	1	0	1	8.178e-4	3	NC	1	NC	1
608			min	0	1	0	1	0	1	-5.148e-4	2	NC	1	NC	1

Anchor Designer™
Software
Version 2.4.5673.0

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

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

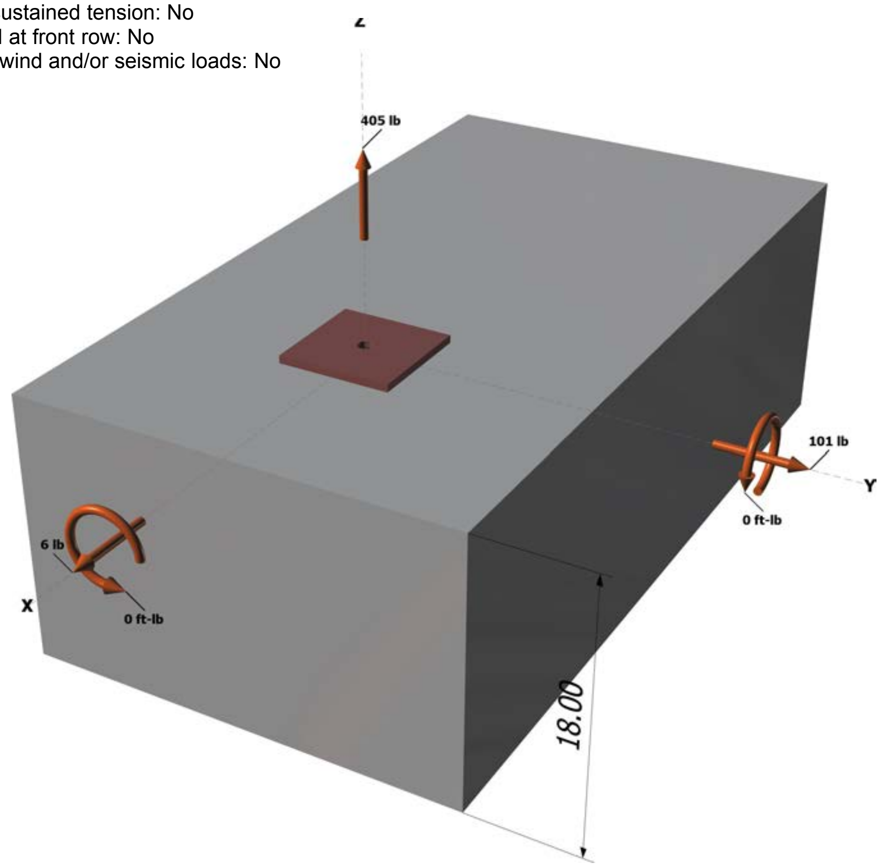
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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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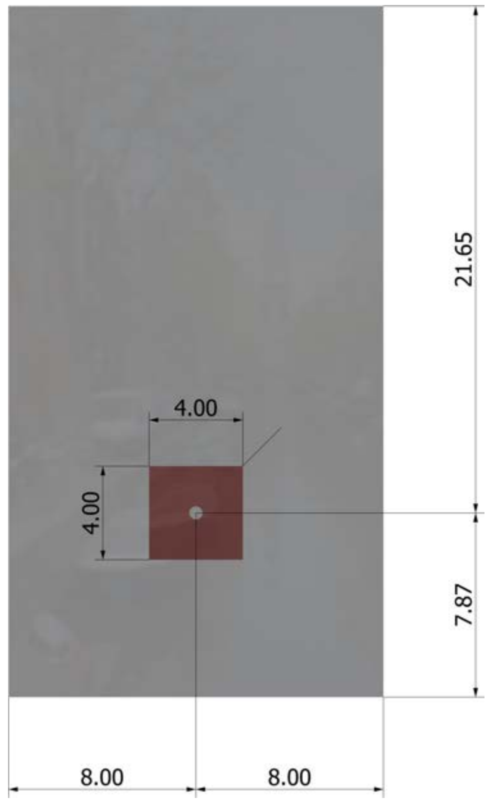


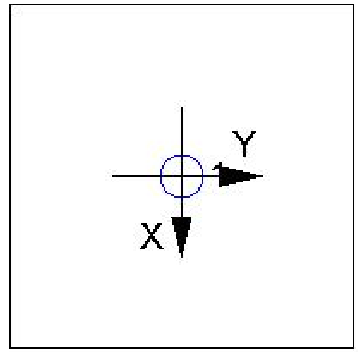
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

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, ϕN_n (lb)	Ratio	Status
Steel	405	6071	0.07	Pass
Concrete breakout	405	6717	0.06	Pass
Adhesive	**405**	**5365**	**0.08**	**Pass (Governs)**

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

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

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

12. Warnings

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

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

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

SIMPSON Strong-Tie

Anchor Designer™
Software
Version 2.4.5673.0

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

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

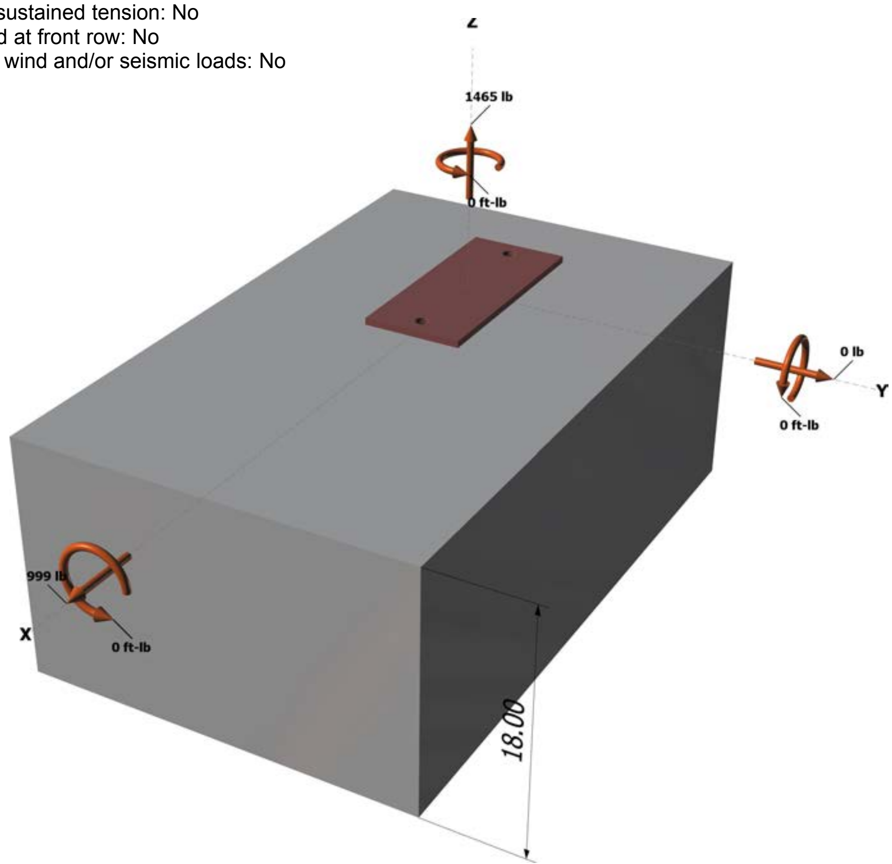
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

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

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

<Figure 1>



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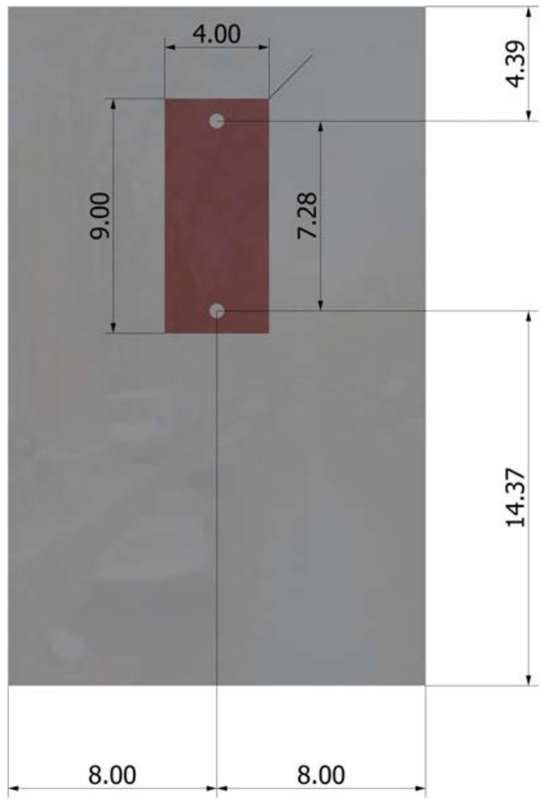


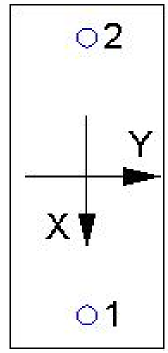
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

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

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

<Figure 3>



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Shear perpendicular to edge in x-direction:

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

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

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

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

Shear parallel to edge in x-direction:

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

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

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

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

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

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

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

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

ϕV_{cpg} (lb)
15580

11. Results

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

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

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

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

Sec. D.7.3	0.20	0.25	45.0 %	1.2	Pass

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

12. Warnings

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

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

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