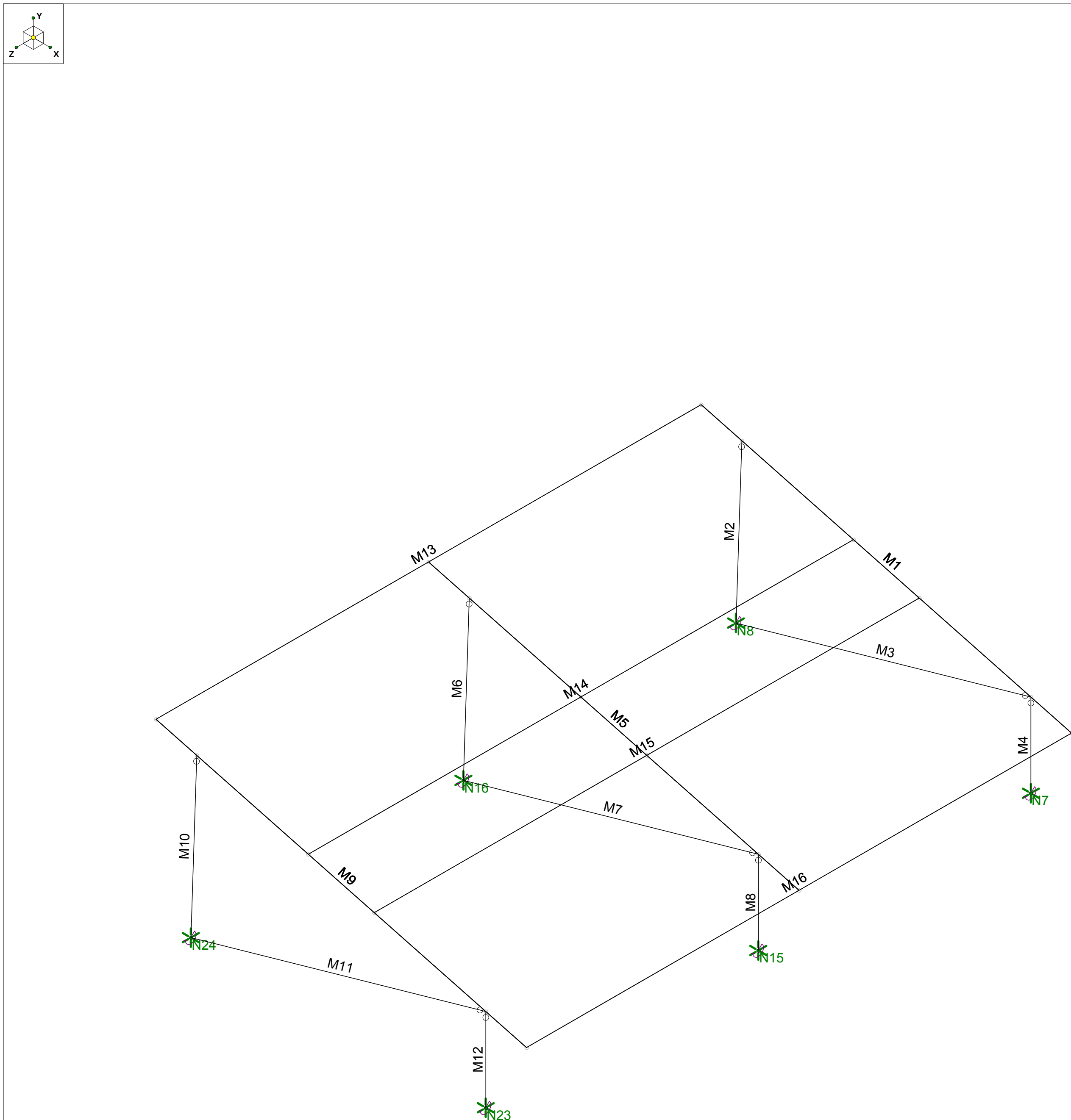


Schletter, Inc.		15° Tilt w/o Seismic Design
HCV	Standard PVMax Racking System	
	Representative Calculations - ASCE 7-05	

1. INTRODUCTION

1.1 Project Description

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

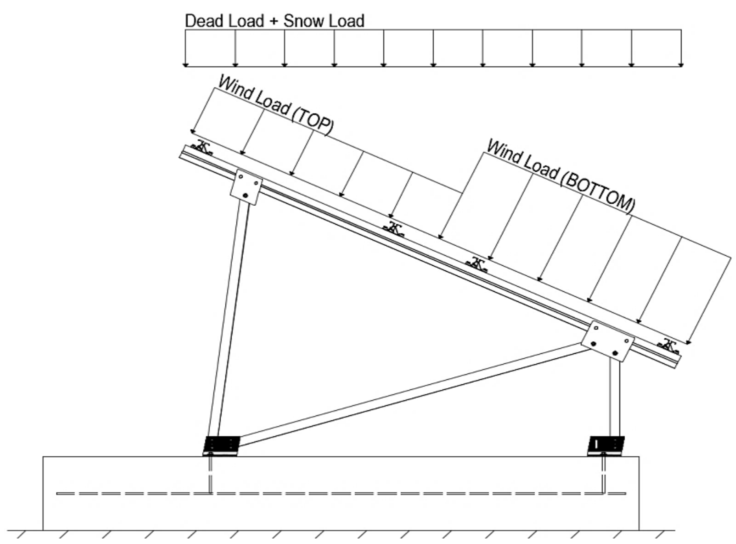
1.2 Construction

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 = 2
Module Tilt = 15°
Maximum Height Above Grade = 3 ft



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

1.3 Technical Codes

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

2. LOAD ACTIONS

2.1 Permanent Loads

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

Self-weight of the PV modules.

2.2 Snow Loads

Ground Snow Load, P_g = 30.00 psf
Sloped Roof Snow Load, P_s = 22.68 psf *(ASCE 7-05, Eq. 7-2)*
I_s = 1.00
C_s = 1.00
C_e = 0.90
C_t = 1.20

2.3 Wind Loads

Design Wind Speed, V = 130 mph
Height < 15 ft

Exposure Category = C
Importance Category = II

Peak Velocity Pressure, q_z = 26.53 psf *Including the gust factor, G=0.85. (ASCE 7-05, Eq. 6-15)*

Pressure Coefficients

$Cf+_{TOP}$	=	1.000	(Pressure)
$Cf+_{BOTTOM}$	=	1.600	
$Cf-_{TOP, OUTER PURLIN}$	=	-2.300	
$Cf-_{TOP, INNER PURLIN}$	=	-1.780	(Suction)
$Cf-_{BOTTOM}$	=	-1.000	

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

2.4 Seismic Loads - N/A

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

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

2.5 Combination of Loads

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

Strength Design, LRFD

Component stresses are checked using the following LRFD load combinations:

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

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

Allowable Stress Design, ASD

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

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

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

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

3. STRUCTURAL ANALYSIS

3.1 RISA Results

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

3.2 RISA Components

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

Purlins	Location	**Diagonal Struts**	Location	**Front Reactions**	Location
M13	Top	M3	Outer	N7	Outer
M14	Mid-Top	M7	Inner	N15	Inner
M15	Mid-Bottom	M11	Outer	N23	Outer
M16	Bottom				

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

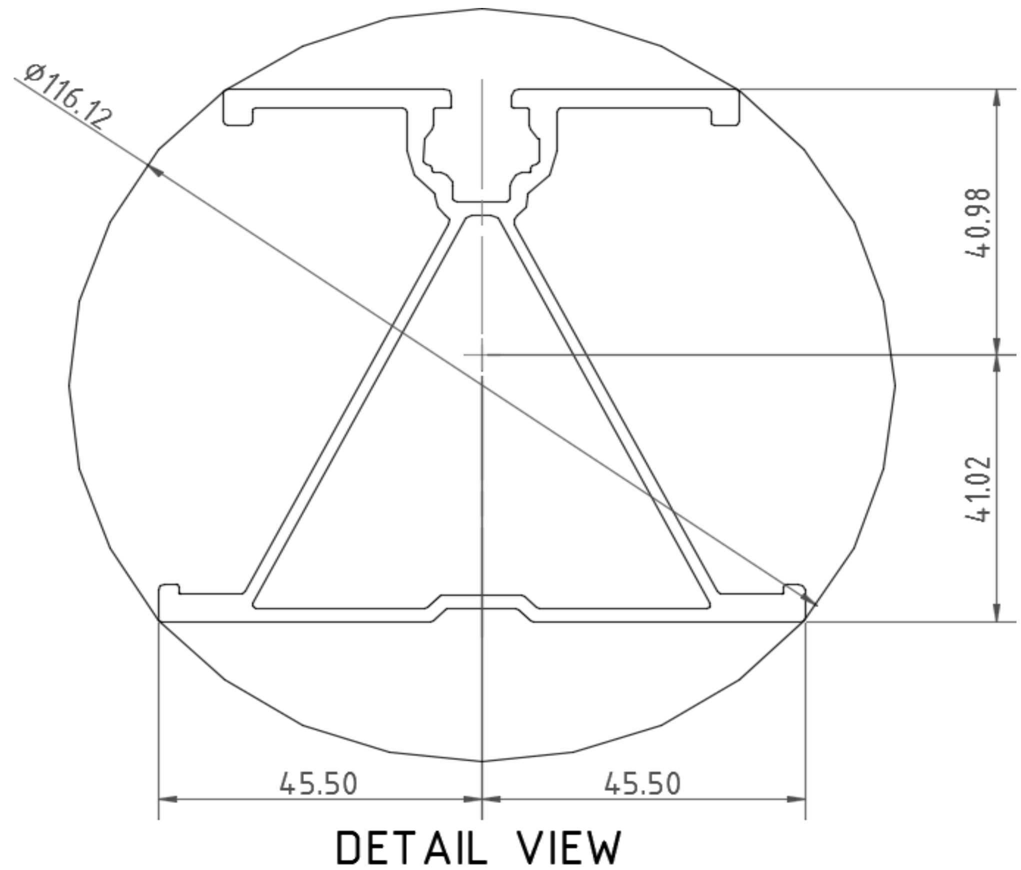
Front Struts	Location
M4	Outer
M8	Inner
M12	Outer

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).

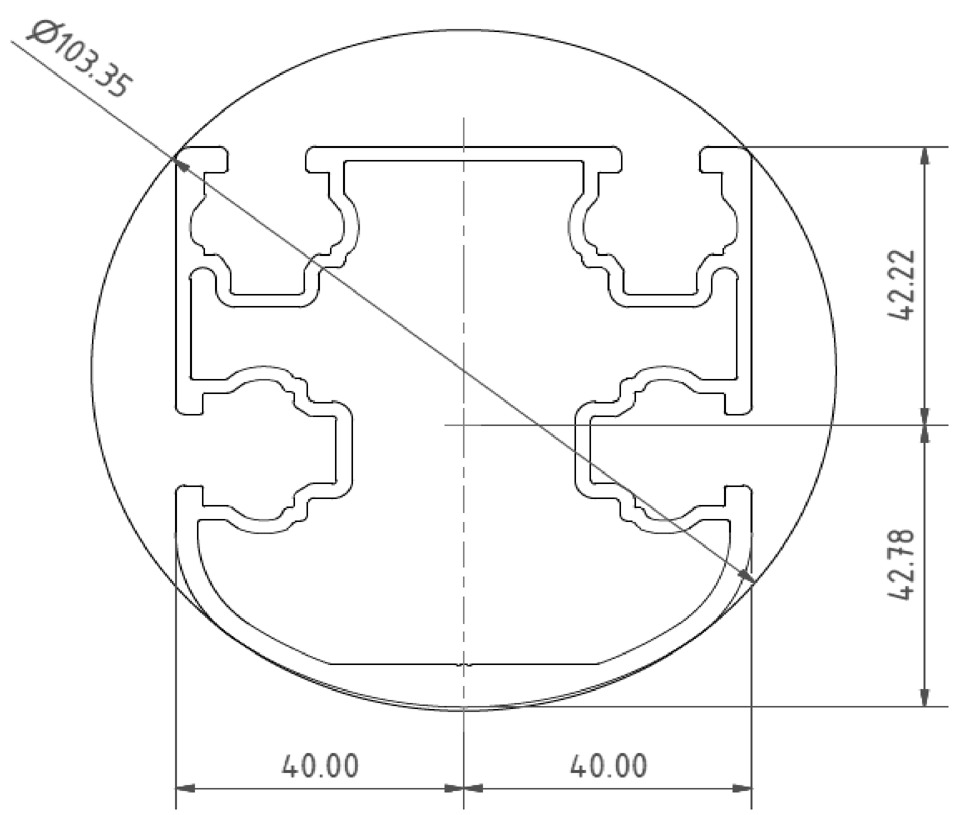
Purlin Type =	**S1.5**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	99	in
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	25.07	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	23.08	ksi
S_y =	1.33	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	2.16	in^4
I_x =	1.07	in^4
A =	1.25	in^2
g =	1.50	lbs/ft
M_y =	-2.271	k-ft
M_z =	0.002	k-ft
$M_{y\ allowable}$ =	2.779	k-ft
$M_{z\ allowable}$ =	1.154	k-ft
Utilization =	82%	



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).

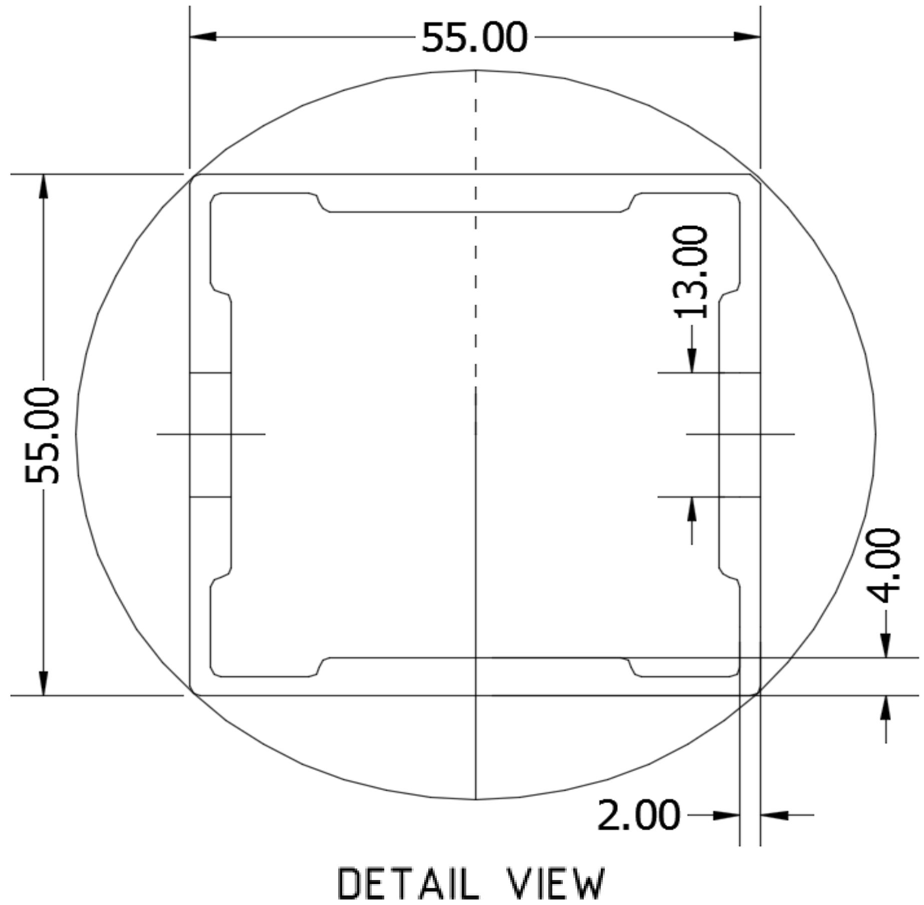
Girder Type =	**BF0**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	88.90	in
$\Phi F_{ty\ AXIAL}$ =	31.09	ksi
$\Phi F_{ty\ STRONG\text{-}AXIS}$ =	29.35	ksi
$\Phi F_{ty\ WEAK\text{-}AXIS}$ =	33.25	ksi
S_y =	1.42	in^3
S_x =	1.41	in^3
E =	10100	ksi
I_y =	2.39	in^4
I_x =	2.22	in^4
A =	1.88	in^2
g =	2.26	lbs/ft
M_y =	-3.398	k-ft
M_z =	0.000	k-ft
P_n =	-0.589	k
$M_{y\ allowable}$ =	3.464	k-ft
$M_{z\ allowable}$ =	3.907	k-ft
$P_{n\ allowable}$ =	58.535	k
Utilization =	99%	



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 M12 bolts at each end. See Appendix A.3 for detailed member calculations. Section units are in (mm).

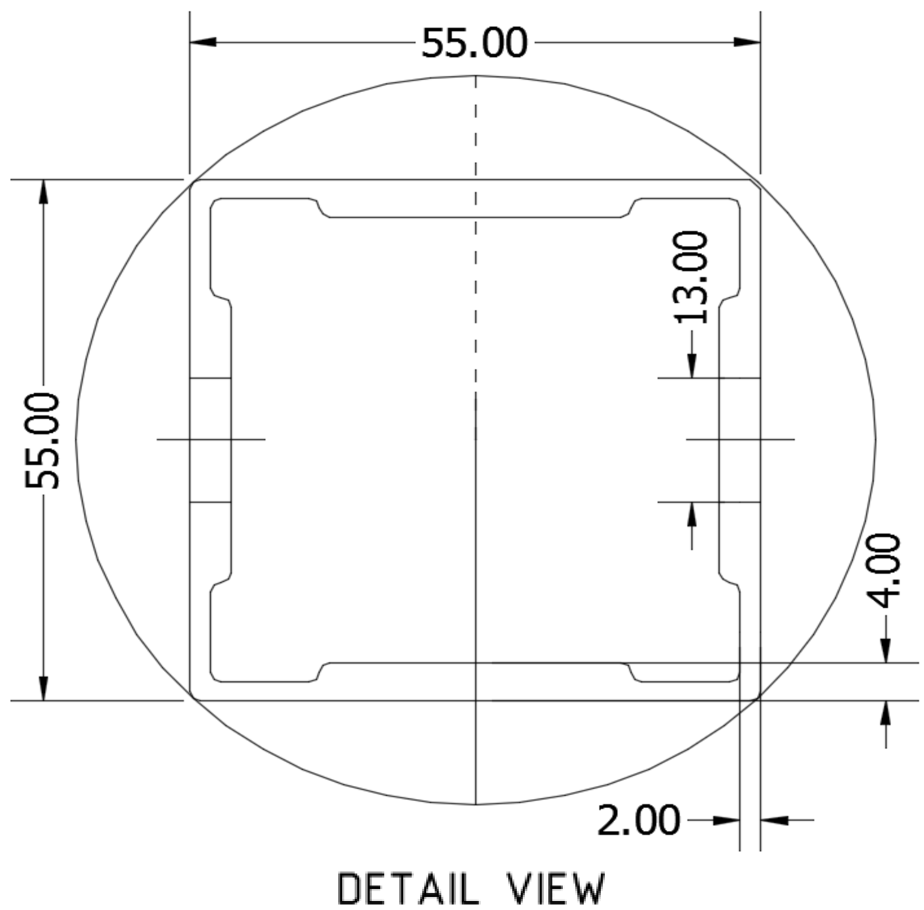
Strut Type =	**55x55**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	24.80	in
$\Phi F_{ty\ AXIAL}$ =	28.03	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.000	k-ft
M_z =	0.000	k-ft
P_n =	3.822	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	27.532	k
Utilization =	14%	



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 M12 bolts at each end. See Appendix A.4 for detailed member calculations. Section units are in (mm).

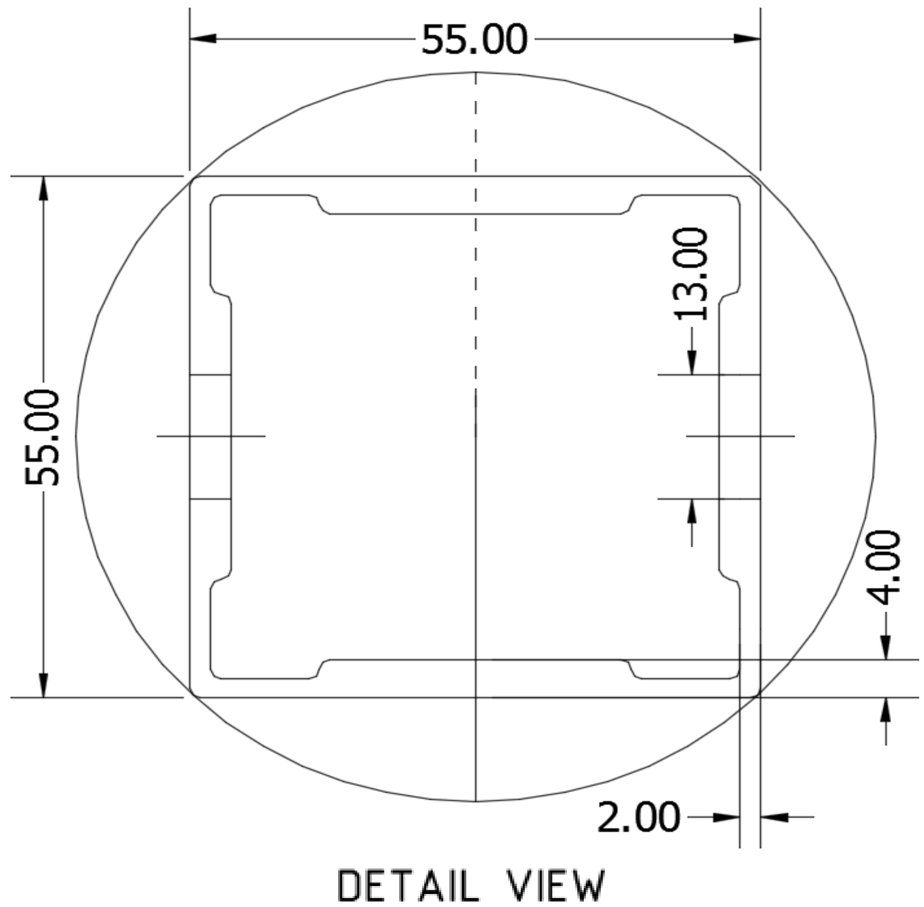
Strut Type =	**55x55**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	86.60	in
$\Phi F_{ty\ AXIAL}$ =	7.50	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	0.012	k-ft
M_z =	0.000	k-ft
P_n =	1.615	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	7.371	k
Utilization =	23%	



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 M12 bolts at each end. See Appendix A.5 for detailed member calculations. Section units are in (mm).

Strut Type =	**55x55**	
Aluminum Type =	6105-T5	
F_{ty} =	35	ksi
L_b =	48.30	in
$\Phi F_{ty\ AXIAL}$ =	18.93	ksi
$\Phi F_{ty\ BENDING}$ =	28.22	ksi
S_y =	0.60	in^3
S_x =	0.60	in^3
E =	10100	ksi
I_y =	0.67	in^4
I_x =	0.67	in^4
A =	0.98	in^2
g =	1.18	lbs/ft
M_y =	-0.010	k-ft
M_z =	0.000	k-ft
P_n =	3.544	k
$M_{y\ allowable}$ =	1.408	k-ft
$M_{z\ allowable}$ =	1.408	k-ft
$P_{n\ allowable}$ =	18.592	k
Utilization =	20%	



5. FOUNDATION DESIGN CALCULATIONS

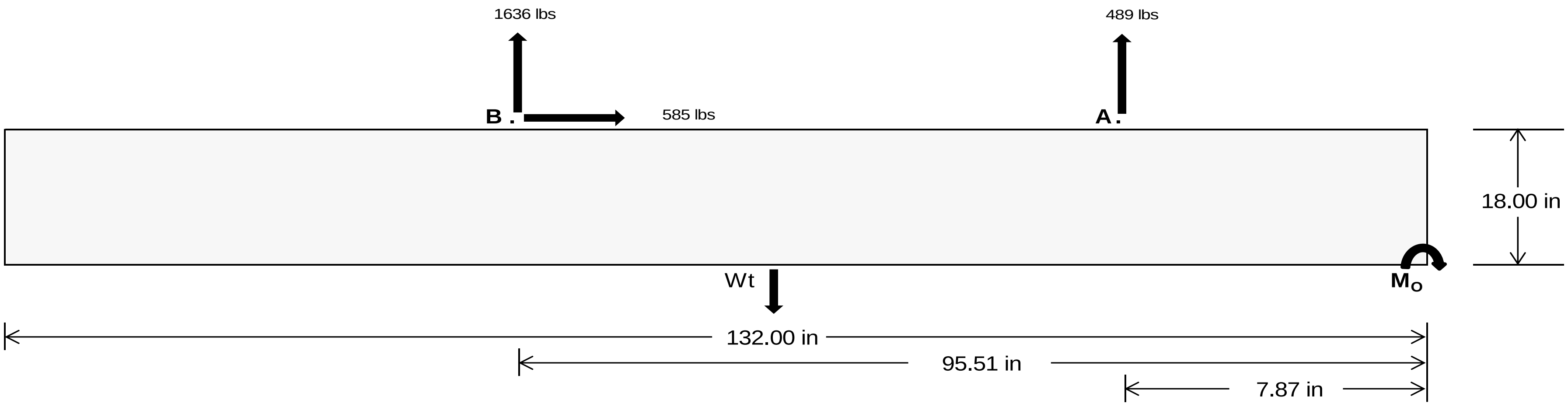
5.1 Helical Pile Foundations

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 =	2044.55	6814.04	k
Compressive Load =	4969.14	5142.14	k
Lateral Load =	6.66	2433.28	k
Moment (Weak Axis) =	0.01	0.00	k

5.2 Design of Ballast Foundations

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



Concrete Properties

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

Overturning Check

M_O = 170602.6 in-lbs
Resisting Force Required = 2584.89 lbs
S.F. = 1.67
Weight Required = 4308.15 lbs
Minimum Width = 38 in in
Weight Provided = 7576.25 lbs

Sliding

Force = 584.92 lbs
Friction = 0.4
Weight Required = 1462.30 lbs
Resisting Weight = 7576.25 lbs
Additional Weight Required = 0 lbs

Cohesion

Sliding Force = 584.92 lbs
Cohesion = 130 psf
Area = 34.83 ft^2
Resisting = 3788.13 lbs
Additional Weight Required = 0 lbs

Shear Key

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

Footing Reinforcement

Use fiber reinforcing with (3) #5 rebar.

A minimum 132in long x 38in wide x 18in tall ballast foundation is required to resist overturning.

Use a 132in long x 38in wide x 18in tall ballast foundation to resist sliding. Friction is OK.

Use a 132in long x 38in wide x 18in tall ballast foundation. Cohesion is OK.

Shear key is not required.

Bearing Pressure

	Ballast Width			
	38 in	39 in	40 in	41 in
P_{ftg} = (145 pcf)(11 ft)(1.5 ft)(3.17 ft) =	7576 lbs	7776 lbs	7975 lbs	8174 lbs

ASD LC	1.0D + 1.0S				1.0D + 1.0W				1.0D + 0.75L + 0.75W + 0.75S				0.6D + 1.0W			
Width	38 in	39 in	40 in	41 in	38 in	39 in	40 in	41 in	38 in	39 in	40 in	41 in	38 in	39 in	40 in	41 in
F_A	1420 lbs	1420 lbs	1420 lbs	1420 lbs	2066 lbs	2066 lbs	2066 lbs	2066 lbs	2507 lbs	2507 lbs	2507 lbs	2507 lbs	-978 lbs	-978 lbs	-978 lbs	-978 lbs
F_B	1465 lbs	1465 lbs	1465 lbs	1465 lbs	2138 lbs	2138 lbs	2138 lbs	2138 lbs	2592 lbs	2592 lbs	2592 lbs	2592 lbs	-3271 lbs	-3271 lbs	-3271 lbs	-3271 lbs
F_V	118 lbs	118 lbs	118 lbs	118 lbs	1022 lbs	1022 lbs	1022 lbs	1022 lbs	847 lbs	847 lbs	847 lbs	847 lbs	-1170 lbs	-1170 lbs	-1170 lbs	-1170 lbs
P_{total}	10460 lbs	10660 lbs	10859 lbs	11059 lbs	11780 lbs	11979 lbs	12179 lbs	12378 lbs	12675 lbs	12874 lbs	13074 lbs	13273 lbs	297 lbs	416 lbs	536 lbs	656 lbs
M	3452 lbs-ft	3452 lbs-ft	3452 lbs-ft	3452 lbs-ft	6283 lbs-ft	6283 lbs-ft	6283 lbs-ft	6283 lbs-ft	7040 lbs-ft	7040 lbs-ft	7040 lbs-ft	7040 lbs-ft	1554 lbs-ft	1554 lbs-ft	1554 lbs-ft	1554 lbs-ft
e	0.33 ft	0.32 ft	0.32 ft	0.31 ft	0.53 ft	0.52 ft	0.52 ft	0.51 ft	0.56 ft	0.55 ft	0.54 ft	0.53 ft	5.24 ft	3.73 ft	2.90 ft	2.37 ft
L/6	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft	1.83 ft
f_{min}	246.2 psf	245.5 psf	244.8 psf	244.1 psf	239.8 psf	239.2 psf	238.7 psf	238.2 psf	253.6 psf	252.7 psf	251.8 psf	251.0 psf	0.0 psf	0.0 psf	0.0 psf	0.0 psf
f_{max}	354.4 psf	350.8 psf	347.5 psf	344.3 psf	436.6 psf	430.9 psf	425.6 psf	420.5 psf	474.1 psf	467.5 psf	461.3 psf	455.3 psf	239.4 psf	48.3 psf	41.2 psf	40.9 psf

Maximum Bearing Pressure = 474 psf
Allowable Bearing Pressure = 1500 psf

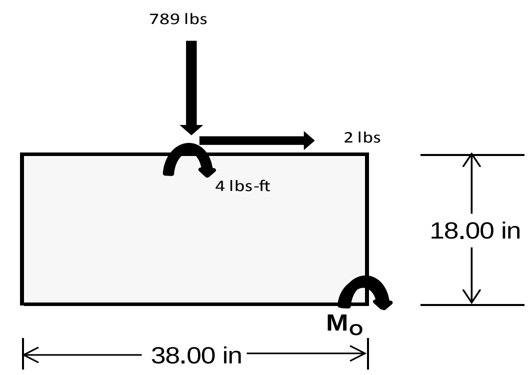
Use a 132in long x 38in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Weak Side Design

Overturning Check

M_O = 1242.0 ft-lbs
Resisting Force Required = 784.43 lbs
S.F. = 1.67
Weight Required = 1307.38 lbs
Minimum Width = 38 in in
Weight Provided = 7576.25 lbs

A minimum 132in long x 38in 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	38 in			38 in			38 in		
Support	Outer	Inner	Outer	Outer	Inner	Outer	Outer	Inner	Outer
F_Y	206 lbs	538 lbs	206 lbs	789 lbs	2349 lbs	789 lbs	60 lbs	157 lbs	60 lbs
F_V	1 lbs	0 lbs	1 lbs	2 lbs	0 lbs	2 lbs	0 lbs	0 lbs	0 lbs
P_{total}	9585 lbs	7576 lbs	9585 lbs	9718 lbs	7576 lbs	9718 lbs	2803 lbs	7576 lbs	2803 lbs
M	2 lbs-ft	0 lbs-ft	2 lbs-ft	8 lbs-ft	0 lbs-ft	8 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	0.53 ft	0.53 ft	0.53 ft	0.53 ft	0.53 ft	0.53 ft	0.53 ft	0.53 ft	0.53 ft
f_{min}	275.1 psf	217.5 psf	275.1 psf	278.6 psf	217.5 psf	278.6 psf	80.4 psf	217.5 psf	80.4 psf
f_{max}	275.3 psf	217.5 psf	275.3 psf	279.4 psf	217.5 psf	279.4 psf	80.5 psf	217.5 psf	80.5 psf

Maximum Bearing Pressure = 279 psf
Allowable Bearing Pressure = 1500 psf

Use a 132in long x 38in wide x 18in tall ballast foundation for an acceptable bearing pressure.

Foundation Requirements: 132in long x 38in wide x 18in tall ballast foundation and fiber reinforcing with (3) #5 rebar.

5.3 Foundation Anchors

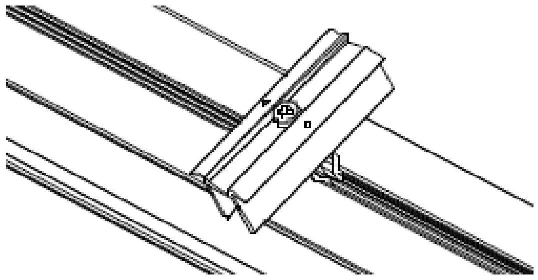
Threaded rods are anchored to the the ballast foundations using the Simpson AT-XP epoxy solution. LRFD load results are compared to the allowable strengths of the epoxy solution. Please see the supplementary calculations provided by the Simpson Anchor Designer software.

6. DESIGN OF JOINTS AND CONNECTIONS

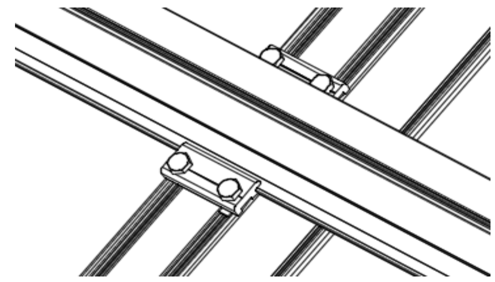
6.1 Anchorage of Modules to Purlins and Connection of Purlins to Girders

Modules are secured to the purlins with Schletter, Inc. Rapid2+ mounting clamps. Purlins are secured to the girders with the use of 80mm mounting clamps. The reliability of calculations is uncertain due to limited standards, therefore the strength of the clamp fasteners has been evaluated by load testing.

Fastening of Modules to Purlins		
Maximum Uplifting Force =	0.923	k
Allowable Uplift =	1.214	k
Utilization =	76%	



Fastening of Purlins to Girders		
Maximum Uplifting Force =	2.721	k
Allowable Uplift =	4.357	k
Utilization =	62%	



6.2 Strut Connections

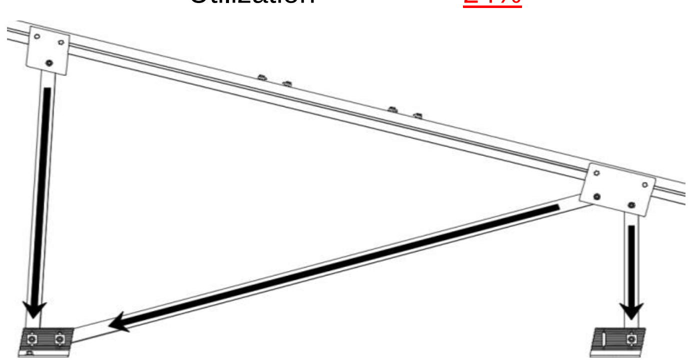
The aluminum struts connect the aluminum girder ends to custom brackets with mounting holes. Single M12 bolts are used to attach each end of the strut to the girder and post. ASTM A193/A193M-86 equivalent stainless steel bolts are used.

Front Strut		
Maximum Axial Load =	3.822	k
M12 Bolt Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	52%	

Rear Strut		
Maximum Axial Load =	4.773	k
M12 Bolt Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	64%	

Diagonal Strut		
Maximum Axial Load =	1.764	k
M12 Bolt Shear Capacity =	12.808	k
Strut Bearing Capacity =	7.421	k
Utilization =	24%	

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 M12 bolts are located at each end of the strut and are subjected to double shear.

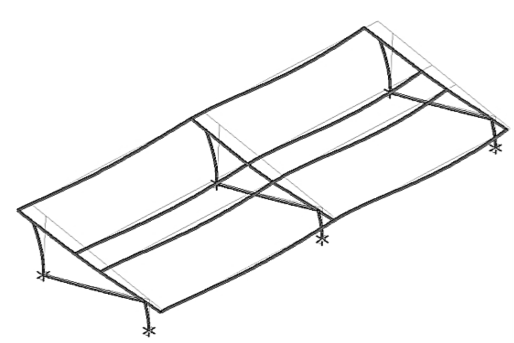
7. SEISMIC DESIGN

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} =	36.30	in
Allowable Story Drift for All Other Structures, Δ = {	$0.020h_{sx}$	
	0.726	in
Max Drift, Δ_{MAX} =	0.017	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 = **S1.5**

Strong Axis:

3.4.14

L_b = 99 in

J = 0.432

273.88

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 28.0 ksi

3.4.16

b/t = 32.195

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 25.1 ksi

3.4.16.1 Not Used

Rb/t =

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

φF_L= 1.17φyFcy

φF_L= 38.9 ksi

3.4.18

h/t = 37.0588

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

S1 = 36.9

m = 0.65

C_0 = 40.985

Cc = 41.015

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

S2 = 77.2

φF_L= φb[Bbr-mDbr*h/t]

φF_L= 43.2 ksi

φF_LSt= 25.1 ksi

Ix = 897074 mm^4

2.155 in^4

y = 41.015 mm

Sx = 1.335 in³

M_{max}St = 2.788 k-ft

Weak Axis:

3.4.14

L_b = 99

J = 0.432

174.171

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

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 = 37.0588

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 23.1 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 32.195

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

S1 = 36.9

m = 0.65

C_0 = 45.5

Cc = 45.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 23.1 ksi

Iy = 446476 mm^4

1.073 in^4

x = 45.5 mm

Sy = 0.599 in³

M_{max}Wk = 1.152 k-ft

Compression

3.4.9

b/t = 32.195
S1 = 12.21 (See 3.4.16 above for formula)
S2 = 32.70 (See 3.4.16 above for formula)
φF_L= φc[Bp-1.6Dp*b/t]
φF_L= 25.1 ksi

b/t = 37.0588
S1 = 12.21
S2 = 32.70
φF_L= (φck2*√(BpE))/(1.6b/t)
φF_L= 21.9 ksi

3.4.10

Rb/t = 0.0

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

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

φF_L= 21.94 ksi
A = 1215.13 mm^2
1.88 in^2
P_{max} = 41.32 kips

A.2 Design of Aluminum Girders - Aluminum Design Manual, 2005 Edition

Girder = **BF0**

Strong Axis:
3.4.14

L_b = 88.9 in
J = 1.08
152.913

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

S1 = 0.51461

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

S2 = 1701.56
φF_L= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
φF_L= 29.4 ksi

3.4.16

b/t = 16.2

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

S1 = 12.2

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

S2 = 46.7
φF_L= φb[Bp-1.6Dp*b/t]
φF_L= 31.6 ksi

Weak Axis:
3.4.14

L_b = 88.9
J = 1.08
161.829

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

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

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 Used

Rb/t = 18.1

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

S1 = 1.1

$$S2 = C_t$$

S2 = 141.0

$\varphi F_L = \varphi b[Bt-Dt*\sqrt{(Rb/t)}]$

$\varphi F_L =$ 31.1 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 7.4

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

S1 = 35.2

m = 0.68

C_0 = 41.067

Cc = 43.717

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

S2 = 73.8

$\varphi F_L = 1.3\varphi yFcy$

$\varphi F_L =$ 43.2 ksi

$\varphi F_L St =$ 29.4 ksi

Ix = 984962 mm^4

2.366 in^4

y = 43.717 mm

Sx = 1.375 in^3

$M_{max}St$ = 3.363 k-ft

3.4.18

h/t = 16.2

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

S1 = 36.9

m = 0.65

C_0 = 40

Cc = 40

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

S2 = 77.3

$\varphi F_L = 1.3\varphi yFcy$

$\varphi F_L =$ 43.2 ksi

$\varphi F_L Wk =$ 33.3 ksi

Iy = 923544 mm^4

2.219 in^4

x = 40 mm

Sy = 1.409 in^3

$M_{max}Wk$ = 3.904 k-ft

Compression

3.4.9

b/t = 16.2

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

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

$\varphi F_L =$ 31.6 ksi

b/t = 7.4

S1 = 12.21

S2 = 32.70

$\varphi F_L = \varphi yFcy$

$\varphi F_L =$ 33.3 ksi

3.4.10

Rb/t = 18.1

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

S1 = 6.87

S2 = 131.3

$\varphi F_L = \varphi c[Bt-Dt*\sqrt{(Rb/t)}]$

$\varphi F_L =$ 31.09 ksi

$\varphi F_L =$ 31.09 ksi

A = 1215.13 mm^2

1.88 in^2

P_{max} = 58.55 kips

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

Strut = **55x55**

Strong Axis:

3.4.14

L_b = 24.8 in

J = 0.942

38.7028

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

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= 31.4 ksi

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 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

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 28.2 ksi

Ix = 279836 mm^4

0.672 in^4

y = 27.5 mm

Sx = 0.621 in^3

M_{max}St = 1.460 k-ft

Weak Axis:

3.4.14

L_b = 24.8

J = 0.942

38.7028

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

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= 31.4

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

φF_L= φb[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 28.2 ksi

Iy = 279836 mm^4

0.672 in^4

x = 27.5 mm

Sy = 0.621 in^3

M_{max}Wk = 1.460 k-ft

Compression

3.4.7

λ = 0.57371

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.87952

φF_L= φcc(Bc-Dc*λ)

φF_L= 28.0279 ksi

3.4.9

b/t = 24.5

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

b/t = 24.5

S1 = 12.21

S2 = 32.70

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 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= 28.03 ksi

A = 663.99 mm^2

1.03 in^2

P_{max} = 28.85 kips

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

Strut = **<u>55x55</u>**

Strong Axis:

3.4.14

L_b = 86.60 in

J = 0.942

135.148

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.6 ksi

Weak Axis:

3.4.14

L_b = 86.6

J = 0.942

135.148

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

S1 = 0.51461

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

S2 = 1701.56

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

φF_L= 29.6

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

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

$\varphi F_L =$ 28.2 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

$\varphi F_L = 1.17\varphi yFcy$

$\varphi F_L =$ 38.9 ksi

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

$C_0 =$ 27.5

Cc = 27.5

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

S2 = 77.3

$\varphi F_L = 1.3\varphi yFcy$

$\varphi F_L =$ 43.2 ksi

$\varphi F_L St =$ 28.2 ksi

Ix = 279836 mm^4

0.672 in^4

y = 27.5 mm

Sx = 0.621 in^3

$M_{max}St =$ 1.460 k-ft

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7

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

$\varphi F_L =$ 28.2 ksi

3.4.16.1

N/A for Weak Direction

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

$C_0 =$ 27.5

Cc = 27.5

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

S2 = 77.3

$\varphi F_L = 1.3\varphi yFcy$

$\varphi F_L =$ 43.2 ksi

$\varphi F_L Wk =$ 28.2 ksi

Iy = 279836 mm^4

0.672 in^4

x = 27.5 mm

Sy = 0.621 in^3

$M_{max}Wk =$ 1.460 k-ft

Compression

3.4.7

$\lambda =$ 2.00335

r = 0.81 in

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

$S1^* =$ 0.33515

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

$S2^* =$ 1.23671

$\varphi cc =$ 0.86047

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

$\varphi F_L =$ 7.50396 ksi

3.4.9

b/t = 24.5
S1 = 12.21 (See 3.4.16 above for formula)
S2 = 32.70 (See 3.4.16 above for formula)
$\varphi F_L = \varphi c[Bp-1.6Dp*b/t]$
$\varphi F_L =$ 28.2 ksi

b/t = 24.5
S1 = 12.21
S2 = 32.70
$\varphi F_L = \varphi c[Bp-1.6Dp*b/t]$
$\varphi F_L =$ 28.2 ksi

3.4.10

Rb/t = 0.0

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

S1 = 6.87
S2 = 131.3
$\varphi F_L = \varphi yFcy$
$\varphi F_L =$ 33.25 ksi

$\varphi F_L =$ 7.50 ksi
A = 663.99 mm^2
1.03 in^2
$P_{max} =$ 7.72 kips

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

Strut = **55x55**

Strong Axis:
3.4.14

$L_b =$ 48.30 in
J = 0.942
75.3767

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

S1 = 0.51461

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

S2 = 1701.56
$\varphi F_L = \varphi b[Bc-1.6Dc*\sqrt{((LbSc)/(Cb*\sqrt{(IyJ)/2}))}]$
$\varphi F_L =$ 30.6 ksi

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7
$\varphi F_L = \varphi b[Bp-1.6Dp*b/t]$
$\varphi F_L =$ 28.2 ksi

Weak Axis:
3.4.14

$L_b =$ 48.3
J = 0.942
75.3767

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

S1 = 0.51461

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

S2 = 1701.56
$\varphi F_L = \varphi b[Bc-1.6Dc*\sqrt{((LbSc)/(Cb*\sqrt{(IyJ)/2}))}]$
$\varphi F_L =$ 30.6

3.4.16

b/t = 24.5

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

S1 = 12.2

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

S2 = 46.7
$\varphi F_L = \varphi b[Bp-1.6Dp*b/t]$
$\varphi F_L =$ 28.2 ksi

3.4.16.1 Not Used

Rb/t = 0.0

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

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

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LSt= 28.2 ksi

Ix = 279836 mm^4

0.672 in^4

y = 27.5 mm

Sx = 0.621 in^3

M_{max}St = 1.460 k-ft

3.4.18

h/t = 24.5

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

S1 = 36.9

m = 0.65

C_0 = 27.5

Cc = 27.5

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

S2 = 77.3

φF_L= 1.3φyFcy

φF_L= 43.2 ksi

φF_LWk= 28.2 ksi

Iy = 279836 mm^4

0.672 in^4

x = 27.5 mm

Sy = 0.621 in^3

M_{max}Wk = 1.460 k-ft

Compression

3.4.7

λ = 1.11734

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.76536

φF_L= φcc(Bc-Dc*λ)

φF_L= 18.9268 ksi

3.4.9

b/t = 24.5

S1 = 12.21 (See 3.4.16 above for formula)

S2 = 32.70 (See 3.4.16 above for formula)

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 ksi

b/t = 24.5

S1 = 12.21

S2 = 32.70

φF_L= φc[Bp-1.6Dp*b/t]

φF_L= 28.2 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

$\varphi F_L = \varphi y Fcy$

$\varphi F_L =$ 33.25 ksi

$\varphi F_L =$ 18.93 ksi

A = 663.99 mm^2

1.03 in^2

$P_{max} =$ 19.48 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				4		
2	Dead Load, Min	DL		-1				4		
3	Snow Load	SL						4		
4	Wind Load - Pressure	WL						4		
5	Wind Load - Suction	WL						4		
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	M14	Y	-8.366	-8.366	0	0
3	M15	Y	-8.366	-8.366	0	0
4	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	M14	Y	-4.45	-4.45	0	0
3	M15	Y	-4.45	-4.45	0	0
4	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	-61.093	-61.093	0	0
2	M14	Y	-61.093	-61.093	0	0
3	M15	Y	-61.093	-61.093	0	0
4	M16	Y	-61.093	-61.093	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	-73.997	-73.997	0	0
2	M14	y	-73.997	-73.997	0	0
3	M15	y	-118.396	-118.396	0	0
4	M16	y	-118.396	-118.396	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	170.194	170.194	0	0
2	M14	y	131.716	131.716	0	0
3	M15	y	73.997	73.997	0	0
4	M16	y	73.997	73.997	0	0

Load Combinations

	Description	S...	P...	S...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	LRFD 1.2D + 1.6S + 0.8W	Yes	Y		1	1.2	3	1.6	4	.8														
2	LRFD 1.2D + 1.6W + 0.5S	Yes	Y		1	1.2	3	.5	4	1.6														
3	LRFD 0.9D + 1.6W	Yes	Y		2	.9					5	1.6												
4	LATERAL - LRFD 1.54D + 1.3E ...	Yes	Y		1	1.54	3	.2			6	1.3												
5	LATERAL - LRFD 0.56D + 1.3E	Yes	Y		1	.56					6	1.3												
6	LATERAL - LRFD 1.54D + 1.25...	Yes	Y		1	1.54	3	.2			6	1.25												
7	LATERAL - LRFD 0.56D + 1.25E	Yes	Y		1	.56					6	1.25												

Load Combinations (Continued)

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

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N8	max	475.225	2	1246.163	2	.713	1	.003	1	0	1	0	1
2		min	-600.61	3	-1626.948	3	.027	15	0	15	0	1	0	1
3	N7	max	.022	9	1243.87	1	-.175	15	0	15	0	1	0	1
4		min	-.163	2	-473.66	3	-5.121	1	-.011	1	0	1	0	1
5	N15	max	.02	9	3822.412	2	0	1	0	1	0	1	0	1
6		min	-1.866	2	-1572.732	3	0	12	0	2	0	1	0	1
7	N16	max	1680.918	2	3955.495	2	0	3	0	3	0	1	0	1
8		min	-1871.756	3	-5241.57	3	0	2	0	2	0	1	0	1
9	N23	max	.022	9	1243.87	1	5.121	1	.011	1	0	1	0	1
10		min	-.163	2	-473.66	3	.175	15	0	15	0	1	0	1
11	N24	max	475.225	2	1246.163	2	-.027	15	0	15	0	1	0	1
12		min	-600.61	3	-1626.948	3	-.713	1	-.003	1	0	1	0	1
13	Totals:	max	2629.175	2	12748.09	2	0	12						
14		min	-3074.114	3	-11015.518	3	0	2						

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	M13	1	max	55.171	1	501.811	1	-3.647	15	0	15	.131	1	0	1
2			min	1.827	15	-826.704	3	-111.352	1	-.016	2	.004	15	0	3
3		2	max	55.171	1	350.509	1	-2.799	15	0	15	.041	1	.646	3
4			min	1.827	15	-581.831	3	-85.351	1	-.016	2	.001	15	-.391	1
5		3	max	55.171	1	199.207	1	-1.952	15	0	15	.002	3	1.067	3
6			min	1.827	15	-336.958	3	-59.35	1	-.016	2	-.026	1	-.643	1
7		4	max	55.171	1	47.904	1	-1.104	15	0	15	-.001	12	1.263	3
8			min	1.827	15	-92.085	3	-33.349	1	-.016	2	-.068	1	-.756	1
9		5	max	55.171	1	152.788	3	-.076	10	0	15	-.003	12	1.235	3
10			min	1.827	15	-103.398	1	-7.348	1	-.016	2	-.087	1	-.73	1
11		6	max	55.171	1	397.661	3	18.654	1	0	15	-.003	15	.983	3
12			min	1.827	15	-254.7	1	-.571	3	-.016	2	-.082	1	-.566	1
13		7	max	55.171	1	642.534	3	44.655	1	0	15	-.002	15	.506	3
14			min	1.827	15	-406.003	1	.526	12	-.016	2	-.053	1	-.263	1
15		8	max	55.171	1	887.407	3	70.656	1	0	15	.002	2	.181	2
16			min	1.827	15	-557.305	1	1.374	12	-.016	2	-.004	3	-.195	3
17		9	max	55.171	1	1132.281	3	96.657	1	0	15	.077	1	.758	1
18			min	1.827	15	-708.607	1	2.221	12	-.016	2	-.001	3	-1.12	3
19		10	max	55.171	1	859.909	1	-3.069	12	.016	2	.177	1	1.477	1
20			min	1.827	15	-1377.154	3	-122.659	1	0	12	.002	12	-2.271	3
21		11	max	55.171	1	708.607	1	-2.221	12	.016	2	.077	1	.758	1
22			min	1.827	15	-1132.281	3	-96.657	1	0	15	-.001	3	-1.12	3
23		12	max	55.171	1	557.305	1	-1.374	12	.016	2	.002	2	.181	2
24			min	1.827	15	-887.407	3	-70.656	1	0	15	-.004	3	-.195	3
25		13	max	55.171	1	406.003	1	-.526	12	.016	2	-.002	15	.506	3
26			min	1.827	15	-642.534	3	-44.655	1	0	15	-.053	1	-.263	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
27		14	max	55.171	1	254.7	1	.571	3	.016	2	-.003	15	.983	3
28			min	1.827	15	-397.661	3	-18.654	1	0	15	-.082	1	-.566	1
29		15	max	55.171	1	103.398	1	7.348	1	.016	2	-.003	12	1.235	3
30			min	1.827	15	-152.788	3	.076	10	0	15	-.087	1	-.73	1
31		16	max	55.171	1	92.085	3	33.349	1	.016	2	-.001	12	1.263	3
32			min	1.827	15	-47.904	1	1.104	15	0	15	-.068	1	-.756	1
33		17	max	55.171	1	336.958	3	59.35	1	.016	2	.002	3	1.067	3
34			min	1.827	15	-199.207	1	1.952	15	0	15	-.026	1	-.643	1
35		18	max	55.171	1	581.831	3	85.351	1	.016	2	.041	1	.646	3
36			min	1.827	15	-350.509	1	2.799	15	0	15	.001	15	-.391	1
37		19	max	55.171	1	826.704	3	111.352	1	.016	2	.131	1	0	1
38			min	1.827	15	-501.811	1	3.647	15	0	15	.004	15	0	3
39	M14	1	max	28.997	1	550.748	1	-3.779	15	.012	3	.153	1	0	1
40			min	.959	15	-667.166	3	-115.38	1	-.014	2	.005	15	0	3
41		2	max	28.997	1	399.446	1	-2.931	15	.012	3	.059	1	.525	3
42			min	.959	15	-478.727	3	-89.379	1	-.014	2	.002	15	-.436	1
43		3	max	28.997	1	248.143	1	-2.083	15	.012	3	.003	3	.878	3
44			min	.959	15	-290.288	3	-63.378	1	-.014	2	-.011	1	-.732	1
45		4	max	28.997	1	97.12	2	-1.236	15	.012	3	0	12	1.057	3
46			min	.959	15	-101.85	3	-37.377	1	-.014	2	-.057	1	-.89	1
47		5	max	28.997	1	86.589	3	-.388	15	.012	3	-.002	12	1.064	3
48			min	.959	15	-54.461	1	-11.376	1	-.014	2	-.08	1	-.91	1
49		6	max	28.997	1	275.028	3	14.626	1	.012	3	-.003	15	.899	3
50			min	.959	15	-205.763	1	-.776	3	-.014	2	-.078	1	-.791	1
51		7	max	28.997	1	463.466	3	40.627	1	.012	3	-.002	15	.56	3
52			min	.959	15	-357.066	1	.39	12	-.014	2	-.053	1	-.534	2
53		8	max	28.997	1	651.905	3	66.628	1	.012	3	.001	10	.049	3
54			min	.959	15	-508.368	1	1.238	12	-.014	2	-.004	1	-.155	2
55		9	max	28.997	1	840.344	3	92.629	1	.012	3	.069	1	.399	1
56			min	.959	15	-659.67	1	2.085	12	-.014	2	-.001	3	-.635	3
57		10	max	28.997	1	810.973	1	-2.933	12	.014	2	.166	1	1.073	1
58			min	.959	15	-1028.782	3	-118.631	1	-.012	3	.002	12	-1.492	3
59		11	max	28.997	1	659.67	1	-2.085	12	.014	2	.069	1	.399	1
60			min	.959	15	-840.344	3	-92.629	1	-.012	3	-.001	3	-.635	3
61		12	max	28.997	1	508.368	1	-1.238	12	.014	2	.001	10	.049	3
62			min	.959	15	-651.905	3	-66.628	1	-.012	3	-.004	1	-.155	2
63		13	max	28.997	1	357.066	1	-.39	12	.014	2	-.002	15	.56	3
64			min	.959	15	-463.466	3	-40.627	1	-.012	3	-.053	1	-.534	2
65		14	max	28.997	1	205.763	1	.776	3	.014	2	-.003	15	.899	3
66			min	.959	15	-275.028	3	-14.626	1	-.012	3	-.078	1	-.791	1
67		15	max	28.997	1	54.461	1	11.376	1	.014	2	-.002	12	1.064	3
68			min	.959	15	-86.589	3	.388	15	-.012	3	-.08	1	-.91	1
69		16	max	28.997	1	101.85	3	37.377	1	.014	2	0	12	1.057	3
70			min	.959	15	-97.12	2	1.236	15	-.012	3	-.057	1	-.89	1
71		17	max	28.997	1	290.288	3	63.378	1	.014	2	.003	3	.878	3
72			min	.959	15	-248.143	1	2.083	15	-.012	3	-.011	1	-.732	1
73		18	max	28.997	1	478.727	3	89.379	1	.014	2	.059	1	.525	3
74			min	.959	15	-399.446	1	2.931	15	-.012	3	.002	15	-.436	1
75		19	max	28.997	1	667.166	3	115.38	1	.014	2	.153	1	0	1
76			min	.959	15	-550.748	1	3.779	15	-.012	3	.005	15	0	3
77	M15	1	max	-1	15	755.231	2	-3.778	15	.014	2	.153	1	0	2
78			min	-30.11	1	-381.977	3	-115.388	1	-.01	3	.005	15	0	3
79		2	max	-1	15	544.049	2	-2.93	15	.014	2	.059	1	.303	3
80			min	-30.11	1	-278.193	3	-89.386	1	-.01	3	.002	15	-.595	2
81		3	max	-1	15	332.867	2	-2.082	15	.014	2	.003	3	.51	3
82			min	-30.11	1	-174.409	3	-63.385	1	-.01	3	-.011	1	-.997	2
83		4	max	-1	15	121.685	2	-1.235	15	.014	2	0	12	.622	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
84			min	-30.11	1	-70.625	3	-37.384	1	-.01	3	-.057	1	-1.206	2
85		5	max	-1	15	33.16	3	-.387	15	.014	2	-.002	12	.639	3
86			min	-30.11	1	-89.496	2	-11.383	1	-.01	3	-.08	1	-1.221	2
87		6	max	-1	15	136.944	3	14.618	1	.014	2	-.003	15	.562	3
88			min	-30.11	1	-300.678	2	-.662	3	-.01	3	-.078	1	-1.042	2
89		7	max	-1	15	240.728	3	40.62	1	.014	2	-.002	15	.388	3
90			min	-30.11	1	-511.86	2	.461	12	-.01	3	-.053	1	-.669	2
91		8	max	-1	15	344.512	3	66.621	1	.014	2	0	10	.12	3
92			min	-30.11	1	-723.042	2	1.309	12	-.01	3	-.004	1	-.11	1
93		9	max	-1	15	448.296	3	92.622	1	.014	2	.069	1	.656	2
94			min	-30.11	1	-934.223	2	2.156	12	-.01	3	-.001	3	-.243	3
95		10	max	-1	15	1145.405	2	-3.004	12	.01	3	.166	1	1.609	2
96			min	-30.11	1	-552.08	3	-118.623	1	-.014	2	.002	12	-.702	3
97		11	max	-1	15	934.223	2	-2.156	12	.01	3	.069	1	.656	2
98			min	-30.11	1	-448.296	3	-92.622	1	-.014	2	-.001	3	-.243	3
99		12	max	-1	15	723.042	2	-1.309	12	.01	3	0	10	.12	3
100			min	-30.11	1	-344.512	3	-66.621	1	-.014	2	-.004	1	-.11	1
101		13	max	-1	15	511.86	2	-.461	12	.01	3	-.002	15	.388	3
102			min	-30.11	1	-240.728	3	-40.62	1	-.014	2	-.053	1	-.669	2
103		14	max	-1	15	300.678	2	.662	3	.01	3	-.003	15	.562	3
104			min	-30.11	1	-136.944	3	-14.618	1	-.014	2	-.078	1	-1.042	2
105		15	max	-1	15	89.496	2	11.383	1	.01	3	-.002	12	.639	3
106			min	-30.11	1	-33.16	3	.387	15	-.014	2	-.08	1	-1.221	2
107		16	max	-1	15	70.625	3	37.384	1	.01	3	0	12	.622	3
108			min	-30.11	1	-121.685	2	1.235	15	-.014	2	-.057	1	-1.206	2
109		17	max	-1	15	174.409	3	63.385	1	.01	3	.003	3	.51	3
110			min	-30.11	1	-332.867	2	2.082	15	-.014	2	-.011	1	-.997	2
111		18	max	-1	15	278.193	3	89.386	1	.01	3	.059	1	.303	3
112			min	-30.11	1	-544.049	2	2.93	15	-.014	2	.002	15	-.595	2
113		19	max	-1	15	381.977	3	115.388	1	.01	3	.153	1	0	2
114			min	-30.11	1	-755.231	2	3.778	15	-.014	2	.005	15	0	3
115	M16	1	max	-1.935	15	705.34	2	-3.652	15	.012	1	.132	1	0	2
116			min	-58.466	1	-342.004	3	-111.599	1	-.013	3	.004	15	0	3
117		2	max	-1.935	15	494.159	2	-2.804	15	.012	1	.041	1	.266	3
118			min	-58.466	1	-238.219	3	-85.598	1	-.013	3	.001	15	-.55	2
119		3	max	-1.935	15	282.977	2	-1.956	15	.012	1	.001	3	.437	3
120			min	-58.466	1	-134.435	3	-59.597	1	-.013	3	-.025	1	-.906	2
121		4	max	-1.935	15	71.795	2	-1.108	15	.012	1	-.001	12	.512	3
122			min	-58.466	1	-30.651	3	-33.596	1	-.013	3	-.068	1	-1.069	2
123		5	max	-1.935	15	73.133	3	-.22	10	.012	1	-.003	12	.493	3
124			min	-58.466	1	-139.387	2	-7.594	1	-.013	3	-.087	1	-1.038	2
125		6	max	-1.935	15	176.917	3	18.407	1	.012	1	-.003	15	.378	3
126			min	-58.466	1	-350.568	2	-.187	3	-.013	3	-.082	1	-.813	2
127		7	max	-1.935	15	280.701	3	44.408	1	.012	1	-.002	15	.169	3
128			min	-58.466	1	-561.75	2	.766	12	-.013	3	-.053	1	-.395	2
129		8	max	-1.935	15	384.485	3	70.409	1	.012	1	.001	2	.217	2
130			min	-58.466	1	-772.932	2	1.614	12	-.013	3	-.003	3	-.136	3
131		9	max	-1.935	15	488.27	3	96.41	1	.012	1	.076	1	1.022	2
132			min	-58.466	1	-984.114	2	2.462	12	-.013	3	0	3	-.536	3
133		10	max	-1.935	15	1195.295	2	-3.309	12	.013	3	.176	1	2.021	2
134			min	-58.466	1	-592.054	3	-122.412	1	-.012	1	.003	12	-1.031	3
135		11	max	-1.935	15	984.114	2	-2.462	12	.013	3	.076	1	1.022	2
136			min	-58.466	1	-488.27	3	-96.41	1	-.012	1	0	3	-.536	3
137		12	max	-1.935	15	772.932	2	-1.614	12	.013	3	.001	2	.217	2
138			min	-58.466	1	-384.485	3	-70.409	1	-.012	1	-.003	3	-.136	3
139		13	max	-1.935	15	561.75	2	-.766	12	.013	3	-.002	15	.169	3
140			min	-58.466	1	-280.701	3	-44.408	1	-.012	1	-.053	1	-.395	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
141		14	max	-1.935	15	350.568	2	.187	3	.013	3	-.003	15	.378	3
142			min	-58.466	1	-176.917	3	-18.407	1	-.012	1	-.082	1	-.813	2
143		15	max	-1.935	15	139.387	2	7.594	1	.013	3	-.003	12	.493	3
144			min	-58.466	1	-73.133	3	.22	10	-.012	1	-.087	1	-1.038	2
145		16	max	-1.935	15	30.651	3	33.596	1	.013	3	-.001	12	.512	3
146			min	-58.466	1	-71.795	2	1.108	15	-.012	1	-.068	1	-1.069	2
147		17	max	-1.935	15	134.435	3	59.597	1	.013	3	.001	3	.437	3
148			min	-58.466	1	-282.977	2	1.956	15	-.012	1	-.025	1	-.906	2
149		18	max	-1.935	15	238.219	3	85.598	1	.013	3	.041	1	.266	3
150			min	-58.466	1	-494.159	2	2.804	15	-.012	1	.001	15	-.55	2
151		19	max	-1.935	15	342.004	3	111.599	1	.013	3	.132	1	0	2
152			min	-58.466	1	-705.34	2	3.652	15	-.012	1	.004	15	0	3
153	M2	1	max	1120.243	1	2.283	4	.788	1	0	3	0	3	0	1
154			min	-1481.995	3	.538	15	.026	15	0	1	0	1	0	1
155		2	max	1120.572	1	2.268	4	.788	1	0	3	0	1	0	15
156			min	-1481.749	3	.534	15	.026	15	0	1	0	15	0	4
157		3	max	1120.9	1	2.253	4	.788	1	0	3	0	1	0	15
158			min	-1481.503	3	.53	15	.026	15	0	1	0	15	-.001	4
159		4	max	1121.229	1	2.237	4	.788	1	0	3	0	1	0	15
160			min	-1481.256	3	.527	15	.026	15	0	1	0	15	-.002	4
161		5	max	1121.557	1	2.222	4	.788	1	0	3	0	1	0	15
162			min	-1481.01	3	.523	15	.026	15	0	1	0	15	-.002	4
163		6	max	1121.885	1	2.207	4	.788	1	0	3	0	1	0	15
164			min	-1480.764	3	.52	15	.026	15	0	1	0	15	-.002	4
165		7	max	1122.214	1	2.192	4	.788	1	0	3	.001	1	0	15
166			min	-1480.517	3	.516	15	.026	15	0	1	0	15	-.003	4
167		8	max	1122.542	1	2.176	4	.788	1	0	3	.001	1	0	15
168			min	-1480.271	3	.512	15	.026	15	0	1	0	15	-.003	4
169		9	max	1122.871	1	2.161	4	.788	1	0	3	.001	1	0	15
170			min	-1480.025	3	.509	15	.026	15	0	1	0	15	-.004	4
171		10	max	1123.199	1	2.146	4	.788	1	0	3	.002	1	-.001	15
172			min	-1479.778	3	.505	15	.026	15	0	1	0	15	-.004	4
173		11	max	1123.528	1	2.13	4	.788	1	0	3	.002	1	-.001	15
174			min	-1479.532	3	.502	15	.026	15	0	1	0	15	-.005	4
175		12	max	1123.856	1	2.115	4	.788	1	0	3	.002	1	-.001	15
176			min	-1479.286	3	.498	15	.026	15	0	1	0	15	-.005	4
177		13	max	1124.185	1	2.1	4	.788	1	0	3	.002	1	-.001	15
178			min	-1479.04	3	.495	15	.026	15	0	1	0	15	-.006	4
179		14	max	1124.513	1	2.085	4	.788	1	0	3	.002	1	-.001	15
180			min	-1478.793	3	.491	15	.026	15	0	1	0	15	-.006	4
181		15	max	1124.841	1	2.069	4	.788	1	0	3	.002	1	-.002	15
182			min	-1478.547	3	.487	15	.026	15	0	1	0	15	-.007	4
183		16	max	1125.17	1	2.054	4	.788	1	0	3	.003	1	-.002	15
184			min	-1478.301	3	.484	15	.026	15	0	1	0	15	-.007	4
185		17	max	1125.498	1	2.039	4	.788	1	0	3	.003	1	-.002	15
186			min	-1478.054	3	.48	15	.026	15	0	1	0	15	-.008	4
187		18	max	1125.827	1	2.024	4	.788	1	0	3	.003	1	-.002	15
188			min	-1477.808	3	.477	15	.026	15	0	1	0	15	-.008	4
189		19	max	1126.155	1	2.008	4	.788	1	0	3	.003	1	-.002	15
190			min	-1477.562	3	.473	15	.026	15	0	1	0	15	-.009	4
191	M3	1	max	451.812	2	8.079	4	.019	1	0	3	0	1	.009	4
192			min	-567.851	3	1.9	15	0	15	0	1	0	15	.002	15
193		2	max	451.642	2	7.307	4	.019	1	0	3	0	1	.005	2
194			min	-567.979	3	1.718	15	0	15	0	1	0	15	0	12
195		3	max	451.471	2	6.534	4	.019	1	0	3	0	1	.003	2
196			min	-568.107	3	1.536	15	0	15	0	1	0	15	0	3
197		4	max	451.301	2	5.762	4	.019	1	0	3	0	1	.001	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
198			min	-568.235	3	1.355	15	0	15	0	1	0	15	-.002	3
199		5	max	451.131	2	4.989	4	.019	1	0	3	0	1	0	15
200			min	-568.362	3	1.173	15	0	15	0	1	0	15	-.003	3
201		6	max	450.96	2	4.217	4	.019	1	0	3	0	1	-.001	15
202			min	-568.49	3	.992	15	0	15	0	1	0	15	-.004	4
203		7	max	450.79	2	3.445	4	.019	1	0	3	0	1	-.001	15
204			min	-568.618	3	.81	15	0	15	0	1	0	15	-.006	4
205		8	max	450.62	2	2.672	4	.019	1	0	3	0	1	-.002	15
206			min	-568.746	3	.629	15	0	15	0	1	0	15	-.007	4
207		9	max	450.449	2	1.9	4	.019	1	0	3	0	1	-.002	15
208			min	-568.873	3	.447	15	0	15	0	1	0	15	-.008	4
209		10	max	450.279	2	1.127	4	.019	1	0	3	0	1	-.002	15
210			min	-569.001	3	.265	15	0	15	0	1	0	15	-.009	4
211		11	max	450.109	2	.462	2	.019	1	0	3	0	1	-.002	15
212			min	-569.129	3	-.045	3	0	15	0	1	0	15	-.009	4
213		12	max	449.938	2	-.098	15	.019	1	0	3	0	1	-.002	15
214			min	-569.257	3	-.497	3	0	15	0	1	0	15	-.009	4
215		13	max	449.768	2	-.279	15	.019	1	0	3	0	1	-.002	15
216			min	-569.385	3	-1.19	4	0	15	0	1	0	15	-.009	4
217		14	max	449.598	2	-.461	15	.019	1	0	3	0	1	-.002	15
218			min	-569.512	3	-1.962	4	0	15	0	1	0	15	-.008	4
219		15	max	449.427	2	-.642	15	.019	1	0	3	0	1	-.002	15
220			min	-569.64	3	-2.735	4	0	15	0	1	0	15	-.007	4
221		16	max	449.257	2	-.824	15	.019	1	0	3	0	1	-.001	15
222			min	-569.768	3	-3.507	4	0	15	0	1	0	15	-.006	4
223		17	max	449.087	2	-1.005	15	.019	1	0	3	0	1	-.001	15
224			min	-569.896	3	-4.28	4	0	15	0	1	0	15	-.004	4
225		18	max	448.916	2	-1.187	15	.019	1	0	3	0	1	0	15
226			min	-570.023	3	-5.052	4	0	15	0	1	0	15	-.002	4
227		19	max	448.746	2	-1.369	15	.019	1	0	3	0	1	0	1
228			min	-570.151	3	-5.824	4	0	15	0	1	0	15	0	1
229	M4	1	max	1240.804	1	0	1	-.176	15	0	1	0	1	0	1
230			min	-475.96	3	0	1	-5.326	1	0	1	0	10	0	1
231		2	max	1240.974	1	0	1	-.176	15	0	1	0	15	0	1
232			min	-475.832	3	0	1	-5.326	1	0	1	0	1	0	1
233		3	max	1241.144	1	0	1	-.176	15	0	1	0	15	0	1
234			min	-475.704	3	0	1	-5.326	1	0	1	-.001	1	0	1
235		4	max	1241.315	1	0	1	-.176	15	0	1	0	15	0	1
236			min	-475.576	3	0	1	-5.326	1	0	1	-.002	1	0	1
237		5	max	1241.485	1	0	1	-.176	15	0	1	0	15	0	1
238			min	-475.449	3	0	1	-5.326	1	0	1	-.002	1	0	1
239		6	max	1241.655	1	0	1	-.176	15	0	1	0	15	0	1
240			min	-475.321	3	0	1	-5.326	1	0	1	-.003	1	0	1
241		7	max	1241.826	1	0	1	-.176	15	0	1	0	15	0	1
242			min	-475.193	3	0	1	-5.326	1	0	1	-.004	1	0	1
243		8	max	1241.996	1	0	1	-.176	15	0	1	0	15	0	1
244			min	-475.065	3	0	1	-5.326	1	0	1	-.004	1	0	1
245		9	max	1242.166	1	0	1	-.176	15	0	1	0	15	0	1
246			min	-474.938	3	0	1	-5.326	1	0	1	-.005	1	0	1
247		10	max	1242.337	1	0	1	-.176	15	0	1	0	15	0	1
248			min	-474.81	3	0	1	-5.326	1	0	1	-.005	1	0	1
249		11	max	1242.507	1	0	1	-.176	15	0	1	0	15	0	1
250			min	-474.682	3	0	1	-5.326	1	0	1	-.006	1	0	1
251		12	max	1242.677	1	0	1	-.176	15	0	1	0	15	0	1
252			min	-474.554	3	0	1	-5.326	1	0	1	-.007	1	0	1
253		13	max	1242.848	1	0	1	-.176	15	0	1	0	15	0	1
254			min	-474.427	3	0	1	-5.326	1	0	1	-.007	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
255		14	max	1243.018	1	0	1	-.176	15	0	1	0	15	0	1
256			min	-474.299	3	0	1	-5.326	1	0	1	-.008	1	0	1
257		15	max	1243.188	1	0	1	-.176	15	0	1	0	15	0	1
258			min	-474.171	3	0	1	-5.326	1	0	1	-.008	1	0	1
259		16	max	1243.359	1	0	1	-.176	15	0	1	0	15	0	1
260			min	-474.043	3	0	1	-5.326	1	0	1	-.009	1	0	1
261		17	max	1243.529	1	0	1	-.176	15	0	1	0	15	0	1
262			min	-473.916	3	0	1	-5.326	1	0	1	-.01	1	0	1
263		18	max	1243.699	1	0	1	-.176	15	0	1	0	15	0	1
264			min	-473.788	3	0	1	-5.326	1	0	1	-.01	1	0	1
265		19	max	1243.87	1	0	1	-.176	15	0	1	0	15	0	1
266			min	-473.66	3	0	1	-5.326	1	0	1	-.011	1	0	1
267	M6	1	max	3537.753	1	2.997	2	0	1	0	1	0	1	0	1
268			min	-4773.176	3	-.181	3	0	1	0	1	0	1	0	1
269		2	max	3538.081	1	2.985	2	0	1	0	1	0	1	0	3
270			min	-4772.93	3	-.19	3	0	1	0	1	0	1	0	2
271		3	max	3538.41	1	2.974	2	0	1	0	1	0	1	0	3
272			min	-4772.684	3	-.199	3	0	1	0	1	0	1	-.001	2
273		4	max	3538.738	1	2.962	2	0	1	0	1	0	1	0	3
274			min	-4772.437	3	-.208	3	0	1	0	1	0	1	-.002	2
275		5	max	3539.067	1	2.95	2	0	1	0	1	0	1	0	3
276			min	-4772.191	3	-.217	3	0	1	0	1	0	1	-.003	2
277		6	max	3539.395	1	2.938	2	0	1	0	1	0	1	0	3
278			min	-4771.945	3	-.226	3	0	1	0	1	0	1	-.003	2
279		7	max	3539.724	1	2.926	2	0	1	0	1	0	1	0	3
280			min	-4771.698	3	-.235	3	0	1	0	1	0	1	-.004	2
281		8	max	3540.052	1	2.914	2	0	1	0	1	0	1	0	3
282			min	-4771.452	3	-.244	3	0	1	0	1	0	1	-.005	2
283		9	max	3540.38	1	2.902	2	0	1	0	1	0	1	0	3
284			min	-4771.206	3	-.253	3	0	1	0	1	0	1	-.005	2
285		10	max	3540.709	1	2.89	2	0	1	0	1	0	1	0	3
286			min	-4770.959	3	-.261	3	0	1	0	1	0	1	-.006	2
287		11	max	3541.037	1	2.878	2	0	1	0	1	0	1	0	3
288			min	-4770.713	3	-.27	3	0	1	0	1	0	1	-.007	2
289		12	max	3541.366	1	2.867	2	0	1	0	1	0	1	0	3
290			min	-4770.467	3	-.279	3	0	1	0	1	0	1	-.007	2
291		13	max	3541.694	1	2.855	2	0	1	0	1	0	1	0	3
292			min	-4770.22	3	-.288	3	0	1	0	1	0	1	-.008	2
293		14	max	3542.023	1	2.843	2	0	1	0	1	0	1	0	3
294			min	-4769.974	3	-.297	3	0	1	0	1	0	1	-.008	2
295		15	max	3542.351	1	2.831	2	0	1	0	1	0	1	0	3
296			min	-4769.728	3	-.306	3	0	1	0	1	0	1	-.009	2
297		16	max	3542.679	1	2.819	2	0	1	0	1	0	1	0	3
298			min	-4769.481	3	-.315	3	0	1	0	1	0	1	-.01	2
299		17	max	3543.008	1	2.807	2	0	1	0	1	0	1	0	3
300			min	-4769.235	3	-.324	3	0	1	0	1	0	1	-.01	2
301		18	max	3543.336	1	2.795	2	0	1	0	1	0	1	0	3
302			min	-4768.989	3	-.333	3	0	1	0	1	0	1	-.011	2
303		19	max	3543.665	1	2.783	2	0	1	0	1	0	1	.001	3
304			min	-4768.742	3	-.342	3	0	1	0	1	0	1	-.012	2
305	M7	1	max	1615.187	2	8.111	4	0	1	0	1	0	1	.012	2
306			min	-1762.009	3	1.904	15	0	1	0	1	0	1	-.001	3
307		2	max	1615.016	2	7.338	4	0	1	0	1	0	1	.009	2
308			min	-1762.137	3	1.722	15	0	1	0	1	0	1	-.003	3
309		3	max	1614.846	2	6.566	4	0	1	0	1	0	1	.006	2
310			min	-1762.265	3	1.541	15	0	1	0	1	0	1	-.004	3
311		4	max	1614.676	2	5.793	4	0	1	0	1	0	1	.004	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
312			min	-1762.392	3	1.359	15	0	1	0	1	0	1	-.005	3
313		5	max	1614.505	2	5.021	4	0	1	0	1	0	1	.002	2
314			min	-1762.52	3	1.177	15	0	1	0	1	0	1	-.006	3
315		6	max	1614.335	2	4.249	4	0	1	0	1	0	1	0	2
316			min	-1762.648	3	.996	15	0	1	0	1	0	1	-.007	3
317		7	max	1614.165	2	3.476	4	0	1	0	1	0	1	-.001	15
318			min	-1762.776	3	.814	15	0	1	0	1	0	1	-.008	3
319		8	max	1613.994	2	2.722	2	0	1	0	1	0	1	-.002	15
320			min	-1762.903	3	.543	12	0	1	0	1	0	1	-.008	3
321		9	max	1613.824	2	2.12	2	0	1	0	1	0	1	-.002	15
322			min	-1763.031	3	.243	12	0	1	0	1	0	1	-.008	3
323		10	max	1613.654	2	1.519	2	0	1	0	1	0	1	-.002	15
324			min	-1763.159	3	-.137	3	0	1	0	1	0	1	-.009	4
325		11	max	1613.483	2	.917	2	0	1	0	1	0	1	-.002	15
326			min	-1763.287	3	-.589	3	0	1	0	1	0	1	-.009	4
327		12	max	1613.313	2	.315	2	0	1	0	1	0	1	-.002	15
328			min	-1763.414	3	-1.04	3	0	1	0	1	0	1	-.009	4
329		13	max	1613.143	2	-.275	15	0	1	0	1	0	1	-.002	15
330			min	-1763.542	3	-1.492	3	0	1	0	1	0	1	-.009	4
331		14	max	1612.972	2	-.457	15	0	1	0	1	0	1	-.002	15
332			min	-1763.67	3	-1.943	3	0	1	0	1	0	1	-.008	4
333		15	max	1612.802	2	-.638	15	0	1	0	1	0	1	-.002	15
334			min	-1763.798	3	-2.703	4	0	1	0	1	0	1	-.007	4
335		16	max	1612.632	2	-.82	15	0	1	0	1	0	1	-.001	15
336			min	-1763.926	3	-3.476	4	0	1	0	1	0	1	-.006	4
337		17	max	1612.461	2	-1.001	15	0	1	0	1	0	1	0	15
338			min	-1764.053	3	-4.248	4	0	1	0	1	0	1	-.004	4
339		18	max	1612.291	2	-1.183	15	0	1	0	1	0	1	0	15
340			min	-1764.181	3	-5.02	4	0	1	0	1	0	1	-.002	4
341		19	max	1612.121	2	-1.365	15	0	1	0	1	0	1	0	1
342			min	-1764.309	3	-5.793	4	0	1	0	1	0	1	0	1
343	M8	1	max	3819.346	2	0	1	0	1	0	1	0	1	0	1
344			min	-1575.032	3	0	1	0	1	0	1	0	1	0	1
345		2	max	3819.516	2	0	1	0	1	0	1	0	1	0	1
346			min	-1574.904	3	0	1	0	1	0	1	0	1	0	1
347		3	max	3819.687	2	0	1	0	1	0	1	0	1	0	1
348			min	-1574.776	3	0	1	0	1	0	1	0	1	0	1
349		4	max	3819.857	2	0	1	0	1	0	1	0	1	0	1
350			min	-1574.649	3	0	1	0	1	0	1	0	1	0	1
351		5	max	3820.027	2	0	1	0	1	0	1	0	1	0	1
352			min	-1574.521	3	0	1	0	1	0	1	0	1	0	1
353		6	max	3820.198	2	0	1	0	1	0	1	0	1	0	1
354			min	-1574.393	3	0	1	0	1	0	1	0	1	0	1
355		7	max	3820.368	2	0	1	0	1	0	1	0	1	0	1
356			min	-1574.265	3	0	1	0	1	0	1	0	1	0	1
357		8	max	3820.538	2	0	1	0	1	0	1	0	1	0	1
358			min	-1574.137	3	0	1	0	1	0	1	0	1	0	1
359		9	max	3820.709	2	0	1	0	1	0	1	0	1	0	1
360			min	-1574.01	3	0	1	0	1	0	1	0	1	0	1
361		10	max	3820.879	2	0	1	0	1	0	1	0	1	0	1
362			min	-1573.882	3	0	1	0	1	0	1	0	1	0	1
363		11	max	3821.049	2	0	1	0	1	0	1	0	1	0	1
364			min	-1573.754	3	0	1	0	1	0	1	0	1	0	1
365		12	max	3821.22	2	0	1	0	1	0	1	0	1	0	1
366			min	-1573.626	3	0	1	0	1	0	1	0	1	0	1
367		13	max	3821.39	2	0	1	0	1	0	1	0	1	0	1
368			min	-1573.499	3	0	1	0	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
369		14	max	3821.56	2	0	1	0	1	0	1	0	1	0	1
370			min	-1573.371	3	0	1	0	1	0	1	0	1	0	1
371		15	max	3821.731	2	0	1	0	1	0	1	0	1	0	1
372			min	-1573.243	3	0	1	0	1	0	1	0	1	0	1
373		16	max	3821.901	2	0	1	0	1	0	1	0	1	0	1
374			min	-1573.115	3	0	1	0	1	0	1	0	1	0	1
375		17	max	3822.072	2	0	1	0	1	0	1	0	1	0	1
376			min	-1572.988	3	0	1	0	1	0	1	0	1	0	1
377		18	max	3822.242	2	0	1	0	1	0	1	0	1	0	1
378			min	-1572.86	3	0	1	0	1	0	1	0	1	0	1
379		19	max	3822.412	2	0	1	0	1	0	1	0	1	0	1
380			min	-1572.732	3	0	1	0	1	0	1	0	1	0	1
381	M10	1	max	1120.243	1	2.283	4	-.026	15	0	1	0	1	0	1
382			min	-1481.995	3	.538	15	-.788	1	0	3	0	3	0	1
383		2	max	1120.572	1	2.268	4	-.026	15	0	1	0	15	0	15
384			min	-1481.749	3	.534	15	-.788	1	0	3	0	1	0	4
385		3	max	1120.9	1	2.253	4	-.026	15	0	1	0	15	0	15
386			min	-1481.503	3	.53	15	-.788	1	0	3	0	1	-.001	4
387		4	max	1121.229	1	2.237	4	-.026	15	0	1	0	15	0	15
388			min	-1481.256	3	.527	15	-.788	1	0	3	0	1	-.002	4
389		5	max	1121.557	1	2.222	4	-.026	15	0	1	0	15	0	15
390			min	-1481.01	3	.523	15	-.788	1	0	3	0	1	-.002	4
391		6	max	1121.885	1	2.207	4	-.026	15	0	1	0	15	0	15
392			min	-1480.764	3	.52	15	-.788	1	0	3	0	1	-.002	4
393		7	max	1122.214	1	2.192	4	-.026	15	0	1	0	15	0	15
394			min	-1480.517	3	.516	15	-.788	1	0	3	-.001	1	-.003	4
395		8	max	1122.542	1	2.176	4	-.026	15	0	1	0	15	0	15
396			min	-1480.271	3	.512	15	-.788	1	0	3	-.001	1	-.003	4
397		9	max	1122.871	1	2.161	4	-.026	15	0	1	0	15	0	15
398			min	-1480.025	3	.509	15	-.788	1	0	3	-.001	1	-.004	4
399		10	max	1123.199	1	2.146	4	-.026	15	0	1	0	15	-.001	15
400			min	-1479.778	3	.505	15	-.788	1	0	3	-.002	1	-.004	4
401		11	max	1123.528	1	2.13	4	-.026	15	0	1	0	15	-.001	15
402			min	-1479.532	3	.502	15	-.788	1	0	3	-.002	1	-.005	4
403		12	max	1123.856	1	2.115	4	-.026	15	0	1	0	15	-.001	15
404			min	-1479.286	3	.498	15	-.788	1	0	3	-.002	1	-.005	4
405		13	max	1124.185	1	2.1	4	-.026	15	0	1	0	15	-.001	15
406			min	-1479.04	3	.495	15	-.788	1	0	3	-.002	1	-.006	4
407		14	max	1124.513	1	2.085	4	-.026	15	0	1	0	15	-.001	15
408			min	-1478.793	3	.491	15	-.788	1	0	3	-.002	1	-.006	4
409		15	max	1124.841	1	2.069	4	-.026	15	0	1	0	15	-.002	15
410			min	-1478.547	3	.487	15	-.788	1	0	3	-.002	1	-.007	4
411		16	max	1125.17	1	2.054	4	-.026	15	0	1	0	15	-.002	15
412			min	-1478.301	3	.484	15	-.788	1	0	3	-.003	1	-.007	4
413		17	max	1125.498	1	2.039	4	-.026	15	0	1	0	15	-.002	15
414			min	-1478.054	3	.48	15	-.788	1	0	3	-.003	1	-.008	4
415		18	max	1125.827	1	2.024	4	-.026	15	0	1	0	15	-.002	15
416			min	-1477.808	3	.477	15	-.788	1	0	3	-.003	1	-.008	4
417		19	max	1126.155	1	2.008	4	-.026	15	0	1	0	15	-.002	15
418			min	-1477.562	3	.473	15	-.788	1	0	3	-.003	1	-.009	4
419	M11	1	max	451.812	2	8.079	4	0	15	0	1	0	15	.009	4
420			min	-567.851	3	1.9	15	-.019	1	0	3	0	1	.002	15
421		2	max	451.642	2	7.307	4	0	15	0	1	0	15	.005	2
422			min	-567.979	3	1.718	15	-.019	1	0	3	0	1	0	12
423		3	max	451.471	2	6.534	4	0	15	0	1	0	15	.003	2
424			min	-568.107	3	1.536	15	-.019	1	0	3	0	1	0	3
425		4	max	451.301	2	5.762	4	0	15	0	1	0	15	.001	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
426			min	-568.235	3	1.355	15	-.019	1	0	3	0	1	-.002	3
427		5	max	451.131	2	4.989	4	0	15	0	1	0	15	0	15
428			min	-568.362	3	1.173	15	-.019	1	0	3	0	1	-.003	3
429		6	max	450.96	2	4.217	4	0	15	0	1	0	15	-.001	15
430			min	-568.49	3	.992	15	-.019	1	0	3	0	1	-.004	4
431		7	max	450.79	2	3.445	4	0	15	0	1	0	15	-.001	15
432			min	-568.618	3	.81	15	-.019	1	0	3	0	1	-.006	4
433		8	max	450.62	2	2.672	4	0	15	0	1	0	15	-.002	15
434			min	-568.746	3	.629	15	-.019	1	0	3	0	1	-.007	4
435		9	max	450.449	2	1.9	4	0	15	0	1	0	15	-.002	15
436			min	-568.873	3	.447	15	-.019	1	0	3	0	1	-.008	4
437		10	max	450.279	2	1.127	4	0	15	0	1	0	15	-.002	15
438			min	-569.001	3	.265	15	-.019	1	0	3	0	1	-.009	4
439		11	max	450.109	2	.462	2	0	15	0	1	0	15	-.002	15
440			min	-569.129	3	-.045	3	-.019	1	0	3	0	1	-.009	4
441		12	max	449.938	2	-.098	15	0	15	0	1	0	15	-.002	15
442			min	-569.257	3	-.497	3	-.019	1	0	3	0	1	-.009	4
443		13	max	449.768	2	-.279	15	0	15	0	1	0	15	-.002	15
444			min	-569.385	3	-1.19	4	-.019	1	0	3	0	1	-.009	4
445		14	max	449.598	2	-.461	15	0	15	0	1	0	15	-.002	15
446			min	-569.512	3	-1.962	4	-.019	1	0	3	0	1	-.008	4
447		15	max	449.427	2	-.642	15	0	15	0	1	0	15	-.002	15
448			min	-569.64	3	-2.735	4	-.019	1	0	3	0	1	-.007	4
449		16	max	449.257	2	-.824	15	0	15	0	1	0	15	-.001	15
450			min	-569.768	3	-3.507	4	-.019	1	0	3	0	1	-.006	4
451		17	max	449.087	2	-1.005	15	0	15	0	1	0	15	-.001	15
452			min	-569.896	3	-4.28	4	-.019	1	0	3	0	1	-.004	4
453		18	max	448.916	2	-1.187	15	0	15	0	1	0	15	0	15
454			min	-570.023	3	-5.052	4	-.019	1	0	3	0	1	-.002	4
455		19	max	448.746	2	-1.369	15	0	15	0	1	0	15	0	1
456			min	-570.151	3	-5.824	4	-.019	1	0	3	0	1	0	1
457	M12	1	max	1240.804	1	0	1	5.326	1	0	1	0	10	0	1
458			min	-475.96	3	0	1	.176	15	0	1	0	1	0	1
459		2	max	1240.974	1	0	1	5.326	1	0	1	0	1	0	1
460			min	-475.832	3	0	1	.176	15	0	1	0	15	0	1
461		3	max	1241.144	1	0	1	5.326	1	0	1	.001	1	0	1
462			min	-475.704	3	0	1	.176	15	0	1	0	15	0	1
463		4	max	1241.315	1	0	1	5.326	1	0	1	.002	1	0	1
464			min	-475.576	3	0	1	.176	15	0	1	0	15	0	1
465		5	max	1241.485	1	0	1	5.326	1	0	1	.002	1	0	1
466			min	-475.449	3	0	1	.176	15	0	1	0	15	0	1
467		6	max	1241.655	1	0	1	5.326	1	0	1	.003	1	0	1
468			min	-475.321	3	0	1	.176	15	0	1	0	15	0	1
469		7	max	1241.826	1	0	1	5.326	1	0	1	.004	1	0	1
470			min	-475.193	3	0	1	.176	15	0	1	0	15	0	1
471		8	max	1241.996	1	0	1	5.326	1	0	1	.004	1	0	1
472			min	-475.065	3	0	1	.176	15	0	1	0	15	0	1
473		9	max	1242.166	1	0	1	5.326	1	0	1	.005	1	0	1
474			min	-474.938	3	0	1	.176	15	0	1	0	15	0	1
475		10	max	1242.337	1	0	1	5.326	1	0	1	.005	1	0	1
476			min	-474.81	3	0	1	.176	15	0	1	0	15	0	1
477		11	max	1242.507	1	0	1	5.326	1	0	1	.006	1	0	1
478			min	-474.682	3	0	1	.176	15	0	1	0	15	0	1
479		12	max	1242.677	1	0	1	5.326	1	0	1	.007	1	0	1
480			min	-474.554	3	0	1	.176	15	0	1	0	15	0	1
481		13	max	1242.848	1	0	1	5.326	1	0	1	.007	1	0	1
482			min	-474.427	3	0	1	.176	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
483		14	max	1243.018	1	0	1	5.326	1	0	1	.008	1	0	1
484			min	-474.299	3	0	1	.176	15	0	1	0	15	0	1
485		15	max	1243.188	1	0	1	5.326	1	0	1	.008	1	0	1
486			min	-474.171	3	0	1	.176	15	0	1	0	15	0	1
487		16	max	1243.359	1	0	1	5.326	1	0	1	.009	1	0	1
488			min	-474.043	3	0	1	.176	15	0	1	0	15	0	1
489		17	max	1243.529	1	0	1	5.326	1	0	1	.01	1	0	1
490			min	-473.916	3	0	1	.176	15	0	1	0	15	0	1
491		18	max	1243.699	1	0	1	5.326	1	0	1	.01	1	0	1
492			min	-473.788	3	0	1	.176	15	0	1	0	15	0	1
493		19	max	1243.87	1	0	1	5.326	1	0	1	.011	1	0	1
494			min	-473.66	3	0	1	.176	15	0	1	0	15	0	1
495	M1	1	max	111.355	1	826.679	3	-1.827	15	0	1	.131	1	0	15
496			min	3.647	15	-500.722	1	-55.129	1	0	3	.004	15	-.016	2
497		2	max	111.726	1	825.641	3	-1.827	15	0	1	.102	1	.25	1
498			min	3.759	15	-502.106	1	-55.129	1	0	3	.003	15	-.436	3
499		3	max	339.61	3	595.834	2	-1.801	15	0	3	.072	1	.502	1
500			min	-203.734	2	-622.337	3	-54.464	1	0	1	.002	15	-.854	3
501		4	max	339.888	3	594.451	2	-1.801	15	0	3	.044	1	.193	1
502			min	-203.364	2	-623.375	3	-54.464	1	0	1	.001	15	-.526	3
503		5	max	340.166	3	593.067	2	-1.801	15	0	3	.015	1	-.004	15
504			min	-202.993	2	-624.412	3	-54.464	1	0	1	0	15	-.196	3
505		6	max	340.444	3	591.683	2	-1.801	15	0	3	0	15	.133	3
506			min	-202.622	2	-625.45	3	-54.464	1	0	1	-.014	1	-.459	2
507		7	max	340.722	3	590.3	2	-1.801	15	0	3	-.001	15	.464	3
508			min	-202.251	2	-626.488	3	-54.464	1	0	1	-.042	1	-.77	2
509		8	max	341	3	588.916	2	-1.801	15	0	3	-.002	15	.795	3
510			min	-201.881	2	-627.525	3	-54.464	1	0	1	-.071	1	-1.082	2
511		9	max	348.411	3	54.699	2	-2.76	15	0	9	.044	1	.926	3
512			min	-157.721	2	.42	15	-83.48	1	0	3	.001	15	-1.237	2
513		10	max	348.689	3	53.315	2	-2.76	15	0	9	0	10	.904	3
514			min	-157.35	2	.002	15	-83.48	1	0	3	0	1	-1.265	2
515		11	max	348.967	3	51.931	2	-2.76	15	0	9	-.001	15	.883	3
516			min	-156.98	2	-1.727	4	-83.48	1	0	3	-.045	1	-1.293	2
517		12	max	356.264	3	423.056	3	-1.76	15	0	2	.07	1	.772	3
518			min	-112.77	2	-703.421	2	-53.382	1	0	3	.002	15	-1.147	2
519		13	max	356.542	3	422.018	3	-1.76	15	0	2	.042	1	.549	3
520			min	-112.399	2	-704.805	2	-53.382	1	0	3	.001	15	-.775	2
521		14	max	356.82	3	420.98	3	-1.76	15	0	2	.014	1	.326	3
522			min	-112.028	2	-706.188	2	-53.382	1	0	3	0	15	-.403	2
523		15	max	357.098	3	419.943	3	-1.76	15	0	2	0	15	.104	3
524			min	-111.658	2	-707.572	2	-53.382	1	0	3	-.014	1	-.056	1
525		16	max	357.377	3	418.905	3	-1.76	15	0	2	-.001	15	.343	2
526			min	-111.287	2	-708.955	2	-53.382	1	0	3	-.042	1	-.117	3
527		17	max	357.655	3	417.867	3	-1.76	15	0	2	-.002	15	.718	2
528			min	-110.916	2	-710.339	2	-53.382	1	0	3	-.07	1	-.338	3
529		18	max	-3.763	15	707.119	2	-1.935	15	0	3	-.003	15	.362	2
530			min	-111.968	1	-341.013	3	-58.507	1	0	2	-.101	1	-.167	3
531		19	max	-3.652	15	705.735	2	-1.935	15	0	3	-.004	15	.013	3
532			min	-111.597	1	-342.051	3	-58.507	1	0	2	-.132	1	-.012	1
533	M5	1	max	245.312	1	2754.259	3	0	1	0	1	0	1	.033	2
534			min	6.139	12	-1714.214	1	0	1	0	1	0	1	0	15
535		2	max	245.682	1	2753.221	3	0	1	0	1	0	1	.934	1
536			min	6.324	12	-1715.598	1	0	1	0	1	0	1	-1.453	3
537		3	max	1074.845	3	1730.949	2	0	1	0	1	0	1	1.798	1
538			min	-685.168	2	-1922.796	3	0	1	0	1	0	1	-2.849	3
539		4	max	1075.123	3	1729.566	2	0	1	0	1	0	1	.896	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
540			min	-684.797	2	-1923.833	3	0	1	0	1	0	1	-1.834	3
541		5	max	1075.401	3	1728.182	2	0	1	0	1	0	1	.025	9
542			min	-684.427	2	-1924.871	3	0	1	0	1	0	1	-.819	3
543		6	max	1075.679	3	1726.799	2	0	1	0	1	0	1	.197	3
544			min	-684.056	2	-1925.909	3	0	1	0	1	0	1	-.991	2
545		7	max	1075.957	3	1725.415	2	0	1	0	1	0	1	1.214	3
546			min	-683.685	2	-1926.946	3	0	1	0	1	0	1	-1.902	2
547		8	max	1076.235	3	1724.031	2	0	1	0	1	0	1	2.231	3
548			min	-683.314	2	-1927.984	3	0	1	0	1	0	1	-2.812	2
549		9	max	1085.133	3	184.318	2	0	1	0	1	0	1	2.565	3
550			min	-589.49	2	.417	15	0	1	0	1	0	1	-3.205	2
551		10	max	1085.411	3	182.934	2	0	1	0	1	0	1	2.487	3
552			min	-589.119	2	0	15	0	1	0	1	0	1	-3.302	2
553		11	max	1085.689	3	181.55	2	0	1	0	1	0	1	2.408	3
554			min	-588.749	2	-1.665	4	0	1	0	1	0	1	-3.398	2
555		12	max	1094.813	3	1275.592	3	0	1	0	1	0	1	2.113	3
556			min	-495.025	2	-2095.706	2	0	1	0	1	0	1	-3.044	2
557		13	max	1095.091	3	1274.554	3	0	1	0	1	0	1	1.44	3
558			min	-494.654	2	-2097.089	2	0	1	0	1	0	1	-1.937	2
559		14	max	1095.369	3	1273.516	3	0	1	0	1	0	1	.768	3
560			min	-494.283	2	-2098.473	2	0	1	0	1	0	1	-.83	2
561		15	max	1095.647	3	1272.479	3	0	1	0	1	0	1	.277	2
562			min	-493.913	2	-2099.856	2	0	1	0	1	0	1	-.002	13
563		16	max	1095.925	3	1271.441	3	0	1	0	1	0	1	1.386	2
564			min	-493.542	2	-2101.24	2	0	1	0	1	0	1	-.575	3
565		17	max	1096.203	3	1270.403	3	0	1	0	1	0	1	2.495	2
566			min	-493.171	2	-2102.624	2	0	1	0	1	0	1	-1.245	3
567		18	max	-6.803	12	2393.915	2	0	1	0	1	0	1	1.285	2
568			min	-245.198	1	-1183.266	3	0	1	0	1	0	1	-.651	3
569		19	max	-6.618	12	2392.532	2	0	1	0	1	0	1	.024	1
570			min	-244.827	1	-1184.304	3	0	1	0	1	0	1	-.026	3
571	M9	1	max	111.355	1	826.679	3	55.129	1	0	3	-.004	15	0	15
572			min	3.647	15	-500.722	1	1.827	15	0	1	-.131	1	-.016	2
573		2	max	111.726	1	825.641	3	55.129	1	0	3	-.003	15	.25	1
574			min	3.759	15	-502.106	1	1.827	15	0	1	-.102	1	-.436	3
575		3	max	339.61	3	595.834	2	54.464	1	0	1	-.002	15	.502	1
576			min	-203.734	2	-622.337	3	1.801	15	0	3	-.072	1	-.854	3
577		4	max	339.888	3	594.451	2	54.464	1	0	1	-.001	15	.193	1
578			min	-203.364	2	-623.375	3	1.801	15	0	3	-.044	1	-.526	3
579		5	max	340.166	3	593.067	2	54.464	1	0	1	0	15	-.004	15
580			min	-202.993	2	-624.412	3	1.801	15	0	3	-.015	1	-.196	3
581		6	max	340.444	3	591.683	2	54.464	1	0	1	.014	1	.133	3
582			min	-202.622	2	-625.45	3	1.801	15	0	3	0	15	-.459	2
583		7	max	340.722	3	590.3	2	54.464	1	0	1	.042	1	.464	3
584			min	-202.251	2	-626.488	3	1.801	15	0	3	.001	15	-.77	2
585		8	max	341	3	588.916	2	54.464	1	0	1	.071	1	.795	3
586			min	-201.881	2	-627.525	3	1.801	15	0	3	.002	15	-1.082	2
587		9	max	348.411	3	54.699	2	83.48	1	0	3	-.001	15	.926	3
588			min	-157.721	2	.42	15	2.76	15	0	9	-.044	1	-1.237	2
589		10	max	348.689	3	53.315	2	83.48	1	0	3	0	1	.904	3
590			min	-157.35	2	.002	15	2.76	15	0	9	0	10	-1.265	2
591		11	max	348.967	3	51.931	2	83.48	1	0	3	.045	1	.883	3
592			min	-156.98	2	-1.727	4	2.76	15	0	9	.001	15	-1.293	2
593		12	max	356.264	3	423.056	3	53.382	1	0	3	-.002	15	.772	3
594			min	-112.77	2	-703.421	2	1.76	15	0	2	-.07	1	-1.147	2
595		13	max	356.542	3	422.018	3	53.382	1	0	3	-.001	15	.549	3
596			min	-112.399	2	-704.805	2	1.76	15	0	2	-.042	1	-.775	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
597		14	max	356.82	3	420.98	3	53.382	1	0	3	0	15	.326	3
598			min	-112.028	2	-706.188	2	1.76	15	0	2	-.014	1	-.403	2
599		15	max	357.098	3	419.943	3	53.382	1	0	3	.014	1	.104	3
600			min	-111.658	2	-707.572	2	1.76	15	0	2	0	15	-.056	1
601		16	max	357.377	3	418.905	3	53.382	1	0	3	.042	1	.343	2
602			min	-111.287	2	-708.955	2	1.76	15	0	2	.001	15	-.117	3
603		17	max	357.655	3	417.867	3	53.382	1	0	3	.07	1	.718	2
604			min	-110.916	2	-710.339	2	1.76	15	0	2	.002	15	-.338	3
605		18	max	-3.763	15	707.119	2	58.507	1	0	2	.101	1	.362	2
606			min	-111.968	1	-341.013	3	1.935	15	0	3	.003	15	-.167	3
607		19	max	-3.652	15	705.735	2	58.507	1	0	2	.132	1	.013	3
608			min	-111.597	1	-342.051	3	1.935	15	0	3	.004	15	-.012	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	M13	1	max	0	1	.137	2	.006	3	1.098e-2	2	NC	1	NC	1
2			min	0	15	-.036	3	-.003	2	-2.773e-3	3	NC	1	NC	1
3		2	max	0	1	.183	3	.015	1	1.23e-2	2	NC	4	NC	1
4			min	0	15	-.002	9	-.001	10	-2.752e-3	3	902	3	NC	1
5		3	max	0	1	.361	3	.036	1	1.362e-2	2	NC	5	NC	2
6			min	0	15	-.076	1	0	10	-2.731e-3	3	498.458	3	5577.109	1
7		4	max	0	1	.469	3	.053	1	1.494e-2	2	NC	5	NC	2
8			min	0	15	-.122	1	0	10	-2.71e-3	3	392.033	3	3742.239	1
9		5	max	0	1	.494	3	.062	1	1.626e-2	2	NC	5	NC	3
10			min	0	15	-.119	1	0	10	-2.689e-3	3	373.654	3	3223.021	1
11		6	max	0	1	.437	3	.059	1	1.758e-2	2	NC	5	NC	2
12			min	0	15	-.067	1	0	10	-2.668e-3	3	418.066	3	3380.35	1
13		7	max	0	1	.317	3	.045	1	1.89e-2	2	NC	4	NC	2
14			min	0	15	-.004	9	-.002	10	-2.647e-3	3	560.901	3	4397.447	1
15		8	max	0	1	.164	3	.025	1	2.022e-2	2	NC	1	NC	2
16			min	0	15	.003	15	-.005	10	-2.626e-3	3	990.625	3	8023.465	1
17		9	max	0	1	.248	2	.019	3	2.154e-2	2	NC	4	NC	1
18			min	0	15	.005	15	-.008	2	-2.604e-3	3	1783.149	2	NC	1
19		10	max	0	1	.288	2	.019	3	2.286e-2	2	NC	3	NC	1
20			min	0	1	-.038	3	-.012	2	-2.583e-3	3	1308.866	2	NC	1
21		11	max	0	15	.248	2	.019	3	2.154e-2	2	NC	4	NC	1
22			min	0	1	.005	15	-.008	2	-2.604e-3	3	1783.149	2	NC	1
23		12	max	0	15	.164	3	.025	1	2.022e-2	2	NC	1	NC	2
24			min	0	1	.003	15	-.005	10	-2.626e-3	3	990.625	3	8023.465	1
25		13	max	0	15	.317	3	.045	1	1.89e-2	2	NC	4	NC	2
26			min	0	1	-.004	9	-.002	10	-2.647e-3	3	560.901	3	4397.447	1
27		14	max	0	15	.437	3	.059	1	1.758e-2	2	NC	5	NC	2
28			min	0	1	-.067	1	0	10	-2.668e-3	3	418.066	3	3380.35	1
29		15	max	0	15	.494	3	.062	1	1.626e-2	2	NC	5	NC	3
30			min	0	1	-.119	1	0	10	-2.689e-3	3	373.654	3	3223.021	1
31		16	max	0	15	.469	3	.053	1	1.494e-2	2	NC	5	NC	2
32			min	0	1	-.122	1	0	10	-2.71e-3	3	392.033	3	3742.239	1
33		17	max	0	15	.361	3	.036	1	1.362e-2	2	NC	5	NC	2
34			min	0	1	-.076	1	0	10	-2.731e-3	3	498.458	3	5577.109	1
35		18	max	0	15	.183	3	.015	1	1.23e-2	2	NC	4	NC	1
36			min	0	1	-.002	9	-.001	10	-2.752e-3	3	902	3	NC	1
37		19	max	0	15	.137	2	.006	3	1.098e-2	2	NC	1	NC	1
38			min	0	1	-.036	3	-.003	2	-2.773e-3	3	NC	1	NC	1
39	M14	1	max	0	1	.277	3	.005	3	6.286e-3	2	NC	1	NC	1
40			min	0	15	-.413	2	-.003	2	-4.928e-3	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
41		2	max	0	1	.523	3	.01	1	7.41e-3	2	NC	5	NC	1
42			min	0	15	-.648	2	-.001	10	-5.889e-3	3	806.884	3	NC	1
43		3	max	0	1	.734	3	.028	1	8.534e-3	2	NC	5	NC	2
44			min	0	15	-.856	2	0	10	-6.849e-3	3	433.529	3	7157.612	1
45		4	max	0	1	.888	3	.045	1	9.657e-3	2	NC	5	NC	2
46			min	0	15	-1.017	2	0	10	-7.809e-3	3	324.334	3	4464.976	1
47		5	max	0	1	.972	3	.054	1	1.078e-2	2	NC	15	NC	2
48			min	0	15	-1.12	2	0	10	-8.77e-3	3	280.15	2	3693.067	1
49		6	max	0	1	.986	3	.053	1	1.191e-2	2	NC	15	NC	2
50			min	0	15	-1.165	2	0	10	-9.73e-3	3	263.468	2	3773.184	1
51		7	max	0	1	.941	3	.042	1	1.303e-2	2	NC	15	NC	2
52			min	0	15	-1.158	2	-.002	10	-1.069e-2	3	265.769	2	4814.062	1
53		8	max	0	1	.86	3	.024	1	1.415e-2	2	NC	15	NC	2
54			min	0	15	-1.117	2	-.004	10	-1.165e-2	3	281.399	2	8620.405	1
55		9	max	0	1	.777	3	.017	3	1.528e-2	2	NC	5	NC	1
56			min	0	15	-1.066	2	-.007	2	-1.261e-2	3	303.363	2	NC	1
57		10	max	0	1	.737	3	.017	3	1.64e-2	2	NC	5	NC	1
58			min	0	1	-1.04	2	-.011	2	-1.357e-2	3	316.083	2	NC	1
59		11	max	0	15	.777	3	.017	3	1.528e-2	2	NC	5	NC	1
60			min	0	1	-1.066	2	-.007	2	-1.261e-2	3	303.363	2	NC	1
61		12	max	0	15	.86	3	.024	1	1.415e-2	2	NC	15	NC	2
62			min	0	1	-1.117	2	-.004	10	-1.165e-2	3	281.399	2	8620.405	1
63		13	max	0	15	.941	3	.042	1	1.303e-2	2	NC	15	NC	2
64			min	0	1	-1.158	2	-.002	10	-1.069e-2	3	265.769	2	4814.062	1
65		14	max	0	15	.986	3	.053	1	1.191e-2	2	NC	15	NC	2
66			min	0	1	-1.165	2	0	10	-9.73e-3	3	263.468	2	3773.184	1
67		15	max	0	15	.972	3	.054	1	1.078e-2	2	NC	15	NC	2
68			min	0	1	-1.12	2	0	10	-8.77e-3	3	280.15	2	3693.067	1
69		16	max	0	15	.888	3	.045	1	9.657e-3	2	NC	5	NC	2
70			min	0	1	-1.017	2	0	10	-7.809e-3	3	324.334	3	4464.976	1
71		17	max	0	15	.734	3	.028	1	8.534e-3	2	NC	5	NC	2
72			min	0	1	-.856	2	0	10	-6.849e-3	3	433.529	3	7157.612	1
73		18	max	0	15	.523	3	.01	1	7.41e-3	2	NC	5	NC	1
74			min	0	1	-.648	2	-.001	10	-5.889e-3	3	806.884	3	NC	1
75		19	max	0	15	.277	3	.005	3	6.286e-3	2	NC	1	NC	1
76			min	0	1	-.413	2	-.003	2	-4.928e-3	3	NC	1	NC	1
77	M15	1	max	0	15	.283	3	.005	3	4.206e-3	3	NC	1	NC	1
78			min	0	1	-.413	2	-.003	2	-6.492e-3	2	NC	1	NC	1
79		2	max	0	15	.454	3	.01	1	5.021e-3	3	NC	5	NC	1
80			min	0	1	-.706	2	-.001	10	-7.654e-3	2	674.343	2	NC	1
81		3	max	0	15	.606	3	.028	1	5.837e-3	3	NC	5	NC	2
82			min	0	1	-.961	2	0	10	-8.816e-3	2	360.915	2	7130.431	1
83		4	max	0	15	.724	3	.045	1	6.653e-3	3	NC	5	NC	2
84			min	0	1	-1.151	2	0	10	-9.978e-3	2	268.234	2	4449.652	1
85		5	max	0	15	.8	3	.054	1	7.469e-3	3	NC	15	NC	2
86			min	0	1	-1.261	2	.001	10	-1.114e-2	2	233.383	2	3679.673	1
87		6	max	0	15	.835	3	.053	1	8.284e-3	3	NC	15	NC	2
88			min	0	1	-1.291	2	0	10	-1.23e-2	2	225.432	2	3756.585	1
89		7	max	0	15	.833	3	.042	1	9.1e-3	3	NC	15	NC	2
90			min	0	1	-1.253	2	-.002	10	-1.346e-2	2	235.755	2	4783.591	1
91		8	max	0	15	.806	3	.024	1	9.916e-3	3	NC	15	NC	2
92			min	0	1	-1.171	2	-.004	10	-1.463e-2	2	261.268	2	8514.895	1
93		9	max	0	15	.771	3	.016	3	1.073e-2	3	NC	5	NC	1
94			min	0	1	-1.083	2	-.007	2	-1.579e-2	2	295.512	2	NC	1
95		10	max	0	1	.752	3	.015	3	1.155e-2	3	NC	5	NC	1
96			min	0	1	-1.04	2	-.01	2	-1.695e-2	2	315.769	2	NC	1
97		11	max	0	1	.771	3	.016	3	1.073e-2	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
98			min	0	15	-1.083	2	-.007	2	-1.579e-2	2	295.512	2	NC	1
99		12	max	0	1	.806	3	.024	1	9.916e-3	3	NC	15	NC	2
100			min	0	15	-1.171	2	-.004	10	-1.463e-2	2	261.268	2	8514.895	1
101		13	max	0	1	.833	3	.042	1	9.1e-3	3	NC	15	NC	2
102			min	0	15	-1.253	2	-.002	10	-1.346e-2	2	235.755	2	4783.591	1
103		14	max	0	1	.835	3	.053	1	8.284e-3	3	NC	15	NC	2
104			min	0	15	-1.291	2	0	10	-1.23e-2	2	225.432	2	3756.585	1
105		15	max	0	1	.8	3	.054	1	7.469e-3	3	NC	15	NC	2
106			min	0	15	-1.261	2	.001	10	-1.114e-2	2	233.383	2	3679.673	1
107		16	max	0	1	.724	3	.045	1	6.653e-3	3	NC	5	NC	2
108			min	0	15	-1.151	2	0	10	-9.978e-3	2	268.234	2	4449.652	1
109		17	max	0	1	.606	3	.028	1	5.837e-3	3	NC	5	NC	2
110			min	0	15	-.961	2	0	10	-8.816e-3	2	360.915	2	7130.431	1
111		18	max	0	1	.454	3	.01	1	5.021e-3	3	NC	5	NC	1
112			min	0	15	-.706	2	-.001	10	-7.654e-3	2	674.343	2	NC	1
113		19	max	0	1	.283	3	.005	3	4.206e-3	3	NC	1	NC	1
114			min	0	15	-.413	2	-.003	2	-6.492e-3	2	NC	1	NC	1
115	M16	1	max	0	15	.119	2	.004	3	7.584e-3	3	NC	1	NC	1
116			min	0	1	-.096	3	-.002	2	-9.155e-3	2	NC	1	NC	1
117		2	max	0	15	.003	4	.015	1	8.641e-3	3	NC	4	NC	1
118			min	0	1	-.052	2	0	10	-1.006e-2	2	1161.241	2	NC	1
119		3	max	0	15	.031	3	.036	1	9.698e-3	3	NC	5	NC	2
120			min	0	1	-.187	2	0	10	-1.102e-2	1	648.262	2	5572.379	1
121		4	max	0	15	.058	3	.054	1	1.075e-2	3	NC	5	NC	2
122			min	0	1	-.262	2	.002	10	-1.198e-2	1	519.653	2	3728.628	1
123		5	max	0	15	.051	3	.062	1	1.181e-2	3	NC	5	NC	3
124			min	0	1	-.268	2	.002	10	-1.294e-2	1	512.369	2	3201.428	1
125		6	max	0	15	.011	3	.06	1	1.287e-2	3	NC	5	NC	2
126			min	0	1	-.205	2	.001	10	-1.39e-2	1	611.589	2	3342.491	1
127		7	max	0	15	.003	4	.046	1	1.393e-2	3	NC	4	NC	2
128			min	0	1	-.089	2	0	10	-1.486e-2	1	952.302	2	4310.327	1
129		8	max	0	15	.078	1	.026	1	1.498e-2	3	NC	4	NC	2
130			min	0	1	-.127	3	-.003	10	-1.582e-2	1	2962.558	2	7673.956	1
131		9	max	0	15	.188	1	.014	3	1.604e-2	3	NC	4	NC	1
132			min	0	1	-.193	3	-.005	2	-1.678e-2	1	2051.533	3	NC	1
133		10	max	0	1	.238	1	.014	3	1.71e-2	3	NC	4	NC	1
134			min	0	1	-.222	3	-.009	2	-1.774e-2	1	1578.631	3	NC	1
135		11	max	0	1	.188	1	.014	3	1.604e-2	3	NC	4	NC	1
136			min	0	15	-.193	3	-.005	2	-1.678e-2	1	2051.533	3	NC	1
137		12	max	0	1	.078	1	.026	1	1.498e-2	3	NC	4	NC	2
138			min	0	15	-.127	3	-.003	10	-1.582e-2	1	2962.558	2	7673.956	1
139		13	max	0	1	.003	4	.046	1	1.393e-2	3	NC	4	NC	2
140			min	0	15	-.089	2	0	10	-1.486e-2	1	952.302	2	4310.327	1
141		14	max	0	1	.011	3	.06	1	1.287e-2	3	NC	5	NC	2
142			min	0	15	-.205	2	.001	10	-1.39e-2	1	611.589	2	3342.491	1
143		15	max	0	1	.051	3	.062	1	1.181e-2	3	NC	5	NC	3
144			min	0	15	-.268	2	.002	10	-1.294e-2	1	512.369	2	3201.428	1
145		16	max	0	1	.058	3	.054	1	1.075e-2	3	NC	5	NC	2
146			min	0	15	-.262	2	.002	10	-1.198e-2	1	519.653	2	3728.628	1
147		17	max	0	1	.031	3	.036	1	9.698e-3	3	NC	5	NC	2
148			min	0	15	-.187	2	0	10	-1.102e-2	1	648.262	2	5572.379	1
149		18	max	0	1	.003	4	.015	1	8.641e-3	3	NC	4	NC	1
150			min	0	15	-.052	2	0	10	-1.006e-2	2	1161.241	2	NC	1
151		19	max	0	1	.119	2	.004	3	7.584e-3	3	NC	1	NC	1
152			min	0	15	-.096	3	-.002	2	-9.155e-3	2	NC	1	NC	1
153	M2	1	max	.005	1	.004	2	.004	1	-3.458e-6	15	NC	1	NC	1
154			min	-.007	3	-.008	3	0	15	-1.045e-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
155		2	max	.005	1	.004	2	.004	1	-3.206e-6	15	NC	1	NC	1
156			min	-.006	3	-.007	3	0	15	-9.687e-5	1	NC	1	NC	1
157		3	max	.005	1	.003	2	.004	1	-2.953e-6	15	NC	1	NC	1
158			min	-.006	3	-.007	3	0	15	-8.922e-5	1	NC	1	NC	1
159		4	max	.004	1	.003	2	.003	1	-2.7e-6	15	NC	1	NC	1
160			min	-.006	3	-.007	3	0	15	-8.157e-5	1	NC	1	NC	1
161		5	max	.004	1	.002	2	.003	1	-2.448e-6	15	NC	1	NC	1
162			min	-.005	3	-.006	3	0	15	-7.392e-5	1	NC	1	NC	1
163		6	max	.004	1	.002	2	.003	1	-2.195e-6	15	NC	1	NC	1
164			min	-.005	3	-.006	3	0	15	-6.626e-5	1	NC	1	NC	1
165		7	max	.003	1	.001	2	.002	1	-1.943e-6	15	NC	1	NC	1
166			min	-.005	3	-.006	3	0	15	-5.861e-5	1	NC	1	NC	1
167		8	max	.003	1	0	2	.002	1	-1.69e-6	15	NC	1	NC	1
168			min	-.004	3	-.005	3	0	15	-5.096e-5	1	NC	1	NC	1
169		9	max	.003	1	0	2	.002	1	-1.437e-6	15	NC	1	NC	1
170			min	-.004	3	-.005	3	0	15	-4.331e-5	1	NC	1	NC	1
171		10	max	.003	1	0	2	.001	1	-1.185e-6	15	NC	1	NC	1
172			min	-.003	3	-.005	3	0	15	-3.566e-5	1	NC	1	NC	1
173		11	max	.002	1	0	2	.001	1	-9.322e-7	15	NC	1	NC	1
174			min	-.003	3	-.004	3	0	15	-2.8e-5	1	NC	1	NC	1
175		12	max	.002	1	0	2	0	1	-6.796e-7	15	NC	1	NC	1
176			min	-.003	3	-.004	3	0	15	-2.035e-5	1	NC	1	NC	1
177		13	max	.002	1	0	15	0	1	-4.27e-7	15	NC	1	NC	1
178			min	-.002	3	-.003	3	0	15	-1.27e-5	1	NC	1	NC	1
179		14	max	.001	1	0	15	0	1	-1.405e-7	10	NC	1	NC	1
180			min	-.002	3	-.003	3	0	15	-5.048e-6	1	NC	1	NC	1
181		15	max	.001	1	0	15	0	1	2.604e-6	1	NC	1	NC	1
182			min	-.002	3	-.002	3	0	15	-5.16e-7	3	NC	1	NC	1
183		16	max	0	1	0	15	0	1	1.026e-5	1	NC	1	NC	1
184			min	-.001	3	-.002	3	0	15	1.464e-7	12	NC	1	NC	1
185		17	max	0	1	0	15	0	1	1.791e-5	1	NC	1	NC	1
186			min	0	3	-.001	3	0	15	5.835e-7	15	NC	1	NC	1
187		18	max	0	1	0	15	0	1	2.556e-5	1	NC	1	NC	1
188			min	0	3	0	3	0	15	8.361e-7	15	NC	1	NC	1
189		19	max	0	1	0	1	0	1	3.321e-5	1	NC	1	NC	1
190			min	0	1	0	1	0	1	1.089e-6	15	NC	1	NC	1
191	M3	1	max	0	1	0	1	0	1	-3.404e-7	15	NC	1	NC	1
192			min	0	1	0	1	0	1	-1.037e-5	1	NC	1	NC	1
193		2	max	0	3	0	15	0	1	3.173e-6	1	NC	1	NC	1
194			min	0	2	-.001	4	0	15	1.051e-7	15	NC	1	NC	1
195		3	max	0	3	0	15	0	1	1.672e-5	1	NC	1	NC	1
196			min	0	2	-.003	4	0	15	5.505e-7	15	NC	1	NC	1
197		4	max	0	3	-.001	15	0	1	3.026e-5	1	NC	1	NC	1
198			min	0	2	-.005	4	0	15	9.959e-7	15	NC	1	NC	1
199		5	max	.001	3	-.002	15	0	1	4.38e-5	1	NC	1	NC	1
200			min	0	2	-.007	4	0	15	1.441e-6	15	NC	1	NC	1
201		6	max	.001	3	-.002	15	0	1	5.735e-5	1	NC	1	NC	1
202			min	-.001	2	-.009	4	0	15	1.887e-6	15	NC	1	NC	1
203		7	max	.002	3	-.002	15	.001	1	7.089e-5	1	NC	1	NC	1
204			min	-.001	2	-.01	4	0	15	2.332e-6	15	9295.61	4	NC	1
205		8	max	.002	3	-.003	15	.001	1	8.444e-5	1	NC	1	NC	1
206			min	-.002	2	-.011	4	0	15	2.777e-6	15	8285.413	4	NC	1
207		9	max	.002	3	-.003	15	.001	1	9.798e-5	1	NC	1	NC	1
208			min	-.002	2	-.012	4	0	15	3.223e-6	15	7681.691	4	NC	1
209		10	max	.002	3	-.003	15	.002	1	1.115e-4	1	NC	1	NC	1
210			min	-.002	2	-.013	4	0	15	3.668e-6	15	7377.133	4	NC	1
211		11	max	.003	3	-.003	15	.002	1	1.251e-4	1	NC	2	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
212			min	-.002	2	-.013	4	0	15	4.114e-6	15	7326.065	4	NC	1
213		12	max	.003	3	-.003	15	.002	1	1.386e-4	1	NC	1	NC	1
214			min	-.002	2	-.012	4	0	15	4.559e-6	15	7526.799	4	NC	1
215		13	max	.003	3	-.003	15	.002	1	1.522e-4	1	NC	1	NC	1
216			min	-.003	2	-.012	4	0	15	5.004e-6	15	8023.13	4	NC	1
217		14	max	.004	3	-.002	15	.003	1	1.657e-4	1	NC	1	NC	1
218			min	-.003	2	-.011	4	0	15	5.45e-6	15	8927.698	4	NC	1
219		15	max	.004	3	-.002	15	.003	1	1.792e-4	1	NC	1	NC	1
220			min	-.003	2	-.009	4	0	15	5.895e-6	15	NC	1	NC	1
221		16	max	.004	3	-.002	15	.003	1	1.928e-4	1	NC	1	NC	1
222			min	-.003	2	-.007	1	0	15	6.341e-6	15	NC	1	NC	1
223		17	max	.004	3	-.001	15	.003	1	2.063e-4	1	NC	1	NC	1
224			min	-.004	2	-.006	1	0	15	6.786e-6	15	NC	1	NC	1
225		18	max	.005	3	0	15	.004	1	2.199e-4	1	NC	1	NC	1
226			min	-.004	2	-.004	1	0	15	7.231e-6	15	NC	1	NC	1
227		19	max	.005	3	0	15	.004	1	2.334e-4	1	NC	1	NC	1
228			min	-.004	2	-.003	1	0	15	7.677e-6	15	NC	1	NC	1
229	M4	1	max	.003	1	.003	2	0	15	1.517e-7	3	NC	1	NC	2
230			min	-.001	3	-.005	3	-.004	1	-3.785e-6	1	NC	1	6063.828	1
231		2	max	.003	1	.003	2	0	15	1.517e-7	3	NC	1	NC	2
232			min	-.001	3	-.005	3	-.004	1	-3.785e-6	1	NC	1	6603.959	1
233		3	max	.003	1	.003	2	0	15	1.517e-7	3	NC	1	NC	2
234			min	-.001	3	-.004	3	-.003	1	-3.785e-6	1	NC	1	7246.247	1
235		4	max	.002	1	.003	2	0	15	1.517e-7	3	NC	1	NC	2
236			min	0	3	-.004	3	-.003	1	-3.785e-6	1	NC	1	8017.331	1
237		5	max	.002	1	.003	2	0	15	1.517e-7	3	NC	1	NC	2
238			min	0	3	-.004	3	-.003	1	-3.785e-6	1	NC	1	8953.406	1
239		6	max	.002	1	.002	2	0	15	1.517e-7	3	NC	1	NC	1
240			min	0	3	-.004	3	-.002	1	-3.785e-6	1	NC	1	NC	1
241		7	max	.002	1	.002	2	0	15	1.517e-7	3	NC	1	NC	1
242			min	0	3	-.003	3	-.002	1	-3.785e-6	1	NC	1	NC	1
243		8	max	.002	1	.002	2	0	15	1.517e-7	3	NC	1	NC	1
244			min	0	3	-.003	3	-.002	1	-3.785e-6	1	NC	1	NC	1
245		9	max	.002	1	.002	2	0	15	1.517e-7	3	NC	1	NC	1
246			min	0	3	-.003	3	-.002	1	-3.785e-6	1	NC	1	NC	1
247		10	max	.001	1	.002	2	0	15	1.517e-7	3	NC	1	NC	1
248			min	0	3	-.002	3	-.001	1	-3.785e-6	1	NC	1	NC	1
249		11	max	.001	1	.001	2	0	15	1.517e-7	3	NC	1	NC	1
250			min	0	3	-.002	3	-.001	1	-3.785e-6	1	NC	1	NC	1
251		12	max	.001	1	.001	2	0	15	1.517e-7	3	NC	1	NC	1
252			min	0	3	-.002	3	0	1	-3.785e-6	1	NC	1	NC	1
253		13	max	0	1	.001	2	0	15	1.517e-7	3	NC	1	NC	1
254			min	0	3	-.002	3	0	1	-3.785e-6	1	NC	1	NC	1
255		14	max	0	1	0	2	0	15	1.517e-7	3	NC	1	NC	1
256			min	0	3	-.001	3	0	1	-3.785e-6	1	NC	1	NC	1
257		15	max	0	1	0	2	0	15	1.517e-7	3	NC	1	NC	1
258			min	0	3	-.001	3	0	1	-3.785e-6	1	NC	1	NC	1
259		16	max	0	1	0	2	0	15	1.517e-7	3	NC	1	NC	1
260			min	0	3	0	3	0	1	-3.785e-6	1	NC	1	NC	1
261		17	max	0	1	0	2	0	15	1.517e-7	3	NC	1	NC	1
262			min	0	3	0	3	0	1	-3.785e-6	1	NC	1	NC	1
263		18	max	0	1	0	2	0	15	1.517e-7	3	NC	1	NC	1
264			min	0	3	0	3	0	1	-3.785e-6	1	NC	1	NC	1
265		19	max	0	1	0	1	0	1	1.517e-7	3	NC	1	NC	1
266			min	0	1	0	1	0	1	-3.785e-6	1	NC	1	NC	1
267	M6	1	max	.016	1	.016	2	0	1	0	1	NC	4	NC	1
268			min	-.022	3	-.024	3	0	1	0	1	1984.449	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
269		2	max	.015	1	.015	2	0	1	0	1	NC	4	NC	1
270			min	-.021	3	-.023	3	0	1	0	1	2104.24	3	NC	1
271		3	max	.014	1	.013	2	0	1	0	1	NC	4	NC	1
272			min	-.02	3	-.021	3	0	1	0	1	2239.368	3	NC	1
273		4	max	.014	1	.012	2	0	1	0	1	NC	4	NC	1
274			min	-.018	3	-.02	3	0	1	0	1	2392.915	3	NC	1
275		5	max	.013	1	.011	2	0	1	0	1	NC	4	NC	1
276			min	-.017	3	-.019	3	0	1	0	1	2568.846	3	NC	1
277		6	max	.012	1	.01	2	0	1	0	1	NC	1	NC	1
278			min	-.016	3	-.017	3	0	1	0	1	2772.343	3	NC	1
279		7	max	.011	1	.008	2	0	1	0	1	NC	1	NC	1
280			min	-.015	3	-.016	3	0	1	0	1	3010.319	3	NC	1
281		8	max	.01	1	.007	2	0	1	0	1	NC	1	NC	1
282			min	-.013	3	-.015	3	0	1	0	1	3292.202	3	NC	1
283		9	max	.009	1	.006	2	0	1	0	1	NC	1	NC	1
284			min	-.012	3	-.013	3	0	1	0	1	3631.19	3	NC	1
285		10	max	.008	1	.005	2	0	1	0	1	NC	1	NC	1
286			min	-.011	3	-.012	3	0	1	0	1	4046.351	3	NC	1
287		11	max	.007	1	.004	2	0	1	0	1	NC	1	NC	1
288			min	-.01	3	-.01	3	0	1	0	1	4566.287	3	NC	1
289		12	max	.006	1	.003	2	0	1	0	1	NC	1	NC	1
290			min	-.009	3	-.009	3	0	1	0	1	5235.946	3	NC	1
291		13	max	.005	1	.002	2	0	1	0	1	NC	1	NC	1
292			min	-.007	3	-.008	3	0	1	0	1	6130.246	3	NC	1
293		14	max	.005	1	.002	2	0	1	0	1	NC	1	NC	1
294			min	-.006	3	-.006	3	0	1	0	1	7384.04	3	NC	1
295		15	max	.004	1	.001	2	0	1	0	1	NC	1	NC	1
296			min	-.005	3	-.005	3	0	1	0	1	9267.042	3	NC	1
297		16	max	.003	1	0	2	0	1	0	1	NC	1	NC	1
298			min	-.004	3	-.004	3	0	1	0	1	NC	1	NC	1
299		17	max	.002	1	0	2	0	1	0	1	NC	1	NC	1
300			min	-.002	3	-.003	3	0	1	0	1	NC	1	NC	1
301		18	max	0	1	0	2	0	1	0	1	NC	1	NC	1
302			min	-.001	3	-.001	3	0	1	0	1	NC	1	NC	1
303		19	max	0	1	0	1	0	1	0	1	NC	1	NC	1
304			min	0	1	0	1	0	1	0	1	NC	1	NC	1
305	M7	1	max	0	1	0	1	0	1	0	1	NC	1	NC	1
306			min	0	1	0	1	0	1	0	1	NC	1	NC	1
307		2	max	0	3	0	2	0	1	0	1	NC	1	NC	1
308			min	0	2	-.002	3	0	1	0	1	NC	1	NC	1
309		3	max	.002	3	0	15	0	1	0	1	NC	1	NC	1
310			min	-.002	2	-.005	3	0	1	0	1	NC	1	NC	1
311		4	max	.003	3	-.001	15	0	1	0	1	NC	1	NC	1
312			min	-.002	2	-.007	3	0	1	0	1	NC	1	NC	1
313		5	max	.003	3	-.002	15	0	1	0	1	NC	1	NC	1
314			min	-.003	2	-.009	3	0	1	0	1	NC	1	NC	1
315		6	max	.004	3	-.002	15	0	1	0	1	NC	1	NC	1
316			min	-.004	2	-.01	3	0	1	0	1	9118.604	3	NC	1
317		7	max	.005	3	-.002	15	0	1	0	1	NC	1	NC	1
318			min	-.005	2	-.011	3	0	1	0	1	8122.012	3	NC	1
319		8	max	.006	3	-.003	15	0	1	0	1	NC	1	NC	1
320			min	-.005	2	-.012	3	0	1	0	1	7528.764	3	NC	1
321		9	max	.007	3	-.003	15	0	1	0	1	NC	1	NC	1
322			min	-.006	2	-.013	3	0	1	0	1	7216.948	3	NC	1
323		10	max	.008	3	-.003	15	0	1	0	1	NC	1	NC	1
324			min	-.007	2	-.013	3	0	1	0	1	7131.387	3	NC	1
325		11	max	.009	3	-.003	15	0	1	0	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
326			min	-.008	2	-.013	4	0	1	0	1	7257.28	3	NC	1
327		12	max	.009	3	-.003	15	0	1	0	1	NC	1	NC	1
328			min	-.009	2	-.013	4	0	1	0	1	7613.735	3	NC	1
329		13	max	.01	3	-.003	15	0	1	0	1	NC	1	NC	1
330			min	-.009	2	-.012	4	0	1	0	1	8148.009	4	NC	1
331		14	max	.011	3	-.003	15	0	1	0	1	NC	1	NC	1
332			min	-.01	2	-.011	4	0	1	0	1	9061.396	4	NC	1
333		15	max	.012	3	-.002	15	0	1	0	1	NC	1	NC	1
334			min	-.011	2	-.011	1	0	1	0	1	NC	1	NC	1
335		16	max	.013	3	-.002	15	0	1	0	1	NC	1	NC	1
336			min	-.012	2	-.01	1	0	1	0	1	NC	1	NC	1
337		17	max	.014	3	-.001	15	0	1	0	1	NC	1	NC	1
338			min	-.013	2	-.009	1	0	1	0	1	NC	1	NC	1
339		18	max	.015	3	0	15	0	1	0	1	NC	1	NC	1
340			min	-.013	2	-.008	1	0	1	0	1	NC	1	NC	1
341		19	max	.015	3	0	15	0	1	0	1	NC	1	NC	1
342			min	-.014	2	-.007	1	0	1	0	1	NC	1	NC	1
343	M8	1	max	.009	2	.012	2	0	1	0	1	NC	1	NC	1
344			min	-.004	3	-.015	3	0	1	0	1	NC	1	NC	1
345		2	max	.009	2	.011	2	0	1	0	1	NC	1	NC	1
346			min	-.004	3	-.014	3	0	1	0	1	NC	1	NC	1
347		3	max	.008	2	.011	2	0	1	0	1	NC	1	NC	1
348			min	-.003	3	-.013	3	0	1	0	1	NC	1	NC	1
349		4	max	.008	2	.01	2	0	1	0	1	NC	1	NC	1
350			min	-.003	3	-.012	3	0	1	0	1	NC	1	NC	1
351		5	max	.007	2	.009	2	0	1	0	1	NC	1	NC	1
352			min	-.003	3	-.012	3	0	1	0	1	NC	1	NC	1
353		6	max	.007	2	.009	2	0	1	0	1	NC	1	NC	1
354			min	-.003	3	-.011	3	0	1	0	1	NC	1	NC	1
355		7	max	.006	2	.008	2	0	1	0	1	NC	1	NC	1
356			min	-.003	3	-.01	3	0	1	0	1	NC	1	NC	1
357		8	max	.006	2	.007	2	0	1	0	1	NC	1	NC	1
358			min	-.002	3	-.009	3	0	1	0	1	NC	1	NC	1
359		9	max	.005	2	.007	2	0	1	0	1	NC	1	NC	1
360			min	-.002	3	-.008	3	0	1	0	1	NC	1	NC	1
361		10	max	.005	2	.006	2	0	1	0	1	NC	1	NC	1
362			min	-.002	3	-.007	3	0	1	0	1	NC	1	NC	1
363		11	max	.004	2	.005	2	0	1	0	1	NC	1	NC	1
364			min	-.002	3	-.007	3	0	1	0	1	NC	1	NC	1
365		12	max	.004	2	.005	2	0	1	0	1	NC	1	NC	1
366			min	-.001	3	-.006	3	0	1	0	1	NC	1	NC	1
367		13	max	.003	2	.004	2	0	1	0	1	NC	1	NC	1
368			min	-.001	3	-.005	3	0	1	0	1	NC	1	NC	1
369		14	max	.003	2	.003	2	0	1	0	1	NC	1	NC	1
370			min	-.001	3	-.004	3	0	1	0	1	NC	1	NC	1
371		15	max	.002	2	.003	2	0	1	0	1	NC	1	NC	1
372			min	0	3	-.003	3	0	1	0	1	NC	1	NC	1
373		16	max	.002	2	.002	2	0	1	0	1	NC	1	NC	1
374			min	0	3	-.002	3	0	1	0	1	NC	1	NC	1
375		17	max	.001	2	.001	2	0	1	0	1	NC	1	NC	1
376			min	0	3	-.002	3	0	1	0	1	NC	1	NC	1
377		18	max	0	2	0	2	0	1	0	1	NC	1	NC	1
378			min	0	3	0	3	0	1	0	1	NC	1	NC	1
379		19	max	0	1	0	1	0	1	0	1	NC	1	NC	1
380			min	0	1	0	1	0	1	0	1	NC	1	NC	1
381	M10	1	max	.005	1	.004	2	0	15	1.045e-4	1	NC	1	NC	1
382			min	-.007	3	-.008	3	-.004	1	3.458e-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
383		2	max	.005	1	.004	2	0	15	9.687e-5	1	NC	1	NC	1
384			min	-.006	3	-.007	3	-.004	1	3.206e-6	15	NC	1	NC	1
385		3	max	.005	1	.003	2	0	15	8.922e-5	1	NC	1	NC	1
386			min	-.006	3	-.007	3	-.004	1	2.953e-6	15	NC	1	NC	1
387		4	max	.004	1	.003	2	0	15	8.157e-5	1	NC	1	NC	1
388			min	-.006	3	-.007	3	-.003	1	2.7e-6	15	NC	1	NC	1
389		5	max	.004	1	.002	2	0	15	7.392e-5	1	NC	1	NC	1
390			min	-.005	3	-.006	3	-.003	1	2.448e-6	15	NC	1	NC	1
391		6	max	.004	1	.002	2	0	15	6.626e-5	1	NC	1	NC	1
392			min	-.005	3	-.006	3	-.003	1	2.195e-6	15	NC	1	NC	1
393		7	max	.003	1	.001	2	0	15	5.861e-5	1	NC	1	NC	1
394			min	-.005	3	-.006	3	-.002	1	1.943e-6	15	NC	1	NC	1
395		8	max	.003	1	0	2	0	15	5.096e-5	1	NC	1	NC	1
396			min	-.004	3	-.005	3	-.002	1	1.69e-6	15	NC	1	NC	1
397		9	max	.003	1	0	2	0	15	4.331e-5	1	NC	1	NC	1
398			min	-.004	3	-.005	3	-.002	1	1.437e-6	15	NC	1	NC	1
399		10	max	.003	1	0	2	0	15	3.566e-5	1	NC	1	NC	1
400			min	-.003	3	-.005	3	-.001	1	1.185e-6	15	NC	1	NC	1
401		11	max	.002	1	0	2	0	15	2.8e-5	1	NC	1	NC	1
402			min	-.003	3	-.004	3	-.001	1	9.322e-7	15	NC	1	NC	1
403		12	max	.002	1	0	2	0	15	2.035e-5	1	NC	1	NC	1
404			min	-.003	3	-.004	3	0	1	6.796e-7	15	NC	1	NC	1
405		13	max	.002	1	0	15	0	15	1.27e-5	1	NC	1	NC	1
406			min	-.002	3	-.003	3	0	1	4.27e-7	15	NC	1	NC	1
407		14	max	.001	1	0	15	0	15	5.048e-6	1	NC	1	NC	1
408			min	-.002	3	-.003	3	0	1	1.405e-7	10	NC	1	NC	1
409		15	max	.001	1	0	15	0	15	5.16e-7	3	NC	1	NC	1
410			min	-.002	3	-.002	3	0	1	-2.604e-6	1	NC	1	NC	1
411		16	max	0	1	0	15	0	15	-1.464e-7	12	NC	1	NC	1
412			min	-.001	3	-.002	3	0	1	-1.026e-5	1	NC	1	NC	1
413		17	max	0	1	0	15	0	15	-5.835e-7	15	NC	1	NC	1
414			min	0	3	-.001	3	0	1	-1.791e-5	1	NC	1	NC	1
415		18	max	0	1	0	15	0	15	-8.361e-7	15	NC	1	NC	1
416			min	0	3	0	3	0	1	-2.556e-5	1	NC	1	NC	1
417		19	max	0	1	0	1	0	1	-1.089e-6	15	NC	1	NC	1
418			min	0	1	0	1	0	1	-3.321e-5	1	NC	1	NC	1
419	M11	1	max	0	1	0	1	0	1	1.037e-5	1	NC	1	NC	1
420			min	0	1	0	1	0	1	3.404e-7	15	NC	1	NC	1
421		2	max	0	3	0	15	0	15	-1.051e-7	15	NC	1	NC	1
422			min	0	2	-.001	4	0	1	-3.173e-6	1	NC	1	NC	1
423		3	max	0	3	0	15	0	15	-5.505e-7	15	NC	1	NC	1
424			min	0	2	-.003	4	0	1	-1.672e-5	1	NC	1	NC	1
425		4	max	0	3	-.001	15	0	15	-9.959e-7	15	NC	1	NC	1
426			min	0	2	-.005	4	0	1	-3.026e-5	1	NC	1	NC	1
427		5	max	.001	3	-.002	15	0	15	-1.441e-6	15	NC	1	NC	1
428			min	0	2	-.007	4	0	1	-4.38e-5	1	NC	1	NC	1
429		6	max	.001	3	-.002	15	0	15	-1.887e-6	15	NC	1	NC	1
430			min	-.001	2	-.009	4	0	1	-5.735e-5	1	NC	1	NC	1
431		7	max	.002	3	-.002	15	0	15	-2.332e-6	15	NC	1	NC	1
432			min	-.001	2	-.01	4	-.001	1	-7.089e-5	1	9295.61	4	NC	1
433		8	max	.002	3	-.003	15	0	15	-2.777e-6	15	NC	1	NC	1
434			min	-.002	2	-.011	4	-.001	1	-8.444e-5	1	8285.413	4	NC	1
435		9	max	.002	3	-.003	15	0	15	-3.223e-6	15	NC	1	NC	1
436			min	-.002	2	-.012	4	-.001	1	-9.798e-5	1	7681.691	4	NC	1
437		10	max	.002	3	-.003	15	0	15	-3.668e-6	15	NC	1	NC	1
438			min	-.002	2	-.013	4	-.002	1	-1.115e-4	1	7377.133	4	NC	1
439		11	max	.003	3	-.003	15	0	15	-4.114e-6	15	NC	2	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
440			min	-.002	2	-.013	4	-.002	1	-1.251e-4	1	7326.065	4	NC	1
441		12	max	.003	3	-.003	15	0	15	-4.559e-6	15	NC	1	NC	1
442			min	-.002	2	-.012	4	-.002	1	-1.386e-4	1	7526.799	4	NC	1
443		13	max	.003	3	-.003	15	0	15	-5.004e-6	15	NC	1	NC	1
444			min	-.003	2	-.012	4	-.002	1	-1.522e-4	1	8023.13	4	NC	1
445		14	max	.004	3	-.002	15	0	15	-5.45e-6	15	NC	1	NC	1
446			min	-.003	2	-.011	4	-.003	1	-1.657e-4	1	8927.698	4	NC	1
447		15	max	.004	3	-.002	15	0	15	-5.895e-6	15	NC	1	NC	1
448			min	-.003	2	-.009	4	-.003	1	-1.792e-4	1	NC	1	NC	1
449		16	max	.004	3	-.002	15	0	15	-6.341e-6	15	NC	1	NC	1
450			min	-.003	2	-.007	1	-.003	1	-1.928e-4	1	NC	1	NC	1
451		17	max	.004	3	-.001	15	0	15	-6.786e-6	15	NC	1	NC	1
452			min	-.004	2	-.006	1	-.003	1	-2.063e-4	1	NC	1	NC	1
453		18	max	.005	3	0	15	0	15	-7.231e-6	15	NC	1	NC	1
454			min	-.004	2	-.004	1	-.004	1	-2.199e-4	1	NC	1	NC	1
455		19	max	.005	3	0	15	0	15	-7.677e-6	15	NC	1	NC	1
456			min	-.004	2	-.003	1	-.004	1	-2.334e-4	1	NC	1	NC	1
457	M12	1	max	.003	1	.003	2	.004	1	3.785e-6	1	NC	1	NC	2
458			min	-.001	3	-.005	3	0	15	-1.517e-7	3	NC	1	6063.828	1
459		2	max	.003	1	.003	2	.004	1	3.785e-6	1	NC	1	NC	2
460			min	-.001	3	-.005	3	0	15	-1.517e-7	3	NC	1	6603.959	1
461		3	max	.003	1	.003	2	.003	1	3.785e-6	1	NC	1	NC	2
462			min	-.001	3	-.004	3	0	15	-1.517e-7	3	NC	1	7246.247	1
463		4	max	.002	1	.003	2	.003	1	3.785e-6	1	NC	1	NC	2
464			min	0	3	-.004	3	0	15	-1.517e-7	3	NC	1	8017.331	1
465		5	max	.002	1	.003	2	.003	1	3.785e-6	1	NC	1	NC	2
466			min	0	3	-.004	3	0	15	-1.517e-7	3	NC	1	8953.406	1
467		6	max	.002	1	.002	2	.002	1	3.785e-6	1	NC	1	NC	1
468			min	0	3	-.004	3	0	15	-1.517e-7	3	NC	1	NC	1
469		7	max	.002	1	.002	2	.002	1	3.785e-6	1	NC	1	NC	1
470			min	0	3	-.003	3	0	15	-1.517e-7	3	NC	1	NC	1
471		8	max	.002	1	.002	2	.002	1	3.785e-6	1	NC	1	NC	1
472			min	0	3	-.003	3	0	15	-1.517e-7	3	NC	1	NC	1
473		9	max	.002	1	.002	2	.002	1	3.785e-6	1	NC	1	NC	1
474			min	0	3	-.003	3	0	15	-1.517e-7	3	NC	1	NC	1
475		10	max	.001	1	.002	2	.001	1	3.785e-6	1	NC	1	NC	1
476			min	0	3	-.002	3	0	15	-1.517e-7	3	NC	1	NC	1
477		11	max	.001	1	.001	2	.001	1	3.785e-6	1	NC	1	NC	1
478			min	0	3	-.002	3	0	15	-1.517e-7	3	NC	1	NC	1
479		12	max	.001	1	.001	2	0	1	3.785e-6	1	NC	1	NC	1
480			min	0	3	-.002	3	0	15	-1.517e-7	3	NC	1	NC	1
481		13	max	0	1	.001	2	0	1	3.785e-6	1	NC	1	NC	1
482			min	0	3	-.002	3	0	15	-1.517e-7	3	NC	1	NC	1
483		14	max	0	1	0	2	0	1	3.785e-6	1	NC	1	NC	1
484			min	0	3	-.001	3	0	15	-1.517e-7	3	NC	1	NC	1
485		15	max	0	1	0	2	0	1	3.785e-6	1	NC	1	NC	1
486			min	0	3	-.001	3	0	15	-1.517e-7	3	NC	1	NC	1
487		16	max	0	1	0	2	0	1	3.785e-6	1	NC	1	NC	1
488			min	0	3	0	3	0	15	-1.517e-7	3	NC	1	NC	1
489		17	max	0	1	0	2	0	1	3.785e-6	1	NC	1	NC	1
490			min	0	3	0	3	0	15	-1.517e-7	3	NC	1	NC	1
491		18	max	0	1	0	2	0	1	3.785e-6	1	NC	1	NC	1
492			min	0	3	0	3	0	15	-1.517e-7	3	NC	1	NC	1
493		19	max	0	1	0	1	0	1	3.785e-6	1	NC	1	NC	1
494			min	0	1	0	1	0	1	-1.517e-7	3	NC	1	NC	1
495	M1	1	max	.006	3	.137	2	0	1	1.078e-2	1	NC	1	NC	1
496			min	-.003	2	-.036	3	0	15	-2.072e-2	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
497		2	max	.006	3	.067	2	0	15	5.251e-3	1	NC	4	NC	1
498			min	-.003	2	-.018	3	-.003	1	-1.025e-2	3	1657.278	2	NC	1
499		3	max	.006	3	.009	3	0	15	3.832e-5	10	NC	5	NC	1
500			min	-.003	2	-.008	2	-.004	1	-1.114e-4	3	800.737	2	NC	1
501		4	max	.006	3	.052	3	0	15	4.079e-3	2	NC	5	NC	1
502			min	-.003	2	-.091	2	-.004	1	-4.336e-3	3	507.295	2	NC	1
503		5	max	.006	3	.106	3	0	15	8.12e-3	2	NC	5	NC	1
504			min	-.003	2	-.178	2	-.003	1	-8.561e-3	3	367.244	2	NC	1
505		6	max	.006	3	.163	3	0	15	1.216e-2	2	NC	15	NC	1
506			min	-.003	2	-.262	2	-.001	1	-1.279e-2	3	289.926	2	NC	1
507		7	max	.006	3	.218	3	0	1	1.62e-2	2	NC	15	NC	1
508			min	-.003	2	-.336	2	0	3	-1.701e-2	3	244.202	2	NC	1
509		8	max	.005	3	.263	3	0	1	2.024e-2	2	9590.456	15	NC	1
510			min	-.003	2	-.395	2	0	15	-2.123e-2	3	217.119	2	NC	1
511		9	max	.005	3	.293	3	0	15	2.289e-2	2	8972.989	15	NC	1
512			min	-.003	2	-.433	2	0	1	-2.16e-2	3	203.006	2	NC	1
513		10	max	.005	3	.303	3	0	1	2.462e-2	2	8784.578	15	NC	1
514			min	-.003	2	-.445	2	0	15	-1.941e-2	3	198.87	2	NC	1
515		11	max	.005	3	.296	3	0	1	2.635e-2	2	8972.734	15	NC	1
516			min	-.003	2	-.433	2	0	15	-1.721e-2	3	203.703	2	NC	1
517		12	max	.005	3	.271	3	0	15	2.538e-2	2	9589.907	15	NC	1
518			min	-.003	2	-.394	2	0	1	-1.472e-2	3	219.216	2	NC	1
519		13	max	.005	3	.231	3	0	15	2.034e-2	2	NC	15	NC	1
520			min	-.003	2	-.333	2	0	1	-1.179e-2	3	249.255	2	NC	1
521		14	max	.005	3	.179	3	.001	1	1.531e-2	2	NC	15	NC	1
522			min	-.003	2	-.255	2	0	15	-8.853e-3	3	300.636	2	NC	1
523		15	max	.005	3	.121	3	.003	1	1.027e-2	2	NC	5	NC	1
524			min	-.002	2	-.17	2	0	15	-5.918e-3	3	389.114	2	NC	1
525		16	max	.005	3	.061	3	.004	1	5.236e-3	2	NC	5	NC	1
526			min	-.002	2	-.084	2	0	15	-2.983e-3	3	553.002	2	NC	1
527		17	max	.004	3	.004	3	.004	1	3.345e-4	1	NC	5	NC	1
528			min	-.002	2	-.005	2	0	15	-4.862e-5	3	903.399	2	NC	1
529		18	max	.004	3	.06	2	.003	1	8.029e-3	2	NC	4	NC	1
530			min	-.002	2	-.048	3	0	15	-3.4e-3	3	1917.056	2	NC	1
531		19	max	.004	3	.119	2	0	15	1.616e-2	2	NC	1	NC	1
532			min	-.002	2	-.096	3	0	1	-6.898e-3	3	NC	1	NC	1
533	M5	1	max	.019	3	.288	2	0	1	0	1	NC	1	NC	1
534			min	-.012	2	-.038	3	0	1	0	1	NC	1	NC	1
535		2	max	.019	3	.141	2	0	1	0	1	NC	5	NC	1
536			min	-.012	2	-.019	3	0	1	0	1	794.086	2	NC	1
537		3	max	.019	3	.029	3	0	1	0	1	NC	5	NC	1
538			min	-.012	2	-.024	2	0	1	0	1	373.315	2	NC	1
539		4	max	.018	3	.13	3	0	1	0	1	NC	15	NC	1
540			min	-.012	2	-.221	2	0	1	0	1	228.269	2	NC	1
541		5	max	.018	3	.267	3	0	1	0	1	8130.099	15	NC	1
542			min	-.012	2	-.434	2	0	1	0	1	160.54	2	NC	1
543		6	max	.018	3	.422	3	0	1	0	1	6249.513	15	NC	1
544			min	-.011	2	-.646	2	0	1	0	1	124.019	2	NC	1
545		7	max	.017	3	.572	3	0	1	0	1	5165.445	15	NC	1
546			min	-.011	2	-.838	2	0	1	0	1	102.84	2	NC	1
547		8	max	.017	3	.698	3	0	1	0	1	4535.969	15	NC	1
548			min	-.011	2	-.993	2	0	1	0	1	90.488	2	NC	1
549		9	max	.016	3	.779	3	0	1	0	1	4213.477	15	NC	1
550			min	-.011	2	-1.091	2	0	1	0	1	84.141	2	NC	1
551		10	max	.016	3	.808	3	0	1	0	1	4116.351	15	NC	1
552			min	-.011	2	-1.124	2	0	1	0	1	82.285	2	NC	1
553		11	max	.016	3	.788	3	0	1	0	1	4213.59	15	NC	1

Envelope Member Section Deflections (Continued)

	Member	Sec		x [in]	LC	y [in]	LC	z [in]	LC	x Rotate [r...	LC	(n) L/y Ratio	LC	(n) L/z Ratio	LC
554			min	-.01	2	-1.092	2	0	1	0	1	84.443	2	NC	1
555		12	max	.015	3	.719	3	0	1	0	1	4536.23	15	NC	1
556			min	-.01	2	-.991	2	0	1	0	1	91.486	2	NC	1
557		13	max	.015	3	.608	3	0	1	0	1	5165.963	15	NC	1
558			min	-.01	2	-.829	2	0	1	0	1	105.442	2	NC	1
559		14	max	.015	3	.468	3	0	1	0	1	6250.502	15	NC	1
560			min	-.01	2	-.628	2	0	1	0	1	129.913	2	NC	1
561		15	max	.014	3	.313	3	0	1	0	1	8132.021	15	NC	1
562			min	-.01	2	-.411	2	0	1	0	1	173.443	2	NC	1
563		16	max	.014	3	.156	3	0	1	0	1	NC	15	NC	1
564			min	-.01	2	-.2	2	0	1	0	1	257.587	2	NC	1
565		17	max	.014	3	.011	3	0	1	0	1	NC	5	NC	1
566			min	-.009	2	-.016	2	0	1	0	1	446.066	2	NC	1
567		18	max	.014	3	.123	1	0	1	0	1	NC	5	NC	1
568			min	-.009	2	-.112	3	0	1	0	1	985.687	1	NC	1
569		19	max	.014	3	.238	1	0	1	0	1	NC	1	NC	1
570			min	-.009	2	-.222	3	0	1	0	1	NC	1	NC	1
571	M9	1	max	.006	3	.137	2	0	15	2.072e-2	3	NC	1	NC	1
572			min	-.003	2	-.036	3	0	1	-1.078e-2	1	NC	1	NC	1
573		2	max	.006	3	.067	2	.003	1	1.025e-2	3	NC	4	NC	1
574			min	-.003	2	-.018	3	0	15	-5.251e-3	1	1657.278	2	NC	1
575		3	max	.006	3	.009	3	.004	1	1.114e-4	3	NC	5	NC	1
576			min	-.003	2	-.008	2	0	15	-3.832e-5	10	800.737	2	NC	1
577		4	max	.006	3	.052	3	.004	1	4.336e-3	3	NC	5	NC	1
578			min	-.003	2	-.091	2	0	15	-4.079e-3	2	507.295	2	NC	1
579		5	max	.006	3	.106	3	.003	1	8.561e-3	3	NC	5	NC	1
580			min	-.003	2	-.178	2	0	15	-8.12e-3	2	367.244	2	NC	1
581		6	max	.006	3	.163	3	.001	1	1.279e-2	3	NC	15	NC	1
582			min	-.003	2	-.262	2	0	15	-1.216e-2	2	289.926	2	NC	1
583		7	max	.006	3	.218	3	0	3	1.701e-2	3	NC	15	NC	1
584			min	-.003	2	-.336	2	0	1	-1.62e-2	2	244.202	2	NC	1
585		8	max	.005	3	.263	3	0	15	2.123e-2	3	9590.456	15	NC	1
586			min	-.003	2	-.395	2	0	1	-2.024e-2	2	217.119	2	NC	1
587		9	max	.005	3	.293	3	0	1	2.16e-2	3	8972.989	15	NC	1
588			min	-.003	2	-.433	2	0	15	-2.289e-2	2	203.006	2	NC	1
589		10	max	.005	3	.303	3	0	15	1.941e-2	3	8784.578	15	NC	1
590			min	-.003	2	-.445	2	0	1	-2.462e-2	2	198.87	2	NC	1
591		11	max	.005	3	.296	3	0	15	1.721e-2	3	8972.734	15	NC	1
592			min	-.003	2	-.433	2	0	1	-2.635e-2	2	203.703	2	NC	1
593		12	max	.005	3	.271	3	0	1	1.472e-2	3	9589.907	15	NC	1
594			min	-.003	2	-.394	2	0	15	-2.538e-2	2	219.216	2	NC	1
595		13	max	.005	3	.231	3	0	1	1.179e-2	3	NC	15	NC	1
596			min	-.003	2	-.333	2	0	15	-2.034e-2	2	249.255	2	NC	1
597		14	max	.005	3	.179	3	0	15	8.853e-3	3	NC	15	NC	1
598			min	-.003	2	-.255	2	-.001	1	-1.531e-2	2	300.636	2	NC	1
599		15	max	.005	3	.121	3	0	15	5.918e-3	3	NC	5	NC	1
600			min	-.002	2	-.17	2	-.003	1	-1.027e-2	2	389.114	2	NC	1
601		16	max	.005	3	.061	3	0	15	2.983e-3	3	NC	5	NC	1
602			min	-.002	2	-.084	2	-.004	1	-5.236e-3	2	553.002	2	NC	1
603		17	max	.004	3	.004	3	0	15	4.862e-5	3	NC	5	NC	1
604			min	-.002	2	-.005	2	-.004	1	-3.345e-4	1	903.399	2	NC	1
605		18	max	.004	3	.06	2	0	15	3.4e-3	3	NC	4	NC	1
606			min	-.002	2	-.048	3	-.003	1	-8.029e-3	2	1917.056	2	NC	1
607		19	max	.004	3	.119	2	0	1	6.898e-3	3	NC	1	NC	1
608			min	-.002	2	-.096	3	0	15	-1.616e-2	2	NC	1	NC	1

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

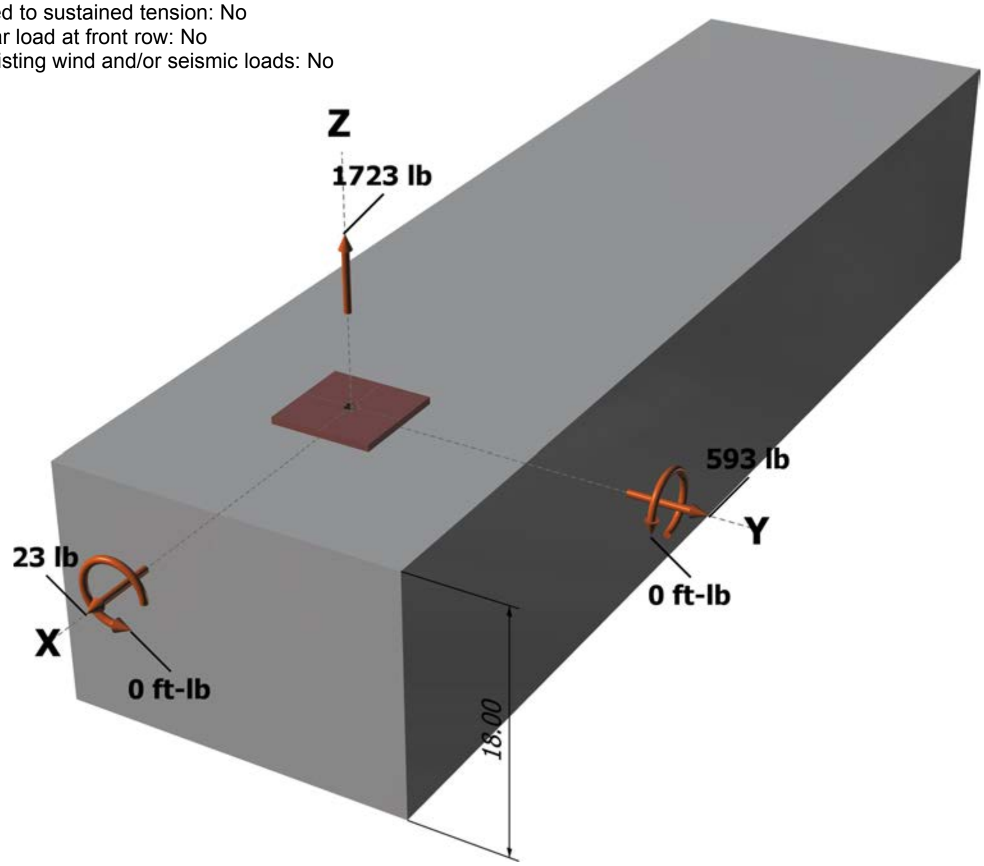
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

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

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

<Figure 1>



<Figure 2>

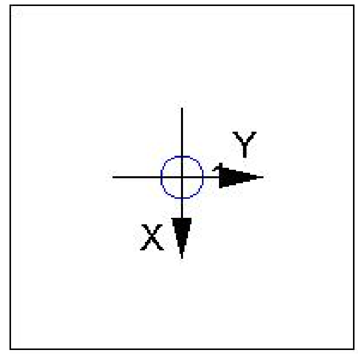
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	1723.0	23.0	593.0	593.4
Sum	1723.0	23.0	593.0	593.4

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 1723
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	5.247	10215

$\phi N_{cb} = \phi\,(A_{Nc}/A_{Nco})\,\Psi_{ed,N}\,\Psi_{c,N}\,\Psi_{cp,N} N_b$ (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)
220.36	247.75	0.967	1.00	1.000	10215	0.65	5710

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	7.00	6947

$\phi V_{cby} = \phi\ (A_{Vc} / A_{Vco})\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{by}$ (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)
192.89	220.50	0.925	1.000	1.000	6947	0.70	3934

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)
165.27	278.72	0.878	1.000	1.000	8282	0.70	3018

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	7.00	6947

$\phi V_{cbx} = \phi\ (2)(A_{Vc} / A_{Vco})\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{by}$ (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)
192.89	220.50	1.000	1.000	1.000	6947	0.70	8508

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)
165.27	278.72	1.000	1.000	1.000	8282	0.70	6875

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)
220.36	247.75	0.967	1.000	1.000	10215	8785	0.70	12298

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	1723	6071	0.28	Pass
Concrete breakout	1723	5710	0.30	Pass
Adhesive	**1723**	**5365**	**0.32**	**Pass (Governs)**

Shear	Factored Load, V_{ua} (lb)	Design Strength, øV_n (lb)	Ratio	Status
Steel	**593**	**3156**	**0.19**	**Pass (Governs)**
T Concrete breakout y+	593	3934	0.15	Pass
T Concrete breakout x+	23	3018	0.01	Pass
|| Concrete breakout y+	23	8508	0.00	Pass
|| Concrete breakout x+	593	6875	0.09	Pass
Concrete breakout, combined	-	-	0.15	Pass
Pryout	593	12298	0.05	Pass

Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. D.7.1	0.32	0.00	32.1 %	1.0	Pass

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

12. Warnings

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

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

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

1.Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

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

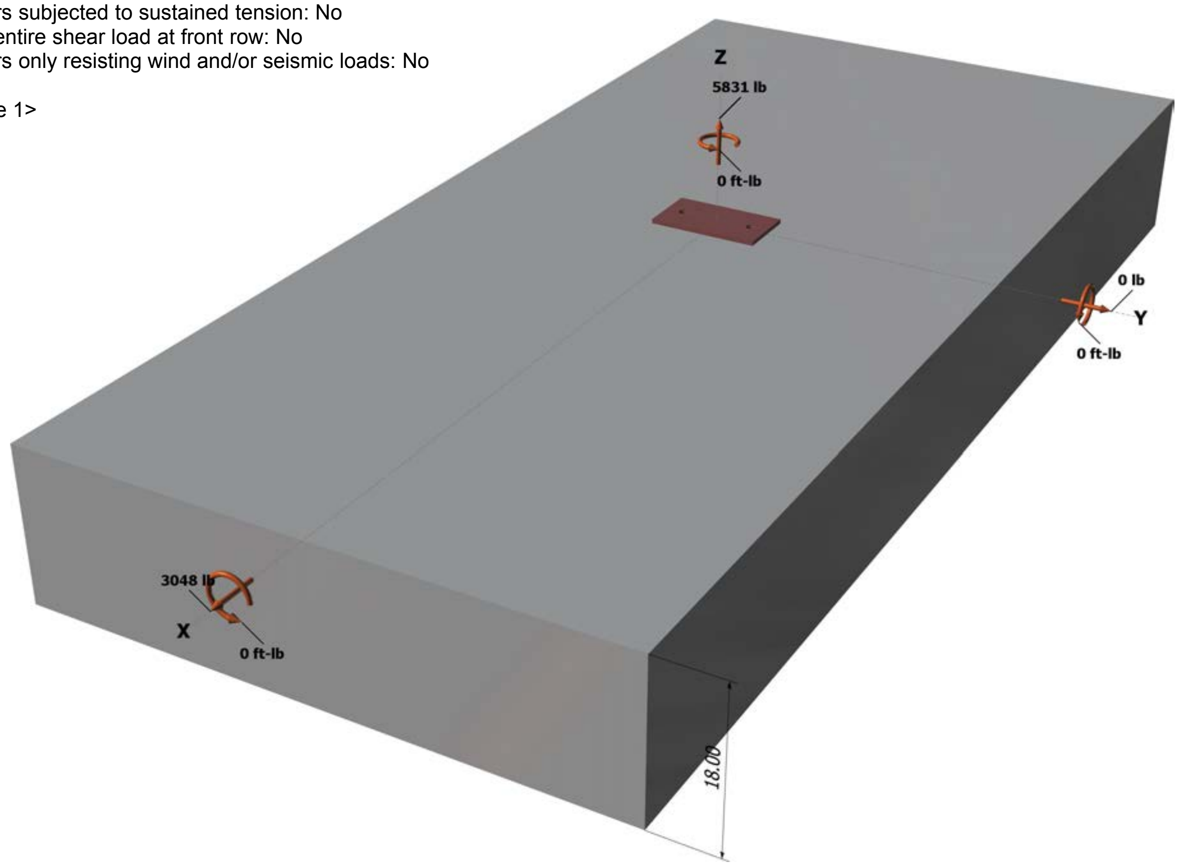
Anchor Information:
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, h_{ef} (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 8.50
c_{ac} (inch): 9.67
C_{min} (inch): 1.75
S_{min} (inch):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

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

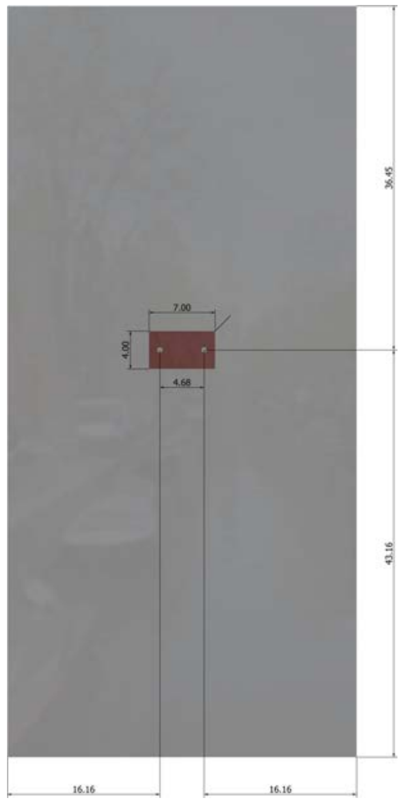
Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout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

Base Plate
Length x Width x Thickness (inch): 4.00 x 7.00 x 0.28

<Figure 1>



<Figure 2>



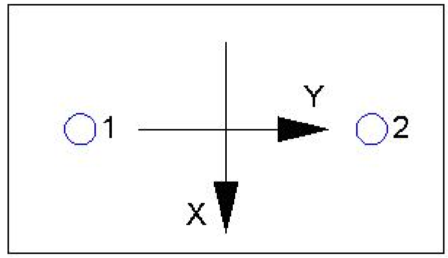
Recommended Anchor
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	2915.5	1524.0	0.0	1524.0
2	2915.5	1524.0	0.0	1524.0
Sum	5831.0	3048.0	0.0	3048.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 5831
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	6.000	12492

$\phi N_{cbg} = \phi\,(A_{Nc} / A_{Nco})\,\Psi_{ec,N}\,\Psi_{ed,N}\,\Psi_{c,N}\,\Psi_{cp,N} N_b$ (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)
408.24	324.00	1.000	1.000	1.00	1.000	12492	0.65	10231

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)
158.66	109.66	1.000	1.043	1.000	1.000	9755	0.55	8093

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

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

A_{Vc} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{bx} (lb)	ϕ	ϕV_{cbgx} (lb)
666.00	648.00	1.000	0.969	1.000	1.000	15593	0.70	10875

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	16.16	24369

$\phi V_{cbx} = \phi\,(2)(A_{Vc} / A_{Vco})\,\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{by}$ (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)
872.64	1175.16	1.000	1.000	1.000	24369	0.70	25334

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	158.66	109.66	1.000	1.043	1.000	1.000	9755	14715

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
408.24	324.00	1.000	1.000	1.000	1.000	12492	15740	0.70

ϕV_{cpg} (lb)
20601

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	2916	6071	0.48	Pass
Concrete breakout	5831	10231	0.57	Pass
Adhesive	**5831**	**8093**	**0.72**	**Pass (Governs)**

Shear	Factored Load, V_{ua} (lb)	Design Strength, $øV_n$ (lb)	Ratio	Status
Steel	**1524**	**3156**	**0.48**	**Pass (Governs)**
T Concrete breakout x+	3048	10875	0.28	Pass
|| Concrete breakout y-	1524	25334	0.06	Pass
Pryout	3048	20601	0.15	Pass

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

Sec. D.7.3	0.72	0.48	120.3 %	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.