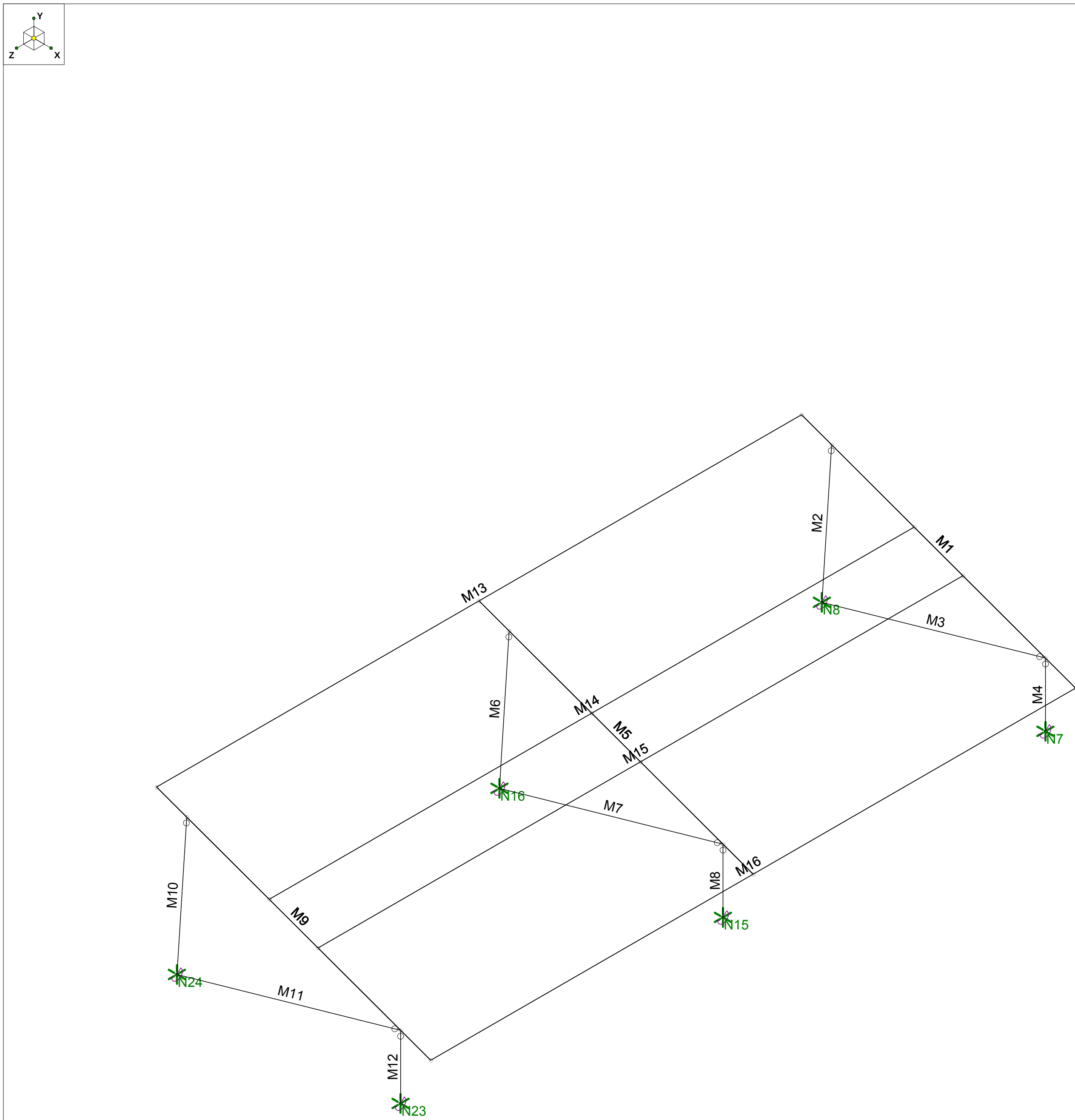



| | | |
|---|---|---|
| Schletter, Inc. | | 20° Tilt w/ Seismic Design |
| HCV | Standard PVMax Racking System | |
| | Representative Calculations - ASCE 7-05 | |

## 1. INTRODUCTION

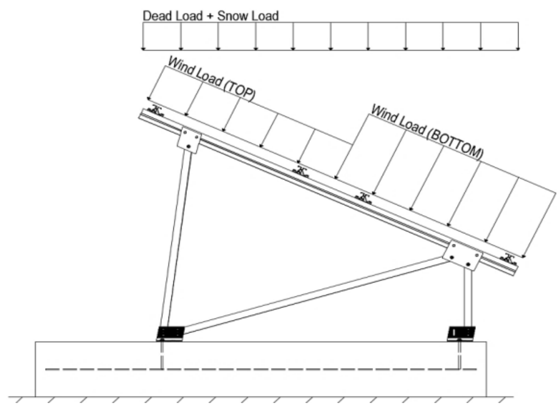
### 1.1 Project Description
*The following sections will cover the determination of forces and structural design calculations for the Schletter, Inc. PVMax ground mount system.*

### 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 = 20°
Maximum Height Above Grade = 3 ft




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

### 1.3 Technical Codes
- ASCE 7-05 - 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, $P_s$ = 20.62 psf *(ASCE 7-05, Eq. 7-2)*
$I_s$ = 1.00
$C_s$ = 0.91
$C_e$ = 0.90
$C_t$ = 1.20

### 2.3 Wind Loads
Design Wind Speed, V = 90 mph
Height < 15 ft

Exposure Category = C
Importance Category = II

Peak Velocity Pressure, $q_z$ = 12.72 psf *Including the gust factor, G=0.85. (ASCE 7-05, Eq. 6-15)*

Pressure Coefficients

| | | | |
|---|---|---|---|
| $Cf+_{TOP}$ | = | 1.050 | *(Pressure)* |
| $Cf+_{BOTTOM}$ | = | 1.650 | |
| $Cf-_{TOP, OUTER PURLIN}$ | = | -2.400 | *(Suction)* |
| $Cf-_{TOP, INNER PURLIN}$ | = | -1.840 | |
| $Cf-_{BOTTOM}$ | = | -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

| | | | |
|---|---|---|---|
| $S_S$ = | 2.50 | R = | 1.25 |
| $S_{DS}$ = | 1.67 | $C_S$ = | 0.8 |
| $S_1$ = | 1.00 | ρ = | 1.3 |
| $S_{D1}$ = | 1.00 | Ω = | 1.25 |
| $T_a$ = | 0.05 | $C_d$ = | 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 |

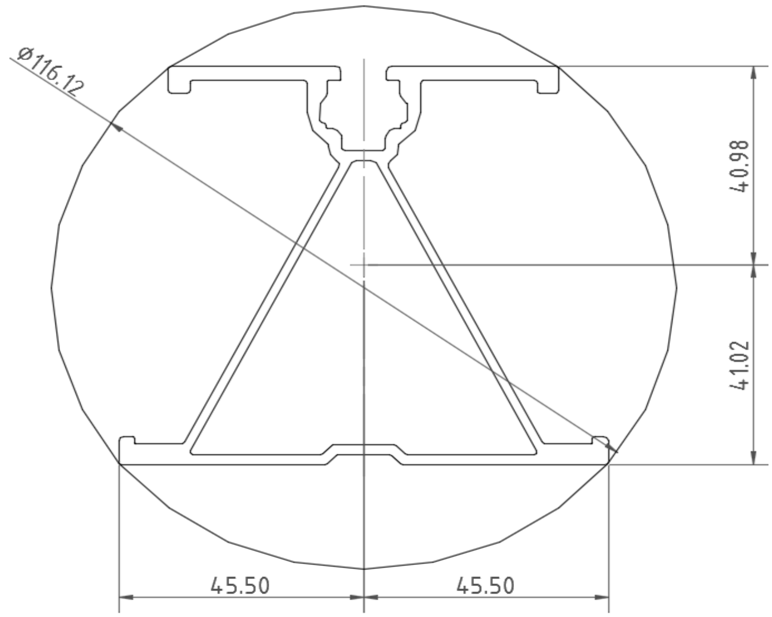
| **Front Struts** | Location |
|---|---|
| M4 | Outer |
| M8 | Inner |
| M12 | Outer |

## 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 |
| $L_b$ = | 126 | 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 |
| $M_y$ = | 1.965 | k-ft |
| $M_z$ = | 0.332 | k-ft |
| $M_{y\ allowable}$ = | 2.779 | k-ft |
| $M_{z\ allowable}$ = | 1.154 | k-ft |
| Utilization = | 99% | |

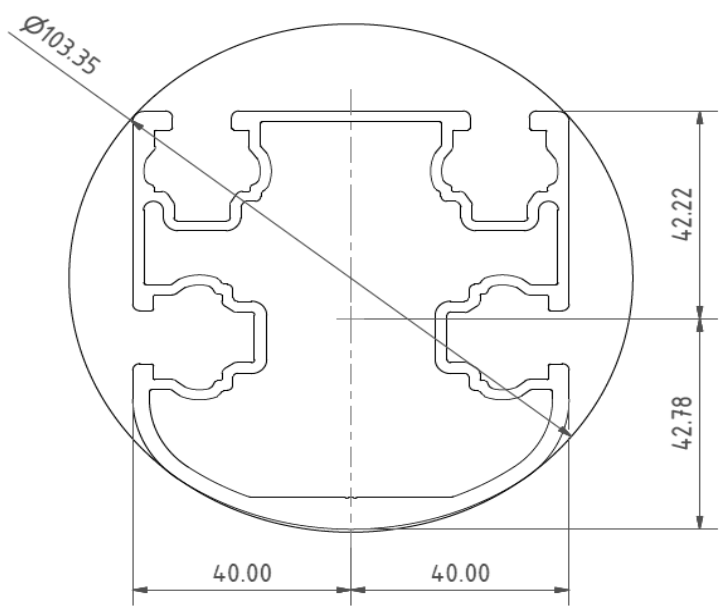



DETAIL VIEW

### 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).*

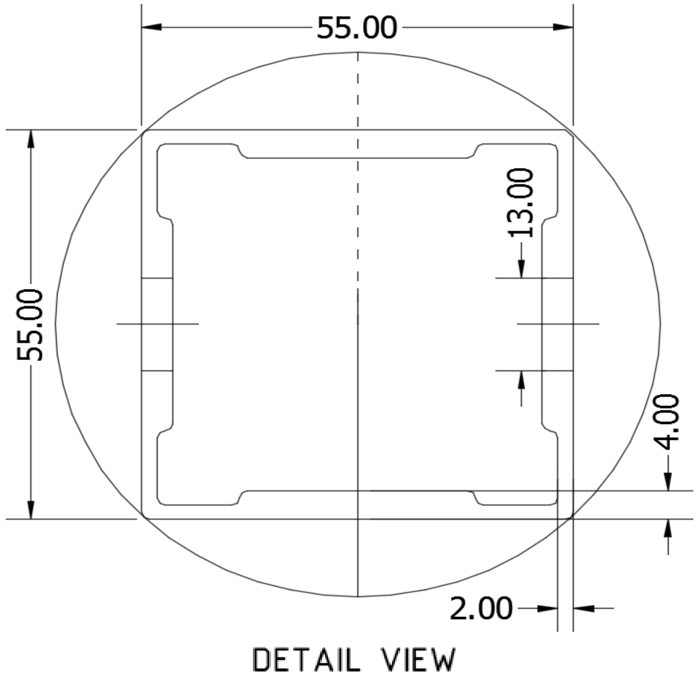
| | | |
|---|---|---|
| Girder Type = | **BF0** | |
| Aluminum Type = | 6105-T5 | |
| $F_{ty}$ = | 35 | ksi |
| $L_b$ = | 88.90 | in |
| $\Phi F_{ty\ AXIAL}$ = | 31.09 | ksi |
| $\Phi F_{ty\ STRONG\text{-}AXIS}$ = | 29.35 | ksi |
| $\Phi F_{ty\ WEAK\text{-}AXIS}$ = | 33.25 | ksi |
| $S_y$ = | 1.42 | $in^3$ |
| $S_x$ = | 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 |
| $M_y$ = | -2.982 | k-ft |
| $M_z$ = | 0.000 | k-ft |
| $P_n$ = | -0.207 | k |
| $M_{y\ allowable}$ = | 3.464 | k-ft |
| $M_{z\ allowable}$ = | 3.907 | k-ft |
| $P_{n\ allowable}$ = | 58.535 | k |
| Utilization = | 86% | |



### 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).*

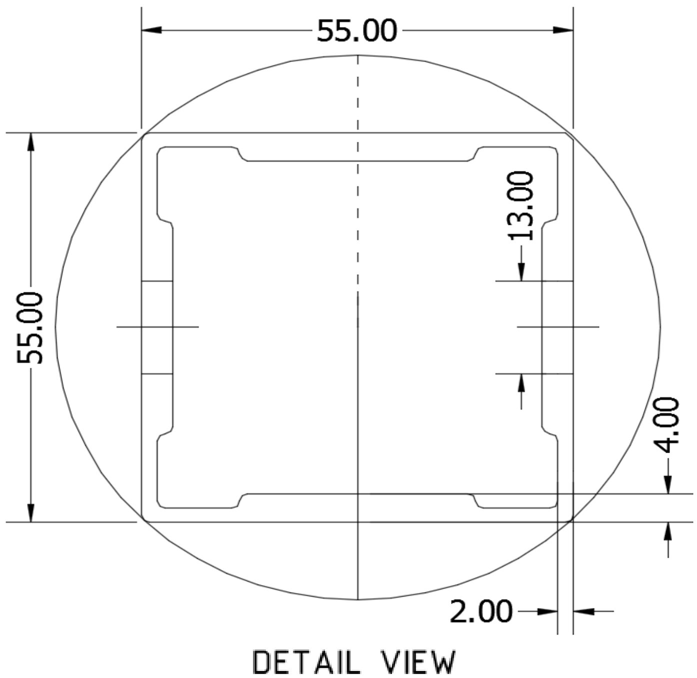
| | | |
|---|---|---|
| Strut Type = | **55x55** | |
| Aluminum Type = | 6105-T5 | |
| $F_{ty}$ = | 35 | ksi |
| $L_b$ = | 24.80 | in |
| $\Phi F_{ty\ AXIAL}$ = | 28.03 | ksi |
| $\Phi F_{ty\ BENDING}$ = | 28.22 | ksi |
| $S_y$ = | 0.60 | $in^3$ |
| $S_x$ = | 0.60 | $in^3$ |
| E = | 10100 | ksi |
| $I_y$ = | 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 |
| $M_z$ = | -0.528 | k-ft |
| $P_n$ = | 0.685 | k |
| $M_{y\ allowable}$ = | 1.408 | k-ft |
| $M_{z\ allowable}$ = | 1.408 | k-ft |
| $P_{n\ allowable}$ = | 27.532 | k |
| Utilization = | 40% | |




### 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).*

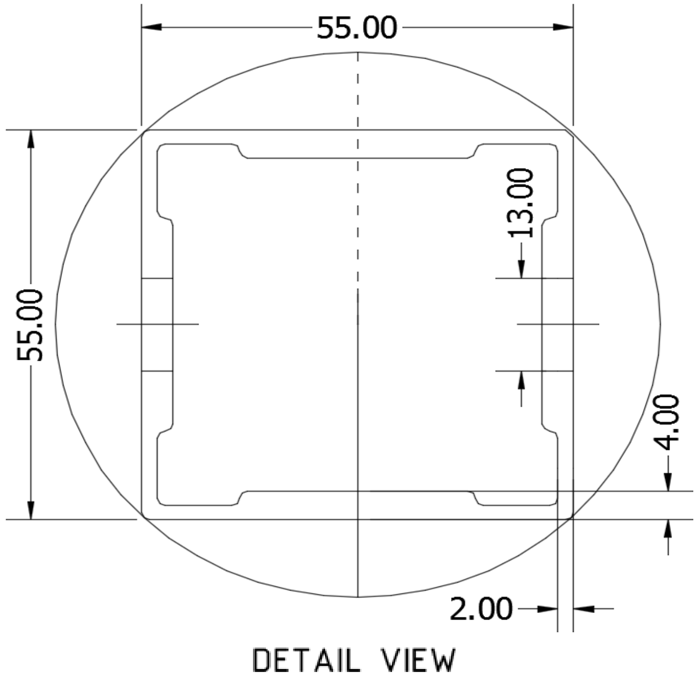
| | | |
|---|---|---|
| Strut Type = | **55x55** | |
| Aluminum Type = | 6105-T5 | |
| $F_{ty}$ = | 35 | ksi |
| $L_b$ = | 86.60 | in |
| $\Phi F_{ty\ AXIAL}$ = | 7.50 | ksi |
| $\Phi F_{ty\ BENDING}$ = | 28.22 | ksi |
| $S_y$ = | 0.60 | $in^3$ |
| $S_x$ = | 0.60 | $in^3$ |
| E = | 10100 | ksi |
| $I_y$ = | 0.67 | $in^4$ |
| $I_x$ = | 0.67 | $in^4$ |
| A = | 0.98 | $in^2$ |
| g = | 1.18 | lbs/ft |
| $M_y$ = | 0.010 | k-ft |
| $M_z$ = | 0.000 | k-ft |
| $P_n$ = | 1.340 | k |
| $M_{y\ allowable}$ = | 1.408 | k-ft |
| $M_{z\ allowable}$ = | 1.408 | k-ft |
| $P_{n\ allowable}$ = | 7.371 | k |
| Utilization = | 19% | |



### 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 |
| $L_b$ = | 55.91 | in |
| $\Phi F_{ty\ AXIAL}$ = | 15.92 | 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 |
| $M_y$ = | -0.008 | k-ft |
| $M_z$ = | -0.307 | k-ft |
| $P_n$ = | 0.686 | k |
| $M_{y\ allowable}$ = | 1.408 | k-ft |
| $M_{z\ allowable}$ = | 1.408 | k-ft |
| $P_{n\ allowable}$ = | 15.642 | k |
| Utilization = | 27% | |




## 5. FOUNDATION DESIGN CALCULATIONS

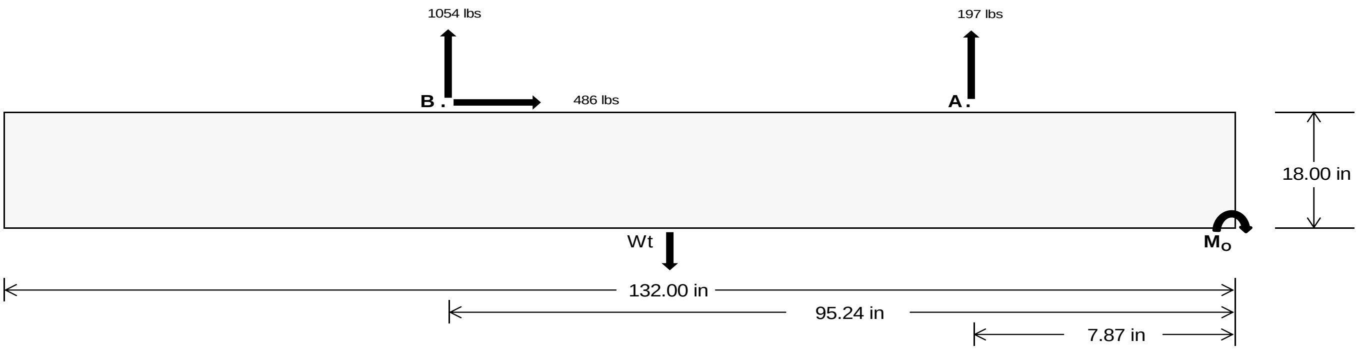
### 5.1 Helical Pile Foundations

*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 = | 834.30 | 4399.12 | k |
| Compressive Load = | 4335.58 | 4673.29 | k |
| Lateral Load = | 350.77 | 2023.85 | k |
| Moment (Weak Axis) = | 0.71 | 0.39 | k |

## 5.2 Design of Ballast Foundations

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




<u>Concrete Properties</u>

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

<u>Footing Reinforcement</u>

*Use fiber reinforcing with (2) #5 rebar.*

<u>Overturning Check</u>

$M_O$ = 110717.0 in-lbs
Resisting Force Required = 1677.53 lbs
S.F. = 1.67
Weight Required = 2795.88 lbs
Minimum Width = <u>24 in</u> in
Weight Provided = 4785.00 lbs

*A minimum 132in long x 24in wide x 18in tall ballast foundation is required to resist overturning.*

<u>Sliding</u>

Force = 486.24 lbs
Friction = 0.4
Weight Required = 1215.60 lbs
Resisting Weight = 4785.00 lbs
Additional Weight Required = 0 lbs

*Use a 132in long x 24in wide x 18in tall ballast foundation to resist sliding. Friction is OK.*

<u>Cohesion</u>

Sliding Force = 486.24 lbs
Cohesion = 130 psf
Area = 22.00 $ft^2$
Resisting = 2392.50 lbs
Additional Weight Required = 0 lbs

*Use a 132in long x 24in wide x 18in tall ballast foundation. Cohesion is OK.*

<u>Shear Key</u>

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

*Shear key is not required.*

<u>Bearing Pressure</u>

| | Ballast Width | | | |
|---|---|---|---|---|
| | 24 in | 25 in | 26 in | 27 in |
| $P_{ftg}$ = (145 pcf)(11 ft)(1.5 ft)(2 ft) = | 4785 lbs | 4984 lbs | 5184 lbs | 5383 lbs |

| ASD LC | 1.0D + 1.0S | | | | 1.0D + 1.0W | | | | 1.0D + 0.75L + 0.75W + 0.75S | | | | 0.6D + 1.0W | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Width | 24 in | 25 in | 26 in | 27 in | 24 in | 25 in | 26 in | 27 in | 24 in | 25 in | 26 in | 27 in | 24 in | 25 in | 26 in | 27 in |
| $F_A$ | 1630 lbs | 1630 lbs | 1630 lbs | 1630 lbs | 1313 lbs | 1313 lbs | 1313 lbs | 1313 lbs | 2073 lbs | 2073 lbs | 2073 lbs | 2073 lbs | -395 lbs | -395 lbs | -395 lbs | -395 lbs |
| $F_B$ | 1665 lbs | 1665 lbs | 1665 lbs | 1665 lbs | 1571 lbs | 1571 lbs | 1571 lbs | 1571 lbs | 2290 lbs | 2290 lbs | 2290 lbs | 2290 lbs | -2109 lbs | -2109 lbs | -2109 lbs | -2109 lbs |
| $F_V$ | 187 lbs | 187 lbs | 187 lbs | 187 lbs | 879 lbs | 879 lbs | 879 lbs | 879 lbs | 786 lbs | 786 lbs | 786 lbs | 786 lbs | -972 lbs | -972 lbs | -972 lbs | -972 lbs |
| $P_{total}$ | 8081 lbs | 8280 lbs | 8479 lbs | 8679 lbs | 7669 lbs | 7868 lbs | 8068 lbs | 8267 lbs | 9149 lbs | 9348 lbs | 9547 lbs | 9747 lbs | 368 lbs | 487 lbs | 607 lbs | 727 lbs |
| M | 4121 lbs-ft | 4121 lbs-ft | 4121 lbs-ft | 4121 lbs-ft | 3853 lbs-ft | 3853 lbs-ft | 3853 lbs-ft | 3853 lbs-ft | 5641 lbs-ft | 5641 lbs-ft | 5641 lbs-ft | 5641 lbs-ft | 1767 lbs-ft | 1767 lbs-ft | 1767 lbs-ft | 1767 lbs-ft |
| e | 0.51 ft | 0.50 ft | 0.49 ft | 0.47 ft | 0.50 ft | 0.49 ft | 0.48 ft | 0.47 ft | 0.62 ft | 0.60 ft | 0.59 ft | 0.58 ft | 4.81 ft | 3.63 ft | 2.91 ft | 2.43 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 |
| $f_{min}$ | 265.1 psf | 263.2 psf | 261.5 psf | 259.8 psf | 253.0 psf | 251.6 psf | 250.3 psf | 249.1 psf | 276.0 psf | 273.6 psf | 271.5 psf | 269.5 psf | 0.0 psf | 0.0 psf | 0.0 psf | 0.0 psf |
| $f_{max}$ | 469.5 psf | 459.4 psf | 450.1 psf | 441.5 psf | 444.1 psf | 435.1 psf | 426.7 psf | 418.9 psf | 555.7 psf | 542.2 psf | 529.7 psf | 518.1 psf | 176.6 psf | 83.2 psf | 72.1 psf | 70.2 psf |

Maximum Bearing Pressure = 556 psf
Allowable Bearing Pressure = 1500 psf

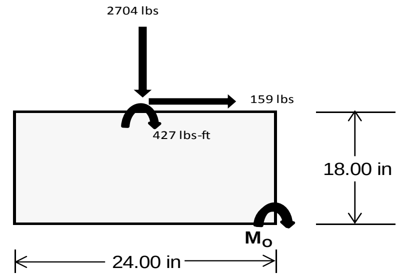
*Use a 132in long x 24in wide x 18in tall ballast foundation for an acceptable bearing pressure.*

## Seismic Design

Overturning Check

| | |
|---|---|
| $M_O$ = | 2039.5 ft-lbs |
| Resisting Force Required = | 2039.47 lbs |
| S.F. = | 1.67 |
| Weight Required = | 3399.12 lbs |
| Minimum Width = | 24 in in |
| Weight Provided = | 4785.00 lbs |

*A minimum 132in long x 24in 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 | 24 in | | | 24 in | | | 24 in | | |
| Support | Outer | Inner | Outer | Outer | Inner | Outer | Outer | Inner | Outer |
| $F_Y$ | 274 lbs | 671 lbs | 226 lbs | 926 lbs | 2704 lbs | 889 lbs | 97 lbs | 196 lbs | 50 lbs |
| $F_V$ | 221 lbs | 217 lbs | 224 lbs | 164 lbs | 159 lbs | 174 lbs | 222 lbs | 219 lbs | 222 lbs |
| $P_{total}$ | 6198 lbs | 6595 lbs | 6150 lbs | 6565 lbs | 8344 lbs | 6528 lbs | 1829 lbs | 1928 lbs | 1782 lbs |
| M | 886 lbs-ft | 878 lbs-ft | 894 lbs-ft | 668 lbs-ft | 665 lbs-ft | 701 lbs-ft | 883 lbs-ft | 875 lbs-ft | 887 lbs-ft |
| e | 0.14 ft | 0.13 ft | 0.15 ft | 0.10 ft | 0.08 ft | 0.11 ft | 0.48 ft | 0.45 ft | 0.50 ft |
| L/6 | 0.33 ft | 0.33 ft | 0.33 ft | 0.33 ft | 0.33 ft | 0.33 ft | 0.33 ft | 0.33 ft | 0.33 ft |
| $f_{min}$ | 160.9 psf | 180.0 psf | 157.7 psf | 207.4 psf | 288.6 psf | 201.1 psf | 0.0 psf | 0.0 psf | 0.0 psf |
| $f_{max}$ | 402.5 psf | 419.5 psf | 401.5 psf | 389.5 psf | 469.9 psf | 392.4 psf | 214.4 psf | 213.9 psf | 215.0 psf |

Maximum Bearing Pressure = 470 psf
Allowable Bearing Pressure = 1500 psf

*Use a 132in long x 24in wide x 18in tall ballast foundation for an acceptable bearing pressure.*

Foundation Requirements: 132in long x 24in wide x 18in tall ballast foundation and fiber reinforcing with (2) #5 rebar.

### 5.3 Foundation Anchors

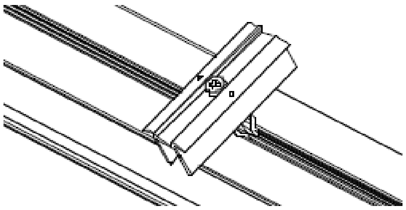
*Threaded rods are anchored to the the ballast foundations using the Simpson AT-XP epoxy solution. LRFD load results are compared to the allowable strengths of the epoxy solution. Please see the supplementary calculations provided by the Simpson Anchor Designer software.*

## 6. DESIGN OF JOINTS AND CONNECTIONS

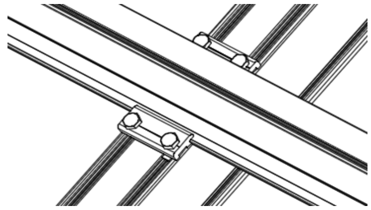
### 6.1 Anchorage of Modules to Purlins and Connection of Purlins to Girders

*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 = | 0.454 | k |
| Allowable Uplift = | 1.214 | k |
| Utilization = | 37% | |



| Fastening of Purlins to Girders | | |
|---|---|---|
| Maximum Uplifting Force = | 1.679 | k |
| Allowable Uplift = | 4.357 | k |
| Utilization = | 39% | |



### 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 = | 3.335 | k |
| M12 Bolt Capacity = | 12.808 | k |
| Strut Bearing Capacity = | 7.421 | k |
| Utilization = | 45% | |

| Rear Strut | | |
|---|---|---|
| Maximum Axial Load = | 3.387 | k |
| M12 Bolt Capacity = | 12.808 | k |
| Strut Bearing Capacity = | 7.421 | k |
| Utilization = | 46% | |

| Diagonal Strut | | |
|---|---|---|
| Maximum Axial Load = | 1.404 | k |
| M12 Bolt Shear Capacity = | 12.808 | k |
| Strut Bearing Capacity = | 7.421 | k |
| Utilization = | 19% | |

*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

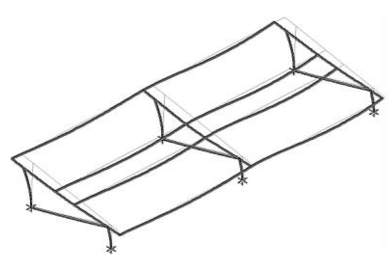
### 7.1 Seismic Drift

*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, $h_{sx}$ = | 40.12 | in |
| Allowable Story Drift for All Other Structures, $\Delta$ = { | $0.020h_{sx}$ | |
| | 0.802 | in |
| Max Drift, $\Delta_{MAX}$ = | 0.578 | in |

$0.578 \leq 0.802$, OK.

*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**

$L_b$ = 126 in

J = 0.432

348.575

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

S1 = 0.51461

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

S2 = 1701.56

$\varphi F_L$= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]

$\varphi F_L$= 27.2 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

$\varphi F_L$= φb[Bp-1.6Dp*b/t]

$\varphi F_L$= 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

$\varphi F_L$= 1.17φyFcy

$\varphi F_L$= 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

$\varphi F_L$= φb[Bbr-mDbr*h/t]

$\varphi F_L$= 43.2 ksi

$\varphi F_L St$= 25.1 ksi

Ix = 897074 $mm^4$

2.155 $in^4$

y = 41.015 mm

Sx = 1.335 $in^3$

$M_{max}St$ = 2.788 k-ft

Weak Axis:

**3.4.14**

$L_b$ = 126

J = 0.432

221.673

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

S1 = 0.51461

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

S2 = 1701.56

$\varphi F_L$= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]

$\varphi F_L$= 28.5

**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

$\varphi F_L$= φb[Bp-1.6Dp*b/t]

$\varphi F_L$= 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

$\varphi F_L$= 1.3φyFcy

$\varphi F_L$= 43.2 ksi

$\varphi F_L Wk$= 23.1 ksi

Iy = 446476 $mm^4$

1.073 $in^4$

x = 45.5 mm

Sy = 0.599 $in^3$

$M_{max}Wk$ = 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)
$\varphi F_L$= φc[Bp-1.6Dp*b/t]
$\varphi F_L$= 25.1 ksi

b/t = 37.0588
S1 = 12.21
S2 = 32.70
$\varphi F_L$= (φck2*√(BpE))/(1.6b/t)
$\varphi F_L$= 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
$\varphi F_L$= φyFcy
$\varphi F_L$= 33.25 ksi

$\varphi F_L$= 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
$\varphi F_L$= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
$\varphi F_L$= 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
$\varphi F_L$= φb[Bp-1.6Dp*b/t]
$\varphi F_L$= 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
$\varphi F_L$= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
$\varphi F_L$= 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
$\varphi F_L$= φyFcy
$\varphi F_L$= 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

$\varphi F_L$= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]

$\varphi F_L$= 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

$\varphi F_L$= φb[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

$\varphi F_L$= 1.17φyFcy

$\varphi F_L$= 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

$\varphi F_L$= 1.3φyFcy

$\varphi F_L$= 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

### 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

$\varphi F_L$= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]

$\varphi F_L$= 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

$\varphi F_L$= φb[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

$\varphi F_L$= 1.3φyFcy

$\varphi F_L$= 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**

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

$\varphi F_L$= φcc(Bc-Dc*λ)

$\varphi F_L$= 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)

$\varphi F_L$= φc[Bp-1.6Dp*b/t]

$\varphi F_L$= 28.2 ksi

b/t = 24.5

S1 = 12.21

S2 = 32.70

$\varphi F_L$= φc[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

$\varphi F_L$= φyFcy

$\varphi F_L$= 33.25 ksi

$\varphi F_L$= 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 = **55x55**

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

$\varphi F_L$= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]

$\varphi F_L$= 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

$\varphi F_L$= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]

$\varphi F_L$= 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

$\varphi F_L$= φb[Bp-1.6Dp*b/t]

$\varphi F_L$= 28.2 ksi

**3.4.16** (weak direction)

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

$\varphi F_L$= φb[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

$\varphi F_L$= 1.17φyFcy

$\varphi F_L$= 38.9 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

$\varphi F_L$= 1.3φyFcy

$\varphi F_L$= 43.2 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

$\varphi F_L$= 1.3φyFcy

$\varphi F_L$= 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

$\varphi F_L Wk$= 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**

λ = 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

φcc = 0.86047

$\varphi F_L$= (φccFcy)/(λ²)

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

b/t = 24.5
S1 = 12.21
S2 = 32.70
$\varphi F_L$= φc[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
$\varphi F_L$= φyFcy
$\varphi F_L$= 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**

$L_b$ = 55.91 in
J = 0.942
87.2529

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

S1 = 0.51461

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

S2 = 1701.56
$\varphi F_L$= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
$\varphi F_L$= 30.4 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
$\varphi F_L$= φb[Bp-1.6Dp*b/t]
$\varphi F_L$= 28.2 ksi

Weak Axis:

**3.4.14**

$L_b$ = 55.91
J = 0.942
87.2529

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

S1 = 0.51461

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

S2 = 1701.56
$\varphi F_L$= φb[Bc-1.6Dc*√((LbSc)/(Cb*√(IyJ)/2))]
$\varphi F_L$= 30.4

**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
$\varphi F_L$= φb[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

$\varphi F_L$= 1.17φyFcy

$\varphi F_L$= 38.9 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

$\varphi F_L$= 1.3φyFcy

$\varphi F_L$= 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

**3.4.18**

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

$\varphi F_L$= 1.3φyFcy

$\varphi F_L$= 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**

λ = 1.29339

r = 0.81 in

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

$S1^*$ = 0.33515

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

$S2^*$ = 1.23671

φcc = 0.76107

$\varphi F_L$= (φccFcy)/(λ²)

$\varphi F_L$= 15.9235 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)

$\varphi F_L$= φc[Bp-1.6Dp*b/t]

$\varphi F_L$= 28.2 ksi

b/t = 24.5

S1 = 12.21

S2 = 32.70

$\varphi F_L$= φc[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

$\varphi F_L =$ 15.92 ksi

A = 663.99 $mm^2$

1.03 $in^2$

$P_{max} =$ 16.39 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 | | | .8 | | | 8 | | |

## 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 | -54.031 | -54.031 | 0 | 0 |
| 2 | M14 | Y | -54.031 | -54.031 | 0 | 0 |
| 3 | M15 | Y | -54.031 | -54.031 | 0 | 0 |
| 4 | M16 | Y | -54.031 | -54.031 | 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 | -37.24 | -37.24 | 0 | 0 |
| 2 | M14 | y | -37.24 | -37.24 | 0 | 0 |
| 3 | M15 | y | -58.519 | -58.519 | 0 | 0 |
| 4 | M16 | y | -58.519 | -58.519 | 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 | 85.119 | 85.119 | 0 | 0 |
| 2 | M14 | y | 65.258 | 65.258 | 0 | 0 |
| 3 | M15 | y | 35.466 | 35.466 | 0 | 0 |
| 4 | M16 | y | 35.466 | 35.466 | 0 | 0 |

## Member Distributed Loads (BLC 6 : Seismic - Lateral)

| | Member Label | Direction | Start Magnitude[lb/ft,F] | End Magnitude[lb/ft,F] | Start Location[ft,%] | End Location[ft,%] |
|---|---|---|---|---|---|---|
| 1 | M13 | Z | 6.693 | 6.693 | 0 | 0 |
| 2 | M14 | Z | 6.693 | 6.693 | 0 | 0 |
| 3 | M15 | Z | 6.693 | 6.693 | 0 | 0 |
| 4 | M16 | Z | 6.693 | 6.693 | 0 | 0 |
| 5 | M13 | Z | 0 | 0 | 0 | 0 |
| 6 | M14 | Z | 0 | 0 | 0 | 0 |
| 7 | M15 | Z | 0 | 0 | 0 | 0 |
| 8 | M16 | Z | 0 | 0 | 0 | 0 |

## Load Combinations

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

## Envelope Joint Reactions

| | Joint | | X [lb] | LC | Y [lb] | LC | Z [lb] | LC | MX [k-ft] | LC | MY [k-ft] | LC | MZ [k-ft] | LC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | N8 | max | 363.376 | 2 | 1055.763 | 1 | .948 | 1 | .005 | 1 | 0 | 1 | 0 | 1 |
| 2 | | min | -493.038 | 3 | -1028.136 | 3 | -65.952 | 5 | -.297 | 4 | 0 | 1 | 0 | 1 |
| 3 | N7 | max | .042 | 1 | 1189.736 | 1 | -.45 | 12 | 0 | 12 | 0 | 1 | 0 | 1 |
| 4 | | min | -.082 | 2 | -174.928 | 3 | -269.826 | 4 | -.543 | 4 | 0 | 1 | 0 | 1 |
| 5 | N15 | max | .027 | 9 | 3335.063 | 1 | 0 | 2 | 0 | 2 | 0 | 1 | 0 | 1 |
| 6 | | min | -1.115 | 2 | -641.771 | 3 | -258.747 | 4 | -.528 | 4 | 0 | 1 | 0 | 1 |
| 7 | N16 | max | 1475.428 | 2 | 3594.838 | 1 | 0 | 2 | 0 | 2 | 0 | 1 | 0 | 1 |
| 8 | | min | -1556.804 | 3 | -3383.936 | 3 | -65.638 | 5 | -.3 | 4 | 0 | 1 | 0 | 1 |
| 9 | N23 | max | .042 | 1 | 1189.736 | 1 | 10.387 | 1 | .022 | 1 | 0 | 1 | 0 | 1 |
| 10 | | min | -.082 | 2 | -174.928 | 3 | -263.112 | 4 | -.531 | 4 | 0 | 1 | 0 | 1 |
| 11 | N24 | max | 363.376 | 2 | 1055.763 | 1 | -.048 | 12 | 0 | 12 | 0 | 1 | 0 | 1 |
| 12 | | min | -493.038 | 3 | -1028.136 | 3 | -66.509 | 5 | -.3 | 4 | 0 | 1 | 0 | 1 |
| 13 | Totals: | max | 2200.901 | 2 | 11420.898 | 1 | 0 | 2 | | | | | | |
| 14 | | min | -2543.256 | 3 | -6431.836 | 3 | -984.268 | 4 | | | | | | |

## 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 | 110.413 | 1 | 476.399 | 1 | -6.557 | 12 | 0 | 3 | .263 | 1 | 0 | 4 |
| 2 | | | min | 4.804 | 12 | -516.473 | 3 | -169.918 | 1 | -.013 | 1 | .011 | 12 | 0 | 3 |
| 3 | | 2 | max | 110.413 | 1 | 333.881 | 1 | -5.131 | 12 | 0 | 3 | .099 | 4 | .513 | 3 |
| 4 | | | min | 4.804 | 12 | -363.459 | 3 | -130.697 | 1 | -.013 | 1 | .005 | 12 | -.473 | 1 |
| 5 | | 3 | max | 110.413 | 1 | 191.364 | 1 | -3.706 | 12 | 0 | 3 | .051 | 5 | .848 | 3 |
| 6 | | | min | 4.804 | 12 | -210.445 | 3 | -91.475 | 1 | -.013 | 1 | -.042 | 1 | -.779 | 1 |
| 7 | | 4 | max | 110.413 | 1 | 48.846 | 1 | -2.28 | 12 | 0 | 3 | .026 | 5 | 1.004 | 3 |
| 8 | | | min | 4.804 | 12 | -57.431 | 3 | -52.254 | 1 | -.013 | 1 | -.125 | 1 | -.919 | 1 |
| 9 | | 5 | max | 110.413 | 1 | 95.583 | 3 | -.855 | 12 | 0 | 3 | .004 | 5 | .982 | 3 |
| 10 | | | min | 4.804 | 12 | -93.671 | 1 | -21.214 | 4 | -.013 | 1 | -.164 | 1 | -.893 | 1 |
| 11 | | 6 | max | 110.413 | 1 | 248.597 | 3 | 26.189 | 1 | 0 | 3 | -.006 | 12 | .781 | 3 |
| 12 | | | min | 4.192 | 15 | -236.189 | 1 | -15.853 | 5 | -.013 | 1 | -.156 | 1 | -.701 | 1 |
| 13 | | 7 | max | 110.413 | 1 | 401.611 | 3 | 65.411 | 1 | 0 | 3 | -.004 | 12 | .402 | 3 |
| 14 | | | min | -5.468 | 5 | -378.707 | 1 | -13.648 | 5 | -.013 | 1 | -.102 | 1 | -.342 | 1 |
| 15 | | 8 | max | 110.413 | 1 | 554.625 | 3 | 104.632 | 1 | 0 | 3 | 0 | 10 | .183 | 1 |
| 16 | | | min | -17.444 | 5 | -521.224 | 1 | -11.442 | 5 | -.013 | 1 | -.049 | 4 | -.156 | 3 |
| 17 | | 9 | max | 110.413 | 1 | 707.639 | 3 | 143.854 | 1 | 0 | 3 | .142 | 1 | .874 | 1 |
| 18 | | | min | -29.42 | 5 | -663.742 | 1 | -9.237 | 5 | -.013 | 1 | -.06 | 5 | -.892 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | | 10 | max | 110.413 | 1 | 860.653 | 3 | 183.075 | 1 | .005 | 14 | .332 | 1 | 1.732 | 1 |
| 20 | | | min | 4.804 | 12 | -806.259 | 1 | -106.219 | 14 | -.013 | 1 | .01 | 12 | -1.807 | 3 |
| 21 | | 11 | max | 110.413 | 1 | 663.742 | 1 | -4.847 | 12 | .013 | 1 | .142 | 1 | .874 | 1 |
| 22 | | | min | 4.804 | 12 | -707.639 | 3 | -143.854 | 1 | 0 | 3 | .004 | 12 | -.892 | 3 |
| 23 | | 12 | max | 110.413 | 1 | 521.224 | 1 | -3.422 | 12 | .013 | 1 | .047 | 4 | .183 | 1 |
| 24 | | | min | 4.804 | 12 | -554.625 | 3 | -104.632 | 1 | 0 | 3 | -.003 | 1 | -.156 | 3 |
| 25 | | 13 | max | 110.413 | 1 | 378.707 | 1 | -1.996 | 12 | .013 | 1 | .021 | 5 | .402 | 3 |
| 26 | | | min | 4.804 | 12 | -401.611 | 3 | -65.411 | 1 | 0 | 3 | -.102 | 1 | -.342 | 1 |
| 27 | | 14 | max | 110.413 | 1 | 236.189 | 1 | -.571 | 12 | .013 | 1 | -.001 | 15 | .781 | 3 |
| 28 | | | min | 3.827 | 15 | -248.597 | 3 | -26.189 | 1 | 0 | 3 | -.156 | 1 | -.701 | 1 |
| 29 | | 15 | max | 110.413 | 1 | 93.671 | 1 | 13.032 | 1 | .013 | 1 | -.006 | 12 | .982 | 3 |
| 30 | | | min | -6.108 | 5 | -95.583 | 3 | -16.569 | 5 | 0 | 3 | -.164 | 1 | -.893 | 1 |
| 31 | | 16 | max | 110.413 | 1 | 57.431 | 3 | 52.254 | 1 | .013 | 1 | -.004 | 12 | 1.004 | 3 |
| 32 | | | min | -18.084 | 5 | -48.846 | 1 | -14.363 | 5 | 0 | 3 | -.125 | 1 | -.919 | 1 |
| 33 | | 17 | max | 110.413 | 1 | 210.445 | 3 | 91.475 | 1 | .013 | 1 | 0 | 12 | .848 | 3 |
| 34 | | | min | -30.061 | 5 | -191.364 | 1 | -12.158 | 5 | 0 | 3 | -.066 | 4 | -.779 | 1 |
| 35 | | 18 | max | 110.413 | 1 | 363.459 | 3 | 130.697 | 1 | .013 | 1 | .088 | 1 | .513 | 3 |
| 36 | | | min | -42.037 | 5 | -333.881 | 1 | -9.952 | 5 | 0 | 3 | -.069 | 5 | -.473 | 1 |
| 37 | | 19 | max | 110.413 | 1 | 516.473 | 3 | 169.918 | 1 | .013 | 1 | .263 | 1 | 0 | 1 |
| 38 | | | min | -54.013 | 5 | -476.399 | 1 | -7.747 | 5 | 0 | 3 | -.079 | 5 | 0 | 3 |
| 39 | M14 | 1 | max | 63.806 | 4 | 500.769 | 1 | -6.735 | 12 | .006 | 3 | .299 | 1 | 0 | 1 |
| 40 | | | min | 2.041 | 12 | -401.249 | 3 | -174.972 | 1 | -.01 | 1 | .013 | 12 | 0 | 3 |
| 41 | | 2 | max | 51.83 | 4 | 358.251 | 1 | -5.309 | 12 | .006 | 3 | .14 | 4 | .4 | 3 |
| 42 | | | min | 2.041 | 12 | -285.309 | 3 | -135.751 | 1 | -.01 | 1 | .006 | 12 | -.501 | 1 |
| 43 | | 3 | max | 49.85 | 1 | 215.734 | 1 | -3.884 | 12 | .006 | 3 | .075 | 5 | .666 | 3 |
| 44 | | | min | 2.041 | 12 | -169.369 | 3 | -96.529 | 1 | -.01 | 1 | -.018 | 1 | -.836 | 1 |
| 45 | | 4 | max | 49.85 | 1 | 73.216 | 1 | -2.458 | 12 | .006 | 3 | .04 | 5 | .796 | 3 |
| 46 | | | min | 2.041 | 12 | -53.429 | 3 | -57.308 | 1 | -.01 | 1 | -.108 | 1 | -1.004 | 1 |
| 47 | | 5 | max | 49.85 | 1 | 62.511 | 3 | -1.033 | 12 | .006 | 3 | .007 | 5 | .79 | 3 |
| 48 | | | min | 2.041 | 12 | -69.301 | 1 | -31.218 | 4 | -.01 | 1 | -.152 | 1 | -1.007 | 1 |
| 49 | | 6 | max | 49.85 | 1 | 178.451 | 3 | 21.135 | 1 | .006 | 3 | -.006 | 12 | .65 | 3 |
| 50 | | | min | -6.586 | 5 | -211.819 | 1 | -24.596 | 5 | -.01 | 1 | -.15 | 1 | -.843 | 1 |
| 51 | | 7 | max | 49.85 | 1 | 294.391 | 3 | 60.357 | 1 | .006 | 3 | -.004 | 12 | .374 | 3 |
| 52 | | | min | -18.562 | 5 | -354.337 | 1 | -22.391 | 5 | -.01 | 1 | -.103 | 1 | -.513 | 1 |
| 53 | | 8 | max | 49.85 | 1 | 410.332 | 3 | 99.578 | 1 | .006 | 3 | 0 | 10 | 0 | 15 |
| 54 | | | min | -30.538 | 5 | -496.854 | 1 | -20.185 | 5 | -.01 | 1 | -.079 | 4 | -.037 | 3 |
| 55 | | 9 | max | 49.85 | 1 | 526.272 | 3 | 138.8 | 1 | .006 | 3 | .13 | 1 | .647 | 1 |
| 56 | | | min | -42.514 | 5 | -639.372 | 1 | -17.98 | 5 | -.01 | 1 | -.097 | 5 | -.583 | 3 |
| 57 | | 10 | max | 70.182 | 4 | 642.212 | 3 | 178.021 | 1 | .006 | 3 | .315 | 1 | 1.476 | 1 |
| 58 | | | min | 2.041 | 12 | -781.889 | 1 | -108.042 | 14 | -.01 | 1 | .009 | 12 | -1.265 | 3 |
| 59 | | 11 | max | 58.206 | 4 | 639.372 | 1 | -4.669 | 12 | .01 | 1 | .141 | 4 | .647 | 1 |
| 60 | | | min | 2.041 | 12 | -526.272 | 3 | -138.8 | 1 | -.006 | 3 | .003 | 12 | -.583 | 3 |
| 61 | | 12 | max | 49.85 | 1 | 496.854 | 1 | -3.244 | 12 | .01 | 1 | .074 | 5 | 0 | 15 |
| 62 | | | min | 2.041 | 12 | -410.332 | 3 | -99.578 | 1 | -.006 | 3 | -.009 | 1 | -.037 | 3 |
| 63 | | 13 | max | 49.85 | 1 | 354.337 | 1 | -1.818 | 12 | .01 | 1 | .038 | 5 | .374 | 3 |
| 64 | | | min | 2.041 | 12 | -294.391 | 3 | -60.357 | 1 | -.006 | 3 | -.103 | 1 | -.513 | 1 |
| 65 | | 14 | max | 49.85 | 1 | 211.819 | 1 | -.393 | 12 | .01 | 1 | .006 | 5 | .65 | 3 |
| 66 | | | min | 2.041 | 12 | -178.451 | 3 | -31.909 | 4 | -.006 | 3 | -.15 | 1 | -.843 | 1 |
| 67 | | 15 | max | 49.85 | 1 | 69.301 | 1 | 18.086 | 1 | .01 | 1 | -.005 | 12 | .79 | 3 |
| 68 | | | min | -.082 | 15 | -62.511 | 3 | -24.744 | 5 | -.006 | 3 | -.152 | 1 | -1.007 | 1 |
| 69 | | 16 | max | 49.85 | 1 | 53.429 | 3 | 57.308 | 1 | .01 | 1 | -.003 | 12 | .796 | 3 |
| 70 | | | min | -12.043 | 5 | -73.216 | 1 | -22.538 | 5 | -.006 | 3 | -.108 | 1 | -1.004 | 1 |
| 71 | | 17 | max | 49.85 | 1 | 169.369 | 3 | 96.529 | 1 | .01 | 1 | 0 | 3 | .666 | 3 |
| 72 | | | min | -24.02 | 5 | -215.734 | 1 | -20.333 | 5 | -.006 | 3 | -.083 | 4 | -.836 | 1 |
| 73 | | 18 | max | 49.85 | 1 | 285.309 | 3 | 135.751 | 1 | .01 | 1 | .117 | 1 | .4 | 3 |
| 74 | | | min | -35.996 | 5 | -358.251 | 1 | -18.127 | 5 | -.006 | 3 | -.1 | 5 | -.501 | 1 |
| 75 | | 19 | max | 49.85 | 1 | 401.249 | 3 | 174.972 | 1 | .01 | 1 | .299 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 76 | | | min | -47.972 | 5 | -500.769 | 1 | -15.922 | 5 | -.006 | 3 | -.119 | 5 | 0 | 3 |
| 77 | M15 | 1 | max | 84.958 | 5 | 567.778 | 1 | -6.706 | 12 | .011 | 1 | .298 | 1 | 0 | 2 |
| 78 | | | min | -52.537 | 1 | -213.716 | 3 | -174.944 | 1 | -.005 | 3 | .013 | 12 | 0 | 12 |
| 79 | | 2 | max | 72.982 | 5 | 405.4 | 1 | -5.28 | 12 | .011 | 1 | .176 | 4 | .214 | 3 |
| 80 | | | min | -52.537 | 1 | -153.387 | 3 | -135.722 | 1 | -.005 | 3 | .006 | 12 | -.568 | 1 |
| 81 | | 3 | max | 61.006 | 5 | 243.022 | 1 | -3.855 | 12 | .011 | 1 | .101 | 5 | .358 | 3 |
| 82 | | | min | -52.537 | 1 | -93.059 | 3 | -96.501 | 1 | -.005 | 3 | -.018 | 1 | -.946 | 1 |
| 83 | | 4 | max | 49.03 | 5 | 80.644 | 1 | -2.429 | 12 | .011 | 1 | .056 | 5 | .431 | 3 |
| 84 | | | min | -52.537 | 1 | -32.73 | 3 | -57.279 | 1 | -.005 | 3 | -.108 | 1 | -1.135 | 1 |
| 85 | | 5 | max | 37.054 | 5 | 27.598 | 3 | -1.004 | 12 | .011 | 1 | .013 | 5 | .434 | 3 |
| 86 | | | min | -52.537 | 1 | -81.734 | 1 | -39.976 | 4 | -.005 | 3 | -.152 | 1 | -1.134 | 1 |
| 87 | | 6 | max | 25.078 | 5 | 87.926 | 3 | 21.164 | 1 | .011 | 1 | -.006 | 12 | .367 | 3 |
| 88 | | | min | -52.537 | 1 | -244.112 | 1 | -33.34 | 5 | -.005 | 3 | -.15 | 1 | -.944 | 1 |
| 89 | | 7 | max | 13.102 | 5 | 148.255 | 3 | 60.385 | 1 | .011 | 1 | -.004 | 12 | .229 | 3 |
| 90 | | | min | -52.537 | 1 | -406.49 | 1 | -31.135 | 5 | -.005 | 3 | -.103 | 1 | -.565 | 1 |
| 91 | | 8 | max | 1.126 | 5 | 208.583 | 3 | 99.607 | 1 | .011 | 1 | 0 | 10 | .021 | 3 |
| 92 | | | min | -52.537 | 1 | -568.868 | 1 | -28.929 | 5 | -.005 | 3 | -.103 | 4 | -.003 | 9 |
| 93 | | 9 | max | -2.333 | 12 | 268.912 | 3 | 138.828 | 1 | .011 | 1 | .13 | 1 | .763 | 1 |
| 94 | | | min | -52.537 | 1 | -731.246 | 1 | -26.724 | 5 | -.005 | 3 | -.132 | 5 | -.258 | 3 |
| 95 | | 10 | max | -2.333 | 12 | 329.24 | 3 | 178.05 | 1 | .011 | 1 | .315 | 1 | 1.711 | 1 |
| 96 | | | min | -52.537 | 1 | -893.624 | 1 | -112.502 | 14 | -.005 | 3 | .01 | 12 | -.607 | 3 |
| 97 | | 11 | max | 4.655 | 5 | 731.246 | 1 | -4.699 | 12 | .005 | 3 | .176 | 4 | .763 | 1 |
| 98 | | | min | -52.537 | 1 | -268.912 | 3 | -138.828 | 1 | -.011 | 1 | .003 | 12 | -.258 | 3 |
| 99 | | 12 | max | -2.333 | 12 | 568.868 | 1 | -3.273 | 12 | .005 | 3 | .098 | 5 | .021 | 3 |
| 100 | | | min | -52.537 | 1 | -208.583 | 3 | -99.607 | 1 | -.011 | 1 | -.009 | 1 | -.003 | 9 |
| 101 | | 13 | max | -2.333 | 12 | 406.49 | 1 | -1.847 | 12 | .005 | 3 | .053 | 5 | .229 | 3 |
| 102 | | | min | -52.537 | 1 | -148.255 | 3 | -60.385 | 1 | -.011 | 1 | -.103 | 1 | -.565 | 1 |
| 103 | | 14 | max | -2.333 | 12 | 244.112 | 1 | -.422 | 12 | .005 | 3 | .01 | 5 | .367 | 3 |
| 104 | | | min | -52.537 | 1 | -87.926 | 3 | -40.687 | 4 | -.011 | 1 | -.15 | 1 | -.944 | 1 |
| 105 | | 15 | max | -2.333 | 12 | 81.734 | 1 | 18.058 | 1 | .005 | 3 | -.005 | 12 | .434 | 3 |
| 106 | | | min | -54.878 | 4 | -27.598 | 3 | -33.49 | 5 | -.011 | 1 | -.152 | 1 | -1.134 | 1 |
| 107 | | 16 | max | -2.333 | 12 | 32.73 | 3 | 57.279 | 1 | .005 | 3 | -.003 | 12 | .431 | 3 |
| 108 | | | min | -66.854 | 4 | -80.644 | 1 | -31.285 | 5 | -.011 | 1 | -.108 | 1 | -1.135 | 1 |
| 109 | | 17 | max | -2.333 | 12 | 93.059 | 3 | 96.501 | 1 | .005 | 3 | 0 | 3 | .358 | 3 |
| 110 | | | min | -78.83 | 4 | -243.022 | 1 | -29.079 | 5 | -.011 | 1 | -.109 | 4 | -.946 | 1 |
| 111 | | 18 | max | -2.333 | 12 | 153.387 | 3 | 135.722 | 1 | .005 | 3 | .117 | 1 | .214 | 3 |
| 112 | | | min | -90.806 | 4 | -405.4 | 1 | -26.874 | 5 | -.011 | 1 | -.136 | 5 | -.568 | 1 |
| 113 | | 19 | max | -2.333 | 12 | 213.716 | 3 | 174.944 | 1 | .005 | 3 | .298 | 1 | 0 | 2 |
| 114 | | | min | -102.782 | 4 | -567.778 | 1 | -24.668 | 5 | -.011 | 1 | -.166 | 5 | 0 | 5 |
| 115 | M16 | 1 | max | 83.875 | 5 | 543.601 | 1 | -6.463 | 12 | .011 | 1 | .265 | 1 | 0 | 1 |
| 116 | | | min | -117.164 | 1 | -200.783 | 3 | -170.12 | 1 | -.007 | 3 | .011 | 12 | 0 | 3 |
| 117 | | 2 | max | 71.899 | 5 | 381.223 | 1 | -5.037 | 12 | .011 | 1 | .133 | 4 | .199 | 3 |
| 118 | | | min | -117.164 | 1 | -140.454 | 3 | -130.899 | 1 | -.007 | 3 | .004 | 12 | -.539 | 1 |
| 119 | | 3 | max | 59.922 | 5 | 218.845 | 1 | -3.612 | 12 | .011 | 1 | .075 | 5 | .328 | 3 |
| 120 | | | min | -117.164 | 1 | -80.126 | 3 | -91.677 | 1 | -.007 | 3 | -.041 | 1 | -.89 | 1 |
| 121 | | 4 | max | 47.946 | 5 | 56.467 | 1 | -2.186 | 12 | .011 | 1 | .041 | 5 | .386 | 3 |
| 122 | | | min | -117.164 | 1 | -19.797 | 3 | -52.455 | 1 | -.007 | 3 | -.125 | 1 | -1.05 | 1 |
| 123 | | 5 | max | 35.97 | 5 | 40.531 | 3 | -.761 | 12 | .011 | 1 | .01 | 5 | .374 | 3 |
| 124 | | | min | -117.164 | 1 | -105.911 | 1 | -29.123 | 4 | -.007 | 3 | -.163 | 1 | -1.021 | 1 |
| 125 | | 6 | max | 23.994 | 5 | 100.859 | 3 | 25.988 | 1 | .011 | 1 | -.006 | 12 | .291 | 3 |
| 126 | | | min | -117.164 | 1 | -268.289 | 1 | -23.668 | 5 | -.007 | 3 | -.156 | 1 | -.803 | 1 |
| 127 | | 7 | max | 12.018 | 5 | 161.188 | 3 | 65.209 | 1 | .011 | 1 | -.004 | 12 | .139 | 3 |
| 128 | | | min | -117.164 | 1 | -430.667 | 1 | -21.462 | 5 | -.007 | 3 | -.103 | 1 | -.395 | 1 |
| 129 | | 8 | max | .135 | 15 | 221.516 | 3 | 104.431 | 1 | .011 | 1 | 0 | 10 | .202 | 1 |
| 130 | | | min | -117.164 | 1 | -593.045 | 1 | -19.257 | 5 | -.007 | 3 | -.071 | 4 | -.085 | 3 |
| 131 | | 9 | max | -4.914 | 12 | 281.844 | 3 | 143.652 | 1 | .011 | 1 | .141 | 1 | .989 | 1 |
| 132 | | | min | -117.164 | 1 | -755.423 | 1 | -17.051 | 5 | -.007 | 3 | -.09 | 5 | -.378 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 133 | | 10 | max | -4.914 | 12 | 342.173 | 3 | 182.874 | 1 | .009 | 2 | .332 | 1 | 1.965 | 1 |
| 134 | | | min | -117.164 | 1 | -917.801 | 1 | -110.145 | 14 | -.011 | 1 | .011 | 12 | -.742 | 3 |
| 135 | | 11 | max | -.604 | 15 | 755.423 | 1 | -4.941 | 12 | .007 | 3 | .141 | 1 | .989 | 1 |
| 136 | | | min | -117.164 | 1 | -281.844 | 3 | -143.652 | 1 | -.011 | 1 | .004 | 12 | -.378 | 3 |
| 137 | | 12 | max | -4.914 | 12 | 593.045 | 1 | -3.516 | 12 | .007 | 3 | .069 | 4 | .202 | 1 |
| 138 | | | min | -117.164 | 1 | -221.516 | 3 | -104.431 | 1 | -.011 | 1 | -.004 | 1 | -.085 | 3 |
| 139 | | 13 | max | -4.914 | 12 | 430.667 | 1 | -2.09 | 12 | .007 | 3 | .034 | 5 | .139 | 3 |
| 140 | | | min | -117.164 | 1 | -161.188 | 3 | -65.209 | 1 | -.011 | 1 | -.103 | 1 | -.395 | 1 |
| 141 | | 14 | max | -4.914 | 12 | 268.289 | 1 | -.665 | 12 | .007 | 3 | .001 | 5 | .291 | 3 |
| 142 | | | min | -117.164 | 1 | -100.859 | 3 | -32.41 | 4 | -.011 | 1 | -.156 | 1 | -.803 | 1 |
| 143 | | 15 | max | -4.914 | 12 | 105.911 | 1 | 13.234 | 1 | .007 | 3 | -.006 | 12 | .374 | 3 |
| 144 | | | min | -117.164 | 1 | -40.531 | 3 | -24.371 | 5 | -.011 | 1 | -.163 | 1 | -1.021 | 1 |
| 145 | | 16 | max | -4.914 | 12 | 19.797 | 3 | 52.455 | 1 | .007 | 3 | -.004 | 12 | .386 | 3 |
| 146 | | | min | -117.164 | 1 | -56.467 | 1 | -22.165 | 5 | -.011 | 1 | -.125 | 1 | -1.05 | 1 |
| 147 | | 17 | max | -4.914 | 12 | 80.126 | 3 | 91.677 | 1 | .007 | 3 | 0 | 12 | .328 | 3 |
| 148 | | | min | -117.164 | 1 | -218.845 | 1 | -19.96 | 5 | -.011 | 1 | -.09 | 4 | -.89 | 1 |
| 149 | | 18 | max | -4.914 | 12 | 140.454 | 3 | 130.899 | 1 | .007 | 3 | .089 | 1 | .199 | 3 |
| 150 | | | min | -117.164 | 1 | -381.223 | 1 | -17.754 | 5 | -.011 | 1 | -.102 | 5 | -.539 | 1 |
| 151 | | 19 | max | -4.914 | 12 | 200.783 | 3 | 170.12 | 1 | .007 | 3 | .265 | 1 | 0 | 1 |
| 152 | | | min | -122.506 | 4 | -543.601 | 1 | -15.548 | 5 | -.011 | 1 | -.121 | 5 | 0 | 5 |
| 153 | M2 | 1 | max | 1047.078 | 1 | 2.07 | 4 | 1.029 | 1 | 0 | 3 | 0 | 3 | 0 | 1 |
| 154 | | | min | -917.673 | 3 | .507 | 15 | -62.957 | 4 | 0 | 4 | 0 | 1 | 0 | 1 |
| 155 | | 2 | max | 1047.457 | 1 | 2.037 | 4 | 1.029 | 1 | 0 | 3 | 0 | 1 | 0 | 15 |
| 156 | | | min | -917.389 | 3 | .499 | 15 | -63.286 | 4 | 0 | 4 | -.016 | 4 | 0 | 4 |
| 157 | | 3 | max | 1047.837 | 1 | 2.003 | 4 | 1.029 | 1 | 0 | 3 | 0 | 1 | 0 | 15 |
| 158 | | | min | -917.104 | 3 | .491 | 15 | -63.616 | 4 | 0 | 4 | -.032 | 4 | -.001 | 4 |
| 159 | | 4 | max | 1048.216 | 1 | 1.97 | 4 | 1.029 | 1 | 0 | 3 | 0 | 1 | 0 | 15 |
| 160 | | | min | -916.82 | 3 | .483 | 15 | -63.945 | 4 | 0 | 4 | -.049 | 4 | -.002 | 4 |
| 161 | | 5 | max | 1048.595 | 1 | 1.937 | 4 | 1.029 | 1 | 0 | 3 | .001 | 1 | 0 | 15 |
| 162 | | | min | -916.535 | 3 | .475 | 15 | -64.275 | 4 | 0 | 4 | -.065 | 4 | -.002 | 4 |
| 163 | | 6 | max | 1048.975 | 1 | 1.903 | 4 | 1.029 | 1 | 0 | 3 | .001 | 1 | 0 | 15 |
| 164 | | | min | -916.251 | 3 | .467 | 15 | -64.604 | 4 | 0 | 4 | -.082 | 4 | -.003 | 4 |
| 165 | | 7 | max | 1049.354 | 1 | 1.87 | 4 | 1.029 | 1 | 0 | 3 | .002 | 1 | 0 | 15 |
| 166 | | | min | -915.967 | 3 | .46 | 15 | -64.934 | 4 | 0 | 4 | -.098 | 4 | -.003 | 4 |
| 167 | | 8 | max | 1049.733 | 1 | 1.836 | 4 | 1.029 | 1 | 0 | 3 | .002 | 1 | 0 | 15 |
| 168 | | | min | -915.682 | 3 | .452 | 15 | -65.263 | 4 | 0 | 4 | -.115 | 4 | -.004 | 4 |
| 169 | | 9 | max | 1050.112 | 1 | 1.803 | 4 | 1.029 | 1 | 0 | 3 | .002 | 1 | 0 | 15 |
| 170 | | | min | -915.398 | 3 | .444 | 15 | -65.593 | 4 | 0 | 4 | -.132 | 4 | -.004 | 4 |
| 171 | | 10 | max | 1050.492 | 1 | 1.77 | 4 | 1.029 | 1 | 0 | 3 | .002 | 1 | -.001 | 15 |
| 172 | | | min | -915.113 | 3 | .436 | 15 | -65.922 | 4 | 0 | 4 | -.149 | 4 | -.004 | 4 |
| 173 | | 11 | max | 1050.871 | 1 | 1.736 | 4 | 1.029 | 1 | 0 | 3 | .003 | 1 | -.001 | 15 |
| 174 | | | min | -914.829 | 3 | .428 | 15 | -66.251 | 4 | 0 | 4 | -.166 | 4 | -.005 | 4 |
| 175 | | 12 | max | 1051.25 | 1 | 1.703 | 4 | 1.029 | 1 | 0 | 3 | .003 | 1 | -.001 | 15 |
| 176 | | | min | -914.544 | 3 | .42 | 15 | -66.581 | 4 | 0 | 4 | -.183 | 4 | -.005 | 4 |
| 177 | | 13 | max | 1051.629 | 1 | 1.669 | 4 | 1.029 | 1 | 0 | 3 | .003 | 1 | -.001 | 15 |
| 178 | | | min | -914.26 | 3 | .412 | 15 | -66.91 | 4 | 0 | 4 | -.2 | 4 | -.006 | 4 |
| 179 | | 14 | max | 1052.009 | 1 | 1.636 | 4 | 1.029 | 1 | 0 | 3 | .003 | 1 | -.002 | 15 |
| 180 | | | min | -913.975 | 3 | .405 | 15 | -67.24 | 4 | 0 | 4 | -.217 | 4 | -.006 | 4 |
| 181 | | 15 | max | 1052.388 | 1 | 1.603 | 4 | 1.029 | 1 | 0 | 3 | .004 | 1 | -.002 | 15 |
| 182 | | | min | -913.691 | 3 | .397 | 15 | -67.569 | 4 | 0 | 4 | -.234 | 4 | -.007 | 4 |
| 183 | | 16 | max | 1052.767 | 1 | 1.569 | 4 | 1.029 | 1 | 0 | 3 | .004 | 1 | -.002 | 15 |
| 184 | | | min | -913.407 | 3 | .389 | 15 | -67.899 | 4 | 0 | 4 | -.251 | 4 | -.007 | 4 |
| 185 | | 17 | max | 1053.146 | 1 | 1.536 | 4 | 1.029 | 1 | 0 | 3 | .004 | 1 | -.002 | 15 |
| 186 | | | min | -913.122 | 3 | .381 | 15 | -68.228 | 4 | 0 | 4 | -.269 | 4 | -.007 | 4 |
| 187 | | 18 | max | 1053.526 | 1 | 1.502 | 4 | 1.029 | 1 | 0 | 3 | .004 | 1 | -.002 | 15 |
| 188 | | | min | -912.838 | 3 | .373 | 15 | -68.558 | 4 | 0 | 4 | -.286 | 4 | -.008 | 4 |
| 189 | | 19 | max | 1053.905 | 1 | 1.469 | 4 | 1.029 | 1 | 0 | 3 | .005 | 1 | -.002 | 15 |

## Envelope Member Section Forces (Continued)

| | Member | Sec | | Axial[lb] | LC | y Shear[lb] | LC | z Shear[lb] | LC | Torque[k-ft] | LC | y-y Mome... | LC | z-z Mome... | LC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 190 | | | min | -912.553 | 3 | .365 | 15 | -68.887 | 4 | 0 | 4 | -.304 | 4 | -.008 | 4 |
| 191 | M3 | 1 | max | 317.463 | 2 | 8.008 | 4 | 1.335 | 4 | 0 | 3 | 0 | 1 | .008 | 4 |
| 192 | | | min | -446.788 | 3 | 1.895 | 15 | .004 | 12 | 0 | 4 | -.022 | 4 | .002 | 15 |
| 193 | | 2 | max | 317.293 | 2 | 7.239 | 4 | 1.876 | 4 | 0 | 3 | 0 | 1 | .005 | 4 |
| 194 | | | min | -446.916 | 3 | 1.714 | 15 | .004 | 12 | 0 | 4 | -.021 | 4 | .001 | 12 |
| 195 | | 3 | max | 317.122 | 2 | 6.469 | 4 | 2.416 | 4 | 0 | 3 | 0 | 1 | .002 | 2 |
| 196 | | | min | -447.043 | 3 | 1.533 | 15 | .004 | 12 | 0 | 4 | -.02 | 4 | 0 | 3 |
| 197 | | 4 | max | 316.952 | 2 | 5.699 | 4 | 2.957 | 4 | 0 | 3 | 0 | 1 | 0 | 2 |
| 198 | | | min | -447.171 | 3 | 1.352 | 15 | .004 | 12 | 0 | 4 | -.019 | 4 | -.001 | 3 |
| 199 | | 5 | max | 316.782 | 2 | 4.929 | 4 | 3.497 | 4 | 0 | 3 | 0 | 1 | 0 | 15 |
| 200 | | | min | -447.299 | 3 | 1.171 | 15 | .004 | 12 | 0 | 4 | -.018 | 4 | -.003 | 6 |
| 201 | | 6 | max | 316.611 | 2 | 4.159 | 4 | 4.038 | 4 | 0 | 3 | 0 | 1 | -.001 | 15 |
| 202 | | | min | -447.427 | 3 | .99 | 15 | .004 | 12 | 0 | 4 | -.016 | 4 | -.005 | 6 |
| 203 | | 7 | max | 316.441 | 2 | 3.389 | 4 | 4.579 | 4 | 0 | 3 | 0 | 1 | -.001 | 15 |
| 204 | | | min | -447.554 | 3 | .809 | 15 | .004 | 12 | 0 | 4 | -.014 | 4 | -.006 | 6 |
| 205 | | 8 | max | 316.271 | 2 | 2.619 | 4 | 5.119 | 4 | 0 | 3 | 0 | 1 | -.002 | 15 |
| 206 | | | min | -447.682 | 3 | .628 | 15 | .004 | 12 | 0 | 4 | -.012 | 4 | -.007 | 6 |
| 207 | | 9 | max | 316.1 | 2 | 1.849 | 4 | 5.66 | 4 | 0 | 3 | 0 | 1 | -.002 | 15 |
| 208 | | | min | -447.81 | 3 | .447 | 15 | .004 | 12 | 0 | 4 | -.01 | 5 | -.008 | 6 |
| 209 | | 10 | max | 315.93 | 2 | 1.079 | 4 | 6.2 | 4 | 0 | 3 | 0 | 1 | -.002 | 15 |
| 210 | | | min | -447.938 | 3 | .266 | 15 | .004 | 12 | 0 | 4 | -.007 | 5 | -.009 | 6 |
| 211 | | 11 | max | 315.76 | 2 | .338 | 2 | 6.741 | 4 | 0 | 3 | 0 | 1 | -.002 | 15 |
| 212 | | | min | -448.065 | 3 | .001 | 3 | .004 | 12 | 0 | 4 | -.005 | 5 | -.009 | 6 |
| 213 | | 12 | max | 315.589 | 2 | -.096 | 15 | 7.281 | 4 | 0 | 3 | 0 | 1 | -.002 | 15 |
| 214 | | | min | -448.193 | 3 | -.463 | 6 | .004 | 12 | 0 | 4 | -.002 | 5 | -.009 | 6 |
| 215 | | 13 | max | 315.419 | 2 | -.277 | 15 | 7.822 | 4 | 0 | 3 | .001 | 4 | -.002 | 15 |
| 216 | | | min | -448.321 | 3 | -1.233 | 6 | .004 | 12 | 0 | 4 | 0 | 12 | -.009 | 6 |
| 217 | | 14 | max | 315.249 | 2 | -.458 | 15 | 8.362 | 4 | 0 | 3 | .005 | 4 | -.002 | 15 |
| 218 | | | min | -448.449 | 3 | -2.003 | 6 | .004 | 12 | 0 | 4 | 0 | 12 | -.008 | 6 |
| 219 | | 15 | max | 315.078 | 2 | -.639 | 15 | 8.903 | 4 | 0 | 3 | .008 | 4 | -.002 | 15 |
| 220 | | | min | -448.576 | 3 | -2.772 | 6 | .004 | 12 | 0 | 4 | 0 | 12 | -.007 | 6 |
| 221 | | 16 | max | 314.908 | 2 | -.82 | 15 | 9.444 | 4 | 0 | 3 | .012 | 4 | -.001 | 15 |
| 222 | | | min | -448.704 | 3 | -3.542 | 6 | .004 | 12 | 0 | 4 | 0 | 12 | -.006 | 6 |
| 223 | | 17 | max | 314.738 | 2 | -1.001 | 15 | 9.984 | 4 | 0 | 3 | .016 | 4 | 0 | 15 |
| 224 | | | min | -448.832 | 3 | -4.312 | 6 | .004 | 12 | 0 | 4 | 0 | 12 | -.004 | 6 |
| 225 | | 18 | max | 314.567 | 2 | -1.182 | 15 | 10.525 | 4 | 0 | 3 | .021 | 4 | 0 | 15 |
| 226 | | | min | -448.96 | 3 | -5.082 | 6 | .004 | 12 | 0 | 4 | 0 | 12 | -.002 | 6 |
| 227 | | 19 | max | 314.397 | 2 | -1.363 | 15 | 11.065 | 4 | 0 | 3 | .025 | 4 | 0 | 1 |
| 228 | | | min | -449.087 | 3 | -5.852 | 6 | .004 | 12 | 0 | 4 | 0 | 12 | 0 | 1 |
| 229 | M4 | 1 | max | 1186.669 | 1 | 0 | 1 | -.449 | 12 | 0 | 1 | .016 | 4 | 0 | 1 |
| 230 | | | min | -177.228 | 3 | 0 | 1 | -268.831 | 4 | 0 | 1 | 0 | 12 | 0 | 1 |
| 231 | | 2 | max | 1186.84 | 1 | 0 | 1 | -.449 | 12 | 0 | 1 | 0 | 12 | 0 | 1 |
| 232 | | | min | -177.1 | 3 | 0 | 1 | -268.979 | 4 | 0 | 1 | -.015 | 4 | 0 | 1 |
| 233 | | 3 | max | 1187.01 | 1 | 0 | 1 | -.449 | 12 | 0 | 1 | 0 | 12 | 0 | 1 |
| 234 | | | min | -176.972 | 3 | 0 | 1 | -269.127 | 4 | 0 | 1 | -.046 | 4 | 0 | 1 |
| 235 | | 4 | max | 1187.181 | 1 | 0 | 1 | -.449 | 12 | 0 | 1 | 0 | 12 | 0 | 1 |
| 236 | | | min | -176.844 | 3 | 0 | 1 | -269.274 | 4 | 0 | 1 | -.077 | 4 | 0 | 1 |
| 237 | | 5 | max | 1187.351 | 1 | 0 | 1 | -.449 | 12 | 0 | 1 | 0 | 12 | 0 | 1 |
| 238 | | | min | -176.717 | 3 | 0 | 1 | -269.422 | 4 | 0 | 1 | -.108 | 4 | 0 | 1 |
| 239 | | 6 | max | 1187.521 | 1 | 0 | 1 | -.449 | 12 | 0 | 1 | 0 | 12 | 0 | 1 |
| 240 | | | min | -176.589 | 3 | 0 | 1 | -269.57 | 4 | 0 | 1 | -.139 | 4 | 0 | 1 |
| 241 | | 7 | max | 1187.692 | 1 | 0 | 1 | -.449 | 12 | 0 | 1 | 0 | 12 | 0 | 1 |
| 242 | | | min | -176.461 | 3 | 0 | 1 | -269.717 | 4 | 0 | 1 | -.17 | 4 | 0 | 1 |
| 243 | | 8 | max | 1187.862 | 1 | 0 | 1 | -.449 | 12 | 0 | 1 | 0 | 12 | 0 | 1 |
| 244 | | | min | -176.333 | 3 | 0 | 1 | -269.865 | 4 | 0 | 1 | -.201 | 4 | 0 | 1 |
| 245 | | 9 | max | 1188.032 | 1 | 0 | 1 | -.449 | 12 | 0 | 1 | 0 | 12 | 0 | 1 |
| 246 | | | min | -176.206 | 3 | 0 | 1 | -270.013 | 4 | 0 | 1 | -.232 | 4 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 247 | | 10 | max | 1188.203 | 1 | 0 | 1 | -.449 | 12 | 0 | 1 | 0 | 12 | 0 | 1 |
| 248 | | | min | -176.078 | 3 | 0 | 1 | -270.16 | 4 | 0 | 1 | -.263 | 4 | 0 | 1 |
| 249 | | 11 | max | 1188.373 | 1 | 0 | 1 | -.449 | 12 | 0 | 1 | 0 | 12 | 0 | 1 |
| 250 | | | min | -175.95 | 3 | 0 | 1 | -270.308 | 4 | 0 | 1 | -.294 | 4 | 0 | 1 |
| 251 | | 12 | max | 1188.543 | 1 | 0 | 1 | -.449 | 12 | 0 | 1 | 0 | 12 | 0 | 1 |
| 252 | | | min | -175.822 | 3 | 0 | 1 | -270.455 | 4 | 0 | 1 | -.325 | 4 | 0 | 1 |
| 253 | | 13 | max | 1188.714 | 1 | 0 | 1 | -.449 | 12 | 0 | 1 | 0 | 12 | 0 | 1 |
| 254 | | | min | -175.695 | 3 | 0 | 1 | -270.603 | 4 | 0 | 1 | -.356 | 4 | 0 | 1 |
| 255 | | 14 | max | 1188.884 | 1 | 0 | 1 | -.449 | 12 | 0 | 1 | 0 | 12 | 0 | 1 |
| 256 | | | min | -175.567 | 3 | 0 | 1 | -270.751 | 4 | 0 | 1 | -.387 | 4 | 0 | 1 |
| 257 | | 15 | max | 1189.054 | 1 | 0 | 1 | -.449 | 12 | 0 | 1 | 0 | 12 | 0 | 1 |
| 258 | | | min | -175.439 | 3 | 0 | 1 | -270.898 | 4 | 0 | 1 | -.418 | 4 | 0 | 1 |
| 259 | | 16 | max | 1189.225 | 1 | 0 | 1 | -.449 | 12 | 0 | 1 | 0 | 12 | 0 | 1 |
| 260 | | | min | -175.311 | 3 | 0 | 1 | -271.046 | 4 | 0 | 1 | -.449 | 4 | 0 | 1 |
| 261 | | 17 | max | 1189.395 | 1 | 0 | 1 | -.449 | 12 | 0 | 1 | 0 | 12 | 0 | 1 |
| 262 | | | min | -175.184 | 3 | 0 | 1 | -271.194 | 4 | 0 | 1 | -.48 | 4 | 0 | 1 |
| 263 | | 18 | max | 1189.565 | 1 | 0 | 1 | -.449 | 12 | 0 | 1 | 0 | 12 | 0 | 1 |
| 264 | | | min | -175.056 | 3 | 0 | 1 | -271.341 | 4 | 0 | 1 | -.511 | 4 | 0 | 1 |
| 265 | | 19 | max | 1189.736 | 1 | 0 | 1 | -.449 | 12 | 0 | 1 | 0 | 12 | 0 | 1 |
| 266 | | | min | -174.928 | 3 | 0 | 1 | -271.489 | 4 | 0 | 1 | -.543 | 4 | 0 | 1 |
| 267 | M6 | 1 | max | 3380.292 | 1 | 2.326 | 2 | 0 | 1 | 0 | 1 | 0 | 4 | 0 | 1 |
| 268 | | | min | -3017.398 | 3 | .25 | 12 | -63.573 | 4 | 0 | 4 | 0 | 1 | 0 | 1 |
| 269 | | 2 | max | 3380.671 | 1 | 2.3 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 12 |
| 270 | | | min | -3017.114 | 3 | .237 | 12 | -63.902 | 4 | 0 | 4 | -.016 | 4 | 0 | 2 |
| 271 | | 3 | max | 3381.05 | 1 | 2.274 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 12 |
| 272 | | | min | -3016.829 | 3 | .224 | 12 | -64.232 | 4 | 0 | 4 | -.033 | 4 | -.001 | 2 |
| 273 | | 4 | max | 3381.43 | 1 | 2.248 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 12 |
| 274 | | | min | -3016.545 | 3 | .211 | 12 | -64.561 | 4 | 0 | 4 | -.049 | 4 | -.002 | 2 |
| 275 | | 5 | max | 3381.809 | 1 | 2.222 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 12 |
| 276 | | | min | -3016.261 | 3 | .198 | 12 | -64.891 | 4 | 0 | 4 | -.066 | 4 | -.002 | 2 |
| 277 | | 6 | max | 3382.188 | 1 | 2.196 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 12 |
| 278 | | | min | -3015.976 | 3 | .185 | 12 | -65.22 | 4 | 0 | 4 | -.082 | 4 | -.003 | 2 |
| 279 | | 7 | max | 3382.567 | 1 | 2.17 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 12 |
| 280 | | | min | -3015.692 | 3 | .172 | 12 | -65.55 | 4 | 0 | 4 | -.099 | 4 | -.003 | 2 |
| 281 | | 8 | max | 3382.947 | 1 | 2.144 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 12 |
| 282 | | | min | -3015.407 | 3 | .159 | 12 | -65.879 | 4 | 0 | 4 | -.116 | 4 | -.004 | 2 |
| 283 | | 9 | max | 3383.326 | 1 | 2.118 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 12 |
| 284 | | | min | -3015.123 | 3 | .146 | 12 | -66.209 | 4 | 0 | 4 | -.133 | 4 | -.005 | 2 |
| 285 | | 10 | max | 3383.705 | 1 | 2.092 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 12 |
| 286 | | | min | -3014.838 | 3 | .133 | 12 | -66.538 | 4 | 0 | 4 | -.15 | 4 | -.005 | 2 |
| 287 | | 11 | max | 3384.084 | 1 | 2.066 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 12 |
| 288 | | | min | -3014.554 | 3 | .12 | 12 | -66.868 | 4 | 0 | 4 | -.167 | 4 | -.006 | 2 |
| 289 | | 12 | max | 3384.464 | 1 | 2.04 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 12 |
| 290 | | | min | -3014.269 | 3 | .105 | 3 | -67.197 | 4 | 0 | 4 | -.184 | 4 | -.006 | 2 |
| 291 | | 13 | max | 3384.843 | 1 | 2.014 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 12 |
| 292 | | | min | -3013.985 | 3 | .086 | 3 | -67.526 | 4 | 0 | 4 | -.202 | 4 | -.007 | 2 |
| 293 | | 14 | max | 3385.222 | 1 | 1.988 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 12 |
| 294 | | | min | -3013.701 | 3 | .066 | 3 | -67.856 | 4 | 0 | 4 | -.219 | 4 | -.007 | 2 |
| 295 | | 15 | max | 3385.602 | 1 | 1.962 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 12 |
| 296 | | | min | -3013.416 | 3 | .047 | 3 | -68.185 | 4 | 0 | 4 | -.236 | 4 | -.008 | 2 |
| 297 | | 16 | max | 3385.981 | 1 | 1.936 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 12 |
| 298 | | | min | -3013.132 | 3 | .027 | 3 | -68.515 | 4 | 0 | 4 | -.254 | 4 | -.008 | 2 |
| 299 | | 17 | max | 3386.36 | 1 | 1.91 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 12 |
| 300 | | | min | -3012.847 | 3 | .008 | 3 | -68.844 | 4 | 0 | 4 | -.271 | 4 | -.009 | 2 |
| 301 | | 18 | max | 3386.739 | 1 | 1.884 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 12 |
| 302 | | | min | -3012.563 | 3 | -.012 | 3 | -69.174 | 4 | 0 | 4 | -.289 | 4 | -.009 | 2 |
| 303 | | 19 | max | 3387.119 | 1 | 1.858 | 2 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 12 |

## Envelope Member Section Forces (Continued)

| | Member | Sec | | Axial[lb] | LC | y Shear[lb] | LC | z Shear[lb] | LC | Torque[k-ft] | LC | y-y Mome... | LC | z-z Mome... | LC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 304 | | | min | -3012.278 | 3 | -.031 | 3 | -69.503 | 4 | 0 | 4 | -.307 | 4 | -.01 | 2 |
| 305 | M7 | 1 | max | 1339.877 | 2 | 8.022 | 6 | 1.196 | 4 | 0 | 1 | 0 | 1 | .01 | 2 |
| 306 | | | min | -1401.628 | 3 | 1.882 | 15 | 0 | 1 | 0 | 4 | -.022 | 4 | 0 | 12 |
| 307 | | 2 | max | 1339.706 | 2 | 7.252 | 6 | 1.737 | 4 | 0 | 1 | 0 | 1 | .007 | 2 |
| 308 | | | min | -1401.756 | 3 | 1.701 | 15 | 0 | 1 | 0 | 4 | -.021 | 4 | 0 | 3 |
| 309 | | 3 | max | 1339.536 | 2 | 6.482 | 6 | 2.277 | 4 | 0 | 1 | 0 | 1 | .005 | 2 |
| 310 | | | min | -1401.884 | 3 | 1.52 | 15 | 0 | 1 | 0 | 4 | -.02 | 4 | -.002 | 3 |
| 311 | | 4 | max | 1339.366 | 2 | 5.712 | 6 | 2.818 | 4 | 0 | 1 | 0 | 1 | .002 | 2 |
| 312 | | | min | -1402.012 | 3 | 1.339 | 15 | 0 | 1 | 0 | 4 | -.019 | 4 | -.004 | 3 |
| 313 | | 5 | max | 1339.195 | 2 | 4.942 | 6 | 3.358 | 4 | 0 | 1 | 0 | 1 | 0 | 2 |
| 314 | | | min | -1402.139 | 3 | 1.158 | 15 | 0 | 1 | 0 | 4 | -.018 | 4 | -.005 | 3 |
| 315 | | 6 | max | 1339.025 | 2 | 4.172 | 6 | 3.899 | 4 | 0 | 1 | 0 | 1 | -.001 | 15 |
| 316 | | | min | -1402.267 | 3 | .977 | 15 | 0 | 1 | 0 | 4 | -.016 | 4 | -.006 | 3 |
| 317 | | 7 | max | 1338.855 | 2 | 3.402 | 6 | 4.439 | 4 | 0 | 1 | 0 | 1 | -.001 | 15 |
| 318 | | | min | -1402.395 | 3 | .796 | 15 | 0 | 1 | 0 | 4 | -.015 | 4 | -.006 | 3 |
| 319 | | 8 | max | 1338.684 | 2 | 2.632 | 6 | 4.98 | 4 | 0 | 1 | 0 | 1 | -.002 | 15 |
| 320 | | | min | -1402.523 | 3 | .615 | 15 | 0 | 1 | 0 | 4 | -.013 | 4 | -.007 | 4 |
| 321 | | 9 | max | 1338.514 | 2 | 1.875 | 2 | 5.52 | 4 | 0 | 1 | 0 | 1 | -.002 | 15 |
| 322 | | | min | -1402.65 | 3 | .381 | 12 | 0 | 1 | 0 | 4 | -.011 | 4 | -.008 | 4 |
| 323 | | 10 | max | 1338.344 | 2 | 1.275 | 2 | 6.061 | 4 | 0 | 1 | 0 | 1 | -.002 | 15 |
| 324 | | | min | -1402.778 | 3 | .081 | 12 | 0 | 1 | 0 | 4 | -.008 | 4 | -.009 | 4 |
| 325 | | 11 | max | 1338.173 | 2 | .675 | 2 | 6.602 | 4 | 0 | 1 | 0 | 1 | -.002 | 15 |
| 326 | | | min | -1402.906 | 3 | -.362 | 3 | 0 | 1 | 0 | 4 | -.005 | 4 | -.009 | 4 |
| 327 | | 12 | max | 1338.003 | 2 | .075 | 2 | 7.142 | 4 | 0 | 1 | 0 | 1 | -.002 | 15 |
| 328 | | | min | -1403.034 | 3 | -.812 | 3 | 0 | 1 | 0 | 4 | -.003 | 4 | -.009 | 4 |
| 329 | | 13 | max | 1337.832 | 2 | -.29 | 15 | 7.683 | 4 | 0 | 1 | 0 | 4 | -.002 | 15 |
| 330 | | | min | -1403.161 | 3 | -1.262 | 3 | 0 | 1 | 0 | 4 | 0 | 1 | -.009 | 4 |
| 331 | | 14 | max | 1337.662 | 2 | -.471 | 15 | 8.223 | 4 | 0 | 1 | .004 | 4 | -.002 | 15 |
| 332 | | | min | -1403.289 | 3 | -1.988 | 4 | 0 | 1 | 0 | 4 | 0 | 1 | -.008 | 4 |
| 333 | | 15 | max | 1337.492 | 2 | -.652 | 15 | 8.764 | 4 | 0 | 1 | .007 | 4 | -.002 | 15 |
| 334 | | | min | -1403.417 | 3 | -2.758 | 4 | 0 | 1 | 0 | 4 | 0 | 1 | -.007 | 4 |
| 335 | | 16 | max | 1337.321 | 2 | -.833 | 15 | 9.304 | 4 | 0 | 1 | .011 | 4 | -.001 | 15 |
| 336 | | | min | -1403.545 | 3 | -3.528 | 4 | 0 | 1 | 0 | 4 | 0 | 1 | -.006 | 4 |
| 337 | | 17 | max | 1337.151 | 2 | -1.014 | 15 | 9.845 | 4 | 0 | 1 | .015 | 4 | -.001 | 15 |
| 338 | | | min | -1403.672 | 3 | -4.298 | 4 | 0 | 1 | 0 | 4 | 0 | 1 | -.004 | 4 |
| 339 | | 18 | max | 1336.981 | 2 | -1.195 | 15 | 10.385 | 4 | 0 | 1 | .02 | 4 | 0 | 15 |
| 340 | | | min | -1403.8 | 3 | -5.068 | 4 | 0 | 1 | 0 | 4 | 0 | 1 | -.002 | 4 |
| 341 | | 19 | max | 1336.81 | 2 | -1.376 | 15 | 10.926 | 4 | 0 | 1 | .024 | 4 | 0 | 1 |
| 342 | | | min | -1403.928 | 3 | -5.838 | 4 | 0 | 1 | 0 | 4 | 0 | 1 | 0 | 1 |
| 343 | M8 | 1 | max | 3331.996 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | .015 | 4 | 0 | 1 |
| 344 | | | min | -644.071 | 3 | 0 | 1 | -261.502 | 4 | 0 | 1 | 0 | 1 | 0 | 1 |
| 345 | | 2 | max | 3332.167 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 346 | | | min | -643.943 | 3 | 0 | 1 | -261.649 | 4 | 0 | 1 | -.015 | 4 | 0 | 1 |
| 347 | | 3 | max | 3332.337 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 348 | | | min | -643.815 | 3 | 0 | 1 | -261.797 | 4 | 0 | 1 | -.045 | 4 | 0 | 1 |
| 349 | | 4 | max | 3332.507 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 350 | | | min | -643.688 | 3 | 0 | 1 | -261.945 | 4 | 0 | 1 | -.075 | 4 | 0 | 1 |
| 351 | | 5 | max | 3332.678 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 352 | | | min | -643.56 | 3 | 0 | 1 | -262.092 | 4 | 0 | 1 | -.105 | 4 | 0 | 1 |
| 353 | | 6 | max | 3332.848 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 354 | | | min | -643.432 | 3 | 0 | 1 | -262.24 | 4 | 0 | 1 | -.135 | 4 | 0 | 1 |
| 355 | | 7 | max | 3333.018 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 356 | | | min | -643.304 | 3 | 0 | 1 | -262.388 | 4 | 0 | 1 | -.165 | 4 | 0 | 1 |
| 357 | | 8 | max | 3333.189 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 358 | | | min | -643.177 | 3 | 0 | 1 | -262.535 | 4 | 0 | 1 | -.196 | 4 | 0 | 1 |
| 359 | | 9 | max | 3333.359 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 360 | | | min | -643.049 | 3 | 0 | 1 | -262.683 | 4 | 0 | 1 | -.226 | 4 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 361 | | 10 | max | 3333.529 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 362 | | | min | -642.921 | 3 | 0 | 1 | -262.831 | 4 | 0 | 1 | -.256 | 4 | 0 | 1 |
| 363 | | 11 | max | 3333.7 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 364 | | | min | -642.793 | 3 | 0 | 1 | -262.978 | 4 | 0 | 1 | -.286 | 4 | 0 | 1 |
| 365 | | 12 | max | 3333.87 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 366 | | | min | -642.666 | 3 | 0 | 1 | -263.126 | 4 | 0 | 1 | -.316 | 4 | 0 | 1 |
| 367 | | 13 | max | 3334.04 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 368 | | | min | -642.538 | 3 | 0 | 1 | -263.273 | 4 | 0 | 1 | -.347 | 4 | 0 | 1 |
| 369 | | 14 | max | 3334.211 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 370 | | | min | -642.41 | 3 | 0 | 1 | -263.421 | 4 | 0 | 1 | -.377 | 4 | 0 | 1 |
| 371 | | 15 | max | 3334.381 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 372 | | | min | -642.282 | 3 | 0 | 1 | -263.569 | 4 | 0 | 1 | -.407 | 4 | 0 | 1 |
| 373 | | 16 | max | 3334.551 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 374 | | | min | -642.155 | 3 | 0 | 1 | -263.716 | 4 | 0 | 1 | -.437 | 4 | 0 | 1 |
| 375 | | 17 | max | 3334.722 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 376 | | | min | -642.027 | 3 | 0 | 1 | -263.864 | 4 | 0 | 1 | -.468 | 4 | 0 | 1 |
| 377 | | 18 | max | 3334.892 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 378 | | | min | -641.899 | 3 | 0 | 1 | -264.012 | 4 | 0 | 1 | -.498 | 4 | 0 | 1 |
| 379 | | 19 | max | 3335.063 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 380 | | | min | -641.771 | 3 | 0 | 1 | -264.159 | 4 | 0 | 1 | -.528 | 4 | 0 | 1 |
| 381 | M10 | 1 | max | 1047.078 | 1 | 1.983 | 6 | -.041 | 12 | 0 | 1 | 0 | 1 | 0 | 1 |
| 382 | | | min | -917.673 | 3 | .448 | 15 | -63.503 | 4 | 0 | 5 | 0 | 3 | 0 | 1 |
| 383 | | 2 | max | 1047.457 | 1 | 1.949 | 6 | -.041 | 12 | 0 | 1 | 0 | 10 | 0 | 15 |
| 384 | | | min | -917.389 | 3 | .44 | 15 | -63.832 | 4 | 0 | 5 | -.016 | 4 | 0 | 6 |
| 385 | | 3 | max | 1047.837 | 1 | 1.916 | 6 | -.041 | 12 | 0 | 1 | 0 | 12 | 0 | 15 |
| 386 | | | min | -917.104 | 3 | .432 | 15 | -64.162 | 4 | 0 | 5 | -.033 | 4 | 0 | 6 |
| 387 | | 4 | max | 1048.216 | 1 | 1.882 | 6 | -.041 | 12 | 0 | 1 | 0 | 12 | 0 | 15 |
| 388 | | | min | -916.82 | 3 | .424 | 15 | -64.491 | 4 | 0 | 5 | -.049 | 4 | -.001 | 6 |
| 389 | | 5 | max | 1048.595 | 1 | 1.849 | 6 | -.041 | 12 | 0 | 1 | 0 | 12 | 0 | 15 |
| 390 | | | min | -916.535 | 3 | .416 | 15 | -64.82 | 4 | 0 | 5 | -.066 | 4 | -.002 | 6 |
| 391 | | 6 | max | 1048.975 | 1 | 1.816 | 6 | -.041 | 12 | 0 | 1 | 0 | 12 | 0 | 15 |
| 392 | | | min | -916.251 | 3 | .409 | 15 | -65.15 | 4 | 0 | 5 | -.082 | 4 | -.002 | 6 |
| 393 | | 7 | max | 1049.354 | 1 | 1.782 | 6 | -.041 | 12 | 0 | 1 | 0 | 12 | 0 | 15 |
| 394 | | | min | -915.967 | 3 | .401 | 15 | -65.479 | 4 | 0 | 5 | -.099 | 4 | -.003 | 6 |
| 395 | | 8 | max | 1049.733 | 1 | 1.749 | 6 | -.041 | 12 | 0 | 1 | 0 | 12 | 0 | 15 |
| 396 | | | min | -915.682 | 3 | .393 | 15 | -65.809 | 4 | 0 | 5 | -.116 | 4 | -.003 | 6 |
| 397 | | 9 | max | 1050.112 | 1 | 1.715 | 6 | -.041 | 12 | 0 | 1 | 0 | 12 | 0 | 15 |
| 398 | | | min | -915.398 | 3 | .385 | 15 | -66.138 | 4 | 0 | 5 | -.133 | 4 | -.004 | 6 |
| 399 | | 10 | max | 1050.492 | 1 | 1.682 | 6 | -.041 | 12 | 0 | 1 | 0 | 12 | 0 | 15 |
| 400 | | | min | -915.113 | 3 | .377 | 15 | -66.468 | 4 | 0 | 5 | -.15 | 4 | -.004 | 6 |
| 401 | | 11 | max | 1050.871 | 1 | 1.649 | 6 | -.041 | 12 | 0 | 1 | 0 | 12 | -.001 | 15 |
| 402 | | | min | -914.829 | 3 | .369 | 15 | -66.797 | 4 | 0 | 5 | -.167 | 4 | -.005 | 6 |
| 403 | | 12 | max | 1051.25 | 1 | 1.615 | 6 | -.041 | 12 | 0 | 1 | 0 | 12 | -.001 | 15 |
| 404 | | | min | -914.544 | 3 | .362 | 15 | -67.127 | 4 | 0 | 5 | -.184 | 4 | -.005 | 6 |
| 405 | | 13 | max | 1051.629 | 1 | 1.582 | 6 | -.041 | 12 | 0 | 1 | 0 | 12 | -.001 | 15 |
| 406 | | | min | -914.26 | 3 | .354 | 15 | -67.456 | 4 | 0 | 5 | -.201 | 4 | -.005 | 6 |
| 407 | | 14 | max | 1052.009 | 1 | 1.548 | 6 | -.041 | 12 | 0 | 1 | 0 | 12 | -.001 | 15 |
| 408 | | | min | -913.975 | 3 | .346 | 15 | -67.786 | 4 | 0 | 5 | -.219 | 4 | -.006 | 6 |
| 409 | | 15 | max | 1052.388 | 1 | 1.515 | 6 | -.041 | 12 | 0 | 1 | 0 | 12 | -.001 | 15 |
| 410 | | | min | -913.691 | 3 | .338 | 15 | -68.115 | 4 | 0 | 5 | -.236 | 4 | -.006 | 6 |
| 411 | | 16 | max | 1052.767 | 1 | 1.482 | 6 | -.041 | 12 | 0 | 1 | 0 | 12 | -.001 | 15 |
| 412 | | | min | -913.407 | 3 | .33 | 15 | -68.445 | 4 | 0 | 5 | -.254 | 4 | -.007 | 6 |
| 413 | | 17 | max | 1053.146 | 1 | 1.448 | 6 | -.041 | 12 | 0 | 1 | 0 | 12 | -.002 | 15 |
| 414 | | | min | -913.122 | 3 | .322 | 15 | -68.774 | 4 | 0 | 5 | -.271 | 4 | -.007 | 6 |
| 415 | | 18 | max | 1053.526 | 1 | 1.415 | 6 | -.041 | 12 | 0 | 1 | 0 | 12 | -.002 | 15 |
| 416 | | | min | -912.838 | 3 | .314 | 15 | -69.103 | 4 | 0 | 5 | -.289 | 4 | -.007 | 6 |
| 417 | | 19 | max | 1053.905 | 1 | 1.381 | 6 | -.041 | 12 | 0 | 1 | 0 | 12 | -.002 | 15 |

## Envelope Member Section Forces (Continued)

| | Member | Sec | | Axial[lb] | LC | y Shear[lb] | LC | z Shear[lb] | LC | Torque[k-ft] | LC | y-y Mome... | LC | z-z Mome... | LC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 418 | | | min | -912.553 | 3 | .307 | 15 | -69.433 | 4 | 0 | 5 | -.307 | 4 | -.008 | 6 |
| 419 | M11 | 1 | max | 317.463 | 2 | 7.955 | 6 | 1.293 | 4 | 0 | 1 | 0 | 12 | .008 | 6 |
| 420 | | | min | -446.788 | 3 | 1.859 | 15 | -.081 | 1 | 0 | 4 | -.022 | 4 | .002 | 15 |
| 421 | | 2 | max | 317.293 | 2 | 7.185 | 6 | 1.833 | 4 | 0 | 1 | 0 | 12 | .005 | 6 |
| 422 | | | min | -446.916 | 3 | 1.678 | 15 | -.081 | 1 | 0 | 4 | -.021 | 4 | 0 | 15 |
| 423 | | 3 | max | 317.122 | 2 | 6.415 | 6 | 2.374 | 4 | 0 | 1 | 0 | 12 | .002 | 2 |
| 424 | | | min | -447.043 | 3 | 1.497 | 15 | -.081 | 1 | 0 | 4 | -.02 | 4 | 0 | 3 |
| 425 | | 4 | max | 316.952 | 2 | 5.645 | 6 | 2.914 | 4 | 0 | 1 | 0 | 12 | 0 | 2 |
| 426 | | | min | -447.171 | 3 | 1.316 | 15 | -.081 | 1 | 0 | 4 | -.019 | 4 | -.001 | 3 |
| 427 | | 5 | max | 316.782 | 2 | 4.875 | 6 | 3.455 | 4 | 0 | 1 | 0 | 12 | 0 | 15 |
| 428 | | | min | -447.299 | 3 | 1.135 | 15 | -.081 | 1 | 0 | 4 | -.018 | 4 | -.003 | 4 |
| 429 | | 6 | max | 316.611 | 2 | 4.105 | 6 | 3.995 | 4 | 0 | 1 | 0 | 12 | -.001 | 15 |
| 430 | | | min | -447.427 | 3 | .954 | 15 | -.081 | 1 | 0 | 4 | -.016 | 4 | -.005 | 4 |
| 431 | | 7 | max | 316.441 | 2 | 3.335 | 6 | 4.536 | 4 | 0 | 1 | 0 | 12 | -.002 | 15 |
| 432 | | | min | -447.554 | 3 | .773 | 15 | -.081 | 1 | 0 | 4 | -.014 | 4 | -.006 | 4 |
| 433 | | 8 | max | 316.271 | 2 | 2.565 | 6 | 5.076 | 4 | 0 | 1 | 0 | 12 | -.002 | 15 |
| 434 | | | min | -447.682 | 3 | .592 | 15 | -.081 | 1 | 0 | 4 | -.012 | 4 | -.008 | 4 |
| 435 | | 9 | max | 316.1 | 2 | 1.795 | 6 | 5.617 | 4 | 0 | 1 | 0 | 12 | -.002 | 15 |
| 436 | | | min | -447.81 | 3 | .411 | 15 | -.081 | 1 | 0 | 4 | -.01 | 4 | -.009 | 4 |
| 437 | | 10 | max | 315.93 | 2 | 1.025 | 6 | 6.157 | 4 | 0 | 1 | 0 | 12 | -.002 | 15 |
| 438 | | | min | -447.938 | 3 | .23 | 15 | -.081 | 1 | 0 | 4 | -.008 | 4 | -.009 | 4 |
| 439 | | 11 | max | 315.76 | 2 | .338 | 2 | 6.698 | 4 | 0 | 1 | 0 | 12 | -.002 | 15 |
| 440 | | | min | -448.065 | 3 | .001 | 3 | -.081 | 1 | 0 | 4 | -.005 | 4 | -.01 | 4 |
| 441 | | 12 | max | 315.589 | 2 | -.132 | 15 | 7.239 | 4 | 0 | 1 | 0 | 12 | -.002 | 15 |
| 442 | | | min | -448.193 | 3 | -.516 | 4 | -.081 | 1 | 0 | 4 | -.002 | 4 | -.009 | 4 |
| 443 | | 13 | max | 315.419 | 2 | -.313 | 15 | 7.779 | 4 | 0 | 1 | .001 | 5 | -.002 | 15 |
| 444 | | | min | -448.321 | 3 | -1.286 | 4 | -.081 | 1 | 0 | 4 | 0 | 1 | -.009 | 4 |
| 445 | | 14 | max | 315.249 | 2 | -.494 | 15 | 8.32 | 4 | 0 | 1 | .005 | 5 | -.002 | 15 |
| 446 | | | min | -448.449 | 3 | -2.056 | 4 | -.081 | 1 | 0 | 4 | 0 | 1 | -.008 | 4 |
| 447 | | 15 | max | 315.078 | 2 | -.675 | 15 | 8.86 | 4 | 0 | 1 | .008 | 5 | -.002 | 15 |
| 448 | | | min | -448.576 | 3 | -2.826 | 4 | -.081 | 1 | 0 | 4 | 0 | 1 | -.007 | 4 |
| 449 | | 16 | max | 314.908 | 2 | -.856 | 15 | 9.401 | 4 | 0 | 1 | .012 | 4 | -.001 | 15 |
| 450 | | | min | -448.704 | 3 | -3.596 | 4 | -.081 | 1 | 0 | 4 | 0 | 1 | -.006 | 4 |
| 451 | | 17 | max | 314.738 | 2 | -1.037 | 15 | 9.941 | 4 | 0 | 1 | .016 | 4 | -.001 | 15 |
| 452 | | | min | -448.832 | 3 | -4.366 | 4 | -.081 | 1 | 0 | 4 | 0 | 1 | -.004 | 4 |
| 453 | | 18 | max | 314.567 | 2 | -1.218 | 15 | 10.482 | 4 | 0 | 1 | .02 | 4 | 0 | 15 |
| 454 | | | min | -448.96 | 3 | -5.136 | 4 | -.081 | 1 | 0 | 4 | 0 | 1 | -.002 | 4 |
| 455 | | 19 | max | 314.397 | 2 | -1.399 | 15 | 11.022 | 4 | 0 | 1 | .025 | 4 | 0 | 1 |
| 456 | | | min | -449.087 | 3 | -5.906 | 4 | -.081 | 1 | 0 | 4 | 0 | 1 | 0 | 1 |
| 457 | M12 | 1 | max | 1186.669 | 1 | 0 | 1 | 10.775 | 1 | 0 | 1 | .015 | 4 | 0 | 1 |
| 458 | | | min | -177.228 | 3 | 0 | 1 | -263.097 | 4 | 0 | 1 | 0 | 1 | 0 | 1 |
| 459 | | 2 | max | 1186.84 | 1 | 0 | 1 | 10.775 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 460 | | | min | -177.1 | 3 | 0 | 1 | -263.245 | 4 | 0 | 1 | -.015 | 4 | 0 | 1 |
| 461 | | 3 | max | 1187.01 | 1 | 0 | 1 | 10.775 | 1 | 0 | 1 | .002 | 1 | 0 | 1 |
| 462 | | | min | -176.972 | 3 | 0 | 1 | -263.392 | 4 | 0 | 1 | -.045 | 4 | 0 | 1 |
| 463 | | 4 | max | 1187.181 | 1 | 0 | 1 | 10.775 | 1 | 0 | 1 | .003 | 1 | 0 | 1 |
| 464 | | | min | -176.844 | 3 | 0 | 1 | -263.54 | 4 | 0 | 1 | -.075 | 4 | 0 | 1 |
| 465 | | 5 | max | 1187.351 | 1 | 0 | 1 | 10.775 | 1 | 0 | 1 | .004 | 1 | 0 | 1 |
| 466 | | | min | -176.717 | 3 | 0 | 1 | -263.688 | 4 | 0 | 1 | -.106 | 4 | 0 | 1 |
| 467 | | 6 | max | 1187.521 | 1 | 0 | 1 | 10.775 | 1 | 0 | 1 | .006 | 1 | 0 | 1 |
| 468 | | | min | -176.589 | 3 | 0 | 1 | -263.835 | 4 | 0 | 1 | -.136 | 4 | 0 | 1 |
| 469 | | 7 | max | 1187.692 | 1 | 0 | 1 | 10.775 | 1 | 0 | 1 | .007 | 1 | 0 | 1 |
| 470 | | | min | -176.461 | 3 | 0 | 1 | -263.983 | 4 | 0 | 1 | -.166 | 4 | 0 | 1 |
| 471 | | 8 | max | 1187.862 | 1 | 0 | 1 | 10.775 | 1 | 0 | 1 | .008 | 1 | 0 | 1 |
| 472 | | | min | -176.333 | 3 | 0 | 1 | -264.131 | 4 | 0 | 1 | -.196 | 4 | 0 | 1 |
| 473 | | 9 | max | 1188.032 | 1 | 0 | 1 | 10.775 | 1 | 0 | 1 | .009 | 1 | 0 | 1 |
| 474 | | | min | -176.206 | 3 | 0 | 1 | -264.278 | 4 | 0 | 1 | -.227 | 4 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 475 | | 10 | max | 1188.203 | 1 | 0 | 1 | 10.775 | 1 | 0 | 1 | .011 | 1 | 0 | 1 |
| 476 | | | min | -176.078 | 3 | 0 | 1 | -264.426 | 4 | 0 | 1 | -.257 | 4 | 0 | 1 |
| 477 | | 11 | max | 1188.373 | 1 | 0 | 1 | 10.775 | 1 | 0 | 1 | .012 | 1 | 0 | 1 |
| 478 | | | min | -175.95 | 3 | 0 | 1 | -264.574 | 4 | 0 | 1 | -.287 | 4 | 0 | 1 |
| 479 | | 12 | max | 1188.543 | 1 | 0 | 1 | 10.775 | 1 | 0 | 1 | .013 | 1 | 0 | 1 |
| 480 | | | min | -175.822 | 3 | 0 | 1 | -264.721 | 4 | 0 | 1 | -.318 | 4 | 0 | 1 |
| 481 | | 13 | max | 1188.714 | 1 | 0 | 1 | 10.775 | 1 | 0 | 1 | .014 | 1 | 0 | 1 |
| 482 | | | min | -175.695 | 3 | 0 | 1 | -264.869 | 4 | 0 | 1 | -.348 | 4 | 0 | 1 |
| 483 | | 14 | max | 1188.884 | 1 | 0 | 1 | 10.775 | 1 | 0 | 1 | .016 | 1 | 0 | 1 |
| 484 | | | min | -175.567 | 3 | 0 | 1 | -265.016 | 4 | 0 | 1 | -.379 | 4 | 0 | 1 |
| 485 | | 15 | max | 1189.054 | 1 | 0 | 1 | 10.775 | 1 | 0 | 1 | .017 | 1 | 0 | 1 |
| 486 | | | min | -175.439 | 3 | 0 | 1 | -265.164 | 4 | 0 | 1 | -.409 | 4 | 0 | 1 |
| 487 | | 16 | max | 1189.225 | 1 | 0 | 1 | 10.775 | 1 | 0 | 1 | .018 | 1 | 0 | 1 |
| 488 | | | min | -175.311 | 3 | 0 | 1 | -265.312 | 4 | 0 | 1 | -.44 | 4 | 0 | 1 |
| 489 | | 17 | max | 1189.395 | 1 | 0 | 1 | 10.775 | 1 | 0 | 1 | .019 | 1 | 0 | 1 |
| 490 | | | min | -175.184 | 3 | 0 | 1 | -265.459 | 4 | 0 | 1 | -.47 | 4 | 0 | 1 |
| 491 | | 18 | max | 1189.565 | 1 | 0 | 1 | 10.775 | 1 | 0 | 1 | .02 | 1 | 0 | 1 |
| 492 | | | min | -175.056 | 3 | 0 | 1 | -265.607 | 4 | 0 | 1 | -.501 | 4 | 0 | 1 |
| 493 | | 19 | max | 1189.736 | 1 | 0 | 1 | 10.775 | 1 | 0 | 1 | .022 | 1 | 0 | 1 |
| 494 | | | min | -174.928 | 3 | 0 | 1 | -265.755 | 4 | 0 | 1 | -.531 | 4 | 0 | 1 |
| 495 | M1 | 1 | max | 169.922 | 1 | 516.458 | 3 | 53.993 | 5 | 0 | 1 | .263 | 1 | 0 | 3 |
| 496 | | | min | -7.747 | 5 | -475.052 | 1 | -110.282 | 1 | 0 | 3 | -.079 | 5 | -.013 | 1 |
| 497 | | 2 | max | 170.412 | 1 | 515.449 | 3 | 55.234 | 5 | 0 | 1 | .205 | 1 | .239 | 1 |
| 498 | | | min | -7.518 | 5 | -476.398 | 1 | -110.282 | 1 | 0 | 3 | -.05 | 5 | -.272 | 3 |
| 499 | | 3 | max | 265.484 | 3 | 526.257 | 1 | -3.271 | 15 | 0 | 3 | .147 | 1 | .478 | 1 |
| 500 | | | min | -165.127 | 2 | -368.253 | 3 | -109.515 | 1 | 0 | 1 | -.022 | 5 | -.533 | 3 |
| 501 | | 4 | max | 265.852 | 3 | 524.911 | 1 | -2.435 | 15 | 0 | 3 | .089 | 1 | .201 | 1 |
| 502 | | | min | -164.637 | 2 | -369.262 | 3 | -109.515 | 1 | 0 | 1 | -.024 | 5 | -.338 | 3 |
| 503 | | 5 | max | 266.219 | 3 | 523.565 | 1 | -1.6 | 15 | 0 | 3 | .031 | 1 | -.003 | 15 |
| 504 | | | min | -164.147 | 2 | -370.272 | 3 | -109.515 | 1 | 0 | 1 | -.026 | 5 | -.143 | 3 |
| 505 | | 6 | max | 266.587 | 3 | 522.219 | 1 | -.764 | 15 | 0 | 3 | -.001 | 12 | .052 | 3 |
| 506 | | | min | -163.657 | 2 | -371.281 | 3 | -109.515 | 1 | 0 | 1 | -.032 | 4 | -.352 | 1 |
| 507 | | 7 | max | 266.954 | 3 | 520.873 | 1 | .072 | 15 | 0 | 3 | -.004 | 12 | .248 | 3 |
| 508 | | | min | -163.168 | 2 | -372.291 | 3 | -109.515 | 1 | 0 | 1 | -.084 | 1 | -.627 | 1 |
| 509 | | 8 | max | 267.322 | 3 | 519.527 | 1 | 1.208 | 5 | 0 | 3 | -.006 | 12 | .445 | 3 |
| 510 | | | min | -162.678 | 2 | -373.3 | 3 | -109.515 | 1 | 0 | 1 | -.142 | 1 | -.901 | 1 |
| 511 | | 9 | max | 277.827 | 3 | 34.241 | 2 | 50.345 | 5 | 0 | 9 | .083 | 1 | .521 | 3 |
| 512 | | | min | -93.364 | 2 | .406 | 15 | -159.392 | 1 | 0 | 3 | -.13 | 5 | -1.027 | 1 |
| 513 | | 10 | max | 278.194 | 3 | 32.895 | 2 | 51.587 | 5 | 0 | 9 | 0 | 12 | .506 | 3 |
| 514 | | | min | -92.874 | 2 | 0 | 5 | -159.392 | 1 | 0 | 3 | -.104 | 4 | -1.037 | 1 |
| 515 | | 11 | max | 278.562 | 3 | 31.549 | 2 | 52.828 | 5 | 0 | 9 | -.004 | 12 | .492 | 3 |
| 516 | | | min | -92.384 | 2 | -1.674 | 4 | -159.392 | 1 | 0 | 3 | -.093 | 4 | -1.045 | 1 |
| 517 | | 12 | max | 289.021 | 3 | 240.076 | 3 | 145.058 | 5 | 0 | 1 | .14 | 1 | .429 | 3 |
| 518 | | | min | -58.753 | 10 | -555.61 | 1 | -106.918 | 1 | 0 | 3 | -.194 | 5 | -.923 | 1 |
| 519 | | 13 | max | 289.389 | 3 | 239.067 | 3 | 146.299 | 5 | 0 | 1 | .084 | 1 | .302 | 3 |
| 520 | | | min | -58.372 | 5 | -556.956 | 1 | -106.918 | 1 | 0 | 3 | -.117 | 5 | -.629 | 1 |
| 521 | | 14 | max | 289.756 | 3 | 238.057 | 3 | 147.54 | 5 | 0 | 1 | .027 | 1 | .176 | 3 |
| 522 | | | min | -58.143 | 5 | -558.302 | 1 | -106.918 | 1 | 0 | 3 | -.04 | 5 | -.335 | 1 |
| 523 | | 15 | max | 290.124 | 3 | 237.048 | 3 | 148.782 | 5 | 0 | 1 | .038 | 5 | .051 | 3 |
| 524 | | | min | -57.915 | 5 | -559.648 | 1 | -106.918 | 1 | 0 | 3 | -.029 | 1 | -.04 | 1 |
| 525 | | 16 | max | 290.491 | 3 | 236.038 | 3 | 150.023 | 5 | 0 | 1 | .117 | 5 | .255 | 1 |
| 526 | | | min | -57.686 | 5 | -560.994 | 1 | -106.918 | 1 | 0 | 3 | -.085 | 1 | -.074 | 3 |
| 527 | | 17 | max | 290.859 | 3 | 235.029 | 3 | 151.265 | 5 | 0 | 1 | .197 | 5 | .552 | 1 |
| 528 | | | min | -57.457 | 5 | -562.34 | 1 | -106.918 | 1 | 0 | 3 | -.142 | 1 | -.198 | 3 |
| 529 | | 18 | max | 15.32 | 5 | 546.216 | 1 | -4.914 | 12 | 0 | 5 | .173 | 5 | .277 | 1 |
| 530 | | | min | -170.607 | 1 | -199.811 | 3 | -123.832 | 4 | 0 | 1 | -.203 | 1 | -.098 | 3 |
| 531 | | 19 | max | 15.548 | 5 | 544.87 | 1 | -4.914 | 12 | 0 | 5 | .121 | 5 | .007 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 532 | | | min | -170.117 | 1 | -200.82 | 3 | -122.591 | 4 | 0 | 1 | -.265 | 1 | -.011 | 1 |
| 533 | M5 | 1 | max | 366.143 | 1 | 1721.251 | 3 | 95.218 | 5 | 0 | 1 | 0 | 1 | .025 | 1 |
| 534 | | | min | 12.546 | 12 | -1604.421 | 1 | 0 | 1 | 0 | 4 | -.179 | 4 | 0 | 3 |
| 535 | | 2 | max | 366.632 | 1 | 1720.241 | 3 | 96.459 | 5 | 0 | 1 | 0 | 1 | .872 | 1 |
| 536 | | | min | 12.791 | 12 | -1605.767 | 1 | 0 | 1 | 0 | 4 | -.129 | 4 | -.909 | 3 |
| 537 | | 3 | max | 854.23 | 3 | 1618.473 | 1 | 39.76 | 4 | 0 | 4 | 0 | 1 | 1.681 | 1 |
| 538 | | | min | -607.214 | 2 | -1191.152 | 3 | 0 | 1 | 0 | 1 | -.079 | 4 | -1.781 | 3 |
| 539 | | 4 | max | 854.597 | 3 | 1617.127 | 1 | 41.002 | 4 | 0 | 4 | 0 | 1 | .827 | 1 |
| 540 | | | min | -606.724 | 2 | -1192.161 | 3 | 0 | 1 | 0 | 1 | -.058 | 4 | -1.152 | 3 |
| 541 | | 5 | max | 854.965 | 3 | 1615.781 | 1 | 42.243 | 4 | 0 | 4 | 0 | 1 | .009 | 9 |
| 542 | | | min | -606.234 | 2 | -1193.171 | 3 | 0 | 1 | 0 | 1 | -.036 | 4 | -.523 | 3 |
| 543 | | 6 | max | 855.332 | 3 | 1614.435 | 1 | 43.485 | 4 | 0 | 4 | 0 | 1 | .107 | 3 |
| 544 | | | min | -605.744 | 2 | -1194.18 | 3 | 0 | 1 | 0 | 1 | -.013 | 5 | -.878 | 1 |
| 545 | | 7 | max | 855.7 | 3 | 1613.089 | 1 | 44.726 | 4 | 0 | 4 | .01 | 4 | .737 | 3 |
| 546 | | | min | -605.254 | 2 | -1195.19 | 3 | 0 | 1 | 0 | 1 | 0 | 1 | -1.73 | 1 |
| 547 | | 8 | max | 856.067 | 3 | 1611.743 | 1 | 45.967 | 4 | 0 | 4 | .034 | 4 | 1.368 | 3 |
| 548 | | | min | -604.764 | 2 | -1196.199 | 3 | 0 | 1 | 0 | 1 | 0 | 1 | -2.58 | 1 |
| 549 | | 9 | max | 874.647 | 3 | 113.348 | 2 | 161.685 | 4 | 0 | 1 | 0 | 1 | 1.577 | 3 |
| 550 | | | min | -462.815 | 2 | .407 | 15 | 0 | 1 | 0 | 1 | -.18 | 4 | -2.919 | 1 |
| 551 | | 10 | max | 875.015 | 3 | 112.002 | 2 | 162.926 | 4 | 0 | 1 | 0 | 1 | 1.526 | 3 |
| 552 | | | min | -462.326 | 2 | .001 | 15 | 0 | 1 | 0 | 1 | -.094 | 5 | -2.951 | 1 |
| 553 | | 11 | max | 875.382 | 3 | 110.656 | 2 | 164.168 | 4 | 0 | 1 | 0 | 1 | 1.475 | 3 |
| 554 | | | min | -461.836 | 2 | -1.497 | 6 | 0 | 1 | 0 | 1 | -.01 | 5 | -2.982 | 1 |
| 555 | | 12 | max | 894.054 | 3 | 765.434 | 3 | 204.184 | 4 | 0 | 1 | 0 | 1 | 1.294 | 3 |
| 556 | | | min | -319.899 | 2 | -1733.559 | 1 | 0 | 1 | 0 | 4 | -.279 | 4 | -2.657 | 1 |
| 557 | | 13 | max | 894.421 | 3 | 764.424 | 3 | 205.425 | 4 | 0 | 1 | 0 | 1 | .89 | 3 |
| 558 | | | min | -319.409 | 2 | -1734.905 | 1 | 0 | 1 | 0 | 4 | -.17 | 4 | -1.741 | 1 |
| 559 | | 14 | max | 894.789 | 3 | 763.415 | 3 | 206.667 | 4 | 0 | 1 | 0 | 1 | .487 | 3 |
| 560 | | | min | -318.919 | 2 | -1736.251 | 1 | 0 | 1 | 0 | 4 | -.062 | 4 | -.826 | 1 |
| 561 | | 15 | max | 895.156 | 3 | 762.405 | 3 | 207.908 | 4 | 0 | 1 | .048 | 4 | .143 | 2 |
| 562 | | | min | -318.429 | 2 | -1737.597 | 1 | 0 | 1 | 0 | 4 | 0 | 1 | -.004 | 13 |
| 563 | | 16 | max | 895.524 | 3 | 761.396 | 3 | 209.15 | 4 | 0 | 1 | .158 | 4 | 1.008 | 1 |
| 564 | | | min | -317.939 | 2 | -1738.944 | 1 | 0 | 1 | 0 | 4 | 0 | 1 | -.317 | 3 |
| 565 | | 17 | max | 895.891 | 3 | 760.386 | 3 | 210.391 | 4 | 0 | 1 | .268 | 4 | 1.926 | 1 |
| 566 | | | min | -317.449 | 2 | -1740.29 | 1 | 0 | 1 | 0 | 4 | 0 | 1 | -.719 | 3 |
| 567 | | 18 | max | -12.978 | 12 | 1844.522 | 1 | 0 | 1 | 0 | 4 | .277 | 4 | .996 | 1 |
| 568 | | | min | -366.243 | 1 | -683.572 | 3 | -35.971 | 5 | 0 | 1 | 0 | 1 | -.376 | 3 |
| 569 | | 19 | max | -12.733 | 12 | 1843.176 | 1 | 0 | 1 | 0 | 4 | .26 | 4 | .023 | 1 |
| 570 | | | min | -365.754 | 1 | -684.582 | 3 | -34.729 | 5 | 0 | 1 | 0 | 1 | -.015 | 3 |
| 571 | M9 | 1 | max | 169.922 | 1 | 516.458 | 3 | 110.282 | 1 | 0 | 3 | -.011 | 12 | 0 | 3 |
| 572 | | | min | 6.556 | 12 | -475.052 | 1 | 4.804 | 12 | 0 | 4 | -.263 | 1 | -.013 | 1 |
| 573 | | 2 | max | 170.412 | 1 | 515.449 | 3 | 110.282 | 1 | 0 | 3 | -.009 | 12 | .239 | 1 |
| 574 | | | min | 6.801 | 12 | -476.398 | 1 | 4.804 | 12 | 0 | 4 | -.205 | 1 | -.272 | 3 |
| 575 | | 3 | max | 265.484 | 3 | 526.257 | 1 | 109.515 | 1 | 0 | 1 | -.006 | 12 | .478 | 1 |
| 576 | | | min | -165.127 | 2 | -368.253 | 3 | 4.721 | 15 | 0 | 3 | -.147 | 1 | -.533 | 3 |
| 577 | | 4 | max | 265.852 | 3 | 524.911 | 1 | 109.515 | 1 | 0 | 1 | -.004 | 12 | .201 | 1 |
| 578 | | | min | -164.637 | 2 | -369.262 | 3 | 4.761 | 12 | 0 | 3 | -.089 | 1 | -.338 | 3 |
| 579 | | 5 | max | 266.219 | 3 | 523.565 | 1 | 109.515 | 1 | 0 | 1 | -.001 | 12 | -.003 | 15 |
| 580 | | | min | -164.147 | 2 | -370.272 | 3 | 4.761 | 12 | 0 | 3 | -.036 | 4 | -.143 | 3 |
| 581 | | 6 | max | 266.587 | 3 | 522.219 | 1 | 109.515 | 1 | 0 | 1 | .026 | 1 | .052 | 3 |
| 582 | | | min | -163.657 | 2 | -371.281 | 3 | 4.761 | 12 | 0 | 3 | -.024 | 5 | -.352 | 1 |
| 583 | | 7 | max | 266.954 | 3 | 520.873 | 1 | 109.515 | 1 | 0 | 1 | .084 | 1 | .248 | 3 |
| 584 | | | min | -163.168 | 2 | -372.291 | 3 | 4.761 | 12 | 0 | 3 | -.017 | 5 | -.627 | 1 |
| 585 | | 8 | max | 267.322 | 3 | 519.527 | 1 | 109.515 | 1 | 0 | 1 | .142 | 1 | .445 | 3 |
| 586 | | | min | -162.678 | 2 | -373.3 | 3 | 4.761 | 12 | 0 | 3 | -.011 | 5 | -.901 | 1 |
| 587 | | 9 | max | 277.827 | 3 | 34.241 | 2 | 159.392 | 1 | 0 | 3 | -.004 | 12 | .521 | 3 |
| 588 | | | min | -93.364 | 2 | .412 | 15 | 6.799 | 12 | 0 | 9 | -.158 | 4 | -1.027 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 589 | | 10 | max | 278.194 | 3 | 32.895 | 2 | 159.392 | 1 | 0 | 3 | .001 | 1 | .506 | 3 |
| 590 | | | min | -92.874 | 2 | .006 | 15 | 6.799 | 12 | 0 | 9 | -.103 | 4 | -1.037 | 1 |
| 591 | | 11 | max | 278.562 | 3 | 31.549 | 2 | 159.392 | 1 | 0 | 3 | .085 | 1 | .492 | 3 |
| 592 | | | min | -92.384 | 2 | -1.628 | 6 | 6.799 | 12 | 0 | 9 | -.066 | 5 | -1.045 | 1 |
| 593 | | 12 | max | 289.021 | 3 | 240.076 | 3 | 181.718 | 4 | 0 | 3 | -.006 | 12 | .429 | 3 |
| 594 | | | min | -58.753 | 10 | -555.61 | 1 | 4.468 | 12 | 0 | 1 | -.242 | 4 | -.923 | 1 |
| 595 | | 13 | max | 289.389 | 3 | 239.067 | 3 | 182.96 | 4 | 0 | 3 | -.004 | 12 | .302 | 3 |
| 596 | | | min | -58.344 | 10 | -556.956 | 1 | 4.468 | 12 | 0 | 1 | -.146 | 4 | -.629 | 1 |
| 597 | | 14 | max | 289.756 | 3 | 238.057 | 3 | 184.201 | 4 | 0 | 3 | -.001 | 12 | .176 | 3 |
| 598 | | | min | -57.936 | 10 | -558.302 | 1 | 4.468 | 12 | 0 | 1 | -.049 | 4 | -.335 | 1 |
| 599 | | 15 | max | 290.124 | 3 | 237.048 | 3 | 185.443 | 4 | 0 | 3 | .049 | 4 | .051 | 3 |
| 600 | | | min | -57.528 | 10 | -559.648 | 1 | 4.468 | 12 | 0 | 1 | .001 | 12 | -.04 | 1 |
| 601 | | 16 | max | 290.491 | 3 | 236.038 | 3 | 186.684 | 4 | 0 | 3 | .147 | 4 | .255 | 1 |
| 602 | | | min | -57.12 | 10 | -560.994 | 1 | 4.468 | 12 | 0 | 1 | .004 | 12 | -.074 | 3 |
| 603 | | 17 | max | 290.859 | 3 | 235.029 | 3 | 187.925 | 4 | 0 | 3 | .246 | 4 | .552 | 1 |
| 604 | | | min | -56.711 | 10 | -562.34 | 1 | 4.468 | 12 | 0 | 1 | .006 | 12 | -.198 | 3 |
| 605 | | 18 | max | -6.708 | 12 | 546.216 | 1 | 117.291 | 1 | 0 | 1 | .241 | 4 | .277 | 1 |
| 606 | | | min | -170.607 | 1 | -199.811 | 3 | -85.252 | 5 | 0 | 3 | .008 | 12 | -.098 | 3 |
| 607 | | 19 | max | -6.463 | 12 | 544.87 | 1 | 117.291 | 1 | 0 | 1 | .265 | 1 | .007 | 3 |
| 608 | | | min | -170.117 | 1 | -200.82 | 3 | -84.011 | 5 | 0 | 3 | .011 | 12 | -.011 | 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 | .001 | 1 | .103 | 1 | .005 | 3 | 8.239e-3 | 1 | NC | 1 | NC | 1 |
| 2 | | | min | -.601 | 4 | -.012 | 3 | -.002 | 2 | -9.636e-4 | 3 | NC | 1 | NC | 1 |
| 3 | | 2 | max | 0 | 1 | .271 | 3 | .045 | 1 | 9.523e-3 | 1 | NC | 5 | NC | 2 |
| 4 | | | min | -.601 | 4 | -.136 | 1 | -.02 | 5 | -9.937e-4 | 3 | 891.919 | 3 | 5819.924 | 1 |
| 5 | | 3 | max | 0 | 1 | .5 | 3 | .109 | 1 | 1.081e-2 | 1 | NC | 5 | NC | 3 |
| 6 | | | min | -.601 | 4 | -.326 | 1 | -.023 | 5 | -1.024e-3 | 3 | 492.918 | 3 | 2365.804 | 1 |
| 7 | | 4 | max | 0 | 1 | .638 | 3 | .164 | 1 | 1.209e-2 | 1 | NC | 5 | NC | 3 |
| 8 | | | min | -.601 | 4 | -.434 | 1 | -.016 | 5 | -1.054e-3 | 3 | 387.721 | 3 | 1560.106 | 1 |
| 9 | | 5 | max | 0 | 1 | .67 | 3 | .192 | 1 | 1.338e-2 | 1 | NC | 5 | NC | 3 |
| 10 | | | min | -.601 | 4 | -.443 | 1 | -.003 | 5 | -1.084e-3 | 3 | 369.614 | 3 | 1325.389 | 1 |
| 11 | | 6 | max | 0 | 1 | .597 | 3 | .186 | 1 | 1.466e-2 | 1 | NC | 5 | NC | 3 |
| 12 | | | min | -.601 | 4 | -.358 | 1 | .008 | 15 | -1.114e-3 | 3 | 413.68 | 3 | 1369.054 | 1 |
| 13 | | 7 | max | 0 | 1 | .442 | 3 | .147 | 1 | 1.594e-2 | 1 | NC | 5 | NC | 3 |
| 14 | | | min | -.601 | 4 | -.198 | 1 | .01 | 10 | -1.144e-3 | 3 | 555.361 | 3 | 1737.925 | 1 |
| 15 | | 8 | max | 0 | 1 | .245 | 3 | .087 | 1 | 1.723e-2 | 1 | NC | 4 | NC | 3 |
| 16 | | | min | -.601 | 4 | -.011 | 9 | .003 | 10 | -1.174e-3 | 3 | 982.312 | 3 | 2981.372 | 1 |
| 17 | | 9 | max | 0 | 1 | .17 | 1 | .027 | 4 | 1.851e-2 | 1 | NC | 4 | NC | 1 |
| 18 | | | min | -.601 | 4 | .005 | 15 | -.003 | 10 | -1.204e-3 | 3 | 3241.114 | 3 | 9442.513 | 4 |
| 19 | | 10 | max | 0 | 1 | .248 | 1 | .015 | 3 | 1.98e-2 | 1 | NC | 3 | NC | 1 |
| 20 | | | min | -.601 | 4 | -.015 | 3 | -.01 | 2 | -1.234e-3 | 3 | 1735.23 | 1 | NC | 1 |
| 21 | | 11 | max | 0 | 12 | .17 | 1 | .026 | 1 | 1.851e-2 | 1 | NC | 4 | NC | 1 |
| 22 | | | min | -.601 | 4 | .005 | 15 | -.016 | 5 | -1.204e-3 | 3 | 3241.114 | 3 | NC | 1 |
| 23 | | 12 | max | 0 | 12 | .245 | 3 | .087 | 1 | 1.723e-2 | 1 | NC | 4 | NC | 3 |
| 24 | | | min | -.601 | 4 | -.011 | 9 | -.016 | 5 | -1.174e-3 | 3 | 982.312 | 3 | 2981.372 | 1 |
| 25 | | 13 | max | 0 | 12 | .442 | 3 | .147 | 1 | 1.594e-2 | 1 | NC | 5 | NC | 3 |
| 26 | | | min | -.601 | 4 | -.198 | 1 | -.005 | 5 | -1.144e-3 | 3 | 555.361 | 3 | 1737.925 | 1 |
| 27 | | 14 | max | 0 | 12 | .597 | 3 | .186 | 1 | 1.466e-2 | 1 | NC | 5 | NC | 3 |
| 28 | | | min | -.601 | 4 | -.358 | 1 | .006 | 15 | -1.114e-3 | 3 | 413.68 | 3 | 1369.054 | 1 |
| 29 | | 15 | max | 0 | 12 | .67 | 3 | .192 | 1 | 1.338e-2 | 1 | NC | 5 | NC | 3 |
| 30 | | | min | -.601 | 4 | -.443 | 1 | .013 | 12 | -1.084e-3 | 3 | 369.614 | 3 | 1325.389 | 1 |
| 31 | | 16 | max | 0 | 12 | .638 | 3 | .164 | 1 | 1.209e-2 | 1 | NC | 5 | NC | 3 |
| 32 | | | min | -.601 | 4 | -.434 | 1 | .011 | 12 | -1.054e-3 | 3 | 387.721 | 3 | 1560.106 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33 | | 17 | max | 0 | 12 | .5 | 3 | .109 | 1 | 1.081e-2 | 1 | NC | 5 | NC | 3 |
| 34 | | | min | -.601 | 4 | -.326 | 1 | .008 | 12 | -1.024e-3 | 3 | 492.918 | 3 | 2365.804 | 1 |
| 35 | | 18 | max | 0 | 12 | .271 | 3 | .045 | 1 | 9.523e-3 | 1 | NC | 5 | NC | 2 |
| 36 | | | min | -.601 | 4 | -.136 | 1 | .002 | 10 | -9.937e-4 | 3 | 891.919 | 3 | 5819.924 | 1 |
| 37 | | 19 | max | 0 | 12 | .103 | 1 | .005 | 3 | 8.239e-3 | 1 | NC | 1 | NC | 1 |
| 38 | | | min | -.601 | 4 | -.012 | 3 | -.002 | 2 | -9.636e-4 | 3 | NC | 1 | NC | 1 |
| 39 | M14 | 1 | max | 0 | 1 | .153 | 3 | .004 | 3 | 5.18e-3 | 1 | NC | 1 | NC | 1 |
| 40 | | | min | -.461 | 4 | -.336 | 1 | -.002 | 2 | -2.779e-3 | 3 | NC | 1 | NC | 1 |
| 41 | | 2 | max | 0 | 1 | .418 | 3 | .032 | 1 | 6.24e-3 | 1 | NC | 5 | NC | 2 |
| 42 | | | min | -.461 | 4 | -.7 | 1 | -.028 | 5 | -3.399e-3 | 3 | 693.315 | 1 | 8462.14 | 1 |
| 43 | | 3 | max | 0 | 1 | .64 | 3 | .088 | 1 | 7.3e-3 | 1 | NC | 15 | NC | 3 |
| 44 | | | min | -.461 | 4 | -1.011 | 1 | -.034 | 5 | -4.019e-3 | 3 | 373.712 | 1 | 2934.913 | 1 |
| 45 | | 4 | max | 0 | 1 | .792 | 3 | .141 | 1 | 8.36e-3 | 1 | NC | 15 | NC | 3 |
| 46 | | | min | -.461 | 4 | -1.233 | 1 | -.022 | 5 | -4.638e-3 | 3 | 281.134 | 1 | 1815.002 | 1 |
| 47 | | 5 | max | 0 | 1 | .859 | 3 | .172 | 1 | 9.42e-3 | 1 | 9260.991 | 15 | NC | 3 |
| 48 | | | min | -.461 | 4 | -1.348 | 1 | -.003 | 5 | -5.258e-3 | 3 | 249.153 | 1 | 1488.975 | 1 |
| 49 | | 6 | max | 0 | 1 | .842 | 3 | .17 | 1 | 1.048e-2 | 1 | 9228.063 | 15 | NC | 3 |
| 50 | | | min | -.461 | 4 | -1.356 | 1 | .012 | 12 | -5.877e-3 | 3 | 247.244 | 1 | 1504.288 | 1 |
| 51 | | 7 | max | 0 | 1 | .756 | 3 | .136 | 1 | 1.154e-2 | 1 | NC | 15 | NC | 3 |
| 52 | | | min | -.461 | 4 | -1.274 | 1 | .009 | 10 | -6.497e-3 | 3 | 268.794 | 1 | 1879.748 | 1 |
| 53 | | 8 | max | 0 | 1 | .631 | 3 | .081 | 1 | 1.26e-2 | 1 | NC | 15 | NC | 3 |
| 54 | | | min | -.461 | 4 | -1.138 | 1 | .003 | 10 | -7.117e-3 | 3 | 314.238 | 1 | 3182.663 | 1 |
| 55 | | 9 | max | 0 | 1 | .51 | 3 | .039 | 4 | 1.366e-2 | 1 | NC | 15 | NC | 1 |
| 56 | | | min | -.461 | 4 | -1.003 | 1 | -.003 | 10 | -7.736e-3 | 3 | 378.303 | 1 | 6528.983 | 4 |
| 57 | | 10 | max | 0 | 1 | .455 | 3 | .014 | 3 | 1.472e-2 | 1 | NC | 5 | NC | 1 |
| 58 | | | min | -.461 | 4 | -.938 | 1 | -.009 | 2 | -8.356e-3 | 3 | 418.824 | 1 | NC | 1 |
| 59 | | 11 | max | 0 | 12 | .51 | 3 | .025 | 1 | 1.366e-2 | 1 | NC | 15 | NC | 1 |
| 60 | | | min | -.461 | 4 | -1.003 | 1 | -.028 | 5 | -7.736e-3 | 3 | 378.303 | 1 | 9298.292 | 5 |
| 61 | | 12 | max | 0 | 12 | .631 | 3 | .081 | 1 | 1.26e-2 | 1 | NC | 15 | NC | 3 |
| 62 | | | min | -.461 | 4 | -1.138 | 1 | -.032 | 5 | -7.117e-3 | 3 | 314.238 | 1 | 3182.663 | 1 |
| 63 | | 13 | max | 0 | 12 | .756 | 3 | .136 | 1 | 1.154e-2 | 1 | NC | 15 | NC | 3 |
| 64 | | | min | -.461 | 4 | -1.274 | 1 | -.02 | 5 | -6.497e-3 | 3 | 268.794 | 1 | 1879.748 | 1 |
| 65 | | 14 | max | 0 | 12 | .842 | 3 | .17 | 1 | 1.048e-2 | 1 | 9227.713 | 15 | NC | 3 |
| 66 | | | min | -.461 | 4 | -1.356 | 1 | 0 | 15 | -5.877e-3 | 3 | 247.244 | 1 | 1504.288 | 1 |
| 67 | | 15 | max | 0 | 12 | .859 | 3 | .172 | 1 | 9.42e-3 | 1 | 9260.55 | 15 | NC | 3 |
| 68 | | | min | -.461 | 4 | -1.348 | 1 | .011 | 12 | -5.258e-3 | 3 | 249.153 | 1 | 1488.975 | 1 |
| 69 | | 16 | max | 0 | 12 | .792 | 3 | .141 | 1 | 8.36e-3 | 1 | NC | 15 | NC | 3 |
| 70 | | | min | -.461 | 4 | -1.233 | 1 | .009 | 12 | -4.638e-3 | 3 | 281.134 | 1 | 1815.002 | 1 |
| 71 | | 17 | max | 0 | 12 | .64 | 3 | .088 | 1 | 7.3e-3 | 1 | NC | 15 | NC | 3 |
| 72 | | | min | -.461 | 4 | -1.011 | 1 | .007 | 10 | -4.019e-3 | 3 | 373.712 | 1 | 2934.913 | 1 |
| 73 | | 18 | max | 0 | 12 | .418 | 3 | .04 | 4 | 6.24e-3 | 1 | NC | 5 | NC | 2 |
| 74 | | | min | -.461 | 4 | -.7 | 1 | .001 | 10 | -3.399e-3 | 3 | 693.315 | 1 | 6290.567 | 4 |
| 75 | | 19 | max | 0 | 12 | .153 | 3 | .004 | 3 | 5.18e-3 | 1 | NC | 1 | NC | 1 |
| 76 | | | min | -.461 | 4 | -.336 | 1 | -.002 | 2 | -2.779e-3 | 3 | NC | 1 | NC | 1 |
| 77 | M15 | 1 | max | 0 | 12 | .157 | 3 | .004 | 3 | 2.337e-3 | 3 | NC | 1 | NC | 1 |
| 78 | | | min | -.381 | 4 | -.336 | 1 | -.001 | 2 | -5.288e-3 | 1 | NC | 1 | NC | 1 |
| 79 | | 2 | max | 0 | 12 | .32 | 3 | .032 | 1 | 2.862e-3 | 3 | NC | 5 | NC | 2 |
| 80 | | | min | -.381 | 4 | -.736 | 1 | -.039 | 5 | -6.375e-3 | 1 | 629.985 | 1 | 6217.04 | 5 |
| 81 | | 3 | max | 0 | 12 | .46 | 3 | .088 | 1 | 3.386e-3 | 3 | NC | 15 | NC | 3 |
| 82 | | | min | -.381 | 4 | -1.076 | 1 | -.048 | 5 | -7.463e-3 | 1 | 340.353 | 1 | 2927.019 | 1 |
| 83 | | 4 | max | 0 | 12 | .562 | 3 | .141 | 1 | 3.911e-3 | 3 | NC | 15 | NC | 3 |
| 84 | | | min | -.381 | 4 | -1.316 | 1 | -.034 | 5 | -8.551e-3 | 1 | 257.053 | 1 | 1811.223 | 1 |
| 85 | | 5 | max | 0 | 12 | .618 | 3 | .172 | 1 | 4.435e-3 | 3 | 9271.126 | 15 | NC | 3 |
| 86 | | | min | -.381 | 4 | -1.435 | 1 | -.008 | 5 | -9.639e-3 | 1 | 229.212 | 1 | 1486.175 | 1 |
| 87 | | 6 | max | 0 | 12 | .628 | 3 | .17 | 1 | 4.96e-3 | 3 | 9240.17 | 15 | NC | 3 |
| 88 | | | min | -.381 | 4 | -1.434 | 1 | .012 | 12 | -1.073e-2 | 1 | 229.57 | 1 | 1501.36 | 1 |
| 89 | | 7 | max | 0 | 12 | .599 | 3 | .137 | 1 | 5.485e-3 | 3 | NC | 15 | NC | 3 |

## Envelope Member Section Deflections (Continued)

| | Member | Sec | | x [in] | LC | y [in] | LC | z [in] | LC | x Rotate [r... | LC | (n) L/y Ratio | LC | (n) L/z Ratio | LC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 90 | | | min | -.381 | 4 | -1.332 | 1 | .009 | 10 | -1.182e-2 | 1 | 253.08 | 1 | 1875.271 | 1 |
| 91 | | 8 | max | 0 | 12 | .546 | 3 | .082 | 1 | 6.009e-3 | 3 | NC | 15 | NC | 3 |
| 92 | | | min | -.381 | 4 | -1.17 | 1 | .003 | 10 | -1.29e-2 | 1 | 301.981 | 1 | 3170.398 | 1 |
| 93 | | 9 | max | 0 | 12 | .491 | 3 | .048 | 4 | 6.534e-3 | 3 | NC | 15 | NC | 1 |
| 94 | | | min | -.381 | 4 | -1.011 | 1 | -.003 | 10 | -1.399e-2 | 1 | 373.092 | 1 | 5216.355 | 4 |
| 95 | | 10 | max | 0 | 1 | .465 | 3 | .013 | 3 | 7.058e-3 | 3 | NC | 5 | NC | 1 |
| 96 | | | min | -.381 | 4 | -.936 | 1 | -.008 | 2 | -1.508e-2 | 1 | 419.661 | 1 | NC | 1 |
| 97 | | 11 | max | 0 | 1 | .491 | 3 | .026 | 1 | 6.534e-3 | 3 | NC | 15 | NC | 1 |
| 98 | | | min | -.381 | 4 | -1.011 | 1 | -.038 | 5 | -1.399e-2 | 1 | 373.092 | 1 | 6656.508 | 5 |
| 99 | | 12 | max | 0 | 1 | .546 | 3 | .082 | 1 | 6.009e-3 | 3 | NC | 15 | NC | 3 |
| 100 | | | min | -.381 | 4 | -1.17 | 1 | -.044 | 5 | -1.29e-2 | 1 | 301.981 | 1 | 3170.398 | 1 |
| 101 | | 13 | max | 0 | 1 | .599 | 3 | .137 | 1 | 5.485e-3 | 3 | NC | 15 | NC | 3 |
| 102 | | | min | -.381 | 4 | -1.332 | 1 | -.029 | 5 | -1.182e-2 | 1 | 253.08 | 1 | 1875.271 | 1 |
| 103 | | 14 | max | 0 | 1 | .628 | 3 | .17 | 1 | 4.96e-3 | 3 | 9239.911 | 15 | NC | 3 |
| 104 | | | min | -.381 | 4 | -1.434 | 1 | -.002 | 5 | -1.073e-2 | 1 | 229.57 | 1 | 1501.36 | 1 |
| 105 | | 15 | max | 0 | 1 | .618 | 3 | .172 | 1 | 4.435e-3 | 3 | 9270.801 | 15 | NC | 3 |
| 106 | | | min | -.381 | 4 | -1.435 | 1 | .011 | 12 | -9.639e-3 | 1 | 229.212 | 1 | 1486.175 | 1 |
| 107 | | 16 | max | 0 | 1 | .562 | 3 | .141 | 1 | 3.911e-3 | 3 | NC | 15 | NC | 3 |
| 108 | | | min | -.381 | 4 | -1.316 | 1 | .009 | 12 | -8.551e-3 | 1 | 257.053 | 1 | 1811.223 | 1 |
| 109 | | 17 | max | 0 | 1 | .46 | 3 | .088 | 1 | 3.386e-3 | 3 | NC | 15 | NC | 3 |
| 110 | | | min | -.381 | 4 | -1.076 | 1 | .006 | 12 | -7.463e-3 | 1 | 340.353 | 1 | 2927.019 | 1 |
| 111 | | 18 | max | 0 | 1 | .32 | 3 | .051 | 4 | 2.862e-3 | 3 | NC | 5 | NC | 2 |
| 112 | | | min | -.381 | 4 | -.736 | 1 | .001 | 10 | -6.375e-3 | 1 | 629.985 | 1 | 4933.914 | 4 |
| 113 | | 19 | max | 0 | 1 | .157 | 3 | .004 | 3 | 2.337e-3 | 3 | NC | 1 | NC | 1 |
| 114 | | | min | -.381 | 4 | -.336 | 1 | -.001 | 2 | -5.288e-3 | 1 | NC | 1 | NC | 1 |
| 115 | M16 | 1 | max | 0 | 12 | .1 | 1 | .004 | 3 | 4.087e-3 | 3 | NC | 1 | NC | 1 |
| 116 | | | min | -.15 | 4 | -.052 | 3 | -.001 | 2 | -7.728e-3 | 1 | NC | 1 | NC | 1 |
| 117 | | 2 | max | 0 | 12 | .045 | 3 | .045 | 1 | 4.848e-3 | 3 | NC | 5 | NC | 2 |
| 118 | | | min | -.15 | 4 | -.18 | 2 | -.03 | 5 | -8.887e-3 | 1 | 909.578 | 1 | 5858.006 | 1 |
| 119 | | 3 | max | 0 | 12 | .121 | 3 | .108 | 1 | 5.609e-3 | 3 | NC | 5 | NC | 3 |
| 120 | | | min | -.15 | 4 | -.397 | 1 | -.037 | 5 | -1.005e-2 | 1 | 506.492 | 1 | 2373.348 | 1 |
| 121 | | 4 | max | 0 | 12 | .163 | 3 | .163 | 1 | 6.37e-3 | 3 | NC | 5 | NC | 3 |
| 122 | | | min | -.15 | 4 | -.523 | 1 | -.027 | 5 | -1.12e-2 | 1 | 404.069 | 1 | 1562.256 | 1 |
| 123 | | 5 | max | 0 | 12 | .163 | 3 | .192 | 1 | 7.131e-3 | 3 | NC | 5 | NC | 3 |
| 124 | | | min | -.15 | 4 | -.538 | 1 | -.009 | 5 | -1.236e-2 | 1 | 394.95 | 1 | 1325.275 | 1 |
| 125 | | 6 | max | 0 | 12 | .123 | 3 | .186 | 1 | 7.892e-3 | 3 | NC | 5 | NC | 3 |
| 126 | | | min | -.15 | 4 | -.443 | 1 | .008 | 15 | -1.352e-2 | 1 | 463.361 | 1 | 1366.633 | 1 |
| 127 | | 7 | max | 0 | 12 | .053 | 3 | .148 | 1 | 8.653e-3 | 3 | NC | 5 | NC | 3 |
| 128 | | | min | -.15 | 4 | -.275 | 2 | .011 | 10 | -1.468e-2 | 1 | 691.123 | 1 | 1730.097 | 1 |
| 129 | | 8 | max | 0 | 12 | .001 | 13 | .087 | 1 | 9.414e-3 | 3 | NC | 3 | NC | 3 |
| 130 | | | min | -.15 | 4 | -.071 | 2 | .004 | 10 | -1.584e-2 | 1 | 1641.838 | 2 | 2948.058 | 1 |
| 131 | | 9 | max | 0 | 12 | .153 | 1 | .035 | 4 | 1.018e-2 | 3 | NC | 4 | NC | 2 |
| 132 | | | min | -.15 | 4 | -.107 | 3 | -.002 | 10 | -1.7e-2 | 1 | 4582.12 | 3 | 7222.543 | 4 |
| 133 | | 10 | max | 0 | 1 | .241 | 1 | .011 | 3 | 1.094e-2 | 3 | NC | 5 | NC | 1 |
| 134 | | | min | -.15 | 4 | -.14 | 3 | -.007 | 2 | -1.816e-2 | 1 | 1793.348 | 1 | NC | 1 |
| 135 | | 11 | max | 0 | 1 | .153 | 1 | .027 | 1 | 1.018e-2 | 3 | NC | 4 | NC | 2 |
| 136 | | | min | -.15 | 4 | -.107 | 3 | -.024 | 5 | -1.7e-2 | 1 | 4582.12 | 3 | 9944.161 | 1 |
| 137 | | 12 | max | 0 | 1 | .001 | 13 | .087 | 1 | 9.414e-3 | 3 | NC | 3 | NC | 3 |
| 138 | | | min | -.15 | 4 | -.071 | 2 | -.025 | 5 | -1.584e-2 | 1 | 1641.838 | 2 | 2948.058 | 1 |
| 139 | | 13 | max | 0 | 1 | .053 | 3 | .148 | 1 | 8.653e-3 | 3 | NC | 5 | NC | 3 |
| 140 | | | min | -.15 | 4 | -.275 | 2 | -.012 | 5 | -1.468e-2 | 1 | 691.123 | 1 | 1730.097 | 1 |
| 141 | | 14 | max | 0 | 1 | .123 | 3 | .186 | 1 | 7.892e-3 | 3 | NC | 5 | NC | 3 |
| 142 | | | min | -.15 | 4 | -.443 | 1 | .006 | 15 | -1.352e-2 | 1 | 463.361 | 1 | 1366.633 | 1 |
| 143 | | 15 | max | 0 | 1 | .163 | 3 | .192 | 1 | 7.131e-3 | 3 | NC | 5 | NC | 3 |
| 144 | | | min | -.15 | 4 | -.538 | 1 | .011 | 12 | -1.236e-2 | 1 | 394.95 | 1 | 1325.275 | 1 |
| 145 | | 16 | max | 0 | 1 | .163 | 3 | .163 | 1 | 6.37e-3 | 3 | NC | 5 | NC | 3 |
| 146 | | | min | -.15 | 4 | -.523 | 1 | .009 | 12 | -1.12e-2 | 1 | 404.069 | 1 | 1562.256 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 147 | | 17 | max | 0 | 1 | .121 | 3 | .108 | 1 | 5.609e-3 | 3 | NC | 5 | NC | 3 |
| 148 | | | min | -.149 | 4 | -.397 | 1 | .007 | 12 | -1.005e-2 | 1 | 506.492 | 1 | 2373.348 | 1 |
| 149 | | 18 | max | .001 | 1 | .045 | 3 | .046 | 4 | 4.848e-3 | 3 | NC | 5 | NC | 2 |
| 150 | | | min | -.149 | 4 | -.18 | 2 | .003 | 10 | -8.887e-3 | 1 | 909.578 | 1 | 5519.972 | 4 |
| 151 | | 19 | max | .001 | 1 | .1 | 1 | .004 | 3 | 4.087e-3 | 3 | NC | 1 | NC | 1 |
| 152 | | | min | -.149 | 4 | -.052 | 3 | -.001 | 2 | -7.728e-3 | 1 | NC | 1 | NC | 1 |
| 153 | M2 | 1 | max | .006 | 1 | .003 | 2 | .008 | 1 | 1.381e-3 | 5 | NC | 1 | NC | 2 |
| 154 | | | min | -.005 | 3 | -.006 | 3 | -.565 | 4 | -2.289e-4 | 1 | NC | 1 | 97.93 | 4 |
| 155 | | 2 | max | .005 | 1 | .003 | 2 | .008 | 1 | 1.483e-3 | 5 | NC | 1 | NC | 2 |
| 156 | | | min | -.005 | 3 | -.006 | 3 | -.519 | 4 | -2.135e-4 | 1 | NC | 1 | 106.669 | 4 |
| 157 | | 3 | max | .005 | 1 | .002 | 2 | .007 | 1 | 1.585e-3 | 5 | NC | 1 | NC | 2 |
| 158 | | | min | -.004 | 3 | -.006 | 3 | -.473 | 4 | -1.981e-4 | 1 | NC | 1 | 117.053 | 4 |
| 159 | | 4 | max | .005 | 1 | .002 | 2 | .006 | 1 | 1.687e-3 | 5 | NC | 1 | NC | 2 |
| 160 | | | min | -.004 | 3 | -.006 | 3 | -.427 | 4 | -1.828e-4 | 1 | NC | 1 | 129.513 | 4 |
| 161 | | 5 | max | .004 | 1 | .001 | 2 | .006 | 1 | 1.788e-3 | 5 | NC | 1 | NC | 2 |
| 162 | | | min | -.004 | 3 | -.006 | 3 | -.383 | 4 | -1.674e-4 | 1 | NC | 1 | 144.631 | 4 |
| 163 | | 6 | max | .004 | 1 | 0 | 2 | .005 | 1 | 1.89e-3 | 5 | NC | 1 | NC | 1 |
| 164 | | | min | -.004 | 3 | -.006 | 3 | -.339 | 4 | -1.52e-4 | 1 | NC | 1 | 163.217 | 4 |
| 165 | | 7 | max | .004 | 1 | 0 | 2 | .004 | 1 | 1.992e-3 | 5 | NC | 1 | NC | 1 |
| 166 | | | min | -.003 | 3 | -.005 | 3 | -.297 | 4 | -1.366e-4 | 1 | NC | 1 | 186.42 | 4 |
| 167 | | 8 | max | .003 | 1 | 0 | 15 | .004 | 1 | 2.094e-3 | 5 | NC | 1 | NC | 1 |
| 168 | | | min | -.003 | 3 | -.005 | 3 | -.256 | 4 | -1.212e-4 | 1 | NC | 1 | 215.917 | 4 |
| 169 | | 9 | max | .003 | 1 | 0 | 15 | .003 | 1 | 2.2e-3 | 4 | NC | 1 | NC | 1 |
| 170 | | | min | -.003 | 3 | -.005 | 3 | -.218 | 4 | -1.058e-4 | 1 | NC | 1 | 254.23 | 4 |
| 171 | | 10 | max | .003 | 1 | 0 | 15 | .003 | 1 | 2.307e-3 | 4 | NC | 1 | NC | 1 |
| 172 | | | min | -.002 | 3 | -.005 | 3 | -.181 | 4 | -9.047e-5 | 1 | NC | 1 | 305.306 | 4 |
| 173 | | 11 | max | .002 | 1 | 0 | 15 | .002 | 1 | 2.414e-3 | 4 | NC | 1 | NC | 1 |
| 174 | | | min | -.002 | 3 | -.004 | 3 | -.147 | 4 | -7.509e-5 | 1 | NC | 1 | 375.604 | 4 |
| 175 | | 12 | max | .002 | 1 | 0 | 15 | .002 | 1 | 2.522e-3 | 4 | NC | 1 | NC | 1 |
| 176 | | | min | -.002 | 3 | -.004 | 3 | -.116 | 4 | -5.97e-5 | 1 | NC | 1 | 476.302 | 4 |
| 177 | | 13 | max | .002 | 1 | 0 | 15 | .001 | 1 | 2.629e-3 | 4 | NC | 1 | NC | 1 |
| 178 | | | min | -.002 | 3 | -.003 | 3 | -.088 | 4 | -4.432e-5 | 1 | NC | 1 | 628.163 | 4 |
| 179 | | 14 | max | .002 | 1 | 0 | 15 | 0 | 1 | 2.737e-3 | 4 | NC | 1 | NC | 1 |
| 180 | | | min | -.001 | 3 | -.003 | 3 | -.063 | 4 | -2.894e-5 | 1 | NC | 1 | 873.462 | 4 |
| 181 | | 15 | max | .001 | 1 | 0 | 15 | 0 | 1 | 2.844e-3 | 4 | NC | 1 | NC | 1 |
| 182 | | | min | -.001 | 3 | -.002 | 3 | -.042 | 4 | -1.356e-5 | 1 | NC | 1 | 1309.768 | 4 |
| 183 | | 16 | max | 0 | 1 | 0 | 15 | 0 | 1 | 2.952e-3 | 4 | NC | 1 | NC | 1 |
| 184 | | | min | 0 | 3 | -.002 | 3 | -.025 | 4 | -2.231e-7 | 3 | NC | 1 | 2207.274 | 4 |
| 185 | | 17 | max | 0 | 1 | 0 | 15 | 0 | 1 | 3.059e-3 | 4 | NC | 1 | NC | 1 |
| 186 | | | min | 0 | 3 | -.001 | 6 | -.012 | 4 | 5.421e-7 | 12 | NC | 1 | 4570.601 | 4 |
| 187 | | 18 | max | 0 | 1 | 0 | 15 | 0 | 1 | 3.167e-3 | 4 | NC | 1 | NC | 1 |
| 188 | | | min | 0 | 3 | 0 | 6 | -.004 | 4 | 1.22e-6 | 12 | NC | 1 | NC | 1 |
| 189 | | 19 | max | 0 | 1 | 0 | 1 | 0 | 1 | 3.274e-3 | 4 | NC | 1 | NC | 1 |
| 190 | | | min | 0 | 1 | 0 | 1 | 0 | 1 | 1.898e-6 | 12 | NC | 1 | NC | 1 |
| 191 | M3 | 1 | max | 0 | 1 | 0 | 1 | 0 | 1 | -6.029e-7 | 12 | NC | 1 | NC | 1 |
| 192 | | | min | 0 | 1 | 0 | 1 | 0 | 1 | -7.707e-4 | 4 | NC | 1 | NC | 1 |
| 193 | | 2 | max | 0 | 3 | 0 | 15 | .016 | 4 | 1.079e-5 | 1 | NC | 1 | NC | 1 |
| 194 | | | min | 0 | 2 | -.002 | 6 | 0 | 12 | -8.724e-5 | 5 | NC | 1 | NC | 1 |
| 195 | | 3 | max | 0 | 3 | 0 | 15 | .03 | 4 | 5.999e-4 | 4 | NC | 1 | NC | 1 |
| 196 | | | min | 0 | 2 | -.003 | 6 | 0 | 12 | 1.515e-6 | 12 | NC | 1 | NC | 1 |
| 197 | | 4 | max | 0 | 3 | -.001 | 15 | .044 | 4 | 1.285e-3 | 4 | NC | 1 | NC | 1 |
| 198 | | | min | 0 | 2 | -.005 | 6 | 0 | 12 | 2.574e-6 | 12 | NC | 1 | 8617.972 | 4 |
| 199 | | 5 | max | 0 | 3 | -.002 | 15 | .057 | 4 | 1.97e-3 | 4 | NC | 1 | NC | 1 |
| 200 | | | min | 0 | 2 | -.007 | 6 | 0 | 12 | 3.633e-6 | 12 | NC | 1 | 7390.55 | 5 |
| 201 | | 6 | max | .001 | 3 | -.002 | 15 | .069 | 4 | 2.656e-3 | 4 | NC | 1 | NC | 1 |
| 202 | | | min | 0 | 2 | -.009 | 6 | 0 | 12 | 4.692e-6 | 12 | NC | 1 | 6848.374 | 5 |
| 203 | | 7 | max | .001 | 3 | -.002 | 15 | .081 | 4 | 3.341e-3 | 4 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 204 | | | min | 0 | 2 | -.01 | 6 | 0 | 12 | 5.751e-6 | 12 | 9082.49 | 6 | 6718.377 | 5 |
| 205 | | 8 | max | .002 | 3 | -.002 | 15 | .092 | 4 | 4.026e-3 | 4 | NC | 1 | NC | 1 |
| 206 | | | min | -.001 | 2 | -.011 | 6 | 0 | 12 | 6.809e-6 | 12 | 8115.637 | 6 | 6912.69 | 5 |
| 207 | | 9 | max | .002 | 3 | -.003 | 15 | .102 | 4 | 4.712e-3 | 4 | NC | 2 | NC | 1 |
| 208 | | | min | -.001 | 2 | -.012 | 6 | 0 | 12 | 7.868e-6 | 12 | 7539.713 | 6 | 7437.247 | 5 |
| 209 | | 10 | max | .002 | 3 | -.003 | 15 | .112 | 4 | 5.397e-3 | 4 | NC | 2 | NC | 1 |
| 210 | | | min | -.001 | 2 | -.013 | 6 | 0 | 12 | 8.927e-6 | 12 | 7253.115 | 6 | 8379.469 | 5 |
| 211 | | 11 | max | .002 | 3 | -.003 | 15 | .121 | 4 | 6.082e-3 | 4 | NC | 3 | NC | 1 |
| 212 | | | min | -.002 | 2 | -.013 | 6 | 0 | 12 | 9.986e-6 | 12 | 7213.156 | 6 | 9948.217 | 5 |
| 213 | | 12 | max | .002 | 3 | -.003 | 15 | .13 | 4 | 6.767e-3 | 4 | NC | 2 | NC | 1 |
| 214 | | | min | -.002 | 2 | -.012 | 6 | 0 | 12 | 1.105e-5 | 12 | 7419.628 | 6 | NC | 1 |
| 215 | | 13 | max | .003 | 3 | -.003 | 15 | .14 | 4 | 7.453e-3 | 4 | NC | 1 | NC | 1 |
| 216 | | | min | -.002 | 2 | -.012 | 6 | 0 | 12 | 1.21e-5 | 12 | 7916.766 | 6 | NC | 1 |
| 217 | | 14 | max | .003 | 3 | -.002 | 15 | .149 | 4 | 8.138e-3 | 4 | NC | 1 | NC | 1 |
| 218 | | | min | -.002 | 2 | -.011 | 6 | 0 | 12 | 1.316e-5 | 12 | 8816.602 | 6 | NC | 1 |
| 219 | | 15 | max | .003 | 3 | -.002 | 15 | .158 | 4 | 8.823e-3 | 4 | NC | 1 | NC | 1 |
| 220 | | | min | -.002 | 2 | -.009 | 6 | 0 | 12 | 1.422e-5 | 12 | NC | 1 | NC | 1 |
| 221 | | 16 | max | .003 | 3 | -.001 | 15 | .168 | 4 | 9.508e-3 | 4 | NC | 1 | NC | 1 |
| 222 | | | min | -.002 | 2 | -.008 | 1 | 0 | 12 | 1.528e-5 | 12 | NC | 1 | NC | 1 |
| 223 | | 17 | max | .003 | 3 | 0 | 15 | .179 | 4 | 1.019e-2 | 4 | NC | 1 | NC | 1 |
| 224 | | | min | -.002 | 2 | -.006 | 1 | 0 | 12 | 1.634e-5 | 12 | NC | 1 | NC | 1 |
| 225 | | 18 | max | .004 | 3 | 0 | 15 | .19 | 4 | 1.088e-2 | 4 | NC | 1 | NC | 1 |
| 226 | | | min | -.003 | 2 | -.005 | 1 | 0 | 12 | 1.74e-5 | 12 | NC | 1 | NC | 1 |
| 227 | | 19 | max | .004 | 3 | 0 | 5 | .202 | 4 | 1.156e-2 | 4 | NC | 1 | NC | 1 |
| 228 | | | min | -.003 | 2 | -.003 | 1 | 0 | 12 | 1.846e-5 | 12 | NC | 1 | NC | 1 |
| 229 | M4 | 1 | max | .003 | 1 | .002 | 2 | 0 | 12 | 2.055e-5 | 1 | NC | 1 | NC | 3 |
| 230 | | | min | 0 | 3 | -.004 | 3 | -.202 | 4 | -7.457e-4 | 4 | NC | 1 | 122.815 | 4 |
| 231 | | 2 | max | .003 | 1 | .002 | 2 | 0 | 12 | 2.055e-5 | 1 | NC | 1 | NC | 3 |
| 232 | | | min | 0 | 3 | -.004 | 3 | -.186 | 4 | -7.457e-4 | 4 | NC | 1 | 133.654 | 4 |
| 233 | | 3 | max | .003 | 1 | .002 | 2 | 0 | 12 | 2.055e-5 | 1 | NC | 1 | NC | 3 |
| 234 | | | min | 0 | 3 | -.004 | 3 | -.169 | 4 | -7.457e-4 | 4 | NC | 1 | 146.547 | 4 |
| 235 | | 4 | max | .002 | 1 | .002 | 2 | 0 | 12 | 2.055e-5 | 1 | NC | 1 | NC | 2 |
| 236 | | | min | 0 | 3 | -.003 | 3 | -.153 | 4 | -7.457e-4 | 4 | NC | 1 | 162.029 | 4 |
| 237 | | 5 | max | .002 | 1 | .002 | 2 | 0 | 12 | 2.055e-5 | 1 | NC | 1 | NC | 2 |
| 238 | | | min | 0 | 3 | -.003 | 3 | -.137 | 4 | -7.457e-4 | 4 | NC | 1 | 180.826 | 4 |
| 239 | | 6 | max | .002 | 1 | .002 | 2 | 0 | 12 | 2.055e-5 | 1 | NC | 1 | NC | 2 |
| 240 | | | min | 0 | 3 | -.003 | 3 | -.122 | 4 | -7.457e-4 | 4 | NC | 1 | 203.947 | 4 |
| 241 | | 7 | max | .002 | 1 | .002 | 2 | 0 | 12 | 2.055e-5 | 1 | NC | 1 | NC | 2 |
| 242 | | | min | 0 | 3 | -.003 | 3 | -.107 | 4 | -7.457e-4 | 4 | NC | 1 | 232.821 | 4 |
| 243 | | 8 | max | .002 | 1 | .001 | 2 | 0 | 12 | 2.055e-5 | 1 | NC | 1 | NC | 2 |
| 244 | | | min | 0 | 3 | -.002 | 3 | -.092 | 4 | -7.457e-4 | 4 | NC | 1 | 269.534 | 4 |
| 245 | | 9 | max | .002 | 1 | .001 | 2 | 0 | 12 | 2.055e-5 | 1 | NC | 1 | NC | 2 |
| 246 | | | min | 0 | 3 | -.002 | 3 | -.078 | 4 | -7.457e-4 | 4 | NC | 1 | 317.228 | 4 |
| 247 | | 10 | max | .001 | 1 | .001 | 2 | 0 | 12 | 2.055e-5 | 1 | NC | 1 | NC | 2 |
| 248 | | | min | 0 | 3 | -.002 | 3 | -.065 | 4 | -7.457e-4 | 4 | NC | 1 | 380.811 | 4 |
| 249 | | 11 | max | .001 | 1 | .001 | 2 | 0 | 12 | 2.055e-5 | 1 | NC | 1 | NC | 1 |
| 250 | | | min | 0 | 3 | -.002 | 3 | -.053 | 4 | -7.457e-4 | 4 | NC | 1 | 468.318 | 4 |
| 251 | | 12 | max | .001 | 1 | 0 | 2 | 0 | 12 | 2.055e-5 | 1 | NC | 1 | NC | 1 |
| 252 | | | min | 0 | 3 | -.002 | 3 | -.042 | 4 | -7.457e-4 | 4 | NC | 1 | 593.643 | 4 |
| 253 | | 13 | max | 0 | 1 | 0 | 2 | 0 | 12 | 2.055e-5 | 1 | NC | 1 | NC | 1 |
| 254 | | | min | 0 | 3 | -.001 | 3 | -.032 | 4 | -7.457e-4 | 4 | NC | 1 | 782.581 | 4 |
| 255 | | 14 | max | 0 | 1 | 0 | 2 | 0 | 12 | 2.055e-5 | 1 | NC | 1 | NC | 1 |
| 256 | | | min | 0 | 3 | -.001 | 3 | -.023 | 4 | -7.457e-4 | 4 | NC | 1 | 1087.614 | 4 |
| 257 | | 15 | max | 0 | 1 | 0 | 2 | 0 | 12 | 2.055e-5 | 1 | NC | 1 | NC | 1 |
| 258 | | | min | 0 | 3 | 0 | 3 | -.015 | 4 | -7.457e-4 | 4 | NC | 1 | 1629.735 | 4 |
| 259 | | 16 | max | 0 | 1 | 0 | 2 | 0 | 12 | 2.055e-5 | 1 | NC | 1 | NC | 1 |
| 260 | | | min | 0 | 3 | 0 | 3 | -.009 | 4 | -7.457e-4 | 4 | NC | 1 | 2743.456 | 4 |

## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 261 | | 17 | max | 0 | 1 | 0 | 2 | 0 | 12 | 2.055e-5 | 1 | NC | 1 | NC | 1 |
| 262 | | | min | 0 | 3 | 0 | 3 | -.004 | 4 | -7.457e-4 | 4 | NC | 1 | 5669.297 | 4 |
| 263 | | 18 | max | 0 | 1 | 0 | 2 | 0 | 12 | 2.055e-5 | 1 | NC | 1 | NC | 1 |
| 264 | | | min | 0 | 3 | 0 | 3 | -.001 | 4 | -7.457e-4 | 4 | NC | 1 | NC | 1 |
| 265 | | 19 | max | 0 | 1 | 0 | 1 | 0 | 1 | 2.055e-5 | 1 | NC | 1 | NC | 1 |
| 266 | | | min | 0 | 1 | 0 | 1 | 0 | 1 | -7.457e-4 | 4 | NC | 1 | NC | 1 |
| 267 | M6 | 1 | max | .018 | 1 | .014 | 2 | 0 | 1 | 1.456e-3 | 4 | NC | 3 | NC | 1 |
| 268 | | | min | -.016 | 3 | -.02 | 3 | -.57 | 4 | 0 | 1 | 3873.963 | 2 | 97.044 | 4 |
| 269 | | 2 | max | .017 | 1 | .013 | 2 | 0 | 1 | 1.556e-3 | 4 | NC | 3 | NC | 1 |
| 270 | | | min | -.015 | 3 | -.019 | 3 | -.524 | 4 | 0 | 1 | 4263.253 | 2 | 105.705 | 4 |
| 271 | | 3 | max | .016 | 1 | .012 | 2 | 0 | 1 | 1.656e-3 | 4 | NC | 3 | NC | 1 |
| 272 | | | min | -.014 | 3 | -.018 | 3 | -.477 | 4 | 0 | 1 | 4735.496 | 2 | 115.997 | 4 |
| 273 | | 4 | max | .015 | 1 | .01 | 2 | 0 | 1 | 1.757e-3 | 4 | NC | 1 | NC | 1 |
| 274 | | | min | -.013 | 3 | -.017 | 3 | -.431 | 4 | 0 | 1 | 5315.289 | 2 | 128.347 | 4 |
| 275 | | 5 | max | .014 | 1 | .009 | 2 | 0 | 1 | 1.857e-3 | 4 | NC | 1 | NC | 1 |
| 276 | | | min | -.012 | 3 | -.016 | 3 | -.386 | 4 | 0 | 1 | 6037.394 | 2 | 143.331 | 4 |
| 277 | | 6 | max | .013 | 1 | .008 | 2 | 0 | 1 | 1.957e-3 | 4 | NC | 1 | NC | 1 |
| 278 | | | min | -.012 | 3 | -.015 | 3 | -.342 | 4 | 0 | 1 | 6952.254 | 2 | 161.754 | 4 |
| 279 | | 7 | max | .012 | 1 | .007 | 2 | 0 | 1 | 2.057e-3 | 4 | NC | 1 | NC | 1 |
| 280 | | | min | -.011 | 3 | -.014 | 3 | -.3 | 4 | 0 | 1 | 8135.403 | 2 | 184.754 | 4 |
| 281 | | 8 | max | .011 | 1 | .006 | 2 | 0 | 1 | 2.157e-3 | 4 | NC | 1 | NC | 1 |
| 282 | | | min | -.01 | 3 | -.013 | 3 | -.259 | 4 | 0 | 1 | 9704.238 | 2 | 213.992 | 4 |
| 283 | | 9 | max | .01 | 1 | .005 | 2 | 0 | 1 | 2.257e-3 | 4 | NC | 1 | NC | 1 |
| 284 | | | min | -.009 | 3 | -.012 | 3 | -.22 | 4 | 0 | 1 | NC | 1 | 251.972 | 4 |
| 285 | | 10 | max | .009 | 1 | .004 | 2 | 0 | 1 | 2.358e-3 | 4 | NC | 1 | NC | 1 |
| 286 | | | min | -.008 | 3 | -.011 | 3 | -.183 | 4 | 0 | 1 | NC | 1 | 302.607 | 4 |
| 287 | | 11 | max | .008 | 1 | .003 | 2 | 0 | 1 | 2.458e-3 | 4 | NC | 1 | NC | 1 |
| 288 | | | min | -.007 | 3 | -.009 | 3 | -.149 | 4 | 0 | 1 | NC | 1 | 372.302 | 4 |
| 289 | | 12 | max | .007 | 1 | .002 | 2 | 0 | 1 | 2.558e-3 | 4 | NC | 1 | NC | 1 |
| 290 | | | min | -.006 | 3 | -.008 | 3 | -.117 | 4 | 0 | 1 | NC | 1 | 472.145 | 4 |
| 291 | | 13 | max | .006 | 1 | .001 | 2 | 0 | 1 | 2.658e-3 | 4 | NC | 1 | NC | 1 |
| 292 | | | min | -.005 | 3 | -.007 | 3 | -.089 | 4 | 0 | 1 | NC | 1 | 622.731 | 4 |
| 293 | | 14 | max | .005 | 1 | 0 | 2 | 0 | 1 | 2.758e-3 | 4 | NC | 1 | NC | 1 |
| 294 | | | min | -.004 | 3 | -.006 | 3 | -.064 | 4 | 0 | 1 | NC | 1 | 866.002 | 4 |
| 295 | | 15 | max | .004 | 1 | 0 | 2 | 0 | 1 | 2.859e-3 | 4 | NC | 1 | NC | 1 |
| 296 | | | min | -.004 | 3 | -.005 | 3 | -.043 | 4 | 0 | 1 | NC | 1 | 1298.785 | 4 |
| 297 | | 16 | max | .003 | 1 | 0 | 2 | 0 | 1 | 2.959e-3 | 4 | NC | 1 | NC | 1 |
| 298 | | | min | -.003 | 3 | -.004 | 3 | -.025 | 4 | 0 | 1 | NC | 1 | 2189.298 | 4 |
| 299 | | 17 | max | .002 | 1 | 0 | 2 | 0 | 1 | 3.059e-3 | 4 | NC | 1 | NC | 1 |
| 300 | | | min | -.002 | 3 | -.002 | 3 | -.012 | 4 | 0 | 1 | NC | 1 | 4535.364 | 4 |
| 301 | | 18 | max | .001 | 1 | 0 | 2 | 0 | 1 | 3.159e-3 | 4 | NC | 1 | NC | 1 |
| 302 | | | min | 0 | 3 | -.001 | 3 | -.004 | 4 | 0 | 1 | NC | 1 | NC | 1 |
| 303 | | 19 | max | 0 | 1 | 0 | 1 | 0 | 1 | 3.259e-3 | 4 | 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 | -7.655e-4 | 4 | NC | 1 | NC | 1 |
| 307 | | 2 | max | 0 | 3 | 0 | 15 | .016 | 4 | 0 | 1 | NC | 1 | NC | 1 |
| 308 | | | min | 0 | 2 | -.002 | 3 | 0 | 1 | -9.605e-5 | 4 | NC | 1 | NC | 1 |
| 309 | | 3 | max | .001 | 3 | 0 | 15 | .03 | 4 | 5.734e-4 | 4 | NC | 1 | NC | 1 |
| 310 | | | min | -.001 | 2 | -.004 | 3 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 311 | | 4 | max | .002 | 3 | -.001 | 15 | .044 | 4 | 1.243e-3 | 4 | NC | 1 | NC | 1 |
| 312 | | | min | -.002 | 2 | -.006 | 3 | 0 | 1 | 0 | 1 | NC | 1 | 8138.135 | 4 |
| 313 | | 5 | max | .003 | 3 | -.002 | 15 | .057 | 4 | 1.912e-3 | 4 | NC | 1 | NC | 1 |
| 314 | | | min | -.003 | 2 | -.007 | 3 | 0 | 1 | 0 | 1 | NC | 1 | 6944.786 | 4 |
| 315 | | 6 | max | .003 | 3 | -.002 | 15 | .069 | 4 | 2.582e-3 | 4 | NC | 1 | NC | 1 |
| 316 | | | min | -.003 | 2 | -.009 | 3 | 0 | 1 | 0 | 1 | NC | 1 | 6403.42 | 4 |
| 317 | | 7 | max | .004 | 3 | -.002 | 15 | .08 | 4 | 3.251e-3 | 4 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 318 | | | min | -.004 | 2 | -.01 | 4 | 0 | 1 | 0 | 1 | 9173.392 | 4 | 6243.857 | 4 |
| 319 | | 8 | max | .005 | 3 | -.003 | 15 | .091 | 4 | 3.92e-3 | 4 | NC | 1 | NC | 1 |
| 320 | | | min | -.005 | 2 | -.012 | 4 | 0 | 1 | 0 | 1 | 8190.612 | 4 | 6376.054 | 4 |
| 321 | | 9 | max | .005 | 3 | -.003 | 15 | .101 | 4 | 4.59e-3 | 4 | NC | 1 | NC | 1 |
| 322 | | | min | -.005 | 2 | -.013 | 4 | 0 | 1 | 0 | 1 | 7604.587 | 4 | 6793.991 | 4 |
| 323 | | 10 | max | .006 | 3 | -.003 | 15 | .11 | 4 | 5.259e-3 | 4 | NC | 1 | NC | 1 |
| 324 | | | min | -.006 | 2 | -.013 | 4 | 0 | 1 | 0 | 1 | 7311.699 | 4 | 7557.96 | 4 |
| 325 | | 11 | max | .007 | 3 | -.003 | 15 | .12 | 4 | 5.929e-3 | 4 | NC | 1 | NC | 1 |
| 326 | | | min | -.006 | 2 | -.013 | 4 | 0 | 1 | 0 | 1 | 7268.238 | 4 | 8817.35 | 4 |
| 327 | | 12 | max | .007 | 3 | -.003 | 15 | .129 | 4 | 6.598e-3 | 4 | NC | 1 | NC | 1 |
| 328 | | | min | -.007 | 2 | -.013 | 4 | 0 | 1 | 0 | 1 | 7473.546 | 4 | NC | 1 |
| 329 | | 13 | max | .008 | 3 | -.003 | 15 | .137 | 4 | 7.268e-3 | 4 | NC | 1 | NC | 1 |
| 330 | | | min | -.008 | 2 | -.012 | 4 | 0 | 1 | 0 | 1 | 7971.852 | 4 | NC | 1 |
| 331 | | 14 | max | .009 | 3 | -.003 | 15 | .146 | 4 | 7.937e-3 | 4 | NC | 1 | NC | 1 |
| 332 | | | min | -.008 | 2 | -.011 | 4 | 0 | 1 | 0 | 1 | 8875.695 | 4 | NC | 1 |
| 333 | | 15 | max | .01 | 3 | -.002 | 15 | .155 | 4 | 8.606e-3 | 4 | NC | 1 | NC | 1 |
| 334 | | | min | -.009 | 2 | -.011 | 1 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 335 | | 16 | max | .01 | 3 | -.002 | 15 | .165 | 4 | 9.276e-3 | 4 | NC | 1 | NC | 1 |
| 336 | | | min | -.01 | 2 | -.01 | 1 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 337 | | 17 | max | .011 | 3 | -.001 | 15 | .175 | 4 | 9.945e-3 | 4 | NC | 1 | NC | 1 |
| 338 | | | min | -.01 | 2 | -.009 | 1 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 339 | | 18 | max | .012 | 3 | 0 | 15 | .185 | 4 | 1.061e-2 | 4 | NC | 1 | NC | 1 |
| 340 | | | min | -.011 | 2 | -.008 | 1 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 341 | | 19 | max | .012 | 3 | 0 | 15 | .197 | 4 | 1.128e-2 | 4 | NC | 1 | NC | 1 |
| 342 | | | min | -.012 | 2 | -.006 | 1 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 343 | M8 | 1 | max | .008 | 1 | .01 | 2 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 344 | | | min | -.002 | 3 | -.012 | 3 | -.197 | 4 | -7.953e-4 | 4 | NC | 1 | 126.119 | 4 |
| 345 | | 2 | max | .008 | 1 | .01 | 2 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 346 | | | min | -.001 | 3 | -.012 | 3 | -.181 | 4 | -7.953e-4 | 4 | NC | 1 | 137.253 | 4 |
| 347 | | 3 | max | .007 | 1 | .009 | 2 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 348 | | | min | -.001 | 3 | -.011 | 3 | -.165 | 4 | -7.953e-4 | 4 | NC | 1 | 150.497 | 4 |
| 349 | | 4 | max | .007 | 1 | .009 | 2 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 350 | | | min | -.001 | 3 | -.01 | 3 | -.149 | 4 | -7.953e-4 | 4 | NC | 1 | 166.4 | 4 |
| 351 | | 5 | max | .006 | 1 | .008 | 2 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 352 | | | min | -.001 | 3 | -.01 | 3 | -.134 | 4 | -7.953e-4 | 4 | NC | 1 | 185.709 | 4 |
| 353 | | 6 | max | .006 | 1 | .007 | 2 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 354 | | | min | -.001 | 3 | -.009 | 3 | -.118 | 4 | -7.953e-4 | 4 | NC | 1 | 209.458 | 4 |
| 355 | | 7 | max | .005 | 1 | .007 | 2 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 356 | | | min | -.001 | 3 | -.008 | 3 | -.104 | 4 | -7.953e-4 | 4 | NC | 1 | 239.117 | 4 |
| 357 | | 8 | max | .005 | 1 | .006 | 2 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 358 | | | min | 0 | 3 | -.008 | 3 | -.09 | 4 | -7.953e-4 | 4 | NC | 1 | 276.829 | 4 |
| 359 | | 9 | max | .004 | 1 | .006 | 2 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 360 | | | min | 0 | 3 | -.007 | 3 | -.076 | 4 | -7.953e-4 | 4 | NC | 1 | 325.819 | 4 |
| 361 | | 10 | max | .004 | 1 | .005 | 2 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 362 | | | min | 0 | 3 | -.006 | 3 | -.063 | 4 | -7.953e-4 | 4 | NC | 1 | 391.131 | 4 |
| 363 | | 11 | max | .004 | 1 | .005 | 2 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 364 | | | min | 0 | 3 | -.005 | 3 | -.052 | 4 | -7.953e-4 | 4 | NC | 1 | 481.017 | 4 |
| 365 | | 12 | max | .003 | 1 | .004 | 2 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 366 | | | min | 0 | 3 | -.005 | 3 | -.041 | 4 | -7.953e-4 | 4 | NC | 1 | 609.75 | 4 |
| 367 | | 13 | max | .003 | 1 | .003 | 2 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 368 | | | min | 0 | 3 | -.004 | 3 | -.031 | 4 | -7.953e-4 | 4 | NC | 1 | 803.827 | 4 |
| 369 | | 14 | max | .002 | 1 | .003 | 2 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 370 | | | min | 0 | 3 | -.003 | 3 | -.022 | 4 | -7.953e-4 | 4 | NC | 1 | 1117.158 | 4 |
| 371 | | 15 | max | .002 | 1 | .002 | 2 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 372 | | | min | 0 | 3 | -.003 | 3 | -.015 | 4 | -7.953e-4 | 4 | NC | 1 | 1674.03 | 4 |
| 373 | | 16 | max | .001 | 1 | .002 | 2 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 374 | | | min | 0 | 3 | -.002 | 3 | -.009 | 4 | -7.953e-4 | 4 | NC | 1 | 2818.067 | 4 |

## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 375 | | 17 | max | 0 | 1 | .001 | 2 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 376 | | | min | 0 | 3 | -.001 | 3 | -.004 | 4 | -7.953e-4 | 4 | NC | 1 | 5823.589 | 4 |
| 377 | | 18 | max | 0 | 1 | 0 | 2 | 0 | 1 | 0 | 1 | NC | 1 | NC | 1 |
| 378 | | | min | 0 | 3 | 0 | 3 | -.001 | 4 | -7.953e-4 | 4 | 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 | -7.953e-4 | 4 | NC | 1 | NC | 1 |
| 381 | M10 | 1 | max | .006 | 1 | .003 | 2 | 0 | 12 | 1.461e-3 | 4 | NC | 1 | NC | 2 |
| 382 | | | min | -.005 | 3 | -.006 | 3 | -.57 | 4 | 1.03e-5 | 12 | NC | 1 | 97.154 | 4 |
| 383 | | 2 | max | .005 | 1 | .003 | 2 | 0 | 12 | 1.561e-3 | 4 | NC | 1 | NC | 2 |
| 384 | | | min | -.005 | 3 | -.006 | 3 | -.523 | 4 | 9.626e-6 | 12 | NC | 1 | 105.825 | 4 |
| 385 | | 3 | max | .005 | 1 | .002 | 2 | 0 | 12 | 1.66e-3 | 4 | NC | 1 | NC | 2 |
| 386 | | | min | -.004 | 3 | -.006 | 3 | -.477 | 4 | 8.948e-6 | 12 | NC | 1 | 116.129 | 4 |
| 387 | | 4 | max | .005 | 1 | .002 | 2 | 0 | 12 | 1.759e-3 | 4 | NC | 1 | NC | 2 |
| 388 | | | min | -.004 | 3 | -.006 | 3 | -.431 | 4 | 8.27e-6 | 12 | NC | 1 | 128.493 | 4 |
| 389 | | 5 | max | .004 | 1 | .001 | 2 | 0 | 12 | 1.859e-3 | 4 | NC | 1 | NC | 2 |
| 390 | | | min | -.004 | 3 | -.006 | 3 | -.386 | 4 | 7.592e-6 | 12 | NC | 1 | 143.495 | 4 |
| 391 | | 6 | max | .004 | 1 | 0 | 2 | 0 | 12 | 1.958e-3 | 4 | NC | 1 | NC | 1 |
| 392 | | | min | -.004 | 3 | -.006 | 3 | -.342 | 4 | 6.914e-6 | 12 | NC | 1 | 161.939 | 4 |
| 393 | | 7 | max | .004 | 1 | 0 | 2 | 0 | 12 | 2.057e-3 | 4 | NC | 1 | NC | 1 |
| 394 | | | min | -.003 | 3 | -.005 | 3 | -.299 | 4 | 6.236e-6 | 12 | NC | 1 | 184.965 | 4 |
| 395 | | 8 | max | .003 | 1 | 0 | 2 | 0 | 12 | 2.156e-3 | 4 | NC | 1 | NC | 1 |
| 396 | | | min | -.003 | 3 | -.005 | 3 | -.258 | 4 | 5.559e-6 | 12 | NC | 1 | 214.238 | 4 |
| 397 | | 9 | max | .003 | 1 | 0 | 2 | 0 | 12 | 2.256e-3 | 4 | NC | 1 | NC | 1 |
| 398 | | | min | -.003 | 3 | -.005 | 3 | -.219 | 4 | 4.881e-6 | 12 | NC | 1 | 252.262 | 4 |
| 399 | | 10 | max | .003 | 1 | 0 | 10 | 0 | 12 | 2.355e-3 | 4 | NC | 1 | NC | 1 |
| 400 | | | min | -.002 | 3 | -.005 | 3 | -.183 | 4 | 4.203e-6 | 12 | NC | 1 | 302.957 | 4 |
| 401 | | 11 | max | .002 | 1 | -.001 | 15 | 0 | 12 | 2.454e-3 | 4 | NC | 1 | NC | 1 |
| 402 | | | min | -.002 | 3 | -.004 | 3 | -.148 | 4 | 3.525e-6 | 12 | NC | 1 | 372.735 | 4 |
| 403 | | 12 | max | .002 | 1 | -.001 | 15 | 0 | 12 | 2.553e-3 | 4 | NC | 1 | NC | 1 |
| 404 | | | min | -.002 | 3 | -.004 | 3 | -.117 | 4 | 2.847e-6 | 12 | NC | 1 | 472.698 | 4 |
| 405 | | 13 | max | .002 | 1 | 0 | 15 | 0 | 12 | 2.653e-3 | 4 | NC | 1 | NC | 1 |
| 406 | | | min | -.002 | 3 | -.003 | 4 | -.089 | 4 | 2.169e-6 | 12 | NC | 1 | 623.467 | 4 |
| 407 | | 14 | max | .002 | 1 | 0 | 15 | 0 | 12 | 2.752e-3 | 4 | NC | 1 | NC | 1 |
| 408 | | | min | -.001 | 3 | -.003 | 4 | -.064 | 4 | 1.491e-6 | 12 | NC | 1 | 867.04 | 4 |
| 409 | | 15 | max | .001 | 1 | 0 | 15 | 0 | 12 | 2.851e-3 | 4 | NC | 1 | NC | 1 |
| 410 | | | min | -.001 | 3 | -.003 | 4 | -.043 | 4 | 8.136e-7 | 12 | NC | 1 | 1300.372 | 4 |
| 411 | | 16 | max | 0 | 1 | 0 | 15 | 0 | 12 | 2.951e-3 | 4 | NC | 1 | NC | 1 |
| 412 | | | min | 0 | 3 | -.002 | 4 | -.025 | 4 | -1.821e-6 | 1 | NC | 1 | 2192.056 | 4 |
| 413 | | 17 | max | 0 | 1 | 0 | 15 | 0 | 12 | 3.05e-3 | 4 | NC | 1 | NC | 1 |
| 414 | | | min | 0 | 3 | -.002 | 4 | -.012 | 4 | -1.72e-5 | 1 | NC | 1 | 4541.398 | 4 |
| 415 | | 18 | max | 0 | 1 | 0 | 15 | 0 | 12 | 3.149e-3 | 4 | NC | 1 | NC | 1 |
| 416 | | | min | 0 | 3 | 0 | 4 | -.004 | 4 | -3.258e-5 | 1 | NC | 1 | NC | 1 |
| 417 | | 19 | max | 0 | 1 | 0 | 1 | 0 | 1 | 3.248e-3 | 4 | NC | 1 | NC | 1 |
| 418 | | | min | 0 | 1 | 0 | 1 | 0 | 1 | -4.796e-5 | 1 | NC | 1 | NC | 1 |
| 419 | M11 | 1 | max | 0 | 1 | 0 | 1 | 0 | 1 | 1.508e-5 | 1 | NC | 1 | NC | 1 |
| 420 | | | min | 0 | 1 | 0 | 1 | 0 | 1 | -7.626e-4 | 4 | NC | 1 | NC | 1 |
| 421 | | 2 | max | 0 | 3 | 0 | 15 | .016 | 4 | -4.56e-7 | 12 | NC | 1 | NC | 1 |
| 422 | | | min | 0 | 2 | -.002 | 4 | 0 | 1 | -9.11e-5 | 4 | NC | 1 | NC | 1 |
| 423 | | 3 | max | 0 | 3 | 0 | 15 | .03 | 4 | 5.804e-4 | 4 | NC | 1 | NC | 1 |
| 424 | | | min | 0 | 2 | -.004 | 4 | 0 | 1 | -3.666e-5 | 1 | NC | 1 | NC | 1 |
| 425 | | 4 | max | 0 | 3 | -.001 | 15 | .044 | 4 | 1.252e-3 | 4 | NC | 1 | NC | 1 |
| 426 | | | min | 0 | 2 | -.006 | 4 | 0 | 1 | -6.253e-5 | 1 | NC | 1 | 8372.29 | 4 |
| 427 | | 5 | max | 0 | 3 | -.002 | 15 | .057 | 4 | 1.923e-3 | 4 | NC | 1 | NC | 1 |
| 428 | | | min | 0 | 2 | -.007 | 4 | -.001 | 1 | -8.84e-5 | 1 | NC | 1 | 7167.02 | 4 |
| 429 | | 6 | max | .001 | 3 | -.002 | 15 | .069 | 4 | 2.595e-3 | 4 | NC | 1 | NC | 1 |
| 430 | | | min | 0 | 2 | -.009 | 4 | -.001 | 1 | -1.143e-4 | 1 | NC | 1 | 6632.812 | 4 |
| 431 | | 7 | max | .001 | 3 | -.003 | 15 | .08 | 4 | 3.266e-3 | 4 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 432 | | | min | 0 | 2 | -.011 | 4 | -.002 | 1 | -1.401e-4 | 1 | 8763.091 | 4 | 6496.338 | 4 |
| 433 | | 8 | max | .002 | 3 | -.003 | 15 | .09 | 4 | 3.938e-3 | 4 | NC | 1 | NC | 1 |
| 434 | | | min | -.001 | 2 | -.012 | 4 | -.002 | 1 | -1.66e-4 | 1 | 7851.293 | 4 | 6670.169 | 4 |
| 435 | | 9 | max | .002 | 3 | -.003 | 15 | .101 | 4 | 4.609e-3 | 4 | NC | 2 | NC | 1 |
| 436 | | | min | -.001 | 2 | -.013 | 4 | -.002 | 1 | -1.919e-4 | 1 | 7310.332 | 4 | 7156.402 | 4 |
| 437 | | 10 | max | .002 | 3 | -.003 | 15 | .11 | 4 | 5.281e-3 | 4 | NC | 2 | NC | 1 |
| 438 | | | min | -.001 | 2 | -.013 | 4 | -.003 | 1 | -2.178e-4 | 1 | 7045.48 | 4 | 8032.673 | 4 |
| 439 | | 11 | max | .002 | 3 | -.003 | 15 | .119 | 4 | 5.952e-3 | 4 | NC | 3 | NC | 1 |
| 440 | | | min | -.002 | 2 | -.014 | 4 | -.003 | 1 | -2.436e-4 | 1 | 7017.546 | 4 | 9485.761 | 4 |
| 441 | | 12 | max | .002 | 3 | -.003 | 15 | .128 | 4 | 6.624e-3 | 4 | NC | 2 | NC | 1 |
| 442 | | | min | -.002 | 2 | -.013 | 4 | -.004 | 1 | -2.695e-4 | 1 | 7227.833 | 4 | NC | 1 |
| 443 | | 13 | max | .003 | 3 | -.003 | 15 | .137 | 4 | 7.295e-3 | 4 | NC | 1 | NC | 1 |
| 444 | | | min | -.002 | 2 | -.013 | 4 | -.004 | 1 | -2.954e-4 | 1 | 7720.54 | 4 | NC | 1 |
| 445 | | 14 | max | .003 | 3 | -.003 | 15 | .146 | 4 | 7.967e-3 | 4 | NC | 1 | NC | 1 |
| 446 | | | min | -.002 | 2 | -.011 | 4 | -.005 | 1 | -3.213e-4 | 1 | 8605.859 | 4 | NC | 1 |
| 447 | | 15 | max | .003 | 3 | -.002 | 15 | .155 | 4 | 8.638e-3 | 4 | NC | 1 | NC | 1 |
| 448 | | | min | -.002 | 2 | -.01 | 4 | -.005 | 1 | -3.471e-4 | 1 | NC | 1 | NC | 1 |
| 449 | | 16 | max | .003 | 3 | -.002 | 15 | .165 | 4 | 9.31e-3 | 4 | NC | 1 | NC | 1 |
| 450 | | | min | -.002 | 2 | -.008 | 4 | -.006 | 1 | -3.73e-4 | 1 | NC | 1 | NC | 1 |
| 451 | | 17 | max | .003 | 3 | -.002 | 15 | .175 | 4 | 9.981e-3 | 4 | NC | 1 | NC | 1 |
| 452 | | | min | -.002 | 2 | -.006 | 1 | -.007 | 1 | -3.989e-4 | 1 | NC | 1 | NC | 1 |
| 453 | | 18 | max | .004 | 3 | 0 | 15 | .186 | 4 | 1.065e-2 | 4 | NC | 1 | NC | 1 |
| 454 | | | min | -.003 | 2 | -.005 | 1 | -.007 | 1 | -4.247e-4 | 1 | NC | 1 | NC | 1 |
| 455 | | 19 | max | .004 | 3 | 0 | 15 | .198 | 4 | 1.132e-2 | 4 | NC | 1 | NC | 1 |
| 456 | | | min | -.003 | 2 | -.003 | 1 | -.008 | 1 | -4.506e-4 | 1 | NC | 1 | NC | 1 |
| 457 | M12 | 1 | max | .003 | 1 | .002 | 2 | .008 | 1 | -9.874e-7 | 12 | NC | 1 | NC | 3 |
| 458 | | | min | 0 | 3 | -.004 | 3 | -.198 | 4 | -7.564e-4 | 4 | NC | 1 | 125.492 | 4 |
| 459 | | 2 | max | .003 | 1 | .002 | 2 | .007 | 1 | -9.874e-7 | 12 | NC | 1 | NC | 3 |
| 460 | | | min | 0 | 3 | -.004 | 3 | -.182 | 4 | -7.564e-4 | 4 | NC | 1 | 136.566 | 4 |
| 461 | | 3 | max | .003 | 1 | .002 | 2 | .007 | 1 | -9.874e-7 | 12 | NC | 1 | NC | 3 |
| 462 | | | min | 0 | 3 | -.004 | 3 | -.166 | 4 | -7.564e-4 | 4 | NC | 1 | 149.74 | 4 |
| 463 | | 4 | max | .002 | 1 | .002 | 2 | .006 | 1 | -9.874e-7 | 12 | NC | 1 | NC | 2 |
| 464 | | | min | 0 | 3 | -.003 | 3 | -.15 | 4 | -7.564e-4 | 4 | NC | 1 | 165.559 | 4 |
| 465 | | 5 | max | .002 | 1 | .002 | 2 | .005 | 1 | -9.874e-7 | 12 | NC | 1 | NC | 2 |
| 466 | | | min | 0 | 3 | -.003 | 3 | -.134 | 4 | -7.564e-4 | 4 | NC | 1 | 184.765 | 4 |
| 467 | | 6 | max | .002 | 1 | .002 | 2 | .005 | 1 | -9.874e-7 | 12 | NC | 1 | NC | 2 |
| 468 | | | min | 0 | 3 | -.003 | 3 | -.119 | 4 | -7.564e-4 | 4 | NC | 1 | 208.389 | 4 |
| 469 | | 7 | max | .002 | 1 | .002 | 2 | .004 | 1 | -9.874e-7 | 12 | NC | 1 | NC | 2 |
| 470 | | | min | 0 | 3 | -.003 | 3 | -.104 | 4 | -7.564e-4 | 4 | NC | 1 | 237.891 | 4 |
| 471 | | 8 | max | .002 | 1 | .001 | 2 | .004 | 1 | -9.874e-7 | 12 | NC | 1 | NC | 2 |
| 472 | | | min | 0 | 3 | -.002 | 3 | -.09 | 4 | -7.564e-4 | 4 | NC | 1 | 275.403 | 4 |
| 473 | | 9 | max | .002 | 1 | .001 | 2 | .003 | 1 | -9.874e-7 | 12 | NC | 1 | NC | 2 |
| 474 | | | min | 0 | 3 | -.002 | 3 | -.077 | 4 | -7.564e-4 | 4 | NC | 1 | 324.134 | 4 |
| 475 | | 10 | max | .001 | 1 | .001 | 2 | .003 | 1 | -9.874e-7 | 12 | NC | 1 | NC | 2 |
| 476 | | | min | 0 | 3 | -.002 | 3 | -.064 | 4 | -7.564e-4 | 4 | NC | 1 | 389.1 | 4 |
| 477 | | 11 | max | .001 | 1 | .001 | 2 | .002 | 1 | -9.874e-7 | 12 | NC | 1 | NC | 1 |
| 478 | | | min | 0 | 3 | -.002 | 3 | -.052 | 4 | -7.564e-4 | 4 | NC | 1 | 478.51 | 4 |
| 479 | | 12 | max | .001 | 1 | 0 | 2 | .002 | 1 | -9.874e-7 | 12 | NC | 1 | NC | 1 |
| 480 | | | min | 0 | 3 | -.002 | 3 | -.041 | 4 | -7.564e-4 | 4 | NC | 1 | 606.561 | 4 |
| 481 | | 13 | max | 0 | 1 | 0 | 2 | .001 | 1 | -9.874e-7 | 12 | NC | 1 | NC | 1 |
| 482 | | | min | 0 | 3 | -.001 | 3 | -.031 | 4 | -7.564e-4 | 4 | NC | 1 | 799.608 | 4 |
| 483 | | 14 | max | 0 | 1 | 0 | 2 | 0 | 1 | -9.874e-7 | 12 | NC | 1 | NC | 1 |
| 484 | | | min | 0 | 3 | -.001 | 3 | -.022 | 4 | -7.564e-4 | 4 | NC | 1 | 1111.274 | 4 |
| 485 | | 15 | max | 0 | 1 | 0 | 2 | 0 | 1 | -9.874e-7 | 12 | NC | 1 | NC | 1 |
| 486 | | | min | 0 | 3 | 0 | 3 | -.015 | 4 | -7.564e-4 | 4 | NC | 1 | 1665.182 | 4 |
| 487 | | 16 | max | 0 | 1 | 0 | 2 | 0 | 1 | -9.874e-7 | 12 | NC | 1 | NC | 1 |
| 488 | | | min | 0 | 3 | 0 | 3 | -.009 | 4 | -7.564e-4 | 4 | NC | 1 | 2803.118 | 4 |

## *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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 489 | | 17 | max | 0 | 1 | 0 | 2 | 0 | 1 | -9.874e-7 | 12 | NC | 1 | NC | 1 |
| 490 | | | min | 0 | 3 | 0 | 3 | -.004 | 4 | -7.564e-4 | 4 | NC | 1 | 5792.566 | 4 |
| 491 | | 18 | max | 0 | 1 | 0 | 2 | 0 | 1 | -9.874e-7 | 12 | NC | 1 | NC | 1 |
| 492 | | | min | 0 | 3 | 0 | 3 | -.001 | 4 | -7.564e-4 | 4 | NC | 1 | NC | 1 |
| 493 | | 19 | max | 0 | 1 | 0 | 1 | 0 | 1 | -9.874e-7 | 12 | NC | 1 | NC | 1 |
| 494 | | | min | 0 | 1 | 0 | 1 | 0 | 1 | -7.564e-4 | 4 | NC | 1 | NC | 1 |
| 495 | M1 | 1 | max | .005 | 3 | .103 | 1 | .601 | 4 | 1.781e-2 | 1 | NC | 1 | NC | 1 |
| 496 | | | min | -.002 | 2 | -.012 | 3 | 0 | 12 | -2.093e-2 | 3 | NC | 1 | NC | 1 |
| 497 | | 2 | max | .005 | 3 | .051 | 1 | .583 | 4 | 9.28e-3 | 4 | NC | 3 | NC | 1 |
| 498 | | | min | -.002 | 2 | -.005 | 3 | -.006 | 1 | -1.036e-2 | 3 | 2178.901 | 1 | NC | 1 |
| 499 | | 3 | max | .005 | 3 | .007 | 3 | .565 | 4 | 1.48e-2 | 4 | NC | 5 | NC | 1 |
| 500 | | | min | -.002 | 2 | -.007 | 1 | -.009 | 1 | -1.709e-4 | 1 | 1041.764 | 1 | 7295.677 | 5 |
| 501 | | 4 | max | .005 | 3 | .029 | 3 | .547 | 4 | 1.303e-2 | 4 | NC | 5 | NC | 1 |
| 502 | | | min | -.002 | 2 | -.073 | 1 | -.008 | 1 | -3.69e-3 | 3 | 650.288 | 1 | 5094.894 | 5 |
| 503 | | 5 | max | .005 | 3 | .058 | 3 | .528 | 4 | 1.126e-2 | 4 | NC | 15 | NC | 1 |
| 504 | | | min | -.002 | 2 | -.143 | 1 | -.005 | 1 | -7.279e-3 | 3 | 464.926 | 1 | 3984.534 | 5 |
| 505 | | 6 | max | .005 | 3 | .089 | 3 | .51 | 4 | 1.475e-2 | 1 | NC | 15 | NC | 1 |
| 506 | | | min | -.002 | 2 | -.211 | 1 | -.002 | 1 | -1.087e-2 | 3 | 363.542 | 1 | 3323.935 | 5 |
| 507 | | 7 | max | .005 | 3 | .12 | 3 | .49 | 4 | 1.973e-2 | 1 | 9683.113 | 15 | NC | 1 |
| 508 | | | min | -.002 | 2 | -.273 | 1 | 0 | 12 | -1.446e-2 | 3 | 304.052 | 1 | 2882.437 | 4 |
| 509 | | 8 | max | .004 | 3 | .145 | 3 | .47 | 4 | 2.47e-2 | 1 | 8599.544 | 15 | NC | 1 |
| 510 | | | min | -.002 | 2 | -.322 | 1 | 0 | 12 | -1.804e-2 | 3 | 269.016 | 1 | 2574.457 | 4 |
| 511 | | 9 | max | .004 | 3 | .162 | 3 | .448 | 4 | 2.72e-2 | 1 | 8034.912 | 15 | NC | 1 |
| 512 | | | min | -.002 | 2 | -.353 | 1 | 0 | 1 | -1.806e-2 | 3 | 250.834 | 1 | 2395.488 | 4 |
| 513 | | 10 | max | .004 | 3 | .168 | 3 | .424 | 4 | 2.804e-2 | 1 | 7863.026 | 15 | NC | 1 |
| 514 | | | min | -.001 | 2 | -.363 | 1 | 0 | 12 | -1.57e-2 | 3 | 245.388 | 1 | 2348.325 | 4 |
| 515 | | 11 | max | .004 | 3 | .164 | 3 | .397 | 4 | 2.889e-2 | 1 | 8034.713 | 15 | NC | 1 |
| 516 | | | min | -.001 | 2 | -.352 | 1 | 0 | 12 | -1.335e-2 | 3 | 251.131 | 1 | 2411.651 | 4 |
| 517 | | 12 | max | .004 | 3 | .15 | 3 | .369 | 4 | 2.727e-2 | 1 | 8599.09 | 15 | NC | 1 |
| 518 | | | min | -.001 | 2 | -.321 | 1 | -.001 | 1 | -1.105e-2 | 3 | 269.945 | 1 | 2603.71 | 4 |
| 519 | | 13 | max | .004 | 3 | .128 | 3 | .337 | 4 | 2.193e-2 | 1 | 9682.242 | 15 | NC | 1 |
| 520 | | | min | -.001 | 2 | -.271 | 1 | 0 | 1 | -8.846e-3 | 3 | 306.356 | 1 | 3072.219 | 4 |
| 521 | | 14 | max | .004 | 3 | .099 | 3 | .303 | 4 | 1.659e-2 | 1 | NC | 15 | NC | 1 |
| 522 | | | min | -.001 | 2 | -.208 | 1 | 0 | 12 | -6.64e-3 | 3 | 368.518 | 1 | 4034.061 | 4 |
| 523 | | 15 | max | .004 | 3 | .067 | 3 | .268 | 4 | 1.125e-2 | 1 | NC | 15 | NC | 1 |
| 524 | | | min | -.001 | 2 | -.139 | 1 | 0 | 12 | -4.434e-3 | 3 | 475.232 | 1 | 6103.546 | 4 |
| 525 | | 16 | max | .004 | 3 | .034 | 3 | .234 | 4 | 9.788e-3 | 4 | NC | 5 | NC | 1 |
| 526 | | | min | -.001 | 2 | -.069 | 1 | 0 | 12 | -2.228e-3 | 3 | 672.109 | 1 | NC | 1 |
| 527 | | 17 | max | .004 | 3 | .002 | 3 | .203 | 4 | 1.082e-2 | 4 | NC | 5 | NC | 1 |
| 528 | | | min | -.001 | 2 | -.004 | 2 | 0 | 12 | -2.213e-5 | 3 | 1091.372 | 1 | NC | 1 |
| 529 | | 18 | max | .004 | 3 | .051 | 1 | .175 | 4 | 1.04e-2 | 1 | NC | 4 | NC | 1 |
| 530 | | | min | -.001 | 2 | -.026 | 3 | 0 | 12 | -3.552e-3 | 3 | 2305.296 | 1 | NC | 1 |
| 531 | | 19 | max | .004 | 3 | .1 | 1 | .149 | 4 | 2.058e-2 | 1 | NC | 1 | NC | 1 |
| 532 | | | min | -.001 | 2 | -.052 | 3 | -.001 | 1 | -7.217e-3 | 3 | NC | 1 | NC | 1 |
| 533 | M5 | 1 | max | .015 | 3 | .248 | 1 | .601 | 4 | 0 | 1 | NC | 1 | NC | 1 |
| 534 | | | min | -.01 | 2 | -.015 | 3 | 0 | 1 | -3.194e-6 | 4 | NC | 1 | NC | 1 |
| 535 | | 2 | max | .015 | 3 | .121 | 1 | .587 | 4 | 7.587e-3 | 4 | NC | 5 | NC | 1 |
| 536 | | | min | -.01 | 2 | -.005 | 3 | 0 | 1 | 0 | 1 | 900.345 | 1 | NC | 1 |
| 537 | | 3 | max | .015 | 3 | .022 | 3 | .57 | 4 | 1.494e-2 | 4 | NC | 15 | NC | 1 |
| 538 | | | min | -.01 | 2 | -.023 | 1 | 0 | 1 | 0 | 1 | 421.076 | 1 | 5964.644 | 4 |
| 539 | | 4 | max | .015 | 3 | .083 | 3 | .551 | 4 | 1.217e-2 | 4 | 9121.389 | 15 | NC | 1 |
| 540 | | | min | -.009 | 2 | -.199 | 1 | 0 | 1 | 0 | 1 | 255.656 | 1 | 4464.517 | 4 |
| 541 | | 5 | max | .015 | 3 | .167 | 3 | .531 | 4 | 9.406e-3 | 4 | 6386.097 | 15 | NC | 1 |
| 542 | | | min | -.009 | 2 | -.391 | 1 | 0 | 1 | 0 | 1 | 178.788 | 1 | 3711.194 | 4 |
| 543 | | 6 | max | .014 | 3 | .261 | 3 | .511 | 4 | 6.638e-3 | 4 | 4918.289 | 15 | NC | 1 |
| 544 | | | min | -.009 | 2 | -.582 | 1 | 0 | 1 | 0 | 1 | 137.544 | 1 | 3244.597 | 4 |
| 545 | | 7 | max | .014 | 3 | .353 | 3 | .49 | 4 | 3.87e-3 | 4 | 4070.301 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 546 | | | min | -.009 | 2 | -.756 | 1 | 0 | 1 | 0 | 1 | 113.718 | 1 | 2902.83 | 4 |
| 547 | | 8 | max | .014 | 3 | .431 | 3 | .469 | 4 | 1.103e-3 | 4 | 3577.093 | 15 | NC | 1 |
| 548 | | | min | -.009 | 2 | -.896 | 1 | 0 | 1 | 0 | 1 | 99.861 | 1 | 2613.008 | 4 |
| 549 | | 9 | max | .013 | 3 | .481 | 3 | .448 | 4 | 0 | 1 | 3324.108 | 15 | NC | 1 |
| 550 | | | min | -.009 | 2 | -.984 | 1 | 0 | 1 | -2.008e-6 | 5 | 92.758 | 1 | 2393.332 | 4 |
| 551 | | 10 | max | .013 | 3 | .499 | 3 | .424 | 4 | 0 | 1 | 3247.878 | 15 | NC | 1 |
| 552 | | | min | -.008 | 2 | -1.013 | 1 | 0 | 1 | -1.923e-6 | 5 | 90.643 | 1 | 2364.423 | 4 |
| 553 | | 11 | max | .013 | 3 | .486 | 3 | .397 | 4 | 0 | 1 | 3324.175 | 15 | NC | 1 |
| 554 | | | min | -.008 | 2 | -.983 | 1 | 0 | 1 | -1.839e-6 | 5 | 92.877 | 1 | 2437.367 | 4 |
| 555 | | 12 | max | .013 | 3 | .444 | 3 | .37 | 4 | 7.742e-4 | 4 | 3577.254 | 15 | NC | 1 |
| 556 | | | min | -.008 | 2 | -.893 | 1 | 0 | 1 | 0 | 1 | 100.254 | 1 | 2560.733 | 4 |
| 557 | | 13 | max | .012 | 3 | .377 | 3 | .338 | 4 | 2.718e-3 | 4 | 4070.636 | 15 | NC | 1 |
| 558 | | | min | -.008 | 2 | -.75 | 1 | 0 | 1 | 0 | 1 | 114.74 | 1 | 3023.902 | 4 |
| 559 | | 14 | max | .012 | 3 | .291 | 3 | .302 | 4 | 4.662e-3 | 4 | 4918.955 | 15 | NC | 1 |
| 560 | | | min | -.008 | 2 | -.572 | 1 | 0 | 1 | 0 | 1 | 139.844 | 1 | 4187.971 | 4 |
| 561 | | 15 | max | .012 | 3 | .195 | 3 | .266 | 4 | 6.606e-3 | 4 | 6387.428 | 15 | NC | 1 |
| 562 | | | min | -.008 | 2 | -.378 | 1 | 0 | 1 | 0 | 1 | 183.767 | 1 | 7394.309 | 4 |
| 563 | | 16 | max | .011 | 3 | .098 | 3 | .23 | 4 | 8.55e-3 | 4 | 9124.194 | 15 | NC | 1 |
| 564 | | | min | -.008 | 2 | -.185 | 1 | 0 | 1 | 0 | 1 | 266.783 | 1 | NC | 1 |
| 565 | | 17 | max | .011 | 3 | .008 | 3 | .197 | 4 | 1.049e-2 | 4 | NC | 15 | NC | 1 |
| 566 | | | min | -.008 | 2 | -.013 | 1 | 0 | 1 | 0 | 1 | 448.055 | 1 | NC | 1 |
| 567 | | 18 | max | .011 | 3 | .124 | 1 | .171 | 4 | 5.329e-3 | 4 | NC | 5 | NC | 1 |
| 568 | | | min | -.007 | 2 | -.07 | 3 | 0 | 1 | 0 | 1 | 972.458 | 1 | NC | 1 |
| 569 | | 19 | max | .011 | 3 | .241 | 1 | .15 | 4 | 0 | 1 | NC | 1 | NC | 1 |
| 570 | | | min | -.007 | 2 | -.14 | 3 | 0 | 1 | -1.591e-6 | 4 | NC | 1 | NC | 1 |
| 571 | M9 | 1 | max | .005 | 3 | .103 | 1 | .601 | 4 | 2.093e-2 | 3 | NC | 1 | NC | 1 |
| 572 | | | min | -.002 | 2 | -.012 | 3 | -.001 | 1 | -1.781e-2 | 1 | NC | 1 | NC | 1 |
| 573 | | 2 | max | .005 | 3 | .051 | 1 | .586 | 4 | 1.036e-2 | 3 | NC | 3 | NC | 1 |
| 574 | | | min | -.002 | 2 | -.005 | 3 | 0 | 12 | -8.656e-3 | 1 | 2178.901 | 1 | NC | 1 |
| 575 | | 3 | max | .005 | 3 | .007 | 3 | .569 | 4 | 1.49e-2 | 4 | NC | 5 | NC | 1 |
| 576 | | | min | -.002 | 2 | -.007 | 1 | 0 | 12 | -1.758e-5 | 10 | 1041.764 | 1 | 6065.74 | 4 |
| 577 | | 4 | max | .005 | 3 | .029 | 3 | .551 | 4 | 1.168e-2 | 5 | NC | 5 | NC | 1 |
| 578 | | | min | -.002 | 2 | -.073 | 1 | 0 | 12 | -4.804e-3 | 1 | 650.288 | 1 | 4497.108 | 4 |
| 579 | | 5 | max | .005 | 3 | .058 | 3 | .531 | 4 | 8.77e-3 | 5 | NC | 15 | NC | 1 |
| 580 | | | min | -.002 | 2 | -.143 | 1 | 0 | 12 | -9.779e-3 | 1 | 464.926 | 1 | 3707.015 | 4 |
| 581 | | 6 | max | .005 | 3 | .089 | 3 | .511 | 4 | 1.087e-2 | 3 | NC | 15 | NC | 1 |
| 582 | | | min | -.002 | 2 | -.211 | 1 | 0 | 12 | -1.475e-2 | 1 | 363.542 | 1 | 3222.143 | 4 |
| 583 | | 7 | max | .005 | 3 | .12 | 3 | .49 | 4 | 1.446e-2 | 3 | 9666.594 | 15 | NC | 1 |
| 584 | | | min | -.002 | 2 | -.273 | 1 | 0 | 1 | -1.973e-2 | 1 | 304.052 | 1 | 2877.185 | 4 |
| 585 | | 8 | max | .004 | 3 | .145 | 3 | .469 | 4 | 1.804e-2 | 3 | 8585.214 | 15 | NC | 1 |
| 586 | | | min | -.002 | 2 | -.322 | 1 | 0 | 1 | -2.47e-2 | 1 | 269.016 | 1 | 2597.848 | 4 |
| 587 | | 9 | max | .004 | 3 | .162 | 3 | .448 | 4 | 1.806e-2 | 3 | 8021.697 | 15 | NC | 1 |
| 588 | | | min | -.002 | 2 | -.353 | 1 | 0 | 12 | -2.72e-2 | 1 | 250.834 | 1 | 2388.947 | 4 |
| 589 | | 10 | max | .004 | 3 | .168 | 3 | .424 | 4 | 1.57e-2 | 3 | 7850.139 | 15 | NC | 1 |
| 590 | | | min | -.001 | 2 | -.363 | 1 | 0 | 1 | -2.804e-2 | 1 | 245.388 | 1 | 2349.411 | 4 |
| 591 | | 11 | max | .004 | 3 | .164 | 3 | .397 | 4 | 1.335e-2 | 3 | 8021.509 | 15 | NC | 1 |
| 592 | | | min | -.001 | 2 | -.352 | 1 | 0 | 1 | -2.889e-2 | 1 | 251.131 | 1 | 2420.049 | 4 |
| 593 | | 12 | max | .004 | 3 | .15 | 3 | .369 | 4 | 1.105e-2 | 3 | 8584.861 | 15 | NC | 1 |
| 594 | | | min | -.001 | 2 | -.321 | 1 | 0 | 12 | -2.727e-2 | 1 | 269.945 | 1 | 2580.198 | 4 |
| 595 | | 13 | max | .004 | 3 | .128 | 3 | .337 | 4 | 8.846e-3 | 3 | 9666.043 | 15 | NC | 1 |
| 596 | | | min | -.001 | 2 | -.271 | 1 | 0 | 12 | -2.193e-2 | 1 | 306.356 | 1 | 3073.776 | 4 |
| 597 | | 14 | max | .004 | 3 | .099 | 3 | .302 | 4 | 6.64e-3 | 3 | NC | 15 | NC | 1 |
| 598 | | | min | -.001 | 2 | -.208 | 1 | -.002 | 1 | -1.659e-2 | 1 | 368.518 | 1 | 4163.073 | 5 |
| 599 | | 15 | max | .004 | 3 | .067 | 3 | .266 | 4 | 6.177e-3 | 5 | NC | 15 | NC | 1 |
| 600 | | | min | -.001 | 2 | -.139 | 1 | -.005 | 1 | -1.125e-2 | 1 | 475.232 | 1 | 6758.695 | 5 |
| 601 | | 16 | max | .004 | 3 | .034 | 3 | .23 | 4 | 8.323e-3 | 5 | NC | 5 | NC | 1 |
| 602 | | | min | -.001 | 2 | -.069 | 1 | -.008 | 1 | -5.913e-3 | 1 | 672.109 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 603 | | 17 | max | .004 | 3 | .002 | 3 | .198 | 4 | 1.053e-2 | 4 | NC | 5 | NC | 1 |
| 604 | | | min | -.001 | 2 | -.004 | 2 | -.008 | 1 | -5.744e-4 | 1 | 1091.372 | 1 | NC | 1 |
| 605 | | 18 | max | .004 | 3 | .051 | 1 | .172 | 4 | 4.944e-3 | 5 | NC | 4 | NC | 1 |
| 606 | | | min | -.001 | 2 | -.026 | 3 | -.006 | 1 | -1.04e-2 | 1 | 2305.296 | 1 | NC | 1 |
| 607 | | 19 | max | .004 | 3 | .1 | 1 | .15 | 4 | 7.217e-3 | 3 | NC | 1 | NC | 1 |
| 608 | | | min | -.001 | 2 | -.052 | 3 | 0 | 12 | -2.058e-2 | 1 | NC | 1 | NC | 1 |

| Company: | Schletter, Inc. | Date: | 11/17/2015 |
|---|---|---|---|
| Engineer: | HCV | Page: | 1/5 |
| Project: | Standard PVMax - Worst Case, 14-42 Inch Width | | |
| Address: | | | |
| Phone: | | | |
| E-mail: | | | |

## 1.Project information

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

Project description:
Location:
Fastening description:

## 2. Input Data & Anchor Parameters

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

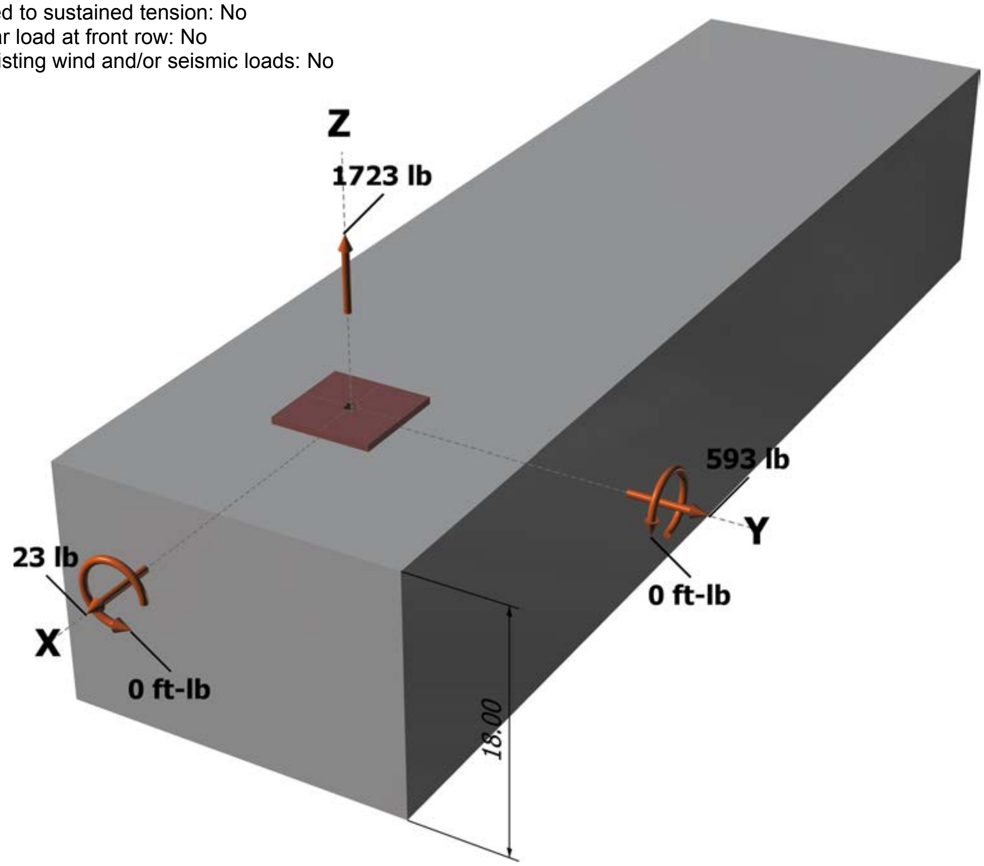
**Anchor Information:**
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, $h_{ef}$ (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
$h_{min}$ (inch): 8.50
$c_{ac}$ (inch): 9.67
$C_{min}$ (inch): 1.75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

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

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

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

<Figure 1>



<Figure 2>

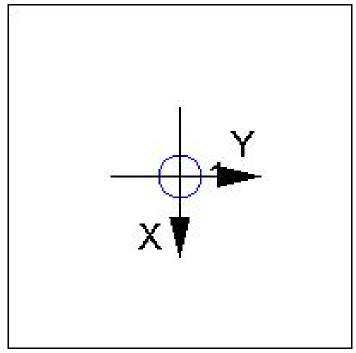

**Recommended Anchor**
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

## 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) | $\phi$ | $\phi N_{sa}$ (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)

| $k_c$ | $\lambda$ | $f'_c$ (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) | $\phi$ | $\phi N_{cb}$ (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) | $\phi$ | $\phi N_a$ (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) | $\phi_{grout}$ | $\phi$ | $\phi_{grout}\phi V_{sa}$ (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) | $\lambda$ | $f'_c$ (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) | $\phi$ | $\phi V_{cby}$ (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) | $\lambda$ | $f'_c$ (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) | $\phi$ | $\phi V_{cbx}$ (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) | $\lambda$ | $f'_c$ (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) | $\phi$ | $\phi V_{cbx}$ (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) | $\lambda$ | $f'_c$ (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) | $\phi$ | $\phi V_{cby}$ (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) | $\phi$ | $\phi V_{cp}$ (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, $\phi N_n$ (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, $\phi V_n$ (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.

| Company: | Schletter, Inc. | Date: | 11/17/2015 |
| --- | --- | --- | --- |
| Engineer: | HCV | Page: | 1/5 |
| Project: | Standard PVMax - Worst Case, 21-30 Inch Width | | |
| Address: | | | |
| Phone: | | | |
| E-mail: | | | |

## 1.Project information

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

Project description:
Location:
Fastening description:

## 2. Input Data & Anchor Parameters

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

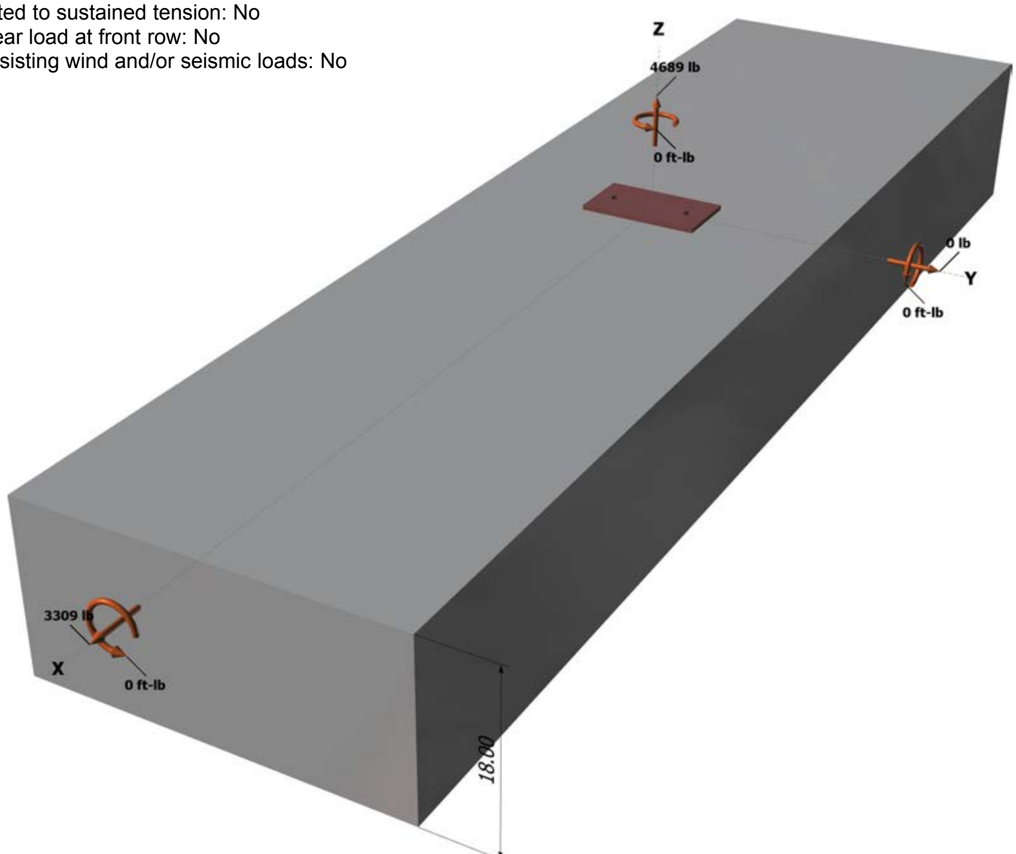
**Anchor Information:**
Anchor type: Bonded anchor
Material: A193 Grade B8/B8M (304/316SS)
Diameter (inch): 0.500
Effective Embedment depth, $h_{ef}$ (inch): 6.000
Code report: IAPMO UES ER-263
Anchor category: -
Anchor ductility: Yes
$h_{min}$ (inch): 8.50
$c_{ac}$ (inch): 9.67
$C_{min}$ (inch): 1.75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

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

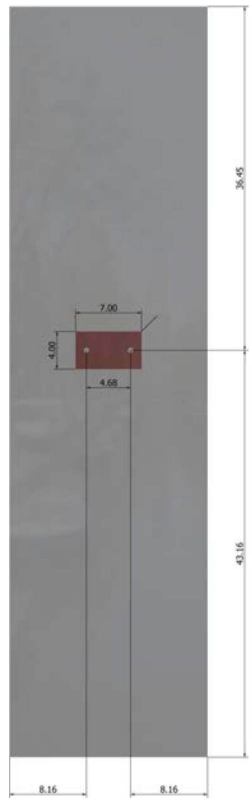
**Base Material**
Concrete: Normal-weight
Concrete thickness, h (inch): 18.00
State: Cracked
Compressive strength, f'c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Do not evaluate concrete breakout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

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

<Figure 1>



<Figure 2>



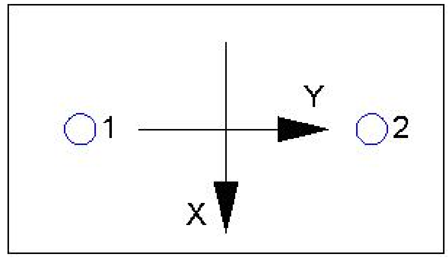

**Recommended Anchor**
Anchor Name: AT-XP® - AT-XP w/ 1/2"Ø A193 Gr. B8/B8M (304/316SS)
Code Report: IAPMO UES ER-263

## 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 | 2344.5 | 1654.5 | 0.0 | 1654.5 |
| 2 | 2344.5 | 1654.5 | 0.0 | 1654.5 |
| Sum | 4689.0 | 3309.0 | 0.0 | 3309.0 |

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 4689
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) | $\phi$ | $\phi N_{sa}$ (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)

| $k_c$ | $\lambda$ | $f'_c$ (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) | $\phi$ | $\phi N_{cbg}$ (lb) |
|---|---|---|---|---|---|---|---|---|
| 378.00 | 324.00 | 1.000 | 0.972 | 1.00 | 1.000 | 12492 | 0.65 | 9208 |

## 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) | $\phi$ | $\phi N_{ag}$ (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) | $\phi_{grout}$ | $\phi$ | $\phi_{grout}\phi V_{sa}$ (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) | $\lambda$ | $f'_c$ (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) | $\phi$ | $\phi V_{cbgx}$ (lb) |
|---|---|---|---|---|---|---|---|---|
| 378.00 | 648.00 | 1.000 | 0.836 | 1.000 | 1.000 | 15593 | 0.70 | 5323 |

***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) | $\lambda$ | $f'_c$ (psi) | $c_{a1}$ (in) | $V_{by}$ (lb) |
|---|---|---|---|---|---|
| 4.00 | 0.50 | 1.00 | 2500 | 8.16 | 8744 |

$\phi V_{cbx} = \phi\,(2)(A_{Vc} / A_{Vco})\,\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{by}$ (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) | $\phi$ | $\phi V_{cbx}$ (lb) |
|---|---|---|---|---|---|---|---|
| 299.64 | 299.64 | 1.000 | 1.000 | 1.000 | 8744 | 0.70 | 12241 |

**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) | $\phi$ |
|---|---|---|---|---|---|---|---|---|
| 378.00 | 324.00 | 1.000 | 0.972 | 1.000 | 1.000 | 12492 | 14166 | 0.70 |

| $\phi V_{cpg}$ (lb) |
|---|
| 19833 |

**11. Results**

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

| Tension | Factored Load, $N_{ua}$ (lb) | Design Strength, $\phi N_n$ (lb) | Ratio | Status |
|---|---|---|---|---|
| Steel | 2345 | 6071 | 0.39 | Pass |
| Concrete breakout | 4689 | 9208 | 0.51 | Pass |
| **Adhesive** | **4689** | **8093** | **0.58** | **Pass (Governs)** |

| Shear | Factored Load, $V_{ua}$ (lb) | Design Strength, $\phi V_n$ (lb) | Ratio | Status |
|---|---|---|---|---|
| Steel | 1655 | 3156 | 0.52 | Pass |
| **T Concrete breakout x+** | **3309** | **5323** | **0.62** | **Pass (Governs)** |
| **\|\| Concrete breakout y-** | **1655** | **12241** | **0.14** | **Pass (Governs)** |
| Pryout | 3309 | 19833 | 0.17 | Pass |

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

| | | | | | |
|---|---|---|---|---|---|
| Sec. D.7.3 | 0.58 | 0.62 | 120.1 % | 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.