PAUL J. FORD & COMPANY

**Report Date:** July 13, 2026

**Client:** ARE Structures
ATTN: Flaubert Zinkia
1043 Grand Ave #213
St Paul, MN, 55105
Phone: (240) 584-9714
Email: fzinkia@aretelecom.com

**Structure:** 179.74ft Monopole
**Site Name:** NST-00001
**Site Address:** SR 41
**City, County, State:** Hillsboro, Highland County, OH
**Latitude, Longitude:** 39.081142, -83.392496

**PJF Project Number:** 21226-0033.001.7205
**ARE Project Number:** NST-00001

Paul J. Ford and Company is pleased to submit this **Structural Analysis Report** to determine the tower stress level.

**Analysis Criteria:**
This analysis utilizes an ultimate 3-second gust wind speed of 107 mph as required by the 2024 Ohio Building Code. Applicable standard references and design criteria are listed in Section 2 - Analysis Criteria.

**Proposed Appurtenance Loads:**
The structure was analyzed with the proposed loading configuration shown in Table 1 of this report.

**Summary of Analysis Results:**

| | | |
|---|---|---|
| Proposed Structure: | Pass | 90.0% |
| Proposed Foundation: | Pass | 98.0% |

We at Paul J. Ford and Company appreciate the opportunity of providing our continuing professional services to you and ARE Structures. If you have any questions or need further assistance on this or any other projects, please give us a call.

Respectfully Submitted By:
Paul J. Ford and Company

Alexander Brown
Structural Designer
abrown@pauljford.com

STATE OF OHIO
THOMAS
DEHNKE
PROFESSIONAL ENGINEER
07/14/2026

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## 1) INTRODUCTION

This is a 179.74ft Monopole designed by ARE Structures in June of 2026.

## 2) ANALYSIS CRITERIA

**TIA-222 Revision:** TIA-222-H
**Risk Category:** II
**Wind Speed:** 107 mph
**Exposure Category:** C
**Topographic Factor, Kzt:** 1
**Ice Thickness:** 1 in
**Ice Wind Speed:** 30 mph
**Service Wind Speed:** 60 mph

**Table 1 - Proposed Equipment Configuration**

| Mounting Level (ft) | Center Line Elevation (ft) | Number of Antennas | Antenna Manufacturer | Antenna Model | Number of Feed Lines | Feed Line Size (in) |
|---|---|---|---|---|---|---|
| 170.0 | 170.0 | 1 | - | 42,000 sq in. | - | - |
| 155.0 | 155.0 | 1 | - | 20,000 sq in. | - | - |
| 140.0 | 140.0 | 1 | - | 20,000 sq in. | - | - |

## 3) ANALYSIS PROCEDURE

**Table 2 - Documents Provided**

| Document | Remarks | Reference | Source |
|---|---|---|---|
| Manufacturer Pole Drawings | 54.8m (180ft) 5SSJTF, 06/29/2026 | AFS-2000/3000 revA | ARE Structures |

### 3.1) Analysis Method

tnxTower (version 8.3.0.5), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

### 3.2) Assumptions

1) Tower and structures were maintained in accordance with the TIA-222 standard.
2) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Table 1 and the referenced drawings.
3) All coaxial cables are assumed to run internal to the monopole shaft.

This analysis may be affected if any assumptions are not valid or have been made in error. Paul J. Ford and Company should be notified to determine the effect on the structural integrity of the tower.

## 4) ANALYSIS RESULTS

**Table 3 - Section Capacity (Summary)**

| Section No. | Elevation (ft) | Component Type | Size | Critical Element | P (K) | SF*P_allow (K) | % Capacity | Pass / Fail |
|---|---|---|---|---|---|---|---|---|
| L1 | 179.739 - 140.862 | Pole | TP26.8504x14.9606x0.1969 | 1 | -5.81 | 718.08 | 77.8 | Pass |
| L2 | 140.862 - 105.625 | Pole | TP37.2323x25.343x0.3149 | 2 | -12.09 | 1592.30 | 76.9 | Pass |
| L3 | 105.625 - 71.7015 | Pole | TP47.126x35.0875x0.3149 | 3 | -18.71 | 2019.89 | 90.0 | Pass |
| L4 | 71.7015 - 38.9652 | Pole | TP56.5118x44.5944x0.3937 | 4 | -28.19 | 3029.53 | 72.5 | Pass |
| L5 | 38.9652 - 7.5676 | Pole | TP65.2756x53.4817x0.3937 | 5 | -42.44 | 3648.45 | 76.8 | Pass |
| | | | | | | | Summary | |
| | | | | | | Pole (L3) | 90.0 | Pass |
| | | | | | | Rating = | 90.0 | Pass |

**Table 4 - Tower Component Stresses vs Capacity**

| Notes | Component | Elevation (ft) | % Capacity | Pass / Fail |
|---|---|---|---|---|
| 1 | Anchor Rods | 7.57 | 81.4 | Pass |
| | Base Plate | | 84.1 | Pass |
| | King Post Flange | | 83.9 | Pass |
| | Base Foundation (Structure) | 0 | 98.0 | Pass |
| | Base Foundation (Soil Interaction) | | 96.3 | Pass |

| Structure Rating (max from all components) = | 98.0% |
|---|---|

Notes:
1) See additional documentation in “Appendix B – Additional Calculations” for calculations supporting the % capacity consumed.

### 4.1) Recommendations

The pole and its foundation have sufficient capacity to carry the proposed load configuration. Install the pole and its foundation per the direction of ARE Structures.

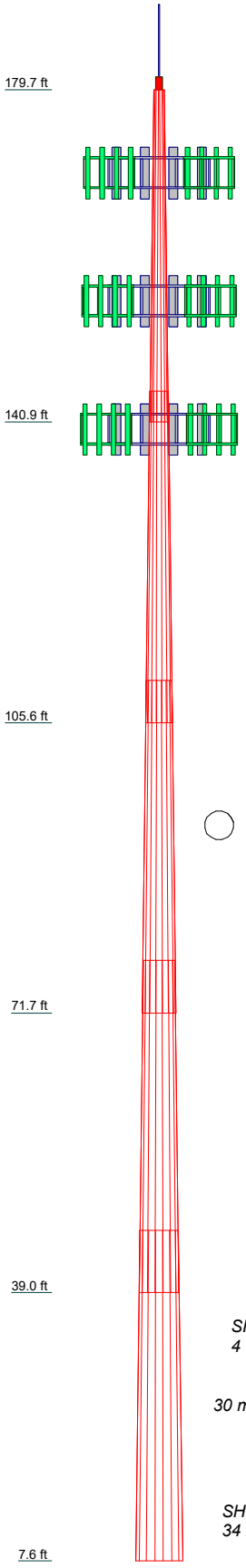
STANDARD CONDITIONS FOR FURNISHING OF PROFESSIONAL ENGINEERING SERVICES ON EXISTING STRUCTURES BY PAUL J. FORD AND COMPANY

1) Paul J. Ford and Company has not made a field inspection to verify the monopole dimensions or the antenna/coax loading. If the existing conditions are not as represented on these sketches, we should be contacted immediately to reevaluate any conclusions stated in this report.
2) No allowance was made for any damaged, missing, or rusted materials. The analysis of this structure assumes that no physical deterioration has occurred in any of the structural components of the tower and that all the structural members have the same load carrying capacity as the day the tower was erected.
3) It is not possible to have all the detailed information to perform a thorough analysis of every structural sub-component of an existing structure. The structural analysis provided by Paul J. Ford and Company verifies the adequacy of the main structural members of the tower. Paul J. Ford and Company provides a limited scope of service in that we cannot verify the adequacy of every weld, plate connection detail, etc.
4) Miscellaneous items such as antenna mounts, etc., have not been designed or detailed as part of our work. We recommend that material of adequate size and strength be purchased from a reputable tower manufacturer.

**APPENDIX A**

**TNXTOWER OUTPUT**

| Section | Length (ft) | Number of Sides | Thickness (in) | Socket Length (ft) | Top Dia (in) | Bot Dia (in) | Grade | Weight (K) |
|---|---|---|---|---|---|---|---|---|
| 1 | 38.88 | 18 | 0.1968 | 3.64 | 14.9606 | 26.8504 | A572-50 | 1.7 |
| 2 | 38.88 | 18 | 0.3149 | 4.95 | 25.3430 | 37.2323 | | 4.1 |
| 3 | 38.88 | 18 | 0.3149 | 6.14 | 35.0875 | 47.1260 | | 5.4 |
| 4 | 38.88 | 18 | 0.3937 | 7.32 | 44.5944 | 56.5118 | | 8.3 |
| 5 | 38.71 | 18 | 0.3937 | | 53.4817 | 65.2756 | | 9.7 |
| | | | | | | | | 29.2 |




*ALL REACTIONS ARE FACTORED*

*AXIAL 61 K*

*SHEAR 4 K* *MOMENT 495 kip-ft*

*TORQUE 0 kip-ft*
*30 mph WIND - 1.0000 in ICE*

*AXIAL 42 K*

*SHEAR 34 K* *MOMENT 4092 kip-ft*

*TORQUE 0 kip-ft*
*REACTIONS - 107 mph WIND*

## DESIGNED APPURTENANCE LOADING

| TYPE | ELEVATION | TYPE | ELEVATION |
|---|---|---|---|
| Beacon | 179.739 | 20,000 sq in. - Carrier 2 | 155 |
| 9/16" x 10' Lightning Rod | 179.739 | 20,000 sq in. - Carrier 3 | 140 |
| 42,000 sq in. - Carrier 1 | 170 | | |

## MATERIAL STRENGTH

| GRADE | Fy | Fu | GRADE | Fy | Fu |
|---|---|---|---|---|---|
| A572-50 | 50 ksi | 65 ksi | | | |

## TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-H Standard.
2. Tower designed for a 107 mph basic wind in accordance with the TIA-222-H Standard.
3. Tower is also designed for a 30 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Risk Category II.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 90%


PJFLogo

*Paul J. Ford and Company*
250 East Broad Street, STE 600
Columbus, Ohio
Phone: 614-221-6679
FAX:


| | | | |
|---|---|---|---|
| Job: ***54.8m 5SSJTF AFS-2000/3000*** | | | |
| Project: ***PJF 21226-0033 \| NST-00001*** | | | |
| Client: ARE Structures | Drawn by: Alex Brown | App'd: | |
| Code: TIA-222-H | Date: 07/09/26 | Scale: NTS | |
| Path: G:\TOWER\212_ARE\2026\21226-0033_NST-00001\21226-0033.001.T205_Final\TNX\21226-0033.001.T205.eri | | Dwg No. E-1 | |

# Tower Input Data

The tower is a monopole.
This tower is designed using the TIA-222-H standard.
The following design criteria apply:

- Tower base elevation above sea level: 859.07 ft.
- Basic wind speed of 107 mph.
- Risk Category II.
- Exposure Category C.
- Simplified Topographic Factor Procedure for wind speed-up calculations is used.
- Topographic Category: 1.
- Crest Height: 0.00 ft.
- Nominal ice thickness of 1.0000 in.
- Ice thickness is considered to increase with height.
- Ice density of 56 pcf.
- A wind speed of 30 mph is used in combination with ice.
- Temperature drop of 50 °F.
- Deflections calculated using a wind speed of 60 mph.
- Non-linear (P-delta) analysis was used.
- Pressures are calculated at each section.
- Stress ratio used in pole design is 1.
- Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

# Options

| | | | | | |
|---|---|---|---|---|---|
| | Consider Moments - Legs | | Assume Legs Pinned | | Calculate Redundant Bracing Forces |
| | Consider Moments - Horizontals | √ | Assume Rigid Index Plate | | Ignore Redundant Members in FEA |
| | Consider Moments - Diagonals | √ | Use Clear Spans For Wind Area | | SR Leg Bolts Resist Compression |
| | Use Moment Magnification | | Use Clear Spans For KL/r | | All Leg Panels Have Same Allowable |
| √ | Use Code Stress Ratios | | Retension Guys To Initial Tension | | Offset Girt At Foundation |
| | Use Code Safety Factors - Guys | √ | Bypass Mast Stability Checks | √ | Consider Feed Line Torque |
| | Escalate Ice | √ | Use Azimuth Dish Coefficients | | Include Angle Block Shear Check |
| | Always Use Max Kz | √ | Project Wind Area of Appurtenances | | Use TIA-222-H Bracing Resist. Exemption |
| | Kz In Exposure D Hurricane Region | | Alternative Appurt. EPA Calculation | | Use TIA-222-H Tension Splice Exemption |
| | Include Bolts In Member Capacity | | Autocalc Torque Arm Areas | | Poles |
| | Leg Bolts Are At Top Of Section | | Add IBC .6D+W Combination | √ | Include Shear-Torsion Interaction |
| | Secondary Horizontal Braces Leg | | Sort Capacity Reports By Component | | Always Use Sub-Critical Flow |
| | Use Diamond Inner Bracing (4 Sided) | | Triangulate Diamond Inner Bracing | | Use Top Mounted Sockets |
| | SR Members Have Cut Ends | | Treat Feed Line Bundles As Cylinder | | Pole Without Linear Attachments |
| | SR Members Are Concentric | | Ignore KL/ry For 60 Deg. Angle Legs | | Pole With Shroud Or No Appurtenances |
| | Distribute Leg Loads As Uniform | | Use ASCE 10 X-Brace Ly Rules | | Outside and Inside Corner Radii Are Known |
| | Use Special Wind Profile | | | | |

# Tapered Pole Section Geometry

| *Section* | *Elevation* *ft* | *Section Length* *ft* | *Splice Length* *ft* | *Number of Sides* | *Top Diameter* *in* | *Bottom Diameter* *in* | *Wall Thickness* *in* | *Bend Radius* *in* | *Pole Grade* |
|---|---|---|---|---|---|---|---|---|---|
| L1 | 179.74-140.86 | 38.88 | 3.64 | 18 | 14.9606 | 26.8504 | 0.1968 | 0.7874 | A572-50 (50 ksi) |
| L2 | 140.86-105.63 | 38.88 | 4.95 | 18 | 25.3430 | 37.2323 | 0.3149 | 1.2596 | A572-50 (50 ksi) |
| L3 | 105.63-71.70 | 38.88 | 6.14 | 18 | 35.0875 | 47.1260 | 0.3149 | 1.2596 | A572-50 (50 ksi) |
| L4 | 71.70-38.97 | 38.88 | 7.32 | 18 | 44.5944 | 56.5118 | 0.3937 | 1.5748 | A572-50 (50 ksi) |
| L5 | 38.97-7.57 | 38.71 | | 18 | 53.4817 | 65.2756 | 0.3937 | 1.5748 | A572-50 (50 ksi) |

# Tapered Pole Properties

| Section | Tip Dia. in | Area $in^2$ | I $in^4$ | r in | C in | I/C $in^3$ | J $in^4$ | It/Q $in^2$ | w in | w/t |
|---|---|---|---|---|---|---|---|---|---|---|
| L1 | 15.1610 | 9.2244 | 254.0211 | 5.2411 | 7.6000 | 33.4239 | 508.3765 | 4.6131 | 2.2866 | 11.616 |
| | 27.2342 | 16.6532 | 1494.6688 | 9.4620 | 13.6400 | 109.5798 | 2991.3044 | 8.3282 | 4.3792 | 22.246 |
| L2 | 26.8162 | 25.0154 | 1979.6993 | 8.8850 | 12.8742 | 153.7722 | 3962.0035 | 12.5101 | 3.9061 | 12.404 |
| | 37.7581 | 36.8987 | 6353.4608 | 13.1057 | 18.9140 | 335.9130 | 12715.2816 | 18.4528 | 5.9987 | 19.049 |
| L3 | 37.1379 | 34.7549 | 5309.1877 | 12.3443 | 17.8244 | 297.8599 | 10625.3613 | 17.3808 | 5.6212 | 17.851 |
| | 47.8044 | 46.7873 | 12952.7974 | 16.6179 | 23.9400 | 541.0523 | 25922.6385 | 23.3981 | 7.7400 | 24.579 |
| L4 | 47.1333 | 55.2334 | 13633.2004 | 15.6913 | 22.6540 | 601.8019 | 27284.3397 | 27.6219 | 7.1557 | 18.176 |
| | 57.3229 | 70.1254 | 27900.9290 | 19.9219 | 28.7080 | 971.8871 | 55838.5707 | 35.0694 | 9.2532 | 23.503 |
| L5 | 56.5093 | 66.3390 | 23621.0594 | 18.8462 | 27.1687 | 869.4213 | 47273.1999 | 33.1758 | 8.7199 | 22.149 |
| | 66.2218 | 81.0767 | 43120.1701 | 23.0331 | 33.1600 | 1300.3668 | 86297.0788 | 40.5460 | 10.7956 | 27.421 |

| Tower Elevation ft | Gusset Area (per face) $ft^2$ | Gusset Thickness in | Gusset Grade | Adjust. Factor $A_f$ | Adjust. Factor $A_r$ | Weight Mult. | Double Angle Stitch Bolt Spacing Diagonals in | Double Angle Stitch Bolt Spacing Horizontals in | Double Angle Stitch Bolt Spacing Redundants in |
|---|---|---|---|---|---|---|---|---|---|
| L1 179.74-140.86 | | | | 1 | 1 | 1 | | | |
| L2 140.86-105.63 | | | | 1 | 1 | 1 | | | |
| L3 105.63-71.70 | | | | 1 | 1 | 1 | | | |
| L4 71.70-38.97 | | | | 1 | 1 | 1 | | | |
| L5 38.97-7.57 | | | | 1 | 1 | 1 | | | |

# Feed Line/Linear Appurtenances - Entered As Area

| Description | Face or Leg | Allow Shield | Exclude From Torque Calculation | Component Type | Placement ft | Total Number | $C_AA_A$ $ft^2/ft$ | Weight plf |
|---|---|---|---|---|---|---|---|---|
| ***** | | | | | | | | |

# Feed Line/Linear Appurtenances Section Areas

| Tower Section | Tower Elevation ft | Face | $A_R$ $ft^2$ | $A_F$ $ft^2$ | $C_AA_A$ In Face $ft^2$ | $C_AA_A$ Out Face $ft^2$ | Weight K |
|---|---|---|---|---|---|---|---|
| L1 | 179.74-140.86 | A | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | B | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | C | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| L2 | 140.86-105.63 | A | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | B | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | C | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| L3 | 105.63-71.70 | A | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | B | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | C | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| L4 | 71.70-38.97 | A | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | B | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | C | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| L5 | 38.97-7.57 | A | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | B | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | C | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |

## Feed Line/Linear Appurtenances Section Areas - With Ice

| Tower Section | Tower Elevation ft | Face or Leg | Ice Thickness in | $A_R$ $ft^2$ | $A_F$ $ft^2$ | $C_AA_A$ In Face $ft^2$ | $C_AA_A$ Out Face $ft^2$ | Weight K |
|---|---|---|---|---|---|---|---|---|
| L1 | 179.74-140.86 | A | 1.170 | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | B | | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | C | | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| L2 | 140.86-105.63 | A | 1.140 | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | B | | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | C | | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| L3 | 105.63-71.70 | A | 1.103 | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | B | | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | C | | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| L4 | 71.70-38.97 | A | 1.053 | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | B | | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | C | | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| L5 | 38.97-7.57 | A | 0.966 | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | B | | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | C | | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |

## Feed Line Center of Pressure

| Section | Elevation ft | $CP_X$ in | $CP_Z$ in | $CP_X$ Ice in | $CP_Z$ Ice in |
|---|---|---|---|---|---|
| L1 | 179.74-140.86 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| L2 | 140.86-105.63 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| L3 | 105.63-71.70 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| L4 | 71.70-38.97 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| L5 | 38.97-7.57 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

Note: For pole sections, center of pressure calculations do not consider feed line shielding.

## Discrete Tower Loads

| Description | Face or Leg | Offset Type | Offsets: Horz Lateral ft / Vert ft / ft | Azimuth Adjustment ° | Placement ft | | $C_AA_A$ Front $ft^2$ | $C_AA_A$ Side $ft^2$ | Weight K |
|---|---|---|---|---|---|---|---|---|---|
| Beacon | A | None | | 0.0000 | 179.74 | No Ice | 3.60 | 3.60 | 0.10 |
| | | | | | | 1/2" Ice | 4.00 | 4.00 | 0.15 |
| | | | | | | 1" Ice | 4.40 | 4.40 | 0.20 |
| 9/16" x 10' Lightning Rod | A | From Leg | 0.00<br>0.00<br>5.00 | 0.0000 | 179.74 | No Ice<br>1/2" Ice<br>1" Ice | 0.62<br>1.64<br>2.67 | 0.62<br>1.64<br>2.67 | 0.01<br>0.01<br>0.03 |
| *** | | | | | | | | | |
| 42,000 sq in. - Carrier 1 | C | None | | 0.0000 | 170.00 | No Ice | 291.67 | 291.67 | 3.11 |
| | | | | | | 1/2" Ice | 342.22 | 342.22 | 4.67 |
| | | | | | | 1" Ice | 392.77 | 392.77 | 6.23 |
| *** | | | | | | | | | |
| 20,000 sq in. - Carrier 2 | C | None | | 0.0000 | 155.00 | No Ice | 138.88 | 138.88 | 1.48 |
| | | | | | | 1/2" Ice | 162.96 | 162.96 | 2.22 |
| | | | | | | 1" Ice | 187.04 | 187.04 | 2.96 |
| *** | | | | | | | | | |
| 20,000 sq in. - Carrier 3 | C | None | | 0.0000 | 140.00 | No Ice | 138.88 | 138.88 | 1.48 |
| | | | | | | 1/2" Ice | 162.96 | 162.96 | 2.22 |
| | | | | | | 1" Ice | 187.04 | 187.04 | 2.96 |

# Tower Pressures - No Ice

$G_H = 1.100$

| Section Elevation ft | z ft | $K_Z$ | $q_z$ psf | $A_G$ ft² | Face | $A_F$ ft² | $A_R$ ft² | $A_{leg}$ ft² | Leg % | $C_AA_A$ In Face ft² | $C_AA_A$ Out Face ft² |
|---|---|---|---|---|---|---|---|---|---|---|---|
| L1 179.74-140.86 | 158.58 | 1.395 | 38 | 68.677 | A | 0.000 | 68.677 | 68.677 | 100.00 | 0.000 | 0.000 |
| | | | | | B | 0.000 | 68.677 | | 100.00 | 0.000 | 0.000 |
| | | | | | C | 0.000 | 68.677 | | 100.00 | 0.000 | 0.000 |
| L2 140.86-105.63 | 122.38 | 1.321 | 36 | 94.806 | A | 0.000 | 94.806 | 94.806 | 100.00 | 0.000 | 0.000 |
| | | | | | B | 0.000 | 94.806 | | 100.00 | 0.000 | 0.000 |
| | | | | | C | 0.000 | 94.806 | | 100.00 | 0.000 | 0.000 |
| L3 105.63-71.70 | 88.12 | 1.232 | 33 | 120.066 | A | 0.000 | 120.066 | 120.066 | 100.00 | 0.000 | 0.000 |
| | | | | | B | 0.000 | 120.066 | | 100.00 | 0.000 | 0.000 |
| | | | | | C | 0.000 | 120.066 | | 100.00 | 0.000 | 0.000 |
| L4 71.70-38.97 | 55.06 | 1.116 | 30 | 142.479 | A | 0.000 | 142.479 | 142.479 | 100.00 | 0.000 | 0.000 |
| | | | | | B | 0.000 | 142.479 | | 100.00 | 0.000 | 0.000 |
| | | | | | C | 0.000 | 142.479 | | 100.00 | 0.000 | 0.000 |
| L5 38.97-7.57 | 23.43 | 0.932 | 25 | 160.561 | A | 0.000 | 160.561 | 160.561 | 100.00 | 0.000 | 0.000 |
| | | | | | B | 0.000 | 160.561 | | 100.00 | 0.000 | 0.000 |
| | | | | | C | 0.000 | 160.561 | | 100.00 | 0.000 | 0.000 |

# Tower Pressure - With Ice

$G_H = 1.100$

| Section Elevation ft | z ft | $K_Z$ | $q_z$ psf | $t_Z$ in | $A_G$ ft² | Face | $A_F$ ft² | $A_R$ ft² | $A_{leg}$ ft² | Leg % | $C_AA_A$ In Face ft² | $C_AA_A$ Out Face ft² |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L1 179.74-140.86 | 158.58 | 1.395 | 3 | 1.1700 | 76.258 | A | 0.000 | 76.258 | 76.258 | 100.00 | 0.000 | 0.000 |
| | | | | | | B | 0.000 | 76.258 | | 100.00 | 0.000 | 0.000 |
| | | | | | | C | 0.000 | 76.258 | | 100.00 | 0.000 | 0.000 |
| L2 140.86-105.63 | 122.38 | 1.321 | 3 | 1.1400 | 101.677 | A | 0.000 | 101.677 | 101.677 | 100.00 | 0.000 | 0.000 |
| | | | | | | B | 0.000 | 101.677 | | 100.00 | 0.000 | 0.000 |
| | | | | | | C | 0.000 | 101.677 | | 100.00 | 0.000 | 0.000 |
| L3 105.63-71.70 | 88.12 | 1.232 | 3 | 1.1032 | 126.511 | A | 0.000 | 126.511 | 126.511 | 100.00 | 0.000 | 0.000 |
| | | | | | | B | 0.000 | 126.511 | | 100.00 | 0.000 | 0.000 |
| | | | | | | C | 0.000 | 126.511 | | 100.00 | 0.000 | 0.000 |
| L4 71.70-38.97 | 55.06 | 1.116 | 2 | 1.0525 | 148.498 | A | 0.000 | 148.498 | 148.498 | 100.00 | 0.000 | 0.000 |
| | | | | | | B | 0.000 | 148.498 | | 100.00 | 0.000 | 0.000 |
| | | | | | | C | 0.000 | 148.498 | | 100.00 | 0.000 | 0.000 |
| L5 38.97-7.57 | 23.43 | 0.932 | 2 | 0.9663 | 166.069 | A | 0.000 | 166.069 | 166.069 | 100.00 | 0.000 | 0.000 |
| | | | | | | B | 0.000 | 166.069 | | 100.00 | 0.000 | 0.000 |
| | | | | | | C | 0.000 | 166.069 | | 100.00 | 0.000 | 0.000 |

# Tower Pressure - Service

$G_H = 1.100$

| Section Elevation ft | z ft | $K_Z$ | $q_z$ psf | $A_G$ ft² | Face | $A_F$ ft² | $A_R$ ft² | $A_{leg}$ ft² | Leg % | $C_AA_A$ In Face ft² | $C_AA_A$ Out Face ft² |
|---|---|---|---|---|---|---|---|---|---|---|---|
| L1 179.74-140.86 | 158.58 | 1.395 | 11 | 68.677 | A | 0.000 | 68.677 | 68.677 | 100.00 | 0.000 | 0.000 |
| | | | | | B | 0.000 | 68.677 | | 100.00 | 0.000 | 0.000 |
| | | | | | C | 0.000 | 68.677 | | 100.00 | 0.000 | 0.000 |
| L2 140.86-105.63 | 122.38 | 1.321 | 10 | 94.806 | A | 0.000 | 94.806 | 94.806 | 100.00 | 0.000 | 0.000 |
| | | | | | B | 0.000 | 94.806 | | 100.00 | 0.000 | 0.000 |
| | | | | | C | 0.000 | 94.806 | | 100.00 | 0.000 | 0.000 |
| L3 105.63-71.70 | 88.12 | 1.232 | 9 | 120.066 | A | 0.000 | 120.066 | 120.066 | 100.00 | 0.000 | 0.000 |
| | | | | | B | 0.000 | 120.066 | | 100.00 | 0.000 | 0.000 |
| | | | | | C | 0.000 | 120.066 | | 100.00 | 0.000 | 0.000 |

| Section Elevation ft | z ft | $K_Z$ | $q_z$ psf | $A_G$ ft² | Face | $A_F$ ft² | $A_R$ ft² | $A_{leg}$ ft² | Leg % | $C_AA_A$ In Face ft² | $C_AA_A$ Out Face ft² |
|---|---|---|---|---|---|---|---|---|---|---|---|
| L4 71.70-38.97 | 55.06 | 1.116 | 8 | 142.479 | A | 0.000 | 142.479 | 142.479 | 100.00 | 0.000 | 0.000 |
| | | | | | B | 0.000 | 142.479 | | 100.00 | 0.000 | 0.000 |
| | | | | | C | 0.000 | 142.479 | | 100.00 | 0.000 | 0.000 |
| L5 38.97-7.57 | 23.43 | 0.932 | 7 | 160.561 | A | 0.000 | 160.561 | 160.561 | 100.00 | 0.000 | 0.000 |
| | | | | | B | 0.000 | 160.561 | | 100.00 | 0.000 | 0.000 |
| | | | | | C | 0.000 | 160.561 | | 100.00 | 0.000 | 0.000 |

# Load Combinations

| Comb. No. | Description |
|---|---|
| 1 | Dead Only |
| 2 | 1.2 Dead+1.0 Wind 0 deg - No Ice |
| 3 | 0.9 Dead+1.0 Wind 0 deg - No Ice |
| 4 | 1.2 Dead+1.0 Wind 30 deg - No Ice |
| 5 | 0.9 Dead+1.0 Wind 30 deg - No Ice |
| 6 | 1.2 Dead+1.0 Wind 60 deg - No Ice |
| 7 | 0.9 Dead+1.0 Wind 60 deg - No Ice |
| 8 | 1.2 Dead+1.0 Wind 90 deg - No Ice |
| 9 | 0.9 Dead+1.0 Wind 90 deg - No Ice |
| 10 | 1.2 Dead+1.0 Wind 120 deg - No Ice |
| 11 | 0.9 Dead+1.0 Wind 120 deg - No Ice |
| 12 | 1.2 Dead+1.0 Wind 150 deg - No Ice |
| 13 | 0.9 Dead+1.0 Wind 150 deg - No Ice |
| 14 | 1.2 Dead+1.0 Wind 180 deg - No Ice |
| 15 | 0.9 Dead+1.0 Wind 180 deg - No Ice |
| 16 | 1.2 Dead+1.0 Wind 210 deg - No Ice |
| 17 | 0.9 Dead+1.0 Wind 210 deg - No Ice |
| 18 | 1.2 Dead+1.0 Wind 240 deg - No Ice |
| 19 | 0.9 Dead+1.0 Wind 240 deg - No Ice |
| 20 | 1.2 Dead+1.0 Wind 270 deg - No Ice |
| 21 | 0.9 Dead+1.0 Wind 270 deg - No Ice |
| 22 | 1.2 Dead+1.0 Wind 300 deg - No Ice |
| 23 | 0.9 Dead+1.0 Wind 300 deg - No Ice |
| 24 | 1.2 Dead+1.0 Wind 330 deg - No Ice |
| 25 | 0.9 Dead+1.0 Wind 330 deg - No Ice |
| 26 | 1.2 Dead+1.0 Ice+1.0 Temp |
| 27 | 1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp |
| 28 | 1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp |
| 29 | 1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp |
| 30 | 1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp |
| 31 | 1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp |
| 32 | 1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp |
| 33 | 1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp |
| 34 | 1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp |
| 35 | 1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp |
| 36 | 1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp |
| 37 | 1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp |
| 38 | 1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp |
| 39 | Dead+Wind 0 deg - Service |
| 40 | Dead+Wind 30 deg - Service |
| 41 | Dead+Wind 60 deg - Service |
| 42 | Dead+Wind 90 deg - Service |
| 43 | Dead+Wind 120 deg - Service |
| 44 | Dead+Wind 150 deg - Service |
| 45 | Dead+Wind 180 deg - Service |
| 46 | Dead+Wind 210 deg - Service |
| 47 | Dead+Wind 240 deg - Service |
| 48 | Dead+Wind 270 deg - Service |
| 49 | Dead+Wind 300 deg - Service |
| 50 | Dead+Wind 330 deg - Service |

# Maximum Reactions

| Location | Condition | Gov. Load Comb. | Vertical K | Horizontal, X K | Horizontal, Z K |
|---|---|---|---|---|---|
| Pole | Max. Vert | 26 | 60.53 | 0.00 | 0.00 |
| | Max. $H_x$ | 21 | 31.84 | 33.67 | -0.01 |
| | Max. $H_z$ | 2 | 42.46 | 0.00 | 33.67 |
| | Max. $M_x$ | 2 | 4091.86 | 0.00 | 33.67 |
| | Max. $M_z$ | 8 | 4091.85 | -33.67 | 0.00 |
| | Max. Torsion | 8 | 0.02 | -33.67 | 0.00 |
| | Min. Vert | 3 | 31.84 | 0.00 | 33.67 |
| | Min. $H_x$ | 9 | 31.84 | -33.67 | -0.01 |
| | Min. $H_z$ | 14 | 42.46 | 0.00 | -33.67 |
| | Min. $M_x$ | 14 | -4091.85 | 0.00 | -33.67 |
| | Min. $M_z$ | 20 | -4091.85 | 33.67 | 0.00 |
| | Min. Torsion | 20 | -0.02 | 33.67 | 0.00 |

# Tower Mast Reaction Summary

| Load Combination | Vertical K | $Shear_x$ K | $Shear_z$ K | Overturning Moment, $M_x$ kip-ft | Overturning Moment, $M_z$ kip-ft | Torque kip-ft |
|---|---|---|---|---|---|---|
| Dead Only | 35.38 | 0.00 | -0.02 | -0.02 | 0.00 | 0.00 |
| 1.2 Dead+1.0 Wind 0 deg - No Ice | 42.46 | 0.00 | -33.67 | -4091.86 | 0.00 | 0.00 |
| 0.9 Dead+1.0 Wind 0 deg - No Ice | 31.84 | 0.00 | -33.67 | -4063.93 | 0.00 | 0.00 |
| 1.2 Dead+1.0 Wind 30 deg - No Ice | 42.46 | 16.84 | -29.16 | -3543.96 | -2046.11 | -0.01 |
| 0.9 Dead+1.0 Wind 30 deg - No Ice | 31.84 | 16.84 | -29.16 | -3520.00 | -2032.27 | -0.01 |
| 1.2 Dead+1.0 Wind 60 deg - No Ice | 42.46 | 29.16 | -16.84 | -2046.11 | -3543.96 | -0.01 |
| 0.9 Dead+1.0 Wind 60 deg - No Ice | 31.84 | 29.16 | -16.84 | -2032.27 | -3519.99 | -0.01 |
| 1.2 Dead+1.0 Wind 90 deg - No Ice | 42.46 | 33.67 | -0.00 | -0.01 | -4091.85 | -0.02 |
| 0.9 Dead+1.0 Wind 90 deg - No Ice | 31.84 | 33.67 | 0.01 | 0.01 | -4064.29 | -0.02 |
| 1.2 Dead+1.0 Wind 120 deg - No Ice | 42.46 | 29.16 | 16.84 | 2046.10 | -3543.96 | -0.01 |
| 0.9 Dead+1.0 Wind 120 deg - No Ice | 31.84 | 29.16 | 16.84 | 2032.26 | -3519.99 | -0.01 |
| 1.2 Dead+1.0 Wind 150 deg - No Ice | 42.46 | 16.84 | 29.16 | 3543.95 | -2046.11 | -0.01 |
| 0.9 Dead+1.0 Wind 150 deg - No Ice | 31.84 | 16.84 | 29.16 | 3519.99 | -2032.27 | -0.01 |
| 1.2 Dead+1.0 Wind 180 deg - No Ice | 42.46 | 0.00 | 33.67 | 4091.85 | 0.00 | 0.00 |
| 0.9 Dead+1.0 Wind 180 deg - No Ice | 31.84 | 0.00 | 33.67 | 4063.92 | 0.00 | 0.00 |
| 1.2 Dead+1.0 Wind 210 deg - No Ice | 42.46 | -16.84 | 29.16 | 3543.95 | 2046.11 | 0.01 |
| 0.9 Dead+1.0 Wind 210 deg - No Ice | 31.84 | -16.84 | 29.16 | 3519.99 | 2032.27 | 0.01 |
| 1.2 Dead+1.0 Wind 240 deg - No Ice | 42.46 | -29.16 | 16.84 | 2046.10 | 3543.96 | 0.01 |
| 0.9 Dead+1.0 Wind 240 deg - No Ice | 31.84 | -29.16 | 16.84 | 2032.26 | 3519.99 | 0.01 |
| 1.2 Dead+1.0 Wind 270 deg - No Ice | 42.46 | -33.67 | -0.00 | -0.01 | 4091.85 | 0.02 |
| 0.9 Dead+1.0 Wind 270 deg - No Ice | 31.84 | -33.67 | 0.01 | 0.01 | 4064.29 | 0.02 |
| 1.2 Dead+1.0 Wind 300 deg - No Ice | 42.46 | -29.16 | -16.84 | -2046.11 | 3543.96 | 0.01 |
| 0.9 Dead+1.0 Wind 300 deg - No Ice | 31.84 | -29.16 | -16.84 | -2032.27 | 3519.99 | 0.01 |

| Load Combination | Vertical K | $Shear_x$ K | $Shear_z$ K | Overturning Moment, $M_x$ kip-ft | Overturning Moment, $M_z$ kip-ft | Torque kip-ft |
|---|---|---|---|---|---|---|
| 1.2 Dead+1.0 Wind 330 deg - No Ice | 42.46 | -16.84 | -29.16 | -3543.96 | 2046.11 | 0.01 |
| 0.9 Dead+1.0 Wind 330 deg - No Ice | 31.84 | -16.84 | -29.16 | -3520.00 | 2032.27 | 0.01 |
| 1.2 Dead+1.0 Ice+1.0 Temp | 60.53 | 0.00 | -0.00 | -0.02 | 0.00 | 0.00 |
| 1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp | 60.53 | 0.00 | -4.11 | -494.73 | 0.00 | 0.00 |
| 1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp | 60.53 | 2.05 | -3.56 | -428.45 | -247.35 | -0.00 |
| 1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp | 60.53 | 3.56 | -2.05 | -247.38 | -428.42 | -0.01 |
| 1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp | 60.53 | 4.11 | 0.00 | -0.03 | -494.70 | -0.01 |
| 1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp | 60.53 | 3.56 | 2.05 | 247.32 | -428.42 | -0.01 |
| 1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp | 60.53 | 2.05 | 3.56 | 428.40 | -247.35 | -0.00 |
| 1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp | 60.53 | 0.00 | 4.11 | 494.67 | 0.00 | 0.00 |
| 1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp | 60.53 | -2.05 | 3.56 | 428.40 | 247.35 | 0.00 |
| 1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp | 60.53 | -3.56 | 2.05 | 247.32 | 428.42 | 0.01 |
| 1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp | 60.53 | -4.11 | 0.00 | -0.03 | 494.70 | 0.01 |
| 1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp | 60.53 | -3.56 | -2.05 | -247.38 | 428.42 | 0.01 |
| 1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp | 60.53 | -2.05 | -3.56 | -428.45 | 247.35 | 0.00 |
| Dead+Wind 0 deg - Service | 35.38 | 0.00 | -9.47 | -1147.48 | 0.00 | 0.00 |
| Dead+Wind 30 deg - Service | 35.38 | 4.74 | -8.20 | -993.75 | -573.74 | -0.00 |
| Dead+Wind 60 deg - Service | 35.38 | 8.20 | -4.74 | -573.74 | -993.74 | -0.00 |
| Dead+Wind 90 deg - Service | 35.38 | 9.47 | 0.02 | 0.01 | -1147.69 | -0.00 |
| Dead+Wind 120 deg - Service | 35.38 | 8.20 | 4.74 | 573.73 | -993.74 | -0.00 |
| Dead+Wind 150 deg - Service | 35.38 | 4.74 | 8.20 | 993.74 | -573.74 | -0.00 |
| Dead+Wind 180 deg - Service | 35.38 | 0.00 | 9.47 | 1147.47 | 0.00 | 0.00 |
| Dead+Wind 210 deg - Service | 35.38 | -4.74 | 8.20 | 993.74 | 573.74 | 0.00 |
| Dead+Wind 240 deg - Service | 35.38 | -8.20 | 4.74 | 573.73 | 993.74 | 0.00 |
| Dead+Wind 270 deg - Service | 35.38 | -9.47 | 0.02 | 0.01 | 1147.69 | 0.00 |
| Dead+Wind 300 deg - Service | 35.38 | -8.20 | -4.74 | -573.74 | 993.74 | 0.00 |
| Dead+Wind 330 deg - Service | 35.38 | -4.74 | -8.20 | -993.75 | 573.74 | 0.00 |

# Solution Summary

| | Sum of Applied Forces | | | Sum of Reactions | | | |
|---|---|---|---|---|---|---|---|
| Load Comb. | PX K | PY K | PZ K | PX K | PY K | PZ K | % Error |
| 1 | 0.00 | -35.38 | 0.00 | 0.00 | 35.38 | 0.02 | 0.045% |
| 2 | 0.00 | -42.46 | -33.68 | 0.00 | 42.46 | 33.67 | 0.005% |
| 3 | 0.00 | -31.84 | -33.68 | 0.00 | 31.84 | 33.67 | 0.010% |
| 4 | 16.84 | -42.46 | -29.16 | -16.84 | 42.46 | 29.16 | 0.000% |
| 5 | 16.84 | -31.84 | -29.16 | -16.84 | 31.84 | 29.16 | 0.000% |
| 6 | 29.16 | -42.46 | -16.84 | -29.16 | 42.46 | 16.84 | 0.000% |
| 7 | 29.16 | -31.84 | -16.84 | -29.16 | 31.84 | 16.84 | 0.000% |
| 8 | 33.68 | -42.46 | 0.00 | -33.67 | 42.46 | 0.00 | 0.005% |
| 9 | 33.68 | -31.84 | 0.00 | -33.67 | 31.84 | -0.01 | 0.032% |
| 10 | 29.16 | -42.46 | 16.84 | -29.16 | 42.46 | -16.84 | 0.000% |
| 11 | 29.16 | -31.84 | 16.84 | -29.16 | 31.84 | -16.84 | 0.000% |
| 12 | 16.84 | -42.46 | 29.16 | -16.84 | 42.46 | -29.16 | 0.000% |
| 13 | 16.84 | -31.84 | 29.16 | -16.84 | 31.84 | -29.16 | 0.000% |
| 14 | 0.00 | -42.46 | 33.68 | 0.00 | 42.46 | -33.67 | 0.005% |
| 15 | 0.00 | -31.84 | 33.68 | 0.00 | 31.84 | -33.67 | 0.010% |
| 16 | -16.84 | -42.46 | 29.16 | 16.84 | 42.46 | -29.16 | 0.000% |
| 17 | -16.84 | -31.84 | 29.16 | 16.84 | 31.84 | -29.16 | 0.000% |
| 18 | -29.16 | -42.46 | 16.84 | 29.16 | 42.46 | -16.84 | 0.000% |
| 19 | -29.16 | -31.84 | 16.84 | 29.16 | 31.84 | -16.84 | 0.000% |
| 20 | -33.68 | -42.46 | 0.00 | 33.67 | 42.46 | 0.00 | 0.005% |

| | Sum of Applied Forces | | | Sum of Reactions | | | |
|---|---|---|---|---|---|---|---|
| Load Comb. | PX K | PY K | PZ K | PX K | PY K | PZ K | % Error |
| 21 | -33.68 | -31.84 | 0.00 | 33.67 | 31.84 | -0.01 | 0.032% |
| 22 | -29.16 | -42.46 | -16.84 | 29.16 | 42.46 | 16.84 | 0.000% |
| 23 | -29.16 | -31.84 | -16.84 | 29.16 | 31.84 | 16.84 | 0.000% |
| 24 | -16.84 | -42.46 | -29.16 | 16.84 | 42.46 | 29.16 | 0.000% |
| 25 | -16.84 | -31.84 | -29.16 | 16.84 | 31.84 | 29.16 | 0.000% |
| 26 | 0.00 | -60.53 | 0.00 | 0.00 | 60.53 | 0.00 | 0.000% |
| 27 | 0.00 | -60.53 | -4.11 | 0.00 | 60.53 | 4.11 | 0.001% |
| 28 | 2.05 | -60.53 | -3.56 | -2.05 | 60.53 | 3.56 | 0.001% |
| 29 | 3.56 | -60.53 | -2.05 | -3.56 | 60.53 | 2.05 | 0.001% |
| 30 | 4.11 | -60.53 | 0.00 | -4.11 | 60.53 | -0.00 | 0.001% |
| 31 | 3.56 | -60.53 | 2.05 | -3.56 | 60.53 | -2.05 | 0.001% |
| 32 | 2.05 | -60.53 | 3.56 | -2.05 | 60.53 | -3.56 | 0.001% |
| 33 | 0.00 | -60.53 | 4.11 | 0.00 | 60.53 | -4.11 | 0.001% |
| 34 | -2.05 | -60.53 | 3.56 | 2.05 | 60.53 | -3.56 | 0.001% |
| 35 | -3.56 | -60.53 | 2.05 | 3.56 | 60.53 | -2.05 | 0.001% |
| 36 | -4.11 | -60.53 | 0.00 | 4.11 | 60.53 | -0.00 | 0.001% |
| 37 | -3.56 | -60.53 | -2.05 | 3.56 | 60.53 | 2.05 | 0.001% |
| 38 | -2.05 | -60.53 | -3.56 | 2.05 | 60.53 | 3.56 | 0.001% |
| 39 | 0.00 | -35.38 | -9.47 | 0.00 | 35.38 | 9.47 | 0.004% |
| 40 | 4.74 | -35.38 | -8.20 | -4.74 | 35.38 | 8.20 | 0.004% |
| 41 | 8.20 | -35.38 | -4.74 | -8.20 | 35.38 | 4.74 | 0.004% |
| 42 | 9.47 | -35.38 | 0.00 | -9.47 | 35.38 | -0.02 | 0.045% |
| 43 | 8.20 | -35.38 | 4.74 | -8.20 | 35.38 | -4.74 | 0.004% |
| 44 | 4.74 | -35.38 | 8.20 | -4.74 | 35.38 | -8.20 | 0.004% |
| 45 | 0.00 | -35.38 | 9.47 | 0.00 | 35.38 | -9.47 | 0.004% |
| 46 | -4.74 | -35.38 | 8.20 | 4.74 | 35.38 | -8.20 | 0.004% |
| 47 | -8.20 | -35.38 | 4.74 | 8.20 | 35.38 | -4.74 | 0.004% |
| 48 | -9.47 | -35.38 | 0.00 | 9.47 | 35.38 | -0.02 | 0.045% |
| 49 | -8.20 | -35.38 | -4.74 | 8.20 | 35.38 | 4.74 | 0.004% |
| 50 | -4.74 | -35.38 | -8.20 | 4.74 | 35.38 | 8.20 | 0.004% |

# Non-Linear Convergence Results

| Load Combination | Converged? | Number of Cycles | Displacement Tolerance | Force Tolerance |
|---|---|---|---|---|
| 1 | Yes | 16 | 0.00000001 | 0.00000000 |
| 2 | Yes | 14 | 0.00005511 | 0.00007550 |
| 3 | Yes | 13 | 0.00008962 | 0.00014467 |
| 4 | Yes | 17 | 0.00000001 | 0.00014947 |
| 5 | Yes | 17 | 0.00000001 | 0.00011088 |
| 6 | Yes | 17 | 0.00000001 | 0.00014952 |
| 7 | Yes | 17 | 0.00000001 | 0.00011091 |
| 8 | Yes | 14 | 0.00005511 | 0.00007550 |
| 9 | Yes | 14 | 0.00003812 | 0.00011888 |
| 10 | Yes | 17 | 0.00000001 | 0.00014946 |
| 11 | Yes | 17 | 0.00000001 | 0.00011087 |
| 12 | Yes | 17 | 0.00000001 | 0.00014951 |
| 13 | Yes | 17 | 0.00000001 | 0.00011090 |
| 14 | Yes | 14 | 0.00005511 | 0.00007550 |
| 15 | Yes | 13 | 0.00008962 | 0.00014467 |
| 16 | Yes | 17 | 0.00000001 | 0.00014951 |
| 17 | Yes | 17 | 0.00000001 | 0.00011090 |
| 18 | Yes | 17 | 0.00000001 | 0.00014946 |
| 19 | Yes | 17 | 0.00000001 | 0.00011087 |
| 20 | Yes | 14 | 0.00005511 | 0.00007550 |
| 21 | Yes | 14 | 0.00003812 | 0.00011888 |
| 22 | Yes | 17 | 0.00000001 | 0.00014952 |
| 23 | Yes | 17 | 0.00000001 | 0.00011091 |
| 24 | Yes | 17 | 0.00000001 | 0.00014947 |
| 25 | Yes | 17 | 0.00000001 | 0.00011088 |
| 26 | Yes | 6 | 0.00000001 | 0.00000001 |
| 27 | Yes | 14 | 0.00000001 | 0.00012310 |
| 28 | Yes | 14 | 0.00000001 | 0.00012680 |
| 29 | Yes | 14 | 0.00000001 | 0.00012680 |
| 30 | Yes | 14 | 0.00000001 | 0.00012308 |
| 31 | Yes | 14 | 0.00000001 | 0.00012677 |
| 32 | Yes | 14 | 0.00000001 | 0.00012677 |
| 33 | Yes | 14 | 0.00000001 | 0.00012306 |
| 34 | Yes | 14 | 0.00000001 | 0.00012677 |
| 35 | Yes | 14 | 0.00000001 | 0.00012677 |
| 36 | Yes | 14 | 0.00000001 | 0.00012308 |
| 37 | Yes | 14 | 0.00000001 | 0.00012680 |
| 38 | Yes | 14 | 0.00000001 | 0.00012680 |
| 39 | Yes | 13 | 0.00011036 | 0.00007159 |
| 40 | Yes | 13 | 0.00011005 | 0.00009409 |
| 41 | Yes | 13 | 0.00011005 | 0.00009425 |
| 42 | Yes | 23 | 0.00000001 | 0.00000000 |
| 43 | Yes | 13 | 0.00011005 | 0.00009404 |
| 44 | Yes | 13 | 0.00011005 | 0.00009420 |
| 45 | Yes | 13 | 0.00011035 | 0.00007159 |
| 46 | Yes | 13 | 0.00011005 | 0.00009420 |
| 47 | Yes | 13 | 0.00011005 | 0.00009404 |
| 48 | Yes | 23 | 0.00000001 | 0.00000000 |
| 49 | Yes | 13 | 0.00011005 | 0.00009425 |
| 50 | Yes | 13 | 0.00011005 | 0.00009409 |

# Maximum Tower Deflections - Service Wind

| Section No. | Elevation ft | Horz. Deflection in | Gov. Load Comb. | Tilt ° | Twist ° |
|---|---|---|---|---|---|
| L1 | 179.739 - 140.862 | 32.490 | 42 | 1.9048 | 0.0001 |
| L2 | 144.503 - 105.625 | 19.177 | 42 | 1.5516 | 0.0000 |
| L3 | 110.579 - 71.7015 | 9.869 | 42 | 1.0404 | 0.0000 |
| L4 | 77.8432 - 38.9652 | 4.224 | 42 | 0.5875 | 0.0000 |
| L5 | 46.2815 - 7.5676 | 1.260 | 42 | 0.2953 | 0.0000 |

## Critical Deflections and Radius of Curvature - Service Wind

| Elevation ft | Appurtenance | Gov. Load Comb. | Deflection in | Tilt ° | Twist ° | Radius of Curvature ft |
|---|---|---|---|---|---|---|
| 179.74 | Beacon | 42 | 32.490 | 1.9048 | 0.0001 | 22657 |
| 170.00 | 42,000 sq in. - Carrier 1 | 42 | 28.612 | 1.8196 | 0.0001 | 11631 |
| 155.00 | 20,000 sq in. - Carrier 2 | 42 | 22.867 | 1.6742 | 0.0001 | 4578 |
| 140.00 | 20,000 sq in. - Carrier 3 | 42 | 17.711 | 1.4917 | 0.0000 | 3293 |

## Maximum Tower Deflections - Design Wind

| Section No. | Elevation ft | Horz. Deflection in | Gov. Load Comb. | Tilt ° | Twist ° |
|---|---|---|---|---|---|
| L1 | 179.739 - 140.862 | 115.742 | 2 | 6.7925 | 0.0005 |
| L2 | 144.503 - 105.625 | 68.361 | 2 | 5.5341 | 0.0001 |
| L3 | 110.579 - 71.7015 | 35.196 | 2 | 3.7118 | 0.0000 |
| L4 | 77.8432 - 38.9652 | 15.066 | 2 | 2.0958 | 0.0000 |
| L5 | 46.2815 - 7.5676 | 4.495 | 4 | 1.0534 | 0.0000 |

## Critical Deflections and Radius of Curvature - Design Wind

| Elevation ft | Appurtenance | Gov. Load Comb. | Deflection in | Tilt ° | Twist ° | Radius of Curvature ft |
|---|---|---|---|---|---|---|
| 179.74 | Beacon | 2 | 115.742 | 6.7925 | 0.0005 | 6514 |
| 170.00 | 42,000 sq in. - Carrier 1 | 2 | 101.945 | 6.4891 | 0.0004 | 3343 |
| 155.00 | 20,000 sq in. - Carrier 2 | 2 | 81.499 | 5.9709 | 0.0002 | 1312 |
| 140.00 | 20,000 sq in. - Carrier 3 | 2 | 63.140 | 5.3208 | 0.0001 | 940 |

## *Compression Checks*

## Pole Design Data

| Section No. | Elevation ft | Size | L ft | $L_u$ ft | Kl/r | A $in^2$ | $P_u$ K | $\phi P_n$ K | Ratio $\frac{P_u}{\phi P_n}$ |
|---|---|---|---|---|---|---|---|---|---|
| L1 | 179.739 - 140.862 (1) | TP26.8504x14.9606x0.1969 | 38.88 | 0.00 | 0.0 | 15.9573 | -5.81 | 718.08 | 0.008 |
| L2 | 140.862 - 105.625 (2) | TP37.2323x25.343x0.3149 | 38.88 | 0.00 | 0.0 | 35.3844 | -12.09 | 1592.30 | 0.008 |
| L3 | 105.625 - 71.7015 (3) | TP47.126x35.0875x0.3149 | 38.88 | 0.00 | 0.0 | 44.8865 | -18.71 | 2019.89 | 0.009 |
| L4 | 71.7015 - 38.9652 (4) | TP56.5118x44.5944x0.3937 | 38.88 | 0.00 | 0.0 | 67.3229 | -28.19 | 3029.53 | 0.009 |
| L5 | 38.9652 - 7.5676 (5) | TP65.2756x53.4817x0.3937 | 38.71 | 0.00 | 0.0 | 81.0767 | -42.44 | 3648.45 | 0.012 |

## Pole Bending Design Data

| Section No. | Elevation ft | Size | $M_{ux}$ kip-ft | $\phi M_{nx}$ kip-ft | Ratio $\frac{M_{ux}}{\phi M_{nx}}$ | $M_{uy}$ kip-ft | $\phi M_{ny}$ kip-ft | Ratio $\frac{M_{uy}}{\phi M_{ny}}$ |
|---|---|---|---|---|---|---|---|---|
| L1 | 179.739 - 140.862 (1) | TP26.8504x14.9606x0.1969 | 348.25 | 455.93 | 0.764 | 0.00 | 455.93 | 0.000 |
| L2 | 140.862 - 105.625 (2) | TP37.2323x25.343x0.3149 | 1105.33 | 1455.78 | 0.759 | 0.00 | 1455.78 | 0.000 |
| L3 | 105.625 - 71.7015 (3) | TP47.126x35.0875x0.3149 | 1946.24 | 2189.57 | 0.889 | 0.00 | 2189.57 | 0.000 |

| Section No. | Elevation ft | Size | $M_{ux}$ kip-ft | $\phi M_{nx}$ kip-ft | Ratio $\frac{M_{ux}}{\phi M_{nx}}$ | $M_{uy}$ kip-ft | $\phi M_{ny}$ kip-ft | Ratio $\frac{M_{uy}}{\phi M_{ny}}$ |
|---|---|---|---|---|---|---|---|---|
| L4 | 71.7015 - 38.9652 (4) | TP56.5118x44.5944x0.3937 | 2851.74 | 3992.64 | 0.714 | 0.00 | 3992.64 | 0.000 |
| L5 | 38.9652 - 7.5676 (5) | TP65.2756x53.4817x0.3937 | 4092.22 | 5417.00 | 0.755 | 0.00 | 5417.00 | 0.000 |

## Pole Shear Design Data

| Section No. | Elevation ft | Size | Actual $V_u$ K | $\phi V_n$ K | Ratio $\frac{V_u}{\phi V_n}$ | Actual $T_u$ kip-ft | $\phi T_n$ kip-ft | Ratio $\frac{T_u}{\phi T_n}$ |
|---|---|---|---|---|---|---|---|---|
| L1 | 179.739 - 140.862 (1) | TP26.8504x14.9606x0.1969 | 17.05 | 215.42 | 0.079 | 0.01 | 481.83 | 0.000 |
| L2 | 140.862 - 105.625 (2) | TP37.2323x25.343x0.3149 | 24.26 | 477.69 | 0.051 | 0.01 | 1481.01 | 0.000 |
| L3 | 105.625 - 71.7015 (3) | TP47.126x35.0875x0.3149 | 27.13 | 605.97 | 0.045 | 0.01 | 2383.23 | 0.000 |
| L4 | 71.7015 - 38.9652 (4) | TP56.5118x44.5944x0.3937 | 30.22 | 908.86 | 0.033 | 0.01 | 4288.12 | 0.000 |
| L5 | 38.9652 - 7.5676 (5) | TP65.2756x53.4817x0.3937 | 33.69 | 1094.54 | 0.031 | 0.01 | 6219.18 | 0.000 |

## Pole Interaction Design Data

| Section No. | Elevation ft | Ratio $\frac{P_u}{\phi P_n}$ | Ratio $\frac{M_{ux}}{\phi M_{nx}}$ | Ratio $\frac{M_{uy}}{\phi M_{ny}}$ | Ratio $\frac{V_u}{\phi V_n}$ | Ratio $\frac{T_u}{\phi T_n}$ | Comb. Stress Ratio | Allow. Stress Ratio | Criteria |
|---|---|---|---|---|---|---|---|---|---|
| L1 | 179.739 - 140.862 (1) | 0.008 | 0.764 | 0.000 | 0.079 | 0.000 | 0.778 | 1.000 | |
| L2 | 140.862 - 105.625 (2) | 0.008 | 0.759 | 0.000 | 0.051 | 0.000 | 0.769 | 1.000 | |
| L3 | 105.625 - 71.7015 (3) | 0.009 | 0.889 | 0.000 | 0.045 | 0.000 | 0.900 | 1.000 | |
| L4 | 71.7015 - 38.9652 (4) | 0.009 | 0.714 | 0.000 | 0.033 | 0.000 | 0.725 | 1.000 | |
| L5 | 38.9652 - 7.5676 (5) | 0.012 | 0.755 | 0.000 | 0.031 | 0.000 | 0.768 | 1.000 | |

## Section Capacity Table

| Section No. | Elevation ft | Component Type | Size | Critical Element | P K | $\phi P_{allow}$ K | % Capacity | Pass Fail |
|---|---|---|---|---|---|---|---|---|
| L1 | 179.739 - 140.862 | Pole | TP26.8504x14.9606x0.1969 | 1 | -5.81 | 718.08 | 77.8 | Pass |
| L2 | 140.862 - 105.625 | Pole | TP37.2323x25.343x0.3149 | 2 | -12.09 | 1592.30 | 76.9 | Pass |
| L3 | 105.625 - 71.7015 | Pole | TP47.126x35.0875x0.3149 | 3 | -18.71 | 2019.89 | 90.0 | Pass |
| L4 | 71.7015 - 38.9652 | Pole | TP56.5118x44.5944x0.3937 | 4 | -28.19 | 3029.53 | 72.5 | Pass |
| L5 | 38.9652 - 7.5676 | Pole | TP65.2756x53.4817x0.3937 | 5 | -42.44 | 3648.45 | 76.8 | Pass |
| | | | | | | | Summary | |
| | | | | | | Pole (L3) | 90.0 | Pass |
| | | | | | | **RATING =** | **90.0** | **Pass** |

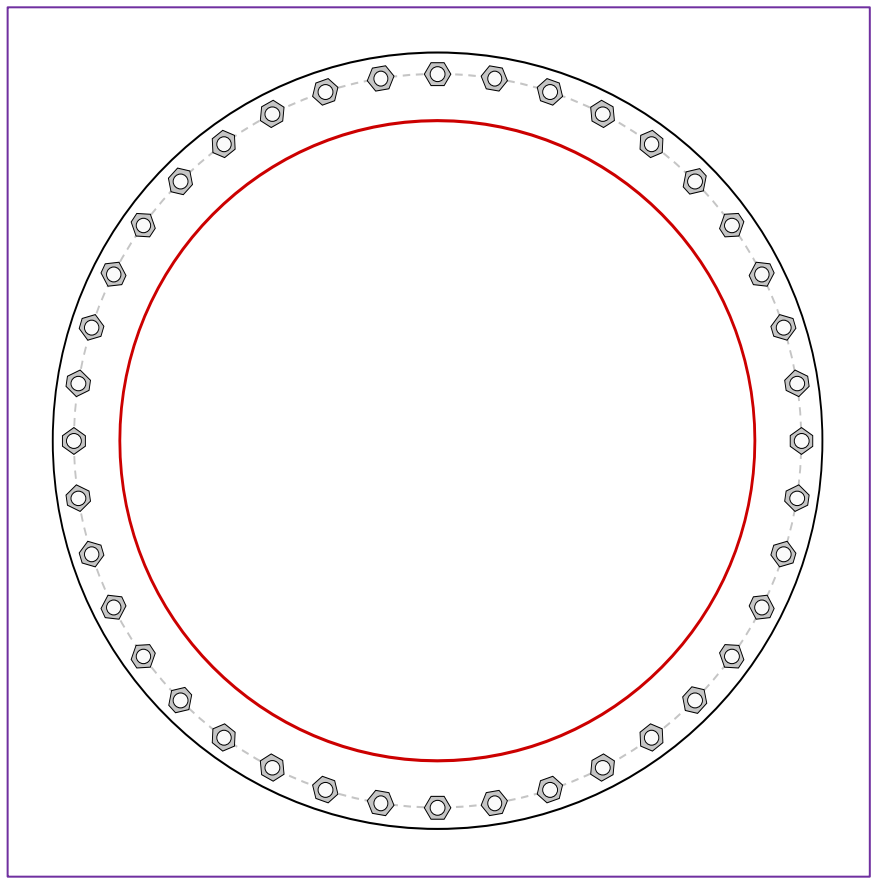
## APPENDIX B

## ADDITIONAL CALCULATIONS

# Monopole Base Plate Connection

| Analysis Considerations | |
|---|---|
| TIA-222 Revision | H |
| Grout Considered: | No |
| $l_{ar}$ (in) | 0 |

| Applied Loads | |
|---|---|
| Moment (kip-ft) | 4092.21 |
| Axial Force (kips) | 42.44 |
| Shear Force (kips) | 33.69 |



## Connection Properties

**Anchor Rod Data**

(40) 1-1/2" ø bolts (F1554-55 N; Fy=55 ksi, Fu=75 ksi) on 74.803" BC

**Base Plate Data**

79.134" OD x 1.9685" Plate (A572-50; Fy=50 ksi, Fu=65 ksi)

**Stiffener Data**

N/A

**Pole Data**

65.2756" x 0.3937" 18-sided pole (A572-50; Fy=50 ksi, Fu=65 ksi)

## Analysis Results

**Anchor Rod Summary** *(units of kips, kip-in)*

| | | |
|---|---|---|
| Pu_t = 64.58 | ϕPn_t = 79.31 | **Stress Rating** |
| Vu = 0.84 | ϕVn = 49.7 | **81.4%** |
| Mu = n/a | ϕMn = n/a | **Pass** |

**Base Plate Summary**

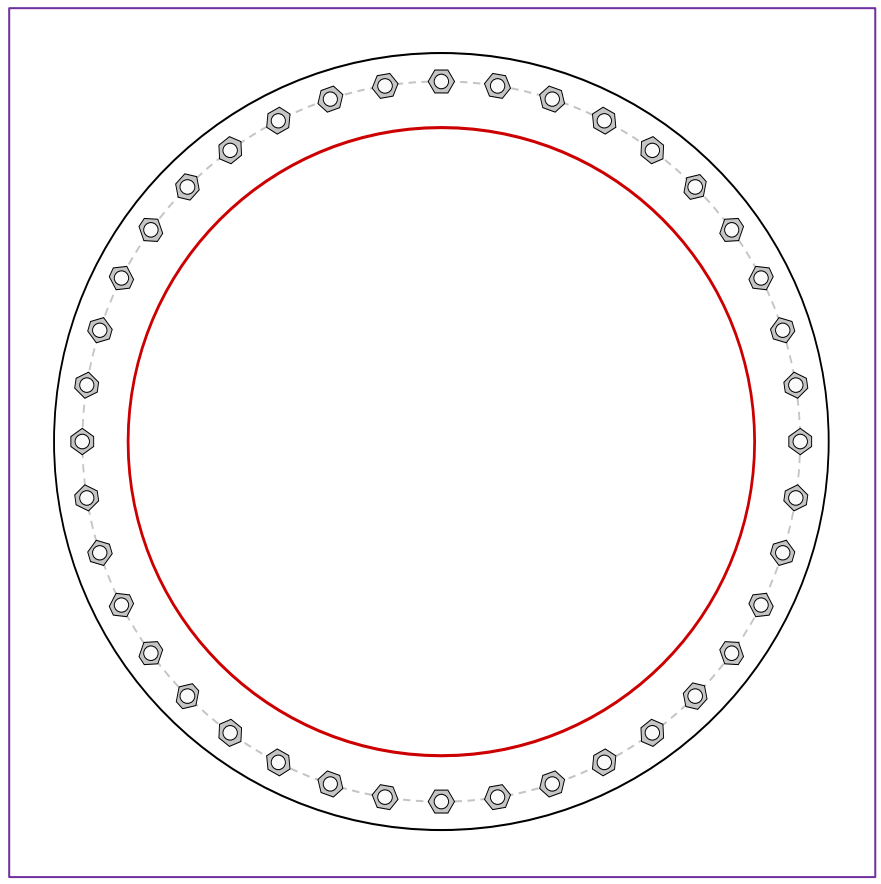
| | | |
|---|---|---|
| Max Stress (ksi): | 37.84 | (Flexural) |
| Allowable Stress (ksi): | 45 | |
| Stress Rating: | **84.1%** | **Pass** |

Analysis Date: 7/9/2026

# King Post Flange

| Analysis Considerations | |
|---|---|
| TIA-222 Revision | H |
| Grout Considered: | No |
| $I_{ar}$ (in) | 0 |

| Applied Loads | |
|---|---|
| Moment (kip-ft) | 4092.21 |
| Axial Force (kips) | 42.44 |
| Shear Force (kips) | 33.69 |



## Connection Properties

**Anchor Rod Data**

(40) 1-1/2" ø bolts (F1554-55 N; Fy=55 ksi, Fu=75 ksi) on 74.803" BC

**Base Plate Data**

80.7" OD x 1.97" Plate (A572-50; Fy=50 ksi, Fu=65 ksi)

**Stiffener Data**

N/A

**Pole Data**

65.28" x 0.3937" 18-sided pole (A572-50; Fy=50 ksi, Fu=65 ksi)

## Analysis Results

**Anchor Rod Summary** *(units of kips, kip-in)*

| | | |
|---|---|---|
| Pu_t = 64.58 | ϕPn_t = 79.31 | **Stress Rating** |
| Vu = 0.84 | ϕVn = 49.7 | **81.4%** |
| Mu = n/a | ϕMn = n/a | **Pass** |

**Base Plate Summary**

| | | |
|---|---|---|
| Max Stress (ksi): | 37.76 | (Flexural) |
| Allowable Stress (ksi): | 45 | |
| Stress Rating: | **83.9%** | **Pass** |

Analysis Date: 7/13/2026

PAUL J. FORD & COMPANY
250 E Broad St, Ste 600 • Columbus, OH 43215
Phone 614.221.6679 www.pauljford.com


| | |
|---|---|
| Job Number: | A21226-0033.001.7205 |
| Engineer: | AGB |
| Date: | 7/9/2026 |
| Site Name: | NST-00001 |
| Site Number: | |
| Client Project: | NST-00001 |
| Client Project 1: | |

# AFS-3000 - Foundation Calculations

(Version v1.4 - Effective Date 07/7/2026 )

| | |
|---|---|
| Foundation Specification | AFS-3000 |
| Foundation Description | 20-Sided Soil Filled Basket |

## General

| | |
|---|---|
| Code | ANSI/TIA-222-H |
| Methodology | LRFD |

## Base Reactions

| | | |
|---|---|---|
| Factored Moment (Mu) | 4092.214457 | kip*ft |
| Factored Shear (Vu) | 33.69217249 | kip |
| Factored Axial (Pu) | 42.44265821 | kip |
| Ultimate Bearing Capacity | 4000 | psf |

## Foundation Components

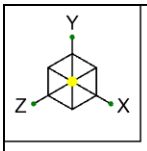
| | | Overrides | |
|---|---|---|---|
| Diameter of King Post (D_KingPost) | 67.50 | | in |
| Foundation Height (H_Fdn) | 7.75 | | ft |
| Foundation Outside Diameter (OD) | 27.33 | | ft |
| Foundation Inside Diameter (ID) | 12.50 | | ft |
| Foundation Steel Weight (W_Steel) | 33.47 | | kip |
| Unit Weight of Soil Inside Ballast | 100 | | pcf |
| Depth of Ballast Soil | 6.90 | | ft |
| Ballast Tray Depth | 6.94 | | ft |
| Include King Post In Ballast Volume? | Yes | | |
| Max Plate Width (a) | 39.69 | | in |
| Max Plate Height (b) | 15.13 | | in |
| Plate Thickness (t) | 0.24 | | in |
| Plate Yield Strength | 50.00 | | ksi |
| Plate Support Condition (Roark) | Fixed | | |
| Adjust for Internal Soil Pressure | No | | |
| Bay Width (Outside) | 50.16 | | in |
| Bay Width (Inside) | 10.77 | | in |
| Bay Length | 127.20 | | in |
| Bay Member Adjustment | 4.70 | | inches per end |
| Bay Member End Restraint | Simply Supported | | |
| Weld Electrode | E70 | | |
| Bay Taper | 0.31 | | in/in |

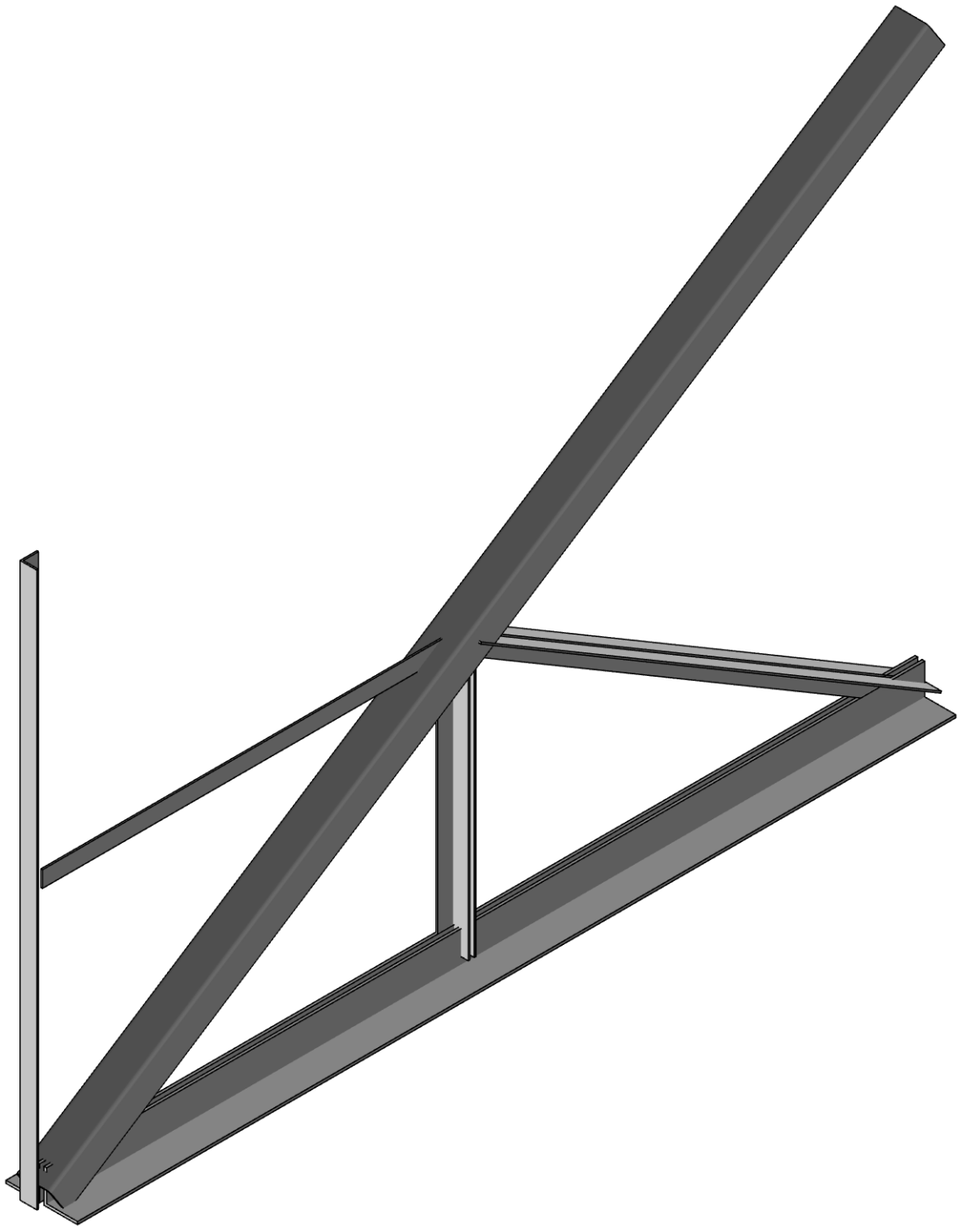
## AFS-3000 - Foundation Calculations

**Pass**

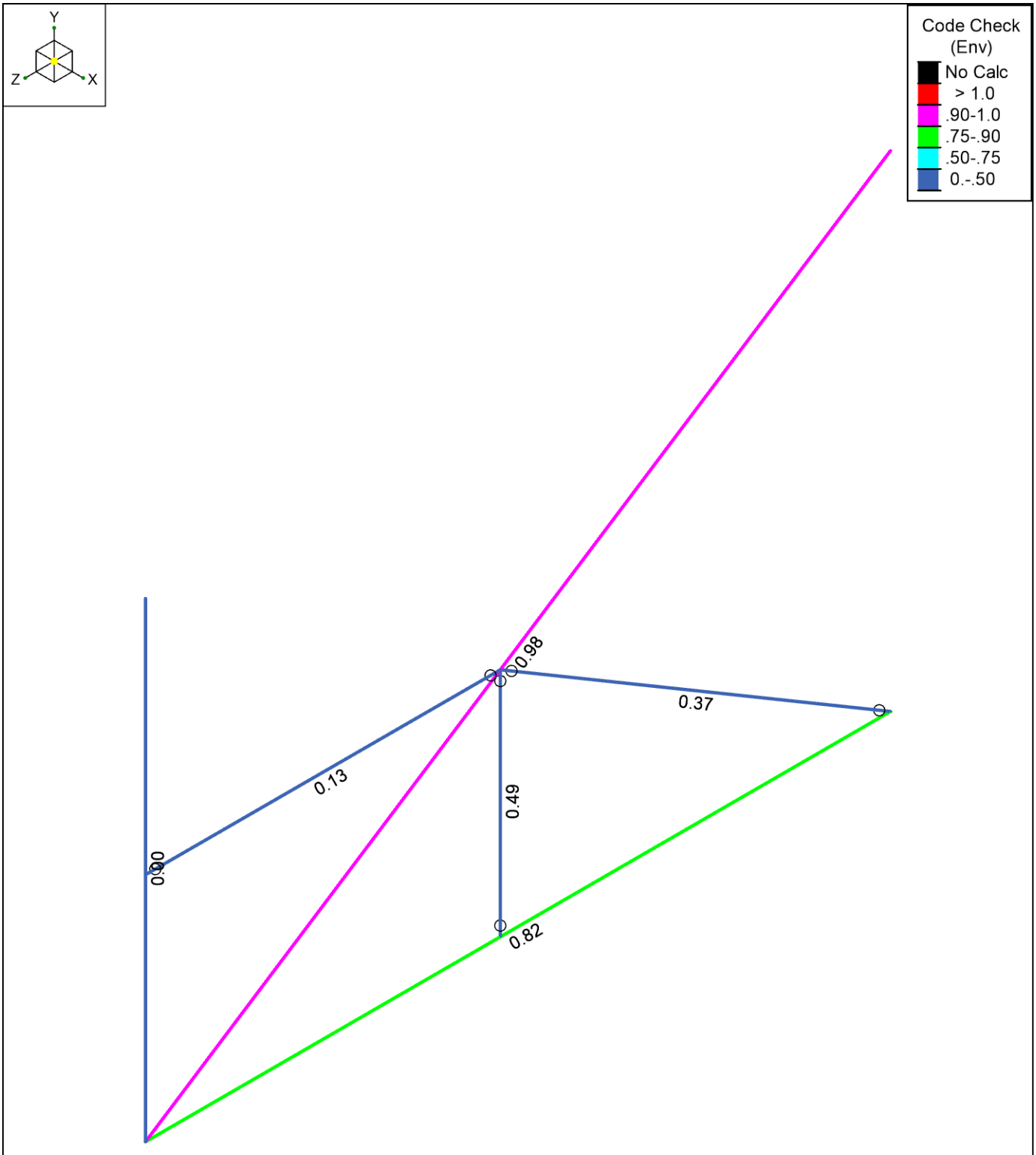
| | | | |
|---|---|---|---|
| **Overturning Moment Capacity** | | | **69.9% Pass** |
| | Applied Load: | 4353.33 | kip-ft |
| | Capacity: | 6228.83 | kip-ft |
| **Soil Bearing Capacity** | | | **96.3% Pass** |
| | Applied Load: | 2888.39 | psf |
| | Capacity: | 3000.00 | psf |
| **Plate Bending Capacity** | | | **60.8% Pass** |
| | Applied Load: | 27337.70 | psi |
| | Capacity: | 45000.00 | psi |
| **Tray Member Capacity** | | | **72.5% Pass** |
| | Applied Load: | 51.40 | kip-in |
| | Capacity: | 70.88 | kip-in |
| **Tray Member Weld Capacity** | | | **86.6% Pass** |
| | Min Weld Size Required: | 0.20 | in |
| | Weld Size: | 0.24 | in |

**Soil Bearing Capacity Controls**



| | | | |
|---|---|---|---|
| RISA A NEMETSCHEK COMPANY | Paul J. Ford and Company | AFS-3000 | SK-1 |
| | AGB | | Jul 07, 2026 at 04:48 PM |
| | 21226-0033.001.7205 | | AFS-3000.r3d |




Member Code Checks Displayed (Enveloped)

| | | | |
|---|---|---|---|
| IRISA A NEMETSCHEK COMPANY | Paul J. Ford and Company | AFS-3000 | SK-2 |
| | AGB | | Jul 13, 2026 at 03:25 PM |
| | 21226-0033.001.7205 | | AFS-3000.r3d |

## Model Settings

| | |
|---|---|
| Number of Reported Sections | 5 |
| Number of Internal Sections | 100 |
| Member Area Load Mesh Size ($in^2$) | 92903.412 |
| Consider Shear Deformation | Yes |
| Consider Torsional Warping | Yes |
| Approximate Mesh Size (in) | 304.801 |
| Transfer Forces Between Intersecting Wood Walls | Yes |
| Increase Wood Wall Nailing Capacity for Wind Loads | Yes |
| Include P-Delta for Walls | Yes |
| Optimize Masonry and Wood Walls | Yes |
| Maximum Number of Iterations | 3 |
| Single | No |
| Multiple (Optimum) | Yes |
| Maximum | No |

| | |
|---|---|
| Global Axis corresponding to vertical direction | Y |
| Convert Existing Data | Yes |
| Default Global Plane for z-axis | XZ |
| Plate Local Axis Orientation | Nodal |

| | |
|---|---|
| Hot Rolled Steel | AISC 15th (360-16): LRFD |
| Stiffness Adjustment | Yes (Iterative) |
| Notional Annex | None |
| Connections | None |
| Cold Formed Steel | None |
| Stiffness Adjustment | Yes (Iterative) |
| Wood | None |
| Temperature | < 100F |
| Concrete | None |
| Masonry | None |
| Aluminum | None |
| Structure Type | Building |
| Stiffness Adjustment | Yes (Iterative) |
| Stainless | None |
| Stiffness Adjustment | Yes (Iterative) |

| | |
|---|---|
| Compression Stress Block | Rectangular Stress Block |
| Analyze using Cracked Sections | Yes |
| Leave room for horizontal rebar splices (2*d bar spacing) | Yes |
| List forces which were ignored for design in the Detail Report | Yes |

| | |
|---|---|
| Column Min Steel | 1 |
| Column Max Steel | 8 |
| Rebar Material Spec | ASTM A615 |
| Warn if beam-column framing arrangement is not understood | No |
| Number of Shear Regions | 4 |
| Region 2 & 3 Spacing Increase Increment (in) | 101.6 |

| | |
|---|---|
| Code | ASCE 7-16 |
| Risk Category | I or II |
| Drift Cat | Other |

***Model Settings (Continued)***

| | |
|---|---|
| Base Elevation (ft) | |
| Include the weight of the structure in base shear calcs | Yes |
| $S_1$ (g) | 1 |
| $SD_1$ (g) | 1 |
| $SD_S$ (g) | 1 |
| $T_L$ (sec) | 5 |
| T Z (sec) | |
| T X (sec) | |
| $C_tZ$ | 0.02 |
| $C_tX$ | 0.02 |
| $C_t$Exp. Z | 0.75 |
| $C_t$Exp. X | 0.75 |
| R Z | 3 |
| R X | 3 |
| $\Omega_0Z$ | 1 |
| $\Omega_0X$ | 1 |
| $C_dZ$ | 4 |
| $C_dX$ | 4 |
| ρ Z | 1 |
| ρ X | 1 |

### Hot Rolled Steel Properties

| | Label | E [ksi] | G [ksi] | Nu | Therm. Coeff. [1e⁵°F⁻¹] | Density [k/ft³] | Yield [ksi] | Ry | Fu [ksi] | Rt |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | A36 Gr.36 | 29000 | 11154 | 0.3 | 0.65 | 0.49 | 36 | 1.5 | 58 | 1.2 |
| 2 | A572 Gr.50 | 29000 | 11154 | 0.3 | 0.65 | 0.49 | 50 | 1.1 | 65 | 1.1 |
| 3 | A992 | 29000 | 11154 | 0.3 | 0.65 | 0.49 | 50 | 1.1 | 65 | 1.1 |
| 4 | A500 Gr.42 | 29000 | 11154 | 0.3 | 0.65 | 0.49 | 42 | 1.4 | 58 | 1.3 |
| 5 | A500 Gr.46 | 29000 | 11154 | 0.3 | 0.65 | 0.49 | 46 | 1.4 | 58 | 1.3 |
| 6 | A53 Gr. B | 29000 | 11154 | 0.3 | 0.65 | 0.49 | 35 | 1.5 | 58 | 1.2 |
| 7 | Q235-B | 29000 | 11154 | 0.3 | 0.65 | 0.49 | 34 | 1.5 | 58 | 1.2 |
| 8 | Q345-B | 29000 | 11154 | 0.3 | 0.65 | 0.49 | 50 | 1.5 | 65 | 1.2 |

### Member Primary Data

| | Label | I Node | J Node | Rotate(deg) | Section/Shape | Type | Design List | Material | Design Rule |
|---|---|---|---|---|---|---|---|---|---|
| 1 | P14 | N1 | N86 | | HSS5X5X4 | None | None | A500 Gr.46 | Typical |
| 2 | LL14 | KPBASE | N1 | 180 | LL 125X125X10X16 | None | None | Q345-B | Typical |
| 3 | M55 | N5 | N88 | | LL 63X63X6X16 | None | None | Q345-B | Typical |
| 4 | M56 | KPBASE | N88 | | LL 63X63X6X16 | None | None | Q345-B | Typical |
| 5 | M17 | N1 | N24 | 180 | L 63X6 | None | None | Q345-B | Typical |
| 6 | M6 | B1 | N88 | | PL6X60 | None | None | Q345-B | Typical |

### Hot Rolled Steel Design Parameters

| | Label | Shape | Length [in] | Channel Conn. | a [in] | Function |
|---|---|---|---|---|---|---|
| 1 | P14 | HSS5X5X4 | 153.372 | N/A | N/A | Lateral |
| 2 | LL14 | LL 125X125X10X16 | 128.504 | N/A | N/A | Lateral |
| 3 | M55 | LL 63X63X6X16 | 39.874 | N/A | N/A | Lateral |
| 4 | M56 | LL 63X63X6X16 | 78.229 | N/A | N/A | Lateral |
| 5 | M17 | L 63X6 | 81.09 | N/A | N/A | Lateral |
| 6 | M6 | PL6X60 | 61.2 | N/A | N/A | Lateral |

### Node Loads and Enforced Displacements (BLC 1 : BLC1)

| | Node Label | L, D, M | Direction | Magnitude [(k, k-ft), (in, rad), (k*s²/in, k*s²*in)] |
|---|---|---|---|---|
| 1 | N1 | L | MX | -12.61 |
| 2 | B1 | L | Z | 3.32 |
| 3 | N1 | L | Y | 24.11 |
| 4 | N2 | L | Y | 15.4 |
| 5 | N3 | L | Y | 10.42 |
| 6 | N4 | L | Y | 9.34 |
| 7 | N5 | L | Y | 8.26 |
| 8 | N6 | L | Y | 7.18 |
| 9 | N7 | L | Y | 5.42 |

### Envelope Node Reactions

| | Node Label | | X [k] | LC | Y [k] | LC | Z [k] | LC | MX [k-ft] | LC | MY [k-ft] | LC | MZ [k-ft] | LC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | N86 | max | 0 | 1 | -58.722 | 1 | 90.599 | 1 | 0.766 | 1 | 0 | 1 | -0.001 | 1 |
| 2 | | min | 0 | 1 | -58.722 | 1 | 90.599 | 1 | 0.766 | 1 | 0 | 1 | -0.001 | 1 |
| 3 | KPBASE | max | 0 | 1 | -21.408 | 1 | -93.919 | 1 | 5.362 | 1 | 0 | 1 | 0 | 1 |
| 4 | | min | 0 | 1 | -21.408 | 1 | -93.919 | 1 | 5.362 | 1 | 0 | 1 | 0 | 1 |
| 5 | N1 | max | 0.001 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 6 | | min | 0.001 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 7 | Totals: | max | 0 | 1 | -80.13 | 1 | -3.32 | 1 | | | | | | |
| 8 | | min | 0 | 1 | -80.13 | 1 | -3.32 | 1 | | | | | | |

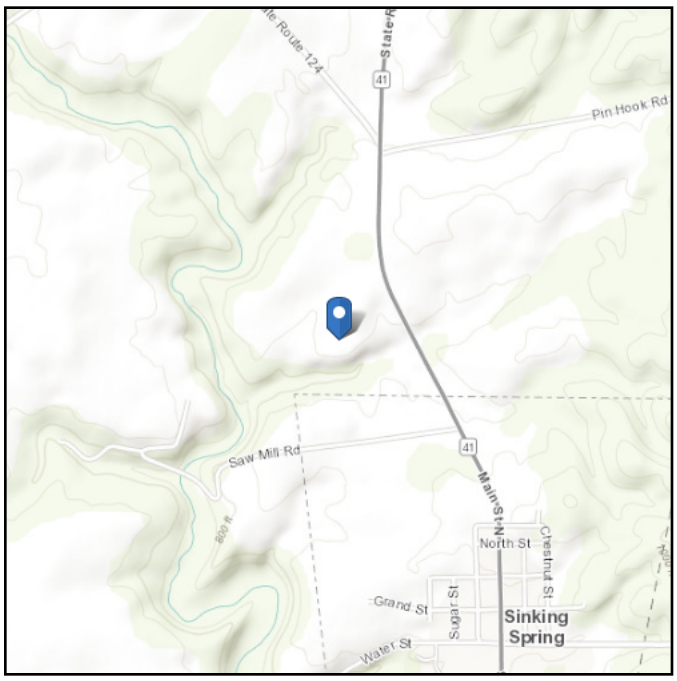
***Envelope AISC 15TH (360-16): LRFD Member Steel Code Checks***

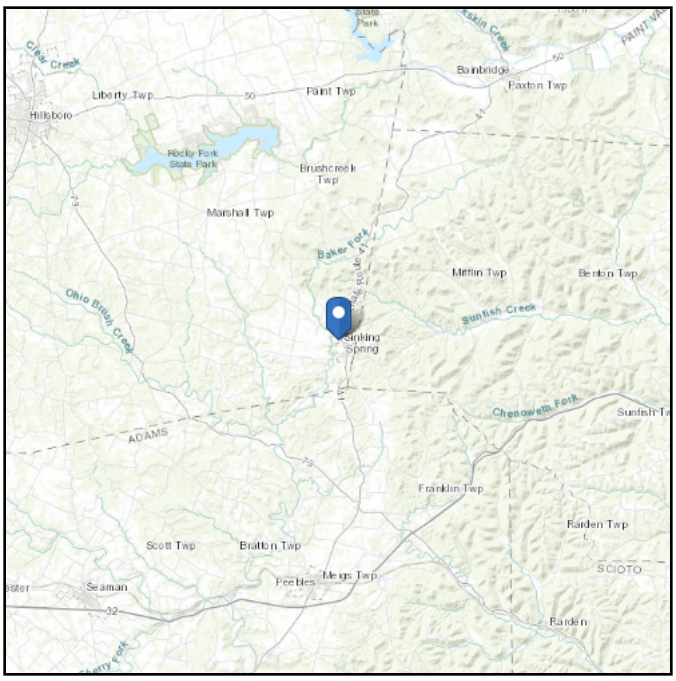
| | Member | Shape | Code Check | Loc[in] | LC | Shear Check | Loc[in] | Dir | LC | phi*Pnc [k] | phi*Pnt [k] | phi*Mn y-y [k-ft] | phi*Mn z-z [k-ft] | Cb | Eqn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | P14 | HSS5X5X4 | 0.98 | 73.491 | 1 | 0.018 | 71.893 | y | 1 | 116.354 | 178.02 | 26.255 | 26.255 | 2.212 | H1-1a |
| 2 | LL14 | LL_125X125X10X16 | 0.822 | 128.504 | 1 | 0.171 | 80.315 | y | 1 | 201.15 | 340.031 | 44.218 | 22.841 | 1 | H1-1b |
| 3 | M55 | LL_63X63X6X16 | 0.491 | 39.874 | 1 | 0 | 39.874 | y | 1 | 75.96 | 101.695 | 7.796 | 4.416 | 1 | H1-1a* |
| 4 | M56 | LL_63X63X6X16 | 0.373 | 78.229 | 1 | 0 | 78.229 | z | 1 | 46.858 | 101.695 | 7.796 | 4.346 | 1 | H1-1a |
| 5 | M6 | PL6X60 | 0.133 | 61.2 | 1 | 0.001 | 61.2 | y | 1 | 0.157 | 25.11 | 0.124 | 0.35 | 1 | H1-1b* |
| 6 | M17 | L_63X6 | 0 | 39.7 | 1 | 0.002 | 39.7 | z | 1 | 9.25 | 50.834 | 0.673 | 1.766 | 1.5 | H2-1 |

# ASCE Hazards Report

**Address:**
No Address at This Location

| | | | |
|---|---|---|---|
| **Standard:** | ASCE/SEI 7-16 | **Latitude:** | 39.081142 |
| **Risk Category:** | II | **Longitude:** | -83.392496 |
| **Soil Class:** | D - Default (see Section 11.4.3) | **Elevation:** | 851.4971267164111 ft (NAVD 88) |




## Wind

**Results:**

| | |
|---|---|
| Wind Speed | 107 Vmph |
| 10-year MRI | 74 Vmph |
| 25-year MRI | 80 Vmph |
| 50-year MRI | 85 Vmph |
| 100-year MRI | 92 Vmph |

Data Source: ASCE/SEI 7-16, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4, and Section 26.5.2

Date Accessed: Fri Feb 13 2026

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-16 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years).

Site is not in a hurricane-prone region as defined in ASCE/SEI 7-16 Section 26.2.

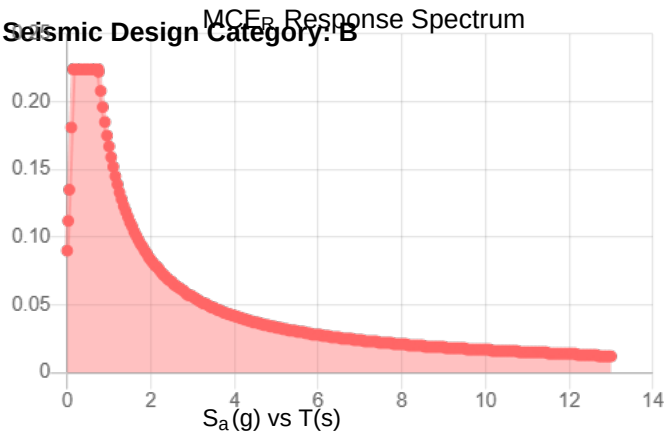
# Seismic

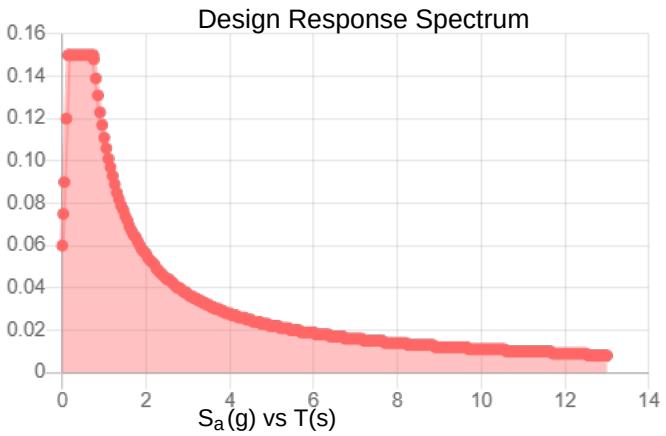
**Site Soil Class:** D - Default (see Section 11.4.3)

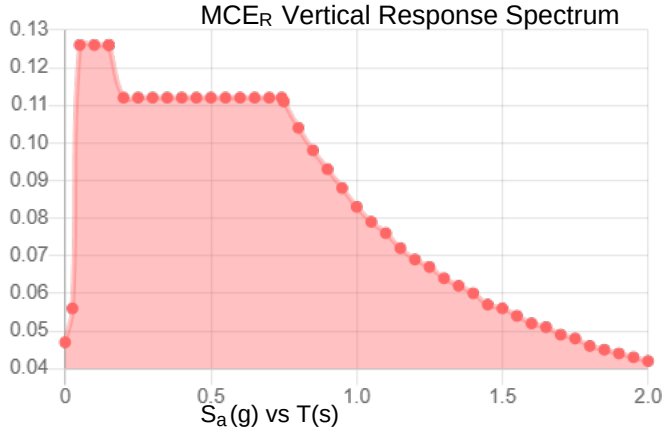
**Results:**

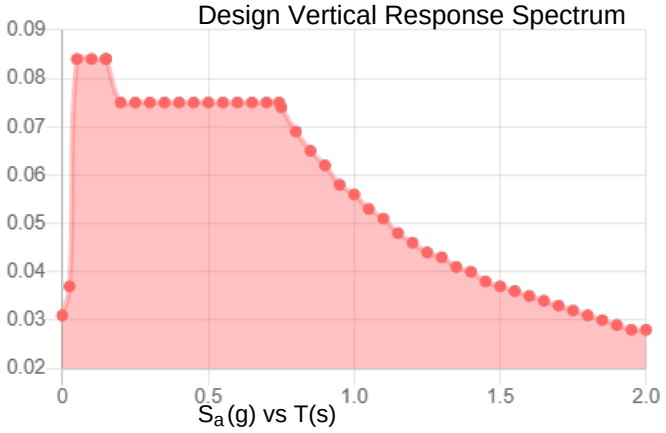
| | | | |
|---|---|---|---|
| $S_S$ : | 0.14 | $S_{D1}$ : | 0.111 |
| $S_1$ : | 0.069 | $T_L$ : | 12 |
| $F_a$ : | 1.6 | PGA : | 0.071 |
| $F_v$ : | 2.4 | $PGA_M$ : | 0.113 |
| $S_{MS}$ : | 0.224 | $F_{PGA}$ : | 1.6 |
| $S_{M1}$ : | 0.167 | $I_e$ : | 1 |
| $S_{DS}$ : | 0.15 | $C_v$ : | 0.7 |

**Seismic Design Category: B**




**Data Accessed:** **Fri Feb 13 2026**

**Date Source:**

**USGS Seismic Design Maps based on ASCE/SEI 7-16 and ASCE/SEI 7-16 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-16 Ch. 21 are available from USGS.**

# Ice

**Results:**

| | |
|---|---|
| Ice Thickness: | 1.00 in. |
| Concurrent Temperature: | 5 F |
| Gust Speed | 30 mph |
| **Data Source:** | Standard ASCE/SEI 7-16, Figs. 10-2 through 10-8 |
| **Date Accessed:** | Fri Feb 13 2026 |

Ice thicknesses on structures in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

Values provided are equivalent radial ice thicknesses due to freezing rain with concurrent 3-second gust speeds, for a 500-year mean recurrence interval, and temperatures concurrent with ice thicknesses due to freezing rain. Thicknesses for ice accretions caused by other sources shall be obtained from local meteorological studies. Ice thicknesses in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.