

Date: August 31, 2021

To: Verizon Wireless
14123 Cicero Road
Houston, TX 77095



P. Marshall & Associates, LLC
1000 Holcomb Woods Pkwy, Suite 210
Roswell, GA 30076
(678) 280-2325

Subject: Feasibility Structural Analysis Report

Carrier Designation: Verizon Wireless Co-locate
Carrier Site Number: 229230
Carrier Site Name: NO Hwy 428 (ALTL)

Engineering Firm Designation: PM&A Project Number: 21_V1M-100

Site Data: 4422 General Meyer Ave, New Orleans, Orleans Parish, LA 70130
Latitude 29°56'6.306" Longitude -90°0'32.5008"
119.5 ft Monopole Tower

To whom it may concern,

PM&A is pleased to submit this "Feasibility Structural Analysis Report" to determine the structural integrity of the above-mentioned tower.

The purpose of the analysis is to determine acceptability of the tower stress level. Based on our analysis we have determined the tower stress level for the structure, under the following load case, to be:

Proposed Equipment Configuration

Sufficient Capacity

This analysis has been performed in accordance with the 2018 Louisiana State Uniform Construction Code (2015 IBC) based upon an ultimate 3-second gust wind speed of 145 mph converted to a nominal 3-second gust wind speed of 112 mph per section 1609.3.1 as required for use in the TIA-222-G Standard per Exception #5 of Section 1609.1.1. Exposure Category C and Risk Category II were used in this analysis.

We appreciate the opportunity to work with Verizon Wireless and look forward to contributing to the success of this project. If we can be of further assistance, please do not hesitate to contact us at (678) 280-2325.

Respectfully Submitted by:

Andrei Barba, P.E.
Louisiana Professional Engineer
License Number: 42350
LAPELS Firm #: EF6388

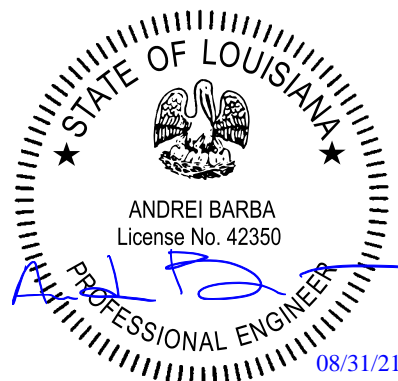


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1) INTRODUCTION

This tower is a 119.5 ft Monopole Tower mapped by Hightower Solutions, Inc.

2) ANALYSIS CRITERIA

TIA-222 Revision: TIA-222-G
 Risk Category: II
 Wind Speed: 112 mph
 Exposure Category: C
 Topographic Factor at Base: 1
 Ice Thickness: 0.0 in
 Wind Speed with Ice: 30 mph
 Service Wind Speed: 60 mph

Table 1 - Proposed Equipment Loading

| Mounting Level (ft) | Center Line Elevation (ft) | Number of Antennas | Antenna Manufacturer | Antenna Model | Number of Feed Lines | Feed Line Size (in) |
|---------------------|----------------------------|--------------------|----------------------|------------------|----------------------|---------------------|
| 85.0 | 85.0 | 2 | Commscope | NHHS4-65B-R3B | 4 | 1-5/8 2x4 HCS |
| | | 2 | Commscope | TD-850AB1-43 | | |
| | | 2 | Samsung | RT-8808-77A | 1 | |
| | | 1 | Raycap | RC2DC-1064-PF-48 | | |

Table 2 – Other Considered Equipment Loading

| Mounting Level (ft) | Center Line Elevation (ft) | Number of Antennas | Antenna Manufacturer | Antenna Model | Number of Feed Lines | Feed Line Size (in) |
|---------------------|----------------------------|--------------------|----------------------|------------------|----------------------|---------------------|
| 115.9 | 115.9 | 3 | Andrew | DBXLH-9090A-R2M | - | - |
| | | 3 | RFS | ATM192012BD-0 | | |
| 105.4 | 105.4 | 3 | Kathrein | 800372991 | 6 | 7/8 |
| | | 3 | Commscope | TMAT1921xB68-21A | | |
| 95.1 | 95.1 | 3 | Kathrein | 800372991 | 6 | 7/8 |
| | | 3 | Commscope | TMAT192123B68-31 | | |

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

| Document | Remarks | Source |
|-----------------------------------|--|---------|
| Tower Mapping Report | Hightower Solutions, Inc., Job #: 229230, dated 06/16/2021 | PM&A |
| Preliminary Construction Drawings | PM&A, Site: NO Hwy 428 (ALTL), dated 08/29/2021 | PM&A |
| Proposed Carrier Loading | Verizon RFDS, Site: NO Hwy 428 (ALTL), dated 07/28/2021 | Verizon |

3.1) Analysis Method

tnxTower (version 8.1.1.0) 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 built and maintained in accordance with the manufacturer's specifications.
- 2) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
- 3) PM&A shall assume that all tower components are in sufficient condition to carry their full design capacity.
- 4) We have not based the adequacy of the tower on limitations for antenna twist, tilt, roll, or lateral translation.
- 5) We have not designed for construction load or tower climber live load.
- 6) Antenna mounts are not part of this analysis. Antenna mounts and mounting hardware should be verified by carrier to confirm that mounts are in compliance.
- 7) Existing tower loading and geometry have been modeled based on the configuration found in the Tower Mapping Report by Hightower Solutions, Inc., Job #: 229230, dated 06/16/2021 and is assumed to be accurate.
- 8) Final Carrier loading has been modeled based on the configuration specified in the Verizon RFS, Site: NO Hwy 428 (ALTL), dated 07/28/2021 and the Preliminary Construction Drawings by PM&A, Site: NO Hwy 428 (ALTL), dated 08/29/2021 and is assumed to be accurate.
- 9) Tower Shaft steel grade is assumed to be A572-65 ($F_y=65$ ksi) based on previous experience with similar structures.
- 10) Tower Pipe steel grade is assumed to be A53 Gr. B ($F_y=35$ ksi) based on previous experience with similar structures.
- 11) Tower base plate and flange plate steel grade is assumed to be A36 ($F_y=36$ ksi) based on previous experience with similar structures
- 12) Anchor Rod steel grade is assumed to be A615-75 based on previous experience with similar structures.
- 13) Flange bolt steel grade is assumed to be A325 based on previous experience with similar structures.
- 14) Acceptance of changed conditions shall be based upon a rigorous structural analysis in accordance with TIA-222-G, Section 15.5.2.

This analysis may be affected if any assumptions are not valid or have been made in error. PM&A should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

| Section No. | Elevation (ft) | Component Type | Size | Critical Element | P (K) | ϕP_{allow} (K) | % Capacity | Pass Fail |
|-------------|----------------|----------------|------------------------|------------------|---------|----------------------|------------|-------------|
| L1 | 119.5 - 109.5 | Pole | Pipe 6"ODx0.6" | 1 | -0.529 | 320.631 | 15.6 | Pass |
| L2 | 109.5 - 99.5 | Pole | Pipe 6"ODx0.6" | 2 | -1.305 | 320.631 | 61.2 | Pass |
| L3 | 99.5 - 89.5 | Pole | Pipe 9.5"ODx1" | 3 | -2.810 | 841.161 | 34.5 | Pass |
| L4 | 89.5 - 79.5 | Pole | Pipe 9.5"ODx1" | 4 | -4.516 | 841.161 | 63.9 | Pass |
| L1 | 79.5 - 48.75 | Pole | TP33.9345x29.5356x0.25 | 1 | -7.663 | 1775.960 | 43.5 | Pass |
| L2 | 48.75 - 0 | Pole | TP39.2761x32.8265x0.25 | 2 | -15.483 | 1945.320 | 92.1 | Pass |
| | | | | | | | Summary | |
| | | | | | | Pole (L2) | 92.1 | Pass |
| | | | | | | RATING | 92.1 | Pass |
| | | | | | | = | | |

Table 5 - Tower Component Stresses vs. Capacity

| Notes | Component | Elevation (ft) | % Capacity | Pass / Fail |
|-------|-----------------|----------------|------------|-------------|
| 1 | Anchor Rods | 0 | 96.5 | Pass |
| 1 | Base Plate | 0 | 99.9 | Pass |
| 1 | Flange Bolts | 79.5 | 67.3 | Pass |
| 1 | Flange Plate | 79.5 | 31.4 | Pass |
| 2 | Base Foundation | 0 | N/A | N/A |

| | |
|--|--------------|
| Structure Rating (max from all components) = | 99.9% |
|--|--------------|

Notes:

- 1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.
- 2) No foundation and/or soil information was provided at the time of this analysis, therefore, below grade capacity could not be verified.

4.1) Recommendations

The tower has sufficient capacity to carry the proposed load configuration. No modifications are required at this time.

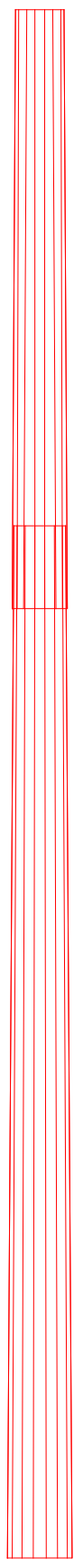
APPENDIX A
TNXTOWER OUTPUT

| | | |
|--------------------|---------|---------|
| Section | 1 | 2 |
| Length (ft) | 30.75 | 53.00 |
| Number of Sides | 16 | 16 |
| Thickness (in) | 0.2500 | 0.2500 |
| Socket Length (ft) | 4.25 | |
| Top Dia (in) | 29.5356 | 32.8265 |
| Bot Dia (in) | 33.9345 | 39.2761 |
| Grade | | A572-65 |
| Weight (K) | 2.6 | 5.1 |

79.5 ft

48.8 ft

0.0 ft

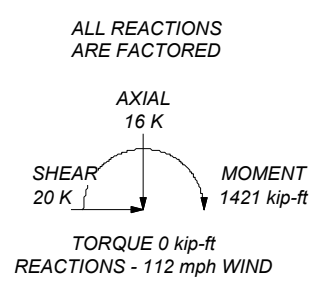


MATERIAL STRENGTH

| GRADE | Fy | Fu | GRADE | Fy | Fu |
|---------|--------|--------|-------|----|----|
| A572-65 | 65 ksi | 80 ksi | | | |

TOWER DESIGN NOTES

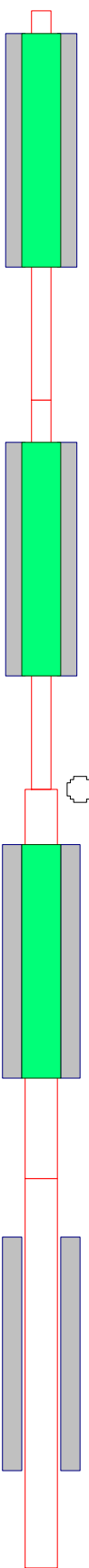
1. Tower is located in Orleans Parish, Louisiana.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 112 mph basic wind in accordance with the TIA-222-G Standard.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class II.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. Force Couples (top of tower)



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 FAX: (678) 280-2329

| | | |
|-----------------------------------|----------------|-------------|
| Job: 21_V1M-100 | | |
| Project: NO Hwy 428 (ALTL) | | |
| Client: Verizon Wireless | Drawn by: jll | App'd: |
| Code: TIA-222-G | Date: 08/31/21 | Scale: NTS |
| Path: | | Dwg No. E-1 |

| | | | | | |
|---------|----------------|-------------|----------|------------|----------|
| 1 | Pipe 6"ODx0.6" | 10.00 | A53-B-35 | 0.3 | 119.5 ft |
| 2 | Pipe 6"ODx0.6" | 10.00 | A53-B-35 | 0.3 | 109.5 ft |
| 3 | Pipe 9.5"ODx1" | 10.00 | A53-B-35 | 0.9 | 99.5 ft |
| 4 | Pipe 9.5"ODx1" | 10.00 | A53-B-35 | 0.9 | 89.5 ft |
| Section | Size | Length (ft) | Grade | Weight (K) | 79.5 ft |



DESIGNED APPURTENANCE LOADING

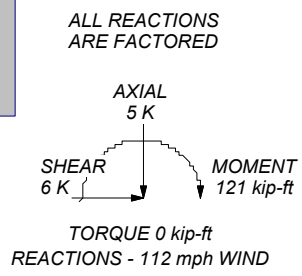
| TYPE | ELEVATION | TYPE | ELEVATION |
|------------------|-----------|------------------|-----------|
| DBXLH-9090A-R2M | 115.9 | 800372991 | 95.1 |
| DBXLH-9090A-R2M | 115.9 | 800372991 | 95.1 |
| DBXLH-9090A-R2M | 115.9 | 800372991 | 95.1 |
| ATM192012BD-0 | 115.9 | TMAT1923B68-31 | 95.1 |
| ATM192012BD-0 | 115.9 | TMAT1923B68-31 | 95.1 |
| ATM192012BD-0 | 115.9 | TMAT1923B68-31 | 95.1 |
| 800372991 | 105.4 | NHHS4-65C-R3B | 85 |
| 800372991 | 105.4 | NHHS4-65C-R3B | 85 |
| 800372991 | 105.4 | (2) TD-850AB1-43 | 85 |
| TMAT1921xB68-21A | 105.4 | (2) RT-8808-77A | 85 |
| TMAT1921xB68-21A | 105.4 | RC2DC-1064-PF-48 | 85 |
| TMAT1921xB68-21A | 105.4 | | |

MATERIAL STRENGTH

| GRADE | Fy | Fu | GRADE | Fy | Fu |
|----------|--------|--------|-------|----|----|
| A53-B-35 | 35 ksi | 60 ksi | | | |

TOWER DESIGN NOTES

1. Tower is located in Orleans Parish, Louisiana.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 112 mph basic wind in accordance with the TIA-222-G Standard.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class II.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 63.9%



| | | | |
|--|------------------------------------|------------|-----------------------------------|
| | PM&A | | Job: 21_V1M-100 |
| | 1000 Holcomb Woods Pkwy, Suite 210 | | Project: NO Hwy 428 (ALTL) |
| | Roswell, GA 30076 | | Client: Verizon Wireless |
| | Phone: (678) 280-2325 | | Drawn by: jll |
| | FAX: (678) 280-2329 | | Date: 08/31/21 |
| | | Scale: NTS | App'd: |
| | | Path: | Dwg No. E-1 |

| | | | | |
|---|----------------|-------------------|--------------------|-------------------|
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| | Project | NO Hwy 428 (ALTL) | Date | 14:07:48 08/31/21 |
| | Client | Verizon Wireless | Designed by | jll |

Tower Input Data

The tower is a monopole.

This tower is designed using the TIA-222-G standard.

The following design criteria apply:

Tower is located in Orleans Parish, Louisiana.

Basic wind speed of 112 mph.

Structure Class II.

Exposure Category C.

Topographic Category 1.

Crest Height 0.00 ft.

Deflections calculated using a wind speed of 60 mph.

A 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

| | | |
|--|---|--|
| <ul style="list-style-type: none"> Consider Moments - Legs Consider Moments - Horizontals Consider Moments - Diagonals Use Moment Magnification √ Use Code Stress Ratios √ Use Code Safety Factors - Guys Escalate Ice Always Use Max Kz Use Special Wind Profile Include Bolts In Member Capacity Leg Bolts Are At Top Of Section Secondary Horizontal Braces Leg Use Diamond Inner Bracing (4 Sided) SR Members Have Cut Ends SR Members Are Concentric | <ul style="list-style-type: none"> Distribute Leg Loads As Uniform Assume Legs Pinned √ Assume Rigid Index Plate √ Use Clear Spans For Wind Area Use Clear Spans For KL/r Retension Guys To Initial Tension √ Bypass Mast Stability Checks √ Use Azimuth Dish Coefficients √ Project Wind Area of Appurt. Autocalc Torque Arm Areas Add IBC .6D+W Combination √ Sort Capacity Reports By Component Triangulate Diamond Inner Bracing Treat Feed Line Bundles As Cylinder Ignore KL/ry For 60 Deg. Angle Legs | <ul style="list-style-type: none"> Use ASCE 10 X-Brace Ly Rules Calculate Redundant Bracing Forces Ignore Redundant Members in FEA SR Leg Bolts Resist Compression All Leg Panels Have Same Allowable Offset Girt At Foundation √ Consider Feed Line Torque Include Angle Block Shear Check Use TIA-222-G Bracing Resist. Exemption Use TIA-222-G Tension Splice Exemption <div style="background-color: #e0e0e0; text-align: center; padding: 2px;">Poles</div> <ul style="list-style-type: none"> √ Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets √ Pole Without Linear Attachments Pole With Shroud Or No Appurtenances Outside and Inside Corner Radii Are Known |
|--|---|--|

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 | 79.50-48.75 | 30.75 | 4.25 | 16 | 29.5356 | 33.9345 | 0.2500 | 1.0000 | A572-65 (65 ksi) |
| L2 | 48.75-0.00 | 53.00 | | 16 | 32.8265 | 39.2761 | 0.2500 | 1.0000 | A572-65 (65 ksi) |

| | | | | |
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| | Project | NO Hwy 428 (ALTL) | Date | 14:07:48 08/31/21 |
| | Client | Verizon Wireless | Designed by | jll |

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 | 30.0653 | 23.3553 | 2530.5064 | 10.4257 | 15.0632 | 167.9931 | 5099.3277 | 11.5479 | 5.3801 | 21.52 |
| | 34.5503 | 26.8634 | 3850.6617 | 11.9917 | 17.3066 | 222.4968 | 7759.6272 | 13.2825 | 6.2555 | 25.022 |
| L2 | 33.9480 | 25.9798 | 3483.0459 | 11.5972 | 16.7415 | 208.0483 | 7018.8294 | 12.8456 | 6.0350 | 24.14 |
| | 39.9966 | 31.1233 | 5988.3960 | 13.8933 | 20.0308 | 298.9592 | 12067.4637 | 15.3888 | 7.3184 | 29.274 |

| Tower Elevation | Gusset Area (per face) | Gusset Thickness | 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 |
|--------------------|------------------------------|---------------------|--------------|----------------------------------|-------------------------------------|--------------|---|---|--|
| ft | ft ² | in | | | | | | | |
| L1 79.50-48.75 | | | | 1 | 1 | 1 | | | |
| L2 48.75-0.00 | | | | 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 _A A _A ft ² /ft | Weight plf |
|--------------------|-------------------|-----------------|--|-------------------|-----------------|-----------------|--------|--|---------------|
| LDF5-50A(7/8) | A | No | No | Inside Pole | 79.50 - 0.00 | 6 | No Ice | 0.00 | 0.33 |
| LDF5-50A(7/8) | B | No | No | Inside Pole | 79.50 - 0.00 | 6 | No Ice | 0.00 | 0.33 |
| ***** | | | | | | | | | |
| LDF7-50A(1-5/8) | C | No | No | Inside Pole | 79.50 - 0.00 | 4 | No Ice | 0.00 | 0.82 |
| HBFO78-U2S4-150-LI | C | No | No | Inside Pole | 79.50 - 0.00 | 1 | No Ice | 0.00 | 0.70 |

Feed Line/Linear Appurtenances Section Areas

| Tower Section | Tower Elevation ft | Face | A _R ft ² | A _F ft ² | C _A A _A In Face ft ² | C _A A _A Out Face ft ² | Weight K |
|------------------|--------------------------|------|-----------------------------------|-----------------------------------|---|--|-------------|
| L1 | 79.50-48.75 | A | 0.000 | 0.000 | 0.000 | 0.000 | 0.061 |
| | | B | 0.000 | 0.000 | 0.000 | 0.000 | 0.061 |
| | | C | 0.000 | 0.000 | 0.000 | 0.000 | 0.122 |
| L2 | 48.75-0.00 | A | 0.000 | 0.000 | 0.000 | 0.000 | 0.097 |
| | | B | 0.000 | 0.000 | 0.000 | 0.000 | 0.097 |
| | | C | 0.000 | 0.000 | 0.000 | 0.000 | 0.194 |

Feed Line Center of Pressure

| Section | Elevation ft | CP _X in | CP _Z in | CP _X Ice in | CP _Z Ice in |
|---------|-----------------|-----------------------|-----------------------|------------------------------|------------------------------|
| L1 | 79.50-48.75 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| L2 | 48.75-0.00 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

| | | | | |
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| | Project | NO Hwy 428 (ALTL) | Date | 14:07:48 08/31/21 |
| | Client | Verizon Wireless | Designed by | jll |

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

Force Couples At Top Of Tower

| Description | Shear | Vertical | Moment | Torque |
|-------------|-------|----------|---------|--------|
| | K | K | kip-ft | kip-ft |
| No Ice | 6.420 | 4.520 | 120.670 | 0.291 |
| With Ice | 0.000 | 0.000 | 0.000 | 0.000 |

Load Combinations

| Comb. No. | Description |
|-----------|------------------------------------|
| 1 | Dead Only |
| 2 | 1.2 Dead+1.6 Wind 0 deg - No Ice |
| 3 | 0.9 Dead+1.6 Wind 0 deg - No Ice |
| 4 | 1.2 Dead+1.6 Wind 30 deg - No Ice |
| 5 | 0.9 Dead+1.6 Wind 30 deg - No Ice |
| 6 | 1.2 Dead+1.6 Wind 60 deg - No Ice |
| 7 | 0.9 Dead+1.6 Wind 60 deg - No Ice |
| 8 | 1.2 Dead+1.6 Wind 90 deg - No Ice |
| 9 | 0.9 Dead+1.6 Wind 90 deg - No Ice |
| 10 | 1.2 Dead+1.6 Wind 120 deg - No Ice |
| 11 | 0.9 Dead+1.6 Wind 120 deg - No Ice |
| 12 | 1.2 Dead+1.6 Wind 150 deg - No Ice |
| 13 | 0.9 Dead+1.6 Wind 150 deg - No Ice |
| 14 | 1.2 Dead+1.6 Wind 180 deg - No Ice |
| 15 | 0.9 Dead+1.6 Wind 180 deg - No Ice |
| 16 | 1.2 Dead+1.6 Wind 210 deg - No Ice |
| 17 | 0.9 Dead+1.6 Wind 210 deg - No Ice |
| 18 | 1.2 Dead+1.6 Wind 240 deg - No Ice |
| 19 | 0.9 Dead+1.6 Wind 240 deg - No Ice |
| 20 | 1.2 Dead+1.6 Wind 270 deg - No Ice |
| 21 | 0.9 Dead+1.6 Wind 270 deg - No Ice |
| 22 | 1.2 Dead+1.6 Wind 300 deg - No Ice |
| 23 | 0.9 Dead+1.6 Wind 300 deg - No Ice |
| 24 | 1.2 Dead+1.6 Wind 330 deg - No Ice |
| 25 | 0.9 Dead+1.6 Wind 330 deg - No Ice |
| 26 | Dead+Wind 0 deg - Service |
| 27 | Dead+Wind 30 deg - Service |
| 28 | Dead+Wind 60 deg - Service |
| 29 | Dead+Wind 90 deg - Service |
| 30 | Dead+Wind 120 deg - Service |
| 31 | Dead+Wind 150 deg - Service |
| 32 | Dead+Wind 180 deg - Service |
| 33 | Dead+Wind 210 deg - Service |
| 34 | Dead+Wind 240 deg - Service |
| 35 | Dead+Wind 270 deg - Service |
| 36 | Dead+Wind 300 deg - Service |
| 37 | Dead+Wind 330 deg - Service |

| | | |
|---|-------------------------------------|----------------------------------|
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| | Project NO Hwy 428 (ALTL) | Date 14:07:48 08/31/21 |
| | Client Verizon Wireless | Designed by jll |

Maximum Member Forces

| Section No. | Elevation ft | Component Type | Condition | Gov. Load Comb. | Axial K | Major Axis Moment kip-ft | Minor Axis Moment kip-ft |
|-------------|--------------|----------------|------------------|-----------------|---------|--------------------------|--------------------------|
| L1 | 79.5 - 48.75 | Pole | Max Tension | 1 | 0.000 | 0.000 | 0.000 |
| | | | Max. Compression | 8 | -7.663 | -518.511 | 0.007 |
| | | | Max. Mx | 8 | -7.663 | -518.511 | 0.007 |
| | | | Max. My | 2 | -7.663 | 0.007 | 518.511 |
| | | | Max. Vy | 8 | 13.971 | -518.511 | 0.007 |
| | | | Max. Vx | 2 | -13.971 | 0.007 | 518.511 |
| | | | Max. Torque | 13 | | | |
| L2 | 48.75 - 0 | Pole | Max Tension | 1 | 0.000 | 0.000 | 0.000 |
| | | | Max. Compression | 2 | -15.483 | 0.001 | 1421.032 |
| | | | Max. Mx | 8 | -15.483 | -1421.032 | 0.001 |
| | | | Max. My | 2 | -15.483 | 0.001 | 1421.032 |
| | | | Max. Vy | 8 | 19.772 | -1421.032 | 0.001 |
| | | | Max. Vx | 2 | -19.772 | 0.001 | 1421.032 |
| | | | Max. Torque | 3 | | | |

Maximum Reactions

| Location | Condition | Gov. Load Comb. | Vertical K | Horizontal, X K | Horizontal, Z K |
|----------|---------------------|-----------------|------------|-----------------|-----------------|
| Pole | Max. Vert | 2 | 15.513 | -0.000 | 19.748 |
| | Max. H _x | 20 | 15.513 | 19.748 | 0.000 |
| | Max. H _z | 2 | 15.513 | -0.000 | 19.748 |
| | Max. M _x | 2 | 1421.032 | -0.000 | 19.748 |
| | Max. M _z | 8 | 1421.032 | -19.748 | -0.000 |
| | Max. Torsion | 28 | 0.000 | -1.317 | 0.760 |
| | Min. Vert | 13 | 11.635 | -9.874 | -17.103 |
| | Min. H _x | 8 | 15.513 | -19.748 | -0.000 |
| | Min. H _z | 14 | 15.513 | 0.000 | -19.748 |
| | Min. M _x | 14 | -1421.032 | 0.000 | -19.748 |
| | Min. M _z | 20 | -1421.032 | 19.748 | 0.000 |
| | Min. Torsion | 3 | -0.464 | 0.000 | 19.748 |

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 | 12.928 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1.2 Dead+1.6 Wind 0 deg - No Ice | 15.513 | 0.000 | -19.748 | -1421.032 | 0.001 | 0.464 |
| 0.9 Dead+1.6 Wind 0 deg - No Ice | 11.635 | 0.000 | -19.748 | -1414.201 | 0.001 | 0.464 |
| 1.2 Dead+1.6 Wind 30 deg - No Ice | 15.513 | 9.874 | -17.103 | -1230.651 | -710.515 | 0.464 |
| 0.9 Dead+1.6 Wind 30 deg - No Ice | 11.635 | 9.874 | -17.103 | -1224.735 | -707.100 | 0.464 |
| 1.2 Dead+1.6 Wind 60 deg - No Ice | 15.513 | 17.103 | -9.874 | -710.517 | -1230.649 | 0.464 |
| 0.9 Dead+1.6 Wind 60 deg - No Ice | 11.635 | 17.103 | -9.874 | -707.101 | -1224.734 | 0.464 |

| | | |
|---|--|---|
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| | <p style="text-align: center;">Project</p> <p style="text-align: center;">NO Hwy 428 (ALTL)</p> | <p style="text-align: center;">Date</p> <p style="text-align: center;">14:07:48 08/31/21</p> |
| | <p style="text-align: center;">Client</p> <p style="text-align: center;">Verizon Wireless</p> | <p style="text-align: center;">Designed by</p> <p style="text-align: center;">jll</p> |

| 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 |
|------------------------------------|---------------|-------------------------|-------------------------|---|---|------------------|
| Ice | | | | | | |
| 1.2 Dead+1.6 Wind 90 deg - No Ice | 15.513 | 19.748 | 0.000 | -0.001 | -1421.032 | 0.464 |
| 0.9 Dead+1.6 Wind 90 deg - No Ice | 11.635 | 19.748 | 0.000 | -0.001 | -1414.201 | 0.464 |
| 1.2 Dead+1.6 Wind 120 deg - No Ice | 15.513 | 17.103 | 9.874 | 710.515 | -1230.651 | 0.464 |
| 0.9 Dead+1.6 Wind 120 deg - No Ice | 11.635 | 17.103 | 9.874 | 707.100 | -1224.735 | 0.464 |
| 1.2 Dead+1.6 Wind 150 deg - No Ice | 15.513 | 9.874 | 17.103 | 1230.649 | -710.517 | 0.464 |
| 0.9 Dead+1.6 Wind 150 deg - No Ice | 11.635 | 9.874 | 17.103 | 1224.734 | -707.101 | 0.464 |
| 1.2 Dead+1.6 Wind 180 deg - No Ice | 15.513 | -0.000 | 19.748 | 1421.032 | -0.001 | 0.464 |
| 0.9 Dead+1.6 Wind 180 deg - No Ice | 11.635 | 0.000 | 19.748 | 1414.201 | -0.001 | 0.464 |
| 1.2 Dead+1.6 Wind 210 deg - No Ice | 15.513 | -9.874 | 17.103 | 1230.651 | 710.515 | 0.464 |
| 0.9 Dead+1.6 Wind 210 deg - No Ice | 11.635 | -9.874 | 17.103 | 1224.735 | 707.100 | 0.464 |
| 1.2 Dead+1.6 Wind 240 deg - No Ice | 15.513 | -17.103 | 9.874 | 710.517 | 1230.649 | 0.464 |
| 0.9 Dead+1.6 Wind 240 deg - No Ice | 11.635 | -17.103 | 9.874 | 707.101 | 1224.734 | 0.464 |
| 1.2 Dead+1.6 Wind 270 deg - No Ice | 15.513 | -19.748 | -0.000 | 0.001 | 1421.032 | 0.464 |
| 0.9 Dead+1.6 Wind 270 deg - No Ice | 11.635 | -19.748 | 0.000 | 0.001 | 1414.201 | 0.464 |
| 1.2 Dead+1.6 Wind 300 deg - No Ice | 15.513 | -17.103 | -9.874 | -710.515 | 1230.651 | 0.464 |
| 0.9 Dead+1.6 Wind 300 deg - No Ice | 11.635 | -17.103 | -9.874 | -707.100 | 1224.735 | 0.464 |
| 1.2 Dead+1.6 Wind 330 deg - No Ice | 15.513 | -9.874 | -17.103 | -1230.649 | 710.517 | 0.464 |
| 0.9 Dead+1.6 Wind 330 deg - No Ice | 11.635 | -9.874 | -17.103 | -1224.734 | 707.101 | 0.464 |
| Dead+Wind 0 deg - Service | 12.928 | 0.000 | -1.521 | -62.588 | 0.000 | 0.000 |
| Dead+Wind 30 deg - Service | 12.928 | 0.760 | -1.317 | -54.203 | -31.294 | 0.000 |
| Dead+Wind 60 deg - Service | 12.928 | 1.317 | -0.760 | -31.294 | -54.203 | 0.000 |
| Dead+Wind 90 deg - Service | 12.928 | 1.521 | 0.000 | 0.000 | -62.588 | 0.000 |
| Dead+Wind 120 deg - Service | 12.928 | 1.317 | 0.760 | 31.294 | -54.203 | 0.000 |
| Dead+Wind 150 deg - Service | 12.928 | 0.760 | 1.317 | 54.203 | -31.294 | 0.000 |
| Dead+Wind 180 deg - Service | 12.928 | 0.000 | 1.521 | 62.588 | 0.000 | 0.000 |
| Dead+Wind 210 deg - Service | 12.928 | -0.760 | 1.317 | 54.203 | 31.294 | 0.000 |
| Dead+Wind 240 deg - Service | 12.928 | -1.317 | 0.760 | 31.294 | 54.203 | 0.000 |
| Dead+Wind 270 deg - Service | 12.928 | -1.521 | 0.000 | 0.000 | 62.588 | 0.000 |
| Dead+Wind 300 deg - Service | 12.928 | -1.317 | -0.760 | -31.294 | 54.203 | 0.000 |
| Dead+Wind 330 deg - Service | 12.928 | -0.760 | -1.317 | -54.203 | 31.294 | 0.000 |

Solution Summary

| Load Comb. | Sum of Applied Forces | | | Sum of Reactions | | | % Error |
|------------|-----------------------|---------|---------|------------------|---------|---------|---------|
| | PX K | PY K | PZ K | PX K | PY K | PZ K | |
| 1 | 0.000 | -12.928 | 0.000 | 0.000 | 12.928 | 0.000 | 0.000% |
| 2 | 0.000 | -15.513 | -19.748 | -0.000 | 15.513 | 19.748 | 0.000% |
| 3 | 0.000 | -11.635 | -19.748 | 0.000 | 11.635 | 19.748 | 0.000% |

| | | |
|---|--|---|
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| | <p style="text-align: center;">Project</p> <p style="text-align: center;">NO Hwy 428 (ALTL)</p> | <p style="text-align: center;">Date</p> <p style="text-align: center;">14:07:48 08/31/21</p> |
| | <p style="text-align: center;">Client</p> <p style="text-align: center;">Verizon Wireless</p> | <p style="text-align: center;">Designed by</p> <p style="text-align: center;">jll</p> |

| Load Comb. | Sum of Applied Forces | | | Sum of Reactions | | | % Error |
|------------|-----------------------|---------|---------|------------------|---------|---------|---------|
| | PX K | PY K | PZ K | PX K | PY K | PZ K | |
| 4 | 9.874 | -15.513 | -17.103 | -9.874 | 15.513 | 17.103 | 0.000% |
| 5 | 9.874 | -11.635 | -17.103 | -9.874 | 11.635 | 17.103 | 0.000% |
| 6 | 17.103 | -15.513 | -9.874 | -17.103 | 15.513 | 9.874 | 0.000% |
| 7 | 17.103 | -11.635 | -9.874 | -17.103 | 11.635 | 9.874 | 0.000% |
| 8 | 19.748 | -15.513 | 0.000 | -19.748 | 15.513 | -0.000 | 0.000% |
| 9 | 19.748 | -11.635 | 0.000 | -19.748 | 11.635 | 0.000 | 0.000% |
| 10 | 17.103 | -15.513 | 9.874 | -17.103 | 15.513 | -9.874 | 0.000% |
| 11 | 17.103 | -11.635 | 9.874 | -17.103 | 11.635 | -9.874 | 0.000% |
| 12 | 9.874 | -15.513 | 17.103 | -9.874 | 15.513 | -17.103 | 0.000% |
| 13 | 9.874 | -11.635 | 17.103 | -9.874 | 11.635 | -17.103 | 0.000% |
| 14 | 0.000 | -15.513 | 19.748 | 0.000 | 15.513 | -19.748 | 0.000% |
| 15 | 0.000 | -11.635 | 19.748 | 0.000 | 11.635 | -19.748 | 0.000% |
| 16 | -9.874 | -15.513 | 17.103 | 9.874 | 15.513 | -17.103 | 0.000% |
| 17 | -9.874 | -11.635 | 17.103 | 9.874 | 11.635 | -17.103 | 0.000% |
| 18 | -17.103 | -15.513 | 9.874 | 17.103 | 15.513 | -9.874 | 0.000% |
| 19 | -17.103 | -11.635 | 9.874 | 17.103 | 11.635 | -9.874 | 0.000% |
| 20 | -19.748 | -15.513 | 0.000 | 19.748 | 15.513 | 0.000 | 0.000% |
| 21 | -19.748 | -11.635 | 0.000 | 19.748 | 11.635 | 0.000 | 0.000% |
| 22 | -17.103 | -15.513 | -9.874 | 17.103 | 15.513 | 9.874 | 0.000% |
| 23 | -17.103 | -11.635 | -9.874 | 17.103 | 11.635 | 9.874 | 0.000% |
| 24 | -9.874 | -15.513 | -17.103 | 9.874 | 15.513 | 17.103 | 0.000% |
| 25 | -9.874 | -11.635 | -17.103 | 9.874 | 11.635 | 17.103 | 0.000% |
| 26 | 0.000 | -12.928 | -1.521 | 0.000 | 12.928 | 1.521 | 0.000% |
| 27 | 0.760 | -12.928 | -1.317 | -0.760 | 12.928 | 1.317 | 0.000% |
| 28 | 1.317 | -12.928 | -0.760 | -1.317 | 12.928 | 0.760 | 0.000% |
| 29 | 1.521 | -12.928 | 0.000 | -1.521 | 12.928 | 0.000 | 0.000% |
| 30 | 1.317 | -12.928 | 0.760 | -1.317 | 12.928 | -0.760 | 0.000% |
| 31 | 0.760 | -12.928 | 1.317 | -0.760 | 12.928 | -1.317 | 0.000% |
| 32 | 0.000 | -12.928 | 1.521 | 0.000 | 12.928 | -1.521 | 0.000% |
| 33 | -0.760 | -12.928 | 1.317 | 0.760 | 12.928 | -1.317 | 0.000% |
| 34 | -1.317 | -12.928 | 0.760 | 1.317 | 12.928 | -0.760 | 0.000% |
| 35 | -1.521 | -12.928 | 0.000 | 1.521 | 12.928 | 0.000 | 0.000% |
| 36 | -1.317 | -12.928 | -0.760 | 1.317 | 12.928 | 0.760 | 0.000% |
| 37 | -0.760 | -12.928 | -1.317 | 0.760 | 12.928 | 1.317 | 0.000% |

Non-Linear Convergence Results

| Load Combination | Converged? | Number of Cycles | Displacement Tolerance | Force Tolerance |
|------------------|------------|------------------|------------------------|-----------------|
| 1 | Yes | 4 | 0.00000001 | 0.00000001 |
| 2 | Yes | 4 | 0.00000001 | 0.00016165 |
| 3 | Yes | 4 | 0.00000001 | 0.00009514 |
| 4 | Yes | 5 | 0.00000001 | 0.00009548 |
| 5 | Yes | 5 | 0.00000001 | 0.00003904 |
| 6 | Yes | 5 | 0.00000001 | 0.00009187 |
| 7 | Yes | 5 | 0.00000001 | 0.00003739 |
| 8 | Yes | 4 | 0.00000001 | 0.00016165 |
| 9 | Yes | 4 | 0.00000001 | 0.00009514 |
| 10 | Yes | 5 | 0.00000001 | 0.00009548 |
| 11 | Yes | 5 | 0.00000001 | 0.00003904 |
| 12 | Yes | 5 | 0.00000001 | 0.00009187 |
| 13 | Yes | 5 | 0.00000001 | 0.00003739 |
| 14 | Yes | 4 | 0.00000001 | 0.00016165 |
| 15 | Yes | 4 | 0.00000001 | 0.00009514 |
| 16 | Yes | 5 | 0.00000001 | 0.00009548 |
| 17 | Yes | 5 | 0.00000001 | 0.00003904 |

| | | | | |
|---|----------------|-------------------|--------------------|-------------------|
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| | | | | |
|----|-----|---|-----------|------------|
| 18 | Yes | 5 | 0.0000001 | 0.00009187 |
| 19 | Yes | 5 | 0.0000001 | 0.00003739 |
| 20 | Yes | 4 | 0.0000001 | 0.00016165 |
| 21 | Yes | 4 | 0.0000001 | 0.00009514 |
| 22 | Yes | 5 | 0.0000001 | 0.00009548 |
| 23 | Yes | 5 | 0.0000001 | 0.00003904 |
| 24 | Yes | 5 | 0.0000001 | 0.00009187 |
| 25 | Yes | 5 | 0.0000001 | 0.00003739 |
| 26 | Yes | 4 | 0.0000001 | 0.00000001 |
| 27 | Yes | 4 | 0.0000001 | 0.00000001 |
| 28 | Yes | 4 | 0.0000001 | 0.00000001 |
| 29 | Yes | 4 | 0.0000001 | 0.00000001 |
| 30 | Yes | 4 | 0.0000001 | 0.00000001 |
| 31 | Yes | 4 | 0.0000001 | 0.00000001 |
| 32 | Yes | 4 | 0.0000001 | 0.00000001 |
| 33 | Yes | 4 | 0.0000001 | 0.00000001 |
| 34 | Yes | 4 | 0.0000001 | 0.00000001 |
| 35 | Yes | 4 | 0.0000001 | 0.00000001 |
| 36 | Yes | 4 | 0.0000001 | 0.00000001 |
| 37 | Yes | 4 | 0.0000001 | 0.00000001 |

Maximum Tower Deflections - Service Wind

| Section No. | Elevation ft | Horz. Deflection in | Gov. Load Comb. | Tilt ° | Twist ° |
|-------------|-----------------|------------------------|-----------------|-----------|------------|
| L1 | 79.5 - 48.75 | 1.166 | 29 | 0.0972 | 0.0000 |
| L2 | 53 - 0 | 0.635 | 29 | 0.0917 | 0.0000 |

Maximum Tower Deflections - Design Wind

| Section No. | Elevation ft | Horz. Deflection in | Gov. Load Comb. | Tilt ° | Twist ° |
|-------------|-----------------|------------------------|-----------------|-----------|------------|
| L1 | 79.5 - 48.75 | 36.469 | 8 | 3.7429 | 0.0034 |
| L2 | 53 - 0 | 17.813 | 8 | 2.9011 | 0.0019 |

Compression Checks

Pole Design Data

| Section No. | Elevation ft | Size | L ft | L _u ft | Kl/r | A in ² | P _u K | φP _n K | Ratio $\frac{P_u}{\phi P_n}$ |
|-------------|------------------|------------------------|---------|----------------------|------|----------------------|---------------------|----------------------|---------------------------------|
| L1 | 79.5 - 48.75 (1) | TP33.9345x29.5356x0.25 | 30.75 | 0.00 | 0.0 | 26.3785 | -7.663 | 1775.960 | 0.004 |
| L2 | 48.75 - 0 (2) | TP39.2761x32.8265x0.25 | 53.00 | 0.00 | 0.0 | 31.1233 | -15.483 | 1945.320 | 0.008 |

| | | | | |
|---|----------------|-------------------|--------------------|-------------------|
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Pole Bending Design Data

| Section No. | Elevation ft | Size | M_{ux} | ϕM_{nx} | Ratio | M_{uy} | ϕM_{ny} | Ratio |
|-------------|------------------|------------------------|----------|---------------|------------------------------|----------|---------------|------------------------------|
| | | | kip-ft | kip-ft | $\frac{M_{ux}}{\phi M_{nx}}$ | kip-ft | kip-ft | $\frac{M_{uy}}{\phi M_{ny}}$ |
| L1 | 79.5 - 48.75 (1) | TP33.9345x29.5356x0.25 | 518.512 | 1203.500 | 0.431 | 0.000 | 1203.500 | 0.000 |
| L2 | 48.75 - 0 (2) | TP39.2761x32.8265x0.25 | 1421.033 | 1557.167 | 0.913 | 0.000 | 1557.167 | 0.000 |

Pole Shear Design Data

| Section No. | Elevation ft | Size | Actual | ϕV_n | Ratio | Actual | ϕT_n | Ratio |
|-------------|------------------|------------------------|------------|------------|------------------------|-----------------|------------|------------------------|
| | | | V_u K | K | $\frac{V_u}{\phi V_n}$ | T_u kip-ft | kip-ft | $\frac{T_u}{\phi T_n}$ |
| L1 | 79.5 - 48.75 (1) | TP33.9345x29.5356x0.25 | 13.971 | 887.980 | 0.016 | 0.465 | 2429.700 | 0.000 |
| L2 | 48.75 - 0 (2) | TP39.2761x32.8265x0.25 | 19.772 | 972.658 | 0.020 | 0.464 | 3143.008 | 0.000 |

Pole Interaction Design Data

| Section No. | Elevation ft | Ratio | Ratio | Ratio | Ratio | Ratio | Comb. Stress Ratio | Allow. Stress Ratio | Criteria |
|-------------|------------------|------------------------|------------------------------|------------------------------|------------------------|------------------------|--------------------|---------------------|----------|
| | | $\frac{P_u}{\phi P_n}$ | $\frac{M_{ux}}{\phi M_{nx}}$ | $\frac{M_{uy}}{\phi M_{ny}}$ | $\frac{V_u}{\phi V_n}$ | $\frac{T_u}{\phi T_n}$ | | | |
| L1 | 79.5 - 48.75 (1) | 0.004 | 0.431 | 0.000 | 0.016 | 0.000 | 0.435 | 1.000 | 4.8.2 ✓ |
| L2 | 48.75 - 0 (2) | 0.008 | 0.913 | 0.000 | 0.020 | 0.000 | 0.921 | 1.000 | 4.8.2 ✓ |

Section Capacity Table

| Section No. | Elevation ft | Component Type | Size | Critical Element | P K | ϕP_{allow} K | % Capacity | Pass Fail |
|-----------------|-----------------|----------------|------------------------|------------------|---------|-----------------------|---------------|--------------|
| L1 | 79.5 - 48.75 | Pole | TP33.9345x29.5356x0.25 | 1 | -7.663 | 1775.960 | 43.5 | Pass |
| L2 | 48.75 - 0 | Pole | TP39.2761x32.8265x0.25 | 2 | -15.483 | 1945.320 | 92.1 | Pass |
| Summary | | | | | | | | |
| Pole (L2) | | | | | | | 92.1 | Pass |
| RATING = | | | | | | | 92.1 | Pass |

| | | | | |
|---|----------------|-------------------|--------------------|-------------------|
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Tower Input Data

The tower is a monopole.

This tower is designed using the TIA-222-G standard.

The following design criteria apply:

Tower is located in Orleans Parish, Louisiana.

Basic wind speed of 112 mph.

Structure Class II.

Exposure Category C.

Topographic Category 1.

Crest Height 0.00 ft.

Deflections calculated using a wind speed of 60 mph.

A 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

| | | |
|--|---|--|
| <ul style="list-style-type: none"> Consider Moments - Legs Consider Moments - Horizontals Consider Moments - Diagonals Use Moment Magnification √ Use Code Stress Ratios √ Use Code Safety Factors - Guys Escalate Ice Always Use Max Kz Use Special Wind Profile Include Bolts In Member Capacity Leg Bolts Are At Top Of Section Secondary Horizontal Braces Leg Use Diamond Inner Bracing (4 Sided) SR Members Have Cut Ends SR Members Are Concentric | <ul style="list-style-type: none"> Distribute Leg Loads As Uniform Assume Legs Pinned √ Assume Rigid Index Plate √ Use Clear Spans For Wind Area Use Clear Spans For KL/r Retension Guys To Initial Tension √ Bypass Mast Stability Checks √ Use Azimuth Dish Coefficients √ Project Wind Area of Appurt. Autocalc Torque Arm Areas Add IBC .6D+W Combination √ Sort Capacity Reports By Component Triangulate Diamond Inner Bracing Treat Feed Line Bundles As Cylinder Ignore KL/ry For 60 Deg. Angle Legs | <ul style="list-style-type: none"> Use ASCE 10 X-Brace Ly Rules Calculate Redundant Bracing Forces Ignore Redundant Members in FEA SR Leg Bolts Resist Compression All Leg Panels Have Same Allowable Offset Girt At Foundation √ Consider Feed Line Torque Include Angle Block Shear Check Use TIA-222-G Bracing Resist. Exemption Use TIA-222-G Tension Splice Exemption |
| Poles | | |
| <ul style="list-style-type: none"> √ Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets √ Pole Without Linear Attachments Pole With Shroud Or No Appurtenances Outside and Inside Corner Radii Are Known | | |

Pole Section Geometry

| Section | Elevation ft | Section Length ft | Pole Size | Pole Grade | Socket Length ft |
|---------|-----------------|-------------------------|----------------|----------------------|---------------------|
| L1 | 119.50-109.50 | 10.00 | Pipe 6"ODx0.6" | A53-B-35 (35 ksi) | |
| L2 | 109.50-99.50 | 10.00 | Pipe 6"ODx0.6" | A53-B-35 (35 ksi) | |
| L3 | 99.50-89.50 | 10.00 | Pipe 9.5"ODx1" | A53-B-35 (35 ksi) | |
| L4 | 89.50-79.50 | 10.00 | Pipe 9.5"ODx1" | A53-B-35 (35 ksi) | |

| | | | | |
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| Tower Elevation | Gusset Area (per face) | Gusset Thickness | Gusset Grade | Adjust. Factor A_f | Adjust. Factor A_r | Weight Mult. | Double Angle Stitch Bolt Spacing Diagonals | Double Angle Stitch Bolt Spacing Horizontals | Double Angle Stitch Bolt Spacing Redundants |
|---------------------|------------------------|------------------|--------------|----------------------|----------------------|--------------|--|--|---|
| ft | ft ² | in | | | | | in | in | in |
| L1 119.50-109.50 | | | | 1 | 1 | 1 | | | |
| L2 109.50-99.50 | | | | 1 | 1 | 1 | | | |
| L3 99.50-89.50 | | | | 1 | 1 | 1 | | | |
| L4 89.50-79.50 | | | | 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} ft ² /ft | Weight plf |
|--------------------|-------------|--------------|---------------------------------|----------------|----------------|--------------|--------|------------------------------|------------|
| LDF5-50A(7/8) | A | No | No | Inside Pole | 105.40 - 79.50 | 6 | No Ice | 0.00 | 0.33 |
| LDF5-50A(7/8) | B | No | No | Inside Pole | 95.10 - 79.50 | 6 | No Ice | 0.00 | 0.33 |
| ***** | | | | | | | | | |
| LDF7-50A(1-5/8) | C | No | No | Inside Pole | 85.00 - 79.50 | 4 | No Ice | 0.00 | 0.82 |
| HBFO78-U2S4-150-LI | C | No | No | Inside Pole | 85.00 - 79.50 | 1 | No Ice | 0.00 | 0.70 |

Feed Line/Linear Appurtenances Section Areas

| Tower Section | Tower Elevation ft | Face | A_R ft ² | A_F ft ² | C_{AA} In Face ft ² | C_{AA} Out Face ft ² | Weight K |
|---------------|--------------------|------|-----------------------|-----------------------|----------------------------------|-----------------------------------|----------|
| L1 | 119.50-109.50 | A | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | | B | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | | C | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| L2 | 109.50-99.50 | A | 0.000 | 0.000 | 0.000 | 0.000 | 0.012 |
| | | B | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | | C | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| L3 | 99.50-89.50 | A | 0.000 | 0.000 | 0.000 | 0.000 | 0.020 |
| | | B | 0.000 | 0.000 | 0.000 | 0.000 | 0.011 |
| | | C | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| L4 | 89.50-79.50 | A | 0.000 | 0.000 | 0.000 | 0.000 | 0.020 |
| | | B | 0.000 | 0.000 | 0.000 | 0.000 | 0.020 |
| | | C | 0.000 | 0.000 | 0.000 | 0.000 | 0.022 |

Feed Line Center of Pressure

| Section | Elevation ft | CP_x in | CP_z in | CP_x Ice in | CP_z Ice in |
|---------|---------------|-----------|-----------|---------------|---------------|
| L1 | 119.50-109.50 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

| | | | | |
|---|----------------|-------------------|--------------------|-------------------|
| tnxTower PM&A 1000 Holcomb Woods Pkwy, Suite 210 Roswell, GA 30076 Phone: (678) 280-2325 FAX: (678) 280-2329 | Job | 21_V1M-100 | Page | 3 of 11 |
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| | Client | Verizon Wireless | Designed by | jll |

| Section | Elevation | CP _x | CP _z | CP _x Ice | CP _z Ice |
|---------|--------------|-----------------|-----------------|------------------------|------------------------|
| | ft | in | in | in | in |
| L2 | 109.50-99.50 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| L3 | 99.50-89.50 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| L4 | 89.50-79.50 | 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 Vert ft ft ft | Azimuth Adjustment ° | Placement ft | C _{AA} Front ft ² | C _{AA} Side ft ² | Weight K |
|--------------------|-------------------|----------------|---|----------------------------|-----------------|---|--|-------------|
| DBXLH-9090A-R2M | A | From Face | 0.50 0.00 0.00 | 0.0000 | 115.90 | No Ice 6.80 | 2.69 | 0.028 |
| DBXLH-9090A-R2M | B | From Face | 0.50 0.00 0.00 | 0.0000 | 115.90 | No Ice 6.80 | 2.69 | 0.028 |
| DBXLH-9090A-R2M | C | From Face | 0.50 0.00 0.00 | 0.0000 | 115.90 | No Ice 6.80 | 2.69 | 0.028 |
| ATM192012BD-0 | A | From Face | 0.50 0.00 0.00 | 0.0000 | 115.90 | No Ice 0.96 | 0.50 | 0.019 |
| ATM192012BD-0 | B | From Face | 0.50 0.00 0.00 | 0.0000 | 115.90 | No Ice 0.96 | 0.50 | 0.019 |
| ATM192012BD-0 | C | From Face | 0.50 0.00 0.00 | 0.0000 | 115.90 | No Ice 0.96 | 0.50 | 0.019 |
| ***** 800372991 | A | From Face | 0.50 0.00 0.00 | 0.0000 | 105.40 | No Ice 10.65 | 5.19 | 0.085 |
| 800372991 | B | From Face | 0.50 0.00 0.00 | 0.0000 | 105.40 | No Ice 10.65 | 5.19 | 0.085 |
| 800372991 | C | From Face | 0.50 0.00 0.00 | 0.0000 | 105.40 | No Ice 10.65 | 5.19 | 0.085 |
| TMAT1921xB68-21A | A | From Face | 0.50 0.00 0.00 | 0.0000 | 105.40 | No Ice 0.66 | 0.31 | 0.018 |
| TMAT1921xB68-21A | B | From Face | 0.50 0.00 0.00 | 0.0000 | 105.40 | No Ice 0.66 | 0.31 | 0.018 |
| TMAT1921xB68-21A | C | From Face | 0.50 0.00 0.00 | 0.0000 | 105.40 | No Ice 0.66 | 0.31 | 0.018 |
| ***** 800372991 | A | From Face | 0.50 0.00 | 0.0000 | 95.10 | No Ice 10.65 | 5.19 | 0.085 |

| | | | | |
|--|----------------|-------------------|--------------------|-------------------|
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| Description | Face or Leg | Offset Type | Offsets: | | | Azimuth Adjustment | Placement | CAA Front | CAA Side | Weight | |
|------------------|-------------|-------------|----------|---------|------|--------------------|-----------|-----------|----------|--------|-------|
| | | | Horz | Lateral | Vert | | | | | | ° |
| 800372991 | B | From Face | 0.50 | 0.00 | 0.00 | 0.0000 | 95.10 | No Ice | 10.65 | 5.19 | 0.085 |
| 800372991 | C | From Face | 0.50 | 0.00 | 0.00 | 0.0000 | 95.10 | No Ice | 10.65 | 5.19 | 0.085 |
| TMAT1923B68-31 | A | From Face | 0.50 | 0.00 | 0.00 | 0.0000 | 95.10 | No Ice | 0.89 | 0.36 | 0.021 |
| TMAT1923B68-31 | B | From Face | 0.50 | 0.00 | 0.00 | 0.0000 | 95.10 | No Ice | 0.89 | 0.36 | 0.021 |
| TMAT1923B68-31 | C | From Face | 0.50 | 0.00 | 0.00 | 0.0000 | 95.10 | No Ice | 0.89 | 0.36 | 0.021 |
| ***** | | | | | | | | | | | |
| NHHS4-65C-R3B | A | From Face | 0.50 | 0.00 | 0.00 | 0.0000 | 85.00 | No Ice | 12.85 | 8.50 | 0.072 |
| NHHS4-65C-R3B | B | From Face | 0.50 | 0.00 | 0.00 | 0.0000 | 85.00 | No Ice | 12.85 | 8.50 | 0.072 |
| (2) TD-850AB1-43 | C | From Face | 0.50 | 0.00 | 0.00 | 0.0000 | 85.00 | No Ice | 1.80 | 0.68 | 0.046 |
| (2) RT-8808-77A | B | From Leg | 0.50 | 0.00 | 0.00 | 0.0000 | 85.00 | No Ice | 1.87 | 0.85 | 0.060 |
| RC2DC-1064-PF-48 | B | From Leg | 0.50 | 0.00 | 0.00 | 0.0000 | 85.00 | No Ice | 4.05 | 2.96 | 0.032 |

Load Combinations

| Comb. No. | Description |
|-----------|------------------------------------|
| 1 | Dead Only |
| 2 | 1.2 Dead+1.6 Wind 0 deg - No Ice |
| 3 | 0.9 Dead+1.6 Wind 0 deg - No Ice |
| 4 | 1.2 Dead+1.6 Wind 30 deg - No Ice |
| 5 | 0.9 Dead+1.6 Wind 30 deg - No Ice |
| 6 | 1.2 Dead+1.6 Wind 60 deg - No Ice |
| 7 | 0.9 Dead+1.6 Wind 60 deg - No Ice |
| 8 | 1.2 Dead+1.6 Wind 90 deg - No Ice |
| 9 | 0.9 Dead+1.6 Wind 90 deg - No Ice |
| 10 | 1.2 Dead+1.6 Wind 120 deg - No Ice |
| 11 | 0.9 Dead+1.6 Wind 120 deg - No Ice |
| 12 | 1.2 Dead+1.6 Wind 150 deg - No Ice |
| 13 | 0.9 Dead+1.6 Wind 150 deg - No Ice |
| 14 | 1.2 Dead+1.6 Wind 180 deg - No Ice |

| | | |
|---|--|---|
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| | <p>Project</p> <p>NO Hwy 428 (ALTL)</p> | <p>Date</p> <p>13:49:34 08/31/21</p> |
| | <p>Client</p> <p>Verizon Wireless</p> | <p>Designed by</p> <p>jll</p> |

| Comb. No. | Description |
|-----------|------------------------------------|
| 15 | 0.9 Dead+1.6 Wind 180 deg - No Ice |
| 16 | 1.2 Dead+1.6 Wind 210 deg - No Ice |
| 17 | 0.9 Dead+1.6 Wind 210 deg - No Ice |
| 18 | 1.2 Dead+1.6 Wind 240 deg - No Ice |
| 19 | 0.9 Dead+1.6 Wind 240 deg - No Ice |
| 20 | 1.2 Dead+1.6 Wind 270 deg - No Ice |
| 21 | 0.9 Dead+1.6 Wind 270 deg - No Ice |
| 22 | 1.2 Dead+1.6 Wind 300 deg - No Ice |
| 23 | 0.9 Dead+1.6 Wind 300 deg - No Ice |
| 24 | 1.2 Dead+1.6 Wind 330 deg - No Ice |
| 25 | 0.9 Dead+1.6 Wind 330 deg - No Ice |
| 26 | Dead+Wind 0 deg - Service |
| 27 | Dead+Wind 30 deg - Service |
| 28 | Dead+Wind 60 deg - Service |
| 29 | Dead+Wind 90 deg - Service |
| 30 | Dead+Wind 120 deg - Service |
| 31 | Dead+Wind 150 deg - Service |
| 32 | Dead+Wind 180 deg - Service |
| 33 | Dead+Wind 210 deg - Service |
| 34 | Dead+Wind 240 deg - Service |
| 35 | Dead+Wind 270 deg - Service |
| 36 | Dead+Wind 300 deg - Service |
| 37 | Dead+Wind 330 deg - Service |

Maximum Member Forces

| Section No. | Elevation ft | Component Type | Condition | Gov. Load Comb. | Axial K | Major Axis Moment kip-ft | Minor Axis Moment kip-ft |
|-------------|---------------|----------------|------------------|-----------------|---------|--------------------------|--------------------------|
| L1 | 119.5 - 109.5 | Pole | Max Tension | 2 | 0.000 | 0.000 | 0.000 |
| | | | Max. Compression | 2 | -0.529 | -0.000 | 7.096 |
| | | | Max. Mx | 8 | -0.529 | -7.097 | 0.000 |
| | | | Max. My | 14 | -0.529 | -0.000 | -7.096 |
| | | | Max. Vy | 8 | 1.159 | -7.097 | 0.000 |
| | | | Max. Vx | 14 | 1.158 | -0.000 | -7.096 |
| | | | Max. Torque | 6 | | | 0.000 |
| L2 | 109.5 - 99.5 | Pole | Max Tension | 1 | 0.000 | 0.000 | 0.000 |
| | | | Max. Compression | 2 | -1.305 | -0.001 | 28.006 |
| | | | Max. Mx | 8 | -1.305 | -28.008 | 0.000 |
| | | | Max. My | 14 | -1.305 | -0.001 | -28.007 |
| | | | Max. Vy | 8 | 2.765 | -28.008 | 0.000 |
| | | | Max. Vx | 14 | 2.765 | -0.001 | -28.007 |
| | | | Max. Torque | 22 | | | 0.000 |
| L3 | 99.5 - 89.5 | Pole | Max Tension | 1 | 0.000 | 0.000 | 0.000 |
| | | | Max. Compression | 2 | -2.810 | -0.002 | 65.066 |
| | | | Max. Mx | 8 | -2.810 | -65.069 | 0.001 |
| | | | Max. My | 14 | -2.810 | -0.003 | -65.067 |
| | | | Max. Vy | 8 | 4.478 | -65.069 | 0.001 |
| | | | Max. Vx | 14 | 4.478 | -0.003 | -65.067 |
| | | | Max. Torque | 22 | | | 0.000 |
| L4 | 89.5 - 79.5 | Pole | Max Tension | 1 | 0.000 | 0.000 | 0.000 |
| | | | Max. Compression | 4 | -4.517 | -60.015 | 103.069 |
| | | | Max. Mx | 8 | -4.516 | -120.567 | -0.496 |
| | | | Max. My | 14 | -4.517 | -0.534 | -119.464 |
| | | | Max. Vy | 8 | 6.416 | -120.567 | -0.496 |
| | | | Max. Vx | 14 | 6.223 | -0.534 | -119.464 |
| | | | Max. Torque | 10 | | | 0.291 |

| | | | | |
|---|----------------|-------------------|--------------------|-------------------|
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| | Project | NO Hwy 428 (ALTL) | Date | 13:49:34 08/31/21 |
| | Client | Verizon Wireless | Designed by | jll |

Maximum Reactions

| Location | Condition | Gov. Load Comb. | Vertical K | Horizontal, X K | Horizontal, Z K |
|----------|---------------------|-----------------|------------|-----------------|-----------------|
| Pole | Max. Vert | 8 | 4.524 | -6.410 | -0.071 |
| | Max. H _x | 21 | 3.393 | 6.410 | 0.071 |
| | Max. H _z | 3 | 3.393 | 0.071 | 6.218 |
| | Max. M _x | 2 | 119.256 | 0.071 | 6.218 |
| | Max. M _z | 8 | 120.567 | -6.410 | -0.071 |
| | Max. Torsion | 10 | 0.291 | -5.587 | -3.170 |
| | Min. Vert | 5 | 3.393 | -3.144 | 5.349 |
| | Min. H _x | 9 | 3.393 | -6.410 | -0.071 |
| | Min. H _z | 15 | 3.393 | -0.071 | -6.218 |
| | Min. M _x | 14 | -119.464 | -0.071 | -6.218 |
| | Min. M _z | 20 | -120.282 | 6.410 | 0.071 |
| | Min. Torsion | 22 | -0.291 | 5.587 | 3.170 |

Tower Mast Reaction Summary

| Load Combination | Vertical K | Shear _x K | Shear _z K | Overtopping Moment, M _x kip-ft | Overtopping Moment, M _z kip-ft | Torque kip-ft |
|------------------------------------|------------|----------------------|----------------------|---|---|---------------|
| Dead Only | 3.770 | 0.000 | 0.000 | 0.086 | -0.118 | 0.000 |
| 1.2 Dead+1.6 Wind 0 deg - No Ice | 4.524 | -0.071 | -6.218 | -119.256 | 0.249 | 0.189 |
| 0.9 Dead+1.6 Wind 0 deg - No Ice | 3.393 | -0.071 | -6.218 | -118.930 | 0.285 | 0.189 |
| 1.2 Dead+1.6 Wind 30 deg - No Ice | 4.524 | 3.144 | -5.349 | -103.069 | -60.015 | 0.050 |
| 0.9 Dead+1.6 Wind 30 deg - No Ice | 3.393 | 3.144 | -5.349 | -102.790 | -59.803 | 0.051 |
| 1.2 Dead+1.6 Wind 60 deg - No Ice | 4.524 | 5.516 | -3.047 | -59.237 | -104.237 | -0.102 |
| 0.9 Dead+1.6 Wind 60 deg - No Ice | 3.393 | 5.516 | -3.047 | -59.087 | -103.895 | -0.101 |
| 1.2 Dead+1.6 Wind 90 deg - No Ice | 4.524 | 6.410 | 0.071 | 0.496 | -120.567 | -0.227 |
| 0.9 Dead+1.6 Wind 90 deg - No Ice | 3.393 | 6.410 | 0.071 | 0.469 | -120.178 | -0.226 |
| 1.2 Dead+1.6 Wind 120 deg - No Ice | 4.524 | 5.587 | 3.170 | 60.123 | -104.629 | -0.291 |
| 0.9 Dead+1.6 Wind 120 deg - No Ice | 3.393 | 5.587 | 3.170 | 59.921 | -104.287 | -0.291 |
| 1.2 Dead+1.6 Wind 150 deg - No Ice | 4.524 | 3.267 | 5.420 | 103.668 | -60.694 | -0.277 |
| 0.9 Dead+1.6 Wind 150 deg - No Ice | 3.393 | 3.267 | 5.420 | 103.337 | -60.481 | -0.277 |
| 1.2 Dead+1.6 Wind 180 deg - No Ice | 4.524 | 0.071 | 6.218 | 119.464 | -0.534 | -0.189 |
| 0.9 Dead+1.6 Wind 180 deg - No Ice | 3.393 | 0.071 | 6.218 | 119.085 | -0.498 | -0.189 |
| 1.2 Dead+1.6 Wind 210 deg - No Ice | 4.524 | -3.144 | 5.349 | 103.277 | 59.730 | -0.050 |
| 0.9 Dead+1.6 Wind 210 deg - No Ice | 3.393 | -3.144 | 5.349 | 102.945 | 59.590 | -0.051 |

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| | <p style="text-align: center;">Project</p> <p style="text-align: center;">NO Hwy 428 (ALTL)</p> | <p style="text-align: center;">Date</p> <p style="text-align: center;">13:49:34 08/31/21</p> |
| | <p style="text-align: center;">Client</p> <p style="text-align: center;">Verizon Wireless</p> | <p style="text-align: center;">Designed by</p> <p style="text-align: center;">jll</p> |

| Load Combination | Vertical | Shear _x | Shear _z | Overturning Moment, M _x | Overturning Moment, M _z | Torque |
|------------------------------------|----------|--------------------|--------------------|------------------------------------|------------------------------------|--------|
| | K | K | K | kip-ft | kip-ft | kip-ft |
| 1.2 Dead+1.6 Wind 240 deg - No Ice | 4.524 | -5.516 | 3.047 | 59.444 | 103.952 | 0.102 |
| 0.9 Dead+1.6 Wind 240 deg - No Ice | 3.393 | -5.516 | 3.047 | 59.242 | 103.682 | 0.101 |
| 1.2 Dead+1.6 Wind 270 deg - No Ice | 4.524 | -6.410 | -0.071 | -0.288 | 120.282 | 0.227 |
| 0.9 Dead+1.6 Wind 270 deg - No Ice | 3.393 | -6.410 | -0.071 | -0.314 | 119.964 | 0.226 |
| 1.2 Dead+1.6 Wind 300 deg - No Ice | 4.524 | -5.587 | -3.170 | -59.915 | 104.344 | 0.291 |
| 0.9 Dead+1.6 Wind 300 deg - No Ice | 3.393 | -5.587 | -3.170 | -59.765 | 104.074 | 0.291 |
| 1.2 Dead+1.6 Wind 330 deg - No Ice | 4.524 | -3.267 | -5.420 | -103.461 | 60.409 | 0.277 |
| 0.9 Dead+1.6 Wind 330 deg - No Ice | 3.393 | -3.267 | -5.420 | -103.181 | 60.268 | 0.277 |
| Dead+Wind 0 deg - Service | 3.770 | -0.011 | -1.077 | -21.017 | -0.056 | 0.030 |
| Dead+Wind 30 deg - Service | 3.770 | 0.544 | -0.927 | -18.158 | -10.701 | 0.008 |
| Dead+Wind 60 deg - Service | 3.770 | 0.954 | -0.529 | -10.411 | -18.511 | -0.016 |
| Dead+Wind 90 deg - Service | 3.770 | 1.108 | 0.011 | 0.149 | -21.393 | -0.036 |
| Dead+Wind 120 deg - Service | 3.770 | 0.966 | 0.549 | 10.693 | -18.574 | -0.047 |
| Dead+Wind 150 deg - Service | 3.770 | 0.564 | 0.939 | 18.394 | -10.810 | -0.044 |
| Dead+Wind 180 deg - Service | 3.770 | 0.011 | 1.077 | 21.190 | -0.181 | -0.030 |
| Dead+Wind 210 deg - Service | 3.770 | -0.544 | 0.927 | 18.331 | 10.464 | -0.008 |
| Dead+Wind 240 deg - Service | 3.770 | -0.954 | 0.529 | 10.584 | 18.274 | 0.016 |
| Dead+Wind 270 deg - Service | 3.770 | -1.108 | -0.011 | 0.024 | 21.156 | 0.036 |
| Dead+Wind 300 deg - Service | 3.770 | -0.966 | -0.549 | -10.520 | 18.337 | 0.047 |
| Dead+Wind 330 deg - Service | 3.770 | -0.564 | -0.939 | -18.221 | 10.573 | 0.044 |

Solution Summary

| Load Comb. | Sum of Applied Forces | | | Sum of Reactions | | | % Error |
|------------|-----------------------|---------|---------|------------------|---------|---------|---------|
| | PX K | PY K | PZ K | PX K | PY K | PZ K | |
| 1 | 0.000 | -3.770 | 0.000 | 0.000 | 3.770 | 0.000 | 0.000% |
| 2 | -0.071 | -4.524 | -6.218 | 0.071 | 4.524 | 6.218 | 0.000% |
| 3 | -0.071 | -3.393 | -6.218 | 0.071 | 3.393 | 6.218 | 0.000% |
| 4 | 3.144 | -4.524 | -5.349 | -3.144 | 4.524 | 5.349 | 0.000% |
| 5 | 3.144 | -3.393 | -5.349 | -3.144 | 3.393 | 5.349 | 0.000% |
| 6 | 5.516 | -4.524 | -3.047 | -5.516 | 4.524 | 3.047 | 0.000% |
| 7 | 5.516 | -3.393 | -3.047 | -5.516 | 3.393 | 3.047 | 0.000% |
| 8 | 6.410 | -4.524 | 0.071 | -6.410 | 4.524 | -0.071 | 0.000% |
| 9 | 6.410 | -3.393 | 0.071 | -6.410 | 3.393 | -0.071 | 0.000% |
| 10 | 5.587 | -4.524 | 3.170 | -5.587 | 4.524 | -3.170 | 0.000% |
| 11 | 5.587 | -3.393 | 3.170 | -5.587 | 3.393 | -3.170 | 0.000% |
| 12 | 3.267 | -4.524 | 5.420 | -3.267 | 4.524 | -5.420 | 0.000% |
| 13 | 3.267 | -3.393 | 5.420 | -3.267 | 3.393 | -5.420 | 0.000% |
| 14 | 0.071 | -4.524 | 6.218 | -0.071 | 4.524 | -6.218 | 0.000% |
| 15 | 0.071 | -3.393 | 6.218 | -0.071 | 3.393 | -6.218 | 0.000% |
| 16 | -3.144 | -4.524 | 5.349 | 3.144 | 4.524 | -5.349 | 0.000% |
| 17 | -3.144 | -3.393 | 5.349 | 3.144 | 3.393 | -5.349 | 0.000% |
| 18 | -5.516 | -4.524 | 3.047 | 5.516 | 4.524 | -3.047 | 0.000% |
| 19 | -5.516 | -3.393 | 3.047 | 5.516 | 3.393 | -3.047 | 0.000% |
| 20 | -6.410 | -4.524 | -0.071 | 6.410 | 4.524 | 0.071 | 0.000% |
| 21 | -6.410 | -3.393 | -0.071 | 6.410 | 3.393 | 0.071 | 0.000% |
| 22 | -5.587 | -4.524 | -3.170 | 5.587 | 4.524 | 3.170 | 0.000% |
| 23 | -5.587 | -3.393 | -3.170 | 5.587 | 3.393 | 3.170 | 0.000% |
| 24 | -3.267 | -4.524 | -5.420 | 3.267 | 4.524 | 5.420 | 0.000% |

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| | Project <p style="text-align: center;">NO Hwy 428 (ALTL)</p> | Date <p style="text-align: center;">13:49:34 08/31/21</p> |
| | Client <p style="text-align: center;">Verizon Wireless</p> | Designed by <p style="text-align: center;">jll</p> |

| Load Comb. | Sum of Applied Forces | | | Sum of Reactions | | | % Error |
|------------|-----------------------|--------|--------|------------------|-------|--------|---------|
| | PX K | PY K | PZ K | PX K | PY K | PZ K | |
| 25 | -3.267 | -3.393 | -5.420 | 3.267 | 3.393 | 5.420 | 0.000% |
| 26 | -0.011 | -3.770 | -1.077 | 0.011 | 3.770 | 1.077 | 0.000% |
| 27 | 0.544 | -3.770 | -0.927 | -0.544 | 3.770 | 0.927 | 0.000% |
| 28 | 0.954 | -3.770 | -0.529 | -0.954 | 3.770 | 0.529 | 0.000% |
| 29 | 1.108 | -3.770 | 0.011 | -1.108 | 3.770 | -0.011 | 0.000% |
| 30 | 0.966 | -3.770 | 0.549 | -0.966 | 3.770 | -0.549 | 0.000% |
| 31 | 0.564 | -3.770 | 0.939 | -0.564 | 3.770 | -0.939 | 0.000% |
| 32 | 0.011 | -3.770 | 1.077 | -0.011 | 3.770 | -1.077 | 0.000% |
| 33 | -0.544 | -3.770 | 0.927 | 0.544 | 3.770 | -0.927 | 0.000% |
| 34 | -0.954 | -3.770 | 0.529 | 0.954 | 3.770 | -0.529 | 0.000% |
| 35 | -1.108 | -3.770 | -0.011 | 1.108 | 3.770 | 0.011 | 0.000% |
| 36 | -0.966 | -3.770 | -0.549 | 0.966 | 3.770 | 0.549 | 0.000% |
| 37 | -0.564 | -3.770 | -0.939 | 0.564 | 3.770 | 0.939 | 0.000% |

Non-Linear Convergence Results

| Load Combination | Converged? | Number of Cycles | Displacement Tolerance | Force Tolerance |
|------------------|------------|------------------|------------------------|-----------------|
| 1 | Yes | 4 | 0.0000001 | 0.0000001 |
| 2 | Yes | 4 | 0.0000001 | 0.0000001 |
| 3 | Yes | 4 | 0.0000001 | 0.0000001 |
| 4 | Yes | 4 | 0.0000001 | 0.00019805 |
| 5 | Yes | 4 | 0.0000001 | 0.00011295 |
| 6 | Yes | 4 | 0.0000001 | 0.00019822 |
| 7 | Yes | 4 | 0.0000001 | 0.00011302 |
| 8 | Yes | 4 | 0.0000001 | 0.0000001 |
| 9 | Yes | 4 | 0.0000001 | 0.0000001 |
| 10 | Yes | 4 | 0.0000001 | 0.00018916 |
| 11 | Yes | 4 | 0.0000001 | 0.00010743 |
| 12 | Yes | 4 | 0.0000001 | 0.00020409 |
| 13 | Yes | 4 | 0.0000001 | 0.00011647 |
| 14 | Yes | 4 | 0.0000001 | 0.0000001 |
| 15 | Yes | 4 | 0.0000001 | 0.0000001 |
| 16 | Yes | 4 | 0.0000001 | 0.00019524 |
| 17 | Yes | 4 | 0.0000001 | 0.00011130 |
| 18 | Yes | 4 | 0.0000001 | 0.00019326 |
| 19 | Yes | 4 | 0.0000001 | 0.00011003 |
| 20 | Yes | 4 | 0.0000001 | 0.0000001 |
| 21 | Yes | 4 | 0.0000001 | 0.0000001 |
| 22 | Yes | 4 | 0.0000001 | 0.00020284 |
| 23 | Yes | 4 | 0.0000001 | 0.00011578 |
| 24 | Yes | 4 | 0.0000001 | 0.00018972 |
| 25 | Yes | 4 | 0.0000001 | 0.00010793 |
| 26 | Yes | 4 | 0.0000001 | 0.0000001 |
| 27 | Yes | 4 | 0.0000001 | 0.0000001 |
| 28 | Yes | 4 | 0.0000001 | 0.0000001 |
| 29 | Yes | 4 | 0.0000001 | 0.0000001 |
| 30 | Yes | 4 | 0.0000001 | 0.0000001 |
| 31 | Yes | 4 | 0.0000001 | 0.0000001 |
| 32 | Yes | 4 | 0.0000001 | 0.0000001 |
| 33 | Yes | 4 | 0.0000001 | 0.0000001 |
| 34 | Yes | 4 | 0.0000001 | 0.0000001 |
| 35 | Yes | 4 | 0.0000001 | 0.0000001 |
| 36 | Yes | 4 | 0.0000001 | 0.0000001 |
| 37 | Yes | 4 | 0.0000001 | 0.0000001 |

| | | |
|---|-------------------------------------|----------------------------------|
| tnxTower PM&A 1000 Holcomb Woods Pkwy, Suite 210 Roswell, GA 30076 Phone: (678) 280-2325 FAX: (678) 280-2329 | Job 21_V1M-100 | Page 9 of 11 |
| | Project NO Hwy 428 (ALTL) | Date 13:49:34 08/31/21 |
| | Client Verizon Wireless | Designed by jll |

Maximum Tower Deflections - Service Wind

| Section No. | Elevation ft | Horz. Deflection in | Gov. Load Comb. | Tilt ° | Twist ° |
|-------------|-----------------|------------------------|-----------------|-----------|------------|
| L1 | 119.5 - 109.5 | 2.685 | 30 | 0.5296 | 0.0004 |
| L2 | 109.5 - 99.5 | 1.591 | 30 | 0.4981 | 0.0004 |
| L3 | 99.5 - 89.5 | 0.723 | 30 | 0.2817 | 0.0004 |
| L4 | 89.5 - 79.5 | 0.217 | 30 | 0.1882 | 0.0004 |

Critical Deflections and Radius of Curvature - Service Wind

| Elevation ft | Appurtenance | Gov. Load Comb. | Deflection in | Tilt ° | Twist ° | Radius of Curvature ft |
|-----------------|-----------------|-----------------|------------------|-----------|------------|---------------------------|
| 115.90 | DBXLH-9090A-R2M | 30 | 2.279 | 0.5371 | 0.0004 | 10026 |
| 105.40 | 800372991 | 30 | 1.197 | 0.4137 | 0.0004 | 3926 |
| 95.10 | 800372991 | 30 | 0.455 | 0.2326 | 0.0004 | 3238 |
| 85.00 | NHHS4-65C-R3B | 30 | 0.098 | 0.1178 | 0.0003 | 6567 |

Maximum Tower Deflections - Design Wind

| Section No. | Elevation ft | Horz. Deflection in | Gov. Load Comb. | Tilt ° | Twist ° |
|-------------|-----------------|------------------------|-----------------|-----------|------------|
| L1 | 119.5 - 109.5 | 14.923 | 10 | 2.9338 | 0.0024 |
| L2 | 109.5 - 99.5 | 8.863 | 10 | 2.7606 | 0.0024 |
| L3 | 99.5 - 89.5 | 4.043 | 10 | 1.5723 | 0.0024 |
| L4 | 89.5 - 79.5 | 1.218 | 10 | 1.0539 | 0.0024 |

Critical Deflections and Radius of Curvature - Design Wind

| Elevation ft | Appurtenance | Gov. Load Comb. | Deflection in | Tilt ° | Twist ° | Radius of Curvature ft |
|-----------------|-----------------|-----------------|------------------|-----------|------------|---------------------------|
| 115.90 | DBXLH-9090A-R2M | 10 | 12.673 | 2.9747 | 0.0024 | 1835 |
| 105.40 | 800372991 | 10 | 6.678 | 2.2970 | 0.0024 | 718 |
| 95.10 | 800372991 | 10 | 2.549 | 1.3024 | 0.0026 | 586 |
| 85.00 | NHHS4-65C-R3B | 10 | 0.551 | 0.6600 | 0.0016 | 1171 |

Compression Checks

| | | |
|---|-------------------------------------|----------------------------------|
| tnxTower PM&A 1000 Holcomb Woods Pkwy, Suite 210 Roswell, GA 30076 Phone: (678) 280-2325 FAX: (678) 280-2329 | Job 21_V1M-100 | Page 10 of 11 |
| | Project NO Hwy 428 (ALTL) | Date 13:49:34 08/31/21 |
| | Client Verizon Wireless | Designed by jll |

Pole Design Data

| Section No. | Elevation ft | Size | L ft | L _u ft | Kl/r | A in ² | P _u K | φP _n K | Ratio $\frac{P_u}{\phi P_n}$ |
|-------------|----------------------|----------------|---------|----------------------|------|----------------------|---------------------|----------------------|---------------------------------|
| L1 | 119.5 - 109.5 (1) | Pipe 6"ODx0.6" | 10.00 | 0.00 | 0.0 | 10.1788 | -0.529 | 320.631 | 0.002 |
| L2 | 109.5 - 99.5 (2) | Pipe 6"ODx0.6" | 10.00 | 0.00 | 0.0 | 10.1788 | -1.305 | 320.631 | 0.004 |
| L3 | 99.5 - 89.5 (3) | Pipe 9.5"ODx1" | 10.00 | 0.00 | 0.0 | 26.7035 | -2.810 | 841.161 | 0.003 |
| L4 | 89.5 - 79.5 (4) | Pipe 9.5"ODx1" | 10.00 | 0.00 | 0.0 | 26.7035 | -4.516 | 841.161 | 0.005 |

Pole Bending Design Data

| Section No. | Elevation ft | Size | M _{ux} kip-ft | φM _{ux} kip-ft | Ratio $\frac{M_{ux}}{\phi M_{ux}}$ | M _{uy} kip-ft | φM _{uy} kip-ft | Ratio $\frac{M_{uy}}{\phi M_{uy}}$ |
|-------------|----------------------|----------------|---------------------------|----------------------------|---------------------------------------|---------------------------|----------------------------|---------------------------------------|
| L1 | 119.5 - 109.5 (1) | Pipe 6"ODx0.6" | 7.097 | 46.116 | 0.154 | 0.000 | 46.116 | 0.000 |
| L2 | 109.5 - 99.5 (2) | Pipe 6"ODx0.6" | 28.008 | 46.116 | 0.607 | 0.000 | 46.116 | 0.000 |
| L3 | 99.5 - 89.5 (3) | Pipe 9.5"ODx1" | 65.069 | 190.532 | 0.342 | 0.000 | 190.532 | 0.000 |
| L4 | 89.5 - 79.5 (4) | Pipe 9.5"ODx1" | 120.673 | 190.532 | 0.633 | 0.000 | 190.532 | 0.000 |

Pole Shear Design Data

| Section No. | Elevation ft | Size | Actual V _u K | φV _n K | Ratio $\frac{V_u}{\phi V_n}$ | Actual T _u kip-ft | φT _n kip-ft | Ratio $\frac{T_u}{\phi T_n}$ |
|-------------|----------------------|----------------|-------------------------------|----------------------|---------------------------------|------------------------------------|---------------------------|---------------------------------|
| L1 | 119.5 - 109.5 (1) | Pipe 6"ODx0.6" | 1.159 | 160.315 | 0.007 | 0.000 | 65.729 | 0.000 |
| L2 | 109.5 - 99.5 (2) | Pipe 6"ODx0.6" | 2.765 | 160.315 | 0.017 | 0.000 | 65.729 | 0.000 |
| L3 | 99.5 - 89.5 (3) | Pipe 9.5"ODx1" | 4.478 | 420.581 | 0.011 | 0.000 | 270.242 | 0.000 |
| L4 | 89.5 - 79.5 (4) | Pipe 9.5"ODx1" | 6.429 | 420.581 | 0.015 | 0.291 | 270.242 | 0.001 |

Pole Interaction Design Data

| Section No. | Elevation ft | Ratio $\frac{P_u}{\phi P_n}$ | Ratio $\frac{M_{ux}}{\phi M_{ux}}$ | Ratio $\frac{M_{uy}}{\phi M_{uy}}$ | Ratio $\frac{V_u}{\phi V_n}$ | Ratio $\frac{T_u}{\phi T_n}$ | Comb. Stress Ratio | Allow. Stress Ratio | Criteria |
|-------------|----------------------|---------------------------------|---------------------------------------|---------------------------------------|---------------------------------|---------------------------------|--------------------------|---------------------------|----------|
| L1 | 119.5 - 109.5 (1) | 0.002 | 0.154 | 0.000 | 0.007 | 0.000 | 0.156 | 1.000 | 4.8.2 ✓ |
| L2 | 109.5 - 99.5 (2) | 0.004 | 0.607 | 0.000 | 0.017 | 0.000 | 0.612 | 1.000 | 4.8.2 ✓ |
| L3 | 99.5 - 89.5 (3) | 0.003 | 0.342 | 0.000 | 0.011 | 0.000 | 0.345 | 1.000 | 4.8.2 ✓ |
| L4 | 89.5 - 79.5 (4) | 0.005 | 0.633 | 0.000 | 0.015 | 0.001 | 0.639 | 1.000 | 4.8.2 ✓ |

| | | |
|--|-------------------------------------|----------------------------------|
| <p>tnxTower</p> <p>PM&A</p> <p>1000 Holcomb Woods Pkwy, Suite 210 Roswell, GA 30076 Phone: (678) 280-2325 FAX: (678) 280-2329</p> | Job 21_V1M-100 | Page 11 of 11 |
| | Project NO Hwy 428 (ALTL) | Date 13:49:34 08/31/21 |
| | Client Verizon Wireless | Designed by jll |

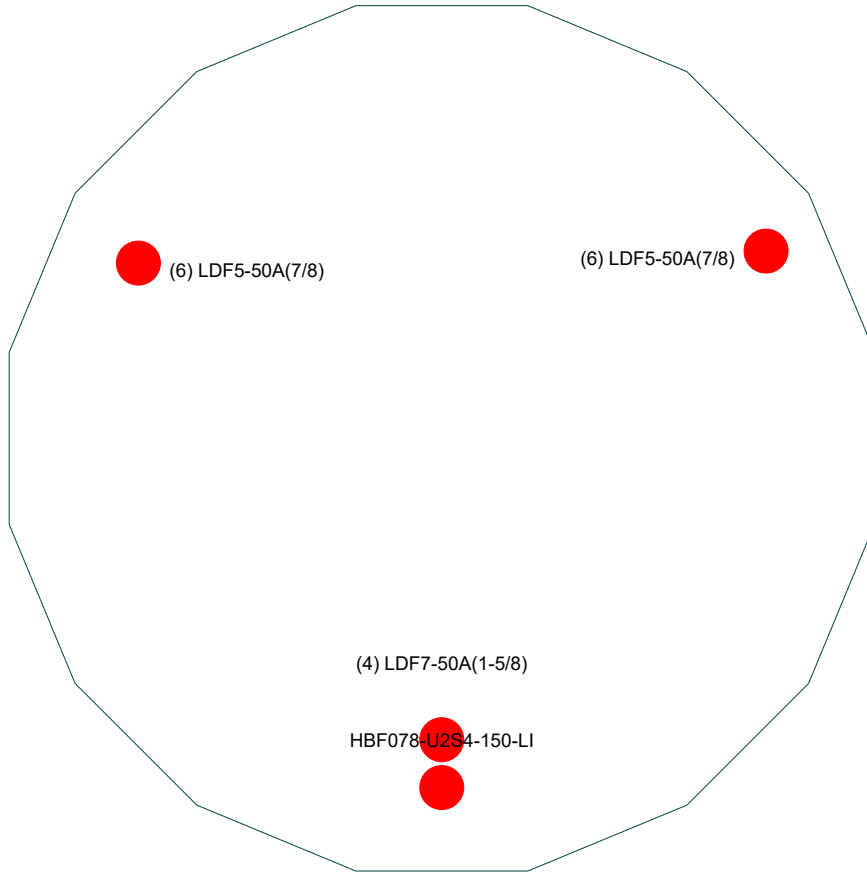
Section Capacity Table

| Section No. | Elevation ft | Component Type | Size | Critical Element | P K | ϕP_{allow} K | % Capacity | Pass Fail | |
|-------------|---------------|----------------|----------------|------------------|--------|--------------------|-----------------|-------------|-------------|
| L1 | 119.5 - 109.5 | Pole | Pipe 6"ODx0.6" | 1 | -0.529 | 320.631 | 15.6 | Pass | |
| L2 | 109.5 - 99.5 | Pole | Pipe 6"ODx0.6" | 2 | -1.305 | 320.631 | 61.2 | Pass | |
| L3 | 99.5 - 89.5 | Pole | Pipe 9.5"ODx1" | 3 | -2.810 | 841.161 | 34.5 | Pass | |
| L4 | 89.5 - 79.5 | Pole | Pipe 9.5"ODx1" | 4 | -4.516 | 841.161 | 63.9 | Pass | |
| | | | | | | | Summary | | |
| | | | | | | | Pole (L4) | 63.9 | Pass |
| | | | | | | | RATING = | 63.9 | Pass |

APPENDIX B
BASE LEVEL DRAWINGS

Feed Line Plan

Round Flat App In Face App Out Face



PM&A
1000 Holcomb Woods Pkwy, Suite 210
Roswell, GA 30076
Phone: (678) 280-2325
FAX: (678) 280-2329

| | | |
|-----------------------------------|----------------|-------------|
| Job: 21_V1M-100 | | |
| Project: NO Hwy 428 (ALTL) | | |
| Client: Verizon Wireless | Drawn by: jll | App'd: |
| Code: TIA-222-G | Date: 08/31/21 | Scale: NTS |
| Path: | | Dwg No. E-7 |

APPENDIX C
ADDITIONAL CALCULATIONS



P. Marshall and Associates, LLC
1000 Holcomb Woods Pkwy, Suite 210
Roswell, GA 30076
Tel: (678) 280-2325
Fax: (678) 280-2329

| | |
|----------|-------------------|
| Job: | 21_V1M-100 |
| Project: | NO Hwy 428 (ALTL) |
| Client: | Verizon Wireless |

| | |
|-----------|-----------|
| Engineer: | JLL |
| Date: | 8/31/2021 |
| Sheet: | 1 of 1 |

Flange Plate and Bolt Analysis (TIA-G) for Elevation 79.5 ft

Reactions

| | | |
|---------|-------|---------|
| Moment: | 120.7 | ft-kips |
| Axial: | 4.5 | kips |
| Shear: | 6.4 | kips |

Tower Information

| | | |
|-------------|----------|-----|
| Diameter: | 9.5 | in |
| Thickness: | 1 | in |
| Pole Grade: | A53-B-35 | |
| Fy: | 35 | ksi |
| Fu: | 60 | ksi |
| # of Sides: | Round | |

Plate Information

| | | |
|--------------|-------|-----|
| Diameter: | 29.92 | in |
| Thickness: | 3 | in |
| Plate Grade: | A36 | |
| Fy: | 36 | ksi |
| Fu: | 58 | ksi |

Bolt Information

| | | |
|--------------|-------|-----|
| Quantity: | 6 | |
| Diameter: | 1.125 | in |
| Bolt Grade: | A325N | |
| Fy: | 81 | ksi |
| Fu: | 105 | ksi |
| Bolt Circle: | 23.42 | in |

Capacity Results

Bolt Results

| | | |
|--------------------|-------|------|
| Bolt Force: | 40.43 | kips |
| Bolt Capacity: | 60.06 | kips |
| Bolt Stress Ratio: | 67.3% | |

Good

Plate Results

| | | |
|-------------------------|-------|-----|
| Plate Stress: | 25.0 | ksi |
| Allowable Plate Stress: | 32.40 | ksi |
| Plate Stress Ratio: | 77.0% | |
| Tension Side Stress: | 31.4% | |

Good



P. Marshall and Associates, LLC
 1000 Holcomb Woods Pkwy, Suite 210
 Roswell, GA 30076
 Tel: (678) 280-2325
 Fax: (678) 280-2329

| | |
|----------|-------------------|
| Job: | 21_V1M-100 |
| Project: | NO Hwy 428 (ALTL) |
| Client: | Verizon Wireless |

| | |
|-----------|-----------|
| Engineer: | JLL |
| Date: | 8/31/2021 |
| Sheet: | 1 of 1 |

Circular Base Plate and Anchor Rod Analysis (TIA-G)

Analysis Reactions and Information

| | | |
|----------------------|---------|---------|
| Moment: | 1421.03 | ft-kips |
| Axial: | 15.48 | kips |
| Shear: | 19.77 | kips |
| Grout Considered: | N/A | |
| I_{ar} : | 0 | in |
| Eta Factor, η : | N/A | |

Anchor Rod Information

| | |
|--------------|----------|
| Quantity: | 6 |
| Diameter: | 2.25 in |
| Bolt Grade: | A615-75 |
| Fy: | 75 ksi |
| Fu: | 100 ksi |
| Bolt Circle: | 47.00 in |

Tower Information

| | | |
|-------------|----------|-----|
| Diameter: | 39.28 | in |
| Thickness: | 0.25 | in |
| Pole Grade: | A572-65 | |
| Fy: | 65 | ksi |
| Fu: | 80 | ksi |
| # of Sides: | 16-sided | |

Base Plate Information

| | | |
|--------------|-------|-----|
| Diameter: | 52.00 | in |
| Thickness: | 2.13 | in |
| Plate Grade: | A36 | |
| Fy: | 36.00 | ksi |
| Fu: | 58.00 | ksi |

Capacity Results

Anchor Rod Results

| | | | | | |
|----------|--------|---------|---------------|--------|---------|
| Pu_c = | 244.23 | kips | ϕPn_c = | 260.00 | kips |
| Vu = | 3.30 | kips | ϕVn = | N/A | kips |
| Mu = | N/A | in-kips | ϕMn = | N/A | in-kips |

Anchor Rod Stress Ratio: 96.5%

Good

Base Plate Results

| | | |
|--------------------------|-------|-----|
| Base Plate Stress: | 32.37 | ksi |
| Allowable Plate Stress: | 32.4 | ksi |
| Base Plate Stress Ratio: | 99.9% | |

Good