

Date: February 22, 2017

Timothy Howell
Crown Castle
3530 Toringdon Way Suite 300
Charlotte, NC 28277

JACOBS
Jacobs Engineering Group, Inc.
5449 Bells Ferry Road
Acworth, GA 30102
770-701-2500

Subject: Structural Analysis Report

Carrier Designation: *US Cellular Co-Locate*
Carrier Site Number: 853337
Carrier Site Name: North Portland

Crown Castle Designation:
Crown Castle BU Number: 878783
Crown Castle Site Name: PORTLAND NORTH
Crown Castle JDE Job Number: 375976
Crown Castle Work Order Number: 1367448
Crown Castle Application Number: 343122 Rev. 3

Engineering Firm Designation: Jacobs Engineering Group Inc. Project Number: 1367448

Site Data: 517 Presumpscot Street, Portland, Cumberland County, ME
Latitude 43° 41' 58.53", Longitude -70° 15' 30.64"
178 Foot - Monopole Tower

Dear Timothy Howell,

Jacobs Engineering Group Inc. is pleased to submit this “**Structural Analysis Report**” to determine the structural integrity of the above mentioned tower. This analysis has been performed in accordance with the Crown Castle Structural ‘Statement of Work’ and the terms of Crown Castle Purchase Order Number 1004897, in accordance with application 343122, revision 3.

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 and foundation, under the following load case, to be:

LC7: Existing + Reserved + Proposed Equipment **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

The analysis has been performed in accordance with the TIA-222-G standard and 2009 International Building Code based upon a wind speed of 100 mph 3-second gust, exposure category C

All modifications and equipment proposed in this report shall be installed in accordance with the attached drawings for the determined available structural capacity to be effective.

We at *Jacobs Engineering Group Inc.* appreciate the opportunity of providing our continuing professional services to you and Crown Castle. If you have any questions or need further assistance on this or any other projects please give us a call.

Structural analysis prepared by:

Jeremy Earnest, EIT
Structural Engineer

Reviewed By:

Paul L. Mucci P.E.
Sr. Project Engineer

TABLE OF CONTENTS

1) INTRODUCTION

2) ANALYSIS CRITERIA

Table 1 - Proposed Antenna and Cable Information

Table 2 - Existing and Reserved Antenna and Cable Information

Table 3 - Design Antenna and Cable Information

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

3.1) Analysis Method

3.2) Assumptions

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Table 6 – Tower Components vs. Capacity

4.1) Recommendations

5) APPENDIX A

tnxTower Output

6) APPENDIX B

Base Level Drawing

7) APPENDIX C

Additional Calculations

1) INTRODUCTION

This tower is a 178 ft Monopole tower designed by PITTSBURG MONOPOLE in December of 1996. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-F.

The tower has been modified multiple times in the past to accommodate additional loading.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA-222-G Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a 3-second gust wind speed of 100 mph with no ice, 40 mph with 1 inch ice thickness and 60 mph under service loads, exposure category C.

Table 1 - Proposed Antenna and Cable Information

| Mounting Level (ft) | Center Line Elevation (ft) | Number of Antennas | Antenna Manufacturer | Antenna Model | Number of Feed Lines | Feed Line Size (in) | Note |
|---------------------|----------------------------|--------------------|----------------------|-------------------------------------|----------------------|---------------------|------|
| 134.0 | 135.0 | 3 | kmw communications | AM-X-CD-17-65-00T-RET w/ Mount Pipe | - | - | - |

Table 2 - Existing and Reserved Antenna and Cable Information

| Mounting Level (ft) | Center Line Elevation (ft) | Number of Antennas | Antenna Manufacturer | Antenna Model | Number of Feed Lines | Feed Line Size (in) | Note |
|---------------------|----------------------------|--------------------|------------------------|-------------------------------------|----------------------|---------------------|------|
| 178.0 | 180.0 | 2 | decibel | DB978G30E-M w/ Mount Pipe | 6 | 1-5/8 | 1 |
| | | 4 | decibel | DB978H65E-M w/ Mount Pipe | | | |
| | | 1 | tower mounts | Miscellaneous [NA 510-1] | | | |
| | 178.0 | 1 | tower mounts | Platform Mount [LP 1201-1] | | | |
| 168.0 | 171.0 | 3 | ericsson | KRY 112 144/1 | 12 | 1-5/8 | 1 |
| | | 3 | rfs celwave | APX16DWV-16DWV-S-E-A20 w/Mount Pipe | | | |
| | 170.0 | 6 | ericsson | KRY 112 71 | | | |
| | | 6 | rfs celwave | APXV18-206517-C w/Mount Pipe | | | |
| | 168.0 | 1 | tower mounts | Platform Mount [LP 305-1] | | | |
| 160.0 | 160.0 | 1 | andrew | SBNH-1D6565C w/ Mount Pipe | 12 1 2 | 1-5/8 3/8 3/4 | 1 |
| | | 3 | ericsson | RRUS 11 B4 | | | |
| | | 3 | ericsson | RRUS-11 | | | |
| | | 6 | kathrein | 782 10254 | | | |
| | | 1 | kmw communications | AM-X-CD-16-65-00T-RET w/ Mount Pipe | | | |
| | | 6 | powerwave technologies | 7020.00 | | | |
| | | 3 | powerwave technologies | 7770.00 w/Mount Pipe | | | |

| Mounting Level (ft) | Center Line Elevation (ft) | Number of Antennas | Antenna Manufacturer | Antenna Model | Number of Feed Lines | Feed Line Size (in) | Note |
|---------------------|----------------------------|--------------------|----------------------------|-------------------------------|----------------------|---------------------|------------------------------|
| 160.0 | 160.0 | 6 | powerwave technologies | LGP21401 | - | - | 1 |
| | | 6 | powerwave technologies | LGP21903 | | | |
| | | 1 | powerwave technologies | P65-17-XLH-RR w/ Mount Pipe | | | |
| | | 1 | raycap | DC6-48-60-18-8F | | | |
| | | 1 | tower mounts | T-Arm Mount [TA 602-3] | 2 1 | 3/4 3/8 | 3 |
| | | 1 | cci antennas | HPA-65R-BUU-H6 w/ Mount Pipe | | | |
| | | 2 | cci antennas | HPA-65R-BUU-H8 w/ Mount Pipe | | | |
| | | 3 | ericsson | RRUS12/RRUS A2 | | | |
| 1 | raycap | DC6-48-60-18-8F | 19 | 1-5/8 | 1 | | |
| 149.0 | 151.0 | 1 | | | | alcatel lucent | RRH2X40-AWS |
| | | 1 | | | | andrew | HBX-6517DS-T2M w/ Mount Pipe |
| | | 2 | | | | andrew | LNx-6514DS-VTM w/ Mount Pipe |
| | | 1 | | | | commscope | HBX-6516DS-A1M w/ Mount Pipe |
| | | 1 | | | | commscope | LNx-6514DS-VTM w/ Mount Pipe |
| | 150.0 | 2 | | | | alcatel lucent | RRH2X40-AWS |
| | | 2 | | | | andrew | HBX-6517DS-T2M w/ Mount Pipe |
| | | 2 | | | | commscope | LNx-6514DS-VTM w/ Mount Pipe |
| | | 1 | | | | andrew | LNx-6514DS-VTM w/ Mount Pipe |
| | | 2 | | | | commscope | HBX-6516DS-A1M w/ Mount Pipe |
| 1 | rfs celwave | DB-B1-6C-12AB-0Z | | | | | |
| 149.0 | 1 | tower mounts | Platform Mount [LP 1201-1] | | | | |
| 134.0 | 135.0 | 3 | powerwave tech | P65-17-XL-R w/ Mount Pipe | - | - | 2 |
| | | 6 | antel | BSA-185065/10CF w/ Mount Pipe | 6 6 | 1-5/8 7/8 | 1 |
| | | 3 | ericsson | KRC 115 032/2 | | | |
| | 134.0 | 1 | tower mounts | Platform Mount [LP 403-1] | | | |

- Notes:
 1) Existing Equipment
 2) Equipment to be removed; Not Considered in this Analysis
 3) Reserved Equipment

Table 3 - Design Antenna and Cable Information

| Mounting Level (ft) | Center Line Elevation (ft) | Number of Antennas | Antenna Manufacturer | Antenna Model | Number of Feed Lines | Feed Line Size (in) |
|---------------------|----------------------------|--------------------|----------------------|---------------|----------------------|---------------------|
| 180.0 | 180.0 | 12 | Generic | 4 SQ. FT. | - | - |
| 170.0 | 170.0 | 2 | Generic | 6' DISHES | - | - |
| 160.0 | 160.0 | 12 | Generic | 4 SQ. FT. | - | - |

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

| Document | Remarks | Reference | Source |
|------------------------------------------|---------------|-----------|----------|
| 4-GEOTECHNICAL REPORTS | FDH Velocitel | 1620506 | CCISITES |
| 4-POST-MODIFICATION INSPECTION | TEP | 3455671 | CCISITES |
| 4-POST-MODIFICATION INSPECTION | PSG | 3630219 | CCISITES |
| 4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS | Pittsburg | 1620582 | CCISITES |
| 4-REINFORCEMENT DESIGN/DRAWINGS/DATA | PSG | 2415719 | CCISITES |
| 4-REINFORCEMENT DESIGN/DRAWINGS/DATA | FDH | 3175691 | CCISITES |
| 4-TOWER MANUFACTURER DRAWINGS | Pittsburg | 3633205 | CCISITES |

3.1) Analysis Method

tnxTower (version 7.0.7.0), 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 in accordance with the manufacturer's specifications.
- 2) The tower and structures have been maintained in accordance with the manufacturer's specification.
- 3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
- 4) The existing base plate grout was not considered in this analysis.

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

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

| Section No. | Elevation (ft) | Component Type | Size | Critical Element | P (K) | SF*P _{allow} (K) | % Capacity | Pass / Fail |
|-------------|----------------|----------------|---------|------------------|--------|---------------------------|------------|-------------------|
| L1 | 178 - 140 | Pole | P24x1/2 | 1 | -16.58 | 1162.78 | 70.8 | Pass |
| L2 | 140 - 100 | Pole | P36x1/2 | 2 | -30.78 | 1756.54 | 103.8 | Pass ² |

| Section No. | Elevation (ft) | Component Type | Size | Critical Element | P (K) | SF*P allow (K) | % Capacity | Pass / Fail |
|-------------|----------------|----------------|---------|------------------|--------|----------------|------------|-------------------|
| L3 | 100 - 60 | Pole | P48x5/8 | 3 | -48.99 | 2930.15 | 85.7 | Pass |
| L4 | 60 - 20 | Pole | P54x5/8 | 4 | -69.38 | 3301.25 | 104.0 | Pass ² |
| L5 | 20 - 0 | Pole | P60x5/8 | 5 | -80.56 | 3649.51 | 101.0 | Pass ² |
| | | | | | | | Summary | |
| | | | | | | Pole (L4) | 104.0 | Pass ² |
| | | | | | | Rating = | 104.0 | Pass ² |

Table 6 - Tower Component Stresses vs. Capacity – LC7

| Notes | Component | Elevation (ft) | % Capacity | Pass / Fail |
|-------|----------------------------------|----------------|------------|-------------------|
| 1 | Anchor Rods | 0 | 95.3 | Pass |
| 1 | Base Plate | 0 | 39.9 | Pass |
| 1 | Base Foundation Structural | 0 | 15.8 | Pass |
| 1 | Base Foundation Soil Interaction | 0 | 94.2 | Pass |
| 1 | Bolts | 20 | 102.7 | Pass ² |
| | Top Flange Plate | | 23.8 | Pass |
| | Bottom Flange Plate | | 31.2 | Pass |
| 1 | Bolts | 60 | 89.9 | Pass |
| | Top Flange Plate | | 25.3 | Pass |
| | Bottom Flange Plate | | 33.3 | Pass |
| 1 | Bolts | 100 | 94.4 | Pass |
| | Top Flange Plate | | 49.1 | Pass |
| | Bottom Flange Plate | | 68.9 | Pass |
| 1 | Bolts | 140 | 88.9 | Pass |
| | Top Flange Plate | | 50.7 | Pass |
| | Bottom Flange Plate | | 73.2 | Pass |

| | |
|-----------------------------------------------------|---------------------------|
| Structure Rating (max from all components) = | 104.0²% |
|-----------------------------------------------------|---------------------------|

Notes:

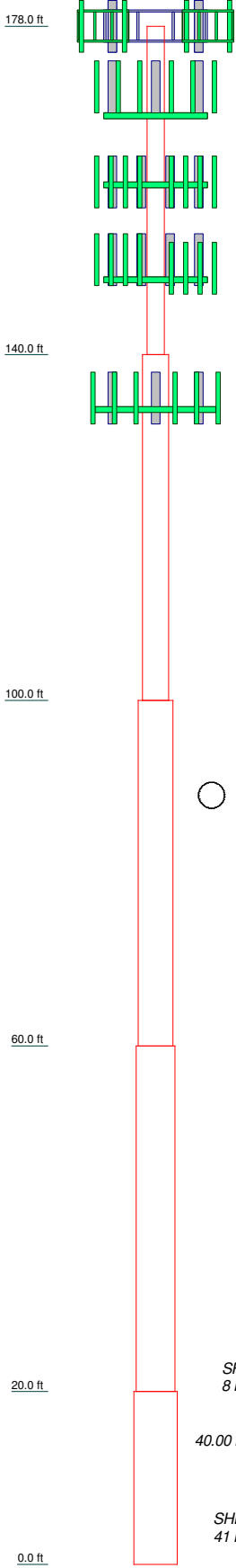
- 1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.
- 2) Capacities up to 105% are considered acceptable based on analysis methods used.

4.1) Recommendations

The tower and its foundation have sufficient capacity to carry the existing, reserved and proposed loads. No modifications are required at this time.

APPENDIX A
TNXTOWER OUTPUT

| | | | | | | | |
|-------------|----------|--|--|--|--|--|--|
| Section | 1 | | | | | | |
| Size | P24x1/2 | | | | | | |
| Length (ft) | 38.0000 | | | | | | |
| Grade | A53-B-35 | | | | | | |
| Weight (K) | 4.8 | | | | | | |
| Section | 2 | | | | | | |
| Size | P36x1/2 | | | | | | |
| Length (ft) | 40.0000 | | | | | | |
| Grade | A53-B-35 | | | | | | |
| Weight (K) | 7.6 | | | | | | |
| Section | 3 | | | | | | |
| Size | P48x5/8 | | | | | | |
| Length (ft) | 40.0000 | | | | | | |
| Grade | A53-B-35 | | | | | | |
| Weight (K) | 12.7 | | | | | | |
| Section | 4 | | | | | | |
| Size | P54x5/8 | | | | | | |
| Length (ft) | 40.0000 | | | | | | |
| Grade | A53-B-35 | | | | | | |
| Weight (K) | 14.3 | | | | | | |
| Section | 5 | | | | | | |
| Size | P60x5/8 | | | | | | |
| Length (ft) | 20.0000 | | | | | | |
| Grade | A53-B-35 | | | | | | |
| Weight (K) | 7.9 | | | | | | |
| Section | | | | | | | |
| Size | | | | | | | |
| Length (ft) | | | | | | | |
| Grade | | | | | | | |
| Weight (K) | 47.2 | | | | | | |



DESIGNED APPURTENANCE LOADING

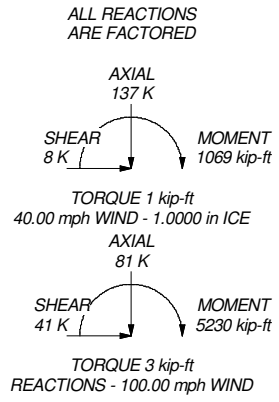
| TYPE | ELEVATION | TYPE | ELEVATION |
|-------------------------------------|-----------|-------------------------------------|-----------|
| Top Hat 2' 3" x 31.83" | 179 | RRUS-11 | 160 |
| Lighting Rod 5/8" x 8' | 178 | RRUS-11 | 160 |
| (2) DB978H65E-M w/ Mount Pipe | 178 | RRUS-11 | 160 |
| (2) DB978G30E-M w/ Mount Pipe | 178 | RRUS 11 B4 | 160 |
| (2) DB978H65E-M w/ Mount Pipe | 178 | RRUS 11 B4 | 160 |
| (2) 4' x 2" Pipe Mount | 178 | RRUS 11 B4 | 160 |
| (2) 4' x 2" Pipe Mount | 178 | (2) LGP21903 | 160 |
| (2) 4' x 2" Pipe Mount | 178 | (2) LGP21903 | 160 |
| 6' x 2" Horiz. Pipe | 178 | (2) LGP21903 | 160 |
| 6' x 2" Horiz. Pipe | 178 | (2) 782 10254 | 160 |
| 6' x 2" Horiz. Pipe | 178 | (2) 782 10254 | 160 |
| Miscellaneous [NA 510-1] | 178 | (2) 782 10254 | 160 |
| Platform Mount [LP 1201-1] | 178 | RRUS12/RRUS A2 | 160 |
| APX16DWV-16DWV-S-E-A20 w/Mount Pipe | 168 | RRUS12/RRUS A2 | 160 |
| APX16DWV-16DWV-S-E-A20 w/Mount Pipe | 168 | RRUS12/RRUS A2 | 160 |
| APX16DWV-16DWV-S-E-A20 w/Mount Pipe | 168 | T-Arm Mount [TA 602-3] | 160 |
| (2) APXV18-206517-C w/Mount Pipe | 168 | (2) LNX-6514DS-VTM w/ Mount Pipe | 149 |
| (2) APXV18-206517-C w/Mount Pipe | 168 | (2) LNX-6514DS-VTM w/ Mount Pipe | 149 |
| (2) APXV18-206517-C w/Mount Pipe | 168 | LNX-6514DS-VTM w/ Mount Pipe | 149 |
| (2) KRY 112 71 | 168 | LNX-6514DS-VTM w/ Mount Pipe | 149 |
| (2) KRY 112 71 | 168 | HBX-6517DS-T2M w/ Mount Pipe | 149 |
| (2) KRY 112 71 | 168 | HBX-6517DS-T2M w/ Mount Pipe | 149 |
| KRY 112 144/1 | 168 | HBX-6517DS-T2M w/ Mount Pipe | 149 |
| KRY 112 144/1 | 168 | HBX-6517DS-T2M w/ Mount Pipe | 149 |
| KRY 112 144/1 | 168 | HBX-6516DS-A1M w/ Mount Pipe | 149 |
| Platform Mount [LP 305-1] | 168 | HBX-6516DS-A1M w/ Mount Pipe | 149 |
| HPA-65R-BUU-H6 w/ Mount Pipe | 160 | HBX-6516DS-A1M w/ Mount Pipe | 149 |
| HPA-65R-BUU-H8 w/ Mount Pipe | 160 | DB-B1-6C-12AB-0Z | 149 |
| HPA-65R-BUU-H8 w/ Mount Pipe | 160 | RRH2X40-AWS | 149 |
| 7770.00 w/Mount Pipe | 160 | RRH2X40-AWS | 149 |
| 7770.00 w/Mount Pipe | 160 | RRH2X40-AWS | 149 |
| 7770.00 w/Mount Pipe | 160 | 6' x 2" Horiz. Pipe | 149 |
| AM-X-CD-16-65-00T-RET w/ Mount Pipe | 160 | 6' x 2" Horiz. Pipe | 149 |
| P65-17-XLH-RR w/ Mount Pipe | 160 | Platform Mount [LP 1201-1] | 149 |
| SBNH-1D6565C w/ Mount Pipe | 160 | Miscellaneous [NA 510-1] | 149 |
| (2) 7020.00 | 160 | AM-X-CD-17-65-00T-RET w/ Mount Pipe | 134 |
| (2) 7020.00 | 160 | AM-X-CD-17-65-00T-RET w/ Mount Pipe | 134 |
| (2) 7020.00 | 160 | AM-X-CD-17-65-00T-RET w/ Mount Pipe | 134 |
| (2) LGP21401 | 160 | (2) BSA-185065/10CF w/ Mount Pipe | 134 |
| (2) LGP21401 | 160 | (2) BSA-185065/10CF w/ Mount Pipe | 134 |
| (2) LGP21401 | 160 | (2) BSA-185065/10CF w/ Mount Pipe | 134 |
| DC6-48-60-18-8F | 160 | KRC 115 032/2 | 134 |
| DC6-48-60-18-8F | 160 | KRC 115 032/2 | 134 |
| | | KRC 115 032/2 | 134 |
| | | Platform Mount [LP 403-1] | 134 |

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Cumberland County, Maine.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 100.00 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 40.00 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60.00 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.0000 ft
8. TOWER RATING: 104%



Jacobs Engineering Group, Inc. Job: **PORTLAND NORTH**
 5449 Bells Ferry Rd Project: **BU878783 WO1341150**
 Acworth, GA 30102 Client: Crown Castle Drawn by: J. Earnest App'd:
 Phone: 770-701-2500 Code: TIA-222-G Date: 02/22/17 Scale: NTS
 FAX: 770-701-2501 Path: C:\Users\EARNESJT\Desktop\878783\BU878783_WO1341150_LC7.dwg Dwg No. E-1

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 1 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

Tower Input Data

There is a pole section.

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

The following design criteria apply:

- Tower is located in Cumberland County, Maine.
- Basic wind speed of 100.00 mph.
- Structure Class II.
- Exposure Category C.
- Topographic Category 1.
- Crest Height 0.0000 ft.
- Nominal ice thickness of 1.0000 in.
- Ice thickness is considered to increase with height.
- Ice density of 56.00 pcf.
- A wind speed of 40.00 mph is used in combination with ice.
- Temperature drop of 50.00 °F.
- Deflections calculated using a wind speed of 60.00 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 Retention 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 | <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 <li style="text-align: center;">Poles √ Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Pole Section Geometry

| Section | Elevation | Section Length | Pole Size | Pole Grade | Socket Length |
|---------|-------------------|----------------|-----------|------------|---------------|
| | ft | ft | | | ft |
| L1 | 178.0000-140.0000 | 38.0000 | P24x1/2 | A53-B-35 | |
| | 0 | | | (35 ksi) | |
| L2 | 140.0000-100.0000 | 40.0000 | P36x1/2 | A53-B-35 | |
| | 0 | | | (35 ksi) | |

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 2 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

| Section | Elevation ft | Section Length ft | Pole Size | Pole Grade | Socket Length ft |
|---------|------------------|----------------------|-----------|----------------------|---------------------|
| L3 | 100.0000-60.0000 | 40.0000 | P48x5/8 | A53-B-35 (35 ksi) | |
| L4 | 60.0000-20.0000 | 40.0000 | P54x5/8 | A53-B-35 (35 ksi) | |
| L5 | 20.0000-0.0000 | 20.0000 | P60x5/8 | A53-B-35 (35 ksi) | |

| 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 178.0000-140.0000 | | | | 1 | 1 | 1 | | | |
| L2 140.0000-100.0000 | | | | 1 | 1 | 1 | | | |
| L3 100.0000-60.0000 | | | | 1 | 1 | 1 | | | |
| L4 60.0000-20.0000 | | | | 1 | 1 | 1 | | | |
| L5 20.0000-0.0000 | | | | 1 | 1 | 1 | | | |

Feed Line/Linear Appurtenances - Entered As Round Or Flat

| Description | Sector | Component Type | Placement ft | Total Number | Number Per Row | Start/End Position | Width or Diameter in | Perimeter in | Weight plf |
|---------------------------------|--------|-------------------|-------------------|--------------|----------------|--------------------|-------------------------|-----------------|---------------|
| ** T-Brackets (Af) | C | Surface Af (CaAa) | 178.0000 - 3.0000 | 1 | 1 | 0.200 0.200 | 1.0000 | 4.0000 | 8.40 |
| Safety Line 3/8 | C | Surface Ar (CaAa) | 178.0000 - 3.0000 | 1 | 1 | 0.000 0.000 | 0.3750 | | 0.22 |
| ** HB158-1-08U8-S8J18(1-5/8) | B | Surface Ar (CaAa) | 149.0000 - 0.0000 | 1 | 1 | 0.170 0.170 | 1.9800 | | 1.30 |

Feed Line/Linear Appurtenances - Entered As Area

| Description | Face or Leg | Allow Shield | Component Type | Placement ft | Total Number | C _A A _A ft ² /ft | Weight plf |
|------------------------------|-------------|--------------|----------------|-------------------|--------------|------------------------------------------------------|----------------------|
| ** *** LDF7-50A(1-5/8) | A | No | Inside Pole | 178.0000 - 0.0000 | 6 | No Ice 1/2" Ice 1" Ice | 0.82 0.82 0.82 |

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 3 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

| Description | Face or Leg | Allow Shield | Component Type | Placement ft | Total Number | C _{AA} | | Weight plf |
|------------------------|-------------|--------------|----------------|-------------------|--------------|-----------------|----------|---------------|
| | | | | | | In Face | Out Face | |
| LDF7-50A(1-5/8) | C | No | Inside Pole | 168.0000 - 0.0000 | 12 | No Ice | 0.0000 | 0.82 |
| | | | | | | 1/2" Ice | 0.0000 | 0.82 |
| | | | | | | 1" Ice | 0.0000 | 0.82 |
| AL7-50(1-5/8) | A | No | Inside Pole | 160.0000 - 0.0000 | 12 | No Ice | 0.0000 | 0.52 |
| | | | | | | 1/2" Ice | 0.0000 | 0.52 |
| | | | | | | 1" Ice | 0.0000 | 0.52 |
| FB-L98B-002-75000(3/8) | A | No | Inside Pole | 160.0000 - 0.0000 | 1 | No Ice | 0.0000 | 0.06 |
| | | | | | | 1/2" Ice | 0.0000 | 0.06 |
| | | | | | | 1" Ice | 0.0000 | 0.06 |
| WR-VG86ST-BRD(3/4) | A | No | Inside Pole | 160.0000 - 0.0000 | 2 | No Ice | 0.0000 | 0.58 |
| | | | | | | 1/2" Ice | 0.0000 | 0.58 |
| | | | | | | 1" Ice | 0.0000 | 0.58 |
| FB-L98B-034-XXX(3/8) | A | No | Inside Pole | 160.0000 - 0.0000 | 1 | No Ice | 0.0000 | 0.06 |
| | | | | | | 1/2" Ice | 0.0000 | 0.06 |
| | | | | | | 1" Ice | 0.0000 | 0.06 |
| WR-VG86ST-BRD(3/4) | A | No | Inside Pole | 160.0000 - 0.0000 | 2 | No Ice | 0.0000 | 0.58 |
| | | | | | | 1/2" Ice | 0.0000 | 0.58 |
| | | | | | | 1" Ice | 0.0000 | 0.58 |
| LDF7-50A(1-5/8) | B | No | Inside Pole | 149.0000 - 0.0000 | 18 | No Ice | 0.0000 | 0.82 |
| | | | | | | 1/2" Ice | 0.0000 | 0.82 |
| | | | | | | 1" Ice | 0.0000 | 0.82 |
| LDF5-50A(7/8) | C | No | Inside Pole | 134.0000 - 0.0000 | 6 | No Ice | 0.0000 | 0.33 |
| | | | | | | 1/2" Ice | 0.0000 | 0.33 |
| | | | | | | 1" Ice | 0.0000 | 0.33 |
| LDF7-50A(1-5/8) | C | No | Inside Pole | 134.0000 - 0.0000 | 6 | No Ice | 0.0000 | 0.82 |
| | | | | | | 1/2" Ice | 0.0000 | 0.82 |
| | | | | | | 1" Ice | 0.0000 | 0.82 |

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 | 178.0000-140.0000 | A | 0.000 | 0.000 | 0.000 | 0.000 | 0.36 |
| | | B | 0.000 | 0.000 | 1.782 | 0.000 | 0.14 |
| | | C | 0.000 | 0.000 | 7.758 | 0.000 | 0.60 |
| L2 | 140.0000-100.0000 | A | 0.000 | 0.000 | 0.000 | 0.000 | 0.54 |
| | | B | 0.000 | 0.000 | 7.920 | 0.000 | 0.64 |
| | | C | 0.000 | 0.000 | 8.167 | 0.000 | 0.97 |
| L3 | 100.0000-60.0000 | A | 0.000 | 0.000 | 0.000 | 0.000 | 0.54 |
| | | B | 0.000 | 0.000 | 7.920 | 0.000 | 0.64 |
| | | C | 0.000 | 0.000 | 8.167 | 0.000 | 1.01 |
| L4 | 60.0000-20.0000 | A | 0.000 | 0.000 | 0.000 | 0.000 | 0.54 |
| | | B | 0.000 | 0.000 | 7.920 | 0.000 | 0.64 |
| | | C | 0.000 | 0.000 | 8.167 | 0.000 | 1.01 |
| L5 | 20.0000-0.0000 | A | 0.000 | 0.000 | 0.000 | 0.000 | 0.27 |
| | | B | 0.000 | 0.000 | 3.960 | 0.000 | 0.32 |
| | | C | 0.000 | 0.000 | 3.471 | 0.000 | 0.48 |

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} In Face ft ² | C _{AA} Out Face ft ² | Weight K |
|---------------|-----------------------|-------------|---------------------|-----------------------------------|-----------------------------------|-----------------------------------------------|------------------------------------------------|-------------|
| L1 | 178.0000-140.0000 | A | 2.341 | 0.000 | 0.000 | 0.000 | 0.000 | 0.36 |

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 4 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

| Tower Section | Tower Elevation ft | Face or Leg | Ice Thickness in | A _R ft ² | A _F ft ² | C _{AA} In Face ft ² | C _{AA} Out Face ft ² | Weight K |
|---------------|-----------------------|-------------|---------------------|-----------------------------------|-----------------------------------|-----------------------------------------------|------------------------------------------------|-------------|
| | 0 | B | | 0.000 | 0.000 | 5.995 | 0.000 | 0.26 |
| | | C | | 0.000 | 0.000 | 43.337 | 0.000 | 1.34 |
| L2 | 140.0000-100.0000 | A | 2.276 | 0.000 | 0.000 | 0.000 | 0.000 | 0.54 |
| | 0 | B | | 0.000 | 0.000 | 26.127 | 0.000 | 1.12 |
| | | C | | 0.000 | 0.000 | 44.582 | 0.000 | 1.71 |
| L3 | 100.0000-60.0000 | A | 2.186 | 0.000 | 0.000 | 0.000 | 0.000 | 0.54 |
| | | B | | 0.000 | 0.000 | 25.407 | 0.000 | 1.09 |
| | | C | | 0.000 | 0.000 | 43.141 | 0.000 | 1.71 |
| L4 | 60.0000-20.0000 | A | 2.042 | 0.000 | 0.000 | 0.000 | 0.000 | 0.54 |
| | | B | | 0.000 | 0.000 | 24.253 | 0.000 | 1.04 |
| | | C | | 0.000 | 0.000 | 40.832 | 0.000 | 1.63 |
| L5 | 20.0000-0.0000 | A | 1.775 | 0.000 | 0.000 | 0.000 | 0.000 | 0.27 |
| | | B | | 0.000 | 0.000 | 11.060 | 0.000 | 0.48 |
| | | C | | 0.000 | 0.000 | 15.540 | 0.000 | 0.69 |

Feed Line Center of Pressure

| Section | Elevation ft | CP _X in | CP _Z in | CP _X Ice in | CP _Z Ice in |
|---------|-------------------|-----------------------|-----------------------|------------------------------|------------------------------|
| L1 | 178.0000-140.0000 | -0.1086 | 0.2147 | -0.2705 | 0.8019 |
| L2 | 140.0000-100.0000 | 0.0997 | 0.1752 | 0.1681 | 0.7568 |
| L3 | 100.0000-60.0000 | 0.0997 | 0.1795 | 0.1784 | 0.8223 |
| L4 | 60.0000-20.0000 | 0.0997 | 0.1811 | 0.1789 | 0.8199 |
| L5 | 20.0000-0.0000 | 0.1275 | 0.1487 | 0.2466 | 0.6567 |

Shielding Factor Ka

| Tower Section | Feed Line Record No. | Description | Feed Line Segment Elev. | K _a No Ice | K _a Ice |
|---------------|----------------------|---------------------------|-------------------------|--------------------------|-----------------------|
| L1 | 2 | T-Brackets (Af) | 140.00 - 178.00 | 1.0000 | 1.0000 |
| L1 | 3 | Safety Line 3/8 | 140.00 - 178.00 | 1.0000 | 1.0000 |
| L1 | 14 | HB158-1-08U8-S8J18(1-5/8) | 140.00 - 149.00 | 1.0000 | 1.0000 |
| L2 | 2 | T-Brackets (Af) | 100.00 - 140.00 | 1.0000 | 1.0000 |
| L2 | 3 | Safety Line 3/8 | 100.00 - 140.00 | 1.0000 | 1.0000 |
| L2 | 14 | HB158-1-08U8-S8J18(1-5/8) | 100.00 - 140.00 | 1.0000 | 1.0000 |
| L3 | 2 | T-Brackets (Af) | 60.00 - 100.00 | 1.0000 | 1.0000 |
| L3 | 3 | Safety Line 3/8 | 60.00 - 100.00 | 1.0000 | 1.0000 |
| L3 | 14 | HB158-1-08U8-S8J18(1-5/8) | 60.00 - 100.00 | 1.0000 | 1.0000 |
| L4 | 2 | T-Brackets (Af) | 20.00 - 60.00 | 1.0000 | 1.0000 |
| L4 | 3 | Safety Line 3/8 | 20.00 - 60.00 | 1.0000 | 1.0000 |
| L4 | 14 | HB158-1-08U8-S8J18(1-5/8) | 20.00 - 60.00 | 1.0000 | 1.0000 |
| L5 | 2 | T-Brackets (Af) | 3.00 - 20.00 | 1.0000 | 1.0000 |
| L5 | 3 | Safety Line 3/8 | 3.00 - 20.00 | 1.0000 | 1.0000 |
| L5 | 14 | HB158-1-08U8-S8J18(1-5/8) | 0.00 - 20.00 | 1.0000 | 1.0000 |

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 5 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

Discrete Tower Loads

| Description | Face or Leg | Offset Type | Offsets: | | Azimuth Adjustment | Placement | C _{AA} Front | C _{AA} Side | Weight |
|--------------------------------------|-------------|-------------|--------------|--------|--------------------|-----------|-----------------------|----------------------|--------|
| | | | Horz Lateral | Vert | | | | | |
| Lighting Rod 5/8" x 8' | C | From Leg | 0.0000 | 0.0000 | 178.0000 | No Ice | 0.5000 | 0.5000 | 0.03 |
| | | | 0.00 | 0.00 | | 1/2" Ice | 1.3135 | 1.3135 | 0.04 |
| | | | 4.00 | 0.00 | | 1" Ice | 2.1437 | 2.1437 | 0.05 |
| Top Hat 2' 3" x 31.83" | C | None | 0.0000 | 0.0000 | 179.0000 | No Ice | 2.9841 | 2.9841 | 0.10 |
| | | | 0.00 | 0.00 | | 1/2" Ice | 4.4685 | 4.4685 | 0.17 |
| | | | 4.00 | 0.00 | | 1" Ice | 4.7691 | 4.7691 | 0.25 |
| **178** | | | | | | | | | |
| (2) DB978H65E-M w/ Mount Pipe | A | From Leg | 4.0000 | 0.0000 | 178.0000 | No Ice | 3.1431 | 2.8097 | 0.03 |
| | | | 0.00 | 0.00 | | 1/2" Ice | 3.5154 | 3.4107 | 0.05 |
| | | | 2.00 | 0.00 | | 1" Ice | 3.8856 | 4.0226 | 0.09 |
| (2) DB978G30E-M w/ Mount Pipe | B | From Leg | 4.0000 | 0.0000 | 178.0000 | No Ice | 6.0537 | 4.3281 | 0.04 |
| | | | 0.00 | 0.00 | | 1/2" Ice | 6.4678 | 5.0073 | 0.09 |
| | | | 2.00 | 0.00 | | 1" Ice | 6.8840 | 5.6680 | 0.14 |
| (2) DB978H65E-M w/ Mount Pipe | C | From Leg | 4.0000 | 0.0000 | 178.0000 | No Ice | 3.1431 | 2.8097 | 0.03 |
| | | | 0.00 | 0.00 | | 1/2" Ice | 3.5154 | 3.4107 | 0.05 |
| | | | 2.00 | 0.00 | | 1" Ice | 3.8856 | 4.0226 | 0.09 |
| (2) 4' x 2" Pipe Mount | A | From Leg | 4.0000 | 0.0000 | 178.0000 | No Ice | 0.7852 | 0.7852 | 0.03 |
| | | | 0.00 | 0.00 | | 1/2" Ice | 1.0284 | 1.0284 | 0.04 |
| | | | 2.00 | 0.00 | | 1" Ice | 1.2809 | 1.2809 | 0.04 |
| (2) 4' x 2" Pipe Mount | B | From Leg | 4.0000 | 0.0000 | 178.0000 | No Ice | 0.7852 | 0.7852 | 0.03 |
| | | | 0.00 | 0.00 | | 1/2" Ice | 1.0284 | 1.0284 | 0.04 |
| | | | 2.00 | 0.00 | | 1" Ice | 1.2809 | 1.2809 | 0.04 |
| (2) 4' x 2" Pipe Mount | C | From Leg | 4.0000 | 0.0000 | 178.0000 | No Ice | 0.7852 | 0.7852 | 0.03 |
| | | | 0.00 | 0.00 | | 1/2" Ice | 1.0284 | 1.0284 | 0.04 |
| | | | 2.00 | 0.00 | | 1" Ice | 1.2809 | 1.2809 | 0.04 |
| 6' x 2" Horiz. Pipe | A | From Leg | 4.0000 | 0.0000 | 178.0000 | No Ice | 0.5938 | 0.5938 | 0.02 |
| | | | 0.00 | 0.00 | | 1/2" Ice | 1.1977 | 1.1977 | 0.17 |
| | | | 0.00 | 0.00 | | 1" Ice | 1.5738 | 1.5738 | 0.32 |
| 6' x 2" Horiz. Pipe | B | From Leg | 4.0000 | 0.0000 | 178.0000 | No Ice | 0.5938 | 0.5938 | 0.02 |
| | | | 0.00 | 0.00 | | 1/2" Ice | 1.1977 | 1.1977 | 0.17 |
| | | | 0.00 | 0.00 | | 1" Ice | 1.5738 | 1.5738 | 0.32 |
| 6' x 2" Horiz. Pipe | C | From Leg | 4.0000 | 0.0000 | 178.0000 | No Ice | 0.5938 | 0.5938 | 0.02 |
| | | | 0.00 | 0.00 | | 1/2" Ice | 1.1977 | 1.1977 | 0.17 |
| | | | 0.00 | 0.00 | | 1" Ice | 1.5738 | 1.5738 | 0.32 |
| Miscellaneous [NA 510-1] | C | From Leg | 4.0000 | 0.0000 | 178.0000 | No Ice | 6.0000 | 6.0000 | 0.26 |
| | | | 0.00 | 0.00 | | 1/2" Ice | 8.5000 | 8.5000 | 0.34 |
| | | | 2.00 | 0.00 | | 1" Ice | 8.6000 | 8.6000 | 0.34 |
| Platform Mount [LP 1201-1] | C | None | 0.0000 | 0.0000 | 178.0000 | No Ice | 23.1000 | 23.1000 | 2.10 |
| | | | 0.00 | 0.00 | | 1/2" Ice | 26.8000 | 26.8000 | 2.50 |
| | | | 0.00 | 0.00 | | 1" Ice | 30.5000 | 30.5000 | 2.90 |
| **168** | | | | | | | | | |
| APX16DWV-16DWV-S-E-A 20 w/Mount Pipe | A | From Leg | 4.0000 | 0.0000 | 168.0000 | No Ice | 6.6275 | 3.2856 | 0.06 |
| | | | 0.00 | 0.00 | | 1/2" Ice | 7.0134 | 3.9182 | 0.10 |
| | | | 3.00 | 0.00 | | 1" Ice | 7.4067 | 4.5675 | 0.16 |
| APX16DWV-16DWV-S-E-A 20 w/Mount Pipe | B | From Leg | 4.0000 | 0.0000 | 168.0000 | No Ice | 6.6275 | 3.2856 | 0.06 |
| | | | 0.00 | 0.00 | | 1/2" Ice | 7.0134 | 3.9182 | 0.10 |
| | | | 3.00 | 0.00 | | 1" Ice | 7.4067 | 4.5675 | 0.16 |

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 6 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

| 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 | |
|-----------------------------------------|-------------|-------------|----------------------------------------------|-------------------------|-----------------|------------------------------------------------------|-----------------------------------------|----------------------|--|
| APX16DWV-16DWV-S-E-A 20 w/Mount Pipe | C | From Leg | 4.0000 0.00 3.00 | 0.0000 | 168.0000 | No Ice 6.6275 1/2" Ice 7.0134 1" Ice 7.4067 | 3.2856 3.9182 4.5675 | 0.06 0.10 0.16 | |
| (2) APXV18-206517-C w/Mount Pipe | A | From Leg | 4.0000 0.00 2.00 | 0.0000 | 168.0000 | No Ice 5.2062 1/2" Ice 5.6723 1" Ice 6.1415 | 4.5021 5.4702 6.2880 | 0.02 0.07 0.12 | |
| (2) APXV18-206517-C w/Mount Pipe | B | From Leg | 4.0000 0.00 2.00 | 0.0000 | 168.0000 | No Ice 5.2062 1/2" Ice 5.6723 1" Ice 6.1415 | 4.5021 5.4702 6.2880 | 0.02 0.07 0.12 | |
| (2) APXV18-206517-C w/Mount Pipe | C | From Leg | 4.0000 0.00 2.00 | 0.0000 | 168.0000 | No Ice 5.2062 1/2" Ice 5.6723 1" Ice 6.1415 | 4.5021 5.4702 6.2880 | 0.02 0.07 0.12 | |
| (2) KRY 112 71 | A | From Leg | 4.0000 0.00 2.00 | 0.0000 | 168.0000 | No Ice 0.5833 1/2" Ice 0.6876 1" Ice 0.7993 | 0.3980 0.4883 0.5856 | 0.01 0.02 0.03 | |
| (2) KRY 112 71 | B | From Leg | 4.0000 0.00 2.00 | 0.0000 | 168.0000 | No Ice 0.5833 1/2" Ice 0.6876 1" Ice 0.7993 | 0.3980 0.4883 0.5856 | 0.01 0.02 0.03 | |
| (2) KRY 112 71 | C | From Leg | 4.0000 0.00 2.00 | 0.0000 | 168.0000 | No Ice 0.5833 1/2" Ice 0.6876 1" Ice 0.7993 | 0.3980 0.4883 0.5856 | 0.01 0.02 0.03 | |
| KRY 112 144/1 | A | From Leg | 4.0000 0.00 3.00 | 0.0000 | 168.0000 | No Ice 0.3523 1/2" Ice 0.4284 1" Ice 0.5119 | 0.1617 0.2195 0.2846 | 0.01 0.01 0.02 | |
| KRY 112 144/1 | B | From Leg | 4.0000 0.00 3.00 | 0.0000 | 168.0000 | No Ice 0.3523 1/2" Ice 0.4284 1" Ice 0.5119 | 0.1617 0.2195 0.2846 | 0.01 0.01 0.02 | |
| KRY 112 144/1 | C | From Leg | 4.0000 0.00 3.00 | 0.0000 | 168.0000 | No Ice 0.3523 1/2" Ice 0.4284 1" Ice 0.5119 | 0.1617 0.2195 0.2846 | 0.01 0.01 0.02 | |
| Platform Mount [LP 305-1] | C | None | | 0.0000 | 168.0000 | No Ice 18.0100 1/2" Ice 23.3300 1" Ice 28.6500 | 18.0100 23.3300 28.6500 | 1.12 1.35 1.58 | |
| **160** | | | | | | | | | |
| HPA-65R-BUU-H6 w/ Mount Pipe | A | From Leg | 4.0000 0.00 0.00 | 0.0000 | 160.0000 | No Ice 9.8953 1/2" Ice 10.4700 1" Ice 11.0098 | 8.1125 9.3041 10.2095 | 0.08 0.16 0.25 | |
| HPA-65R-BUU-H8 w/ Mount Pipe | B | From Leg | 4.0000 0.00 0.00 | 0.0000 | 160.0000 | No Ice 13.5881 1/2" Ice 14.1897 1" Ice 14.7983 | 10.7958 12.1244 13.1669 | 0.08 0.18 0.29 | |
| HPA-65R-BUU-H8 w/ Mount Pipe | C | From Leg | 4.0000 0.00 0.00 | 0.0000 | 160.0000 | No Ice 13.5881 1/2" Ice 14.1897 1" Ice 14.7983 | 10.7958 12.1244 13.1669 | 0.08 0.18 0.29 | |
| 7770.00 w/Mount Pipe | A | From Leg | 4.0000 0.00 0.00 | 0.0000 | 160.0000 | No Ice 5.5473 1/2" Ice 5.9163 1" Ice 6.2926 | 4.0355 4.6682 5.3175 | 0.05 0.10 0.15 | |
| 7770.00 w/Mount Pipe | B | From Leg | 4.0000 0.00 0.00 | 0.0000 | 160.0000 | No Ice 5.5473 1/2" Ice 5.9163 1" Ice 6.2926 | 4.0355 4.6682 5.3175 | 0.05 0.10 0.15 | |
| 7770.00 w/Mount Pipe | C | From Leg | 4.0000 0.00 0.00 | 0.0000 | 160.0000 | No Ice 5.5473 1/2" Ice 5.9163 1" Ice 6.2926 | 4.0355 4.6682 5.3175 | 0.05 0.10 0.15 | |
| AM-X-CD-16-65-00T-RET w/ Mount Pipe | A | From Leg | 4.0000 0.00 0.00 | 0.0000 | 160.0000 | No Ice 8.2619 1/2" Ice 8.8215 1" Ice 9.3462 | 6.3042 7.4790 8.3676 | 0.07 0.14 0.21 | |
| P65-17-XLH-RR w/ Mount Pipe | B | From Leg | 4.0000 0.00 | 0.0000 | 160.0000 | No Ice 11.7042 1/2" Ice 12.4240 | 8.9375 10.4499 | 0.09 0.18 | |

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 7 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

| Description | Face or Leg | Offset Type | Offsets: | | Azimuth Adjustment | Placement | C _{AA} Front | C _{AA} Side | Weight | |
|----------------------------|-------------|-------------|----------|------|--------------------|-----------|-----------------------|----------------------|---------|------|
| | | | Horz | Vert | | | | | | |
| | | | ft | ft | ° | ft | ft ² | ft ² | K | |
| SBNH-1D6565C w/ Mount Pipe | C | From Leg | 0.00 | 0.00 | 0.0000 | 160.0000 | 1" Ice | 13.1530 | 11.9863 | 0.27 |
| | | | 4.0000 | 0.00 | | | No Ice | 11.6828 | 9.8418 | 0.10 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 12.4043 | 11.3657 | 0.19 |
| (2) 7020.00 | A | From Leg | 0.00 | 0.00 | 0.0000 | 160.0000 | 1" Ice | 13.1351 | 12.9138 | 0.29 |
| | | | 4.0000 | 0.00 | | | No Ice | 0.1021 | 0.1750 | 0.00 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 0.1469 | 0.2393 | 0.01 |
| (2) 7020.00 | B | From Leg | 0.00 | 0.00 | 0.0000 | 160.0000 | 1" Ice | 0.1991 | 0.3109 | 0.01 |
| | | | 4.0000 | 0.00 | | | No Ice | 0.1021 | 0.1750 | 0.00 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 0.1469 | 0.2393 | 0.01 |
| (2) 7020.00 | C | From Leg | 0.00 | 0.00 | 0.0000 | 160.0000 | 1" Ice | 0.1991 | 0.3109 | 0.01 |
| | | | 4.0000 | 0.00 | | | No Ice | 0.1021 | 0.1750 | 0.00 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 0.1469 | 0.2393 | 0.01 |
| (2) LGP21401 | A | From Leg | 0.00 | 0.00 | 0.0000 | 160.0000 | 1" Ice | 0.1991 | 0.3109 | 0.01 |
| | | | 4.0000 | 0.00 | | | No Ice | 1.1040 | 0.2070 | 0.01 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 1.2388 | 0.2738 | 0.02 |
| (2) LGP21401 | B | From Leg | 0.00 | 0.00 | 0.0000 | 160.0000 | 1" Ice | 1.3810 | 0.3475 | 0.03 |
| | | | 4.0000 | 0.00 | | | No Ice | 1.1040 | 0.2070 | 0.01 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 1.2388 | 0.2738 | 0.02 |
| (2) LGP21401 | C | From Leg | 0.00 | 0.00 | 0.0000 | 160.0000 | 1" Ice | 1.3810 | 0.3475 | 0.03 |
| | | | 4.0000 | 0.00 | | | No Ice | 1.1040 | 0.2070 | 0.01 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 1.2388 | 0.2738 | 0.02 |
| DC6-48-60-18-8F | B | From Leg | 0.00 | 0.00 | 0.0000 | 160.0000 | 1" Ice | 1.3810 | 0.3475 | 0.03 |
| | | | 4.0000 | 0.00 | | | No Ice | 0.9167 | 0.9167 | 0.03 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 1.4583 | 1.4583 | 0.05 |
| DC6-48-60-18-8F | B | From Leg | 0.00 | 0.00 | 0.0000 | 160.0000 | 1" Ice | 1.6431 | 1.6431 | 0.07 |
| | | | 4.0000 | 0.00 | | | No Ice | 0.9167 | 0.9167 | 0.03 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 1.4583 | 1.4583 | 0.05 |
| RRUS-11 | A | From Leg | 0.00 | 0.00 | 0.0000 | 160.0000 | 1" Ice | 1.6431 | 1.6431 | 0.07 |
| | | | 4.0000 | 0.00 | | | No Ice | 2.5217 | 1.0680 | 0.06 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 2.7187 | 1.2106 | 0.07 |
| RRUS-11 | B | From Leg | 0.00 | 0.00 | 0.0000 | 160.0000 | 1" Ice | 2.9231 | 1.3606 | 0.10 |
| | | | 4.0000 | 0.00 | | | No Ice | 2.5217 | 1.0680 | 0.06 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 2.7187 | 1.2106 | 0.07 |
| RRUS-11 | C | From Leg | 0.00 | 0.00 | 0.0000 | 160.0000 | 1" Ice | 2.9231 | 1.3606 | 0.10 |
| | | | 4.0000 | 0.00 | | | No Ice | 2.5217 | 1.0680 | 0.06 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 2.7187 | 1.2106 | 0.07 |
| RRUS 11 B4 | A | From Leg | 0.00 | 0.00 | 0.0000 | 160.0000 | 1" Ice | 2.9231 | 1.3606 | 0.10 |
| | | | 4.0000 | 0.00 | | | No Ice | 2.8333 | 1.1821 | 0.05 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 3.0426 | 1.3299 | 0.07 |
| RRUS 11 B4 | B | From Leg | 0.00 | 0.00 | 0.0000 | 160.0000 | 1" Ice | 3.2593 | 1.4848 | 0.10 |
| | | | 4.0000 | 0.00 | | | No Ice | 2.8333 | 1.1821 | 0.05 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 3.0426 | 1.3299 | 0.07 |
| RRUS 11 B4 | C | From Leg | 0.00 | 0.00 | 0.0000 | 160.0000 | 1" Ice | 3.2593 | 1.4848 | 0.10 |
| | | | 4.0000 | 0.00 | | | No Ice | 2.8333 | 1.1821 | 0.05 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 3.0426 | 1.3299 | 0.07 |
| (2) LGP21903 | A | From Leg | 0.00 | 0.00 | 0.0000 | 160.0000 | 1" Ice | 3.2593 | 1.4848 | 0.10 |
| | | | 4.0000 | 0.00 | | | No Ice | 0.2310 | 0.1575 | 0.01 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 0.2941 | 0.2129 | 0.01 |
| (2) LGP21903 | B | From Leg | 0.00 | 0.00 | 0.0000 | 160.0000 | 1" Ice | 0.3647 | 0.2756 | 0.02 |
| | | | 4.0000 | 0.00 | | | No Ice | 0.2310 | 0.1575 | 0.01 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 0.2941 | 0.2129 | 0.01 |
| (2) LGP21903 | C | From Leg | 0.00 | 0.00 | 0.0000 | 160.0000 | 1" Ice | 0.3647 | 0.2756 | 0.02 |
| | | | 4.0000 | 0.00 | | | No Ice | 0.2310 | 0.1575 | 0.01 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 0.2941 | 0.2129 | 0.01 |
| (2) 782 10254 | A | From Leg | 0.00 | 0.00 | 0.0000 | 160.0000 | 1" Ice | 0.3647 | 0.2756 | 0.02 |
| | | | 4.0000 | 0.00 | | | No Ice | 0.1421 | 0.0800 | 0.00 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 0.1936 | 0.1221 | 0.00 |

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 8 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

| Description | Face or Leg | Offset Type | Offsets: | | Azimuth Adjustment | Placement | C _{AA} | | Weight | |
|----------------------------------|-------------|-------------|----------|---------|--------------------|-----------|-----------------|-----------------|---------|------|
| | | | Horz | Lateral | | | Front | Side | | |
| | | | ft | ft | ° | ft | ft ² | ft ² | K | |
| (2) 782 10254 | B | From Leg | 0.00 | 0.00 | 0.0000 | 160.0000 | 1" Ice | 0.2525 | 0.1727 | 0.01 |
| | | | 4.0000 | 0.00 | | | No Ice | 0.1421 | 0.0800 | 0.00 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 0.1936 | 0.1221 | 0.00 |
| | | | 0.00 | 0.00 | | | 1" Ice | 0.2525 | 0.1727 | 0.01 |
| (2) 782 10254 | C | From Leg | 4.0000 | 0.00 | 0.0000 | 160.0000 | No Ice | 0.1421 | 0.0800 | 0.00 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 0.1936 | 0.1221 | 0.00 |
| | | | 0.00 | 0.00 | | | 1" Ice | 0.2525 | 0.1727 | 0.01 |
| | | | 0.00 | 0.00 | | | No Ice | 3.1435 | 1.8351 | 0.07 |
| RRUS12/RRUS A2 | A | From Leg | 4.0000 | 0.00 | 0.0000 | 160.0000 | 1/2" Ice | 3.3632 | 2.0121 | 0.10 |
| | | | 0.00 | 0.00 | | | 1" Ice | 3.5904 | 2.1965 | 0.13 |
| | | | 0.00 | 0.00 | | | No Ice | 3.1435 | 1.8351 | 0.07 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 3.3632 | 2.0121 | 0.10 |
| RRUS12/RRUS A2 | B | From Leg | 4.0000 | 0.00 | 0.0000 | 160.0000 | 1" Ice | 3.5904 | 2.1965 | 0.13 |
| | | | 0.00 | 0.00 | | | No Ice | 3.1435 | 1.8351 | 0.07 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 3.3632 | 2.0121 | 0.10 |
| | | | 0.00 | 0.00 | | | 1" Ice | 3.5904 | 2.1965 | 0.13 |
| RRUS12/RRUS A2 | C | From Leg | 4.0000 | 0.00 | 0.0000 | 160.0000 | No Ice | 3.1435 | 1.8351 | 0.07 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 3.3632 | 2.0121 | 0.10 |
| | | | 0.00 | 0.00 | | | 1" Ice | 3.5904 | 2.1965 | 0.13 |
| | | | 0.00 | 0.00 | | | No Ice | 11.5900 | 11.5900 | 0.26 |
| T-Arm Mount [TA 602-3] | C | None | | | 0.0000 | 160.0000 | 1/2" Ice | 15.4400 | 15.4400 | 0.33 |
| | | | | | | | 1" Ice | 19.2900 | 19.2900 | 0.42 |
| | | | | | | | | | | |
| **149** | | | | | | | | | | |
| (2) LNX-6514DS-VTM w/ Mount Pipe | A | From Leg | 4.0000 | 0.00 | 0.0000 | 149.0000 | No Ice | 8.4106 | 7.0817 | 0.06 |
| | | | 0.00 | 2.00 | | | 1/2" Ice | 8.9745 | 8.2729 | 0.13 |
| | | | 0.00 | 0.00 | | | 1" Ice | 9.5048 | 9.1847 | 0.21 |
| | | | 0.00 | 1.00 | | | No Ice | 8.3164 | 7.0042 | 0.06 |
| (2) LNX-6514DS-VTM w/ Mount Pipe | B | From Leg | 4.0000 | 0.00 | 0.0000 | 149.0000 | 1/2" Ice | 8.8765 | 8.1855 | 0.13 |
| | | | 0.00 | 0.00 | | | 1" Ice | 9.4016 | 9.0806 | 0.20 |
| | | | 0.00 | 0.00 | | | No Ice | 8.3164 | 7.0042 | 0.06 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 8.8765 | 8.1855 | 0.13 |
| LNX-6514DS-VTM w/ Mount Pipe | C | From Leg | 4.0000 | 0.00 | 0.0000 | 149.0000 | 1" Ice | 9.4016 | 9.0806 | 0.20 |
| | | | 0.00 | 0.00 | | | No Ice | 8.3164 | 7.0042 | 0.06 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 8.8765 | 8.1855 | 0.13 |
| | | | 0.00 | 0.00 | | | 1" Ice | 9.4016 | 9.0806 | 0.20 |
| LNX-6514DS-VTM w/ Mount Pipe | C | From Leg | 4.0000 | 0.00 | 0.0000 | 149.0000 | No Ice | 8.3164 | 7.0042 | 0.06 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 8.8765 | 8.1855 | 0.13 |
| | | | 0.00 | 0.00 | | | 1" Ice | 9.4016 | 9.0806 | 0.20 |
| | | | 0.00 | 0.00 | | | No Ice | 5.4805 | 5.0210 | 0.04 |
| HBX-6517DS-T2M w/ Mount Pipe | A | From Leg | 4.0000 | 0.00 | 0.0000 | 149.0000 | 1/2" Ice | 6.0509 | 6.2225 | 0.08 |
| | | | 0.00 | 0.00 | | | 1" Ice | 6.5922 | 7.1672 | 0.14 |
| | | | 0.00 | 0.00 | | | No Ice | 5.4805 | 5.0210 | 0.04 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 6.0509 | 6.2225 | 0.08 |
| HBX-6517DS-T2M w/ Mount Pipe | B | From Leg | 4.0000 | 0.00 | 0.0000 | 149.0000 | 1" Ice | 6.5922 | 7.1672 | 0.14 |
| | | | 0.00 | 0.00 | | | No Ice | 5.4805 | 5.0210 | 0.04 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 6.0509 | 6.2225 | 0.08 |
| | | | 0.00 | 0.00 | | | 1" Ice | 6.5922 | 7.1672 | 0.14 |
| HBX-6517DS-T2M w/ Mount Pipe | C | From Leg | 4.0000 | 0.00 | 0.0000 | 149.0000 | No Ice | 5.4805 | 5.0210 | 0.04 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 6.0509 | 6.2225 | 0.08 |
| | | | 0.00 | 0.00 | | | 1" Ice | 6.5922 | 7.1672 | 0.14 |
| | | | 0.00 | 0.00 | | | No Ice | 3.5559 | 3.2406 | 0.03 |
| HBX-6516DS-A1M w/ Mount Pipe | A | From Leg | 4.0000 | 0.00 | 0.0000 | 149.0000 | 1/2" Ice | 3.9559 | 3.9135 | 0.06 |
| | | | 0.00 | 0.00 | | | 1" Ice | 4.3492 | 4.5638 | 0.10 |
| | | | 0.00 | 0.00 | | | No Ice | 3.5559 | 3.2406 | 0.03 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 3.9559 | 3.9135 | 0.06 |
| HBX-6516DS-A1M w/ Mount Pipe | B | From Leg | 4.0000 | 0.00 | 0.0000 | 149.0000 | 1" Ice | 4.3492 | 4.5638 | 0.10 |
| | | | 0.00 | 0.00 | | | No Ice | 3.5559 | 3.2406 | 0.03 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 3.9559 | 3.9135 | 0.06 |
| | | | 0.00 | 0.00 | | | 1" Ice | 4.3492 | 4.5638 | 0.10 |
| HBX-6516DS-A1M w/ Mount Pipe | C | From Leg | 4.0000 | 0.00 | 0.0000 | 149.0000 | No Ice | 3.5559 | 3.2406 | 0.03 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 3.9559 | 3.9135 | 0.06 |
| | | | 0.00 | 0.00 | | | 1" Ice | 4.3492 | 4.5638 | 0.10 |
| | | | 0.00 | 0.00 | | | No Ice | 3.3636 | 2.1921 | 0.02 |
| DB-B1-6C-12AB-0Z | B | From Leg | 4.0000 | 0.00 | 0.0000 | 149.0000 | 1/2" Ice | 3.5972 | 2.3950 | 0.05 |
| | | | 0.00 | 0.00 | | | 1" Ice | 3.8383 | 2.6056 | 0.08 |
| | | | 0.00 | 0.00 | | | No Ice | 2.1614 | 1.4199 | 0.04 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 2.3597 | 1.5903 | 0.06 |
| RRH2X40-AWS | A | From Leg | 4.0000 | 0.00 | 0.0000 | 149.0000 | 1" Ice | 2.5655 | 1.7676 | 0.08 |
| | | | 0.00 | 0.00 | | | No Ice | 2.1614 | 1.4199 | 0.04 |
| | | | 0.00 | 0.00 | | | 1/2" Ice | 2.3597 | 1.5903 | 0.06 |
| RRH2X40-AWS | B | From Leg | 4.0000 | 0.00 | 0.0000 | 149.0000 | No Ice | 2.1614 | 1.4199 | 0.04 |
| | | | 0.00 | 0.00 | | | 1" Ice | 2.5655 | 1.7676 | 0.08 |

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 9 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

| Description | Face or Leg | Offset Type | Offsets: | | Azimuth Adjustment | Placement | C _{AA} Front | C _{AA} Side | Weight |
|-------------------------------------|-------------|-------------|----------|---------|--------------------|-----------|-----------------------|----------------------|--------|
| | | | Horz | Lateral | | | | | |
| | | | 0.00 | | | | | | |
| | | | 1.00 | | | 1/2" Ice | 2.3597 | 1.5903 | 0.06 |
| | | | 1.00 | | | 1" Ice | 2.5655 | 1.7676 | 0.08 |
| RRH2X40-AWS | C | From Leg | 4.0000 | 0.0000 | 149.0000 | No Ice | 2.1614 | 1.4199 | 0.04 |
| | | | 0.00 | | | 1/2" Ice | 2.3597 | 1.5903 | 0.06 |
| | | | 1.00 | | | 1" Ice | 2.5655 | 1.7676 | 0.08 |
| 6' x 2" Horiz. Pipe | A | From Leg | 4.0000 | 0.0000 | 149.0000 | No Ice | 0.5938 | 0.5938 | 0.02 |
| | | | 0.00 | | | 1/2" Ice | 1.1977 | 1.1977 | 0.17 |
| | | | 0.00 | | | 1" Ice | 1.5738 | 1.5738 | 0.32 |
| 6' x 2" Horiz. Pipe | B | From Leg | 4.0000 | 0.0000 | 149.0000 | No Ice | 0.5938 | 0.5938 | 0.02 |
| | | | 0.00 | | | 1/2" Ice | 1.1977 | 1.1977 | 0.17 |
| | | | 0.00 | | | 1" Ice | 1.5738 | 1.5738 | 0.32 |
| 6' x 2" Horiz. Pipe | C | From Leg | 4.0000 | 0.0000 | 149.0000 | No Ice | 0.5938 | 0.5938 | 0.02 |
| | | | 0.00 | | | 1/2" Ice | 1.1977 | 1.1977 | 0.17 |
| | | | 0.00 | | | 1" Ice | 1.5738 | 1.5738 | 0.32 |
| Platform Mount [LP 1201-1] | C | None | | 0.0000 | 149.0000 | No Ice | 23.1000 | 23.1000 | 2.10 |
| | | | | | | 1/2" Ice | 26.8000 | 26.8000 | 2.50 |
| | | | | | | 1" Ice | 30.5000 | 30.5000 | 2.90 |
| Miscellaneous [NA 510-1] | C | None | | 0.0000 | 149.0000 | No Ice | 6.0000 | 6.0000 | 0.26 |
| | | | | | | 1/2" Ice | 8.5000 | 8.5000 | 0.34 |
| | | | | | | 1" Ice | 8.6000 | 8.6000 | 0.34 |
| **134** | | | | | | | | | |
| AM-X-CD-17-65-00T-RET w/ Mount Pipe | A | From Leg | 4.0000 | 0.0000 | 134.0000 | No Ice | 11.5486 | 8.9375 | 0.09 |
| | | | 0.00 | | | 1/2" Ice | 12.2673 | 10.4499 | 0.18 |
| | | | 1.00 | | | 1" Ice | 12.9953 | 11.9863 | 0.27 |
| AM-X-CD-17-65-00T-RET w/ Mount Pipe | B | From Leg | 4.0000 | 0.0000 | 134.0000 | No Ice | 11.5486 | 8.9375 | 0.09 |
| | | | 0.00 | | | 1/2" Ice | 12.2673 | 10.4499 | 0.18 |
| | | | 1.00 | | | 1" Ice | 12.9953 | 11.9863 | 0.27 |
| AM-X-CD-17-65-00T-RET w/ Mount Pipe | C | From Leg | 4.0000 | 0.0000 | 134.0000 | No Ice | 11.5486 | 8.9375 | 0.09 |
| | | | 0.00 | | | 1/2" Ice | 12.2673 | 10.4499 | 0.18 |
| | | | 1.00 | | | 1" Ice | 12.9953 | 11.9863 | 0.27 |
| (2) BSA-185065/10CF w/ Mount Pipe | A | From Leg | 4.0000 | 0.0000 | 134.0000 | No Ice | 4.1491 | 3.1012 | 0.03 |
| | | | 0.00 | | | 1/2" Ice | 4.6143 | 4.1051 | 0.07 |
| | | | 1.00 | | | 1" Ice | 5.0646 | 4.8407 | 0.11 |
| (2) BSA-185065/10CF w/ Mount Pipe | B | From Leg | 4.0000 | 0.0000 | 134.0000 | No Ice | 4.1491 | 3.1012 | 0.03 |
| | | | 0.00 | | | 1/2" Ice | 4.6143 | 4.1051 | 0.07 |
| | | | 1.00 | | | 1" Ice | 5.0646 | 4.8407 | 0.11 |
| (2) BSA-185065/10CF w/ Mount Pipe | C | From Leg | 4.0000 | 0.0000 | 134.0000 | No Ice | 4.1491 | 3.1012 | 0.03 |
| | | | 0.00 | | | 1/2" Ice | 4.6143 | 4.1051 | 0.07 |
| | | | 1.00 | | | 1" Ice | 5.0646 | 4.8407 | 0.11 |
| KRC 115 032/2 | A | From Leg | 4.0000 | 0.0000 | 134.0000 | No Ice | 0.1633 | 0.1176 | 0.00 |
| | | | 0.00 | | | 1/2" Ice | 0.2176 | 0.1664 | 0.00 |
| | | | 1.00 | | | 1" Ice | 0.2793 | 0.2226 | 0.01 |
| KRC 115 032/2 | B | From Leg | 4.0000 | 0.0000 | 134.0000 | No Ice | 0.1633 | 0.1176 | 0.00 |
| | | | 0.00 | | | 1/2" Ice | 0.2176 | 0.1664 | 0.00 |
| | | | 1.00 | | | 1" Ice | 0.2793 | 0.2226 | 0.01 |
| KRC 115 032/2 | C | From Leg | 4.0000 | 0.0000 | 134.0000 | No Ice | 0.1633 | 0.1176 | 0.00 |
| | | | 0.00 | | | 1/2" Ice | 0.2176 | 0.1664 | 0.00 |
| | | | 1.00 | | | 1" Ice | 0.2793 | 0.2226 | 0.01 |
| Platform Mount [LP 403-1] | C | None | | 0.0000 | 134.0000 | No Ice | 18.8500 | 18.8500 | 1.50 |
| | | | | | | 1/2" Ice | 24.3000 | 24.3000 | 1.80 |
| | | | | | | 1" Ice | 29.7500 | 29.7500 | 2.09 |
| **124** | | | | | | | | | |
| *** | | | | | | | | | |

| | | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| <p style="text-align: center;">tnxTower</p> <p>Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501</p> | Job | PORTLAND NORTH | Page | 10 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

Load Combinations

| <i>Comb. No.</i> | <i>Description</i> |
|------------------|--------------------------------------------|
| 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 | 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 Member Forces

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 11 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

| Section No. | Elevation ft | Component Type | Condition | Gov. Load Comb. | Axial K | Major Axis Moment kip-ft | Minor Axis Moment kip-ft |
|-------------|--------------|----------------|------------------|-----------------|---------|--------------------------|--------------------------|
| L1 | 178 - 140 | Pole | Max Tension | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Compression | 26 | -48.20 | -0.12 | -5.81 |
| | | | Max. Mx | 20 | -16.59 | 501.04 | 2.27 |
| | | | Max. My | 14 | -16.61 | -2.50 | -496.41 |
| | | | Max. Vy | 20 | -22.44 | 501.04 | 2.27 |
| | | | Max. Vx | 14 | 22.26 | -2.50 | -496.41 |
| | | | Max. Torque | 8 | | | -3.27 |
| L2 | 140 - 100 | Pole | Max Tension | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Compression | 26 | -72.02 | 0.05 | -7.66 |
| | | | Max. Mx | 20 | -30.78 | 1613.52 | 6.61 |
| | | | Max. My | 14 | -30.80 | -7.03 | -1601.56 |
| | | | Max. Vy | 20 | -30.27 | 1613.52 | 6.61 |
| | | | Max. Vx | 14 | 30.09 | -7.03 | -1601.56 |
| | | | Max. Torque | 8 | | | -3.27 |
| L3 | 100 - 60 | Pole | Max Tension | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Compression | 26 | -96.35 | 0.30 | -9.60 |
| | | | Max. Mx | 20 | -48.99 | 2927.28 | 10.85 |
| | | | Max. My | 14 | -49.00 | -11.43 | -2908.02 |
| | | | Max. Vy | 20 | -35.21 | 2927.28 | 10.85 |
| | | | Max. Vx | 14 | 35.02 | -11.43 | -2908.02 |
| | | | Max. Torque | 8 | | | -3.26 |
| L4 | 60 - 20 | Pole | Max Tension | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Compression | 26 | -122.72 | 0.60 | -11.33 |
| | | | Max. Mx | 20 | -69.38 | 4422.25 | 14.98 |
| | | | Max. My | 14 | -69.38 | -15.71 | -4395.81 |
| | | | Max. Vy | 20 | -39.24 | 4422.25 | 14.98 |
| | | | Max. Vx | 14 | 39.06 | -15.71 | -4395.81 |
| | | | Max. Torque | 8 | | | -3.26 |
| L5 | 20 - 0 | Pole | Max Tension | 1 | 0.00 | 0.00 | 0.00 |
| | | | Max. Compression | 26 | -136.58 | 0.68 | -12.02 |
| | | | Max. Mx | 20 | -80.56 | 5222.43 | 17.02 |
| | | | Max. My | 14 | -80.56 | -17.82 | -5192.50 |
| | | | Max. Vy | 20 | -40.76 | 5222.43 | 17.02 |
| | | | Max. Vx | 14 | 40.58 | -17.82 | -5192.50 |
| | | | Max. Torque | 8 | | | -3.26 |

Maximum Reactions

| Location | Condition | Gov. Load Comb. | Vertical K | Horizontal, X K | Horizontal, Z K |
|----------|---------------------|-----------------|------------|-----------------|-----------------|
| Pole | Max. Vert | 26 | 136.58 | 0.00 | -0.00 |
| | Max. H _x | 21 | 60.43 | 40.74 | 0.12 |
| | Max. H _z | 2 | 80.57 | 0.12 | 40.56 |
| | Max. M _x | 2 | 5184.79 | 0.12 | 40.56 |
| | Max. M _z | 8 | 5216.37 | -40.74 | -0.12 |
| | Max. Torsion | 20 | 3.23 | 40.74 | 0.12 |
| | Min. Vert | 5 | 60.43 | -20.27 | 35.07 |
| | Min. H _x | 9 | 60.43 | -40.74 | -0.12 |
| | Min. H _z | 14 | 80.57 | -0.12 | -40.56 |
| | Min. M _x | 14 | -5192.50 | -0.12 | -40.56 |
| | Min. M _z | 20 | -5222.43 | 40.74 | 0.12 |
| | Min. Torsion | 8 | -3.25 | -40.74 | -0.12 |

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 12 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

Tower Mast Reaction Summary

| Load Combination | Vertical | Shear _x | Shear _z | Overturing Moment, M _x | Overturing Moment, M _z | Torque |
|-------------------------------------------|----------|--------------------|--------------------|-----------------------------------|-----------------------------------|--------|
| | K | K | K | kip-ft | kip-ft | kip-ft |
| Dead Only | 67.14 | 0.00 | 0.00 | 3.08 | 2.42 | 0.00 |
| 1.2 Dead+1.6 Wind 0 deg - No Ice | 80.57 | -0.12 | -40.56 | -5184.79 | 23.90 | -0.30 |
| 0.9 Dead+1.6 Wind 0 deg - No Ice | 60.43 | -0.12 | -40.56 | -5132.85 | 22.86 | -0.27 |
| 1.2 Dead+1.6 Wind 30 deg - No Ice | 80.57 | 20.27 | -35.07 | -4479.26 | -2588.64 | 1.37 |
| 0.9 Dead+1.6 Wind 30 deg - No Ice | 60.43 | 20.27 | -35.07 | -4434.52 | -2562.98 | 1.39 |
| 1.2 Dead+1.6 Wind 60 deg - No Ice | 80.57 | 35.22 | -20.18 | -2572.42 | -4506.71 | 2.68 |
| 0.9 Dead+1.6 Wind 60 deg - No Ice | 60.43 | 35.22 | -20.18 | -2547.16 | -4461.45 | 2.68 |
| 1.2 Dead+1.6 Wind 90 deg - No Ice | 80.57 | 40.74 | 0.12 | 24.70 | -5216.37 | 3.25 |
| 0.9 Dead+1.6 Wind 90 deg - No Ice | 60.43 | 40.74 | 0.12 | 23.45 | -5163.83 | 3.24 |
| 1.2 Dead+1.6 Wind 120 deg - No Ice | 80.57 | 35.34 | 20.38 | 2616.19 | -4527.51 | 2.95 |
| 0.9 Dead+1.6 Wind 120 deg - No Ice | 60.43 | 35.34 | 20.38 | 2588.50 | -4482.00 | 2.93 |
| 1.2 Dead+1.6 Wind 150 deg - No Ice | 80.57 | 20.47 | 35.19 | 4507.75 | -2624.74 | 1.86 |
| 0.9 Dead+1.6 Wind 150 deg - No Ice | 60.43 | 20.47 | 35.19 | 4460.75 | -2598.66 | 1.83 |
| 1.2 Dead+1.6 Wind 180 deg - No Ice | 80.57 | 0.12 | 40.56 | 5192.50 | -17.82 | 0.28 |
| 0.9 Dead+1.6 Wind 180 deg - No Ice | 60.43 | 0.12 | 40.56 | 5138.54 | -18.37 | 0.25 |
| 1.2 Dead+1.6 Wind 210 deg - No Ice | 80.57 | -20.27 | 35.07 | 4486.95 | 2594.72 | -1.37 |
| 0.9 Dead+1.6 Wind 210 deg - No Ice | 60.43 | -20.27 | 35.07 | 4440.20 | 2567.48 | -1.39 |
| 1.2 Dead+1.6 Wind 240 deg - No Ice | 80.57 | -35.22 | 20.18 | 2580.10 | 4512.79 | -2.66 |
| 0.9 Dead+1.6 Wind 240 deg - No Ice | 60.43 | -35.22 | 20.18 | 2552.83 | 4465.94 | -2.66 |
| 1.2 Dead+1.6 Wind 270 deg - No Ice | 80.57 | -40.74 | -0.12 | -17.02 | 5222.43 | -3.23 |
| 0.9 Dead+1.6 Wind 270 deg - No Ice | 60.43 | -40.74 | -0.12 | -17.78 | 5168.31 | -3.22 |
| 1.2 Dead+1.6 Wind 300 deg - No Ice | 80.57 | -35.34 | -20.38 | -2608.51 | 4533.57 | -2.95 |
| 0.9 Dead+1.6 Wind 300 deg - No Ice | 60.43 | -35.34 | -20.38 | -2582.82 | 4486.48 | -2.93 |
| 1.2 Dead+1.6 Wind 330 deg - No Ice | 80.57 | -20.47 | -35.19 | -4500.04 | 2630.80 | -1.88 |
| 0.9 Dead+1.6 Wind 330 deg - No Ice | 60.43 | -20.47 | -35.19 | -4455.06 | 2603.14 | -1.85 |
| 1.2 Dead+1.0 Ice+1.0 Temp | 136.58 | -0.00 | 0.00 | 12.02 | 0.68 | 0.00 |
| 1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp | 136.58 | -0.01 | -8.04 | -1043.89 | 2.99 | -0.19 |
| 1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp | 136.58 | 4.01 | -6.95 | -901.23 | -526.58 | 0.12 |
| 1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp | 136.58 | 6.96 | -4.01 | -513.76 | -914.88 | 0.40 |
| 1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp | 136.58 | 8.05 | 0.01 | 14.69 | -1057.84 | 0.57 |

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 13 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

| 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 120 deg+1.0 Ice+1.0 Temp | 136.58 | 6.98 | 4.03 | 542.52 | -917.17 | 0.59 |
| 1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp | 136.58 | 4.03 | 6.97 | 928.31 | -530.56 | 0.45 |
| 1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp | 136.58 | 0.01 | 8.04 | 1068.67 | -1.60 | 0.19 |
| 1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp | 136.58 | -4.01 | 6.95 | 926.01 | 527.98 | -0.12 |
| 1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp | 136.58 | -6.96 | 4.01 | 538.55 | 916.28 | -0.40 |
| 1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp | 136.58 | -8.05 | -0.01 | 10.10 | 1059.24 | -0.57 |
| 1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp | 136.58 | -6.98 | -4.03 | -517.74 | 918.57 | -0.59 |
| 1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp | 136.58 | -4.03 | -6.97 | -903.52 | 531.96 | -0.45 |
| Dead+Wind 0 deg - Service | 67.14 | -0.02 | -8.17 | -1035.12 | 6.68 | -0.05 |
| Dead+Wind 30 deg - Service | 67.14 | 4.08 | -7.06 | -893.93 | -516.11 | 0.28 |
| Dead+Wind 60 deg - Service | 67.14 | 7.09 | -4.06 | -512.35 | -899.94 | 0.54 |
| Dead+Wind 90 deg - Service | 67.14 | 8.20 | 0.02 | 7.36 | -1041.96 | 0.66 |
| Dead+Wind 120 deg - Service | 67.14 | 7.11 | 4.10 | 525.96 | -904.11 | 0.60 |
| Dead+Wind 150 deg - Service | 67.14 | 4.12 | 7.08 | 904.48 | -523.34 | 0.37 |
| Dead+Wind 180 deg - Service | 67.14 | 0.02 | 8.17 | 1041.50 | -1.66 | 0.05 |
| Dead+Wind 210 deg - Service | 67.14 | -4.08 | 7.06 | 900.31 | 521.13 | -0.28 |
| Dead+Wind 240 deg - Service | 67.14 | -7.09 | 4.06 | 518.73 | 904.96 | -0.54 |
| Dead+Wind 270 deg - Service | 67.14 | -8.20 | -0.02 | -0.98 | 1046.98 | -0.66 |
| Dead+Wind 300 deg - Service | 67.14 | -7.11 | -4.10 | -519.58 | 909.13 | -0.60 |
| Dead+Wind 330 deg - Service | 67.14 | -4.12 | -7.08 | -898.10 | 528.36 | -0.38 |

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 | 0.00 | -67.14 | 0.00 | 0.00 | 67.14 | 0.00 | 0.000% |
| 2 | -0.12 | -80.57 | -40.56 | 0.12 | 80.57 | 40.56 | 0.000% |
| 3 | -0.12 | -60.43 | -40.56 | 0.12 | 60.43 | 40.56 | 0.000% |
| 4 | 20.27 | -80.57 | -35.07 | -20.27 | 80.57 | 35.07 | 0.000% |
| 5 | 20.27 | -60.43 | -35.07 | -20.27 | 60.43 | 35.07 | 0.000% |
| 6 | 35.22 | -80.57 | -20.18 | -35.22 | 80.57 | 20.18 | 0.000% |
| 7 | 35.22 | -60.43 | -20.18 | -35.22 | 60.43 | 20.18 | 0.000% |
| 8 | 40.74 | -80.57 | 0.12 | -40.74 | 80.57 | -0.12 | 0.000% |
| 9 | 40.74 | -60.43 | 0.12 | -40.74 | 60.43 | -0.12 | 0.000% |
| 10 | 35.34 | -80.57 | 20.38 | -35.34 | 80.57 | -20.38 | 0.000% |
| 11 | 35.34 | -60.43 | 20.38 | -35.34 | 60.43 | -20.38 | 0.000% |
| 12 | 20.47 | -80.57 | 35.19 | -20.47 | 80.57 | -35.19 | 0.000% |
| 13 | 20.47 | -60.43 | 35.19 | -20.47 | 60.43 | -35.19 | 0.000% |
| 14 | 0.12 | -80.57 | 40.56 | -0.12 | 80.57 | -40.56 | 0.000% |
| 15 | 0.12 | -60.43 | 40.56 | -0.12 | 60.43 | -40.56 | 0.000% |
| 16 | -20.27 | -80.57 | 35.07 | 20.27 | 80.57 | -35.07 | 0.000% |
| 17 | -20.27 | -60.43 | 35.07 | 20.27 | 60.43 | -35.07 | 0.000% |
| 18 | -35.22 | -80.57 | 20.18 | 35.22 | 80.57 | -20.18 | 0.000% |
| 19 | -35.22 | -60.43 | 20.18 | 35.22 | 60.43 | -20.18 | 0.000% |
| 20 | -40.74 | -80.57 | -0.12 | 40.74 | 80.57 | 0.12 | 0.000% |
| 21 | -40.74 | -60.43 | -0.12 | 40.74 | 60.43 | 0.12 | 0.000% |
| 22 | -35.34 | -80.57 | -20.38 | 35.34 | 80.57 | 20.38 | 0.000% |
| 23 | -35.34 | -60.43 | -20.38 | 35.34 | 60.43 | 20.38 | 0.000% |
| 24 | -20.47 | -80.57 | -35.19 | 20.47 | 80.57 | 35.19 | 0.000% |

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 14 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

| Load Comb. | Sum of Applied Forces | | | Sum of Reactions | | | % Error |
|------------|-----------------------|---------|--------|------------------|--------|-------|---------|
| | PX K | PY K | PZ K | PX K | PY K | PZ K | |
| 25 | -20.47 | -60.43 | -35.19 | 20.47 | 60.43 | 35.19 | 0.000% |
| 26 | 0.00 | -136.58 | 0.00 | 0.00 | 136.58 | -0.00 | 0.000% |
| 27 | -0.01 | -136.58 | -8.04 | 0.01 | 136.58 | 8.04 | 0.000% |
| 28 | 4.01 | -136.58 | -6.95 | -4.01 | 136.58 | 6.95 | 0.000% |
| 29 | 6.96 | -136.58 | -4.01 | -6.96 | 136.58 | 4.01 | 0.000% |
| 30 | 8.05 | -136.58 | 0.01 | -8.05 | 136.58 | -0.01 | 0.000% |
| 31 | 6.97 | -136.58 | 4.03 | -6.98 | 136.58 | -4.03 | 0.000% |
| 32 | 4.03 | -136.58 | 6.96 | -4.03 | 136.58 | -6.97 | 0.000% |
| 33 | 0.01 | -136.58 | 8.04 | -0.01 | 136.58 | -8.04 | 0.000% |
| 34 | -4.01 | -136.58 | 6.95 | 4.01 | 136.58 | -6.95 | 0.000% |
| 35 | -6.96 | -136.58 | 4.01 | 6.96 | 136.58 | -4.01 | 0.000% |
| 36 | -8.05 | -136.58 | -0.01 | 8.05 | 136.58 | 0.01 | 0.000% |
| 37 | -6.97 | -136.58 | -4.03 | 6.98 | 136.58 | 4.03 | 0.000% |
| 38 | -4.03 | -136.58 | -6.96 | 4.03 | 136.58 | 6.97 | 0.000% |
| 39 | -0.02 | -67.14 | -8.17 | 0.02 | 67.14 | 8.17 | 0.000% |
| 40 | 4.08 | -67.14 | -7.06 | -4.08 | 67.14 | 7.06 | 0.000% |
| 41 | 7.09 | -67.14 | -4.06 | -7.09 | 67.14 | 4.06 | 0.000% |
| 42 | 8.20 | -67.14 | 0.02 | -8.20 | 67.14 | -0.02 | 0.000% |
| 43 | 7.11 | -67.14 | 4.10 | -7.11 | 67.14 | -4.10 | 0.000% |
| 44 | 4.12 | -67.14 | 7.08 | -4.12 | 67.14 | -7.08 | 0.000% |
| 45 | 0.02 | -67.14 | 8.17 | -0.02 | 67.14 | -8.17 | 0.000% |
| 46 | -4.08 | -67.14 | 7.06 | 4.08 | 67.14 | -7.06 | 0.000% |
| 47 | -7.09 | -67.14 | 4.06 | 7.09 | 67.14 | -4.06 | 0.000% |
| 48 | -8.20 | -67.14 | -0.02 | 8.20 | 67.14 | 0.02 | 0.000% |
| 49 | -7.11 | -67.14 | -4.10 | 7.11 | 67.14 | 4.10 | 0.000% |
| 50 | -4.12 | -67.14 | -7.08 | 4.12 | 67.14 | 7.08 | 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 | 0.00042523 |
| 3 | Yes | 4 | 0.0000001 | 0.00023008 |
| 4 | Yes | 5 | 0.0000001 | 0.00060006 |
| 5 | Yes | 5 | 0.0000001 | 0.00028325 |
| 6 | Yes | 5 | 0.0000001 | 0.00056897 |
| 7 | Yes | 5 | 0.0000001 | 0.00026725 |
| 8 | Yes | 5 | 0.0000001 | 0.00006230 |
| 9 | Yes | 4 | 0.0000001 | 0.00086306 |
| 10 | Yes | 5 | 0.0000001 | 0.00063438 |
| 11 | Yes | 5 | 0.0000001 | 0.00029857 |
| 12 | Yes | 5 | 0.0000001 | 0.00059066 |
| 13 | Yes | 5 | 0.0000001 | 0.00027691 |
| 14 | Yes | 4 | 0.0000001 | 0.00031686 |
| 15 | Yes | 4 | 0.0000001 | 0.00014650 |
| 16 | Yes | 5 | 0.0000001 | 0.00058290 |
| 17 | Yes | 5 | 0.0000001 | 0.00027355 |
| 18 | Yes | 5 | 0.0000001 | 0.00061899 |
| 19 | Yes | 5 | 0.0000001 | 0.00029175 |
| 20 | Yes | 5 | 0.0000001 | 0.00004934 |
| 21 | Yes | 4 | 0.0000001 | 0.00068375 |
| 22 | Yes | 5 | 0.0000001 | 0.00058340 |
| 23 | Yes | 5 | 0.0000001 | 0.00027315 |
| 24 | Yes | 5 | 0.0000001 | 0.00062216 |
| 25 | Yes | 5 | 0.0000001 | 0.00029264 |

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 15 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

| | | | | |
|----|-----|---|------------|------------|
| 26 | Yes | 4 | 0.00000001 | 0.00006530 |
| 27 | Yes | 5 | 0.00000001 | 0.00042093 |
| 28 | Yes | 5 | 0.00000001 | 0.00044750 |
| 29 | Yes | 5 | 0.00000001 | 0.00044968 |
| 30 | Yes | 5 | 0.00000001 | 0.00043094 |
| 31 | Yes | 5 | 0.00000001 | 0.00046593 |
| 32 | Yes | 5 | 0.00000001 | 0.00046596 |
| 33 | Yes | 5 | 0.00000001 | 0.00043818 |
| 34 | Yes | 5 | 0.00000001 | 0.00046418 |
| 35 | Yes | 5 | 0.00000001 | 0.00046344 |
| 36 | Yes | 5 | 0.00000001 | 0.00043137 |
| 37 | Yes | 5 | 0.00000001 | 0.00045255 |
| 38 | Yes | 5 | 0.00000001 | 0.00045101 |
| 39 | Yes | 4 | 0.00000001 | 0.00004540 |
| 40 | Yes | 4 | 0.00000001 | 0.00014005 |
| 41 | Yes | 4 | 0.00000001 | 0.00012091 |
| 42 | Yes | 4 | 0.00000001 | 0.00006720 |
| 43 | Yes | 4 | 0.00000001 | 0.00016030 |
| 44 | Yes | 4 | 0.00000001 | 0.00012839 |
| 45 | Yes | 4 | 0.00000001 | 0.00004552 |
| 46 | Yes | 4 | 0.00000001 | 0.00012905 |
| 47 | Yes | 4 | 0.00000001 | 0.00015599 |
| 48 | Yes | 4 | 0.00000001 | 0.00006595 |
| 49 | Yes | 4 | 0.00000001 | 0.00012542 |
| 50 | Yes | 4 | 0.00000001 | 0.00014996 |

Maximum Tower Deflections - Service Wind

| Section No. | Elevation ft | Horz. Deflection in | Gov. Load Comb. | Tilt ° | Twist ° |
|-------------|-----------------|---------------------------|-----------------------|-----------|------------|
| L1 | 178 - 140 | 18.789 | 48 | 0.9542 | 0.0043 |
| L2 | 140 - 100 | 11.548 | 48 | 0.7963 | 0.0018 |
| L3 | 100 - 60 | 5.800 | 49 | 0.5274 | 0.0007 |
| L4 | 60 - 20 | 2.127 | 49 | 0.3306 | 0.0004 |
| L5 | 20 - 0 | 0.230 | 49 | 0.1070 | 0.0001 |

Critical Deflections and Radius of Curvature - Service Wind

| Elevation ft | Appurtenance | Gov. Load Comb. | Deflection in | Tilt ° | Twist ° | Radius of Curvature ft |
|-----------------|----------------------------------------|-----------------------|------------------|-----------|------------|------------------------------|
| 179.0000 | Top Hat 2' 3" x 31.83" | 48 | 18.789 | 0.9542 | 0.0044 | 156373 |
| 178.0000 | Lighting Rod 5/8" x 8' | 48 | 18.789 | 0.9542 | 0.0044 | 156373 |
| 168.0000 | APX16DWV-16DWV-S-E-A20 w/Mount Pipe | 48 | 16.798 | 0.9202 | 0.0036 | 31274 |
| 160.0000 | HPA-65R-BUU-H6 w/ Mount Pipe | 48 | 15.230 | 0.8907 | 0.0030 | 17374 |
| 149.0000 | (2) LNX-6514DS-VTM w/ Mount Pipe | 48 | 13.151 | 0.8435 | 0.0023 | 10784 |
| 134.0000 | AM-X-CD-17-65-00T-RET w/ Mount Pipe | 48 | 10.542 | 0.7595 | 0.0015 | 8331 |

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 16 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

Maximum Tower Deflections - Design Wind

| Section No. | Elevation ft | Horz. Deflection in | Gov. Load Comb. | Tilt ° | Twist ° |
|-------------|-----------------|------------------------|-----------------|-----------|------------|
| L1 | 178 - 140 | 93.779 | 22 | 4.7551 | 0.0212 |
| L2 | 140 - 100 | 57.700 | 22 | 3.9803 | 0.0089 |
| L3 | 100 - 60 | 28.992 | 22 | 2.6372 | 0.0036 |
| L4 | 60 - 20 | 10.630 | 22 | 1.6527 | 0.0017 |
| L5 | 20 - 0 | 1.151 | 22 | 0.5346 | 0.0005 |

Critical Deflections and Radius of Curvature - Design Wind

| Elevation ft | Appurtenance | Gov. Load Comb. | Deflection in | Tilt ° | Twist ° | Radius of Curvature ft |
|-----------------|-------------------------------------|-----------------|------------------|-----------|------------|---------------------------|
| 179.0000 | Top Hat 2' 3" x 31.83" | 22 | 93.779 | 4.7551 | 0.0218 | 31999 |
| 178.0000 | Lighting Rod 5/8" x 8' | 22 | 93.779 | 4.7551 | 0.0218 | 31999 |
| 168.0000 | APX16DWV-16DWV-S-E-A20 w/Mount Pipe | 22 | 83.861 | 4.5898 | 0.0180 | 6399 |
| 160.0000 | HPA-65R-BUU-H6 w/ Mount Pipe | 22 | 76.053 | 4.4460 | 0.0151 | 3553 |
| 149.0000 | (2) LNX-6514DS-VTM w/ Mount Pipe | 22 | 65.693 | 4.2141 | 0.0115 | 2203 |
| 134.0000 | AM-X-CD-17-65-00T-RET w/ Mount Pipe | 22 | 52.679 | 3.7975 | 0.0077 | 1697 |

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 | 178 - 176.1 | P24x1/2 | 38.0000 | 0.0000 | 0.0 | 36.9137 | -3.52 | 1162.78 | 0.003 |
| | 176.1 - 174.2 | | | | | 36.9137 | -3.86 | 1162.78 | 0.003 |
| | 174.2 - 172.3 | | | | | 36.9137 | -4.21 | 1162.78 | 0.004 |
| | 172.3 - 170.4 | | | | | 36.9137 | -4.55 | 1162.78 | 0.004 |
| | 170.4 - 168.5 | | | | | 36.9137 | -4.89 | 1162.78 | 0.004 |
| | 168.5 - 166.6 | | | | | 36.9137 | -6.76 | 1162.78 | 0.006 |
| | 166.6 - 164.7 | | | | | 36.9137 | -7.09 | 1162.78 | 0.006 |
| | 164.7 - 162.8 | | | | | 36.9137 | -7.44 | 1162.78 | 0.006 |
| | 162.8 - 160.9 | | | | | 36.9137 | -7.78 | 1162.78 | 0.007 |
| | 160.9 - 159 | | | | | 36.9137 | -9.65 | 1162.78 | 0.008 |
| | 159 - 157.1 | | | | | 36.9137 | -10.00 | 1162.78 | 0.009 |
| | 157.1 - 155.2 | | | | | 36.9137 | -10.35 | 1162.78 | 0.009 |
| | 155.2 - 153.3 | | | | | 36.9137 | -10.70 | 1162.78 | 0.009 |
| | 153.3 - 151.4 | | | | | 36.9137 | -11.06 | 1162.78 | 0.010 |
| | 151.4 - 149.5 | | | | | 36.9137 | -11.41 | 1162.78 | 0.010 |
| | 149.5 - 147.6 | | | | | 36.9137 | -15.08 | 1162.78 | 0.013 |
| | 147.6 - 145.7 | | | | | 36.9137 | -15.45 | 1162.78 | 0.013 |
| | 145.7 - 143.8 | | | | | 36.9137 | -15.82 | 1162.78 | 0.014 |
| | 143.8 - 141.9 | | | | | 36.9137 | -16.20 | 1162.78 | 0.014 |

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 17 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

| Section No. | Elevation ft | Size | L ft | L _u ft | Kl/r | A in ² | P _u K | φP _n K | Ratio P _u / φP _n |
|-------------|-----------------|-----------------------------------|---------|----------------------|------|----------------------|---------------------|----------------------|----------------------------------------------|
| L2 | 141.9 - 140 | P36x1/2 4.8.2 (1.04 CR) - 2/19 | 40.0000 | 0.0000 | 0.0 | 36.9137 | -16.58 | 1162.78 | 0.014 |
| | 140 - 138 | | | | | 55.7633 | -17.18 | 1756.54 | 0.010 |
| | 138 - 136 | | | | | 55.7633 | -17.76 | 1756.54 | 0.010 |
| | 136 - 134 | | | | | 55.7633 | -18.35 | 1756.54 | 0.010 |
| | 134 - 132 | | | | | 55.7633 | -21.04 | 1756.54 | 0.012 |
| | 132 - 130 | | | | | 55.7633 | -21.63 | 1756.54 | 0.012 |
| | 130 - 128 | | | | | 55.7633 | -22.22 | 1756.54 | 0.013 |
| | 128 - 126 | | | | | 55.7633 | -22.82 | 1756.54 | 0.013 |
| | 126 - 124 | | | | | 55.7633 | -23.42 | 1756.54 | 0.013 |
| | 124 - 122 | | | | | 55.7633 | -24.02 | 1756.54 | 0.014 |
| | 122 - 120 | | | | | 55.7633 | -24.62 | 1756.54 | 0.014 |
| | 120 - 118 | | | | | 55.7633 | -25.22 | 1756.54 | 0.014 |
| | 118 - 116 | | | | | 55.7633 | -25.83 | 1756.54 | 0.015 |
| | 116 - 114 | | | | | 55.7633 | -26.44 | 1756.54 | 0.015 |
| | 114 - 112 | | | | | 55.7633 | -27.05 | 1756.54 | 0.015 |
| | 112 - 110 | | | | | 55.7633 | -27.67 | 1756.54 | 0.016 |
| | 110 - 108 | | | | | 55.7633 | -28.28 | 1756.54 | 0.016 |
| | 108 - 106 | | | | | 55.7633 | -28.90 | 1756.54 | 0.016 |
| | 106 - 104 | | | | | 55.7633 | -29.53 | 1756.54 | 0.017 |
| | 104 - 102 | | | | | 55.7633 | -30.15 | 1756.54 | 0.017 |
| 102 - 100 | 55.7633 | -30.78 | 1756.54 | 0.018 | | | | | |
| L3 | 100 - 98 | P48x5/8 | 40.0000 | 0.0000 | 0.0 | 93.0206 | -31.70 | 2930.15 | 0.011 |
| | 98 - 96 | | | | | 93.0206 | -32.59 | 2930.15 | 0.011 |
| | 96 - 94 | | | | | 93.0206 | -33.49 | 2930.15 | 0.011 |
| | 94 - 92 | | | | | 93.0206 | -34.40 | 2930.15 | 0.012 |
| | 92 - 90 | | | | | 93.0206 | -35.30 | 2930.15 | 0.012 |
| | 90 - 88 | | | | | 93.0206 | -36.20 | 2930.15 | 0.012 |
| | 88 - 86 | | | | | 93.0206 | -37.11 | 2930.15 | 0.013 |
| | 86 - 84 | | | | | 93.0206 | -38.01 | 2930.15 | 0.013 |
| | 84 - 82 | | | | | 93.0206 | -38.92 | 2930.15 | 0.013 |
| | 82 - 80 | | | | | 93.0206 | -39.83 | 2930.15 | 0.014 |
| | 80 - 78 | | | | | 93.0206 | -40.74 | 2930.15 | 0.014 |
| | 78 - 76 | | | | | 93.0206 | -41.65 | 2930.15 | 0.014 |
| | 76 - 74 | | | | | 93.0206 | -42.56 | 2930.15 | 0.015 |
| | 74 - 72 | | | | | 93.0206 | -43.48 | 2930.15 | 0.015 |
| | 72 - 70 | | | | | 93.0206 | -44.39 | 2930.15 | 0.015 |
| | 70 - 68 | | | | | 93.0206 | -45.31 | 2930.15 | 0.015 |
| | 68 - 66 | | | | | 93.0206 | -46.23 | 2930.15 | 0.016 |
| 66 - 64 | 93.0206 | -47.14 | 2930.15 | 0.016 | | | | | |
| 64 - 62 | 93.0206 | -48.07 | 2930.15 | 0.016 | | | | | |

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 18 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

| Section No. | Elevation ft | Size | L ft | L _u ft | Kl/r | A in ² | P _u K | φP _n K | Ratio $\frac{P_u}{\phi P_n}$ |
|-------------|-----------------|------------------------|---------|----------------------|------|----------------------|---------------------|----------------------|---------------------------------|
| L4 | 62 - 60 | P54x5/8 | 40.0000 | 0.0000 | 0.0 | 93.0206 | -48.99 | 2930.15 | 0.017 |
| | 60 - 58 | | | | | 104.802 0 | -50.00 | 3301.25 | 0.015 |
| | 58 - 56 | 4.8.2 (1.04 CR) - 4/19 | | | | 104.802 0 | -51.01 | 3301.25 | 0.015 |
| | 56 - 54 | 4.8.2 (1.04 CR) - 4/18 | | | | 104.802 0 | -52.02 | 3301.25 | 0.016 |
| | 54 - 52 | 4.8.2 (1.04 CR) - 4/17 | | | | 104.802 0 | -53.03 | 3301.25 | 0.016 |
| | 52 - 50 | 4.8.2 (1.04 CR) - 4/16 | | | | 104.802 0 | -54.04 | 3301.25 | 0.016 |
| | 50 - 48 | 4.8.2 (1.04 CR) - 4/15 | | | | 104.802 0 | -55.06 | 3301.25 | 0.017 |
| | 48 - 46 | 4.8.2 (1.04 CR) - 4/14 | | | | 104.802 0 | -56.07 | 3301.25 | 0.017 |
| | 46 - 44 | 4.8.2 (1.04 CR) - 4/13 | | | | 104.802 0 | -57.09 | 3301.25 | 0.017 |
| | 44 - 42 | 4.8.2 (1.04 CR) - 4/12 | | | | 104.802 0 | -58.11 | 3301.25 | 0.018 |
| | 42 - 40 | 4.8.2 (1.04 CR) - 4/11 | | | | 104.802 0 | -59.12 | 3301.25 | 0.018 |
| | 40 - 38 | 4.8.2 (1.04 CR) - 4/10 | | | | 104.802 0 | -60.14 | 3301.25 | 0.018 |
| | 38 - 36 | 4.8.2 (1.04 CR) - 4/9 | | | | 104.802 0 | -61.16 | 3301.25 | 0.019 |
| | 36 - 34 | 4.8.2 (1.04 CR) - 4/8 | | | | 104.802 0 | -62.19 | 3301.25 | 0.019 |
| | 34 - 32 | 4.8.2 (1.04 CR) - 4/7 | | | | 104.802 0 | -63.21 | 3301.25 | 0.019 |
| | 32 - 30 | 4.8.2 (1.04 CR) - 4/6 | | | | 104.802 0 | -64.23 | 3301.25 | 0.019 |
| | 30 - 28 | 4.8.2 (1.04 CR) - 4/5 | | | | 104.802 0 | -65.26 | 3301.25 | 0.020 |
| | 28 - 26 | 4.8.2 (1.04 CR) - 4/4 | | | | 104.802 0 | -66.29 | 3301.25 | 0.020 |
| | 26 - 24 | 4.8.2 (1.04 CR) - 4/3 | | | | 104.802 0 | -67.32 | 3301.25 | 0.020 |
| | 24 - 22 | 4.8.2 (1.04 CR) - 4/2 | | | | 104.802 0 | -68.35 | 3301.25 | 0.021 |
| | 22 - 20 | 4.8.2 (1.04 CR) - 4 | | | | 104.802 0 | -69.38 | 3301.25 | 0.021 |

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 19 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

| Section No. | Elevation ft | Size | L ft | L _u ft | Kl/r | A in ² | P _u K | φP _n K | Ratio $\frac{P_u}{\phi P_n}$ |
|-------------|-----------------|--------------------------------|---------|----------------------|------|----------------------|---------------------|----------------------|---------------------------------|
| L5 | 20 - 19 | 4.8.2 (1.04 CR) - 4 P60x5/8 | 20.0000 | 0.0000 | 0.0 | 116.583 0 | -69.95 | 3649.51 | 0.019 |
| | 19 - 18 | 4.8.2 (1.01 CR) - 5/19 | | | | 116.583 0 | -70.50 | 3649.51 | 0.019 |
| | 18 - 17 | 4.8.2 (1.01 CR) - 5/18 | | | | 116.583 0 | -71.06 | 3649.51 | 0.019 |
| | 17 - 16 | 4.8.2 (1.01 CR) - 5/17 | | | | 116.583 0 | -71.62 | 3649.51 | 0.020 |
| | 16 - 15 | 4.8.2 (1.01 CR) - 5/16 | | | | 116.583 0 | -72.18 | 3649.51 | 0.020 |
| | 15 - 14 | 4.8.2 (1.01 CR) - 5/15 | | | | 116.583 0 | -72.73 | 3649.51 | 0.020 |
| | 14 - 13 | 4.8.2 (1.01 CR) - 5/14 | | | | 116.583 0 | -73.29 | 3649.51 | 0.020 |
| | 13 - 12 | 4.8.2 (1.01 CR) - 5/13 | | | | 116.583 0 | -73.85 | 3649.51 | 0.020 |
| | 12 - 11 | 4.8.2 (1.01 CR) - 5/12 | | | | 116.583 0 | -74.41 | 3649.51 | 0.020 |
| | 11 - 10 | 4.8.2 (1.01 CR) - 5/11 | | | | 116.583 0 | -74.97 | 3649.51 | 0.021 |
| | 10 - 9 | 4.8.2 (1.01 CR) - 5/10 | | | | 116.583 0 | -75.52 | 3649.51 | 0.021 |
| | 9 - 8 | 4.8.2 (1.01 CR) - 5/9 | | | | 116.583 0 | -76.08 | 3649.51 | 0.021 |
| | 8 - 7 | 4.8.2 (1.01 CR) - 5/8 | | | | 116.583 0 | -76.64 | 3649.51 | 0.021 |
| | 7 - 6 | 4.8.2 (1.01 CR) - 5/7 | | | | 116.583 0 | -77.20 | 3649.51 | 0.021 |
| | 6 - 5 | 4.8.2 (1.01 CR) - 5/6 | | | | 116.583 0 | -77.76 | 3649.51 | 0.021 |
| | 5 - 4 | 4.8.2 (1.01 CR) - 5/5 | | | | 116.583 0 | -78.32 | 3649.51 | 0.021 |
| | 4 - 3 | 4.8.2 (1.01 CR) - 5/4 | | | | 116.583 0 | -78.88 | 3649.51 | 0.022 |
| | 3 - 2 | 4.8.2 (1.01 CR) - 5/3 | | | | 116.583 0 | -79.44 | 3649.51 | 0.022 |
| | 2 - 1 | 4.8.2 (1.01 CR) - 5/2 | | | | 116.583 0 | -80.00 | 3649.51 | 0.022 |
| | 1 - 0 | 4.8.2 (1.01 CR) - 5 | | | | 116.583 0 | -80.56 | 3649.51 | 0.022 |

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 20 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

| Section No. | Elevation ft | Size | L ft | L _u ft | Kl/r | A in ² | P _u K | φP _n K | Ratio $\frac{P_u}{\phi P_n}$ |
|---------------------|-----------------|------|---------|----------------------|------|----------------------|---------------------|----------------------|---------------------------------|
| 4.8.2 (1.01 CR) - 5 | | | | | | | | | |

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 | 178 - 176.1 | P24x1/2 | 13.62 | 724.94 | 0.019 | 0.00 | 724.94 | 0.000 |
| | 176.1 - 174.2 | | 21.86 | 724.94 | 0.030 | 0.00 | 724.94 | 0.000 |
| | 174.2 - 172.3 | | 30.41 | 724.94 | 0.042 | 0.00 | 724.94 | 0.000 |
| | 172.3 - 170.4 | | 39.28 | 724.94 | 0.054 | 0.00 | 724.94 | 0.000 |
| | 170.4 - 168.5 | | 48.47 | 724.94 | 0.067 | 0.00 | 724.94 | 0.000 |
| | 168.5 - 166.6 | | 68.29 | 724.94 | 0.094 | 0.00 | 724.94 | 0.000 |
| | 166.6 - 164.7 | | 84.84 | 724.94 | 0.117 | 0.00 | 724.94 | 0.000 |
| | 164.7 - 162.8 | | 101.75 | 724.94 | 0.140 | 0.00 | 724.94 | 0.000 |
| | 162.8 - 160.9 | | 118.98 | 724.94 | 0.164 | 0.00 | 724.94 | 0.000 |
| | 160.9 - 159 | | 141.94 | 724.94 | 0.196 | 0.00 | 724.94 | 0.000 |
| | 159 - 157.1 | | 170.83 | 724.94 | 0.236 | 0.00 | 724.94 | 0.000 |
| | 157.1 - 155.2 | | 200.01 | 724.94 | 0.276 | 0.00 | 724.94 | 0.000 |
| | 155.2 - 153.3 | | 229.50 | 724.94 | 0.317 | 0.00 | 724.94 | 0.000 |
| | 153.3 - 151.4 | | 259.27 | 724.94 | 0.358 | 0.00 | 724.94 | 0.000 |
| | 151.4 - 149.5 | | 289.33 | 724.94 | 0.399 | 0.00 | 724.94 | 0.000 |
| | 149.5 - 147.6 | | 333.14 | 724.94 | 0.460 | 0.00 | 724.94 | 0.000 |
| | 147.6 - 145.7 | | 374.98 | 724.94 | 0.517 | 0.00 | 724.94 | 0.000 |
| L2 | 145.7 - 143.8 | P36x1/2 | 417.07 | 724.94 | 0.575 | 0.00 | 724.94 | 0.000 |
| | 143.8 - 141.9 | | 459.43 | 724.94 | 0.634 | 0.00 | 724.94 | 0.000 |
| | 141.9 - 140 | | 502.03 | 724.94 | 0.693 | 0.00 | 724.94 | 0.000 |
| | 140 - 138 | | 547.25 | 1586.55 | 0.345 | 0.00 | 1586.55 | 0.000 |
| | 138 - 136 | | 592.93 | 1586.55 | 0.374 | 0.00 | 1586.55 | 0.000 |
| | 136 - 134 | | 639.09 | 1586.55 | 0.403 | 0.00 | 1586.55 | 0.000 |
| | 134 - 132 | | 695.50 | 1586.55 | 0.438 | 0.00 | 1586.55 | 0.000 |
| | 132 - 130 | | 749.93 | 1586.55 | 0.473 | 0.00 | 1586.55 | 0.000 |
| | 130 - 128 | | 804.81 | 1586.55 | 0.507 | 0.00 | 1586.55 | 0.000 |
| | 128 - 126 | | 860.13 | 1586.55 | 0.542 | 0.00 | 1586.55 | 0.000 |
| | 126 - 124 | | 915.89 | 1586.55 | 0.577 | 0.00 | 1586.55 | 0.000 |
| | 124 - 122 | | 972.08 | 1586.55 | 0.613 | 0.00 | 1586.55 | 0.000 |
| | 122 - 120 | | 1028.70 | 1586.55 | 0.648 | 0.00 | 1586.55 | 0.000 |
| | 120 - 118 | | 1085.73 | 1586.55 | 0.684 | 0.00 | 1586.55 | 0.000 |
| | 118 - 116 | | 1143.18 | 1586.55 | 0.721 | 0.00 | 1586.55 | 0.000 |
| | 116 - 114 | | 1201.03 | 1586.55 | 0.757 | 0.00 | 1586.55 | 0.000 |
| | 114 - 112 | | 1259.28 | 1586.55 | 0.794 | 0.00 | 1586.55 | 0.000 |
| L3 | 112 - 110 | P48x5/8 | 1317.92 | 1586.55 | 0.831 | 0.00 | 1586.55 | 0.000 |
| | 110 - 108 | | 1376.93 | 1586.55 | 0.868 | 0.00 | 1586.55 | 0.000 |
| | 108 - 106 | | 1436.32 | 1586.55 | 0.905 | 0.00 | 1586.55 | 0.000 |
| | 106 - 104 | | 1496.07 | 1586.55 | 0.943 | 0.00 | 1586.55 | 0.000 |
| | 104 - 102 | | 1556.18 | 1586.55 | 0.981 | 0.00 | 1586.55 | 0.000 |
| | 102 - 100 | | 1616.63 | 1586.55 | 1.019 | 0.00 | 1586.55 | 0.000 |
| | 100 - 98 | | 1677.53 | 3492.39 | 0.480 | 0.00 | 3492.39 | 0.000 |
| | 98 - 96 | | 1738.97 | 3492.39 | 0.498 | 0.00 | 3492.39 | 0.000 |
| | 96 - 94 | | 1800.97 | 3492.39 | 0.516 | 0.00 | 3492.39 | 0.000 |
| | 94 - 92 | | 1863.51 | 3492.39 | 0.534 | 0.00 | 3492.39 | 0.000 |
| | 92 - 90 | | 1926.58 | 3492.39 | 0.552 | 0.00 | 3492.39 | 0.000 |
| | 90 - 88 | | 1990.19 | 3492.39 | 0.570 | 0.00 | 3492.39 | 0.000 |
| 88 - 86 | 2054.32 | 3492.39 | 0.588 | 0.00 | 3492.39 | 0.000 | | |
| 86 - 84 | 2118.97 | 3492.39 | 0.607 | 0.00 | 3492.39 | 0.000 | | |
| 84 - 82 | 2184.12 | 3492.39 | 0.625 | 0.00 | 3492.39 | 0.000 | | |

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 21 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

| Section No. | Elevation ft | Size | M_{ux} | ϕM_{rx} | Ratio | M_{uy} | ϕM_{ry} | Ratio |
|-------------|-----------------|---------|----------|---------------|------------------------------|----------|---------------|------------------------------|
| | | | kip-ft | kip-ft | $\frac{M_{ux}}{\phi M_{rx}}$ | kip-ft | kip-ft | $\frac{M_{uy}}{\phi M_{ry}}$ |
| | 82 - 80 | | 2249.78 | 3492.39 | 0.644 | 0.00 | 3492.39 | 0.000 |
| | 80 - 78 | | 2315.93 | 3492.39 | 0.663 | 0.00 | 3492.39 | 0.000 |
| | 78 - 76 | | 2382.57 | 3492.39 | 0.682 | 0.00 | 3492.39 | 0.000 |
| | 76 - 74 | | 2449.69 | 3492.39 | 0.701 | 0.00 | 3492.39 | 0.000 |
| | 74 - 72 | | 2517.28 | 3492.39 | 0.721 | 0.00 | 3492.39 | 0.000 |
| | 72 - 70 | | 2585.35 | 3492.39 | 0.740 | 0.00 | 3492.39 | 0.000 |
| | 70 - 68 | | 2653.88 | 3492.39 | 0.760 | 0.00 | 3492.39 | 0.000 |
| | 68 - 66 | | 2722.85 | 3492.39 | 0.780 | 0.00 | 3492.39 | 0.000 |
| | 66 - 64 | | 2792.27 | 3492.39 | 0.800 | 0.00 | 3492.39 | 0.000 |
| | 64 - 62 | | 2862.12 | 3492.39 | 0.820 | 0.00 | 3492.39 | 0.000 |
| | 62 - 60 | | 2932.39 | 3492.39 | 0.840 | 0.00 | 3492.39 | 0.000 |
| L4 | 60 - 58 | P54x5/8 | 3003.13 | 4349.32 | 0.690 | 0.00 | 4349.32 | 0.000 |
| | 58 - 56 | | 3074.35 | 4349.32 | 0.707 | 0.00 | 4349.32 | 0.000 |
| | 56 - 54 | | 3146.06 | 4349.32 | 0.723 | 0.00 | 4349.32 | 0.000 |
| | 54 - 52 | | 3218.24 | 4349.32 | 0.740 | 0.00 | 4349.32 | 0.000 |
| | 52 - 50 | | 3290.88 | 4349.32 | 0.757 | 0.00 | 4349.32 | 0.000 |
| | 50 - 48 | | 3363.97 | 4349.32 | 0.773 | 0.00 | 4349.32 | 0.000 |
| | 48 - 46 | | 3437.52 | 4349.32 | 0.790 | 0.00 | 4349.32 | 0.000 |
| | 46 - 44 | | 3511.49 | 4349.32 | 0.807 | 0.00 | 4349.32 | 0.000 |
| | 44 - 42 | | 3585.88 | 4349.32 | 0.824 | 0.00 | 4349.32 | 0.000 |
| | 42 - 40 | | 3660.69 | 4349.32 | 0.842 | 0.00 | 4349.32 | 0.000 |
| | 40 - 38 | | 3735.91 | 4349.32 | 0.859 | 0.00 | 4349.32 | 0.000 |
| | 38 - 36 | | 3811.52 | 4349.32 | 0.876 | 0.00 | 4349.32 | 0.000 |
| | 36 - 34 | | 3887.51 | 4349.32 | 0.894 | 0.00 | 4349.32 | 0.000 |
| | 34 - 32 | | 3963.88 | 4349.32 | 0.911 | 0.00 | 4349.32 | 0.000 |
| | 32 - 30 | | 4040.61 | 4349.32 | 0.929 | 0.00 | 4349.32 | 0.000 |
| | 30 - 28 | | 4117.69 | 4349.32 | 0.947 | 0.00 | 4349.32 | 0.000 |
| | 28 - 26 | | 4195.11 | 4349.32 | 0.965 | 0.00 | 4349.32 | 0.000 |
| | 26 - 24 | | 4272.86 | 4349.32 | 0.982 | 0.00 | 4349.32 | 0.000 |
| | 24 - 22 | | 4350.93 | 4349.32 | 1.000 | 0.00 | 4349.32 | 0.000 |
| | 22 - 20 | | 4429.31 | 4349.32 | 1.018 | 0.00 | 4349.32 | 0.000 |
| L5 | 20 - 19 | P60x5/8 | 4468.62 | 5299.02 | 0.843 | 0.00 | 5299.02 | 0.000 |
| | 19 - 18 | | 4508.00 | 5299.02 | 0.851 | 0.00 | 5299.02 | 0.000 |
| | 18 - 17 | | 4547.48 | 5299.02 | 0.858 | 0.00 | 5299.02 | 0.000 |
| | 17 - 16 | | 4587.03 | 5299.02 | 0.866 | 0.00 | 5299.02 | 0.000 |
| | 16 - 15 | | 4626.67 | 5299.02 | 0.873 | 0.00 | 5299.02 | 0.000 |
| | 15 - 14 | | 4666.38 | 5299.02 | 0.881 | 0.00 | 5299.02 | 0.000 |
| | 14 - 13 | | 4706.18 | 5299.02 | 0.888 | 0.00 | 5299.02 | 0.000 |
| | 13 - 12 | | 4746.05 | 5299.02 | 0.896 | 0.00 | 5299.02 | 0.000 |
| | 12 - 11 | | 4786.01 | 5299.02 | 0.903 | 0.00 | 5299.02 | 0.000 |
| | 11 - 10 | | 4826.04 | 5299.02 | 0.911 | 0.00 | 5299.02 | 0.000 |
| | 10 - 9 | | 4866.15 | 5299.02 | 0.918 | 0.00 | 5299.02 | 0.000 |
| | 9 - 8 | | 4906.33 | 5299.02 | 0.926 | 0.00 | 5299.02 | 0.000 |
| | 8 - 7 | | 4946.59 | 5299.02 | 0.933 | 0.00 | 5299.02 | 0.000 |
| | 7 - 6 | | 4986.93 | 5299.02 | 0.941 | 0.00 | 5299.02 | 0.000 |
| | 6 - 5 | | 5027.33 | 5299.02 | 0.949 | 0.00 | 5299.02 | 0.000 |
| | 5 - 4 | | 5067.82 | 5299.02 | 0.956 | 0.00 | 5299.02 | 0.000 |
| | 4 - 3 | | 5108.37 | 5299.02 | 0.964 | 0.00 | 5299.02 | 0.000 |
| | 3 - 2 | | 5148.99 | 5299.02 | 0.972 | 0.00 | 5299.02 | 0.000 |
| | 2 - 1 | | 5189.68 | 5299.02 | 0.979 | 0.00 | 5299.02 | 0.000 |
| | 1 - 0 | | 5230.44 | 5299.02 | 0.987 | 0.00 | 5299.02 | 0.000 |

Pole Shear Design Data

| | | | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| <p style="text-align: center;">tnxTower</p> <p>Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501</p> | Job | PORTLAND NORTH | Page | 22 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

| Section No. | Elevation ft | Size | Actual V_u K | ϕV_n K | Ratio | Actual | ϕT_n | Ratio |
|-------------|-----------------|---------|----------------------|-----------------|------------------------|-----------------|------------|------------------------|
| | | | | | $\frac{V_u}{\phi V_n}$ | T_u kip-ft | kip-ft | $\frac{T_u}{\phi T_n}$ |
| L1 | 178 - 176.1 | P24x1/2 | 4.25 | 581.39 | 0.007 | 1.46 | 1115.34 | 0.001 |
| | 176.1 - 174.2 | | 4.41 | 581.39 | 0.008 | 1.46 | 1115.34 | 0.001 |
| | 174.2 - 172.3 | | 4.58 | 581.39 | 0.008 | 1.46 | 1115.34 | 0.001 |
| | 172.3 - 170.4 | | 4.75 | 581.39 | 0.008 | 1.46 | 1115.34 | 0.001 |
| | 170.4 - 168.5 | | 4.91 | 581.39 | 0.008 | 1.46 | 1115.34 | 0.001 |
| | 168.5 - 166.6 | | 8.61 | 581.39 | 0.015 | 1.46 | 1115.34 | 0.001 |
| | 166.6 - 164.7 | | 8.82 | 581.39 | 0.015 | 1.73 | 1115.34 | 0.002 |
| | 164.7 - 162.8 | | 8.99 | 581.39 | 0.015 | 1.73 | 1115.34 | 0.002 |
| | 162.8 - 160.9 | | 9.15 | 581.39 | 0.016 | 1.73 | 1115.34 | 0.002 |
| | 160.9 - 159 | | 15.13 | 581.39 | 0.026 | 3.00 | 1115.34 | 0.003 |
| | 159 - 157.1 | | 15.29 | 581.39 | 0.026 | 3.00 | 1115.34 | 0.003 |
| | 157.1 - 155.2 | | 15.44 | 581.39 | 0.027 | 3.00 | 1115.34 | 0.003 |
| | 155.2 - 153.3 | | 15.60 | 581.39 | 0.027 | 3.00 | 1115.34 | 0.003 |
| | 153.3 - 151.4 | | 15.75 | 581.39 | 0.027 | 3.00 | 1115.34 | 0.003 |
| | 151.4 - 149.5 | | 15.90 | 581.39 | 0.027 | 3.00 | 1115.34 | 0.003 |
| | 149.5 - 147.6 | | 21.96 | 581.39 | 0.038 | 3.00 | 1115.34 | 0.003 |
| | 147.6 - 145.7 | | 22.10 | 581.39 | 0.038 | 2.97 | 1115.34 | 0.003 |
| | 145.7 - 143.8 | | 22.24 | 581.39 | 0.038 | 2.97 | 1115.34 | 0.003 |
| | 143.8 - 141.9 | | 22.37 | 581.39 | 0.038 | 2.97 | 1115.34 | 0.003 |
| | 141.9 - 140 | | 22.50 | 581.39 | 0.039 | 2.97 | 1115.34 | 0.003 |
| L2 | 140 - 138 | P36x1/2 | 22.73 | 878.27 | 0.026 | 2.97 | 2562.64 | 0.001 |
| | 138 - 136 | | 22.97 | 878.27 | 0.026 | 2.97 | 2562.64 | 0.001 |
| | 136 - 134 | | 23.20 | 878.27 | 0.026 | 2.97 | 2562.64 | 0.001 |
| | 134 - 132 | | 27.11 | 878.27 | 0.031 | 2.96 | 2562.64 | 0.001 |
| | 132 - 130 | | 27.34 | 878.27 | 0.031 | 2.96 | 2562.64 | 0.001 |
| | 130 - 128 | | 27.56 | 878.27 | 0.031 | 2.96 | 2562.64 | 0.001 |
| | 128 - 126 | | 27.78 | 878.27 | 0.032 | 2.96 | 2562.64 | 0.001 |
| | 126 - 124 | | 28.00 | 878.27 | 0.032 | 2.96 | 2562.64 | 0.001 |
| | 124 - 122 | | 28.22 | 878.27 | 0.032 | 2.96 | 2562.64 | 0.001 |
| | 122 - 120 | | 28.43 | 878.27 | 0.032 | 2.96 | 2562.64 | 0.001 |
| | 120 - 118 | | 28.64 | 878.27 | 0.033 | 2.96 | 2562.64 | 0.001 |
| | 118 - 116 | | 28.84 | 878.27 | 0.033 | 2.96 | 2562.64 | 0.001 |
| | 116 - 114 | | 29.04 | 878.27 | 0.033 | 2.96 | 2562.64 | 0.001 |
| | 114 - 112 | | 29.24 | 878.27 | 0.033 | 2.96 | 2562.64 | 0.001 |
| | 112 - 110 | | 29.43 | 878.27 | 0.034 | 2.96 | 2562.64 | 0.001 |
| | 110 - 108 | | 29.62 | 878.27 | 0.034 | 2.96 | 2562.64 | 0.001 |
| | 108 - 106 | | 29.81 | 878.27 | 0.034 | 2.96 | 2562.64 | 0.001 |
| | 106 - 104 | | 29.99 | 878.27 | 0.034 | 2.96 | 2562.64 | 0.001 |
| | 104 - 102 | | 30.16 | 878.27 | 0.034 | 2.96 | 2562.64 | 0.001 |
| | 102 - 100 | | 30.34 | 878.27 | 0.035 | 2.96 | 2562.64 | 0.001 |
| L3 | 100 - 98 | P48x5/8 | 30.60 | 1465.07 | 0.021 | 2.96 | 5709.67 | 0.001 |
| | 98 - 96 | | 30.87 | 1465.07 | 0.021 | 2.96 | 5709.67 | 0.001 |
| | 96 - 94 | | 31.15 | 1465.07 | 0.021 | 2.96 | 5709.67 | 0.001 |
| | 94 - 92 | | 31.42 | 1465.07 | 0.021 | 2.96 | 5709.67 | 0.001 |
| | 92 - 90 | | 31.68 | 1465.07 | 0.022 | 2.96 | 5709.67 | 0.001 |
| | 90 - 88 | | 31.95 | 1465.07 | 0.022 | 2.96 | 5709.67 | 0.001 |
| | 88 - 86 | | 32.21 | 1465.07 | 0.022 | 2.96 | 5709.67 | 0.001 |
| | 86 - 84 | | 32.46 | 1465.07 | 0.022 | 2.96 | 5709.67 | 0.001 |
| | 84 - 82 | | 32.72 | 1465.07 | 0.022 | 2.96 | 5709.67 | 0.001 |
| | 82 - 80 | | 32.97 | 1465.07 | 0.023 | 2.96 | 5709.67 | 0.001 |
| | 80 - 78 | | 33.22 | 1465.07 | 0.023 | 2.96 | 5709.67 | 0.001 |
| | 78 - 76 | | 33.46 | 1465.07 | 0.023 | 2.96 | 5709.67 | 0.001 |
| | 76 - 74 | | 33.70 | 1465.07 | 0.023 | 2.96 | 5709.67 | 0.001 |
| | 74 - 72 | | 33.93 | 1465.07 | 0.023 | 2.96 | 5709.67 | 0.001 |
| | 72 - 70 | | 34.17 | 1465.07 | 0.023 | 2.96 | 5709.67 | 0.001 |
| | 70 - 68 | | 34.40 | 1465.07 | 0.023 | 2.96 | 5709.67 | 0.001 |
| | 68 - 66 | | 34.62 | 1465.07 | 0.024 | 2.96 | 5709.67 | 0.001 |
| | 66 - 64 | | 34.84 | 1465.07 | 0.024 | 2.96 | 5709.67 | 0.001 |
| | 64 - 62 | | 35.06 | 1465.07 | 0.024 | 2.96 | 5709.67 | 0.001 |
| | 62 - 60 | | 35.27 | 1465.07 | 0.024 | 2.96 | 5709.67 | 0.001 |

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 23 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

| Section No. | Elevation ft | Size | Actual V_u K | ϕV_n K | Ratio V_u ϕV_n | Actual T_u kip-ft | ϕT_n kip-ft | Ratio T_u ϕT_n | | |
|-------------|-----------------|---------|----------------------|-----------------|------------------------------|---------------------------|----------------------|------------------------------|---------|-------|
| L4 | 60 - 58 | P54x5/8 | 35.51 | 1650.62 | 0.022 | 2.96 | 7257.86 | 0.000 | | |
| | 58 - 56 | | 35.75 | 1650.62 | 0.022 | 2.96 | 7257.86 | 0.000 | | |
| | 56 - 54 | | 35.99 | 1650.62 | 0.022 | 2.96 | 7257.86 | 0.000 | | |
| | 54 - 52 | | 36.23 | 1650.62 | 0.022 | 2.96 | 7257.86 | 0.000 | | |
| | 52 - 50 | | 36.46 | 1650.62 | 0.022 | 2.96 | 7257.86 | 0.000 | | |
| | 50 - 48 | | 36.68 | 1650.62 | 0.022 | 2.96 | 7257.86 | 0.000 | | |
| | 48 - 46 | | 36.90 | 1650.62 | 0.022 | 2.95 | 7257.86 | 0.000 | | |
| | 46 - 44 | | 37.12 | 1650.62 | 0.022 | 2.95 | 7257.86 | 0.000 | | |
| | 44 - 42 | | 37.33 | 1650.62 | 0.023 | 2.95 | 7257.86 | 0.000 | | |
| | 42 - 40 | | 37.53 | 1650.62 | 0.023 | 2.95 | 7257.86 | 0.000 | | |
| | 40 - 38 | | 37.73 | 1650.62 | 0.023 | 2.95 | 7257.86 | 0.000 | | |
| | 38 - 36 | | 37.93 | 1650.62 | 0.023 | 2.95 | 7257.86 | 0.000 | | |
| | 36 - 34 | | 38.12 | 1650.62 | 0.023 | 2.95 | 7257.86 | 0.000 | | |
| | 34 - 32 | | 38.30 | 1650.62 | 0.023 | 2.95 | 7257.86 | 0.000 | | |
| | 32 - 30 | | 38.48 | 1650.62 | 0.023 | 2.95 | 7257.86 | 0.000 | | |
| | 30 - 28 | | 38.66 | 1650.62 | 0.023 | 2.95 | 7257.86 | 0.000 | | |
| | 28 - 26 | | 38.83 | 1650.62 | 0.024 | 2.95 | 7257.86 | 0.000 | | |
| | 26 - 24 | | 38.99 | 1650.62 | 0.024 | 2.95 | 7257.86 | 0.000 | | |
| | 24 - 22 | | 39.15 | 1650.62 | 0.024 | 2.95 | 7257.86 | 0.000 | | |
| | 22 - 20 | | 39.30 | 1650.62 | 0.024 | 2.95 | 7257.86 | 0.000 | | |
| | L5 | | 20 - 19 | P60x5/8 | 39.36 | 1824.75 | 0.022 | 2.95 | 8935.67 | 0.000 |
| | | | 19 - 18 | | 39.44 | 1824.75 | 0.022 | 2.95 | 8935.67 | 0.000 |
| 18 - 17 | | 39.53 | 1824.75 | | 0.022 | 2.95 | 8935.67 | 0.000 | | |
| 17 - 16 | | 39.61 | 1824.75 | | 0.022 | 2.95 | 8935.67 | 0.000 | | |
| 16 - 15 | | 39.69 | 1824.75 | | 0.022 | 2.95 | 8935.67 | 0.000 | | |
| 15 - 14 | | 39.77 | 1824.75 | | 0.022 | 2.95 | 8935.67 | 0.000 | | |
| 14 - 13 | | 39.85 | 1824.75 | | 0.022 | 2.95 | 8935.67 | 0.000 | | |
| 13 - 12 | | 39.93 | 1824.75 | | 0.022 | 2.95 | 8935.67 | 0.000 | | |
| 12 - 11 | | 40.01 | 1824.75 | | 0.022 | 2.95 | 8935.67 | 0.000 | | |
| 11 - 10 | | 40.08 | 1824.75 | | 0.022 | 2.95 | 8935.67 | 0.000 | | |
| 10 - 9 | | 40.16 | 1824.75 | | 0.022 | 2.95 | 8935.67 | 0.000 | | |
| 9 - 8 | | 40.24 | 1824.75 | | 0.022 | 2.95 | 8935.67 | 0.000 | | |
| 8 - 7 | | 40.31 | 1824.75 | | 0.022 | 2.95 | 8935.67 | 0.000 | | |
| 7 - 6 | | 40.39 | 1824.75 | | 0.022 | 2.95 | 8935.67 | 0.000 | | |
| 6 - 5 | | 40.46 | 1824.75 | | 0.022 | 2.95 | 8935.67 | 0.000 | | |
| 5 - 4 | | 40.53 | 1824.75 | | 0.022 | 2.95 | 8935.67 | 0.000 | | |
| 4 - 3 | | 40.60 | 1824.75 | | 0.022 | 2.95 | 8935.67 | 0.000 | | |
| 3 - 2 | | 40.68 | 1824.75 | | 0.022 | 2.95 | 8935.67 | 0.000 | | |
| 2 - 1 | 40.75 | 1824.75 | 0.022 | 2.95 | 8935.67 | 0.000 | | | | |
| 1 - 0 | 40.81 | 1824.75 | 0.022 | 2.95 | 8935.67 | 0.000 | | | | |

Pole Interaction Design Data

| Section No. | Elevation ft | Ratio P_u ϕP_n | Ratio M_{ux} ϕM_{nx} | Ratio M_{uy} ϕM_{ny} | Ratio V_u ϕV_n | Ratio T_u ϕT_n | Comb. Stress Ratio | Allow. Stress Ratio | Criteria |
|-------------|-----------------|------------------------------|------------------------------------|------------------------------------|------------------------------|------------------------------|--------------------------|---------------------------|----------|
| L1 | 178 - 176.1 | 0.003 | 0.019 | 0.000 | 0.007 | 0.001 | 0.022 | 1.000 | 4.8.2 ✓ |
| | 176.1 - 174.2 | 0.003 | 0.030 | 0.000 | 0.008 | 0.001 | 0.034 | 1.000 | 4.8.2 ✓ |
| | 174.2 - 172.3 | 0.004 | 0.042 | 0.000 | 0.008 | 0.001 | 0.046 | 1.000 | 4.8.2 ✓ |
| | 172.3 - 170.4 | 0.004 | 0.054 | 0.000 | 0.008 | 0.001 | 0.058 | 1.000 | 4.8.2 ✓ |

| | | | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| <p>tnxTower</p> <p>Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501</p> | Job | PORTLAND NORTH | Page | 24 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

| Section No. | Elevation ft | Ratio P_u ϕP_n | Ratio M_{ux} ϕM_{nx} | Ratio M_{uy} ϕM_{ny} | Ratio V_u ϕV_n | Ratio T_u ϕT_n | Comb. Stress Ratio | Allow. Stress Ratio | Criteria |
|-------------|-----------------|------------------------------|------------------------------------|------------------------------------|------------------------------|------------------------------|--------------------------|---------------------------|----------|
| | 170.4 - 168.5 | 0.004 | 0.067 | 0.000 | 0.008 | 0.001 | 0.071 | 1.000 | 4.8.2 ✓ |
| | 168.5 - 166.6 | 0.006 | 0.094 | 0.000 | 0.015 | 0.001 | 0.100 | 1.000 | 4.8.2 ✓ |
| | 166.6 - 164.7 | 0.006 | 0.117 | 0.000 | 0.015 | 0.002 | 0.123 | 1.000 | 4.8.2 ✓ |
| | 164.7 - 162.8 | 0.006 | 0.140 | 0.000 | 0.015 | 0.002 | 0.147 | 1.000 | 4.8.2 ✓ |
| | 162.8 - 160.9 | 0.007 | 0.164 | 0.000 | 0.016 | 0.002 | 0.171 | 1.000 | 4.8.2 ✓ |
| | 160.9 - 159 | 0.008 | 0.196 | 0.000 | 0.026 | 0.003 | 0.205 | 1.000 | 4.8.2 ✓ |
| | 159 - 157.1 | 0.009 | 0.236 | 0.000 | 0.026 | 0.003 | 0.245 | 1.000 | 4.8.2 ✓ |
| | 157.1 - 155.2 | 0.009 | 0.276 | 0.000 | 0.027 | 0.003 | 0.286 | 1.000 | 4.8.2 ✓ |
| | 155.2 - 153.3 | 0.009 | 0.317 | 0.000 | 0.027 | 0.003 | 0.327 | 1.000 | 4.8.2 ✓ |
| | 153.3 - 151.4 | 0.010 | 0.358 | 0.000 | 0.027 | 0.003 | 0.368 | 1.000 | 4.8.2 ✓ |
| | 151.4 - 149.5 | 0.010 | 0.399 | 0.000 | 0.027 | 0.003 | 0.410 | 1.000 | 4.8.2 ✓ |
| | 149.5 - 147.6 | 0.013 | 0.460 | 0.000 | 0.038 | 0.003 | 0.474 | 1.000 | 4.8.2 ✓ |
| | 147.6 - 145.7 | 0.013 | 0.517 | 0.000 | 0.038 | 0.003 | 0.532 | 1.000 | 4.8.2 ✓ |
| | 145.7 - 143.8 | 0.014 | 0.575 | 0.000 | 0.038 | 0.003 | 0.591 | 1.000 | 4.8.2 ✓ |
| | 143.8 - 141.9 | 0.014 | 0.634 | 0.000 | 0.038 | 0.003 | 0.649 | 1.000 | 4.8.2 ✓ |
| | 141.9 - 140 | 0.014 | 0.693 | 0.000 | 0.039 | 0.003 | 0.708 | 1.000 | 4.8.2 ✓ |
| L2 | 140 - 138 | 0.010 | 0.345 | 0.000 | 0.026 | 0.001 | 0.355 | 1.000 | 4.8.2 ✓ |
| | 138 - 136 | 0.010 | 0.374 | 0.000 | 0.026 | 0.001 | 0.385 | 1.000 | 4.8.2 ✓ |
| | 136 - 134 | 0.010 | 0.403 | 0.000 | 0.026 | 0.001 | 0.414 | 1.000 | 4.8.2 ✓ |
| | 134 - 132 | 0.012 | 0.438 | 0.000 | 0.031 | 0.001 | 0.451 | 1.000 | 4.8.2 ✓ |
| | 132 - 130 | 0.012 | 0.473 | 0.000 | 0.031 | 0.001 | 0.486 | 1.000 | 4.8.2 ✓ |
| | 130 - 128 | 0.013 | 0.507 | 0.000 | 0.031 | 0.001 | 0.521 | 1.000 | 4.8.2 ✓ |
| | 128 - 126 | 0.013 | 0.542 | 0.000 | 0.032 | 0.001 | 0.556 | 1.000 | 4.8.2 ✓ |
| | 126 - 124 | 0.013 | 0.577 | 0.000 | 0.032 | 0.001 | 0.592 | 1.000 | 4.8.2 ✓ |
| | 124 - 122 | 0.014 | 0.613 | 0.000 | 0.032 | 0.001 | 0.627 | 1.000 | 4.8.2 ✓ |
| | 122 - 120 | 0.014 | 0.648 | 0.000 | 0.032 | 0.001 | 0.664 | 1.000 | 4.8.2 ✓ |

| | | | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| <p>tnxTower</p> <p>Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501</p> | Job | PORTLAND NORTH | Page | 25 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

| Section No. | Elevation ft | Ratio P_u ϕP_n | Ratio M_{ux} ϕM_{nx} | Ratio M_{uy} ϕM_{ny} | Ratio V_u ϕV_n | Ratio T_u ϕT_n | Comb. Stress Ratio | Allow. Stress Ratio | Criteria |
|-------------|-----------------|------------------------------|------------------------------------|------------------------------------|------------------------------|------------------------------|--------------------------|---------------------------|----------|
| | 120 - 118 | 0.014 | 0.684 | 0.000 | 0.033 | 0.001 | 0.700 | 1.000 | 4.8.2 ✓ |
| | 118 - 116 | 0.015 | 0.721 | 0.000 | 0.033 | 0.001 | 0.736 | 1.000 | 4.8.2 ✓ |
| | 116 - 114 | 0.015 | 0.757 | 0.000 | 0.033 | 0.001 | 0.773 | 1.000 | 4.8.2 ✓ |
| | 114 - 112 | 0.015 | 0.794 | 0.000 | 0.033 | 0.001 | 0.810 | 1.000 | 4.8.2 ✓ |
| | 112 - 110 | 0.016 | 0.831 | 0.000 | 0.034 | 0.001 | 0.848 | 1.000 | 4.8.2 ✓ |
| | 110 - 108 | 0.016 | 0.868 | 0.000 | 0.034 | 0.001 | 0.885 | 1.000 | 4.8.2 ✓ |
| | 108 - 106 | 0.016 | 0.905 | 0.000 | 0.034 | 0.001 | 0.923 | 1.000 | 4.8.2 ✓ |
| | 106 - 104 | 0.017 | 0.943 | 0.000 | 0.034 | 0.001 | 0.961 | 1.000 | 4.8.2 ✓ |
| | 104 - 102 | 0.017 | 0.981 | 0.000 | 0.034 | 0.001 | 0.999 | 1.000 | 4.8.2 ✓ |
| L3 | 102 - 100 | 0.018 | 1.019 | 0.000 | 0.035 | 0.001 | 1.038 | 1.000 | 4.8.2 |
| | 100 - 98 | 0.011 | 0.480 | 0.000 | 0.021 | 0.001 | 0.492 | 1.000 | 4.8.2 ✓ |
| | 98 - 96 | 0.011 | 0.498 | 0.000 | 0.021 | 0.001 | 0.510 | 1.000 | 4.8.2 ✓ |
| | 96 - 94 | 0.011 | 0.516 | 0.000 | 0.021 | 0.001 | 0.528 | 1.000 | 4.8.2 ✓ |
| | 94 - 92 | 0.012 | 0.534 | 0.000 | 0.021 | 0.001 | 0.546 | 1.000 | 4.8.2 ✓ |
| | 92 - 90 | 0.012 | 0.552 | 0.000 | 0.022 | 0.001 | 0.564 | 1.000 | 4.8.2 ✓ |
| | 90 - 88 | 0.012 | 0.570 | 0.000 | 0.022 | 0.001 | 0.583 | 1.000 | 4.8.2 ✓ |
| | 88 - 86 | 0.013 | 0.588 | 0.000 | 0.022 | 0.001 | 0.601 | 1.000 | 4.8.2 ✓ |
| | 86 - 84 | 0.013 | 0.607 | 0.000 | 0.022 | 0.001 | 0.620 | 1.000 | 4.8.2 ✓ |
| | 84 - 82 | 0.013 | 0.625 | 0.000 | 0.022 | 0.001 | 0.639 | 1.000 | 4.8.2 ✓ |
| | 82 - 80 | 0.014 | 0.644 | 0.000 | 0.023 | 0.001 | 0.658 | 1.000 | 4.8.2 ✓ |
| | 80 - 78 | 0.014 | 0.663 | 0.000 | 0.023 | 0.001 | 0.678 | 1.000 | 4.8.2 ✓ |
| | 78 - 76 | 0.014 | 0.682 | 0.000 | 0.023 | 0.001 | 0.697 | 1.000 | 4.8.2 ✓ |
| | 76 - 74 | 0.015 | 0.701 | 0.000 | 0.023 | 0.001 | 0.717 | 1.000 | 4.8.2 ✓ |
| | 74 - 72 | 0.015 | 0.721 | 0.000 | 0.023 | 0.001 | 0.736 | 1.000 | 4.8.2 ✓ |
| | 72 - 70 | 0.015 | 0.740 | 0.000 | 0.023 | 0.001 | 0.756 | 1.000 | 4.8.2 ✓ |
| | 70 - 68 | 0.015 | 0.760 | 0.000 | 0.023 | 0.001 | 0.776 | 1.000 | 4.8.2 ✓ |
| | 68 - 66 | 0.016 | 0.780 | 0.000 | 0.024 | 0.001 | 0.796 | 1.000 | 4.8.2 ✓ |

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 26 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

| Section No. | Elevation ft | Ratio | Ratio | Ratio | Ratio | Ratio | Comb. Stress Ratio | Allow. Stress Ratio | Criteria |
|-------------|-----------------|------------|---------------|---------------|------------|------------|--------------------|---------------------|----------|
| | | P_u | M_{ux} | M_{uy} | V_u | T_u | | | |
| | | ϕP_n | ϕM_{nx} | ϕM_{ny} | ϕV_n | ϕT_n | | | |
| | 66 - 64 | 0.016 | 0.800 | 0.000 | 0.024 | 0.001 | 0.816 | 1.000 | 4.8.2 ✓ |
| | 64 - 62 | 0.016 | 0.820 | 0.000 | 0.024 | 0.001 | 0.837 | 1.000 | 4.8.2 ✓ |
| | 62 - 60 | 0.017 | 0.840 | 0.000 | 0.024 | 0.001 | 0.857 | 1.000 | 4.8.2 ✓ |
| L4 | 60 - 58 | 0.015 | 0.690 | 0.000 | 0.022 | 0.000 | 0.706 | 1.000 | 4.8.2 ✓ |
| | 58 - 56 | 0.015 | 0.707 | 0.000 | 0.022 | 0.000 | 0.723 | 1.000 | 4.8.2 ✓ |
| | 56 - 54 | 0.016 | 0.723 | 0.000 | 0.022 | 0.000 | 0.740 | 1.000 | 4.8.2 ✓ |
| | 54 - 52 | 0.016 | 0.740 | 0.000 | 0.022 | 0.000 | 0.757 | 1.000 | 4.8.2 ✓ |
| | 52 - 50 | 0.016 | 0.757 | 0.000 | 0.022 | 0.000 | 0.774 | 1.000 | 4.8.2 ✓ |
| | 50 - 48 | 0.017 | 0.773 | 0.000 | 0.022 | 0.000 | 0.791 | 1.000 | 4.8.2 ✓ |
| | 48 - 46 | 0.017 | 0.790 | 0.000 | 0.022 | 0.000 | 0.808 | 1.000 | 4.8.2 ✓ |
| | 46 - 44 | 0.017 | 0.807 | 0.000 | 0.022 | 0.000 | 0.825 | 1.000 | 4.8.2 ✓ |
| | 44 - 42 | 0.018 | 0.824 | 0.000 | 0.023 | 0.000 | 0.843 | 1.000 | 4.8.2 ✓ |
| | 42 - 40 | 0.018 | 0.842 | 0.000 | 0.023 | 0.000 | 0.860 | 1.000 | 4.8.2 ✓ |
| | 40 - 38 | 0.018 | 0.859 | 0.000 | 0.023 | 0.000 | 0.878 | 1.000 | 4.8.2 ✓ |
| | 38 - 36 | 0.019 | 0.876 | 0.000 | 0.023 | 0.000 | 0.895 | 1.000 | 4.8.2 ✓ |
| | 36 - 34 | 0.019 | 0.894 | 0.000 | 0.023 | 0.000 | 0.913 | 1.000 | 4.8.2 ✓ |
| | 34 - 32 | 0.019 | 0.911 | 0.000 | 0.023 | 0.000 | 0.931 | 1.000 | 4.8.2 ✓ |
| | 32 - 30 | 0.019 | 0.929 | 0.000 | 0.023 | 0.000 | 0.949 | 1.000 | 4.8.2 ✓ |
| | 30 - 28 | 0.020 | 0.947 | 0.000 | 0.023 | 0.000 | 0.967 | 1.000 | 4.8.2 ✓ |
| | 28 - 26 | 0.020 | 0.965 | 0.000 | 0.024 | 0.000 | 0.985 | 1.000 | 4.8.2 ✓ |
| | 26 - 24 | 0.020 | 0.982 | 0.000 | 0.024 | 0.000 | 1.003 | 1.000 | 4.8.2 |
| | 24 - 22 | 0.021 | 1.000 | 0.000 | 0.024 | 0.000 | 1.022 | 1.000 | 4.8.2 |
| | 22 - 20 | 0.021 | 1.018 | 0.000 | 0.024 | 0.000 | 1.040 | 1.000 | 4.8.2 |
| L5 | 20 - 19 | 0.019 | 0.843 | 0.000 | 0.022 | 0.000 | 0.863 | 1.000 | 4.8.2 ✓ |
| | 19 - 18 | 0.019 | 0.851 | 0.000 | 0.022 | 0.000 | 0.871 | 1.000 | 4.8.2 ✓ |
| | 18 - 17 | 0.019 | 0.858 | 0.000 | 0.022 | 0.000 | 0.878 | 1.000 | 4.8.2 ✓ |
| | 17 - 16 | 0.020 | 0.866 | 0.000 | 0.022 | 0.000 | 0.886 | 1.000 | 4.8.2 ✓ |

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------------|--------------------|-------------------|
| tnxTower Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd Acworth, GA 30102 Phone: 770-701-2500 FAX: 770-701-2501 | Job | PORTLAND NORTH | Page | 27 of 28 |
| | Project | BU878783 WO1367448 | Date | 12:58:55 02/22/17 |
| | Client | Crown Castle | Designed by | J. Earnest |

| Section No. | Elevation ft | Ratio | Ratio | Ratio | Ratio | Ratio | Comb. Stress Ratio | Allow. Stress Ratio | Criteria |
|-------------|-----------------|-------|----------|----------|-------|-------|--------------------|---------------------|----------|
| | | P_u | M_{ux} | M_{uy} | V_u | T_u | | | |
| | 16 - 15 | 0.020 | 0.873 | 0.000 | 0.022 | 0.000 | 0.893 | 1.000 | 4.8.2 ✓ |
| | 15 - 14 | 0.020 | 0.881 | 0.000 | 0.022 | 0.000 | 0.901 | 1.000 | 4.8.2 ✓ |
| | 14 - 13 | 0.020 | 0.888 | 0.000 | 0.022 | 0.000 | 0.909 | 1.000 | 4.8.2 ✓ |
| | 13 - 12 | 0.020 | 0.896 | 0.000 | 0.022 | 0.000 | 0.916 | 1.000 | 4.8.2 ✓ |
| | 12 - 11 | 0.020 | 0.903 | 0.000 | 0.022 | 0.000 | 0.924 | 1.000 | 4.8.2 ✓ |
| | 11 - 10 | 0.021 | 0.911 | 0.000 | 0.022 | 0.000 | 0.932 | 1.000 | 4.8.2 ✓ |
| | 10 - 9 | 0.021 | 0.918 | 0.000 | 0.022 | 0.000 | 0.940 | 1.000 | 4.8.2 ✓ |
| | 9 - 8 | 0.021 | 0.926 | 0.000 | 0.022 | 0.000 | 0.947 | 1.000 | 4.8.2 ✓ |
| | 8 - 7 | 0.021 | 0.933 | 0.000 | 0.022 | 0.000 | 0.955 | 1.000 | 4.8.2 ✓ |
| | 7 - 6 | 0.021 | 0.941 | 0.000 | 0.022 | 0.000 | 0.963 | 1.000 | 4.8.2 ✓ |
| | 6 - 5 | 0.021 | 0.949 | 0.000 | 0.022 | 0.000 | 0.971 | 1.000 | 4.8.2 ✓ |
| | 5 - 4 | 0.021 | 0.956 | 0.000 | 0.022 | 0.000 | 0.978 | 1.000 | 4.8.2 ✓ |
| | 4 - 3 | 0.022 | 0.964 | 0.000 | 0.022 | 0.000 | 0.986 | 1.000 | 4.8.2 ✓ |
| | 3 - 2 | 0.022 | 0.972 | 0.000 | 0.022 | 0.000 | 0.994 | 1.000 | 4.8.2 ✓ |
| | 2 - 1 | 0.022 | 0.979 | 0.000 | 0.022 | 0.000 | 1.002 | 1.000 | 4.8.2 |
| | 1 - 0 | 0.022 | 0.987 | 0.000 | 0.022 | 0.000 | 1.010 | 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 | 178 - 140 | Pole | P24x1/2 | 1 | -16.58 | 1162.78 | 70.8 | Pass |
| L2 | 140 - 100 | Pole | P36x1/2 | 2 | -30.78 | 1756.54 | 103.8 | Pass ² |
| L3 | 100 - 60 | Pole | P48x5/8 | 3 | -48.99 | 2930.15 | 85.7 | Pass |
| L4 | 60 - 20 | Pole | P54x5/8 | 4 | -69.38 | 3301.25 | 104.0 | Pass ² |
| L5 | 20 - 0 | Pole | P60x5/8 | 5 | -80.56 | 3649.51 | 101.0 | Pass ² |
| Summary | | | | | | | | |
| Pole (L4) | | | | | | | 104.0 | Pass ² |
| RATING = | | | | | | | 104.0 | Pass² |

| | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|---------------------------------------------|
| <p>tnxTower</p> <p>Jacobs Engineering Group, Inc. 5449 Bells Ferry Rd</p> <p>Program Version 7.0.30108/2016 File: C:\Users\J.EARNESJT\Desktop\878783\Analysis\BU878783_WO1367448_LC7.eri Phone: 770-701-2500 FAX: 770-701-2501</p> | <p>Job</p> <p>PORTLAND NORTH</p> | <p>Page</p> <p>28 of 28</p> |
| | <p>Project</p> <p>BU878783 WO1367448</p> | <p>Date</p> <p>12:58:55 02/22/17</p> |
| | <p>Client</p> <p>Crown Castle</p> | <p>Designed by</p> <p>J. Earnest</p> |

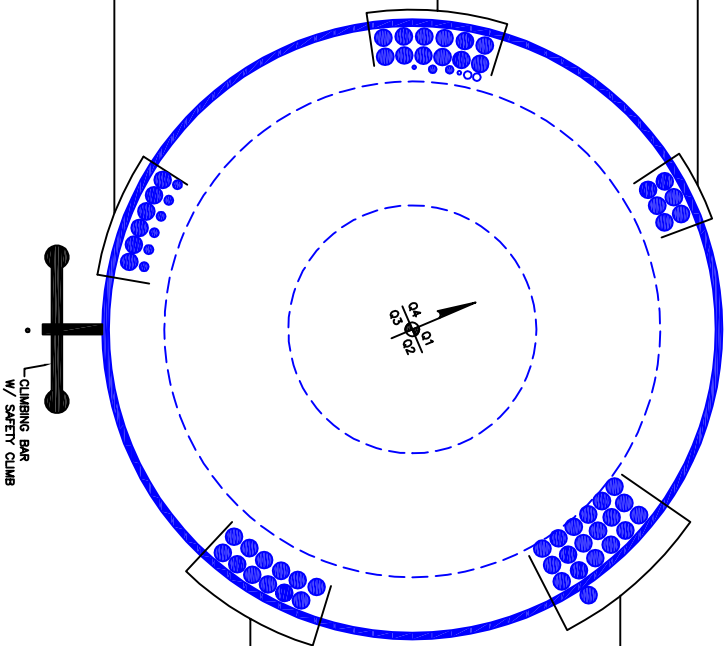
APPENDIX B
BASE LEVEL DRAWING



(INSTALLED)
(6) 1-5/8" TO 178 FT LEVEL

(RESERVED)
(1) 3/8" TO 160 FT LEVEL
(2) 3/4" TO 160 FT LEVEL
(INSTALLED)
(1) 3/8" TO 160 FT LEVEL
(2) 3/4" TO 160 FT LEVEL
(12) 1-5/8" TO 160 FT LEVEL

(INSTALLED)
(6) 7/8" TO 134 FT LEVEL
(6) 1-5/8" TO 134 FT LEVEL



(INSTALLED)
(19) 1-5/8" TO 149 FT LEVEL

(INSTALLED)
(12) 1-5/8" TO 168 FT LEVEL

BASE LEVEL DRAWING

BUSINESS UNIT: 878783 TOWER ID: C.BASELEVEL

SCALE: 1"=1'-0" 1

CROWN REGION ADDRESS
USA

| | | |
|-----|----------|--------------------------------|
| AM | 16/03/16 | UPDATED PER WORK ORDER 1208711 |
| AM | 16/03/16 | UPDATED PER WORK ORDER 1208821 |
| BA | 30/03/16 | UPDATED PER WORK ORDER 1216094 |
| CS | 11/05/16 | UPDATED PER WORK ORDER 1233111 |
| SS | 17/06/16 | UPDATED PER WORK ORDER 1255336 |
| SAT | 11/07/16 | UPDATED PER WORK ORDER 1267913 |
| HR | 03/12/16 | UPDATED PER WORK ORDER 1322445 |
| JW | 19/12/16 | UPDATED PER WORK ORDER 1338601 |
| JP | 02/02/17 | UPDATED PER WORK ORDER 1357780 |

DRAWN BY: DVA
CHECKED BY: BBE
DRAWING DATE: 130807

SITE NUMBER: _____
 SITE NAME: _____
 PORTLAND NORTH
 BUSINESS UNIT NUMBER: 878783
 SITE ADDRESS: 837 PERSIMMONCOT
 PORTLAND, ME 04101
 CUMBERLAND COUNTY
 USA
 SHEET TITLE: BASE LEVEL
 SHEET NUMBER: _____

A1-0

APPENDIX C
ADDITIONAL CALCULATIONS

Stiffened or Unstiffened, UngROUTED, Circular Base Plate - Any Rod Material

TIA Rev G Assumption: Clear space between bottom of leveling nut and top of concrete **not** exceeding (1)*(Rod Diameter)

Site Data

| |
|---------------------------------|
| BU#: 878783 |
| Site Name: PORTLAND NORTH |
| App #: 364306 Rev 0 |
| Pole Manufacturer: Other |

Anchor Rod Data

| | | |
|----------------|--------|-----|
| Qty: | 32 | |
| Diam: | 2 | in |
| Rod Material: | A615-5 | |
| Strength (Fu): | 58 | ksi |
| Yield (Fy): | 36 | ksi |
| Bolt Circle: | 66 | in |

Plate Data

| | | |
|-------------------|------|-----|
| Diam: | 72 | in |
| Thick: | 3.25 | in |
| Grade: | 36 | ksi |
| Single-Rod B-eff: | 5.89 | in |

Stiffener Data (Welding at both sides)

| | | |
|-----------------|---|---------------|
| Config: | 0 | * |
| Weld Type: | | |
| Groove Depth: | | <-- Disregard |
| Groove Angle: | | <-- Disregard |
| Fillet H. Weld: | | in |
| Fillet V. Weld: | | in |
| Width: | | in |
| Height: | | in |
| Thick: | | in |
| Notch: | | in |
| Grade: | | ksi |
| Weld str.: | | ksi |

Pole Data

| | | |
|--------------------|-------|--------------|
| Diam: | 60 | in |
| Thick: | 0.625 | in |
| Grade: | 35 | ksi |
| # of Sides: | 0 | "0" IF Round |
| Fu | 63 | ksi |
| Reinf. Fillet Weld | 0 | "0" if None |

Reactions

| | | |
|---------------|------|------------------|
| Mu: | 4650 | ft-kips |
| Axial, Pu: | 81 | kips |
| Shear, Vu: | 41 | kips |
| Eta Factor, η | 0.55 | TIA G (Fig. 4-4) |

If No stiffeners, Criteria: **AISC LRFD** <-Only Applicable to Unstiffened Cases

Anchor Rod Results

Max Rod (Cu+ Vu/η): 110.5 Kips
 Allowable Axial, Φ*Fu*Anet: 116.0 Kips
 Anchor Rod Stress Ratio: 95.3% **Pass**

| |
|-----------|
| Rigid |
| AISC LRFD |
| φ*Tn |

Base Plate Results

Base Plate Stress: 12.9 ksi
 Allowable Plate Stress: 32.4 ksi
 Base Plate Stress Ratio: 39.9% **Pass**

Flexural Check

| |
|--------------|
| Rigid |
| AISC LRFD |
| φ*Fy |
| Y.L. Length: |
| 27.50 |

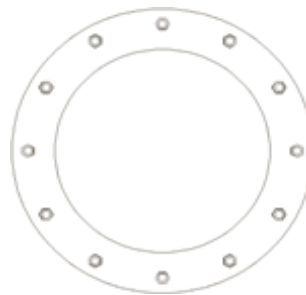
n/a

Stiffener Results

Horizontal Weld : n/a
 Vertical Weld: n/a
 Plate Flex+Shear, fb/Fb+(fv/Fv)^2: n/a
 Plate Tension+Shear, ft/Ft+(fv/Fv)^2: n/a
 Plate Comp. (AISC Bracket): n/a

Pole Results

Pole Punching Shear Check: n/a



* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

** Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes

Stiffened or Unstiffened, Exterior Flange Plate - Any Bolt Material TIA Rev G

Site Data

BU#: 878783
 Site Name: PORTLAND NORTH
 App #: 364306 Rev 0

| Reactions | | |
|------------|---------|---------|
| Mu | 4429.31 | ft-kips |
| Axial, Pu: | 69.38 | kips |
| Shear, Vu: | 39.30 | kips |
| Elevation: | 20 | feet |

| Bolt Threads: |
|---------------------------------|
| X-Excluded |
| $\phi V_n = \phi(0.55 A_b F_u)$ |
| $\phi = 0.75, \phi V_n$ (kips): |
| 43.05 |

| | |
|--------------------|-------|
| Pole Manufacturer: | Other |
|--------------------|-------|

If No stiffeners, Criteria: **TIA G** <-Only Applicable to Unstiffened Cases

| Bolt Data | | | |
|-----------------|--------|---------------|-----|
| Qty: | 60 | | |
| Diameter (in.): | 1.125 | Bolt Fu: | 105 |
| Bolt Material: | A325 | Bolt Fy: | 81 |
| N/A: | 100 | <-- Disregard | |
| N/A: | 75 | <-- Disregard | |
| Circle (in.): | 56.375 | | |

Flange Bolt Results
 Bolt Tension Capacity, $\phi^*T_n, B1$: 60.09 kips
 Adjusted ϕ^*T_n (due to $V_u = V_u/Q_t$), **B**: 60.08 kips
 Max Bolt directly applied T_u : 61.70 Kips
 Min. PL "tc" for **B** cap. w/o Pry: $\tau_u > B$ N/A in
 Min PL "treq" for actual **T** w/ Pry: 1.022 in
 Min PL "t1" for actual **T** w/o Pry: $\tau_u > B$ N/A in
 T allowable w/o Prying: 60.09 kips
 Prying Force, q: 0.00 kips
 Total Bolt Tension = $T_u + q$: 61.70 kips
 Non-Prying Bolt Stress Ratio, T_u/B : 102.7% **Pass**

| Rigid |
|-------------------------------------------|
| ϕ^*T_n |
| $\phi T_n [1 - (V_u / \phi V_n)^2]^{0.5}$ |

| Plate Data | | |
|-------------------|-------|-----|
| Diam: | 58.5 | in |
| Thick, t: | 3.125 | in |
| Grade (Fy): | 36 | ksi |
| Strength, Fu: | 58 | ksi |
| Single-Rod B-eff: | 2.83 | in |

Exterior Flange Plate Results Flexural Check
 Compression Side Plate Stress: 7.7 ksi
 Allowable Plate Stress: 32.4 ksi
 Compression Plate Stress Ratio: 23.8% **Pass**
No Prying Check for $T_u > B$
 Tension Side Stress Ratio, $(t_{req}/t)^2$: 10.7% **Pass**

T > B Case

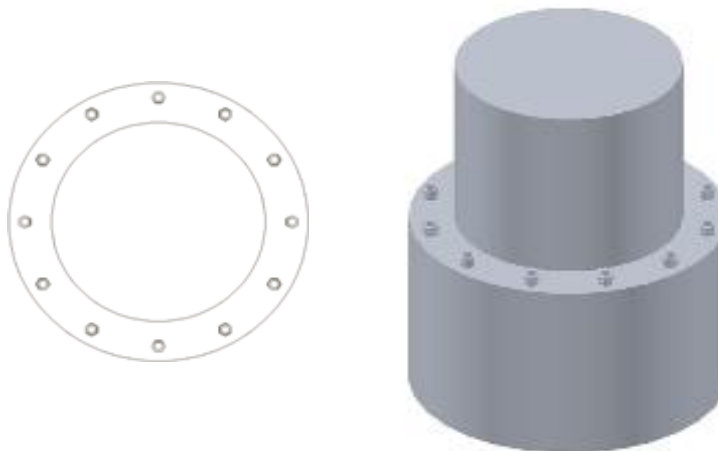
| Rigid |
|--------------------|
| TIA G |
| ϕ^*F_y |
| Comp. Y.L. Length: |
| 16.19 |

| Stiffener Data (Welding at Both Sides) | | |
|----------------------------------------|---|---------------|
| Config: | 0 | * |
| Weld Type: | | |
| Groove Depth: | | <-- Disregard |
| Groove Angle: | | <-- Disregard |
| Fillet H. Weld: | | in |
| Fillet V. Weld: | | in |
| Width: | | in |
| Height: | | in |
| Thick: | | in |
| Notch: | | in |
| Grade: | | ksi |
| Weld str.: | | ksi |

n/a
Stiffener Results
 Horizontal Weld : n/a
 Vertical Weld: n/a
 Plate Flex+Shear, $f_b/F_b + (f_v/F_v)^2$: n/a
 Plate Tension+Shear, $f_t/F_t + (f_v/F_v)^2$: n/a
 Plate Comp. (AISC Bracket): n/a

Pole Results
 Pole Punching Shear Check: n/a

| Pole Data | | |
|--------------------|-------|--------------|
| Diam: | 54 | in |
| Thick: | 0.625 | in |
| Grade: | 35 | ksi |
| # of Sides: | 0 | "0" IF Round |
| Fu | 63 | ksi |
| Reinf. Fillet Weld | 0 | "0" if None |



* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

** Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes

Stiffened or Unstiffened, Interior Flange Plate - Any Bolt Material TIA Rev G

Site Data

BU#: 878783
 Site Name: PORTLAND NORTH
 App #: 364306 Rev 0

Reactions

| | | |
|---------|---------|---------|
| Moment: | 4429.31 | ft-kips |
| Axial: | 69.38 | kips |
| Shear: | 39.30 | kips |

Bolt Threads:

| |
|-----------------------------------|
| X-Excluded |
| $\phi V_n = \phi(0.55 A_b F_u)$ |
| $\phi = 0.75, \phi^* V_n$ (kips): |
| 43.05 |

Manufacturer: Other

Elevation: 20 feet

Bolt Data

| | | | |
|----------------|--------|---------------|-----|
| Qty: | 60 | | |
| Diam: | 1.125 | Bolt Fu: | 105 |
| Bolt Material: | A325 | Bolt Fy: | 81 |
| N/A: | 100 | <-- Disregard | |
| N/A: | 75 | <-- Disregard | |
| Circle: | 56.375 | in | |

Interior Flange Bolt Results

Maximum Bolt Tension, Tu: 61.7 Kips, Ext. Tu=Interior Tu
 Adjusted $\phi^* T_n$ (due to $V_u = V_u / Q_t$): 60.1 Kips
 Bolt Stress Ratio: 102.7% **Pass**

Plate Data

| | | |
|-------------------|-------|-----------------|
| Plate Outer Diam: | 58.75 | in |
| Plate Inner Diam: | 54.25 | in (Hole @ Ctr) |
| Thick: | 3.125 | in |
| Grade: | 36 | ksi |
| Effective Width: | 3.08 | in |

Interior Flange Plate Results

Flexural Check
 Controlling Bolt Axial Force: 64.0 Kips, Ext. Cu=Interior Cu
 Plate Stress: 10.1 ksi
 Allowable Plate Stress, $\phi^* F_y$: 32.4 ksi
 Plate Stress Ratio: 31.2% **Pass**

Stiffener Data (Welding at Both Sides)

| | | |
|-----------------|---|---------------|
| Config: | 0 | * |
| Weld Type: | | |
| Groove Depth: | | <-- Disregard |
| Groove Angle: | | <-- Disregard |
| Fillet H. Weld: | | in |
| Fillet V. Weld: | | in |
| Width: | | in |
| Height: | | in |
| Thick: | | in |
| Notch: | | in |
| Grade: | | ksi |
| Weld str.: | | ksi |

n/a

Stiffener Results

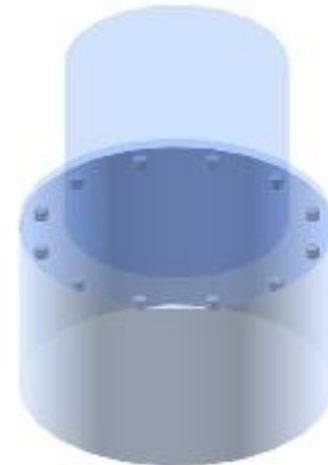
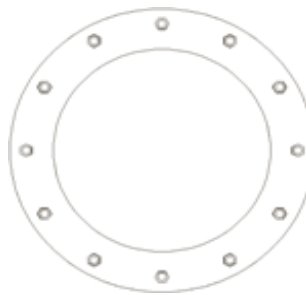
Horizontal Weld : n/a
 Vertical Weld: n/a
 Plate Flex+Shear, $f_b / F_b + (f_v / F_v)^2$: n/a
 Plate Tension+Shear, $f_t / F_t + (f_v / F_v)^2$: n/a
 Plate Comp. (AISC Bracket): n/a

Pole Results

Pole Punching Shear Check: n/a

Pole Data

| | | |
|------------------|-------|--------------|
| Pole OuterDiam: | 60 | in |
| Thick: | 0.625 | in |
| Pole Inner Diam: | 58.75 | in |
| Grade: | 35 | ksi |
| # of Sides: | 0 | "0" IF Round |
| Fu | 63 | ksi |



* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

** Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes

Stiffened or Unstiffened, Exterior Flange Plate - Any Bolt Material TIA Rev G

Site Data

BU#: 878783
 Site Name: PORTLAND NORTH
 App #: 364306 Rev 0

| Reactions | | |
|------------|---------|---------|
| Mu | 2932.39 | ft-kips |
| Axial, Pu: | 48.99 | kips |
| Shear, Vu: | 35.27 | kips |
| Elevation: | 60 | feet |

| Bolt Threads: |
|---------------------------------------------|
| X-Excluded |
| $\phi V_n = \phi(0.55 \cdot A_b \cdot F_u)$ |
| $\phi = 0.75, \phi \cdot V_n$ (kips): |
| 38.88 |

| | |
|--------------------|-------|
| Pole Manufacturer: | Other |
|--------------------|-------|

If No stiffeners, Criteria: TIA G <-Only Applicable to Unstiffened Cases

| Bolt Data | | | |
|-----------------|--------|---------------|-----|
| Qty: | 56 | | |
| Diameter (in.): | 1 | Bolt Fu: | 120 |
| Bolt Material: | A325 | Bolt Fy: | 92 |
| N/A: | 100 | <-- Disregard | |
| N/A: | 75 | <-- Disregard | |
| Circle (in.): | 50.375 | | |

Flange Bolt Results
 Bolt Tension Capacity, $\phi \cdot T_n, B1$: 54.54 kips
 Adjusted $\phi \cdot T_n$ (due to $V_u = V_u / Q_t$), **B**: 54.53 kips
 Max Bolt directly applied T_u : 49.02 Kips
 Min. PL "tc" for **B** cap. **w/o Pry**: 1.032 in
 Min PL "treq" for actual **T w/ Pry**: 0.845 in
 Min PL "t1" for actual **T w/o Pry**: 0.979 in
 T allowable w/o Prying: 54.54 kips
 Prying Force, q: 0.00 kips
 Total Bolt Tension= $T_u + q$: 49.02 kips
 Non-Prying Bolt Stress Ratio, T_u / B : 89.9% Pass

| Rigid |
|-------------------------------------------|
| $\phi \cdot T_n$ |
| $\phi T_n [1 - (V_u / \phi V_n)^2]^{0.5}$ |

| Plate Data | | |
|-------------------|------|-----|
| Diam: | 52.5 | in |
| Thick, t: | 2.75 | in |
| Grade (Fy): | 36 | ksi |
| Strength, Fu: | 58 | ksi |
| Single-Rod B-eff: | 2.69 | in |

Exterior Flange Plate Results Flexural Check
 Compression Side Plate Stress: 8.2 ksi
 Allowable Plate Stress: 32.4 ksi
 Compression Plate Stress Ratio: 25.3% Pass
No Prying
 Tension Side Stress Ratio, $(t_{req}/t)^2$: 9.4% Pass

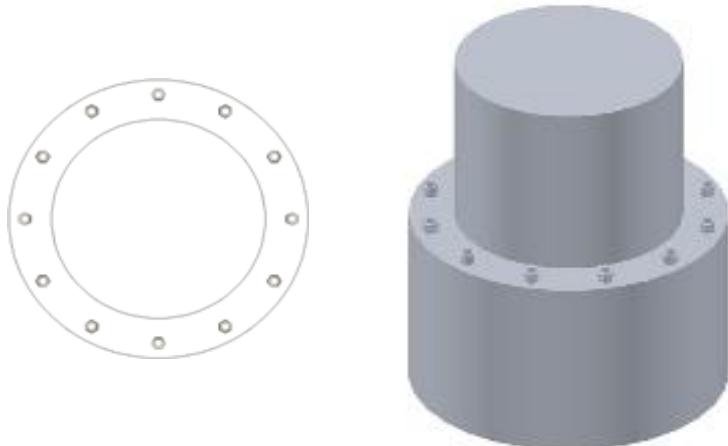
$\alpha' < 0$ case

| Rigid |
|--------------------|
| TIA G |
| $\phi \cdot F_y$ |
| Comp. Y.L. Length: |
| 15.29 |

| Stiffener Data (Welding at Both Sides) | | |
|----------------------------------------|---|---------------|
| Config: | 0 | * |
| Weld Type: | | |
| Groove Depth: | | <-- Disregard |
| Groove Angle: | | <-- Disregard |
| Fillet H. Weld: | | in |
| Fillet V. Weld: | | in |
| Width: | | in |
| Height: | | in |
| Thick: | | in |
| Notch: | | in |
| Grade: | | ksi |
| Weld str.: | | ksi |

n/a
Stiffener Results
 Horizontal Weld : n/a
 Vertical Weld: n/a
 Plate Flex+Shear, $f_b / F_b + (f_v / F_v)^2$: n/a
 Plate Tension+Shear, $f_t / F_t + (f_v / F_v)^2$: n/a
 Plate Comp. (AISC Bracket): n/a
Pole Results
 Pole Punching Shear Check: n/a

| Pole Data | | |
|--------------------|-------|--------------|
| Diam: | 48 | in |
| Thick: | 0.625 | in |
| Grade: | 35 | ksi |
| # of Sides: | 0 | "0" IF Round |
| Fu | 63 | ksi |
| Reinf. Fillet Weld | 0 | "0" if None |



* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt
 ** Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes

Stiffened or Unstiffened, Interior Flange Plate - Any Bolt Material TIA Rev G

Site Data

BU#: 878783
 Site Name: PORTLAND NORTH
 App #: 364306 Rev 0

Manufacturer: Other

Bolt Data

| | | | |
|----------------|--------|---------------|-----|
| Qty: | 56 | | |
| Diam: | 1 | Bolt Fu: | 120 |
| Bolt Material: | A325 | Bolt Fy: | 92 |
| N/A: | 100 | <-- Disregard | |
| N/A: | 75 | <-- Disregard | |
| Circle: | 50.375 | in | |

Plate Data

| | | |
|-------------------------|-------|-----------------|
| Plate Outer Diam: | 52.75 | in |
| Plate Inner Diam: | 48.25 | in (Hole @ Ctr) |
| Thick: | 2.75 | in |
| Grade: | 36 | ksi |
| Effective Width: | 2.96 | in |

Stiffener Data (Welding at Both Sides)

| | | |
|-----------------|---|---------------|
| Config: | 0 | * |
| Weld Type: | | |
| Groove Depth: | | <-- Disregard |
| Groove Angle: | | <-- Disregard |
| Fillet H. Weld: | | in |
| Fillet V. Weld: | | in |
| Width: | | in |
| Height: | | in |
| Thick: | | in |
| Notch: | | in |
| Grade: | | ksi |
| Weld str.: | | ksi |

Pole Data

| | | |
|------------------|-------|--------------|
| Pole OuterDiam: | 54 | in |
| Thick: | 0.625 | in |
| Pole Inner Diam: | 52.75 | in |
| Grade: | 35 | ksi |
| # of Sides: | 0 | "0" IF Round |
| Fu | 63 | ksi |

Reactions

| | | |
|---------------------------|---------|---------|
| Moment: | 2932.39 | ft-kips |
| Axial: | 48.99 | kips |
| Shear: | 35.27 | kips |
| Exterior Flange Run, T+q: | 49.02 | kips |

Bolt Threads:

| |
|-----------------------------------|
| X-Excluded |
| $\phi V_n = \phi(0.55 A_b F_u)$ |
| $\phi = 0.75, \phi^* V_n$ (kips): |
| 38.88 |

Elevation: 60 feet

Interior Flange Bolt Results

Maximum Bolt Tension, Tu: 49.0 Kips, Ext. Tu=Interior Tu
 Adjusted $\phi^* T_n$ (due to $V_u = V_u / Q_t$): 54.5 Kips
 Bolt Stress Ratio: 89.9% **Pass**

Interior Flange Plate Results

Flexural Check
 Controlling Bolt Axial Force: 50.8 Kips, Ext. Cu=Interior Cu
 Plate Stress: 10.8 ksi
 Allowable Plate Stress, $\phi^* F_y$: 32.4 ksi
 Plate Stress Ratio: 33.3% **Pass**

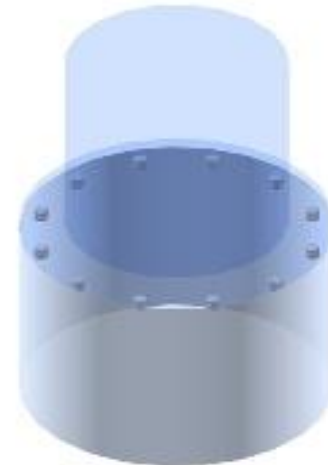
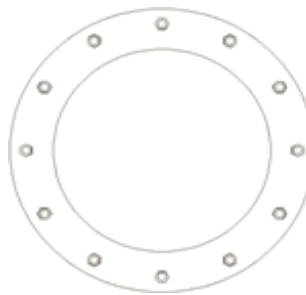
n/a

Stiffener Results

Horizontal Weld : n/a
 Vertical Weld: n/a
 Plate Flex+Shear, $f_b / F_b + (f_v / F_v)^2$: n/a
 Plate Tension+Shear, $f_t / F_t + (f_v / F_v)^2$: n/a
 Plate Comp. (AISC Bracket): n/a

Pole Results

Pole Punching Shear Check: n/a



* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

** Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes

Stiffened or Unstiffened, Exterior Flange Plate - Any Bolt Material TIA Rev G

Site Data

BU#: 878783
 Site Name: PORTLAND NORTH
 App #: 364306 Rev 0

| Reactions | | |
|------------|---------|---------|
| Mu | 1616.62 | ft-kips |
| Axial, Pu: | 30.78 | kips |
| Shear, Vu: | 30.34 | kips |
| Elevation: | 100 | feet |

| Bolt Threads: |
|---------------------------------------------|
| X-Excluded |
| $\phi V_n = \phi(0.55 \cdot A_b \cdot F_u)$ |
| $\phi = 0.75, \phi \cdot V_n$ (kips): |
| 27.34 |

| | |
|--------------------|-------|
| Pole Manufacturer: | Other |
|--------------------|-------|

If No stiffeners, Criteria: TIA G <-Only Applicable to Unstiffened Cases

| Bolt Data | | |
|-----------------|--------|--------------|
| Qty: | 52 | |
| Diameter (in.): | 0.75 | Bolt Fu: 150 |
| Bolt Material: | Other | Bolt Fy: 130 |
| Strength (Fu): | 150 | ksi |
| Yield (Fy): | 130 | ksi |
| Circle (in.): | 41.375 | |

Flange Bolt Results
 Bolt Tension Capacity, $\phi \cdot T_n, B1$: 37.58 kips
 Adjusted $\phi \cdot T_n$ (due to $V_u = V_u / Q_t$), **B**: 37.57 kips
 Max Bolt directly applied T_u : 35.47 Kips
 Min. PL "tc" for **B** cap. **w/o Pry**: 1.749 in
 Min PL "treq" for actual **T w/ Pry**: 1.634 in
 Min PL "t1" for actual **T w/o Pry**: 1.699 in
 T allowable w/o Prying: 37.58 kips
 Prying Force, q: 0.00 kips
 Total Bolt Tension = $T_u + q$: 35.47 kips
 Non-Prying Bolt Stress Ratio, T_u / B : 94.4% Pass

| Rigid |
|-------------------------------------------|
| $\phi \cdot T_n$ |
| $\phi T_n [1 - (V_u / \phi V_n)^2]^{0.5}$ |

| Plate Data | | |
|-------------------|------|-----|
| Diam: | 46.5 | in |
| Thick, t: | 2.5 | in |
| Grade (Fy): | 36 | ksi |
| Strength, Fu: | 58 | ksi |
| Single-Rod B-eff: | 2.17 | in |

Exterior Flange Plate Results Flexural Check
 Compression Side Plate Stress: 15.9 ksi
 Allowable Plate Stress: 32.4 ksi
 Compression Plate Stress Ratio: 49.1% Pass
No Prying
 Tension Side Stress Ratio, $(t_{req}/t)^2$: 42.7% Pass

$\alpha' < 0$ case

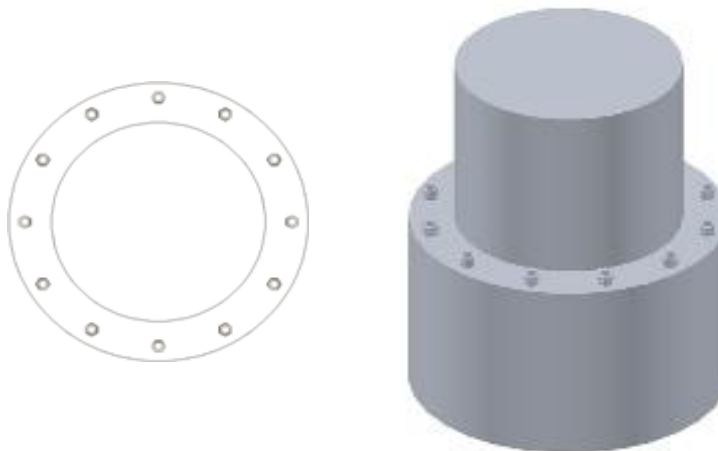
| Rigid |
|--------------------|
| TIA G |
| $\phi \cdot F_y$ |
| Comp. Y.L. Length: |
| 20.39 |

| Stiffener Data (Welding at Both Sides) | | |
|----------------------------------------|---|---------------|
| Config: | 0 | * |
| Weld Type: | | |
| Groove Depth: | | <-- Disregard |
| Groove Angle: | | <-- Disregard |
| Fillet H. Weld: | | in |
| Fillet V. Weld: | | in |
| Width: | | in |
| Height: | | in |
| Thick: | | in |
| Notch: | | in |
| Grade: | | ksi |
| Weld str.: | | ksi |

n/a
Stiffener Results
 Horizontal Weld : n/a
 Vertical Weld: n/a
 Plate Flex+Shear, $f_b / F_b + (f_v / F_v)^2$: n/a
 Plate Tension+Shear, $f_t / F_t + (f_v / F_v)^2$: n/a
 Plate Comp. (AISC Bracket): n/a

Pole Results
 Pole Punching Shear Check: n/a

| Pole Data | | |
|--------------------|-----|--------------|
| Diam: | 36 | in |
| Thick: | 0.5 | in |
| Grade: | 35 | ksi |
| # of Sides: | 0 | "0" IF Round |
| Fu | 63 | ksi |
| Reinf. Fillet Weld | 0 | "0" if None |



* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

** Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes

Stiffened or Unstiffened, Interior Flange Plate - Any Bolt Material TIA Rev G

Site Data

BU#: 878783
 Site Name: PORTLAND NORTH
 App #: 364306 Rev 0

Manufacturer: Other

Bolt Data

| | | | |
|----------------|--------|----------|-----|
| Qty: | 52 | | |
| Diam: | 0.75 | Bolt Fu: | 150 |
| Bolt Material: | Other | Bolt Fy: | 130 |
| Strength (Fu): | 150 | ksi | |
| Yield (Fy): | 130 | ksi | |
| Circle: | 41.375 | in | |

Plate Data

| | | |
|-------------------|-------|-----------------|
| Plate Outer Diam: | 46.75 | in |
| Plate Inner Diam: | 36.25 | in (Hole @ Ctr) |
| Thick: | 2.5 | in |
| Grade: | 36 | ksi |
| Effective Width: | 2.82 | in |

Stiffener Data (Welding at Both Sides)

| | | |
|-----------------|---|---------------|
| Config: | 0 | * |
| Weld Type: | | |
| Groove Depth: | | <-- Disregard |
| Groove Angle: | | <-- Disregard |
| Fillet H. Weld: | | in |
| Fillet V. Weld: | | in |
| Width: | | in |
| Height: | | in |
| Thick: | | in |
| Notch: | | in |
| Grade: | | ksi |
| Weld str.: | | ksi |

Pole Data

| | | |
|------------------|-------|--------------|
| Pole OuterDiam: | 48 | in |
| Thick: | 0.625 | in |
| Pole Inner Diam: | 46.75 | in |
| Grade: | 35 | ksi |
| # of Sides: | 0 | "0" IF Round |
| Fu | 63 | ksi |

Reactions

| | | |
|---------------------------|---------|---------|
| Moment: | 1616.62 | ft-kips |
| Axial: | 30.78 | kips |
| Shear: | 30.34 | kips |
| Exterior Flange Run, T+q: | 35.47 | kips |

Bolt Threads:

| |
|-----------------------------------|
| X-Excluded |
| $\phi V_n = \phi(0.55 A_b F_u)$ |
| $\phi = 0.75, \phi^* V_n$ (kips): |
| 27.34 |

Elevation: 100 feet

Interior Flange Bolt Results

Maximum Bolt Tension, Tu: 35.5 Kips, Ext. Tu=Interior Tu
 Adjusted $\phi^* T_n$ (due to $V_u = V_u / Q_t$): 37.6 Kips
 Bolt Stress Ratio: 94.4% **Pass**

Interior Flange Plate Results

Flexural Check
 Controlling Bolt Axial Force: 36.7 Kips, Ext. Cu=Interior Cu
 Plate Stress: 22.3 ksi
 Allowable Plate Stress, $\phi^* F_y$: 32.4 ksi
 Plate Stress Ratio: 68.9% **Pass**

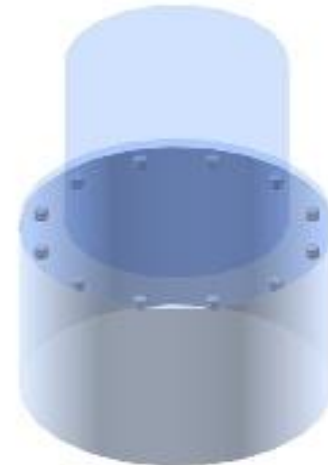
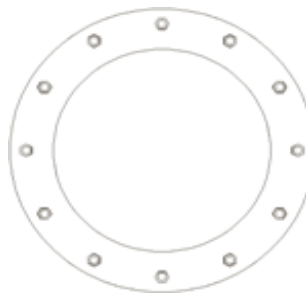
n/a

Stiffener Results

Horizontal Weld : n/a
 Vertical Weld: n/a
 Plate Flex+Shear, $f_b / F_b + (f_v / F_v)^2$: n/a
 Plate Tension+Shear, $f_t / F_t + (f_v / F_v)^2$: n/a
 Plate Comp. (AISC Bracket): n/a

Pole Results

Pole Punching Shear Check: n/a



* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

** Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes

Stiffened or Unstiffened, Exterior Flange Plate - Any Bolt Material TIA Rev G

Site Data

BU#: 878783
 Site Name: PORTLAND NORTH
 App #: 364306 Rev 0

| Reactions | | |
|------------|--------|---------|
| Mu | 502.03 | ft-kips |
| Axial, Pu: | 16.58 | kips |
| Shear, Vu: | 22.50 | kips |
| Elevation: | 140 | feet |

| Bolt Threads: |
|---------------------------------------------|
| X-Excluded |
| $\phi V_n = \phi(0.55 \cdot A_b \cdot F_u)$ |
| $\phi = 0.75, \phi \cdot V_n$ (kips): |
| 27.34 |

| | |
|--------------------|-------|
| Pole Manufacturer: | Other |
|--------------------|-------|

If No stiffeners, Criteria: **TIA G** <-Only Applicable to Unstiffened Cases

| Bolt Data | | |
|-----------------|-------|--------------|
| Qty: | 24 | |
| Diameter (in.): | 0.75 | Bolt Fu: 150 |
| Bolt Material: | Other | Bolt Fy: 130 |
| Strength (Fu): | 150 | ksi |
| Yield (Fy): | 130 | ksi |
| Circle (in.): | 29.5 | |

Flange Bolt Results
 Bolt Tension Capacity, $\phi \cdot T_n, B1$: 37.58 kips
 Adjusted $\phi \cdot T_n$ (due to $V_u = V_u / Q_t$), **B**: 37.55 kips
 Max Bolt directly applied T_u : 33.35 Kips
 Min. PL "tc" for **B** cap. **w/o Pry**: 1.474 in
 Min PL "treq" for actual **T w/ Pry**: 1.274 in
 Min PL "t1" for actual **T w/o Pry**: 1.389 in
 T allowable w/o Prying: 37.58 kips
 Prying Force, q: 0.00 kips
 Total Bolt Tension= $T_u + q$: 33.35 kips
 Non-Prying Bolt Stress Ratio, T_u / B : 88.8% **Pass**

| Rigid |
|-------------------------------------------|
| $\phi \cdot T_n$ |
| $\phi T_n [1 - (V_u / \phi V_n)^2]^{0.5}$ |

| Plate Data | | |
|-------------------|-------|-----|
| Diam: | 34.75 | in |
| Thick, t: | 1.875 | in |
| Grade (Fy): | 36 | ksi |
| Strength, Fu: | 58 | ksi |
| Single-Rod B-eff: | 3.14 | in |

Exterior Flange Plate Results Flexural Check
 Compression Side Plate Stress: 16.4 ksi
 Allowable Plate Stress: 32.4 ksi
 Compression Plate Stress Ratio: 50.7% **Pass**
No Prying
 Tension Side Stress Ratio, $(t_{req} / t)^2$: 46.1% **Pass**

$\alpha' < 0$ case

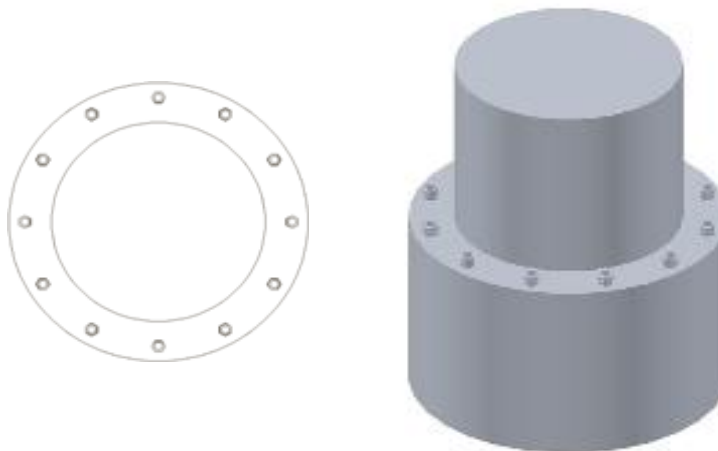
| Rigid |
|--------------------|
| TIA G |
| $\phi \cdot F_y$ |
| Comp. Y.L. Length: |
| 17.15 |

| Stiffener Data (Welding at Both Sides) | | |
|----------------------------------------|---|---------------|
| Config: | 0 | * |
| Weld Type: | | |
| Groove Depth: | | <-- Disregard |
| Groove Angle: | | <-- Disregard |
| Fillet H. Weld: | | in |
| Fillet V. Weld: | | in |
| Width: | | in |
| Height: | | in |
| Thick: | | in |
| Notch: | | in |
| Grade: | | ksi |
| Weld str.: | | ksi |

n/a
Stiffener Results
 Horizontal Weld : n/a
 Vertical Weld: n/a
 Plate Flex+Shear, $f_b / F_b + (f_v / F_v)^2$: n/a
 Plate Tension+Shear, $f_t / F_t + (f_v / F_v)^2$: n/a
 Plate Comp. (AISC Bracket): n/a

Pole Results
 Pole Punching Shear Check: n/a

| Pole Data | | |
|--------------------|-----|--------------|
| Diam: | 24 | in |
| Thick: | 0.5 | in |
| Grade: | 35 | ksi |
| # of Sides: | 0 | "0" IF Round |
| Fu | 63 | ksi |
| Reinf. Fillet Weld | 0 | "0" if None |



* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

** Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes

Stiffened or Unstiffened, Interior Flange Plate - Any Bolt Material TIA Rev G

Site Data

BU#: 878783
 Site Name: PORTLAND NORTH
 App #: 364306 Rev 0

Reactions

Moment: 502.03 ft-kips
 Axial: 16.58 kips
 Shear: 22.50 kips

Bolt Threads:

X-Excluded
 $\phi V_n = \phi(0.55 A_b F_u)$
 $\phi = 0.75, \phi^* V_n$ (kips):
 27.34

Manufacturer: Other

Elevation: 140 feet

Bolt Data

| | | | |
|----------------|-------|----------|-----|
| Qty: | 24 | | |
| Diam: | 0.75 | Bolt Fu: | 150 |
| Bolt Material: | Other | Bolt Fy: | 130 |
| Strength (Fu): | 150 | ksi | |
| Yield (Fy): | 130 | ksi | |
| Circle: | 29.5 | in | |

Interior Flange Bolt Results

Maximum Bolt Tension, Tu: 33.3 Kips, Ext. Tu=Interior Tu
 Adjusted $\phi^* T_n$ (due to $V_u = V_u / Q_t$): 37.6 Kips
 Bolt Stress Ratio: 88.8% **Pass**

Plate Data

| | | |
|-------------------|-------|-----------------|
| Plate Outer Diam: | 35 | in |
| Plate Inner Diam: | 24.25 | in (Hole @ Ctr) |
| Thick: | 1.875 | in |
| Grade: | 36 | ksi |
| Effective Width: | 4.58 | in |

Interior Flange Plate Results

Flexural Check
 Controlling Bolt Axial Force: 34.7 Kips, Ext. Cu=Interior Cu
 Plate Stress: 23.7 ksi
 Allowable Plate Stress, $\phi^* F_y$: 32.4 ksi
 Plate Stress Ratio: 73.2% **Pass**

Stiffener Data (Welding at Both Sides)

| | | |
|-----------------|---|---------------|
| Config: | 0 | * |
| Weld Type: | | |
| Groove Depth: | | <-- Disregard |
| Groove Angle: | | <-- Disregard |
| Fillet H. Weld: | | in |
| Fillet V. Weld: | | in |
| Width: | | in |
| Height: | | in |
| Thick: | | in |
| Notch: | | in |
| Grade: | | ksi |
| Weld str.: | | ksi |

n/a

Stiffener Results

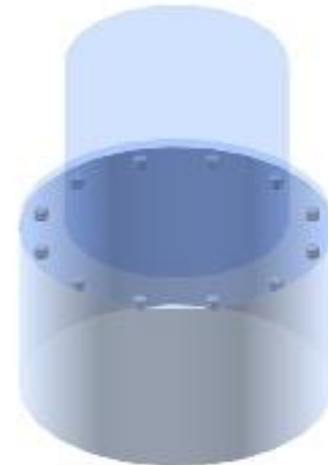
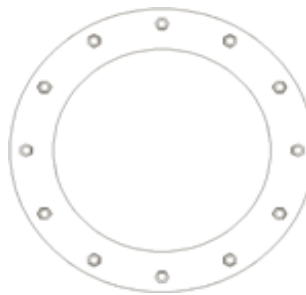
Horizontal Weld : n/a
 Vertical Weld: n/a
 Plate Flex+Shear, $f_b / F_b + (f_v / F_v)^2$: n/a
 Plate Tension+Shear, $f_t / F_t + (f_v / F_v)^2$: n/a
 Plate Comp. (AISC Bracket): n/a

Pole Results

Pole Punching Shear Check: n/a

Pole Data

| | | |
|------------------|-----|--------------|
| Pole OuterDiam: | 36 | in |
| Thick: | 0.5 | in |
| Pole Inner Diam: | 35 | in |
| Grade: | 35 | ksi |
| # of Sides: | 0 | "0" IF Round |
| Fu | 63 | ksi |



* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

** Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes

| | | | |
|-----------------|----------------|-------------------------------------------------|-----------------------|
| Project Name: | Portland North | JACOBS Jacobs Engineering Group, Inc. | Created On: 6/17/2014 |
| Project Number: | BU#878783 | | Checked By: SMR |
| Job Number: | WO#1367448 | | Revised On: 9/16/2016 |
| Date: | 2/22/2017 | | Revision No.: 2.5 |

Monopole Additional Anchor Rod and Bracket Checks

| | | |
|--------------------|------|--------|
| New Design? | No | |
| Code: | G | |
| Moment (M) | 5230 | kip-ft |
| Axial (P) | 81 | kips |
| Shear (V) | 41 | kips |

| Existing Rods | | |
|-----------------------|-----------|-----------------|
| Number of Rods | 32 | |
| Rod Circle | 66 | in |
| y | 33 | in |
| Moment of Inertia (I) | 43560 | in ⁴ |
| Rod Grade | A36 | |
| Thread Type | Non-Upset | |
| Diameter (d) | 2 | in |
| Ag | 3.14 | in ² |
| Ae | 2.5 | in ² |
| Fy | 36 | ksi |
| Fu | 58 | ksi |
| Tension per Rod | 110.51 | kips |
| Shear per Rod | 1.28 | kips |
| Allowable | 116.0 | kips |
| % Capacity | 95.3% | % |
| | Pass | |

| New Rods | | |
|-----------------------|-----------|-----------------|
| Number of Rods | 3 | |
| Rod Circle | 77 | in |
| y | 38.5 | in |
| Moment of Inertia (I) | 5,558 | in ⁴ |
| Rod Grade | A615-75 | |
| Thread Type | Non-Upset | |
| Diameter (d) | 2 | in |
| Ag | 3.14 | in ² |
| Ae | 2.50 | in ² |
| Fy | 75 | ksi |
| Fu | 100 | ksi |
| Tension per Rod | 122.98 | kips |
| Shear per Rod | 0.00 | kips |
| Allowable | 200.0 | kips |
| % Capacity | 61.5% | % |
| | Pass | |

| | | |
|-------------------------|----------|-----------------|
| Total Moment of Inertia | 49118.44 | in ⁴ |
|-------------------------|----------|-----------------|

| Pipe/HSS Checks | | |
|-------------------------|--------|-----------------|
| Pipe/HSS | Pipe | |
| Diameter Pipe/Width HSS | 3.5 | in |
| thickness of pipe | 0.6 | in |
| inner diameter of pipe | 2.3 | in |
| Pipe Fy | 50 | ksi |
| Length of Pipe | 26 | in |
| Pipe Area | 5.17 | in ² |
| MOI of pipe | 5.79 | in ⁴ |
| r pipe | 1.06 | in |
| Allowable Bearing | 348.98 | k |
| % Capacity | 35.2% | % |
| | Pass | |
| Fa | 27.80 | ksi |
| Fe | 474.2 | ksi |
| kl/r | 24.57 | |
| $4.71 * v(E/Fy)$ | 113.43 | |
| Fcr | 47.84 | ksi |
| ϕPn | 232.65 | k |
| % Capacity | 52.9% | % |
| | Pass | |

| Horizontal and Vertical Weld to Pole Checks | | |
|---------------------------------------------|-------|---------|
| Pole Grade | | |
| Fy | 35 | ksi |
| Fu | 60 | ksi |
| Base Plate Grade | | |
| Fy | 36 | ksi |
| Fu | 58 | ksi |
| Bracket Plate Grade | | |
| Fy | 65 | ksi |
| Fu | 80 | ksi |
| Bracket plate thickness | 1.25 | in |
| Bracket Plate width | 6.875 | in |
| Height of vertical weld from base plate | 18 | in |
| Notch | 0.75 | in |
| Gap between Base Plate and Pipe | 0.875 | in |
| Vertical fillet weld size (bracket to pole) | 8 | x/16 in |
| Weld Material Grade | 70 | ksi |

Case 1: Vertical Fillet Weld Controls

Case 2: Vertical Fillet Base Material Controls

| Check extreme fiber 1 | | |
|-----------------------|-------|-----|
| ra1 | 15.56 | ksi |
| Rnweld | 31.50 | ksi |
| Cap1 | 49.4% | % |
| | Pass | |
| Check extreme fiber 2 | | |
| ra2 | 14.60 | ksi |
| Fu | 58.00 | ksi |
| Rnplate | 26.10 | ksi |
| Cap2 | 55.9% | % |
| | Pass | |

| Check extreme fiber 1 | | |
|-----------------------|-------|-----|
| ra1 | 12.33 | ksi |
| Rnweld | 27.00 | ksi |
| Cap3 | 45.7% | % |
| | Pass | |
| Check extreme fiber 2 | | |
| ra2 | 12.56 | ksi |
| Fu | 58.00 | ksi |
| Rnplate | 26.10 | ksi |
| Cap4 | 48.1% | % |
| | Pass | |

| Vertical Weld to Pipe Checks | | |
|---------------------------------------------|--------|---------|
| length of vertical weld to pipe | 18 | in |
| Vertical fillet weld size (bracket to pipe) | 6 | x/16 in |
| Weld Material Grade | 70 | ksi |
| C1 | 1 | |
| ex | 1.75 | in |
| a | 0.10 | |
| C | 3.72 | |
| Allowable | 301.30 | k |
| % Capacity | 40.8% | % |
| | Pass | |

| Bracket Plate Check | | |
|-------------------------------------|--------|-----------------|
| ΦF_v | 35.1 | ksi |
| ΦV_n | 789.75 | k |
| V_n | 123.0 | k |
| bracket plate welded to base plate? | No | |
| Elastic Section Modulus | 67.5 | in ³ |
| Plastic Section Modulus | 101.3 | in ³ |
| ΦM_n | 5923.1 | k-in |
| M_u | 1060.7 | k-in |
| % Capacity | 17.9% | % |
| | Pass | |

| | | | | |
|-----------------|----------------|------------------------------------------------------------------------------------|---------------|-----------|
| Project Name: | PORTLAND NORTH |  | Created On: | 9/4/2014 |
| Project Number: | BU#878783 | | Checked By: | JTE |
| Job Number: | WO#1367448 | | Revised On: | 10/6/2014 |
| Date: | 2/22/2017 | | Revision No.: | 1.5 |

Single Pad Stability Checks

| Foundation Properties | | |
|-----------------------|------------|----|
| Foundation Type: | Single Pad | |
| Length (Short Side): | 25 | ft |
| Width (Long Side): | 28 | ft |
| Thickness: | 5 | ft |
| Bearing Depth: | 4.5 | ft |

| Reactions | |
|-----------|------|
| Code: | G |
| Axial: | 81 |
| Shear: | 41 |
| Moment: | 5230 |

| Factored Loads | |
|----------------|-------|
| 0.9 Axial: | 60.75 |
| 1.2 Axial: | 81 |
| Shear: | 41 |
| Moment: | 5230 |

| Soil Properties | | |
|---------------------------------|-----|-----|
| Unit Weight: | 105 | pcf |
| Friction Angle: | 28 | |
| Cohesion: | 0 | psf |
| Friction Coefficient (μ): | 0.3 | |
| Ultimate Bearing Strength: | 7 | ksf |
| Water Table: | 99 | ft |

Calculate Bearing Length

| Sliding Resistance: | | |
|----------------------|---------|------|
| K_p : | 2.76983 | |
| Friction Resistance: | 159.98 | kip |
| Passive Resistance: | 82.45 | kip |
| Total Resistance: | 242.43 | kip |
| Sliding Capacity: | 16.9% | Pass |

| Overturning Check | | |
|----------------------|--------|--------|
| Orthogonal Direction | | |
| Eccentricity: | 10.69 | ft |
| Allowable Moment: | 5554.9 | kip-ft |
| Moment Capacity: | 94.2% | Pass |
| Diagonal Direction: | | |
| Eccentricity: | 9.0 | ft |
| Allowable Moment: | 6306.1 | kip-ft |
| Moment Capacity: | 82.9% | Pass |

| Bearing Check | | |
|----------------------|-------|------|
| Orthogonal Direction | | |
| Compressive Force: | 711.0 | kip |
| Eccentricity: | 7.56 | ft |
| q_{max} : | 3.425 | ksf |
| Bearing Capacity: | 65.2% | Pass |
| Diagonal Direction | | |
| Compressive Force: | 711.0 | kip |
| Eccentricity: | 5.64 | ft |
| q_{max} : | 3.097 | ksf |
| Bearing Capacity: | 59.0% | Pass |

| | | | | |
|-----------------|----------------|------------------------------------------------------------------------------------|---------------|-----------|
| Project Name: | PORTLAND NORTH |  | Created On: | 9/4/2014 |
| Project Number: | BU#878783 | | Checked By: | JTE |
| Job Number: | WO#1367448 | | Revised On: | 10/6/2014 |
| Date: | 2/22/2017 | | Revision No.: | 1.5 |

Single Pad Structural Checks

| Structural Properties | | |
|--------------------------|------|-----|
| f'_c : | 4000 | psi |
| Concrete Density: | 150 | pcf |
| Clear Cover: | 3 | in |
| Flexural Rebar Strength: | 60 | ksi |
| Tie Strength: | 40 | ksi |

| Pad Reinforcement: | | |
|--------------------|----|--|
| Rebar Size: | 10 | |
| Rebar Quantity: | 22 | |

| Anchor Bolt Properties | | |
|------------------------|----|----|
| Anchor Bolt Circle | 66 | in |

| Factored Pad Reactions | | |
|------------------------|-------|--------|
| Max Shear: | 204.5 | kip |
| Max Moment: | 402.0 | kip-ft |

| Pad Beam Shear | | |
|----------------------|--------|------|
| d_{pad} : | 55.095 | in |
| V_c : | 2090.7 | kip |
| ϕV_n : | 1568.0 | kip |
| Beam Shear Capacity: | 13.0% | Pass |

| Punching Shear | | |
|--------------------------|--------|------|
| q_{comp} : | 1.016 | ksf |
| Punching Force: | 629.8 | kip |
| b_o : | 380.4 | in |
| V_c : | 5302.5 | kip |
| ϕV_n : | 3976.9 | kip |
| Punching Shear Capacity: | 15.8% | Pass |

| Pad Flexural Strength | | |
|-----------------------|--------|--------|
| β_1 : | 0.85 | |
| c : | 1.934 | in |
| a : | 1.644 | in |
| M_n : | 7582.0 | kip-ft |
| ϕM_n : | 6823.8 | kip-ft |
| Flexural Capacity: | 5.9% | Pass |