

280 Trumbull Street
Hartford, CT 06103-3597
Main (860) 275-8200
Fax (860) 275-8299
kbaldwin@rc.com
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Also admitted in Massachusetts

June 20, 2014

RECEIVED
JUN 26 2014

CONNECTICUT
SITING COUNCIL

Melanie A. Bachman
Acting Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Completion of Construction Activity**

Dear Ms. Bachman:

The purpose of this letter is to notify the Siting Council that construction activity associated with the Cellco Partnership d/b/a Verizon Wireless telecommunications facility modifications listed below has been completed.

EM-VER-007-130226 – 260 Beckley Road, Berlin, Connecticut
EM-VER-011-130125 – 811 Blue Hills Avenue, Bloomfield, Connecticut
EM-VER-011-130214 – 785 Park Avenue, Bloomfield, Connecticut
EM-VER-012-130107 – 130 Vernon Road, Bolton, Connecticut
EM-VER-043-130220 – 148 Roberts Road, East Hartford, Connecticut
EM-VER-057-130214 – Butternut Hollow Road, Greenwich, Connecticut
EM-VER-059-130220 – 68 Groton Long Point Road, Groton, Connecticut
EM-VER-062-130128 – 265 Benham Street, Hamden, Connecticut
EM-VER-062-130220 – 890 Evergreen Avenue, Hamden, Connecticut
EM-VER-064-130125 – 590-600 Asylum Avenue, Hartford, Connecticut
EM-VER-064-130220 – 439-455 Homestead Avenue, Hartford, Connecticut
EM-VER-077-130220A – 60 Adams Street, Manchester, Connecticut
EM-VER-077-130220B – 266 Center Street, Manchester, Connecticut
EM-VER-080-130128 – 38 Elm Street, Meriden, Connecticut
EM-VER-096-130125 – 586 Danbury Road, New Milford, Connecticut
EM-VER-094-130114 – 605 Willard Avenue, Newington, Connecticut
EM-VER-094-130220 – 123 Costello Road, Newington, Connecticut
EM-VER-144-130227 – Indian Ledge Road, Trumbull, Connecticut
EM-VER-146-130123 – 777 Talcottville Road, Vernon, Connecticut
EM-VER-152-130301 – 41 Manitock Hill Road, Waterford, Connecticut
EM-VER-156-130227 – 85 Plainfield Avenue, West Haven, Connecticut



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Melanie A. Bachman
June 20, 2014
Page 2

✓ **EM-VER-164-130128 – 482 Pigeon Hill Road, Windsor, Connecticut**
EM-VER-169-130220 – 445 Prospect Street, Woodstock, Connecticut

If you have any questions or need any additional information regarding this facility please do not hesitate to contact me.

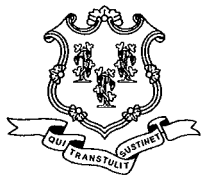
Sincerely,



Kenneth C. Baldwin

Copy to:
Sandy M. Carter





STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051

Phone: (860) 827-2935 Fax: (860) 827-2950

E-Mail: siting.council@ct.gov

www.ct.gov/csc

March 26, 2013

Kenneth C. Baldwin, Esq.
Robinson & Cole
280 Trumbull Street
Hartford, CT 06103-3597

RE: **EM-VER-152-130301** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 41Manitock Hill Road, Waterford, Connecticut.

Dear Attorney Baldwin:

The Connecticut Siting Council (Council) hereby acknowledges your notice to modify this existing telecommunications facility, pursuant to Section 16-50j-73 of the Regulations of Connecticut State Agencies with the following conditions:

- Any deviation from the proposed modification as specified in this notice and supporting materials with Council shall render this acknowledgement invalid;
- Any material changes to this modification as proposed shall require the filing of a new notice with the Council;
- Within 45 days after completion of construction, the Council shall be notified in writing that construction has been completed;
- The validity of this action shall expire one year from the date of this letter; and
- The applicant may file a request for an extension of time beyond the one year deadline provided that such request is submitted to the Council not less than 60 days prior to the expiration;

The proposed modifications including the placement of all necessary equipment and shelters within the tower compound are to be implemented as specified here and in your notice dated March 1, 2013. The modifications are in compliance with the exception criteria in Section 16-50j-72 (b) of the Regulations of Connecticut State Agencies as changes to an existing facility site that would not increase tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by six decibels, and increase the total radio frequencies electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

This decision is under the exclusive jurisdiction of the Council. Please be advised that the validity of this action shall expire one year from the date of this letter. Any additional change to this facility will require explicit notice to this agency pursuant to Regulations of Connecticut State Agencies Section 16-50j-73. Such notice shall include all relevant information regarding the proposed change with cumulative worst-case modeling of radio frequency exposure at the closest point of uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin 65. Thank you for your attention and cooperation.

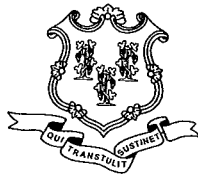
Very truly yours,

Linda Roberts
Executive Director

LR/CDM/jb

c: The Honorable Daniel M. Steward, First Selectman, Town of Waterford
Thomas V. Wagner, Planning Director, Town of Waterford
Crown Castle





STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051

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E-Mail: siting.council@ct.gov

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March 11, 2013

The Honorable Daniel M. Steward
First Selectman
Town of Waterford
Town Hall
15 Rope Ferry Road
Waterford, CT 06385

RE: **EM-VER-152-130301** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 41 Manitock Hill Road, Waterford, Connecticut.

Dear Mr. Steward:

The Connecticut Siting Council (Council) received a request to modify an existing telecommunications facility, pursuant to Regulations of Connecticut State Agencies Section 16-50j-72, a copy of which has already been provided to you.

If you have any questions or comments regarding the proposal, please call me or inform the Council by March 25, 2013.

Thank you for your cooperation and consideration.

Very truly yours,

Linda Roberts
Executive Director

LR/jb

c: Thomas V. Wagner, Planning Director, Town of Waterford

KENNETH C. BALDWIN

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Hartford, CT 06103-3597
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Direct (860) 275-8345

Also admitted in Massachusetts

March 1, 2013

ORIGINAL

Linda Roberts
Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

RECEIVED
MAR - 1 2013
CONNECTICUT
SITING COUNCIL

Re: **Notice of Exempt Modification – Facility Modification
41 Manitock Hill Road, Waterford, Connecticut**

Dear Ms. Roberts:

Cellco Partnership d/b/a Verizon Wireless (“Cellco”) currently maintains twelve (12) wireless telecommunications antennas at the 107-foot level on an existing 136-foot tower at the above-referenced address. The tower is owned by Crown Castle. The Council approved Cellco’s shared use of this tower in 2005. Cellco now intends replace six (6) of its existing antennas with three (3) model BXA-80063-4CF cellular antennas and three (3) model BXA-171063-12CF AWS antennas, at the same 107-foot level. Cellco also intends to install three (3) remote radio heads (“RRHs”) behind its antennas and one (1) HYBRIFLEX™ fiber cable attached to the leg of the tower. Attached behind Tab 1 are the specifications for the new antennas, RRHs and HYBRIFLEX™ cable.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Daniel M. Steward, First Selectman for the Town of Waterford. The Town of Waterford is the owner of the property on which the tower is located.

The planned modifications to the facility fall squarely within those activities explicitly provided for in R.C.S.A. § 16-50j-72(b)(2).



Law Offices

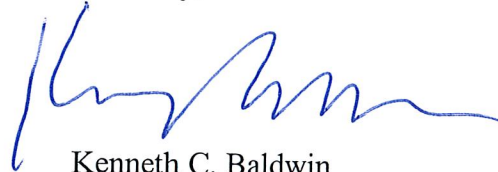
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- PROVIDENCE
- HARTFORD
- NEW LONDON
- STAMFORD
- WHITE PLAINS
- NEW YORK CITY
- ALBANY
- SARASOTA

Linda Roberts
March 1, 2013
Page 2

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas and RRHs will be located at the 107-foot level on the 136-foot tower.
2. The proposed modifications will not involve any change to ground-mounted equipment and, therefore, will not require the extension of the site boundary.
3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.
4. The operation of the additional antennas will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) adopted safety standard. A cumulative General Power Density table for Cellco's modified facility is included behind Tab 2.
5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.
6. The tower and its foundation can support Cellco's proposed modifications. (*See Structural Analysis Report attached behind Tab 3*).

For the foregoing reasons, Cellco respectfully submits that the proposed modifications to the above-referenced telecommunications facility constitutes an exempt modification under R.C.S.A. § 16-50j-72(b)(2).

Sincerely,



Kenneth C. Baldwin

Enclosures
Copy to:

Daniel M. Steward, Waterford First Selectman
Sandy M. Carter

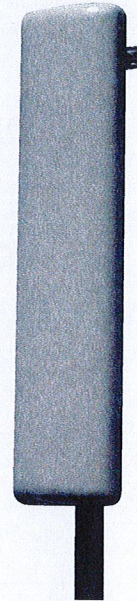


BXA-80063-4CF-EDIN-X

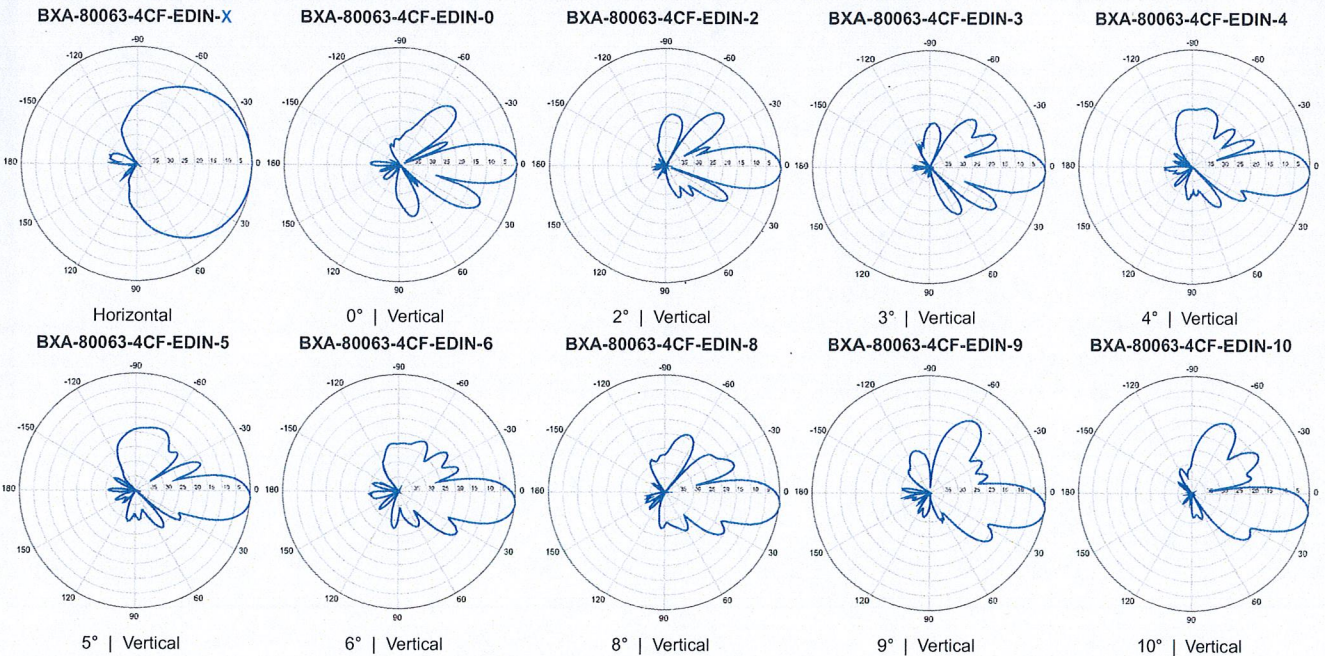
X-Pol | FET Panel | 63° | 13.0 dBd

Replace "X" with desired electrical downtilt.

Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering.



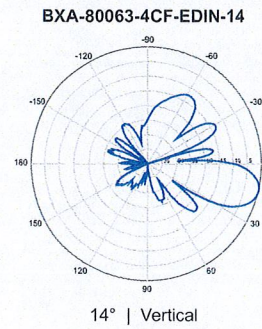
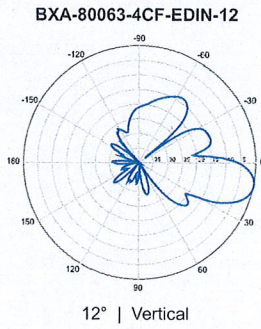
| Electrical Characteristics | |
|---|---|
| Frequency bands | 806-900 MHz* |
| *Optional frequency band for iDEN | 806-941 MHz (specify when ordering) |
| Polarization | ±45° |
| Horizontal beamwidth | 63° |
| Vertical beamwidth | 15° |
| Gain | 13.0 dBd (15.1 dBi) |
| Electrical downtilt (X) | 0, 2, 3, 4, 5, 6, 8, 9, 10, 12, 14 |
| Impedance | 50Ω |
| VSWR | ≤1.4:1 |
| Upper sidelobe suppression (0°) | -22.1 dB |
| Front-to-back ratio (+/-30°) | -34.9 dB |
| Null fill | 5% (-26.02 dB) |
| Isolation between ports | < -30 dB |
| Input power with EDIN connectors | 500 W |
| Input power with NE connectors | 300 W |
| Lightning protection | Direct Ground |
| Connector(s) | 2 Ports / EDIN or NE / Female / Center (Back) |
| Mechanical Characteristics | |
| Dimensions Length x Width x Depth | 1205 x 285 x 133 mm 47.4 x 11.2 x 5.2 in |
| Depth with z-brackets | 173 mm 6.8 in |
| Weight without mounting brackets | 4.5 kg 9.9 lbs |
| Survival wind speed | > 201 km/hr > 125 mph |
| Wind area | Front: 0.34 m ² Side: 0.16 m ² Front: 3.7 ft ² Side: 1.7 ft ² |
| Wind load @ 161 km/hr (100 mph) | Front: 498 N Side: 260 N Front: 111 lbf Side: 55 lbf |
| Mounting Options | |
| | Part Number Fits Pipe Diameter Weight |
| 2-Point Mounting & Downtilt Bracket Kit | 36210006 40-115 mm 1.57-4.5 in 4.1 kg 9 lbs |
| Concealment Configurations | For concealment configurations, order BXA-80063-4CF-EDIN-X-FP |



Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.

BXA-80063-4CF-EDIN-X

X-Pol | FET Panel | 63° | 13.0 dBd



Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.

BXA-171063-12CF-EDIN-X

X-Pol | FET Panel | 63° | 19.0 dBi

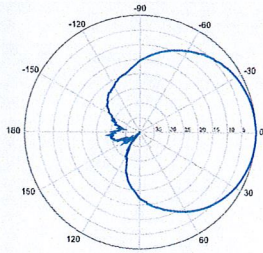
Replace "X" with desired electrical downtilt.

Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering.

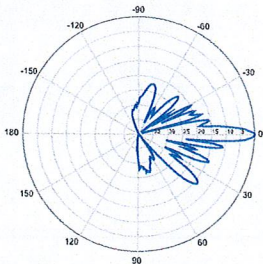


| Electrical Characteristics | 1710-2170 MHz | | |
|---|---|--|---------------------|
| Frequency bands | 1710-1880 MHz | 1850-1990 MHz | 1920-2170 MHz |
| Polarization | ±45° | ±45° | ±45° |
| Horizontal beamwidth | 68° | 65° | 60° |
| Vertical beamwidth | 4.5° | 4.5° | 4.5° |
| Gain | 16.1 dBd / 18.2 dBi | 16.5 dBd / 18.6 dBi | 16.9 dBd / 19.0 dBi |
| Electrical downtilt (X) | 0, 2, 5 | | |
| Impedance | 50Ω | | |
| VSWR | ≤1.5:1 | | |
| First upper sidelobe | < -17 dB | | |
| Front-to-back ratio | > 30 dB | | |
| In-band isolation | > 28 dB | | |
| IM3 (20W carrier) | < -150 dBc | | |
| Input power | 300 W | | |
| Lightning protection | Direct Ground | | |
| Connector(s) | 2 Ports / EDIN or NE / Female / Center (Back) | | |
| Operating temperature | -40° to +60° C / -40° to +140° F | | |
| Mechanical Characteristics | | | |
| Dimensions Length x Width x Depth | 1842 x 154 x 105 mm | | 72.5 x 6.1 x 4.1 in |
| Depth with z-brackets | 133 mm | | 5.2 in |
| Weight without mounting brackets | 5.8 kg | | 12.8 lbs |
| Survival wind speed | > 201 km/hr | | > 125 mph |
| Wind area | Front: 0.28 m ² Side: 0.19 m ² | Front: 3.1 ft ² Side: 2.1 ft ² | |
| Wind load @ 161 km/hr (100 mph) | Front: 460 N Side: 304 N | Front: 103 lbf Side: 68 lbf | |
| Mounting Options | Part Number | Fits Pipe Diameter | Weight |
| 2-Point Mounting Bracket Kit | 26799997 | 50-102 mm 2.0-4.0 in | 2.3 kg 5 lbs |
| 2-Point Mounting & Downtilt Bracket Kit | 26799999 | 50-102 mm 2.0-4.0 in | 3.6 kg 8 lbs |
| Concealment Configurations | For concealment configurations, order BXA-171063-12CF-EDIN-X-FP | | |

BXA-171063-12CF-EDIN-X

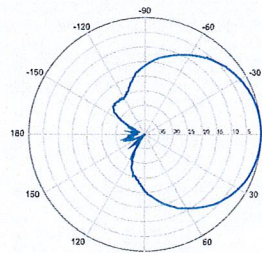


Horizontal | 1710-1880 MHz
BXA-171063-12CF-EDIN-0

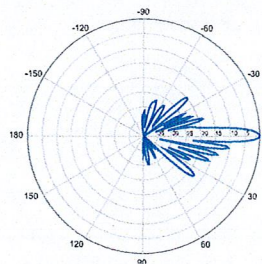


0° | Vertical | 1710-1880 MHz

BXA-171063-12CF-EDIN-X

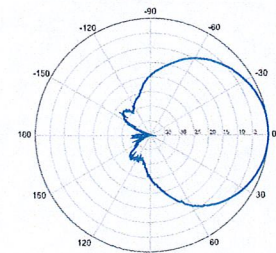


Horizontal | 1850-1990 MHz
BXA-171063-12CF-EDIN-0

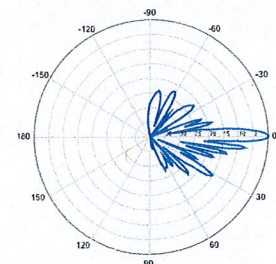


0° | Vertical | 1850-1990 MHz

BXA-171063-12CF-EDIN-X



Horizontal | 1920-2170 MHz
BXA-171063-12CF-EDIN-0



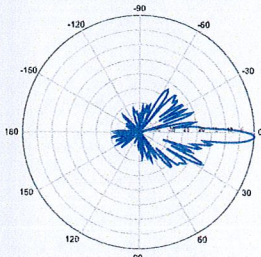
0° | Vertical | 1920-2170 MHz

Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.

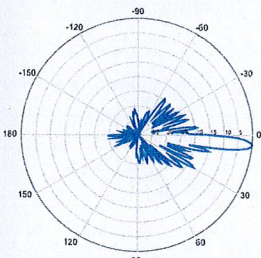
BXA-171063-12CF-EDIN-X

X-Pol | FET Panel | 63° | 19.0 dBi

BXA-171063-12CF-EDIN-2

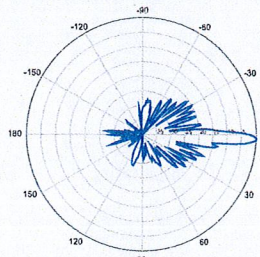


2° | Vertical | 1710-1880 MHz
BXA-171063-12CF-EDIN-5

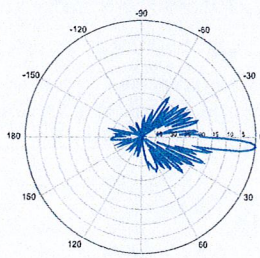


5° | Vertical | 1710-1880 MHz

BXA-171063-12CF-EDIN-2

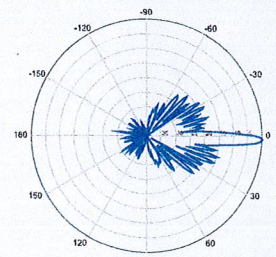


2° | Vertical | 1850-1990 MHz
BXA-171063-12CF-EDIN-5

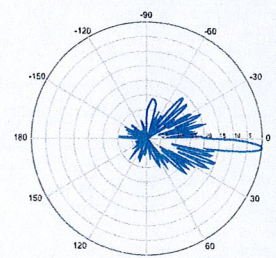


5° | Vertical | 1850-1990 MHz

BXA-171063-12CF-EDIN-2



2° | Vertical | 1920-2170 MHz
BXA-171063-12CF-EDIN-5



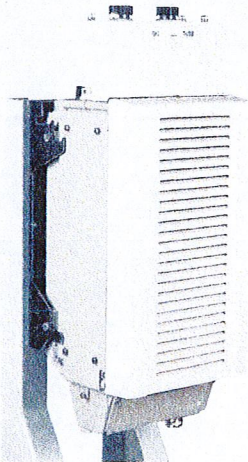
5° | Vertical | 1920-2170 MHz

Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.

Alcatel-Lucent RRH2x40-AWS

REMOTE RADIO HEAD

The Alcatel-Lucent RRH2x40-AWS is a high-power, small form-factor Remote Radio Head (RRH) operating in the AWS frequency band (1700/2100MHz - 3GPP Band 4). The Alcatel-Lucent RRH2x40-AWS is designed with an eco-efficient approach, providing operators with the means to achieve high quality and capacity coverage with minimum site requirements.



A distributed eNodeB expands deployment options by using two components, a Base Band Unit (BBU) containing the digital assets and a separate RRH containing the radio-frequency (RF) elements. This modular design optimizes available space and allows the main components of an eNodeB to be installed separately, within the same site or several kilometres apart.

The Alcatel-Lucent RRH2x40-AWS is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information. The Alcatel-Lucent RRH2x40-AWS has two transmit RF paths, 40 W RF output power per transmit path, and is designed to manage up to four-way receive diversity. The device is ideally suited to support macro coverage, with multiple-input multiple-output (MIMO) 2x2 operation in up to 20 MHz of bandwidth.

The Alcatel-Lucent RRH2x40-AWS is designed to make available all the benefits of a distributed eNodeB, with excellent RF characteristics, with low

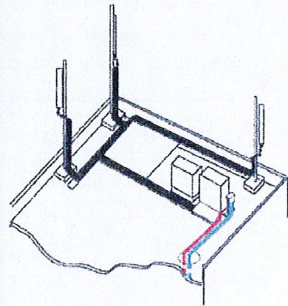
capital expenditures (CAPEX) and low operating expenditures (OPEX). The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment or require costly cranes to be employed, leaving costly coverage holes. However, many of these sites can host an Alcatel-Lucent RRH2x40-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

Fast, low-cost installation and deployment

The Alcatel-Lucent RRH2x40-AWS is a zero-footprint solution and operates noise-free, simplifying negotiations with site property owners and minimizing environmental impacts. Installation can easily be done by a single person because the Alcatel-Lucent RRH2x40-AWS is compact and weighs less than 20 kg (44 lb), eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day — a fraction of the time required for a traditional BTS.

Excellent RF performance

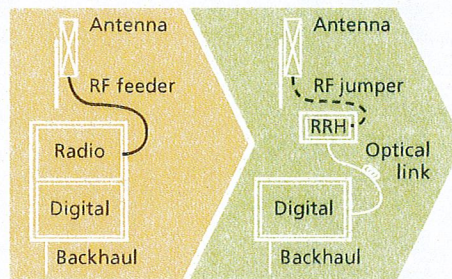
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation costs are reduced or eliminated, and there is no need for a Tower Mounted Amplifier (TMA) because losses introduced by the RF feeder are greatly reduced. The Alcatel-Lucent RRH2x40-AWS provides more RF power while at the same time consuming less electricity.



Macro

Features

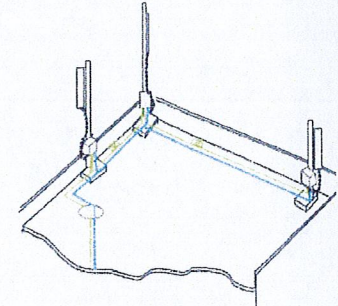
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption



RRH for space-constrained cell sites

Benefits

- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility to network planning



Distributed

Technical specifications

Physical dimensions

- Height: 620 mm (24.4 in.)
- Width: 270 mm (10.63 in.)
- Depth: 170mm (6.7 in.)
- Weight (without mounting kit): less than 20 kg (44 lb)

Power

- Power supply: -48VDC

Operating environment

- Outdoor temperature range:
 - With solar load: -40°C to +50°C (-40°F to +122°F)
 - Without solar load: -40°C to +55°C (-40°F to +131°F)

- Passive convection cooling (no fans)
- Enclosure protection
 - IP65 (International Protection rating)

RF characteristics

- Frequency band: 1700/2100 MHz (AWS); 3GPP Band 4
- Bandwidth: up to 20 MHz
- RF output power at antenna port: 40 W nominal RF power for each Tx port
- Rx diversity: 2-way or 4-way with optional Rx Diversity module
- Noise figure: below 2.0 dB typical
- Antenna Line Device features
 - TMA and Remote electrical tilt (RET) support via AISG v2.0

Optical characteristics

Type/number of fibers

- Single-mode variant
 - One Single Mode Single Fiber per RRH2x, carrying UL and DL using CWDM
 - Single mode dual fiber (SM/DF)
- Multi-mode variant
 - Two Multi-mode fibers per RRH2x: one carrying UL, the other carrying DL

Optical fiber length

- Up to 500 m (0.31 mi), using MM fiber
- Up to 20 km (12.43 mi), using SM fiber

Digital Ports and Alarms

- Two optical ports to support daisy-chaining
- Six external alarms

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HYBRIFLEX™ RRH Hybrid Feeder Cabling Solution, 1-5/8", Single-Mode Fiber

Product Description

RFS' HYBRIFLEX Remote Radio Head (RRH) hybrid feeder cabling solution combines optical fiber and DC power for RRHs in a single lightweight aluminum corrugated cable, making it the world's most innovative solution for RRH deployments.

It was developed to reduce installation complexity and costs at Cellular sites. HYBRIFLEX allows mobile operators deploying an RRH architecture to standardize the RRH installation process and eliminate the need for and cost of cable grounding. HYBRIFLEX combines optical fiber (multi-mode or single-mode) and power in a single corrugated cable. It eliminates the need for junction boxes and can connect multiple RRHs with a single feeder. Standard RFS CELLFLEX® accessories can be used with HYBRIFLEX cable. Both pre-connectorized and on-site options are available.

Features/Benefits

- Aluminum corrugated armor with outstanding bending characteristics – minimizes installation time and enables mechanical protection and shielding
- Same accessories as 1 5/8" coaxial cable
- Outer conductor grounding – Eliminates typical grounding requirements and saves on installation costs
- Lightweight solution and compact design – Decreases tower loading
- Robust cabling – Eliminates need for expensive cable trays and ducts
- Installation of tight bundled fiber optic cable pairs directly to the RRH – Reduces CAPEX and wind load by eliminating need for interconnection
- Optical fiber and power cables housed in single corrugated cable – Saves CAPEX by standardizing RRH cable installation and reducing installation requirements
- Outdoor polyethylene jacket – Ensures long-lasting cable protection

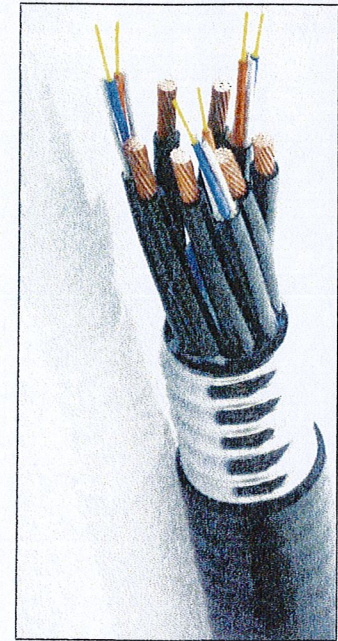


Figure 1: HYBRIFLEX Series

Technical Specifications

| | | | |
|--|--------------------------------|-------------------------|---|
| Structure | | | |
| Outer Conductor Armor: | Corrugated Aluminum | [mm (in)] | 46.5 (1.83) |
| Jacket: | Polyethylene, PE | [mm (in)] | 50.3 (1.98) |
| UV-Protection: | Individual and External Jacket | | Yes |
| Mechanical Properties | | | |
| Weight, Approximate | | [kg/m (lb/ft)] | 1.9 (1.30) |
| Minimum Bending Radius, Single Bending | | [mm (in)] | 200 (8) |
| Minimum Bending Radius, Repeated Bending | | [mm (in)] | 500 (20) |
| Recommended/Maximum Clamp Spacing | | [m (ft)] | 1.0 / 1.2 (3.25 / 4.0) |
| Electrical Properties | | | |
| DC-Resistance Outer Conductor Armor | | [Ω/km (Ω/1000ft)] | 068 (0.205) |
| DC-Resistance Power Cable, 8.4mm ² (8AWG) | | [Ω/km (Ω/1000ft)] | 2.1 (0.307) |
| Fiber Optic Properties | | | |
| Version | | | Single-mode OM3 |
| Quantity, Fiber Count | | | 16 (8 pairs) |
| Core/Clad | | [μm] | 50/125 |
| Primary Coating (Acrylate) | | [μm] | 245 |
| Buffer Diameter, Nominal | | [μm] | 900 |
| Secondary Protection, Jacket, Nominal | | [mm (in)] | 2.0 (0.08) |
| Minimum Bending Radius | | [mm (in)] | 104 (4.1) |
| Insertion Loss @ wavelength 850nm | | dB/km | 3.0 |
| Insertion Loss @ wavelength 1310nm | | dB/km | 1.0 |
| Standards (Meets or exceeds) | | | UL94-V0, UL1666 RoHS Compliant |
| DC Power Cable Properties | | | |
| Size (Power) | | [mm ² (AWG)] | 8.4 (8) |
| Quantity, Wire Count (Power) | | | 16 (8 pairs) |
| Size (Alarm) | | [mm ² (AWG)] | 0.8 (18) |
| Quantity, Wire Count (Alarm) | | | 4 (2 pairs) |
| Type | | | UV protected |
| Strands | | | 19 |
| Primary Jacket Diameter, Nominal | | [mm (in)] | 6.8 (0.27) |
| Standards (Meets or exceeds) | | | NFPA 130, ICEA S-95-658 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant |
| Environment | | | |
| Installation Temperature | | [°C (°F)] | -40 to +65 (-40 to 149) |
| Operation Temperature | | [°C (°F)] | -40 to +65 (-40 to 149) |

* This data is provisional and subject to change.

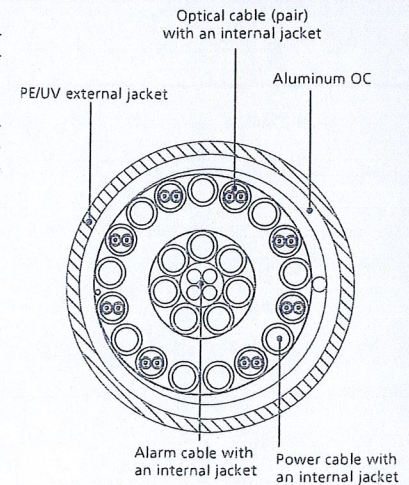


Figure 2: Construction Detail

All information contained in the present datasheet is subject to confirmation at time of ordering.

| Site Name: Waterford 2 | | General | | Power | | Density | | | | | | | |
|-------------------------------|------------|-----------|--------|------------------|--------|--------------------|--------------|-------|--|--|--|--|--------|
| Tower Height: Verizon @ 107ft | | | | | | | | | | | | | |
| CARRIER | # OF CHAN. | WATTS ERP | HEIGHT | CALC. POWER DENS | FREQ. | MAX. PERMISS. EXP. | FRACTION MPE | Total | | | | | |
| *Nextel | 9 | 100 | 127 | 0.0201 | 851 | 0.5673 | 3.54% | | | | | | |
| *Sprint | 11 | 122 | 137 | 0.0257 | 1957.5 | 1.0000 | 2.57% | | | | | | |
| *MetroPCS | 3 | 443.61 | 89 | 0.0604 | 2140 | 1.0000 | 6.04% | | | | | | |
| *AT&T GSM | 2 | 296 | 97 | 0.0226 | 880 | 0.5867 | 3.86% | | | | | | |
| *AT&T GSM | 2 | 427 | 97 | 0.0326 | 1900 | 1.0000 | 3.26% | | | | | | |
| *AT&T UMTS | 2 | 500 | 97 | 0.0382 | 880 | 0.5867 | 6.51% | | | | | | |
| *AT&T UMTS | 2 | 500 | 97 | 0.0382 | 1900 | 1.0000 | 3.82% | | | | | | |
| *AT&T LTE | 1 | 500 | 97 | 0.0191 | 740 | 0.4933 | 3.87% | | | | | | |
| *T-Mobile GSM | 8 | 139 | 117 | 0.0292 | 1945 | 1.0000 | 2.92% | | | | | | |
| *T-Mobile UMTS | 2 | 782 | 117 | 0.0411 | 2100 | 1.0000 | 4.11% | | | | | | |
| Verizon PCS | 11 | 264 | 107 | 0.0912 | 1970 | 1.0000 | 9.12% | | | | | | |
| Verizon Cellular | 9 | 266 | 107 | 0.0752 | 869 | 0.5793 | 12.98% | | | | | | |
| Verizon AWS | 1 | 1750 | 107 | 0.0550 | 2145 | 1.0000 | 5.50% | | | | | | |
| Verizon 700 | 1 | 1050 | 107 | 0.0330 | 698 | 0.4653 | 7.09% | | | | | | |
| * Source: Siting Council | | | | | | | | | | | | | 75.19% |

Date: **December 20, 2012**

Veronica Harris
Crown Castle
1200 McArthur Blvd
Mahwah, NJ 07430
(201) 236-9094



Tower Engineering Professionals
3703 Junction Boulevard
Raleigh, NC
(919) 661-6351
crown@tepgroup.net

Subject: Structural Analysis Report

Carrier Designation: Verizon Wireless Co-Locate
Carrier Site Number: 117854
Carrier Site Name: Waterford 2 CT

Crown Castle Designation: Crown Castle BU Number: 876338
Crown Castle Site Name: Waterford
Crown Castle JDE Job Number: 214291
Crown Castle Work Order Number: 560116
Crown Castle Application Number: 173309 Rev. 1

Engineering Firm Designation: TEP Project Number: 129881

Site Data: 41 Manitock Hill Road, Waterford, New London County, CT 06385
Latitude 41° 21' 16.42", Longitude -72° 9' 3.38"
136 Foot - Self Support Tower

Dear Veronica Harris,

Tower Engineering Professionals 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 510136, in accordance with application 173309, revision 1.

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/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures, ASCE 7-05 Minimum Design Loads for Buildings and Other Structures and the 2005 Connecticut State Building Code based upon a wind speed of 85 mph fastest mile.

All modifications and equipment proposed in this report shall be installed in accordance with the appurtenances listed in Tables 1 and 2 and the attached drawing for the determined available structural capacity to be effective.

We at Tower Engineering Professionals 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: Matt Young, E.I. / NSH

Respectfully submitted by:

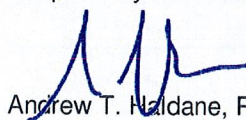

Andrew T. Haldane, P.E.



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1) INTRODUCTION

This tower is a 136-ft self support tower designed by Pirod, Inc. in February of 1999. The tower was originally designed for a wind speed of 90 mph per EIA/TIA-222-F for the appurtenances listed in Table 3. The tower has been modified per reinforcement drawings prepared by Vertical Structures, Inc. in October of 2007. TEP did not visit the site. All information provided to TEP was assumed to be accurate and complete.

2) ANALYSIS CRITERIA

The analysis has been performed in accordance with the TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures and ASCE 7-05 Minimum Design Loads for Buildings and Other Structures using a fastest mile wind speed of 85 mph with no ice, 37.6 mph with 0.75 inch escalating ice thickness and 50 mph under service loads.

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 |
|---------------------|----------------------------|--------------------|----------------------|-----------------|----------------------|---------------------|------|
| 107.0 | 107.0 | 3 | Alcatel Lucent | RRH2x40-AWS | 1 | 1-5/8 | 1 |
| | | 3 | Antel | BXA-171063/12CF | | | |
| | | 3 | Antel | BXA-80063/4CF | | | |
| | | 1 | RFS Celwave | DB-T1-6Z-8AB-0Z | | | |

Notes:

- 1) See "Appendix B – Base Level Drawing" for assumed feed line configuration.

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 |
|---------------------|----------------------------|--------------------|----------------------|--------------------------------------|----------------------|---------------------|------|
| 136.0 | 136.0 | 6 | Alcatel Lucent | 1900MHz RRH (65MHz) | 3 | 1-1/4 | 1 |
| | | 3 | Alcatel Lucent | 800MHz 2X50W RRH w/ Filter | | | |
| | | 3 | RFS Celwave | APXVSP18-C-A20 w/ Mount Pipe | | | |
| | | 3 | RFS Celwave | IBC1900BB-1 | | | |
| | | 3 | RFS Celwave | IBC1900HG-2A | | | |
| | | 1 | Tower Mounts | Platform Mount [LP 405-1] | | | |
| 127.0 | 127.0 | 12 | Decibel | DB844H90E-XY w/ Mount Pipe | 12 | 1-1/4 | 2 |
| | | 1 | Tower Mounts | Sector Mount [SM 411-3] | | | |
| 117.0 | 119.0 | 3 | EMS Wireless | RR90-17-02DP w/ Mount Pipe | 14 | 1-5/8 | 2 |
| | | 3 | RFS Celwave | APX16DWV-16DWV-S-E-A20 w/ Mount Pipe | | | |
| | 6 | RFS Celwave | ATMAA1412D-1A20 | | | | |
| | 117.0 | 1 | Tower Mounts | Sector Mount [SM 411-3] | | | |
| 107.0 | 107.0 | 3 | Antel | BXA-185063/8CF | 12 | 1-5/8 | 2 |
| | | 3 | Antel | BXA-70063/6CF | | | |
| | | 6 | RFS Celwave | FD9R6004/2C-3L | | | |
| | | 1 | Tower Mounts | Sector Mount [SM 307-3] | | | |
| | | 6 | Antel | LPA-80063/4CF | - | - | 3 |

| Mounting Level (ft) | Center Line Elevation (ft) | Number of Antennas | Antenna Manufacturer | Antenna Model | Number of Feed Lines | Feed Line Size (in) | Note |
|---------------------|----------------------------|--------------------|-------------------------|-------------------------------------|----------------------|---------------------|------|
| 97.0 | 97.0 | 1 | Andrew | SBNH-1D6565C w/ Mount Pipe | 1 2 6 | 3/8 5/8 1-1/4 | 2 |
| | | 3 | Ericsson | RRUS-11 | | | |
| | | 2 | KMW Comm. | AM-X-CD-14-65-00T-RET w/ Mount Pipe | | | |
| | | 3 | Powerwave Technologies | 7770.00 w/ Mount Pipe | | | |
| | | 6 | Powerwave Technologies | LGP21401 | | | |
| | | 1 | Raycap | DC6-48-60-18-8F | | | |
| | | 1 | Tower Mounts | Side Arm Mount [SO 201-3] | | | |
| 87.0 | 89.0 | 3 | Kathrein | 800 10504 w/ Mount Pipe | 1 6 | 3/8 7/8 | 2 |
| | | 3 | Kathrein | 860 10118 | | | |
| | 1 | Tower Mounts | Sector Mount [SM 104-3] | | | | |
| 80.0 | 81.0 | 1 | Unknown | GPS | 1 | 1/2 | 2 |
| | 80.0 | 1 | Tower Mounts | Side Arm Mount [SO 701-1] | | | |
| 72.0 | 72.0 | 2 | Unknown | GPS | 2 | 1/2 | 2 |
| | | 2 | Tower Mounts | Side Arm Mount [SO 701-1] | | | |

Notes:

- 1) Reserved equipment
- 2) Existing equipment
- 3) Existing equipment; to be removed

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) |
|---------------------|----------------------------|--------------------|----------------------|----------------------|----------------------|---------------------|
| 136.0 | 136.0 | 12 | Allgon | 7184.05 | 12 | 1 5/8 |
| | | 1 | Tower Mounts | Low Profile Platform | | |
| 127.0 | 127.0 | 12 | Swedcom | ALP9212 | 12 | 1-5/8 |
| | | 3 | Tower Mounts | T-Frame | | |
| 117.0 | 117.0 | 12 | Swedcom | ALP9212 | 12 | 1 5/8 |
| | | 3 | Tower Mounts | T-Frame | | |
| 102.0 | 102.0 | 2 | Decibel | DB810 | 2 | 1-5/8 |
| | | 2 | Tower Mounts | 6'-8" Rigid Sidearms | | |
| 80.0 | 80.0 | 2 | Generic | GPS Antenna | 2 | 1/2 |

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

| Document | Remarks | Reference | Source |
|------------------------------|---------------------------|-----------|----------|
| Geotechnical Reports | SEA Consultants, Inc. | 2035622 | CCISites |
| Tower Foundation Drawings | Pirod, Inc. | 2068030 | CCISites |
| Tower Manufacturer Drawings | Pirod, Inc. | 1441523 | CCISites |
| Tower Reinforcement Drawings | Vertical Structures, Inc. | 2125417 | CCISites |
| Previous Structural Analysis | Crown Castle | 3352462 | CCISites |

3.1) Analysis Method

tnxTower (version 6.0.4.0), 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) The tower and foundation were built in accordance with the manufacturer's specifications.
- 2) The tower and foundation 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 "Appendix B – Base Level Drawing".
- 4) When applicable, transmission cables are considered as structural components for calculating wind loads as allowed by the standard.
- 5) All tower components are in sufficient condition to carry their full design capacity.
- 6) Serviceability with respect to antenna twist, tilt, roll, or lateral translation, is not checked and is left to the carrier or tower owner to ensure conformance.
- 7) All antenna mounts and mounting hardware are structurally sufficient to carry the full design capacity requirements of appurtenance wind area and weight as provided by the original manufacturer specifications. It is the carrier's responsibility to ensure compliance to the structural limitations of the existing and/or proposed antenna mounts. TEP did not perform a site visit to verify the size, condition or capacity of the antenna mounts and did not analyze antennas supporting mounts as part of this structural analysis report.

This analysis may be affected if any assumptions are not valid or have been made in error. Tower Engineering Professionals 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 |
|-------------|----------------|----------------|--------------------------------------|------------------|---------|----------------|------------|-------------|
| T1 | 136 - 130 | Leg | 1 1/2 | 1 | -5.73 | 46.64 | 12.3 | Pass |
| T2 | 130 - 110 | Leg | 2 | 22 | -39.91 | 97.25 | 41.0 | Pass |
| T3 | 110 - 95 | Leg | 2 1/4 | 79 | -77.63 | 128.26 | 60.5 | Pass |
| T4 | 95 - 90 | Leg | 2 1/4 | 121 | -97.23 | 147.86 | 65.8 | Pass |
| T5 | 90 - 80 | Leg | Pirod 105244 w/ 1 1/4" Reinforcement | Note 1 | Note 1 | Note 1 | 66.4 | Pass |
| T6 | 80 - 60 | Leg | Pirod 105217 | 154 | -149.38 | 184.67 | 80.9 | Pass |
| T7 | 60 - 40 | Leg | Pirod 105218 | 169 | -187.22 | 258.24 | 72.5 | Pass |
| T8 | 40 - 20 | Leg | Pirod 105218 | 184 | -220.04 | 258.24 | 85.2 | Pass |

| Section No. | Elevation (ft) | Component Type | Size | Critical Element | P (K) | SF*P_allow (K) | % Capacity | Pass / Fail | |
|-------------|----------------|----------------------|-------------------|------------------|---------|----------------|---------------------------|-------------|-------------|
| T9 | 20 - 0 | Leg | Pirod 105219 | 199 | -249.90 | 343.62 | 72.7 | Pass | |
| T1 | 136 - 130 | Diagonal | 3/4 | 16 | -1.43 | 5.22 | 27.4 | Pass | |
| T2 | 130 - 110 | Diagonal | 7/8 | 33 | -3.45 | 8.17 | 42.2 | Pass | |
| T3 | 110 - 95 | Diagonal | 1 | 89 | -5.04 | 12.27 | 41.1 | Pass | |
| T4 | 95 - 90 | Diagonal | 1 | 129 | -5.76 | 12.15 | 47.4 | Pass | |
| T5 | 90 - 80 | Diagonal | L3x3x3/16 | 151 | -7.66 | 17.60 | 43.5 62.5 (b) | Pass | |
| T6 | 80 - 60 | Diagonal | L2 1/2x2 1/2x3/16 | 157 | -7.39 | 9.65 | 76.6 | Pass | |
| T7 | 60 - 40 | Diagonal | L3x3x3/16 | 172 | -7.00 | 13.37 | 52.4 60.6 (b) | Pass | |
| T8 | 40 - 20 | Diagonal | L3x3x3/16 | 187 | -6.93 | 10.67 | 65.0 | Pass | |
| T9 | 20 - 0 | Diagonal | L3x3x5/16 | 202 | -8.58 | 14.01 | 61.3 | Pass | |
| T4 | 95 - 90 | Secondary Horizontal | 1 1/2 | 135 | -1.68 | 30.81 | 5.5 | Pass | |
| T1 | 136 - 130 | Top Girt | 7/8 | 5 | -0.65 | 5.41 | 12.0 | Pass | |
| T2 | 130 - 110 | Top Girt | 1 | 26 | -0.71 | 9.33 | 7.6 | Pass | |
| T3 | 110 - 95 | Top Girt | 1 | 84 | -1.06 | 7.39 | 14.3 | Pass | |
| T1 | 136 - 130 | Bottom Girt | 7/8 | 8 | -0.45 | 5.41 | 8.3 | Pass | |
| T2 | 130 - 110 | Bottom Girt | 1 | 29 | -1.55 | 7.39 | 21.0 | Pass | |
| T4 | 95 - 90 | Bottom Girt | 1 | 125 | -0.90 | 6.02 | 15.0 | Pass | |
| | | | | | | | Summary | | |
| | | | | | | | Leg (T8) | 85.2 | Pass |
| | | | | | | | Diagonal (T6) | 76.6 | Pass |
| | | | | | | | Secondary Horizontal (T4) | 5.5 | Pass |
| | | | | | | | Top Girt (T3) | 14.3 | Pass |
| | | | | | | | Bottom Girt (T2) | 21.0 | Pass |
| | | | | | | | Bolt Checks | 72.3 | Pass |
| | | | | | | | RATING = | 85.2 | Pass |

Table 6 - Tower Component Stresses vs. Capacity

| Notes | Component | Elevation (ft) | % Capacity | Pass / Fail |
|-------|----------------------------------|----------------|------------|-------------|
| - | Anchor Rods | - | 55.6 | Pass |
| 1 | Base Foundation Soil Interaction | - | 89.7 | Pass |
| 1 | Base Foundation Structural | - | 33.5 | Pass |

| | |
|---|--------------|
| Structure Rating (max from all components) = | 89.7% |
|---|--------------|

Notes:

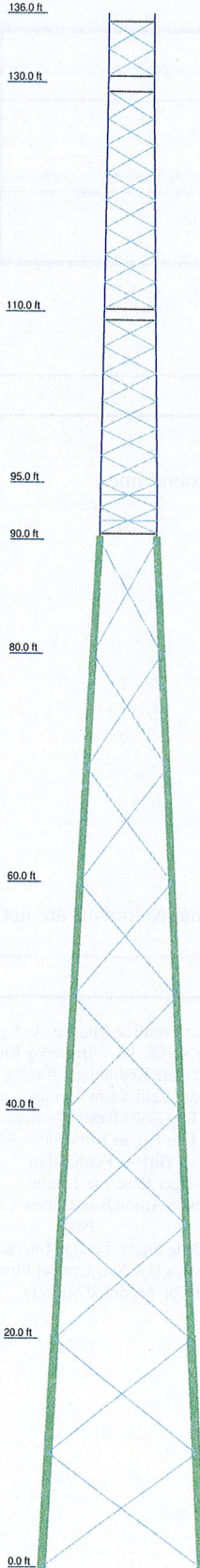
- 1) See additional documentation in "Appendix C - Additional Calculations" for calculations supporting the % capacity listed.

4.1) Recommendations

- 1) If the load differs from that described in Tables 1 and 2 of this report, "Appendix B – Base Level Drawing" or the provisions of this analysis are found to be invalid, another structural analysis should be performed.
- 2) 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 | T ₁ | T ₂ | T ₃ | T ₄ | T ₅ | T ₆ | T ₇ | T ₈ | T ₉ |
| Legs | SR 1 1/2 | SR 2 | SR 2 1/4 | SR 1 | SR 1 | SR 1 1/2 | SR 1 1/2 | SR 1 1/2 | SR 1 1/2 |
| Diagonals | SR 3/4 | SR 7/8 | SR 1 | SR 1 | SR 1 | SR 1 1/2 | SR 1 1/2 | SR 1 1/2 | SR 1 1/2 |
| Diagonal Grade | A572-50 | A572-50 | A572-50 | A572-50 | A572-50 | A572-50 | A572-50 | A572-50 | A572-50 |
| Top Girts | | | | | | | | | |
| Bottom Girts | | | | | | | | | |
| Sacs, Horizontal | | | | | | | | | |
| Face Width (ft) | | | | | | | | | |
| # Panels @ (ft) | | | | | | | | | |
| Weight (K) | 0.3 | 1.2 | 1.2 | 0.6 | 2.3 | 2.8 | 2.8 | 4.4 | 17.0 |



DESIGNED APPURTENANCE LOADING

| TYPE | ELEVATION | TYPE | ELEVATION |
|-------------------------------------|-----------|-------------------------------------|-----------|
| APXVSP18-C-A20 w/ Mount Pipe | 136 | (2) FD9R6004/2C-3L | 107 |
| APXVSP18-C-A20 w/ Mount Pipe | 136 | (2) FD9R6004/2C-3L | 107 |
| APXVSP18-C-A20 w/ Mount Pipe | 136 | (2) FD9R6004/2C-3L | 107 |
| (2) 1900MHz RRH (65MHz) | 136 | BXA-171063/12CF | 107 |
| (2) 1900MHz RRH (65MHz) | 136 | BXA-171063/12CF | 107 |
| (2) 1900MHz RRH (65MHz) | 136 | BXA-171063/12CF | 107 |
| 800MHz 2X50W RRH W/FILTER | 136 | RRH2x40-AWS | 107 |
| 800MHz 2X50W RRH W/FILTER | 136 | RRH2x40-AWS | 107 |
| 800MHz 2X50W RRH W/FILTER | 136 | RRH2x40-AWS | 107 |
| IBC1900BB-1 | 136 | DB-T1-62-8AB-02 | 107 |
| IBC1900BB-1 | 136 | Sector Mount [SM 307-3] | 107 |
| IBC1900BB-1 | 136 | AM-X-CD-14-65-00T-RET w/ Mount Pipe | 97 |
| IBC1900HG-2A | 136 | AM-X-CD-14-65-00T-RET w/ Mount Pipe | 97 |
| IBC1900HG-2A | 136 | SBNH-1DB565C w/ Mount Pipe | 97 |
| IBC1900HG-2A | 136 | 7770.00 w/Mount Pipe | 97 |
| (2) 2.4" x 6-ft pipe | 136 | 7770.00 w/Mount Pipe | 97 |
| (2) 2.4" x 6-ft pipe | 136 | 7770.00 w/Mount Pipe | 97 |
| (2) 2.4" x 6-ft pipe | 136 | (2) LGP21401 | 97 |
| Platform Mount [LP 405-1] | 136 | (2) LGP21401 | 97 |
| (4) DB844H90E-XY w/ Mount Pipe | 127 | (2) LGP21401 | 97 |
| (4) DB844H90E-XY w/ Mount Pipe | 127 | RRUS-11 | 97 |
| (4) DB844H90E-XY w/ Mount Pipe | 127 | RRUS-11 | 97 |
| Sector Mount [SM 411-3] | 127 | RRUS-11 | 97 |
| APX16DWV-16DWV-S-E-A20 w/Mount Pipe | 117 | DC6-48-60-18-8F | 97 |
| APX16DWV-16DWV-S-E-A20 w/Mount Pipe | 117 | Side Arm Mount [SO 201-3] | 97 |
| APX16DWV-16DWV-S-E-A20 w/Mount Pipe | 117 | 800 10504 w/ Mount Pipe | 87 |
| RR90-17-02DP w/ Mount Pipe | 117 | 800 10504 w/ Mount Pipe | 87 |
| RR90-17-02DP w/ Mount Pipe | 117 | 800 10504 w/ Mount Pipe | 87 |
| (2) ATMAA1412D-1A20 | 117 | 860 10118 | 87 |
| (2) ATMAA1412D-1A20 | 117 | 860 10118 | 87 |
| (2) ATMAA1412D-1A20 | 117 | 860 10118 | 87 |
| Sector Mount [SM 411-3] | 117 | 2.4" x 6-ft pipe | 87 |
| BXA-185063/8CF | 107 | 2.4" x 6-ft pipe | 87 |
| BXA-185063/8CF | 107 | Sector Mount [SM 104-3] | 87 |
| BXA-185063/8CF | 107 | GPS | 80 |
| BXA-70063/6CF | 107 | Side Arm Mount [SO 701-1] | 80 |
| BXA-70063/6CF | 107 | GPS | 72 |
| BXA-70063/6CF | 107 | GPS | 72 |
| BXA-80063/4CF | 107 | Side Arm Mount [SO 701-1] | 72 |
| BXA-80063/4CF | 107 | Side Arm Mount [SO 701-1] | 72 |
| BXA-80063/4CF | 107 | | |

SYMBOL LIST

| MARK | SIZE | MARK | SIZE |
|------|--------------------------------------|------|------|
| A | Pirod 105244 w/ 1 1/4" Reinforcement | | |

MATERIAL STRENGTH

| GRADE | Fy | Fu | GRADE | Fy | Fu |
|---------|--------|--------|-------|--------|--------|
| A572-50 | 50 ksi | 65 ksi | A36 | 36 ksi | 58 ksi |

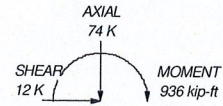
TOWER DESIGN NOTES

1. Tower is located in New London County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 38 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 85.2%

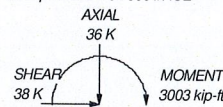
MAX. CORNER REACTIONS AT BASE:

DOWN: 260 K
SHEAR: 26 K


UPLIFT: -233 K
SHEAR: 23 K



TORQUE 2 kip-ft
38 mph WIND - 0.7500 in ICE



TORQUE 6 kip-ft
REACTIONS - 85 mph WIND

| | | | | |
|--|--|--|---|--|
|  Tower Engineering Professionals | Tower Engineering Professionals 3703 Junction Blvd. Raleigh, NC 27603 Phone: (919) 661-6339 FAX: (919) 661-6350 | | Job: Waterford (BU# 876338) Project: TEP No. 129881 Client: Crown Castle Drawn by: Nick Hudson App'd: Code: TIA/EIA-222-F Date: 12/20/12 Scale: NTS Path: C:\Users\nudson\Desktop\Check\876338\876338_LC7.dwg Dwg No. E-1 | |
|--|--|--|---|--|

| | | |
|---|--------------------------------------|-----------------------------------|
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| | Project TEP No. 129881 | Date 12:41:09 12/20/12 |
| | Client Crown Castle | Designed by Nick Hudson |

Tower Input Data

The main tower is a 3x free standing tower with an overall height of 136' above the ground line.

The base of the tower is set at an elevation of 0' above the ground line.

The face width of the tower is 4' at the top and 14' at the base.

This tower is designed using the TIA/EIA-222-F standard.

The following design criteria apply:

Tower is located in New London County, Connecticut.

Basic wind speed of 85 mph.

Nominal ice thickness of 0.7500 in.

Ice thickness is considered to increase with height.

Ice density of 56.00 pcf.

A wind speed of 38 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 50 mph.

A non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

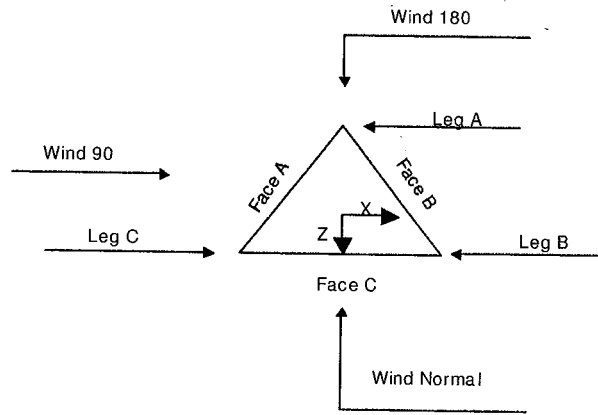
Stress ratio used in tower member design is 1.333.

Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

| | | |
|-------------------------------------|--------------------------------------|--------------------------------------|
| Consider Moments - Legs | Distribute Leg Loads As Uniform | Treat Feedline Bundles As Cylinder |
| Consider Moments - Horizontals | Assume Legs Pinned | Use ASCE 10 X-Brace Ly Rules |
| Consider Moments - Diagonals | √ Assume Rigid Index Plate | √ Calculate Redundant Bracing Forces |
| Use Moment Magnification | √ Use Clear Spans For Wind Area | Ignore Redundant Members in FEA |
| √ Use Code Stress Ratios | √ Use Clear Spans For KL/r | √ SR Leg Bolts Resist Compression |
| √ Use Code Safety Factors - Guys | Retension Guys To Initial Tension | √ All Leg Panels Have Same Allowable |
| √ Escalate Ice | √ Bypass Mast Stability Checks | √ Offset Girt At Foundation |
| Always Use Max Kz | √ Use Azimuth Dish Coefficients | √ Consider Feedline Torque |
| Use Special Wind Profile | √ Project Wind Area of Appurt. | √ Include Angle Block Shear Check |
| √ Include Bolts In Member Capacity | Autocalc Torque Arm Areas | Poles |
| Leg Bolts Are At Top Of Section | SR Members Have Cut Ends | Include Shear-Torsion Interaction |
| √ Secondary Horizontal Braces Leg | √ Sort Capacity Reports By Component | Always Use Sub-Critical Flow |
| Use Diamond Inner Bracing (4 Sided) | Triangulate Diamond Inner Bracing | Use Top Mounted Sockets |
| Add IBC .6D+W Combination | | |

| | | |
|---|--------------------------------------|-----------------------------------|
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| | Client Crown Castle | Designed by Nick Hudson |



Triangular Tower

Tower Section Geometry

| Tower Section | Tower Elevation | Assembly Database | Description | Section Width | Number of Sections | Section Length |
|---------------|-----------------|-------------------|-------------|---------------|--------------------|----------------|
| | <i>ft</i> | | | <i>ft</i> | | <i>ft</i> |
| T1 | 136'-130' | | | 4' | 1 | 6' |
| T2 | 130'-110' | | | 4' | 1 | 20' |
| T3 | 110'-95' | | | 4'6" | 1 | 15' |
| T4 | 95'-90' | | | 4'10-9/16" | 1 | 5' |
| T5 | 90'-80' | | | 5' | 1 | 10' |
| T6 | 80'-60' | | | 6' | 1 | 20' |
| T7 | 60'-40' | | | 8' | 1 | 20' |
| T8 | 40'-20' | | | 10' | 1 | 20' |
| T9 | 20'-0' | | | 12' | 1 | 20' |

Tower Section Geometry (cont'd)

| Tower Section | Tower Elevation | Diagonal Spacing | Bracing Type | Has K Brace End Panels | Has Horizontals | Top Girt Offset | Bottom Girt Offset |
|---------------|-----------------|------------------|--------------|------------------------|-----------------|-----------------|--------------------|
| | <i>ft</i> | <i>ft</i> | | | | <i>in</i> | <i>in</i> |
| T1 | 136'-130' | 2'4-9/16" | X Brace | No | Steps | 8.5000 | 6.5000 |
| T2 | 130'-110' | 2'4-9/16" | X Brace | No | Steps | 9.5000 | 2.5000 |
| T3 | 110'-95' | 2'4-11/16" | X Brace | No | Steps | 8.0000 | 0.0000 |
| T4 | 95'-90' | 2'2-17/32" | X Brace | No | Yes | 0.0000 | 7.0000 |
| T5 | 90'-80' | 10' | X Brace | No | No | 0.0000 | 0.0000 |
| T6 | 80'-60' | 10' | X Brace | No | No | 0.0000 | 0.0000 |

| | | |
|---|--------------------------------------|-----------------------------------|
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| Tower Section | Tower Elevation ft | Diagonal Spacing ft | Bracing Type | Has K Brace End Panels | Has Horizontals | Top Girt Offset in | Bottom Girt Offset in |
|---------------|-----------------------|------------------------|--------------|------------------------|-----------------|-----------------------|--------------------------|
| T7 | 60'-40' | 10' | X Brace | No | No | 0.0000 | 0.0000 |
| T8 | 40'-20' | 10' | X Brace | No | No | 0.0000 | 0.0000 |
| T9 | 20'-0' | 10' | X Brace | No | No | 0.0000 | 0.0000 |

Tower Section Geometry (cont'd)

| Tower Elevation ft | Leg Type | Leg Size | Leg Grade | Diagonal Type | Diagonal Size | Diagonal Grade |
|-----------------------|-------------|--------------------------------------|---------------------|---------------|-------------------|---------------------|
| T1 136'-130' | Solid Round | 1 1/2 | A572-50 (50 ksi) | Solid Round | 3/4 | A572-50 (50 ksi) |
| T2 130'-110' | Solid Round | 2 | A572-50 (50 ksi) | Solid Round | 7/8 | A572-50 (50 ksi) |
| T3 110'-95' | Solid Round | 2 1/4 | A572-50 (50 ksi) | Solid Round | 1 | A572-50 (50 ksi) |
| T4 95'-90' | Solid Round | 2 1/4 | A572-50 (50 ksi) | Solid Round | 1 | A572-50 (50 ksi) |
| T5 90'-80' | Truss Leg | Pirod 105244 w/ 1 1/4" Reinforcement | A572-50 (50 ksi) | Equal Angle | L3x3x3/16 | A36 (36 ksi) |
| T6 80'-60' | Truss Leg | Pirod 105217 | A572-50 (50 ksi) | Equal Angle | L2 1/2x2 1/2x3/16 | A36 (36 ksi) |
| T7 60'-40' | Truss Leg | Pirod 105218 | A572-50 (50 ksi) | Equal Angle | L3x3x3/16 | A36 (36 ksi) |
| T8 40'-20' | Truss Leg | Pirod 105218 | A572-50 (50 ksi) | Equal Angle | L3x3x3/16 | A36 (36 ksi) |
| T9 20'-0' | Truss Leg | Pirod 105219 | A572-50 (50 ksi) | Equal Angle | L3x3x5/16 | A36 (36 ksi) |

Tower Section Geometry (cont'd)

| Tower Elevation ft | Top Girt Type | Top Girt Size | Top Girt Grade | Bottom Girt Type | Bottom Girt Size | Bottom Girt Grade |
|-----------------------|---------------|---------------|---------------------|------------------|------------------|---------------------|
| T1 136'-130' | Solid Round | 7/8 | A572-50 (50 ksi) | Solid Round | 7/8 | A572-50 (50 ksi) |
| T2 130'-110' | Solid Round | 1 | A572-50 (50 ksi) | Solid Round | 1 | A572-50 (50 ksi) |
| T3 110'-95' | Solid Round | 1 | A572-50 (50 ksi) | Solid Round | | A572-50 (50 ksi) |
| T4 95'-90' | Solid Round | | A572-50 (50 ksi) | Solid Round | 1 | A572-50 (50 ksi) |

Tower Section Geometry (cont'd)

| | | |
|---|--------------------------------------|-----------------------------------|
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| | Client Crown Castle | Designed by Nick Hudson |

| Tower Elevation ft | Calc K Single Angles | Calc K Solid Rounds | K Factors ¹ | | | | | | | | |
|-----------------------|-------------------------|------------------------|------------------------|---------------------|---------------------|-----------------|--------|--------|----------------|----------------|---|
| | | | Legs | X Brace Diags | K Brace Diags | Single Diags | Girts | Horiz. | Sec. Horiz. | Inner Brace | |
| | | | | X Y | X Y | X Y | X Y | X Y | X Y | X Y | |
| T9 20'-0' | Yes | Yes | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

¹Note: K factors are applied to member segment lengths. K-braces without inner supporting members will have the K factor in the out-of-plane direction applied to the overall length.

Tower Section Geometry (cont'd)

| Tower Elevation ft | Truss-Leg K Factors | | | | | |
|-----------------------|--------------------------------|-------------------------|-------------------------|----------------------------------|-------------------------|-------------------------|
| | Truss-Legs Used As Leg Members | | | Truss-Legs Used As Inner Members | | |
| | Leg Panels | X Brace Diagonals | Z Brace Diagonals | Leg Panels | X Brace Diagonals | Z Brace Diagonals |
| T5 90'-80' | 1 | 0.5 | 0.85 | 1 | 0.5 | 0.85 |
| T6 80'-60' | 1 | 0.5 | 0.85 | 1 | 0.5 | 0.85 |
| T7 60'-40' | 1 | 0.5 | 0.85 | 1 | 0.5 | 0.85 |
| T8 40'-20' | 1 | 0.5 | 0.85 | 1 | 0.5 | 0.85 |
| T9 20'-0' | 1 | 0.5 | 0.85 | 1 | 0.5 | 0.85 |

Tower Section Geometry (cont'd)

| Tower Elevation ft | Leg | | Diagonal | | Top Girt | | Bottom Girt | | Mid Girt | | Long Horizontal | | Short Horizontal | |
|-----------------------|---------------------------|---|---------------------------|------|---------------------------|------|------------------------------|---|------------------------------|---|------------------------------|---|------------------------------|---|
| | Net Width Deduct in | U | Net Width Deduct in | U | Net Width Deduct in | U | Net Width Deduct in | U | Net Width Deduct in | U | Net Width Deduct in | U | Net Width Deduct in | U |
| T1 136'-130' | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 |
| T2 130'-110' | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 |
| T3 110'-95' | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 |
| T4 95'-90' | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 |
| T5 90'-80' | 0.0000 | 1 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 |
| T6 80'-60' | 0.0000 | 1 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 |
| T7 60'-40' | 0.0000 | 1 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 |
| T8 40'-20' | 0.0000 | 1 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 |
| T9 20'-0' | 0.0000 | 1 | 0.0000 | 0.75 | 0.0000 | 0.75 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 | 0.0000 | 1 |

Tower Section Geometry (cont'd)

| | | |
|---|--------------------------------------|-----------------------------------|
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| | Client Crown Castle | Designed by Nick Hudson |

| Tower Elevation ft | Leg Connection Type | Leg | | Diagonal | | Top Girt | | Bottom Girt | | Mid Girt | | Long Horizontal | | Short Horizontal | |
|-----------------------|---------------------|-----------------|-----|-----------------|-----|-----------------|-----|-----------------|-----|-----------------|-----|-----------------|-----|------------------|-----|
| | | Bolt Size in | No. | Bolt Size in | No. | Bolt Size in | No. | Bolt Size in | No. | Bolt Size in | No. | Bolt Size in | No. | Bolt Size in | No. |
| T1 136'-130' | Sleeve DS | 0.6250 | 0 | 1.0000 | 0 | 0.6250 | 0 | 0.0000 | 0 | 0.6250 | 0 | 0.6250 | 0 | 0.6250 | 0 |
| | | A325N | | A325N | | A325N | | A325N | | A325X | | A325N | | A325X | |
| T2 130'-110' | Sleeve DS | 0.7500 | 0 | 1.0000 | 0 | 0.6250 | 0 | 0.0000 | 0 | 0.6250 | 0 | 0.6250 | 0 | 0.6250 | 0 |
| | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | |
| T3 110'-95' | Sleeve DS | 0.7500 | 0 | 1.0000 | 0 | 0.0000 | 0 | 0.0000 | 0 | 0.6250 | 0 | 0.6250 | 0 | 0.6250 | 0 |
| | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | |
| T4 95'-90' | Flange | 1.0000 | 6 | 1.0000 | 0 | 0.6250 | 0 | 0.0000 | 0 | 0.6250 | 0 | 0.6250 | 0 | 0.6250 | 0 |
| | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | |
| T5 90'-80' | Flange | 1.0000 | 6 | 1.0000 | 1 | 0.6250 | 0 | 0.0000 | 0 | 0.6250 | 0 | 0.6250 | 0 | 0.6250 | 0 |
| | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | |
| T6 80'-60' | Flange | 1.0000 | 6 | 1.0000 | 1 | 0.6250 | 0 | 0.0000 | 0 | 0.6250 | 0 | 0.6250 | 0 | 0.6250 | 0 |
| | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | |
| T7 60'-40' | Flange | 1.0000 | 6 | 1.0000 | 1 | 0.6250 | 0 | 0.0000 | 0 | 0.6250 | 0 | 0.6250 | 0 | 0.6250 | 0 |
| | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | |
| T8 40'-20' | Flange | 1.0000 | 6 | 1.0000 | 1 | 0.6250 | 0 | 0.0000 | 0 | 0.6250 | 0 | 0.6250 | 0 | 0.6250 | 0 |
| | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | |
| T9 20'-0' | Flange | 1.2500 | 6 | 1.2500 | 1 | 0.6250 | 0 | 0.0000 | 0 | 0.6250 | 0 | 0.6250 | 0 | 0.6250 | 0 |
| | | A687 | | A325N | | A325N | | A325N | | A325N | | A325N | | A325N | |

Feed Line/Linear Appurtenances - Entered As Round Or Flat

| Description | Face or Leg | Allow Shield | Component Type | Placement ft | Face Offset in | Lateral Offset (Frac FW) | # | # Per Row | Clear Spacing in | Width or Diameter in | Perimeter in | Weight klf |
|--|-------------|--------------|----------------|-----------------|-------------------|-----------------------------|----|-----------|---------------------|-------------------------|-----------------|---------------|
| LDF4-50A(1/2") * | A | No | Ar (Leg) | 72' - 0' | 0.0000 | 0.15 | 2 | 2 | 0.5000 | 0.6300 | | 0.00 |
| LDF6-50A(1-1/4") T-Brackets (Af) * | A | No | Ar (Leg) | 127' - 0' | 0.0000 | 0.1 | 12 | 7 | 0.5000 | 1.5500 | | 0.00 |
| HB114-1-08U 4-M5J(1 1/4") T-Brackets (Af) * | A | No | Af (Leg) | 127' - 0' | 0.0000 | 0.1 | 1 | 1 | 1.0000 | 1.0000 | 4.0000 | 0.01 |
| HB114-1-08U 4-M5J(1 1/4") T-Brackets (Af) * | B | No | Ar (Leg) | 136' - 0' | 0.0000 | 0.15 | 3 | 3 | 0.5000 | 1.5400 | | 0.00 |
| LDF7-50A(1-5/8") HB158-1-08U 8-S8J18(1-5/8) * | B | No | Af (Leg) | 136' - 0' | 0.0000 | 0.1 | 1 | 1 | 1.0000 | 1.0000 | 4.0000 | 0.01 |
| LDF6-50A(1-1/4") FB-L98-002-XXX(3/8) WR-VG82ST-BRDA(5/8") * | B | No | Ar (Leg) | 107' - 0' | 0.0000 | 0.1 | 12 | 8 | 0.5000 | 1.9800 | | 0.00 |
| FLC 12-50J(1/2") * | B | No | Ar (Leg) | 107' - 0' | 0.0000 | 0.15 | 1 | 1 | 1.9800 | 1.9800 | | 0.00 |
| LDF6-50A(1-1/4") FB-L98-002-XXX(3/8) WR-VG82ST-BRDA(5/8") * | B | No | Ar (Leg) | 97' - 0' | 0.0000 | 0.075 | 6 | 6 | 0.5000 | 1.5500 | | 0.00 |
| FLC 12-50J(1/2") * | B | No | Ar (Leg) | 97' - 0' | 0.0000 | 0.1 | 1 | 1 | 0.3937 | 0.3937 | | 0.00 |
| LDF7-50A(1-1/2") * | B | No | Ar (Leg) | 97' - 0' | 0.0000 | 0.12 | 2 | 2 | 0.5000 | 0.6450 | | 0.00 |
| LDF7-50A(1-1/2") * | B | No | Ar (Leg) | 80' - 0' | 0.0000 | 0.05 | 1 | 1 | 0.5000 | 0.6400 | | 0.00 |
| LDF7-50A(1-1/2") * | C | No | Ar (Leg) | 117' - 0' | 0.0000 | 0.1 | 14 | 7 | 0.5000 | 1.9800 | | 0.00 |

| | | |
|---|--------------------------------------|-----------------------------------|
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| | Client Crown Castle | Designed by Nick Hudson |

| Description | Face or Leg | Allow Shield | Component Type | Placement ft | Face Offset in | Lateral Offset (Frac FW) | # | # Per Row | Clear Spacing in | Width or Diameter in | Perimeter in | Weight klf |
|--------------------------------------|-------------|--------------|----------------|--------------|----------------|--------------------------|---|-----------|------------------|----------------------|--------------|------------|
| 5/8") T-Brackets (Af) * | C | No | Af (Leg) | 117' - 0' | 0.0000 | 0.1 | 1 | 1 | 1.0000 | 1.0000 | 4.0000 | 0.01 |
| FSJ2-50(3/8") | A | Yes | Ar (CfAe) | 87' - 0' | 0.0000 | 0 | 1 | 1 | 0.4250 | 0.4250 | | 0.00 |
| FXL 780 | A | Yes | Ar (CfAe) | 87' - 0' | 0.0000 | -0.1 | 6 | 6 | 0.5000 | 1.0900 | | 0.00 |
| PE(7/8) Feedline Ladder (Af) | A | Yes | Af (CfAe) | 87' - 0' | 0.0000 | 0 | 1 | 1 | 3.0000 | 3.0000 | 12.0000 | 0.01 |
| Safety Line 3/8 | C | Yes | Ar (CfAe) | 136' - 0' | 0.0000 | 0.5 | 1 | 1 | 0.3750 | 0.3750 | | 0.00 |
| Ladder Rung SR 3/4 (48"w 26"s) | C | Yes | Ar (CfAe) | 136' - 90' | 0.0000 | 0 | 1 | 1 | 1.3500 | 1.3500 | | 0.00 |

Feed Line/Linear Appurtenances Section Areas

| Tower Section | Tower Elevation ft | Face | A _R ft ² | A _F ft ² | C _A A _A In Face ft ² | C _A A _A Out Face ft ² | Weight K |
|---------------|--------------------|------|--------------------------------|--------------------------------|---|--|----------|
| T1 | 136'-130' | A | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |
| | | B | 2.310 | 0.500 | 0.000 | 0.000 | 0.07 |
| | | C | 3.172 | 0.500 | 0.000 | 0.000 | 0.02 |
| T2 | 130'-110' | A | 23.456 | 2.000 | 0.000 | 0.000 | 0.28 |
| | | B | 23.071 | 3.083 | 0.000 | 0.000 | 0.23 |
| | | C | 18.660 | 2.250 | 0.000 | 0.000 | 0.20 |
| T3 | 110'-95' | A | 30.887 | 2.500 | 0.000 | 0.000 | 0.24 |
| | | B | 38.988 | 2.500 | 0.000 | 0.000 | 0.32 |
| | | C | 44.907 | 2.500 | 0.000 | 0.000 | 0.34 |
| T4 | 95'-90' | A | 10.296 | 0.833 | 0.000 | 0.000 | 0.08 |
| | | B | 18.447 | 0.833 | 0.000 | 0.000 | 0.14 |
| | | C | 20.420 | 0.833 | 0.000 | 0.000 | 0.11 |
| T5 | 90'-80' | A | 24.655 | 3.417 | 0.000 | 0.000 | 0.23 |
| | | B | 36.895 | 1.667 | 0.000 | 0.000 | 0.27 |
| | | C | 39.716 | 1.667 | 0.000 | 0.000 | 0.20 |
| T6 | 80'-60' | A | 54.052 | 8.333 | 0.000 | 0.000 | 0.53 |
| | | B | 76.116 | 3.333 | 0.000 | 0.000 | 0.55 |
| | | C | 80.498 | 3.333 | 0.000 | 0.000 | 0.40 |
| T7 | 60'-40' | A | 54.892 | 8.333 | 0.000 | 0.000 | 0.53 |
| | | B | 76.956 | 3.333 | 0.000 | 0.000 | 0.55 |
| | | C | 80.498 | 3.333 | 0.000 | 0.000 | 0.40 |
| T8 | 40'-20' | A | 54.892 | 8.333 | 0.000 | 0.000 | 0.53 |
| | | B | 76.956 | 3.333 | 0.000 | 0.000 | 0.55 |
| | | C | 80.498 | 3.333 | 0.000 | 0.000 | 0.40 |
| T9 | 20'-0' | A | 54.892 | 8.333 | 0.000 | 0.000 | 0.53 |
| | | B | 76.956 | 3.333 | 0.000 | 0.000 | 0.55 |
| | | C | 80.498 | 3.333 | 0.000 | 0.000 | 0.40 |

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 _A A _A In Face ft ² | C _A A _A Out Face ft ² | Weight K |
|---------------|--------------------|-------------|------------------|--------------------------------|--------------------------------|---|--|----------|
| T1 | 136'-130' | A | 0.887 | 0.000 | 0.000 | 0.000 | 0.000 | 0.00 |

| | | |
|---|--------------------------------------|-----------------------------------|
| tnxTower Tower Engineering Professionals 3703 Junction Blvd. Raleigh, NC 27603 Phone: (919) 661-6339 FAX: (919) 661-6350 | Job Waterford (BU# 876338) | Page 8 of 28 |
| | Project TEP No. 129881 | Date 12:41:09 12/20/12 |
| | Client Crown Castle | Designed by Nick Hudson |

| Tower Section | Tower Elevation ft | Face or Leg | Ice Thickness in | A _R ft ² | A _F ft ² | C _A A _A In Face ft ² | C _A A _A Out Face ft ² | Weight K |
|---------------|-----------------------|-------------|---------------------|-----------------------------------|-----------------------------------|---|--|-------------|
| | | B | | 1.657 | 3.131 | 0.000 | 0.000 | 0.12 |
| | | C | | 4.292 | 3.131 | 0.000 | 0.000 | 0.04 |
| T2 | 130'-110' | A | 0.876 | 6.854 | 30.440 | 0.000 | 0.000 | 0.65 |
| | | B | | 10.162 | 30.908 | 0.000 | 0.000 | 0.41 |
| | | C | | 16.375 | 20.357 | 0.000 | 0.000 | 0.48 |
| T3 | 110'-95' | A | 0.859 | 8.709 | 39.339 | 0.000 | 0.000 | 0.57 |
| | | B | | 16.847 | 45.098 | 0.000 | 0.000 | 0.82 |
| | | C | | 23.837 | 48.323 | 0.000 | 0.000 | 0.83 |
| T4 | 95'-90' | A | 0.849 | 2.885 | 13.101 | 0.000 | 0.000 | 0.19 |
| | | B | | 8.967 | 20.583 | 0.000 | 0.000 | 0.40 |
| | | C | | 11.280 | 21.658 | 0.000 | 0.000 | 0.28 |
| T5 | 90'-80' | A | 0.840 | 8.586 | 33.225 | 0.000 | 0.000 | 0.55 |
| | | B | | 17.834 | 41.146 | 0.000 | 0.000 | 0.79 |
| | | C | | 19.905 | 43.296 | 0.000 | 0.000 | 0.50 |
| T6 | 80'-60' | A | 0.821 | 21.624 | 73.486 | 0.000 | 0.000 | 1.26 |
| | | B | | 41.292 | 83.336 | 0.000 | 0.000 | 1.59 |
| | | C | | 43.098 | 86.506 | 0.000 | 0.000 | 0.99 |
| T7 | 60'-40' | A | 0.788 | 22.597 | 74.022 | 0.000 | 0.000 | 1.26 |
| | | B | | 41.831 | 83.945 | 0.000 | 0.000 | 1.56 |
| | | C | | 42.123 | 86.362 | 0.000 | 0.000 | 0.98 |
| T8 | 40'-20' | A | 0.750 | 21.958 | 73.767 | 0.000 | 0.000 | 1.23 |
| | | B | | 40.681 | 83.775 | 0.000 | 0.000 | 1.51 |
| | | C | | 40.973 | 86.192 | 0.000 | 0.000 | 0.96 |
| T9 | 20'-0' | A | 0.750 | 21.958 | 73.767 | 0.000 | 0.000 | 1.23 |
| | | B | | 40.681 | 83.775 | 0.000 | 0.000 | 1.51 |
| | | C | | 40.973 | 86.192 | 0.000 | 0.000 | 0.96 |

Feed Line Shielding

| Section | Elevation ft | Face | A _R ft ² | A _R Ice ft ² | A _F ft ² | A _F Ice ft ² |
|---------|-----------------|------|-----------------------------------|--|-----------------------------------|--|
| T1 | 136'-130' | A | 0.000 | 0.000 | 0.000 | 0.000 |
| | | B | 0.000 | 0.000 | 0.000 | 0.000 |
| | | C | 0.063 | 0.624 | 0.000 | 0.000 |
| T2 | 130'-110' | A | 0.000 | 0.000 | 0.000 | 0.000 |
| | | B | 0.000 | 0.000 | 0.000 | 0.000 |
| | | C | 0.216 | 1.947 | 0.000 | 0.000 |
| T3 | 110'-95' | A | 0.000 | 0.000 | 0.000 | 0.000 |
| | | B | 0.000 | 0.000 | 0.000 | 0.000 |
| | | C | 0.173 | 1.410 | 0.000 | 0.000 |
| T4 | 95'-90' | A | 0.000 | 0.000 | 0.000 | 0.000 |
| | | B | 0.000 | 0.000 | 0.000 | 0.000 |
| | | C | 0.100 | 0.744 | 0.000 | 0.000 |
| T5 | 90'-80' | A | 0.000 | 0.593 | 0.602 | 1.058 |
| | | B | 0.000 | 0.000 | 0.000 | 0.000 |
| | | C | 0.000 | 0.099 | 0.032 | 0.178 |
| T6 | 80'-60' | A | 0.000 | 1.388 | 1.211 | 2.113 |
| | | B | 0.000 | 0.000 | 0.000 | 0.000 |
| | | C | 0.000 | 0.161 | 0.046 | 0.245 |
| T7 | 60'-40' | A | 0.000 | 1.128 | 1.244 | 2.146 |
| | | B | 0.000 | 0.000 | 0.000 | 0.000 |
| | | C | 0.000 | 0.128 | 0.047 | 0.244 |
| T8 | 40'-20' | A | 0.000 | 0.956 | 1.123 | 1.913 |
| | | B | 0.000 | 0.000 | 0.000 | 0.000 |
| | | C | 0.000 | 0.106 | 0.042 | 0.211 |

| | | |
|---|--------------------------------------|-----------------------------------|
| tnxTower Tower Engineering Professionals 3703 Junction Blvd. Raleigh, NC 27603 Phone: (919) 661-6339 FAX: (919) 661-6350 | Job Waterford (BU# 876338) | Page 9 of 28 |
| | Project TEP No. 129881 | Date 12:41:09 12/20/12 |
| | Client Crown Castle | Designed by Nick Hudson |

| Section | Elevation | Face | A_R | $A_{R\ Ice}$ | A_F | $A_{F\ Ice}$ |
|---------|-----------|------|-----------------|-----------------|-----------------|-----------------|
| | ft | | ft ² | ft ² | ft ² | ft ² |
| T9 | 20'-0' | A | 0.000 | 0.892 | 1.048 | 1.785 |
| | | B | 0.000 | 0.000 | 0.000 | 0.000 |
| | | C | 0.000 | 0.099 | 0.039 | 0.197 |

Feed Line Center of Pressure

| Section | Elevation | CP_x | CP_z | $CP_x\ Ice$ | $CP_z\ Ice$ |
|---------|-----------|---------|---------|-------------|-------------|
| | ft | in | in | in | in |
| T1 | 136'-130' | 2.9250 | 2.5606 | 1.0080 | 1.6424 |
| T2 | 130'-110' | -0.2168 | -1.4257 | -0.4055 | -0.7629 |
| T3 | 110'-95' | 1.0554 | 1.5199 | 0.6155 | 1.1567 |
| T4 | 95'-90' | 2.8752 | 2.3853 | 1.9758 | 1.7140 |
| T5 | 90'-80' | 2.0074 | 1.8762 | 1.3515 | 1.3555 |
| T6 | 80'-60' | 2.2821 | 2.1602 | 1.5751 | 1.5842 |
| T7 | 60'-40' | 2.8100 | 2.5525 | 1.9544 | 1.9119 |
| T8 | 40'-20' | 3.3796 | 3.0764 | 2.3673 | 2.3269 |
| T9 | 20'-0' | 3.8604 | 3.5187 | 2.6695 | 2.6356 |

Discrete Tower Loads

| Description | Face or Leg | Offset Type | Offsets: | | Azimuth Adjustment | Placement | C_{AA} | | Weight | |
|-------------------------------|-------------|--------------------|--------------|------|--------------------|-----------|-----------------|-----------------|--------|------|
| | | | Horz Lateral | Vert | | | Front | Side | | |
| | | | ft | ft | ° | ft | ft ² | ft ² | K | |
| APXVSPP18-C-A20 w/ Mount Pipe | A | From Centroid-Face | 4.00 | 0' | 0.0000 | 136' | No Ice | 8.50 | 6.95 | 0.08 |
| | | | | | | | 1/2" Ice | 9.15 | 8.13 | 0.15 |
| | | | | | | | 1" Ice | 9.77 | 9.02 | 0.22 |
| | | | | | | | 2" Ice | 11.03 | 10.84 | 0.41 |
| | | | | | | | 4" Ice | 13.68 | 14.85 | 0.91 |
| APXVSPP18-C-A20 w/ Mount Pipe | B | From Centroid-Face | 4.00 | 0' | 20.0000 | 136' | No Ice | 8.50 | 6.95 | 0.08 |
| | | | | | | | 1/2" Ice | 9.15 | 8.13 | 0.15 |
| | | | | | | | 1" Ice | 9.77 | 9.02 | 0.22 |
| | | | | | | | 2" Ice | 11.03 | 10.84 | 0.41 |
| | | | | | | | 4" Ice | 13.68 | 14.85 | 0.91 |
| APXVSPP18-C-A20 w/ Mount Pipe | C | From Centroid-Face | 4.00 | 0' | 40.0000 | 136' | No Ice | 8.50 | 6.95 | 0.08 |
| | | | | | | | 1/2" Ice | 9.15 | 8.13 | 0.15 |
| | | | | | | | 1" Ice | 9.77 | 9.02 | 0.22 |
| | | | | | | | 2" Ice | 11.03 | 10.84 | 0.41 |
| | | | | | | | 4" Ice | 13.68 | 14.85 | 0.91 |
| (2) 1900MHz RRH (65MHz) | A | From Centroid-Face | 4.00 | 0' | 0.0000 | 136' | No Ice | 2.70 | 2.77 | 0.06 |
| | | | | | | | 1/2" Ice | 2.94 | 3.01 | 0.08 |
| | | | | | | | 1" Ice | 3.18 | 3.26 | 0.11 |
| | | | | | | | 2" Ice | 3.70 | 3.78 | 0.18 |
| | | | | | | | 4" Ice | 4.85 | 4.93 | 0.35 |
| (2) 1900MHz RRH (65MHz) | B | From Centroid-Face | 4.00 | 0' | 20.0000 | 136' | No Ice | 2.70 | 2.77 | 0.06 |
| | | | | | | | 1/2" Ice | 2.94 | 3.01 | 0.08 |
| | | | | | | | 1" Ice | 3.18 | 3.26 | 0.11 |
| | | | | | | | 2" Ice | 3.70 | 3.78 | 0.18 |
| | | | | | | | 4" Ice | 4.85 | 4.93 | 0.35 |

| | | |
|---|--------------------------------------|-----------------------------------|
| tnxTower Tower Engineering Professionals 3703 Junction Blvd. Raleigh, NC 27603 Phone: (919) 661-6339 FAX: (919) 661-6350 | Job Waterford (BU# 876338) | Page 11 of 28 |
| | Project TEP No. 129881 | Date 12:41:09 12/20/12 |
| | Client Crown Castle | Designed by Nick Hudson |

| Description | Face or Leg | Offset Type | Offsets: | | Azimuth Adjustment | Placement | C _A A _{Front} | C _A A _{Side} | Weight | |
|---|-------------|---------------|----------|---------|--------------------|-----------|-----------------------------------|----------------------------------|--------|------|
| | | | Horz | Lateral | | | | | | |
| | | | ft | ft | ° | ft | ft ² | ft ² | K | |
| (2) 2.4" x 6-ft pipe | C | Centroid-Face | 0' | 0' | 0.0000 | 136' | 1/2" Ice | 1.93 | 1.93 | 0.03 |
| | | | | | | | 1" Ice | 2.30 | 2.30 | 0.05 |
| | | | | | | | 2" Ice | 3.07 | 3.07 | 0.09 |
| | | | | | | | 4" Ice | 4.71 | 4.71 | 0.23 |
| | | | | | | | No Ice | 1.44 | 1.44 | 0.02 |
| | | | | | | | 1/2" Ice | 1.93 | 1.93 | 0.03 |
| | | | | | | | 1" Ice | 2.30 | 2.30 | 0.05 |
| | | | | | | | 2" Ice | 3.07 | 3.07 | 0.09 |
| | | | | | | | 4" Ice | 4.71 | 4.71 | 0.23 |
| Platform Mount [LP 405-1] | C | None | | | 0.0000 | 136' | No Ice | 20.80 | 20.80 | 1.80 |
| | | | | | | | 1/2" Ice | 28.10 | 28.10 | 2.07 |
| | | | | | | | 1" Ice | 35.40 | 35.40 | 2.33 |
| | | | | | | | 2" Ice | 50.00 | 50.00 | 2.86 |
| | | | | | | | 4" Ice | 79.20 | 79.20 | 3.93 |
| * (4) DB844H90E-XY w/ Mount Pipe | A | From Leg | 4.00 | 0' | 50.0000 | 127' | No Ice | 3.30 | 4.92 | 0.03 |
| | | | | | | | 1/2" Ice | 3.69 | 5.60 | 0.07 |
| | | | | | | | 1" Ice | 4.12 | 6.28 | 0.12 |
| | | | | | | | 2" Ice | 5.01 | 7.71 | 0.23 |
| | | | | | | | 4" Ice | 6.92 | 10.83 | 0.56 |
| (4) DB844H90E-XY w/ Mount Pipe | B | From Leg | 4.00 | 0' | 50.0000 | 127' | No Ice | 3.30 | 4.92 | 0.03 |
| | | | | | | | 1/2" Ice | 3.69 | 5.60 | 0.07 |
| | | | | | | | 1" Ice | 4.12 | 6.28 | 0.12 |
| | | | | | | | 2" Ice | 5.01 | 7.71 | 0.23 |
| | | | | | | | 4" Ice | 6.92 | 10.83 | 0.56 |
| (4) DB844H90E-XY w/ Mount Pipe | C | From Leg | 4.00 | 0' | 50.0000 | 127' | No Ice | 3.30 | 4.92 | 0.03 |
| | | | | | | | 1/2" Ice | 3.69 | 5.60 | 0.07 |
| | | | | | | | 1" Ice | 4.12 | 6.28 | 0.12 |
| | | | | | | | 2" Ice | 5.01 | 7.71 | 0.23 |
| | | | | | | | 4" Ice | 6.92 | 10.83 | 0.56 |
| Sector Mount [SM 411-3] | C | None | | | 0.0000 | 127' | No Ice | 21.88 | 21.88 | 1.07 |
| | | | | | | | 1/2" Ice | 30.68 | 30.68 | 1.48 |
| | | | | | | | 1" Ice | 39.48 | 39.48 | 1.90 |
| | | | | | | | 2" Ice | 57.08 | 57.08 | 2.73 |
| | | | | | | | 4" Ice | 92.28 | 92.28 | 4.40 |
| * APX16DWV-16DWV-S-E-A 20 w/ Mount Pipe | A | From Leg | 4.00 | 6' | 80.0000 | 117' | No Ice | 7.27 | 3.29 | 0.06 |
| | | | | | | | 1/2" Ice | 7.73 | 3.92 | 0.10 |
| | | | | | | | 1" Ice | 8.21 | 4.57 | 0.16 |
| | | | | | | | 2" Ice | 9.18 | 5.92 | 0.28 |
| | | | | | | | 4" Ice | 11.23 | 8.88 | 0.65 |
| APX16DWV-16DWV-S-E-A 20 w/ Mount Pipe | B | From Leg | 4.00 | 6' | 80.0000 | 117' | No Ice | 7.27 | 3.29 | 0.06 |
| | | | | | | | 1/2" Ice | 7.73 | 3.92 | 0.10 |
| | | | | | | | 1" Ice | 8.21 | 4.57 | 0.16 |
| | | | | | | | 2" Ice | 9.18 | 5.92 | 0.28 |
| | | | | | | | 4" Ice | 11.23 | 8.88 | 0.65 |
| APX16DWV-16DWV-S-E-A 20 w/ Mount Pipe | C | From Leg | 4.00 | 6' | 80.0000 | 117' | No Ice | 7.27 | 3.29 | 0.06 |
| | | | | | | | 1/2" Ice | 7.73 | 3.92 | 0.10 |
| | | | | | | | 1" Ice | 8.21 | 4.57 | 0.16 |
| | | | | | | | 2" Ice | 9.18 | 5.92 | 0.28 |
| | | | | | | | 4" Ice | 11.23 | 8.88 | 0.65 |
| RR90-17-02DP w/ Mount Pipe | A | From Leg | 4.00 | -6' | 80.0000 | 117' | No Ice | 4.59 | 3.32 | 0.03 |
| | | | | | | | 1/2" Ice | 5.09 | 4.09 | 0.07 |
| | | | | | | | 1" Ice | 5.58 | 4.78 | 0.11 |
| | | | | | | | 2" Ice | 6.59 | 6.23 | 0.22 |
| | | | | | | | 4" Ice | 8.73 | 9.31 | 0.56 |
| RR90-17-02DP w/ Mount | B | From Leg | 4.00 | | 80.0000 | 117' | No Ice | 4.59 | 3.32 | 0.03 |

| | | | | | | | | |
|---|----------------|--|------------------------|--|--------------------|--|-------------------|--|
| tnxTower Tower Engineering Professionals 3703 Junction Blvd. Raleigh, NC 27603 Phone: (919) 661-6339 FAX: (919) 661-6350 | Job | | Waterford (BU# 876338) | | Page | | 12 of 28 | |
| | Project | | TEP No. 129881 | | Date | | 12:41:09 12/20/12 | |
| | Client | | Crown Castle | | Designed by | | Nick Hudson | |

| Description | Face or Leg | Offset Type | Offsets: | | | Azimuth Adjustment | Placement | C _{AA} Front | C _{AA} Side | Weight |
|----------------------------|-------------|-------------|----------|---------|------|--------------------|-----------|-----------------------|----------------------|--------|
| | | | Horz | Lateral | Vert | | | | | |
| Pipe | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| RR90-17-02DP w/ Mount Pipe | C | From Leg | 4.00 | 80.0000 | 117' | 1/2" Ice | 5.09 | 4.09 | 0.07 | |
| | | | | | | 1" Ice | 5.58 | 4.78 | 0.11 | |
| | | | | | | 2" Ice | 6.59 | 6.23 | 0.22 | |
| | | | | | | 4" Ice | 8.73 | 9.31 | 0.56 | |
| | | | | | | No Ice | 4.59 | 3.32 | 0.03 | |
| | | | | | | 1/2" Ice | 5.09 | 4.09 | 0.07 | |
| | | | | | | 1" Ice | 5.58 | 4.78 | 0.11 | |
| | | | | | | 2" Ice | 6.59 | 6.23 | 0.22 | |
| | | | | | | 4" Ice | 8.73 | 9.31 | 0.56 | |
| (2) ATMAA1412D-1A20 | A | From Leg | 4.00 | 80.0000 | 117' | No Ice | 1.17 | 0.47 | 0.01 | |
| | | | | | | 1/2" Ice | 1.31 | 0.57 | 0.02 | |
| | | | | | | 1" Ice | 1.47 | 0.69 | 0.03 | |
| | | | | | | 2" Ice | 1.81 | 0.95 | 0.06 | |
| | | | | | | 4" Ice | 2.58 | 1.57 | 0.14 | |
| (2) ATMAA1412D-1A20 | B | From Leg | 4.00 | 80.0000 | 117' | No Ice | 1.17 | 0.47 | 0.01 | |
| | | | | | | 1/2" Ice | 1.31 | 0.57 | 0.02 | |
| | | | | | | 1" Ice | 1.47 | 0.69 | 0.03 | |
| | | | | | | 2" Ice | 1.81 | 0.95 | 0.06 | |
| | | | | | | 4" Ice | 2.58 | 1.57 | 0.14 | |
| (2) ATMAA1412D-1A20 | C | From Leg | 4.00 | 80.0000 | 117' | No Ice | 1.17 | 0.47 | 0.01 | |
| | | | | | | 1/2" Ice | 1.31 | 0.57 | 0.02 | |
| | | | | | | 1" Ice | 1.47 | 0.69 | 0.03 | |
| | | | | | | 2" Ice | 1.81 | 0.95 | 0.06 | |
| | | | | | | 4" Ice | 2.58 | 1.57 | 0.14 | |
| Sector Mount [SM 411-3] | C | None | | 0.0000 | 117' | No Ice | 21.88 | 21.88 | 1.07 | |
| | | | | | | 1/2" Ice | 30.68 | 30.68 | 1.48 | |
| | | | | | | 1" Ice | 39.48 | 39.48 | 1.90 | |
| | | | | | | 2" Ice | 57.08 | 57.08 | 2.73 | |
| | | | | | | 4" Ice | 92.28 | 92.28 | 4.40 | |
| * | | | | | | | | | | |
| BXA-185063/8CF | A | From Leg | 4.00 | 50.0000 | 107' | No Ice | 2.94 | 1.79 | 0.01 | |
| | | | | | | 1/2" Ice | 3.26 | 2.09 | 0.03 | |
| | | | | | | 1" Ice | 3.60 | 2.40 | 0.05 | |
| | | | | | | 2" Ice | 4.36 | 3.04 | 0.10 | |
| | | | | | | 4" Ice | 5.99 | 4.46 | 0.27 | |
| BXA-185063/8CF | B | From Leg | 4.00 | 50.0000 | 107' | No Ice | 2.94 | 1.79 | 0.01 | |
| | | | | | | 1/2" Ice | 3.26 | 2.09 | 0.03 | |
| | | | | | | 1" Ice | 3.60 | 2.40 | 0.05 | |
| | | | | | | 2" Ice | 4.36 | 3.04 | 0.10 | |
| | | | | | | 4" Ice | 5.99 | 4.46 | 0.27 | |
| BXA-185063/8CF | C | From Leg | 4.00 | 50.0000 | 107' | No Ice | 2.94 | 1.79 | 0.01 | |
| | | | | | | 1/2" Ice | 3.26 | 2.09 | 0.03 | |
| | | | | | | 1" Ice | 3.60 | 2.40 | 0.05 | |
| | | | | | | 2" Ice | 4.36 | 3.04 | 0.10 | |
| | | | | | | 4" Ice | 5.99 | 4.46 | 0.27 | |
| BXA-70063/6CF | A | From Leg | 4.00 | 50.0000 | 107' | No Ice | 7.73 | 3.76 | 0.02 | |
| | | | | | | 1/2" Ice | 8.27 | 4.19 | 0.06 | |
| | | | | | | 1" Ice | 8.81 | 4.63 | 0.10 | |
| | | | | | | 2" Ice | 9.93 | 5.53 | 0.22 | |
| | | | | | | 4" Ice | 12.27 | 7.43 | 0.52 | |
| BXA-70063/6CF | B | From Leg | 4.00 | 50.0000 | 107' | No Ice | 7.73 | 3.76 | 0.02 | |
| | | | | | | 1/2" Ice | 8.27 | 4.19 | 0.06 | |
| | | | | | | 1" Ice | 8.81 | 4.63 | 0.10 | |
| | | | | | | 2" Ice | 9.93 | 5.53 | 0.22 | |
| | | | | | | 4" Ice | 12.27 | 7.43 | 0.52 | |
| BXA-70063/6CF | C | From Leg | 4.00 | 50.0000 | 107' | No Ice | 7.73 | 3.76 | 0.02 | |
| | | | | | | 1/2" Ice | 8.27 | 4.19 | 0.06 | |

| | | |
|---|--------------------------------------|-----------------------------------|
| tnxTower Tower Engineering Professionals 3703 Junction Blvd. Raleigh, NC 27603 Phone: (919) 661-6339 FAX: (919) 661-6350 | Job Waterford (BU# 876338) | Page 13 of 28 |
| | Project TEP No. 129881 | Date 12:41:09 12/20/12 |
| | Client Crown Castle | Designed by Nick Hudson |

| Description | Face or Leg | Offset Type | Offsets: | | Azimuth Adjustment | Placement | C _{AA} Front | C _{AA} Side | Weight |
|--------------------|-------------|-------------|--------------|------|--------------------|-----------|-----------------------|----------------------|--------|
| | | | Horz Lateral | Vert | | | | | |
| | | | | 0' | | | 1" Ice 8.81 | 4.63 | 0.10 |
| | | | | | | | 2" Ice 9.93 | 5.53 | 0.22 |
| | | | | | | | 4" Ice 12.27 | 7.43 | 0.52 |
| BXA-80063/4CF | A | From Leg | 4.00 | | 50.0000 | 107' | No Ice 5.16 | 2.25 | 0.01 |
| | | | -6' | | | | 1/2" Ice 5.55 | 2.55 | 0.04 |
| | | | 0' | | | | 1" Ice 5.94 | 2.85 | 0.07 |
| | | | | | | | 2" Ice 6.75 | 3.49 | 0.15 |
| | | | | | | | 4" Ice 8.48 | 5.04 | 0.36 |
| BXA-80063/4CF | B | From Leg | 4.00 | | 50.0000 | 107' | No Ice 5.16 | 2.25 | 0.01 |
| | | | -6' | | | | 1/2" Ice 5.55 | 2.55 | 0.04 |
| | | | 0' | | | | 1" Ice 5.94 | 2.85 | 0.07 |
| | | | | | | | 2" Ice 6.75 | 3.49 | 0.15 |
| | | | | | | | 4" Ice 8.48 | 5.04 | 0.36 |
| BXA-80063/4CF | C | From Leg | 4.00 | | 50.0000 | 107' | No Ice 5.16 | 2.25 | 0.01 |
| | | | -6' | | | | 1/2" Ice 5.55 | 2.55 | 0.04 |
| | | | 0' | | | | 1" Ice 5.94 | 2.85 | 0.07 |
| | | | | | | | 2" Ice 6.75 | 3.49 | 0.15 |
| | | | | | | | 4" Ice 8.48 | 5.04 | 0.36 |
| (2) FD9R6004/2C-3L | A | From Leg | 4.00 | | 50.0000 | 107' | No Ice 0.37 | 0.08 | 0.00 |
| | | | -6' | | | | 1/2" Ice 0.45 | 0.14 | 0.01 |
| | | | 0' | | | | 1" Ice 0.54 | 0.20 | 0.01 |
| | | | | | | | 2" Ice 0.75 | 0.34 | 0.02 |
| | | | | | | | 4" Ice 1.28 | 0.74 | 0.06 |
| (2) FD9R6004/2C-3L | B | From Leg | 4.00 | | 50.0000 | 107' | No Ice 0.37 | 0.08 | 0.00 |
| | | | -6' | | | | 1/2" Ice 0.45 | 0.14 | 0.01 |
| | | | 0' | | | | 1" Ice 0.54 | 0.20 | 0.01 |
| | | | | | | | 2" Ice 0.75 | 0.34 | 0.02 |
| | | | | | | | 4" Ice 1.28 | 0.74 | 0.06 |
| (2) FD9R6004/2C-3L | C | From Leg | 4.00 | | 50.0000 | 107' | No Ice 0.37 | 0.08 | 0.00 |
| | | | -6' | | | | 1/2" Ice 0.45 | 0.14 | 0.01 |
| | | | 0' | | | | 1" Ice 0.54 | 0.20 | 0.01 |
| | | | | | | | 2" Ice 0.75 | 0.34 | 0.02 |
| | | | | | | | 4" Ice 1.28 | 0.74 | 0.06 |
| BXA-171063/12CF | A | From Leg | 4.00 | | 50.0000 | 107' | No Ice 4.79 | 3.62 | 0.02 |
| | | | 6' | | | | 1/2" Ice 5.24 | 4.06 | 0.04 |
| | | | 0' | | | | 1" Ice 5.70 | 4.50 | 0.08 |
| | | | | | | | 2" Ice 6.64 | 5.42 | 0.16 |
| | | | | | | | 4" Ice 8.64 | 7.34 | 0.40 |
| BXA-171063/12CF | B | From Leg | 4.00 | | 50.0000 | 107' | No Ice 4.79 | 3.62 | 0.02 |
| | | | 6' | | | | 1/2" Ice 5.24 | 4.06 | 0.04 |
| | | | 0' | | | | 1" Ice 5.70 | 4.50 | 0.08 |
| | | | | | | | 2" Ice 6.64 | 5.42 | 0.16 |
| | | | | | | | 4" Ice 8.64 | 7.34 | 0.40 |
| BXA-171063/12CF | C | From Leg | 4.00 | | 50.0000 | 107' | No Ice 4.79 | 3.62 | 0.02 |
| | | | 6' | | | | 1/2" Ice 5.24 | 4.06 | 0.04 |
| | | | 0' | | | | 1" Ice 5.70 | 4.50 | 0.08 |
| | | | | | | | 2" Ice 6.64 | 5.42 | 0.16 |
| | | | | | | | 4" Ice 8.64 | 7.34 | 0.40 |
| RRH2x40-AWS | A | From Leg | 4.00 | | 50.0000 | 107' | No Ice 2.52 | 1.59 | 0.04 |
| | | | 6' | | | | 1/2" Ice 2.75 | 1.80 | 0.06 |
| | | | 0' | | | | 1" Ice 2.99 | 2.01 | 0.08 |
| | | | | | | | 2" Ice 3.50 | 2.46 | 0.13 |
| | | | | | | | 4" Ice 4.61 | 3.48 | 0.28 |
| RRH2x40-AWS | B | From Leg | 4.00 | | 50.0000 | 107' | No Ice 2.52 | 1.59 | 0.04 |
| | | | 6' | | | | 1/2" Ice 2.75 | 1.80 | 0.06 |
| | | | 0' | | | | 1" Ice 2.99 | 2.01 | 0.08 |
| | | | | | | | 2" Ice 3.50 | 2.46 | 0.13 |

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| tnxTower Tower Engineering Professionals 3703 Junction Blvd. Raleigh, NC 27603 Phone: (919) 661-6339 FAX: (919) 661-6350 | Job Waterford (BU# 876338) | | Page 14 of 28 |
| | Project TEP No. 129881 | | Date 12:41:09 12/20/12 |
| | Client Crown Castle | | Designed by Nick Hudson |

| Description | Face or Leg | Offset Type | Offsets: | | Azimuth Adjustment | Placement | C _A A | | Weight | |
|---|-------------|-------------|--------------|------|--------------------|-----------|------------------|-----------------|--------|------|
| | | | Horz Lateral | Vert | | | Front | Side | | |
| | | | ft | ft | ° | ft | ft ² | ft ² | K | |
| RRH2x40-AWS | C | From Leg | 4.00 | 6' | 50.0000 | 107' | 4" Ice | 4.61 | 3.48 | 0.28 |
| | | | | | | | No Ice | 2.52 | 1.59 | 0.04 |
| | | | | | | | 1/2" Ice | 2.75 | 1.80 | 0.06 |
| | | | | | | | 1" Ice | 2.99 | 2.01 | 0.08 |
| | | | | | | | 2" Ice | 3.50 | 2.46 | 0.13 |
| DB-T1-6Z-8AB-0Z | A | From Leg | 4.00 | 6' | 50.0000 | 107' | 4" Ice | 4.61 | 3.48 | 0.28 |
| | | | | | | | No Ice | 5.60 | 2.33 | 0.04 |
| | | | | | | | 1/2" Ice | 5.92 | 2.56 | 0.08 |
| | | | | | | | 1" Ice | 6.24 | 2.79 | 0.12 |
| | | | | | | | 2" Ice | 6.91 | 3.28 | 0.21 |
| Sector Mount [SM 307-3] | C | None | | | 0.0000 | 107' | 4" Ice | 8.37 | 4.37 | 0.45 |
| | | | | | | | No Ice | 26.22 | 26.22 | 1.62 |
| | | | | | | | 1/2" Ice | 36.28 | 36.28 | 2.15 |
| | | | | | | | 1" Ice | 46.34 | 46.34 | 2.68 |
| | | | | | | | 2" Ice | 66.46 | 66.46 | 3.73 |
| | | | | | | 4" Ice | 106.70 | 106.70 | 5.85 | |
| * AM-X-CD-14-65-00T-RET w/ Mount Pipe | A | From Leg | 1.00 | -1' | -30.0000 | 97' | No Ice | 5.74 | 4.02 | 0.05 |
| | | | | | | 1/2" Ice | 6.20 | 4.63 | 0.09 | |
| | | | | | | 1" Ice | 6.66 | 5.28 | 0.14 | |
| | | | | | | 2" Ice | 7.62 | 6.68 | 0.27 | |
| | | | | | | 4" Ice | 9.67 | 9.74 | 0.62 | |
| AM-X-CD-14-65-00T-RET w/ Mount Pipe | B | From Leg | 1.00 | -1' | -40.0000 | 97' | No Ice | 5.74 | 4.02 | 0.05 |
| | | | | | | 1/2" Ice | 6.20 | 4.63 | 0.09 | |
| | | | | | | 1" Ice | 6.66 | 5.28 | 0.14 | |
| | | | | | | 2" Ice | 7.62 | 6.68 | 0.27 | |
| | | | | | | 4" Ice | 9.67 | 9.74 | 0.62 | |
| SBNH-1D6565C w/ Mount Pipe | C | From Leg | 1.00 | -1' | -25.0000 | 97' | No Ice | 11.69 | 9.85 | 0.10 |
| | | | | | | 1/2" Ice | 12.42 | 11.38 | 0.19 | |
| | | | | | | 1" Ice | 13.16 | 12.94 | 0.29 | |
| | | | | | | 2" Ice | 14.63 | 15.31 | 0.52 | |
| | | | | | | 4" Ice | 17.92 | 20.19 | 1.17 | |
| 7770.00 w/Mount Pipe | A | From Leg | 1.00 | 1' | -25.0000 | 97' | No Ice | 5.92 | 4.04 | 0.05 |
| | | | | | | 1/2" Ice | 6.36 | 4.67 | 0.10 | |
| | | | | | | 1" Ice | 6.81 | 5.32 | 0.15 | |
| | | | | | | 2" Ice | 7.74 | 6.67 | 0.27 | |
| | | | | | | 4" Ice | 9.71 | 9.81 | 0.63 | |
| 7770.00 w/Mount Pipe | B | From Leg | 1.00 | 1' | 20.0000 | 97' | No Ice | 5.92 | 4.04 | 0.05 |
| | | | | | | 1/2" Ice | 6.36 | 4.67 | 0.10 | |
| | | | | | | 1" Ice | 6.81 | 5.32 | 0.15 | |
| | | | | | | 2" Ice | 7.74 | 6.67 | 0.27 | |
| | | | | | | 4" Ice | 9.71 | 9.81 | 0.63 | |
| 7770.00 w/Mount Pipe | C | From Leg | 1.00 | 1' | 20.0000 | 97' | No Ice | 5.92 | 4.04 | 0.05 |
| | | | | | | 1/2" Ice | 6.36 | 4.67 | 0.10 | |
| | | | | | | 1" Ice | 6.81 | 5.32 | 0.15 | |
| | | | | | | 2" Ice | 7.74 | 6.67 | 0.27 | |
| | | | | | | 4" Ice | 9.71 | 9.81 | 0.63 | |
| (2) LGP21401 | A | From Leg | 1.00 | 1' | -25.0000 | 97' | No Ice | 1.29 | 0.23 | 0.01 |
| | | | | | | 1/2" Ice | 1.45 | 0.31 | 0.02 | |
| | | | | | | 1" Ice | 1.61 | 0.40 | 0.03 | |
| | | | | | | 2" Ice | 1.97 | 0.61 | 0.05 | |
| | | | | | | 4" Ice | 2.79 | 1.12 | 0.14 | |
| (2) LGP21401 | B | From Leg | 1.00 | 1' | 20.0000 | 97' | No Ice | 1.29 | 0.23 | 0.01 |
| | | | | | | 1/2" Ice | 1.45 | 0.31 | 0.02 | |
| | | | | | | 1" Ice | 1.61 | 0.40 | 0.03 | |
| | | | | | | 2" Ice | 1.97 | 0.61 | 0.05 | |
| | | | | | | 4" Ice | 2.79 | 1.12 | 0.14 | |

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| tnxTower Tower Engineering Professionals 3703 Junction Blvd. Raleigh, NC 27603 Phone: (919) 661-6339 FAX: (919) 661-6350 | Job Waterford (BU# 876338) | Page 15 of 28 |
| | Project TEP No. 129881 | Date 12:41:09 12/20/12 |
| | Client Crown Castle | Designed by Nick Hudson |

| Description | Face or Leg | Offset Type | Offsets: | | Azimuth Adjustment | Placement | CMA Front | CMA Side | Weight | |
|------------------------------|-------------|-------------|----------|---------|--------------------|-----------|-----------|----------|--------|------|
| | | | Horz | Lateral | | | | | | Vert |
| (2) LGP21401 | C | From Leg | 1.00 | 1' | 20.0000 | 97' | No Ice | 1.29 | 0.23 | 0.01 |
| | | | | | | | 1/2" Ice | 1.45 | 0.31 | 0.02 |
| | | | | | | | 1" Ice | 1.61 | 0.40 | 0.03 |
| | | | | | | | 2" Ice | 1.97 | 0.61 | 0.05 |
| | | | | | | | 4" Ice | 2.79 | 1.12 | 0.14 |
| RRUS-11 | A | From Leg | 1.00 | -1' | -30.0000 | 97' | No Ice | 3.25 | 1.37 | 0.05 |
| | | | | | | | 1/2" Ice | 3.49 | 1.55 | 0.07 |
| | | | | | | | 1" Ice | 3.74 | 1.74 | 0.09 |
| | | | | | | | 2" Ice | 4.27 | 2.14 | 0.15 |
| | | | | | | | 4" Ice | 5.43 | 3.04 | 0.31 |
| RRUS-11 | B | From Leg | 1.00 | -1' | -40.0000 | 97' | No Ice | 3.25 | 1.37 | 0.05 |
| | | | | | | | 1/2" Ice | 3.49 | 1.55 | 0.07 |
| | | | | | | | 1" Ice | 3.74 | 1.74 | 0.09 |
| | | | | | | | 2" Ice | 4.27 | 2.14 | 0.15 |
| | | | | | | | 4" Ice | 5.43 | 3.04 | 0.31 |
| RRUS-11 | C | From Leg | 1.00 | -1' | -25.0000 | 97' | No Ice | 3.25 | 1.37 | 0.05 |
| | | | | | | | 1/2" Ice | 3.49 | 1.55 | 0.07 |
| | | | | | | | 1" Ice | 3.74 | 1.74 | 0.09 |
| | | | | | | | 2" Ice | 4.27 | 2.14 | 0.15 |
| | | | | | | | 4" Ice | 5.43 | 3.04 | 0.31 |
| DC6-48-60-18-8F | A | From Leg | 1.00 | -1' | -30.0000 | 97' | No Ice | 1.27 | 1.27 | 0.02 |
| | | | | | | | 1/2" Ice | 1.46 | 1.46 | 0.04 |
| | | | | | | | 1" Ice | 1.66 | 1.66 | 0.05 |
| | | | | | | | 2" Ice | 2.09 | 2.09 | 0.10 |
| | | | | | | | 4" Ice | 3.10 | 3.10 | 0.21 |
| Side Arm Mount [SO 201-3] | C | None | | | 0.0000 | 97' | No Ice | 5.71 | 5.71 | 0.29 |
| | | | | | | | 1/2" Ice | 7.91 | 7.91 | 0.35 |
| | | | | | | | 1" Ice | 10.11 | 10.11 | 0.41 |
| | | | | | | | 2" Ice | 14.51 | 14.51 | 0.54 |
| | | | | | | | 4" Ice | 23.31 | 23.31 | 0.79 |
| * 800 10504 w/ Mount Pipe | A | From Leg | 4.00 | -6' | 90.0000 | 87' | No Ice | 3.59 | 3.18 | 0.04 |
| | | | | | | | 1/2" Ice | 4.01 | 3.91 | 0.07 |
| | | | | | | | 1" Ice | 4.42 | 4.58 | 0.11 |
| | | | | | | | 2" Ice | 5.34 | 5.98 | 0.21 |
| | | | | | | | 4" Ice | 7.38 | 8.98 | 0.51 |
| 800 10504 w/ Mount Pipe | B | From Leg | 4.00 | -6' | 70.0000 | 87' | No Ice | 3.59 | 3.18 | 0.04 |
| | | | | | | | 1/2" Ice | 4.01 | 3.91 | 0.07 |
| | | | | | | | 1" Ice | 4.42 | 4.58 | 0.11 |
| | | | | | | | 2" Ice | 5.34 | 5.98 | 0.21 |
| | | | | | | | 4" Ice | 7.38 | 8.98 | 0.51 |
| 800 10504 w/ Mount Pipe | C | From Leg | 4.00 | -6' | 70.0000 | 87' | No Ice | 3.59 | 3.18 | 0.04 |
| | | | | | | | 1/2" Ice | 4.01 | 3.91 | 0.07 |
| | | | | | | | 1" Ice | 4.42 | 4.58 | 0.11 |
| | | | | | | | 2" Ice | 5.34 | 5.98 | 0.21 |
| | | | | | | | 4" Ice | 7.38 | 8.98 | 0.51 |
| 860 10118 | A | From Leg | 4.00 | -6' | 90.0000 | 87' | No Ice | 0.04 | 0.14 | 0.00 |
| | | | | | | | 1/2" Ice | 0.07 | 0.21 | 0.00 |
| | | | | | | | 1" Ice | 0.11 | 0.28 | 0.01 |
| | | | | | | | 2" Ice | 0.22 | 0.46 | 0.01 |
| | | | | | | | 4" Ice | 0.54 | 0.91 | 0.05 |
| 860 10118 | B | From Leg | 4.00 | -6' | 70.0000 | 87' | No Ice | 0.04 | 0.14 | 0.00 |
| | | | | | | | 1/2" Ice | 0.07 | 0.21 | 0.00 |
| | | | | | | | 1" Ice | 0.11 | 0.28 | 0.01 |
| | | | | | | | 2" Ice | 0.22 | 0.46 | 0.01 |
| | | | | | | | 4" Ice | 0.54 | 0.91 | 0.05 |
| 860 10118 | C | From Leg | 4.00 | | 70.0000 | 87' | No Ice | 0.04 | 0.14 | 0.00 |
| | | | | | | | | | | |

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| tnxTower Tower Engineering Professionals 3703 Junction Blvd. Raleigh, NC 27603 Phone: (919) 661-6339 FAX: (919) 661-6350 | Job Waterford (BU# 876338) | Page 17 of 28 |
| | Project TEP No. 129881 | Date 12:41:09 12/20/12 |
| | Client Crown Castle | Designed by Nick Hudson |

Truss-Leg Properties

| Section Designation | Area <i>in</i> ² | Area Ice <i>in</i> ² | Self Weight <i>K</i> | Ice Weight <i>K</i> | Equiv. Diameter <i>in</i> | Equiv. Diameter Ice <i>in</i> | Leg Area <i>in</i> ² |
|------------------------------------|--------------------------------|---------------------------------------|----------------------------|---------------------------|---------------------------------|--|---------------------------------------|
| Pirod 105244 w/ 1/4" Reinforcement | 2261.8218 | 4388.8287 | 0.60 | 0.79 | 7.8535 | 15.2390 | 5.8293 |
| Pirod 105217 | 2312.6169 | 5036.1403 | 0.60 | 0.96 | 8.0299 | 17.4866 | 5.3014 |
| Pirod 105218 | 2441.6826 | 5107.8359 | 0.73 | 0.92 | 8.4781 | 17.7355 | 7.2158 |
| Pirod 105218 | 2441.6826 | 4911.6957 | 0.73 | 0.85 | 8.4781 | 17.0545 | 7.2158 |
| Pirod 105219 | 2634.3485 | 5405.4675 | 1.11 | 0.93 | 9.1470 | 18.7690 | 9.4248 |

Load Combinations

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

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| | Project TEP No. 129881 | Date 12:41:09 12/20/12 |
| | Client Crown Castle | Designed by Nick Hudson |

| Comb. No. | Description |
|-----------|-----------------------------|
| 38 | Dead+Wind 330 deg - Service |

Maximum Member Forces

| Section No. | Elevation ft | Component Type | Condition | Gov. Load Comb. | Force K | Major Axis Moment kip-ft | Minor Axis Moment kip-ft |
|-------------|--------------|------------------|------------------|-----------------|---------|--------------------------|--------------------------|
| T1 | 136 - 130 | Leg | Max Tension | 4 | 3.70 | 0.31 | -0.16 |
| | | | Max. Compression | 10 | -5.73 | 0.19 | -0.10 |
| | | | Max. Mx | 11 | -0.92 | 0.64 | -0.01 |
| | | | Max. My | 2 | -0.92 | -0.01 | 0.63 |
| | | | Max. Vy | 11 | -1.04 | 0.21 | -0.01 |
| | | Diagonal | Max. Vx | 2 | -1.02 | 0.01 | 0.21 |
| | | | Max Tension | 5 | 1.43 | 0.00 | 0.00 |
| | | | Max. Compression | 11 | -1.43 | 0.00 | 0.00 |
| | | | Max. Mx | 19 | 0.33 | -0.00 | 0.00 |
| | | | Max. My | 10 | -1.29 | -0.00 | -0.00 |
| | | | Max. Vy | 18 | 0.00 | -0.00 | 0.00 |
| | | | Max. Vx | 10 | -0.00 | -0.00 | -0.00 |
| | | | Top Girt | Max Tension | 10 | 0.64 | 0.00 |
| | | Max. Compression | | 4 | -0.65 | 0.00 | 0.00 |
| | | Max. Mx | | 14 | -0.01 | 0.01 | 0.00 |
| | | Max. My | | 3 | 0.01 | 0.00 | -0.00 |
| | | Max. Vy | | 14 | -0.01 | 0.00 | 0.00 |
| | | Max. Vx | | 3 | 0.00 | 0.00 | 0.00 |
| | | Bottom Girt | | Max Tension | 4 | 0.43 | 0.00 |
| | | | Max. Compression | 10 | -0.45 | 0.00 | 0.00 |
| | | | Max. Mx | 14 | 0.00 | 0.01 | 0.00 |
| | | | Max. My | 3 | 0.01 | 0.00 | -0.00 |
| | | | Max. Vy | 14 | -0.01 | 0.00 | 0.00 |
| | | | Max. Vx | 3 | 0.00 | 0.00 | 0.00 |
| T2 | 130 - 110 | | Leg | Max Tension | 4 | 34.74 | 0.98 |
| | | Max. Compression | | 10 | -39.91 | -0.39 | -0.00 |
| | | Max. Mx | | 10 | -39.91 | -1.00 | -0.01 |
| | | Max. My | | 3 | -1.24 | 0.02 | -0.96 |
| | | Max. Vy | | 10 | -2.93 | -0.39 | -0.00 |
| | | Diagonal | Max. Vx | 11 | 2.30 | 0.01 | 0.32 |
| | | | Max Tension | 13 | 3.45 | 0.00 | 0.00 |
| | | | Max. Compression | 7 | -3.45 | 0.00 | 0.00 |
| | | | Max. Mx | 18 | 1.03 | -0.00 | -0.00 |
| | | | Max. My | 13 | -2.78 | -0.00 | 0.00 |
| | | | Max. Vy | 18 | 0.01 | -0.00 | -0.00 |
| | | | Max. Vx | 13 | -0.00 | -0.00 | 0.00 |
| | | | Top Girt | Max Tension | 10 | 0.71 | 0.00 |
| | | Max. Compression | | 4 | -0.71 | 0.00 | 0.00 |
| | | Max. Mx | | 14 | -0.01 | 0.01 | 0.00 |
| | | Max. My | | 3 | -0.01 | 0.00 | -0.00 |
| | | Max. Vy | | 14 | -0.01 | 0.00 | 0.00 |
| | | Max. Vx | | 3 | 0.00 | 0.00 | 0.00 |
| | | Bottom Girt | | Max Tension | 4 | 1.54 | 0.00 |
| | | | Max. Compression | 10 | -1.55 | 0.00 | 0.00 |
| | | | Max. Mx | 14 | 0.04 | 0.01 | 0.00 |
| | | | Max. My | 3 | 0.12 | 0.00 | -0.00 |
| | | | Max. Vy | 14 | -0.01 | 0.00 | 0.00 |
| | | | Max. Vx | 3 | 0.00 | 0.00 | 0.00 |
| T3 | 110 - 95 | | Leg | Max Tension | 4 | 69.49 | -0.15 |
| | | Max. Compression | | 10 | -77.63 | -0.02 | 0.01 |
| | | Max. Mx | | 10 | -39.92 | 1.56 | 0.01 |
| | | | Max. My | 11 | -2.45 | -0.01 | -1.22 |

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|---|--------------------------------------|-----------------------------------|
| tnxTower Tower Engineering Professionals 3703 Junction Blvd. Raleigh, NC 27603 Phone: (919) 661-6339 FAX: (919) 661-6350 | Job Waterford (BU# 876338) | Page 19 of 28 |
| | Project TEP No. 129881 | Date 12:41:09 12/20/12 |
| | Client Crown Castle | Designed by Nick Hudson |

| Section No. | Elevation ft | Component Type | Condition | Gov. Load Comb. | Force K | Major Axis Moment kip-ft | Minor Axis Moment kip-ft | |
|------------------|------------------|------------------|----------------------|------------------|---------|--------------------------|--------------------------|------|
| T4 | 95 - 90 | Diagonal | Max. Vy | 10 | -2.93 | 1.56 | 0.01 | |
| | | | Max. Vx | 11 | 2.30 | -0.01 | -1.22 | |
| | | | Max Tension | 9 | 5.00 | 0.00 | 0.00 | |
| | | | Max. Compression | 3 | -5.04 | 0.00 | 0.00 | |
| | | | Max. Mx | 4 | 4.42 | -0.01 | 0.00 | |
| | | | Max. My | 7 | -3.81 | -0.00 | -0.00 | |
| | | Top Girt | Max. Vy | 15 | 0.01 | -0.01 | -0.00 | |
| | | | Max. Vx | 7 | 0.00 | -0.00 | -0.00 | |
| | | | Max Tension | 10 | 1.12 | 0.00 | 0.00 | |
| | | | Max. Compression | 12 | -1.06 | 0.00 | 0.00 | |
| | | | Max. Mx | 14 | 0.02 | 0.01 | 0.00 | |
| | | | Max. My | 10 | -0.61 | 0.00 | 0.00 | |
| | | Leg | Max. Vy | 14 | -0.01 | 0.00 | 0.00 | |
| | | | Max. Vx | 10 | -0.00 | 0.00 | 0.00 | |
| | | | Max Tension | 4 | 87.93 | 0.79 | -0.00 | |
| | | | Max. Compression | 10 | -97.23 | 3.29 | 0.02 | |
| | | | Max. Mx | 10 | -97.23 | 3.29 | 0.02 | |
| | | | Max. My | 3 | -5.35 | 0.04 | -1.56 | |
| | | | Max. Vy | 10 | -7.06 | 3.29 | 0.02 | |
| | | | Max. Vx | 5 | -3.04 | 0.02 | 1.55 | |
| | | | Diagonal | Max Tension | 13 | 5.62 | 0.00 | 0.00 |
| | | | | Max. Compression | 7 | -5.76 | 0.00 | 0.00 |
| | | | | Max. Mx | 10 | 4.52 | -0.01 | 0.00 |
| | | | Secondary Horizontal | Max. My | 11 | -5.06 | 0.00 | 0.00 |
| | | | | Max. Vy | 19 | 0.01 | -0.01 | 0.00 |
| | | | | Max. Vx | 11 | -0.00 | 0.00 | 0.00 |
| | | | | Max Tension | 10 | 1.68 | 0.00 | 0.00 |
| | | Max. Compression | | 10 | -1.68 | 0.00 | 0.00 | |
| | | Max. Mx | | 14 | 0.15 | 0.03 | 0.00 | |
| | | Bottom Girt | Max. My | 3 | 1.45 | 0.00 | -0.00 | |
| | | | Max. Vy | 14 | -0.02 | 0.00 | 0.00 | |
| | | | Max. Vx | 3 | -0.00 | 0.00 | 0.00 | |
| | | | Max Tension | 4 | 0.98 | 0.00 | 0.00 | |
| Max. Compression | 10 | | -0.90 | 0.00 | 0.00 | | | |
| Max. Mx | 14 | | 0.06 | 0.01 | 0.00 | | | |
| T5 | 90 - 80 | Leg | Max. My | 3 | -0.03 | 0.00 | -0.00 | |
| | | | Max. Vy | 14 | -0.01 | 0.00 | 0.00 | |
| | | | Max. Vx | 3 | 0.00 | 0.00 | 0.00 | |
| | | Diagonal | Max Tension | 4 | 95.03 | -3.12 | -0.01 | |
| | | | Max. Compression | 10 | -104.43 | 4.61 | 0.03 | |
| | | | Max. Mx | 4 | 94.53 | -5.12 | -0.04 | |
| | | | Max. My | 5 | -5.22 | -0.22 | 7.95 | |
| | | | Max. Vy | 4 | 0.45 | -5.12 | -0.04 | |
| | | | Max. Vx | 9 | -0.91 | -0.27 | 7.89 | |
| | | | Max Tension | 8 | 7.02 | 0.11 | 0.02 | |
| | | | Max. Compression | 2 | -7.66 | 0.00 | 0.00 | |
| | | | Max. Mx | 4 | 6.84 | 0.11 | 0.01 | |
| T6 | 80 - 60 | Leg | Max. My | 7 | -6.86 | -0.09 | 0.04 | |
| | | | Max. Vy | 4 | 0.02 | 0.11 | 0.01 | |
| | | | Max. Vx | 7 | -0.01 | 0.00 | 0.00 | |
| Diagonal | Max Tension | 4 | 136.19 | -5.49 | -0.04 | | | |
| | Max. Compression | 10 | -149.38 | 5.97 | 0.06 | | | |
| | Max. Mx | 4 | 135.89 | -6.00 | -0.07 | | | |
| | Max. My | 5 | -6.10 | -0.22 | 7.95 | | | |
| | Max. Vy | 2 | -0.21 | 5.55 | -0.00 | | | |
| | Max. Vx | 13 | 0.35 | -0.21 | 7.81 | | | |
| | Max Tension | 11 | 7.35 | 0.00 | 0.00 | | | |
| | Max. Compression | 5 | -7.70 | 0.00 | 0.00 | | | |
| | Max. Mx | 10 | 6.24 | 0.08 | 0.00 | | | |
| Max. My | 3 | -6.91 | -0.04 | -0.01 | | | | |

| | | |
|---|--------------------------------------|-----------------------------------|
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| | Project TEP No. 129881 | Date 12:41:09 12/20/12 |
| | Client Crown Castle | Designed by Nick Hudson |

| Section No. | Elevation ft | Component Type | Condition | Gov. Load Comb. | Force K | Major Axis Moment kip-ft | Minor Axis Moment kip-ft |
|-------------|--------------|----------------|------------------|-----------------|---------|--------------------------|--------------------------|
| T7 | 60 - 40 | Leg | Max. Vy | 19 | -0.02 | 0.05 | -0.01 |
| | | | Max. Vx | 3 | 0.00 | -0.04 | -0.01 |
| | | | Max Tension | 4 | 170.40 | -5.59 | -0.03 |
| | | | Max. Compression | 10 | -187.22 | 5.57 | 0.03 |
| | | | Max. Mx | 4 | 154.23 | -6.00 | -0.07 |
| | | | Max. My | 9 | -6.55 | -0.04 | 5.54 |
| | | Diagonal | Max. Vy | 12 | -0.13 | -5.99 | 0.04 |
| | | | Max. Vx | 9 | 0.14 | -0.04 | 5.54 |
| | | | Max Tension | 11 | 6.81 | 0.00 | 0.00 |
| | | | Max. Compression | 11 | -7.20 | 0.00 | 0.00 |
| | | | Max. Mx | 10 | 5.46 | 0.10 | 0.00 |
| | | | Max. My | 17 | -1.89 | 0.02 | -0.01 |
| | | | Max. Vy | 21 | 0.03 | 0.05 | 0.01 |
| T8 | 40 - 20 | Leg | Max. Vx | 17 | 0.00 | 0.00 | 0.00 |
| | | | Max Tension | 4 | 199.71 | -4.96 | -0.02 |
| | | | Max. Compression | 10 | -220.04 | 6.92 | 0.10 |
| | | | Max. Mx | 10 | -220.04 | 6.92 | 0.10 |
| | | | Max. My | 5 | -8.89 | -0.15 | 6.04 |
| | | | Max. Vy | 25 | 0.48 | -4.68 | 0.02 |
| | | Diagonal | Max. Vx | 9 | 0.25 | -0.17 | 6.01 |
| | | | Max Tension | 11 | 6.56 | 0.00 | 0.00 |
| | | | Max. Compression | 11 | -6.93 | 0.00 | 0.00 |
| | | | Max. Mx | 10 | 5.25 | 0.09 | 0.00 |
| | | | Max. My | 17 | 2.39 | 0.05 | -0.01 |
| | | | Max. Vy | 21 | 0.03 | 0.06 | 0.01 |
| | | | Max. Vx | 17 | 0.00 | 0.00 | 0.00 |
| T9 | 20 - 0 | Leg | Max Tension | 4 | 225.07 | -5.19 | -0.03 |
| | | | Max. Compression | 10 | -249.90 | 0.00 | -0.00 |
| | | | Max. Mx | 10 | -236.09 | 6.92 | 0.10 |
| | | | Max. My | 5 | -10.65 | -0.35 | 9.22 |
| | | | Max. Vy | 25 | -0.80 | -4.68 | 0.02 |
| | | | Max. Vx | 9 | 1.01 | -0.37 | 9.20 |
| | | Diagonal | Max Tension | 4 | 7.85 | 0.00 | 0.00 |
| | | | Max. Compression | 10 | -8.58 | 0.00 | 0.00 |
| | | | Max. Mx | 10 | 4.65 | 0.13 | 0.01 |
| | | | Max. My | 3 | -7.32 | -0.01 | -0.01 |
| | | | Max. Vy | 21 | 0.05 | 0.11 | 0.01 |
| | | | Max. Vx | 17 | 0.00 | 0.00 | 0.00 |

Maximum Reactions

| Location | Condition | Gov. Load Comb. | Vertical K | Horizontal, X K | Horizontal, Z K |
|----------|---------------------|-----------------|------------|-----------------|-----------------|
| Leg C | Max. Vert | 10 | 259.51 | 22.33 | -12.59 |
| | Max. H _x | 10 | 259.51 | 22.33 | -12.59 |
| | Max. H _z | 4 | -232.85 | -20.40 | 11.49 |
| | Min. Vert | 4 | -232.85 | -20.40 | 11.49 |
| | Min. H _x | 4 | -232.85 | -20.40 | 11.49 |
| | Min. H _z | 10 | 259.51 | 22.33 | -12.59 |
| Leg B | Max. Vert | 6 | 259.39 | -22.23 | -12.76 |
| | Max. H _x | 12 | -232.63 | 20.30 | 11.65 |
| | Max. H _z | 12 | -232.63 | 20.30 | 11.65 |
| | Min. Vert | 12 | -232.63 | 20.30 | 11.65 |
| | Min. H _x | 6 | 259.39 | -22.23 | -12.76 |
| | Min. H _z | 6 | 259.39 | -22.23 | -12.76 |
| Leg A | Max. Vert | 2 | 258.12 | 0.20 | 25.56 |

| | | |
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| | Project TEP No. 129881 | Date 12:41:09 12/20/12 |
| | Client Crown Castle | Designed by Nick Hudson |

| Location | Condition | Gov. Load Comb. | Vertical K | Horizontal, X K | Horizontal, Z K |
|----------|---------------------|-----------------|------------|-----------------|-----------------|
| | Max. H _x | 12 | 133.39 | 0.27 | 13.07 |
| | Max. H _z | 2 | 258.12 | 0.20 | 25.56 |
| | Min. Vert | 8 | -231.99 | -0.20 | -23.35 |
| | Min. H _x | 6 | -111.50 | -0.35 | -11.39 |
| | Min. H _z | 8 | -231.99 | -0.20 | -23.35 |

Tower Mast Reaction Summary

| Load Combination | Vertical K | Shear _x K | Shear _z K | Overturning Moment, M _x kip-ft | Overturning Moment, M _z kip-ft | Torque kip-ft |
|------------------------------|------------|----------------------|----------------------|---|---|---------------|
| Dead Only | 35.55 | 0.00 | 0.00 | 2.36 | -0.34 | 0.00 |
| Dead+ Wind 0 deg - No Ice | 35.55 | -0.00 | -37.69 | -2985.87 | -1.54 | 4.78 |
| Dead+ Wind 30 deg - No Ice | 35.55 | 18.65 | -32.21 | -2564.58 | -1491.01 | 6.37 |
| Dead+ Wind 60 deg - No Ice | 35.55 | 32.16 | -18.50 | -1475.65 | -2573.78 | 6.27 |
| Dead+ Wind 90 deg - No Ice | 35.55 | 37.31 | 0.01 | 1.62 | -2980.32 | 4.59 |
| Dead+ Wind 120 deg - No Ice | 35.55 | 32.75 | 18.85 | 1495.48 | -2602.20 | 1.70 |
| Dead+ Wind 150 deg - No Ice | 35.55 | 18.66 | 32.21 | 2567.74 | -1489.67 | -1.70 |
| Dead+ Wind 180 deg - No Ice | 35.55 | 0.00 | 37.01 | 2956.41 | 0.83 | -4.62 |
| Dead+ Wind 210 deg - No Ice | 35.55 | -18.65 | 32.20 | 2568.93 | 1491.01 | -6.37 |
| Dead+ Wind 240 deg - No Ice | 35.55 | -32.74 | 18.84 | 1497.53 | 2602.68 | -6.48 |
| Dead+ Wind 270 deg - No Ice | 35.55 | -37.31 | 0.00 | 3.99 | 2979.63 | -4.59 |
| Dead+ Wind 300 deg - No Ice | 35.55 | -32.16 | -18.51 | -1473.61 | 2571.90 | -1.66 |
| Dead+ Wind 330 deg - No Ice | 35.55 | -18.65 | -32.21 | -2563.41 | 1488.25 | 1.70 |
| Dead+Ice+Temp | 73.92 | -0.00 | -0.00 | 8.65 | -4.23 | 0.00 |
| Dead+ Wind 0 deg+Ice+Temp | 73.92 | -0.00 | -12.43 | -917.74 | -4.12 | 1.13 |
| Dead+ Wind 30 deg+Ice+Temp | 73.92 | 6.06 | -10.48 | -781.72 | -461.71 | 1.58 |
| Dead+ Wind 60 deg+Ice+Temp | 73.92 | 10.37 | -5.98 | -444.45 | -791.39 | 1.63 |
| Dead+ Wind 90 deg+Ice+Temp | 73.92 | 12.12 | 0.00 | 8.88 | -919.45 | 1.30 |
| Dead+ Wind 120 deg+Ice+Temp | 73.92 | 10.78 | 6.22 | 472.07 | -808.75 | 0.60 |
| Dead+ Wind 150 deg+Ice+Temp | 73.92 | 6.07 | 10.49 | 799.26 | -462.00 | -0.29 |
| Dead+ Wind 180 deg+Ice+Temp | 73.92 | 0.00 | 11.97 | 915.28 | -4.41 | -1.06 |
| Dead+ Wind 210 deg+Ice+Temp | 73.92 | -6.06 | 10.48 | 799.12 | 453.23 | -1.58 |
| Dead+ Wind 240 deg+Ice+Temp | 73.92 | -10.78 | 6.21 | 471.82 | 800.08 | -1.73 |
| Dead+ Wind 270 deg+Ice+Temp | 73.92 | -12.12 | -0.00 | 8.59 | 910.93 | -1.30 |
| Dead+ Wind 300 deg+Ice+Temp | 73.92 | -10.38 | -5.99 | -444.70 | 783.02 | -0.57 |
| Dead+ Wind 330 deg+Ice+Temp | 73.92 | -6.06 | -10.49 | -781.87 | 453.44 | 0.29 |
| Dead+ Wind 0 deg - Service | 35.55 | -0.00 | -13.04 | -1031.52 | -0.76 | 1.65 |
| Dead+ Wind 30 deg - Service | 35.55 | 6.45 | -11.14 | -885.84 | -516.24 | 2.19 |
| Dead+ Wind 60 deg - Service | 35.55 | 11.13 | -6.40 | -509.13 | -890.92 | 2.17 |
| Dead+ Wind 90 deg - Service | 35.55 | 12.91 | 0.00 | 2.01 | -1031.52 | 1.60 |
| Dead+ Wind 120 deg - Service | 35.55 | 11.33 | 6.52 | 518.96 | -900.55 | 0.59 |
| Dead+ Wind 150 deg - Service | 35.55 | 6.46 | 11.14 | 890.12 | -515.62 | -0.60 |
| Dead+ Wind 180 deg - Service | 35.55 | 0.00 | 12.81 | 1024.66 | 0.06 | -1.60 |
| Dead+ Wind 210 deg - Service | 35.55 | -6.45 | 11.14 | 890.53 | 515.64 | -2.19 |
| Dead+ Wind 240 deg - Service | 35.55 | -11.33 | 6.52 | 519.67 | 900.27 | -2.24 |
| Dead+ Wind 270 deg - Service | 35.55 | -12.91 | -0.00 | 2.83 | 1030.82 | -1.60 |
| Dead+ Wind 300 deg - Service | 35.55 | -11.13 | -6.41 | -508.42 | 889.81 | -0.57 |
| Dead+ Wind 330 deg - Service | 35.55 | -6.46 | -11.14 | -885.43 | 514.84 | 0.60 |

Solution Summary

| | | |
|---|--------------------------------------|-----------------------------------|
| tnxTower Tower Engineering Professionals 3703 Junction Blvd. Raleigh, NC 27603 Phone: (919) 661-6339 FAX: (919) 661-6350 | Job Waterford (BU# 876338) | Page 22 of 28 |
| | Project TEP No. 129881 | Date 12:41:09 12/20/12 |
| | Client Crown Castle | Designed by Nick Hudson |

| 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 | -35.55 | 0.00 | -0.00 | 35.55 | -0.00 | 0.000% |
| 2 | -0.00 | -35.55 | -37.73 | 0.00 | 35.55 | 37.69 | 0.075% |
| 3 | 18.67 | -35.55 | -32.23 | -18.65 | 35.55 | 32.21 | 0.059% |
| 4 | 32.19 | -35.55 | -18.52 | -32.16 | 35.55 | 18.50 | 0.066% |
| 5 | 37.34 | -35.55 | 0.00 | -37.31 | 35.55 | -0.01 | 0.059% |
| 6 | 32.78 | -35.55 | 18.87 | -32.75 | 35.55 | -18.85 | 0.075% |
| 7 | 18.67 | -35.55 | 32.23 | -18.66 | 35.55 | -32.21 | 0.059% |
| 8 | 0.00 | -35.55 | 37.05 | -0.00 | 35.55 | -37.01 | 0.065% |
| 9 | -18.67 | -35.55 | 32.23 | 18.65 | 35.55 | -32.20 | 0.059% |
| 10 | -32.78 | -35.55 | 18.86 | 32.74 | 35.55 | -18.84 | 0.076% |
| 11 | -37.34 | -35.55 | -0.00 | 37.31 | 35.55 | -0.00 | 0.059% |
| 12 | -32.19 | -35.55 | -18.53 | 32.16 | 35.55 | 18.51 | 0.066% |
| 13 | -18.67 | -35.55 | -32.23 | 18.65 | 35.55 | 32.21 | 0.059% |
| 14 | 0.00 | -73.92 | 0.00 | 0.00 | 73.92 | 0.00 | 0.000% |
| 15 | -0.00 | -73.92 | -12.45 | 0.00 | 73.92 | 12.43 | 0.015% |
| 16 | 6.06 | -73.92 | -10.49 | -6.06 | 73.92 | 10.48 | 0.015% |
| 17 | 10.38 | -73.92 | -5.98 | -10.37 | 73.92 | 5.98 | 0.015% |
| 18 | 12.13 | -73.92 | 0.00 | -12.12 | 73.92 | -0.00 | 0.015% |
| 19 | 10.79 | -73.92 | 6.23 | -10.78 | 73.92 | -6.22 | 0.015% |
| 20 | 6.07 | -73.92 | 10.50 | -6.07 | 73.92 | -10.49 | 0.015% |
| 21 | 0.00 | -73.92 | 11.98 | -0.00 | 73.92 | -11.97 | 0.015% |
| 22 | -6.06 | -73.92 | 10.49 | 6.06 | 73.92 | -10.48 | 0.015% |
| 23 | -10.79 | -73.92 | 6.22 | 10.78 | 73.92 | -6.21 | 0.015% |
| 24 | -12.13 | -73.92 | -0.00 | 12.12 | 73.92 | 0.00 | 0.015% |
| 25 | -10.39 | -73.92 | -5.99 | 10.38 | 73.92 | 5.99 | 0.015% |
| 26 | -6.07 | -73.92 | -10.50 | 6.06 | 73.92 | 10.49 | 0.015% |
| 27 | -0.00 | -35.55 | -13.06 | 0.00 | 35.55 | 13.04 | 0.039% |
| 28 | 6.46 | -35.55 | -11.15 | -6.45 | 35.55 | 11.14 | 0.028% |
| 29 | 11.14 | -35.55 | -6.41 | -11.13 | 35.55 | 6.40 | 0.029% |
| 30 | 12.92 | -35.55 | 0.00 | -12.91 | 35.55 | -0.00 | 0.028% |
| 31 | 11.34 | -35.55 | 6.53 | -11.33 | 35.55 | -6.52 | 0.039% |
| 32 | 6.46 | -35.55 | 11.15 | -6.46 | 35.55 | -11.14 | 0.027% |
| 33 | 0.00 | -35.55 | 12.82 | -0.00 | 35.55 | -12.81 | 0.029% |
| 34 | -6.46 | -35.55 | 11.15 | 6.45 | 35.55 | -11.14 | 0.028% |
| 35 | -11.34 | -35.55 | 6.53 | 11.33 | 35.55 | -6.52 | 0.039% |
| 36 | -12.92 | -35.55 | -0.00 | 12.91 | 35.55 | 0.00 | 0.028% |
| 37 | -11.14 | -35.55 | -6.41 | 11.13 | 35.55 | 6.41 | 0.029% |
| 38 | -6.46 | -35.55 | -11.15 | 6.46 | 35.55 | 11.14 | 0.027% |

Non-Linear Convergence Results

| Load Combination | Converged? | Number of Cycles | Displacement Tolerance | Force Tolerance |
|------------------|------------|------------------|------------------------|-----------------|
| 1 | Yes | 4 | 0.0000001 | 0.0000001 |
| 2 | Yes | 5 | 0.00061664 | 0.00092810 |
| 3 | Yes | 6 | 0.00048129 | 0.00072180 |
| 4 | Yes | 6 | 0.00053735 | 0.00080478 |
| 5 | Yes | 6 | 0.00048058 | 0.00072073 |
| 6 | Yes | 5 | 0.00061634 | 0.00092765 |
| 7 | Yes | 6 | 0.00047946 | 0.00071933 |
| 8 | Yes | 6 | 0.00053645 | 0.00080381 |
| 9 | Yes | 6 | 0.00047957 | 0.00071941 |
| 10 | Yes | 5 | 0.00061640 | 0.00092769 |
| 11 | Yes | 6 | 0.00048004 | 0.00072007 |
| 12 | Yes | 6 | 0.00053694 | 0.00080448 |
| 13 | Yes | 6 | 0.00048062 | 0.00072104 |

| | | | | |
|---|----------------|------------------------|--------------------|-------------------|
| tnxTower Tower Engineering Professionals 3703 Junction Blvd. Raleigh, NC 27603 Phone: (919) 661-6339 FAX: (919) 661-6350 | Job | Waterford (BU# 876338) | Page | 23 of 28 |
| | Project | TEP No. 129881 | Date | 12:41:09 12/20/12 |
| | Client | Crown Castle | Designed by | Nick Hudson |

| | | | | |
|----|-----|---|------------|------------|
| 14 | Yes | 4 | 0.00000001 | 0.00000705 |
| 15 | Yes | 7 | 0.00058269 | 0.00079675 |
| 16 | Yes | 7 | 0.00059550 | 0.00081296 |
| 17 | Yes | 7 | 0.00060766 | 0.00082959 |
| 18 | Yes | 7 | 0.00059524 | 0.00081440 |
| 19 | Yes | 7 | 0.00058286 | 0.00079963 |
| 20 | Yes | 7 | 0.00059500 | 0.00081469 |
| 21 | Yes | 7 | 0.00060722 | 0.00083040 |
| 22 | Yes | 7 | 0.00059524 | 0.00081467 |
| 23 | Yes | 7 | 0.00058287 | 0.00079910 |
| 24 | Yes | 7 | 0.00059502 | 0.00081343 |
| 25 | Yes | 7 | 0.00060729 | 0.00082850 |
| 26 | Yes | 7 | 0.00059502 | 0.00081199 |
| 27 | Yes | 5 | 0.00067625 | 0.00099894 |
| 28 | Yes | 6 | 0.00047799 | 0.00070490 |
| 29 | Yes | 6 | 0.00049844 | 0.00073465 |
| 30 | Yes | 6 | 0.00047780 | 0.00070481 |
| 31 | Yes | 5 | 0.00067639 | 0.00099946 |
| 32 | Yes | 6 | 0.00047715 | 0.00070409 |
| 33 | Yes | 6 | 0.00049777 | 0.00073410 |
| 34 | Yes | 6 | 0.00047730 | 0.00070439 |
| 35 | Yes | 5 | 0.00067648 | 0.00099988 |
| 36 | Yes | 6 | 0.00047749 | 0.00070469 |
| 37 | Yes | 6 | 0.00049803 | 0.00073445 |
| 38 | Yes | 6 | 0.00047751 | 0.00070448 |

Bolt Design Data

| Section No. | Elevation ft | Component Type | Bolt Grade | Bolt Size in | Number Of Bolts | Maximum Load per Bolt K | Allowable Load K | Ratio Load Allowable | Allowable Ratio | Criteria |
|-------------|--------------|----------------|------------|--------------|-----------------|-------------------------|------------------|----------------------|-----------------|--------------------|
| T4 | 95 | Leg | A325N | 1.0000 | 6 | 14.66 | 34.48 | 0.425 | 1.333 | Bolt Tension |
| T5 | 90 | Leg | A325N | 1.0000 | 6 | 15.84 | 34.56 | 0.458 | 1.333 | Bolt Tension |
| | | Diagonal | A325N | 1.0000 | 1 | 7.02 | 8.43 | 0.833 | 1.333 | Member Block Shear |
| T6 | 80 | Leg | A325N | 1.0000 | 6 | 22.70 | 34.56 | 0.657 | 1.333 | Bolt Tension |
| | | Diagonal | A325N | 1.0000 | 1 | 7.35 | 7.75 | 0.949 | 1.333 | Member Block Shear |
| T7 | 60 | Leg | A325N | 1.0000 | 6 | 28.40 | 34.56 | 0.822 | 1.333 | Bolt Tension |
| | | Diagonal | A325N | 1.0000 | 1 | 6.81 | 8.43 | 0.808 | 1.333 | Member Block Shear |
| T8 | 40 | Leg | A325N | 1.0000 | 6 | 33.28 | 34.56 | 0.963 | 1.333 | Bolt Tension |
| | | Diagonal | A325N | 1.0000 | 1 | 6.56 | 8.43 | 0.779 | 1.333 | Member Block Shear |
| T9 | 20 | Leg | A687 | 1.2500 | 6 | 37.51 | 50.62 | 0.741 | 1.333 | Bolt Tension |
| | | Diagonal | A325N | 1.2500 | 1 | 7.85 | 17.22 | 0.456 | 1.333 | Member Block Shear |

Compression Checks

Leg Design Data (Compression)

| | | |
|---|--------------------------------------|-----------------------------------|
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| | Project TEP No. 129881 | Date 12:41:09 12/20/12 |
| | Client Crown Castle | Designed by Nick Hudson |

| Section No. | Elevation ft | Size | L ft | L _u ft | Kl/r | F _a ksi | A in ² | Actual P K | Allow. P _a K | Ratio P/P _a |
|-------------|-----------------|--------------------------------------|---------|----------------------|------|-----------------------|----------------------|---------------|----------------------------|---------------------------|
| T1 | 136 - 130 | 1 1/2 | 6' | 2'4-9/16" | 76.0 | 19.800 | 1.7672 | -5.73 | 34.99 | 0.164 |
| T2 | 130 - 110 | 2 | 20' | 2'4-9/16" | 57.0 | 23.222 | 3.1416 | -39.91 | 72.95 | 0.547 |
| T3 | 110 - 95 | 2 1/4 | 15' | 2'4-11/16" | 51.0 | 24.199 | 3.9761 | -77.63 | 96.22 | 0.807 |
| T4 | 95 - 90 | 2 1/4 | 5' | 1'1-5/16" | 23.7 | 27.898 | 3.9761 | -97.23 | 110.92 | 0.877 |
| T5 | 90 - 80 | Pirod 105244 w/ 1 1/4" Reinforcement | 10'1/4" | 10'1/4" | 36.1 | 26.370 | 5.8293 | -104.43 | 153.72 | 0.679 |
| T6 | 80 - 60 | Pirod 105217 | 20'3/8" | 10'1/4" | 37.8 | 26.132 | 5.3014 | -149.38 | 138.54 | 1.078 |
| T7 | 60 - 40 | Pirod 105218 | 20'3/8" | 10'1/4" | 32.4 | 26.848 | 7.2158 | -187.22 | 193.73 | 0.966 |
| T8 | 40 - 20 | Pirod 105218 | 20'3/8" | 10'1/4" | 32.4 | 26.848 | 7.2158 | -220.04 | 193.73 | 1.136 |
| T9 | 20 - 0 | Pirod 105219 | 20'3/8" | 10'1/4" | 28.4 | 27.351 | 9.4248 | -249.90 | 257.78 | 0.969 |

Truss-Leg Diagonal Data

| Section No. | Elevation ft | Diagonal Size | L _d ft | Kl/r | F _a ksi | A in ² | Actual V K | Allow. V _a K | Stress Ratio |
|-------------|-----------------|---------------|----------------------|-------|-----------------------|----------------------|---------------|----------------------------|--------------|
| T5 | 90 - 80 | 0.5 | 1'5-5/8" | 119.7 | 10.321 | 0.1963 | 0.91 | 2.27 | 0.402 |
| T6 | 80 - 60 | 0.5 | 1'5-5/8" | 120.0 | 10.279 | 0.1963 | 0.35 | 2.26 | 0.155 |
| T7 | 60 - 40 | 0.5 | 1'5-17/32" | 119.0 | 10.423 | 0.1963 | 0.15 | 2.29 | 0.064 |
| T8 | 40 - 20 | 0.5 | 1'5-17/32" | 119.0 | 10.423 | 0.1963 | 0.48 | 2.29 | 0.210 |
| T9 | 20 - 0 | 0.625 | 1'5-13/32" | 94.4 | 15.970 | 0.3068 | 1.01 | 5.48 | 0.184 |

Diagonal Design Data (Compression)

| Section No. | Elevation ft | Size | L ft | L _u ft | Kl/r | F _a ksi | A in ² | Actual P K | Allow. P _a K | Ratio P/P _a |
|-------------|-----------------|-------------------|-------------|----------------------|-------|-----------------------|----------------------|---------------|----------------------------|---------------------------|
| T1 | 136 - 130 | 3/4 | 4'7-13/16" | 2'3" | 129.8 | 8.865 | 0.4418 | -1.43 | 3.92 | 0.365 |
| T2 | 130 - 110 | 7/8 | 5'23/32" | 2'5-13/32" | 121.0 | 10.197 | 0.6013 | -3.45 | 6.13 | 0.562 |
| T3 | 110 - 95 | 1 | 5'4-13/16" | 2'7-5/16" | 112.9 | 11.718 | 0.7854 | -5.04 | 9.20 | 0.547 |
| T4 | 95 - 90 | 1 | 5'5-3/32" | 2'7-9/16" | 113.5 | 11.602 | 0.7854 | -5.76 | 9.11 | 0.632 |
| T5 | 90 - 80 | L3x3x3/16 | 11'5-1/32" | 4'11-3/4" | 105.2 | 12.113 | 1.0900 | -7.66 | 13.20 | 0.580 |
| T6 | 80 - 60 | L2 1/2x2 1/2x3/16 | 12'6" | 5'7-9/16" | 136.4 | 8.025 | 0.9020 | -7.39 | 7.24 | 1.021 |
| T7 | 60 - 40 | L3x3x3/16 | 13'9-19/32" | 6'3-31/32" | 127.4 | 9.200 | 1.0900 | -7.00 | 10.03 | 0.698 |

| | | |
|---|--------------------------------------|-----------------------------------|
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| | Client Crown Castle | Designed by Nick Hudson |

| Section No. | Elevation ft | Size | L ft | L _u ft | Kl/r | F _a ksi | A in ² | Actual P K | Allow. P _a K | Ratio P P _a |
|-------------|-----------------|-----------|-------------|----------------------|-----------------|-----------------------|----------------------|---------------|----------------------------|---------------------------|
| T8 | 40 - 20 | L3x3x3/16 | 15'2-7/8" | 7'31/32" | 142.6 K=1.00 | 7.345 | 1.0900 | -6.93 | 8.01 | 0.866 |
| T9 | 20 - 0 | L3x3x5/16 | 16'9-19/32" | 7'9-23/32" | 159.0 K=1.00 | 5.905 | 1.7800 | -8.58 | 10.51 | 0.817 |

Secondary Horizontal Design Data (Compression)

| Section No. | Elevation ft | Size | L ft | L _u ft | Kl/r | F _a ksi | A in ² | Actual P K | Allow. P _a K | Ratio P P _a |
|-------------|-----------------|-------|-------------|----------------------|-----------------|-----------------------|----------------------|---------------|----------------------------|---------------------------|
| T4 | 95 - 90 | 1 1/2 | 4'11-17/32" | 4'9-1/4" | 106.9 K=0.70 | 13.079 | 1.7672 | -1.68 | 23.11 | 0.073 |

Top Girt Design Data (Compression)

| Section No. | Elevation ft | Size | L ft | L _u ft | Kl/r | F _a ksi | A in ² | Actual P K | Allow. P _a K | Ratio P P _a |
|-------------|-----------------|------|----------|----------------------|-----------------|-----------------------|----------------------|---------------|----------------------------|---------------------------|
| T1 | 136 - 130 | 7/8 | 4' | 3'10-9/16" | 148.8 K=0.70 | 6.744 | 0.6013 | -0.65 | 4.06 | 0.160 |
| T2 | 130 - 110 | 1 | 4'1/4" | 3'10-3/16" | 129.5 K=0.70 | 8.909 | 0.7854 | -0.71 | 7.00 | 0.101 |
| T3 | 110 - 95 | 1 | 4'6-1/4" | 4'3-31/32" | 145.5 K=0.70 | 7.058 | 0.7854 | -1.06 | 5.54 | 0.191 |

Bottom Girt Design Data (Compression)

| Section No. | Elevation ft | Size | L ft | L _u ft | Kl/r | F _a ksi | A in ² | Actual P K | Allow. P _a K | Ratio P P _a |
|-------------|-----------------|------|-----------|----------------------|-----------------|-----------------------|----------------------|---------------|----------------------------|---------------------------|
| T1 | 136 - 130 | 7/8 | 4' | 3'10-9/16" | 148.8 K=0.70 | 6.744 | 0.6013 | -0.45 | 4.06 | 0.110 |
| T2 | 130 - 110 | 1 | 4'5-7/8" | 4'3-31/32" | 145.4 K=0.70 | 7.061 | 0.7854 | -1.55 | 5.55 | 0.280 |
| T4 | 95 - 90 | 1 | 4'11-7/8" | 4'9-19/32" | 161.2 K=0.70 | 5.746 | 0.7854 | -0.90 | 4.51 | 0.200 |

Tension Checks

Leg Design Data (Tension)

| | | |
|---|--------------------------------------|-----------------------------------|
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| Section No. | Elevation ft | Size | L ft | L _u ft | Kl/r | F _a ksi | A in ² | Actual P K | Allow. P _a K | Ratio P P _a |
|-------------|-----------------|--------------------------------------|---------|----------------------|------|-----------------------|----------------------|------------------|-------------------------------|------------------------------|
| T1 | 136 - 130 | 1 1/2 | 6' | 2'4-9/16" | 76.0 | 30.000 | 1.7672 | 3.70 | 53.01 | 0.070 |
| T2 | 130 - 110 | 2 | 20' | 2'4-9/16" | 57.0 | 30.000 | 3.1416 | 34.74 | 94.25 | 0.369 |
| T3 | 110 - 95 | 2 1/4 | 15' | 2'4-11/16" | 51.0 | 30.000 | 3.9761 | 69.49 | 119.28 | 0.583 |
| T4 | 95 - 90 | 2 1/4 | 5' | 1'1-5/16" | 23.7 | 30.000 | 3.9761 | 87.93 | 119.28 | 0.737 |
| T5 | 90 - 80 | Pirod 105244 w/ 1 1/4" Reinforcement | 10'1/4" | 10'1/4" | 36.1 | 30.000 | 5.8293 | 95.03 | 174.88 | 0.543 |
| T6 | 80 - 60 | Pirod 105217 | 20'3/8" | 10'1/4" | 37.8 | 30.000 | 5.3014 | 136.19 | 159.04 | 0.856 |
| T7 | 60 - 40 | Pirod 105218 | 20'3/8" | 10'1/4" | 32.4 | 30.000 | 7.2158 | 170.40 | 216.47 | 0.787 |
| T8 | 40 - 20 | Pirod 105218 | 20'3/8" | 10'1/4" | 32.4 | 30.000 | 7.2158 | 199.71 | 216.47 | 0.923 |
| T9 | 20 - 0 | Pirod 105219 | 20'3/8" | 10'1/4" | 28.4 | 30.000 | 9.4248 | 225.07 | 282.74 | 0.796 |

Truss-Leg Diagonal Data

| Section No. | Elevation ft | Diagonal Size | L _d ft | Kl/r | F _a ksi | A in ² | Actual V K | Allow. V _a K | Stress Ratio |
|-------------|-----------------|---------------|----------------------|-------|-----------------------|----------------------|------------------|-------------------------------|-----------------|
| T5 | 90 - 80 | 0.5 | 1'5-5/8" | 119.7 | 10.321 | 0.1963 | 0.91 | 2.27 | 0.402 |
| T6 | 80 - 60 | 0.5 | 1'5-5/8" | 120.0 | 10.279 | 0.1963 | 0.35 | 2.26 | 0.155 |
| T7 | 60 - 40 | 0.5 | 1'5-17/32" 2" | 119.0 | 10.423 | 0.1963 | 0.15 | 2.29 | 0.064 |
| T8 | 40 - 20 | 0.5 | 1'5-17/32" 2" | 119.0 | 10.423 | 0.1963 | 0.48 | 2.29 | 0.210 |
| T9 | 20 - 0 | 0.625 | 1'5-13/32" 2" | 94.4 | 15.970 | 0.3068 | 1.01 | 5.48 | 0.184 |

Diagonal Design Data (Tension)

| Section No. | Elevation ft | Size | L ft | L _u ft | Kl/r | F _a ksi | A in ² | Actual P K | Allow. P _a K | Ratio P P _a |
|-------------|-----------------|-------------------------|-------------|----------------------|-------|-----------------------|----------------------|------------------|-------------------------------|------------------------------|
| T1 | 136 - 130 | 3/4 | 4'7-13/16' | 2'3" | 144.2 | 30.000 | 0.4418 | 1.43 | 13.25 | 0.108 |
| T2 | 130 - 110 | 7/8 | 5'23/32" | 2'5-13/32' | 134.5 | 30.000 | 0.6013 | 3.45 | 18.04 | 0.191 |
| T3 | 110 - 95 | 1 | 5'4-13/16' | 2'7-5/16" | 125.4 | 30.000 | 0.7854 | 5.00 | 23.56 | 0.212 |
| T4 | 95 - 90 | 1 | 5'5-5/32" | 2'7-9/16" | 126.1 | 30.000 | 0.7854 | 5.62 | 23.56 | 0.238 |
| T5 | 90 - 80 | L3x3x3/16 | 11'5-1/32' | 4'11-3/4" | 66.3 | 29.000 | 0.6593 | 7.02 | 19.12 | 0.367 |
| T6 | 80 - 60 | L2 1/2x2 1/2x3/16 2" | 11'11-5/32" | 5'4-9/16" | 86.2 | 29.000 | 0.5183 | 7.35 | 15.03 | 0.489 |
| T7 | 60 - 40 | L3x3x3/16 | 13'1-9/16' | 6'1/4" | 79.5 | 29.000 | 0.6593 | 6.81 | 19.12 | 0.356 |
| T8 | 40 - 20 | L3x3x3/16 | 14'6" | 6'8-3/4" | 88.6 | 29.000 | 0.6593 | 6.56 | 19.12 | 0.343 |
| T9 | 20 - 0 | L3x3x5/16 | 16'9-19/32" | 7'9-23/32" | 105.3 | 29.000 | 1.0127 | 7.85 | 29.37 | 0.267 |

Secondary Horizontal Design Data (Tension)

| | | |
|---|--------------------------------------|-----------------------------------|
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| Section No. | Elevation ft | Size | L ft | L _u ft | Kl/r | F _a ksi | A in ² | Actual P K | Allow. P _a K | Ratio P P _a |
|-------------|-----------------|-------|-------------|----------------------|-------|-----------------------|----------------------|---------------|----------------------------|---------------------------|
| T4 | 95 - 90 | 1 1/2 | 4'11-17/32" | 4'9-1/4" | 152.6 | 30.000 | 1.7672 | 1.68 | 53.01 | 0.032 |

Top Girt Design Data (Tension)

| Section No. | Elevation ft | Size | L ft | L _u ft | Kl/r | F _a ksi | A in ² | Actual P K | Allow. P _a K | Ratio P P _a |
|-------------|-----------------|------|----------|----------------------|-------|-----------------------|----------------------|---------------|----------------------------|---------------------------|
| T1 | 136 - 130 | 7/8 | 4' | 3'10-9/16" | 212.6 | 30.000 | 0.6013 | 0.64 | 18.04 | 0.035 |
| T2 | 130 - 110 | 1 | 4'1/4" | 3'10-3/16" | 184.9 | 30.000 | 0.7854 | 0.71 | 23.56 | 0.030 |
| T3 | 110 - 95 | 1 | 4'6-1/4" | 4'3-31/32" | 207.8 | 30.000 | 0.7854 | 1.12 | 23.56 | 0.048 |

Bottom Girt Design Data (Tension)

| Section No. | Elevation ft | Size | L ft | L _u ft | Kl/r | F _a ksi | A in ² | Actual P K | Allow. P _a K | Ratio P P _a |
|-------------|-----------------|------|-----------|----------------------|-------|-----------------------|----------------------|---------------|----------------------------|---------------------------|
| T1 | 136 - 130 | 7/8 | 4' | 3'10-9/16" | 212.6 | 30.000 | 0.6013 | 0.43 | 18.04 | 0.024 |
| T2 | 130 - 110 | 1 | 4'5-7/8" | 4'3-31/32" | 207.8 | 30.000 | 0.7854 | 1.54 | 23.56 | 0.065 |
| T4 | 95 - 90 | 1 | 4'11-7/8" | 4'9-19/32" | 230.3 | 30.000 | 0.7854 | 0.98 | 23.56 | 0.041 |

Section Capacity Table

| Section No. | Elevation ft | Component Type | Size | Critical Element | P K | SF*P _{allow} K | % Capacity | Pass Fail |
|-------------|-----------------|----------------|------------------------|------------------|---------|----------------------------|---------------|--------------|
| T1 | 136 - 130 | Leg | 1 1/2 | 1 | -5.73 | 46.64 | 12.3 | Pass |
| T2 | 130 - 110 | Leg | 2 | 22 | -39.91 | 97.25 | 41.0 | Pass |
| T3 | 110 - 95 | Leg | 2 1/4 | 79 | -77.63 | 128.26 | 60.5 | Pass |
| T4 | 95 - 90 | Leg | 2 1/4 | 121 | -97.23 | 147.86 | 65.8 | Pass |
| T5 | 90 - 80 | Leg | Pirod 105244 w/ 1 1/4" | Note 1 | Note 1 | Note 1 | 66.4 | Pass |
| | | | Reinforcement | | | | | |
| T6 | 80 - 60 | Leg | Pirod 105217 | 154 | -149.38 | 184.67 | 80.9 | Pass |
| T7 | 60 - 40 | Leg | Pirod 105218 | 169 | -187.22 | 258.24 | 72.5 | Pass |
| T8 | 40 - 20 | Leg | Pirod 105218 | 184 | -220.04 | 258.24 | 85.2 | Pass |
| T9 | 20 - 0 | Leg | Pirod 105219 | 199 | -249.90 | 343.62 | 72.7 | Pass |
| T1 | 136 - 130 | Diagonal | 3/4 | 16 | -1.43 | 5.22 | 27.4 | Pass |
| T2 | 130 - 110 | Diagonal | 7/8 | 33 | -3.45 | 8.17 | 42.2 | Pass |
| T3 | 110 - 95 | Diagonal | 1 | 89 | -5.04 | 12.27 | 41.1 | Pass |
| T4 | 95 - 90 | Diagonal | 1 | 129 | -5.76 | 12.15 | 47.4 | Pass |
| T5 | 90 - 80 | Diagonal | L3x3x3/16 | 151 | -7.66 | 17.60 | 43.5 | Pass |

62.5 (b)

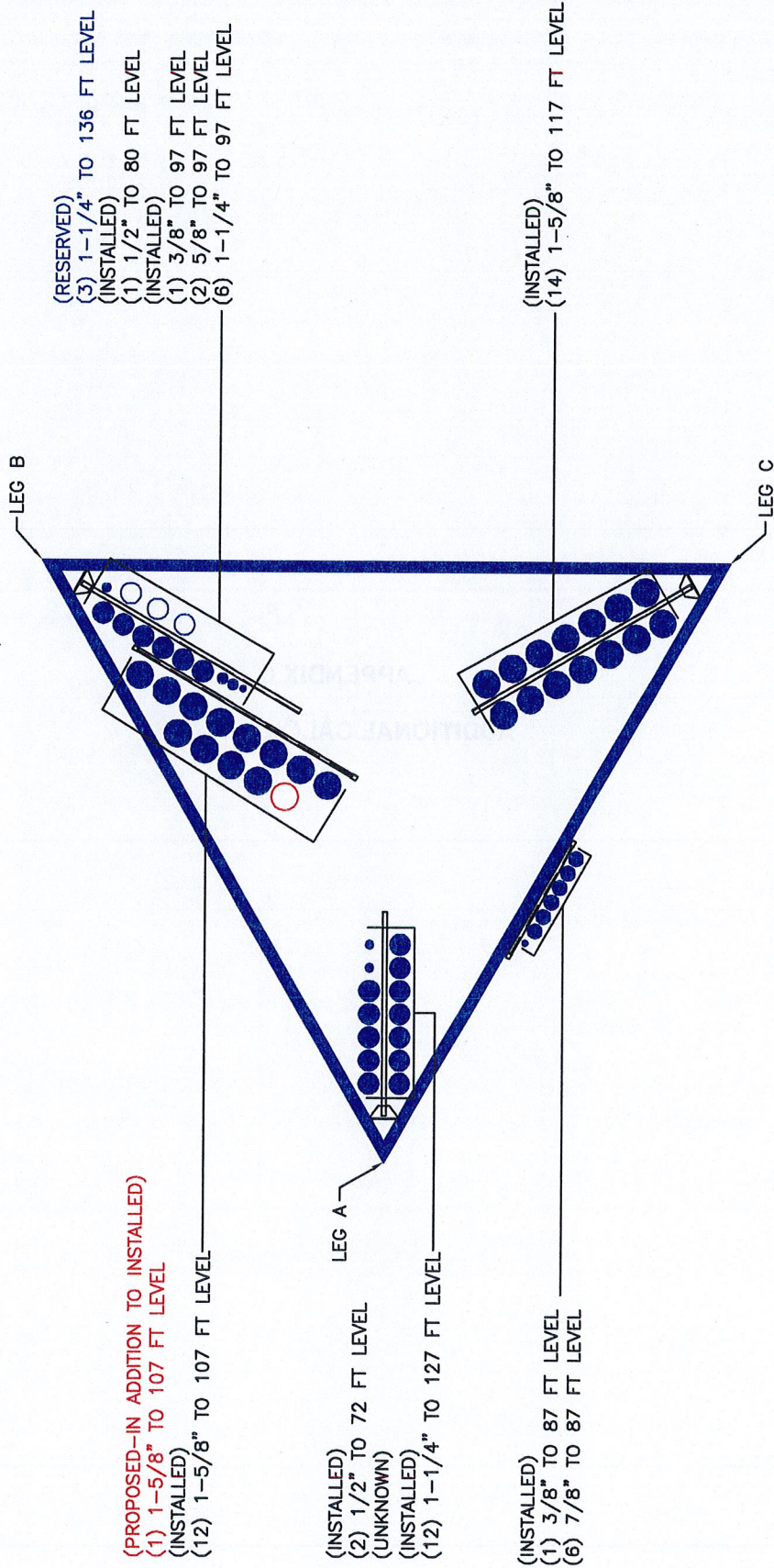
| | | |
|---|--------------------------------------|-----------------------------------|
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| | Project TEP No. 129881 | Date 12:41:09 12/20/12 |
| | Client Crown Castle | Designed by Nick Hudson |

| Section No. | Elevation ft | Component Type | Size | Critical Element | P K | SF*P _{allow} K | % Capacity | Pass Fail | |
|-------------|--------------|----------------------|-------------------|------------------|-------|-------------------------|---------------------------|-------------|-------------|
| T6 | 80 - 60 | Diagonal | L2 1/2x2 1/2x3/16 | 157 | -7.39 | 9.65 | 76.6 | Pass | |
| T7 | 60 - 40 | Diagonal | L3x3x3/16 | 172 | -7.00 | 13.37 | 52.4 | Pass | |
| | | | | | | | 60.6 (b) | | |
| T8 | 40 - 20 | Diagonal | L3x3x3/16 | 187 | -6.93 | 10.67 | 65.0 | Pass | |
| T9 | 20 - 0 | Diagonal | L3x3x5/16 | 202 | -8.58 | 14.01 | 61.3 | Pass | |
| T4 | 95 - 90 | Secondary Horizontal | 1 1/2 | 135 | -1.68 | 30.81 | 5.5 | Pass | |
| T1 | 136 - 130 | Top Girt | 7/8 | 5 | -0.65 | 5.41 | 12.0 | Pass | |
| T2 | 130 - 110 | Top Girt | 1 | 26 | -0.71 | 9.33 | 7.6 | Pass | |
| T3 | 110 - 95 | Top Girt | 1 | 84 | -1.06 | 7.39 | 14.3 | Pass | |
| T1 | 136 - 130 | Bottom Girt | 7/8 | 8 | -0.45 | 5.41 | 8.3 | Pass | |
| T2 | 130 - 110 | Bottom Girt | 1 | 29 | -1.55 | 7.39 | 21.0 | Pass | |
| T4 | 95 - 90 | Bottom Girt | 1 | 125 | -0.90 | 6.02 | 15.0 | Pass | |
| | | | | | | | Summary | | |
| | | | | | | | Leg (T8) | 85.2 | Pass |
| | | | | | | | Diagonal (T6) | 76.6 | Pass |
| | | | | | | | Secondary Horizontal (T4) | 5.5 | Pass |
| | | | | | | | Top Girt (T3) | 14.3 | Pass |
| | | | | | | | Bottom Girt (T2) | 21.0 | Pass |
| | | | | | | | Bolt Checks | 72.3 | Pass |
| | | | | | | | RATING = | 85.2 | Pass |

Notes:

- 1) See additional documentation in "Appendix C - Additional Calculations" for calculations supporting the % capacity listed.

APPENDIX B
BASE LEVEL DRAWING



BUSINESS UNIT: 876338 TOWER ID: C_BASELEVEL

APPENDIX C
ADDITIONAL CALCULATIONS

Project Name: Waterford
 Project Number: 129881
 Client Site Number: 876338

Engineer: MGY
 Check: NSH
 Date: 12/20/12

PIRod Leg Splice Connections

Input - Properties

Elevation: 130 ft - elevation of leg splice connection
 F_y : 50.00 ksi - yield stress of leg
 F_u : 65.00 ksi - tensile stress of leg
 D_t : 1.50 in - diameter of leg above splice
 D_b : 2.00 in - diameter of leg below splice
 d_{bolt} : 0.625 in - bolt diameter
 Type: A325-N - bolt type (X - threads excluded, N - threads included)
 n: 5 - number of bolts

Input - Loads

Code: TIA-F - select version of the TIA
 T_u : 3.70 kips - maximum leg tension load
 P_u : 5.73 kips - maximum leg compression load
 ASIF: 1.33 - stress increase factor
 U: 1.00 - shear lag coefficient
 ϕ_t : 0.90 <== DISREGARD
 ϕ_c : 0.75 <== DISREGARD
 ϕ_b : 0.75 <== DISREGARD

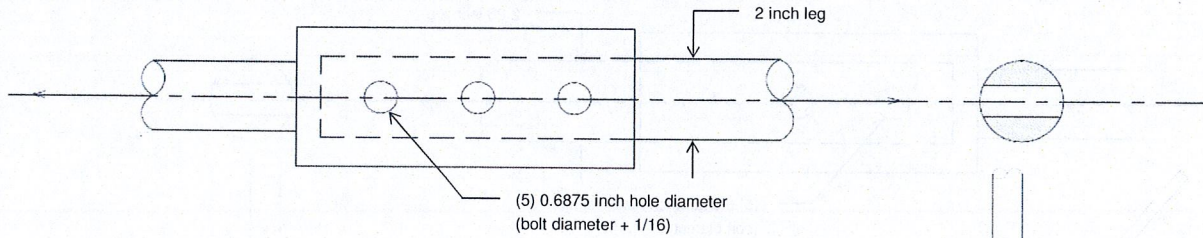
Leg Capacity:

1.5 inch diameter leg above splice

Gross Allowable Tension = $ASIF(0.6)(F_y)(A_g) = 1.333(0.6)(50 \text{ ksi})(1.7671 \text{ in}^2) =$ **70.69** kips

2 inch diameter leg below splice

$A_n = \text{Net Area} = (D_b/2)^2(2(\theta - \sin(\theta))) = 1.79 \text{ in}^2$
 Gross Allowable Tension = $ASIF(0.6)(F_y)(A_g) = 1.333(0.6)(50 \text{ ksi})(3.1416 \text{ in}^2) = 125.66 \text{ kips}$
 Net Allowable Tension = $ASIF(0.5)(U)(F_u)(A_n) = 1.333(0.5)(1)(65 \text{ ksi})(1.7942 \text{ in}^2) = 77.75 \text{ kips}$



Bolt Capacity:

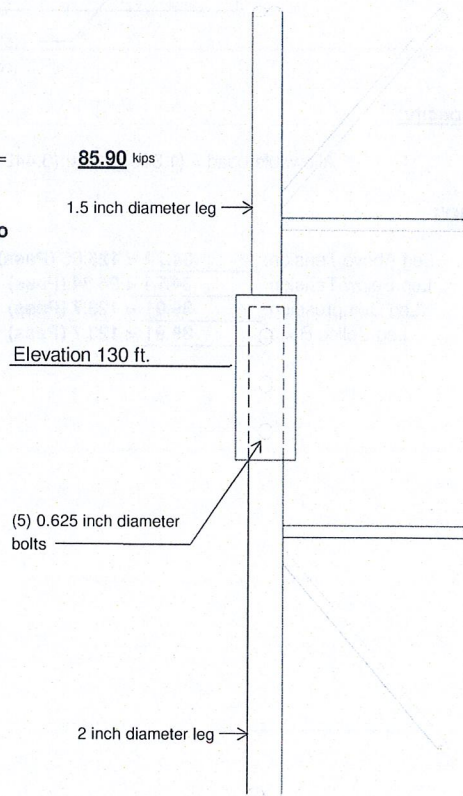
Allowable Load = $(1.333)(21 \text{ ksi})(0.307 \text{ in}^2)(5)(2 \text{ shear planes}) =$ **85.90** kips

Summary:

Leg Above Tension: 3.70 < 70.69 (Pass)
 Leg Below Tension: 3.70 < 77.75 (Pass)
 Leg Compression: 5.73 < 85.9 (Pass)
 Leg Splice Bolts: 5.73 < 85.9 (Pass)

Stress Ratio

5.2%
 4.8%
6.7%
6.7%



Project Name: Waterford
 Project Number: 129881
 Client Site Number: 876338

Engineer: MGY
 Check: NSH
 Date: 12/20/12

PIRod Leg Splice Connections

Input - Properties

Elevation: 110 ft - elevation of leg splice connection
 F_y : 50.00 ksi - yield stress of leg
 F_u : 65.00 ksi - tensile stress of leg
 D_t : 2.00 in - diameter of leg above splice
 D_b : 2.25 in - diameter of leg below splice
 d_{bolt} : 0.750 in - bolt diameter
 Type: A325-N - bolt type (X - threads excluded, N - threads included)
 n: 5 - number of bolts

Input - Loads

Code: TIA-F - select version of the TIA
 T_u : 34.74 kips - maximum leg tension load
 P_u : 39.91 kips - maximum leg compression load
 ASIF: 1.33 - stress increase factor
 U: 1.00 - shear lag coefficient
 ϕ_t : 0.90 < = DISREGARD
 ϕ_c : 0.75 < = DISREGARD
 ϕ_b : 0.75 < = DISREGARD

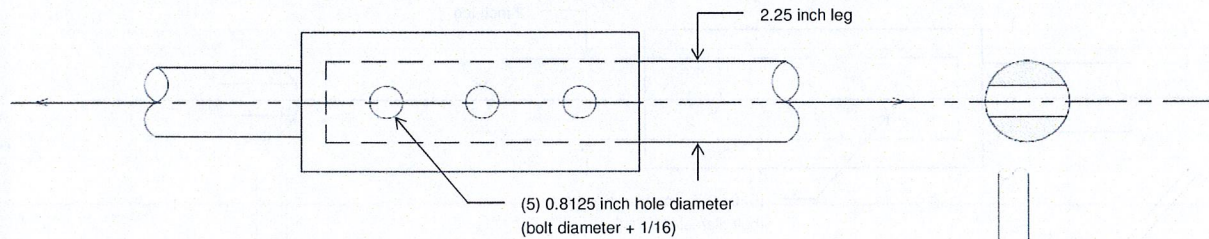
Leg Capacity:

2 inch diameter leg above splice

Gross Allowable Tension = $ASIF(0.6)(F_y)(A_g) = 1.333(0.6)(50 \text{ ksi})(3.1416 \text{ in}^2) = \underline{125.66}$ kips

2.25 inch diameter leg below splice

$A_n = \text{Net Area} = (D_b/2)^2(2(\theta - \sin(\theta))) = 2.19 \text{ in}^2$
 Gross Allowable Tension = $ASIF(0.6)(F_y)(A_g) = 1.333(0.6)(50 \text{ ksi})(3.9761 \text{ in}^2) = 159.04$ kips
 Net Allowable Tension = $ASIF(0.5)(U)(F_u)(A_n) = 1.333(0.5)(1)(65 \text{ ksi})(2.1885 \text{ in}^2) = \underline{94.84}$ kips



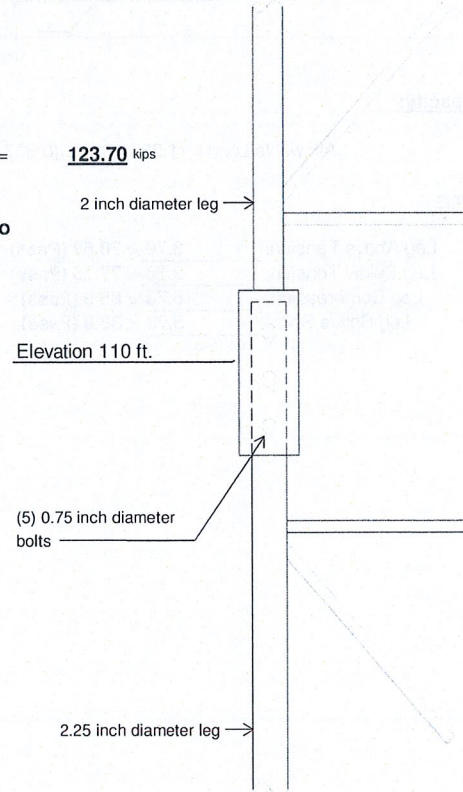
Bolt Capacity:

Allowable Load = $(1.333)(21 \text{ ksi})(0.442 \text{ in}^2)(5)(2 \text{ shear planes}) = \underline{123.70}$ kips

Summary:

Leg Above Tension: 34.74 < 125.66 (Pass)
 Leg Below Tension: 34.74 < 94.84 (Pass)
 Leg Compression: 39.91 < 123.7 (Pass)
 Leg Splice Bolts: 39.91 < 123.7 (Pass)

Stress Ratio
 27.6%
36.6%
 32.3%
 32.3%



Project Name: Waterford
 Project Number: 129881
 Client Site Number: BU876338
 Elevation: 80-90

Engineer: MGY
 Check: NSH
 Date: 12/20/2012
 CODE: TIA-F

PiRod Leg Mod Check

ASIF: 1.33 - allowable stress increase factor (typically 1.33)
 Mast St.: 1.00 - from trnTower

Input - Loads

$P_{initial}$: 5.16 kips - force from initial load (no wind)
 P_{wind} : 104.43 kips - force due to final loading including reinforcement
 T_u : 95.03 kips - maximum load on leg

Input - Tower Leg

K : 1.00 - effective length factor for leg
 L_u : 10.03 ft - unbraced length of tower leg
 F_{y_leg} : 50.00 ksi - minimum specified yield strength of tower leg
 F_{u_leg} : 65.00 ksi - minimum specified ultimate strength of tower leg
 r : 0.31 in - minimum radius of gyration of tower leg
 A_{leg} : 1.23 in² - area of tower leg
 D_I : 1.25 in - inside diameter of tower leg
 f'_c : 0.00 ksi - minimum specified compressive strength of grout (if ungrouted enter 0)

Quick Check

Crushing Check: 44.0%
 Leg Comp. Check: 59.1%
 Sleeve Check: 54.4%
 Built-up Check: 60.3%
 Slenderness Check: Decrease Connector 5
 Leg Tension Check: 38.7%
 Combined Check: 66.4%

Input - Sleeve R/F

F_{y_sleeve} : 50.00 ksi - minimum specified yield strength of sleeve r/f
 F_{u_sleeve} : 65.00 ksi - minimum specified ultimate strength of sleeve r/f
 r_{x_sleeve} : 0.31 in - minimum radius of gyration of sleeve r/f about the x-axis
 r_{y_sleeve} : 0.31 in - minimum radius of gyration of sleeve r/f about the y-axis
 A_{sleeve} : 1.23 in² - area of sleeve r/f

Termination: Connected to Flange

Input - Sleeve Connection to Leg

a : 19.50 in - spacing of connectors connecting the sleeve to the leg
 Gap: 0.00 in - length of leg considered for crushing

Input - Built-up Leg Section

r_{x_bu} : 4.17 in - minimum radius of gyration of the built-up section about the x-axis
 r_{y_bu} : 5.38 in - minimum radius of gyration of the built-up section about the y-axis

Moment Capacity of Drilled Concrete Shaft (Caisson) for TIA Rev F or G

Note: Shaft assumed to have ties, not spiral, transverse reinforcing

Site Data

| | |
|----------------------|--|
| BU#: 876338 | |
| Site Name: Waterford | |
| App #: 173309 Rev. 1 | |

Enter Load Factors Below:

| | | |
|------------|-----|--------------------|
| For M (WL) | 1.3 | <---- Enter Factor |
| For P (DL) | 1.3 | <---- Enter Factor |

Pier Properties

| | |
|----------------------------|------------------------|
| Concrete: | |
| Pier Diameter = | 3.0 ft |
| Concrete Area = | 1017.9 in ² |
| Reinforcement: | |
| Clear Cover to Tie = | 3.00 in |
| Horiz. Tie Bar Size = | 4 |
| Vert. Cage Diameter = | 2.33 ft |
| Vert. Cage Diameter = | 28.00 in |
| Vertical Bar Size = | 8 |
| Bar Diameter = | 1.00 in |
| Bar Area = | 0.79 in ² |
| Number of Bars = | 15 |
| As Total = | 11.85 in ² |
| A s/ Aconc, Rho: | 0.0116 1.16% |

ACI 10.5 , ACI 21.10.4, and IBC 1810.
 Min As for Flexural, Tension Controlled, Shafts:
 (3)*(Sqrt(f'c)/Fy: 0.0027
 200 / Fy: 0.0033

Minimum Rho Check:

| | | |
|------------------------|-------|-----------|
| Actual Req'd Min. Rho: | 0.33% | Flexural |
| Provided Rho: | 1.16% | OK |

| Ref. Shaft Max Axial Capacities, ϕ Max(Pn or Tn): | | |
|--|---------|---------|
| Max Pu = ($\phi=0.65$) Pn. | | |
| Pn per ACI 318 (10-2) | 1703.71 | kips |
| at Mu=($\phi=0.65$)Mn= | 415.16 | ft-kips |
| | | |
| Max Tu, ($\phi=0.9$) Tn = | 639.9 | kips |
| at Mu= $\phi=(0.90)$ Mn= | 0.00 | ft-kips |

Maximum Shaft Superimposed Forces

| | | |
|-----------------------|---------|------------------|
| TIA Revision: | F | |
| Max. Service Shaft M: | 74.75 | ft-kips (* Note) |
| Max. Service Shaft P: | 233 | kips |
| Max Axial Force Type: | Tension | |

(* Note: Max Shaft Superimposed Moment does not necessarily equal to the shaft top reaction moment

| Load Factor | Shaft Factored Loads | |
|-------------|----------------------|----------------|
| 1.30 | Mu: | 97.175 ft-kips |
| 1.30 | Pu: | 302.9 kips |

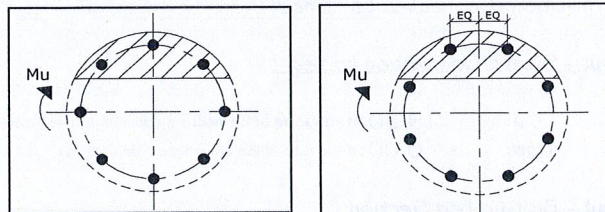
Material Properties

| | | |
|--|---------|-----|
| Concrete Comp. strength, f'c = | 3000 | psi |
| Reinforcement yield strength, Fy = | 60 | ksi |
| Reinforcing Modulus of Elasticity, E = | 29000 | ksi |
| Reinforcement yield strain = | 0.00207 | |
| Limiting compressive strain = | 0.003 | |
| ACI 318 Code | | |
| Select Analysis ACI Code= | 2005 | |
| Seismic Properties | | |
| Seismic Design Category = | D | |
| Seismic Risk = | High | |

Solve (Run) <-- Press Upon Completing All Input

Results:

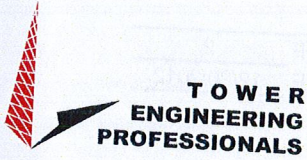
Governing Orientation Case: 2



| | |
|----------------------------------|---|
| Case 1 | Case 2 |
| Dist. From Edge to Neutral Axis: | 5.41 in |
| Extreme Steel Strain, et: | 0.0148 |
| | et > 0.0050, Tension Controlled |
| Reduction Factor, ϕ : | 0.900 |

Output Note: Negative Pu=Tension
 For Axial Compression, ϕ Pn = Pu: -302.90 kips
 Drilled Shaft Moment Capacity, ϕ Mn: 396.20 ft-kips
 Drilled Shaft Superimposed Mu: 97.18 ft-kips

(Mu/ ϕ Mn, Drilled Shaft Flexure CSR): 24.5%



JOB: _____ TEP# 129881
 SHEET #: _____ OF _____
 CALCULATED BY: MGY DATE 12/20/2012

Mat Foundation Design for Self Supporting Tower -TIA-222-F

| | |
|--|------|
| Q _a , ALLOWABLE SOIL PRESS. (ksf) | 4 |
| NET OR GROSS BEARING? | NET |
| SOIL DENSITY (pcf) | 125 |
| TOWER FACE WIDTH (ft.) | 14.0 |
| Tower Eccentricity (ft) | 2.02 |

| | |
|-----------|----|
| F'c (ksi) | 3 |
| F'y (ksi) | 60 |

Distance between tower centroid and the foundation centroid

Base Reactions LC1: Maximum Wind

| | |
|--------------------------------|--------|
| M _u , MOMENT (k-ft) | 3003.0 |
| P _t , AXIAL (k) | 36.0 |
| H, SHEAR (k) | 38.0 |

Base Reactions LC 2: Ice + Ice Wind

| | |
|----------------------------|-------|
| M, MOMENT (k-ft) | 936.0 |
| P _t , AXIAL (k) | 74.0 |
| H, SHEAR (k) | 12.0 |

| Try: | L (ft.) | B (ft.) | t (ft.) | Soil depth to TOP of mat (ft.) | Soil depth to BOT. of mat (ft.) | Pier dia./width (ft.) | Pier Height, h (ft.) | Pier Shape |
|------|---------|---------|---------|--------------------------------|---------------------------------|-----------------------|----------------------|------------|
| | 23 | 23 | 3.25 | 2.75 | 6 | 3.00 | 3.25 | Round |

| | |
|---|-------|
| W _f , WEIGHT OF FOUNDATION (k) = | 268.2 |
| W _s , WEIGHT OF SOIL (k) = | 174.6 |

| | |
|-------------------------|------|
| Concrete Volume (cu ft) | 66.2 |
|-------------------------|------|

CHECK BEARING CAPACITY: LC1

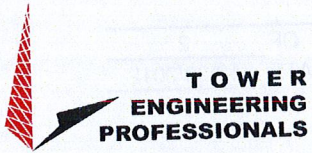
| | LC1 | LC2 |
|---|----------|----------|
| P = P _t + W _f + W _s = | 478.8 k | 516.8 k |
| e = (M _{ot} + P _t *e _t)/P = | 6.94 ft | 2.43 ft |
| L/6 = | 3.83 ft | 3.83 ft |
| 90 Axis: q _{max} = | 2.29 ksf | 0.85 ksf |
| Diag. Axis: q _{max} = | 3.40 ksf | 1.10 ksf |

Capacity: 85.1%

CHECK OVERTURNING SF: LC1

| | LC1 | LC2 |
|---|-------------|-------------|
| M _{ot} = M + H*(t+h) = | 3250.0 k-ft | 1014.0 k-ft |
| M _{st} = P*(L/2 - e _t) + (W _{f+s} *L/2) = | 5433.2 k-ft | 5793.4 k-ft |
| SF = M _{ot} /M _{st} = | 1.67 > 1.5 | 5.71 > 1.5 |

Capacity: 89.73%



JOB: TEP# 129881
 SHEET NUMBER: 2 OF 2
 CALCULATED BY: MGY DATE 12/20/2012

CHECK BEAM SHEAR

$V_u = 260.4 \text{ k}$
 $\phi V_c = 778.1 \text{ k}$ $V_c > V_u$ **O.K.** **Capacity: 33.47%**

CHECK PUNCHING SHEAR

$V_u = 133.5 \text{ k}$
 $\phi V_c = 1025.2 \text{ k}$ $V_c > V_u$ **O.K.** **Capacity: 13.02%**

CALCULATE REINFORCING REQUIRED

$F'_c = 3.0 \text{ ksi}$ $F'_y = 60.0 \text{ ksi}$

Temp & Shrinkage Reinforcement, $A_s, \text{temp} = 0.39 \text{ in}^2/\text{ft}$ (ACI 318 Sec. 10.5.4)

BOTTOM REINFORCING

Bar Size = 9
 Bar Spacing = 6.0 in.
 $d = 34.3 \text{ in.}$

$M_u = -491.9 \text{ in-k/ft}$

$\phi M_n = 0.9 * A_s * F_y * (d - 1/2 * A_s * F_y / (0.85 * b * F'_c))$

Solution: $A_s, \text{req} = 0.27 \text{ in}^2/\text{ft}$ $A_s, \text{temp controls}$
 Check, $A_s = 2.00 \text{ in}^2/\text{ft}$

Capacity: 19.50%

TOP REINFORCING

Bar Size = 9
 Bar Spacing = 6.0 in.
 $d = 34.3 \text{ in.}$

$M_u = 101.2 \text{ in-k/ft}$

$\phi M_n = 0.9 * A_s * F_y * d * (1 - 0.59 * A_s * F_y / (b * d * F'_c))$

Solution: $A_s, \text{req} = 0.05 \text{ in}^2/\text{ft}$ $A_s, \text{temp controls}$
 Check, $A_s = 2.00 \text{ in}^2/\text{ft}$

Capacity: 19.50%