STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

IN RE:	:	
	:	
A PETITION OF CELLCO PARTNERSHIP	:	SUB-PETITION NO. 1133
D/B/A VERIZON WIRELESS FOR A	:	426 RIVER ROAD
DECLARATORY RULING FOR	:	WILLINGTON, CT
APPROVAL OF AN ELIGIBLE FACILITY	:	
REQUEST FOR MODIFICATIONS TO AN	:	
EXISTING TELECOMMUNICATIONS	:	
TOWER AT 426 RIVER ROAD,	:	
WILLINGTON, CONNECTICUT	:	MARCH 27, 2015

SUB-PETITION FOR DECLARATORY RULING:
ELIGIBLE FACILITIES REQUEST FOR MODIFICATIONS
THAT WILL NOT SUBSTANTIALLY CHANGE THE
PHYSICAL DIMENSIONS OF AN EXISTING TOWER

I. Introduction

Pursuant to Section 6409(a) of the Middle Class Tax Relief and Job Creation Act of 2012, codified at 47 U.S.C. § 1455(a) ("Section 6409(a)") and the October 21, 2014 Report and Order (FCC-14-533) issued by the Federal Communications Commission ("FCC") (the "FCC Order"), Cellco Partnership d/b/a Verizon Wireless ("Cellco") hereby petitions the Connecticut Siting Council (the "Council") for a declaratory ruling ("Sub-Petition") that the proposed modifications to the existing Willington Fire Department ("WFD") tower at 426 River Road in Willington, Connecticut (the "Property") constitutes an Eligible Facilities Request ("EFR") under the FCC Order. Cellco has designated this site as its Willington West Facility.

II. Factual Background

The WFD maintains a 110-foot monopole tower behind its firehouse on a 15-acre parcel at 426 River Road (Route 32), south of Route 32 and I-84 in eastern Willington. *See* Attachment 1 – Site Vicinity and Site Schematic Maps (Aerial Photograph). The existing tower is used by

the WFD as a part of its communications system and is shared by AT&T Wireless, T-Mobile and Metro PCS. Equipment associated with the existing antennas is located within a fenced compound near the base of the tower.

Cellco is licensed to provide wireless telecommunications services in the 850 MHz, 1900 MHz, 700 MHz and 2100 MHz frequency ranges in Willington and throughout the State of Connecticut and intends to deploy wireless service in its 700 MHz and 2100 MHz frequencies at the Willington West Facility.

III. Proposed Willington West Facility

At the Willington West Facility, Cellco will install a total of four (4) model SBNHH-1D65A antennas and four (4) remote radio heads ("RRHs") at a height of 83 feet above ground level ("AGL"). Cellco will install a 12' x 26' shelter to house its radio equipment and back-up (diesel) generator in the easterly portion of the site compound. Power and telephone service will extend from the existing utility backboard at the tower site. Project Plans for the Willington West Facility are included in Attachment 2. Specifications for Cellco's antennas and RRHs are included in Attachment 3. A Structural (Modification) Analysis Report, confirming that with certain modifications, the tower can accommodate Cellco's proposed installation is included in Attachment 4.

IV. Discussion

A. The Proposed Modification Will Not Cause a Substantial Change to the Physical Dimensions of the Existing Tower or Base Station

Section 6409(a) provides, in relevant part, that "a State or local government may not deny, and shall approve, any eligible facilities request for a modification of an existing wireless tower or base station that does not substantially change the physical dimensions of such tower or base station." Pursuant to the FCC Order, the proposed modification does not substantially

change the physical dimensions of the tower or base station if the following criteria are satisfied.

1. *The proposed modified facility will not increase the height of the base station by more than ten (10) percent or ten (10) feet, whichever is greater.* Cellco proposes to install its antennas and RRHs at the 83-foot level on the existing 110-foot tower.

2. *The proposed facility will not protrude from the edge of the structure more than six (6) feet.* The proposed antennas and RRHs will protrude approximately four (4) feet from the edge of the existing tower.

3. *The proposed facility does not involve installation of more than the standard number of new equipment cabinets for the technology involved, but not to exceed four cabinets.* Cellco intends to install its standard (12' x 26') equipment shelter to house its radio equipment and back-up generator.

4. *The proposed facility does not entail any excavation or deployment outside the current site of the base station.* All of Cellco's site improvements will occur within the limits of the WFD's 15-acre Property and the existing fenced compound.

5. *The proposed facility does not defeat the existing concealment elements of the base station.* None of the existing antennas on the WFD tower are concealed in any fashion. Cellco's antennas will not be concealed.

6. *The proposed facility complies with conditions associated with the prior approval of construction or modification of the base station.* Cellco is not aware of any conditions associated with the WFD tower. Cellco's proposed facility modifications are consistent with other existing installations both on the ground and on the tower.

B. FCC Compliance

Cumulative radio frequency ("RF") emissions from the WFD tower following the

installation of Cellco antennas will be far below the standards adopted by the FCC. Included in Attachment 5 is a worst-case RF emissions calculation for Cellco's proposed modifications.

C. Notice to the Town, Property Owner and Abutting Landowners

On March 27, 2015, a copy of this Sub-Petition was sent to the Willington First Selectman Christina B. Mailhos and the WFD, the owner of the Property. *See* Attachment 6.

A copy of this Sub-Petition was also sent to each owner of land that abuts the Property. A sample abutter's cover letter and the list of those abutting landowners who were sent notice and a copy of the Sub-Petition is included in Attachment 7.

V. Conclusion

Based on the information provided above, Cellco respectfully submits that the proposed modification of the existing base station at the Property constitutes an "eligible facilities request" under Section 6409(a) and the FCC Order.

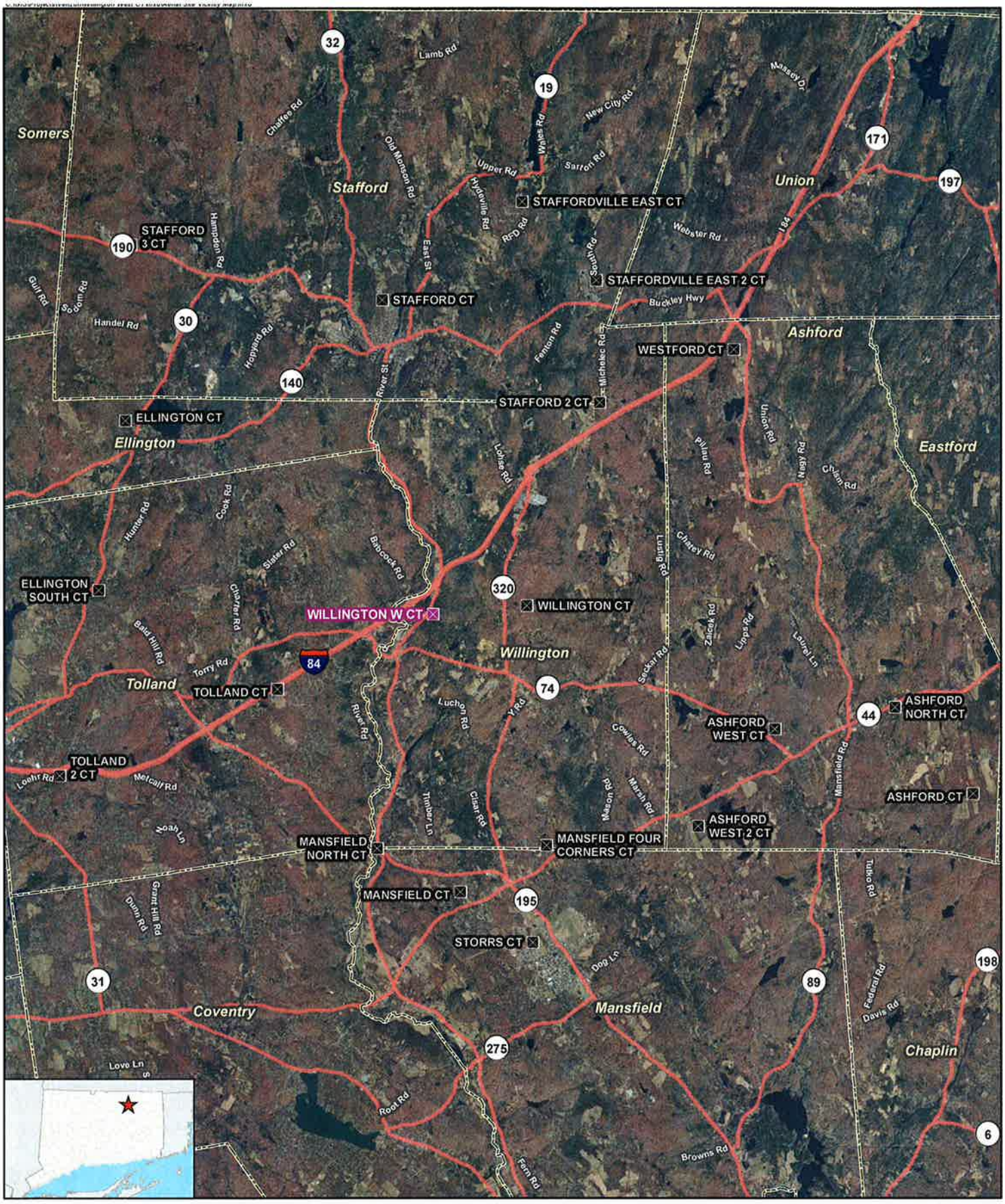
Respectfully submitted,

CELLCO PARTNERSHIP d/b/a VERIZON WIRELESS

By _____

Kenneth C. Baldwin, Esq.
Robinson & Cole LLP
280 Trumbull Street
Hartford, CT 06103-3597
(860) 275-8200
Its Attorneys

ATTACHMENT 1



Legend

- Proposed Verizon Wireless Facility
- Surrounding Verizon Wireless Facilities
- Municipal Boundary

Site Vicinity Map

Proposed Wireless
Willington West CT
426 River Road
Willington, Connecticut

N
W E
S

11,000 5,500 0 11,000
Feet

Base Map Source: 2012 Aerial Photograph (CTECO)
Map Scale: 1 inch = 11,000 feet
Map Date: March 2015

verizon wireless

ALL-POINTS

Legend

- Existing Fenced Compound
- Proposed 12'x26' Verizon Wireless Equipment Shelter
- Existing Facility Access
- Approximate Parcel Boundary (CTDEEP GIS)

Site Schematic

Proposed Wireless
Willington West CT
426 River Road
Willington, Connecticut

N
W E
S

150 75 0 150 Feet

verizon wireless

ALL-POINTS

Map Notes:
Base Map Source: 2012 Aerial Photograph (CTECO)
Map Scale: 1 inch = 150 feet
Map Date: March 2015

ATTACHMENT 2

Cellco Partnership

d.b.a. **verizon** *wireless*

WIRELESS COMMUNICATIONS FACILITY

WILLINGTON W

426 RIVER ROAD

WILLINGTON, CT 06279

SITE DIRECTIONS

FROM: 99 EAST RIVER DRIVE, EAST HARTFORD, CONNECTICUT **TO:** 426 RIVER ROAD, WILLINGTON, CT 06279

1. Head northeast on E River Dr	335 ft
2. Turn left onto the CT-2 E ramp to Norwich	0.2 mi
3. Merge onto I-84 E	20.7 mi
4. Take exit 69 for Connecticut 74 toward U.S. 44/Willington/Putnam	0.3 mi
5. Turn right onto CT-74 E	0.7 mi
6. Turn left onto CT-32 N, and Destination will be on the right.	

GENERAL NOTES

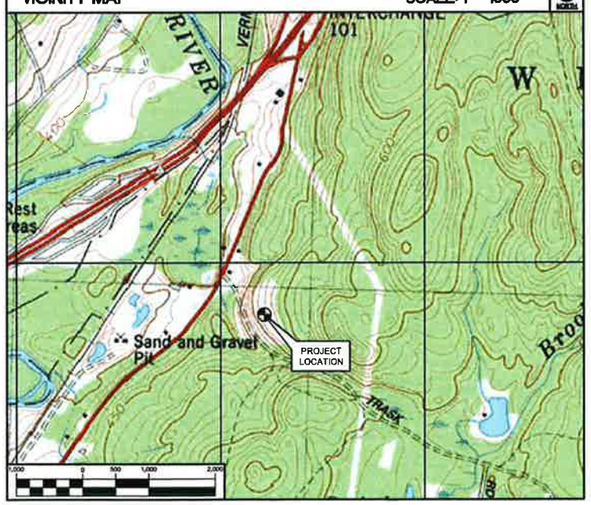
1. PROPOSED ANTENNA LOCATIONS AND HEIGHTS PROVIDED BY CELLCO PARTNERSHIP.

PROJECT SCOPE

1. THE PROPOSED SCOPE OF WORK GENERALLY INCLUDES THE INSTALLATION OF A PROPOSED CELLCO PARTNERSHIP ±12'x26' EQUIPMENT SHELTER TO HOUSE A DIESEL FUELED EMERGENCY GENERATOR.
2. A TOTAL OF FOUR (4) PANEL ANTENNAS, FOUR (4) REMOTE RADIO HEADS AND ASSOCIATED APPURTENANCES ARE PROPOSED TO BE MOUNTED TO EXISTING 110' TALL MONOPOLE TOWER WITH AN ANTENNA CENTERLINE ELEVATION AT ±83'-0" A.G.L.
3. POWER AND TELCO UTILITIES SHALL BE ROUTED UNDERGROUND FROM THE EXISTING UTILITY BACKBOARD. UTILITIES ROUTING WILL BE UNDERGROUND FROM UTILITY BACKBOARD TO THE PROPOSED NOMINAL 12'x26' WIRELESS EQUIPMENT SHELTER.
4. THERE WILL NOT BE ANY LIGHTING UNLESS REQUIRED BY THE FCC OR THE FAA.
5. THE PROPOSED WIRELESS FACILITY INSTALLATION WILL BE DESIGNED IN ACCORDANCE WITH THE 2003 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2009 CONNECTICUT SUPPLEMENT.

VICINITY MAP

SCALE: 1" = 1000'



PROJECT SUMMARY

SITE NAME:	WILLINGTON W
SITE ADDRESS:	426 RIVER ROAD WILLINGTON, CT 06279
LESSEE/TENANT:	CELLCO PARTNERSHIP d.b.a. PROPOSED CELLCO PARTNERSHIP 99 EAST RIVER DRIVE EAST HARTFORD, CT 06108
VERIZON SITE ACQUISITION CONTACT:	STEVEN SCHADLER CELLCO PARTNERSHIP (508) 887-0357
LEGAL/REGULATORY COUNSEL:	KENNETH C. BALDWIN, ESQ. ROBINSON & COLE (860) 257-8345
SITE COORDINATES:	LATITUDE: 41°-53'-28.690" N LONGITUDE: 72°-17'-21.816" W
	GROUND ELEVATION: ±526.8' A.M.S.L.
	(SITE COORDINATES AND GROUND ELEVATION REFERENCED FROM FAA 1-A SURVEY CERTIFICATION AS PREPARED BY MARTINEZ COUCH AND ASSOCIATES LLC, DATED MARCH 10, 2015)

SHEET INDEX

SHT. NO.	DESCRIPTION	REV. NO.
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C-1	ABUTTERS MAP	2
C-2	COMPOUND PLAN, TOWER ELEVATION AND ANTENNA CONFIGURATION	2

PROFESSIONAL ENGINEER SEAL

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
2	03/27/15	HMR	DMD	ISSUED FOR CSC - UPDATED FOR FAA 1-A AND ANTENNA CONFIGURATION
1	03/17/15	DRA	DMD	ISSUED FOR CSC
0	03/11/15	DRA	DMD	ISSUED FOR CSC-CLIENT REVIEW

Cellco Partnership d.b.a. verizon wireless

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www.CentekEng.com

Cellco Partnership d/b/a Verizon Wireless

WIRELESS COMMUNICATIONS FACILITY

WILLINGTON W

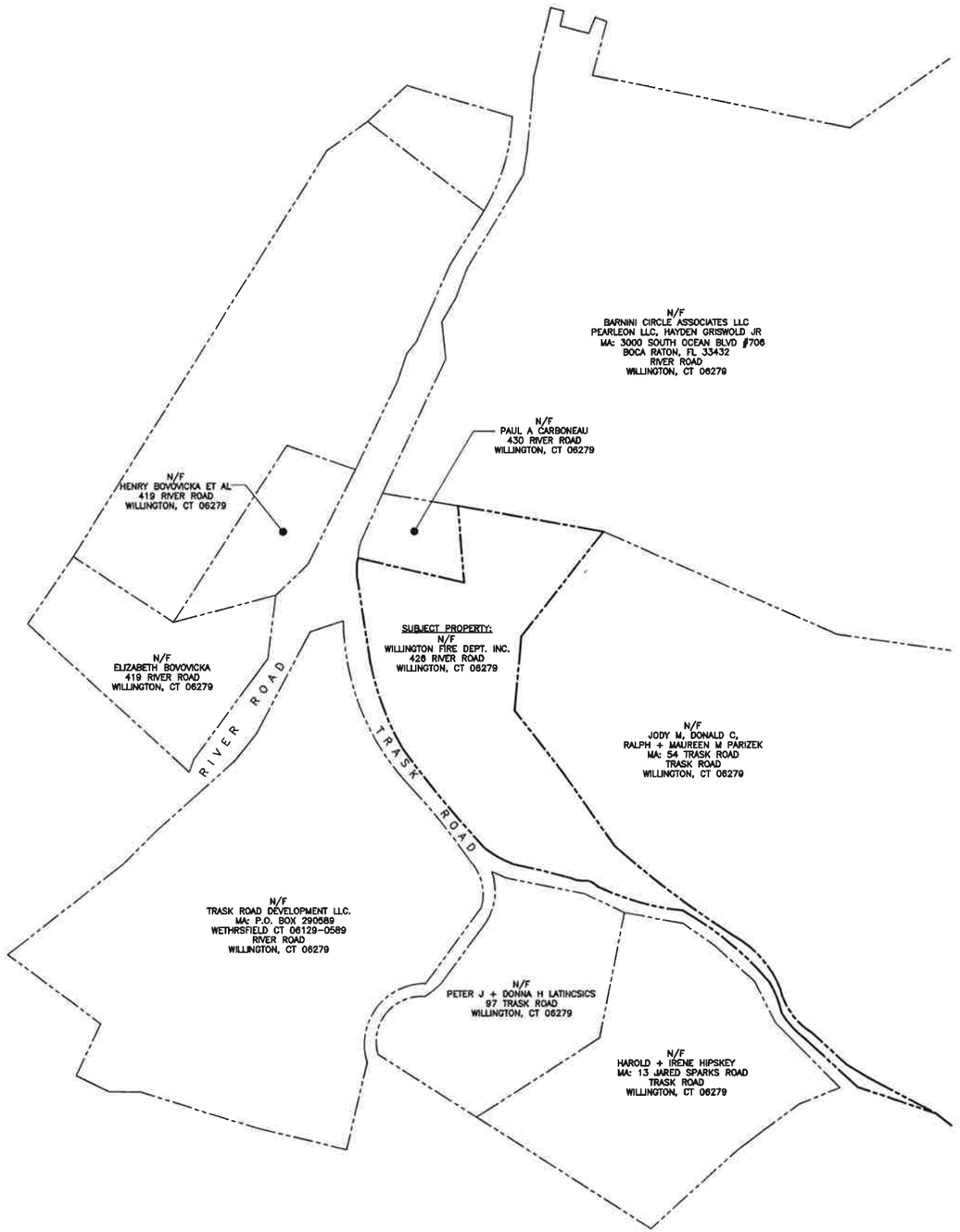
426 RIVER ROAD
WILLINGTON, CT 06279

DATE: 03/09/15
SCALE: AS NOTED
JOB NO. 14193.000

TITLE SHEET

T-1

Sheet No. 1 of 3



1 / C-1 **ABUTTERS MAP**
SCALE: 1" = 1200'

APPROXIMATE NORTH

GRAPHIC SCALE
1200 0 600 1200 1800 2400
(IN FEET)
1 inch = 1200 ft.

PROFESSIONAL ENGINEER SEAL

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
2	03/27/15	HMR	DMD	ISSUED FOR CSC - UPDATED FOR FAA 1-A AND ANTENNA CONFIGURATION
1	03/19/15	DRA	DMD	ISSUED FOR CSC-CLIENT REVIEW
0	03/11/15	DRA	DMD	

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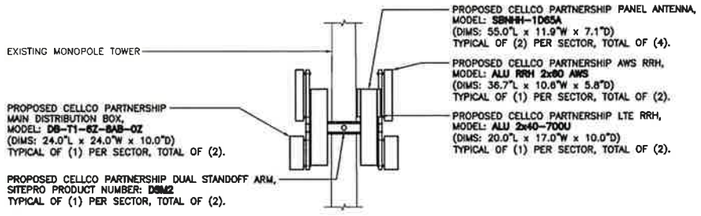
WIRELESS COMMUNICATIONS FACILITY
WILLINGTON W
426 RIVER ROAD
WILLINGTON, CT 06279

DATE: 03/09/15
SCALE: AS NOTED
JOB NO. 14193.000

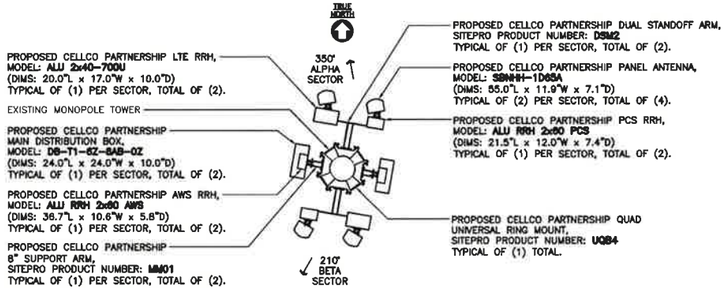
ABUTTERS MAP

C-1

Sheet No. 2 of 3



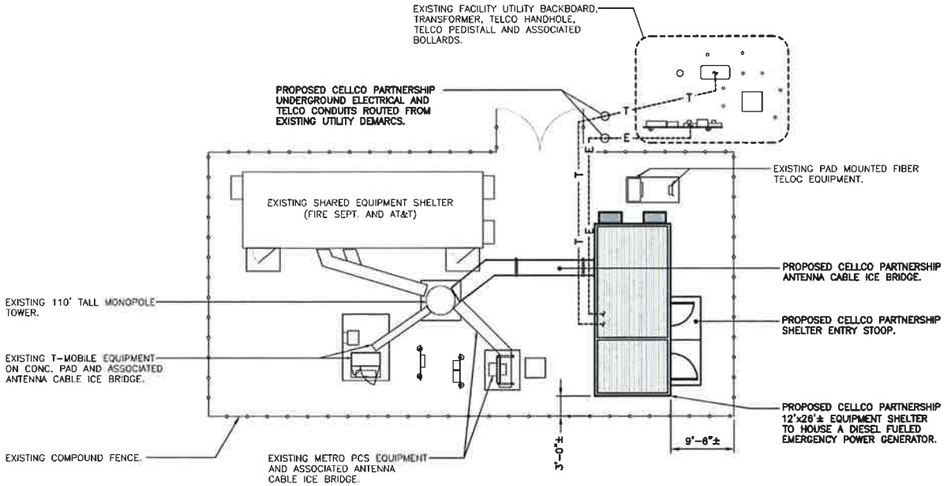
ELEVATION



PLAN

3 C-2 ANTENNA CONFIGURATION
SCALE: 1/4" = 1'-0"

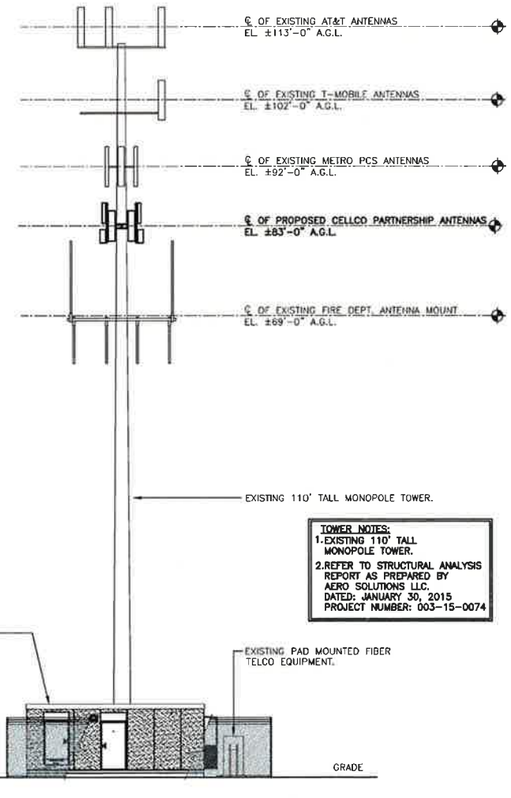
GRAPHIC SCALE
(IN FEET)
1/4 inch = 1 ft



1 C-2 COMPOUND PLAN
SCALE: 1" = 10'

APPROXIMATE NORTH

GRAPHIC SCALE
(IN FEET)
1 inch = 10 ft



2 C-2 TOWER ELEVATION
SCALE: 1" = 10'

GRAPHIC SCALE
(IN FEET)
1 inch = 10 ft

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
2	03/27/15	HMR	DMD	ISSUED FOR CSC - UPDATED FOR FAA T-A AND ANTENNA CONFIGURATION
1	03/17/15	DRA	DMD	ISSUED FOR CSC
0	03/13/15	DRA	DMD	ISSUED FOR CSC-CLIENT REVIEW

PROFESSIONAL ENGINEER SEAL

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WIRELESS COMMUNICATIONS FACILITY
WILLINGTON W
426 RIVER ROAD
WILLINGTON, CT 06279

DATE: 03/09/15
SCALE: AS NOTED
JOB NO. 14193.000

COMPOUND PLAN, TOWER ELEVATION AND ANTENNA CONFIGURATION

C-2

Sheet No. 3 of 3

ATTACHMENT 3

Product Specifications

COMMSCOPE®

SBNHH-1D65A

Andrew® Tri-band Antenna, 698–896 and 2x 1695–2360 MHz, 65° horizontal beamwidth, internal RET. Both high bands share the same electrical tilt.

POWERED BY ANDREW.

Electrical Specifications

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2180	2300–2360
Gain, dBi	13.6	13.7	16.5	16.9	17.1	17.6
Beamwidth, Horizontal, degrees	66	61	70	65	62	61
Beamwidth, Vertical, degrees	17.6	15.9	7.1	6.6	6.2	5.5
Beam Tilt, degrees	0–18	0–18	0–10	0–10	0–10	0–10
USLS, dB	16	13	13	13	12	12
Front-to-Back Ratio at 180°, dB	25	27	28	28	27	29
CPR at Boresight, dB	20	16	20	23	17	20
CPR at Sector, dB	10	5	11	6	1	4
Isolation, dB	25	25	25	25	25	25
Isolation, Intersystem, dB	30	30	30	30	30	30
VSWR | Return Loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350	350	350	300
Polarization	±45°	±45°	±45°	±45°	±45°	±45°

Electrical Specifications, BASTA*

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2180	2300–2360
Gain by all Beam Tilts, average, dBi	13.1	13.1	16.1	16.5	16.7	17.2
Gain by all Beam Tilts Tolerance, dB	±0.5	±0.5	±0.5	±0.3	±0.5	±0.4
Gain by Beam Tilt, average, dBi	0 ° | 13.4	0 ° | 13.4	0 ° | 16.0	0 ° | 16.3	0 ° | 16.5	0 ° | 17.0
	9 ° | 13.1	9 ° | 13.1	5 ° | 16.2	5 ° | 16.5	5 ° | 16.8	5 ° | 17.3
	18 ° | 12.7	18 ° | 12.7	10 ° | 16.1	10 ° | 16.5	10 ° | 16.6	10 ° | 16.9
Beamwidth, Horizontal Tolerance, degrees	±3.1	±5.4	±2.8	±4	±6.6	±4.6
Beamwidth, Vertical Tolerance, degrees	±1.8	±1.4	±0.3	±0.4	±0.5	±0.3
USLS, dB	15	14	15	15	15	14
Front-to-Back Total Power at 180° ± 30°, dB	22	21	26	26	24	25
CPR at Boresight, dB	22	16	22	25	21	22
CPR at Sector, dB	10	6	12	8	5	4

* CommScope® supports NGMN recommendations on Base Station Antenna Standards (BASTA). To learn more about the benefits of BASTA, download the whitepaper Time to Raise the Bar on BSAs.

Mechanical Specifications

Color | Radome Material	Light gray | Fiberglass, UV resistant
Connector Interface | Location | Quantity	7-16 DIN Female | Bottom | 6
Wind Loading, maximum	445.0 N @ 150 km/h 100.0 lbf @ 150 km/h
Wind Speed, maximum	241.4 km/h | 150.0 mph
Antenna Dimensions, L x W x D	1409.0 mm x 301.0 mm x 180.0 mm | 55.5 in x 11.9 in x 7.1 in
Net Weight	15.2 kg | 33.5 lb

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All specifications are subject to change without notice. See www.commscope.com for the most current information. Revised: March 11, 2015

Alcatel-Lucent RRH2x40-07-U

REMOTE RADIO HEAD

The Alcatel-Lucent RRH2x40-07-U is a high-power, small form-factor Remote Radio Head (RRH) operating in the North American Digital Dividend / 700MHz frequency band (3GPP Band 13). The Alcatel-Lucent RRH2x40-07-U 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 RRH2x40-07-U 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 RRH2x40-07-U has two transmit RF paths, 40 W RF output power per transmit path, and is designed to manage up to two-way receive diversity. The device is ideally suited to support macro coverage, with multiple-input multiple-output (MIMO) 2x2 operation in up to 10 MHz of bandwidth.

The Alcatel-Lucent RRH2x40-07-U 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 coverage holes. However, many of these sites can host an Alcatel-Lucent RRH2x40-07-U 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 RRH2x40-07-U 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 RRH2x40-07-U is compact and weights less than 23 kg (50 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

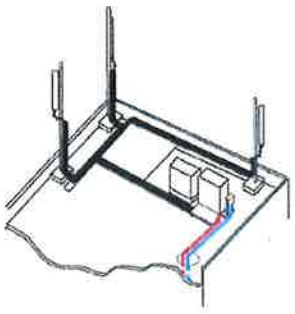
Because of its small size and weight, the Alcatel-Lucent RRH2x40-07-U can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-07-U where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and 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 RRH2x40-07-U provides more RF power while at the same time consuming less electricity.

Features

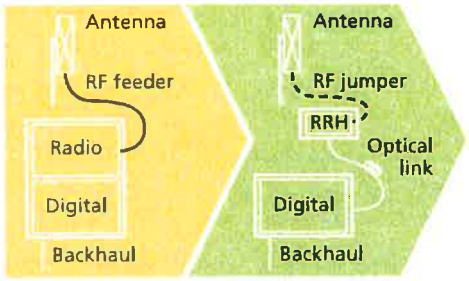
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless), noise-free, and heaterless unit
- Best-in-class power efficiency, with significantly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

Benefits

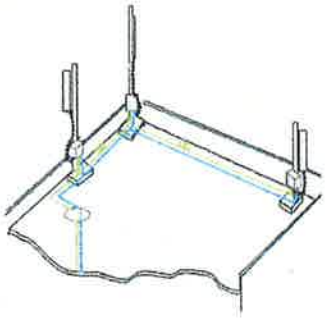
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

- Height: 390 mm (15.4 in.)
- Width: 380 mm (15 in.)
- Depth: 210 mm (8.2 in.)
- Weight (without mounting kit): less than 23 kg (50 lb)

Power

- Power supply: -48V

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: 700 MHz; 3GPP Band 13
- Bandwidth: up to 10 MHz
- RF output power at antenna port:
  - ¬ 40 W nominal RF power for each Tx port
- Rx diversity: 2-way or 4-way
- Noise figure: below 2.5 dB typical
- ALD features
  - ¬ TMA
  - ¬ Remote electrical tilt (RET) support (AISG v2.0)

Optical characteristics

Type/number of fibers

- Up to 3.12 Gb/s line bit rate
- Single-mode variant
  - ¬ One SM fiber (9/125 µm) per RRH2x, carrying UL and DL using CWDM (at 1550/1310 nm)
- Multi-mode variant
  - ¬ Two MM fibers (50/125 µm) per RRH2x: one carrying UL, the other carrying DL (at 850 nm)

Optical fiber length

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

Alarms and ports

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

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CPG2809100913 (09)

Alcatel·Lucent

ALCATEL-LUCENT WIRELESS PRODUCT DATASHEET

RRH2x60-AWS FOR BAND 4 APPLICATIONS

The Alcatel-Lucent RRH2x60-AWS is a high power, small form factor Remote Radio Head operating in the AWS frequency band (3GPP Band 4) for LTE technology. It is designed with an eco-efficient approach, providing operators with the means to achieve high quality and high capacity coverage with minimum site requirements and efficient operation.

A distributed Node B expands the 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 a Node B to be installed separately, within the same site or several kilometers apart.

The Alcatel-Lucent RRH2x60-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.

[illegible]

The Alcatel-Lucent RRH2x60-AWS integrates all the latest technologies. This allows to offer best-in-class characteristics.

It delivers an outstanding 120 watts of total RF power thanks to its two transmit RF paths of 60 W each.

It is ideally suited to support multiple-input multiple-output (MIMO) 2x2 operation.

It includes four RF receivers to natively support 4-way uplink reception diversity. This improves the radio uplink coverage and this can be used to extend the cell radius commensurate with 2x2MIMO 2x60 W for the downlink.

It supports multiple discontinuous LTE carriers within an instantaneous bandwidth of 45 MHz corresponding to the entire AWS B4 spectrum.

The latest generation power amplifiers (PA) used in this product achieve high efficiency (>40%), resulting in improved power consumption figures.

[illegible]

The Alcatel-Lucent RRH2x60-AWS is designed to make available all the benefits of a distributed Node B, with excellent RF characteristics, with low capital expenditures (CAPEX) and low operating expenditures (OPEX).

The Alcatel-Lucent RRH2x60-AWS is a very cost-effective solution to deploy LTE MIMO.

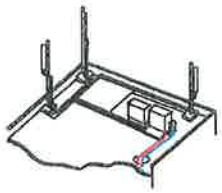
[illegible]

The RRH2x60-AWS includes a reversible mounting bracket which allows for ease of installation behind an antenna, or on a rooftop knee wall while providing easy access to the mid body RF connectors.

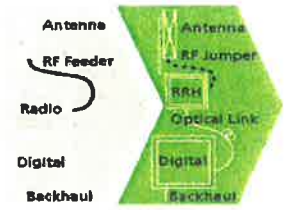
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

The Alcatel-Lucent RRH2x60-AWS is a zero-footprint solution and is convection cooled without fans for silent operation, simplifying negotiations with site property owners and minimizing environmental impacts.

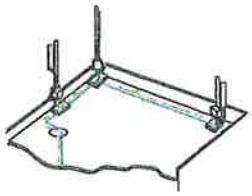
Installation can easily be done by a single person as the Alcatel-Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



Macro



RRH for space-constrained cell sites



Distributed

FEATURES

- RRH2x60-AWS integrates two power amplifiers of 60W rating (at each antenna connector)
- Support multiple carriers over the entire 3GPP band 4
- RRH2x60-AWS is optimized for LTE operation
- RRH2x60-AWS is a very compact and lightweight product
- Advanced power management techniques are embedded to provide power savings, such as PA bias control

BENEFITS

- MIMO LTE operation with only one single unit per sector
- Improved uplink coverage with built-in 4-way receive diversity capability
- RRH can be mounted close to the antenna, eliminating nearly all losses in RF cables and thus reducing power consumption by 50% compared to conventional solutions
- Distributed configurations provide easily deployable and cost-effective solutions, near zero footprint and silent solutions, with minimum impact on the neighborhood, which ease the deployment
- RETA and TMA support without additional hardware thanks to the AISG v2.0 port and the integrated Bias-Tees. Bias-Tees support AISG DC supply and signaling.

TECHNICAL SPECIFICATIONS

Specifications listed are hardware capabilities. Some capabilities depend on support in a specific software release or future release.

Dimensions and weights

- HxWxD : 510x285x186mm (27 l with solar shield)
- Weight : 20 kg (44 lbs)

Electrical Data

- Power Supply : -48V DC (-40.5 to -57V)
- Power Consumption (ETSI average traffic load reference) : 250W @2x60W

RF Characteristics

- Frequency band: 1710-1755, UL / 2110-2155 MHz, DL (3GPP band 4)
- Output power: 2x60W at antenna connectors
- Technology supported: LTE
- Instantaneous bandwidth: 45 MHz
- Rx diversity: 2-way and 4-way uplink reception
- Typical sensitivity without Rx diversity: -105 dBm for LTE

Connectivity

- Two CPRI optical ports for daisychaining and up to six RRHs per fiber
- Type of optical fiber: Single-Mode (SM) and Multi-Mode (MM) SFPs
- Optical fiber length: up to 500m using MM fiber, up to 20km using SM fiber
- TMA/RETA : AISG 2.0 (RS485 connector and internal Bias-Tee)
- Six external alarms
- Surge protection for all external ports (DC and RF)

Environmental specifications

- Operating temperature: -40°C to 55°C including solar load
- Operating relative humidity: 8% to 100%
- Environmental Conditions : ETS 300 019-1-4 class 4.1E
- Ingress Protection : IEC 60529 IP65
- Acoustic Noise : Noiseless (natural convection cooling)

Safety and Regulatory Data

- EMC : 3GPP 25113, EN 301 489-1, EN 301 489-23, GR 1089, GR 3108, OET-65
- Safety : IEC60950-1, EN 60825-1, UL, ANSI/NFPA 70, CAN/CSA-C22.2
- Regulatory : FCC Part 15 Class B, CE Mark – European Directive : 2002/95/EC (ROHS); 2002/96/EC (WEEE); 1999/5/EC (R&TTE)
- Health : EN 50385

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AT THE SPEED OF IDEAS™

ATTACHMENT 4

Date: **January 30, 2015**

George Finley
Crown Castle
3530 Toringdon Way, Suite 300
Charlotte, NC 28277

Aero Solutions LLC
5500 Flatiron Pkwy, Suite 100
Boulder, CO 80301
(720) 304-6882

Subject: **Structural Analysis Report**

Carrier Designation:	***Verizon Wireless* Co-Locate Carrier Site Name:**	Willington West, CT
Crown Castle Designation:	**Crown Castle BU Number:**	841301
	Crown Castle Site Name:	WILLINGTON-RIVER RD
	Crown Castle JDE Job Number:	306865
	Crown Castle Work Order Number:	1001202
	Crown Castle Application Number:	262559 Rev. 11
Engineering Firm Designation:	**Aero Solutions LLC Project Number:**	003-15-0074
Site Data:	**426 River Road, Willington, Tolland County, CT** **Latitude *41° 53' 26.72"*, Longitude *-72° 17' 21.77"*** **110 Foot - Monopole Tower**	

Dear George Finley,

Aero Solutions LLC is pleased to submit this **"Structural Modification 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 751104, in accordance with application 262559, revision 11.

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:

LC4.5: Modified Structure w/ Existing + Proposed **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing loading, respectively.

This analysis has been performed in accordance with the TIA/EIA-222-F standard and 2005 CT State Building Code with 2009 amendment 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 attached drawings for the determined available structural capacity to be effective.

We at *Aero Solutions LLC* 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: Shawn D. Cook, P.E.

Respectfully submitted by:

Shraddha Dharia, P.E.
Structural Engineer
CT PE#: PEN0028187
Expires: 1/31/2016

1.30.2015

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 110 ft Monopole tower mapped by ADP Structural & Welding in May of 2011. The original design code and wind speed are unknown.

The tower has been modified per reinforcement drawings prepared by GPD, in June of 2012. Modifications consist of shaft reinforcement and base plate stiffeners.

This analysis considers the proposed modifications in "Appendix D - Modification Drawings".

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a fastest mile wind speed of 85 mph with no ice, 37.6 mph with 1 inch 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
83.0	83.0	2	alcatel lucent	RRH-2X40W-700-MHZ	2	1-5/8"	
		2	alcatel lucent	RRH2X60-AWS			
		2	alcatel lucent	RRH2X60-PCS			
		4	andrew	SBNHH-1D65A w/ Mount Pipe			
		2	rfs celwave	DB-T1-6Z-8AB-0Z			
		4	tower mounts	Pipe Mount [PM 601-1]			

Table 2 - Existing and 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
110.0	113.0	2	kmw communications	AM-X-CD-16-65-00T-RET w/ Mount Pipe	1 2 12	3/8" 3/4" 7/8"	1
		6	powerwave technologies	P65-15-XLH-RR w/ Mount Pipe			
		1	powerwave technologies	P65-16-XLH-RR w/ Mount Pipe			
		6	powerwave technologies	TT19-08BP111-001			
	111.0	6	ericsson	RRUS 11			
		1	raycap	DC6-48-60-18-8F			
	110.0	1	tower mounts	Platform Mount [LP 714-1]			
100.0	102.0	2	allgon	7271.01 w/ Mount Pipe	4	1-5/8"	1
	100.0	1	tower mounts	Platform Mount [LP 712-1]			
92.0	92.0	3	rfs celwave	APXV18-206517S-ACU w/ Mount Pipe	6	1-5/8"	1
		1	tower mounts	Side Arm Mount [SO 102-3]			
69.0	74.0	1	decibel	DB810M-XC	3	1/2"	1

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
	72.0	1	scala	OGB6-900			
	71.0	1	decibel	DB201-F			
	69.0	1	tower mounts	12' Horizontal x 4" HSS			
		1	tower mounts	Pipe Mount [PM 502-1]			

Notes:
1) Existing Equipment

Table 3 - Design Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
Unknown						

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	WEI	4710168	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	WEI	4710170	CCISITES
4-TOWER MANUFACTURER DRAWINGS	ADP Structural & Welding	5113552	CCISITES
4-TOWER REINFORCEMENT DESIGN/DRAWINGS/DATA	GPD	4945191	CCISITES

3.1) Analysis Method

tnxTower (version 6.1.4.1), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

1) Tower and structures were built in accordance with the manufacturer's specifications.
2) The tower and structures have been maintained in accordance with the manufacturer's specification.
3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
4) When applicable, transmission cables are considered as structural components for calculating wind loads as allowed by TIA/EIA-222-F.
5) The following material grades were assumed based on previous experience with similar towers: Pole Shaft A572-65, Base Plate A572-60, Anchor Rods A615-75, Concrete f'c 3 ksi, and Rebar Yield Strength 60 ksi.
6) The existing reinforcement was installed per the referenced documents.

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

4) ANALYSIS RESULTS

tnxTower Report - version 6.1.4.1

Table 5 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	110 - 93	Pole	TP15.941x13.051x0.188	1	-4.059	476.874	72.5	Pass
L2	93 - 80	Pole	TP17.89x15.226x0.25	2	-6.045	727.665	97.5	Pass
L3	80 - 64.25	Pole	TP20.686x17.89x0.503	3	-8.157	1209.672	94.4	Pass
L4	64.25 - 56.5	Pole	TP22.063x20.686x0.732	4	-9.459	1620.941	84.4	Pass
L5	56.5 - 45.5	Pole	TP24.016x22.063x0.912	5	-10.909	2126.442	73.7	Pass
L6	45.5 - 33.75	Pole	TP25.652x22.806x0.687	6	-14.610	2269.299	85.9	Pass
L7	33.75 - 0	Pole	TP31.751x25.652x0.606	7	-22.421	2743.234	97.7	Pass
							Summary	
						Pole (L7)	97.7	Pass
						Rating =	97.7	Pass

Table 6 - Tower Component Stresses vs. Capacity - LC4.5

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	90.9	Pass
1	Base Plate	0	87.2	Pass
1	Base Foundation	0	44.3	Pass
1	Base Foundation Soil Interaction	0	69.8	Pass

Structure Rating (max from all components) =	97.7%

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

4.1) Recommendations

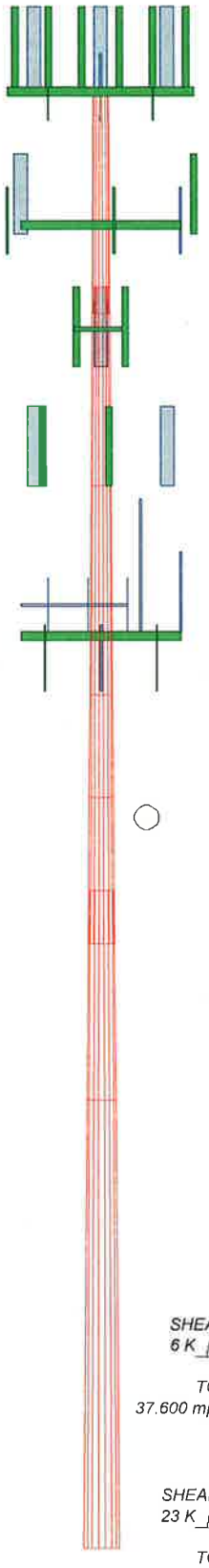
The tower and its foundation have sufficient capacity to carry the existing and proposed loads once the proposed modifications are installed.

APPENDIX A

TNXTOWER OUTPUT

Section	1	2	3	4	5	6	7
Length (ft)	17.000	15.000	15.750	7.750	11.000	15.750	33.750
Number of Sides	18	18	18	18	18	18	18
Thickness (in)	0.188	0.250	0.503	0.732	0.912	0.687	0.606
Socket Length (ft)	2.000				4.000		
Top Dia (in)	13.051	15.226	17.890	20.686	22.063	22.806	25.652
Bot Dia (in)	15.941	17.890	20.686	22.063	24.016	25.652	31.751
Grade	A572-65		46.892226ksi	40.914505ksi		41.033948ksi	52.136166ksi / 57.287284ksi
Weight (K)	0.5	0.7	1.5	1.1	2.1	2.5	6.6

110.0 ft
93.0 ft
80.0 ft
64.3 ft
56.5 ft
45.5 ft
33.8 ft
0.0 ft



AXIAL
34 K
SHEAR
6 K
MOMENT
451 kip-ft
TORQUE 1 kip-ft
37.600 mph WIND - 1.000 in ICE
AXIAL
22 K
SHEAR
23 K
MOMENT
1683 kip-ft
TORQUE 4 kip-ft
REACTIONS - 85.000 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(2) P65-15-XLH-RR w/ Mount Pipe	110	APXV18-206517S-ACU w/ Mount Pipe	92
P65-16-XLH-RR w/ Mount Pipe	110	APXV18-206517S-ACU w/ Mount Pipe	92
(2) RRUS 11	110	APXV18-206517S-ACU w/ Mount Pipe	92
(2) TT19-08BP111-001	110	Side Arm Mount [SO 102-3]	92
DC6-48-60-18-8F	110	RRH-2X40W-700-MHZ	83
(2) P65-15-XLH-RR w/ Mount Pipe	110	RRH2X60-AWS	83
AM-X-CD-16-65-00T-RET w/ Mount Pipe	110	RRH2X60-PCS	83
		(2) SBNHH-1D65A w/ Mount Pipe	83
(2) RRUS 11	110	DB-T1-6Z-8AB-0Z	83
(2) TT19-08BP111-001	110	RRH-2X40W-700-MHZ	83
(2) P65-15-XLH-RR w/ Mount Pipe	110	RRH2X60-AWS	83
AM-X-CD-16-65-00T-RET w/ Mount Pipe	110	RRH2X60-PCS	83
(2) RRUS 11	110	(2) SBNHH-1D65A w/ Mount Pipe	83
(2) TT19-08BP111-001	110	DB-T1-6Z-8AB-0Z	83
Platform Mount [LP 714-1]	110	Pipe Mount [PM 601-1]	83
Transition Ladder	110	Pipe Mount [PM 601-1]	83
Pipe Mount 2 x 5'	110	Pipe Mount [PM 601-1]	83
Pipe Mount 2 x 5'	110	Pipe Mount [PM 601-1]	83
Pipe Mount 2 x 5'	110	DB201-F	69
7271.01 w/ Mount Pipe	100	DB810M-XC	69
7271.01 w/ Mount Pipe	100	OGB6-900	69
Platform Mount [LP 712-1]	100	Pipe Mount [PM 502-1]	69
Transition Ladder	100	12' Horizontal x 4" HSS	69
Pipe Mount 2 x 5'	100	Pipe Mount 2 x 5'	69
Pipe Mount 2 x 5'	100	Pipe Mount 2 x 5'	69
(2) Pipe Mount 2 x 5'	100	Pipe Mount 2 x 5'	69

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi	41.033948ksi	41 ksi	56 ksi
46.892226ksi	47 ksi	62 ksi	52.136166ksi	52 ksi	67 ksi
40.914505ksi	41 ksi	56 ksi	57.287284ksi	57 ksi	72 ksi

TOWER DESIGN NOTES

1. Tower is located in Tolland County, Connecticut.
2. Tower designed for a 85.000 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 37.600 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50.000 mph wind.
5. TOWER RATING: 97.7%

Aero Solutions LLC
5500 Flatiron Pkwy, Suite 100
Boulder, CO 80301
Phone: (720) 304-6882
FAX: (720) 304-6883

Job:	BU#841301 WILLINGTONRIVER RD		
Project:	Existing 110 ft Monopole		
Client:	CROWN CASTLE	Drawn by: Shawn D. Cook, P.E.	App'd:
Code:	TIA/EIA-222-F	Date: 01/29/15	Scale: NTS
Path:			Dwg No. E-1

Tower Input Data

There is a pole section.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

2) Tower is located in Tolland County, Connecticut.
3) Basic wind speed of 85.000 mph.
4) Nominal ice thickness of 1.000 in.
5) Ice thickness is considered to increase with height.
6) Ice density of 56.000 pcf.
7) A wind speed of 37.600 mph is used in combination with ice.
8) Temperature drop of 50.000 °F.
9) Deflections calculated using a wind speed of 50.000 mph.
10) A non-linear (P-delta) analysis was used.
11) Pressures are calculated at each section.
12) Stress ratio used in pole design is 1.333.
13) Local bending stresses due to climbing loads, feed line 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	Use TIA-222-G Tension Splice	
	Capacity Exemption	

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	110.000-93.000	17.000	2.000	18	13.051	15.941	0.188	0.750	A572-65 (65 ksi)
L2	93.000-80.000	15.000	0.000	18	15.226	17.890	0.250	1.000	A572-65 (65 ksi)
L3	80.000-64.250	15.750	0.000	18	17.890	20.686	0.503	2.014	46.892226ksi (47 ksi)
L4	64.250-56.500	7.750	0.000	18	20.686	22.063	0.732	2.927	40.914505ksi (41 ksi)
L5	56.500-45.500	11.000	4.000	18	22.063	24.016	0.912	3.646	41.033948ksi (41 ksi)
L6	45.500-33.750	15.750	0.000	18	22.806	25.652	0.687	2.747	52.136166ksi (52 ksi)
L7	33.750-0.000	33.750		18	25.652	31.751	0.606	2.423	57.287284ksi (57 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	13.252	7.655	160.038	4.567	6.630	24.139	320.287	3.828	1.967	10.491
	16.187	9.375	293.952	5.592	8.098	36.299	588.291	4.689	2.476	13.203
L2	15.822	11.883	336.722	5.316	7.735	43.533	673.888	5.943	2.240	8.959
	18.166	13.997	550.241	6.262	9.088	60.546	1101.207	7.000	2.709	10.834
L3	18.166	27.785	1061.079	6.172	9.088	116.757	2123.553	13.895	2.262	4.493
	21.006	32.254	1659.940	7.165	10.509	157.958	3322.065	16.130	2.755	5.471
L4	21.006	46.339	2331.189	7.084	10.509	221.834	4665.446	23.174	2.353	3.216
	22.403	49.535	2847.539	7.573	11.208	254.067	5698.825	24.772	2.595	3.547
L5	22.403	61.196	3458.834	7.509	11.208	308.609	6922.220	30.604	2.279	2.5
	24.386	66.848	4508.342	8.202	12.200	369.532	9022.615	33.430	2.622	2.877
L6	23.892	48.217	2980.335	7.852	11.585	257.252	5964.591	24.113	2.805	4.084
	26.048	54.422	4285.250	8.863	13.031	328.846	8576.138	27.216	3.306	4.814
L7	26.048	48.147	3815.901	8.891	13.031	292.829	7636.823	24.078	3.449	5.694
	32.241	59.872	7337.483	11.057	16.130	454.911	14684.620	29.942	4.522	7.467

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 110.000-93.000				1	1	1		
L2 93.000-80.000				1	1	1		
L3 80.000-64.250				1	1	0.921899		
L4 64.250-56.500				1	1	0.887663		
L5 56.500-45.500				1	1	0.861919		
L6 45.500-33.750				1	1	0.910331		
L7 33.750-0.000				1	1	1.0645		

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Sector	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or Diameter in	Perimeter in	Weight plf
***									
PL1.25x3.5-12	A	Surface Af (CaAa)	65.500 - 45.500	1	1	0.383 0.383	3.500	9.500	0.000
PL1.25x3.5-12	B	Surface Af (CaAa)	65.500 - 45.500	1	1	0.383 0.383	3.500	9.500	0.000
PL1.25x3.5-12	C	Surface Af (CaAa)	65.500 - 45.500	1	1	0.383 0.383	3.500	9.500	0.000
***									
CCI-SFP-06512535	A	Surface Af (CaAa)	36.500 - 1.500	1	1	-0.280 -0.280	6.500	15.500	0.000
CCI-SFP-06512535	B	Surface Af (CaAa)	36.500 - 1.500	1	1	0.217 0.217	6.500	15.500	0.000
CCI-SFP-06512535	B	Surface Af (CaAa)	36.500 - 1.500	1	1	-0.280 0.280	6.500	15.500	0.000
CCI-SFP-06512535	C	Surface Af (CaAa)	36.500 - 1.500	1	1	0.050 0.050	6.500	15.500	0.000
CCI-SFP-06512535	A	Surface Af (CaAa)	56.500 - 36.500	1	1	-0.280 -0.280	6.500	15.500	0.000
CCI-SFP-06512535	B	Surface Af (CaAa)	56.500 - 36.500	1	1	-0.280 -0.280	6.500	15.500	0.000

Description	Sector	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or Diameter in	Perimeter in	Weight plf
CCI-SFP-06512535	C	Surface Af (CaAa)	56.500 - 36.500	1	1	-0.280 -0.280	6.500	15.500	0.000
CCI-SFP-04510025	A	Surface Af (CaAa)	81.500 - 56.500	1	1	-0.280 -0.280	4.500	11.000	0.000
CCI-SFP-04510025	B	Surface Af (CaAa)	81.500 - 56.500	1	1	-0.280 -0.280	4.500	11.000	0.000
CCI-SFP-04510025	C	Surface Af (CaAa)	81.500 - 56.500	1	1	-0.280 -0.280	4.500	11.000	0.000
***									

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
LDF5-50A(7/8")	A	No	Inside Pole	110.000 - 6.000	12	No Ice	0.000	0.330
						1/2" Ice	0.000	0.330
						1" Ice	0.000	0.330
						2" Ice	0.000	0.330
						4" Ice	0.000	0.330
FB-L98-002-XXX(3/8)	A	No	Inside Pole	110.000 - 6.000	1	No Ice	0.000	0.065
						1/2" Ice	0.000	0.065
						1" Ice	0.000	0.065
						2" Ice	0.000	0.065
						4" Ice	0.000	0.065
WR-VG86ST-BRD(3/4)	A	No	Inside Pole	110.000 - 6.000	2	No Ice	0.000	0.584
						1/2" Ice	0.000	0.584
						1" Ice	0.000	0.584
						2" Ice	0.000	0.584
						4" Ice	0.000	0.584
2" Flex Conduit	A	No	Inside Pole	110.000 - 6.000	1	No Ice	0.000	0.320
						1/2" Ice	0.000	0.320
						1" Ice	0.000	0.320
						2" Ice	0.000	0.320
						4" Ice	0.000	0.320
***								
LDF7-50A(1-5/8")	C	No	Inside Pole	100.000 - 6.000	4	No Ice	0.000	0.820
						1/2" Ice	0.000	0.820
						1" Ice	0.000	0.820
						2" Ice	0.000	0.820
						4" Ice	0.000	0.820
***								
LDF7-50A(1-5/8")	C	No	Inside Pole	92.000 - 6.000	6	No Ice	0.000	0.820
						1/2" Ice	0.000	0.820
						1" Ice	0.000	0.820
						2" Ice	0.000	0.820
						4" Ice	0.000	0.820
***								
HB158-1-08U8-S8J18(1-5/8)	B	No	Inside Pole	83.000 - 6.000	2	No Ice	0.000	1.300
						1/2" Ice	0.000	1.300
						1" Ice	0.000	1.300
						2" Ice	0.000	1.300
						4" Ice	0.000	1.300
***								
LDF4-50A(1/2")	A	No	Inside Pole	69.000 - 6.000	3	No Ice	0.000	0.150
						1/2" Ice	0.000	0.150
						1" Ice	0.000	0.150
						2" Ice	0.000	0.150
						4" Ice	0.000	0.150
***								

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	110.000-93.000	A	0.000	0.000	0.000	0.000	0.094
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	0.023
L2	93.000-80.000	A	0.000	0.000	1.125	0.000	0.072
		B	0.000	0.000	1.125	0.000	0.008
		C	0.000	0.000	1.125	0.000	0.102
L3	80.000-64.250	A	0.000	0.000	12.542	0.000	0.089
		B	0.000	0.000	12.542	0.000	0.041
		C	0.000	0.000	12.542	0.000	0.129
L4	64.250-56.500	A	0.000	0.000	10.333	0.000	0.046
		B	0.000	0.000	10.333	0.000	0.020
		C	0.000	0.000	10.333	0.000	0.064
L5	56.500-45.500	A	0.000	0.000	18.333	0.000	0.066
		B	0.000	0.000	18.333	0.000	0.029
		C	0.000	0.000	18.333	0.000	0.090
L6	45.500-33.750	A	0.000	0.000	12.729	0.000	0.070
		B	0.000	0.000	15.708	0.000	0.031
		C	0.000	0.000	12.729	0.000	0.096
L7	33.750-0.000	A	0.000	0.000	34.938	0.000	0.165
		B	0.000	0.000	69.875	0.000	0.072
		C	0.000	0.000	34.938	0.000	0.228

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	110.000-93.000	A	1.144	0.000	0.000	0.000	0.000	0.094
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	0.023
L2	93.000-80.000	A	1.122	0.000	0.000	1.697	0.000	0.082
		B		0.000	0.000	1.697	0.000	0.018
		C		0.000	0.000	1.697	0.000	0.112
L3	80.000-64.250	A	1.098	0.000	0.000	18.764	0.000	0.198
		B		0.000	0.000	18.764	0.000	0.150
		C		0.000	0.000	18.764	0.000	0.238
L4	64.250-56.500	A	1.075	0.000	0.000	15.888	0.000	0.139
		B		0.000	0.000	15.888	0.000	0.113
		C		0.000	0.000	15.888	0.000	0.156
L5	56.500-45.500	A	1.053	0.000	0.000	26.059	0.000	0.214
		B		0.000	0.000	26.059	0.000	0.177
		C		0.000	0.000	26.059	0.000	0.239
L6	45.500-33.750	A	1.022	0.000	0.000	16.855	0.000	0.164
		B		0.000	0.000	20.800	0.000	0.146
		C		0.000	0.000	16.855	0.000	0.190
L7	33.750-0.000	A	1.000	0.000	0.000	45.688	0.000	0.407
		B		0.000	0.000	91.375	0.000	0.556
		C		0.000	0.000	45.688	0.000	0.469

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	110.000-93.000	0.000	0.000	0.000	0.000
L2	93.000-80.000	0.000	0.000	0.000	0.000
L3	80.000-64.250	0.000	0.000	0.000	0.000
L4	64.250-56.500	0.000	0.000	0.000	0.000
L5	56.500-45.500	0.000	0.000	0.000	0.000
L6	45.500-33.750	0.111	0.217	0.119	0.232
L7	33.750-0.000	0.430	0.844	0.461	0.904

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(2) P65-15-XLH-RR w/ Mount Pipe	A	From Leg	4.000 0.000 3.000	30.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.188 6.667 7.151 8.149 10.273	4.328 5.007 5.668 7.126 10.299	0.059 0.107 0.162 0.292 0.668
P65-16-XLH-RR w/ Mount Pipe	A	From Leg	4.000 0.000 3.000	30.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.637 9.290 9.910 11.176 13.829	6.362 7.538 8.427 10.239 14.099	0.079 0.144 0.218 0.393 0.886
(2) RRUS 11	A	From Leg	4.000 0.000 1.000	30.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.249 3.491 3.741 4.268 5.426	1.373 1.551 1.738 2.138 3.042	0.051 0.071 0.095 0.153 0.313
(2) TT19-08BP111-001	A	From Leg	4.000 0.000 3.000	30.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.645 0.757 0.877 1.144 1.782	0.520 0.623 0.735 0.986 1.590	0.016 0.022 0.029 0.050 0.119
DC6-48-60-18-8F	A	From Leg	4.000 0.000 1.000	30.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.567 2.798 3.038 3.543 4.658	2.567 2.798 3.038 3.543 4.658	0.033 0.055 0.081 0.143 0.313
(2) P65-15-XLH-RR w/ Mount Pipe	B	From Leg	4.000 0.000 3.000	30.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.188 6.667 7.151 8.149 10.273	4.328 5.007 5.668 7.126 10.299	0.059 0.107 0.162 0.292 0.668
AM-X-CD-16-65-00T-RET w/ Mount Pipe	B	From Leg	4.000 0.000 3.000	30.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.498 9.149 9.767 11.031 13.679	6.304 7.479 8.368 10.179 14.024	0.074 0.139 0.212 0.385 0.874
(2) RRUS 11	B	From Leg	4.000 0.000 1.000	30.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.249 3.491 3.741 4.268 5.426	1.373 1.551 1.738 2.138 3.042	0.051 0.071 0.095 0.153 0.313
(2) TT19-08BP111-001	B	From Leg	4.000 0.000 3.000	30.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.645 0.757 0.877 1.144 1.782	0.520 0.623 0.735 0.986 1.590	0.016 0.022 0.029 0.050 0.119
(2) P65-15-XLH-RR w/ Mount Pipe	C	From Leg	4.000 0.000 3.000	30.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice	6.188 6.667 7.151 8.149 10.273	4.328 5.007 5.668 7.126 10.299	0.059 0.107 0.162 0.292 0.668

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						4" Ice			
AM-X-CD-16-65-00T-RET w/ Mount Pipe	C	From Leg	4.000 0.000 3.000	30.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.498 9.149 9.767 11.031 13.679	6.304 7.479 8.368 10.179 14.024	0.074 0.139 0.212 0.385 0.874
(2) RRUS 11	C	From Leg	4.000 0.000 1.000	30.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.249 3.491 3.741 4.268 5.426	1.373 1.551 1.738 2.138 3.042	0.051 0.071 0.095 0.153 0.313
(2) TT19-08BP111-001	C	From Leg	4.000 0.000 3.000	30.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.645 0.757 0.877 1.144 1.782	0.520 0.623 0.735 0.986 1.590	0.016 0.022 0.029 0.050 0.119
Platform Mount [LP 714-1]	C	None		0.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	37.470 44.230 50.990 64.510 91.550	37.470 44.230 50.990 64.510 91.550	1.600 2.040 2.480 3.360 5.119
Transition Ladder	C	From Leg	2.000 0.000 -3.000	0.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.000 8.000 10.000 14.000 22.000	6.000 8.000 10.000 14.000 22.000	0.160 0.240 0.320 0.480 0.800
Pipe Mount 2 x 5'	A	From Leg	4.000 0.000 0.000	0.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.188 1.496 1.807 2.458 3.919	1.188 1.496 1.807 2.458 3.919	0.018 0.027 0.040 0.076 0.196
Pipe Mount 2 x 5'	B	From Leg	4.000 0.000 0.000	0.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.188 1.496 1.807 2.458 3.919	1.188 1.496 1.807 2.458 3.919	0.018 0.027 0.040 0.076 0.196
Pipe Mount 2 x 5'	C	From Leg	4.000 0.000 0.000	0.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.188 1.496 1.807 2.458 3.919	1.188 1.496 1.807 2.458 3.919	0.018 0.027 0.040 0.076 0.196
***									
7271.01 w/ Mount Pipe	A	From Leg	4.000 -6.000 2.000	0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.344 5.819 6.297 7.283 9.381	2.711 3.414 4.063 5.412 8.317	0.035 0.072 0.115 0.222 0.548
7271.01 w/ Mount Pipe	B	From Leg	4.000 -6.000 2.000	0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.344 5.819 6.297 7.283 9.381	2.711 3.414 4.063 5.412 8.317	0.035 0.072 0.115 0.222 0.548
Platform Mount [LP 712-1]	C	None		0.000	100.000	No Ice 1/2" Ice Ice	24.530 29.940 35.350	24.530 29.940 35.350	1.335 1.646 1.956

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						1" Ice	46.170	46.170	2.577
						2" Ice	67.810	67.810	3.820
						4" Ice			
Transition Ladder	C	From Leg	2.000 0.000 -3.000	0.000	100.000	No Ice	6.000	6.000	0.160
						1/2" Ice	8.000	8.000	0.240
						1" Ice	10.000	10.000	0.320
						2" Ice	14.000	14.000	0.480
						4" Ice	22.000	22.000	0.800
Pipe Mount 2 x 5'	A	From Leg	4.000 6.000 0.000	0.000	100.000	No Ice	1.188	1.188	0.018
						1/2" Ice	1.496	1.496	0.027
						1" Ice	1.807	1.807	0.040
						2" Ice	2.458	2.458	0.076
						4" Ice	3.919	3.919	0.196
Pipe Mount 2 x 5'	B	From Leg	4.000 6.000 0.000	0.000	100.000	No Ice	1.188	1.188	0.018
						1/2" Ice	1.496	1.496	0.027
						1" Ice	1.807	1.807	0.040
						2" Ice	2.458	2.458	0.076
						4" Ice	3.919	3.919	0.196
(2) Pipe Mount 2 x 5'	C	From Leg	4.000 6.000 0.000	0.000	100.000	No Ice	1.188	1.188	0.018
						1/2" Ice	1.496	1.496	0.027
						1" Ice	1.807	1.807	0.040
						2" Ice	2.458	2.458	0.076
						4" Ice	3.919	3.919	0.196
***									
APXV18-206517S-ACU w/ Mount Pipe	A	From Leg	1.500 0.000 0.000	0.000	92.000	No Ice	5.404	4.700	0.052
						1/2" Ice	5.960	5.860	0.097
						1" Ice	6.481	6.734	0.150
						2" Ice	7.547	8.515	0.280
						4" Ice	9.919	12.277	0.679
APXV18-206517S-ACU w/ Mount Pipe	B	From Leg	1.500 0.000 0.000	0.000	92.000	No Ice	5.404	4.700	0.052
						1/2" Ice	5.960	5.860	0.097
						1" Ice	6.481	6.734	0.150
						2" Ice	7.547	8.515	0.280
						4" Ice	9.919	12.277	0.679
APXV18-206517S-ACU w/ Mount Pipe	C	From Leg	1.500 0.000 0.000	0.000	92.000	No Ice	5.404	4.700	0.052
						1/2" Ice	5.960	5.860	0.097
						1" Ice	6.481	6.734	0.150
						2" Ice	7.547	8.515	0.280
						4" Ice	9.919	12.277	0.679
Side Arm Mount [SO 102-3]	C	None		0.000	92.000	No Ice	3.000	3.000	0.081
						1/2" Ice	3.480	3.480	0.111
						1" Ice	3.960	3.960	0.141
						2" Ice	4.920	4.920	0.201
						4" Ice	6.840	6.840	0.321
***									
RRH-2X40W-700-MHZ	A	From Leg	1.500 0.000 0.000	20.000	83.000	No Ice	3.218	1.934	0.052
						1/2" Ice	3.459	2.132	0.076
						1" Ice	3.708	2.338	0.103
						2" Ice	4.233	2.776	0.169
						4" Ice	5.387	3.756	0.346
RRH2X60-AWS	A	From Leg	1.500 0.000 0.000	20.000	83.000	No Ice	3.957	1.816	0.060
						1/2" Ice	4.272	2.075	0.083
						1" Ice	4.596	2.360	0.109
						2" Ice	5.271	2.957	0.173
						4" Ice	6.722	4.253	0.354

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
RRH2X60-PCS	A	From Leg	1.500 0.000 0.000	20.000	83.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.567 2.791 3.025 3.517 4.606	2.011 2.218 2.435 2.894 3.915	0.055 0.075 0.099 0.155 0.313
(2) SBNHH-1D65A w/ Mount Pipe	A	From Leg	1.500 0.000 0.000	20.000	83.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.387 6.896 7.402 8.445 10.653	5.190 5.961 6.705 8.279 11.643	0.061 0.114 0.174 0.316 0.720
DB-T1-6Z-8AB-0Z	A	From Leg	1.500 0.000 0.000	20.000	83.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.600 5.915 6.240 6.914 8.365	2.333 2.558 2.791 3.284 4.373	0.044 0.080 0.120 0.213 0.455
RRH-2X40W-700-MHZ	C	From Leg	1.500 0.000 0.000	20.000	83.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.218 3.459 3.708 4.233 5.387	1.934 2.132 2.338 2.776 3.756	0.052 0.076 0.103 0.169 0.346
RRH2X60-AWS	C	From Leg	1.500 0.000 0.000	20.000	83.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.957 4.272 4.596 5.271 6.722	1.816 2.075 2.360 2.957 4.253	0.060 0.083 0.109 0.173 0.354
RRH2X60-PCS	C	From Leg	1.500 0.000 0.000	20.000	83.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.567 2.791 3.025 3.517 4.606	2.011 2.218 2.435 2.894 3.915	0.055 0.075 0.099 0.155 0.313
(2) SBNHH-1D65A w/ Mount Pipe	C	From Leg	1.500 0.000 0.000	20.000	83.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.387 6.896 7.402 8.445 10.653	5.190 5.961 6.705 8.279 11.643	0.061 0.114 0.174 0.316 0.720
DB-T1-6Z-8AB-0Z	C	From Leg	1.500 0.000 0.000	20.000	83.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.600 5.915 6.240 6.914 8.365	2.333 2.558 2.791 3.284 4.373	0.044 0.080 0.120 0.213 0.455
Pipe Mount [PM 601-1]	A	From Leg	0.500 0.000 0.000	0.000	83.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.000 3.740 4.480 5.960 8.920	0.900 1.120 1.340 1.780 2.660	0.065 0.079 0.093 0.122 0.178
Pipe Mount [PM 601-1]	A	From Leg	0.500 0.000 0.000	0.000	83.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.000 3.740 4.480 5.960 8.920	0.900 1.120 1.340 1.780 2.660	0.065 0.079 0.093 0.122 0.178
Pipe Mount [PM 601-1]	C	From Leg	0.500 0.000 0.000	0.000	83.000	No Ice 1/2" Ice 1" Ice 2" Ice	3.000 3.740 4.480 5.960 8.920	0.900 1.120 1.340 1.780 2.660	0.065 0.079 0.093 0.122 0.178

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						4" Ice			
Pipe Mount [PM 601-1]	C	From Leg	0.500 0.000 0.000	0.000	83.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.000 3.740 4.480 5.960 8.920	0.900 1.120 1.340 1.780 2.660	0.065 0.079 0.093 0.122 0.178
***									
DB201-F	A	From Leg	2.000 -6.000 2.000	0.000	69.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.400 0.720 1.040 1.680 2.960	0.400 0.720 1.040 1.680 2.960	0.010 0.013 0.016 0.022 0.034
DB810M-XC	A	From Leg	2.000 3.000 5.000	0.000	69.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.115 3.141 4.184 5.766 8.323	2.115 3.141 4.184 5.766 8.323	0.030 0.046 0.069 0.134 0.350
OGB6-900	A	From Leg	2.000 6.000 3.000	0.000	69.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.183 1.767 2.129 2.882 4.499	1.183 1.767 2.129 2.882 4.499	0.011 0.020 0.034 0.072 0.205
Pipe Mount [PM 502-1]	A	From Leg	1.000 0.000 0.000	0.000	69.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.590 4.710 6.830 11.070 19.550	3.130 4.400 5.670 8.210 13.290	0.100 0.110 0.119 0.138 0.176
12' Horizontal x 4" HSS	A	From Leg	2.000 0.000 0.000	0.000	69.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.600 6.564 7.536 9.506 13.551	0.156 0.212 0.277 0.432 0.847	0.144 0.187 0.240 0.376 0.779
Pipe Mount 2 x 5'	A	From Leg	4.000 0.000 -2.000	0.000	69.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.188 1.496 1.807 2.458 3.919	1.188 1.496 1.807 2.458 3.919	0.018 0.027 0.040 0.076 0.196
Pipe Mount 2 x 5'	B	From Leg	4.000 0.000 -2.000	0.000	69.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.188 1.496 1.807 2.458 3.919	1.188 1.496 1.807 2.458 3.919	0.018 0.027 0.040 0.076 0.196
Pipe Mount 2 x 5'	C	From Leg	4.000 0.000 -2.000	0.000	69.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.188 1.496 1.807 2.458 3.919	1.188 1.496 1.807 2.458 3.919	0.018 0.027 0.040 0.076 0.196
***									

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
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
L1	110 - 93	Pole	Max Tension	14	0.000	-0.000	-0.000
			Max. Compression	14	-9.517	1.830	0.725
			Max. Mx	11	-4.063	107.357	0.263
			Max. My	2	-4.049	0.993	107.089
			Max. Vy	11	-8.211	107.357	0.263
			Max. Vx	2	-8.273	0.993	107.089
			Max. Torque	3			2.335
L2	93 - 80	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-13.607	3.768	1.854
			Max. Mx	11	-6.033	252.340	0.577
			Max. My	2	-6.016	1.564	252.734
			Max. Vy	11	-11.929	252.340	0.577
			Max. Vx	2	-12.010	1.564	252.734
			Max. Torque	3			4.263
L3	80 - 64.25	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-16.744	3.497	3.219
			Max. Mx	11	-8.201	457.591	-2.217
			Max. My	2	-8.171	-1.967	460.996
			Max. Vy	11	-14.326	457.591	-2.217
			Max. Vx	2	-14.597	-1.967	460.996
			Max. Torque	3			4.260
L4	64.25 - 56.5	Pole	Max Tension	1	0.000	0.000	0.000

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Compression	14	-18.505	3.525	3.245
			Max. Mx	11	-9.499	572.553	-3.942
			Max. My	2	-9.471	-3.687	578.063
			Max. Vy	11	-15.362	572.553	-3.942
			Max. Vx	2	-15.633	-3.687	578.063
			Max. Torque	3			4.188
L5	56.5 - 45.5	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-20.419	3.547	3.266
			Max. Mx	11	-10.947	683.375	-5.504
			Max. My	2	-10.921	-5.245	690.789
			Max. Vy	11	-16.318	683.375	-5.504
			Max. Vx	2	-16.591	-5.245	690.789
			Max. Torque	3			4.184
L6	45.5 - 33.75	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-25.058	3.572	3.271
			Max. Mx	11	-14.639	957.480	-9.034
			Max. My	2	-14.619	-8.768	969.189
			Max. Vy	11	-18.438	957.480	-9.034
			Max. Vx	2	-18.710	-8.768	969.189
			Max. Torque	3			4.181
L7	33.75 - 0	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-34.331	3.350	2.843
			Max. Mx	11	-22.421	1652.838	-16.550
			Max. My	2	-22.421	-16.285	1673.638
			Max. Vy	11	-22.897	1652.838	-16.550
			Max. Vx	2	-23.162	-16.285	1673.638
			Max. Torque	3			4.149

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	14	34.331	-0.001	-0.000
	Max. H_x	11	22.443	22.875	-0.219
	Max. H_z	2	22.443	-0.219	23.141
	Max. M_x	2	1673.637	-0.219	23.141
	Max. M_z	5	1649.665	-22.875	0.219
	Max. Torsion	3	3.807	-11.628	20.150
	Min. Vert	2	22.443	-0.219	23.141
	Min. H_x	5	22.443	-22.875	0.219
	Min. H_z	8	22.443	0.219	-23.141
	Min. M_x	8	-1670.997	0.219	-23.141
	Min. M_z	11	-1652.838	22.875	-0.219
	Min. Torsion	9	-3.785	11.628	-20.150

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	22.443	0.001	0.001	-1.252	1.472	-0.000
Dead+Wind 0 deg - No Ice	22.443	0.219	-23.141	-1673.637	-16.286	-3.009
Dead+Wind 30 deg - No Ice	22.443	11.628	-20.150	-1458.508	-839.493	-3.807
Dead+Wind 60 deg - No Ice	22.443	19.921	-11.761	-852.938	-1437.355	-3.579
Dead+Wind 90 deg - No Ice	22.443	22.875	-0.219	-19.155	-1649.665	-2.396
Dead+Wind 120 deg - No Ice	22.443	19.701	11.380	819.449	-1419.564	-0.583
Dead+Wind 150 deg - No Ice	22.443	11.248	19.931	1438.104	-808.599	1.378
Dead+Wind 180 deg - No Ice	22.443	-0.219	23.141	1670.997	19.419	2.973
Dead+Wind 210 deg - No Ice	22.443	-11.628	20.150	1455.894	842.618	3.785
Dead+Wind 240 deg - No Ice	22.443	-19.921	11.761	850.343	1440.501	3.591

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead+Wind 270 deg - No Ice	22.443	-22.875	0.219	16.551	1652.838	2.430
Dead+Wind 300 deg - No Ice	22.443	-19.701	-11.380	-822.079	1422.744	0.605
Dead+Wind 330 deg - No Ice	22.443	-11.248	-19.931	-1440.753	811.759	-1.391
Dead+Ice+Temp	34.331	0.001	0.000	-2.843	3.350	-0.001
Dead+Wind 0 deg+Ice+Temp	34.331	0.050	-5.694	-451.486	-0.809	-0.884
Dead+Wind 30 deg+Ice+Temp	34.331	2.846	-4.957	-393.533	-221.026	-1.116
Dead+Wind 60 deg+Ice+Temp	34.331	4.879	-2.890	-230.880	-381.099	-1.049
Dead+Wind 90 deg+Ice+Temp	34.331	5.605	-0.050	-7.140	-438.107	-0.701
Dead+Wind 120 deg+Ice+Temp	34.331	4.829	2.804	217.734	-376.861	-0.166
Dead+Wind 150 deg+Ice+Temp	34.331	2.759	4.907	383.488	-213.685	0.413
Dead+Wind 180 deg+Ice+Temp	34.331	-0.050	5.694	445.677	7.666	0.881
Dead+Wind 210 deg+Ice+Temp	34.331	-2.846	4.957	387.727	227.884	1.114
Dead+Wind 240 deg+Ice+Temp	34.331	-4.879	2.890	225.075	387.960	1.048
Dead+Wind 270 deg+Ice+Temp	34.331	-5.605	0.050	1.335	444.970	0.701
Dead+Wind 300 deg+Ice+Temp	34.331	-4.829	-2.804	-223.543	383.726	0.166
Dead+Wind 330 deg+Ice+Temp	34.331	-2.759	-4.907	-389.300	220.546	-0.415
Dead+Wind 0 deg - Service	22.443	0.076	-8.007	-580.940	-4.586	-1.054
Dead+Wind 30 deg - Service	22.443	4.023	-6.972	-506.377	-289.901	-1.337
Dead+Wind 60 deg - Service	22.443	6.893	-4.069	-296.506	-497.138	-1.260
Dead+Wind 90 deg - Service	22.443	7.915	-0.076	-7.513	-570.690	-0.846
Dead+Wind 120 deg - Service	22.443	6.816	3.938	283.120	-490.926	-0.207
Dead+Wind 150 deg - Service	22.443	3.892	6.896	497.534	-279.190	0.486
Dead+Wind 180 deg - Service	22.443	-0.076	8.007	578.277	7.782	1.050
Dead+Wind 210 deg - Service	22.443	-4.023	6.972	503.747	293.113	1.334
Dead+Wind 240 deg - Service	22.443	-6.892	4.069	293.831	500.305	1.261
Dead+Wind 270 deg - Service	22.443	-7.915	0.076	4.855	573.889	0.850
Dead+Wind 300 deg - Service	22.443	-6.817	-3.938	-285.798	494.156	0.210
Dead+Wind 330 deg - Service	22.443	-3.892	-6.896	-500.227	282.405	-0.488

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.000	-22.443	0.000	-0.001	22.443	-0.001	0.006%
2	0.219	-22.443	-23.141	-0.219	22.443	23.141	0.001%
3	11.628	-22.443	-20.150	-11.628	22.443	20.150	0.000%
4	19.921	-22.443	-11.761	-19.921	22.443	11.761	0.000%
5	22.876	-22.443	-0.219	-22.875	22.443	0.219	0.001%
6	19.701	-22.443	11.380	-19.701	22.443	-11.380	0.000%
7	11.248	-22.443	19.931	-11.248	22.443	-19.931	0.000%
8	-0.219	-22.443	23.141	0.219	22.443	-23.141	0.001%
9	-11.628	-22.443	20.150	11.628	22.443	-20.150	0.000%
10	-19.921	-22.443	11.761	19.921	22.443	-11.761	0.000%
11	-22.876	-22.443	0.219	22.875	22.443	-0.219	0.001%
12	-19.701	-22.443	-11.380	19.701	22.443	11.380	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
13	-11.248	-22.443	-19.931	11.248	22.443	19.931	0.000%
14	0.000	-34.331	0.000	-0.001	34.331	-0.000	0.002%
15	0.050	-34.331	-5.695	-0.050	34.331	5.694	0.002%
16	2.846	-34.331	-4.957	-2.846	34.331	4.957	0.001%
17	4.880	-34.331	-2.891	-4.879	34.331	2.890	0.001%
18	5.606	-34.331	-0.050	-5.605	34.331	0.050	0.002%
19	4.830	-34.331	2.804	-4.829	34.331	-2.804	0.001%
20	2.760	-34.331	4.907	-2.759	34.331	-4.907	0.001%
21	-0.050	-34.331	5.695	0.050	34.331	-5.694	0.002%
22	-2.846	-34.331	4.957	2.846	34.331	-4.957	0.001%
23	-4.880	-34.331	2.891	4.879	34.331	-2.890	0.001%
24	-5.606	-34.331	0.050	5.605	34.331	-0.050	0.002%
25	-4.830	-34.331	-2.804	4.829	34.331	2.804	0.001%
26	-2.760	-34.331	-4.907	2.759	34.331	4.907	0.001%
27	0.076	-22.443	-8.007	-0.076	22.443	8.007	0.003%
28	4.024	-22.443	-6.972	-4.023	22.443	6.972	0.003%
29	6.893	-22.443	-4.069	-6.893	22.443	4.069	0.001%
30	7.916	-22.443	-0.076	-7.915	22.443	0.076	0.003%
31	6.817	-22.443	3.938	-6.816	22.443	-3.938	0.003%
32	3.892	-22.443	6.897	-3.892	22.443	-6.896	0.003%
33	-0.076	-22.443	8.007	0.076	22.443	-8.007	0.003%
34	-4.024	-22.443	6.972	4.023	22.443	-6.972	0.001%
35	-6.893	-22.443	4.069	6.892	22.443	-4.069	0.003%
36	-7.916	-22.443	0.076	7.915	22.443	-0.076	0.003%
37	-6.817	-22.443	-3.938	6.817	22.443	3.938	0.001%
38	-3.892	-22.443	-6.897	3.892	22.443	6.896	0.001%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.00000001	0.00001738
2	Yes	18	0.00000001	0.00010541
3	Yes	21	0.00000001	0.00007274
4	Yes	21	0.00000001	0.00008941
5	Yes	18	0.00000001	0.00011530
6	Yes	21	0.00000001	0.00007475
7	Yes	21	0.00000001	0.00007307
8	Yes	18	0.00000001	0.00013820
9	Yes	21	0.00000001	0.00009054
10	Yes	21	0.00000001	0.00007354
11	Yes	18	0.00000001	0.00008300
12	Yes	21	0.00000001	0.00007878
13	Yes	21	0.00000001	0.00008077
14	Yes	11	0.00000001	0.00005642
15	Yes	17	0.00000001	0.00014692
16	Yes	18	0.00000001	0.00010170
17	Yes	18	0.00000001	0.00011074
18	Yes	17	0.00000001	0.00013828
19	Yes	18	0.00000001	0.00009683
20	Yes	18	0.00000001	0.00009629
21	Yes	17	0.00000001	0.00014407
22	Yes	18	0.00000001	0.00011334
23	Yes	18	0.00000001	0.00010249
24	Yes	17	0.00000001	0.00014285
25	Yes	18	0.00000001	0.00010568
26	Yes	18	0.00000001	0.00010801
27	Yes	16	0.00000001	0.00009538
28	Yes	16	0.00000001	0.00013504
29	Yes	17	0.00000001	0.00012297
30	Yes	16	0.00000001	0.00008614
31	Yes	16	0.00000001	0.00014289
32	Yes	16	0.00000001	0.00013351
33	Yes	16	0.00000001	0.00010216
34	Yes	17	0.00000001	0.00012766

35	Yes	16	0.00000001	0.00013757
36	Yes	16	0.00000001	0.00008010
37	Yes	17	0.00000001	0.00008851
38	Yes	17	0.00000001	0.00009668

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	110 - 93	29.764	34	2.703	0.035
L2	95 - 80	21.734	28	2.349	0.025
L3	80 - 64.25	15.148	28	1.792	0.014
L4	64.25 - 56.5	9.890	28	1.386	0.008
L5	56.5 - 45.5	7.765	28	1.232	0.006
L6	49.5 - 33.75	6.045	28	1.115	0.005
L7	33.75 - 0	2.808	28	0.809	0.003

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
110.000	(2) P65-15-XLH-RR w/ Mount Pipe	34	29.764	2.703	0.035	4500
100.000	7271.01 w/ Mount Pipe	28	24.300	2.491	0.029	2249
92.000	APXV18-206517S-ACU w/ Mount Pipe	28	20.281	2.245	0.023	1531
83.000	RRH-2X40W-700-MHZ	28	16.332	1.899	0.016	1609
69.000	DB201-F	28	11.327	1.490	0.009	2239

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	110 - 93	85.534	9	7.756	0.100
L2	95 - 80	62.510	3	6.755	0.072
L3	80 - 64.25	43.596	3	5.161	0.041
L4	64.25 - 56.5	28.479	3	3.992	0.022
L5	56.5 - 45.5	22.366	3	3.548	0.018
L6	49.5 - 33.75	17.415	3	3.212	0.015
L7	33.75 - 0	8.094	3	2.332	0.009

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
110.000	(2) P65-15-XLH-RR w/ Mount Pipe	9	85.534	7.756	0.100	1635
100.000	7271.01 w/ Mount Pipe	3	69.874	7.158	0.082	816
92.000	APXV18-206517S-ACU w/ Mount Pipe	3	58.339	6.459	0.066	553
83.000	RRH-2X40W-700-MHZ	3	46.996	5.469	0.046	576
69.000	DB201-F	3	32.612	4.291	0.026	790

Compression Checks

Pole Design Data

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 $\frac{P}{P_a}$
L1	110 - 93 (1)	TP15.941x13.051x0.188	17.000	0.000	0.0	39.000	9.173	-4.059	357.745	0.011
L2	93 - 80 (2)	TP17.89x15.226x0.25	15.000	0.000	0.0	39.000	13.997	-6.045	545.885	0.011
L3	80 - 64.25 (3)	TP20.686x17.89x0.503	15.750	0.000	0.0	28.135	32.254	-8.157	907.481	0.009
L4	64.25 - 56.5 (4)	TP22.063x20.686x0.732	7.750	0.000	0.0	24.549	49.535	-9.459	1216.010	0.008
L5	56.5 - 45.5 (5)	TP24.016x22.063x0.912	11.000	0.000	0.0	24.620	64.793	-10.909	1595.230	0.007
L6	45.5 - 33.75 (6)	TP25.652x22.806x0.687	15.750	0.000	0.0	31.282	54.422	-14.610	1702.400	0.009
L7	33.75 - 0 (7)	TP31.751x25.652x0.606	33.750	0.000	0.0	34.372	59.872	-22.421	2057.940	0.011

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	110 - 93 (1)	TP15.941x13.051x0.188	107.656	37.187	39.000	0.954	0.000	0.000	39.000	0.000
L2	93 - 80 (2)	TP17.89x15.226x0.25	253.235	50.190	39.000	1.287	0.000	0.000	39.000	0.000
L3	80 - 64.25 (3)	TP20.686x17.89x0.503	462.084	35.104	28.135	1.248	0.000	0.000	28.135	0.000
L4	64.25 - 56.5 (4)	TP22.063x20.686x0.732	580.133	27.401	24.549	1.116	0.000	0.000	24.549	0.000
L5	56.5 - 45.5 (5)	TP24.016x22.063x0.912	693.747	24.009	24.620	0.975	0.000	0.000	24.620	0.000
L6	45.5 - 33.75 (6)	TP25.652x22.806x0.687	974.150	35.548	31.282	1.136	0.000	0.000	31.282	0.000
L7	33.75 - 0 (7)	TP31.751x25.652x0.606	1682.850	44.392	34.372	1.291	0.000	0.000	34.372	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	110 - 93 (1)	TP15.941x13.051x0.188	8.266	0.901	26.000	0.069	0.374	0.063	26.000	0.002
L2	93 - 80 (2)	TP17.89x15.226x0.25	11.799	0.843	26.000	0.065	2.060	0.198	26.000	0.008
L3	80 - 64.25 (3)	TP20.686x17.89x0.503	14.725	0.457	18.757	0.049	4.188	0.153	18.757	0.008
L4	64.25 - 56.5 (4)	TP22.063x20.686x0.732	15.762	0.318	16.366	0.039	4.185	0.094	16.366	0.006
L5	56.5 - 45.5 (5)	TP24.016x22.063x0.912	16.719	0.258	16.414	0.031	4.182	0.068	16.414	0.004
L6	45.5 - 33.75 (6)	TP25.652x22.806x0.687	18.838	0.346	20.855	0.033	4.152	0.073	20.855	0.003
L7	33.75 - 0 (7)	TP31.751x25.652x0.606	23.287	0.389	22.915	0.034	3.826	0.049	22.915	0.002

Pole Interaction Design Data

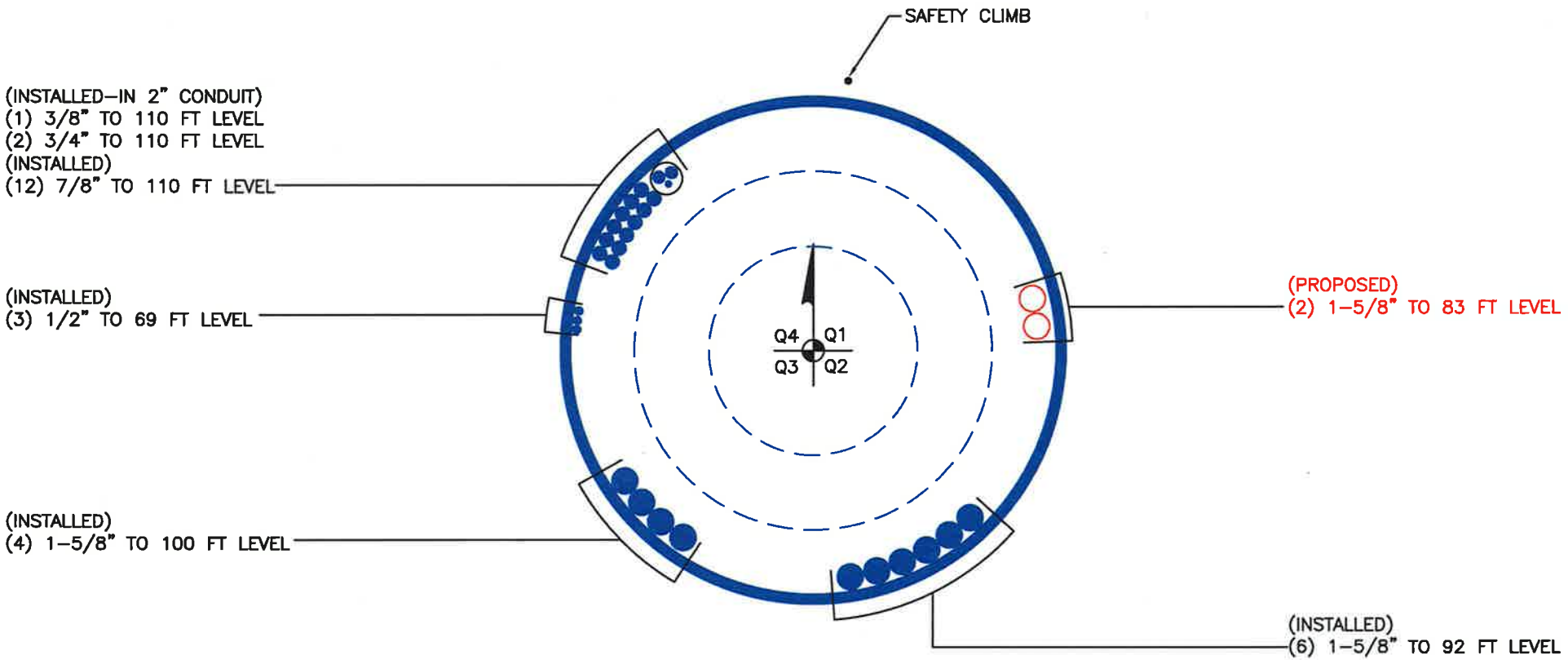
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	110 - 93 (1)	0.011	0.954	0.000	0.069	0.002	0.966 ✔	1.333	H1-3+VT ✔
L2	93 - 80 (2)	0.011	1.287	0.000	0.065	0.008	1.300 ✔	1.333	H1-3+VT ✔
L3	80 - 64.25 (3)	0.009	1.248	0.000	0.049	0.008	1.258 ✔	1.333	H1-3+VT ✔
L4	64.25 - 56.5 (4)	0.008	1.116	0.000	0.039	0.006	1.125 ✔	1.333	H1-3+VT ✔
L5	56.5 - 45.5 (5)	0.007	0.975	0.000	0.031	0.004	0.982 ✔	1.333	H1-3+VT ✔
L6	45.5 - 33.75 (6)	0.009	1.136	0.000	0.033	0.003	1.145 ✔	1.333	H1-3+VT ✔
L7	33.75 - 0 (7)	0.011	1.291	0.000	0.034	0.002	1.303 ✔	1.333	H1-3+VT ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	110 - 93	Pole	TP15.941x13.051x0.188	1	-4.059	476.874	72.5	Pass
L2	93 - 80	Pole	TP17.89x15.226x0.25	2	-6.045	727.665	97.5	Pass
L3	80 - 64.25	Pole	TP20.686x17.89x0.503	3	-8.157	1209.672	94.4	Pass
L4	64.25 - 56.5	Pole	TP22.063x20.686x0.732	4	-9.459	1620.941	84.4	Pass
L5	56.5 - 45.5	Pole	TP24.016x22.063x0.912	5	-10.909	2126.442	73.7	Pass
L6	45.5 - 33.75	Pole	TP25.652x22.806x0.687	6	-14.610	2269.299	85.9	Pass
L7	33.75 - 0	Pole	TP31.751x25.652x0.606	7	-22.421	2743.234	97.7	Pass
							Summary	
						Pole (L7)	97.7	Pass
						RATING =	**97.7**	**Pass**

APPENDIX B

BASE LEVEL DRAWING


SAFETY CLIMB
(INSTALLED–IN 2" CONDUIT)
(1) 3/8" TO 110 FT LEVEL
(2) 3/4" TO 110 FT LEVEL
(INSTALLED)
(12) 7/8" TO 110 FT LEVEL
(INSTALLED)
(3) 1/2" TO 69 FT LEVEL
(INSTALLED)
(4) 1–5/8" TO 100 FT LEVEL
Q4
Q1
Q3
Q2
(PROPOSED)
(2) 1–5/8" TO 83 FT LEVEL
(INSTALLED)
(6) 1–5/8" TO 92 FT LEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

Reinforcement Capacity

AeroSolutions LLC
Optimizing Your Tower Infrastructure
5500 Flatirons Parkway, Suite 100
Boulder, CO 80301
720-304-6882

Dimensions and Properties														Compression				Axial				
																		ASD-9			LRFD	
Model	Weight (lb/ft)	Area (in^2)	Moment of Inertia (in^4)	Moment of Inertia (in^4)	Centroid from Mating Edge (in)	Centroid from Bolt Hole Center (in)	Web Thickness (in)	Width (in)	Flange Width (in)	Flange Thickness (in)	Hole Diameter (in)	Yield Stress (ksi)	Ultimate Stress (ksi)	Slender. Ratio Coefficient	Unbraced Length (in)	Slender. Ratio Coefficient	Unbraced Length (in)	Allowable Axial (kip)	Allowable Axial w/ Increase (kip)	Governing Axial	Design Axial Strength (kip)	Governing Axial
CCI-XFP-045100	15.3	4.50	0.38	7.59	0.5	0	1	4.5	0	0	1.1875	65	80	0.80	20	1.00	20	129.7	172.9	Compress.	195.0	Rupture
CCI-XFP-065125	27.6	8.13	1.06	28.61	0.625	0	1.25	6.5	0	0	1.1875	65	80	0.80	19	1.00	19	260.4	347.2	Compress.	393.8	Rupture
PL1.25x3.5-12	14.9	4.38	0.57	4.47	0.625	0	1.25	3.5	0	0	1.21875	65	80	0.80	12	1.00	12	110.9	147.9	Rupture	166.4	Rupture

Rein1

Bottom	Top	Qty	Model	Position	T or T&C
47.75	64.25		3L.25x3.5-12	F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C

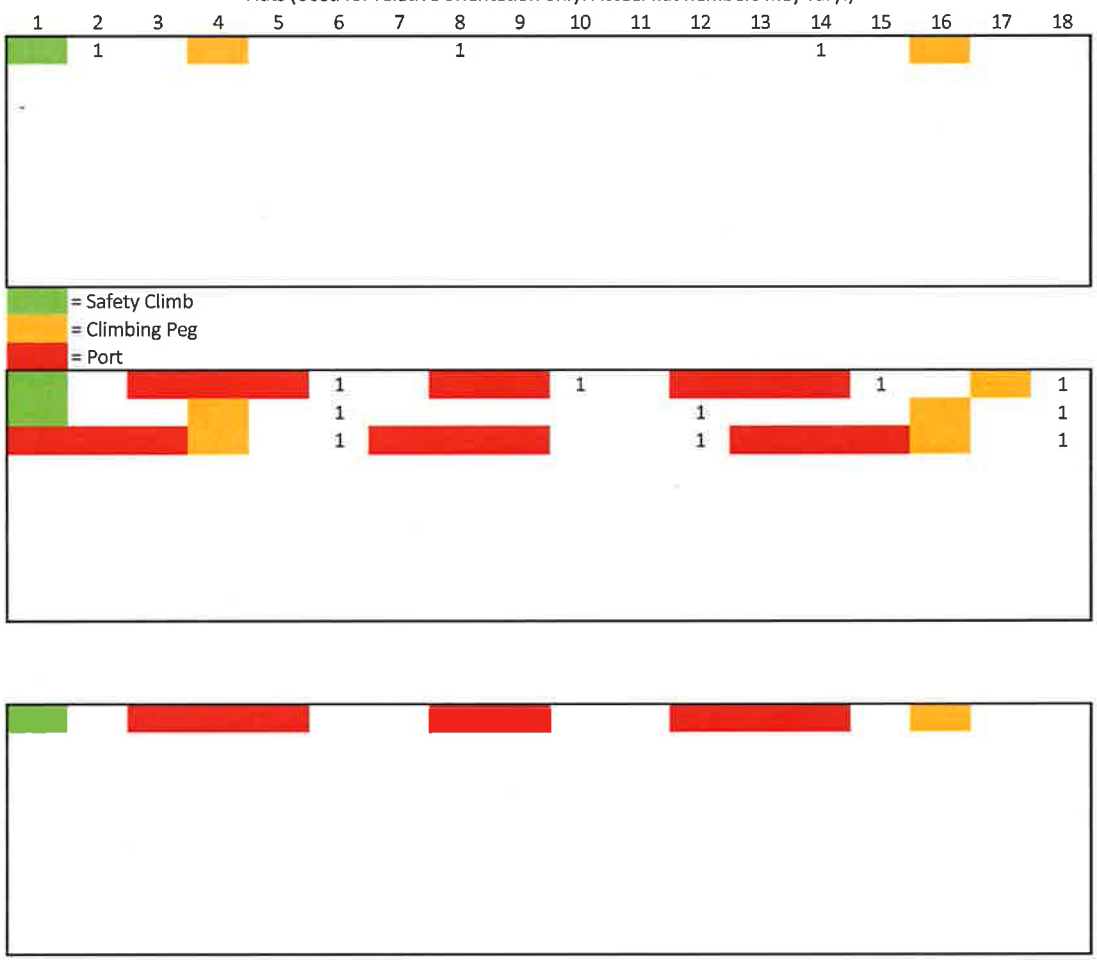
Rein2

Bottom	Top	Qty	Model	Position	T or T&C
0	33.75		4(FP-065125	F	T&C
33.75	56.5		3(FP-065125	F	T&C
56.5	80		3(FP-045100	F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C

Rein3

Bottom	Top	Qty	Model	Position	T or T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C

Flats (Used for relative orientation only. Actual flat numbers may vary.)



Reinforced Pole Stress and Effective Thickness Check

Anchor Rod Information for TIA/EIA-222-F and TIA-222-G-2

Site Information	
ID:	841301
Name:	WILLINGTON-RIVER RD
App. #:	262559 R11

AeroSolutions LLC
Optimizing Your Tower Infrastructure

Base Reactions		
Moment:	1683	ft-kip
Axial:	22	kip
Shear:	23	kip
Base Plate Type:	Circular	

Design Information	
TIA Code:	F
ASIF:	1.333
Failure:	105%
eta Factor:	0.50

Original Anchor Rod Data		
Quantity:	8	
Diameter:	2.25	in
Material:	A615 GR 75	
Bolt Circle:	38.8	in
Bolt Spacing:		in
Bolt Group Area:	31.81	in^2
Bolt Group MOIx:	5970	in^4

Reactions Seen by Original AR Group		
Moment:	898.9	kip-ft
Axial:	22.4	kip
Shear:	23.3	kip

Original AR Capacity Check		
Tension Load:	136.4	kip
Allowable load:	194.8	kip
AR Capacity:	70.0%	Pass

First Added Anchor Rod Data		
Quantity:	4	
Diameter:	2.25	in
Material:	A193 B7	
Bolt Circle:	51.3	in
Bolt Group Area:	15.90	in^2
Bolt Group MOIx:	5207	in^4

Reactions Seen by First Added AR Group		
Moment:	784.0	kip-ft
Axial:	0.0	kip
Shear:	0.0	kip

First Added AR Capacity Check		
Tension Load:	183.8	kip
Allowable load:	218.6	kip
AR Capacity:	84.1%	Pass

Second Added Anchor Rod Data		
Quantity:		
Diameter:		in
Material:		
Bolt Circle:		in
Bolt Group Area:	0.00	in^2
Bolt Group MOIx:	0	in^4

Reactions Seen by Second Added AR Group		
Moment:	0.0	kip-ft
Axial:	0.0	kip
Shear:	0.0	kip

Second Added AR Capacity Check		
Tension Load:	0.0	kip
Allowable load:	0.0	kip
AR Capacity:	0.0%	

Third Added Anchor Rod Data		
Quantity:		
Diameter:		in
Material:		
Bolt Circle:		in
Bolt Group Area:	0.00	in^2
Bolt Group MOIx:	0	in^4

Reactions Seen by Second Added AR Group		
Moment:	0.0	kip-ft
Axial:	0.0	kip
Shear:	0.0	kip

Second Added AR Capacity Check		
Tension Load:	0.0	kip
Allowable load:	0.0	kip
AR Capacity:	0.0%	

Rev.4.1

AeroSolutions LLC
Optimizing Your Tower Infrastructure

5500 Flatiron Parkway, Suite 100
Boulder, CO 80301
720-304-6882
www.AeroSolutionsLLC.com

Anchor Rod Embedment (v1.2)

Analysis Standard				
TIA Code:	*TIACode*	F		
Allowable Stress Increase:	*ASIF*	1.333		
Dimensions and Properties				
Pier Diameter:	*PierDia*	72	in	
Concrete Strength:	*Fc*	3000	psi	
Clear Cover, Side:	*cc.side*	3	in	
Clear Cover, Top:	*cc.top*	3	in	
Rebar Yield Strength:	*BarFy*	60	ksi	
Rebar Tie Size:	*TieSize*	4		
Rebar Tie Diameter:	*TieDia*	0.50	in	
Vertical Bar Quantity:	*BarQty*	32		
Vertical Bar Size:	*BarSize*	10		
Vertical Bar Diameter:	*BarDia*	1.270	in	
Vertical Bar Area:	*BarArea*	1.27	in	
Vertical Bar Circle Diameter:	*BarBC*	63.7	in	
Vertical Bar Spacing:	*BarSp*	6.2	in	
Vertical Bar Radial Angle Between:	*BarAngle*	11.3	deg	
Anchor Rod Type:	*RodType*	Other		
Anchor Rod Diameter:	*RodDia*	2.25	in	
Anchor Rod Threads per Inch:	*RodThreads*	4.5		
Anchor Rod Net Area Through Threads:	*RodArea*	3.25	sq in	
Anchor Rod Circle Diameter:	*RodBC*	51.25	in	
Anchor Rod Material:	*RodMatl*	A193 B7		
Anchor Rod Yield Strength:	*RodFy*	105	ksi	
Anchor Rod Ultimate Strength:	*RodFu*	125	ksi	
Anchor Rod Loading				
Anchor Rod Tensile Requirement:	*RodP*	324.8	kip	*LRFD capacity is used for designs.
Anchor Rod Design Criteria:	*DesCrit*	Design		
Development Length of Vertical Rebar				
Reinforcement Location Factor[1]:	*Alpha*	1.0		ACI 12.2.4
Coating Factor[1]:	*Beta*	1.0		ACI 12.2.4
Lightweight Aggregate Concrete Factor[1]:	*Lambda*	1.0		ACI 12.2.4
Reinforcement Size Factor[1]:	*Gamma*	1.0		ACI 12.2.4
Transverse Reinforcement Ratio[2]:	*Ktr*	0.0	in	ACI 12.2.4
Maximum Spacing or Cover Dimension:	*Cover*	3.12	in	ACI 12.2.4
Development Length:	*Ld*	42.4	in	ACI 12.2.3
Reinforcment Stress Ratio[3]:	*SR*	0.44		
Reduced Development Length:	*Ld.red*	18.8	in	ACI 12.2.5 Used only if DesCrit = "Analysis"
Force Transfer Length				
Angle to Vertical Bar:	*Angle*	5.6	deg	
Distance to Farthest Bar:	*BarDist*	6.8	in	
Epoxy Bond				
Epoxy Ultimate Bond Stress:	*EpoxyBond*	1800	psi	
Strength Resistance Factor:	*EpoxyPhi*	0.5		*LRFD capacity is used for designs.
Bond Length Required:	*EpoxyL*	51.1	in	
Embedment Length				
Total Required Embedment Length:	*EmbedIn*	**63**	**in**	**Rebar Length Controls**
	EmbedFt	**5.2**	**ft**	
Actual Embedment length:	*ActEmbed*	5.8	ft	
Embedment Capacity	*EmbedCap*	**90.9%**		

Notes:
(1) These factors are typically 1.0 for most tower foundations.
(2) This factor is typically 0 inches for most tower foundations.
(3) Stress ratio of reinforcement can be entered to reduce required development length. Only to be used in already installed desperate situations.
(4) This is consistent with on CCI Foundations Criteria Item AC-1, dated 06/01/2010.

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

TIA Rev F

Site Data

BU#: *841301*
Site Name: *WILLINGTON-RIVER RD*
App #: *262559 R11*

Pole Manufacturer:	*Other*

Reactions		
Moment:	898.85717	ft-kips
Axial:	22.4206	kips
Shear:	23.286477	kips

If No stiffeners, Criteria:	AISC ASD	<-Only Applcable to Unstiffened Cases

Anchor Rod Data		
Qty:	8	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	38.75	in

Plate Data		
Diam:	46.75	in
Thick:	1.5	in
Grade:	60	ksi
Single-Rod B-eff:	12.60	in

Stiffener Data (Welding at both sides)		
Config:	3	*
Weld Type:	Both	
Groove Depth:	0.25	in **
Groove Angle:	45	degrees
Fillet H. Weld:	0.375	in
Fillet V. Weld:	0.375	in
Width:	7	in
Height:	18	in
Thick:	0.5	in
Notch:	0.5	in
Grade:	36	ksi
Weld str.:	70	ksi
Clear Space between Stiffeners (b):	6	in

Pole Data		
Diam:	31.751	in
Thick:	0.3125	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Stress Increase Factor		
ASIF:	1.333	

Stiffened
Service, ASD
Fty*ASIF

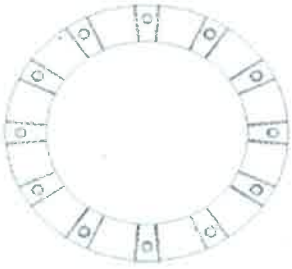
Base Plate Results	Flexural Check	Stiffened
Base Plate Stress:	52.3 ksi	Service, ASD
Allowable Plate Stress:	60.0 ksi	0.75*Fy*ASIF
Base Plate Stress Ratio:	87.2% Pass	Y.L. Length: N/A, Roark

Stiffener Results

Horizontal Weld :	56.4% Pass
Vertical Weld:	22.5% Pass
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	20.9% Pass
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	59.7% Pass
Plate Comp. (AISC Bracket):	69.7% Pass

Pole Results

Pole Punching Shear Check:	8.0% Pass



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

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

(Bearing and Stability Checks) Tool for TIA Rev F or G - Application (MP, SST with unitbase)

Site Data

BU#: *841301*
Site Name: *WILLINGTON-RIVER RD*
App #: *????*

Enter Load Factors Below:		
For P (DL)	1.2	<---- Enter Factor
For P,V, and M (WL)	1.35	<---- Enter Factor

Pad & Pier Data		
Base PL Dist. Above Pier:	0	in
Pier Dist. Above Grade:	12	in
Pad Bearing Depth, D:	5	ft
Pad Thickness, T:	2.5	ft
Pad Width=Length, L:	22	ft
Pier Cross Section Shape:	Square	<--Pull Down
Enter Pier Side Width:	6	ft
Concrete Density:	150.0	pcf
Pier Cross Section Area:	36.00	ft^2
Pier Height:	3.50	ft
Soil (above pad) Height:	2.50	ft

Soil Parameters		
Unit Weight, γ:	125.0	pcf
Ultimate Bearing Capacity, qn:	8.00	ksf
Strength Reduct. factor, ϕ:	0.75	
Angle of Friction, Φ:	36.0	degrees
Undrained Shear Strength, Cu:	0.00	ksf
Allowable Bearing: ϕ*qn:	6.00	ksf
Passive Pres. Coeff., Kp	3.85	

Forces/Moments due to Wind and Lateral Soil		
Minimum of (φ*Ultimate Pad Passive Force, Vu):	31.4	kips
Pad Force Location Above D:	1.11	ft
ϕ(Passive Pressure Moment):	34.93	ft-kips
Factored O.T. M(WL), "1.6W":	2460.5	ft-kips
Factored OT (MW-Msoil), M1	2425.54	ft-kips

Resistance due to Foundation Gravity		
Soil Wedge Projection grade, a:	1.82	ft
Sum of Soil Wedges Wt:	14.70	kips
Soil Wedges ecc, K1:	7.67	ft
Ftg+Soil above Pad wt:	340.4	kips
Unfactored (Total ftg-soil Wt):	355.10	kips
1.2D. **No Soil Wedges.**	435.38	kips
0.9D. **With Soil Wedges**	339.77	kips

Resistance due to Cohesion (Vertical)		
ϕ*(1/2*Cu)(Total Vert. Planes)	0.00	kips
Cohesion Force Eccentricity, K2	0.00	ft

Monopole Base Reaction Forces		
TIA Revision:	F	<--Pull Down
Unfactored DL Axial, PD:	22.4206	kips
Unfactored WL Axial, PW:	0	kips
Unfactored WL Shear, V:	23.28648	kips
Unfactored WL Moment, M:	1682.853	ft-kips

Load Factor	Shaft Factored Loads		
1.20	1.2D+1.6W, Pu:	26.90472	kips
0.90	0.9D+1.6W, Pu:	20.17854	kips
1.35	Vu:	31.43674	kips
	Mu:	2271.852	ft-kips

1.2D+1.6W Load Combination, Bearing Results:

(**No Soil Wedges**) [Reaction+Conc+Soil]	435.38	P1="1.2D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil), M1	2425.54	ft-kips

Orthogonal Direction:

ecc1 = M1/P1 =	5.57	ft
Orthogonal qu=	1.82	ksf
qu/ϕ*qn Ratio=	**30.38%**	Pass

Diagonal Direction:

ecc2 = (0.707M1)/P1 =	3.94	ft
Diagonal qu=	2.18	ksf
qu/ϕ*qn Ratio=	**36.38%**	Pass

Run <-- Press Upon Completing All Input

Overturning Stability Check

0.9D+1.6W Load Combination, Bearing Results:

(**w/ Soil Wedges**) [Reaction+Conc+Soil]	339.77	P2="0.9D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil) - 0.9(M of Wedge + M of Cohesion), M2	2324.03	ft-kips

Orthogonal ecc3 = M2/P2 =	6.84	ft
Ortho Non Bearing Length,NBL=	13.68	ft
Orthogonal qu=	1.86	ksf
Diagonal qu=	2.24	ksf

Max Reaction Moment (ft-kips) so that qu=φ*qn = 100% Capacity Rating			
Actual M:	1682.85		
M Orthogonal:	2412.12	**69.77%**	Pass
M Diagonal:	2412.12	**69.77%**	Pass

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#: *841301*
Site Name: *WILLINGTON-RIVER RD*
App #: *262559 R11*

Maximum Shaft Superimposed Forces		
TIA Revision:	F	
Max. Service Shaft M:	1764.356	ft-kips **(* Note)**
Max. Service Shaft P:	22.4206	kips
Max Axial Force Type:	Comp.	

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

Enter Load Factors Below:		
For M (WL)	1.3	<---- Enter Factor
For P (DL)	1.3	<---- Enter Factor

Load Factor	Shaft Factored Loads		
1.30	Mu:	2293.663	ft-kips
1.30	Pu:	29.14678	kips

Pier Properties		
Concrete:		
Pier Diameter =	6.0	ft
Concrete Area =	4071.5	in^2
Reinforcement:		
Clear Cover to **Tie**=	3.00	in
Horiz. **Tie** Bar Size=	4	
Vert. Cage Diameter =	5.31	ft
Vert. Cage Diameter =	63.73	in
Vertical Bar Size =	10	
Bar Diameter =	1.27	in
Bar Area =	1.27	in^2
Number of Bars =	32	
As Total=	40.64	in^2
A s/ Aconc, Rho:	0.0100	1.00%

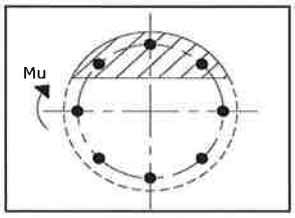
Material Properties		
Concrete Comp. strength, f'c =	3000	psi
Reinforcement yield strength, Fy =	60	ksi
Reinforcing Modulus of Elasticity, E =	29000	ksi
Reinforcement yield strain =	0.00207	
Limiting compressive strain =	0.003	
ACI 318 Code		
Select Analysis ACI Code=	2002	
Seismic Properties		
Seismic Design Category =	D	
Seismic Risk =	**High**	

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

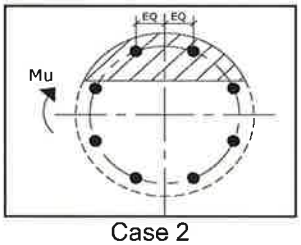
ACI 10.5 , ACI 21.10.4, and IBC 1810.
Min As for Flexural, Tension Controlled, Shafts:
(3)*(Sqrt(f'c)/Fy: 0.0027
200 / Fy: 0.0033

Results:

Governing Orientation Case: **2**



Case 1



Case 2

Dist. From Edge to Neutral Axis: **14.95** in
Extreme Steel Strain, εt: **0.0106**
εt > 0.0050, Tension Controlled
Reduction Factor,φ: **0.900**

Minimum Rho Check:
Actual Req'd Min. Rho: 0.33% Flexural
Provided Rho: 1.00% OK

Ref. Shaft Max Axial Capacities, ϕ Max(Pn or Tn):		
Max Pu = (φ=0.65) Pn.		
Pn per ACI 318 (10-2)	6612.89	kips
at Mu=(ϕ=0.65)Mn=	3413.54	ft-kips
Max Tu, (φ=0.9) Tn =	2194.56	kips
at Mu=ϕ=(0.90)Mn=	0.00	ft-kips

Output Note: Negative Pu=Tension
For Axial Compression, φ Pn = Pu: 29.15 kips
Drilled Shaft Moment Capacity, φMn: **5176.42** ft-kips
Drilled Shaft Superimposed Mu: **2293.66** ft-kips

(Mu/φMn, Drilled Shaft Flexure CSR:	**44.3%**

APPENDIX D

MODIFICATION DRAWINGS

PREPARED FOR CROWN CASTLE

MONOPOLE REINFORCEMENT DRAWINGS

SITE NAME: WILLINGTON-RIVER RD

BU NUMBER:841301

SITE ADDRESS:

426 RIVER ROAD
WILLINGTON, CT 6279
TOLLAND COUNTY

TOWER INFORMATION		
TOWER HEIGHT/TYPE:	110 FT	MONOPOLE TOWER
TOWER LOCATION:	LAT: 41.8907	
	LONG: -72.2893	
AERO ID:	003-15-0074	
APPLICATION ID:	262559 R11	

CODE COMPLIANCE

THIS REINFORCEMENT DESIGN IS BASED ON THE REQUIREMENTS OF TIA STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND ANTENNA SUPPORTING STRUCTURES USING

TIA CODE: TIA/EIA-222-F
WIND SPEED NO ICE: 85 MPH FASTEST MILE WIND SPEED
ICE THICKNESS: 1"
WIND SPEED WITH ICE: 38 MPH
SERVICE LOADS: 50 MPH

PROJECT CONTACTS

1 CROWN PROJECT MANAGER
Jerry Bruno
781-970-0069
Jerry.Bruno.Contractor@crowncastle.com

ATTENTION ALL CONTRACTORS, ANYTIME YOU ACCESS A CROWN SITE FOR ANY REASON, YOU ARE TO CALL THE CROWN NOC UPON ARRIVAL AND DEPARTURE, DAILY AT 800-788-7011.

Bradley International Airport
Schoephoester Road, Windsor Locks, CT 06096

Take Bradley International Airport to Schoephoester Rd 2 min (0.9 mi)
Take I-91 S, I-291 E and I-84 E to CT-74 E in Tolland Take exit 69 from I-84 E 30 min (31.9 mi)
Merge onto Schoephoester Rd 0.2 mi
Continue onto Bradley International Airport Con 1.2 mi
Continue onto CT-20 E/Bradley International Airport Con 2.6 mi
Take the exit onto I-91 S toward Hartford 6.2 mi
Take exit 35A for I-291 toward Manchester 0.5 mi
Continue onto I-291 E 5.6 mi
Take the exit on the left onto I-84 E toward Boston 15.4 mi
Take exit 69 for Connecticut 74 toward U.S. 44/Willington/Putnam 0.3 mi
Drive to CT-32 N 3 min (1.6 mi)

426 River Rd
Willington, CT 06279

DRAWINGS INCLUDED

SHEET NUMBER	DESCRIPTION
S-1	TITLE PAGE
S-2	MODIFICATION INSPECTION CHECKLIST
S-3	NOTES
S-4	AJAX/DTI BOLT SPECIFICATIONS AND TIGHTENING PROCEDURE
S-5	ELEVATION
S-6	DETAILS
S-7	PORT HOLE DETAILS
S-8	FAB DETAILS

NO.	DATE	DESCRIPTION	BY
00	01/30/15	INITIAL RELEASE	MB

REVISIONS

PREPARED FOR CROWN CASTLE

STATE OF CONNECTICUT · VIRGINIA A. EVERETT · No. 20157 · LICENSED PROFESSIONAL ENGINEER

1.31.2015

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Optimizing Your Tower Infrastructure

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SITE NAME: WILLINGTON-RIVER RD
BU NUMBER: 841301
WO NUMBER: 1001202
SITE ADDRESS:
426 RIVER ROAD
WILLINGTON, CT 6279
TOLLAND COUNTY

ENG/QA BY: SC	DATE: 01/30/2015	
DFT BY: MB	DATE: 01/30/2015	
DFT/QA BY: BU	DATE: 01/30/2015	
APRV'D BY: SD	DATE: 01/30/2015	
SCALE: N.T.S.		

TITLE PAGE

S-1 | REV 00

MI CHECKLIST

CONSTRUCTION / INSTALLATION INSPECTIONS AND TESTING REQUIRED (COMPLETED BY EOR)	REPORT ITEM
PRE-CONSTRUCTION	
X	MI CHECKLIST DRAWING
X	EOR APPROVAL
X	FABRICATION INSPECTION
X	FABRICATOR CERTIFIED WELD INSPECTION
X	MATERIAL TEST REPORT (MTR)
NA	FABRICATOR NDE INSPECTION
X	NDE REPORT OF MONOPOLE BASE PLATE PER ENG-SOW-10033
X	PACKING SLIPS
ADDITIONAL TESTING AND INSPECTIONS:	
None	
CONSTRUCTION	
X	CONSTRUCTION INSPECTIONS
NA	FOUNDATION INSPECTIONS
NA	CONCRETE COMP. STRENGTH AND SLUMP TESTS
X	POST INSTALLED ANCHOR ROD VERIFICATION
NA	BASE PLATE GROUT VERIFICATION
X	CONTRACTORS CERTIFIED WELD INSPECTION AND NDE REPORTS
NA	EARTHWORK LIFT AND DENSITY
X	ON SITE COLD GALVANIZING VERIFICATION
NA	GUY WIRE TENSION REPORT
X	GC AS BUILT DOCUMENTS
ADDITIONAL TESTING AND INSPECTIONS:	
None	
POST CONSTRUCTION	
X	MI INSPECTOR REDLINE OR RECORD DRAWING(S)
X	POST INSTALLED ANCHOR ROD PULL OUT TESTING
X	PHOTOGRAPHS
ADDITIONAL TESTING AND INSPECTIONS:	
None	

NOTE: X DENOTES A DOCUMENT REQUIRED FOR THE MI REPORT
NA DENOTES A DOCUMENT THAT IS NOT REQUIRED FOR THE MI REPORT

MODIFICATION INSPECTION NOTES

GENERAL

THE MODIFICATION INSPECTION (MI) IS A VISUAL INSPECTION OF TOWER MODIFICATIONS AND A REVIEW OF CONSTRUCTION INSPECTIONS AND OTHER REPORTS TO ENSURE THE INSTALLATION WAS CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS, NAMELY THE MODIFICATION DRAWINGS, AS DESIGNED BY THE ENGINEER OF RECORD (EOR).

THE MI IS TO CONFIRM INSTALLATION CONFIGURATION AND WORKMANSHIP ONLY AND IS NOT A REVIEW OF THE MODIFICATION DESIGN ITSELF, NOR DOES THE MI INSPECTOR TAKE OWNERSHIP OF THE MODIFICATION DESIGN. OWNERSHIP OF THE STRUCTURAL MODIFICATION DESIGN EFFECTIVENESS AND INTEGRITY RESIDES WITH THE EOR AT ALL TIMES.

ALL MI'S SHALL BE CONDUCTED BY A CROWN ENGINEERING VENDOR (AEV) OR ENGINEERING SERVICE VENDOR (AESV) THAT IS APPROVED TO PERFORM ELEVATED WORK FOR CROWN. SEE CROWN ENG-BUL-10173, "APPROVED MI VENDORS".

TO ENSURE THAT THE REQUIREMENTS OF THE MI ARE MET, IT IS VITAL THAT THE GENERAL CONTRACTOR (GC) AND THE MI INSPECTOR BEGIN COMMUNICATING AND COORDINATING AS SOON AS A PURCHASE ORDER (PO) IS RECEIVED. IT IS EXPECTED THAT EACH PARTY WILL BE PROACTIVE IN REACHING OUT TO THE OTHER PARTY. IF CONTACT INFORMATION IS NOT KNOWN, CONTACT YOUR CROWN POINT OF CONTACT (POC).

REFER TO CROWN ENG-SOW-10007, "MODIFICATION INSPECTION SOW", FOR FURTHER DETAILS AND REQUIREMENTS.

MI INSPECTOR

THE MI INSPECTOR IS REQUIRED TO CONTACT THE GC AS SOON AS RECEIVING A PO FOR THE MI TO, AT A MINIMUM:

- REVIEW THE REQUIREMENTS OF THE MI CHECKLIST
- WORK WITH THE GC TO DEVELOP A SCHEDULE TO CONDUCT ON-SITE INSPECTIONS, INCLUDING FOUNDATION INSPECTIONS

THE MI INSPECTOR IS RESPONSIBLE FOR COLLECTING ALL GC INSPECTION AND TEST REPORTS, REVIEWING THE DOCUMENTS FOR ADHERENCE TO THE CONTRACT DOCUMENTS, CONDUCTING THE IN-FIELD INSPECTIONS, AND SUBMITTING THE MI REPORT TO CROWN

GENERAL CONTRACTOR

THE GC IS REQUIRED TO CONTACT THE MI INSPECTOR AS SOON AS RECEIVING A PO FOR THE MODIFICATION INSTALLATION OR TURNKEY PROJECT TO, AT A MINIMUM:

- REVIEW THE REQUIREMENTS OF THE MI CHECKLIST
- WORK WITH THE MI INSPECTOR TO DEVELOP A SCHEDULE TO CONDUCT ON-SITE MI INSPECTIONS, INCLUDING FOUNDATION INSPECTIONS
- BETTER UNDERSTAND ALL INSPECTION AND TESTING REQUIREMENTS

THE GC SHALL PERFORM AND RECORD THE TEST AND INSPECTION RESULTS IN ACCORDANCE WITH THE REQUIREMENTS OF THE MI CHECKLIST AND CROWN ENG-SOW-10007

RECOMMENDATIONS

THE FOLLOWING RECOMMENDATIONS AND SUGGESTIONS ARE OFFERED TO ENHANCE THE EFFICIENCY AND EFFECTIVENESS OF DELIVERING AN MI REPORT:

- IT IS SUGGESTED THAT THE GC PROVIDE A MINIMUM OF 5 BUSINESS DAYS NOTICE, PREFERABLY 10, TO THE MI INSPECTOR AS TO WHEN THE SITE WILL BE READY FOR THE MI TO BE CONDUCTED
- THE GC AND MI INSPECTOR COORDINATE CLOSELY THROUGHOUT THE ENTIRE PROJECT
- WHEN POSSIBLE, IT IS PREFERRED TO HAVE THE GC AND MI INSPECTOR ON-SITE SIMULTANEOUSLY FOR ANY GUY WIRE TENSIONING OR RE-TENSIONING OPERATIONS
- IT MAY BE BENEFICIAL TO INSTALL ALL TOWER MODIFICATIONS PRIOR TO CONDUCTING THE FOUNDATION INSPECTIONS TO ALLOW THE FOUNDATION AND MI INSPECTION(S) TO COMMENCE WITH ONE SITE VISIT
- WHEN POSSIBLE, IT IS PREFERRED TO HAVE THE GC AND MI INSPECTOR ON-SITE DURING THE MI TO HAVE ANY DEFICIENCIES CORRECTED DURING THE INITIAL MI. THEREFORE, THE GC MAY CHOOSE TO COORDINATE THE MI CAREFULLY TO ENSURE ALL CONSTRUCTION FACILITIES ARE AT THEIR DISPOSAL WHEN THE MI INSPECTOR IS ON SITE

CANCELLATION OR DELAYS IN SCHEDULED MI

IF THE GC AND MI INSPECTOR AGREE TO A DATE ON WHICH THE MI WILL BE CONDUCTED, AND EITHER PARTY CANCELS OR DELAYS, CROWN SHALL NOT BE RESPONSIBLE FOR ANY COSTS, FEES, LOSS OF DEPOSITS AND/OR OTHER PENALTIES RELATED TO THE CANCELLATION OR DELAY INCURRED BY EITHER PARTY, NOR FOR ANY TIME (E.G. TRAVEL AND LODGING, COSTS OF KEEPING EQUIPMENT ON-SITE, ETC.). IF CROWN CONTRACTS DIRECTLY FOR A THIRD PARTY MI, EXCEPTIONS MAY BE MADE IN THE EVENT THAT THE DELAY/CANCELLATION IS CAUSED BY WEATHER OR OTHER CONDITIONS THAT MAY COMPROMISE THE SAFETY OF THE PARTIES INVOLVED.

CORRECTION OF FAILING MI'S

IF THE MODIFICATION INSTALLATION WOULD FAIL THE MI ("FAILED MI"), THE GC SHALL WORK WITH CROWN TO COORDINATE A REMEDIATION PLAN IN ONE OF TWO WAYS:

- CORRECT FAILING ISSUES TO COMPLY WITH THE SPECIFICATIONS CONTAINED IN THE ORIGINAL CONTRACT DOCUMENTS AND COORDINATE A SUPPLEMENT MI
- OR, WITH CROWN'S APPROVAL, THE GC MAY WORK WITH THE EOR TO RE-ANALYZE THE MODIFICATION/REINFORCEMENT USING THE AS-BUILT CONDITION

MI VERIFICATION INSPECTIONS

CROWN RESERVES THE RIGHT TO CONDUCT AN MI VERIFICATION INSPECTION TO VERIFY THE ACCURACY AND COMPLETENESS OF PREVIOUSLY COMPLETED MI INSPECTION(S) ON TOWER MODIFICATION PROJECTS.

ALL VERIFICATION INSPECTIONS SHALL BE HELD TO THE SAME SPECIFICATIONS AND REQUIREMENTS IN THE CONTRACT DOCUMENTS AND IN ACCORDANCE WITH CROWN ENG-SOW-10007.

VERIFICATION INSPECTION MAY BE CONDUCTED BY AN INDEPENDENT AEV/AESV FIRM AFTER A MODIFICATION PROJECT IS COMPLETED, AS MARKED BY THE DATE OF AN ACCEPTED "[illegible] MI" OR "[illegible]" REPORT FOR THE ORIGINAL PROJECT.

REQUIRED PHOTOS

BETWEEN THE GC AND THE MI INSPECTOR THE FOLLOWING PHOTOGRAPHS, AT A MINIMUM, ARE TO BE TAKEN AND INCLUDED IN THE MI REPORT:

- PRE-CONSTRUCTION GENERAL SITE CONDITION
- PHOTOGRAPHS DURING THE REINFORCEMENT MODIFICATION CONSTRUCTION/ERECTION AND INSPECTION
  - RAW MATERIALS
  - PHOTOS OF ALL CRITICAL DETAILS
  - FOUNDATION MODIFICATIONS
  - WELD PREPARATION
  - BOLT INSTALLATION
  - FINAL INSTALLED CONDITION
  - SURFACE COATING REPAIR
- POST CONSTRUCTION PHOTOGRAPHS
  - FINAL INFIELD CONDITION

PHOTOS OF ELEVATED MODIFICATIONS TAKEN ONLY FROM THE GROUND SHALL BE CONSIDERED INADEQUATE.

THIS IS NOT A COMPLETE LIST OF REQUIRED PHOTOS, PLEASE REFER TO CROWN ENG-SOW-10007

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REVISIONS

PREPARED FOR CROWN CASTLE

1.31.2015

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SCALE: N.T.S.	

MODIFICATION INSPECTION CHECKLIST

S-2 REV 00

GENERAL NOTES

1. ALL WORK PRESENTED ON THESE DRAWINGS MUST BE COMPLETED BY THE CONTRACTOR UNLESS NOTED OTHERWISE. THE CONTRACTOR MUST BE EXPERIENCED IN THE PERFORMANCE OF WORK SIMILAR TO THAT DESCRIBED HEREIN. BY ACCEPTANCE OF THIS ASSIGNMENT, THE CONTRACTOR IS ATTESTING THAT HE DOES HAVE SUFFICIENT EXPERIENCE AND ABILITY, THAT HE IS KNOWLEDGEABLE OF THE WORK TO BE PERFORMED, THAT HE IS PROPERLY LICENSED, AND THAT HE IS PROPERLY REGISTERED TO DO THIS WORK IN THE STATE AND/OR COUNTY IN WHICH IT IS TO BE PERFORMED.

2. THE GENERAL NOTES AND TYPICAL DETAILS ARE APPLICABLE TO ALL PARTS OF THE STRUCTURE AND SHALL BE READ IN CONJUNCTION WITH THE STRUCTURAL DRAWINGS AND PROJECT SPECIFICATIONS.

3. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING APPROVALS FROM ALL AUTHORITIES HAVING JURISDICTION FOR THIS PROJECT AND SHALL NOTIFY THE APPLICABLE JURISDICTIONAL (STATE, COUNTY, OR CITY) ENGINEER 24 HOURS PRIOR TO THE BEGINNING OF CONSTRUCTION.

4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ABIDING BY ALL CONDITIONS AND REQUIREMENTS OF THE PERMITS.

5. ERECT GUARDS AND BARRIERS PER APPLICABLE LABOR AND CONSTRUCTION SAFETY REGULATIONS.

6. THE CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS, POSSIBLE INTERFERENCES, AND DIMENSIONS BEFORE PROCEEDING WITH THE WORK. REPORT ANY AND ALL DISCREPANCIES TO THE ENGINEER OF RECORD (EOR) AND FIELD PERSONNEL IMMEDIATELY. ANY AND ALL FIELD CHANGES SHALL BE APPROVED AND DOCUMENTED BY THE EOR PRIOR TO FIELD IMPLEMENTATION.

7. ALL MATERIALS AND WORKMANSHIP SHALL BE WARRANTED FOR TWO (2) YEARS FROM THE DATE OF COMPLETED CONSTRUCTION.

8. USE ONLY THE LATEST ISSUES OF ANY APPLICABLE CODES, STANDARDS, OR REGULATIONS MENTIONED IN THE FOLLOWING NOTES AND SPECIFICATIONS, UNO.

9. ALL WORKMANSHIP SHALL BE IN ACCORDANCE WITH ANSI, ASTM, ACI, TIA, AND AISC STANDARDS AS REFERENCED IN THE APPLICABLE CODE.

10. STRUCTURAL ELEMENTS SHOWN ON THESE DRAWINGS ARE DESIGNED IN ACCORDANCE WITH APPLICABLE BUILDING CODES/STANDARDS. ALL CONSTRUCTION, EXCEPT WHERE NOTED OTHERWISE, SHALL COMPLY WITH THOSE CODES/STANDARDS.

11. ALL MATERIALS AND EQUIPMENT FURNISHED SHALL BE NEW AND OF GOOD QUALITY, FREE FROM FAULTS AND DEFECTS, AND IN CONFORMANCE WITH THE DRAWINGS. ANY AND ALL SUBSTITUTIONS MUST BE DULY APPROVED AND AUTHORIZED IN WRITING BY THE OWNER AND ENGINEER OF RECORD PRIOR TO FABRICATION AND INSTALLATION. THE CONTRACTOR SHALL FURNISH SATISFACTORY EVIDENCE AS TO THE KIND AND QUALITY OF THE MATERIALS AND EQUIPMENT BEING SUBSTITUTED.

12. ALL MANUFACTURER'S HARDWARE ASSEMBLY INSTRUCTIONS SHALL BE FOLLOWED EXACTLY AND SHALL SUPERSEDE ANY CONFLICTING NOTES ENCLOSED HEREIN.

13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INITIATING, MAINTAINING, AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE WORK. THE CONTRACTOR IS ALSO RESPONSIBLE FOR ENSURING THAT ALL CONSTRUCTION PROCEDURES MEET THE REQUIREMENTS OF OSHA, THE OWNER, AND ALL OTHER APPLICABLE LOCAL, STATE, AND FEDERAL SAFETY REGULATIONS.

14. ACCESS TO THE PROPOSED WORK SITE MAY BE RESTRICTED. THE CONTRACTOR SHALL COORDINATE INTENDED CONSTRUCTION ACTIVITY, INCLUDING WORK SCHEDULE AND MATERIAL ACCESS, WITH THE RESIDENT LEASING AGENT.

15. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO SAFEGUARD ALL EXISTING STRUCTURES OR BURIED SERVICES AFFECTED BY THIS CONSTRUCTION. CONTRACTOR IS ALSO RESPONSIBLE FOR TEMPORARILY RELOCATING ANY LINES OR STRUTS AS NECESSARY TO COMPLETE THE REQUIRED WORK.

16. STRUCTURAL DESIGN IS FOR THE COMPLETE CONDITION ONLY. THE CONTRACTOR MUST BE COGNIZANT THAT THE REMOVAL OF ANY STRUCTURAL COMPONENT OF AN EXISTING TOWER HAS THE POTENTIAL TO CAUSE THE PARTIAL OR COMPLETE COLLAPSE OF THE STRUCTURE. ALL NECESSARY PRECAUTIONS MUST BE TAKEN TO ENSURE STRUCTURAL INTEGRITY, INCLUDING, BUT NOT LIMITED TO, ENGINEERING ASSESSMENT OF CONSTRUCTION STRESSES WITH INSTALLATION MAXIMUM WIND SPEED AND/OR TEMPORARY BRACING AND SHORING.

17. DO NOT SCALE DRAWINGS.

18. FOR THIS ANALYSIS AND MODIFICATION, THE TOWER HAS BEEN ASSUMED TO BE IN GOOD CONDITION WITHOUT ANY DEFECTS. IF THE CONTRACTOR DISCOVERS ANY INDICATION OF AN EXISTING STRUCTURAL DEFECT, CONTACT THE ENGINEER OF RECORD IMMEDIATELY.

19. MODIFICATION WORK SHALL BE COMPLETED IN CALM WIND CONDITIONS / OR APPROPRIATE WIND SPEED FOR THE TYPE OF MODIFICATION WORK TO BE INSTALLED.

20. THE CLIMBING FACILITIES, SAFETY CLIMB AND ALL PARTS THEREOF SHALL NOT BE IMPEDED, MODIFIED OR ALTERED WITHOUT THE EXPRESS APPROVAL OF THE ENGINEER OF RECORD.

STRUCTURAL STEEL NOTES

1. DESIGN, FABRICATION, ERECTION, ALTERATION AND MAINTENANCE SHALL CONFORM TO THE FOLLOWING, UNLESS NOTED OTHERWISE (UNO).
   A. TIA-222: STRUCTURAL STANDARD FOR ANTENNA SUPPORTING STRUCTURES AND ANTENNAS
   B. TIA-1019-A: INSTALLATION, ALTERATION, AND MAINTENANCE OF ANTENNA SUPPORTING STRUCTURES AND ANTENNAS
   C. AISC: MANUAL OF STEEL CONSTRUCTION

2. ALL STRUCTURAL ELEMENTS SHALL CONFORM TO THE FOLLOWING REQUIREMENTS, UNO.
   A. STRUCTURAL STEEL, ASTM A572 GRADE 65 (FY = 65KSI).
   B. ALL BOLTS, ASTM A325 TYPE 1 GALVANIZED HIGH STRENGTH BOLTS.
   C. ALL NUTS, ASTM A563 CARBON AND ALLOY STEEL NUTS.
   D. ALL WASHERS, ASTM F436 HARDENED STEEL WASHERS.

3. HOLES SHALL NOT BE FLAME CUT THRU STEEL UNLESS APPROVED BY THE ENGINEER OF RECORD.

4. ALL FASTENERS SHALL NOT BE REUSED.

5. A NUT LOCKING DEVICE SHALL BE INSTALLED ON ALL PROPOSED AND/OR REPLACED ASTM A325 BOLTS.

6. ALL PROPOSED AND/OR REPLACED BOLTS SHALL BE OF SUFFICIENT LENGTH SUCH THAT THE END OF THE BOLT BE AT LEAST FLUSH WITH THE FACE OF THE NUT. IT IS NOT PERMITTED FOR THE BOLT END TO BE BELOW THE FACE OF THE NUT AFTER TIGHTENING IS COMPLETED.

7. HOT-DIP GALVANIZE ALL ITEMS, UNO.
   GALVANIZE PER ASTM A123, ASTM A153/A153M OR ASTM A653 G90, AS APPLICABLE.

8. FOR A LIST OF CROWN APPROVED COLD GALVANIZING COMPOUNDS, REFER TO CROWN ENG-BUL-10149, "TOWER PROTECTIVE COATINGS BULLETIN".

9. AFTER FINAL INSPECTION, ALL EXPOSED STRUCTURAL STEEL AS THE RESULT OF THIS SCOPE OF WORK INCLUDING WELDS, FIELD DRILLED HOLES, AND SHAFT INTERIORS (WHERE ACCESSIBLE), SHALL BE CLEANED AND COLD GALVANIZING APPLIED BY BRUSH IN ACCORDANCE WITH CROWN ENG-BUL-10149, "TOWER PROTECTIVE COATINGS BULLETIN". PHOTO DOCUMENTATION IS REQUIRED TO BE SUBMITTED TO THE MI INSPECTOR.

WELDING NOTES

1. ALL WELDING SHALL BE IN ACCORDANCE WITH THE AWS D1.1/D1.1M, "STRUCTURAL WELDING CODE-STEEL".

2. ALL WELDING SHALL BE PERFORMED BY AWS CERTIFIED WELDERS.

3. ALL ARC WELDING ON CROWN STRUCTURES SHALL BE DONE IN ACCORDANCE WITH THE CROWN ENG-PLN-10015, "CUTTING AND WELDING SAFETY PLAN" AND AWS D1.1 (LATEST EDITION). **THIS SHALL INCLUDE A CERTIFIED WELDING INSPECTOR (CWI) FOR ACCEPTANCE OR REJECTION OF ALL WELDING** OPERATIONS, PRE-DURING-POST, USING THE **ACCEPTANCE CRITERIA OF AWS D1.1. THE CWI SHALL WORK WITH THE GC ON THE LEVEL OF INTERACTION** NEEDED TO CONDUCT THE WELDING INSPECTION. THE CERTIFIED WELDING INSPECTION IS THE RESPONSIBILITY OF THE GC.

4. FOR ALL WELDING, USE E80XX ELECTRODES FOR SMAW PROCESS AND E8XT-XX ELECTRODES FOR FCAW PROCESS, UNO.

5. SURFACES TO BE WELDED SHALL BE FREE FROM SCALE, SLAG, RUST, MOISTURE, GREASE OR ANY OTHER FOREIGN MATERIAL THAT WOULD PREVENT PROPER WELDING. GRIND THE SURFACE ADJACENT TO THE WELD FOR A DISTANCE OF 2" MINIMUM ALL AROUND. ENSURE BOTH AREAS ARE 100% FREE OF ALL GALVANIZING.

6. DO NOT WELD IF THE TEMPERATURE OF THE STEEL IN THE VICINITY OF THE WELD AREA IS BELOW 0° F. WHEN THE TEMPERATURE IS BETWEEN 0° F AND 32° F, PREHEAT AND MAINTAIN THE STEEL IN THE VICINITY OF THE WELD AREA AT 70° F DURING THE WELDING PROCESS.

7. DO NOT WELD ON WET OR FROST-COVERED SURFACES & PROVIDE ADEQUATE PROTECTION FROM HIGH WINDS.

8. FULL PENETRATION WELDS IN THE VICINITY OF THE BASE OF THE TOWER ARE REQUIRED TO BE 100% NDE INSPECTED BY UT IN ACCORDANCE WITH AWS D1.1.

9. PARTIAL PENETRATION AND FILLET WELDS IN THE VICINITY OF THE BASE OF THE TOWER ARE REQUIRED TO BE 50% NDE INSPECTED BY MP IN ACCORDANCE WITH AWS D1.1.

DETAIL DRAWINGS SHALL GOVERN OVER ANY VARIANCE FROM THIS SHEET

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REVISIONS

PREPARED FOR CROWN CASTLE

STATE OF CONNECTICUT · JOSHUA A. CROWN · No. 29167 · LICENSED PROFESSIONAL ENGINEER

1.31.2015

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NOTES

S-3 | REV 00

AJAX/DTI BOLT SPECIFICATIONS AND TIGHTENING PROCEDURE

M20 AJAX/DTI BOLT ASSEMBLY COMPONENT SPECIFICATIONS:

BOLT:
AJAX ONESIDE™ BLIND BOLT (M8.8; EQUIVALENT TO A325)
FINISH: HOT DIP GALVANIZED PER ASTM A153.

SPLIT WASHER:
AJAX ONESIDE™ SPLIT WASHER
FINISH: HOT DIP GALVANIZED PER ASTM A153.

SHEAR SLEEVE:
Fu = 120 KSI MIN. (ASTM A519)
29MM O.D. x 20MM I.D.
LENGTH = NOMINAL [GRIP-6MM] = [GRIP-0.25"] (TOL. -0", +1/32")
SLEEVES SHALL BE ROUND, WITH ENDS CUT SQUARE AND DEBURRED.
FINISH: GALVANIZED (COLD GALVANIZED AS PER CROWN ENG-BUL-10149, HOT DIP GALVANIZED PER ASTM A123, MECHANICALLY GALVANIZED AND SPUN) OR CADMIUM PLATED.

SOLID WASHER:
AJAX ONESIDE™ SOLID WASHER
FINISH: HOT DIP GALVANIZED PER ASTM A153.

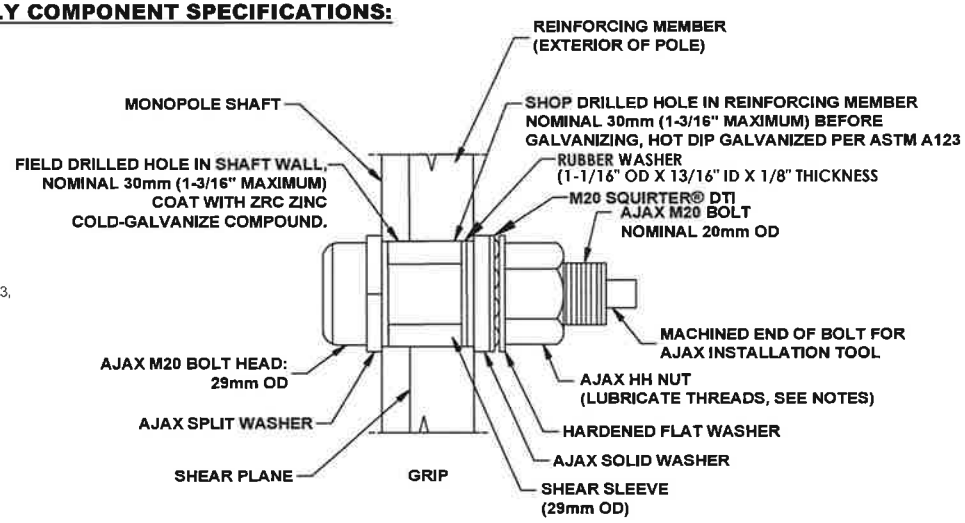
DIRECT TENSION INDICATOR WASHER:
SQUIRTER® DTI, ASTM F959M
FINISH: COLD MECHANICALLY GALVANIZED (TO ASTM B695) AND EPOXY COATED.

MANUFACTURER:
APPLIED BOLTING TECHNOLOGY PRODUCTS, INC.
1413 ROCKINGHAM ROAD, BELLOWS FALLS, VERMONT, USA 05101
PHONE: 1-800-552-1999
WEBSITE: WWW.APPLIEDBOLTING.COM

DISTRIBUTORS OF SQUIRTER® DTI'S:
http://www.appliedbolting.com/applied-bolting-distributors.html

FLAT WASHER:
HARDENED FLAT WASHER, ASTM F436M (MINIMUM HARDNESS RC38)
FINISH: COLD MECHANICALLY GALVANIZED

HEX NUT:
AJAX ONESIDE™ HEAVY HEX NUT
FINISH: HOT DIP GALVANIZED PER ASTM A153.



DETAIL 1: M20 AJAX/DTI BOLT ASSEMBLY

BOLT ASSEMBLY AND INSTALLATION:
BOLT ASSEMBLY SHALL ADHERE TO THE REQUIREMENTS OF DETAIL 1.
NON-PETROLEUM BASED, WATER SOLUBLE, INERT BOLT LUBRICANT SHALL BE USED ON ALL AJAX BOLTS TO ENSURE PROPER TENSIONING OF THE ASSEMBLY. CARE SHOULD BE TAKEN TO ENSURE THE BOLT HEAD AND SPLIT WASHER ARE NOT LUBRICATED AS THIS MAY CAUSE EXCESSIVE BOLT SLIPPAGE UPON APPLYING TORQUE, WHICH MAY LEAD TO DIFFICULTIES IN ENGAGING THE SQUIRTER® DTI WASHER PROPERLY. NOTE: ONLY LUBRICATING THE THREADS OF THE NUT MAY ACHIEVE BETTER RESULTS.
THE TYPICAL RULE OF THUMB WHEN USING AN IMPACT WRENCH IS TO ENGAGE FOR NO MORE THAN 10 SECONDS. IF THE BOLT IS NOT SPINNING AND THE SQUIRTER HAVE NOT ENGAGED AFTER 10 SECONDS USING AN IMPACT WRENCH, REMOVE THE NUT AND REAPPLY LUBRICANT. NOTE: PROLONGED USE OF THE IMPACT WRENCH TENDS TO HEAT THE BOLT THREAD/NUT, THEREBY, INCREASING FRICTION ON THE THREADS WHICH WOULD REQUIRE ADDITIONAL TORQUE. HOLDING FOR LONGER THAN 10 SECONDS CAN BE COUNTERPRODUCTIVE.

A MINIMUM OF 4 OUT OF 5 SQUIRTER® DTI "BUMPS" SHALL BE ENGAGED IN ANY AJAX/DTI BOLT ASSEMBLY IN THE END CONNECTION OF REINFORCING MEMBERS. INTERMEDIATE BOLTS SHALL ENGAGE A MINIMUM OF 3 OUT OF 5 SQUIRTER® DTI "BUMPS".

DTI WASHERS MUST BE PLACED DIRECTLY AGAINST THE OUTER AJAX WASHER WITH THE "BUMPS" FACING AWAY FROM THE AJAX WASHER. PLACE A HARDENED WASHER BETWEEN THE DTI AND THE AJAX NUT. THE DTI "BUMPS" SHALL BEAR AGAINST THE UNDERSIDE OF A HARDENED FLAT WASHER, NEVER DIRECTLY AGAINST THE NUT.

FOLLOW THE DTI MANUFACTURER'S INSTRUCTIONS FOR INSTALLATION, LUBRICATION, TIGHTENING, AND INSPECTION.

INSPECTION:
VISUALLY INSPECT ALL BOLT ASSEMBLIES TO ENSURE THE MINIMUM "BUMP" ENGAGEMENT AS DEFINED IN THE SECTION "BOLT ASSEMBLY AND INSTALLATION" HAS BEEN ACHIEVED. FOR MORE INFORMATION ON INSPECTION, SEE THE MANUFACTURER'S GUIDELINES.
WHERE FEASIBLE, CHECK A SAMPLE OF THE END CONNECTION DTI WASHERS WITH THE APPROPRIATE FEELER GAGE. IF THE FEELER GAGE CANNOT BE INSERTED TO THE BOLT SHANK HALF WAY AROUND THE BOLT, THE INSTALLATION IS OKAY. IF YOU CAN INSERT THE FEELER GAGE TO THE SHANK ALL THE WAY AROUND THE BOLT, THE INSTALLATION IS NOT OKAY. IF YOU FIND MORE THAN ONE SUCH "NOT OKAY" BOLT IN ANY ONE END CONNECTION, CHECK ALL BOLTS IN THAT END CONNECTION. A MINIMUM OF THREE BOLTS SHALL BE CHECKED IN EACH END CONNECTION. PHOTOS SHALL BE TAKEN TO INDICATE THE BOLTS TESTED.

ALL BOLT ASSEMBLIES AND DTI WASHERS SHALL BE VISUALLY INSPECTED. THE BOLT INSPECTOR SHALL PROVIDE COMPLETE PHOTO DOCUMENTATION OF ALL BOLTS AFTER TIGHTENING CLEARLY SHOWING THE CONDITION OF THE DTI WASHERS.

NO.	DATE	DESCRIPTION	BY
00	01/30/15	INITIAL RELEASE	MB

REVISIONS

PREPARED FOR CROWN CASTLE

1.31.2015

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SITE NAME: WILLINGTON-RIVER RD
BU NUMBER: 841301
WO NUMBER: 1001202
SITE ADDRESS:
426 RIVER ROAD
WILLINGTON, CT 6279
TOLLAND COUNTY

ENG/QA BY: SC DATE: 01/30/2015
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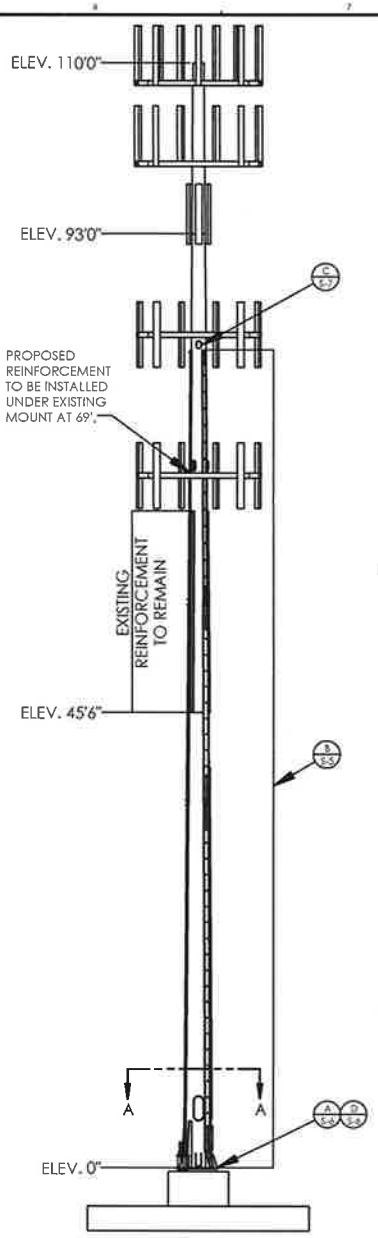
APRV'D BY: SD DATE: 01/30/2015
SCALE: N.T.S.

AJAX/DTI BOLT SPECIFICATIONS AND TIGHTENING PROCEDURE

S-4 REV 00



POLE SPECIFICATIONS

POLE SHAPE TYPE: 18 SIDED POLYGON
TAPER: 0.18071 IN/FT
SHAFT STEEL: A572-65
BASE PL STEEL: 60 KSI YIELD STRENGTH
ANCHOR RODS: 2.25 INCH A615 GR 75

SHAFT SECTION DATA

SHAFT SECTION	SECTION LENGTH	PLATE THICKNE	LAP SPLICE	DIAMETER ACROSS FLATS (IN)	
1	17.00	0.1875	2.00	13.051	15.941
2	49.50	0.2500	4.00	15.226	24.016
3	49.50	0.3125	0.00	22.806	31.751

POLE MODIFICATION SCHEDULE

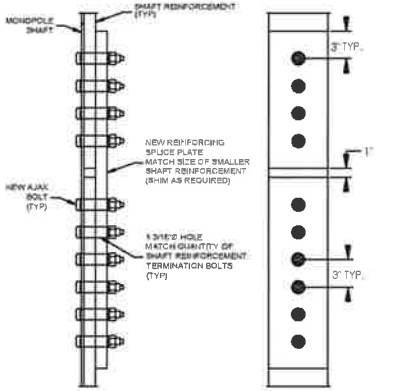
	ELEVATION (FT)	MODIFICATION	REFERENCE SHEET
A	0	Anchor Rods	S-6
B	1.5-86.5	Shaft Reinforcement	S-6
C	81	Port Holes	S-7
D	0	Remove Base Plate Stiffeners as Required to Install Anchor Rod Brackets	S-6

CCI FLAT PLATE (65 KSI) REINFORCING SCHEDULE

BOTTOM ELEVATION (FT)	TOP ELEVATION (FT)	PART NUMBER	FLAT/DEGREE ()	TERMINATION BOLTS (BOTTOM)	TERMINATION BOLTS (TOP)	MAX INTERMEDIATE BOLT SPACING	AJAX BOLT QUANTITY PER PLATE	STEEL WEIGHT PER PLATE (BLACK)	TOTAL AJAX BOLT QUANTITY	TOTAL STEEL WEIGHT (BLACK)
1.5	36.5	CCI-SFP-06512535	6,10,15,18	11	11	1'-7"	40	966.9	160	3867.6
31.5	56.5	CCI-SFP-06512525	12	11	11	1'-7"	34	690.6	34	690.6
36.5	56.5	CCI-SFP-06512520	6,18	11	11	1'-7"	31	552.5	62	1105
56.5	81.5	CCI-SFP-04510025	6,12,18	6	6	1'-8"	25	382.5	75	1147.5
									331	6810.7

NOTES FOR CROWN REINFORCING (65 KSI) MATERIAL:

1 DO NOT WELD WITHOUT APPROVAL FROM THE EOR.
2 SHIMS FOR MONOPOLE REINFORCEMENT MEMBER SHALL BE REQUIRED WHERE GAPS BETWEEN THE POLE SHAFT AND REINFORCING MEMBER EXIST AT FASTENER LOCATIONS. FOR INTERMEDIATE CONNECTIONS, THE MINIMUM SHIM LENGTH AND WIDTH SHALL BE THE WIDTH OF THE REINFORCING MEMBER. FOR TERMINATION CONNECTIONS, A CONTINUOUS SHIM PLATE (PREFERRED) OR EQUIVALENT INDIVIDUAL SHIM PLATES THE WIDTH OF THE REINFORCING MEMBER MAY BE USED. SHIM THICKNESS SHALL BE NO LESS THAN 1/16". STACKING OF SHIMS IS PERMITTED.
3 ALL FLAT PLATE REINFORCEMENT IS TO BE INSTALLED CENTERED ON ITS DESIGNATED FLAT, UNO.
4 SEE CMRP 65 KSI PARTS CATALOG 2nd EDITION FOR PART DETAILS.
5 AS AN ALTERNATIVE TO USING DTI WASHERS, AJAX BOLTS MAY BE PRETENSIONED PER THE AISC TURN-OF-NUT METHOD.
6 ON MULTISIDED POLES, EXISTING SAFETY CLIMB IS CONSIDERED FLAT 1. THEN FLATS ARE NUMBERED COUNTER CLOCKWISE.
7 CLIMBING PEGS TO BE RELOCATED AS REQUIRED.



REINFORCING SPLICE PLATE DETAIL

NO.	DATE	DESCRIPTION	BY
00	2/24/14	INITIAL RELEASE	AS

REVISIONS

PREPARED FOR CROWN CASTLE

STATE OF CONNECTICUT — BARBARA A. DIGNAM — No. 28187 — LICENSED PROFESSIONAL ENGINEER

1.31.2015

AeroSolutions LLC
Optimizing Your Tower Infrastructure

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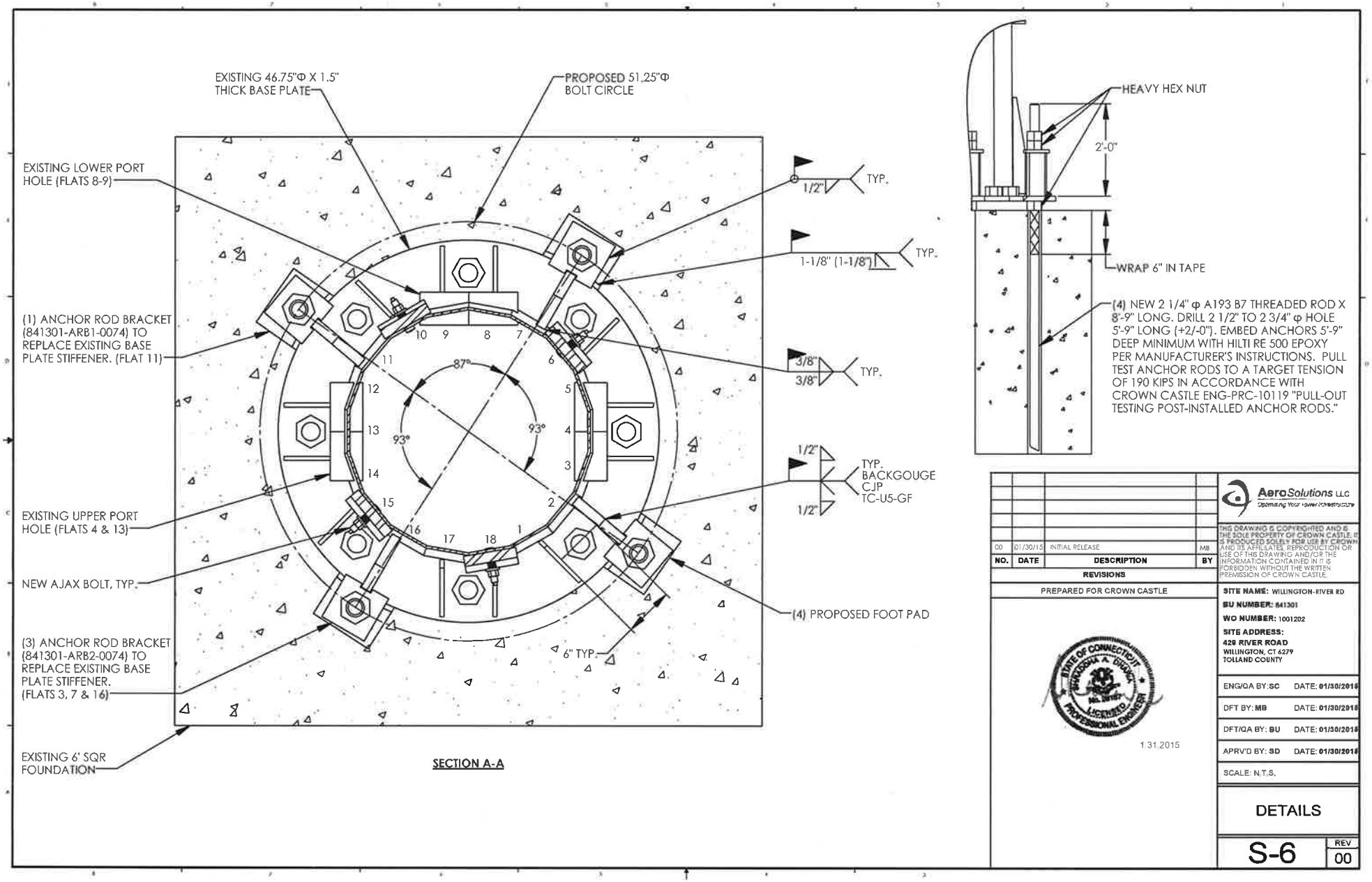
SITE NAME:
BU NUMBER:
WO NUMBER:
SITE ADDRESS:

ENG/QA BY: DATE:
DFT BY: AS DATE:
DFT/QA BY: DATE:
APRV'D BY: SC DATE:
SCALE: N.T.S.

ELEVATION

S-5 REV 00



SECTION A-A

NO.	DATE	DESCRIPTION	BY
00	01/30/15	INITIAL RELEASE	MB

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1.31.2015

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Optimizing Your Tower Potential

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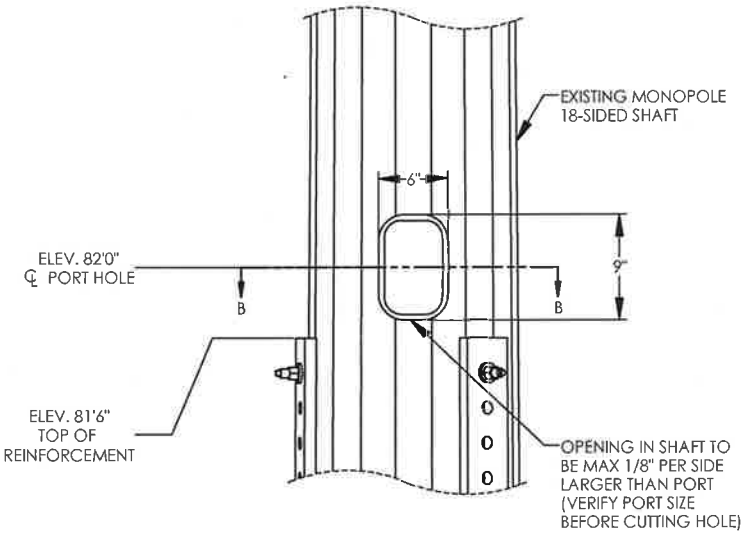
APRV'D BY: SD	DATE: 01/30/2015
SCALE: N.T.S.	

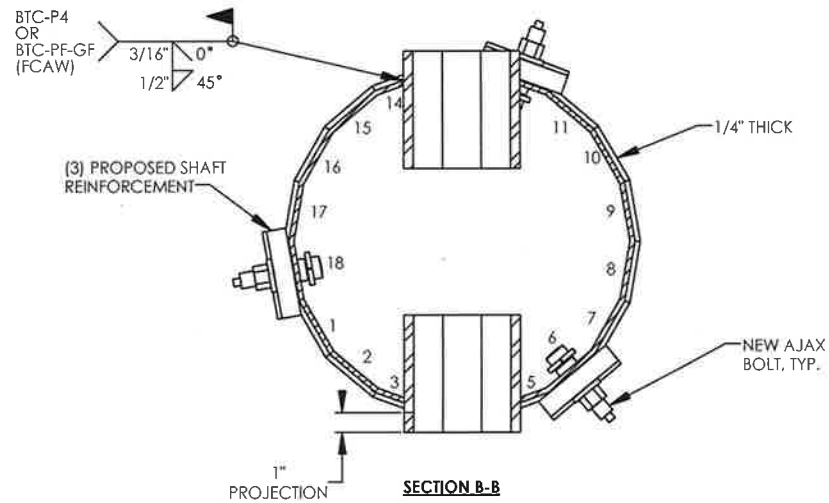
DETAILS

S-6 REV 00

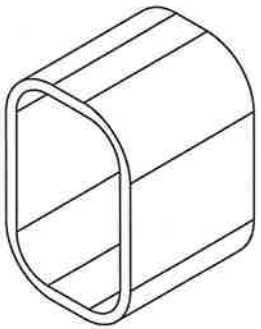
NOTE:
1. ACTUAL PORT ORIENTATION MUST BE AT A MINIMUM 90 DEGREES RADIALLY AND 5 FT VERTICALLY, CENTER TO CENTER, FROM ANY OTHER PORTS AND SLIP JOINTS.



PORTS



SECTION B-B



VALMONT PART#HHR69-G
(2) REQUIRED

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00	01/30/15	INITIAL RELEASE	MB

REVISIONS

PREPARED FOR CROWN CASTLE

STATE OF CONNECTICUT
JOSHUA A. CHASE
No. 28182
LICENSED
PROFESSIONAL ENGINEER

1.31.2015

AeroSolutions LLC

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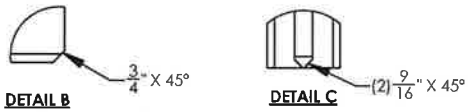
SCALE: N.T.S.	

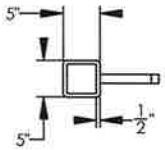
PORT HOLE DETAILS

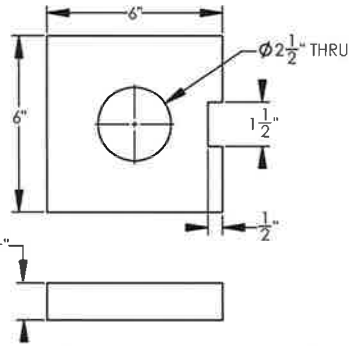
S-7 | REV 00



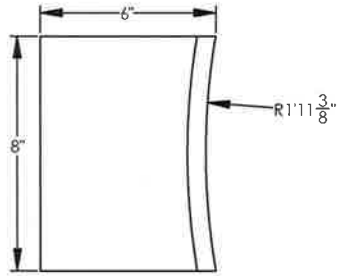
DETAIL B

DETAIL C

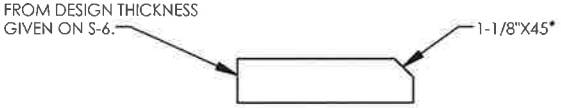




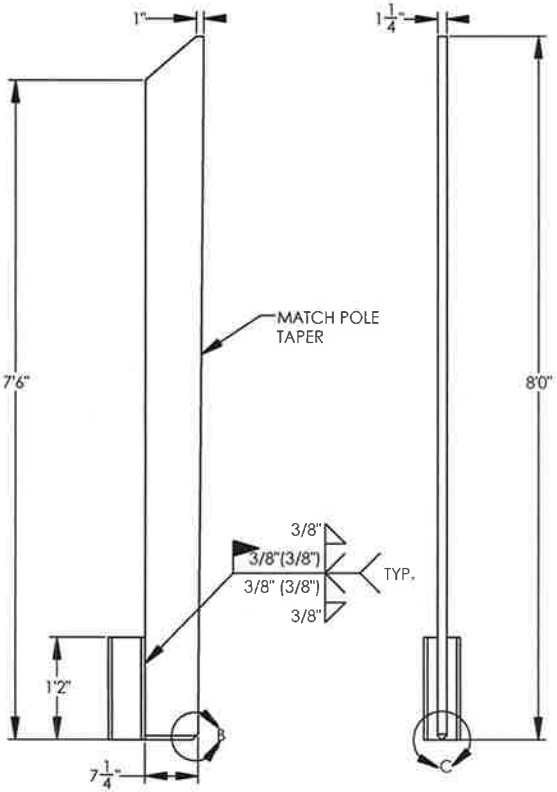
ANCHOR ROD WASHER (841301-ARW1-0074)
(4) REQUIRED (FY=65 KSI)



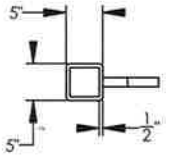
MATCH BASE PLATE THICKNESS. ACTUAL THICKNESS MAY VARY FROM DESIGN THICKNESS GIVEN ON S-6.

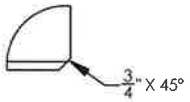


FOOT PAD (841301-FP1-0074)
(4) REQUIRED (FY=60 KSI)

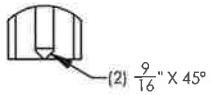


ANCHOR ROD BRACKET (841301-ARB1-0074)
(1) REQUIRED (STIFFENER FY=65 KSI, TUBE FY=46 KSI)

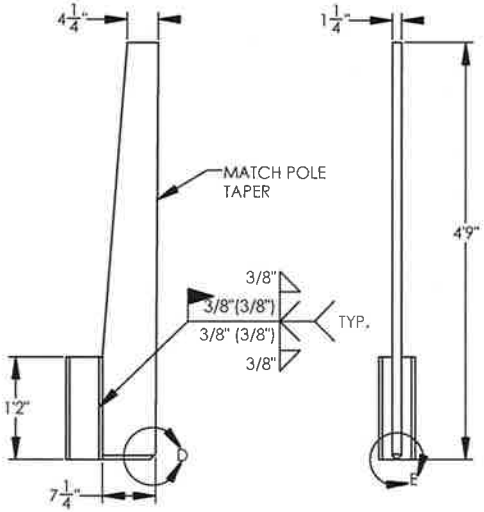




DETAIL D



DETAIL E



ANCHOR ROD BRACKET (841301-ARB2-0074)
(3) REQUIRED (STIFFENER FY=65 KSI, TUBE FY=46 KSI)

NO.	DATE	DESCRIPTION	BY
		REVISIONS	
00	01/30/15	INITIAL RELEASE	MB

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SCALE: N.T.S.	

FAB DETAILS

S-8 REV 00

ATTACHMENT 5

Site Name: Willinton W CT
Cumulative Power Density

Operator	Operating Frequency	Number of Trans.	ERP Per Trans.	Total ERP	Distance to Target	Calculated Power Density	Maximum Permissable Exposure*	Fraction of MPE
	(MHz)		(watts)	(watts)	(feet)	(mW/cm^2)	(mW/cm^2)	(%)
VZW PCS	1970	11	478	5258.388	83	0.2745	1.0	27.45%
VZW Cellular	869	9	426	3834.984	83	0.2002	0.579333333	34.56%
VZW AWS	2145	1	1750	1750	83	0.0914	1.0	9.14%
VZW 700	746	1	1050	1050	83	0.0548	0.497333333	11.02%

Total Percentage of Maximum Permissible Exposure 82.16%

*Guidelines adopted by the FCC on August 1, 1996, 47 CFR Part 1 based on NCRP Report 86, 1986 and generally on ANSI/IEEE C95.1-1992

MHz = Megahertz
mW/cm^2 = milliwatts per square centimeter
ERP = Effective Radiated Power

Absolute worst case maximum values used.

ATTACHMENT 6

Robinson+Cole

KENNETH C. BALDWIN

280 Trumbull Street
Hartford, CT 06103-3597
Main (860) 275-8200
Fax (860) 275-8299
kbaldwin@rc.com
Direct (860) 275-8345

Also admitted in Massachusetts

March 27, 2015

Via Certified Mail, Return Receipt Requested

Christina B. Mailhos
First Selectman
Town of Willington
40 Old Farms Road
Willington, CT 06279

Re: **Proposed Installation of a Telecommunications Facility at 426 River Road, Willington, Connecticut**

Dear Ms. Mailhos:

This firm represents Cellco Partnership d/b/a Verizon Wireless ("Cellco"). Today, Cellco filed a Sub-Petition for Declaratory Ruling ("Sub-Petition") with the Connecticut Siting Council ("Council") seeking approval to install a new telecommunications facility at 426 River Road in Willington (the "Property"). The facility will consist of four (4) panel-type antennas and four (4) remote radio heads attached at the 83-foot level to the existing Willington Fire Department ("WFD") tower. Equipment associated with Cellco's antennas will be located inside a 12' x 26' equipment shelter installed at the base of the tower. Cellco will be the fourth commercial wireless carrier to install antennas on the WFD tower, joining AT&T, T-Mobile and Metro PCS. The WFD also maintains antennas on the tower.

As presented in the Sub-Petition, the proposed "small cell" facility improvements at the Property constitute an eligible facility request pursuant to Section 6409(a) of the Federal Middle Class Tax Relief and Job Creation act of 2012 (47 U.S.C. § 1455(a)) and the October 21, 2014 Order of the Federal Communications Commission (FCC-14-533). A copy of the full Sub-Petition is attached for your review. Landowners whose property abuts the Property were also sent a copy of this Sub-Petition.

Robinson+Cole

Pursuant to its decision in Petition No. 1133, comments or concerns regarding this proposal should be submitted to the Council within thirty (30) days of the date of the attached Sub-Petition.

Please contact me if you have any questions regarding this proposal.

Sincerely,

Kenneth C. Baldwin

Attachment
Copy to:
Tim Parks

Robinson+Cole

KENNETH C. BALDWIN

280 Trumbull Street
Hartford, CT 06103-3597
Main (860) 275-8200
Fax (860) 275-8299
kbaldwin@rc.com
Direct (860) 275-8345

Also admitted in Massachusetts

March 27, 2015

Via Certified Mail, Return Receipt Requested

Willington Fire Department, Inc.
P.O. Box 161
Willington, CT 06279

Re: **Proposed Installation of a Telecommunications Facility on Property at 426 River Road, Willington, Connecticut**

Dear Sir or Madam:

This firm represents Cellco Partnership d/b/a Verizon Wireless ("Cellco"). Today, Cellco filed a Sub-Petition for Declaratory Ruling ("Sub-Petition") with the Connecticut Siting Council ("Council") seeking approval to install a new telecommunications facility at 426 River Road in Willington (the "Property"). The facility will consist of four (4) panel-type antennas and four (4) remote radio heads attached at the 83-foot level to the existing Willington Fire Department ("WFD") tower. Equipment associated with Cellco's antennas will be located inside a 12' x 26' equipment shelter installed at the base of the tower. Cellco will be the fourth commercial wireless carrier to install antennas on the WFD tower, joining AT&T, T-Mobile and Metro PCS. The WFD also maintains antennas on the tower.

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Pursuant to its decision in Petition No. 1133, comments or concerns regarding this proposal should be submitted to the Council within thirty (30) days of the date of the attached Sub-Petition.

Please contact me if you have any questions regarding this proposal.

Sincerely,

Kenneth C. Baldwin

Attachment
Copy to:
Tim Parks

ATTACHMENT 7

KENNETH C. BALDWIN

280 Trumbull Street
Hartford, CT 06103-3597
Main (860) 275-8200
Fax (860) 275-8299
kbaldwin@rc.com
Direct (860) 275-8345

Also admitted in Massachusetts

March 27, 2015

Via Certified Mail, Return Receipt Requested

«Name_and_Address»

Re: **Sub-Petition for Declaratory Ruling Filed with the Connecticut Siting Council for the Installation of a Telecommunications Facility at 426 River Road, Willington, Connecticut**

Dear «Salutation»:

This firm represents Cellco Partnership d/b/a Verizon Wireless ("Cellco"). Today, Cellco filed a Sub-Petition for Declaratory Ruling ("Sub-Petition") with the Connecticut Siting Council ("Council") seeking approval to install a new telecommunications facility at 426 River Road in Willington (the "Property"). The facility will consist of four (4) panel-type antennas and four (4) remote radio heads attached at the 83-foot level to the existing Willington Fire Department ("WFD") tower. Equipment associated with Cellco's antennas will be located inside a 12' x 26' equipment shelter at the base of the tower. Cellco will be the fourth commercial wireless carrier to install antennas on the WFD tower, joining AT&T, T-Mobile and Metro PCS. The WFD also maintains antennas on the tower.

The facility improvements constitute a eligible facility request pursuant to Section 6409(a) of the Federal Middle Class Tax Relief and Job Creation Act of 2012 (47 U.S.C. § 1455(a)) and the October 21, 2014 Order of the Federal Communications Commission (FCC-14-533). A copy of the full Sub-Petition is attached for your review.

Pursuant to its decision in Petition No. 1133, comments or concerns regarding this proposal should be submitted to the Council within thirty (30) days of the date of the Sub-Petition.

This notice is being sent to you because you are listed as an owner of land that abuts the Property. If you have any questions regarding the Sub-Petition, the Council's process for reviewing the Sub-Petition or the details of the filing itself, please feel free to contact me at the number listed above. You may also contact the Council directly at 860-827-2935.

Sincerely,

Kenneth C. Baldwin

Attachment
Copy to:
Tim Parks

CELLCO PARTNERSHIP D/B/A VERIZON WIRELESS

ABUTTERS LIST
MAP 34/LOT 010-00

426 RIVER ROAD
WILLINGTON, CONNECTICUT

	Map/Lot	Property Address	Owner and Mailing Address
1.	34/009-0C	River Road	Barnini Circle Associates LLC Pearleon LLC Hayden L. Griswold, Jr. 3000 South Ocean Boulevard, #706 Boca Raton, FL 33432
2.	34/010-0A	430 River Road	Paul A. Carboneau 430 River Road Willington, CT 06279
3.	34/007-00	425 River Road	Henry Bovovicka, Et Al. 407 River Road Willington, CT 06279
4.	34/008-00	419 River Road	Elizabeth Bovovicka 419 River Road Willington, CT 06279
5.	29/004-00	River Road	Trask Road Development LLC P.O. Box 290589 Wethersfield, CT 06129-0589
6.	29/005-0B	97 Trask Road	Peter J. and Donna H. Latincics 97 Trask Road Willington, CT 06279
7.	29/005-0A	Trask Road	Harold and Irene Hipsky 13 Jared Sparks Road Willington, CT 06279
8.	33/003-00	Trask Road	Jody M., Donald C., Ralph and Maureen M. Parizek 54 Trask Road Willington, CT 06279