

March 8, 2017

Melanie A. Bachman, Esq.
Executive Director/Staff Attorney
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Notice of Exempt Modification – Facility Modification
75 Roberts Road, Groton, Connecticut**

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless (“Cellco”) currently maintains fifteen (15) wireless telecommunications antennas at the 137-foot level of the existing 144.5-foot tower at 75 Roberts Road in Groton, Connecticut (the “Property”). The tower is owned by Crown Castle (“Crown”). The Council approved Cellco’s use of this tower in 2007. Cellco now intends to replace nine (9) of its existing antennas with three (3) model QUAD656C, 700 MHz antennas; three (3) model HBXX-6517DS-VTM, 1900 MHz antennas; and three (3) model HBXX-6517DS-VTM, 2100 MHz antennas, all at the same level on the tower. Cellco also intends to replace three (3) remote radio heads (“RRHs”) and install six (6) new RRHs and one (1) HYBRIFLEX™ fiber optic antenna cable. Included in Attachment 1 are specifications for Cellco’s replacement antennas, RRHs and HYBRIFLEX™ cable.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Mark R. Oefinger, Town Manager of the Town of Groton; Jonathan J. Reiner, Groton’s Director of Planning; Philip A. Strickland and Daniel J. Perrotta, the owners of the Property; and to Crown, the tower owner.

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

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1. The proposed modifications will not result in an increase in the height of the existing structure. Cellco's replacement antennas and new RRHs will be installed on its existing platform at the 137-foot level on the tower.
2. The proposed modifications will not involve any change to ground-mounted equipment and, therefore, will not require the extension of the site boundary.
3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.
4. The operation of the replacement antennas will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. A cumulative General Power Density table for Cellco's modified facility is included in Attachment 2.
5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.
6. The tower and its foundation, with certain modifications, can support Cellco's proposed modifications. (See Structural Modification Report included in Attachment 3).

A copy of the Groton's parcel map and property owner information is included in Attachment 4.

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

Sincerely,



Kenneth C. Baldwin

Enclosures

Copy to:

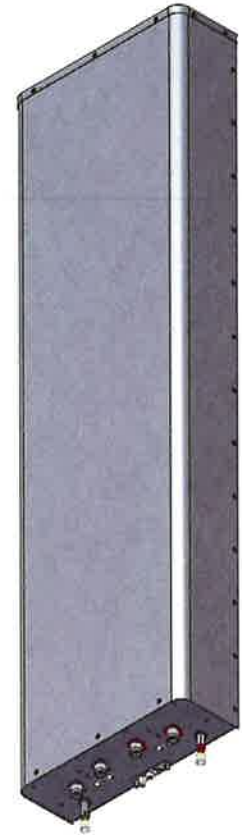
Mark R. Oefinger, Groton Town Manager
Jonathan J. Reiner, Groton Director of Planning
Philip A. Strickland and Daniel J. Perrotta
Crown Castle
Tim Parks

ATTACHMENT 1

QUAD656C0000x

Twin Band | Quad Port | Panel Antenna | (2x) X-Pol | 65° / 65° | 15.0 / 15.0 dBi | Variable Tilt

- Twin band, quad-port panel antenna with variable electrical tilt
- 4x4 MIMO
- Patented internal RET actuator adds no additional length to the antenna



Ordering Options	Model Number
When ordering, replace "x" in the model number with one of the options listed below.	
Manual Electrical Tilt	QUAD656C0000M
Remote Electrical Tilt AISG v2.0 / 3GPP with an MDCU RET Actuator	QUAD656C0000G
Remote Electrical Tilt AISG v2.0 / 3GPP with an MDDU RET Actuator	QUAD656C0000L

Mounting bracket kits and other accessories are ordered separately.

Electrical Characteristics	(2x) 696-900 MHz	
Frequency Bands	696-806 MHz	806-900 MHz
Polarization	(2x) ±45° (Quad-Pol)	
Horizontal Beamwidth	67°	66°
Vertical Beamwidth	13.6°	12.4°
Gain	14.5 dBi	15.0 dBi
Electrical Downtilt	0-12°	
Impedance	50Ω	
VSWR	≤ 1.5:1	
Upper Sidelobe Suppression	18 dB	18 dB
Front-to-Back Ratio	> 25 dB	> 25 dB
Inband Isolation	25 dB	
Isolation Between Bands	28 dB	
IM3 (2x20W carrier)	< -153 dBc	
Input Power	(4x) 500 W	
Total Number of Connectors	Antennas has 4 connectors located at the bottom	
Connectors Per Band	696-900 MHz	(2x) 7/16-DIN Female
	696-900 MHz	(2x) 7/16-DIN Female
Diplexed	No	
Lightning Protection	Direct Ground	
Operating Temperature	-40° to +60° C (-40° to +140° F)	

Mechanical Characteristics		
Dimensions (Length x Width x Depth)	1889 x 520 x 182 mm	74.4 x 20.5 x 7.2 in
Depth with Z-Brackets	227 mm	8.9 in
Weight without Mounting Brackets: MET	24.5 kg	54.0 lbs
Weight without Mounting Brackets: RET	24.8 kg	54.7 lbs
Survival Wind Speed	> 241 km/hr	> 150 mph
Wind Area	Front	0.98 m ² / 10.6 ft ²
	Side	0.34 m ² / 3.7 ft ²
Wind Loads (160 km/hr or 100 mph)	Front	1200 N / 270 lbf
	Side	415 N / 93 lbf

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

QUAD656C0000x

Twin Band | Quad Port | Panel Antenna | (2x) X-Pol | 65° / 65° | 15.0 / 15.0 dBi | Variable Tilt

Electrical Downtilt Control

Electrical downtilt for each band can be controlled separately. Tilt indicator(s) are covered by removable transparent cap(s).


Manual Electrical Tilt (MET) Control
A colored knob at the end of the tilt indicator allows change of the tilt without need of a tool. The knob color is identical to the corresponding connector ring color. To access the knob, remove the cap by turning it counter-clockwise. It is re-installed by opposite rotation. Do not remove the transparent cap(s) from the antenna.

Remote Electrical Tilt (RET) Control
The remote control of the electrical tilt is managed by either a Multi-Device Control Unit (MDCU) or a Multi-Device Dual Unit (MDDU) inserted in the bottom of the antenna. A single actuator individually controls the tilt of each band (no need for daisy chain cables between the bands). This module does not add any additional length to the antenna. For RET control, the transparent caps must be in place and locked. The tilt angle indicators always remain visible and the antenna still has manual tilt control (manual override).

RET Actuator
Select one of the following RET actuators when ordering this antenna.

Multi-Device Control Unit (MDCU)	The MDCU is an electronic module that allows the remote control of the electrical downtilt (RET) in Amphenol antennas with factory embedded motors. The MDCU is factory installed. Refer to ordering options.
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Multi-Device Dual Unit (MDDU)	The MDDU allows two separate RET Controllers to independently drive the RETs in Amphenol antennas with factory installed motors (for antenna sharing). The MDDU is factory installed. Refer to ordering options.
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Important Installation Instructions  In order to operate RET control, the transparent caps covering the tilt adjustment indicators must be engaged and locked. Do not cut them from the antenna.

Do not install the antenna with the connectors facing upward.

Mounting Options	Part Number	Image	Fits Pipe Diameter	Weight
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All mounting bracket kits are ordered separately unless otherwise indicated. Select from the options listed below.

3-Point Mounting and Downtilt Bracket Kit	36210008		40-115 mm 1.6-4.5 in	6.9 kg 15.2 lbs
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Configuration Options

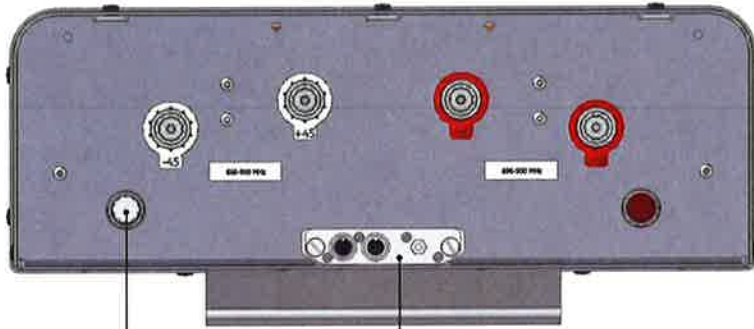
This antenna model cannot be used with Amphenol's UNICELL 3-sector antenna enclosures.

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QUAD656C0000x

Twin Band | Quad Port | Panel Antenna | (2x) X-Pol | 65° / 65° | 15.0 / 15.0 dBi | Variable Tilt

Bottom View of Antenna



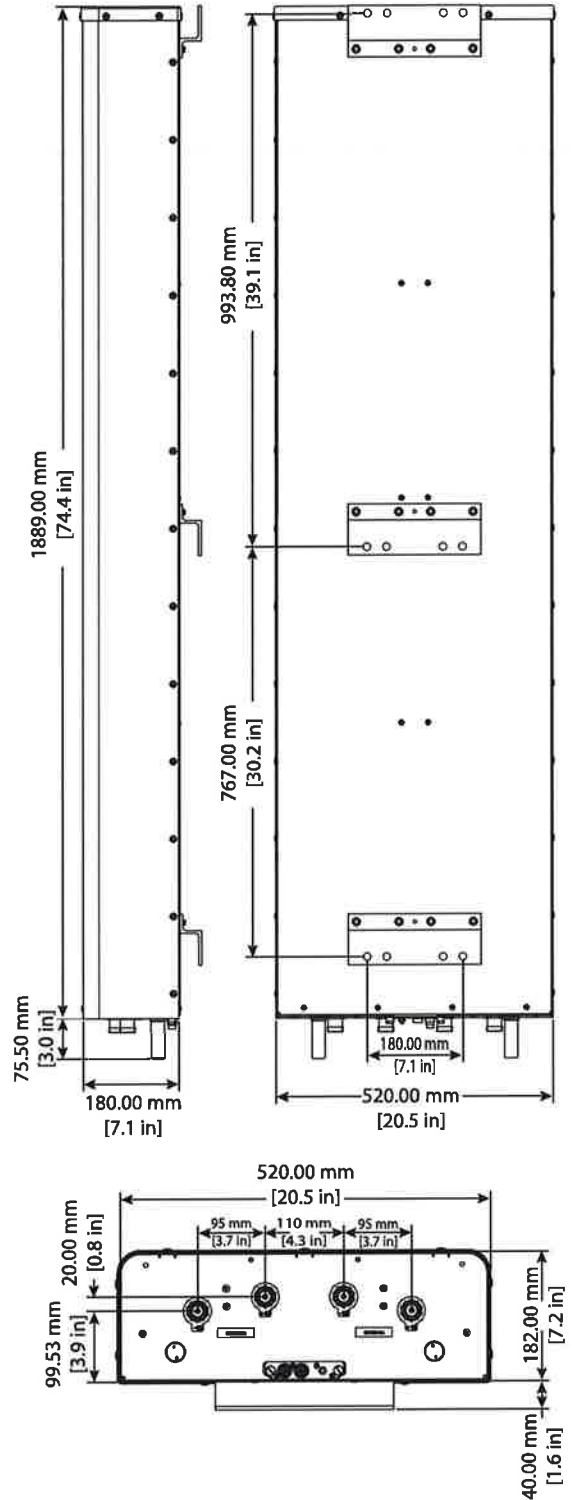
Location of the MDCU or MDDU for RET Control (MDCU shown)

Tilt indicators covered by transparent caps.
Manual adjustment is accessed by removing the caps.
Knob colors are the same as the connectors.



In order to operate RET control, the transparent caps covering the tilt adjustment indicators must be engaged and locked. Do not cut them from the antenna.

Dimensions

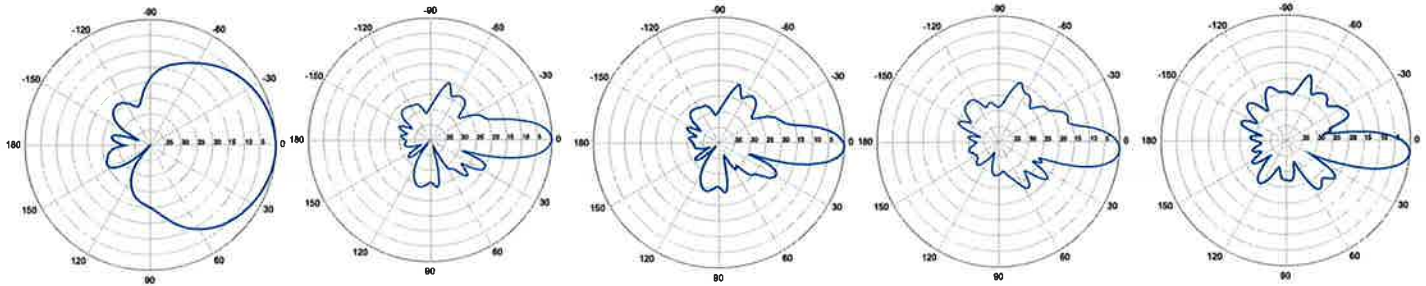


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QUAD656C0000x

Twin Band | Quad Port | Panel Antenna | (2x) X-Pol | 65° / 65° | 15.0 / 15.0 dBi | Variable Tilt

696-900 MHz



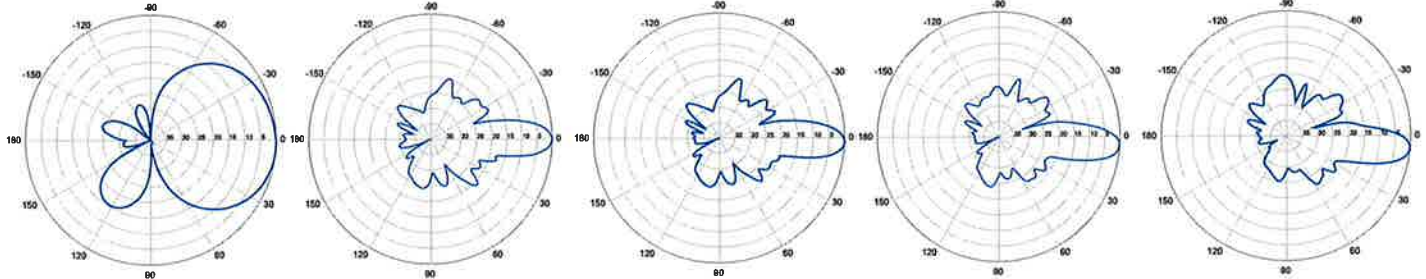
Horizontal | 750 MHz

0° | Vertical | 750 MHz

2° | Vertical | 750 MHz

4° | Vertical | 750 MHz

6° | Vertical | 750 MHz



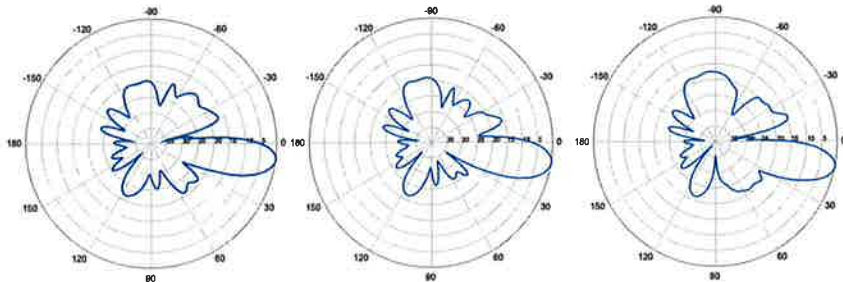
Horizontal | 850 MHz

0° | Vertical | 850 MHz

2° | Vertical | 850 MHz

4° | Vertical | 850 MHz

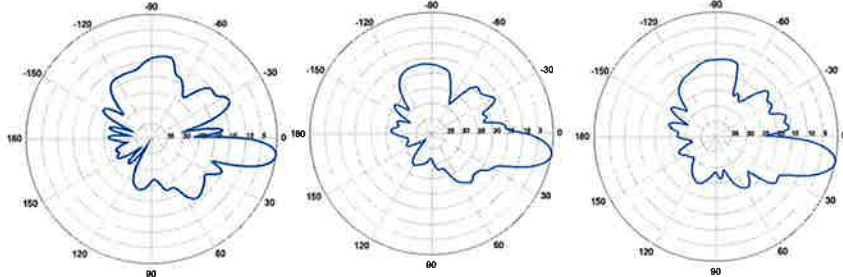
6° | Vertical | 850 MHz



8° | Vertical | 750 MHz

10° | Vertical | 750 MHz

12° | Vertical | 750 MHz



8° | Vertical | 850 MHz

10° | Vertical | 850 MHz

12° | Vertical | 850 MHz

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HBXX-6517DS-VTM

Andrew® Quad Port Antenna, 1710–2180 MHz, 65° horizontal beamwidth, RET compatible

- Superior azimuth tracking and pattern symmetry with excellent passive intermodulation suppression

Electrical Specifications

Frequency Band, MHz	1710–1880	1850–1990	1920–2180
Gain, dBi	19.0	19.1	19.2
Beamwidth, Horizontal, degrees	67	66	65
Beamwidth, Vertical, degrees	5.0	4.7	4.4
Beam Tilt, degrees	0–6	0–6	0–6
USLS, dB	18	18	18
Front-to-Back Ratio at 180°, dB	30	30	30
CPR at Boresight, dB	21	22	21
CPR at Sector, dB	10	11	9
Isolation, dB	30	30	30
VSWR Return Loss, dB	1.4 15.6	1.4 15.6	1.4 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350
Polarization	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	1710–1880	1850–1990	1920–2180
Gain by all Beam Tilts, average, dBi	18.5	18.6	18.8
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.3	±0.4
	0 ° 18.4	0 ° 18.4	0 ° 18.7
Gain by Beam Tilt, average, dBi	3 ° 18.7	3 ° 18.7	3 ° 18.9
	6 ° 18.4	6 ° 18.5	6 ° 18.6
Beamwidth, Horizontal Tolerance, degrees	±2.4	±1.7	±2.9
Beamwidth, Vertical Tolerance, degrees	±0.3	±0.3	±0.3
USLS, dB	18	19	19
Front-to-Back Total Power at 180° ± 30°, dB	25	26	26
CPR at Boresight, dB	22	23	22
CPR at Sector, dB	10	10	9

* 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.](#)

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol® quad
Band	Single band
Brand	DualPol® Teletilt®
Operating Frequency Band	1710 – 2180 MHz

HBXX-6517DS-VTM

POWERED BY



Performance Note

Outdoor usage

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Low loss circuit board
Radome Material	PVC, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	4
Wind Loading, maximum	668.0 N @ 150 km/h 150.2 lbf @ 150 km/h
Wind Speed, maximum	241 km/h 150 mph

Dimensions

Depth	166.0 mm 6.5 in
Length	1903.0 mm 74.9 in
Width	305.0 mm 12.0 in
Net Weight	19.5 kg 43.0 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 2.0 Actuator	HBXX-6517DS-A2M
RET System	Teletilt®

Packed Dimensions

Depth	292.0 mm 11.5 in
Length	2219.0 mm 87.4 in
Width	409.0 mm 16.1 in
Shipping Weight	29.3 kg 64.6 lb

Regulatory Compliance/Certifications

Agency

RoHS 2011/65/EU
China RoHS SJ/T 11364-2006
ISO 9001:2008

Classification

Compliant by Exemption
Above Maximum Concentration Value (MCV)
Designed, manufactured and/or distributed under this quality management system



Included Products

600899A-2 — Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

Product Specifications

COMMSCOPE®

HBXX-6517DS-VTM

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* Footnotes

Performance Note

Severe environmental conditions may degrade optimum performance

ALCATEL-LUCENT B13 RRH4X30-4R

Alcatel-Lucent B13 Remote Radio Head 4x30-4R is the newest addition of Remote Radio Head to the extended product line of Alcatel-Lucent's distributed Base Station solutions, aimed at facilitating smooth RF site acquisition and related civil engineering.

Supporting 2Tx/4Tx MIMO and 4-way Rx diversity, Alcatel-Lucent B13 RRH4x30-4R allows operators to have a compact radio solution to deploy LTE in the 700U band (700 MHz, 3GPP band 13), providing them with the means to achieve high capacity, high quality and high coverage with minimum site requirements.



The Alcatel-Lucent B13 RRH4x30-4R product has four transmit RF paths, offering the possibility to **select, via software only, 2Tx or 4Tx MIMO configurations** with either 2x60 W or 4x30 W RF output power. It supports also 4-way Rx diversity and up to 10MHz instantaneous bandwidth.

The Alcatel-Lucent B13 RRH4x30-4R is a near zero-footprint solution and operates noise free, simplifying negotiations with site property owners and minimizing environmental impacts.

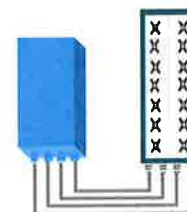
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the RF feeder needs and installation costs.

FEATURES

- Supporting LTE in 700 MHz band (700U, 3GPP band 13)
- LTE 2Tx or 4Tx MIMO (SW switchable)
- Output power: Up to 2x60W or 4x30W
- 10MHz LTE carrier with 4Rx Diversity
- Convection-cooled (fan-less)
- Supports AISG 2.0 ALD devices (RET, TMA) through RS485 or RF ports

BENEFITS

- Compact to reduce additional footprint when adding LTE in 700U band
- MIMO scheme operation selection (2Tx or 4Tx) by software only
- Improves downlink spectral efficiency through MIMO4
- Increases LTE coverage thanks to 4Rx diversity capability and best in class Rx sensitivity
- Flexible mounting options: Pole or Wall



4x30W with 4T4R
or
2x60W with 2T4R

Can be switched between
modes via SW w/o site
visit

TECHNICAL SPECIFICATIONS

Features & performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R by SW)
Frequency band	U700 (C) (3GPP bands 13): DL: 746 - 756 MHz / UL: 777 - 787 MHz
Instantaneous bandwidth - #carriers	10MHz – 1 LTE carrier (in 10MHz occupied bandwidth)
LTE carrier bandwidth	10 MHz
RF output power	2x60W or 4x30W (by SW)
Noise figure – RX Diversity scheme	2 dB typ. (<2.5 dB max) – 2 or 4 way Rx diversity
Sizes (HxWxD) in mm (in.)	550 x 305 x 230 (21.6" x 12.0" x 9") (with solar shield)
Volume in L	38 (with solar shield)
Weight in kg (lb) (w/o mounting HW)	26 (57.2) (with solar shield)
DC voltage range	-40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption
DC power consumption	550W typical @100% RF load (in 2Tx or 4TX mode)
Environmental conditions	-40°C (-40°F) / +55°C (+131°F) IP65
Wind load (@150km/h or 93mph)	Frontal:<200N / Lateral :<150N
Antenna ports	4 ports 7/16 DIN female (50 ohms) VSWR < 1.5
CPRI ports	2 CPRI ports (HW ready for Rate7, 9.8 Gbps) SFP single mode dual fiber
AISG interfaces	1 AISG2.0 output (RS485) Integrated Smart Bias Tees (x2)
Misc. Interfaces	4 external alarms (1 connector) – 4 RF Tx & 4 RF Rx monitor ports - 1 DC connector (2 pins)
Installation conditions	Pole and wall mounting
Regulatory compliance	3GPP 36.141 / 3GPP 36.113 / GR-1089-CORE / GR-3108-CORE / UL 60950-1 / FCC Part 27

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ALCATEL-LUCENT B25 RRH4X30

Alcatel-Lucent Band 25 Remote Radio Head 4x30W is the new addition of Remote Radio Head to the extended product line of Alcatel-Lucent's distributed Base Station solutions, aimed at facilitating smooth RF site acquisition and related civil engineering.

Supporting 2Tx/4Tx MIMO and 4-way Rx diversity, Alcatel-Lucent B25 RRH4x30 allows operators to have a compact radio solution to deploy LTE in the PCS band (1.9 GHz, 3GPP band 25), providing them with the means to achieve high capacity, high quality and high coverage with minimum site requirements.

The Alcatel-Lucent B25 RRH4x30 product has four transmit RF paths, offering the possibility to **select, via software only, 2Tx or 4Tx MIMO configurations** with either 2x60 W or 4x30 W RF output power. It supports also 4-way Rx diversity, LTE carriers from 3 MHz up to 20 MHz and up to 65 MHz instantaneous bandwidth.

The Alcatel-Lucent B25 RRH4x30 is a near zero-footprint solution and operates noise free, simplifying negotiations with site property owners and minimizing environmental impacts.

Its compactness and slim design makes the Alcatel-Lucent B25 RRH4x30 easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the RF feeder needs and installation costs.

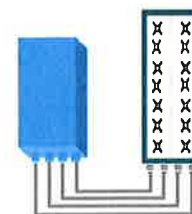


FEATURES

- Supporting LTE in 1.9 GHz band (PCS, 3GPP band 2 & 25)
- LTE 2Tx or 4Tx MIMO (SW switchable)
- Output power: Up to 2x60W or 4x30W
- Ready for 3, 5, 10, 15 or 20MHz LTE carrier operation with 4Rx Diversity
- Ready to support up to 4 carriers anywhere in 65MHz instantaneous bandwidth
- Convection-cooled (fan-less)
- Supports AISG 2.0 devices (RET, TMA) through RS485 or RF ports

BENEFITS

- Compact to reduce additional footprint when adding LTE in PCS band
- MIMO scheme operation selection (2Tx or 4Tx) by software only
- Full flexibility for multiple carriers operation over entire PCS spectrum
- Improves downlink spectral efficiency and cell edge throughput through MIMO4
- Increases LTE coverage thanks to 4-way Rx diversity capability and best in class Rx sensitivity
- Flexible mounting options (Pole or Wall)



4x30W with 4T4R
or
2x60W with 2T4R

Can be switched between modes via SW w/o site visit

TECHNICAL SPECIFICATIONS

Features & performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R by SW)
Frequency band	3GPP bands 2 & 25 (PCS-G) DL: 1930 - 1995 MHz UL: 1850 - 1915 MHz
Instantaneous bandwidth - #carriers	65MHz – Up to 4 LTE carriers (in 40MHz occupied bandwidth)
LTE carrier bandwidth	3, 5, 10, 15 or 20 MHz
RF output power	2x60W or 4x30W (by SW)
Noise figure (3GPP band 2)	2.0 dB typ. (<2.5 dB max)
RX Diversity scheme	2 or 4 way Rx diversity
Sizes (HxWxD)(w/ solar shield) in mm (in.)	538 x 304 x 182 (21.2" x 12.0" x 7.2")
Volume (w/ solar shield) in L	30
Weight (w/ solar shield) in kg (lb)	24 (53)
DC voltage range	-40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption
DC power consumption	580W typical @100% RF load
Environmental conditions	-40°C (-40°F) / +55°C (+131°F) IP65
Wind load (@150km/h or 93mph)	Frontal:<200N / Lateral :<150N
Antenna ports	4 ports 7/16 DIN female (50 ohms) VSWR < 1.5 (> 14dB)
CPRI ports	2 CPRI ports (HW ready for Rate7 / 9.8 Gbps)
AISG interfaces	1 AISG2.0 output (RS485), +24V/2A DC power Integrated Smart Bias Tees (x2)
Misc. Interfaces	1 external alarms connector (4 alarms) 4 RF Tx & 4 RF Rx monitor ports 1 DC connector (2 pins)
Installation conditions	Pole and wall mounting
Regulatory compliance	3GPP 36.141 / 3GPP 36.113 / GR-1089-CORE / GR-3108-CORE / UL 60950-1 / FCC Part 27

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ALCATEL-LUCENT B66A RRH4X45

The Alcatel-Lucent B66a Remote Radio Head 4x45 is the newest addition of Remote Radio Head to the extended product line of Alcatel-Lucent's distributed Base Station solutions, aimed at facilitating smooth RF site acquisition and related civil engineering. Its operational range covers beyond that of B4 (AWS) and B10 (AWS+).

Supporting 2Tx/4Tx MIMO and 2-way/4-way Rx diversity, the Alcatel-Lucent B66a RRH4x45 allows operators to have a compact radio solution to deploy LTE in the 2100 band (3GPP band 4, 10, and 66), providing them with the means to achieve high capacity, high quality, high reliability, large instantaneous bandwidth, and high coverage with minimum site requirements.

The Alcatel-Lucent B66a RRH4x45 product has four transmit RF paths, offering the possibility to **select, via software only, 2Tx or 4Tx MIMO configurations** with either 2x90W or 4x45W RF output power. It also supports 4-way Rx diversity at the 70 MHz instantaneous bandwidth.



The Alcatel-Lucent B66a RRH4x45 is a compact (near zero-footprint) solution and operates noise free, simplifying negotiations with site property owners and minimizing environmental impacts.

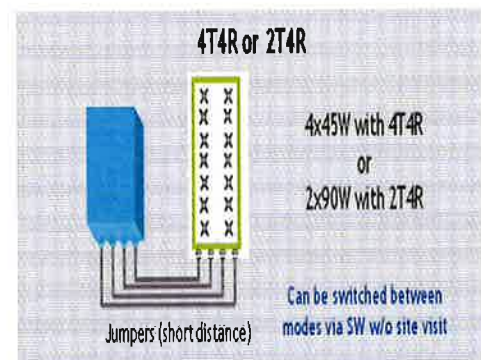
Its compactness and slim design makes the Alcatel-Lucent B66a RRH4x45 easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the RF feeder needs and installation costs.

FEATURES

- Supporting LTE in 2110 - 2180 MHz band/DL, 1710-1780MHz/UL (3GPP band 4, 10, and 66a)
- LTE 2Tx or 4Tx MIMO (SW selectable)
- Configuration: 2T2R/2T4R/4T4R
- Output power: Up to 2x90W or 4x45W (SW configurable)
- 70MHz LTE carrier with 4Rx Diversity
- Convection-cooled (fan-less)
- Supports AISG 2.0 ALD devices (RET, TMA) through RS485 or RF ports

BENEFITS

- Compact to reduce additional footprint when adding LTE in AWS 1-3 band
- Selection of MIMO configuration (2Tx or 4Tx) by software only
- Improves downlink spectral efficiency through 4Tx MIMO
- Increases LTE coverage thanks to 4Rx diversity capability and best in class Rx sensitivity
- Flexible mounting options: Pole or Wall



TECHNICAL SPECIFICATIONS

Features & Performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R selectable by SW)
Frequency band	AWS 1-3, B4/B66a DL: 2110-2180 MHz / UL: 1710-1780 MHz
Instantaneous bandwidth - #carriers	70 MHz – 4 LTE MIMO carriers (in 70 MHz occupied bandwidth)
LTE carrier bandwidth	5, 10, 15, 20 MHz
RF output power	2x90W or 4x45W (selectable by SW)
Noise figure – RX Diversity scheme Receiver Sensivity (FRC A1-3)	2 dB typical (<2.5 dB max) – 2 or 4 way Rx diversity -104.5 dBm maximum
Sizes (HxWxD) in mm (in.)	655x299x182 (25.8x11.8x7.2) (with solar shield) 640x290x160 (25.2x11.4x6.3) (without solar shield)
Volume in Liters	35.5 (with solar shield) 29.7 (without solar shield)
Weight in kg (lb) (w/o mounting HW)	25.8kg (56.8lb) (with solar shield)
DC voltage range	Nominal: -48V, -40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption
DC power consumption	750W typical @100% RF load (in 2Tx or 4Tx mode); Add 58W for 2A*29V for AISG
Environmental conditions	-40°C (-40°F) /+55°C (+131°F) UL50E Type 4 Enclosure
Wind load (@150km/h or 93mph)	250N (56lb) Frontal/150N (34lb) Lateral
Antenna ports	4 ports 4.3-10 female (50 ohms) VSWR < 1.5
CPRI ports	2 CPRI ports (HW ready for Rate 7, 9.8 Gbps) SFP: SMDF (HW supports also SMSF and MMDF)
AISG interfaces	1 AISG 2.0 output (RS485) Integrated Smart Bias Tees (x2)
Misc. Interfaces	4 external alarms (1 connector) 1 DC connector (2 pins)
Installation conditions	Pole and wall mounting
Regulatory compliance	3GPP 36.141 / 3GPP 36.113 / GR-487 / GR-1089-CORE / GR-3108-CORE / UL 60950-1 / FCC Part 27 / FCC Part 15 / GR-3178-CORE

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

Product Description

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

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

Features/Benefits

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

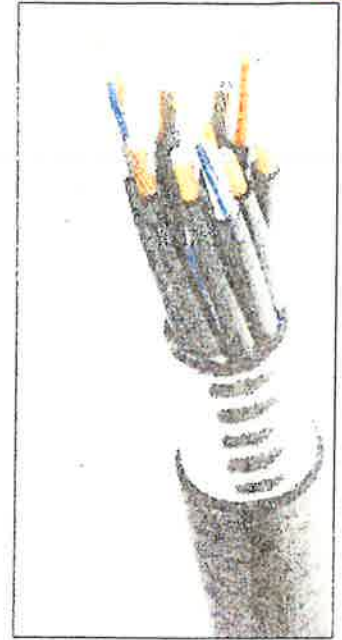


Figure 1: HYBRIFLEX Series

Technical Specifications

Outer Conductor Armor	Corrugated Aluminum	[mm (in)]	46.5 (1.83)
Jacket	Polyethylene, PE	[mm (in)]	50.3 (1.98)
UV-Protection	Individual and External Jacket		Yes
Weight, Approximate		[kg/m (lb/ft)]	1.9 (1.30)
Minimum Bending Radius, Single Bending		[mm (in)]	200 (8)
Minimum Bending Radius, Repeated Bending		[mm (in)]	500 (20)
Recommended/Maximum Clamp Spacing		[m (ft)]	1.0 / 1.2 (3.25 / 4.0)
DC-Resistance Outer Conductor Armor		[Ω/km (Ω/1000ft)]	0.68 (0.205)
DC-Resistance Power Cable, 8.4mm ² (8AWG)		[Ω/km (Ω/1000ft)]	2.1 (0.307)
Version			Single-mode OM3
Quantity, Fiber Count			16 (8 pairs)
Core/Clad		[μm]	50/125
Primary Coating (Acrylate)		[μm]	245
Buffer Diameter, Nominal		[μm]	900
Secondary Protection, Jacket, Nominal		[mm (in)]	2.0 (0.08)
Minimum Bending Radius		[mm (in)]	104 (4.1)
Insertion Loss @ wavelength 850nm		dB/km	3.0
Insertion Loss @ wavelength 1310nm		dB/km	1.0
Standards (Meets or exceeds)			UL94-V0, UL1666 RoHS Compliant
Size (Power)		[mm (AWG)]	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		[mm (AWG)]	0.8 (18)
Quantity, Wire Count (Alarm)			4 (2 pairs)
Type			UV protected
Strands			19
Primary Jacket Diameter, Nominal		[mm (in)]	6.8 (0.27)
Standards (Meets or exceeds)			NFPA 130, ICEA S-95-658 UL Type XH-HW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to 149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to 149)

* This data is provisional and subject to change

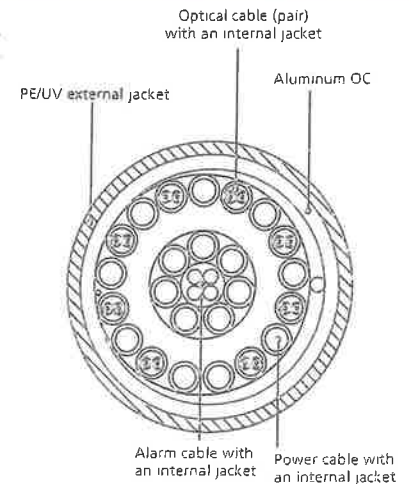


Figure 2: Construction Detail

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

ATTACHMENT 2

Site Name: Grofon 5 Tower Height: 144.5ft		General		Power		Density							
CARRIER	# OF CHAN.	WATTS ERP	HEIGHT	CALC. POWER DENS	FREQ.	MAX. PERMISS. EXP.	FRACTION MPE	Total					
*Sprint	4	693	113	0.0871	1900	1.0000	0.87%						
*Sprint	1	390	113	0.0123	850	0.5667	0.22%						
*Sprint	2	693	113	0.0435	2500	1.0000	0.44%						
*MetroPCS	3	727	102	0.0851	2140	1.0000	0.85%						
*T-Mobile	2	2334	126	2100	0.1166	1.0000	1.17%						
*T-Mobile	1	865	126	700	0.0216	0.4667	0.46%						
*T-Mobile	2	1167	126	1900	0.0583	1.0000	0.58%						
*T-Mobile	2	1167	126	2100	0.0583	1.0000	0.58%						
*AT&T	2	565	147	880	0.0204	0.5867	0.35%						
*AT&T	2	875	147	1900	0.0317	1.0000	0.32%						
*AT&T	1	283	147	880	0.0051	0.5867	0.09%						
*AT&T	4	525	147	1900	0.0380	1.0000	0.38%						
*AT&T	1	1615	144.75	734	0.0302	0.4893	0.62%						
Verizon PCS	1	3446	137	0.0660	1970	1.0000	6.60%						
Verizon Cellular	9	252	137	0.0434	869	0.5793	7.50%						
Verizon AWS	1	8096	137	0.1551	2145	1.0000	15.51%						
Verizon 700	1	1595	137	0.0306	746	0.4973	6.14%						42.67%
* Source: Siting Council													

ATTACHMENT 3



February 21, 2017

Mr. Timothy Howell
Crown Castle
3530 Toringdon Way Suite 300
Charlotte, NC 28277
(980) 209-8242

B+T Group
1717 S. Boulder, Suite 300
Tulsa, OK 74119
(918) 587-4630
ModDwgs@btgrp.com

Subject: **Structural Modification Report**

Carrier Designation: **Verizon Wireless Co-Locate**
Carrier Site Number: N/A
Carrier Site Name: Groton 5 CT

Crown Castle Designation: **Crown Castle BU Number:** 881533
Crown Castle Site Name: Groton Tower
Crown Castle JDE Job Number: 395283
Crown Castle Work Order Number: 1359797
Crown Castle Application Number: 360907 Rev. 1

Engineering Firm Designation: **B+T Group Project Number:** 92739.007.01

Site Data: **75 Roberts Road, Groton, CT, New London County**
Latitude 41° 21' 36.8", Longitude -72° 2' 55.1"
144.5 Ft - Monopole

Dear Mr. Howell,

B+T Group 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 998751, in accordance with application 360907, revision 1.

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

LC4.7: TSA specified load case with proposed modifications **Sufficient Capacity**
Note: See Table 1 and Table 2 for the proposed and existing/reserved loading, respectively.

This analysis has been performed in accordance with the 2012 International Building Code based upon an ultimate 3-second gust wind speed of 135 mph converted to a nominal 3-second gust wind speed of 105 mph per section 1609.3.1 as required for use in the TIA-222-G Standard per Exception #5 of Section 1609.1.1. Exposure Category C and Risk Category II were used in this analysis.

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 B+T Group 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.

Respectfully submitted by:
B+T Engineering, Inc.
PEC.0001564; Exp: 02/10/18

Robert M. Frazier, P.E.
Project Engineer

Scott S. Vance, P.E.
Engineer of Record



2/21/17

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1) INTRODUCTION

This is a 144.5 ft. monopole designed by Engineered Endeavors, Inc. in January of 2001. The monopole was originally designed for a wind speed of 85 mph per TIA/EIA-222-F. This monopole has been modified by WEI in August of 2007, Vertical Structures in November of 2008, Crown Castle in February of 2014, B+T Group in July of 2015 and October of 2015 and those modifications were considered in this analysis.

2) ANALYSIS CRITERIA

The structural analysis was performed for this monopole in accordance with the requirements of TIA-222-G Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a 3-second gust wind speed of 105 mph with no ice, 50 mph with 0.75 inch ice thickness and 60 mph under service loads, exposure category C.

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
135.0	137.0	3	Alcatel Lucent	B66A RRH4X45	1	1-5/8	--
		3	Alcatel Lucent	RRH2X60-PCS			
		3	Alcatel Lucent	RRH2x60-700			
		3	Amphenol	QUAD656C0000X			
		6	Commscope	HBXX-6517DS-A2M			
		1	RFS Celwave	DB-T1-6Z-8AB-0Z			

Table 2 - Existing and Reserved Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note	
145.0	146.0	12	Powerwave Tech.	7020.00	--	--	1	
		6	Powerwave Tech.	7770.00				
	145.0	145.0	3	CCI Antennas	HPA-65R-BUU-H8	--	--	2
			3	Ericsson	RRUS 11 B4			
			3	Ericsson	RRUS A2			
			6	Ericsson	RRUS 11			
			6	Kathrein	782-10250			
			6	Powerwave Tech.	LGP21401			
1	--	Platform Mount [LP 712-1]	12	3/8 3/4 1-5/8	1			
135.0	137.0	3	Alcatel Lucent	RRH2X40-AWS	6	1-5/8	4	
		6	Andrew	CBC721-DF				
		3	Andrew	HBXX-6517DS-VTM				
		3	Antel	BXA-171063/8CF				
		3	Antel	BXA-70063-6CF-EDIN-0				
		6	RFS Celwave	FD9R6004/2C-3L				
		3	Andrew	LNx-6512DS-VTM				
	1	RFS Celwave	DB-T1-6Z-8AB-0Z	7	1-5/8	1		
135.0	1	--	Platform Mount [LP 712-1]					

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
125.0	126.0	3	Commscope	LNx-6515DS-A1M	12 1	1-5/8 1-1/4	1
		3	Ericsson	Ericsson Air 21 B2A B4P			
		3	Ericsson	Ericsson Air 21 B4A B2P			
		3	Ericsson	KRY 112 144/1			
	3	Ericsson	RRUS 11 B12				
	125.0	1	--	Platform Mount [LP 712-1]			
113.0	113.0	3	Alcatel Lucent	TD-RRH8x20-25	3 1	1-1/4 5/8	1
		3	RFS Celwave	APXVSP18-C-A20			
		3	RFS Celwave	APXVTM14-C-120			
		1	--	Platform Mount [LP 712-1]			
111.0	111.0	3	Alcatel Lucent	PCS 1900MHz 4x45W-65MHz	--	--	1
		1	--	Side Arm Mount [SO 102-3]			
	109.0	3	Alcatel Lucent	800MHz 2X50W RRH W/FILTER			
100.0	100.0	1	--	Platform Mount [LP 712-1]	--	--	3
51.0	52.0	1	Lucent	KS24019-L112A	1	1/2	1
	51.0	1	--	Side Arm Mount [SO 701-1]			

- Notes:
 1) Existing Equipment
 2) Reserved Equipment
 3) Empty Mount ; Considered in This Analysis
 4) Equipment To Be Removed; Not Considered in This Analysis

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)
145	145	12	Allgon	7120.16	--	--
		1	Generic	Low Profile Platform		
135	135	12	Allgon	7120.16	--	--
		1	Generic	Low Profile Platform		
125	125	9	Allgon	7120.16	--	--
		1	Generic	Low Profile Platform		
115	115	12	Allgon	7120.16	--	--
		1	Generic	Low Profile Platform		
105	105	12	Allgon	7120.16	--	--
		1	Generic	Low Profile Platform		
95	95	12	Allgon	7120.16	--	--
		1	Generic	Low Profile Platform		

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
Online Application	Verizon Wireless Co-Locate, Rev# 1	360907	CCI Sites
Tower Manufacturer Drawing	EEL, Job No. 8409	1405782	CCI Sites
Foundation Drawing	URS, Project No. F301877.01/F04	1405796	CCI Sites
Geotech Report	Clarence Welti, Date: 03/13/2000	1406209	CCI Sites
Tower Modification Drawing	Walker Engineering, Job No. 0705-0147VRE	2048224	CCI Sites
	Vertical Structures, Date: 11/25/08	2353860	CCI Sites
	CCI, Date: 02/25/14	4491288	CCI Sites
	B+T Group, Project No. 92739.004.01	5756537	CCI Sites
	B+T Group, Project No. 92739.005.01	5916747	CCI Sites
Post Modification Inspection	Vertical Structures, Project No. 2007-004-164	2304223	CCI Sites
	Vertical Structures, Project No. 2009-004-059	2435103	CCI Sites
	SGS, Project No. 145071	5246681	CCI Sites
	ETS, Project No. 151208	6017666	CCI Sites
	ETS, Project No. 151208	6089847	CCI Sites
Antenna Configuration	Crown CAD Package	Date: 02/02/17	CCI Sites

3.1) Analysis Method

tnxTower (version 7.0.5.1), 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) Mount areas and weights are assumed based on photographs provided.

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

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary) - LC4.7

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	144.5 - 117.568	Pole	TP26.882x21x0.188	1	-9.052	-	73.4	Pass ¹
L2	117.568 - 112.58	Pole	TP27.555x25.668x0.25	2	-12.605	-	72.4	Pass ¹
L3	112.58 - 106	Pole	TP28.962x27.555x0.418	3	-14.483	-	90.5	Pass ¹
L4	106 - 103.5	Pole	TP29.496x28.962x0.525	4	-15.109	-	80.3	Pass ¹
L5	103.5 - 100.92	Pole	TP30.047x29.496x0.69	5	-15.889	-	65.3	Pass ¹
L6	100.92 - 98.5	Pole	TP30.564x30.047x0.514	6	-18.173	-	90.0	Pass ¹
L7	98.5 - 87.1178	Pole	TP32.997x30.564x0.554	7	-20.060	-	89.3	Pass ¹
L8	87.1178 - 83	Pole	TP33.392x31.509x0.375	8	-23.025	-	84.7	Pass ¹
L9	83 - 77.41	Pole	TP34.596x33.392x0.563	9	-24.780	-	95.3	Pass ¹
L10	77.41 - 77	Pole	TP34.685x34.596x0.832	10	-24.962	-	66.2	Pass ¹
L11	77 - 60.08	Pole	TP38.33x34.685x0.605	11	-30.826	-	96.6	Pass ¹
L12	60.08 - 58.5	Pole	TP38.67x38.33x0.603	12	-31.389	-	97.6	Pass ¹
L13	58.5 - 42.0418	Pole	TP42.216x38.67x0.609	13	-35.865	-	94.2	Pass ¹
L14	42.0418 - 31.25	Pole	TP43.783x40.221x0.656	14	-45.269	-	94.8	Pass ¹
L15	31.25 - 27.25	Pole	TP44.642x43.783x0.582	15	-47.125	-	98.7	Pass ¹
L16	27.25 - 0	Pole	TP50.5x44.642x0.817	16	-62.107	-	93.5	Pass ¹
							Summary	
						Pole (L15)	98.7	Pass ¹
						RATING =	98.7	Pass¹

Table 6 - Tower Component Stresses vs. Capacity - LC4.7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	Base	81.6	Pass
1	Base Plate	Base	81.2	Pass
1	Base Foundation (Structure)	Base	41.6	Pass
1	Base Foundation (Soil Interaction)	Base	55.9	Pass

Structure Rating (max from all components) =	98.7%
---	--------------

Notes:

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

4.1) Recommendations

- 1) All modifications proposed in this report shall be installed in accordance with the attached drawings (Appendix D) for the determined available structural capacity to be effective.

APPENDIX A

tnxTOWER OUTPUT

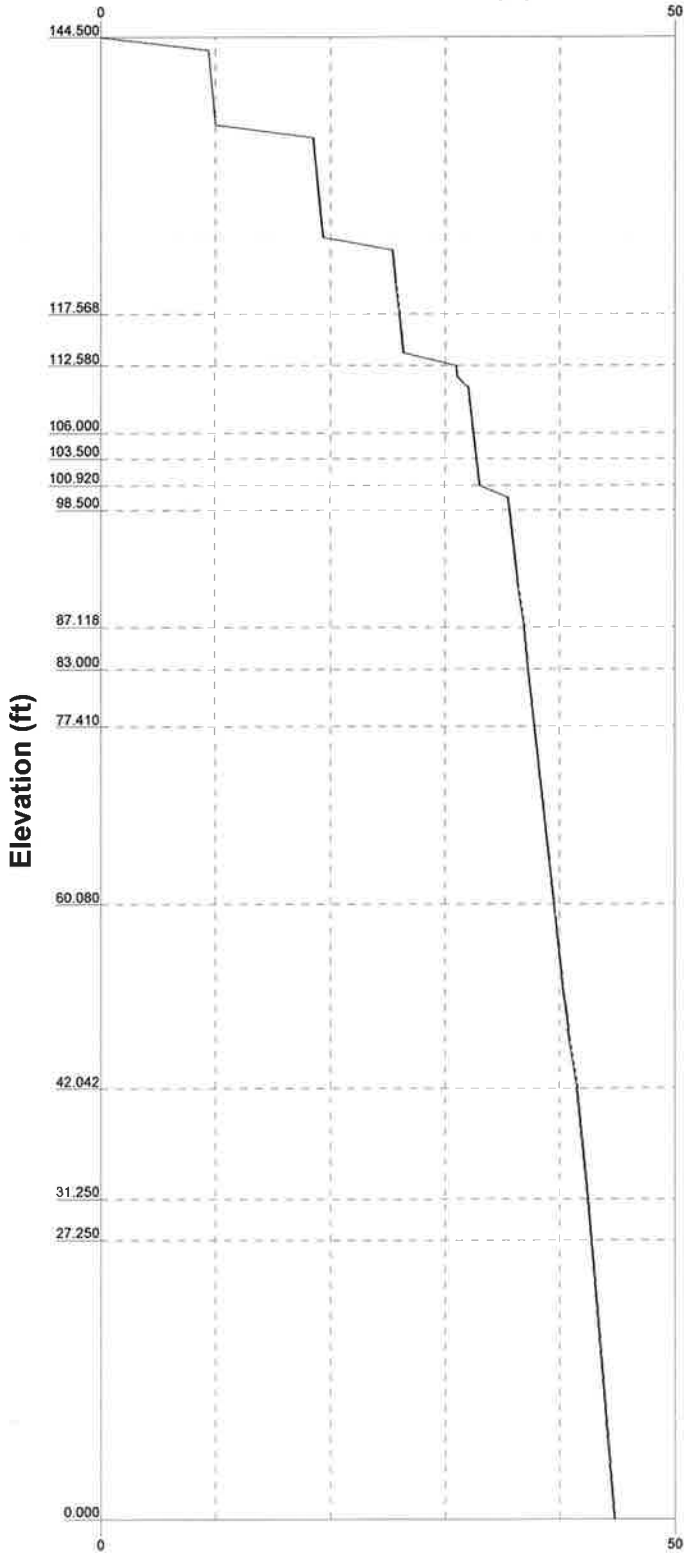
Vx

Vz

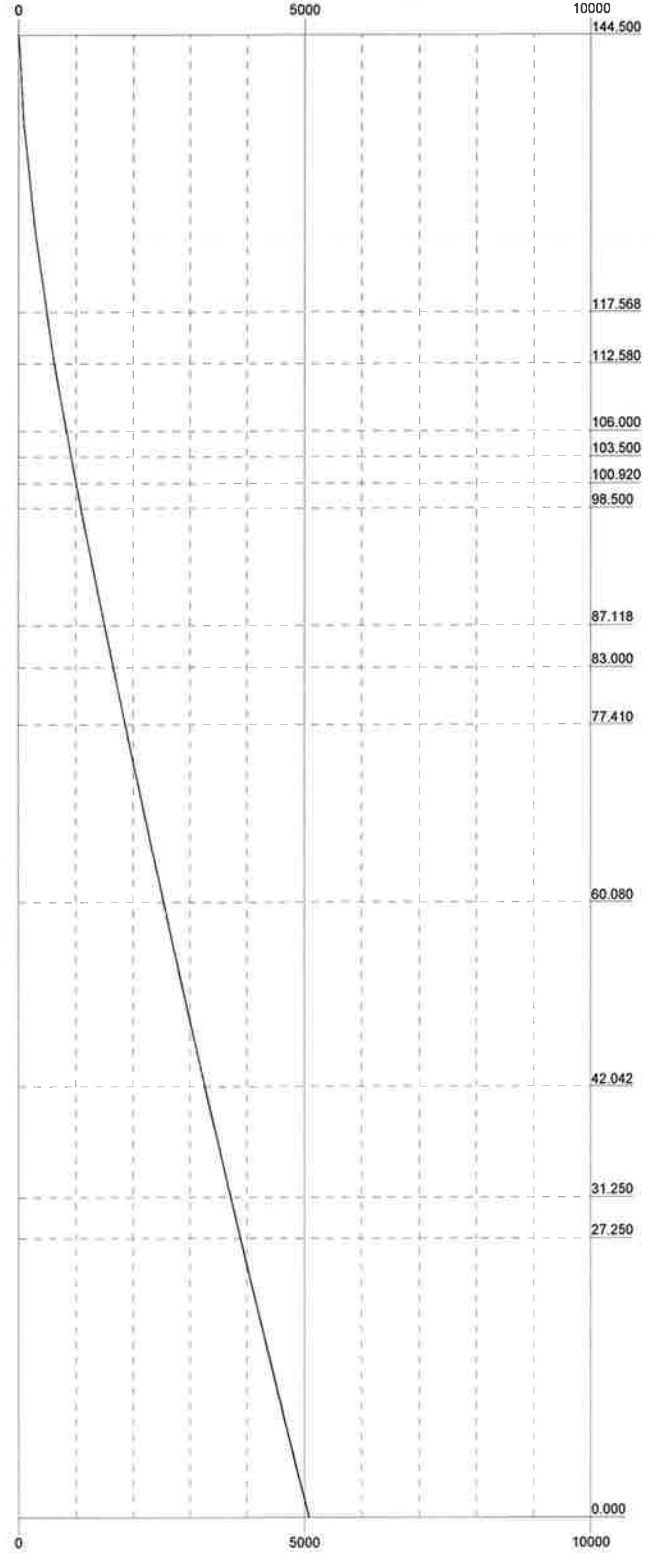
Mx

Mz

Global Mast Shear (K)

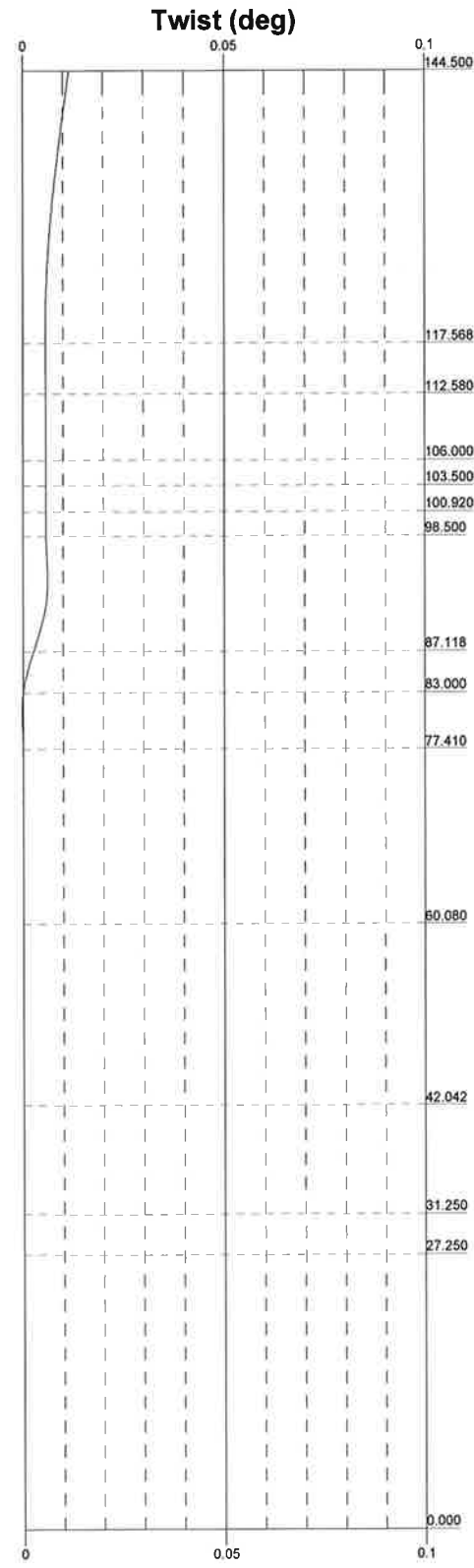
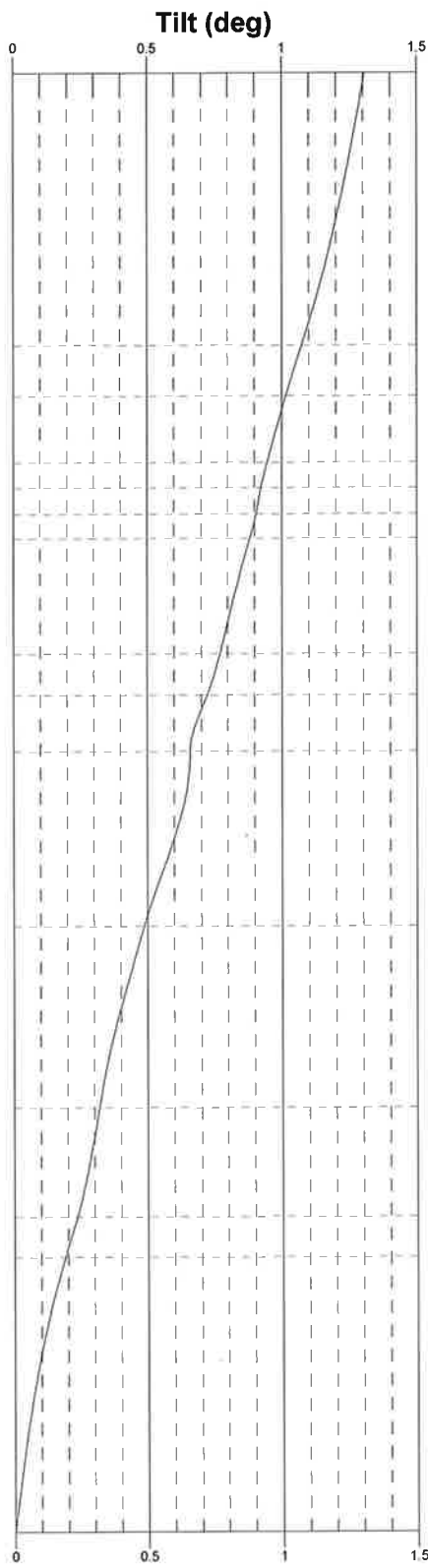
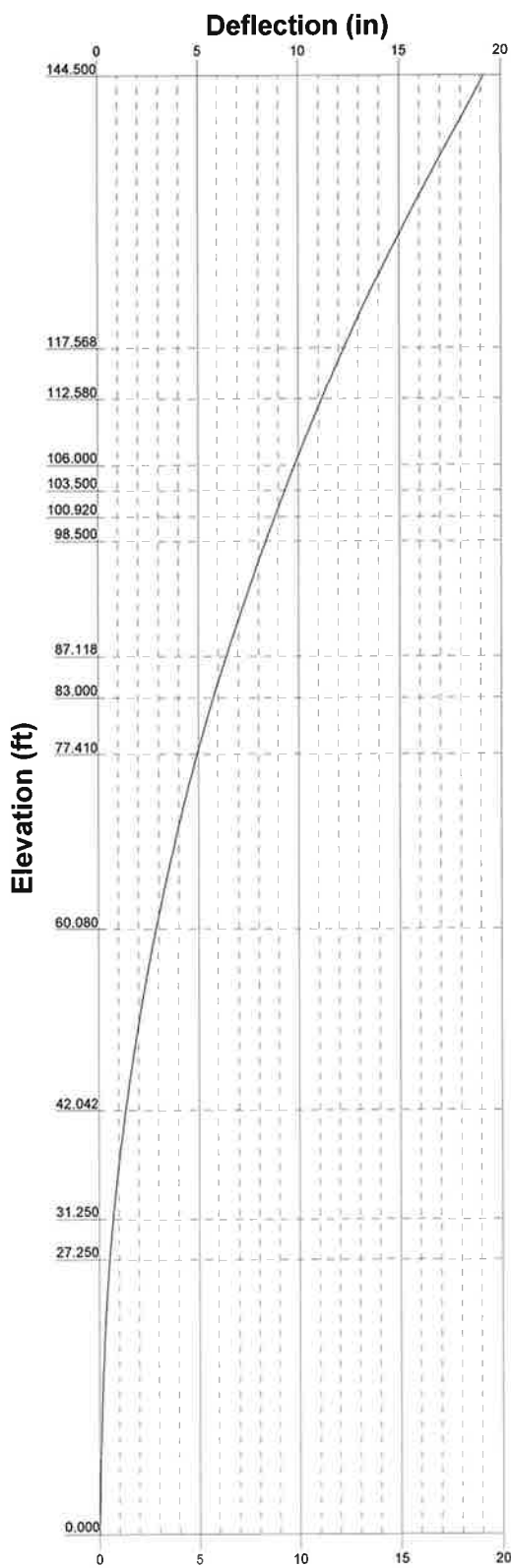



Global Mast Moment (kip-ft)



B+T Group
 1717 S Boulder, Suite 300
 Tulsa, OK 74119
 Phone: (918) 587-4630
 FAX: (918) 587-4630

Job: 92739.007.01 - GROTON TOWER, CT (BU# 8815)		
Project:		
Client: Crown Castle	Drawn by: CJangonda	App'd:
Code: TIA-222-G	Date: 02/20/17	Scale: NTS
Path:	Dwg No: E-4	



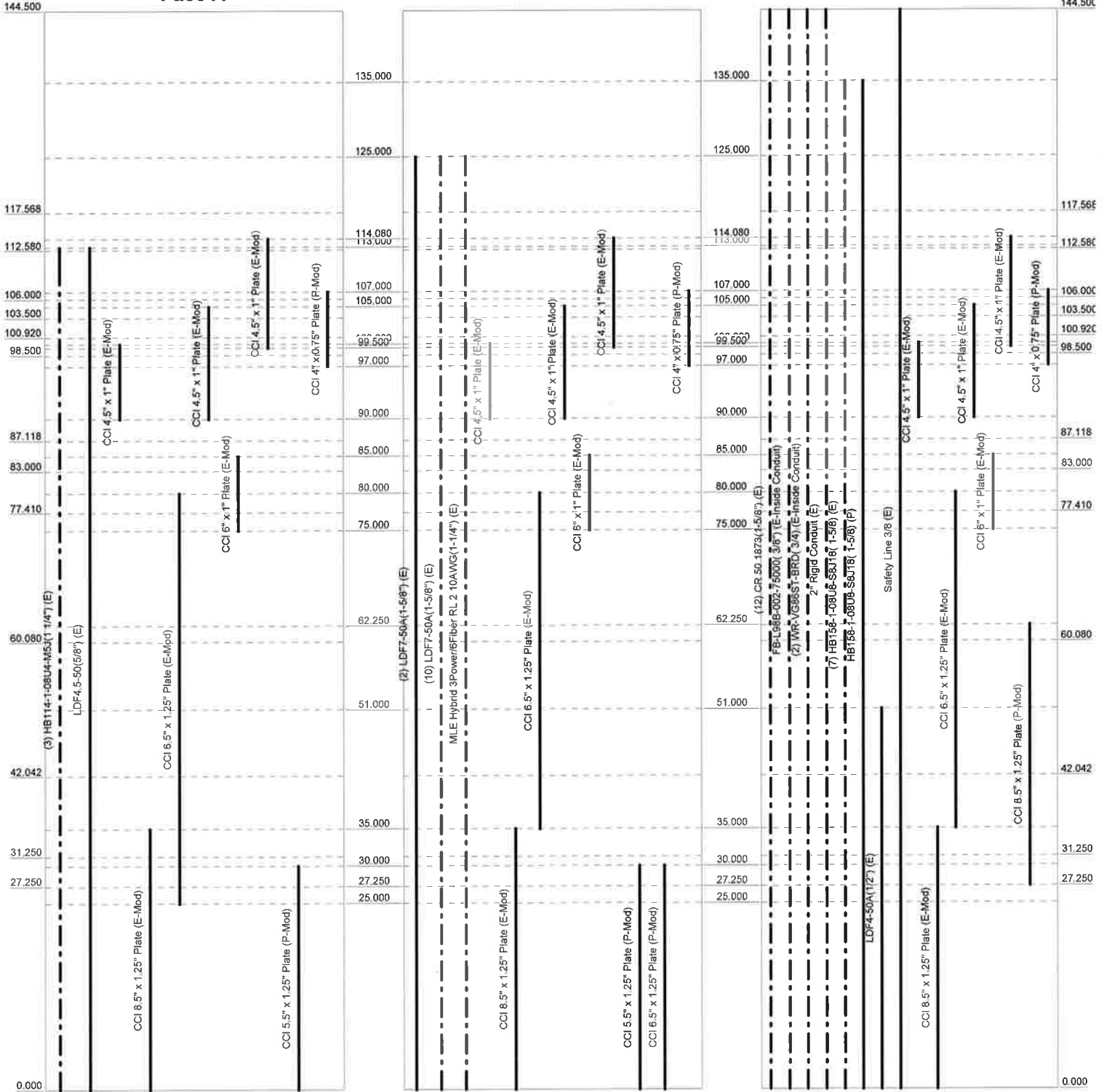
 B+T Group 1717 S Boulder, Suite 300 Tulsa, OK 74119 Phone: (918) 587-4630 FAX: (918) 587-4630	Job: 92739.007.01 - GROTON TOWER, CT (BU# 8815)		
	Project: _____		
	Client: Crown Castle	Drawn by: CJangonda	App'd: _____
	Code: TIA-222-G	Date: 02/20/17	Scale: NTS
	Path: _____	Dwg No. E-5	


Face A

Face B

Face C

Elevation (ft)



 B+T Group 1717 S Boulder, Suite 300 Tulsa, OK 74119 Phone: (918) 587-4630 FAX: (918) 587-4630	Job: 92739.007.01 - GROTON TOWER, CT (BU# 8815)		
	Project:		
	Client: Crown Castle	Drawn by: CJangonda	App'd:
	Code: TIA-222-G	Date: 02/20/17	Scale: NTS
	Path:	Dwg No: E-7	

tnxTower B+T Group 1717 S Boulder, Suite 300 Tulsa, OK 74119 Phone: (918) 587-4630 FAX: (918) 587-4630	Job 92739.007.01 - GROTON TOWER, CT (BU# 881533)	Page 1 of 22
	Project	Date 18:20:13 02/20/17
	Client Crown Castle	Designed by CJangonda

Tower Input Data

There is a pole section.

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

The following design criteria apply:

Tower is located in New London County, Connecticut.

Basic wind speed of 105 mph.

Structure Class II.

Exposure Category C.

Topographic Category 1.

Crest Height 0.000 ft.

Nominal ice thickness of 0.750 in.

Ice thickness is considered to increase with height.

Ice density of 56.000 pcf.

A wind speed of 50 mph is used in combination with ice.

Temperature drop of 50.000 °F.

Deflections calculated using a wind speed of 60 mph.

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

Pressures are calculated at each section.

Stress ratio used in pole design is 1.

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

Options

<ul style="list-style-type: none"> Consider Moments - Legs Consider Moments - Horizontals Consider Moments - Diagonals Use Moment Magnification √ Use Code Stress Ratios √ Use Code Safety Factors - Guys Escalate Ice Always Use Max Kz Use Special Wind Profile Include Bolts In Member Capacity Leg Bolts Are At Top Of Section Secondary Horizontal Braces Leg Use Diamond Inner Bracing (4 Sided) SR Members Have Cut Ends SR Members Are Concentric 	<ul style="list-style-type: none"> Distribute Leg Loads As Uniform Assume Legs Pinned √ Assume Rigid Index Plate √ Use Clear Spans For Wind Area Use Clear Spans For KL/r Retension Guys To Initial Tension √ Bypass Mast Stability Checks √ Use Azimuth Dish Coefficients √ Project Wind Area of Appurt. Autocalc Torque Arm Areas Add IBC .6D+W Combination Sort Capacity Reports By Component Triangulate Diamond Inner Bracing Treat Feed Line Bundles As Cylinder 	<ul style="list-style-type: none"> Use ASCE 10 X-Brace Ly Rules Calculate Redundant Bracing Forces Ignore Redundant Members in FEA SR Leg Bolts Resist Compression All Leg Panels Have Same Allowable Offset Girt At Foundation √ Consider Feed Line Torque Include Angle Block Shear Check Use TIA-222-G Bracing Resist. Exemption Use TIA-222-G Tension Splice Exemption <li style="text-align: center;">Poles √ Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets
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Tapered Pole Section Geometry

Section	Elevation	Section Length	Splice Length	Number of Sides	Top Diameter	Bottom Diameter	Wall Thickness	Bend Radius	Pole Grade
	ft	ft	ft		in	in	in	in	
L1	144.500-117.568	26.932	3.841	18	21.000	26.882	0.188	0.750	A572-65 (65 ksi)
L2	117.568-112.580	8.829	0.000	18	25.668	27.555	0.250	1.000	A572-65 (65 ksi)
L3	112.580-106.000	6.580	0.000	18	27.555	28.962	0.418	1.671	36.294205ksi

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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
	0								(36 ksi)
L4	106.000-103.50	2.500	0.000	18	28.962	29.496	0.525	2.101	34.794406ksi
	0								(35 ksi)
L5	103.500-100.92	2.580	0.000	18	29.496	30.047	0.690	2.760	34.810247ksi
	0								(35 ksi)
L6	100.920-98.500	2.420	0.000	18	30.047	30.564	0.514	2.056	34.824598ksi
									(35 ksi)
L7	98.500-87.118	11.382	4.625	18	30.564	32.997	0.554	2.214	36.409888ksi
									(36 ksi)
L8	87.118-83.000	8.743	0.000	18	31.509	33.392	0.375	1.500	A572-65
									(65 ksi)
L9	83.000-77.410	5.590	0.000	18	33.392	34.596	0.563	2.251	40.124121ksi
									(40 ksi)
L10	77.410-77.000	0.410	0.000	18	34.596	34.685	0.832	3.326	40.126992ksi
									(40 ksi)
L11	77.000-60.080	16.920	0.000	18	34.685	38.330	0.605	2.421	40.815117ksi
									(41 ksi)
L12	60.080-58.500	1.580	0.000	18	38.330	38.670	0.603	2.411	40.826466ksi
									(41 ksi)
L13	58.500-42.042	16.458	5.776	18	38.670	42.215	0.609	2.437	43.310707ksi
									(43 ksi)
L14	42.042-31.250	16.568	0.000	18	40.221	43.783	0.656	2.625	43.155199ksi
									(43 ksi)
L15	31.250-27.250	4.000	0.000	18	43.783	44.642	0.582	2.326	46.633108ksi
									(47 ksi)
L16	27.250-0.000	27.250		18	44.642	50.500	0.817	3.269	43.511847ksi
									(44 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	I/Q in ²	w in	w/t
L1	21.324	12.386	677.826	7.388	10.668	63.538	1356.544	6.194	3.366	17.952
	27.297	15.887	1430.295	9.477	13.656	104.736	2862.472	7.945	4.401	23.474
L2	26.898	20.169	1646.369	9.024	13.040	126.260	3294.904	10.087	4.078	16.311
	27.980	21.667	2040.910	9.693	13.998	145.799	4084.505	10.835	4.410	17.639
L3	27.980	35.992	3348.717	9.634	13.998	239.227	6701.840	17.999	4.114	9.846
	29.408	37.857	3896.763	10.133	14.712	264.861	7798.654	18.932	4.362	10.438
L4	29.408	47.409	4843.289	10.095	14.712	329.196	9692.950	23.709	4.173	7.944
	29.951	48.299	5121.459	10.285	14.984	341.798	10249.658	24.154	4.267	8.123
L5	29.951	63.076	6612.480	10.226	14.984	441.306	13233.661	31.544	3.977	5.765
	30.511	64.283	6999.522	10.422	15.264	458.564	14008.255	32.148	4.074	5.906
L6	30.511	48.172	5308.369	10.484	15.264	347.770	10623.723	24.091	4.384	8.531
	31.036	49.016	5592.172	10.668	15.527	360.164	11191.703	24.513	4.475	8.708
L7	31.036	52.732	6000.266	10.654	15.527	386.447	12008.427	26.371	4.405	7.957
	33.506	57.007	7580.845	11.517	16.763	452.250	15171.664	28.509	4.833	8.731
L8	33.006	37.057	4538.007	11.052	16.006	283.512	9081.985	18.532	4.886	13.028
	33.907	39.299	5412.411	11.721	16.963	319.068	10831.944	19.653	5.217	13.912
L9	33.907	58.646	7985.447	11.654	16.963	470.752	15981.401	29.329	4.886	8.682
	35.130	60.797	8896.832	12.082	17.575	506.223	17805.371	30.405	5.098	9.059
L10	35.130	89.115	12835.512	11.986	17.575	730.331	25687.912	44.566	4.625	5.563
	35.220	89.348	12936.503	12.018	17.620	734.203	25890.028	44.682	4.641	5.581
L11	35.220	65.462	9605.340	12.098	17.620	545.145	19223.319	32.737	5.039	8.327
	38.921	72.464	13028.783	13.392	19.471	669.123	26074.710	36.239	5.681	9.387
L12	38.921	72.182	12979.715	13.393	19.471	666.603	25976.509	36.098	5.685	9.431
	39.267	72.833	13334.205	13.514	19.644	678.781	26685.955	36.423	5.745	9.531
L13	39.267	73.601	13470.202	13.512	19.644	685.704	26958.128	36.807	5.734	9.411
	42.867	80.457	17596.179	14.770	21.445	820.508	35215.511	40.236	6.358	10.435

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Section	Tip Dia. in	Area in ²	I in ⁴	r in	C in	I/C in ³	J in ⁴	I/Q in ²	w in	w/t
L14	42.102	82.413	16298.684	14.046	20.432	797.689	32618.814	41.214	5.924	9.027
	44.458	89.831	21108.045	15.310	22.242	949.037	42243.865	44.924	6.551	9.982
L15	44.458	79.741	18802.228	15.336	22.242	845.365	37629.197	39.878	6.682	11.49
	45.331	81.328	19947.383	15.642	22.678	879.579	39921.013	40.672	6.834	11.751
L16	45.331	113.689	27586.927	15.558	22.678	1216.444	55210.154	56.856	6.419	7.853
	51.279	128.885	40192.963	17.637	25.654	1566.733	80438.814	64.455	7.450	9.115

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A _f	Adjust. Factor A _r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals	Double Angle Stitch Bolt Spacing Redundants
ft	ft ²	in					in	in	in
L1				1	1	1			
144.500-117.5									
68				1	1	1			
L2									
117.568-112.5									
80				1	1	0.95912			
L3									
112.580-106.0									
00				1	1	0.94712			
L4									
106.000-103.5									
00				1	1	0.928712			
L5									
103.500-100.9									
20				1	1	0.950592			
L6									
100.920-98.50									
0				1	1	0.945315			
L7									
98.500-87.118									
L8				1	1	1			
87.118-83.000									
L9				1	1	0.966546			
83.000-77.410									
L10				1	1	0.93203			
77.410-77.000									
L11				1	1	0.96042			
77.000-60.080									
L12				1	1	0.961122			
60.080-58.500									
L13				1	1	1.06831			
58.500-42.042									
L14				1	1	1.06035			
42.042-31.250									
L15				1	1	1.14743			
31.250-27.250									
L16				1	1	0.957174			
27.250-0.000									

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Sector	Component Type	Placement	Total Number	Number Per Row	Start/End Position	Width or Diameter	Perimeter	Weight
			ft				in	in	klf
HB158-1-08U8-S8J18(1-5/8) (P)	C	Surface Ar (CaAa)	135.000 - 0.000	1	1	0.250 0.270	1.980		0.001

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Description	Sector	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or	Perimeter	Weight
							Diameter	in	klf
CCI 8.5" x 1.25" Plate (P-Mod) **	C	Surface Af (CaAa)	62.250 - 27.250	1	1	0.250 0.250	8.500	19.500	0.000
CCI 4" x 0.75" Plate (P-Mod)	A	Surface Af (CaAa)	107.000 - 97.000	1	1	-0.250 -0.250	4.000	9.500	0.000
CCI 4" x 0.75" Plate (P-Mod)	B	Surface Af (CaAa)	107.000 - 97.000	1	1	-0.250 -0.250	4.000	9.500	0.000
CCI 4" x 0.75" Plate (P-Mod) **@**	C	Surface Af (CaAa)	107.000 - 97.000	1	1	-0.250 -0.250	4.000	9.500	0.000

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_{AA}	Weight
							ft^2/ft	klf
hh								
CR 50 1873(1-5/8") (E)	C	No	Inside Pole	144.500 - 0.000	12	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.001 0.001 0.001
FB-L98B-002-75000(3/8") (E-Inside Conduit)	C	No	Inside Pole	144.500 - 0.000	1	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.000 0.000 0.000
WR-VG86ST-BRD(3/4) (E-Inside Conduit)	C	No	Inside Pole	144.500 - 0.000	2	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.001 0.001 0.001
2" Rigid Conduit (E)	C	No	Inside Pole	144.500 - 0.000	1	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.003 0.003 0.003
hh								
HB158-1-08U8-S8J18(1-5/8) (E)	C	No	Inside Pole	135.000 - 0.000	7	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.001 0.001 0.001
LDF7-50A(1-5/8") (E)	B	No	Inside Pole	125.000 - 0.000	10	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.001 0.001 0.001
MLE Hybrid 3Power/6Fiber RL 2 10AWG(1-1/4") (E)	B	No	Inside Pole	125.000 - 0.000	1	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.000 0.000 0.000
hh								
HB114-1-08U4-M5J(1 1/4") (E) **@**	A	No	Inside Pole	113.000 - 0.000	3	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.001 0.001 0.001

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R	A_F	C_{AA}	C_{AA}	Weight
			ft^2	ft^2	In Face ft^2	Out Face ft^2	K
L1	144.500-117.568	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	2.943	0.000	0.077
		C	0.000	0.000	4.462	0.000	0.564
L2	117.568-112.580	A	0.000	0.000	1.161	0.000	0.001

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Tower Section	Tower Elevation ft	Face	A _R ft ²	A _F ft ²	C _{AA} In Face ft ²	C _{AA} Out Face ft ²	Weight K
L3	112.580-106.000	B	0.000	0.000	3.100	0.000	0.051
		C	0.000	0.000	2.300	0.000	0.123
		A	0.000	0.000	6.171	0.000	0.022
L4	106.000-103.500	B	0.000	0.000	8.207	0.000	0.068
		C	0.000	0.000	7.151	0.000	0.162
		A	0.000	0.000	4.883	0.000	0.008
L5	103.500-100.920	B	0.000	0.000	5.657	0.000	0.026
		C	0.000	0.000	5.255	0.000	0.062
		A	0.000	0.000	5.813	0.000	0.009
L6	100.920-98.500	B	0.000	0.000	6.612	0.000	0.027
		C	0.000	0.000	6.198	0.000	0.064
		A	0.000	0.000	5.828	0.000	0.008
L7	98.500-87.118	B	0.000	0.000	6.577	0.000	0.025
		C	0.000	0.000	6.188	0.000	0.060
		A	0.000	0.000	14.735	0.000	0.039
L8	87.118-83.000	B	0.000	0.000	18.257	0.000	0.117
		C	0.000	0.000	16.431	0.000	0.280
		A	0.000	0.000	2.356	0.000	0.014
L9	83.000-77.410	B	0.000	0.000	3.631	0.000	0.042
		C	0.000	0.000	2.970	0.000	0.101
		A	0.000	0.000	8.879	0.000	0.019
L10	77.410-77.000	B	0.000	0.000	10.609	0.000	0.058
		C	0.000	0.000	9.712	0.000	0.138
		A	0.000	0.000	0.890	0.000	0.001
L11	77.000-60.080	B	0.000	0.000	1.017	0.000	0.004
		C	0.000	0.000	0.951	0.000	0.010
		A	0.000	0.000	21.794	0.000	0.057
L12	60.080-58.500	B	0.000	0.000	27.030	0.000	0.174
		C	0.000	0.000	27.389	0.000	0.417
		A	0.000	0.000	1.848	0.000	0.005
L13	58.500-42.042	B	0.000	0.000	2.337	0.000	0.016
		C	0.000	0.000	4.322	0.000	0.039
		A	0.000	0.000	19.253	0.000	0.056
L14	42.042-31.250	B	0.000	0.000	24.347	0.000	0.170
		C	0.000	0.000	45.586	0.000	0.407
		A	0.000	0.000	17.937	0.000	0.037
L15	31.250-27.250	B	0.000	0.000	17.215	0.000	0.111
		C	0.000	0.000	31.451	0.000	0.267
		A	0.000	0.000	12.867	0.000	0.014
L16	27.250-0.000	B	0.000	0.000	12.751	0.000	0.041
		C	0.000	0.000	12.527	0.000	0.099
		A	0.000	0.000	68.378	0.000	0.092
		B	0.000	0.000	103.895	0.000	0.281
		C	0.000	0.000	46.738	0.000	0.675

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A _R ft ²	A _F ft ²	C _{AA} In Face ft ²	C _{AA} Out Face ft ²	Weight K
L1	144.500-117.568	A	1.721	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	6.877	0.000	0.157
		C		0.000	0.000	19.732	0.000	0.819
L2	117.568-112.580	A	1.700	0.000	0.000	1.799	0.000	0.021
		B		0.000	0.000	6.233	0.000	0.123
		C		0.000	0.000	6.226	0.000	0.201
L3	112.580-106.000	A	1.691	0.000	0.000	10.749	0.000	0.143
		B		0.000	0.000	13.993	0.000	0.223

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Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft ²	A_F ft ²	$C_A A_A$ In Face ft ²	$C_A A_A$ Out Face ft ²	Weight K
L4	106.000-103.500	C		0.000	0.000	13.954	0.000	0.326
		A	1.684	0.000	0.000	7.582	0.000	0.093
		B		0.000	0.000	8.814	0.000	0.123
		C		0.000	0.000	8.796	0.000	0.162
L5	103.500-100.920	A	1.680	0.000	0.000	8.929	0.000	0.107
		B		0.000	0.000	10.199	0.000	0.139
		C		0.000	0.000	10.180	0.000	0.179
L6	100.920-98.500	A	1.675	0.000	0.000	8.711	0.000	0.106
		B		0.000	0.000	9.902	0.000	0.135
		C		0.000	0.000	9.882	0.000	0.173
L7	98.500-87.118	A	1.663	0.000	0.000	23.221	0.000	0.303
		B		0.000	0.000	28.817	0.000	0.440
		C		0.000	0.000	28.703	0.000	0.617
L8	87.118-83.000	A	1.649	0.000	0.000	3.910	0.000	0.061
		B		0.000	0.000	5.935	0.000	0.111
		C		0.000	0.000	5.894	0.000	0.175
L9	83.000-77.410	A	1.639	0.000	0.000	12.058	0.000	0.155
		B		0.000	0.000	14.800	0.000	0.222
		C		0.000	0.000	14.723	0.000	0.309
L10	77.410-77.000	A	1.633	0.000	0.000	1.194	0.000	0.014
		B		0.000	0.000	1.395	0.000	0.019
		C		0.000	0.000	1.389	0.000	0.026
L11	77.000-60.080	A	1.613	0.000	0.000	32.886	0.000	0.395
		B		0.000	0.000	41.162	0.000	0.596
		C		0.000	0.000	44.641	0.000	0.892
L12	60.080-58.500	A	1.591	0.000	0.000	2.854	0.000	0.034
		B		0.000	0.000	3.625	0.000	0.053
		C		0.000	0.000	6.332	0.000	0.102
L13	58.500-42.042	A	1.564	0.000	0.000	29.550	0.000	0.347
		B		0.000	0.000	37.561	0.000	0.540
		C		0.000	0.000	68.982	0.000	1.085
L14	42.042-31.250	A	1.516	0.000	0.000	25.862	0.000	0.285
		B		0.000	0.000	25.879	0.000	0.364
		C		0.000	0.000	48.330	0.000	0.742
L15	31.250-27.250	A	1.482	0.000	0.000	17.239	0.000	0.167
		B		0.000	0.000	17.444	0.000	0.198
		C		0.000	0.000	18.455	0.000	0.269
L16	27.250-0.000	A	1.370	0.000	0.000	91.397	0.000	0.849
		B		0.000	0.000	138.329	0.000	1.430
		C		0.000	0.000	76.608	0.000	1.357

Feed Line Center of Pressure

Section	Elevation ft	CP_x in	CP_z in	CP_x Ice in	CP_z Ice in
L1	144.500-117.568	-0.013	0.076	-0.153	0.393
L2	117.568-112.580	0.129	-0.113	0.078	0.025
L3	112.580-106.000	0.058	-0.117	-0.029	-0.112
L4	106.000-103.500	0.038	-0.078	-0.020	-0.079
L5	103.500-100.920	0.035	-0.072	-0.019	-0.073
L6	100.920-98.500	0.034	-0.069	-0.019	-0.072
L7	98.500-87.118	0.052	-0.106	-0.027	-0.108
L8	87.118-83.000	0.076	-0.155	-0.040	-0.158
L9	83.000-77.410	0.048	-0.098	-0.027	-0.109
L10	77.410-77.000	0.040	-0.081	-0.022	-0.092
L11	77.000-60.080	-0.054	-0.038	-0.120	-0.057
L12	60.080-58.500	-0.699	0.405	-0.671	0.326

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Section	Elevation	CP _X	CP _Z	CP _X	CP _Z
	ft	in	in	Ice	Ice
				in	in
L13	58.500-42.042	-0.703	0.430	-0.627	0.396
L14	42.042-31.250	-0.766	0.160	-0.663	0.209
L15	31.250-27.250	-0.588	0.111	-0.534	0.199
L16	27.250-0.000	0.547	-0.373	0.511	-0.216

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
L1	16	HB158-1-08U8-S8J18(1-5/8)	117.57 - 135.00	1.0000	1.0000
L1	18	LDF7-50A(1-5/8")	117.57 - 125.00	1.0000	1.0000
L1	27	Safety Line 3/8	117.57 - 144.50	1.0000	1.0000
L1	23	LDF4.5-50(5/8")	117.57 - 113.00	1.0000	1.0000
L1	49	CCI 4.5" x 1" Plate	117.57 - 114.08	1.0000	1.0000
L1	50	CCI 4.5" x 1" Plate	117.57 - 114.08	1.0000	1.0000
L1	51	CCI 4.5" x 1" Plate	117.57 - 114.08	1.0000	1.0000
L3	16	HB158-1-08U8-S8J18(1-5/8)	106.00 - 112.58	1.0000	1.0000
L3	18	LDF7-50A(1-5/8")	106.00 - 112.58	1.0000	1.0000
L3	23	LDF4.5-50(5/8")	106.00 - 112.58	1.0000	1.0000
L3	27	Safety Line 3/8	106.00 - 112.58	1.0000	1.0000
L3	49	CCI 4.5" x 1" Plate	106.00 - 112.58	1.0000	1.0000
L3	50	CCI 4.5" x 1" Plate	106.00 - 112.58	1.0000	1.0000
L3	51	CCI 4.5" x 1" Plate	106.00 - 112.58	1.0000	1.0000
L3	59	CCI 4" x 0.75" Plate	106.00 - 107.00	1.0000	1.0000
L3	60	CCI 4" x 0.75" Plate	106.00 - 107.00	1.0000	1.0000
L3	61	CCI 4" x 0.75" Plate	106.00 - 107.00	1.0000	1.0000
L4	16	HB158-1-08U8-S8J18(1-5/8)	103.50 - 106.00	1.0000	1.0000
L4	18	LDF7-50A(1-5/8")	103.50 - 106.00	1.0000	1.0000
L4	23	LDF4.5-50(5/8")	103.50 - 106.00	1.0000	1.0000
L4	27	Safety Line 3/8	103.50 - 106.00	1.0000	1.0000
L4	41	CCI 4.5" x 1" Plate	103.50 - 105.00	1.0000	1.0000
L4	42	CCI 4.5" x 1" Plate	103.50 - 105.00	1.0000	1.0000
L4	43	CCI 4.5" x 1" Plate	103.50 - 105.00	1.0000	1.0000
L4	49	CCI 4.5" x 1" Plate	103.50 -	1.0000	1.0000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
L4	50	CCI 4.5" x 1" Plate	106.00 103.50 - 106.00	1.0000	1.0000
L4	51	CCI 4.5" x 1" Plate	103.50 - 106.00	1.0000	1.0000
L4	59	CCI 4" x 0.75" Plate	103.50 - 106.00	1.0000	1.0000
L4	60	CCI 4" x 0.75" Plate	103.50 - 106.00	1.0000	1.0000
L4	61	CCI 4" x 0.75" Plate	103.50 - 106.00	1.0000	1.0000
L5	16	HB158-1-08U8-S8J18(1-5/8)	100.92 - 103.50	1.0000	1.0000
L5	18	LDF7-50A(1-5/8")	100.92 - 103.50	1.0000	1.0000
L5	23	LDF4.5-50(5/8")	100.92 - 103.50	1.0000	1.0000
L5	27	Safety Line 3/8	100.92 - 103.50	1.0000	1.0000
L5	41	CCI 4.5" x 1" Plate	100.92 - 103.50	1.0000	1.0000
L5	42	CCI 4.5" x 1" Plate	100.92 - 103.50	1.0000	1.0000
L5	43	CCI 4.5" x 1" Plate	100.92 - 103.50	1.0000	1.0000
L5	49	CCI 4.5" x 1" Plate	100.92 - 103.50	1.0000	1.0000
L5	50	CCI 4.5" x 1" Plate	100.92 - 103.50	1.0000	1.0000
L5	51	CCI 4.5" x 1" Plate	100.92 - 103.50	1.0000	1.0000
L5	59	CCI 4" x 0.75" Plate	100.92 - 103.50	1.0000	1.0000
L5	60	CCI 4" x 0.75" Plate	100.92 - 103.50	1.0000	1.0000
L5	61	CCI 4" x 0.75" Plate	100.92 - 103.50	1.0000	1.0000
L6	16	HB158-1-08U8-S8J18(1-5/8)	98.50 - 100.92	1.0000	1.0000
L6	18	LDF7-50A(1-5/8")	98.50 - 100.92	1.0000	1.0000
L6	23	LDF4.5-50(5/8")	98.50 - 100.92	1.0000	1.0000
L6	27	Safety Line 3/8	98.50 - 100.92	1.0000	1.0000
L6	29	CCI 4.5" x 1" Plate	98.50 - 100.00	1.0000	1.0000
L6	30	CCI 4.5" x 1" Plate	98.50 - 100.00	1.0000	1.0000
L6	31	CCI 4.5" x 1" Plate	98.50 - 100.00	1.0000	1.0000
L6	41	CCI 4.5" x 1" Plate	98.50 - 100.92	1.0000	1.0000
L6	42	CCI 4.5" x 1" Plate	98.50 - 100.92	1.0000	1.0000
L6	43	CCI 4.5" x 1" Plate	98.50 - 100.92	1.0000	1.0000
L6	49	CCI 4.5" x 1" Plate	99.50 - 100.92	1.0000	1.0000
L6	50	CCI 4.5" x 1" Plate	99.50 - 100.92	1.0000	1.0000
L6	51	CCI 4.5" x 1" Plate	99.50 - 100.92	1.0000	1.0000
L6	59	CCI 4" x 0.75" Plate	98.50 - 100.92	1.0000	1.0000
L6	60	CCI 4" x 0.75" Plate	98.50 - 100.92	1.0000	1.0000
L6	61	CCI 4" x 0.75" Plate	98.50 - 100.92	1.0000	1.0000
L7	16	HB158-1-08U8-S8J18(1-5/8)	87.12 - 98.50	1.0000	1.0000
L7	18	LDF7-50A(1-5/8")	87.12 - 98.50	1.0000	1.0000
L7	23	LDF4.5-50(5/8")	87.12 - 98.50	1.0000	1.0000
L7	27	Safety Line 3/8	87.12 - 98.50	1.0000	1.0000
L7	29	CCI 4.5" x 1" Plate	90.00 - 98.50	1.0000	1.0000
L7	30	CCI 4.5" x 1" Plate	90.00 - 98.50	1.0000	1.0000
L7	31	CCI 4.5" x 1" Plate	90.00 - 98.50	1.0000	1.0000
L7	41	CCI 4.5" x 1" Plate	90.00 - 98.50	1.0000	1.0000
L7	42	CCI 4.5" x 1" Plate	90.00 - 98.50	1.0000	1.0000

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Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
L7	43	CCI 4.5" x 1" Plate	90.00 - 98.50	1.0000	1.0000
L7	59	CCI 4" x 0.75" Plate	97.00 - 98.50	1.0000	1.0000
L7	60	CCI 4" x 0.75" Plate	97.00 - 98.50	1.0000	1.0000
L7	61	CCI 4" x 0.75" Plate	97.00 - 98.50	1.0000	1.0000
L7	45	CCI 6" x 1" Plate	87.12 - 85.00	1.0000	1.0000
L7	46	CCI 6" x 1" Plate	87.12 - 85.00	1.0000	1.0000
L7	47	CCI 6" x 1" Plate	87.12 - 85.00	1.0000	1.0000
L9	16	HB158-1-08U8-S8J18(1-5/8)	77.41 - 83.00	1.0000	1.0000
L9	18	LDF7-50A(1-5/8")	77.41 - 83.00	1.0000	1.0000
L9	23	LDF4.5-50(5/8")	77.41 - 83.00	1.0000	1.0000
L9	27	Safety Line 3/8	77.41 - 83.00	1.0000	1.0000
L9	37	CCI 6.5" x 1.25" Plate	77.41 - 80.00	1.0000	1.0000
L9	38	CCI 6.5" x 1.25" Plate	77.41 - 80.00	1.0000	1.0000
L9	39	CCI 6.5" x 1.25" Plate	77.41 - 80.00	1.0000	1.0000
L9	45	CCI 6" x 1" Plate	77.41 - 83.00	1.0000	1.0000
L9	46	CCI 6" x 1" Plate	77.41 - 83.00	1.0000	1.0000
L9	47	CCI 6" x 1" Plate	77.41 - 83.00	1.0000	1.0000
L10	16	HB158-1-08U8-S8J18(1-5/8)	77.00 - 77.41	1.0000	1.0000
L10	18	LDF7-50A(1-5/8")	77.00 - 77.41	1.0000	1.0000
L10	23	LDF4.5-50(5/8")	77.00 - 77.41	1.0000	1.0000
L10	27	Safety Line 3/8	77.00 - 77.41	1.0000	1.0000
L10	37	CCI 6.5" x 1.25" Plate	77.00 - 77.41	1.0000	1.0000
L10	38	CCI 6.5" x 1.25" Plate	77.00 - 77.41	1.0000	1.0000
L10	39	CCI 6.5" x 1.25" Plate	77.00 - 77.41	1.0000	1.0000
L10	45	CCI 6" x 1" Plate	77.00 - 77.41	1.0000	1.0000
L10	46	CCI 6" x 1" Plate	77.00 - 77.41	1.0000	1.0000
L10	47	CCI 6" x 1" Plate	77.00 - 77.41	1.0000	1.0000
L11	16	HB158-1-08U8-S8J18(1-5/8)	60.08 - 77.00	1.0000	1.0000
L11	18	LDF7-50A(1-5/8")	60.08 - 77.00	1.0000	1.0000
L11	23	LDF4.5-50(5/8")	60.08 - 77.00	1.0000	1.0000
L11	27	Safety Line 3/8	60.08 - 77.00	1.0000	1.0000
L11	37	CCI 6.5" x 1.25" Plate	60.08 - 77.00	1.0000	1.0000
L11	38	CCI 6.5" x 1.25" Plate	60.08 - 77.00	1.0000	1.0000
L11	39	CCI 6.5" x 1.25" Plate	60.08 - 77.00	1.0000	1.0000
L11	45	CCI 6" x 1" Plate	75.00 - 77.00	1.0000	1.0000
L11	46	CCI 6" x 1" Plate	75.00 - 77.00	1.0000	1.0000
L11	47	CCI 6" x 1" Plate	75.00 - 77.00	1.0000	1.0000
L11	57	CCI 8.5" x 1.25" Plate	60.08 - 62.25	1.0000	1.0000
L12	16	HB158-1-08U8-S8J18(1-5/8)	58.50 - 60.08	1.0000	1.0000
L12	18	LDF7-50A(1-5/8")	58.50 - 60.08	1.0000	1.0000
L12	23	LDF4.5-50(5/8")	58.50 - 60.08	1.0000	1.0000
L12	27	Safety Line 3/8	58.50 - 60.08	1.0000	1.0000
L12	37	CCI 6.5" x 1.25" Plate	58.50 - 60.08	1.0000	1.0000
L12	38	CCI 6.5" x 1.25" Plate	58.50 - 60.08	1.0000	1.0000
L12	39	CCI 6.5" x 1.25" Plate	58.50 - 60.08	1.0000	1.0000
L12	57	CCI 8.5" x 1.25" Plate	58.50 - 60.08	1.0000	1.0000
L13	16	HB158-1-08U8-S8J18(1-5/8)	42.04 - 58.50	1.0000	1.0000
L13	18	LDF7-50A(1-5/8")	42.04 - 58.50	1.0000	1.0000
L13	23	LDF4.5-50(5/8")	42.04 - 58.50	1.0000	1.0000
L13	25	LDF4-50A(1/2")	42.04 - 51.00	1.0000	1.0000
L13	27	Safety Line 3/8	42.04 - 58.50	1.0000	1.0000
L13	37	CCI 6.5" x 1.25" Plate	42.04 - 58.50	1.0000	1.0000
L13	38	CCI 6.5" x 1.25" Plate	42.04 - 58.50	1.0000	1.0000
L13	39	CCI 6.5" x 1.25" Plate	42.04 - 58.50	1.0000	1.0000
L13	57	CCI 8.5" x 1.25" Plate	42.04 - 58.50	1.0000	1.0000
L13	33	CCI 8.5" x 1.25" Plate	42.04 - 35.00	1.0000	1.0000
L13	34	CCI 8.5" x 1.25" Plate	42.04 - 35.00	1.0000	1.0000
L13	35	CCI 8.5" x 1.25" Plate	42.04 - 35.00	1.0000	1.0000
L15	16	HB158-1-08U8-S8J18(1-5/8)	27.25 - 31.25	1.0000	1.0000
L15	18	LDF7-50A(1-5/8")	27.25 - 31.25	1.0000	1.0000
L15	23	LDF4.5-50(5/8")	27.25 - 31.25	1.0000	1.0000
L15	25	LDF4-50A(1/2")	27.25 - 31.25	1.0000	1.0000

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Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
L15	27	Safety Line 3/8	27.25 - 31.25	1.0000	1.0000
L15	33	CCI 8.5" x 1.25" Plate	27.25 - 31.25	1.0000	1.0000
L15	34	CCI 8.5" x 1.25" Plate	27.25 - 31.25	1.0000	1.0000
L15	35	CCI 8.5" x 1.25" Plate	27.25 - 31.25	1.0000	1.0000
L15	37	CCI 6.5" x 1.25" Plate	27.25 - 31.25	1.0000	1.0000
L15	53	CCI 5.5" x 1.25" Plate	27.25 - 30.00	1.0000	1.0000
L15	54	CCI 5.5" x 1.25" Plate	27.25 - 30.00	1.0000	1.0000
L15	55	CCI 6.5" x 1.25" Plate	27.25 - 30.00	1.0000	1.0000
L15	57	CCI 8.5" x 1.25" Plate	27.25 - 31.25	1.0000	1.0000
L16	16	HB158-1-08U8-S8J18(1-5/8)	0.00 - 27.25	1.0000	1.0000
L16	18	LDF7-50A(1-5/8")	0.00 - 27.25	1.0000	1.0000
L16	23	LDF4.5-50(5/8")	0.00 - 27.25	1.0000	1.0000
L16	25	LDF4-50A(1/2")	0.00 - 27.25	1.0000	1.0000
L16	27	Safety Line 3/8	0.00 - 27.25	1.0000	1.0000
L16	33	CCI 8.5" x 1.25" Plate	0.00 - 27.25	1.0000	1.0000
L16	34	CCI 8.5" x 1.25" Plate	0.00 - 27.25	1.0000	1.0000
L16	35	CCI 8.5" x 1.25" Plate	0.00 - 27.25	1.0000	1.0000
L16	37	CCI 6.5" x 1.25" Plate	25.00 - 27.25	1.0000	1.0000
L16	53	CCI 5.5" x 1.25" Plate	0.00 - 27.25	1.0000	1.0000
L16	54	CCI 5.5" x 1.25" Plate	0.00 - 27.25	1.0000	1.0000
L16	55	CCI 6.5" x 1.25" Plate	0.00 - 27.25	1.0000	1.0000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _A A ₁ Front	C _A A ₁ Side	Weight
			Horz Lateral	Vert					
			ft	ft	°	ft	ft ²	ft ²	K
Lightning Rod 5/8" x 5' (E)	C	None			0.000	147.000	No Ice	0.313	0.031
							1/2" Ice	0.826	0.035
							1" Ice	1.322	0.041
Strobe (E)	C	None			0.000	149.500	No Ice	4.500	0.020
							1/2" Ice	4.770	0.058
							1" Ice	5.048	0.100
5' x 2" Pipe Mount (E-For Strobe)	C	None			0.000	147.000	No Ice	1.000	0.029
							1/2" Ice	1.393	0.037
							1" Ice	1.703	0.048
Top Hat (E)	C	None			0.000	146.000	No Ice	3.000	0.081
							1/2" Ice	3.480	0.111
							1" Ice	3.960	0.141
hh									
hh									
LNX-6512DS-VTM w/ Mount Pipe (E)	A	From Leg	4.000	0.000	0.000	135.000	No Ice	5.268	0.039
							1/2" Ice	5.655	0.087
							1" Ice	6.049	0.140
LNX-6512DS-VTM w/ Mount Pipe (E)	B	From Leg	4.000	0.000	0.000	135.000	No Ice	5.268	0.039
							1/2" Ice	5.655	0.087
							1" Ice	6.049	0.140
LNX-6512DS-VTM w/ Mount Pipe (E)	C	From Leg	4.000	0.000	0.000	135.000	No Ice	5.268	0.039
							1/2" Ice	5.655	0.087
							1" Ice	6.049	0.140
DB-T1-6Z-8AB-0Z (E)	A	From Leg	4.000	0.000	0.000	135.000	No Ice	4.800	0.044
							1/2" Ice	5.070	0.080
							1" Ice	5.348	0.120
QUAD656C0000X w/ Mount Pipe	A	From Leg	4.000	0.000	0.000	135.000	No Ice	13.479	0.080
							1/2" Ice	14.096	0.174

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Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _A A _{Front}	C _A A _{Side}	Weight
			Horz	Vert					
			ft	ft	°	ft	ft ²	ft ²	K
(P)			2.000						
QUAD656C0000X w/ Mount Pipe	B	From Leg	4.000		0.000	135.000	1" Ice 14.682	9.500	0.277
(P)			0.000				No Ice 13.479	7.331	0.080
(P)			0.000				1/2" Ice 14.096	8.547	0.174
QUAD656C0000X w/ Mount Pipe	C	From Leg	2.000				1" Ice 14.682	9.500	0.277
(P)			4.000		0.000	135.000	No Ice 13.479	7.331	0.080
(P)			0.000				1/2" Ice 14.096	8.547	0.174
(2) HBXX-6517DS-A2M w/ Mount Pipe	A	From Leg	2.000				1" Ice 14.682	9.500	0.277
(P)			4.000		0.000	135.000	No Ice 8.765	6.963	0.069
(P)			0.000				1/2" Ice 9.342	8.182	0.139
(2) HBXX-6517DS-A2M w/ Mount Pipe	B	From Leg	2.000				1" Ice 9.889	9.144	0.217
(P)			4.000		0.000	135.000	No Ice 8.765	6.963	0.069
(P)			0.000				1/2" Ice 9.342	8.182	0.139
(2) HBXX-6517DS-A2M w/ Mount Pipe	C	From Leg	2.000				1" Ice 9.889	9.144	0.217
(P)			4.000		0.000	135.000	No Ice 8.765	6.963	0.069
(P)			0.000				1/2" Ice 9.342	8.182	0.139
RRH2x60-700	A	From Leg	2.000				1" Ice 9.889	9.144	0.217
(P)			4.000		0.000	135.000	No Ice 3.500	1.816	0.060
(P)			0.000				1/2" Ice 3.761	2.052	0.083
RRH2x60-700	B	From Leg	2.000				1" Ice 4.029	2.289	0.109
(P)			4.000		0.000	135.000	No Ice 3.500	1.816	0.060
(P)			0.000				1/2" Ice 3.761	2.052	0.083
RRH2x60-700	C	From Leg	2.000				1" Ice 4.029	2.289	0.109
(P)			4.000		0.000	135.000	No Ice 3.500	1.816	0.060
(P)			0.000				1/2" Ice 3.761	2.052	0.083
RRH2X60-PCS	A	From Leg	2.000				1" Ice 4.029	2.289	0.109
(P)			4.000		0.000	135.000	No Ice 2.200	1.355	0.055
(P)			0.000				1/2" Ice 2.393	1.515	0.073
RRH2X60-PCS	B	From Leg	2.000				1" Ice 2.593	1.682	0.094
(P)			4.000		0.000	135.000	No Ice 2.200	1.355	0.055
(P)			0.000				1/2" Ice 2.393	1.515	0.073
RRH2X60-PCS	C	From Leg	2.000				1" Ice 2.593	1.682	0.094
(P)			4.000		0.000	135.000	No Ice 2.200	1.355	0.055
(P)			0.000				1/2" Ice 2.393	1.515	0.073
B66A RRH4X45	A	From Leg	2.000				1" Ice 2.593	1.682	0.094
(P)			4.000		0.000	135.000	No Ice 2.537	1.610	0.057
(P)			0.000				1/2" Ice 2.750	1.791	0.077
B66A RRH4X45	B	From Leg	2.000				1" Ice 2.970	1.978	0.100
(P)			4.000		0.000	135.000	No Ice 2.537	1.610	0.057
(P)			0.000				1/2" Ice 2.750	1.791	0.077
B66A RRH4X45	C	From Leg	2.000				1" Ice 2.970	1.978	0.100
(P)			4.000		0.000	135.000	No Ice 2.537	1.610	0.057
(P)			0.000				1/2" Ice 2.750	1.791	0.077
DB-T1-6Z-8AB-0Z	C	From Leg	2.000				1" Ice 2.970	1.978	0.100
(P)			4.000		0.000	135.000	No Ice 4.800	2.000	0.044
(P)			0.000				1/2" Ice 5.070	2.193	0.080
Platform Mount [LP 712-1]	C	None	2.000				1" Ice 5.348	2.393	0.120
(E)					0.000	135.000	No Ice 24.530	24.530	1.335
							1/2" Ice 29.940	29.940	1.646
							1" Ice 35.350	35.350	1.956
hh									
LNX-6515DS-A1M w/ Mount Pipe	A	From Leg	4.000		0.000	125.000	No Ice 11.683	9.842	0.083
(E)			0.000				1/2" Ice 12.404	11.366	0.173
(E)			1.000				1" Ice 13.135	12.914	0.273
LNX-6515DS-A1M w/ Mount Pipe	B	From Leg	4.000		0.000	125.000	No Ice 11.683	9.842	0.083
(E)			0.000				1/2" Ice 12.404	11.366	0.173
(E)			1.000				1" Ice 13.135	12.914	0.273
LNX-6515DS-A1M w/	C	From Leg	4.000		0.000	125.000	No Ice 11.683	9.842	0.083

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Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} Front	C _{AA} Side	Weight	
			Horz	Vert						
			ft	ft	°	ft	ft ²	ft ²	K	
Mount Pipe			0.000				1/2" Ice	12.404	11.366	0.173
(E)			1.000				1" Ice	13.135	12.914	0.273
ERICSSON AIR 21 B2A	A	From Leg	4.000		0.000	125.000	No Ice	6.329	5.642	0.112
B4P w/ Mount Pipe			0.000				1/2" Ice	6.775	6.426	0.169
(E)			1.000				1" Ice	7.214	7.131	0.233
ERICSSON AIR 21 B2A	B	From Leg	4.000		0.000	125.000	No Ice	6.329	5.642	0.112
B4P w/ Mount Pipe			0.000				1/2" Ice	6.775	6.426	0.169
(E)			1.000				1" Ice	7.214	7.131	0.233
ERICSSON AIR 21 B2A	C	From Leg	4.000		0.000	125.000	No Ice	6.329	5.642	0.112
B4P w/ Mount Pipe			0.000				1/2" Ice	6.775	6.426	0.169
(E)			1.000				1" Ice	7.214	7.131	0.233
ERICSSON AIR 21 B4A	A	From Leg	4.000		0.000	125.000	No Ice	6.329	5.642	0.112
B2P w/ Mount Pipe			0.000				1/2" Ice	6.775	6.426	0.169
(E)			1.000				1" Ice	7.214	7.131	0.233
ERICSSON AIR 21 B4A	B	From Leg	4.000		0.000	125.000	No Ice	6.329	5.642	0.112
B2P w/ Mount Pipe			0.000				1/2" Ice	6.775	6.426	0.169
(E)			1.000				1" Ice	7.214	7.131	0.233
ERICSSON AIR 21 B4A	C	From Leg	4.000		0.000	125.000	No Ice	6.329	5.642	0.112
B2P w/ Mount Pipe			0.000				1/2" Ice	6.775	6.426	0.169
(E)			1.000				1" Ice	7.214	7.131	0.233
KRY 112 144/1	A	From Leg	4.000		0.000	125.000	No Ice	0.350	0.175	0.011
(E)			0.000				1/2" Ice	0.426	0.234	0.014
			1.000				1" Ice	0.509	0.301	0.019
KRY 112 144/1	B	From Leg	4.000		0.000	125.000	No Ice	0.350	0.175	0.011
(E)			0.000				1/2" Ice	0.426	0.234	0.014
			1.000				1" Ice	0.509	0.301	0.019
KRY 112 144/1	C	From Leg	4.000		0.000	125.000	No Ice	0.350	0.175	0.011
(E)			0.000				1/2" Ice	0.426	0.234	0.014
			1.000				1" Ice	0.509	0.301	0.019
RRUS 11 B12	A	From Leg	4.000		0.000	125.000	No Ice	2.833	1.182	0.051
(E)			0.000				1/2" Ice	3.043	1.330	0.072
			1.000				1" Ice	3.259	1.485	0.095
RRUS 11 B12	B	From Leg	4.000		0.000	125.000	No Ice	2.833	1.182	0.051
(E)			0.000				1/2" Ice	3.043	1.330	0.072
			1.000				1" Ice	3.259	1.485	0.095
RRUS 11 B12	C	From Leg	4.000		0.000	125.000	No Ice	2.833	1.182	0.051
(E)			0.000				1/2" Ice	3.043	1.330	0.072
			1.000				1" Ice	3.259	1.485	0.095
Platform Mount [LP 712-1]	C	None			0.000	125.000	No Ice	24.530	24.530	1.335
(E)							1/2" Ice	29.940	29.940	1.646
							1" Ice	35.350	35.350	1.956
hh										
APXVSP18-C-A20 w/	A	From Leg	4.000		0.000	113.000	No Ice	8.262	6.946	0.083
Mount Pipe			0.000				1/2" Ice	8.822	8.127	0.151
(E)			0.000				1" Ice	9.346	9.021	0.227
APXVSP18-C-A20 w/	B	From Leg	4.000		0.000	113.000	No Ice	8.262	6.946	0.083
Mount Pipe			0.000				1/2" Ice	8.822	8.127	0.151
(E)			0.000				1" Ice	9.346	9.021	0.227
APXVSP18-C-A20 w/	C	From Leg	4.000		0.000	113.000	No Ice	8.262	6.946	0.083
Mount Pipe			0.000				1/2" Ice	8.822	8.127	0.151
(E)			0.000				1" Ice	9.346	9.021	0.227
APXVTM14-C-120 w/	A	From Leg	4.000		0.000	113.000	No Ice	6.580	4.959	0.077
Mount Pipe			0.000				1/2" Ice	7.031	5.754	0.132
(E)			0.000				1" Ice	7.473	6.472	0.193
APXVTM14-C-120 w/	B	From Leg	4.000		0.000	113.000	No Ice	6.580	4.959	0.077
Mount Pipe			0.000				1/2" Ice	7.031	5.754	0.132
(E)			0.000				1" Ice	7.473	6.472	0.193

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Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} Front	C _{AA} Side	Weight	
			Horz Lateral	Vert						ft
APXVTM14-C-120 w/ Mount Pipe (E)	C	From Leg	4.000	0.000	0.000	113.000	No Ice	6.580	4.959	0.077
			0.000				1/2" Ice	7.031	5.754	0.132
			0.000				1" Ice	7.473	6.472	0.193
TD-RRH8x20-25 (E)	A	From Leg	4.000	0.000	0.000	113.000	No Ice	3.704	1.294	0.066
			0.000				1/2" Ice	3.946	1.465	0.090
			0.000				1" Ice	4.196	1.642	0.117
TD-RRH8x20-25 (E)	B	From Leg	4.000	0.000	0.000	113.000	No Ice	3.704	1.294	0.066
			0.000				1/2" Ice	3.946	1.465	0.090
			0.000				1" Ice	4.196	1.642	0.117
TD-RRH8x20-25 (E)	C	From Leg	4.000	0.000	0.000	113.000	No Ice	3.704	1.294	0.066
			0.000				1/2" Ice	3.946	1.465	0.090
			0.000				1" Ice	4.196	1.642	0.117
Platform Mount [LP 712-1] (E)	C	None			0.000	113.000	No Ice	24.530	24.530	1.335
							1/2" Ice	29.940	29.940	1.646
							1" Ice	35.350	35.350	1.956
hh										
PCS 1900MHz 4x45W-65MHz (E)	A	From Leg	1.000	0.000	0.000	111.000	No Ice	2.322	2.238	0.060
			0.000				1/2" Ice	2.527	2.441	0.083
			0.000				1" Ice	2.739	2.651	0.110
PCS 1900MHz 4x45W-65MHz (E)	B	From Leg	1.000	0.000	0.000	111.000	No Ice	2.322	2.238	0.060
			0.000				1/2" Ice	2.527	2.441	0.083
			0.000				1" Ice	2.739	2.651	0.110
PCS 1900MHz 4x45W-65MHz (E)	C	From Leg	1.000	0.000	0.000	111.000	No Ice	2.322	2.238	0.060
			0.000				1/2" Ice	2.527	2.441	0.083
			0.000				1" Ice	2.739	2.651	0.110
800MHz 2X50W RRH W/FILTER (E)	A	From Leg	1.000	0.000	0.000	111.000	No Ice	2.058	1.932	0.064
			0.000				1/2" Ice	2.240	2.109	0.086
			-2.000				1" Ice	2.429	2.293	0.111
800MHz 2X50W RRH W/FILTER (E)	B	From Leg	1.000	0.000	0.000	111.000	No Ice	2.058	1.932	0.064
			0.000				1/2" Ice	2.240	2.109	0.086
			-2.000				1" Ice	2.429	2.293	0.111
800MHz 2X50W RRH W/FILTER (E)	C	From Leg	1.000	0.000	0.000	111.000	No Ice	2.058	1.932	0.064
			0.000				1/2" Ice	2.240	2.109	0.086
			-2.000				1" Ice	2.429	2.293	0.111
Side Arm Mount [SO 102-3] (E)	C	None			0.000	111.000	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
hh										
5' x 2" Pipe Mount (E)	A	From Leg	4.000	0.000	0.000	100.000	No Ice	1.000	1.000	0.029
			0.000				1/2" Ice	1.393	1.393	0.037
			2.000				1" Ice	1.703	1.703	0.048
5' x 2" Pipe Mount (E)	B	From Leg	4.000	0.000	0.000	100.000	No Ice	1.000	1.000	0.029
			0.000				1/2" Ice	1.393	1.393	0.037
			2.000				1" Ice	1.703	1.703	0.048
5' x 2" Pipe Mount (E)	C	From Leg	4.000	0.000	0.000	100.000	No Ice	1.000	1.000	0.029
			0.000				1/2" Ice	1.393	1.393	0.037
			2.000				1" Ice	1.703	1.703	0.048
7'x2" Antenna Mount Pipe (E)	A	From Leg	4.000	0.000	0.000	100.000	No Ice	1.663	1.663	0.026
			0.000				1/2" Ice	2.391	2.391	0.039
			0.000				1" Ice	2.825	2.825	0.056
7'x2" Antenna Mount Pipe (E)	B	From Leg	4.000	0.000	0.000	100.000	No Ice	1.663	1.663	0.026
			0.000				1/2" Ice	2.391	2.391	0.039
			0.000				1" Ice	2.825	2.825	0.056
7'x2" Antenna Mount Pipe (E)	C	From Leg	4.000	0.000	0.000	100.000	No Ice	1.663	1.663	0.026
			0.000				1/2" Ice	2.391	2.391	0.039
			0.000				1" Ice	2.825	2.825	0.056
Platform Mount [LP 712-1]	C	None			0.000	100.000	No Ice	24.530	24.530	1.335

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Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment °	Placement ft	C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K
			Horz ft	Vert ft					
(E)							1/2" Ice 29.940 1" Ice 35.350	29.940 35.350	1.646 1.956
hh									
KS24019-L112A	C	From Leg	3.000	0.000	51.000	No Ice	0.141	0.141	0.005
(E)			0.000			1/2" Ice	0.198	0.198	0.007
			1.000			1" Ice	0.262	0.262	0.009
Side Arm Mount [SO 701-1]	C	From Leg	1.500	0.000	51.000	No Ice	0.850	1.670	0.065
(E)			0.000			1/2" Ice	1.140	2.340	0.079
			0.000			1" Ice	1.430	3.010	0.093
* Platform Ladders*									
Climbing Ladder (Flat)	A	From Leg	3.000	0.000	145.000	No Ice	5.844	5.844	0.048
			0.000			1/2" Ice	10.300	10.300	0.071
			0.000			1" Ice	14.756	14.756	0.094
Climbing Ladder (Flat)	A	From Leg	3.000	0.000	135.000	No Ice	5.844	5.844	0.048
			0.000			1/2" Ice	10.300	10.300	0.071
			0.000			1" Ice	14.756	14.756	0.094
Climbing Ladder (Flat)	A	From Leg	3.000	0.000	125.000	No Ice	5.844	5.844	0.048
			0.000			1/2" Ice	10.300	10.300	0.071
			0.000			1" Ice	14.756	14.756	0.094
Climbing Ladder (Flat)	A	From Leg	3.000	0.000	113.000	No Ice	5.844	5.844	0.048
			0.000			1/2" Ice	10.300	10.300	0.071
			0.000			1" Ice	14.756	14.756	0.094
Climbing Ladder (Flat)	A	From Leg	3.000	0.000	100.000	No Ice	5.844	5.844	0.048
			0.000			1/2" Ice	10.300	10.300	0.071
			0.000			1" Ice	14.756	14.756	0.094
**									
(2) 7770.00 w/ Mount Pipe	A	From Leg	4.000	0.000	145.000	No Ice	5.746	4.254	0.055
(E)			0.000			1/2" Ice	6.179	5.014	0.103
			1.000			1" Ice	6.607	5.711	0.157
(2) 7770.00 w/ Mount Pipe	B	From Leg	4.000	0.000	145.000	No Ice	5.746	4.254	0.055
(E)			0.000			1/2" Ice	6.179	5.014	0.103
			1.000			1" Ice	6.607	5.711	0.157
(2) 7770.00 w/ Mount Pipe	C	From Leg	4.000	0.000	145.000	No Ice	5.746	4.254	0.055
(E)			0.000			1/2" Ice	6.179	5.014	0.103
			1.000			1" Ice	6.607	5.711	0.157
(2) LGP21401	A	From Leg	4.000	0.000	145.000	No Ice	1.104	0.207	0.014
(E)			0.000			1/2" Ice	1.239	0.274	0.021
			0.000			1" Ice	1.381	0.348	0.030
(2) LGP21401	B	From Leg	4.000	0.000	145.000	No Ice	1.104	0.207	0.014
(E)			0.000			1/2" Ice	1.239	0.274	0.021
			0.000			1" Ice	1.381	0.348	0.030
(2) LGP21401	C	From Leg	4.000	0.000	145.000	No Ice	1.104	0.207	0.014
(E)			0.000			1/2" Ice	1.239	0.274	0.021
			0.000			1" Ice	1.381	0.348	0.030
(2) 782-10250	A	From Leg	4.000	0.000	145.000	No Ice	0.449	0.245	0.006
(E)			0.000			1/2" Ice	0.541	0.321	0.010
			0.000			1" Ice	0.641	0.404	0.015
(2) 782-10250	B	From Leg	4.000	0.000	145.000	No Ice	0.449	0.245	0.006
(E)			0.000			1/2" Ice	0.541	0.321	0.010
			0.000			1" Ice	0.641	0.404	0.015
(2) 782-10250	C	From Leg	4.000	0.000	145.000	No Ice	0.449	0.245	0.006
(E)			0.000			1/2" Ice	0.541	0.321	0.010
			0.000			1" Ice	0.641	0.404	0.015
(4) 7020.00	A	From Leg	4.000	0.000	145.000	No Ice	0.102	0.175	0.002
(E)			0.000			1/2" Ice	0.147	0.239	0.005
			1.000			1" Ice	0.199	0.311	0.009
(4) 7020.00	B	From Leg	4.000	0.000	145.000	No Ice	0.102	0.175	0.002

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	Client Crown Castle	Designed by CJangonda

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} Front	C _{AA} Side	Weight
			Horz	Lateral					
(E)			0.000						0.005
			1.000						0.009
(4) 7020.00	C	From Leg	4.000	0.000	145.000	No Ice	0.102	0.175	0.002
(E)			0.000			1/2" Ice	0.147	0.239	0.005
			1.000			1" Ice	0.199	0.311	0.009
(2) RRUS 11	A	From Leg	4.000	0.000	145.000	No Ice	2.784	1.187	0.048
(E)			0.000			1/2" Ice	2.992	1.334	0.068
			0.000			1" Ice	3.207	1.490	0.092
(2) RRUS 11	B	From Leg	4.000	0.000	145.000	No Ice	2.784	1.187	0.048
(E)			0.000			1/2" Ice	2.992	1.334	0.068
			0.000			1" Ice	3.207	1.490	0.092
(2) RRUS 11	C	From Leg	4.000	0.000	145.000	No Ice	2.784	1.187	0.048
(E)			0.000			1/2" Ice	2.992	1.334	0.068
			0.000			1" Ice	3.207	1.490	0.092
HPA-65R-BUU-H8 w/ Mount Pipe	A	From Leg	4.000	0.000	145.000	No Ice	13.213	9.582	0.100
(R)			0.000			1/2" Ice	13.899	11.052	0.196
			0.000			1" Ice	14.587	12.496	0.303
HPA-65R-BUU-H8 w/ Mount Pipe	B	From Leg	4.000	0.000	145.000	No Ice	13.213	9.582	0.100
(R)			0.000			1/2" Ice	13.899	11.052	0.196
			0.000			1" Ice	14.587	12.496	0.303
HPA-65R-BUU-H8 w/ Mount Pipe	C	From Leg	4.000	0.000	145.000	No Ice	13.213	9.582	0.100
(R)			0.000			1/2" Ice	13.899	11.052	0.196
			0.000			1" Ice	14.587	12.496	0.303
RRUS A2	A	From Leg	4.000	0.000	145.000	No Ice	2.066	0.498	0.022
(R)			0.000			1/2" Ice	2.245	0.607	0.035
			0.000			1" Ice	2.431	0.724	0.050
RRUS A2	B	From Leg	4.000	0.000	145.000	No Ice	2.066	0.498	0.022
(R)			0.000			1/2" Ice	2.245	0.607	0.035
			0.000			1" Ice	2.431	0.724	0.050
RRUS A2	C	From Leg	4.000	0.000	145.000	No Ice	2.066	0.498	0.022
(R)			0.000			1/2" Ice	2.245	0.607	0.035
			0.000			1" Ice	2.431	0.724	0.050
RRUS 11 B4	A	From Leg	4.000	0.000	145.000	No Ice	2.833	1.182	0.051
(R)			0.000			1/2" Ice	3.043	1.330	0.072
			0.000			1" Ice	3.259	1.485	0.095
RRUS 11 B4	B	From Leg	4.000	0.000	145.000	No Ice	2.833	1.182	0.051
(R)			0.000			1/2" Ice	3.043	1.330	0.072
			0.000			1" Ice	3.259	1.485	0.095
RRUS 11 B4	C	From Leg	4.000	0.000	145.000	No Ice	2.833	1.182	0.051
(R)			0.000			1/2" Ice	3.043	1.330	0.072
			0.000			1" Ice	3.259	1.485	0.095
8'x2" Antenna Mount Pipe	A	From Leg	4.000	0.000	145.000	No Ice	1.900	1.900	0.030
(E)			0.000			1/2" Ice	2.728	2.728	0.044
			0.000			1" Ice	3.401	3.401	0.064
8'x2" Antenna Mount Pipe	B	From Leg	4.000	0.000	145.000	No Ice	1.900	1.900	0.030
(E)			0.000			1/2" Ice	2.728	2.728	0.044
			0.000			1" Ice	3.401	3.401	0.064
8'x2" Antenna Mount Pipe	C	From Leg	4.000	0.000	145.000	No Ice	1.900	1.900	0.030
(E)			0.000			1/2" Ice	2.728	2.728	0.044
			0.000			1" Ice	3.401	3.401	0.064
Platform Mount [LP 712-1]	C	None		0.000	145.000	No Ice	24.530	24.530	1.335
(E)						1/2" Ice	29.940	29.940	1.646
						1" Ice	35.350	35.350	1.956

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Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 60 deg - No Ice
7	0.9 Dead+1.6 Wind 60 deg - No Ice
8	1.2 Dead+1.6 Wind 90 deg - No Ice
9	0.9 Dead+1.6 Wind 90 deg - No Ice
10	1.2 Dead+1.6 Wind 120 deg - No Ice
11	0.9 Dead+1.6 Wind 120 deg - No Ice
12	1.2 Dead+1.6 Wind 150 deg - No Ice
13	0.9 Dead+1.6 Wind 150 deg - No Ice
14	1.2 Dead+1.6 Wind 180 deg - No Ice
15	0.9 Dead+1.6 Wind 180 deg - No Ice
16	1.2 Dead+1.6 Wind 210 deg - No Ice
17	0.9 Dead+1.6 Wind 210 deg - No Ice
18	1.2 Dead+1.6 Wind 240 deg - No Ice
19	0.9 Dead+1.6 Wind 240 deg - No Ice
20	1.2 Dead+1.6 Wind 270 deg - No Ice
21	0.9 Dead+1.6 Wind 270 deg - No Ice
22	1.2 Dead+1.6 Wind 300 deg - No Ice
23	0.9 Dead+1.6 Wind 300 deg - No Ice
24	1.2 Dead+1.6 Wind 330 deg - No Ice
25	0.9 Dead+1.6 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

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Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	144.5 - 117.568	19.173	49	1.308	0.010
L2	121.409 - 112.58	13.157	49	1.120	0.006
L3	112.58 - 106	11.167	49	1.015	0.005
L4	106 - 103.5	9.814	49	0.946	0.004
L5	103.5 - 100.92	9.324	49	0.923	0.004
L6	100.92 - 98.5	8.831	49	0.904	0.004
L7	98.5 - 87.1178	8.378	49	0.880	0.004
L8	91.7428 - 83	7.179	49	0.814	0.003
L9	83 - 77.41	5.754	49	0.721	0.002
L10	77.41 - 77	4.945	49	0.660	0.002
L11	77 - 60.08	4.888	49	0.657	0.002
L12	60.08 - 58.5	2.865	49	0.485	0.001
L13	58.5 - 42.0418	2.707	49	0.469	0.001
L14	47.8178 - 31.25	1.778	49	0.362	0.001
L15	31.25 - 27.25	0.716	49	0.233	0.001
L16	27.25 - 0	0.538	49	0.192	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
149.500	Strobe	49	19.173	1.308	0.010	18763
147.000	Lightning Rod 5/8" x 5'	49	19.173	1.308	0.010	18763
146.000	Top Hat	49	19.173	1.308	0.010	18763
145.000	Climbing Ladder (Flat)	49	19.173	1.308	0.010	18763
135.000	LNx-6512DS-VTM w/ Mount Pipe	49	16.609	1.243	0.009	9875
125.000	LNx-6515DS-AIM w/ Mount Pipe	49	14.029	1.158	0.007	4817
113.000	APXVSP18-C-A20 w/ Mount Pipe	49	11.256	1.020	0.005	4628
111.000	PCS 1900MHz 4x45W-65MHz	49	10.832	0.998	0.005	4868
100.000	5' x 2" Pipe Mount	49	8.657	0.896	0.004	6174
51.000	KS24019-L112A	49	2.033	0.392	0.001	7000

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	144.5 - 117.568	105.022	22	7.171	0.056
L2	121.409 - 112.58	72.165	22	6.146	0.033
L3	112.58 - 106	61.272	22	5.575	0.027
L4	106 - 103.5	53.863	22	5.197	0.023
L5	103.5 - 100.92	51.181	22	5.071	0.021
L6	100.92 - 98.5	48.474	22	4.967	0.021
L7	98.5 - 87.1178	45.995	22	4.835	0.019
L8	91.7428 - 83	39.418	22	4.474	0.017
L9	83 - 77.41	31.600	22	3.962	0.013
L10	77.41 - 77	27.161	22	3.629	0.011
L11	77 - 60.08	26.851	22	3.612	0.011
L12	60.08 - 58.5	15.742	22	2.664	0.007
L13	58.5 - 42.0418	14.875	22	2.577	0.007

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Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L14	47.8178 - 31.25	9.769	22	1.992	0.005
L15	31.25 - 27.25	3.933	22	1.280	0.003
L16	27.25 - 0	2.955	22	1.054	0.002

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
149.500	Strobe	22	105.022	7.171	0.056	3549
147.000	Lightning Rod 5/8" x 5'	22	105.022	7.171	0.056	3549
146.000	Top Hat	22	105.022	7.171	0.056	3549
145.000	Climbing Ladder (Flat)	22	105.022	7.171	0.056	3549
135.000	LNx-6512DS-VTM w/ Mount Pipe	22	91.024	6.815	0.046	1867
125.000	LNx-6515DS-A1M w/ Mount Pipe	22	76.935	6.352	0.036	908
113.000	APXVSPPI8-C-A20 w/ Mount Pipe	22	61.764	5.601	0.027	863
111.000	PCS 1900MHz 4x45W-65MHz	22	59.442	5.479	0.026	906
100.000	5' x 2" Pipe Mount	22	47.524	4.921	0.020	1144
51.000	KS24019-L112A	22	11.170	2.155	0.005	1278

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
L1	144.5 - 117.568 (1)	TP26.882x21x0.188	26.932	0.000	0.0	15.387	-9.052	1034.750	0.009
L2	117.568 - 112.58 (2)	TP27.555x25.668x0.25	8.829	0.000	0.0	21.667	-12.605	1572.760	0.008
L3	112.58 - 106 (3)	TP28.962x27.555x0.418	6.580	0.000	0.0	37.857	-14.483	1570.470	0.009
L4	106 - 103.5 (4)	TP29.496x28.962x0.525	2.500	0.000	0.0	48.299	-15.109	1920.870	0.008
L5	103.5 - 100.92 (5)	TP30.047x29.496x0.69	2.580	0.000	0.0	64.283	-15.889	2557.700	0.006
L6	100.92 - 98.5 (6)	TP30.564x30.047x0.514	2.420	0.000	0.0	49.016	-18.173	1951.060	0.009
L7	98.5 - 87.1178 (7)	TP32.997x30.564x0.554	11.382	0.000	0.0	55.270	-20.060	2300.130	0.009
L8	87.1178 - 83 (8)	TP33.392x31.509x0.375	8.743	0.000	0.0	39.299	-23.025	2919.690	0.008
L9	83 - 77.41 (9)	TP34.596x33.392x0.563	5.590	0.000	0.0	60.798	-24.780	2788.290	0.009
L10	77.41 - 77 (10)	TP34.685x34.596x0.832	0.410	0.000	0.0	89.348	-24.962	4097.940	0.006
L11	77 - 60.08 (11)	TP38.33x34.685x0.605	16.920	0.000	0.0	72.464	-30.826	3380.560	0.009
L12	60.08 - 58.5 (12)	TP38.67x38.33x0.603	1.580	0.000	0.0	72.833	-31.389	3398.730	0.009
L13	58.5 - 42.0418 (13)	4.8.2 (1.00 CR) - 12 TP42.216x38.67x0.609	16.458	0.000	0.0	78.051	-35.865	3863.840	0.009
L14	42.0418 -	TP43.783x40.221x0.656	16.568	0.000	0.0	89.831	-45.269	4431.040	0.010

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Section No.	Elevation ft	Size	L ft	L _u ft	KI/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
L15	31.25 (14) 31.25 - 27.25 (15)	TP44.642x43.783x0.582	4.000	0.000	0.0	81.328	-47.125	4334.940	0.011
L16	27.25 - 0 (16)	4.8.2 (1.02 CR) - 15 TP50.5x44.642x0.817	27.250	0.000	0.0	128.885	-62.107	6409.970	0.010

Pole Bending Design Data

Section No.	Elevation ft	Size	M _{ux} kip-ft	φM _{ux} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{ux}}$	M _{uy} kip-ft	φM _{uy} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{uy}}$
L1	144.5 - 117.568 (1)	TP26.882x21x0.188	398.936	550.488	0.725	0.000	550.488	0.000
L2	117.568 - 112.58 (2)	TP27.555x25.668x0.25	631.892	881.950	0.716	0.000	881.950	0.000
L3	112.58 - 106 (3)	TP28.962x27.555x0.418	841.800	915.633	0.919	0.000	915.633	0.000
L4	106 - 103.5 (4)	TP29.496x28.962x0.525	923.417	1132.775	0.815	0.000	1132.775	0.000
L5	103.5 - 100.92 (5)	TP30.047x29.496x0.69	1008.350	1520.450	0.663	0.000	1520.450	0.000
L6	100.92 - 98.5 (6)	TP30.564x30.047x0.514	1092.692	1194.675	0.915	0.000	1194.675	0.000
L7	98.5 - 87.1178 (7)	TP32.997x30.564x0.554	1336.025	1473.525	0.907	0.000	1473.525	0.000
L8	87.1178 - 83 (8)	TP33.392x31.509x0.375	1659.908	1975.433	0.840	0.000	1975.433	0.000
L9	83 - 77.41 (9)	TP34.596x33.392x0.563	1872.100	1934.700	0.968	0.000	1934.700	0.000
L10	77.41 - 77 (10)	TP34.685x34.596x0.832	1887.808	2806.192	0.673	0.000	2806.192	0.000
L11	77 - 60.08 (11)	TP38.33x34.685x0.605	2553.067	2601.308	0.981	0.000	2601.308	0.000
L12	60.08 - 58.5 (12)	TP38.67x38.33x0.603	2616.917	2639.592	0.991	0.000	2639.592	0.000
L13	58.5 - 42.0418 (13)	TP42.216x38.67x0.609	3056.725	3184.025	0.960	0.000	3184.025	0.000
L14	42.0418 - 31.25 (14)	TP43.783x40.221x0.656	3767.742	3901.050	0.966	0.000	3901.050	0.000
L15	31.25 - 27.25 (15)	TP44.642x43.783x0.582	3943.800	3906.917	1.009	0.000	3906.917	0.000
L16	27.25 - 0 (16)	TP50.5x44.642x0.817	5178.600	6493.333	0.798	0.000	6493.333	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V _u K	φV _n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T _u kip-ft	φT _n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	144.5 - 117.568 (1)	TP26.882x21x0.188	25.723	517.374	0.050	2.720	1102.325	0.002
L2	117.568 - 112.58 (2)	TP27.555x25.668x0.25	31.027	786.379	0.039	3.450	1766.050	0.002
L3	112.58 - 106 (3)	TP28.962x27.555x0.418	32.526	785.235	0.041	3.447	1833.500	0.002
L4	106 - 103.5 (4)	TP29.496x28.962x0.525	32.786	960.433	0.034	3.446	2268.317	0.002
L5	103.5 - 100.92	TP30.047x29.496x0.69	33.073	1278.850	0.026	3.445	3044.617	0.001

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Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L6	100.92 - 98.5 (5)	TP30.564x30.047x0.514	35.671	975.528	0.037	4.183	2392.275	0.002
L7	98.5 - 87.1178 (6)	TP32.997x30.564x0.554	36.371	1150.070	0.032	4.180	2950.658	0.001
L8	87.1178 - 83 (7)	TP33.392x31.509x0.375	37.662	1459.840	0.026	6.362	3955.700	0.002
L9	83 - 77.41 (8)	TP34.596x33.392x0.563	38.291	1394.140	0.027	6.357	3874.125	0.002
L10	77.41 - 77 (9)	TP34.685x34.596x0.832	38.335	2048.970	0.019	6.357	5619.258	0.001
L11	77 - 60.08 (10)	TP38.33x34.685x0.605	40.332	1690.280	0.024	6.346	5208.975	0.001
L12	60.08 - 58.5 (11)	TP38.67x38.33x0.603	40.533	1699.360	0.024	6.346	5285.633	0.001
L13	58.5 - 42.0418 (12)	TP42.216x38.67x0.609	41.863	1931.920	0.022	6.064	6375.841	0.001
L14	42.0418 - 31.25 (13)	TP43.783x40.221x0.656	43.847	2215.520	0.020	6.060	7811.633	0.001
L15	31.25 - 27.25 (14)	TP44.642x43.783x0.582	44.228	2167.470	0.020	6.058	7823.383	0.001
L16	27.25 - 0 (15)	TP50.5x44.642x0.817	46.445	3204.990	0.014	6.056	13002.500	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio P_u ϕP_n	Ratio M_{ux} ϕM_{nx}	Ratio M_{uy} ϕM_{ny}	Ratio V_u ϕV_n	Ratio T_u ϕT_n	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	144.5 - 117.568 (1)	0.009	0.725	0.000	0.050	0.002	0.736	1.000	4.8.2 ✓
L2	117.568 - 112.58 (2)	0.008	0.716	0.000	0.039	0.002	0.726	1.000	4.8.2 ✓
L3	112.58 - 106 (3)	0.009	0.919	0.000	0.041	0.002	0.930	1.000	4.8.2 ✓
L4	106 - 103.5 (4)	0.008	0.815	0.000	0.034	0.002	0.824	1.000	4.8.2 ✓
L5	103.5 - 100.92 (5)	0.006	0.663	0.000	0.026	0.001	0.670	1.000	4.8.2 ✓
L6	100.92 - 98.5 (6)	0.009	0.915	0.000	0.037	0.002	0.925	1.000	4.8.2 ✓
L7	98.5 - 87.1178 (7)	0.009	0.907	0.000	0.032	0.001	0.916	1.000	4.8.2 ✓
L8	87.1178 - 83 (8)	0.008	0.840	0.000	0.026	0.002	0.849	1.000	4.8.2 ✓
L9	83 - 77.41 (9)	0.009	0.968	0.000	0.027	0.002	0.977	1.000	4.8.2 ✓
L10	77.41 - 77 (10)	0.006	0.673	0.000	0.019	0.001	0.679	1.000	4.8.2 ✓
L11	77 - 60.08 (11)	0.009	0.981	0.000	0.024	0.001	0.991	1.000	4.8.2 ✓
L12	60.08 - 58.5 (12)	0.009	0.991	0.000	0.024	0.001	1.001 ✗	1.000	4.8.2 ✗
L13	58.5 - 42.0418 (13)	0.009	0.960	0.000	0.022	0.001	0.970	1.000	4.8.2 ✓
L14	42.0418 - 31.25 (14)	0.010	0.966	0.000	0.020	0.001	0.976	1.000	4.8.2 ✓

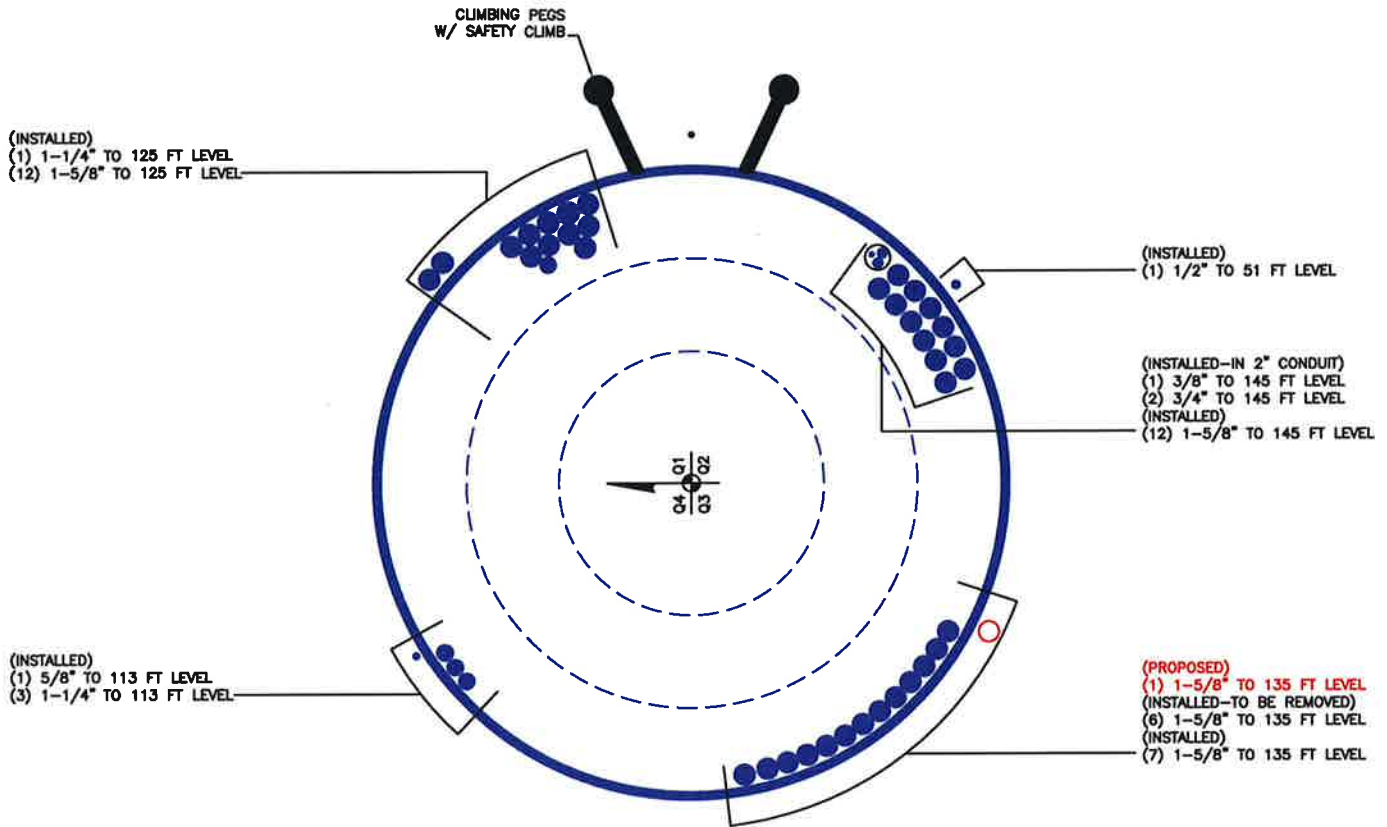
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Section No.	Elevation ft	Ratio P_u ϕP_n	Ratio M_{ux} ϕM_{ux}	Ratio M_{uy} ϕM_{uy}	Ratio V_u ϕV_n	Ratio T_u ϕT_n	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L15	31.25 - 27.25 (15)	0.011	1.009	0.000	0.020	0.001	1.021 X	1.000	4.8.2 X
L16	27.25 - 0 (16)	0.010	0.798	0.000	0.014	0.000	0.807 ✓	1.000	4.8.2 ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail	
L1	144.5 - 117.568	Pole	TP26.882x21x0.188	1	-9.052	1034.750	73.4	Pass	
L2	117.568 - 112.58	Pole	TP27.555x25.668x0.25	2	-12.605	1572.760	72.4	Pass	
L3	112.58 - 106	Pole	TP28.962x27.555x0.418	3	-14.483	1570.470	90.5	Pass	
L4	106 - 103.5	Pole	TP29.496x28.962x0.525	4	-15.109	1920.870	80.3	Pass	
L5	103.5 - 100.92	Pole	TP30.047x29.496x0.69	5	-15.889	2557.700	65.3	Pass	
L6	100.92 - 98.5	Pole	TP30.564x30.047x0.514	6	-18.173	1951.060	90.0	Pass	
L7	98.5 - 87.1178	Pole	TP32.997x30.564x0.554	7	-20.060	2300.130	89.3	Pass	
L8	87.1178 - 83	Pole	TP33.392x31.509x0.375	8	-23.025	2919.690	84.7	Pass	
L9	83 - 77.41	Pole	TP34.596x33.392x0.563	9	-24.780	2788.290	95.3	Pass	
L10	77.41 - 77	Pole	TP34.685x34.596x0.832	10	-24.962	4097.940	66.2	Pass	
L11	77 - 60.08	Pole	TP38.33x34.685x0.605	11	-30.826	3380.560	96.6	Pass	
L12	60.08 - 58.5	Pole	TP38.67x38.33x0.603	12	-31.389	3398.730	97.6	Pass	
L13	58.5 - 42.0418	Pole	TP42.216x38.67x0.609	13	-35.865	3863.840	94.2	Pass	
L14	42.0418 - 31.25	Pole	TP43.783x40.221x0.656	14	-45.269	4431.040	94.8	Pass	
L15	31.25 - 27.25	Pole	TP44.642x43.783x0.582	15	-47.125	4334.940	98.7	Pass	
L16	27.25 - 0	Pole	TP50.5x44.642x0.817	16	-62.107	6409.970	93.5	Pass	
							Summary		
							Pole (L15)	98.7	Pass
							RATING =	98.7	Pass

APPENDIX B
BASE LEVEL DRAWING



BUSINESS UNIT: 881533

APPENDIX C
ADDITIONAL CALCULATIONS

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

Bottom	Top	Qty	Model	Position	T or T&C
0	27.25	2	CCI-1.25x5.5	F	T&C
31.25	58.5	1	CCI-1.25x8.5	F	T&C
91.5	98.5	3	CCI-1x4.5	F	T&C
98.5	106	3	CCI-0.75x4	F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C

Bottom	Top	Qty	Model	Position	T or T&C
0	31.25	3	CCI-1.25x8.5	F	T&C
31.25	60.08	3	CCI-1.25x6.5	F	T&C
60.08	77.41	3	CCI-1.25x6.5	F	T&C
91.5	103.5	3	CCI-1x4.5	F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C

Bottom	Top	Qty	Model	Position	T or T&C
0	27.25	1	CCI-1.25x6.5	F	T&C
77	83	3	CCI-1x6	F	T&C
100.92	112.58	3	CCI-1x4.5	F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C

Rein1

Bottom	Top	Qty	Model	Position	T or T&C
1	2				
2	3				
3	4				
4	5				
5	6				
6	7				
7	8				
8	9				
9	10				
10	11				
11	12				
12	13				
13	14				
14	15				
15	16				
16	17				
17	18				

Rein2

Bottom	Top	Qty	Model	Position	T or T&C
1	2				
2	3				
3	4				
4	5				
5	6				
6	7				
7	8				
8	9				
9	10				
10	11				
11	12				
12	13				
13	14				
14	15				
15	16				
16	17				
17	18				

Rein3

Bottom	Top	Qty	Model	Position	T or T&C
1	2				
2	3				
3	4				
4	5				
5	6				
6	7				
7	8				
8	9				
9	10				
10	11				
11	12				
12	13				
13	14				
14	15				
15	16				
16	17				
17	18				

Reinforcement Capacity

Dimensions and Properties																					
Model	Weight (lb/ft)	Area (in ²)	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)	Compression			Axial			LRFD		
													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
CC-0.75x4	10.2	3.00	0.14	4.00	0.375	0	4	0	0	1.21875	65	80	0.80	16	1.00	16	31.6	108.9	Rupture	122.3	Rupture
CC-1x4.5	15.3	4.50	0.38	7.59	0.5	1	4.5	0	0	1.21875	65	80	0.80	20	1.00	20	328.8	171.7	Rupture	198.1	Rupture
CC-1x6	20.4	6.00	0.50	18.00	0.5	1	6	0	0	1.21875	65	80	0.80	16	1.00	16	318.8	251.7	Rupture	283.1	Rupture
CC-1.25x6.5	27.6	8.13	1.06	28.61	0.625	0	6.5	0	0	1.21875	65	80	0.80	19	1.00	19	360.4	347.2	Compress.	391.4	Rupture
CC-1.25x8.5	36.2	10.63	1.38	63.97	0.625	0	8.5	0	0	1.21875	65	80	0.80	17	1.00	17	350.9	467.9	Compress.	541.4	Rupture
CC-1.25x8.5	23.4	6.88	0.90	17.33	0.625	0	5.5	0	0	1.21875	65	80	0.80	21	1.00	21	210.9	281.3	Rupture	316.4	Rupture

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

Site Information	
ID:	881533
Name:	GROTON TOWER
App. #:	360907; Rev.1



AeroSolutions LLC
Optimizing Your Tower Infrastructure

Base Reactions	
Moment:	5179 ft-kip
Axial:	62 kip
Shear:	46 kip
Base Plate Type:	Circular

Design Information	
TIA Code:	G
ASIF:	1.000
Failure:	100%
eta Factor:	0.50

Original Anchor Rod Data	
Quantity:	16
Diameter:	2.25 in
Material:	A615 GR.75
Bolt Circle:	59.0 in
Bolt Spacing:	in
Bolt Group Area:	63.62 in ²
Bolt Group MOIx:	27698 in ⁴
Reactions Seen by Original AR Group	
Moment:	4049.2 kip-ft
Axial:	62.1 kip
Shear:	46.4 kip
Original AR Capacity Check	
Combined Load:	211.9 kip
Allowable load:	259.8 kip
AR Capacity:	81.6% Pass

First Added Anchor Rod Data	
Quantity:	7
Diameter:	1.75 in
Material:	F1554 GR.316
Bolt Circle:	62.6 in
Bolt Group Area:	16.84 in ²
Bolt Group MOIx:	7725 in ⁴
Reactions Seen by First Added AR Group	
Moment:	1129.4 kip-ft
Axial:	0.0 kip
Shear:	0.0 kip
First Added AR Capacity Check	
Combined Load:	131.9 kip
Allowable load:	189.9 kip
AR Capacity:	69.5% 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	
Combined 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	
Combined Load:	0.0 kip
Allowable load:	0.0 kip
AR Capacity:	0.0%

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

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

Site Data	
BU#:	881533
Site Name:	GROTON TOWER
App #:	360907; Rev. 1
Pole Manufacturer:	Other

Reactions		
Mu:	3979	ft-kips
Axial, Pu:	62	kips
Shear, Vu:	46	kips
Eta Factor, η	0.5	TIA G (Fig. 4-4)

Anchor Rod Data		
Qty:	16	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	59	in

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

Anchor Rod Results
 Max Rod (Cu+ Vu/η): 211.9 Kips
 Allowable Axial, Φ*Fu*Anet: 260.0 Kips
 Anchor Rod Stress Ratio: 81.5% **Pass**

Stiffened
AISC LRFD
φ*Tn

Plate Data		
Diam:	65	in
Thick:	2	in
Grade:	60	ksi
Single-Rod B-eff:	10.02	in

Base Plate Results
 Base Plate Stress: 34.7 ksi
 Allowable Plate Stress: 54.0 ksi
 Base Plate Stress Ratio: 64.3% **Pass**

Flexural Check

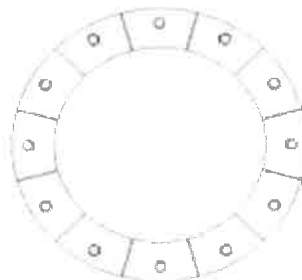
Stiffened
AISC LRFD
φ*Fy
Y.L. Length:
N/A, Roark

Stiffener Data (Welding at both sides)		
Config:	1	*
Weld Type:	Fillet	
Groove Depth:		<-- Disregard
Groove Angle:		<-- Disregard
Fillet H. Weld:	0.625	in
Fillet V. Weld:	0.375	in
Width:	6.75	in
Height:	17.75	in
Thick:	0.625	in
Notch:	0.75	in
Grade:	50	ksi
Weld str.:	70	ksi

Stiffener Results
 Horizontal Weld : 70.0% **Pass**
 Vertical Weld: 45.9% **Pass**
 Plate Flex+Shear, fb/Fb+(fv/Fv)^2: 29.3% **Pass**
 Plate Tension+Shear, ft/Ft+(fv/Fv)^2: 78.2% **Pass**
 Plate Comp. (AISC Bracket): 81.2% **Pass**

Pole Results
 Pole Punching Shear Check: 13.0% **Pass**

Pole Data		
Diam:	50.5	in
Thick:	0.4375	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None



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

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

Proj. Number 92739.007.01
Proj. Name Groton Tower, CT
Code Rev. G

Previously Added Anchor Rods

Diameter	1.75 in
Grade	F1554-105
Quantity	7
Bolt Circle	62.6 in

Existing Mfg Anchor Rods

Diameter	2.25 in
Quantity	16
Bolt Circle	59 in

Summary Output	
- Anchor Rod Bracket Checks	
Tube Stress:	76.2%
Max. Weld Stress:	54.1%

Analysis Criteria

Load for Calcs?	AR Capacity
Current Load	131.9 kips
Capacity	190 kips

Foundation Properties

Type	Pad
Pad Thickness	5 ft
f'_c	4000 psi
Clear Cover	3 inch
Pad Width	30 ft
	10
	18
	3

Tower Properties

F_{ypole}	65 ksi
F_{Upole}	80 ksi
F_{ybase}	60 ksi
F_{Ubase}	75 ksi

Anchor Rod Bracket Properties

Gusset Properties

Thickness	1.25 inch
Pole to Tube CL	6 inch
Height	30 inch
Width at Tube	4 inch
F_{yplate}	65 ksi
F_{Uplate}	80 ksi
Gap	0 inch
Notch	0.75 inch

Pipe /Tube Properties

Size	HSS4x4x1/2
L_{pipe}	27 inch
Length Above Gusset	3 inch
F_{ypipe}	46 ksi
D_{pipe}	4 inch
t_{pipe}	0.5 inch
A_{pipe}	6.02 inch ²
I_{pipe}	11.9 inch ⁴
r_{pipe}	1.41 inch

Weld Properties

F_{EXX}	70 ksi	Weld Material Grade
Load Angle	45 degrees	

- Bracket to Tube Weld

Weld Type	Double Fillet	
Fillet Size	5	Vertical fillet weld size in <u>sixteenths</u>
N/A	0.375 inch	
$l_{weldpipe}$	24 inch	Length of Vertical Weld to Pipe

- Bracket to Pole Weld

Weld Type	Double Fillet	
D_{vpole}	5	Vertical fillet weld size in <u>sixteenths</u>
H	30 inch	Height of vertical weld from base plate

- Gusset to Base Plate Weld

Weld Type	Double Bevel+Fillet	
Bevel Depth	0.5625 inch	Bevel depth in <u>inches</u>
Fillet Size	9	Fillet weld size in <u>sixteenths</u>

Additional Variables

C_1	1.00	Electrode Strength Coefficient
k_{rt}	0	Transverse Reinforcement Index :
ψ_t	1	Rebar Location Factor :

PROJECT	92739.007.01 - GROTON TOWER, CT		
SUBJECT	Foundation Analysis		
DATE	02/20/17	PAGE	1 OF 1



Monopole Pad & Pier Foundation Analysis

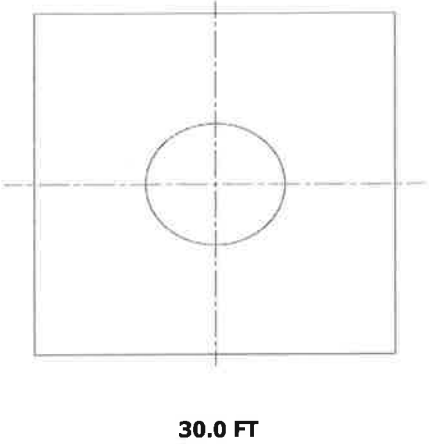
Rev. Type: **G**

Design Loads:

	Input factored loads	
Shear:	<u>46.0</u>	kips
Moment:	<u>5,179.0</u>	ft-kips
Tower Height:	<u>144.5</u>	ft
Tower Weight:	<u>62.0</u>	kips

Pad & Pier Dimensions / Properties:

Pole Diameter at Base:	<u>50.50</u>	in
Bearing Depth:	<u>5.0</u>	ft
Pad Width:	<u>30.0</u>	ft
Neglected Depth:	<u>3.3</u>	ft
Thickness:	<u>5.0</u>	ft
Pier Diameter:	<u>0.0</u>	ft
Pier Height Above Grade:	<u>0.0</u>	ft
BP Dist. Above Pier:	<u>0.0</u>	in
Clear Cover:	<u>3.0</u>	in
Pad Rebar Size:	<u>8</u>	
Pad Rebar Quantity:	<u>44</u>	
Rebar Yield Strength:	<u>60000</u>	psi
Concrete Strength:	<u>4000</u>	psi
Concrete Unit Weight:	<u>0.15</u>	kcf



Soil Data:

	Allowable Values	
Soil Unit Weight:	<u>0.120</u>	kcf
Ult. Bearing Capacity:	<u>24.000</u>	ksf
Angle of Friction:	<u>30.000</u>	deg
Cohesion:	<u>0.000</u>	ksf
Passive Pressure:	<u>0.000</u>	ksf
Base Friction:	<u>0.200</u>	

** Notes:

<u>Summary of Results</u>	
Overturning	55.9%
Shear Capacity	41.6%
Bearing	10.6%
Pad Shear - 1-way	26.5%
Pad Moment Capacity	35.8%

APPENDIX D
TOWER MODIFICATION DRAWINGS

TOWER MODIFICATION DRAWINGS PREPARED FOR: CROWN CASTLE

PROJECT CONTACTS:

1. CROWN PROJECT MANAGER

DAN VADNEY
(518) 373-3510
DAN.VADNEY@CROWNCastle.COM

2. CROWN CONSTRUCTION MANAGER

JASON D'AMICO
(860) 209-0104
JASON.D'AMICO@CROWNCastle.COM

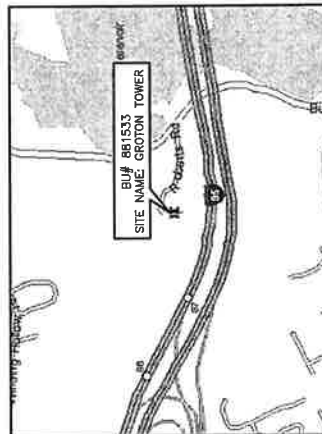
3. B+T GROUP RFI CONTACT

ROBERT M. FRAZIER, P.E.
(918) 587-4630
RFRAZIER@BTGRP.COM
MODDWGS@BTGRP.COM
1717 S BOULDER AVENUE, SUITE 300
TULSA, OK 74119

QUALIFIED ENGINEERING SERVICES ARE AVAILABLE FROM B+T GROUP TO ASSIST CONTRACTORS IN CLASS IV RIGGING PLAN REVIEWS. FOR REQUESTED QUALIFIED ENGINEERING SERVICES, PLEASE CONTACT B+T GROUP AT MODDWGS@BTGRP.COM.

SITE NAME: GROTON TOWER
BU NUMBER: 881533

SITE ADDRESS:
75 ROBERTS ROAD
GROTON, CT 06340
NEW LONDON COUNTY, USA



MAP

DIRECTIONS

95 N TO 117 S TO BUDDINGTON RD. RIGHT ON BUDDINGTON TO ROBERTS RD. LEFT ON ROBERTS RD TO TOP OF HILL. *NOTE* ZAKJAK PLOWS SITE

TOWER INFORMATION

TOWER MANUFACTURER / DWG #: EEI / GS62968
TOWER HEIGHT / TYPE: 144.5' MONOPOLE
TOWER LOCATION: LAT. 41° 21' 36.8"
LONG. -72° 2' 55.1"
DATUM: (NAD 1983) ELEV. 125 FT AMSL
STRUCTURAL DESIGN DRAWING REPORT: B+T GROUP / WO. # 1359797
STRUCTURAL ANALYSIS REPORT: B+T GROUP / WO. # 1307689
STRUCTURAL ANALYSIS DATE: 10/10/16
APPLICATION ID / REVISION #: 360907 / 1
CCSITES DOCUMENT ID: 6485746

CODE COMPLIANCE

THIS REINFORCEMENT DESIGN HAS BEEN PERFORMED IN ACCORDANCE WITH THE 2012 INTERNATIONAL BUILDING CODE BASED UPON AN ULTIMATE 3-SECOND GUST WIND SPEED OF 135 MPH CONVERTED TO A NOMINAL 3-SECOND GUST WIND SPEED OF 105 MPH PER SECTION 1609.3.1 AS REQUIRED FOR USE IN THE TIA-222-G STANDARD PER EXCEPTION #6 OF SECTION 1609.1.1. EXPOSURE CATEGORY C AND RISK CATEGORY II WERE USED IN THIS REINFORCEMENT DESIGN.

DRAWINGS INCLUDED

SHEET NUMBER	DESCRIPTION
S1	TITLE SHEET
S2	MODIFICATION INSPECTION NOTES AND CHECKLIST
S3	GENERAL NOTES
S4	NG2 BOLT NOTES AND DETAILS
S5	FORGBOLT NOTES AND DETAILS
S6	AJAX ONESIDE™ BOLT SPECIFICATIONS AND TIGHTENING PROCEDURE
S7	TOWER ELEV., SCHEDULE AND TX LINE DIST. DIAGRAM
S8	TOWER SECTIONS (0'-30', 27.25'-62.25' AND 97'-107') AND DETAIL
D1	PART DETAIL
D2	DETAILS

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.



**CROWN
CASTLE**

REV	DATE	DESCRIPTION
0	02/21/17	ISSUED FOR CONSTRUCTION

PROJECT NO:	92739.007.01
PROJECT ENG:	ROBERT M. FRAZIER
DRAWN BY:	SDP / GJS
CHECKED BY:	SSC
B+T ENGINEERING, INC. P.E.C. 0001564 Expires 02/10/18	



THIS IS A WARNING OF LAW FOR THE PROFESSION. UNLESS YOU ARE A LICENSED PROFESSIONAL ENGINEER, DO NOT ALTER THIS DOCUMENT.

GROTON TOWER
881533
75 ROBERTS ROAD
GROTON, CT
ENGINEERING 144.5' MONOPOLE

SHEET TITLE
TITLE SHEET

SHEET NUMBER: **S1**
REVISION: **0**



CROWN CASTLE

REV	DATE	DESCRIPTION
0	02/21/17	ISSUED FOR CONSTRUCTION
PROJECT NO: 92726.007.01		
PROJECT ENG: ROBERT M. FRAZIER		
DRAWN BY: SDP/GLS		
CHECKED BY: SSC		
B+T ENGINEERING, INC. REC-0001564 Expires 02/10/18		



GROTON TOWER 881533 75 ROBERTS ROAD GROTON, CT EXISTING 144.5 MONOPOLE
SHEET TITLE MODIFICATION INSPECTION NOTES AND CHECKLIST
SHEET NUMBER S2
REVISION 0

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 GENERAL CONTRACTOR (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 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 ENG-SOW-10007.

RECOMMENDATIONS AND SUGGESTIONS ARE OFFERED TO ENHANCE THE EFFICIENCY AND EFFECTIVENESS OF DELIVERING A 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 INSPECTION.
- 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 FOUNDATION AND MI INSPECTIONS(S) TO COMMENCE WITH ONE 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 DISPOSE OF 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 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 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
- WELD PREPARATION
- BOLT INSTALLATION AND TORQUE
- FINAL INSTALLED CONDITION
- SURFACE COATING REPAIR
- POST CONSTRUCTION PHOTOGRAPHS
- FINAL IN-FIELD CONDITION

VERIFICATION INSPECTION MAY BE CONDUCTED BY AN INDEPENDENT A/E/V/ESV FIRM AFTER A PHOTOGRAPHIC RECORD IS OBTAINED AND THE RESULTS OF AN ACCEPTED 'PASSING MI' OR 'PASS AS NOTED' MI REPORT FOR THE ORIGINAL PROJECT.

REQUIRED PHOTOS 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
- WELD PREPARATION
- BOLT INSTALLATION AND TORQUE
- FINAL INSTALLED CONDITION
- SURFACE COATING REPAIR
- POST CONSTRUCTION PHOTOGRAPHS
- FINAL IN-FIELD CONDITION

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

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

MI CHECKLIST

REQUIRED	REPORT ITEM	BRIEF DESCRIPTION
X	MI CHECKLIST DRAWING	THIS CHECKLIST SHALL BE INCLUDED IN THE MI REPORT.
X	FOR APPROVAL	ONCE THE PRE-MODIFICATION MAPPING IS COMPLETE AND PRIOR TO FABRICATION, THE CONTRACTOR SHALL PROVIDE DETAILED ASSEMBLY DRAWINGS AND/OR SHOP DRAWINGS AS NECESSARY FOR NON-STANDARD PARTS. THESE ARE TO INCLUDE, BUT ARE NOT LIMITED TO, A VISUAL LAYOUT OF NEW REINFORCEMENT, EXISTING REINFORCEMENT CONFIGURATION, PORTHOLES, ACCESS, SLEEVES, AND OTHER MODIFICATIONS ON THE TOWER. THESE DRAWINGS SHALL BE SUBMITTED TO THE EOR FOR APPROVAL. APPROVED ASSEMBLY/SHOP DRAWINGS SHALL BE SUBMITTED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
X	FABRICATION INSPECTION	A LETTER FROM THE FABRICATOR STATING THAT THE WORK WAS PERFORMED IN ACCORDANCE WITH INDUSTRY STANDARDS AND THE CONTRACT DOCUMENTS SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
N/A	FABRICATOR CERTIFIED WELD INSPECTION	A VISUAL OBSERVATION BY A CWI OF A PORTION OF THE PROPOSED STRUCTURAL MEMBERS IS REQUIRED AND A WRITTEN REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
X	MATERIAL TEST REPORT (MTR)	MILL CERTIFICATION SHALL BE PROVIDED FOR ALL STEEL AS SPECIFIED IN THE MODIFICATION DRAWINGS AND THIS DOCUMENTATION SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
N/A	FABRICATOR NDE INSPECTION	CRITICAL SHOP WELDS THAT REQUIRE TESTING (PER ENG-STD-10069) ARE NOTED ON THESE CONTRACT DRAWINGS. TESTING METHODS AND REPORTS SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
N/A	NDE REPORT OF MONOPOLE BASE PLATE	A NDE (PER ENG-SOW-10003) OF THE POLE TO BASE PLATE CONNECTION IS REQUIRED AND A WRITTEN REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
X	PACKING SLIPS	THE MATERIAL SHIPPING LIST SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
CONSTRUCTION (PERFORMED BY CONTRACTOR)		
X	CONSTRUCTION INSPECTIONS	A LETTER FROM THE GENERAL CONTRACTOR STATING THAT THE WORKMANSHIP WAS PERFORMED IN ACCORDANCE WITH INDUSTRY STANDARDS AND THESE CONTRACT DRAWINGS.
N/A	FOUNDATION INSPECTIONS	A VISUAL OBSERVATION OF THE EXCAVATION AND REBAR SHALL BE PERFORMED BEFORE PLACING THE CONCRETE. A WRITTEN REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
N/A	CONCRETE COMP. STRENGTH AND SLUMP TESTS	THE CONCRETE MIX DESIGN, SLUMP TEST, AND COMPRESSIVE STRENGTH TESTS SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
N/A	POST INSTALLED ANCHOR ROD VERIFICATION	POST INSTALLED ANCHOR ROD VERIFICATION SHALL BE PERFORMED IN ACCORDANCE WITH CROWN REQUIREMENTS AND A REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
N/A	BASE PLATE GROUT VERIFICATION	THE GENERAL CONTRACTOR SHALL PROVIDE DOCUMENTATION TO THE MI INSPECTOR THAT CERTIFIES THAT THE GROUT WAS INSTALLED IN ACCORDANCE WITH CROWN ENG-PRC-10012 FOR INCLUSION IN THE MI REPORT.
X	CONTRACTOR'S CERTIFIED WELD INSPECTION	A CERTIFIED WELD INSPECTOR SHALL INSPECT AND TEST AS NECESSARY ALL FIELD WELDS. CWI SHALL FOLLOW ALL THE PROCEDURES SPECIFIED IN CROWN STANDARD DOCUMENTS ENG-SOW-10066, ENG-STD-10069 AND SRY-STD-10159. A REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
N/A	EARTHWORK: LIFT AND DENSITY	FOUNDATION SUB-GRADES SHALL BE INSPECTED AND APPROVED BY A GEOTECHNICAL ENGINEER AND A REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
X	ON SITE COLD GALVANIZING VERIFICATION	THE GENERAL CONTRACTOR SHALL PROVIDE DOCUMENTATION TO THE MI INSPECTOR VERIFYING THAT ANY ON-SITE COLD GALVANIZING WAS APPLIED IN ACCORDANCE WITH ENG-BUL-10149.
N/A	GUY WIRE TENSION REPORT	THE GENERAL CONTRACTOR SHALL PROVIDE A REPORT TO THE MI INSPECTOR INDICATING THE TEMPERATURE AND TENSION IN EVERY GUY CABLE AS PART OF PLUMB AND TENSION PROCEDURE FOR INCLUSION IN THE MI REPORT.
X	GC AS-BUILT DOCUMENTS	THE GENERAL CONTRACTOR SHALL SUBMIT A COPY OF THE CONTRACT DRAWINGS EITHER STATING "INSTALLED AS DESIGNED" OR NOTING ANY CHANGES THAT WERE REQUIRED AND APPROVED BY THE ENGINEER OF RECORD.
POST-CONSTRUCTION		
X	MI INSPECTOR REDLINE OR RECORD DRAWINGS(S)	THE MI INSPECTOR SHALL OBSERVE AND REPORT ANY DISCREPANCIES BETWEEN THE CONTRACTORS REDLINE DRAWING AND THE ACTUAL COMPLETED INSTALLATION.
N/A	POST INSTALLED ANCHOR ROD PULL-OUT TESTING	POST-INSTALLED ANCHOR RODS SHALL BE TESTED IN ACCORDANCE WITH ENG-PRC-10119 AND A REPORT SHALL BE PROVIDED TO THE MI INSPECTOR FOR INCLUSION IN THE MI REPORT.
X	PHOTOGRAPHS	PHOTOGRAPHS SHALL BE SUBMITTED TO THE MI WHICH DOCUMENT ALL PHASES OF THE CONSTRUCTION. THE PHOTOS SHALL BE ORGANIZED IN A MANNER THAT EASILY IDENTIFIES THE EXACT LOCATION OF THE PHOTO.
ADDITIONAL TESTING AND INSPECTIONS:		
NOTE: X DENOTES A DOCUMENT NEEDED FOR THE MI REPORT AND N/A 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 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 ENG-BUL-10173 LIST OF 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 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 ENG-SOW-10007 : MODIFICATION INSPECTION SOW FOR FURTHER DETAILS AND REQUIREMENTS.



B+T GRP
1717 S. BOULDER AVE.
SUITE 300
LITTLE ROCK, AR 72118
PH: (501) 582-4650
www.btgrp.com

CROWN CASTLE

REV	DATE	DESCRIPTION
0	02/21/17	ISSUED FOR CONSTRUCTION

PROJECT NO: 92736.007.01
PROJECT ENG: ROBERT M. FRAZIER
DRAWN BY: SDP / G.S.
CHECKED BY: SSC

B+T ENGINEERING, INC.
31627
P.E.C.0001564
Expiree 02/10/18



IT IS A VIOLATION OF LAW FOR ANY PERSON, FIRM OR CORPORATION TO REPRODUCE THIS DRAWING WITHOUT THE PROFESSIONAL NUMBER TO APPEAR THEREON.

GROTON TOWER
881533
75 ROBERTS ROAD
GROTON, CT
EXISTING 144.5 MONOPOLE

SHEET TITLE
GENERAL NOTES

SHEET NUMBER: **S3**
REVISION: **0**

GENERAL NOTES

- 1.1 ALL WORK SHALL COMPLY WITH THE TM-222-G STANDARD AS WELL AS ANY OTHER GOVERNING BUILDING CODES.
- 1.2 FIELD WORK WILL BE DONE AROUND EXISTING CABLE AND EQUIPMENT. ALL WORK SHALL BE DONE IN A MANNER SUCH THAT THERE IS NO DAMAGE TO EXISTING STRUCTURE.
- 1.3 A MINIMUM OF TWO COATS OF ZINC-RICH COLD GALVANIZING COMPOUND (OR APPROVED EQUIVALENT) SHALL BE APPLIED TO ANY FIELD CUTS OR FIELD DRILLED HOLES.
- 1.4 THE USE OF A GAS TORCH OR WELDER WILL NOT BE PERMITTED ON THE TOWER WITHOUT THE CONSENT OF THE OWNER.
- 1.5 IN LIEU OF TEMPORARY BRACING CONTRACTOR MAY HAVE A STABILITY ANALYSIS PERFORMED BY AN ENGINEER LICENSED IN THE STATE THE TOWER IS LOCATED. THE ANALYSIS SHALL USE A MINIMUM WIND SPEED OF 45 MPH (3-SEC) PER TM-1019 PLANS AND RESISTIVE PLANS SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR FOR THE EXECUTION OF THE WORK CONTAINED HEREIN AND SHALL MEET ANSI/TIA-1019 (LATEST EDITION), OSHA AND GENERAL INDUSTRY STANDARDS. ALL RIGGING PLANS SHALL ADHERE TO ANSI/TIA-1019 (LATEST EDITION) INCLUDING THE REQUIRED INVOLVEMENT OF A QUALIFIED ENGINEER FOR CLASS IV CONSTRUCTION.
- 1.7 ALL THE PARTS STARTING WITH "CG-" DESIGNATION - REFER TO "CROWN CASTLE APPROVED REINFORCEMENT COMPONENTS CATALOGUE EDITION 1" FOR PART DETAILS.
- 1.8 BLIND BOLTS ARE TO BE 30MM DIAMETER WITH CORRESPONDING 30MM DIAMETER SLEEVE WITH SPECIFIED STEEL GRADE.
- 1.9 STIFFENER PLATE STEEL REINFORCING MAY BE COLD GALVANIZED AS FOLLOWS: APPLY A MINIMUM OF TWO COATS OF ZINC-RICH COLD GALVANIZING COMPOUND. FILM THICKNESS: 1-800-831-3275 FOR PRODUCT INFORMATION.
- 1.10 ALL SHIMS SHALL BE ASTM A36.
- 1.11 HOLES FOR BOLTS AND SHEAR SLEEVES ARE 30MM, U.N.O.
- 1.12 CUTTING AND REMOVING OF MATERIAL SHALL BE PERFORMED IN ACCORDANCE WITH THE FOLLOWING:
 - 1.12.1 IF THE MODIFICATION REQUIRES REMOVAL OF TOWER ID TAG, IT MUST BE REPLACED.
 - 1.12.2 IF THE MODIFICATION REQUIRES SAFETY CLIMB AND ALL PARTS THEREOF SHALL NOT BE IMPEDED, MODIFIED OR ALTERED WITHOUT THE EXPRESS APPROVAL OF THE ENGINEER OF RECORD OR TOWER OWNER.
- 1.13 WHERE POSSIBLE, CLIMBING HARDWARE SHOULD REMAIN IN-LINE ALONG THE POLE. IF AN OBSTRUCTION CAUSES A LATERAL OFFSET OF 2-00 OR MORE, CLIMBING ANCHORS SHALL BE PROVIDED AT EACH CHANGE IN ALIGNMENT. IF NEW REINFORCEMENT IS REQUIRED, CLIMBING HARDWARE SHALL BE REPLACED WITH A NEW HARDWARE.
- 1.14 ANY WORK PERFORMED WITHOUT A PREFABRICATION MAPPING IS DONE AT THE RISK OF THE GC AND/OR FABRICATOR.

FABRICATION

- 2.1 ALL WORK SHALL BE DONE IN ACCORDANCE WITH A.I.S.C. "SPECIFICATIONS FOR THE DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS".
- 2.2 STRUCTURAL STEEL SHALL MEET THE FOLLOWING SPECIFICATIONS:

YIELD	ASTM SPECS
65ksi	A572
- 2.3 ALL NEW MATERIAL INCLUDING STRUCTURAL STEEL AND FASTENERS SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 AND A153.
- 2.4 WELDING SHALL MEET ANSI/AWS D1.1 STRUCTURAL WELDING CODE (LATEST REVISION). ELECTRODES SHALL BE E60 SERIES.
- 2.5 CONTRACTOR SHALL PROVIDE SHOP FABRICATION DRAWINGS TO B+T GROUP 5 DAYS PRIOR TO FABRICATION.

FIELD NDE MINIMUM REQUIREMENTS

- 3.1 ALL NDE SHALL BE IN ACCORDANCE WITH AWS D1.1.
- 3.2 FOR NEW BASE STIFFENERS (INCLUDING OF TRANSITION STIFFENERS) AND ANCHOR ROD BRACKETS, COMPLETE JOINT PENETRATION WELDS SHALL BE 100% INSPECTED BY UT. ALL PARTIAL JOINT PENETRATION AND FILLET WELDS SHALL BE 100% INSPECTED BY UT.
- 3.3 FOR NEW FLAT PLATE REINFORCEMENT AT THE BASE OF THE TOWER, COMPLETE JOINT PENETRATION WELDS SHALL BE 100% INSPECTED BY UT. ALL PARTIAL JOINT PENETRATION AND FILLET WELDS SHALL BE 100% INSPECTED BY MT, BUT MAY BE LIMITED TO A HEIGHT OF 10'-0".
- 3.4 FOR NDE OF THE EXISTING BASE PLATE CIRCUMFERENTIAL WELD, GC SHALL REFERENCE THE MT CHECKLIST FOR APPLICABILITY. BASE PLATE CIRCUMFERENTIAL WELD AND ANCHOR ROD BRACKETS REQUIREMENTS FOR MONOPOLE IDENTIFIED IN PRESENT CONSTRUCTION FAILURE REPORT. THE E.O.R. AND CROWN ENGINEERING IMMEDIATELY IF ANY CRACKS ARE SUSPECTED OR HAVE BEEN IDENTIFIED. THE NDE SHALL INCLUDE ALL EXISTING MODIFICATIONS THAT HAVE BEEN WELDED TO THE BASE PLATE.
- 3.5 ALL TESTING LIMITATIONS SHALL BE NOTED IN THE NDE REPORT.

KEY NOTES

(E) TOWER MODIFICATION I.D.

B+T GRP
 1747 S BOULDER AVE
 SUITE 300
 BOULDER, CO 80502
 PH: (303) 440-4830
 WWW.B+TGRP.COM

CROWN CASTLE

REV	DATE	DESCRIPTION
0	02/21/17	ISSUED FOR CONSTRUCTION

PROJECT NO.: 82750.007.01
 PROJECT ENG: ROBERT M. FRAZER
 DRAWN BY: BOP / GLS
 CHECKED BY: SSC

B+T ENGINEERING, INC.
 PEC-0001564
 Expires: 02/10/18



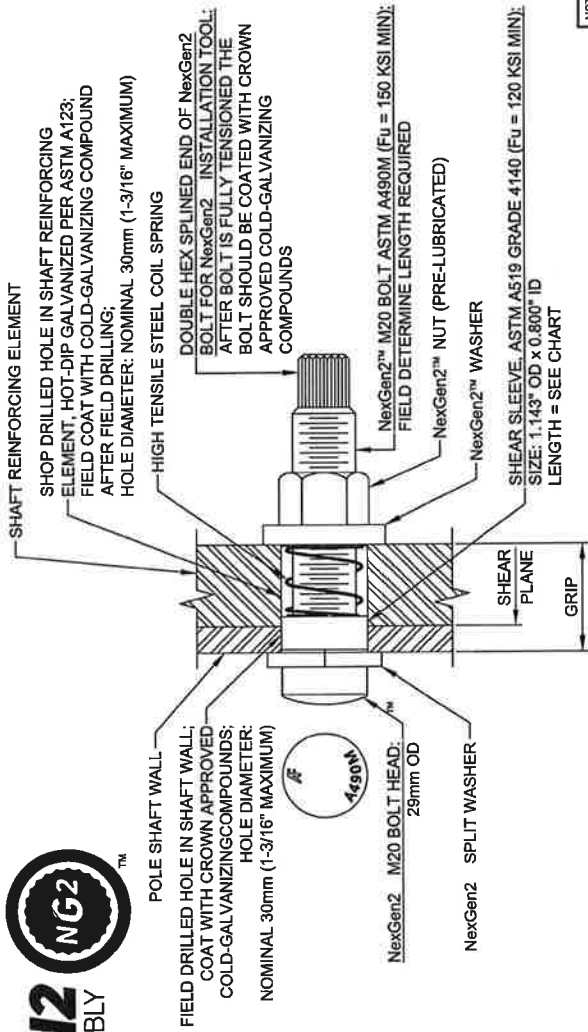
IT IS A VIOLATION OF LAW FOR ANY PERSON, FINDER OR CONTRACTOR TO REPRODUCE OR TRANSMIT THIS DOCUMENT TO ANY OTHER PERSON WITHOUT THE WRITTEN PERMISSION OF B+T GRP.

GROTON TOWER
 881653
 75 ROBERTS ROAD
 GROTON, CT
 EXISTING 144.5' MONOPOLE

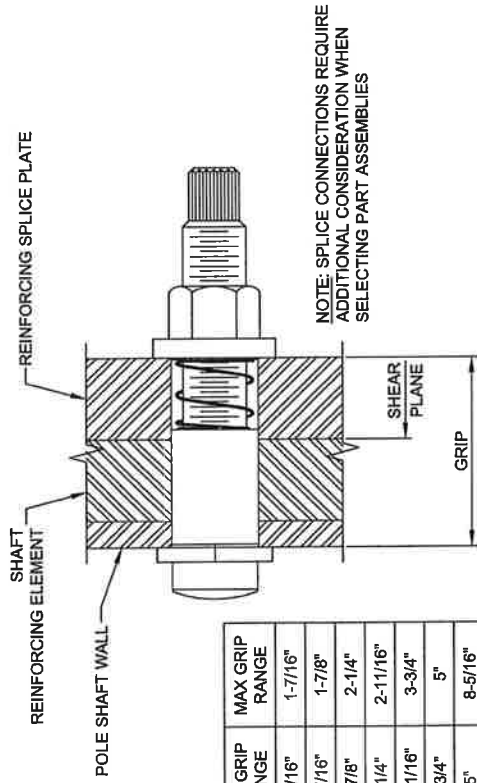
SHEET TITLE
 NG2 BOLT NOTES
 AND DETAILS

SHEET NUMBER: **S4**
 REVISION: **0**

EXTERIOR OF POLE SHAFT



TYPICAL NG2 BOLT DETAIL



NOTE: SPLICE CONNECTIONS REQUIRE ADDITIONAL CONSIDERATION WHEN SELECTING PART ASSEMBLIES

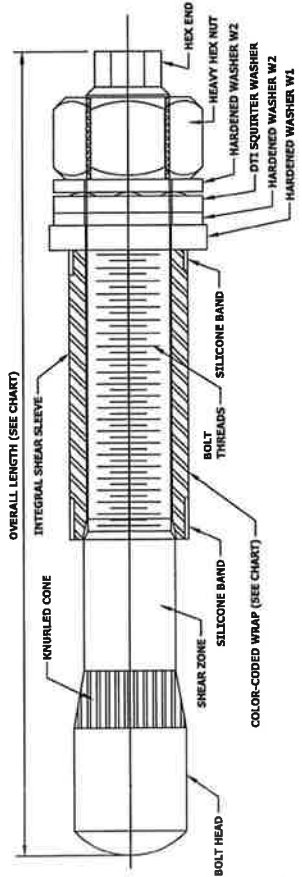
- NOTES:
- ALL STRUCTURAL BOLTS SHALL BE INSTALLED AND TIGHTENED TO THE PRE-TENSIONED CONDITION ACCORDING TO THE REQUIREMENTS OF THE ASC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009.
 - ALL STRUCTURAL BOLTS SHALL BE INSPECTED ACCORDING TO THE REQUIREMENTS OF THE ASC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009.
 - ALL SHOP AND FIELD DRILLED HOLES SHALL BE NOMINAL SIZE. THE MAXIMUM HOLE DIAMETER PERMITTED IS 1 3/16".
 - NexGen2™ COMPLETE ASSEMBLY SHALL BE MAGNI 565 COATED PER ASTM F2835 AS APPROPRIATE.
 - INSTALL PER MANUFACTURER'S INSTRUCTIONS.
- MANUFACTURER:
 ALLFASTENERS
 15400 COMMERCE PARK DRIVE
 FARMERSVILLE, OH 43024
 PHONE: 440-232-6060
 WEBSITE: WWW.ALLFASTENERS.COM



PART NUMBER	BOLT LENGTH	SLEEVE LENGTH	MIN GRIP RANGE	MAX GRIP RANGE
M20x36	M20x95	1-1/16"	15/16"	1-7/16"
M20x48	M20x95	1-3/16"	1-7/16"	1-7/8"
M20x57	M20x95	1-5/8"	1-7/8"	2-1/4"
M20x68	M20x135	2"	2-1/4"	2-11/16"
M20x96	M20x135	2-7/16"	2-11/16"	3-3/4"
M20x127	M20x165	3"	3-3/4"	5"
M20x212	M20x250	4"	5"	8-5/16"

FORGBoIt™ NOTE SHEET: A325/PC8.8 LANDSCAPE VERSION DATE 01/29/2015; Rev. 1.0 04/23/2015

- NOTES:**
1. ALL STRUCTURAL BOLTS SHALL BE INSTALLED AND TIGHTENED TO THE PRETENSIONED CONDITION ACCORDING TO THE REQUIREMENTS OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009.
 2. ALL STRUCTURAL BOLTS SHALL BE INSPECTED ACCORDING TO THE REQUIREMENTS OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009.



PRE-INSTALLED FORGBoIt™ ASSEMBLY DETAIL 1

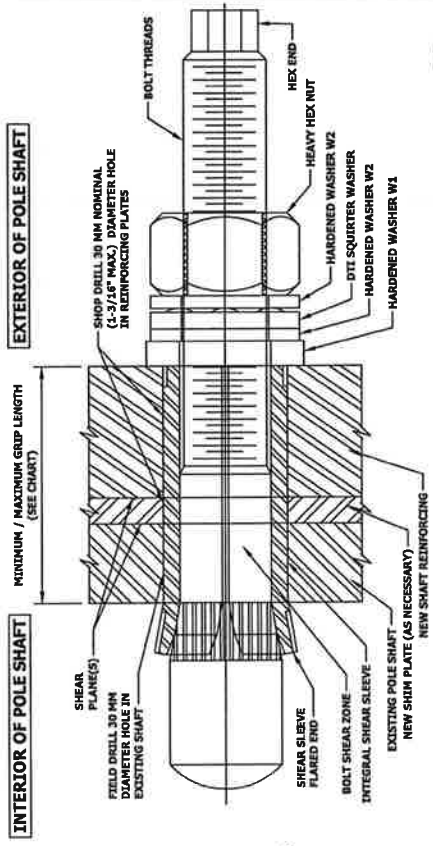
BOLT HOLE NOTES:

1. ALL SHOP-DRILLED HOLES SHALL BE NOMINAL 30 MM DIAMETER. THE MAXIMUM SHOP-DRILLED HOLE DIAMETER PERMITTED IS 1-3/16".
2. ALL FIELD-DRILLED HOLES SHALL BE NOMINAL 30 MM DIAMETER. THE MAXIMUM FIELD-DRILLED HOLE DIAMETER PERMITTED IS 30 MM.

FORGBoIt™ AISC Group A Material: ASTM A325 and PC8.8 (Tensile Stress, Fu = 120 ksi minimum)

GROUP	FORGBoIt™ Size (mm)	Overall Length (inches)	Estimated Weight Each (lbs)	Grip Range (inch)	Comment	Color Code
A	135	5.31	1.3	3/8" to 1"	--	RED
	160	6.30	1.6	3/4" to 1-1/2"	--	GREEN
	195	7.68	1.9	1-1/4" to 2-1/4"	--	BLUE
	260	10.24	2.6	2" to 3-1/2"	Splice Bolt	YELLOW
	365	14.37	3.6	3-1/2" to 5-1/2"	Flange Jump Bolt	ORANGE
	440	17.32	4.3	5-1/2" to 8-1/2"	Flange Jump Bolt	BLACK

DTI Note
Each Group A (A325/PC8.8) FORGBoIt™ assembly shall have a 'Squirter' DTI that is compatible with a M20-PC8.8 bolt.



INSTALLED FORGBoIt™ ASSEMBLY DETAIL 2

DISTRIBUTOR CONTACT:
PRECISION TOWER PRODUCTS
 PHONE: 888-926-4857
 EMAIL: info@precisiontowerproducts.com
 WEB: www.precisiontowerproducts.com
CONTAINS PROPRIETARY INFORMATION PATENT PENDING
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FORGBoIt™ Installation

Follow all Manufacturer/Distributor Recommendations for Installation, Tightening, and Inspection.

1. FIELD DRILL HOLES TO 30 MM DIAMETER.
2. SELECT CORRECT BOLT SIZE FOR INSTALLATION GRIP (REFER TO PLANS).
3. INSERT BOLT ASSEMBLY THROUGH HOLES IN SHAFT REINFORCING PLATES AND SEAT THE HARDENED WASHER W1 FLUSH AGAINST OUTSIDE OF PLATE.
4. HAND TIGHTEN NUT TO FINGER TIGHT.
5. TIGHTEN NUT TO PRETENSIONED CONDITION AND UNTIL DTI SHOWS PROPER INDICATION.
6. PROPERLY DOCUMENT AND INSPECT BOLT TIGHTENING PER PLAN REQUIREMENTS.

B+T GRP
 1777 S. BOULDER AVE
 SUITE 300
 FAYETTEVILLE, AR 72715
 PH: (816) 587-4850
 www.btgpp.com

CROWN CASTLE

REV	DATE	DESCRIPTION
0	02/21/17	ISSUED FOR CONSTRUCTION

PROJECT NO: 82736.007.01
 PROJECT ENG: ROBERT M. FRAIBER
 DRAWN BY: SDP / GLS
 CHECKED BY: SSC

B+T ENGINEERING, INC.
 REC-0001864
 Expires 02/10/18



I AM A MEMBER OF LAW FOR ANY PROFESSION, LICENSED PROFESSIONAL ENGINEER, LICENSE NO. 31627, PROFESSIONAL ENGINEER, STATE OF CONNECTICUT, EXPIRES 2/2/17

GROTON TOWER
 881633
 75 ROBERTS ROAD
 GROTON, CT
 EXISTING 144.5' MONOPOLE

SHEET TITLE
 FORGBOIT NOTES
 AND DETAILS

SHEET NUMBER: S5
 REVISION: 0



1717 S. BOULDER AVE.
SUITE 300
DULSA, OK 74719
PHONE: 405.466.1660
WWW.B+TGRP.COM

CROWN CASTLE

REV	DATE	DESCRIPTION
0	02/21/17	ISSUED FOR CONSTRUCTION

PROJECT NO: 42739.007.01
PROJECT ENG: ROBERT M. FRAZIER
DRAWN BY: SDP / G.S.
CHECKED BY: SSC

B+T ENGINEERING, INC.
PEC.0001564
Expires 02/10/18



IF A VOLUNTEER OF LAW FOR ANY PERSON, UNLESS PROFESSIONAL JUDGMENT IS MADE THAT OTHERWISE

GROTON TOWER
881553

75 ROBERTS ROAD
GROTON, CT

EXISTING 14.5' MONOPOLE

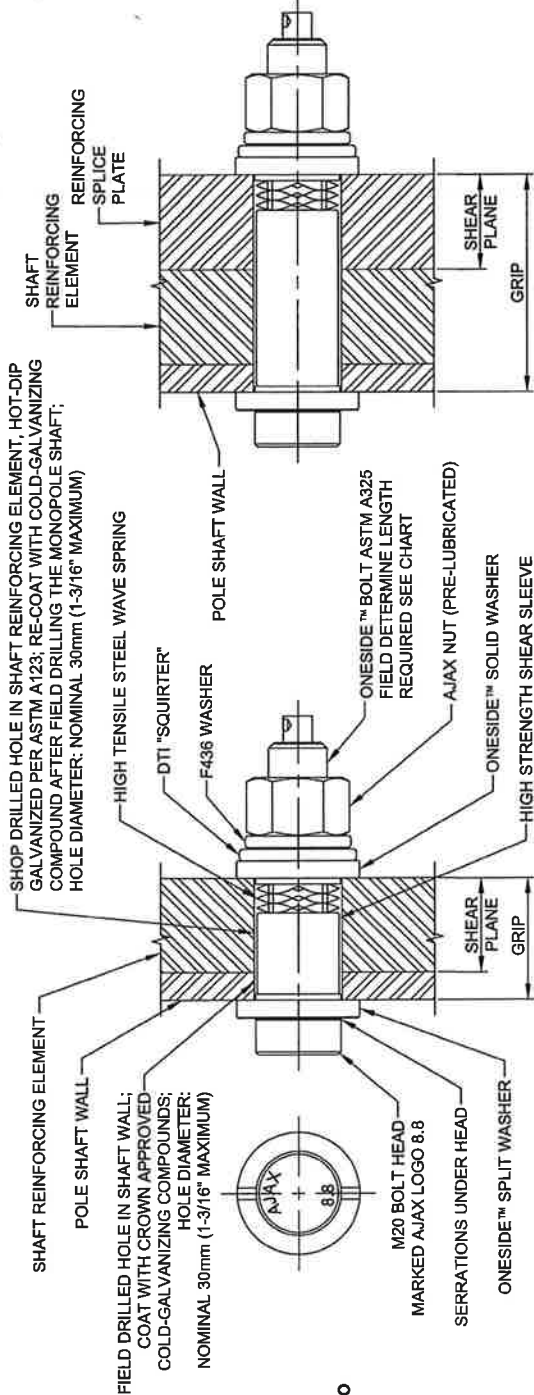
SHEET TITLE
AJAX ONESIDE™ BOLT
SPECIFICATIONS AND
TIGHTENING PROCEDURE

SHEET NUMBER
S6

REVISION
0

INTERIOR OF POLE SHAFT

EXTERIOR OF POLE SHAFT



NOTE:
SPICE CONNECTIONS REQUIRE
ADDITIONAL CONSIDERATION WHEN
SELECTING PART ASSEMBLIES

AJAX ONESIDE BOLT DETAIL

CODE	SIZE	COLOR	SLEEVE LENGTH	GRIP	GRIP IMP
OSBA20.65-6	M20 x 65	ORANGE	6.0 (0.236")	12.5 / 20.0	0.500" / 0.787"
OSBA20.95-14	M20 x 95	BLACK	14.0 (0.551")	20.0 / 32.0	0.787" / 1.259"
OSBA20.95-22	M20 x 95	GREEN	22.0 (0.866")	30.0 / 50.0	1.181" / 1.968"
OSBA20.95-30	M20 x 95	YELLOW	30.0 (1.181")	40.5 / 50.0	1.595" / 1.968"
OSBA20.135-39	M20 x 135	BLUE	39.0 (1.535")	49.0 / 77.0	1.929" / 3.031"
OSBA20.135-48	M20 x 135	BROWN	48.0 (1.889")	60.5 / 77.0	2.375" / 3.031"
OSBA20.135-57	M20 x 135	PURPLE	57.0 (2.244")	67.0 / 90.0	2.637" / 3.543"
OSBA20.165-76	M20 x 165	RED	76.0 (3.000")	87.0 / 120.0	3.425" / 4.724"
OSBA20.250	M20 x 250	SILVER	MTO	121.0 / 211.0	4.724" / 8.310"

BOLT ASSEMBLY AND INSTALLATION:

- BOLT MUST BE PURCHASED PRE-ASSEMBLED.
- FOLLOW BOLT AND DTI MANUFACTURERS INSTRUCTIONS FOR INSTALLATION.

INSPECTION:

- A MINIMUM OF 4 OUT OF 5 SQUIRTER® DTI PROTRUSIONS SHALL BE ENGAGED IN ANY AJAX/DTI BOLT ASSEMBLY IN THE REINFORCING MEMBERS. A FEELER GAGE MAY BE USED TO VERIFY PROTRUSION COMPRESSION.
- INSPECTIONS SHALL BE IN ACCORDANCE WITH THE MANUFACTURERS REQUIREMENTS AND CROWN DOCUMENT ENG-SOW-10007: MODIFICATION INSPECTION SOW.



PATENT US 7,373,709B2

MANUFACTURER INSTALLATION VIDEO



https://www.youtube.com/watch?v=ZGBS9del7Zsw&feature=em-share_video_user

MANUFACTURER
AJAX FASTENERS
SALES + TECH: ONESIDE@AJAXFAST.COM.AU

DISTRIBUTOR
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PETER SVENSGAARD - PETERS@IRASVENS.COM
JOHN KILLAM - JOHN@IRASVENS.COM
PHONE (530) 647-8225
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REV	DATE	DESCRIPTION
0	02/21/17	ISSUED FOR CONSTRUCTION

PROJECT NO: 82758.007/01
 DRAWN BY: ROBERT M. FRAZER
 CHECKED BY: SDF/GLS
 SBC

B+T ENGINEERING, INC.
 PEC 0001564
 Expires 02/10/18



IF IT IS A VIOLATION OF LAW FOR ANY REASON, WHICH REQUIRES THE PROFESSIONAL ENGINEER TO SIGN THIS DOCUMENT.

GROTON TOWER
 881533
 75 ROBERTS ROAD
 GROTON, CT
 EXISTING 144.9 MONOPOLE

SHEET TITLE
 TOWER ELEV., SCHEDULE
 AND TX LINE DIST. DIAGRAM

SHEET NUMBER: **S7**
 REVISION: **0**

CCI: FLAT PLATE-BILL OF MATERIALS (65KSI)

BOTTOM ELEVATION	TOP ELEVATION	FLAT PLATE DESIGNATION	FLAT PLATE LENGTH	FLAT PLATE QUANTITY	PLAT #	BOLETS PER PLATE	TOTAL BOLT QTY	TERMINATION BOLTS (BOTTOM)	TERMINATION BOLTS (TOP)	MAXIMUM INTERMEDIATE BOLT SPACING	TOTAL STEEL WEIGHT
0'-0"	30'-0"	CCI-WCFP-06S12530**	30'-0"	1	15	27	27	11	19"	829 LBS.	
0'-0"	30'-0"	CCI-WCFP-05S12530**	30'-0"	2	5, 6, 12	24	48	9	21"	1404 LBS.	
27'-3"	62'-3"	CCI-SFP-06S12535	35'-0"	1	7	49	49	15	17"	1284 LBS.	
97'-0"	107'-0"	CCI-SFP-04007510	10'-0"	3	4, 10 & 16	13	39	4	16"	306 LBS.	
							163			8603 LBS.	

** UNIQUE PART. SEE PART DETAIL SHEET D1
 ALL BOLTS SHALL BE PRE-APPROVED BLIND M20 BOLTS WITH HIGH STRENGTH SHEAR SLEEVES (ASTM A519 WITH MIN. Fu=120 KSI), CONTACT SUPPLIER FOR MATERIAL (PLATE AND BOLTS) AND INSTALLATION PROCEDURES.

NOTES:

- CONTRACTOR SHALL BE RESPONSIBLE FOR PROPER FITTING OF REINFORCEMENT ON MONOPOLES. SHIMS FOR MONOPOLE REINFORCEMENT MEMBER SHALL BE REQUIRED WHERE GAPS BETWEEN THE POLE SHAFT AND REINFORCING MEMBER EXIST AT FASTENER LOCATIONS. REFER TO MEMBER CONNECTIONS. THE MINIMUM SHIM PLATE THICKNESS SHALL BE THE THICKNESS OF THE REINFORCING MEMBER. INDIVIDUAL SHIM PLATES (PROPERLY ORIENTED) 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. FINGER SHIMS AND HORSESHOE SHIMS ARE PERMITTED. STACKED SHIMS SHALL BE NO GREATER THAN 1/4" WITHOUT E.O.R. APPROVAL.
- FOR PLATES STARTING AT 6", THE BOTTOM OF THE FLAT PLATE SHALL BEGIN AT 6" +/- 1". FOR SINGLE PLATES OR MULTIPLE PLATES SPLICED TOGETHER, THE BOTTOM OF THE FLAT PLATE RUN SHALL BEGIN AT THE PROPOSED ELEVATION +/- 3". FOR MULTIPLE PLATE SPLICES TOGETHER, THE TOP OF THE FLAT PLATE IS TO BE PLACED SUCH THAT THERE IS NO MORE THAN 3" DIFFERENCE BETWEEN THE ACTUAL OVERALL LENGTH OF THE SPAN AND THE PROPOSED OVERALL LENGTH OF THE SPAN, FROM THE BOTTOM OF THE BOTTOM PLATE TO THE TOP OF THE TOP PLATE.

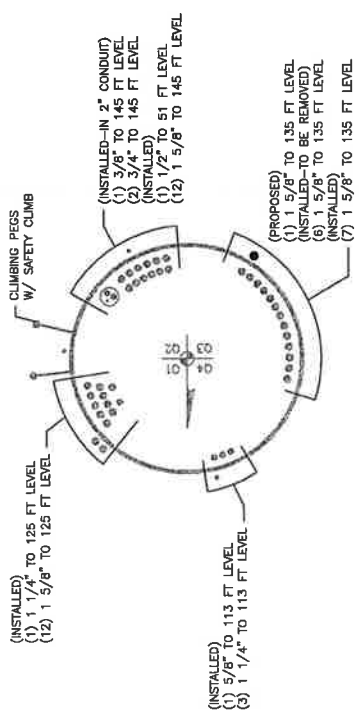
EXISTING MEMBER SCHEDULE

SECTION	NUMBER OF SIDES	THICKNESS	ASTM STEEL GRADE	Fy (ksi)	TOP DIAMETER	TOP LAP SPACE
1	18	0.438"	A572	65	50.500"	69"
2	18	0.375"	A572	65	42.215"	31.509"
3	18	0.250"	A572	65	32.997"	25.668"
4	18	0.188"	A572	65	26.682"	21.000"

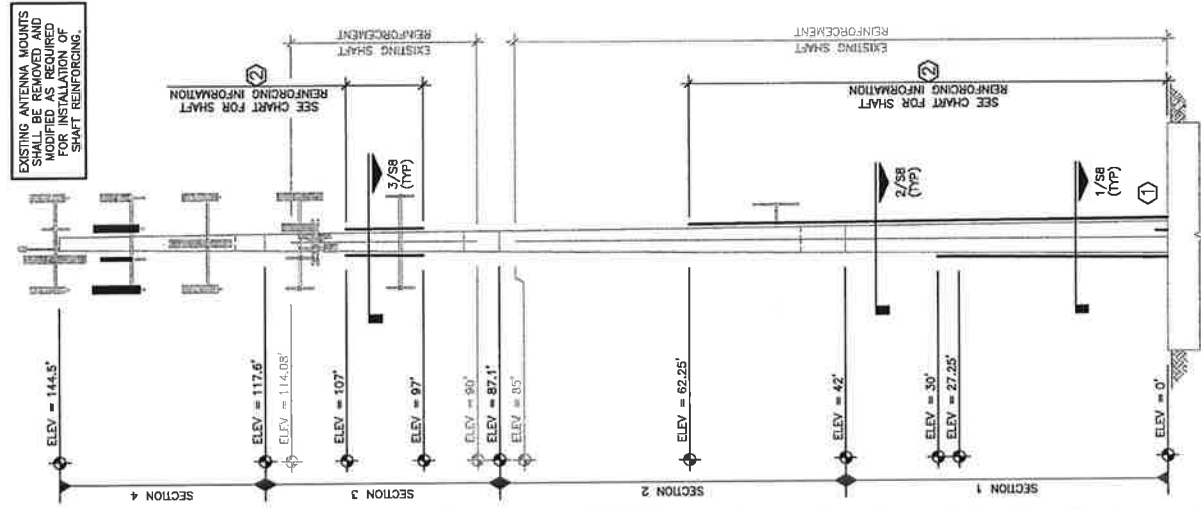
EXISTING BASE PLATE GRADE = 60' (ASTM GRADE = A572)

EXISTING TOWER HAS BEEN PREVIOUSLY MODIFIED

WALKER ENGINEERING INCORPORATED	DATE
VERTICAL STRUCTURES, INC.	08/01/07
CROWN CASTLE	11/25/08
B+T GROUP	02/25/14
B+T GROUP	07/23/15
B+T GROUP	10/20/15



1 TOWER ELEVATION
 SCALE: N.T.S.



1 TOWER ELEVATION
 SCALE: N.T.S.

TOWER MODIFICATIONS:

- REMOVE EXISTING BASE PLATE STIFFENER AND INSTALL NEW BASE PLATE STIFFENER AT 0' RE: SHEET SB.
- INSTALL NEW REINFORCING ELEMENTS FROM 0' TO 62.25' AND 97' TO 107' RE: SHEET SB.

* PRIOR TO FABRICATION AND INSTALLATION, CONTRACTOR SHALL BUDGET A SITE VISIT TO CHECK CRITICAL DIMENSIONS AND VERIFY ALL LENGTHS AND QUANTITIES GIVEN. LENGTH AND QUANTITY PROVIDED ARE FOR INFORMATION ONLY. CONTRACTOR SHALL NOT BE USED FOR FABRICATION. ANY WORK PERFORMED WITHOUT A PREFABRICATION MAPPING IS DONE AT THE RISK OF THE GENERAL CONTRACTOR AND/OR FABRICATOR.

** THE NEW AND EXISTING TRANSMISSION LINES MUST BE SHOWN AND AS NOTED ON THE TX LINE DIST. DIAGRAM RE: DETAIL 2/S7.

*** CONTRACTOR SHALL PROVIDE TEMPORARY BRACING FOR ALL REMOVE AND REPLACE PROCEDURES.

**** MODIFICATIONS SHALL BE COMPLETED PRIOR TO ADDING THE PROPOSED APPURTENANCES.

CROWN CASTLE

REV	DATE	DESCRIPTION
0	02/21/17	ISSUED FOR CONSTRUCTION

PROJECT NO: 92790007.01
 PROJECT ENG: ROBERT M. FRAZIER
 DRAWN BY: SDP / GJS
 CHECKED BY: SSC

B+T ENGINEERING, INC.
 PEC.0001564
 Expires 02/10/18



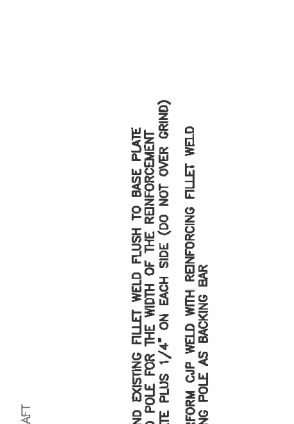
IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THE PERSON IS A LICENSED PROFESSIONAL ENGINEER, TO SEAL THIS DOCUMENT.

GROTON TOWER
 881533
 75 ROBERTS ROAD
 GROTON, CT
 EXISTING 144-F MONOPOLE

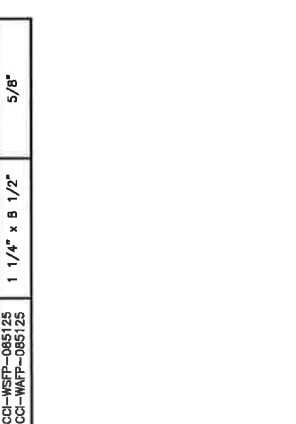
SHEET TITLE
 DETAILS

SHEET NUMBER
D2

REVISIONS
 0



1 WELD DETAIL-OPTION 1
 SCALE: N.T.S.



2 WELD DETAIL-OPTION 2
 SCALE: N.T.S.

- NOTES:
- GRIND EXISTING FILLET WELD FLUSH TO BASE PLATE AND POLE FOR THE WIDTH OF THE REINFORCEMENT PLATE PLUS 1/4" ON EACH SIDE (DO NOT OVER GRIND)
 - PERFORM CJP WELD WITH REINFORCING FILLET WELD USING POLE AS BACKING BAR

PART NUMBER	PLATE SIZE	MINIMUM REINFORCING WELD
CC-WSEF-040075 CC-WAFP-040075	3/4" x 4"	1/4"
CC-WSEF-045100 CC-WAFP-045100	1" x 4 1/2"	1/4"
CC-WSEF-060100 CC-WAFP-060100	1" x 6"	3/8"
CC-WSEF-085125 CC-WAFP-085125	1 1/4" x 6 1/2"	1/2"
CC-WSEF-085125 CC-WAFP-085125	1 1/4" x 8 1/2"	5/8"

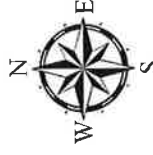
- NOTES:
- CLEAN EXISTING WELD FROM GALVANIZING
 - BUILD A PLATFORM WITH WELD AT THE SAME HEIGHT AS THE EXISTING WELD TO BUILD THE PLATFORM. ALLOWING FOR WELD TO BUILD THE PLATFORM. IT IS ALLOWABLE TO PARTIALLY GRIND THE HEIGHT OF THE EXISTING FILLET WELD TO A 1/4" MINIMUM
 - PERFORM CJP WELD WITH REINFORCING FILLET WELD USING POLE AS BACKING BAR

ATTACHMENT 4

Town of Groton



75 ROBERTS RD

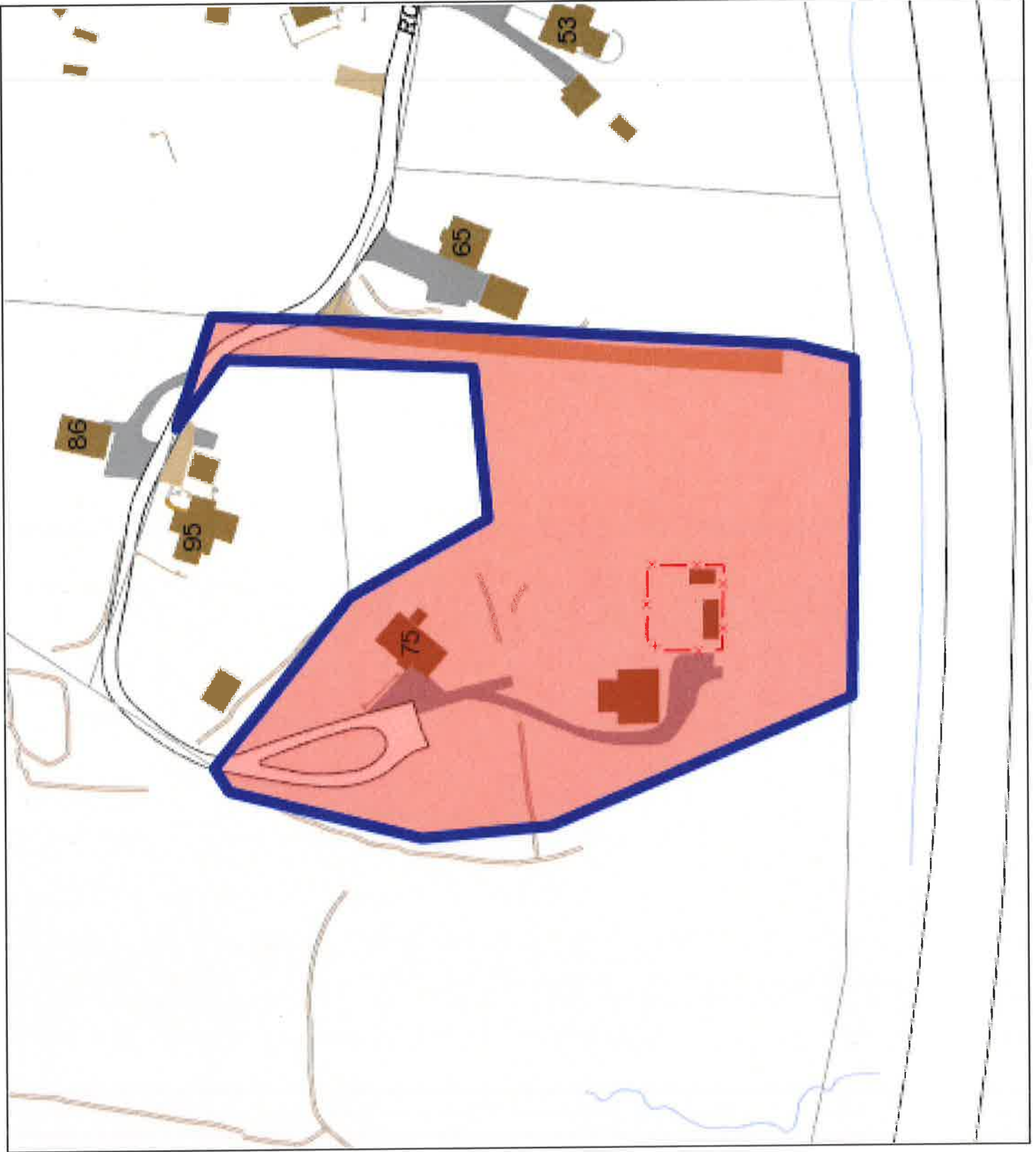


Disclaimer:

The planimetric and topographic information depicted on this map was compiled by The Sanborn Map Company based on an aerial flight performed in April 2009. The parcel and property line information shown on this map is derived from a combination of recorded deeds, maps, assessor records, and other sources of information in the Town of Groton. The intent of this map is to depict a graphical representation of real property information available to the planimetric features of the town or district. The Town of Groton and the mapping companies assume no legal responsibility for the information contained in this data. THIS MAP IS NOT TO BE USED FOR THE TRANSFER OF PROPERTY.

Horizontal Datum: Connecticut State Plane Coordinates, North American Datum of 1983 (NAD83 Feet)

Vertical Datum: North American Vertical Datum of 1988 (NAVD88)



Date: 3/8/2017

Residential Property Card

Print Date: 3/8/2017

Card 1 Of 1

Account 169914226707	Location 75 ROBERTS RD	Grand List Code RESIDENTIAL	Zoning RU-20	Acres 3.18
District POQUONNOCK BRIDGE	Neighborhood 1031	Deed Book/Page 1091/1053	Use Code SINGLE FAMILY	

Current Owner

STRICKLAND PHILIP A & PERROTTA DANIEL J
75 ROBERTS RD
GROTON CT 06340

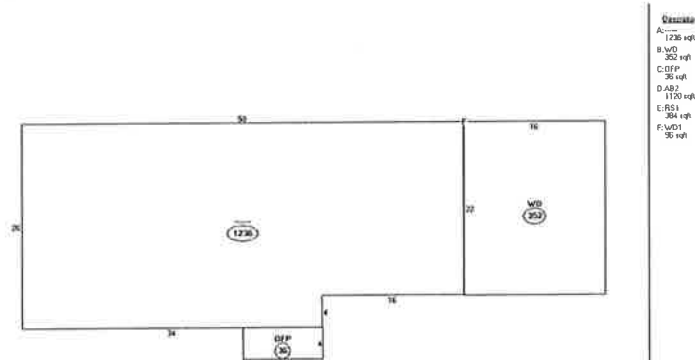
Property Picture



Building Information

Style:	RAISED RANCH
Exterior:	ALUM/VINYL
Attic:	NONE
Stories:	1
Basement:	FULL
Year Built:	1977
Tot Living Area:	2120 SqFt.
Fuel:	ELECTRIC
Heating:	BASIC
System:	ELECTRIC
Bedrooms:	4
Full Baths:	2
Half Baths:	

Building Sketch



Valuation

Land:	\$94,000
Building:	\$200,500
Total:	\$294,500
Assessed Value:	\$206,150

Recent Sales

Book/Page	Date	Price
1091/1053	5/4/2012	\$300,000
1091/1050	5/3/2012	\$0

Sketch Legend

— Main Living Area	ISMA Masonry	GRHS Attached Greenhouse
JFR Frame	OMP Open Masonry Porch	CAT Cathedral Ceiling
OFF Open Frame Porch	EMP Enclosed Msry Porch	SOP Screen Open Frame Prch
EFP Enclosed Frame Porch	MUB Masonry Utility	SMP Screen Open Msry Prch
FUB Frame Utility Building	MB Masonry Bay	CPAT Concrete Patio
FB Frame Bay	MOH Masonry Overhang	B Basement
FG Frame Garage	SMA 1/2 Story Masonry	
FOH Frame Overhang	MP Masonry Patio	
SFR 1/2 Story Frame	WD Wood Deck	
A(U) Attic (Unfinished)	CPY Canopy	
A(F) Attic (Finished)		