Robinson+Cole

KENNETH C. BALDWIN

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Also admitted in Massachusetts

January 15, 2015

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

Re: **Notice of Exempt Modification – Facility Modification**
363 Riversville Road, Greenwich, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) antennas at the 142-foot level of the existing 160-foot tower at 363 Riversville Road in Greenwich (the "Property"). The tower is owned by Crown Castle. Cellco's shared use of this tower was approved by the Council in 1994. Cellco now intends to modify its facility by replacing six (6) of its existing antennas with one (1) model BXA-70063-8CF, 700 MHz antenna; two (2) model DB844H80(E)-XY, 850 MHz antennas; three (3) model WWX063X19G00, 1900 MHz antennas, and adding three (3) model WWX063X19G00, 2100 MHz antennas, for a total of (15) antennas, all at the same 142-foot level on the tower. Cellco also intends to install six (6) remote radio heads ("RRHs") behind its 1900 MHz and 2100 MHz antennas and two (2) HYBRIFLEX™ antenna cables, inside the monopole tower. Included in Attachment 1 are specifications for Cellco's replacement and new antennas, RRHs and HYBRIFLEX™ cables.

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 Peter J. Tesei, First Selectman of the Town of Greenwich. A copy of this letter is also being sent to The Greenwich Council, Boy Scouts of America, Inc., the owner of the Property.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas and RRHs will be installed on its existing antenna platform at the 142-foot level of the 160-foot tower.

2. The proposed modifications will not involve any change to ground-mounted equipment and, therefore, will not require the extension of the site boundary.

3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.

4. The operation of the 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 can support Cellco's proposed modifications. (*See* Structural Analysis Report included in Attachment 3).

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

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
Peter J. Tesei, Greenwich First Selectman
The Greenwich Council, Boy Scouts of America, Inc.
Sandy M. Carter

ATTACHMENT 1

Amphenol ANTENNA SOLUTIONS

BXA-70063-8CF-EDIN-X

X-Pol | FET Panel | 63° | 16.0 dBd

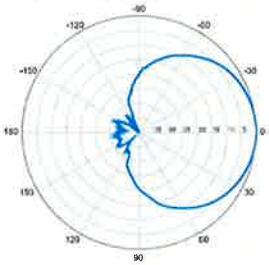
Replace "X" with desired electrical downtilt.

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

Electrical Characteristics	696-900 MHz	
Frequency bands	696-806 MHz	806-900 MHz
Polarization	±45°	
Horizontal beamwidth	65°	63°
Vertical beamwidth	9°	7°
Gain	15.5 dBd (17.6 dBi)	16.0 dBd (18.1 dBi)
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 7, 8, 10	
Impedance	50Ω	
VSWR	≤1.35:1	
Upper sidelobe suppression (0°)	-16.2 dB	-19.0 dB
Front-to-back ratio (+/-30°)	-32.9 dB	-31.3 dB
Null fill	5% (-26.02 dB)	
Isolation between ports	< -25 dB	
Input power with EDIN connectors	500 W	
Input power with NE connectors	300 W	
Lightning protection	Direct Ground	
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)	
Mechanical Characteristics		
Dimensions Length x Width x Depth	2405 x 285 x 132 mm	94.7 x 11.2 x 5.2 in
Depth with z-brackets	170 mm	6.7 in
Weight without mounting brackets	10.9 kg	24 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.69 m^2 Side: 0.31 m^2	Front: 7.4 ft^2 Side: 3.4 ft^2
Wind load @ 161 km/hr (100 mph)	Front:1031 N Side: 581 N	Front: 232 lbf Side: 129 lbf

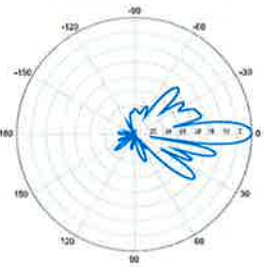
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-70063-8CF-EDIN-X-FP		

BXA-70063-8CF-EDIN-X



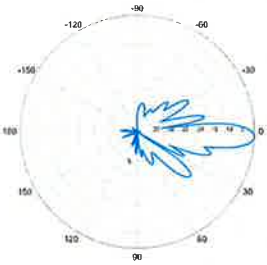
Horizontal | 750 MHz

BXA-70063-8CF-EDIN-0



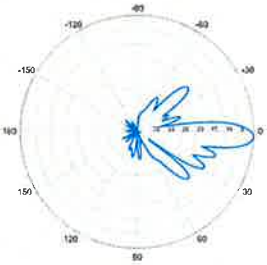
0° | Vertical | 750 MHz

BXA-70063-8CF-EDIN-2



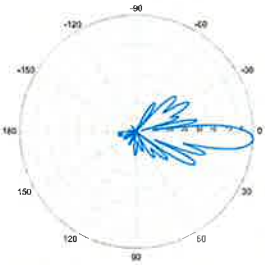
2° | Vertical | 750 MHz

BXA-70063-8CF-EDIN-3

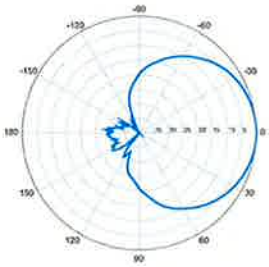


3° | Vertical | 750 MHz

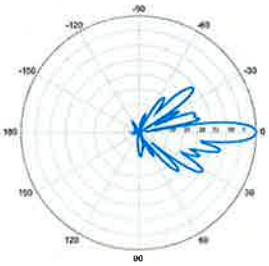
BXA-70063-8CF-EDIN-4



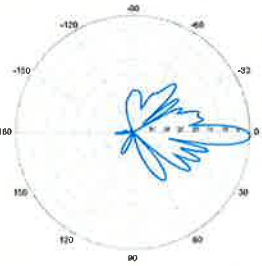
4° | Vertical | 750 MHz



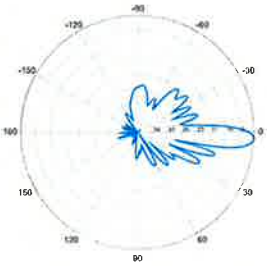
Horizontal | 850 MHz



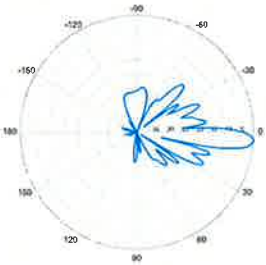
0° | Vertical | 850 MHz



2° | Vertical | 850 MHz



3° | Vertical | 850 MHz



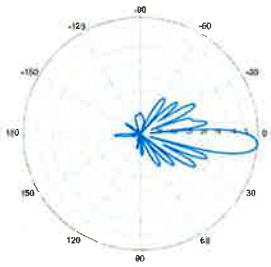
4° | Vertical | 850 MHz

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

BXA-70063-8CF-EDIN-X

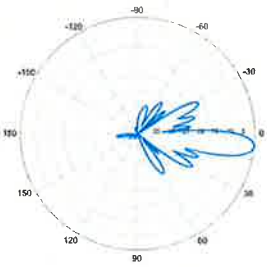
X-Pol | FET Panel | 63° | 16.0 dBd

BXA-70063-8CF-EDIN-5



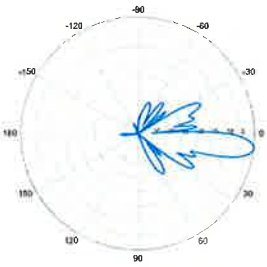
5° | Vertical | 750 MHz

BXA-70063-8CF-EDIN-6



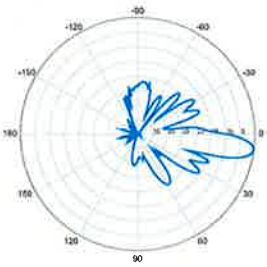
6° | Vertical | 750 MHz

BXA-70063-8CF-EDIN-7



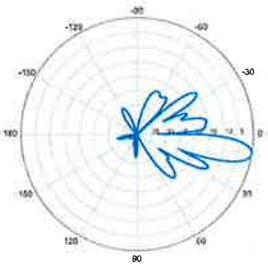
7° | Vertical | 750 MHz

BXA-70063-8CF-EDIN-8

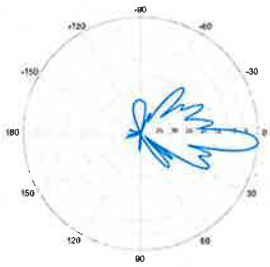


8° | Vertical | 750 MHz

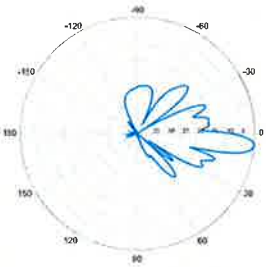
BXA-70063-8CF-EDIN-10



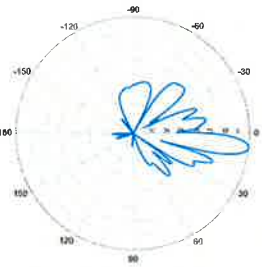
10° | Vertical | 750 MHz



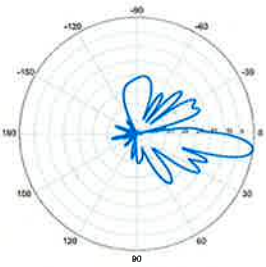
5° | Vertical | 850 MHz



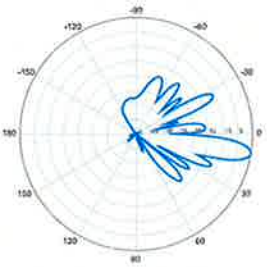
6° | Vertical | 850 MHz



7° | Vertical | 850 MHz



8° | Vertical | 850 MHz



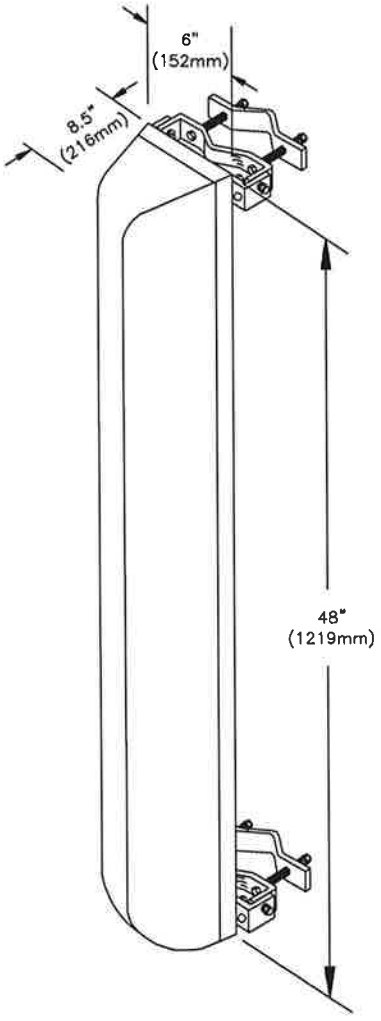
10° | Vertical | 850 MHz

DB844H80(E)-XY

dB Director®

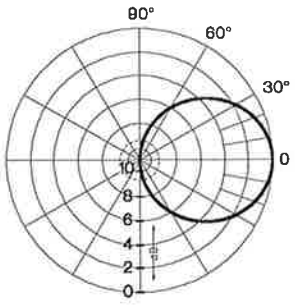
12.7 dBd, 80°, Directional Log Periodic Antenna

Model Number	DB844H80-XY	DB844H80E-XY
Termination	Type N-Female	7/16 DIN
Frequency Range	806-960 MHz	
Gain	12.7 dBd (14.8 dBi)	
VSWR	< 1.5:1	
Beamwidth (3dB from max)	Horizontal: 80° ± 5° Vertical: 15° ± 1°	
Front to Back Ratio	> 40 dB	
Polarization	Vertical	
Max. Input Power	500 Watts	
Application	Cellular, ESMR	
Weight	10 lbs (4.5 kg)	
Wind Area	2 ft² (0.19 m²)	
Wind Load	80 lbf (356N) 35.9 kp (at 100 mph)	
Max. Wind Speed	125 mph (200 km/h)	
Material	Radiators: Brass Back Panel: Pass. Aluminum Radome: ABS Mounting Hdw: Galvanized Steel	
Color	Normal: Gray	
Mounting	DB380 pipe mount kit (max. 3.5" OD), included.	
Downtilt Brackets (Optional)	DB5083	
Weather Protection	Fully protected by metal and ABS.	
Lightning Protection	All metal parts grounded.	
Packing Size	59" x 10" x 15" (150 x 25 x 38 cm)	
Shipping Weight	29 lbs (13 kg)	

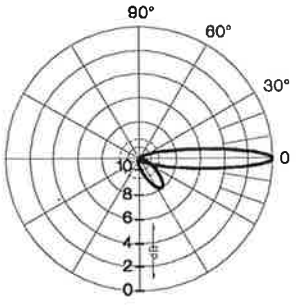


12.7 dBd (14.8 dBi) Gain Directional Log Periodic Antenna with 80° horizontal 3 dB beamwidth for 806-960 MHz.

Antenna Patterns



Horizontal



Vertical

Electrical Downtilt (T) Option

Model Number	Downtilt	Gain
DB844H80T6XY/844H80T6E-XY	6°	12.0 dBd
DB844H80T8XY/844H80T8E-XY	8°	11.7 dBd
844H80T11(- or E)XY	11°	11.7 dBd
844H80T13(- or E)XY	13°	11.5 dBd

Specifications are for reference only. 099089-000-M 04/00

DECIBEL PRODUCTS

A Division of Allen Telecom Inc.

8635 Stemmons Freeway • P. O. Box 569610 • Dallas, Texas 75356-9610

214 / 631-0310 • Fax: 214 / 631-4706

ALLEN TELECOM DECIBEL PRODUCTS

80°

WWX063X19x00

Twin Band | Panel Antenna | 2x X-Pol | 65° / 65° | 19.0 / 19.0 dBi | Variable Tilt

- Twin band, 2x X-Pol (Quad-Pol), variable tilt, panel antenna
- Part of Amphenol's UNIVERSAL series of antennas featuring consistent form factors for future-proofing
- Patented internal RET actuator adds no additional length to the antenna
- Can be used with our UNICELL 3-sector antenna enclosures
- Features an adjustable mounting bracket channel for custom mounting in any situation

Ordering Options	Model Number
When ordering, replace "x" in the model number with one of the options listed below.	
Manual Electrical Tilt	WWX063X19M00
Remote Electrical Tilt AISG v1.1	WWX063X19R00
Remote Electrical Tilt AISG v2.0 / 3GPP	WWX063X19G00
Mounting bracket kits and other accessories are ordered separately.	

Electrical Characteristics	2 x 1710-2170 MHz		
Frequency Bands	1710-1880 MHz	1850-1990 MHz	1900-2170 MHz
Polarization	2 x ±45° (Quad-Pol)		
Horizontal Beamwidth	70°	67°	66°
Vertical Beamwidth	5°	4.5°	4°
Gain	18.3 dBi	18.6 dBi	19.0 dBi
Electrical Downtilt	0-10°		
Impedance	50Ω		
VSWR	< 1.5:1		
Upper Sidelobe Suppression	< -17 dB Typical		
Front-to-Back Ratio	> 27 dB		
In-Band Isolation	> 30 dB		
Isolation Between Ports	> 30 dB		
IM3 (2x20W carrier)	< -153 dBc		
Input Power	250 W		
Total Number of Connectors	Antennas has 4 connectors located at the bottom		
Connectors Per Band, Type, Location — 1710-2170 MHz	2 Connectors / 7/16-DIN Female / Bottom / Blue Rings		
Connectors Per Band, Type, Location — 1710-2170 MHz	2 Connectors / 7/16-DIN Female / Bottom / White Rings		
Diplexed	No		
Lightning Protection	Direct Ground		
Operating Temperature	-40° to +60° C (-40° to +140° F)		

Mechanical Characteristics			
Dimensions (Length x Width x Depth)	1906 x 307.3 x 177.2 mm	75.0 x 12.1 x 7.0 in	
Weight without Mounting Brackets: MET	14.5 kg	32.0 lbs	
Weight without Mounting Brackets: RET	14.8 kg	32.7 lbs	
Survival Wind Speed	241 km/hr	150 mph	
Wind Loads (160 km/hr or 100 mph) — Front	707 N	159 lbf	
Wind Loads (160 km/hr or 100 mph) — Side	419 N	94 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.

WWX063X19x00

Twin Band | Panel Antenna | 2x X-Pol | 65° / 65° | 19.0 / 19.0 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 a module (MDCU) totally inserted at the bottom of the antenna. One single module controls individually the tilt of each band (no need of daisy chain cables between the bands). This module does not add any additional length at the bottom of the antenna. For RET control, the transparent cap must be in place and locked. The tilt angle indicator always remains visible and the antenna still has manual tilt control (manual override).		
RET Module	The RET module is factory installed and does not need to be ordered separately.		
	Part Number for AISG v1.1 protocol:	MDCU-A0000	One unit installed in WWX063X19R00
	Part Number for 3GPP/AISG v2.0 protocol:	MDCU-G0000	One unit installed in WWX063X19G00
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
All mounting bracket kits are ordered separately unless otherwise indicated. Select from the options listed below.				
3-Point Mounting Bracket Kit	MKS09P02		50-115 mm 2.0-4.5 in	4.1 kg 9 lbs
3-Point Mounting & Downtilt Bracket Kit	MKS09T02		50-115 mm 2.0-4.5 in	6.4 kg 14 lbs

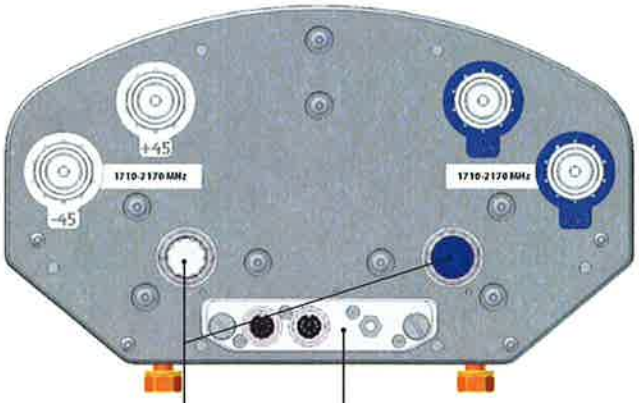
Configuration Options	Part Number	Image	Product Description
This antenna model can be used with Amphenol's UNICELL 3-sector antenna enclosures.			
UNICELL 3-Sector Antenna Enclosure	UNX-20-xx		3-Sector, 511 mm (20 inch) diameter antenna enclosure

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.

WWX063X19x00

Twin Band | Panel Antenna | 2x X-Pol | 65° / 65° | 19.0 / 19.0 dBi | Variable Tilt

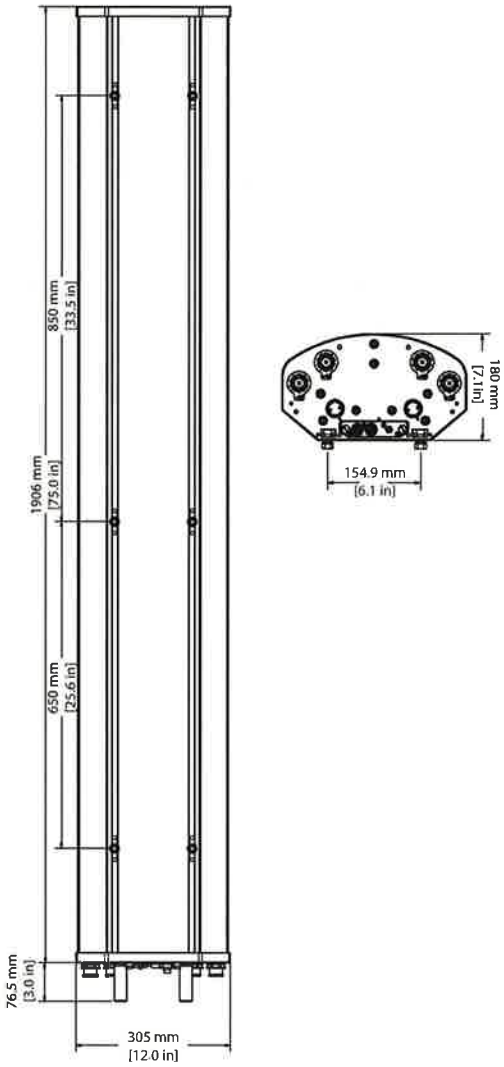
Bottom View of Antenna



Location of the MDCU
for RET Control

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

Dimensions

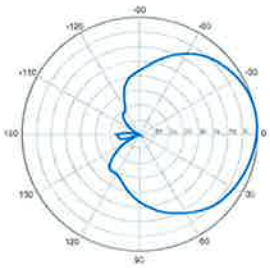


In order to operate RET control, the transparent caps covering the tilt adjustment indicators must be engaged and locked. Do not cut them from the antenna.

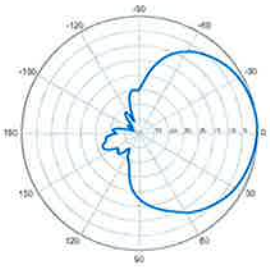
WWX063X19x00

Twin Band | Panel Antenna | 2x X-Pol | 65° / 65° | 19.0 / 19.0 dBi | Variable Tilt

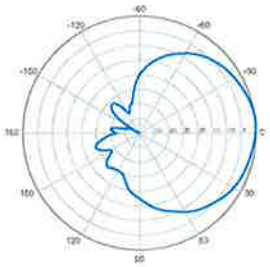
1710-2170 MHz



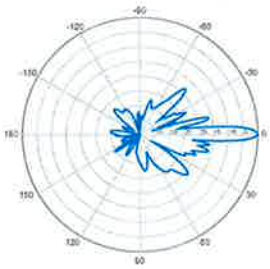
Horizontal | 1800 MHz



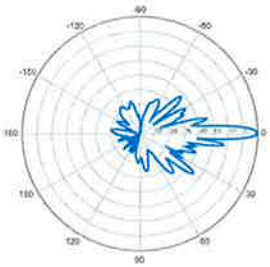
Horizontal | 1900 MHz



Horizontal | 2100 MHz



0° | Vertical | 1800 MHz



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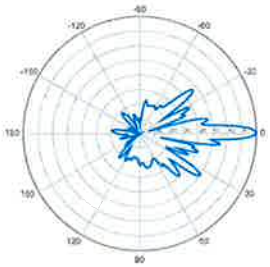

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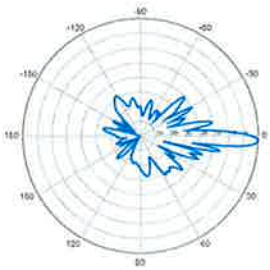

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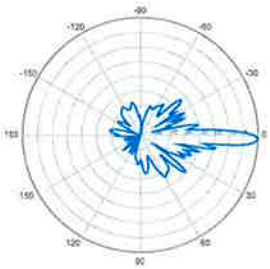

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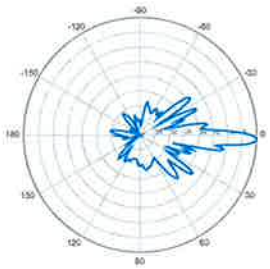
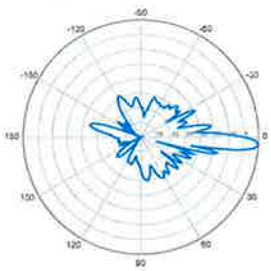


2° | Vertical | 2100 MHz



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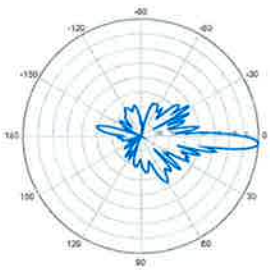
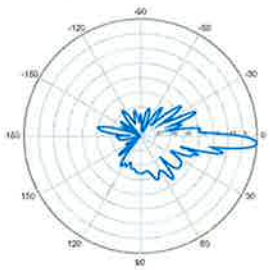
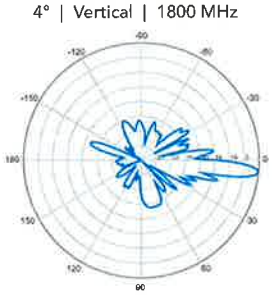


4° | Vertical | 1900 MHz



4° | Vertical | 2100 MHz



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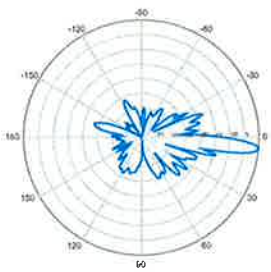
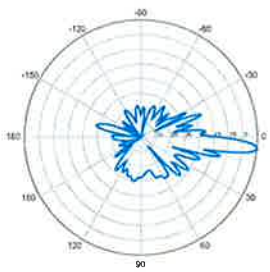


6° | Vertical | 1900 MHz

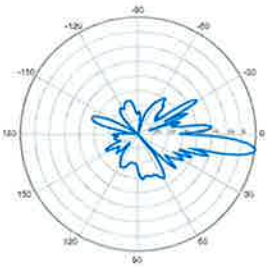


6° | Vertical | 2100 MHz

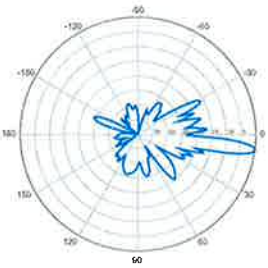
WWX063X19x00

Twin Band | Panel Antenna | 2x X-Pol | 65° / 65° | 19.0 / 19.0 dBi | Variable Tilt

1710-2170 MHz



8° | Vertical | 1800 MHz



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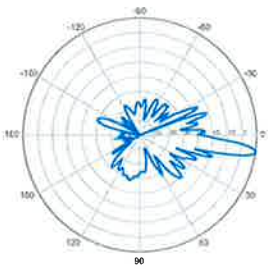

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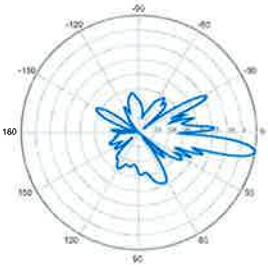
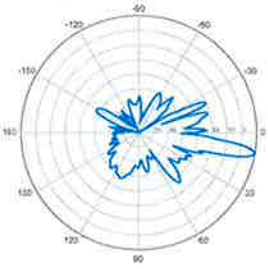
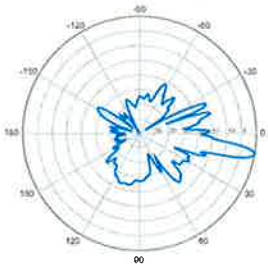


10° | Vertical | 1800 MHz



10° | Vertical | 1900 MHz



10° | Vertical | 2100 MHz

PCS RF MODULES

RRH1900 2X60 - HW CHARACTERISTICS

LA6.0.1/13.3

		RRH2x60
RF Output Power		2x60W
Instantaneous Bandwidth		20MHz
Transmitter		2 TX
Receiver	1900 HW version	2 Branch RX – LA6.0.1
	1900A HW version	4 Branch RX – LR13.3
Features		AISG 2.0 for RET/TMA
		Internal Smart Bias-T
Power		-48VDC
CPRI Ports		2 CPRI Rate 3 Ports
External Alarms		4 External User Alarms
Monitor Ports		TX
Environmental		GR487 Compliance
RF Connectors		7/16 DIN (top mounted)

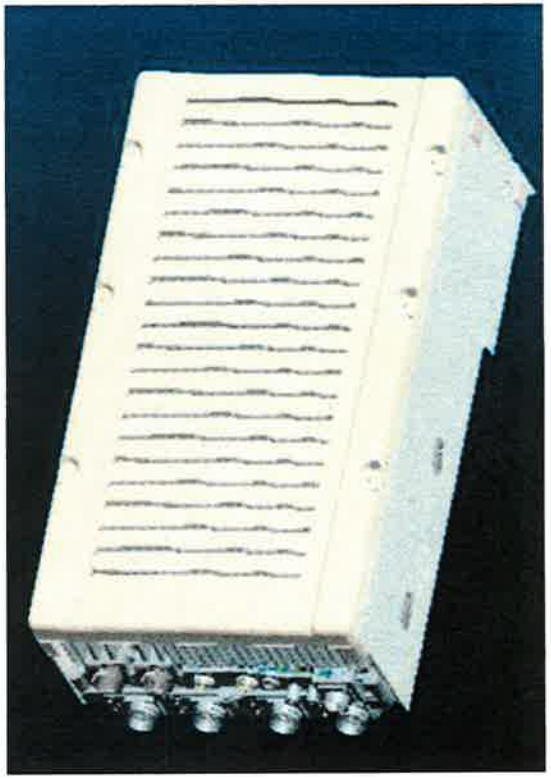
** Not a Verizon Wireless deployed product

Alcatel·Lucent

NEW PCS RF MODULES FOR VZW
RRH2X60 - HW CHARACTERISTICS

LR14.3

	RRH2x60
RF Output Power	2x60W (4x30W HW Ready)
Instantaneous Bandwidth	60MHz
Target Reliability (Annual Return Rate)	<2%
Receiver	4 Branch Rx
Features	AISG 2.0 for RET/TMA
Power	-48VDC
	Internal Smart Bias-T
CPRI Ports	2 CPRI Rate 5 Ports
External Alarms	4 External User Alarms
Monitor Ports	TX, RX
Environmental	GR487 Compliance
RF Connectors	7/16 DIN (downward facing)
Dimensions	22"(h) x 12"(w)x 9.4" (d)**
Weight	55lb**



**- Includes solar shield but not mounting brackets (8 lbs.)

Alcatel·Lucent

ALCATEL-LUCENT
WIRELESS PRODUCT DATASHEET
RRH2X60-AWS FOR BAND 4 APPLICATIONS

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

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

The Alcatel-Lucent RRH2x60-AWS is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information.

SUPERIOR RF PERFORMANCE

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

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

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

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

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

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

OPTIMIZED TCO

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

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

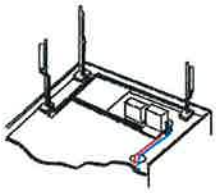
EASY INSTALLATION

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

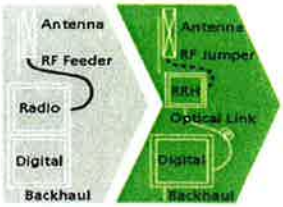
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

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

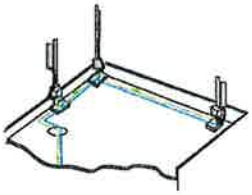
Installation can easily be done by a single person as the Alcatel-Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



Macro



RRH for space-constrained cell sites



Distributed

FEATURES

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

BENEFITS

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

TECHNICAL SPECIFICATIONS

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

Dimensions and weights

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

Electrical Data

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

RF Characteristics

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

Connectivity

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

Environmental specifications

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

Safety and Regulatory Data

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

AT THE SPEED OF IDEAS™

Alcatel·Lucent

Product Data Sheet **HB158-1-08U8-S8J18**

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 CELLFLEX² accessories can be used with HYBRIFLEX cable. Both pre-connectorized and on-site options are available.

Figure 1: HYBRIFLEX Series

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

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)]	.068 (0.205)
DC-Resistance Power Cable 8.4mm²/8AWG)		[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)		[mm² (AWG)]	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		[mm² (AWG)]	0.8 (18)
Quantity, Wire Count (Alarm)			4 (2 pairs)
Type			UV protected
Strands			19
Primary Jacket Diameter, Nominal		[mm (in)]	6.8 (0.27)
Standards (Meets or exceeds)			NFPA 130, ICEA S-95-658 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to149)

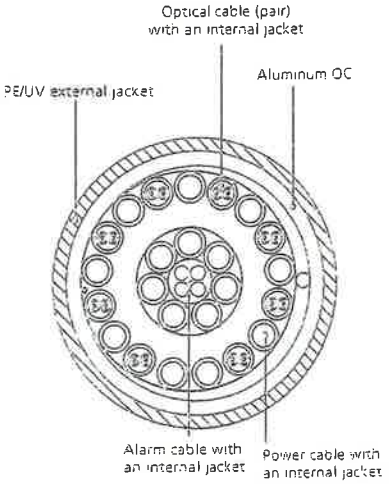


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

	General	Power	Density					
Site Name: West Greenwich								
Tower Height: 160ft								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*AT&T UMTS	1	500	150	0.0080	880	0.5867	1.36%	
*AT&T UMTS	1	500	150	0.0080	1900	1.0000	0.80%	
*AT&T GSM	6	296	150	0.0284	880	0.5867	4.84%	
*AT&T GSM	6	427	150	0.0409	1900	1.0000	4.09%	
*AT&T LTE	1	500	150	0.0080	740	0.4933	1.62%	
*T-Mobile LTE	2	24	163	0.0006	2100	1.0000	0.06%	
*T-Mobile GSM/UMTS	2	12	163	0.0003	1950	1.0000	0.03%	
*T-Mobile UMTS	2	12	163	0.0003	2100	1.0000	0.03%	
*Nextel	9	100	130	0.0191	851	0.5673	3.38%	
*Sprint CDMA/LTE	2	693	122	0.0335	1900	1.0000	3.35%	
*Sprint CDMA/LTE	1	390	122	0.0094	850	0.5667	1.66%	
*Sprint CDMA/LTE	2	693	122	0.0335	2500	1.0000	3.35%	
Verizon PCS	**15**	**418**	**142**	**0.1118**	**1970**	**1.0000**	**11.18%**	
Verizon Cellular	**9**	**271**	**142**	**0.0435**	**869**	**0.5793**	**7.51%**	
Verizon AWS	**1**	**1750**	**142**	**0.0312**	**2145**	**1.0000**	**3.12%**	
Verizon 700	**1**	**1149**	**142**	**0.0205**	**746**	**0.4973**	**4.12%**	
								50.51%
* Source: Siting Council								

ATTACHMENT 3

September 23, 2014

Brittany Richardson
Crown Castle
3530 Toringdon Way Suite 300
Charlotte, NC 28277
(980) 209-8239

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

Subject:	**Structural Analysis Report**	
Carrier Designation:	***Verizon Wireless* Co-Locate**	
	Carrier Site Number:	N/A
	Carrier Site Name:	West Greenwich
Crown Castle Designation:	**Crown Castle BU Number:**	841290
	Crown Castle Site Name:	Greenwich North
	Crown Castle JDE Job Number:	307374
	Crown Castle Work Order Number:	930772
	Crown Castle Application Number:	265486 Rev. 1
Engineering Firm Designation:	**B+T Group Project Number:**	94951.001.01
Site Data:	**363 Riversville Road, Greenwich, Fairfield County, CT** **Latitude *41° 3' 58.6"*, Longitude *-73° 40' 17.4"*** **160 Foot - Monopole Tower**	

Dear Brittany Richardson,

B+T Group is pleased to submit this **"Structural Analysis Report"** to determine the structural integrity of the above mentioned tower. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 707141, in accordance with application 265486, revision 1.

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

LC7: Existing + Reserved + Proposed Equipment **Sufficient Capacity**
Note: See Table 1 and Table 2 for the proposed and existing/reserved loading, respectively.

The analysis has been performed in accordance with the TIA/EIA-222-F standard and 2005 CT State Building Code based upon a wind speed of 85 mph fastest mile.

All 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.

James Lindsey
Project Engineer

Chad E. Tuttle, P.E.
President

tnxTower Report - version 6.1.4.1

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 160 ft. Monopole tower designed by Engineered Endeavors, Inc. in April of 2003. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-F.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a fastest mile wind speed of 85 mph with no ice, 37.6 mph with 0.75 inch ice thickness and 50 mph under service loads.

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
140.0	142.0	6	Amphenol	WWX063X19G00	2	1-5/8	--
		1	Antel	BXA-70063/8CFx2			
		2	Decibel	DB844H80E-XY			
	140.0	3	Alcatel Lucent	RRH2X60-AWS			
		3	Alcatel Lucent	RRH2X60-PCS			
		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
160.0	163.0	3	Ericsson	ERICSSON AIR 21 B2A B4P	1	1-1/4	2
		3	Ericsson	ERICSSON AIR 21 B4A B2P			
		3	Rfs Celwave	ATMAA1412D-1A20			
		3	Ems Wireless	RR90-17-02DP	12	1-5/8	1
	160.0	1	--	Platform Mount [LP 1201-1]			
153.0	153.0	3	Ericsson	TME-RRUS-11	2	3/8	1
		1	Raycap	TME-DC6-48-60-18-8F			
		1	--	Side Arm Mount [SO 102-3)			
149.0	151.0	6	Powerwave Tech.	7770.00	12	1-5/8	1
		6	Powerwave Tech.	LGP21401			
	149.0	6	Powerwave Tech.	LGP21401			
		3	Powerwave Tech.	P65-16-XLH-RR			
		1	--	Platform Mount [LP 1201-1]			
140.0	142.0	**3**	**Rymsa Wireless**	**MG D3-800Tx**	--	--	**3**
		2	**Rfs Celwave**	**APL868013-42T0**			
		1	**Powerwave Tech.**	**P65-16-XL-M**			
		2	Powerwave Tech.	P65-16-XL-M	18	1-5/8	1
		4	Rfs Celwave	APL868013-42T0			
	140.0	1	--	Platform Mount [LP 1201-1]			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
120.0	122.0	3	Alcatel Lucent	TD-RRH8x20-25	1	1-1/4	2
		3	Rfs Celwave	APXVTM14-C-120			
		3	Rfs Celwave	APXVSPP18-C-A20	2	1/2	1
	120.0	1	--	Platform Mount [LP 1201-1]	3	1-1/4	
		1	--	Miscellaneous [NA 510-1]			
119.0	119.0	3	Alcatel Lucent	TME-1900MHz RRH	--	--	1
		3	Alcatel Lucent	TME-800MHZ RRH			
		1	--	Side Arm Mount [SO 102-3]			
72.0	73.0	2	Gps	GPS_A	2	1/2	1
	72.0	2	--	Side Arm Mount [SO 701-1]			

Notes:
1) Existing Equipment
2) Reserved Equipment
3) Equipment To Be Removed

Table 3 - Design Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
160	160	3	Generic	Panel Antenna	--	--
150	150	1	Generic	Low Profile Platform	--	--
		12	Allgon	ALP 11011		
140	140	1	Generic	Low Profile Platform	--	--
		12	Allgon	ALP 11011		
130	130	1	Generic	Low Profile Platform	--	--
		12	Allgon	ALP 11011		

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
Online Application	Verizon Wireless Co-Locate Rev #1	265486	CCI Sites
Tower Manufacturer Drawing	EEI, Project No. 5590	5121537	CCI Sites
Foundation Drawing	WEI, Project No. 2009-895	4468638	CCI Sites
Geotech Report	WEI, Project No. 2009-895	5121535	CCI Sites
Antenna Configuration	Crown CAD Package	Date: 09/16/2014	CCI Sites

3.1) Analysis Method

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

3.2) Assumptions

1) Tower and structures were built in accordance with the manufacturer's specifications.
2) The tower and structures have been maintained in accordance with the manufacturer's specification.
3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
4) When applicable, transmission cables are considered as structural components for calculating wind loads as allowed by TIA/EIA-222-F.
5) 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)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	160 - 152	Pole	TP30.62x29x0.188	1	-3.425	908.478	8.2	Pass
L2	152 - 111.29	Pole	TP38.86x30.62x0.25	2	-16.302	1547.560	54.2	Pass
L3	111.29 - 77.41	Pole	TP45.09x37.265x0.313	3	-23.070	2245.678	76.8	Pass
L4	77.41 - 36.44	Pole	TP52.62x43.238x0.438	4	-35.198	3665.043	72.5	Pass
L5	36.44 - 0	Pole	TP59x50.332x0.5	5	-52.203	4826.446	73.6	Pass
							Summary	
						Pole (L3)	76.8	Pass
						RATING =	**76.8**	**Pass**

Table 6 - Tower Component Stresses vs. Capacity – LC7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Flange Connection	152	10.4	Pass
1	Anchor Rods	Base	63.3	Pass
1	Base Plate	Base	79.9	Pass
1	Base Foundation	Base	99.9	Fail

Structure Rating (max from all components) =	**99.9%**

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

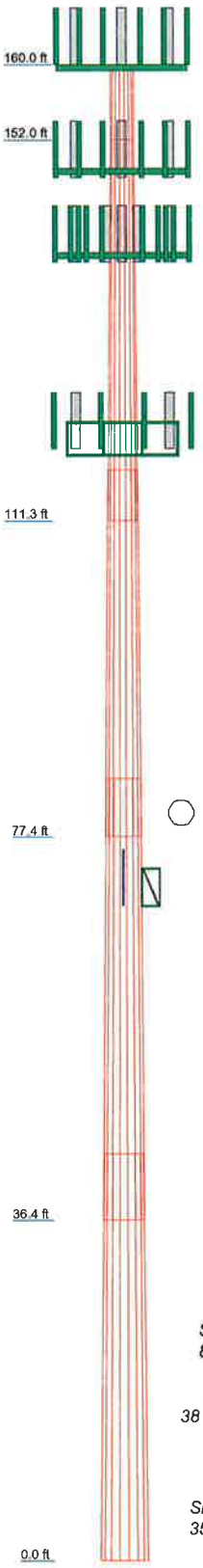
4.1) Recommendations

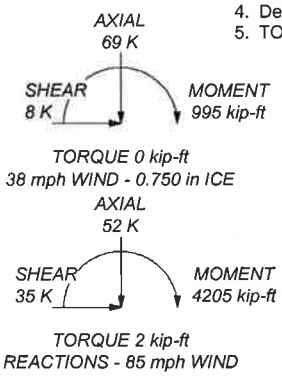
The tower and its foundation have sufficient capacity to carry the existing, reserved and proposed loads. No modifications are required at this time.

APPENDIX A

TNXTOWER OUTPUT

Section	1	2	3	4	5
Length (ft)	8.000	40.710	39.290	47.130	43.540
Number of Sides	18	18	18	18	18
Thickness (in)	0.188	0.250	0.313	0.438	0.500
Socket Length (ft)		5.410	6.160	7.100	
Top Dia (in)	29.000	30.620	37.265	43.238	50.332
Bot Dia (in)	30.620	38.860	45.090	52.620	59.000
Grade	A572-65				
Weight (K)	0.5	3.8	5.4	10.6	12.7





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
RR90-17-02DP w/ Mount Pipe (E)	160	(2) WWX063X19G00 w/ Mount Pipe (P)	140
RR90-17-02DP w/ Mount Pipe (E)	160	(2) WWX063X19G00 w/ Mount Pipe (P)	140
RR90-17-02DP w/ Mount Pipe (E)	160	BXA-70063/8CFx2 w/ Mount Pipe (P)	140
ERICSSON AIR 21 B2A B4P w/ Mount Pipe (R)	160	(2) DB844H80E-XY w/ Mount Pipe (P)	140
ERICSSON AIR 21 B2A B4P w/ Mount Pipe (R)	160	RRH2x60-AWS (P)	140
ERICSSON AIR 21 B2A B4P w/ Mount Pipe (R)	160	RRH2x60-AWS (P)	140
ERICSSON AIR 21 B4A B2P w/ Mount Pipe (R)	160	RRH2x60-AWS (P)	140
ERICSSON AIR 21 B4A B2P w/ Mount Pipe (R)	160	RRH2X60-PCS (P)	140
ERICSSON AIR 21 B4A B2P w/ Mount Pipe (R)	160	RRH2X60-PCS (P)	140
ATMAA1412D-1A20 (R)	160	RRH2X60-PCS (P)	140
ATMAA1412D-1A20 (R)	160	DB-T1-6Z-8AB-0Z (P)	140
ATMAA1412D-1A20 (R)	160	(2) APL868013-42T0 w/ Mount Pipe (E)	140
6' x 2" Mount Pipe (E)	160	(2) APL868013-42T0 w/ Mount Pipe (E)	140
6' x 2" Mount Pipe (E)	160	P65-16-XL-M w/ Mount Pipe (E)	140
6' x 2" Mount Pipe (E)	160	P65-16-XL-M w/ Mount Pipe (E)	140
Platform Mount [LP 1201-1] (E)	160	Platform Mount [LP 1201-1] (E)	140
TME-RRUS-11 (E)	153	APXVTM14-C-120 w/ Mount Pipe (R)	120
TME-RRUS-11 (E)	153	APXVTM14-C-120 w/ Mount Pipe (R)	120
TME-RRUS-11 (E)	153	APXVTM14-C-120 w/ Mount Pipe (R)	120
TME-DC6-48-60-18-8F (E)	153	TD-RRH8x20-25 (R)	120
Side Arm Mount [SO 102-3) (E)	153	TD-RRH8x20-25 (R)	120
(2) 7770.00 w/ Mount Pipe (E)	149	TD-RRH8x20-25 (R)	120
(2) 7770.00 w/ Mount Pipe (E)	149	APXVSPP18-C-A20 w/ Mount Pipe (E)	120
(2) 7770.00 w/ Mount Pipe (E)	149	APXVSPP18-C-A20 w/ Mount Pipe (E)	120
P65-16-XLH-RR w/ Mount Pipe (E)	149	APXVSPP18-C-A20 w/ Mount Pipe (E)	120
P65-16-XLH-RR w/ Mount Pipe (E)	149	Miscellaneous [NA 510-1] (E)	120
P65-16-XLH-RR w/ Mount Pipe (E)	149	Platform Mount [LP 1201-1] (E)	120
(2) LGP21401 (E)	149	(2) 6' x 2" Mount Pipe (E)	120
(2) LGP21401 (E)	149	(2) 6' x 2" Mount Pipe (E)	120
(2) LGP21401 (E)	149	(2) 6' x 2" Mount Pipe (E)	120
(2) LGP21401 (E)	149	TME-1900MHz RRH (E)	119
(2) LGP21401 (E)	149	TME-1900MHz RRH (E)	119
(2) LGP21401 (E)	149	TME-1900MHz RRH (E)	119
6' x 2" Mount Pipe (E)	149	TME-800MHZ RRH (E)	119
6' x 2" Mount Pipe (E)	149	TME-800MHZ RRH (E)	119
6' x 2" Mount Pipe (E)	149	TME-800MHZ RRH (E)	119
Platform Mount [LP 1201-1] (E)	149	Side Arm Mount [SO 102-3) (E)	119
(2) WWX063X19G00 w/ Mount Pipe (P)	140	GPS_A (E)	72
		GPS_A (E)	72
		Side Arm Mount [SO 701-1] (E)	72
		Side Arm Mount [SO 701-1] (E)	72

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Fairfield County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 38 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 76.8%

B+T Group
1717 S. Boulder Ave., Suite 300
Tulsa, OK 74119
Phone: (918) 587-4630
FAX: (918) 295-0265

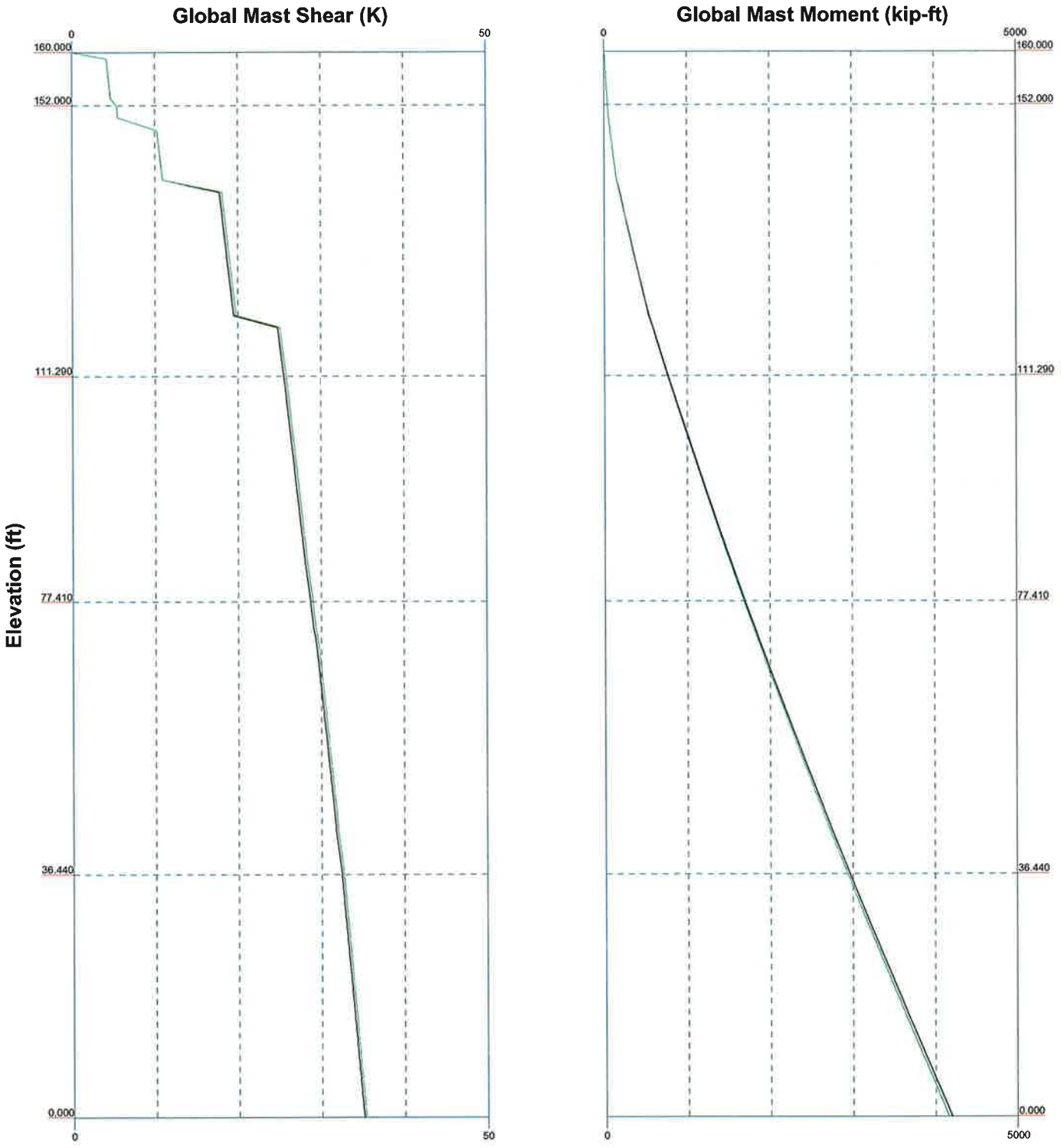
Job: 94951.001.01 - GREENWICH NORTH,CT (BU# 84129			
Project:			
Client: Crown Castle	Drawn by: James Lindsey	App'd:	
Code: TIA/EIA-222-F	Date: 09/23/14	Scale: NTS	
Path:		Dwg No. E-1	

TIA/EIA-222-F - 85 mph/38 mph 0.750 in Ice

Vx Vz

Maximum Values

Mx Mz



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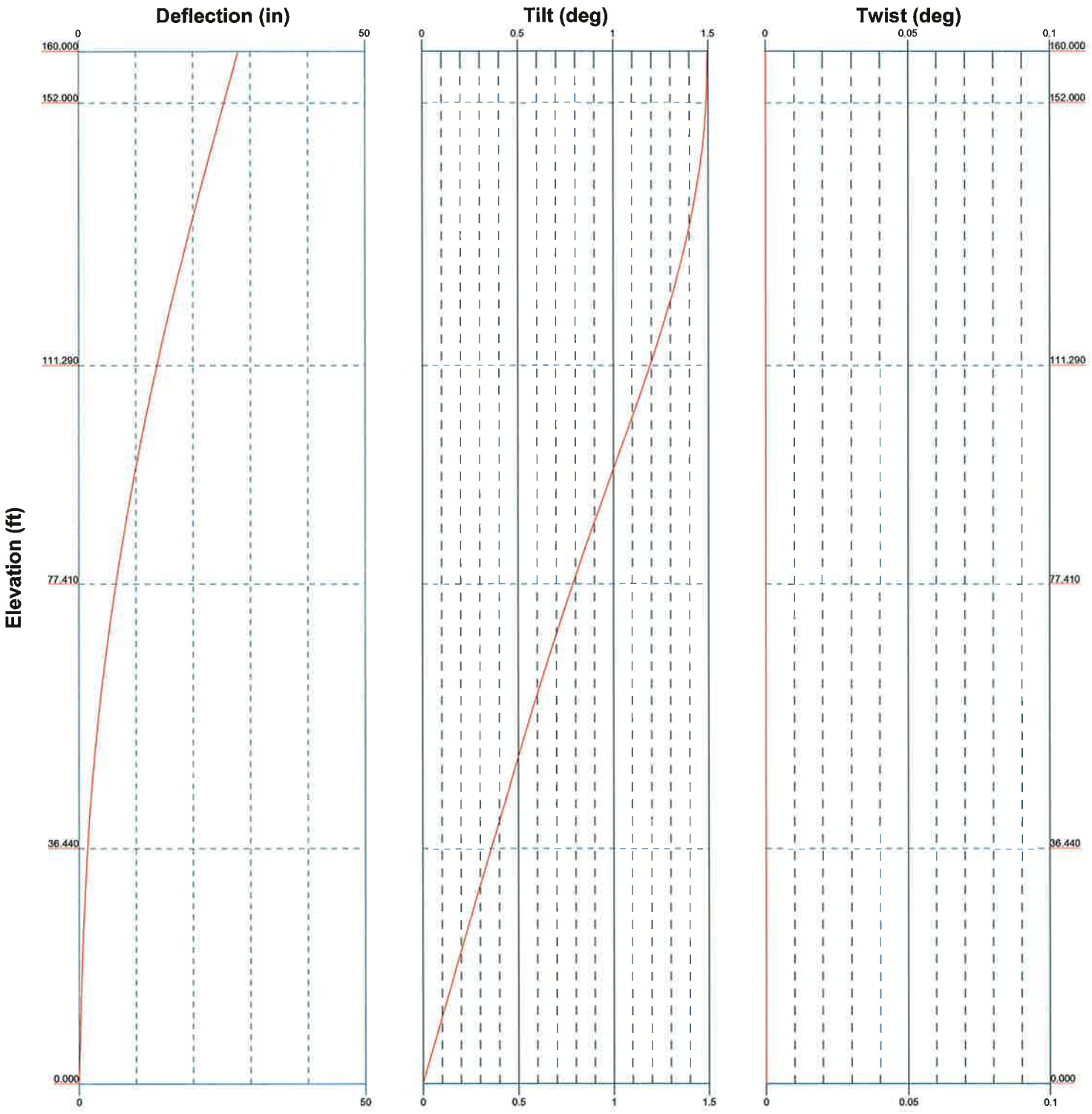
Project:			
Client: Crown Castle	Drawn by: James Lindsey	App'd:	
Code: TIA/EIA-222-F	Date: 09/23/14	Scale: NTS	
Path:		Dwg No. E-4	

TIA/EIA-222-F - Service - 50 mph

Maximum Values



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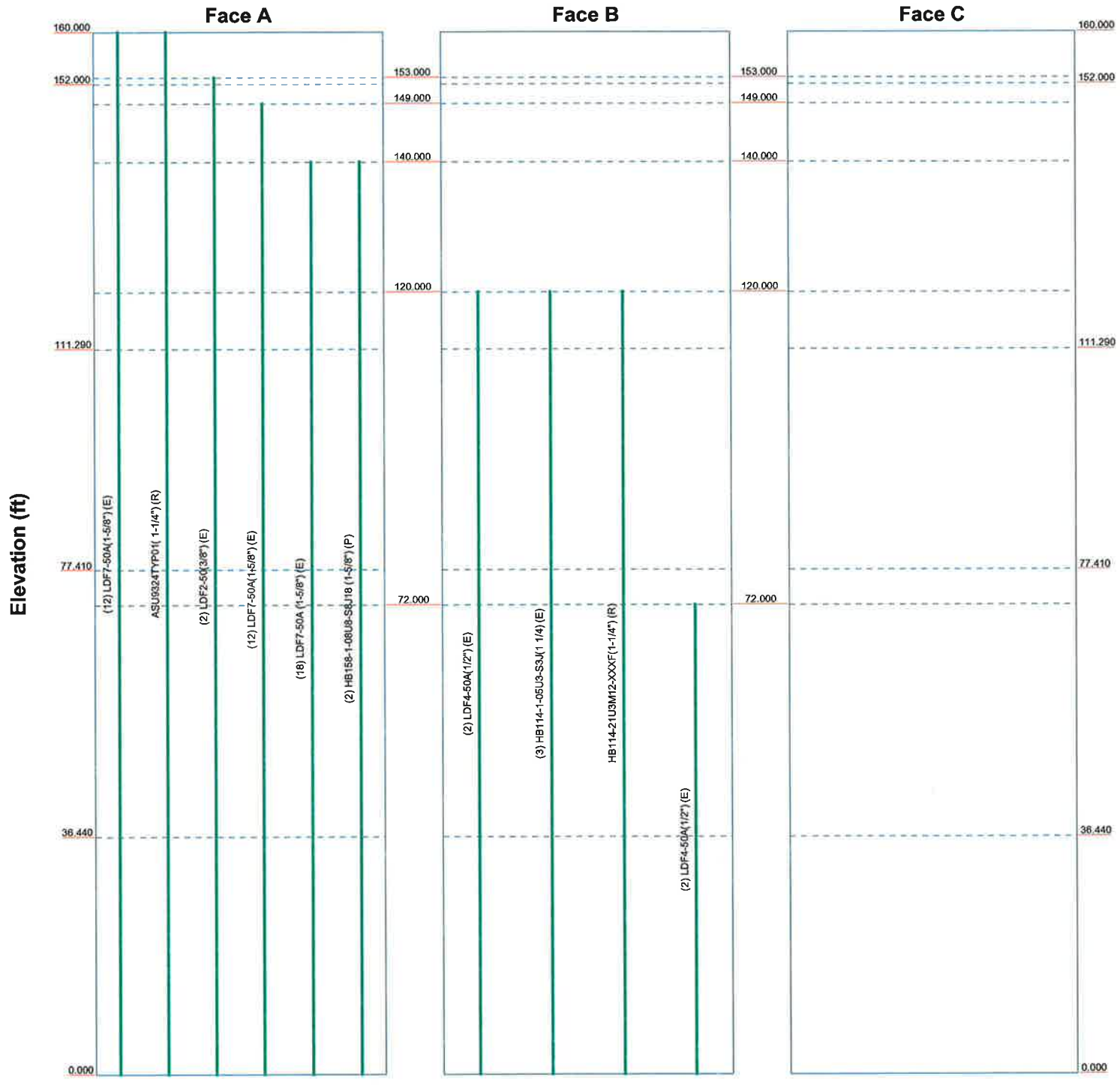
Tulsa, OK 74119
Phone: (918) 587-4630
FAX: (918) 295-0265

Job: 94951.001.01 - GREENWICH NORTH,CT (BU# 84129		
Project:		
Client: Crown Castle	Drawn by: James Lindsey	App'd:
Code: TIA/EIA-222-F	Date: 09/23/14	Scale: NTS
Path:		Dwg No. E-5

Feed Line Distribution Chart
0' - 160'

Round | Flat | App In Face | App Out Face | Truss Leg



B+T Group
1717 S. Boulder Ave., Suite 300
Tulsa, OK 74119
Phone: (918) 587-4630
FAX: (918) 295-0265

Job: 94951.001.01 - GREENWICH NORTH,CT (BU# 84129			
Project:			
Client: Crown Castle	Drawn by: James Lindsey	App'd:	
Code: TIA/EIA-222-F	Date: 09/23/14	Scale: NTS	
Path:		Dwg No. E-7	

tnxTower	Job	Page
	94951.001.01 - GREENWICH NORTH,CT (BU# 841290)	1 of 18
B+T Group 1717 S. Boulder Ave., Suite 300 Tulsa, OK 74119 Phone: (918) 587-4630 FAX: (918) 295-0265	Project	Date 15:00:11 09/23/14
	Client Crown Castle	Designed by James Lindsey

Tower Input Data

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

Tower is located in Fairfield County, Connecticut.
Basic wind speed of 85 mph.
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 38 mph is used in combination with ice.
Temperature drop of 50.000 °F.
Deflections calculated using a wind speed of 50 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

	Consider Moments - Legs		Distribute Leg Loads As Uniform		Treat Feedline Bundles As Cylinder
	Consider Moments - Horizontals		Assume Legs Pinned		Use ASCE 10 X-Brace Ly Rules
	Consider Moments - Diagonals	√	Assume Rigid Index Plate		Calculate Redundant Bracing Forces
	Use Moment Magnification	√	Use Clear Spans For Wind Area		Ignore Redundant Members in FEA
√	Use Code Stress Ratios		Use Clear Spans For KL/r		SR Leg Bolts Resist Compression
√	Use Code Safety Factors - Guys		Retension Guys To Initial Tension		All Leg Panels Have Same Allowable
√	Escalate Ice	√	Bypass Mast Stability Checks		Offset Girt At Foundation
	Always Use Max Kz	√	Use Azimuth Dish Coefficients	√	Consider Feedline Torque
	Use Special Wind Profile	√	Project Wind Area of Appurt.		Include Angle Block Shear Check
	Include Bolts In Member Capacity		Autocalc Torque Arm Areas		Poles
	Leg Bolts Are At Top Of Section		SR Members Have Cut Ends	√	Include Shear-Torsion Interaction
	Secondary Horizontal Braces Leg		Sort Capacity Reports By Component		Always Use Sub-Critical Flow
	Use Diamond Inner Bracing (4 Sided)		Triangulate Diamond Inner Bracing		Use Top Mounted Sockets
	Add IBC .6D+W Combination		Use TIA-222-G Tension Splice Capacity Exemption		

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	160.000-152.000	8.000	0.000	18	29.000	30.620	0.188	0.750	A572-65 (65 ksi)
L2	152.000-111.290	40.710	5.410	18	30.620	38.860	0.250	1.000	A572-65 (65 ksi)
L3	111.290-77.410	39.290	6.160	18	37.265	45.090	0.313	1.250	A572-65 (65 ksi)
L4	77.410-36.440	47.130	7.100	18	43.238	52.620	0.438	1.750	A572-65 (65 ksi)
L5	36.440-0.000	43.540		18	50.332	59.000	0.500	2.000	A572-65

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
									(65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	29.447	17.147	1798.409	10.228	14.732	122.075	3599.184	8.575	4.774	25.461
	31.092	18.111	2119.135	10.804	15.555	136.235	4241.058	9.057	5.059	26.982
L2	31.092	24.099	2808.140	10.781	15.555	180.530	5619.975	12.052	4.949	19.796
	39.459	30.637	5770.106	13.707	19.741	292.292	11547.804	15.321	6.399	25.597
L3	38.934	36.652	6323.027	13.118	18.931	334.011	12654.374	18.330	6.009	19.228
	45.786	44.414	11250.554	15.896	22.906	491.168	22515.912	22.211	7.386	23.635
L4	45.150	59.434	13755.429	15.194	21.965	626.243	27528.958	29.723	6.840	15.634
	53.432	72.462	24928.553	18.525	26.731	932.572	49889.908	36.238	8.491	19.408
L5	52.543	79.083	24810.201	17.690	25.568	970.343	49653.048	39.549	7.978	15.957
	59.910	92.840	40140.426	20.767	29.972	1339.264	80333.669	46.429	9.504	19.008

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 160.000-152.000				1	1	1		
L2 152.000-111.290				1	1	1		
L3 111.290-77.410				1	1	1		
L4 77.410-36.440				1	1	1		
L5 36.440-0.000				1	1	1		

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	Number Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight klf
*****										

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight klf
LDF7-50A(1-5/8")	A	No	Inside Pole	160.000 - 0.000	12	No Ice	0.000	0.001

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft²/ft	Weight klf
(E)						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
						2" Ice	0.000	0.001
						4" Ice	0.000	0.001
ASU9324TYP01(1-1/4")	A	No	Inside Pole	160.000 - 0.000	1	No Ice	0.000	0.001
(R)						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
						2" Ice	0.000	0.001
						4" Ice	0.000	0.001
*****								
LDF2-50(3/8")	A	No	Inside Pole	153.000 - 0.000	2	No Ice	0.000	0.000
(E)						1/2" Ice	0.000	0.000
						1" Ice	0.000	0.000
						2" Ice	0.000	0.000
						4" Ice	0.000	0.000
******								
LDF7-50A(1-5/8")	A	No	Inside Pole	149.000 - 0.000	12	No Ice	0.000	0.001
(E)						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
						2" Ice	0.000	0.001
						4" Ice	0.000	0.001
*****								
LDF7-50A (1-5/8")	A	No	Inside Pole	140.000 - 0.000	18	No Ice	0.000	0.001
(E)						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
						2" Ice	0.000	0.001
						4" Ice	0.000	0.001
HB158-1-08U8-S8J18	A	No	Inside Pole	140.000 - 0.000	2	No Ice	0.000	0.001
(1-5/8")						1/2" Ice	0.000	0.001
(P)						1" Ice	0.000	0.001
						2" Ice	0.000	0.001
						4" Ice	0.000	0.001
*****								
LDF4-50A(1/2")	B	No	Inside Pole	120.000 - 0.000	2	No Ice	0.000	0.000
(E)						1/2" Ice	0.000	0.000
						1" Ice	0.000	0.000
						2" Ice	0.000	0.000
						4" Ice	0.000	0.000
HB114-1-05U3-S3J(1	B	No	Inside Pole	120.000 - 0.000	3	No Ice	0.000	0.001
1/4)						1/2" Ice	0.000	0.001
(E)						1" Ice	0.000	0.001
						2" Ice	0.000	0.001
						4" Ice	0.000	0.001
HB114-21U3M12-XXX	B	No	Inside Pole	120.000 - 0.000	1	No Ice	0.000	0.001
F(1-1/4")						1/2" Ice	0.000	0.001
(R)						1" Ice	0.000	0.001
						2" Ice	0.000	0.001
						4" Ice	0.000	0.001
******								
LDF4-50A(1/2")	B	No	Inside Pole	72.000 - 0.000	2	No Ice	0.000	0.000
(E)						1/2" Ice	0.000	0.000
						1" Ice	0.000	0.000
						2" Ice	0.000	0.000
						4" Ice	0.000	0.000
*****								
*****								

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
L1	160.000-152.000	A	0.000	0.000	0.000	0.000	0.087
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	0.000
L2	152.000-111.290	A	0.000	0.000	0.000	0.000	1.319
		B	0.000	0.000	0.000	0.000	0.037
		C	0.000	0.000	0.000	0.000	0.000
L3	111.290-77.410	A	0.000	0.000	0.000	0.000	1.296
		B	0.000	0.000	0.000	0.000	0.143
		C	0.000	0.000	0.000	0.000	0.000
L4	77.410-36.440	A	0.000	0.000	0.000	0.000	1.567
		B	0.000	0.000	0.000	0.000	0.184
		C	0.000	0.000	0.000	0.000	0.000
L5	36.440-0.000	A	0.000	0.000	0.000	0.000	1.394
		B	0.000	0.000	0.000	0.000	0.165
		C	0.000	0.000	0.000	0.000	0.000

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
L1	160.000-152.000	A	0.904	0.000	0.000	0.000	0.000	0.087
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	0.000
L2	152.000-111.290	A	0.885	0.000	0.000	0.000	0.000	1.319
		B		0.000	0.000	0.000	0.000	0.037
		C		0.000	0.000	0.000	0.000	0.000
L3	111.290-77.410	A	0.851	0.000	0.000	0.000	0.000	1.296
		B		0.000	0.000	0.000	0.000	0.143
		C		0.000	0.000	0.000	0.000	0.000
L4	77.410-36.440	A	0.801	0.000	0.000	0.000	0.000	1.567
		B		0.000	0.000	0.000	0.000	0.184
		C		0.000	0.000	0.000	0.000	0.000
L5	36.440-0.000	A	0.750	0.000	0.000	0.000	0.000	1.394
		B		0.000	0.000	0.000	0.000	0.165
		C		0.000	0.000	0.000	0.000	0.000

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	160.000-152.000	0.000	0.000	0.000	0.000
L2	152.000-111.290	0.000	0.000	0.000	0.000
L3	111.290-77.410	0.000	0.000	0.000	0.000
L4	77.410-36.440	0.000	0.000	0.000	0.000
L5	36.440-0.000	0.000	0.000	0.000	0.000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
RR90-17-02DP w/ Mount Pipe (E)	A	From Leg	4.000 0.000 3.000	0.000	160.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.593 5.088 5.578 6.588 8.731	3.319 4.089 4.784 6.225 9.308	0.034 0.072 0.115 0.224 0.557
RR90-17-02DP w/ Mount Pipe (E)	B	From Leg	4.000 0.000 3.000	0.000	160.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.593 5.088 5.578 6.588 8.731	3.319 4.089 4.784 6.225 9.308	0.034 0.072 0.115 0.224 0.557
RR90-17-02DP w/ Mount Pipe (E)	C	From Leg	4.000 0.000 3.000	0.000	160.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.593 5.088 5.578 6.588 8.731	3.319 4.089 4.784 6.225 9.308	0.034 0.072 0.115 0.224 0.557
ERICSSON AIR 21 B2A B4P w/ Mount Pipe (R)	A	From Leg	4.000 0.000 3.000	0.000	160.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.825 7.347 7.863 8.926 11.175	5.642 6.480 7.257 8.864 12.293	0.112 0.169 0.233 0.383 0.807
ERICSSON AIR 21 B2A B4P w/ Mount Pipe (R)	B	From Leg	4.000 0.000 3.000	0.000	160.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.825 7.347 7.863 8.926 11.175	5.642 6.480 7.257 8.864 12.293	0.112 0.169 0.233 0.383 0.807
ERICSSON AIR 21 B2A B4P w/ Mount Pipe (R)	C	From Leg	4.000 0.000 3.000	0.000	160.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.825 7.347 7.863 8.926 11.175	5.642 6.480 7.257 8.864 12.293	0.112 0.169 0.233 0.383 0.807
ERICSSON AIR 21 B4A B2P w/ Mount Pipe (R)	A	From Leg	4.000 0.000 3.000	0.000	160.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.825 7.347 7.863 8.926 11.175	5.642 6.480 7.257 8.864 12.293	0.112 0.169 0.233 0.383 0.807
ERICSSON AIR 21 B4A B2P w/ Mount Pipe (R)	B	From Leg	4.000 0.000 3.000	0.000	160.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.825 7.347 7.863 8.926 11.175	5.642 6.480 7.257 8.864 12.293	0.112 0.169 0.233 0.383 0.807
ERICSSON AIR 21 B4A B2P w/ Mount Pipe (R)	C	From Leg	4.000 0.000 3.000	0.000	160.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.825 7.347 7.863 8.926 11.175	5.642 6.480 7.257 8.864 12.293	0.112 0.169 0.233 0.383 0.807
ATMAA1412D-1A20 (R)	A	From Leg	4.000 0.000 3.000	0.000	160.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.467 0.575 0.691 0.951 1.573	1.167 1.314 1.469 1.806 2.584	0.013 0.021 0.030 0.056 0.137
ATMAA1412D-1A20 (R)	B	From Leg	4.000 0.000 3.000	0.000	160.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.467 0.575 0.691 0.951 1.573	1.167 1.314 1.469 1.806 2.584	0.013 0.021 0.030 0.056 0.137
ATMAA1412D-1A20	C	From Leg	4.000	0.000	160.000	No Ice	0.467	1.167	0.013

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(R)			0.000			1/2" Ice	0.575	1.314	0.021
			3.000			1" Ice	0.691	1.469	0.030
						2" Ice	0.951	1.806	0.056
						4" Ice	1.573	2.584	0.137
6' x 2" Mount Pipe	A	From Leg	4.000	0.000	160.000	No Ice	1.425	1.425	0.022
(E)			0.000			1/2" Ice	1.925	1.925	0.033
			2.000			1" Ice	2.294	2.294	0.048
						2" Ice	3.060	3.060	0.090
						4" Ice	4.702	4.702	0.231
6' x 2" Mount Pipe	B	From Leg	4.000	0.000	160.000	No Ice	1.425	1.425	0.022
(E)			0.000			1/2" Ice	1.925	1.925	0.033
			2.000			1" Ice	2.294	2.294	0.048
						2" Ice	3.060	3.060	0.090
						4" Ice	4.702	4.702	0.231
6' x 2" Mount Pipe	C	From Leg	4.000	0.000	160.000	No Ice	1.425	1.425	0.022
(E)			0.000			1/2" Ice	1.925	1.925	0.033
			2.000			1" Ice	2.294	2.294	0.048
						2" Ice	3.060	3.060	0.090
						4" Ice	4.702	4.702	0.231
Platform Mount [LP 1201-1]	C	None		0.000	160.000	No Ice	23.100	23.100	2.100
(E)						1/2" Ice	26.800	26.800	2.500
						1" Ice	30.500	30.500	2.900
						2" Ice	37.900	37.900	3.700
						4" Ice	52.700	52.700	5.300
*****									
TME-RRUS-11	A	From Leg	1.000	0.000	153.000	No Ice	3.423	1.850	0.057
(E)			0.000			1/2" Ice	3.725	2.192	0.085
			0.000			1" Ice	4.038	2.552	0.117
						2" Ice	4.720	3.378	0.194
						4" Ice	6.246	5.290	0.425
TME-RRUS-11	B	From Leg	1.000	0.000	153.000	No Ice	3.423	1.850	0.057
(E)			0.000			1/2" Ice	3.725	2.192	0.085
			0.000			1" Ice	4.038	2.552	0.117
						2" Ice	4.720	3.378	0.194
						4" Ice	6.246	5.290	0.425
TME-RRUS-11	C	From Leg	1.000	0.000	153.000	No Ice	3.423	1.850	0.057
(E)			0.000			1/2" Ice	3.725	2.192	0.085
			0.000			1" Ice	4.038	2.552	0.117
						2" Ice	4.720	3.378	0.194
						4" Ice	6.246	5.290	0.425
TME-DC6-48-60-18-8F	A	From Leg	1.000	0.000	153.000	No Ice	1.266	1.266	0.020
(E)			0.000			1/2" Ice	1.456	1.456	0.035
			0.000			1" Ice	1.658	1.658	0.053
						2" Ice	2.093	2.093	0.095
						4" Ice	3.098	3.098	0.215
Side Arm Mount [SO 102-3)	C	None		0.000	153.000	No Ice	3.000	3.000	0.081
(E)						1/2" Ice	3.480	3.480	0.111
						1" Ice	3.960	3.960	0.141
						2" Ice	4.920	4.920	0.201
						4" Ice	6.840	6.840	0.321
*********									
(2) 7770.00 w/ Mount Pipe	A	From Leg	4.000	0.000	149.000	No Ice	6.119	4.254	0.055
(E)			0.000			1/2" Ice	6.626	5.014	0.103
			2.000			1" Ice	7.128	5.711	0.157
						2" Ice	8.164	7.155	0.287
						4" Ice	10.360	10.412	0.665
(2) 7770.00 w/ Mount Pipe	B	From Leg	4.000	0.000	149.000	No Ice	6.119	4.254	0.055

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(E)			0.000			1/2" Ice	6.626	5.014	0.103
			2.000			1" Ice	7.128	5.711	0.157
						2" Ice	8.164	7.155	0.287
						4" Ice	10.360	10.412	0.665
(2) 7770.00 w/ Mount Pipe	C	From Leg	4.000	0.000	149.000	No Ice	6.119	4.254	0.055
(E)			0.000			1/2" Ice	6.626	5.014	0.103
			2.000			1" Ice	7.128	5.711	0.157
						2" Ice	8.164	7.155	0.287
						4" Ice	10.360	10.412	0.665
P65-16-XLH-RR w/ Mount Pipe	A	From Leg	4.000	0.000	149.000	No Ice	8.637	6.362	0.079
(E)			0.000			1/2" Ice	9.290	7.538	0.144
			0.000			1" Ice	9.910	8.427	0.218
						2" Ice	11.176	10.239	0.393
						4" Ice	13.829	14.099	0.886
P65-16-XLH-RR w/ Mount Pipe	B	From Leg	4.000	0.000	149.000	No Ice	8.637	6.362	0.079
(E)			0.000			1/2" Ice	9.290	7.538	0.144
			0.000			1" Ice	9.910	8.427	0.218
						2" Ice	11.176	10.239	0.393
						4" Ice	13.829	14.099	0.886
P65-16-XLH-RR w/ Mount Pipe	C	From Leg	4.000	0.000	149.000	No Ice	8.637	6.362	0.079
(E)			0.000			1/2" Ice	9.290	7.538	0.144
			0.000			1" Ice	9.910	8.427	0.218
						2" Ice	11.176	10.239	0.393
						4" Ice	13.829	14.099	0.886
(2) LGP21401	A	From Leg	4.000	0.000	149.000	No Ice	1.288	0.233	0.014
(E)			0.000			1/2" Ice	1.445	0.313	0.021
			2.000			1" Ice	1.611	0.403	0.030
						2" Ice	1.969	0.608	0.055
						4" Ice	2.788	1.121	0.135
(2) LGP21401	B	From Leg	4.000	0.000	149.000	No Ice	1.288	0.233	0.014
(E)			0.000			1/2" Ice	1.445	0.313	0.021
			2.000			1" Ice	1.611	0.403	0.030
						2" Ice	1.969	0.608	0.055
						4" Ice	2.788	1.121	0.135
(2) LGP21401	C	From Leg	4.000	0.000	149.000	No Ice	1.288	0.233	0.014
(E)			0.000			1/2" Ice	1.445	0.313	0.021
			2.000			1" Ice	1.611	0.403	0.030
						2" Ice	1.969	0.608	0.055
						4" Ice	2.788	1.121	0.135
(2) LGP21401	A	From Leg	4.000	0.000	149.000	No Ice	1.288	0.233	0.014
(E)			0.000			1/2" Ice	1.445	0.313	0.021
			0.000			1" Ice	1.611	0.403	0.030
						2" Ice	1.969	0.608	0.055
						4" Ice	2.788	1.121	0.135
(2) LGP21401	B	From Leg	4.000	0.000	149.000	No Ice	1.288	0.233	0.014
(E)			0.000			1/2" Ice	1.445	0.313	0.021
			0.000			1" Ice	1.611	0.403	0.030
						2" Ice	1.969	0.608	0.055
						4" Ice	2.788	1.121	0.135
(2) LGP21401	C	From Leg	4.000	0.000	149.000	No Ice	1.288	0.233	0.014
(E)			0.000			1/2" Ice	1.445	0.313	0.021
			0.000			1" Ice	1.611	0.403	0.030
						2" Ice	1.969	0.608	0.055
						4" Ice	2.788	1.121	0.135
6' x 2" Mount Pipe	A	From Leg	4.000	0.000	149.000	No Ice	1.425	1.425	0.022
(E)			0.000			1/2" Ice	1.925	1.925	0.033
			0.000			1" Ice	2.294	2.294	0.048

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						2" Ice	3.060	3.060	0.090
						4" Ice	4.702	4.702	0.231
6' x 2" Mount Pipe (E)	B	From Leg	4.000 0.000 0.000	0.000	149.000	No Ice	1.425	1.425	0.022
						1/2" Ice	1.925	1.925	0.033
						1" Ice	2.294	2.294	0.048
						2" Ice	3.060	3.060	0.090
						4" Ice	4.702	4.702	0.231
6' x 2" Mount Pipe (E)	C	From Leg	4.000 0.000 0.000	0.000	149.000	No Ice	1.425	1.425	0.022
						1/2" Ice	1.925	1.925	0.033
						1" Ice	2.294	2.294	0.048
						2" Ice	3.060	3.060	0.090
						4" Ice	4.702	4.702	0.231
Platform Mount [LP 1201-1] (E)	C	None		0.000	149.000	No Ice	23.100	23.100	2.100
						1/2" Ice	26.800	26.800	2.500
						1" Ice	30.500	30.500	2.900
						2" Ice	37.900	37.900	3.700
						4" Ice	52.700	52.700	5.300
*****									
(2) WWX063X19G00 w/ Mount Pipe (P)	A	From Leg	4.000 0.000 2.000	0.000	140.000	No Ice	9.060	7.277	0.059
						1/2" Ice	9.733	8.500	0.131
						1" Ice	10.378	9.467	0.210
						2" Ice	11.685	11.353	0.398
						4" Ice	14.416	15.436	0.922
(2) WWX063X19G00 w/ Mount Pipe (P)	B	From Leg	4.000 0.000 2.000	0.000	140.000	No Ice	9.060	7.277	0.059
						1/2" Ice	9.733	8.500	0.131
						1" Ice	10.378	9.467	0.210
						2" Ice	11.685	11.353	0.398
						4" Ice	14.416	15.436	0.922
(2) WWX063X19G00 w/ Mount Pipe (P)	C	From Leg	4.000 0.000 2.000	0.000	140.000	No Ice	9.060	7.277	0.059
						1/2" Ice	9.733	8.500	0.131
						1" Ice	10.378	9.467	0.210
						2" Ice	11.685	11.353	0.398
						4" Ice	14.416	15.436	0.922
BXA-70063/8CFx2 w/ Mount Pipe (P)	B	From Leg	4.000 0.000 2.000	0.000	140.000	No Ice	10.893	7.630	0.056
						1/2" Ice	11.601	9.115	0.133
						1" Ice	12.316	10.611	0.220
						2" Ice	13.685	12.881	0.425
						4" Ice	16.890	17.621	1.010
(2) DB844H80E-XY w/ Mount Pipe (P)	C	From Leg	4.000 0.000 2.000	0.000	140.000	No Ice	3.299	4.921	0.032
						1/2" Ice	3.690	5.596	0.072
						1" Ice	4.119	6.284	0.117
						2" Ice	5.007	7.712	0.228
						4" Ice	6.920	10.833	0.557
RRH2x60-AWS (P)	A	From Leg	4.000 0.000 0.000	0.000	140.000	No Ice	3.957	1.816	0.060
						1/2" Ice	4.272	2.075	0.083
						1" Ice	4.596	2.360	0.109
						2" Ice	5.271	2.957	0.173
						4" Ice	6.722	4.253	0.354
RRH2x60-AWS (P)	A	From Leg	4.000 0.000 0.000	0.000	140.000	No Ice	3.957	1.816	0.060
						1/2" Ice	4.272	2.075	0.083
						1" Ice	4.596	2.360	0.109
						2" Ice	5.271	2.957	0.173
						4" Ice	6.722	4.253	0.354
RRH2x60-AWS (P)	B	From Leg	4.000 0.000 0.000	0.000	140.000	No Ice	3.957	1.816	0.060
						1/2" Ice	4.272	2.075	0.083
						1" Ice	4.596	2.360	0.109
						2" Ice	5.271	2.957	0.173

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						4" Ice	6.722	4.253	0.354
RRH2X60-PCS	A	From Leg	4.000	0.000	140.000	No Ice	2.567	2.011	0.055
(P)			0.000			1/2" Ice	2.791	2.218	0.075
			0.000			1" Ice	3.025	2.435	0.099
						2" Ice	3.517	2.894	0.155
						4" Ice	4.606	3.915	0.313
RRH2X60-PCS	B	From Leg	4.000	0.000	140.000	No Ice	2.567	2.011	0.055
(P)			0.000			1/2" Ice	2.791	2.218	0.075
			0.000			1" Ice	3.025	2.435	0.099
						2" Ice	3.517	2.894	0.155
						4" Ice	4.606	3.915	0.313
RRH2X60-PCS	C	From Leg	4.000	0.000	140.000	No Ice	2.567	2.011	0.055
(P)			0.000			1/2" Ice	2.791	2.218	0.075
			0.000			1" Ice	3.025	2.435	0.099
						2" Ice	3.517	2.894	0.155
						4" Ice	4.606	3.915	0.313
DB-T1-6Z-8AB-0Z	A	From Leg	4.000	0.000	140.000	No Ice	5.600	2.333	0.044
(P)			0.000			1/2" Ice	5.915	2.558	0.080
			0.000			1" Ice	6.240	2.791	0.120
						2" Ice	6.914	3.284	0.213
						4" Ice	8.365	4.373	0.455
(2) APL868013-42T0 w/	A	From Leg	4.000	0.000	140.000	No Ice	3.104	4.921	0.025
Mount Pipe			0.000			1/2" Ice	3.476	5.596	0.063
(E)			2.000			1" Ice	3.879	6.284	0.108
						2" Ice	4.761	7.712	0.216
						4" Ice	6.660	10.833	0.541
(2) APL868013-42T0 w/	B	From Leg	4.000	0.000	140.000	No Ice	3.104	4.921	0.025
Mount Pipe			0.000			1/2" Ice	3.476	5.596	0.063
(E)			2.000			1" Ice	3.879	6.284	0.108
						2" Ice	4.761	7.712	0.216
						4" Ice	6.660	10.833	0.541
P65-16-XL-M w/ Mount Pipe	A	From Leg	4.000	0.000	140.000	No Ice	8.637	6.362	0.070
(E)			0.000			1/2" Ice	9.290	7.538	0.135
			2.000			1" Ice	9.910	8.427	0.209
						2" Ice	11.176	10.239	0.384
						4" Ice	13.829	14.099	0.877
P65-16-XL-M w/ Mount Pipe	C	From Leg	4.000	0.000	140.000	No Ice	8.637	6.362	0.070
(E)			0.000			1/2" Ice	9.290	7.538	0.135
			2.000			1" Ice	9.910	8.427	0.209
						2" Ice	11.176	10.239	0.384
						4" Ice	13.829	14.099	0.877
Platform Mount [LP 1201-1]	C	None		0.000	140.000	No Ice	23.100	23.100	2.100
(E)						1/2" Ice	26.800	26.800	2.500
						1" Ice	30.500	30.500	2.900
						2" Ice	37.900	37.900	3.700
						4" Ice	52.700	52.700	5.300
*****									
APXVTM14-C-120 w/	A	From Leg	4.000	0.000	120.000	No Ice	7.134	4.959	0.074
Mount Pipe			0.000			1/2" Ice	7.662	5.754	0.128
(R)			2.000			1" Ice	8.183	6.472	0.190
						2" Ice	9.256	8.010	0.335
						4" Ice	11.526	11.412	0.749
APXVTM14-C-120 w/	B	From Leg	4.000	0.000	120.000	No Ice	7.134	4.959	0.074
Mount Pipe			0.000			1/2" Ice	7.662	5.754	0.128
(R)			2.000			1" Ice	8.183	6.472	0.190
						2" Ice	9.256	8.010	0.335
						4" Ice	11.526	11.412	0.749

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
APXVTM14-C-120 w/ Mount Pipe (R)	C	From Leg	4.000 0.000 2.000	0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.134 7.662 8.183 9.256 11.526	4.959 5.754 6.472 8.010 11.412	0.074 0.128 0.190 0.335 0.749
TD-RRH8x20-25 (R)	A	From Leg	4.000 0.000 2.000	0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.720 5.014 5.316 5.948 7.314	1.703 1.920 2.145 2.622 3.680	0.070 0.097 0.128 0.201 0.397
TD-RRH8x20-25 (R)	B	From Leg	4.000 0.000 2.000	0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.720 5.014 5.316 5.948 7.314	1.703 1.920 2.145 2.622 3.680	0.070 0.097 0.128 0.201 0.397
TD-RRH8x20-25 (R)	C	From Leg	4.000 0.000 2.000	0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.720 5.014 5.316 5.948 7.314	1.703 1.920 2.145 2.622 3.680	0.070 0.097 0.128 0.201 0.397
APXVSPP18-C-A20 w/ Mount Pipe (E)	A	From Leg	4.000 0.000 2.000	0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.498 9.149 9.767 11.031 13.679	6.946 8.127 9.021 10.844 14.851	0.083 0.151 0.227 0.406 0.909
APXVSPP18-C-A20 w/ Mount Pipe (E)	B	From Leg	4.000 0.000 2.000	0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.498 9.149 9.767 11.031 13.679	6.946 8.127 9.021 10.844 14.851	0.083 0.151 0.227 0.406 0.909
APXVSPP18-C-A20 w/ Mount Pipe (E)	C	From Leg	4.000 0.000 2.000	0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.498 9.149 9.767 11.031 13.679	6.946 8.127 9.021 10.844 14.851	0.083 0.151 0.227 0.406 0.909
Miscellaneous [NA 510-1] (E)	C	None		0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.000 8.500 11.000 16.000 26.000	6.000 8.500 11.000 16.000 26.000	0.256 0.340 0.423 0.591 0.926
Platform Mount [LP 1201-1] (E)	C	None		0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	23.100 26.800 30.500 37.900 52.700	23.100 26.800 30.500 37.900 52.700	2.100 2.500 2.900 3.700 5.300
(2) 6' x 2" Mount Pipe (E)	A	From Leg	4.000 0.000 0.000	0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.425 1.925 2.294 3.060 4.702	1.425 1.925 2.294 3.060 4.702	0.022 0.033 0.048 0.090 0.231
(2) 6' x 2" Mount Pipe (E)	B	From Leg	4.000 0.000 0.000	0.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.425 1.925 2.294 3.060 4.702	1.425 1.925 2.294 3.060 4.702	0.022 0.033 0.048 0.090 0.231
(2) 6' x 2" Mount Pipe (E)	C	From Leg	4.000 0.000	0.000	120.000	No Ice 1/2" Ice	1.425 1.925	1.425 1.925	0.022 0.033

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.000			1" Ice	2.294	2.294	0.048
						2" Ice	3.060	3.060	0.090
						4" Ice	4.702	4.702	0.231
******									
TME-1900MHz RRH (E)	A	From Leg	2.000 0.000 0.000	0.000	119.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.907 3.145 3.391 3.909 5.050	3.801 4.065 4.337 4.908 6.152	0.044 0.075 0.110 0.192 0.407
TME-1900MHz RRH (E)	B	From Leg	2.000 0.000 0.000	0.000	119.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.907 3.145 3.391 3.909 5.050	3.801 4.065 4.337 4.908 6.152	0.044 0.075 0.110 0.192 0.407
TME-1900MHz RRH (E)	C	From Leg	2.000 0.000 0.000	0.000	119.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.907 3.145 3.391 3.909 5.050	3.801 4.065 4.337 4.908 6.152	0.044 0.075 0.110 0.192 0.407
TME-800MHZ RRH (E)	A	From Leg	2.000 0.000 0.000	0.000	119.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.490 2.706 2.931 3.407 4.462	2.068 2.271 2.481 2.928 3.927	0.053 0.074 0.098 0.157 0.318
TME-800MHZ RRH (E)	B	From Leg	2.000 0.000 0.000	0.000	119.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.490 2.706 2.931 3.407 4.462	2.068 2.271 2.481 2.928 3.927	0.053 0.074 0.098 0.157 0.318
TME-800MHZ RRH (E)	C	From Leg	2.000 0.000 0.000	0.000	119.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.490 2.706 2.931 3.407 4.462	2.068 2.271 2.481 2.928 3.927	0.053 0.074 0.098 0.157 0.318
Side Arm Mount [SO 102-3] (E)	C	None		0.000	119.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.000 3.480 3.960 4.920 6.840	3.000 3.480 3.960 4.920 6.840	0.081 0.111 0.141 0.201 0.321
*****									
GPS_A (E)	A	From Leg	3.000 0.000 1.000	0.000	72.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.297 0.374 0.459 0.655 1.151	0.297 0.374 0.459 0.655 1.151	0.001 0.005 0.010 0.025 0.079
GPS_A (E)	B	From Leg	3.000 0.000 1.000	0.000	72.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.297 0.374 0.459 0.655 1.151	0.297 0.374 0.459 0.655 1.151	0.001 0.005 0.010 0.025 0.079
Side Arm Mount [SO 701-1] (E)	A	From Leg	1.500 0.000 0.000	0.000	72.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.850 1.140 1.430 2.010 3.170	1.670 2.340 3.010 4.350 7.030	0.065 0.079 0.093 0.121 0.177
Side Arm Mount [SO 701-1] (E)	B	From Leg	1.500 0.000	0.000	72.000	No Ice 1/2" Ice	0.850 1.140	1.670 2.340	0.065 0.079

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.000			1" Ice	1.430	3.010	0.093
						2" Ice	2.010	4.350	0.121
						4" Ice	3.170	7.030	0.177
******									

Load Combinations

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	160 - 152	Pole	Max Tension	14	0.000	0.000	-0.000
			Max. Compression	14	-6.047	-0.001	0.116
			Max. Mx	5	-3.429	-44.191	0.038
			Max. My	2	-3.425	0.000	44.254
			Max. Vy	5	5.384	-44.191	0.038
			Max. Vx	2	-5.387	0.000	44.254
			Max. Torque	5			0.143
L2	152 - 111.29	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-28.167	-0.433	1.482
			Max. Mx	5	-16.336	-627.054	-0.648
			Max. My	2	-16.302	1.255	634.227
			Max. Vy	5	24.987	-627.054	-0.648
			Max. Vx	2	-25.270	1.255	634.227
			Max. Torque	6			1.408
L3	111.29 - 77.41	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-36.272	-0.434	1.482
			Max. Mx	5	-23.094	-1506.663	-2.536
			Max. My	2	-23.070	3.163	1523.240
			Max. Vy	5	28.061	-1506.663	-2.536
			Max. Vx	2	-28.344	3.163	1523.240
			Max. Torque	6			1.406
L4	77.41 - 36.44	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-50.168	-0.726	1.652
			Max. Mx	5	-35.211	-2708.145	-4.326
			Max. My	2	-35.198	4.887	2735.494
			Max. Vy	5	31.776	-2708.145	-4.326
			Max. Vx	2	-32.041	4.887	2735.494
			Max. Torque	6			1.647
L5	36.44 - 0	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-69.101	-0.726	1.651
			Max. Mx	5	-52.204	-4166.612	-6.197
			Max. My	2	-52.203	6.760	4205.362
			Max. Vy	5	35.123	-4166.612	-6.197
			Max. Vx	2	-35.380	6.760	4205.362
			Max. Torque	6			1.645

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	15	69.101	0.004	8.016
	Max. H_x	11	52.221	35.097	0.042
	Max. H_z	2	52.221	0.042	35.354
	Max. M_x	2	4205.362	0.042	35.354
	Max. M_z	5	4166.612	-35.097	-0.042
	Max. Torsion	6	1.644	-30.416	-17.714
	Min. Vert	1	52.221	0.000	0.000
	Min. H_x	5	52.221	-35.097	-0.042
	Min. H_z	8	52.221	-0.042	-35.354
	Min. M_x	8	-4203.517	-0.042	-35.354
	Min. M_z	11	-4165.896	35.097	0.042
	Min. Torsion	12	-1.643	30.416	17.714

Tower Mast Reaction Summary

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead Only	52.221	0.000	0.000	-0.878	-0.344	0.000
Dead+Wind 0 deg - No Ice	52.221	-0.042	-35.354	-4205.362	6.761	0.914
Dead+Wind 30 deg - No Ice	52.221	17.512	-30.596	-3638.548	-2077.304	0.105
Dead+Wind 60 deg - No Ice	52.221	30.373	-17.640	-2097.015	-3604.883	-0.732
Dead+Wind 90 deg - No Ice	52.221	35.097	0.042	6.197	-4166.612	-1.373
Dead+Wind 120 deg - No Ice	52.221	30.416	17.714	2107.488	-3611.974	-1.644
Dead+Wind 150 deg - No Ice	52.221	17.585	30.639	3643.799	-2089.612	-1.475
Dead+Wind 180 deg - No Ice	52.221	0.042	35.354	4203.517	-7.470	-0.911
Dead+Wind 210 deg - No Ice	52.221	-17.512	30.596	3636.703	2076.590	-0.104
Dead+Wind 240 deg - No Ice	52.221	-30.373	17.640	2095.173	3604.165	0.731
Dead+Wind 270 deg - No Ice	52.221	-35.097	-0.042	-8.034	4165.896	1.370
Dead+Wind 300 deg - No Ice	52.221	-30.416	-17.714	-2109.324	3611.262	1.643
Dead+Wind 330 deg - No Ice	52.221	-17.585	-30.639	-3645.639	2088.904	1.477
Dead+Ice+Temp	69.101	0.000	-0.000	-1.651	-0.726	0.000
Dead+Wind 0 deg+Ice+Temp	69.101	-0.004	-8.016	-994.931	0.097	0.261
Dead+Wind 30 deg+Ice+Temp	69.101	3.978	-6.941	-861.437	-492.472	0.063
Dead+Wind 60 deg+Ice+Temp	69.101	6.894	-4.005	-497.602	-853.293	-0.152
Dead+Wind 90 deg+Ice+Temp	69.101	7.963	0.004	-0.914	-985.683	-0.326
Dead+Wind 120 deg+Ice+Temp	69.101	6.898	4.011	495.540	-854.168	-0.413
Dead+Wind 150 deg+Ice+Temp	69.101	3.985	6.944	858.734	-493.989	-0.389
Dead+Wind 180 deg+Ice+Temp	69.101	0.004	8.016	991.351	-1.655	-0.261
Dead+Wind 210 deg+Ice+Temp	69.101	-3.978	6.941	857.858	490.914	-0.063
Dead+Wind 240 deg+Ice+Temp	69.101	-6.894	4.005	494.022	851.734	0.152
Dead+Wind 270 deg+Ice+Temp	69.101	-7.963	-0.004	-2.666	984.124	0.326
Dead+Wind 300 deg+Ice+Temp	69.101	-6.898	-4.011	-499.119	852.610	0.413
Dead+Wind 330 deg+Ice+Temp	69.101	-3.985	-6.944	-862.313	492.431	0.389
Dead+Wind 0 deg - Service	52.221	-0.015	-12.233	-1456.891	2.105	0.318
Dead+Wind 30 deg - Service	52.221	6.059	-10.587	-1260.598	-719.583	0.036
Dead+Wind 60 deg - Service	52.221	10.510	-6.104	-726.776	-1248.556	-0.255
Dead+Wind 90 deg - Service	52.221	12.144	0.015	1.537	-1443.076	-0.477
Dead+Wind 120 deg - Service	52.221	10.524	6.129	729.189	-1251.019	-0.572
Dead+Wind 150 deg - Service	52.221	6.085	10.602	1261.205	-723.850	-0.513
Dead+Wind 180 deg - Service	52.221	0.015	12.233	1455.035	-2.824	-0.317
Dead+Wind 210 deg - Service	52.221	-6.059	10.587	1258.742	718.864	-0.036
Dead+Wind 240 deg - Service	52.221	-10.510	6.104	724.921	1247.837	0.255
Dead+Wind 270 deg - Service	52.221	-12.144	-0.015	-3.392	1442.357	0.477
Dead+Wind 300 deg - Service	52.221	-10.524	-6.129	-731.044	1250.301	0.572
Dead+Wind 330 deg - Service	52.221	-6.085	-10.602	-1263.061	723.132	0.514

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.000	-52.221	0.000	0.000	52.221	0.000	0.000%
2	-0.042	-52.221	-35.354	0.042	52.221	35.354	0.000%
3	17.512	-52.221	-30.596	-17.512	52.221	30.596	0.000%
4	30.373	-52.221	-17.640	-30.373	52.221	17.640	0.000%
5	35.097	-52.221	0.042	-35.097	52.221	-0.042	0.000%
6	30.416	-52.221	17.714	-30.416	52.221	-17.714	0.000%
7	17.585	-52.221	30.639	-17.585	52.221	-30.639	0.000%
8	0.042	-52.221	35.354	-0.042	52.221	-35.354	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
9	-17.512	-52.221	30.596	17.512	52.221	-30.596	0.000%
10	-30.373	-52.221	17.640	30.373	52.221	-17.640	0.000%
11	-35.097	-52.221	-0.042	35.097	52.221	0.042	0.000%
12	-30.416	-52.221	-17.714	30.416	52.221	17.714	0.000%
13	-17.585	-52.221	-30.639	17.585	52.221	30.639	0.000%
14	0.000	-69.101	0.000	-0.000	69.101	0.000	0.000%
15	-0.004	-69.101	-8.016	0.004	69.101	8.016	0.000%
16	3.978	-69.101	-6.941	-3.978	69.101	6.941	0.000%
17	6.894	-69.101	-4.005	-6.894	69.101	4.005	0.000%
18	7.963	-69.101	0.004	-7.963	69.101	-0.004	0.000%
19	6.898	-69.101	4.011	-6.898	69.101	-4.011	0.000%
20	3.985	-69.101	6.944	-3.985	69.101	-6.944	0.000%
21	0.004	-69.101	8.016	-0.004	69.101	-8.016	0.000%
22	-3.978	-69.101	6.941	3.978	69.101	-6.941	0.000%
23	-6.894	-69.101	4.005	6.894	69.101	-4.005	0.000%
24	-7.963	-69.101	-0.004	7.963	69.101	0.004	0.000%
25	-6.898	-69.101	-4.011	6.898	69.101	4.011	0.000%
26	-3.985	-69.101	-6.944	3.985	69.101	6.944	0.000%
27	-0.015	-52.221	-12.233	0.015	52.221	12.233	0.000%
28	6.059	-52.221	-10.587	-6.059	52.221	10.587	0.000%
29	10.510	-52.221	-6.104	-10.510	52.221	6.104	0.000%
30	12.144	-52.221	0.015	-12.144	52.221	-0.015	0.000%
31	10.524	-52.221	6.129	-10.524	52.221	-6.129	0.000%
32	6.085	-52.221	10.602	-6.085	52.221	-10.602	0.000%
33	0.015	-52.221	12.233	-0.015	52.221	-12.233	0.000%
34	-6.059	-52.221	10.587	6.059	52.221	-10.587	0.000%
35	-10.510	-52.221	6.104	10.510	52.221	-6.104	0.000%
36	-12.144	-52.221	-0.015	12.144	52.221	0.015	0.000%
37	-10.524	-52.221	-6.129	10.524	52.221	6.129	0.000%
38	-6.085	-52.221	-10.602	6.085	52.221	10.602	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00031673
3	Yes	5	0.00000001	0.00049815
4	Yes	5	0.00000001	0.00050377
5	Yes	4	0.00000001	0.00055665
6	Yes	5	0.00000001	0.00048809
7	Yes	5	0.00000001	0.00051380
8	Yes	4	0.00000001	0.00043589
9	Yes	5	0.00000001	0.00049701
10	Yes	5	0.00000001	0.00048957
11	Yes	4	0.00000001	0.00068101
12	Yes	5	0.00000001	0.00051488
13	Yes	5	0.00000001	0.00049099
14	Yes	4	0.00000001	0.00000329
15	Yes	5	0.00000001	0.00012216
16	Yes	5	0.00000001	0.00014377
17	Yes	5	0.00000001	0.00014349
18	Yes	5	0.00000001	0.00012087
19	Yes	5	0.00000001	0.00014221
20	Yes	5	0.00000001	0.00014365
21	Yes	5	0.00000001	0.00012128

22	Yes	5	0.00000001	0.00014225
23	Yes	5	0.00000001	0.00014164
24	Yes	5	0.00000001	0.00012056
25	Yes	5	0.00000001	0.00014390
26	Yes	5	0.00000001	0.00014336
27	Yes	4	0.00000001	0.00008948
28	Yes	4	0.00000001	0.00088956
29	Yes	4	0.00000001	0.00091349
30	Yes	4	0.00000001	0.00011914
31	Yes	4	0.00000001	0.00084383
32	Yes	4	0.00000001	0.00094515
33	Yes	4	0.00000001	0.00009392
34	Yes	4	0.00000001	0.00088230
35	Yes	4	0.00000001	0.00085390
36	Yes	4	0.00000001	0.00012503
37	Yes	4	0.00000001	0.00095233
38	Yes	4	0.00000001	0.00085539

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	160 - 152	27.933	27	1.498	0.002
L2	152 - 111.29	25.430	27	1.488	0.002
L3	116.7 - 77.41	15.067	27	1.252	0.001
L4	83.57 - 36.44	7.584	27	0.858	0.001
L5	43.54 - 0	2.070	27	0.427	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
160.000	RR90-17-02DP w/ Mount Pipe	27	27.933	1.498	0.002	48182
153.000	TME-RRUS-11	27	25.742	1.489	0.002	34307
149.000	(2) 7770.00 w/ Mount Pipe	27	24.497	1.480	0.002	21522
140.000	(2) WWX063X19G00 w/ Mount Pipe	27	21.733	1.442	0.002	11534
120.000	APXVTM14-C-120 w/ Mount Pipe	27	15.951	1.286	0.001	5679
119.000	TME-1900MHz RRH	27	15.681	1.276	0.001	5551
72.000	GPS_A	27	5.579	0.725	0.001	4894

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	160 - 152	80.506	2	4.316	0.007
L2	152 - 111.29	73.300	2	4.287	0.007
L3	116.7 - 77.41	43.451	2	3.610	0.004

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L4	83.57 - 36.44	21.879	2	2.476	0.002
L5	43.54 - 0	5.973	2	1.232	0.001

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
160.000	RR90-17-02DP w/ Mount Pipe	2	80.506	4.316	0.007	16941
153.000	TME-RRUS-11	2	74.199	4.292	0.007	12061
149.000	(2) 7770.00 w/ Mount Pipe	2	70.613	4.265	0.007	7567
140.000	(2) WWX063X19G00 w/ Mount Pipe	2	62.655	4.155	0.006	4050
120.000	APXVTM14-C-120 w/ Mount Pipe	2	45.999	3.707	0.004	1990
119.000	TME-1900MHz RRH	2	45.220	3.678	0.004	1945
72.000	GPS_A	2	16.097	2.092	0.002	1702

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
L1	160 - 152 (1)	TP30.62x29x0.188	8.000	0.000	0.0	37.630	18.111	-3.425	681.529	0.005
L2	152 - 111.29 (2)	TP38.86x30.62x0.25	40.710	0.000	0.0	39.000	29.768	-16.302	1160.960	0.014
L3	111.29 - 77.41 (3)	TP45.09x37.265x0.313	39.290	0.000	0.0	39.000	43.197	-23.070	1684.680	0.014
L4	77.41 - 36.44 (4)	TP52.62x43.238x0.438	47.130	0.000	0.0	39.000	70.499	-35.198	2749.470	0.013
L5	36.44 - 0 (5)	TP59x50.332x0.5	43.540	0.000	0.0	39.000	92.840	-52.203	3620.740	0.014

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	160 - 152 (1)	TP30.62x29x0.188	44.254	3.898	37.630	0.104	0.000	0.000	37.630	0.000
L2	152 - 111.29 (2)	TP38.86x30.62x0.25	634.228	27.586	39.000	0.707	0.000	0.000	39.000	0.000
L3	111.29 - 77.41 (3)	TP45.09x37.265x0.313	1523.242	39.349	39.000	1.009	0.000	0.000	39.000	0.000
L4	77.41 - 36.44 (4)	TP52.62x43.238x0.438	2735.500	37.195	39.000	0.954	0.000	0.000	39.000	0.000
L5	36.44 - 0 (5)	TP59x50.332x0.5	4205.367	37.681	39.000	0.966	0.000	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	160 - 152 (1)	TP30.62x29x0.188	5.387	0.297	26.000	0.023	0.001	0.000	26.000	0.000
L2	152 - 111.29 (2)	TP38.86x30.62x0.25	25.270	0.849	26.000	0.065	0.673	0.014	26.000	0.001
L3	111.29 - 77.41 (3)	TP45.09x37.265x0.313	28.344	0.656	26.000	0.050	0.672	0.008	26.000	0.000
L4	77.41 - 36.44 (4)	TP52.62x43.238x0.438	32.041	0.454	26.000	0.035	0.914	0.006	26.000	0.000
L5	36.44 - 0 (5)	TP59x50.332x0.5	35.380	0.381	26.000	0.029	0.914	0.004	26.000	0.000

Pole Interaction Design Data

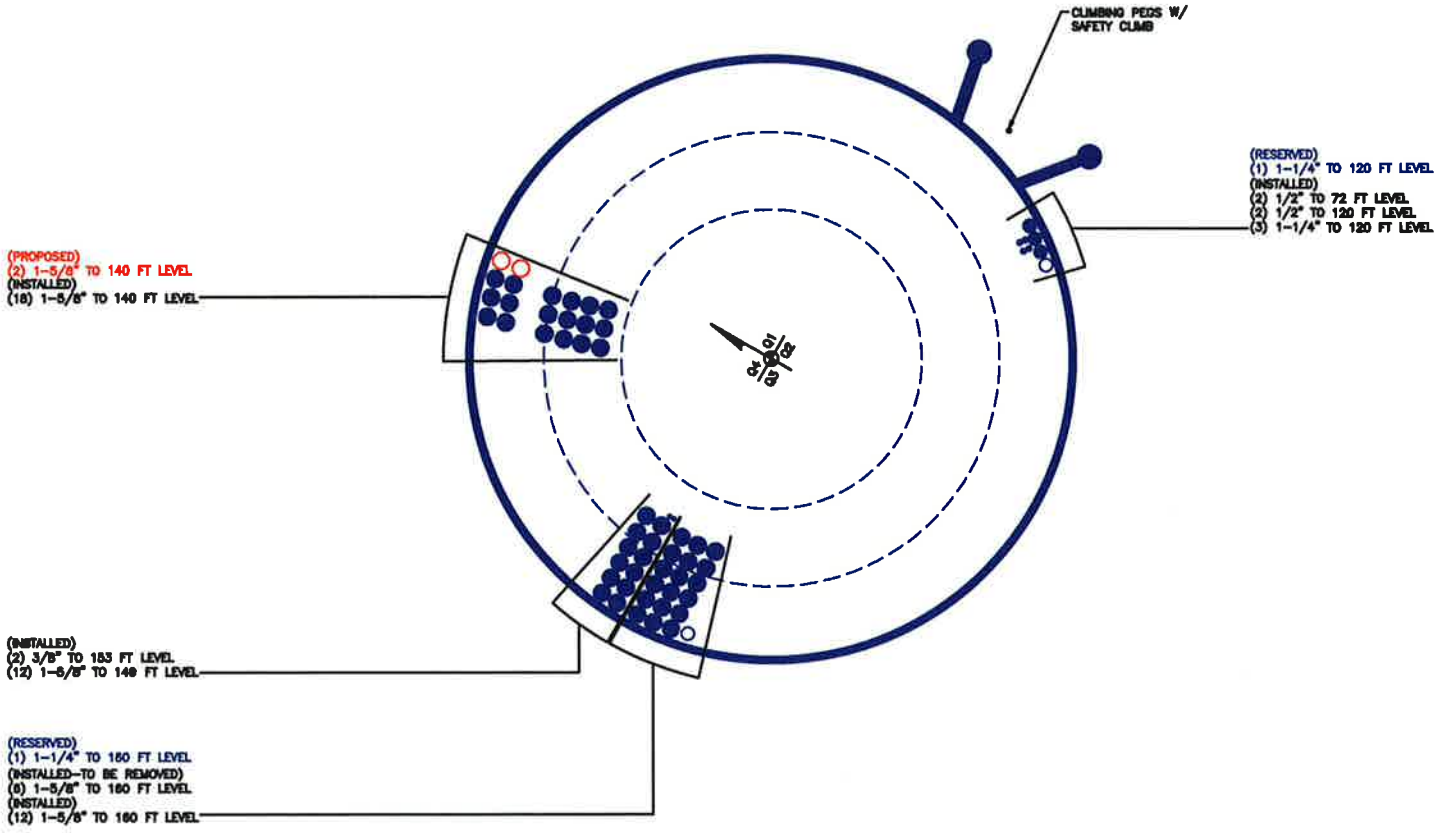
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	160 - 152 (1)	0.005	0.104	0.000	0.023	0.000	0.109 ✔	1.333	H1-3+VT ✔
L2	152 - 111.29 (2)	0.014	0.707	0.000	0.065	0.001	0.722 ✔	1.333	H1-3+VT ✔
L3	111.29 - 77.41 (3)	0.014	1.009	0.000	0.050	0.000	1.023 ✔	1.333	H1-3+VT ✔
L4	77.41 - 36.44 (4)	0.013	0.954	0.000	0.035	0.000	0.967 ✔	1.333	H1-3+VT ✔
L5	36.44 - 0 (5)	0.014	0.966	0.000	0.029	0.000	0.981 ✔	1.333	H1-3+VT ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	160 - 152	Pole	TP30.62x29x0.188	1	-3.425	908.478	8.2	Pass
L2	152 - 111.29	Pole	TP38.86x30.62x0.25	2	-16.302	1547.560	54.2	Pass
L3	111.29 - 77.41	Pole	TP45.09x37.265x0.313	3	-23.070	2245.678	76.8	Pass
L4	77.41 - 36.44	Pole	TP52.62x43.238x0.438	4	-35.198	3665.043	72.5	Pass
L5	36.44 - 0	Pole	TP59x50.332x0.5	5	-52.203	4826.446	73.6	Pass
							Summary	
						Pole (L3)	76.8	Pass
						RATING =	**76.8**	**Pass**

APPENDIX B

BASE LEVEL DRAWING



BUSINESS UNIT:841290

APPENDIX C

ADDITIONAL CALCULATIONS

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

TIA Rev F

Site Data

BU#: *841290*
Site Name: *GREENWICH NORTH,CT*
App #: *265486 Rev# 1*
Pole Manufacturer: *Other*

Reactions		
Moment:	4205	ft-kips
Axial:	52	kips
Shear:	35	kips

Anchor Rod Data		
Qty:	24	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	67	in

Plate Data		
Diam:	73	in
Thick:	2.25	in
Grade:	60	ksi
Single-Rod B-eff:	7.80	in

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

Pole Data		
Diam:	59	in
Thick:	0.5	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Stress Increase Factor		
ASIF:	1.333	

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

Anchor Rod Results

Maximum Rod Tension:	123.4 Kips	Rigid
Allowable Tension:	195.0 Kips	Service, ASD
Anchor Rod Stress Ratio:	63.3% **Pass**	Fty*ASIF

Base Plate Results Flexural Check

Base Plate Stress:	47.9 ksi	Rigid
Allowable Plate Stress:	60.0 ksi	Service ASD
Base Plate Stress Ratio:	79.9% Pass	0.75*Fy*ASIF
		Y,L, Length: 31.75

n/a

Stiffener Results

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

Pole Results

Pole Punching Shear Check: n/a

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

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

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

Site Data

BU#: *841290*
Site Name: *GREENWICH NORTH,CT*
App #: *265486 Rev# 1*

Pole Manufacturer:	Other

Reactions		
Moment:	44.25	ft-kips
Axial:	3.42	kips
Shear:	5.39	kips
Elevation:	152	feet

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

Bolt Data

Qty:	12		
Diameter (in.):	1	Bolt Fu:	120
Bolt Material:	A325	Bolt Fy:	92
N/A:	100	<-- Disregard	Bolt Fty:
N/A:	75	<-- Disregard	44.00
Circle (in.):	35		

Plate Data

Diam:	38	in
Thick, t:	1	in
Grade (Fy):	60	ksi
Strength, Fu:	75	ksi
Single-Rod B-eff:	8.10	in

Stiffener Data (Welding at Both Sides)

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

Pole Data

Diam:	30.62	in
Thick:	0.25	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Stress Increase Factor

ASIF:	1.333	

Flange Bolt Results

			Rigid
Bolt Tension Capacity, B:	46.07	kips	Service, ASD
Max Bolt directly applied T:	4.77	Kips	Fty*ASIF
Min. PL "tc" for B cap. w/o Pry:	0.986	in	
Min PL "treq" for actual T w/ Pry:	0.232	in	
Min PL "t1" for actual T w/o Pry:	0.317	in	
T allowable w/o Prying:	46.07	kips	α'<0 case
Prying Force, Q:	0.00	kips	
Total Bolt Tension=T+Q:	4.77	kips	
Non-Prying Bolt Stress Ratio, T/B:	10.4%	Pass	

Exterior Flange Plate Results — Flexural Check

			Rigid
Compression Side Plate Stress:	5.8	ksi	Service ASD
Allowable Plate Stress:	60.0	ksi	0.75*Fy*ASIF
Compression Plate Stress Ratio:	9.7%	Pass	Comp. Y.L. Length:
No Prying			16.95
Tension Side Stress Ratio, (treq/t)^2:	5.4%	Pass	

n/a

Stiffener Results

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

Pole Results

Pole Punching Shear Check: n/a

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

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

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

Site Data

BU#: *841290*
Site Name: *GREENWICH NORTH,CT*
App #: *265486 Rev# 1*

Pole Manufacturer:	Other

Reactions		
Moment:	44.25	ft-kips
Axial:	3.42	kips
Shear:	5.39	kips
Elevation:	152	feet

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

Bolt Data

Qty:	12		
Diameter (in.):	1	Bolt Fu:	120
Bolt Material:	A325	Bolt Fy:	92
N/A:	100	<-- Disregard	Bolt Fty: 44.00
N/A:	75	<-- Disregard	
Circle (in.):	35		

Plate Data

Diam:	38	in
Thick, t:	1	in
Grade (Fy):	60	ksi
Strength, Fu:	75	ksi
Single-Rod B-eff:	8.10	in

Stiffener Data (Welding at Both Sides)

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

Pole Data

Diam:	30.62	in
Thick:	0.1875	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Stress Increase Factor

ASIF:	1.333	

Flange Bolt Results

Bolt Tension Capacity, B:	46.07	kips	Rigid
Max Bolt directly applied T:	4.77	Kips	Service, ASD
Min. PL "tc" for B cap. w/o Pry:	0.986	in	Fty*ASIF
Min PL "treq" for actual T w/ Pry:	0.232	in	
Min PL "t1" for actual T w/o Pry:	0.317	in	
T allowable w/o Prying:	46.07	kips	α'<0 case
Prying Force, Q:	0.00	kips	
Total Bolt Tension=T+Q:	4.77	kips	
Non-Prying Bolt Stress Ratio, T/B:	10.4%	Pass	

Exterior Flange Plate Results — Flexural Check

Compression Side Plate Stress:	5.8	ksi	Rigid
Allowable Plate Stress:	60.0	ksi	Service ASD
Compression Plate Stress Ratio:	9.7%	Pass	0.75*Fy*ASIF
No Prying			Comp. Y.L. Length: 16.95
Tension Side Stress Ratio, (treq/t)^2:	5.4%	Pass	

n/a

Stiffener Results

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

Pole Results

Pole Punching Shear Check: n/a

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

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

PROJECT	**841290 - GREENWICH NORTH**			
SUBJECT	**Foundation Analysis**			
DATE	**09/23/14**	PAGE 1	OF 1	

B+T GRP
1717 S. Boulder, Suite 300
Tulsa, OK 74159
(918) 587-4630

Monopole Pad & Pier Foundation Analysis

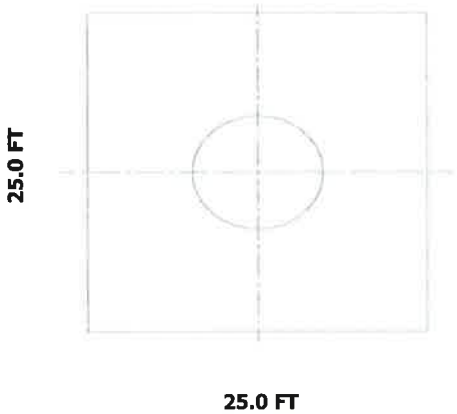
Rev. Type: F

Design Loads:

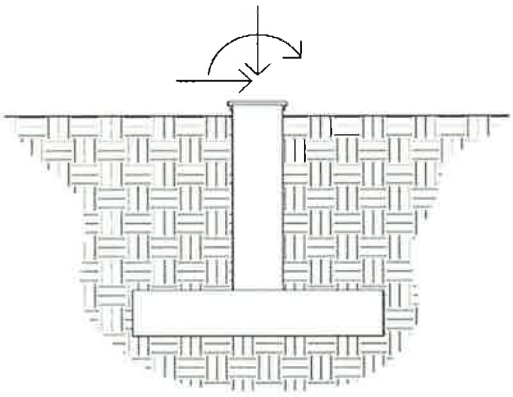
	Input unfactored loads	
Shear:	35.0	kips
Moment:	4,205.0	ft-kips
Tower Height:	160.0	ft
Tower Weight:	52.0	kips

Pad & Pier Dimensions / Properties:

Pole Diameter at Base:	59.00	in
Bearing Depth:	9.5	ft
Pad Width:	25.0	ft
Neglected Depth:	5.0	ft
Thickness:	4.5	ft
Pier Diameter:	7.0	ft
Pier Height Above Grade:	0.5	ft
BP Dist. Above Pier:	3.0	in
Clear Cover:	3.5	in
Pier Rebar Size:	11	
Pier Rebar Quanity:	23	
Pad Rebar Size:		
Pad Rebar Quanity:		
Pier Tie Size:	4	
Tie Quanity:	11	
Rebar Yield Strength:	60000	psi
Concrete Strength:	3000	psi
Concrete Unit Weight:	0.15	kcf



Elevation Overview



Soil Data:

	Allowable Values	
Soil Unit Weight:	0.120	kcf
Ult. Bearing Capacity:	30.000	ksf
Angle of Friction:	34.000	deg
Cohesion:	0.000	ksf
Passive Pressure:	0.000	ksf
Base Friction:	0.300	

Summary of Results

Req'd Pier Diam.	OK
Overturning	57.4%
Shear Capacity	24.1%
Bearing	16.5%
Pad Shear - 1-way	38.1%
Pad Shear - 2-way	4.1%
Pad Moment Capacity	28.8%
Pier Moment Capacity	99.9%

** Notes:

Pad steel is unknown.