Robinson+Cole

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Also admitted in Massachusetts

October 6, 2014

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

Re: **Notice of Exempt Modification – Facility Modification**
101R Old Blue Hill Road, Durham, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains fifteen (15) antennas at the 100-foot level of the existing 120-foot tower at 101R Old Blue Hill Road in Durham, Connecticut (the Property"). The tower is owned by Crown Castle. The Council approved Cellco's use of this tower in 1994 (Docket No. 161). Cellco now intends to modify its facility by replacing nine (9) of its existing antennas with three (3) model LNX-6514DS-VTM, 700 MHz antennas; three (3) model HBXX-6517DS-VTM, 1900 MHz antennas; and three (3) HBXX-6517DS-VTM, 2100 MHz antennas, all at the same 100-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 one (1) HYBRIFLEX™ antenna cable. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cable.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Laura L. Francis, First Selectman for the Town of Durham. A copy of this letter is also being sent to Frances Behrens, 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).

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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 at the 100-foot level on the existing 120-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. Far Field Approximation tables for each of Cellco's operating frequencies are included behind Attachment 2. The Far Field calculations demonstrate that Cellco's modified facility will operate well within the RF emissions safety limits established by the FCC.

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:
Laura L. Francis, Durham First Selectman
Frances Behrens
Sandy M. Carter

ATTACHMENT 1

Product Specifications

COMMSCOPE®

LNX-6514DS-VTM

Andrew® Antenna, 698–896 MHz, 65° horizontal beamwidth, RET compatible

POWERED BY ANDREW.

Electrical Specifications

Frequency Band, MHz	698–806	806–896
Gain, dBi	15.7	16.3
Beamwidth, Horizontal, degrees	65	65
Beamwidth, Horizontal Tolerance, degrees	±3	±3
Beamwidth, Vertical, degrees	12.5	11.2
Beam Tilt, degrees	0–10	0–10
USLS, typical, dB	17	18
Front-to-Back Ratio at 180°, dB	32	30
CPR at Boresight, dB	20	20
CPR at Sector, dB	10	10
Isolation, dB	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153
Input Power per Port, maximum, watts	400	400
Polarization	±45°	±45°

Mechanical Specifications

Color | Radome Material	Light gray | Fiberglass, UV resistant
Connector Interface | Location | Quantity	7-16 DIN Female | Bottom | 2
Wind Loading, maximum	617.7 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph
Antenna Dimensions, L x W x D	1847.0 mm x 301.0 mm x 181.0 mm | 72.7 in x 11.9 in x 7.1 in
Net Weight	17.6 kg | 38.8 lb
Model with factory installed AISG 2.0 RET	LNX-6514DS-A1M

Product Specifications

COMMSCOPE®

HBXX-6517DS-VTM

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

POWERED BY ANDREW.

Electrical Specifications

Frequency Band, MHz	1710–1880	1850–1990	1920–2180
Gain by all Beam Tilts, average, dBi	18.5	18.6	18.8
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.3	±0.4
Gain by Beam Tilt, average, dBi	0 ° | 18.4 3 ° | 18.7 6 ° | 18.4	0 ° | 18.4 3 ° | 18.7 6 ° | 18.5	0 ° | 18.7 3 ° | 18.9 6 ° | 18.6
Beamwidth, Horizontal, degrees	67	66	65
Beamwidth, Horizontal Tolerance, degrees	±2.4	±1.7	±2.9
Beamwidth, Vertical, degrees	5.0	4.7	4.4
Beamwidth, Vertical Tolerance, degrees	±0.3	±0.3	±0.3
Beam Tilt, degrees	0–6	0–6	0–6
USLS, dB	18	19	19
Front-to-Back Total Power at 180° ± 30°, dB	25	26	26
CPR at Boresight, dB	22	23	22
CPR at Sector, dB	10	10	9
Isolation, dB	30	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350
Polarization	±45°	±45°	±45°

**Values calculated using NGMN Alliance N-P-BASTA v9.6*

Mechanical Specifications

Color | Radome Material	Light gray | PVC, UV resistant
Connector Interface | Location | Quantity	7-16 DIN Female | Bottom | 4
Wind Loading, maximum	668.0 N @ 150 km/h 150.2 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph
Antenna Dimensions, L x W x D	1903.0 mm x 305.0 mm x 166.0 mm | 74.9 in x 12.0 in x 6.5 in
Net Weight	19.5 kg | 43.0 lb
Model with factory installed AISG 2.0 RET	HBXX-6517DS-A2M

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 1900A HW version	2 Branch RX – LA6.0.1 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)

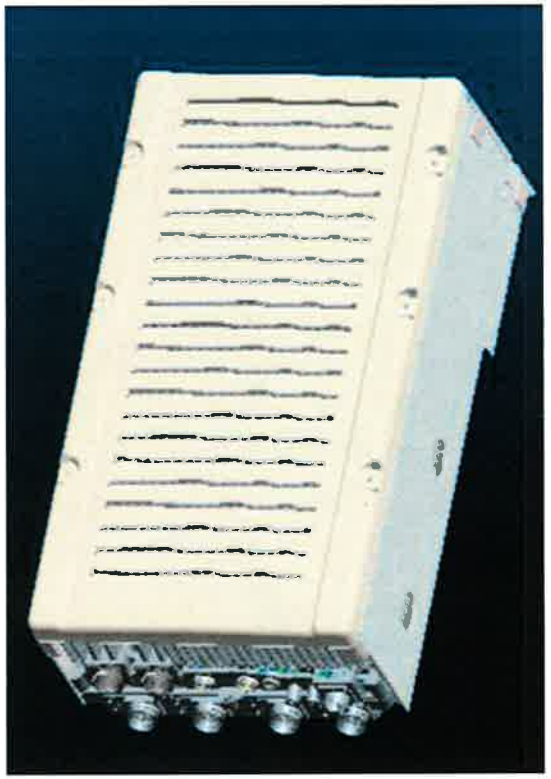
** Not a Verizon Wireless deployed product

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
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.

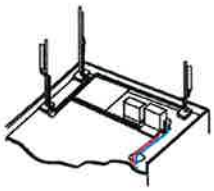
EASY INSTALLATION

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.

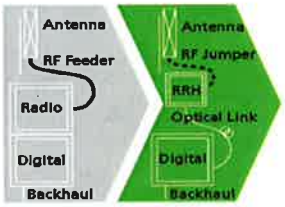
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

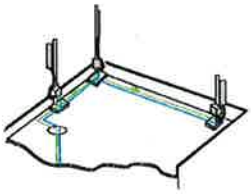
Installation can easily be done by a single person as the Alcatel–Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



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

Alcatel·Lucent

AT THE SPEED OF IDEAS™

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 CELLFLEX® 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
Mechanical Properties			
Weight, Approximate		[kg/m (lb/ft)]	1.9 (1.30)
Minimum Bending Radius, Single Bending		[mm (in)]	200 (8)
Minimum Bending Radius, Repeated Bending		[mm (in)]	500 (20)
Recommended/Maximum Clamp Spacing		[m (ft)]	1.0 / 1.2 (3.25 / 4.0)
Electrical Properties			
DC-Resistance Outer Conductor Armor		[Ω/km (Ω/1000ft)]	068 (0.205)
DC-Resistance Power Cable, 8.4mm²(8AWG)		[Ω/km (Ω/1000ft)]	2.1 (0.307)
Optical Properties			
Version			Single-mode OM3
Quantity, Fiber Count			16 (8 pairs)
Core/Clad		[µm]	50/125
Primary Coating (Acrylate)		[µm]	245
Buffer Diameter, Nominal		[µm]	900
Secondary Protection, Jacket, Nominal		[mm (in)]	2.0 (0.08)
Minimum Bending Radius		[mm (in)]	104 (4.1)
Insertion Loss @ wavelength 850nm		dB/km	3.0
Insertion Loss @ wavelength 1310nm		dB/km	1.0
Standards (Meets or exceeds)			UL94-V0 UL1666 RoHS Compliant
DC Power Properties			
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
Environmental			
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to149)

* This data is provisional and subject to change

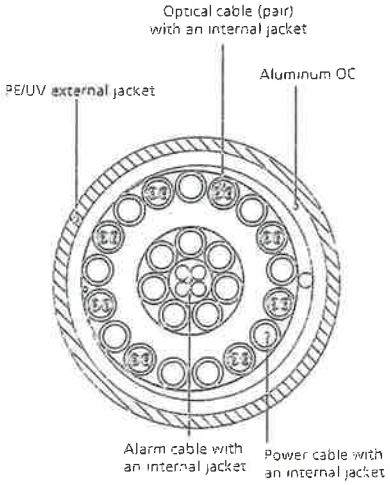


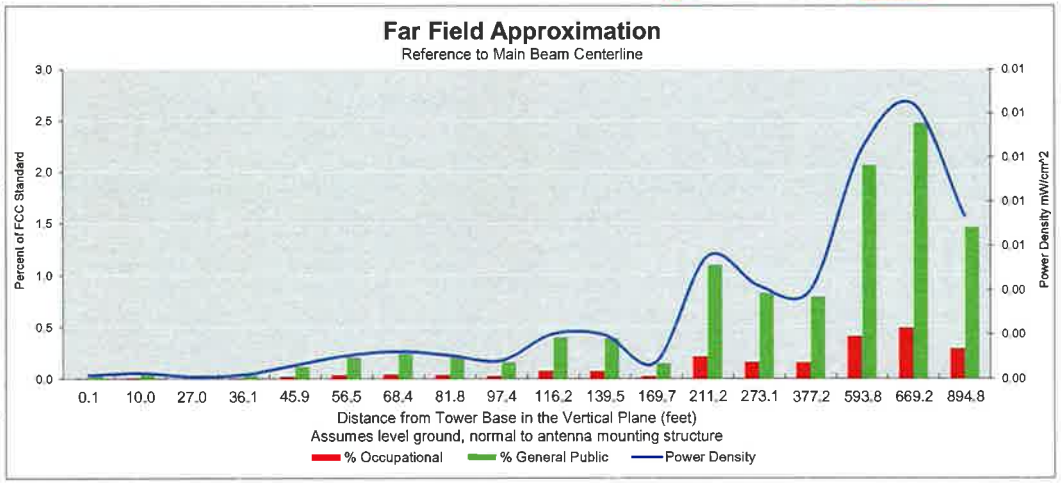
Figure 2: Construction Detail

ATTACHMENT 2

Estimated Radiated Emission
Single Emitter Far Field Model
Dipole/Wire/Yagi Antenna Types

Location:	**DURHAM CT**
Site #:	2-0163
Date:	10/01/14
Name:	Jaime Laredo
File Name:	DURHAM CT - FF POWER (LTE-700).xlsx

Operating Freq. (MHz):	**751.0**
Antenna Height (ft):	**97.0**
Antenna Gain (dBi):	**15.8**
Antenna Size (in.):	**72.7**
Downtilt (degrees):	**4.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**706.0**



Calc Angle	90.0	84.0	74.0	69.0	64.0	59.0	54.0	49.0	44.0	39.0	34.0	29.0	24.0	19.0	14.0	9.0	8.0	6.0
Solve for r, dx to antenna	94.0	94.5	97.8	100.7	104.6	109.7	116.2	124.6	135.4	149.4	168.2	194.0	231.2	288.9	388.7	601.2	675.8	899.7
Distance from Antenna Structure Base in Horizontal plane	0.1	10.0	27.0	36.1	45.9	56.5	68.4	81.8	97.4	116.2	139.5	169.7	211.2	273.1	377.2	593.8	669.2	894.8
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.01
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.2	0.2	0.2	0.4	0.5	0.3
Percent of General Population Standard	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.2	0.4	0.4	0.1	1.1	0.8	0.8	2.1	2.5	1.5

Antenna Type: **LNX-6514DS-A1M_4DT_750MHZ**

Max%: **2.48%**

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 Power (in watts).
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

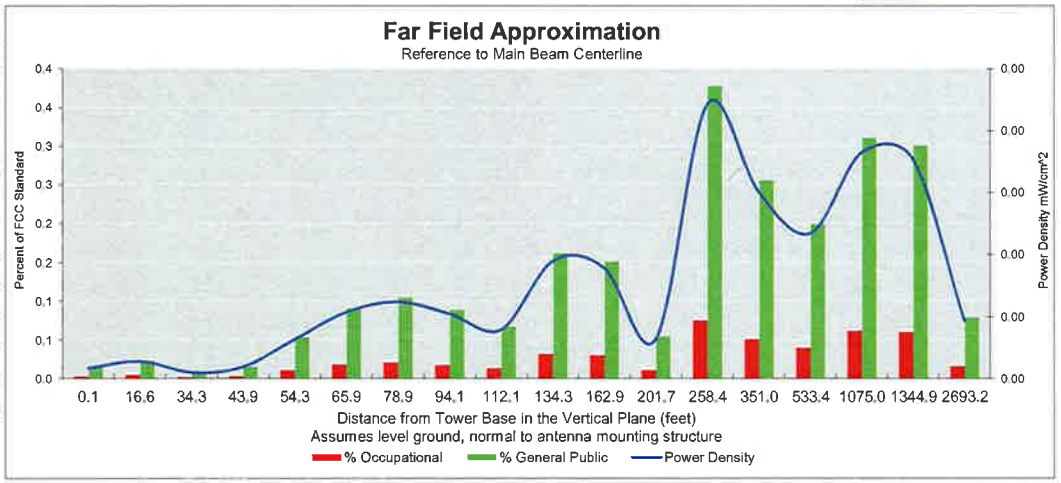
Far Field Approximation
with downtilt variation

Estimated Radiated Emission
Single Emitter Far Field Model
Dipole/Wire/Yagi Antenna Types

verizonwireless

Location:	**DURHAM CT**
Site #:	2-0163
Date:	10/01/14
Name:	Jaime Laredo
File Name:	DURHAM CT - FF POWER (Cellular).xlsx

Operating Freq. (MHz):	**878.5**
Antenna Height (ft):	**97.0**
Antenna Gain (dBi):	**16.2**
Antenna Size (in.):	**70.9**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**370.3**



Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0
Solve for r, dx to antenna	94.0	95.5	100.1	103.7	108.6	114.8	122.8	133.0	146.3	164.0	188.1	222.5	275.0	363.4	541.6	1079.1	1348.2	2694.8
Distance from Antenna Structure Base in Horizontal plane	0.1	16.6	34.3	43.9	54.3	65.9	78.9	94.1	112.1	134.3	162.9	201.7	258.4	351.0	533.4	1075.0	1344.9	2693.2
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0
Percent of General Population Standard	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.4	0.3	0.2	0.3	0.3	0.1

Antenna Type: **LPA-80080/6CF**

Max%: **0.38%**

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 Power (in watts).
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

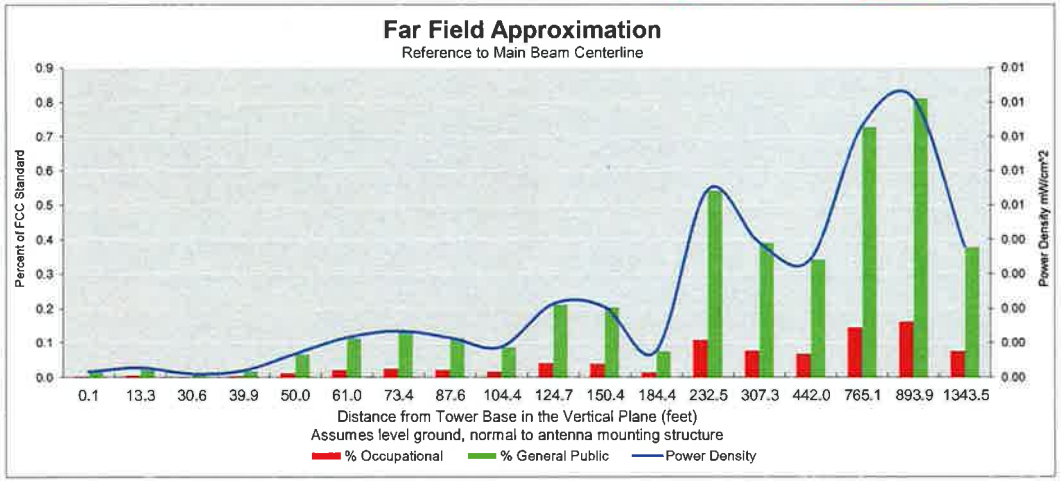
Far Field Approximation
with downtilt variation

Estimated Radiated Emission
Single Emitter Far Field Model
Dipole/Wire/Yagi Antenna Types

verizonwireless

Location:	**DURHAM CT**
Site #:	2-0163
Date:	10/01/14
Name:	Jaime Laredo
File Name:	DURHAM CT - FF POWER (PCS).xlsx

Operating Freq. (MHz):	**1973.8**
Antenna Height (ft):	**96.9**
Antenna Gain (dBi):	**18.5**
Antenna Size (in.):	**74.9**
Downtilt (degrees):	**2.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**441.7**



Calc Angle	90.0	82.0	72.0	67.0	62.0	57.0	52.0	47.0	42.0	37.0	32.0	27.0	22.0	17.0	12.0	7.0	6.0	4.0
Solve for r, dx to antenna	93.9	94.8	98.8	102.0	106.4	112.0	119.2	128.4	140.4	156.1	177.3	206.9	250.8	321.3	451.9	770.9	898.8	1346.8
Distance from Antenna Structure Base in Horizontal plane	0.1	13.3	30.6	39.9	50.0	61.0	73.4	87.6	104.4	124.7	150.4	184.4	232.5	307.3	442.0	765.1	893.9	1343.5
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.00
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.1
Percent of General Population Standard	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.5	0.4	0.3	0.7	0.8	0.4

Antenna Type: **HBXX-6517DS-A2M_PORT 3 - +45_02DT_1920**

Max%: **0.81%**

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 Power (in watts).
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

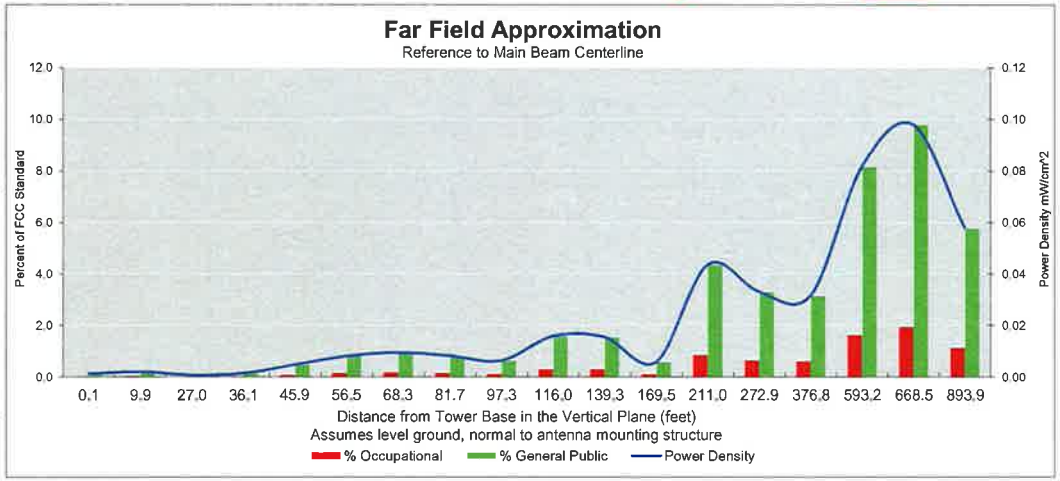
Far Field Approximation
with downtilt variation

Estimated Radiated Emission
Single Emitter Far Field Model
Dipole/Wire/Yagi Antenna Types

verizonwireless

Location:	DURHAM CT
Site #:	2-0163
Date:	10/01/14
Name:	Jaime Laredo
File Name:	DURHAM CT - FF POWER (LTE-AWS).xlsx

Operating Freq. (MHz):	**2120.0**
Antenna Height (ft):	**96.9**
Antenna Gain (dBi):	**19.0**
Antenna Size (in.):	**74.9**
Downtilt (degrees):	**4.0**
Feedline Loss (dB):	**0.0**
Power @ J4 (w):	**2691.2**



Calc Angle	90.0	84.0	74.0	69.0	64.0	59.0	54.0	49.0	44.0	39.0	34.0	29.0	24.0	19.0	14.0	9.0	8.0	6.0
Solve for r, dx to antenna	93.9	94.4	97.7	100.6	104.5	109.6	116.1	124.5	135.2	149.3	168.0	193.8	231.0	288.6	388.3	600.6	675.0	898.8
Distance from Antenna Structure Base in Horizontal plane	0.1	9.9	27.0	36.1	45.9	56.5	68.3	81.7	97.3	116.0	139.3	169.5	211.0	272.9	376.8	593.2	668.5	893.9
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.04	0.03	0.03	0.08	0.10	0.06
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.1	0.3	0.3	0.1	0.9	0.7	0.6	1.6	2.0	1.2
Percent of General Population Standard	0.1	0.2	0.1	0.1	0.5	0.8	1.0	0.8	0.6	1.6	1.5	0.6	4.4	3.3	3.2	8.2	9.8	5.8

Antenna Type: **HBXX-6517DS-A2M_PORT 3 - +45_04DT_2110**

Max%: **9.78%**

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 Power (in watts).
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

ATTACHMENT 3

PAUL J. FORD AND COMPANY
STRUCTURAL ENGINEERS
250 East Broad Street • Suite 600 • Columbus, Ohio 43215-3708

Date: **September 16, 2014**

Rebecca Klein
Crown Castle
525 Alderman Lane
Fort Mill, SC 29715
704.405.5625

Paul J. Ford and Company
250 E. Broad Street, Suite 600
Columbus, OH 43215
614.221.6679
jmeinerding@pjfweb.com

Subject: **Structural Analysis Report**

Carrier Designation:	***Verizon Wireless* Co-Locate**	
	Carrier Site Number:	N/A
	Carrier Site Name:	Durham, CT
Crown Castle Designation:	**Crown Castle BU Number:**	806364
	Crown Castle Site Name:	HRT 106(B) 943202
	Crown Castle JDE Job Number:	306864
	Crown Castle Work Order Number:	926835
	Crown Castle Application Number:	265334 Rev. 0
Engineering Firm Designation:	**Paul J. Ford and Company Project Number:**	37514-0797.004.7805
Site Data:	**101 R OLD BLUE HILL ROAD, DURHAM, Middlesex County, CT**	
	Latitude *41° 27' 33.67"*, Longitude *-72° 39' 45.83"*	
	120 Foot - Monopole Tower	

Dear Rebecca Klein,

Paul J. Ford and Company 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 704142, in accordance with application 265334, revision 0.

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

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

The structural analysis was performed for this tower in accordance with the requirements of the 2005 Connecticut Building Code and the 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.

We at *Paul J. Ford and Company* 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:

Joey Meinerding, E.I.
Structural Designer

STATE OF CONNECTICUT
JUSTIN T. KLINE
No. 30301
LICENSED
PROFESSIONAL ENGINEER
9-15-14

tnxTower Report - version 6.1.4.1

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 120 ft. monopole tower designed by Valmont in March of 1994. The tower was originally designed for a wind speed of 90 mph per TIA/EIA-222-E.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of the 2005 Connecticut Building Code and the 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
98.0	100.0	3	alcatel lucent	RRH2X60-AWS	1	1-5/8	--
		3	alcatel lucent	RRH2X60-PCS			
		3	andrew	HBXX-6517DS-A2M w/ Mount Pipe			
		3	andrew	HBXX-6517DS-VTM w/ Mount Pipe			
		3	andrew	LNX-6514DS-A1M w/ Mount Pipe			
		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
118.0	125.0	1	decibel	DB809MT3-XT	2	7/8	1
	123.0	1	decibel	DB201-A			
	118.0	2	tower mounts	Side Arm Mount [SO 701-1]			
115.0	115.0	12	decibel	DB844H90 w/ Mount Pipe	12	1-1/4	3
		1	tower mounts	Platform Mount [LP 401-1]			
107.0	107.0	1	gabriel electronics	GLF6-450	1	7/8	1
		1	tower mounts	Pipe Mount [PM 601-1]			
98.0	100.0	3	antel	BXA-70063/6CF-2 w/ Mount Pipe	--	--	3
		6	antel	LPA-171063-12CF-EDIN-2 w/ Mount Pipe			
		6	antel	LPA-80080/6CF w/ Mount Pipe	18	7/8	1
	98.0	1	tower mounts	Platform Mount [LP 602-1]			
87.0	89.0	6	decibel	DB980H90E-M w/ Mount Pipe	6	1-1/4	1
	87.0	1	tower mounts	Platform Mount [LP 602-1]			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
73.0	79.0	1	decibel	DB636-C	--	--	3
	74.0	2	raycap	DC6-48-60-18-8F			
		3	cci antennas	AM-X-CD-16-65-00T-RET w/ Mount Pipe	1 2 13	3/8 3/4 7/8	1
		6	powerwave technologies	LGP21401			
		6	powerwave technologies	LGP21903			
		3	ericsson	RRUS 11			
		6	powerwave technologies	7770.00 w/ Mount Pipe			
		1	raycap	DC6-48-60-18-8F			
		3	ericsson	RRUS 11	--	--	2
	73.0	1	tower mounts	MTC3607R Platform Mount [LP 1303-1]			
50.0	57.0	1	rfs celwave	PD1142-1	1 3	1/2 7/8	1
	54.0	1	decibel	ASP-655			
	53.0	1	celwave	PD1121-6			
	50.0	1	decibel	DB492A			
		1	tower mounts	Side Arm Mount [SO 701-3]			
40.0	41.0	1	tekelec systemes	EPSILON GPS ANTENNA 35 DB	1	1/2	1
	40.0	1	tower mounts	Side Arm Mount [SO 701-1]			

Notes:
1) Existing Equipment
2) Reserved Equipment
3) Equipment to be Removed

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	Clarence Welti, 3/18/1993	262150	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	SAC, 1994-8A, 4/5/1994	297341	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Valmont, 11512-94, 3/23/1994	262153	CCISITES
4-TOWER EXTENSION DESIGN	Valmont, 17248-64, 5/5/2004	942187	CCISITES

3.1) Analysis Method

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

3.2) Assumptions

1) Tower and structures were built in accordance with the manufacturer's specifications.
2) The tower and structures have been maintained in accordance with the manufacturer's specification.
3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
4) Monopole has been extended per the referenced extension design. Per photos on CCISITES, 8 bolts were installed at the flange connection at 100'. We have assumed that 8 bolts were installed on a matching bolt circle to the design specifications with the same flange plate dimensions.

This analysis may be affected if any assumptions are not valid or have been made in error. Paul J. Ford and Company should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	120 - 100	Pole	TP20.263x15.0403x0.1875	1	-0.99	630.11	11.8	Pass
L2	100 - 47.0833	Pole	TP33.127x20.263x0.2813	2	-12.53	1490.13	87.9	Pass
L3	47.0833 - 0	Pole	TP44x31.3693x0.375	3	-23.29	2738.53	89.6	Pass
							Summary	
						Pole (L3)	89.6	Pass
						RATING =	89.6	Pass

Table 5 - Tower Component Stresses vs. Capacity

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	84.1	Pass
1	Base Plate	0	48.4	Pass
1	Base Foundation Structural Steel	0	25.4	Pass
1	Base Foundation Soil Interaction	0	29.6	Pass
1	Flange Connection	100	15.7	Pass

Structure Rating (max from all components) =	89.6%

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

Tower Input Data

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

1) Tower is located in Middlesex County, Connecticut.
2) Basic wind speed of 85 mph.
3) Nominal ice thickness of 0.7500 in.
4) Ice thickness is considered to increase with height.
5) Ice density of 56.00 pcf.
6) A wind speed of 38 mph is used in combination with ice.
7) Deflections calculated using a wind speed of 50 mph.
8) A non-linear (P-delta) analysis was used.
9) Pressures are calculated at each section.
10) Stress ratio used in pole design is 1.333.
11) 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	120.00-100.00	20.00	0.00	12	15.0403	20.2630	0.1875	0.7500	A572-65 (65 ksi)
L2	100.00-47.08	52.92	4.92	12	20.2630	33.1270	0.2813	1.1250	A572-65 (65 ksi)
L3	47.08-0.00	52.00		12	31.3693	44.0000	0.3750	1.5000	A572-65 (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	15.5709	8.9674	252.5039	5.3173	7.7909	32.4102	511.6414	4.4135	3.5283	18.818
	20.9778	12.1206	623.5083	7.1870	10.4962	59.4030	1263.3968	5.9654	4.9280	26.283
L2	20.9778	18.0960	922.2208	7.1535	10.4962	87.8621	1868.6694	8.9063	4.6767	16.628
	34.2956	29.7459	4096.1127	11.7588	17.1598	238.7042	8299.8349	14.6400	8.1243	28.886

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
L3	33.7122	37.4256	4588.9856	11.0959	16.2493	282.4117	9298.5290	18.4197	7.4020	19.739
	45.5522	52.6772	12796.152 6	15.6177	22.7920	561.4318	25928.474 3	25.9261	10.7870	28.765

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 120.00-100.00				1	1	1		
L2 100.00-47.08				1	1	1		
L3 47.08-0.00				1	1	1		

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
LDF5-50A(7/8")	C	No	Inside Pole	118.00 - 0.00	2	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00
***								
***								
VXL5-50(7/8")	C	No	Inside Pole	107.00 - 0.00	1	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00
***								
LDF5-50A(7/8")	C	No	Inside Pole	98.00 - 0.00	18	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00
HB158-1-08U8-S8J18(1-5/8)	C	No	Inside Pole	98.00 - 0.00	1	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00
***								
LDF6-50A(1-1/4")	C	No	Inside Pole	87.00 - 0.00	6	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00
***								
LDF5-50A(7/8")	C	No	Inside Pole	73.00 - 0.00	12	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00
VXL5-50(7/8")	C	No	Inside Pole	73.00 - 0.00	1	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00
L98B-002-XXX_DB(3/8")	C	No	Inside Pole	73.00 - 0.00	1	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00
WR-VG86ST-BRD(	C	No	Inside Pole	73.00 - 0.00	2	No Ice	0.00	0.00

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight klf
3/4)						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00
2" Conduit	C	No	Inside Pole	73.00 - 0.00	1	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00
***								
LDF4-50A(1/2")	C	No	Inside Pole	50.00 - 0.00	1	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00
LDF5-50A(7/8")	C	No	Inside Pole	50.00 - 0.00	3	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00
***								
LDF4-50A(1/2")	C	No	Inside Pole	40.00 - 0.00	1	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	120.00-100.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.01
L2	100.00-47.08	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.75
L3	47.08-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.94

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	120.00-100.00	A	0.866	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.01
L2	100.00-47.08	A	0.824	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.75
L3	47.08-0.00	A	0.750	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.94

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
L1	120.00-100.00	0.0000	0.0000	0.0000	0.0000
L2	100.00-47.08	0.0000	0.0000	0.0000	0.0000
L3	47.08-0.00	0.0000	0.0000	0.0000	0.0000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
DB809MT3-XT	A	From Leg	3.00 0.00 7.00	0.00	118.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.84 4.29 5.75 8.72 12.90	2.84 4.29 5.75 8.72 12.90	0.03 0.05 0.08 0.17 0.46
DB201-A	B	From Leg	3.00 0.00 5.00	0.00	118.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.10 1.98 2.86 4.62 8.14	1.10 1.98 2.86 4.62 8.14	0.03 0.03 0.04 0.06 0.09
2.375" OD x 5' Mount Pipe	A	From Leg	3.00 0.00 0.00	0.00	118.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.19 1.50 1.81 2.46 3.92	1.19 1.50 1.81 2.46 3.92	0.02 0.03 0.04 0.08 0.20
2.375" OD x 5' Mount Pipe	B	From Leg	3.00 0.00 0.00	0.00	118.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.19 1.50 1.81 2.46 3.92	1.19 1.50 1.81 2.46 3.92	0.02 0.03 0.04 0.08 0.20
Side Arm Mount [SO 701-1]	A	None		0.00	118.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.85 1.14 1.43 2.01 3.17	1.67 2.34 3.01 4.35 7.03	0.07 0.08 0.09 0.12 0.18
Side Arm Mount [SO 701-1]	B	None		0.00	118.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.85 1.14 1.43 2.01 3.17	1.67 2.34 3.01 4.35 7.03	0.07 0.08 0.09 0.12 0.18
***									
***									
Pipe Mount [PM 601-1]	B	None		0.00	107.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.00 3.74 4.48 5.96 8.92	0.90 1.12 1.34 1.78 2.66	0.07 0.08 0.09 0.12 0.18
***									
(2) LPA-80080/6CF w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.00	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.56 5.11 5.61 6.65 8.83	10.73 11.99 12.97 14.98 19.22	0.05 0.11 0.19 0.36 0.86
(2) LPA-80080/6CF w/	B	From Leg	4.00	0.00	98.00	No Ice	4.56	10.73	0.05

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
Mount Pipe			0.00 2.00			1/2" Ice 1" Ice 2" Ice 4" Ice	5.11 5.61 6.65 8.83	11.99 12.97 14.98 19.22	0.11 0.19 0.36 0.86
(2) LPA-80080/6CF w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.00	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.56 5.11 5.61 6.65 8.83	10.73 11.99 12.97 14.98 19.22	0.05 0.11 0.19 0.36 0.86
HBXX-6517DS-A2M w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.00	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.98 9.65 10.29 11.59 14.32	6.96 8.18 9.14 11.02 15.03	0.07 0.14 0.21 0.40 0.91
HBXX-6517DS-A2M w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	0.00	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.98 9.65 10.29 11.59 14.32	6.96 8.18 9.14 11.02 15.03	0.07 0.14 0.21 0.40 0.91
HBXX-6517DS-A2M w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.00	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.98 9.65 10.29 11.59 14.32	6.96 8.18 9.14 11.02 15.03	0.07 0.14 0.21 0.40 0.91
HBXX-6517DS-VTM w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.00	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.98 9.65 10.29 11.59 14.32	6.96 8.18 9.14 11.02 15.03	0.07 0.14 0.21 0.40 0.91
HBXX-6517DS-VTM w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	0.00	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.98 9.65 10.29 11.59 14.32	6.96 8.18 9.14 11.02 15.03	0.07 0.14 0.21 0.40 0.91
HBXX-6517DS-VTM w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.00	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.98 9.65 10.29 11.59 14.32	6.96 8.18 9.14 11.02 15.03	0.07 0.14 0.21 0.40 0.91
LNX-6514DS-A1M w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.00	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.65 9.31 9.93 11.20 13.87	7.08 8.27 9.18 11.02 15.06	0.06 0.13 0.21 0.39 0.90
LNX-6514DS-A1M w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	0.00	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.65 9.31 9.93 11.20 13.87	7.08 8.27 9.18 11.02 15.06	0.06 0.13 0.21 0.39 0.90
LNX-6514DS-A1M w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.00	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.65 9.31 9.93 11.20 13.87	7.08 8.27 9.18 11.02 15.06	0.06 0.13 0.21 0.39 0.90

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
RRH2X60-AWS	A	From Leg	4.00 0.00 2.00	0.00	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.96 4.27 4.60 5.27 6.72	2.16 2.44 2.73 3.34 4.66	0.06 0.08 0.11 0.18 0.37
RRH2X60-AWS	B	From Leg	4.00 0.00 2.00	0.00	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.96 4.27 4.60 5.27 6.72	2.16 2.44 2.73 3.34 4.66	0.06 0.08 0.11 0.18 0.37
RRH2X60-AWS	C	From Leg	4.00 0.00 2.00	0.00	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.96 4.27 4.60 5.27 6.72	2.16 2.44 2.73 3.34 4.66	0.06 0.08 0.11 0.18 0.37
RRH2X60-PCS	A	From Leg	4.00 0.00 2.00	0.00	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.57 2.79 3.02 3.52 4.61	2.01 2.22 2.43 2.89 3.92	0.06 0.08 0.10 0.16 0.31
RRH2X60-PCS	B	From Leg	4.00 0.00 2.00	0.00	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.57 2.79 3.02 3.52 4.61	2.01 2.22 2.43 2.89 3.92	0.06 0.08 0.10 0.16 0.31
RRH2X60-PCS	C	From Leg	4.00 0.00 2.00	0.00	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.57 2.79 3.02 3.52 4.61	2.01 2.22 2.43 2.89 3.92	0.06 0.08 0.10 0.16 0.31
DB-T1-6Z-8AB-0Z	B	From Leg	4.00 0.00 2.00	0.00	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.60 5.92 6.24 6.91 8.37	2.33 2.56 2.79 3.28 4.37	0.04 0.08 0.12 0.21 0.45
Platform Mount [LP 602-1]	C	None		0.00	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	32.03 38.71 45.39 58.75 85.47	32.03 38.71 45.39 58.75 85.47	1.34 1.80 2.26 3.17 5.00
***									
(2) DB980H90E-M w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.00	87.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.04 4.50 4.95 5.87 8.05	3.62 4.48 5.22 6.74 10.00	0.03 0.07 0.11 0.22 0.55
(2) DB980H90E-M w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	0.00	87.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.04 4.50 4.95 5.87 8.05	3.62 4.48 5.22 6.74 10.00	0.03 0.07 0.11 0.22 0.55
(2) DB980H90E-M w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.00	87.00	No Ice 1/2" Ice 1" Ice	4.04 4.50 4.95 5.87	3.62 4.48 5.22 6.74	0.03 0.07 0.11 0.22

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						2" Ice	8.05	10.00	0.55
						4" Ice			
Platform Mount [LP 602-1]	C	None		0.00	87.00	No Ice	32.03	32.03	1.34
						1/2" Ice	38.71	38.71	1.80
						1" Ice	45.39	45.39	2.26
						2" Ice	58.75	58.75	3.17
						4" Ice	85.47	85.47	5.00
***									
(2) DC6-48-60-18-8F	A	From Leg	4.00 0.00 1.00	0.00	73.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.51 2.74 2.98 3.48 4.58	2.51 2.74 2.98 3.48 4.58	0.02 0.04 0.07 0.13 0.30
(2) LGP21401	A	From Leg	4.00 0.00 1.00	0.00	73.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.29 1.45 1.61 1.97 2.79	0.36 0.48 0.60 0.87 1.52	0.01 0.02 0.03 0.05 0.14
(2) LGP21401	B	From Leg	4.00 0.00 1.00	0.00	73.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.29 1.45 1.61 1.97 2.79	0.36 0.48 0.60 0.87 1.52	0.01 0.02 0.03 0.05 0.14
(2) LGP21401	C	From Leg	4.00 0.00 1.00	0.00	73.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.29 1.45 1.61 1.97 2.79	0.36 0.48 0.60 0.87 1.52	0.01 0.02 0.03 0.05 0.14
(2) LGP21903	B	From Leg	4.00 0.00 1.00	0.00	73.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.27 0.34 0.43 0.62 1.10	0.18 0.25 0.32 0.49 0.94	0.01 0.01 0.02 0.03 0.07
(4) LGP21903	C	From Leg	4.00 0.00 1.00	0.00	73.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.27 0.34 0.43 0.62 1.10	0.18 0.25 0.32 0.49 0.94	0.01 0.01 0.02 0.03 0.07
(2) 7770.00 w/ Mount Pipe	A	From Leg	4.00 0.00 1.00	0.00	73.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.12 6.63 7.13 8.16 10.36	4.25 5.01 5.71 7.16 10.41	0.06 0.10 0.16 0.29 0.66
(2) 7770.00 w/ Mount Pipe	B	From Leg	4.00 0.00 1.00	0.00	73.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.12 6.63 7.13 8.16 10.36	4.25 5.01 5.71 7.16 10.41	0.06 0.10 0.16 0.29 0.66
(2) 7770.00 w/ Mount Pipe	C	From Leg	4.00 0.00 1.00	0.00	73.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.12 6.63 7.13 8.16 10.36	4.25 5.01 5.71 7.16 10.41	0.06 0.10 0.16 0.29 0.66
AM-X-CD-16-65-00T-RET w/ Mount Pipe	A	From Leg	4.00 0.00	0.00	73.00	No Ice 1/2"	8.50 9.15	6.30 7.48	0.07 0.14

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			1.00			Ice	9.77	8.37	0.21
						1" Ice	11.03	10.18	0.38
						2" Ice	13.68	14.02	0.87
						4" Ice			
AM-X-CD-16-65-00T-RET w/ Mount Pipe	B	From Leg	4.00	0.00	73.00	No Ice	8.50	6.30	0.07
			0.00			1/2"	9.15	7.48	0.14
			1.00			Ice	9.77	8.37	0.21
						1" Ice	11.03	10.18	0.38
						2" Ice	13.68	14.02	0.87
						4" Ice			
AM-X-CD-16-65-00T-RET w/ Mount Pipe	C	From Leg	4.00	0.00	73.00	No Ice	8.50	6.30	0.07
			0.00			1/2"	9.15	7.48	0.14
			1.00			Ice	9.77	8.37	0.21
						1" Ice	11.03	10.18	0.38
						2" Ice	13.68	14.02	0.87
						4" Ice			
(2) RRUS 11	B	From Leg	4.00	0.00	73.00	No Ice	3.25	1.37	0.05
			0.00			1/2"	3.49	1.55	0.07
			1.00			Ice	3.74	1.74	0.10
						1" Ice	4.27	2.14	0.15
						2" Ice	5.43	3.04	0.31
						4" Ice			
(2) RRUS 11	B	From Leg	4.00	0.00	73.00	No Ice	3.25	1.37	0.05
			0.00			1/2"	3.49	1.55	0.07
			1.00			Ice	3.74	1.74	0.10
						1" Ice	4.27	2.14	0.15
						2" Ice	5.43	3.04	0.31
						4" Ice			
RRUS 11	C	From Leg	4.00	0.00	73.00	No Ice	3.25	1.37	0.05
			0.00			1/2"	3.49	1.55	0.07
			1.00			Ice	3.74	1.74	0.10
						1" Ice	4.27	2.14	0.15
						2" Ice	5.43	3.04	0.31
						4" Ice			
DC6-48-60-18-8F	C	From Leg	4.00	0.00	73.00	No Ice	2.51	2.51	0.02
			0.00			1/2"	2.74	2.74	0.04
			1.00			Ice	2.98	2.98	0.07
						1" Ice	3.48	3.48	0.13
						2" Ice	4.58	4.58	0.30
						4" Ice			
(2) RRUS 11	A	From Leg	4.00	0.00	73.00	No Ice	3.25	1.37	0.05
			0.00			1/2"	3.49	1.55	0.07
			1.00			Ice	3.74	1.74	0.10
						1" Ice	4.27	2.14	0.15
						2" Ice	5.43	3.04	0.31
						4" Ice			
RRUS 11	C	From Leg	4.00	0.00	73.00	No Ice	3.25	1.37	0.05
			0.00			1/2"	3.49	1.55	0.07
			1.00			Ice	3.74	1.74	0.10
						1" Ice	4.27	2.14	0.15
						2" Ice	5.43	3.04	0.31
						4" Ice			
MTC3607R Platform Mount [LP 1303-1]	C	None		0.00	73.00	No Ice	56.80	56.80	2.53
						1/2"	70.80	70.80	3.38
						Ice	84.80	84.80	4.24
						1" Ice	112.80	112.80	5.96
						2" Ice	168.80	168.80	9.38
						4" Ice			
***									
PD1142-1	A	From Leg	3.00	0.00	50.00	No Ice	1.32	1.32	0.01
			0.00			1/2"	3.21	3.21	0.02
			7.00			Ice	5.12	5.12	0.05
						1" Ice	8.99	8.99	0.14
						2" Ice	16.94	16.94	0.46
						4" Ice			

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
DB492A	A	From Leg	3.00 0.00 0.00	0.00	50.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.10 1.98 2.86 4.62 8.14	1.10 1.98 2.86 4.62 8.14	0.01 0.01 0.01 0.01 0.02
ASP-655	B	From Leg	3.00 0.00 4.00	0.00	50.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.56 1.02 1.30 1.88 3.19	0.56 1.02 1.30 1.88 3.19	0.00 0.01 0.01 0.04 0.13
PD1121-6	C	From Leg	3.00 0.00 3.00	0.00	50.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.23 0.41 0.60 0.97 1.70	0.23 0.41 0.60 0.97 1.70	0.00 0.00 0.00 0.01 0.01
Side Arm Mount [SO 701-3]	C	None		0.00	50.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.83 3.92 5.01 7.19 11.55	2.83 3.92 5.01 7.19 11.55	0.20 0.24 0.28 0.36 0.53
***									
EPSILON GPS ANTENNA 35 DB	A	From Leg	3.00 0.00 1.00	0.00	40.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.13 0.19 0.25 0.39 0.79	0.13 0.19 0.25 0.39 0.79	0.00 0.00 0.00 0.01 0.05
Side Arm Mount [SO 701-1]	A	None		0.00	40.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.85 1.14 1.43 2.01 3.17	1.67 2.34 3.01 4.35 7.03	0.07 0.08 0.09 0.12 0.18

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
GLF6-450	B	Grid	From Leg	1.00 0.00 0.00	0.00		107.00	6.40	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	32.17 33.01 33.86 35.54 38.92	0.20 0.37 0.54 0.88 1.56

Tower Pressures - No Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z ksf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 120.00-100.00	109.51	1.409	0.03	29.419	A	0.000	29.419	29.419	100.00	0.000	0.000
					B	0.000	29.419		100.00	0.000	0.000
					C	0.000	29.419		100.00	0.000	0.000
L2 100.00-47.08	72.10	1.25	0.02	117.718	A	0.000	117.718	117.718	100.00	0.000	0.000
					B	0.000	117.718		100.00	0.000	0.000
					C	0.000	117.718		100.00	0.000	0.000
L3 47.08-0.00	22.47	1	0.02	150.203	A	0.000	150.203	150.203	100.00	0.000	0.000
					B	0.000	150.203		100.00	0.000	0.000
					C	0.000	150.203		100.00	0.000	0.000

Tower Pressure - With Ice

G_H = 1.690

Section Elevation ft	z ft	K_Z	q_z ksf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 120.00-100.00	109.51	1.409	0.01	0.8661	32.306	A	0.000	32.306	32.306	100.00	0.000	0.000
						B	0.000	32.306		100.00	0.000	0.000
						C	0.000	32.306		100.00	0.000	0.000
L2 100.00-47.08	72.10	1.25	0.00	0.8237	124.983	A	0.000	124.983	124.983	100.00	0.000	0.000
						B	0.000	124.983		100.00	0.000	0.000
						C	0.000	124.983		100.00	0.000	0.000
L3 47.08-0.00	22.47	1	0.00	0.7500	156.667	A	0.000	156.667	156.667	100.00	0.000	0.000
						B	0.000	156.667		100.00	0.000	0.000
						C	0.000	156.667		100.00	0.000	0.000

Tower Pressure - Service

G_H = 1.690

Section Elevation ft	z ft	K_Z	q_z ksf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 120.00-100.00	109.51	1.409	0.01	29.419	A	0.000	29.419	29.419	100.00	0.000	0.000
					B	0.000	29.419		100.00	0.000	0.000
					C	0.000	29.419		100.00	0.000	0.000
L2 100.00-47.08	72.10	1.25	0.01	117.718	A	0.000	117.718	117.718	100.00	0.000	0.000
					B	0.000	117.718		100.00	0.000	0.000
					C	0.000	117.718		100.00	0.000	0.000
L3 47.08-0.00	22.47	1	0.01	150.203	A	0.000	150.203	150.203	100.00	0.000	0.000
					B	0.000	150.203		100.00	0.000	0.000
					C	0.000	150.203		100.00	0.000	0.000

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

Comb. No.	Description
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
15	Dead+Wind 0 deg+Ice
16	Dead+Wind 30 deg+Ice
17	Dead+Wind 60 deg+Ice
18	Dead+Wind 90 deg+Ice
19	Dead+Wind 120 deg+Ice
20	Dead+Wind 150 deg+Ice
21	Dead+Wind 180 deg+Ice
22	Dead+Wind 210 deg+Ice
23	Dead+Wind 240 deg+Ice
24	Dead+Wind 270 deg+Ice
25	Dead+Wind 300 deg+Ice
26	Dead+Wind 330 deg+Ice
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	120 - 100	Pole	Max Tension	24	0.00	0.00	-0.00
			Max. Compression	14	-2.08	-1.00	-0.19
			Max. Mx	5	-1.00	-29.11	-0.68
			Max. My	8	-1.03	-1.26	-27.33
			Max. Vy	5	2.72	-29.11	-0.68
			Max. Vx	8	2.52	-1.26	-27.33
			Max. Torque	2			-1.53
L2	100 - 47.0833	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-22.61	-1.90	-0.72
			Max. Mx	5	-12.55	-826.05	-9.78
			Max. My	8	-12.58	-12.55	-809.03
			Max. Vy	5	22.64	-826.05	-9.78
			Max. Vx	8	22.27	-12.55	-809.03
			Max. Torque	2			-1.95
L3	47.0833 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-34.54	-1.92	-0.53
			Max. Mx	5	-23.29	-2139.78	-20.82
			Max. My	8	-23.30	-25.82	-2104.02
			Max. Vy	11	-27.72	2137.99	15.20
			Max. Vx	8	27.36	-25.82	-2104.02
			Max. Torque	13			-2.07

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	25	34.54	5.85	3.37
	Max. H_x	11	23.32	27.69	0.17
	Max. H_z	2	23.32	0.21	27.32
	Max. M_x	2	2101.38	0.21	27.32
	Max. M_z	5	2139.78	-27.69	-0.21
	Max. Torsion	7	1.99	-14.03	-23.87
	Min. Vert	1	23.32	0.00	0.00
	Min. H_x	5	23.32	-27.69	-0.21
	Min. H_z	8	23.32	-0.25	-27.34
	Min. M_x	8	-2104.02	-0.25	-27.34
	Min. M_z	11	-2137.99	27.69	0.17
	Min. Torsion	13	-2.07	13.99	23.89

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	23.32	0.00	0.00	0.37	-0.88	-0.00
Dead+Wind 0 deg - No Ice	23.32	-0.21	-27.32	-2101.38	19.54	1.96
Dead+Wind 30 deg - No Ice	23.32	13.61	-23.42	-1794.67	-1046.84	1.20
Dead+Wind 60 deg - No Ice	23.32	23.81	-13.45	-1029.86	-1836.05	0.73
Dead+Wind 90 deg - No Ice	23.32	27.69	0.21	20.82	-2139.78	-0.11
Dead+Wind 120 deg - No Ice	23.32	24.14	13.93	1078.54	-1869.22	-1.21
Dead+Wind 150 deg - No Ice	23.32	14.03	23.87	1841.60	-1088.04	-1.99
Dead+Wind 180 deg - No Ice	23.32	0.25	27.34	2104.02	-25.82	-1.93
Dead+Wind 210 deg - No Ice	23.32	-13.49	23.49	1803.26	1031.45	-1.20
Dead+Wind 240 deg - No Ice	23.32	-23.78	13.48	1033.55	1830.37	-0.75
Dead+Wind 270 deg - No Ice	23.32	-27.69	-0.17	-15.20	2137.99	0.02
Dead+Wind 300 deg - No Ice	23.32	-24.07	-13.89	-1073.27	1859.60	1.21
Dead+Wind 330 deg - No Ice	23.32	-13.99	-23.89	-1843.29	1082.04	2.07
Dead+Ice	34.54	0.00	0.00	0.53	-1.92	-0.00
Dead+Wind 0 deg+Ice	34.54	-0.40	-6.55	-528.24	42.35	0.21
Dead+Wind 30 deg+Ice	34.54	3.18	-5.49	-436.84	-255.06	0.45
Dead+Wind 60 deg+Ice	34.54	5.61	-3.16	-250.64	-452.53	0.31
Dead+Wind 90 deg+Ice	34.54	6.54	0.04	4.36	-528.18	0.04
Dead+Wind 120 deg+Ice	34.54	5.72	3.30	267.23	-464.10	-0.44
Dead+Wind 150 deg+Ice	34.54	3.30	5.64	454.13	-268.39	-0.80
Dead+Wind 180 deg+Ice	34.54	0.07	6.44	516.14	-9.63	-0.74
Dead+Wind 210 deg+Ice	34.54	-3.17	5.49	438.30	250.44	-0.45
Dead+Wind 240 deg+Ice	34.54	-5.88	2.93	226.55	478.33	0.22
Dead+Wind 270 deg+Ice	34.54	-6.67	-0.26	-27.62	539.20	0.45
Dead+Wind 300 deg+Ice	34.54	-5.85	-3.37	-274.12	473.96	0.44
Dead+Wind 330 deg+Ice	34.54	-3.56	-5.65	-453.85	293.00	0.30
Dead+Wind 0 deg - Service	23.32	-0.07	-9.45	-727.50	6.17	0.68
Dead+Wind 30 deg - Service	23.32	4.71	-8.10	-621.26	-363.13	0.42
Dead+Wind 60 deg - Service	23.32	8.24	-4.66	-356.41	-636.46	0.25
Dead+Wind 90 deg - Service	23.32	9.58	0.07	7.46	-741.67	-0.04
Dead+Wind 120 deg - Service	23.32	8.35	4.82	373.79	-647.98	-0.42
Dead+Wind 150 deg - Service	23.32	4.85	8.26	638.05	-377.42	-0.69
Dead+Wind 180 deg - Service	23.32	0.09	9.46	728.91	-9.54	-0.67
Dead+Wind 210 deg - Service	23.32	-4.67	8.13	624.74	356.60	-0.42
Dead+Wind 240 deg - Service	23.32	-8.23	4.66	358.19	633.29	-0.26
Dead+Wind 270 deg - Service	23.32	-9.58	-0.06	-5.02	739.86	0.01
Dead+Wind 300 deg - Service	23.32	-8.33	-4.81	-371.46	643.45	0.42
Dead+Wind 330 deg - Service	23.32	-4.84	-8.27	-638.14	374.15	0.72

Solution Summary

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
1	0.00	-23.32	0.00	0.00	23.32	0.00	0.000%
2	-0.21	-23.32	-27.32	0.21	23.32	27.32	0.000%
3	13.61	-23.32	-23.42	-13.61	23.32	23.42	0.000%
4	23.81	-23.32	-13.45	-23.81	23.32	13.45	0.000%
5	27.69	-23.32	0.21	-27.69	23.32	-0.21	0.000%
6	24.14	-23.32	13.93	-24.14	23.32	-13.93	0.000%
7	14.03	-23.32	23.87	-14.03	23.32	-23.87	0.000%
8	0.25	-23.32	27.34	-0.25	23.32	-27.34	0.000%
9	-13.49	-23.32	23.49	13.49	23.32	-23.49	0.000%
10	-23.78	-23.32	13.48	23.78	23.32	-13.48	0.000%
11	-27.69	-23.32	-0.17	27.69	23.32	0.17	0.000%
12	-24.07	-23.32	-13.89	24.07	23.32	13.89	0.000%
13	-13.99	-23.32	-23.89	13.99	23.32	23.89	0.000%
14	0.00	-34.54	0.00	0.00	34.54	0.00	0.000%
15	-0.40	-34.54	-6.55	0.40	34.54	6.55	0.000%
16	3.18	-34.54	-5.49	-3.18	34.54	5.49	0.000%
17	5.61	-34.54	-3.16	-5.61	34.54	3.16	0.000%
18	6.54	-34.54	0.04	-6.54	34.54	-0.04	0.000%
19	5.72	-34.54	3.30	-5.72	34.54	-3.30	0.000%
20	3.30	-34.54	5.64	-3.30	34.54	-5.64	0.000%
21	0.07	-34.54	6.44	-0.07	34.54	-6.44	0.000%
22	-3.17	-34.54	5.49	3.17	34.54	-5.49	0.000%
23	-5.88	-34.54	2.93	5.88	34.54	-2.93	0.000%
24	-6.67	-34.54	-0.26	6.67	34.54	0.26	0.000%
25	-5.85	-34.54	-3.37	5.85	34.54	3.37	0.000%
26	-3.56	-34.54	-5.65	3.56	34.54	5.65	0.000%
27	-0.07	-23.32	-9.45	0.07	23.32	9.45	0.000%
28	4.71	-23.32	-8.10	-4.71	23.32	8.10	0.000%
29	8.24	-23.32	-4.66	-8.24	23.32	4.66	0.000%
30	9.58	-23.32	0.07	-9.58	23.32	-0.07	0.000%
31	8.35	-23.32	4.82	-8.35	23.32	-4.82	0.000%
32	4.85	-23.32	8.26	-4.85	23.32	-8.26	0.000%
33	0.09	-23.32	9.46	-0.09	23.32	-9.46	0.000%
34	-4.67	-23.32	8.13	4.67	23.32	-8.13	0.000%
35	-8.23	-23.32	4.66	8.23	23.32	-4.66	0.000%
36	-9.58	-23.32	-0.06	9.58	23.32	0.06	0.000%
37	-8.33	-23.32	-4.81	8.33	23.32	4.81	0.000%
38	-4.84	-23.32	-8.27	4.84	23.32	8.27	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	0.00074888
3	Yes	5	0.00000001	0.00011308
4	Yes	5	0.00000001	0.00009842
5	Yes	4	0.00000001	0.00026605
6	Yes	5	0.00000001	0.00010607
7	Yes	5	0.00000001	0.00012275
8	Yes	5	0.00000001	0.00002531
9	Yes	5	0.00000001	0.00009461
10	Yes	5	0.00000001	0.00011241
11	Yes	4	0.00000001	0.00009757
12	Yes	5	0.00000001	0.00011552
13	Yes	5	0.00000001	0.00009951
14	Yes	4	0.00000001	0.00000001
15	Yes	4	0.00000001	0.00003617
16	Yes	4	0.00000001	0.00039728
17	Yes	4	0.00000001	0.00023534

18	Yes	4	0.00000001	0.00009504
19	Yes	4	0.00000001	0.00028517
20	Yes	4	0.00000001	0.00050975
21	Yes	4	0.00000001	0.00030832
22	Yes	4	0.00000001	0.00022759
23	Yes	4	0.00000001	0.00024177
24	Yes	4	0.00000001	0.00016582
25	Yes	4	0.00000001	0.00041257
26	Yes	4	0.00000001	0.00032128
27	Yes	4	0.00000001	0.00017442
28	Yes	4	0.00000001	0.00041884
29	Yes	4	0.00000001	0.00031148
30	Yes	4	0.00000001	0.00004056
31	Yes	4	0.00000001	0.00035857
32	Yes	4	0.00000001	0.00048821
33	Yes	4	0.00000001	0.00019233
34	Yes	4	0.00000001	0.00029193
35	Yes	4	0.00000001	0.00040872
36	Yes	4	0.00000001	0.00003256
37	Yes	4	0.00000001	0.00042268
38	Yes	4	0.00000001	0.00032863

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	120 - 100	25.30	31	1.67	0.01
L2	100 - 47.0833	18.36	31	1.63	0.01
L3	52 - 0	4.95	31	0.89	0.00

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
118.00	DB809MT3-XT	31	24.60	1.67	0.01	41533
107.00	GLF6-450	31	20.76	1.66	0.01	15974
98.00	(2) LPA-80080/6CF w/ Mount Pipe	31	17.68	1.62	0.01	9017
87.00	(2) DB980H90E-M w/ Mount Pipe	31	14.07	1.50	0.01	5307
73.00	(2) DC6-48-60-18-8F	31	9.88	1.28	0.00	3476
50.00	PD1142-1	31	4.59	0.85	0.00	2397
40.00	EPSILON GPS ANTENNA 35 DB	31	3.07	0.67	0.00	2976

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	120 - 100	72.76	6	4.81	0.03
L2	100 - 47.0833	52.82	6	4.69	0.02
L3	52 - 0	14.27	6	2.56	0.00

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
118.00	DB809MT3-XT	6	70.74	4.81	0.03	14996
107.00	GLF6-450	6	59.72	4.77	0.03	5766
98.00	(2) LPA-80080/6CF w/ Mount Pipe	6	50.87	4.65	0.02	3237
87.00	(2) DB980H90E-M w/ Mount Pipe	6	40.50	4.32	0.02	1879
73.00	(2) DC6-48-60-18-8F	6	28.47	3.69	0.01	1221
50.00	PD1142-1	6	13.23	2.45	0.00	835
40.00	EPSILON GPS ANTENNA 35 DB	6	8.85	1.93	0.00	1036

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	120 - 100 (1)	TP20.263x15.0403x0.1875	20.00	0.00	0.0	39.00	12.1206	-0.99	472.70	0.002
L2	100 - 47.0833 (2)	TP33.127x20.263x0.2813	52.92	0.00	0.0	39.00	28.6635	-12.53	1117.88	0.011
L3	47.0833 - 0 (3)	TP44x31.3693x0.375	52.00	0.00	0.0	39.00	52.6772	-23.29	2054.41	0.011

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	120 - 100 (1)	TP20.263x15.0403x0.1875	29.88	6.04	39.00	0.155	0.00	0.00	39.00	0.000
L2	100 - 47.0833 (2)	TP33.127x20.263x0.2813	834.89	45.22	39.00	1.159	0.00	0.00	39.00	0.000
L3	47.0833 - 0 (3)	TP44x31.3693x0.375	2158.06	46.13	39.00	1.183	0.00	0.00	39.00	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	120 - 100 (1)	TP20.263x15.0403x0.1875	2.83	0.23	26.00	0.018	0.59	0.06	26.00	0.002
L2	100 - 47.0833 (2)	TP33.127x20.263x0.2813	22.82	0.80	26.00	0.062	0.90	0.02	26.00	0.001
L3	47.0833 - 0 (3)	TP44x31.3693x0.375	27.90	0.53	26.00	0.041	1.21	0.01	26.00	0.000

Pole Interaction Design Data

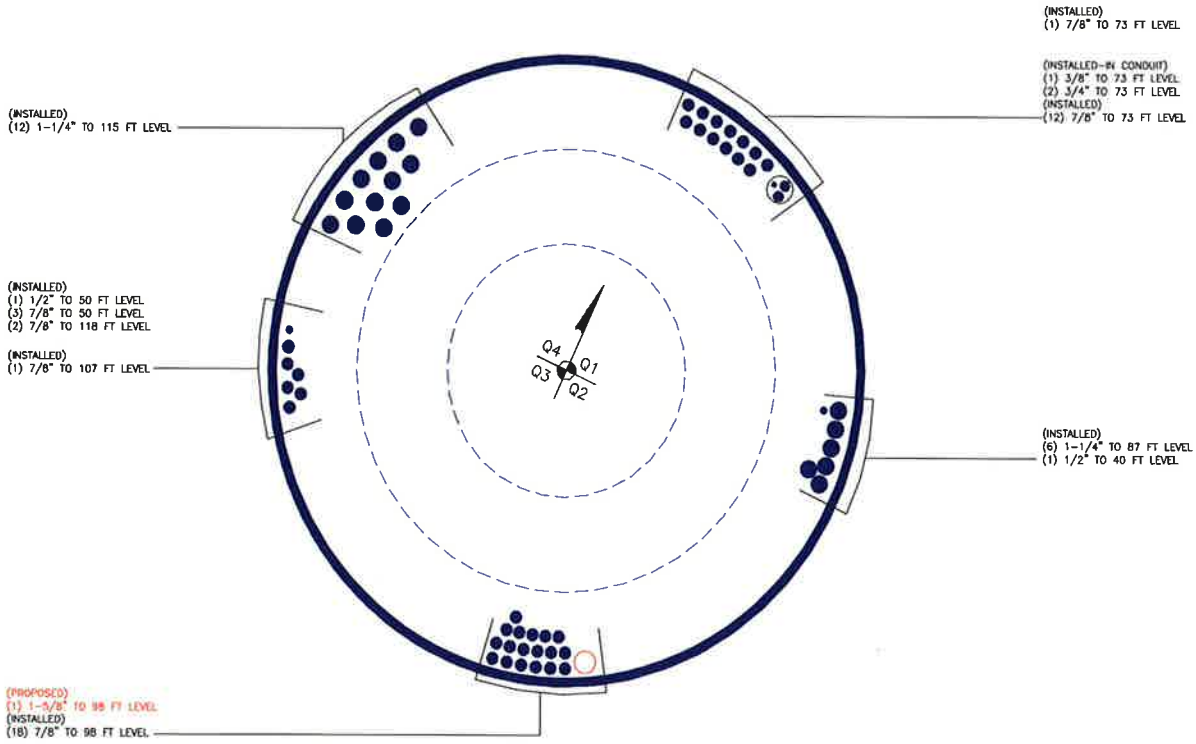
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	120 - 100 (1)	0.002	0.155	0.000	0.018	0.002	0.157 ✔	1.333	H1-3+VT ✔
L2	100 - 47.0833 (2)	0.011	1.159	0.000	0.062	0.001	1.172 ✔	1.333	H1-3+VT ✔
L3	47.0833 - 0 (3)	0.011	1.183	0.000	0.041	0.000	1.194 ✔	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	120 - 100	Pole	TP20.263x15.0403x0.1875	1	-0.99	630.11	11.8	Pass
L2	100 - 47.0833	Pole	TP33.127x20.263x0.2813	2	-12.53	1490.13	87.9	Pass
L3	47.0833 - 0	Pole	TP44x31.3693x0.375	3	-23.29	2738.53	89.6	Pass
							Summary	
						Pole (L3)	89.6	Pass
						RATING =	**89.6**	**Pass**

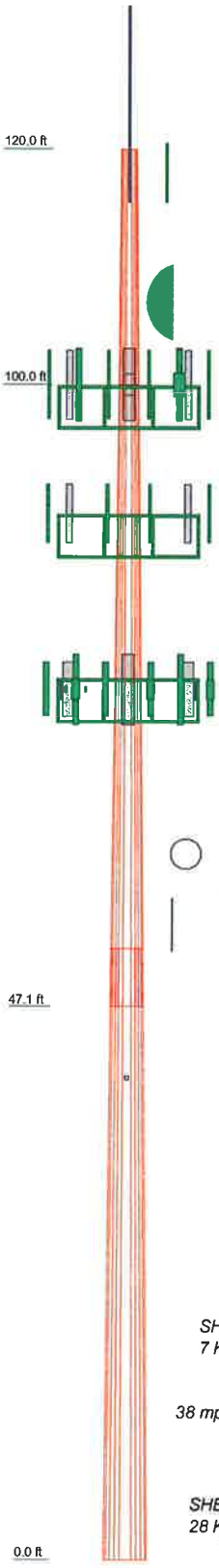
APPENDIX B

BASE LEVEL DRAWING

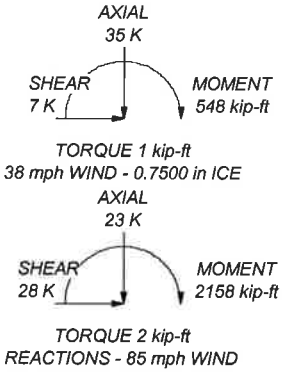

(INSTALLED)
(1) 7/8" TO 73 FT LEVEL
(INSTALLED-IN CONDUIT)
(1) 3/8" TO 73 FT LEVEL
(2) 3/4" TO 73 FT LEVEL
(INSTALLED)
(12) 7/8" TO 73 FT LEVEL
(INSTALLED)
(12) 1-1/4" TO 115 FT LEVEL
(INSTALLED)
(1) 1/2" TO 50 FT LEVEL
(3) 7/8" TO 50 FT LEVEL
(2) 7/8" TO 118 FT LEVEL
(INSTALLED)
(1) 7/8" TO 107 FT LEVEL
(INSTALLED)
(6) 1-1/4" TO 87 FT LEVEL
(1) 1/2" TO 40 FT LEVEL
Q4
Q1
Q3
Q2
(PROPOSED)
(1) 1-5/8" TO 98 FT LEVEL
(INSTALLED)
(18) 7/8" TO 98 FT LEVEL

APPENDIX C

ADDITIONAL CALCULATIONS



Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	20.00	12	0.1875		15.0403	20.2630		0.7
2	52.92	12	0.2813	4.92	20.2630	33.1270	A572-65	4.3
3	52.00	12	0.3750		31.3693	44.0000		8.0



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
DB809MT3-XT	118	(2) DB980H90E-M w/ Mount Pipe	87
DB201-A	118	(2) LGP21401	73
2.375" OD x 5' Mount Pipe	118	(2) LGP21401	73
2.375" OD x 5' Mount Pipe	118	(2) LGP21401	73
Side Arm Mount [SO 701-1]	118	(2) LGP21903	73
Side Arm Mount [SO 701-1]	118	(4) LGP21903	73
Pipe Mount [PM 601-1]	107	(2) 7770.00 w/ Mount Pipe	73
GLF6-450	107	(2) 7770.00 w/ Mount Pipe	73
(2) LPA-80080/6CF w/ Mount Pipe	98	(2) 7770.00 w/ Mount Pipe	73
(2) LPA-80080/6CF w/ Mount Pipe	98	AM-X-CD-16-65-00T-RET w/ Mount Pipe	73
HBXX-6517DS-A2M w/ Mount Pipe	98		
HBXX-6517DS-A2M w/ Mount Pipe	98	AM-X-CD-16-65-00T-RET w/ Mount Pipe	73
HBXX-6517DS-A2M w/ Mount Pipe	98		
HBXX-6517DS-VTM w/ Mount Pipe	98	AM-X-CD-16-65-00T-RET w/ Mount Pipe	73
HBXX-6517DS-VTM w/ Mount Pipe	98		
HBXX-6517DS-VTM w/ Mount Pipe	98	(2) RRUS 11	73
LNX-6514DS-A1M w/ Mount Pipe	98	(2) RRUS 11	73
LNX-6514DS-A1M w/ Mount Pipe	98	RRUS 11	73
LNX-6514DS-A1M w/ Mount Pipe	98	DC6-48-60-18-8F	73
RRH2X60-AWS	98	(2) RRUS 11	73
RRH2X60-AWS	98	RRUS 11	73
RRH2X60-AWS	98	MTC3607R Platform Mount [LP 1303-1]	73
RRH2X60-PCS	98	(2) DC6-48-60-18-8F	73
RRH2X60-PCS	98	DB492A	50
RRH2X60-PCS	98	ASP-655	50
DB-T1-6Z-8AB-0Z	98	PD1121-6	50
Platform Mount [LP 602-1]	98	Side Arm Mount [SO 701-3]	50
(2) LPA-80080/6CF w/ Mount Pipe	98	PD1142-1	50
(2) DB980H90E-M w/ Mount Pipe	87	Side Arm Mount [SO 701-1]	40
(2) DB980H90E-M w/ Mount Pipe	87	EPSILON GPS ANTENNA 35 DB	40
Platform Mount [LP 602-1]	87		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Middlesex 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: 89.6%

Paul J. Ford and Company
250 E. Broad Street, Suite 600
Columbus, OH 43215
Phone: 614.221.6679
FAX: 614.448.4105

Job:	120 ft Monopole / HRT 106(B) 943202
Project:	PJF 37514-0797 / BU 806364
Client: CCI	Drawn by: Joey Meinerding App'd:
Code: TIA/EIA-222-F	Date: 09/16/14 Scale: NTS
Path:	Dwg No. E-1

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

Site Data

BU#: *806364*
Site Name: *HRT 106(B) 943202*
App #:

Pole Manufacturer:	Other

Bolt Data			
Qty:	8		
Diameter (in.):	1	Bolt Fu:	120
Bolt Material:	A325	Bolt Fy:	92
N/A:	75	<-- Disregard	Bolt Fty: 44.00
N/A:	55	<-- Disregard	
Circle (in.):	24.41		

Plate Data		
Diam:	26.91	in
Thick, t:	1.5	in
Grade (Fy):	60	ksi
Strength, Fu:	75	ksi
Single-Rod B-eff:	8.14	in

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

Pole Data		
Diam:	20.26	in
Thick:	0.1875	in
Grade:	65	ksi
# of Sides:	12	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Stress Increase Factor		
ASIF:	1.333	

Reactions		
Moment:	29.88	ft-kips
Axial:	0.99	kips
Shear:	2.83	kips
Elevation:	100	feet

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

Flange Bolt Results

		Rigid
Bolt Tension Capacity, B:	46.07 kips	Service, ASD
Max Bolt directly applied T:	7.22 Kips	Fty*ASIF
Min. PL "tc" for B cap. w/o Pry:	0.955 in	
Min PL "treq" for actual T w/ Pry:	0.277 in	
Min PL "t1" for actual T w/o Pry:	0.378 in	
T allowable w/o Prying:	**46.07 kips**	**α'<0 case**
Prying Force, Q:	0.00 kips	
Total Bolt Tension=T+Q:	7.22 kips	
Non-Prying Bolt Stress Ratio, T/B:	15.7% **Pass**	

Exterior Flange Plate Results	Flexural Check	Rigid
Compression Side Plate Stress:	3.1 ksi	Service ASD
Allowable Plate Stress:	60.0 ksi	0.75*Fy*ASIF
Compression Plate Stress Ratio:	5.2% **Pass**	Comp. Y.L. Length:
No Prying		13.62
Tension Side Stress Ratio, (treq/t)^2:	3.4% **Pass**	

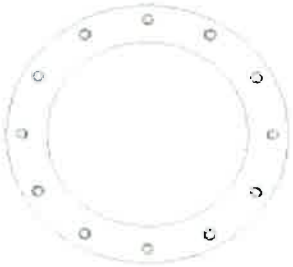
n/a

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, Ungrouted, Circular Base Plate - Any Rod Material

TIA Rev F

Site Data

BU#: *806364*
Site Name: *HRT 106(B) 943202*
App #:

Pole Manufacturer:	*Other*

Reactions		
Moment:	2158	ft-kips
Axial:	23	kips
Shear:	28	kips

Anchor Rod Data		
Qty:	12	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	52.05	in

Plate Data		
Diam:	58.05	in
Thick:	2.75	in
Grade:	60	ksi
Single-Rod B-eff:	11.79	in

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

Pole Data		
Diam:	44	in
Thick:	0.375	in
Grade:	65	ksi
# of Sides:	12	"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:	163.9 Kips	Rigid
Allowable Tension:	195.0 Kips	Service, ASD
Anchor Rod Stress Ratio:	84.1% **Pass**	Fty*ASIF

Base Plate Results Flexural Check

Base Plate Stress:	29.0 ksi	Rigid
Allowable Plate Stress:	60.0 ksi	Service ASD
Base Plate Stress Ratio:	48.4% **Pass**	0.75*Fy*ASIF
		Y.L. Length: 27.81

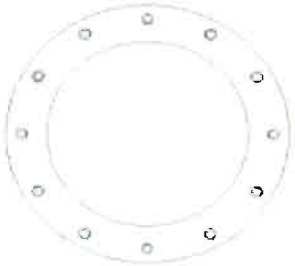
n/a

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

foundation loads

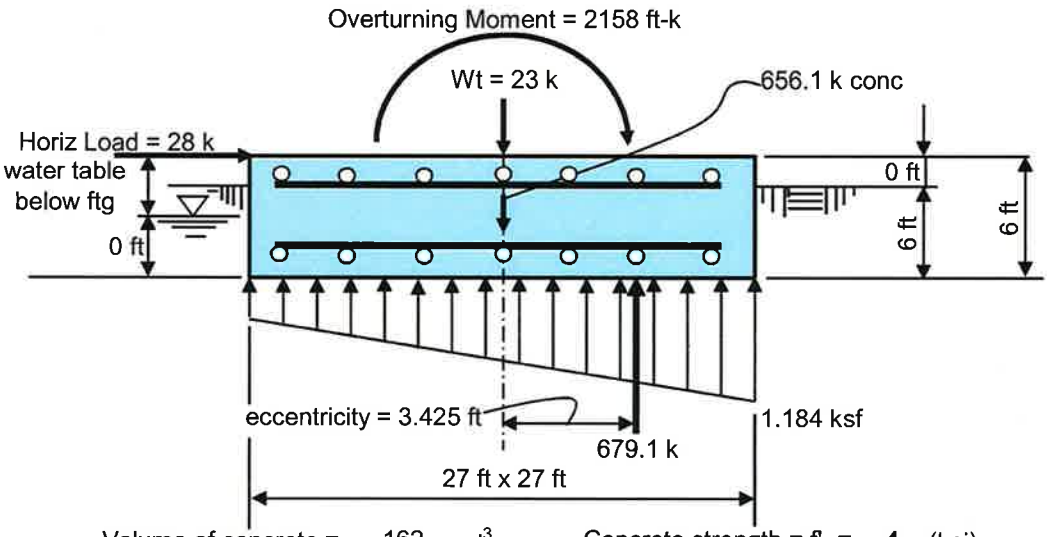
Tower or Pole Weight =	**23**	kips
Total Horizontal Force =	**28**	kips
Overturning Moment =	**2158**	ft-kips

soil properties

Safety factor against overturning =	**1**	
Soil density =	**125**	pcf
Allowable soil bearing =	**4**	ksf
Depth to water table =	**99**	ft

mat dimensions

depth to bottom of footing =	**6**	ft
Footing thickness =	**6**	ft
Footing Width =	**27**	ft
Footing Length =	**27**	ft
Tower/Pole Center Offset =	**0**	ft



Volume of concrete = 162 yd^3 Concrete strength = f'_c = **4** (ksi)

Rebar = (104) #11 bars by 26.5 ft long

reinforcing steel = **(26) #11 @ 12.72 in o.c. ea way top and bottom**

Summary of analysis results

Overturning Moment: (Stress Ratio = 0.254)

Calculated Overturning Moment = 2326 ft-kips

Resisting Moment = 9167.9 ft-kips

Factor of Safety against overturning = 3.941 **> 1 okay**

Rebar strength = F_y = **60** (ksi)

minimum cover over rebar = **4** inches

Soil Bearing (Stress Ratio = 0.296) < CONTROLLING CRITERIA

Net Soil Bearing Resistance = 4 ksf

Calculated Soil Bearing Pressure = 1.184 **ksf < 4 ksf okay**

Bending Moment (Stress Ratio = 0.098)

Ultimate Bending Moment Resistance = 11833 ft-kips

Calculated Ultimate Bending Moment = 1163 **ft-kips < 11833 ft-kips okay**

Bending Shear (Stress Ratio = 0.073)

Ultimate Bending Shear Resistance = 2297 kips

Calculated Ultimate Bending Shear = 168 **kips < 2297 kips okay**