ROBINSON & COLE LLP

KENNETH C. BALDWIN

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Also admitted in Massachusetts

June 19, 2014

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

Re: **Notice of Exempt Modification – Facility Modification**
1749 Durham Road, Madison, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 96-foot level on an existing 119-foot tower at 1749 Durham Road in Madison, Connecticut (the "Property"). The tower is owned by Crown Castle. Cellco's use of the tower was approved by the Council in 2007. Cellco now intends to modify its facility by adding three (3) model 742 213V01, 2100 MHz antennas, for a total of fifteen (15) antennas, all at the 96-foot level on the tower. Cellco also intends to install three (3) remote radio heads ("RRHs") behind its new 2100 MHz antennas and one (1) HYBRIFLEX™ antenna cable inside of the monopole. Included in Attachment 1 are specifications for Cellco's new antennas, RRHs and HYBRIFLEX™ cable.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Fillmore McPherson, First Selectman for the Town of Madison. A copy of this letter is also being sent to South Central Connecticut Regional Water Authority, 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 new antennas and RRHs will be installed at the 96-foot level on the existing 119-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:
Fillmore McPherson, Madison First Selectman
South Central Connecticut Regional Water Authority
Sandy M. Carter

ATTACHMENT 1

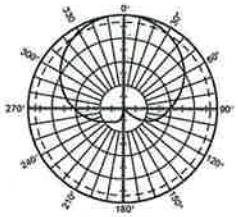
KATHREIN
SCALA DIVISION

742 213V01

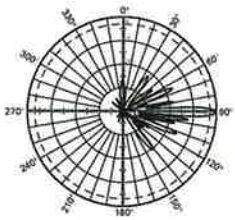
65° Panel Antenna

Kathrein's X-polarized adjustable electrical downtilt antennas offer the wireless carrier the ability to tailor polarization diversity sites for optimum performance. Using variable downtilt, only a few models need be procured to accommodate the needs of widely varying conditions. Remotely controlled downtilt is available as a retrofitable option.

- 0-6° downtilt range.
- UV resistant pulltruded fiberglass radome.
- DC Grounded metallic parts for impulse suppression.
- No moving electrical connections.
- Wideband vector dipole technology.
- Optional remote downtilt Control.
- Will accomodate future 3G / UMTS applications.



Horizontal pattern
±45°- polarization



Vertical pattern
±45°- polarization
0°–6° electrical downtilt

General specifications:

Frequency range	1710–2200 MHz
VSWR	< 1.5:1
Impedance	50 ohms
Intermodulation (2x20w)	IM3: <-150 dBc
Polarization	+45° and -45°
Front-to-back ratio (180°±30°)	>30 dB (co-polar) >25 dB (total power)
Maximum input power	300 watts per input (at 50°C)
Electrical downtilt continuously adjustable	0–6 degrees
Connector	2 x 7-16 DIN female
Isolation	>30 dB
Cross polar ratio Main direction 0° Sector ±60°	 25 dB (typical) >10 dB
Tracking, average	0.5 dB
Squint	±2.0°
Weight	19.8 lb (9 kg) 24.3 lb (11 kg) clamps included
Dimensions	76.9 x 6.1 x 2.8 inches (1954 x 155 x 70 mm)
Wind load Front/Side/Rear Mounting category	at 93 mph (150kph) 115 lbf / 32 lbf / 115 lbf (510 N) / (140 N) / (510 N) M (Medium)
Wind survival rating*	120 mph (200 kph)
Shipping dimensions	88 x 6.8 x 3.6 inches (2235 x 172 x 92 mm)
Shipping weight	28.7 lb (13 kg)
Mounting	Fixed mounts for 2 to 4.6 inch (50 to 115 mm) OD masts are included and tilt options are available.
See reverse for order information.	

Specifications:	**1710–1880 MHz**	**1850–1990 MHz**	**1920–2200 MHz**
Gain	19 dBi	19.2 dBi	19.5 dBi
+45° and -45° polarization horizontal beamwidth	67° (half-power)	65° (half-power)	63° (half-power)
+45° and -45° polarization vertical beamwidth	4.7° (half-power)	4.5° (half-power)	4.3° (half-power)
Sidelobe suppression for first sidelobe above main beam	0° 2° 4° 6° T 18 18 16 15 dB	0° 2° 4° 6° T 18 18 17 16 dB	0° 2° 4° 6° T 18 18 18 18 dB

RoHS Lead-Free

11271-B
936.3740/b

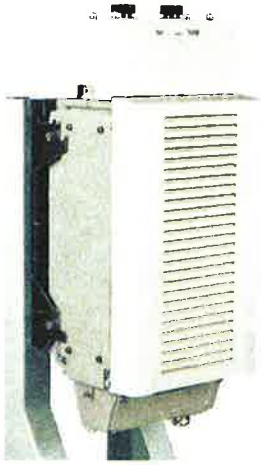
*Mechanical design is based on environmental conditions as stipulated in TIA-222-G-2 (December 2009) and/or ETS 300 019-1-4 which include the static mechanical load imposed on an antenna by wind at maximum velocity. See the Engineering Section of the catalog for further details.

Kathrein Inc., Scala Division Post Office Box 4580 Medford, OR 97501 (USA) Phone: (541) 779-6500 Fax: (541) 779-3991
Email: communications@kathrein.com Internet: www.kathrein-scala.com

Alcatel-Lucent RRH2x40-AWS

REMOTE RADIO HEAD

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



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

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

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

Fast, low-cost installation and deployment

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

Excellent RF performance

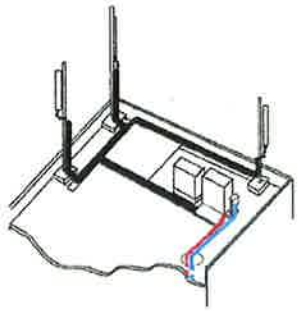
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation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

Features

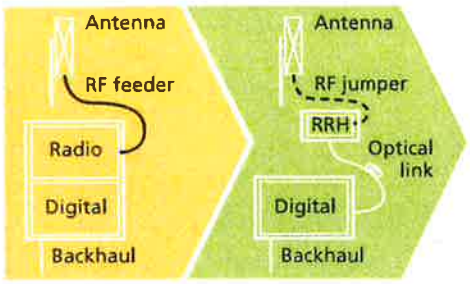
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

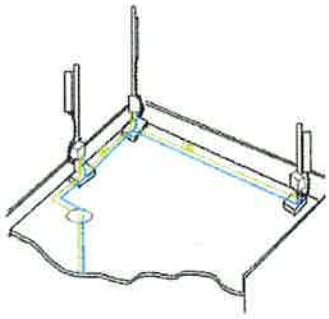
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility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



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

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

Power

- Power supply: -48VDC

Operating environment

- Outdoor temperature range:
  - ¬ With solar load: -40°C to +50°C (-40°F to +122°F)
  - ¬ Without solar load: -40°C to +55°C (-40°F to +131°F)
- Passive convection cooling (no fans)
- Enclosure protection
  - ¬ IP65 (International Protection rating)

RF characteristics

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

Optical characteristics

Type/number of fibers

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

Optical fiber length

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

Digital Ports and Alarms

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

CPG2809100912 (09)

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

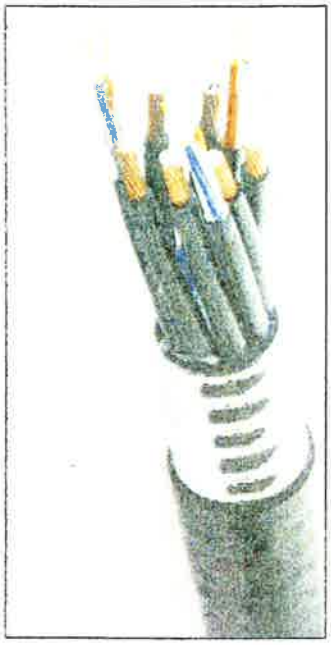


Figure 1: HYBRIFLEX Series

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
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)			UL34-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-93-638 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)

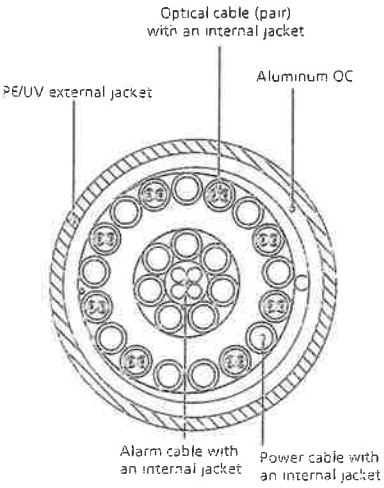


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

	General	Power	Density					
Site Name: Madison N								
Tower Height: 119Ft								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*AT&T UMTS	2	875	117.5	0.0456	1900	1.0000	4.56%	
*AT&T UMTS	2	565	117.5	0.0294	880	0.5867	5.02%	
*AT&T GSM	4	525	117.5	0.0547	1900	1.0000	5.47%	
*AT&T GSM	1	283	117.5	0.0074	880	0.5867	1.26%	
*AT&T LTE	1	1313	117.5	0.0342	734	0.4893	6.99%	
*Sprint CDMA/LTE	2	778	110.3	0.0460	1900	1.0000	4.60%	
*Sprint CDMA/LTE	1	438	110.3	0.0129	850	0.5667	2.28%	
Verizon	**7**	**450**	**96**	**0.1229**	**1970**	**1.0000**	**12.29%**	
Verizon	**9**	**411**	**96**	**0.1443**	**869**	**0.5900**	**24.46%**	
Verizon	**1**	**2202**	**96**	**0.0859**	**2145**	**1.0000**	**8.59%**	
Verizon	**1**	**861**	**96**	**0.0336**	**698**	**0.5000**	**6.72%**	
								82.23%
* Source: Siting Council								

ATTACHMENT 3

Date: **April 17, 2014**

Mitzi Parker
Crown Castle
3530 Toringdon Way Suite 300
Charlotte, NC 28277

FDH Engineering, Inc.
6521 Meridien Drive, Suite 107
Raleigh, North Carolina
9197551012

Subject: Structural Analysis Report

Carrier Designation:	***Verizon Wireless* Co-Locate**	
	Carrier Site Number:	117643
	Carrier Site Name:	Madison North CT
Crown Castle Designation:	**Crown Castle BU Number:**	846176
	Crown Castle Site Name:	MADISON DURHAM ROAD
	Crown Castle JDE Job Number:	268512
	Crown Castle Work Order Number:	744468
	Crown Castle Application Number:	214833 Rev. 1
Engineering Firm Designation:	**FDH Engineering, Inc. Project Number:**	1463L01400
Site Data:	**1749 DURHAM ROAD, MADISON, New Haven County, CT**	
	Latitude *41° 23' 22.3"*, Longitude *-72° 38' 56"*	
	119 Foot - Monopole Tower	

Dear Mitzi Parker,

FDH Engineering, Inc. 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 636758, in accordance with application 214833, 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:

LC5: Existing + Proposed Equipment **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing loading, respectively.

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

All modifications and equipment proposed in this report shall be installed in accordance with the attached drawings for the determined available structural capacity to be effective.

We at *FDH Engineering, Inc.* 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:

Jeffrey B. Ray, EI
Project Engineer

Reviewed by:

Dennis D. Abel, PE
Director - Structural Engineering
CT PE License No. 23247

STATE OF CONNECTICUT
DENNIS D. ABEL
No. 23247
LICENSED
PROFESSIONAL ENGINEER

04-17-2014

tnxTower Report - version 6.1.4.1

TABLE OF CONTENTS

1) INTRODUCTION

2) ANALYSIS CRITERIA
Table 1 - Proposed Antenna and Cable Information
Table 2 - Existing and Reserved Antenna and Cable Information
Table 3 - Design Antenna and Cable Information

3) ANALYSIS PROCEDURE
Table 4 - Documents Provided
3.1) Analysis Method
3.2) Assumptions

4) ANALYSIS RESULTS
Table 5 - Section Capacity (Summary)
Table 6 – Tower Component Stresses vs. Capacity
4.1) Recommendations

5) APPENDIX A
tnxTower Output

6) APPENDIX B
Base Level Drawing

7) APPENDIX C
Additional Calculations

1) INTRODUCTION

This tower is a 119 ft Monopole tower designed by Sabre Communications Corporation December of 2005. The original design specification are unknown.

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, 38 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
94.0	96.0	3	alcatel lucent	RRH2X40-AWS	1	1-5/8	--
		3	kathrein	742 213 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
116.0	118.0	6	kmw communications	AM-X-CD-16-65-00T-RET w/ Mount Pipe	1 2 18	1/2 7/8 1-5/8	1
		6	powerwave	7770.00 w/Mount Pipe			
		6	ericsson	RBS6601			
		1	raycap	DC6-48-60-18-8F			
		6	powerwave	LGP13519 TMA			
		6	powerwave	LGP21401 TMA			
	116.0	1	crown mounts	Platform Mount [LP 601-1]			
106.0	108.0	3	alcatel lucent	1900 MHz RRH	3 6	1-1/4 1-5/8	1
		3	alcatel lucent	800 MHz External Notch Filter			
		3	alcatel lucent	800 MHz RRH			
		6	decibel	DB950F85T2E-M w/ Mount Pipe			
		3	rfs celwave	APXVSPP18-C-A20 w/Mount Pipe			
	106.0	1	crown mounts	Platform Mount [LP 601-1]			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
94.0	96.0	1	antel	BXA-171063-12BF w/ Mount Pipe	12	1-5/8	1
		2	antel	BXA-171063-8BF-EDIN-0 w/ Mount Pipe			
		3	antel	BXA-70063-6CF-EDIN-0 w/ Mount Pipe			
		2	decibel	DB846F65E-SX w/ Mount Pipe			
		4	rfs celwave	APL868013 w/ Mount Pipe			
		6	rfs celwave	FD9R6004/2C-3L			
	94.0	1	crown mounts	Platform Mount [LP 601-1]			
55.0	55.0	1	crown mounts	Side Arm Mount [SO 701-1]	1	1/2	1
		1	pctel	GPS-TMG-HR-26NCM GPS			

Notes:
1) Existing Equipment

Table 3 - Design Antenna and Cable Information

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

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	TEP	4301706	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	Sabre	4552185	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Sabre	4516773	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.

This analysis may be affected if any assumptions are not valid or have been made in error. FDH Engineering, Inc. 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	119 - 97.25	Pole	TP30.86x25.5x0.25	1	-5.39	1222.05	18.3	Pass
L2	97.25 - 48	Pole	TP42.47x29.3743x0.3125	2	-15.05	2107.26	57.3	Pass
L3	48 - 0	Pole	TP53.65x40.5539x0.375	3	-28.53	3296.52	62.0	Pass
							Summary	
						Pole (L3)	62.0	Pass
						RATING =	**62.0**	**Pass**

Table 6 - Tower Component Stresses vs. Capacity – LC5

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	55.8	Pass
1	Base Plate	0	54.9	Pass
1	Base Foundation	0	9.0	Pass
1	Base Foundation Soil Interaction	0	72.9	Pass

Structure Rating (max from all components) =	**75.0%**

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

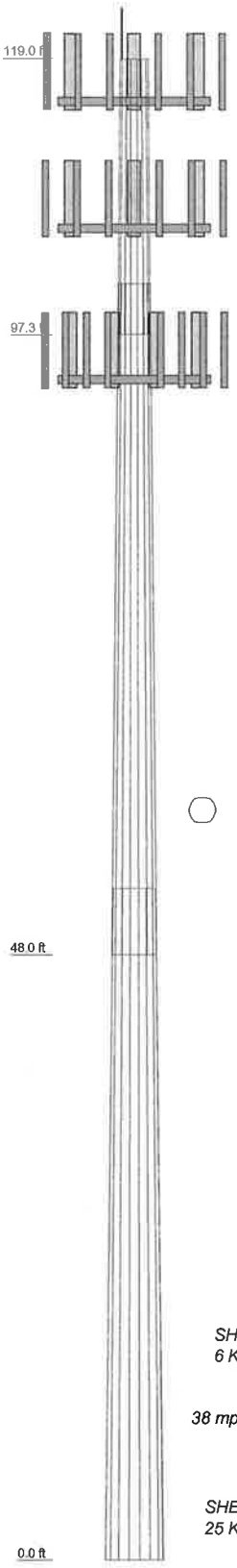
4.1) Recommendations

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

APPENDIX A

TNXTOWER OUTPUT

Section	1	2	3
Length (ft)	21.75	53.25	53.25
Number of Sides	18	18	18
Thickness (in)	0.2500	0.3125	0.3750
Socket Length (ft)	4.00	5.25	
Top Dia (in)	25.5000	29.3743	40.5539
Bot Dia (in)	30.8600	42.4700	53.6500
Grade		A572-65	
Weight (K)	1.6	6.4	10.1



DESIGNED APPURTENANCE LOADING

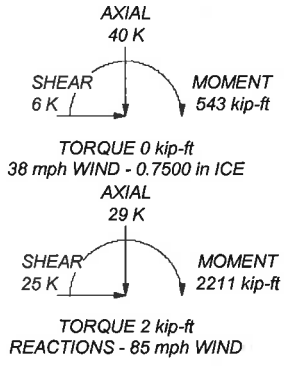
TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod	119	1900 MHz RRH	106
(2) 7770.00 w/Mount Pipe	116	1900 MHz RRH	106
(2) 7770.00 w/Mount Pipe	116	Platform Mount [LP 601-1]	106
(2) AM-X-CD-16-65-00T-RET w/ Mount Pipe	116	(2) DB950F85T2E-M w/ Mount Pipe	106
(2) AM-X-CD-16-65-00T-RET w/ Mount Pipe	116	BXA-171063-8BF-EDIN-0 w/ Mount Pipe	94
(2) AM-X-CD-16-65-00T-RET w/ Mount Pipe	116	BXA-171063-12BF w/ Mount Pipe	94
(2) LGP21401 TMA	116	BXA-70063-6CF-EDIN-0 w/ Mount Pipe	94
(2) LGP21401 TMA	116	BXA-70063-6CF-EDIN-0 w/ Mount Pipe	94
(2) LGP21401 TMA	116	BXA-70063-6CF-EDIN-0 w/ Mount Pipe	94
(2) LGP13519 TMA	116	APL868013 w/ Mount Pipe	94
(2) LGP13519 TMA	116	DB846F65E-SX w/ Mount Pipe	94
(2) LGP13519 TMA	116	(2) APL868013 w/ Mount Pipe	94
(2) RBS6601	116	APL868013 w/ Mount Pipe	94
(2) RBS6601	116	DB846F65E-SX w/ Mount Pipe	94
(2) RBS6601	116	(2) FD9R6004/2C-3L	94
DC6-48-60-18-8F	116	(2) FD9R6004/2C-3L	94
Platform Mount [LP 601-1]	116	(2) FD9R6004/2C-3L	94
(2) 7770.00 w/Mount Pipe	116	RRH2X40-AWS	94
(2) DB950F85T2E-M w/ Mount Pipe	106	RRH2X40-AWS	94
(2) DB950F85T2E-M w/ Mount Pipe	106	RRH2X40-AWS	94
APXVSPP18-C-A20 w/Mount Pipe	106	742 213 w/ Mount Pipe	94
APXVSPP18-C-A20 w/Mount Pipe	106	742 213 w/ Mount Pipe	94
APXVSPP18-C-A20 w/Mount Pipe	106	742 213 w/ Mount Pipe	94
800 MHz External Notch Filter	106	DB-T1-6Z-8AB-0Z	94
800 MHz External Notch Filter	106	Platform Mount [LP 601-1]	94
800 MHz External Notch Filter	106	BXA-171063-8BF-EDIN-0 w/ Mount Pipe	94
800 MHz RRH	106	Side Arm Mount [SO 701-1]	55
800 MHz RRH	106	GPS-TMG-HR-26NCM GPS	55
800 MHz RRH	106		
1900 MHz RRH	106		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in New Haven 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: 62%



FDH Engineering, Inc.
6521 Meridien Drive, Suite 107
Raleigh, North Carolina
Phone: 9197551012
FAX: 9197551031

Tower Analysis

Job: Madison Durham Road, 846176			
Project: 1463L01400			
Client: Crown Castle	Drawn by: Jeffrey B. Ray	App'd:	
Code: TIA/EIA-222-F	Date: 04/18/14	Scale: NTS	
Path:		Dwg No. E-1	

Tower Input Data

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

Tower is located in New Haven County, Connecticut.
Basic wind speed of 85 mph.
Nominal ice thickness of 0.7500 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 38 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

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	119.00-97.25	21.75	4.00	18	25.5000	30.8600	0.2500	1.0000	A572-65 (65 ksi)
L2	97.25-48.00	53.25	5.25	18	29.3743	42.4700	0.3125	1.2500	A572-65 (65 ksi)
L3	48.00-0.00	53.25		18	40.5539	53.6500	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	25.8934	20.0359	1613.8699	8.9637	12.9540	124.5847	3229.8634	10.0198	4.0480	16.192
	31.3361	24.2890	2875.2418	10.8666	15.6769	183.4065	5754.2669	12.1468	4.9914	19.965
L2	30.8263	28.8256	3075.8122	10.3169	14.9221	206.1243	6155.6716	14.4156	4.6199	14.784
	43.1252	41.8150	9388.9914	14.9659	21.5748	435.1840	18790.3370	20.9115	6.9247	22.159
L3	42.4906	47.8229	9753.6866	14.2635	20.6014	473.4485	19520.2073	23.9160	6.4775	17.273
	54.4776	63.4106	22737.6730	18.9126	27.2542	834.2814	45505.2647	31.7113	8.7824	23.42

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 119.00-97.25				1	1	1		
L2 97.25-48.00				1	1	1		

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals
ft	ft^2	in					in	in
L3 48.00-0.00				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 plf
Safety Line 3/8	C	No	CaAa (Out Of Face)	119.00 - 0.00	1	No Ice	0.04	0.22
						1/2" Ice	0.14	0.75
						1" Ice	0.24	1.28
						2" Ice	0.44	2.34
						4" Ice	0.84	4.46
**								
LDF4-50A(1/2")	C	No	Inside Pole	116.00 - 0.00	1	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15
						1" Ice	0.00	0.15
						2" Ice	0.00	0.15
						4" Ice	0.00	0.15
LDF5-50A(7/8")	C	No	Inside Pole	116.00 - 0.00	2	No Ice	0.00	0.33
						1/2" Ice	0.00	0.33
						1" Ice	0.00	0.33
						2" Ice	0.00	0.33
						4" Ice	0.00	0.33
LDF7-50A(1-5/8")	C	No	Inside Pole	116.00 - 0.00	18	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
						2" Ice	0.00	0.82
						4" Ice	0.00	0.82
**								
LDF6-50A(1-1/4")	C	No	Inside Pole	106.00 - 0.00	3	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
						1" Ice	0.00	0.66
						2" Ice	0.00	0.66
						4" Ice	0.00	0.66
LDF7-50A(1-5/8")	C	No	Inside Pole	106.00 - 0.00	6	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
						2" Ice	0.00	0.82
						4" Ice	0.00	0.82
**								
561(1-5/8")	C	No	Inside Pole	94.00 - 0.00	12	No Ice	0.00	1.35
						1/2" Ice	0.00	1.35
						1" Ice	0.00	1.35
						2" Ice	0.00	1.35
						4" Ice	0.00	1.35
HB158-1-08U8-S8J18(1-5/8)	C	No	Inside Pole	94.00 - 0.00	1	No Ice	0.00	1.30
						1/2" Ice	0.00	1.30
						1" Ice	0.00	1.30
						2" Ice	0.00	1.30
						4" Ice	0.00	1.30
**								
LDF4-50A(1/2")	C	No	Inside Pole	55.00 - 0.00	1	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15
						1" Ice	0.00	0.15
						2" Ice	0.00	0.15

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C_AA_A ft^2/ft	Weight plf
					4" Ice	0.00	0.15

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	119.00-97.25	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	0.816	0.36
L2	97.25-48.00	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	1.847	1.92
L3	48.00-0.00	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	1.800	1.94

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	119.00-97.25	A	0.864	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	4.576	0.38
L2	97.25-48.00	A	0.823	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	10.362	
L3	48.00-0.00	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	9.705	1.98

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	119.00-97.25	-0.0479	0.0277	-0.2375	0.1371
L2	97.25-48.00	-0.0481	0.0278	-0.2447	0.1413
L3	48.00-0.00	-0.0483	0.0279	-0.2420	0.1397

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
(2) 7770.00 w/Mount Pipe	A	From Leg	4.00 0.00 2.00	30.0000	116.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.46 7.14 7.73 8.94 11.51	4.59 5.66 6.45 8.06 11.64	0.05 0.10 0.16 0.30 0.71
(2) 7770.00 w/Mount Pipe	B	From Leg	4.00 0.00 2.00	30.0000	116.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.46 7.14 7.73 8.94 11.51	4.59 5.66 6.45 8.06 11.64	0.05 0.10 0.16 0.30 0.71
(2) 7770.00 w/Mount Pipe	C	From Leg	4.00 0.00 2.00	30.0000	116.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.46 7.14 7.73 8.94 11.51	4.59 5.66 6.45 8.06 11.64	0.05 0.10 0.16 0.30 0.71
(2) AM-X-CD-16-65-00T-RET w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	30.0000	116.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.50 9.15 9.77 11.03 13.68	6.30 7.48 8.37 10.18 14.02	0.07 0.14 0.21 0.38 0.87
(2) AM-X-CD-16-65-00T-RET w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	30.0000	116.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.50 9.15 9.77 11.03 13.68	6.30 7.48 8.37 10.18 14.02	0.07 0.14 0.21 0.38 0.87
(2) AM-X-CD-16-65-00T-RET w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	30.0000	116.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.50 9.15 9.77 11.03 13.68	6.30 7.48 8.37 10.18 14.02	0.07 0.14 0.21 0.38 0.87
(2) LGP21401 TMA	A	From Leg	4.00 0.00 2.00	0.0000	116.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.95 1.09 1.24 1.57 2.32	0.37 0.48 0.60 0.87 1.51	0.02 0.02 0.03 0.05 0.12
(2) LGP21401 TMA	B	From Leg	4.00 0.00 2.00	0.0000	116.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.95 1.09 1.24 1.57 2.32	0.37 0.48 0.60 0.87 1.51	0.02 0.02 0.03 0.05 0.12
(2) LGP21401 TMA	C	From Leg	4.00 0.00 2.00	0.0000	116.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.95 1.09 1.24 1.57 2.32	0.37 0.48 0.60 0.87 1.51	0.02 0.02 0.03 0.05 0.12
(2) LGP13519 TMA	A	From Leg	4.00 0.00 2.00	0.0000	116.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.34 0.42 0.51 0.73 1.25	0.21 0.28 0.36 0.55 1.03	0.01 0.01 0.01 0.02 0.07
(2) LGP13519 TMA	B	From Leg	4.00 0.00 2.00	0.0000	116.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.34 0.42 0.51 0.73 1.25	0.21 0.28 0.36 0.55 1.03	0.01 0.01 0.01 0.02 0.07
(2) LGP13519 TMA	C	From Leg	4.00 0.00	0.0000	116.00	No Ice 1/2" Ice	0.34 0.42	0.21 0.28	0.01 0.01

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
			2.00			1" Ice	0.51	0.36	0.01
						2" Ice	0.73	0.55	0.02
						4" Ice	1.25	1.03	0.07
(2) RBS6601	A	From Leg	4.00	0.0000	116.00	No Ice	2.94	1.25	0.06
			0.00			1/2" Ice	3.17	1.41	0.07
			2.00			1" Ice	3.41	1.59	0.10
						2" Ice	3.91	1.96	0.15
						4" Ice	5.02	2.82	0.30
(2) RBS6601	B	From Leg	4.00	0.0000	116.00	No Ice	2.94	1.25	0.06
			0.00			1/2" Ice	3.17	1.41	0.07
			2.00			1" Ice	3.41	1.59	0.10
						2" Ice	3.91	1.96	0.15
						4" Ice	5.02	2.82	0.30
(2) RBS6601	C	From Leg	4.00	0.0000	116.00	No Ice	2.94	1.25	0.06
			0.00			1/2" Ice	3.17	1.41	0.07
			2.00			1" Ice	3.41	1.59	0.10
						2" Ice	3.91	1.96	0.15
						4" Ice	5.02	2.82	0.30
DC6-48-60-18-8F	A	From Leg	4.00	0.0000	116.00	No Ice	2.57	4.32	0.03
			0.00			1/2" Ice	2.80	4.60	0.06
			2.00			1" Ice	3.04	4.88	0.10
						2" Ice	3.54	5.49	0.18
						4" Ice	4.66	6.80	0.40
Platform Mount [LP 601-1]	A	None		0.0000	116.00	No Ice	28.47	28.47	1.12
						1/2" Ice	33.59	33.59	1.51
						1" Ice	38.71	38.71	1.91
						2" Ice	48.95	48.95	2.69
						4" Ice	69.43	69.43	4.26
*									
(2) DB950F85T2E-M w/ Mount Pipe	A	From Leg	4.00	0.0000	106.00	No Ice	2.77	5.66	0.03
			0.00			1/2" Ice	3.22	6.55	0.07
			2.00			1" Ice	3.65	7.31	0.12
						2" Ice	4.55	8.95	0.23
						4" Ice	6.45	12.54	0.58
(2) DB950F85T2E-M w/ Mount Pipe	B	From Leg	4.00	0.0000	106.00	No Ice	2.77	5.66	0.03
			0.00			1/2" Ice	3.22	6.55	0.07
			2.00			1" Ice	3.65	7.31	0.12
						2" Ice	4.55	8.95	0.23
						4" Ice	6.45	12.54	0.58
(2) DB950F85T2E-M w/ Mount Pipe	C	From Leg	4.00	0.0000	106.00	No Ice	2.77	5.66	0.03
			0.00			1/2" Ice	3.22	6.55	0.07
			2.00			1" Ice	3.65	7.31	0.12
						2" Ice	4.55	8.95	0.23
						4" Ice	6.45	12.54	0.58
APXVSPP18-C-A20 w/Mount Pipe	A	From Leg	4.00	-20.0000	106.00	No Ice	8.50	6.95	0.08
			0.00			1/2" Ice	9.15	8.13	0.15
			2.00			1" Ice	9.77	9.02	0.22
						2" Ice	11.03	10.84	0.41
						4" Ice	13.68	14.85	0.91
APXVSPP18-C-A20 w/Mount Pipe	B	From Leg	4.00	-20.0000	106.00	No Ice	8.50	6.95	0.08
			0.00			1/2" Ice	9.15	8.13	0.15
			2.00			1" Ice	9.77	9.02	0.22
						2" Ice	11.03	10.84	0.41
						4" Ice	13.68	14.85	0.91
APXVSPP18-C-A20 w/Mount Pipe	C	From Leg	4.00	-20.0000	106.00	No Ice	8.50	6.95	0.08
			0.00			1/2" Ice	9.15	8.13	0.15
			2.00			1" Ice	9.77	9.02	0.22

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	11.03	10.84	0.41
						4" Ice	13.68	14.85	0.91
800 MHz External Notch Filter	A	From Leg	4.00 0.00 2.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.78 0.90 1.03 1.31 1.99	0.29 0.38 0.48 0.70 1.24	0.01 0.01 0.02 0.04 0.10
800 MHz External Notch Filter	B	From Leg	4.00 0.00 2.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.78 0.90 1.03 1.31 1.99	0.29 0.38 0.48 0.70 1.24	0.01 0.01 0.02 0.04 0.10
800 MHz External Notch Filter	C	From Leg	4.00 0.00 2.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.78 0.90 1.03 1.31 1.99	0.29 0.38 0.48 0.70 1.24	0.01 0.01 0.02 0.04 0.10
800 MHz RRH	A	From Leg	4.00 0.00 2.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.49 2.71 2.93 3.41 4.46	2.07 2.27 2.48 2.93 3.93	0.05 0.07 0.10 0.16 0.32
800 MHz RRH	B	From Leg	4.00 0.00 2.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.49 2.71 2.93 3.41 4.46	2.07 2.27 2.48 2.93 3.93	0.05 0.07 0.10 0.16 0.32
800 MHz RRH	C	From Leg	4.00 0.00 2.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.49 2.71 2.93 3.41 4.46	2.07 2.27 2.48 2.93 3.93	0.05 0.07 0.10 0.16 0.32
1900 MHz RRH	A	From Leg	4.00 0.00 2.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.70 2.94 3.18 3.70 4.85	2.77 3.01 3.26 3.78 4.93	0.06 0.08 0.11 0.18 0.35
1900 MHz RRH	B	From Leg	4.00 0.00 2.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.70 2.94 3.18 3.70 4.85	2.77 3.01 3.26 3.78 4.93	0.06 0.08 0.11 0.18 0.35
1900 MHz RRH	C	From Leg	4.00 0.00 2.00	0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.70 2.94 3.18 3.70 4.85	2.77 3.01 3.26 3.78 4.93	0.06 0.08 0.11 0.18 0.35
Platform Mount [LP 601-1]	C	None		0.0000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	28.47 33.59 38.71 48.95 69.43	28.47 33.59 38.71 48.95 69.43	1.12 1.51 1.91 2.69 4.26
***									
BXA-171063-8BF-EDIN-0 w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.0000	94.00	No Ice 1/2" Ice 1" Ice 2" Ice	3.18 3.56 3.96 4.85	3.35 3.97 4.60 5.89	0.03 0.06 0.10 0.19

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
						4" Ice	6.77	8.89	0.49
BXA-171063-8BF-EDIN-0 w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	0.0000	94.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.18 3.56 3.96 4.85 6.77	3.35 3.97 4.60 5.89 8.89	0.03 0.06 0.10 0.19 0.49
BXA-171063-12BF w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.0000	94.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.97 5.52 6.04 7.09 9.36	5.23 6.39 7.26 9.05 12.82	0.04 0.09 0.14 0.27 0.67
BXA-70063-6CF-EDIN-0 w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.0000	94.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.97 8.61 9.22 10.46 13.07	5.80 6.95 7.82 9.60 13.37	0.04 0.10 0.17 0.34 0.80
BXA-70063-6CF-EDIN-0 w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	0.0000	94.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.97 8.61 9.22 10.46 13.07	5.80 6.95 7.82 9.60 13.37	0.04 0.10 0.17 0.34 0.80
BXA-70063-6CF-EDIN-0 w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.0000	94.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.97 8.61 9.22 10.46 13.07	5.80 6.95 7.82 9.60 13.37	0.04 0.10 0.17 0.34 0.80
APL868013 w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.0000	94.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.10 3.48 3.88 4.76 6.66	4.92 5.60 6.28 7.71 10.83	0.02 0.06 0.11 0.22 0.54
DB846F65E-SX w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.0000	94.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	14.59 15.30 15.97 17.35 20.22	8.11 9.30 10.21 12.17 16.35	0.04 0.14 0.24 0.48 1.11
(2) APL868013 w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	0.0000	94.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.10 3.48 3.88 4.76 6.66	4.92 5.60 6.28 7.71 10.83	0.02 0.06 0.11 0.22 0.54
APL868013 w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.0000	94.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.10 3.48 3.88 4.76 6.66	4.92 5.60 6.28 7.71 10.83	0.02 0.06 0.11 0.22 0.54
DB846F65E-SX w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.0000	94.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	14.59 15.30 15.97 17.35 20.22	8.11 9.30 10.21 12.17 16.35	0.04 0.14 0.24 0.48 1.11
(2) FD9R6004/2C-3L	A	From Leg	4.00 0.00 2.00	0.0000	94.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.37 0.45 0.54 0.75 1.28	0.08 0.14 0.20 0.34 0.74	0.00 0.01 0.01 0.02 0.06
(2) FD9R6004/2C-3L	B	From Leg	4.00	0.0000	94.00	No Ice	0.37	0.08	0.00

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
			0.00			1/2" Ice	0.45	0.14	0.01
			2.00			1" Ice	0.54	0.20	0.01
						2" Ice	0.75	0.34	0.02
						4" Ice	1.28	0.74	0.06
(2) FD9R6004/2C-3L	C	From Leg	4.00	0.0000	94.00	No Ice	0.37	0.08	0.00
			0.00			1/2" Ice	0.45	0.14	0.01
			2.00			1" Ice	0.54	0.20	0.01
						2" Ice	0.75	0.34	0.02
						4" Ice	1.28	0.74	0.06
RRH2X40-AWS	A	From Leg	4.00	0.0000	94.00	No Ice	2.52	1.59	0.04
			0.00			1/2" Ice	2.75	1.80	0.06
			2.00			1" Ice	2.99	2.01	0.08
						2" Ice	3.50	2.46	0.13
						4" Ice	4.61	3.48	0.28
RRH2X40-AWS	B	From Leg	4.00	0.0000	94.00	No Ice	2.52	1.59	0.04
			0.00			1/2" Ice	2.75	1.80	0.06
			2.00			1" Ice	2.99	2.01	0.08
						2" Ice	3.50	2.46	0.13
						4" Ice	4.61	3.48	0.28
RRH2X40-AWS	C	From Leg	4.00	0.0000	94.00	No Ice	2.52	1.59	0.04
			0.00			1/2" Ice	2.75	1.80	0.06
			2.00			1" Ice	2.99	2.01	0.08
						2" Ice	3.50	2.46	0.13
						4" Ice	4.61	3.48	0.28
742 213 w/ Mount Pipe	A	From Leg	4.00	0.0000	94.00	No Ice	5.37	4.62	0.05
			0.00			1/2" Ice	5.95	6.00	0.09
			2.00			1" Ice	6.50	6.98	0.15
						2" Ice	7.61	8.85	0.28
						4" Ice	9.93	12.79	0.68
742 213 w/ Mount Pipe	B	From Leg	4.00	0.0000	94.00	No Ice	5.37	4.62	0.05
			0.00			1/2" Ice	5.95	6.00	0.09
			2.00			1" Ice	6.50	6.98	0.15
						2" Ice	7.61	8.85	0.28
						4" Ice	9.93	12.79	0.68
742 213 w/ Mount Pipe	C	From Leg	4.00	0.0000	94.00	No Ice	5.37	4.62	0.05
			0.00			1/2" Ice	5.95	6.00	0.09
			2.00			1" Ice	6.50	6.98	0.15
						2" Ice	7.61	8.85	0.28
						4" Ice	9.93	12.79	0.68
DB-T1-6Z-8AB-0Z	A	From Leg	4.00	0.0000	94.00	No Ice	5.60	2.33	0.04
			0.00			1/2" Ice	5.92	2.56	0.08
			2.00			1" Ice	6.24	2.79	0.12
						2" Ice	6.91	3.28	0.21
						4" Ice	8.37	4.37	0.45
Platform Mount [LP 601-1]	C	None		0.0000	94.00	No Ice	28.47	28.47	1.12
						1/2" Ice	33.59	33.59	1.51
						1" Ice	38.71	38.71	1.91
						2" Ice	48.95	48.95	2.69
						4" Ice	69.43	69.43	4.26
*									
GPS-TMG-HR-26NCM GPS	C	From Leg	1.00	0.0000	55.00	No Ice	0.09	0.09	0.00
			0.00			1/2" Ice	0.14	0.14	0.00
			0.00			1" Ice	0.20	0.20	0.00
						2" Ice	0.36	0.36	0.01
						4" Ice	0.81	0.81	0.04
Side Arm Mount [SO 701-1]	C	From Leg	0.50	0.0000	55.00	No Ice	0.85	1.67	0.07
			0.00			1/2" Ice	1.14	2.34	0.08

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
			0.00			1" Ice	1.43	3.01	0.09
						2" Ice	2.01	4.35	0.12
						4" Ice	3.17	7.03	0.18
*									
Lightning Rod	C	From Leg	0.00	0.0000	119.00	No Ice	0.25	0.25	0.03
			0.00			1/2" Ice	0.66	0.66	0.03
			2.00			1" Ice	0.97	0.97	0.04
						2" Ice	1.49	1.49	0.06
						4" Ice	2.68	2.68	0.14
**									

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

Comb. No.	Description
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	119 - 97.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-10.61	0.06	0.43
			Max. Mx	11	-5.39	132.58	0.09
			Max. My	2	-5.39	0.03	131.38
			Max. Vy	11	-11.34	132.58	0.09
			Max. Vx	2	-11.27	0.03	131.38
			Max. Torque	11			-0.98
L2	97.25 - 48	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-24.57	0.99	1.07
			Max. Mx	11	-15.06	988.99	-6.27
			Max. My	2	-15.05	-6.25	997.60
			Max. Vy	11	-20.39	988.99	-6.27
			Max. Vx	2	-20.65	-6.25	997.60
			Max. Torque	10			-1.94
L3	48 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-40.16	1.09	1.01
			Max. Mx	11	-28.53	2182.12	-13.70
			Max. My	2	-28.53	-13.66	2204.26
			Max. Vy	11	-24.43	2182.12	-13.70
			Max. Vx	2	-24.69	-13.66	2204.26
			Max. Torque	10			-1.93

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	15	40.16	-0.02	5.90
	Max. H_x	11	28.54	24.42	-0.14
	Max. H_z	2	28.54	-0.14	24.67
	Max. M_x	2	2204.26	-0.14	24.67
	Max. M_z	5	2181.45	-24.42	0.14
	Max. Torsion	4	1.92	-21.21	12.45
	Min. Vert	1	28.54	0.00	0.00
	Min. H_x	5	28.54	-24.42	0.14
	Min. H_z	8	28.54	0.14	-24.67
	Min. M_x	8	-2203.68	0.14	-24.67
	Min. M_z	11	-2182.12	24.42	-0.14
	Min. Torsion	10	-1.93	21.21	-12.45

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	28.54	0.00	0.00	-0.28	0.33	0.00
Dead+Wind 0 deg - No Ice	28.54	0.14	-24.67	-2204.26	-13.66	-1.16
Dead+Wind 30 deg - No Ice	28.54	12.33	-21.43	-1915.98	-1102.67	-1.77
Dead+Wind 60 deg - No Ice	28.54	21.21	-12.45	-1114.39	-1896.13	-1.92
Dead+Wind 90 deg - No Ice	28.54	24.42	-0.14	-14.28	-2181.45	-1.55
Dead+Wind 120 deg - No Ice	28.54	21.08	12.21	1089.59	-1882.16	-0.78
Dead+Wind 150 deg - No Ice	28.54	12.09	21.29	1901.42	-1078.44	0.21
Dead+Wind 180 deg - No Ice	28.54	-0.14	24.67	2203.68	14.33	1.15
Dead+Wind 210 deg - No Ice	28.54	-12.33	21.43	1915.40	1103.33	1.78
Dead+Wind 240 deg - No Ice	28.54	-21.21	12.45	1113.82	1896.80	1.93
Dead+Wind 270 deg - No Ice	28.54	-24.42	0.14	13.71	2182.12	1.56
Dead+Wind 300 deg - No Ice	28.54	-21.08	-12.21	-1090.17	1882.83	0.77
Dead+Wind 330 deg - No Ice	28.54	-12.09	-21.29	-1902.00	1079.11	-0.23
Dead+Ice+Temp	40.16	0.00	0.00	-1.01	1.09	0.00
Dead+Wind 0 deg+Ice+Temp	40.16	0.02	-5.90	-542.71	-1.36	-0.34
Dead+Wind 30 deg+Ice+Temp	40.16	2.94	-5.12	-471.39	-269.46	-0.45
Dead+Wind 60 deg+Ice+Temp	40.16	5.07	-2.97	-274.06	-465.05	-0.44
Dead+Wind 90 deg+Ice+Temp	40.16	5.85	-0.02	-3.57	-535.72	-0.32
Dead+Wind 120 deg+Ice+Temp	40.16	5.05	2.93	267.58	-462.55	-0.11
Dead+Wind 150 deg+Ice+Temp	40.16	2.90	5.10	466.75	-265.13	0.13
Dead+Wind 180 deg+Ice+Temp	40.16	-0.02	5.90	540.57	3.64	0.34
Dead+Wind 210 deg+Ice+Temp	40.16	-2.94	5.12	469.25	271.74	0.45
Dead+Wind 240 deg+Ice+Temp	40.16	-5.07	2.97	271.92	467.33	0.45
Dead+Wind 270 deg+Ice+Temp	40.16	-5.85	0.02	1.43	538.00	0.32
Dead+Wind 300 deg+Ice+Temp	40.16	-5.05	-2.93	-269.72	464.83	0.11
Dead+Wind 330 deg+Ice+Temp	40.16	-2.90	-5.10	-468.89	267.41	-0.14
Dead+Wind 0 deg - Service	28.54	0.05	-8.54	-763.19	-4.51	-0.40
Dead+Wind 30 deg - Service	28.54	4.27	-7.42	-663.40	-381.47	-0.62
Dead+Wind 60 deg - Service	28.54	7.34	-4.31	-385.94	-656.12	-0.67
Dead+Wind 90 deg - Service	28.54	8.45	-0.05	-5.13	-754.88	-0.54
Dead+Wind 120 deg - Service	28.54	7.29	4.23	376.97	-651.28	-0.27
Dead+Wind 150 deg - Service	28.54	4.18	7.37	657.98	-373.08	0.07
Dead+Wind 180 deg - Service	28.54	-0.05	8.54	762.61	5.18	0.40
Dead+Wind 210 deg - Service	28.54	-4.27	7.42	662.82	382.14	0.62
Dead+Wind 240 deg - Service	28.54	-7.34	4.31	385.35	656.79	0.67
Dead+Wind 270 deg - Service	28.54	-8.45	0.05	4.55	755.55	0.54
Dead+Wind 300 deg - Service	28.54	-7.29	-4.23	-377.55	651.95	0.27
Dead+Wind 330 deg - Service	28.54	-4.18	-7.37	-658.56	373.75	-0.08

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-28.54	0.00	0.00	28.54	0.00	0.000%
2	0.14	-28.54	-24.67	-0.14	28.54	24.67	0.000%
3	12.33	-28.54	-21.43	-12.33	28.54	21.43	0.000%
4	21.21	-28.54	-12.45	-21.21	28.54	12.45	0.000%
5	24.42	-28.54	-0.14	-24.42	28.54	0.14	0.000%
6	21.08	-28.54	12.21	-21.08	28.54	-12.21	0.000%
7	12.09	-28.54	21.29	-12.09	28.54	-21.29	0.000%
8	-0.14	-28.54	24.67	0.14	28.54	-24.67	0.000%
9	-12.33	-28.54	21.43	12.33	28.54	-21.43	0.000%
10	-21.21	-28.54	12.45	21.21	28.54	-12.45	0.000%
11	-24.42	-28.54	0.14	24.42	28.54	-0.14	0.000%
12	-21.08	-28.54	-12.21	21.08	28.54	12.21	0.000%
13	-12.09	-28.54	-21.29	12.09	28.54	21.29	0.000%
14	0.00	-40.16	0.00	0.00	40.16	0.00	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
15	0.02	-40.16	-5.90	-0.02	40.16	5.90	0.000%
16	2.94	-40.16	-5.12	-2.94	40.16	5.12	0.000%
17	5.07	-40.16	-2.97	-5.07	40.16	2.97	0.000%
18	5.85	-40.16	-0.02	-5.85	40.16	0.02	0.000%
19	5.05	-40.16	2.93	-5.05	40.16	-2.93	0.000%
20	2.90	-40.16	5.10	-2.90	40.16	-5.10	0.000%
21	-0.02	-40.16	5.90	0.02	40.16	-5.90	0.000%
22	-2.94	-40.16	5.12	2.94	40.16	-5.12	0.000%
23	-5.07	-40.16	2.97	5.07	40.16	-2.97	0.000%
24	-5.85	-40.16	0.02	5.85	40.16	-0.02	0.000%
25	-5.05	-40.16	-2.93	5.05	40.16	2.93	0.000%
26	-2.90	-40.16	-5.10	2.90	40.16	5.10	0.000%
27	0.05	-28.54	-8.54	-0.05	28.54	8.54	0.000%
28	4.27	-28.54	-7.42	-4.27	28.54	7.42	0.000%
29	7.34	-28.54	-4.31	-7.34	28.54	4.31	0.000%
30	8.45	-28.54	-0.05	-8.45	28.54	0.05	0.000%
31	7.29	-28.54	4.23	-7.29	28.54	-4.23	0.000%
32	4.18	-28.54	7.37	-4.18	28.54	-7.37	0.000%
33	-0.05	-28.54	8.54	0.05	28.54	-8.54	0.000%
34	-4.27	-28.54	7.42	4.27	28.54	-7.42	0.000%
35	-7.34	-28.54	4.31	7.34	28.54	-4.31	0.000%
36	-8.45	-28.54	0.05	8.45	28.54	-0.05	0.000%
37	-7.29	-28.54	-4.23	7.29	28.54	4.23	0.000%
38	-4.18	-28.54	-7.37	4.18	28.54	7.37	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	0.00013164
3	Yes	5	0.00000001	0.00003782
4	Yes	5	0.00000001	0.00004469
5	Yes	4	0.00000001	0.00034499
6	Yes	5	0.00000001	0.00003767
7	Yes	5	0.00000001	0.00003963
8	Yes	4	0.00000001	0.00019506
9	Yes	5	0.00000001	0.00004401
10	Yes	5	0.00000001	0.00003750
11	Yes	4	0.00000001	0.00028211
12	Yes	5	0.00000001	0.00004172
13	Yes	5	0.00000001	0.00003939
14	Yes	4	0.00000001	0.00000001
15	Yes	4	0.00000001	0.00057870
16	Yes	4	0.00000001	0.00066032
17	Yes	4	0.00000001	0.00066681
18	Yes	4	0.00000001	0.00057150
19	Yes	4	0.00000001	0.00064616
20	Yes	4	0.00000001	0.00064902
21	Yes	4	0.00000001	0.00057391
22	Yes	4	0.00000001	0.00066646
23	Yes	4	0.00000001	0.00065738
24	Yes	4	0.00000001	0.00057527
25	Yes	4	0.00000001	0.00065977
26	Yes	4	0.00000001	0.00065948
27	Yes	4	0.00000001	0.00002845

28	Yes	4	0.00000001	0.00012762
29	Yes	4	0.00000001	0.00018326
30	Yes	4	0.00000001	0.00005879
31	Yes	4	0.00000001	0.00012592
32	Yes	4	0.00000001	0.00014032
33	Yes	4	0.00000001	0.00003228
34	Yes	4	0.00000001	0.00017679
35	Yes	4	0.00000001	0.00012708
36	Yes	4	0.00000001	0.00005497
37	Yes	4	0.00000001	0.00015902
38	Yes	4	0.00000001	0.00013868

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	119 - 97.25	14.110	28	0.9737	0.0035
L2	101.25 - 48	10.535	28	0.9344	0.0028
L3	53.25 - 0	2.939	28	0.5100	0.0008

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
119.00	Lightning Rod	28	14.110	0.9737	0.0036	45282
116.00	(2) 7770.00 w/Mount Pipe	28	13.498	0.9699	0.0034	45282
106.00	(2) DB950F85T2E-M w/ Mount Pipe	28	11.475	0.9507	0.0030	17416
94.00	BXA-171063-8BF-EDIN-0 w/ Mount Pipe	28	9.142	0.8965	0.0025	9820
55.00	GPS-TMG-HR-26NCM GPS	28	3.128	0.5285	0.0009	4378

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	119 - 97.25	40.727	3	2.8106	0.0101
L2	101.25 - 48	30.412	3	2.6975	0.0080
L3	53.25 - 0	8.488	3	1.4729	0.0024

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
119.00	Lightning Rod	3	40.727	2.8106	0.0104	15772
116.00	(2) 7770.00 w/Mount Pipe	3	38.960	2.7995	0.0100	15772
106.00	(2) DB950F85T2E-M w/ Mount Pipe	3	33.125	2.7443	0.0088	6065
94.00	BXA-171063-8BF-EDIN-0 w/ Mount Pipe	3	26.393	2.5883	0.0072	3418
55.00	GPS-TMG-HR-26NCM GPS	3	9.033	1.5264	0.0025	1518

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	119 - 97.25 (1)	TP30.86x25.5x0.25	21.75	0.00	0.0	39.000	23.5068	-5.39	916.77	0.006
L2	97.25 - 48 (2)	TP42.47x29.3743x0.3125	53.25	0.00	0.0	39.000	40.5343	-15.05	1580.84	0.010
L3	48 - 0 (3)	TP53.65x40.5539x0.375	53.25	0.00	0.0	39.000	63.4106	-28.53	2473.01	0.012

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	119 - 97.25 (1)	TP30.86x25.5x0.25	132.58	9.264	39.000	0.238	0.00	0.000	39.000	0.000
L2	97.25 - 48 (2)	TP42.47x29.3743x0.3125	1000.92	29.378	39.000	0.753	0.00	0.000	39.000	0.000
L3	48 - 0 (3)	TP53.65x40.5539x0.375	2210.63	31.797	39.000	0.815	0.00	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	119 - 97.25 (1)	TP30.86x25.5x0.25	11.34	0.483	26.000	0.037	0.98	0.033	26.000	0.001
L2	97.25 - 48 (2)	TP42.47x29.3743x0.3125	20.71	0.511	26.000	0.039	1.76	0.025	26.000	0.001
L3	48 - 0 (3)	TP53.65x40.5539x0.375	24.74	0.390	26.000	0.030	1.77	0.012	26.000	0.000

Pole Interaction Design Data

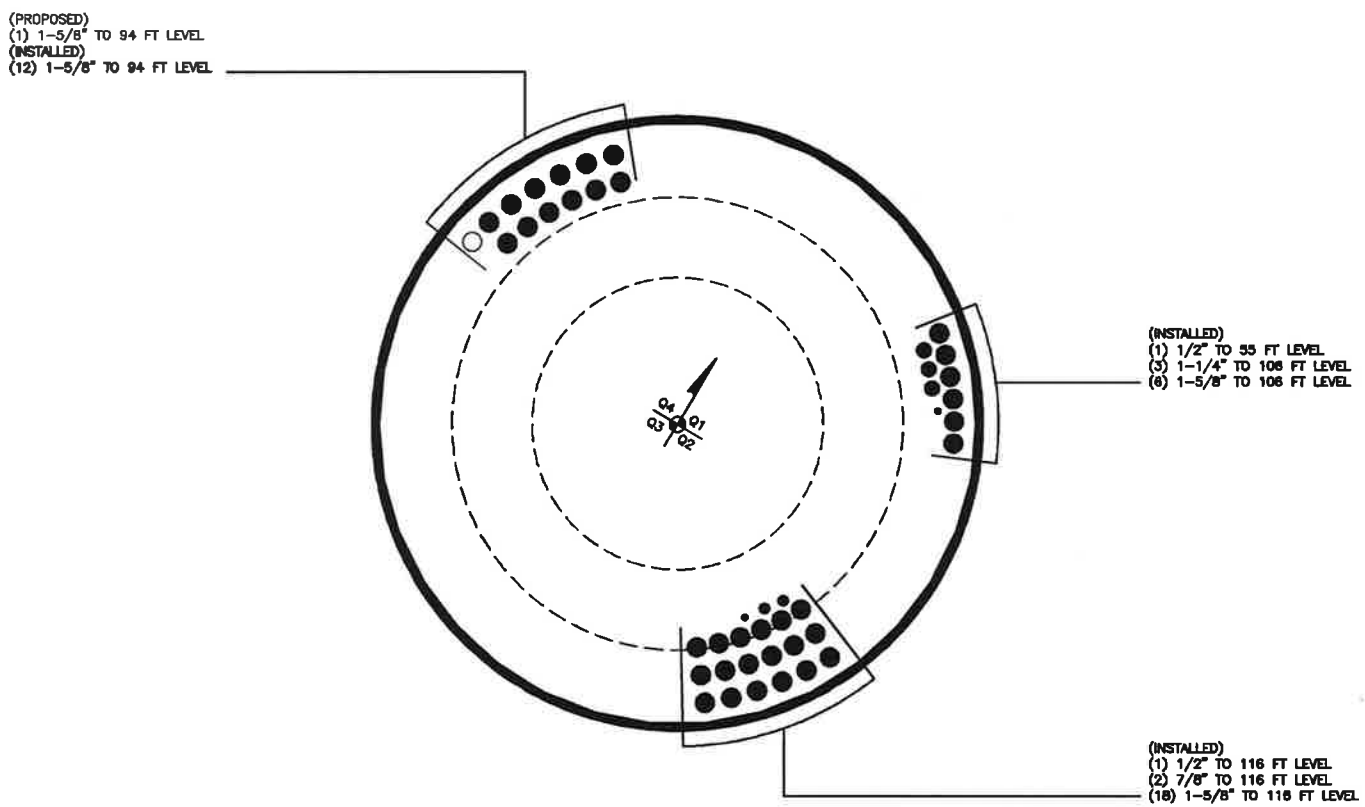
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	119 - 97.25 (1)	0.006	0.238	0.000	0.037	0.001	0.244 ✔	1.333	H1-3+VT ✔
L2	97.25 - 48 (2)	0.010	0.753	0.000	0.039	0.001	0.763 ✔	1.333	H1-3+VT ✔
L3	48 - 0 (3)	0.012	0.815	0.000	0.030	0.000	0.827 ✔	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	119 - 97.25	Pole	TP30.86x25.5x0.25	1	-5.39	1222.05	18.3	Pass
L2	97.25 - 48	Pole	TP42.47x29.3743x0.3125	2	-15.05	2107.26	57.3	Pass
L3	48 - 0	Pole	TP53.65x40.5539x0.375	3	-28.53	3296.52	62.0	Pass
							Summary	
						Pole (L3)	62.0	Pass
						RATING =	**62.0**	**Pass**

APPENDIX B

BASE LEVEL DRAWING



BUSINESS UNIT: 846176 TOWER ID: C_BASELEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

Square, Stiffened / Unstiffened Base Plate, Any Rod Material - Rev. F /G

Assumptions: 1) Rod groups at corners. Total # rods divisible by 4. Maximum total # of rods = 48 (12 per Corner).
2) Rod Spacing = Straight Center-to-Center distance between any (2) adjacent rods (same corner)
3) Clear space between bottom of leveling nut and top of concrete **not** exceeding (1)*(Rod Diameter)

Site Data

Site ID#
Site Name: *Madison Durham Road*
App #:

Anchor Rod Data		
Qty:	16	
Diam:	2.25	in
Rod Material:	A615-J	
Yield, Fy:	75	ksi
Strength, Fu:	100	ksi
Bolt Circle:	60	in
Anchor Spacing:	6	in

Plate Data		
W=Side:	60	in
Thick:	2.5	in
Grade:	60	ksi
Clip Distance:	12	in

Stiffener Data (Welding at both sides)		
Configuration:	Unstiffened	
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:	53.65	in
Thick:	0.375	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round

Stress Increase Factor		
ASD ASIF:	1.333	

Base Reactions		
TIA Revision:	F	
Unfactored Moment, M:	2211	ft-kips
Unfactored Axial, P:	29	kips
Unfactored Shear, V:	25	kips

Anchor Rod Results

TIA F --> Maximum Rod Tension	108.7 Kips
Allowable Tension:	195.0 Kips
Anchor Rod Stress Ratio:	55.8% Pass

Base Plate Results	Flexural Check
Base Plate Stress:	32.9 ksi
Allowable PL Bending Stress:	60.0 ksi
Base Plate Stress Ratio:	54.9% Pass

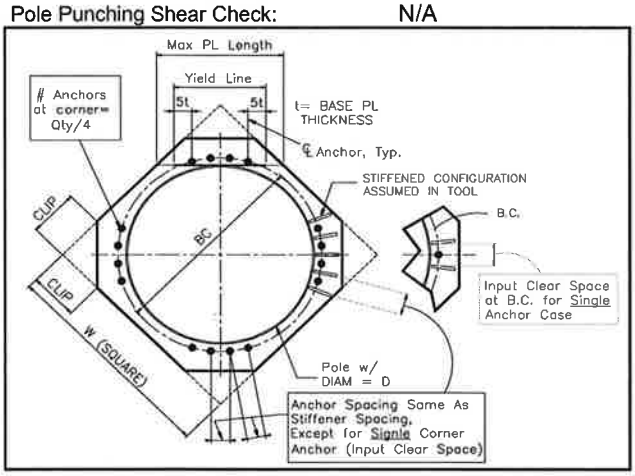
PL Ref. Data
Yield Line (in): 31.20
Max PL Length: 31.20

N/A - Unstiffened
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



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

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

Site Data

Site ID# *83947-A*
Site Name: *Madison Durham Road*
App #:

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

Pad & Pier Data		
Base PL Dist. Above Pier:	0	in
Pier Dist. Above Grade:	0	in
Pad Bearing Depth, D:	1	ft
Pad Thickness, T:	2	ft
Pad Width=Length, L:	30.5	ft
Pier Cross Section Shape:	Round	<--Pull Down
Enter Pier Diameter:	0	ft
Concrete Density:	150.0	pcf
Pier Cross Section Area:	0.00	ft^2
Pier Height:	0.00	ft
Soil (above pad) Height:	0.00	ft

Soil Parameters		
Unit Weight, γ:	120.0	pcf
Ultimate Bearing Capacity, qn:	15.25	ksf
Strength Reduct. factor, ϕ:	0.75	
Angle of Friction, Φ:	39.0	degrees
Undrained Shear Strength, Cu:	0.00	ksf
Allowable Bearing: ϕ*qn:	11.44	ksf
Passive Pres. Coeff., Kp	4.40	

Forces/Moments due to Wind and Lateral Soil		
Minimum of (φ*Ultimate Pad Passive Force, Vu):	12.1	kips
Pad Force Location Above D:	0.67	ft
ϕ(Passive Pressure Moment):	8.04	ft-kips
Factored O.T. M(WL), "1.6W":	3018.6	ft-kips
Factored OT (MW-Msoil), M1	3010.56	ft-kips

Resistance due to Foundation Gravity		
Soil Wedge Projection grade, a:	0.00	ft
Sum of Soil Wedges Wt:	0.00	kips
Soil Wedges ecc, K1:	0.00	ft
Ftg+Soil above Pad wt:	279.1	kips
Unfactored (Total ftg-soil Wt):	279.08	kips
1.2D. **No Soil Wedges**.	369.69	kips
0.9D. **With Soil Wedges**	277.27	kips

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

Monopole Base Reaction Forces		
TIA Revision:	F	<--Pull Down
Unfactored DL Axial, PD:	29	kips
Unfactored WL Axial, PW:	0	kips
Unfactored WL Shear, V:	25	kips
Unfactored WL Moment, M:	2211	ft-kips

Load Factor	Shaft Factored Loads		
1.20	1.2D+1.6W, Pu:	34.8	kips
0.90	0.9D+1.6W, Pu:	26.1	kips
1.35	Vu:	33.75	kips
	Mu:	2984.85	ft-kips

1.2D+1.6W Load Combination, Bearing Results:

(**No Soil Wedges**) [Reaction+Conc+Soil]	369.69	P1="1.2D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil), M1	3010.56	ft-kips

Orthogonal Direction:

ecc1 = M1/P1 =	8.14	ft
Orthogonal qu=	0.85	ksf
qu/ϕ*qn Ratio=	**7.46%**	Pass

Diagonal Direction:

ecc2 = (0.707M1)/P1 =	5.76	ft
Diagonal qu=	1.03	ksf
qu/ϕ*qn Ratio=	**8.97%**	Pass

Run <-- Press Upon Completing All Input

Overturning Stability Check

0.9D+1.6W Load Combination, Bearing Results:

(**w/ Soil Wedges**) [Reaction+Conc+Soil]	277.27	P2="0.9D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil) - 0.9(M of Wedge + M of Cohesion), M2	3010.56	ft-kips

Orthogonal ecc3 = M2/P2 =	10.86	ft
Ortho Non Bearing Length,NBL=	21.72	ft
Orthogonal qu=	1.03	ksf
Diagonal qu=	1.21	ksf

Max Reaction Moment (ft-kips) so that qu=φ*qn = 100% Capacity Rating			
Actual M:	2211.00		
M Orthogonal:	3031.43	**72.94%**	Pass
M Diagonal:	3031.43	**72.94%**	Pass