Robinson+Cole

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Also admitted in Massachusetts

October 21, 2014

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

Re: **Notice of Exempt Modification – Facility Modification**
74 Goodrich Lane, Portland, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) antennas at the top of the existing 160-foot tower at 74 Goodrich Lane in Portland, Connecticut (the Property"). The tower is owned by Crown Castle. The Council approved Cellco's use of this tower in 1986 (Docket No. 58). Cellco now intends to modify its facility by replacing six (6) of its existing antennas with three (3) model BXA-70063-6CF, 700 MHz antennas and three (3) model HBXX-6517DS-VTM, 1900 MHz antennas and adding three (3) HBXX-6517DS-VTM, 2100 MHz antennas, for a total of fifteen (15) antennas, all at the same 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. Included in Attachment 1 are specifications for Cellco's new antennas, RRHs and HYBRIFLEX™ cables.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Susan Bransfield, First Selectwoman of the Town of Portland. A copy of this letter is also being sent to Joan Hale, the owner of the Property.

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

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

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

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

4. The operation of the replacement antennas will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. A cumulative General Power Density table for Cellco's modified facility is included in Attachment 2.

5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.

6. The tower and its foundation can support Cellco's proposed modifications. (*See* Structural Analysis Report included in Attachment 3).

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

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
Susan Bransfield, Portland First Selectwoman
Joan Hale
Sandy M. Carter

ATTACHMENT 1

BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

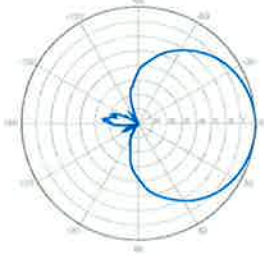
Replace "X" with desired electrical downtilt.

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

Electrical Characteristics	696-900 MHz	
Frequency bands	696-806 MHz	806-900 MHz
Polarization	±45°	
Horizontal beamwidth	65°	63°
Vertical beamwidth	13°	11°
Gain	14.0 dBd (16.1 dBi)	14.5 dBd (16.6 dBi)
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 10	
Impedance	**50Ω**	
VSWR	**≤1.35:1**	
Upper sidelobe suppression (0°)	-18.3 dB	-18.2 dB
Front-to-back ratio (+/-30°)	-33.4 dB	-36.3 dB
Null fill	5% (-26.02 dB)	
Isolation between ports	< -25 dB	
Input power with EDIN connectors	500 W	
Input power with NE connectors	300 W	
IM3 (2x20W carriers)	< -153 dBc	
Lightning protection	Direct Ground	
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)	
Mechanical Characteristics		
Dimensions Length x Width x Depth	1804 x 285 x 132 mm	71.0 x 11.2 x 5.2 in
Depth with z-brackets	172 mm	6.8 in
Weight without mounting brackets	7.9 kg	17 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.51 m^2 Side: 0.24 m^2	Front: 5.5 ft^2 Side: 2.6 ft^2
Wind load @ 161 km/hr (100 mph)	Front: 759 N Side: 391 N	Front: 169 lbf Side: 89 lbf

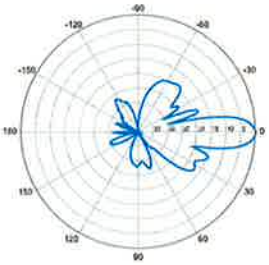
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-70063-6CF-EDIN-X-FP		

BXA-70063-6CF-EDIN-X



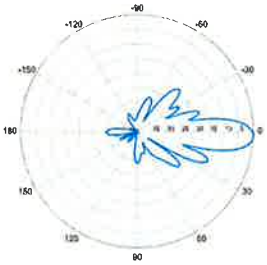
Horizontal | 750 MHz

BXA-70063-6CF-EDIN-0

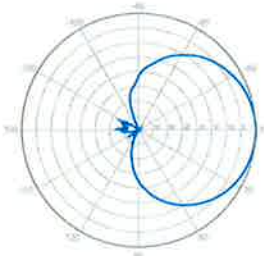


0° | Vertical | 750 MHz

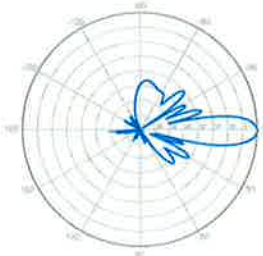
BXA-70063-6CF-EDIN-2



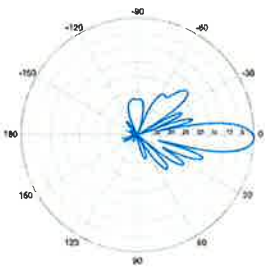
2° | Vertical | 750 MHz



Horizontal | 850 MHz



0° | Vertical | 850 MHz

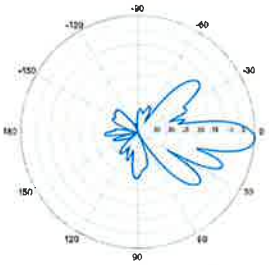


2° | Vertical | 850 MHz

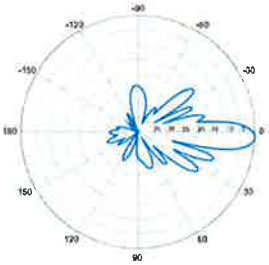
BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

BXA-70063-6CF-EDIN-3

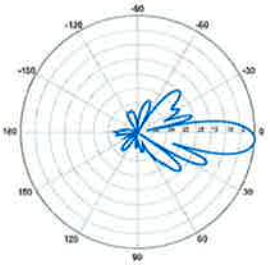


3° | Vertical | 750 MHz

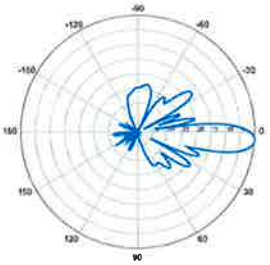


3° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-4

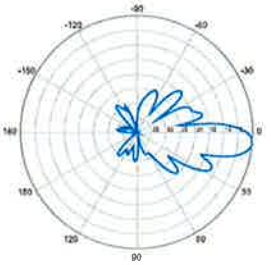


4° | Vertical | 750 MHz

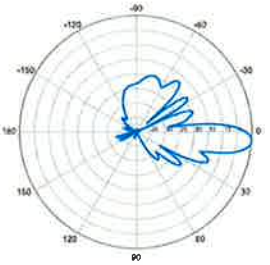


4° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-5

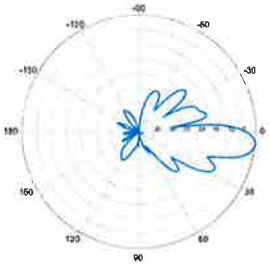


5° | Vertical | 750 MHz

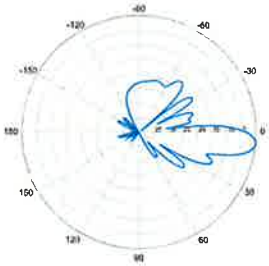


5° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-6

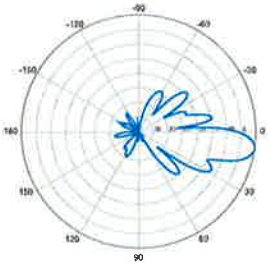


6° | Vertical | 750 MHz

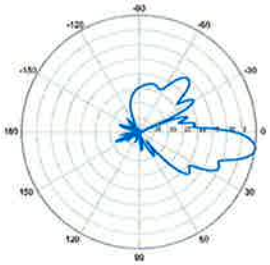


6° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-8

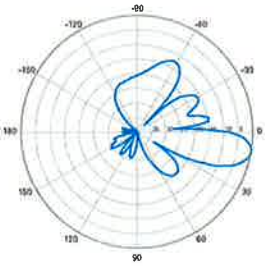


8° | Vertical | 750 MHz

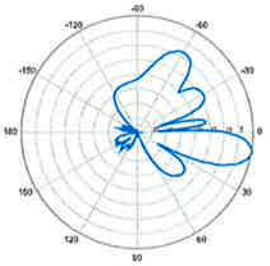


8° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-10



10° | Vertical | 750 MHz



10° | Vertical | 850 MHz

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

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.

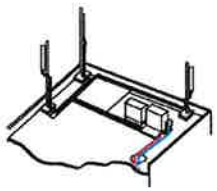
EASY INSTALLATION

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.

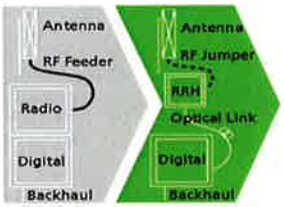
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

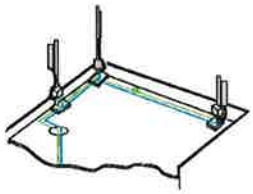
Installation can easily be done by a single person as the Alcatel–Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



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
Weight, Approximate		[kg/m (lb/ft)]	1.9 (1.30)
Minimum Bending Radius, Single Bending		[mm (in)]	200 (8)
Minimum Bending Radius, Repeated Bending		[mm (in)]	500 (20)
Recommended/Maximum Clamp Spacing		[m (ft)]	1.0 / 1.2 (3.25 / 4.0)
DC-Resistance Outer Conductor Armor		[Ω/km (Ω/1000ft)]	068 (0.205)
DC-Resistance Power Cable, 8.4mm²(8AWG)		[Ω/km (Ω/1000ft)]	2.1 (0.307)
Version			Single-mode OM3
Quantity, Fiber Count			16 (8 pairs)
Core/Clad		[µm]	50/125
Primary Coating (Acrylate)		[µm]	245
Buffer Diameter, Nominal		[µm]	900
Secondary Protection, Jacket, Nominal		[mm (in)]	2.0 (0.08)
Minimum Bending Radius		[mm (in)]	104 (4.1)
Insertion Loss @ wavelength 850nm		dB/km	3.0
Insertion Loss @ wavelength 1310nm		dB/km	1.0
Standards (Meets or exceeds)			UL94-V0, UL1666 RoHS Compliant
Size (Power)		[mm² (AWG)]	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		[mm² (AWG)]	0.8 (18)
Quantity, Wire Count (Alarm)			4 (2 pairs)
Type			UV protected
Strands			19
Primary Jacket Diameter, Nominal		[mm (in)]	6.8 (0.27)
Standards (Meets or exceeds)			NFPA 130, ICEA S-95-658 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to149)

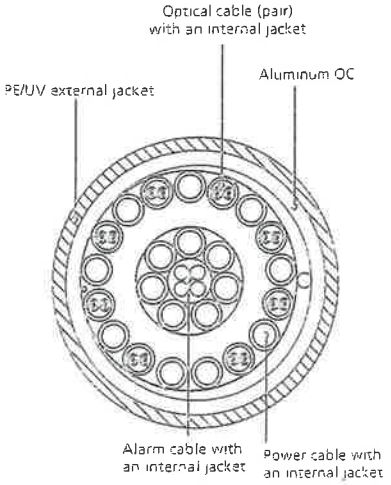


Figure 2: Construction Detail

- This data is provisional and subject to change

ATTACHMENT 2

	General	Power	Density					
Site Name: Portland								
Tower Height: 160 ft								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*AT&T UMTS	2	565	120	0.0282	880	0.5867	4.81%	
*AT&T UMTS	2	875	120	0.0437	1900	1.0000	4.37%	
*AT&T GSM	1	283	120	0.0071	880	0.5867	1.20%	
*AT&T GSM	4	525	120	0.0524	1900	1.0000	5.24%	
*AT&T LTE	1	1313	120	0.0328	734	0.4893	6.70%	
*Clearwire	2	153	142	0.0055	2469	1.0000	0.55%	
*Clearwire	1	211	142	0.0038	11 GHz	1.0000	0.38%	
*Sprint	11	122	153	0.0206	1950	1.0000	2.06%	
*Nextel	9	100	132	0.0186	850	0.5667	3.28%	
*VoiceStream	8	245	135	0.0387	1935	1.0000	3.87%	
Verizon	**11**	**378**	**160**	**0.0584**	**1970**	**1.0000**	**5.84%**	
Verizon	**9**	**374**	**160**	**0.0473**	**869**	**0.5793**	**8.16%**	
Verizon	**1**	**1900**	**160**	**0.0267**	**2145**	**1.0000**	**2.67%**	
Verizon	**1**	**793**	**160**	**0.0111**	**746**	**0.4973**	**2.24%**	
								51.36%
* Source: Siting Council								

ATTACHMENT 3

September 18, 2014

Andrew Bazinet
Crown Castle
3 Corporate Park Drive Suite 101
Clifton Park, NY 12065
(980) 209-8239

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

Subject:	**Structural Analysis Report**	
Carrier Designation:	***Verizon Wireless* Co-Locate**	
	Carrier Site Number:	N/A
	Carrier Site Name:	Portland, CT
Crown Castle Designation:	**Crown Castle BU Number:**	806382
	Crown Castle Site Name:	HRT 082 943274
	Crown Castle JDE Job Number:	293420
	Crown Castle Work Order Number:	931038
	Crown Castle Application Number:	250061 Rev. 3
Engineering Firm Designation:	**B+T Group Project Number:**	81363.006.01
Site Data:	**Old Marlborough Turnpike, Portland, Middlesex County, CT** **Latitude *41° 36' 29.9"*, Longitude *-72° 35' 29.56"*** **160 Foot - Monopole Tower**	

Dear Andrew Bazinet,

B+T Group is pleased to submit this **"Structural Analysis Report"** to determine the structural integrity of the above mentioned tower. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 706541, in accordance with application 250061, revision 3.

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 1 and Table 2 for the proposed and existing loading, respectively.

This analysis has been performed in accordance with the TIA/EIA-222-F standard and 2005 CT State Building Code with 2009 amendment based upon a wind speed of 85 mph fastest mile.

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

We at *B+T Group* appreciate the opportunity of providing our continuing professional services to you and Crown Castle. If you have any questions or need further assistance on this or any other projects please give us a call.

Respectfully submitted by:
B+T Engineering, Inc.

STATE OF CONNECTICUT
CHAD TUTTLE
No. 22824
LICENSED
PROFESSIONAL ENGINEER
9/18/14

Venu Ambati
Project Engineer

Chad E. Tuttle, P.E.
President

tnxTower Report - version 6.1.4.1

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 160 ft Monopole tower designed by Valmont in January of 1998. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-F. This tower has been modified by B+T Group in May of 2013 and considered in this analysis to accommodate additional loading.

2) ANALYSIS CRITERIA

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

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
160.0	160.0	3	Alcatel Lucent	RRH2x40-AWS	2	1-5/8	--
		6	Andrew	HBXX-6517DS-A2M			
		3	Antel	BXA-70063/6CF			
		1	RFS Celwave	DB-T1-6Z-8AB-0Z			

Table 2 - Existing Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
160.0	160.0	**2**	**Andrew**	**LNX-6512DS-T2M**	--	--	**2**
		3	**Rymsa Wireless**	**MG D3-800Tx**			
		1	**Andrew**	**LNX-6512DS-T4M**			
		2	Decibel	DB846F65ZAXY	12	1-5/8	1
		4	Decibel	DB846H80E-SX			
		6	RFS Celwave	FD9R6004/2C-3L			
		1	--	Platform Mount [LP 602-1]			
150.0	152.0	6	Decibel	DB980H90E-M	6	1-5/8	1
	150.0	1	--	Platform Mount [LP 602-1]			
142.0	144.0	2	Radiowaves	HP3-11	2	1/2	1
	142.0	1	--	Side Arm Mount [SO 101-3]			
134.0	137.0	3	EMS Wireless	RR90-17-00DP	6	7/8	1
		6	Ericsson	KRY 112 71/1			
	134.0	1	--	Curved Mount[CO401-3]			
128.0	**130.0**	**9**	**Decibel**	**DB844H90E-XY**	**9**	**1-1/4**	**2**
	128.0	**1**	**--**	**Platform Mount [LP 601-1]**			
116.0	120.0	3	Ericsson	RRUS-11	12 2 1	1-1/4 3/4 3/8	1
		3	KMW Comm.	AM-X-CD-16-65-00T-RET			
		6	Powerwave Tech.	7770.00			
		6	Powerwave Tech.	LGP21401			
		6	Powerwave Tech.	LGP21901			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
		1	Raycap	DC6-48-60-18-8F			
	116.0	1	--	Platform Mount [LP 303-1]			
50.0	50.0	2	--	Side Arm Mount [SO 701-1]	2	1/2	1
		2	Unknown	GPS			
45.0	45.0	2	--	Side Arm Mount [SO 701-1]	--	--	1

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

Table 3 - Design Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
157	157	12	Swedcom	ALP 9212-N	--	--
		1	Valmont	Platform w/rail		
148	148	12	Swedcom	ALP 9212-N	--	--
		1	Valmont	Platform w/rail		
138	138	12	Swedcom	ALP 9212-N	--	--
		1	Valmont	Platform w/rail		
128	128	12	Swedcom	ALP 9212-N	--	--
		1	Valmont	Platform w/rail		
60	60	2	Generic	GPS	--	--
		2	Generic	Short Straight Arm Mount		
50	50	2	Generic	GPS	--	--
		2	Generic	Short Straight Arm Mount		

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
Online Application	Verizon Wireless Co-locate, Rev # 3	250061	CCI Sites
Tower Manufacturer Drawings	Valmont Industries, Inc. Order No. 16750-98	255193	CCI Sites
Tower Modification Drawing	B+T Group, Project No. 81363.004.01	3865159	CCI Sites
Post Modification Inspection	TEP, Project No. 47567.5988	3996803	CCI Sites
Foundation Drawings	Unknown	301226	CCI Sites
Geotech Report	Timmerman Geotechnical Group Inc., Job No. 067058	1041653	CCI Sites
Antenna Configuration	Crown CAD Package	Date: 06/03/2014	CCI Sites

3.1) Analysis Method

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

3.2) Assumptions

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

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

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	160 - 123.667	Pole	TP29.05x18.87x0.188	1	-6.151	772.705	94.8	Pass
L2	123.667 - 76.25	Pole	TP41.95x27.461x0.313	2	-15.801	2028.373	91.9	Pass
L3	76.25 - 51	Pole	TP48.398x39.715x0.344	3	-23.574	2547.816	99.1	Pass
L4	51 - 37	Pole	TP52.32x48.398x0.433	4	-25.865	2579.022	99.3	Pass
L5	37 - 0	Pole	TP62x49.672x0.406	5	-41.152	3659.311	95.2	Pass
							Summary	
						Pole (L4)	99.3	Pass
						RATING =	**99.3**	Pass

Table 6 - Tower Component Stresses vs. Capacity – LC5

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	Base	93.3	Pass
1	Base Plate	Base	54.0	Pass
1	Base Foundation (Soil Interaction)	Base	98.9	Pass

Structure Rating (max from all components) =	99.3%

Notes:
1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.
2) Capacities up to 100% are considered acceptable based on analysis methods used.

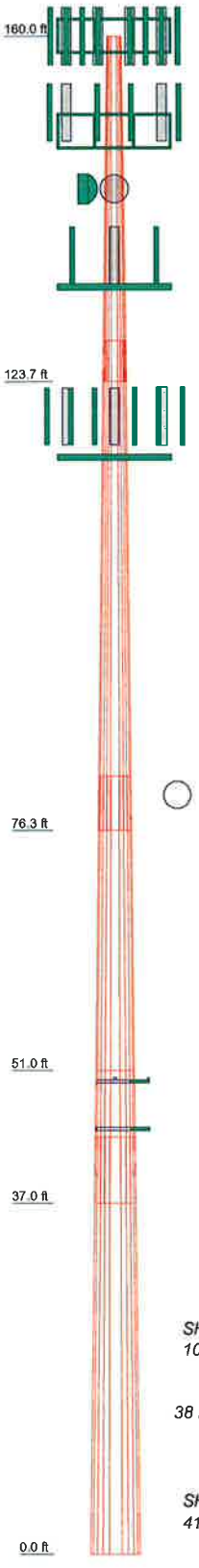
4.1) Recommendations

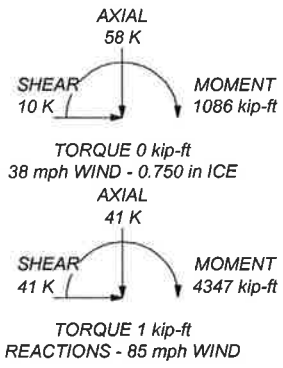
The tower and its foundation have sufficient capacity to carry the existing, reserved, and proposed loads. No modifications are required at this time.

APPENDIX A

TNXTOWER OUTPUT

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	36.333	12	0.188	4.333	18.670	29.050	A572-65	1.8
2	51.750	12	0.313	5.750	27.461	41.950	A572-65	6.1
3	31.000	12	0.344		39.715	48.398	A572-65	5.1
4	14.000	12	0.433	7.000	48.398	52.320	A572-65	3.3
5	44.000	12	0.406		49.672	62.000	A572-65	10.9
							46.34673ksi	27.1





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(2) DB846H80E-SX w/ Mount Pipe (E)	160	(2) KRY 112 71/1 (E)	134
(2) DB846H80E-SX w/ Mount Pipe (E)	160	(2) KRY 112 71/1 (E)	134
(2) DB846F65ZAXY w/ Mount Pipe (E)	160	Curved Mount[CO401-3] (E)	134
(2) FD9R6004/2C-3L (E)	160	RR90-17-00DP w/ Mount Pipe (E)	134
(2) FD9R6004/2C-3L (E)	160	RR90-17-00DP w/ Mount Pipe (E)	134
(2) FD9R6004/2C-3L (E)	160	(2) 7770.00 w/ Mount Pipe (E)	116
BXA-70063/6CF w/ Mount Pipe (P)	160	AM-X-CD-16-65-00T-RET w/ Mount Pipe (E)	116
BXA-70063/6CF w/ Mount Pipe (P)	160		
BXA-70063/6CF w/ Mount Pipe (P)	160	AM-X-CD-16-65-00T-RET w/ Mount Pipe (E)	116
(2) HBXX-6517DS-A2M w/ Mount Pipe (P)	160	AM-X-CD-16-65-00T-RET w/ Mount Pipe (E)	116
(2) HBXX-6517DS-A2M w/ Mount Pipe (P)	160	(2) LGP21401 (E)	116
(2) HBXX-6517DS-A2M w/ Mount Pipe (P)	160	(2) LGP21401 (E)	116
		(2) LGP21401 (E)	116
RRH2x40-AWS (P)	160	RRUS-11 (E)	116
RRH2x40-AWS (P)	160	RRUS-11 (E)	116
RRH2x40-AWS (P)	160	RRUS-11 (E)	116
DB-T1-6Z-8AB-0Z (P)	160	(2) LGP21901 (E)	116
Platform Mount [LP 602-1] (E)	160	(2) LGP21901 (E)	116
(2) DB980H90E-M w/ Mount Pipe (E)	150	(2) LGP21901 (E)	116
(2) DB980H90E-M w/ Mount Pipe (E)	150	DC6-48-60-18-8F (E)	116
(2) DB980H90E-M w/ Mount Pipe (E)	150	2' x 2" Pipe Mount (E-For TMA)	116
(2) 6' x 2" Mount Pipe (E)	150	2' x 2" Pipe Mount (E-For TMA)	116
(2) 6' x 2" Mount Pipe (E)	150	2' x 2" Pipe Mount (E-For TMA)	116
(2) 6' x 2" Mount Pipe (E)	150	Platform Mount [LP 303-1] (E)	116
Platform Mount [LP 602-1] (E)	150	(2) 7770.00 w/ Mount Pipe (E)	116
(2) 6' x 2" Mount Pipe (E)	142	(2) 7770.00 w/ Mount Pipe (E)	116
(2) 6' x 2" Mount Pipe (E)	142	Side Arm Mount [SO 701-1] (E)	50
(2) 6' x 2" Mount Pipe (E)	142	Side Arm Mount [SO 701-1] (E)	50
Side Arm Mount [SO 101-3] (E)	142	GPS (E)	50
HP3-11 (E)	142	GPS (E)	50
HP3-11 (E)	142	Side Arm Mount [SO 701-1] (E)	45
RR90-17-00DP w/ Mount Pipe (E)	134	Side Arm Mount [SO 701-1] (E)	45
(2) KRY 112 71/1 (E)	134		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi	46.34673ksi	46 ksi	61 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: 99.3%

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

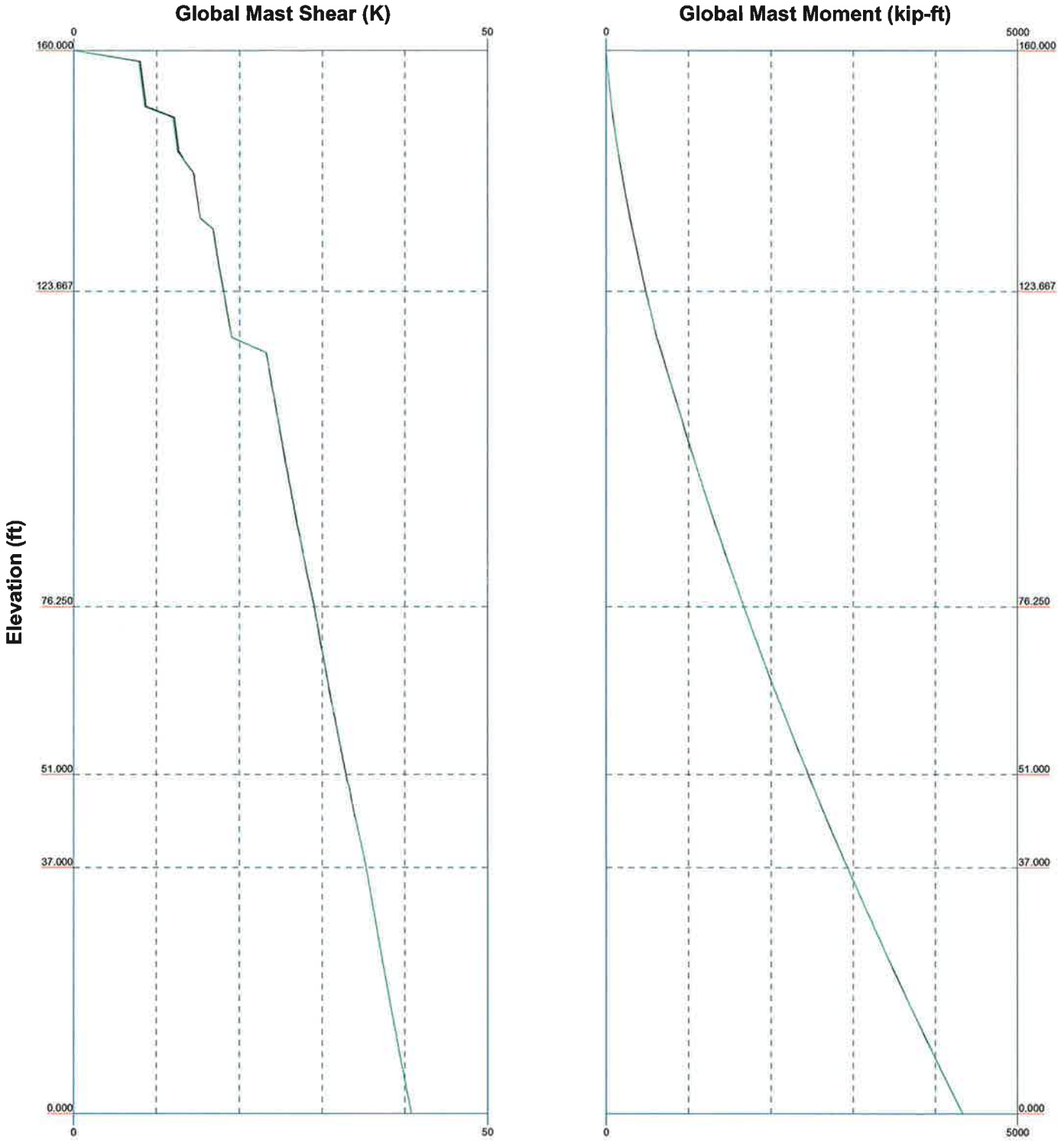
Job: 81363.006.01 - HRT 082 943274, CT (BU# 80638			
Project:			
Client: Crown Castle	Drawn by: VenuAmbati	App'd:	
Code: TIA/EIA-222-F	Date: 09/18/14	Scale: NTS	
Path:		Dwg No. E-1	

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

Vx Vz

Maximum Values

Mx Mz



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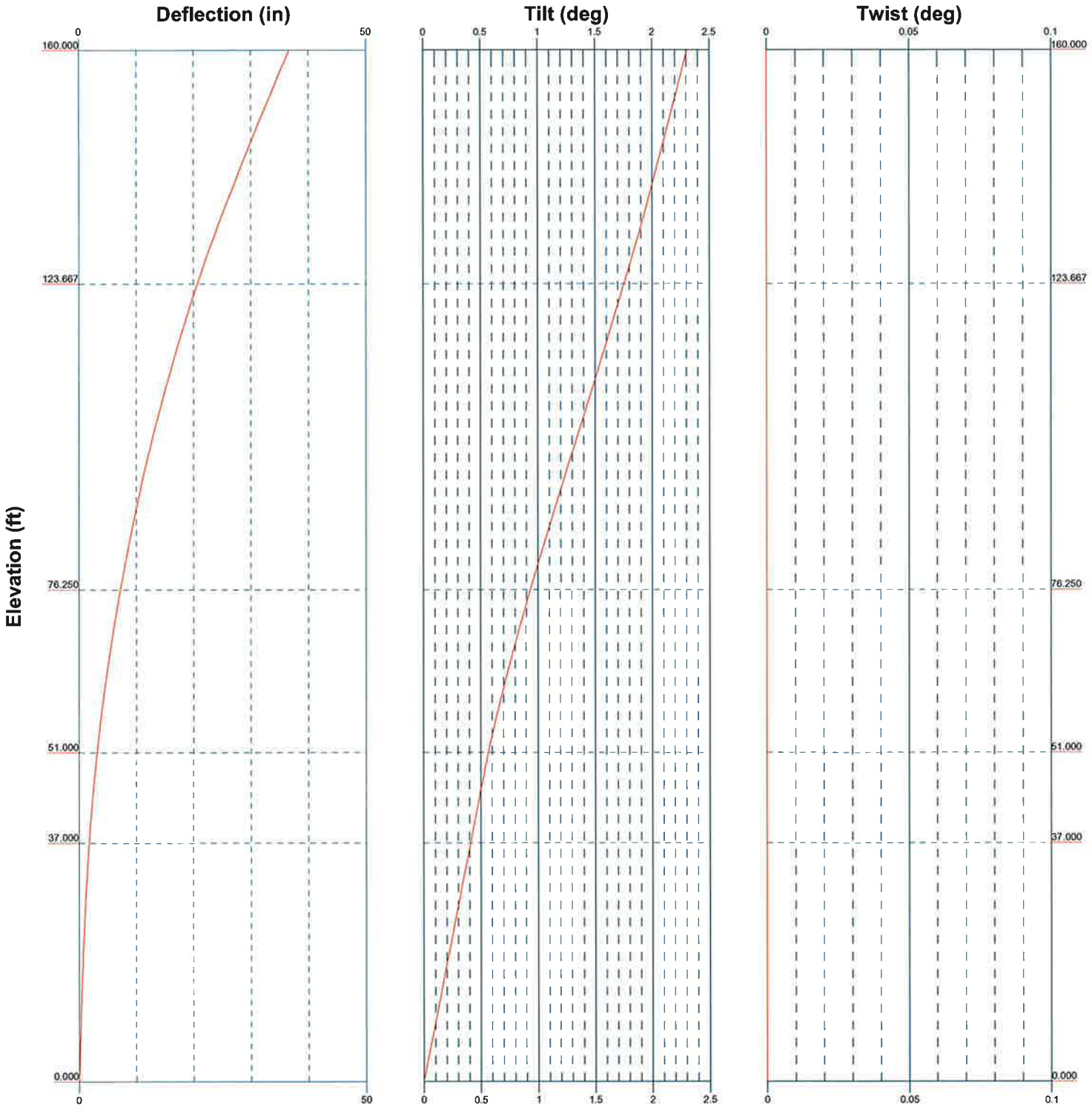
Job: 81363.006.01 - HRT 082 943274, CT (BU# 80638			
Project:			
Client: Crown Castle	Drawn by: VenuAmbati	App'd:	
Code: TIA/EIA-222-F	Date: 09/18/14	Scale: NTS	
Path:		Dwg No. E-4	

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

Maximum Values



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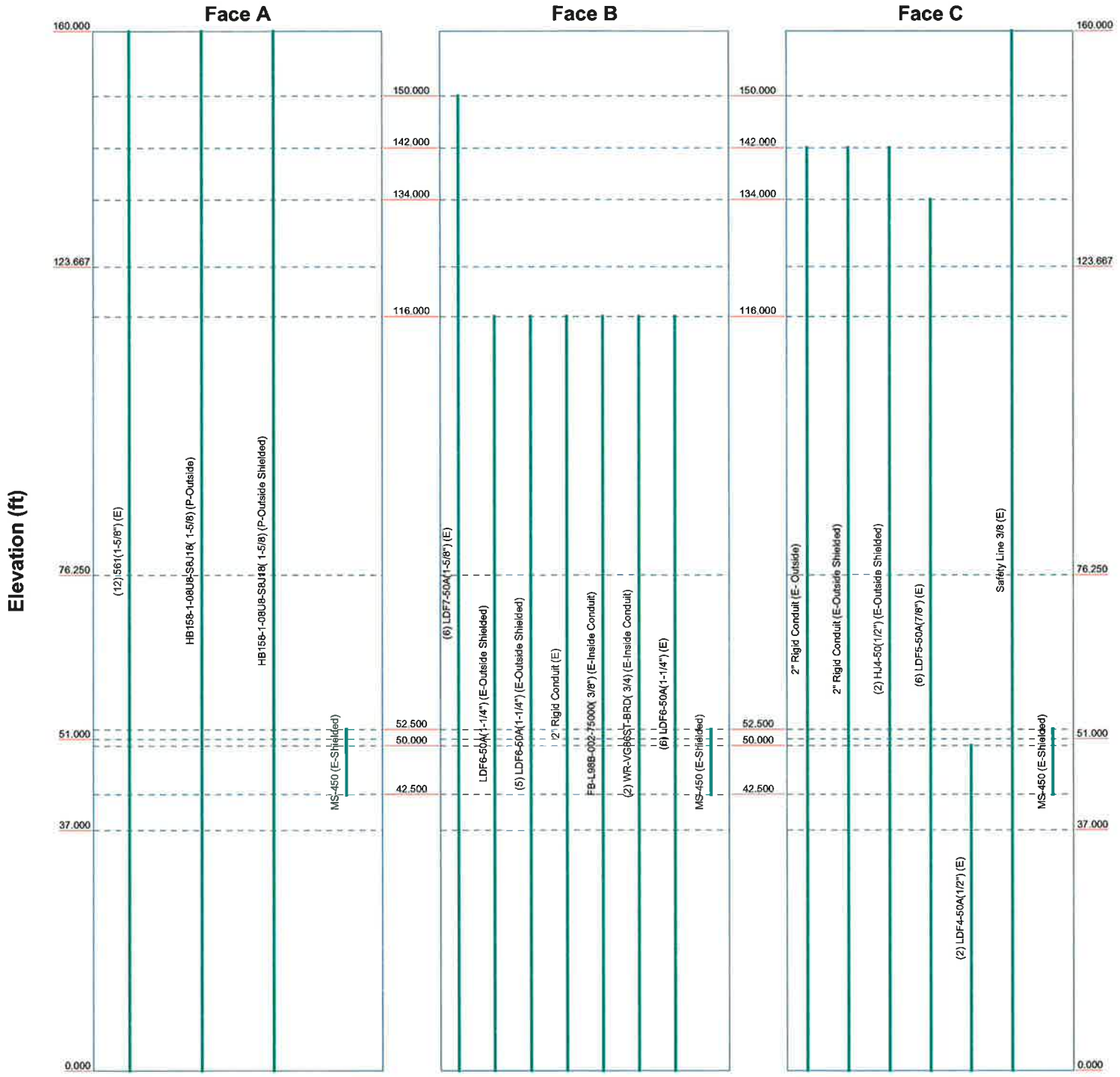
Phone: (918) 587-4630
FAX: (918) 295-0265

Job: 81363.006.01 - HRT 082 943274, CT (BU# 80638			
Project:			
Client: Crown Castle	Drawn by: VenuAmbati	App'd:	
Code: TIA/EIA-222-F	Date: 09/18/14	Scale: NTS	
Path:		Dwg No. E-5	

Feed Line Distribution Chart
0' - 160'

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



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Phone: (918) 587-4630
FAX: (918) 295-0265

Job: 81363.006.01 - HRT 082 943274, CT (BU# 80638			
Project:			
Client: Crown Castle	Drawn by: VenuAmbati	App'd:	
Code: TIA/EIA-222-F	Date: 09/18/14	Scale: NTS	
Path:		Dwg No. E-7	

tnxTower	Job	Page
B+T Group 1717 S. Boulder, Suite 300 Tulsa, OK 74119 Phone: (918) 587-4630 FAX: (918) 295-0265	81363.006.01 - HRT 082 943274, CT (BU# 806382)	1 of 18
	Project	Date 14:13:12 09/18/14
	Client Crown Castle	Designed by VenuAmbati

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 Middlesex County, Connecticut.
Basic wind speed of 85 mph.
Nominal ice thickness of 0.750 in.
Ice thickness is considered to increase with height.
Ice density of 56.000 pcf.
A wind speed of 38 mph is used in combination with ice.
Temperature drop of 50.000 °F.
Deflections calculated using a wind speed of 50 mph.
Tower Rating: 99.3%.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	*Elevation* *ft*	*Section Length* *ft*	*Splice Length* *ft*	*Number of Sides*	*Top Diameter* *in*	*Bottom Diameter* *in*	*Wall Thickness* *in*	*Bend Radius* *in*	*Pole Grade*
L1	160.000-123.667	36.333	4.333	12	18.870	29.050	0.188	0.750	A572-65 (65 ksi)
L2	123.667-76.250	51.750	5.750	12	27.461	41.950	0.313	1.250	A572-65 (65 ksi)
L3	76.250-51.000	31.000	0.000	12	39.715	48.398	0.344	1.375	A572-65 (65 ksi)
L4	51.000-37.000	14.000	7.000	12	48.398	52.320	0.433	1.731	46.34673ksi (46 ksi)

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
L5	37.000-0.000	44.000		12	49.672	62.000	0.406	1.625	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	19.536	11.280	502.514	6.688	9.775	51.410	1018.229	5.551	4.555	24.292
	30.075	17.426	1852.870	10.333	15.048	123.131	3754.417	8.576	7.283	38.842
L2	29.686	27.318	2569.965	9.719	14.225	180.668	5207.445	13.445	6.522	20.871
	43.430	41.898	9271.410	14.906	21.730	426.662	18786.390	20.621	10.405	33.296
L3	42.784	43.579	8622.350	14.095	20.572	419.122	17471.219	21.448	9.722	28.283
	50.106	53.191	15678.080	17.204	25.070	625.362	31768.040	26.179	12.050	35.053
L4	50.106	66.843	19629.140	17.172	25.070	782.960	39773.960	32.898	11.811	27.291
	54.166	72.308	24847.930	18.576	27.102	916.838	50348.643	35.588	12.862	29.719
L5	53.454	64.445	19964.737	17.637	25.730	775.933	40453.969	31.718	12.223	30.088
	64.187	80.572	39016.215	22.051	32.116	1214.853	79057.429	39.655	15.527	38.221

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 160.000-123.667				1	1	1		
L2 123.667-76.250				1	1	1		
L3 76.250-51.000				1	1	1		
L4 51.000-37.000				1	1	0.987468		
L5 37.000-0.000				1	1	1		

Feed Line/Linear Appurtenances - Entered As Round Or Flat

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

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight klf
561(1-5/8")	A	No	Inside Pole	160.000 - 0.000	12	No Ice	0.000	0.001

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight klf
(E)						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
						2" Ice	0.000	0.001
						4" Ice	0.000	0.001
HB158-1-08U8-S8J18(	A	No	CaAa (Out Of	160.000 - 0.000	1	No Ice	0.198	0.001
1-5/8)			Face)			1/2" Ice	0.298	0.003
(P-Outside)						1" Ice	0.398	0.005
						2" Ice	0.598	0.011
						4" Ice	0.998	0.031
HB158-1-08U8-S8J18(	A	No	Inside Pole	160.000 - 0.000	1	No Ice	0.000	0.001
1-5/8)						1/2" Ice	0.000	0.001
(P-Outside Shielded)						1" Ice	0.000	0.001
						2" Ice	0.000	0.001
						4" Ice	0.000	0.001
$$$								
LDF7-50A(1-5/8")	B	No	Inside Pole	150.000 - 0.000	6	No Ice	0.000	0.001
(E)						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
						2" Ice	0.000	0.001
						4" Ice	0.000	0.001
$$$								
2" Rigid Conduit	C	No	CaAa (Out Of	142.000 - 0.000	1	No Ice	0.200	0.003
(E- Outside)			Face)			1/2" Ice	0.300	0.004
						1" Ice	0.400	0.006
						2" Ice	0.600	0.013
						4" Ice	1.000	0.032
2" Rigid Conduit	C	No	Inside Pole	142.000 - 0.000	1	No Ice	0.000	0.003
(E-Outside Shielded)						1/2" Ice	0.000	0.003
						1" Ice	0.000	0.003
						2" Ice	0.000	0.003
						4" Ice	0.000	0.003
HJ4-50(1/2")	C	No	Inside Pole	142.000 - 0.000	2	No Ice	0.000	0.000
(E-Outside Shielded)						1/2" Ice	0.000	0.000
						1" Ice	0.000	0.000
						2" Ice	0.000	0.000
						4" Ice	0.000	0.000
$$$								
LDF5-50A(7/8")	C	No	Inside Pole	134.000 - 0.000	6	No Ice	0.000	0.000
(E)						1/2" Ice	0.000	0.000
						1" Ice	0.000	0.000
						2" Ice	0.000	0.000
						4" Ice	0.000	0.000
$$$								
$$$								
LDF6-50A(1-1/4")	B	No	CaAa (Out Of	116.000 - 0.000	1	No Ice	0.000	0.001
(E-Outside Shielded)			Face)			1/2" Ice	0.000	0.002
						1" Ice	0.000	0.004
						2" Ice	0.000	0.009
						4" Ice	0.000	0.028
LDF6-50A(1-1/4")	B	No	CaAa (Out Of	116.000 - 0.000	5	No Ice	0.000	0.001
(E-Outside Shielded)			Face)			1/2" Ice	0.000	0.002
						1" Ice	0.000	0.004
						2" Ice	0.000	0.009
						4" Ice	0.000	0.028
2" Rigid Conduit	B	No	Inside Pole	116.000 - 0.000	1	No Ice	0.000	0.003
(E)						1/2" Ice	0.000	0.003
						1" Ice	0.000	0.003
						2" Ice	0.000	0.003
						4" Ice	0.000	0.003
FB-L98B-002-75000(	B	No	Inside Pole	116.000 - 0.000	1	No Ice	0.000	0.000
3/8")						1/2" Ice	0.000	0.000

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight klf
(E-Inside Conduit)						1" Ice	0.000	0.000
						2" Ice	0.000	0.000
						4" Ice	0.000	0.000
WR-VG86ST-BRD(3/4)	B	No	Inside Pole	116.000 - 0.000	2	No Ice	0.000	0.001
(E-Inside Conduit)						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
						2" Ice	0.000	0.001
						4" Ice	0.000	0.001
LDF6-50A(1-1/4")	B	No	Inside Pole	116.000 - 0.000	6	No Ice	0.000	0.001
(E)						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
						2" Ice	0.000	0.001
						4" Ice	0.000	0.001
$$$								
LDF4-50A(1/2")	C	No	Inside Pole	50.000 - 0.000	2	No Ice	0.000	0.000
(E)						1/2" Ice	0.000	0.000
						1" Ice	0.000	0.000
						2" Ice	0.000	0.000
						4" Ice	0.000	0.000
$$$								
Safety Line 3/8	C	No	CaAa (Out Of	160.000 - 0.000	1	No Ice	0.037	0.000
(E)			Face)			1/2" Ice	0.137	0.001
						1" Ice	0.238	0.001
						2" Ice	0.437	0.002
						4" Ice	0.838	0.004
$$$								
MS-450	A	No	CaAa (Out Of	52.500 - 42.500	1	No Ice	0.000	0.000
(E-Shielded)			Face)			1/2" Ice	0.000	0.000
						1" Ice	0.000	0.000
						2" Ice	0.000	0.000
						4" Ice	0.000	0.000
MS-450	B	No	CaAa (Out Of	52.500 - 42.500	1	No Ice	0.000	0.000
(E-Shielded)			Face)			1/2" Ice	0.000	0.000
						1" Ice	0.000	0.000
						2" Ice	0.000	0.000
						4" Ice	0.000	0.000
MS-450	C	No	CaAa (Out Of	52.500 - 42.500	1	No Ice	0.000	0.000
(E-Shielded)			Face)			1/2" Ice	0.000	0.000
						1" Ice	0.000	0.000
						2" Ice	0.000	0.000
						4" Ice	0.000	0.000
$$$								

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	160.000-123.667	A	0.000	0.000	0.000	7.194	0.683
		B	0.000	0.000	0.000	0.000	0.130
		C	0.000	0.000	0.000	5.029	0.140
L2	123.667-76.250	A	0.000	0.000	0.000	9.389	0.891
		B	0.000	0.000	0.000	0.000	0.709
		C	0.000	0.000	0.000	11.262	0.394
L3	76.250-51.000	A	0.000	0.000	0.000	5.000	0.475
		B	0.000	0.000	0.000	0.000	0.426
		C	0.000	0.000	0.000	5.997	0.210
L4	51.000-37.000	A	0.000	0.000	0.000	2.772	0.263

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
		B	0.000	0.000	0.000	0.000	0.236
		C	0.000	0.000	0.000	3.325	0.120
L5	37.000-0.000	A	0.000	0.000	0.000	7.326	0.696
		B	0.000	0.000	0.000	0.000	0.625
		C	0.000	0.000	0.000	8.788	0.318

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	160.000-123.667	A	0.893	0.000	0.000	0.000	13.680	0.799
		B		0.000	0.000	0.000	0.000	0.130
		C		0.000	0.000	0.000	14.788	0.233
L2	123.667-76.250	A	0.856	0.000	0.000	0.000	17.853	1.042
		B		0.000	0.000	0.000	0.000	1.356
		C		0.000	0.000	0.000	28.191	0.590
L3	76.250-51.000	A	0.811	0.000	0.000	0.000	9.320	0.551
		B		0.000	0.000	0.000	0.000	0.817
		C		0.000	0.000	0.000	14.638	0.309
L4	51.000-37.000	A	0.776	0.000	0.000	0.000	4.945	0.301
		B		0.000	0.000	0.000	0.000	0.428
		C		0.000	0.000	0.000	7.671	0.170
L5	37.000-0.000	A	0.750	0.000	0.000	0.000	13.070	0.795
		B		0.000	0.000	0.000	0.000	1.131
		C		0.000	0.000	0.000	20.275	0.449

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	160.000-123.667	-0.166	-0.159	-0.378	-0.167
L2	123.667-76.250	-0.269	-0.104	-0.559	-0.086
L3	76.250-51.000	-0.276	-0.106	-0.583	-0.092
L4	51.000-37.000	-0.280	-0.108	-0.571	-0.095
L5	37.000-0.000	-0.283	-0.109	-0.585	-0.098

Discrete Tower Loads

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
(2) DB846H80E-SX w/ Mount Pipe	A	From Leg	4.000 0.000	0.000	160.000	No Ice 1/2" Ice	5.331 5.888	7.735 8.930	0.041 0.099

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(E)			0.000			1" Ice	6.412	9.843	0.165
						2" Ice	7.481	11.711	0.323
						4" Ice	9.828	15.894	0.782
(2) DB846H80E-SX w/ Mount Pipe	B	From Leg	4.000	0.000	160.000	No Ice	5.331	7.735	0.041
			0.000			1/2" Ice	5.888	8.930	0.099
(E)			0.000			1" Ice	6.412	9.843	0.165
						2" Ice	7.481	11.711	0.323
						4" Ice	9.828	15.894	0.782
(2) DB846F65ZAXY w/ Mount Pipe	C	From Leg	4.000	0.000	160.000	No Ice	7.271	7.821	0.047
			0.000			1/2" Ice	7.877	9.010	0.114
(E)			0.000			1" Ice	8.484	9.912	0.189
						2" Ice	9.724	11.812	0.367
						4" Ice	12.325	15.978	0.867
(2) FD9R6004/2C-3L	A	From Leg	4.000	0.000	160.000	No Ice	0.367	0.085	0.003
(E)			0.000			1/2" Ice	0.451	0.136	0.005
			0.000			1" Ice	0.543	0.196	0.009
						2" Ice	0.755	0.343	0.020
						4" Ice	1.281	0.740	0.063
(2) FD9R6004/2C-3L	B	From Leg	4.000	0.000	160.000	No Ice	0.367	0.085	0.003
(E)			0.000			1/2" Ice	0.451	0.136	0.005
			0.000			1" Ice	0.543	0.196	0.009
						2" Ice	0.755	0.343	0.020
						4" Ice	1.281	0.740	0.063
(2) FD9R6004/2C-3L	C	From Leg	4.000	0.000	160.000	No Ice	0.367	0.085	0.003
(E)			0.000			1/2" Ice	0.451	0.136	0.005
			0.000			1" Ice	0.543	0.196	0.009
						2" Ice	0.755	0.343	0.020
						4" Ice	1.281	0.740	0.063
BXA-70063/6CF w/ Mount Pipe	A	From Leg	4.000	0.000	160.000	No Ice	7.979	5.695	0.040
			0.000			1/2" Ice	8.621	6.849	0.100
(P)			0.000			1" Ice	9.228	7.715	0.168
						2" Ice	10.473	9.497	0.331
						4" Ice	13.082	13.262	0.798
BXA-70063/6CF w/ Mount Pipe	B	From Leg	4.000	0.000	160.000	No Ice	7.979	5.695	0.040
			0.000			1/2" Ice	8.621	6.849	0.100
(P)			0.000			1" Ice	9.228	7.715	0.168
						2" Ice	10.473	9.497	0.331
						4" Ice	13.082	13.262	0.798
BXA-70063/6CF w/ Mount Pipe	C	From Leg	4.000	0.000	160.000	No Ice	7.979	5.695	0.040
			0.000			1/2" Ice	8.621	6.849	0.100
(P)			0.000			1" Ice	9.228	7.715	0.168
						2" Ice	10.473	9.497	0.331
						4" Ice	13.082	13.262	0.798
(2) HBXX-6517DS-A2M w/ Mount Pipe	A	From Leg	4.000	0.000	160.000	No Ice	8.976	6.963	0.067
			0.000			1/2" Ice	9.647	8.182	0.137
(P)			0.000			1" Ice	10.291	9.144	0.215
						2" Ice	11.595	11.022	0.398
						4" Ice	14.321	15.027	0.914
(2) HBXX-6517DS-A2M w/ Mount Pipe	B	From Leg	4.000	0.000	160.000	No Ice	8.976	6.963	0.067
			0.000			1/2" Ice	9.647	8.182	0.137
(P)			0.000			1" Ice	10.291	9.144	0.215
						2" Ice	11.595	11.022	0.398
						4" Ice	14.321	15.027	0.914
(2) HBXX-6517DS-A2M w/ Mount Pipe	C	From Leg	4.000	0.000	160.000	No Ice	8.976	6.963	0.067
			0.000			1/2" Ice	9.647	8.182	0.137
(P)			0.000			1" Ice	10.291	9.144	0.215
						2" Ice	11.595	11.022	0.398

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						4" Ice	14.321	15.027	0.914
RRH2x40-AWS	A	From Leg	4.000	0.000	160.000	No Ice	2.522	1.589	0.044
(P)			0.000			1/2" Ice	2.753	1.795	0.061
			0.000			1" Ice	2.993	2.010	0.082
						2" Ice	3.499	2.465	0.132
						4" Ice	4.615	3.479	0.275
RRH2x40-AWS	B	From Leg	4.000	0.000	160.000	No Ice	2.522	1.589	0.044
(P)			0.000			1/2" Ice	2.753	1.795	0.061
			0.000			1" Ice	2.993	2.010	0.082
						2" Ice	3.499	2.465	0.132
						4" Ice	4.615	3.479	0.275
RRH2x40-AWS	C	From Leg	4.000	0.000	160.000	No Ice	2.522	1.589	0.044
(P)			0.000			1/2" Ice	2.753	1.795	0.061
			0.000			1" Ice	2.993	2.010	0.082
						2" Ice	3.499	2.465	0.132
						4" Ice	4.615	3.479	0.275
DB-T1-6Z-8AB-0Z	B	From Leg	4.000	0.000	160.000	No Ice	5.600	2.333	0.044
(P)			0.000			1/2" Ice	5.915	2.558	0.080
			0.000			1" Ice	6.240	2.791	0.120
						2" Ice	6.914	3.284	0.213
						4" Ice	8.365	4.373	0.455
Platform Mount [LP 602-1]	C	None		0.000	160.000	No Ice	32.030	32.030	1.343
(E)						1/2" Ice	38.710	38.710	1.800
						1" Ice	45.390	45.390	2.257
						2" Ice	58.750	58.750	3.170
						4" Ice	85.470	85.470	4.998
$$$									
(2) DB980H90E-M w/ Mount Pipe	A	From Leg	4.000	0.000	150.000	No Ice	4.036	3.619	0.030
(E)			0.000			1/2" Ice	4.499	4.481	0.066
			2.000			1" Ice	4.947	5.219	0.109
						2" Ice	5.870	6.744	0.216
						4" Ice	8.046	9.995	0.549
(2) DB980H90E-M w/ Mount Pipe	B	From Leg	4.000	0.000	150.000	No Ice	4.036	3.619	0.030
(E)			0.000			1/2" Ice	4.499	4.481	0.066
			2.000			1" Ice	4.947	5.219	0.109
						2" Ice	5.870	6.744	0.216
						4" Ice	8.046	9.995	0.549
(2) DB980H90E-M w/ Mount Pipe	C	From Leg	4.000	0.000	150.000	No Ice	4.036	3.619	0.030
(E)			0.000			1/2" Ice	4.499	4.481	0.066
			2.000			1" Ice	4.947	5.219	0.109
						2" Ice	5.870	6.744	0.216
						4" Ice	8.046	9.995	0.549
(2) 6' x 2" Mount Pipe	A	From Leg	4.000	0.000	150.000	No Ice	1.425	1.425	0.022
(E)			0.000			1/2" Ice	1.925	1.925	0.033
			0.000			1" Ice	2.294	2.294	0.048
						2" Ice	3.060	3.060	0.090
						4" Ice	4.702	4.702	0.231
(2) 6' x 2" Mount Pipe	B	From Leg	4.000	0.000	150.000	No Ice	1.425	1.425	0.022
(E)			0.000			1/2" Ice	1.925	1.925	0.033
			0.000			1" Ice	2.294	2.294	0.048
						2" Ice	3.060	3.060	0.090
						4" Ice	4.702	4.702	0.231
(2) 6' x 2" Mount Pipe	C	From Leg	4.000	0.000	150.000	No Ice	1.425	1.425	0.022
(E)			0.000			1/2" Ice	1.925	1.925	0.033
			0.000			1" Ice	2.294	2.294	0.048
						2" Ice	3.060	3.060	0.090
						4" Ice	4.702	4.702	0.231

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
Platform Mount [LP 602-1]	C	None		0.000	150.000	No Ice	32.030	32.030	1.343
(E)						1/2" Ice	38.710	38.710	1.800
						1" Ice	45.390	45.390	2.257
						2" Ice	58.750	58.750	3.170
						4" Ice	85.470	85.470	4.998
$$$									
(2) 6' x 2" Mount Pipe	A	From Leg	1.000	0.000	142.000	No Ice	1.425	1.425	0.022
(E)			0.000			1/2" Ice	1.925	1.925	0.033
			0.000			1" Ice	2.294	2.294	0.048
						2" Ice	3.060	3.060	0.090
						4" Ice	4.702	4.702	0.231
(2) 6' x 2" Mount Pipe	B	From Leg	1.000	0.000	142.000	No Ice	1.425	1.425	0.022
(E)			0.000			1/2" Ice	1.925	1.925	0.033
			0.000			1" Ice	2.294	2.294	0.048
						2" Ice	3.060	3.060	0.090
						4" Ice	4.702	4.702	0.231
(2) 6' x 2" Mount Pipe	C	From Leg	1.000	0.000	142.000	No Ice	1.425	1.425	0.022
(E)			0.000			1/2" Ice	1.925	1.925	0.033
			0.000			1" Ice	2.294	2.294	0.048
						2" Ice	3.060	3.060	0.090
						4" Ice	4.702	4.702	0.231
Side Arm Mount [SO 101-3]	C	None		0.000	142.000	No Ice	7.500	7.500	0.252
(E)						1/2" Ice	8.900	8.900	0.333
						1" Ice	10.300	10.300	0.414
						2" Ice	13.100	13.100	0.576
						4" Ice	18.700	18.700	0.900
$$$									
RR90-17-00DP w/ Mount Pipe	A	From Leg	4.000	0.000	134.000	No Ice	4.593	3.319	0.034
			0.000			1/2" Ice	5.088	4.089	0.072
(E)			3.000			1" Ice	5.578	4.784	0.115
						2" Ice	6.588	6.225	0.224
						4" Ice	8.731	9.308	0.557
RR90-17-00DP w/ Mount Pipe	B	From Leg	4.000	0.000	134.000	No Ice	4.593	3.319	0.034
			0.000			1/2" Ice	5.088	4.089	0.072
(E)			3.000			1" Ice	5.578	4.784	0.115
						2" Ice	6.588	6.225	0.224
						4" Ice	8.731	9.308	0.557
RR90-17-00DP w/ Mount Pipe	C	From Leg	4.000	0.000	134.000	No Ice	4.593	3.319	0.034
			0.000			1/2" Ice	5.088	4.089	0.072
(E)			3.000			1" Ice	5.578	4.784	0.115
						2" Ice	6.588	6.225	0.224
						4" Ice	8.731	9.308	0.557
(2) KRY 112 71/1	A	From Leg	4.000	0.000	134.000	No Ice	0.681	0.450	0.013
(E)			0.000			1/2" Ice	0.802	0.559	0.018
			3.000			1" Ice	0.932	0.677	0.025
						2" Ice	1.219	0.939	0.044
						4" Ice	1.896	1.566	0.111
(2) KRY 112 71/1	B	From Leg	4.000	0.000	134.000	No Ice	0.681	0.450	0.013
(E)			0.000			1/2" Ice	0.802	0.559	0.018
			3.000			1" Ice	0.932	0.677	0.025
						2" Ice	1.219	0.939	0.044
						4" Ice	1.896	1.566	0.111
(2) KRY 112 71/1	C	From Leg	4.000	0.000	134.000	No Ice	0.681	0.450	0.013
(E)			0.000			1/2" Ice	0.802	0.559	0.018
			3.000			1" Ice	0.932	0.677	0.025
						2" Ice	1.219	0.939	0.044
						4" Ice	1.896	1.566	0.111

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
Curved Mount[CO401-3]	C	None		0.000	134.000	No Ice	12.000	12.000	0.754
(E)						1/2" Ice	15.000	14.000	1.005
						1" Ice	18.000	16.000	1.256
						2" Ice	24.000	20.000	1.758
						4" Ice	36.000	28.000	2.762
$$$									
$$$									
(2) 7770.00 w/ Mount Pipe	A	From Leg	4.000	0.000	116.000	No Ice	6.119	4.254	0.055
(E)			0.000			1/2" Ice	6.626	5.014	0.103
			4.000			1" Ice	7.128	5.711	0.157
						2" Ice	8.164	7.155	0.287
						4" Ice	10.360	10.412	0.665
(2) 7770.00 w/ Mount Pipe	B	From Leg	4.000	0.000	116.000	No Ice	6.119	4.254	0.055
(E)			0.000			1/2" Ice	6.626	5.014	0.103
			4.000			1" Ice	7.128	5.711	0.157
						2" Ice	8.164	7.155	0.287
						4" Ice	10.360	10.412	0.665
(2) 7770.00 w/ Mount Pipe	C	From Leg	4.000	0.000	116.000	No Ice	6.119	4.254	0.055
(E)			0.000			1/2" Ice	6.626	5.014	0.103
			4.000			1" Ice	7.128	5.711	0.157
						2" Ice	8.164	7.155	0.287
						4" Ice	10.360	10.412	0.665
AM-X-CD-16-65-00T-RET	A	From Leg	4.000	0.000	116.000	No Ice	8.498	6.304	0.074
w/ Mount Pipe			0.000			1/2" Ice	9.149	7.479	0.139
(E)			4.000			1" Ice	9.767	8.368	0.212
						2" Ice	11.031	10.179	0.385
						4" Ice	13.679	14.024	0.874
AM-X-CD-16-65-00T-RET	B	From Leg	4.000	0.000	116.000	No Ice	8.498	6.304	0.074
w/ Mount Pipe			0.000			1/2" Ice	9.149	7.479	0.139
(E)			4.000			1" Ice	9.767	8.368	0.212
						2" Ice	11.031	10.179	0.385
						4" Ice	13.679	14.024	0.874
AM-X-CD-16-65-00T-RET	C	From Leg	4.000	0.000	116.000	No Ice	8.498	6.304	0.074
w/ Mount Pipe			0.000			1/2" Ice	9.149	7.479	0.139
(E)			4.000			1" Ice	9.767	8.368	0.212
						2" Ice	11.031	10.179	0.385
						4" Ice	13.679	14.024	0.874
(2) LGP21401	A	From Leg	4.000	0.000	116.000	No Ice	1.288	0.233	0.014
(E)			0.000			1/2" Ice	1.445	0.313	0.021
			4.000			1" Ice	1.611	0.403	0.030
						2" Ice	1.969	0.608	0.055
						4" Ice	2.788	1.121	0.135
(2) LGP21401	B	From Leg	4.000	0.000	116.000	No Ice	1.288	0.233	0.014
(E)			0.000			1/2" Ice	1.445	0.313	0.021
			4.000			1" Ice	1.611	0.403	0.030
						2" Ice	1.969	0.608	0.055
						4" Ice	2.788	1.121	0.135
(2) LGP21401	C	From Leg	4.000	0.000	116.000	No Ice	1.288	0.233	0.014
(E)			0.000			1/2" Ice	1.445	0.313	0.021
			4.000			1" Ice	1.611	0.403	0.030
						2" Ice	1.969	0.608	0.055
						4" Ice	2.788	1.121	0.135
RRUS-11	A	From Leg	4.000	0.000	116.000	No Ice	3.249	1.373	0.048
(E)			0.000			1/2" Ice	3.491	1.551	0.068
			4.000			1" Ice	3.741	1.738	0.092
						2" Ice	4.268	2.138	0.150
						4" Ice	5.426	3.042	0.310

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
RRUS-11	B	From Leg	4.000	0.000	116.000	No Ice	3.249	1.373	0.048
(E)			0.000			1/2" Ice	3.491	1.551	0.068
			4.000			1" Ice	3.741	1.738	0.092
						2" Ice	4.268	2.138	0.150
						4" Ice	5.426	3.042	0.310
RRUS-11	C	From Leg	4.000	0.000	116.000	No Ice	3.249	1.373	0.048
(E)			0.000			1/2" Ice	3.491	1.551	0.068
			4.000			1" Ice	3.741	1.738	0.092
						2" Ice	4.268	2.138	0.150
						4" Ice	5.426	3.042	0.310
(2) LGP21901	A	From Leg	4.000	0.000	116.000	No Ice	0.270	0.184	0.006
(E)			0.000			1/2" Ice	0.343	0.248	0.008
			4.000			1" Ice	0.425	0.322	0.011
						2" Ice	0.616	0.494	0.022
						4" Ice	1.101	0.943	0.066
(2) LGP21901	B	From Leg	4.000	0.000	116.000	No Ice	0.270	0.184	0.006
(E)			0.000			1/2" Ice	0.343	0.248	0.008
			4.000			1" Ice	0.425	0.322	0.011
						2" Ice	0.616	0.494	0.022
						4" Ice	1.101	0.943	0.066
(2) LGP21901	C	From Leg	4.000	0.000	116.000	No Ice	0.270	0.184	0.006
(E)			0.000			1/2" Ice	0.343	0.248	0.008
			4.000			1" Ice	0.425	0.322	0.011
						2" Ice	0.616	0.494	0.022
						4" Ice	1.101	0.943	0.066
DC6-48-60-18-8F	C	From Leg	4.000	0.000	116.000	No Ice	1.266	1.266	0.020
(E)			0.000			1/2" Ice	1.456	1.456	0.035
			4.000			1" Ice	1.658	1.658	0.053
						2" Ice	2.093	2.093	0.095
						4" Ice	3.098	3.098	0.215
2' x 2" Pipe Mount	A	From Leg	4.000	0.000	116.000	No Ice	0.026	0.026	0.007
(E-For TMA)			0.000			1/2" Ice	0.056	0.056	0.008
			0.000			1" Ice	0.097	0.097	0.009
						2" Ice	0.212	0.212	0.013
						4" Ice	0.576	0.576	0.034
2' x 2" Pipe Mount	B	From Leg	4.000	0.000	116.000	No Ice	0.026	0.026	0.007
(E-For TMA)			0.000			1/2" Ice	0.056	0.056	0.008
			0.000			1" Ice	0.097	0.097	0.009
						2" Ice	0.212	0.212	0.013
						4" Ice	0.576	0.576	0.034
2' x 2" Pipe Mount	C	From Leg	4.000	0.000	116.000	No Ice	0.026	0.026	0.007
(E-For TMA)			0.000			1/2" Ice	0.056	0.056	0.008
			0.000			1" Ice	0.097	0.097	0.009
						2" Ice	0.212	0.212	0.013
						4" Ice	0.576	0.576	0.034
Platform Mount [LP 303-1]	C	None		0.000	116.000	No Ice	14.660	14.660	1.250
(E)						1/2" Ice	18.870	18.870	1.481
						1" Ice	23.080	23.080	1.713
						2" Ice	31.500	31.500	2.175
						4" Ice	48.340	48.340	3.101
$$$									
GPS	A	From Leg	2.000	0.000	50.000	No Ice	0.175	0.175	0.000
(E)			0.000			1/2" Ice	0.238	0.238	0.002
			0.000			1" Ice	0.309	0.309	0.005
						2" Ice	0.477	0.477	0.014
						4" Ice	0.918	0.918	0.053
GPS	B	From Leg	2.000	0.000	50.000	No Ice	0.175	0.175	0.000

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(E)			0.000			1/2" Ice	0.238	0.238	0.002
			0.000			1" Ice	0.309	0.309	0.005
						2" Ice	0.477	0.477	0.014
						4" Ice	0.918	0.918	0.053
Side Arm Mount [SO 701-1]	A	From Leg	1.000	0.000	50.000	No Ice	0.850	1.670	0.065
(E)			0.000			1/2" Ice	1.140	2.340	0.079
			0.000			1" Ice	1.430	3.010	0.093
						2" Ice	2.010	4.350	0.121
						4" Ice	3.170	7.030	0.177
Side Arm Mount [SO 701-1]	B	From Leg	1.000	0.000	50.000	No Ice	0.850	1.670	0.065
(E)			0.000			1/2" Ice	1.140	2.340	0.079
			0.000			1" Ice	1.430	3.010	0.093
						2" Ice	2.010	4.350	0.121
						4" Ice	3.170	7.030	0.177
$$$									
Side Arm Mount [SO 701-1]	A	From Leg	1.000	0.000	45.000	No Ice	0.850	1.670	0.065
(E)			0.000			1/2" Ice	1.140	2.340	0.079
			0.000			1" Ice	1.430	3.010	0.093
						2" Ice	2.010	4.350	0.121
						4" Ice	3.170	7.030	0.177
Side Arm Mount [SO 701-1]	B	From Leg	1.000	0.000	45.000	No Ice	0.850	1.670	0.065
(E)			0.000			1/2" Ice	1.140	2.340	0.079
			0.000			1" Ice	1.430	3.010	0.093
						2" Ice	2.010	4.350	0.121
						4" Ice	3.170	7.030	0.177
$$$									

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
HP3-11	A	Paraboloid	From	1.000	-42.000		142.000	3.167	No Ice	7.880	0.050
(E)		w/Shroud (HP)	Leg	0.000					1/2" Ice	8.300	0.050
				2.000					1" Ice	8.720	0.063
									2" Ice	9.560	0.103
									4" Ice	11.240	0.274
HP3-11	C	Paraboloid	From	1.000	-50.000		142.000	3.167	No Ice	7.880	0.050
(E)		w/Shroud (HP)	Leg	0.000					1/2" Ice	8.300	0.050
				2.000					1" Ice	8.720	0.063
									2" Ice	9.560	0.103
									4" Ice	11.240	0.274
$$$											

Load Combinations

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	160 - 123.667	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-14.106	-0.052	-0.252
			Max. Mx	5	-6.163	-410.636	-2.567
			Max. My	2	-6.162	1.613	408.245
			Max. Vy	5	17.478	-410.636	-2.567
			Max. Vx	2	-17.504	1.613	408.245
			Max. Torque	4			0.624
L2	123.667 - 76.25	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-27.970	-0.363	-0.850
			Max. Mx	5	-15.809	-1508.105	-10.275
			Max. My	2	-15.808	6.726	1506.833
			Max. Vy	5	28.044	-1508.105	-10.275
			Max. Vx	2	-28.070	6.726	1506.833
			Max. Torque	4			0.745

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L3	76.25 - 51	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-37.578	-0.948	-1.336
			Max. Mx	5	-23.579	-2452.900	-15.471
			Max. My	2	-23.578	10.077	2452.294
			Max. Vy	5	32.899	-2452.900	-15.471
			Max. Vx	2	-32.925	10.077	2452.294
			Max. Torque	4			0.839
L4	51 - 37	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-40.334	-1.561	-1.182
			Max. Mx	5	-25.868	-2687.891	-16.361
			Max. My	2	-25.868	10.403	2687.182
			Max. Vy	5	34.155	-2687.891	-16.361
			Max. Vx	2	-34.153	10.403	2687.182
			Max. Torque	4			0.861
L5	37 - 0	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-58.410	-2.544	-2.011
			Max. Mx	5	-41.152	-4336.989	-22.592
			Max. My	2	-41.152	13.974	4335.900
			Max. Vy	5	40.824	-4336.989	-22.592
			Max. Vx	2	-40.823	13.974	4335.900
			Max. Torque	4			1.003

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	18	58.410	-9.742	-0.026
	Max. H_x	11	41.174	40.756	0.048
	Max. H_z	2	41.174	0.082	40.801
	Max. M_x	2	4335.900	0.082	40.801
	Max. M_z	5	4336.989	-40.802	-0.134
	Max. Torsion	4	1.003	-35.268	20.458
	Min. Vert	1	41.174	0.000	0.000
	Min. H_x	5	41.174	-40.802	-0.134
	Min. H_z	8	41.174	-0.144	-40.775
	Min. M_x	8	-4332.920	-0.144	-40.775
	Min. M_z	11	-4329.398	40.756	0.048
	Min. Torsion	10	-0.817	35.271	-20.372

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	41.174	0.000	0.000	0.417	-0.402	0.000
Dead+Wind 0 deg - No Ice	41.174	-0.082	-40.801	-4335.900	13.974	-0.470
Dead+Wind 30 deg - No Ice	41.174	20.307	-35.393	-3762.513	-2152.820	-0.811
Dead+Wind 60 deg - No Ice	41.174	35.268	-20.458	-2174.300	-3744.836	-1.003
Dead+Wind 90 deg - No Ice	41.174	40.802	0.134	22.592	-4336.989	-0.418
Dead+Wind 120 deg - No Ice	41.174	35.326	20.518	2188.013	-3755.640	0.052
Dead+Wind 150 deg - No Ice	41.174	20.384	35.372	3762.520	-2168.194	0.123
Dead+Wind 180 deg - No Ice	41.174	0.144	40.775	4332.920	-24.037	0.142

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+Wind 210 deg - No Ice	41.174	-20.242	35.306	3750.561	2142.470	0.396
Dead+Wind 240 deg - No Ice	41.174	-35.271	20.372	2162.485	3744.473	0.817
Dead+Wind 270 deg - No Ice	41.174	-40.756	-0.048	-8.908	4329.398	0.435
Dead+Wind 300 deg - No Ice	41.174	-35.222	-20.493	-2183.383	3739.488	-0.042
Dead+Wind 330 deg - No Ice	41.174	-20.323	-35.382	-3763.076	2158.288	-0.319
Dead+Ice+Temp	58.410	0.000	0.000	2.011	-2.544	-0.000
Dead+Wind 0 deg+Ice+Temp	58.410	-0.014	-9.740	-1078.473	0.342	-0.193
Dead+Wind 30 deg+Ice+Temp	58.410	4.854	-8.449	-935.450	-539.617	-0.256
Dead+Wind 60 deg+Ice+Temp	58.410	8.424	-4.885	-539.777	-936.116	-0.266
Dead+Wind 90 deg+Ice+Temp	58.410	9.742	0.026	6.775	-1083.250	-0.094
Dead+Wind 120 deg+Ice+Temp	58.410	8.433	4.892	546.493	-938.309	0.055
Dead+Wind 150 deg+Ice+Temp	58.410	4.865	8.441	939.298	-542.670	0.104
Dead+Wind 180 deg+Ice+Temp	58.410	0.028	9.734	1081.842	-7.615	0.122
Dead+Wind 210 deg+Ice+Temp	58.410	-4.840	8.430	936.848	532.276	0.166
Dead+Wind 240 deg+Ice+Temp	58.410	-8.425	4.867	541.212	930.963	0.225
Dead+Wind 270 deg+Ice+Temp	58.410	-9.732	-0.007	0.244	1076.513	0.097
Dead+Wind 300 deg+Ice+Temp	58.410	-8.411	-4.887	-541.450	929.694	-0.053
Dead+Wind 330 deg+Ice+Temp	58.410	-4.852	-8.443	-935.394	535.430	-0.147
Dead+Wind 0 deg - Service	41.174	-0.028	-14.118	-1501.952	4.578	-0.164
Dead+Wind 30 deg - Service	41.174	7.027	-12.247	-1303.293	-746.139	-0.283
Dead+Wind 60 deg - Service	41.174	12.203	-7.079	-753.034	-1297.714	-0.350
Dead+Wind 90 deg - Service	41.174	14.118	0.046	8.111	-1502.885	-0.146
Dead+Wind 120 deg - Service	41.174	12.223	7.100	758.359	-1301.474	0.019
Dead+Wind 150 deg - Service	41.174	7.053	12.239	1303.867	-751.472	0.043
Dead+Wind 180 deg - Service	41.174	0.050	14.109	1501.480	-8.595	0.050
Dead+Wind 210 deg - Service	41.174	-7.004	12.217	1299.701	742.015	0.138
Dead+Wind 240 deg - Service	41.174	-12.204	7.049	749.499	1297.054	0.285
Dead+Wind 270 deg - Service	41.174	-14.102	-0.016	-2.806	1499.716	0.151
Dead+Wind 300 deg - Service	41.174	-12.187	-7.091	-756.182	1295.333	-0.016
Dead+Wind 330 deg - Service	41.174	-7.032	-12.243	-1303.492	747.508	-0.112

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	0.000	-41.174	0.000	0.000	41.174	0.000	0.000%
2	-0.082	-41.174	-40.801	0.082	41.174	40.801	0.000%
3	20.307	-41.174	-35.393	-20.307	41.174	35.393	0.000%
4	35.268	-41.174	-20.458	-35.268	41.174	20.458	0.000%
5	40.802	-41.174	0.134	-40.802	41.174	-0.134	0.000%
6	35.326	-41.174	20.518	-35.326	41.174	-20.518	0.000%
7	20.384	-41.174	35.372	-20.384	41.174	-35.372	0.000%
8	0.144	-41.174	40.775	-0.144	41.174	-40.775	0.000%
9	-20.242	-41.174	35.306	20.242	41.174	-35.306	0.000%
10	-35.271	-41.174	20.372	35.271	41.174	-20.372	0.000%
11	-40.756	-41.174	-0.048	40.756	41.174	0.048	0.000%
12	-35.222	-41.174	-20.493	35.222	41.174	20.493	0.000%
13	-20.323	-41.174	-35.382	20.323	41.174	35.382	0.000%
14	0.000	-58.410	0.000	0.000	58.410	0.000	0.000%
15	-0.014	-58.410	-9.740	0.014	58.410	9.740	0.000%
16	4.854	-58.410	-8.449	-4.854	58.410	8.449	0.000%
17	8.424	-58.410	-4.885	-8.424	58.410	4.885	0.000%
18	9.742	-58.410	0.026	-9.742	58.410	-0.026	0.000%
19	8.433	-58.410	4.892	-8.433	58.410	-4.892	0.000%
20	4.865	-58.410	8.441	-4.865	58.410	-8.441	0.000%
21	0.028	-58.410	9.734	-0.028	58.410	-9.734	0.000%
22	-4.840	-58.410	8.430	4.840	58.410	-8.430	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
23	-8.425	-58.410	4.867	8.425	58.410	-4.867	0.000%
24	-9.732	-58.410	-0.007	9.732	58.410	0.007	0.000%
25	-8.411	-58.410	-4.887	8.411	58.410	4.887	0.000%
26	-4.852	-58.410	-8.443	4.852	58.410	8.443	0.000%
27	-0.028	-41.174	-14.118	0.028	41.174	14.118	0.000%
28	7.027	-41.174	-12.247	-7.027	41.174	12.247	0.000%
29	12.203	-41.174	-7.079	-12.203	41.174	7.079	0.000%
30	14.118	-41.174	0.046	-14.118	41.174	-0.046	0.000%
31	12.223	-41.174	7.100	-12.223	41.174	-7.100	0.000%
32	7.053	-41.174	12.239	-7.053	41.174	-12.239	0.000%
33	0.050	-41.174	14.109	-0.050	41.174	-14.109	0.000%
34	-7.004	-41.174	12.217	7.004	41.174	-12.217	0.000%
35	-12.204	-41.174	7.049	12.204	41.174	-7.049	0.000%
36	-14.102	-41.174	-0.016	14.102	41.174	0.016	0.000%
37	-12.187	-41.174	-7.091	12.187	41.174	7.091	0.000%
38	-7.032	-41.174	-12.243	7.032	41.174	12.243	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	0.00021673
3	Yes	5	0.00000001	0.00022065
4	Yes	5	0.00000001	0.00022716
5	Yes	4	0.00000001	0.00016489
6	Yes	5	0.00000001	0.00022648
7	Yes	5	0.00000001	0.00022396
8	Yes	4	0.00000001	0.00019355
9	Yes	5	0.00000001	0.00022257
10	Yes	5	0.00000001	0.00022082
11	Yes	4	0.00000001	0.00017700
12	Yes	5	0.00000001	0.00022388
13	Yes	5	0.00000001	0.00022503
14	Yes	4	0.00000001	0.00000001
15	Yes	5	0.00000001	0.00020038
16	Yes	5	0.00000001	0.00021955
17	Yes	5	0.00000001	0.00022005
18	Yes	5	0.00000001	0.00020130
19	Yes	5	0.00000001	0.00022170
20	Yes	5	0.00000001	0.00022112
21	Yes	5	0.00000001	0.00020113
22	Yes	5	0.00000001	0.00021919
23	Yes	5	0.00000001	0.00021940
24	Yes	5	0.00000001	0.00020035
25	Yes	5	0.00000001	0.00021931
26	Yes	5	0.00000001	0.00021951
27	Yes	4	0.00000001	0.00008980
28	Yes	4	0.00000001	0.00067706
29	Yes	4	0.00000001	0.00071257
30	Yes	4	0.00000001	0.00008704
31	Yes	4	0.00000001	0.00070933
32	Yes	4	0.00000001	0.00069554
33	Yes	4	0.00000001	0.00008751
34	Yes	4	0.00000001	0.00068746
35	Yes	4	0.00000001	0.00067765

36	Yes	4	0.00000001	0.00008792
37	Yes	4	0.00000001	0.00069317
38	Yes	4	0.00000001	0.00070130

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	160 - 123.667	36.665	31	2.312	0.001
L2	128 - 76.25	22.370	31	1.825	0.001
L3	82 - 51	8.408	31	1.031	0.000
L4	51 - 37	3.114	31	0.570	0.000
L5	44 - 0	2.341	31	0.484	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
160.000	(2) DB846H80E-SX w/ Mount Pipe	31	36.665	2.312	0.002	16825
150.000	(2) DB980H90E-M w/ Mount Pipe	31	31.977	2.165	0.001	8412
144.000	HP3-11	31	29.224	2.075	0.001	5257
142.000	(2) 6' x 2" Mount Pipe	31	28.324	2.045	0.001	4673
134.000	RR90-17-00DP w/ Mount Pipe	31	24.834	1.921	0.001	3234
116.000	(2) 7770.00 w/ Mount Pipe	31	17.915	1.623	0.001	2856
50.000	GPS	31	2.994	0.557	0.000	3774
45.000	Side Arm Mount [SO 701-1]	31	2.442	0.496	0.000	3845

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	160 - 123.667	105.474	6	6.655	0.003
L2	128 - 76.25	64.426	6	5.259	0.003
L3	82 - 51	24.242	6	2.973	0.001
L4	51 - 37	8.982	6	1.644	0.000
L5	44 - 0	6.754	6	1.398	0.000

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
160.000	(2) DB846H80E-SX w/ Mount Pipe	6	105.474	6.655	0.005	5974
150.000	(2) DB980H90E-M w/ Mount Pipe	6	92.018	6.234	0.004	2986

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
144.000	HP3-11	6	84.114	5.977	0.004	1864
142.000	(2) 6' x 2" Mount Pipe	6	81.528	5.890	0.004	1657
134.000	RR90-17-00DP w/ Mount Pipe	6	71.507	5.536	0.004	1145
116.000	(2) 7770.00 w/ Mount Pipe	6	51.618	4.677	0.003	1006
50.000	GPS	6	8.637	1.607	0.001	1312
45.000	Side Arm Mount [SO 701-1]	6	7.045	1.432	0.000	1335

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
L1	160 - 123.667 (1)	TP29.05x18.87x0.188	36.333	0.000	0.0	34.726	16.693	-6.151	579.674	0.011
L2	123.667 - 76.25 (2)	TP41.95x27.461x0.313	51.750	0.000	0.0	37.779	40.278	-15.801	1521.660	0.010
L3	76.25 - 51 (3)	TP48.398x39.715x0.344	31.000	0.000	0.0	35.934	53.191	-23.574	1911.340	0.012
L4	51 - 37 (4)	TP52.32x48.398x0.433	14.000	0.000	0.0	27.808	69.575	-25.865	1934.750	0.013
L5	37 - 0 (5)	H1-3+VT (1.38 CR) - 4 TP62x49.672x0.406	44.000	0.000	0.0	34.071	80.572	-41.152	2745.170	0.015

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	160 - 123.667 (1)	TP29.05x18.87x0.188	411.138	43.677	34.726	1.258	0.000	0.000	34.726	0.000
L2	123.667 - 76.25 (2)	TP41.95x27.461x0.313	1512.408	46.041	37.779	1.219	0.000	0.000	37.779	0.000
L3	76.25 - 51 (3)	TP48.398x39.715x0.344	2459.758	47.200	35.934	1.314	0.000	0.000	35.934	0.000
L4	51 - 37 (4)	TP52.32x48.398x0.433	2695.075	38.112	27.808	1.371	0.000	0.000	27.808	0.000
L5	37 - 0 (5)	TP62x49.672x0.406	4346.517	42.934	34.071	1.260	0.000	0.000	34.071	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	160 - 123.667 (1)	TP29.05x18.87x0.188	17.558	1.052	26.000	0.082	0.060	0.003	26.000	0.000

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 $\frac{f_{vt}}{F_{vt}}$
L2	123.667 - 76.25 (2)	TP41.95x27.461x0.313	28.125	0.698	26.000	0.055	0.338	0.005	26.000	0.000
L3	76.25 - 51 (3)	TP48.398x39.715x0.344	32.979	0.620	26.000	0.048	0.357	0.003	26.000	0.000
L4	51 - 37 (4)	TP52.32x48.398x0.433	34.206	0.492	18.539	0.054	0.024	0.000	18.539	0.000
L5	37 - 0 (5)	TP62x49.672x0.406	40.874	0.507	26.000	0.040	0.052	0.000	26.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	160 - 123.667 (1)	0.011	1.258	0.000	0.082	0.000	1.270 ✔	1.333	H1-3+VT ✔
L2	123.667 - 76.25 (2)	0.010	1.219	0.000	0.055	0.000	1.230 ✔	1.333	H1-3+VT ✔
L3	76.25 - 51 (3)	0.012	1.314	0.000	0.048	0.000	1.326 ✔	1.333	H1-3+VT ✔
L4	51 - 37 (4)	0.013	1.371	0.000	0.054	0.000	**1.385** ✘	1.333	H1-3+VT ✘
L5	37 - 0 (5)	0.015	1.260	0.000	0.040	0.000	1.276 ✔	1.333	H1-3+VT ✔

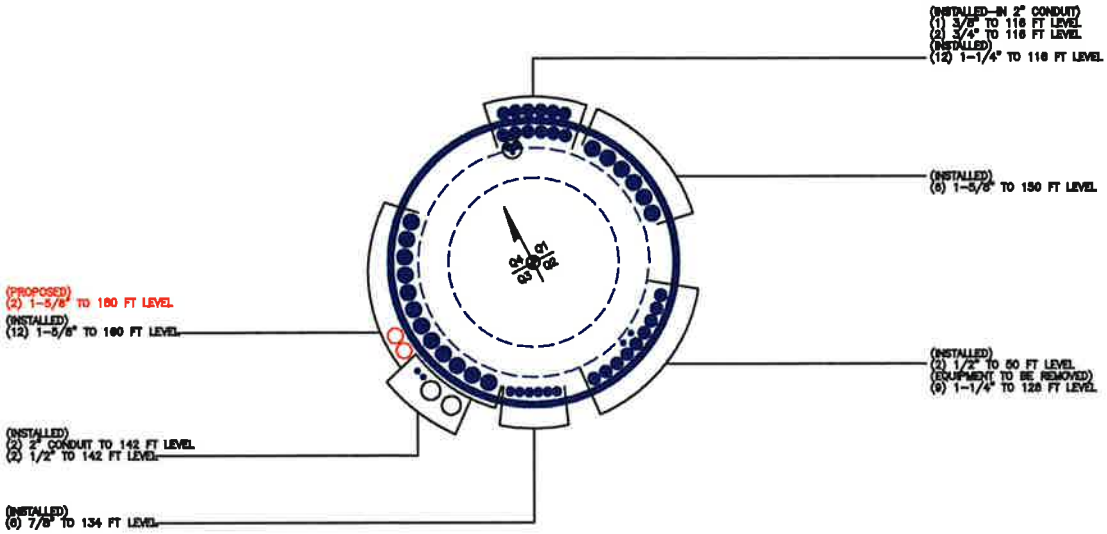
Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	160 - 123.667	Pole	TP29.05x18.87x0.188	1	-6.151	772.705	94.8	Pass
L2	123.667 - 76.25	Pole	TP41.95x27.461x0.313	2	-15.801	2028.373	91.9	Pass
L3	76.25 - 51	Pole	TP48.398x39.715x0.344	3	-23.574	2547.816	99.1	Pass
L4	51 - 37	Pole	TP52.32x48.398x0.433	4	-25.865	2579.022	99.3	Pass
L5	37 - 0	Pole	TP62x49.672x0.406	5	-41.152	3659.311	95.2	Pass
							Summary	
						Pole (L4)	99.3	Pass
						RATING =	**99.3**	Pass

Program Version 6.1.4.1 - 12/17/2013

APPENDIX B

BASE LEVEL DRAWING



BUSINESS UNIT: 806382 TOWER ID: C_BASELEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

Reinforcement 1						
Bottom	Top	QTY	Type	Position	Gap	Ten/Comp
42.5	51	3	MS-450	F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C

Reinforcement 2						
Bottom	Top	QTY	Type	Position	Gap	Ten/Comp
0				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C

Reinforcement 3						
Bottom	Top	QTY	Type	Position	Gap	Ten/Comp
0				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C
				F	0	T&C

	Bottom Elevation	Top Elevation	Original Thickness	Original Yield Stress	Original Ultimate Stress	Reinforced Shaft Capacity	Reinf. 1 QTY	Reinf. 1 Type	Rein. 1 Capacity	Reinf. 2 QTY	Reinf. 2 Type	Rein. 2 Capacity	Reinf. 3 QTY	Reinf. 3 Type	Rein. 3 Capacity	Control Stress Ratio	Top Height	Section Length	Lap Splice	# of Sides	Top Diameter	Bottom Diameter	Equivalent Shaft Thickness	Equivalent Shaft Fy	Equivelent Weight Mult.
1	123.6670	160.0000	0.1875	65	80	94.8%										94.8%	160.0000	36.3330	4.3330	12	18.8700	29.0500	0.1875	65.0	1.00
2	76.2500	128.0000	0.3125	65	80	91.9%										91.9%	128.0000	51.7500	5.7500	12	27.4610	41.9500	0.3125	65.0	1.00
3	51.0000	82.0000	0.3438	65	80	99.1%										99.1%	82.0000	31.0000	0.0000	12	39.7151	48.3985	0.3438	65.0	1.00
4	37.0000	51.0000	0.3438	65	80	79.7%	3	MS-450	99.3%							99.3%	51.0000	14.0000	7.0000	12	48.3985	52.3200	0.4328	46.3	0.99
5	0.0000	44.0000	0.4063	65	80	95.2%										99.2%	44.0000	44.0000	0.0000	12	49.6717	62.0000	0.4063	65.0	1.00
6																									
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	Bottom Elevation Failure	Top Elevation Failure	Section Failure %
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Reinforced Pole Stress
and Effective Thickness Check

AeroSolutions LLC
5541 Flatiron Parkway, Suite 1??
Boulder, CO 80301
720-304-6882

Section	Loads					Pole																
Section	Elevation (ft)	Moment (ft-kip)	Compression (kip)	Shear (kip)	Torsion (kip-ft)	Number of Sides	OD (in)	Thickness (in)	Yield Strength (ksi)	Flat Width (in)	Area (in²)	Moment of Inertia (in⁴)	Percent of Compact Moment of Inertia	Angle Offset to Pole Flat	Distance to Extreme Fiber (in)	Section Modulus (in³)	Torsion Constant (in⁴)	Polygonal Compact Criterion	Allowable Bending Stress (ksi)	Allowable Bending Moment Strength (ft-kip)	Allowable Axial Stress (ksi)	Allowable Shear Stress (ksi)
Section	Elevation	Moment	Compression	Shear	Torsion	PoleSides	PoleOD	PoleT	PoleFy	PoleW	PoleA	PoleI	PolePer	PoleCheck	PoleC	PoleS	PoleJ	PoleWT	PoleFb	PoleMall	PoleFa	PoleFv
1	160	0.5	5.2	1.8	0.1	12	18.8700	0.1875	65	4.29	11.2	502	100%	TRUE	9.73	52	985	196	52.0	223.4	52.0	34.7
2	128	413.1	8.2	17.8	0.1	12	27.8360	0.1875	65	6.96	16.6	1628	100%	TRUE	14.28	121	3189	299	49.3	497.0	52.0	34.7
3	123.667	488.6	6.9	18.2	0.1	12	29.0500	0.5000	65	6.44	45.7	4759	100%	TRUE	14.95	319	9376	106	52.0	1382.1	52.0	34.7
4	82	1512.4	15.8	28.1	0.5	12	40.3421	0.3125	65	9.97	40.2	8234	100%	TRUE	20.43	395	16151	257	50.4	1659.5	52.0	34.7
5	76.25	1679.9	17.8	29.1	0.3	12	41.9500	0.6563	65	9.48	86.8	18848	100%	TRUE	21.60	877	37732	126	52.0	3802.4	52.0	34.7
6	51	2458.8	23.6	33.0	0.4	12	48.2983	0.3438	65	12.05	53.0	15674	100%	TRUE	24.99	627	30103	283	47.9	2503.6	52.0	34.7
7	44	2695.1	23.9	34.2	0.0	12	50.3392	0.3438	65	12.57	55.2	17675	86%	0	25.18	702	34616	295	46.7	2731.9	52.0	34.7
8	42.5	2749.7	26.7	34.5	-0.1	12	50.7794	0.7500	65	11.69	120.3	38518	89%	TRUE	26.15	1473	75645	129	52.0	6380.5	52.0	34.7
9	37	2938.6	29.3	35.4	0.0	12	52.2200	0.7500	65	12.41	124.0	42150	100%	TRUE	26.93	1566	83869	129	52.0	6782.2	52.0	34.7
10	0	4549.5	41.2	40.9	0.1	12	62.0000	0.4063	65	15.32	80.5	59011	100%	TRUE	32.02	1218	79401	308	45.4	4611.3	52.0	34.7

Section	Unreinforced Pole - Rev. F					Reinforced Pole					Rev. F
Section	Bending Stress (ksi)	Axial Stress (ksi)	Shear Stress (ksi)	Torsion Shear Stress (ksi)	Stress Ratio	Moment in Pole when Reinforced	Bending Stress (ksi)	Axial Stress (ksi)	Shear Stress (ksi)	Torsion Shear Stress (ksi)	Reinforced Pole Stress Ratio
Section	PoleFbAct	PoleFaAct	PoleFvAct	PoleFvtAct	PoleSR	PoleMoment	RPoleFbAct	RPoleFaAct	RPoleFvAct	RPoleFvtAct	RPoleSR
1	0.1	0.46	0.00	0.01	0.011	0.5	0.1	0.46	0.00	0.00	0.011
2	43.8	0.37	0.00	0.00	0.868	413.1	43.6	0.37	0.00	0.00	0.868
3	18.4	0.15	0.00	0.00	0.356	488.6	18.4	0.15	0.00	0.00	0.356
4	45.9	0.39	0.00	0.01	0.919	1512.4	45.9	0.39	0.00	0.00	0.919
5	22.9	0.20	0.00	0.00	0.445	1679.9	22.9	0.20	0.00	0.00	0.445
6	47.1	0.44	0.00	0.00	0.991	2458.8	47.1	0.44	0.00	0.00	0.991
7	46.1	0.47	0.00	0.00	0.996	2153.7	36.8	0.47	0.00	0.00	0.797
8	22.4	0.22	0.00	0.00	0.435	2457.3	20.0	0.22	0.00	0.00	0.389
9	22.5	0.24	0.00	0.00	0.438	2938.6	22.5	0.24	0.00	0.00	0.438
10	43.8	0.51	0.00	0.00	0.952	4549.5	43.8	0.51	0.00	0.00	0.952
					0.996						0.991

Section	Reinforcement 1								Composite							
Section	Qty	Model	Position (F-Flat, C-Corner)	Gap Between Pole and Back of Rein. (in)	Tension only or Tension & Comp.	Total Moment of Inertia (in⁴)	Axial Force (kip)	Stress Ratio	Centroid Offset (in)	Area (in²)	Moment of Inertia (in⁴)	Controlling Stress Ratio	Thickness (in)	Weight Multiplier	Derated Yield Stress (ksi)	% Error in Derated Yield Stress
Section	Rein1Qty	Rein1Model	Rein1Pos	Rein1Gap	Rein1TC	Rein1ITotal	Rein1P	Rein1SR	CompYBar	CompA	CompI	CompSR	EPoleT	EPoleWM	EEPoleFy	EEPoleMCheck
1									0.000	11.2	502	0.011	[illegible]	1.00	65.0	19.4%
2									0.000	16.6	1628	0.868	[illegible]	1.00	65.0	0.7%
3									0.000	45.7	4759	0.356	[illegible]	1.00	65.0	0.7%
4									0.000	40.2	8234	0.919	[illegible]	1.00	65.0	0.5%
5									0.000	86.8	18848	0.445	[illegible]	1.00	65.0	0.5%
6									0.000	53.0	15674	0.991	[illegible]	1.00	65.0	0.5%
7	3	MS-432	F	0	T&C	4463	168.9	0.992	0.000	68.7	22136	0.992	[illegible]	[illegible]	46.3	0.7%
8	3	MS-432	F	0	T&C	4556	89.2	0.524	0.000	133.8	45034	0.524	[illegible]	[illegible]	47.7	1.5%
9									0.000	124.0	42150	0.438	[illegible]	1.00	65.0	0.4%
10									0.000	80.5	59011	0.952	[illegible]	1.00	65.0	0.5%
								0.992				0.992				

Rein1

Bottom	Top	Qty	Model	Position	T or T&C
42.5	51	3	MS-450	F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C
				F	T&C

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

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
		1				1				1							

Rein2

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

Rein3

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

Reinforcement Capacity

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

Dimensions and Properties														Compression				Axial				
																		ASD-9			LRFD	
Model	Weight (lb/ft)	Area (in^2)	Moment of Inertia (in^4)	Moment of Inertia (in^4)	Centroid from Mating Edge (in)	Centroid from Bolt Hole Center (in)	Web Thickness (in)	Width (in)	Flange Width (in)	Flange Thickness (in)	Hole Diameter (in)	Yield Stress (ksi)	Ultimate Stress (ksi)	Slender. Ratio Coefficient	Unbraced Length (in)	Slender. Ratio Coefficient	Unbraced Length (in)	Allowable Axial (kip)	Allowable Axial w/ increase (kip)	Governing Axial	Design Axial Strength (kip)	Governing Axial
MS-450	15.3	4.50	0.38	7.59	0.5	0	1	4.5	0	0	1.21875	65	80	0.80	20.625	1.00	20.625	127.6	170.2	Compress.	193.0	Compress.

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

TIA Rev F

Site Data

BU#: *806382*
Site Name: *HRT 082 943274*
App #: *250061 Revision # 3*

Pole Manufacturer:	*Other*

Reactions		
Moment:	4346.519	ft-kips
Axial:	41.1522	kips
Shear:	40.87447	kips

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

Anchor Rod Data		
Qty:	16	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	70.69	in

Plate Data		
Diam:	76.69	in
Thick:	2.75	in
Grade:	60	ksi
Single-Rod B-eff:	12.46	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:	62	in
Thick:	0.40625	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	

Anchor Rod Results

Maximum Rod Tension:	181.9 Kips	Rigid
Allowable Tension:	195.0 Kips	Service, ASD
Anchor Rod Stress Ratio:	93.3% **Pass**	Fty*ASIF

Base Plate Results

	Flexural Check	Rigid
Base Plate Stress:	32.4 ksi	Service ASD
Allowable Plate Stress:	60.0 ksi	0.75*Fy*ASIF
Base Plate Stress Ratio:	54.0% **Pass**	Y.L, Length: 33.96

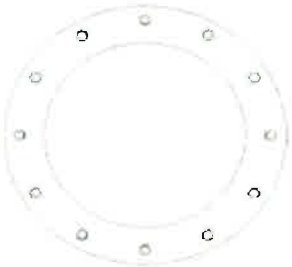
n/a

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

CCI Foundation Tool Suite - Monopole Pier - Beta Release

CCI Foundation Tool Suite - v1.0 Date: 9/18/2014

BU:	806382
Site Name:	HRT 082 943274, CT
App Number:	250061 Rev. 3
Work Order:	776027

Monopole Drilled Pier

Input

Criteria

TIA Revision:	F
ACI 318 Revision:	2002
Seismic Category:	B

Forces

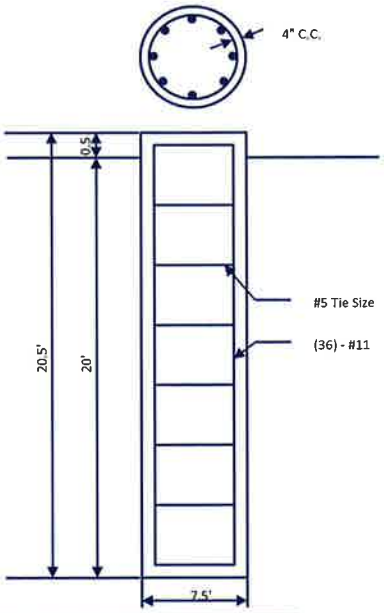
Compression	53.3 kips
Shear	53.3 kips
Moment	5651.1 k-ft
Swelling Force	0 kips

Foundation Dimensions

Pier Diameter:	7.5 ft
Ext. above grade:	0.5 ft
Depth below grade:	20 ft

Material Properties

Number of Rebar:	36
Rebar Size:	11
Tie Size	5
Rebar tensile strength:	60 ksi
Concrete Strength:	4000 psi
Ultimate Concrete Strain	0.003 in/in
Clear Cover to Ties:	4 in



Soil Profile: Soil

Layer	Thickness (ft)	From (ft)	To (ft)	Unit Weight (pcf)	Cohesion (psf)	Friction Angle (deg)	Ultimate Uplift Skin Friction (ksf)	Ultimate Comp. Skin Friction (ksf)	Ultimate Bearing Capacity (ksf)	SPT 'N' Counts
1	1	0	1	100	0	0	0	0	0	
2	5	1	6	110		34			0	
3	3.5	6	9.5	115		38			0	
4	10.5	9.5	20	145		45			30	

Analysis Results

Soil Lateral Capacity

Depth to Zero Shear:	4.30 ft
Max Moment, Mu:	4486.36 k-ft
Soil Safety Factor:	2.02
Safety Factor Req'd:	2
RATING:	98.9%

Soil Axial Capacity

Skin Friction (k):	186.68 kips
End Bearing (k):	662.68 kips
Comp. Capacity (k), ϕCn:	849.36 kips
Comp. (k), Cu:	53.30 kips
RATING:	6.3%

Concrete/Steel Check

Mu (from soil analysis)	5832.27 k-ft
ϕMn	9342.15 k-ft
RATING:	62.4%

rho provided	0.88
rho required	0.33 OK
Rebar Spacing	5.51
Spacing required	22.56 OK
Dev. Length required	15.37
Dev. Length provided	53.51 OK

Overall Foundation Rating: 98.9%