Robinson+Cole

KENNETH C. BALDWIN

280 Trumbull Street
Hartford, CT 06103-3597
Main (860) 275-8200
Fax (860) 275-8299
kbaldwin@rc.com
Direct (860) 275-8345

Also admitted in Massachusetts

April 9, 2015

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

Re: **Notice of Exempt Modification – Facility Modification**
46 Brendan Street, Stafford, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the top of an existing 115-foot tower at 46 Brendan Street in Stafford (the "Property"). The tower is owned Crown Castle. Cellco's use of the tower was approved by the Council in 1994 (Docket No. 165). Cellco now intends to modify its facility by replacing all of its existing antennas with three (3) model LNX-8513DS-VTM, 700 MHz antennas; three (3) model LNX-8513DS-VTM, 850 MHz antennas; three (3) model HBXX-6517DS-VTM, 1900 MHz antennas; and three (3) model HBXX-6517DS-VTM, 2100 MHz antennas, all at the same level on the tower. Cellco also intends to install six (6) remote radio heads ("RRHs") behind its 1900 MHz and 2100 MHz antennas and two (2) HYBRIFLEX™ antenna cables attached to the outside of the monopole tower. Included in Attachment 1 are specifications for Cellco's replacement 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 Richard Shuck, First Selectman of the Town of Stafford. A copy of this letter is also being sent to Tiziani LLC, the owner of the Property.

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

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1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas and RRHs will be installed on its existing antenna platform at the top of the 115-foot tower.

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

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

4. The operation of the replacement antennas will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. Far Field Approximation tables for each of Cellco's operating frequencies are included behind Attachment 2. The Far Field calculations demonstrate that Cellco's modified facility will operate well within the RF emissions safety limits established by the FCC.

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

6. The tower and its foundation, with certain modifications, can support Cellco's proposed modifications. (*See* Structural Modification 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:
Richard Shuck, Stafford First Selectman
Tiziani LLC
Tim Parks

ATTACHMENT 1

Product Specifications

COMMSCOPE®

LNX-8513DS-VTM

Andrew® Teletilt® Antenna, 698–896 MHz, 85° horizontal beamwidth, RET compatible

POWERED BY ANDREW.

Electrical Specifications

Frequency Band, MHz	698–806	806–896
Gain, dBi	14.6	15.3
Beamwidth, Horizontal, degrees	85	85
Beamwidth, Vertical, degrees	12.2	11.0
Beam Tilt, degrees	0–10	0–10
USLS, typical, dB	17	17
Front-to-Back Ratio at 180°, dB	25	26
Isolation, dB	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153
Input Power per Port, maximum, watts	400	400
Polarization	±45°	±45°

Mechanical Specifications

Color | Radome Material	Light gray | Fiberglass, UV resistant
Connector Interface | Location | Quantity	7-16 DIN Female | Bottom | 2
Wind Loading, maximum	617.7 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph
Antenna Dimensions, L x W x D	1847.0 mm x 301.0 mm x 181.0 mm | 72.7 in x 11.9 in x 7.1 in
Net Weight	17.8 kg | 39.2 lb
Model with factory installed AISG 2.0 RET	LNX-8513DS-A1M

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

HBXX-6517DS-VTM

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

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

Electrical Specifications

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

Electrical Specifications, BASTA*

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

* CommScope® supports NGMN recommendations on Base Station Antenna Standards (BASTA). To learn more about the benefits of BASTA, download the whitepaper Time to Raise the Bar on BSAs.

General Specifications

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

Product Specifications

HBXX-6517DS-VTM

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Low loss circuit board
Radome Material	PVC, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	4
Wind Loading, maximum	668.0 N @ 150 km/h 150.2 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

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

Remote Electrical Tilt (RET) Information

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

Regulatory Compliance/Certifications

Agency	Classification
RoHS 2011/65/EU	Compliant by Exemption
China RoHS SJ/T 11364-2006	Above Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

Included Products

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

PCS RF MODULES
RRH1900 2X60 - HW CHARACTERISTICS

LA6.0.1/13.3

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

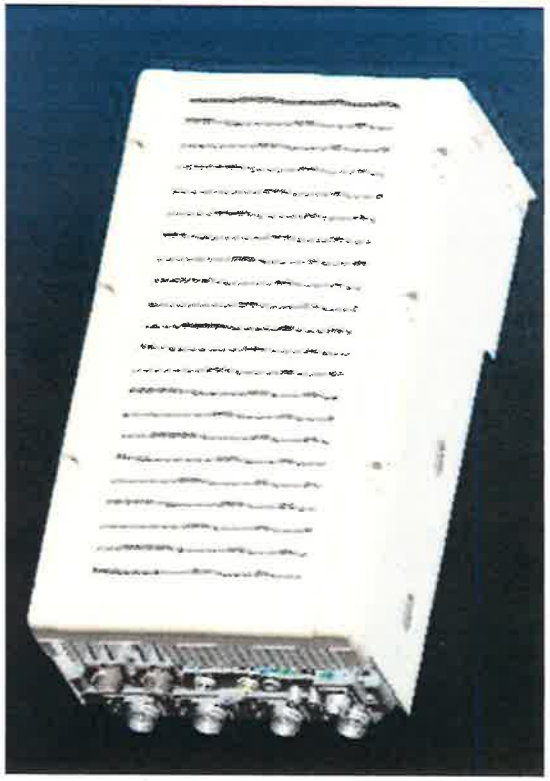
** Not a Verizon Wireless deployed product

Alcatel·Lucent

NEW PCS RF MODULES FOR VZW
RRH2X60 - HW CHARACTERISTICS

LR14.3

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



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

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

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

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

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

SUPERIOR RF PERFORMANCE

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

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

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

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

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

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

OPTIMIZED TCO

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

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

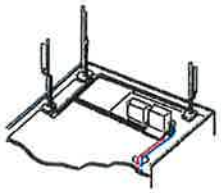
EASY INSTALLATION

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

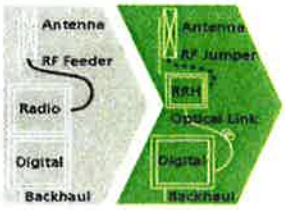
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

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

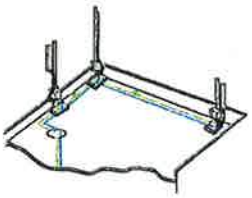
Installation can easily be done by a single person as the Alcatel-Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



Macro



RRH for space-constrained cell sites



Distributed

FEATURES

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

BENEFITS

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

TECHNICAL SPECIFICATIONS

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

Dimensions and weights

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

Electrical Data

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

RF Characteristics

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

Connectivity

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

Environmental specifications

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

Safety and Regulatory Data

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

Alcatel·Lucent

AT THE SPEED OF IDEAS™

Product Data Sheet HB158-1-08U8-S8J18

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

Product Description

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

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

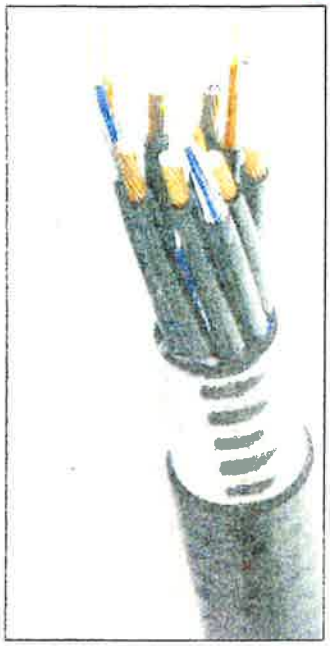


Figure 1: HYBRIFLEX Series

Features/Benefits

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

Technical Specifications

Outer Conductor Armor	Corrugated Aluminum	[mm (in)]	46.5 (1.83)
Jacket	Polyethylene, PE	[mm (in)]	50.3 (1.98)
UV-Protection	Individual and External Jacket		Yes
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)

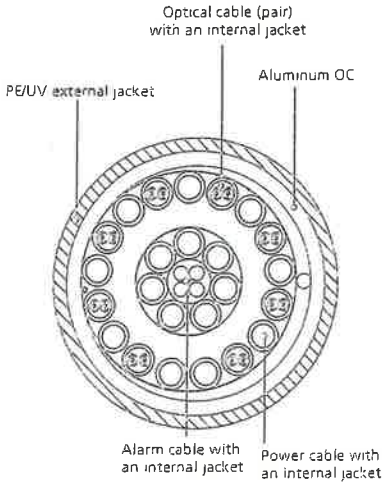


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

Far Field Approximation
with downtilt variation

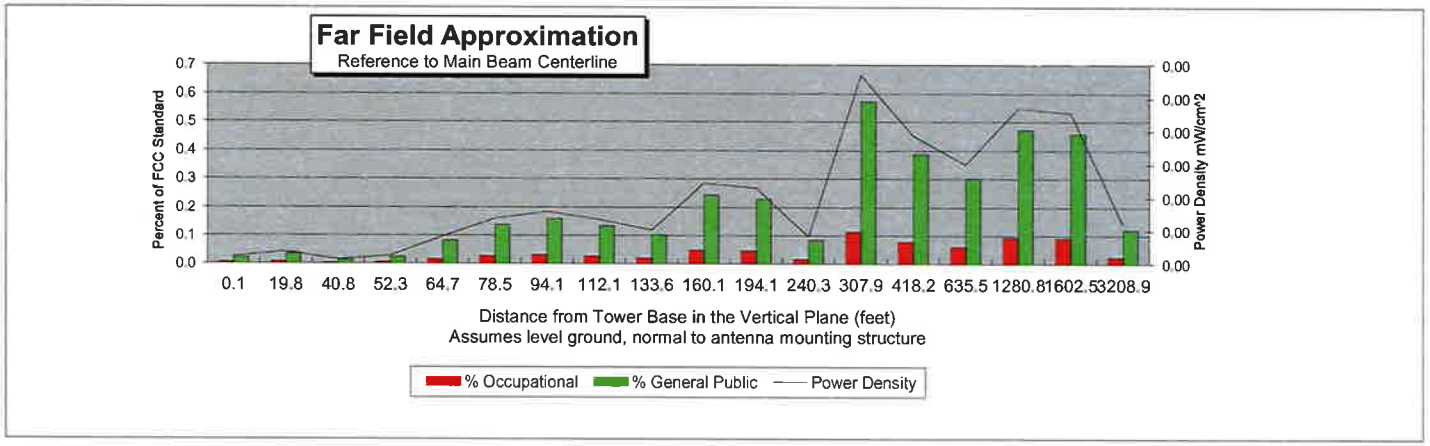
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Stafford, CT
Site #:	
Date:	04/02/15
Name:	Mark Brauer
File Name:	Stafford, CT - FF Power

Operating Freq. (MHz)	**746.0**
Antenna Height (ft):	**115.0**
Antenna Gain (dBi):	**14.3**
Antenna Size (in.):	**73.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
ERP (w):	**1050.0**
Number of Channels	**1**



Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0
Solve for r, dx to antenna	112.0	113.7	119.2	123.6	129.4	136.8	146.3	158.5	174.3	195.4	224.1	265.1	327.6	432.9	645.3	1285.7	1606.4	3210.8
Distance from Antenna Structure Base in Horizontal plane	0.1	19.8	40.8	52.3	64.7	78.5	94.1	112.1	133.6	160.1	194.1	240.3	307.9	418.2	635.5	1280.8	1602.5	3208.9
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0
Percent of General Population Standard	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.1	0.6	0.4	0.3	0.5	0.5	0.1

Antenna Type LNX-8513DS
Max% 0.57%

Instructions:

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

Far Field Approximation
with downtilt variation

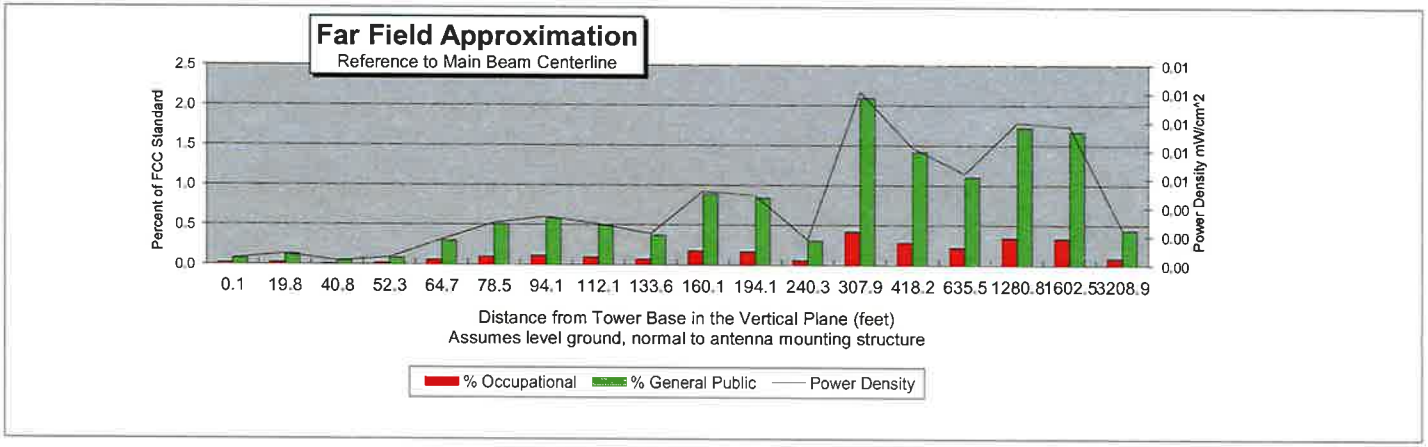
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Stafford, CT
Site #:	
Date:	04/02/15
Name:	Mark Brauer
File Name:	Stafford, CT - FF Power

Operating Freq. (MHz)	**869.0**
Antenna Height (ft):	**115.0**
Antenna Gain (dBi):	**15.1**
Antenna Size (in.):	**73.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
ERP (w):	**3658.0**
Number of Channels	**9**



Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0	
Solve for r, dx to antenna	112.0	113.7	119.2	123.6	129.4	136.8	146.3	158.5	174.3	195.4	224.1	265.1	327.6	432.9	645.3	1285.7	1606.4	3210.8	
Distance from Antenna Structure Base in Horizontal plane	0.1	19.8	40.8	52.3	64.7	78.5	94.1	112.1	133.6	160.1	194.1	240.3	307.9	418.2	635.5	1280.8	1602.5	3208.9	
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1	0.4	0.3	0.2	0.3	0.3	0.1	
Percent of General Population Standard	0.1	0.1	0.0	0.1	0.3	0.5	0.6	0.5	0.4	0.9	0.8	0.3	2.1	1.4	1.1	1.7	1.7	0.4	

Antenna Type LNX-8513DS
Max% 2.09%

Instructions:

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

Far Field Approximation
with downtilt variation

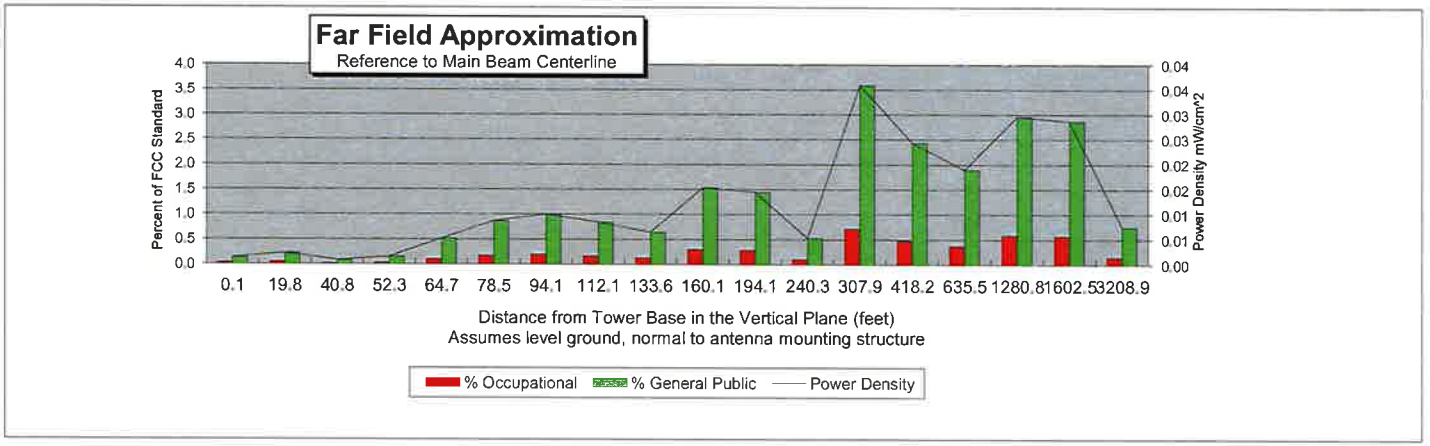
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Stafford, CT
Site #:	
Date:	04/02/15
Name:	Mark Brauer
File Name:	Stafford, CT - FF Power

Operating Freq. (MHz)	**1970.0**
Antenna Height (ft):	**115.0**
Antenna Gain (dBi):	**18.6**
Antenna Size (in.):	**75.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
ERP (w):	**4878.0**
Number of Channels	**11**



Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0	
Solve for r, dx to antenna	112.0	113.7	119.2	123.6	129.4	136.8	146.3	158.5	174.3	195.4	224.1	265.1	327.6	432.9	645.3	1285.7	1606.4	3210.8	
Distance from Antenna Structure Base in Horizontal plane	0.1	19.8	40.8	52.3	64.7	78.5	94.1	112.1	133.6	160.1	194.1	240.3	307.9	418.2	635.5	1280.8	1602.5	3208.9	
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.04	0.02	0.02	0.03	0.03	0.01	
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.1	0.3	0.3	0.1	0.7	0.5	0.4	0.6	0.6	0.2	
Percent of General Population Standard	0.1	0.2	0.1	0.1	0.5	0.9	1.0	0.8	0.6	1.5	1.4	0.5	3.6	2.4	1.9	3.0	2.9	0.8	

Antenna Type HBXX-6517DS
Max% 3.59%

Instructions:

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

Far Field Approximation
with downtilt variation

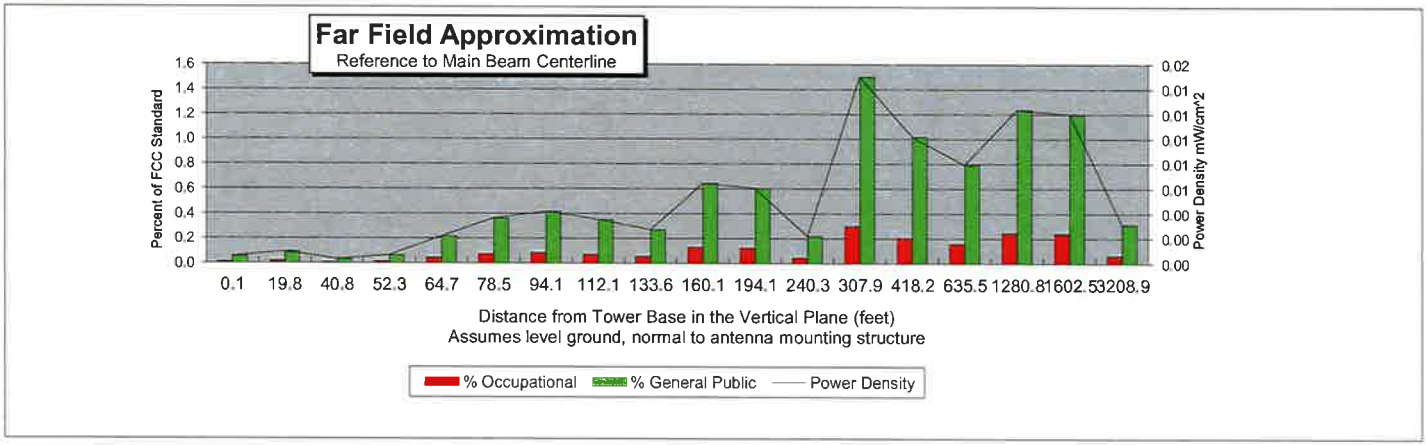
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Stafford, CT
Site #:	
Date:	04/02/15
Name:	Mark Brauer
File Name:	Stafford, CT - FF Power

Operating Freq. (MHz)	**2145.0**
Antenna Height (ft):	**115.0**
Antenna Gain (dBi):	**19.3**
Antenna Size (in.):	**75.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
ERP (w):	**1750.0**
Number of Channels	**1**



Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0
Solve for r, dx to antenna	112.0	113.7	119.2	123.6	129.4	136.8	146.3	158.5	174.3	195.4	224.1	265.1	327.6	432.9	645.3	1285.7	1606.4	3210.8
Distance from Antenna Structure Base in Horizontal plane	0.1	19.8	40.8	52.3	64.7	78.5	94.1	112.1	133.6	160.1	194.1	240.3	307.9	418.2	635.5	1280.8	1602.5	3208.9
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.02	0.01	0.01	0.01	0.01	0.00
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.3	0.2	0.2	0.2	0.2	0.1
Percent of General Population Standard	0.1	0.1	0.0	0.1	0.2	0.4	0.4	0.4	0.3	0.6	0.6	0.2	1.5	1.0	0.8	1.2	1.2	0.3

Antenna Type HBXX-6517DS
Max% 1.50%

Instructions:

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

ATTACHMENT 3

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

Date: **March 3, 2015**

Adam Winters
Crown Castle
3530 Toringdon Way, Suite 300
Charlotte, NC 28277

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

Subject: **Structural Modification Report**

Carrier Designation:	***Verizon Wireless* Co-Locate**	
	Carrier Site Number:	119688
	Carrier Site Name:	Stafford Springs CT
Crown Castle Designation:	**Crown Castle BU Number:**	806365
	Crown Castle Site Name:	HRT 303 943203
	Crown Castle JDE Job Number:	321819
	Crown Castle Work Order Number:	1012571
	Crown Castle Application Number:	281658 Rev. 2
Engineering Firm Designation:	**Paul J. Ford and Company Project Number:**	37515-0530.002.7700
Site Data:	**BRENDON & QUINN STREETS, STAFFORD, Tolland County, CT** **Latitude *41° 57' 51.2"*, Longitude *-72° 18' 17.8"*** **115 Foot - Monopole Tower**	

Dear Adam Winters,

Paul J. Ford and Company is pleased to submit this **"Structural Modification Report"** to determine the structural integrity of the above mentioned tower. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 758134, in accordance with application 281658, revision 2.

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

LC4.5: Modified Structure w/ Existing + Proposed Equipment **Sufficient Capacity**
Note: See Table I and Table II 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 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 *Paul J. Ford and Company* appreciate the opportunity of providing our continuing professional services to you and Crown Castle. If you have any questions or need further assistance on this or any other projects please give us a call.

Respectfully submitted by:

Christopher Poelking, E.I.
Structural Designer

3-3-15

tnxTower Report - version 6.1.4.1

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1) INTRODUCTION

This tower is a 115-ft Monopole tower designed by VALMONT in January of 1995. The tower was originally designed for a wind speed of 90 mph per TIA/EIA-222-E.

2) ANALYSIS CRITERIA

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.

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
113.0	115.0	2	alcatel lucent	RRH2X60-AWS	2	1-5/8	-
		3	alcatel lucent	RRH2X60-PCS			
		1	alcatel lucent	RRH2x60-AWS			
		6	andrew	HBXX-6517DS-VTM w/ Mount Pipe			
		6	andrew	LNX-8513DS-VTM w/ Mount Pipe			
		2	rfs celwave	DB-B1-6C-12AB-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
115.0	122.0	3	ems wireless	RR90-17-02DP w/ Mount Pipe	6	1-5/8	1
		6	remec	GSM PCS 1900 MASTHEAD AMPLIFIER			
	115.0	1	tower mounts	Pipe Mount [PM 601-3]			
113.0	115.0	3	antel	BXA-171085-8BF-EDIN-2 w/ Mount Pipe	-	-	2
		3	antel	BXA-70080/4CF w/ Mount Pipe			
		6	antel	LPA-80080/4CF w/ Mount Pipe			
		6	rfs celwave	FD9R6004/2C-3L			
	113.0	1	tower mounts	Platform Mount [LP 602-1]	12	7/8	1
100.0	100.0	6	decibel	DB980H90E-M w/ Mount Pipe	6	1-5/8	1
		1	tower mounts	Platform Mount [LP 1201-1]			
92.0	94.0	3	ericsson	RRUS 11	-	-	1
		1	raycap	DC6-48-60-18-8F			
	92.0	1	tower mounts	Side Arm Mount [SO 102-3]			
90.0	90.0	6	communication components inc.	DTMABP7819VG12A	1* 1 2 12	1-5/8 3/8 3/4 1-1/4	1
		3	powerwave technologies	7770.00 w/ Mount Pipe			
		8	powerwave technologies	LGP13519			
		6	powerwave technologies	P65-17-XLH-RR w/ Mount Pipe			
		1	tower mounts	Platform Mount [LP 601-1]			
71.0	74.0	12	decibel	DB844H80-XY w/ Mount Pipe	9	7/8	2
	71.0	1	tower mounts	T-Arm Mount [TA 602-3]			
59.0	59.0	1	gps	GPS_A	1	1/2	1
		1	tower mounts	Side Arm Mount [SO 701-1]			

Notes:
1) Existing Equipment
2) Equipment to Be Removed
*Installed in 2" conduit

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)
-	-	-	-	-	-	-

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	Clarence Welti Assoc., Inc.	262167	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	Tower Engineering Professionals (Mapping)	2294383	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Valmont Industries, Inc.	2046046	CCISITES

3.1) Analysis Method

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

3.2) Assumptions

1) Tower and structures were built in accordance with the manufacturer's specifications.
2) The tower and structures have been maintained in accordance with the manufacturer's specification.
3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
4) Pier foundation information was taken from Crown analysis, CCI# 3833112
5) Monopole will be reinforced in conformance with the attached proposed modification drawings.

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

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	115 - 73.75	Pole	TP27.3x17.81x0.219	1	-8.90	956.95	96.8	Pass
L2	73.75 - 56.5	Pole	TP30.8231x25.8842x0.313	2	-12.24	1598.60	95.6	Pass
L3	56.5 - 36.75	Pole	TP35.36x30.8231x0.4952	3	-15.35	2269.09	83.3	Pass
L4	36.75 - 18	Pole	TP39.0549x33.1636x0.375	4	-21.01	2428.10	99.7	Pass
L5	18 - 3	Pole	TP42.5091x39.0549x0.5186	5	-25.15	2980.19	91.5	Pass
L6	3 - 0	Pole	TP43.2x42.5091x0.573	6	-26.08	3660.24	76.2	Pass
							Summary	
						Pole (L4)	99.7	Pass
						RATING =	**99.7**	**Pass**

Table 6 - Tower Component Stresses vs. Capacity – LC4.5

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	94.4	Pass
1	Base Plate	0	60.3	Pass
1	Base Foundation Structural Steel	0	75.8	Pass
1	Base Foundation Soil Interaction	0	42.0	Pass

Structure Rating (max from all components) =	99.7%

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

4.1) Recommendations

Install modifications per the attached reinforcement drawings.

APPENDIX A

TNXTOWER OUTPUT

Tower Input Data

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

1) Tower is located in Tolland County, Connecticut.
2) Basic wind speed of 85 mph.
3) Nominal ice thickness of 1.0000 in.
4) Ice thickness is considered to increase with height.
5) Ice density of 56 pcf.
6) A wind speed of 38 mph is used in combination with ice.
7) Temperature drop of 50 °F.
8) Deflections calculated using a wind speed of 50 mph.
9) A non-linear (P-delta) analysis was used.
10) Pressures are calculated at each section.
11) Stress ratio used in pole design is 1.333.
12) 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	115.00-73.75	41.25	4.25	12	17.8100	27.3000	0.2190	0.8760	A572-65 (65 ksi)
L2	73.75-56.50	21.50	0.00	12	25.8842	30.8231	0.3130	1.2520	A572-65 (65 ksi)
L3	56.50-36.75	19.75	5.25	12	30.8231	35.3600	0.4952	1.9808	Reinf 52.86 ksi (53 ksi)
L4	36.75-18.00	24.00	0.00	12	33.1636	39.0549	0.3750	1.5000	A572-65 (65 ksi)
L5	18.00-3.00	15.00	0.00	12	39.0549	42.5091	0.5186	2.0744	Reinf 53.14 ksi (53 ksi)
L6	3.00-0.00	3.00		12	42.5091	43.2000	0.5730	2.2919	Reinf 58.19 ksi (58 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	18.4383	12.4048	489.9565	6.2976	9.2256	53.1085	992.7847	6.1053	4.1862	19.115
	28.2630	19.0970	1787.6399	9.6950	14.1414	126.4118	3622.2430	9.3990	6.7295	30.728
L2	27.8081	25.7722	2151.0061	9.1545	13.4080	160.4266	4358.5216	12.6843	6.0981	19.483
	31.9104	30.7499	3653.5668	10.9226	15.9664	228.8290	7403.1169	15.1342	7.4218	23.712
L3	31.9104	48.3601	5677.5088	10.8574	15.9664	355.5918	11504.1721	23.8014	6.9334	14.001
	36.6074	55.5946	8625.6611	12.4816	18.3165	470.9235	17477.9278	27.3620	8.1493	16.456
L4	35.6676	39.5922	5433.0095	11.7383	17.1787	316.2638	11008.7502	19.4861	7.8828	21.021
	40.4326	46.7059	8919.2384	13.8474	20.2304	440.8826	18072.7950	22.9872	9.4617	25.231
L5	40.4326	64.3514	12197.8426	13.7960	20.2304	602.9457	24716.1361	31.6718	9.0769	17.503
	44.0087	70.1197	15780.7890	15.0326	22.0197	716.6657	31976.1569	34.5108	10.0026	19.288
L6	44.0087	77.3720	17367.8983	15.0131	22.0197	788.7424	35192.0706	38.0802	9.8569	17.203
	44.7239	78.6467	18240.4775	15.2605	22.3776	815.1222	36960.1527	38.7075	10.0420	17.526

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 115.00-73.75				1	1	1		
L2 73.75-56.50				1	1	1		
L3 56.50-36.75				1	1	1		
L4 36.75-18.00				1	1	1		
L5 18.00-3.00				1	1	1		
L6 3.00-0.00				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
LCF158-50J(1-5/8")	C	No	CaAa (Out Of Face)	115.00 - 0.00	5	No Ice	0.00	0.92
						1/2" Ice	0.00	2.45
						1" Ice	0.00	4.60
						2" Ice	0.00	10.72
						4" Ice	0.00	30.29
LCF158-50J(1-5/8")	C	No	CaAa (Out Of Face)	115.00 - 0.00	1	No Ice	0.20	0.92
						1/2" Ice	0.30	2.45
						1" Ice	0.40	4.60
						2" Ice	0.60	10.72
						4" Ice	1.00	30.29
****								
LDF5-50A(7/8")	C	No	Inside Pole	113.00 - 0.00	12	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
HB158-1-08U8-S8J18(1-5/8)	C	No	CaAa (Out Of Face)	113.00 - 0.00	2	No Ice	0.20	1.30
						1/2" Ice	0.30	2.81
						1" Ice	0.40	4.94
						2" Ice	0.60	11.02
						4" Ice	1.00	30.52
****								
LDF7-50A(1-5/8")	C	No	Inside Pole	100.00 - 0.00	6	No Ice	0.00	0.82

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
						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	90.00 - 0.00	12	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
FB-L98B-002-75000(3/8")	C	No	Inside Pole	90.00 - 0.00	1	No Ice	0.00	0.06
						1/2" Ice	0.00	0.06
						1" Ice	0.00	0.06
						2" Ice	0.00	0.06
						4" Ice	0.00	0.06
WR-VG86ST-BRD(3/4)	C	No	Inside Pole	90.00 - 0.00	2	No Ice	0.00	0.59
						1/2" Ice	0.00	0.59
						1" Ice	0.00	0.59
						2" Ice	0.00	0.59
						4" Ice	0.00	0.59
2" (Nominal) Conduit	C	No	Inside Pole	90.00 - 0.00	1	No Ice	0.00	0.72
						1/2" Ice	0.00	0.72
						1" Ice	0.00	0.72
						2" Ice	0.00	0.72
						4" Ice	0.00	0.72
0(1 5/8")	C	No	Inside Pole	90.00 - 0.00	1	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00
****								
****								
FLC 12-50J(1/2")	C	No	Inside Pole	59.00 - 0.00	1	No Ice	0.00	0.17
						1/2" Ice	0.00	0.17
						1" Ice	0.00	0.17
						2" Ice	0.00	0.17
						4" Ice	0.00	0.17
****								
1" Flat Reinforcement	C	No	CaAa (Out Of Face)	20.50 - 0.00	1	No Ice	0.17	0.00
						1/2" Ice	0.28	0.00
						1" Ice	0.39	0.00
						2" Ice	0.61	0.00
						4" Ice	1.06	0.00
1" Flat Reinforcement	C	No	CaAa (Out Of Face)	59.00 - 39.00	1	No Ice	0.17	0.00
						1/2" Ice	0.28	0.00
						1" Ice	0.39	0.00
						2" Ice	0.61	0.00
						4" Ice	1.06	0.00

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	115.00-73.75	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	23.834	0.77
L2	73.75-56.50	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	10.715	0.46
L3	56.50-36.75	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	14.707	0.53
L4	36.75-18.00	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	11.610	0.51

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
L5	18.00-3.00	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	11.455	0.41
L6	3.00-0.00	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	2.291	0.08

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	115.00-73.75	A	1.133	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	50.964	2.24
L2	73.75-56.50	A	1.085	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	23.068	1.08
L3	56.50-36.75	A	1.042	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	31.103	1.15
L4	36.75-18.00	A	1.000	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	23.909	1.10
L5	18.00-3.00	A	1.000	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	23.788	0.85
L6	3.00-0.00	A	1.000	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	4.758	0.17

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	115.00-73.75	-0.5779	0.3337	-0.9192	0.5307
L2	73.75-56.50	-0.6427	0.3710	-1.0654	0.6151
L3	56.50-36.75	-0.7605	0.4391	-1.2498	0.7216
L4	36.75-18.00	-0.6704	0.3871	-1.1271	0.6507
L5	18.00-3.00	-0.8100	0.4677	-1.3592	0.7847
L6	3.00-0.00	-0.8173	0.4719	-1.3820	0.7979

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
RR90-17-02DP w/ Mount Pipe	A	From Leg	1.00 0.00 7.00	0.0000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.59 5.09 5.58 6.59 8.73	3.32 4.09 4.78 6.23 9.31	0.03 0.07 0.12 0.22 0.56

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
RR90-17-02DP w/ Mount Pipe	B	From Leg	1.00 0.00 7.00	0.0000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.59 5.09 5.58 6.59 8.73	3.32 4.09 4.78 6.23 9.31	0.03 0.07 0.12 0.22 0.56
RR90-17-02DP w/ Mount Pipe	C	From Leg	1.00 0.00 7.00	0.0000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.59 5.09 5.58 6.59 8.73	3.32 4.09 4.78 6.23 9.31	0.03 0.07 0.12 0.22 0.56
(2) GSM PCS 1900 MASTHEAD AMPLIFIER	A	From Leg	1.00 0.00 7.00	0.0000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.83 0.96 1.10 1.41 2.13	0.39 0.50 0.62 0.89 1.52	0.01 0.02 0.02 0.04 0.11
(2) GSM PCS 1900 MASTHEAD AMPLIFIER	B	From Leg	1.00 0.00 7.00	0.0000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.83 0.96 1.10 1.41 2.13	0.39 0.50 0.62 0.89 1.52	0.01 0.02 0.02 0.04 0.11
(2) GSM PCS 1900 MASTHEAD AMPLIFIER	C	From Leg	1.00 0.00 7.00	0.0000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.83 0.96 1.10 1.41 2.13	0.39 0.50 0.62 0.89 1.52	0.01 0.02 0.02 0.04 0.11
Pipe Mount [PM 601-3]	C	None		0.0000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.39 5.48 6.57 8.75 13.11	4.39 5.48 6.57 8.75 13.11	0.20 0.24 0.28 0.36 0.53
8' x 3" Mount Pipe	C	None		0.0000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.40 3.19 3.67 4.68 6.79	2.40 3.19 3.67 4.68 6.79	0.04 0.06 0.08 0.14 0.34
****									
(2) LNX-8513DS-VTM w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.0000	113.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.65 9.31 9.93 11.20 13.87	7.08 8.27 9.18 11.02 15.06	0.06 0.13 0.21 0.39 0.90
(2) LNX-8513DS-VTM w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	0.0000	113.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.65 9.31 9.93 11.20 13.87	7.08 8.27 9.18 11.02 15.06	0.06 0.13 0.21 0.39 0.90
(2) LNX-8513DS-VTM w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.0000	113.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.65 9.31 9.93 11.20 13.87	7.08 8.27 9.18 11.02 15.06	0.06 0.13 0.21 0.39 0.90
(2) HBXX-6517DS-VTM w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.0000	113.00	No Ice 1/2" Ice 1" Ice	8.98 9.65 10.29 11.59	6.96 8.18 9.14 11.02	0.07 0.14 0.21 0.40

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						2" Ice	14.32	15.03	0.91
						4" Ice			
(2) HBXX-6517DS-VTM w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	0.0000	113.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.98 9.65 10.29 11.59 14.32	6.96 8.18 9.14 11.02 15.03	0.07 0.14 0.21 0.40 0.91
(2) HBXX-6517DS-VTM w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.0000	113.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.98 9.65 10.29 11.59 14.32	6.96 8.18 9.14 11.02 15.03	0.07 0.14 0.21 0.40 0.91
RRH2X60-AWS	A	From Leg	4.00 0.00 2.00	0.0000	113.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.96 4.27 4.60 5.27 6.72	2.16 2.44 2.73 3.34 4.66	0.06 0.08 0.11 0.18 0.37
RRH2x60-AWS	B	From Leg	4.00 0.00 2.00	0.0000	113.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.96 4.27 4.60 5.27 6.72	2.16 2.44 2.73 3.34 4.66	0.06 0.08 0.11 0.18 0.37
RRH2X60-AWS	C	From Leg	4.00 0.00 2.00	0.0000	113.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.96 4.27 4.60 5.27 6.72	2.16 2.44 2.73 3.34 4.66	0.06 0.08 0.11 0.18 0.37
RRH2X60-PCS	A	From Leg	4.00 0.00 2.00	0.0000	113.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.57 2.79 3.02 3.52 4.61	2.01 2.22 2.43 2.89 3.92	0.06 0.08 0.10 0.16 0.31
RRH2X60-PCS	B	From Leg	4.00 0.00 2.00	0.0000	113.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.57 2.79 3.02 3.52 4.61	2.01 2.22 2.43 2.89 3.92	0.06 0.08 0.10 0.16 0.31
RRH2X60-PCS	C	From Leg	4.00 0.00 2.00	0.0000	113.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.57 2.79 3.02 3.52 4.61	2.01 2.22 2.43 2.89 3.92	0.06 0.08 0.10 0.16 0.31
(2) DB-B1-6C-12AB-0Z	A	From Leg	4.00 0.00 2.00	0.0000	113.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.92 4.20 4.48 5.07 6.35	2.56 2.79 3.04 3.56 4.70	0.03 0.06 0.09 0.17 0.37
Platform Mount [LP 602-1]	C	None		0.0000	113.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	32.03 38.71 45.39 58.75 85.47	32.03 38.71 45.39 58.75 85.47	1.34 1.80 2.26 3.17 5.00
****									
(2) DB980H90E-M w/ Mount Pipe	A	From Leg	4.00 0.00	0.0000	100.00	No Ice 1/2"	4.04 4.50	3.62 4.48	0.03 0.07

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00			Ice	4.95	5.22	0.11
						1" Ice	5.87	6.74	0.22
						2" Ice	8.05	10.00	0.55
						4" Ice			
(2) DB980H90E-M w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	100.00	No Ice	4.04	3.62	0.03
						1/2"	4.50	4.48	0.07
						Ice	4.95	5.22	0.11
						1" Ice	5.87	6.74	0.22
						2" Ice	8.05	10.00	0.55
						4" Ice			
(2) DB980H90E-M w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	100.00	No Ice	4.04	3.62	0.03
						1/2"	4.50	4.48	0.07
						Ice	4.95	5.22	0.11
						1" Ice	5.87	6.74	0.22
						2" Ice	8.05	10.00	0.55
						4" Ice			
Platform Mount [LP 1201-1]	C	None		0.0000	100.00	No Ice	23.10	23.10	2.10
						1/2"	26.80	26.80	2.50
						Ice	30.50	30.50	2.90
						1" Ice	37.90	37.90	3.70
						2" Ice	52.70	52.70	5.30
						4" Ice			
****									
RRUS 11	A	From Leg	2.00 0.00 2.00	0.0000	92.00	No Ice	3.26	1.38	0.05
						1/2"	3.50	1.56	0.07
						Ice	3.75	1.74	0.10
						1" Ice	4.28	2.15	0.15
						2" Ice	5.44	3.05	0.31
						4" Ice			
RRUS 11	B	From Leg	2.00 0.00 2.00	0.0000	92.00	No Ice	3.26	1.38	0.05
						1/2"	3.50	1.56	0.07
						Ice	3.75	1.74	0.10
						1" Ice	4.28	2.15	0.15
						2" Ice	5.44	3.05	0.31
						4" Ice			
RRUS 11	C	From Leg	2.00 0.00 2.00	0.0000	92.00	No Ice	3.26	1.38	0.05
						1/2"	3.50	1.56	0.07
						Ice	3.75	1.74	0.10
						1" Ice	4.28	2.15	0.15
						2" Ice	5.44	3.05	0.31
						4" Ice			
DC6-48-60-18-8F	A	From Leg	2.00 0.00 2.00	0.0000	92.00	No Ice	1.47	1.47	0.02
						1/2"	1.67	1.67	0.04
						Ice	1.88	1.88	0.06
						1" Ice	2.33	2.33	0.11
						2" Ice	3.38	3.38	0.24
						4" Ice			
5' x 2" Pipe Mount	A	From Leg	2.00 0.00 0.00	0.0000	92.00	No Ice	1.00	1.00	0.03
						1/2"	1.39	1.39	0.04
						Ice	1.70	1.70	0.05
						1" Ice	2.35	2.35	0.08
						2" Ice	3.78	3.78	0.20
						4" Ice			
5' x 2" Pipe Mount	B	From Leg	2.00 0.00 0.00	0.0000	92.00	No Ice	1.00	1.00	0.03
						1/2"	1.39	1.39	0.04
						Ice	1.70	1.70	0.05
						1" Ice	2.35	2.35	0.08
						2" Ice	3.78	3.78	0.20
						4" Ice			
5' x 2" Pipe Mount	C	From Leg	2.00 0.00 0.00	0.0000	92.00	No Ice	1.00	1.00	0.03
						1/2"	1.39	1.39	0.04
						Ice	1.70	1.70	0.05
						1" Ice	2.35	2.35	0.08
						2" Ice	3.78	3.78	0.20
						4" Ice			

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Offsets: Vert ft	Offsets: Horz Lateral ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
Side Arm Mount [SO 102-3]	C	None				0.0000	92.00	No Ice	3.00	3.00	0.08
								1/2" Ice	3.48	3.48	0.11
								1" Ice	3.96	3.96	0.14
								2" Ice	4.92	4.92	0.20
								4" Ice	6.84	6.84	0.32
****											
7770.00 w/ Mount Pipe	A	From Leg	4.00	0.00	0.00	0.0000	90.00	No Ice	6.22	4.82	0.09
								1/2" Ice	6.71	5.51	0.14
								1" Ice	7.22	6.21	0.21
								2" Ice	8.26	7.67	0.36
								4" Ice	10.48	11.06	0.76
7770.00 w/ Mount Pipe	B	From Leg	4.00	0.00	0.00	0.0000	90.00	No Ice	6.22	4.82	0.09
								1/2" Ice	6.71	5.51	0.14
								1" Ice	7.22	6.21	0.21
								2" Ice	8.26	7.67	0.36
								4" Ice	10.48	11.06	0.76
7770.00 w/ Mount Pipe	C	From Leg	4.00	0.00	0.00	0.0000	90.00	No Ice	6.22	4.82	0.09
								1/2" Ice	6.71	5.51	0.14
								1" Ice	7.22	6.21	0.21
								2" Ice	8.26	7.67	0.36
								4" Ice	10.48	11.06	0.76
(2) P65-17-XLH-RR w/ Mount Pipe	A	From Leg	4.00	0.00	0.00	0.0000	90.00	No Ice	11.82	9.06	0.09
								1/2" Ice	12.59	10.62	0.18
								1" Ice	13.38	12.21	0.28
								2" Ice	14.94	14.70	0.51
								4" Ice	18.33	19.64	1.14
(2) P65-17-XLH-RR w/ Mount Pipe	B	From Leg	4.00	0.00	0.00	0.0000	90.00	No Ice	11.82	9.06	0.09
								1/2" Ice	12.59	10.62	0.18
								1" Ice	13.38	12.21	0.28
								2" Ice	14.94	14.70	0.51
								4" Ice	18.33	19.64	1.14
(2) P65-17-XLH-RR w/ Mount Pipe	C	From Leg	4.00	0.00	0.00	0.0000	90.00	No Ice	11.82	9.06	0.09
								1/2" Ice	12.59	10.62	0.18
								1" Ice	13.38	12.21	0.28
								2" Ice	14.94	14.70	0.51
								4" Ice	18.33	19.64	1.14
(4) LGP13519	A	From Leg	4.00	0.00	0.00	0.0000	90.00	No Ice	0.34	0.21	0.01
								1/2" Ice	0.42	0.28	0.01
								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) LGP13519	B	From Leg	4.00	0.00	0.00	0.0000	90.00	No Ice	0.34	0.21	0.01
								1/2" Ice	0.42	0.28	0.01
								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) LGP13519	C	From Leg	4.00	0.00	0.00	0.0000	90.00	No Ice	0.34	0.21	0.01
								1/2" Ice	0.42	0.28	0.01
								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) DTMABP7819VG12A	A	From Leg	4.00	0.00	0.00	0.0000	90.00	No Ice	1.14	0.39	0.02
								1/2" Ice	1.28	0.49	0.03
								1" Ice	1.44	0.59	0.04
								2" Ice	1.77	0.83	0.06

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						2" Ice	2.54	1.41	0.14
						4" Ice			
(2) DTMABP7819VG12A	B	From Leg	4.00	0.0000	90.00	No Ice	1.14	0.39	0.02
			0.00			1/2" Ice	1.28	0.49	0.03
			0.00			1" Ice	1.44	0.59	0.04
						2" Ice	1.77	0.83	0.06
						4" Ice	2.54	1.41	0.14
(2) DTMABP7819VG12A	C	From Leg	4.00	0.0000	90.00	No Ice	1.14	0.39	0.02
			0.00			1/2" Ice	1.28	0.49	0.03
			0.00			1" Ice	1.44	0.59	0.04
						2" Ice	1.77	0.83	0.06
						4" Ice	2.54	1.41	0.14
6' x 2" Mount Pipe	A	From Leg	4.00	0.0000	90.00	No Ice	1.43	1.43	0.02
			0.00			1/2" Ice	1.92	1.92	0.03
			0.00			1" Ice	2.29	2.29	0.05
						2" Ice	3.06	3.06	0.09
						4" Ice	4.70	4.70	0.23
6' x 2" Mount Pipe	B	From Leg	4.00	0.0000	90.00	No Ice	1.43	1.43	0.02
			0.00			1/2" Ice	1.92	1.92	0.03
			0.00			1" Ice	2.29	2.29	0.05
						2" Ice	3.06	3.06	0.09
						4" Ice	4.70	4.70	0.23
6' x 2" Mount Pipe	C	From Leg	4.00	0.0000	90.00	No Ice	1.43	1.43	0.02
			0.00			1/2" Ice	1.92	1.92	0.03
			0.00			1" Ice	2.29	2.29	0.05
						2" Ice	3.06	3.06	0.09
						4" Ice	4.70	4.70	0.23
Platform Mount [LP 601-1]	C	None		0.0000	90.00	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_A	C	From Leg	3.00	0.0000	59.00	No Ice	0.30	0.30	0.00
			0.00			1/2" Ice	0.37	0.37	0.00
			0.00			1" Ice	0.46	0.46	0.01
						2" Ice	0.65	0.65	0.02
						4" Ice	1.15	1.15	0.08
4' x 2" Pipe Mount	C	From Leg	3.00	0.0000	59.00	No Ice	0.79	0.79	0.03
			0.00			1/2" Ice	1.03	1.03	0.04
			0.00			1" Ice	1.28	1.28	0.04
						2" Ice	1.81	1.81	0.07
						4" Ice	3.11	3.11	0.17
Side Arm Mount [SO 701-1]	C	From Leg	1.50	0.0000	59.00	No Ice	0.85	1.67	0.07
			0.00			1/2" Ice	1.14	2.34	0.08
			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
****									

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	115 - 73.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-21.80	1.44	0.57
			Max. Mx	11	-8.92	482.07	0.21
			Max. My	2	-8.90	0.26	486.85
			Max. Vy	11	-19.68	482.07	0.21
			Max. Vx	2	-19.82	0.26	486.85
			Max. Torque	5			1.31
L2	73.75 - 56.5	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-26.62	2.90	-0.24
			Max. Mx	11	-12.26	932.32	0.02
			Max. My	2	-12.24	0.74	939.39
			Max. Vy	11	-22.22	932.32	0.02
			Max. Vx	8	22.37	0.66	-939.38
			Max. Torque	5			1.25
L3	56.5 - 36.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-30.63	3.63	-0.64
			Max. Mx	11	-15.37	1266.76	0.14
			Max. My	8	-15.35	0.62	-1275.96
			Max. Vy	11	-23.93	1266.76	0.14
			Max. Vx	8	24.08	0.62	-1275.96

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Torque	4			1.19
L4	36.75 - 18	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-37.91	4.86	-1.35
			Max. Mx	11	-21.02	1873.72	0.32
			Max. My	8	-21.01	0.56	-1886.45
			Max. Vy	11	-26.54	1873.72	0.32
			Max. Vx	8	26.69	0.56	-1886.45
			Max. Torque	3			1.19
L5	18 - 3	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-42.97	5.69	-1.83
			Max. Mx	11	-25.15	2284.92	0.41
			Max. My	8	-25.15	0.54	-2299.81
			Max. Vy	11	-28.30	2284.92	0.41
			Max. Vx	8	28.45	0.54	-2299.81
			Max. Torque	3			1.27
L6	3 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-44.10	5.86	-1.93
			Max. Mx	11	-26.08	2370.40	0.43
			Max. My	8	-26.08	0.54	-2385.72
			Max. Vy	11	-28.67	2370.40	0.43
			Max. Vx	8	28.82	0.54	-2385.72
			Max. Torque	3			1.29

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	14	44.10	0.00	-0.00
	Max. H_x	11	26.09	28.66	0.01
	Max. H_z	2	26.09	0.01	28.81
	Max. M_x	2	2385.02	0.01	28.81
	Max. M_z	5	2367.75	-28.66	-0.01
	Max. Torsion	3	1.29	-14.32	24.94
	Min. Vert	1	26.09	0.00	0.00
	Min. H_x	5	26.09	-28.66	-0.01
	Min. H_z	8	26.09	-0.01	-28.81
	Min. M_x	8	-2385.72	-0.01	-28.81
	Min. M_z	11	-2370.40	28.66	0.01
	Min. Torsion	9	-1.28	14.32	-24.94

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	26.09	0.00	0.00	0.35	1.29	0.00
Dead+Wind 0 deg - No Ice	26.09	-0.01	-28.81	-2385.02	2.11	-1.04
Dead+Wind 30 deg - No Ice	26.09	14.32	-24.94	-2065.06	-1182.52	-1.29
Dead+Wind 60 deg - No Ice	26.09	24.82	-14.39	-1191.67	-2049.95	-1.18
Dead+Wind 90 deg - No Ice	26.09	28.66	0.01	1.14	-2367.75	-0.76
Dead+Wind 120 deg - No Ice	26.09	24.83	14.42	1193.74	-2050.73	-0.14
Dead+Wind 150 deg - No Ice	26.09	14.34	24.96	2066.55	-1183.87	0.52
Dead+Wind 180 deg - No Ice	26.09	0.01	28.81	2385.72	0.54	1.04
Dead+Wind 210 deg - No Ice	26.09	-14.32	24.94	2065.76	1185.16	1.28
Dead+Wind 240 deg - No Ice	26.09	-24.82	14.39	1192.38	2052.60	1.18
Dead+Wind 270 deg - No Ice	26.09	-28.66	-0.01	-0.43	2370.40	0.76
Dead+Wind 300 deg - No Ice	26.09	-24.83	-14.42	-1193.03	2053.39	0.14
Dead+Wind 330 deg - No Ice	26.09	-14.34	-24.96	-2065.84	1186.52	-0.52
Dead+Ice+Temp	44.10	-0.00	0.00	1.93	5.86	0.00
Dead+Wind 0	44.10	-0.01	-7.36	-631.47	6.24	-0.41

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
deg+Ice+Temp Dead+Wind 30	44.10	3.66	-6.37	-546.45	-308.66	-0.42
deg+Ice+Temp Dead+Wind 60	44.10	6.34	-3.68	-314.49	-539.27	-0.31
deg+Ice+Temp Dead+Wind 90	44.10	7.33	0.01	2.26	-623.79	-0.12
deg+Ice+Temp Dead+Wind 120	44.10	6.35	3.69	318.93	-539.58	0.10
deg+Ice+Temp Dead+Wind 150	44.10	3.67	6.38	550.66	-309.20	0.29
deg+Ice+Temp Dead+Wind 180	44.10	0.01	7.36	635.37	5.62	0.41
deg+Ice+Temp Dead+Wind 210	44.10	-3.66	6.37	550.35	320.52	0.42
deg+Ice+Temp Dead+Wind 240	44.10	-6.34	3.68	318.39	551.13	0.31
deg+Ice+Temp Dead+Wind 270	44.10	-7.33	-0.01	1.64	635.65	0.13
deg+Ice+Temp Dead+Wind 300	44.10	-6.35	-3.69	-315.03	551.44	-0.10
deg+Ice+Temp Dead+Wind 330	44.10	-3.67	-6.38	-546.76	321.06	-0.29
deg+Ice+Temp Dead+Wind 0 deg - Service	26.09	-0.00	-9.97	-826.06	1.60	-0.36
Dead+Wind 30 deg - Service	26.09	4.96	-8.63	-715.21	-408.81	-0.45
Dead+Wind 60 deg - Service	26.09	8.59	-4.98	-412.62	-709.32	-0.41
Dead+Wind 90 deg - Service	26.09	9.92	0.00	0.62	-819.42	-0.27
Dead+Wind 120 deg - Service	26.09	8.59	4.99	413.79	-709.59	-0.05
Dead+Wind 150 deg - Service	26.09	4.96	8.64	716.18	-409.28	0.18
Dead+Wind 180 deg - Service	26.09	0.00	9.97	826.76	1.06	0.36
Dead+Wind 210 deg - Service	26.09	-4.96	8.63	715.90	411.47	0.45
Dead+Wind 240 deg - Service	26.09	-8.59	4.98	413.32	711.98	0.41
Dead+Wind 270 deg - Service	26.09	-9.92	-0.00	0.08	822.07	0.27
Dead+Wind 300 deg - Service	26.09	-8.59	-4.99	-413.09	712.25	0.05
Dead+Wind 330 deg - Service	26.09	-4.96	-8.64	-715.48	411.94	-0.18

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	-26.09	0.00	0.00	26.09	0.00	0.000%
2	-0.01	-26.09	-28.81	0.01	26.09	28.81	0.000%
3	14.32	-26.09	-24.94	-14.32	26.09	24.94	0.000%
4	24.82	-26.09	-14.39	-24.82	26.09	14.39	0.000%
5	28.66	-26.09	0.01	-28.66	26.09	-0.01	0.000%
6	24.83	-26.09	14.42	-24.83	26.09	-14.42	0.000%
7	14.34	-26.09	24.96	-14.34	26.09	-24.96	0.000%
8	0.01	-26.09	28.81	-0.01	26.09	-28.81	0.000%
9	-14.32	-26.09	24.94	14.32	26.09	-24.94	0.000%
10	-24.82	-26.09	14.39	24.82	26.09	-14.39	0.000%
11	-28.66	-26.09	-0.01	28.66	26.09	0.01	0.000%
12	-24.83	-26.09	-14.42	24.83	26.09	14.42	0.000%
13	-14.34	-26.09	-24.96	14.34	26.09	24.96	0.000%
14	0.00	-44.10	0.00	0.00	44.10	-0.00	0.000%
15	-0.01	-44.10	-7.36	0.01	44.10	7.36	0.000%
16	3.66	-44.10	-6.37	-3.66	44.10	6.37	0.000%
17	6.34	-44.10	-3.68	-6.34	44.10	3.68	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
18	7.33	-44.10	0.01	-7.33	44.10	-0.01	0.000%
19	6.35	-44.10	3.69	-6.35	44.10	-3.69	0.000%
20	3.67	-44.10	6.38	-3.67	44.10	-6.38	0.000%
21	0.01	-44.10	7.36	-0.01	44.10	-7.36	0.000%
22	-3.66	-44.10	6.37	3.66	44.10	-6.37	0.000%
23	-6.34	-44.10	3.68	6.34	44.10	-3.68	0.000%
24	-7.33	-44.10	-0.01	7.33	44.10	0.01	0.000%
25	-6.35	-44.10	-3.69	6.35	44.10	3.69	0.000%
26	-3.67	-44.10	-6.38	3.67	44.10	6.38	0.000%
27	-0.00	-26.09	-9.97	0.00	26.09	9.97	0.000%
28	4.96	-26.09	-8.63	-4.96	26.09	8.63	0.000%
29	8.59	-26.09	-4.98	-8.59	26.09	4.98	0.000%
30	9.92	-26.09	0.00	-9.92	26.09	-0.00	0.000%
31	8.59	-26.09	4.99	-8.59	26.09	-4.99	0.000%
32	4.96	-26.09	8.64	-4.96	26.09	-8.64	0.000%
33	0.00	-26.09	9.97	-0.00	26.09	-9.97	0.000%
34	-4.96	-26.09	8.63	4.96	26.09	-8.63	0.000%
35	-8.59	-26.09	4.98	8.59	26.09	-4.98	0.000%
36	-9.92	-26.09	-0.00	9.92	26.09	0.00	0.000%
37	-8.59	-26.09	-4.99	8.59	26.09	4.99	0.000%
38	-4.96	-26.09	-8.64	4.96	26.09	8.64	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	0.00036257
3	Yes	5	0.00000001	0.00029843
4	Yes	5	0.00000001	0.00031610
5	Yes	4	0.00000001	0.00047078
6	Yes	5	0.00000001	0.00030273
7	Yes	5	0.00000001	0.00030612
8	Yes	4	0.00000001	0.00034984
9	Yes	5	0.00000001	0.00031596
10	Yes	5	0.00000001	0.00029827
11	Yes	4	0.00000001	0.00048388
12	Yes	5	0.00000001	0.00031136
13	Yes	5	0.00000001	0.00030800
14	Yes	4	0.00000001	0.00004951
15	Yes	5	0.00000001	0.00031192
16	Yes	5	0.00000001	0.00035811
17	Yes	5	0.00000001	0.00035903
18	Yes	5	0.00000001	0.00030663
19	Yes	5	0.00000001	0.00035841
20	Yes	5	0.00000001	0.00035922
21	Yes	5	0.00000001	0.00031202
22	Yes	5	0.00000001	0.00036746
23	Yes	5	0.00000001	0.00036462
24	Yes	5	0.00000001	0.00031298
25	Yes	5	0.00000001	0.00036544
26	Yes	5	0.00000001	0.00036645
27	Yes	4	0.00000001	0.00010462
28	Yes	4	0.00000001	0.00084520
29	Yes	4	0.00000001	0.00094788
30	Yes	4	0.00000001	0.00012335
31	Yes	4	0.00000001	0.00086660
32	Yes	4	0.00000001	0.00088757
33	Yes	4	0.00000001	0.00010391
34	Yes	4	0.00000001	0.00095213
35	Yes	4	0.00000001	0.00084621
36	Yes	4	0.00000001	0.00012453
37	Yes	4	0.00000001	0.00092049
38	Yes	4	0.00000001	0.00090252

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	115 - 73.75	25.427	27	2.0890	0.0072
L2	78 - 56.5	11.095	33	1.4382	0.0020
L3	56.5 - 36.75	5.606	33	0.9564	0.0010
L4	42 - 18	3.061	33	0.7196	0.0006
L5	18 - 3	0.480	33	0.2611	0.0002
L6	3 - 0	0.012	33	0.0389	0.0000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
115.00	RR90-17-02DP w/ Mount Pipe	27	25.427	2.0890	0.0072	14827
113.00	(2) LNX-8513DS-VTM w/ Mount Pipe	27	24.579	2.0585	0.0069	14827
100.00	(2) DB980H90E-M w/ Mount Pipe	27	19.151	1.8547	0.0047	4942
92.00	RRUS 11	27	15.993	1.7177	0.0035	3222
90.00	7770.00 w/ Mount Pipe	33	15.238	1.6812	0.0032	2964
59.00	GPS_A	33	6.128	1.0050	0.0010	2702

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	115 - 73.75	73.238	2	6.0153	0.0208
L2	78 - 56.5	31.990	8	4.1470	0.0057
L3	56.5 - 36.75	16.167	8	2.7584	0.0027
L4	42 - 18	8.830	8	2.0758	0.0018
L5	18 - 3	1.385	8	0.7533	0.0006
L6	3 - 0	0.035	8	0.1123	0.0001

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
115.00	RR90-17-02DP w/ Mount Pipe	2	73.238	6.0153	0.0208	5244
113.00	(2) LNX-8513DS-VTM w/ Mount Pipe	2	70.797	5.9279	0.0198	5244
100.00	(2) DB980H90E-M w/ Mount Pipe	2	55.185	5.3434	0.0134	1746
92.00	RRUS 11	2	46.098	4.9502	0.0101	1137
90.00	7770.00 w/ Mount Pipe	8	43.924	4.8456	0.0093	1045
59.00	GPS_A	8	17.673	2.8986	0.0029	942

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	115 - 73.75 (1)	TP27.3x17.81x0.219	41.25	0.00	0.0	39.000	18.4075	-8.90	717.89	0.012
L2	73.75 - 56.5 (2)	TP30.8231x25.8842x0.313	21.50	0.00	0.0	39.000	30.7499	-12.24	1199.25	0.010
L3	56.5 - 36.75 (3)	TP35.36x30.8231x0.4952	19.75	0.00	0.0	31.716	53.6715	-15.35	1702.24	0.009
L4	36.75 - 18 (4)	TP39.0549x33.1636x0.375	24.00	0.00	0.0	39.000	46.7059	-21.01	1821.53	0.012
L5	18 - 3 (5)	TP42.5091x39.0549x0.5186	15.00	0.00	0.0	31.884	70.1197	-25.15	2235.70	0.011
L6	3 - 0 (6)	TP43.2x42.5091x0.573	3.00	0.00	0.0	34.914	78.6467	-26.08	2745.87	0.009

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	115 - 73.75 (1)	TP27.3x17.81x0.219	486.85	49.758	39.000	1.276	0.00	0.000	39.000	0.000
L2	73.75 - 56.5 (2)	TP30.8231x25.8842x0.313	939.39	49.263	39.000	1.263	0.00	0.000	39.000	0.000
L3	56.5 - 36.75 (3)	TP35.36x30.8231x0.4952	1275.97	34.903	31.716	1.100	0.00	0.000	31.716	0.000
L4	36.75 - 18 (4)	TP39.0549x33.1636x0.375	1886.45	51.346	39.000	1.317	0.00	0.000	39.000	0.000
L5	18 - 3 (5)	TP42.5091x39.0549x0.5186	2299.82	38.509	31.884	1.208	0.00	0.000	31.884	0.000
L6	3 - 0 (6)	TP43.2x42.5091x0.573	2385.72	35.122	34.914	1.006	0.00	0.000	34.914	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	115 - 73.75 (1)	TP27.3x17.81x0.219	19.82	1.077	26.000	0.084	0.18	0.009	26.000	0.000
L2	73.75 - 56.5 (2)	TP30.8231x25.8842x0.313	22.37	0.727	26.000	0.057	0.60	0.015	26.000	0.001
L3	56.5 - 36.75 (3)	TP35.36x30.8231x0.4952	24.08	0.449	21.144	0.043	0.71	0.009	21.144	0.000
L4	36.75 - 18 (4)	TP39.0549x33.1636x0.375	26.69	0.571	26.000	0.045	0.88	0.011	26.000	0.000
L5	18 - 3 (5)	TP42.5091x39.0549x0.5186	28.45	0.406	21.256	0.039	1.01	0.008	21.256	0.000
L6	3 - 0 (6)	TP43.2x42.5091x0.573	28.82	0.366	23.276	0.032	1.04	0.007	23.276	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

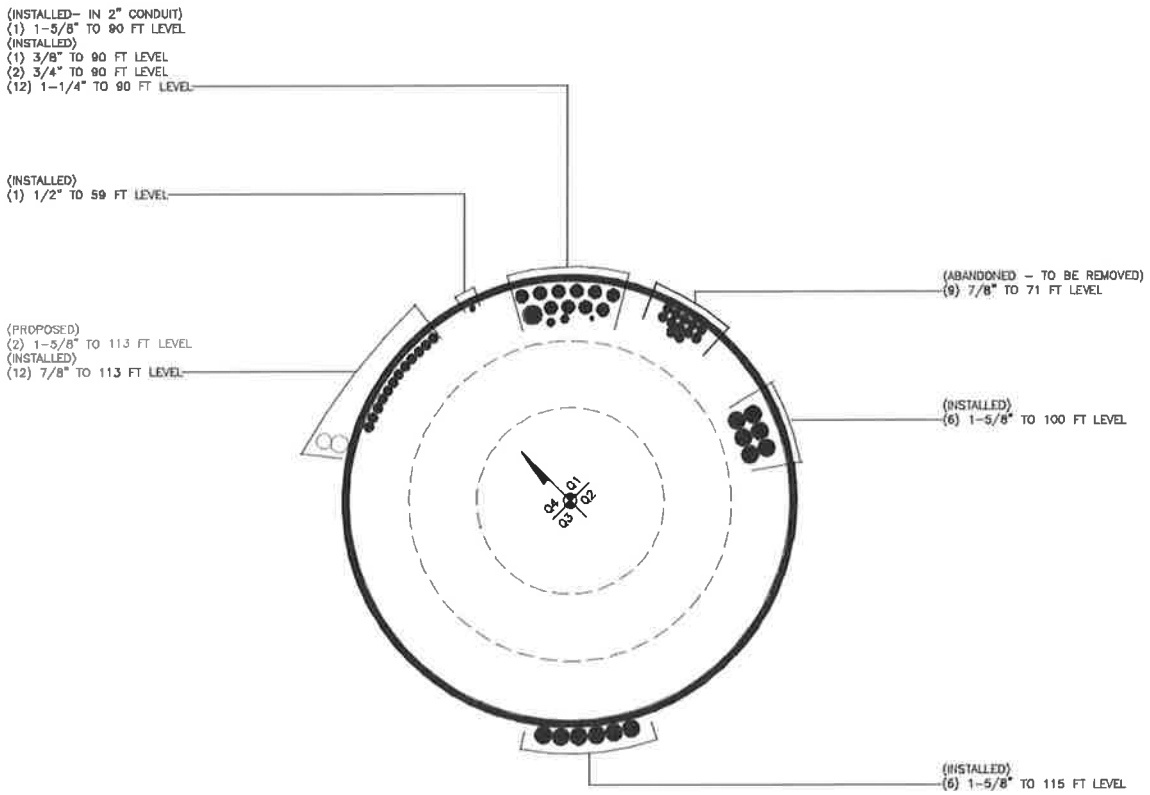
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	115 - 73.75 (1)	0.012	1.276	0.000	0.084	0.000	1.290 ✔	1.333	H1-3+VT ✔
L2	73.75 - 56.5 (2)	0.010	1.263	0.000	0.057	0.001	1.274 ✔	1.333	H1-3+VT ✔
L3	56.5 - 36.75 (3)	0.009	1.100	0.000	0.043	0.000	1.110 ✔	1.333	H1-3+VT ✔
L4	36.75 - 18 (4)	0.012	1.317	0.000	0.045	0.000	1.329 ✔	1.333	H1-3+VT ✔
L5	18 - 3 (5)	0.011	1.208	0.000	0.039	0.000	1.219 ✔	1.333	H1-3+VT ✔
L6	3 - 0 (6)	0.009	1.006	0.000	0.032	0.000	1.016 ✔	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	115 - 73.75	Pole	TP27.3x17.81x0.219	1	-8.90	956.95	96.8	Pass
L2	73.75 - 56.5	Pole	TP30.8231x25.8842x0.313	2	-12.24	1598.60	95.6	Pass
L3	56.5 - 36.75	Pole	TP35.36x30.8231x0.4952	3	-15.35	2269.09	83.3	Pass
L4	36.75 - 18	Pole	TP39.0549x33.1636x0.375	4	-21.01	2428.10	99.7	Pass
L5	18 - 3	Pole	TP42.5091x39.0549x0.5186	5	-25.15	2980.19	91.5	Pass
L6	3 - 0	Pole	TP43.2x42.5091x0.573	6	-26.08	3660.24	76.2	Pass
							Summary	
						Pole (L4)	99.7	Pass
						RATING =	**99.7**	**Pass**

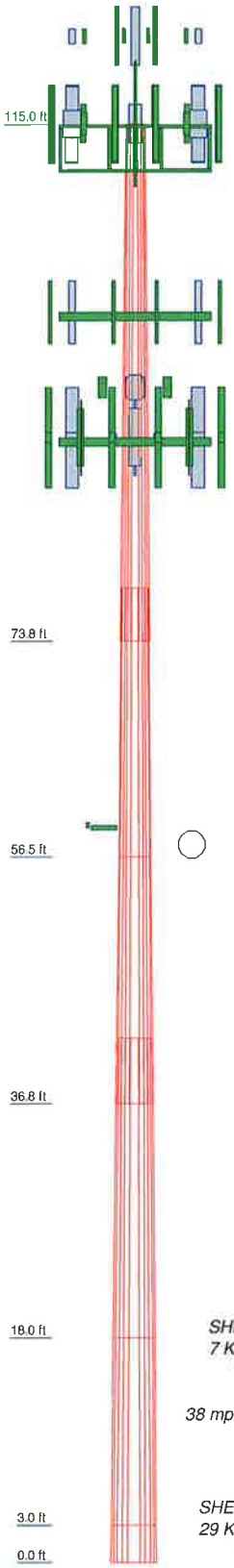
APPENDIX B

BASE LEVEL DRAWING

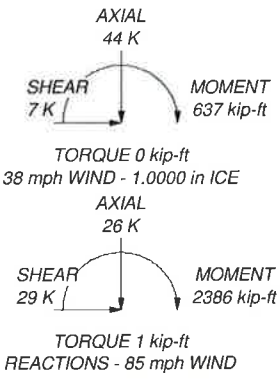

(INSTALLED- IN 2" CONDUIT)
(1) 1-5/8" TO 90 FT LEVEL
(INSTALLED)
(1) 3/8" TO 90 FT LEVEL
(2) 3/4" TO 90 FT LEVEL
(12) 1-1/4" TO 90 FT LEVEL
(INSTALLED)
(1) 1/2" TO 59 FT LEVEL
(PROPOSED)
(2) 1-5/8" TO 113 FT LEVEL
(INSTALLED)
(12) 7/8" TO 113 FT LEVEL
(ABANDONED - TO BE REMOVED)
(9) 7/8" TO 71 FT LEVEL
(INSTALLED)
(6) 1-5/8" TO 100 FT LEVEL
(INSTALLED)
(6) 1-5/8" TO 115 FT LEVEL
A1
A2
A3
A4

APPENDIX C

ADDITIONAL CALCULATIONS



Section	1	2	3	4	5	6
Length (ft)	41.25	21.50	19.75	24.00	15.00	3.00
Number of Sides	12	12	12	12	12	12
Thickness (in)	0.2190	0.3130	0.4952	0.3750	0.5186	0.5609
Socket Length (ft)	4.25	5.25				
Top Dia (in)	17.8100	25.8842	30.8231	33.1636	39.0549	42.5091
Bot Dia (in)	27.3000	30.8231	35.3600	39.0549	42.5091	43.2000
Grade	A572-65	A572-65	Reinf 52.86 ksi	A572-65	Reinf 53.14 ksi	Reinf 59.99 ksi
Weight (K)	2.2	2.1	3.5	3.5	3.4	0.8
					15.5	



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
RR90-17-02DP w/ Mount Pipe	115	Platform Mount [LP 1201-1]	100
RR90-17-02DP w/ Mount Pipe	115	RRUS 11	92
RR90-17-02DP w/ Mount Pipe	115	RRUS 11	92
(2) GSM PCS 1900 MASTHEAD AMPLIFIER	115	RRUS 11	92
		DC6-48-60-18-8F	92
(2) GSM PCS 1900 MASTHEAD AMPLIFIER	115	5' x 2" Pipe Mount	92
		5' x 2" Pipe Mount	92
(2) GSM PCS 1900 MASTHEAD AMPLIFIER	115	5' x 2" Pipe Mount	92
		Side Arm Mount [SO 102-3]	92
Pipe Mount [PM 601-3]	115	7770.00 w/ Mount Pipe	90
8' x 3" Mount Pipe	115	7770.00 w/ Mount Pipe	90
(2) LNX-8513DS-VTM w/ Mount Pipe	113	7770.00 w/ Mount Pipe	90
(2) LNX-8513DS-VTM w/ Mount Pipe	113	(2) P65-17-XLH-RR w/ Mount Pipe	90
(2) LNX-8513DS-VTM w/ Mount Pipe	113	(2) P65-17-XLH-RR w/ Mount Pipe	90
(2) HBXX-6517DS-VTM w/ Mount Pipe	113	(2) P65-17-XLH-RR w/ Mount Pipe	90
(2) HBXX-6517DS-VTM w/ Mount Pipe	113	(4) LGP13519	90
(2) HBXX-6517DS-VTM w/ Mount Pipe	113	(2) LGP13519	90
RRH2X60-AWS	113	(2) LGP13519	90
RRH2x60-AWS	113	(2) DTMABP7819VG12A	90
RRH2X60-AWS	113	(2) DTMABP7819VG12A	90
RRH2X60-PCS	113	(2) DTMABP7819VG12A	90
RRH2X60-PCS	113	6' x 2" Mount Pipe	90
RRH2X60-PCS	113	6' x 2" Mount Pipe	90
(2) DB-B1-6C-12AB-0Z	113	6' x 2" Mount Pipe	90
Platform Mount [LP 602-1]	113	Platform Mount [LP 601-1]	90
(2) DB980H90E-M w/ Mount Pipe	100	GPS_A	59
(2) DB980H90E-M w/ Mount Pipe	100	4' x 2" Pipe Mount	59
(2) DB980H90E-M w/ Mount Pipe	100	Side Arm Mount [SO 701-1]	59

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi	Reinf 53.14 ksi	53 ksi	67 ksi
Reinf 52.86 ksi	53 ksi	67 ksi	Reinf 59.99 ksi	60 ksi	75 ksi

TOWER DESIGN NOTES

1. Tower is located in Tolland 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 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 99.7%

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

Job:	115 FT Monopole, Stafford, CT
Project:	BU #806365 PJF #37515-0530
Client: Crown Castle	Drawn by: Chris Poelking App'd:
Code: TIA/EIA-222-F	Date: 02/24/15 Scale: NTS
Path:	Dwg No. E-1

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

TIA Rev F

Site Data

BU#: *806365*
Site Name: *HRT 303 943203*
App #:

Pole Manufacturer:	*Other*

Reactions		
Moment:	2386	ft-kips
Axial:	26	kips
Shear:	29	kips

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

Anchor Rod Data		
Qty:	12	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	51.23	in

Anchor Rod Results

Maximum Rod Tension:	184.1 Kips	Rigid
Allowable Tension:	195.0 Kips	Service, ASD
Anchor Rod Stress Ratio:	94.4% Pass	Fty*ASIF

Plate Data		
Diam:	57.23	in
Thick:	2.625	in
Grade:	60	ksi
Single-Rod B-eff:	11.58	in

Base Plate Results

	Flexural Check	Rigid
Base Plate Stress:	36.2 ksi	Service ASD
Allowable Plate Stress:	60.0 ksi	0.75*Fy*ASIF
Base Plate Stress Ratio:	60.3% Pass	Y.L. Length: 27.54

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

n/a

Stiffener Results

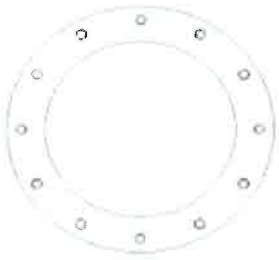
Horizontal Weld :	n/a
Vertical Weld:	n/a
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	n/a
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	n/a
Plate Comp. (AISC Bracket):	n/a

Pole Results

Pole Punching Shear Check: n/a

Pole Data		
Diam:	43.2	in
Thick:	0.375	in
Grade:	65	ksi
# of Sides:	12	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Stress Increase Factor		
ASIF:	1.333	



* 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

PJF job no. **37515-0530.002** Project name **BU 806365**

Foundation Loads:

Pole weight or tower leg compression =	26	(kips)
Horizontal load at top of pier =	29	(kips)
Overturning moment at top of pier=	2386	(ft-kips)

Design criteria:

Safety factor against overturning =	2	

Soil Properties:

Soil density =	135	(pcf)
Allowable soil bearing =	10	(ksf)
Depth to water table =	5	(ft)

Dimensions:

Pier shape (round or square)	R	("R" or "S")
Pier width =	7	(ft)
Pier height above grade =	0.6667	(ft)
depth to bottom of footing =	10.333	(ft)
Footing thickness =	5.0833	(ft)
Footing width =	28	(ft)
Footing length =	28	(ft)

Concrete:

Concrete strength =	3	(ksi)
Rebar strength =	60	(ksi)
ultimate load factor =	1.3	

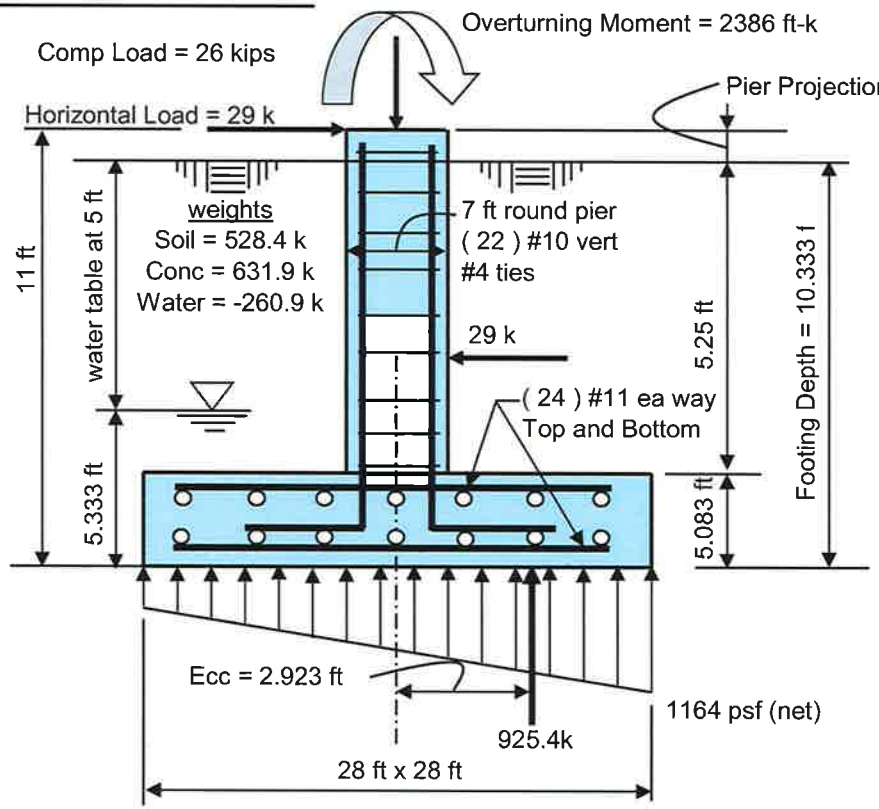
Reinforcing Steel:

	Pad	
minimum cover over rebar =	3	inches
size of pad rebar =	#11	bar
quantity of pad rebar =	24	(ea direction)

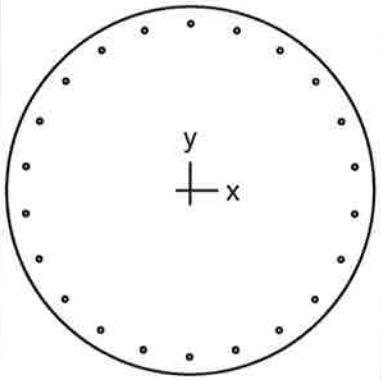
Reinforcing Steel:

	Pier	
size of vert rebar in pier=	#10	bar
vertical rebar quantity =	22	
size of pier ties =	#4	bar
minimum cover over rebar =	3	inches

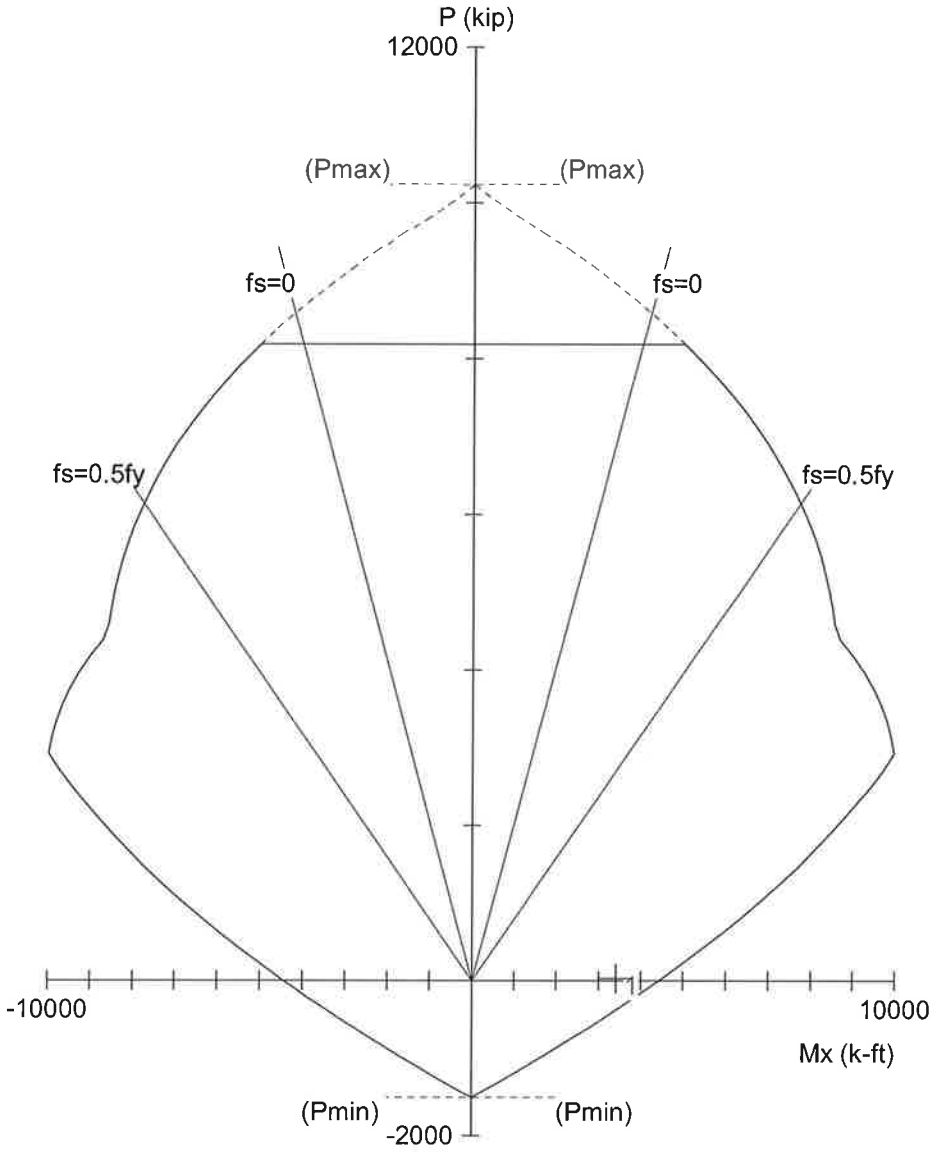
Total volume of concrete = #### cu yd



Summary of analysis results	
Maximum Net Soil Bearing = 1.164 ksf Allowable Net Soil Bearing = 10 ksf **Soil Bearing Stress Ratio = 0.12 Okay**	Ult Bending Shear Capacity = 110 psi Ult Bending Shear Stress = 11 psi **Bending Shear Stress Ratio = 0.1 Okay**
Ftg Overturning Resistance = 12956 ft-kips Overturning Moment = 2705 ft-kips Required Overturning Safety Factor = 2 Overturning Safety Factor = 4.79 **Ratio = 0.42 Okay**	Pad Bending Moment Capacity= 9203 ft-k Pad Bending Moment = 1197 ft-k **Bending Moment Stress Ratio = 0.13 OK**



84 in diam.



Code: ACI 318-11

Units: English

Run axis: About X-axis

Run option: Investigation

Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 02/24/15

Time: 08:54:49

File: G:\TOWER\375_Crown_Castle\2015\37515-0530_806365...\37515-0530.002.7700 - Foundation Reinforcement.col

Project:

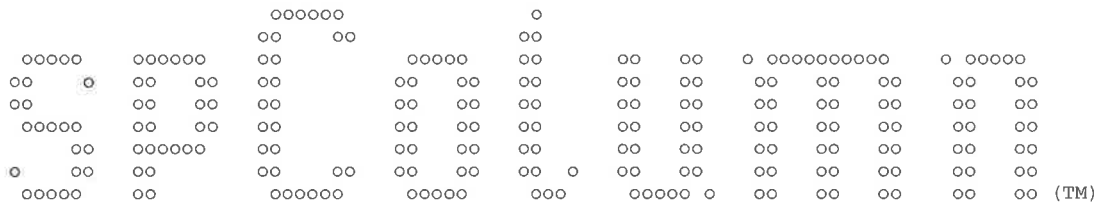
Column:

Engineer:

f'c = 3 ksi	fy = 60 ksi	Ag = 5541.77 in^2	22 #10 bars
Ec = 3122 ksi	Es = 29000 ksi	As = 27.94 in^2	rho = 0.50%
fc = 2.55 ksi		Xo = 0.00 in	Ix = 2.44392e+006 in^4
e_u = 0.003 in/in		Yo = 0.00 in	Iy = 2.44392e+006 in^4
Beta1 = 0.85		Min clear spacing = 9.54 in	Clear cover = 3.38 in

Confinement: Tied

phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65



General Information:

File Name: G:\TOWER\375_Crown_Castle\2015\3751...\37515-0530.002.7700 - Foundation Reinforcement.col
Project:
Column: Engineer:
Code: ACI 318-11 Units: English

Run Option: Investigation Slenderness: Not considered
Run Axis: X-axis Column Type: Structural

Material Properties:

f'c = 3 ksi fy = 60 ksi
Ec = 3122.02 ksi Es = 29000 ksi
Ultimate strain = 0.003 in/in
Beta1 = 0.85

Section:

Circular: Diameter = 84 in

Gross section area, Ag = 5541.77 in^2
Ix = 2.44392e+006 in^4 Iy = 2.44392e+006 in^4
rx = 21 in ry = 21 in
Xo = 0 in Yo = 0 in

Reinforcement:

Bar Set: ASTM A615

Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)
# 3	0.38	0.11	# 4	0.50	0.20	# 5	0.63	0.31
# 6	0.75	0.44	# 7	0.88	0.60	# 8	1.00	0.79
# 9	1.13	1.00	# 10	1.27	1.27	# 11	1.41	1.56
# 14	1.69	2.25	# 18	2.26	4.00			

Confinement: Tied; #3 ties with #10 bars, #4 with larger bars.
phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65

Layout: Circular
Pattern: All Sides Equal (Cover to transverse reinforcement)
Total steel area: As = 27.94 in^2 at rho = 0.50% (Note: rho < 1.0%)
Minimum clear spacing = 9.54 in

22 #10 Cover = 3 in

Factored Loads and Moments with Corresponding Capacities:

No.	Pu kip	Mux k-ft	PhiMnx k-ft	PhiMn/Mu	NA depth in	Dt depth in	eps_t	Phi
1	26.00	3409.26	4497.26	1.319	12.45	79.99	0.01628	0.900

*** End of output ***

37515-0530.002.DWG

MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

BU NUMBER; SITE NAME

BU #806365; HRT 303 943203

APP: 281658 REV. 2; WO: 1012571

SITE ADDRESS

BRENDON & QUINN STREETS

STAFFORD, CONNECTICUT 06076

TOLLAND COUNTY

PROJECT NOTES

1. THESE DRAWINGS WERE PREPARED FROM INFORMATION AND DOCUMENTS PROVIDED BY CROWN CASTLE. THE INFORMATION PROVIDED HAS NOT BEEN FIELD VERIFIED BY THE ENGINEER OF RECORD (EOR) FOR ACCURACY AND THEREFORE DISCREPANCIES BETWEEN THESE DRAWINGS AND ACTUAL SITE CONDITIONS SHOULD BE ANTICIPATED. DETAILED FIELD INFORMATION REGARDING INTERFERENCES AND/OR EXISTING FIELD CONDITIONS MAY BE AVAILABLE ON CROWN CASTLE'S CCISITES AND FROM CONTRACTOR'S PRE-MOD MAPPING. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS AND COORDINATE WITH THE AVAILABLE SOURCES OF INFORMATION ABOVE AND WITH THE PROJECT DRAWINGS BEFORE PROCEEDING WITH THE WORK. CONTRACTOR SHALL IMMEDIATELY REPORT ANY AND ALL DISCREPANCIES TO THE EOR AND CROWN CASTLE FIELD PERSONNEL BEFORE PROCEEDING WITH THE WORK.
2. ALL STRUCTURAL BOLTS SHALL BE INSTALLED AND TIGHTENED TO THE PRETENSIONED CONDITION ACCORDING TO THE REQUIRMENTS OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009.
3. ALL STRUCTURAL BOLTS SHALL BE FIELD INSPECTED ACCORDING TO THE REQUIREMENTS OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009.
4. DTI'S REQUIRED: ALL ONE SIDED BOLTS SHALL BE INSTALLED USING DIRECT TENSION INDICATORS (DTI'S) AND HARDENED WASHERS. ALL ONE SIDED BOLTS SHALL BE PRETENSIONED AND TIGHTENED UNTIL THE DTI WASHERS SHOW THAT THE PROPER BOLT TENSION HAS BEEN REACHED. SEE NOTES AND DETAILS ON SHEET S-2 FOR REQUIREMENTS ON THE USE OF DTI WASHERS WITH THE BOLTS.
5. NDE OF THE CIRCUMFERENTIAL WELD OF THE BASE PLATE TO SHAFT CONNECTION IS REQUIRED. SEE CCI DOCUMENTS ENG-SOW-10033 *'TOWER BASE PLATE NDE'* AND ENG-BUL-10051 *'NDE REQUIREMENTS FOR MONOPOLE BASE PLATE TO PREVENT CONNECTION FAILURE'*. NOTIFY THE EOR AND CROWN CASTLE ENGINEERING IMMEDIATELY IF ANY CRACKS ARE SUSPECTED OR HAVE BEEN IDENTIFIED. THE NDE SHALL INCLUDE ALL EXISTING REINFORCEMENTS THAT HAVE BEEN WELDED TO THE BASE PLATE. ANY FULL PENETRATION WELDING TO THE BASE PLATE REQUIRED AS PART OF THIS ACTIVE REINFORCEMENT DESIGN SHALL BE INCLUDED IN THE NDE SCOPE OF WORK.

PROJECT CONTACT:

MONOPOLE OWNER:
CROWN CASTLE
MOD PM: JOHN MCGEE AT JOHN.MCGEE@CROWNCASTLE.COM
PH: (704) 877-8397

DESIGN STANDARD

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.

REFER TO THE POLE DESIGN AND ANTENNA LOADING DOCUMENTED IN THE PJF STRUCTURAL ANALYSIS FOR THIS SITE (PJF#37515-0530.002.7700), DATED 3/3/2015.

THIS PROJECT INCLUDES THE FOLLOWING ITEMS:

- SHAFT REINFORCING
- FIELD WELDED STIFFENERS
- REMOVE ABANDONED EQUIPMENT AT 71'-0".

SHEET INDEX

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STATE OF CONNECTICUT
KRISTIN T. KLINE
No. 30301
LICENSED
PROFESSIONAL ENGINEER

3.3.15

PAUL J. FORD AND COMPANY
STRUCTURAL ENGINEERS
250 East Broad Street · Suite 600 · Columbus, Ohio 43215
(614) 221-6679 www.pjfweb.com

CROWN CASTLE
3530 TORINGDON WAY SUITE 300, CHARLOTTE, NC 28277
PH: (724) 416-2000

BU #806365; HRT 303 943203
STAFFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0530.002.7700

DRAWN BY: CAW	TITLE SHEET
CHECKED BY: CP	
APPROVED BY:	T-1
DATE: 3/3/2015	

37515-0530.002.DWG

CROWN CASTLE PROJECT: BU #806365; HRT 303 943203; STAFFORD, CONNECTICUT
MONOPOLE RETROFIT PROJECT MASTER NOTES DOCUMENT (REV. 3, 02/05/2015)

1. **GENERAL NOTES**

1.1. THE MONOPOLE STRUCTURE IN ITS EXISTING CONDITION DOES NOT HAVE THE STRUCTURAL CAPACITY TO CARRY ALL OF THE ANTENNA AND PLATFORM LOADS SHOWN ON THESE DRAWINGS AT THE REQUIRED MINIMUM WIND SPEEDS. DO NOT INSTALL ANY ADDITIONAL OR NEW ANTENNA AND PLATFORM LOADS UNTIL THE MONOPOLE REINFORCING SYSTEM IS COMPLETELY AND SUCCESSFULLY INSTALLED.

1.2. IF MATERIALS, QUANTITIES, STRENGTHS OR SIZES INDICATED BY THE DRAWINGS OR SPECIFICATIONS ARE NOT IN AGREEMENT WITH THESE NOTES, THE BETTER QUALITY AND/OR GREATER QUANTITY, STRENGTH OR SIZE INDICATED, SPECIFIED OR NOTED SHALL BE PROVIDED.

1.3. THIS STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER THE INSTALLATION OF THE REINFORCING REPAIR SYSTEM HAS BEEN SUCCESSFULLY COMPLETED. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO ENSURE THE SAFETY AND STABILITY OF THE MONOPOLE AND ITS COMPONENT PARTS DURING FIELD MODIFICATIONS. THIS INCLUDES, BUT IS NOT LIMITED TO, THE ADDITION OF WHATEVER TEMPORARY BRACING, GUYS OR TIE DOWNS THAT MAY BE NECESSARY. SUCH MATERIAL SHALL BE REMOVED AND SHALL REMAIN THE PROPERTY OF THE CONTRACTOR AFTER THE COMPLETION OF THE PROJECT.

1.4. THE STRUCTURAL CONTRACT DOCUMENTS DO NOT INDICATE THE METHOD OR MEANS OF CONSTRUCTION. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK AND SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES. OBSERVATION VISITS TO THE SITE BY CROWN CASTLE AND/OR THE EOR SHALL NOT INCLUDE INSPECTIONS OF THE PROTECTIVE MEASURES OR THE CONSTRUCTION PROCEDURES.

1.5. ANY SUPPORT SERVICES PERFORMED BY THE EOR DURING CONSTRUCTION ARE SOLELY FOR THE PURPOSE OF ASSISTING IN QUALITY CONTROL AND IN ACHIEVING GENERAL CONFORMANCE WITH CONTRACT DOCUMENTS. THEY DO NOT GUARANTEE CONTRACTOR'S PERFORMANCE AND SHALL NOT BE CONSTRUED AS SUPERVISION OF CONSTRUCTION.

1.6. ALL MATERIALS AND EQUIPMENT FURNISHED SHALL BE NEW AND OF GOOD QUALITY, FREE FROM FAULTS AND DEFECTS AND IN CONFORMANCE WITH THE CONTRACT DOCUMENTS. ANY AND ALL SUBSTITUTIONS MUST BE PROPERLY APPROVED AND AUTHORIZED IN WRITING BY CROWN CASTLE AND EOR PRIOR TO INSTALLATION. THE CONTRACTOR SHALL FURNISH SATISFACTORY EVIDENCE AS TO THE KIND AND QUALITY OF MATERIALS AND EQUIPMENT BEING SUBSTITUTED.

1.7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INITIATING, MAINTAINING, AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE WORK. THE CONTRACTOR IS RESPONSIBLE TO ENSURE THAT THIS PROJECT AND RELATED WORK COMPLIES WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL SAFETY CODES AND REGULATIONS GOVERNING THIS WORK AS WELL AS CROWN CASTLE SAFETY GUIDELINES.

1.8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING AND NEW COAXIAL CABLES AND OTHER EQUIPMENT DURING CONSTRUCTION.

1.9. ANY EXISTING ATTACHMENTS AND/OR PROJECTIONS ON THE POLE THAT MAY INTERFERE WITH THE INSTALLATION OF THE REINFORCING SYSTEM WILL HAVE TO BE REMOVED AND RELOCATED, REPLACED, OR RE-INSTALLED AS REQUIRED AFTER THE REINFORCING IS SUCCESSFULLY COMPLETED. THE CONTRACTOR SHALL IDENTIFY AND COORDINATE THESE ITEMS PRIOR TO CONSTRUCTION WITH CROWN CASTLE, TESTING AGENCY, AND EOR.

1.10. ANY AND ALL EXISTING PLATFORMS THAT ARE LOCATED IN AREAS OF THE POLE SHAFT WHERE SHAFT REINFORCING MUST BE APPLIED SHALL BE TEMPORARILY REMOVED OR OTHERWISE SUPPORTED TO PERMIT NEW CONTINUOUS REINFORCEMENT TO BE ATTACHED. AFTER THE CONTRACTOR HAS SUCCESSFULLY INSTALLED THE MONOPOLE REINFORCEMENT SYSTEM, THE CONTRACTOR SHALL RE-INSTALL THE PLATFORMS.

2. **STRUCTURAL STEEL**

2.1. STRUCTURAL STEEL MATERIALS, FABRICATION, DETAILING, AND WORKMANSHIP SHALL CONFORM TO THE LATEST EDITION OF THE FOLLOWING REFERENCE STANDARDS:

2.1.1. BY THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC):

2.1.1.1. "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS."

2.1.1.2. SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM HIGH STRENGTH BOLTS," AS APPROVED BY THE RESEARCH COUNCIL ON STRUCTURAL CONNECTIONS.

2.1.1.3. "CODE OF STANDARD PRACTICE FOR STEEL BUILDINGS AND BRIDGES" (PARAGRAPH 4.2.1 SPECIFICALLY EXCLUDED).

2.1.2. BY THE AMERICAN WELDING SOCIETY (AWS):

2.1.2.1. "STRUCTURAL WELDING CODE – STEEL D1.1."

2.1.2.2. "STANDARD SYMBOLS FOR WELDING, BRAZING, AND NONDESTRUCTIVE EXAMINATION"

2.2. ANY MATERIAL OR WORKMANSHIP WHICH IS OBSERVED TO BE DEFECTIVE OR INCONSISTENT WITH THE CONTRACT DOCUMENTS SHALL BE CORRECTED, MODIFIED, OR REPLACED AT THE CONTRACTOR'S EXPENSE.

2.3. WELDED CONNECTIONS SHALL CONFORM TO THE LATEST REVISED CODE OF THE AMERICAN WELDING SOCIETY, AWS D1.1. ALL WELD ELECTRODES SHALL BE E80XX UNLESS NOTED OTHERWISE ON THE DRAWINGS.

2.4. ALL WELDED CONNECTIONS SHALL BE MADE BY WELDERS CERTIFIED BY AWS. CONTRACTOR SHALL SUBMIT WELDERS' CERTIFICATION AND QUALIFICATION DOCUMENTATION TO CROWN CASTLE'S TESTING AGENCY FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.

2.5. STRUCTURAL STEEL PLATES SHALL CONFORM TO ASTM A572 GRADE 65(FY = 65 KSI MIN.) UNLESS NOTED OTHERWISE ON THE DRAWINGS.

2.6. SURFACES OF EXISTING STEEL SHALL BE PREPARED AS REQUIRED FOR FIELD WELDING PER AWS. SEE SECTION I NOTES REGARDING TOUCH UP OF GALVANIZED SURFACES DAMAGED DURING TRANSPORTATION OR ERECTION AND ASSEMBLY AS WELL AS FIELD WELDING.

2.7. NO WELDING SHALL BE DONE TO THE EXISTING STRUCTURE WITHOUT THE PRIOR APPROVAL AND SUPERVISION OF THE TESTING AGENCY.

2.8. FIELD CUTTING OF STEEL:

2.8.1. IMPORTANT CUTTING AND WELDING SAFTEY GUIDELINES: THE CONTRACTOR SHALL FOLLOW ALL CROWN CASTLE CUTTING, WELDING, FIRE PREVENTION AND SAFTEY GUIDELINES. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL OBTAIN A COPY OF THE CURRENT CROWN CASTLE GUIDELINES. PER THE 12-01-2005 CROWN CASTLE DIRECTIVE: "ALL CUTTING AND WELDING ACTIVITIES SHALL BE CONDUCTED IN ACCORDANCE WITH CROWN CASTLE POLICY 'CUTTING AND WELDING SAFETY PLAN' (DOC #ENG-PLN-10015) ON AN ONGOING BASIS THROUGHOUT THE ENTIRE LIFE OF THE PROJECT". ANY DAMAGE TO THE COAX CABLES, AND/OR OTHER EQUIPMENT AND/OR THE STRUCTURE, RESULTING FROM THE CONTRACTOR'S ACTIVITIES SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE. THE INSPECTION/TESTING AGENCY SHALL CLOSELY AND CONTINUOUSLY MONITOR THIS ACTIVITY.

2.8.2. ALL REQUIRED CUTS SHALL BE CUT WITHIN THE DIMENSIONS SHOWN ON THE DRAWINGS. NO CUTS SHALL EXTEND BEYOND THE OUTLINE OF THE DIMENSIONS SHOWN ON THE DRAWINGS. ALL CUT EDGES SHALL BE GROUND SMOOTH AND DE-BURRED. CUT EDGES THAT ARE TO BE FIELD WELDED SHALL BE PREPARED FOR FIELD WELDING PER AWS D1.1 AND AS SHOWN ON THE DRAWINGS. CONTRACTOR TO AVOID 90 DEGREE CORNERS. IT MAY BE NECESSARY TO DRILL STARTER HOLES AS REQUIRED TO MAKE THE CUTS.

3. **BASE PLATE GROUT - (NOT REQUIRED)**

4. **FOUNDATION WORK - (NOT REQUIRED)**

5. **CAST-IN-PLACE CONCRETE - (NOT REQUIRED)**

6. **EPOXY GROUTED REINFORCING ANCHOR RODS - (NOT REQUIRED)**

7. **TOUCH UP OF GALVANIZING**

7.1. THE CONTRACTOR SHALL TOUCH UP ANY AND ALL AREAS OF GALVANIZING ON THE EXISTING STRUCTURE OR NEW COMPONENTS THAT ARE DAMAGED OR ABRADED DURING CONSTRUCTION. GALVANIZED SURFACES DAMAGED DURING TRANSPORTATION OR ERECTION AND ASSEMBLY AS WELL AS ANY AND ALL ABRASIONS, CUTS, FIELD DRILLING, AND ALL FIELD WELDING SHALL BE TOUCHED UP WITH TWO (2) COATS OF ZRC COLD GALVANIZING COMPOUND. FILM THICKNESS PER COAT SHALL BE: WET 3.0 MILS; DRY 1.5 MILS. APPLY PER ZRC MANUFACTURER RECOMMENDED PROCEDURES. CONTACT ZRC AT 1-800-831-3275 FOR PRODUCT INFORMATION.

7.2. CONTRACTOR SHALL CLEAN AND PREPARE ALL FIELD WELDS ON GALVANIZED AND PRIME PAINTED SURFACES FOR TOUCH-UP COATING IN ACCORDANCE WITH AWS D1.1. CROWN CASTLE'S TESTING AGENCY SHALL VERIFY THE PREPARED SURFACE PRIOR TO APPLICATION OF THE TOUCH-UP COATING.

7.3. CROWN CASTLE'S TESTING AGENCY SHALL TEST AND VERIFY THE COATING THICKNESS AFTER THE CONTRACTOR HAS APPLIED THE ZRC COLD GALVANIZING COMPOUND AND IT HAS SUFFICIENTLY DRIED. AREAS FOUND TO BE ADEQUATELY COATED, SHALL BE RE-COATED BY THE CONTRACTOR AND RE-TESTED BY THE TESTING AGENCY.

8. **HOT-DIP GALVANIZING**

8.1. HOT-DIP GALVANIZE ALL STRUCTURAL STEEL MEMBERS AND ALL STEEL ACCESSORIES, BOLTS, WASHERS, ETC. PER ASTM A123 OR PER ASTM A153, AS APPROPRIATE.

8.2. PROPERLY PREPARE STEEL ITEMS FOR GALVANIZING.

8.3. DRILL OR PUNCH WEEP AND/OR DRAINAGE HOLES WITH EOR APPROVAL OF LOCATIONS.

8.4. ALL GALVANIZING SHALL BE DONE AFTER FABRICATION IS COMPLETED AND PRIOR TO FIELD INSTALLATION.

9. **PERPETUAL INSPECTION AND MAINTENANCE BY THE OWNER**

9.1. AFTER THE CONTRACTOR HAS SUCCESSFULLY COMPLETED THE INSTALLATION OF THE MONOPOLE REINFORCING SYSTEM AND THE WORK HAS BEEN ACCEPTED BY CROWN CASTLE, CROWN CASTLE WILL BE RESPONSIBLE FOR THE LONG TERM AND PERPETUAL INSPECTION AND MAINTENANCE OF THE POLE AND REINFORCING SYSTEM.

9.2. ANY FIELD WELDED CONNECTIONS ARE SUBJECT TO CORROSION DAMAGE AND DETERIORATION IF THEY ARE NOT PROPERLY MAINTAINED AND COVERED WITH CORROSION PREVENTIVE COATING SUCH AS THE ZRC GALVANIZING COMPOUND SPECIFIED PREVIOUSLY. THE STRUCTURAL LOAD CARRYING CAPACITY OF THE REINFORCED POLE SYSTEM IS DEPENDENT UPON THE INSTALLED SIZE AND QUALITY, MAINTAINED SOUND CONDITION AND STRENGTH OF THESE FIELD WELDED CONNECTIONS. ANY CORROSION OF, DAMAGE TO, FATIGUE, FRACTURE, AND/OR DETERIORATION OF THESE WELDS AND/OR THE EXISTING GALVANIZED STEEL POLE STRUCTURE AND THE WELDED COMPONENTS WILL RESULT IN THE LOSS OF STRUCTURAL LOAD CARRYING CAPACITY AND MAY LEAD TO FAILURE OF THE STRUCTURAL SYSTEM. THEREFORE, IT IS IMPERATIVE THAT CROWN CASTLE REGULARLY INSPECTS, MAINTAINS, AND REPAIRS AS NECESSARY, ALL OF THESE WELDS, CONNECTIONS, AND COMPONENTS FOR THE LIFE OF THE STRUCTURE.

9.3. CROWN CASTLE SHALL REFER TO ANSI/TIA-222-G-2-2009, SECTION 14 AND ANNEX J FOR RECOMMENDATIONS FOR MAINTENANCE AND INSPECTION. THE FREQUENCY OF THE INSPECTION AND MAINTENANCE INTERVALS IS TO BE DETERMINED BY CROWN CASTLE BASED UPON ACTUAL SITE AND ENVIRONMENTAL CONDITIONS. THE EOR RECOMMENDS THAT A COMPLETE AND THOROUGH INSPECTION OF THE ENTIRE REINFORCED MONOPOLE STRUCTURAL SYSTEM BE PERFORMED YEARLY AND/OR AS FREQUENTLY AS CONDITIONS WARRANT. ACCORDING TO ANSI/TIA-222-G-2-2009 SECTION 14.2: "IT IS RECOMMENDED THAT THE STRUCTURE BE INSPECTED AFTER SEVER WIND AND/OR ICE STORMS OR OTHER EXTREME LOADING CONDITIONS".

STATE OF CONNECTICUT
JUSTIN T. KLINE
No. 30303
LICENSED
PROFESSIONAL ENGINEER

3-3-15

PAUL J. FORD AND COMPANY
STRUCTURAL ENGINEERS
250 East Broad Street · Suite 600 · Columbus, Ohio 43215
(614) 221-6679 www.pjfweb.com

CROWN CASTLE
3530 TORINGDON WAY SUITE 300, CHARLOTTE,NC 28277
PH: (724) 416-2000

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MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0530.002.7700

DRAWN BY: CAW	GENERAL NOTES
CHECKED BY: CP	
APPROVED BY: JK	S-1
DATE: 3/3/2015	

37515-0530.002.DWG

AJAX BOLT NOTE SHEET: REV. 1.5, 5-12-2014

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

2. ALL STRUCTURAL BOLTS SHALL BE INSPECTED ACCORDING TO THE REQUIREMENTS OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009.

3. ALL AJAX M20 BOLTS WITH SHEAR SLEEVES SHALL BE PRETENSIONED AND TIGHTENED UNTIL THE DIRECT TENSION INDICATOR (DTI) WASHERS SHOW THAT THE PROPER BOLT TENSION HAS BEEN REACHED. SEE NOTES AND DETAIL BELOW FOR THE USE OF DIRECT TENSION INDICATOR (DTI) WASHERS WITH THE AJAX M20 BOLTS.

4. ALL AJAX BOLTS SHALL BE INSTALLED USING DIRECT TENSION INDICATORS (DTI'S) AND HARDENED WASHERS. DTI'S SHALL BE THE SQUIRTER® STYLE, MADE TO ASTM F959 LATEST REVISION; AND HARDENED WASHERS SHALL CONFORM TO ASTM F436 AND HAVE A HARDNESS OF RC 38 OR HIGHER.

NOTES FOR AJAX M20 'ONE-SIDE BOLTS WITH DIRECT TENSION INDICATORS (DTI'S):

DTI'S REQUIRED: DTI'S SHALL BE "SELF-INDICATING" SQUIRTER® STYLE DTI'S MADE WITH RED DURABLE SQUIRT MEDIA EMBEDDED IN THEM, INSPECTED BY MEANS OF THE VISUAL EJECTION OF SILICONE AS THE DTI PROTRUSIONS COMPRESS. SQUIRTER® DTI'S SHALL BE CALIBRATED PER MANUFACTURER'S INSTRUCTIONS PRIOR TO USE.

THE DIRECT TENSION INDICATOR (DTI) WASHERS SHALL BE THE "SQUIRTER® STYLE" AS MANUFACTURED BY APPLIED BOLTING TECHNOLOGY PRODUCTS' INC.:

PART NUMBER: 2DTIM208MGAFSIF

DESCRIPTION: P.C. 8.8 DTI SQUIRTER WASHER WITH RED DURABLE SQUIRT MEDIA DESIGNED SPECIFICALLY FOR THE AJAX M20 ONESIDE BOLT. FINISH SHALL BE ZINC GALVANIZED AS PROVIDED BY THE DTI MANUFACTURER.

DISTRIBUTOR CONTACT DETAILS:
ALLFASTENERS
15401 COMMERCE PARK DR.
BROOKPARK, OHIO 44142
PHONE: 440-232-6060
E-MAIL: SALES@ALLFASTENERS.COM

DTI: USE DIRECT TENSION INDICATOR (DTI) WASHERS COMPATIBLE WITH 20 MM (M20) NOMINAL A325 BOLTS FOR THE AJAX M20 BOLTS. DTI'S SHALL NOT BE HOT-DIP GALVANIZED. DTI'S SHALL BE MECHANICALLY GALVANIZED (MG) BY THE COLD MECHANICAL PROCESS ONLY AS PROVIDED BY THE DTI MANUFACTURER.

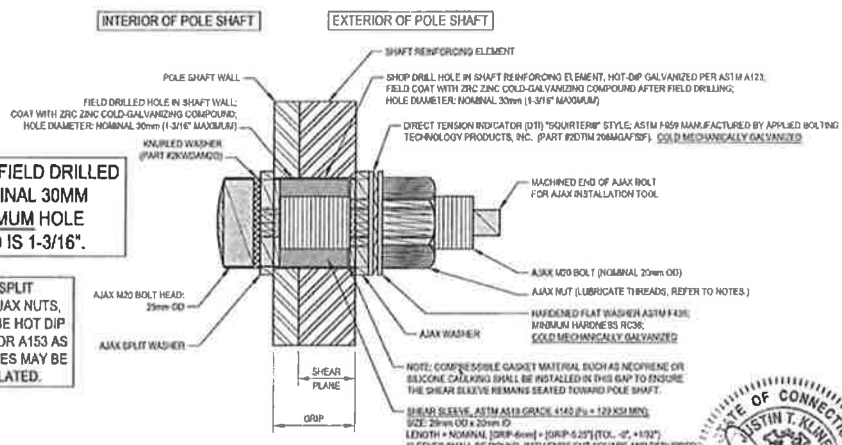
HARDENED WASHERS REQUIRED: USE A HARDENED WASHER FOR A 20 MM (M20) NOMINAL BOLT BETWEEN THE TOP OF THE DIRECT TENSION INDICATOR (DTI) WASHER AND THE NUT OF THE AJAX M20 BOLTS. HARDENED WASHERS SHALL CONFORM TO ASTM F436 AND HAVE A MINIMUM HARDNESS OF RC 38 OR HIGHER. THE HARDENED WASHERS SHALL BE MECHANICALLY GALVANIZED BY THE COLD MECHANICAL PROCESS. ALTERNATIVELY, CORRECTLY MADE HOT DIP GALVANIZED HARDENED FLAT WASHERS HAVING A MINIMUM HARDNESS OF RC 38 CAN BE USED; CONTRACTOR SHALL PROVIDE DOCUMENTATION OF WASHER SPECIFICATION AND HARDNESS.

NUT LUBRICATION REQUIRED: PROPERLY LUBRICATE THE THREADS OF THE NUT OF THE AJAX BOLT SO THAT IT CAN BE PROPERLY TIGHTENED WITHOUT GALLING AND/OR LOCKING UP ON THE BOLT THREADS. CONTRACTOR SHALL FOLLOW DTI MANUFACTURER INSTRUCTIONS FOR PROPER LUBRICATION AND TIGHTENING.

NOTE: COMPLETELY COMPRESSED DTI'S SHOWING NO VISIBLE REMAINING GAP ARE ACCEPTABLE. DTI WASHERS SHALL BE PLACED DIRECTLY AGAINST THE OUTER AJAX WASHER WITH THE DTI BUMPS FACING AWAY FROM THE AJAX WASHER. PLACE A HARDENED WASHER BETWEEN THE DTI AND THE AJAX NUT. THE DTI BUMPS SHALL BEAR AGAINST THE UNDERSIDE OF A HARDENED FLAT WASHER, NEVER DIRECTLY AGAINST THE NUT.

CONTRACTOR SHALL FOLLOW DTI MANUFACTURER'S INSTRUCTIONS FOR INSTALLATION, LUBRICATION, TIGHTENING AND INSPECTION.

INSPECTION REQUIRED: ALL AJAX BOLTS SHALL BE INSPECTED ACCORDING TO THE REQUIREMENTS OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009, BY A QUALIFIED BOLT INSPECTOR. DURING INSTALLATION, THE BOLT INSPECTOR SHALL VERIFY AND DOCUMENT: THE SHOP-DRILLED AND FIELD-DRILLED HOLE SIZES; THE INSTALLATION OF THE AJAX BOLT ASSEMBLY, INCLUDING THE SHEAR SLEEVE PLACEMENT AND NUT LUBRICATION; AND THE CONTRACTOR'S TENSIONING PROCEDURE. IN ADDITION, ALL AJAX BOLTS AND DTI'S SHALL BE VISUALLY INSPECTED ACCORDING TO THE DTI MANUFACTURER'S INSTRUCTIONS. THE BOLT INSPECTOR SHALL PROVIDE COMPLETE PHOTO DOCUMENTATION OF ALL BOLTS AFTER TIGHTENING CLEARLY SHOWING THE CONDITION OF THE DTI'S.



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

NOTE: ALL AJAX BOLTS, AJAX SPLIT WASHERS, AJAX WASHERS, AJAX NUTS, AND SHEAR SLEEVES SHALL BE HOT DIP GALVANIZED PER ASTM A123 OR A153 AS APPROPRIATE. SHEAR SLEEVES MAY BE COLD GALVANIZED OR ZINC PLATED.

TYPICAL AJAX BOLT DETAIL (1 / S-2)

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3-3-15

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250 East Broad Street - Suite 600 - Columbus, Ohio 43215
(614) 221-6679 www.pjfweb.com

CROWN CASTLE
3530 TORINGDON WAY SUITE 300, CHARLOTTE, NC 28277
PH: (724) 416-2000

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MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0530.002.7700	
DRAWN BY: CAW	AJAX BOLT DETAIL
CHECKED BY: CP	
APPROVED BY: JTK	S-2
DATE: 3/3/2015	

37515-8530-002.DWG

POLE SPECIFICATIONS	
POLE SHAPE TYPE:	12-SIDED POLYGON
TAPER:	0.230285 IN/FT
SHAFT STEEL:	ASTM A572 GRADE 65
BASE PL STEEL:	Fy=60 KSI
ANCHOR RODS:	2 1/4" ø #18J ASTM A615 GRADE 75

SHAFT SECTION DATA

SHAFT SECTION	SECTION LENGTH (FT)	PLATE THICKNESS (IN)	LAP SPLICE (IN)	DIAMETER ACROSS FLATS (IN)	
				@ TOP	@ BOTTOM
1	41.25	0.2190	51.00	17.610	27.300
2	41.25	0.3130	83.00	25.854	35.360
3	42.00	0.3750		33.528	43.200

NOTE: DIMENSIONS SHOWN DO NOT INCLUDE GALVANIZING TOLERANCES

CONTRACTOR SHALL PROVIDE ASTM A36 SHIM PLATES BELOW SLIP JOINTS. THE SHIM PLATES SHALL BE PLACED BETWEEN THE NEW SHAFT REINFORCEMENT AND THE EXISTING POLE SHAFT FROM THE SLIP JOINT TO THE NEW SHAFT REINFORCEMENT SPLICE PLATE LOCATION AND A EXTRA LONG "SPLICE SHIM" SHALL BE PLACED BETWEEN THE NEW UPPER AND LOWER SHAFT REINFORCEMENT PLATES AT THE SHAFT REINFORCEMENT SPLICE PLATE LOCATION AND ALL TERMINATION POINTS, AS REQUIRED.

MODIFICATIONS:

(A) INSTALL NEW TRANSITION STIFFENERS AT BASE PLATE. SEE SHEET S-4.

(B) INSTALL NEW SHAFT REINFORCING. SEE CHART ON THIS SHEET.

(C) REMOVE ABANDONED EQUIPMENT AT 21'-0".

NEW CCI FLAT PLATE (65 KSI) REINFORCING SCHEDULE

BOTTOM ELEVATION	TOP ELEVATION	FLAT #1 DEGREE SEPARATION	ELEMENT	ELEMENT LENGTH	ELEMENT QUANTITY	APPROXIMATE AJAX BOLTS PER ELEMENT	APPROXIMATE TOTAL AJAX BOLT QUANTITY	TERMINATION BOLTS (BOTTOM)	TERMINATION BOLTS (TOP)	MAXIMUM INTERMEDIATE BOLT SPACING	ESTIMATED TOTAL STEEL WEIGHT
0'-6"	20'-6"	F3, F7 & F11	CCI-AFP-0501-0820	20'-0"	3	31	93	10	10	16"	1225 LBS
33'-0"	59'-0"	F3, F7 & F11	CCI-AFP-0501-0070	26'-0"	3	31	93	10	10	16"	1225 LBS
							186				2450 LBS

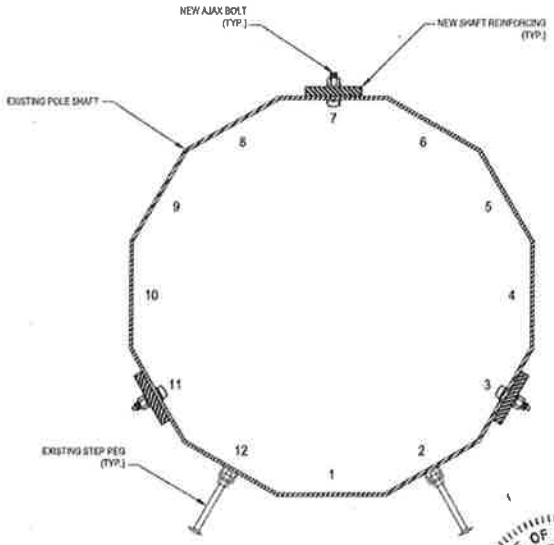
NOTES:

1) AJAX BOLTS ARE TO BE 20mm DIAMETER WITH CORRESPONDING 29mm DIAMETER SLEEVE WITH MATCHING STEEL GRADE.
2) ALL STEEL SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123. ALTERNATIVELY, ALL NEW STIFFENER PLATE STEEL REINFORCING MAY BE COLD GALVANIZED AS FOLLOWS: APPLY A MINIMUM OF TWO COATS OF ZRC-BRAND ZINC RICH COLD GALVANIZING COMPOUND. FILM THICKNESS PER COAT SHALL BE: WET 3.0 MILS, DRY 1.5 MILS. APPLY PER ZRC (MANUFACTURER) RECOMMENDED PROCEDURES. CONTACT ZRC AT 1-800-831-3275 FOR PRODUCT INFORMATION.
3) ALL REINFORCING SHALL BE ASTM A572 GR. 65.
4) WELDS SHALL BE E80XX OR GREATER. TERMINATION WELDS SHALL BE 3/8" FILLET WELDS.
5) HOLES FOR AJAX BOLTS AND SHEAR SLEEVES ARE 30mm UNLESS NOTED OTHERWISE.
6) ALL SHIMS SHALL BE ASTM A36.

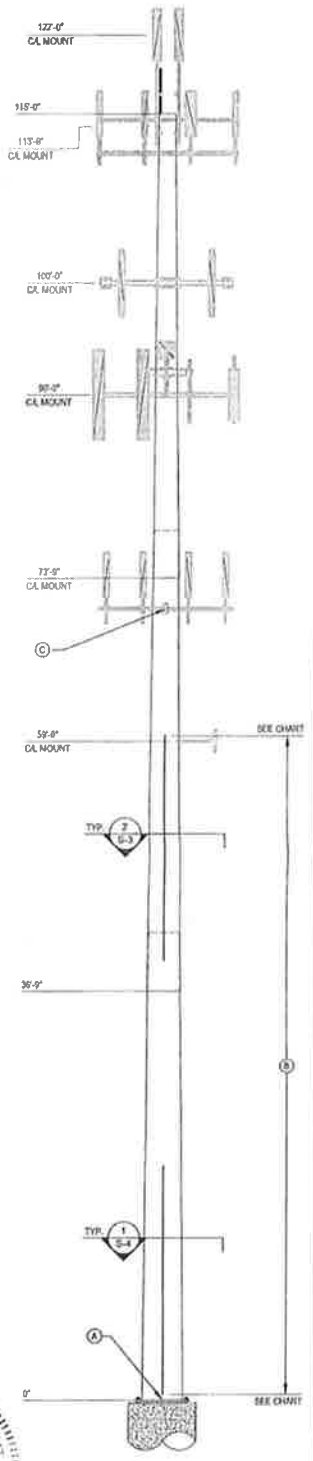
NEW SHIM CHART

1/16" SHIM QUANTITY	1/4" SHIM QUANTITY	SHIM WIDTH	SHIM LENGTH	HOLE DIAMETER
0	4	8"	4"	1 1/4"

SHIMS ARE FOR BIDDING PURPOSES ONLY. FINAL SHIM REQUIREMENTS TO BE DETERMINED BY CONTRACTOR DURING FABRICATION.



DETAIL 2 / S-3
SCALE: NTS



POLE ELEVATION 1 / S-3

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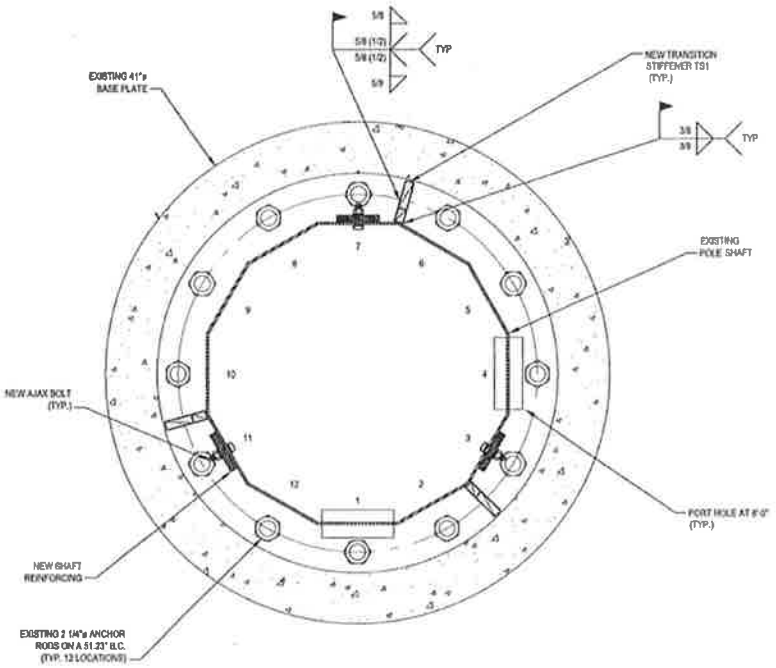
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

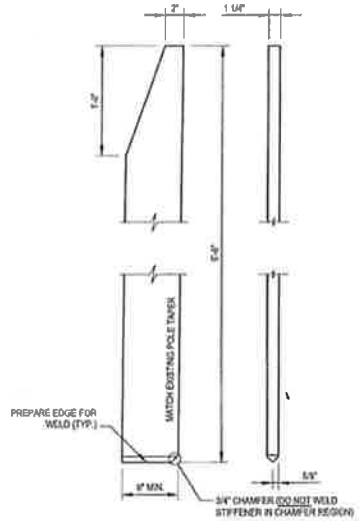
PROJECT: 37515-0530.002.7700

DRAWN BY: CAW	MONOPOLE PROFILE
CHECKED BY: CP	
APPROVED BY:	S-3
DATE: 3/3/2015	

37515-0530.002.DWG



BASE PLATE 1 / S-4



TRANSITION STIFFENER MK~TS1

(3 REQUIRED) (Fy = 65 KSI)

STATE OF CONNECTICUT
JUSTIN T. KLINE
No. 30301
LICENSED
PROFESSIONAL ENGINEER

3-3-15

PAUL J. FORD AND COMPANY
STRUCTURAL ENGINEERS
250 East Broad Street - Suite 600 - Columbus, Ohio 43215
(614) 221-6679 www.pjfweb.com

CROWN CASTLE
3530 TORINGDON WAY SUITE 300, CHARLOTTE,NC 28277
PH: (724) 416-2000

BU #806365; HRT 303 943203
STAFFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0530.002.7700

DRAWN BY: CAW	BASE PLATE DETAILS
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MODIFICATION INSPECTION NOTES:

1. **GENERAL**
   - 1.1. THE MODIFICATION INSPECTION (MI) IS A VISUAL INSPECTION OF TOWER MODIFICATIONS AND A REVIEW OF CONSTRUCTION INSPECTIONS AND OTHER REPORTS TO ENSURE THE INSTALLATION WAS CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS, NAMELY THE MODIFICATION DRAWINGS, AS DESIGNED BY THE EOR.
   - 1.2. THE MI IS TO CONFIRM INSTALLATION CONFIGURATION AND WORKMANSHIP ONLY AND IS NOT A REVIEW OF THE MODIFICATION DESIGN ITSELF, NOR DOES THE MI INSPECTOR TAKE OWNERSHIP OF THE MODIFICATION DESIGN. OWNERSHIP OF THE STRUCTURAL MODIFICATION DESIGN EFFECTIVENESS AND INTEGRITY RESIDES WITH THE EOR AT ALL TIMES.
   - 1.3. ALL MI'S SHALL BE CONDUCTED BY A CROWN CASTLE ENGINEERING VENDOR (AEV) OR ENGINEERING SERVICE VENDOR (AESV) THAT IS APPROVED TO PERFORM ELEVATED WORK FOR CROWN CASTLE.
   - 1.4. TO ENSURE THAT THE REQUIREMENTS OF THE MI ARE MET, IT IS VITAL THAT THE GENERAL CONTRACTOR (GC) AND THE MI INSPECTOR BEGIN COMMUNICATING AND COORDINATING AS SOON AS A PO IS RECEIVED. IT IS EXPECTED THAT EACH PARTY WILL BE PROACTIVE IN REACHING OUT TO THE OTHER PARTY. IF CONTACT INFORMATION IS NOT KNOWN, CONTACT YOUR CROWN CASTLE POINT OF CONTACT (POC).
   - 1.5. REFER TO ENG-SOW-10007: MODIFICATION INSPECTION SOW FOR FURTHER DETAILS AND REQUIREMENTS.

2. **MI INSPECTOR**
   - 2.1. THE MI INSPECTOR IS REQUIRED TO CONTACT THE GC AS SOON AS RECEIVING A PO FOR THE MI TO, AT A MINIMUM:
     - 2.1.1. REVIEW THE REQUIREMENTS OF THE MI CHECKLIST.
     - 2.1.2. WORK WITH THE GC TO DEVELOP A SCHEDULE TO CONDUCT ON-SITE INSPECTIONS, INCLUDING FOUNDATION INSPECTIONS.
     - 2.1.3. THE MI INSPECTOR IS RESPONSIBLE FOR COLLECTING ALL GC INSPECTION AND TEST REPORTS, REVIEWING THE DOCUMENTS FOR ADHERENCE TO THE CONTRACT DOCUMENTS, CONDUCTING THE IN-FIELD INSPECTIONS, AND SUBMITTING THE MI REPORT TO CROWN CASTLE.

3. **GENERAL CONTRACTOR**
   - 3.1. THE GC IS REQUIRED TO CONTACT THE MI INSPECTOR AS SOON AS RECEIVING A PO FOR THE MODIFICATION INSTALLATION OR TURNKEY PROJECT TO, AT A MINIMUM:
     - 3.1.1. REVIEW THE REQUIREMENTS OF THE MI CHECKLIST.
     - 3.1.2. WORK WITH THE MI INSPECTOR TO DEVELOP A SCHEDULE TO CONDUCT ON-SITE INSPECTIONS, INCLUDING FOUNDATION INSPECTIONS.
     - 3.1.3. BETTER UNDERSTAND ALL INSPECTION AND TESTING REQUIREMENTS.
     - 3.1.4. THE GC SHALL PERFORM AND RECORD THE TEST AND INSPECTION RESULTS IN ACCORDANCE WITH THE REQUIREMENTS OF THE MI CHECKLIST AND ENG-SOW-10007.

4. **RECOMMENDATIONS**
   - 4.1. THE FOLLOWING RECOMMENDATIONS AND SUGGESTIONS ARE OFFERED TO ENHANCE THE EFFICIENCY AND EFFECTIVENESS OF DELIVERING AN MI REPORT:
     - 4.1.1. IT IS SUGGESTED THAT THE GC PROVIDE A MINIMUM OF 5 BUSINESS DAYS NOTICE, PREFERABLE 10, TO THE MI INSPECTOR AS TO WHEN THE SITE WILL BE READY FOR THE MI TO BE CONDUCTED.
     - 4.1.2. THE GC AND MI INSPECTOR COORDINATE CLOSELY THROUGHOUT THE ENTIRE PROJECT.
     - 4.1.3. WHEN POSSIBLE, IT IS PREFERRED TO HAVE THE GC AND MI INSPECTOR ON-SITE SIMULTANEOUSLY FOR ANY GUY WIRE TENSIONING OR RE-TENSIONING OPERATIONS.
     - 4.1.4. IT MAY BE BENEFICIAL TO INSTALL ALL TOWER MODIFICATIONS PRIOR TO CONDUCTING THE FOUNDATION INSPECTIONS TO ALLOW FOUNDATION AND MI INSPECTION(S) TO COMMENCE WITH ONE SITE VISIT.
     - 4.1.5. WHEN POSSIBLE, IT IS PREFERRED TO HAVE THE GC AND MI INSPECTOR ON-SITE DURING THE MI TO HAVE ANY DEFICIENCIES CORRECTED DURING THE INITIAL MI. THEREFORE, THE GC MAY CHOOSE TO COORDINATE THE MI CAREFULLY TO ENSURE ALL CONSTRUCTION FACILITIES ARE AT THEIR DISPOSAL WHEN THE MI INSPECTOR IS ON SITE.

5. **CANCELLATION OR DELAYS IN SCHEDULED MI**
   - 5.1. IF THE GC AND MI INSPECTOR AGREE TO A DATE ON WHICH THE MI WILL BE CONDUCTED, AND EITHER PARTY CANCELS OR DELAYS, CROWN CASTLE SHALL NOT BE RESPONSIBLE FOR ANY COSTS, FEES, LOSS OF DEPOSITS AND/OR OTHER PENALTIES RELATED TO THE CANCELLATION OR DELAY INCURRED BY EITHER PARTY FOR ANY TIME (E.G. TRAVEL AND LODGING, COSTS OF KEEPING EQUIPMENT ON-SITE, ETC.). IF CROWN CASTLE CONTRACTS DIRECTLY FOR A THIRD PARTY MI, EXCEPTIONS MAY BE MADE IN THE EVENT THAT THE DELAY/CANCELLATION IS CAUSED BY WEATHER OR OTHER CONDITIONS THAT MAY COMPROMISE THE SAFETY OF THE PARTIES INVOLVED.

6. **CORRECTION OF FAILING MI'S**
   - 6.1. IF THE MODIFICATION INSTALLATION WOULD FAIL THE MI ("FAILED MI"), THE GC SHALL WORK WITH CROWN CASTLE TO COORDINATE A REMEDIATION PLAN IN ONE OF TWO WAYS:
     - 6.1.1. CORRECT FAILING ISSUES TO COMPLY WITH THE SPECIFICATIONS CONTAINED IN THE ORIGINAL CONTRACT DOCUMENTS AND COORDINATE A SUPPLEMENT MI.
     - 6.1.2. OR, WITH CROWN CASTLE'S APPROVAL, THE GC MAY WORK WITH THE EOR TO RE-ANALYZE THE MODIFICATION/REINFORCEMENT USING THE AS-BUILT CONDITION.

7. **MI VERIFICATION INSPECTIONS**
   - 7.1. CROWN CASTLE RESERVES THE RIGHT TO CONDUCT A MI VERIFICATION INSPECTION TO VERIFY THE ACCURACY AND COMPLETENESS OF PREVIOUSLY COMPLETED MI INSPECTION(S) ON TOWER MODIFICATION PROJECTS.
   - 7.2. ALL VERIFICATION INSPECTIONS SHALL BE HELD TO THE SAME SPECIFICATIONS AND REQUIREMENTS IN THE CONTRACT DOCUMENTS AND IN ACCORDANCE WITH ENG-SOW-10007.
   - 7.3. VERIFICATION INSPECTION MAY BE CONDUCTED BY AN INDEPENDENT AEV/AESV FIRM AFTER A MODIFICATION PROJECT IS COMPLETED, AS MARKED BY THE DATE OF AN ACCEPTED "PASSING MI" OR "PASS AS NOTED MI" REPORT FOR THE ORIGINAL PROJECT.

8. **PHOTOGRAPHS**
   - 8.1. BETWEEN THE GC AND THE MI INSPECTOR THE FOLLOWING PHOTOGRAPHS, AT A MINIMUM, ARE TO BE TAKEN AND INCLUDED IN THE MI REPORT:
     - 8.1.1. PRECONSTRUCTION GENERAL SITE CONDITION
     - 8.1.2. PHOTOGRAPHS DURING THE REINFORCEMENT MODIFICATION CONSTRUCTION/ERECTION AND INSPECTION
     - 8.1.3. RAW MATERIALS
     - 8.1.4. PHOTOS OF ALL CRITICAL DETAILS
     - 8.1.5. FOUNDATION MODIFICATIONS
     - 8.1.6. WELD PREPARATION
     - 8.1.7. BOLT INSTALLATION AND TORQUE
     - 8.1.8. FINAL INSTALLED CONDITION
     - 8.1.9. SURFACE COATING REPAIR
     - 8.1.10. POST CONSTRUCTION PHOTOGRAPHS
     - 8.1.11. FINAL INFIELD CONDITION
     - 8.1.12. PHOTOS OF ELEVATED MODIFICATIONS TAKEN FROM THE GROUND SHALL BE CONSIDERED INADEQUATE.
     - 8.1.13. THIS IS NOT A COMPLETE LIST OF REQUIRED PHOTOS, PLEASE REFER TO ENG-SOW-10007.

9. **INSPECTION AND TESTING**
   - 9.1. ALL WORK SHALL BE SUBJECT TO REVIEW AND OBSERVATION BY CROWN CASTLE'S REPRESENTATIVE AND CROWN CASTLE'S AUTHORIZED INDEPENDENT INSPECTION AND TESTING AGENCY.
   - 9.2. INSPECTION SERVICES WHICH ARE FURNISHED BY OTHERS ARE STILL REQUIRED WHEN THE EOR PERFORMS SUPPORT SERVICES DURING CONSTRUCTION.
   - 9.3. OBSERVED DISCREPANCIES BETWEEN THE WORK AND THE CONTRACT DOCUMENTS SHALL BE CORRECTED BY THE CONTRACTOR AT NO ADDITIONAL COST.
   - 9.4. AN INDEPENDENT QUALIFIED INSPECTION/TESTING AGENCY SHALL BE SELECTED, RETAINED AND PAID FOR BY CROWN CASTLE FOR THE SOLE PURPOSE OF INSPECTING, TESTING, DOCUMENTING, AND APPROVING ALL WELDING AND FIELD WORK PERFORMED BY THE CONTRACTOR.
     - 9.4.1. ACCESS TO ANY PLACE WHERE WORK IS BEING DONE SHALL BE PERMITTED AT ALL TIMES.
     - 9.4.2. THE INSPECTION AGENCY SHALL SO SCHEDULE THIS WORK AS TO CAUSE A MINIMUM OF INTERRUPTION TO, AND COORDINATE WITH, THE WORK IN PROGRESS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE THE WORK SCHEDULE WITH THE TESTING AGENCY. THE CONTRACTOR SHALL ALLOW FOR ADEQUATE TIME AND ACCESS FOR THE TESTING AGENCY TO PERFORM THEIR DUTIES.
   - 9.5. THE INSPECTION AND TESTING AGENCY SHALL BE RESPONSIBLE TO PERFORM THE FOLLOWING SERVICES AND INSPECT THE FOLLOWING ITEMS IN ACCORDANCE WITH THE CONSTRUCTION DRAWINGS. THE TESTING AGENCY SHALL INSPECT ITEMS ON THIS LIST AND OTHER ITEMS AS NECESSARY TO FULFILL THEIR RESPONSIBILITY. THE TESTING AGENCY SHALL UTILIZE EXPERIENCED, TRAINED INSPECTORS INCLUDING AWS CERTIFIED WELDING INSPECTORS (CWI). INSPECTORS SHALL HAVE THE TRAINING, CREDENTIALS, AND EXPERIENCE APPROPRIATE FOR AND COMMENSURATE WITH THE SCOPE AND TYPE OF INSPECTION WORK TO BE PERFORMED.
   - 9.6. **GENERAL**
     - 9.6.1. PERFORM PERIODIC ON-SITE OBSERVATION, INSPECTION, VERIFICATION, AND TESTING DURING THE TIME THE CONTRACTOR IS WORKING ON-SITE. AGENCY SHALL NOTIFY CROWN CASTLE AND THE EOR IMMEDIATELY WHEN FIELD PROBLEMS OR DISCREPANCIES OCCUR.
   - 9.7. **FOUNDATIONS AND SOIL PREPARATION - (NOT REQUIRED)**
   - 9.8. **CONCRETE TESTING PER ACI - (NOT REQUIRED)**
   - 9.9. **STRUCTURAL STEEL**
     - 9.9.1. CHECK STEEL ON THE JOB WITH THE PLANS.
     - 9.9.2. CHECK MILL CERTIFICATIONS. CALL FOR LABORATORY TEST REPORTS WHEN MILL CERTIFICATION IS IN QUESTION.
     - 9.9.3. CHECK GRADE OF STEEL MEMBERS, AND BOLTS FOR CONFORMANCE WITH DRAWINGS.
     - 9.9.4. INSPECT STEEL MEMBERS FOR DISTORTION, EXCESSIVE RUST, FLAWS AND BURNED HOLES.
     - 9.9.5. CHECK STEEL MEMBERS FOR SIZES, SWEEP AND DIMENSIONAL TOLERANCES
     - 9.9.6. CHECK FOR SURFACE FINISH SPECIFIED, GALVANIZED.
     - 9.9.7. CHECK THAT BOLTS HAVE BEEN TIGHTENED PROPERLY.
     - 9.9.8. PRIOR TO ANY FIELD CUTTING THE CONTRACTOR SHALL MARK THE CUTOUT LINES ON THE STEEL AND THE INSPECTION/TESTING AGENCY SHALL VERIFY PROPOSED LAYOUT, LOCATION, AND DIMENSIONS. THE INSPECTION/TESTING AGENCY SHALL CLOSELY AND CONTINUOUSLY MONITOR THIS ACTIVITY.
   - 9.10. **WELDING:**
     - 9.10.1. VERIFY FIELD WELDING PROCEDURES, WELDERS, AND WELDING OPERATORS, NOT DEEMED PREQUALIFIED, IN ACCORDANCE WITH AWS D1.1.
     - 9.10.2. INSPECT FIELD WELDED CONNECTIONS IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED AND WITH AWS D1.1.
     - 9.10.3. APPROVE FIELD WELDING SEQUENCE.
     - 9.10.4. A PROGRAM OF THE APPROVED SEQUENCES SHALL BE SUBMITTED TO CROWN CASTLE BEFORE WELDING BEGINS. NO CHANGE IN APPROVED SEQUENCES MAY BE MADE WITHOUT PERMISSION FROM CROWN CASTLE.
     - 9.10.5. INSPECT WELDED CONNECTIONS AS FOLLOWS AND IN ACCORDANCE WITH AWS D1.1:
       - 9.10.5.1. INSPECT WELDING EQUIPMENT FOR CAPACITY, MAINTENANCE, AND WORKING CONDITIONS.
       - 9.10.5.2. VERIFY SPECIFIED ELECTRODES AND HANDLING AND STORAGE OF ELECTRODES FOR CONFORMANCE TO SPECIFICATIONS.
       - 9.10.5.3. INSPECT PREHEATING AND INTERPASS TEMPERATURES FOR CONFORMANCE WITH AWS D1.1.
       - 9.10.5.4. VISUALLY INSPECT ALL WELDS AND VERIFY THAT QUALITY OF WELDS MEETS THE REQUIREMENTS OF AWS D1.1. OTHER TESTS MAY ALSO BE PERFORMED ON THE WELDS BY THE TESTING AGENCY IN ORDER FOR THEM TO PERFORM THEIR DUTIES FOR THIS PROJECT.
       - 9.10.5.5. SPOT TEST AT LEAST ONE FILLET WELD OF EACH MEMBER USING MAGNETIC PARTICLE.
       - 9.10.5.6. INSPECT FOR SIZE, SPACING, TYPE AND LOCATION AS PER APPROVED DRAWINGS.
       - 9.10.5.7. VERIFY THAT THE BASE METAL CONFORMS TO THE DRAWINGS.
       - 9.10.5.8. REVIEW THE REPORTS BY TESTING LABS.
       - 9.10.5.9. CHECK TO SEE THAT WELDS ARE CLEAN AND FREE FROM SLAG.
       - 9.10.5.10. INSPECT RUST PROTECTION OF WELDS AS PER SPECIFICATIONS.
       - 9.10.5.11. CHECK THAT DEFECTIVE WELDS ARE CLEARLY MARKED AND HAVE BEEN ADEQUATELY REPAIRED.
   - 9.11. **REPORTS:**
     - 9.11.1. COMPILE AND PERIODICALLY SUBMIT DAILY INSPECTION REPORTS TO CROWN CASTLE.
     - 9.11.2. THE INSPECTION PLAN OUTLINED HEREIN IS INTENDED AS A DESCRIPTION OF GENERAL AND SPECIFIC ITEMS OF CONCERN. IT IS NOT INTENDED TO BE ALL-INCLUSIVE. IT DOES NOT LIMIT THE TESTING AND INSPECTION AGENCY TO THE ITEMS LISTED. ADDITIONAL TESTING, INSPECTION, AND CHECKING MAY BE REQUIRED AND SHOULD BE ANTICIPATED. THE TESTING AGENCY SHALL USE THEIR PROFESSIONAL JUDGMENT AND KNOWLEDGE OF THE JOB SITE CONDITIONS AND THE CONTRACTOR'S PERFORMANCE TO DECIDE WHAT OTHER ITEMS REQUIRE ADDITIONAL ATTENTION. THE TESTING AGENCY'S JUDGMENT MUST PREVAIL ON ITEMS NOT SPECIFICALLY COVERED. ANY DISCREPANCIES OR PROBLEMS SHALL BE BROUGHT IMMEDIATELY TO CROWN CASTLE'S ATTENTION. RESOLUTIONS ARE NOT TO BE MADE WITHOUT CROWN CASTLE'S REVIEW AND SPECIFIC WRITTEN CONSENT. CROWN CASTLE RESERVES THE RIGHT TO DETERMINE WHETHER OR NOT A RESOLUTION IS ACCEPTABLE.
     - 9.11.3. AFTER EACH INSPECTION, THE TESTING AGENCY WILL PREPARE A WRITTEN ACCEPTANCE OR REJECTION WHICH WILL BE GIVEN TO THE CONTRACTOR AND FILED AS DAILY REPORTS TO CROWN CASTLE. THIS WRITTEN ACTION WILL GIVE THE CONTRACTOR A LIST OF ITEMS TO BE CORRECTED, PRIOR TO CONTINUING CONSTRUCTION, AND/OR LOADING OF STRUCTURAL ITEMS.
     - 9.11.4. THE TESTING AGENCY DOES NOT RELIEVE THE CONTRACTOR'S CONTRACTUAL OR STATUTORY OBLIGATIONS. THE CONTRACTOR HAS THE SOLE RESPONSIBILITY FOR ANY DEVIATIONS FROM THE OFFICIAL CONTRACT DOCUMENTS. THE TESTING AGENCY WILL NOT REPLACE THE CONTRACTOR'S QUALITY CONTROL PERSONNEL.

MI CHECKLIST

CONSTRUCTION/INSTALLATION INSPECTIONS AND TESTING REQUIRED (COMPLETED BY EOR)	REPORT ITEM
PRE-CONSTRUCTION	
X	MI CHECKLIST DRAWINGS
X	EOR REVIEW
X	FABRICATION INSPECTION
N/A	FABRICATOR CERTIFIED WELD INSPECTION
X	MATERIAL TEST REPORT (MTR)
N/A	FABRICATOR NDE INSPECTION
X	NDE REPORT OF MONOPOLE BASE PLATE (AS REQUIRED)
X	PACKING SLIPS
ADDITIONAL TESTING AND INSPECTIONS:	
CONSTRUCTION	
X	CONSTRUCTION INSPECTIONS
N/A	FOUNDATION INSPECTIONS
N/A	CONCRETE COMP. STRENGTH AND SLUMP TESTS
N/A	POST INSTALLED ANCHOR ROD VERIFICATION
N/A	BASE PLATE GROUT VERIFICATION
X	CONTRACTOR'S CERTIFIED WELD INSPECTION
N/A	EARTHWORK: PROVIDE PHOTO DOCUMENTATION OF EXCAVATION QUALITY AND COMPACTION
X	ON SITE COLD GALVANIZING VERIFICATION
N/A	GUY WIRE TENSION REPORT
X	GC AS-BUILT DOCUMENTS
X	INSPECTION OF ONE SIDED BOLTS AND DTI'S PER REQUIREMENTS ON SHEET S-2
N/A	MICROPILE/ROCK ANCHOR INSTALLER'S DRILLING AND INSTALLATION LOGS AND QA/QC DOCUMENTS
ADDITIONAL TESTING AND INSPECTIONS:	
POST-CONSTRUCTION	
X	MI INSPECTOR REDLINE OR RECORD DRAWING(S)
N/A	POST INSTALLED ANCHOR ROD PULL-OUT TESTING
N/A	REFER TO MICROPILE/ROCK ANCHOR NOTES FOR SPECIAL INSPECTION AND TESTING REQUIREMENTS.
X	PHOTOGRAPHS
ADDITIONAL TESTING AND INSPECTIONS:	

NOTE: X DENOTES A DOCUMENT NEEDED FOR THE PMI REPORT
NA DENOTES A DOCUMENT THAT IS NOT REQUIRED FOR THE PMI REPORT

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