Robinson+Cole

KENNETH C. BALDWIN

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Also admitted in Massachusetts

April 28, 2015

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

Re: **Notice of Exempt Modification – Facility Modification**
338 Oxford Road, Oxford, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 129-foot level on an existing 150-foot monopole tower at 338 Oxford Road in Oxford, Connecticut (the "Property"). The tower is owned by Crown Castle. Cellco's use of the tower was approved by the Council in 2000. Cellco now intends to modify its facility by replacing seven (7) of its existing antennas with one (1) model BXA70040-4CF, 700 MHz antenna; three (3) model HBXX-6517DS-VTM, 1900 MHz antennas; and three (3) model HBXX-6517DS-VTM, 2100 MHz antennas, all at the same 129-foot level on the tower. Cellco also intends to install six (6) remote radio heads ("RRHs") behind its 1900 MHz and 2100 MHz antennas and one (1) HYBRIFLEX™ antenna cable inside the monopole tower. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cable.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to George R. Temple, First Selectman of the Town of Oxford. A copy of this letter is also being sent to William and Ellen Fritz, the owners of the Property.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. The replacement antennas and RRHs will be installed on Cellco's existing antenna platform at the 129-foot level on the tower.

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

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

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

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

6. The tower and its foundation, with certain modifications, can support Cellco's proposed modifications. (*See* Structural Modification Report dated April 9, 2015, 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:
George R. Temple, Oxford First Selectman
William and Ellen Fritz
Tim Parks

ATTACHMENT 1

BXA-70040-4CF-EDIN-X

X-Pol | FET Panel | 40° | 14.5 dBd

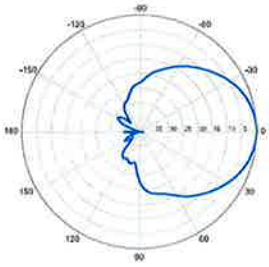
Replace "X" with desired electrical downtilt.

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

Electrical Characteristics	696-900 MHz	
Frequency bands	696-806 MHz	806-900 MHz
Polarization	±45°	
Horizontal beamwidth	42°	40°
Vertical beamwidth	17°	15°
Gain	14.0 dBd (16.1 dBi)	14.5 dBd (16.6 dBi)
Electrical downtilt (X)	0, 2, 4, 5, 6, 7, 8, 9, 10, 12, 14	
Impedance	50Ω	
VSWR	≤1.35:1	
Upper sidelobe suppression (0°)	-16.5 dB	-15.8 dB
Front-to-back ratio (+/-30°)	-37.0 dB	-37.0 dB
Null fill	5% (-26.02 dB)	
Isolation between ports	< -27 dB	
Input power with EDIN connectors	500 W	
Input power with NE connectors	300 W	
Lightning protection	Direct Ground	
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)	
Mechanical Characteristics		
Dimensions Length x Width x Depth	1206 x 606 x 200 mm	47.5 x 23.9 x 7.9 in
Depth with z-brackets	240 mm	9.4 in
Weight without mounting brackets	11.3 kg	25 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.73 m² Side: 0.24 m²	Front: 7.9 ft² Side: 2.6 ft²
Wind load @ 161 km/hr (100 mph)	Front: 1033 N Side: 353 N	Front: 232 lbf Side: 79 lbf

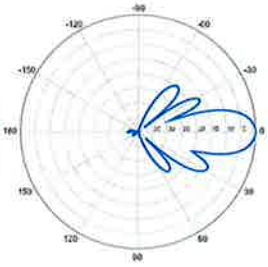
Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting & Downtilt Bracket Kit	36210006	40-115 mm 1.57-4.5 in	4.1 kg 9 lbs
Concealment Configurations	This model cannot be used in a standard FP concealment configuration.		

BXA-70040-4CF-EDIN-X



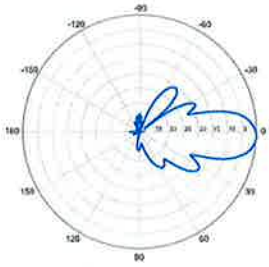
Horizontal | 750 MHz

BXA-70040-4CF-EDIN-0



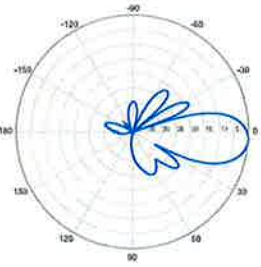
0° | Vertical | 750 MHz

BXA-70040-4CF-EDIN-2

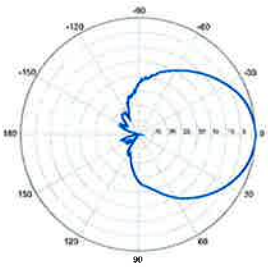


2° | Vertical | 750 MHz

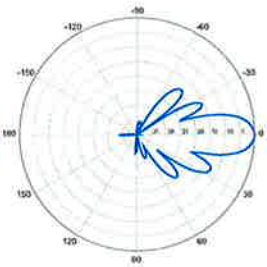
BXA-70040-4CF-EDIN-4



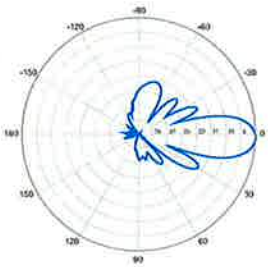
4° | Vertical | 750 MHz



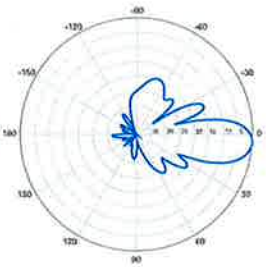
Horizontal | 850 MHz



0° | Vertical | 850 MHz



2° | Vertical | 850 MHz

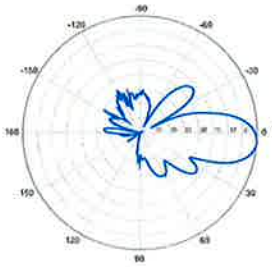


4° | Vertical | 850 MHz

BXA-70040-4CF-EDIN-X

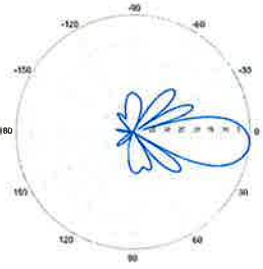
X-Pol | FET Panel | 40° | 14.5 dBd

BXA-70040-4CF-EDIN-5



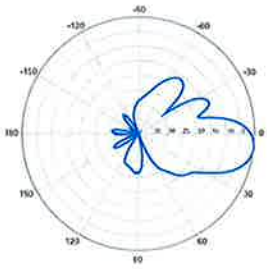
5° | Vertical | 750 MHz

BXA-70040-4CF-EDIN-6



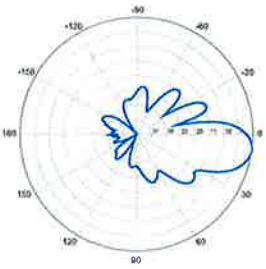
6° | Vertical | 750 MHz

BXA-70040-4CF-EDIN-7

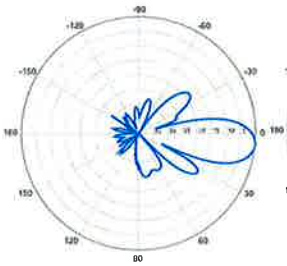


7° | Vertical | 750 MHz

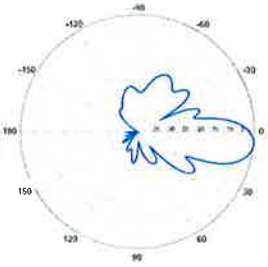
BXA-70040-4CF-EDIN-8



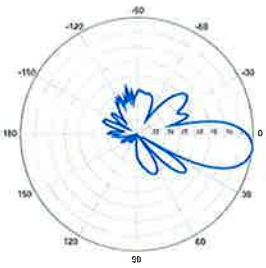
8° | Vertical | 750 MHz



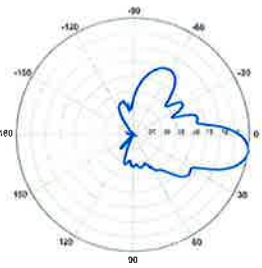
5° | Vertical | 850 MHz



6° | Vertical | 850 MHz

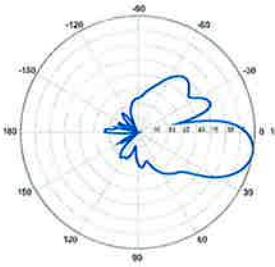


7° | Vertical | 850 MHz



8° | Vertical | 850 MHz

BXA-70040-4CF-EDIN-9



9° | Vertical | 750 MHz

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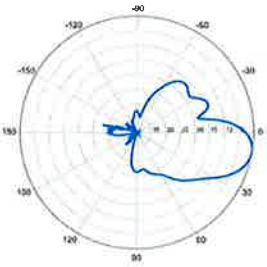

10° | Vertical | 750 MHz

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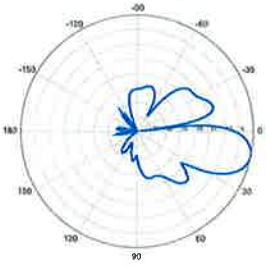
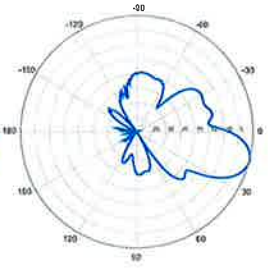
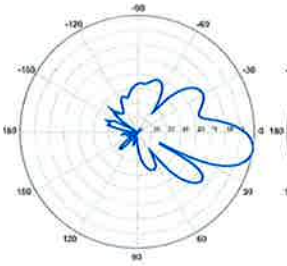


12° | Vertical | 750 MHz

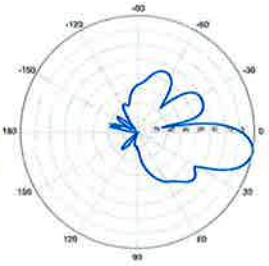
BXA-70040-4CF-EDIN-14



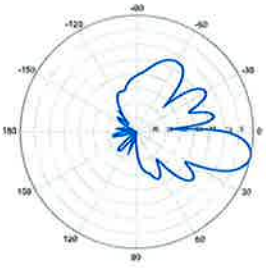
14° | Vertical | 750 MHz



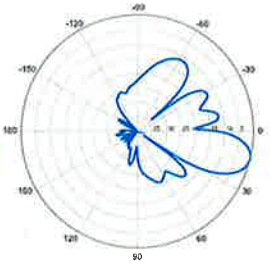
9° | Vertical | 850 MHz



10° | Vertical | 850 MHz



12° | Vertical | 850 MHz



14° | Vertical | 850 MHz

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)

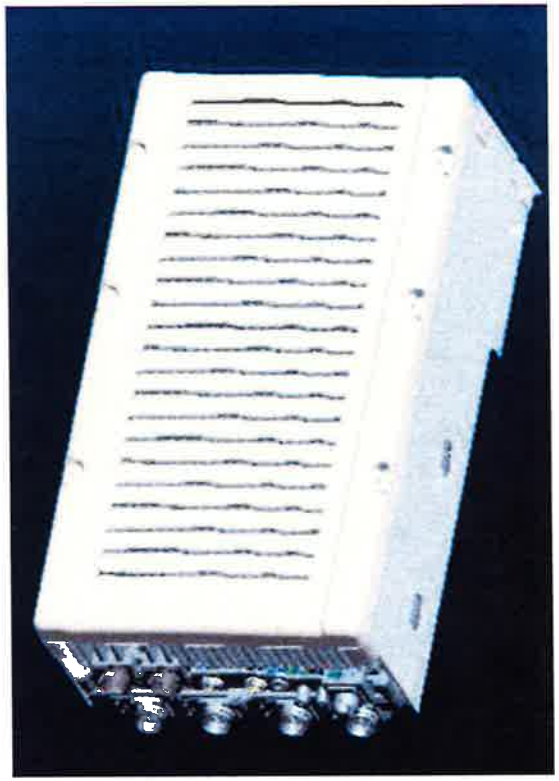
** Not a Verizon Wireless deployed product

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

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

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

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

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

SUPERIOR RF PERFORMANCE

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

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

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

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

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

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

OPTIMIZED TCO

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

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

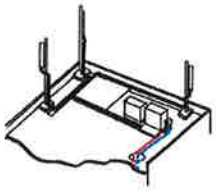
EASY INSTALLATION

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

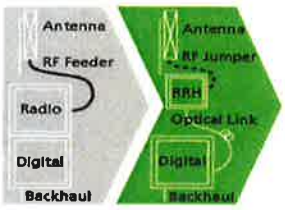
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

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

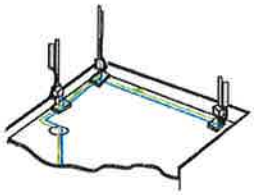
Installation can easily be done by a single person as the Alcatel–Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



Macro



RRH for space-constrained cell sites



Distributed

FEATURES

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

BENEFITS

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

TECHNICAL SPECIFICATIONS

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

Dimensions and weights

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

Electrical Data

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

RF Characteristics

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

Connectivity

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

Environmental specifications

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

Safety and Regulatory Data

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

AT THE SPEED OF IDEAS™

Alcatel·Lucent

Product Data Sheet HB158-1-08U8-S8J18

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

Product Description

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

It was developed to reduce installation complexity and costs at Cellular sites. HYBRIFLEX allows mobile operators deploying an RRH architecture to standardize the RRH installation process and eliminate the need for and cost of cable grounding. HYBRIFLEX combines optical fiber (multi-mode or single-mode) and power in a single corrugated cable. It eliminates the need for junction boxes and can connect multiple RRHs with a single feeder. Standard RFS 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-93-658 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to149)

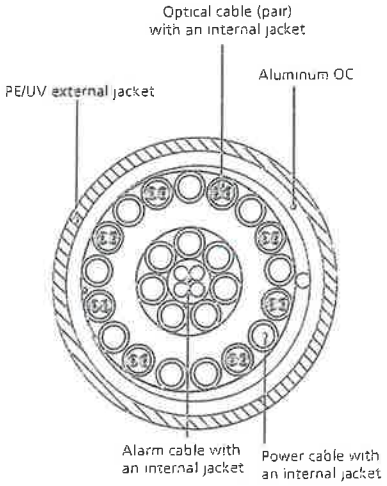


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

	General	Power	Density					
Site Name: Oxford								
Tower Height: 150Ft.								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*AT&T UMTS	2	565	139	0.0210	880	0.5867	3.58%	
*AT&T UMTS	2	875	139	0.0326	1900	1.0000	3.26%	
*AT&T GSM	1	538	139	0.0100	880	0.5867	1.71%	
*AT&T GSM	4	934	139	0.0695	1900	1.0000	6.95%	
*AT&T LTE	1	1375	139	0.0256	734	0.4893	5.23%	
*Sprint CDMA/LTE	2	693	150	0.0221	1900	1.0000	2.21%	
*Sprint CDMA/LTE	1	390	150	0.0062	850	0.5667	1.10%	
Verizon PCS	**7**	**400**	**129**	**0.0605**	**1970**	**1.0000**	**6.05%**	
Verizon Cellular	**9**	**290**	**129**	**0.0564**	**869**	**0.5793**	**9.73%**	
Verizon AWS	**1**	**2812**	**129**	**0.0608**	**2145**	**1.0000**	**6.08%**	
Verizon 700	**1**	**735**	**129**	**0.0159**	**746**	**0.4973**	**3.19%**	
								49.10%
* Source: Siting Council								

ATTACHMENT 3

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

Date: **April 09, 2015**

Jason Rouse
Crown Castle
3530 Toringdon Way, Suite 300
Charlotte, NC 28277
704.405.6605

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

Subject: **Structural Modification Report**

Carrier Designation:	***Verizon Wireless* Co-Locate**	
	Carrier Site Number:	N/A
	Carrier Site Name:	Oxford, CT
Crown Castle Designation:	**Crown Castle BU Number:**	876362
	Crown Castle Site Name:	Oxford / Fritz Property
	Crown Castle JDE Job Number:	316679
	Crown Castle Work Order Number:	1034764
	Crown Castle Application Number:	274626 Rev. 2
Engineering Firm Designation:	**Paul J Ford and Company Project Number:**	37515-0074.003.7700
Site Data:	**338 Oxford Rd., OXFORD, New Haven County, CT**	
	Latitude *41° 25' 40.77"*, Longitude *-73° 6' 30.75"*	
	150 Foot - Monopole Tower	

Dear Jason Rouse,

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 771506, in accordance with application 246820, revision 1.

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

LC4.5: Modified Structure w/ Existing + Proposed Equipment **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing loading, respectively.

The analysis has been performed in accordance with the TIA/EIA-222-F standard and the 2005 CT State Building Code and is based upon a fastest mile wind speed of 85 mph with no ice, 37.6 mph with 1.25 inch ice thickness and 50 mph under service loads.

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:

Bob Koors, E.I. JTK
Structural Designer

4-9-15

tnxTower Report - version 6.1.4.1

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 150 ft Monopole tower designed by ENGINEERED ENDEAVORS, INC. in September of 1999. The tower was originally designed for a wind speed of 89.25 mph per TIA/EIA-222-F.

2) ANALYSIS CRITERIA

The analysis has been performed in accordance with the TIA/EIA-222-F standard and the 2005 CT State Building Code and is based upon a fastest mile wind speed of 85 mph with no ice, 37.6 mph with 1.25 inch ice thickness and 50 mph under service loads.

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
127.0	129.0	3	alcatel lucent	RRH2X60-AWS	1	1-5/8	-
		3	alcatel lucent	RRH2X60-PCS			
		1	antel	BXA-70040/4CF w/ Mount Pipe			
		6	commscope	HBXX-6517DS-A2M w/ Mount Pipe			
		1	rfs celwave	DB-T1-6Z-8AB-0Z			

Table 2 - Existing Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
152.0	152.0	3	alcatel lucent	800 EXTERNAL NOTCH FILTER	3	1-1/4	1
		9	rfs celwave	ACU-A20-N			
		1	tower mounts	Platform Mount [LP 601-1]			
	150.0	3	rfs celwave	APXVSPP18-C-A20 w/ Mount Pipe			
150.0	151.0	3	alcatel lucent	TME-800MHz RRH	-	-	1
	150.0	1	tower mounts	Side Arm Mount [SO 102-3]			
	149.0	3	alcatel lucent	TME-1900MHz RRH (65 MHz)			
137.0	139.0	6	adc	DD1900 FULL BAND w/850 BY-PASS MASTHEAD	12 1 2	1-1/4 3/8 3/4	1
		4	andrew	SBNH-1D6565C w/ Mount Pipe			
		6	communication components inc.	DTMABP7819VG12A			
		3	ericsson	RRUS 11			
		2	kmw communications	AM-X-CD-16-65-00T-RET w/ Mount Pipe			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
		3	powerwave technologies	7020.00			
		3	powerwave technologies	7770.00 w/ Mount Pipe			
		6	powerwave technologies	LGP21901			
	137.0	1	tower mounts	Platform Mount [LP 712-1]			
136.0	137.0	3	ericsson	RRUS 11	-	-	1
		1	raycap	DC6-48-60-18-8F			
	136.0	1	tower mounts	Side Arm Mount [SO 102-3]			
134.0	137.0	3	ericsson	TME-RRUS 11 BAND 12	-	-	1
	134.0	1	raycap	DC6-48-60-18-8F			
		1	tower mounts	Side Arm Mount [SO 102-3]			
127.0	129.0	3	antel	BXA-171063-12BF w/ Mount Pipe	-	-	2
		1	antel	BXA-70063-4CF-EDIN-X w/ Mount Pipe			
	130.0	1	gps	GPS_A	12 1	1-5/8 1/2	1
	129.0	2	antel	BXA-70063-4CF-EDIN-X w/ Mount Pipe			
		6	rfs celwave	APL866513-42T0 w/ Mount Pipe			
		6	rfs celwave	FD9R6004/2C-3L			
	127.0	1	tower mounts	Platform Mount [LP 712-1]			
117.0	117.0	3	andrew	HBX-6516DS-VTM w/ Mount Pipe	6 1	1-5/8 3/8	1
		1	tower mounts	T-Arm Mount [TA 601-3]			
75.0	76.0	1	kathrein	OG-860/1920/GPS-A	1	1/2	1
	75.0	1	tower mounts	Side Arm Mount [SO 701-1]			

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

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	Clarence Welti Assoc, 09/14/99	1531939	CCISITES
4-POST-MODIFICATION INSPECTION	VSI, 080876.07 Rev0, 12/01/08	2364903	CCISITES
4-POST-MODIFICATION INSPECTION	PJF, 41712-0018, 05/18/12	3192205	CCISITES
4-POST-MODIFICATION INSPECTION	TEP, 127765, 05/15/13	3872724	CCISITES
4-POST-MODIFICATION INSPECTION	TEP, 25611.19662, 09/18/2014	5301920	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	EEI, 5724, 12/09/99	1440552	CCISITES
4-TOWER MANUFACTURER DRAWINGS	EEI, 99-1188, 09/21/99	1441271	CCISITES

3.1) Analysis Method

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

3.2) Assumptions

1) Tower and structures were built in accordance with the manufacturer's specifications.
2) The tower and structures have been maintained in accordance with the manufacturer's specification.
3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
4) Monopole was reinforced in conformance with the referenced modification drawings.
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 4 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	150 - 123.42	Pole	TP20.74x15x0.1875	1	-6.71	614.69	89.6	Pass
L2	123.42 - 122.25	Pole	TP20.6033x19.6804x0.25	2	-7.21	839.61	88.5	Pass
L3	122.25 - 120.25	Pole	TP21.0285x20.6033x0.4093	3	-7.48	962.23	86.7	Pass
L4	120.25 - 115.25	Pole	TP22.0918x21.0285x0.5569	4	-9.09	1354.07	76.8	Pass
L5	115.25 - 105.25	Pole	TP24.2182x22.0918x0.5238	5	-10.82	1405.53	99.4	Pass
L6	105.25 - 101.9	Pole	TP24.9305x24.2182x0.7187	6	-11.58	1765.20	86.7	Pass
L7	101.9 - 101.25	Pole	TP25.0687x24.9305x0.7468	7	-11.74	1988.62	78.2	Pass
L8	101.25 - 85.96	Pole	TP28.32x25.0687x0.6922	8	-14.35	2036.92	92.6	Pass
L9	85.96 - 82	Pole	TP28.6653x26.0681x0.7374	9	-16.19	2164.89	96.0	Pass
L10	82 - 77.25	Pole	TP29.6773x28.6653x0.9	10	-18.70	2858.78	80.4	Pass
L11	77.25 - 75	Pole	TP30.1567x29.6773x0.7726	11	-19.34	2507.52	93.0	Pass
L12	75 - 72.15	Pole	TP30.7639x30.1567x0.8125	12	-20.27	2689.10	89.6	Pass
L13	72.15 - 71.25	Pole	TP30.9556x30.7639x0.8269	13	-20.55	2840.41	85.7	Pass
L14	71.25 - 42.41	Pole	TP37.1x30.9556x0.8364	14	-28.55	3411.96	86.5	Pass
L15	42.41 - 36.25	Pole	TP37.7849x34.3257x0.7173	15	-31.80	3320.96	94.5	Pass
L16	36.25 - 31.25	Pole	TP38.849x37.7849x0.742	16	-34.51	3497.71	92.8	Pass
L17	31.25 - 18.75	Pole	TP41.5094x38.849x0.7139	17	-35.56	3434.25	96.0	Pass
L18	18.75 - 0	Pole	TP45.5x41.5094x0.6399	18	-39.96	3532.60	99.1	Pass
							Summary	
						Pole (L5)	99.4	Pass
						Rating =	99.4	Pass

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

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	86.1	Pass
1	Base Plate	0	84.3	Pass
1	Base Foundation Steel	0	30.7	Pass
1	Base Foundation Soil Interaction	0	66.9	Pass

Structure Rating (max from all components) =	**99.4%**

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

4.1) Recommendations

Reinforce monopole in conformance with the attached proposed modification 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:

3) Tower is located in New Haven County, Connecticut.
4) Basic wind speed of 85 mph.
5) Nominal ice thickness of 1.2500 in.
6) Ice thickness is considered to increase with height.
7) Ice density of 56.00 pcf.
8) A wind speed of 38 mph is used in combination with ice.
9) Temperature drop of 50 °F.
10) Deflections calculated using a wind speed of 50 mph.
11) A non-linear (P-delta) analysis was used.
12) Pressures are calculated at each section.
13) Stress ratio used in pole design is 1.333.
14) 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	150.0000-123.4200	26.5800	3.17	18	15.0000	20.7400	0.1875	0.7500	A572-65 (65 ksi)
L2	123.4200-122.2500	4.3400	0.00	18	19.6804	20.6033	0.2500	1.0000	A572-65 (65 ksi)
L3	122.2500-120.2500	2.0000	0.00	18	20.6033	21.0285	0.4093	1.6373	Reinf 44.91 ksi (45 ksi)
L4	120.2500-115.2500	5.0000	0.00	18	21.0285	22.0918	0.5569	2.2274	Reinf 44.48 ksi (44 ksi)
L5	115.2500-105.2500	10.0000	0.00	18	22.0918	24.2182	0.5238	2.0952	Reinf 44.61 ksi (45 ksi)
L6	105.2500-101.9000	3.3500	0.00	18	24.2182	24.9305	0.7187	2.8748	Reinf 39.96 ksi (40 ksi)
L7	101.9000-101.2500	0.6500	0.00	18	24.9305	25.0687	0.7468	2.9871	Reinf 43.13 ksi (43 ksi)
L8	101.2500-85.9600	15.2900	4.08	18	25.0687	28.3200	0.6922	2.7686	Reinf 43.32 ksi (43 ksi)
L9	85.9600-82.0000	8.0400	0.00	18	26.0681	28.6653	0.7374	2.9494	Reinf 43.40 ksi (43 ksi)

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L10	82.0000-77.2500	4.7500	0.00	18	28.6653	29.6773	0.9000	3.6001	Reinf 43.48 ksi (43 ksi)
L11	77.2500-75.0000	2.2500	0.00	18	29.6773	30.1567	0.7726	3.0904	Reinf 43.51 ksi (44 ksi)
L12	75.0000-72.1500	2.8500	0.00	18	30.1567	30.7639	0.8125	3.2499	Reinf 43.53 ksi (44 ksi)
L13	72.1500-71.2500	0.9000	0.00	18	30.7639	30.9556	0.8269	3.3077	Reinf 44.91 ksi (45 ksi)
L14	71.2500-42.4100	28.8400	5.17	18	30.9556	37.1000	0.8364	3.3457	Reinf 45.70 ksi (46 ksi)
L15	42.4100-36.2500	11.3300	0.00	18	34.3257	37.7849	0.7173	2.8693	Reinf 51.83 ksi (52 ksi)
L16	36.2500-31.2500	5.0000	0.00	18	37.7849	38.8490	0.7420	2.9680	Reinf 49.56 ksi (50 ksi)
L17	31.2500-18.7500	12.5000	0.00	18	38.8490	41.5094	0.7139	2.8557	Reinf 49.69 ksi (50 ksi)
L18	18.7500-0.0000	18.7500		18	41.5094	45.5000	0.6399	2.5596	Reinf 53.21 ksi (53 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	15.2314	8.8153	244.3603	5.2584	7.6200	32.0683	489.0422	4.4085	2.3100	12.32
	21.0599	12.2313	652.7391	7.2961	10.5359	61.9537	1306.3371	6.1168	3.3202	17.708
L2	20.6685	15.4180	735.4135	6.8978	9.9977	73.5586	1471.7947	7.7105	3.0238	12.095
	20.9211	16.1503	845.2522	7.2254	10.4665	80.7582	1691.6167	8.0767	3.1862	12.745
L3	20.9211	26.2362	1351.7005	7.1688	10.4665	129.1460	2705.1797	13.1206	2.9058	7.099
	21.3529	26.7888	1438.9113	7.3198	10.6825	134.6980	2879.7159	13.3969	2.9806	7.282
L4	21.3529	36.1832	1915.8030	7.2674	10.6825	179.3404	3834.1269	18.0950	2.7209	4.886
	22.4326	38.0624	2230.0694	7.6449	11.2226	198.7122	4463.0731	19.0348	2.9081	5.222
L5	22.4326	35.8583	2107.3863	7.6566	11.2226	187.7804	4217.5456	17.9325	2.9662	5.663
	24.5918	39.3936	2794.1683	8.4115	12.3028	227.1160	5592.0132	19.7005	3.3405	6.377
L6	24.5918	53.6066	3739.9961	8.3423	12.3028	303.9949	7484.9135	26.8084	2.9975	4.171
	25.3151	55.2316	4090.5222	8.5952	12.6647	322.9863	8186.4268	27.6210	3.1228	4.345
L7	25.3151	57.3214	4235.4649	8.5852	12.6647	334.4309	8476.5030	28.6662	3.0735	4.116
	25.4554	57.6491	4308.5031	8.6343	12.7349	338.3222	8622.6754	28.8300	3.0978	4.148
L8	25.4554	53.5533	4020.3895	8.6537	12.7349	315.6983	8046.0690	26.7817	3.1939	4.614
	28.7569	60.6960	5853.1771	9.8079	14.3866	406.8504	11714.0560	30.3538	3.7661	5.441
L9	27.8086	59.2836	4805.8209	8.9924	13.2426	362.9063	9617.9654	29.6474	3.2902	4.462
	29.1075	65.3621	6440.8332	9.9144	14.5620	442.3045	12890.1415	32.6873	3.7473	5.082
L10	29.1075	79.3161	7725.1001	9.8567	14.5620	530.4976	15460.3650	39.6656	3.4611	3.846
	30.1351	82.2071	8600.9548	10.2159	15.0761	570.5034	17213.2270	41.1113	3.6392	4.043
L11	30.1351	70.8811	7481.7876	10.2612	15.0761	496.2688	14973.4200	35.4473	3.8634	5.001
	30.6219	72.0566	7860.2321	10.4313	15.3196	513.0836	15730.8069	36.0351	3.9478	5.11
L12	30.6219	75.6732	8232.3509	10.4172	15.3196	537.3740	16475.5341	37.8438	3.8776	4.773
	31.2385	77.2390	8754.0381	10.6327	15.6281	560.1491	17519.5950	38.6268	3.9845	4.904
L13	31.2385	78.5748	8896.8399	10.6276	15.6281	569.2866	17805.3865	39.2949	3.9590	4.788
	31.4332	79.0780	9068.8844	10.6957	15.7255	576.7009	18149.7019	39.5465	3.9928	4.828
L14	31.4332	79.9604	9164.2954	10.6923	15.7255	582.7682	18340.6494	39.9878	3.9761	4.754
	37.6723	96.2724	15994.8735	12.8736	18.8468	848.6785	32010.7935	48.1454	5.0575	6.047
L15	36.4580	76.5187	10919.4223	11.9310	17.4375	626.2052	21853.2126	38.2666	4.7788	6.662

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
	38.3678	84.3944	14650.0569	13.1590	19.1947	763.2337	29319.3906	42.2052	5.3877	7.511
L16	38.3678	87.2388	15123.6637	13.1502	19.1947	787.9075	30267.2275	43.6277	5.3442	7.203
	39.4483	89.7450	16464.8611	13.5280	19.7353	834.2845	32951.3872	44.8810	5.5315	7.455
L17	39.4483	86.4135	15877.0178	13.5380	19.7353	804.4981	31774.9270	43.2149	5.5809	7.817
	42.1498	92.4419	19437.0657	14.4824	21.0868	921.7652	38899.7072	46.2297	6.0492	8.473
L18	42.1498	83.0077	17516.8130	14.5087	21.0868	830.7010	35056.6751	41.5118	6.1794	9.657
	46.2019	91.1128	23165.2608	15.9253	23.1140	1002.2177	46361.0031	45.5650	6.8818	10.754

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_r	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 150.0000-123.4200				1	1	1		
L2 123.4200-122.2500				1	1	1		
L3 122.2500-120.2500				1	1	1		
L4 120.2500-115.2500				1	1	1		
L5 115.2500-105.2500				1	1	1		
L6 105.2500-101.9000				1	1	1		
L7 101.9000-101.2500				1	1	1		
L8 101.2500-85.9600				1	1	1		
L9 85.9600-82.0000				1	1	1		
L10 82.0000-77.2500				1	1	1		
L11 77.2500-75.0000				1	1	1		
L12 75.0000-72.1500				1	1	1		
L13 72.1500-71.2500				1	1	1		
L14 71.2500-42.4100				1	1	1		
L15 42.4100-36.2500				1	1	1		
L16 36.2500-31.2500				1	1	1		
L17 31.2500-18.7500				1	1	1		
L18 18.7500-0.0000				1	1	1		

Feed Line/Linear Appurtenances - Entered As Round Or Flat

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

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
HB114-1-0813U4-M5J(1 1/4")	C	No	Inside Pole	150.0000 - 0.0000	3	No Ice	0.0000	1.20
						1/2" Ice	0.0000	1.20
						1" Ice	0.0000	1.20
						2" Ice	0.0000	1.20
						4" Ice	0.0000	1.20
****								
LDF6-50A(1-1/4")	C	No	Inside Pole	137.0000 - 0.0000	12	No Ice	0.0000	0.66
						1/2" Ice	0.0000	0.66
						1" Ice	0.0000	0.66
						2" Ice	0.0000	0.66
						4" Ice	0.0000	0.66
FB-L98B-002-75000(3/8")	C	No	Inside Pole	137.0000 - 0.0000	1	No Ice	0.0000	0.06
						1/2" Ice	0.0000	0.06
						1" Ice	0.0000	0.06
						2" Ice	0.0000	0.06
						4" Ice	0.0000	0.06
WR-VG86ST-BRD(3/4)	C	No	Inside Pole	137.0000 - 0.0000	2	No Ice	0.0000	0.59
						1/2" Ice	0.0000	0.59
						1" Ice	0.0000	0.59
						2" Ice	0.0000	0.59
						4" Ice	0.0000	0.59
2" (Nominal) Conduit	C	No	Inside Pole	137.0000 - 0.0000	1	No Ice	0.0000	0.72
						1/2" Ice	0.0000	0.72
						1" Ice	0.0000	0.72
						2" Ice	0.0000	0.72
						4" Ice	0.0000	0.72
**								
AVA7-50(1-5/8)	C	No	Inside Pole	127.0000 - 0.0000	12	No Ice	0.0000	0.70
						1/2" Ice	0.0000	0.70
						1" Ice	0.0000	0.70
						2" Ice	0.0000	0.70
						4" Ice	0.0000	0.70
LDF4-50A(1/2")	C	No	Inside Pole	127.0000 - 0.0000	1	No Ice	0.0000	0.15
						1/2" Ice	0.0000	0.15
						1" Ice	0.0000	0.15
						2" Ice	0.0000	0.15
						4" Ice	0.0000	0.15
HB158-1-08U8-S8J18(1-5/8)	C	No	Inside Pole	127.0000 - 0.0000	1	No Ice	0.0000	1.30
						1/2" Ice	0.0000	1.30
						1" Ice	0.0000	1.30
						2" Ice	0.0000	1.30
						4" Ice	0.0000	1.30
**								
FXL-1873(1 5/8")	C	No	Inside Pole	117.0000 - 0.0000	6	No Ice	0.0000	0.67
						1/2" Ice	0.0000	0.67
						1" Ice	0.0000	0.67
						2" Ice	0.0000	0.67
						4" Ice	0.0000	0.67
860 10033(3/8)	C	No	Inside Pole	117.0000 - 0.0000	1	No Ice	0.0000	0.00
						1/2" Ice	0.0000	0.00
						1" Ice	0.0000	0.00
						2" Ice	0.0000	0.00
						4" Ice	0.0000	0.00
**								
LDF4-50A(1/2")	C	No	Inside Pole	75.0000 - 0.0000	1	No Ice	0.0000	0.15
						1/2" Ice	0.0000	0.15
						1" Ice	0.0000	0.15
						2" Ice	0.0000	0.15
						4" Ice	0.0000	0.15
****								
Aero MP3-05	C	No	CaAa (Out Of Face)	46.2500 - 0.0000	1	No Ice	0.3478	0.00
						1/2" Ice	0.4001	0.00
						1" Ice	0.6566	0.00
						2" Ice	0.8788	0.00
						4" Ice	1.3232	0.00

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
Aero MP3-03	C	No	CaAa (Out Of Face)	116.2500 - 46.2500	1	No Ice	0.2625	0.00
						1/2" Ice	0.3736	0.00
						1" Ice	0.4847	0.00
						2" Ice	0.7069	0.00
						4" Ice	1.1514	0.00
1 1/4" Flat Reinforcement	C	No	CaAa (Out Of Face)	36.2500 - 0.0000	1	No Ice	0.2083	0.00
						1/2" Ice	0.3194	0.00
						1" Ice	0.4306	0.00
						2" Ice	0.6528	0.00
						4" Ice	1.0972	0.00
1" Flat Reinforcement	C	No	CaAa (Out Of Face)	71.2500 - 36.2500	1	No Ice	0.1667	0.00
						1/2" Ice	0.2778	0.00
						1" Ice	0.3889	0.00
						2" Ice	0.6111	0.00
						4" Ice	1.0556	0.00
3/4" Flat Reinforcement	C	No	CaAa (Out Of Face)	121.2500 - 71.2500	1	No Ice	0.1250	0.00
						1/2" Ice	0.2361	0.00
						1" Ice	0.3472	0.00
						2" Ice	0.5694	0.00
						4" Ice	1.0139	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	150.0000-123.4200	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.27
L2	123.4200-122.2500	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.03
L3	122.2500-120.2500	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.125	0.05
L4	120.2500-115.2500	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.887	0.12
L5	115.2500-105.2500	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	3.875	0.27
L6	105.2500-101.9000	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	1.298	0.09
L7	101.9000-101.2500	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.252	0.02
L8	101.2500-85.9600	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	5.924	0.42
L9	85.9600-82.0000	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	1.534	0.11
L10	82.0000-77.2500	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	1.840	0.13
L11	77.2500-75.0000	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.872	0.06
L12	75.0000-72.1500	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	1.104	0.08
L13	72.1500-71.2500	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.349	0.02

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
L14	71.2500-42.4100	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	12.704	0.79
L15	42.4100-36.2500	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	3.169	0.17
L16	36.2500-31.2500	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	2.781	0.14
L17	31.2500-18.7500	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	6.952	0.34
L18	18.7500-0.0000	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	10.427	0.52

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	150.0000-123.4200	A	1.482	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.27
L2	123.4200-122.2500	A	1.464	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.03
L3	122.2500-120.2500	A	1.461	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.450	0.05
L4	120.2500-115.2500	A	1.456	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	2.829	0.12
L5	115.2500-105.2500	A	1.445	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	10.295	0.27
L6	105.2500-101.9000	A	1.434	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	3.433	0.09
L7	101.9000-101.2500	A	1.431	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.665	0.02
L8	101.2500-85.9600	A	1.416	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	15.549	0.42
L9	85.9600-82.0000	A	1.398	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	4.027	0.11
L10	82.0000-77.2500	A	1.389	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	4.773	0.13
L11	77.2500-75.0000	A	1.382	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	2.254	0.06
L12	75.0000-72.1500	A	1.376	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	2.848	0.08
L13	72.1500-71.2500	A	1.372	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.898	0.02
L14	71.2500-42.4100	A	1.333	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	30.123	0.79
L15	42.4100-36.2500	A	1.276	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	7.352	0.17

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
L16	36.2500-31.2500	A	1.253	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	5.999	0.14
L17	31.2500-18.7500	A	1.250	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	14.978	0.34
L18	18.7500-0.0000	A	1.250	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	22.467	0.52

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	150.0000-123.4200	0.0000	0.0000	0.0000	0.0000
L2	123.4200-122.2500	0.0000	0.0000	0.0000	0.0000
L3	122.2500-120.2500	-0.0788	0.0455	-0.2312	0.1335
L4	120.2500-115.2500	-0.2111	0.1219	-0.5090	0.2938
L5	115.2500-105.2500	-0.4192	0.2420	-0.8065	0.4656
L6	105.2500-101.9000	-0.4233	0.2444	-0.8232	0.4753
L7	101.9000-101.2500	-0.4244	0.2450	-0.8279	0.4780
L8	101.2500-85.9600	-0.4287	0.2475	-0.8451	0.4879
L9	85.9600-82.0000	-0.4317	0.2492	-0.8598	0.4964
L10	82.0000-77.2500	-0.4341	0.2506	-0.8653	0.4996
L11	77.2500-75.0000	-0.4356	0.2515	-0.8708	0.5028
L12	75.0000-72.1500	-0.4367	0.2521	-0.8746	0.5050
L13	72.1500-71.2500	-0.4374	0.2525	-0.8773	0.5065
L14	71.2500-42.4100	-0.4963	0.2865	-0.9395	0.5424
L15	42.4100-36.2500	-0.5724	0.3305	-1.0611	0.6126
L16	36.2500-31.2500	-0.6153	0.3552	-1.0814	0.6244
L17	31.2500-18.7500	-0.6195	0.3577	-1.0961	0.6328
L18	18.7500-0.0000	-0.6264	0.3616	-1.1214	0.6475

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
APXVSPP18-C-A20 w/ Mount Pipe	A	From Face	4.0000 0.00 -2.00	0.00	152.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.4975 9.1490 9.7672 11.0311 13.6786	6.9458 8.1266 9.0212 10.8440 14.8507	0.08 0.15 0.23 0.41 0.91
APXVSPP18-C-A20 w/ Mount Pipe	B	From Face	4.0000 0.00 -2.00	0.00	152.0000	No Ice 1/2" Ice 1" Ice 2" Ice	8.4975 9.1490 9.7672 11.0311 13.6786	6.9458 8.1266 9.0212 10.8440 14.8507	0.08 0.15 0.23 0.41 0.91

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
						4" Ice			
APXVSPP18-C-A20 w/ Mount Pipe	C	From Face	4.0000 0.00 -2.00	0.00	152.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.4975 9.1490 9.7672 11.0311 13.6786	6.9458 8.1266 9.0212 10.8440 14.8507	0.08 0.15 0.23 0.41 0.91
(3) ACU-A20-N	A	From Face	4.0000 0.00 0.00	0.00	152.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.0778 0.1210 0.1728 0.3025 0.6654	0.1361 0.1890 0.2506 0.3997 0.8015	0.00 0.00 0.00 0.01 0.04
(3) ACU-A20-N	B	From Face	4.0000 0.00 0.00	0.00	152.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.0778 0.1210 0.1728 0.3025 0.6654	0.1361 0.1890 0.2506 0.3997 0.8015	0.00 0.00 0.00 0.01 0.04
(3) ACU-A20-N	C	From Face	4.0000 0.00 0.00	0.00	152.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.0778 0.1210 0.1728 0.3025 0.6654	0.1361 0.1890 0.2506 0.3997 0.8015	0.00 0.00 0.00 0.01 0.04
800 EXTERNAL NOTCH FILTER	A	From Face	4.0000 0.00 0.00	0.00	152.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.7701 0.8898 1.0181 1.3007 1.9696	0.3747 0.4647 0.5634 0.7868 1.3372	0.01 0.02 0.02 0.04 0.11
800 EXTERNAL NOTCH FILTER	B	From Face	4.0000 0.00 0.00	0.00	152.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.7701 0.8898 1.0181 1.3007 1.9696	0.3747 0.4647 0.5634 0.7868 1.3372	0.01 0.02 0.02 0.04 0.11
800 EXTERNAL NOTCH FILTER	C	From Face	4.0000 0.00 0.00	0.00	152.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.7701 0.8898 1.0181 1.3007 1.9696	0.3747 0.4647 0.5634 0.7868 1.3372	0.01 0.02 0.02 0.04 0.11
Platform Mount [LP 601-1]	C	None		0.00	152.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	28.4700 33.5900 38.7100 48.9500 69.4300	28.4700 33.5900 38.7100 48.9500 69.4300	1.12 1.51 1.91 2.69 4.26
2.375" OD x 6' Mount Pipe	A	From Face	4.0000 0.00 0.00	0.00	152.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.4250 1.9250 2.2939 3.0596 4.7022	1.4250 1.9250 2.2939 3.0596 4.7022	0.03 0.04 0.05 0.09 0.23
2.375" OD x 6' Mount Pipe	B	From Face	4.0000 0.00 0.00	0.00	152.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.4250 1.9250 2.2939 3.0596 4.7022	1.4250 1.9250 2.2939 3.0596 4.7022	0.03 0.04 0.05 0.09 0.23
2.375" OD x 6' Mount Pipe	C	From Face	4.0000 0.00 0.00	0.00	152.0000	No Ice 1/2" Ice 1" Ice	1.4250 1.9250 2.2939 3.0596	1.4250 1.9250 2.2939 3.0596	0.03 0.04 0.05 0.09

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	4.7022	4.7022	0.23
						4" Ice			
(2) 2.375" OD x 6' Mount Pipe	A	From Face	4.0000 0.00 0.00	0.00	152.0000	No Ice	1.4250	1.4250	0.03
						1/2" Ice	1.9250	1.9250	0.04
						1" Ice	2.2939	2.2939	0.05
						2" Ice	3.0596	3.0596	0.09
						4" Ice	4.7022	4.7022	0.23
(2) 2.375" OD x 6' Mount Pipe	B	From Face	4.0000 0.00 0.00	0.00	152.0000	No Ice	1.4250	1.4250	0.03
						1/2" Ice	1.9250	1.9250	0.04
						1" Ice	2.2939	2.2939	0.05
						2" Ice	3.0596	3.0596	0.09
						4" Ice	4.7022	4.7022	0.23
(2) 2.375" OD x 6' Mount Pipe	C	From Face	4.0000 0.00 0.00	0.00	152.0000	No Ice	1.4250	1.4250	0.03
						1/2" Ice	1.9250	1.9250	0.04
						1" Ice	2.2939	2.2939	0.05
						2" Ice	3.0596	3.0596	0.09
						4" Ice	4.7022	4.7022	0.23
8-ft Ladder	C	From Face	2.0000 0.00 -2.00	0.00	152.0000	No Ice	7.0700	7.0700	0.04
						1/2" Ice	9.7300	9.7300	0.07
						1" Ice	11.1900	11.1900	0.08
						2" Ice	13.9800	13.9800	0.11
						4" Ice	18.8900	18.8900	0.15
****									
TME-1900MHz RRH (65 MHz)	A	From Face	2.0000 0.00 -1.00	0.00	150.0000	No Ice	2.6979	2.7708	0.06
						1/2" Ice	2.9362	3.0111	0.08
						1" Ice	3.1832	3.2600	0.11
						2" Ice	3.7030	3.7837	0.18
						4" Ice	4.8463	4.9348	0.35
TME-1900MHz RRH (65 MHz)	B	From Face	2.0000 0.00 -1.00	0.00	150.0000	No Ice	2.6979	2.7708	0.06
						1/2" Ice	2.9362	3.0111	0.08
						1" Ice	3.1832	3.2600	0.11
						2" Ice	3.7030	3.7837	0.18
						4" Ice	4.8463	4.9348	0.35
TME-1900MHz RRH (65 MHz)	C	From Face	2.0000 0.00 -1.00	0.00	150.0000	No Ice	2.6979	2.7708	0.06
						1/2" Ice	2.9362	3.0111	0.08
						1" Ice	3.1832	3.2600	0.11
						2" Ice	3.7030	3.7837	0.18
						4" Ice	4.8463	4.9348	0.35
TME-800MHz RRH	A	From Face	2.0000 0.00 1.00	0.00	150.0000	No Ice	2.4899	2.0685	0.05
						1/2" Ice	2.7061	2.2705	0.07
						1" Ice	2.9310	2.4812	0.10
						2" Ice	3.4068	2.9284	0.16
						4" Ice	4.4620	3.9265	0.32
TME-800MHz RRH	B	From Face	2.0000 0.00 1.00	0.00	150.0000	No Ice	2.4899	2.0685	0.05
						1/2" Ice	2.7061	2.2705	0.07
						1" Ice	2.9310	2.4812	0.10
						2" Ice	3.4068	2.9284	0.16
						4" Ice	4.4620	3.9265	0.32
TME-800MHz RRH	C	From Face	2.0000 0.00 1.00	0.00	150.0000	No Ice	2.4899	2.0685	0.05
						1/2" Ice	2.7061	2.2705	0.07
						1" Ice	2.9310	2.4812	0.10
						2" Ice	3.4068	2.9284	0.16
						4" Ice	4.4620	3.9265	0.32
Side Arm Mount [SO 102-3]	C	None		0.00	150.0000	No Ice	3.0000	3.0000	0.08
						1/2"	3.4800	3.4800	0.11

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
						Ice	3.9600	3.9600	0.14
						1" Ice	4.9200	4.9200	0.20
						2" Ice	6.8400	6.8400	0.32
						4" Ice			
****									
7770.00 w/ Mount Pipe	A	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.2208 6.7144 7.2182 8.2568 10.4762	4.8204 5.5082 6.2127 7.6716 11.0613	0.09 0.14 0.21 0.36 0.76
7770.00 w/ Mount Pipe	B	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.2208 6.7144 7.2182 8.2568 10.4762	4.8204 5.5082 6.2127 7.6716 11.0613	0.09 0.14 0.21 0.36 0.76
7770.00 w/ Mount Pipe	C	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.2208 6.7144 7.2182 8.2568 10.4762	4.8204 5.5082 6.2127 7.6716 11.0613	0.09 0.14 0.21 0.36 0.76
AM-X-CD-16-65-00T-RET w/ Mount Pipe	A	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.4975 9.1490 9.7672 11.0311 13.6786	6.3042 7.4790 8.3676 10.1785 14.0237	0.07 0.14 0.21 0.38 0.87
AM-X-CD-16-65-00T-RET w/ Mount Pipe	B	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.4975 9.1490 9.7672 11.0311 13.6786	6.3042 7.4790 8.3676 10.1785 14.0237	0.07 0.14 0.21 0.38 0.87
SBNH-1D6565C w/ Mount Pipe	A	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	11.5561 12.2227 12.8929 14.2911 17.4280	9.7151 11.1857 12.5942 14.8689 19.6184	0.10 0.19 0.28 0.51 1.15
SBNH-1D6565C w/ Mount Pipe	B	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	11.5561 12.2227 12.8929 14.2911 17.4280	9.7151 11.1857 12.5942 14.8689 19.6184	0.10 0.19 0.28 0.51 1.15
(2) SBNH-1D6565C w/ Mount Pipe	C	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	11.5561 12.2227 12.8929 14.2911 17.4280	9.7151 11.1857 12.5942 14.8689 19.6184	0.10 0.19 0.28 0.51 1.15
7020.00	A	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.1191 0.1714 0.2323 0.3801 0.7793	0.2042 0.2791 0.3627 0.5559 1.0459	0.00 0.01 0.01 0.02 0.07
7020.00	B	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.1191 0.1714 0.2323 0.3801 0.7793	0.2042 0.2791 0.3627 0.5559 1.0459	0.00 0.01 0.01 0.02 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
7020.00	C	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.1191 0.1714 0.2323 0.3801 0.7793	0.2042 0.2791 0.3627 0.5559 1.0459	0.00 0.01 0.01 0.02 0.07
(2) DTMABP7819VG12A	A	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.1389 1.2835 1.4368 1.7693 2.5380	0.3907 0.4884 0.5947 0.8334 1.4144	0.02 0.03 0.04 0.06 0.14
(2) DTMABP7819VG12A	B	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.1389 1.2835 1.4368 1.7693 2.5380	0.3907 0.4884 0.5947 0.8334 1.4144	0.02 0.03 0.04 0.06 0.14
(2) DTMABP7819VG12A	C	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.1389 1.2835 1.4368 1.7693 2.5380	0.3907 0.4884 0.5947 0.8334 1.4144	0.02 0.03 0.04 0.06 0.14
(2) DD1900 FULL BAND w/850 BY-PASS MASTHEAD	A	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.2854 1.4388 1.6008 1.9508 2.7545	0.3185 0.4168 0.5237 0.7636 1.3469	0.02 0.02 0.03 0.06 0.14
(2) DD1900 FULL BAND w/850 BY-PASS MASTHEAD	B	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.2854 1.4388 1.6008 1.9508 2.7545	0.3185 0.4168 0.5237 0.7636 1.3469	0.02 0.02 0.03 0.06 0.14
(2) DD1900 FULL BAND w/850 BY-PASS MASTHEAD	C	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.2854 1.4388 1.6008 1.9508 2.7545	0.3185 0.4168 0.5237 0.7636 1.3469	0.02 0.02 0.03 0.06 0.14
(2) LGP21901	A	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.2695 0.3432 0.4255 0.6160 1.1009	0.1838 0.2483 0.3216 0.4940 0.9425	0.01 0.01 0.01 0.02 0.07
(2) LGP21901	B	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.2695 0.3432 0.4255 0.6160 1.1009	0.1838 0.2483 0.3216 0.4940 0.9425	0.01 0.01 0.01 0.02 0.07
(2) LGP21901	C	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.2695 0.3432 0.4255 0.6160 1.1009	0.1838 0.2483 0.3216 0.4940 0.9425	0.01 0.01 0.01 0.02 0.07
RRUS 11	A	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice	3.2560 3.4982 3.7490 4.2766 5.4355	1.3790 1.5577 1.7450 2.1455 3.0504	0.05 0.07 0.10 0.15 0.31

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
						4" Ice			
RRUS 11	B	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.2560 3.4982 3.7490 4.2766 5.4355	1.3790 1.5577 1.7450 2.1455 3.0504	0.05 0.07 0.10 0.15 0.31
RRUS 11	C	From Face	4.0000 0.00 2.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.2560 3.4982 3.7490 4.2766 5.4355	1.3790 1.5577 1.7450 2.1455 3.0504	0.05 0.07 0.10 0.15 0.31
Platform Mount [LP 712-1]	C	None		0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	24.5300 29.9400 35.3500 46.1700 67.8100	24.5300 29.9400 35.3500 46.1700 67.8100	1.34 1.65 1.96 2.58 3.82
2.375" OD x 6' Mount Pipe	A	From Face	4.0000 0.00 0.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.4250 1.9250 2.2939 3.0596 4.7022	1.4250 1.9250 2.2939 3.0596 4.7022	0.03 0.04 0.05 0.09 0.23
2.375" OD x 6' Mount Pipe	B	From Face	4.0000 0.00 0.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.4250 1.9250 2.2939 3.0596 4.7022	1.4250 1.9250 2.2939 3.0596 4.7022	0.03 0.04 0.05 0.09 0.23
2.375" OD x 6' Mount Pipe	C	From Face	4.0000 0.00 0.00	0.00	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.4250 1.9250 2.2939 3.0596 4.7022	1.4250 1.9250 2.2939 3.0596 4.7022	0.03 0.04 0.05 0.09 0.23
****									
RRUS 11	A	From Face	2.0000 0.00 1.00	0.00	136.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.2560 3.4982 3.7490 4.2766 5.4355	1.3790 1.5577 1.7450 2.1455 3.0504	0.05 0.07 0.10 0.15 0.31
RRUS 11	B	From Face	2.0000 0.00 1.00	0.00	136.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.2560 3.4982 3.7490 4.2766 5.4355	1.3790 1.5577 1.7450 2.1455 3.0504	0.05 0.07 0.10 0.15 0.31
RRUS 11	C	From Face	2.0000 0.00 1.00	0.00	136.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.2560 3.4982 3.7490 4.2766 5.4355	1.3790 1.5577 1.7450 2.1455 3.0504	0.05 0.07 0.10 0.15 0.31
DC6-48-60-18-8F	B	From Face	2.0000 0.00 1.00	0.00	136.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.4667 1.6667 1.8778 2.3333 3.3778	1.4667 1.6667 1.8778 2.3333 3.3778	0.02 0.04 0.06 0.11 0.24
Side Arm Mount [SO 102-3]	C	None		0.00	136.0000	No Ice 1/2" Ice	3.0000 3.4800 3.9600	3.0000 3.4800 3.9600	0.08 0.11 0.14

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						1" Ice	4.9200	4.9200	0.20
						2" Ice	6.8400	6.8400	0.32
						4" Ice			
****									
TME-RRUS 11 BAND 12	A	From Face	2.0000 0.00 3.00	0.00	134.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.9939 3.2257 3.4661 3.9730 5.0904	1.2633 1.4303 1.6060 1.9832 2.8413	0.05 0.07 0.09 0.15 0.30
TME-RRUS 11 BAND 12	B	From Face	2.0000 0.00 3.00	0.00	134.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.9939 3.2257 3.4661 3.9730 5.0904	1.2633 1.4303 1.6060 1.9832 2.8413	0.05 0.07 0.09 0.15 0.30
TME-RRUS 11 BAND 12	C	From Face	2.0000 0.00 3.00	0.00	134.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.9939 3.2257 3.4661 3.9730 5.0904	1.2633 1.4303 1.6060 1.9832 2.8413	0.05 0.07 0.09 0.15 0.30
DC6-48-60-18-8F	C	None		0.00	134.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.4667 1.6667 1.8778 2.3333 3.3778	1.4667 1.6667 1.8778 2.3333 3.3778	0.02 0.04 0.06 0.11 0.24
Side Arm Mount [SO 102-3]	C	None		0.00	134.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.0000 3.4800 3.9600 4.9200 6.8400	3.0000 3.4800 3.9600 4.9200 6.8400	0.08 0.11 0.14 0.20 0.32
**									
(2) APL866513-42T0 w/ Mount Pipe	A	From Face	4.0000 0.00 2.00	0.00	127.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.5308 4.9675 5.4135 6.3370 8.3197	4.9208 5.5962 6.2837 7.7123 10.8330	0.03 0.08 0.13 0.25 0.60
(2) APL866513-42T0 w/ Mount Pipe	B	From Face	4.0000 0.00 2.00	0.00	127.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.5308 4.9675 5.4135 6.3370 8.3197	4.9208 5.5962 6.2837 7.7123 10.8330	0.03 0.08 0.13 0.25 0.60
(2) APL866513-42T0 w/ Mount Pipe	C	From Face	4.0000 0.00 2.00	0.00	127.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.5308 4.9675 5.4135 6.3370 8.3197	4.9208 5.5962 6.2837 7.7123 10.8330	0.03 0.08 0.13 0.25 0.60
BXA-70063-4CF-EDIN-X w/ Mount Pipe	B	From Face	4.0000 0.00 2.00	0.00	127.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.3988 5.8435 6.2986 7.2405 9.2612	3.6927 4.2947 4.9133 6.2583 9.2851	0.03 0.07 0.12 0.23 0.58
BXA-70063-4CF-EDIN-X w/ Mount Pipe	C	From Face	4.0000 0.00 2.00	0.00	127.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.3988 5.8435 6.2986 7.2405 9.2612	3.6927 4.2947 4.9133 6.2583 9.2851	0.03 0.07 0.12 0.23 0.58

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
GPS_A	B	From Face	4.0000 0.00 3.00	0.00	127.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.2975 0.3739 0.4589 0.6549 1.1506	0.2975 0.3739 0.4589 0.6549 1.1506	0.00 0.00 0.01 0.02 0.08
(2) FD9R6004/2C-3L	A	From Face	4.0000 0.00 2.00	0.00	127.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.3665 0.4506 0.5433 0.7546 1.2808	0.0846 0.1362 0.1965 0.3430 0.7396	0.00 0.01 0.01 0.02 0.06
(2) FD9R6004/2C-3L	B	From Face	4.0000 0.00 2.00	0.00	127.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.3665 0.4506 0.5433 0.7546 1.2808	0.0846 0.1362 0.1965 0.3430 0.7396	0.00 0.01 0.01 0.02 0.06
(2) FD9R6004/2C-3L	C	From Face	4.0000 0.00 2.00	0.00	127.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.3665 0.4506 0.5433 0.7546 1.2808	0.0846 0.1362 0.1965 0.3430 0.7396	0.00 0.01 0.01 0.02 0.06
BXA-70040/4CF w/ Mount Pipe	A	From Face	4.0000 0.00 2.00	0.00	127.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	11.2046 11.7303 12.2664 13.3704 15.7158	4.7953 5.4552 6.1330 7.5424 10.6321	0.04 0.11 0.19 0.37 0.84
(2) HBXX-6517DS-A2M w/ Mount Pipe	A	From Face	4.0000 0.00 2.00	0.00	127.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.9758 9.6473 10.2909 11.5946 14.3212	6.9629 8.1817 9.1436 11.0219 15.0267	0.07 0.14 0.21 0.40 0.91
(2) HBXX-6517DS-A2M w/ Mount Pipe	B	From Face	4.0000 0.00 2.00	0.00	127.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.9758 9.6473 10.2909 11.5946 14.3212	6.9629 8.1817 9.1436 11.0219 15.0267	0.07 0.14 0.21 0.40 0.91
(2) HBXX-6517DS-A2M w/ Mount Pipe	C	From Face	4.0000 0.00 2.00	0.00	127.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.9758 9.6473 10.2909 11.5946 14.3212	6.9629 8.1817 9.1436 11.0219 15.0267	0.07 0.14 0.21 0.40 0.91
DB-T1-6Z-8AB-0Z	A	From Face	4.0000 0.00 2.00	0.00	127.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.6000 5.9154 6.2395 6.9136 8.3654	2.3333 2.5580 2.7914 3.2840 4.3728	0.04 0.08 0.12 0.21 0.45
RRH2X60-PCS	A	From Face	4.0000 0.00 2.00	0.00	127.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.5667 2.7914 3.0247 3.5173 4.6062	2.0106 2.2184 2.4349 2.8938 3.9152	0.06 0.08 0.10 0.16 0.31
RRH2X60-PCS	B	From Face	4.0000 0.00 2.00	0.00	127.0000	No Ice 1/2" Ice 1" Ice 2" Ice	2.5667 2.7914 3.0247 3.5173 4.6062	2.0106 2.2184 2.4349 2.8938 3.9152	0.06 0.08 0.10 0.16 0.31

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
							4" Ice			
RRH2X60-PCS	C	From Face	4.0000	0.00	0.00	127.0000	No Ice	2.5667	2.0106	0.06
			0.00				1/2" Ice	2.7914	2.2184	0.08
			2.00				1" Ice	3.0247	2.4349	0.10
							2" Ice	3.5173	2.8938	0.16
							4" Ice	4.6062	3.9152	0.31
RRH2X60-AWS	A	From Face	4.0000	0.00	0.00	127.0000	No Ice	2.1904	1.4290	0.04
			0.00				1/2" Ice	2.3976	1.6109	0.06
			2.00				1" Ice	2.6134	1.8015	0.08
							2" Ice	3.0710	2.2085	0.13
							4" Ice	4.0899	3.1263	0.26
RRH2X60-AWS	B	From Face	4.0000	0.00	0.00	127.0000	No Ice	2.1904	1.4290	0.04
			0.00				1/2" Ice	2.3976	1.6109	0.06
			2.00				1" Ice	2.6134	1.8015	0.08
							2" Ice	3.0710	2.2085	0.13
							4" Ice	4.0899	3.1263	0.26
RRH2X60-AWS	C	From Face	4.0000	0.00	0.00	127.0000	No Ice	2.1904	1.4290	0.04
			0.00				1/2" Ice	2.3976	1.6109	0.06
			2.00				1" Ice	2.6134	1.8015	0.08
							2" Ice	3.0710	2.2085	0.13
							4" Ice	4.0899	3.1263	0.26
Platform Mount [LP 712-1]	C	None			0.00	127.0000	No Ice	24.5300	24.5300	1.34
							1/2" Ice	29.9400	29.9400	1.65
							1" Ice	35.3500	35.3500	1.96
							2" Ice	46.1700	46.1700	2.58
							4" Ice	67.8100	67.8100	3.82
****										
HBX-6516DS-VTM w/ Mount Pipe	A	From Face	4.0000	0.00	0.00	117.0000	No Ice	3.5975	3.2406	0.03
			0.00				1/2" Ice	3.9981	3.9135	0.06
			0.00				1" Ice	4.4346	4.5638	0.10
							2" Ice	5.3677	5.9143	0.20
							4" Ice	7.3611	8.8773	0.50
HBX-6516DS-VTM w/ Mount Pipe	B	From Face	4.0000	0.00	0.00	117.0000	No Ice	3.5975	3.2406	0.03
			0.00				1/2" Ice	3.9981	3.9135	0.06
			0.00				1" Ice	4.4346	4.5638	0.10
							2" Ice	5.3677	5.9143	0.20
							4" Ice	7.3611	8.8773	0.50
HBX-6516DS-VTM w/ Mount Pipe	C	From Face	4.0000	0.00	0.00	117.0000	No Ice	3.5975	3.2406	0.03
			0.00				1/2" Ice	3.9981	3.9135	0.06
			0.00				1" Ice	4.4346	4.5638	0.10
							2" Ice	5.3677	5.9143	0.20
							4" Ice	7.3611	8.8773	0.50
T-Arm Mount [TA 601-3]	C	None			0.00	117.0000	No Ice	10.9000	10.9000	0.73
							1/2" Ice	14.6500	14.6500	0.93
							1" Ice	18.4000	18.4000	1.13
							2" Ice	25.9000	25.9000	1.52
							4" Ice	40.9000	40.9000	2.32
2.375" OD x 6' Mount Pipe	A	From Face	4.0000	0.00	0.00	117.0000	No Ice	1.4250	1.4250	0.03
			0.00				1/2" Ice	1.9250	1.9250	0.04
			0.00				1" Ice	2.2939	2.2939	0.05
							2" Ice	3.0596	3.0596	0.09
							4" Ice	4.7022	4.7022	0.23
2.375" OD x 6' Mount Pipe	B	From Face	4.0000	0.00	0.00	117.0000	No Ice	1.4250	1.4250	0.03
			0.00				1/2" Ice	1.9250	1.9250	0.04
			0.00				1" Ice	2.2939	2.2939	0.05

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						1" Ice	3.0596	3.0596	0.09
						2" Ice	4.7022	4.7022	0.23
						4" Ice			
2.375" OD x 6' Mount Pipe	C	From Face	4.0000	0.00	117.0000	No Ice	1.4250	1.4250	0.03
			0.00			1/2"	1.9250	1.9250	0.04
			0.00			Ice	2.2939	2.2939	0.05
						1" Ice	3.0596	3.0596	0.09
						2" Ice	4.7022	4.7022	0.23
						4" Ice			
**									
OG-860/1920/GPS-A	C	From Face	4.0000	0.00	75.0000	No Ice	0.3286	0.4044	0.00
			0.00			1/2"	0.4340	0.5138	0.01
			1.00			Ice	0.5481	0.6317	0.01
						1" Ice	0.8022	0.8936	0.02
						2" Ice	1.4140	1.5210	0.08
						4" Ice			
Side Arm Mount [SO 701-1]	C	None		0.00	75.0000	No Ice	0.8500	1.6700	0.07
						1/2"	1.1400	2.3400	0.08
						Ice	1.4300	3.0100	0.09
						1" Ice	2.0100	4.3500	0.12
						2" Ice	3.1700	7.0300	0.18
						4" Ice			
**									

Tower Pressures - No Ice

G_H = 1.690

Section Elevation ft	z ft	K_Z	q_z ksf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1 150.0000-123.4200	135.9985	1.499	0.03	39.582	A	0.000	39.582	39.582	100.00	0.000	0.000
					B	0.000	39.582		100.00	0.000	0.000
					C	0.000	39.582		100.00	0.000	0.000
L2 123.4200-122.2500	122.8338	1.456	0.03	1.997	A	0.000	1.997	1.997	100.00	0.000	0.000
					B	0.000	1.997		100.00	0.000	0.000
					C	0.000	1.997		100.00	0.000	0.000
L3 122.2500-120.2500	121.2466	1.45	0.03	3.469	A	0.000	3.469	3.469	100.00	0.000	0.000
					B	0.000	3.469		100.00	0.000	0.000
					C	0.000	3.469		100.00	0.000	0.125
L4 120.2500-115.2500	117.7295	1.438	0.03	8.983	A	0.000	8.983	8.983	100.00	0.000	0.000
					B	0.000	8.983		100.00	0.000	0.000
					C	0.000	8.983		100.00	0.000	0.887
L5 115.2500-105.2500	110.1735	1.411	0.03	19.296	A	0.000	19.296	19.296	100.00	0.000	0.000
					B	0.000	19.296		100.00	0.000	0.000
					C	0.000	19.296		100.00	0.000	3.875
L6 105.2500-101.9000	103.5669	1.386	0.03	6.860	A	0.000	6.860	6.860	100.00	0.000	0.000
					B	0.000	6.860		100.00	0.000	0.000
					C	0.000	6.860		100.00	0.000	1.298
L7 101.9000-101.2500	101.5747	1.379	0.03	1.354	A	0.000	1.354	1.354	100.00	0.000	0.000
					B	0.000	1.354		100.00	0.000	0.000
					C	0.000	1.354		100.00	0.000	0.252
L8 101.2500-85.9600	93.4498	1.346	0.02	34.013	A	0.000	34.013	34.013	100.00	0.000	0.000
					B	0.000	34.013		100.00	0.000	0.000
					C	0.000	34.013		100.00	0.000	5.924
L9 85.9600-82.0000	83.9649	1.306	0.02	9.248	A	0.000	9.248	9.248	100.00	0.000	0.000
					B	0.000	9.248		100.00	0.000	0.000
					C	0.000	9.248		100.00	0.000	1.534

Section Elevation ft	z ft	K_Z	q_z ksf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L10 82.0000-77.2500	79.6113	1.286	0.02	11.547	A	0.000	11.547	11.547	100.00	0.000	0.000
					B	0.000	11.547		100.00	0.000	0.000
					C	0.000	11.547		100.00	0.000	1.840
L11 77.2500-75.0000	76.1220	1.27	0.02	5.609	A	0.000	5.609	5.609	100.00	0.000	0.000
					B	0.000	5.609		100.00	0.000	0.000
					C	0.000	5.609		100.00	0.000	0.872
L12 75.0000-72.1500	73.5703	1.257	0.02	7.234	A	0.000	7.234	7.234	100.00	0.000	0.000
					B	0.000	7.234		100.00	0.000	0.000
					C	0.000	7.234		100.00	0.000	1.104
L13 72.1500-71.2500	71.6995	1.248	0.02	2.314	A	0.000	2.314	2.314	100.00	0.000	0.000
					B	0.000	2.314		100.00	0.000	0.000
					C	0.000	2.314		100.00	0.000	0.349
L14 71.2500-42.4100	56.3960	1.165	0.02	81.780	A	0.000	81.780	81.780	100.00	0.000	0.000
					B	0.000	81.780		100.00	0.000	0.000
					C	0.000	81.780		100.00	0.000	12.704
L15 42.4100-36.2500	39.3038	1.051	0.02	18.914	A	0.000	18.914	18.914	100.00	0.000	0.000
					B	0.000	18.914		100.00	0.000	0.000
					C	0.000	18.914		100.00	0.000	3.169
L16 36.2500-31.2500	33.7384	1.006	0.02	15.965	A	0.000	15.965	15.965	100.00	0.000	0.000
					B	0.000	15.965		100.00	0.000	0.000
					C	0.000	15.965		100.00	0.000	2.781
L17 31.2500-18.7500	24.9310	1	0.02	41.853	A	0.000	41.853	41.853	100.00	0.000	0.000
					B	0.000	41.853		100.00	0.000	0.000
					C	0.000	41.853		100.00	0.000	6.952
L18 18.7500-0.0000	9.2317	1	0.02	67.976	A	0.000	67.976	67.976	100.00	0.000	0.000
					B	0.000	67.976		100.00	0.000	0.000
					C	0.000	67.976		100.00	0.000	10.427

Tower Pressure - With Ice

G_H = 1.690

Section Elevation ft	z ft	K_Z	q_z ksf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 150.0000-123.4200	135.9985	1.499	0.01	1.4815	46.145	A	0.000	46.145	46.145	100.00	0.000	0.000
						B	0.000	46.145		100.00	0.000	0.000
						C	0.000	46.145		100.00	0.000	0.000
L2 123.4200-122.2500	122.8338	1.456	0.01	1.4635	2.286	A	0.000	2.286	2.286	100.00	0.000	0.000
						B	0.000	2.286		100.00	0.000	0.000
						C	0.000	2.286		100.00	0.000	0.000
L3 122.2500-120.2500	121.2466	1.45	0.01	1.4613	3.956	A	0.000	3.956	3.956	100.00	0.000	0.000
						B	0.000	3.956		100.00	0.000	0.000
						C	0.000	3.956		100.00	0.000	0.450
L4 120.2500-115.2500	117.7295	1.438	0.01	1.4561	10.197	A	0.000	10.197	10.197	100.00	0.000	0.000
						B	0.000	10.197		100.00	0.000	0.000
						C	0.000	10.197		100.00	0.000	2.829
L5 115.2500-105.2500	110.1735	1.411	0.01	1.4446	21.703	A	0.000	21.703	21.703	100.00	0.000	0.000
						B	0.000	21.703		100.00	0.000	0.000
						C	0.000	21.703		100.00	0.000	10.295
L6 105.2500-101.9000	103.5669	1.386	0.01	1.4339	7.661	A	0.000	7.661	7.661	100.00	0.000	0.000
						B	0.000	7.661		100.00	0.000	0.000
						C	0.000	7.661		100.00	0.000	3.433
L7 101.9000-101.2500	101.5747	1.379	0.00	1.4305	1.509	A	0.000	1.509	1.509	100.00	0.000	0.000
						B	0.000	1.509		100.00	0.000	0.000
						C	0.000	1.509		100.00	0.000	0.665
L8 101.2500-85.9600	93.4498	1.346	0.00	1.4163	37.622	A	0.000	37.622	37.622	100.00	0.000	0.000
						B	0.000	37.622		100.00	0.000	0.000
						C	0.000	37.622		100.00	0.000	15.549
L9 85.9600-82.0000	83.9649	1.306	0.00	1.3982	10.183	A	0.000	10.183	10.183	100.00	0.000	0.000
						B	0.000	10.183		100.00	0.000	0.000
						C	0.000	10.183		100.00	0.000	4.027
L10 82.0000-77.2500	79.6113	1.286	0.00	1.3893	12.647	A	0.000	12.647	12.647	100.00	0.000	0.000
						B	0.000	12.647		100.00	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z ksf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
						C	0.000	12.647		100.00	0.000	4.773
L11 77.2500-75.0000	76.1220	1.27	0.00	1.3819	6.128	A	0.000	6.128	6.128	100.00	0.000	0.000
						B	0.000	6.128		100.00	0.000	0.000
						C	0.000	6.128		100.00	0.000	2.254
L12 75.0000-72.1500	73.5703	1.257	0.00	1.3762	7.888	A	0.000	7.888	7.888	100.00	0.000	0.000
						B	0.000	7.888		100.00	0.000	0.000
						C	0.000	7.888		100.00	0.000	2.848
L13 72.1500-71.2500	71.6995	1.248	0.00	1.3720	2.520	A	0.000	2.520	2.520	100.00	0.000	0.000
						B	0.000	2.520		100.00	0.000	0.000
						C	0.000	2.520		100.00	0.000	0.898
L14 71.2500-42.4100	56.3960	1.165	0.00	1.3330	88.188	A	0.000	88.188	88.188	100.00	0.000	0.000
						B	0.000	88.188		100.00	0.000	0.000
						C	0.000	88.188		100.00	0.000	30.123
L15 42.4100-36.2500	39.3038	1.051	0.00	1.2765	20.282	A	0.000	20.282	20.282	100.00	0.000	0.000
						B	0.000	20.282		100.00	0.000	0.000
						C	0.000	20.282		100.00	0.000	7.352
L16 36.2500-31.2500	33.7384	1.006	0.00	1.2533	17.010	A	0.000	17.010	17.010	100.00	0.000	0.000
						B	0.000	17.010		100.00	0.000	0.000
						C	0.000	17.010		100.00	0.000	5.999
L17 31.2500-18.7500	24.9310	1	0.00	1.2500	44.458	A	0.000	44.458	44.458	100.00	0.000	0.000
						B	0.000	44.458		100.00	0.000	0.000
						C	0.000	44.458		100.00	0.000	14.978
L18 18.7500-0.0000	9.2317	1	0.00	1.2500	71.882	A	0.000	71.882	71.882	100.00	0.000	0.000
						B	0.000	71.882		100.00	0.000	0.000
						C	0.000	71.882		100.00	0.000	22.467

Tower Pressure - Service

G_H = 1.690

Section Elevation ft	z ft	K_Z	q_z ksf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 150.0000-123.4200	135.9985	1.499	0.01	39.582	A	0.000	39.582	39.582	100.00	0.000	0.000
					B	0.000	39.582		100.00	0.000	0.000
					C	0.000	39.582		100.00	0.000	0.000
L2 123.4200-122.2500	122.8338	1.456	0.01	1.997	A	0.000	1.997	1.997	100.00	0.000	0.000
					B	0.000	1.997		100.00	0.000	0.000
					C	0.000	1.997		100.00	0.000	0.000
L3 122.2500-120.2500	121.2466	1.45	0.01	3.469	A	0.000	3.469	3.469	100.00	0.000	0.000
					B	0.000	3.469		100.00	0.000	0.000
					C	0.000	3.469		100.00	0.000	0.125
L4 120.2500-115.2500	117.7295	1.438	0.01	8.983	A	0.000	8.983	8.983	100.00	0.000	0.000
					B	0.000	8.983		100.00	0.000	0.000
					C	0.000	8.983		100.00	0.000	0.887
L5 115.2500-105.2500	110.1735	1.411	0.01	19.296	A	0.000	19.296	19.296	100.00	0.000	0.000
					B	0.000	19.296		100.00	0.000	0.000
					C	0.000	19.296		100.00	0.000	3.875
L6 105.2500-101.9000	103.5669	1.386	0.01	6.860	A	0.000	6.860	6.860	100.00	0.000	0.000
					B	0.000	6.860		100.00	0.000	0.000
					C	0.000	6.860		100.00	0.000	1.298
L7 101.9000-101.2500	101.5747	1.379	0.01	1.354	A	0.000	1.354	1.354	100.00	0.000	0.000
					B	0.000	1.354		100.00	0.000	0.000
					C	0.000	1.354		100.00	0.000	0.252
L8 101.2500-85.9600	93.4498	1.346	0.01	34.013	A	0.000	34.013	34.013	100.00	0.000	0.000
					B	0.000	34.013		100.00	0.000	0.000
					C	0.000	34.013		100.00	0.000	5.924
L9 85.9600-82.0000	83.9649	1.306	0.01	9.248	A	0.000	9.248	9.248	100.00	0.000	0.000
					B	0.000	9.248		100.00	0.000	0.000
					C	0.000	9.248		100.00	0.000	1.534
L10 82.0000-77.2500	79.6113	1.286	0.01	11.547	A	0.000	11.547	11.547	100.00	0.000	0.000
					B	0.000	11.547		100.00	0.000	0.000

Section Elevation ft	z ft	K_z	q_z ksf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
					C	0.000	11.547		100.00	0.000	1.840
L11 77.2500-75.0000	76.1220	1.27	0.01	5.609	A	0.000	5.609	5.609	100.00	0.000	0.000
					B	0.000	5.609		100.00	0.000	0.000
					C	0.000	5.609		100.00	0.000	0.872
L12 75.0000-72.1500	73.5703	1.257	0.01	7.234	A	0.000	7.234	7.234	100.00	0.000	0.000
					B	0.000	7.234		100.00	0.000	0.000
					C	0.000	7.234		100.00	0.000	1.104
L13 72.1500-71.2500	71.6995	1.248	0.01	2.314	A	0.000	2.314	2.314	100.00	0.000	0.000
					B	0.000	2.314		100.00	0.000	0.000
					C	0.000	2.314		100.00	0.000	0.349
L14 71.2500-42.4100	56.3960	1.165	0.01	81.780	A	0.000	81.780	81.780	100.00	0.000	0.000
					B	0.000	81.780		100.00	0.000	0.000
					C	0.000	81.780		100.00	0.000	12.704
L15 42.4100-36.2500	39.3038	1.051	0.01	18.914	A	0.000	18.914	18.914	100.00	0.000	0.000
					B	0.000	18.914		100.00	0.000	0.000
					C	0.000	18.914		100.00	0.000	3.169
L16 36.2500-31.2500	33.7384	1.006	0.01	15.965	A	0.000	15.965	15.965	100.00	0.000	0.000
					B	0.000	15.965		100.00	0.000	0.000
					C	0.000	15.965		100.00	0.000	2.781
L17 31.2500-18.7500	24.9310	1	0.01	41.853	A	0.000	41.853	41.853	100.00	0.000	0.000
					B	0.000	41.853		100.00	0.000	0.000
					C	0.000	41.853		100.00	0.000	6.952
L18 18.7500-0.0000	9.2317	1	0.01	67.976	A	0.000	67.976	67.976	100.00	0.000	0.000
					B	0.000	67.976		100.00	0.000	0.000
					C	0.000	67.976		100.00	0.000	10.427

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

Comb. No.	Description
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	150 - 123.42	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-21.54	0.85	0.06
			Max. Mx	11	-6.73	220.86	0.43
			Max. My	8	-6.77	-0.31	-220.09
			Max. Vy	5	19.40	-220.56	-0.44
			Max. Vx	2	-19.20	0.57	219.92
			Max. Torque	11			1.65
L2	123.42 - 122.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-22.24	0.85	0.06
			Max. Mx	11	-7.22	305.56	1.13
			Max. My	8	-7.26	-1.02	-303.90
			Max. Vy	5	19.64	-305.26	-1.17
			Max. Vx	2	-19.43	1.29	303.74
			Max. Torque	6			-1.21
L3	122.25 - 120.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-22.55	0.85	0.06
			Max. Mx	11	-7.49	344.93	1.46
			Max. My	8	-7.53	-1.34	-342.86
			Max. Vy	5	19.75	-344.63	-1.50
			Max. Vx	2	-19.54	1.62	342.70
			Max. Torque	6			-1.21
L4	120.25 - 115.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-25.47	0.85	0.06
			Max. Mx	11	-9.11	446.60	2.27
			Max. My	8	-9.14	-2.16	-443.50
			Max. Vy	5	21.30	-446.31	-2.34
			Max. Vx	2	-21.09	2.44	443.34
			Max. Torque	6			-1.21
L5	115.25 - 105.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-27.46	0.85	0.06
			Max. Mx	11	-10.83	663.24	3.91
			Max. My	8	-10.87	-3.81	-658.07
			Max. Vy	5	22.05	-662.96	-4.00
			Max. Vx	2	-21.84	4.10	657.93
			Max. Torque	6			-1.24
L6	105.25 - 101.9	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-28.33	0.85	0.06
			Max. Mx	11	-11.59	737.52	4.46
			Max. My	8	-11.62	-4.36	-731.65
			Max. Vy	5	22.32	-737.24	-4.56
			Max. Vx	2	-22.11	4.66	731.52
			Max. Torque	6			-1.24
L7	101.9 - 101.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-28.50	0.85	0.06
			Max. Mx	11	-11.75	752.04	4.56
			Max. My	8	-11.78	-4.47	-746.04
			Max. Vy	5	22.37	-751.76	-4.67
			Max. Vx	2	-22.16	4.77	745.90
			Max. Torque	6			-1.25
L8	101.25 - 85.96	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-31.50	0.85	0.06

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Mx	11	-14.37	1007.67	6.41
			Max. My	8	-14.39	-6.32	-999.34
			Max. Vy	5	23.26	-1007.42	-6.54
			Max. Vx	2	-23.05	6.63	999.23
			Max. Torque	6			-1.27
L9	85.96 - 82	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-34.86	0.85	0.06
			Max. Mx	11	-17.21	1197.70	7.74
			Max. My	8	-17.23	-7.65	-1187.70
			Max. Vy	5	23.99	-1197.47	-7.88
			Max. Vx	2	-23.78	7.97	1187.60
			Max. Torque	6			-1.30
L10	82 - 77.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-36.55	0.85	0.06
			Max. Mx	11	-18.71	1312.51	8.52
			Max. My	8	-18.73	-8.44	-1301.52
			Max. Vy	5	24.38	-1312.29	-8.68
			Max. Vx	2	-24.17	8.76	1301.43
			Max. Torque	6			-1.31
L11	77.25 - 75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-37.28	0.85	0.06
			Max. Mx	11	-19.35	1367.54	8.90
			Max. My	8	-19.37	-8.82	-1356.07
			Max. Vy	5	24.56	-1367.32	-9.05
			Max. Vx	2	-24.35	9.14	1355.99
			Max. Torque	6			-1.31
L12	75 - 72.15	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-38.37	0.85	-0.02
			Max. Mx	11	-20.28	1438.07	9.36
			Max. My	8	-20.30	-9.29	-1426.01
			Max. Vy	5	24.87	-1437.86	-9.53
			Max. Vx	2	-24.66	9.61	1425.91
			Max. Torque	6			-1.40
L13	72.15 - 71.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-38.69	0.85	-0.02
			Max. Mx	11	-20.56	1460.48	9.51
			Max. My	8	-20.58	-9.44	-1448.22
			Max. Vy	5	24.94	-1460.26	-9.69
			Max. Vx	2	-24.73	9.76	1448.13
			Max. Torque	6			-1.40
L14	71.25 - 42.41	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-47.69	0.85	-0.01
			Max. Mx	11	-28.55	2072.02	13.44
			Max. My	8	-28.57	-13.37	-2054.74
			Max. Vy	5	26.78	-2071.86	-13.63
			Max. Vx	2	-26.57	13.70	2054.71
			Max. Torque	6			-1.48
L15	42.41 - 36.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-53.76	0.85	-0.01
			Max. Mx	11	-33.80	2380.90	15.31
			Max. My	8	-33.81	-15.24	-2361.23
			Max. Vy	5	27.69	-2380.77	-15.51
			Max. Vx	2	-27.47	15.58	2361.22
			Max. Torque	6			-1.52
L16	36.25 - 31.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-55.71	0.85	-0.01
			Max. Mx	11	-35.54	2520.04	16.14
			Max. My	2	-35.55	16.40	2499.32
			Max. Vy	5	28.01	-2519.92	-16.33
			Max. Vx	2	-27.80	16.40	2499.32
			Max. Torque	6			-1.54
L17	31.25 - 18.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-60.65	0.85	-0.01
			Max. Mx	11	-39.94	2874.83	18.19

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. My	2	-39.94	18.45	2851.52
			Max. Vy	5	28.80	-2874.74	-18.38
			Max. Vx	2	-28.59	18.45	2851.52
			Max. Torque	6			-1.59
L18	18.75 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-68.02	0.84	-0.01
			Max. Mx	11	-46.42	3424.90	21.21
			Max. My	2	-46.42	21.47	3397.78
			Max. Vy	5	29.92	-3424.85	-21.40
			Max. Vx	2	-29.72	21.47	3397.78
			Max. Torque	6			-1.68

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	14	68.02	-0.00	0.00
	Max. H_x	11	46.43	29.90	0.16
	Max. H_z	2	46.43	0.16	29.70
	Max. M_x	2	3397.78	0.16	29.70
	Max. M_z	5	3424.85	-29.91	-0.16
	Max. Torsion	12	1.68	25.98	14.99
	Min. Vert	11	46.43	29.90	0.16
	Min. H_x	5	46.43	-29.91	-0.16
	Min. H_z	8	46.43	-0.16	-29.70
	Min. M_x	8	-3397.70	-0.16	-29.70
	Min. M_z	11	-3424.90	29.90	0.16
	Min. Torsion	6	-1.68	-25.98	-14.99

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	46.43	-0.00	0.00	0.10	0.16	0.00
Dead+Wind 0 deg - No Ice	46.43	-0.16	-29.70	-3397.78	21.47	-0.84
Dead+Wind 30 deg - No Ice	46.43	14.82	-25.64	-2932.14	-1694.08	-0.00
Dead+Wind 60 deg - No Ice	46.43	25.82	-14.71	-1680.51	-2955.62	0.83
Dead+Wind 90 deg - No Ice	46.43	29.91	0.16	21.40	-3424.85	1.45
Dead+Wind 120 deg - No Ice	46.43	25.98	14.99	1717.54	-2976.82	1.68
Dead+Wind 150 deg - No Ice	46.43	15.09	25.80	2953.53	-1730.93	1.47
Dead+Wind 180 deg - No Ice	46.43	0.16	29.70	3397.70	-21.14	0.85
Dead+Wind 210 deg - No Ice	46.43	-14.82	25.64	2932.34	1694.42	0.00
Dead+Wind 240 deg - No Ice	46.43	-25.82	14.71	1680.70	2955.96	-0.85
Dead+Wind 270 deg - No Ice	46.43	-29.90	-0.16	-21.21	3424.90	-1.46
Dead+Wind 300 deg - No Ice	46.43	-25.98	-14.99	-1717.35	2977.14	-1.68
Dead+Wind 330 deg - No Ice	46.43	-15.09	-25.80	-2953.34	1731.25	-1.45
Dead+Ice+Temp	68.02	0.00	-0.00	0.01	0.84	0.00
Dead+Wind 0 deg+Ice+Temp	68.02	-0.03	-8.17	-983.49	5.49	-0.29
Dead+Wind 30 deg+Ice+Temp	68.02	4.08	-7.06	-849.47	-490.38	0.01
Dead+Wind 60 deg+Ice+Temp	68.02	7.10	-4.06	-487.82	-854.60	0.32
Dead+Wind 90 deg+Ice+Temp	68.02	8.22	0.03	4.54	-989.57	0.53
Dead+Wind 120 deg+Ice+Temp	68.02	7.13	4.11	495.69	-859.12	0.61
Dead+Wind 150 deg+Ice+Temp	68.02	4.14	7.09	854.03	-498.22	0.52

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead+Wind 180 deg+Ice+Temp	68.02	0.03	8.17	983.54	-3.55	0.29
Dead+Wind 210 deg+Ice+Temp	68.02	-4.08	7.06	849.51	492.33	-0.02
Dead+Wind 240 deg+Ice+Temp	68.02	-7.10	4.06	487.86	856.55	-0.32
Dead+Wind 270 deg+Ice+Temp	68.02	-8.22	-0.03	-4.50	991.51	-0.53
Dead+Wind 300 deg+Ice+Temp	68.02	-7.13	-4.11	-495.65	861.06	-0.61
Dead+Wind 330 deg+Ice+Temp	68.02	-4.14	-7.09	-853.99	500.16	-0.52
Dead+Wind 0 deg - Service	46.43	-0.06	-10.28	-1177.38	7.55	-0.29
Dead+Wind 30 deg - Service	46.43	5.13	-8.87	-1016.03	-586.95	0.00
Dead+Wind 60 deg - Service	46.43	8.93	-5.09	-582.30	-1024.14	0.29
Dead+Wind 90 deg - Service	46.43	10.35	0.06	7.49	-1186.75	0.51
Dead+Wind 120 deg - Service	46.43	8.99	5.19	595.29	-1031.52	0.59
Dead+Wind 150 deg - Service	46.43	5.22	8.93	1023.62	-599.74	0.51
Dead+Wind 180 deg - Service	46.43	0.06	10.28	1177.59	-7.21	0.30
Dead+Wind 210 deg - Service	46.43	-5.13	8.87	1016.24	587.29	-0.00
Dead+Wind 240 deg - Service	46.43	-8.93	5.09	582.51	1024.47	-0.30
Dead+Wind 270 deg - Service	46.43	-10.35	-0.06	-7.28	1187.09	-0.51
Dead+Wind 300 deg - Service	46.43	-8.99	-5.19	-595.08	1031.85	-0.59
Dead+Wind 330 deg - Service	46.43	-5.22	-8.93	-1023.41	600.07	-0.51

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	-46.43	0.00	0.00	46.43	-0.00	0.000%
2	-0.16	-46.43	-29.70	0.16	46.43	29.70	0.004%
3	14.82	-46.43	-25.64	-14.82	46.43	25.64	0.000%
4	25.82	-46.43	-14.71	-25.82	46.43	14.71	0.000%
5	29.91	-46.43	0.16	-29.91	46.43	-0.16	0.004%
6	25.98	-46.43	14.99	-25.98	46.43	-14.99	0.000%
7	15.09	-46.43	25.80	-15.09	46.43	-25.80	0.000%
8	0.16	-46.43	29.70	-0.16	46.43	-29.70	0.008%
9	-14.82	-46.43	25.64	14.82	46.43	-25.64	0.000%
10	-25.82	-46.43	14.71	25.82	46.43	-14.71	0.000%
11	-29.91	-46.43	-0.16	29.90	46.43	0.16	0.008%
12	-25.98	-46.43	-14.99	25.98	46.43	14.99	0.000%
13	-15.09	-46.43	-25.80	15.09	46.43	25.80	0.000%
14	0.00	-68.02	0.00	-0.00	68.02	0.00	0.000%
15	-0.03	-68.02	-8.17	0.03	68.02	8.17	0.000%
16	4.08	-68.02	-7.06	-4.08	68.02	7.06	0.000%
17	7.10	-68.02	-4.06	-7.10	68.02	4.06	0.000%
18	8.22	-68.02	0.03	-8.22	68.02	-0.03	0.000%
19	7.13	-68.02	4.11	-7.13	68.02	-4.11	0.000%
20	4.14	-68.02	7.09	-4.14	68.02	-7.09	0.000%
21	0.03	-68.02	8.17	-0.03	68.02	-8.17	0.000%
22	-4.08	-68.02	7.06	4.08	68.02	-7.06	0.000%
23	-7.10	-68.02	4.06	7.10	68.02	-4.06	0.000%
24	-8.22	-68.02	-0.03	8.22	68.02	0.03	0.000%
25	-7.13	-68.02	-4.11	7.13	68.02	4.11	0.000%
26	-4.14	-68.02	-7.09	4.14	68.02	7.09	0.000%
27	-0.06	-46.43	-10.28	0.06	46.43	10.28	0.003%
28	5.13	-46.43	-8.87	-5.13	46.43	8.87	0.002%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
29	8.93	-46.43	-5.09	-8.93	46.43	5.09	0.002%
30	10.35	-46.43	0.06	-10.35	46.43	-0.06	0.003%
31	8.99	-46.43	5.19	-8.99	46.43	-5.19	0.002%
32	5.22	-46.43	8.93	-5.22	46.43	-8.93	0.002%
33	0.06	-46.43	10.28	-0.06	46.43	-10.28	0.003%
34	-5.13	-46.43	8.87	5.13	46.43	-8.87	0.002%
35	-8.93	-46.43	5.09	8.93	46.43	-5.09	0.002%
36	-10.35	-46.43	-0.06	10.35	46.43	0.06	0.003%
37	-8.99	-46.43	-5.19	8.99	46.43	5.19	0.002%
38	-5.22	-46.43	-8.93	5.22	46.43	8.93	0.002%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.00000001	0.00000001
2	Yes	16	0.00003783	0.00008680
3	Yes	20	0.00000001	0.00012515
4	Yes	20	0.00000001	0.00012375
5	Yes	16	0.00003778	0.00012970
6	Yes	20	0.00000001	0.00013186
7	Yes	20	0.00000001	0.00012721
8	Yes	15	0.00008025	0.00008842
9	Yes	20	0.00000001	0.00012476
10	Yes	20	0.00000001	0.00012672
11	Yes	15	0.00008015	0.00012876
12	Yes	20	0.00000001	0.00012702
13	Yes	20	0.00000001	0.00013109
14	Yes	6	0.00000001	0.00000355
15	Yes	18	0.00000001	0.00008487
16	Yes	18	0.00000001	0.00011254
17	Yes	18	0.00000001	0.00011217
18	Yes	18	0.00000001	0.00008545
19	Yes	18	0.00000001	0.00011533
20	Yes	18	0.00000001	0.00011347
21	Yes	18	0.00000001	0.00008488
22	Yes	18	0.00000001	0.00011281
23	Yes	18	0.00000001	0.00011381
24	Yes	18	0.00000001	0.00008574
25	Yes	18	0.00000001	0.00011405
26	Yes	18	0.00000001	0.00011528
27	Yes	15	0.00008577	0.00004349
28	Yes	16	0.00000001	0.00013394
29	Yes	16	0.00000001	0.00012918
30	Yes	15	0.00008575	0.00005136
31	Yes	16	0.00000001	0.00014798
32	Yes	16	0.00000001	0.00013280
33	Yes	15	0.00008577	0.00004112
34	Yes	16	0.00000001	0.00013266
35	Yes	16	0.00000001	0.00013903
36	Yes	15	0.00008576	0.00004675
37	Yes	16	0.00000001	0.00013203
38	Yes	16	0.00000001	0.00014557

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	150 - 123.42	37.29	37	2.51	0.01

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L2	126.59 - 122.25	25.71	37	2.08	0.00
L3	122.25 - 120.25	23.86	37	1.99	0.00
L4	120.25 - 115.25	23.03	37	1.94	0.00
L5	115.25 - 105.25	21.05	37	1.85	0.00
L6	105.25 - 101.9	17.42	37	1.62	0.00
L7	101.9 - 101.25	16.30	37	1.56	0.00
L8	101.25 - 85.96	16.09	37	1.55	0.00
L9	90.04 - 82	12.69	37	1.34	0.00
L10	82 - 77.25	10.52	37	1.23	0.00
L11	77.25 - 75	9.33	37	1.15	0.00
L12	75 - 72.15	8.80	37	1.11	0.00
L13	72.15 - 71.25	8.15	37	1.07	0.00
L14	71.25 - 42.41	7.95	37	1.05	0.00
L15	47.58 - 36.25	3.62	37	0.70	0.00
L16	36.25 - 31.25	2.10	37	0.56	0.00
L17	31.25 - 18.75	1.56	37	0.48	0.00
L18	18.75 - 0	0.56	37	0.29	0.00

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
152.0000	APXVSPP18-C-A20 w/ Mount Pipe	37	37.29	2.51	0.01	8232
150.0000	TME-1900MHz RRH (65 MHz)	37	37.29	2.51	0.01	8232
137.0000	7770.00 w/ Mount Pipe	37	30.62	2.29	0.01	3165
136.0000	RRUS 11	37	30.13	2.27	0.01	2939
134.0000	TME-RRUS 11 BAND 12	37	29.15	2.23	0.01	2572
127.0000	(2) APL866513-42T0 w/ Mount Pipe	37	25.89	2.09	0.00	1924
117.0000	HBX-6516DS-VTM w/ Mount Pipe	37	21.73	1.88	0.00	2823
75.0000	OG-860/1920/GPS-A	37	8.80	1.11	0.00	3489

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	150 - 123.42	107.24	12	7.22	0.04
L2	126.59 - 122.25	74.02	12	6.00	0.01
L3	122.25 - 120.25	68.69	12	5.72	0.01
L4	120.25 - 115.25	66.32	12	5.59	0.01
L5	115.25 - 105.25	60.62	12	5.32	0.01
L6	105.25 - 101.9	50.17	12	4.67	0.01
L7	101.9 - 101.25	46.96	12	4.50	0.00
L8	101.25 - 85.96	46.35	12	4.47	0.00
L9	90.04 - 82	36.58	12	3.86	0.00
L10	82 - 77.25	30.31	12	3.53	0.00
L11	77.25 - 75	26.91	12	3.33	0.00
L12	75 - 72.15	25.37	12	3.21	0.00
L13	72.15 - 71.25	23.49	12	3.08	0.00
L14	71.25 - 42.41	22.91	12	3.04	0.00
L15	47.58 - 36.25	10.44	12	2.02	0.00
L16	36.25 - 31.25	6.06	12	1.60	0.00
L17	31.25 - 18.75	4.50	12	1.38	0.00
L18	18.75 - 0	1.61	12	0.83	0.00

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
152.0000	APXVSPP18-C-A20 w/ Mount Pipe	12	107.24	7.22	0.04	2947
150.0000	TME-1900MHz RRH (65 MHz)	12	107.24	7.22	0.04	2947
137.0000	7770.00 w/ Mount Pipe	12	88.11	6.59	0.02	1131
136.0000	RRUS 11	12	86.69	6.54	0.02	1050
134.0000	TME-RRUS 11 BAND 12	12	83.89	6.43	0.02	918
127.0000	(2) APL866513-42T0 w/ Mount Pipe	12	74.54	6.03	0.01	685
117.0000	HBX-6516DS-VTM w/ Mount Pipe	12	62.58	5.41	0.01	1000
75.0000	OG-860/1920/GPS-A	12	25.37	3.21	0.00	1219

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	150 - 123.42 (1)	TP20.74x15x0.1875	26.5800	0.0000	0.0	39.00	11.8239	-6.71	461.13	0.015
L2	123.42 - 122.25 (2)	TP20.6033x19.6804x0.25	4.3400	0.0000	0.0	39.00	16.1503	-7.21	629.86	0.011
L3	122.25 - 120.25 (3)	TP21.0285x20.6033x0.409 3	2.0000	0.0000	0.0	26.95	26.7888	-7.48	721.85	0.010
L4	120.25 - 115.25 (4)	TP22.0918x21.0285x0.556 9	5.0000	0.0000	0.0	26.69	38.0624	-9.09	1015.81	0.009
L5	115.25 - 105.25 (5)	TP24.2182x22.0918x0.523 8	10.0000	0.0000	0.0	26.77	39.3936	-10.82	1054.41	0.010
L6	105.25 - 101.9 (6)	TP24.9305x24.2182x0.718 7	3.3500	0.0000	0.0	23.98	55.2316	-11.58	1324.23	0.009
L7	101.9 - 101.25 (7)	TP25.0687x24.9305x0.746 8	0.6500	0.0000	0.0	25.88	57.6491	-11.74	1491.84	0.008
L8	101.25 - 85.96 (8)	TP28.32x25.0687x0.6922	15.2900	0.0000	0.0	25.99	58.7901	-14.35	1528.07	0.009
L9	85.96 - 82 (9)	TP28.6653x26.0681x0.737 4	8.0400	0.0000	0.0	26.04	62.3682	-16.19	1624.07	0.010
L10	82 - 77.25 (10)	TP29.6773x28.6653x0.9	4.7500	0.0000	0.0	26.09	82.2071	-18.70	2144.62	0.009
L11	77.25 - 75 (11)	TP30.1567x29.6773x0.772 6	2.2500	0.0000	0.0	26.11	72.0566	-19.34	1881.11	0.010
L12	75 - 72.15 (12)	TP30.7639x30.1567x0.812 5	2.8500	0.0000	0.0	26.12	77.2390	-20.27	2017.33	0.010
L13	72.15 - 71.25 (13)	TP30.9556x30.7639x0.826 9	0.9000	0.0000	0.0	26.95	79.0780	-20.55	2130.84	0.010
L14	71.25 - 42.41 (14)	TP37.1x30.9556x0.8364	28.8400	0.0000	0.0	27.42	93.3483	-28.55	2559.61	0.011
L15	42.41 - 36.25 (15)	TP37.7849x34.3257x0.717 3	11.3300	0.0000	0.0	31.10	80.1125	-31.80	2491.34	0.013
L16	36.25 - 31.25 (16)	TP38.849x37.7849x0.742	5.0000	0.0000	0.0	29.74	88.2413	-34.51	2623.94	0.013
L17	31.25 - 18.75 (17)	TP41.5094x38.849x0.7139	12.5000	0.0000	0.0	29.81	86.4135	-35.56	2576.33	0.014
L18	18.75 - 0 (18)	TP45.5x41.5094x0.6399	18.7500	0.0000	0.0	31.93	83.0077	-39.96	2650.11	0.015

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	150 - 123.42 (1)	TP20.74x15x0.1875	221.01	45.82	39.00	1.175	0.00	0.00	39.00	0.000
L2	123.42 - 122.25 (2)	TP20.6033x19.6804x0.25	306.11	45.49	39.00	1.166	0.00	0.00	39.00	0.000
L3	122.25 - 120.25 (3)	TP21.0285x20.6033x0.4093	345.66	30.79	26.95	1.143	0.00	0.00	26.95	0.000
L4	120.25 - 115.25 (4)	TP22.0918x21.0285x0.5569	447.79	27.04	26.69	1.013	0.00	0.00	26.69	0.000
L5	115.25 - 105.25 (5)	TP24.2182x22.0918x0.5238	665.36	35.16	26.77	1.313	0.00	0.00	26.77	0.000
L6	105.25 - 101.9 (6)	TP24.9305x24.2182x0.7187	739.96	27.49	23.98	1.147	0.00	0.00	23.98	0.000
L7	101.9 - 101.25 (7)	TP25.0687x24.9305x0.7468	754.54	26.76	25.88	1.034	0.00	0.00	25.88	0.000
L8	101.25 - 85.96 (8)	TP28.32x25.0687x0.6922	1011.23	31.82	25.99	1.224	0.00	0.00	25.99	0.000
L9	85.96 - 82 (9)	TP28.6653x26.0681x0.7374	1107.33	33.04	26.04	1.269	0.00	0.00	26.04	0.000
L10	82 - 77.25 (10)	TP29.6773x28.6653x0.9	1317.29	27.71	26.09	1.062	0.00	0.00	26.09	0.000
L11	77.25 - 75 (11)	TP30.1567x29.6773x0.7726	1372.53	32.10	26.11	1.230	0.00	0.00	26.11	0.000
L12	75 - 72.15 (12)	TP30.7639x30.1567x0.8125	1443.33	30.92	26.12	1.184	0.00	0.00	26.12	0.000
L13	72.15 - 71.25 (13)	TP30.9556x30.7639x0.8269	1465.83	30.50	26.95	1.132	0.00	0.00	26.95	0.000
L14	71.25 - 42.41 (14)	TP37.1x30.9556x0.8364	2079.62	31.30	27.42	1.141	0.00	0.00	27.42	0.000
L15	42.41 - 36.25 (15)	TP37.7849x34.3257x0.7173	2219.78	38.77	31.10	1.247	0.00	0.00	31.10	0.000
L16	36.25 - 31.25 (16)	TP38.849x37.7849x0.742	2445.22	36.39	29.74	1.224	0.00	0.00	29.74	0.000
L17	31.25 - 18.75 (17)	TP41.5094x38.849x0.7139	2529.19	37.73	29.81	1.265	0.00	0.00	29.81	0.000
L18	18.75 - 0 (18)	TP45.5x41.5094x0.6399	2885.15	41.68	31.93	1.305	0.00	0.00	31.93	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v 3x26Ra	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	150 - 123.42 (1)	TP20.74x15x0.1875	19.50	1.65	26.00	0.127	1.26	0.13	26.00	0.005
L2	123.42 - 122.25 (2)	TP20.6033x19.6804x0.25	19.73	1.22	26.00	0.094	1.21	0.09	26.00	0.003
L3	122.25 - 120.25 (3)	TP21.0285x20.6033x0.4093	19.84	0.74	17.96	0.082	1.21	0.05	17.96	0.003
L4	120.25 - 115.25 (4)	TP22.0918x21.0285x0.5569	21.40	0.56	17.79	0.063	1.21	0.04	17.79	0.002
L5	115.25 - 105.25 (5)	TP24.2182x22.0918x0.5238	22.14	0.56	17.84	0.063	1.23	0.03	17.84	0.002
L6	105.25 - 101.9 (6)	TP24.9305x24.2182x0.7187	22.41	0.41	15.98	0.051	1.24	0.02	15.98	0.001
L7	101.9 - 101.25 (7)	TP25.0687x24.9305x0.7468	22.48	0.39	17.25	0.045	1.24	0.02	17.25	0.001
L8	101.25 - 85.96 (8)	TP28.32x25.0687x0.6922	23.36	0.40	17.33	0.046	1.27	0.02	17.33	0.001
L9	85.96 - 82 (9)	TP28.6653x26.0681x0.7374	23.88	0.38	17.36	0.043	1.29	0.02	17.36	0.001
L10	82 - 77.25 (10)	TP29.6773x28.6653x0.9	24.48	0.30	17.39	0.034	1.31	0.01	17.39	0.001

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 $\frac{f_{vt}}{F_{vt}}$
L11	77.25 - 75 (11)	TP30.1567x29.6773x0.7726	24.65	0.34	17.40	0.039	1.31	0.01	17.40	0.001
L12	75 - 72.15 (12)	TP30.7639x30.1567x0.8125	24.97	0.32	17.41	0.037	1.39	0.01	17.41	0.001
L13	72.15 - 71.25 (13)	TP30.9556x30.7639x0.8269	25.04	0.32	17.96	0.035	1.40	0.01	17.96	0.001
L14	71.25 - 42.41 (14)	TP37.1x30.9556x0.8364	26.87	0.29	18.28	0.031	1.48	0.01	18.28	0.001
L15	42.41 - 36.25 (15)	TP37.7849x34.3257x0.7173	27.45	0.34	20.73	0.033	1.50	0.01	20.73	0.001
L16	36.25 - 31.25 (16)	TP38.849x37.7849x0.742	27.97	0.32	19.82	0.032	1.53	0.01	19.82	0.001
L17	31.25 - 18.75 (17)	TP41.5094x38.849x0.7139	28.16	0.33	19.88	0.033	1.54	0.01	19.88	0.001
L18	18.75 - 0 (18)	TP45.5x41.5094x0.6399	28.95	0.35	21.28	0.033	1.60	0.01	21.28	0.001

Pole Interaction Design Data

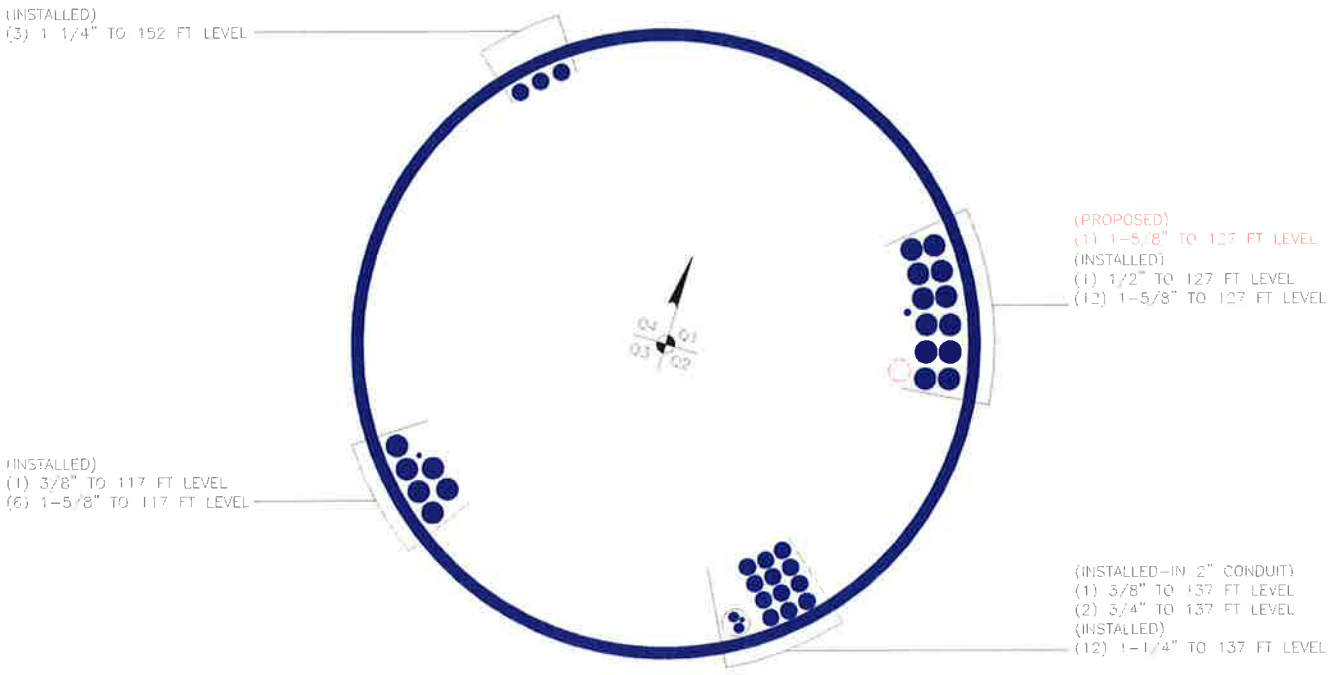
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	150 - 123.42 (1)	0.015	1.175	0.000	0.127	0.005	1.194 ✔	1.333	H1-3+VT ✔
L2	123.42 - 122.25 (2)	0.011	1.166	0.000	0.094	0.003	1.180 ✔	1.333	H1-3+VT ✔
L3	122.25 - 120.25 (3)	0.010	1.143	0.000	0.082	0.003	1.155 ✔	1.333	H1-3+VT ✔
L4	120.25 - 115.25 (4)	0.009	1.013	0.000	0.063	0.002	1.023 ✔	1.333	H1-3+VT ✔
L5	115.25 - 105.25 (5)	0.010	1.313	0.000	0.063	0.002	1.325 ✔	1.333	H1-3+VT ✔
L6	105.25 - 101.9 (6)	0.009	1.147	0.000	0.051	0.001	1.156 ✔	1.333	H1-3+VT ✔
L7	101.9 - 101.25 (7)	0.008	1.034	0.000	0.045	0.001	1.043 ✔	1.333	H1-3+VT ✔
L8	101.25 - 85.96 (8)	0.009	1.224	0.000	0.046	0.001	1.234 ✔	1.333	H1-3+VT ✔
L9	85.96 - 82 (9)	0.010	1.269	0.000	0.043	0.001	1.279 ✔	1.333	H1-3+VT ✔
L10	82 - 77.25 (10)	0.009	1.062	0.000	0.034	0.001	1.071 ✔	1.333	H1-3+VT ✔
L11	77.25 - 75 (11)	0.010	1.230	0.000	0.039	0.001	1.240 ✔	1.333	H1-3+VT ✔
L12	75 - 72.15 (12)	0.010	1.184	0.000	0.037	0.001	1.194 ✔	1.333	H1-3+VT ✔
L13	72.15 - 71.25 (13)	0.010	1.132	0.000	0.035	0.001	1.142 ✔	1.333	H1-3+VT ✔
L14	71.25 - 42.41 (14)	0.011	1.141	0.000	0.031	0.001	1.153 ✔	1.333	H1-3+VT ✔
L15	42.41 - 36.25 (15)	0.013	1.247	0.000	0.033	0.001	1.260 ✔	1.333	H1-3+VT ✔
L16	36.25 - 31.25 (16)	0.013	1.224	0.000	0.032	0.001	1.237 ✔	1.333	H1-3+VT ✔
L17	31.25 - 18.75 (17)	0.014	1.265	0.000	0.033	0.001	1.279 ✔	1.333	H1-3+VT ✔
L18	18.75 - 0 (18)	0.015	1.305	0.000	0.033	0.001	1.321 ✔	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	150 - 123.42	Pole	TP20.74x15x0.1875	1	-6.71	614.69	89.6	Pass
L2	123.42 - 122.25	Pole	TP20.6033x19.6804x0.25	2	-7.21	839.61	88.5	Pass
L3	122.25 - 120.25	Pole	TP21.0285x20.6033x0.4093	3	-7.48	962.23	86.7	Pass
L4	120.25 - 115.25	Pole	TP22.0918x21.0285x0.5569	4	-9.09	1354.07	76.8	Pass
L5	115.25 - 105.25	Pole	TP24.2182x22.0918x0.5238	5	-10.82	1405.53	99.4	Pass
L6	105.25 - 101.9	Pole	TP24.9305x24.2182x0.7187	6	-11.58	1765.20	86.7	Pass
L7	101.9 - 101.25	Pole	TP25.0687x24.9305x0.7468	7	-11.74	1988.62	78.2	Pass
L8	101.25 - 85.96	Pole	TP28.32x25.0687x0.6922	8	-14.35	2036.92	92.6	Pass
L9	85.96 - 82	Pole	TP28.6653x26.0681x0.7374	9	-16.19	2164.89	96.0	Pass
L10	82 - 77.25	Pole	TP29.6773x28.6653x0.9	10	-18.70	2858.78	80.4	Pass
L11	77.25 - 75	Pole	TP30.1567x29.6773x0.7726	11	-19.34	2507.52	93.0	Pass
L12	75 - 72.15	Pole	TP30.7639x30.1567x0.8125	12	-20.27	2689.10	89.6	Pass
L13	72.15 - 71.25	Pole	TP30.9556x30.7639x0.8269	13	-20.55	2840.41	85.7	Pass
L14	71.25 - 42.41	Pole	TP37.1x30.9556x0.8364	14	-28.55	3411.96	86.5	Pass
L15	42.41 - 36.25	Pole	TP37.7849x34.3257x0.7173	15	-31.80	3320.96	94.5	Pass
L16	36.25 - 31.25	Pole	TP38.849x37.7849x0.742	16	-34.51	3497.71	92.8	Pass
L17	31.25 - 18.75	Pole	TP41.5094x38.849x0.7139	17	-35.56	3434.25	96.0	Pass
L18	18.75 - 0	Pole	TP45.5x41.5094x0.6399	18	-39.96	3532.60	99.1	Pass
							Summary	
						Pole (L5)	99.4	Pass
						RATING =	**99.4**	**Pass**

APPENDIX B

BASE LEVEL DRAWING

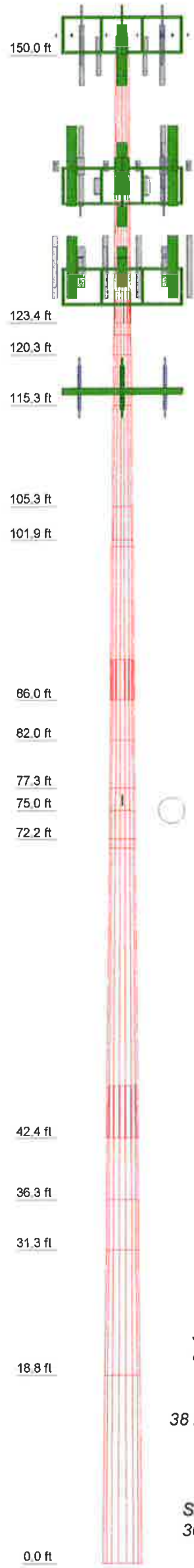

(INSTALLED)
(3) 1 1/4" TO 152 FT LEVEL
(PROPOSED)
(1) 1-5/8" TO 127 FT LEVEL
(INSTALLED)
(1) 1/2" TO 127 FT LEVEL
(12) 1-5/8" TO 127 FT LEVEL
(INSTALLED)
(1) 3/8" TO 117 FT LEVEL
(6) 1-5/8" TO 117 FT LEVEL
(INSTALLED-IN 2" CONDUIT)
(1) 3/8" TO 137 FT LEVEL
(2) 3/4" TO 137 FT LEVEL
(INSTALLED)
(12) 1-1/4" TO 137 FT LEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

Section	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Length (ft)	26.5800	[illegible]	[illegible]	5.0000	10.0000	[illegible]	[illegible]	15.2900	8.0400	[illegible]	[illegible]	[illegible]	[illegible]	28.8400	11.3300	5.0000	12.5000	18.7500
Number of Sides	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Thickness (in)	0.1875	[illegible]	[illegible]	0.5569	0.5238	[illegible]	[illegible]	0.6922	0.7374	[illegible]	[illegible]	[illegible]	[illegible]	0.8364	0.7173	0.7420	0.7139	0.6399
Socket Length (ft)	3.1700							4.0800						5.1700				
Top Dia (in)	15.0000	[illegible]	[illegible]	[illegible]	22.0918	[illegible]	[illegible]	25.0687	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	30.9556	34.3257	37.7849	38.8490	41.5094
Bot Dia (in)	20.7400	[illegible]	[illegible]	[illegible]	24.2182	[illegible]	[illegible]	28.3200	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	37.1000	37.7849	38.8490	41.5094	45.5000
Grade	A572-65	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Reinf 43.32 ksi	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Reinf 45.70 ksi	Reinf 51.83 ksi	Reinf 49.56 ksi	Reinf 49.69 ksi	Reinf 53.21 ksi
Weight (K)	1.0	0.2	0.2	0.6	1.3	0.1	0.6	3.0	1.7	1.3	0.5	0.2	0.7	8.6	3.1	1.5	3.8	5.6

Total Weight (K): 34.2



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
APXVSPP18-C-A20 w/ Mount Pipe	152	RRUS 11	137
APXVSPP18-C-A20 w/ Mount Pipe	152	RRUS 11	137
APXVSPP18-C-A20 w/ Mount Pipe	152	RRUS 11	137
(3) ACU-A20-N	152	Platform Mount [LP 712-1]	137
(3) ACU-A20-N	152	2.375" OD x 6' Mount Pipe	137
(3) ACU-A20-N	152	2.375" OD x 6' Mount Pipe	137
800 EXTERNAL NOTCH FILTER	152	2.375" OD x 6' Mount Pipe	137
800 EXTERNAL NOTCH FILTER	152	RRUS 11	136
800 EXTERNAL NOTCH FILTER	152	RRUS 11	136
Platform Mount [LP 601-1]	152	RRUS 11	136
2.375" OD x 6' Mount Pipe	152	DC6-48-60-18-8F	136
2.375" OD x 6' Mount Pipe	152	Side Arm Mount [SO 102-3]	136
2.375" OD x 6' Mount Pipe	152	TME-RRUS 11 BAND 12	134
(2) 2.375" OD x 6' Mount Pipe	152	TME-RRUS 11 BAND 12	134
(2) 2.375" OD x 6' Mount Pipe	152	TME-RRUS 11 BAND 12	134
(2) 2.375" OD x 6' Mount Pipe	152	DC6-48-60-18-8F	134
8-ft Ladder	152	Side Arm Mount [SO 102-3]	134
TME-1900MHz RRH (65 MHz)	150	(2) APL866513-42T0 w/ Mount Pipe	127
TME-1900MHz RRH (65 MHz)	150	(2) APL866513-42T0 w/ Mount Pipe	127
TME-1900MHz RRH (65 MHz)	150	(2) APL866513-42T0 w/ Mount Pipe	127
TME-800MHz RRH	150	BXA-70063-4CF-EDIN-X w/ Mount Pipe	127
TME-800MHz RRH	150	BXA-70063-4CF-EDIN-X w/ Mount Pipe	127
TME-800MHz RRH	150	GPS_A	127
Side Arm Mount [SO 102-3]	150	(2) FD9R6004/2C-3L	127
7770.00 w/ Mount Pipe	137	(2) FD9R6004/2C-3L	127
7770.00 w/ Mount Pipe	137	(2) FD9R6004/2C-3L	127
7770.00 w/ Mount Pipe	137	BXA-70040/4CF w/ Mount Pipe	127
AM-X-CD-16-65-00T-RET w/ Mount Pipe	137	(2) HBXX-6517DS-A2M w/ Mount Pipe	127
AM-X-CD-16-65-00T-RET w/ Mount Pipe	137	(2) HBXX-6517DS-A2M w/ Mount Pipe	127
SBNH-1D6565C w/ Mount Pipe	137	(2) HBXX-6517DS-A2M w/ Mount Pipe	127
SBNH-1D6565C w/ Mount Pipe	137	DB-T1-6Z-8AB-0Z	127
(2) SBNH-1D6565C w/ Mount Pipe	137	RRH2X60-PCS	127
7020.00	137	RRH2X60-PCS	127
7020.00	137	RRH2X60-PCS	127
7020.00	137	RRH2X60-AWS	127
(2) DTMABP7819VG12A	137	RRH2X60-AWS	127
(2) DTMABP7819VG12A	137	RRH2X60-AWS	127
(2) DTMABP7819VG12A	137	Platform Mount [LP 712-1]	127
(2) DD1900 FULL BAND w/850 BY-PASS MASTHEAD	137	HBX-6516DS-VTM w/ Mount Pipe	117
(2) DD1900 FULL BAND w/850 BY-PASS MASTHEAD	137	HBX-6516DS-VTM w/ Mount Pipe	117
(2) DD1900 FULL BAND w/850 BY-PASS MASTHEAD	137	HBX-6516DS-VTM w/ Mount Pipe	117
(2) LGP21901	137	T-Arm Mount [TA 601-3]	117
(2) LGP21901	137	2.375" OD x 6' Mount Pipe	117
(2) LGP21901	137	2.375" OD x 6' Mount Pipe	117
		2.375" OD x 6' Mount Pipe	117
		OG-860/1920/GPS-A	75
		Side Arm Mount [SO 701-1]	75

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi	Reinf 43.48 ksi	43 ksi	55 ksi
Reinf 44.91 ksi	45 ksi	57 ksi	Reinf 43.51 ksi	44 ksi	55 ksi
Reinf 44.48 ksi	44 ksi	56 ksi	Reinf 43.53 ksi	44 ksi	55 ksi
Reinf 44.61 ksi	45 ksi	56 ksi	Reinf 45.70 ksi	46 ksi	58 ksi
Reinf 39.96 ksi	40 ksi	50 ksi	Reinf 51.83 ksi	52 ksi	65 ksi
Reinf 43.13 ksi	43 ksi	54 ksi	Reinf 49.56 ksi	50 ksi	62 ksi
Reinf 43.32 ksi	43 ksi	55 ksi	Reinf 49.69 ksi	50 ksi	63 ksi
Reinf 43.40 ksi	43 ksi	55 ksi	Reinf 53.21 ksi	53 ksi	67 ksi

AXIAL
68 K
SHEAR
8 K
MOMENT
994 kip-ft
TORQUE 1 kip-ft
38 mph WIND - 1.2500 in ICE

AXIAL
46 K
SHEAR
30 K
MOMENT
3437 kip-ft
TORQUE 2 kip-ft
REACTIONS - 85 mph WIND

TOWER DESIGN NOTES

1. Tower is located in New Haven County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 38 mph basic wind with 1.25 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 99.4%

Paul J Ford and Company
250 E. Broad Street Suite 600
Columbus, OH 43215
Phone: 614.221.6679
FAX: 614.448.44105

Job: ***150' Monopole / Oxford/Fritz Property***		
Project: ***PJF 37515-0074 / BU 876362***		
Client: Crown Castle	Drawn by: Robert Koors	App'd:
Code: TIA/EIA-222-F	Date: 04/09/15	Scale: N
Path:		Dwg No.

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

v4.4 - Effective 7-12-13

Date: 4/9/2015
PJF Project: 37515-0074.003.7700
Client Ref. # BU 876362
Site Name: Oxford / Fritz Property
Description: 150' MP
Owner: CCI
Engineer: RMK

Asymmetric Anchor Rod Analysis

Moment =	3437	k-ft	TIA Ref.	F	Location =	Base Plate		
Axial =	46.0	kips	ASIF =	1.3333	η =	N/A	for BP, Rev. G Sect. 4.9.9	
Shear =	30.0	kips	Max Ratio =	100.0%	Threads =	N/A	for FP, Rev. G	
Anchor Qty =	21							

**** For Post Installed Anchors: Check anchors for embedment, epoxy/grout bond, and capacity based on proof load. ****

Item	Nominal Anchor Dia, in	Spec	Fy, ksi	Fu, ksi	Location, degrees	Anchor Circle, in	Area Override, in^2	Area, in^2	Max Net Compression, kips	Max Net Tension, kips	Load for Capacity Calc, kips	Capacity Override, kips	Capacity, kips	Capacity Ratio
1	2.250	#18J A615 Gr 75	75	100	0.0	54.00	0.00	3.98	146.43	141.16	141.16	0.00	195.00	72.4%
2	2.250	#18J A615 Gr 75	75	100	30.0	54.00	0.00	3.98	147.02	141.74	141.74	0.00	195.00	72.7%
3	2.250	#18J A615 Gr 75	75	100	60.0	54.00	0.00	3.98	149.55	144.27	144.27	0.00	195.00	74.0%
4	2.250	#18J A615 Gr 75	75	100	90.0	54.00	0.00	3.98	151.19	145.91	145.91	0.00	195.00	74.8%
5	2.250	#18J A615 Gr 75	75	100	120.0	54.00	0.00	3.98	150.16	144.88	144.88	0.00	195.00	74.3%
6	2.250	#18J A615 Gr 75	75	100	150.0	54.00	0.00	3.98	147.41	142.14	142.14	0.00	195.00	72.9%
7	2.250	#18J A615 Gr 75	75	100	180.0	54.00	0.00	3.98	145.80	140.53	140.53	0.00	195.00	72.1%
8	2.250	#18J A615 Gr 75	75	100	210.0	54.00	0.00	3.98	147.23	141.95	141.95	0.00	195.00	72.8%
9	2.250	#18J A615 Gr 75	75	100	240.0	54.00	0.00	3.98	150.51	145.24	145.24	0.00	195.00	74.5%
10	2.250	#18J A615 Gr 75	75	100	270.0	54.00	0.00	3.98	152.64	147.36	147.36	0.00	195.00	75.6%
11	2.250	#18J A615 Gr 75	75	100	300.0	54.00	0.00	3.98	151.73	146.45	146.45	0.00	195.00	75.1%
12	2.250	#18J A615 Gr 75	75	100	330.0	54.00	0.00	3.98	148.69	143.42	143.42	0.00	195.00	73.5%
13	1.750	A193 Gr B7	105	125	40.0	69.00	0.00	2.41	113.71	110.52	110.52	0.00	132.29	83.5%
14	1.750	A193 Gr B7	105	125	110.0	69.00	0.00	2.41	116.14	112.95	112.95	0.00	132.29	85.4%
15	1.750	A193 Gr B7	105	125	160.0	69.00	0.00	2.41	112.86	109.67	109.67	0.00	132.29	82.9%
16	1.750	A193 Gr B7	105	125	230.0	69.00	0.00	2.41	114.86	111.67	111.67	0.00	132.29	84.4%
17	1.750	A193 Gr B7	105	125	290.0	69.00	0.00	2.41	117.09	113.90	113.90	0.00	132.29	86.1%
18	1.750	A193 Gr B7	105	125	350.0	69.00	0.00	2.41	112.94	109.75	109.75	0.00	132.29	83.0%
19	1.750	A193 Gr B7	105	125	20.0	69.00	0.00	2.41	112.68	109.49	109.49	0.00	132.29	82.8%
20	1.750	A193 Gr B7	105	125	140.0	69.00	0.00	2.41	114.24	111.05	111.05	0.00	132.29	83.9%
21	1.750	A193 Gr B7	105	125	247.0	69.00	0.00	2.41	116.24	113.05	113.05	0.00	132.29	85.5%
								69.41						

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

TIA Rev F

Site Data

BU#: *876362*
Site Name: *Oxford / Fritz Property*
App #:

Pole Manufacturer:	*Other*

Reactions		
Moment:	2025	ft-kips
Axial:	31.7	kips
Shear:	20.6	kips

Reactions adjusted to account for additional anchor rods.

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:	54	in

Anchor Rod Results

Maximum Rod Tension: 147.4 Kips

Stiffened
Service, ASD
Fty*ASIF

See asymmetric anchor rod spreadsheet

Plate Data		
Diam:	60	in
Thick:	1.75	in
Grade:	60	ksi
Single-Rod B-eff:	12.03	in

Base Plate Results

	Flexural Check	Stiffened
Base Plate Stress:	50.6 ksi	Service, ASD
Allowable Plate Stress:	60.0 ksi	0.75*Fy*ASIF
Base Plate Stress Ratio:	84.3% Pass	Y.L. Length: N/A, Roark

Stiffener Data (Welding at both sides)		
Config:	3	*
Weld Type:	Both	
Groove Depth:	0.375	in **
Groove Angle:	45	degrees
Fillet H. Weld:	0.375	in
Fillet V. Weld:	0.375	in
Width:	6.75	in
Height:	13.75	in
Thick:	0.5	in
Notch:	0.75	in
Grade:	50	ksi
Weld str.:	80	ksi
Clear Space between Stiffeners (b):	7.5	in

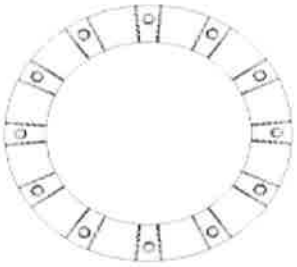
Stiffener Results

Horizontal Weld :	56.3% Pass
Vertical Weld:	28.7% Pass
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	23.2% Pass
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	48.2% Pass
Plate Comp. (AISC Bracket):	63.2% Pass

Pole Results

Pole Punching Shear Check:	11.5% Pass

Pole Data		
Diam:	45.5	in
Thick:	0.375	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None



Stress Increase Factor		
ASIF:	1.333	

* 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

Moment Capacity of Rock Anchored Foundation - Wind into Corner

Determination of effective rock compression area (for moment loads)

Controlling foundation % Capacity = 52.7% OK

Elevation = 0 feet Total pole plus soil & fdn weight = 403.5 kips
Diagonal dimension = 386.10 in 1/2 x diagonal dimension = 193.05 in
Neutral axis location = 61.99 in (Measured from max. compression fiber)
Therefore c= 61.99 inches and a = β_1 x c = 52.69 inches β_1 = 0.85

Area of fdn-rock contact, Afr = 2776.1 square inches Net area of Afr = 2746.2 square inches

Centroid of Afr located 350.97 inches from maximum tension fiber of cross-section

Check fdn-rock contact area compression capacity versus actual rock compressive stress

Rock f'c = 416.7 psi Gross area of rock, Ac = ###### sq. in. $\Sigma T - \Sigma C$ = 0.0

Total rock anchor load, T_L, on annulus area, ΣT = 569.2 kips

Usable rock and rock anchor compression capacity, SC = 972.7 kips

Rock contribution to Mn = 2177.3 ft-kips

Pole / foundation / soil wt contribution to Mn = 4407.0 ft-kips

Cross-section Moment Cap.		
M_{ult} =	13718.8	ft-kips
M_{cap} =	6859.4	ft-kips

phi= 0.5
(Mcap = ϕMult)

M_{actual} = 3617 ft-kips (At bottom of pad)
Mact / Mcap = 52.7%

Strand information

No. of strands, Ns = 4 Number of strand group locations = 3 No. of strands per group location = 1

Separation angle between strand groups = 90 degrees Strand diameter = 1.4375 in

Strand edge distance = 33.9 inches (measured to center of strand group)

Modulus of elasticity of strand, E_s = 29000 ksi (*PCI Design Handbook*, 4th Edition) Area of strand = 1.25 sq. in.

Effective prestress = R x Initial prestress = 90.4 kips (Where R varies between 0.75 and 0.90)

Strand strain calculations

PJF job no. 37515-0074.003

Strand strain due to effective prestress, ε_{se} = Eff. prestress of strand / (area of strand x E_s) = **0.00249**

rock strain due to effective prestress, ece = Total eff. prestress of strands / (Ac x Es) = **0.00000**

Assumed rock strain = **0.003**

Location	No. of strand groups	Dist. to neutral axis	Bending Strain	Total Strain	Strain Factor
1	1	290.21	0.0140	0.0165	1.00
2	2	131.06	0.0063	0.0088	1.00
3	1	-28.09	0.0000	0.0025	1.00
4	0	---	---	---	---
5	0	---	---	---	---
6	0	---	---	---	---
7	0	---	---	---	---
8	0	---	---	---	---
9	0	---	---	---	---
10	0	---	---	---	---
11	0	---	---	---	---
12	0	---	---	---	---
13	0	---	---	---	---
14	0	---	---	---	---
15	0	---	---	---	---
16	0	---	---	---	---
17	0	---	---	---	---
18	0	---	---	---	---
19	0	---	---	---	---
20	0	---	---	---	---
21	0	---	---	---	---
22	0	---	---	---	---
23	0	---	---	---	---
24	0	---	---	---	---
25	0	---	---	---	---
26	0	---	---	---	---
27	0	---	---	---	---
28	0	---	---	---	---
29	0	---	---	---	---
30	0	---	---	---	---
31	0	---	---	---	---

Determination of strand contribution to ultimate moment capacity

PJF job no. 37515-0074.003

Location	Group Strand Tension Load	Total Strand Tension Load Per Location, T_L	Contribution to Mn	Area Occupied by Strands
1	159.6	159.6	3859.8	---
2	159.6	319.2	3486.3	---
3	90.4	90.4	-211.6	1.62
4	---	---	---	---
5	---	---	---	---
6	---	---	---	---
7	---	---	---	---
8	---	---	---	---
9	---	---	---	---
10	---	---	---	---
11	---	---	---	---
12	---	---	---	---
13	---	---	---	---
14	---	---	---	---
15	---	---	---	---
16	---	---	---	---
17	---	---	---	---
18	---	---	---	---
19	---	---	---	---
20	---	---	---	---
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25	---	---	---	---
26	---	---	---	---
27	---	---	---	---
28	---	---	---	---
29	---	---	---	---
30	---	---	---	---
31	---	---	---	---

$M_n = \Sigma$ (Tension in strand groups x strand group distance to N.A.) = **7134.5** ft-kips

$M_u = \phi M_n = 0.9 \times M_n =$ **6421.1** ft-kips

Tendon yield strength = **159.600** kips

Rock Anchored Foundation Structural and Overturning Checks

PJF job no. 37515-0074.003

Beam Shear, Tension Side - Wind into corner

b =	188	in	(Critical section at distance of d away from center of anchor, towards face of pier)
d=	49.5	in	
f'c=	4000	psi	
Vu=	90.4	kips	
ϕ=	0.85		
ϕVc=	1000.6	kips	
% Cap=	4.8%	OK	(Vu adjusted for actual rock bolt load)

Beam Shear, Compression Side - Wind into corner

b =	204.4	in	(Critical section at distance of a plus d away from corner of foundation)
d=	49.5	in	
f'c=	4000	psi	
Vu=	333.4	kips	(1.3 times SC, adjusted for overall foundation % Capacity and phi)
ϕ=	0.85		
ϕVc=	1087.7	kips	
% Cap=	30.7%	OK	

Punching Shear, Tension Side - Wind into corner

b =	96	in	(Critical section at distance of 0.5d away from center of anchor in all applicable directions)
d=	49.5	in	
f'c=	4000	psi	
Vu=	90.4	kips	
ϕ=	0.85		
ϕVc=	1021.8	kips	
% Cap=	4.7%	OK	(Adjusted for actual rock bolt load)

Moment Capacity of Rock Anchored Foundation - Wind into Side

PJF job no. 37515-0074.003

Determination of effective rock compression area (for moment loads)

Controlling foundation % Capacity = 66.9% OK

Elevation = 0 feet Total pole plus soil & fdn weight = 403.5 kips Pier diameter / square dim = 6 feet

Side dimension = 273.00 in 1/2 x diagonal dimension = 136.50 in

Neutral axis location = 12.80 in (Measured from max. compression fiber)

Therefore c= 12.80 inches and a = β_1 x c = 10.88 inches β_1 = 0.85

Area of fdn-rock contact, Afr = 2969.9 square inches Net area of Afr = 2941.6 square inches

Centroid of Afr located 267.56 inches from maximum tension fiber of cross-section

Check fdn-rock contact area compression capacity versus actual rock compressive stress

Rock f'c = 416.7 psi Gross area of rock, Ac = ####### sq. in. $\Sigma T - \Sigma C$ = 0.0

Total rock anchor load, T_L, on annulus area, ΣT = 638.4 kips

Usable rock and rock anchor compression capacity, SC = 1041.9 kips

Rock contribution to Mn = 638.95 ft-kips

Pole / foundation / soil wt contribution to Mn = 4159.5 ft-kips

Cross-section Moment Cap.		
M_{ult} =	11379.3	ft-kips
M_{cap} =	5689.7	ft-kips

phi= 0.5 (Mcap = ϕMult)

M_{actual} = 3617 ft-kips (At bottom of pad)

Mact / Mcap = 63.6%

Strand information

No. of strands, Ns = 4 Number of strand group locations = 3 No. of strands per group location = 2

Separation angle between strand groups = 90 degrees Strand diameter = 1.4375 in

Strand edge distance = 24 inches (measured to center of strand group)

Modulus of elasticity of strand, E_s = 29000 ksi (*PCI Design Handbook*, 4th Edition) Area of strand = 1.25 sq. in.

Effective prestress = R x Initial prestress = 90.4 kips (Where R varies between 0.75 and 0.90)

Strand strain calculations

PJF job no. 37515-0074.003

Strand strain due to effective prestress, ε_{se} = Eff. prestress of strand / (area of strand x E_s) = **0.00249**

rock strain due to effective prestress, ece = Total eff. prestress of strands / (Ac x Es) = **0.00000**

Assumed rock strain = **0.003**

Location	No. of strand groups	Dist. to neutral axis	Bending Strain	Total Strain	Strain Factor
1	1	236.20	0.0554	0.0579	1.00
2	0	123.70	0.0290	0.0315	1.00
3	1	11.20	0.0026	0.0051	1.00
4	0	---	---	---	---
5	0	---	---	---	---
6	0	---	---	---	---
7	0	---	---	---	---
8	0	---	---	---	---
9	0	---	---	---	---
10	0	---	---	---	---
11	0	---	---	---	---
12	0	---	---	---	---
13	0	---	---	---	---
14	0	---	---	---	---
15	0	---	---	---	---
16	0	---	---	---	---
17	0	---	---	---	---
18	0	---	---	---	---
19	0	---	---	---	---
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25	0	---	---	---	---
26	0	---	---	---	---
27	0	---	---	---	---
28	0	---	---	---	---
29	0	---	---	---	---
30	0	---	---	---	---
31	0	---	---	---	---

Determination of strand contribution to ultimate moment capacity

PJF job no. 37515-0074.003

Location	Group Strand Tension Load	Total Strand Tension Load Per Location, T_L	Contribution to Mn	Area Occupied by Strands
1	159.6	319.2	6283.0	---
2	159.6	0.0	0.0	---
3	159.6	319.2	298.0	---
4	---	---	---	---
5	---	---	---	---
6	---	---	---	---
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28	---	---	---	---
29	---	---	---	---
30	---	---	---	---
31	---	---	---	---

$M_n = \Sigma$ (Tension in strand groups x strand group distance to N.A.) = **6580.9** ft-kips

$M_u = \phi M_n = 0.9 \times M_n =$ **5922.8** ft-kips

Tendon yield strength = **159.600** kips

Rock Anchored Foundation Structural and Overturning Checks

Beam Shear, Tension Side - Wind into Side

b =	273.00	in	(Equal to width of mat)
d=	49.5	in	
f'c=	4000	psi	
Vu=	180.8	kips	
ϕ=	0.85		
ϕVc=	1452.9	kips	
% Cap=	12.4%	OK	

Beam Shear, Compression Side - Wind into Side

b =	273.0	in	(Equal to width of mat)
d=	49.5	in	
f'c=	4000	psi	
Vu=	430.5	kips	(1.3 times SC, adjusted for overall foundation % Capacity and phi)
ϕ=	0.85		
ϕVc=	1452.9	kips	
% Cap=	29.6%	OK	

Punching Shear, Tension Side - Wind into Side

b =	96	in	(Critical section at distance of 0.5d away from center of anchor in all applicable directions)
d=	49.5	in	
f'c=	4000	psi	
Vu=	90.4	kips	
ϕ=	0.85		
ϕVc=	1021.8	kips	
% Cap=	5.6%	OK	(Adjusted for actual rock bolt load)

Internal Pad Bending - Wind into Side

Moment at face of pier, Mu =	2569.7	ft-k	Load factor = 1.3
Fact. Nom. moment cap, ϕMn =	5338.8	ft-k	From PJF Spread Footing Spreadsheet
% Capacity =	48.1%	OK	

Overturning / Stability - Worst case assumed to be wind into the side

Rock anchor proof load, PL =	150	kips	(Assumed to be ultimate anchor capacity)
# of anchors in Line 1, N1 =	2		
Line 1 distance to rotation pt, d1 =	20.75	feet	
# of anchors in Line 2, N2 =	0		(Combined anchors on either side of foundation centerline)
Line 2 distance to rotation pt, d2 =	0	feet	
Foundation / pole / soil wt, W =	403.5	kips	
Distance to rotation pt, dw =	11.375	feet	
Foundation actual OTM, Mo =	3617	ft-k	(At bottom of foundation)
Overturning resistance, Mr =	10815	ft-k	(N1 x d1 x PL + N2 x d2 x [d2/d1 x PL] + W x dw)
% Cap = Mo / 0.5Mr =	66.9%	OK	(Min SF=2)

Note - Overturning % Cap conservative due to:

1) Line of anchors closest to point of overturning not included in calculation
2) Ultimate / maximum anchor capacity likely greater than proof load applied to anchor during installation

37515-0074.003.DWG

MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

BU NUMBER; SITE NAME

BU #876362; OXFORD/FRITZ PROPERTY

APP: 274626 REV. 2; WO: 1034764

SITE ADDRESS

338 OXFORD RD.
OXFORD, CONNECTICUT 06478
NEW HAVEN 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.

PROJECT CONTACTS:

MONOPOLE OWNER:
CROWN CASTLE
MOD PM: DAN VADNEY AT DAN.VADNEY@CROWNCASTLE.COM
PH: (518) 373-3510

DESIGN STANDARD

THIS REINFORCEMENT DESIGN IS BASED UPON THE REQUIREMENTS OF THE TIA/EIA-222-F-1996 STRUCTURAL STANDARD FOR ANTENNA SUPPORTING STRUCTURES AND ANTENNAS, USING A DESIGN BASIC WIND SPEED OF 85 MPH (FASTEST MILE) WITH NO ICE, 38 MPH WITH 1 1/4 INCH ICE AND 50 MPH SERVICE LOADS.

REFER TO THE POLE DESIGN AND ANTENNA LOADING DOCUMENTED IN THE PJF STRUCTURAL ANALYSIS FOR THIS SITE (PJF#37515-0074.003.7700), DATED 4-9-2015.

THIS PROJECT INCLUDES THE FOLLOWING REINFORCING ELEMENTS:

SHAFT REINFORCING
FIELD WELDED ANCHOR BRACKETS
POST INSTALLED ANCHOR RODS
FOUNDATION AUGMENTATION: ROCK ANCHORS
REMOVAL OF AERO WING SPLICE BARS
REMOVAL OF STIFFENERS AT BASE
REMOVAL OF STEP BOLTS

SHEET INDEX

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3530 TORINGDON WAY, SUITE 300, CHARLOTTE, NC 28277
PH: (704) 405-6605

BU #876362; OXFORD/FRITZ PROPERTY
OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	TITLE SHEET
CHECKED BY: R.M.K.	
APPROVED BY:	T-1
DATE: 4-9-2015	

CROWN CASTLE PROJECT: BU #876362; OXFORD/FRITZ PROPERTY; OXFORD, 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.
   1.11. THE CLIMBING FACILITIES, SAFETY CLIMB AND ALL PARTS THEREOF SHALL NOT BE IMPEDED, MODIFIED OR ALTERED WITHOUT THE EXPRESS APPROVAL OF THE EOR.
   1.12. ALL SOLUTIONS FOR THE REPLACEMENT, RELOCATION OR MODIFICATION OF THE SAFETY CLIMB AND/OR ANY OF THE MONOPOLE CLIMBING FACILITIES SHALL BE COORDINATED WITH TUF-TUG. CONTACT DETAILS:
   TUF-TUG PRODUCTS
   3434 ENCRETE LANE
   MORAINE, OHIO 45439
   PHONE: 937-299-1213
   EMAIL: TUFTUG@AOL.COM

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"
      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**
   4.1. THE CONTRACTOR SHALL PROTECT THE EXISTING MONOPOLE STRUCTURE, AS WELL AS ANY OTHER NEARBY EXISTING FOUNDATIONS FOR OTHER STRUCTURES OR EQUIPMENT, FROM LOSS OF SOIL AROUND AND/OR BENEATH FOOTINGS DURING ANY EXCAVATION. THE CONTRACTOR SHALL BRACE THE SITES OF THE OPEN EXCAVATION AS REQUIRED.
   4.2. THE EFFECT OF ADDITIONAL EXCAVATION FOR FOUNDATION AUGMENTATION AND REINFORCING, WHERE REQUIRED, MAY HAVE IMPACT ON EXISTING EQUIPMENT AND/OR OTHER EXISTING STRUCTURES NEAR THE EXCAVATION. THE EOR HAS NOT BEEN PROVIDED WITH ANY SPECIFIC INFORMATION OR DETAILS REGARDING EXISTING EQUIPMENT OR OTHER EXISTING STRUCTURES ON THE SITE. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE THE EFFECT THAT ANY EXCAVATION WORK HAS ON EXISTING NEARBY EQUIPMENT AND/OR STRUCTURES. CONTRACTOR SHALL COORDINATE THIS SITE-SPECIFIC INFORMATION WITH CROWN CASTLE AND THE TESTING AGENCY PRIOR TO CONSTRUCTION AND FOUNDATION WORK. AFTER OBTAINING THE PRIOR WRITTEN PERMISSION OF CROWN CASTLE, THE CONTRACTOR SHALL ADEQUATELY BRACE, SHORE, AND/OR RELOCATE THE INTERFERING EXISTING NEARBY EQUIPMENT AND/OR STRUCTURES AS NECESSARY.

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

6. **EPOXY GROUTED REINFORCING ANCHOR RODS**
   6.1. UNLESS OTHERWISE NOTED, REINFORCING ANCHOR RODS SHALL BE 150 KSI ALL-THREAD BARS CONFORMING TO ASTM A722. RECOMMENDED MANUFACTURERS/SUPPLIERS OF 150 KSI ALL-THREAD BARS ARE WILLIAMS FORM ENGINEERING CORPORATION AND DYWIDAG SYSTEMS INTERNATIONAL.
   6.2. ALL REINFORCING ANCHOR RODS SHALL BE HOT DIP GALVANIZED PER ASTM A123. ALTERNATIVELY, ALL REINFORCING ANCHOR RODS MAY BE EPOXY COATED PER ASTM A775.
   6.3. THE CORE-DRILLED HOLES IN THE CONCRETE FOR THE ANCHOR RODS SHALL BE CLEAN AND DRY, AND OTHERWISE PROPERLY PREPARED ACCORDING TO THE ANCHOR ROD AND EPOXY MANUFACTURERS' INSTRUCTIONS, PRIOR TO PLACEMENT OF ANCHOR RODS AND EPOXY. CONTRACTOR SHALL FOLLOW ALL ANCHOR ROD AND EPOXY MANUFACTURER RECOMMENDATIONS REGARDING HANDLING OF RODS, EPOXY, ACCEPTABLE AMBIENT TEMPERATURE RANGE DURING INSTALLATION AND POST-INSTALLATION CURING, THE EFFECT OF TEMPERATURE ON EPOXY CURING TIME, PREPARATION OF HOLE, ETC.
   6.4. HILTI HIT RE-500 SD OR ITW RED HEAD EPCON G5 EPOXY SHALL BE USED TO ANCHOR THE BAR IN THE DRILL HOLES. IF CONTRACTOR WISHES TO USE A DIFFERENT EPOXY, A REQUEST INCLUDING THE EPOXY TECHNICAL DATA SHEET(S) SHALL BE SUBMITTED TO THE EOR FOR REVIEW PRIOR TO CONSTRUCTION.
   6.5. ONCE THE REINFORCING ANCHOR RODS HAVE BEEN INSTALLED AND ALL EPOXY AND GROUT HAVE CURED (IF BASE PLATE AND/OR BEARING PLATES HAVE BEEN GROUTED PRIOR TO TESTING), ALL REINFORCING ANCHORS SHALL BE LOAD TESTED PER CROWN CASTLE ENGINEERING DOCUMENT #ENG-PRC-10119. REFER TO THE NEW ANCHOR & BRACKET DETAIL ON FOLLOWING SHEETS FOR SPECIFIED ANCHOR ROD PROOF LOAD.
   6.6. ONCE THE REINFORCING ANCHOR RODS HAVE BEEN SUCCESSFULLY LOAD TESTED AND APPROVED THE CONTRACTOR SHALL TIGHTEN ALL HEAVY HEX ANCHOR NUTS TO SNUG TIGHT PLUS 1/8 TURN OF NUT.

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".

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BU #876362; OXFORD/FRITZ PROPERTY
OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700
DRAWN BY: B.M.S.
CHECKED BY: R.M.K.
APPROVED BY:
DATE: 4-9-2015
GENERAL NOTES
S-1

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.

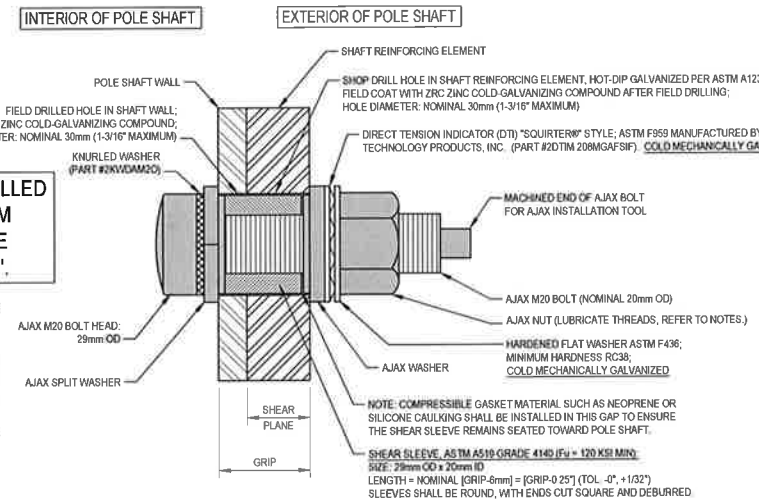
NOTE: COMPLETELY COMPRESSED DTI'S SHOWING NO VISIBLE REMAINING GAP ARE ACCEPTABLE. DTI WASHERS SHALL BE PLACED DIRECTLY AGAINST THE OUTER AJAX WASHER WITH THE DTI BUMPS FACING AWAY FROM THE AJAX WASHER. PLACE A HARDENED WASHER BETWEEN THE DTI AND THE AJAX NUT. THE DTI BUMPS SHALL BEAR AGAINST THE UNDERSIDE 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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OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	AJAX BOLT DETAIL
CHECKED BY: R.M.K.	
APPROVED BY:	S-2
DATE: 4-9-2015	

37515-0074.003.DWG

POLE SPECIFICATIONS	
POLE SHAPE TYPE:	18-SIDED POLYGON
TAPER:	0.2033 IN/FT
SHAFT STEEL:	ASTM A572 GRADE 65
BASE PL STEEL:	ASTM A871 GRADE 60
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	26.5800	0.1875	38.00	15.000	20.740
2	40.6300	0.2500	49.00	19.680	28.320
3	47.6300	0.3125	62.00	26.952	37.100
4	47.5800	0.3750		35.374	45.500
NOTE: DIMENSIONS SHOWN DO NOT INCLUDE GALVANIZING TOLERANCES					

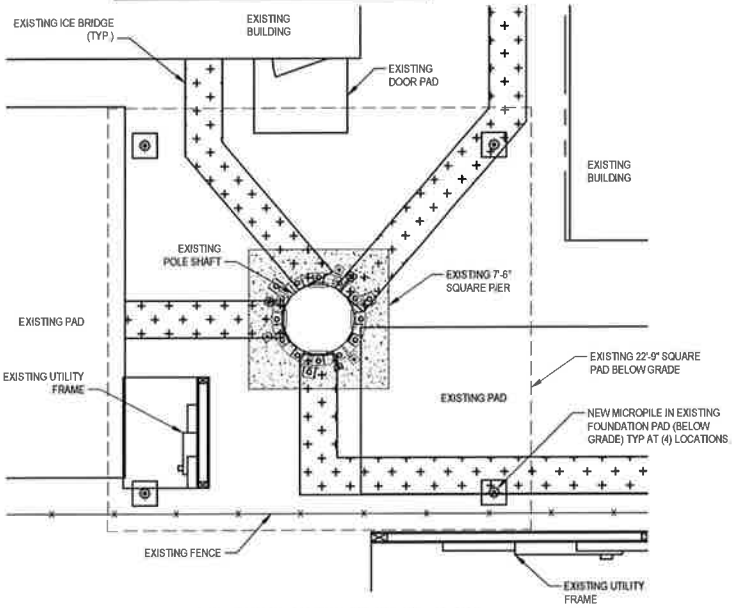
CONTRACTOR SHALL PROVIDE ASTM A36 SHIM PLATES BELOW SLIP JOINTS. THE SHIM PLATES SHALL BE PLACED BETWEEN THE NEW SHAFT REINFORCEMENT AND THE EXISTING POLE SHAFT FROM THE SLIP JOINT TO THE NEW SHAFT REINFORCEMENT SPLICE PLATE LOCATION AND A EXTRA LONG "SPLICE SHIM" SHALL BE PLACED BETWEEN THE NEW UPPER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

MODIFICATIONS:

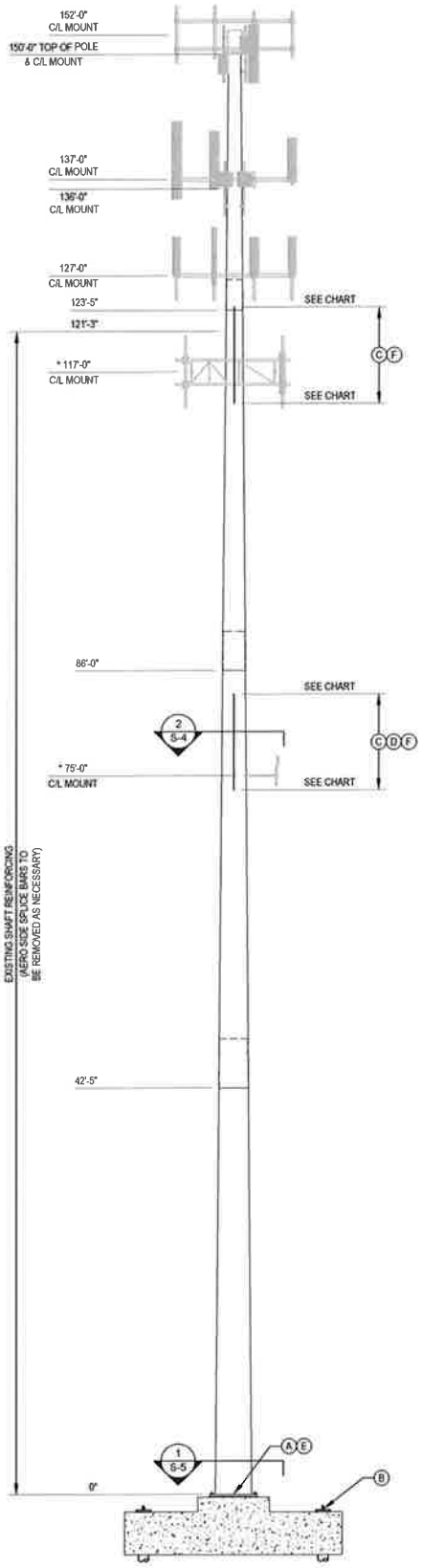
- (A) INSTALL NEW ANCHOR RODS AND BRACKETS AT BASE PLATE. SEE SHEET S-5.
- (B) INSTALL NEW ROCK ANCHORS IN EXISTING FOUNDATION PAD. SEE SHEETS S-7 & S-8.
- (C) INSTALL NEW SHAFT REINFORCING. SEE CHART AND DETAILS ON SHEET S-4.
- (D) REMOVAL OF AERO WING SPLICE BARS AS NECESSARY.
- (E) REMOVAL OF EXISTING STIFFENERS. SEE SHEET S-5.
- (F) STEP BOLTS AS NECESSARY.

SITE COORDINATION REQUIRED: PRIOR TO CONSTRUCTION CONTRACTOR SHALL COORDINATE AND FIELD VERIFY LOCATION OF REQUIRED NEW FOUNDATION RELATIVE TO EXISTING SITE EQUIPMENT AND CONSTRAINTS IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE THE MEANS AND METHODS OF SHORING AND/OR RELOCATION OF GROUND BASED EQUIPMENT THAT WILL BE AFFECTED BY THE PROPOSED ENVELOPE OF THE CURRENT FOUNDATION MOD DESIGN. PLEASE CONTACT THE EOR IF DESIGN INPUT OR NECESSARY CHANGES TO THE DESIGN ARE NEEDED. IF THE DESIGN IS FEASIBLE, BUT THE CONTRACTOR HAS A PREFERENCE TO INSTALL A DIFFERENT OPTION TO ACCOMMODATE ALTERNATE TECHNIQUES OR SUBCONTRACTOR LIMITATIONS - IT IS EXPECTED THAT THESE ISSUES WILL BE ADDRESSED AT THE TIME OF BIDDING. ANY CHANGES TO ORIGINAL DESIGN WILL REQUIRE FURTHER ENGINEERING - CONTRACTOR IS EXPECTED TO BUDGET ACCORDINGLY.

* EXISTING MOUNTS MAY NEED TO BE ADJUSTED, MOVED AND/OR TEMPORARILY SUPPORTED DURING THE INSTALLATION OF SHAFT REINFORCING



PARTIAL SITE PLAN 2 / S-3



POLE ELEVATION 1 / S-3

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BU #876362; OXFORD/FRITZ PROPERTY
OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	MONOPOLE PROFILE
CHECKED BY: R.M.K.	
APPROVED BY:	S-3
DATE: 4-9-2015	

37515-0074.003.DWG

NEW CCI FLAT PLATE (65 KSI) REINFORCING SCHEDULE

BOTTOM ELEVATION	TOP ELEVATION	FLAT # / 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
73' - 6"	83' - 6"	F5, F11 & F17	CCI-SFP-04510010	10' - 0"	3	16	48	6	6	20"	459 LBS
113' - 9"	123' - 9"	F5, F11 & F17	CCI-AFP-04007510	10' - 0"	3	17	51	6	6	18"	306 LBS
							99				765 LBS

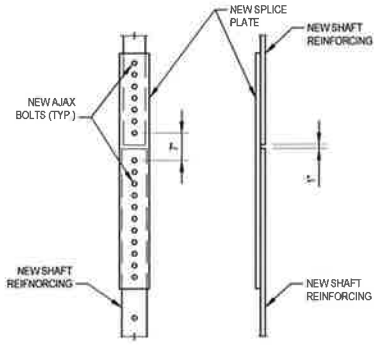
NOTES:

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 1-800-631-3275 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 A-36.

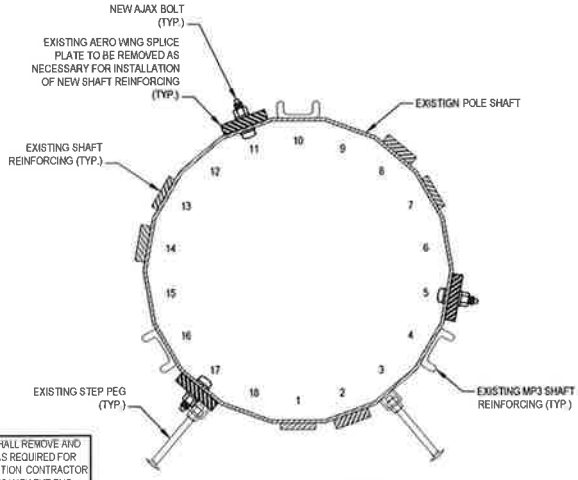
NEW SHIM CHART

1/16" SHIM QUANTITY	1/4" SHIM QUANTITY	SHIM WIDTH	SHIM LENGTH	HOLE DIAMETER
39	0	4"	4"	1-1/4"

SHIMS ARE FOR BIDDING PURPOSES ONLY. CONTRACTOR SHALL DETERMINE FINAL SHIM REQUIREMENTS DURING FABRICATION



DETAIL 1 / S-4
SCALE: NTS



NOTE: CONTRACTOR SHALL REMOVE AND REPLACE STEP BOLTS AS REQUIRED FOR REINFORCING INSTALLATION. CONTRACTOR SHALL COORDINATE THIS WITH TUF-TUG

SECTION 2 / S-4

CROWN CASTLE US PATENT NOS 8,046,972; 8,156,712; 7,849,659; 8,424,269 AND PATENT PENDING

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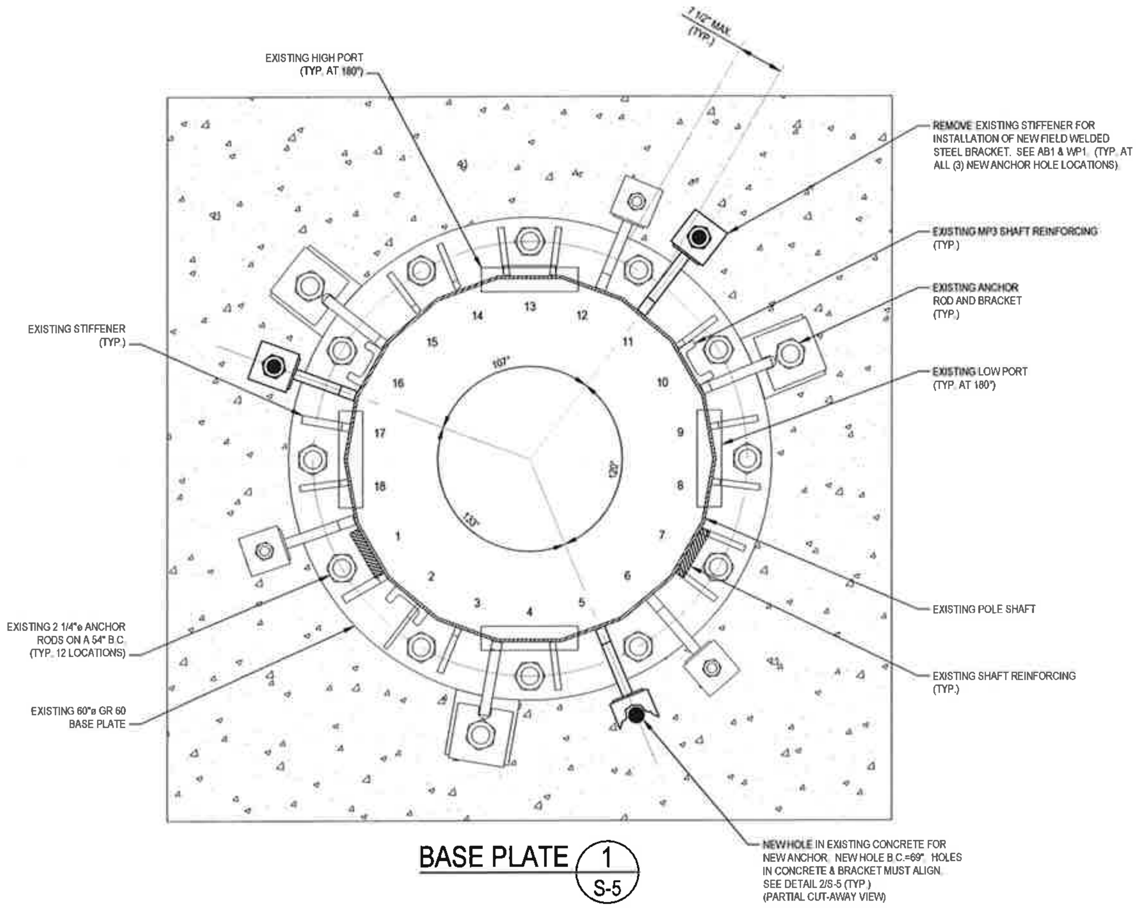
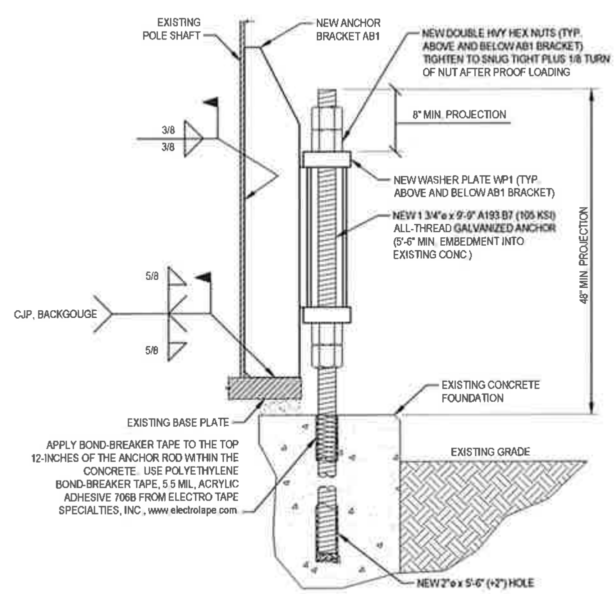
OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700

DRAWN BY:	SHAFT REINFORCING CHART AND DETAILS
B.M.S.	
CHECKED BY: R.M.K.	
APPROVED BY:	S-4
DATE: 4-9-2015	



BASE PLATE 1/S-5



NEW ANCHOR ROD REINFORCING SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. ONCE ALL RESIN HAS CURED, ALL NEW ANCHOR ROD REINFORCING SHALL BE PROOF LOADED TO 120 KIPS. ONCE THE PROOF LOAD HAS BEEN RELEASED, TIGHTEN HEAVY HEX NUT TO SNUG TIGHT PLUS 1/8 TURN OF NUT. REFER TO SHEET S-2, SECTION H FOR ADDITIONAL INFORMATION.

NEW ANCHOR & BRACKET DETAIL 2/S-5

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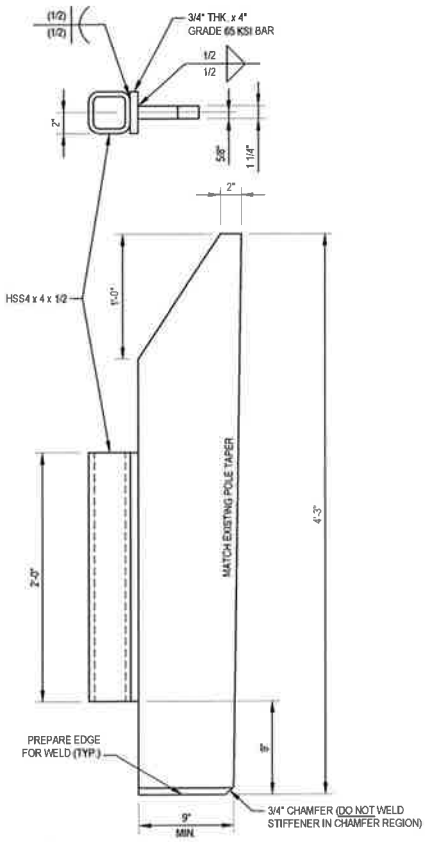
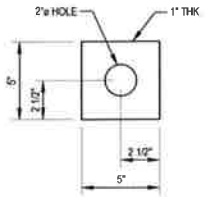
PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	BASE PLATE DETAILS
CHECKED BY: R.M.K.	
APPROVED BY:	
DATE: 4-9-2015	S-5



ANCHOR BRACKET MK~AB1

(3 REQUIRED) (TUBE Fy = 46 KSI) (STIFFENER Fy = 65 KSI)



WASHER PLATE MK~WP1

(6 REQUIRED) (Fy = 50 KSI)

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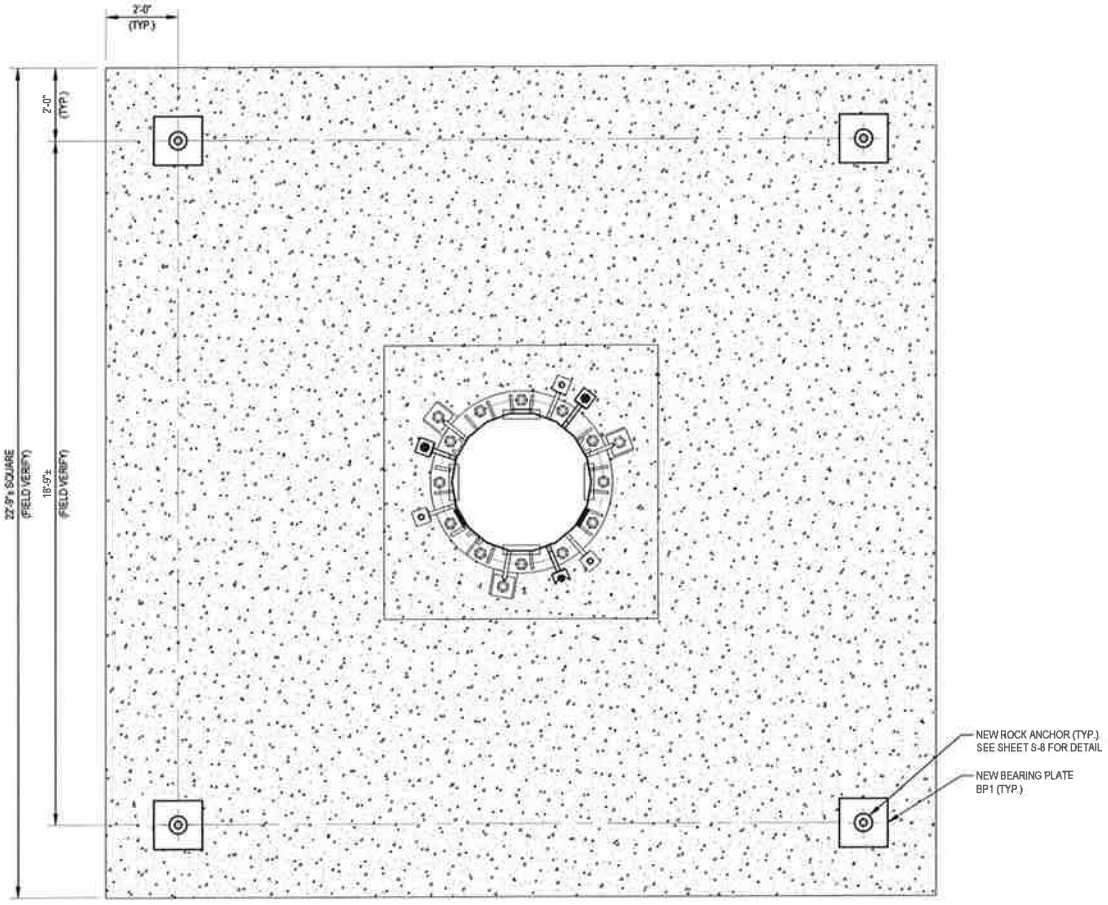
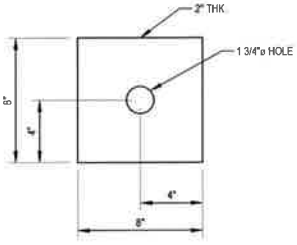
OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	MISC DETAILS
CHECKED BY: R.M.K.	
APPROVED BY:	S-6
DATE: 4-9-2015	



FOUNDATION REINFORCING PLAN 1/S-7



BEARING PLATE MK~BP1

(4 REQUIRED) (Fy = 50 KSI)

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PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	FOUNDATION REINFORCING DETAILS
CHECKED BY: R.M.K.	
APPROVED BY:	S-7
DATE: 4-9-2015	

37515-0074 003.DWG

* THE DESIGN REQUIRES ROCK ANCHORS FOR THE LISTED CAPACITY IN TENSION AND COMPRESSION AS LAID OUT PER PLAN. THE CONTRACTOR/ROCK ANCHOR INSTALLER IS RESPONSIBLE FOR THE MEANS AND METHODS TO ENSURE THE NECESSARY CAPACITY AND WILL DEMONSTRATE THE INSTALLED CAPACITY PER THE SPECIFIED TESTING. THE EMBEDMENT DEPTH AND GROUT DIAMETER ARE LISTED AS A PRELIMINARY BASIS FOR BIDDING. THE INTENT IS FOR THE INSTALLER TO REVIEW THE CURRENT SOIL INFORMATION AND DESIGN REQUIREMENTS TO ENSURE THAT THE CONTRACTOR'S SPECIFIC EQUIPMENT OR INSTALLATION TECHNIQUE IS APPROPRIATE. IF THE CONTRACTOR BELIEVES THE SCOPE SHOULD CHANGE UPON REVIEW, PLEASE ADDRESS PRIOR TO BIDDING. PLEASE COORDINATE WITH ENGINEER OF RECORD PRIOR TO INSTALLATION.

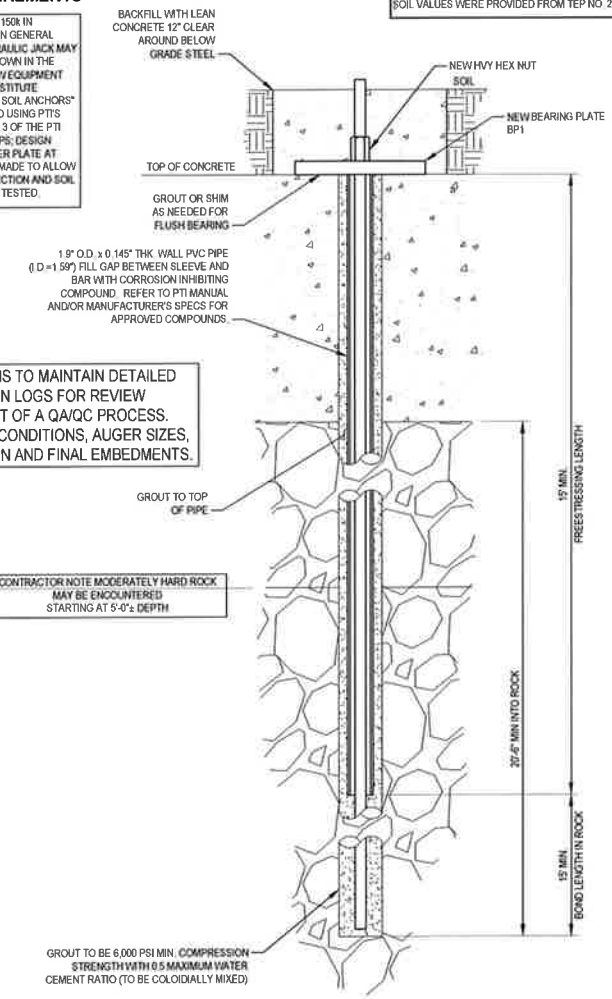
ROCK ANCHOR NOTES:

1. ALL BAR STEEL AND ASSOCIATED HARDWARE SHALL BE SUPPLIED BY WILLIAMS FORM ENGINEERING CORP. OR OWNER/EOR APPROVED EQUIVALENT.
2. ALL BAR, NUTS AND BEARING PLATES SHALL BE HOT-DIP GALVANIZED PER ASTM A123 OR A153, AS APPROPRIATE.
3. CONTACT WILLIAMS FORM ENGINEERING CORP. (OR MANUFACTURER OF APPROVED ALTERNATE) FOR MATERIALS AND INSTALLATION PROCEDURES AND RECOMMENDATIONS.
4. SPECIAL INSPECTION OF THE ROCK ANCHORS IS REQUIRED AS FOLLOWS: (1) VERIFY THAT ROCK ANCHOR AND PIPE MATERIAL, SIZE AND LENGTH COMPLY WITH THE INFORMATION SHOWN ON THIS DRAWING, (2) VERIFY PLACEMENT OF EACH ROCK ANCHOR, (3) OBSERVE DRILLING, GROUTING AND TESTING (AS APPROPRIATE) OPERATIONS FOR EACH ROCK ANCHOR AND MAINTAIN COMPLETE AND ACCURATE RECORDS FOR EACH ROCK ANCHOR
5. CONTACT WILLIAMS FORM ENGINEERING CORP. (OR MANUFACTURER OF APPROVED ALTERNATE) TO VERIFY NUT & WASHER CONNECTION ARE COMPATIBLE WITH ROCK ANCHOR THREADS

DRILLER/INSTALLER SOIL DESIGN PARAMETERS			
LAYER THICKNESS	BORING LOG	ULTIMATE GROUT BOND VALUES	AUGER/CORE HOLE DESIGN SIZE
4'-6"±	EXISTING FOUNDATION	IGNORE	3.5" / N/A
10'-6"±	WEATHERED SANDSTONE	IGNORE	3.5" / N/A
10'-0"±	WEATHERED SANDSTONE	450 PSI	3.5" / 3.675"
SOIL VALUES WERE PROVIDED FROM TEP NO. 25611.19662G DATED 10-8-2014.			

ROCK ANCHOR TESTING REQUIREMENTS

ALL (4) IN-PLACE ROCK ANCHOR IS TO BE TESTED TO 150k IN TENSION. ALL PILE TESTING SHALL BE CARRIED OUT IN GENERAL CONFORMANCE WITH ASTM D1143 OR D3689. A HYDRAULIC JACK MAY BE SUBSTITUTED FOR THE PILE TESTING SET-UPS SHOWN IN THE ASTM SPECS. IF A HYDRAULIC JACK IS USED, FOLLOW EQUIPMENT GUIDELINES DISCUSSED IN THE POST TENSIONING INSTITUTE "RECOMMENDATIONS FOR PRESTRESSED ROCK AND SOIL ANCHORS" DESIGN GUIDE, SECTION 8.2. PILES SHALL BE LOADED USING PTI'S PROOF TEST METHODOLOGY (REFER TO SECTION 8.3.3 OF THE PTI DESIGN GUIDE; ALIGNMENT LOAD, AL, SHALL BE 12 KIPS; DESIGN LOAD, DL, IS 113 KIPS). LOCK OFF ANCHOR TO WASHER PLATE AT LOCK OFF LOAD OF 112.5 KIPS. PROVISION SHALL BE MADE TO ALLOW FOR MOVEMENT BETWEEN ROCK ANCHOR CROSS-SECTION AND SOIL SO THAT GROUT-TO-SOIL BOND LINE IS ADEQUATELY TESTED.



PROPOSED ANCHOR DESIGN PARAMETERS

(TYPICAL)

1 / S-8

PILE DESIGN PARAMETER SCHEDULE						
PARAMETER / OPTIONS	ROCK ANCHOR	PILE CAPACITY Pn/Ω (kips)	EXTENSION ABOVE EXISTING CONCRETE FOUNDATION	FREESTRESSING LENGTH	FRICTION DEVELOPMENT LENGTH/BOND LENGTH	TOTAL LENGTH
ROCK ANCHOR	* 1 1/4"ø	112.5	1' MIN.	15' MIN.	15' MIN.	31' MIN.

* DESIGN BASED ON 1 1/4"ø WILLIAMS R71 (150 KSI)

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BU #876362; OXFORD/FRITZ PROPERTY
OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	ROCK ANCHOR DETAILS
CHECKED BY: R.M.K.	
APPROVED BY:	
DATE: 4-9-2015	S-8

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
     - 9.7.1. VERIFY MATERIALS AT BOTTOM OF EXCAVATION ARE ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY.
     - 9.7.2. VERIFY THAT EXCAVATIONS HAVE EXTENDED TO PROPER DEPTH AND ARE FOUNDED ON PROPER MATERIAL.
     - 9.7.3. PERFORM CLASSIFICATION AND TESTING OF COMPACTED FILL MATERIALS AS SPECIFIED.
     - 9.7.4. VERIFY USE OF PROPER MATERIALS, DENSITIES AND LIFT THICKNESS DURING PLACEMENT AND COMPACTION OF COMPACTED FILL.
     - 9.7.5. PRIOR TO PLACEMENT OF COMPACTED FILL, OBSERVE SUBGRADE AND VERIFY SITE HAS BEEN PREPARED PROPERLY.
   - 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.
       - 9.10.5.12. FULL PENETRATION WELDS IN THE VICINITY OF THE BASE OF THE TOWER ARE REQUIRED TO BE 100% NDE INSPECTED BY UT IN ACCORDANCE WITH AWS D1.1.
       - 9.10.5.13. PARTIAL PENETRATION AND FILLET WELDS IN THE VICINITY OF THE BASE OF THE TOWER ARE REQUIRED TO BE 50% NDE INSPECTED BY MP IN ACCORDANCE WITH AWS D1.1.
   - 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
X	FABRICATOR CERTIFIED WELD INSPECTION
X	MATERIAL TEST REPORT (MTR)
NA	FABRICATOR NDE INSPECTION
NA	NDE REPORT OF MONOPOLE BASE PLATE (AS REQUIRED)
X	PACKING SLIPS
ADDITIONAL TESTING AND INSPECTIONS:	
CONSTRUCTION	
X	CONSTRUCTION INSPECTIONS
X	FOUNDATION INSPECTIONS
NA	CONCRETE COMP. STRENGTH AND SLUMP TESTS
X	POST INSTALLED ANCHOR ROD VERIFICATION
NA	BASE PLATE GROUT VERIFICATION
X	CONTRACTOR'S CERTIFIED WELD INSPECTION
NA	EARTHWORK: PROVIDE PHOTO DOCUMENTATION OF EXCAVATION QUALITY AND COMPACTION
X	ON SITE COLD GALVANIZING VERIFICATION
NA	GUY WIRE TENSION REPORT
X	GC AS-BUILT DOCUMENTS
X	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)
X	POST INSTALLED ANCHOR ROD PULL-OUT TESTING
X	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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BU #876362; OXFORD/FRITZ PROPERTY
OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	MI CHECKLIST
CHECKED BY: R.M.K.	
APPROVED BY:	
DATE: 4-9-2015	S-9

37515-0074.003.DWG

MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

BU NUMBER; SITE NAME

BU #876362; OXFORD/FRITZ PROPERTY

APP: 274626 REV. 2; WO: 1034764

SITE ADDRESS

338 OXFORD RD.
OXFORD, CONNECTICUT 06478
NEW HAVEN 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.

PROJECT CONTACTS:

MONOPOLE OWNER:
CROWN CASTLE
MOD PM: DAN VADNEY AT DAN.VADNEY@CROWNCASTLE.COM
PH: (518) 373-3510

DESIGN STANDARD

THIS REINFORCEMENT DESIGN IS BASED UPON THE REQUIREMENTS OF THE TIA/EIA-222-F-1996 STRUCTURAL STANDARD FOR ANTENNA SUPPORTING STRUCTURES AND ANTENNAS, USING A DESIGN BASIC WIND SPEED OF 85 MPH (FASTEST MILE) WITH NO ICE, 38 MPH WITH 1 1/4 INCH ICE AND 50 MPH SERVICE LOADS.

REFER TO THE POLE DESIGN AND ANTENNA LOADING DOCUMENTED IN THE PJF STRUCTURAL ANALYSIS FOR THIS SITE (PJF#37515-0074.003.7700), DATED 4-9-2015.

THIS PROJECT INCLUDES THE FOLLOWING REINFORCING ELEMENTS:

SHAFT REINFORCING
FIELD WELDED ANCHOR BRACKETS
POST INSTALLED ANCHOR RODS
FOUNDATION AUGMENTATION: ROCK ANCHORS
REMOVAL OF AERO WING SPLICE BARS
REMOVAL OF STIFFENERS AT BASE
REMOVAL OF STEP BOLTS

SHEET INDEX

STATE OF CONNECTICUT
JUSTIN T. KLINE
NO. 30991
LICENSED PROFESSIONAL ENGINEER

4-9-15

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BU #876362; OXFORD/FRITZ PROPERTY
OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	TITLE SHEET
CHECKED BY: R.M.K.	
APPROVED BY: JTK	T-1
DATE: 4-9-2015	

CROWN CASTLE PROJECT: BU #876362; OXFORD/FRITZ PROPERTY; OXFORD, 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.

1.11. THE CLIMBING FACILITIES, SAFETY CLIMB AND ALL PARTS THEREOF SHALL NOT BE IMPEDED, MODIFIED OR ALTERED WITHOUT THE EXPRESS APPROVAL OF THE EOR.

1.12. ALL SOLUTIONS FOR THE REPLACEMENT, RELOCATION OR MODIFICATION OF THE SAFETY CLIMB AND/OR ANY OF THE MONOPOLE CLIMBING FACILITIES SHALL BE COORDINATED WITH TUF-TUG. CONTACT DETAILS:

TUF-TUG PRODUCTS
3434 ENCRETE LANE
MORAINE, OHIO 45439
PHONE: 937-299-1213
EMAIL: TUFTUG@AOL.COM

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"

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

4.1. THE CONTRACTOR SHALL PROTECT THE EXISTING MONOPOLE STRUCTURE, AS WELL AS ANY OTHER NEARBY EXISTING FOUNDATIONS FOR OTHER STRUCTURES OR EQUIPMENT, FROM LOSS OF SOIL AROUND AND/OR BENEATH FOOTINGS DURING ANY EXCAVATION. THE CONTRACTOR SHALL BRACE THE SITES OF THE OPEN EXCAVATION AS REQUIRED.

4.2. THE EFFECT OF ADDITIONAL EXCAVATION FOR FOUNDATION AUGMENTATION AND REINFORCING, WHERE REQUIRED, MAY HAVE IMPACT ON EXISTING EQUIPMENT AND/OR OTHER EXISTING STRUCTURES NEAR THE EXCAVATION. THE EOR HAS NOT BEEN PROVIDED WITH ANY SPECIFIC INFORMATION OR DETAILS REGARDING EXISTING EQUIPMENT OR OTHER EXISTING STRUCTURES ON THE SITE. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE THE EFFECT THAT ANY EXCAVATION WORK HAS ON EXISTING NEARBY EQUIPMENT AND/OR STRUCTURES. CONTRACTOR SHALL COORDINATE THIS SITE-SPECIFIC INFORMATION WITH CROWN CASTLE AND THE TESTING AGENCY PRIOR TO CONSTRUCTION AND FOUNDATION WORK. AFTER OBTAINING THE PRIOR WRITTEN PERMISSION OF CROWN CASTLE, THE CONTRACTOR SHALL ADEQUATELY BRACE, SHORE, AND/OR RELOCATE THE INTERFERING EXISTING NEARBY EQUIPMENT AND/OR STRUCTURES AS NECESSARY.

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

6. EPOXY GROUTED REINFORCING ANCHOR RODS

6.1. UNLESS OTHERWISE NOTED, REINFORCING ANCHOR RODS SHALL BE 150 KSI ALL-THREAD BARS CONFORMING TO ASTM A722. RECOMMENDED MANUFACTURERS/SUPPLIERS OF 150 KSI ALL-THREAD BARS ARE WILLIAMS FORM ENGINEERING CORPORATION AND DYWIDAG SYSTEMS INTERNATIONAL.

6.2. ALL REINFORCING ANCHOR RODS SHALL BE HOT DIP GALVANIZED PER ASTM A123. ALTERNATIVELY, ALL REINFORCING ANCHOR RODS MAY BE EPOXY COATED PER ASTM A775.

6.3. THE CORE-DRILLED HOLES IN THE CONCRETE FOR THE ANCHOR RODS SHALL BE CLEAN AND DRY, AND OTHERWISE PROPERLY PREPARED ACCORDING TO THE ANCHOR ROD AND EPOXY MANUFACTURERS' INSTRUCTIONS, PRIOR TO PLACEMENT OF ANCHOR RODS AND EPOXY. CONTRACTOR SHALL FOLLOW ALL ANCHOR ROD AND EPOXY MANUFACTURER RECOMMENDATIONS REGARDING HANDLING OF RODS, EPOXY, ACCEPTABLE AMBIENT TEMPERATURE RANGE DURING INSTALLATION AND POST-INSTALLATION CURING, THE EFFECT OF TEMPERATURE ON EPOXY CURING TIME, PREPARATION OF HOLE, ETC.

6.4. HILTI HIT RE-500 SD OR ITW RED HEAD EPCON G5 EPOXY SHALL BE USED TO ANCHOR THE BAR IN THE DRILL HOLES. IF CONTRACTOR WISHES TO USE A DIFFERENT EPOXY, A REQUEST INCLUDING THE EPOXY TECHNICAL DATA SHEET(S) SHALL BE SUBMITTED TO THE EOR FOR REVIEW PRIOR TO CONSTRUCTION.

6.5. ONCE THE REINFORCING ANCHOR RODS HAVE BEEN INSTALLED AND ALL EPOXY AND GROUT HAVE CURED (IF BASE PLATE AND/OR BEARING PLATES HAVE BEEN GROUTED PRIOR TO TESTING), ALL REINFORCING ANCHORS SHALL BE LOAD TESTED PER CROWN CASTLE ENGINEERING DOCUMENT #ENG-PRC-10119. REFER TO THE NEW ANCHOR & BRACKET DETAIL ON FOLLOWING SHEETS FOR SPECIFIED ANCHOR ROD PROOF LOAD.

6.6. ONCE THE REINFORCING ANCHOR RODS HAVE BEEN SUCCESSFULLY LOAD TESTED AND APPROVED THE CONTRACTOR SHALL TIGHTEN ALL HEAVY HEX ANCHOR NUTS TO SNUG TIGHT PLUS 1/8 TURN OF NUT.

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. 30301
LICENSED PROFESSIONAL ENGINEER
4.9.15

PAUL J. FORD AND COMPANY
STRUCTURAL ENGINEERS
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(614) 221-6679 www.pjfweb.com

CROWN CASTLE
3530 TORINGDON WAY, SUITE 300, CHARLOTTE, NC 28277
PH: (704) 405-6605

BU #876362; OXFORD/FRITZ PROPERTY
OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700	
DRAWN BY: B.M.S.	GENERAL NOTES
CHECKED BY: R.M.K.	
APPROVED BY: JTK	S-1
DATE: 4-9-2015	

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.

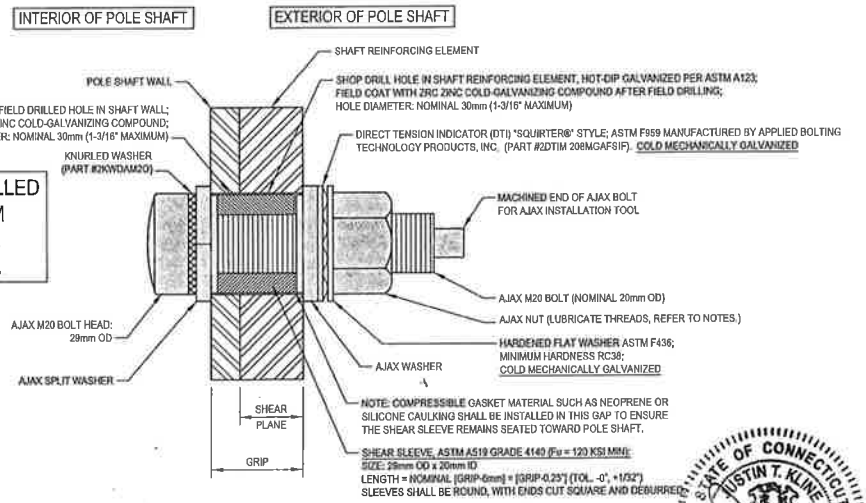
NOTE: COMPLETELY COMPRESSED DTI'S SHOWING NO VISIBLE REMAINING GAP ARE ACCEPTABLE. DTI WASHERS SHALL BE PLACED DIRECTLY AGAINST THE OUTER AJAX WASHER WITH THE DTI BUMPS FACING AWAY FROM THE AJAX WASHER. PLACE A HARDENED WASHER BETWEEN THE DTI AND THE AJAX NUT. THE DTI BUMPS SHALL BEAR AGAINST THE UNDERSIDE 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

STATE OF CONNECTICUT
JUSTIN T. KLINE
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LICENSED
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BU #876362; OXFORD/FRITZ PROPERTY
OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	AJAX BOLT DETAIL
CHECKED BY: R.M.K.	
APPROVED BY: JTK	S-2
DATE: 4-9-2015	

37515-0074.003.DWG

POLE SPECIFICATIONS	
POLE SHAPE TYPE:	18-SIDED POLYGON
TAPER:	0.2033 IN/FT
SHAFT STEEL:	ASTM A572 GRADE 65
BASE PL STEEL:	ASTM A871 GRADE 60
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	26.5800	0.1875	38.00	15.000	20.740
2	40.6300	0.2500	49.00	19.680	28.320
3	47.6300	0.3125	62.00	26.952	37.100
4	47.5800	0.3750		35.374	45.500

NOTE: DIMENSIONS SHOWN DO NOT INCLUDE GALVANIZING TOLERANCES

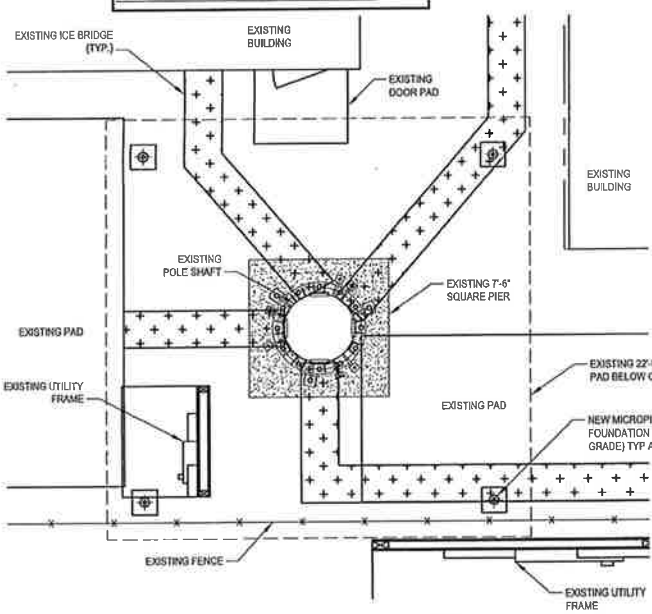
CONTRACTOR SHALL PROVIDE ASTM A36 SHIM PLATES BELOW SLIP JOINTS. THE SHIM PLATES SHALL BE PLACED BETWEEN THE NEW SHAFT REINFORCEMENT AND THE EXISTING POLE SHAFT FROM THE SLIP JOINT TO THE NEW SHAFT REINFORCEMENT SPLICE PLATE LOCATION AND A EXTRA LONG "SPLICE SHIM" SHALL BE PLACED BETWEEN THE NEW UPPER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

MODIFICATIONS:

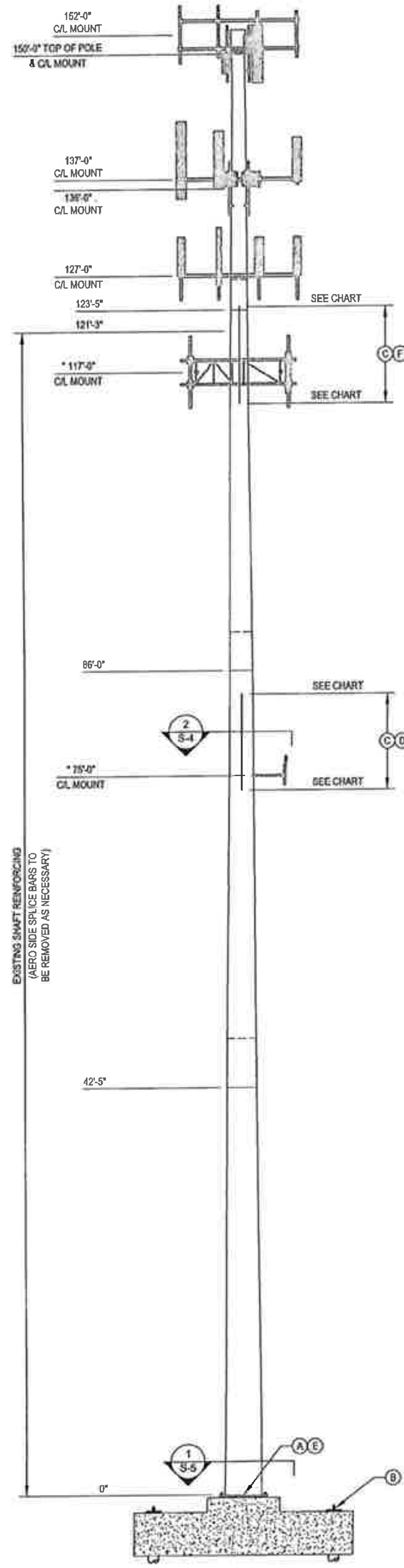
- (A) INSTALL NEW ANCHOR RODS AND BRACKETS AT BASE PLATE. SEE SHEET S-5.
- (B) INSTALL NEW ROCK ANCHORS IN EXISTING FOUNDATION PAD. SEE SHEETS S-7 & S-8.
- (C) INSTALL NEW SHAFT REINFORCING. SEE CHART AND DETAILS ON SHEET S-4.
- (D) REMOVAL OF AERO WING SPLICE BARS AS NECESSARY.
- (E) REMOVAL OF EXISTING STIFFENERS. SEE SHEET S-5.
- (F) STEP BOLTS AS NECESSARY.

SITE COORDINATION REQUIRED: PRIOR TO CONSTRUCTION CONTRACTOR SHALL COORDINATE AND FIELD VERIFY LOCATION OF REQUIRED NEW FOUNDATION RELATIVE TO EXISTING SITE EQUIPMENT AND CONSTRAINTS.IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE THE MEANS AND METHODS OF SHORING AND/OR RELOCATION OF GROUND BASED EQUIPMENT THAT WILL BE AFFECTED BY THE PROPOSED ENVELOPE OF THE CURRENT FOUNDATION MOD DESIGN. PLEASE CONTACT THE EOR IF DESIGN INPUT OR NECESSARY CHANGES TO THE DESIGN ARE NEEDED. IF THE DESIGN IS FEASIBLE, BUT THE CONTRACTOR HAS A PREFERENCE TO INSTALL A DIFFERENT OPTION TO ACCOMMODATE ALTERNATE TECHNIQUES OR SUBCONTRACTOR LIMITATIONS - IT IS EXPECTED THAT THESE ISSUES WILL BE ADDRESSED AT THE TIME OF BIDDING. ANY CHANGES TO ORIGINAL DESIGN WILL REQUIRE FURTHER ENGINEERING - CONTRACTOR IS EXPECTED TO BUDGET ACCORDINGLY.

* EXISTING MOUNTS MAY NEED TO BE ADJUSTED, MOVED AND/OR TEMPORARILY SUPPORTED DURING THE INSTALLATION OF SHAFT REINFORCING



PARTIAL SITE PLAN 2/S-3



POLE ELEVATION 1/S-3

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

4-9-15

PAUL J. FORD AND COMPANY
STRUCTURAL ENGINEERS
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(614) 221-6679 www.pjfweb.com

CROWN CASTLE
3530 TORINGDON WAY, SUITE 300, CHARLOTTE, NC 28277
PH: (704) 405-6605

BU #876362; OXFORD/FRITZ PROPERTY
OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	MONOPOLE PROFILE
CHECKED BY: R.M.K.	
APPROVED BY: JTK	S-3
DATE: 4-9-2015	

37515-0074.003.DWG

NEW CCI FLAT PLATE (65 KSI) REINFORCING SCHEDULE

BOTTOM ELEVATION	TOP ELEVATION	FLAT # / 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
73' - 6"	83' - 6"	F5, F11 & F17	CCI-SFP-04510010	10' - 0"	3	16	48	6	6	20"	459 LBS.
113' - 9"	123' - 9"	F5, F11 & F17	CCI-APP-04007510	10' - 0"	3	17	51	6	6	16"	306 LBS.
							99				765 LBS.

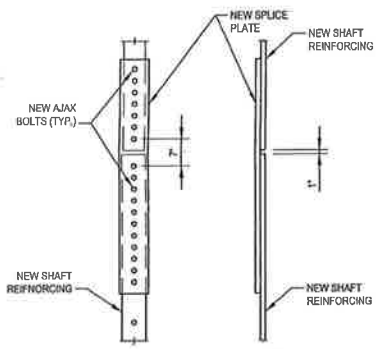
NOTES:

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 E60XX 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 A-36.

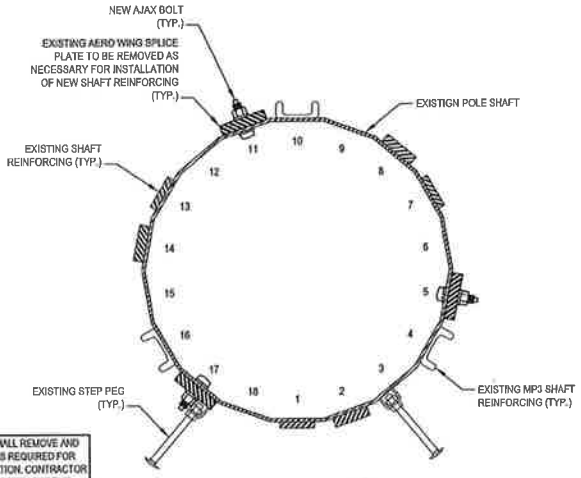
NEW SHIM CHART

1/16" SHIM QUANTITY	1/4" SHIM QUANTITY	SHIM WIDTH	SHIM LENGTH	HOLE DIAMETER
39	0	4"	4"	1-1/4"

SHIMS ARE FOR BIDDING PURPOSES ONLY. CONTRACTOR SHALL DETERMINE FINAL SHIM REQUIREMENTS DURING FABRICATION.



DETAIL 1 / S-4
SCALE: NTS



NOTE: CONTRACTOR SHALL REMOVE AND REPLACE STEP BOLTS AS REQUIRED FOR REINFORCING INSTALLATION. CONTRACTOR SHALL COORDINATE THIS WITH TUF-TUG.

SECTION 2 / S-4

49.15

CROWN CASTLE US PATENT NOS 8,046,972; 8,156,712; 7,849,659; 8,424,269 AND PATENT PENDING

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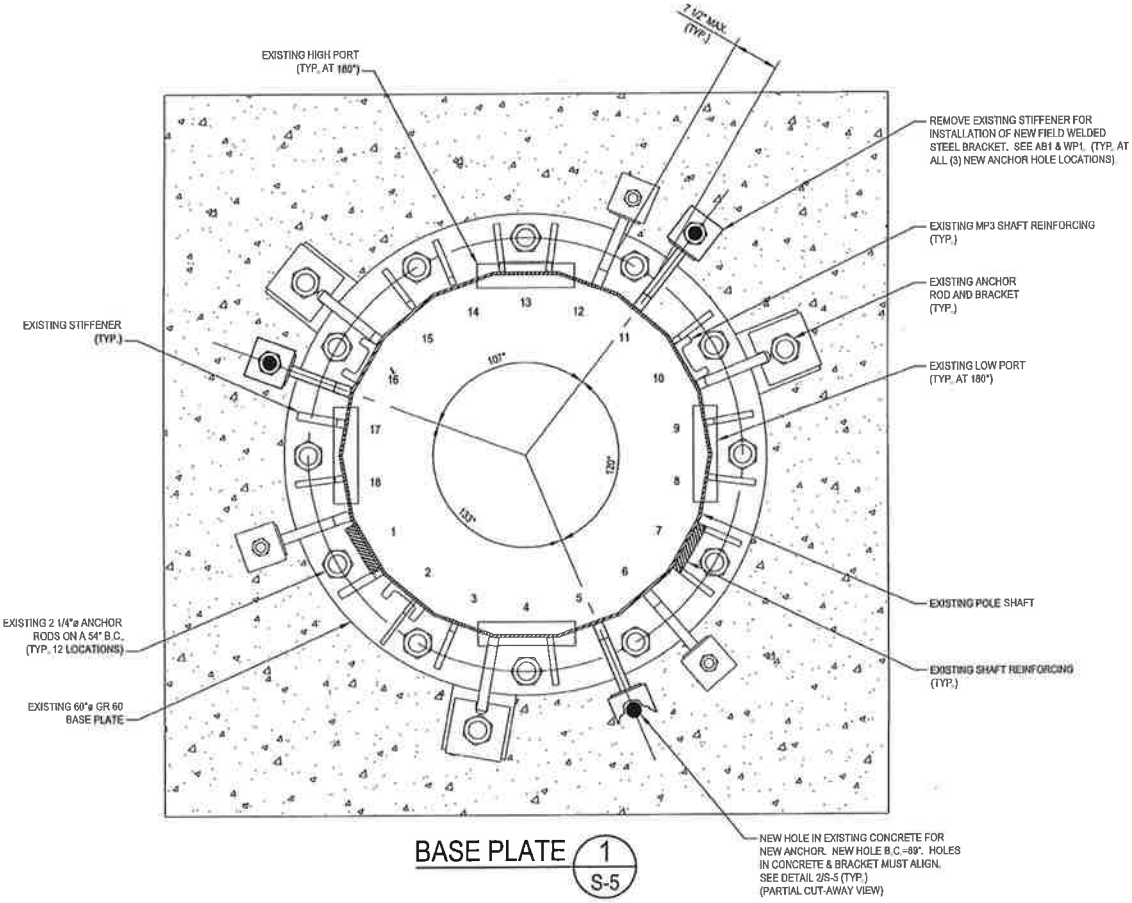
B.M.S.	R.M.K.	R.M.K.	4-9-2015

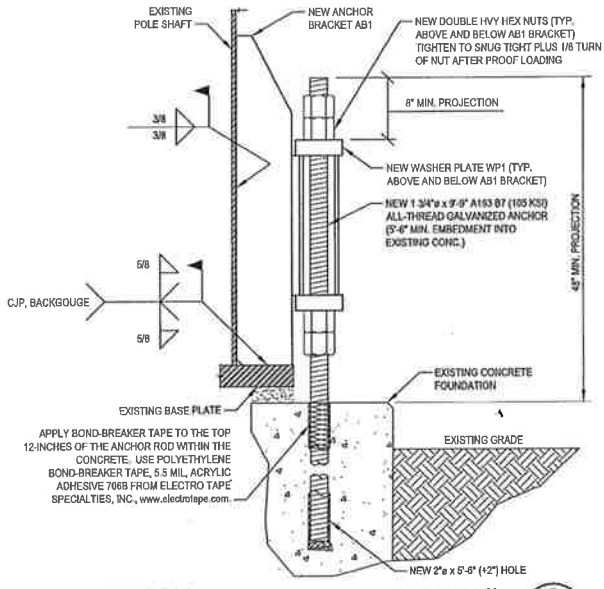
SHAFT REINFORCING CHART AND DETAILS

S-4

37515-0074.003.DWG



BASE PLATE 1 S-5



NEW ANCHOR & BRACKET DETAIL 2 S-5

NEW ANCHOR ROD REINFORCING SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. ONCE ALL RESIN HAS CURED, ALL NEW ANCHOR ROD REINFORCING SHALL BE PROOF LOADED TO 120 KIPS. ONCE THE PROOF LOAD HAS BEEN RELEASED, TIGHTEN HEAVY HEX NUT TO SNUG TIGHT PLUS 1/8 TURN OF NUT. REFER TO SHEET S-2, SECTION H FOR ADDITIONAL INFORMATION.

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DRAWN BY: B.M.S.	BASE PLATE DETAILS
CHECKED BY: R.M.K.	
APPROVED BY:	S-5
DATE: 4-9-2015	

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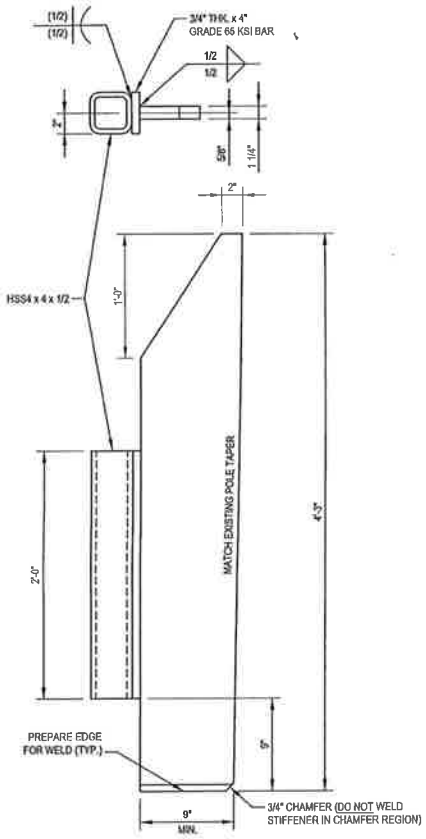
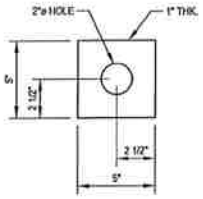


ANCHOR BRACKET MK~AB1

(3 REQUIRED) (TUBE Fy = 46 KSI) (STIFFENER Fy = 65 KSI)



WASHER PLATE MK~WP1

(6 REQUIRED) (Fy = 50 KSI)

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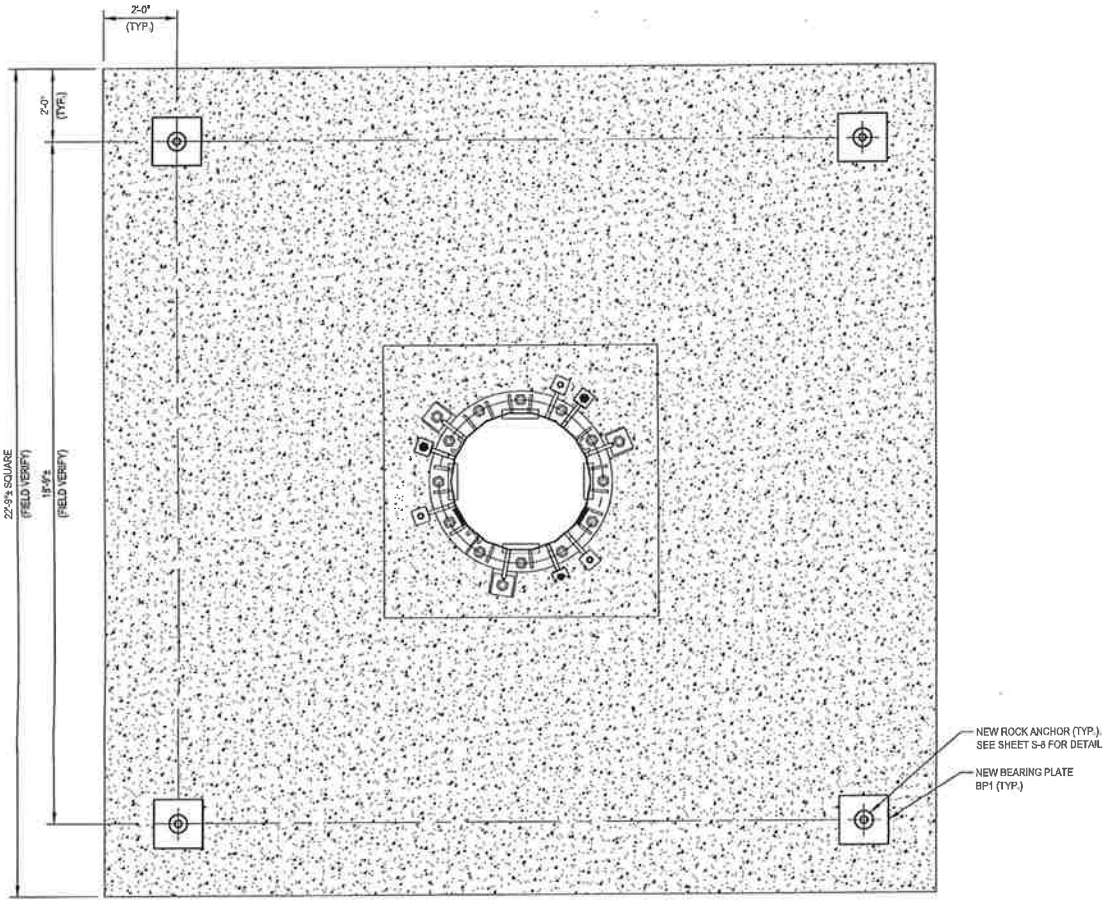
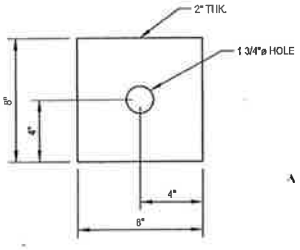
MISC DETAILS
S-6



FOUNDATION REINFORCING PLAN 1 / S-7



BEARING PLATE MK~BP1

(4 REQUIRED) (Fy = 50 KSI)

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* THE DESIGN REQUIRES ROCK ANCHORS FOR THE LISTED CAPACITY IN TENSION AND COMPRESSION AS LAID OUT PER PLAN. THE CONTRACTOR/ROCK ANCHOR INSTALLER IS RESPONSIBLE FOR THE MEANS AND METHODS TO ENSURE THE NECESSARY CAPACITY AND WILL DEMONSTRATE THE INSTALLED CAPACITY PER THE SPECIFIED TESTING. THE EMBEDMENT DEPTH AND GROUT DIAMETER ARE LISTED AS A PRELIMINARY BASIS FOR BIDDING. THE INTENT IS FOR THE INSTALLER TO REVIEW THE CURRENT SOIL INFORMATION AND DESIGN REQUIREMENTS TO ENSURE THAT THE CONTRACTOR'S SPECIFIC EQUIPMENT OR INSTALLATION TECHNIQUE IS APPROPRIATE. IF THE CONTRACTOR BELIEVES THE SCOPE SHOULD CHANGE UPON REVIEW, PLEASE ADDRESS PRIOR TO BIDDING. PLEASE COORDINATE WITH ENGINEER OF RECORD PRIOR TO INSTALLATION.

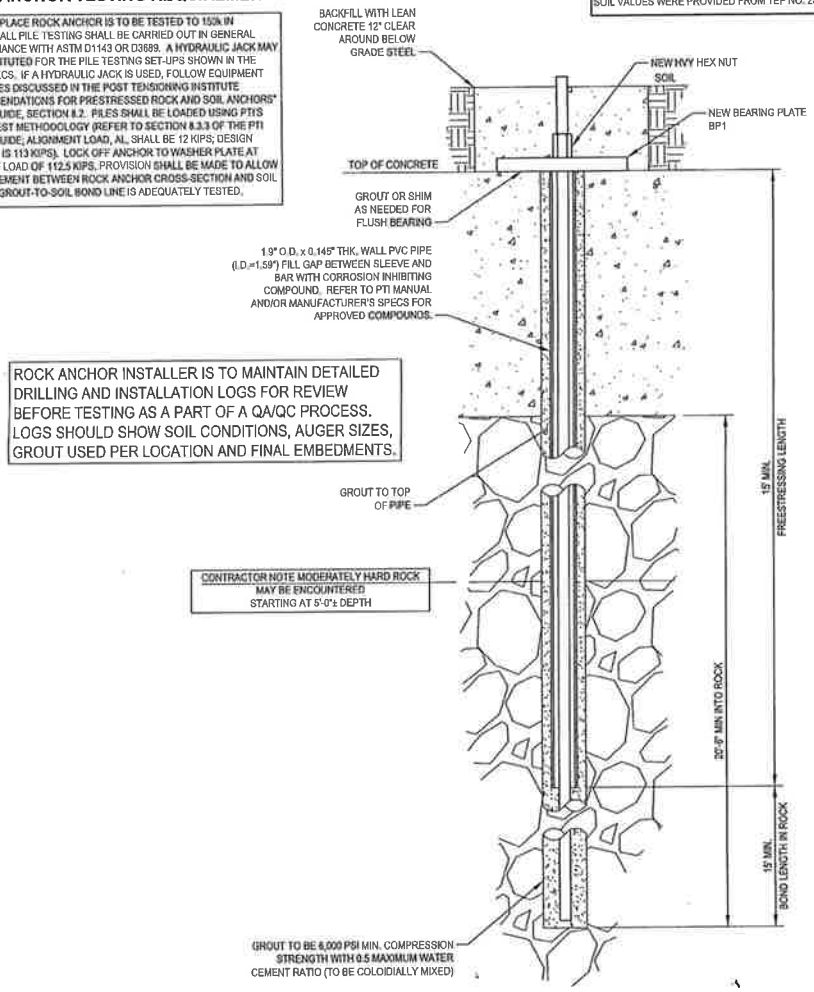
ROCK ANCHOR NOTES:

1. ALL BAR STEEL AND ASSOCIATED HARDWARE SHALL BE SUPPLIED BY WILLIAMS FORM ENGINEERING CORP. OR OWNER/EOR APPROVED EQUIVALENT.
2. ALL BAR, NUTS AND BEARING PLATES SHALL BE HOT-DIP GALVANIZED PER ASTM A123 OR A153, AS APPROPRIATE.
3. CONTACT WILLIAMS FORM ENGINEERING CORP. (OR MANUFACTURER OF APPROVED ALTERNATE) FOR MATERIALS AND INSTALLATION PROCEDURES AND RECOMMENDATIONS.
4. SPECIAL INSPECTION OF THE ROCK ANCHORS IS REQUIRED AS FOLLOWS: (1) VERIFY THAT ROCK ANCHOR AND PIPE MATERIAL, SIZE AND LENGTH COMPLY WITH THE INFORMATION SHOWN ON THIS DRAWING, (2) VERIFY PLACEMENT OF EACH ROCK ANCHOR, (3) OBSERVE DRILLING, GROUTING AND TESTING (AS APPROPRIATE) OPERATIONS FOR EACH ROCK ANCHOR AND MAINTAIN COMPLETE AND ACCURATE RECORDS FOR EACH ROCK ANCHOR.
5. CONTACT WILLIAMS FORM ENGINEERING CORP. (OR MANUFACTURER OF APPROVED ALTERNATE) TO VERIFY NUT & WASHER CONNECTION ARE COMPATIBLE WITH ROCK ANCHOR THREADS

DRILLER/INSTALLER SOIL DESIGN PARAMETERS			
LAYER THICKNESS	BORING LOG	ULTIMATE GROUT BOND VALUES	AUGER/CORE HOLE DESIGN SIZE
4'-6"±	EXISTING FOUNDATION	IGNORE	3.5" / N/A
10'-6"±	WEATHERED SANDSTONE	IGNORE	3.5" / N/A
10'-0"±	WEATHERED SANDSTONE	450 PSI	3.5" / 3.875"
SOIL VALUES WERE PROVIDED FROM TEP NO. 25811.19882G DATED 10-8-2014.			

ROCK ANCHOR TESTING REQUIREMENTS

ALL (4) IN-PLACE ROCK ANCHOR IS TO BE TESTED TO 150% IN TENSION. ALL PILE TESTING SHALL BE CARRIED OUT IN GENERAL CONFORMANCE WITH ASTM D1143 OR D3689. A HYDRAULIC JACK MAY BE SUBSTITUTED FOR THE PILE TESTING SET-UPS SHOWN IN THE ASTM SPECS. IF A HYDRAULIC JACK IS USED, FOLLOW EQUIPMENT GUIDELINES DISCUSSED IN THE POST TENSIONING INSTITUTE "RECOMMENDATIONS FOR PRESTRESSED ROCK AND SOIL ANCHORS" DESIGN GUIDE, SECTION 8.2. PILES SHALL BE LOADED USING PTI'S PROOF TEST METHODOLOGY (REFER TO SECTION 8.3.3 OF THE PTI DESIGN GUIDE; ALIGNMENT LOAD, AL, SHALL BE 12 KIPS; DESIGN LOAD, DL, IS 113 KIPS). LOCK OFF ANCHOR TO WASHER PLATE AT LOCK OFF LOAD OF 112.5 KIPS. PROVISION SHALL BE MADE TO ALLOW FOR MOVEMENT BETWEEN ROCK ANCHOR CROSS-SECTION AND SOIL SO THAT GROUT-TO-SOIL BOND LINE IS ADEQUATELY TESTED.



PROPOSED ANCHOR DESIGN PARAMETERS (TYPICAL) — 1 / S-8

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PILE DESIGN PARAMETER SCHEDULE						
PARAMETER / OPTIONS	ROCK ANCHOR	PILE CAPACITY Pn/Ω (kips)	EXTENSION ABOVE EXISTING CONCRETE FOUNDATION	FREESTRESSING LENGTH	FRICTION DEVELOPMENT LENGTH/BOND LENGTH	TOTAL LENGTH
ROCK ANCHOR	* 1 1/4"ø	112.5	1' MIN.	15' MIN.	15' MIN.	31' MIN.

* DESIGN BASED ON 1 1/4"ø WILLIAMS R71 (150 KSI)

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S-8

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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.

4.9.15

   - 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**
     - 9.7.1. VERIFY MATERIALS AT BOTTOM OF EXCAVATION ARE ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY.
     - 9.7.2. VERIFY THAT EXCAVATIONS HAVE EXTENDED TO PROPER DEPTH AND ARE FOUNDED ON PROPER MATERIAL.
     - 9.7.3. PERFORM CLASSIFICATION AND TESTING OF COMPACTED FILL MATERIALS AS SPECIFIED.
     - 9.7.4. VERIFY USE OF PROPER MATERIALS, DENSITIES AND LIFT THICKNESS DURING PLACEMENT AND COMPACTION OF COMPACTED FILL.
     - 9.7.5. PRIOR TO PLACEMENT OF COMPACTED FILL, OBSERVE SUBGRADE AND VERIFY SITE HAS BEEN PREPARED PROPERLY.
   - 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.
       - 9.10.5.12. FULL PENETRATION WELDS IN THE VICINITY OF THE BASE OF THE TOWER ARE REQUIRED TO BE 100% NDE INSPECTED BY UT IN ACCORDANCE WITH AWS D1.1.
       - 9.10.5.13. PARTIAL PENETRATION AND FILLET WELDS IN THE VICINITY OF THE BASE OF THE TOWER ARE REQUIRED TO BE 50% NDE INSPECTED BY MP IN ACCORDANCE WITH AWS D1.1.
   - 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
X	FABRICATOR CERTIFIED WELD INSPECTION
X	MATERIAL TEST REPORT (MTR)
NA	FABRICATOR NDE INSPECTION
NA	NDE REPORT OF MONOPOLE BASE PLATE (AS REQUIRED)
X	PACKING SLIPS
ADDITIONAL TESTING AND INSPECTIONS:	
	CONSTRUCTION
X	CONSTRUCTION INSPECTIONS
X	FOUNDATION INSPECTIONS
NA	CONCRETE COMP. STRENGTH AND SLUMP TESTS
X	POST INSTALLED ANCHOR ROD VERIFICATION
NA	BASE PLATE GROUT VERIFICATION
X	CONTRACTOR'S CERTIFIED WELD INSPECTION
NA	EARTHWORK: PROVIDE PHOTO DOCUMENTATION OF EXCAVATION QUALITY AND COMPACTION
X	ON SITE COLD GALVANIZING VERIFICATION
NA	GUY WIRE TENSION REPORT
X	GC AS-BUILT DOCUMENTS
X	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)
X	POST INSTALLED ANCHOR ROD PULL-OUT TESTING
X	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

PAUL J. FORD AND COMPANY
STRUCTURAL ENGINEERS
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(614) 221-6679 www.pjfweb.com

CROWN CASTLE
3530 TORINGDON WAY, SUITE 300, CHARLOTTE, NC 28277
PH: (704) 405-6605

BU #876362; OXFORD/FRITZ PROPERTY
OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700

DRAWN BY:	MI CHECKLIST
B.M.S.	
CHECKED BY: R.M.K.	
APPROVED BY: JTK	
DATE: 4-9-2015	S-9

37515-0074.003.DWG

MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

BU NUMBER; SITE NAME

BU #876362; OXFORD/FRITZ PROPERTY

APP: 274626 REV. 2; WO: 1034764

SITE ADDRESS

338 OXFORD RD.
OXFORD, CONNECTICUT 06478
NEW HAVEN 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.

PROJECT CONTACTS:

MONOPOLE OWNER:
CROWN CASTLE
MOD PM: DAN VADNEY AT DAN.VADNEY@CROWNCASTLE.COM
PH: (518) 373-3510

DESIGN STANDARD

THIS REINFORCEMENT DESIGN IS BASED UPON THE REQUIREMENTS OF THE TIA/EIA-222-F-1996 STRUCTURAL STANDARD FOR ANTENNA SUPPORTING STRUCTURES AND ANTENNAS, USING A DESIGN BASIC WIND SPEED OF 85 MPH (FASTEST MILE) WITH NO ICE, 38 MPH WITH 1 1/4 INCH ICE AND 50 MPH SERVICE LOADS.

REFER TO THE POLE DESIGN AND ANTENNA LOADING DOCUMENTED IN THE PJF STRUCTURAL ANALYSIS FOR THIS SITE (PJF#37515-0074.003.7700), DATED 4-9-2015.

THIS PROJECT INCLUDES THE FOLLOWING REINFORCING ELEMENTS:

SHAFT REINFORCING
FIELD WELDED ANCHOR BRACKETS
POST INSTALLED ANCHOR RODS
FOUNDATION AUGMENTATION: ROCK ANCHORS
REMOVAL OF AERO WING SPLICE BARS
REMOVAL OF STIFFENERS AT BASE
REMOVAL OF STEP BOLTS

SHEET INDEX

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BU #876362; OXFORD/FRITZ PROPERTY
OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	TITLE SHEET
CHECKED BY: R.M.K.	
APPROVED BY:	
DATE: 4-9-2015	T-1

CROWN CASTLE PROJECT: BU #876362; OXFORD/FRITZ PROPERTY; OXFORD, 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.
   - 1.11. THE CLIMBING FACILITIES, SAFETY CLIMB AND ALL PARTS THEREOF SHALL NOT BE IMPEDED, MODIFIED OR ALTERED WITHOUT THE EXPRESS APPROVAL OF THE EOR.
   - 1.12. ALL SOLUTIONS FOR THE REPLACEMENT, RELOCATION OR MODIFICATION OF THE SAFETY CLIMB AND/OR ANY OF THE MONOPOLE CLIMBING FACILITIES SHALL BE COORDINATED WITH TUF-TUG. CONTACT DETAILS:
     TUF-TUG PRODUCTS
     3434 ENCRETE LANE
     MORAINE, OHIO 45439
     PHONE: 937-299-1213
     EMAIL: TUFTUG@AOL.COM

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"
     - 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**
   - 4.1. THE CONTRACTOR SHALL PROTECT THE EXISTING MONOPOLE STRUCTURE, AS WELL AS ANY OTHER NEARBY EXISTING FOUNDATIONS FOR OTHER STRUCTURES OR EQUIPMENT, FROM LOSS OF SOIL AROUND AND/OR BENEATH FOOTINGS DURING ANY EXCAVATION. THE CONTRACTOR SHALL BRACE THE SITES OF THE OPEN EXCAVATION AS REQUIRED.
   - 4.2. THE EFFECT OF ADDITIONAL EXCAVATION FOR FOUNDATION AUGMENTATION AND REINFORCING, WHERE REQUIRED, MAY HAVE IMPACT ON EXISTING EQUIPMENT AND/OR OTHER EXISTING STRUCTURES NEAR THE EXCAVATION. THE EOR HAS NOT BEEN PROVIDED WITH ANY SPECIFIC INFORMATION OR DETAILS REGARDING EXISTING EQUIPMENT OR OTHER EXISTING STRUCTURES ON THE SITE. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE THE EFFECT THAT ANY EXCAVATION WORK HAS ON EXISTING NEARBY EQUIPMENT AND/OR STRUCTURES. CONTRACTOR SHALL COORDINATE THIS SITE-SPECIFIC INFORMATION WITH CROWN CASTLE AND THE TESTING AGENCY PRIOR TO CONSTRUCTION AND FOUNDATION WORK. AFTER OBTAINING THE PRIOR WRITTEN PERMISSION OF CROWN CASTLE, THE CONTRACTOR SHALL ADEQUATELY BRACE, SHORE, AND/OR RELOCATE THE INTERFERING EXISTING NEARBY EQUIPMENT AND/OR STRUCTURES AS NECESSARY.

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

6. **EPOXY GROUTED REINFORCING ANCHOR RODS**
   - 6.1. UNLESS OTHERWISE NOTED, REINFORCING ANCHOR RODS SHALL BE 150 KSI ALL-THREAD BARS CONFORMING TO ASTM A722. RECOMMENDED MANUFACTURERS/SUPPLIERS OF 150 KSI ALL-THREAD BARS ARE WILLIAMS FORM ENGINEERING CORPORATION AND DYWIDAG SYSTEMS INTERNATIONAL.
   - 6.2. ALL REINFORCING ANCHOR RODS SHALL BE HOT DIP GALVANIZED PER ASTM A123. ALTERNATIVELY, ALL REINFORCING ANCHOR RODS MAY BE EPOXY COATED PER ASTM A775.
   - 6.3. THE CORE-DRILLED HOLES IN THE CONCRETE FOR THE ANCHOR RODS SHALL BE CLEAN AND DRY, AND OTHERWISE PROPERLY PREPARED ACCORDING TO THE ANCHOR ROD AND EPOXY MANUFACTURERS' INSTRUCTIONS, PRIOR TO PLACEMENT OF ANCHOR RODS AND EPOXY. CONTRACTOR SHALL FOLLOW ALL ANCHOR ROD AND EPOXY MANUFACTURER RECOMMENDATIONS REGARDING HANDLING OF RODS, EPOXY, ACCEPTABLE AMBIENT TEMPERATURE RANGE DURING INSTALLATION AND POST-INSTALLATION CURING, THE EFFECT OF TEMPERATURE ON EPOXY CURING TIME, PREPARATION OF HOLE, ETC.
   - 6.4. HILTI HIT RE-500 SD OR ITW RED HEAD EPCON G5 EPOXY SHALL BE USED TO ANCHOR THE BAR IN THE DRILL HOLES. IF CONTRACTOR WISHES TO USE A DIFFERENT EPOXY, A REQUEST INCLUDING THE EPOXY TECHNICAL DATA SHEET(S) SHALL BE SUBMITTED TO THE EOR FOR REVIEW PRIOR TO CONSTRUCTION.
   - 6.5. ONCE THE REINFORCING ANCHOR RODS HAVE BEEN INSTALLED AND ALL EPOXY AND GROUT HAVE CURED (IF BASE PLATE AND/OR BEARING PLATES HAVE BEEN GROUTED PRIOR TO TESTING), ALL REINFORCING ANCHORS SHALL BE LOAD TESTED PER CROWN CASTLE ENGINEERING DOCUMENT #ENG-PRC-10119. REFER TO THE NEW ANCHOR & BRACKET DETAIL ON FOLLOWING SHEETS FOR SPECIFIED ANCHOR ROD PROOF LOAD.
   - 6.6. ONCE THE REINFORCING ANCHOR RODS HAVE BEEN SUCCESSFULLY LOAD TESTED AND APPROVED THE CONTRACTOR SHALL TIGHTEN ALL HEAVY HEX ANCHOR NUTS TO SNUG TIGHT PLUS 1/8 TURN OF NUT.

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".

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BU #876362; OXFORD/FRITZ PROPERTY
OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	GENERAL NOTES
CHECKED BY: R.M.K.	
APPROVED BY:	S-1
DATE: 4-9-2015	

37515-0074.003.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.

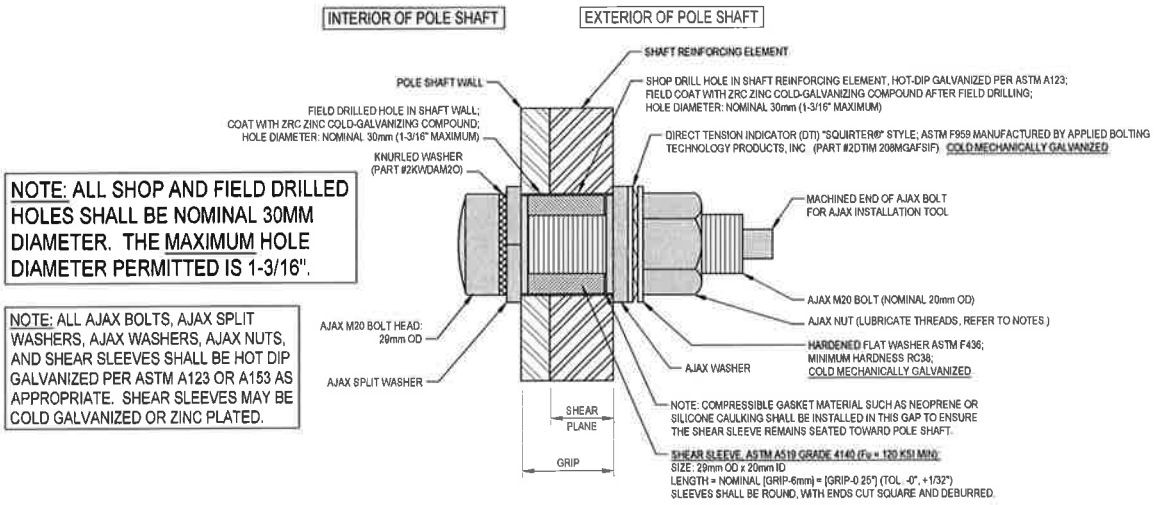
HARDENED WASHERS REQUIRED: USE A HARDENED WASHER FOR A 20 MM (M20) NOMINAL BOLT BETWEEN THE TOP OF THE DIRECT TENSION INDICATOR (DTI) WASHER AND THE NUT OF THE AJAX M20 BOLTS. HARDENED WASHERS SHALL CONFORM TO ASTM F436 AND HAVE A MINIMUM HARDNESS OF RC 38 OR HIGHER. THE HARDENED WASHERS SHALL BE MECHANICALLY 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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OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	AJAX BOLT DETAIL
CHECKED BY: R.M.K.	
APPROVED BY:	S-2
DATE: 4-9-2015	

37515-0074.003.DWG

POLE SPECIFICATIONS	
POLE SHAPE TYPE:	18-SIDED POLYGON
TAPER:	0.2033 IN/FT
SHAFT STEEL:	ASTM A572 GRADE 65
BASE PL STEEL:	ASTM A871 GRADE 60
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	DIAMETER ACROSS FLATS (IN) @ BOTTOM
1	26.5800	0.1875	38.00	15.000	20.740
2	40.6300	0.2500	49.00	19.680	28.320
3	47.6300	0.3125	62.00	26.952	37.100
4	47.5800	0.3750		35.374	45.500

NOTE: DIMENSIONS SHOWN DO NOT INCLUDE GALVANIZING TOLERANCES

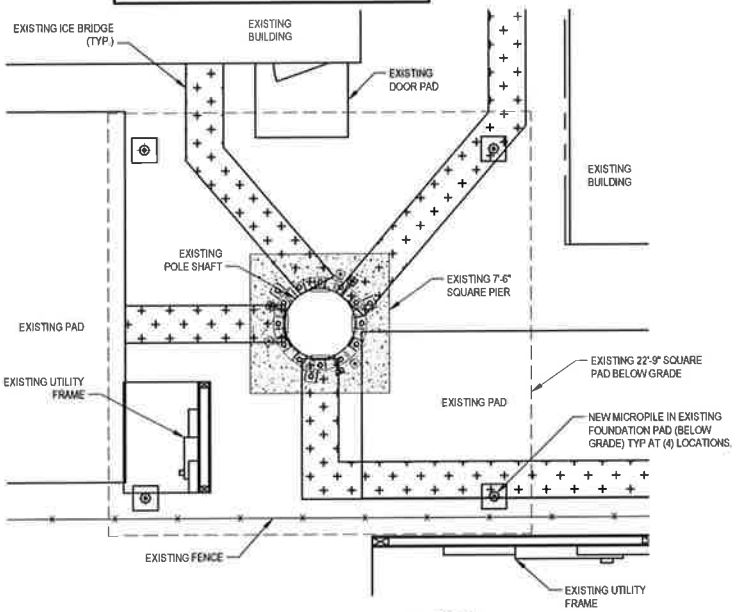
CONTRACTOR SHALL PROVIDE ASTM A36 SHIM PLATES BELOW SLIP JOINTS. THE SHIM PLATES SHALL BE PLACED BETWEEN THE NEW SHAFT REINFORCEMENT AND THE EXISTING POLE SHAFT FROM THE SLIP JOINT TO THE NEW SHAFT REINFORCEMENT SPLICE PLATE LOCATION AND A EXTRA LONG "SPLICE SHIM" SHALL BE PLACED BETWEEN THE NEW UPPER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

MODIFICATIONS:

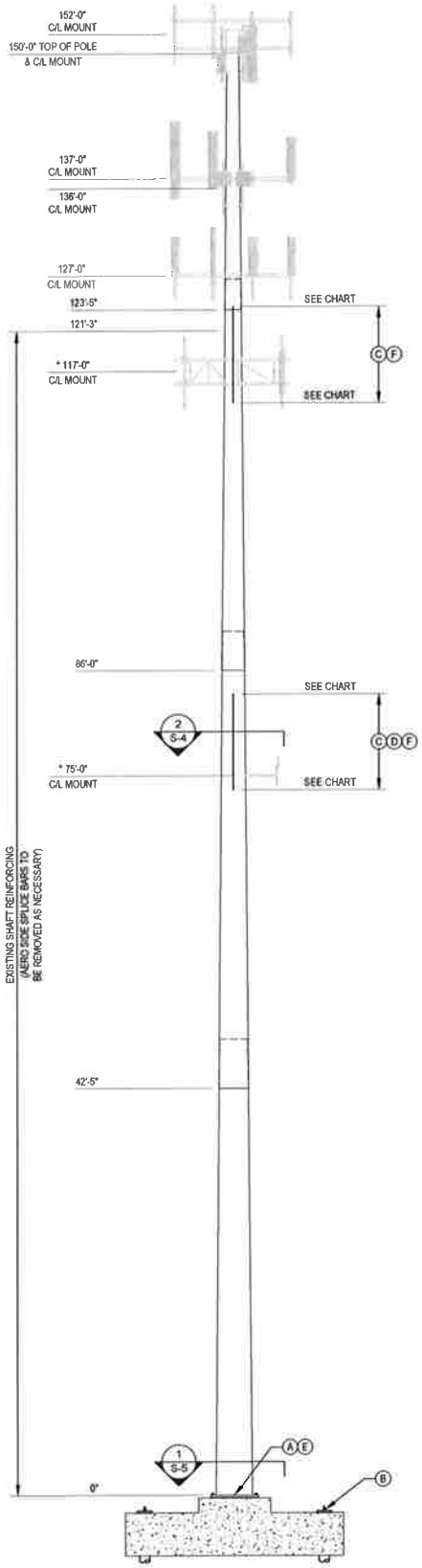
- (A) INSTALL NEW ANCHOR RODS AND BRACKETS AT BASE PLATE. SEE SHEET S-5
- (B) INSTALL NEW ROCK ANCHORS IN EXISTING FOUNDATION PAD. SEE SHEETS S-7 & S-8.
- (C) INSTALL NEW SHAFT REINFORCING. SEE CHART AND DETAILS ON SHEET S-4.
- (D) REMOVAL OF AERO WING SPLICE BARS AS NECESSARY.
- (E) REMOVAL OF EXISTING STIFFENERS. SEE SHEET S-5.
- (F) STEP BOLTS AS NECESSARY.

SITE COORDINATION REQUIRED: PRIOR TO CONSTRUCTION CONTRACTOR SHALL COORDINATE AND FIELD VERIFY LOCATION OF REQUIRED NEW FOUNDATION RELATIVE TO EXISTING SITE EQUIPMENT AND CONSTRAINTS.IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE THE MEANS AND METHODS OF SHORING AND/OR RELOCATION OF GROUND BASED EQUIPMENT THAT WILL BE AFFECTED BY THE PROPOSED ENVELOPE OF THE CURRENT FOUNDATION MOD DESIGN. PLEASE CONTACT THE EOR IF DESIGN INPUT OR NECESSARY CHANGES TO THE DESIGN ARE NEEDED. IF THE DESIGN IS FEASIBLE, BUT THE CONTRACTOR HAS A PREFERENCE TO INSTALL A DIFFERENT OPTION TO ACCOMMODATE ALTERNATE TECHNIQUES OR SUBCONTRACTOR LIMITATIONS - IT IS EXPECTED THAT THESE ISSUES WILL BE ADDRESSED AT THE TIME OF BIDDING. ANY CHANGES TO ORIGINAL DESIGN WILL REQUIRE FURTHER ENGINEERING - CONTRACTOR IS EXPECTED TO BUDGET ACCORDINGLY.

* EXISTING MOUNTS MAY NEED TO BE ADJUSTED, MOVED AND/OR TEMPORARILY SUPPORTED DURING THE INSTALLATION OF SHAFT REINFORCING



PARTIAL SITE PLAN 2 / S-3



POLE ELEVATION 1 / S-3

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MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	MONOPOLE PROFILE
CHECKED BY: R.M.K.	
APPROVED BY:	S-3
DATE: 4-9-2015	

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
73' - 6"	83' - 6"	F5, F11 & F17	CCI SFP 04510010	10' - 0"	3	16	48	6	6	20"	459 LBS
113' - 9"	123' - 9"	F5, F11 & F17	CCI AFP 04007510	10' - 0"	3	17	51	6	6	16"	306 LBS
							99				765 LBS

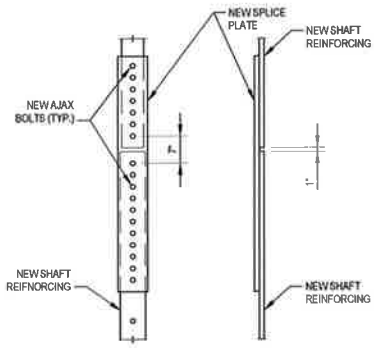
NOTES:

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 A-36

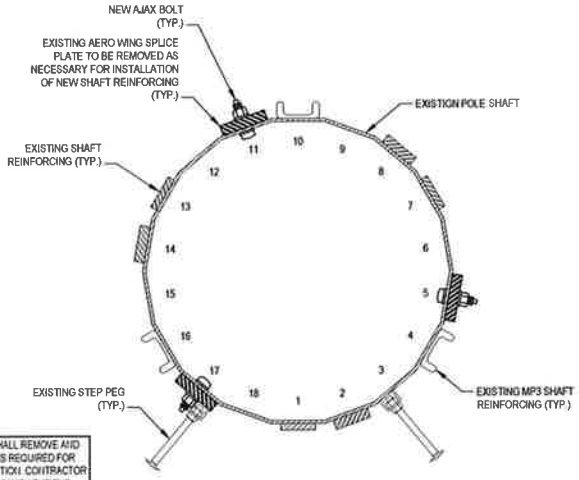
NEW SHIM CHART

1/16" SHIM QUANTITY	1/8" SHIM QUANTITY	SHIM WIDTH	SHIM LENGTH	HOLE DIAMETER
20	0	4"	4"	1-1/4"

SHIMS ARE FOR BIDDING PURPOSES ONLY. CONTRACTOR SHALL DETERMINE FINAL SHIM REQUIREMENTS DURING FABRICATION



DETAIL 1 / S-4
SCALE: NTS



NOTE: CONTRACTOR SHALL REMOVE AND REPLACE STEP BOLTS AS REQUIRED FOR REINFORCING INSTALLATION. CONTRACTOR SHALL COORDINATE THIS WITH TUF-TUG.

SECTION 2 / S-4

CROWN CASTLE US PATENT NOS 8,046,972; 8,156,712; 7,849,659; 8,424,269 AND PATENT PENDING

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OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

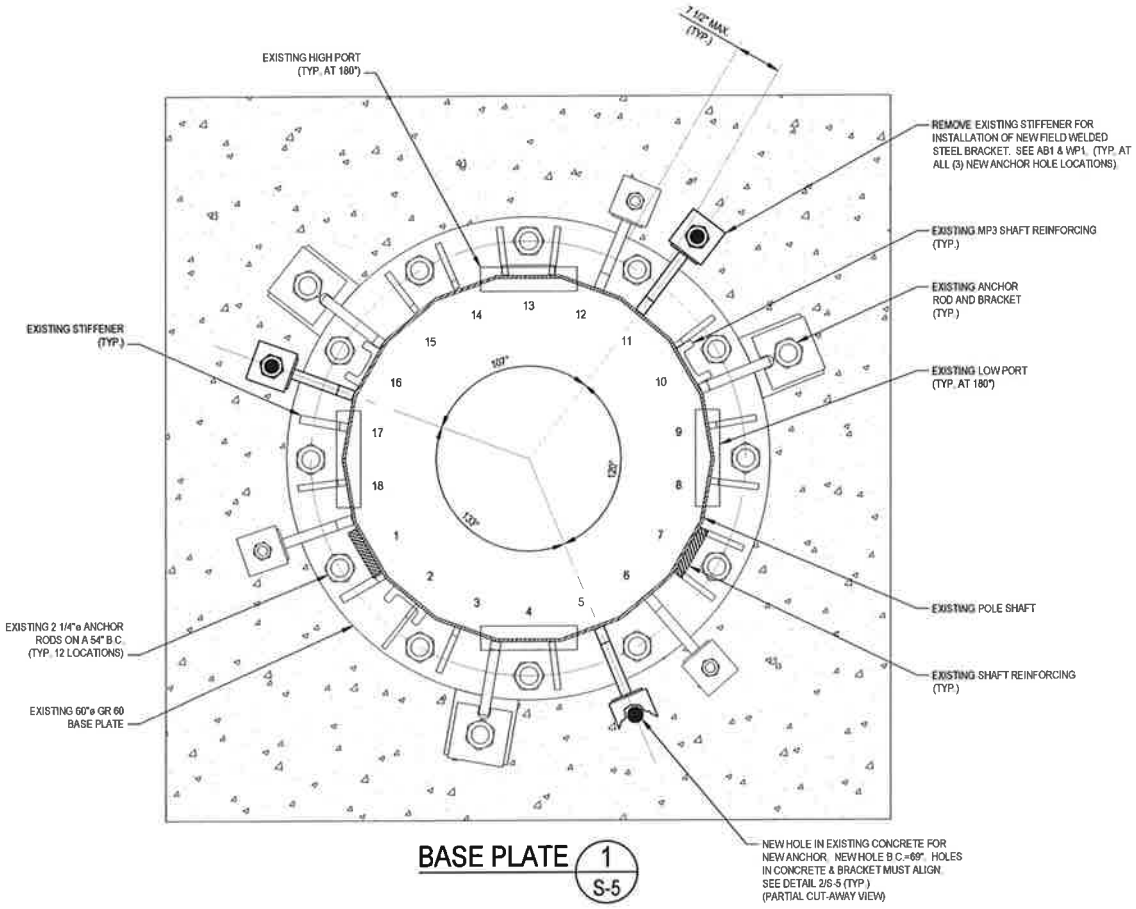
PROJECT: 37515-0074.003.7700

DRAWN BY:	B.M.S.
CHECKED BY:	R.M.K.
APPROVED BY:	
DATE:	4-9-2015

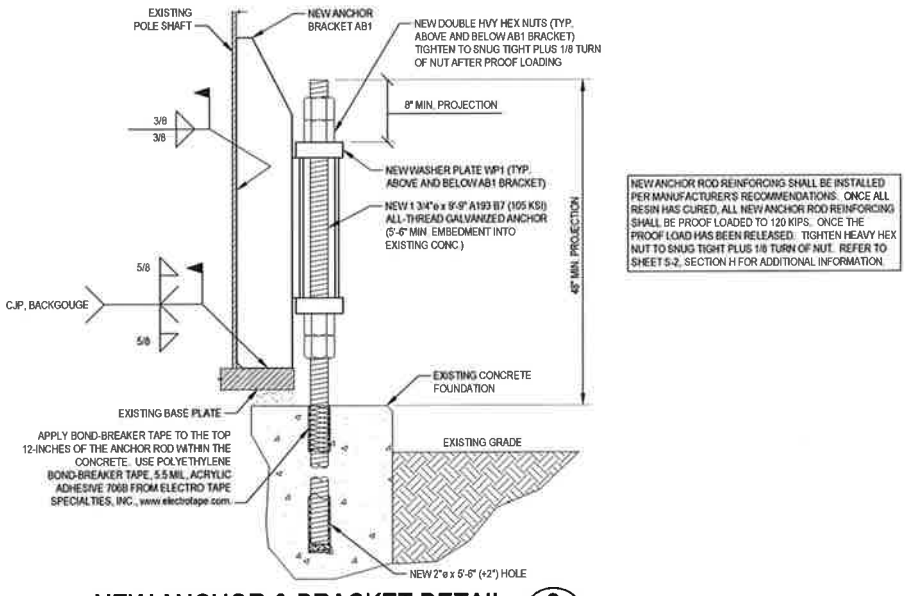
SHAFT REINFORCING CHART AND DETAILS

S-4

37515-0074.003.DWG



BASE PLATE 1 / S-5



NEW ANCHOR ROD REINFORCING SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. ONCE ALL RESIN HAS CURED, ALL NEW ANCHOR ROD REINFORCING SHALL BE PROOF LOADED TO 120 KIPS. ONCE THE PROOF LOAD HAS BEEN RELEASED, TIGHTEN HEAVY HEX NUT TO SNUG TIGHT PLUS 1/8 TURN OF NUT. REFER TO SHEET S-2, SECTION H FOR ADDITIONAL INFORMATION.

NEW ANCHOR & BRACKET DETAIL 2 / S-5

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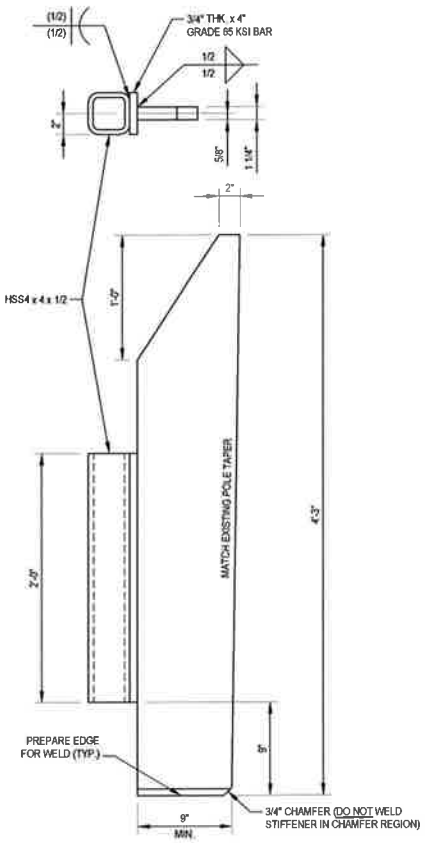
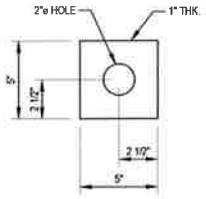
DRAWN BY: B.M.S.	BASE PLATE DETAILS
CHECKED BY: R.M.K.	
APPROVED BY:	S-5
DATE: 4-9-2015	

37515-0074.003.DWG



ANCHOR BRACKET MK~AB1

(3 REQUIRED) (TUBE Fy = 46 KSI) (STIFFENER Fy = 65 KSI)



WASHER PLATE MK~WP1

(6 REQUIRED) (Fy = 50 KSI)

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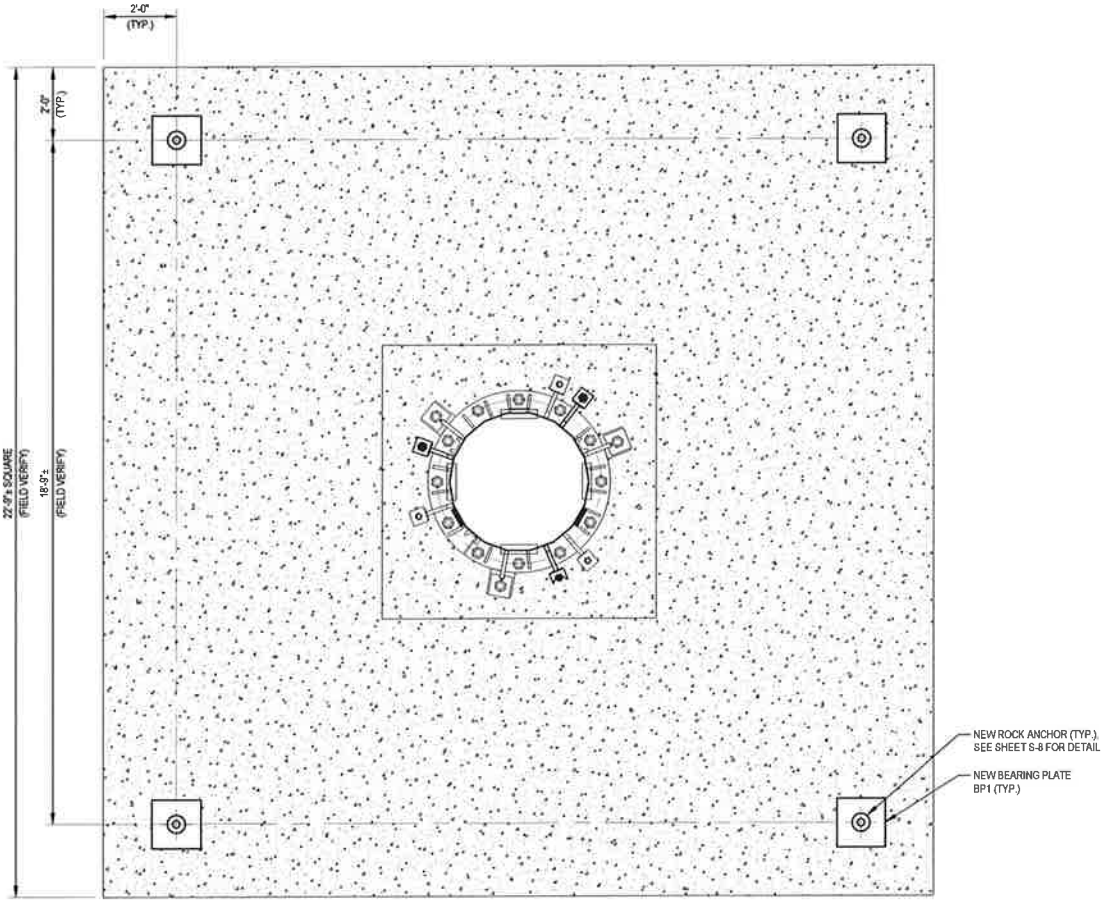
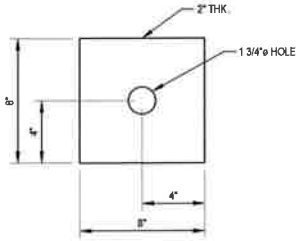
PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	MISC DETAILS
CHECKED BY: R.M.K.	
APPROVED BY:	S-6
DATE: 4-9-2015	



FOUNDATION REINFORCING PLAN 1 / S-7



BEARING PLATE MK~BP1

(4 REQUIRED) (Fy = 50 KSI)

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PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	FOUNDATION REINFORCING DETAILS
CHECKED BY: R.M.K.	
APPROVED BY:	S-7
DATE: 4-9-2015	

37515-0074.003.DWG

* THE DESIGN REQUIRES ROCK ANCHORS FOR THE LISTED CAPACITY IN TENSION AND COMPRESSION AS LAID OUT PER PLAN. THE CONTRACTOR/ROCK ANCHOR INSTALLER IS RESPONSIBLE FOR THE MEANS AND METHODS TO ENSURE THE NECESSARY CAPACITY AND WILL DEMONSTRATE THE INSTALLED CAPACITY PER THE SPECIFIED TESTING. THE EMBEDMENT DEPTH AND GROUT DIAMETER ARE LISTED AS A PRELIMINARY BASIS FOR BIDDING. THE INTENT IS FOR THE INSTALLER TO REVIEW THE CURRENT SOIL INFORMATION AND DESIGN REQUIREMENTS TO ENSURE THAT THE CONTRACTOR'S SPECIFIC EQUIPMENT OR INSTALLATION TECHNIQUE IS APPROPRIATE. IF THE CONTRACTOR BELIEVES THE SCOPE SHOULD CHANGE UPON REVIEW, PLEASE ADDRESS PRIOR TO BIDDING. PLEASE COORDINATE WITH ENGINEER OF RECORD PRIOR TO INSTALLATION.

ROCK ANCHOR NOTES:

1. ALL BAR STEEL AND ASSOCIATED HARDWARE SHALL BE SUPPLIED BY WILLIAMS FORM ENGINEERING CORP. OR OWNER/EOR APPROVED EQUIVALENT.
2. ALL BAR, NUTS AND BEARING PLATES SHALL BE HOT-DIP GALVANIZED PER ASTM A123 OR A153, AS APPROPRIATE.
3. CONTACT WILLIAMS FORM ENGINEERING CORP. (OR MANUFACTURER OF APPROVED ALTERNATE) FOR MATERIALS AND INSTALLATION PROCEDURES AND RECOMMENDATIONS.
4. SPECIAL INSPECTION OF THE ROCK ANCHORS IS REQUIRED AS FOLLOWS: (1) VERIFY THAT ROCK ANCHOR AND PIPE MATERIAL, SIZE AND LENGTH COMPLY WITH THE INFORMATION SHOWN ON THIS DRAWING, (2) VERIFY PLACEMENT OF EACH ROCK ANCHOR, (3) OBSERVE DRILLING, GROUTING AND TESTING (AS APPROPRIATE) OPERATIONS FOR EACH ROCK ANCHOR AND MAINTAIN COMPLETE AND ACCURATE RECORDS FOR EACH ROCK ANCHOR.
5. CONTACT WILLIAMS FORM ENGINEERING CORP. (OR MANUFACTURER OF APPROVED ALTERNATE) TO VERIFY NUT & WASHER CONNECTION ARE COMPATIBLE WITH ROCK ANCHOR THREADS

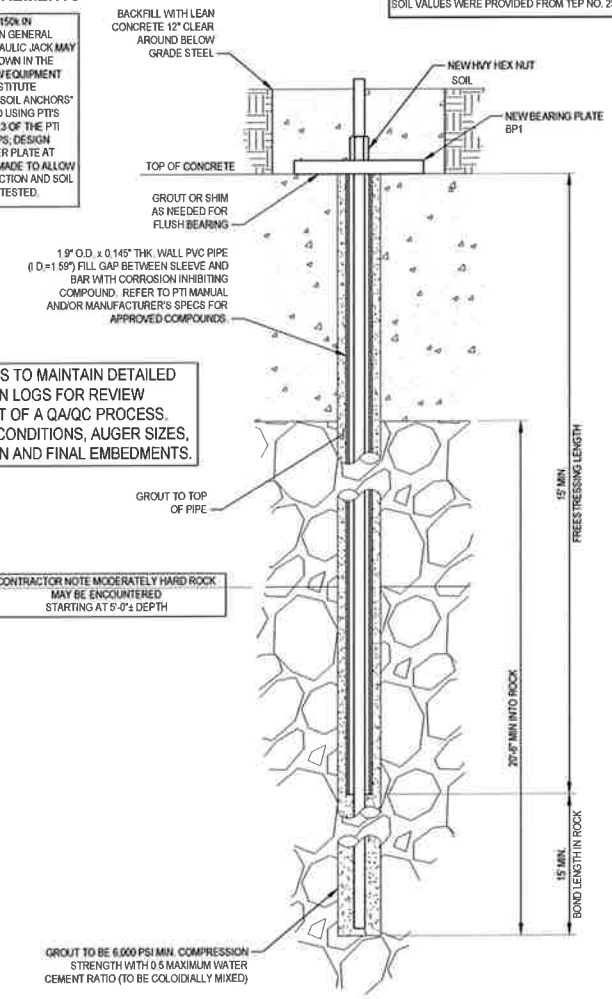
DRILLER/INSTALLER SOIL DESIGN PARAMETERS

LAYER THICKNESS	BORING LOG	ULTIMATE GROUT BOND VALUES	AUGER/CORE HOLE DESIGN SIZE
4'-6"±	EXISTING FOUNDATION	IGNORE	3.5" / N/A
10'-6"±	WEATHERED SANDSTONE	IGNORE	3.5" / N/A
10'-0"±	WEATHERED SANDSTONE	450 PSI	3.5" / 3.875"

SOIL VALUES WERE PROVIDED FROM TEP NO. 25611.19662G DATED 10-8-2014.

ROCK ANCHOR TESTING REQUIREMENTS

ALL (4) IN-PLACE ROCK ANCHOR IS TO BE TESTED TO 150k IN TENSION. ALL PILE TESTING SHALL BE CARRIED OUT IN GENERAL CONFORMANCE WITH ASTM D1143 OR D3689. A HYDRAULIC JACK MAY BE SUBSTITUTED FOR THE PILE TESTING SET-UPS SHOWN IN THE ASTM SPECS. IF A HYDRAULIC JACK IS USED, FOLLOW EQUIPMENT GUIDELINES DISCUSSED IN THE POST TENSIONING INSTITUTE "RECOMMENDATIONS FOR PRESTRESSED ROCK AND SOIL ANCHORS" DESIGN GUIDE, SECTION 8.2. PILES SHALL BE LOADED USING PTI'S PROOF TEST METHODOLOGY (REFER TO SECTION 8.3.3 OF THE PTI DESIGN GUIDE; ALIGNMENT LOAD, AL, SHALL BE 12 KIPS; DESIGN LOAD, DL, IS 113 KIPS). LOCK OFF ANCHOR TO WASHER PLATE AT LOCK OFF LOAD OF 112.5 KIPS. PROVISION SHALL BE MADE TO ALLOW FOR MOVEMENT BETWEEN ROCK ANCHOR CROSS-SECTION AND SOIL SO THAT GROUT-TO-SOIL BOND LINE IS ADEQUATELY TESTED.



PROPOSED ANCHOR DESIGN PARAMETERS (TYPICAL) 1 S-8

PILE DESIGN PARAMETER SCHEDULE

OPTIONS \ PARAMETER	ROCK ANCHOR	PILE CAPACITY Pn/Ω (kips)	EXTENSION ABOVE EXISTING CONCRETE FOUNDATION	FREESTRESSING LENGTH	FRICTION DEVELOPMENT LENGTH/BOND LENGTH	TOTAL LENGTH
ROCK ANCHOR	* 1 1/4"ø	112.5	1' MIN.	15' MIN.	15' MIN.	31' MIN.

* DESIGN BASED ON 1 1/4"ø WILLIAMS R71 (150 KSI)

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BU #876362; OXFORD/FRITZ PROPERTY
OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	ROCK ANCHOR DETAILS
CHECKED BY: R.M.K.	
APPROVED BY:	S-8
DATE: 4-9-2015	

37515-0074.003.DWG

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**
   - 9.7.1. VERIFY MATERIALS AT BOTTOM OF EXCAVATION ARE ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY.
   - 9.7.2. VERIFY THAT EXCAVATIONS HAVE EXTENDED TO PROPER DEPTH AND ARE FOUNDED ON PROPER MATERIAL.
   - 9.7.3. PERFORM CLASSIFICATION AND TESTING OF COMPACTED FILL MATERIALS AS SPECIFIED.
   - 9.7.4. VERIFY USE OF PROPER MATERIALS, DENSITIES AND LIFT THICKNESS DURING PLACEMENT AND COMPACTION OF COMPACTED FILL.
   - 9.7.5. PRIOR TO PLACEMENT OF COMPACTED FILL, OBSERVE SUBGRADE AND VERIFY SITE HAS BEEN PREPARED PROPERLY.

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.
     - 9.10.5.12. FULL PENETRATION WELDS IN THE VICINITY OF THE BASE OF THE TOWER ARE REQUIRED TO BE 100% NDE INSPECTED BY UT IN ACCORDANCE WITH AWS D1.1.
     - 9.10.5.13. PARTIAL PENETRATION AND FILLET WELDS IN THE VICINITY OF THE BASE OF THE TOWER ARE REQUIRED TO BE 50% NDE INSPECTED BY MP IN ACCORDANCE WITH AWS D1.1.

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
X	FABRICATOR CERTIFIED WELD INSPECTION
X	MATERIAL TEST REPORT (MTR)
NA	FABRICATOR NDE INSPECTION
NA	NDE REPORT OF MONOPOLE BASE PLATE (AS REQUIRED)
X	PACKING SLIPS
ADDITIONAL TESTING AND INSPECTIONS:	
	CONSTRUCTION
X	CONSTRUCTION INSPECTIONS
X	FOUNDATION INSPECTIONS
NA	CONCRETE COMP. STRENGTH AND SLUMP TESTS
X	POST INSTALLED ANCHOR ROD VERIFICATION
NA	BASE PLATE GROUT VERIFICATION
X	CONTRACTOR'S CERTIFIED WELD INSPECTION
NA	EARTHWORK: PROVIDE PHOTO DOCUMENTATION OF EXCAVATION QUALITY AND COMPACTION
X	ON SITE COLD GALVANIZING VERIFICATION
NA	GUY WIRE TENSION REPORT
X	GC AS-BUILT DOCUMENTS
X	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)
X	POST INSTALLED ANCHOR ROD PULL-OUT TESTING
X	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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BU #876362; OXFORD/FRITZ PROPERTY
OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	MI CHECKLIST
CHECKED BY: R.M.K.	
APPROVED BY:	
DATE: 4-9-2015	S-9

37515-0074.003.DWG

MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

BU NUMBER; SITE NAME

BU #876362; OXFORD/FRITZ PROPERTY

APP: 274626 REV. 2; WO: 1034764

SITE ADDRESS

338 OXFORD RD.
OXFORD, CONNECTICUT 06478
NEW HAVEN 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.

PROJECT CONTACTS:

MONOPOLE OWNER:
CROWN CASTLE
MOD PM: DAN VADNEY AT DAN.VADNEY@CROWNCASTLE.COM
PH: (518) 373-3510

DESIGN STANDARD

THIS REINFORCEMENT DESIGN IS BASED UPON THE REQUIREMENTS OF THE TIA/EIA-222-F-1996 STRUCTURAL STANDARD FOR ANTENNA SUPPORTING STRUCTURES AND ANTENNAS, USING A DESIGN BASIC WIND SPEED OF 85 MPH (FASTEST MILE) WITH NO ICE, 38 MPH WITH 1 1/4 INCH ICE AND 50 MPH SERVICE LOADS.

REFER TO THE POLE DESIGN AND ANTENNA LOADING DOCUMENTED IN THE PJF STRUCTURAL ANALYSIS FOR THIS SITE (PJF#37515-0074.003.7700), DATED 4-9-2015.

THIS PROJECT INCLUDES THE FOLLOWING REINFORCING ELEMENTS:

SHAFT REINFORCING
FIELD WELDED ANCHOR BRACKETS
POST INSTALLED ANCHOR RODS
FOUNDATION AUGMENTATION: ROCK ANCHORS
REMOVAL OF AERO WING SPLICE BARS
REMOVAL OF STIFFENERS AT BASE
REMOVAL OF STEP BOLTS

SHEET INDEX

STATE OF CONNECTICUT
JUSTIN T. KEENE
No. 30391
LICENSED PROFESSIONAL ENGINEER

4-9-15

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BU #876362; OXFORD/FRITZ PROPERTY
OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	TITLE SHEET
CHECKED BY: R.M.K.	
APPROVED BY: JTK	T-1
DATE: 4-9-2015	

37515-0074.003.DWG

CROWN CASTLE PROJECT: BU #876362; OXFORD/FRITZ PROPERTY; OXFORD, 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.
1.11. THE CLIMBING FACILITIES, SAFETY CLIMB AND ALL PARTS THEREOF SHALL NOT BE IMPEDED, MODIFIED OR ALTERED WITHOUT THE EXPRESS APPROVAL OF THE EOR.
1.12. ALL SOLUTIONS FOR THE REPLACEMENT, RELOCATION OR MODIFICATION OF THE SAFETY CLIMB AND/OR ANY OF THE MONOPOLE CLIMBING FACILITIES SHALL BE COORDINATED WITH TUF-TUG. CONTACT DETAILS:
TUF-TUG PRODUCTS
3434 ENCRETE LANE
MORAINE, OHIO 45439
PHONE: 937-299-1213
EMAIL: TUFTUG@AOL.COM

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"
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
4.1. THE CONTRACTOR SHALL PROTECT THE EXISTING MONOPOLE STRUCTURE, AS WELL AS ANY OTHER NEARBY EXISTING FOUNDATIONS FOR OTHER STRUCTURES OR EQUIPMENT, FROM LOSS OF SOIL AROUND AND/OR BENEATH FOOTINGS DURING ANY EXCAVATION. THE CONTRACTOR SHALL BRACE THE SITES OF THE OPEN EXCAVATION AS REQUIRED.
4.2. THE EFFECT OF ADDITIONAL EXCAVATION FOR FOUNDATION AUGMENTATION AND REINFORCING, WHERE REQUIRED, MAY HAVE IMPACT ON EXISTING EQUIPMENT AND/OR OTHER EXISTING STRUCTURES NEAR THE EXCAVATION. THE EOR HAS NOT BEEN PROVIDED WITH ANY SPECIFIC INFORMATION OR DETAILS REGARDING EXISTING EQUIPMENT OR OTHER EXISTING STRUCTURES ON THE SITE. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE THE EFFECT THAT ANY EXCAVATION WORK HAS ON EXISTING NEARBY EQUIPMENT AND/OR STRUCTURES. CONTRACTOR SHALL COORDINATE THIS SITE-SPECIFIC INFORMATION WITH CROWN CASTLE AND THE TESTING AGENCY PRIOR TO CONSTRUCTION AND FOUNDATION WORK. AFTER OBTAINING THE PRIOR WRITTEN PERMISSION OF CROWN CASTLE, THE CONTRACTOR SHALL ADEQUATELY BRACE, SHORE, AND/OR RELOCATE THE INTERFERING EXISTING NEARBY EQUIPMENT AND/OR STRUCTURES AS NECESSARY.

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

6. EPOXY GROUTED REINFORCING ANCHOR RODS
6.1. UNLESS OTHERWISE NOTED, REINFORCING ANCHOR RODS SHALL BE 150 KSI ALL-THREAD BARS CONFORMING TO ASTM A722. RECOMMENDED MANUFACTURERS/SUPPLIERS OF 150 KSI ALL-THREAD BARS ARE WILLIAMS FORM ENGINEERING CORPORATION AND DYWIDAG SYSTEMS INTERNATIONAL.
6.2. ALL REINFORCING ANCHOR RODS SHALL BE HOT DIP GALVANIZED PER ASTM A123. ALTERNATIVELY, ALL REINFORCING ANCHOR RODS MAY BE EPOXY COATED PER ASTM A775.
6.3. THE CORE-DRILLED HOLES IN THE CONCRETE FOR THE ANCHOR RODS SHALL BE CLEAN AND DRY, AND OTHERWISE PROPERLY PREPARED ACCORDING TO THE ANCHOR ROD AND EPOXY MANUFACTURERS' INSTRUCTIONS, PRIOR TO PLACEMENT OF ANCHOR RODS AND EPOXY. CONTRACTOR SHALL FOLLOW ALL ANCHOR ROD AND EPOXY MANUFACTURER RECOMMENDATIONS REGARDING HANDLING OF RODS, EPOXY, ACCEPTABLE AMBIENT TEMPERATURE RANGE DURING INSTALLATION AND POST-INSTALLATION CURING, THE EFFECT OF TEMPERATURE ON EPOXY CURING TIME, PREPARATION OF HOLE, ETC.
6.4. HILTI HIT RE-500 SD OR ITW RED HEAD EPCON G5 EPOXY SHALL BE USED TO ANCHOR THE BAR IN THE DRILL HOLES. IF CONTRACTOR WISHES TO USE A DIFFERENT EPOXY, A REQUEST INCLUDING THE EPOXY TECHNICAL DATA SHEET(S) SHALL BE SUBMITTED TO THE EOR FOR REVIEW PRIOR TO CONSTRUCTION.
6.5. ONCE THE REINFORCING ANCHOR RODS HAVE BEEN INSTALLED AND ALL EPOXY AND GROUT HAVE CURED (IF BASE PLATE AND/OR BEARING PLATES HAVE BEEN GROUTED PRIOR TO TESTING), ALL REINFORCING ANCHORS SHALL BE LOAD TESTED PER CROWN CASTLE ENGINEERING DOCUMENT #ENG-PRC-10119. REFER TO THE NEW ANCHOR & BRACKET DETAIL ON FOLLOWING SHEETS FOR SPECIFIED ANCHOR ROD PROOF LOAD.
6.6. ONCE THE REINFORCING ANCHOR RODS HAVE BEEN SUCCESSFULLY LOAD TESTED AND APPROVED THE CONTRACTOR SHALL TIGHTEN ALL HEAVY HEX ANCHOR NUTS TO SNUG TIGHT PLUS 1/8 TURN OF NUT.

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 1-800-631-3275 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
AUSTIN I. KLINE
No. 30301
LICENSED
PROFESSIONAL ENGINEER
4.9.15

PAUL J. FORD AND COMPANY
STRUCTURAL ENGINEERS
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(614) 221-8679 www.pjfweb.com

CROWN CASTLE
3530 TORINGDON WAY, SUITE 300, CHARLOTTE, NC 28277
PH: (704) 405-6505

BU #876362; OXFORD/FRITZ PROPERTY
OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700
DRAWN BY: B.M.S.
CHECKED BY: R.M.K.
APPROVED BY: R.M.K.
DATE: 4-9-2015
GENERAL NOTES
S-1

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.

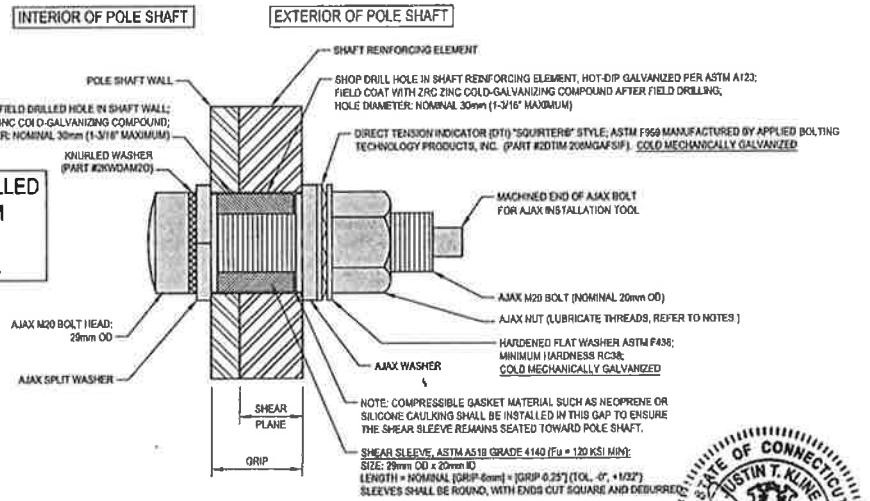
NOTE: COMPLETELY COMPRESSED DTI'S SHOWING NO VISIBLE REMAINING GAP ARE ACCEPTABLE. DTI WASHERS SHALL BE PLACED DIRECTLY AGAINST THE OUTER AJAX WASHER WITH THE DTI BUMPS FACING AWAY FROM THE AJAX WASHER. PLACE A HARDENED WASHER BETWEEN THE DTI AND THE AJAX NUT. THE DTI BUMPS SHALL BEAR AGAINST THE UNDERSIDE 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

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

4-9-15

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BU #876362; OXFORD/FRITZ PROPERTY
OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700
DRAWN BY: B.M.S.
CHECKED BY: R.M.K.
APPROVED BY: JTK
DATE: 4-9-2015
AJAX BOLT DETAIL
S-2

37515-0074.003.DWG

POLE SPECIFICATIONS	
POLE SHAPE TYPE:	18-SIDED POLYGON
TAPER:	0.2033 IN/FT
SHAFT STEEL:	ASTM A572 GRADE 65
BASE PL STEEL:	ASTM A871 GRADE 60
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	26.5800	0.1875	38.00	15.000	20.740
2	49.6300	0.2500	49.00	19.680	28.320
3	47.5300	0.3125	62.00	26.952	37.100
4	47.5800	0.3750		35.374	45.500

NOTE: DIMENSIONS SHOWN DO NOT INCLUDE GALVANIZING TOLERANCES

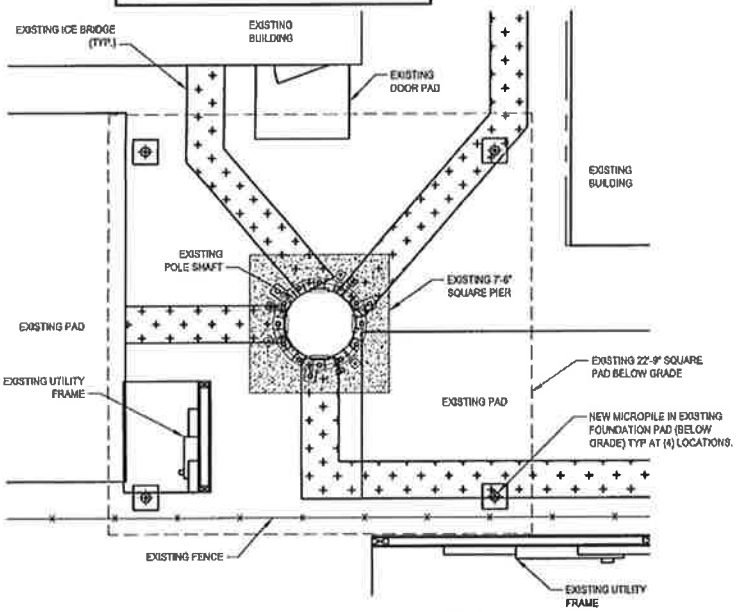
CONTRACTOR SHALL PROVIDE ASTM A36 SHIM PLATES BELOW SLIP JOINTS. THE SHIM PLATES SHALL BE PLACED BETWEEN THE NEW SHAFT REINFORCEMENT AND THE EXISTING POLE SHAFT FROM THE SLIP JOINT TO THE NEW SHAFT REINFORCEMENT SPLICE PLATE LOCATION AND A EXTRA LONG "SPLICE SHIM" SHALL BE PLACED BETWEEN THE NEW UPPER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

MODIFICATIONS:

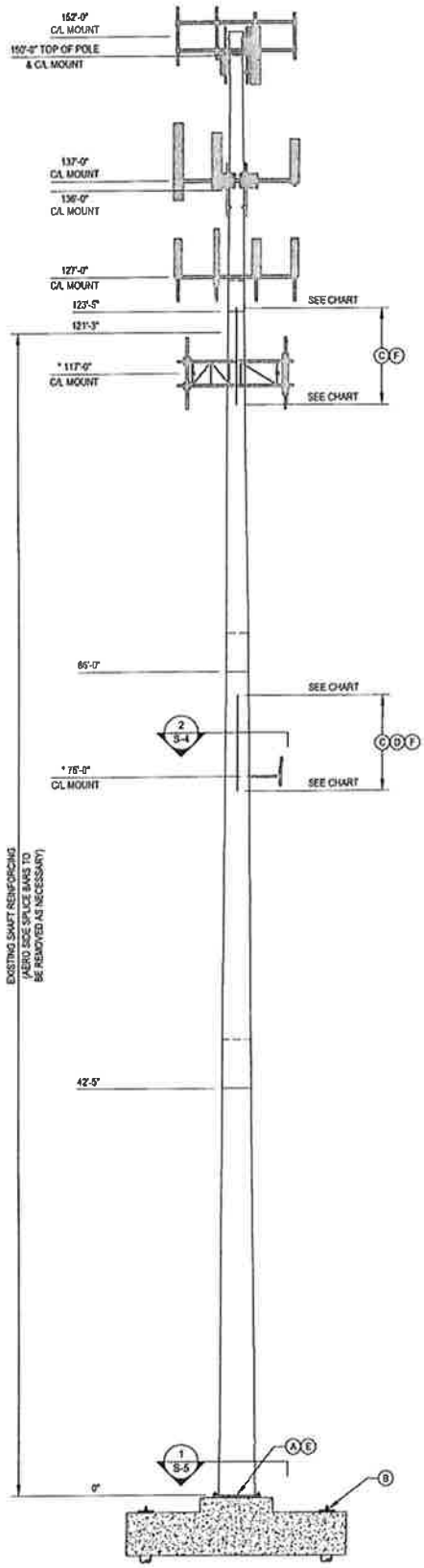
- (A) INSTALL NEW ANCHOR RODS AND BRACKETS AT BASE PLATE. SEE SHEET S-5
- (B) INSTALL NEW ROCK ANCHORS IN EXISTING FOUNDATION PAD. SEE SHEETS S-7 & S-8.
- (C) INSTALL NEW SHAFT REINFORCING. SEE CHART AND DETAILS ON SHEET S-4.
- (D) REMOVAL OF AERO WING SPLICE BARS AS NECESSARY.
- (E) REMOVAL OF EXISTING STIFFENERS. SEE SHEET S-5.
- (F) STEP BOLTS AS NECESSARY.

SITE COORDINATION REQUIRED: PRIOR TO CONSTRUCTION CONTRACTOR SHALL COORDINATE AND FIELD VERIFY LOCATION OF REQUIRED NEW FOUNDATION RELATIVE TO EXISTING SITE EQUIPMENT AND CONSTRAINTS. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE THE MEANS AND METHODS OF SHORING AND/OR RELOCATION OF GROUND BASED EQUIPMENT THAT WILL BE AFFECTED BY THE PROPOSED ENVELOPE OF THE CURRENT FOUNDATION MOD DESIGN. PLEASE CONTACT THE EOR IF DESIGN INPUT OR NECESSARY CHANGES TO THE DESIGN ARE NEEDED. IF THE DESIGN IS FEASIBLE, BUT THE CONTRACTOR HAS A PREFERENCE TO INSTALL A DIFFERENT OPTION TO ACCOMMODATE ALTERNATE TECHNIQUES OR SUBCONTRACTOR LIMITATIONS - IT IS EXPECTED THAT THESE ISSUES WILL BE ADDRESSED AT THE TIME OF BIDDING. ANY CHANGES TO ORIGINAL DESIGN WILL REQUIRE FURTHER ENGINEERING - CONTRACTOR IS EXPECTED TO BUDGET ACCORDINGLY.

* EXISTING MOUNTS MAY NEED TO BE ADJUSTED, MOVED AND/OR TEMPORARILY SUPPORTED DURING THE INSTALLATION OF SHAFT REINFORCING



PARTIAL SITE PLAN 2 / S-3



POLE ELEVATION 1 / S-3

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

4-9-15

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BU #876362; OXFORD/FRITZ PROPERTY
OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	MONOPOLE PROFILE
CHECKED BY: R.M.K.	
APPROVED BY: RMK	S-3
DATE: 4-9-2015	

NEW CCI FLAT PLATE (65 KSI) REINFORCING SCHEDULE											
BOTTOM ELEVATION	TOP ELEVATION	FLAT #/ 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
73' - 6"	83' - 6"	F5, F11 & F17	CCI-SFP-04510010	10' - 0"	3	16	48	6	6	20"	459 LBS.
113' - 9"	123' - 9"	F5, F11 & F17	CCI-AFP-04007510	10' - 0"	3	17	51	6	6	16"	306 LBS.
							99				765 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

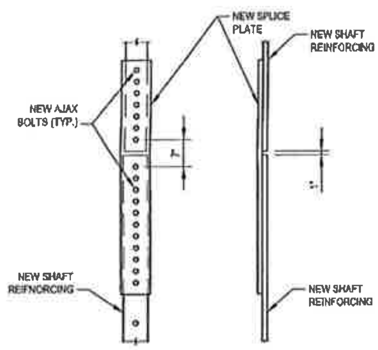
4.) WELDS SHALL BE E80XX OR GREATER. TERMINATION WELDS SHALL BE 3/8" FILLET WELDS.

5.) HOLES FOR AJAX BOLTS AND SHEAR SLEEVES ARE 30mm UNLESS NOTED OTHERWISE.

6.) ALL SHIMS SHALL BE ASTM A-36.

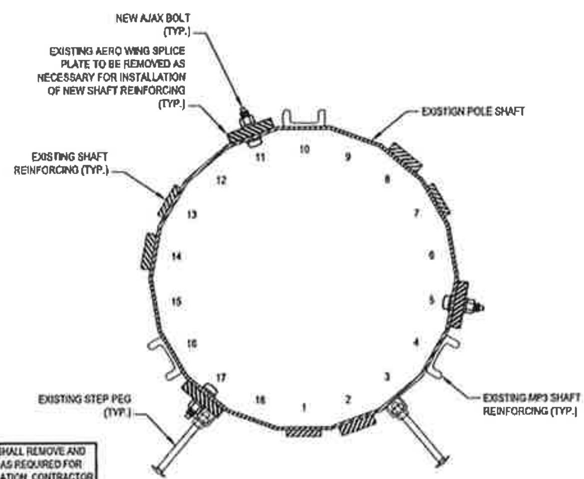
NEW SHIM CHART				
1/16" SHIM QUANTITY	1/4" SHIM QUANTITY	SHIM WIDTH	SHIM LENGTH	HOLE DIAMETER
39	0	4"	4"	1-1/4"

SHIMS ARE FOR BIDDING PURPOSES ONLY. CONTRACTOR SHALL DETERMINE FINAL SHIM REQUIREMENTS DURING FABRICATION.



DETAIL 1 / S-4

SCALE: NTS



NOTE: CONTRACTOR SHALL REMOVE AND REPLACE STEP BOLTS AS REQUIRED FOR REINFORCING INSTALLATION. CONTRACTOR SHALL COORDINATE THIS WITH TUF-TUG.

SECTION 2 / S-4

4.9.15

CROWN CASTLE US PATENT NOS 8,046,972; 8,156,712; 7,849,659; 8,424,269 AND PATENT PENDING

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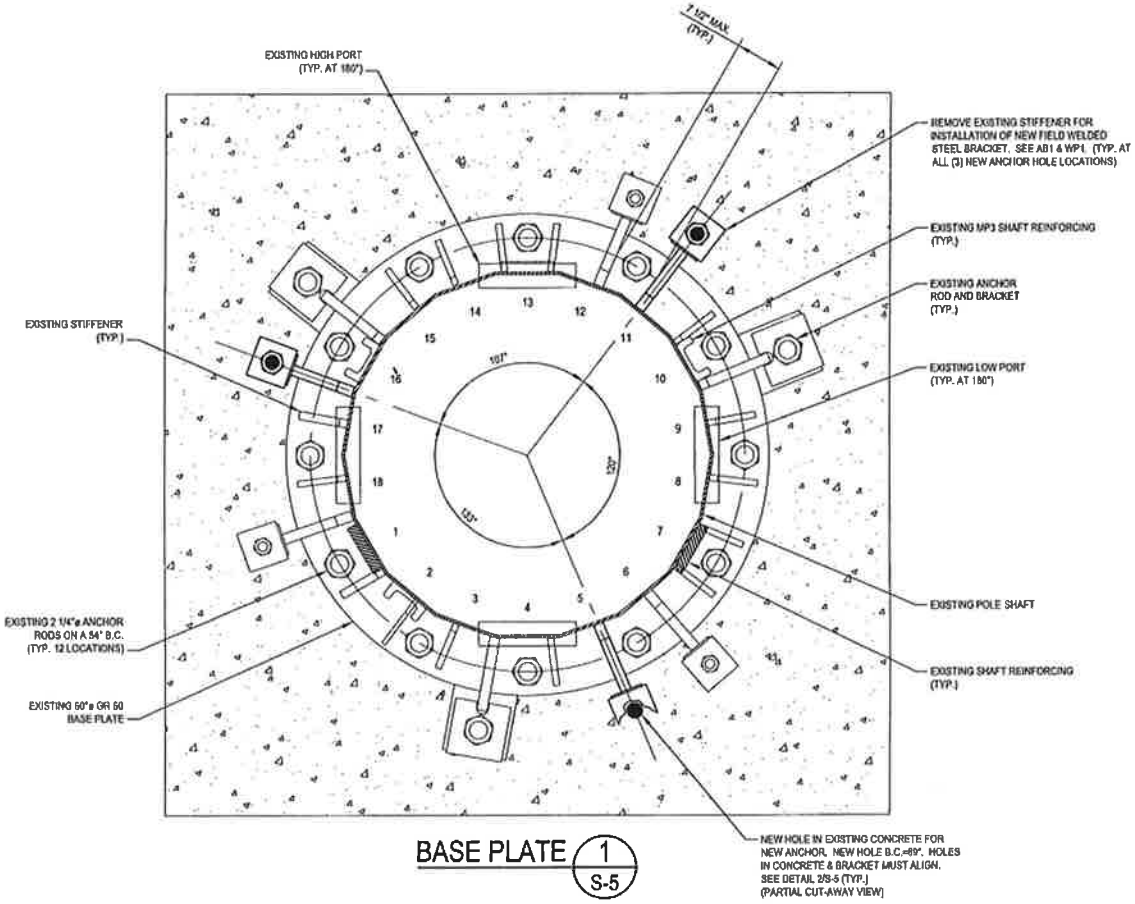
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

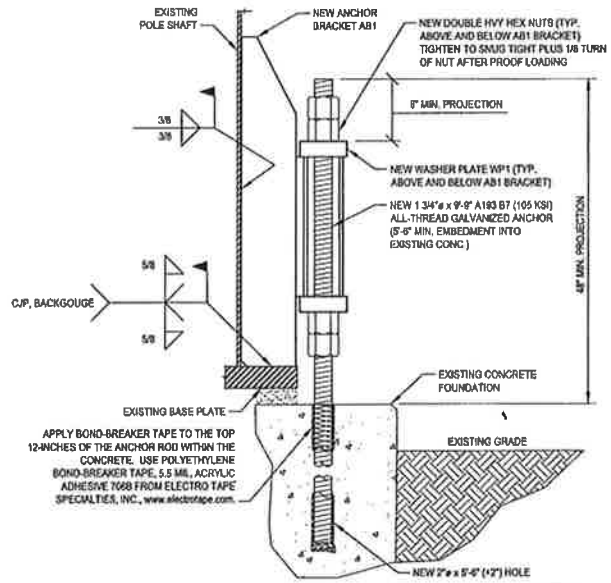
PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	SHAFT REINFORCING CHART AND DETAILS
CHECKED BY: R.M.K.	
APPROVED BY: JKK	S-4
DATE: 4-9-2015	

37515-0074.003.DWG



BASE PLATE 1 / S-5



NEW ANCHOR & BRACKET DETAIL 2 / S-5

NEW ANCHOR ROD REINFORCING SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. ONCE ALL RESIN HAS CURED, ALL NEW ANCHOR ROD REINFORCING SHALL BE PROOF LOADED TO 120 KIPS. ONCE THE PROOF LOAD HAS BEEN RELEASED, TIGHTEN HEAVY HEX NUT TO SNUG TIGHT PLUS 1/8 TURN OF NUT. REFER TO SHEET S-2, SECTION H FOR ADDITIONAL INFORMATION.

4.9.15

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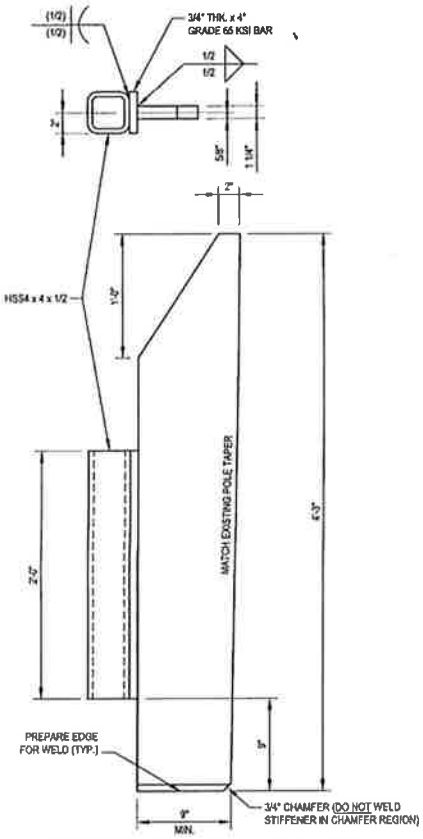
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700

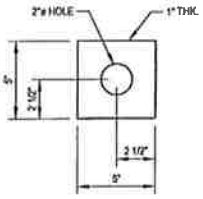
DRAWN BY: B.M.S.	BASE PLATE DETAILS
CHECKED BY: R.M.K.	
APPROVED BY: RMK	S-5
DATE: 4-9-2015	

37515-0074.003.DWG



ANCHOR BRACKET MK~AB1

(3 REQUIRED) (TUBE Fy = 46 KSI) (STIFFENER Fy = 65 KSI)



WASHER PLATE MK~WP1

(6 REQUIRED) (Fy = 50 KSI)

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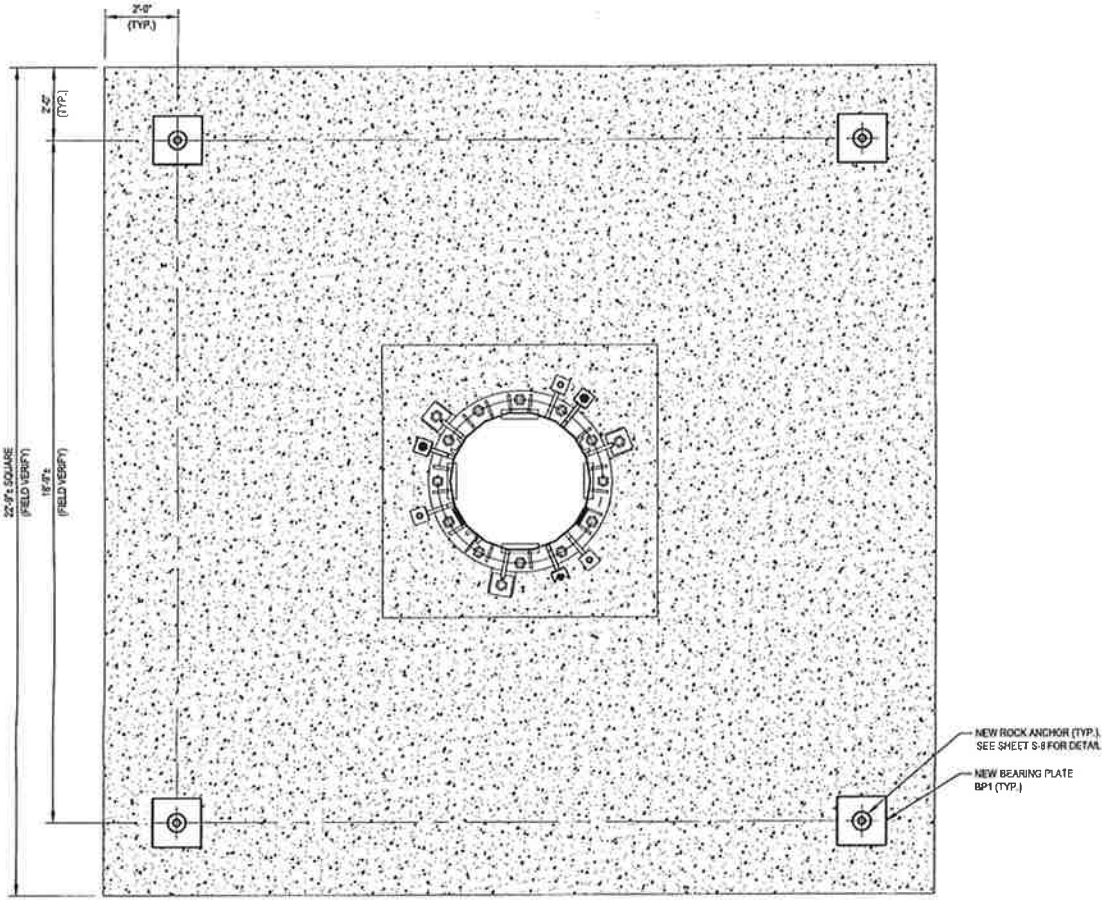
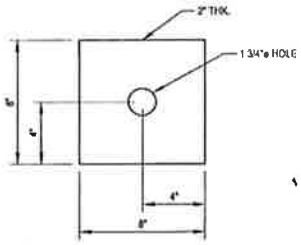
OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	MISC DETAILS
CHECKED BY: R.M.K.	
APPROVED BY:	S-6
DATE: 4-9-2015	



FOUNDATION REINFORCING PLAN (1 / S-7)



BEARING PLATE MK~BP1
(4 REQUIRED) (Fy = 50 KSI)

STATE OF CONNECTICUT
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4.9.15

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OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700
DRAWN BY: B.M.S.
CHECKED BY: R.M.K.
APPROVED BY: JTK
DATE: 4-9-2015
FOUNDATION REINFORCING DETAILS
S-7

37515-0074.003.DWG

* THE DESIGN REQUIRES ROCK ANCHORS FOR THE LISTED CAPACITY IN TENSION AND COMPRESSION AS LAID OUT PER PLAN. THE CONTRACTOR/ROCK ANCHOR INSTALLER IS RESPONSIBLE FOR THE MEANS AND METHODS TO ENSURE THE NECESSARY CAPACITY AND WILL DEMONSTRATE THE INSTALLED CAPACITY PER THE SPECIFIED TESTING. THE EMBEDMENT DEPTH AND GROUT DIAMETER ARE LISTED AS A PRELIMINARY BASIS FOR BIDDING. THE INTENT IS FOR THE INSTALLER TO REVIEW THE CURRENT SOIL INFORMATION AND DESIGN REQUIREMENTS TO ENSURE THAT THE CONTRACTOR'S SPECIFIC EQUIPMENT OR INSTALLATION TECHNIQUE IS APPROPRIATE. IF THE CONTRACTOR BELIEVES THE SCOPE SHOULD CHANGE UPON REVIEW, PLEASE ADDRESS PRIOR TO BIDDING. PLEASE COORDINATE WITH ENGINEER OF RECORD PRIOR TO INSTALLATION.

ROCK ANCHOR NOTES.

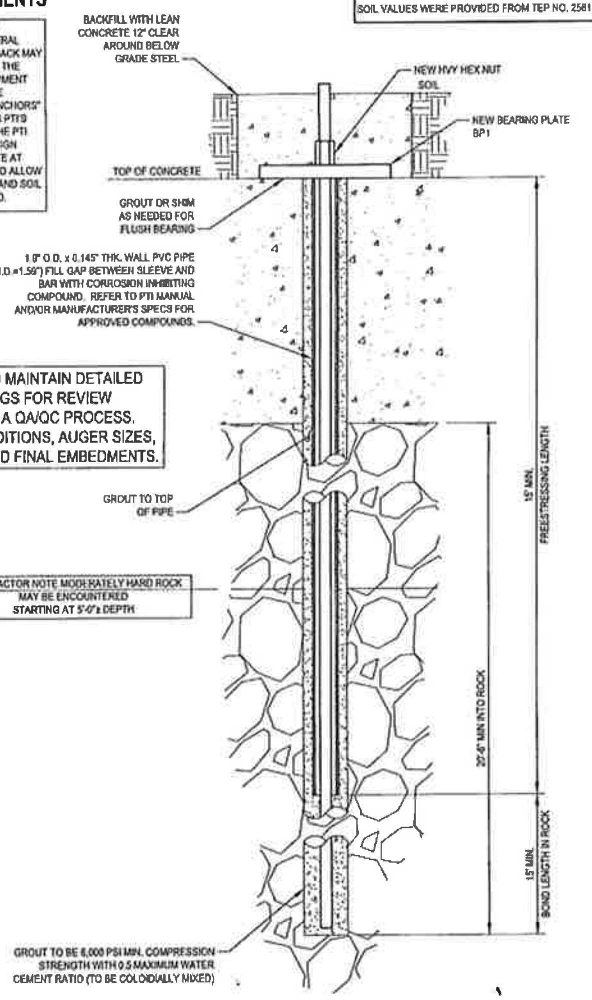
1. ALL BAR STEEL AND ASSOCIATED HARDWARE SHALL BE SUPPLIED BY WILLIAMS FORM ENGINEERING CORP. OR OWNER/EOR APPROVED EQUIVALENT.
2. ALL BAR, NUTS AND BEARING PLATES SHALL BE HOT-DIP GALVANIZED PER ASTM A123 OR A153, AS APPROPRIATE.
3. CONTACT WILLIAMS FORM ENGINEERING CORP. (OR MANUFACTURER OF APPROVED ALTERNATE) FOR MATERIALS AND INSTALLATION PROCEDURES AND RECOMMENDATIONS.
4. SPECIAL INSPECTION OF THE ROCK ANCHORS IS REQUIRED AS FOLLOWS: (1) VERIFY THAT ROCK ANCHOR AND PIPE MATERIAL, SIZE AND LENGTH COMPLY WITH THE INFORMATION SHOWN ON THIS DRAWING, (2) VERIFY PLACEMENT OF EACH ROCK ANCHOR, (3) OBSERVE DRILLING, GROUTING AND TESTING (AS APPROPRIATE) OPERATIONS FOR EACH ROCK ANCHOR AND MAINTAIN COMPLETE AND ACCURATE RECORDS FOR EACH ROCK ANCHOR.
5. CONTACT WILLIAMS FORM ENGINEERING CORP. (OR MANUFACTURER OF APPROVED ALTERNATE) TO VERIFY NUT & WASHER CONNECTION ARE COMPATIBLE WITH ROCK ANCHOR THREADS

DRILLER/INSTALLER SOIL DESIGN PARAMETERS			
LAYER THICKNESS	BORING LOG	ULTIMATE GROUT BOND VALUES	AUGER/CORE HOLE DESIGN SIZE
4'-6"±	EXISTING FOUNDATION	IGNORE	3.5" / N/A
10'-6"±	WEATHERED SANDSTONE	IGNORE	3.5" / N/A
10'-0"±	WEATHERED SANDSTONE	450 PSI	3.6" / 3.875"
SOIL VALUES WERE PROVIDED FROM TEP NO. 25811.19862G DATED 10-6-2014.			

ROCK ANCHOR TESTING REQUIREMENTS

ALL (4) IN-PLACE ROCK ANCHOR IS TO BE TESTED TO 150k IN TENSION. ALL PILE TESTING SHALL BE CARRIED OUT IN GENERAL CONFORMANCE WITH ASTM D1143 OR D3689. A HYDRAULIC JACK MAY BE SUBSTITUTED FOR THE PILE TESTING SET-UPS SHOWN IN THE ASTM SPECS. IF A HYDRAULIC JACK IS USED, FOLLOW EQUIPMENT GUIDELINES DISCUSSED IN THE POST TENSIONING INSTITUTE "RECOMMENDATIONS FOR PRESTRESSED ROCK AND SOIL ANCHORS" DESIGN GUIDE, SECTION 8.2. PILES SHALL BE LOADED USING PTI'S PROOF TEST METHODOLOGY (REFER TO SECTION 8.3.3 OF THE PTI DESIGN GUIDE; ALIGNMENT LOAD, AL, SHALL BE 12 KIPS; DESIGN LOAD, DL, IS 113 KIPS). LOCK OFF ANCHOR TO WASHER PLATE AT LOCK OFF LOAD OF 112.5 KIPS. PROVISION SHALL BE MADE TO ALLOW FOR MOVEMENT BETWEEN ROCK ANCHOR CROSS-SECTION AND SOIL SO THAT GROUT-TO-SOIL BOND LINE IS ADEQUATELY TESTED.

ROCK ANCHOR INSTALLER IS TO MAINTAIN DETAILED DRILLING AND INSTALLATION LOGS FOR REVIEW BEFORE TESTING AS A PART OF A QA/QC PROCESS. LOGS SHOULD SHOW SOIL CONDITIONS, AUGER SIZES, GROUT USED PER LOCATION AND FINAL EMBEDMENTS.



STATE OF CONNECTICUT
JUSTIN T. KLINE
No 30301
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PROPOSED ANCHOR DESIGN PARAMETERS (1 / S-8)

(TYPICAL)

PILE DESIGN PARAMETER SCHEDULE						
PARAMETER / OPTIONS	ROCK ANCHOR	PILE CAPACITY Pn/Ω (kips)	EXTENSION ABOVE EXISTING CONCRETE FOUNDATION	FREESTRESSING LENGTH	FRICTION DEVELOPMENT LENGTH/BOND LENGTH	TOTAL LENGTH
ROCK ANCHOR	* 1 1/4"ø	112.6	1' MIN.	15' MIN.	15' MIN.	31' MIN.

* DESIGN BASED ON 1 1/4"ø WILLIAMS R71 (150 KSI)

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MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700

DRAWN BY: B.M.S.	ROCK ANCHOR DETAILS
CHECKED BY: R.M.K.	
APPROVED BY: JTK	S-8
DATE: 4-9-2015	

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**
     - 9.7.1. VERIFY MATERIALS AT BOTTOM OF EXCAVATION ARE ADEQUATE TO ACHIEVE THE DESIGN BEARING CAPACITY.
     - 9.7.2. VERIFY THAT EXCAVATIONS HAVE EXTENDED TO PROPER DEPTH AND ARE FOUNDED ON PROPER MATERIAL.
     - 9.7.3. PERFORM CLASSIFICATION AND TESTING OF COMPACTED FILL MATERIALS AS SPECIFIED.
     - 9.7.4. VERIFY USE OF PROPER MATERIALS, DENSITIES AND LIFT THICKNESS DURING PLACEMENT AND COMPACTION OF COMPACTED FILL.
     - 9.7.5. PRIOR TO PLACEMENT OF COMPACTED FILL, OBSERVE SUBGRADE AND VERIFY SITE HAS BEEN PREPARED PROPERLY.
   - 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.
       - 9.10.5.12. FULL PENETRATION WELDS IN THE VICINITY OF THE BASE OF THE TOWER ARE REQUIRED TO BE 100% NDE INSPECTED BY UT IN ACCORDANCE WITH AWS D1.1.
       - 9.10.5.13. PARTIAL PENETRATION AND FILLET WELDS IN THE VICINITY OF THE BASE OF THE TOWER ARE REQUIRED TO BE 50% NDE INSPECTED BY MP IN ACCORDANCE WITH AWS D1.1.
   - 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.

4.9.15

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
X	FABRICATOR CERTIFIED WELD INSPECTION
X	MATERIAL TEST REPORT (MTR)
NA	FABRICATOR NDE INSPECTION
NA	NDE REPORT OF MONOPOLE BASE PLATE (AS REQUIRED)
X	PACKING SLIPS
ADDITIONAL TESTING AND INSPECTIONS:	
	CONSTRUCTION
X	CONSTRUCTION INSPECTIONS
X	FOUNDATION INSPECTIONS
NA	CONCRETE COMP. STRENGTH AND SLUMP TESTS
X	POST INSTALLED ANCHOR ROD VERIFICATION
NA	BASE PLATE GROUT VERIFICATION
X	CONTRACTOR'S CERTIFIED WELD INSPECTION
NA	EARTHWORK: PROVIDE PHOTO DOCUMENTATION OF EXCAVATION QUALITY AND COMPACTION
X	ON SITE COLD GALVANIZING VERIFICATION
NA	GUY WIRE TENSION REPORT
X	GC AS-BUILT DOCUMENTS
X	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)
X	POST INSTALLED ANCHOR ROD PULL-OUT TESTING
X	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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BU #876362; OXFORD/FRITZ PROPERTY
OXFORD, CONNECTICUT
MONOPOLE REINFORCEMENT AND RETROFIT PROJECT

PROJECT: 37515-0074.003.7700	
DRAWN BY: B.M.S.	MI CHECKLIST
CHECKED BY: R.M.K.	
APPROVED BY: JTK	S-9
DATE: 4-9-2015	