

May 22, 2017

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

**RE: Notice of Exempt Modification for T-Mobile / L700 Crown Site BU: 876316**  
**T-Mobile Site ID: CTNH509A**  
**Located at: 21 Acorn Road, Branford, CT 06405**  
**Latitude: 41° 17' 35.06" / Longitude: -72° 45' 46.4"**

Dear Ms. Bachman,

T-Mobile currently maintains six (6) antennas at the 135-foot level of the existing 147-foot monopole at 21 Acorn Road, Branford, CT. The tower is owned by Crown Castle. The property is owned by Altrio Investment Group LLC. T-Mobile now intends to add three (3) antennas and three (3) BiasTs at the same 135-foot level.

This facility was approved by the Town of Branford Planning and Zoning Commission, Application Number 97-5.1 on September 5, 1997. This approval included the condition(s) that:

1. Prior to issuance of a building permit, revise landscape plan to show plantings 36" only in height on all four sides of the equipment area. Eight plants on two sides only.
2. All users of the telecommunications facility must demonstrate compliance with current FCC regulations for electromagnetic frequency emissions and any future changes in these standards.
3. The owner of the telecommunications facility shall provide for and encourage co-locations of other antennae on the facility.

This modification complies with the aforementioned condition(s).

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies §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.S.C.A. § 16-50j-73, a copy of this letter is being sent to the First Selectman James B. Cosgrove, Mr. Harry Smith the Town Planner, the property owner and the tower owner.

1. The proposed modifications will not result in an increase in the height of the existing tower.
2. The proposed modification will not require the extension of the site boundary.
3. The proposed modification 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 emissions at the facility to a level at or above the Federal Communication Commission safety standard.
5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.
6. The existing structure and its foundation can support the proposed loading.

For the foregoing reasons, T-Mobile 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). Please send approval/rejection letter to Attn: Amanda Cornwall.

Sincerely,

Amanda Cornwall

Real Estate Specialist

12 Gill Street, Suite 5800, Woburn, MA 01801

Melanie A. Bachman

May 22, 2017

Page 3

339-205-7017

[Amanda.Cornwall@crowncastle.com](mailto:Amanda.Cornwall@crowncastle.com)

Attachments:

Tab 1: Exhibit-1: Compound plan and elevation depicting the planned changes

Tab 2: Exhibit-2: Structural Modification Report

Tab 3: Exhibit-3: General Power Density Table report (RF Emissions Analysis Report)

cc: First Selectman James B. Cosgrove

Town of Branford

1019 Main Street

Branford, CT 06405

Mr. Harry Smith-Town Planner

Planning and Zoning

1019 Main Street,

Branford CT 06405

Crown Castle (Tower Owner)

12 Gill Street, Suite 5800

Woburn, Ma 01801

Altrio Investment Group LLC (Property Owner)

21 Acorn Road

PO Box 622

Branford, CT 06405

H5/3/10

PLANNING AND ZONING COMMISSION  
TOWN OF BRANFORD TOWN HALL DRIVE P.O. BOX 150  
Branford, Connecticut 06405 488-1255

NOTICE OF DECISION

September 5, 1997

Sprint PCS  
9 Barnes Industrial Road  
Wallingford, Connecticut 06492

SUBJECT: Special Exception APPLICATION: #97-5.1

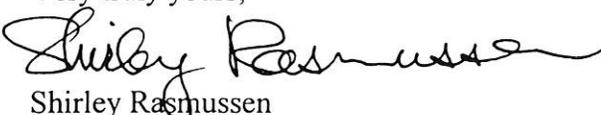
LOCATION: 21 Acorn Road

OWNER OF RECORD: Altrio Investment Group

Dear Sir:

At a meeting of the Branford Planning & Zoning Commission held on Thursday,  
September 4, 1997, the Commission voted to:

Approve your above subject application with the conditions noted below.

Very truly yours,  
  
Shirley Rasmussen  
Town Planner

NOTE: This Special Exception shall become effective only after it is filed on the Land Records  
in the office of the Town Clerk.

1. Prior to issuance of a building permit, revise landscape plan to show plantings 5 to 6 feet in height on all four sides of the equipment area. *36" only*  
*8 plants on two sides only*
2. All users of the telecommunications facility must demonstrate compliance with current FCC regulations for electromagnetic frequency emissions and any future changes in these standards.
3. The owner of the telecommunications facility shall provide for and encourage co-location of other antennae on the facility.

NOTE: Special Exception shall become null and void in the event the applicant fails to obtain a building permit within one (1) year of date of approval.  
(Per Section 31.7 of the Branford Zoning Regulations)

CC: Attorney John Knuff

## 21 ACORN RD

**Location** 21 ACORN RD

**Mblu** H05/000 003/ 00010/ /

**Acct#** 008133

**Owner** ALTRIO INVESTMENT GROUP  
LLC

**Assessment** \$634,200

**Appraisal** \$905,900

**PID** 1176

**Building Count** 1

### Current Value

Appraisal			
Valuation Year	Improvements	Land	Total
2016	\$477,600	\$428,300	\$905,900

Assessment			
Valuation Year	Improvements	Land	Total
2016	\$334,300	\$299,900	\$634,200

### Owner of Record

**Owner** ALTRIO INVESTMENT GROUP LLC

**Sale Price** \$0

**Co-Owner**

**Certificate**

**Address** P O BOX 622  
BRANFORD, CT 06405

**Book & Page** 0568/0731

**Sale Date** 04/08/1994

### Ownership History

Ownership History				
Owner	Sale Price	Certificate	Book & Page	Sale Date
ALTRIO INVESTMENT GROUP LLC			0568/0731	04/08/1994

### Building Information

#### Building 1 : Section 1

**Year Built:** 2001  
**Living Area:** 10911  
**Replacement Cost:** \$647,741  
**Building Percent** 67  
**Good:**  
**Replacement Cost**  
**Less Depreciation:** \$434,000

Building Attributes	
Field	Description

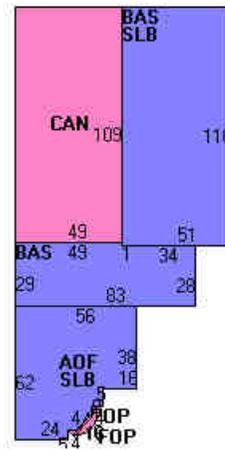
STYLE	Warehouse
MODEL	Ind/Comm
Grade	B
Stories:	1
Occupancy	1
Exterior Wall 1	Concr/Cinder
Exterior Wall 2	
Roof Structure	Flat
Roof Cover	T&G/Rubber
Interior Wall 1	Minim/Masonry
Interior Wall 2	
Interior Floor 1	Concr-Finished
Interior Floor 2	
Heating Fuel	Gas
Heating Type	Forced Air-Duc
AC Type	None
Bldg Use	COMM WHS MDL96
Total Rooms	
Total Bedrms	00
Total Baths	0
1st Floor Use:	3160
Heat/AC	HEAT/AC SPLIT
Frame Type	MASONRY
Baths/Plumbing	AVERAGE
Ceiling/Wall	NONE
Rooms/Prtns	AVERAGE
Wall Height	17
% Comn Wall	0

### Building Photo



(<http://images.vgsi.com/photos/BranfordCTPhotos//\00\01\93/>)

### Building Layout



Building Sub-Areas (sq ft)			Legend
Code	Description	Gross Area	Living Area
BAS	First Floor	7983	7983
AOF	Office	2928	2928
CAN	Canopy	5341	0
FOP	Porch, Open	80	0
SLB	Slab	8538	0
		24870	10911

### Extra Features

Extra Features				Legend
Code	Description	Size	Value	Bldg #
SPR1	SPRINKLERS-WET	13324 S.F.	\$8,900	1
SPR2	WET/CONCEALED	2928 S.F.	\$2,600	1
A/C	AIR CONDITION	2928 S.F.	\$4,300	1

**Land****Land Use**

**Use Code** 3160  
**Description** COMM WHS MDL96  
**Zone** IG-2  
**Neighborhood** 350  
**Alt Land Appr** No  
**Category**

**Land Line Valuation**

**Size (Acres)** 1.56  
**Frontage**  
**Depth**  
**Assessed Value** \$299,900  
**Appraised Value** \$428,300

**Outbuildings**

Outbuildings						<b>Legend</b>
Code	Description	Sub Code	Sub Description	Size	Value	Bldg #
PAV1	PAVING-ASPHALT			21000 S.F.	\$24,300	1
FN3	FENCE-6' CHAIN			500 L.F.	\$3,500	1

**Valuation History**

Appraisal			
Valuation Year	Improvements	Land	Total
2015	\$477,600	\$428,300	\$905,900
2014	\$477,600	\$428,300	\$905,900
2013	\$547,900	\$428,300	\$976,200

Assessment			
Valuation Year	Improvements	Land	Total
2015	\$334,300	\$299,900	\$634,200
2014	\$334,300	\$299,900	\$634,200
2013	\$383,500	\$299,900	\$683,400

Google Maps 21 Acorn Rd



Imagery ©2017 Google, Map data ©2017 Google 50 ft















Date: April 21, 2017

Timothy Howell  
Crown Castle  
3530 Toringdon Way Suite 300  
Charlotte, NC 28277  
704.302.6927

Paul J. Ford and Company  
250 E Broad St, Suite 600  
Columbus, OH 43215  
(614) 221-6679  
mherbert@pjfweb.com

**Subject: Structural Modification Report**

**Carrier Designation:** Metro PCS Co-Locate  
Carrier Site Number: CTNH509A  
Carrier Site Name: Crown Brandford Acorn Rd Mono

**Crown Castle Designation:** Crown Castle BU Number: 876316  
Crown Castle Site Name: SECONDINO PROPERTY  
Crown Castle JDE Job Number: 427805  
Crown Castle Work Order Number: 1392288  
Crown Castle Application Number: 380950 Rev. 5

**Engineering Firm Designation:** Paul J. Ford and Company Project Number: 37517-1800.001.7700

**Site Data:** 21 Acorn Road, BRANFORD, New Haven County, CT  
Latitude 41° 17' 35.06", Longitude -72° 45' 46.4"  
147 Foot - Monopole Tower

Dear Timothy Howell,

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 1025602, in accordance with application 380950, revision 5.

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:

LC4.7: Modified Structure w/ Existing + Reserved + Proposed **Sufficient Capacity**  
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

This analysis has been performed in accordance with the 2016 Connecticut State Building Code based upon an ultimate 3-second gust wind speed of 130 mph converted to a nominal 3-second gust wind speed of 101 mph per Section 1609.3 and Appendix N as required for use in the ANSI/TIA-222-G-2005 Standard, "Structural Standard for Antenna Supporting Structures and Antennas", with ANSI/TIA-222-G-1-2007 and ANSI/TIA-222-G-2-2009 Addenda per Exception #5 of Section 1609.1.1. Risk Category II, Exposure Category C and Topographic Category 1 were used in this analysis.

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:

Michelle Herbert  
Structural Designer TJD



4-24-17

Date: **April 21, 2017**

Timothy Howell  
Crown Castle  
3530 Toringdon Way Suite 300  
Charlotte, NC 28277  
704.302.6927

Paul J. Ford and Company  
250 E Broad St, Suite 600  
Columbus, OH 43215  
(614) 221-6679  
mherbert@pjfweb.com

**Subject: Structural Modification Report**

**Carrier Designation:**

**Metro PCS Co-Locate**

**Carrier Site Number:**

CTNH509A

**Carrier Site Name:**

Crown Brandford Acorn Rd Mono

**Crown Castle Designation:**

**Crown Castle BU Number:**

876316

**Crown Castle Site Name:**

SECONDINO PROPERTY

**Crown Castle JDE Job Number:**

427805

**Crown Castle Work Order Number:**

1392288

**Crown Castle Application Number:**

380950 Rev. 5

**Engineering Firm Designation:**

**Paul J. Ford and Company Project Number:** 37517-1800.001.7700

**Site Data:**

**21 Acorn Road, BRANFORD, New Haven County, CT**  
**Latitude 41° 17' 35.06", Longitude -72° 45' 46.4"**  
**147 Foot - Monopole Tower**

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LC4.7: Modified Structure w/ Existing + Reserved + Proposed

**Sufficient Capacity**

Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

This analysis has been performed in accordance with the 2016 Connecticut State Building Code based upon an ultimate 3-second gust wind speed of 130 mph converted to a nominal 3-second gust wind speed of 101 mph per Section 1609.3 and Appendix N as required for use in the ANSI/TIA-222-G-2005 Standard, "Structural Standard for Antenna Supporting Structures and Antennas", with ANSI/TIA-222-G-1-2007 and ANSI/TIA-222-G-2-2009 Addenda per Exception #5 of Section 1609.1.1. Risk Category II, Exposure Category C and Topographic Category 1 were used in this analysis.

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:

Michelle Herbert  
Structural Designer *TJD*

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**1) INTRODUCTION**

This tower is a 147 ft Monopole tower designed by SUMMIT in September of 1997. The tower was originally designed for a wind speed of 90 mph per TIA/EIA-222-F.

**2) ANALYSIS CRITERIA**

This analysis has been performed in accordance with the 2016 Connecticut State Building Code based upon an ultimate 3-second gust wind speed of 130 mph converted to a nominal 3-second gust wind speed of 101 mph per Section 1609.3 and Appendix N as required for use in the ANSI/TIA-222-G-2005 Standard, "Structural Standard for Antenna Supporting Structures and Antennas", with ANSI/TIA-222-G-1-2007 and ANSI/TIA-222-G-2-2009 Addenda per Exception #5 of Section 1609.1.1. Risk Category II, Exposure Category C and Topographic Category 1 were used in this analysis.

**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
135.0	135.0	3	commscope	ATSBT-TOP-MF-4G	--	--	--
		3	commscope	LNx-6515DS-A1M w/ MP			

**Table 2 - Existing and Reserved Antenna and Cable Information**

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
147.0	147.0	3	alcatel lucent	1900MHz RRH (65MHz)	1 3	5/8 1-1/4	1
		3	alcatel lucent	800 EXTERNAL NOTCH FILTER			
		3	alcatel lucent	800MHZ RRH			
		3	alcatel lucent	TD-RRH8x20-25			
		9	rfs celwave	ACU-A20-N			
		3	rfs celwave	APXVSPP18-C-A20 w/ MP			
		3	rfs celwave	APXVTM14-C-120 w/ MP			
	1	tower mounts	Platform Mount [LP 1201-1]				
	143.0	1	tower mounts	Miscellaneous [NA 507-1]			
135.0	135.0	3	ericsson	ERICSSON AIR 21 B2A B4P w/ MP	1 6	1-3/16 1-5/8	1
		3	ericsson	ERICSSON AIR 21 B4A B2P w/ MP			
		1	tower mounts	T-Arm Mount [TA 602-3]			
116.0	116.0	3	alcatel lucent	RRH2X60-PCS	1	1-5/8	2
		3	alcatel lucent	RRH2x60-700			
		3	alcatel lucent	RRH4X45-AWS4 B66			
		3	commscope	HBXX-6517DS-A2M w/ MP			
		6	commscope	SBNHH-1D65B w/ MP			
		1	rfs celwave	DB-T1-6Z-8AB-0Z			
	2	adc	ClearGain Dual Band 800/1900 MHz	7	1-5/8	1	
	2	antel	LPA-80063/6CF w/ MP				
	2	antel	LPA-80080/4CF w/ MP				
	2	rfs celwave	APL868013 w/ MP				
	1	rfs celwave	DB-T1-6Z-8AB-0Z				
1	tower mounts	Platform Mount [LP 1201-1]					
106.0	108.0	3	andrew	SBNHH-1D65A w/ MP	--	--	2
		3	ericsson	RRUS12/RRUS A2			
		6	ericsson	RRUS-11	2 1 1 12	7/8 17/64 3/8 1-1/4	1
		6	powerwave	7770.00 w/ MP			
		12	powerwave	LGP2140X			
	1	raycap	DC6-48-60-18-8F				
	106.0	1	tower mounts	Platform Mount [LP 1201-1]			
76.0	77.0	1	kathrein	OG-860/1920/GPS-A	--	--	1
		1	lucent	KS24019-L112A			
	76.0	1	tower mounts	Side Arm Mount [SO 701-3]			

- Notes:  
 1) Existing Equipment  
 2) Reserved Equipment  
 3) Equipment To Be Removed

### 3) ANALYSIS PROCEDURE

**Table 3 - Documents Provided**

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	TEP, 25581.34391, 07/30/82015	1529736	CCISITES
4-POST-MODIFICATION INSPECTION	JTec Enterprises, 3017636, 10/10/2005	2031904	CCISITES
4-POST-MODIFICATION INSPECTION	PJF, 41708-0180, 03/15/2009	2417887	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	Summit, 2737, 09/29/1997	1632435	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Summit, 2737-97, 09/29/1997	1632399	CCISITES

#### 3.1) Analysis Method

tnxTower (version 7.0.5.1), 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) For existing modifications: monopole was modified in conformance with the referenced modification drawings.
- 5) For proposed modifications: monopole will be modified 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	147 - 105	Pole	TP29.141x22x0.25	1	-11.90	1503.30	54.3	Pass
L2	105 - 89.75	Pole	TP31.2343x28.0034x0.3125	2	-19.09	2103.39	75.4	Pass
L3	89.75 - 88.25	Pole	TP31.4893x31.2343x0.3125	3	-19.36	2092.11	78.5	Pass
L4	88.25 - 86	Pole	TP31.8719x31.4893x0.5085	4	-19.93	2520.13	69.3	Pass
L5	86 - 84.25	Pole	TP32.1695x31.8719x0.5063	5	-20.37	2510.72	72.1	Pass
L6	84.25 - 73.75	Pole	TP33.955x32.1695x0.455	6	-21.88	2511.02	80.9	Pass
L7	73.75 - 63.0833	Pole	TP35.1437x32.3223x0.5515	7	-27.20	3027.30	86.4	Pass
L8	63.0833 - 42.75	Pole	TP38.601x35.1437x0.6697	8	-32.83	3863.68	82.0	Pass
L9	42.75 - 32.75	Pole	TP39.5513x36.454x0.7197	9	-40.27	4331.21	86.6	Pass
L10	32.75 - 8.25	Pole	TP43.7172x39.5513x0.7306	10	-51.30	4984.42	91.2	Pass
L11	8.25 - 6.25	Pole	TP44.0573x43.7172x0.7918	11	-52.32	5147.59	89.7	Pass
L12	6.25 - 3.25	Pole	TP44.5674x44.0573x0.7682	12	-53.81	5156.32	91.3	Pass
L13	3.25 - 0	Pole	TP45.12x44.5674x0.7629	13	-55.44	5424.96	88.5	Pass
							Summary	
						Pole (L12)	91.3	Pass
						RATING =	91.3	Pass

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

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	98.6	Pass
1	Base Plate	0	83.5	Pass
1	Base Foundation Structural Steel	0	66.0	Pass
1	Base Foundation Soil Interaction	0	66.1	Pass

<b>Structure Rating (max from all components) =</b>	<b>98.6%</b>
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Notes:

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

#### 4.1) Recommendations

The monopole and its foundation will have sufficient capacity to carry the proposed loading configuration once the proposed modifications are installed.

- Install the proposed modifications per the attached drawings.

**APPENDIX A**  
**TNXTOWER OUTPUT**

## Tower Input Data

There is a pole section.

This tower is designed using the TIA-222-G standard.

The following design criteria apply:

- 1) Tower is located in New Haven County, Connecticut.
- 2) ASCE 7-10 Wind Data is used (wind speeds converted to nominal values).
- 3) Basic wind speed of 101 mph.
- 4) Structure Class II.
- 5) Exposure Category C.
- 6) Topographic Category 1.
- 7) Crest Height 0.00 ft.
- 8) Nominal ice thickness of 0.7500 in.
- 9) Ice thickness is considered to increase with height.
- 10) Ice density of 56 pcf.
- 11) A wind speed of 50 mph is used in combination with ice.
- 12) Temperature drop of 50 °F.
- 13) Deflections calculated using a wind speed of 60 mph.
- 14) A non-linear (P-delta) analysis was used.
- 15) Pressures are calculated at each section.
- 16) Stress ratio used in pole design is 1.
- 17) Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

## Options

Consider Moments - Legs Consider Moments - Horizontals Consider Moments - Diagonals Use Moment Magnification ✓ Use Code Stress Ratios ✓ Use Code Safety Factors - Guys Escalate Ice Always Use Max Kz Use Special Wind Profile  Include Bolts In Member Capacity  Leg Bolts Are At Top Of Section Secondary Horizontal Braces Leg Use Diamond Inner Bracing (4 Sided) SR Members Have Cut Ends SR Members Are Concentric	Distribute Leg Loads As Uniform Assume Legs Pinned ✓ Assume Rigid Index Plate ✓ Use Clear Spans For Wind Area ✓ Use Clear Spans For KL/r Retension Guys To Initial Tension ✓ Bypass Mast Stability Checks ✓ Use Azimuth Dish Coefficients ✓ Project Wind Area of Appurt.  Autocalc Torque Arm Areas  Add IBC .6D+W Combination Sort Capacity Reports By Component Triangulate Diamond Inner Bracing Treat Feed Line Bundles As Cylinder	Use ASCE 10 X-Brace Ly Rules Calculate Redundant Bracing Forces Ignore Redundant Members in FEA SR Leg Bolts Resist Compression All Leg Panels Have Same Allowable Offset Girt At Foundation ✓ Consider Feed Line Torque Include Angle Block Shear Check Use TIA-222-G Bracing Resist. Exemption Use TIA-222-G Tension Splice Exemption  <div style="text-align: center; background-color: #e0e0e0; padding: 2px;"><b>Poles</b></div> ✓ Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets
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## Tapered Pole Section Geometry

Section	Elevation <small>ft</small>	Section Length <small>ft</small>	Splice Length <small>ft</small>	Number of Sides	Top Diameter <small>in</small>	Bottom Diameter <small>in</small>	Wall Thickness <small>in</small>	Bend Radius <small>in</small>	Pole Grade
L1	147.00-105.00	42.00	3.75	18	22.0000	29.1410	0.2500	1.0000	A607-60 (60 ksi)
L2	105.00-89.75	19.00	0.00	18	28.0034	31.2343	0.3125	1.2500	A607-60 (60 ksi)
L3	89.75-88.25	1.50	0.00	18	31.2343	31.4893	0.3125	1.2500	Reinf 59.19 ksi (59 ksi)
L4	88.25-86.00	2.25	0.00	18	31.4893	31.8719	0.5085	2.0338	Reinf 43.56 ksi (44 ksi)
L5	86.00-84.25	1.75	0.00	18	31.8719	32.1695	0.5063	2.0252	Reinf 43.17 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
L6	84.25-73.75	10.50	4.25	18	32.1695	33.9550	0.4550	1.8200	(43 ksi) Reinf 46.41 ksi
L7	73.75-63.08	14.92	0.00	18	32.3223	35.1437	0.5515	2.2060	(46 ksi) Reinf 43.74 ksi
L8	63.08-42.75	20.33	4.75	18	35.1437	38.6010	0.6696	2.6786	(44 ksi) Reinf 42.84 ksi
L9	42.75-32.75	14.75	0.00	18	36.4540	39.5513	0.7197	2.8787	(43 ksi) Reinf 42.72 ksi
L10	32.75-8.25	24.50	0.00	18	39.5513	43.7172	0.7306	2.9222	(43 ksi) Reinf 43.75 ksi
L11	8.25-6.25	2.00	0.00	18	43.7172	44.0573	0.7918	3.1671	(44 ksi) Reinf 41.42 ksi
L12	6.25-3.25	3.00	0.00	18	44.0573	44.5674	0.7682	3.0730	(41 ksi) Reinf 42.24 ksi
L13	3.25-0.00	3.25		18	44.5674	45.1200	0.7629	3.0515	(42 ksi) Reinf 44.19 ksi (44 ksi)

### Tapered Pole Properties

Section	Tip Dia. in	Area in <sup>2</sup>	I in <sup>4</sup>	r in	C in	I/C in <sup>3</sup>	J in <sup>4</sup>	It/Q in <sup>2</sup>	w in	w/t
L1	22.3394	17.2586	1031.4832	7.7212	11.1760	92.2945	2064.3237	8.6310	3.4320	13.728
	29.5905	22.9250	2417.5313	10.2563	14.8036	163.3067	4838.2436	11.4647	4.6888	18.755
L2	29.0829	27.4659	2660.7623	9.8303	14.2257	187.0387	5325.0257	13.7356	4.3786	14.012
	31.7161	30.6705	3704.9933	10.9772	15.8670	233.5029	7414.8618	15.3382	4.9472	15.831
L3	31.7161	30.6705	3704.9933	10.9772	15.8670	233.5029	7414.8618	15.3382	4.9472	15.831
	31.9751	30.9235	3797.4379	11.0678	15.9966	237.3905	7599.8725	15.4647	4.9921	15.975
L4	31.9751	49.9986	6062.9281	10.9982	15.9966	379.0139	12133.833	25.0040	4.6472	9.14
	32.3636	50.6160	6290.3368	11.1340	16.1909	388.5095	12588.950	25.3128	4.7146	9.272
L5	32.3636	50.4045	6264.9089	11.1348	16.1909	386.9390	12538.061	25.2070	4.7184	9.319
	32.6658	50.8827	6444.9201	11.2404	16.3421	394.3749	12898.320	25.4462	4.7707	9.423
L6	32.6658	45.8012	5820.0967	11.2587	16.3421	356.1409	11647.851	22.9049	4.8610	10.684
	34.4788	48.3797	6859.4641	11.8925	17.2491	397.6699	13727.954	24.1944	5.1753	11.374
L7	33.6372	55.6136	7092.0984	11.2786	16.4197	431.9253	14193.528	27.8121	4.7181	8.555
	35.6858	60.5522	9154.2455	12.2802	17.8530	512.7574	18320.536	30.2819	5.2146	9.455
L8	35.6858	73.2734	11001.889	12.2383	17.8530	616.2497	22018.255	36.6437	5.0067	7.477
	39.1965	80.6219	14655.044	13.4656	19.6093	747.3514	29329.372	40.3186	5.6152	8.385
L9	38.0292	81.6267	13168.656	12.6857	18.5186	711.1025	26354.640	40.8211	5.1493	7.155
	40.1615	88.7018	16898.234	13.7852	20.0921	841.0398	33818.704	44.3593	5.6944	7.912
L10	40.1615	90.0163	17139.063	13.7814	20.0921	853.0260	34300.679	45.0167	5.6753	7.768
	44.3916	99.6760	23269.932	15.2603	22.2083	1047.8016	46570.484	49.8475	6.4085	8.772
L11	44.3916	107.8750	25112.351	15.2385	22.2083	1130.7623	50257.746	53.9477	6.3007	7.958
	44.7369	108.7296	25713.956	15.3593	22.3811	1148.9140	51461.747	54.3751	6.3606	8.033
L12	44.7369	105.5557	24990.511	15.3676	22.3811	1116.5901	50013.907	52.7879	6.4020	8.333
	45.2549	106.7995	25884.396	15.5487	22.6402	1143.2922	51802.851	53.4099	6.4918	8.45
L13	45.2549	106.0674	25713.238	15.5506	22.6402	1135.7323	51460.311	53.0438	6.5012	8.522

Section	Tip Dia. in	Area in <sup>2</sup>	I in <sup>4</sup>	r in	C in	I/C in <sup>3</sup>	J in <sup>4</sup>	It/Q in <sup>2</sup>	w in	w/t
	45.8160	107.4055	26698.731 3	15.7468	22.9210	1164.8173	53432.593 4	53.7130	6.5985	8.649

Tower Elevation ft	Gusset Area (per face) ft <sup>2</sup>	Gusset Thickness in	Gusset Grade	Adjust. Factor A <sub>r</sub>	Adjust. Factor A <sub>r</sub>	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
L1 147.00-105.00				1	1	1			
L2 105.00-89.75				1	1	1			
L3 89.75-88.25				1	1	1			
L4 88.25-86.00				1	1	1			
L5 86.00-84.25				1	1	1			
L6 84.25-73.75				1	1	1			
L7 73.75-63.08				1	1	1			
L8 63.08-42.75				1	1	1			
L9 42.75-32.75				1	1	1			
L10 32.75-8.25				1	1	1			
L11 8.25-6.25				1	1	1			
L12 6.25-3.25				1	1	1			
L13 3.25-0.00				1	1	1			

### Feed Line/Linear Appurtenances - Entered As Area

Description	Face Leg	Allow Shield	Component Type	Placement ft	Total Number		C <sub>A</sub> A <sub>A</sub> ft <sup>2</sup> /ft	Weight plf
***								
HB058-M12-XXXF(5/8)	C	No	CaAa (Out Of Face)	147.00 - 0.00	1	No Ice 1/2" Ice 1" Ice	0.08 0.18 0.28	0.24 1.06 2.49
HB114-1-0813U4-M5J(1-1/4)	C	No	Inside Pole	147.00 - 0.00	3	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	1.20 1.20 1.20
***								
1.2 Masterline Extreme Hybrid(1-3/16)	C	No	Inside Pole	135.00 - 0.00	1	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.95 0.95 0.95
AVA7-50(1-5/8)	C	No	CaAa (Out Of Face)	135.00 - 0.00	5	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.70 2.23 4.38
AVA7-50(1-5/8)	C	No	CaAa (Out Of Face)	135.00 - 0.00	1	No Ice 1/2" Ice 1" Ice	0.20 0.30 0.40	0.70 2.23 4.38
***								
HB158-1-08U8-S8J18(1-5/8)	C	No	Inside Pole	116.00 - 0.00	1	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	1.30 1.30 1.30
LDF7-50A(1-5/8)	C	No	Inside Pole	116.00 - 0.00	6	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.82 0.82 0.82
HB158-1-08U8-S8J18(1-5/8)	C	No	Inside Pole	116.00 - 0.00	1	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	1.30 1.30 1.30
***								

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C <sub>A</sub> A <sub>A</sub>		Weight
						ft <sup>2</sup> /ft	plf	
6-8AWG 3 PAIR(7/8)	C	No	Inside Pole	106.00 - 0.00	2	No Ice	0.00	0.68
						1/2" Ice	0.00	0.68
						1" Ice	0.00	0.68
A-DQZNB2Yn1750 N(17/64)	C	No	Inside Pole	106.00 - 0.00	1	No Ice	0.00	0.03
						1/2" Ice	0.00	0.03
						1" Ice	0.00	0.03
2" (Nominal) Conduit	C	No	Inside Pole	106.00 - 0.00	1	No Ice	0.00	0.72
						1/2" Ice	0.00	0.72
						1" Ice	0.00	0.72
LDF2-50A(3/8)	C	No	Inside Pole	106.00 - 0.00	1	No Ice	0.00	0.08
						1/2" Ice	0.00	0.08
						1" Ice	0.00	0.08
LDF6-50A(1-1/4)	C	No	Inside Pole	106.00 - 0.00	12	No Ice	0.00	0.60
						1/2" Ice	0.00	0.60
						1" Ice	0.00	0.60
*****								
*****								
Aero MP3-05	C	No	CaAa (Out Of Face)	90.50 - 0.00	1	No Ice	0.35	0.00
						1/2" Ice	0.40	0.00
						1" Ice	0.66	0.00
1 1/4" Flat Reinforcement	C	No	CaAa (Out Of Face)	35.00 - 0.00	1	No Ice	0.21	0.00
						1/2" Ice	0.32	0.00
						1" Ice	0.43	0.00
1" Flat Reinforcement	C	No	CaAa (Out Of Face)	65.00 - 35.00	1	No Ice	0.17	0.00
						1/2" Ice	0.28	0.00
						1" Ice	0.39	0.00

**Feed Line/Linear Appurtenances Section Areas**

Tower Section	Tower Elevation	Face	A <sub>R</sub>	A <sub>F</sub>	C <sub>A</sub> A <sub>A</sub> In Face	C <sub>A</sub> A <sub>A</sub> Out Face	Weight
n	ft		ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>2</sup>	K
L1	147.00-105.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	9.558	0.41
L2	105.00-89.75	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	4.607	0.40
L3	89.75-88.25	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.949	0.04
L4	88.25-86.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	1.424	0.06
L5	86.00-84.25	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	1.107	0.05
L6	84.25-73.75	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	6.644	0.27
L7	73.75-63.08	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	7.069	0.28
L8	63.08-42.75	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	16.256	0.53
L9	42.75-32.75	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	8.088	0.26
L10	32.75-8.25	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	20.608	0.63
L11	8.25-6.25	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	1.682	0.05
L12	6.25-3.25	A	0.000	0.000	0.000	0.000	0.00

Tower Section n	Tower Elevation ft	Face	$A_R$ $ft^2$	$A_F$ $ft^2$	$C_{AA}$ In Face $ft^2$	$C_{AA}$ Out Face $ft^2$	Weight K
L13	3.25-0.00	B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	2.523	0.08
		A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	2.734	0.08

### Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section n	Tower Elevation ft	Face or Leg	Ice Thickness in	$A_R$ $ft^2$	$A_F$ $ft^2$	$C_{AA}$ In Face $ft^2$	$C_{AA}$ Out Face $ft^2$	Weight K
L1	147.00-105.00	A	1.714	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	34.239	2.09
L2	105.00-89.75	A	1.671	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	15.413	1.22
L3	89.75-88.25	A	1.656	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	2.625	0.12
L4	88.25-86.00	A	1.653	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	3.933	0.17
L5	86.00-84.25	A	1.649	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	3.055	0.13
L6	84.25-73.75	A	1.637	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	18.246	0.80
L7	73.75-63.08	A	1.613	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	19.552	0.82
L8	63.08-42.75	A	1.572	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	45.008	1.50
L9	42.75-32.75	A	1.520	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	22.229	0.74
L10	32.75-8.25	A	1.429	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	52.289	1.67
L11	8.25-6.25	A	1.289	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	4.032	0.12
L12	6.25-3.25	A	1.236	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	5.913	0.18
L13	3.25-0.00	A	1.110	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	6.061	0.18

### Feed Line Center of Pressure

Section	Elevation ft	$CP_x$ in	$CP_z$ in	$CP_x$ Ice in	$CP_z$ Ice in
L1	147.00-105.00	-0.2701	0.1559	-0.7044	0.4067
L2	105.00-89.75	-0.3461	0.1998	-0.8567	0.4946
L3	89.75-88.25	-0.6537	0.3774	-1.2695	0.7330
L4	88.25-86.00	-0.6549	0.3781	-1.2743	0.7357
L5	86.00-84.25	-0.6563	0.3789	-1.2792	0.7385
L6	84.25-73.75	-0.6602	0.3812	-1.2935	0.7468

Section	Elevation ft	CP <sub>x</sub> in	CP <sub>z</sub> in	CP <sub>x</sub> Ice in	CP <sub>z</sub> Ice in
L7	73.75-63.08	-0.6904	0.3986	-1.3580	0.7840
L8	63.08-42.75	-0.8141	0.4700	-1.5790	0.9116
L9	42.75-32.75	-0.8292	0.4787	-1.6134	0.9315
L10	32.75-8.25	-0.8687	0.5015	-1.6316	0.9420
L11	8.25-6.25	-0.8773	0.5065	-1.6113	0.9303
L12	6.25-3.25	-0.8789	0.5074	-1.5954	0.9211
L13	3.25-0.00	-0.8808	0.5085	-1.5490	0.8943

### Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K <sub>a</sub> No Ice	K <sub>a</sub> Ice

### Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment t °	Placement ft	C <sub>A</sub> A <sub>A</sub> Front ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Side ft <sup>2</sup>	Weight K	
***									
APXVSP18-C-A20 w/ Mount Pipe	A	From Leg	4.00	0.0000	147.00	No Ice	8.26	6.95	0.08
			0.00			1/2"	8.82	8.13	0.15
			0.00			Ice	9.35	9.02	0.23
						1" Ice			
APXVSP18-C-A20 w/ Mount Pipe	B	From Leg	4.00	0.0000	147.00	No Ice	8.26	6.95	0.08
			0.00			1/2"	8.82	8.13	0.15
			0.00			Ice	9.35	9.02	0.23
						1" Ice			
APXVSP18-C-A20 w/ Mount Pipe	C	From Leg	4.00	0.0000	147.00	No Ice	8.26	6.95	0.08
			0.00			1/2"	8.82	8.13	0.15
			0.00			Ice	9.35	9.02	0.23
						1" Ice			
APXVTM14-C-120 w/ Mount Pipe	A	From Leg	4.00	0.0000	147.00	No Ice	6.58	4.96	0.08
			0.00			1/2"	7.03	5.75	0.13
			0.00			Ice	7.47	6.47	0.19
						1" Ice			
APXVTM14-C-120 w/ Mount Pipe	B	From Leg	4.00	0.0000	147.00	No Ice	6.58	4.96	0.08
			0.00			1/2"	7.03	5.75	0.13
			0.00			Ice	7.47	6.47	0.19
						1" Ice			
APXVTM14-C-120 w/ Mount Pipe	C	From Leg	4.00	0.0000	147.00	No Ice	6.58	4.96	0.08
			0.00			1/2"	7.03	5.75	0.13
			0.00			Ice	7.47	6.47	0.19
						1" Ice			
800 EXTERNAL NOTCH FILTER	A	From Leg	4.00	0.0000	147.00	No Ice	0.66	0.32	0.01
			0.00			1/2"	0.76	0.40	0.02
			0.00			Ice	0.87	0.48	0.02
						1" Ice			
800 EXTERNAL NOTCH FILTER	B	From Leg	4.00	0.0000	147.00	No Ice	0.66	0.32	0.01
			0.00			1/2"	0.76	0.40	0.02
			0.00			Ice	0.87	0.48	0.02
						1" Ice			
800 EXTERNAL NOTCH FILTER	C	From Leg	4.00	0.0000	147.00	No Ice	0.66	0.32	0.01
			0.00			1/2"	0.76	0.40	0.02
			0.00			Ice	0.87	0.48	0.02
						1" Ice			
1900MHz RRH (65MHz)	A	From Leg	4.00	0.0000	147.00	No Ice	2.32	2.24	0.06
			0.00			1/2"	2.53	2.44	0.08

Description	Face or Leg	Offset Type	Offsets:			Azimuth Adjustment	Placement	C <sub>A</sub> A <sub>A</sub> Front	C <sub>A</sub> A <sub>A</sub> Side	Weight	
			Horz	Lateral	Vert						ft
			0.00								
1900MHz RRH (65MHz)	B	From Leg				147.00	Ice	2.74	2.65	0.11	
							1" Ice				
							No Ice	2.32	2.24	0.06	
							1/2"	2.53	2.44	0.08	
1900MHz RRH (65MHz)	C	From Leg				147.00	Ice	2.74	2.65	0.11	
							1" Ice				
							No Ice	2.32	2.24	0.06	
							1/2"	2.53	2.44	0.08	
(3) ACU-A20-N	A	From Leg				147.00	Ice	2.74	2.65	0.11	
							1" Ice				
							No Ice	0.07	0.12	0.00	
							1/2"	0.10	0.16	0.00	
(3) ACU-A20-N	B	From Leg				147.00	Ice	0.15	0.21	0.00	
							1" Ice				
							No Ice	0.07	0.12	0.00	
							1/2"	0.10	0.16	0.00	
(3) ACU-A20-N	C	From Leg				147.00	Ice	0.15	0.21	0.00	
							1" Ice				
							No Ice	0.07	0.12	0.00	
							1/2"	0.10	0.16	0.00	
800MHZ RRH	A	From Leg				147.00	Ice	2.51	2.13	0.10	
							1" Ice				
							No Ice	2.13	1.77	0.05	
							1/2"	2.32	1.95	0.07	
800MHZ RRH	B	From Leg				147.00	Ice	2.51	2.13	0.10	
							1" Ice				
							No Ice	2.13	1.77	0.05	
							1/2"	2.32	1.95	0.07	
800MHZ RRH	C	From Leg				147.00	Ice	2.51	2.13	0.10	
							1" Ice				
							No Ice	2.13	1.77	0.05	
							1/2"	2.32	1.95	0.07	
TD-RRH8x20-25	A	From Leg				147.00	Ice	4.56	1.90	0.13	
							1" Ice				
							No Ice	4.05	1.53	0.07	
							1/2"	4.30	1.71	0.10	
TD-RRH8x20-25	B	From Leg				147.00	Ice	4.56	1.90	0.13	
							1" Ice				
							No Ice	4.05	1.53	0.07	
							1/2"	4.30	1.71	0.10	
TD-RRH8x20-25	C	From Leg				147.00	Ice	4.56	1.90	0.13	
							1" Ice				
							No Ice	4.05	1.53	0.07	
							1/2"	4.30	1.71	0.10	
Platform Mount [LP 1201-1]	C	None				147.00	Ice	30.50	30.50	2.90	
							1" Ice				
							No Ice	23.10	23.10	2.10	
							1/2"	26.80	26.80	2.50	
Miscellaneous [NA 507-1]	C	From Leg				147.00	Ice	8.60	8.60	0.34	
							1" Ice				
							No Ice	4.80	4.80	0.25	
							1/2"	6.70	6.70	0.29	
(2) 2 3/8" OD x 6 ft mount pipe	A	From Leg				147.00	Ice	2.29	2.29	0.03	
							1" Ice				
							No Ice	1.43	1.43	0.00	
							1/2"	1.92	1.92	0.01	
(2) 2 3/8" OD x 6 ft mount pipe	B	From Leg				147.00	Ice	2.29	2.29	0.03	
							1" Ice				
							No Ice	1.43	1.43	0.00	
							1/2"	1.92	1.92	0.01	
(2) 2 3/8" OD x 6 ft mount pipe	C	From Leg				147.00	Ice	2.29	2.29	0.03	
							1" Ice				
							No Ice	1.43	1.43	0.00	
							1/2"	1.92	1.92	0.01	

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment t °	Placement ft	C <sub>A</sub> A <sub>A</sub> Front ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Side ft <sup>2</sup>	Weight K	
						1" Ice			
*** ERICSSON AIR 21 B2A B4P w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	6.33 6.78 7.21	5.64 6.43 7.13	0.11 0.17 0.23
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	6.33 6.78 7.21	5.64 6.43 7.13	0.11 0.17 0.23
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	6.33 6.78 7.21	5.64 6.43 7.13	0.11 0.17 0.23
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	6.32 6.76 7.20	5.63 6.42 7.12	0.11 0.17 0.23
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	6.32 6.76 7.20	5.63 6.42 7.12	0.11 0.17 0.23
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	6.32 6.76 7.20	5.63 6.42 7.12	0.11 0.17 0.23
LNX-6515DS-A1M w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	11.68 12.40 13.14	9.84 11.37 12.91	0.08 0.17 0.27
LNX-6515DS-A1M w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	11.68 12.40 13.14	9.84 11.37 12.91	0.08 0.17 0.27
LNX-6515DS-A1M w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	11.68 12.40 13.14	9.84 11.37 12.91	0.08 0.17 0.27
ATSBT-TOP-MF-4G	A	From Leg	4.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	0.17 0.23 0.29	0.09 0.14 0.19	0.00 0.00 0.01
ATSBT-TOP-MF-4G	B	From Leg	4.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	0.17 0.23 0.29	0.09 0.14 0.19	0.00 0.00 0.01
ATSBT-TOP-MF-4G	C	From Leg	4.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	0.17 0.23 0.29	0.09 0.14 0.19	0.00 0.00 0.01
T-Arm Mount [TA 602-3]	C	None		0.0000	135.00	No Ice 1/2" Ice	11.59 15.44 19.29	11.59 15.44 19.29	0.77 0.99 1.21
*** (2) LPA-80080/4CF w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	116.00	No Ice 1/2" Ice	2.86 3.22 3.59	6.57 7.19 7.84	0.03 0.08 0.13
(2) LPA-80063/6CF w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	116.00	No Ice 1/2" Ice	9.83 10.40 10.93	10.22 11.38 12.27	0.05 0.14 0.25
(2) APL868013 w/ Mount Pipe	C	From Leg	4.00 0.00	0.0000	116.00	No Ice 1/2"	3.10 3.48	4.80 5.42	0.02 0.06



Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C <sub>A</sub> A <sub>A</sub> Front ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Side ft <sup>2</sup>	Weight K	
RRH4X45-AWS4 B66	C	From Leg	4.00 0.00 0.00	0.0000	116.00	1" Ice			
						No Ice	2.66	1.59	0.06
						1/2" Ice	2.88	1.77	0.08
DB-T1-6Z-8AB-0Z	C	From Leg	4.00 0.00 0.00	0.0000	116.00	1" Ice			
						No Ice	4.80	2.00	0.04
						1/2" Ice	5.07	2.19	0.08
Platform Mount [LP 1201-1]	C	None		0.0000	116.00	1" Ice			
						No Ice	23.10	23.10	2.10
						1/2" Ice	26.80	26.80	2.50
*** (2) 7770.00 w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.0000	106.00	1" Ice			
						No Ice	5.80	4.58	0.09
						1/2" Ice	6.27	5.51	0.14
(2) 7770.00 w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	0.0000	106.00	1" Ice			
						No Ice	5.80	4.58	0.09
						1/2" Ice	6.27	5.51	0.14
(2) 7770.00 w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.0000	106.00	1" Ice			
						No Ice	5.80	4.58	0.09
						1/2" Ice	6.27	5.51	0.14
(4) LGP2140X	A	From Leg	4.00 0.00 2.00	0.0000	106.00	1" Ice			
						No Ice	1.08	0.36	0.01
						1/2" Ice	1.21	0.45	0.02
(4) LGP2140X	B	From Leg	4.00 0.00 2.00	0.0000	106.00	1" Ice			
						No Ice	1.08	0.36	0.01
						1/2" Ice	1.21	0.45	0.02
(4) LGP2140X	C	From Leg	4.00 0.00 2.00	0.0000	106.00	1" Ice			
						No Ice	1.08	0.36	0.01
						1/2" Ice	1.21	0.45	0.02
DC6-48-60-18-8F	A	From Leg	4.00 0.00 2.00	0.0000	106.00	1" Ice			
						No Ice	0.92	0.92	0.02
						1/2" Ice	1.46	1.46	0.04
(2) RRUS-11	A	From Leg	4.00 0.00 2.00	0.0000	106.00	1" Ice			
						No Ice	2.79	1.19	0.05
						1/2" Ice	3.00	1.34	0.07
(2) RRUS-11	B	From Leg	4.00 0.00 2.00	0.0000	106.00	1" Ice			
						No Ice	2.79	1.19	0.05
						1/2" Ice	3.00	1.34	0.07
(2) RRUS-11	C	From Leg	4.00 0.00 2.00	0.0000	106.00	1" Ice			
						No Ice	2.79	1.19	0.05
						1/2" Ice	3.00	1.34	0.07
SBNHH-1D65A w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.0000	106.00	1" Ice			
						No Ice	5.82	5.05	0.06
						1/2" Ice	6.20	5.72	0.11
SBNHH-1D65A w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	0.0000	106.00	1" Ice			
						No Ice	5.82	5.05	0.06
						1/2" Ice	6.20	5.72	0.11
SBNHH-1D65A w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.0000	106.00	1" Ice			
						No Ice	5.82	5.05	0.06
						1/2" Ice	6.20	5.72	0.11
						Ice	6.60	6.38	0.17

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>A</sub> A <sub>A</sub> Front	C <sub>A</sub> A <sub>A</sub> Side	Weight
			Horz	Vert					
RRUS12/RRUS A2	A	From Leg	4.00	0.0000	106.00	1" Ice	3.14	1.84	0.07
			0.00			No Ice	3.36	2.01	0.10
			2.00			1/2" Ice	3.59	2.20	0.13
RRUS12/RRUS A2	B	From Leg	4.00	0.0000	106.00	1" Ice	3.14	1.84	0.07
			0.00			No Ice	3.36	2.01	0.10
			2.00			1/2" Ice	3.59	2.20	0.13
RRUS12/RRUS A2	C	From Leg	4.00	0.0000	106.00	1" Ice	3.14	1.84	0.07
			0.00			No Ice	3.36	2.01	0.10
			2.00			1/2" Ice	3.59	2.20	0.13
Platform Mount [LP 1201-1]	C	None		0.0000	106.00	1" Ice	23.10	23.10	2.10
						No Ice	26.80	26.80	2.50
						1/2" Ice	30.50	30.50	2.90
						1" Ice			
*** OG-860/1920/GPS-A	B	From Leg	4.00	0.0000	76.00	No Ice	0.31	0.37	0.00
			0.00			1/2" Ice	0.40	0.46	0.01
			1.00			1" Ice	0.49	0.55	0.01
KS24019-L112A	C	From Leg	4.00	0.0000	76.00	No Ice	0.14	0.14	0.01
			0.00			1/2" Ice	0.20	0.20	0.01
			1.00			1" Ice	0.26	0.26	0.01
Side Arm Mount [SO 701-3]	C	None		0.0000	76.00	1" Ice	2.83	2.83	0.20
						No Ice	3.92	3.92	0.24
						1/2" Ice	5.01	5.01	0.28
						1" Ice			

### Tower Pressures - No Ice

$G_H = 1.100$

Section Elevation	z	K <sub>Z</sub>	q <sub>z</sub>	A <sub>G</sub>	F a c e	A <sub>F</sub>	A <sub>R</sub>	A <sub>leg</sub>	Leg %	C <sub>A</sub> A <sub>A</sub> In Face	C <sub>A</sub> A <sub>A</sub> Out Face
ft	ft		psf	ft <sup>2</sup>		ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>2</sup>		ft <sup>2</sup>	ft <sup>2</sup>
L1 147.00-105.00	125.21	1.327	32.89	90.877	A	0.000	90.877	90.877	100.00	0.000	0.000
					B	0.000	90.877	100.00	0.000	0.000	
					C	0.000	90.877	100.00	0.000	9.558	
L2 105.00-89.75	97.26	1.258	31.22	38.633	A	0.000	38.633	38.633	100.00	0.000	0.000
					B	0.000	38.633	100.00	0.000	0.000	
					C	0.000	38.633	100.00	0.000	4.607	
L3 89.75-88.25	89.00	1.235	30.64	3.981	A	0.000	3.981	3.981	100.00	0.000	0.000
					B	0.000	3.981	100.00	0.000	0.000	
					C	0.000	3.981	100.00	0.000	0.949	
L4 88.25-86.00	87.12	1.229	30.50	6.032	A	0.000	6.032	6.032	100.00	0.000	0.000
					B	0.000	6.032	100.00	0.000	0.000	
					C	0.000	6.032	100.00	0.000	1.424	
L5 86.00-84.25	85.12	1.223	30.35	4.742	A	0.000	4.742	4.742	100.00	0.000	0.000
					B	0.000	4.742	100.00	0.000	0.000	
					C	0.000	4.742	100.00	0.000	1.107	
L6 84.25-73.75	78.95	1.204	29.87	29.376	A	0.000	29.376	29.376	100.00	0.000	0.000
					B	0.000	29.376	100.00	0.000	0.000	
					C	0.000	29.376	100.00	0.000	6.644	
L7 73.75-63.08	68.36	1.168	28.98	30.810	A	0.000	30.810	30.810	100.00	0.000	0.000
					B	0.000	30.810	100.00	0.000	0.000	
					C	0.000	30.810	100.00	0.000	0.000	

Section Elevation ft	z ft	K <sub>Z</sub>	q <sub>z</sub> psf	A <sub>G</sub> ft <sup>2</sup>	F a c e	A <sub>F</sub> ft <sup>2</sup>	A <sub>R</sub> ft <sup>2</sup>	A <sub>leg</sub> ft <sup>2</sup>	Leg %	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>
L8 63.08-42.75	52.76	1.106	27.44	63.442	C	0.000	30.810	63.442	100.00	0.000	7.069
					A	0.000	63.442		100.00	0.000	0.000
					B	0.000	63.442		100.00	0.000	0.000
L9 42.75-32.75	37.70	1.031	25.57	32.579	C	0.000	63.442	32.579	100.00	0.000	16.256
					A	0.000	32.579		100.00	0.000	0.000
					B	0.000	32.579		100.00	0.000	0.000
L10 32.75-8.25	20.30	0.905	22.44	86.315	C	0.000	32.579	86.315	100.00	0.000	8.088
					A	0.000	86.315		100.00	0.000	0.000
					B	0.000	86.315		100.00	0.000	0.000
L11 8.25-6.25	7.25	0.85	21.09	7.427	C	0.000	86.315	7.427	100.00	0.000	20.608
					A	0.000	7.427		100.00	0.000	0.000
					B	0.000	7.427		100.00	0.000	0.000
L12 6.25-3.25	4.75	0.85	21.09	11.249	C	0.000	7.427	11.249	100.00	0.000	1.682
					A	0.000	11.249		100.00	0.000	0.000
					B	0.000	11.249		100.00	0.000	0.000
L13 3.25-0.00	1.62	0.85	21.09	12.333	C	0.000	11.249	12.333	100.00	0.000	2.523
					A	0.000	12.333		100.00	0.000	0.000
					B	0.000	12.333		100.00	0.000	0.000
					C	0.000	12.333		100.00	0.000	2.734

**Tower Pressure - With Ice**

$G_H = 1.100$

Section Elevation ft	z ft	K <sub>Z</sub>	q <sub>z</sub> psf	t <sub>z</sub> in	A <sub>G</sub> ft <sup>2</sup>	F a c e	A <sub>F</sub> ft <sup>2</sup>	A <sub>R</sub> ft <sup>2</sup>	A <sub>leg</sub> ft <sup>2</sup>	Leg %	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>
L1 147.00-105.00	125.21	1.327	8.06	1.7140	102.875	A	0.000	102.875	102.875	100.00	0.000	0.000
						B	0.000	102.875		100.00	0.000	0.000
						C	0.000	102.875		100.00	0.000	34.239
L2 105.00-89.75	97.26	1.258	7.65	1.6712	42.989	A	0.000	42.989	42.989	100.00	0.000	0.000
						B	0.000	42.989		100.00	0.000	0.000
						C	0.000	42.989		100.00	0.000	15.413
L3 89.75-88.25	89.00	1.235	7.51	1.6565	4.395	A	0.000	4.395	4.395	100.00	0.000	0.000
						B	0.000	4.395		100.00	0.000	0.000
						C	0.000	4.395		100.00	0.000	2.625
L4 88.25-86.00	87.12	1.229	7.47	1.6529	6.652	A	0.000	6.652	6.652	100.00	0.000	0.000
						B	0.000	6.652		100.00	0.000	0.000
						C	0.000	6.652		100.00	0.000	3.933
L5 86.00-84.25	85.12	1.223	7.44	1.6491	5.223	A	0.000	5.223	5.223	100.00	0.000	0.000
						B	0.000	5.223		100.00	0.000	0.000
						C	0.000	5.223		100.00	0.000	3.055
L6 84.25-73.75	78.95	1.204	7.32	1.6367	32.240	A	0.000	32.240	32.240	100.00	0.000	0.000
						B	0.000	32.240		100.00	0.000	0.000
						C	0.000	32.240		100.00	0.000	18.246
L7 73.75-63.08	68.36	1.168	7.10	1.6133	33.720	A	0.000	33.720	33.720	100.00	0.000	0.000
						B	0.000	33.720		100.00	0.000	0.000
						C	0.000	33.720		100.00	0.000	19.552
L8 63.08-42.75	52.76	1.106	6.73	1.5721	68.769	A	0.000	68.769	68.769	100.00	0.000	0.000
						B	0.000	68.769		100.00	0.000	0.000
						C	0.000	68.769		100.00	0.000	45.008
L9 42.75-32.75	37.70	1.031	6.27	1.5201	35.200	A	0.000	35.200	35.200	100.00	0.000	0.000
						B	0.000	35.200		100.00	0.000	0.000
						C	0.000	35.200		100.00	0.000	22.229
L10 32.75-8.25	20.30	0.905	5.50	1.4288	92.149	A	0.000	92.149	92.149	100.00	0.000	0.000
						B	0.000	92.149		100.00	0.000	0.000
						C	0.000	92.149		100.00	0.000	52.289
L11 8.25-6.25	7.25	0.85	5.17	1.2890	7.857	A	0.000	7.857	7.857	100.00	0.000	0.000
						B	0.000	7.857		100.00	0.000	0.000
						C	0.000	7.857		100.00	0.000	4.032
L12 6.25-3.25	4.75	0.85	5.17	1.2356	11.867	A	0.000	11.867	11.867	100.00	0.000	0.000
						B	0.000	11.867		100.00	0.000	0.000
						C	0.000	11.867		100.00	0.000	5.913
L13 3.25-0.00	1.62	0.85	5.17	1.1098	12.934	A	0.000	12.934	12.934	100.00	0.000	0.000

Section Elevation ft	z ft	K <sub>Z</sub>	q <sub>z</sub> psf	t <sub>z</sub> in	A <sub>G</sub> ft <sup>2</sup>	F a c e ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	A <sub>R</sub> ft <sup>2</sup>	A <sub>leg</sub> ft <sup>2</sup>	Leg %	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>
						B	0.000	12.934		100.00	0.000	0.000
						C	0.000	12.934		100.00	0.000	6.061

### Tower Pressure - Service

$G_H = 1.100$

Section Elevation ft	z ft	K <sub>Z</sub>	q <sub>z</sub> psf	A <sub>G</sub> ft <sup>2</sup>	F a c e ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	A <sub>R</sub> ft <sup>2</sup>	A <sub>leg</sub> ft <sup>2</sup>	Leg %	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>
L1 147.00-105.00	125.21	1.327	10.39	90.877	A	0.000	90.877	90.877	100.00	0.000	0.000
					B	0.000	90.877		100.00	0.000	0.000
					C	0.000	90.877		100.00	0.000	9.558
L2 105.00-89.75	97.26	1.258	9.86	38.633	A	0.000	38.633	38.633	100.00	0.000	0.000
					B	0.000	38.633		100.00	0.000	0.000
					C	0.000	38.633		100.00	0.000	4.607
L3 89.75-88.25	89.00	1.235	9.67	3.981	A	0.000	3.981	3.981	100.00	0.000	0.000
					B	0.000	3.981		100.00	0.000	0.000
					C	0.000	3.981		100.00	0.000	0.949
L4 88.25-86.00	87.12	1.229	9.63	6.032	A	0.000	6.032	6.032	100.00	0.000	0.000
					B	0.000	6.032		100.00	0.000	0.000
					C	0.000	6.032		100.00	0.000	1.424
L5 86.00-84.25	85.12	1.223	9.58	4.742	A	0.000	4.742	4.742	100.00	0.000	0.000
					B	0.000	4.742		100.00	0.000	0.000
					C	0.000	4.742		100.00	0.000	1.107
L6 84.25-73.75	78.95	1.204	9.43	29.376	A	0.000	29.376	29.376	100.00	0.000	0.000
					B	0.000	29.376		100.00	0.000	0.000
					C	0.000	29.376		100.00	0.000	6.644
L7 73.75-63.08	68.36	1.168	9.15	30.810	A	0.000	30.810	30.810	100.00	0.000	0.000
					B	0.000	30.810		100.00	0.000	0.000
					C	0.000	30.810		100.00	0.000	7.069
L8 63.08-42.75	52.76	1.106	8.67	63.442	A	0.000	63.442	63.442	100.00	0.000	0.000
					B	0.000	63.442		100.00	0.000	0.000
					C	0.000	63.442		100.00	0.000	16.256
L9 42.75-32.75	37.70	1.031	8.07	32.579	A	0.000	32.579	32.579	100.00	0.000	0.000
					B	0.000	32.579		100.00	0.000	0.000
					C	0.000	32.579		100.00	0.000	8.088
L10 32.75-8.25	20.30	0.905	7.09	86.315	A	0.000	86.315	86.315	100.00	0.000	0.000
					B	0.000	86.315		100.00	0.000	0.000
					C	0.000	86.315		100.00	0.000	20.608
L11 8.25-6.25	7.25	0.85	6.66	7.427	A	0.000	7.427	7.427	100.00	0.000	0.000
					B	0.000	7.427		100.00	0.000	0.000
					C	0.000	7.427		100.00	0.000	1.682
L12 6.25-3.25	4.75	0.85	6.66	11.249	A	0.000	11.249	11.249	100.00	0.000	0.000
					B	0.000	11.249		100.00	0.000	0.000
					C	0.000	11.249		100.00	0.000	2.523
L13 3.25-0.00	1.62	0.85	6.66	12.333	A	0.000	12.333	12.333	100.00	0.000	0.000
					B	0.000	12.333		100.00	0.000	0.000
					C	0.000	12.333		100.00	0.000	2.734

### Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 60 deg - No Ice

Comb. No.	Description
7	0.9 Dead+1.6 Wind 60 deg - No Ice
8	1.2 Dead+1.6 Wind 90 deg - No Ice
9	0.9 Dead+1.6 Wind 90 deg - No Ice
10	1.2 Dead+1.6 Wind 120 deg - No Ice
11	0.9 Dead+1.6 Wind 120 deg - No Ice
12	1.2 Dead+1.6 Wind 150 deg - No Ice
13	0.9 Dead+1.6 Wind 150 deg - No Ice
14	1.2 Dead+1.6 Wind 180 deg - No Ice
15	0.9 Dead+1.6 Wind 180 deg - No Ice
16	1.2 Dead+1.6 Wind 210 deg - No Ice
17	0.9 Dead+1.6 Wind 210 deg - No Ice
18	1.2 Dead+1.6 Wind 240 deg - No Ice
19	0.9 Dead+1.6 Wind 240 deg - No Ice
20	1.2 Dead+1.6 Wind 270 deg - No Ice
21	0.9 Dead+1.6 Wind 270 deg - No Ice
22	1.2 Dead+1.6 Wind 300 deg - No Ice
23	0.9 Dead+1.6 Wind 300 deg - No Ice
24	1.2 Dead+1.6 Wind 330 deg - No Ice
25	0.9 Dead+1.6 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

**Maximum Member Forces**

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	147 - 105	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-31.82	1.16	-3.58
			Max. Mx	20	-11.90	466.43	-0.86
			Max. My	14	-11.96	0.65	-463.62
			Max. Vy	20	-22.03	466.43	-0.86
			Max. Vx	14	21.62	0.65	-463.62
			Max. Torque	19			1.74
L2	105 - 89.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-46.16	2.45	-3.93
			Max. Mx	20	-19.09	993.67	-1.53
			Max. My	14	-19.15	1.41	-982.78
			Max. Vy	20	-29.08	993.67	-1.53
			Max. Vx	14	28.66	1.41	-982.78
			Max. Torque	19			1.55
L3	89.75 - 88.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-46.57	2.56	-3.99

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft			
L4	88.25 - 86	Pole	Max. Mx	20	-19.36	1037.44	-1.59			
			Max. My	14	-19.41	1.47	-1025.91			
			Max. Vy	20	-29.29	1037.44	-1.59			
			Max. Vx	14	28.88	1.47	-1025.91			
			Max. Torque	19			1.55			
			Max Tension	1	0.00	0.00	0.00			
			Max. Compression	26	-47.37	2.72	-4.10			
			Max. Mx	20	-19.93	1103.71	-1.68			
			Max. My	14	-19.99	1.57	-1091.24			
			Max. Vy	20	-29.63	1103.71	-1.68			
L5	86 - 84.25	Pole	Max. Vx	14	29.22	1.57	-1091.24			
			Max. Torque	19			1.55			
			Max Tension	1	0.00	0.00	0.00			
			Max. Compression	26	-48.00	2.85	-4.18			
			Max. Mx	20	-20.37	1155.79	-1.75			
			Max. My	14	-20.42	1.63	-1142.59			
			Max. Vy	20	-29.91	1155.79	-1.75			
			Max. Vx	14	29.49	1.63	-1142.59			
			Max. Torque	9			-1.55			
			Max Tension	1	0.00	0.00	0.00			
L6	84.25 - 73.75	Pole	Max. Compression	26	-50.14	3.31	-4.46			
			Max. Mx	20	-21.88	1345.48	-2.00			
			Max. My	14	-21.93	1.89	-1329.66			
			Max. Vy	20	-30.81	1345.48	-2.00			
			Max. Vx	14	30.40	1.89	-1329.66			
			Max. Torque	9			-1.69			
			Max Tension	1	0.00	0.00	0.00			
			L7	73.75 - 63.0833	Pole	Max. Compression	26	-57.49	4.41	-5.24
						Max. Mx	20	-27.20	1825.10	-2.63
						Max. My	14	-27.24	2.54	-1803.02
Max. Vy	20	-33.29				1825.10	-2.63			
Max. Vx	14	32.87				2.54	-1803.02			
Max. Torque	9						-2.10			
Max Tension	1	0.00				0.00	0.00			
L8	63.0833 - 42.75	Pole				Max. Compression	26	-64.73	5.59	-5.96
						Max. Mx	20	-32.83	2368.71	-3.26
						Max. My	14	-32.86	3.20	-2340.11
			Max. Vy	20	-36.51	2368.71	-3.26			
			Max. Vx	14	36.10	3.20	-2340.11			
			Max. Torque	10			-2.82			
			Max Tension	1	0.00	0.00	0.00			
			L9	42.75 - 32.75	Pole	Max. Compression	26	-74.03	6.70	-6.61
						Max. Mx	20	-40.27	2930.63	-3.86
						Max. My	14	-40.29	3.82	-2895.88
Max. Vy	20	-39.56				2930.63	-3.86			
Max. Vx	14	39.14				3.82	-2895.88			
Max. Torque	10						-3.57			
Max Tension	1	0.00				0.00	0.00			
L10	32.75 - 8.25	Pole				Max. Compression	26	-87.18	8.42	-7.58
						Max. Mx	20	-51.30	3935.24	-4.83
						Max. My	14	-51.31	4.87	-3890.38
			Max. Vy	20	-42.47	3935.24	-4.83			
			Max. Vx	14	42.07	4.87	-3890.38			
			Max. Torque	10			-4.79			
			Max Tension	1	0.00	0.00	0.00			
			L11	8.25 - 6.25	Pole	Max. Compression	26	-88.34	8.55	-7.66
						Max. Mx	20	-52.32	4020.37	-4.91
						Max. My	14	-52.32	4.96	-3974.69
Max. Vy	20	-42.68				4020.37	-4.91			
Max. Vx	14	42.28				4.96	-3974.69			
Max. Torque	10						-4.89			
Max Tension	1	0.00				0.00	0.00			
L12	6.25 - 3.25	Pole				Max. Compression	26	-90.04	8.74	-7.76
						Max. Mx	20	-53.81	4148.85	-5.02
						Max. My	14	-53.81	5.09	-4101.96
			Max. Vy	20	-53.81	5.09	-4101.96			

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L13	3.25 - 0	Pole	Max. Vy	20	-43.00	4148.85	-5.02
			Max. Vx	14	42.60	5.09	-4101.96
			Max. Torque	10			-5.04
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-91.86	8.91	-7.86
			Max. M <sub>x</sub>	20	-55.44	4289.10	-5.15
			Max. M <sub>y</sub>	14	-55.44	5.22	-4240.89
			Max. V <sub>y</sub>	20	-43.33	4289.10	-5.15
			Max. V <sub>x</sub>	14	42.93	5.22	-4240.89
			Max. Torque	10			-5.21

### Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	26	91.86	-0.00	0.00
	Max. H <sub>x</sub>	20	55.46	43.31	-0.03
	Max. H <sub>z</sub>	3	41.59	-0.03	42.91
	Max. M <sub>x</sub>	2	4238.82	-0.03	42.91
	Max. M <sub>z</sub>	8	4286.79	-43.31	0.03
	Max. Torsion	22	5.20	37.49	21.43
	Min. Vert	21	41.59	43.31	-0.03
	Min. H <sub>x</sub>	9	41.59	-43.31	0.03
	Min. H <sub>z</sub>	15	41.59	0.03	-42.91
	Min. M <sub>x</sub>	14	-4240.89	0.03	-42.91
	Min. M <sub>z</sub>	20	-4289.10	43.31	-0.03
	Min. Torsion	10	-5.21	-37.49	-21.43

### Tower Mast Reaction Summary

Load Combination	Vertical K	Shear <sub>x</sub> K	Shear <sub>z</sub> K	Overturning Moment, M <sub>x</sub> kip-ft	Overturning Moment, M <sub>z</sub> kip-ft	Torque kip-ft
Dead Only	46.21	-0.00	0.00	0.82	0.87	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	55.46	0.03	-42.91	-4238.82	-3.04	-3.60
0.9 Dead+1.6 Wind 0 deg - No Ice	41.59	0.03	-42.91	-4196.71	-3.28	-3.59
1.2 Dead+1.6 Wind 30 deg - No Ice	55.46	21.69	-37.18	-3672.98	-2146.58	-1.15
0.9 Dead+1.6 Wind 30 deg - No Ice	41.59	21.69	-37.18	-3636.46	-2125.35	-1.15
1.2 Dead+1.6 Wind 60 deg - No Ice	55.46	37.53	-21.49	-2122.51	-3714.57	1.60
0.9 Dead+1.6 Wind 60 deg - No Ice	41.59	37.53	-21.49	-2101.52	-3677.65	1.61
1.2 Dead+1.6 Wind 90 deg - No Ice	55.46	43.31	-0.03	-3.12	-4286.79	3.93
0.9 Dead+1.6 Wind 90 deg - No Ice	41.59	43.31	-0.03	-3.34	-4244.20	3.93
1.2 Dead+1.6 Wind 120 deg - No Ice	55.46	37.49	21.43	2117.41	-3710.48	5.21
0.9 Dead+1.6 Wind 120 deg - No Ice	41.59	37.49	21.43	2095.95	-3673.59	5.20
1.2 Dead+1.6 Wind 150 deg - No Ice	55.46	21.63	37.15	3670.93	-2139.44	5.08
0.9 Dead+1.6 Wind 150 deg - No Ice	41.59	21.63	37.15	3633.91	-2118.29	5.08
1.2 Dead+1.6 Wind 180 deg - No Ice	55.46	-0.03	42.91	4240.89	5.22	3.60

Load Combination	Vertical K	Shear <sub>x</sub> K	Shear <sub>z</sub> K	Overturing Moment, M <sub>x</sub> kip-ft	Overturing Moment, M <sub>z</sub> kip-ft	Torque kip-ft
0.9 Dead+1.6 Wind 180 deg - No Ice	41.59	-0.03	42.91	4198.24	4.90	3.59
1.2 Dead+1.6 Wind 210 deg - No Ice	55.46	-21.69	37.18	3675.04	2148.77	1.15
0.9 Dead+1.6 Wind 210 deg - No Ice	41.59	-21.69	37.18	3637.99	2126.98	1.14
1.2 Dead+1.6 Wind 240 deg - No Ice	55.46	-37.53	21.49	2124.56	3716.77	-1.61
0.9 Dead+1.6 Wind 240 deg - No Ice	41.59	-37.53	21.49	2103.03	3679.28	-1.61
1.2 Dead+1.6 Wind 270 deg - No Ice	55.46	-43.31	0.03	5.15	4289.10	-3.93
0.9 Dead+1.6 Wind 270 deg - No Ice	41.59	-43.31	0.03	4.84	4245.82	-3.93
1.2 Dead+1.6 Wind 300 deg - No Ice	55.46	-37.49	-21.43	-2115.37	3712.64	-5.20
0.9 Dead+1.6 Wind 300 deg - No Ice	41.59	-37.49	-21.43	-2094.45	3675.19	-5.20
1.2 Dead+1.6 Wind 330 deg - No Ice	55.46	-21.63	-37.15	-3668.87	2141.61	-5.08
0.9 Dead+1.6 Wind 330 deg - No Ice	41.59	-21.63	-37.15	-3632.39	2119.89	-5.08
1.2 Dead+1.0 Ice+1.0 Temp	91.86	0.00	-0.00	7.86	8.91	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	91.86	0.01	-11.40	-1193.94	7.58	-1.86
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	91.86	5.75	-9.88	-1033.67	-598.02	-0.86
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	91.86	9.94	-5.71	-594.27	-1040.93	0.38
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	91.86	11.48	-0.01	6.54	-1202.48	1.51
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	91.86	9.93	5.69	607.77	-1039.39	2.24
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	91.86	5.73	9.87	1048.31	-595.34	2.37
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	91.86	-0.01	11.40	1210.12	10.68	1.86
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	91.86	-5.75	9.88	1049.86	616.28	0.86
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	91.86	-9.94	5.71	610.45	1059.19	-0.38
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	91.86	-11.48	0.01	9.64	1220.75	-1.51
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	91.86	-9.93	-5.69	-591.59	1057.65	-2.24
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	91.86	-5.73	-9.87	-1032.13	613.60	-2.37
Dead+Wind 0 deg - Service	46.21	0.01	-8.47	-831.54	0.10	0.29
Dead+Wind 30 deg - Service	46.21	4.28	-7.34	-720.43	-420.73	0.35
Dead+Wind 60 deg - Service	46.21	7.41	-4.24	-416.04	-728.57	0.32
Dead+Wind 90 deg - Service	46.21	8.55	-0.01	0.05	-840.95	0.21
Dead+Wind 120 deg - Service	46.21	7.40	4.23	416.36	-727.76	0.03
Dead+Wind 150 deg - Service	46.21	4.27	7.33	721.33	-419.32	-0.15
Dead+Wind 180 deg - Service	46.21	-0.01	8.47	833.26	1.72	-0.29
Dead+Wind 210 deg - Service	46.21	-4.28	7.34	722.14	422.54	-0.35
Dead+Wind 240 deg - Service	46.21	-7.41	4.24	417.76	730.38	-0.32
Dead+Wind 270 deg - Service	46.21	-8.55	0.01	1.67	842.76	-0.21
Dead+Wind 300 deg - Service	46.21	-7.40	-4.23	-414.64	729.57	-0.03
Dead+Wind 330 deg - Service	46.21	-4.27	-7.33	-719.61	421.13	0.15

### Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0.00	-46.21	0.00	0.00	46.21	-0.00	0.000%
2	0.03	-55.46	-42.91	-0.03	55.46	42.91	0.002%
3	0.03	-41.59	-42.91	-0.03	41.59	42.91	0.002%
4	21.69	-55.46	-37.18	-21.69	55.46	37.18	0.000%
5	21.69	-41.59	-37.18	-21.69	41.59	37.18	0.000%
6	37.53	-55.46	-21.49	-37.53	55.46	21.49	0.000%
7	37.53	-41.59	-21.49	-37.53	41.59	21.49	0.000%
8	43.31	-55.46	-0.03	-43.31	55.46	0.03	0.002%
9	43.31	-41.59	-0.03	-43.31	41.59	0.03	0.002%
10	37.49	-55.46	21.43	-37.49	55.46	-21.43	0.000%
11	37.49	-41.59	21.43	-37.49	41.59	-21.43	0.000%
12	21.63	-55.46	37.15	-21.63	55.46	-37.15	0.000%
13	21.63	-41.59	37.15	-21.63	41.59	-37.15	0.000%
14	-0.03	-55.46	42.91	0.03	55.46	-42.91	0.002%
15	-0.03	-41.59	42.91	0.03	41.59	-42.91	0.002%
16	-21.69	-55.46	37.18	21.69	55.46	-37.18	0.000%
17	-21.69	-41.59	37.18	21.69	41.59	-37.18	0.000%
18	-37.53	-55.46	21.49	37.53	55.46	-21.49	0.000%
19	-37.53	-41.59	21.49	37.53	41.59	-21.49	0.000%
20	-43.31	-55.46	0.03	43.31	55.46	-0.03	0.001%
21	-43.31	-41.59	0.03	43.31	41.59	-0.03	0.002%
22	-37.49	-55.46	-21.43	37.49	55.46	21.43	0.000%
23	-37.49	-41.59	-21.43	37.49	41.59	21.43	0.000%
24	-21.63	-55.46	-37.15	21.63	55.46	37.15	0.000%
25	-21.63	-41.59	-37.15	21.63	41.59	37.15	0.000%
26	0.00	-91.86	0.00	-0.00	91.86	0.00	0.001%
27	0.01	-91.86	-11.40	-0.01	91.86	11.40	0.000%
28	5.75	-91.86	-9.88	-5.75	91.86	9.88	0.000%
29	9.94	-91.86	-5.71	-9.94	91.86	5.71	0.000%
30	11.48	-91.86	-0.01	-11.48	91.86	0.01	0.000%
31	9.93	-91.86	5.69	-9.93	91.86	-5.69	0.000%
32	5.73	-91.86	9.87	-5.73	91.86	-9.87	0.000%
33	-0.01	-91.86	11.40	0.01	91.86	-11.40	0.000%
34	-5.75	-91.86	9.88	5.75	91.86	-9.88	0.000%
35	-9.94	-91.86	5.71	9.94	91.86	-5.71	0.000%
36	-11.48	-91.86	0.01	11.48	91.86	-0.01	0.000%
37	-9.93	-91.86	-5.69	9.93	91.86	5.69	0.000%
38	-5.73	-91.86	-9.87	5.73	91.86	9.87	0.000%
39	0.01	-46.21	-8.47	-0.01	46.21	8.47	0.002%
40	4.28	-46.21	-7.34	-4.28	46.21	7.34	0.002%
41	7.41	-46.21	-4.24	-7.41	46.21	4.24	0.002%
42	8.55	-46.21	-0.01	-8.55	46.21	0.01	0.002%
43	7.40	-46.21	4.23	-7.40	46.21	-4.23	0.002%
44	4.27	-46.21	7.33	-4.27	46.21	-7.33	0.002%
45	-0.01	-46.21	8.47	0.01	46.21	-8.47	0.002%
46	-4.28	-46.21	7.34	4.28	46.21	-7.34	0.002%
47	-7.41	-46.21	4.24	7.41	46.21	-4.24	0.002%
48	-8.55	-46.21	0.01	8.55	46.21	-0.01	0.002%
49	-7.40	-46.21	-4.23	7.40	46.21	4.23	0.002%
50	-4.27	-46.21	-7.33	4.27	46.21	7.33	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	14	0.00002971	0.00007794
3	Yes	14	0.00000001	0.00006187
4	Yes	18	0.00000001	0.00005803
5	Yes	17	0.00000001	0.00011334

6	Yes	18	0.00000001	0.00005696
7	Yes	17	0.00000001	0.00011109
8	Yes	14	0.00002965	0.00014663
9	Yes	14	0.00000001	0.00011458
10	Yes	18	0.00000001	0.00005952
11	Yes	17	0.00000001	0.00011626
12	Yes	18	0.00000001	0.00005637
13	Yes	17	0.00000001	0.00010999
14	Yes	14	0.00002970	0.00008816
15	Yes	14	0.00000001	0.00006939
16	Yes	18	0.00000001	0.00005778
17	Yes	17	0.00000001	0.00011274
18	Yes	18	0.00000001	0.00005917
19	Yes	17	0.00000001	0.00011547
20	Yes	15	0.00000001	0.00006368
21	Yes	14	0.00000001	0.00012450
22	Yes	18	0.00000001	0.00005614
23	Yes	17	0.00000001	0.00010944
24	Yes	18	0.00000001	0.00005897
25	Yes	17	0.00000001	0.00011525
26	Yes	9	0.00000001	0.00007375
27	Yes	16	0.00000001	0.00008447
28	Yes	16	0.00000001	0.00010668
29	Yes	16	0.00000001	0.00010687
30	Yes	16	0.00000001	0.00008529
31	Yes	16	0.00000001	0.00011063
32	Yes	16	0.00000001	0.00010781
33	Yes	16	0.00000001	0.00008616
34	Yes	16	0.00000001	0.00011140
35	Yes	16	0.00000001	0.00011180
36	Yes	16	0.00000001	0.00008673
37	Yes	16	0.00000001	0.00010776
38	Yes	16	0.00000001	0.00010998
39	Yes	13	0.00000001	0.00002513
40	Yes	13	0.00000001	0.00007264
41	Yes	13	0.00000001	0.00005925
42	Yes	13	0.00000001	0.00002429
43	Yes	13	0.00000001	0.00006595
44	Yes	13	0.00000001	0.00006789
45	Yes	13	0.00000001	0.00002508
46	Yes	13	0.00000001	0.00005949
47	Yes	13	0.00000001	0.00007349
48	Yes	13	0.00000001	0.00002447
49	Yes	13	0.00000001	0.00006443
50	Yes	13	0.00000001	0.00006190

**Maximum Tower Deflections - Service Wind**

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	147 - 105	21.428	48	1.2860	0.0019
L2	108.75 - 89.75	11.697	48	1.0717	0.0016
L3	89.75 - 88.25	7.813	48	0.8496	0.0009
L4	88.25 - 86	7.549	48	0.8272	0.0009
L5	86 - 84.25	7.165	48	0.8054	0.0008
L6	84.25 - 73.75	6.873	48	0.7883	0.0008
L7	78 - 63.0833	5.887	48	0.7171	0.0007
L8	63.0833 - 42.75	3.841	48	0.5760	0.0005
L9	47.5 - 32.75	2.200	48	0.4285	0.0003
L10	32.75 - 8.25	1.040	48	0.3071	0.0002
L11	8.25 - 6.25	0.064	48	0.0737	0.0000
L12	6.25 - 3.25	0.037	48	0.0562	0.0000
L13	3.25 - 0	0.010	48	0.0293	0.0000

### Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
147.00	APXVSP18-C-A20 w/ Mount Pipe	48	21.428	1.2860	0.0019	43782
135.00	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	48	18.231	1.2346	0.0019	18242
116.00	(2) LPA-80080/4CF w/ Mount Pipe	48	13.399	1.1279	0.0018	7061
106.00	(2) 7770.00 w/ Mount Pipe	48	11.079	1.0473	0.0015	5334
76.00	OG-860/1920/GPS-A	48	5.588	0.6955	0.0006	6578

### Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	147 - 105	109.011	20	6.5469	0.0123
L2	108.75 - 89.75	59.542	20	5.4599	0.0088
L3	89.75 - 88.25	39.778	20	4.3284	0.0064
L4	88.25 - 86	38.437	20	4.2143	0.0063
L5	86 - 84.25	36.479	20	4.1034	0.0061
L6	84.25 - 73.75	34.992	20	4.0161	0.0060
L7	78 - 63.0833	29.974	20	3.6530	0.0056
L8	63.0833 - 42.75	19.557	20	2.9341	0.0046
L9	47.5 - 32.75	11.202	20	2.1825	0.0034
L10	32.75 - 8.25	5.294	20	1.5637	0.0025
L11	8.25 - 6.25	0.326	20	0.3750	0.0006
L12	6.25 - 3.25	0.187	20	0.2859	0.0004
L13	3.25 - 0	0.051	20	0.1489	0.0002

### Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
147.00	APXVSP18-C-A20 w/ Mount Pipe	20	109.011	6.5469	0.0125	8828
135.00	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	20	92.761	6.2869	0.0115	3677
116.00	(2) LPA-80080/4CF w/ Mount Pipe	20	68.200	5.7456	0.0097	1419
106.00	(2) 7770.00 w/ Mount Pipe	20	56.398	5.3358	0.0085	1068
76.00	OG-860/1920/GPS-A	20	28.450	3.5431	0.0054	1301

### Compression Checks

### Pole Design Data

Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	KI/r	A in <sup>2</sup>	P <sub>u</sub> K	φP <sub>n</sub> K	Ratio P <sub>u</sub> / φP <sub>n</sub>
L1	147 - 105 (1)	TP29.141x22x0.25	42.00	0.00	0.0	22.419 1	-11.90	1503.30	0.008

Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	KI/r	A in <sup>2</sup>	P <sub>u</sub> K	φP <sub>n</sub> K	Ratio $\frac{P_u}{\phi P_n}$
L2	105 - 89.75 (2)	TP31.2343x28.0034x0.31 25	19.00	0.00	0.0	30.670 5	-19.09	2103.39	0.009
L3	89.75 - 88.25 (3)	TP31.4893x31.2343x0.31 25	1.50	0.00	0.0	30.923 5	-19.36	2092.11	0.009
L4	88.25 - 86 (4)	TP31.8719x31.4893x0.50 85	2.25	0.00	0.0	50.616 0	-19.93	2520.13	0.008
L5	86 - 84.25 (5)	TP32.1695x31.8719x0.50 63	1.75	0.00	0.0	50.882 7	-20.37	2510.72	0.008
L6	84.25 - 73.75 (6)	TP33.955x32.1695x0.455	10.50	0.00	0.0	47.336 0	-21.88	2511.02	0.009
L7	73.75 - 63.0833 (7)	TP35.1437x32.3223x0.55 15	14.92	0.00	0.0	60.552 2	-27.20	3027.30	0.009
L8	63.0833 - 42.75 (8)	TP38.601x35.1437x0.669 7	20.33	0.00	0.0	78.905 3	-32.83	3863.68	0.008
L9	42.75 - 32.75 (9)	TP39.5513x36.454x0.719 7	14.75	0.00	0.0	88.701 8	-40.27	4331.21	0.009
L10	32.75 - 8.25 (10)	TP43.7172x39.5513x0.73 06	24.50	0.00	0.0	99.676 0	-51.30	4984.42	0.010
L11	8.25 - 6.25 (11)	TP44.0573x43.7172x0.79 18	2.00	0.00	0.0	108.73 00	-52.32	5147.59	0.010
L12	6.25 - 3.25 (12)	TP44.5674x44.0573x0.76 82	3.00	0.00	0.0	106.80 00	-53.81	5156.32	0.010
L13	3.25 - 0 (13)	TP45.12x44.5674x0.7629	3.25	0.00	0.0	107.40 50	-55.44	5424.96	0.010

### Pole Bending Design Data

Section No.	Elevation ft	Size	M <sub>ux</sub> kip-ft	φM <sub>nx</sub> kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M <sub>uy</sub> kip-ft	φM <sub>ny</sub> kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	147 - 105 (1)	TP29.141x22x0.25	466.43	872.53	0.535	0.00	872.53	0.000
L2	105 - 89.75 (2)	TP31.2343x28.0034x0.31 25	993.67	1334.47	0.745	0.00	1334.47	0.000
L3	89.75 - 88.25 (3)	TP31.4893x31.2343x0.31 25	1037.43	1338.38	0.775	0.00	1338.38	0.000
L4	88.25 - 86 (4)	TP31.8719x31.4893x0.50 85	1103.71	1611.96	0.685	0.00	1611.96	0.000
L5	86 - 84.25 (5)	TP32.1695x31.8719x0.50 63	1155.79	1621.65	0.713	0.00	1621.65	0.000
L6	84.25 - 73.75 (6)	TP33.955x32.1695x0.455	1345.48	1682.39	0.800	0.00	1682.39	0.000
L7	73.75 - 63.0833 (7)	TP35.1437x32.3223x0.55 15	1825.10	2136.27	0.854	0.00	2136.27	0.000
L8	63.0833 - 42.75 (8)	TP38.601x35.1437x0.669 7	2368.71	2919.99	0.811	0.00	2919.99	0.000
L9	42.75 - 32.75 (9)	TP39.5513x36.454x0.719 7	2930.63	3422.26	0.856	0.00	3422.26	0.000
L10	32.75 - 8.25 (10)	TP43.7172x39.5513x0.73 06	3935.24	4366.38	0.901	0.00	4366.38	0.000
L11	8.25 - 6.25 (11)	TP44.0573x43.7172x0.79 18	4020.37	4532.76	0.887	0.00	4532.76	0.000
L12	6.25 - 3.25 (12)	TP44.5674x44.0573x0.76 82	4148.85	4599.88	0.902	0.00	4599.88	0.000
L13	3.25 - 0 (13)	TP45.12x44.5674x0.7629	4289.10	4902.83	0.875	0.00	4902.83	0.000

### Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V <sub>u</sub> K	φV <sub>n</sub> K	Ratio $\frac{V_u}{\phi V_n}$	Actual T <sub>u</sub> kip-ft	φT <sub>n</sub> kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	147 - 105 (1)	TP29.141x22x0.25	22.04	751.65	0.029	1.46	1747.20	0.001

Section No.	Elevation ft	Size	Actual $V_u$ K	$\phi V_n$ K	Ratio $\frac{V_u}{\phi V_n}$	Actual $T_u$ kip-ft	$\phi T_n$ kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L2	105 - 89.75 (2)	TP31.2343x28.0034x0.31 25	29.08	1051.69	0.028	1.43	2672.20	0.001
L3	89.75 - 88.25 (3)	TP31.4893x31.2343x0.31 25	29.29	1046.05	0.028	1.46	2680.02	0.001
L4	88.25 - 86 (4)	TP31.8719x31.4893x0.50 85	29.63	1260.06	0.024	1.51	3227.87	0.000
L5	86 - 84.25 (5)	TP32.1695x31.8719x0.50 63	29.91	1255.36	0.024	1.55	3247.26	0.000
L6	84.25 - 73.75 (6)	TP33.955x32.1695x0.455	30.81	1255.51	0.025	1.69	3368.91	0.001
L7	73.75 - 63.0833 (7)	TP35.1437x32.3223x0.55 15	33.29	1513.65	0.022	2.10	4277.76	0.000
L8	63.0833 - 42.75 (8)	TP38.601x35.1437x0.669 7	36.51	1931.84	0.019	2.55	5847.12	0.000
L9	42.75 - 32.75 (9)	TP39.5513x36.454x0.719 7	39.56	2165.61	0.018	2.99	6852.88	0.000
L10	32.75 - 8.25 (10)	TP43.7172x39.5513x0.73 06	42.47	2492.21	0.017	3.69	8743.42	0.000
L11	8.25 - 6.25 (11)	TP44.0573x43.7172x0.79 18	42.68	2573.80	0.017	3.75	9076.58	0.000
L12	6.25 - 3.25 (12)	TP44.5674x44.0573x0.76 82	43.00	2578.16	0.017	3.84	9211.00	0.000
L13	3.25 - 0 (13)	TP45.12x44.5674x0.7629	43.34	2712.48	0.016	3.93	9817.67	0.000

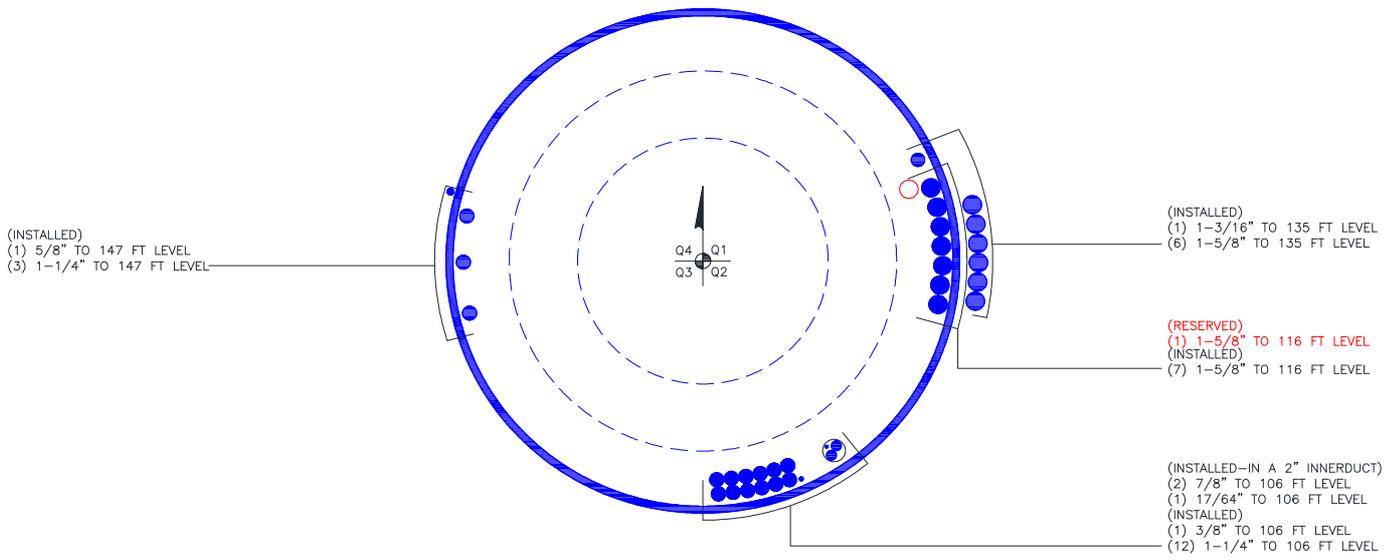
### Pole Interaction Design Data

Section No.	Elevation ft	Ratio $P_u$ $\phi P_n$	Ratio $M_{ux}$ $\phi M_{nx}$	Ratio $M_{uy}$ $\phi M_{ny}$	Ratio $V_u$ $\phi V_n$	Ratio $T_u$ $\phi T_n$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	147 - 105 (1)	0.008	0.535	0.000	0.029	0.001	0.543	1.000	4.8.2 ✓
L2	105 - 89.75 (2)	0.009	0.745	0.000	0.028	0.001	0.754	1.000	4.8.2 ✓
L3	89.75 - 88.25 (3)	0.009	0.775	0.000	0.028	0.001	0.785	1.000	4.8.2 ✓
L4	88.25 - 86 (4)	0.008	0.685	0.000	0.024	0.000	0.693	1.000	4.8.2 ✓
L5	86 - 84.25 (5)	0.008	0.713	0.000	0.024	0.000	0.721	1.000	4.8.2 ✓
L6	84.25 - 73.75 (6)	0.009	0.800	0.000	0.025	0.001	0.809	1.000	4.8.2 ✓
L7	73.75 - 63.0833 (7)	0.009	0.854	0.000	0.022	0.000	0.864	1.000	4.8.2 ✓
L8	63.0833 - 42.75 (8)	0.008	0.811	0.000	0.019	0.000	0.820	1.000	4.8.2 ✓
L9	42.75 - 32.75 (9)	0.009	0.856	0.000	0.018	0.000	0.866	1.000	4.8.2 ✓
L10	32.75 - 8.25 (10)	0.010	0.901	0.000	0.017	0.000	0.912	1.000	4.8.2 ✓
L11	8.25 - 6.25 (11)	0.010	0.887	0.000	0.017	0.000	0.897	1.000	4.8.2 ✓
L12	6.25 - 3.25 (12)	0.010	0.902	0.000	0.017	0.000	0.913	1.000	4.8.2 ✓
L13	3.25 - 0 (13)	0.010	0.875	0.000	0.016	0.000	0.885	1.000	4.8.2 ✓

### Section Capacity Table

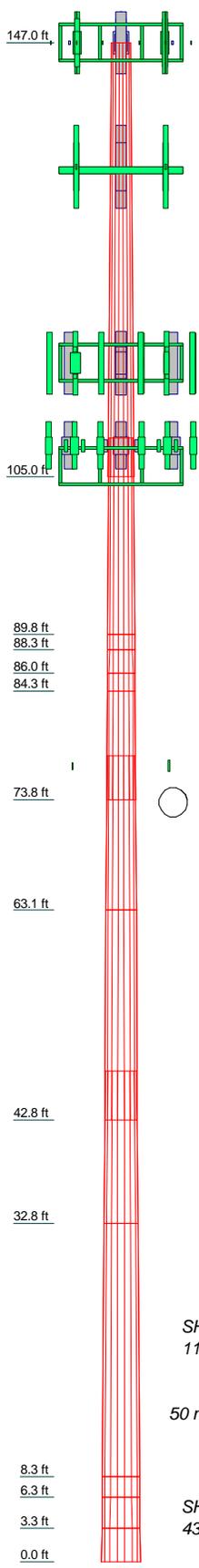
Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$\phi P_{allow}$ K	% Capacity	Pass Fail
L1	147 - 105	Pole	TP29.141x22x0.25	1	-11.90	1503.30	54.3	Pass
L2	105 - 89.75	Pole	TP31.2343x28.0034x0.3125	2	-19.09	2103.39	75.4	Pass
L3	89.75 - 88.25	Pole	TP31.4893x31.2343x0.3125	3	-19.36	2092.11	78.5	Pass
L4	88.25 - 86	Pole	TP31.8719x31.4893x0.5085	4	-19.93	2520.13	69.3	Pass
L5	86 - 84.25	Pole	TP32.1695x31.8719x0.5063	5	-20.37	2510.72	72.1	Pass
L6	84.25 - 73.75	Pole	TP33.955x32.1695x0.455	6	-21.88	2511.02	80.9	Pass
L7	73.75 - 63.0833	Pole	TP35.1437x32.3223x0.5515	7	-27.20	3027.30	86.4	Pass
L8	63.0833 - 42.75	Pole	TP38.601x35.1437x0.6697	8	-32.83	3863.68	82.0	Pass
L9	42.75 - 32.75	Pole	TP39.5513x36.454x0.7197	9	-40.27	4331.21	86.6	Pass
L10	32.75 - 8.25	Pole	TP43.7172x39.5513x0.7306	10	-51.30	4984.42	91.2	Pass
L11	8.25 - 6.25	Pole	TP44.0573x43.7172x0.7918	11	-52.32	5147.59	89.7	Pass
L12	6.25 - 3.25	Pole	TP44.5674x44.0573x0.7682	12	-53.81	5156.32	91.3	Pass
L13	3.25 - 0	Pole	TP45.12x44.5674x0.7629	13	-55.44	5424.96	88.5	Pass
Summary								
Pole (L12)							91.3	Pass
<b>RATING =</b>							<b>91.3</b>	<b>Pass</b>

**APPENDIX B**  
**BASE LEVEL DRAWING**



**APPENDIX C**  
**ADDITIONAL CALCULATIONS**

Section	1	2	3	4	5	6	7	8	9	10	11	12	13
Length (ft)	42.00	19.00	7.72	25.50	10.50	14.92	20.33	14.75	24.50	3.00	3.00	3.25	3.25
Number of Sides	18	18	18	18	18	18	18	18	18	18	18	18	18
Thickness (in)	0.2500	0.3125	0.5000	0.5125	0.4550	0.5515	0.6696	0.7197	0.7306	0.7620	0.7620	0.7620	0.7620
Socket Length (ft)	3.75	4.25	4.25	4.25	4.25	4.25	4.75	4.75	4.75	4.75	4.75	4.75	4.75
Top Dia (in)	22.0000	28.0034	31.6995	31.6995	31.6995	32.3223	35.1437	36.4540	39.5513	44.5614	44.5614	44.5614	44.5614
Bot Dia (in)	29.1410	31.2343	33.9950	32.9857	32.9857	35.1437	38.6010	39.5513	43.7172	45.1200	45.1200	45.1200	45.1200
Grade	A607-60	Reinf 46.41 ksi	Reinf 43.74 ksi	Reinf 42.84 ksi	Reinf 42.72 ksi	Reinf 43.75 ksi	Reinf 43.75 ksi	Reinf 43.75 ksi	Reinf 43.75 ksi				
Weight (K)	2.9	1.9	0.30	4.0	1.7	2.9	5.3	4.3	7.9	1.1	1.1	1.2	1.2



**DESIGNED APPURTENANCE LOADING**

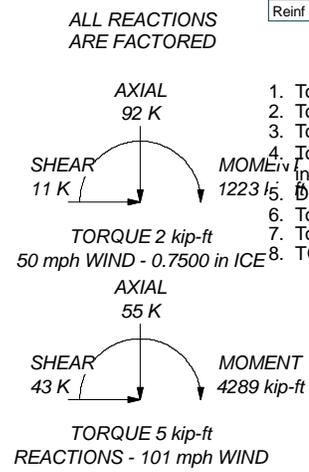
TYPE	ELEVATION	TYPE	ELEVATION
APXVSP18-C-A20 w/ Mount Pipe	147	T-Arm Mount [TA 602-3]	135
APXVSP18-C-A20 w/ Mount Pipe	147	(2) LPA-80080/4CF w/ Mount Pipe	116
APXVSP18-C-A20 w/ Mount Pipe	147	(2) LPA-80063/6CF w/ Mount Pipe	116
APXVTM14-C-120 w/ Mount Pipe	147	(2) APL868013 w/ Mount Pipe	116
APXVTM14-C-120 w/ Mount Pipe	147	DB-T1-6Z-8AB-0Z	116
APXVTM14-C-120 w/ Mount Pipe	147	(2) ClearGain Dual Band 800/1900 MHz	116
800 EXTERNAL NOTCH FILTER	147	(2) SBNHH-1D65B w/ Mount Pipe	116
800 EXTERNAL NOTCH FILTER	147	(2) SBNHH-1D65B w/ Mount Pipe	116
800 EXTERNAL NOTCH FILTER	147	(2) SBNHH-1D65B w/ Mount Pipe	116
1900MHz RRH (65MHz)	147	(2) SBNHH-1D65B w/ Mount Pipe	116
1900MHz RRH (65MHz)	147	HBXX-6517DS-A2M w/ Mount Pipe	116
1900MHz RRH (65MHz)	147	HBXX-6517DS-A2M w/ Mount Pipe	116
(3) ACU-A20-N	147	HBXX-6517DS-A2M w/ Mount Pipe	116
(3) ACU-A20-N	147	RRH2x60-PCS	116
(3) ACU-A20-N	147	RRH2x60-PCS	116
800MHz RRH	147	RRH2x60-PCS	116
800MHz RRH	147	RRH2x60-700	116
800MHz RRH	147	RRH2x60-700	116
800MHz RRH	147	RRH2x60-700	116
TD-RRH8x20-25	147	RRH2x60-700	116
TD-RRH8x20-25	147	RRH4X45-AWS4 B66	116
TD-RRH8x20-25	147	RRH4X45-AWS4 B66	116
Platform Mount [LP 1201-1]	147	RRH4X45-AWS4 B66	116
Miscellaneous [NA 507-1]	147	DB-T1-6Z-8AB-0Z	116
(2) 2 3/8" OD x 6 ft mount pipe	147	Platform Mount [LP 1201-1]	116
(2) 2 3/8" OD x 6 ft mount pipe	147	(2) 7770.00 w/ Mount Pipe	106
(2) 2 3/8" OD x 6 ft mount pipe	147	(2) 7770.00 w/ Mount Pipe	106
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	135	(4) LGP2140X	106
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	135	(4) LGP2140X	106
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	135	DC6-48-60-18-8F	106
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	135	(2) RRUS-11	106
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	135	(2) RRUS-11	106
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	135	(2) RRUS-11	106
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	135	SBNHH-1D65A w/ Mount Pipe	106
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	135	SBNHH-1D65A w/ Mount Pipe	106
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	135	SBNHH-1D65A w/ Mount Pipe	106
LNx-6515DS-A1M w/ Mount Pipe	135	RRUS12/RRUS A2	106
LNx-6515DS-A1M w/ Mount Pipe	135	RRUS12/RRUS A2	106
LNx-6515DS-A1M w/ Mount Pipe	135	RRUS12/RRUS A2	106
ATSBT-TOP-MF-4G	135	Platform Mount [LP 1201-1]	106
ATSBT-TOP-MF-4G	135	OG-860/1920/GPS-A	76
ATSBT-TOP-MF-4G	135	KS24019-L112A	76
ATSBT-TOP-MF-4G	135	KS24019-L112A	76
		Side Arm Mount [SO 701-3]	76

**MATERIAL STRENGTH**

GRADE	Fy	Fu	GRADE	Fy	Fu
A607-60	60 ksi	75 ksi	Reinf 42.84 ksi	43 ksi	54 ksi
Reinf 59.19 ksi	59 ksi	74 ksi	Reinf 42.72 ksi	43 ksi	54 ksi
Reinf 43.56 ksi	44 ksi	55 ksi	Reinf 43.75 ksi	44 ksi	55 ksi
Reinf 43.17 ksi	43 ksi	54 ksi	Reinf 41.42 ksi	41 ksi	52 ksi
Reinf 46.41 ksi	46 ksi	59 ksi	Reinf 42.24 ksi	42 ksi	53 ksi
Reinf 43.74 ksi	44 ksi	55 ksi	Reinf 44.19 ksi	44 ksi	56 ksi

**TOWER DESIGN NOTES**

1. Tower is located in New Haven County, Connecticut.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 101 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 91.3%



**Paul J. Ford and Company**  
 250 E Broad St, Suite 600  
 Columbus, OH 43215  
 Phone: (614) 221-6679  
 FAX: (555) 555-1235

Job: **147-Ft. Monopole / Secondino Property**  
 Project: **37517-1800.001 / BU 876316**  
 Client: **Crown Castle** Drawn by: **mherbert** App'd:  
 Code: **TIA-222-G** Date: **04/21/17** Scale: **NTS**  
 Path: Dwg No. **E-1**

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

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

### Site Data

BU#: 876316

Site Name: *Secondino Property*

App #:

### Anchor Rod Data

Eta Factor, $\eta$	0.5	TIA G (Fig. 4-4)
Qty:	16	
Diam:	2.25	in
Rod Material:	A615-J	
Yield, $F_y$ :	75	ksi
Strength, $F_u$ :	100	ksi
Bolt Circle:	52	in
Anchor Spacing:	6	in

### Plate Data

W=Side:	53	in
Thick:	3	in
Grade:	50	ksi
Clip Distance:	6	in

### Stiffener Data (Welding at both sides)

Configuration:	Unstiffened	
Weld Type:		**
Groove Depth:		in **
Groove Angle:		degrees
Fillet H. Weld:		<-- Disregard
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		ksi

### Pole Data

Diam:	45.12	in
Thick:	0.4375	in
Grade:	60	ksi
# of Sides:	18	"0" IF Round

### Base Reactions

TIA Revision:	G	
Factored Moment, $M_u$ :	4289	ft-kips
Factored Axial, $P_u$ :	55	kips
Factored Shear, $V_u$ :	43	kips

### Anchor Rod Results

TIA G --> Max Rod ( $C_u + V_u/\eta$ ): 256.3 Kips  
 Axial Design Strength,  $\Phi \cdot F_u \cdot A_{net}$ : 260.0 Kips  
 Anchor Rod Stress Ratio: 98.6% **Pass**

### Base Plate Results

Base Plate Stress: 37.6 ksi  
 PL Design Bending Strength,  $\Phi \cdot F_y$ : 45.0 ksi  
 Base Plate Stress Ratio: 83.5% **Pass**

### Flexural Check

### PL Ref. Data

Yield Line (in):	29.83
Max PL Length:	29.83

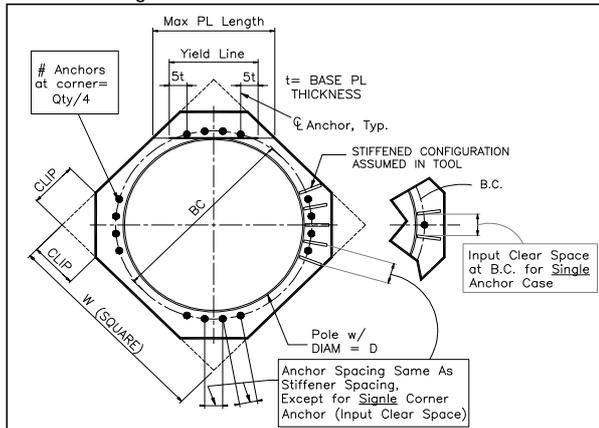
### N/A - Unstiffened

### Stiffener Results

Horizontal Weld : N/A  
 Vertical Weld: N/A  
 Plate Flex+Shear,  $f_b/F_b + (f_v/F_v)^2$ : N/A  
 Plate Tension+Shear,  $f_t/F_t + (f_v/F_v)^2$ : N/A  
 Plate Comp. (AISC Bracket): N/A

### Pole Results

Pole Punching Shear Check: N/A



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

**DRILLED PIER SOIL AND STEEL ANALYSIS - TIA-222-G**

**Factored Base Reactions from RISAs**

	Comp. (+)	Tension (-)	
Moment, Mu =	4289.0		k-ft
Shear, Vu =	43.0		kips
Axial Load, Pu1 =	55.0		kips (from 1.2D + 1.6W)*
Axial Load, Pu2 =	41.3	0.0	kips (from 0.9D + 1.6W)**
OTMu =	4310.5	0.0	k-ft @ Ground

\*Axial Load, Pu1 will be used for Soil Compression Analysis.

\*\*Axial Load, Pu2 will be used for Steel Analysis.

**Drilled Pier Parameters**

Diameter =	7	ft
Height Above Grade =	0.5	ft
Depth Below Grade =	22.5	ft
fc' =	3	ksi
εc =	0.003	in/in
L / D Ratio =	3.29	

Mat Ftdn. Cap Width =		ft
Mat Ftdn. Cap Length =		ft
Depth Below Grade =		ft

**Steel Parameters**

Number of Bars =	32	
Rebar Size =	#11	
Rebar Fy =	60	ksi
Rebar MOE =	29000	ksi
Tie Size =	#5	
Side Clear Cover to Ties =	4	in

**Direct Embed Pole Shaft Parameters**

Dia @ Grade =		in
Dia @ Depth Below Grade =		in
Number of Sides =		
Thickness =		in
Fy =		ksi
Backfill Condition =		

**Define Soil Layers**

Note: Cohesion = Undrained Shear Strength = Unconfined Compressive Strength / 2

Layer	Thickness ft	Unit Weight pcf	Cohesion psf	Friction Angle degrees	Soil Type	Ultimate End Bearing psf	Comp. Ult. Skin Friction psf	Tension Ult. Skin Friction psf	Depth ft
1	3	116	0	45	Sand		80		3
2	2	115	0	38	Sand		180		5
3	2	116	0	41	Sand		240		7
4	3	117	0	45	Sand		380		10
5	5	117	0	45	Sand		480		15
6	5	117	3250	0	Clay		1200		20
7	5	117	0	45	Sand	29050	760		25
8									
9									
10									
11									
12									

**Soil Results: Overturning**

Depth to COR =	16.01	ft, from Grade
Bending Moment, Mu =	4998.84	k-ft, from COR
Resisting Moment, ΦMn =	7561.29	k-ft, from COR

**MOMENT RATIO = 66.1% OK**

Shear, Vu =	43.00	kips
Resisting Shear, ΦVn =	65.04	kips

**Shear Ratio = 66.1% OK**

**Soil Results: Uplift**

Uplift, Tu =	0.00	kips
Uplift Capacity, ΦTn =	81.67	kips

**UPLIFT RATIO = 0.0% OK**

**Soil Results: Compression**

Compression, Cu =	55.00	kips
Comp. Capacity, ΦCn =	1001.37	kips

**COMPRESSION RATIO = 5.5% OK**

**Steel Results (ACI 318-05):**

Minimum Steel Area =	18.47	sq in
Actual Steel Area =	49.92	sq in

Axial, ΦPn (min) =	-2695.68	kips, Where ΦMn = 0 k-ft
Axial, ΦPn (max) =	8839.70	kips, Where ΦMn = 0 k-ft

Axial Load, Pu =	67.33	kips @ 5.36 ft Below Grade
Moment, Mu =	4504.66	k-ft @ 5.36 ft Below Grade
Moment, ΦMn =	7513.38	k-ft

**MOMENT RATIO = 60.0% OK**

**Safety Factors / Load Factors / Φ Factors**

Tower Type =	Monopole DP
ACI Code =	ACI 318-05
Seismic Design Category =	D
Reference Standard =	TIA-222-G
Use 1.3 Load Factor?	No
Load Factor =	1.00

	Safety Factor	Φ Factor
Soil Lateral Resistance =	2.00	0.75
Skin Friction =	2.00	0.75
End Bearing =	2.00	0.75
Concrete Wt. Resist Uplift =	1.25	

**Load Combinations Checked per TIA-222-G**

- (0.75) Ult. Skin Friction + (0.75) Ult. End Bearing + (1.2) Effective Soil Wt. - (1.2) Buoyant Conc. Wt. ≥ Comp.
- (0.75) Ult. Skin Friction + (0.9) Buoyant Conc. Wt. ≥ Uplift

**Soil Parameters**

Water Table Depth =	5.00	ft
Depth to Ignore Soil =	3.50	ft
Depth to Full Cohesion =	0	ft
Full Cohesion Starts at?*	Ground	

Above Full Cohesion Lateral Resistance = 4(Cohesion)(Dia)(H)  
 Below Full Cohesion Lateral Resistance = 8(Cohesion)(Dia)(H)

**Maximum Capacity Ratios**

Maximum Soil Ratio =	110.0%
Maximum Steel Ratio =	105.0%

\*Note: The drilled pier foundation was analyzed using the methodology in the software 'PLS-Caisson' (Version 8.10, or newer, by Power Line Systems, Inc.). Per the methods in PLS-Caisson, the soil reactions of cohesive soils are calculated using 8CD independent of the depth of the soil layer. The depth of soil to be ignored at the top of the drilled pier is based on the recommendations of the site specific geotechnical report. In the absence of any recommendations, the frost depth at the site or one half of the drilled pier diameter (whichever is greater) shall be ignored.

## Moment Capacity of Drilled Concrete Shaft (Caisson) for TIA Rev F or G

**Note:** Shaft assumed to have ties, not spiral, transverse reinforcing

### Site Data

BU#: 876316	
Site Name: <i>Secondino Property</i>	
App #:	

### Loads Already Factored

For M (WL)	1	<----Disregard
For P (DL)	1	<----Disregard

### Pier Properties

<b>Concrete:</b>	
Pier Diameter =	7.0 ft
Concrete Area =	5541.8 in <sup>2</sup>
<b>Reinforcement:</b>	
Clear Cover to Tie=	4.00 in
Horiz. Tie Bar Size=	5
Vert. Cage Diameter =	6.11 ft
Vert. Cage Diameter =	73.34 in
<b>Vertical Bar Size =</b>	<b>11</b>
Bar Diameter =	1.41 in
Bar Area =	1.56 in <sup>2</sup>
Number of Bars =	32
As Total=	49.92 in <sup>2</sup>
A s/ Aconc, Rho:	0.0090 0.90%

ACI 10.5, ACI 21.10.4, and IBC 1810.  
 Min As for Flexural, Tension Controlled, Shafts:  
 (3)\*(Sqrt(f'c)/Fy: 0.0027  
 200 / Fy: 0.0033

### Minimum Rho Check:

Actual Req'd Min. Rho:	0.33%	Flexural
Provided Rho:	0.90%	<b>OK</b>

Ref. Shaft Max Axial Capacities, $\phi$ Max(Pn or Tn):		
Max Pu = ( $\phi=0.65$ ) Pn		
Pn per ACI 318 (10-2)	8839.70	kips
at Mu=( $\phi=0.65$ )Mn=	5309.39	ft-kips
Max Tu, ( $\phi=0.9$ ) Tn =	2695.68	kips
at Mu= $\phi=(0.90)$ Mn=	0.00	ft-kips

### Maximum Shaft Superimposed Forces

TIA Revision:	G	
Max. Factored Shaft Mu:	4504.66	ft-kips (* Note)
Max. Factored Shaft Pu:	67.33	kips
Max Axial Force Type:	Comp.	

**(\*) Note:** Max Shaft Superimposed Moment does not necessarily equal to the shaft top reaction moment

Load Factor	Shaft Factored Loads	
1.00	Mu:	4504.66 ft-kips
1.00	Pu:	67.33 kips

### Material Properties

Concrete Comp. strength, f'c =	3000	psi
Reinforcement yield strength, Fy =	60	ksi
Reinforcing Modulus of Elasticity, E =	29000	ksi
Reinforcement yield strain =	0.00207	
Limiting compressive strain =	0.003	

### ACI 318 Code

Select Analysis ACI Code=	2005
---------------------------	------

### Seismic Properties

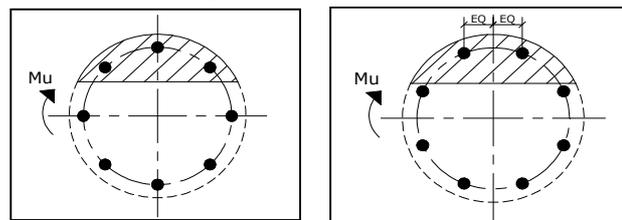
Seismic Design Category =	D
Seismic Risk =	High

Solve  
(Run)

<< Press Upon Completing All Input

### Results:

Governing Orientation Case: **2**



Case 1

Case 2

Dist. From Edge to Neutral Axis: **16.97** in

Extreme Steel Strain,  $\epsilon_t$ : **0.0109**

**$\epsilon_t > 0.0050$ , Tension Controlled**

Reduction Factor,  $\phi$ : **0.900**

Output Note: Negative Pu=Tension

For Axial Compression, $\phi$ Pn = Pu:	67.33	kips
Drilled Shaft Moment Capacity, $\phi$ Mn:	<b>7513.39</b>	ft-kips
Drilled Shaft Superimposed Mu:	<b>4504.66</b>	ft-kips

<b>(Mu/<math>\phi</math>Mn, Drilled Shaft Flexure CSR:</b>	<b>60.0%</b>
--	--------------

# MODIFICATION OF AN EXISTING 147' MONOPOLE SUMMIT #2737-97 BU #876316; SECONDINO PROPERTY

21 ACORN ROAD  
BRANFORD, CONNECTICUT 06405  
NEW HAVEN COUNTY  
LAT: 41° 17' 35.06"; LONG: -72° 45' 46.4"  
APP: 380950 REV. 5; WO: 1392288

### PROJECT CONTACTS

STRUCTURE OWNER:  
CROWN CASTLE  
MOD PM: DAN VADNEY AT DAN.VADNEY@CROWNCastle.COM  
PH: (518) 373-3510  
MOD CM: JASON D'AMICO AT JASON.D'AMICO@CROWNCastle.COM  
PH: (860) 209-0104

ENGINEER OF RECORD:  
PJFMOD@PJFWEB.COM

### THIS PROJECT INCLUDES THE FOLLOWING ITEMS

SHAFT REINFORCING
FIELD WELDED STIFFENERS
HIGH STRENGTH GROUT
REMOVE AND REPLACE STEP BOLTS

### SHEET INDEX

SHEET NUMBER	DESCRIPTION
T-1	TITLE SHEET
T-2	MI CHECKLIST
S-1	GENERAL NOTES
S-2A	FORGBOLT™ DETAILS
S-2B	NEXGEN2™ BOLT DETAIL
S-2C	AJAX ONESIDE™ BOLT DETAIL
S-3	MONOPOLE PROFILE
S-4	SHAFT REINFORCING DETAILS
S-5	BASE PLATE DETAILS

### WIND DESIGN DATA

REFERENCE STANDARD	ANSI/TIA-222-G-2-2009
LOCAL CODE	2016 CONNECTICUT BUILDING CODE
ULTIMATE WIND SPEED (3-SECOND GUST)	130 MPH
CONVERTED NOMINAL WIND SPEED (3-SECOND GUST)	101 MPH
ICE THICKNESS	0.75 IN
ICE WIND SPEED	50 MPH
SERVICE WIND SPEED	60 MPH
RISK CATEGORY	II
EXPOSURE CATEGORY	C
Kzt	1.0

QUALIFIED ENGINEERING SERVICES ARE AVAILABLE FROM PAUL J. FORD & COMPANY TO ASSIST CONTRACTORS IN CLASS IV RIGGING PLAN REVIEWS. FOR REQUESTED QUALIFIED ENGINEERING SERVICES, PLEASE CONTACT RIGGING@PJFWEB.COM.

THE ASSOCIATED FAILING SA WO NUMBER FOR THIS PROJECT IS 1376852

ATTENTION ALL CONTRACTORS, ANYTIME YOU ACCESS A CROWN SITE FOR ANY REASON YOU ARE TO CALL THE CROWN NOC UPON ARRIVAL AND DEPARTURE, DAILY AT (800) 788-7011.

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

**MODIFICATION OF AN EXISTING 147'  
MONOPOLE  
BU #876316; SECONDINO PROPERTY  
BRANFORD, CONNECTICUT**

PROJECT No: 37517-1800.001.7700  
DRAWN BY: B.M.S.  
DESIGNED BY: M.E.H.  
CHECKED BY: *TJD*  
DATE: 4-19-2017

TITLE SHEET

T-1

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

MI CHECKLIST	
CONSTRUCTION/INSTALLATION INSPECTIONS AND TESTING REQUIRED (COMPLETED BY EOR)	REPORT ITEM
<b>PRE-CONSTRUCTION</b>	
X	MI CHECKLIST DRAWINGS
X	EOR REVIEW
X	FABRICATION INSPECTION
NA	FABRICATOR CERTIFIED WELD INSPECTION
X	MATERIAL TEST REPORT (MTR)
NA	FABRICATOR NDE INSPECTION
X	NDE REPORT OF MONOPOLE BASE PLATE (AS REQUIRED)
X	PACKING SLIPS
ADDITIONAL TESTING AND INSPECTIONS: _____	
<b>CONSTRUCTION</b>	
X	CONSTRUCTION INSPECTIONS
NA	FOUNDATION INSPECTIONS
NA	CONCRETE COMP. STRENGTH AND SLUMP TESTS
NA	POST INSTALLED ANCHOR ROD VERIFICATION
X	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
NA	MICROPILE/ROCK ANCHOR INSTALLER'S DRILLING AND INSTALLATION LOGS AND QA/QC DOCUMENTS
ADDITIONAL TESTING AND INSPECTIONS: _____	
<b>POST-CONSTRUCTION</b>	
X	MI INSPECTOR REDLINE OR RECORD DRAWING(S)
NA	POST INSTALLED ANCHOR ROD TARGET TENSION LOAD TESTING
NA	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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**CROWN CASTLE**  
 3530 TORINGDON WAY, SUITE 300, CHARLOTTE, NC 28277  
 PH: (724) 416-2000

**MODIFICATION OF AN EXISTING 147' MONOPOLE**  
**BU #876316; SECONDINO PROPERTY BRANFORD, CONNECTICUT**

PROJECT No: 37517-1800.001.7700  
 DRAWN BY: B.M.S.  
 DESIGNED BY: M.E.H.  
 CHECKED BY: *TJD*  
 DATE: 4-19-2017

MI CHECKLIST

T-2

**1. GENERAL NOTES**

- 1.1. THE MONOPOLE STRUCTURE IN ITS EXISTING CONDITION DOES NOT HAVE THE STRUCTURAL CAPACITY TO CARRY ALL OF THE PROPOSED AND EXISTING LOADS FROM THE ATTACHED STRUCTURAL MODIFICATION REPORT AT THE REQUIRED MINIMUM WIND SPEEDS. DO NOT INSTALL ANY NEW LOADS UNTIL THE MONOPOLE REINFORCING SYSTEM IS COMPLETELY AND SUCCESSFULLY INSTALLED.
- 1.2. THESE DRAWINGS WERE PREPARED FROM INFORMATION 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. PRIOR TO FABRICATION AND INSTALLATION CONTRACTOR SHALL VERIFY ALL LENGTHS AND QUANTITIES GIVEN. LENGTH AND QUANTITIES PROVIDED ARE FOR QUOTING PURPOSES ONLY AND SHALL NOT BE USED FOR FABRICATION. THE CONTRACTOR SHALL COORDINATE WITH THE PROJECT DRAWINGS AND THEIR FIELD VERIFIED CONDITIONS AND DIMENSIONS BEFORE PROCEEDING WITH THE WORK. THE CONTRACTOR SHALL IMMEDIATELY REPORT ANY AND ALL DISCREPANCIES TO THE EOR AND CROWN CASTLE BEFORE PROCEEDING WITH THE WORK. ANY WORK PERFORMED WITHOUT A PREFABRICATION MAPPING IS DONE AT THE RISK OF THE GENERAL CONTRACTOR AND/OR THE FABRICATOR
- 1.3. 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.
- 1.4. 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.
- 1.5. ALL CONSTRUCTION MEANS AND METHODS; INCLUDING BUT NOT LIMITED TO, ERECTION PLANS, RIGGING PLANS, CLIMBING PLANS AND RESCUE PLANS SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR RESPONSIBLE FOR THE EXECUTION OF THE WORK CONTAINED HEREIN AND SHALL MEET ANSI/TIA-1019 (LATEST EDITION), OSHA AND GENERAL INDUSTRY STANDARDS. ALL RIGGING PLANS SHALL ADHERE TO ANSI/TIA-1019 (LATEST EDITION) INCLUDING THE REQUIRED INVOLVEMENT OF A QUALIFIED ENGINEER FOR CLASS IV CONSTRUCTION.
- 1.6. OBSERVATION VISITS TO THE SITE BY CROWN CASTLE AND/OR THE EOR SHALL NOT INCLUDE INSPECTIONS OF THE PROTECTIVE MEASURES OR THE CONSTRUCTION PROCEDURES. ANY SUPPORT SERVICES PERFORMED BY THE EOR DURING CONSTRUCTION ARE SOLELY FOR THE PURPOSE OF ACHIEVING GENERAL CONFORMANCE WITH THE CONTRACT DOCUMENTS. THEY DO NOT GUARANTEE THE CONTRACTOR'S PERFORMANCE AND SHALL NOT BE CONSTRUED AS SUPERVISION OF CONSTRUCTION.
- 1.7. 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.
- 1.8. 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.
- 1.9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING AND NEW COAXIAL CABLES AND OTHER EQUIPMENT DURING CONSTRUCTION.
- 1.10. 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.
- 1.11. 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.
- 1.12. THE CLIMBING FACILITIES, SAFETY CLIMB AND ALL PARTS THEREOF SHALL NOT BE IMPEDED, MODIFIED OR ALTERED WITHOUT THE EXPRESS APPROVAL OF THE EOR.
- 1.13. FOR STANDARD CROWN PARTS SEE THE MOST RECENT VERSION OF THE 'CCI APPROVED REINFORCEMENT COMPONENTS' CATALOG.
- 1.14. 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 PRODUCTS. CONTACT DETAILS:  
3434 ENCRETE LANE, MORAIN, 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. ALL STRUCTURAL BOLTS SHALL BE INSTALLED AND TIGHTENED TO THE PRETENSIONED CONDITION ACCORDING TO THE REQUIREMENTS OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM HIGH STRENGTH BOLTS', DEC. 31, 2009.
- 2.3. 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.
- 2.4. 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.
- 2.5. 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.
- 2.6. STRUCTURAL STEEL PLATES SHALL CONFORM TO ASTM A572 GRADE 65(FY = 65 KSI MIN) UNLESS NOTED OTHERWISE ON THE DRAWINGS.
- 2.7. 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.
- 2.8. NO WELDING SHALL BE DONE TO THE EXISTING STRUCTURE WITHOUT THE PRIOR APPROVAL AND SUPERVISION OF THE TESTING AGENCY.
- 2.9. FIELD CUTTING OF STEEL:
  - 2.9.1. IMPORTANT CUTTING AND WELDING SAFETY GUIDELINES: THE CONTRACTOR SHALL FOLLOW ALL CROWN CASTLE CUTTING, WELDING, FIRE PREVENTION AND SAFETY 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.
  - 2.9.2. 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**

- 3.1. NEW GROUT FOR THE POLE BASE SHALL BE NON-SHRINK, NON-METALLIC, GROUT (NS GROUT BY EUCLID, OR APPROVED EQUAL) WITH A 7500 PSI MINIMUM COMPRESSIVE STRENGTH. CONTRACTOR SHALL SUBMIT PROPOSED GROUT SPECIFICATION INFORMATION TO CROWN CASTLE FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION. CONTRACTOR SHALL FOLLOW GROUT MANUFACTURER'S SPECIFICATIONS FOR COLD WEATHER GROUTING PROCEDURES (IF NECESSARY) AND THE TESTING AGENCY SHALL PREPARE GROUT SAMPLE SPECIMENS FOR COMPRESSIVE STRENGTH TESTING AND VERIFICATION.
- 3.2. GROUT SHALL BE INSTALLED TIGHT UNDER THE BASE PLATE AND BEARING PLATE REGION WITH NO VOIDS REMAINING BETWEEN THE TOP OF THE EXISTING CONCRETE AND THE UNDERSIDE OF THE EXISTING BASE PLATE AND BEARING PLATE.
- 3.3. CAULK AROUND ANCHOR RODS WHEN GROUTING.

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

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

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

**7. TOUCH UP OF GALVANIZING**

- 7.1. THE CONTRACTOR SHALL TOUCH UP ANY AND ALL AREAS OF GALVANIZING ON THE EXISTING STRUCTURE OR NEW COMPONENTS THAT ARE DAMAGED OR ABRATED 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. DRILL OR PUNCH WEEP AND/OR DRAINAGE HOLES WITH EOR APPROVAL OF LOCATIONS.
- 8.3. 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 ANSITIA-222-G-2-2009 SECTION 14.2: "IT IS RECOMMENDED THAT THE STRUCTURE BE INSPECTED AFTER SEVERE WIND AND/OR ICE STORMS OR OTHER EXTREME LOADING CONDITIONS".

**10. FIELD NDE MINIMUM REQUIREMENTS**

- 10.1. ALL NDE SHALL BE IN ACCORDANCE WITH AWS D1.1.
- 10.2. FOR NEW BASE STIFFENERS (INCLUSIVE OF TRANSITION STIFFENERS) AND ANCHOR ROD BRACKETS, COMPLETE JOINT PENETRATION WELDS SHALL BE 100% INSPECTED BY UT. ALL PARTIAL JOINT PENETRATION AND FILLET WELDS SHALL BE 100% INSPECTED BY MT.
- 10.3. FOR NEW FLAT PLATE REINFORCEMENT AT THE BASE OF THE TOWER, COMPLETE JOINT PENETRATION WELDS SHALL BE 100% INSPECTED BY UT. ALL PARTIAL JOINT PENETRATION AND FILLET WELDS SHALL BE 100% INSPECTED BY MT, BUT MAY BE LIMITED TO A HEIGHT OF 10'-0".
- 10.4. FOR NDE OF THE EXISTING BASE PLATE CIRCUMFERENTIAL WELD, GC SHALL REFERENCE THE MI CHECKLIST FOR APPLICABILITY. PLEASE SEE ENG-SOW-10033: 'TOWER BASE PLATE NDE, AND ENG-BUL-10051: 'NDE REQUIREMENTS FOR MONOPOLE BASE PLATE TO PREVENT CONNECTION FAILURE'. NOTIFY THE EOR AND CROWN ENGINEERING IMMEDIATELY IF ANY CRACKS ARE SUSPECTED OR HAVE BEEN IDENTIFIED. THE NDE SHALL INCLUDE ALL EXISTING MODIFICATIONS THAT HAVE BEEN WELDED TO THE BASE PLATE.
- 10.5. ALL TESTING LIMITATIONS SHALL BE DETAILED IN THE NDE REPORT.

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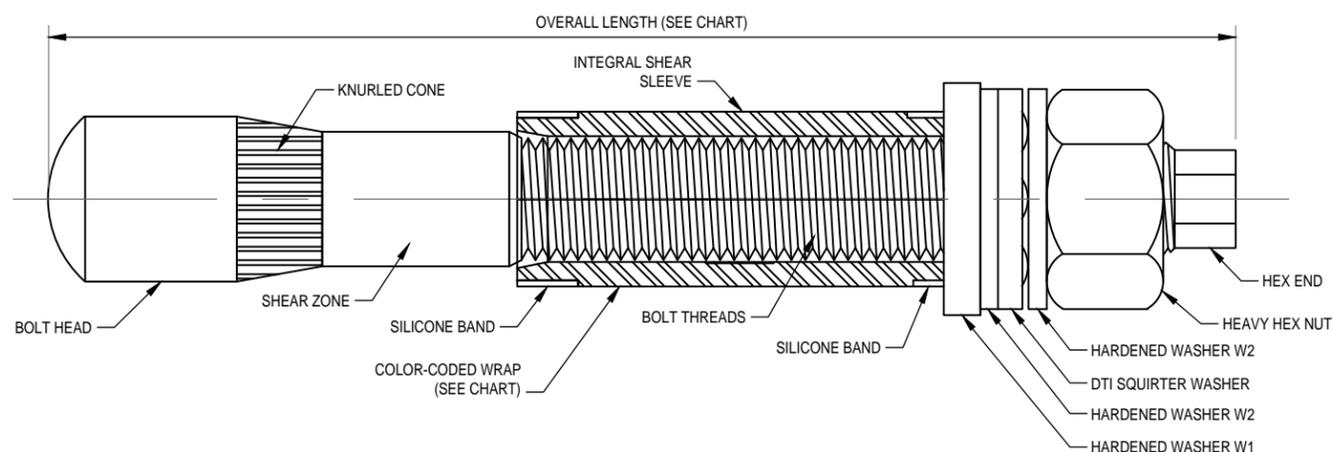
**CROWN CASTLE**  
3530 TORINGDON WAY, SUITE 300, CHARLOTTE, NC 28277  
PH: (724) 416-2000

MODIFICATION OF AN EXISTING 147'  
MONOPOLE  
BU #876316; SECONDINO PROPERTY  
BRANFORD, CONNECTICUT

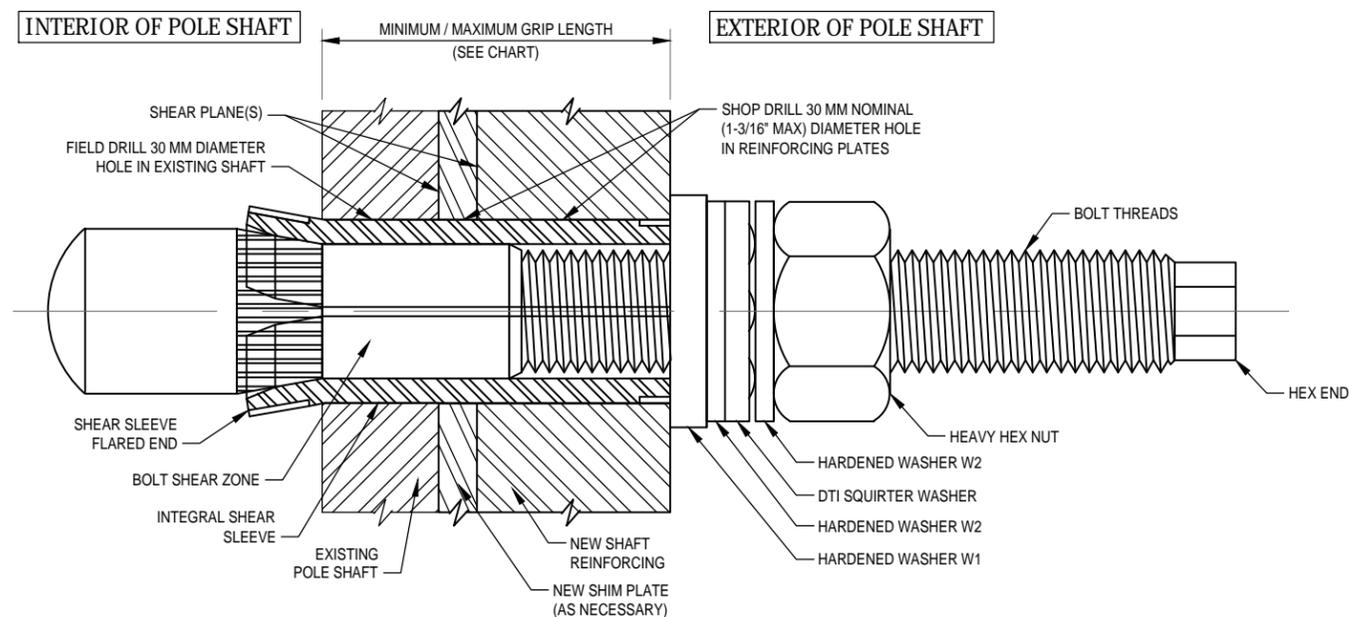
PROJECT No: 37517-1800.001.7700  
DRAWN BY: B.M.S.  
DESIGNED BY: M.E.H.  
CHECKED BY: TJD  
DATE: 4-19-2017

GENERAL NOTES

S-1



**PRE-INSTALLED FORGBolt™ ASSEMBLY DETAIL** 1  
S-2A



**INSTALLED FORGBolt™ ASSEMBLY DETAIL** 2  
S-2A

FORGBolt®		AISC Group A Material: ASTM A325 and PC8.8 (Tensile Stress, Fu = 120 ksi minimum)					
GROUP A	FORGBolt® Size (mm)	Overall Length (inches)	Estimated Weight Each (lbs)	Grip Range (inch)	Comment	Color Code	
FORGBolt® A325 - PC8.8	1	135	5.31	1.3	3/8" to 1"	--	RED
	2	160	6.30	1.6	3/4" to 1-1/2"	--	GREEN
	3	195	7.68	1.9	1-1/4" to 2-1/4"	--	BLUE
	4	260	10.24	2.6	2" to 3-1/2"	Splice Bolt	YELLOW
	5	365	14.37	3.6	3-1/2" to 5-1/2"	Flange Jump Bolt	ORANGE
	6	440	17.32	4.3	5-1/2" to 8-1/2"	Flange Jump Bolt	BLACK
<b>DTI Note</b>	Each Group A (A325/PC8.8) FORGBolt® assembly shall have a 'Squirter' DTI that is compatible with a M20-PC8.8 bolt.						

**FOLLOW ALL MANUFACTURER / DISTRIBUTOR RECOMMENDATIONS FOR INSTALLATION, TIGHTENING, AND INSPECTION**

**INSTALLATION NOTES:**

1. FIELD DRILL HOLES TO 30 MM DIAMETER.
2. SELECT CORRECT BOLT SIZE FOR INSTALLATION GRIP (REFER TO PLANS).
3. INSERT BOLT ASSEMBLY THROUGH HOLES IN SHAFT REINFORCING PLATES AND SEAT THE HARDENED WASHER W1 FLUSH AGAINST OUTSIDE OF PLATE.
4. HAND TIGHTEN NUT TO FINGER TIGHT.
5. TIGHTEN NUT TO PRETENSIONED CONDITION AND UNTIL DTI SHOWS PROPER INDICATION.
6. PROPERLY DOCUMENT AND INSPECT BOLT TIGHTENING PER PLAN REQUIREMENTS.

**BOLT HOLE NOTES:**

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

**BOLT TIGHTENING AND INSPECTION 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.

**AISC GROUP A MATERIAL: ASTM A325 AND PC8.8  
(Fu = 120 KSI MIN TENSILE STRESS)**

**CONTAINS PROPRIETARY INFORMATION PATENT PENDING**

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**DISTRIBUTOR CONTACT:**

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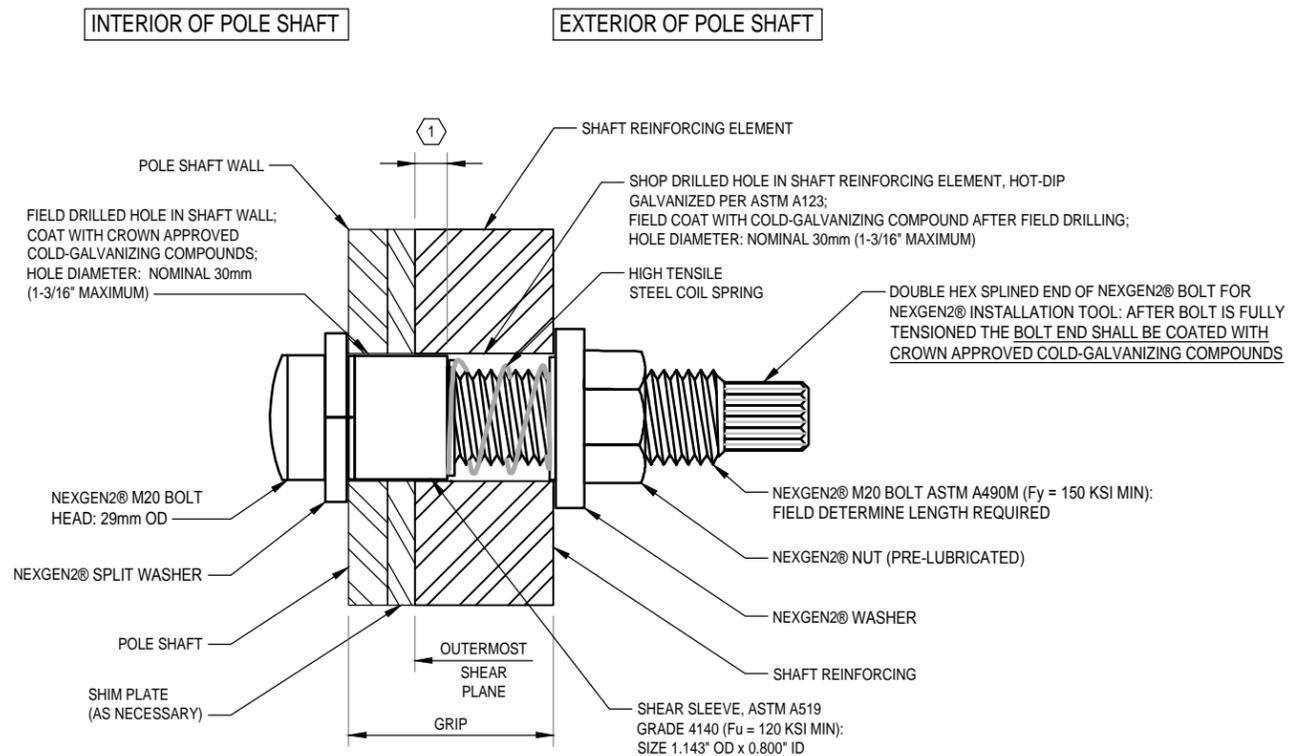
**MODIFICATION OF AN EXISTING 147' MONOPOLE**  
 BU #876316; SECONDINO PROPERTY  
 BRANFORD, CONNECTICUT

PROJECT No:	37517-1800.001.7700
DRAWN BY:	B.M.S.
DESIGNED BY:	M.E.H.
CHECKED BY:	TJD
DATE:	4-19-2017

FORGBOLT™  
DETAILS

S-2A

① NOTE: SHEAR SLEEVE LENGTH: THE SHEAR SLEEVE SHALL PROJECT A MINIMUM OF 3/8" BEYOND THE OUTERMOST SHEAR PLANE. THE CONTRACTOR SHALL SUBMIT FABRICATION DRAWINGS SHOWING NEXGEN2® BOLT LENGTHS AND SHEAR SLEEVE LENGTHS TO THE EOR FOR REVIEW AND APPROVAL.



TYPICAL NEXGEN2™ BOLT DETAIL 1 S-2B

**FOLLOW ALL MANUFACTURER / DISTRIBUTOR RECOMMENDATIONS FOR INSTALLATION, TIGHTENING, AND INSPECTION**

**BOLT HOLE NOTES:**

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

**BOLT TIGHTENING AND INSPECTION NOTES:**

1. ALL NEXGEN2® BOLT ASSEMBLIES SHALL BE INSTALLED AND TIGHTENED TO THE PRETENSIONED CONDITION ACCORDING TO THE REQUIREMENTS OF SECTION 8.2.3 OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009. PER SECTION 8.2.3: ALL FASTENER ASSEMBLIES SHALL BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS IN AISC SECTION 8.1 WITHOUT SEVERING THE SPLINED END AND WITH WASHERS POSITIONED AS REQUIRED IN AISC SECTION 6.2. PER REQUIREMENTS IN SECTION 8.1: PRIOR TO BOLT PRETENSIONING, THE JOINT SHALL FIRST BE COMPACTED TO THE SNUG-TIGHT CONDITION. SNUG TIGHT IS THE CONDITION THAT EXISTS WHEN ALL OF THE PLIES IN THE CONNECTION HAVE BEEN PULLED INTO FIRM CONTACT BY THE BOLTS AND THE BOLTS HAVE BEEN TIGHTENED SUFFICIENTLY TO PREVENT THE REMOVAL OF THE NUTS WITHOUT THE USE OF A WRENCH. ONCE THE SNUG TIGHT CONDITION IS ACHIEVED, THEN THE BOLT ASSEMBLY CAN BE TIGHTENED TO THE PRETENSIONED CONDITION.
2. ALL NEXGEN2® BOLT ASSEMBLIES SHALL BE INSPECTED ACCORDING TO THE REQUIREMENTS OF SECTION 9.2.3 OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009. NOTE THAT COMPLETE INSPECTION OF ALL NEXGEN2® BOLT ASSEMBLIES IS REQUIRED IN ADDITION TO ROUTINE OBSERVATION.
3. ALL NEXGEN2® BOLTS SHALL BE INSPECTED BY A QUALIFIED BOLT INSPECTOR PER NOTES 1 AND 2, ABOVE. DURING INSTALLATION, THE BOLT INSPECTOR SHALL VERIFY AND DOCUMENT: THE SHOP-DRILLED AND FIELD-DRILLED HOLE SIZES; THE INSTALLATION OF THE NEXGEN2® BOLT ASSEMBLY, INCLUDING THE SHEAR SLEEVE PLACEMENT AND NUT LUBRICATION; AND THE CONTRACTOR'S TENSIONING PROCEDURE. THE BOLT INSPECTOR SHALL PROVIDE COMPLETE DOCUMENTATION OF ALL BOLTS AFTER TIGHTENING CLEARLY SHOWING THAT THE DOUBLE HEX SPLINED END OF THE BOLTS HAVE BEEN TWISTED OFF AND COATED WITH CROWN APPROVED COLD-GALVANIZING COMPOUND..

PART NUMBER	BOLT LENGTH	SLEEVE LENGTH	MIN GRIP RANGE	MAX GRIP RANGE
M20x36	M20x95	1 1/16"	1 5/16"	1 7/16"
M20x48	M20x95	1 3/16"	1 7/16"	1 7/8"
M20x57	M20x95	1 5/8"	1 7/8"	2 1/4"
M20x68	M20x135	2"	2 1/4"	2 11/16"
M20x96	M20x135	2 7/16"	2 11/16"	3 3/4"
M20x127	M20x165	3"	3 3/4"	5"
M20x212	M20x250	4"	5"	8 5/16"

NOTE: NEXGEN2® BOLT ASSEMBLY SHALL BE MAGNI 565 COATED PER ASTM F2833 AND MANUFACTURER SPECIFICATIONS.

NOTE: INSTALL NEXGEN2® BOLT ASSEMBLY PER MANUFACTURER'S INSTRUCTIONS.

**DISTRIBUTOR CONTACT DETAILS:**

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 15401 COMMERCE PARK DR.  
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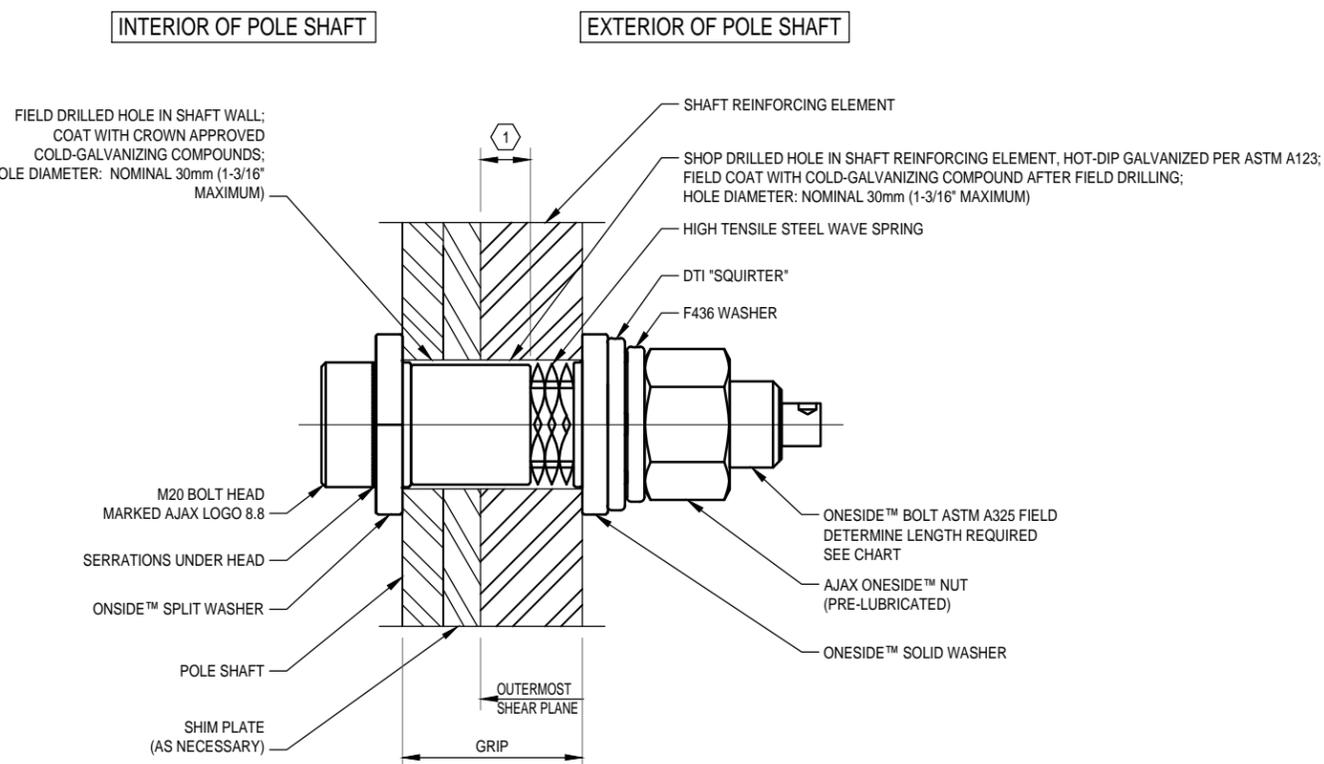
MODIFICATION OF AN EXISTING 147' MONOPOLE  
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 BRANFORD, CONNECTICUT

PROJECT No: 37517-1800.001.7700  
 DRAWN BY: B.M.S.  
 DESIGNED BY: M.E.H.  
 CHECKED BY: TJD  
 DATE: 4-19-2017

NEXGEN2™ BOLT DETAIL

S-2B

① NOTE: SHEAR SLEEVE LENGTH: THE SHEAR SLEEVE SHALL PROJECT A MINIMUM OF 3/8" BEYOND THE OUTERMOST SHEAR PLANE. THE CONTRACTOR SHALL SUBMIT FABRICATION DRAWINGS SHOWING AJAX ONESIDE™ BOLT LENGTHS AND SHEAR SLEEVE LENGTHS TO THE EOR FOR REVIEW AND APPROVAL.



TYPICAL AJAX ONESIDE™ BOLT DETAIL

1  
S-2C

**FOLLOW ALL MANUFACTURER / DISTRIBUTOR RECOMMENDATIONS FOR INSTALLATION, TIGHTENING, AND INSPECTION**

**BOLT HOLE NOTES:**

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

**BOLT TIGHTENING AND INSPECTION NOTES:**

1. ALL AJAX ONESIDE™ BOLT ASSEMBLIES SHALL BE INSTALLED AND TIGHTENED TO THE PRETENSIONED CONDITION ACCORDING TO THE REQUIREMENTS OF SECTION 8.2.4 OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009. PER SECTION 8.2.4: ALL FASTENER ASSEMBLIES SHALL BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS IN AISC SECTION 8.1 WITH WASHERS POSITIONED AS REQUIRED IN AISC SECTION 6.2. PER REQUIREMENTS IN SECTION 8.1: PRIOR TO BOLT PRETENSIONING, THE JOINT SHALL FIRST BE COMPACTED TO THE SNUG-TIGHT CONDITION. SNUG TIGHT IS THE CONDITION THAT EXISTS WHEN ALL OF THE PLIES IN THE CONNECTION HAVE BEEN PULLED INTO FIRM CONTACT BY THE BOLTS AND THE BOLTS HAVE BEEN TIGHTENED SUFFICIENTLY TO PREVENT THE REMOVAL OF THE NUTS WITHOUT THE USE OF A WRENCH. ONCE THE SNUG TIGHT CONDITION IS ACHIEVED, THEN THE BOLT ASSEMBLY CAN BE TIGHTENED TO THE PRETENSIONED CONDITION.
2. ALL AJAX ONESIDE™ BOLT ASSEMBLIES SHALL BE INSPECTED ACCORDING TO THE REQUIREMENTS OF SECTION 9.2.4 OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009. NOTE THAT COMPLETE INSPECTION OF ALL AJAX ONESIDE™ BOLT ASSEMBLIES IS REQUIRED IN ADDITION TO ROUTINE OBSERVATION.
3. ALL AJAX ONESIDE™ BOLTS SHALL BE INSPECTED BY A QUALIFIED BOLT INSPECTOR PER NOTES 1 AND 2, ABOVE. DURING INSTALLATION, THE BOLT INSPECTOR SHALL VERIFY AND DOCUMENT: THE SHOP-DRILLED AND FIELD-DRILLED HOLE SIZES; THE INSTALLATION OF THE AJAX ONESIDE™ BOLT ASSEMBLY, INCLUDING THE SHEAR SLEEVE PLACEMENT AND NUT LUBRICATION; AND THE CONTRACTOR'S TENSIONING PROCEDURE. THE BOLT INSPECTOR SHALL PROVIDE COMPLETE DOCUMENTATION OF ALL BOLTS AFTER TIGHTENING CLEARLY SHOWING THAT THE DIRECT TENSION INDICATOR WASHERS SHOW THAT THE PROPER BOLT TENSION HAS BEEN REACHED.
4. A MINIMUM OF 4 OUT OF 5 SQUIRTER® DTI PROTRUSIONS SHALL BE ENGAGED IN ANY AJAX ONESIDE™/DTI BOLT ASSEMBLY IN THE REINFORCING MEMBERS. A FEELER GAGE MAY BE USED TO VERIFY PROTRUSION COMPRESSION.
5. INSPECTIONS SHALL BE IN ACCORDANCE WITH THE MANUFACTURERS REQUIREMENTS AND CROWN DOCUMENT ENG-SOW-10007: *MODIFICATION INSPECTION SOW*.

**BOLT ASSEMBLY AND INSTALLATION:**

1. BOLT MUST BE PURCHASED PRE-ASSEMBLED.
2. FOLLOW BOLT AND DTI MANUFACTURERS INSTRUCTIONS FOR INSTALLATION.

**AJAX ONESIDE™ BOLT DETAIL**

CODE	SIZE	COLOR	SLEEVE LENGTH	GRIP	GRIP IMP
OSBA20.65-6	M20 x 65	ORANGE	6.0 (0.236")	12.5 / 20.0	0.500" / 0.787"
OSBA20.95-14	M20 x 95	BLACK	14.0 (0.551")	20.0 / 32.0	0.787" / 1.259"
OSBA20.95-22	M20 x 95	GREEN	22.0 (0.866")	30.0 / 50.0	1.181" / 1.968"
OSBA20.95-30	M20 x 95	YELLOW	30.0 (1.181")	40.5 / 50.0	1.595" / 1.968"
OSBA20.135-39	M20 x 135	BLUE	39.0 (1.535")	49.0 / 77.0	1.929" / 3.031"
OSBA20.135-48	M20 x 135	BROWN	48.0 (1.889")	60.5 / 77.0	2.375" / 3.031"
OSBA20.135-57	M20 x 135	PURPLE	57.0 (2.244")	67.0 / 90.0	2.637" / 3.543"
OSBA20.165-76	M20 x 165	RED	76.0 (3.000")	87.0 / 120.0	3.425" / 4.724"
OSBA20.250	M20 x 250	SILVER	MT0	121.0 / 211.0	4.724" / 8.310"

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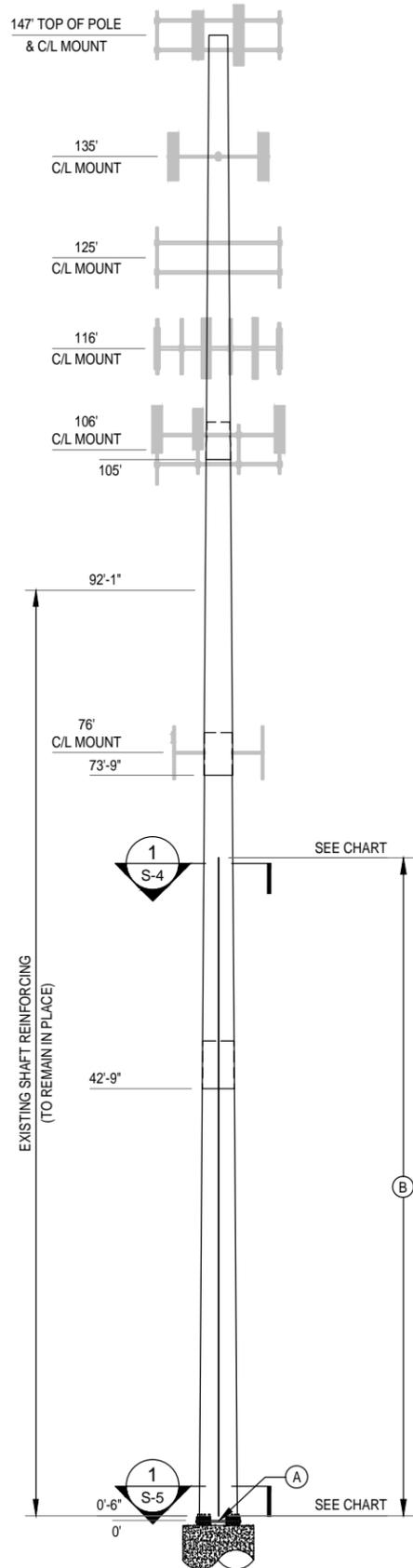
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MODIFICATION OF AN EXISTING 147' MONOPOLE  
 BU #876316; SECONDINO PROPERTY  
 BRANFORD, CONNECTICUT

PROJECT No: 37517-1800.001.7700  
 DRAWN BY: B.M.S.  
 DESIGNED BY: M.E.H.  
 CHECKED BY: TJD  
 DATE: 4-19-2017

AJAX ONESIDE™ BOLT DETAIL

S-2C



**POLE ELEVATION** 1  
S-3

NOTE: SHAFT REINFORCING MAY NEED TO BE INSTALLED OFF-CENTER OF FLAT FOR FIT UP. OFFSETS THAT RESULT IN THE FASTENER BEING LOCATED LESS THAN 1 1/2" FROM THE APEX OF THE FLAT MUST BE APPROVED BY THE ENGINEER OF RECORD.

NEW CCI FLAT PLATE (65 KSI) REINFORCING SCHEDULE											
BOTTOM ELEVATION	TOP ELEVATION	FLAT # / DEGREE SEPARATION	ELEMENT	ELEMENT LENGTH	ELEMENT QUANTITY	APPROXIMATE BOLTS PER ELEMENT	APPROXIMATE TOTAL BOLT QUANTITY	TERMINATION BOLTS (BOTTOM)	TERMINATION BOLTS (TOP)	MAXIMUM INTERMEDIATE BOLT SPACING	ESTIMATED TOTAL STEEL WEIGHT
0' - 6"	35' - 6"	F3 & F9	CCI-SFP-06512535	35' - 0"	2	40	80	11	11	19"	1935 LBS.
0' - 6"	35' - 6"	F14	CCI-WCFP-06512535 #1	35' - 0"	1	27	27	0	11	19"	968 LBS.
35' - 7"	65' - 7"	F3, F9 & F14	CCI-AFP-06010030	30' - 0"	3	38	114	10	10	16"	1838 LBS.
221										4741 LBS.	

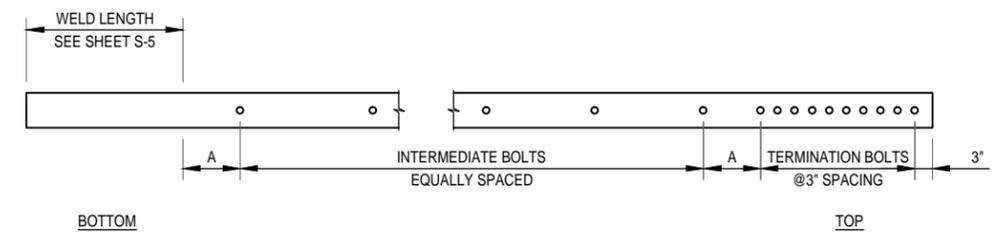
- NOTES:**
- 1.) ALL STEEL SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123. ALTERNATIVELY, ALL NEW STIFFENER PLATE STEEL REINFORCING MAY BE COLD GALVANIZED AS FOLLOWS: APPLY A MINIMUM OF TWO COATS OF ZRC-BRAND ZINC-RICH COLD GALVANIZING COMPOUND. FILM THICKNESS PER COAT SHALL 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.
  - 2.) ALL REINFORCING SHALL BE ASTM A572 GR. 65.
  - 3.) WELDS SHALL BE E80XX OR GREATER. TERMINATION WELDS SHALL BE 3/8" FILLET WELDS.
  - 4.) HOLES FOR BOLTS ARE 30mm UNLESS NOTED OTHERWISE.
  - 5.) ALL SHIMS SHALL BE ASTM A-36.
  - 6.) ALL HOLES ARE TO BE DRILLED, DO NOT BURN OR PUNCH.
  - 7.) FOR PLATES STARTING AT 6", THE BOTTOM OF THE FLAT PLATE SHALL BEGIN AT 6" ± 1". FOR SINGLE PLATES OR MULTIPLE PLATES SPliced TOGETHER, THE BOTTOM OF THE FLAT PLATE SHALL BEGIN AT THE PROPOSED ELEVATION ± 3". FOR MULTIPLE PLATES SPliced TOGETHER, THE TOP OF THE FLAT PLATE IS TO BE PLACED SUCH THAT THERE IS NO MORE THAN 3" DIFFERENCE BETWEEN THE ACTUAL OVERALL LENGTH OF THE SPAN AND THE PROPOSED OVERALL LENGTH OF THE SPAN, FROM THE BOTTOM OF THE PLATE TO THE TOP OF THE PLATE.

SPLICE PLATE INSTALLATION CHART								
ELEVATION	FLAT PLATE THICKNESS	FLAT PLATE WIDTH	FLAT PLATE LENGTH	FLAT PLATE QUANTITY	WELD LENGTH PER SIDE	TOTAL WELD LENGTH	BOLTS PER SPLICE*	TOTAL STEEL WEIGHT
35' - 7"	1"	6"	5' - 10"	3	0"	0"	21	357 LBS.
						0"		357 LBS.

\* BOLTS INCLUDED IN THE TOTAL QUANTITY LISTED IN THE FLAT PLATE INSTALLATION CHART.

NEW SHIM CHART				
1/16" SHIM QUANTITY	1/4" SHIM QUANTITY	SHIM WIDTH	SHIM LENGTH	HOLE DIAMETER
21	6	6"	6"	1-1/4"

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



**CUSTOM WELDED BAR DETAIL**

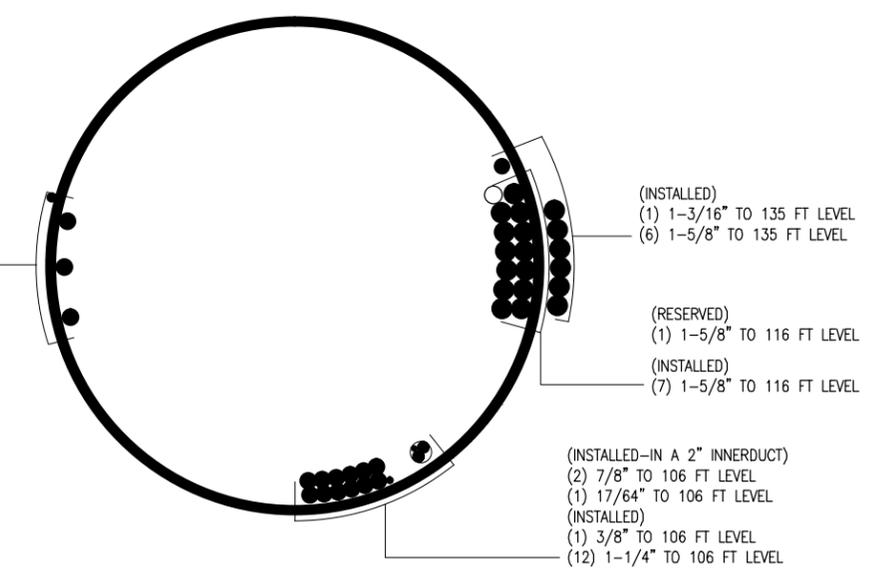
NOTE: "A" DIMENSION MAY VARY, NOT TO EXCEED MAXIMUM INTERMEDIATE BOLT SPACING

SHAFT SECTION DATA							
SHAFT SECTION	SECTION LENGTH (FT)	PLATE THICKNESS (IN)	LAP SPLICE (IN)	DIAMETER ACROSS FLATS (IN)		POLE GRADE (ksi)	POLE SHAPE
				@ TOP	@ BOTTOM		
1	42.00	0.2500		22.000	29.141	60	18-SIDED
2	35.00	0.3125	45.00	28.003	33.955	60	18-SIDED
3	35.25	0.3750	51.00	32.607	38.601	60	18-SIDED
4	47.50	0.4375	57.00	37.043	45.120	60	18-SIDED

NOTE: DIMENSIONS SHOWN DO NOT INCLUDE GALVANIZING TOLERANCES

ASTM A36 SHIMS FOR MONOPOLE REINFORCEMENT MEMBERS SHALL BE REQUIRED WHERE GAPS BETWEEN THE POLE SHAFT AND REINFORCING MEMBER EXIST AT FASTENER LOCATIONS. FOR INTERMEDIATE CONNECTIONS, THE MINIMUM SHIM LENGTH AND WIDTH SHALL BE THE WIDTH OF THE REINFORCING MEMBER. FOR TERMINATION CONNECTIONS, A CONTINUOUS SHIM PLATE (PREFERRED) OR EQUIVALENT INDIVIDUAL SHIM PLATES THE WIDTH OF THE REINFORCING MEMBER MAY BE USED. SHIM THICKNESSES SHALL BE NO LESS THAN 1/16". STACKING OF SHIMS IS PERMITTED. FINGER SHIMS AND HORSESHOE SHIMS ARE PERMITTED. STACKED SHIMS SHALL BE NO GREATER THAN 1/4" WITHOUT ENGINEER OF RECORD APPROVAL.

TOWER MODIFICATION SCHEDULE			
	ELEVATION	TOWER MODIFICATION DESCRIPTION	REFERENCE SHEETS
(A)	0'	INSTALL NEW TRANSITION STIFFENERS AT BASE PLATE	S-5
(B)	0'-6" TO 65'-7"	INSTALL NEW SHAFT REINFORCING	S-3
(C)	0'-6" TO 65'-7"	REMOVE AND REPLACE STEP BOLTS	S-4



**BASE LEVEL DRAWING**

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**PAUL J. FORD & COMPANY**  
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**CROWN CASTLE**  
 3530 TORINGDON WAY, SUITE 300, CHARLOTTE, NC 28277  
 PH: (724) 416-2000

**MODIFICATION OF AN EXISTING 147' MONOPOLE**  
 BU #876316; SECONDINO PROPERTY  
 BRANFORD, CONNECTICUT

PROJECT No:	37517-1800.001.7700
DRAWN BY:	B.M.S.
DESIGNED BY:	M.E.H.
CHECKED BY:	TJD
DATE:	4-19-2017

**MONOPOLE PROFILE**

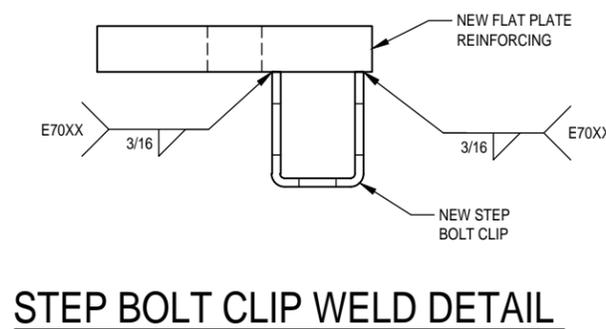
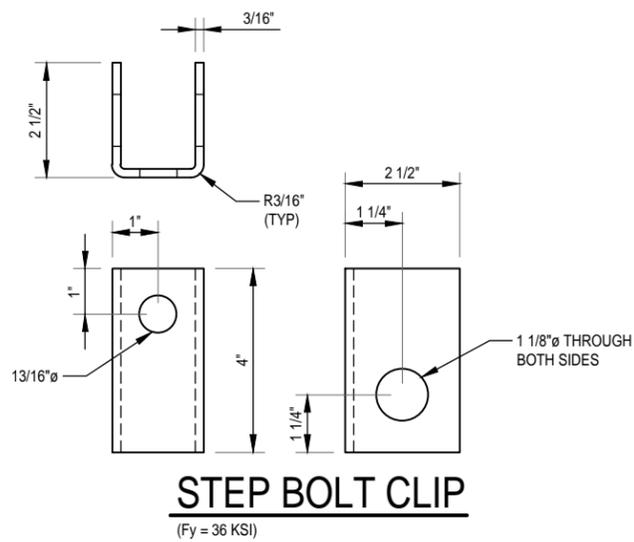
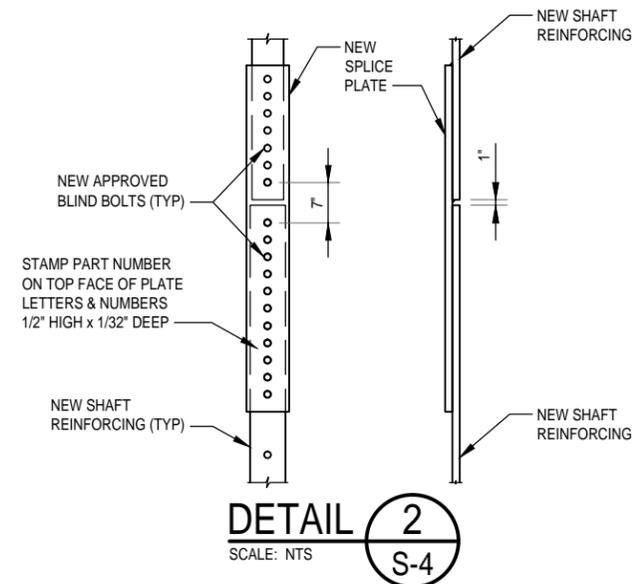
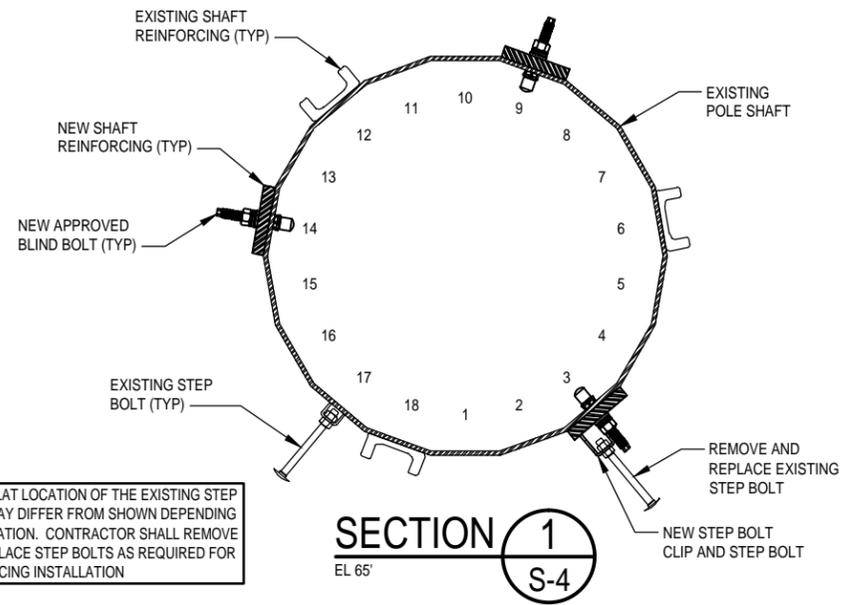
**S-3**

**MODIFICATION OF AN EXISTING 147' MONOPOLE**  
 BU #876316; SECONDINO PROPERTY  
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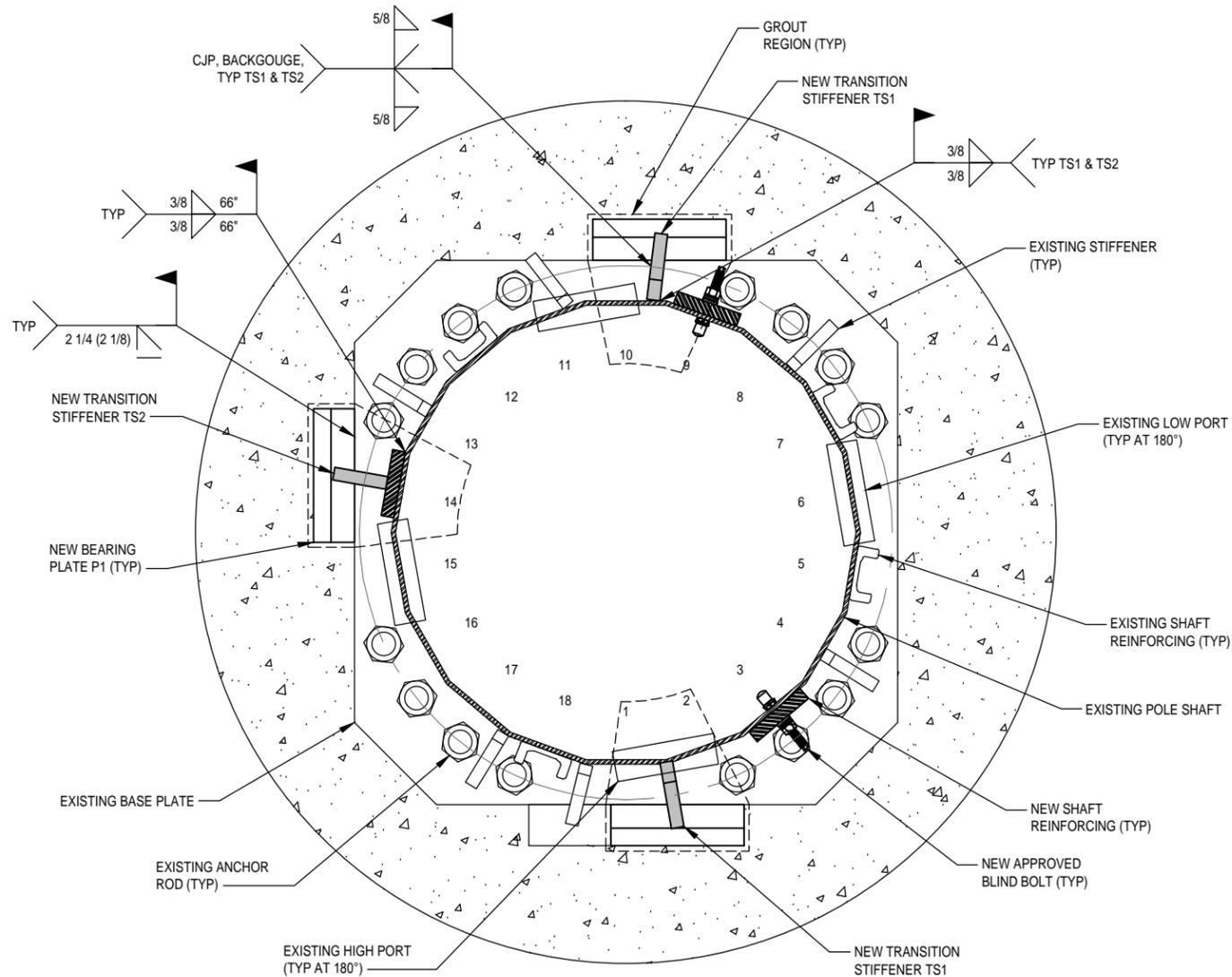
SHAFT REINFORCING DETAILS

S-4

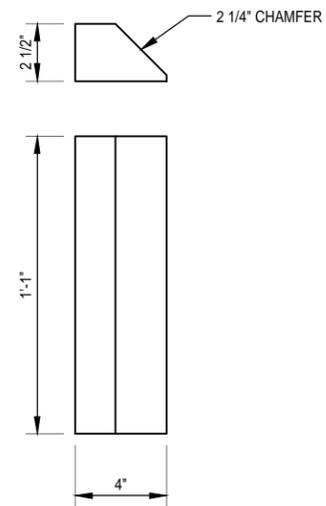


BASE SPECIFICATIONS	
BASE PLATE:	53" SQUARE; 3" THK.; Fy=50 KSI
ANCHOR RODS:	(16) 2 1/4"Ø; A615 GRADE 75; 52" B.C.

PROVIDE NON-SHRINK GROUT (NS GROUT BY EUCLID OR APPROVED, EQUAL: 7500 PSI MIN) BELOW EXIST. BASE PLATE AND NEW BEARING PLATES IN REGION AS SHOWN. GROUT SHALL BE INSTALLED TIGHT UNDER BASE PLATE WITH NO VOIDS REMAINING BETWEEN TOP OF EXISTING CONCRETE AND UNDERSIDE OF EXISTING BASE PLATE. GROUT COMPLETELY SOLID UNDER ENTIRE SURFACE OF BASE PLATE FROM OUTSIDE EDGE TO INSIDE EDGE WITHIN THE REGION INDICATED.

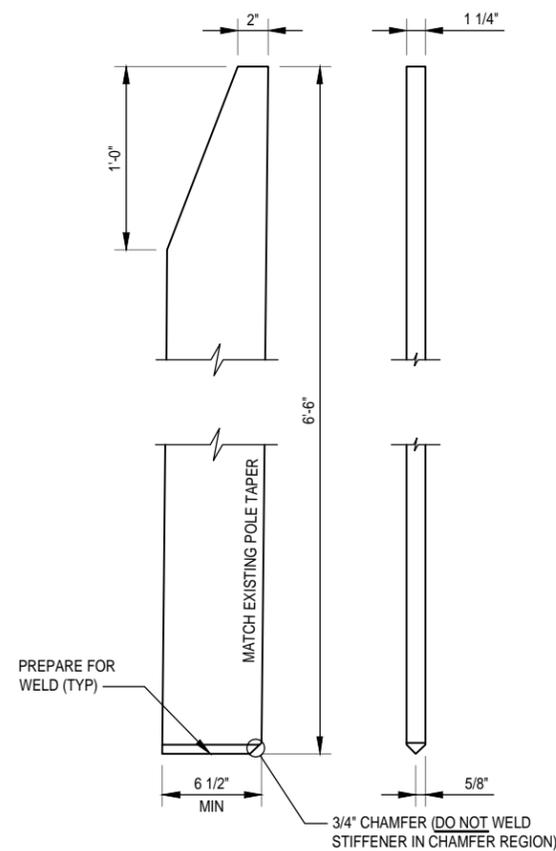


**BASE PLATE 1**  
S-5



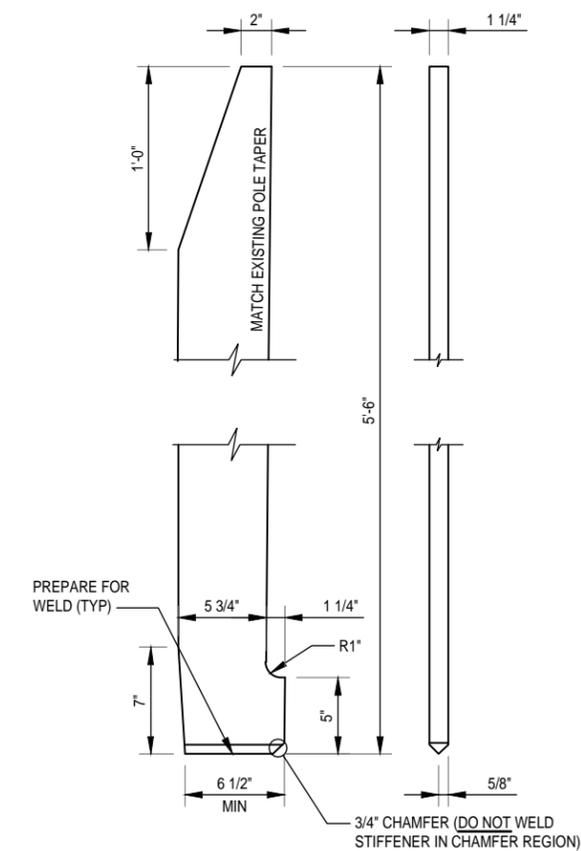
**BEARING PLATE MK~P1**

(3 REQUIRED) (Fy = 50 KSI)



**TRANSITION STIFFENER MK~TS1**

(2 REQUIRED) (Fy = 65 KSI)



**TRANSITION STIFFENER MK~TS2**

(1 REQUIRED) (Fy = 65 KSI)

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PROJECT No:	37517-1800.001.7700
DRAWN BY:	B.M.S.
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BASE PLATE  
DETAILS

S-5

# MODIFICATION OF AN EXISTING 147' MONOPOLE SUMMIT #2737-97 BU #876316; SECONDINO PROPERTY

21 ACORN ROAD  
BRANFORD, CONNECTICUT 06405  
NEW HAVEN COUNTY  
LAT: 41° 17' 35.06"; LONG: -72° 45' 46.4"  
APP: 380950 REV. 5; WO: 1392288

### PROJECT CONTACTS

STRUCTURE OWNER:  
CROWN CASTLE  
MOD PM: DAN VADNEY AT DAN.VADNEY@CROWNCastle.COM  
PH: (518) 373-3510  
MOD CM: JASON D'AMICO AT JASON.D'AMICO@CROWNCastle.COM  
PH: (860) 209-0104

ENGINEER OF RECORD:  
PJFMOD@PJFWEB.COM

### THIS PROJECT INCLUDES THE FOLLOWING ITEMS

SHAFT REINFORCING  
FIELD WELDED STIFFENERS  
HIGH STRENGTH GROUT  
REMOVE AND REPLACE STEP BOLTS

### SHEET INDEX

SHEET NUMBER	DESCRIPTION
T-1	TITLE SHEET
T-2	MI CHECKLIST
S-1	GENERAL NOTES
S-2A	FORGBOLT™ DETAILS
S-2B	NEXGEN2™ BOLT DETAIL
S-2C	AJAX ONESIDE™ BOLT DETAIL
S-3	MONOPOLE PROFILE
S-4	SHAFT REINFORCING DETAILS
S-5	BASE PLATE DETAILS

### WIND DESIGN DATA

REFERENCE STANDARD	ANSI/TIA-222-G-2-2009
LOCAL CODE	2016 CONNECTICUT BUILDING CODE
ULTIMATE WIND SPEED (3-SECOND GUST)	130 MPH
CONVERTED NOMINAL WIND SPEED (3-SECOND GUST)	101 MPH
ICE THICKNESS	0.75 IN
ICE WIND SPEED	50 MPH
SERVICE WIND SPEED	60 MPH
RISK CATEGORY	II
EXPOSURE CATEGORY	C
Kzt	1.0

QUALIFIED ENGINEERING SERVICES ARE AVAILABLE FROM PAUL J. FORD & COMPANY TO ASSIST CONTRACTORS IN CLASS IV RIGGING PLAN REVIEWS. FOR REQUESTED QUALIFIED ENGINEERING SERVICES, PLEASE CONTACT RIGGING@PJFWEB.COM.

THE ASSOCIATED FAILING SA WO NUMBER FOR THIS PROJECT IS 1376852

ATTENTION ALL CONTRACTORS, ANYTIME YOU ACCESS A CROWN SITE FOR ANY REASON YOU ARE TO CALL THE CROWN NOC UPON ARRIVAL AND DEPARTURE, DAILY AT (800) 788-7011.



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MODIFICATION OF AN EXISTING 147'  
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BRANFORD, CONNECTICUT

PROJECT No: 37517-1800.001.7700  
DRAWN BY: B.M.S.  
DESIGNED BY: M.E.H.  
CHECKED BY:  
DATE: 4-19-2017

TITLE SHEET

T-1

**MODIFICATION INSPECTION NOTES:**

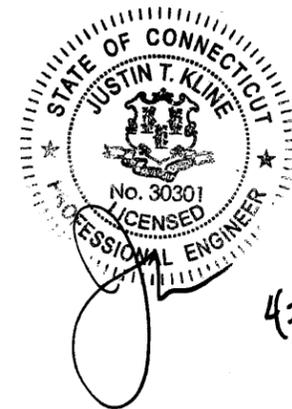
- 1. GENERAL**
  - 1.1. THE MODIFICATION INSPECTION (MI) IS A VISUAL INSPECTION OF TOWER MODIFICATIONS AND A REVIEW OF CONSTRUCTION INSPECTIONS AND OTHER REPORTS TO ENSURE THE INSTALLATION WAS CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS, NAMELY THE MODIFICATION DRAWINGS, AS DESIGNED BY THE 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 AND RETAINED FOR THE SOLE PURPOSE OF INSPECTING, TESTING, DOCUMENTING, AND APPROVING ALL WELDING AND FIELD WORK PERFORMED BY THE CONTRACTOR.
  - 9.4.1. ACCESS TO ANY PLACE WHERE WORK IS BEING DONE SHALL BE PERMITTED AT ALL TIMES.
  - 9.4.2. THE INSPECTION AGENCY SHALL SO SCHEDULE THIS WORK AS TO CAUSE A MINIMUM OF INTERRUPTION TO, AND COORDINATE WITH, THE WORK IN PROGRESS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE THE WORK SCHEDULE WITH THE TESTING AGENCY. THE CONTRACTOR SHALL ALLOW FOR ADEQUATE TIME AND ACCESS FOR THE TESTING AGENCY TO PERFORM THEIR DUTIES.
- 9.5. THE INSPECTION AND TESTING AGENCY SHALL BE RESPONSIBLE TO PERFORM THE FOLLOWING SERVICES AND INSPECT THE FOLLOWING ITEMS IN ACCORDANCE WITH THE CONSTRUCTION DRAWINGS. THE TESTING AGENCY SHALL INSPECT ITEMS ON THIS LIST AND OTHER ITEMS AS NECESSARY TO FULFILL THEIR RESPONSIBILITY. THE TESTING AGENCY SHALL UTILIZE EXPERIENCED, TRAINED INSPECTORS INCLUDING AWS CERTIFIED WELDING INSPECTORS (CWI). INSPECTORS SHALL HAVE THE TRAINING, CREDENTIALS, AND EXPERIENCE APPROPRIATE FOR AND COMMENSURATE WITH THE SCOPE AND TYPE OF INSPECTION WORK TO BE PERFORMED.
- 9.6. **GENERAL**
  - 9.6.1. PERFORM PERIODIC ON-SITE OBSERVATION, INSPECTION, VERIFICATION, AND TESTING DURING THE TIME THE CONTRACTOR IS WORKING ON-SITE. AGENCY SHALL NOTIFY CROWN CASTLE AND THE EOR IMMEDIATELY WHEN FIELD PROBLEMS OR DISCREPANCIES OCCUR.
- 9.7. **FOUNDATIONS AND SOIL PREPARATION - (NOT REQUIRED)**
- 9.8. **CONCRETE TESTING PER ACI - (NOT REQUIRED)**
- 9.9. **STRUCTURAL STEEL**
  - 9.9.1. CHECK STEEL ON THE JOB WITH THE PLANS.
  - 9.9.2. CHECK MILL CERTIFICATIONS. CALL FOR LABORATORY TEST REPORTS WHEN MILL CERTIFICATION IS IN QUESTION.
  - 9.9.3. CHECK GRADE OF STEEL MEMBERS, AND BOLTS FOR CONFORMANCE WITH DRAWINGS.
  - 9.9.4. INSPECT 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.
  - 9.9.5. INSPECT STEEL MEMBERS FOR DISTORTION, EXCESSIVE RUST, FLAWS AND BURNED HOLES.
  - 9.9.6. CHECK STEEL MEMBERS FOR SIZES, SWEEP AND DIMENSIONAL TOLERANCES.
  - 9.9.7. CHECK FOR SURFACE FINISH SPECIFIED, GALVANIZED.
  - 9.9.8. CHECK THAT BOLTS HAVE BEEN TIGHTENED PROPERLY.
  - 9.9.9. PRIOR TO ANY FIELD CUTTING THE CONTRACTOR SHALL MARK THE CUTOFF LINES ON THE STEEL AND THE INSPECTION/TESTING AGENCY SHALL VERIFY PROPOSED LAYOUT, LOCATION, AND DIMENSIONS. THE INSPECTION/TESTING AGENCY SHALL CLOSELY AND CONTINUOUSLY MONITOR THIS ACTIVITY.
- 9.10. **WELDING:**
  - 9.10.1. VERIFY FIELD WELDING PROCEDURES, WELDERS, AND WELDING OPERATORS, NOT DEEMED PREQUALIFIED, IN ACCORDANCE WITH AWS D1.1.
  - 9.10.2. INSPECT FIELD WELDED CONNECTIONS IN ACCORDANCE WITH THE REQUIREMENTS SPECIFIED AND WITH AWS D1.1.
  - 9.10.3. APPROVE FIELD WELDING SEQUENCE.
  - 9.10.4. A PROGRAM OF THE APPROVED SEQUENCES SHALL BE SUBMITTED TO CROWN CASTLE BEFORE WELDING BEGINS. NO CHANGE IN APPROVED SEQUENCES MAY BE MADE WITHOUT PERMISSION FROM CROWN CASTLE.
  - 9.10.5. INSPECT WELDED CONNECTIONS AS FOLLOWS AND IN ACCORDANCE WITH AWS D1.1:
    - 9.10.5.1. INSPECT WELDING EQUIPMENT FOR CAPACITY, MAINTENANCE, AND WORKING CONDITIONS.
    - 9.10.5.2. VERIFY SPECIFIED ELECTRODES AND HANDLING AND STORAGE OF ELECTRODES FOR CONFORMANCE TO SPECIFICATIONS.
    - 9.10.5.3. INSPECT PREHEATING AND INTERPASS TEMPERATURES FOR CONFORMANCE WITH AWS D1.1.
    - 9.10.5.4. VISUALLY INSPECT ALL WELDS AND VERIFY THAT QUALITY OF WELDS MEETS THE REQUIREMENTS OF AWS D1.1. OTHER TESTS MAY ALSO BE PERFORMED ON THE WELDS BY THE TESTING AGENCY IN ORDER FOR THEM TO PERFORM THEIR DUTIES FOR THIS PROJECT.
    - 9.10.5.5. SPOT TEST AT LEAST ONE FILLET WELD OF EACH MEMBER USING MAGNETIC PARTICLE.
    - 9.10.5.6. INSPECT FOR SIZE, SPACING, TYPE AND LOCATION AS PER APPROVED DRAWINGS.
    - 9.10.5.7. VERIFY THAT THE BASE METAL CONFORMS TO THE DRAWINGS.
    - 9.10.5.8. REVIEW THE REPORTS BY TESTING LABS.
    - 9.10.5.9. CHECK TO SEE THAT WELDS ARE CLEAN AND FREE FROM SLAG.
    - 9.10.5.10. INSPECT RUST PROTECTION OF WELDS AS PER SPECIFICATIONS.
    - 9.10.5.11. CHECK THAT DEFECTIVE WELDS ARE CLEARLY MARKED AND HAVE BEEN ADEQUATELY REPAIRED.
- 9.11. **REPORTS:**
  - 9.11.1. COMPILER 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
<b>PRE-CONSTRUCTION</b>	
X	MI CHECKLIST DRAWINGS
X	EOR REVIEW
X	FABRICATION INSPECTION
NA	FABRICATOR CERTIFIED WELD INSPECTION
X	MATERIAL TEST REPORT (MTR)
NA	FABRICATOR NDE INSPECTION
X	NDE REPORT OF MONOPOLE BASE PLATE (AS REQUIRED)
X	PACKING SLIPS
ADDITIONAL TESTING AND INSPECTIONS: _____	
<b>CONSTRUCTION</b>	
X	CONSTRUCTION INSPECTIONS
NA	FOUNDATION INSPECTIONS
NA	CONCRETE COMP. STRENGTH AND SLUMP TESTS
NA	POST INSTALLED ANCHOR ROD VERIFICATION
X	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
NA	MICROPILE/ROCK ANCHOR INSTALLER'S DRILLING AND INSTALLATION LOGS AND QA/QC DOCUMENTS
ADDITIONAL TESTING AND INSPECTIONS: _____	
<b>POST-CONSTRUCTION</b>	
X	MI INSPECTOR REDLINE OR RECORD DRAWING(S)
NA	POST INSTALLED ANCHOR ROD TARGET TENSION LOAD TESTING
NA	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



42967

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**CROWN CASTLE**  
3530 TORINGDON WAY, SUITE 300, CHARLOTTE, NC 28277  
PH: (704) 416-2000

**MODIFICATION OF AN EXISTING 147' MONOPOLE**  
BU #876316; SECONDINO PROPERTY  
BRANFORD, CONNECTICUT

PROJECT No: 37517-1800.001.7700  
DRAWN BY: B.M.S.  
DESIGNED BY: M.E.H.  
CHECKED BY:  
DATE: 4-19-2017

MI CHECKLIST

T-2

1. GENERAL NOTES

- 1.1. THE MONOPOLE STRUCTURE IN ITS EXISTING CONDITION DOES NOT HAVE THE STRUCTURAL CAPACITY TO CARRY ALL OF THE PROPOSED AND EXISTING LOADS FROM THE ATTACHED STRUCTURAL MODIFICATION REPORT AT THE REQUIRED MINIMUM WIND SPEEDS. DO NOT INSTALL ANY NEW LOADS UNTIL THE MONOPOLE REINFORCING SYSTEM IS COMPLETELY AND SUCCESSFULLY INSTALLED.
- 1.2. THESE DRAWINGS WERE PREPARED FROM INFORMATION 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. PRIOR TO FABRICATION AND INSTALLATION CONTRACTOR SHALL VERIFY ALL LENGTHS AND QUANTITIES GIVEN. LENGTH AND QUANTITIES PROVIDED ARE FOR QUOTING PURPOSES ONLY AND SHALL NOT BE USED FOR FABRICATION. THE CONTRACTOR SHALL COORDINATE WITH THE PROJECT DRAWINGS AND THEIR FIELD VERIFIED CONDITIONS AND DIMENSIONS BEFORE PROCEEDING WITH THE WORK. THE CONTRACTOR SHALL IMMEDIATELY REPORT ANY AND ALL DISCREPANCIES TO THE EOR AND CROWN CASTLE BEFORE PROCEEDING WITH THE WORK. ANY WORK PERFORMED WITHOUT A PREFABRICATION MAPPING IS DONE AT THE RISK OF THE GENERAL CONTRACTOR AND/OR THE FABRICATOR
- 1.3. 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.
- 1.4. 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.
- 1.5. ALL CONSTRUCTION MEANS AND METHODS; INCLUDING BUT NOT LIMITED TO, ERECTION PLANS, RIGGING PLANS, CLIMBING PLANS AND RESCUE PLANS SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR RESPONSIBLE FOR THE EXECUTION OF THE WORK CONTAINED HEREIN AND SHALL MEET ANSITIA-1019 (LATEST EDITION), OSHA AND GENERAL INDUSTRY STANDARDS. ALL RIGGING PLANS SHALL ADHERE TO ANSITIA-1019 (LATEST EDITION) INCLUDING THE REQUIRED INVOLVEMENT OF A QUALIFIED ENGINEER FOR CLASS IV CONSTRUCTION.
- 1.6. OBSERVATION VISITS TO THE SITE BY CROWN CASTLE AND/OR THE EOR SHALL NOT INCLUDE INSPECTIONS OF THE PROTECTIVE MEASURES OR THE CONSTRUCTION PROCEDURES. ANY SUPPORT SERVICES PERFORMED BY THE EOR DURING CONSTRUCTION ARE SOLELY FOR THE PURPOSE OF ACHIEVING GENERAL CONFORMANCE WITH THE CONTRACT DOCUMENTS. THEY DO NOT GUARANTEE THE CONTRACTOR'S PERFORMANCE AND SHALL NOT BE CONSTRUED AS SUPERVISION OF CONSTRUCTION.
- 1.7. 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.
- 1.8. 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.
- 1.9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING AND NEW COAXIAL CABLES AND OTHER EQUIPMENT DURING CONSTRUCTION.
- 1.10. 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.
- 1.11. 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.
- 1.12. THE CLIMBING FACILITIES, SAFETY CLIMB AND ALL PARTS THEREOF SHALL NOT BE IMPEDED, MODIFIED OR ALTERED WITHOUT THE EXPRESS APPROVAL OF THE EOR.
- 1.13. FOR STANDARD CROWN PARTS SEE THE MOST RECENT VERSION OF THE "CCI APPROVED REINFORCEMENT COMPONENTS" CATALOG.
- 1.14. 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 PRODUCTS. CONTACT DETAILS:  
3434 ENCRETE LANE, MORAIN, OHIO 45439  
PHONE: 937-299-1213 EMAIL: TUFUG@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. ALL STRUCTURAL BOLTS SHALL BE INSTALLED AND TIGHTENED TO THE PRETENSIONED CONDITION ACCORDING TO THE REQUIREMENTS OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM HIGH STRENGTH BOLTS', DEC. 31, 2009.
- 2.3. 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.
- 2.4. 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.
- 2.5. 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.
- 2.6. STRUCTURAL STEEL PLATES SHALL CONFORM TO ASTM A572 GRADE 65 (FY = 65 KSI MIN) UNLESS NOTED OTHERWISE ON THE DRAWINGS.
- 2.7. 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.
- 2.8. NO WELDING SHALL BE DONE TO THE EXISTING STRUCTURE WITHOUT THE PRIOR APPROVAL AND SUPERVISION OF THE TESTING AGENCY.
- 2.9. FIELD CUTTING OF STEEL:
  - 2.9.1. IMPORTANT CUTTING AND WELDING SAFETY GUIDELINES: THE CONTRACTOR SHALL FOLLOW ALL CROWN CASTLE CUTTING, WELDING, FIRE PREVENTION AND SAFETY 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.
  - 2.9.2. 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

- 3.1. NEW GROUT FOR THE POLE BASE SHALL BE NON-SHRINK, NON-METALLIC, GROUT (NS GROUT BY EUCLID, OR APPROVED EQUAL) WITH A 7500 PSI MINIMUM COMPRESSIVE STRENGTH. CONTRACTOR SHALL SUBMIT PROPOSED GROUT SPECIFICATION INFORMATION TO CROWN CASTLE FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION. CONTRACTOR SHALL FOLLOW GROUT MANUFACTURER'S SPECIFICATIONS FOR COLD WEATHER GROUTING PROCEDURES (IF NECESSARY) AND THE TESTING AGENCY SHALL PREPARE GROUT SAMPLE SPECIMENS FOR COMPRESSIVE STRENGTH TESTING AND VERIFICATION.
- 3.2. GROUT SHALL BE INSTALLED TIGHT UNDER THE BASE PLATE AND BEARING PLATE REGION WITH NO VOIDS REMAINING BETWEEN THE TOP OF THE EXISTING CONCRETE AND THE UNDERSIDE OF THE EXISTING BASE PLATE AND BEARING PLATE.
- 3.3. CAULK AROUND ANCHOR RODS WHEN GROUTING.

4. FOUNDATION WORK - (NOT REQUIRED)

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

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

7. TOUCH UP OF GALVANIZING

- 7.1. THE CONTRACTOR SHALL TOUCH UP ANY AND ALL AREAS OF GALVANIZING ON THE EXISTING STRUCTURE OR NEW COMPONENTS THAT ARE DAMAGED OR ABRADED DURING CONSTRUCTION. GALVANIZED SURFACES DAMAGED DURING TRANSPORTATION OR ERECTION AND ASSEMBLY AS WELL AS ANY AND ALL ABRASIONS, CUTS, FIELD DRILLING, AND ALL FIELD WELDING SHALL BE TOUCHED UP WITH TWO (2) COATS OF ZRC COLD GALVANIZING COMPOUND. FILM THICKNESS PER COAT SHALL BE: WET 3.0 MILS; DRY 1.5 MILS. APPLY PER ZRC (MANUFACTURER) RECOMMENDED PROCEDURES. CONTACT ZRC AT 1-800-831-3275 FOR PRODUCT INFORMATION.
- 7.2. CONTRACTOR SHALL CLEAN AND PREPARE ALL FIELD WELDS ON GALVANIZED AND PRIME PAINTED SURFACES FOR TOUCH-UP COATING IN ACCORDANCE WITH AWS D1.1. CROWN CASTLE'S TESTING AGENCY SHALL VERIFY THE PREPARED SURFACE PRIOR TO APPLICATION OF THE TOUCH-UP COATING.
- 7.3. CROWN CASTLE'S TESTING AGENCY SHALL TEST AND VERIFY THE COATING THICKNESS AFTER THE CONTRACTOR HAS APPLIED THE ZRC COLD GALVANIZING COMPOUND AND IT HAS SUFFICIENTLY DRIED. AREAS FOUND TO BE ADEQUATELY COATED, SHALL BE RE-COATED BY THE CONTRACTOR AND RE-TESTED BY THE TESTING AGENCY.

8. HOT-DIP GALVANIZING

- 8.1. HOT-DIP GALVANIZING 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. DRILL OR PUNCH WEEP AND/OR DRAINAGE HOLES WITH EOR APPROVAL OF LOCATIONS.
- 8.3. 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 ANSITIA-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 ANSITIA-222-G-2-2009 SECTION 14.2: "IT IS RECOMMENDED THAT THE STRUCTURE BE INSPECTED AFTER SEVERE WIND AND/OR ICE STORMS OR OTHER EXTREME LOADING CONDITIONS".

10. FIELD NDE MINIMUM REQUIREMENTS

- 10.1. ALL NDE SHALL BE IN ACCORDANCE WITH AWS D1.1.
- 10.2. FOR NEW BASE STIFFENERS (INCLUSIVE OF TRANSITION STIFFENERS) AND ANCHOR ROD BRACKETS, COMPLETE JOINT PENETRATION WELDS SHALL BE 100% INSPECTED BY UT. ALL PARTIAL JOINT PENETRATION AND FILLET WELDS SHALL BE 100% INSPECTED BY MT.
- 10.3. FOR NEW FLAT PLATE REINFORCEMENT AT THE BASE OF THE TOWER, COMPLETE JOINT PENETRATION WELDS SHALL BE 100% INSPECTED BY UT. ALL PARTIAL JOINT PENETRATION AND FILLET WELDS SHALL BE 100% INSPECTED BY MT, BUT MAY BE LIMITED TO A HEIGHT OF 10'-0".
- 10.4. FOR NDE OF THE EXISTING BASE PLATE CIRCUMFERENTIAL WELD, GC SHALL REFERENCE THE MI CHECKLIST FOR APPLICABILITY. PLEASE SEE ENG-SOW-10033: 'TOWER BASE PLATE NDE, AND ENG-BUL-10051: 'NDE REQUIREMENTS FOR MONOPOLE BASE PLATE TO PREVENT CONNECTION FAILURE'. NOTIFY THE EOR AND CROWN ENGINEERING IMMEDIATELY IF ANY CRACKS ARE SUSPECTED OR HAVE BEEN IDENTIFIED. THE NDE SHALL INCLUDE ALL EXISTING MODIFICATIONS THAT HAVE BEEN WELDED TO THE BASE PLATE.
- 10.5. ALL TESTING LIMITATIONS SHALL BE DETAILED IN THE NDE REPORT.

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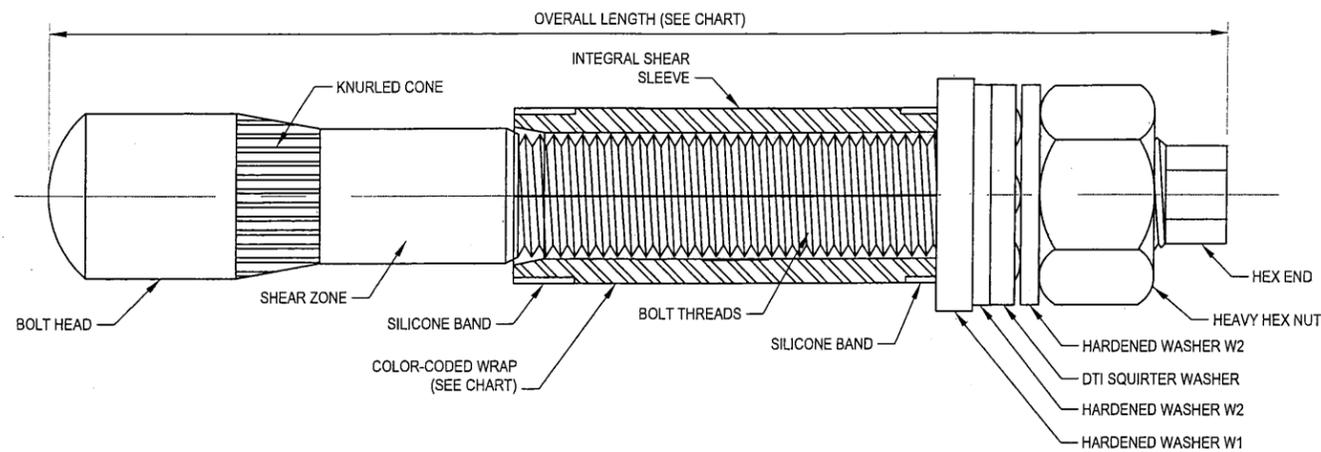
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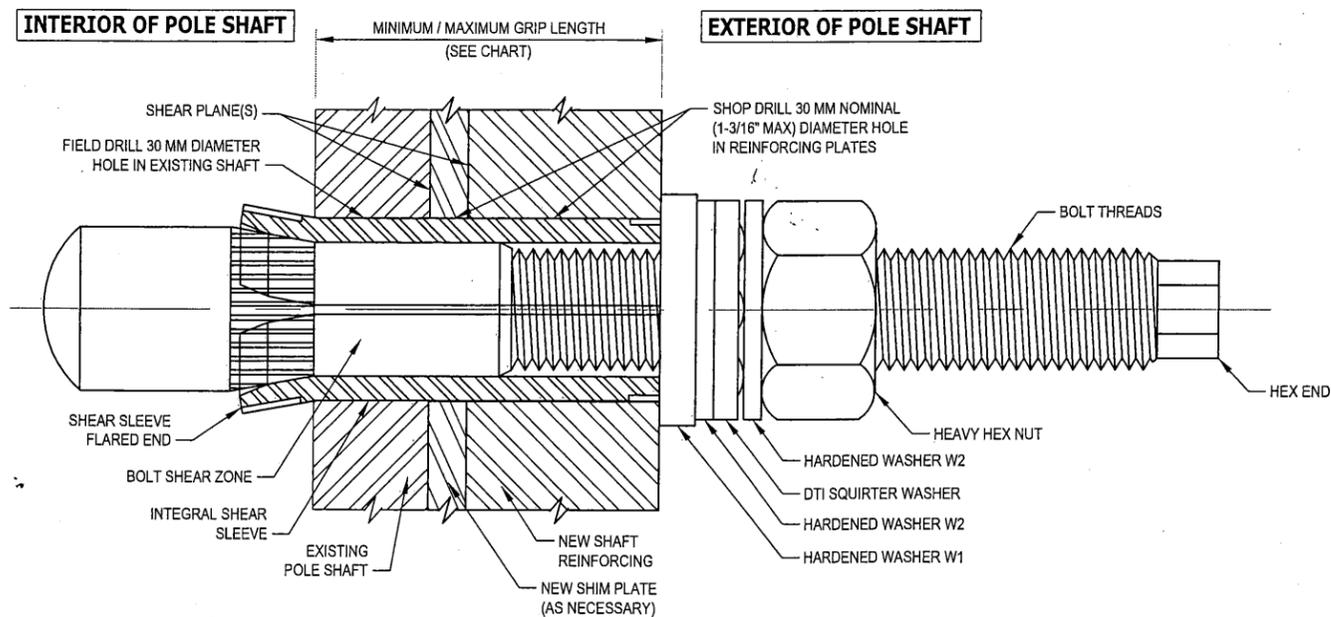


PROJECT No:	37517-1800.001.7700
DRAWN BY:	B.M.S.
DESIGNED BY:	M.E.H.
CHECKED BY:	
DATE:	4-19-2017

GENERAL NOTES  
S-1



PRE-INSTALLED FORGBolt™ ASSEMBLY DETAIL **1**  
S-2A



INSTALLED FORGBolt™ ASSEMBLY DETAIL **2**  
S-2A

FORGBolt®		AISC Group A Material: ASTM A325 and PC8.8 (Tensile Stress, Fu = 120 ksi minimum)					
GROUP A	FORGBolt® Size (mm)	Overall Length (inches)	Estimated Weight Each (lbs)	Grip Range (inch)	Comment	Color Code	
FORGBolt® A325 - PC8.8	1	135	5.31	1.3	3/8" to 1"	--	RED
	2	160	6.30	1.6	3/4" to 1-1/2"	--	GREEN
	3	195	7.68	1.9	1-1/4" to 2-1/4"	--	BLUE
	4	260	10.24	2.6	2" to 3-1/2"	Splice Bolt	YELLOW
	5	365	14.37	3.6	3-1/2" to 5-1/2"	Flange Jump Bolt	ORANGE
	6	440	17.32	4.3	5-1/2" to 8-1/2"	Flange Jump Bolt	BLACK
DTI Note	Each Group A (A325/PC8.8) FORGBolt® assembly shall have a 'Squirter' DTI that is compatible with a M20-PC8.8 bolt.						

**FOLLOW ALL MANUFACTURER / DISTRIBUTOR RECOMMENDATIONS FOR INSTALLATION, TIGHTENING, AND INSPECTION**

**INSTALLATION NOTES:**

1. FIELD DRILL HOLES TO 30 MM DIAMETER.
2. SELECT CORRECT BOLT SIZE FOR INSTALLATION GRIP (REFER TO PLANS).
3. INSERT BOLT ASSEMBLY THROUGH HOLES IN SHAFT REINFORCING PLATES AND SEAT THE HARDENED WASHER W1 FLUSH AGAINST OUTSIDE OF PLATE.
4. HAND TIGHTEN NUT TO FINGER TIGHT.
5. TIGHTEN NUT TO PRETENSIONED CONDITION AND UNTIL DTI SHOWS PROPER INDICATION.
6. PROPERLY DOCUMENT AND INSPECT BOLT TIGHTENING PER PLAN REQUIREMENTS.

**BOLT HOLE NOTES:**

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

**BOLT TIGHTENING AND INSPECTION 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.

**AISC GROUP A MATERIAL: ASTM A325 AND PC8.8  
(Fu = 120 KSI MIN TENSILE STRESS)**

**CONTAINS PROPRIETARY INFORMATION PATENT PENDING**

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**DISTRIBUTOR CONTACT:**

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 EMAIL: info@precisiontowerproducts.com  
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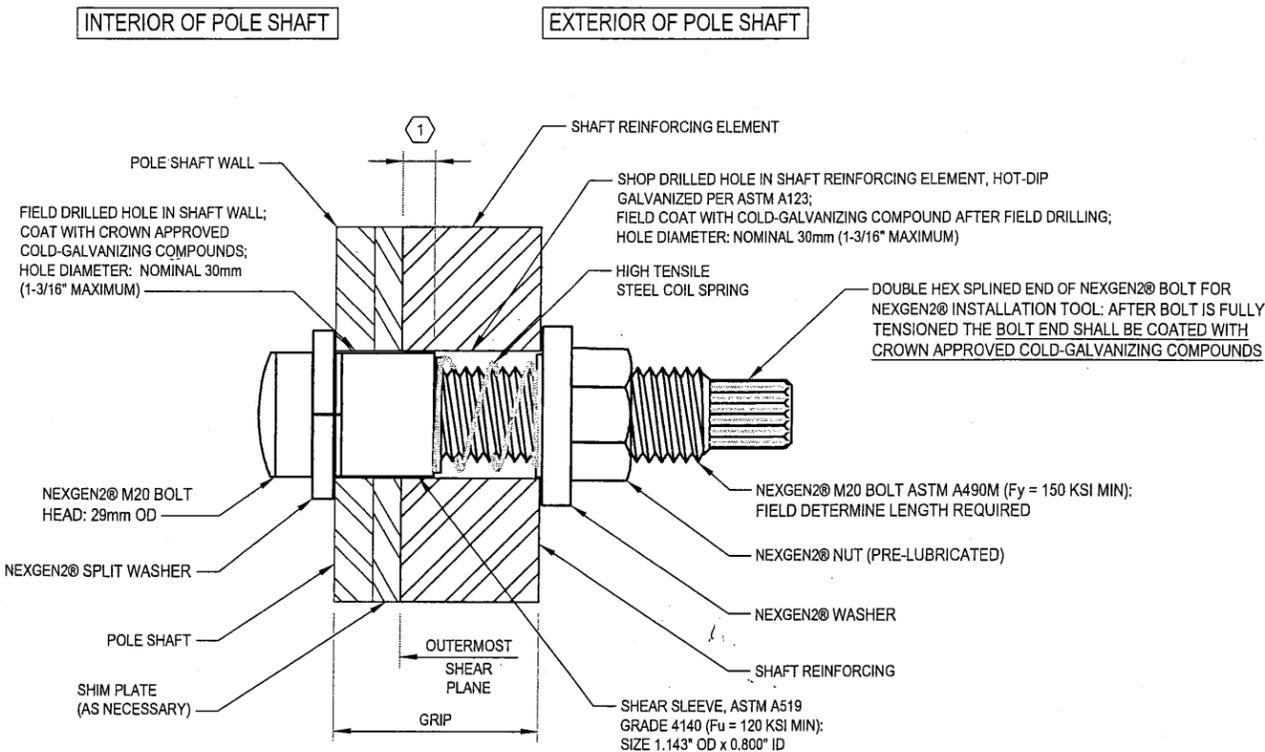
**MODIFICATION OF AN EXISTING 147'  
 MONOPOLE  
 BU #876316; SECONDINO PROPERTY  
 BRANFORD, CONNECTICUT**

PROJECT No: 37517-1800.001.7700  
 DRAWN BY: B.M.S.  
 DESIGNED BY: M.E.H.  
 CHECKED BY:  
 DATE: 4-19-2017

FORGBOLT™  
 DETAILS

S-2A

1 NOTE: SHEAR SLEEVE LENGTH: THE SHEAR SLEEVE SHALL PROJECT A MINIMUM OF 3/8" BEYOND THE OUTERMOST SHEAR PLANE. THE CONTRACTOR SHALL SUBMIT FABRICATION DRAWINGS SHOWING NEXGEN2® BOLT LENGTHS AND SHEAR SLEEVE LENGTHS TO THE EOR FOR REVIEW AND APPROVAL.



TYPICAL NEXGEN2™ BOLT DETAIL 1 S-2B

**FOLLOW ALL MANUFACTURER / DISTRIBUTOR RECOMMENDATIONS FOR INSTALLATION, TIGHTENING, AND INSPECTION**

**BOLT HOLE NOTES:**

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

**BOLT TIGHTENING AND INSPECTION NOTES:**

1. ALL NEXGEN2® BOLT ASSEMBLIES SHALL BE INSTALLED AND TIGHTENED TO THE PRETENSIONED CONDITION ACCORDING TO THE REQUIREMENTS OF SECTION 8.2.3 OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009. PER SECTION 8.2.3: ALL FASTENER ASSEMBLIES SHALL BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS IN AISC SECTION 8.1 WITHOUT SEVERING THE SPLINED END AND WITH WASHERS POSITIONED AS REQUIRED IN AISC SECTION 6.2. PER REQUIREMENTS IN SECTION 8.1: PRIOR TO BOLT PRETENSIONING, THE JOINT SHALL FIRST BE COMPACTED TO THE SNUG-TIGHT CONDITION. SNUG TIGHT IS THE CONDITION THAT EXISTS WHEN ALL OF THE PLIES IN THE CONNECTION HAVE BEEN PULLED INTO FIRM CONTACT BY THE BOLTS AND THE BOLTS HAVE BEEN TIGHTENED SUFFICIENTLY TO PREVENT THE REMOVAL OF THE NUTS WITHOUT THE USE OF A WRENCH. ONCE THE SNUG TIGHT CONDITION IS ACHIEVED, THEN THE BOLT ASSEMBLY CAN BE TIGHTENED TO THE PRETENSIONED CONDITION.
2. ALL NEXGEN2® BOLT ASSEMBLIES SHALL BE INSPECTED ACCORDING TO THE REQUIREMENTS OF SECTION 9.2.3 OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009. NOTE THAT COMPLETE INSPECTION OF ALL NEXGEN2® BOLT ASSEMBLIES IS REQUIRED IN ADDITION TO ROUTINE OBSERVATION.
3. ALL NEXGEN2® BOLTS SHALL BE INSPECTED BY A QUALIFIED BOLT INSPECTOR PER NOTES 1 AND 2, ABOVE. DURING INSTALLATION, THE BOLT INSPECTOR SHALL VERIFY AND DOCUMENT: THE SHOP-DRILLED AND FIELD-DRILLED HOLE SIZES; THE INSTALLATION OF THE NEXGEN2® BOLT ASSEMBLY, INCLUDING THE SHEAR SLEEVE PLACEMENT AND NUT LUBRICATION; AND THE CONTRACTOR'S TENSIONING PROCEDURE. THE BOLT INSPECTOR SHALL PROVIDE COMPLETE DOCUMENTATION OF ALL BOLTS AFTER TIGHTENING CLEARLY SHOWING THAT THE DOUBLE HEX SPLINED END OF THE BOLTS HAVE BEEN TWISTED OFF AND COATED WITH CROWN APPROVED COLD-GALVANIZING COMPOUND..

PART NUMBER	BOLT LENGTH	SLEEVE LENGTH	MIN GRIP RANGE	MAX GRIP RANGE
M20x36	M20x95	1 1/16"	1 5/16"	1 7/16"
M20x48	M20x95	1 3/16"	1 7/16"	1 7/8"
M20x57	M20x95	1 5/8"	1 7/8"	2 1/4"
M20x68	M20x135	2"	2 1/4"	2 11/16"
M20x96	M20x135	2 7/16"	2 11/16"	3 3/4"
M20x127	M20x165	3"	3 3/4"	5"
M20x212	M20x250	4"	5"	8 5/16"

NOTE: NEXGEN2® BOLT ASSEMBLY SHALL BE MAGNI 565 COATED PER ASTM F2833 AND MANUFACTURER SPECIFICATIONS.

NOTE: INSTALL NEXGEN2® BOLT ASSEMBLY PER MANUFACTURER'S INSTRUCTIONS.

**DISTRIBUTOR CONTACT DETAILS:**

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



Handwritten signature and date: 4-29-17

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MODIFICATION OF AN EXISTING 147' MONOPOLE  
 BU #876316; SECONDINO PROPERTY  
 BRANFORD, CONNECTICUT

PROJECT No:	37517-1800.001.7700
DRAWN BY:	B.M.S.
DESIGNED BY:	M.E.H.
CHECKED BY:	
DATE:	4-19-2017

NEXGEN2™ BOLT DETAIL

S-2B

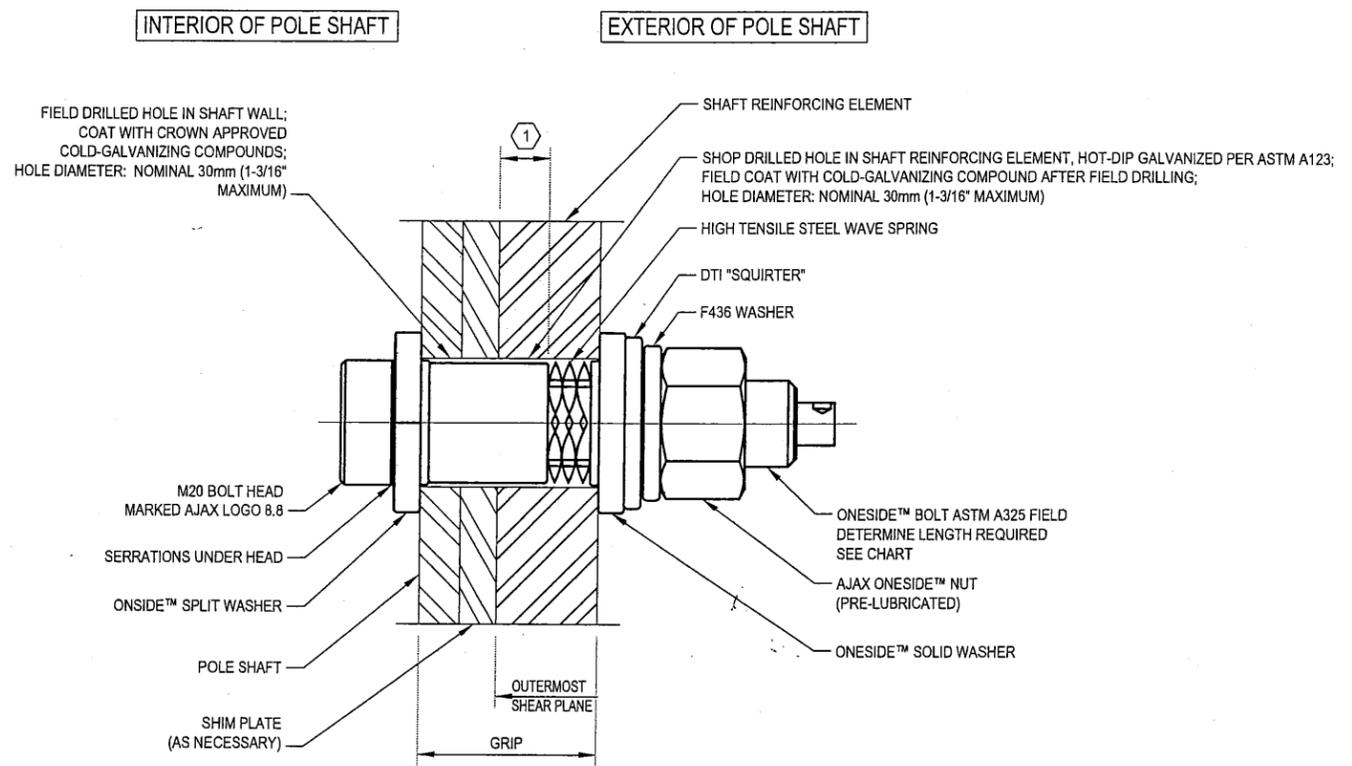
① NOTE: SHEAR SLEEVE LENGTH: THE SHEAR SLEEVE SHALL PROJECT A MINIMUM OF 3/8" BEYOND THE OUTERMOST SHEAR PLANE. THE CONTRACTOR SHALL SUBMIT FABRICATION DRAWINGS SHOWING AJAX ONESIDE™ BOLT LENGTHS AND SHEAR SLEEVE LENGTHS TO THE EOR FOR REVIEW AND APPROVAL.

**FOLLOW ALL MANUFACTURER / DISTRIBUTOR RECOMMENDATIONS FOR INSTALLATION, TIGHTENING, AND INSPECTION**

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

- BOLT TIGHTENING AND INSPECTION NOTES:**
1. ALL AJAX ONESIDE™ BOLT ASSEMBLIES SHALL BE INSTALLED AND TIGHTENED TO THE PRETENSIONED CONDITION ACCORDING TO THE REQUIREMENTS OF SECTION 8.2.4 OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009. PER SECTION 8.2.4: ALL FASTENER ASSEMBLIES SHALL BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS IN AISC SECTION 8.1 WITH WASHERS POSITIONED AS REQUIRED IN AISC SECTION 6.2. PER REQUIREMENTS IN SECTION 8.1: PRIOR TO BOLT PRETENSIONING, THE JOINT SHALL FIRST BE COMPACTED TO THE SNUG-TIGHT CONDITION. SNUG TIGHT IS THE CONDITION THAT EXISTS WHEN ALL OF THE PLIES IN THE CONNECTION HAVE BEEN PULLED INTO FIRM CONTACT BY THE BOLTS AND THE BOLTS HAVE BEEN TIGHTENED SUFFICIENTLY TO PREVENT THE REMOVAL OF THE NUTS WITHOUT THE USE OF A WRENCH. ONCE THE SNUG TIGHT CONDITION IS ACHIEVED, THEN THE BOLT ASSEMBLY CAN BE TIGHTENED TO THE PRETENSIONED CONDITION.
  2. ALL AJAX ONESIDE™ BOLT ASSEMBLIES SHALL BE INSPECTED ACCORDING TO THE REQUIREMENTS OF SECTION 9.2.4 OF THE AISC 'SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS', DEC. 31, 2009. NOTE THAT COMPLETE INSPECTION OF ALL AJAX ONESIDE™ BOLT ASSEMBLIES IS REQUIRED IN ADDITION TO ROUTINE OBSERVATION.
  3. ALL AJAX ONESIDE™ BOLTS SHALL BE INSPECTED BY A QUALIFIED BOLT INSPECTOR PER NOTES 1 AND 2, ABOVE. DURING INSTALLATION, THE BOLT INSPECTOR SHALL VERIFY AND DOCUMENT: THE SHOP-DRILLED AND FIELD-DRILLED HOLE SIZES; THE INSTALLATION OF THE AJAX ONESIDE™ BOLT ASSEMBLY, INCLUDING THE SHEAR SLEEVE PLACEMENT AND NUT LUBRICATION; AND THE CONTRACTOR'S TENSIONING PROCEDURE. THE BOLT INSPECTOR SHALL PROVIDE COMPLETE DOCUMENTATION OF ALL BOLTS AFTER TIGHTENING CLEARLY SHOWING THAT THE DIRECT TENSION INDICATOR WASHERS SHOW THAT THE PROPER BOLT TENSION HAS BEEN REACHED.
  4. A MINIMUM OF 4 OUT OF 5 SQUIRTER® DTI PROTRUSIONS SHALL BE ENGAGED IN ANY AJAX ONESIDE™/DTI BOLT ASSEMBLY IN THE REINFORCING MEMBERS. A FEELER GAGE MAY BE USED TO VERIFY PROTRUSION COMPRESSION.
  5. INSPECTIONS SHALL BE IN ACCORDANCE WITH THE MANUFACTURERS REQUIREMENTS AND CROWN DOCUMENT ENG-SOW-10007: *MODIFICATION INSPECTION SOW*.

- BOLT ASSEMBLY AND INSTALLATION:**
1. BOLT MUST BE PURCHASED PRE-ASSEMBLED.
  2. FOLLOW BOLT AND DTI MANUFACTURERS INSTRUCTIONS FOR INSTALLATION.



**TYPICAL AJAX ONESIDE™ BOLT DETAIL** ①  
S-2C

**AJAX ONESIDE™ BOLT DETAIL**

CODE	SIZE	COLOR	SLEEVE LENGTH	GRIP	GRIP IMP
OSBA20.65-6	M20 x 65	ORANGE	6.0 (0.236")	12.5 / 20.0	0.500" / 0.787"
OSBA20.95-14	M20 x 95	BLACK	14.0 (0.551")	20.0 / 32.0	0.787" / 1.259"
OSBA20.95-22	M20 x 95	GREEN	22.0 (0.866")	30.0 / 50.0	1.181" / 1.968"
OSBA20.95-30	M20 x 95	YELLOW	30.0 (1.181")	40.5 / 50.0	1.595" / 1.968"
OSBA20.135-39	M20 x 135	BLUE	39.0 (1.535")	49.0 / 77.0	1.929" / 3.031"
OSBA20.135-48	M20 x 135	BROWN	48.0 (1.889")	60.5 / 77.0	2.375" / 3.031"
OSBA20.135-57	M20 x 135	PURPLE	57.0 (2.244")	67.0 / 90.0	2.637" / 3.543"
OSBA20.165-76	M20 x 165	RED	76.0 (3.000")	87.0 / 120.0	3.425" / 4.724"
OSBA20.250	M20 x 250	SILVER	MTO	121.0 / 211.0	4.724" / 8.310"

**DISTRIBUTOR**  
 IRA SVENSGAARD AND ASSOCIATES  
 PETER SVENDSGAARD - PETERS@IRASVENS.COM  
 JOHN KILLAM - JOHN@IRASVENS.COM  
 PHONE: (530) 647-8225  
 FAX: (530) 647-8229

**MANUFACTURER**  
 AJAX FASTENERS  
 SALES + TECH: ONESIDE@AJAXFAST.COM.AU



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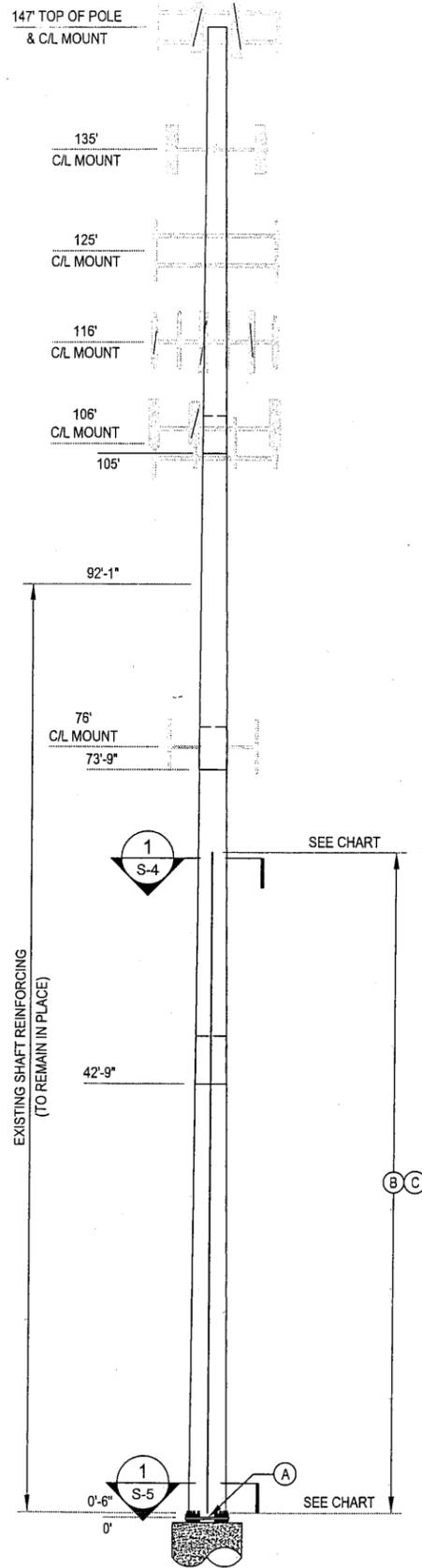
**CROWN CASTLE**  
 3530 TORINGDON WAY, SUITE 300, CHARLOTTE, NC 28277  
 PH: (704) 416-2000

**MODIFICATION OF AN EXISTING 147' MONOPOLE**  
 BU #876316; SECONDINO PROPERTY  
 BRANFORD, CONNECTICUT

PROJECT No: 37517-1800.001.7700  
 DRAWN BY: B.M.S.  
 DESIGNED BY: M.E.H.  
 CHECKED BY:  
 DATE: 4-19-2017

**AJAX ONESIDE™ BOLT DETAIL**

**S-2C**



POLE ELEVATION 1 S-3

NOTE: SHAFT REINFORCING MAY NEED TO BE INSTALLED OFF-CENTER OF FLAT FOR FIT UP. OFFSETS THAT RESULT IN THE FASTENER BEING LOCATED LESS THAN 1 1/2" FROM THE APEX OF THE FLAT MUST BE APPROVED BY THE ENGINEER OF RECORD.

NEW CCI FLAT PLATE (65 KSI) REINFORCING SCHEDULE											
BOTTOM ELEVATION	TOP ELEVATION	FLAT #/ DEGREE SEPARATION	ELEMENT	ELEMENT LENGTH	ELEMENT QUANTITY	APPROXIMATE BOLTS PER ELEMENT	APPROXIMATE TOTAL BOLT QUANTITY	TERMINATION BOLTS (BOTTOM)	TERMINATION BOLTS (TOP)	MAXIMUM INTERMEDIATE BOLT SPACING	ESTIMATED TOTAL STEEL WEIGHT
0'-6"	35'-6"	F3 & F9	CCI-SFP-06512535	35'-0"	2	40	80	11	11	19"	1935 LBS.
0'-6"	35'-6"	F14	CCI-WCFP-06512535 #1	35'-0"	1	27	27	0	11	19"	968 LBS.
35'-7"	65'-7"	F3, F9 & F14	CCI-AFP-06010030	30'-0"	3	38	114	10	10	16"	1838 LBS.
221										4741 LBS.	

NOTES:

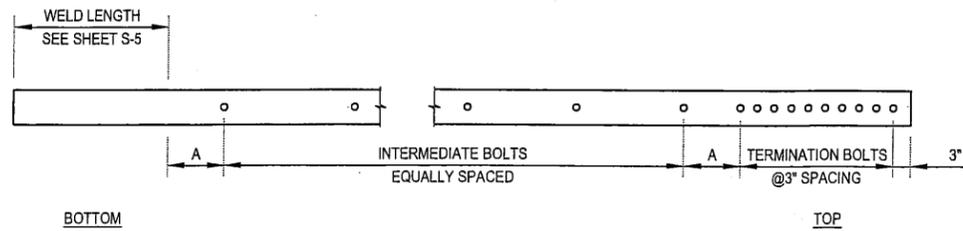
- ALL STEEL SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123. ALTERNATIVELY, ALL NEW STIFFENER PLATE STEEL REINFORCING MAY BE COLD GALVANIZED AS FOLLOWS: APPLY A MINIMUM OF TWO COATS OF ZRC-BRAND ZINC-RICH COLD GALVANIZING COMPOUND. FILM THICKNESS PER COAT SHALL BE WET 3.0 MILS; DRY 1.5 MILS. APPLY PER ZRC (MANUFACTURER) RECOMMENDED PROCEDURES. CONTACT ZRC AT 1-800-831-3275 FOR PRODUCT INFORMATION.
- ALL REINFORCING SHALL BE ASTM A572 GR. 65.
- WELDS SHALL BE E80XX OR GREATER. TERMINATION WELDS SHALL BE 3/8" FILLET WELDS.
- HOLES FOR BOLTS ARE 30mm UNLESS NOTED OTHERWISE.
- ALL SHIMS SHALL BE ASTM A-36.
- ALL HOLES ARE TO BE DRILLED, DO NOT BURN OR PUNCH.
- FOR PLATES STARTING AT 6", THE BOTTOM OF THE FLAT PLATE SHALL BEGIN AT 6" ± 1". FOR SINGLE PLATES OR MULTIPLE PLATES SPLICED TOGETHER, THE BOTTOM OF THE FLAT PLATE SHALL BEGIN AT THE PROPOSED ELEVATION ± 3". FOR MULTIPLE PLATES SPLICED TOGETHER, THE TOP OF THE FLAT PLATE IS TO BE PLACED SUCH THAT THERE IS NO MORE THAN 3" DIFFERENCE BETWEEN THE ACTUAL OVERALL LENGTH OF THE SPAN AND THE PROPOSED OVERALL LENGTH OF THE SPAN, FROM THE BOTTOM OF THE PLATE TO THE TOP OF THE PLATE.

SPLICE PLATE INSTALLATION CHART								
ELEVATION	FLAT PLATE THICKNESS	FLAT PLATE WIDTH	FLAT PLATE LENGTH	FLAT PLATE QUANTITY	WELD LENGTH PER SIDE	TOTAL WELD LENGTH	BOLTS PER SPLICE*	TOTAL STEEL WEIGHT
35'-7"	1"	6"	5'-10"	3	0"	0'	21	357 LBS.

\* BOLTS INCLUDED IN THE TOTAL QUANTITY LISTED IN THE FLAT PLATE INSTALLATION CHART.

NEW SHIM CHART				
1/16" SHIM QUANTITY	1/4" SHIM QUANTITY	SHIM WIDTH	SHIM LENGTH	HOLE DIAMETER
21	6	6"	6"	1-1/4"

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



CUSTOM WELDED BAR DETAIL

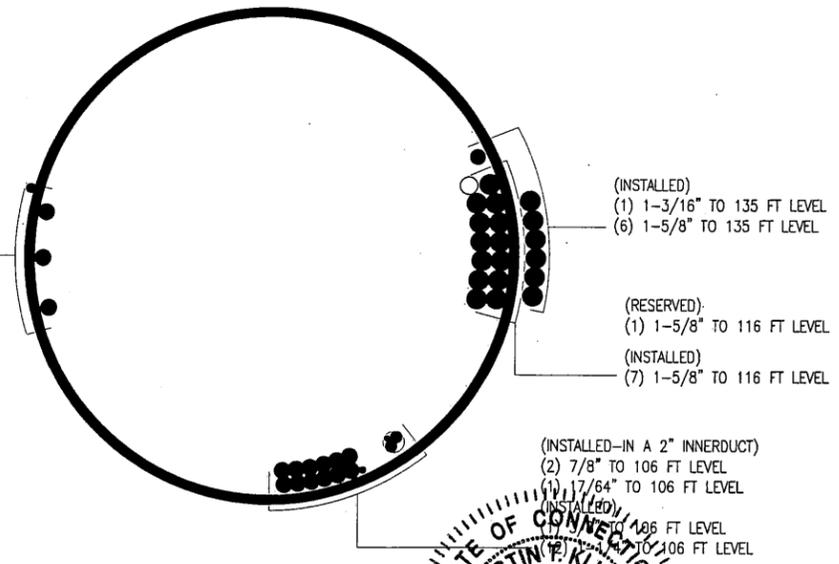
NOTE: "A" DIMENSION MAY VARY, NOT TO EXCEED MAXIMUM INTERMEDIATE BOLT SPACING

SHAFT SECTION DATA							
SHAFT SECTION	SECTION LENGTH (FT)	PLATE THICKNESS (IN)	LAP SPLICE (IN)	DIAMETER ACROSS FLATS (IN)		POLE GRADE (ksi)	POLE SHAPE
				@ TOP	@ BOTTOM		
1	42.00	0.2500	45.00	22.000	29.141	60	18-SIDED
2	35.00	0.3125	51.00	28.003	33.955	60	18-SIDED
3	35.25	0.3750	57.00	32.607	38.601	60	18-SIDED
4	47.50	0.4375		37.043	45.120	60	18-SIDED

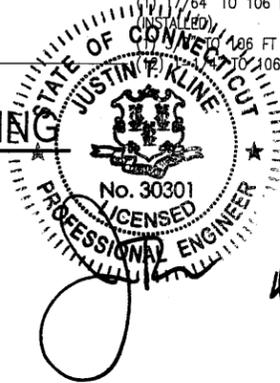
NOTE: DIMENSIONS SHOWN DO NOT INCLUDE GALVANIZING TOLERANCES

ASTM A36 SHIMS FOR MONOPOLE REINFORCEMENT MEMBERS SHALL BE REQUIRED WHERE GAPS BETWEEN THE POLE SHAFT AND REINFORCING MEMBER EXIST AT FASTENER LOCATIONS. FOR INTERMEDIATE CONNECTIONS, THE MINIMUM SHIM LENGTH AND WIDTH SHALL BE THE WIDTH OF THE REINFORCING MEMBER. FOR TERMINATION CONNECTIONS, A CONTINUOUS SHIM PLATE (PREFERRED) OR EQUIVALENT INDIVIDUAL SHIM PLATES THE WIDTH OF THE REINFORCING MEMBER MAY BE USED. SHIM THICKNESSES SHALL BE NO LESS THAN 1/16". STACKING OF SHIMS IS PERMITTED. FINGER SHIMS AND HORSESHOE SHIMS ARE PERMITTED. STACKED SHIMS SHALL BE NO GREATER THAN 1/4" WITHOUT ENGINEER OF RECORD APPROVAL.

TOWER MODIFICATION SCHEDULE			
	ELEVATION	TOWER MODIFICATION DESCRIPTION	REFERENCE SHEETS
(A)	0'	INSTALL NEW TRANSITION STIFFENERS AT BASE PLATE	S-5
(B)	0'-6" TO 65'-7"	INSTALL NEW SHAFT REINFORCING	S-3
(C)	0'-6" TO 65'-7"	REMOVE AND REPLACE STEP BOLTS	S-4



BASE LEVEL DRAWING



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MODIFICATION OF AN EXISTING 147' MONOPOLE  
 BU #876316; SECONDINO PROPERTY  
 BRANFORD, CONNECTICUT

PROJECT No:	37517-1800.001.7700
DRAWN BY:	B.M.S.
DESIGNED BY:	M.E.H.
CHECKED BY:	
DATE:	4-19-2017

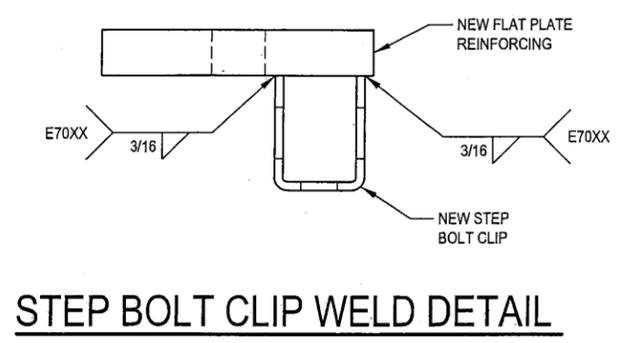
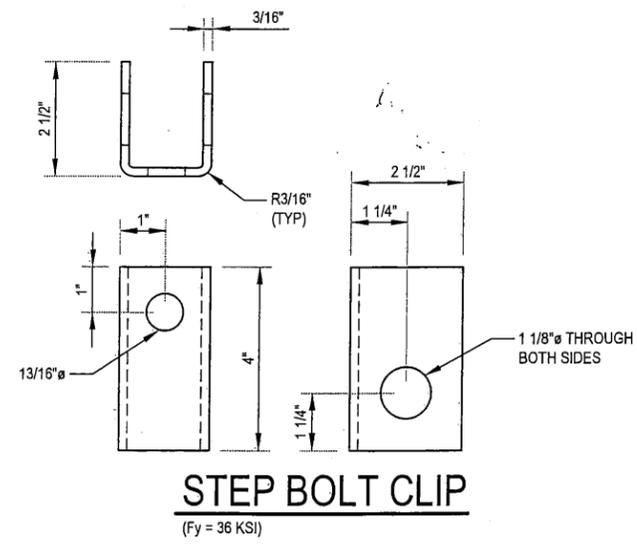
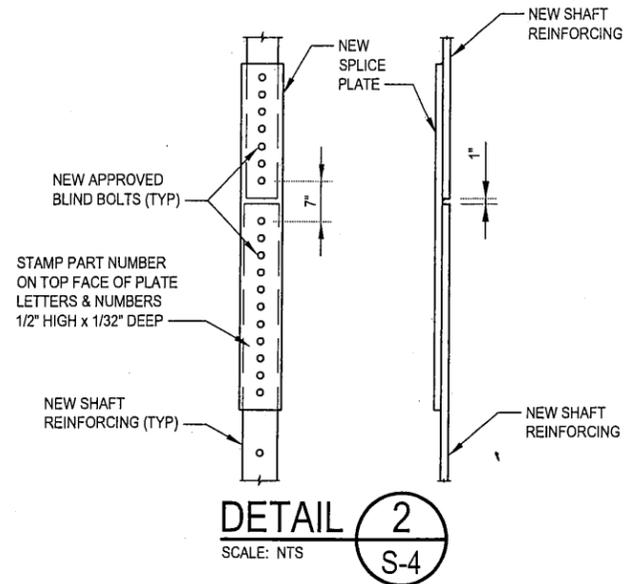
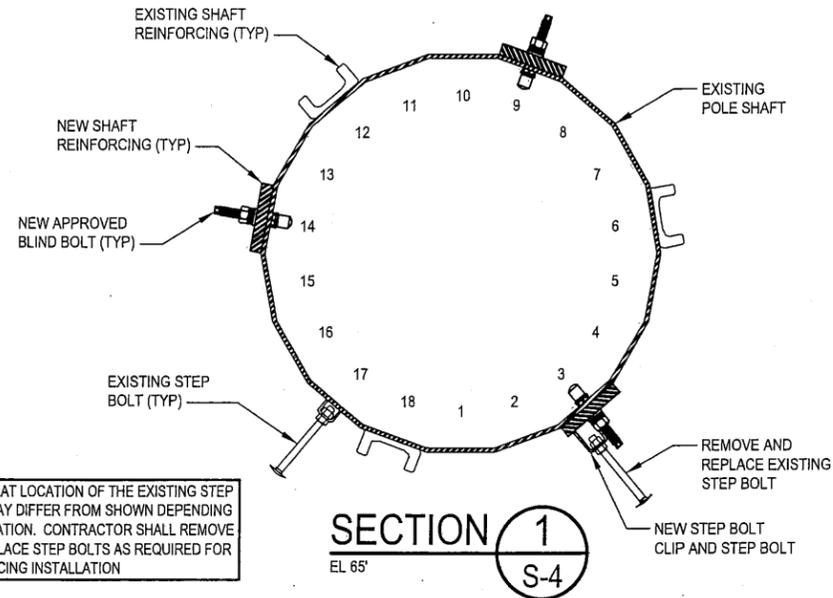
MONOPOLE PROFILE

S-3

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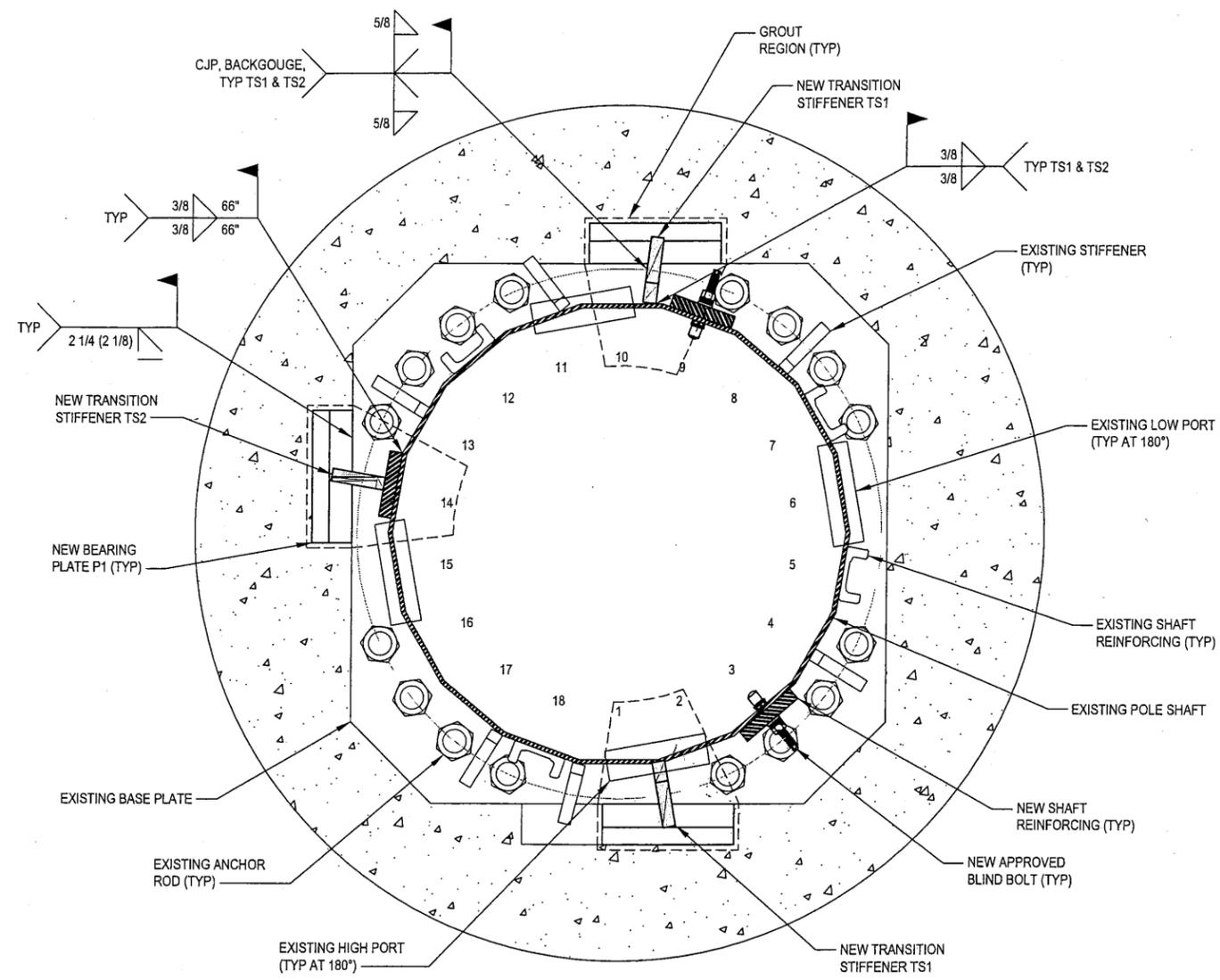
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SHAFT REINFORCING DETAILS

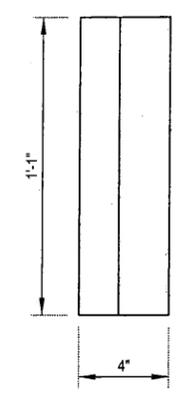
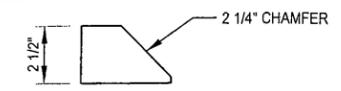
S-4

BASE SPECIFICATIONS	
BASE PLATE:	53" SQUARE; 3" THK.; Fy=50 KSI
ANCHOR RODS:	(16) 2 1/4"Ø; A615 GRADE 75; 52" B.C.

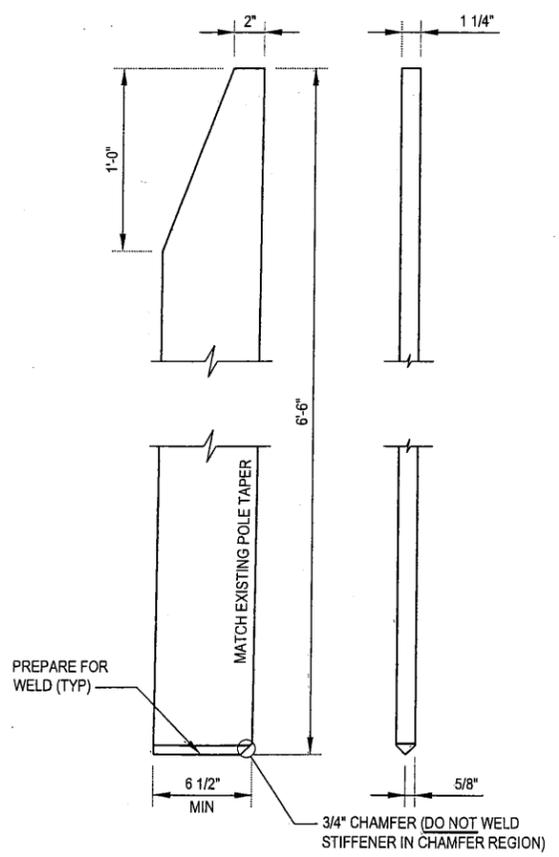
PROVIDE NON-SHRINK GROUT (NS GROUT BY EUCLID OR APPROVED. EQUAL; 7500 PSI MIN) BELOW EXIST. BASE PLATE AND NEW BEARING PLATES IN REGION AS SHOWN. GROUT SHALL BE INSTALLED TIGHT UNDER BASE PLATE WITH NO VOIDS REMAINING BETWEEN TOP OF EXISTING CONCRETE AND UNDERSIDE OF EXISTING BASE PLATE. GROUT COMPLETELY SOLID UNDER ENTIRE SURFACE OF BASE PLATE FROM OUTSIDE EDGE TO INSIDE EDGE WITHIN THE REGION INDICATED.



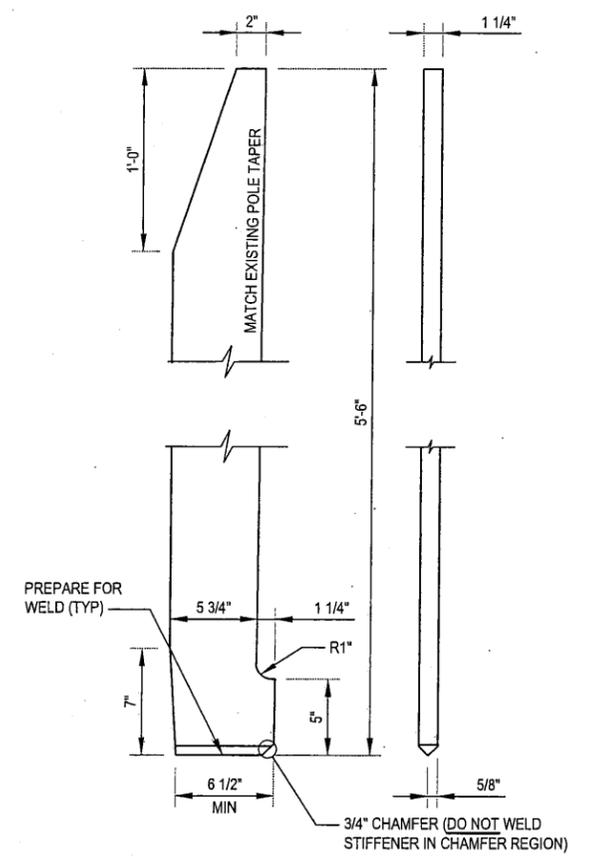
**BASE PLATE** ①  
S-5



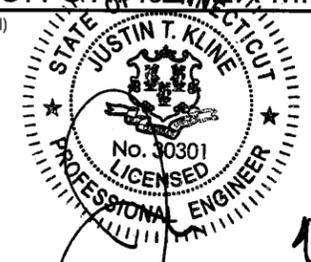
**BEARING PLATE MK~P1**  
(3 REQUIRED) (Fy = 50 KSI)



**TRANSITION STIFFENER MK~TS1**  
(2 REQUIRED) (Fy = 65 KSI)



**TRANSITION STIFFENER MK~TS2**  
(1 REQUIRED) (Fy = 65 KSI)



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BASE PLATE  
DETAILS

S-5

RADIO FREQUENCY EMISSIONS ANALYSIS REPORT  
EVALUATION OF HUMAN EXPOSURE POTENTIAL  
TO NON-IONIZING EMISSIONS

T-Mobile Existing Facility

Site ID: CTNH509A

Secondino Property  
21 Acorn Road  
Branford, CT 06405

**April 18, 2017**

**EBI Project Number: 6217001581**

Site Compliance Summary	
Compliance Status:	<b>COMPLIANT</b>
Site total MPE% of FCC general public allowable limit:	<b>8.00 %</b>

April 18, 2017

T-Mobile USA  
Attn: Jason Overbey, RF Manager  
35 Griffin Road South  
Bloomfield, CT 06002

Emissions Analysis for Site: **CTNH509A – Secondino Property**

EBI Consulting was directed to analyze the proposed T-Mobile facility located at **21 Acorn Road, Branford, CT**, for the purpose of determining whether the emissions from the Proposed T-Mobile Antenna Installation located on this property are within specified federal limits.

All information used in this report was analyzed as a percentage of current Maximum Permissible Exposure (% MPE) as listed in the FCC OET Bulletin 65 Edition 97-01 and ANSI/IEEE Std C95.1. The FCC regulates Maximum Permissible Exposure in units of microwatts per square centimeter ( $\mu\text{W}/\text{cm}^2$ ). The number of  $\mu\text{W}/\text{cm}^2$  calculated at each sample point is called the power density. The exposure limit for power density varies depending upon the frequencies being utilized. Wireless Carriers and Paging Services use different frequency bands each with different exposure limits, therefore it is necessary to report results and limits in terms of percent MPE rather than power density.

All results were compared to the FCC (Federal Communications Commission) radio frequency exposure rules, 47 CFR 1.1307(b)(1) – (b)(3), to determine compliance with the Maximum Permissible Exposure (MPE) limits for General Population/Uncontrolled environments as defined below.

General population/uncontrolled exposure limits apply to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Therefore, members of the general public would always be considered under this category when exposure is not employment related, for example, in the case of a telecommunications tower that exposes persons in a nearby residential area.

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ( $\mu\text{W}/\text{cm}^2$ ). The general population exposure limit for the 700 MHz Band is approximately 467  $\mu\text{W}/\text{cm}^2$ , and the general population exposure limit for the 1900 MHz (PCS) and 2100 MHz (AWS) bands is 1000  $\mu\text{W}/\text{cm}^2$ . Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

Occupational/controlled exposure limits apply to situations in which persons are exposed as a consequence of their employment and in which those persons who are exposed have been made fully aware of the potential for exposure and can exercise control over their exposure. Occupational/controlled exposure limits also apply where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general population/uncontrolled limits (see below), as long as the exposed person has been made fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Additional details can be found in FCC OET 65.

## **CALCULATIONS**

Calculations were done for the proposed T-Mobile Wireless antenna facility located at **21 Acorn Road, Branford, CT**, using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. Since T-Mobile is proposing highly focused directional panel antennas, which project most of the emitted energy out toward the horizon, all calculations were performed assuming a lobe representing the maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB, was focused at the base of the tower. For this report the sample point is the top of a 6-foot person standing at the base of the tower.

For all calculations, all equipment was calculated using the following assumptions:

- 1) 2 UMTS channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.
- 2) 2 LTE channels (AWS Band – 2100 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 Watts per Channel
- 3) 1 LTE channel (700 MHz Band) was considered for each sector of the proposed installation. This channel has a transmit power of 30 Watts.
- 4) Since the 700 MHz LTE radios are ground mounted there are additional cabling losses accounted for. For each ground mounted 700 MHz LTE RF path an additional 1.04 dB of cable loss was factored into the calculations used for this analysis. This is based on manufacturers Specifications for 185 feet of 1-5/8” coax cable on each path.

- 5) All radios at the proposed installation were considered to be running at full power and were uncombined in their RF transmissions paths per carrier prescribed configuration. Per FCC OET Bulletin No. 65 - Edition 97-01 recommendations to achieve the maximum anticipated value at each sample point, all power levels emitting from the proposed antenna installation are increased by a factor of 2.56 to account for possible in-phase reflections from the surrounding environment. This is rarely the case, and if so, is never continuous.
- 6) For the following calculations the sample point was the top of a 6-foot person standing at the base of the tower. The maximum gain of the antenna per the antenna manufactures supplied specifications minus 10 dB was used in this direction. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.
- 7) The antennas used in this modeling are the **Ericsson AIR21 B4A/B2P** & **Ericsson AIR21 B2A/B4P** for 1900 MHz (PCS) and 2100 MHz (AWS) channels and the **Commscope LNX-6515DS-A1M** for 700 MHz channels. This is based on feedback from the carrier with regards to anticipated antenna selection. The **Ericsson AIR21 B4A/B2P** has a maximum gain of **15.9 dBd** at its main lobe at 2100 MHz. The **Ericsson AIR21 B2A/B4P** has a maximum gain of **15.9 dBd** at its main lobe at 1900 MHz. The **Commscope LNX-6515DS-A1M** has a maximum gain of **14.6 dBd** at its main lobe at 700 MHz. The maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB, was used for all calculations. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.
- 8) The antenna mounting height centerline of the proposed antennas is **135 feet** above ground level (AGL).
- 9) Emissions values for additional carriers were taken from the Connecticut Siting Council active database. Values in this database are provided by the individual carriers themselves.
- 10) All calculations were done with respect to uncontrolled / general public threshold limits.

### T-Mobile Site Inventory and Power Data

Sector:	A	Sector:	B	Sector:	C
Antenna #:	1	Antenna #:	1	Antenna #:	1
Make / Model:	Ericsson AIR21 B4A/B2P	Make / Model:	Ericsson AIR21 B4A/B2P	Make / Model:	Ericsson AIR21 B4A/B2P
Gain:	15.9 dBd	Gain:	15.9 dBd	Gain:	15.9 dBd
Height (AGL):	135	Height (AGL):	135	Height (AGL):	135
Frequency Bands	2100 MHz (AWS)	Frequency Bands	2100 MHz (AWS)	Frequency Bands	2100 MHz (AWS)
Channel Count	2	Channel Count	2	Channel Count	2
Total TX Power(W):	120	Total TX Power(W):	120	Total TX Power(W):	120
ERP (W):	4,668.54	ERP (W):	4,668.54	ERP (W):	4,668.54
Antenna A1 MPE%	1.01	Antenna B1 MPE%	1.01	Antenna C1 MPE%	1.01
Antenna #:	2	Antenna #:	2	Antenna #:	2
Make / Model:	Ericsson AIR21 B2A/B4P	Make / Model:	Ericsson AIR21 B2A/B4P	Make / Model:	Ericsson AIR21 B2A/B4P
Gain:	15.9 dBd	Gain:	15.9 dBd	Gain:	15.9 dBd
Height (AGL):	135	Height (AGL):	135	Height (AGL):	135
Frequency Bands	1900 MHz (PCS)	Frequency Bands	1900 MHz (PCS)	Frequency Bands	1900 MHz (PCS)
Channel Count	2	Channel Count	2	Channel Count	2
Total TX Power(W):	60	Total TX Power(W):	60	Total TX Power(W):	60
ERP (W):	2,334.27	ERP (W):	2,334.27	ERP (W):	2,334.27
Antenna A2 MPE%	0.50	Antenna B2 MPE%	0.50	Antenna C2 MPE%	0.50
Antenna #:	3	Antenna #:	3	Antenna #:	3
Make / Model:	Commscope LNX-6515DS-A1M	Make / Model:	Commscope LNX-6515DS-A1M	Make / Model:	Commscope LNX-6515DS-A1M
Gain:	14.6 dBd	Gain:	14.6 dBd	Gain:	14.6 dBd
Height (AGL):	135	Height (AGL):	135	Height (AGL):	135
Frequency Bands	700 MHz	Frequency Bands	700 MHz	Frequency Bands	700 MHz
Channel Count	1	Channel Count	1	Channel Count	1
Total TX Power(W):	30	Total TX Power(W):	30	Total TX Power(W):	30
ERP (W):	680.96	ERP (W):	680.96	ERP (W):	680.96
Antenna A3 MPE%	0.32	Antenna B3 MPE%	0.32	Antenna C3 MPE%	0.32

Site Composite MPE%	
Carrier	MPE%
T-Mobile (Per Sector Max)	<b>1.83 %</b>
AT&T	1.58 %
Verizon Wireless	3.90 %
Sprint	0.32 %
Nextel	0.37 %
<b>Site Total MPE %:</b>	<b>8.00 %</b>

T-Mobile Sector A Total:	1.83 %
T-Mobile Sector B Total:	1.83 %
T-Mobile Sector C Total:	1.83 %
<b>Site Total:</b>	<b>8.00 %</b>

T-Mobile_Max Values per sector	# Channels	Watts ERP (Per Channel)	Height (feet)	Total Power Density ( $\mu\text{W}/\text{cm}^2$ )	Frequency (MHz)	Allowable MPE ( $\mu\text{W}/\text{cm}^2$ )	Calculated % MPE
T-Mobile AWS - 2100 MHz LTE	2	2,334.27	135	10.09	AWS - 2100 MHz	1000	1.01%
T-Mobile PCS - 1900 MHz UMTS	2	1,167.14	135	5.04	PCS - 1900 MHz	1000	0.50%
T-Mobile 700 MHz LTE	1	680.96	135	1.47	700 MHz	467	0.32%
<b>Total:</b>						<b>1.83%</b>	

## Summary

All calculations performed for this analysis yielded results that were **within** the allowable limits for general public exposure to RF Emissions.

The anticipated maximum composite contributions from the T-Mobile facility as well as the site composite emissions value with regards to compliance with FCC's allowable limits for general public exposure to RF Emissions are shown here:

T-Mobile Sector	Power Density Value (%)
Sector A:	1.83 %
Sector B:	1.83 %
Sector C:	1.83 %
T-Mobile Per Sector Maximum:	1.83 %
Site Total:	8.00 %
Site Compliance Status:	<b>COMPLIANT</b>

The anticipated composite MPE value for this site assuming all carriers present is **8.00%** of the allowable FCC established general public limit sampled at the ground level. This is based upon values listed in the Connecticut Siting Council database for existing carrier emissions.

FCC guidelines state that if a site is found to be out of compliance (over allowable thresholds), that carriers over a 5% contribution to the composite value will require measures to bring the site into compliance. For this facility, the composite values calculated were well within the allowable 100% threshold standard per the federal government.