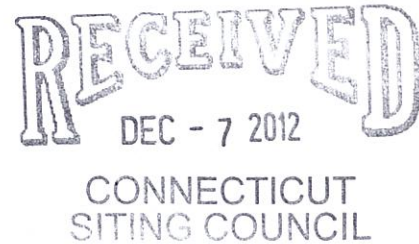




December 7, 2012

Hand Delivered

Connecticut Siting Council
10 Franklin Square
New Britain, Connecticut 06051
Attn: Ms. Linda Roberts, Executive Director



Re: New Cingular Wireless PCS, LLC – Exempt Modification
5 Old Farms Road, Barkhamsted

Dear Ms. Roberts:

This letter and attachments are submitted on behalf of New Cingular Wireless PCS, LLC ("AT&T"). AT&T is making modifications to certain existing sites in its Connecticut system in order to implement LTE technology. Please accept this letter and attachments as notification, pursuant to Section 16-50j-73 of the Regulations of Connecticut State Agencies ("R.C.S.A."), of construction that constitutes an exempt modification pursuant to R.C.S.A. Section 16-50j-72(b)(2). In compliance with R.C.S.A. Section 16-50j-73, a copy of this letter and attachments is being sent to the First Selectman of the Town of Barkhamsted.

AT&T plans to modify the existing wireless communications facility owned by Celco Partnership d/b/a Verizon Wireless and located at 5 Old Farms Road, Barkhamsted, (coordinates 41°-54-52.29" N, 73°-01-20.39" W). Attached are a compound plan and elevation depicting the planned changes, and documentation of the structural sufficiency of the structure to accommodate the revised antenna configuration, subject to modifications detailed in the attached structural documentation. Also included is a power density report reflecting the modification to AT&T's operations at the site.

The changes to the facility do not constitute a modification as defined in Connecticut General Statutes ("C.G.S.") Section 16-50i(d) because the general physical characteristics of the facility will not be significantly changed. Rather, the planned changes to the facility fall squarely within those activities explicitly provided for in R.C.S.A. Section 16-50j-72(b)(2).

1. AT&T will add three (3) LTE panel antenna and one (1) surge arrestor on new mounts attached to the platform, all at a centerline height of approximately 135'. Six (6) RRHS (remote radio units) will be mounted behind the LTE antennas at that same

centerline height. AT&T will also place DC power and fiber runs from the equipment to the antennas along the existing coaxial cable run. These changes will not extend the height of the approximately 145' structure.

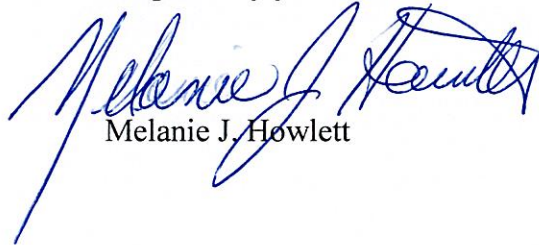
2. AT&T will place related equipment in the existing Equipment Shelter and will also mount a new GPS antenna to the existing Equipment Shelter. These changes will be within the existing compound and will have no effect on the site boundaries.

3. The proposed changes will not increase the noise level at the existing facility by six (6) decibels or more. The incremental effect of the proposed changes will be negligible.

4. The changes to the facility will not increase the calculated "worst case" power density for the combined operations at the site to a level at or above the applicable standard for uncontrolled environments as calculated for a mixed frequency site. As indicated on the attached report prepared by C Squared Systems, LLC, AT&T's operations at the site will result in a power density of approximately 1.77%; the combined site operations will result in a total power density of approximately 25.58%.

Please contact me by phone at (203) 610-1071, or by e-mail at mjhowlett@optonline.net, if there are any questions concerning this matter. Thank you for your consideration.

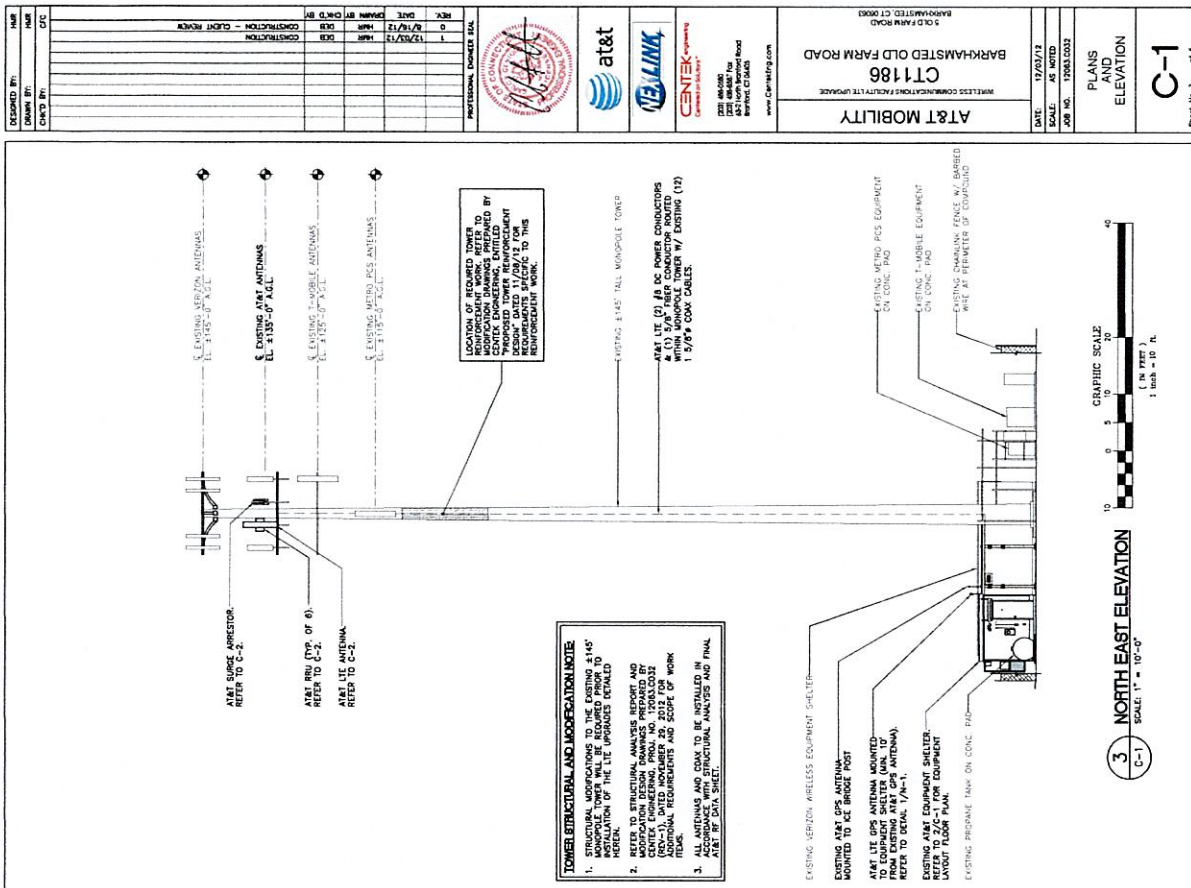
Respectfully yours,

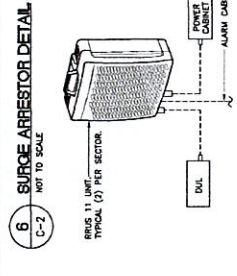
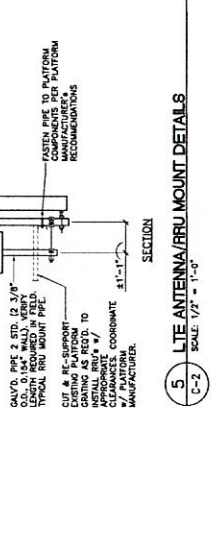
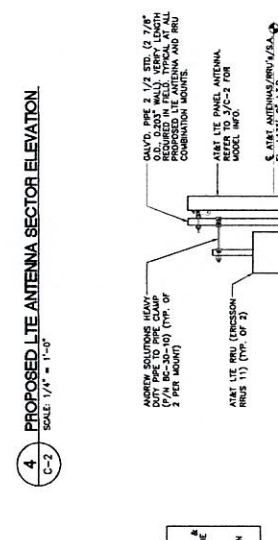
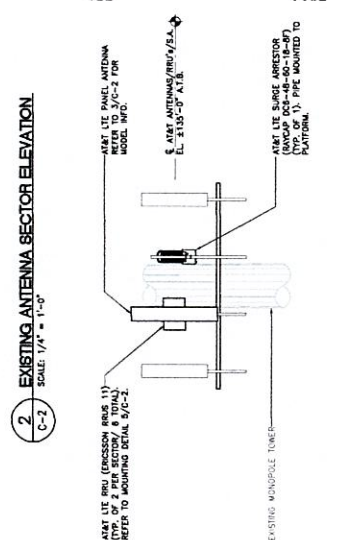
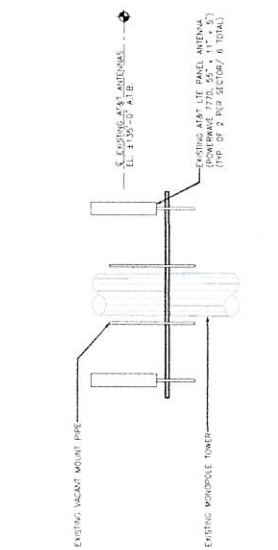


Melanie J. Howlett

Attachments

cc: Honorable Donald S. Stein, First Selectman, Town of Barkhamsted
John N. & Ethel C. Lavieri (underlying property owners)



[illegible]

RFQ (REQUEST FOR QUOTE)			
DIMENSIONS		WEIGHT	CLEARANCES
NAME:	ERICSSON		ADJAC: 16" MIN.
MODEL:	RNUS 11	BAND 4: 44 LBS.	BELOW: 12" MIN.
		BAND 12: 50 LBS.	SIZE: 0" MIN.

NOTES:
 1. CONTRACTOR TO COORDINATE FINAL EQUIPMENT MODEL SELECTION WITH AIAET CONSTRUCTION MANAGER PRIOR TO ORDERING.

7 PRU DETAIL
C-2 NOT TO SCALE

NOTES:

1. PROVIDE MOUNTING PIPES, CROSSOVERS & ASSOCIATED HARDWARE TO COMPLETE THE PROPOSED UPGRADE.
2. REFER TO STRUCTURAL ANALYSIS AND FINAL AT&T RFDs PRIOR TO INSTALLATION OF ANTENNAS AND COAX.



C Squared Systems, LLC
65 Dartmouth Drive, Unit A3
Auburn, NH 03032
(603) 644-2800
support@csquaredsystems.com

Calculated Radio Frequency Emissions



CT1186

(Barkhamsted Old Farm Road)

5 Old Farm Road, Barkhamsted, CT 06063

December 3, 2012

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1. Introduction

The purpose of this report is to investigate compliance with applicable FCC regulations for the proposed modifications to the existing AT&T antenna arrays mounted on the monopole tower located on 5 Old Farm Road in Barkhamsted, CT. The coordinates of the tower are 41° 54' 52.3" N, 73° 1' 20.4" W.

AT&T is proposing the following modifications:

- 1) Install three multi-band (700/850/1900/2100 MHz) antennas for their LTE network (one per sector).

2. FCC Guidelines for Evaluating RF Radiation Exposure Limits

In 1985, the FCC established rules to regulate radio frequency (RF) exposure from FCC licensed antenna facilities. In 1996, the FCC updated these rules, which were further amended in August 1997 by OET Bulletin 65 Edition 97-01. These new rules include Maximum Permissible Exposure (MPE) limits for transmitters operating between 300 kHz and 100 GHz. The FCC MPE limits are based upon those recommended by the National Council on Radiation Protection and Measurements (NCRP), developed by the Institute of Electrical and Electronics Engineers, Inc., (IEEE) and adopted by the American National Standards Institute (ANSI).

The FCC general population/uncontrolled limits set the maximum exposure to which most people may be subjected. General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

Public exposure to radio frequencies is regulated and enforced in units of milliwatts per square centimeter (mW/cm^2). The general population exposure limits for the various frequency ranges are defined in the attached "FCC Limits for Maximum Permissible Exposure (MPE)" in Attachment B of this report.

Higher exposure limits are permitted under the occupational/controlled exposure category, but only for persons who are exposed as a consequence of their employment and who have been made fully aware of the potential for exposure, and they must be able to exercise control over their exposure. General population/uncontrolled limits are five times more stringent than the levels that are acceptable for occupational, or radio frequency trained individuals. Attachment B contains excerpts from OET Bulletin 65 and defines the Maximum Exposure Limit.

Finally, it should be noted that the MPE limits adopted by the FCC for both general population/uncontrolled exposure and for occupational/controlled exposure incorporate a substantial margin of safety and have been established to be well below levels generally accepted as having the potential to cause adverse health effects.

3. RF Exposure Prediction Methods

The emission field calculation results displayed in the following figures were generated using the following formula as outlined in FCC bulletin OET 65:

$$\text{Power Density} = \left(\frac{1.6^2 \times EIRP}{4\pi \times R^2} \right) \times \text{Off Beam Loss}$$

Where:

EIRP = Effective Isotropic Radiated Power

$R = \text{Radial Distance} = \sqrt{H^2 + V^2}$

H = Horizontal Distance from antenna in meters

V = Vertical Distance from radiation center of antenna in meters

Ground reflection factor of 1.6

Off Beam Loss is determined by the selected antenna pattern

These calculations assume that the antennas are operating at 100 percent capacity and power, and that all channels are transmitting simultaneously. Obstructions (trees, buildings, etc.) that would normally attenuate the signal are not taken into account. The calculations assume even terrain in the area of study and do not take into account actual terrain elevations which could attenuate the signal. As a result, the predicted signal levels reported below are much higher than the actual signal levels will be from the finished modifications.

4. Calculation Results

Table 1 below outlines the power density information for the site. Because the proposed AT&T antennas are directional in nature, the majority of the RF power is focused out towards the horizon. As a result, there will be less RF power directed below the antennas relative to the horizon, and consequently lower power density levels around the base of the tower.

Please refer to Attachment C for the vertical patterns of the proposed AT&T antennas. The calculated results for AT&T in Table 1 include a nominal 10 dB off-beam pattern loss to account for the lower relative gain below the antennas.

Carrier	Antenna Height (Feet)	Operating Frequency (MHz)	Number of Trans.	ERP Per Transmitter (Watts)	Power Density (mw/cm ²)	Limit	%MPE
Cingular	105	880	2	296	0.0193	0.5867	3.29%
Cingular	105	1930	2	427	0.0279	1.0000	2.79%
Verizon PCS	145	1970	11	247	0.0465	1.0000	4.65%
Verizon cellular	145	869	9	255	0.0392	0.5793	6.77%
Verizon AWS	145	2145	1	670	0.0115	1.0000	1.15%
Verizon LTE	145	698	1	836	0.0143	0.4653	3.07%
T-Mobile	124	1945	8	162	0.0303	1.0000	3.03%
Pocket	115	2130	3	631	0.0515	1.0000	5.15%
AT&T UMTS	135	880	2	565	0.0022	0.5867	0.38%
AT&T UMTS	135	1900	2	875	0.0035	1.0000	0.35%
AT&T LTE	135	734	1	1313	0.0026	0.4893	0.53%
AT&T GSM	135	880	1	283	0.0006	0.5867	0.10%
AT&T GSM	135	1900	4	525	0.0041	1.0000	0.41%
Total							25.58%

Table 1: Carrier Information^{1 2 3}

¹ The existing CSC filing for Cingular should be removed and replaced with the updated AT&T technologies and values provided in Table 1. The power density information for carriers other than AT&T was taken directly from the CSC database dated 7/26/2012. Please note that %MPE values listed are rounded to two decimal points. The total %MPE listed is a summation of each unrounded contribution. Therefore, summing each rounded value may not reflect the total value listed in the table.

² In the case where antenna models are not uniform across all 3 sectors for the same frequency band, the antenna model with the highest gain was used for the calculations to present a worse-case scenario.

³ Antenna height listed for AT&T is in reference to the Centek Engineering Structural Analysis dated November 29, 2012.

5. Conclusion

The above analysis verifies that emissions from the existing site will be below the maximum power density levels as outlined by the FCC in the OET Bulletin 65 Ed. 97-01. Even when using conservative methods, the cumulative power density from the proposed transmit antennas at the existing facility is well below the limits for the general public. The highest expected percent of Maximum Permissible Exposure at ground level is **25.58% of the FCC limit**.

As noted previously, obstructions (trees, buildings, etc.) that would normally attenuate the signal are not taken into account. As a result, the predicted signal levels are more conservative (higher) than the actual signal levels will be from the finished modifications.

6. Statement of Certification

I certify to the best of my knowledge that the statements in this report are true and accurate. The calculations follow guidelines set forth in ANSI/IEEE Std. C95.3, ANSI/IEEE Std. C95.1 and FCC OET Bulletin 65 Edition 97-01.



Daniel L. Goulet
C Squared Systems, LLC

December 3, 2012

Date

Attachment A: References

OET Bulletin 65 - Edition 97-01 - August 1997 Federal Communications Commission Office of Engineering & Technology

ANSI C95.1-1982, American National Standard Safety Levels With Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300 kHz to 100 GHz. IEEE-SA Standards Board

IEEE Std C95.3-1991 (Reaff 1997), IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave. IEEE-SA Standards Board

Attachment B: FCC Limits for Maximum Permissible Exposure (MPE)

(A) Limits for Occupational/Controlled Exposure⁴

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f ²)*	6
30-300	61.4	0.163	1.0	6
300-1500	-	-	f/300	6
1500-100,000	-	-	5	6

(B) Limits for General Population/Uncontrolled Exposure⁵

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f ²)*	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	f/1500	30
1500-100,000	-	-	1.0	30

f = frequency in MHz * Plane-wave equivalent power density

Table 2: FCC Limits for Maximum Permissible Exposure (MPE)

⁴ Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

⁵ General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

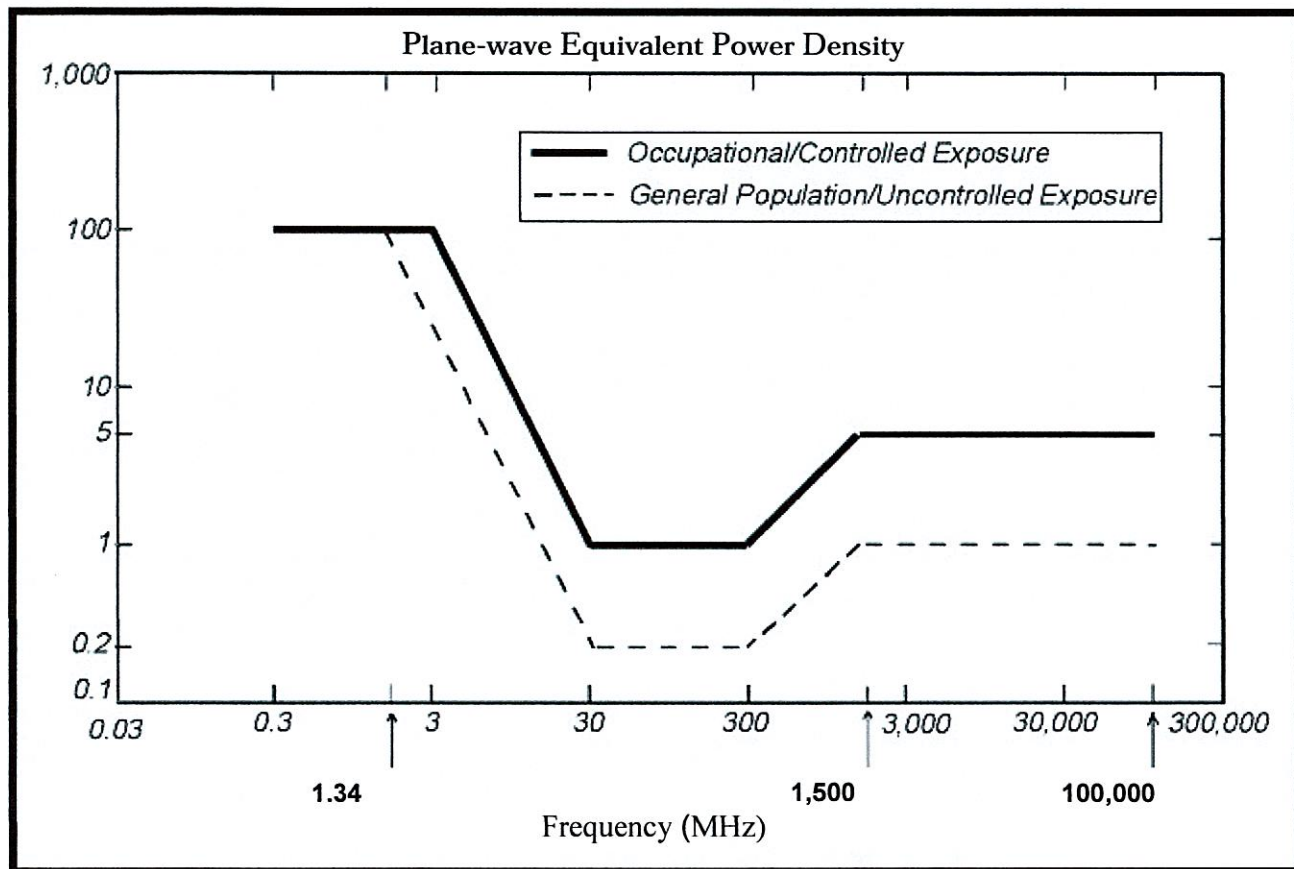
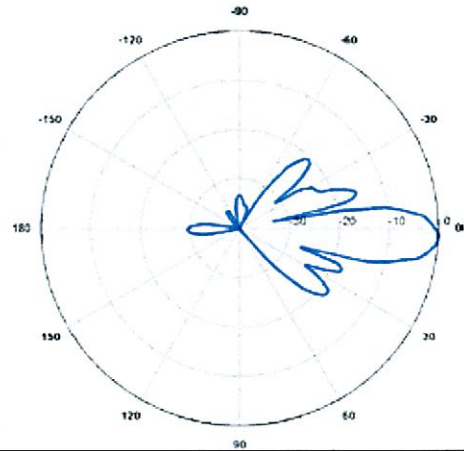


Figure 1: Graph of FCC Limits for Maximum Permissible Exposure (MPE)

Attachment C: AT&T Antenna Data Sheets and Electrical Patterns

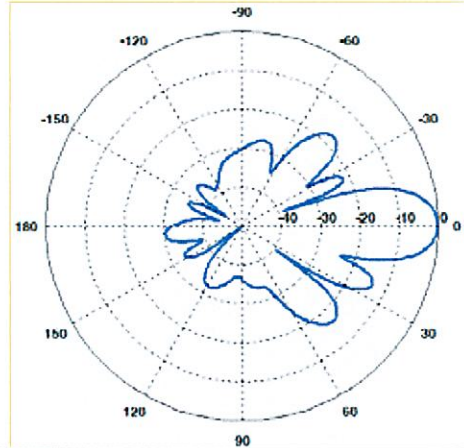
700 MHz

Manufacturer: KMW
 Model #: AM-X-CD-16-65-00T-RET
 Frequency Band: 698-806 MHz
 Gain: 13.4 dBd
 Vertical Beamwidth: 12.3°
 Horizontal Beamwidth: 65°
 Polarization: Dual Slant $\pm 45^\circ$
 Size L x W x D: 72.0" x 11.8" x 5.9"



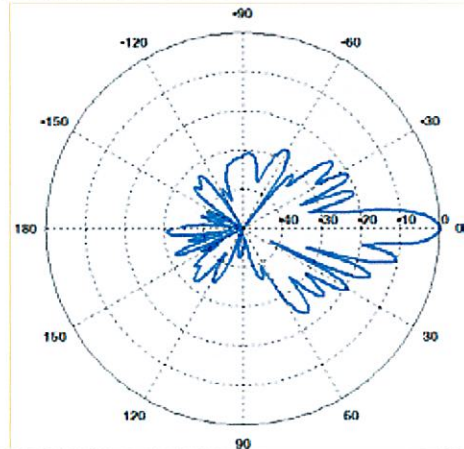
850 MHz

Manufacturer: Powerwave
 Model #: 7770.00
 Frequency Band: 824-896 MHz
 Gain: 11.5 dBd
 Vertical Beamwidth: 15°
 Horizontal Beamwidth: 82°
 Polarization: Dual Linear $\pm 45^\circ$
 Size L x W x D: 55.0" x 11.0" x 5.0"



1900 MHz

Manufacturer: Powerwave
 Model #: 7770.00
 Frequency Band: 1850-1990 MHz
 Gain: 13.4 dBd
 Vertical Beamwidth: 7°
 Horizontal Beamwidth: 86°
 Polarization: Dual Linear $\pm 45^\circ$
 Size L x W x D: 55.0" x 11.0" x 5.0"



Structural Analysis Report
and Reinforcement Design

145-ft Existing EEl Monopole

*Proposed AT&T Mobility
Antenna Upgrade*

AT&T Site Ref: CT1186

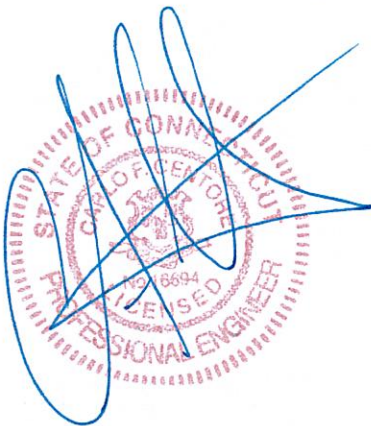
Verizon Site Ref: Barkhamsted West

*5 Old Farm Road
Barkhamsted, CT*

Centek Project No. 12063.CO32

~~Date: September 17, 2012~~

Rev 1: November 29, 2012



Prepared for:

**AT&T Mobility
500 Enterprise Drive, Suite 3A
Rocky Hill, CT 06067**

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- ANTENNA CUT SHEETS.

Introduction

The purpose of this report is to summarize the results of the non-linear, P- Δ structural analysis of the antenna upgrade proposed by AT&T on the existing monopole (tower) located in Barkhamsted, CT.

The host tower is a 145-ft tall, three-section, eighteen sided, tapered monopole, originally designed and manufactured by Engineered Endeavors Inc., job no; 13841-E01, dated December 6, 2005. The tower geometry, structure member sizes and foundation system information were obtained from the aforementioned EEI design documents. Antenna and appurtenance information were obtained from a previous structural report prepared by Centek job no.; 12001.CO4 dated December 19, 2011, visual verification from grade by Centek personnel on June 6, 2012 and an AT&T scope of work sheet.

The tower consists of three (3) tapered steel vertical sections consisting of A572-65 pole sections. The vertical tower sections are slip joint connected. The diameter of the pole (flat-flat) is 17.5-in at the top and 55.0-in at the base.

AT&T Mobility proposes the installation of three (3) panel antennas, six (6) Remote Radio Units (RRU's) and one (1) surge arrestor mounted to the existing low profile platform. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

Antenna and Appurtenance Summary

The existing, proposed and future loads considered in this analysis consist of the following:

- VERIZON (RESERVED):
Antennas: Six (6) Antel LPA-80063-6CF panel antennas, six (6) Antel BXA-70063-6CF panel antennas, six (6) LPA-171063-12CF panel antennas and three (3) RRH's mounted on an existing low profile platform with a RAD center elevation of 145-ft above grade.
Coax Cables: Twelve (12) 1-5/8" $\varnothing$ coax cables running on the inside of the existing monopole, six (6) 1-5/8" $\varnothing$ coax cables banded to the exterior of the existing monopole and one (1) 1-1/4" $\varnothing$ fiber cable banded to the exterior of the existing monopole.
- T-MOBILE (EXISTING):
Antennas: Three (3) RFS APX16DWV-16DWVS-E-A20 panel antennas, three (3) RFS Twin AWS TMA's and three (3) Andrew Twin PCS TMA's mounted on an three (3) 12-ft T-arms with a RAD center elevation of 125-ft above grade.
Coax Cables: Twelve (12) 1-5/8" $\varnothing$ coax cables running on the inside of the existing tower.
- METROPCS (EXISTING):
Antennas: Three (3) RFS APXV18-206517S-C panel antennas flush mounted with a RAD center elevation of 115-ft above grade.
Coax Cables: Six (6) 1-5/8" $\varnothing$ coax cables running on the inside of the existing tower.

- **AT&T (EXISTING TO REMAIN):**
Antennas: Six (6) Powerwave 7770 panel antennas twelve (12) Powerwave LGP21401 TMA's¹ mounted on an existing low profile platform with a RAD center elevation of 135-ft above grade.
Coax Cables: Twelve (12) 1-5/8" Ø coax cables running on the inside of the existing tower.
- **AT&T (PROPOSED):**
Antennas: Two (2) KMW AM-X-CD-16-65-00T-RET panel antennas, one (1) KWM AM-X-CD-14-65-00T-RET panel antenna, six (6) Ericsson RRUS-11, one (1) Raycap DC6-48-60-18-8F surge arrester and one (1) Andrew ABT-DFDM-ADBH Bias Tee mounted on an existing low profile platform with a RAD center elevation of 135-ft above grade.
Coax Cables: One (1) fiber cable and two (2) dc control cables running within the interior of the existing monopole.

Primary Assumptions Used in the Analysis

- The tower structure's theoretical capacity not including any assessment of the condition of the tower.
- The tower carries the horizontal and vertical loads due to the weight of antennas, ice load and wind.
- Tower is properly installed and maintained.
- Tower is in plumb condition.
- Tower loading for antennas and mounts as listed in this report.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds are fabricated with ER-70S-6 electrodes.
- All members are assumed to be as specified in the original tower design documents or reinforcement drawings.
- All members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
- All member protective coatings are in good condition.
- All tower members were properly designed, detailed, fabricated, installed and have been properly maintained since erection.
- Any deviation from the analyzed antenna loading will require a new analysis for verification of structural adequacy.
- All existing coax cables to be installed as indicated in this report.

¹ Six (6) Powerwave LGP 21401 TMA's and six (6) Powerwave LGP 21901 diplexers currently installed on tower. Twelve (12) Powerwave LGP 21401 TMA's used in analysis per AT&T lease rights.

A n a l y s i s

The existing tower was analyzed using a comprehensive computer program entitled RISATower. The program analyzes the tower, considering the worst case loading condition. The tower is considered as loaded by concentric forces along the tower shaft, and the model assumes that the shaft members are subjected to bending, axial, and shear forces.

The existing tower was analyzed for the controlling basic wind speed (fastest mile) with no ice and a 75% reduction of wind force with ½ inch accumulative ice to determine stresses in members as per guidelines of TIA/EIA-222-F-96 entitled "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures", the American Institute of Steel Construction (AISC) and the Manual of Steel Construction; Allowable Stress Design (ASD).

The controlling wind speed is determined by evaluating the local available wind speed data as provided in Appendix K of the CSBC² and the wind speed data available in the TIA/EIA-222-F-96 Standard. The higher of the two wind speeds is utilized in preparation on the tower analysis.

T o w e r L o a d i n g

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA/EIA-222-F, gravity loads of the tower structure and its components, and the application of ½" radial ice on the tower structure and its components.

Basic Wind Speed:	Litchfield; v = 80 mph (fastest mile)	[Section 16 of TIA/EIA-222-F-96]
	Barkhamsted; v = 90 mph (3 second gust) equivalent to v = 75 mph (fastest mile)	[Appendix K of the 2005 CT Building Code Supplement]
	TIA-EIA-222-F wind speed controls.	
Load Cases:	<u>Load Case 1</u> ; 80 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	[Section 2.3.16 of TIA/EIA-222-F-96]
	<u>Load Case 2</u> ; 69 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 69 mph wind speed velocity represents 75% of the wind pressure generated by the 80 mph wind speed.	[Section 2.3.16 of TIA/EIA-222-F-96]
	<u>Load Case 3</u> ; Seismic – not checked	[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type

² The 2005 Connecticut State Building Code as amended by the 2009 CT State Supplement. (CSBC)

Tower Capacity

Tower stresses were calculated utilizing the structural analysis software RISATower. Allowable stresses were determined based on Table 5 of the TIA/EIA code with a 1/3 increase per Section 3.1.1.1 of the same code.

- Calculated stresses **with the reinforcement outlined in section 4 of this report were found** to be within allowable limits. In Load Case 1, per RISATower "Section Capacity Table", this tower was found to be at **110.2%** of its total capacity without reinforcement and at **93.5%** of its total capacity with reinforcement.

Condition	Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Unreinforced	Pole Shaft (L1)	94.79'-145.00'	110.2%	FAIL
Reinforced	Pole Shaft (L1)	109.79'-145.00'	93.5%	PASS

Note 1: Equivalent thickness of 0.25" used for section of pole shaft with reinforcement plates.

Foundation and Anchors

The existing foundation consists of a 7.0-ft square x 5.5-ft long reinforced concrete pier on a 21.5-ft square x 3.5-ft thick reinforced concrete pad. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned EEI design documents; job no; 13841-E01, dated December 6, 2005. The base of the tower is connected to the foundation by means of (14) 2.25"Ø, ASTM A615-75 anchor bolts embedded approximately 7-ft into the concrete foundation structure.

Review of the foundation and anchor design consisted of verification of applied loads obtained from the tower design calculations and code checks of allowable stresses:

- The tower base reactions developed from the governing Load Case 1 were used in the verification of the foundation and its anchors:

Location	Vector	Proposed Reactions
Base	Shear	24 kips
	Compression	30 kips
	Moment	2621 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	IBC 2003/2005 CT State Building Code Section 3108.4.2 (FS) ⁽¹⁾	Proposed Loading (FS) ⁽¹⁾	Result
Reinforced Concrete Pad and Pier	OTM ⁽²⁾	2.0	2.42	PASS

Note 1: FS denotes Factor of Safety.

Note 2: OTM denotes Overturning Moment

- The anchor bolts and base plate were found to be within allowable limits.

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Compression	73.2%	PASS
Base Plate	Bending	91.4%	PASS

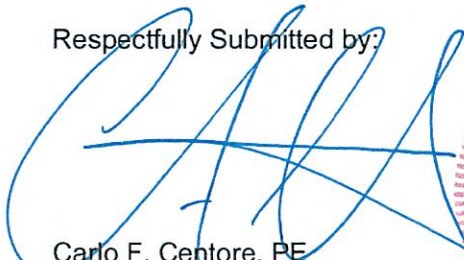
Conclusion

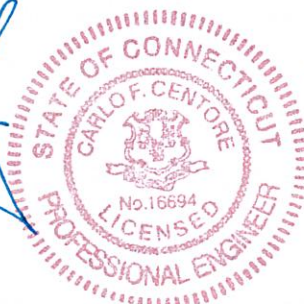
This analysis shows that the subject tower **with the reinforcement detailed in section 4 of this report is adequate** to support the proposed modified antenna configuration.

The analysis is based, in part, on the information provided to this office by AT&T. If the existing conditions are different than the information in this report, Centek Engineering, Inc. must be contacted for resolution of any potential issues.

Please feel free to call with any questions or comments.

Respectfully Submitted by:


 Carlo F. Centore, PE
 Principal ~ Structural Engineer



Prepared by:


 Timothy J. Lynn, EIT
 Structural Engineer

*Standard Conditions for Furnishing of
Professional Engineering Services on
Existing Structures*

All engineering services are performed on the basis that the information used is current and correct. This information may consist of, but is not necessarily limited to:

- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of Centek Engineering, Inc. or generated by field inspections or measurements of the structure.
- It is the responsibility of the client to ensure that the information provided to Centek Engineering, Inc. and used in the performance of our engineering services is correct and complete. In the absence of information to the contrary, we assume that all structures were constructed in accordance with the drawings and specifications and are in an un-corroded condition and have not deteriorated. It is therefore assumed that its capacity has not significantly changed from the "as new" condition.
- All services will be performed to the codes specified by the client, and we do not imply to meet any other codes or requirements unless explicitly agreed in writing. If wind and ice loads or other relevant parameters are to be different from the minimum values recommended by the codes, the client shall specify the exact requirement. In the absence of information to the contrary, all work will be performed in accordance with the latest revision of ANSI/ASCE10 & ANSI/EIA-222
- All services performed, results obtained, and recommendations made are in accordance with generally accepted engineering principles and practices. Centek Engineering, Inc. is not responsible for the conclusions, opinions and recommendations made by others based on the information we supply.

GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

RISATower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, RISATower, formerly ERITower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

RISATower Features:

- RISATower can analyze and design 3- and 4-sided guyed towers, 3- and 4-sided self-supporting towers and either round or tapered ground mounted poles with or without guys.
- The program analyzes towers using the TIA-222-G (2005) standard or any of the previous TIA/EIA standards back to RS-222 (1959). Steel design is checked using the AISC ASD 9th Edition or the AISC LRFD specifications.
- Linear and non-linear (P-delta) analyses can be used in determining displacements and forces in the structure. Wind pressures and forces are automatically calculated.
- Extensive graphics plots include material take-off, shear-moment, leg compression, displacement, twist, feed line, guy anchor and stress plots.
- RISATower contains unique features such as True Cable behavior, hog rod take-up, foundation stiffness and much more.

RISATower Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job	12063.CO32 - CT1186	Page	1 of 27
	Project	145-ft EEI Monopole - 5 Old Farm Rd., Barkhamsted, CT	Date	08:07:22 10/31/12
	Client	AT&T Mobility	Designed by	TJL

Tower Input Data

There is a pole section.

This tower is designed using the TIA/EIA-222-F standard.

The following design criteria apply:

Basic wind speed of 80 mph.

Nominal ice thickness of 0.500 in.

Ice density of 56 pcf.

A wind speed of 69 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 50 mph.

Weld together tower sections have flange connections..

Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications..

Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..

Welds are fabricated with ER-70S-6 electrodes..

A non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

Stress ratio used in pole design is 1.333.

Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	145.000-94.790	50.210	4.420	18	17.500	31.010	0.188	0.750	A572-65 (65 ksi)
L2	94.790-47.000	52.210	6.000	18	29.446	43.370	0.313	1.250	A572-65 (65 ksi)
L3	47.000-1.000	52.000		18	41.145	55.000	0.313	1.250	A572-65 (65 ksi)

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	Client	AT&T Mobility	Designed by	TJL

Tapered Pole Properties

Section	Tip Dia. in	Area in ²	I in ⁴	r in	C in	I/C in ³	J in ⁴	I/Q in ²	w in	w/t
L1	17.770	10.303	390.144	6.146	8.890	43.886	780.801	5.153	2.750	14.667
	31.488	18.343	2201.655	10.942	15.753	139.760	4406.207	9.173	5.128	27.348
L2	31.097	28.897	3098.557	10.342	14.958	207.145	6201.191	14.451	4.632	14.824
	44.039	42.708	10003.243	15.285	22.032	454.033	20019.649	21.358	7.083	22.666
L3	43.403	40.501	8531.126	14.495	20.902	408.157	17073.478	20.254	6.691	21.413
	55.848	54.243	20495.504	19.414	27.940	733.554	41017.977	27.127	9.130	29.216

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A _f	Adjust. Factor A _r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals
ft	ft ²	in					in	in
L1 145.000-94.790				1	1	1		
L2 94.790-47.000				1	1	1		
L3 47.000-1.000				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C _A A _A ft ² /ft	Weight klf
1 5/8 (Verizon - Existing)	B	No	Inside Pole	145.000 - 4.000	12	No Ice	0.000	0.001
1 5/8 (AT&T - Existing)	B	No	Inside Pole	135.000 - 4.000	12	1/2" Ice	0.000	0.001
1 5/8 (T-Mobile - Existing)	B	No	Inside Pole	125.000 - 4.000	12	No Ice	0.000	0.001
1 5/8 (MetroPCS - Existing)	B	No	Inside Pole	135.000 - 4.000	6	1/2" Ice	0.000	0.001
1 5/8 (Verizon - Existing)	B	No	CaAa (Out Of Face)	145.000 - 4.000	1	No Ice	0.198	0.001
1 5/8 (Verizon - Existing)	B	No	CaAa (Out Of Face)	145.000 - 4.000	5	1/2" Ice	0.298	0.003
#8 AWG Copper Wire (AT&T - Proposed)	C	No	Inside Pole	145.000 - 4.000	2	No Ice	0.000	0.001
RG6-Fiber (AT&T - Proposed)	C	No	Inside Pole	135.000 - 4.000	1	1/2" Ice	0.000	0.001
HYBRIFLEX 1-1/4" (Verizon - Reserved)	C	No	CaAa (Out Of Face)	145.000 - 1.000	1	No Ice	0.000	0.001
						1/2" Ice	0.154	0.001
							0.254	0.003

Feed Line/Linear Appurtenances Section Areas

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Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	$C_A A_A$ In Face ft^2	$C_A A_A$ Out Face ft^2	Weight K
L1	145.000-94.790	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	9.942	2.070
		C	0.000	0.000	0.000	7.732	0.110
L2	94.790-47.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	9.462	2.386
		C	0.000	0.000	0.000	7.359	0.115
L3	47.000-1.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	8.514	2.147
		C	0.000	0.000	0.000	7.084	0.107

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	$C_A A_A$ In Face ft^2	$C_A A_A$ Out Face ft^2	Weight K
L1	145.000-94.790	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	14.963	2.525
		C		0.000	0.000	0.000	12.754	0.172
L2	94.790-47.000	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	14.241	2.819
		C		0.000	0.000	0.000	12.139	0.174
L3	47.000-1.000	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	12.814	2.536
		C		0.000	0.000	0.000	11.684	0.164

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	$C_A A_A$ Front ft^2	$C_A A_A$ Side ft^2	Weight K
EEI Low Profile Platform (Verizon - Existing)	C	From Face	2.000 0.000 0.000	0.000	143.000	No Ice 1/2" Ice	22.500 28.200	1.500 2.250
(2) 7770.00 (AT&T - Existing)	A	From Face	3.500 0.000 0.000	0.000	135.000	No Ice 1/2" Ice	5.882 6.314	0.035 0.068
(2) 7770.00 (AT&T - Existing)	B	From Face	3.500 0.000 0.000	0.000	135.000	No Ice 1/2" Ice	5.882 6.314	0.035 0.068
(2) 7770.00 (AT&T - Existing)	C	From Face	3.500 0.000 0.000	0.000	135.000	No Ice 1/2" Ice	5.882 6.314	0.035 0.068
(4) LGP21401 TMA (AT&T - Existing)	A	From Face	3.500 0.000 0.000	0.000	135.000	No Ice 1/2" Ice	0.953 1.093	0.018 0.023
(4) LGP21401 TMA (AT&T - Existing)	B	From Face	3.500 0.000 0.000	0.000	135.000	No Ice 1/2" Ice	0.953 1.093	0.018 0.023
(4) LGP21401 TMA (AT&T - Existing)	C	From Face	3.500 0.000	0.000	135.000	No Ice 1/2" Ice	0.953 1.093	0.018 0.023

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	Client	AT&T Mobility	Designed by TJL

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C _{MA} Front ft ²	C _{MA} Side ft ²	Weight K
EEI Low Profile Platform (AT&T - Existing)	C	From Face	0.000 2.000 0.000	0.000	133.000	No Ice 1/2" Ice	22.500 28.200	22.500 28.200	1.500 2.250
APX16DWV-16DWVS-E-A 20 (T-Mobile - Existing)	A	From Face	3.500 -4.000 0.000	0.000	125.000	No Ice 1/2" Ice	7.065 7.516	2.150 2.490	0.041 0.074
APX16DWV-16DWVS-E-A 20 (T-Mobile - Existing)	B	From Face	3.500 -4.000 0.000	0.000	125.000	No Ice 1/2" Ice	7.065 7.516	2.150 2.490	0.041 0.074
APX16DWV-16DWVS-E-A 20 (T-Mobile - Existing)	C	From Face	3.500 -4.000 0.000	0.000	125.000	No Ice 1/2" Ice	7.065 7.516	2.150 2.490	0.041 0.074
ATMAA1412D-1A20 TMA (T-Mobile - Existing)	A	From Face	3.500 -4.000 0.000	0.000	125.000	No Ice 1/2" Ice	1.167 1.314	0.467 0.575	0.013 0.021
ATMAA1412D-1A20 TMA (T-Mobile - Existing)	B	From Face	3.500 -4.000 0.000	0.000	125.000	No Ice 1/2" Ice	1.167 1.314	0.467 0.575	0.013 0.021
ATMAA1412D-1A20 TMA (T-Mobile - Existing)	C	From Face	3.500 -4.000 0.000	0.000	125.000	No Ice 1/2" Ice	1.167 1.314	0.467 0.575	0.013 0.021
ETW190VS12UB TMA (T-Mobile - Existing)	A	From Face	3.500 -4.000 0.000	0.000	125.000	No Ice 1/2" Ice	0.664 0.778	0.367 0.461	0.015 0.020
ETW190VS12UB TMA (T-Mobile - Existing)	B	From Face	3.500 -4.000 0.000	0.000	125.000	No Ice 1/2" Ice	0.664 0.778	0.367 0.461	0.015 0.020
ETW190VS12UB TMA (T-Mobile - Existing)	C	From Face	3.500 -4.000 0.000	0.000	125.000	No Ice 1/2" Ice	0.664 0.778	0.367 0.461	0.015 0.020
Valmont T-Arm (1) (T-Mobile - Existing)	A	From Face	2.000 0.000 0.000	0.000	123.000	No Ice 1/2" Ice	10.540 14.450	10.540 14.450	0.336 0.412
Valmont T-Arm (1) (T-Mobile - Existing)	B	From Face	2.000 0.000 0.000	0.000	123.000	No Ice 1/2" Ice	10.540 14.450	10.540 14.450	0.336 0.412
Valmont T-Arm (1) (T-Mobile - Existing)	C	From Face	2.000 0.000 0.000	0.000	123.000	No Ice 1/2" Ice	10.540 14.450	10.540 14.450	0.336 0.412
APXV18-206517-C (MetroPCS - Existing)	A	From Face	0.500 0.000 0.000	0.000	115.000	No Ice 1/2" Ice	5.513 5.983	3.929 4.385	0.022 0.053
APXV18-206517-C (MetroPCS - Existing)	B	From Face	0.500 0.000 0.000	0.000	115.000	No Ice 1/2" Ice	5.513 5.983	3.929 4.385	0.022 0.053
APXV18-206517-C (MetroPCS - Existing)	C	From Face	0.500 0.000 0.000	0.000	115.000	No Ice 1/2" Ice	5.513 5.983	3.929 4.385	0.022 0.053
Valmont Uni-Tri Bracket (MetroPCS - Existing)	A	From Face	0.500 0.000 0.000	0.000	115.000	No Ice 1/2" Ice	1.750 1.940	1.750 1.940	0.290 0.306
AM-X-CD-14-65-00T-RET (AT&T - Proposed)	B	From Face	3.000 2.000 0.000	0.000	135.000	No Ice 1/2" Ice	5.507 5.899	2.828 3.137	0.037 0.069
AM-X-CD-16-65-00T-RET(7 2")	B	From Face	3.000 2.000	0.000	135.000	No Ice 1/2" Ice	8.260 8.807	4.642 5.088	0.050 0.096

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	Client	AT&T Mobility	Designed by TJL

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		CMA Front ft ²	CMA Side ft ²	Weight K
(AT&T - Proposed)			0.000						
AM-X-CD-16-65-00T-RET(7 2")	C	From Face	3.000 2.000	0.000	135.000	No Ice 1/2" Ice	8.260 8.807	4.642 5.088	0.050 0.096
(AT&T - Proposed)			0.000						
(2) RRUS-11	A	From Face	1.000 2.000	0.000	135.000	No Ice 1/2" Ice	2.994 3.226	1.246 1.412	0.050 0.070
(AT&T - Proposed)			0.000						
(2) RRUS-11	B	From Face	1.000 2.000	0.000	135.000	No Ice 1/2" Ice	2.994 3.226	1.246 1.412	0.050 0.070
(AT&T - Proposed)			0.000						
(2) RRUS-11	C	From Face	1.000 2.000	0.000	135.000	No Ice 1/2" Ice	2.994 3.226	1.246 1.412	0.050 0.070
(AT&T - Proposed)			0.000						
DC6-48-60-18-8F Surge Arrestor	C	From Face	0.500 0.000	0.000	135.000	No Ice 1/2" Ice	2.228 2.447	2.228 2.447	0.020 0.039
(AT&T - Proposed)			0.000						
ABT-DFDM-ADBH Bias Tee	A	From Face	1.000 2.000	0.000	135.000	No Ice 1/2" Ice	0.052 0.088	0.025 0.050	0.002 0.003
(AT&T - Proposed)			0.000						
LPA-80063/6CF	A	From Face	3.000 6.000	0.000	145.000	No Ice 1/2" Ice	10.308 10.868	9.005 9.554	0.027 0.101
(Verizon - Reserved)			0.000						
LPA-171063-12CF	A	From Face	3.000 4.000	0.000	145.000	No Ice 1/2" Ice	5.994 6.462	6.054 6.523	0.012 0.055
(Verizon - Reserved)			0.000						
BXA-70063/6CF	A	From Face	3.000 1.000	0.000	145.000	No Ice 1/2" Ice	7.731 8.268	4.158 4.595	0.017 0.059
(Verizon - Reserved)			0.000						
BXA-70063/6CF	A	From Face	3.000 -1.000	0.000	145.000	No Ice 1/2" Ice	7.731 8.268	4.158 4.595	0.017 0.059
(Verizon - Reserved)			0.000						
LPA-171063-12CF	A	From Face	3.000 -4.000	0.000	145.000	No Ice 1/2" Ice	5.994 6.462	6.054 6.523	0.012 0.055
(Verizon - Reserved)			0.000						
LPA-80063/6CF	A	From Face	3.000 -6.000	0.000	145.000	No Ice 1/2" Ice	10.308 10.868	9.005 9.554	0.027 0.101
(Verizon - Reserved)			0.000						
LPA-80063/6CF	B	From Face	3.000 6.000	0.000	145.000	No Ice 1/2" Ice	10.308 10.868	9.005 9.554	0.027 0.101
(Verizon - Reserved)			0.000						
LPA-171063-12CF	B	From Face	3.000 4.000	0.000	145.000	No Ice 1/2" Ice	5.994 6.462	6.054 6.523	0.012 0.055
(Verizon - Reserved)			0.000						
BXA-70063/6CF	B	From Face	3.000 1.000	0.000	145.000	No Ice 1/2" Ice	7.731 8.268	4.158 4.595	0.017 0.059
(Verizon - Reserved)			0.000						
BXA-70063/6CF	B	From Face	3.000 -1.000	0.000	145.000	No Ice 1/2" Ice	7.731 8.268	4.158 4.595	0.017 0.059
(Verizon - Reserved)			0.000						
LPA-171063-12CF	B	From Face	3.000 -4.000	0.000	145.000	No Ice 1/2" Ice	5.994 6.462	6.054 6.523	0.012 0.055
(Verizon - Reserved)			0.000						
LPA-80063/6CF	B	From Face	3.000 -6.000	0.000	145.000	No Ice 1/2" Ice	10.308 10.868	9.005 9.554	0.027 0.101
(Verizon - Reserved)			0.000						
LPA-80063/6CF	C	From Face	3.000 6.000	0.000	145.000	No Ice 1/2" Ice	10.308 10.868	9.005 9.554	0.027 0.101
(Verizon - Reserved)			0.000						

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Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K
LPA-171063-12CF (Verizon - Reserved)	C	From Face	0.000 3.000 4.000 0.000	0.000	145.000	No Ice 1/2" Ice	5.994 6.462	6.054 6.523	0.012 0.055
BXA-70063/6CF (Verizon - Reserved)	C	From Face	3.000 1.000 0.000	0.000	145.000	No Ice 1/2" Ice	7.731 8.268	4.158 4.595	0.017 0.059
BXA-70063/6CF (Verizon - Reserved)	C	From Face	3.000 -1.000 0.000	0.000	145.000	No Ice 1/2" Ice	7.731 8.268	4.158 4.595	0.017 0.059
LPA-171063-12CF (Verizon - Reserved)	C	From Face	3.000 -4.000 0.000	0.000	145.000	No Ice 1/2" Ice	5.994 6.462	6.054 6.523	0.012 0.055
LPA-80063/6CF (Verizon - Reserved)	C	From Face	3.000 -6.000 0.000	0.000	145.000	No Ice 1/2" Ice	10.308 10.868	9.005 9.554	0.027 0.101
RRH (Verizon - Reserved)	A	From Face	3.000 0.000 0.000	0.000	145.000	No Ice 1/2" Ice	2.917 3.161	2.188 2.412	0.050 0.072
RRH (Verizon - Reserved)	B	From Face	3.000 0.000 0.000	0.000	145.000	No Ice 1/2" Ice	2.917 3.161	2.188 2.412	0.050 0.072
RRH (Verizon - Reserved)	C	From Face	3.000 0.000 0.000	0.000	145.000	No Ice 1/2" Ice	2.917 3.161	2.188 2.412	0.050 0.072

Tower Pressures - No Ice

$$G_H = 1.690$$

Section Elevation ft	z ft	K _Z	q _z ksf	A _G ft ²	F a c e	A _F ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _{AA} In Face ft ²	C _{AA} Out Face ft ²
L1 145.000-94.79 0	117.932	1.439	0.024	101.487	A	0.000	101.487	101.487	100.00	0.000	0.000
					B	0.000	101.487		100.00	0.000	9.942
					C	0.000	101.487		100.00	0.000	7.732
L2 94.790-47.000	70.101	1.24	0.020	147.342	A	0.000	147.342	147.342	100.00	0.000	0.000
					B	0.000	147.342		100.00	0.000	9.462
					C	0.000	147.342		100.00	0.000	7.359
L3 47.000-1.000	23.146	1	0.017	187.342	A	0.000	187.342	187.342	100.00	0.000	0.000
					B	0.000	187.342		100.00	0.000	8.514
					C	0.000	187.342		100.00	0.000	7.084

Tower Pressure - With Ice

$$G_H = 1.690$$

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Section Elevation	z	K _Z	q _z	t _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
ft	ft		ksf	in	ft ²		ft ²	ft ²	ft ²			
L1 145.000-94.790	117.932	1.439	0.018	0.500	105.671	A	0.000	105.671	105.671	100.00	0.000	0.000
						B	0.000	105.671		100.00	0.000	14.963
						C	0.000	105.671		100.00	0.000	12.754
L2 94.790-47.000	70.101	1.24	0.015	0.500	151.324	A	0.000	151.324	151.324	100.00	0.000	0.000
						B	0.000	151.324		100.00	0.000	14.241
						C	0.000	151.324		100.00	0.000	12.139
L3 47.000-1.000	23.146	1	0.012	0.500	191.175	A	0.000	191.175	191.175	100.00	0.000	0.000
						B	0.000	191.175		100.00	0.000	12.814
						C	0.000	191.175		100.00	0.000	11.684

Tower Pressure - Service

$$G_H = 1.690$$

Section Elevation	z	K _Z	q _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
ft	ft		ksf	ft ²		ft ²	ft ²	ft ²			
L1 145.000-94.790	117.932	1.439	0.009	101.487	A	0.000	101.487	101.487	100.00	0.000	0.000
					B	0.000	101.487		100.00	0.000	9.942
					C	0.000	101.487		100.00	0.000	7.732
L2 94.790-47.000	70.101	1.24	0.008	147.342	A	0.000	147.342	147.342	100.00	0.000	0.000
					B	0.000	147.342		100.00	0.000	9.462
					C	0.000	147.342		100.00	0.000	7.359
L3 47.000-1.000	23.146	1	0.006	187.342	A	0.000	187.342	187.342	100.00	0.000	0.000
					B	0.000	187.342		100.00	0.000	8.514
					C	0.000	187.342		100.00	0.000	7.084

Tower Forces - No Ice - Wind Normal To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1 145.000-94.790	2.179	2.447	A	1	0.65	1	1	1	101.487	3.326	0.066	C
			B	1	0.65	1	1	1	101.487			
			C	1	0.65	1	1	1	101.487			
L2 94.790-47.000	2.500	6.361	A	1	0.65	1	1	1	147.342	3.846	0.080	C
			B	1	0.65	1	1	1	147.342			
			C	1	0.65	1	1	1	147.342			
L3 47.000-1.000	2.254	8.382	A	1	0.65	1	1	1	187.342	3.837	0.083	C
			B	1	0.65	1	1	1	187.342			
			C	1	0.65	1	1	1	187.342			
Sum Weight:	6.933	17.190						OTM	739.625 kip-ft	11.009		

Tower Forces - No Ice - Wind 45 To Face

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	Client	AT&T Mobility	Designed by TJL

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	2.179	2.447	A	1	0.65	1	1	1	101.487	3.326	0.066	C
145.000-94.790			B	1	0.65	1	1	1	101.487			
0			C	1	0.65	1	1	1	101.487			
L2	2.500	6.361	A	1	0.65	1	1	1	147.342	3.846	0.080	C
94.790-47.000			B	1	0.65	1	1	1	147.342			
			C	1	0.65	1	1	1	147.342			
L3	2.254	8.382	A	1	0.65	1	1	1	187.342	3.837	0.083	C
47.000-1.000			B	1	0.65	1	1	1	187.342			
			C	1	0.65	1	1	1	187.342			
Sum Weight:	6.933	17.190						OTM	739.625 kip-ft	11.009		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	2.179	2.447	A	1	0.65	1	1	1	101.487	3.326	0.066	C
145.000-94.790			B	1	0.65	1	1	1	101.487			
0			C	1	0.65	1	1	1	101.487			
L2	2.500	6.361	A	1	0.65	1	1	1	147.342	3.846	0.080	C
94.790-47.000			B	1	0.65	1	1	1	147.342			
			C	1	0.65	1	1	1	147.342			
L3	2.254	8.382	A	1	0.65	1	1	1	187.342	3.837	0.083	C
47.000-1.000			B	1	0.65	1	1	1	187.342			
			C	1	0.65	1	1	1	187.342			
Sum Weight:	6.933	17.190						OTM	739.625 kip-ft	11.009		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	2.179	2.447	A	1	0.65	1	1	1	101.487	3.326	0.066	C
145.000-94.790			B	1	0.65	1	1	1	101.487			
0			C	1	0.65	1	1	1	101.487			
L2	2.500	6.361	A	1	0.65	1	1	1	147.342	3.846	0.080	C
94.790-47.000			B	1	0.65	1	1	1	147.342			
			C	1	0.65	1	1	1	147.342			
L3	2.254	8.382	A	1	0.65	1	1	1	187.342	3.837	0.083	C
47.000-1.000			B	1	0.65	1	1	1	187.342			
			C	1	0.65	1	1	1	187.342			
Sum Weight:	6.933	17.190						OTM	739.625 kip-ft	11.009		

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	Project	145-ft EEI Monopole - 5 Old Farm Rd., Barkhamsted, CT	Date 08:07:22 10/31/12
	Client	AT&T Mobility	Designed by TJL

Tower Forces - With Ice - Wind Normal To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1 145.000-94.79	2.697	3.214	A	1	0.65	1	1	1	105.671	2.875	0.057	C
0			B	1	0.65	1	1	1	105.671			
L2 94.790-47.000	2.993	7.467	C	1	0.65	1	1	1	105.671			
			A	1	0.65	1	1	1	151.324	3.196	0.067	C
			B	1	0.65	1	1	1	151.324			
			C	1	0.65	1	1	1	151.324			
L3 47.000-1.000	2.701	9.784	A	1	0.65	1	1	1	191.175	3.117	0.068	C
			B	1	0.65	1	1	1	191.175			
			C	1	0.65	1	1	1	191.175			
Sum Weight:	8.390	20.465						OTM	626.009 kip-ft	9.187		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1 145.000-94.79	2.697	3.214	A	1	0.65	1	1	1	105.671	2.875	0.057	C
0			B	1	0.65	1	1	1	105.671			
L2 94.790-47.000	2.993	7.467	C	1	0.65	1	1	1	105.671			
			A	1	0.65	1	1	1	151.324	3.196	0.067	C
			B	1	0.65	1	1	1	151.324			
			C	1	0.65	1	1	1	151.324			
L3 47.000-1.000	2.701	9.784	A	1	0.65	1	1	1	191.175	3.117	0.068	C
			B	1	0.65	1	1	1	191.175			
			C	1	0.65	1	1	1	191.175			
Sum Weight:	8.390	20.465						OTM	626.009 kip-ft	9.187		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1 145.000-94.79	2.697	3.214	A	1	0.65	1	1	1	105.671	2.875	0.057	C
0			B	1	0.65	1	1	1	105.671			
L2 94.790-47.000	2.993	7.467	C	1	0.65	1	1	1	105.671			
			A	1	0.65	1	1	1	151.324	3.196	0.067	C
			B	1	0.65	1	1	1	151.324			
			C	1	0.65	1	1	1	151.324			
L3 47.000-1.000	2.701	9.784	A	1	0.65	1	1	1	191.175	3.117	0.068	C
			B	1	0.65	1	1	1	191.175			
			C	1	0.65	1	1	1	191.175			
Sum Weight:	8.390	20.465						OTM	626.009 kip-ft	9.187		

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	Client	AT&T Mobility	Designed by	TJL

Tower Forces - With Ice - Wind 90 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	2.697	3.214	A	1	0.65	1	1	1	105.671	2.875	0.057	C
145.000-94.79			B	1	0.65	1	1	1	105.671			
0			C	1	0.65	1	1	1	105.671			
L2	2.993	7.467	A	1	0.65	1	1	1	151.324	3.196	0.067	C
94.790-47.000			B	1	0.65	1	1	1	151.324			
			C	1	0.65	1	1	1	151.324			
L3	2.701	9.784	A	1	0.65	1	1	1	191.175	3.117	0.068	C
47.000-1.000			B	1	0.65	1	1	1	191.175			
			C	1	0.65	1	1	1	191.175			
Sum Weight:	8.390	20.465						OTM	626.009 kip-ft	9.187		

Tower Forces - Service - Wind Normal To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	2.179	2.447	A	1	0.65	1	1	1	101.487	1.299	0.026	C
145.000-94.79			B	1	0.65	1	1	1	101.487			
0			C	1	0.65	1	1	1	101.487			
L2	2.500	6.361	A	1	0.65	1	1	1	147.342	1.502	0.031	C
94.790-47.000			B	1	0.65	1	1	1	147.342			
			C	1	0.65	1	1	1	147.342			
L3	2.254	8.382	A	1	0.65	1	1	1	187.342	1.499	0.033	C
47.000-1.000			B	1	0.65	1	1	1	187.342			
			C	1	0.65	1	1	1	187.342			
Sum Weight:	6.933	17.190						OTM	288.916 kip-ft	4.300		

Tower Forces - Service - Wind 45 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	2.179	2.447	A	1	0.65	1	1	1	101.487	1.299	0.026	C
145.000-94.79			B	1	0.65	1	1	1	101.487			
0			C	1	0.65	1	1	1	101.487			
L2	2.500	6.361	A	1	0.65	1	1	1	147.342	1.502	0.031	C
94.790-47.000			B	1	0.65	1	1	1	147.342			
			C	1	0.65	1	1	1	147.342			
L3	2.254	8.382	A	1	0.65	1	1	1	187.342	1.499	0.033	C
47.000-1.000			B	1	0.65	1	1	1	187.342			
			C	1	0.65	1	1	1	187.342			
Sum Weight:	6.933	17.190						OTM	288.916	4.300		

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	Client	AT&T Mobility	Designed by	TJL

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
									kip-ft			

Tower Forces - Service - Wind 60 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	2.179	2.447	A	1	0.65	1	1	1	101.487	1.299	0.026	C
145.000-94.790			B	1	0.65	1	1	1	101.487			
0			C	1	0.65	1	1	1	101.487			
L2	2.500	6.361	A	1	0.65	1	1	1	147.342	1.502	0.031	C
94.790-47.000			B	1	0.65	1	1	1	147.342			
			C	1	0.65	1	1	1	147.342			
L3	2.254	8.382	A	1	0.65	1	1	1	187.342	1.499	0.033	C
47.000-1.000			B	1	0.65	1	1	1	187.342			
			C	1	0.65	1	1	1	187.342			
Sum Weight:	6.933	17.190						OTM	288.916 kip-ft	4.300		

Tower Forces - Service - Wind 90 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	2.179	2.447	A	1	0.65	1	1	1	101.487	1.299	0.026	C
145.000-94.790			B	1	0.65	1	1	1	101.487			
0			C	1	0.65	1	1	1	101.487			
L2	2.500	6.361	A	1	0.65	1	1	1	147.342	1.502	0.031	C
94.790-47.000			B	1	0.65	1	1	1	147.342			
			C	1	0.65	1	1	1	147.342			
L3	2.254	8.382	A	1	0.65	1	1	1	187.342	1.499	0.033	C
47.000-1.000			B	1	0.65	1	1	1	187.342			
			C	1	0.65	1	1	1	187.342			
Sum Weight:	6.933	17.190						OTM	288.916 kip-ft	4.300		

Force Totals

Load Case	Vertical Forces	Sum of Forces X	Sum of Forces Z	Sum of Overturning Moments, M _x	Sum of Overturning Moments, M _z	Sum of Torques
	K	K	K	kip-ft	kip-ft	kip-ft
Leg Weight	17.190					
Bracing Weight	0.000					
Total Member Self-Weight	17.190			8.393	0.118	

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	Project	145-ft EEI Monopole - 5 Old Farm Rd., Barkhamsted, CT	Date	08:07:22 10/31/12
	Client	AT&T Mobility	Designed by	TJL

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Total Weight	30.065			8.393	0.118	
Wind 0 deg - No Ice		0.112	-24.077	-2511.063	-14.949	0.822
Wind 30 deg - No Ice		12.127	-20.908	-2181.053	-1271.392	3.941
Wind 45 deg - No Ice		17.091	-17.105	-1783.785	-1790.270	5.149
Wind 60 deg - No Ice		20.891	-12.136	-1264.383	-2187.135	6.005
Wind 90 deg - No Ice		24.058	-0.112	-6.674	-2516.805	6.460
Wind 120 deg - No Ice		20.779	11.941	1255.073	-2172.068	5.183
Wind 135 deg - No Ice		16.932	16.946	1779.263	-1768.962	3.987
Wind 150 deg - No Ice		11.932	20.795	2182.772	-1245.295	2.518
Wind 180 deg - No Ice		-0.112	24.077	2527.849	15.185	-0.822
Wind 210 deg - No Ice		-12.127	20.908	2197.839	1271.628	-3.941
Wind 225 deg - No Ice		-17.091	17.105	1800.571	1790.505	-5.149
Wind 240 deg - No Ice		-20.891	12.136	1281.169	2187.371	-6.005
Wind 270 deg - No Ice		-24.058	0.112	23.460	2517.041	-6.460
Wind 300 deg - No Ice		-20.779	-11.941	-1238.286	2172.304	-5.183
Wind 315 deg - No Ice		-16.932	-16.946	-1762.477	1769.197	-3.987
Wind 330 deg - No Ice		-11.932	-20.795	-2165.986	1245.531	-2.518
Member Ice	3.275					
Total Weight Ice	38.316			12.780	-0.106	
Wind 0 deg - Ice		0.087	-20.319	-2124.843	-11.717	0.682
Wind 30 deg - Ice		10.227	-17.640	-1844.261	-1078.015	3.543
Wind 45 deg - Ice		14.419	-14.429	-1506.958	-1518.489	4.658
Wind 60 deg - Ice		17.628	-10.235	-1066.087	-1855.488	5.455
Wind 90 deg - Ice		20.305	-0.087	1.169	-2135.813	5.906
Wind 120 deg - Ice		17.541	10.085	1071.536	-1843.877	4.774
Wind 135 deg - Ice		14.296	14.307	1516.097	-1502.069	3.694
Wind 150 deg - Ice		10.077	17.554	1858.210	-1057.904	2.362
Wind 180 deg - Ice		-0.087	20.319	2150.402	11.505	-0.682
Wind 210 deg - Ice		-10.227	17.640	1869.821	1077.803	-3.543
Wind 225 deg - Ice		-14.419	14.429	1532.517	1518.277	-4.658
Wind 240 deg - Ice		-17.628	10.235	1091.646	1855.276	-5.455
Wind 270 deg - Ice		-20.305	0.087	24.391	2135.601	-5.906
Wind 300 deg - Ice		-17.541	-10.085	-1045.976	1843.665	-4.774
Wind 315 deg - Ice		-14.296	-14.307	-1490.538	1501.857	-3.694
Wind 330 deg - Ice		-10.077	-17.554	-1832.650	1057.692	-2.362
Total Weight	30.065			8.393	0.118	
Wind 0 deg - Service		0.044	-9.405	-975.769	-5.768	0.321
Wind 30 deg - Service		4.737	-8.167	-846.859	-496.566	1.540
Wind 45 deg - Service		6.676	-6.682	-691.677	-699.252	2.011
Wind 60 deg - Service		8.161	-4.741	-488.785	-854.278	2.346
Wind 90 deg - Service		9.398	-0.044	2.508	-983.055	2.523
Wind 120 deg - Service		8.117	4.665	495.377	-848.392	2.025
Wind 135 deg - Service		6.614	6.619	700.139	-690.929	1.557
Wind 150 deg - Service		4.661	8.123	857.760	-486.372	0.984
Wind 180 deg - Service		-0.044	9.405	992.556	6.003	-0.321
Wind 210 deg - Service		-4.737	8.167	863.646	496.802	-1.540
Wind 225 deg - Service		-6.676	6.682	708.463	699.488	-2.011
Wind 240 deg - Service		-8.161	4.741	505.571	854.514	-2.346
Wind 270 deg - Service		-9.398	0.044	14.279	983.291	-2.523
Wind 300 deg - Service		-8.117	-4.665	-478.591	848.628	-2.025
Wind 315 deg - Service		-6.614	-6.619	-683.353	691.165	-1.557
Wind 330 deg - Service		-4.661	-8.123	-840.974	486.607	-0.984

Load Combinations

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Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 45 deg - No Ice
5	Dead+Wind 60 deg - No Ice
6	Dead+Wind 90 deg - No Ice
7	Dead+Wind 120 deg - No Ice
8	Dead+Wind 135 deg - No Ice
9	Dead+Wind 150 deg - No Ice
10	Dead+Wind 180 deg - No Ice
11	Dead+Wind 210 deg - No Ice
12	Dead+Wind 225 deg - No Ice
13	Dead+Wind 240 deg - No Ice
14	Dead+Wind 270 deg - No Ice
15	Dead+Wind 300 deg - No Ice
16	Dead+Wind 315 deg - No Ice
17	Dead+Wind 330 deg - No Ice
18	Dead+Ice+Temp
19	Dead+Wind 0 deg+Ice+Temp
20	Dead+Wind 30 deg+Ice+Temp
21	Dead+Wind 45 deg+Ice+Temp
22	Dead+Wind 60 deg+Ice+Temp
23	Dead+Wind 90 deg+Ice+Temp
24	Dead+Wind 120 deg+Ice+Temp
25	Dead+Wind 135 deg+Ice+Temp
26	Dead+Wind 150 deg+Ice+Temp
27	Dead+Wind 180 deg+Ice+Temp
28	Dead+Wind 210 deg+Ice+Temp
29	Dead+Wind 225 deg+Ice+Temp
30	Dead+Wind 240 deg+Ice+Temp
31	Dead+Wind 270 deg+Ice+Temp
32	Dead+Wind 300 deg+Ice+Temp
33	Dead+Wind 315 deg+Ice+Temp
34	Dead+Wind 330 deg+Ice+Temp
35	Dead+Wind 0 deg - Service
36	Dead+Wind 30 deg - Service
37	Dead+Wind 45 deg - Service
38	Dead+Wind 60 deg - Service
39	Dead+Wind 90 deg - Service
40	Dead+Wind 120 deg - Service
41	Dead+Wind 135 deg - Service
42	Dead+Wind 150 deg - Service
43	Dead+Wind 180 deg - Service
44	Dead+Wind 210 deg - Service
45	Dead+Wind 225 deg - Service
46	Dead+Wind 240 deg - Service
47	Dead+Wind 270 deg - Service
48	Dead+Wind 300 deg - Service
49	Dead+Wind 315 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	145 - 94.79	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-14.780	-0.118	-13.574
			Max. Mx	14	-8.851	584.946	-12.647

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Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L2	94.79 - 47	Pole	Max. My	10	-8.839	4.346	-594.139
			Max. Vy	14	-16.745	584.946	-12.647
			Max. Vx	10	16.770	4.346	-594.139
			Max. Torque	6			-6.992
			Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-24.441	-0.122	-14.010
			Max. Mx	14	-17.533	1441.696	-18.427
			Max. My	10	-17.528	9.741	-1451.972
			Max. Vy	14	-20.346	1441.696	-18.427
			Max. Vx	10	20.368	9.741	-1451.972
L3	47 - 1	Pole	Max. Torque	6			-6.909
			Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-38.316	-0.123	-14.149
			Max. Mx	14	-30.047	2597.217	-24.496
			Max. My	10	-30.047	15.717	-2608.578
			Max. Vy	14	-24.081	2597.217	-24.496
			Max. Vx	10	24.101	15.717	-2608.578
			Max. Torque	6			-6.883

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	27	38.316	0.087	-20.319
	Max. H _x	14	30.065	24.058	-0.112
	Max. H _z	2	30.065	-0.112	24.077
	Max. M _x	2	2590.821	-0.112	24.077
	Max. M _z	6	2596.974	-24.058	0.112
	Max. Torsion	14	6.871	24.058	-0.112
	Min. Vert	1	30.065	0.000	-0.000
	Min. H _x	6	30.065	-24.058	0.112
	Min. H _z	10	30.065	0.112	-24.077
	Min. M _x	10	-2608.578	0.112	-24.077
	Min. M _z	14	-2597.217	24.058	-0.112
	Min. Torsion	6	-6.875	-24.058	0.112

Tower Mast Reaction Summary

Load Combination	Vertical K	Shear _x K	Shear _z K	Overturning Moment, M _x kip-ft	Overturning Moment, M _z kip-ft	Torque kip-ft
Dead Only	30.065	0.000	0.000	8.966	0.123	-0.000
Dead+Wind 0 deg - No Ice	30.065	0.112	-24.077	-2590.821	-15.458	0.834
Dead+Wind 30 deg - No Ice	30.065	12.127	-20.908	-2250.278	-1311.901	4.160
Dead+Wind 45 deg - No Ice	30.065	17.091	-17.105	-1840.363	-1847.287	5.452
Dead+Wind 60 deg - No Ice	30.065	20.891	-12.136	-1304.433	-2256.785	6.371
Dead+Wind 90 deg - No Ice	30.065	24.058	-0.112	-6.681	-2596.974	6.875
Dead+Wind 120 deg - No Ice	30.065	20.779	11.941	1295.287	-2241.266	5.535
Dead+Wind 135 deg - No Ice	30.065	16.932	16.946	1836.191	-1825.302	4.268
Dead+Wind 150 deg - No Ice	30.065	11.932	20.795	2252.555	-1284.932	2.710
Dead+Wind 180 deg - No Ice	30.065	-0.112	24.077	2608.578	15.717	-0.838
Dead+Wind 210 deg - No Ice	30.065	-12.127	20.908	2268.040	1312.132	-4.159

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Load Combination	Vertical K	Shear _x K	Shear _y K	Overturning Moment, M _x kip-ft	Overturning Moment, M _y kip-ft	Torque kip-ft
Dead+Wind 225 deg - No Ice	30.065	-17.091	17.105	1858.137	1847.510	-5.449
Dead+Wind 240 deg - No Ice	30.065	-20.891	12.136	1322.223	2257.007	-6.367
Dead+Wind 270 deg - No Ice	30.065	-24.058	0.112	24.494	2597.217	-6.871
Dead+Wind 300 deg - No Ice	30.065	-20.779	-11.941	-1277.479	2241.536	-5.536
Dead+Wind 315 deg - No Ice	30.065	-16.932	-16.946	-1818.395	1825.581	-4.271
Dead+Wind 330 deg - No Ice	30.065	-11.932	-20.795	-2234.774	1285.210	-2.715
Dead+Ice+Temp	38.316	0.000	0.000	14.149	-0.123	-0.000
Dead+Wind 0 deg+Ice+Temp	38.316	0.087	-20.319	-2225.168	-12.327	0.705
Dead+Wind 30 deg+Ice+Temp	38.316	10.227	-17.640	-1931.248	-1129.288	3.869
Dead+Wind 45 deg+Ice+Temp	38.316	14.419	-14.429	-1577.921	-1590.680	5.106
Dead+Wind 60 deg+Ice+Temp	38.316	17.628	-10.235	-1116.110	-1943.684	5.995
Dead+Wind 90 deg+Ice+Temp	38.316	20.305	-0.087	1.856	-2237.325	6.515
Dead+Wind 120 deg+Ice+Temp	38.316	17.541	10.085	1123.112	-1931.504	5.287
Dead+Wind 135 deg+Ice+Temp	38.316	14.296	14.307	1588.811	-1573.436	4.105
Dead+Wind 150 deg+Ice+Temp	38.316	10.077	17.554	1947.185	-1108.145	2.643
Dead+Wind 180 deg+Ice+Temp	38.316	-0.087	20.319	2253.247	12.097	-0.707
Dead+Wind 210 deg+Ice+Temp	38.316	-10.227	17.640	1959.332	1129.030	-3.867
Dead+Wind 225 deg+Ice+Temp	38.316	-14.419	14.429	1606.018	1590.416	-5.102
Dead+Wind 240 deg+Ice+Temp	38.316	-17.628	10.235	1144.221	1943.419	-5.991
Dead+Wind 270 deg+Ice+Temp	38.316	-20.305	0.087	26.279	2237.081	-6.512
Dead+Wind 300 deg+Ice+Temp	38.316	-17.541	-10.085	-1094.982	1931.286	-5.289
Dead+Wind 315 deg+Ice+Temp	38.316	-14.296	-14.307	-1560.694	1573.225	-4.109
Dead+Wind 330 deg+Ice+Temp	38.316	-10.077	-17.554	-1919.083	1107.934	-2.648
Dead+Wind 0 deg - Service	30.065	0.044	-9.405	-1008.077	-5.975	0.331
Dead+Wind 30 deg - Service	30.065	4.737	-8.167	-874.864	-513.177	1.650
Dead+Wind 45 deg - Service	30.065	6.676	-6.682	-714.496	-722.636	2.161
Dead+Wind 60 deg - Service	30.065	8.161	-4.741	-504.825	-882.840	2.526
Dead+Wind 90 deg - Service	30.065	9.398	-0.044	2.889	-1015.915	2.725
Dead+Wind 120 deg - Service	30.065	8.117	4.665	512.240	-876.744	2.194
Dead+Wind 135 deg - Service	30.065	6.614	6.619	723.848	-714.011	1.692
Dead+Wind 150 deg - Service	30.065	4.661	8.123	886.740	-502.612	1.075
Dead+Wind 180 deg - Service	30.065	-0.044	9.405	1026.046	6.223	-0.332
Dead+Wind 210 deg - Service	30.065	-4.737	8.167	892.833	513.421	-1.650
Dead+Wind 225 deg - Service	30.065	-6.676	6.682	732.469	722.880	-2.161
Dead+Wind 240 deg - Service	30.065	-8.161	4.741	522.800	883.084	-2.526
Dead+Wind 270 deg - Service	30.065	-9.398	0.044	15.088	1016.160	-2.725
Dead+Wind 300 deg - Service	30.065	-8.117	-4.665	-494.262	876.992	-2.194
Dead+Wind 315 deg - Service	30.065	-6.614	-6.619	-705.874	714.262	-1.693
Dead+Wind 330 deg - Service	30.065	-4.661	-8.123	-868.768	502.864	-1.076

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	0.000	-30.065	0.000	0.000	30.065	-0.000	0.000%
2	0.112	-30.065	-24.077	-0.112	30.065	24.077	0.000%
3	12.127	-30.065	-20.908	-12.127	30.065	20.908	0.000%
4	17.091	-30.065	-17.105	-17.091	30.065	17.105	0.000%
5	20.891	-30.065	-12.136	-20.891	30.065	12.136	0.000%
6	24.058	-30.065	-0.112	-24.058	30.065	0.112	0.000%
7	20.779	-30.065	11.941	-20.779	30.065	-11.941	0.000%
8	16.932	-30.065	16.946	-16.932	30.065	-16.946	0.000%
9	11.932	-30.065	20.795	-11.932	30.065	-20.795	0.000%
10	-0.112	-30.065	24.077	0.112	30.065	-24.077	0.000%
11	-12.127	-30.065	20.908	12.127	30.065	-20.908	0.000%
12	-17.091	-30.065	17.105	17.091	30.065	-17.105	0.000%
13	-20.891	-30.065	12.136	20.891	30.065	-12.136	0.000%

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Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
14	-24.058	-30.065	0.112	24.058	30.065	-0.112	0.000%
15	-20.779	-30.065	-11.941	20.779	30.065	11.941	0.000%
16	-16.932	-30.065	-16.946	16.932	30.065	16.946	0.000%
17	-11.932	-30.065	-20.795	11.932	30.065	20.795	0.000%
18	0.000	-38.316	0.000	-0.000	38.316	-0.000	0.000%
19	0.087	-38.316	-20.319	-0.087	38.316	20.319	0.000%
20	10.227	-38.316	-17.640	-10.227	38.316	17.640	0.000%
21	14.419	-38.316	-14.429	-14.419	38.316	14.429	0.000%
22	17.628	-38.316	-10.235	-17.628	38.316	10.235	0.000%
23	20.305	-38.316	-0.087	-20.305	38.316	0.087	0.000%
24	17.541	-38.316	10.085	-17.541	38.316	-10.085	0.000%
25	14.296	-38.316	14.307	-14.296	38.316	-14.307	0.000%
26	10.077	-38.316	17.554	-10.077	38.316	-17.554	0.000%
27	-0.087	-38.316	20.319	0.087	38.316	-20.319	0.000%
28	-10.227	-38.316	17.640	10.227	38.316	-17.640	0.000%
29	-14.419	-38.316	14.429	14.419	38.316	-14.429	0.000%
30	-17.628	-38.316	10.235	17.628	38.316	-10.235	0.000%
31	-20.305	-38.316	0.087	20.305	38.316	-0.087	0.000%
32	-17.541	-38.316	-10.085	17.541	38.316	10.085	0.000%
33	-14.296	-38.316	-14.307	14.296	38.316	14.307	0.000%
34	-10.077	-38.316	-17.554	10.077	38.316	17.554	0.000%
35	0.044	-30.065	-9.405	-0.044	30.065	9.405	0.000%
36	4.737	-30.065	-8.167	-4.737	30.065	8.167	0.000%
37	6.676	-30.065	-6.682	-6.676	30.065	6.682	0.000%
38	8.161	-30.065	-4.741	-8.161	30.065	4.741	0.000%
39	9.398	-30.065	-0.044	-9.398	30.065	0.044	0.000%
40	8.117	-30.065	4.665	-8.117	30.065	-4.665	0.000%
41	6.614	-30.065	6.619	-6.614	30.065	-6.619	0.000%
42	4.661	-30.065	8.123	-4.661	30.065	-8.123	0.000%
43	-0.044	-30.065	9.405	0.044	30.065	-9.405	0.000%
44	-4.737	-30.065	8.167	4.737	30.065	-8.167	0.000%
45	-6.676	-30.065	6.682	6.676	30.065	-6.682	0.000%
46	-8.161	-30.065	4.741	8.161	30.065	-4.741	0.000%
47	-9.398	-30.065	0.044	9.398	30.065	-0.044	0.000%
48	-8.117	-30.065	-4.665	8.117	30.065	4.665	0.000%
49	-6.614	-30.065	-6.619	6.614	30.065	6.619	0.000%
50	-4.661	-30.065	-8.123	4.661	30.065	8.123	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00039752
3	Yes	5	0.00000001	0.00029712
4	Yes	5	0.00000001	0.00029743
5	Yes	5	0.00000001	0.00023454
6	Yes	5	0.00000001	0.00007859
7	Yes	5	0.00000001	0.00030948
8	Yes	5	0.00000001	0.00029437
9	Yes	5	0.00000001	0.00024978
10	Yes	4	0.00000001	0.00017209
11	Yes	5	0.00000001	0.00024853
12	Yes	5	0.00000001	0.00030265
13	Yes	5	0.00000001	0.00032192
14	Yes	5	0.00000001	0.00008764

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15	Yes	5	0.00000001	0.00023090
16	Yes	5	0.00000001	0.00028895
17	Yes	5	0.00000001	0.00027996
18	Yes	4	0.00000001	0.00006460
19	Yes	5	0.00000001	0.00017810
20	Yes	5	0.00000001	0.00080687
21	Yes	5	0.00000001	0.00085179
22	Yes	5	0.00000001	0.00067840
23	Yes	5	0.00000001	0.00029057
24	Yes	5	0.00000001	0.00085555
25	Yes	5	0.00000001	0.00086565
26	Yes	5	0.00000001	0.00072366
27	Yes	5	0.00000001	0.00017969
28	Yes	5	0.00000001	0.00073007
29	Yes	5	0.00000001	0.00089064
30	Yes	5	0.00000001	0.00088824
31	Yes	5	0.00000001	0.00030514
32	Yes	5	0.00000001	0.00066235
33	Yes	5	0.00000001	0.00082572
34	Yes	5	0.00000001	0.00076511
35	Yes	4	0.00000001	0.00008298
36	Yes	4	0.00000001	0.00095535
37	Yes	4	0.00000001	0.00096387
38	Yes	4	0.00000001	0.00066314
39	Yes	4	0.00000001	0.00054341
40	Yes	5	0.00000001	0.00004537
41	Yes	4	0.00000001	0.00098280
42	Yes	4	0.00000001	0.00072933
43	Yes	4	0.00000001	0.00006699
44	Yes	4	0.00000001	0.00073920
45	Yes	5	0.00000001	0.00004382
46	Yes	5	0.00000001	0.00004868
47	Yes	4	0.00000001	0.00056694
48	Yes	4	0.00000001	0.00062649
49	Yes	4	0.00000001	0.00089930
50	Yes	4	0.00000001	0.00085283

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	145 - 94.79	39.706	44	2.850	0.047
L2	99.21 - 47	16.656	44	1.715	0.012
L3	53 - 1	4.437	44	0.806	0.004

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
145.000	LPA-80063/6CF	44	39.706	2.850	0.047	16115
143.000	EEI Low Profile Platform	44	38.596	2.798	0.046	16115
135.000	(2) 7770.00	44	34.177	2.590	0.038	8057
133.000	EEI Low Profile Platform	44	33.084	2.539	0.036	6714
125.000	APX16DWV-16DWVS-E-A20	44	28.796	2.335	0.029	4027

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Elevation	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
ft						
123.000	Valmont T-Arm (1)	44	27.751	2.285	0.028	3661
115.000	APXV18-206517-C	44	23.713	2.087	0.022	2684

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	145 - 94.79	99.860	11	7.089	0.120
L2	99.21 - 47	42.206	11	4.336	0.030
L3	53 - 1	11.273	11	2.046	0.009

Critical Deflections and Radius of Curvature - Design Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
ft						
145.000	LPA-80063/6CF	11	99.860	7.089	0.120	6688
143.000	EEI Low Profile Platform	11	97.086	6.964	0.115	6688
135.000	(2) 7770.00	11	86.052	6.467	0.097	3343
133.000	EEI Low Profile Platform	11	83.322	6.343	0.092	2785
125.000	APX16DWV-16DWVS-E-A20	11	72.610	5.851	0.074	1669
123.000	Valmont T-Arm (1)	11	69.997	5.730	0.070	1516
115.000	APXV18-206517-C	11	59.899	5.248	0.054	1110

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L _w ft	KI/r	F _a ksi	A in ²	Actual P K	Allow. P _a K	Ratio P/P _a
L1	145 - 142.59	TP31.01x17.5x0.188	50.210	0.000	0.0	39.000	10.689	-3.366	416.872	0.008
	142.59 - 140.18	H1-3+VT (1.47 CR) - 1/19				39.000	11.075	-1.494	431.922	0.003
	140.18 - 137.77	H1-3+VT (1.47 CR) - 1/18				39.000	11.461	-1.680	446.973	0.004
	137.77 - 135.36	H1-3+VT (1.47 CR) - 1/17				39.000	11.847	-1.871	462.024	0.004
	135.36 - 132.95	H1-3+VT (1.47 CR) - 1/16				39.000	12.233	-3.997	477.074	0.008
	132.95 - 130.54	H1-3+VT (1.47 CR) - 1/15				39.000	12.619	-4.206	492.125	0.009
	130.54 - 128.13	H1-3+VT (1.47 CR) - 1/14				39.000	13.005	-4.423	507.175	0.009
		H1-3+VT (1.47 CR) - 1/13								

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	Project 145-ft EEI Monopole - 5 Old Farm Rd., Barkhamsted, CT	Date 08:07:22 10/31/12
	Client AT&T Mobility	Designed by TJL

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P K	Allow. P _a K	Ratio P P _a
	128.13 - 125.72	H1-3+VT (1.47 CR) - 1/12				39.000	13.390	-4.647	522.226	0.009
	125.72 - 123.31	H1-3+VT (1.47 CR) - 1/11				39.000	13.776	-4.987	537.277	0.009
	123.31 - 120.9	H1-3+VT (1.47 CR) - 1/10				39.000	14.162	-6.089	552.327	0.011
	120.9 - 118.49	H1-3+VT (1.47 CR) - 1/9				39.000	14.548	-6.337	567.378	0.011
	118.49 - 116.08	H1-3+VT (1.47 CR) - 1/8				39.000	14.934	-6.591	582.429	0.011
	116.08 - 113.67	H1-3+VT (1.47 CR) - 1/7				39.000	15.320	-7.143	597.479	0.012
	113.67 - 111.26	H1-3+VT (1.47 CR) - 1/6				39.000	15.706	-7.410	612.530	0.012
	111.26 - 108.85	H1-3+VT (1.47 CR) - 1/5				39.000	16.092	-7.684	627.581	0.012
	108.85 - 106.44	H1-3+VT (1.47 CR) - 1/4				39.000	16.478	-7.962	642.631	0.012
	106.44 - 104.03	H1-3+VT (1.47 CR) - 1/3				38.882	16.864	-8.245	655.694	0.013
	104.03 - 101.62	H1-3+VT (1.47 CR) - 1/2				38.495	17.250	-8.534	664.020	0.013
	101.62 - 99.21	H1-3+VT (1.47 CR) - 1				38.108	17.636	-8.826	672.047	0.013
	99.21 - 94.79	H1-3+VT (1.47 CR) - 1				37.398	18.343	-3.748	685.992	0.005
L2	99.21 - 94.79	H1-3+VT (1.47 CR) - 1				39.000	30.066	-6.008	1172.560	0.005
	94.79 - 92.4683	TP43.37x29.446x0.313	52.210	0.000	0.0	39.000	30.680	-10.146	1196.520	0.008
	92.4683 - 90.1467					39.000	31.294	-10.538	1220.470	0.009
	90.1467 - 87.825					39.000	31.908	-10.935	1244.420	0.009
	87.825 - 85.5033					39.000	32.522	-11.338	1268.370	0.009
	85.5033 - 83.1817					39.000	33.137	-11.746	1292.320	0.009
	83.1817 - 80.86					39.000	33.751	-12.159	1316.280	0.009
	80.86 - 78.5383					39.000	34.365	-12.578	1340.230	0.009
	78.5383 - 76.2167					39.000	34.979	-13.002	1364.180	0.010
	76.2167 - 73.895					39.000	35.593	-13.430	1388.130	0.010
	73.895 - 71.5733					39.000	36.207	-13.865	1412.080	0.010
	71.5733 - 69.2517					39.000	36.821	-14.304	1436.030	0.010
	69.2517 - 66.93					39.000	37.436	-14.748	1459.990	0.010
	66.93 - 64.6083					39.000	38.050	-15.198	1483.940	0.010
	64.6083 - 62.2867					39.000	38.664	-15.652	1507.890	0.010
	62.2867 - 59.965					39.000	39.278	-16.112	1531.840	0.011
	59.965 - 57.6433					39.000	39.892	-16.576	1555.790	0.011
	57.6433 - 55.3217					39.000	40.506	-17.046	1579.750	0.011
	55.3217 - 53					39.000	41.120	-17.521	1603.700	0.011
	53 - 47					39.000	42.708	-9.926	1665.600	0.006
L3	53 - 47	TP55x41.145x0.313	52.000	0.000	0.0	39.000	42.086	-9.633	1641.360	0.006
	47 - 44.5789					39.000	42.726	-20.067	1666.320	0.012

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	Client	AT&T Mobility	Designed by	TJL

Section No.	Elevation ft	Size	L ft	L _u ft	KI/r	F _a ksi	A in ²	Actual P K	Allow. P _a K	Ratio P P _a
	44.5789 -					39.000	43.366	-20.576	1691.270	0.012
	42.1579									
	42.1579 -					39.000	44.006	-21.091	1716.220	0.012
	39.7368									
	39.7368 -					39.000	44.646	-21.610	1741.180	0.012
	37.3158									
	37.3158 -					39.000	45.285	-22.135	1766.130	0.013
	34.8947									
	34.8947 -					39.000	45.925	-22.665	1791.090	0.013
	32.4737									
	32.4737 -					38.983	46.565	-23.201	1815.230	0.013
	30.0526									
	30.0526 -					38.752	47.205	-23.742	1829.260	0.013
	27.6316									
	27.6316 -					38.520	47.845	-24.288	1843.000	0.013
	25.2105									
	25.2105 -					38.289	48.485	-24.840	1856.440	0.013
	22.7895									
	22.7895 -					38.058	49.125	-25.397	1869.590	0.014
	20.3684									
	20.3684 -					37.827	49.764	-25.959	1882.440	0.014
	17.9474									
	17.9474 -					37.596	50.404	-26.527	1894.990	0.014
	15.5263									
	15.5263 -					37.365	51.044	-27.100	1907.250	0.014
	13.1053									
	13.1053 -					37.134	51.684	-27.679	1919.210	0.014
	10.6842									
	10.6842 -					36.903	52.324	-28.262	1930.880	0.015
	8.26316									
	8.26316 -					36.672	52.964	-28.852	1942.250	0.015
	5.84211									
	5.84211 -					36.440	53.603	-29.446	1953.320	0.015
	3.42105									
	3.42105 - 1					36.209	54.243	-30.046	1964.100	0.015

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M _x kip-ft	Actual f _{bx} ksi	Allow. F _{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M _y kip-ft	Actual f _{by} ksi	Allow. F _{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	145 - 142.59	TP31.01x17.5x0.188	18.354	4.661	39.000	0.120	0.000	0.000	39.000	0.000
	142.59 -		36.049	8.525	39.000	0.219	0.000	0.000	39.000	0.000
	140.18									
	140.18 -		53.689	11.852	39.000	0.304	0.000	0.000	39.000	0.000
	137.77									
	137.77 -		71.700	14.808	39.000	0.380	0.000	0.000	39.000	0.000
	135.36									
	135.36 -		100.459	19.454	39.000	0.499	0.000	0.000	39.000	0.000
	132.95									
	132.95 -		128.732	23.421	39.000	0.601	0.000	0.000	39.000	0.000
	130.54									
	130.54 -		157.387	26.953	39.000	0.691	0.000	0.000	39.000	0.000
	128.13									
	128.13 -		186.426	30.105	39.000	0.772	0.000	0.000	39.000	0.000
	125.72									

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Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
	125.72 - 123.31		216.946	33.090	39.000	0.848	0.000	0.000	39.000	0.000
	123.31 - 120.9		251.662	36.314	39.000	0.931	0.000	0.000	39.000	0.000
	120.9 - 118.49		287.199	39.265	39.000	1.007	0.000	0.000	39.000	0.000
	118.49 - 116.08		323.133	41.915	39.000	1.075	0.000	0.000	39.000	0.000
	116.08 - 113.67		360.343	44.409	39.000	1.139	0.000	0.000	39.000	0.000
	113.67 - 111.26		398.673	46.739	39.000	1.198	0.000	0.000	39.000	0.000
	111.26 - 108.85		437.408	48.842	39.000	1.252	0.000	0.000	39.000	0.000
	108.85 - 106.44		476.551	50.741	39.000	1.301	0.000	0.000	39.000	0.000
	106.44 - 104.03		516.107	52.459	38.882	1.349	0.000	0.000	38.882	0.000
	104.03 - 101.62		556.080	54.013	38.495	1.403	0.000	0.000	38.495	0.000
	101.62 - 99.21		596.475	55.421	38.108	1.454	0.000	0.000	38.108	0.000
	99.21 - 94.79		260.022	22.326	37.398	0.597	0.000	0.000	37.398	0.000
L2	94.79 - 92.4683	TP43.37x29.446x0.313	411.801	22.027	39.000	0.565	0.000	0.000	39.000	0.000
	92.4683 - 90.1467		712.065	36.572	39.000	0.938	0.000	0.000	39.000	0.000
	90.1467 - 87.825		752.707	37.149	39.000	0.953	0.000	0.000	39.000	0.000
	87.825 - 85.5033		793.753	37.674	39.000	0.966	0.000	0.000	39.000	0.000
	85.5033 - 83.1817		835.200	38.151	39.000	0.978	0.000	0.000	39.000	0.000
	83.1817 - 80.86		877.058	38.585	39.000	0.989	0.000	0.000	39.000	0.000
	80.86 - 78.5383		919.317	38.980	39.000	0.999	0.000	0.000	39.000	0.000
	78.5383 - 76.2167		961.992	39.337	39.000	1.009	0.000	0.000	39.000	0.000
	76.2167 - 73.895		1005.06	39.662	39.000	1.017	0.000	0.000	39.000	0.000
	73.895 - 71.5733		7	39.957	39.000	1.025	0.000	0.000	39.000	0.000
	71.5733 - 69.2517		1048.55	40.224	39.000	1.031	0.000	0.000	39.000	0.000
	69.2517 - 66.93		8	40.465	39.000	1.038	0.000	0.000	39.000	0.000
	66.93 - 64.6083		1092.46	40.683	39.000	1.043	0.000	0.000	39.000	0.000
	64.6083 - 62.2867		7	40.880	39.000	1.048	0.000	0.000	39.000	0.000
	62.2867 - 59.965		1226.66	41.057	39.000	1.053	0.000	0.000	39.000	0.000
	59.965 - 57.6433		7	41.216	39.000	1.057	0.000	0.000	39.000	0.000
	57.6433 - 55.3217		1318.22	41.359	39.000	1.060	0.000	0.000	39.000	0.000
	55.3217 - 53		5	41.486	39.000	1.064	0.000	0.000	39.000	0.000
	53 - 47		1364.63	41.599	39.000	1.067	0.000	0.000	39.000	0.000
	47 - 44.5789		7	21.391	39.000	0.548	0.000	0.000	39.000	0.000
L3	53 - 47	TP55x41.145x0.313	809.356	21.059	39.000	0.540	0.000	0.000	39.000	0.000
	47 - 44.5789		773.702	43.151	39.000	1.106	0.000	0.000	39.000	0.000

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Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
			3						
	44.5789 -		1685.48	43.200	39.000	1.108	0.000	39.000	0.000
	42.1579		3						
	42.1579 -		1737.26	43.237	39.000	1.109	0.000	39.000	0.000
	39.7368		7						
	39.7368 -		1789.43	43.264	39.000	1.109	0.000	39.000	0.000
	37.3158		3						
	37.3158 -		1841.99	43.281	39.000	1.110	0.000	39.000	0.000
	34.8947		2						
	34.8947 -		1894.95	43.289	39.000	1.110	0.000	39.000	0.000
	32.4737		0						
	32.4737 -		1948.29	43.289	38.983	1.110	0.000	38.983	0.000
	30.0526		2						
	30.0526 -		2002.03	43.282	38.752	1.117	0.000	38.752	0.000
	27.6316		3						
	27.6316 -		2056.17	43.267	38.520	1.123	0.000	38.520	0.000
	25.2105		5						
	25.2105 -		2110.72	43.247	38.289	1.129	0.000	38.289	0.000
	22.7895		5						
	22.7895 -		2165.67	43.221	38.058	1.136	0.000	38.058	0.000
	20.3684		5						
	20.3684 -		2221.03	43.190	37.827	1.142	0.000	37.827	0.000
	17.9474		3						
	17.9474 -		2276.80	43.154	37.596	1.148	0.000	37.596	0.000
	15.5263		8						
	15.5263 -		2333.00	43.114	37.365	1.154	0.000	37.365	0.000
	13.1053		0						
	13.1053 -		2389.60	43.070	37.134	1.160	0.000	37.134	0.000
	10.6842		0						
	10.6842 -		2446.60	43.023	36.903	1.166	0.000	36.903	0.000
	8.26316		0						
	8.26316 -		2504.07	42.973	36.672	1.172	0.000	36.672	0.000
	5.84211		5						
	5.84211 -		2561.97	42.920	36.440	1.178	0.000	36.440	0.000
	3.42105		5						
	3.42105 - 1		2620.30	42.865	36.209	1.184	0.000	36.209	0.000
			0						

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{st} ksi	Allow. F_{st} ksi	Ratio $\frac{f_{st}}{F_{st}}$
L1	145 - 142.59	TP31.01x17.5x0.188	6.062	0.567	26.000	0.044	0.001	0.000	26.000	0.000
	142.59 - 140.18		7.244	0.654	26.000	0.052	0.001	0.000	26.000	0.000
	140.18 - 137.77		7.397	0.645	26.000	0.051	0.001	0.000	26.000	0.000
	137.77 - 135.36		7.553	0.638	26.000	0.051	0.001	0.000	26.000	0.000
	135.36 - 132.95		11.657	0.953	26.000	0.073	0.923	0.087	26.000	0.003
	132.95 - 130.54		11.815	0.936	26.000	0.072	0.923	0.082	26.000	0.003
	130.54 - 128.13		11.975	0.921	26.000	0.071	0.922	0.077	26.000	0.003

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	Client	AT&T Mobility	Designed by	TJL

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_t ksi	Allow. F_t ksi	Ratio $\frac{f_t}{F_t}$
	128.13 - 125.72		12.136	0.906	26.000	0.070	0.922	0.073	26.000	0.003
	125.72 - 123.31		13.134	0.953	26.000	0.073	4.287	0.319	26.000	0.012
	123.31 - 120.9		14.675	1.036	26.000	0.080	4.285	0.302	26.000	0.012
	120.9 - 118.49		14.839	1.020	26.000	0.078	4.284	0.286	26.000	0.011
	118.49 - 116.08		15.005	1.005	26.000	0.077	4.282	0.271	26.000	0.010
	116.08 - 113.67		15.834	1.034	26.000	0.079	4.280	0.258	26.000	0.010
	113.67 - 111.26		16.002	1.019	26.000	0.078	4.192	0.240	26.000	0.009
	111.26 - 108.85		16.171	1.005	26.000	0.077	4.190	0.229	26.000	0.009
	108.85 - 106.44		16.342	0.992	26.000	0.076	4.188	0.218	26.000	0.008
	106.44 - 104.03		16.515	0.979	26.000	0.075	4.187	0.208	26.000	0.008
	104.03 - 101.62		16.689	0.968	26.000	0.074	4.185	0.199	26.000	0.008
	101.62 - 99.21		16.866	0.956	26.000	0.074	4.183	0.190	26.000	0.007
	99.21 - 94.79		6.792	0.370	26.000	0.028	1.618	0.068	26.000	0.003
L2	99.21 - 94.79	TP43.37x29.446x0.313	10.468	0.348	26.000	0.027	2.564	0.067	26.000	0.003
	94.79 - 92.4683		17.431	0.568	26.000	0.044	4.180	0.105	26.000	0.004
	92.4683 - 90.1467		17.605	0.563	26.000	0.043	4.179	0.100	26.000	0.004
	90.1467 - 87.825		17.779	0.557	26.000	0.043	4.178	0.097	26.000	0.004
	87.825 - 85.5033		17.953	0.552	26.000	0.042	4.177	0.093	26.000	0.004
	85.5033 - 83.1817		18.129	0.547	26.000	0.042	4.176	0.090	26.000	0.003
	83.1817 - 80.86		18.305	0.542	26.000	0.042	4.175	0.086	26.000	0.003
	80.86 - 78.5383		18.481	0.538	26.000	0.041	4.174	0.083	26.000	0.003
	78.5383 - 76.2167		18.658	0.533	26.000	0.041	4.173	0.080	26.000	0.003
	76.2167 - 73.895		18.836	0.529	26.000	0.041	4.172	0.078	26.000	0.003
	73.895 - 71.5733		19.014	0.525	26.000	0.040	4.172	0.075	26.000	0.003
	71.5733 - 69.2517		19.193	0.521	26.000	0.040	4.171	0.072	26.000	0.003
	69.2517 - 66.93		19.373	0.517	26.000	0.040	4.170	0.070	26.000	0.003
	66.93 - 64.6083		19.553	0.514	26.000	0.040	4.169	0.068	26.000	0.003
	64.6083 - 62.2867		19.734	0.510	26.000	0.039	4.168	0.066	26.000	0.003
	62.2867 - 59.965		19.915	0.507	26.000	0.039	4.168	0.064	26.000	0.002
	59.965 - 57.6433		20.098	0.504	26.000	0.039	4.167	0.062	26.000	0.002
	57.6433 - 55.3217		20.280	0.501	26.000	0.039	4.166	0.060	26.000	0.002
	55.3217 - 53		20.464	0.498	26.000	0.038	4.166	0.058	26.000	0.002
	53 - 47		10.876	0.255	26.000	0.020	2.129	0.027	26.000	0.001
L3	53 - 47	TP55x41.145x0.313	10.144	0.241	26.000	0.019	2.036	0.027	26.000	0.001

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	Client	AT&T Mobility	Designed by	TJL

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
	47 - 44.5789		21.172	0.496	26.000	0.038	4.164	0.054	26.000	0.002
	44.5789 - 42.1579		21.330	0.492	26.000	0.038	4.164	0.052	26.000	0.002
	42.1579 - 39.7368		21.489	0.488	26.000	0.038	4.163	0.051	26.000	0.002
	39.7368 - 37.3158		21.649	0.485	26.000	0.037	4.163	0.049	26.000	0.002
	37.3158 - 34.8947		21.811	0.482	26.000	0.037	4.162	0.048	26.000	0.002
	34.8947 - 32.4737		21.973	0.478	26.000	0.037	4.162	0.046	26.000	0.002
	32.4737 - 30.0526		22.137	0.475	26.000	0.037	4.162	0.045	26.000	0.002
	30.0526 - 27.6316		22.302	0.472	26.000	0.036	4.161	0.044	26.000	0.002
	27.6316 - 25.2105		22.468	0.470	26.000	0.036	4.161	0.043	26.000	0.002
	25.2105 - 22.7895		22.635	0.467	26.000	0.036	4.161	0.042	26.000	0.002
	22.7895 - 20.3684		22.804	0.464	26.000	0.036	4.160	0.041	26.000	0.002
	20.3684 - 17.9474		22.973	0.462	26.000	0.036	4.160	0.040	26.000	0.002
	17.9474 - 15.5263		23.144	0.459	26.000	0.035	4.160	0.039	26.000	0.001
	15.5263 - 13.1053		23.316	0.457	26.000	0.035	4.160	0.038	26.000	0.001
	13.1053 - 10.6842		23.489	0.454	26.000	0.035	4.160	0.037	26.000	0.001
	10.6842 - 8.26316		23.674	0.452	26.000	0.035	5.449	0.047	26.000	0.002
	8.26316 - 5.84211		23.849	0.450	26.000	0.035	5.449	0.046	26.000	0.002
	5.84211 - 3.42105		24.026	0.448	26.000	0.034	5.449	0.045	26.000	0.002
	3.42105 - 1		24.204	0.446	26.000	0.034	5.449	0.044	26.000	0.002

Pole Interaction Design Data

Section No.	Elevation ft	Ratio P P_a	Ratio f_{bx} F_{bx}	Ratio f_{by} F_{by}	Ratio f_v F_v	Ratio f_{vt} F_{vt}	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	145 - 142.59	0.008	0.120	0.000	0.044	0.000	0.128	1.333	H1-3+VT ✓
	142.59 - 140.18	0.003	0.219	0.000	0.052	0.000	0.223	1.333	H1-3+VT ✓
	140.18 - 137.77	0.004	0.304	0.000	0.051	0.000	0.308	1.333	H1-3+VT ✓
	137.77 - 135.36	0.004	0.380	0.000	0.051	0.000	0.384	1.333	H1-3+VT ✓
	135.36 - 132.95	0.008	0.499	0.000	0.073	0.003	0.509	1.333	H1-3+VT ✓
	132.95 -	0.009	0.601	0.000	0.072	0.003	0.611	1.333	H1-3+VT ✓

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Section No.	Elevation ft	Ratio P P_a	Ratio f_{bx} F_{bx}	Ratio f_{by} F_{by}	Ratio f_v F_v	Ratio f_{vt} F_{vt}	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	130.54						✓		
	130.54 - 128.13	0.009	0.691	0.000	0.071	0.003	0.701	1.333	H1-3+VT ✓
	128.13 - 125.72	0.009	0.772	0.000	0.070	0.003	0.782	1.333	H1-3+VT ✓
	125.72 - 123.31	0.009	0.848	0.000	0.073	0.012	0.860	1.333	H1-3+VT ✓
	123.31 - 120.9	0.011	0.931	0.000	0.080	0.012	0.945	1.333	H1-3+VT ✓
	120.9 - 118.49	0.011	1.007	0.000	0.078	0.011	1.020	1.333	H1-3+VT ✓
	118.49 - 116.08	0.011	1.075	0.000	0.077	0.010	1.088	1.333	H1-3+VT ✓
	116.08 - 113.67	0.012	1.139	0.000	0.079	0.010	1.153	1.333	H1-3+VT ✓
	113.67 - 111.26	0.012	1.198	0.000	0.078	0.009	1.213	1.333	H1-3+VT ✓
	111.26 - 108.85	0.012	1.252	0.000	0.077	0.009	1.267	1.333	H1-3+VT ✓
	108.85 - 106.44	0.012	1.301	0.000	0.076	0.008	1.316	1.333	H1-3+VT ✓
	106.44 - 104.03	0.013	1.349	0.000	0.075	0.008	1.364	1.333	H1-3+VT ✗
	104.03 - 101.62	0.013	1.403	0.000	0.074	0.008	1.418	1.333	H1-3+VT ✗
	101.62 - 99.21	0.013	1.454	0.000	0.074	0.007	1.469	1.333	H1-3+VT ✗
	99.21 - 94.79	0.005	0.597	0.000	0.028	0.003	0.603	1.333	H1-3+VT ✓
L2	99.21 - 94.79	0.005	0.565	0.000	0.027	0.003	0.570	1.333	H1-3+VT ✓
	94.79 - 92.4683	0.008	0.938	0.000	0.044	0.004	0.947	1.333	H1-3+VT ✓
	92.4683 - 90.1467	0.009	0.953	0.000	0.043	0.004	0.962	1.333	H1-3+VT ✓
	90.1467 - 87.825	0.009	0.966	0.000	0.043	0.004	0.975	1.333	H1-3+VT ✓
	87.825 - 85.5033	0.009	0.978	0.000	0.042	0.004	0.988	1.333	H1-3+VT ✓
	85.5033 - 83.1817	0.009	0.989	0.000	0.042	0.003	0.999	1.333	H1-3+VT ✓
	83.1817 - 80.86	0.009	0.999	0.000	0.042	0.003	1.009	1.333	H1-3+VT ✓
	80.86 - 78.5383	0.009	1.009	0.000	0.041	0.003	1.019	1.333	H1-3+VT ✓
	78.5383 - 76.2167	0.010	1.017	0.000	0.041	0.003	1.027	1.333	H1-3+VT ✓
	76.2167 - 73.895	0.010	1.025	0.000	0.041	0.003	1.035	1.333	H1-3+VT ✓
	73.895 - 71.5733	0.010	1.031	0.000	0.040	0.003	1.042	1.333	H1-3+VT ✓
	71.5733 - 69.2517	0.010	1.038	0.000	0.040	0.003	1.048	1.333	H1-3+VT ✓

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	Client	AT&T Mobility	Designed by	TJL

Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	69.2517 - 66.93	0.010	1.043	0.000	0.040	0.003	1.054	1.333	H1-3+VT ✓
	66.93 - 64.6083	0.010	1.048	0.000	0.040	0.003	1.059	1.333	H1-3+VT ✓
	64.6083 - 62.2867	0.010	1.053	0.000	0.039	0.003	1.064	1.333	H1-3+VT ✓
	62.2867 - 59.965	0.011	1.057	0.000	0.039	0.002	1.068	1.333	H1-3+VT ✓
	59.965 - 57.6433	0.011	1.060	0.000	0.039	0.002	1.072	1.333	H1-3+VT ✓
	57.6433 - 55.3217	0.011	1.064	0.000	0.039	0.002	1.075	1.333	H1-3+VT ✓
	55.3217 - 53	0.011	1.067	0.000	0.038	0.002	1.078	1.333	H1-3+VT ✓
	53 - 47	0.006	0.548	0.000	0.020	0.001	0.555	1.333	H1-3+VT ✓
L3	53 - 47	0.006	0.540	0.000	0.019	0.001	0.546	1.333	H1-3+VT ✓
	47 - 44.5789	0.012	1.106	0.000	0.038	0.002	1.119	1.333	H1-3+VT ✓
	44.5789 - 42.1579	0.012	1.108	0.000	0.038	0.002	1.120	1.333	H1-3+VT ✓
	42.1579 - 39.7368	0.012	1.109	0.000	0.038	0.002	1.121	1.333	H1-3+VT ✓
	39.7368 - 37.3158	0.012	1.109	0.000	0.037	0.002	1.122	1.333	H1-3+VT ✓
	37.3158 - 34.8947	0.013	1.110	0.000	0.037	0.002	1.123	1.333	H1-3+VT ✓
	34.8947 - 32.4737	0.013	1.110	0.000	0.037	0.002	1.123	1.333	H1-3+VT ✓
	32.4737 - 30.0526	0.013	1.110	0.000	0.037	0.002	1.124	1.333	H1-3+VT ✓
	30.0526 - 27.6316	0.013	1.117	0.000	0.036	0.002	1.130	1.333	H1-3+VT ✓
	27.6316 - 25.2105	0.013	1.123	0.000	0.036	0.002	1.137	1.333	H1-3+VT ✓
	25.2105 - 22.7895	0.013	1.129	0.000	0.036	0.002	1.143	1.333	H1-3+VT ✓
	22.7895 - 20.3684	0.014	1.136	0.000	0.036	0.002	1.150	1.333	H1-3+VT ✓
	20.3684 - 17.9474	0.014	1.142	0.000	0.036	0.002	1.156	1.333	H1-3+VT ✓
	17.9474 - 15.5263	0.014	1.148	0.000	0.035	0.001	1.162	1.333	H1-3+VT ✓
	15.5263 - 13.1053	0.014	1.154	0.000	0.035	0.001	1.168	1.333	H1-3+VT ✓
	13.1053 - 10.6842	0.014	1.160	0.000	0.035	0.001	1.175	1.333	H1-3+VT ✓
	10.6842 - 8.26316	0.015	1.166	0.000	0.035	0.002	1.181	1.333	H1-3+VT ✓
	8.26316 - 5.84211	0.015	1.172	0.000	0.035	0.002	1.187	1.333	H1-3+VT ✓

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	Client	AT&T Mobility	Designed by	TJL

Section No.	Elevation ft	Ratio P P_a	Ratio f_{bx} F_{bx}	Ratio f_{by} F_{by}	Ratio f_v F_v	Ratio f_a F_a	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	5.84211 - 3.42105	0.015	1.178	0.000	0.034	0.002	1.193 ✓	1.333	H1-3+VT ✓
	3.42105 - 1	0.015	1.184	0.000	0.034	0.002	1.199 ✓	1.333	H1-3+VT ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF * P_{allow}$ K	% Capacity	Pass Fail
L1	145 - 94.79	Pole	TP31.01x17.5x0.188	1	-8.826	895.839	110.2	Fail ✗
L2	94.79 - 47	Pole	TP43.37x29.446x0.313	2	-17.521	2137.732	80.9	Pass
L3	47 - 1	Pole	TP55x41.145x0.313	3	-30.046	2618.145	90.0	Pass
							Summary	
							Pole (L1)	110.2 Fail ✗
							RATING =	110.2 Fail ✗

Subject:

Monopole Reinforcement

Location:

Barkhamsted, CT

Rev. 0: 11/29/12

Designed by: T.J.L. Checked by: C.F.C.
 Job No. 12063.CO32

MONOPOLE REINFORCEMENT DESIGN

Note: Existing monopole is a 18 sided polygon. Proposed reinforcements shall comprise of flat bar stock attached to the exterior of the pole.

Design Forces:

Moment =	$M_{act} := 597\text{-ft-kips}$	(User Input)
Axial =	$P := 9\text{-kips}$	(User Input)
Shear =	$V := 17.0\text{-kips}$	(User Input)

Existing Monopole data:

Youngs Modulus of Elasticity for Steel =	$E := 29000\text{ksi}$	(User Input)
Pole Yield Strength =	$F_y := 65\text{-ksi}$	(User Input)
Pole Section Diameter =	$D_{o,pole} := 29.823\text{in}$	(User Input)
Pole Section Wall Thickness =	$t := 0.1875\text{in}$	(User Input)
Pole Cross-Sectional Area =	$A_{pole} := 17.63\text{in}^2$	(User Input)
Pole Section Moment of Inertia =	$I_{pole} := 1956\text{in}^4$	(User Input)

Stiffener Reinforcement Data:

Stiffener Yield Strength =	$F_{ystiff} := 50\text{-ksi}$	(User Input)	
Stiffener Width =	$b := 4\text{in}$	(User Input)	
Stiffener Depth =	$d := 0.75\text{in}$	(User Input)	
Unbraced Length of Stiffener =	$l := 12\text{in}$	(User Input)	(Equal to Bolt Spacing. Assumed pin-pin Between Bolts)
Effective Length K Factor =	$K := 1.0$	(User Input)	
Number of Stiffeners =	$n_{stiff} := 3$	(User Input)	
Distance to Stiffener Centroid =	$d_1 := 15.25\text{in}$	(User Input)	
	$d_2 := 7.875\text{in}$	(User Input)	

AJAX Bolt Data:

Bolt Grade =	AS1252 PC 8.8	(User Input)	NOTE: AJAX bdt's conform to AS 1252 Property Class 8.8 similar to A325 $F_u = 120\text{ksi}$
Number of Bolts per Stiffener =	$n_b := 15$	(User Input)	
Bolt Diameter =	$d_b := 0.75\text{in}$	(User Input)	
Allowable Shear Stress =	$F_{vbolt} := 27\text{-ksi}$	(User Input)	
Number of Shear Planes =	$n_{plane} := 1$	(User Input)	

Calculated Properties:

Distance from Centroid to Extreme Fiber (Pole)

$$c := D_{o,pole} \cdot 0.5 = 14.912 \cdot \text{in}$$

Pole Allowable Axial Stress =

$$F_a := 0.6 \cdot 1.33 F_y = 51.87 \cdot \text{ksi}$$

Note: 1.333 increase allowed per
 TIA/EIA

Pole Allowable Bending Stress =

$$F_b := 0.6 \cdot 1.33 F_y = 51.87 \cdot \text{ksi}$$

Stiffener Area =

$$A_{stiff} := b \cdot d = 3 \cdot \text{in}^2$$

Distance from Centroid to Extreme Fiber =

$$c_{total} := c + d = 15.662 \cdot \text{in}$$

Stiffener Allowable Bending Stress =

$$F_{b,stiff} := 0.60 \cdot 1.33 F_{y,stiff} = 39.9 \cdot \text{ksi}$$

Note: 1.33 increase allowed per
 TIA/EIA

Stiffener Moment of Inertia =

$$I_{stiff} := \left(\frac{b d^3}{12} \right) = 0.141 \cdot \text{in}^4$$

Stiffener Moment Area =

$$Q_{stiff} := A_{stiff} d_1 = 45.75 \cdot \text{in}^3$$

Total Stiffener Moment of Inertia =

$$I_{stiff,total} := I_{stiff} n_{stiff} + A_{stiff} \left[(d_1)^2 \cdot 1 + (d_2)^2 \cdot 2 \right] = 1070.2 \cdot \text{in}^4$$

Total Moment of Inertia =

$$I_{total} := I_{stiff,total} + I_{pole} = 3026.2 \cdot \text{in}^4$$

Stiffener Radius of Gyration =

$$r := \sqrt{\frac{I_{stiff}}{A_{stiff}}} = 0.217 \cdot \text{in}$$

Stiffener Slenderness Ratio =

$$S_{Ratio} := \left(\frac{K \cdot l}{r} \right) = 55.426$$

Stiffener Compression Index =

$$C_c := \pi \cdot \sqrt{\frac{2 \cdot E}{F_{y,stiff}}} = 107$$

Stiffener Allowable Compressive Force =

$$F_{a,stiff} := \begin{cases} \frac{\left[1 - \frac{\left(\frac{K \cdot l}{r} \right)^2}{2 \cdot C_c^2} \right] \cdot F_{y,stiff}}{\frac{5}{3} + \frac{3 \cdot \left(\frac{K \cdot l}{r} \right)}{8 \cdot C_c} - \frac{\left(\frac{K \cdot l}{r} \right)^3}{8 \cdot C_c^3}} & \text{if } \frac{K \cdot l}{r} \leq C_c \\ \frac{12 \cdot \pi^2 \cdot E}{23 \cdot \left(\frac{K \cdot l}{r} \right)^2} & \text{if } \frac{K \cdot l}{r} > C_c \end{cases} = 23.483 \cdot \text{ksi}$$

Subject:

Monopole Reinforcement

Location:

Barkhamsted, CT

Rev. 0: 11/29/12

Designed by: T.J.L. Checked by: C.F.C.
 Job No. 12063.CO32

Check Existing Monopole:

Moment Capacity of Existing Section =

$$Mn_{pole} := \left(\frac{F_b \cdot I_{pole}}{c} \right) = 567 \cdot \text{kip} \cdot \text{ft}$$

$$PoleShaft := \text{if}(Mn_{pole} > M_{act}, "Okay", "Reinforcement_Reqd")$$

$$\frac{M_{act}}{Mn_{pole}} = 1.053$$

PoleShaft = "Reinforcement_Reqd"

Design Moment of Stiffeners:

Moment Capacity (Moment of Inertia) =

$$Mn_{stiff1} := \frac{F_b \cdot I_{stifftotal}}{c_{total}} = 227.208 \cdot \text{ft} \cdot \text{kips}$$

Allowable compressive strength of stiffener =

$$Pa_{stiff} := 1.333 F_a A_{stiff} = 93.908 \cdot \text{kips}$$

Moment Capacity (Compression) =

$$Mn_{stiff2} := Pa_{stiff} (d_1 + d_2) = 180.969 \cdot \text{ft} \cdot \text{kips}$$

Stiffener Design Moment =

$$Mn_{stiff} := \begin{cases} Mn_{stiff1} & \text{if } Mn_{stiff1} \leq Mn_{stiff2} \\ Mn_{stiff2} & \text{otherwise} \end{cases} = 180.969 \cdot \text{ft} \cdot \text{kips}$$

Check Reinforced Monopole:

Moment Capacity Reinforced Section =

$$Mn_{reinf} := (Mn_{pole} + Mn_{stiff}) = 748 \cdot \text{kip} \cdot \text{ft}$$

Compression Force on Pole Section =

$$P_{pole} := P = 9 \cdot \text{kips}$$

Allowable Compression =

$$Pa_{pole} := F_a A_{pole} = 914.468 \cdot \text{kips}$$

$$\text{Reinforced_PoleShaft} := \text{if} \left(\frac{P_{pole}}{Pa_{pole}} + \frac{M_{act}}{Mn_{reinf}} \leq 1.00, "OK", "Overstressed" \right)$$

$$\frac{P_{pole}}{Pa_{pole}} + \frac{M_{act}}{Mn_{reinf}} = 0.81$$

Reinforced_PoleShaft = "OK"

Calculate Equivalent Pole Thickness for RISA Input:

Equivalent Moment of Inertia =

$$Eq_I := \left(\frac{Mn_{reinf} \cdot c}{F_b} \right) = 2580.3 \cdot \text{in}^4$$

Equivalent Pole Inside Diameter =

$$Eq_{Idpole} := \sqrt[4]{\left(D_{o,pole}^4 - \frac{Eq_I \cdot 64}{\pi} \right)}$$

Equivalent Pole Thickness =

$$Eq_{polethk} := \frac{(D_{o,pole} - Eq_{Idpole})}{2} = 0.254 \cdot \text{in}$$

Use 0.25in for RISA input

Design AJAX Bolts:

Bolt Area =

$$a_b := \frac{1}{4} \cdot \pi \cdot d_b^2 = 0.442 \cdot \text{in}^2$$

Bolt Spacing =

$$s_b := l = 1 \text{ ft}$$

Total Force at Stiffener Ends =

$$F := \frac{M_{n\text{reinf}} \cdot Q_{\text{stiff}}}{I_{\text{total}}} = 135.693 \cdot \text{kips}$$

Number of Bolts Required at Ends =

$$N_{B\text{req}} := \frac{F}{F_{v\text{bolt}} \cdot a_b \cdot 1.33} = 8.553$$

$$N_{B\text{req}} = 9$$

Equivalent Shear Force =

$$V_{\text{eq}} := V \cdot \left(\frac{M_{n\text{reinf}}}{M_{\text{act}}} \right) = 21.299 \cdot \text{kips}$$

Shear Flow =

$$q := \frac{V_{\text{eq}} \cdot Q_{\text{stiff}}}{I_{\text{total}}} = 3.864 \cdot \text{klf}$$

Shear per Bolt =

$$V_{\text{bolt}} := q \cdot s_b = 3.864 \cdot \text{kips}$$

Bolt Shear Stress =

$$f_{v\text{bolt}} := \frac{V_{\text{bolt}}}{a_b} = 8.746 \cdot \text{ksi}$$

Note: 1.333 increase allowed per AISC
9th edition for transient loading

$$\text{Boltcheck} := \text{if} \left(\frac{f_{v\text{bolt}}}{F_{v\text{bolt}}} \leq 1.33, \text{"OK"}, \text{"Increase number of bolts"} \right)$$

$$\text{Boltcheck} = \text{"OK"}$$

$$\frac{f_{v\text{bolt}}}{F_{v\text{bolt}}} = 0.32$$

Section	1	2	3	4	
Length (ft)	35.210	15.000	52.210	52.000	
Number of Sides	18	18	18	18	
Thickness (in)	0.188	0.250	0.313	0.313	
Socket Length (ft)		4.420	6.000		
Top Dia (in)	17.500	26.970	29.320	41.130	
Bot Dia (in)	26.970	31.010	43.370	55.000	
Grade			A572-65		
Weight (K)	1.6	1.2	6.3	8.4	17.5

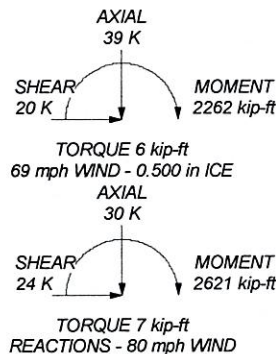
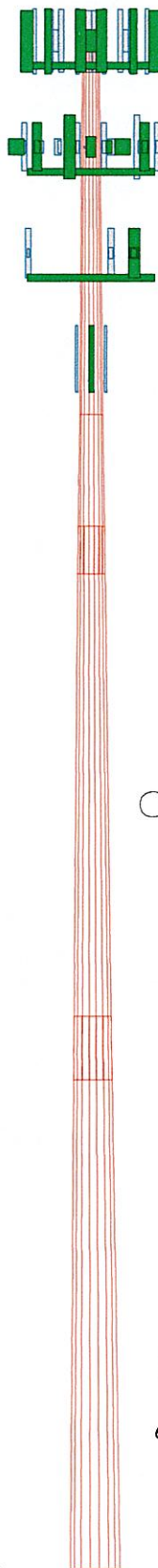
145.0 ft

109.8 ft

94.8 ft

47.0 ft

1.0 ft



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
LPA-80063/6CF (Verizon - Reserved)	145	ABT-DFDM-ADBH Bias Tee (ATI - Proposed)	135
LPA-171063-12CF (Verizon - Reserved)	145	(2) 7770.00 (ATI - Existing)	135
BXA-70063/6CF (Verizon - Reserved)	145	(2) 7770.00 (ATI - Existing)	135
BXA-70063/6CF (Verizon - Reserved)	145	(2) 7770.00 (ATI - Existing)	135
LPA-171063-12CF (Verizon - Reserved)	145	(4) LGP21401 TMA (ATI - Existing)	135
LPA-80063/6CF (Verizon - Reserved)	145	(4) LGP21401 TMA (ATI - Existing)	135
LPA-80063/6CF (Verizon - Reserved)	145	(4) LGP21401 TMA (ATI - Existing)	135
LPA-171063-12CF (Verizon - Reserved)	145	EEL Low Profile Platform (ATI - Existing)	133
BXA-70063/6CF (Verizon - Reserved)	145	APX16DWW-16DWW-S-E-A20 (T-Mobile - Existing)	125
BXA-70063/6CF (Verizon - Reserved)	145	APX16DWW-16DWW-S-E-A20 (T-Mobile - Existing)	125
LPA-171063-12CF (Verizon - Reserved)	145	APX16DWW-16DWW-S-E-A20 (T-Mobile - Existing)	125
LPA-80063/6CF (Verizon - Reserved)	145	ATMAA1412D-1A20 TMA (T-Mobile - Existing)	125
LPA-80063/6CF (Verizon - Reserved)	145	ATMAA1412D-1A20 TMA (T-Mobile - Existing)	125
BXA-70063/6CF (Verizon - Reserved)	145	ATMAA1412D-1A20 TMA (T-Mobile - Existing)	125
BXA-70063/6CF (Verizon - Reserved)	145	ETW190VS12UB TMA (T-Mobile - Existing)	125
LPA-171063-12CF (Verizon - Reserved)	145	ETW190VS12UB TMA (T-Mobile - Existing)	125
LPA-80063/6CF (Verizon - Reserved)	145	ETW190VS12UB TMA (T-Mobile - Existing)	125
RRH (Verizon - Reserved)	145	Valmont T-Arm (1) (T-Mobile - Existing)	123
RRH (Verizon - Reserved)	145	Valmont T-Arm (1) (T-Mobile - Existing)	123
RRH (Verizon - Reserved)	145	Valmont T-Arm (1) (T-Mobile - Existing)	123
EEL Low Profile Platform (Verizon - Existing)	143	Valmont Uni-Tri Bracket (MetroPCS - Existing)	115
AM-X-CD-16-65-00T-RET (ATI - Proposed)	135	APXV18-206517-C (MetroPCS - Existing)	115
AM-X-CD-16-65-00T-RET (7'2") (ATI - Proposed)	135	APXV18-206517-C (MetroPCS - Existing)	115
AM-X-CD-16-65-00T-RET (7'2") (ATI - Proposed)	135	APXV18-206517-C (MetroPCS - Existing)	115
(2) RRUS-11 (ATI - Proposed)	135		
(2) RRUS-11 (ATI - Proposed)	135		
(2) RRUS-11 (ATI - Proposed)	135		
DC6-48-60-18-8F Surge Arrestor (ATI - Proposed)	135		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 69 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 50 mph wind.
4. Weld together tower sections have flange connections.
5. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
6. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
7. Welds are fabricated with ER-70S-6 electrodes.
8. Pole Section 2 - Equivalent Thickness of 0.25" Used to Account for Stiffened Section
9. TOWER RATING: 93.5%

Centek Engineering Inc.
63-2 North Branford Rd.
Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Job: **12063.CO32 - CT1186**
Project: **145-ft EEI Monopole - 5 Old Farm Rd., Barkhamsted, CT**
Client: **AT&T Mobility** Drawn by: **TJL** App'd:
Code: **TIA/EIA-222-F** Date: **11/30/12** Scale: **NTS**
Path: **E-1**

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	Client	AT&T Mobility	Designed by	TJL

Tower Input Data

There is a pole section.

This tower is designed using the TIA/EIA-222-F standard.

The following design criteria apply:

Basic wind speed of 80 mph.

Nominal ice thickness of 0.500 in.

Ice density of 56 pcf.

A wind speed of 69 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 50 mph.

Weld together tower sections have flange connections..

Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications..

Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..

Welds are fabricated with ER-70S-6 electrodes..

Pole Section 2 - Equivalent Thickness of 0.25" Used to Account for Stiffened Section.

A non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

Stress ratio used in pole design is 1.333.

Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	Elevation	Section Length	Splice Length	Number of Sides	Top Diameter	Bottom Diameter	Wall Thickness	Bend Radius	Pole Grade
	ft	ft	ft		in	in	in	in	
L1	145.000-109.790	35.210	0.000	18	17.500	26.970	0.188	0.750	A572-65 (65 ksi)
L2	109.790-94.790	15.000	4.420	18	26.970	31.010	0.250	1.000	A572-65 (65 ksi)
L3	94.790-47.000	52.210	6.000	18	29.320	43.370	0.313	1.250	A572-65

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	Client	AT&T Mobility	Designed by	TJL

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 (65 ksi) A572-65 (65 ksi)
L4	47.000-1.000	52.000		18	41.130	55.000	0.313	1.250	

Tapered Pole Properties

Section	Tip Dia. in	Area in ²	I in ⁴	r in	C in	I/C in ³	J in ⁴	I/Q in ²	w in	w/t
L1	17.770	10.303	390.144	6.146	8.890	43.886	780.801	5.153	2.750	14.667
	27.386	15.939	1444.438	9.508	13.701	105.428	2890.777	7.971	4.417	23.556
L2	27.386	21.202	1912.466	9.486	13.701	139.588	3827.449	10.603	4.307	17.227
	31.488	24.408	2917.718	10.920	15.753	185.216	5839.276	12.206	5.018	20.071
L3	30.980	28.771	3058.475	10.298	14.894	205.345	6120.974	14.388	4.610	14.753
	44.039	42.708	10003.243	15.285	22.032	454.033	20019.649	21.358	7.083	22.666
L4	43.390	40.486	8522.041	14.490	20.894	407.866	17055.296	20.247	6.689	21.405
	55.848	54.243	20495.504	19.414	27.940	733.554	41017.977	27.127	9.130	29.216

Tower Elevation ft	Gusset Area (per face) ft ²	Gusset Thickness in	Gusset Grade	Adjust. Factor A _f	Adjust. Factor A _r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 145.000-109.7 90				1	1	1		
L2 109.790-94.79 0				1	1	1		
L3 94.790-47.000				1	1	1		
L4 47.000-1.000				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C _A A _A ft ² /ft	Weight klf
1 5/8 (Verizon - Existing)	B	No	Inside Pole	145.000 - 4.000	12	No Ice	0.000	0.001
1 5/8 (AT&T - Existing)	B	No	Inside Pole	135.000 - 4.000	12	1/2" Ice	0.000	0.001
1 5/8 (T-Mobile - Existing)	B	No	Inside Pole	125.000 - 4.000	12	No Ice	0.000	0.001
1 5/8 (MetroPCS - Existing)	B	No	Inside Pole	135.000 - 4.000	6	1/2" Ice	0.000	0.001
1 5/8 (Verizon - Existing)	B	No	CaAa (Out Of Face)	145.000 - 4.000	1	No Ice	0.198	0.001
1 5/8 (Verizon - Existing)	B	No	CaAa (Out Of Face)	145.000 - 4.000	5	1/2" Ice	0.298	0.003
1 5/8 (Verizon - Existing)	B	No	CaAa (Out Of Face)	145.000 - 4.000	5	No Ice	0.000	0.001
1 5/8 (Verizon - Existing)	B	No	CaAa (Out Of Face)	145.000 - 4.000	5	1/2" Ice	0.000	0.003
#8 AWG Copper Wire (AT&T - Proposed)	C	No	Inside Pole	135.000 - 4.000	2	No Ice	0.000	0.000
						1/2" Ice	0.000	0.000

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	Client	AT&T Mobility	Designed by	TJL

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C _A A _A ft ² /ft	Weight klf
RG6-Fiber (AT&T - Proposed)	C	No	Inside Pole	135.000 - 4.000	1	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
HYBRIFLEX 1-1/4" (Verizon - Reserved)	C	No	CaAa (Out Of Face)	145.000 - 1.000	1	No Ice	0.154	0.001
						1/2" Ice	0.254	0.003

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A _R ft ²	A _F ft ²	C _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight K
L1	145.000-109.790	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	6.972	1.321
		C	0.000	0.000	0.000	5.422	0.074
L2	109.790-94.790	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	2.970	0.749
		C	0.000	0.000	0.000	2.310	0.036
L3	94.790-47.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	9.462	2.386
		C	0.000	0.000	0.000	7.359	0.115
L4	47.000-1.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	8.514	2.147
		C	0.000	0.000	0.000	7.084	0.107

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A _R ft ²	A _F ft ²	C _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight K
L1	145.000-109.790	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	10.493	1.640
		C		0.000	0.000	0.000	8.943	0.117
L2	109.790-94.790	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	4.470	0.885
		C		0.000	0.000	0.000	3.810	0.055
L3	94.790-47.000	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	14.241	2.819
		C		0.000	0.000	0.000	12.139	0.174
L4	47.000-1.000	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	12.814	2.536
		C		0.000	0.000	0.000	11.684	0.164

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K
EEI Low Profile Platform	C	From Face	2.000	0.000	143.000	No Ice	22.500	22.500	1.500

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	Client	AT&T Mobility	Designed by	TJL

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K
(Verizon - Existing)			0.000			1/2" Ice	28.200	28.200	2.250
(2) 7770.00	A	From Face	0.000	0.000	135.000	No Ice	5.882	2.928	0.035
(AT&T - Existing)			0.000			1/2" Ice	6.314	3.273	0.068
(2) 7770.00	B	From Face	0.000	0.000	135.000	No Ice	5.882	2.928	0.035
(AT&T - Existing)			0.000			1/2" Ice	6.314	3.273	0.068
(2) 7770.00	C	From Face	0.000	0.000	135.000	No Ice	5.882	2.928	0.035
(AT&T - Existing)			0.000			1/2" Ice	6.314	3.273	0.068
(4) LGP21401 TMA	A	From Face	0.000	0.000	135.000	No Ice	0.953	0.367	0.018
(AT&T - Existing)			0.000			1/2" Ice	1.093	0.480	0.023
(4) LGP21401 TMA	B	From Face	0.000	0.000	135.000	No Ice	0.953	0.367	0.018
(AT&T - Existing)			0.000			1/2" Ice	1.093	0.480	0.023
(4) LGP21401 TMA	C	From Face	0.000	0.000	135.000	No Ice	0.953	0.367	0.018
(AT&T - Existing)			0.000			1/2" Ice	1.093	0.480	0.023
EEI Low Profile Platform	C	From Face	0.000	0.000	133.000	No Ice	22.500	22.500	1.500
(AT&T - Existing)			0.000			1/2" Ice	28.200	28.200	2.250
APX16DWV-16DWVS-E-A	A	From Face	0.000	0.000	125.000	No Ice	7.065	2.150	0.041
20			-4.000			1/2" Ice	7.516	2.490	0.074
(T-Mobile - Existing)			0.000						
APX16DWV-16DWVS-E-A	B	From Face	0.000	0.000	125.000	No Ice	7.065	2.150	0.041
20			-4.000			1/2" Ice	7.516	2.490	0.074
(T-Mobile - Existing)			0.000						
APX16DWV-16DWVS-E-A	C	From Face	0.000	0.000	125.000	No Ice	7.065	2.150	0.041
20			-4.000			1/2" Ice	7.516	2.490	0.074
(T-Mobile - Existing)			0.000						
ATMAA1412D-1A20 TMA	A	From Face	0.000	0.000	125.000	No Ice	1.167	0.467	0.013
(T-Mobile - Existing)			-4.000			1/2" Ice	1.314	0.575	0.021
(T-Mobile - Existing)			0.000						
ATMAA1412D-1A20 TMA	B	From Face	0.000	0.000	125.000	No Ice	1.167	0.467	0.013
(T-Mobile - Existing)			-4.000			1/2" Ice	1.314	0.575	0.021
(T-Mobile - Existing)			0.000						
ATMAA1412D-1A20 TMA	C	From Face	0.000	0.000	125.000	No Ice	1.167	0.467	0.013
(T-Mobile - Existing)			-4.000			1/2" Ice	1.314	0.575	0.021
(T-Mobile - Existing)			0.000						
ETW190VS12UB TMA	A	From Face	0.000	0.000	125.000	No Ice	0.664	0.367	0.015
(T-Mobile - Existing)			-4.000			1/2" Ice	0.778	0.461	0.020
(T-Mobile - Existing)			0.000						
ETW190VS12UB TMA	B	From Face	0.000	0.000	125.000	No Ice	0.664	0.367	0.015
(T-Mobile - Existing)			-4.000			1/2" Ice	0.778	0.461	0.020
(T-Mobile - Existing)			0.000						
ETW190VS12UB TMA	C	From Face	0.000	0.000	125.000	No Ice	0.664	0.367	0.015
(T-Mobile - Existing)			-4.000			1/2" Ice	0.778	0.461	0.020
(T-Mobile - Existing)			0.000						
Valmont T-Arm (1)	A	From Face	0.000	0.000	123.000	No Ice	10.540	10.540	0.336
(T-Mobile - Existing)			0.000			1/2" Ice	14.450	14.450	0.412
(T-Mobile - Existing)			0.000						
Valmont T-Arm (1)	B	From Face	0.000	0.000	123.000	No Ice	10.540	10.540	0.336
(T-Mobile - Existing)			0.000			1/2" Ice	14.450	14.450	0.412
(T-Mobile - Existing)			0.000						
Valmont T-Arm (1)	C	From Face	0.000	0.000	123.000	No Ice	10.540	10.540	0.336

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	Client	AT&T Mobility	Designed by	TJL

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K
(T-Mobile - Existing)			0.000 0.000			1/2" Ice	14.450	14.450	0.412
APXV18-206517-C (MetroPCS - Existing)	A	From Face	0.500 0.000 0.000	0.000	115.000	No Ice 1/2" Ice	5.513 5.983	3.929 4.385	0.022 0.053
APXV18-206517-C (MetroPCS - Existing)	B	From Face	0.500 0.000 0.000	0.000	115.000	No Ice 1/2" Ice	5.513 5.983	3.929 4.385	0.022 0.053
APXV18-206517-C (MetroPCS - Existing)	C	From Face	0.500 0.000 0.000	0.000	115.000	No Ice 1/2" Ice	5.513 5.983	3.929 4.385	0.022 0.053
Valmont Uni-Tri Bracket (MetroPCS - Existing)	A	From Face	0.500 0.000 0.000	0.000	115.000	No Ice 1/2" Ice	1.750 1.940	1.750 1.940	0.290 0.306
AM-X-CD-14-65-00T-RET (AT&T - Proposed)	B	From Face	3.000 2.000 0.000	0.000	135.000	No Ice 1/2" Ice	5.507 5.899	2.828 3.137	0.037 0.069
AM-X-CD-16-65-00T-RET(7 2") (AT&T - Proposed)	B	From Face	3.000 2.000 0.000	0.000	135.000	No Ice 1/2" Ice	8.260 8.807	4.642 5.088	0.050 0.096
AM-X-CD-16-65-00T-RET(7 2") (AT&T - Proposed)	C	From Face	3.000 2.000 0.000	0.000	135.000	No Ice 1/2" Ice	8.260 8.807	4.642 5.088	0.050 0.096
(2) RRUS-11 (AT&T - Proposed)	A	From Face	1.000 2.000 0.000	0.000	135.000	No Ice 1/2" Ice	2.994 3.226	1.246 1.412	0.050 0.070
(2) RRUS-11 (AT&T - Proposed)	B	From Face	1.000 2.000 0.000	0.000	135.000	No Ice 1/2" Ice	2.994 3.226	1.246 1.412	0.050 0.070
(2) RRUS-11 (AT&T - Proposed)	C	From Face	1.000 2.000 0.000	0.000	135.000	No Ice 1/2" Ice	2.994 3.226	1.246 1.412	0.050 0.070
DC6-48-60-18-8F Surge Arrestor (AT&T - Proposed)	C	From Face	0.500 0.000 0.000	0.000	135.000	No Ice 1/2" Ice	2.228 2.447	2.228 2.447	0.020 0.039
ABT-DFDM-ADBH Bias Tee (AT&T - Proposed)	A	From Face	1.000 2.000 0.000	0.000	135.000	No Ice 1/2" Ice	0.052 0.088	0.025 0.050	0.002 0.003
LPA-80063/6CF (Verizon - Reserved)	A	From Face	3.000 6.000 0.000	0.000	145.000	No Ice 1/2" Ice	10.308 10.868	9.005 9.554	0.027 0.101
LPA-171063-12CF (Verizon - Reserved)	A	From Face	3.000 4.000 0.000	0.000	145.000	No Ice 1/2" Ice	5.994 6.462	6.054 6.523	0.012 0.055
BXA-70063/6CF (Verizon - Reserved)	A	From Face	3.000 1.000 0.000	0.000	145.000	No Ice 1/2" Ice	7.731 8.268	4.158 4.595	0.017 0.059
BXA-70063/6CF (Verizon - Reserved)	A	From Face	3.000 -1.000 0.000	0.000	145.000	No Ice 1/2" Ice	7.731 8.268	4.158 4.595	0.017 0.059
LPA-171063-12CF (Verizon - Reserved)	A	From Face	3.000 -4.000 0.000	0.000	145.000	No Ice 1/2" Ice	5.994 6.462	6.054 6.523	0.012 0.055
LPA-80063/6CF (Verizon - Reserved)	A	From Face	3.000 -6.000 0.000	0.000	145.000	No Ice 1/2" Ice	10.308 10.868	9.005 9.554	0.027 0.101
LPA-80063/6CF	B	From Face	3.000	0.000	145.000	No Ice	10.308	9.005	0.027

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Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K
(Verizon - Reserved)			6.000 0.000			1/2" Ice 10.868	9.554	0.101
LPA-171063-12CF (Verizon - Reserved)	B	From Face	3.000 4.000 0.000	0.000	145.000	No Ice 1/2" Ice 5.994 6.462	6.054 6.523	0.012 0.055
BXA-70063/6CF (Verizon - Reserved)	B	From Face	3.000 1.000 0.000	0.000	145.000	No Ice 1/2" Ice 7.731 8.268	4.158 4.595	0.017 0.059
BXA-70063/6CF (Verizon - Reserved)	B	From Face	3.000 -1.000 0.000	0.000	145.000	No Ice 1/2" Ice 7.731 8.268	4.158 4.595	0.017 0.059
LPA-171063-12CF (Verizon - Reserved)	B	From Face	3.000 -4.000 0.000	0.000	145.000	No Ice 1/2" Ice 5.994 6.462	6.054 6.523	0.012 0.055
LPA-80063/6CF (Verizon - Reserved)	B	From Face	3.000 -6.000 0.000	0.000	145.000	No Ice 1/2" Ice 10.308 10.868	9.005 9.554	0.027 0.101
LPA-80063/6CF (Verizon - Reserved)	C	From Face	3.000 6.000 0.000	0.000	145.000	No Ice 1/2" Ice 10.308 10.868	9.005 9.554	0.027 0.101
LPA-171063-12CF (Verizon - Reserved)	C	From Face	3.000 4.000 0.000	0.000	145.000	No Ice 1/2" Ice 5.994 6.462	6.054 6.523	0.012 0.055
BXA-70063/6CF (Verizon - Reserved)	C	From Face	3.000 1.000 0.000	0.000	145.000	No Ice 1/2" Ice 7.731 8.268	4.158 4.595	0.017 0.059
BXA-70063/6CF (Verizon - Reserved)	C	From Face	3.000 -1.000 0.000	0.000	145.000	No Ice 1/2" Ice 7.731 8.268	4.158 4.595	0.017 0.059
LPA-171063-12CF (Verizon - Reserved)	C	From Face	3.000 -4.000 0.000	0.000	145.000	No Ice 1/2" Ice 5.994 6.462	6.054 6.523	0.012 0.055
LPA-80063/6CF (Verizon - Reserved)	C	From Face	3.000 -6.000 0.000	0.000	145.000	No Ice 1/2" Ice 10.308 10.868	9.005 9.554	0.027 0.101
RRH (Verizon - Reserved)	A	From Face	3.000 0.000 0.000	0.000	145.000	No Ice 1/2" Ice 2.917 3.161	2.188 2.412	0.050 0.072
RRH (Verizon - Reserved)	B	From Face	3.000 0.000 0.000	0.000	145.000	No Ice 1/2" Ice 2.917 3.161	2.188 2.412	0.050 0.072
RRH (Verizon - Reserved)	C	From Face	3.000 0.000 0.000	0.000	145.000	No Ice 1/2" Ice 2.917 3.161	2.188 2.412	0.050 0.072

Tower Pressures - No Ice

$$G_H = 1.690$$

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Section Elevation	z	K _Z	q _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
ft	ft		ksf	ft ²		ft ²	ft ²	ft ²			
L1 145.000-109.7	126.317	1.467	0.024	65.241	A	0.000	65.241	65.241	100.00	0.000	0.000
90					B	0.000	65.241		100.00	0.000	6.972
L2 109.790-94.79	102.116	1.381	0.023	36.237	C	0.000	65.241		100.00	0.000	5.422
0					A	0.000	36.237	36.237	100.00	0.000	0.000
L3 94.790-47.000	70.087	1.24	0.020	147.112	B	0.000	36.237		100.00	0.000	2.970
					C	0.000	36.237		100.00	0.000	2.310
L4 47.000-1.000	23.145	1	0.017	187.317	A	0.000	147.112	147.112	100.00	0.000	0.000
					B	0.000	147.112		100.00	0.000	9.462
					C	0.000	147.112		100.00	0.000	7.359
					A	0.000	187.317	187.317	100.00	0.000	0.000
					B	0.000	187.317		100.00	0.000	8.514
					C	0.000	187.317		100.00	0.000	7.084

Tower Pressure - With Ice

$$G_H = 1.690$$

Section Elevation	z	K _Z	q _z	t _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
ft	ft		ksf	in	ft ²		ft ²	ft ²	ft ²			
L1 145.000-109.790	126.317	1.467	0.018	0.500	68.175	A	0.000	68.175	68.175	100.00	0.000	0.000
						B	0.000	68.175		100.00	0.000	10.493
						C	0.000	68.175		100.00	0.000	8.943
L2 109.790-94.790	102.116	1.381	0.017	0.500	37.487	A	0.000	37.487	37.487	100.00	0.000	0.000
						B	0.000	37.487		100.00	0.000	4.470
						C	0.000	37.487		100.00	0.000	3.810
L3 94.790-47.000	70.087	1.24	0.015	0.500	151.094	A	0.000	151.094	151.094	100.00	0.000	0.000
						B	0.000	151.094		100.00	0.000	14.241
						C	0.000	151.094		100.00	0.000	12.139
L4 47.000-1.000	23.145	1	0.012	0.500	191.150	A	0.000	191.150	191.150	100.00	0.000	0.000
						B	0.000	191.150		100.00	0.000	12.814
						C	0.000	191.150		100.00	0.000	11.684

Tower Pressure - Service

$$G_H = 1.690$$

Section Elevation	z	K _Z	q _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
ft	ft		ksf	ft ²		ft ²	ft ²	ft ²			
L1 145.000-109.7	126.317	1.467	0.009	65.241	A	0.000	65.241	65.241	100.00	0.000	0.000
90					B	0.000	65.241		100.00	0.000	6.972
L2 109.790-94.79	102.116	1.381	0.009	36.237	C	0.000	65.241		100.00	0.000	5.422
0					A	0.000	36.237	36.237	100.00	0.000	0.000
L3 94.790-47.000	70.087	1.24	0.008	147.112	B	0.000	36.237		100.00	0.000	2.970
					C	0.000	36.237		100.00	0.000	2.310
L4 47.000-1.000	23.145	1	0.006	187.317	A	0.000	147.112	147.112	100.00	0.000	0.000
					B	0.000	147.112		100.00	0.000	9.462
					C	0.000	147.112		100.00	0.000	7.359
					A	0.000	187.317	187.317	100.00	0.000	0.000

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Section Elevation	z	K _Z	q _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	C _{AA} In Face	C _{AA} Out Face
ft	ft		ksf	ft ²		ft ²	ft ²	ft ²		ft ²	ft ²
47.000-1.000					B	0.000	187.317		100.00	0.000	8.514
					C	0.000	187.317		100.00	0.000	7.084

Tower Forces - No Ice - Wind Normal To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	1.394	1.572	A	1	0.65	1	1	1	65.241	2.225	0.063	C
145.000-109.7			B	1	0.65	1	1	1	65.241			
90			C	1	0.65	1	1	1	65.241			
L2	0.785	1.164	A	1	0.65	1	1	1	36.237	1.103	0.074	C
109.790-94.79			B	1	0.65	1	1	1	36.237			
0			C	1	0.65	1	1	1	36.237			
L3	2.500	6.349	A	1	0.65	1	1	1	147.112	3.841	0.080	C
94.790-47.000			B	1	0.65	1	1	1	147.112			
			C	1	0.65	1	1	1	147.112			
L4	2.254	8.381	A	1	0.65	1	1	1	187.317	3.837	0.083	C
47.000-1.000			B	1	0.65	1	1	1	187.317			
			C	1	0.65	1	1	1	187.317			
Sum Weight:	6.933	17.467						OTM	740.573 kip-ft	11.005		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	1.394	1.572	A	1	0.65	1	1	1	65.241	2.225	0.063	C
145.000-109.7			B	1	0.65	1	1	1	65.241			
90			C	1	0.65	1	1	1	65.241			
L2	0.785	1.164	A	1	0.65	1	1	1	36.237	1.103	0.074	C
109.790-94.79			B	1	0.65	1	1	1	36.237			
0			C	1	0.65	1	1	1	36.237			
L3	2.500	6.349	A	1	0.65	1	1	1	147.112	3.841	0.080	C
94.790-47.000			B	1	0.65	1	1	1	147.112			
			C	1	0.65	1	1	1	147.112			
L4	2.254	8.381	A	1	0.65	1	1	1	187.317	3.837	0.083	C
47.000-1.000			B	1	0.65	1	1	1	187.317			
			C	1	0.65	1	1	1	187.317			
Sum Weight:	6.933	17.467						OTM	740.573 kip-ft	11.005		

Tower Forces - No Ice - Wind 60 To Face

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	Project	145-ft EEI Monopole - 5 Old Farm Rd., Barkhamsted, CT	Date	09:47:51 11/30/12
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Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	1.394	1.572	A	1	0.65	1	1	1	65.241	2.225	0.063	C
145.000-109.7			B	1	0.65	1	1	1	65.241			
90			C	1	0.65	1	1	1	65.241			
L2	0.785	1.164	A	1	0.65	1	1	1	36.237	1.103	0.074	C
109.790-94.79			B	1	0.65	1	1	1	36.237			
0			C	1	0.65	1	1	1	36.237			
L3	2.500	6.349	A	1	0.65	1	1	1	147.112	3.841	0.080	C
94.790-47.000			B	1	0.65	1	1	1	147.112			
			C	1	0.65	1	1	1	147.112			
L4	2.254	8.381	A	1	0.65	1	1	1	187.317	3.837	0.083	C
47.000-1.000			B	1	0.65	1	1	1	187.317			
			C	1	0.65	1	1	1	187.317			
Sum Weight:	6.933	17.467						OTM	740.573 kip-ft	11.005		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	1.394	1.572	A	1	0.65	1	1	1	65.241	2.225	0.063	C
145.000-109.7			B	1	0.65	1	1	1	65.241			
90			C	1	0.65	1	1	1	65.241			
L2	0.785	1.164	A	1	0.65	1	1	1	36.237	1.103	0.074	C
109.790-94.79			B	1	0.65	1	1	1	36.237			
0			C	1	0.65	1	1	1	36.237			
L3	2.500	6.349	A	1	0.65	1	1	1	147.112	3.841	0.080	C
94.790-47.000			B	1	0.65	1	1	1	147.112			
			C	1	0.65	1	1	1	147.112			
L4	2.254	8.381	A	1	0.65	1	1	1	187.317	3.837	0.083	C
47.000-1.000			B	1	0.65	1	1	1	187.317			
			C	1	0.65	1	1	1	187.317			
Sum Weight:	6.933	17.467						OTM	740.573 kip-ft	11.005		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	1.757	2.066	A	1	0.65	1	1	1	68.175	1.941	0.055	C
145.000-109.7			B	1	0.65	1	1	1	68.175			
90			C	1	0.65	1	1	1	68.175			
L2	0.939	1.437	A	1	0.65	1	1	1	37.487	0.936	0.062	C
109.790-94.79			B	1	0.65	1	1	1	37.487			
0			C	1	0.65	1	1	1	37.487			
L3	2.993	7.454	A	1	0.65	1	1	1	151.094	3.192	0.067	C
94.790-47.000			B	1	0.65	1	1	1	151.094			
			C	1	0.65	1	1	1	151.094			

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Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L4	2.701	9.782	A	1	0.65	1	1	1	191.150	3.116	0.068	C
47.000-1.000			B	1	0.65	1	1	1	191.150			
			C	1	0.65	1	1	1	191.150			
Sum Weight:	8.390	20.739						OTM	627.414 kip-ft	9.185		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	1.757	2.066	A	1	0.65	1	1	1	68.175	1.941	0.055	C
145.000-109.7			B	1	0.65	1	1	1	68.175			
90			C	1	0.65	1	1	1	68.175			
L2	0.939	1.437	A	1	0.65	1	1	1	37.487	0.936	0.062	C
109.790-94.79			B	1	0.65	1	1	1	37.487			
0			C	1	0.65	1	1	1	37.487			
L3	2.993	7.454	A	1	0.65	1	1	1	151.094	3.192	0.067	C
94.790-47.000			B	1	0.65	1	1	1	151.094			
			C	1	0.65	1	1	1	151.094			
L4	2.701	9.782	A	1	0.65	1	1	1	191.150	3.116	0.068	C
47.000-1.000			B	1	0.65	1	1	1	191.150			
			C	1	0.65	1	1	1	191.150			
Sum Weight:	8.390	20.739						OTM	627.414 kip-ft	9.185		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	1.757	2.066	A	1	0.65	1	1	1	68.175	1.941	0.055	C
145.000-109.7			B	1	0.65	1	1	1	68.175			
90			C	1	0.65	1	1	1	68.175			
L2	0.939	1.437	A	1	0.65	1	1	1	37.487	0.936	0.062	C
109.790-94.79			B	1	0.65	1	1	1	37.487			
0			C	1	0.65	1	1	1	37.487			
L3	2.993	7.454	A	1	0.65	1	1	1	151.094	3.192	0.067	C
94.790-47.000			B	1	0.65	1	1	1	151.094			
			C	1	0.65	1	1	1	151.094			
L4	2.701	9.782	A	1	0.65	1	1	1	191.150	3.116	0.068	C
47.000-1.000			B	1	0.65	1	1	1	191.150			
			C	1	0.65	1	1	1	191.150			
Sum Weight:	8.390	20.739						OTM	627.414 kip-ft	9.185		

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Tower Forces - With Ice - Wind 90 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	1.757	2.066	A	1	0.65	1	1	1	68.175	1.941	0.055	C
145.000-109.7			B	1	0.65	1	1	1	68.175			
90			C	1	0.65	1	1	1	68.175			
L2	0.939	1.437	A	1	0.65	1	1	1	37.487	0.936	0.062	C
109.790-94.79			B	1	0.65	1	1	1	37.487			
0			C	1	0.65	1	1	1	37.487			
L3	2.993	7.454	A	1	0.65	1	1	1	151.094	3.192	0.067	C
94.790-47.000			B	1	0.65	1	1	1	151.094			
			C	1	0.65	1	1	1	151.094			
L4	2.701	9.782	A	1	0.65	1	1	1	191.150	3.116	0.068	C
47.000-1.000			B	1	0.65	1	1	1	191.150			
			C	1	0.65	1	1	1	191.150			
Sum Weight:	8.390	20.739						OTM	627.414 kip-ft	9.185		

Tower Forces - Service - Wind Normal To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	1.394	1.572	A	1	0.65	1	1	1	65.241	0.869	0.025	C
145.000-109.7			B	1	0.65	1	1	1	65.241			
90			C	1	0.65	1	1	1	65.241			
L2	0.785	1.164	A	1	0.65	1	1	1	36.237	0.431	0.029	C
109.790-94.79			B	1	0.65	1	1	1	36.237			
0			C	1	0.65	1	1	1	36.237			
L3	2.500	6.349	A	1	0.65	1	1	1	147.112	1.500	0.031	C
94.790-47.000			B	1	0.65	1	1	1	147.112			
			C	1	0.65	1	1	1	147.112			
L4	2.254	8.381	A	1	0.65	1	1	1	187.317	1.499	0.033	C
47.000-1.000			B	1	0.65	1	1	1	187.317			
			C	1	0.65	1	1	1	187.317			
Sum Weight:	6.933	17.467						OTM	289.286 kip-ft	4.299		

Tower Forces - Service - Wind 45 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1	1.394	1.572	A	1	0.65	1	1	1	65.241	0.869	0.025	C
145.000-109.7			B	1	0.65	1	1	1	65.241			
90			C	1	0.65	1	1	1	65.241			
L2	0.785	1.164	A	1	0.65	1	1	1	36.237	0.431	0.029	C
109.790-94.79			B	1	0.65	1	1	1	36.237			
0			C	1	0.65	1	1	1	36.237			

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Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L3 94.790-47.000	2.500	6.349	A	1	0.65	1	1	1	147.112	1.500	0.031	C
			B	1	0.65	1	1	1	147.112			
			C	1	0.65	1	1	1	147.112			
L4 47.000-1.000	2.254	8.381	A	1	0.65	1	1	1	187.317	1.499	0.033	C
			B	1	0.65	1	1	1	187.317			
			C	1	0.65	1	1	1	187.317			
Sum Weight:	6.933	17.467						OTM	289.286 kip-ft	4.299		

Tower Forces - Service - Wind 60 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1 145.000-109.7	1.394	1.572	A	1	0.65	1	1	1	65.241	0.869	0.025	C
			B	1	0.65	1	1	1	65.241			
			C	1	0.65	1	1	1	65.241			
L2 109.790-94.79	0.785	1.164	A	1	0.65	1	1	1	36.237	0.431	0.029	C
			B	1	0.65	1	1	1	36.237			
			C	1	0.65	1	1	1	36.237			
L3 94.790-47.000	2.500	6.349	A	1	0.65	1	1	1	147.112	1.500	0.031	C
			B	1	0.65	1	1	1	147.112			
			C	1	0.65	1	1	1	147.112			
L4 47.000-1.000	2.254	8.381	A	1	0.65	1	1	1	187.317	1.499	0.033	C
			B	1	0.65	1	1	1	187.317			
			C	1	0.65	1	1	1	187.317			
Sum Weight:	6.933	17.467						OTM	289.286 kip-ft	4.299		

Tower Forces - Service - Wind 90 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	klf	
L1 145.000-109.7	1.394	1.572	A	1	0.65	1	1	1	65.241	0.869	0.025	C
			B	1	0.65	1	1	1	65.241			
			C	1	0.65	1	1	1	65.241			
L2 109.790-94.79	0.785	1.164	A	1	0.65	1	1	1	36.237	0.431	0.029	C
			B	1	0.65	1	1	1	36.237			
			C	1	0.65	1	1	1	36.237			
L3 94.790-47.000	2.500	6.349	A	1	0.65	1	1	1	147.112	1.500	0.031	C
			B	1	0.65	1	1	1	147.112			
			C	1	0.65	1	1	1	147.112			
L4 47.000-1.000	2.254	8.381	A	1	0.65	1	1	1	187.317	1.499	0.033	C
			B	1	0.65	1	1	1	187.317			
			C	1	0.65	1	1	1	187.317			
Sum Weight:	6.933	17.467						OTM	289.286 kip-ft	4.299		

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Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	17.467					
Bracing Weight	0.000					
Total Member Self-Weight	17.467			8.393	0.118	
Total Weight	30.342			8.393	0.118	
Wind 0 deg - No Ice		0.112	-24.073	-2512.011	-14.949	0.822
Wind 30 deg - No Ice		12.124	-20.904	-2181.875	-1271.866	3.941
Wind 45 deg - No Ice		17.088	-17.102	-1784.456	-1790.940	5.149
Wind 60 deg - No Ice		20.888	-12.134	-1264.858	-2187.956	6.005
Wind 90 deg - No Ice		24.054	-0.112	-6.674	-2517.754	6.460
Wind 120 deg - No Ice		20.775	11.939	1255.547	-2172.889	5.183
Wind 135 deg - No Ice		16.929	16.943	1779.934	-1769.632	3.987
Wind 150 deg - No Ice		11.930	20.792	2183.594	-1245.770	2.518
Wind 180 deg - No Ice		-0.112	24.073	2528.797	15.185	-0.822
Wind 210 deg - No Ice		-12.124	20.904	2198.661	1272.102	-3.941
Wind 225 deg - No Ice		-17.088	17.102	1801.242	1791.176	-5.149
Wind 240 deg - No Ice		-20.888	12.134	1281.644	2188.192	-6.005
Wind 270 deg - No Ice		-24.054	0.112	23.460	2517.990	-6.460
Wind 300 deg - No Ice		-20.775	-11.939	-1238.761	2173.125	-5.183
Wind 315 deg - No Ice		-16.929	-16.943	-1763.148	1769.868	-3.987
Wind 330 deg - No Ice		-11.930	-20.792	-2166.808	1246.005	-2.518
Member Ice	3.273					
Total Weight Ice	38.591			12.780	-0.106	
Wind 0 deg - Ice		0.087	-20.317	-2126.248	-11.717	0.682
Wind 30 deg - Ice		10.226	-17.638	-1845.478	-1078.717	3.543
Wind 45 deg - Ice		14.418	-14.428	-1507.951	-1519.482	4.658
Wind 60 deg - Ice		17.626	-10.234	-1066.789	-1856.704	5.455
Wind 90 deg - Ice		20.303	-0.087	1.169	-2137.218	5.906
Wind 120 deg - Ice		17.539	10.084	1072.238	-1845.094	4.773
Wind 135 deg - Ice		14.295	14.305	1517.090	-1503.062	3.694
Wind 150 deg - Ice		10.076	17.552	1859.426	-1058.607	2.362
Wind 180 deg - Ice		-0.087	20.317	2151.807	11.505	-0.682
Wind 210 deg - Ice		-10.226	17.638	1871.037	1078.505	-3.543
Wind 225 deg - Ice		-14.418	14.428	1533.510	1519.270	-4.658
Wind 240 deg - Ice		-17.626	10.234	1092.349	1856.492	-5.455
Wind 270 deg - Ice		-20.303	0.087	24.390	2137.006	-5.906
Wind 300 deg - Ice		-17.539	-10.084	-1046.679	1844.882	-4.773
Wind 315 deg - Ice		-14.295	-14.305	-1491.531	1502.850	-3.694
Wind 330 deg - Ice		-10.076	-17.552	-1833.867	1058.395	-2.362
Total Weight	30.342			8.393	0.118	
Wind 0 deg - Service		0.044	-9.403	-976.140	-5.768	0.321
Wind 30 deg - Service		4.736	-8.166	-847.180	-496.751	1.540
Wind 45 deg - Service		6.675	-6.680	-691.939	-699.514	2.011
Wind 60 deg - Service		8.159	-4.740	-488.970	-854.599	2.346
Wind 90 deg - Service		9.396	-0.044	2.507	-983.426	2.523
Wind 120 deg - Service		8.115	4.664	495.562	-848.713	2.025
Wind 135 deg - Service		6.613	6.618	700.401	-691.191	1.557
Wind 150 deg - Service		4.660	8.122	858.081	-486.557	0.984
Wind 180 deg - Service		-0.044	9.403	992.926	6.003	-0.321
Wind 210 deg - Service		-4.736	8.166	863.966	496.987	-1.540
Wind 225 deg - Service		-6.675	6.680	708.725	699.750	-2.011
Wind 240 deg - Service		-8.159	4.740	505.757	854.834	-2.346
Wind 270 deg - Service		-9.396	0.044	14.279	983.662	-2.523
Wind 300 deg - Service		-8.115	-4.664	-478.776	848.949	-2.025
Wind 315 deg - Service		-6.613	-6.618	-683.615	691.427	-1.557

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Load Case	Vertical Forces	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 330 deg - Service	K	-4.660	-8.122	-841.295	486.793	-0.984

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 45 deg - No Ice
5	Dead+Wind 60 deg - No Ice
6	Dead+Wind 90 deg - No Ice
7	Dead+Wind 120 deg - No Ice
8	Dead+Wind 135 deg - No Ice
9	Dead+Wind 150 deg - No Ice
10	Dead+Wind 180 deg - No Ice
11	Dead+Wind 210 deg - No Ice
12	Dead+Wind 225 deg - No Ice
13	Dead+Wind 240 deg - No Ice
14	Dead+Wind 270 deg - No Ice
15	Dead+Wind 300 deg - No Ice
16	Dead+Wind 315 deg - No Ice
17	Dead+Wind 330 deg - No Ice
18	Dead+Ice+Temp
19	Dead+Wind 0 deg+Ice+Temp
20	Dead+Wind 30 deg+Ice+Temp
21	Dead+Wind 45 deg+Ice+Temp
22	Dead+Wind 60 deg+Ice+Temp
23	Dead+Wind 90 deg+Ice+Temp
24	Dead+Wind 120 deg+Ice+Temp
25	Dead+Wind 135 deg+Ice+Temp
26	Dead+Wind 150 deg+Ice+Temp
27	Dead+Wind 180 deg+Ice+Temp
28	Dead+Wind 210 deg+Ice+Temp
29	Dead+Wind 225 deg+Ice+Temp
30	Dead+Wind 240 deg+Ice+Temp
31	Dead+Wind 270 deg+Ice+Temp
32	Dead+Wind 300 deg+Ice+Temp
33	Dead+Wind 315 deg+Ice+Temp
34	Dead+Wind 330 deg+Ice+Temp
35	Dead+Wind 0 deg - Service
36	Dead+Wind 30 deg - Service
37	Dead+Wind 45 deg - Service
38	Dead+Wind 60 deg - Service
39	Dead+Wind 90 deg - Service
40	Dead+Wind 120 deg - Service
41	Dead+Wind 135 deg - Service
42	Dead+Wind 150 deg - Service
43	Dead+Wind 180 deg - Service
44	Dead+Wind 210 deg - Service
45	Dead+Wind 225 deg - Service
46	Dead+Wind 240 deg - Service
47	Dead+Wind 270 deg - Service
48	Dead+Wind 300 deg - Service
49	Dead+Wind 315 deg - Service

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Comb. No.	Description
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	145 - 109.79	Pole	Max Tension	11	0.091	5.163	-8.967
			Max. Compression	18	-13.285	-0.117	-13.383
			Max. Mx	14	-7.537	412.020	-11.243
			Max. My	10	-7.522	3.107	-420.917
			Max. Vy	6	15.995	-411.777	-5.340
			Max. Vx	10	16.020	3.107	-420.917
L2	109.79 - 94.79	Pole	Max. Torque	14		6.654	
			Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-14.940	-0.118	-13.528
			Max. Mx	14	-9.030	585.192	-12.616
			Max. My	10	-9.018	4.340	-594.349
			Max. Vy	14	-16.763	585.192	-12.616
L3	94.79 - 47	Pole	Max. Vx	10	16.787	4.340	-594.349
			Max. Torque	14		6.562	
			Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-24.717	-0.122	-13.969
			Max. Mx	14	-17.810	1442.664	-18.398
			Max. My	10	-17.805	9.741	-1452.909
L4	47 - 1	Pole	Max. Vy	14	-20.353	1442.664	-18.398
			Max. Vx	10	20.375	9.741	-1452.909
			Max. Torque	14		6.551	
			Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-38.591	-0.123	-14.110
			Max. Mx	14	-30.323	2598.244	-24.469
			Max. My	10	-30.323	15.719	-2609.575
			Max. Vy	14	-24.077	2598.244	-24.469
			Max. Vx	10	24.096	15.719	-2609.575
			Max. Torque	14		6.527	

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	27	38.591	0.087	-20.317
	Max. H _x	14	30.342	24.054	-0.112
	Max. H _z	2	30.342	-0.112	24.073
	Max. M _x	2	2591.876	-0.112	24.073
	Max. M _z	6	2597.995	-24.054	0.112
	Max. Torsion	14	6.519	24.054	-0.112
	Min. Vert	1	30.342	0.000	-0.000
	Min. H _x	6	30.342	-24.054	0.112
	Min. H _z	10	30.342	0.112	-24.073
	Min. M _x	10	-2609.575	0.112	-24.073
	Min. M _z	14	-2598.244	24.054	-0.112
	Min. Torsion	6	-6.517	-24.054	0.112

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Tower Mast Reaction Summary

Load Combination	Vertical K	Shear _x K	Shear _z K	Overturning Moment, M _x kip-ft	Overturning Moment, M _z kip-ft	Torque kip-ft
Dead Only	30.342	0.000	0.000	8.951	0.122	0.000
Dead+Wind 0 deg - No Ice	30.342	0.112	-24.073	-2591.876	-15.456	0.774
Dead+Wind 30 deg - No Ice	30.342	12.124	-20.904	-2251.193	-1312.412	3.929
Dead+Wind 45 deg - No Ice	30.342	17.088	-17.102	-1841.115	-1848.010	5.155
Dead+Wind 60 deg - No Ice	30.342	20.888	-12.134	-1304.972	-2257.670	6.030
Dead+Wind 90 deg - No Ice	30.342	24.054	-0.112	-6.707	-2597.995	6.517
Dead+Wind 120 deg - No Ice	30.342	20.775	11.939	1295.771	-2242.147	5.259
Dead+Wind 135 deg - No Ice	30.342	16.929	16.943	1836.886	-1826.022	4.064
Dead+Wind 150 deg - No Ice	30.342	11.930	20.792	2253.412	-1285.440	2.592
Dead+Wind 180 deg - No Ice	30.342	-0.112	24.073	2609.575	15.719	-0.769
Dead+Wind 210 deg - No Ice	30.342	-12.124	20.904	2268.901	1312.647	-3.923
Dead+Wind 225 deg - No Ice	30.342	-17.088	17.102	1858.836	1848.238	-5.151
Dead+Wind 240 deg - No Ice	30.342	-20.888	12.134	1322.709	2257.899	-6.028
Dead+Wind 270 deg - No Ice	30.342	-24.054	0.112	24.467	2598.244	-6.519
Dead+Wind 300 deg - No Ice	30.342	-20.775	-11.939	-1278.016	2242.424	-5.262
Dead+Wind 315 deg - No Ice	30.342	-16.929	-16.943	-1819.144	1826.306	-4.065
Dead+Wind 330 deg - No Ice	30.342	-11.930	-20.792	-2235.686	1285.724	-2.591
Dead+Ice+Temp	38.591	0.000	0.000	14.110	-0.123	0.001
Dead+Wind 0 deg+Ice+Temp	38.591	0.087	-20.317	-2226.225	-12.321	0.635
Dead+Wind 30 deg+Ice+Temp	38.591	10.226	-17.638	-1932.169	-1129.787	3.577
Dead+Wind 45 deg+Ice+Temp	38.591	14.418	-14.428	-1578.681	-1591.389	4.729
Dead+Wind 60 deg+Ice+Temp	38.591	17.626	-10.234	-1116.659	-1944.552	5.558
Dead+Wind 90 deg+Ice+Temp	38.591	20.303	-0.087	1.810	-2238.327	6.051
Dead+Wind 120 deg+Ice+Temp	38.591	17.539	10.084	1123.566	-1932.371	4.923
Dead+Wind 135 deg+Ice+Temp	38.591	14.295	14.305	1589.471	-1574.144	3.831
Dead+Wind 150 deg+Ice+Temp	38.591	10.076	17.552	1948.004	-1108.646	2.478
Dead+Wind 180 deg+Ice+Temp	38.591	-0.087	20.317	2254.199	12.095	-0.630
Dead+Wind 210 deg+Ice+Temp	38.591	-10.226	17.638	1960.150	1129.532	-3.570
Dead+Wind 225 deg+Ice+Temp	38.591	-14.418	14.428	1606.676	1591.127	-4.722
Dead+Wind 240 deg+Ice+Temp	38.591	-17.626	10.234	1144.671	1944.292	-5.554
Dead+Wind 270 deg+Ice+Temp	38.591	-20.303	0.087	26.225	2238.089	-6.051
Dead+Wind 300 deg+Ice+Temp	38.591	-17.539	-10.084	-1095.538	1932.163	-4.926
Dead+Wind 315 deg+Ice+Temp	38.591	-14.295	-14.305	-1561.457	1573.943	-3.832
Dead+Wind 330 deg+Ice+Temp	38.591	-10.076	-17.552	-1920.006	1108.444	-2.477
Dead+Wind 0 deg - Service	30.342	0.044	-9.404	-1008.429	-5.975	0.306
Dead+Wind 30 deg - Service	30.342	4.736	-8.166	-875.172	-513.345	1.556
Dead+Wind 45 deg - Service	30.342	6.675	-6.680	-714.750	-722.874	2.042
Dead+Wind 60 deg - Service	30.342	8.159	-4.740	-505.009	-883.131	2.389
Dead+Wind 90 deg - Service	30.342	9.396	-0.044	2.873	-1016.252	2.582
Dead+Wind 120 deg - Service	30.342	8.115	4.664	512.391	-877.034	2.083
Dead+Wind 135 deg - Service	30.342	6.613	6.618	724.070	-714.249	1.610
Dead+Wind 150 deg - Service	30.342	4.660	8.122	887.016	-502.781	1.027
Dead+Wind 180 deg - Service	30.342	-0.044	9.404	1026.364	6.223	-0.305
Dead+Wind 210 deg - Service	30.342	-4.736	8.166	893.108	513.589	-1.555
Dead+Wind 225 deg - Service	30.342	-6.675	6.680	732.688	723.117	-2.041
Dead+Wind 240 deg - Service	30.342	-8.159	4.740	522.950	883.374	-2.388
Dead+Wind 270 deg - Service	30.342	-9.396	0.044	15.071	1016.498	-2.582
Dead+Wind 300 deg - Service	30.342	-8.115	-4.664	-494.448	877.285	-2.083
Dead+Wind 315 deg - Service	30.342	-6.613	-6.618	-706.129	714.501	-1.609
Dead+Wind 330 deg - Service	30.342	-4.660	-8.122	-869.077	503.033	-1.026

Solution Summary

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Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0.000	-30.342	0.000	0.000	30.342	-0.000	0.000%
2	0.112	-30.342	-24.073	-0.112	30.342	24.073	0.000%
3	12.124	-30.342	-20.904	-12.124	30.342	20.904	0.000%
4	17.088	-30.342	-17.102	-17.088	30.342	17.102	0.000%
5	20.888	-30.342	-12.134	-20.888	30.342	12.134	0.000%
6	24.054	-30.342	-0.112	-24.054	30.342	0.112	0.000%
7	20.775	-30.342	11.939	-20.775	30.342	-11.939	0.000%
8	16.929	-30.342	16.943	-16.929	30.342	-16.943	0.000%
9	11.930	-30.342	20.792	-11.930	30.342	-20.792	0.000%
10	-0.112	-30.342	24.073	0.112	30.342	-24.073	0.000%
11	-12.124	-30.342	20.904	12.124	30.342	-20.904	0.000%
12	-17.088	-30.342	17.102	17.088	30.342	-17.102	0.000%
13	-20.888	-30.342	12.134	20.888	30.342	-12.134	0.000%
14	-24.054	-30.342	0.112	24.054	30.342	-0.112	0.000%
15	-20.775	-30.342	-11.939	20.775	30.342	11.939	0.000%
16	-16.929	-30.342	-16.943	16.929	30.342	16.943	0.000%
17	-11.930	-30.342	-20.792	11.930	30.342	20.792	0.000%
18	0.000	-38.591	0.000	-0.000	38.591	-0.000	0.000%
19	0.087	-38.591	-20.317	-0.087	38.591	20.317	0.000%
20	10.226	-38.591	-17.638	-10.226	38.591	17.638	0.000%
21	14.418	-38.591	-14.428	-14.418	38.591	14.428	0.000%
22	17.626	-38.591	-10.234	-17.626	38.591	10.234	0.000%
23	20.303	-38.591	-0.087	-20.303	38.591	0.087	0.000%
24	17.539	-38.591	10.084	-17.539	38.591	-10.084	0.000%
25	14.295	-38.591	14.305	-14.295	38.591	-14.305	0.000%
26	10.076	-38.591	17.552	-10.076	38.591	-17.552	0.000%
27	-0.087	-38.591	20.317	0.087	38.591	-20.317	0.000%
28	-10.226	-38.591	17.638	10.226	38.591	-17.638	0.000%
29	-14.418	-38.591	14.428	14.418	38.591	-14.428	0.000%
30	-17.626	-38.591	10.234	17.626	38.591	-10.234	0.000%
31	-20.303	-38.591	0.087	20.303	38.591	-0.087	0.000%
32	-17.539	-38.591	-10.084	17.539	38.591	10.084	0.000%
33	-14.295	-38.591	-14.305	14.295	38.591	14.305	0.000%
34	-10.076	-38.591	-17.552	10.076	38.591	17.552	0.000%
35	0.044	-30.342	-9.403	-0.044	30.342	9.404	0.000%
36	4.736	-30.342	-8.166	-4.736	30.342	8.166	0.000%
37	6.675	-30.342	-6.680	-6.675	30.342	6.680	0.000%
38	8.159	-30.342	-4.740	-8.159	30.342	4.740	0.000%
39	9.396	-30.342	-0.044	-9.396	30.342	0.044	0.000%
40	8.115	-30.342	4.664	-8.115	30.342	-4.664	0.000%
41	6.613	-30.342	6.618	-6.613	30.342	-6.618	0.000%
42	4.660	-30.342	8.122	-4.660	30.342	-8.122	0.000%
43	-0.044	-30.342	9.403	0.044	30.342	-9.404	0.000%
44	-4.736	-30.342	8.166	4.736	30.342	-8.166	0.000%
45	-6.675	-30.342	6.680	6.675	30.342	-6.680	0.000%
46	-8.159	-30.342	4.740	8.159	30.342	-4.740	0.000%
47	-9.396	-30.342	0.044	9.396	30.342	-0.044	0.000%
48	-8.115	-30.342	-4.664	8.115	30.342	4.664	0.000%
49	-6.613	-30.342	-6.618	6.613	30.342	6.618	0.000%
50	-4.660	-30.342	-8.122	4.660	30.342	8.122	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001

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2	Yes	5	0.00000001	0.00004118
3	Yes	5	0.00000001	0.00095335
4	Yes	5	0.00000001	0.00096520
5	Yes	5	0.00000001	0.00077467
6	Yes	5	0.00000001	0.00021952
7	Yes	5	0.00000001	0.00098361
8	Yes	5	0.00000001	0.00095445
9	Yes	5	0.00000001	0.00081683
10	Yes	4	0.00000001	0.00034848
11	Yes	5	0.00000001	0.00081662
12	Yes	5	0.00000001	0.00097950
13	Yes	6	0.00000001	0.00003543
14	Yes	5	0.00000001	0.00024932
15	Yes	5	0.00000001	0.00076279
16	Yes	5	0.00000001	0.00094067
17	Yes	5	0.00000001	0.00090413
18	Yes	4	0.00000001	0.00013414
19	Yes	5	0.00000001	0.00037035
20	Yes	6	0.00000001	0.00013845
21	Yes	6	0.00000001	0.00014530
22	Yes	6	0.00000001	0.00011641
23	Yes	5	0.00000001	0.00071649
24	Yes	6	0.00000001	0.00014523
25	Yes	6	0.00000001	0.00014643
26	Yes	6	0.00000001	0.00012335
27	Yes	5	0.00000001	0.00036697
28	Yes	6	0.00000001	0.00012433
29	Yes	6	0.00000001	0.00015028
30	Yes	6	0.00000001	0.00015044
31	Yes	5	0.00000001	0.00076761
32	Yes	6	0.00000001	0.00011402
33	Yes	6	0.00000001	0.00014142
34	Yes	6	0.00000001	0.00013188
35	Yes	4	0.00000001	0.00022281
36	Yes	5	0.00000001	0.00012606
37	Yes	5	0.00000001	0.00012818
38	Yes	5	0.00000001	0.00008970
39	Yes	5	0.00000001	0.00006356
40	Yes	5	0.00000001	0.00014032
41	Yes	5	0.00000001	0.00013058
42	Yes	5	0.00000001	0.00009922
43	Yes	4	0.00000001	0.00016066
44	Yes	5	0.00000001	0.00010047
45	Yes	5	0.00000001	0.00013839
46	Yes	5	0.00000001	0.00014977
47	Yes	5	0.00000001	0.00006677
48	Yes	5	0.00000001	0.00008558
49	Yes	5	0.00000001	0.00012069
50	Yes	5	0.00000001	0.00011406

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	145 - 109.79	38.977	44	2.761	0.044
L2	109.79 - 94.79	20.788	44	1.989	0.016
L3	99.21 - 47	16.685	44	1.714	0.011
L4	53 - 1	4.441	44	0.807	0.003

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Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
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Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
145.000	LPA-80063/6CF	44	38.977	2.761	0.044	10541
143.000	EEI Low Profile Platform	44	37.850	2.720	0.042	10541
135.000	(2) 7770.00	44	33.380	2.556	0.035	5270
133.000	EEI Low Profile Platform	44	32.281	2.515	0.033	4391
125.000	APX16DWV-16DWVS-E-A20	44	28.010	2.345	0.026	2634
123.000	Valmont T-Arm (1)	44	26.983	2.301	0.024	2394
115.000	APXV18-206517-C	44	23.094	2.117	0.019	1755

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	145 - 109.79	98.078	11	6.868	0.112
L2	109.79 - 94.79	52.633	11	5.019	0.039
L3	99.21 - 47	42.284	11	4.336	0.028
L4	53 - 1	11.282	11	2.048	0.009

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
145.000	LPA-80063/6CF	11	98.078	6.868	0.112	4443
143.000	EEI Low Profile Platform	11	95.270	6.773	0.107	4443
135.000	(2) 7770.00	11	84.127	6.390	0.088	2220
133.000	EEI Low Profile Platform	11	81.386	6.293	0.083	1849
125.000	APX16DWV-16DWVS-E-A20	11	70.727	5.888	0.066	1108
123.000	Valmont T-Arm (1)	11	68.161	5.782	0.062	1006
115.000	APXV18-206517-C	11	58.424	5.335	0.047	736

Compression Checks

Pole Design Data

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Section No.	Elevation ft	Size	L ft	L _u ft	KI/r	F _u ksi	A in ²	Actual P K	Allow. P _a K	Ratio P P _a
L1	145 - 143.239	TP26.97x17.5x0.188	35.210	0.000	3.3	39.000	10.585	0.000	412.811	0.000
	143.239 - 141.479					39.000	10.867	-1.411	423.801	0.003
	141.479 - 139.719					39.000	11.149	-1.537	434.791	0.004
	139.719 - 137.958					39.000	11.430	-1.667	445.780	0.004
	137.958 - 136.197					39.000	11.712	-1.800	456.770	0.004
	136.197 - 134.437					39.000	11.994	-2.494	467.760	0.005
	134.437 - 132.677					39.000	12.276	-4.020	478.750	0.008
	132.677 - 130.916					39.000	12.557	-4.166	489.740	0.009
	130.916 - 129.155					39.000	12.839	-4.317	500.730	0.009
	129.155 - 127.395					39.000	13.121	-4.472	511.720	0.009
	127.395 - 125.634					39.000	13.403	-4.629	522.710	0.009
	125.634 - 123.874					39.000	13.685	-4.919	533.700	0.009
	123.874 - 122.114					39.000	13.966	-5.938	544.689	0.011
	122.114 - 120.353					39.000	14.248	-6.110	555.679	0.011
	120.353 - 118.593					39.000	14.530	-6.286	566.669	0.011
	118.593 - 116.832					39.000	14.812	-6.464	577.659	0.011
	116.832 - 115.072					39.000	15.094	-6.646	588.649	0.011
	115.072 - 113.311					39.000	15.375	-7.126	599.639	0.012
	113.311 - 111.551					39.000	15.657	-7.315	610.629	0.012
	111.551 - 109.79					39.000	15.939	-7.508	621.619	0.012
L2	109.79 - 108.732	TP31.01x26.97x0.25	15.000	0.000	0.0	39.000	21.428	-7.663	835.709	0.009
	108.732 - 107.674					39.000	21.654	-7.808	844.527	0.009
	107.674 - 106.616					39.000	21.881	-7.954	853.346	0.009
	106.616 - 105.558					39.000	22.107	-8.101	862.164	0.009
	105.558 - 104.5					39.000	22.333	-8.249	870.982	0.009
	104.5 - 103.442					39.000	22.559	-8.399	879.801	0.010
	103.442 - 102.384					39.000	22.785	-8.549	888.619	0.010
	102.384 - 101.326					39.000	23.011	-8.700	897.437	0.010
	101.326 - 100.268					39.000	23.237	-8.852	906.256	0.010
	100.268 - 99.21					39.000	23.463	-9.006	915.074	0.010
	99.21 - 94.79					39.000	24.408	-4.565	951.914	0.005
L3	99.21 - 94.79	TP43.37x29.32x0.313	52.210	0.000	0.0	39.000	29.951	-5.474	1168.100	0.005
	94.79 - 92.4683					39.000	30.571	-10.427	1192.270	0.009
	92.4683 -					39.000	31.191	-10.818	1216.430	0.009

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	Client	AT&T Mobility	Designed by	TJL

Section No.	Elevation ft	Size	L ft	L _a ft	Kl/r	F _a ksi	A in ²	Actual P K	Allow. P _a K	Ratio P P _a
	90.1467									
	90.1467 - 87.825					39.000	31.810	-11.215	1240.600	0.009
	87.825 - 85.5033					39.000	32.430	-11.618	1264.770	0.009
	85.5033 - 83.1817					39.000	33.050	-12.025	1288.940	0.009
	83.1817 - 80.86					39.000	33.669	-12.438	1313.110	0.009
	80.86 - 78.5383					39.000	34.289	-12.857	1337.280	0.010
	78.5383 - 76.2167					39.000	34.909	-13.280	1361.450	0.010
	76.2167 - 73.895					39.000	35.529	-13.709	1385.620	0.010
	73.895 - 71.5733					39.000	36.148	-14.143	1409.790	0.010
	71.5733 - 69.2517					39.000	36.768	-14.582	1433.950	0.010
	69.2517 - 66.93					39.000	37.388	-15.026	1458.120	0.010
	66.93 - 64.6083					39.000	38.007	-15.475	1482.290	0.010
	64.6083 - 62.2867					39.000	38.627	-15.930	1506.460	0.011
	62.2867 - 59.965					39.000	39.247	-16.389	1530.630	0.011
	59.965 - 57.6433					39.000	39.867	-16.854	1554.800	0.011
	57.6433 - 55.3217					39.000	40.486	-17.323	1578.970	0.011
	55.3217 - 53					39.000	41.106	-17.798	1603.140	0.011
	53 - 47					39.000	42.708	-10.066	1665.600	0.006
L4	53 - 47	TP55x41.13x0.313	52.000	0.000	0.0	39.000	42.074	-9.770	1640.870	0.006
	47 - 44.5789					39.000	42.714	-20.344	1665.850	0.012
	44.5789 - 42.1579					39.000	43.354	-20.853	1690.830	0.012
	42.1579 - 39.7368					39.000	43.995	-21.367	1715.810	0.012
	39.7368 - 37.3158					39.000	44.636	-21.887	1740.790	0.013
	37.3158 - 34.8947					39.000	45.276	-22.412	1765.770	0.013
	34.8947 - 32.4737					39.000	45.917	-22.942	1790.750	0.013
	32.4737 - 30.0526					38.986	46.557	-23.478	1815.050	0.013
	30.0526 - 27.6316					38.754	47.198	-24.019	1829.100	0.013
	27.6316 - 25.2105					38.523	47.838	-24.565	1842.860	0.013
	25.2105 - 22.7895					38.291	48.479	-25.116	1856.320	0.014
	22.7895 - 20.3684					38.060	49.119	-25.674	1869.480	0.014
	20.3684 - 17.9474					37.829	49.760	-26.236	1882.340	0.014
	17.9474 - 15.5263					37.597	50.400	-26.804	1894.910	0.014
	15.5263 - 13.1053					37.366	51.041	-27.377	1907.190	0.014
	13.1053 - 10.6842					37.135	51.681	-27.955	1919.160	0.015
	10.6842 -					36.903	52.322	-28.539	1930.840	0.015

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Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	F _a ksi	A in ²	Actual P K	Allow. P _a K	Ratio P P _a
	8.26316									
	8.26316 - 5.84211					36.672	52.962	-29.128	1942.220	0.015
	5.84211 - 3.42105					36.441	53.603	-29.723	1953.310	0.015
	3.42105 - 1					36.209	54.243	-30.323	1964.100	0.015

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M _x kip-ft	Actual f _{bx} ksi	Allow. F _{bx} ksi	Ratio f _{bx} F _{bx}	Actual M _y kip-ft	Actual f _{by} ksi	Allow. F _{by} ksi	Ratio f _{by} F _{by}
L1	145 - 143.239	TP26.97x17.5x0.188	10.348	-2.680	39.000	0.069	0.000	0.000	39.000	0.000
	143.239 - 141.479		26.692	6.557	39.000	0.168	0.000	0.000	39.000	0.000
	141.479 - 139.719		39.392	9.192	39.000	0.236	0.000	0.000	39.000	0.000
	139.719 - 137.958		52.288	11.604	39.000	0.298	0.000	0.000	39.000	0.000
	137.958 - 136.197		65.382	13.818	39.000	0.354	0.000	0.000	39.000	0.000
	136.197 - 134.437		80.478	16.214	39.000	0.416	0.000	0.000	39.000	0.000
	134.437 - 132.677		103.609	19.923	39.000	0.511	0.000	0.000	39.000	0.000
	132.677 - 130.916		124.245	22.826	39.000	0.585	0.000	0.000	39.000	0.000
	130.916 - 129.155		145.086	25.493	39.000	0.654	0.000	0.000	39.000	0.000
	129.155 - 127.395		166.134	27.946	39.000	0.717	0.000	0.000	39.000	0.000
	127.395 - 125.634		187.392	30.205	39.000	0.763	0.000	0.000	39.000	0.000
	125.634 - 123.874		209.692	32.416	39.000	0.831	0.000	0.000	39.000	0.000
	123.874 - 122.114		233.846	34.700	39.000	0.890	0.000	0.000	39.000	0.000
	122.114 - 120.353		259.621	37.010	39.000	0.949	0.000	0.000	39.000	0.000
	120.353 - 118.593		285.609	39.145	39.000	1.004	0.000	0.000	39.000	0.000
	118.593 - 116.832		311.814	41.120	39.000	1.054	0.000	0.000	39.000	0.000
	116.832 - 115.072		338.235	42.949	39.000	1.101	0.000	0.000	39.000	0.000
	115.072 - 113.311		365.987	44.779	39.000	1.148	0.000	0.000	39.000	0.000
	113.311 - 111.551		394.008	46.481	39.000	1.192	0.000	0.000	39.000	0.000
	111.551 - 109.79		422.251	48.062	39.000	1.232	0.000	0.000	39.000	0.000
L2	109.79 - 108.732	TP31.01x26.97x0.25	439.330	36.971	39.000	0.948	0.000	0.000	39.000	0.000
	108.732 - 107.674		456.489	37.614	39.000	0.964	0.000	0.000	39.000	0.000
	107.674 -		473.728	38.228	39.000	0.980	0.000	0.000	39.000	0.000

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Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
	106.616									
	106.616 - 105.558		491.048	38.816	39.000	0.995	0.000	0.000	39.000	0.000
	105.558 - 104.5		508.449	39.378	39.000	1.010	0.000	0.000	39.000	0.000
	104.5 - 103.442		525.932	39.916	39.000	1.023	0.000	0.000	39.000	0.000
	103.442 - 102.384		543.497	40.431	39.000	1.037	0.000	0.000	39.000	0.000
	102.384 - 101.326		561.143	40.924	39.000	1.049	0.000	0.000	39.000	0.000
	101.326 - 100.268		578.874	41.396	39.000	1.061	0.000	0.000	39.000	0.000
	100.268 - 99.21		596.688	41.848	39.000	1.073	0.000	0.000	39.000	0.000
L3	99.21 - 94.79	TP43.37x29.32x0.313	308.203	19.968	39.000	0.512	0.000	0.000	39.000	0.000
	99.21 - 94.79		363.950	19.618	39.000	0.503	0.000	0.000	39.000	0.000
	94.79 - 92.4683		712.452	36.854	39.000	0.945	0.000	0.000	39.000	0.000
	92.4683 - 90.1467		753.148	37.419	39.000	0.959	0.000	0.000	39.000	0.000
	90.1467 - 87.825		794.244	37.931	39.000	0.973	0.000	0.000	39.000	0.000
	87.825 - 85.5033		835.742	38.395	39.000	0.984	0.000	0.000	39.000	0.000
	85.5033 - 83.1817		877.642	38.815	39.000	0.995	0.000	0.000	39.000	0.000
	83.1817 - 80.86		919.942	39.195	39.000	1.005	0.000	0.000	39.000	0.000
	80.86 - 78.5383		962.650	39.539	39.000	1.014	0.000	0.000	39.000	0.000
	78.5383 - 76.2167		1005.76	39.850	39.000	1.022	0.000	0.000	39.000	0.000
	76.2167 - 73.895		1049.29	40.131	39.000	1.029	0.000	0.000	39.000	0.000
	73.895 - 71.5733		1093.23	40.384	39.000	1.035	0.000	0.000	39.000	0.000
	71.5733 - 69.2517		1137.57	40.611	39.000	1.041	0.000	0.000	39.000	0.000
	69.2517 - 66.93		1182.33	40.816	39.000	1.047	0.000	0.000	39.000	0.000
	66.93 - 64.6083		1227.50	40.999	39.000	1.051	0.000	0.000	39.000	0.000
	64.6083 - 62.2867		1273.10	41.163	39.000	1.055	0.000	0.000	39.000	0.000
	62.2867 - 59.965		1319.11	41.310	39.000	1.059	0.000	0.000	39.000	0.000
	59.965 - 57.6433		1365.54	41.440	39.000	1.063	0.000	0.000	39.000	0.000
	57.6433 - 55.3217		1412.40	41.554	39.000	1.065	0.000	0.000	39.000	0.000
	55.3217 - 53		1459.67	41.655	39.000	1.068	0.000	0.000	39.000	0.000
L4	53 - 47	TP55x41.13x0.313	810.050	21.409	39.000	0.549	0.000	0.000	39.000	0.000
	53 - 47		773.989	21.080	39.000	0.541	0.000	0.000	39.000	0.000
	47 - 44.5789		1635.07	43.202	39.000	1.108	0.000	0.000	39.000	0.000
	44.5789 - 42.1579		1686.48	43.249	39.000	1.109	0.000	0.000	39.000	0.000
	42.1579 -		1738.28	43.284	39.000	1.110	0.000	0.000	39.000	0.000

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	Client	AT&T Mobility	Designed by	TJL

Section No.	Elevation ft	Size	Actual V K	Actual f _v ksi	Allow. F _v ksi	Ratio f _v F _v	Actual T kip-ft	Actual f _{st} ksi	Allow. F _{st} ksi	Ratio f _{st} F _{st}
L2	129.155 -	TP31.01x26.97x0.25	12.019	0.916	26.000	0.070	0.899	0.074	26.000	0.003
	127.395 -									
	127.395 -		12.139	0.906	26.000	0.070	0.898	0.071	26.000	0.003
	125.634 -									
	125.634 -		12.999	0.950	26.000	0.073	0.898	0.068	26.000	0.003
	123.874 -									
	123.874 -		14.589	1.045	26.000	0.080	4.100	0.297	26.000	0.011
	122.114 -									
	122.114 -		14.710	1.032	26.000	0.079	4.099	0.285	26.000	0.011
	120.353 -									
	120.353 -		14.832	1.021	26.000	0.079	4.097	0.274	26.000	0.011
	118.593 -									
	118.593 -		14.955	1.010	26.000	0.078	4.096	0.264	26.000	0.010
	116.832 -									
	116.832 -		15.079	0.999	26.000	0.077	4.095	0.254	26.000	0.010
	115.072 -									
	115.072 -		15.865	1.032	26.000	0.079	4.094	0.245	26.000	0.009
	113.311 -									
	113.311 -		15.990	1.021	26.000	0.079	3.952	0.228	26.000	0.009
	111.551 -									
	111.551 -		16.116	1.011	26.000	0.078	3.951	0.220	26.000	0.008
	109.79 -									
	109.79 -		16.187	0.755	26.000	0.058	3.950	0.162	26.000	0.006
	108.732 -									
	108.732 -		16.263	0.751	26.000	0.058	3.949	0.159	26.000	0.006
	107.674 -									
	107.674 -		16.339	0.747	26.000	0.057	3.949	0.155	26.000	0.006
	106.616 -									
	106.616 -		16.415	0.743	26.000	0.057	3.948	0.152	26.000	0.006
	105.558 -									
	105.558 -		16.492	0.738	26.000	0.057	3.948	0.149	26.000	0.006
	104.5 -									
	104.5 -		16.570	0.735	26.000	0.056	3.947	0.146	26.000	0.006
	103.442 -									
	103.442 -		16.648	0.731	26.000	0.056	3.947	0.143	26.000	0.006
	102.384 -									
	102.384 -		16.726	0.727	26.000	0.056	3.946	0.140	26.000	0.005
	101.326 -									
	101.326 -		16.805	0.723	26.000	0.056	3.945	0.138	26.000	0.005
	100.268 -									
	100.268 -		16.884	0.720	26.000	0.055	3.945	0.135	26.000	0.005
	99.21 -									
L3	99.21 - 94.79	TP43.37x29.32x0.313	8.021	0.329	26.000	0.025	1.808	0.057	26.000	0.002
	99.21 - 94.79		9.263	0.309	26.000	0.024	2.136	0.056	26.000	0.002
	94.79 -		17.455	0.571	26.000	0.044	3.943	0.099	26.000	0.004
	92.4683 -									
	92.4683 -		17.627	0.565	26.000	0.043	3.942	0.095	26.000	0.004
	90.1467 -									
	90.1467 -		17.800	0.560	26.000	0.043	3.941	0.092	26.000	0.004
	87.825 -									
	87.825 -		17.974	0.554	26.000	0.043	3.940	0.088	26.000	0.003
	85.5033 -									
	85.5033 -		18.148	0.549	26.000	0.042	3.939	0.085	26.000	0.003
	83.1817 -									
	83.1817 -		18.322	0.544	26.000	0.042	3.938	0.082	26.000	0.003
	80.86 -									
	80.86 -		18.498	0.539	26.000	0.041	3.937	0.079	26.000	0.003
	78.5383 -									
	78.5383 -		18.674	0.535	26.000	0.041	3.936	0.076	26.000	0.003
	76.2167 -									

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	Project 145-ft EEI Monopole - 5 Old Farm Rd., Barkhamsted, CT Client AT&T Mobility	Date 09:47:51 11/30/12 Designed by TJL

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_s ksi	Allow. F_s ksi	Ratio $\frac{f_s}{F_s}$
L4	76.2167 -	TP55x41.13x0.313	18.850	0.531	26.000	0.041	3.935	0.073	26.000	0.003
	73.895 -		19.028	0.526	26.000	0.040	3.935	0.071	26.000	0.003
	73.895 -		19.206	0.522	26.000	0.040	3.934	0.068	26.000	0.003
	71.5733 -		19.384	0.518	26.000	0.040	3.933	0.066	26.000	0.003
	71.5733 -		19.564	0.515	26.000	0.040	3.932	0.064	26.000	0.002
	69.2517 -		19.744	0.511	26.000	0.039	3.932	0.062	26.000	0.002
	69.2517 -		19.924	0.508	26.000	0.039	3.931	0.060	26.000	0.002
	66.93 -		20.106	0.504	26.000	0.039	3.930	0.058	26.000	0.002
	66.93 -		20.288	0.501	26.000	0.039	3.930	0.056	26.000	0.002
	64.6083 -		20.471	0.498	26.000	0.038	3.929	0.055	26.000	0.002
	64.6083 -		10.882	0.255	26.000	0.020	2.009	0.026	26.000	0.001
	62.2867 -		10.144	0.241	26.000	0.019	1.920	0.026	26.000	0.001
	62.2867 -		21.178	0.496	26.000	0.038	3.928	0.051	26.000	0.002
	59.965 -		21.335	0.492	26.000	0.038	3.927	0.049	26.000	0.002
	59.965 -		21.494	0.489	26.000	0.038	3.927	0.048	26.000	0.002
	57.6433 -		21.653	0.485	26.000	0.037	3.926	0.046	26.000	0.002
	57.6433 -		21.814	0.482	26.000	0.037	3.926	0.045	26.000	0.002
	55.3217 -		21.976	0.479	26.000	0.037	3.926	0.044	26.000	0.002
	55.3217 -		22.139	0.476	26.000	0.037	3.925	0.043	26.000	0.002
	53 - 47		22.303	0.473	26.000	0.036	3.925	0.041	26.000	0.002
	53 - 47		22.469	0.470	26.000	0.036	3.925	0.040	26.000	0.002
	47 - 44.5789		22.636	0.467	26.000	0.036	3.924	0.039	26.000	0.002
	47 - 44.5789		22.803	0.464	26.000	0.036	3.924	0.038	26.000	0.001
	44.5789 -		22.972	0.462	26.000	0.036	3.924	0.037	26.000	0.001
	44.5789 -		23.143	0.459	26.000	0.035	3.924	0.036	26.000	0.001
	42.1579 -		23.314	0.457	26.000	0.035	3.924	0.035	26.000	0.001
	42.1579 -		23.487	0.454	26.000	0.035	3.923	0.035	26.000	0.001
	39.7368 -		23.671	0.452	26.000	0.035	5.151	0.044	26.000	0.002
	39.7368 -		23.846	0.450	26.000	0.035	5.151	0.043	26.000	0.002
	37.3158 -		24.022	0.448	26.000	0.034	5.151	0.042	26.000	0.002
	37.3158 -		24.200	0.446	26.000	0.034	5.151	0.041	26.000	0.002
	34.8947 -									
	34.8947 -									
	32.4737 -									
	32.4737 -									
	30.0526 -									
	30.0526 -									
	27.6316 -									
	27.6316 -									
	25.2105 -									
	25.2105 -									
	22.7895 -									
	22.7895 -									
	20.3684 -									
	20.3684 -									
	17.9474 -									
	17.9474 -									
	15.5263 -									
	15.5263 -									
	13.1053 -									
	13.1053 -									
	10.6842 -									
	10.6842 -									
	8.26316 -									
	8.26316 -									
	5.84211 -									
	5.84211 -									
	3.42105 -									
	3.42105 -									

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Pole Interaction Design Data

Section No.	Elevation ft	Ratio P P_a	Ratio f_{bc} F_{bx}	Ratio f_{by} F_{by}	Ratio f_v F_v	Ratio f_{vt} F_{vt}	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	145 - 143.239	0.000	0.069	0.000	0.000	0.000	0.069	1.333	H1-3 ✓
	143.239 - 141.479	0.003	0.168	0.000	0.052	0.000	0.172	1.333	H1-3+VT ✓
	141.479 - 139.719	0.004	0.236	0.000	0.051	0.000	0.240	1.333	H1-3+VT ✓
	139.719 - 137.958	0.004	0.298	0.000	0.051	0.000	0.302	1.333	H1-3+VT ✓
	137.958 - 136.197	0.004	0.354	0.000	0.050	0.000	0.359	1.333	H1-3+VT ✓
	136.197 - 134.437	0.005	0.416	0.000	0.067	0.003	0.422	1.333	H1-3+VT ✓
	134.437 - 132.677	0.008	0.511	0.000	0.073	0.003	0.521	1.333	H1-3+VT ✓
	132.677 - 130.916	0.009	0.585	0.000	0.072	0.003	0.595	1.333	H1-3+VT ✓
	130.916 - 129.155	0.009	0.654	0.000	0.071	0.003	0.664	1.333	H1-3+VT ✓
	129.155 - 127.395	0.009	0.717	0.000	0.070	0.003	0.727	1.333	H1-3+VT ✓
	127.395 - 125.634	0.009	0.774	0.000	0.070	0.003	0.785	1.333	H1-3+VT ✓
	125.634 - 123.874	0.009	0.831	0.000	0.073	0.003	0.842	1.333	H1-3+VT ✓
	123.874 - 122.114	0.011	0.890	0.000	0.080	0.011	0.903	1.333	H1-3+VT ✓
	122.114 - 120.353	0.011	0.949	0.000	0.079	0.011	0.963	1.333	H1-3+VT ✓
	120.353 - 118.593	0.011	1.004	0.000	0.079	0.011	1.017	1.333	H1-3+VT ✓
	118.593 - 116.832	0.011	1.054	0.000	0.078	0.010	1.068	1.333	H1-3+VT ✓
	116.832 - 115.072	0.011	1.101	0.000	0.077	0.010	1.115	1.333	H1-3+VT ✓
	115.072 - 113.311	0.012	1.148	0.000	0.079	0.009	1.162	1.333	H1-3+VT ✓
	113.311 - 111.551	0.012	1.192	0.000	0.079	0.009	1.206	1.333	H1-3+VT ✓
	111.551 - 109.79	0.012	1.232	0.000	0.078	0.008	1.247	1.333	H1-3+VT ✓
L2	109.79 - 108.732	0.009	0.948	0.000	0.058	0.006	0.958	1.333	H1-3+VT ✓
	108.732 - 107.674	0.009	0.964	0.000	0.058	0.006	0.975	1.333	H1-3+VT ✓
	107.674 - 106.616	0.009	0.980	0.000	0.057	0.006	0.991	1.333	H1-3+VT ✓
	106.616 - 105.558	0.009	0.995	0.000	0.057	0.006	1.006	1.333	H1-3+VT ✓

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Section No.	Elevation ft	Ratio P P_a	Ratio f_{bx} F_{bx}	Ratio f_{by} F_{by}	Ratio f_v F_v	Ratio f_{vt} F_{vt}	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	105.558 - 104.5	0.009	1.010	0.000	0.057	0.006	1.020	1.333	H1-3+VT ✓
	104.5 - 103.442	0.010	1.023	0.000	0.056	0.006	1.034	1.333	H1-3+VT ✓
	103.442 - 102.384	0.010	1.037	0.000	0.056	0.006	1.047	1.333	H1-3+VT ✓
	102.384 - 101.326	0.010	1.049	0.000	0.056	0.005	1.060	1.333	H1-3+VT ✓
	101.326 - 100.268	0.010	1.061	0.000	0.056	0.005	1.072	1.333	H1-3+VT ✓
	100.268 - 99.21	0.010	1.073	0.000	0.055	0.005	1.084	1.333	H1-3+VT ✓
	99.21 - 94.79	0.005	0.512	0.000	0.025	0.002	0.517	1.333	H1-3+VT ✓
L3	99.21 - 94.79	0.005	0.503	0.000	0.024	0.002	0.508	1.333	H1-3+VT ✓
	94.79 - 92.4683	0.009	0.945	0.000	0.044	0.004	0.954	1.333	H1-3+VT ✓
	92.4683 - 90.1467	0.009	0.959	0.000	0.043	0.004	0.969	1.333	H1-3+VT ✓
	90.1467 - 87.825	0.009	0.973	0.000	0.043	0.004	0.982	1.333	H1-3+VT ✓
	87.825 - 85.5033	0.009	0.984	0.000	0.043	0.003	0.994	1.333	H1-3+VT ✓
	85.5033 - 83.1817	0.009	0.995	0.000	0.042	0.003	1.005	1.333	H1-3+VT ✓
	83.1817 - 80.86	0.009	1.005	0.000	0.042	0.003	1.015	1.333	H1-3+VT ✓
	80.86 - 78.5383	0.010	1.014	0.000	0.041	0.003	1.024	1.333	H1-3+VT ✓
	78.5383 - 76.2167	0.010	1.022	0.000	0.041	0.003	1.032	1.333	H1-3+VT ✓
	76.2167 - 73.895	0.010	1.029	0.000	0.041	0.003	1.039	1.333	H1-3+VT ✓
	73.895 - 71.5733	0.010	1.035	0.000	0.040	0.003	1.046	1.333	H1-3+VT ✓
	71.5733 - 69.2517	0.010	1.041	0.000	0.040	0.003	1.052	1.333	H1-3+VT ✓
	69.2517 - 66.93	0.010	1.047	0.000	0.040	0.003	1.057	1.333	H1-3+VT ✓
	66.93 - 64.6083	0.010	1.051	0.000	0.040	0.002	1.062	1.333	H1-3+VT ✓
	64.6083 - 62.2867	0.011	1.055	0.000	0.039	0.002	1.067	1.333	H1-3+VT ✓
	62.2867 - 59.965	0.011	1.059	0.000	0.039	0.002	1.070	1.333	H1-3+VT ✓
	59.965 - 57.6433	0.011	1.063	0.000	0.039	0.002	1.074	1.333	H1-3+VT ✓
	57.6433 - 55.3217	0.011	1.065	0.000	0.039	0.002	1.077	1.333	H1-3+VT ✓
	55.3217 - 53	0.011	1.068	0.000	0.038	0.002	1.080	1.333	H1-3+VT ✓

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Section No.	Elevation ft	Ratio P P_a	Ratio f_{bx} F_{bx}	Ratio f_{by} F_{by}	Ratio f_v F_v	Ratio f_{vt} F_{vt}	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L4	53 - 47	0.006	0.549	0.000	0.020	0.001	0.555	1.333	H1-3+VT ✓
	53 - 47	0.006	0.541	0.000	0.019	0.001	0.547	1.333	H1-3+VT ✓
	47 - 44.5789	0.012	1.108	0.000	0.038	0.002	1.120	1.333	H1-3+VT ✓
	44.5789 - 42.1579	0.012	1.109	0.000	0.038	0.002	1.122	1.333	H1-3+VT ✓
	42.1579 - 39.7368	0.012	1.110	0.000	0.038	0.002	1.123	1.333	H1-3+VT ✓
	39.7368 - 37.3158	0.013	1.110	0.000	0.037	0.002	1.123	1.333	H1-3+VT ✓
	37.3158 - 34.8947	0.013	1.111	0.000	0.037	0.002	1.124	1.333	H1-3+VT ✓
	34.8947 - 32.4737	0.013	1.111	0.000	0.037	0.002	1.124	1.333	H1-3+VT ✓
	32.4737 - 30.0526	0.013	1.111	0.000	0.037	0.002	1.125	1.333	H1-3+VT ✓
	30.0526 - 27.6316	0.013	1.118	0.000	0.036	0.002	1.131	1.333	H1-3+VT ✓
	27.6316 - 25.2105	0.013	1.124	0.000	0.036	0.002	1.138	1.333	H1-3+VT ✓
	25.2105 - 22.7895	0.014	1.130	0.000	0.036	0.002	1.144	1.333	H1-3+VT ✓
	22.7895 - 20.3684	0.014	1.136	0.000	0.036	0.001	1.151	1.333	H1-3+VT ✓
	20.3684 - 17.9474	0.014	1.142	0.000	0.036	0.001	1.157	1.333	H1-3+VT ✓
	17.9474 - 15.5263	0.014	1.148	0.000	0.035	0.001	1.163	1.333	H1-3+VT ✓
	15.5263 - 13.1053	0.014	1.155	0.000	0.035	0.001	1.169	1.333	H1-3+VT ✓
	13.1053 - 10.6842	0.015	1.160	0.000	0.035	0.001	1.175	1.333	H1-3+VT ✓
	10.6842 - 8.26316	0.015	1.166	0.000	0.035	0.002	1.182	1.333	H1-3+VT ✓
	8.26316 - 5.84211	0.015	1.172	0.000	0.035	0.002	1.188	1.333	H1-3+VT ✓
	5.84211 - 3.42105	0.015	1.178	0.000	0.034	0.002	1.194	1.333	H1-3+VT ✓
	3.42105 - 1	0.015	1.184	0.000	0.034	0.002	1.200	1.333	H1-3+VT ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF* P_{allow} K	% Capacity	Pass Fail
L1	145 - 109.79	Pole	TP26.97x17.5x0.188	1	-7.508	828.618	93.5	Pass

tnxTower Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job	12063.CO32 - CT1186	Page	30 of 30
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	Client	AT&T Mobility	Designed by	TJL

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF*P _{allow} K	% Capacity	Pass Fail
L2	109.79 - 94.79	Pole	TP31.01x26.97x0.25	2	-9.006	1219.794	81.3	Pass
L3	94.79 - 47	Pole	TP43.37x29.32x0.313	3	-17.798	2136.986	81.0	Pass
L4	47 - 1	Pole	TP55x41.13x0.313	4	-30.323	2618.145	90.0	Pass
							Summary	
							Pole (L1)	93.5 Pass
							RATING =	93.5 Pass

Program Version 6.0.0.8 - 9/7/2011 File:J:\Jobs\1206300.W\CO.32 - CT1186\STRUCTURAL\Rev (1)\Calcs\ERI Files\Reinforced\145' EEI Monopole_ Barkhamsted CT - Reinforced.eri

Subject:

Anchor Bolt and Baseplate Analysis

Location:

145-ft EEI Monopole
 Barkhamsted, CT

Rev. 1: 10/31/12

Prepared by: T.J.L. Checked by: C.F.C.
 Job No. 12063.CO32

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	OM := 2621-ft-kips	(Input From RisaTower)
Shear Force =	Shear := 24-kips	(Input From RisaTower)
Axial Force =	Axial := 30-kips	(Input From RisaTower)

Anchor Bolt Data:

Use ASTM A615 Grade 75

Number of Anchor Bolts =	N := 14	(User Input)
Diameter of Bolt Circle =	D _{bc} := 64.0-in	(User Input)
Bolt "Column" Distance =	l := 3.25-in	(User Input)
Bolt Ultimate Strength =	F _u := 100-ksi	(User Input)
Bolt Yield Strength =	F _y := 75-ksi	(User Input)
Bolt Modulus =	E := 29000-ksi	(User Input)
Diameter of Anchor Bolts =	D := 2.25-in	(User Input)
Threads per Inch =	n := 4.5	(User Input)

Base Plate Data:

Use ASTM A572 Mod 60

Plate Yield Strength =	F _{ybp} := 60-ksi	(User Input)
Base Plate Thickness =	t _{bp} := 1.75-in	(User Input)
Base Plate Diameter =	D _{bp} := 70.0-in	(User Input)
Outer Pole Diameter =	D _{pole} := 55.0-in	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

Radius of Bolt Circle =: $R_{bc} := \frac{D_{bc}}{2} = 32\text{-in}$

Distance to Bolts = $i := 1..N$

$$d_i := \begin{cases} \theta \leftarrow 2\pi \cdot \left(\frac{i}{N}\right) \\ d \leftarrow R_{bc} \cdot \sin(\theta) \end{cases}$$

$d_1 = 13.88\text{-in}$	$d_7 = 0.00\text{-in}$
$d_2 = 25.02\text{-in}$	$d_8 = -13.88\text{-in}$
$d_3 = 31.20\text{-in}$	$d_9 = -25.02\text{-in}$
$d_4 = 31.20\text{-in}$	$d_{10} = -31.20\text{-in}$
$d_5 = 25.02\text{-in}$	$d_{11} = -31.20\text{-in}$
$d_6 = 13.88\text{-in}$	etc.

Critical Distances For Bending in Plate:

Outer Pole Radius = $R_{pole} := \frac{D_{pole}}{2} = 27.5\text{-in}$

Moment Arms of Bolts about Neutral Axis = $MA_i := \text{if}(d_i \geq R_{pole}, d_i - R_{pole}, 0\text{in})$

$MA_1 = 0.00\text{-in}$	$MA_7 = 0.00\text{-in}$
$MA_2 = 0.00\text{-in}$	$MA_8 = 0.00\text{-in}$
$MA_3 = 3.70\text{-in}$	$MA_9 = 0.00\text{-in}$
$MA_4 = 3.70\text{-in}$	$MA_{10} = 0.00\text{-in}$
$MA_5 = 0.00\text{-in}$	$MA_{11} = 0.00\text{-in}$
$MA_6 = 0.00\text{-in}$	etc

Effective Width of Baseplate for Bending =

$$B_{eff} := .85 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2} = 36.8\text{-in}$$

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Polar Moment of Inertia =

$$I_p := \sum_i (d_i)^2 = 7.168 \times 10^3 \cdot \text{in}^2$$

Gross Area of Bolt =

$$A_g := \frac{\pi}{4} \cdot D^2 = 3.976 \cdot \text{in}^2$$

Net Area of Bolt =

$$A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot \text{in}}{n} \right)^2 = 3.248 \cdot \text{in}^2$$

Net Diameter =

$$D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 2.033 \cdot \text{in}$$

Radius of Gyration of Bolt =

$$r := \frac{D_n}{4} = 0.508 \cdot \text{in}$$

Section Modulus of Bolt =

$$S_x := \frac{\pi \cdot D_n^3}{32} = 0.826 \cdot \text{in}^3$$

Check Anchor Bolt Tension Force:

Maximum Tensile Force =

$$T_{\text{Max}} := \text{OM} \cdot \frac{R_{bc}}{I_p} - \frac{\text{Axial}}{N} = 138.3 \cdot \text{kips}$$

Allowable Tensile Force =

$$T_{\text{ALL.Gross}} := 1.333 \cdot (0.33 \cdot A_g \cdot F_u) = 174.9 \cdot \text{kips} \quad (1.333 \text{ increase allowed per TIA/EIA})$$

$$T_{\text{ALL.Net}} := 1.333 \cdot (0.60 \cdot A_n \cdot F_y) = 194.812 \cdot \text{kips} \quad (1.333 \text{ increase allowed per TIA/EIA})$$

Bolt Tension % of Capacity =

$$\frac{T_{\text{Max}}}{T_{\text{ALL.Net}}} = 71.0\% \quad \text{Bolts are "upset bolts". Use net area per AISC}$$

Condition1 =

$$\text{Condition1} := \text{if} \left(\frac{T_{\text{Max}}}{T_{\text{ALL.Net}}} \leq 1.00, \text{"OK"}, \text{"Overstressed"} \right)$$

Condition1 = "OK"

Check Anchor Bolt Bending Stress:

Maximum Bending Moment =

$$M_x := \left(\frac{\text{Shear}}{N} \right) \cdot l = 0.464 \cdot \text{ft-kips}$$

Maximum Bending Stress =

$$f_{bx} := \frac{M_x}{S_x} = 6.7 \cdot \text{ksi}$$

Allowable Bending Stress =

$$F_{bx} := 1.333 \cdot 0.6 \cdot F_y = 60 \cdot \text{ksi} \quad (1.333 \text{ increase allowed per TIA/EIA})$$

Check Combined Stress Requirement:

Per ASCE Manual 72: "If the clearance between the base plate and concrete does not exceed two times the bolt diameter a bending stress analysis of the bolts is NOT normally required."

$$l := \begin{cases} l & \text{if } l > 2 \cdot D_n = 0 \text{ in} \\ 0 & \text{otherwise} \end{cases}$$

$$f_{bx} := \begin{cases} f_{bx} & \text{if } l > 2 \cdot D_n = 0 \text{ ksi} \\ 0 & \text{otherwise} \end{cases}$$

Check Anchor Bolt Compression/Combined Stress:

Maximum Compressive Force =

$$C_{Max} := OM \cdot \frac{R_{bc}}{l_p} + \frac{Axial}{N} = 142.6 \text{ kips}$$

Maximum Compressive Stress =

$$f_a := \frac{C_{Max}}{A_n} = 43.9 \text{ ksi}$$

$$K := 0.65$$

$$C_c := \sqrt{\frac{2 \cdot \pi^2 \cdot E}{F_y}} = 87.364$$

$$F_a := \begin{cases} \frac{\left[1 - \frac{\left(\frac{K \cdot l}{r} \right)^2}{2 \cdot C_c^2} \right] \cdot F_y}{\frac{5}{3} + \frac{3 \cdot \left(\frac{K \cdot l}{r} \right)}{8 \cdot C_c} - \frac{\left(\frac{K \cdot l}{r} \right)^3}{8 \cdot C_c^3}} & \text{if } \frac{K \cdot l}{r} \leq C_c = 45 \text{ ksi} \\ \frac{12 \cdot \pi^2 \cdot E}{23 \cdot \left(\frac{K \cdot l}{r} \right)^2} & \text{if } \frac{K \cdot l}{r} > C_c \end{cases}$$

Allowable Compressive Stress =

$$F_a := 1.333 \cdot F_a = 60 \text{ ksi} \quad (1.333 \text{ increase allowed per TIA/EIA})$$

Combined Stress % of Capacity =

$$\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} \right) = 73.2 \%$$

Condition 2 =

$$\text{Condition2} := \text{if } \left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} \leq 1.00, \text{"OK"}, \text{"Overstressed"} \right)$$

Condition2 = "OK"

Subject:

Anchor Bolt and Baseplate Analysis

Location:

145-ft EEI Monopole
 Barkhamsted, CT

Rev. 1: 10/31/12

Prepared by: T.J.L. Checked by: C.F.C.
 Job No. 12063.CO32

Base Plate Analysis:

Force from Bolts =

$$C_i := \frac{OM \cdot d_i}{I_p} + \frac{Axial}{N}$$

$$C_1 = 63.1 \cdot \text{kips}$$

$$C_7 = 2.1 \cdot \text{kips}$$

$$C_2 = 111.9 \cdot \text{kips}$$

$$C_8 = -58.8 \cdot \text{kips}$$

$$C_3 = 139.0 \cdot \text{kips}$$

$$C_9 = -107.6 \cdot \text{kips}$$

$$C_4 = 139.0 \cdot \text{kips}$$

$$C_{10} = -134.7 \cdot \text{kips}$$

$$C_5 = 111.9 \cdot \text{kips}$$

$$C_{11} = -134.7 \cdot \text{kips}$$

$$C_6 = 63.1 \cdot \text{kips}$$

etc.

Maximum Bending Stress in Plate =

$$f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{(B_{eff} t_{bp})^2} = 54.7 \cdot \text{ksi}$$

Allowable Bending Stress in Plate =

$$F_{bp} := 1.33 \cdot 0.75 \cdot F_y = 59.9 \cdot \text{ksi}$$

Plate Bending Stress % of Capacity =

$$\frac{f_{bp}}{F_{bp}} = 91.4\%$$

Condition3 =

$$\text{Condition3} := \text{if} \left(\frac{f_{bp}}{F_{bp}} < 1.00, \text{"Ok"}, \text{"Overstressed"} \right)$$

Condition3 = "Ok"

Standard Monopole Foundation:

Input Data:

Tower Data

Overturing Moment =	OM := 2621-ft-kips	(User Input from RISATower)
Shear Force =	Shear := 24-kip	(User Input from RISATower)
Axial Force =	Axial := 30-kip	(User Input from RISATower)
Tower Height =	H _t := 145-ft	(User Input)

Footing Data:

Overall Depth of Footing =	D _f := 8-ft	(User Input)
Length of Pier =	L _p := 5.5-ft	(User Input)
Extension of Pier Above Grade =	L _{pag} := 1-ft	(User Input)
Diameter of Pier =	d _p := 7-ft	(User Input)
Thickness of Footing =	T _f := 3.5-ft	(User Input)
Width of Footing =	W _f := 21.5-ft	(User Input)

Anchor Bolt Data:

Length of Anchor Bolts =	L _{st} := 96-in	(User Input)
Projection of Anchor Bolts Above Pier =	A _{BP} := 12-in	(User Input)
Anchor Bolt Diameter =	d _{anchor} := 2.25-in	(User Input)
Base Plate Bolt Circle =	MP := 64.0-in	(User Input)

Material Properties:

Concrete Compressive Strength =	f _c := 4000-psi	(User Input)
Steel Reinforcement Yield Strength =	f _y := 60000-psi	(User Input)
Anchor Bolt Yield Strength =	f _{ya} := 75000-psi	(User Input)
Internal Friction Angle of Soil =	Φ _s := 30-deg	(User Input)
Allowable Soil Bearing Capacity =	q _s := 8000-psf	(User Input)
Unit Weight of Soil =	γ _{soil} := 100-pcf	(User Input)
Unit Weight of Concrete =	γ _{conc} := 150-pcf	(User Input)
Foundation Bouyancy =	Bouyancy := 0	(User Input) (Yes=1 / No=0)
Depth to Neglect =	n := 0-ft	(User Input)
Cohesion of Clay Type Soil =	c := 0-ksf	(User Input) (Use 0 for Sandy Soil)
Seismic Zone Factor =	Z := 2	(User Input) (UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	μ := 0.45	(User Input)

Subject:

FOUNDATION ANALYSIS

Location:

145-ft EEI Monopole
 Barkhamsted, CT

Rev. 1: 10/31/12

Prepared by: T.J.L. Checked by: C.F.C.
 Job No. 12063.CO32

Pier Reinforcement:

Bar Size =	$BS_{pier} := 8$	(User Input)	
Bar Diameter =	$d_{bpier} := 1.00\text{-in}$	(User Input)	
Number of Bars =	$NB_{pier} := 46$	(User Input)	
Clear Cover of Reinforcement =	$Cvr_{pier} := 3\text{-in}$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Diameter of Tie =	$d_{Tie} := 3\text{-in}$	(User Input)	

Pad Reinforcement:

Bar Size =	$BS_{top} := 8$	(User Input)	(Top of Pad)
Bar Diameter =	$d_{btop} := 1.00\text{-in}$	(User Input)	(Top of Pad)
Number of Bars =	$NB_{top} := 22$	(User Input)	(Top of Pad)
Bar Size =	$BS_{bot} := 8$	(User Input)	(Bottom of Pad)
Bar Diameter =	$d_{bbot} := 1.00\text{-in}$	(User Input)	(Bottom of Pad)
Number of Bars =	$NB_{bot} := 22$	(User Input)	(Bottom of Pad)
Clear Cover of Reinforcement =	$Cvr_{pad} := 3.0\text{-in}$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)

Calculated Factors:

Pier Reinforcement Bar Area =	$A_{bpier} := \frac{\pi \cdot d_{bpier}^2}{4} = 0.785\text{-in}^2$	
Pad Top Reinforcement Bar Area =	$A_{btop} := \frac{\pi \cdot d_{btop}^2}{4} = 0.785\text{-in}^2$	
Pad Bottom Reinforcement Bar Area =	$A_{bbot} := \frac{\pi \cdot d_{bbot}^2}{4} = 0.785\text{-in}^2$	
Coefficient of Lateral Soil Pressure =	$K_p := \frac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 3$	
Load Factor =	$LF := \begin{cases} 1.333 & \text{if } H_t \leq 700\text{-ft} \\ 1.7 & \text{if } H_t \geq 1200\text{-ft} \\ 1.333 + \left(\frac{H_t - 700\text{ft}}{1200\text{ft} - 700\text{ft}} \right) \cdot 0.4 & \text{otherwise} \end{cases}$	= 1.333

Stability of Footing:

Adjusted Concrete Unit Weight =

$$\gamma_c := \text{if}(\text{Bouyancy} = 1, \gamma_{\text{conc}} - 62.4 \text{pcf}, \gamma_{\text{conc}}) = 150 \text{pcf}$$

Adjusted Soil Unit Weight =

$$\gamma_s := \text{if}(\text{Bouyancy} = 1, \gamma_{\text{soil}} - 62.4 \text{pcf}, \gamma_{\text{soil}}) = 100 \text{pcf}$$

Passive Pressure =

$$P_{pn} := K_p \cdot \gamma_s \cdot n + c \cdot 2 \cdot \sqrt{K_p} = 0 \text{ksf}$$

$$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p} = 1.35 \text{ksf}$$

$$P_{top} := \text{if}(n < (D_f - T_f), P_{pt}, P_{pn}) = 1.35 \text{ksf}$$

$$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p} = 2.4 \text{ksf}$$

$$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 1.875 \text{ksf}$$

$$T_p := \text{if}(n < (D_f - T_f), T_f, (D_f - n)) = 3.5$$

$$A_p := W_f \cdot T_p = 75.25$$

Ultimate Shear =

$$S_u := P_{ave} \cdot A_p = 141.094 \text{kip}$$

Weight of Concrete Pad =

$$WT_c := \left[(W_f^2 \cdot T_f) + \frac{d_p^2 \cdot \pi}{4} L_p \right] \cdot \gamma_c = 274.431 \text{kip}$$

Weight of Soil Above Footing =

$$WT_{s1} := \left[\left(W_f^2 - \frac{d_p^2 \cdot \pi}{4} \right) \cdot (L_p - L_{pag} - n) \right] \cdot \gamma_s = 190.69 \text{kip}$$

Weight of Soil Wedge at Back Face =

$$WT_{s2} := \left(\frac{D_f^2 \cdot \tan(\phi_s)}{2} \cdot W_f \right) \cdot \gamma_s = 39.722 \text{kip}$$

Weight of Soil Wedge at back face Corners =

$$WT_{s3} := 2 \cdot \left[(D_f)^3 \cdot \frac{\tan(\phi_s)}{3} \right] \cdot \gamma_s = 19.707 \text{kips}$$

Total Weight =

$$WT_{tot} := WT_c + WT_{s1} + \text{Axial} = 495.125 \text{kip}$$

Resisting Moment =

$$M_r := (WT_{tot}) \cdot \frac{W_f}{2} + S_u \cdot \frac{T_f}{3} + \left[(WT_{s2} + WT_{s3}) \cdot \left(W_f + \frac{D_f \cdot \tan(\phi_s)}{3} \right) \right] = 6856 \text{kip-ft}$$

Overtuning Moment =

$$M_{ot} := OM + \text{Shear} \cdot (L_p + T_f) = 2837 \text{kip-ft}$$

Factor of Safety Actual =

$$FS := \frac{M_r}{M_{ot}} = 2.42$$

Factor of Safety Required =

$$FS_{req} := 2$$

$$\text{OverTurning_Moment_Check} := \text{if}(FS \geq FS_{req}, \text{"Okay"}, \text{"No Good"})$$

$$\text{OverTurning_Moment_Check} = \text{"Okay"}$$

Shear Capacity in Pier:

Shear Resistance of Pier =

$$S_p := \frac{P_{ave} A_p + \mu \cdot W_{T_{tot}}}{FS_{req}} = 181.95 \text{ kips}$$

$$\text{Shear_Check} := \text{if}(S_p > \text{Shear}, \text{"Okay"}, \text{"No Good"})$$

$$\text{Shear_Check} = \text{"Okay"}$$

Bearing Pressure Caused by Footing:

Area of the Mat =

$$A_{mat} := W_f^2 = 462.25$$

Section Modulus of Mat =

$$S := \frac{W_f^3}{6} = 1656.4 \text{ ft}^3$$

Maximum Pressure in Mat =

$$P_{max} := \frac{W_{T_{tot}}}{A_{mat}} + \frac{M_{ot}}{S} = 2.784 \text{ ksf}$$

$$\text{Max_Pressure_Check} := \text{if}(P_{max} < q_s, \text{"Okay"}, \text{"No Good"})$$

$$\text{Max_Pressure_Check} = \text{"Okay"}$$

Minimum Pressure in Mat =

$$P_{min} := \frac{W_{T_{tot}}}{A_{mat}} - \frac{M_{ot}}{S} = -0.642 \text{ ksf}$$

$$\text{Min_Pressure_Check} := \text{if}((P_{min} \geq 0) \cdot (P_{min} < q_s), \text{"Okay"}, \text{"No Good"})$$

$$\text{Min_Pressure_Check} = \text{"No Good"}$$

Distance to Resultant of Pressure Distribution =

$$X_p := \frac{\frac{P_{max}}{P_{max} - P_{min}} \cdot \frac{1}{3}}{W_f} = 5.824$$

Distance to Kern =

$$X_k := \frac{W_f}{6} = 3.583$$

Since Resultant Force is Not in Kern, Area to which Pressure is Applied Must be Reduced.

Eccentricity =

$$e := \frac{M_{ot}}{W_{T_{tot}}} = 5.73$$

Adjusted Soil Pressure =

$$P_a := \frac{2 \cdot W_{T_{tot}}}{3 \cdot W_f \left(\frac{W_f}{2} - e \right)} = 3.058 \text{ ksf}$$

$$q_{adj} := \text{if}(P_{min} < 0, P_a, P_{max}) = 3.058 \text{ ksf}$$

$$\text{Pressure_Check} := \text{if}(q_{adj} < q_s, \text{"Okay"}, \text{"No Good"})$$

$$\text{Pressure_Check} = \text{"Okay"}$$

Concrete Bearing Capacity:

Strength Reduction Factor =

$$\phi_c := 0.65 \quad (\text{ACI-2008 9.3.2.2})$$

Bearing Strength Between Pier and Pad =

$$P_b := \phi_c \cdot 0.85 \cdot f_c \cdot \frac{\pi \cdot d_p^2}{4} = 1.225 \times 10^4 \text{ kips} \quad (\text{ACI-2008 10.14})$$

$$\text{Bearing_Check} := \text{if}(P_b > \text{LF} \cdot \text{Axial}, \text{"Okay"}, \text{"No Good"})$$

$$\text{Bearing_Check} = \text{"Okay"}$$

Shear Strength of Concrete:

Beam Shear:

(Critical section located at a distance d from the face of Pier) (ACI 11.3 1.1)

$$\phi_c := 0.85 \quad (\text{ACI 9.3.2.5})$$

$$d := T_f - \text{Cvr}_{\text{pad}} - d_{\text{bot}}$$

$$d_1 := \frac{W_f}{2} - \frac{d_p}{2}$$

$$d_2 := d_1 - d$$

$$L := \left(\frac{W_f}{2} - e \right) \cdot 3$$

$$\text{Slope} := \text{if} \left(L > W_f, \frac{P_{\text{max}} - P_{\text{min}}}{W_f}, \frac{q_{\text{adj}}}{L} \right)$$

$$V_{\text{req}} := \text{LF} \cdot \left[(q_{\text{adj}} - \text{Slope} \cdot d_1) + \left(\frac{\text{Slope} \cdot d_1}{2} \right) \right] \cdot W_f \cdot d_1$$

$$V_{\text{Avail}} := \phi_c \cdot 2 \cdot \sqrt{f_c \cdot \text{psi}} \cdot W_f \cdot d \quad (\text{ACI-2008 11.2.1.1})$$

$$\text{Beam_Shear_Check} := \text{if}(V_{\text{req}} < V_{\text{Avail}}, \text{"Okay"}, \text{"No Good"})$$

$$\text{Beam_Shear_Check} = \text{"Okay"}$$

Punching Shear:

(Critical Section Located at a distance of d/2 from the face of pier) (ACI 11.11.2)

Critical Perimeter of Punching Shear =

$$b_o := (d_p + d) \cdot \pi = 31.9$$

Area Included Inside Perimeter =

$$A_{bo} := \frac{\pi \cdot (d_p + d)^2}{4} = 81.2$$

Area Outside of Perimeter =

$$A_{\text{out}} := A_{\text{mat}} - A_{bo} = 381.1$$

Subject:

FOUNDATION ANALYSIS

Location:

145-ft EEI Monopole
 Barkhamsted, CT

Rev. 1: 10/31/12

Prepared by: T.J.L. Checked by: C.F.C.
 Job No. 12063.CO32

Guess Value =

$$v_u := 1 \text{ ksf}$$

(From "Foundation Analysis and design", By Joseph Bowles, Eq. 8-9)

Given

$$d^2 + d_p d = \frac{W_{T_{tot}}}{\pi \cdot v_u}$$

$$v_u := \text{Find}(v_u) = 4.9 \cdot \text{ksf}$$

$$V_u := v_u \cdot d \cdot W_f = 333.3 \cdot \text{kips}$$

Required Shear Strength =

$$V_{req} := L F \cdot V_u = 444.3 \cdot \text{kips}$$

Available Shear Strength =

$$V_{Avail} := \phi_c \cdot 4 \cdot \sqrt{f_c \cdot \text{psi}} \cdot b_o \cdot d = 3131.9 \cdot \text{kip} \quad (\text{ACI-2008 11.11.2.1})$$

$$\text{Punching_Shear_Check} := \text{if}(V_{req} < V_{Avail}, \text{"Okay"}, \text{"No Good"})$$

$$\text{Punching_Shear_Check} = \text{"Okay"}$$

Steel Reinforcement in Pad:

Required Reinforcement for Bending:

Strength Reduction Factor =

$$\phi_m := .90$$

(ACI-2008 9.3.2.1)

$$q_b := q_{adj} - d_1 \cdot \text{Slope} = 1.586 \cdot \text{ksf}$$

Maximum Bending at Face of Pier =

$$M_n := \frac{1}{\phi_m} \cdot \left[(q_{adj} - q_b) \cdot \frac{d_1^2}{3} + q_b \cdot \frac{d_1^2}{2} \right] \cdot W_f = 1611.9 \cdot \text{kip-ft}$$

$$\beta := \begin{cases} 0.85 & \text{if } 2500 \cdot \text{psi} \leq f_c \leq 4000 \cdot \text{psi} \\ 0.65 & \text{if } f_c > 8000 \cdot \text{psi} \\ \left[0.85 - \left(\frac{\left(\frac{f_c}{\text{psi}} - 4000 \right)}{1000} \right) \cdot 0.5 \right] & \text{otherwise} \end{cases} = 0.85 \quad (\text{ACI-2008 10.2.7.3})$$

$$R_u := \frac{M_n}{\phi_m \cdot W_f \cdot d^2} = 57.7 \cdot \text{psi}$$

$$\rho := \frac{0.85 \cdot f_c}{f_y} \left(1 - \sqrt{1 - \frac{2 R_u}{0.85 \cdot f_c}} \right) = 0.001$$

$$\rho_{min} := 1.333 \cdot \rho = 0.00129$$

Required Reinforcement for Temperature and Shrinkage:

$$\rho_{sh} := \begin{cases} .0018 & \text{if } f_y \geq 60000 \text{ psi} \\ .0020 & \text{otherwise} \end{cases} \quad (\text{ACI -2008 7.12.2.1})$$

Check Bottom Bars:

$$A_s := \begin{cases} \rho_{min} \cdot W_f \cdot d & \text{if } \rho_{min} > \frac{\rho_{sh}}{2} \\ \rho_{sh} \cdot W_f \cdot \frac{d}{2} & \text{otherwise} \end{cases} = 12.674 \cdot \text{in}^2$$

$$A_{s_{prov}} := A_{bbot} \cdot NB_{bot} = 17.3 \cdot \text{in}^2$$

$$Pad_Reinforcement_Bot := \text{if}(A_{s_{prov}} > A_s, \text{"Okay"}, \text{"No Good"})$$

$$Pad_Reinforcement_Bot = \text{"Okay"}$$

Check top Bars:

$$A_s := \rho_{sh} \left(W_f \cdot \frac{d}{2} \right) = 8.8 \cdot \text{in}^2$$

$$A_{s_{prov}} := A_{btop} \cdot NB_{top} = 17.3 \cdot \text{in}^2$$

$$Pad_Reinforcement_Top := \text{if}(A_{s_{prov}} > A_s, \text{"Okay"}, \text{"No Good"})$$

$$Pad_Reinforcement_Top = \text{"Okay"}$$

Development Length Pad Reinforcement:

Bar Spacing =

$$B_{sPad} := \frac{W_f - 2 \cdot C_{vr_{pad}} - NB_{bot} \cdot d_{bbot}}{NB_{bot} - 1} = 10.95 \cdot \text{in}$$

Spacing or Cover Dimension =

$$c := \text{if} \left(C_{vr_{pad}} < \frac{B_{sPad}}{2}, C_{vr_{pad}}, \frac{B_{sPad}}{2} \right) = 3 \cdot \text{in}$$

Transverse Reinforcement Index =

$$k_{tr} := 0 \quad (\text{ACI-2008 12.2.3})$$

$$L_{dbt} := \frac{3 \cdot f_y \cdot \alpha_{pad} \cdot \beta_{pad} \cdot \gamma_{pad} \cdot \lambda_{pad}}{40 \cdot \sqrt{f_c} \cdot \text{psi} \cdot \frac{c + k_{tr}}{d_{bbot}}} \cdot d_{bbot} = 23.7 \cdot \text{in}$$

Minimum Development Length =

$$L_{dbmin} := 12 \cdot \text{in} \quad (\text{ACI-2008 12.2.1})$$

$$L_{dbtCheck} := \text{if}(L_{dbt} \geq L_{dbmin}, \text{"Use } L_{dbt} \text{"}, \text{"Use } L_{dbmin} \text{"})$$

Available Length in Pad =

$$L_{Pad} := \frac{W_f}{2} - \frac{d_p}{2} - C_{vr_{pad}} = 84 \cdot \text{in}$$

$$L_{pad_Check} := \text{if}(L_{Pad} > L_{dbt}, \text{"Okay"}, \text{"No Good"})$$

$$L_{pad_Check} = \text{"Okay"}$$

Steel Reinforcement in Pier:

Area of Pier =

$$A_p := \frac{\pi \cdot d_p^2}{4} = 5541.77 \cdot \text{in}^2$$

$$A_{smin} := 0.01 \cdot 0.05 \cdot A_p = 2.77 \cdot \text{in}^2 \quad (\text{ACI-2008 10.8.4 \& 10.9.1})$$

$$A_{sprov} := N_{B_{pier}} \cdot A_{B_{pier}} = 36.13 \cdot \text{in}^2$$

$$\text{Steel_Area_Check} := \text{if}(A_{sprov} > A_{smin}, \text{"Okay"}, \text{"No Good"})$$

$$\text{Steel_Area_Check} = \text{"Okay"}$$

Bar Spacing In Pier =

$$B_{sPier} := \frac{d_p \cdot \pi}{N_{B_{pier}}} - d_{B_{pier}} = 4.737 \cdot \text{in}$$

Diameter of Reinforcement Cage =

$$\text{Diam}_{cage} := d_p - 2 \cdot C_{vr_{pier}} = 78 \cdot \text{in}$$

Maximum Moment in Pier =

$$M_p := \left[OM + \text{Shear} \cdot \left(L_p + \frac{A_{BP}}{2} \right) \right] \cdot LF = 44228.9 \cdot \text{in-kips}$$

Pier Check evaluated from outside program and results are listed below;

$$(D \ N \ n \ P_u \ M_{xu}) := \left(d_p, 12 \ N_{B_{pier}} \ B_{s_{pier}} \ \frac{\text{Axial} \cdot 1.333}{\text{kips}} \ \frac{M_p}{\text{in-kips}} \right)$$

$$(D \ N \ n \ P_u \ M_{xu}) = (84 \ 46 \ 8 \ 40 \ 44228.9)$$

$$(\phi P_n \ \phi M_{xn} \ f_{sp} \ \rho) := (0 \ 0 \ 0 \ 0)$$

$$(\phi P_n \ \phi M_{xn} \ f_{sp} \ \rho) := \phi P'_n (D, N, n, P_u, M_{xu})^T$$

$$(\phi P_n \ \phi M_{xn} \ f_{sp} \ \rho) = (63 \ 69649 \ -60 \ 0)$$

$$\text{Axial_Load_Check} := \text{if}(\phi P_n \geq P_u, \text{"Okay"}, \text{"No Good"})$$

$$\text{Axial_Load_Check} = \text{"Okay"}$$

$$\text{Bending_Check} := \text{if}(\phi M_{xn} \geq M_{xu}, \text{"Okay"}, \text{"No Good"})$$

$$\text{Bending_Check} = \text{"Okay"}$$

Development Length Pier Reinforcement:

Available Length in Foundation:

$$L_{\text{pier}} := L_p - C_{\text{vr}}_{\text{pier}} = 63\text{-in}$$

$$L_{\text{pad}} := T_f - C_{\text{vr}}_{\text{pad}} = 39\text{-in}$$

Tension:

(ACI-2008 12.2.3)

Spacing or Cover Dimension =

$$c := \text{if} \left(C_{\text{vr}}_{\text{pier}} < \frac{B_{\text{SPier}}}{2}, C_{\text{vr}}_{\text{pier}}, \frac{B_{\text{SPier}}}{2} \right) = 2.368\text{-in}$$

Transverse Reinforcement =

$$k_{\text{tr}} := 0$$

(ACI-2008 12.2.3)

$$L_{\text{dbt}} := \frac{3 \cdot f_y \cdot \alpha_{\text{pier}} \cdot \beta_{\text{pier}} \cdot \gamma_{\text{pier}} \cdot \lambda_{\text{pier}}}{40 \cdot \sqrt{f_c \cdot \text{psi}} \cdot \left(\frac{c + k_{\text{tr}}}{d_{\text{bpier}}} \right)} \cdot d_{\text{bpier}} = 30.04\text{-in}$$

Minimum Development Length =

Pier reinforcement bars are standard 90 degree hooks
and therefore development in the pad is computed
as follows:

$$L_{\text{dh}} := \frac{1200 \cdot d_{\text{bpier}}}{\sqrt{\frac{f_c}{\text{psi}}}} \cdot .7 = 13.282\text{-in} \quad (\text{ACI } 12.2.1)$$

$$L_{\text{db}} := \max(L_{\text{dbt}}, L_{\text{dbmin}})$$

$$L_{\text{tension_Check}} := \text{if}(L_{\text{pier}} + L_{\text{pad}} > L_{\text{dbt}}, \text{"Okay"}, \text{"No Good"})$$

$$L_{\text{tension_Check}} = \text{"Okay"}$$

Compression:

(ACI-2008 12.3.2)

$$L_{\text{dbc1}} := \frac{.02 \cdot d_{\text{bpier}} \cdot f_y}{\sqrt{f_c \cdot \text{psi}}} = 18.974\text{-in}$$

$$L_{\text{dbmin}} := 0.0003 \cdot \frac{\text{in}^2}{\text{lb}} \cdot (d_{\text{bpier}} \cdot f_y) = 18\text{-in}$$

$$L_{\text{dbc}} := \text{if}(L_{\text{dbc1}} \geq L_{\text{dbmin}}, L_{\text{dbc1}}, L_{\text{dbmin}}) = 18.974\text{-in}$$

$$L_{\text{compression_Check}} := \text{if}(L_{\text{pier}} + L_{\text{pad}} > L_{\text{dbc}}, \text{"Okay"}, \text{"No Good"})$$

$$L_{\text{compression_Check}} = \text{"Okay"}$$

Tie Size and Spacing in Column:

Minimum Tie Size =

$$Tie_{min} := \text{if}(BS_{pier} \leq 10, 3, 4) = 3$$

Used #3 Ties

Seismic Factor =

$$z := \text{if}(Z \leq 2, 1, 0.5) = 1$$

(ACI-2008 21.10.5)

$$s_{lim1} := 16 \cdot d_{bpier} \cdot z = 16 \cdot \text{in}$$

$$s_{lim2} := \frac{48 \cdot d_{Tie}}{8} \cdot z = 18 \cdot \text{in}$$

$$s_{lim3} := D_f \cdot z = 96 \cdot \text{in}$$

$$s_{lim4} := 18 \cdot \text{in}$$

Maximum Spacing =

$$s_{tie} := \min \left(\begin{matrix} s_{lim1} \\ s_{lim2} \\ s_{lim3} \\ s_{lim4} \end{matrix} \right) = 16 \cdot \text{in}$$

Number of Ties Required =

$$n_{tie} := \frac{L_{pier} - 3 \cdot \text{in}}{s_{tie}} + 1 = 4.75$$

Check Anchor Steel Embedment:

Depth Available =

$$D_{ab} := L_{st} - A_{BP} = 7 \cdot \text{ft}$$

Length of Anchor Bolt =

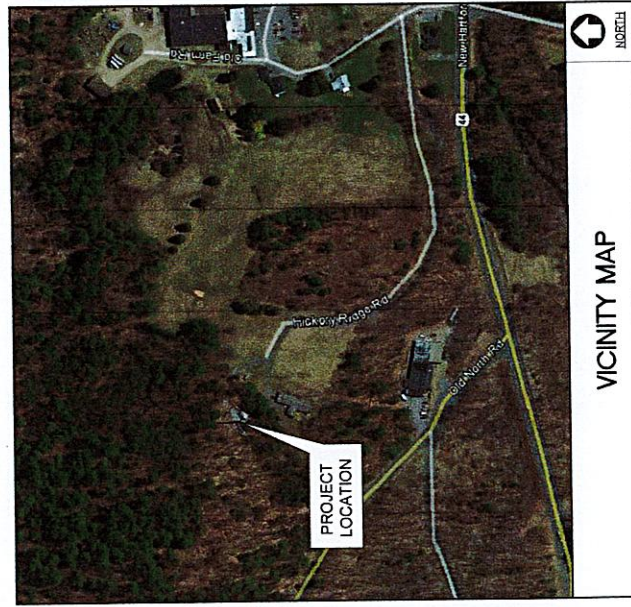
$$L_{anchor} := \frac{(0.11 \cdot f_{ya}) \cdot \text{in}}{\sqrt{f_c \cdot \text{psi}}} = 10.87 \cdot \text{ft}$$

$$\text{Depth_Check} := \text{if}(D_{ab} \geq L_{anchor}, \text{"Okay"}, \text{"No Good"})$$

Depth_Check = "No Good"

Note: Anchor plate is provided

BARKHAMSTED, CT 06063

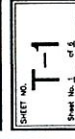


PROJECT SUMMARY

SITE ADDRESS:	5 OLD FARM ROAD BARKHAMSTED, CT 06063
PROJECT COORDINATES:	LAT: 41°-54'-52.272N LON: 73°-1'-20.395W ELEV: ±800' AMSL
TOWER OWNER:	VERIZON WIRELESS 99 E. RIVER DRIVE EAST HARTFORD, CT 06108
VERIZON SITE REF.:	BARKHAMSTED WEST
VERIZON CONTACT:	MARK GAUGER 203.494.0023
AT&T CONTACT:	MARK ROBERTS 860.420.8562
AT&T SITE NUMBER:	CT1186
AT&T SITE NAME:	BARKHAMSTED OLD FARM R
ENGINEER OF RECORD:	CENTEK ENGINEERING, INC. 63-2 NORTH BRANFORD RD BRANFORD, CT 06405
CENTEK CONTACT:	CARLO F. CENTORE, PE 203.488.0580 ext. 122

SHEET INDEX

SHT. NO.	DESCRIPTION	REV.
T-1	TITLE SHEET	0
N-1	DESIGN BASIS & GENERAL NOTES	0
N-2	STRUCTURAL STEEL NOTES	0
M1-1	MODIFICATION INSPECTION REQUIREMENTS	0
S-1	TOWER REINFORCEMENT ELEVATIONS	0
S-2	TOWER REINFORCEMENT DETAILS	0

[illegible]

DESIGN BASIS

1. GOVERNING CODE: 2003 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2005 CT STATE BUILDING CODE AND 2009 AMENDMENTS.

2. TIA/EIA-222-F-1996 "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND ANTENNA SUPPORTING STRUCTURES".

3. DESIGN CRITERIA

WIND LOAD: (TIA/EIA-222-F-1996)

BASIC WIND SPEED (V) = 80 MPH (FASTEST MILE)

WIND LOAD: (2005 CT STATE BUILDING CODE APPENDIX K)
BASIC WIND SPEED (V) = 90 MPH (3-SECOND GUST)
EQUIVALENT TO (V) = 75 MPH (FASTEST MILE)

TIA/EIA-222-F-1996 WIND SPEED CONTROLS

GENERAL NOTES

1. REFER TO STRUCTURAL ANALYSIS AND REINFORCEMENT DESIGN PREPARED BY CENTEK ENGINEERING, INC., FOR AT&T MOBILITY, REVISION #1, DATED 11/29/12.

2. TOWER GEOMETRY AND STRUCTURE MEMBER SIZES WERE OBTAINED FROM THE EEL ORIGINAL TOWER DESIGN DOCUMENTS PREPARED BY ENGINEERED ENDEAVORS INC, PROJECT #13841-E01, DATED DECEMBER 6, 2005.

3. PROVIDE TEMPORARY ANCHORS, GUYING AND/OR BRACING AS REQUIRED TO SAFELY CONDUCT THE WORK.

4. ALL WORK SHALL BE IN ACCORDANCE WITH TIA/EIA-222 REVISION "F" "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND SUPPORTING STRUCTURES".

5. THE TOWER STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER REINFORCEMENTS ARE COMPLETE. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE AND SEQUENCE AND TO INSURE THE SAFETY OF THE TOWER STRUCTURE AND ITS COMPONENT PARTS DURING ERECTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, TEMPORARY BRACING, GUYS OR TIE-DOWNS, WHICH MIGHT BE NECESSARY.

5. THE CONTRACTOR IS SOLELY RESPONSIBLE TO DETERMINE CONSTRUCTION PROCEDURE AND SEQUENCE, AND TO ENSURE THE SAFETY OF THE EXISTING STRUCTURES AND ITS COMPONENT PARTS DURING CONSTRUCTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, BRACING, UNDERPINNING, ETC. THAT MAY BE NECESSARY. MAINTAIN EXISTING SITE OPERATIONS, COORDINATE WORK WITH TOWER OWNER.

6. DRAWINGS INDICATE THE MINIMUM STANDARDS, BUT IF ANY WORK SHOULD BE INDICATED TO BE SUBSTANDARD TO ANY ORDINANCES, LAWS, CODES, RULES, OR REGULATIONS BEARING ON THE WORK, THE CONTRACTOR SHALL INCLUDE IN HIS SCOPE OF WORK AND SHALL EXECUTE THE WORK CORRECTLY IN ACCORDANCE WITH SUCH ORDINANCES, LAWS, CODES, RULES OR REGULATIONS WITH NO INCREASE IN COSTS.

7. THE CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS, ELEVATIONS, ANGLES, AND EXISTING CONDITIONS AT THE SITE, PRIOR TO FABRICATION AND/OR INSTALLATION OF ANY WORK IN THE CONTRACT AREA.

8. ALL DAMAGE CAUSED TO ANY EXISTING STRUCTURE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR WILL BE HELD LIABLE FOR ALL REPAIRS REQUIRED FOR EXISTING STRUCTURES IF DAMAGED DURING CONSTRUCTION ACTIVITIES.

9. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ON-SITE SAFETY FROM THE TIME THE JOB IS AWARDED UNTIL ALL WORK IS COMPLETE AND ACCEPTED BY THE OWNER.

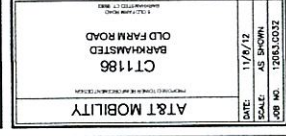
10. CONTRACTOR SHALL TAKE FIELD MEASUREMENTS NECESSARY TO ASSURE PROPER FIT OF ALL FINISHED WORK.

11. TOWER REINFORCING SHALL BE CONDUCTED BY FIELD CREWS EXPERIENCED IN THE ASSEMBLY AND ERECTION OF RADIO ANTENNAS AND SUPPORT STRUCTURES. ALL SAFETY PROCEDURES, RIGGING AND ERECTION METHODS SHALL BE STANDARD TO THE INDUSTRY AND IN COMPLIANCE WITH OSHA.

12. EXISTING COAXIAL CABLES AND ALL ACCESSORIES SHALL BE RELOCATED AS NECESSARY AND REINSTALLED BY THE CONTRACTOR WITHOUT INTERRUPTION IN SERVICE WHERE THEY ARE IN CONFLICT WITH TOWER REINFORCEMENT.

13. IF ANY FIELD CONDITIONS EXIST WHICH PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL PROCEED WITH AFFECTED WORK AFTER CONFLICT IS SATISFACTORILY RESOLVED.

DESIGNED BY:	TAL
DRAWN BY:	TAL
CHECKED BY:	CFC
DATE:	11/29/12
PROJECT:	AT&T MOBILITY
LOCATION:	BARHAMMASTED OLD FARM ROAD
CONTRACT NO.:	CT11186
DATE:	11/29/12
SCALE:	AS SHOWN
JOB NO.:	12093.C0032



STRUCTURAL STEEL

1. ALL STRUCTURAL STEEL IS DESIGNED BY ALLOWABLE STRESS DESIGN (ASD).
 2. MATERIAL SPECIFICATIONS
 - A. STRUCTURAL STEEL (W SHAPES)---ASTM A992 (FY = 50 KSI)
 - B. STRUCTURAL STEEL (OTHER SHAPES)---ASTM A36 (FY = 36 KSI)
 - C. STRUCTURAL STEEL (TOWER REINF. PLATES)---ASTM A572-GR50 (50 KSI)
 - D. STRUCTURAL HSS (RECTANGULAR SHAPES)---ASTM A500 GRADE B, (FY = 46 KSI)
 - E. STRUCTURAL HSS (ROUND SHAPES)---ASTM A500 GRADE B, (FY = 42 KSI)
 - F. PIPE---ASTM A53 GRADE B (FY = 35 KSI)
 3. FASTENER SPECIFICATIONS
 - A. CONNECTION BOLTS---ASTM A325-N, UNLESS OTHERWISE SCHEDULED.
 - B. U-BOLTS---ASTM A307
 - C. ANCHOR RODS---ASTM F1554
 - D. WELDING ELECTRODES---ASTM E70XX FOR A36 & A572-GR50 STEELS; ASTM E80XX FOR A572-GR65 STEEL.
 - E. BLIND BOLTS---ASTM A325 PROPERTY CLASS 8.8 (FU=120 KSI).
 4. CONTRACTOR TO REVIEW ALL SHOP DRAWINGS AND SUBMIT COPY TO ENGINEER FOR APPROVAL. DRAWINGS MUST BEAR THE CHECKER'S INITIALS BEFORE SUBMITTING TO THE ENGINEER FOR REVIEW. SHOP DRAWINGS SHALL INCLUDE THE FOLLOWING: SECTION PROFILES, SIZES, CONNECTION ATTACHMENTS, REINFORCING, ANCHORAGE, SIZE AND TYPE OF FASTENERS AND ACCESSORIES. INCLUDE ERECTION DRAWINGS, ELEVATIONS AND DETAILS.
 5. STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST PROVISIONS OF AISC MANUAL OF STEEL CONSTRUCTION.
 6. PROVIDE ALL PLATES, CLIP ANGLES, CLOSURE PIECES, STRAP ANCHORS, MISCELLANEOUS PIECES AND HOLES REQUIRED TO COMPLETE THE STRUCTURE.
 7. FIT AND SHOP ASSEMBLE FABRICATIONS IN THE LARGEST PRACTICAL SECTIONS FOR DELIVERY TO SITE.
 8. INSTALL FABRICATIONS PLUMB AND LEVEL, ACCURATELY FITTED, AND FREE FROM DISTORTIONS OR DEFECTS.
 9. AFTER ERECTION OF STRUCTURES, TOUCHUP ALL WELDS, ABRASIONS AND NON-GALVANIZED SURFACES WITH A 95% ORGANIC ZINC RICH PAINT IN ACCORDANCE WITH ASTM 780.
10. ALL STEEL MATERIAL (EXPOSED TO WEATHER) SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 "ZINC (HOT DIPPED GALVANIZED) COATINGS" ON IRONS AND STEEL PRODUCTS.
 11. ALL BOLTS, ANCHORS AND MISCELLANEOUS HARDWARE SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153 "ZINC COATING (HOT-DIP) ON IRON AND STEEL HARDWARE".
 12. CONTRACTOR SHALL COMPLY WITH AWS CODE FOR PROCEDURES APPEARANCE AND QUALITY OF WELDS, AND WELDING PROCESSES SHALL BE QUALIFIED IN ACCORDANCE WITH AWS "STANDARD QUALIFICATION PROCEDURES". ALL WELDING SHALL BE DONE USING THE SCHEDULED ELECTRODES AND WELDING SHALL CONFORM TO AISC AND D1.1 WHERE FILLET WELD SIZES ARE NOT SHOWN, PROVIDE THE MINIMUM SIZE PER TABLET J2.4 IN THE AISC "MANUAL OF STEEL CONSTRUCTION" 9TH EDITION. AT THE COMPLETION OF WELDING, ALL DAMAGE TO GALVANIZED COATING SHALL BE REPAIRED.
 13. THE ENGINEER SHALL BE NOTIFIED OF ANY INCORRECTLY FABRICATED, DAMAGED OR OTHERWISE MISFITTING OR NON CONFORMING MATERIALS OR CONDITIONS TO REMEDIAL OR CORRECTIVE ACTION. ANY SUCH ACTION SHALL REQUIRE ENGINEER REVIEW.
 14. CONNECTION ANGLES SHALL HAVE A MINIMUM THICKNESS OF 1/4 INCHES.
 15. STRUCTURAL CONNECTION BOLTS SHALL CONFORM TO ASTM A325. ALL BOLTS SHALL BE 3/4" DIAMETER MINIMUM AND SHALL HAVE A MINIMUM OF TWO BOLTS, UNLESS OTHERWISE ON THE DRAWINGS.
 16. LOCK WASHER ARE NOT PERMITTED FOR A325 BOLTED STEEL ASSEMBLIES.
 17. SHOP CONNECTIONS SHALL BE WELDED OR HIGH STRENGTH BOLTED.
 18. MILL BEARING ENDS OF COLUMNS, STIFFENERS, AND OTHER BEARING SURFACES TO TRANSFER LOAD OVER ENTIRE CROSS SECTION.
 19. FABRICATE BEAMS WITH MILL CAMBER UP.
 20. LEVEL AND PLUMB INDIVIDUAL MEMBERS OF THE STRUCTURE TO AN ACCURACY OF 1:500, BUT NOT TO EXCEED 1/4" IN THE FULL HEIGHT OF THE COLUMN.
 21. COMMENCEMENT OF STRUCTURAL STEEL WORK WITHOUT NOTIFYING THE ENGINEER OF ANY DISCREPANCIES WILL BE CONSIDERED ACCEPTANCE OF PRECEDING WORK.

DESIGNED BY:	TAL	
DRAWN BY:	TAL	
CHECKED BY:	CFZ	
REV	DATE	DESCRIPTION
1	1/23/12	CFZ
2	1/23/12	CFZ
3	1/23/12	CFZ
4	1/23/12	CFZ
5	1/23/12	CFZ
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98	1/23/12	CFZ
99	1/23/12	CFZ
100	1/23/12	CFZ



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BARHAMSTED
OLD FARM ROAD
BARHAMSTED, CT 06020

DATE: 11/8/12
SCALE: AS SHOWN
JOB NO.: 120430032

STRUCTURAL
STEEL
NOTES

SHEET NO.
N-2
Sheet No. 2 of 4

MODIFICATION INSPECTION REPORT REQUIREMENTS

PRE-CONSTRUCTION			DURING CONSTRUCTION			POST-CONSTRUCTION		
SCHEDULED ITEM	REPORT ITEM	SCHEDULED ITEM	REPORT ITEM	SCHEDULED ITEM	REPORT ITEM	SCHEDULED ITEM	REPORT ITEM	
X	FOR MODIFICATION INSPECTION DRAWING	-	FOUNDATIONS	-		X	MODIFICATION INSPECTOR RECORD REDLINE DRAWING	
X	FOR APPROVED SHOP DRAWINGS	-	EARTHWORK: BACKFILL MATERIAL & COMPACTION	-		-	POST-INSTALLED ANCHOR ROD PULL-OUT TEST	
-	FOR APPROVED POST-INSTALLED ANCHOR MPII	-	CONCRETE TESTING	-		X	PHOTOGRAPHS	
-	FABRICATION INSPECTION	X	STEEL INSPECTION	-				
-	FABRICATOR CERTIFIED WELDER INSPECTION	-	POST INSTALLED ANCHOR ROD VERIFICATION	-				
X	MATERIAL CERTIFICATIONS	-	BASE PLATE GROUT VERIFICATION	-				
		-	CONTRACTOR'S CERTIFIED WELD INSPECTION	-				
		X	ON-SITE COLD GALVANIZING VERIFICATION	-				
		-	GUY WIRE TENSION REPORT	-				
		X	CONTRACTOR AS-BUILT REDLINE DRAWINGS	-				

GENERAL

- THE MODIFICATION INSPECTION IS A VISUAL INSPECTION OF STRUCTURAL MODIFICATIONS, TO INCLUDE A REVIEW AND COMPIATION OF SPECIFIED SUBMITTALS AND CONSTRUCTION INSPECTIONS, AS AN ASSURANCE OF COMPLIANCE WITH THE CONSTRUCTION DOCUMENTS PREPARED UNDER THE DIRECTION OF THE ENGINEER OF RECORD (EOR).
- THE MODIFICATION INSPECTION IS TO CONFIRM INSTALLATION CONFIGURATION AND GENERAL WORKMANSHIP AND IS NOT A REVIEW OF THE MODIFICATION DESIGN. OWNERSHIP OF THE MODIFICATION DESIGN EFFECTIVENESS AND INTENT RESIDES WITH THE ENGINEER OF RECORD.
- TO ENSURE COMPLIANCE WITH THE MODIFICATION INSPECTION REQUIREMENTS THE GENERAL CONTRACTOR (GC) AND THE MODIFICATION INSPECTOR (MI) COMMENCE COMMUNICATION UPON AUTHORIZATION TO PROCEED BY THE CLIENT. EACH PARTY SHALL BE PROACTIVE IN CONTACTING THE OTHER. THE EOR SHALL BE CONTACTED IF SPECIFIC GC/MI CONTACT INFORMATION IS NOT MADE AVAILABLE.
- THE GC SHALL PROVIDE THE MI WITH A MINIMUM OF 5 BUSINESS DAYS NOTICE OF IMPENDING INSPECTIONS.
- WHEN POSSIBLE, THE GC AND MI SHALL BE ON SITE DURING THE MODIFICATION INSPECTION TO HAVE ANY NOTED DEFICIENCIES ADDRESSED DURING THE INITIAL MODIFICATION INSPECTION.

MODIFICATION INSPECTOR (MI)

- THE MI SHALL CONTACT THE GC UPON AUTHORIZATION BY THE CLIENT TO:
 - REVIEW THE MODIFICATION INSPECTION REPORT REQUIREMENTS.
 - WORK WITH THE GC IN DEVELOPMENT OF A SCHEDULE FOR ON-SITE INSPECTIONS.
 - DISCUSS CRITICAL INSPECTIONS AND PROJECT CONCERNS.
- THE MI IS RESPONSIBLE FOR COLLECTION OF ALL INSPECTION AND TEST REPORTS, REVIEWING REPORTS FOR ADHERENCE TO THE CONTRACT DOCUMENTS, CONDUCTING ON-SITE INSPECTIONS AND COMPIATION & SUBMISSION OF THE MODIFICATION INSPECTION REPORT TO THE CLIENT AND THE EOR.

GENERAL CONTRACTOR (GC)

- THE GC IS REQUIRED TO CONTACT THE GC UPON AUTHORIZATION TO PROCEED WITH CONSTRUCTION BY THE CLIENT TO:
 - REVIEW THE MODIFICATION INSPECTION REPORT REQUIREMENTS.
 - WORK WITH THE MI IN DEVELOPMENT OF A SCHEDULE FOR ON-SITE INSPECTIONS.
 - DISCUSS CRITICAL INSPECTIONS AND PROJECT CONCERNS.
- THE GC IS RESPONSIBLE FOR COORDINATING AND SCHEDULING IN ADVANCE ALL REQUIRED INSPECTIONS AND TESTS WITH THE MI.

CORRECTION OF FAILING MODIFICATION INSPECTION

- SHOULD THE STRUCTURAL MODIFICATION NOT COMPLY WITH THE REQUIREMENTS OF THE CONSTRUCTION DOCUMENTS, THE GC SHALL WORK WITH THE MODIFICATION INSPECTOR IN A VIABLE REMEDIATION PLAN AS FOLLOWS:
 - CORRECT ALL DEFICIENCIES TO COMPLY WITH THE CONTRACT DOCUMENTS AND COORDINATE WITH THE MI FOR A FOLLOW UP INSPECTION.
 - WITH CLIENT AUTHORIZATION, THE GC MAY WORK WITH THE EOR TO REANALYZE THE MODIFICATION USING THE AS-BUILT CONDITION.

REQUIRED PHOTOGRAPHS

- THE GC AND MI SHALL AT MINIMUM PHOTO DOCUMENT THE FOLLOWING FOR INCLUSION IN THE MODIFICATION INSPECTION REPORT:
 - PRE-CONSTRUCTION: GENERAL CONDITION OF THE SITE.
 - DURING CONSTRUCTION: RAW MATERIALS, CRITICAL DETAILS, WELD PREPARATION, BOLT INSTALLATION & TORQUE, FINAL INSTALLED CONDITION & SURFACE COATING REPAIRS.
 - POST-CONSTRUCTION: FINAL CONDITION OF THE SITE

DESIGNED BY:	TAL
DRAWN BY:	TAL
CHECKED BY:	CFC



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 OLD FARM ROAD
 BARKHAMSTEAD
 DATE: 11/9/12
 SCALE: AS SHOWN
 JOB NO: 12083.0232

MODIFICATION INSPECTION REQUIREMENTS

SHEET NO. **MI-1**
 Sheet No. 1 of 1

AM-X-CD-14-65-00T-RET (4' 65° Dual Broadband Antenna)

Dual Band Electrical DownTilt Antenna

698 ~ 894MHz, X-pol., H65° / V17.0°

1710 ~ 2170MHz, X-pol., H65° / V8.5°

Electrical Specification

Frequency Range	698~894MHz	1710~2170MHz
Impedance	50Ω	
Polarization	Dual, Slant ±45°	
Gain	14.0dBi / 11.85dBd @ 698-806MHz 14.8dBi / 12.65dBd @ 824-894MHz	16.1dBi / 13.95dBd @ 1710-1755MHz 16.3dBi / 14.15dBd @ 1850-1900MHz 16.0dBi / 13.85dBd @ 2110-2155MHz
Beamwidth	Horizontal	67° @ 698-806MHz 65° @ 824-894MHz
	Vertical	60° @ 1710-1755MHz 61° @ 1850-1900MHz 64° @ 2110-2155MHz
Beamwidth	Horizontal	17.5° @ 698-806MHz 16.5° @ 824-894MHz
	Vertical	8.8° @ 1710-1755MHz 8.5° @ 1850-1900MHz 8.0° @ 2110-2155MHz
VSWR	≤1.5:1	
Front-to-Back Ratio	≥28 dB	
Electrical Downtilt Range	2° ~ 16°	0° ~ 10°
Isolation Between Ports	≥30 dB	
Isolation Between Ports of Different Frequency Elements	≥35 dB	
Cross Pole Discrimination	10.0 dB @ ±60° 15.0 dBi @ 0°	
First Upper Side Lobe Suppression	16dB	
Side Lobe Suppression	> 16 dB @ 0-6° Tilt > 18 dB @ 7-12° Tilt (Up to 15° from Boresight)	> 16 dB @ 0-6° Tilt > 18 dB @ 7-10° Tilt (Up to 15° from Boresight)
Passive Intermodulation	≤ -150 dBc @ 2x20w	
Input Maximum CW Power	500 W	300 W
Environmental Compliance	IP65 for Radome IP67 for Connectors	
RET Motor Configuration	Field Replaceable RET Electronic Control Module / RET Motor is internal to antenna & not field replaceable	
Compliant with AISG 1.1 and 2.0	AISG 1.1 and 2.0	

Mechanical Specification

Dimension (W×D×H)	11.8×5.9×48 inches (300×150×1219mm)
Weight (Without clamp)	36.4 lbs (16.5 kg)
Connector	4 x 7/16 DIN(F), Long Neck
Max Wind Speed	150 mph
Wind Load (@150 mph)	1260 N

AM-X-CD-16-65-00T-RET(6' 65° Dual Broadband Antenna)

Dual Band Electrical DownTilt Antenna

698 ~ 894MHz, X-pol., H65° / V12°

1710 ~ 2170MHz, X-pol., H65° / V6.0°

Electrical Specification

Frequency Range	698~894MHz	1710~2170MHz
Impedance	50Ω	
Polarization	Dual, Slant ±45°	
Gain	15.5dBi / 13.35dBd @ 698-806MHz 16.0dBi / 13.85dBd @ 824-894MHz	17.3dBi / 15.15dBd @ 1710-1755MHz 17.4dBi / 15.25dBd @ 1850-1900MHz 17.1dBi / 14.95dBd @ 2110-2155MHz
Beamwidth	Horizontal	65° @ 698-806MHz 63° @ 824-894MHz
	Vertical	65° @ 1710-1755MHz 67° @ 1850-1900MHz 69° @ 2110-2155MHz
Beamwidth	Horizontal	12.3° @ 698-806MHz 11.5° @ 824-894MHz
	Vertical	6.5° @ 1710-1755MHz 6.0° @ 1850-1900MHz 5.7° @ 2110-2155MHz
VSWR	≤1.5:1	
Front-to-Back Ratio	≥27 dB	
Electrical Downtilt Range	2° ~ 16°	0° ~ 10°
Isolation Between Ports	≥30 dB	
Isolation Between Ports of Different Frequency Elements	≥35 dB	
Cross Pole Discrimination	10.0 dB @ ±60°	
	15.0 dBi @ 0°	
First Upper Side Lobe Suppression	16dB	
Side Lobe Suppression	> 16 dB @ 0-6° Tilt > 18 dB @ 7-12° Tilt (Up to 10° from Boresight)	> 16 dB @ 0-6° Tilt > 18 dB @ 7-10° Tilt (Up to 10° from Boresight)
	≤ -150 dBc @ 2x20w	
Passive Intermodulation	≤ -150 dBc @ 2x20w	
Input Maximum CW Power	500 W	300 W
Environmental Compliance	IP65 for Radome IP67 for Connectors	
RET Motor Configuration	Field Replaceable RET Electronic Control Module / RET Motor is internal to antenna & not field replaceable	
Compliant with AISG 1.1 and 2.0	AISG 1.1 and 2.0	

Mechanical Specification

Dimension (W×D×H)	11.8×5.9×72 inches (300×150×1829mm)
Weight (Without clamp)	48.5 lbs (22.0 kg)
Connector	4 x 7/16 DIN(F), Long Neck
Max Wind Speed	150 mph
Wind Load (@150 mph)	1891 N

RRUS 11

Frequency (AT&T)

- ✓ Band 12 (Lower 700 MHz)
- ✓ Band 4 (AWS, 17/2100 MHz) — 2Q2011

RF Characteristics

- ✓ Output power: 2x30 Watts
- ✓ 2x2 MIMO Capable
- ✓ IBW of 20 MHz
- ✓ Rx Sens.: Better than -105 dBm (5 MHz)

RET/TMA Support

- ✓ AISG 2.0 Compatible
- ✓ Via RET Port and Centre Conductor
- ✓ Cascading
- ✓ 30 VDC Bias

Environmental

- ✓ Self Convection
- ✓ Temperature -40 to 131 F

Power

- ✓ Input voltage: -48 VDC or AC (exemption)
- ✓ Fuse size: 13 – 32 A
 - Recommended: 25 A
- ✓ Power Consumption:
 - Typical 200 Watts
 - Max 310 Watts
 - Excl. RET and TMA load



RRUS 11 Mechanics

Wall and pole mounting brackets

- Reused from RRUW and RRU22
- Vertical Mount Only

Clearing distances:

- Above ≥ 16 in.
- Below ≥ 12 in.
- Side ≥ 0 mm

DC connector

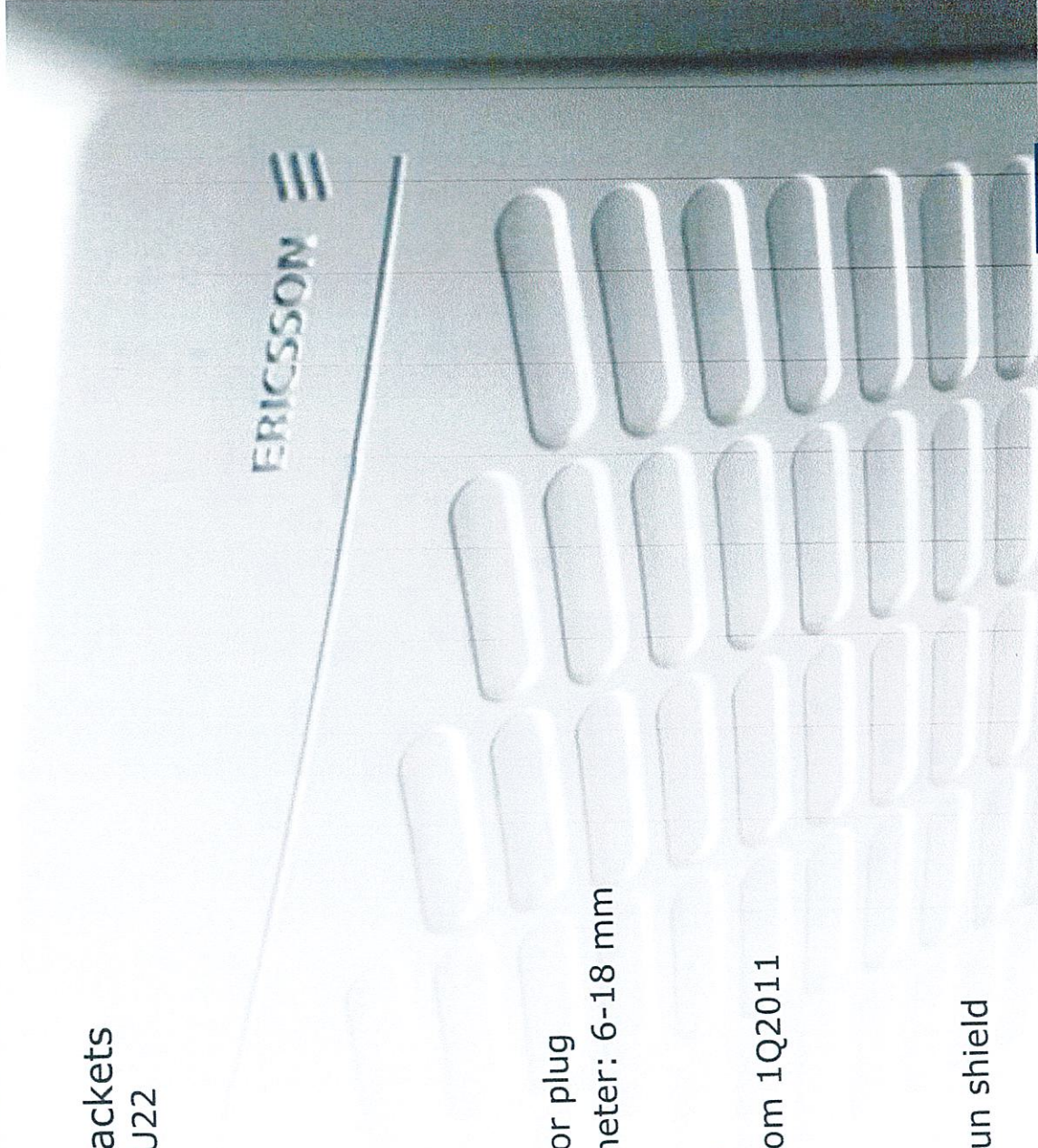
- Bayonet
- Screw terminals in connector plug
- Supported outer cable diameter: 6-18 mm

CPRI connector

- LCD with proprietary cover
- Separate cover available from 1Q2011

Size & Weight

- Band 4: 44 lbs
- Band 12: 50 lbs
- 17.8" x 17.3" x 7.2" incl. sun shield



POWER

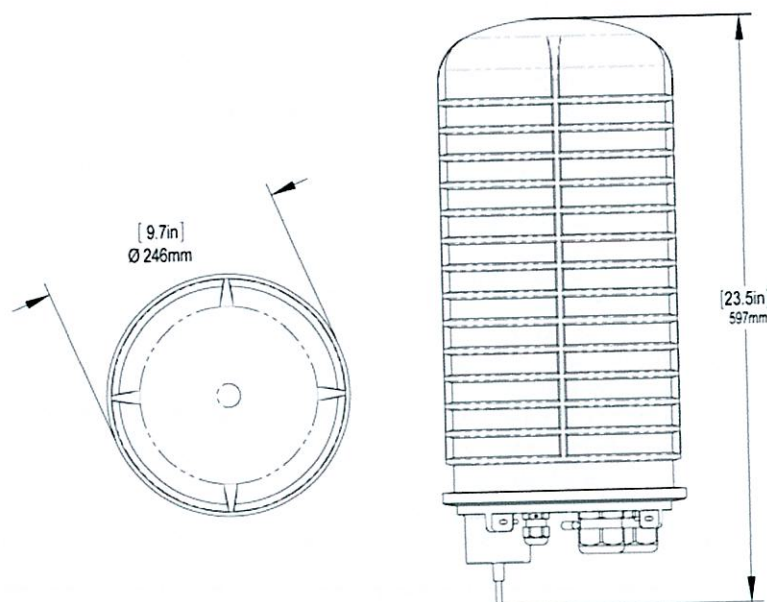
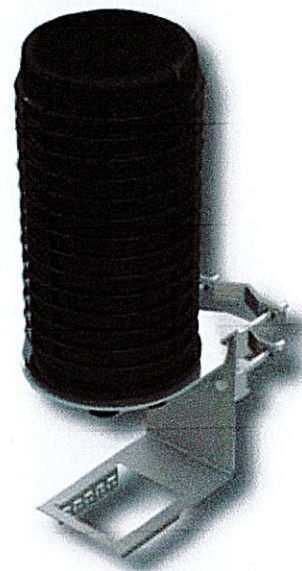
DC6-48-60-18-8F

DC Surge Suppression Solution

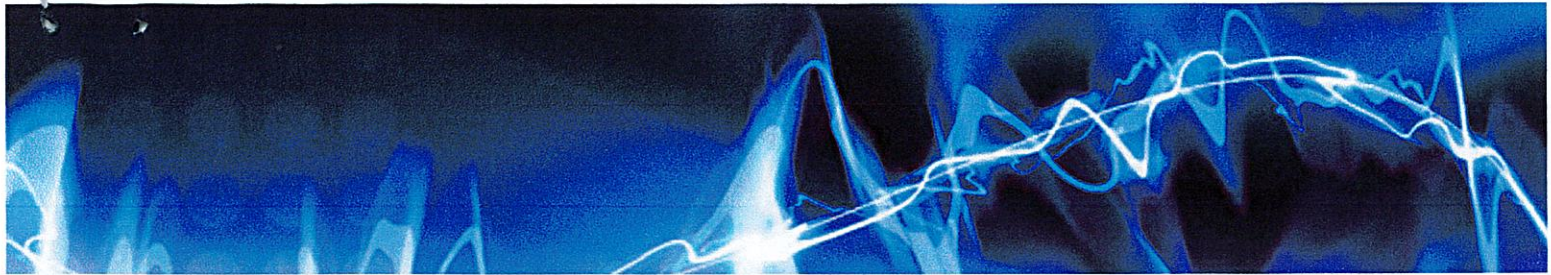
The DC6-48-60-18 is a dual chambered, DC surge suppression system for use in multi-circuit, Distributed Antenna Systems. The system will protect up to 6 Remote Radio Heads from voltage surges and lightning, and connect up to 18 fiber pairs. The system is enclosed in a NEMA 4 rated, waterproof enclosure.

FEATURES

- Protects up to 6 Remote Radio Heads, each with its own protection circuit.
- Flexible design allows for installation at the top of a tower for Remote Radio Head protection.
- Includes fiber connections for up to 18 pairs of fiber.
- LED indicators on individual circuits provide visual indication of suppressor status.
- Form 'C' relays allow for remote monitoring of the suppressor status.
- Patented Strikesorb technology provides over 60 kA of surge current capacity per circuit.
- Strikesorb suppression modules are fully recognized to UL 1449-3rd Edition Safety Standard, meeting all intermediate and high current fault requirements to facilitate use in OEM applications.
- Raycap recommends that DC protection system be installed within 2 meters or 6 feet of the radio.
- Dome design is lightweight and aerodynamic providing maximum flexibility for installation on top of towers.



Raycap



DC6-48-60-18-8F

DC Power Surge Protection

Electrical Specifications	
Model Number	DC6-48-60-18-8F
Nominal Operating Voltage	48 VDC
Nominal Discharge Current (I_n)	20 kA 8/20 μ s
Maximum Discharge Current (I_{max}) per NEMA LS-1	60 kA 8/20 μ s
Maximum Continuous Operating Voltage (U_c)	75 VDC
Voltage Protection Rating	400 V

Mechanical Specifications	
Suppression Connection Method	Compression lug, #2-#14 AWG Copper, #2-#12 Aluminum
Fiber Connection Method	LC-LC Single mode duplex
Environmental Rating	IP 68, 7m 72hrs
Operating Temperature	-40° C to + 80° C
Storage Temperature	-70° C to + 80° C
Cold Temperature Cycling	IEC 61300-2-22e -30° C to + 60° C 200 hrs @ 5 psi
Resistance to Aggressive Materials	CEI IEC 61073-2 including acids and bases
UV Protection	ISO 4892-2 Method A Xenon-Arc 2160 hrs
Weight	20 lbs without Mounting Bracket

STANDARDS

Strikesorb modules are compliant to the following Surge Protection Device (SPD) Standards:

- ANSI/UL 1449 - 3rd Edition
- IEEE C62.41
- NEMA LS-1, IEC 61643-1:2005 2nd Edition:2005
- IEC 61643-12
- EN 61643-11:2002 (including A11:2007)



Raycap

G02-00-068 REV 050610



GS-07F-0435V



Certified to
ISO 9001:2000



TUV Rheinland
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