STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

RE: PETITION BY T-MOBILE NORTHEAST LLC FOR A DECLARATORY RULING THAT NO CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED IS REQUIRED TO MODIFY THE TELECOMMUNICATIONS FACILITY AT 191 MIDDLE HADDAM ROAD IN THE TOWN OF PORTLAND, CONNECTICUT

PETITION NO. _____

Date: December 1, 2014

PETITION FOR DECLARATORY RULING

Pursuant to General Statutes § 16-50g *et seq.* and § 16-50j-1 *et seq.* of the Regulations of Connecticut State Agencies, T-Mobile Northeast LLC ("T-Mobile") submits this Petition for a Declaratory Ruling ("Petition") for a determination that T-Mobile does not require a Certificate of Environmental Compatibility and Public Need ("Certificate") for the modification of the wireless telecommunications facility at 191 Middle Haddam Road, in the Town of Portland ("Portland Facility" or "Facility"). T-Mobile respectfully requests that the Connecticut Siting Council ("Council") issue a declaratory ruling that the modified Portland Facility would not have a substantial adverse impact on the environment and, accordingly, T-Mobile does not need to obtain a Certificate for the modifications to the Portland Facility.

II. BACKGROUND INFORMATION

A. The Applicant

T-Mobile is a limited liability company, organized under the laws of Delaware, with a Connecticut office at 35 Griffin Road South, Bloomfield, Connecticut 06002. The

company and its affiliated entities are licensed by the Federal Communications Commission ("FCC") to construct and operate a personal wireless services system in Connecticut, which has been interpreted as a "cellular system" within the meaning of General Statutes § 16-50i (a) (6). T-Mobile does not conduct any other business in the State of Connecticut other than the provision of cellular services under FCC rules and regulations.

Correspondence and/or communications regarding this Petition should be addressed to the attorney for the Applicant:

Cohen and Wolf, P.C.
1115 Broad Street
Bridgeport, CT 06604
Telephone: (203) 368-0211
Attention: Julie D. Kohler, Esq.

B. The Portland Facility

In Docket No. 206, the Council issued a Certificate to Crown Atlantic Company LLC and Cellco Partnership d/b/a Verizon Wireless for the construction, maintenance and operation of a 130 foot tower facility at 191 Middle Haddam Road, Portland Connecticut. Subsequently, in Petition No. 806 the Council approved T-Mobile's request for a 10 foot extension to the Portland Facility, bringing the height of the Facility to 140 feet.[1] Docket No. 206 Decision and Order and Petition No. 806 are attached hereto as Exhibit A.

[1] The Petition No. 806 staff report indicates that "(t)he top of the tower with the proposed extension and antennas would not exceed 140 feet agl".

II. PROPOSED MODIFICATIONS TO THE PORTLAND FACILITY

T-Mobile seeks to modify the existing Portland Facility by:

- Adding three (3) antennas at a centerline of 139 feet;
- Adding an equipment cabinet and three (3) RRUS (remote radio units) on a proposed H-frame;
- Replacing one (1) of its equipment cabinets on an existing concrete pad within the compound area near the base of the structure; and
- Installing coax cables and reusing existing coax cables.

Plans (revised to October 28, 2014) detailing these proposed modifications are attached hereto as Exhibit B.

The majority of proposed modifications to this Facility qualify for acknowledgement as an exempt modification. However, as the proposed antennas must be located at a centerline of 139 feet, the top of the antennas will extend slightly (approximately 3 feet) above the top of the tower. The top of the antenna will be at a height of 143 feet and 1 inch AGL. Although this is not a substantial change, it is a deviation from the Petition No. 806 approval and T-Mobile seeks a Petition to allow for minor increase in antenna height.[2]

III. STATEMENT OF NEED

The Facility is an integral component of T-Mobile's wireless network in the Portland and the surrounding area. It is imperative that T-Mobile upgrade its antennas

[2] T-Mobile also seeks approval of the other proposed facility modifications identified in Section II.

and equipment so that it may provide improved wireless services to people living in and traveling through this area of the State.

T-Mobile has acquired 700 MHz wireless spectrum in Connecticut to improve the service provided to customers. As T-Mobile's current spectrum deployment is in the PCS (1900 MHz) and AWS (2100 MHz) bands, this new spectrum provides an opportunity to significantly improve coverage for wireless subscribers throughout the area. The 700 MHz spectrum is primarily intended to improve in-building coverage for voice and E911 services. The 700 MHz spectrum has a better ability to penetrate building structures so it will provide superior coverage and will now become the priority use of spectrum for customers that attempt to utilize their phones in poorly covered areas.

As part of this new deployment, T-Mobile has chosen to use the best antennas available so that the best possible service can be provided to customers. The proposed antennas have a gain of 16.7 dBi, which is 1 dB more than a shorter model. This additional gain allows each existing antenna installation to provide the absolute maximum possible coverage from that location. The incremental coverage from each site will provide additional in-building coverage to residents in the area and will ensure fewer areas are out of coverage. Ensuring maximum possible coverage will provide voice service to more customers and provides the ability for E911 services to more area. It will also minimize the need to build additional facilities in the town.

To summarize, the antenna type and length does provide a significant amount of additional coverage that is necessary to implement the full utilization of this T-Mobile

installation, which will then provide better voice coverage and E911 services to residents.

IV. THE PROPOSED MODIFICATIONS WILL NOT HAVE A SUBSTANTIAL ADVERSE ENVIRONMENTAL EFFECT

As indicated above, the only reason this proposed modification is being filed as a Petition is the slight extension of the antennas above the top of the tower. These antennas will only extend approximately 3 feet above the top of the tower. This de minimus modification will not result in an adverse environmental effect. The remainder of the proposed site modifications fall within the exempt modifications criteria, so by regulation have been established to not have a substantial adverse environmental effect.

A. No Site Impacts

T-Mobile is already collocated on this Facility and it seeks to install a necessary equipment upgrade. The proposed modifications would be situated on the existing structure and compound area, without any additional disturbance to the Property or surrounding area. T-Mobile does not propose any generators or HVAC units. Accordingly, the proposed modifications to the Facility would not have a significant adverse impact on the environment.

B. Compliance with MPE Limits

The operation of the proposed antennas will not increase the total radio frequency (RF) power density, measured at the base of the tower, to a level at or above

the applicable standard. According to a Radio Frequency Emissions Analysis Report prepared by EBI Consulting dated October 16, 2014 T-Mobile's operations would add 5.16% of the FCC Standard. Therefore, the calculated "worst case" power density for the planned combined operation at the site including all of the proposed antennas would be 53.92% of the FCC Standard as calculated for a mixed frequency site as evidenced by the engineering exhibit attached hereto as Exhibit C.

C. Structural Analysis

The Portland Facility is structurally capable of supporting T-Mobile's proposed antennas. The Structural Analysis Report dated October 13, 2014 (and attached hereto as Exhibit D) concluded that "the subject tower is adequate to support the proposed modified antenna configuration."

D. Other Environmental Factors

T-Mobile's continued collocation on the Portland Facility is consistent with the Council's Opinion, and Decision and Order in Docket No. 206 and Petition No. 806 approval as it relates to other environmental factors. As such, the modified Portland Facility will not have a significant adverse effect on any of the following: the natural environment; ecological balance; public health and safety; scenic, historic, and recreational values; forests and parks; air; water purity; and fish, aquaculture, and wildlife.

V. NOTICE REQUIRED

In accordance with R.C.S.A. § 16-50j-40(a), T-Mobile sent notice of its intent to file this Petition to each person appearing of record as an owner of property that abuts the site, as well as the appropriate municipal officials and governmental agencies as required by C.G.S. § 16-50l. A copy of the notice, list of the property owners, municipal officials and governmental agencies to whom the notice was sent and a certification of such notice are included in Exhibit E.

VI. CONCLUSION

The information and exhibits referenced above demonstrate that a Petition should issue for the modifications T-Mobile proposes at this Facility.

This Petition and the accompanying materials and documentation demonstrate that the only aspect of the proposal that would not receive acknowledgement as an exempt activity is the location of the proposed antennas at the 139 foot elevation. It is necessary for these antennas to be located at the 139 foot elevation as shifting them significantly lower creates an interference issue with the Verizon antennas located at the 128 foot centerline below.

The top of the T-Mobile antennas will be a mere 3 feet above the top of the tower, which would not have any substantial adverse environmental effect. The other modifications will all be located within the existing compound. T-Mobile therefore respectfully requests that the Council issue a declaratory ruling approving the Portland Facility modifications as proposed.

Respectfully Submitted,

T-MOBILE NORTHEAST LLC

By: _____

Julie D. Kohler, Esq.
Cohen and Wolf, P.C.
1115 Broad Street
Bridgeport, CT 06604
Tel. (203) 368-0211
Fax (203) 394-9901
jkohler@cohenandwolf.com

EXHIBIT A

Connecticut Siting Council
Decisions

DOCKET NO. 206 - Crown Atlantic Company LLC and Cellco Partnership d/b/a Verizon Wireless application for a Certificate of Environmental Compatibility and Public Need for the construction, maintenance and operation of a cellular telecommunications facility at 191 Middle Haddam Road, Portland, Connecticut.	}	Connecticut Siting Council

July 11, 2002

Decision and Order

Pursuant to the foregoing Findings of Fact and Opinion, the Connecticut Siting Council (Council) finds that the effects associated with the construction, operation, and maintenance of a telecommunications facility at the proposed prime site in Portland, Connecticut, including effects on the natural environment; ecological integrity and balance; public health and safety; scenic, historic, and recreational values; forests and parks; air and water purity; and fish and wildlife are not disproportionate either alone or cumulatively with other effects when compared to need, are not in conflict with the policies of the State concerning such effects, and are not sufficient reason to deny the application and therefore directs that a Certificate of Environmental Compatibility and Public Need, as provided by General Statutes § 16-50k, be issued to Crown Atlantic Company LLC and Cellco Partnership d/b/a Verizon Wireless for the construction, maintenance and operation of a cellular telecommunications facility at the proposed prime site located at 191 Middle Haddam Road, Portland, Connecticut. We deny certification of the proposed alternate site located at 191 Middle Haddam Road, Portland, Connecticut.

The facility shall be constructed, operated, and maintained substantially as specified in the Council's record in this matter, and subject to the following conditions:

1. The tower shall be constructed as a monopole, no taller than necessary to provide the proposed telecommunications services, sufficient to accommodate the antennas of Cellco and other entities, both public and private, but such tower shall not exceed a height of 130 feet above ground level unless the need for other wireless telecommunications providers require a height greater than 130 feet, which if approved by the Council through a petition pursuant to Sections 16-50j-38 through 16-50j-40 of the Regulations of Connecticut State Agencies, shall authorize the extension of the tower to a maximum height of 180 feet above ground level.

2. The Certificate Holder shall prepare a Development and Management (D&M) Plan for this site in compliance with Sections 16-50j-75 through 16-50j-77 of the Regulations of Connecticut State Agencies. The D&M Plan shall be submitted to and approved by the Council prior to the commencement of facility construction and shall include: a final site plan(s) for site development to include the location for the tower 180 feet west of the east property boundary and 180 feet north of the south property boundary that incorporates the tower radius within the lessor's property, tower foundation, antennas, equipment building, security fence, access road, utility line, and landscaping plan. The Certificate holder shall provide plans for either an architecturally treated equipment building or security fence. The D&M Plan shall also include construction plans to be submitted prior to construction for site clearing, water drainage, and erosion and sedimentation control consistent with the Connecticut Guidelines for Soil Erosion and Sediment Control, as amended.

3. The Certificate Holder shall provide a recalculated report of electromagnetic radio frequency power density if and when circumstances in operation cause a change in power density above the levels calculated and provided pursuant to this Decision and Order.

4. Upon the establishment of any new State or federal radio frequency standards applicable to frequencies of this facility, the facility granted herein shall be brought into compliance with such standards.

5. The Certificate Holder shall permit public or private entities to share space on the proposed tower for

fair consideration, or shall provide any requesting entity with specific legal, technical, environmental, or economic reasons precluding such tower sharing.

6. Following completion of construction, if the facility does not initially provide, or permanently ceases to provide wireless telecommunications services following completion of construction, this Decision and Order shall be void, and the Certificate Holder shall dismantle the tower and remove all associated equipment within sixty days or reapply for any continued or new use to the Council before any such use is made.

7. Any antenna that becomes obsolete and ceases to function shall be removed within sixty days after such antennas become obsolete and ceases to function.

8. Unless otherwise approved by the Council, this Decision and Order shall be void if construction and operation authorized herein is not completed within one year of the effective date of this Decision and Order or within one year after all appeals to this Decision and Order have been resolved.

Pursuant to General Statutes § 16-50p, we hereby direct that a copy of the Findings of Fact, Opinion, and Decision and Order be served on each person listed below, and notice of issuance shall be published in The Hartford Courant, New Haven Register, and The Middletown Press.

By this Decision and Order, the Council disposes of the legal rights, duties, and privileges of each party named or admitted to the proceeding in accordance with Section 16-50j-17 of the Regulations of Connecticut State Agencies.

The party to this proceeding is:

-

Crown Atlantic Company LLC
And Cellco Partnership d/b/a
Verizon Wireless

Robert Stanford, Project Manager
Crown Atlantic Company LLC
703 Hebron Avenue
Glastonbury, CT 06033

Kenneth C. Baldwin, Esq.
Robinson & Cole LLP
280 Trumbull Street
Hartford, CT 06103-3597

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STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@ct.gov
Internet: ct.gov/csc

Daniel F. Caruso
Chairman

Petition No. 806
T-Mobile
191 Middle Haddam Road, Portland
May 1, 2007
Staff Report

On March 15, 2007, the Connecticut Siting Council (Council) received a petition from Omnipoint Communications, Inc. (T-Mobile) for declaratory ruling that no Certificate of Environmental Compatibility and Public Need is required for the proposed extension of an existing telecommunications facility located at 191 Middle Haddam Road in Portland. The petition was field reviewed by Council member Philip Ashton and Council staff member Robert Mercier on April 19, 2007. T-Mobile representatives Karina Fournier and Scott Heffernan attended the field review.

T-Mobile seeks to place a 10-foot extension on an existing 130-foot monopole owned by Cellco Partnership d/b/a Verizon Wireless. The Council approved the 130-foot tower on July 11, 2002 under Docket 206. The Decision and Order for this docket stipulated an extension up to 180 feet would be considered by the Council through the petition process. The tower currently supports Verizon at the 130-foot level and Cingular at the 120-foot level.

T-Mobile would install the 10-foot extension and mount nine panel antennas on a platform at a centerline height of 137 feet above ground level (agl). The top of the tower with the proposed extension and antennas would not exceed 140 feet agl. T-Mobile would install three radio cabinets and one battery cabinet on a concrete pad within the compound.

The existing tower is structurally capable of supporting the extension and antenna mounting configuration. With T-Mobile's equipment, the collective radio frequency electromagnetic radiation power density level would be 17.9% of the applicable FCC standard.

The site is on a 14-acre residential lot and is set back approximately 1,000 feet from Middle Haddam Road. Although six residences are in proximity to the site, the extended tower would not be visible year-round from these homes due to the wooded terrain of the area. The six residences currently have seasonal views of the existing 130-foot tower. The visibility impact of the 10-foot extension would be minimal.

STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

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Internet: ct.gov/csc

Daniel F. Caruso
Chairman

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

May 2, 2007

H. Karina Fournier
Zoning Department
T-Mobile
35 Griffin Road South
Bloomfield, CT 06002

RE: **PETITION NO. 806** – Omnipoint Communications, Inc. (T-Mobile) Petition for a Declaratory Ruling that no Certificate of Environmental Compatibility and Public Need is required for the proposed modifications to an existing telecommunications facility, located at 191 Middle Haddam Road, Portland, Connecticut.

Dear Ms. Fournier:

At a public meeting held on May 1, 2007, the Connecticut Siting Council (Council) considered and ruled that this proposal would not have a substantial adverse environmental effect, and pursuant to General Statutes § 16-50k would not require a Certificate of Environmental Compatibility and Public Need.

This decision is under the exclusive jurisdiction of the Council and is not applicable to any other modification or construction. All work is to be implemented as specified in the petition, dated March 15, 2007.

Enclosed for your information is a copy of the staff report on this project.

Very truly yours,

Daniel F. Caruso
Chairman

DFC/RDM/laf

Enclosure: Staff Report dated May 1, 2007

c: The Honorable Susan S. Bransfield, First Selectman, Town of Portland
Nancy Mueller, Town Planner, Town of Portland

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EXHIBIT B

ALL EQUIPMENT LOCATIONS ARE APPROXIMATE AND ARE SUBJECT TO APPROVAL BY LESSEE/LICENSEE'S STRUCTURAL & RF ENGINEERS. LOCATIONS OF POWER & TELEPHONE FACILITIES ARE SUBJECT TO APPROVAL BY UTILITY COMPANIES.

KEY MAP
SCALE: N.T.S

1
LE-1

PROJECT : L700
CONFIGURATION
704G

SUBMITTALS	
LE REV A	08.20.14
LE REV 0	08.22.14
LE REV 1	10.21.14
LE REV 2	10.28.14

ATLANTIS GROUP
1340 Centre Street
Suite 203
Newton, MA 02459
Office: 617-965-0789
Fax: 617-213-5056

LEASE EXHIBIT

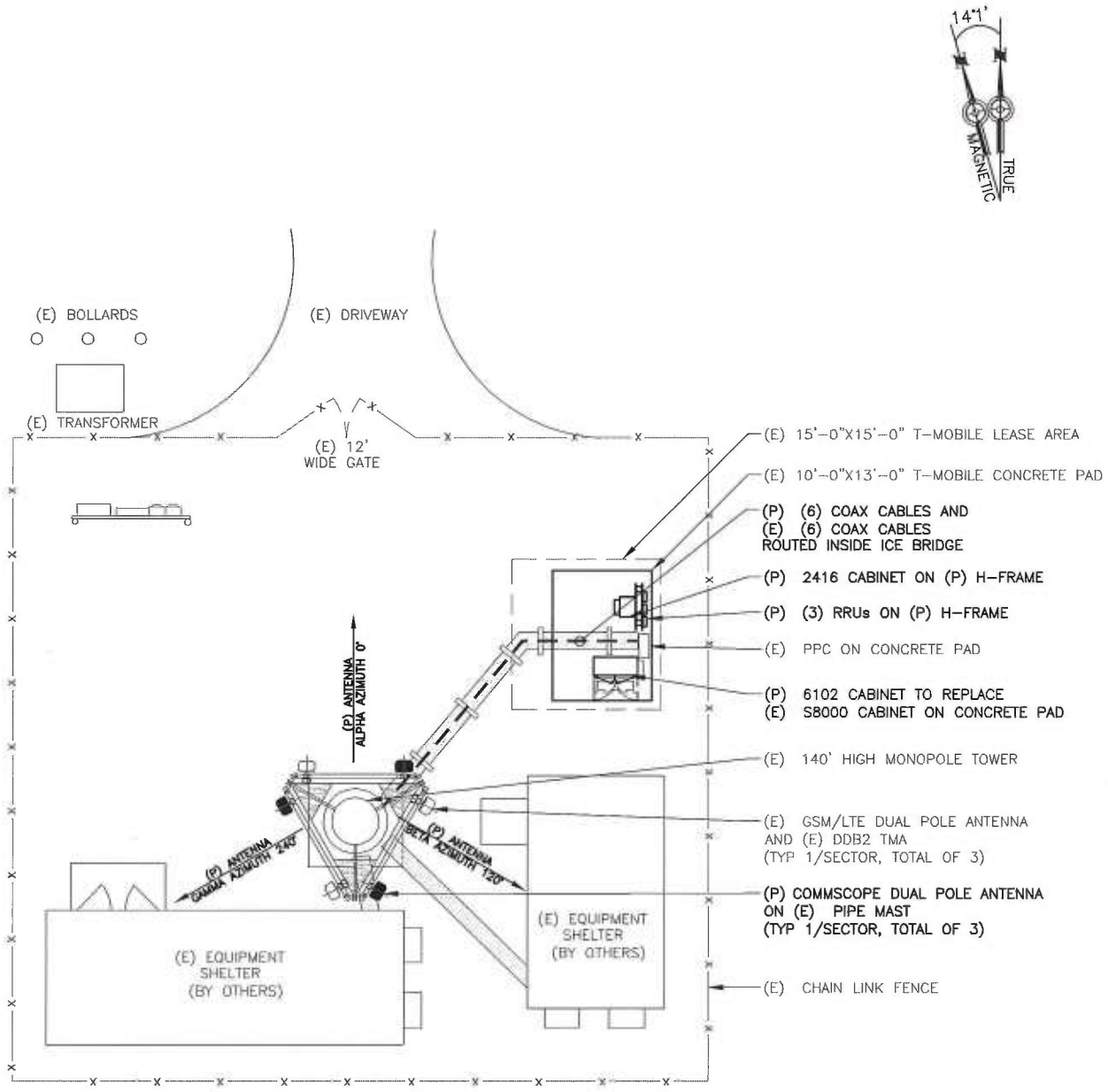
SITE NUMBER:
CT11696E

SITE NAME:
CT696/VERIZON PORTLAND_ET

SITE ADDRESS:
191 MIDDLE HADDAM ROAD
PORTLAND, CT 06480

NORTHEAST SITE SOLUTIONS
54 MAIN STREET, UNIT 3
STURBRIDGE, MA 01566
(508) 434-5237
FOR
T-MOBILE NORTHEAST, LLC
35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002
OFFICE: (860) 692-7100
FAX: (860) 692-7159

DRAWN BY: FG | CHECKED BY: SM



SITE PLAN

SCALE: 1/16" = 1'-0"

1 / LE-2

ALL EQUIPMENT LOCATIONS ARE APPROXIMATE AND ARE SUBJECT TO APPROVAL BY LESSEE/LICENSEE'S STRUCTURAL & RF ENGINEERS. LOCATIONS OF POWER & TELEPHONE FACILITIES ARE SUBJECT TO APPROVAL BY UTILITY COMPANIES.

PROJECT : L700

CONFIGURATION

704G

SUBMITTALS	
LE REV A	08.20.14
LE REV 0	08.22.14
LE REV 1	10.21.14
LE REV 2	10.28.14

ATLANTIS GROUP
1340 Centre Street
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Office: 617-965-0789
Fax: 617-213-5056

LEASE EXHIBIT

SITE NUMBER:
CT11696E

SITE NAME:
CT696/VERIZON PORTLAND_ET

SITE ADDRESS:
191 MIDDLE HADDAM ROAD
PORTLAND, CT 06480

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35 GRIFFIN ROAD SOUTH
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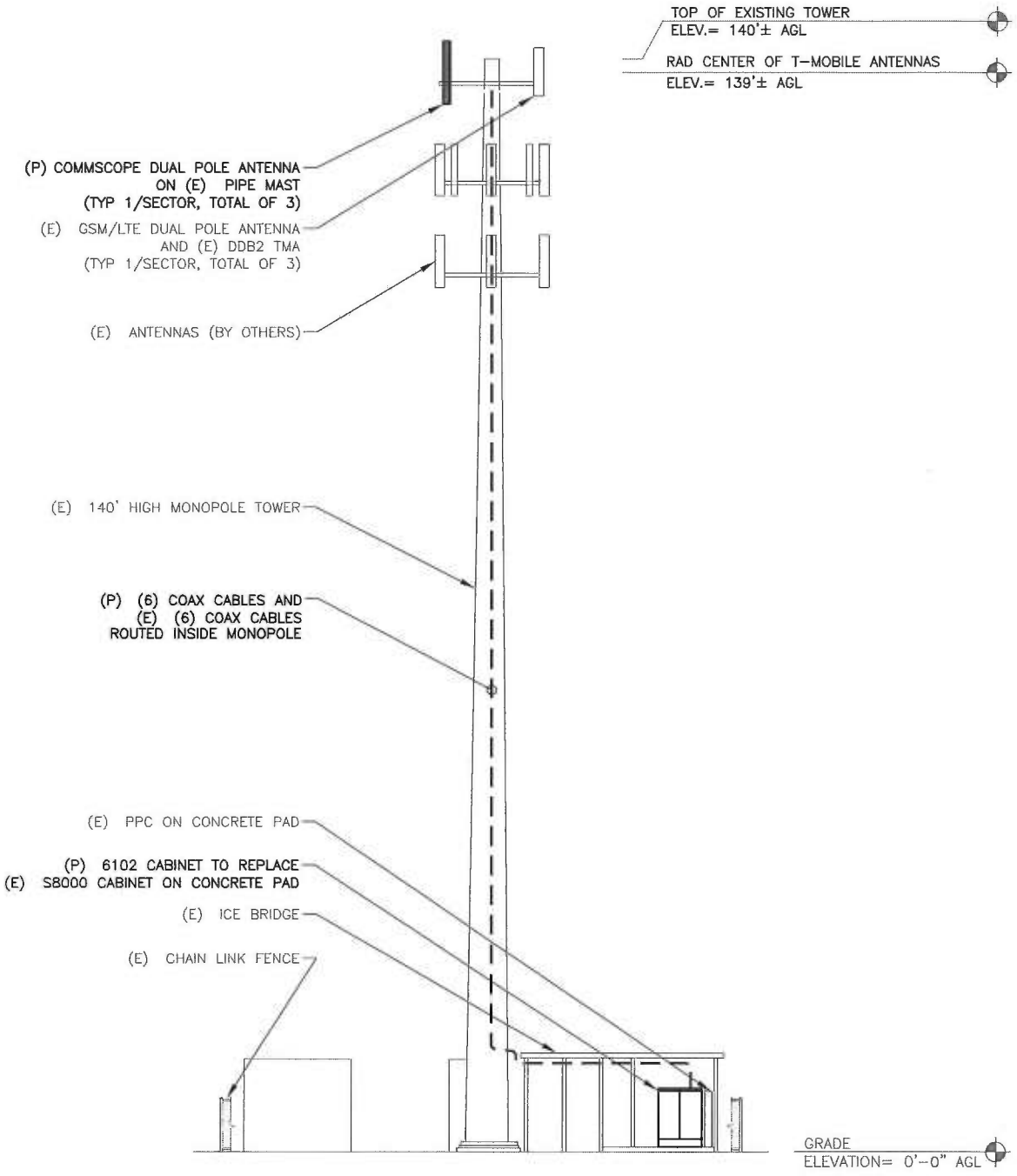
DRAWN BY: FG | CHECKED BY: SM



ALL EQUIPMENT LOCATIONS ARE APPROXIMATE AND ARE SUBJECT TO APPROVAL BY LESSEE/LICENSEE'S STRUCTURAL & RF ENGINEERS. LOCATIONS OF POWER & TELEPHONE FACILITIES ARE SUBJECT TO APPROVAL BY UTILITY COMPANIES.

ELEVATION

SCALE: 1" = 20'-0"

1 / LE-3

PROJECT : L700

CONFIGURATION

704G

SUBMITTALS	
LE REV A	08.20.14
LE REV 0	08.22.14
LE REV 1	10.21.14
LE REV 2	10.28.14

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LEASE EXHIBIT

SITE NUMBER:
CT11696E

SITE NAME:
CT696/VERIZON PORTLAND_ET

SITE ADDRESS:
191 MIDDLE HADDAM ROAD
PORTLAND, CT 06480

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DRAWN BY: FG | CHECKED BY: SM

EXHIBIT C

EBI Consulting
environmental | engineering | due diligence

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

T-Mobile Existing Facility

Site ID: CT11696E

Verizon Portland
191 Middle Haddam Road
Portland, CT 06480

October 16, 2014

EBI Project Number: 62145550

Site Compliance Summary	
Compliance Status:	COMPLIANT
Site total MPE% of FCC general public allowable limit:	53.92 %

21 B Street Burlington, MA 01803 Tel: (781) 273.2500 Fax: (781) 273.3311

EBI Consulting
environmental | engineering | due diligence

October 16, 2014

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

Emissions Analysis for Site: **CT11696E – Verizon Portland**

EBI Consulting was directed to analyze the proposed T-Mobile facility located at **191 Middle Haddam Road, Portland, CT**, for the purpose of determining whether the emissions from the Proposed T-Mobile Antenna Installation located on this property are within specified federal limits.

All information used in this report was analyzed as a percentage of current Maximum Permissible Exposure (% MPE) as listed in the FCC OET Bulletin 65 Edition 97-01and ANSI/IEEE Std C95.1. The FCC regulates Maximum Permissible Exposure in units of microwatts per square centimeter (μW/cm2). The number of $\mu W/cm^2$ calculated at each sample point is called the power density. The exposure limit for power density varies depending upon the frequencies being utilized. Wireless Carriers and Paging Services use different frequency bands each with different exposure limits, therefore it is necessary to report results and limits in terms of percent MPE rather than power density.

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

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

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

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

Additional details can be found in FCC OET 65.

CALCULATIONS

Calculations were done for the proposed T-Mobile Wireless antenna facility located at **191 Middle Haddam Road, Portland, CT**, using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. Since T-Mobile is proposing highly focused directional panel antennas, which project most of the emitted energy out toward the horizon, all calculations were performed assuming a lobe representing the maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB, was focused at the base of the tower. For this report the sample point is the top of a 6 foot person standing at the base of the tower.

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

1) 2 GSM channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel

2) 2 UMTS channels (AWS Band – 2100 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.

3) 2 LTE channels (AWS Band – 2100 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 Watts per Channel.

4) 1 LTE channel (700 MHz Band) was considered for each sector of the proposed installation. This channel has a transmit power of 30 Watts.

5) All radios at the proposed installation were considered to be running at full power and were uncombined in their RF transmissions paths per carrier prescribed configuration. Per FCC OET Bulletin No. 65 - Edition 97-01 recommendations to achieve the maximum anticipated value at each sample point, all power levels emitting from the proposed antenna installation are increased by a factor of 2.56 to account for possible in-phase reflections from the surrounding environment. This is rarely the case, and if so, is never continuous.

6) For the following calculations the sample point was the top of a six foot person standing at the base of the tower. The maximum gain of the antenna per the antenna manufactures supplied specifications minus 10 dB was used in this direction. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.

7) The antennas used in this modeling are the **RFS APXV18-209014** for 1900 MHz (PCS) and 2100 MHz (AWS) channels and the **Commscope LNX-6515DS-VTM** for 700 MHz channels. This is based on feedback from the carrier with regards to anticipated antenna selection. The **RFS APXV18-209014** has a maximum gain of **14.4 dBd** at its main lobe. The **Commscope LNX-6515DS-VTM** has a maximum gain of **14.6 dBd** at its main lobe. The maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB, was used for all calculations. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.

8) The antenna mounting height centerline of the proposed antennas is **139 feet** above ground level (AGL).

9) Emissions values for additional carriers were taken from the Connecticut Siting Council active database. Values in this database are provided by the individual carriers themselves.

All calculations were done with respect to uncontrolled / general public threshold limits.

EBI Consulting
environmental | engineering | due diligence

T-Mobile Site Inventory and Power Data

Sector:	A	Sector:	B	Sector:	C
Antenna #:	1	Antenna #:	1	Antenna #:	1
Make / Model:	RFS APXV18-209014	Make / Model:	RFS APXV18-209014	Make / Model:	RFS APXV18-209014
Gain:	14.4 dBd	Gain:	14.4 dBd	Gain:	14.4 dBd
Height (AGL):	139	Height (AGL):	139	Height (AGL):	139
Frequency Bands	1900 MHz(PCS) / 2100 MHz (AWS)	Frequency Bands	1900 MHz(PCS) / 2100 MHz (AWS)	Frequency Bands	1900 MHz(PCS) / 2100 MHz (AWS)
Channel Count	6	Channel Count	6	# PCS Channels:	6
Total TX Power:	240	Total TX Power:	240	# AWS Channels:	240
ERP (W):	3,505.81	ERP (W):	3,505.81	ERP (W):	3,505.81
Antenna A1 MPE%	1.34	Antenna B1 MPE%	1.34	Antenna C1 MPE%	1.34
Antenna #:	2	Antenna #:	2	Antenna #:	2
Make / Model:	Commscope LNX-6515DS-VTM	Make / Model:	Commscope LNX-6515DS-VTM	Make / Model:	Commscope LNX-6515DS-VTM
Gain:	14.6 dBd	Gain:	14.6 dBd	Gain:	14.6 dBd
Height (AGL):	139	Height (AGL):	139	Height (AGL):	139
Frequency Bands	700 Mhz	Frequency Bands	700 Mhz	Frequency Bands	700 Mhz
Channel Count	1	Channel Count	1	Channel Count	1
Total TX Power:	30	Total TX Power:	30	Total TX Power:	30
ERP (W):	445.37	ERP (W):	445.37	ERP (W):	445.37
Antenna A2 MPE%	0.38	Antenna B2 MPE%	0.38	Antenna C2 MPE%	0.38

Site Composite MPE%	
Carrier	**MPE%**
T-Mobile	**5.16**
Verizon Wireless	25.27 %
AT&T	23.49 %
Site Total MPE %:	**53.92 %**

T-Mobile Sector 1 Total:	1.72 %
T-Mobile Sector 2 Total:	1.72 %
T-Mobile Sector 3 Total:	1.72 %
Site Total:	53.92 %

EBI Consulting
environmental | engineering | due diligence

Summary

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

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

T-Mobile Sector	Power Density Value (%)
Sector 1:	1.72 %
Sector 2:	1.72 %
Sector 3 :	1.72 %
T-Mobile Total:	5.16 %
Site Total:	53.92 %
Site Compliance Status:	**COMPLIANT**

The anticipated composite MPE value for this site assuming all carriers present is **53.92%** of the allowable FCC established general public limit sampled at the ground level. This is based upon values listed in the Connecticut Siting Council database for existing carrier emissions.

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

Scott Heffernan
RF Engineering Director

EBI Consulting
21 B Street
Burlington, MA 01803`

EXHIBIT D

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

140-ft Existing EEI Monopole

Proposed T-Mobile
Antenna Upgrade

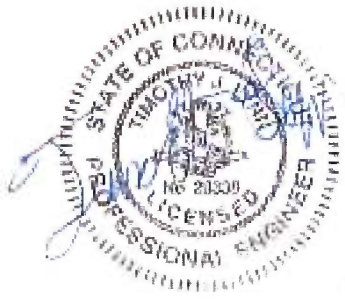
T-Mobile Site Ref: CT11696E

Verizon Site Ref: Portland South

191 Middle Haddam Road
Portland, CT

Centek Project No. 14033.018

Date: October 13, 2014



Prepared for:
T-Mobile USA
35 Griffin Road
Bloomfield, CT 06002

63-2 North Branford Road, Branford, CT 06405 203.488.0580 Fax 203.488.8587 www.CentekEng.com

Table of Contents

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 T-Mobile on the existing monopole (tower) owned and operated by Verizon Wireless, located in Portland, CT.

The host tower is a 140-ft tall four-section, eighteen sided, tapered monopole, originally designed and manufactured by Engineered Endeavors Inc (EEI)—job no: 12477-P01, dated April 16, 2004. The tower geometry, structure member sizes and foundation system information were obtained from the aforementioned EEI design report.

Antenna and appurtenance information were obtained from a previous structural analysis report prepared by Centek Engineering job no. 12044.CO3 dated April 24, 2012, a tower mapping report prepared by Eastern Communications dated October 3, 2014 and a T-Mobile RF data sheet.

The tower is made up of four (4) tapered vertical sections consisting of A572-65 pole sections. The bottom three (3) vertical tower sections are slip joint connected and the top section is connected with a flange plate. The diameter of the pole (flat-flat) is 31.21-in at the top and 63.5-in at the base.

T-Mobile proposes the installation of three (3) panel antennas 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:

- Unknown (Existing):
  Antennas: One (1) 8' Omni-directional whip antenna mounted with an elevation of 130-ft above grade level.
  Coax Cables: One (1) 1/2" ∅ coax cable running on the interior of monopole.
- 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 128-ft above grade.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing monopole, six (6) 1-5/8" ∅ coax cables banded to the exterior of the existing monopole and one (1) 1-5/8" ∅ fiber cable banded to the exterior of the existing monopole.
- AT&T (Existing):
  Antennas: Three (3) KMW AM-X-CD-16-65-00T pane antennas, six (6) Powerwave 7770 panel antennas, six (6) Powerwave LGP21401 TMA's, six (6) Powerwave LGP21901 Diplexers, and three (3) PolyPhaser DAS-HY-DFDM-06 Bias-T mounted on one (1) low profile platform at a RAD center elevation of 119-ft above grade level.
  Coax Cables: Twelve (12) 1 5/8" ∅ coax cables running on the interior of monopole.

- AT&T (Existing):
  Antennas: Six (6) Ericsson RRUS-11 and one (1) Raycap DC6-48-60-18-8F surge arrestor mounted to one (1) universal ring mount with a RAD center elevation of 117-ft above grade level.
  Coax Cables: One (1) fiber cable and two (2) dc control cables running inside of the existing tower.
- T-Mobile (Existing to Remain):
  Antennas: Three (3) RFS APXV18-209014 panel antennas and three (3) Ericsson KRY-112 TMA's mounted to one (1) low profile platform with a RAD center elevation of 139-ft above grade level.
  Coax Cables: Six (6) 1 5/8" ∅ coax cables running on the interior of the monopole.
- **T-MOBILE (Proposed):**
  Antennas: Three (3) Andrew LNX-6515DS panel antennas mounted to one (1) low profile platform with a RAD center elevation of 139-ft above grade level.
  Coax Cable: Six (6) 1-5/8" ∅ coax cables running on the exterior of the existing tower.

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.

Analysis

The existing tower was analyzed using a comprehensive computer program entitled tnxTower. 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 CSBC[1] 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.

Tower Loading

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:	Middlesex; v = 85 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Portland; v = 105 mph (3 second gust) equivalent to v = 85 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	TIA/EIA-222-F and Appendix K wind speeds are equal.	
Load Cases:	Load Case 1; 85 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]*
	Load Case 2; 74 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 74 mph wind speed velocity represents 75% of the wind pressure generated by the 85 mph wind speed.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 3; Seismic – not checked	*[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type*

[1] 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 tnxTower. 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 were found to be within allowable limits. In Load Case 1, per tnxTower "Section Capacity Table", the maximum tower steel usage was found to be at **59.4%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L1)	130.00'-140.00'	2.5%	**PASS**
Pole Shaft (L2)	89.00'-130.00'	30.0%	**PASS**
Pole Shaft (L3)	45.37'-89.00'	43.6%	**PASS**
Pole Shaft (L4)	1.5'-45.37'	59.4%	**PASS**

Foundation and Anchors

The existing foundation consists of an 8-ft ∅ x 3.5-ft long reinforced concrete pier on a 26.5-ft square x 4.0-ft thick reinforced concrete pad. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned EEI design report; job no: 12477-P01, dated April 16, 2004. The base of the tower is connected to the foundation by means of (20) 2.25"∅, ASTM A615-75 anchor bolts embedded approximately 7-ft into the concrete foundation structure.

- 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	29 kips
	Compression	40 kips
	Moment	2808 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	3.44	**PASS**

Note 1: FS denotes Factor of Safety.

Note 2: OTM denotes Overturning Moment

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Flange Bolts	Combined Axial and Bending	3.0%	**PASS**
Flange Plate	Bending	4.4%	**PASS**

- 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	Combined Axial and Bending	48.4%	**PASS**
Base Plate	Bending	65.3%	**PASS**

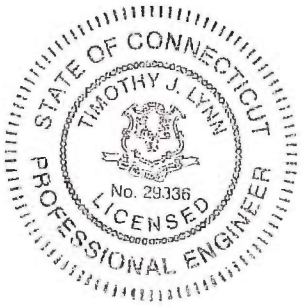
Conclusion

This analysis shows that the subject tower **is adequate** to support the proposed modified antenna configuration.

The analysis is based, in part, on the information provided to this office by T-Mobile. 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:



Timothy J. Lynn, PE
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.

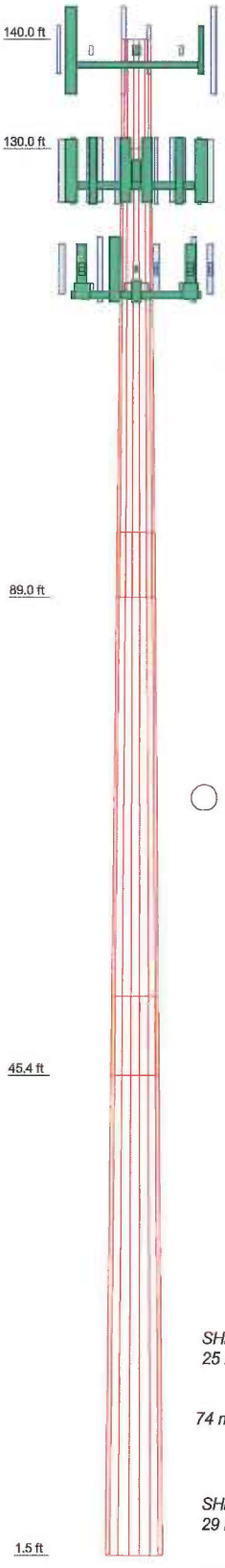
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

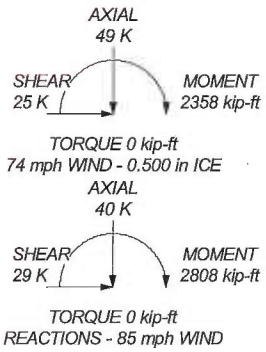
tnxTower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, tnxTower, formerly RISATower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

tnxTower Features:

- tnxTower 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.
- tnxTower contains unique features such as True Cable behavior, hog rod take-up, foundation stiffness and much more.

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	10.000	18	0.313		31.210	33.540		1.1
2	41.000	18	0.313	6.000	33.540	43.620		5.3
3	49.630	18	0.375	7.250	41.520	53.590	A572-65	9.5
4	51.120	18	0.375		51.077	63.500		11.8
								27.6





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
LNX-6515DS (T-Mobile - Proposed)	139	LPA-80063/6CF (Verizon - Reserved)	128
LNX-6515DS (T-Mobile - Proposed)	139	RRH2x40-AWS (Verizon - Reserved)	128
LNX-6515DS (T-Mobile - Proposed)	139	RRH2x40-AWS (Verizon - Reserved)	128
APXV18-209014 (T-Mobile - Existing)	139	RRH2x40-AWS (Verizon - Reserved)	128
APXV18-209014 (T-Mobile - Existing)	139	EEI 14-ft Low Profile Platform (Verizon - Existing)	127
APXV18-209014 (T-Mobile - Existing)	139	(2) 7770.00 (ATI - Existing)	119
KRY 112 TMA (T-Mobile - Existing)	139	AM-X-CD-16-65-00T-RET(72") (ATI - Existing)	119
KRY 112 TMA (T-Mobile - Existing)	139	(2) 7770.00 (ATI - Existing)	119
KRY 112 TMA (T-Mobile - Existing)	139	AM-X-CD-16-65-00T-RET(72") (ATI - Existing)	119
Andrew 12'-6" Low Profile Platform (T-Mobile - Existing)	138	(2) 7770.00 (ATI - Existing)	119
8'x1" Omni	130	AM-X-CD-16-65-00T-RET(72") (ATI - Existing)	119
LPA-80063/6CF (Verizon - Reserved)	128	(2) LGP21401 TMA (ATI - Existing)	119
LPA-171063-12CF (Verizon - Reserved)	128	(2) LGP21401 TMA (ATI - Existing)	119
BXA-70063/6CF (Verizon - Reserved)	128	(2) LGP21401 TMA (ATI - Existing)	119
BXA-70063/6CF (Verizon - Reserved)	128	(2) LGP21901 Diplexer (ATI - Existing)	119
LPA-171063-12CF (Verizon - Reserved)	128	(2) LGP21901 Diplexer (ATI - Existing)	119
LPA-80063/6CF (Verizon - Reserved)	128	(2) LGP21901 Diplexer (ATI - Existing)	119
LPA-80063/6CF (Verizon - Reserved)	128	DAS-HY-DFDM-06 BIAS-T (ATI - Existing)	119
LPA-171063-12CF (Verizon - Reserved)	128	DAS-HY-DFDM-06 BIAS-T (ATI - Existing)	119
BXA-70063/6CF (Verizon - Reserved)	128	DAS-HY-DFDM-06 BIAS-T (ATI - Existing)	119
BXA-70063/6CF (Verizon - Reserved)	128	Valmont Uni-Tri Bracket (ATI - Existing)	117
LPA-171063-12CF (Verizon - Reserved)	128	Andrew 12'-6" Low Profile Platform (ATI - Existing)	117
LPA-80063/6CF (Verizon - Reserved)	128	(2) RRUS-11 (ATI - Existing)	117
LPA-80063/6CF (Verizon - Reserved)	128	(2) RRUS-11 (ATI - Existing)	117
LPA-171063-12CF (Verizon - Reserved)	128	(2) RRUS-11 (ATI - Existing)	117
BXA-70063/6CF (Verizon - Reserved)	128	DC6-48-60-18-8F Surge Arrestor (ATI - Existing)	117
BXA-70063/6CF (Verizon - Reserved)	128		
LPA-171063-12CF (Verizon - Reserved)	128		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Middlesex County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.
5. Weld together tower sections have flange connections.
6. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
7. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
8. Welds are fabricated with ER-70S-6 electrodes.
9. TOWER RATING: 59.4%

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

Job: 14033.018 - CT11696E			
Project: 140' EEI Monopole - 191 Middle Haddam Rd. Portland, CT			
Client: T-Mobile	Drawn by: TJL	App'd:	
Code: TIA/EIA-222-F	Date: 10/13/14	Scale: NTS	
Path: J:\Jobs\14033\00.WI\018 - CT11696E\04_Structural\Backup Documentation\ERI Files\140' Monopole_ Portland, CT.eri		Dwg No. E-1	

Tower Input Data

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

Tower is located in Middlesex County, Connecticut.
Basic wind speed of 85 mph.
Nominal ice thickness of 0.500 in.
Ice density of 56 pcf.
A wind speed of 74 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*	*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	140.000-130.000	10.000	0.000	18	31.210	33.540	0.313	1.250	A572-65 (65 ksi)
L2	130.000-89.000	41.000	6.000	18	33.540	43.620	0.313	1.250	A572-65 (65 ksi)
L3	89.000-45.370	49.630	7.250	18	41.520	53.590	0.375	1.500	A572-65

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
L4	45.370-1.500	51.120		18	51.077	63.500	0.375	1.500	(65 ksi) A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	31.691	30.646	3696.276	10.969	15.855	233.135	7397.416	15.326	4.943	15.817
	34.057	32.958	4597.136	11.796	17.038	269.812	9200.322	16.482	5.353	17.13
L2	34.057	32.958	4597.136	11.796	17.038	269.812	9200.322	16.482	5.353	17.13
	44.293	42.956	10178.499	15.374	22.159	459.340	20370.391	21.482	7.127	22.807
L3	43.642	48.973	10474.251	14.606	21.092	496.596	20962.284	24.491	6.647	17.727
	54.417	63.339	22660.936	18.891	27.224	832.397	45351.689	31.676	8.772	23.392
L4	53.654	60.348	19599.518	17.999	25.947	755.367	39224.825	30.180	8.330	22.212
	64.480	75.135	37825.076	22.409	32.258	1172.580	75699.924	37.574	10.516	28.043

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 140.000-130.000				1	1	1		
L2 130.000-89.000				1	1	1		
L3 89.000-45.370				1	1	1		
L4 45.370-1.500				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight klf
1 5/8 (T-Mobile - Existing)	C	No	Inside Pole	139.000 - 1.500	6	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
1 5/8 (Verizon - Existing)	C	No	Inside Pole	128.000 - 1.500	12	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
1 5/8 (AT&T - Existing)	C	No	Inside Pole	119.000 - 1.500	12	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
1/2	C	No	Inside Pole	130.000 - 1.500	1	No Ice	0.000	0.000
						1/2" Ice	0.000	0.000
1 5/8 (Verizon - Existing)	C	No	CaAa (Out Of Face)	128.000 - 1.500	1	No Ice	0.198	0.001
						1/2" Ice	0.298	0.003
1 5/8 (Verizon - Existing)	C	No	CaAa (Out Of Face)	128.000 - 1.500	5	No Ice	0.000	0.001
						1/2" Ice	0.000	0.003
RG6-Fiber (AT&T - Propsoed)	C	No	Inside Pole	119.000 - 2.500	1	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight klf
#8 AWG Copper WIre (AT&T - Propsoed)	C	No	Inside Pole	119.000 - 2.500	2	No Ice	0.000	0.000
						1/2" Ice	0.000	0.000
1 5/8 (T-Mobile - Proposed)	C	No	CaAa (Out Of Face)	139.000 - 1.500	1	No Ice	0.198	0.001
						1/2" Ice	0.298	0.003
1 5/8 (T-Mobile - Proposed)	C	No	CaAa (Out Of Face)	139.000 - 1.500	5	No Ice	0.000	0.001
						1/2" Ice	0.000	0.003
HYBRIFLEX 1-5/8" (Verizon - Reserved)	C	No	CaAa (Out Of Face)	128.000 - 1.500	1	No Ice	0.198	0.002
						1/2" Ice	0.298	0.003

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	140.000-130.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	1.782	0.112
L2	130.000-89.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	23.562	1.734
L3	89.000-45.370	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	25.916	2.048
L4	45.370-1.500	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	26.059	2.058

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	140.000-130.000	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	2.682	0.194
L2	130.000-89.000	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	35.462	2.517
L3	89.000-45.370	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	39.005	2.904
L4	45.370-1.500	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	39.220	2.919

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
LNX-6515DS	A	From Face	3.500	0.000	139.000	No Ice	11.445	7.696	0.055
(T-Mobile - Proposed)			6.000			1/2" Ice	12.064	8.289	0.121
			0.000						
LNX-6515DS	B	From Face	3.500	0.000	139.000	No Ice	11.445	7.696	0.055
(T-Mobile - Proposed)			6.000			1/2" Ice	12.064	8.289	0.121
			0.000						
LNX-6515DS	C	From Face	3.500	0.000	139.000	No Ice	11.445	7.696	0.055
(T-Mobile - Proposed)			6.000			1/2" Ice	12.064	8.289	0.121
			0.000						
APXV18-209014	A	From Face	3.500	0.000	139.000	No Ice	3.570	2.003	0.009
(T-Mobile - Existing)			-6.000			1/2" Ice	3.913	2.326	0.029
			0.000						
APXV18-209014	B	From Face	3.500	0.000	139.000	No Ice	3.570	2.003	0.009
(T-Mobile - Existing)			-6.000			1/2" Ice	3.913	2.326	0.029
			0.000						
APXV18-209014	C	From Face	3.500	0.000	139.000	No Ice	3.570	2.003	0.009
(T-Mobile - Existing)			-6.000			1/2" Ice	3.913	2.326	0.029
			0.000						
KRY 112 TMA	A	From Face	3.500	0.000	139.000	No Ice	0.778	0.486	0.025
(T-Mobile - Existing)			0.000			1/2" Ice	0.899	0.588	0.031
			0.000						
KRY 112 TMA	B	From Face	3.500	0.000	139.000	No Ice	0.778	0.486	0.025
(T-Mobile - Existing)			0.000			1/2" Ice	0.899	0.588	0.031
			0.000						
KRY 112 TMA	C	From Face	3.500	0.000	139.000	No Ice	0.778	0.486	0.025
(T-Mobile - Existing)			0.000			1/2" Ice	0.899	0.588	0.031
			0.000						
Andrew 12'-6" Low Profile Platform	C	None		0.000	138.000	No Ice	14.450	14.450	1.300
(T-Mobile - Existing)						1/2" Ice	19.000	19.000	1.690
8'x1" Omni	A	From Face	3.500	0.000	130.000	No Ice	0.800	0.800	0.020
			0.000			1/2" Ice	1.617	1.617	0.027
			4.000						
LPA-80063/6CF	A	From Face	3.000	0.000	128.000	No Ice	10.308	9.005	0.027
(Verizon - Reserved)			6.000			1/2" Ice	10.868	9.554	0.101
			0.000						
LPA-171063-12CF	A	From Face	3.000	0.000	128.000	No Ice	5.994	6.054	0.012
(Verizon - Reserved)			4.000			1/2" Ice	6.462	6.523	0.055
			0.000						
BXA-70063/6CF	A	From Face	3.000	0.000	128.000	No Ice	7.731	4.158	0.017
(Verizon - Reserved)			1.000			1/2" Ice	8.268	4.595	0.059
			0.000						
BXA-70063/6CF	A	From Face	3.000	0.000	128.000	No Ice	7.731	4.158	0.017
(Verizon - Reserved)			-1.000			1/2" Ice	8.268	4.595	0.059
			0.000						
LPA-171063-12CF	A	From Face	3.000	0.000	128.000	No Ice	5.994	6.054	0.012
(Verizon - Reserved)			-4.000			1/2" Ice	6.462	6.523	0.055
			0.000						
LPA-80063/6CF	A	From Face	3.000	0.000	128.000	No Ice	10.308	9.005	0.027
(Verizon - Reserved)			-6.000			1/2" Ice	10.868	9.554	0.101
			0.000						
LPA-80063/6CF	B	From Face	3.000	0.000	128.000	No Ice	10.308	9.005	0.027
(Verizon - Reserved)			6.000			1/2" Ice	10.868	9.554	0.101
			0.000						
LPA-171063-12CF	B	From Face	3.000	0.000	128.000	No Ice	5.994	6.054	0.012
(Verizon - Reserved)			4.000			1/2" Ice	6.462	6.523	0.055
			0.000						

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
BXA-70063/6CF	B	From Face	3.000	0.000	128.000	No Ice	7.731	4.158	0.017
(Verizon - Reserved)			1.000			1/2" Ice	8.268	4.595	0.059
			0.000						
BXA-70063/6CF	B	From Face	3.000	0.000	128.000	No Ice	7.731	4.158	0.017
(Verizon - Reserved)			-1.000			1/2" Ice	8.268	4.595	0.059
			0.000						
LPA-171063-12CF	B	From Face	3.000	0.000	128.000	No Ice	5.994	6.054	0.012
(Verizon - Reserved)			-4.000			1/2" Ice	6.462	6.523	0.055
			0.000						
LPA-80063/6CF	B	From Face	3.000	0.000	128.000	No Ice	10.308	9.005	0.027
(Verizon - Reserved)			-6.000			1/2" Ice	10.868	9.554	0.101
			0.000						
LPA-80063/6CF	C	From Face	3.000	0.000	128.000	No Ice	10.308	9.005	0.027
(Verizon - Reserved)			6.000			1/2" Ice	10.868	9.554	0.101
			0.000						
LPA-171063-12CF	C	From Face	3.000	0.000	128.000	No Ice	5.994	6.054	0.012
(Verizon - Reserved)			4.000			1/2" Ice	6.462	6.523	0.055
			0.000						
BXA-70063/6CF	C	From Face	3.000	0.000	128.000	No Ice	7.731	4.158	0.017
(Verizon - Reserved)			1.000			1/2" Ice	8.268	4.595	0.059
			0.000						
BXA-70063/6CF	C	From Face	3.000	0.000	128.000	No Ice	7.731	4.158	0.017
(Verizon - Reserved)			-1.000			1/2" Ice	8.268	4.595	0.059
			0.000						
LPA-171063-12CF	C	From Face	3.000	0.000	128.000	No Ice	5.994	6.054	0.012
(Verizon - Reserved)			-4.000			1/2" Ice	6.462	6.523	0.055
			0.000						
LPA-80063/6CF	C	From Face	3.000	0.000	128.000	No Ice	10.308	9.005	0.027
(Verizon - Reserved)			-6.000			1/2" Ice	10.868	9.554	0.101
			0.000						
RRH2x40-AWS	A	From Face	3.000	0.000	128.000	No Ice	2.522	1.589	0.044
(Verizon - Reserved)			0.000			1/2" Ice	2.753	1.795	0.061
			0.000						
RRH2x40-AWS	B	From Face	3.000	0.000	128.000	No Ice	2.522	1.589	0.044
(Verizon - Reserved)			0.000			1/2" Ice	2.753	1.795	0.061
			0.000						
RRH2x40-AWS	C	From Face	3.000	0.000	128.000	No Ice	2.522	1.589	0.044
(Verizon - Reserved)			0.000			1/2" Ice	2.753	1.795	0.061
			0.000						
EEI 14-ft Low Profile Platform	C	None		0.000	127.000	No Ice	16.500	16.500	1.550
(Verizon - Existing)						1/2" Ice	20.000	20.000	1.800
Valmont Uni-Tri Bracket	C	None		0.000	117.000	No Ice	1.750	1.750	0.290
(AT&T - Existing)						1/2" Ice	1.940	1.940	0.306
(2) 7770.00	A	From Face	3.500	0.000	119.000	No Ice	5.882	2.928	0.035
(AT&T - Existing)			0.000			1/2" Ice	6.314	3.273	0.068
			0.000						
AM-X-CD-16-65-00T-RET(72")	A	From Face	3.500	0.000	119.000	No Ice	8.260	4.642	0.050
			2.000			1/2" Ice	8.807	5.088	0.096
(AT&T - Existing)			0.000						
(2) 7770.00	B	From Face	3.500	0.000	119.000	No Ice	5.882	2.928	0.035
(AT&T - Existing)			0.000			1/2" Ice	6.314	3.273	0.068
			0.000						
AM-X-CD-16-65-00T-RET(72")	B	From Face	3.500	0.000	119.000	No Ice	8.260	4.642	0.050
			2.000			1/2" Ice	8.807	5.088	0.096
(AT&T - Existing)			0.000						
(2) 7770.00	C	From Face	3.500	0.000	119.000	No Ice	5.882	2.928	0.035

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(AT&T - Existing)			0.000 0.000			1/2" Ice	6.314	3.273	0.068
AM-X-CD-16-65-00T-RET(72")	C	From Face	3.500 2.000	0.000	119.000	No Ice 1/2" Ice	8.260 8.807	4.642 5.088	0.050 0.096
(AT&T - Existing)			0.000						
(2) LGP21401 TMA	A	From Face	3.500	0.000	119.000	No Ice	0.953	0.367	0.018
(AT&T - Existing)			0.000 0.000			1/2" Ice	1.093	0.480	0.023
(2) LGP21401 TMA	B	From Face	3.500	0.000	119.000	No Ice	0.953	0.367	0.018
(AT&T - Existing)			0.000 0.000			1/2" Ice	1.093	0.480	0.023
(2) LGP21401 TMA	C	From Face	3.500	0.000	119.000	No Ice	0.953	0.367	0.018
(AT&T - Existing)			0.000 0.000			1/2" Ice	1.093	0.480	0.023
(2) LGP21901 Diplexer	A	From Face	3.500	0.000	119.000	No Ice	0.233	0.117	0.006
(AT&T - Existing)			0.000 0.000			1/2" Ice	0.302	0.166	0.008
(2) LGP21901 Diplexer	B	From Face	3.500	0.000	119.000	No Ice	0.233	0.117	0.006
(AT&T - Existing)			0.000 0.000			1/2" Ice	0.302	0.166	0.008
(2) LGP21901 Diplexer	C	From Face	3.500	0.000	119.000	No Ice	0.233	0.117	0.006
(AT&T - Existing)			0.000 0.000			1/2" Ice	0.302	0.166	0.008
DAS-HY-DFDM-06 BIAS-T	A	From Face	3.500	0.000	119.000	No Ice	0.102	0.136	0.080
(AT&T - Existing)			0.000 0.000			1/2" Ice	0.161	0.199	0.081
DAS-HY-DFDM-06 BIAS-T	B	From Face	3.500	0.000	119.000	No Ice	0.102	0.136	0.080
(AT&T - Existing)			0.000 0.000			1/2" Ice	0.161	0.199	0.081
DAS-HY-DFDM-06 BIAS-T	C	From Face	3.500	0.000	119.000	No Ice	0.102	0.136	0.080
(AT&T - Existing)			0.000 0.000			1/2" Ice	0.161	0.199	0.081
Andrew 12'-6" Low Profile Platform	C	None		0.000	117.000	No Ice 1/2" Ice	14.450 19.000	14.450 19.000	1.300 1.690
(AT&T - Existing)									
(2) RRUS-11	A	From Face	0.500	0.000	117.000	No Ice	2.994	1.246	0.050
(AT&T - Existing)			0.000 0.000			1/2" Ice	3.226	1.412	0.070
(2) RRUS-11	B	From Face	0.500	0.000	117.000	No Ice	2.994	1.246	0.050
(AT&T - Existing)			0.000 0.000			1/2" Ice	3.226	1.412	0.070
(2) RRUS-11	C	From Face	0.500	0.000	117.000	No Ice	2.994	1.246	0.050
(AT&T - Existing)			0.000 0.000			1/2" Ice	3.226	1.412	0.070
DC6-48-60-18-8F Surge Arrestor	C	From Face	0.500 0.000	0.000	117.000	No Ice 1/2" Ice	2.228 2.447	2.228 2.447	0.020 0.039
(AT&T - Existing)			0.000						

Tower Pressures - No Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z ksf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1	134.940	1.495	0.028	26.979	A	0.000	26.979	26.979	100.00	0.000	0.000
140.000-130.0					B	0.000	26.979		100.00	0.000	0.000
00					C	0.000	26.979		100.00	0.000	1.782
L2	108.881	1.406	0.026	131.815	A	0.000	131.815	131.815	100.00	0.000	0.000
130.000-89.00					B	0.000	131.815		100.00	0.000	0.000
0					C	0.000	131.815		100.00	0.000	23.562
L3	66.896	1.224	0.023	175.555	A	0.000	175.555	175.555	100.00	0.000	0.000
89.000-45.370					B	0.000	175.555		100.00	0.000	0.000
					C	0.000	175.555		100.00	0.000	25.916
L4	22.822	1	0.019	212.657	A	0.000	212.657	212.657	100.00	0.000	0.000
45.370-1.500					B	0.000	212.657		100.00	0.000	0.000
					C	0.000	212.657		100.00	0.000	26.059

Tower Pressure - With Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z ksf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1	134.940	1.495	0.021	0.500	27.813	A	0.000	27.813	27.813	100.00	0.000	0.000
140.000-130.000						B	0.000	27.813		100.00	0.000	0.000
						C	0.000	27.813		100.00	0.000	2.682
L2	108.881	1.406	0.019	0.500	135.232	A	0.000	135.232	135.232	100.00	0.000	0.000
130.000-89.000						B	0.000	135.232		100.00	0.000	0.000
						C	0.000	135.232		100.00	0.000	35.462
L3	66.896	1.224	0.017	0.500	179.190	A	0.000	179.190	179.190	100.00	0.000	0.000
89.000-45.370						B	0.000	179.190		100.00	0.000	0.000
						C	0.000	179.190		100.00	0.000	39.005
L4 45.370-1.500	22.822	1	0.014	0.500	216.313	A	0.000	216.313	216.313	100.00	0.000	0.000
						B	0.000	216.313		100.00	0.000	0.000
						C	0.000	216.313		100.00	0.000	39.220

Tower Pressure - Service

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z ksf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1	134.940	1.495	0.010	26.979	A	0.000	26.979	26.979	100.00	0.000	0.000
140.000-130.0					B	0.000	26.979		100.00	0.000	0.000
00					C	0.000	26.979		100.00	0.000	1.782
L2	108.881	1.406	0.009	131.815	A	0.000	131.815	131.815	100.00	0.000	0.000
130.000-89.00					B	0.000	131.815		100.00	0.000	0.000
0					C	0.000	131.815		100.00	0.000	23.562
L3	66.896	1.224	0.008	175.555	A	0.000	175.555	175.555	100.00	0.000	0.000
89.000-45.370					B	0.000	175.555		100.00	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z ksf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
					C	0.000	175.555		100.00	0.000	25.916
L4	22.822	1	0.006	212.657	A	0.000	212.657	212.657	100.00	0.000	0.000
45.370-1.500					B	0.000	212.657		100.00	0.000	0.000
					C	0.000	212.657		100.00	0.000	26.059

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.112	1.082	A	1	0.65	1	1	1	26.979	0.903	0.090	C
140.000-130.0			B	1	0.65	1	1	1	26.979			
00			C	1	0.65	1	1	1	26.979			
L2	1.734	5.295	A	1	0.65	1	1	1	131.815	4.795	0.117	C
130.000-89.00			B	1	0.65	1	1	1	131.815			
0			C	1	0.65	1	1	1	131.815			
L3	2.048	9.484	A	1	0.65	1	1	1	175.555	5.330	0.122	C
89.000-45.370			B	1	0.65	1	1	1	175.555			
			C	1	0.65	1	1	1	175.555			
L4	2.058	11.784	A	1	0.65	1	1	1	212.657	5.161	0.118	C
45.370-1.500			B	1	0.65	1	1	1	212.657			
			C	1	0.65	1	1	1	212.657			
Sum Weight:	5.951	27.645						OTM	1093.969 kip-ft	16.189		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.112	1.082	A	1	0.65	1	1	1	26.979	0.903	0.090	C
140.000-130.0			B	1	0.65	1	1	1	26.979			
00			C	1	0.65	1	1	1	26.979			
L2	1.734	5.295	A	1	0.65	1	1	1	131.815	4.795	0.117	C
130.000-89.00			B	1	0.65	1	1	1	131.815			
0			C	1	0.65	1	1	1	131.815			
L3	2.048	9.484	A	1	0.65	1	1	1	175.555	5.330	0.122	C
89.000-45.370			B	1	0.65	1	1	1	175.555			
			C	1	0.65	1	1	1	175.555			
L4	2.058	11.784	A	1	0.65	1	1	1	212.657	5.161	0.118	C
45.370-1.500			B	1	0.65	1	1	1	212.657			
			C	1	0.65	1	1	1	212.657			
Sum Weight:	5.951	27.645						OTM	1093.969 kip-ft	16.189		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.112	1.082	A	1	0.65	1	1	1	26.979	0.903	0.090	C
140.000-130.0			B	1	0.65	1	1	1	26.979			
00			C	1	0.65	1	1	1	26.979			
L2	1.734	5.295	A	1	0.65	1	1	1	131.815	4.795	0.117	C
130.000-89.00			B	1	0.65	1	1	1	131.815			
0			C	1	0.65	1	1	1	131.815			
L3	2.048	9.484	A	1	0.65	1	1	1	175.555	5.330	0.122	C
89.000-45.370			B	1	0.65	1	1	1	175.555			
			C	1	0.65	1	1	1	175.555			
L4	2.058	11.784	A	1	0.65	1	1	1	212.657	5.161	0.118	C
45.370-1.500			B	1	0.65	1	1	1	212.657			
			C	1	0.65	1	1	1	212.657			
Sum Weight:	5.951	27.645						OTM	1093.969 kip-ft	16.189		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.112	1.082	A	1	0.65	1	1	1	26.979	0.903	0.090	C
140.000-130.0			B	1	0.65	1	1	1	26.979			
00			C	1	0.65	1	1	1	26.979			
L2	1.734	5.295	A	1	0.65	1	1	1	131.815	4.795	0.117	C
130.000-89.00			B	1	0.65	1	1	1	131.815			
0			C	1	0.65	1	1	1	131.815			
L3	2.048	9.484	A	1	0.65	1	1	1	175.555	5.330	0.122	C
89.000-45.370			B	1	0.65	1	1	1	175.555			
			C	1	0.65	1	1	1	175.555			
L4	2.058	11.784	A	1	0.65	1	1	1	212.657	5.161	0.118	C
45.370-1.500			B	1	0.65	1	1	1	212.657			
			C	1	0.65	1	1	1	212.657			
Sum Weight:	5.951	27.645						OTM	1093.969 kip-ft	16.189		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.194	1.285	A	1	0.65	1	1	1	27.813	0.728	0.073	C
140.000-130.0			B	1	0.65	1	1	1	27.813			
00			C	1	0.65	1	1	1	27.813			
L2	2.517	6.284	A	1	0.65	1	1	1	135.232	4.061	0.099	C
130.000-89.00			B	1	0.65	1	1	1	135.232			
0			C	1	0.65	1	1	1	135.232			
L3	2.904	10.797	A	1	0.65	1	1	1	179.190	4.439	0.102	C
89.000-45.370			B	1	0.65	1	1	1	179.190			
			C	1	0.65	1	1	1	179.190			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L4	2.919	13.372	A	1	0.65	1	1	1	216.313	4.237	0.097	C
45.370-1.500			B	1	0.65	1	1	1	216.313			
			C	1	0.65	1	1	1	216.313			
Sum Weight:	8.535	31.739						OTM	913.790 kip-ft	13.464		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.194	1.285	A	1	0.65	1	1	1	27.813	0.728	0.073	C
140.000-130.0			B	1	0.65	1	1	1	27.813			
00			C	1	0.65	1	1	1	27.813			
L2	2.517	6.284	A	1	0.65	1	1	1	135.232	4.061	0.099	C
130.000-89.00			B	1	0.65	1	1	1	135.232			
0			C	1	0.65	1	1	1	135.232			
L3	2.904	10.797	A	1	0.65	1	1	1	179.190	4.439	0.102	C
89.000-45.370			B	1	0.65	1	1	1	179.190			
			C	1	0.65	1	1	1	179.190			
L4	2.919	13.372	A	1	0.65	1	1	1	216.313	4.237	0.097	C
45.370-1.500			B	1	0.65	1	1	1	216.313			
			C	1	0.65	1	1	1	216.313			
Sum Weight:	8.535	31.739						OTM	913.790 kip-ft	13.464		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.194	1.285	A	1	0.65	1	1	1	27.813	0.728	0.073	C
140.000-130.0			B	1	0.65	1	1	1	27.813			
00			C	1	0.65	1	1	1	27.813			
L2	2.517	6.284	A	1	0.65	1	1	1	135.232	4.061	0.099	C
130.000-89.00			B	1	0.65	1	1	1	135.232			
0			C	1	0.65	1	1	1	135.232			
L3	2.904	10.797	A	1	0.65	1	1	1	179.190	4.439	0.102	C
89.000-45.370			B	1	0.65	1	1	1	179.190			
			C	1	0.65	1	1	1	179.190			
L4	2.919	13.372	A	1	0.65	1	1	1	216.313	4.237	0.097	C
45.370-1.500			B	1	0.65	1	1	1	216.313			
			C	1	0.65	1	1	1	216.313			
Sum Weight:	8.535	31.739						OTM	913.790 kip-ft	13.464		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.194	1.285	A	1	0.65	1	1	1	27.813	0.728	0.073	C
140.000-130.0			B	1	0.65	1	1	1	27.813			
00			C	1	0.65	1	1	1	27.813			
L2	2.517	6.284	A	1	0.65	1	1	1	135.232	4.061	0.099	C
130.000-89.00			B	1	0.65	1	1	1	135.232			
0			C	1	0.65	1	1	1	135.232			
L3	2.904	10.797	A	1	0.65	1	1	1	179.190	4.439	0.102	C
89.000-45.370			B	1	0.65	1	1	1	179.190			
			C	1	0.65	1	1	1	179.190			
L4	2.919	13.372	A	1	0.65	1	1	1	216.313	4.237	0.097	C
45.370-1.500			B	1	0.65	1	1	1	216.313			
			C	1	0.65	1	1	1	216.313			
Sum Weight:	8.535	31.739						OTM	913.790 kip-ft	13.464		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.112	1.082	A	1	0.65	1	1	1	26.979	0.312	0.031	C
140.000-130.0			B	1	0.65	1	1	1	26.979			
00			C	1	0.65	1	1	1	26.979			
L2	1.734	5.295	A	1	0.65	1	1	1	131.815	1.659	0.040	C
130.000-89.00			B	1	0.65	1	1	1	131.815			
0			C	1	0.65	1	1	1	131.815			
L3	2.048	9.484	A	1	0.65	1	1	1	175.555	1.844	0.042	C
89.000-45.370			B	1	0.65	1	1	1	175.555			
			C	1	0.65	1	1	1	175.555			
L4	2.058	11.784	A	1	0.65	1	1	1	212.657	1.786	0.041	C
45.370-1.500			B	1	0.65	1	1	1	212.657			
			C	1	0.65	1	1	1	212.657			
Sum Weight:	5.951	27.645						OTM	378.536 kip-ft	5.602		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.112	1.082	A	1	0.65	1	1	1	26.979	0.312	0.031	C
140.000-130.0			B	1	0.65	1	1	1	26.979			
00			C	1	0.65	1	1	1	26.979			
L2	1.734	5.295	A	1	0.65	1	1	1	131.815	1.659	0.040	C
130.000-89.00			B	1	0.65	1	1	1	131.815			
0			C	1	0.65	1	1	1	131.815			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L3	2.048	9.484	A	1	0.65	1	1	1	175.555	1.844	0.042	C
89.000-45.370			B	1	0.65	1	1	1	175.555			
			C	1	0.65	1	1	1	175.555			
L4	2.058	11.784	A	1	0.65	1	1	1	212.657	1.786	0.041	C
45.370-1.500			B	1	0.65	1	1	1	212.657			
			C	1	0.65	1	1	1	212.657			
Sum Weight:	5.951	27.645						OTM	378.536 kip-ft	5.602		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.112	1.082	A	1	0.65	1	1	1	26.979	0.312	0.031	C
140.000-130.0			B	1	0.65	1	1	1	26.979			
00			C	1	0.65	1	1	1	26.979			
L2	1.734	5.295	A	1	0.65	1	1	1	131.815	1.659	0.040	C
130.000-89.00			B	1	0.65	1	1	1	131.815			
0			C	1	0.65	1	1	1	131.815			
L3	2.048	9.484	A	1	0.65	1	1	1	175.555	1.844	0.042	C
89.000-45.370			B	1	0.65	1	1	1	175.555			
			C	1	0.65	1	1	1	175.555			
L4	2.058	11.784	A	1	0.65	1	1	1	212.657	1.786	0.041	C
45.370-1.500			B	1	0.65	1	1	1	212.657			
			C	1	0.65	1	1	1	212.657			
Sum Weight:	5.951	27.645						OTM	378.536 kip-ft	5.602		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.112	1.082	A	1	0.65	1	1	1	26.979	0.312	0.031	C
140.000-130.0			B	1	0.65	1	1	1	26.979			
00			C	1	0.65	1	1	1	26.979			
L2	1.734	5.295	A	1	0.65	1	1	1	131.815	1.659	0.040	C
130.000-89.00			B	1	0.65	1	1	1	131.815			
0			C	1	0.65	1	1	1	131.815			
L3	2.048	9.484	A	1	0.65	1	1	1	175.555	1.844	0.042	C
89.000-45.370			B	1	0.65	1	1	1	175.555			
			C	1	0.65	1	1	1	175.555			
L4	2.058	11.784	A	1	0.65	1	1	1	212.657	1.786	0.041	C
45.370-1.500			B	1	0.65	1	1	1	212.657			
			C	1	0.65	1	1	1	212.657			
Sum Weight:	5.951	27.645						OTM	378.536 kip-ft	5.602		

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	27.645					
Bracing Weight	0.000					
Total Member Self-Weight	27.645			-0.008	0.085	
Total Weight	39.855			-0.008	0.085	
Wind 0 deg - No Ice		0.000	-29.463	-2763.534	0.085	-0.158
Wind 30 deg - No Ice		14.732	-25.516	-2393.292	-1381.678	-0.081
Wind 45 deg - No Ice		20.834	-20.834	-1954.116	-1954.023	-0.033
Wind 60 deg - No Ice		25.516	-14.732	-1381.771	-2393.199	0.018
Wind 90 deg - No Ice		29.463	0.000	-0.008	-2763.441	0.112
Wind 120 deg - No Ice		25.516	14.732	1381.755	-2393.199	0.176
Wind 135 deg - No Ice		20.834	20.834	1954.100	-1954.023	0.191
Wind 150 deg - No Ice		14.732	25.516	2393.275	-1381.678	0.193
Wind 180 deg - No Ice		0.000	29.463	2763.518	0.085	0.158
Wind 210 deg - No Ice		-14.732	25.516	2393.275	1381.848	0.081
Wind 225 deg - No Ice		-20.834	20.834	1954.100	1954.193	0.033
Wind 240 deg - No Ice		-25.516	14.732	1381.755	2393.369	-0.018
Wind 270 deg - No Ice		-29.463	0.000	-0.008	2763.611	-0.112
Wind 300 deg - No Ice		-25.516	-14.732	-1381.771	2393.369	-0.176
Wind 315 deg - No Ice		-20.834	-20.834	-1954.116	1954.193	-0.191
Wind 330 deg - No Ice		-14.732	-25.516	-2393.292	1381.848	-0.193
Member Ice	4.094					
Total Weight Ice	49.392			0.013	0.116	
Wind 0 deg - Ice		0.000	-24.557	-2308.812	0.116	-0.240
Wind 30 deg - Ice		12.278	-21.267	-1999.488	-1154.296	-0.193
Wind 45 deg - Ice		17.364	-17.364	-1632.573	-1632.469	-0.149
Wind 60 deg - Ice		21.267	-12.278	-1154.400	-1999.385	-0.095
Wind 90 deg - Ice		24.557	0.000	0.013	-2308.709	0.029
Wind 120 deg - Ice		21.267	12.278	1154.425	-1999.385	0.145
Wind 135 deg - Ice		17.364	17.364	1632.599	-1632.469	0.190
Wind 150 deg - Ice		12.278	21.267	1999.514	-1154.296	0.222
Wind 180 deg - Ice		0.000	24.557	2308.838	0.116	0.240
Wind 210 deg - Ice		-12.278	21.267	1999.514	1154.529	0.193
Wind 225 deg - Ice		-17.364	17.364	1632.599	1632.702	0.149
Wind 240 deg - Ice		-21.267	12.278	1154.425	1999.617	0.095
Wind 270 deg - Ice		-24.557	0.000	0.013	2308.941	-0.029
Wind 300 deg - Ice		-21.267	-12.278	-1154.400	1999.617	-0.145
Wind 315 deg - Ice		-17.364	-17.364	-1632.573	1632.702	-0.190
Wind 330 deg - Ice		-12.278	-21.267	-1999.488	1154.529	-0.222
Total Weight	39.855			-0.008	0.085	
Wind 0 deg - Service		0.000	-10.195	-956.246	0.085	-0.055
Wind 30 deg - Service		5.097	-8.829	-828.134	-478.034	-0.028
Wind 45 deg - Service		7.209	-7.209	-676.170	-676.077	-0.011
Wind 60 deg - Service		8.829	-5.097	-478.127	-828.041	0.006
Wind 90 deg - Service		10.195	0.000	-0.008	-956.153	0.039
Wind 120 deg - Service		8.829	5.097	478.110	-828.041	0.061
Wind 135 deg - Service		7.209	7.209	676.154	-676.077	0.066
Wind 150 deg - Service		5.097	8.829	828.118	-478.034	0.067
Wind 180 deg - Service		0.000	10.195	956.229	0.085	0.055
Wind 210 deg - Service		-5.097	8.829	828.118	478.204	0.028
Wind 225 deg - Service		-7.209	7.209	676.154	676.247	0.011
Wind 240 deg - Service		-8.829	5.097	478.110	828.211	-0.006
Wind 270 deg - Service		-10.195	0.000	-0.008	956.322	-0.039
Wind 300 deg - Service		-8.829	-5.097	-478.127	828.211	-0.061
Wind 315 deg - Service		-7.209	-7.209	-676.170	676.247	-0.066

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
Wind 330 deg - Service		-5.097	-8.829	-828.134	478.204	-0.067

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

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	140 - 130	Pole	Max Tension	14	0.000	-0.000	0.000
			Max. Compression	18	-3.712	-0.000	0.000
			Max. Mx	14	-2.636	27.089	-0.000
			Max. My	2	-2.636	0.001	27.089
			Max. Vy	14	-3.517	27.089	-0.000
			Max. Vx	2	-3.517	0.001	27.089
			Max. Torque	9			0.000
L2	130 - 89	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-18.009	0.116	-0.013
			Max. Mx	14	-12.804	544.525	0.010
			Max. My	2	-12.804	0.083	544.448
			Max. Vy	14	-18.615	544.525	0.010
			Max. Vx	2	-18.615	0.083	544.448
			Max. Torque	28			-0.281
L3	89 - 45.37	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-30.844	0.116	-0.013
			Max. Mx	14	-23.712	1444.648	0.009
			Max. My	2	-23.712	0.086	1444.570
			Max. Vy	14	-23.816	1444.648	0.009
			Max. Vx	2	-23.816	0.086	1444.570
			Max. Torque	27			-0.243
L4	45.37 - 1.5	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-49.392	0.116	-0.013
			Max. Mx	14	-39.842	2807.952	0.009
			Max. My	2	-39.842	0.087	2807.873
			Max. Vy	14	-29.478	2807.952	0.009
			Max. Vx	2	-29.478	0.087	2807.873
			Max. Torque	27			-0.243

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	18	49.392	0.000	-0.000
	Max. H_x	14	39.855	29.461	-0.000
	Max. H_z	2	39.855	0.000	29.461
	Max. M_x	2	2807.873	0.000	29.461
	Max. M_z	6	2807.778	-29.461	-0.000
	Max. Torsion	19	0.243	0.000	24.557
	Min. Vert	14	39.855	29.461	-0.000
	Min. H_x	6	39.855	-29.461	-0.000
	Min. H_z	10	39.855	0.000	-29.461
	Min. M_x	10	-2807.856	0.000	-29.461
	Min. M_z	14	-2807.952	29.461	-0.000
	Min. Torsion	27	-0.243	0.000	-24.557

Tower Mast Reaction Summary

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead Only	39.855	0.000	0.000	-0.008	0.085	0.000
Dead+Wind 0 deg - No Ice	39.855	-0.000	-29.461	-2807.873	0.087	-0.161
Dead+Wind 30 deg - No Ice	39.855	14.732	-25.516	-2431.945	-1403.992	-0.084
Dead+Wind 45 deg - No Ice	39.855	20.834	-20.834	-1985.677	-1985.581	-0.036
Dead+Wind 60 deg - No Ice	39.855	25.516	-14.732	-1404.088	-2431.849	0.015
Dead+Wind 90 deg - No Ice	39.855	29.461	0.000	-0.009	-2807.778	0.111
Dead+Wind 120 deg - No Ice	39.855	25.516	14.732	1404.071	-2431.850	0.176
Dead+Wind 135 deg - No Ice	39.855	20.834	20.834	1985.659	-1985.581	0.192
Dead+Wind 150 deg - No Ice	39.855	14.732	25.516	2431.928	-1403.992	0.195
Dead+Wind 180 deg - No Ice	39.855	-0.000	29.461	2807.856	0.087	0.161
Dead+Wind 210 deg - No Ice	39.855	-14.732	25.516	2431.928	1404.167	0.084
Dead+Wind 225 deg - No Ice	39.855	-20.834	20.834	1985.659	1985.755	0.036
Dead+Wind 240 deg - No Ice	39.855	-25.516	14.732	1404.071	2432.024	-0.015
Dead+Wind 270 deg - No Ice	39.855	-29.461	0.000	-0.009	2807.952	-0.111
Dead+Wind 300 deg - No Ice	39.855	-25.516	-14.732	-1404.088	2432.024	-0.176
Dead+Wind 315 deg - No Ice	39.855	-20.834	-20.834	-1985.677	1985.755	-0.192
Dead+Wind 330 deg - No Ice	39.855	-14.732	-25.516	-2431.945	1404.166	-0.195
Dead+Ice+Temp	49.392	-0.000	0.000	0.013	0.116	0.000
Dead+Wind 0 deg+Ice+Temp	49.392	-0.000	-24.557	-2358.132	0.121	-0.243
Dead+Wind 30 deg+Ice+Temp	49.392	12.278	-21.267	-2042.216	-1178.961	-0.196
Dead+Wind 45 deg+Ice+Temp	49.392	17.364	-17.364	-1667.460	-1667.353	-0.152
Dead+Wind 60 deg+Ice+Temp	49.392	21.267	-12.278	-1179.069	-2042.109	-0.097
Dead+Wind 90 deg+Ice+Temp	49.392	24.557	0.000	0.013	-2358.024	0.028
Dead+Wind 120 deg+Ice+Temp	49.392	21.267	12.278	1179.095	-2042.109	0.146
Dead+Wind 135 deg+Ice+Temp	49.392	17.364	17.364	1667.487	-1667.353	0.192
Dead+Wind 150 deg+Ice+Temp	49.392	12.278	21.267	2042.243	-1178.961	0.225
Dead+Wind 180 deg+Ice+Temp	49.392	-0.000	24.557	2358.158	0.121	0.243
Dead+Wind 210 deg+Ice+Temp	49.392	-12.278	21.267	2042.243	1179.202	0.196
Dead+Wind 225 deg+Ice+Temp	49.392	-17.364	17.364	1667.487	1667.594	0.152
Dead+Wind 240 deg+Ice+Temp	49.392	-21.267	12.278	1179.095	2042.350	0.097
Dead+Wind 270 deg+Ice+Temp	49.392	-24.557	0.000	0.013	2358.266	-0.028
Dead+Wind 300 deg+Ice+Temp	49.392	-21.267	-12.278	-1179.069	2042.350	-0.146
Dead+Wind 315 deg+Ice+Temp	49.392	-17.364	-17.364	-1667.461	1667.594	-0.192
Dead+Wind 330 deg+Ice+Temp	49.392	-12.278	-21.267	-2042.217	1179.202	-0.225
Dead+Wind 0 deg - Service	39.855	0.000	-10.194	-971.791	0.087	-0.056
Dead+Wind 30 deg - Service	39.855	5.097	-8.828	-841.597	-485.804	-0.029
Dead+Wind 45 deg - Service	39.855	7.208	-7.208	-687.163	-687.067	-0.012
Dead+Wind 60 deg - Service	39.855	8.828	-5.097	-485.900	-841.501	0.005
Dead+Wind 90 deg - Service	39.855	10.194	0.000	-0.009	-971.695	0.038
Dead+Wind 120 deg - Service	39.855	8.828	5.097	485.883	-841.501	0.061
Dead+Wind 135 deg - Service	39.855	7.208	7.208	687.145	-687.067	0.067
Dead+Wind 150 deg - Service	39.855	5.097	8.828	841.580	-485.804	0.068
Dead+Wind 180 deg - Service	39.855	0.000	10.194	971.774	0.087	0.056
Dead+Wind 210 deg - Service	39.855	-5.097	8.828	841.580	485.978	0.029
Dead+Wind 225 deg - Service	39.855	-7.208	7.208	687.145	687.241	0.012
Dead+Wind 240 deg - Service	39.855	-8.828	5.097	485.883	841.675	-0.005
Dead+Wind 270 deg - Service	39.855	-10.194	0.000	-0.009	971.870	-0.038
Dead+Wind 300 deg - Service	39.855	-8.828	-5.097	-485.900	841.675	-0.061
Dead+Wind 315 deg - Service	39.855	-7.208	-7.208	-687.163	687.241	-0.067
Dead+Wind 330 deg - Service	39.855	-5.097	-8.828	-841.597	485.978	-0.068

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.000	-39.855	0.000	0.000	39.855	0.000	0.000%
2	0.000	-39.855	-29.463	0.000	39.855	29.461	0.005%
3	14.732	-39.855	-25.516	-14.732	39.855	25.516	0.000%
4	20.834	-39.855	-20.834	-20.834	39.855	20.834	0.000%
5	25.516	-39.855	-14.732	-25.516	39.855	14.732	0.000%
6	29.463	-39.855	0.000	-29.461	39.855	-0.000	0.005%
7	25.516	-39.855	14.732	-25.516	39.855	-14.732	0.000%
8	20.834	-39.855	20.834	-20.834	39.855	-20.834	0.000%
9	14.732	-39.855	25.516	-14.732	39.855	-25.516	0.000%
10	0.000	-39.855	29.463	0.000	39.855	-29.461	0.005%
11	-14.732	-39.855	25.516	14.732	39.855	-25.516	0.000%
12	-20.834	-39.855	20.834	20.834	39.855	-20.834	0.000%
13	-25.516	-39.855	14.732	25.516	39.855	-14.732	0.000%
14	-29.463	-39.855	0.000	29.461	39.855	-0.000	0.005%
15	-25.516	-39.855	-14.732	25.516	39.855	14.732	0.000%
16	-20.834	-39.855	-20.834	20.834	39.855	20.834	0.000%
17	-14.732	-39.855	-25.516	14.732	39.855	25.516	0.000%
18	0.000	-49.392	0.000	0.000	49.392	-0.000	0.000%
19	0.000	-49.392	-24.557	0.000	49.392	24.557	0.000%
20	12.278	-49.392	-21.267	-12.278	49.392	21.267	0.000%
21	17.364	-49.392	-17.364	-17.364	49.392	17.364	0.000%
22	21.267	-49.392	-12.278	-21.267	49.392	12.278	0.000%
23	24.557	-49.392	0.000	-24.557	49.392	0.000	0.000%
24	21.267	-49.392	12.278	-21.267	49.392	-12.278	0.000%
25	17.364	-49.392	17.364	-17.364	49.392	-17.364	0.000%
26	12.278	-49.392	21.267	-12.278	49.392	-21.267	0.000%
27	0.000	-49.392	24.557	0.000	49.392	-24.557	0.000%
28	-12.278	-49.392	21.267	12.278	49.392	-21.267	0.000%
29	-17.364	-49.392	17.364	17.364	49.392	-17.364	0.000%
30	-21.267	-49.392	12.278	21.267	49.392	-12.278	0.000%
31	-24.557	-49.392	0.000	24.557	49.392	0.000	0.000%
32	-21.267	-49.392	-12.278	21.267	49.392	12.278	0.000%
33	-17.364	-49.392	-17.364	17.364	49.392	17.364	0.000%
34	-12.278	-49.392	-21.267	12.278	49.392	21.267	0.000%
35	0.000	-39.855	-10.195	-0.000	39.855	10.194	0.002%
36	5.097	-39.855	-8.829	-5.097	39.855	8.828	0.002%
37	7.209	-39.855	-7.209	-7.208	39.855	7.208	0.002%
38	8.829	-39.855	-5.097	-8.828	39.855	5.097	0.002%
39	10.195	-39.855	0.000	-10.194	39.855	-0.000	0.002%
40	8.829	-39.855	5.097	-8.828	39.855	-5.097	0.002%
41	7.209	-39.855	7.209	-7.208	39.855	-7.208	0.002%
42	5.097	-39.855	8.829	-5.097	39.855	-8.828	0.002%
43	0.000	-39.855	10.195	-0.000	39.855	-10.194	0.002%
44	-5.097	-39.855	8.829	5.097	39.855	-8.828	0.002%
45	-7.209	-39.855	7.209	7.208	39.855	-7.208	0.002%
46	-8.829	-39.855	5.097	8.828	39.855	-5.097	0.002%
47	-10.195	-39.855	0.000	10.194	39.855	-0.000	0.002%
48	-8.829	-39.855	-5.097	8.828	39.855	5.097	0.002%
49	-7.209	-39.855	-7.209	7.208	39.855	7.208	0.002%
50	-5.097	-39.855	-8.829	5.097	39.855	8.828	0.002%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.00000001	0.00000001

2	Yes	10	0.00008058	0.00014523
3	Yes	13	0.00000001	0.00005366
4	Yes	13	0.00000001	0.00006211
5	Yes	13	0.00000001	0.00005401
6	Yes	10	0.00008058	0.00014330
7	Yes	13	0.00000001	0.00005436
8	Yes	13	0.00000001	0.00006211
9	Yes	13	0.00000001	0.00005346
10	Yes	10	0.00008058	0.00014523
11	Yes	13	0.00000001	0.00005427
12	Yes	13	0.00000001	0.00006213
13	Yes	13	0.00000001	0.00005391
14	Yes	10	0.00008058	0.00014332
15	Yes	13	0.00000001	0.00005358
16	Yes	13	0.00000001	0.00006214
17	Yes	13	0.00000001	0.00005448
18	Yes	6	0.00000001	0.00000001
19	Yes	12	0.00000001	0.00013541
20	Yes	13	0.00000001	0.00007756
21	Yes	13	0.00000001	0.00008688
22	Yes	13	0.00000001	0.00007810
23	Yes	12	0.00000001	0.00013530
24	Yes	13	0.00000001	0.00007809
25	Yes	13	0.00000001	0.00008688
26	Yes	13	0.00000001	0.00007757
27	Yes	12	0.00000001	0.00013541
28	Yes	13	0.00000001	0.00007828
29	Yes	13	0.00000001	0.00008692
30	Yes	13	0.00000001	0.00007772
31	Yes	12	0.00000001	0.00013533
32	Yes	13	0.00000001	0.00007774
33	Yes	13	0.00000001	0.00008692
34	Yes	13	0.00000001	0.00007827
35	Yes	10	0.00000001	0.00006464
36	Yes	10	0.00000001	0.00008437
37	Yes	10	0.00000001	0.00009158
38	Yes	10	0.00000001	0.00008587
39	Yes	10	0.00000001	0.00006452
40	Yes	10	0.00000001	0.00008739
41	Yes	10	0.00000001	0.00009163
42	Yes	10	0.00000001	0.00008355
43	Yes	10	0.00000001	0.00006464
44	Yes	10	0.00000001	0.00008700
45	Yes	10	0.00000001	0.00009165
46	Yes	10	0.00000001	0.00008544
47	Yes	10	0.00000001	0.00006455
48	Yes	10	0.00000001	0.00008403
49	Yes	10	0.00000001	0.00009174
50	Yes	10	0.00000001	0.00008792

Maximum Tower Deflections - Service Wind

Section No.	*Elevation*	*Horz. Deflection*	*Gov. Load Comb.*	*Tilt*	*Twist*
	ft	*in*		°	°
L1	140 - 130	12.806	47	0.722	0.000
L2	130 - 89	11.295	47	0.719	0.000
L3	95 - 45.37	6.335	47	0.601	0.000
L4	52.62 - 1.5	2.001	47	0.350	0.000

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
139.000	LNX-6515DS	47	12.654	0.722	0.000	99143
138.000	Andrew 12'-6" Low Profile Platform	47	12.503	0.722	0.000	99143
130.000	8'x1" Omni	47	11.295	0.719	0.000	50112
128.000	LPA-80063/6CF	47	10.995	0.717	0.000	42304
127.000	EEI 14-ft Low Profile Platform	47	10.845	0.716	0.000	39327
119.000	(2) 7770.00	47	9.662	0.699	0.000	25322
117.000	Valmont Uni-Tri Bracket	47	9.370	0.693	0.000	23253

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	140 - 130	36.986	14	2.085	0.001
L2	130 - 89	32.624	14	2.078	0.001
L3	95 - 45.37	18.301	14	1.736	0.000
L4	52.62 - 1.5	5.781	15	1.012	0.000

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
139.000	LNX-6515DS	14	36.549	2.086	0.001	34494
138.000	Andrew 12'-6" Low Profile Platform	14	36.112	2.086	0.001	34494
130.000	8'x1" Omni	14	32.624	2.078	0.001	17430
128.000	LPA-80063/6CF	14	31.758	2.072	0.001	14710
127.000	EEI 14-ft Low Profile Platform	14	31.326	2.068	0.001	13673
119.000	(2) 7770.00	14	27.907	2.019	0.001	8795
117.000	Valmont Uni-Tri Bracket	14	27.065	2.003	0.001	8075

Compression Checks

Pole Design Data

tnxTower	Job	Page
	14033.018 - CT11696E	20 of 21
Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	**Project** 140' EEI Monopole - 191 Middle Haddam Rd. Portland, CT	**Date** 10:24:50 10/13/14
	Client T-Mobile	**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 $\frac{P}{P_a}$
L1	140 - 130 (1)	TP33.54x31.21x0.313	10.000	0.000	0.0	39.000	32.958	-2.636	1285.340	0.002
L2	130 - 89 (2)	TP43.62x33.54x0.313	41.000	0.000	0.0	39.000	41.493	-12.804	1618.210	0.008
L3	89 - 45.37 (3)	TP53.59x41.52x0.375	49.630	0.000	0.0	39.000	61.241	-23.712	2388.380	0.010
L4	45.37 - 1.5 (4)	TP63.5x51.077x0.375	51.120	0.000	0.0	36.956	75.134	-39.842	2776.640	0.014

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	140 - 130 (1)	TP33.54x31.21x0.313	27.095	1.205	39.000	0.031	0.000	0.000	39.000	0.000
L2	130 - 89 (2)	TP43.62x33.54x0.313	544.577	15.252	39.000	0.391	0.000	0.000	39.000	0.000
L3	89 - 45.37 (3)	TP53.59x41.52x0.375	1444.800	22.286	39.000	0.571	0.000	0.000	39.000	0.000
L4	45.37 - 1.5 (4)	TP63.5x51.077x0.375	2808.242	28.739	36.956	0.778	0.000	0.000	36.956	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	140 - 130 (1)	TP33.54x31.21x0.313	3.519	0.107	26.000	0.008	0.000	0.000	26.000	0.000
L2	130 - 89 (2)	TP43.62x33.54x0.313	18.617	0.449	26.000	0.035	0.176	0.002	26.000	0.000
L3	89 - 45.37 (3)	TP53.59x41.52x0.375	23.818	0.389	26.000	0.030	0.176	0.001	26.000	0.000
L4	45.37 - 1.5 (4)	TP63.5x51.077x0.375	29.480	0.392	26.000	0.030	0.176	0.001	26.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	140 - 130 (1)	0.002	0.031	0.000	0.008	0.000	0.033 ✔	1.333	H1-3+VT ✔
L2	130 - 89 (2)	0.008	0.391	0.000	0.035	0.000	0.399 ✔	1.333	H1-3+VT ✔
L3	89 - 45.37 (3)	0.010	0.571	0.000	0.030	0.000	0.582 ✔	1.333	H1-3+VT ✔
L4	45.37 - 1.5 (4)	0.014	0.778	0.000	0.030	0.000	0.792 ✔	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	140 - 130	Pole	TP33.54x31.21x0.313	1	-2.636	1713.358	2.5	Pass
L2	130 - 89	Pole	TP43.62x33.54x0.313	2	-12.804	2157.074	30.0	Pass
L3	89 - 45.37	Pole	TP53.59x41.52x0.375	3	-23.712	3183.710	43.6	Pass
L4	45.37 - 1.5	Pole	TP63.5x51.077x0.375	4	-39.842	3701.261	59.4	Pass
							Summary	
						Pole (L4)	59.4	Pass
						RATING =	**59.4**	**Pass**

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Subject:	Flange Bolts and Flangeplate Analysis
Location:	140-ft EEI Monopole Portland, CT
Rev. 0: 10/13/14	Prepared by: T.J.L. Checked by: C.F.C. Job No. 14033.018

Flange Bolt and Flange Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	OM := 27.1·ft·kips	(Input From RisaTower)
Shear Force =	Shear := 3.5·kips	(Input From RisaTower)
Axial Force =	Axial := 3.7·kips	(Input From RisaTower)

Flange Bolt Data:

Use ASTM A325

Number of Flange Bolts =	N := 24	(User Input)
Diameter of Bolt Circle =	D_{bc} := 38.0·in	(User Input)
Bolt Ultimate Strength =	F_u := 120·ksi	(User Input)
Bolt Yield Strength =	F_y := 92·ksi	(User Input)
Bolt Modulus =	E := 29000·ksi	(User Input)
Diameter of Flange Bolts =	D := 1.0·in	(User Input)
Threads per Inch =	n := 8	(User Input)

Flange Plate Data:

Use ASTM A572 Mod 60

Plate Yield Strength =	Fy_{bp} := 60·ksi	(User Input)
Flange Plate Thickness =	t_{bp} := 1.00·in	(User Input)
Flange Plate Diameter =	D_{bp} := 41.0·in	(User Input)
Outer Pole Diameter =	D_{pole} := 33.54·in	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

Radius of Bolt Circle =: $R_{bc} := \frac{D_{bc}}{2} = 19 \cdot in$

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

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

$d_1 = 4.92 \cdot in$ $d_7 = 18.35 \cdot in$

$d_2 = 9.50 \cdot in$ $d_8 = 16.45 \cdot in$

$d_3 = 13.44 \cdot in$ $d_9 = 13.44 \cdot in$

$d_4 = 16.45 \cdot in$ $d_{10} = 9.50 \cdot in$

$d_5 = 18.35 \cdot in$ $d_{11} = 4.92 \cdot in$

$d_6 = 19.00 \cdot in$ $d_{12} = 0.00 \cdot in$

Critical Distances For Bending in Plate:

Outer Pole Radius = $R_{pole} := \frac{D_{pole}}{2} = 16.8 \cdot in$

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

$MA_1 = 0.00 \cdot in$ $MA_7 = 1.58 \cdot in$

$MA_2 = 0.00 \cdot in$ $MA_8 = 0.00 \cdot in$

$MA_3 = 0.00 \cdot in$ $MA_9 = 0.00 \cdot in$

$MA_4 = 0.00 \cdot in$ $MA_{10} = 0.00 \cdot in$

$MA_5 = 1.58 \cdot in$ $MA_{11} = 0.00 \cdot in$

$MA_6 = 2.23 \cdot in$ $MA_{12} = 0.00 \cdot in$

Effective Width of Flangeplate for Bending = $B_{eff} := .8 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2} = 18.9 \cdot in$

Flange Bolt Analysis:

Calculated Flange Bolt Properties:

Polar Moment of Inertia = $I_p := \sum_i \left(d_i\right)^2 = 4.332 \times 10^3 \cdot in^2$

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 0.785 \cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 = 0.606 \cdot in^2$

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 0.878 \cdot in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.22 \cdot in$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^3}{32} = 0.066 \cdot in^3$

Check Flange Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{R_{bc}}{I_p} - \frac{Axial}{N} = 1.3 \cdot kips$

Allowable Tensile Force = $T_{ALL.Gross} := 1.333 \cdot \left(0.33 \cdot A_g \cdot F_u\right) = 41.5 \cdot kips$ (1.333 increase allowed per TIA/EIA)

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Gross}} = 3 \cdot \%$

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

Condition1 = "OK"

Flange Plate Analysis:

Force from Bolts =

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

$C_1 = 0.5 \cdot kips$
$C_2 = 0.9 \cdot kips$
$C_3 = 1.2 \cdot kips$
$C_4 = 1.4 \cdot kips$
$C_5 = 1.5 \cdot kips$
$C_6 = 1.6 \cdot kips$
$C_7 = 1.5 \cdot kips$
$C_8 = 1.4 \cdot kips$
$C_9 = 1.2 \cdot kips$
$C_{10} = 0.9 \cdot kips$
$C_{11} = 0.5 \cdot kips$
$C_{12} = 0.2 \cdot kips$

Maximum Bending Stress in Plate =

$$f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{\left(B_{eff} t_{bp}^2\right)} = 2.7 \cdot ksi$$

Allowable Bending Stress in Plate =

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

Plate Bending Stress % of Capacity =

$$\frac{f_{bp}}{F_{bp}} = 4.4 \cdot \%$$

Condition3 =

$$Condition2 := if\left(\frac{f_{bp}}{F_{bp}} < 1.00, "Ok", "Overstressed"\right)$$

Condition2 = "Ok"

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Subject:		Anchor Bolt and Base Plate Anlaysis
Location:		140-ft EEI Monopole Portland, CT
Rev. 0: 10/13/14		Prepared by: T.J.L. Checked by: C.F.C. Job No. 14033.018

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	OM := 2808·ft·kips	(Input From RisaTower)
Shear Force =	Shear := 29·kips	(Input From RisaTower)
Axial Force =	Axial := 40·kips	(Input From RisaTower)

Anchor Bolt Data:

Use ASTM A615 Grade 75

Number of Anchor Bolts =	N := 20	(User Input)
Diameter of Bolt Circle =	D_{bc} := 73.0·in	(User Input)
Bolt "Column" Distance =	l := 3.0·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 60

Plate Yield Strength =	Fy_{bp} := 60·ksi	(User Input)
Base Plate Thickness =	t_{bp} := 2·in	(User Input)
Base Plate Diameter =	D_{bp} := 79.0·in	(User Input)
Outer Pole Diameter =	D_{pole} := 63.5·in	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

Radius of Bolt Circle =: $R_{bc} := \frac{D_{bc}}{2} = 36.5 \cdot in$

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

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

$d_1 = 11.28 \cdot in$ $d_7 = 29.53 \cdot in$

$d_2 = 21.45 \cdot in$ $d_8 = 21.45 \cdot in$

$d_3 = 29.53 \cdot in$ $d_9 = 11.28 \cdot in$

$d_4 = 34.71 \cdot in$ $d_{10} = 0.00 \cdot in$

$d_5 = 36.50 \cdot in$ $d_{11} = -11.28 \cdot in$

$d_6 = 34.71 \cdot in$ etc.

Critical Distances For Bending in Plate:

Outer Pole Radius = $R_{pole} := \frac{D_{pole}}{2} = 31.8 \cdot in$

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

$MA_1 = 0.00 \cdot in$ $MA_7 = 0.00 \cdot in$

$MA_2 = 0.00 \cdot in$ $MA_8 = 0.00 \cdot in$

$MA_3 = 0.00 \cdot in$ $MA_9 = 0.00 \cdot in$

$MA_4 = 2.96 \cdot in$ $MA_{10} = 0.00 \cdot in$

$MA_5 = 4.75 \cdot in$ $MA_{11} = 0.00 \cdot in$

$MA_6 = 2.96 \cdot in$ etc

Effective Width of Baseplate for Bending = $B_{eff} := .8 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2} = 37.6 \cdot in$

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Polar Moment of Inertia = $I_p := \sum_i \left(d_i\right)^2 = 1.332 \times 10^4 \cdot in^2$

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 3.976 \cdot in^2$

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

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

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.508 \cdot in$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^3}{32} = 0.826 \cdot in^3$

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{R_{bc}}{I_p} - \frac{Axial}{N} = 90.3 \cdot kips$

Allowable Tensile Force = $T_{ALL.Gross} := 1.333 \cdot \left(0.33 \cdot A_g \cdot F_u\right) = 174.9 \cdot kips$ (1.333 increase allowed per TIA/EIA)

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

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Net}} \cdot 100 = 46$ Bolts are "upset bolts". Use net area per AISC

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

Condition1 = "OK"

Check Anchor Bolt Bending Stress:

Maximum Bending Moment = $M_x := \left(\frac{Shear}{N}\right) \cdot l = 0.362 \cdot ft \cdot kips$

Maximum Bending Stress = $f_{bx} := \frac{M_x}{S_x} = 5.3 \cdot ksi$

Allowable Bending Stress = $F_{bx} := 1.333 \cdot 0.6 \cdot F_y = 60 \cdot ksi$ (1.333 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.

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

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

Check Anchor Bolt Compression/Combined Stress:

Maximum Compressive Force =

$$C_{Max} := OM \cdot \frac{R_{bc}}{I_p} + \frac{Axial}{N} = 94.3 \cdot kips$$

Maximum Compressive Stress =

$$f_a := \frac{C_{Max}}{A_n} = 29 \cdot ksi$$

$$K := 0.65$$

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

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

Allowable Compressive Stress =

$$F_a := 1.333 \cdot F_a = 60 \cdot ksi$$

(1.333 increase allowed per TIA/EIA)

Combined Stress % of Capacity =

$$\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}}\right) \cdot 100 = 48.4$$

Condition 2 =

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

Condition2 = "OK"

Base Plate Analysis:

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

$C_1 = 30.5 \cdot kips$ $C_7 = 76.7 \cdot kips$

$C_2 = 56.3 \cdot kips$ $C_8 = 56.3 \cdot kips$

$C_3 = 76.7 \cdot kips$ $C_9 = 30.5 \cdot kips$

$C_4 = 89.8 \cdot kips$ $C_{10} = 2.0 \cdot kips$

$C_5 = 94.3 \cdot kips$ $C_{11} = -26.5 \cdot kips$

$C_6 = 89.8 \cdot kips$ etc.

Maximum Bending Stress in Plate = $f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{\left(B_{eff} \cdot t_{bp}^2\right)} = 39.1 \cdot ksi$

Allowable Bending Stress in Plate = $F_{bp} := 1.33 \cdot 0.75 \cdot Fy_{bp} = 59.9 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} \cdot 100 = 65.3$

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

Condition3 = "Ok"

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Subject:		Foundation Analysis
Location:		140-ft Monopole Portland, CT
Rev. 0: 10/13/14		Prepared by: T.J.L. Checked by: C.F.C. Job No. 14033.018

Standard Monopole Foundation:

Input Data:

Tower Data

Overturning Moment =	OM := 2808·ft·kips	(User Input from tnxTower)	
Shear Force =	Shear := 29·kip	(User Input from tnxTower)	
Axial Force =	Axial := 40·kip	(User Input from tnxTower)	
Tower Height =	H_t := 140·ft	(User Input)	

Footing Data:

Overall Depth of Footing =	D_f := 6.5·ft	(User Input)	
Length of Pier =	L_p := 3.5·ft	(User Input)	
Extension of Pier Above Grade =	L_{pag} := 1.0·ft	(User Input)	
Diameter of Pier =	d_p := 8.0·ft	(User Input)	
Thickness of Footing =	T_f := 4.0·ft	(User Input)	
Width of Footing =	W_f := 26.5·ft	(User Input)	

Anchor Bolt Data:

Length of Anchor Bolts =	L_{st} := 84·in	(User Input)	
Projection of Anchor Bolts Above Pier =	A_{BP} := 12.0·in	(User Input)	
Anchor Bolt Diameter =	d_{anchor} := 2.25·in	(User Input)	
Base Plate Bolt Circle =	MP := 73.0·in	(User Input)	

Material Properties:

Concrete Compressive Strength =	f_c := 4000·psi	(User Input)	
Steel Reinforcment 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 := 10000·psf	(User Input)	
Unit Weight of Soil =	γ_{soil} := 110·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)	

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Pier Reinforcement:

Bar Size =	$BS_{pier} := 8$	(User Input)	
Bar Diameter =	$d_{bpier} := 1.0 \cdot in$	(User Input)	
Number of Bars =	$NB_{pier} := 58$	(User Input)	
Clear Cover of Reinforcement =	$Cvr_{pier} := 3 \cdot in$	(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 =	$d_{Tie} := 0.5 \cdot in$	(User Input)	

Pad Reinforcement:

Bar Size =	$BS_{top} := 8$	(User Input)	(Top of Pad)
Bar Diameter =	$d_{btop} := 1.0 \cdot in$	(User Input)	(Top of Pad)
Number of Bars =	$NB_{top} := 32$	(User Input)	(Top of Pad)
Bar Size =	$BS_{bot} := 8$	(User Input)	(Bottom of Pad)
Bar Diameter =	$d_{bbot} := 1.0 \cdot in$	(User Input)	(Bottom of Pad)
Number of Bars =	$NB_{bot} := 44$	(User Input)	(Bottom of Pad)
Clear Cover of Reinforcement =	$Cvr_{pad} := 3.0 \cdot in$	(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 =

$$A_{bpier} := \frac{\pi \cdot d_{bpier}^{2}}{4} = 0.785 \cdot in^{2}$$

Pad Top Reinforcement Bar Area =

$$A_{btop} := \frac{\pi \cdot d_{btop}^{2}}{4} = 0.785 \cdot in^{2}$$

Pad Bottom Reinforcement Bar Area =

$$A_{bbot} := \frac{\pi \cdot d_{bbot}^{2}}{4} = 0.785 \cdot in^{2}$$

Coefficient of Lateral Soil Pressure =

$$K_p := \frac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 3$$

Load Factor =

$$LF := \begin{cases} 1.333 & \text{if } H_t \le 700 \cdot ft \\ 1.7 & \text{if } H_t \ge 1200 \cdot ft \\ 1.333 + \left(\frac{H_t - 700ft}{1200ft - 700ft} \right) \cdot 0.4 & \text{otherwise} \end{cases} = 1.333$$

Stability of Footing:

Adjusted Concrete Unit Weight =

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

Adjusted Soil Unit Weight =

$$\gamma_s := \text{if}\left(\text{Bouyancy} = 1, \gamma_{soil} - 62.4\text{pcf}, \gamma_{soil}\right) = 110\cdot\text{pcf}$$

Passive Pressure =

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

$$P_{pt} := K_p\cdot\gamma_s\cdot\left(D_f - T_f\right) + c\cdot 2\cdot\sqrt{K_p} = 0.825\cdot\text{ksf}$$

$$P_{top} := \text{if}\left[n < \left(D_f - T_f\right), P_{pt}, P_{pn}\right] = 0.825\cdot\text{ksf}$$

$$P_{bot} := K_p\cdot\gamma_s\cdot D_f + c\cdot 2\cdot\sqrt{K_p} = 2.145\cdot\text{ksf}$$

$$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 1.485\cdot\text{ksf}$$

$$T_p := \text{if}\left[n < \left(D_f - T_f\right), T_f, \left(D_f - n\right)\right] = 4$$

$$A_p := W_f\cdot T_p = 106$$

Ultimate Shear =

$$S_u := P_{ave}\cdot A_p = 157.41\cdot\text{kip}$$

Weight of Concrete Pad =

$$WT_c := \left[\left(W_f^{\,2}\cdot T_f\right) + d_p^{\,2}\cdot L_p\right]\cdot\gamma_c = 454.95\cdot\text{kip}$$

Weight of Soil Above Footing =

$$WT_{s1} := \left[\left(W_f^{\,2} - d_p^{\,2}\right)\cdot\begin{cases}\left(L_p - L_{pag} - n\right) & \text{if } \left(L_p - L_{pag} - n\right) \geq 0 \\ 0 & \text{if } \left(L_p - L_{pag} - n\right) \leq 0\end{cases}\right]\cdot\gamma_s = 175.52\cdot\text{kip}$$

Weight of Soil Wedge at Back Face =

$$WT_{s2} := \left(\frac{D_f^{\,2}\cdot\tan\left(\Phi_s\right)}{2}\cdot W_f\right)\cdot\gamma_s = 35.553\cdot\text{kip}$$

Weight of Soil Wedge at back face Corners =

$$WT_{s3} := 2\cdot\left[\left(D_f\right)^3\cdot\frac{\tan\left(\Phi_s\right)}{3}\right]\cdot\gamma_s = 11.627\cdot\text{kips}$$

Total Weight =

$$WT_{tot} := WT_c + WT_{s1} + \text{Axial} = 670.469\cdot\text{kip}$$

Resisting Moment =

$$M_r := \left(WT_{tot}\right)\cdot\frac{W_f}{2} + S_u\cdot\frac{T_f}{3} + \left[\left(WT_{s2} + WT_{s3}\right)\cdot\left(W_f + \frac{D_f\tan\left(\Phi_s\right)}{3}\right)\right] = 10403\cdot\text{kip}\cdot\text{ft}$$

Overturning Moment =

$$M_{ot} := \text{OM} + \text{Shear}\cdot\left(L_p + T_f\right) = 3025\cdot\text{kip}\cdot\text{ft}$$

Factor of Safety Actual =

$$FS := \frac{M_r}{M_{ot}} = 3.44$$

Factor of Safety Required =

$$FS_{req} := 2$$

$$\text{OverTurning\_Moment\_Check} := \text{if}\left(FS \geq FS_{req}, \text{"Okay"}, \text{"No Good"}\right)$$

OverTurning_Moment_Check = "Okay"

Shear Capacity in Pier:

Shear Resistance of Pier =

$$S_p := \frac{\mu \cdot WT_{tot}}{FS_{req}} = 150.855 \cdot kips$$

$$Shear\_Check := if\left(S_p > Shear, "Okay", "No Good"\right)$$

Shear_Check = "Okay"

Bearing Pressure Caused by Footing:

Area of the Mat =

$$A_{mat} := W_f^{\,2} = 702.25$$

Section Modulus of Mat =

$$S := \frac{W_f^{\,3}}{6} = 3101.6 \cdot ft^3$$

Maximum Pressure in Mat =

$$P_{max} := \frac{WT_{tot}}{A_{mat}} + \frac{M_{ot}}{S} = 1.93 \cdot ksf$$

$$Max\_Pressure\_Check := if\left(P_{max} < q_s, "Okay", "No Good"\right)$$

Max_Pressure_Check = "Okay"

Minimum Pressure in Mat =

$$P_{min} := \frac{WT_{tot}}{A_{mat}} - \frac{M_{ot}}{S} = -0.021 \cdot ksf$$

$$Min\_Pressure\_Check := if\left[\left(P_{min} \geq 0\right) \cdot \left(P_{min} < q_s\right), "Okay", "No Good"\right]$$

Min_Pressure_Check = "No Good"

Distance to Resultant of Pressure Distribution =

$$X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3} = 8.74$$

Distance to Kern =

$$X_k := \frac{W_f}{6} = 4.417$$

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

Eccentricity =

$$e := \frac{M_{ot}}{WT_{tot}} = 4.513$$

Adjusted Soil Pressure =

$$P_a := \frac{2 \cdot WT_{tot}}{3 \cdot W_f \left(\frac{W_f}{2} - e\right)} = 1.93 \cdot ksf$$

$$q_{adj} := if\left(P_{min} < 0, P_a, P_{max}\right) = 1.93 \cdot ksf$$

$$Pressure\_Check := if\left(q_{adj} < q_s, "Okay", "No Good"\right)$$

Pressure_Check = "Okay"

Concrete Bearing Capacity:

Strength Reduction Factor = $\Phi_c := 0.65$ (ACI-2008 9.3.2.2)

Bearing Strength Between Pier and Pad = $P_b := \Phi_c \cdot 0.85 \cdot f_c \cdot \frac{\pi \cdot d_p^2}{4} = 1.6 \times 10^4 \cdot kips$ (ACI-2008 10.14)

$Bearing\_Check := if(P_b > LF \cdot Axial, "Okay", "No Good")$

Bearing_Check = "Okay"

Shear Strength of Concrete:

Beam Shear: (Critical section located at a distance d from the face of Pier) (ACI 11.3.1.1)

$\phi_c := 0.85$ (ACI 9.3.2.5)

$d := T_f - Cvr_{pad} - d_{bbot} = 44 \cdot in$

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

$d_2 := d_1 - d$

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

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

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

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

$Beam\_Shear\_Check := if(V_{req} < V_{Avail}, "Okay", "No Good")$

Beam_Shear_Check = "Okay"

Punching Shear: (Critical Section Located at a distance of d/2 from the face of pier) (ACI 11.11.1.2)

Critical Perimeter of Punching Shear = $b_o := \left(d_p + d\right) \cdot \pi = 36.7$

Area Included Inside Perimeter = $A_{bo} := \frac{\pi \cdot \left(d_p + d\right)^2}{4} = 106.9$

Area Outside of Perimeter = $A_{out} := A_{mat} - A_{bo} = 595.3$

Guess Value = $v_u := 1ksf$

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

Given $d^2 + d_p \cdot d = \frac{WT_{tot}}{\pi \cdot v_u}$

$v_u := Find(v_u) = 5 \cdot ksf$

$V_u := v_u \cdot d \cdot W_f = 484.8 \cdot kips$

Required Shear Strength = $V_{req} := LF \cdot V_u = 646.2 \cdot kips$

Available Shear Strength = $V_{Avail} := \phi_c \cdot 4 \cdot \sqrt{f_c \cdot psi} \cdot b_o \cdot d = 4161.4 \cdot kip$ (ACI-2008 11.11.2.1)

$Punching\_Shear\_Check := if(V_{req} < V_{Avail}, "Okay", "No Good")$

$Punching\_Shear\_Check = "Okay"$

Steel Reinforcement in Pad:

Required Reinforcement for Bending:

Strength Reduction Factor = $\phi_m := .90$ (ACI-2008 9.3.2.1)

$q_b := q_{adj} - d_1 \cdot Slope = 1.249 \cdot ksf$

Maximum Bending at Face of Pier = $M_u := LF \cdot \left[\left(q_{adj} - q_b \right) \cdot \frac{d_1^2}{3} + q_b \cdot \frac{d_1^2}{2} \right] \cdot W_f = 2574.2 \cdot kip \cdot ft$

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

(ACI-200810.2.7.3)

$R_n := \frac{M_u}{\phi_m \cdot W_f \cdot d^2} = 55.7 \cdot psi$

$\rho := \frac{0.85 \cdot f_c}{f_y} \left(1 - \sqrt{1 - \frac{2 \cdot R_n}{0.85 \cdot f_c}} \right) = 0.0009$

$\rho_{min} := \rho = 0.00094$

Required Reinforcement for Temperature and Shrinkage:

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

Check Bottom Bars:

$$As := \begin{cases} \rho_{min} \cdot W_f \cdot d & \text{if } \rho_{min} > \frac{\rho_{sh}}{2} \\ \rho_{sh} \cdot W_f \cdot \frac{d}{2} & \text{otherwise} \end{cases} = 13.109 \cdot in^2$$

$$As_{prov} := A_{bbot} \cdot NB_{bot} = 34.6 \cdot in^2$$

$$Pad\_Reinforcement\_Bot := if\left(As_{prov} > As, "Okay", "No Good"\right)$$

Pad_Reinforcement_Bot = "Okay"

Check top Bars:

$$As := \rho_{sh} \cdot \left(W_f \cdot \frac{d}{2}\right) = 12.6 \cdot in^2$$

$$As_{prov} := A_{btop} \cdot NB_{top} = 25.1 \cdot in^2$$

$$Pad\_Reinforcement\_Top := if\left(As_{prov} > As, "Okay", "No Good"\right)$$

Pad_Reinforcement_Top = "Okay"

Developement Length Pad Reinforcement:

Bar Spacing =

$$B_{sPad} := \frac{W_f - 2 \cdot Cvr_{pad} - NB_{bot} \cdot d_{bbot}}{NB_{bot} - 1} = 6.23 \cdot in$$

Spacing or Cover Dimension =

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

Transverse Reinforcement Index =

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

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

Minimum Development Length =

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

$$L_{dbtCheck} := if\left(L_{dbt} \geq L_{dbmin}, "Use\ L.dbt", "Use\ L.dbmin"\right)$$

Available Length in Pad =

$$L_{Pad} := \frac{W_f}{2} - \frac{d_p}{2} - Cvr_{pad} = 108 \cdot in$$

$$Lpad\_Check := if\left(L_{Pad} > L_{dbt}, "Okay", "No Good"\right)$$

Lpad_Check = "Okay"

Steel Reinforcement in Pier:

Area of Pier =

$$A_p := \frac{\pi \cdot d_p^2}{4} = 7238.23 \cdot in^2$$

$$A_{smin} := 0.01 \cdot 0.5 \cdot A_p = 36.19 \cdot in^2 \qquad \text{(ACI-2008 10.8.4 \& 10.9.1)}$$

$$A_{sprov} := NB_{pier} \cdot A_{bpier} = 45.55 \cdot in^2$$

$$Steel\_Area\_Check := if\left(A_{sprov} > A_{smin}, "Okay", "No Good"\right)$$

Steel_Area_Check = "Okay"

Bar Spacing In Pier =

$$B_{sPier} := \frac{d_p \cdot \pi}{NB_{pier}} - d_{bpier} = 4.2 \cdot in$$

Diameter of Reinforcement Cage =

$$Diam_{cage} := d_p - 2 \cdot Cvr_{pier} = 90 \cdot in$$

Maximum Moment in Pier =

$$M_p := \left[OM + Shear \cdot \left(L_p + \frac{A_{BP}}{2}\right)\right] \cdot LF = 46772.3 \cdot in \cdot kips$$

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

$$\left(D \;\; N \;\; n \;\; P_u \;\; M_{xu}\right) := \left(d_p \cdot 12 \;\; NB_{pier} \;\; BS_{pier} \;\; \frac{Axial \cdot 1.333}{kips} \;\; \frac{M_p}{in \cdot kips}\right)$$

$$\left(D \;\; N \;\; n \;\; P_u \;\; M_{xu}\right) = \left(96 \;\; 58 \;\; 8 \;\; 53.32 \;\; 4.677 \times 10^4\right)$$

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

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

$$\left(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho\right) = \left(116.493 \;\; 1.022 \times 10^5 \;\; -60 \;\; 6.33 \times 10^{-3}\right)$$

$$Axial\_Load\_Check := if\left(\phi P_n \geq P_u, "Okay", "No Good"\right)$$

Axial_Load_Check = "Okay"

$$Bending\_Check := if\left(\phi M_{xn} \geq M_{xu}, "Okay", "No Good"\right)$$

Bending_Check = "Okay"

Development Length Pier Reinforcement:

Available Length in Foundation:

$L_{pier} := L_p - Cvr_{pier} = 39 \cdot in$

$L_{pad} := T_f - Cvr_{pad} = 45 \cdot in$

Tension: (ACI-2008 12.2.3)

Spacing or Cover Dimension =

$c := if\left(Cvr_{pier} < \frac{B_{sPier}}{2}, Cvr_{pier}, \frac{B_{sPier}}{2}\right) = 2.1 \cdot in$

Transverse Reinforcement = $k_{tr} := 0$ (ACI-2008 12.2.3)

$L_{dbt} := \frac{3 \cdot f_y \alpha_{pier} \cdot \beta_{pier} \cdot \gamma_{pier} \cdot \lambda_{pier}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \left(\frac{c + k_{tr}}{d_{bpier}}\right)} \cdot d_{bpier} = 33.88 \cdot in$

Minimum Development Length =

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

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

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

$L_{tension\_Check} := if\left(L_{pier} + L_{pad} > L_{dbt}, "Okay", "No Good"\right)$

$L_{tension\_Check} = "Okay"$

Compression: (ACI-2008 12.3.2)

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

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

$L_{dbc} := if\left(L_{dbc1} \geq L_{dbmin}, L_{dbc1}, L_{dbmin}\right) = 18.974 \cdot in$

$L_{compression\_Check} := if\left(L_{pier} + L_{pad} > L_{dbc}, "Okay", "No Good"\right)$

$L_{compression\_Check} = "Okay"$

Tie Size and Spacing in Column:

Minimum Tie Size =

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

Used #4 Ties

Seismic Factor =

$z := if(Z \le 2, 1, 0.5) = 1$ (ACI-2008 21.10.5)

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

$s_{lim2} := 48 \cdot d_{Tie} \cdot z = 24 \cdot in$

$s_{lim3} := D_f \cdot z = 78 \cdot in$

$s_{lim4} := 18in$

Maximum Spacing =

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

Number of Ties Required =

$$n_{tie} := \frac{L_{pier} - 3 \cdot in}{s_{tie}} + 1 = 3.25$$

Check Anchor Steel Embedment:

Depth Available =

$D_{ab} := L_{st} - A_{BP} = 6 \cdot ft$

Length of Anchor Bolt =

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

$Depth\_Check := if(D_{ab} \ge L_{anchor}, "Okay", "No Good")$

Depth_Check = "No Good"

Note: Anchor plate is provided

Network Modernization RFDS v3.0

Site ID	CT11696E	Latitude	41.56444
		Longitude	-72.57361
Site Name	CT696/Verizon Portland_ET	Site Type	Structure (Non-Build
Address	191 Middle Haddam Rd Portland	Site Class	Monopole
Market	Connecticut	Landlord	Verizon

Configuration

704G

Approvals	
Market RF	
Market Development	

RFDS Revision		Date 07/16/2014
RFDS Final		

Site Information

Existing Configuration					Proposed Configuration			
1	2	3	4	Cabinet #	1	2	3	4
GSM				Technology	GSM/LTE			
S8000				Cabinet type	6102			
				CBU				
				DUW30				
				DUL20				
				DUG20	1			
				DUS31	1			
				RBS6601				
3				dTRU/TRX				
				RU22 B4				
				RUS01 B2	6			
				RUS01 B4				

- [ ] Relocate cabinet
- [ ] Add cabinet
- [x] Swap cabinet
- [ ] Remove cabinet
- [ ] Make cabinet dark

Comments

Swap cabinet for Ericsson 6102

ALPHA - Scope of Work

- [x] Add new mount
- [ ] Relocate antenna
- [x] Add antenna
- [ ] Swap antenna
- [ ] Remove antenna
- [ ] Add TMA
- [ ] Swap TMA
- [ ] Remove TMA

- [x] Add RRU
- [ ] Swap existing RRU
- [ ] Remove RRU
- [ ] Consolidate coax cables
- [x] Add coax cables
- [ ] Add fiber cables
- [ ] Add hybrid combiner
- [ ] Add filter combiner

Add LTE 700 passive antenna. Add coax. Add RRUS on ground. Add smart Bias-T

BETA - Scope of Work

- [x] Add new mount
- [ ] Relocate antenna
- [x] Add antenna
- [ ] Swap antenna
- [ ] Remove antenna
- [ ] Add TMA
- [ ] Swap TMA
- [ ] Remove TMA

- [x] Add RRU
- [ ] Swap existing RRU
- [ ] Remove RRU
- [ ] Consolidate coax cables
- [x] Add coax cables
- [ ] Add fiber cables
- [ ] Add hybrid combiner
- [ ] Add filter combiner

Add LTE 700 passive antenna. Add coax. Add RRUS on ground. Add smart Bias-T

GAMMA - Scope of Work

- [x] Add new mount
- [ ] Relocate antenna
- [x] Add antenna
- [ ] Swap antenna
- [ ] Remove antenna
- [ ] Add TMA
- [ ] Swap TMA
- [ ] Remove TMA

- [x] Add RRU
- [ ] Swap existing RRU
- [ ] Remove RRU
- [ ] Consolidate coax cables
- [x] Add coax cables
- [ ] Add fiber cables
- [ ] Add hybrid combiner
- [ ] Add filter combiner

Add LTE 700 passive antenna. Add coax. Add RRUS on ground. Add smart Bias-T

DELTA - Scope of Work

- [ ] Add new mount
- [ ] Relocate antenna
- [ ] Add antenna
- [ ] Swap antenna
- [ ] Remove antenna
- [ ] Add TMA
- [ ] Swap TMA
- [ ] Remove TMA

- [ ] Add RRU
- [ ] Swap existing RRU
- [ ] Remove RRU
- [ ] Consolidate coax cables
- [ ] Add coax cables
- [ ] Add fiber cables
- [ ] Add hybrid combiner
- [ ] Add filter combiner

Network Modernization RFDS v3.0

Site ID	**CT11696E**	**Latitude**	41.56444
		Longitude	-72.57361
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Address	191 Middle Haddam Rd Portland	**Site Class**	Monopole
Market	Connecticut	**Landlord**	Verizon

Configuration

704G

Approvals	
Market RF	
Market Development	

RFDS Revision	
RFDS Final	

Date 07/16/2014

ALPHA (view from behind)

	Existing Configuration					Proposed Configuration			
Mount	X	X	X		X	X	X		
Technology	GSM					GSM/LTE	LTE		
Band	B2					B2	B12		
Active/Passive	P					P	P		
Ant. Type	Dual pole					Dual pole	Dual pole		
Ant. Model	APXV18_209014_02					APXV18_209014_02	LNX-6515DS-VTM		
Ant. Vendor	RFS					RFS	Commscope		
Ant. Height	137					137	137		
Azimuth	0					0	0		
RET deployed						NO	Yes		
E-Tilt	2					2	2		
M-Tilt	0					0	0		
TMA #	1					1			
TMA Type	dd B2					dd B2			
RRU #							1		
RRU Type							RRUS11_B12		
Used Coax #	2					2	2		
Coax Type	1-5/8"					1-5/8"	1-5/8"		
Coax Length (ft)	210								
Fiber (CPRI) #									
Splitter #									
Combiner #									
Combiner Type									

x	Add new mount	x	Add RRU
	Relocate antenna		Swap existing RRU
x	Add antenna		Remove RRU
	Swap antenna		Consolidate coax cables
	Remove antenna	x	Add coax cables
	Add TMA		Add fiber cables
	Swap TMA		Add hybrid combiner
	Remove TMA		Add filter combiner

Scope of work

Add LTE 700 passive antenna. Add coax. Add RRUS on ground. Add smart Bias-T

BETA (view from behind)

	Existing Configuration					Proposed Configuration			
Mount	X	X	X		X	X	X		
Technology	GSM					GSM/LTE	LTE		
Band	B2					B2	B12		
Active/Passive	P					P	P		
Ant. Type	Dual pole					Dual pole	Dual pole		
Ant. Model	APXV18_209014_02					APXV18_209014_02	LNX-6515DS-VTM		
Ant. Vendor	RFS					RFS	Commscope		
Ant. Height	137					137	137		
Azimuth	120					120	120		
RET deployed						NO	Yes		
E-Tilt	2					2	2		
M-Tilt	0					0	0		
TMA #	1					1			
TMA Type	dd B2					dd B2			
RRU #							1		
RRU Type							RRUS11_B12		
Used Coax #	2					2	2		
Coax Type	1-5/8"					1-5/8"	1-5/8"		
Coax Length (ft)	210								
Fiber (CPRI) #									
Splitter #									
Combiner #									
Combiner Type									

x	Add new mount	x	Add RRU
	Relocate antenna		Swap existing RRU
x	Add antenna		Remove RRU
	Swap antenna		Consolidate coax cables
	Remove antenna	x	Add coax cables
	Add TMA		Add fiber cables
	Swap TMA		Add hybrid combiner
	Remove TMA		Add filter combiner

Scope of work

Add LTE 700 passive antenna. Add coax. Add RRUS on ground. Add smart Bias-T

Network Modernization RFDS v3.0

Site ID	**CT11696E**	**Latitude**	41.56444
		Longitude	-72.57361
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Configuration

704G

Approvals	
Market RF	
Market Development	

RFDS Revision	
RFDS Final	

Date 07/16/2014

GAMMA (view from behind)

Existing Configuration					Proposed Configuration			
X	X	X			X	X	X	
	GSM			Technology		GSM/LTE	LTE	
	B2			Band		B2	B12	
	P			Active/Passive		P	P	
	Dual pole			Ant. Type		Dual pole	Dual pole	
	APXV18_209014_02			Ant. Model		APXV18_209014_02	LNX-6515DS-VTM	
	RFS			Ant. Vendor		RFS	Commscope	
	137			Ant. Height		137	137	
	240			Azimuth		240	240	
				RET deployed		NO	Yes	
	2			E-Tilt		2	2	
	0			M-Tilt		0	0	
	1			TMA #		1		
	dd B2			TMA Type		dd B2		
				RRU #			1	
				RRU Type			RRUS11_B12	
	2			Used Coax #		2	2	
	1-5/8"			Coax Type		1-5/8"	1-5/8"	
	210			Coax Length (ft)				
				Fiber (CPRI) #				
				Splitter #				
				Combiner #				
				Combiner Type				

x	Add new mount
	Relocate antenna
x	Add antenna
	Swap antenna
	Remove antenna
	Add TMA
	Swap TMA
	Remove TMA

x	Add RRU
	Swap existing RRU
	Remove RRU
	Consolidate coax cables
x	Add coax cables
	Add fiber cables
	Add hybrid combiner
	Add filter combiner

Scope of work

Add LTE 700 passive antenna. Add coax. Add RRUS on ground. Add smart Bias-T

DELTA (view from behind)

Existing Configuration					Proposed Configuration			
				Technology				
				Band				
				Active/Passive				
				Ant. Type				
				Ant. Model				
				Ant. Vendor				
				Ant. Height				
				Azimuth				
				RET deployed				
				E-Tilt				
				M-Tilt				
				TMA #				
				TMA Type				
				RRU #				
				RRU Type				
				Used Coax #				
				Coax Type				
				Coax Length (ft)				
				Splitter #				
				Fiber (CPRI) #				
				Combiner #				
				Combiner Type				

	Add new mount
	Relocate antenna
	Add antenna
	Swap antenna
	Remove antenna
	Add TMA
	Swap TMA
	Remove TMA

	Add RRU
	Swap existing RRU
	Remove RRU
	Consolidate coax cables
	Add coax cables
	Add fiber cables
	Add hybrid combiner
	Add filter combiner

Scope of work

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

LNX-6515DS-VTM

Andrew® Antenna, 698–896 MHz, 65° horizontal beamwidth, RET compatible

- Excellent choice to maximize both coverage and capacity in suburban and rural applications
- Fully compatible with Andrew remote electrical tilt system for greater OpEx savings
- Exceptional horizontal pattern roll-off and strong front-to-back ratio
- Extended bandwidth allows one antenna to serve multiple frequency allocations
- Great solution to maximize network coverage and capacity
- The RF connectors are designed for IP67 rating and the radome for IP56 rating
- The values presented on this datasheet have been calculated based on N-P-BASTA White Paper version 9.6 by the NGMN Alliance

Electrical Specifications

Frequency Band, MHz	**698–806**	**806–896**
Gain by all Beam Tilts, average, dBi	16.6	16.9
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.3
Gain by Beam Tilt, average, dBi	0 ° | 16.6 4 ° | 16.6 8 ° | 16.4	0 ° | 17.0 4 ° | 17.0 8 ° | 16.8
Beamwidth, Horizontal, degrees	65	64
Beamwidth, Horizontal Tolerance, degrees	±1	±0.9
Beamwidth, Vertical, degrees	9.7	8.6
Beamwidth, Vertical Tolerance, degrees	±0.6	±0.4
Beam Tilt, degrees	0–8	0–8
USLS, dB	18	18
Front-to-Back Total Power at 180° ± 30°, dB	25	23
CPR at Boresight, dB	24	27
CPR at Sector, dB	15	13
Isolation, dB	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153
Input Power per Port, maximum, watts	400	400
Polarization	±45°	±45°
Impedance	50 ohm	50 ohm

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol®
Band	Single band
Brand	DualPol® | Teletilt®
Operating Frequency Band	698 – 896 MHz
Number of Ports, all types	2

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Aluminum

Product Specifications

LNX-6515DS-VTM

Radome Material	Fiberglass, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	2
Wind Loading, maximum	878.0 N @ 150 km/h 197.4 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Depth	181.0 mm | 7.1 in
Length	2449.0 mm | 96.4 in
Width	301.0 mm | 11.9 in
Net Weight	22.8 kg | 50.3 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 1.1 Actuator	LNX-6515DS-R2M
Model with Factory Installed AISG 2.0 Actuator	LNX-6515DS-A1M
RET System	Teletilt®

Regulatory Compliance/Certifications

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

Included Products

DB380-3 — Pipe Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Used for wide panel antennas. Includes three clamp sets.

DB5083D — Downtilt Mounting Kit for 2.4"-4.5" (60-115 mm) OD round members. Consists of two DB5083 heavy-duty, galvanized steel downtilt mounting brackets. This kit is compatible with the DB380-3 pipe mount for panel antennas with three mounting points.

RRUS 11

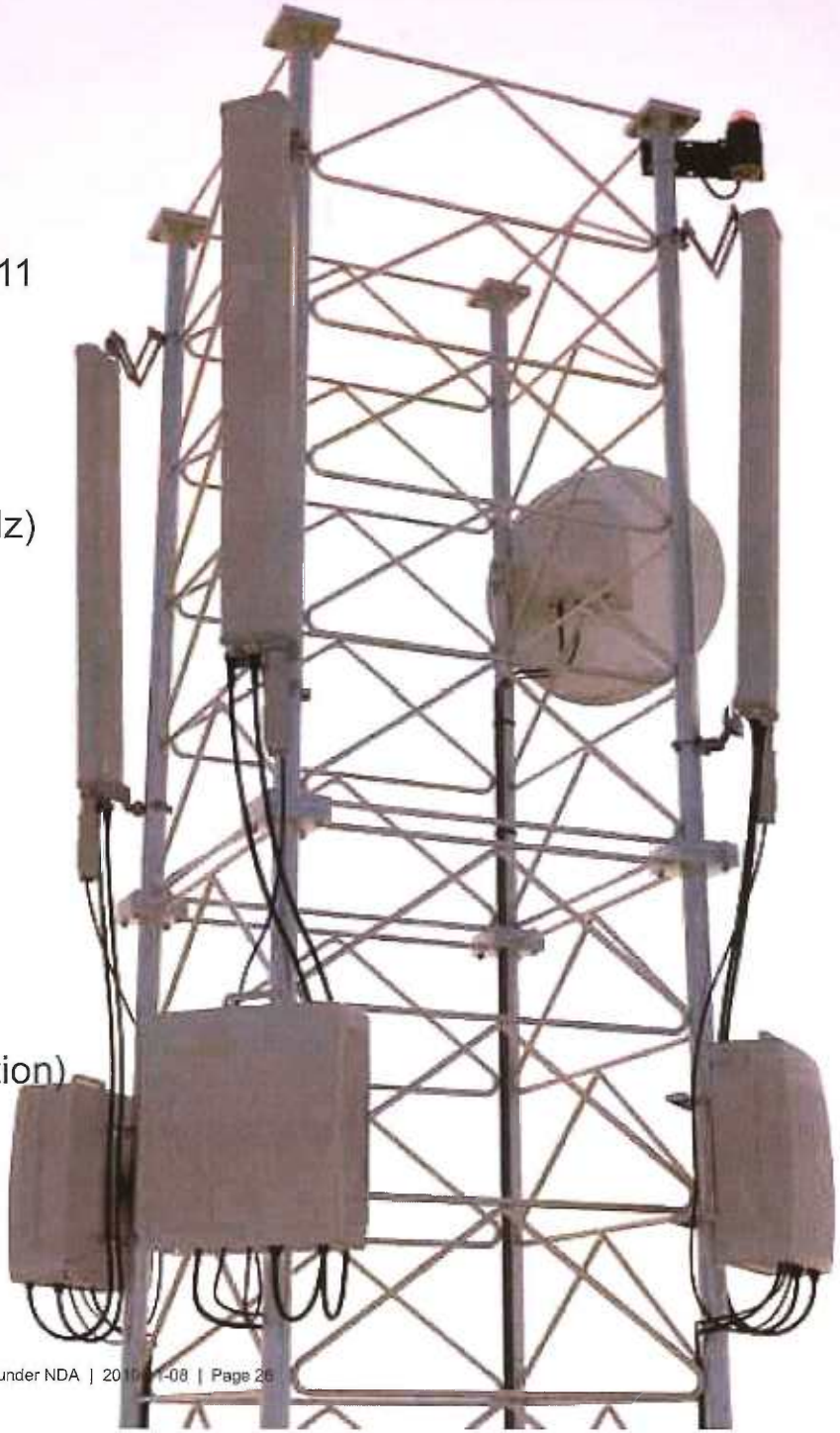
Frequency (AT&T)
- ✓ Band 12 (Lower 700 MHz)
- ✓ Band 4 (AWS, 17/2100 MHz) — 2Q2011

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

ERICSSON

EXHIBIT E

COHEN and WOLF P.C.
ATTORNEYS AT LAW

JULIE D. KOHLER

PLEASE REPLY TO: Bridgeport
WRITER'S DIRECT DIAL: (203) 337-4157
E-Mail Address: jkohler@cohenandwolf.com

November 25, 2014

VIA CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Re: T-Mobile Northeast, LLC
Proposed Modifications to an Existing Telecommunications Facility
191 Middle Haddam Road, Portland CT
Petition to the Connecticut Siting Council

To Whom It May Concern:

We are writing you on behalf of our client T-Mobile Northeast, LLC ("T-Mobile") with respect to the above referenced matter. T-Mobile is currently collocated on the telecommunications facility located at 191 Middle Haddam Road in Portland Connecticut and seeks to modify its existing installation to improve its coverage and service from this location.

The attached notice is being sent to you pursuant to the Regulations of Connecticut State Agencies, which require that owners of records of property that abut a parcel on which the facility is located be sent notice of an applicant's intent to file a Petition with the Connecticut Siting Council.

If you have any question regarding this notice or the Petition, please don't hesitate to contact the Connecticut Siting Council or the undersigned.

Sincerely,

Julie D. Kohler, Esq.

Enclosure

NOTICE

Pursuant to Section 16-50j-40(a) of the Regulations of Connecticut State Agencies, notice is hereby given that T-Mobile Northeast LLC ("T-Mobile") will file a Petition for Declaratory Ruling ("Petition") with the Connecticut Siting Council ("Council") on or after November 26, 2014. T-Mobile will seek a ruling that no Certificate of Environmental Compatibility and Public Need is required to modify its antenna site at the existing telecommunication facility at 191 Middle Haddam Road, Portland Connecticut ("Facility").

T-Mobile has an existing wireless telecommunications site at this Facility and an antenna array at the 139 foot centerline. It seeks to upgrade its equipment and install three (3) new antennas at a centerline of 139 feet (top of antenna height would be approximately 143 feet), add an equipment cabinet and (3) three RRUS (remote radio units) on a proposed H-frame within the existing compound area, replace one of its equipment cabinets on an existing concrete pad within the existing compound area near the base of the structure, and install coax cables and reuse existing coax cables.

The modifications to this Facility are being proposed to allow T-Mobile to provide improved wireless service to Portland and the surrounding area.

The Petition will set forth the need, purpose and benefits of the modifications to the Facility. The Petition provides plans, details of the proposed modifications and explains why T-Mobile submits that these modifications present no significant adverse environmental effect.

Copies of the Petition will be available for review during normal business hours on or after November 26, 2014 at the Connecticut Siting Council:

Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

or at the offices of T-Mobile's legal counsel:

Julie D. Kohler, Esq.
Cohen and Wolf, P.C.
1115 Broad Street
Bridgeport, CT 06604
Tel. (203) 368-0211
Fax (203) 394-9901

All inquiries should be addressed to the Council or to T-Mobile's legal counsel as listed above.

CERTIFICATION OF SERVICE

I hereby certify that on the 25th day of November, 2014, a copy of the foregoing letter and notice was mailed by certified mail, return receipt requested to each of the abutting properties owners on the accompanying list.

Julie D. Kohler, Esq.
Cohen and Wolf, P.C.
1115 Broad Street
Bridgeport, CT 06604

Attorney for:
T-Mobile Northeast, LLC
("T-Mobile")

ABUTTING PROPERTY OWNERS
191 Middle Haddam Road, Portland, CT

Connecticut Light & Power Company (multiple parcels)
P.O. Box 270
Hartford, CT 06141

Edward J. Sharr, Jr., Trustee
168 Middle Haddam Road
Portland, CT 06480

Joan Louise Tester
172 Middle Haddam Road
Portland, CT 06480

Patrick C. Farley and Jennifer Farley
176 Middle Haddam Road
Portland, CT 06480

Johan F. Cooper and Maureen B. Cooper
Floran J. Boland and Stella A. Boland
180 Middle Haddam Road
Portland, CT 06480

Paul H. Binezewski and Michele Binezewski
184 Middle Haddam Road
Portland, CT 06480

Anthony R. Munson and Mary G. Munson
192 Middle Haddam Road
Portland, CT 06480

Brian M. Flood
P.O. Box 517
Portland, CT 06480

Wesleyan University
287 High Street
Middletown, CT 06457

Middlesex Land Trust, Inc.
27 Washington Street
Middletown, CT 06457

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Bridgeport, CT 06604
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CERTIFICATION OF SERVICE

I hereby certify that on the 25th day of November, 2014, copies of the attached notice of filing a Petition with the Connecticut Siting Council for a declaratory ruling was sent by certified mail, return receipt requested to the following:

ATTORNEY GENERAL:

The Honorable George Jepsen
Attorney General
Office of the Attorney General
55 Elm Street
Hartford, CT 06106

LEGISLATIVE MEMBERS:

U.S. Congressman John Larson
First District of Connecticut
221 Main Street, 2nd Floor
Hartford, CT 06106

U.S. Senator Christopher Murphy
One Constitution Plaza, 7th Floor
Hartford, CT 06103

U.S. Senator Richard Blumenthal
90 State House Square, 10th Floor
Hartford CT 06130

State Representative – House District 32
State Representative Christie Carpino
Connecticut House Republican Office
LOB Room 4200
Hartford, CT 06106

State Senator – Senate District 33
State Senator Art Linares
Legislative Office Building
Room 3400
Hartford, CT 06106

STATE AGENCIES:

Department of Public Health
Dr. Jewel Mullen, Commissioner
410 Capital Avenue
P.O. Box 340308
Hartford, CT 06134

Council on Environmental Quality
Susuan D. Merrow, Chair
79 Elm Street
Hartford, CT 06106

Department of Energy & Environmental Protection
Rob Klee, Commissioner
79 Elm Street
Hartford, CT 06106

Office on Policy and Management
Benjamin Barnes, Secretary
450 Capitol Avenue
Hartford, CT 06106

Department of Emergency Services & Public Protection – Homeland Security
Dora B. Schiro, Commissioner
1111 Country Club Road
Middletown, CT 06457

Dept. of Economic and Community Development – Offices of Culture and Tourism
State Historic Preservation Office
Daniel Forrest, State Historic Preservation Officer
One Constitution Plaza, 2nd Floor
Hartford, CT 06103

Department of Economic and Community Development
Catherine H. Smith, Commissioner
505 Hudson Street
Hartford, CT 06106

Department of Energy and Environmental Protection
Public Utilities Regulatory Authority
Chairman Arthur House
Ten Franklin Square
New Britain, CT 06051

Department of Transportation
James P. Redeker, Commissioner
2800 Berlin Turnpike
Newington, CT 06111

Department of Agriculture
Steven K. Reviczky, Commissioner
165 Capitol Avenue
Hartford, CT 06106

FEDERAL AGENCIES:

Federal Communications Commission
445 12th Street SW
Washington, D.C. 20554

Federal Aviation Administration
800 Independence Avenue
Washington, DC 20591

TOWN OF PORTLAND:

First Selectwoman Susan Bransfield
P.O. Box 71
Portland, CT 06480

Bernadette Dillon, Town Clerk
P.O. Box 71
Portland, CT 06480

Planning and Zoning Commission
Bruce Tyler, Chairman
P.O. Box 71
Portland, CT 06480

Inland Wetland Commission
Richard W. Morin, Chairman
P.O. Box 71
Portland, CT 06480

Conservation Commission
Norman D. Ward, Chairman
P.O. Box 71
Portland, CT 06480

Zoning Commission
Ben Srb, Chairman
P.O. Box 71
Portland, CT 06480

REGIONAL PLANNING AGENCIES:

Lower Connecticut River Valley Council of Governments
145 Dennision Road
Essex, CT 06426

Julie D. Kohler, Esq.