EMPIRE telecom
A QualTek Company

Jack Andrews
Zoning Manager, Empire Telecom
o/b/o AT&T Wireless
10130 Donleigh Drive
Columbia, MD 21046
443-677-0144
jandrews@empiretelecomm.com

January 10, 2017

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

NOTICE OF EXEMPT MODIFICATION

1657 Wilbur Cross Hwy, Berlin, CT 06037

Lat: 41-36-22.38 (41.60621667)
Long. 72-44-58.87 (-72.74968611)

Dear Ms. Bachman:

AT&T Wireless currently maintains six (6) antennas at the 170 foot level of an existing 176 foot tall monopole tower located at 1657 Wilbur Cross Hwy in Berlin, CT. The tower is owned by the Berlin Volunteer Fire Department. The property is likewise owned by the Berlin Volunteer Fire Department. AT&T Wireless now seeks to replace three (3) existing remote radio units ("RRU"), with one (1) RRU per sector, to the 170 foot level of the tower, each replacement RRU to be mounted at the same location as the replaced RRU, adjacent to an antenna.

The facility was approved by the Connecticut Siting Council in TS-AT&T-007-021025 on November 8, 2002; there were no conditions enumerated. The most recent decision was in EM-CING-007-160310; there were six (6) conditions enumerated in the Council's decision: 1) any deviation from the modification as specified in the Notice and supporting materials shall render the acknowledgement invalid; 2) any material changes to the modification as proposed shall require the filing of a new Notice with the Council; 3) Within 45 days after the completion of construction the Council shall be notified in writing that the construction has been completed; 4) Any nonfunctioning antenna and associated antenna mounting equipment on this facility owned and operated by AT&T Mobility shall be removed within 60 days of the date the antenna ceased to function; 5) the validity of the action shall expire one year from the date of the letter; and 7) the applicant may request an extension of time beyond the one year deadline provided that such a request is submitted to the Council not less than 60 days prior to the expiration.

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Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies section 16-50j-73 for construction that constitutes an exempt modification pursuant to RCSA section 16-50j-72(b)(2). In accordance with RCSA section 16-50j-73, a copy of this letter and attachments is being sent to the Honorable Mark H. Kaczynski, Mayor of Berlin, as well as to the Berlin Volunteer Fire Department, the property owner and the tower owner.

The planned modifications to the facility fall squarely within those activities expressly provided for in RCSA section 50j-72(b)(2).

1. The proposed modifications will not result in an increase in height of the existing structure.

2. The proposed modifications will not require an extension of the site boundary.

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

4. The operation of the replacement antennas will not increase radio frequency emissions at the facility to a level at or above the Federal Communications Commission safety standard.

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

6. The existing structure and its foundation can support the proposed loading.

For the foregoing reasons, AT&T Wireless respectfully submits that the proposed modifications to the above referenced telecommunications facility constitute an exempt modification under RCSA section 16-50j-72(b)(2).

Respectfully submitted,

Jack Andrews
Zoning Manager, Empire Telecom
o/b/o AT&T Wireless
10130 Donleigh Drive
Columbia, MD 21046
443-677-0144
jandrews@empiretelecomm.com

Enclosures

cc: The Honorable Mark H. Kaczynski, Mayor of Berlin
Berlin Volunteer Fire Department, as Tower Owners and Property Owners

EMPIRE telecom
A QualTek Company

January 10, 2017

Berlin Volunteer Fire Department
1657 Wilbur Cross Highway
Berlin CT 06037
ATTN: James Simons

RE: AT&T Wireless Modifications to Telecommunication Facility –
1657 Wilbur Cross Hwy, Berlin, CT 06037

Dear Mr. Simmons:

In order to accommodate technological changes, implement the Uniform Mobile Telecommunications System and enhance system performance in the State of Connecticut, AT&T Wireless ("AT&T") will be changing its equipment configuration at the above referenced telecommunications facility.

AT&T Wireless currently maintains six (6) antennas at the 170 foot level of an existing 176 foot tall monopole tower located at 1657 Wilbur Cross Hwy in Berlin, CT. The tower is owned by the Berlin Volunteer Fire Department. The property is likewise owned by the Berlin Volunteer Fire Department.

AT&T Wireless now seeks to replace three (3) existing remote radio units ("RRU"), with one (1) RRU per sector, to the 170 foot level of the tower, each replacement RRU to be mounted at the same location as the replaced RRU, adjacent to an antenna.

This letter is intended to serve as the required notice to both the tower owner and the property owner. As required by the Regulations of Connecticut State Agencies ("RCSA") section 16-50j-73, the Connecticut Siting Council ("CSC") has been notified of the proposed changes and will review AT&T's proposal. Please accept this letter as notification under RCSA section 16-50j-73 of construction which constitutes an exempt modification pursuant to RCSA section 16-50j-72(b)(2).

1150 First Ave
Suite 600
King of Prussia, PA 19406

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A QualTek Company

Note that the site is within the boundaries of Berlin; however the drawings and other documentation submitted to the Siting Council reference the town as Kensington; this merely reflects the address as it appears in AT&T's database.

The enclosed letter to the CSC fully describes AT&T's proposal for the above referenced site. However, if you have any questions or require any additional information concerning our plans or the CSC procedures, please contact me at 443-677-0144 or contact Melanie Bachman, Acting Executive Director of the CSC at 860-872-2935.

Respectfully submitted,

Jack Andrews
Zoning Manager, Empire Telecom
o/b/o AT&T Wireless
10130 Donleigh Drive
Columbia, MD 21046
443-677-0144
jandrews@empiretelecomm.com

Enclosures

cc: Melanie Bachman, Connecticut Siting Council

EMPIRE telecom
A QualTek Company

January 10, 201

The Honorable Mark H. Kaczynski, Mayor of Berlin
Berlin Town Hall
240 Kensington Rd
Berlin, CT 06037

RE: AT&T Wireless Modifications to Telecommunication Facility –
1657 Wilbur Cross Hwy, Berlin, CT 06037

Dear Mayor Kaczynski:

In order to accommodate technological changes, implement the Uniform Mobile Telecommunications System and enhance system performance in the State of Connecticut, AT&T Wireless ("AT&T") will be changing its equipment configuration at the above referenced telecommunications facility. AT&T Wireless currently maintains six (6) antennas at the 170 foot level of an existing 176 foot tall monopole tower located at 1657 Wilbur Cross Hwy in Berlin, CT. The tower is owned by the Berlin Volunteer Fire Department. The property is likewise owned by the Berlin Volunteer Fire Department.

AT&T Wireless now seeks to replace three (3) existing remote radio units ("RRU"), with one (1) RRU per sector, to the 170 foot level of the tower, each replacement RRU to be mounted at the same location as the replaced RRU, adjacent to an antenna.

This letter is intended to serve as the required notice to the municipality. As required by the Regulations of Connecticut State Agencies ("RCSA") section 16-50j-73, the Connecticut Siting Council ("CSC") has been notified of the proposed changes and will review AT&T's proposal. Please accept this letter as notification under RCSA section 16-50j-73 of construction which constitutes an exempt modification pursuant to RCSA section 16-50j-72(b)(2).

1150 First Ave
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Note that the site is within the boundaries of Berlin; however the drawings and other documentation submitted to the Siting Council reference the town as Kensington; this merely reflects the address as it appears in AT&T's database.

The enclosed letter to the CSC fully describes AT&T's proposal for the above referenced site. However, if you have any questions or require any additional information concerning our plans or the CSC procedures, please contact me at 443-677-0144 or contact Melanie Bachman, Acting Executive Director of the CSC at 860-872-2935.

Respectfully submitted,

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Enclosures

cc: Melanie Bachman, Connecticut Siting Council

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A QualTek Company

January 10, 2016

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

RE: AT&T Wireless NOTICE OF EXEMPT MODIFICATION
1657 Wilbur Cross Hwy., Berlin CT 06037

Dear Ms. Bachman:

Enclosed please find and original and two (2) copies of a Notice of Exempt Modification including drawings, copies of the two (2) structural reports and RF report, and a check in the amount of six hundred twenty five ($625.00) for the filing fee. In addition, I have included three (3) copies of each notification letter mailed this day to the municipality, and to the owner of both the property and the tower.

Note that the site is within the boundaries of Berlin; however the drawings, structural reports and RF documentation submitted with this application reference the town as Kensington; this merely reflects the address as it appears in AT&T's database. The letters to the municipality and property/tower owner likewise note this fact.

I have submitted electronic copies of this application package along with the Structural Analysis and the RF Emissions Report, to you this day via email, simultaneous with the mailing of this package.

Please feel free to contact me with any questions or comments. Thank you for your kind cooperation in this matter.

Respectfully submitted,

Jack Andrews
Zoning Manager, Empire Telecom
o/b/o AT&T Wireless
10130 Donleigh Drive
Columbia, MD 21046
443-677-0144
jandrews@empiretelecomm.com

Enclosures

Radio Frequency Emissions Analysis Report

AT&T Existing Facility

Site ID: CT5375

Berlin East Central
1657 Wilbur Cross Highway
Kensington, CT 06037

December 22, 2016

Centerline Communications Project Number: 950006-006

Site Compliance Summary	
Compliance Status:	**COMPLIANT**
Site total MPE% of FCC general public allowable limit:	**8.51 %**

December 22, 2016

AT&T Mobility – New England
Attn: John Benedetto, RF Manager
550 Cochituate Road
Suite 550 – 13&14
Framingham, MA 06040

Emissions Analysis for Site: **CT5375 – Berlin East Central**

Centerline Communications, LLC ("Centerline") was directed to analyze the proposed AT&T facility located at **1657 Wilbur Cross Highway, Kensington, CT**, for the purpose of determining whether the emissions from the Proposed AT&T 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 limits for the 700 and 850 MHz Bands are approximately 467 $\mu W/cm^2$ and 567 $\mu W/cm^2$ respectively. The general population exposure limit for the 1900 MHz (PCS), 2100 MHz (AWS) and 2300 MHz (WCS) 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 performed for the proposed AT&T Wireless antenna facility located at **1657 Wilbur Cross Highway, Kensington, CT**, using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. Since AT&T 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.

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. All power values expressed and analyzed are maximum power levels expected to be used on all radios.

All emissions values for additional carriers were taken from the Connecticut Siting Council (CSC) active MPE database. Values in this database are provided by the individual carriers themselves

For each sector the following channel counts, frequency bands and power levels were utilized as shown in *Table 1*:

Technology	Frequency Band	Channel Count	Transmit Power per Channel (W)
UMTS	850 MHz	2	30
UMTS	1900 MHz (PCS)	2	30
GSM	1900 MHz (PCS)	2	30
LTE	700 MHz	2	60
LTE	1900 MHz (PCS)	2	60

Table 1: Channel Data Table

The following antennas listed in *Table 2* were used in the modeling for transmission in the 700 MHz, 850 MHz and 1900 MHz (PCS) frequency bands. This is based on feedback from the carrier with regards to anticipated antenna selection. Maximum gain values for all antennas are listed in the Inventory and Power Data table below. 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.

Sector	Antenna Number	Antenna Make	Antenna Centerline (ft)
A	1	Kathrein 800-10121	170
A	2	CCI HPA-65R-BUU-H6	170
B	1	Kathrein 800-10121	170
B	2	CCI HPA-65R-BUU-H6	170
C	1	Kathrein 800-10121	170
C	2	CCI HPA-65R-BUU-H6	170

Table 2: Antenna Data

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

RESULTS

Per the calculations completed for the proposed AT&T configurations *Table 3* shows resulting emissions power levels and percentages of the FCC's allowable general population limit.

Antenna ID	Antenna Make / Model	Frequency Bands	Antenna Gain (dBd)	Channel Count	Total TX Power (W)	ERP (W)	MPE %
Antenna A1	Kathrein 800-10121	850 MHz / 1900 MHz (PCS)	11.45 / 14.35	6	180	4,105.06	0.63
Antenna A2	CCI HPA-65R-BUU-H6	700 MHz / 1900 MHz (PCS)	11.95 / 14.75	4	240	5,462.56	1.02
						Sector A Composite MPE%	**1.65**
Antenna B1	Kathrein 800-10121	850 MHz / 1900 MHz (PCS)	11.45 / 14.35	6	180	4,105.06	0.63
Antenna B2	CCI HPA-65R-BUU-H6	700 MHz / 1900 MHz (PCS)	11.95 / 14.75	4	240	5,462.56	1.02
						Sector B Composite MPE%	**1.65**
Antenna C1	Kathrein 800-10121	850 MHz / 1900 MHz (PCS)	11.45 / 14.35	6	180	4,105.06	0.63
Antenna C2	CCI HPA-65R-BUU-H6	700 MHz / 1900 MHz (PCS)	11.95 / 14.75	4	240	5,462.56	1.02
						Sector C Composite MPE%	**1.65**

Table 3: AT&T Emissions Levels

The Following table (*table 4*) shows all additional carriers on site and their MPE% as recorded in the CSC active MPE database for this facility along with the newly calculated maximum AT&T MPE contributions per this report. FCC OET 65 specifies that for carriers utilizing directional antennas that the highest recorded sector value be used for composite site MPE values due to their greatly reduced emissions contributions in the directions of the adjacent sectors. For this site, all three sectors have the same configuration yielding the same results on all three sectors. *Table 5* below shows a summary for each AT&T Sector as well as the composite MPE value for the site.

Site Composite MPE%	
Carrier	**MPE%**
AT&T – Max Sector Value	**1.65 %**
Police Channel	0.04 %
Fire Main	0.06 %
Fire Intercity	0.06 %
Highway	0.04 %
Fire Ground	0.01 %
SP Hotline	0.05 %
RAFS	0.01 %
960 Link	0.01 %
Sprint	0.72 %
Clearwire	0.09 %
T-Mobile	0.72 %
Verizon	5.05 %
Site Total MPE %:	**8.51 %**

Table 4: All Carrier MPE Contributions

AT&T Sector A Total:	1.65 %
AT&T Sector B Total:	1.65 %
AT&T Sector C Total:	1.65 %
Site Total:	8.51 %

Table 5: Site MPE Summary

Per FCC OET 65, carriers utilizing directional antennas that the highest recorded sector value be used for composite site MPE values due to their greatly reduced emissions contributions in the directions of the adjacent sectors. *Table 6* below details a breakdown by frequency band and technology for the MPE power values for the maximum calculated AT&T sector(s). For this site, all three sectors have the same configuration yielding the same results on all three sectors.

AT&T _ Frequency Band / Technology	# Channels	Watts ERP (Per Channel)	Height (feet)	Total Power Density ($\mu W/cm^2$)	Frequency (MHz)	Allowable MPE ($\mu W/cm^2$)	Calculated % MPE
AT&T 850 MHz UMTS	2	418.91	170	1.12	850 MHz	567	0.20%
AT&T 1900 MHz (PCS) UMTS	2	816.81	170	2.18	1900 MHz (PCS)	1000	0.22%
AT&T 1900 MHz (PCS) GSM	2	816.81	170	2.18	1900 MHz (PCS)	1000	0.22%
AT&T 700 MHz LTE	2	940.05	170	2.51	700 MHz	467	0.54%
AT&T 1900 MHz (PCS) LTE	2	1,791.23	170	4.79	1900 MHz (PCS)	1000	0.48%
						Total:	1.65 %

Table 6: AT&T Maximum Sector MPE Power Values

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 AT&T 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:

AT&T Sector	Power Density Value (%)
Sector A:	1.65 %
Sector B:	1.65 %
Sector C:	1.65 %
AT&T Maximum Total (per sector):	1.65 %
Site Total:	8.51 %
Site Compliance Status:	**COMPLIANT**

The anticipated composite MPE value for this site assuming all carriers present is **8.51 %** 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
Centerline Communications, LLC
95 Ryan Drive, Suite 1
Raynham, MA 02767

SITE NAME: BERLIN EAST CENTRAL
PROJECT: LTE MULTICARRIER ADD
FA NUMBER: 10070926
SITE NUMBER: CT5375
1657 WILLBUR CROSS HIGHWAY
KENSINGTON, CT 06037
HARTFORD COUNTY

PROJECT TEAM

CLIENT REPRESENTATIVE

COMPANY:	EMPIRE TELECOM
ADDRESS:	16 ESQUIRE ROAD
CITY, STATE, ZIP:	BILLERICA, MA 01862
CONTACT:	DAVID COOPER
E-MAIL:	DCOOPER@EMPIRETELCOMM.COM

ENGINEER

COMPANY:	MASER CONSULTING CONNECTICUT
ADDRESS:	331 NEWMAN SPRINGS ROAD, SUITE 203
CITY, STATE, ZIP:	RED BANK, NJ 07701
CONTACT:	MICHAEL CLEARY
PHONE:	(856) 717-0412 x4105
E-MAIL:	MCLEARY@MASERCONSULTING.COM

RF ENGINEER

COMPANY:	NEW CINGULAR WIRELESS PCS, LLC
ADDRESS:	550 COCHITUATE ROAD
CITY, STATE, ZIP:	FRAMINGHAM, MA 01701
CONTACT:	MD MATEEN
E-MAIL:	MM093Q@US.ATT.COM

SITE INFORMATION

APPLICANT/LESSEE

at&t

NEW CINGULAR WIRELESS PCS, LLC
550 COCHITUATE ROAD
FRAMINGHAM, MA 01701

PROPERTY OWNER:

NAME:	TBD
ADDRESS:	TBD
CITY, STATE, ZIP:	TBD
LATITUDE:	41.6062919° N
LONGITUDE:	72.7495989° W
LAT./LONG. TYPE:	NAD 83
AREA OF CONSTRUCTION:	TELECOMMUNICATIONS EQUIPMENT PLATFORM AND TOWER
ZONING/JURISDICTION:	NATIONAL, STATE & LOCAL CODES OR ORDINANCES
CURRENT/PROPOSED USE:	UNMANNED TELECOMMUNICATIONS FACILITY
HANDICAP REQUIREMENTS:	FACILITY IS UNMANNED AND NOT FOR HUMAN HABITATION. HANDICAPPED ACCESS NOT REQUIRED.
CONSTRUCTION TYPE:	IIB
USE GROUP:	U

VICINITY MAP

NOT TO SCALE
IMAGE SOURCE: BING MAPS

DRIVING DIRECTIONS

DIRECTIONS FROM AT&T OFFICE AT 550 COCHITUATE ROAD, FARMINGHAM, MA:

DEPART RT-30 W / COCHITUATE RD TOWARD BURR ST. TURN BACK ON RT-30 E / COCHITUATE RD. TAKE RAMP RIGHT FOR I-90 WEST TOWARD WORCESTER / SPRINGFIELD. AT EXIT 9, TAKE RAMP RIGHT FOR I-84 TOWARD NEW YORK CITY / HARTFORD. AT EXIT 57, TAKE RAMP LEFT FOR CT-15 SOUTH TOWARD CHARTER OAK BR / N.Y. CITY. KEEP STRAIGHT ONTO US-5 S / CT-15 S. TAKE RAMP FOR US-5 S / CT-15 S / BERLIN TPKE. TURN BACK ON US-5 N / CT-15 N / BERLIN TPKE. THE SITE IS ON THE RIGHT.

CODE COMPLIANCE

ALL WORK AND MATERIALS SHALL BE PERFORMED AND INSTALLED IN ACCORDANCE WITH THE CURRENT EDITIONS OF THE FOLLOWING CODES AS ADOPTED BY THE LOCAL GOVERNING AUTHORITIES. NOTHING IN THESE PLANS IS TO BE CONSTRUED TO PERMIT WORK NOT CONFORMING TO THE LATEST EDITIONS OF THE FOLLOWING CODES.

1. CONNECTICUT STATE BUILDING CODE (2016) & ALL SUBSEQUENT AMENDMENTS
2. NATIONAL ELECTRIC CODE 2014
3. NATIONAL FIRE PROTECTION ASSOCIATION 70 - 2014
4. LIGHTNING PROTECTION CODE 201
5. AMERICAN CONCRETE INSTITUTE 318
6. AMERICAN INSTITUTE OF STEEL CONSTRUCTION 360-10
7. EIA/TIA-222 REVISION G
8. TIA 607 FOR GROUNDING
9. INSTITUTE FOR ELECTRICAL AND ELECTRONICS ENGINEERS 81
10. IEEE C2 LATEST EDITION
11. TELCORDIA GR-1275
12. ANSI T1.311

GENERAL CONTRACTOR NOTES

DO NOT SCALE DRAWINGS

CONTRACTOR SHALL VERIFY ALL PLANS AND EXISTING DIMENSIONS AND CONDITIONS ON THE JOB SITE AND SHALL IMMEDIATELY NOTIFY THE ARCHITECT/ENGINEER IN WRITING OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME.

GENERAL NOTES

THE FACILITY IS UNMANNED AND NOT FOR HUMAN HABITATION. A TECHNICIAN WILL VISIT THE SITE AS REQUIRED FOR ROUTINE MAINTENANCE. THE PROJECT WILL NOT RESULT IN ANY SIGNIFICANT DISTURBANCE OR EFFECT ON DRAINAGE. NO SANITARY SEWER SERVICE, POTABLE WATER, OR TRASH DISPOSAL IS REQUIRED AND NO COMMERCIAL SIGNAGE IS PROPOSED.

SHEET	DESCRIPTION
T-1	TITLE SHEET
GN-1	GENERAL NOTES
A-1	COMPOUND PLAN AND EQUIPMENT PLAN
A-2	ELEVATION VIEW AND ANTENNA SCHEDULE
A-3	ANTENNA LAYOUTS
A-4	DETAILS
A-5	RF PLUMBING DIAGRAMS
G-1	GROUNDING DETAILS

PROJECT DESCRIPTION/SCOPE OF WORK

THIS PROJECT WILL BE COMPRISED OF:

- (3) NEW RRUS-32 TO REPLACE (3) EXISTING RRUS-11+RRUS-A2
- ADD XMU

MASER CONSULTING CONNECTICUT

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at&t

NEW CINGULAR WIRELESS PCS, LLC
550 COCHITUATE ROAD
FRAMINGHAM, MA 01701

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ALL STATES REQUIRE NOTIFICATION OF EXCAVATORS, DESIGNERS, OR ANY PERSON PREPARING TO DISTURB THE EARTH'S SURFACE ANYWHERE IN ANY STATE

FOR STATE SPECIFIC DIRECT PHONE NUMBERS VISIT:
WWW.CALL811.COM

SCALE :	JOB NUMBER :
AS SHOWN	16963024A

REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY
0	12/16/16	FOR CONSTRUCTION	RA	MPC
A	11/30/16	ISSUED FOR REVIEW	MPC	MPC

STATE OF CONNECTICUT
FRANK E. KAZDEN
10
28188
REGISTERED PROFESSIONAL ENGINEER

FRANK E. KAZDEN
STATE OF CONNECTICUT PROFESSIONAL ENGINEER - LICENSE NUMBER: PEN.28188
My. 28188

SITE NAME:

BERLIN EAST CENTRAL
CT5375

1657 WILLBUR CROSS HIGHWAY
KENSINGTON, CT 06037
HARTFORD COUNTY

RED BANK OFFICE
331 Newman Springs Road
Suite 203
Red Bank, NJ 07701-5699
Phone: 732.383.1950
Fax: 732.383.1984

SHEET TITLE :
TITLE SHEET

SHEET NUMBER :
T-1

GENERAL NOTES:

1. THE SUBCONTRACTOR SHALL REVIEW AND INSPECT THE EXISTING FACILITY GROUNDING SYSTEM (AS DESIGNED AND INSTALLED) FOR STRICT COMPLIANCE WITH THE NEC (AS ADOPTED BY THE AHJ), THE SITE-SPECIFIC (UL, LPI, OR NFPA) LIGHTING PROTECTION CODE, AND GENERAL COMPLIANCE WITH TELCORDIA AND TIA GROUNDING STANDARDS. THE SUBCONTRACTOR SHALL REPORT ANY VIOLATIONS OR ADVERSE FINDINGS TO THE CONTRACTOR FOR RESOLUTION.
2. ALL GROUND ELECTRODE SYSTEMS (INCLUDING TELECOMMUNICATION, RADIO, LIGHTNING PROTECTION, AND AC POWER GES'S) SHALL BE BONDED TOGETHER, AT OR BELOW GRADE, BY TWO OR MORE COPPER BONDING CONDUCTORS IN ACCORDANCE WITH THE NEC.
3. THE SUBCONTRACTOR SHALL PERFORM IEEE FALL-OF-POTENTIAL RESISTANCE TO EARTH TESTING (PER IEEE 1100 AND 81) FOR GROUND ELECTRODE SYSTEMS. THE SUBCONTRACTOR SHALL FURNISH AND INSTALL SUPPLEMENTAL GROUND ELECTRODES AS NEEDED TO ACHIEVE A TEST RESULT OF 5O HMS OR LESS.
4. THE SUBCONTRACTOR IS RESPONSIBLE FOR PROPERLY SEQUENCING GROUNDING AND UNDERGROUND CONDUIT INSTALLATION AS TO PREVENT ANY LOSS OF CONTINUITY IN THE GROUNDING SYSTEM OR DAMAGE TO THE CONDUIT.
5. METAL CONDUIT AND TRAY SHALL BE GROUNDED AND MADE ELECTRICALLY CONTINUOUS WITH LISTED BONDING FITTINGS OR BY BONDING ACROSS THE DISCONTINUITY WITH #6 AWG COPPER WIRE UL APPROVED GROUNDING TYPE CONDUIT CLAMPS.
6. METAL RACEWAY SHALL NOT BE USED AS THE NEC REQUIRED EQUIPMENT GROUND CONDUCTOR. STRANDED COPPER CONDUCTORS WITH GREEN INSULATION, SIZED IN ACCORDANCE WITH THE NEC, SHALL BE FURNISHED AND INSTALLED WITH THE POWER CIRCUITS TO BTS EQUIPMENT.
7. EACH BTS CABINET FRAME SHALL BE DIRECTLY CONNECTED TO THE EQUIPMENT GROUND RING WITH GREEN INSULATED SUPPLEMENTAL EQUIPMENT GROUND WIRES, 6 AWG STRANDED COPPER OR LARGER FOR INDOOR BTS; 2 AWG STRANDED COPPER FOR OUTDOOR BTS.
8. CONNECTIONS TO THE GROUND BUS SHALL NOT BE DOUBLED UP OR STACKED. BACK TO BACK CONNECTIONS ON OPPOSITE SIDES OF THE GROUND BUS ARE PERMITTED.
9. ALL EXTERIOR GROUND CONDUCTORS BETWEEN EQUIPMENT/GROUND BARS AND THE GROUND RING, SHALL BE #2 AWG SOLID TINNED COPPER UNLESS OTHERWISE INDICATED.
10. ALUMINUM CONDUCTOR OR COPPER CLAD STEEL CONDUCTOR SHALL NOT BE USED FOR GROUNDING CONNECTIONS.
11. USE OF 90° BENDS IN THE PROTECTION GROUNDING CONDUCTORS SHALL BE AVOIDED WHEN 45° BENDS CAN BE ADEQUATELY SUPPORTED. ALL BENDS SHALL BE MADE WITH 12" RADIUS OR LARGER.
12. EXOTHERMIC WELDS SHALL BE USED FOR ALL GROUNDING CONNECTIONS BELOW GRADE.
13. ALL GROUND CONNECTIONS ABOVE GRADE (INTERIOR) SHALL BE FORMED USING HIGH PRESS CRIMPS EXCEPT FOR GROUND BAR CONNECTION FROM MGB TO OUTSIDE EXTERIOR GROUND SHALL ALL BE CADWELD CONNECTIONS.
14. COMPRESSION GROUND CONNECTIONS MAY BE REPLACED BY EXOTHERMIC WELD CONNECTIONS.
15. ICE BRIDGE BONDING CONDUCTORS SHALL BE EXOTHERMICALLY BONDED TO THE TOWER GROUND BAR.
16. APPROVED ANTIOXIDANT COATINGS (I.E. CONDUCTIVE GEL OR PASTE) SHALL BE USED ON ALL COMPRESSION AND BOLTED GROUND CONNECTIONS.
17. ALL EXTERIOR AND INTERIOR GROUND CONNECTIONS SHALL BE COATED WITH A CORROSION RESISTANT MATERIAL.
18. MISCELLANEOUS ELECTRICAL AND NON-ELECTRICAL METAL BOXES, FRAMES AND SUPPORTS SHALL BE BONDED TO THE GROUND RING, IN ACCORDANCE WITH THE NEC.
19. BOND ALL METALLIC OBJECTS WITHIN 6 FT OF MAIN GROUND WIRES WITH 1-#2 AWG TIN-PLATED COPPER GROUND CONDUCTOR.
20. GROUND CONDUCTORS USED IN THE FACILITY GROUND AND LIGHTNING PROTECTION SYSTEMS SHALL NOT BE ROUTED THROUGH METALLIC OBJECTS THAT FORM A RING AROUND THE CONDUCTOR, SUCH AS METALLIC CONDUITS, METAL SUPPORT CLIPS OR SLEEVES THROUGH WALLS OR FLOORS. WHEN IT IS REQUIRED TO BE HOUSED IN CONDUIT TO MEET CODE REQUIREMENTS OR LOCAL CONDITIONS, NON-METALLIC MATERIAL SUCH AS PVC PLASTIC CONDUIT SHALL BE USED. WHERE USE OF METAL CONDUIT IS UNAVOIDABLE (E.G. NON-METALLIC CONDUIT PROHIBITED BY LOCAL CODE) THE GROUND CONDUCTOR SHALL BE BONDED TO EACH END OF THE METAL CONDUIT.
21. ALL NEW STRUCTURES WITH A FOUNDATION AND/OR FOOTING HAVING 20 FT. OR MORE OF 1/4" IN. OR GREATER ELECTRICALLY CONDUCTIVE REINFORCING STEEL MUST HAVE IT BONDED TO THE GROUND RING USING AN EXOTHERMIC WELD CONNECTION USING #2 AWG SOLID BARE TINNED COPPER GROUND WIRE, PER NEC 250.50.
22. FOR THE PURPOSE OF CONSTRUCTION DRAWING, THE FOLLOWING DEFINITIONS SHALL APPLY:

    CONTRACTOR - EMPIRE TELECOM
    SUBCONTRACTOR - GENERAL CONTRACTOR (CONSTRUCTION)
    OWNER - AT&T (NEW CINGULAR WIRELESS PCS, LLC)

23. ALL SITE WORK SHALL BE COMPLETED AS INDICATED ON THE DRAWINGS AND PROJECT SPECIFICATIONS.
24. DRAWINGS PROVIDED HERE ARE NOT TO BE SCALED AND ARE INTENDED TO SHOW OUTLINE ONLY.
25. ALL MATERIALS FURNISHED AND INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS, AND ORDINANCES. SUBCONTRACTOR SHALL ISSUE ALL APPROPRIATE NOTICES AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS, AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY REGARDING THE PERFORMANCE OF THE WORK.
26. ALL WORK CARRIED OUT SHALL COMPLY WITH ALL APPLICABLE MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS AND LOCAL JURISDICTIONAL CODES, ORDINANCES AND APPLICABLE REGULATIONS.
27. UNLESS NOTED OTHERWISE, THE WORK SHALL INCLUDE FURNISHING MATERIALS, EQUIPMENT, APPURTENANCES, AND LABOR NECESSARY TO COMPLETE ALL INSTALLATIONS AS INDICATED ON THE DRAWINGS.
28. THE SUBCONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS UNLESS SPECIFICALLY STATED OTHERWISE.
29. IF THE SPECIFIED EQUIPMENT CANNOT BE INSTALLED AS SHOWN ON THESE DRAWINGS, THE SUBCONTRACTOR SHALL PROPOSE AN ALTERNATIVE INSTALLATION SPACE FOR APPROVAL BY THE CONTRACTOR.
30. THE SUBCONTRACTOR SHALL PROTECT EXISTING IMPROVEMENTS, PAVEMENTS, CURBS, LANDSCAPING AND STRUCTURES. ANY DAMAGED PART SHALL BE REPAIRED AT SUBCONTRACTOR'S EXPENSE TO THE SATISFACTION OF OWNER.
31. THE SUBCONTRACTOR SHALL CONTACT UTILITY LOCATING SERVICES PRIOR TO THE START OF CONSTRUCTION.
32. ALL EXISTING ACTIVE SEWER, WATER, GAS, ELECTRIC, AND OTHER UTILITIES WHERE ENCOUNTERED IN THE WORK, SHALL BE PROTECTED AT ALL TIMES, AND WHERE REQUIRED FOR THE PROPER EXECUTION OF THE WORK, SHALL BE RELOCATED AS DIRECTED BY THE RESPONSIBLE ENGINEER. EXTREME CAUTION SHOULD BE USED BY THE SUBCONTRACTOR WHEN EXCAVATING OR DRILLING PIERS AROUND OR NEAR UTILITIES. SUBCONTRACTOR SHALL PROVIDE SAFETY TRAINING FOR THE WORKING CREW. THIS WILL INCLUDE BUT NOT BE LIMITED TO A) FALL PROTECTION B) CONFINED SPACE C) ELECTRICAL SAFETY D) TRENCHING & EXCAVATION.
33. ALL EXISTING INACTIVE SEWER, WATER, GAS, ELECTRIC AND OTHER UTILITIES, WHICH INTERFERE WITH THE EXECUTION OF THE WORK, SHALL BE REMOVED AND/OR CAPPED, PLUGGED OR OTHERWISE DISCONTINUED AT POINTS WHICH WILL NOT INTERFERE WITH THE EXECUTION OF THE WORK, AS DIRECTED BY THE RESPONSIBLE ENGINEER, AND SUBJECT TO THE APPROVAL OF THE OWNER AND/OR LOCAL UTILITIES.
34. THE AREAS OF THE OWNER'S PROPERTY DISTURBED BY THE WORK AND NOT COVERED BY THE TOWER, EQUIPMENT OR DRIVEWAY SHALL BE GRADED TO A UNIFORM SLOPE AND STABILIZED TO PREVENT EROSION.
35. SUBCONTRACTOR SHALL MINIMIZE DISTURBANCE TO EXISTING SITE DURING CONSTRUCTION. EROSION CONTROL MEASURES, IF REQUIRED DURING CONSTRUCTION, SHALL BE IN CONFORMANCE WITH THE LOCAL GUIDELINES FOR EROSION AND SEDIMENT CONTROL.
36. NO FILL OR EMBANKMENT MATERIAL SHALL BE PLACED ON FROZEN GROUND. FROZEN MATERIALS, SNOW OR ICE SHALL NOT BE PLACED IN ANY FILL OR EMBANKMENT.
37. THE SUBGRADE SHALL BE COMPACTED AND BROUGHT TO A SMOOTH UNIFORM GRADE PRIOR TO FINISHED SURFACE APPLICATION.
38. THE SITE SHALL BE GRADED TO CAUSE SURFACE WATER TO FLOW AWAY FROM THE BTS EQUIPMENT AND TOWER AREAS.
39. IF NECESSARY, RUBBISH, STUMPS, DEBRIS, STICKS, STONES AND OTHER REFUSE SHALL BE REMOVED FROM THE SITE AND DISPOSED OF LEGALLY.
40. THE SUBCONTRACTOR SHALL PROVIDE SITE SIGNAGE IN ACCORDANCE WITH THE TECHNICAL SPECIFICATION FOR SITE SIGNAGE.
41. SUBCONTRACTOR SHALL LEAVE PREMISES IN CLEAN CONDITION.
42. PRIOR TO THE SUBMISSION OF BIDS, THE BIDDING SUBCONTRACTOR SHALL VISIT THE CELL SITE TO FAMILIARIZE WITH THE EXISTING CONDITIONS AND TO CONSTRUCTION DRAWINGS. ANY DISCREPANCY FOUND SHALL BE BROUGHT TO THE ATTENTION OF THE CONTRACTOR.
43. SUBCONTRACTOR SHALL DETERMINE ACTUAL ROUTING OF CONDUIT, POWER AND T1 CABLES, GROUNDING CABLES AS SHOWN ON THE POWER, GROUNDING AND TELCO PLAN DRAWING. SUBCONTRACTOR SHALL UTILIZE EXISTING TRAYS AND/OR SHALL ADD NEW TRAYS AS NECESSARY. SUBCONTRACTOR SHALL CONFIRM THE ACTUAL ROUTING WITH THE CONTRACTOR.
44. ALL CONCRETE REPAIR WORK SHALL BE DONE IN ACCORDANCE WITH AMERICAN CONCRETE INSTITUTE (ACI) 301.
45. ANY NEW CONCRETE NEEDED FOR THE CONSTRUCTION SHALL BE AIR-ENTRAINED AND SHALL HAVE 4000 PSI STRENGTH AT 28 DAYS.
46. ALL STRUCTURAL STEEL WORK SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH AISC SPECIFICATIONS. ALL STRUCTURAL STEEL SHALL BE ASTM A36 (Fy = 36 ksi) UNLESS OTHERWISE NOTED. PIPES SHALL BE ASTM A53 TYPE E (Fy = 36 ksi). ALL STEEL EXPOSED TO WEATHER SHALL BE HOT DIPPED GALVANIZED. TOUCHUP ALL SCRATCHES AND OTHER MARKS IN THE FIELD AFTER STEEL IS ERECTED USING A COMPATIBLE ZINC RICH PAINT.
47. CONSTRUCTION SHALL COMPLY WITH SPECIFICATIONS AND "GENERAL CONSTRUCTION SERVICES FOR CONSTRUCTION OF AT&T MOBILITY SITES."
48. SUBCONTRACTOR SHALL VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS PRIOR TO COMMENCING ANY WORK. ALL DIMENSIONS OF EXISTING CONSTRUCTION SHOWN ON THE DRAWINGS MUST BE VERIFIED. SUBCONTRACTOR SHALL NOTIFY THE CONTRACTOR OF ANY DISCREPANCIES PRIOR TO ORDERING MATERIAL OR PROCEEDING WITH CONSTRUCTION.
49. THE EXISTING CELL SITE IS IN FULL COMMERCIAL OPERATION, ANY CONSTRUCTION WORK BY SUBCONTRACTOR SHALL NOT DISRUPT THE EXISTING NORMAL OPERATION. ANY WORK ON EXISTING EQUIPMENT MUST BE COORDINATED WITH CONTRACTOR. ALSO, WORK SHOULD BE SCHEDULED FOR AN APPROPRIATE MAINTENANCE WINDOW USUALLY IN LOW TRAFFIC PERIODS AFTER MIDNIGHT.
50. SINCE THE CELL SITE IS ACTIVE, ALL SAFETY PRECAUTIONS MUST BE TAKEN WHEN WORKING AROUND HIGH LEVELS OF ELECTROMAGNETIC RADIATION. EQUIPMENT SHOULD BE SHUTDOWN PRIOR TO PERFORMING ANY WORK THAT COULD EXPOSE THE WORKERS TO DANGER. PERSONAL RF EXPOSURE MONITORS ARE ADVISED TO BE WORN ALERT OF DANGEROUS EXPOSURE LEVELS.

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AS SHOWN	16963024A

REV.	DATE	DESCRIPTION	DRAWN BY	CHECKED BY
0	12/16/16	FOR CONSTRUCTION	RA	MPC
A	11/30/16	ISSUED FOR REVIEW	MPC	MPC

STATE OF CONNECTICUT
FRANK E. LAZDEN
No. 28188
REGISTERED PROFESSIONAL ENGINEER

FRANK E. LAZDEN
CONNECTICUT PROFESSIONAL ENGINEER - LICENSE NUMBER: PEN.28188

SITE NAME:

BERLIN EAST CENTRAL
CT5375

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HARTFORD COUNTY

RED BANK OFFICE
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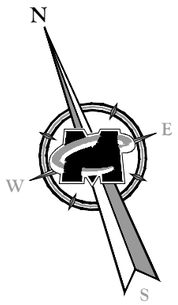
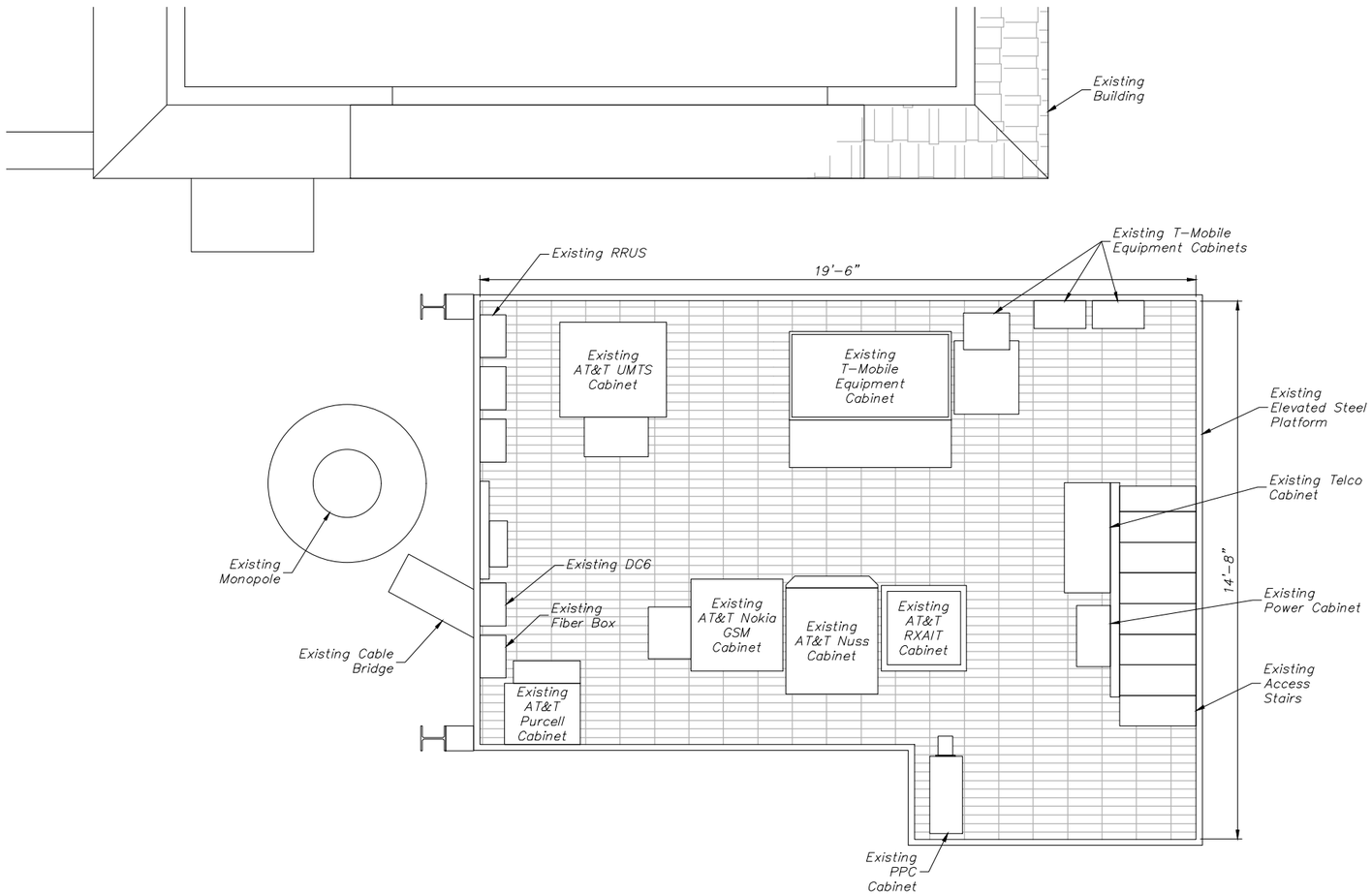
Fax: 732.383.1984

SHEET TITLE :
GENERAL NOTES

SHEET NUMBER :
GN-1





EQUIPMENT PLAN

2 1.6 1.2 0.8 0.4 0 1 2 4

SCALE : 1" = 2'
(DO NOT SCALE 11"X17" DRAWINGS)

EQUIPMENT UPGRADE:

ADD XMU

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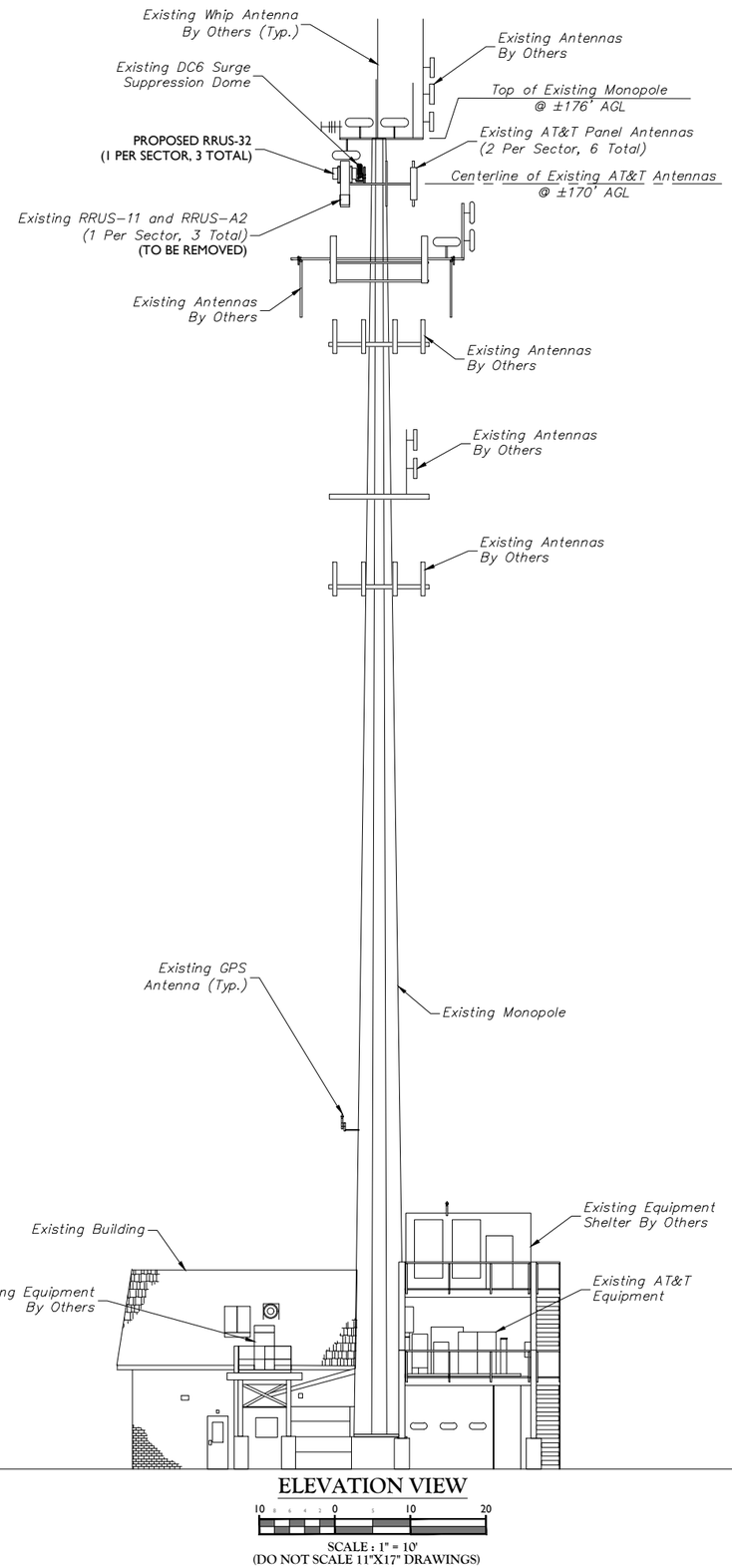
SHEET TITLE :
COMPOUND PLAN AND EQUIPMENT PLAN

SHEET NUMBER :
A-1



ELEVATION VIEW

SCALE : 1" = 10'
(DO NOT SCALE 11"X17" DRAWINGS)

PROPOSED ANTENNA AND RRUS CONFIGURATION

SECTOR		EXISTING ANTENNA CONFIGURATION	PROPOSED ANTENNA CONFIGURATION	TECHNOLOGY	ANTENNA STATUS	HEIGHT (in)	WIDTH (in)	DEPTH (in)	WEIGHT (lbs)	ANTENNA AZIMUTH	ANT. CL. ELEV (ft.)	RRUS CONFIGURATION	STATUS
ALPHA	A1	Kathrein 80010121	Kathrein 80010121	UMTS/GSM	REMAIN	54.90	10.30	5.90	51.20	40°	170.0'	-	-
	A2	-	-	-	-	-	-	-	-	-	-	-	-
	A3	-	-	-	-	-	-	-	-	-	-	-	-
	A4	CCI HPA-65R-BUU-H6	CCI HPA-65R-BUU-H6	LTE	REMAIN	72.30	14.40	7.30	60.50	40°	170.0'	**RRUS-32 B2** RRUS-11	**NEW** REMAIN
BETA	B1	Kathrein 80010121	Kathrein 80010121	UMTS/GSM	REMAIN	54.90	10.30	5.90	51.20	150°	170.0'	-	-
	B2	-	-	-	-	-	-	-	-	-	-	-	-
	B3	-	-	-	-	-	-	-	-	-	-	-	-
	B4	CCI HPA-65R-BUU-H6	CCI HPA-65R-BUU-H6	LTE	REMAIN	72.30	14.40	7.30	60.50	150°	170.0'	**RRUS-32 B2** RRUS-11	**NEW** REMAIN
GAMMA	C1	Kathrein 80010121	Kathrein 80010121	UMTS/GSM	REMAIN	54.90	10.30	5.90	51.20	280°	170.0'	-	-
	C2	-	-	-	-	-	-	-	-	-	-	-	-
	C3	-	-	-	-	-	-	-	-	-	-	-	-
	C4	CCI HPA-65R-BUU-H6	CCI HPA-65R-BUU-H6	LTE	REMAIN	72.30	14.40	7.30	60.50	280°	170.0'	**RRUS-32 B2** RRUS-11	**NEW** REMAIN

ANTENNA SCHEDULE

STRUCTURAL NOTES:

1. NO CONSTRUCTION OF THE PROPOSED LOADING SHOWN SHALL PROCEED UNTIL ADEQUACY OF THE EXISTING STRUCTURE AND FOUNDATION, INCLUDING THE PROPOSED AT&T ANTENNA MOUNTING CONFIGURATION SHOWN HEREIN, HAS BEEN COMPLETED.
2. THE STRUCTURE ELEVATION IS SHOWN FOR INFORMATIONAL PURPOSES ONLY AND MAY NOT REFLECT AS-BUILT FIELD CONDITIONS FOR ALL EXISTING INVENTORY LOADING/ANTENNAS/APPURTANENCES ON STRUCTURE. REFER TO THE LATEST STRUCTURAL ANALYSIS FOR EXISTING STRUCTURE LOADING AND THE PROPOSED METHOD OF ATTACHMENT OF THE PROPOSED ANTENNAS/CABLES.
3. THE CONTRACTOR IS RESPONSIBLE TO CONFIRM THAT ANY IMPROVEMENTS AND REINFORCEMENTS REQUIRED BY THE STRUCTURAL ANALYSIS CERTIFICATION ARE PROPERLY INSTALLED PRIOR TO THE ADDITION OF ANTENNAS, CABLES, SUPPORTS AND APPURTENANCES PROPOSED ON THESE DRAWINGS OR OTHERWISE NOTED IN THE STRUCTURAL ANALYSIS.

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FRANK E. FAZZEN
No. 28188
REGISTERED PROFESSIONAL ENGINEER

FRANK E. FAZZEN
REGISTERED CONNECTICUT PROFESSIONAL ENGINEER - LICENSE NUMBER: PEN.28188

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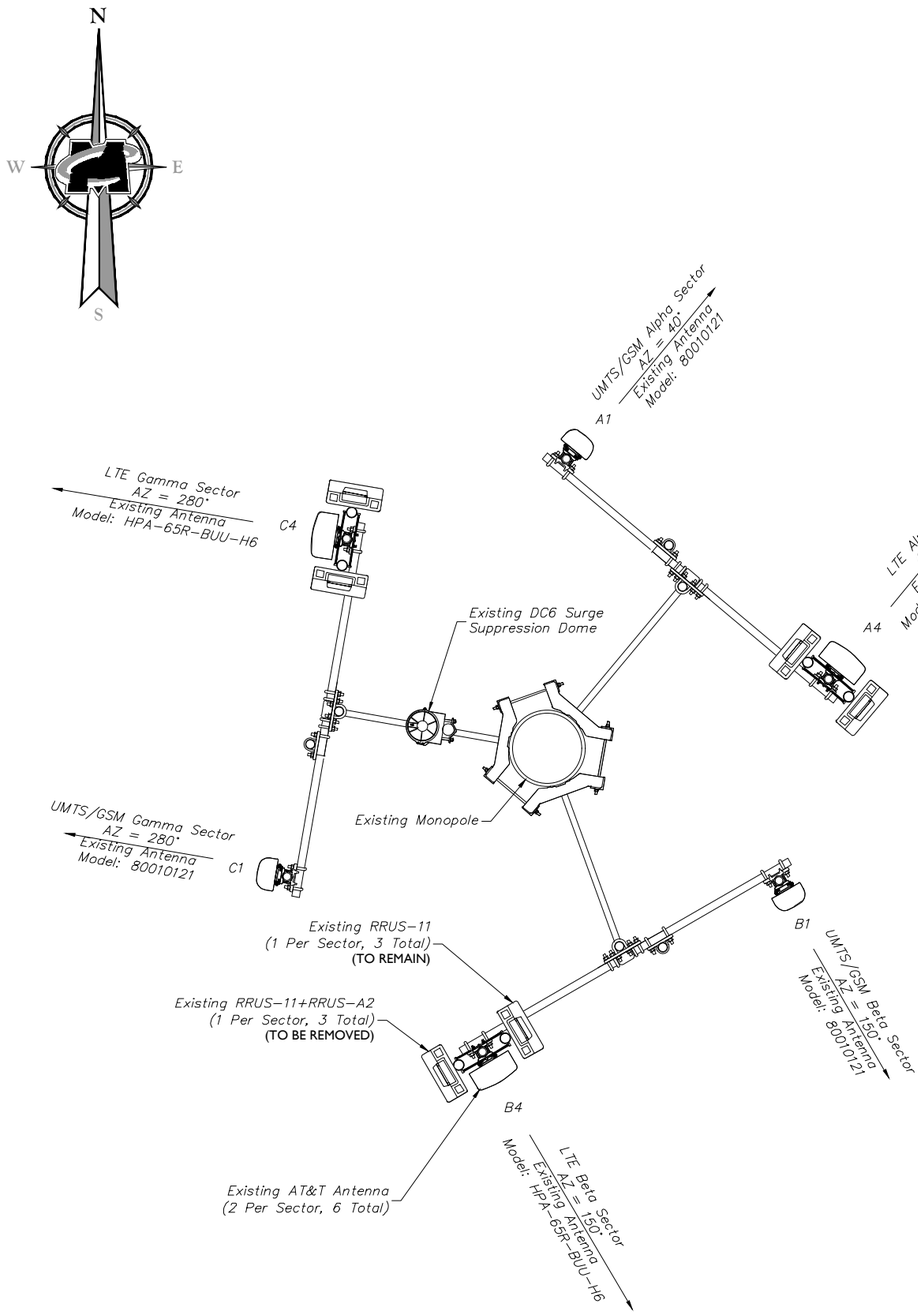
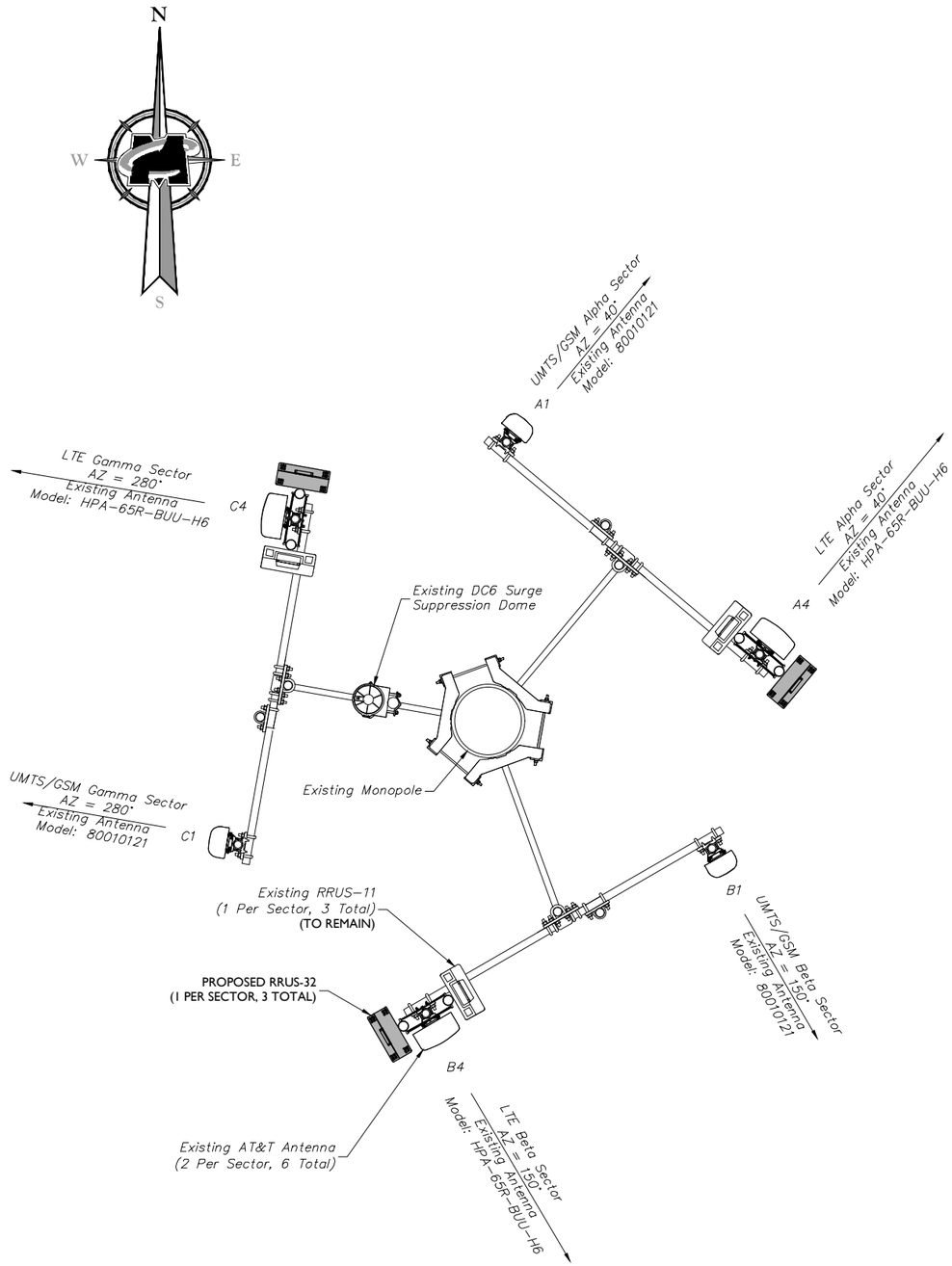
SHEET TITLE :
ELEVATION VIEW AND ANTENNA SCHEDULE

SHEET NUMBER :
A-2



EXISTING - ANTENNA LAYOUT

NOT TO SCALE



PROPOSED - ANTENNA LAYOUT

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12
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No. 28188

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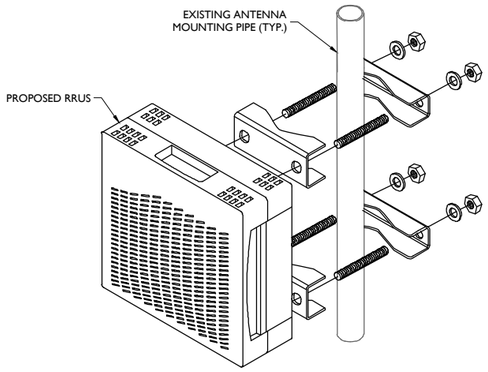
SHEET TITLE :

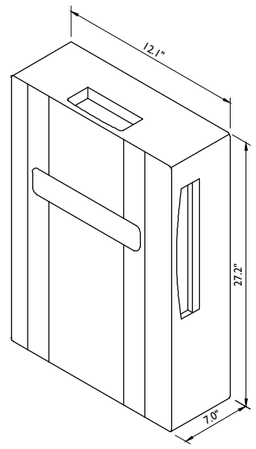
ANTENNA LAYOUTS

SHEET NUMBER :

A-3



RRU MOUNTING DETAIL
NOT TO SCALE



RRUS-32 B2 DIMENSIONS (H X W X D): 27.2" X 12.1" X 7.0" (INCLUDES SUNSHIELD)
WEIGHT: 53 LBS

RRUS-32 B2 DETAIL
NOT TO SCALE

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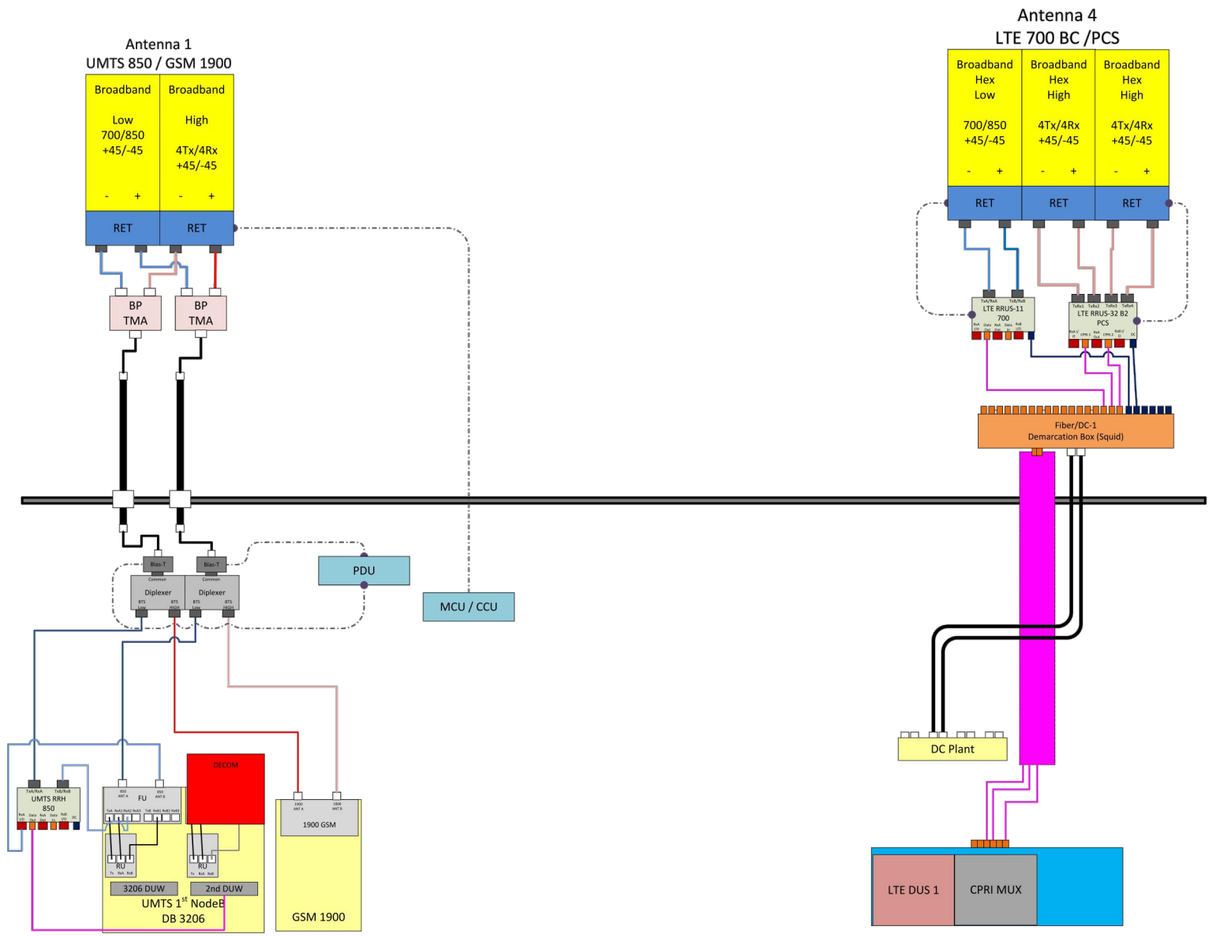
SHEET TITLE :

DETAILS

SHEET NUMBER :

A-4

Diagram - Sector	A	Diagram File Name - CT5375_A_B_C_BWE1900_Rev1.vsd					
Atoll Site Name -	CTV5375	Location Name -	BERLIN E CENTRAL	Market -	CONNECTICUT	Market Cluster -	NEW ENGLAND
Comments:							



ALL SECTORS

NEW-ENGLAND_CONNECTICUT_CTV5375_2017-LTE-Multi-Carrier_1xXMU-RRH-ADD_mm093q_PTN_10070926_25972_08-30-2016_Final-RF-Approval_v1.00

RF PLUMBING DIAGRAMS

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SCALE :	JOB NUMBER :
AS SHOWN	16963024A

REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY
0	12/16/16	FOR CONSTRUCTION	RA	MPC
A	11/30/16	ISSUED FOR REVIEW	MPC	MPC

FRANK E. FAZIEN
CONNECTICUT PROFESSIONAL ENGINEER - LICENSE NUMBER: PEN.28188

SITE NAME:

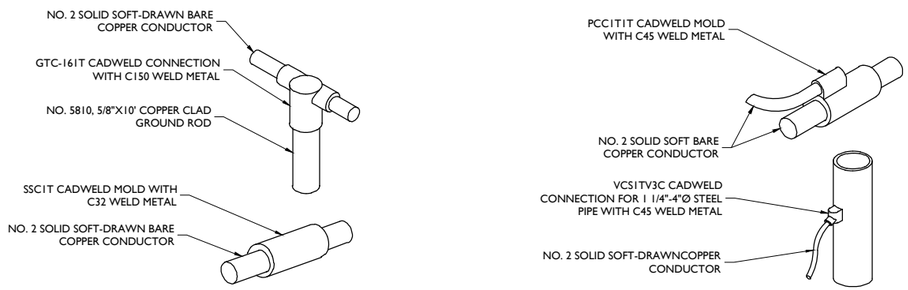
BERLIN EAST CENTRAL
CT5375

1657 WILLBUR CROSS HIGHWAY
KENSINGTON, CT 06037
HARTFORD COUNTY

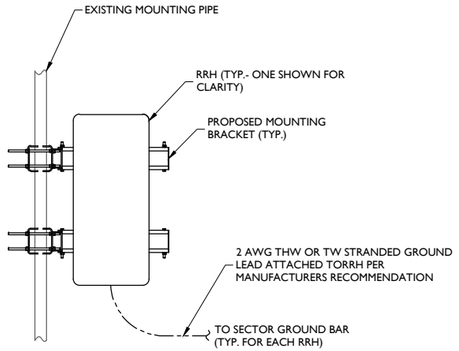
RED BANK OFFICE
331 Newman Springs Road
Suite 203
Red Bank, NJ 07701-5699
Phone: 732.383.1950
Fax: 732.383.1984

SHEET TITLE :
RF PLUMBING DIAGRAMS

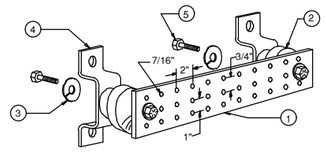
SHEET NUMBER :
A-5



CADWELD DETAILS
NOT TO SCALE



RRU GROUNDING DETAIL
NOT TO SCALE



LEGEND

1- TINNED COPPER GROUND BAR, 1/4"x4"x20", NEWTON INSTRUMENT CO. CAT. NO. B-6142 OR EQUAL. HOLE CENTERS TO MATCH NEMA DOUBLE LUG CONFIGURATION.

2- INSULATORS, NEWTON INSTRUMENT CAT. NO. 3061-4

3- 5/8" LOCKWASHERS, NEWTON INSTRUMENT CO. CAT. NO. 3015-8

4- WALL MOUNTING BRACKET, NEWTON INSTRUMENT CO. CAT NO. A-5056

5- 5/8-11 X 1" HHCS BOLTS, NEWTON INSTRUMENT CO. CAT NO. 3012-1

6- EACH GROUND CONDUCTOR TERMINATING ON ANY GROUND BAR HAVE AN IDENTIFICATION TAG ATTACHED AT EACH END THAT WILL IDENTIFY ITS ORIGIN AND DESTINATION.

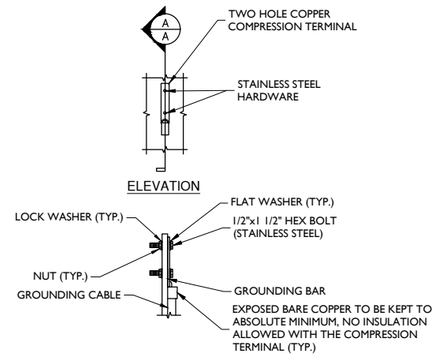
SECTION "P" - SURGE PRODUCERS

CABLE ENTRY PORTS (HATCH PLATES) (#2)
GENERATOR FRAMEWORK (IF AVAILABLE) (#2)
TELCO GROUND BAR
COMMERCIAL POWER COMMON NEUTRAL/GROUND BOND (#2)
+24V POWER SUPPLY RETURN BAR (#2)
-48V POWER SUPPLY RETURN BAR (#2)
RECTIFIER FRAMES.

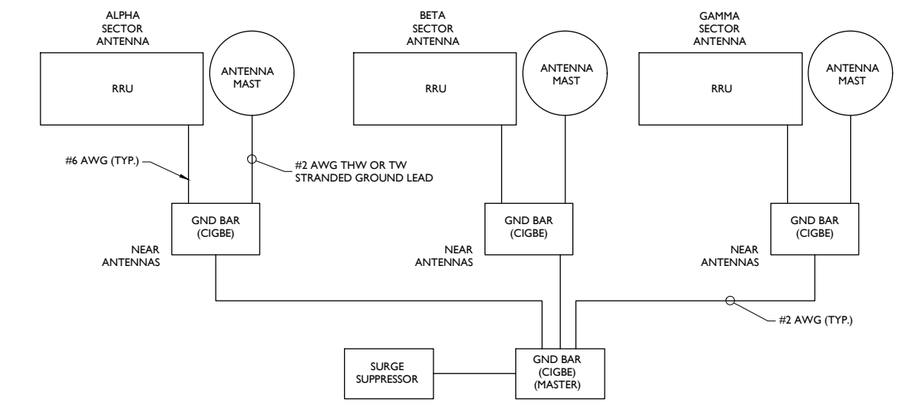
SECTION "A" - SURGE ABSORBERS

INTERIOR GROUND RING (#2)
EXTERNAL EARTH GROUND FIELD (BURIED GROUND RING) (#2)
METALLIC COLD WATER PIPE (IF AVAILABLE) (#2)
BUILDING STEEL (IF AVAILABLE) (#2)

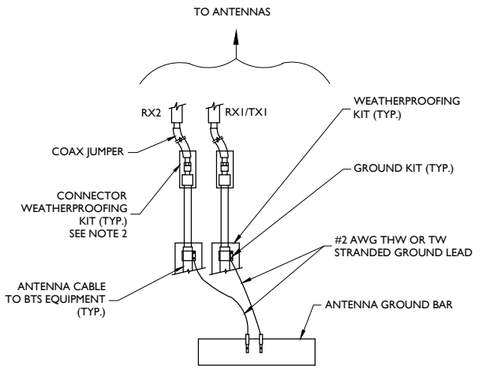
MASTER GROUND BAR
NOT TO SCALE



TYPICAL GROUND BAR CONNECTION DETAIL
NOT TO SCALE



SCHEMATIC DIAGRAM GROUNDING SYSTEM
NOT TO SCALE



NOTES:

1. DO NOT INSTALL CABLE GROUND KIT AT A BEND AND ALWAYS DIRECT GROUND WIRE DOWN TO ANTENNA GROUND BAR.
2. WEATHER PROOFING SHALL BE TWO-PART TAPE KIT, COLD SHRINK SHALL NOT BE USED.

TYPICAL GROUND WIRE TO GROUNDING BAR
NOT TO SCALE

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STATE OF CONNECTICUT
FRANK E. LAZDEN
No. 28188
REGISTERED PROFESSIONAL ENGINEER

FRANK E. LAZDEN
CONNECTICUT PROFESSIONAL ENGINEER - LICENSE NUMBER: PEN.28188

SITE NAME:

BERLIN EAST CENTRAL
CT5375

1657 WILLBUR CROSS HIGHWAY
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HARTFORD COUNTY

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Fax: 732.383.1984

SHEET TITLE :
GROUNDING DETAILS

SHEET NUMBER :
G-1

MASER CONSULTING
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at&t

550 Cochituate Road
Framingham, MA 01701

Revision 0

Monopole Feasibility Study

Site Name:	*Kensington Ct*
FA #:	*10070926*
Site Number:	*CT5375*
Site Address:	*1657 Willbur Cross Highway* *Kensington, CT 06037* *Hartford County*
Maser Project Number:	*16963024A*

December 12, 2016

Analysis Type	*Monopole*
Pass/Fail	*Pass*
Mount Utilization	*90.9%*

Frank E. Pazden, P.E.
Connecticut Professional Engineer
PE License # 28188

Objective:

The objective of this report is to determine the capacity of the existing 176' monopole at the subject facility for the final wireless telecommunications configuration, per the applicable codes and standards.

Introduction:

Maser Consulting Connecticut has reviewed the following documents in completing this report:

- RFDS 1369522 provided by Empire Telecom, dated September 2, 2016.
- Construction Drawings prepared by Maser Consulting Connecticut.
- Mount Mapping Report prepared by Tower Engineering Professionals, TEP# 74314.102188 dated, November 21, 2016.
- Previous Structural Analysis prepared by Destek Engineering, Job # 1629028 dated, February 11, 2016.

The existing **AT&T** equipment is supported on an existing 176' monopole. The existing **AT&T** equipment is supported on an existing antenna support mount constructed of structural steel antenna support pipes supported by HSS tubes and pipes at a centerline of approximately 170'-0" above ground level. This report is based only upon this information, as well as the information obtained in the field.

Discrete and Linear Appurtenances:

The overall antenna loading is found in the Appendix A of this report.

Tower Member Information:

See the material Take-Off sheet in appendix A for tower information.

Codes, Standards and Loading:

Maser Consulting Connecticut utilized the following codes and standards:

- 2016 Connecticut State Building Code, Incorporating The 2012 IBC
- Structural Standards for Antenna Supporting Structures and Antennas ANSI/TIA-222-G
    - Basic Wind Speed – 102 mph, Ice Wind Speed – 50 mph and Ice thickness - 1 in
    - Exposure Category – B
    - Structure Class – II
    - Topographic Category - 1

Analysis Approach & Assumptions:

The analysis approach used in this structural analysis is based on the premise that if the existing monopole structure is structurally adequate to support the existing and proposed equipment per the aforementioned codes and standards, or if the increase in the forces in the structure are deemed to be negligible or acceptable, then the proposed equipment can be installed as intended. Tower Numerics, tnx Tower, an analysis and design program, designed specifically for the telecommunications industry and for all applicable codes and standards was used for this structural analysis.

The following assumptions were utilized in this report:

- Structural Steel for the monopole sections are assumed to be A572-65 Grade.
- Structural Anchor Bolts are assumed to be A615-75 grade.
- No physical deterioration has occurred in any of the structural components of the monopole and all the tower members have the same capacity as the day they were erected.
- The existing monopole foundations are assumed to have been constructed per the original design drawings. As such the foundation design reactions are used for comparison to the base reactions of this analysis.
- It is assumed that the telecommunication equipment supports, antenna supports, and existing structure have been designed by a registered licensed professional engineer for the existing loads acting on the structure, as required by all applicable codes, prior to the proposed modifications listed within this report.
- It is assumed that information provided by the client regarding the structure itself, the antenna models, feed lines, and other relevant information is current and correct.
- It is assumed all other existing appurtenances, antennas, cables, etc. belonging to others have been installed and supported per code and per specifications so as not to damage any existing structural support members, and that any contributing loads from adjacent equipment has been taken into consideration for their design.
- Proposed equipment and locations should not deviate from the proposed locations noted herein and shown on the associated Maser Consulting Connecticut final Construction Drawings.

Calculations:

The calculations are found in Appendix A of this report.

Conclusion:

The existing monopole was analyzed for the loading in the applicable codes and standards. The monopole has been determined to be structurally **ADEQUATE** to support the proposed and existing antennas, based upon the aforementioned assumptions.

The monopole has been determined to be stressed to a maximum of **90.9%** of its structural capacity with the maximum usage occurring at the monopole base plate. Therefore, the proposed **AT&T** installation **CAN** be placed as intended in all sectors, without modifications.

Prior to the installation of the proposed equipment, the contractor shall verify that all bolted connections are properly fastened from the original installation. Additionally, the contractor shall inspect all existing hardware and verify that it is in its original condition and free of rust and deterioration. If any deficiencies are noted the contractor shall notify the engineer of the conditions prior to installation of any equipment for additional evaluation.

Maser Consulting Connecticut has reviewed the original tower foundation reactions and has determined that their values were based upon an Allowable Stress Design procedure. As such, the original design base reactions shall be multiplied by 1.35 per Section 15.5.1 of the ANSI/TIA-222-G code for comparison to the base reactions of this analysis. It is assumed that the tower foundations have been constructed to support the original design reactions. Based on the comparison of the original design reactions to the base reactions of this analysis, the existing concrete foundations have been determined to have **ADEQUATE** structural capacity.

Please see the table below for the comparison of the original design base reactions and the base reactions of this analysis.

Base Reactions Summary:

	Maser Consulting, PA (G-Code)	. Original Design Reactions*
Moment (Kip-Ft)	5535	5813.8
Shear (Kips)	50	47.2
Axial (Kips)	59	66.96

**Reactions were provided in the structural analysis by Destek Engineering and have been multiplied by 1.35 per Section 15.5.1 of the ANSI/TIA-222-G Code*

We appreciate the opportunity to be of service on this project. If you should have any questions or require any additional information, please do not hesitate to call our office.

Sincerely,
Maser Consulting Connecticut

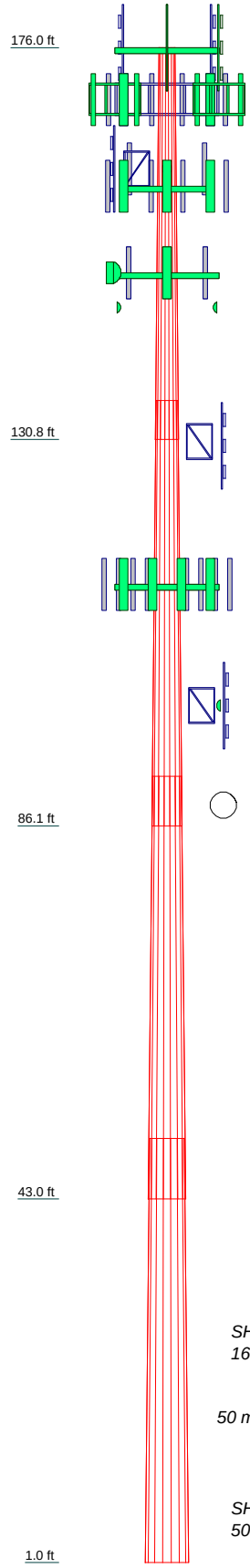
Frank Pazden, P.E.
Telecommunications Department Manager

Anwesha Bera, E.I.T.
Structural Design Engineer

\\maserconsulting.com\luj\Projects\2016\16963000A\16963024A\Structural\Tower Analysis\Rev 0\Word\10070926.CT5375.Kensington Ct.Tower Analysis.Rev 0.doc

APPENDIX A

Section	1	2	3	4
Length (ft)	45.25	49.13	48.87	49.00
Number of Sides	18	18	18	18
Thickness (in)	0.2500	0.3125	0.3750	0.4375
Socket Length (ft)	4.50	5.75	7.00	
Top Dia (in)	21.0000	30.2260	39.8381	48.9596
Bot Dia (in)	31.8000	41.8200	51.3600	60.5000
Grade	A572-65			
Weight (K)	3.2	6.0	9.0	12.7



ALL REACTIONS ARE FACTORED

AXIAL 112 K

SHEAR 16 K

MOMENT 1731 kip-ft

TORQUE 1 kip-ft
50 mph WIND - 1.0000 in ICE

AXIAL 60 K

SHEAR 50 K

MOMENT 5509 kip-ft

TORQUE 2 kip-ft
REACTIONS - 102 mph WIND

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for Exposure B to the TIA-222-G Standard.
2. Tower designed for a 102 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class II.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. Weld together tower sections have flange connections.
8. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
9. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
10. Welds are fabricated with ER-70S-6 electrodes.
11. TOWER RATING: 90.9%

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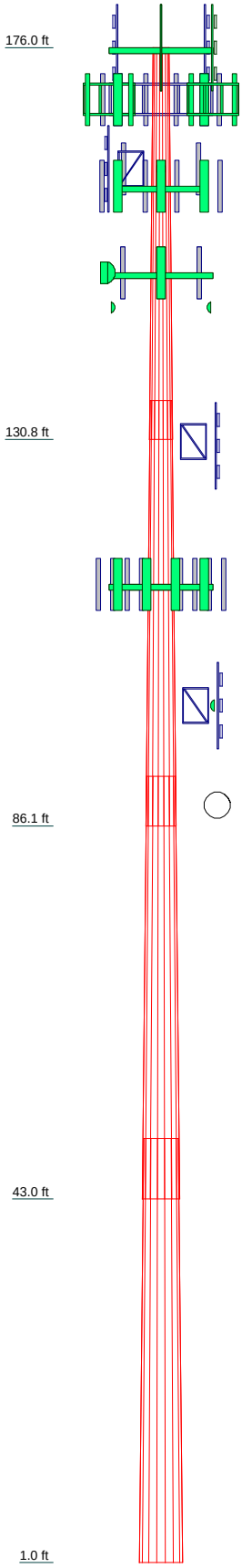
Phone: 856 797-0412
FAX: 856 722-1120

Job: ***KENSINGTON CT-CT5375***			
Project: ***16963024A***			
Client: AT&T	Drawn by:	App'd:	
Code: TIA-222-G	Date: 12/12/16	Scale: NTS	
Path: R:\Projects\2016\16963000A\16963024A\Structural\Tower Analysis\Rev 0\TNX\Monopole.eri		Dwg No. E-1	

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	45.25	18	0.2500	4.50	21.0000	31.8000		3.2
2	49.13	18	0.3125	5.75	30.2260	41.8200		6.0
3	48.87	18	0.3750	7.00	39.8381	51.3600		9.0
4	49.00	18	0.4375		48.9596	60.5000		12.7
							A572-65	30.9



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
10' Dipole AF	176	FD-RRH-4X45-1900 (Sprint)	150
10' Dipole AF	176	FD-RRH-2X50-800 (Sprint)	150
10' Dipole AF	176	FD-RRH-2X50-800 (Sprint)	150
2" Dia 10' Omni	176	FD-RRH-2X50-800 (Sprint)	150
2" Dia 10' Omni	176	840 10054 (Sprint)	150
Valmont 13' Platform w/o Rails	176	840 10054 (Sprint)	150
Valmont T-Arm (3) (ATI)	170	840 10054 (Sprint)	150
800-10121 (ATI)	170	APXV9TM14-C-I20 (sprint)	150
800-10121 (ATI)	170	APXV9TM14-C-I20 (sprint)	150
800-10121 (ATI)	170	APXV9TM14-C-I20 (sprint)	150
HPA-65R-BUU-H6 (ATI)	170	VHLP2.5-180	150
HPA-65R-BUU-H6 (ATI)	170	VHLP2.5-180	150
HPA-65R-BUU-H6 (ATI)	170	APXVSPP18-C-A20 (Sprint)	150
(2) LGP21401 (ATI)	170	MF-900B	146
(2) LGP21401 (ATI)	170	MF-900B	146
(2) LGP21401 (ATI)	170	Custom Standoff Mount	131 - 130
RRUS-11 (ATI)	170	10' Dipole AF	130
RRUS-11 (ATI)	170	TMA	130
RRUS-11 (ATI)	170	MGD3-900TX (Verizon)	114
RRUS 32 (ATI)	170	MGD3-900TX (Verizon)	114
RRUS 32 (ATI)	170	TMA (Verizon)	114
RRUS 32 (ATI)	170	TMA (Verizon)	114
DC6-48-06-18-8F (ATI)	170	TMA (Verizon)	114
10' Dipole AF	162	Valmont 13' Platform w/o Rails (Verizon)	114
Custom Standoff Mount	162		
LNX-6515DS-VTM (T-Mobile)	162	LNX-6514DS-T4M (Verizon)	114
LNX-6515DS-VTM (T-Mobile)	162	BXA-185060 (Verizon)	114
MF-900B	162	LNX-6514DS-T4M (Verizon)	114
(2) Ericsson AIR21 (T-Mobile)	160	(2) LPA-70063-6CF-EDIN-X (Verizon)	114
(2) Ericsson AIR21 (T-Mobile)	160	(2) LPA-70063-6CF-EDIN-X (Verizon)	114
(2) Ericsson AIR21 (T-Mobile)	160	RWA-80013 (Verizon)	114
Rohn T-Arm (3) (T-Mobile)	160	LNX-6514DS-T4M (Verizon)	114
LNX-6515DS-VTM (T-Mobile)	160	(2) RWA-80013 (Verizon)	114
APXVSPP18-C-A20 (Sprint)	150	Custom Standoff Mount	100
APXVSPP18-C-A20 (Sprint)	150	10' Dipole AF	100
TD-RRH8x20-25 (Sprint)	150	TMA	100
TD-RRH8x20-25 (Sprint)	150	MF-900B	100
TD-RRH8x20-25 (Sprint)	150	GPS	61 - 1
Valmont 13' Platform w/o Rails (Sprint)	150	GPS	61 - 1
FD-RRH-4X45-1900 (Sprint)	150	GPS	61 - 1
FD-RRH-4X45-1900 (Sprint)	150		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for Exposure B to the TIA-222-G Standard.
2. Tower designed for a 102 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class II.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. Weld together tower sections have flange connections.
8. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
9. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
10. Welds are fabricated with ER-70S-6 electrodes.

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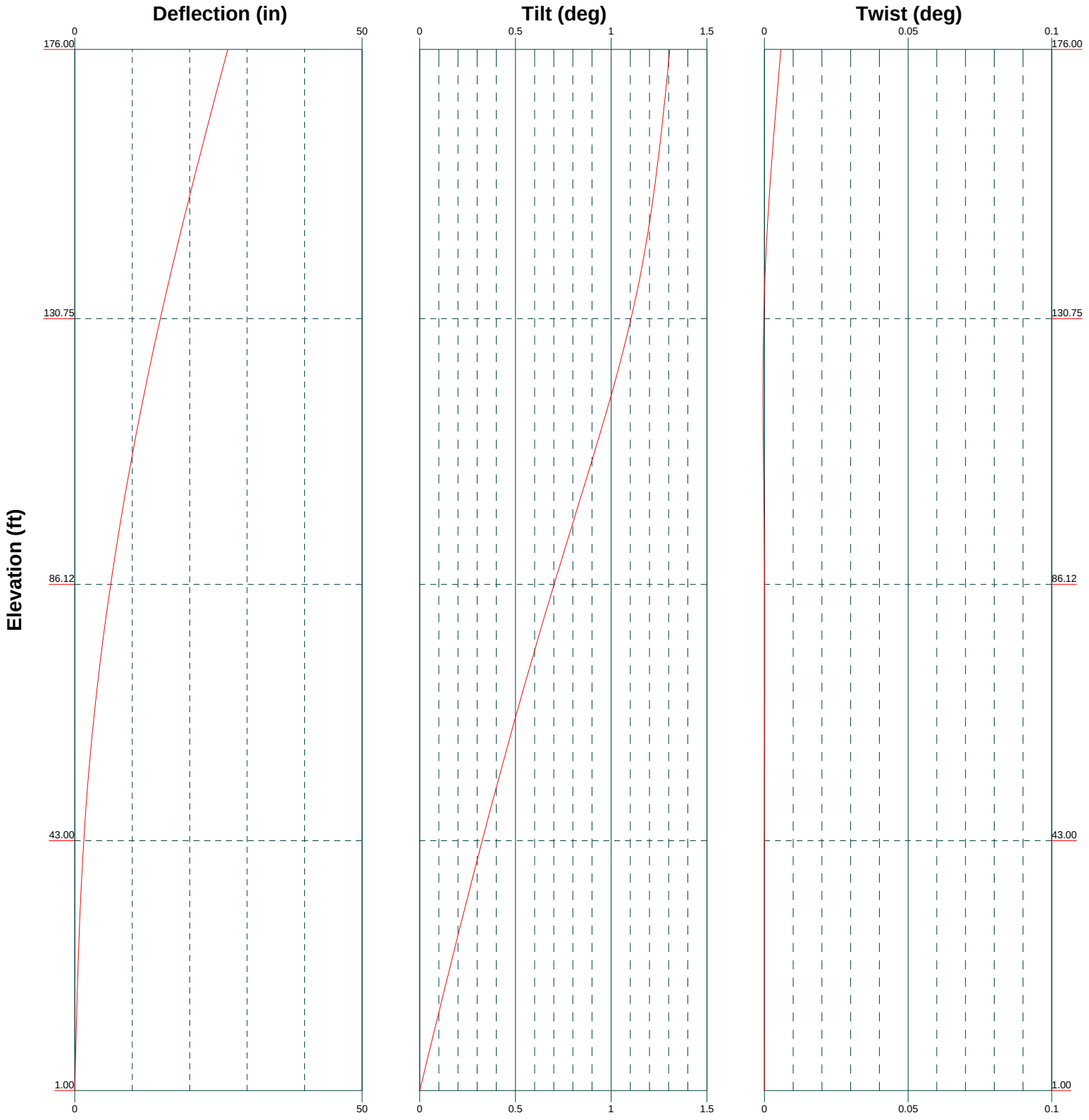
Job: ***KENSINGTON CT-CT5375***			
Project: ***16963024A***			
Client: AT&T	Drawn by:	App'd:	
Code: TIA-222-G	Date: 12/12/16	Scale: NTS	
Path: R:\Projects\2016\16963000A\16963024A\Structural\Tower Analysis\Rev 0\TNX\Monopole.eri		Dwg No. E-1	

TIA-222-G - Service - 60 mph

Maximum Values



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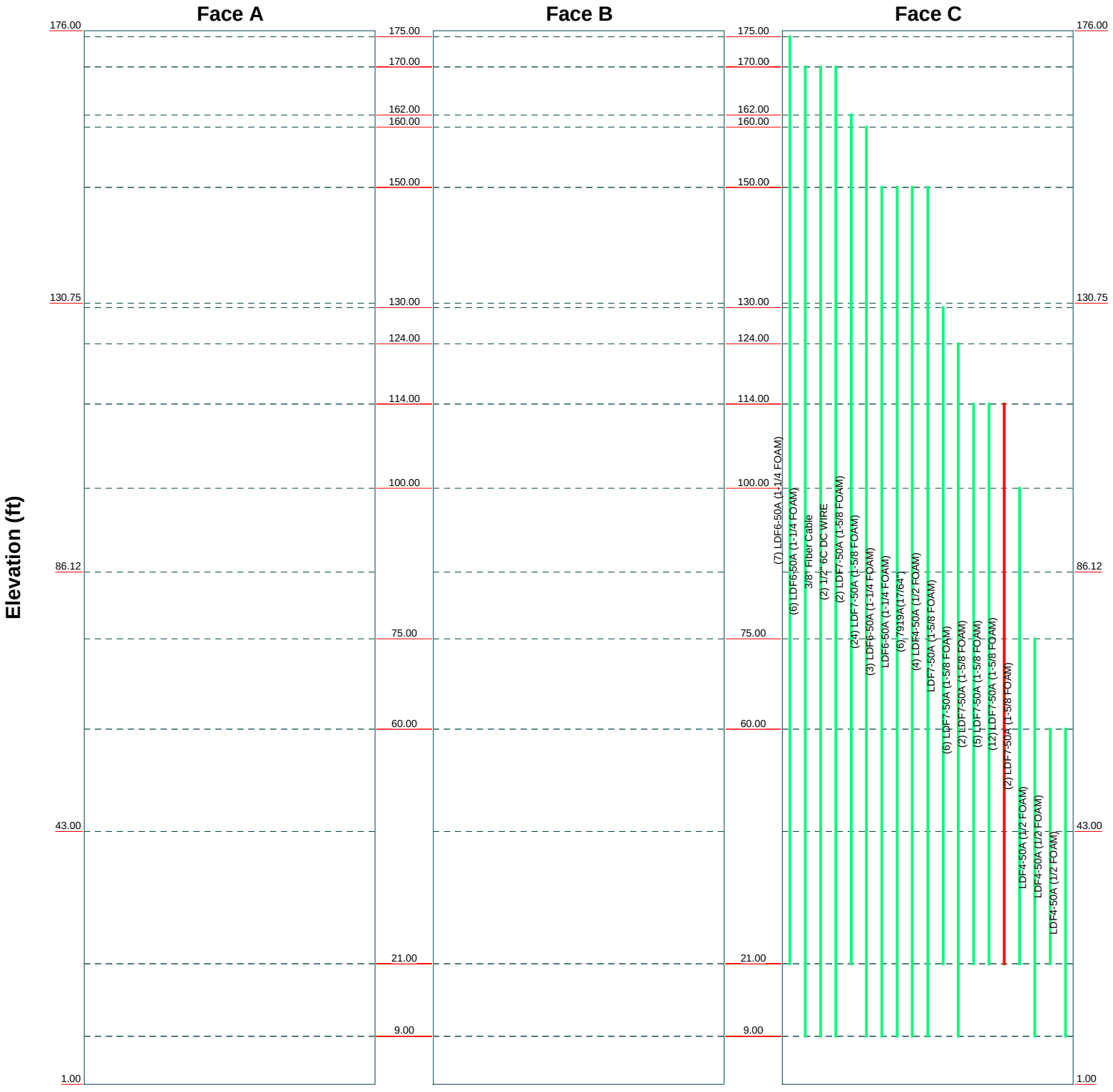
Feed Line Distribution Chart
1' - 176'

Round | Flat | App In Face | App Out Face | Truss Leg



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Tower Input Data

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

- Basic wind speed of 102 mph.
- Structure Class II.
- Exposure Category B.
- Topographic Category 1.
- Crest Height 0.00 ft.
- Nominal ice thickness of 1.0000 in.
- Ice thickness is considered to increase with height.
- Ice density of 56 pcf.
- A wind speed of 50 mph is used in combination with ice.
- Temperature drop of 50 °F.
- Deflections calculated using a wind speed of 60 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.
- Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	176.00-130.75	45.25	4.50	18	21.0000	31.8000	0.2500	1.0000	A572-65 (65 ksi)
L2	130.75-86.12	49.13	5.75	18	30.2260	41.8200	0.3125	1.2500	A572-65 (65 ksi)
L3	86.12-43.00	48.87	7.00	18	39.8381	51.3600	0.3750	1.5000	A572-65 (65 ksi)
L4	43.00-1.00	49.00		18	48.9596	60.5000	0.4375	1.7500	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	21.3240	16.4651	895.6507	7.3663	10.6680	83.9568	1792.4800	8.2341	3.2560	13.024
	32.2906	25.0349	3148.3461	11.2003	16.1544	194.8909	6300.8349	12.5198	5.1568	20.627
L2	31.7706	29.6704	3354.2439	10.6193	15.3548	218.4493	6712.9014	14.8380	4.7698	15.263
	42.4651	41.1703	8961.3641	14.7352	21.2446	421.8192	17934.5198	20.5890	6.8103	21.793
L3	41.8292	46.9709	9241.6269	14.0094	20.2377	456.6531	18495.4142	23.4899	6.3515	16.937
	52.1523	60.6849	19929.7987	18.0997	26.0909	763.8607	39885.8215	30.3482	8.3794	22.345
L4	51.3890	67.3790	20042.0464	17.2254	24.8715	805.8240	40110.4646	33.6959	7.8469	17.936
	61.4333	83.4043	38013.0437	21.3222	30.7340	1236.8401	76076.1060	41.7101	9.8780	22.578

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	Double Angle Stitch Bolt Spacing Redundants in
L1 176.00-130.75				1	1	1.01			
L2 130.75-86.12				1	1	1.01			
L3 86.12-43.00				1	1	1.01			
L4 43.00-1.00				1	1	1.01			

Monopole Base Plate Data

Base Plate Data	
Base plate is square	
Base plate is grouted	
Anchor bolt grade	A615-75
Anchor bolt size	2.2500 in
Number of bolts	18
Embedment length	24.0000 in
f'_c	4 ksi
Grout space	2.0000 in
Base plate grade	A572-65
Base plate thickness	2.0000 in
Bolt circle diameter	70.0000 in
Outer diameter	76.0000 in
Inner diameter	60.7500 in
Base plate type	Stiffened Plate
Bolts per stiffener	1

Base Plate Data	
Stiffener thickness	0.5000 in
Stiffener height	12.0000 in

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Sector	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or Diameter in	Perimeter in	Weight plf
LDF7-50A (1-5/8 FOAM)	C	Surface Af (CaAa)	114.00 - 21.00	12	6	0.000 0.000	1.9800	6.2172	0.82

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
LDF6-50A (1-1/4 FOAM)	C	No	Inside Pole	175.00 - 21.00	7	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.66 0.66 0.66
LDF6-50A (1-1/4 FOAM)	C	No	Inside Pole	170.00 - 9.00	6	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.66 0.66 0.66
3/8" Fiber Cable	C	No	Inside Pole	170.00 - 9.00	1	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	1.00 1.00 1.00
1/2" 6C DC WIRE	C	No	Inside Pole	170.00 - 9.00	2	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	1.00 1.00 1.00
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	162.00 - 21.00	2	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.82 0.82 0.82
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	160.00 - 9.00	24	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.82 0.82 0.82
LDF6-50A (1-1/4 FOAM)	C	No	Inside Pole	150.00 - 9.00	3	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.66 0.66 0.66
LDF6-50A (1-1/4 FOAM)	C	No	Inside Pole	150.00 - 9.00	1	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.66 0.66 0.66
7919A(17/64")	C	No	Inside Pole	150.00 - 9.00	6	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.04 0.04 0.04
LDF4-50A (1/2 FOAM)	C	No	Inside Pole	150.00 - 9.00	4	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.15 0.15 0.15
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	130.00 - 21.00	1	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.82 0.82 0.82
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	124.00 - 9.00	6	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.82 0.82 0.82
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	114.00 - 21.00	2	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.82 0.82 0.82
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	114.00 - 21.00	5	No Ice 1/2" Ice	0.00 0.00	0.82 0.82

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
						1" Ice	0.00	0.82
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	100.00 - 21.00	2	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
LDF4-50A (1/2 FOAM)	C	No	Inside Pole	75.00 - 9.00	1	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15
						1" Ice	0.00	0.15
LDF4-50A (1/2 FOAM)	C	No	Inside Pole	60.00 - 21.00	1	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15
						1" Ice	0.00	0.15
LDF4-50A (1/2 FOAM)	C	No	Inside Pole	60.00 - 9.00	1	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15
						1" Ice	0.00	0.15

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	176.00-130.75	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	1.17
L2	130.75-86.12	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	55.202	0.000	2.30
L3	86.12-43.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	85.378	0.000	2.57
L4	43.00-1.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	43.560	0.000	1.74

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	176.00-130.75	A	2.330	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	1.17
L2	130.75-86.12	A	2.251	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	7.811	0.000	3.60
L3	86.12-43.00	A	2.138	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	11.779	0.000	4.50
L4	43.00-1.00	A	1.916	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	5.791	0.000	2.68

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
L1	15	LDF7-50A (1-5/8 FOAM)	130.75 - 114.00	1.0000	1.0000
L2	15	LDF7-50A (1-5/8 FOAM)	86.12 - 114.00	1.0000	1.0000
L3	15	LDF7-50A (1-5/8 FOAM)	43.00 - 86.12	1.0000	1.0000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
10' Dipole AF	A	From Face	5.00	0.0000	176.00	No Ice	2.00	2.00	0.06
			0.00			1/2" Ice	3.02	3.02	0.08
			0.00			1" Ice	4.07	4.07	0.10
10' Dipole AF	B	From Face	5.00	0.0000	176.00	No Ice	2.00	2.00	0.06
			0.00			1/2" Ice	3.02	3.02	0.08
			0.00			1" Ice	4.07	4.07	0.10
10' Dipole AF	B	From Leg	6.00	0.0000	176.00	No Ice	2.00	2.00	0.06
			0.00			1/2" Ice	3.02	3.02	0.08
			0.00			1" Ice	4.07	4.07	0.10
2" Dia 10' Omni	C	From Face	5.00	0.0000	176.00	No Ice	2.00	2.00	0.03
			0.00			1/2" Ice	3.02	3.02	0.05
			0.00			1" Ice	4.07	4.07	0.07
2" Dia 10' Omni	C	From Face	5.00	0.0000	176.00	No Ice	2.00	2.00	0.03
			0.00			1/2" Ice	3.02	3.02	0.05
			0.00			1" Ice	4.07	4.07	0.07
Valmont 13' Platform w/o Rails	C	From Face	0.00	0.0000	176.00	No Ice	35.00	35.00	1.35
			0.00			1/2" Ice	42.00	42.00	2.00
			0.00			1" Ice	49.00	49.00	3.00
Valmont T-Arm (3) (AT&T)	C	From Face	0.00	0.0000	170.00	No Ice	21.00	21.00	1.01
			0.00			1/2" Ice	29.00	29.00	1.24
			0.00			1" Ice	37.00	37.00	1.46
800-10121 (AT&T)	A	From Face	4.00	0.0000	170.00	No Ice	5.16	3.29	0.05
			0.00			1/2" Ice	5.51	3.64	0.08
			0.00			1" Ice	5.87	3.99	0.12
800-10121 (AT&T)	B	From Face	4.00	0.0000	170.00	No Ice	5.16	3.29	0.05
			0.00			1/2" Ice	5.51	3.64	0.08
			0.00			1" Ice	5.87	3.99	0.12
800-10121 (AT&T)	C	From Face	4.00	0.0000	170.00	No Ice	5.16	3.29	0.05
			0.00			1/2" Ice	5.51	3.64	0.08
			0.00			1" Ice	5.87	3.99	0.12
HPA-65R-BUU-H6 (AT&T)	A	From Face	4.00	0.0000	170.00	No Ice	9.49	5.49	0.03
			0.00			1/2" Ice	9.96	5.94	0.09
			0.00			1" Ice	10.43	6.41	0.15
HPA-65R-BUU-H6 (AT&T)	B	From Face	4.00	0.0000	170.00	No Ice	9.49	5.49	0.03
			0.00			1/2" Ice	9.96	5.94	0.09
			0.00			1" Ice	10.43	6.41	0.15
HPA-65R-BUU-H6 (AT&T)	C	From Face	4.00	0.0000	170.00	No Ice	9.49	5.49	0.03
			0.00			1/2" Ice	9.96	5.94	0.09

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Offsets: Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00				1" Ice	10.43	6.41	0.15
(2) LGP21401	A	From Face	4.00	0.0000	170.00		No Ice	1.66	0.44	0.04
(AT&T)			0.00				1/2" Ice	1.82	0.54	0.05
			0.00				1" Ice	1.98	0.65	0.06
(2) LGP21401	B	From Face	4.00	0.0000	170.00		No Ice	1.66	0.44	0.04
(AT&T)			0.00				1/2" Ice	1.82	0.54	0.05
			0.00				1" Ice	1.98	0.65	0.06
(2) LGP21401	C	From Face	4.00	0.0000	170.00		No Ice	1.66	0.44	0.04
(AT&T)			0.00				1/2" Ice	1.82	0.54	0.05
			0.00				1" Ice	1.98	0.65	0.06
RRUS-11	A	From Face	4.00	0.0000	170.00		No Ice	2.52	1.02	0.06
(AT&T)			0.00				1/2" Ice	2.72	1.16	0.07
			0.00				1" Ice	2.92	1.30	0.10
RRUS-11	B	From Face	4.00	0.0000	170.00		No Ice	2.52	1.02	0.06
(AT&T)			0.00				1/2" Ice	2.72	1.16	0.07
			0.00				1" Ice	2.92	1.30	0.10
RRUS-11	C	From Face	4.00	0.0000	170.00		No Ice	2.52	1.02	0.06
(AT&T)			0.00				1/2" Ice	2.72	1.16	0.07
			0.00				1" Ice	2.92	1.30	0.10
RRUS 32	A	From Face	4.00	0.0000	170.00		No Ice	3.31	2.42	0.09
(AT&T)			0.00				1/2" Ice	3.56	2.64	0.12
			0.00				1" Ice	3.81	2.86	0.15
RRUS 32	B	From Face	4.00	0.0000	170.00		No Ice	3.31	2.42	0.09
(AT&T)			0.00				1/2" Ice	3.56	2.64	0.12
			0.00				1" Ice	3.81	2.86	0.15
RRUS 32	C	From Face	4.00	0.0000	170.00		No Ice	3.31	2.42	0.09
(AT&T)			0.00				1/2" Ice	3.56	2.64	0.12
			0.00				1" Ice	3.81	2.86	0.15
DC6-48-06-18-8F	A	From Face	1.00	0.0000	170.00		No Ice	1.20	1.20	0.03
(AT&T)			0.00				1/2" Ice	1.88	1.88	0.05
			0.00				1" Ice	2.09	2.09	0.08
10' Dipole AF	A	From Face	6.00	0.0000	162.00		No Ice	2.00	2.00	0.06
			0.00				1/2" Ice	3.02	3.02	0.08
			0.00				1" Ice	4.07	4.07	0.10
Custom Standoff Mount	A	From Face	3.00	0.0000	162.00		No Ice	8.83	11.42	0.30
			0.00				1/2" Ice	9.41	12.18	0.39
			0.00				1" Ice	9.99	12.93	0.48
LNX-6515DS-VTM	A	From Face	4.00	0.0000	162.00		No Ice	11.39	9.56	0.07
(T-Mobile)			0.00				1/2" Ice	12.01	10.97	0.16
			0.00				1" Ice	12.63	12.24	0.26
LNX-6515DS-VTM	B	From Face	4.00	0.0000	162.00		No Ice	11.39	9.56	0.07
(T-Mobile)			0.00				1/2" Ice	12.01	10.97	0.16
			0.00				1" Ice	12.63	12.24	0.26
LNX-6515DS-VTM	C	From Face	4.00	0.0000	160.00		No Ice	11.39	9.56	0.07
(T-Mobile)			0.00				1/2" Ice	12.01	10.97	0.16
			0.00				1" Ice	12.63	12.24	0.26
(2) Ericsson AIR21	A	From Face	4.00	0.0000	160.00		No Ice	4.31	6.05	0.10
(T-Mobile)			0.00				1/2" Ice	4.66	6.42	0.14
			0.00				1" Ice	5.02	6.80	0.19
(2) Ericsson AIR21	B	From Face	4.00	0.0000	160.00		No Ice	4.31	6.05	0.10
(T-Mobile)			0.00				1/2" Ice	4.66	6.42	0.14
			0.00				1" Ice	5.02	6.80	0.19
(2) Ericsson AIR21	C	From Face	4.00	0.0000	160.00		No Ice	4.31	6.05	0.10
(T-Mobile)			0.00				1/2" Ice	4.66	6.42	0.14
			0.00				1" Ice	5.02	6.80	0.19
Rohn T-Arm (3)	C	From Face	0.00	0.0000	160.00		No Ice	22.00	22.00	1.13
(T-Mobile)			0.00				1/2" Ice	30.00	30.00	1.47

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00				1" Ice	38.00	38.00	1.81
APXVSPP18-C-A20	A	From Face	4.00	0.0000	150.00		No Ice	8.02	5.81	0.06
(Sprint)			0.00				1/2" Ice	8.48	6.27	0.12
			0.00				1" Ice	8.94	6.73	0.17
APXVSPP18-C-A20	B	From Face	4.00	0.0000	150.00		No Ice	8.02	5.81	0.06
(Sprint)			0.00				1/2" Ice	8.48	6.27	0.12
			0.00				1" Ice	8.94	6.73	0.17
APXVSPP18-C-A20	C	From Face	4.00	0.0000	150.00		No Ice	8.02	5.81	0.06
(Sprint)			0.00				1/2" Ice	8.48	6.27	0.12
			0.00				1" Ice	8.94	6.73	0.17
TD-RRH8x20-25	A	From Face	4.00	0.0000	150.00		No Ice	4.05	1.53	0.07
(Sprint)			0.00				1/2" Ice	4.30	1.71	0.10
			0.00				1" Ice	4.56	1.90	0.13
TD-RRH8x20-25	B	From Face	4.00	0.0000	150.00		No Ice	4.05	1.53	0.07
(Sprint)			0.00				1/2" Ice	4.30	1.71	0.10
			0.00				1" Ice	4.56	1.90	0.13
TD-RRH8x20-25	C	From Face	4.00	0.0000	150.00		No Ice	4.05	1.53	0.07
(Sprint)			0.00				1/2" Ice	4.30	1.71	0.10
			0.00				1" Ice	4.56	1.90	0.13
Valmont 13' Platform w/o Rails	C	From Face	0.00	0.0000	150.00		No Ice	35.00	35.00	1.35
			0.00				1/2" Ice	42.00	42.00	2.00
(Sprint)			0.00				1" Ice	49.00	49.00	3.00
FD-RRH-4X45-1900	A	From Face	4.00	0.0000	150.00		No Ice	2.38	2.32	0.06
(Sprint)			0.00				1/2" Ice	2.59	2.52	0.08
			0.00				1" Ice	2.80	2.74	0.11
FD-RRH-4X45-1900	B	From Face	4.00	0.0000	150.00		No Ice	2.38	2.32	0.06
(Sprint)			0.00				1/2" Ice	2.59	2.52	0.08
			0.00				1" Ice	2.80	2.74	0.11
FD-RRH-4X45-1900	C	From Face	4.00	0.0000	150.00		No Ice	2.38	2.32	0.06
(Sprint)			0.00				1/2" Ice	2.59	2.52	0.08
			0.00				1" Ice	2.80	2.74	0.11
FD-RRH-2X50-800	A	From Face	4.00	0.0000	150.00		No Ice	2.13	2.46	0.06
(Sprint)			0.00				1/2" Ice	2.32	2.66	0.09
			0.00				1" Ice	2.51	2.86	0.12
FD-RRH-2X50-800	B	From Face	4.00	0.0000	150.00		No Ice	2.13	2.46	0.06
(Sprint)			0.00				1/2" Ice	2.32	2.66	0.09
			0.00				1" Ice	2.51	2.86	0.12
FD-RRH-2X50-800	C	From Face	4.00	0.0000	150.00		No Ice	2.13	2.46	0.06
(Sprint)			0.00				1/2" Ice	2.32	2.66	0.09
			0.00				1" Ice	2.51	2.86	0.12
840 10054	A	From Face	4.00	0.0000	150.00		No Ice	4.58	1.36	0.03
(Sprint)			0.00				1/2" Ice	4.87	1.62	0.05
			0.00				1" Ice	5.18	1.89	0.08
840 10054	B	From Face	4.00	0.0000	150.00		No Ice	4.58	1.36	0.03
(Sprint)			0.00				1/2" Ice	4.87	1.62	0.05
			0.00				1" Ice	5.18	1.89	0.08
840 10054	C	From Face	4.00	0.0000	150.00		No Ice	4.58	1.36	0.03
(Sprint)			0.00				1/2" Ice	4.87	1.62	0.05
			0.00				1" Ice	5.18	1.89	0.08
10' Dipole AF	B	From Face	6.00	0.0000	130.00		No Ice	2.00	2.00	0.06
			0.00				1/2" Ice	3.02	3.02	0.08
			0.00				1" Ice	4.07	4.07	0.10
TMA	B	From Face	2.00	0.0000	130.00		No Ice	0.31	0.23	0.01
			0.00				1/2" Ice	0.39	0.31	0.02
			0.00				1" Ice	0.48	0.39	0.02
Custom Standoff Mount	B	From Face	3.00	0.0000	131.00 - 130.00		No Ice	8.83	11.42	0.30
			0.00				1/2" Ice	9.41	12.18	0.39

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00				1" Ice	9.99	12.93	0.48
(2) LPA-70063-6CF-EDIN-X (Verizon)	A	From Face	4.00	0.00	0.0000	114.00	No Ice	13.65	12.13	0.01
			0.00				1/2" Ice	14.25	12.73	0.11
			0.00				1" Ice	14.85	13.33	0.22
(2) LPA-70063-6CF-EDIN-X (Verizon)	B	From Face	4.00	0.00	0.0000	114.00	No Ice	13.65	12.13	0.01
			0.00				1/2" Ice	14.25	12.73	0.11
			0.00				1" Ice	14.85	13.33	0.22
(2) RWA-80013 (Verizon)	C	From Face	4.00	0.00	0.0000	114.00	No Ice	4.80	2.84	0.01
			0.00				1/2" Ice	5.12	3.15	0.05
			0.00				1" Ice	5.45	3.47	0.08
RWA-80013 (Verizon)	C	From Face	4.00	0.00	0.0000	114.00	No Ice	4.80	2.84	0.01
			0.00				1/2" Ice	5.12	3.15	0.05
			0.00				1" Ice	5.45	3.47	0.08
LNX-6514DS-T4M (Verizon)	A	From Face	4.00	0.00	0.0000	114.00	No Ice	8.17	5.41	0.04
			0.00				1/2" Ice	8.63	5.86	0.09
			0.00				1" Ice	9.10	6.33	0.15
LNX-6514DS-T4M (Verizon)	B	From Face	4.00	0.00	0.0000	114.00	No Ice	8.17	5.41	0.04
			0.00				1/2" Ice	8.63	5.86	0.09
			0.00				1" Ice	9.10	6.33	0.15
LNX-6514DS-T4M (Verizon)	C	From Face	4.00	0.00	0.0000	114.00	No Ice	8.17	5.41	0.04
			0.00				1/2" Ice	8.63	5.86	0.09
			0.00				1" Ice	9.10	6.33	0.15
BXA-185060 (Verizon)	A	From Face	4.00	0.00	0.0000	114.00	No Ice	1.36	0.80	0.01
			0.00				1/2" Ice	1.53	0.96	0.01
			0.00				1" Ice	1.71	1.13	0.03
MGD3-900TX (Verizon)	B	From Face	4.00	0.00	0.0000	114.00	No Ice	4.78	3.60	0.02
			0.00				1/2" Ice	5.24	4.04	0.05
			0.00				1" Ice	5.70	4.49	0.08
MGD3-900TX (Verizon)	C	From Face	4.00	0.00	0.0000	114.00	No Ice	4.78	3.60	0.02
			0.00				1/2" Ice	5.24	4.04	0.05
			0.00				1" Ice	5.70	4.49	0.08
TMA (Verizon)	A	From Face	4.00	0.00	0.0000	114.00	No Ice	0.31	0.23	0.01
			0.00				1/2" Ice	0.39	0.31	0.02
			0.00				1" Ice	0.48	0.39	0.02
TMA (Verizon)	B	From Face	4.00	0.00	0.0000	114.00	No Ice	0.31	0.23	0.01
			0.00				1/2" Ice	0.39	0.31	0.02
			0.00				1" Ice	0.48	0.39	0.02
TMA (Verizon)	C	From Face	4.00	0.00	0.0000	114.00	No Ice	0.31	0.23	0.01
			0.00				1/2" Ice	0.39	0.31	0.02
			0.00				1" Ice	0.48	0.39	0.02
Valmont 13' Platform w/o Rails (Verizon)	C	From Face	0.00	0.00	0.0000	114.00	No Ice	35.00	35.00	1.35
			0.00				1/2" Ice	42.00	42.00	2.00
			0.00				1" Ice	49.00	49.00	3.00
10' Dipole AF	B	From Face	6.00	0.00	0.0000	100.00	No Ice	2.00	2.00	0.06
			0.00				1/2" Ice	3.02	3.02	0.08
			0.00				1" Ice	4.07	4.07	0.10
TMA	B	From Face	2.00	0.00	0.0000	100.00	No Ice	0.31	0.23	0.01
			0.00				1/2" Ice	0.39	0.31	0.02
			0.00				1" Ice	0.48	0.39	0.02
Custom Standoff Mount	B	From Face	3.00	0.00	0.0000	100.00	No Ice	8.83	11.42	0.30
			0.00				1/2" Ice	9.41	12.18	0.39
			0.00				1" Ice	9.99	12.93	0.48
GPS	A	From Face	2.00	0.00	0.0000	61.00 - 1.00	No Ice	1.00	1.00	0.01
			0.00				1/2" Ice	1.50	1.50	0.01
			0.00				1" Ice	2.00	2.00	0.02
GPS	A	From Face	2.00	0.00	0.0000	61.00 - 1.00	No Ice	1.00	1.00	0.01
			0.00				1/2" Ice	1.50	1.50	0.01

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
			0.00			1" Ice	2.00	2.00	0.02
GPS	B	From Face	2.00	0.0000	61.00 - 1.00	No Ice	1.00	1.00	0.01
			0.00			1/2" Ice	1.50	1.50	0.01
			0.00			1" Ice	2.00	2.00	0.02
APXV9TM14-C-I20	A	From Face	4.00	0.0000	150.00	No Ice	6.34	3.61	0.06
(sprint)			0.00			1/2" Ice	6.72	3.97	0.09
			0.00			1" Ice	7.10	4.33	0.14
APXV9TM14-C-I20	B	From Face	4.00	0.0000	150.00	No Ice	6.34	3.61	0.06
(sprint)			0.00			1/2" Ice	6.72	3.97	0.09
			0.00			1" Ice	7.10	4.33	0.14
APXV9TM14-C-I20	C	From Face	4.00	0.0000	150.00	No Ice	6.34	3.61	0.06
(sprint)			0.00			1/2" Ice	6.72	3.97	0.09
			0.00			1" Ice	7.10	4.33	0.14

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
VHLP2.5-180	C	Paraboloid w/Shroud (HP)	From Leg	5.00	Worst		150.00	2.50	No Ice	4.90	0.07
				0.00					1/2" Ice	5.24	0.10
				0.00					1" Ice	5.58	0.12
VHLP2.5-180	C	Paraboloid w/Shroud (HP)	From Leg	5.00	Worst		150.00	2.50	No Ice	4.90	0.07
				0.00					1/2" Ice	5.24	0.10
				0.00					1" Ice	5.58	0.12
MF-900B	B	Grid	From Leg	5.00	Worst		146.00	1.33	No Ice	2.66	0.01
				0.00					1/2" Ice	1.58	0.02
				0.00					1" Ice	0.00	0.03
MF-900B	C	Grid	From Leg	5.00	Worst		146.00	1.33	No Ice	2.66	0.01
				0.00					1/2" Ice	1.58	0.02
				0.00					1" Ice	0.00	0.03
MF-900B	A	Grid	From Leg	5.00	Worst		162.00	1.33	No Ice	2.66	0.01
				0.00					1/2" Ice	1.58	0.02
				0.00					1" Ice	0.00	0.03
MF-900B	B	Grid	From Leg	5.00	Worst		100.00	1.33	No Ice	2.66	0.01
				0.00					1/2" Ice	1.58	0.02
				0.00					1" Ice	0.00	0.03

Tower Pressures - No Ice

$G_H = 1.100$

Section Elevation ft	z ft	K_Z	q_z psf	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	152.07	1.114	28	101.086	A	0.000	101.086	101.086	100.00	0.000	0.000
176.00-130.75					B	0.000	101.086		100.00	0.000	0.000
					C	0.000	101.086		100.00	0.000	0.000
L2	107.69	1.009	25	138.047	A	0.000	138.047	138.047	100.00	0.000	0.000
130.75-86.12					B	0.000	138.047		100.00	0.000	0.000
					C	0.000	138.047		100.00	55.202	0.000
L3 86.12-43.00	64.29	0.871	22	168.853	A	0.000	168.853	168.853	100.00	0.000	0.000
					B	0.000	168.853		100.00	0.000	0.000
					C	0.000	168.853		100.00	85.378	0.000
L4 43.00-1.00	21.49	0.7	18	197.439	A	0.000	197.439	197.439	100.00	0.000	0.000
					B	0.000	197.439		100.00	0.000	0.000
					C	0.000	197.439		100.00	43.560	0.000

Tower Pressure - With Ice

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	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	152.07	1.114	7	2.3301	118.659	A	0.000	118.659	118.659	100.00	0.000	0.000
176.00-130.75						B	0.000	118.659		100.00	0.000	0.000
						C	0.000	118.659		100.00	0.000	0.000
L2 130.75-86.12	107.69	1.009	6	2.2511	155.380	A	0.000	155.380	155.380	100.00	0.000	0.000
						B	0.000	155.380		100.00	0.000	0.000
						C	0.000	155.380		100.00	7.811	0.000
L3 86.12-43.00	64.29	0.871	5	2.1379	185.031	A	0.000	185.031	185.031	100.00	0.000	0.000
						B	0.000	185.031		100.00	0.000	0.000
						C	0.000	185.031		100.00	11.779	0.000
L4 43.00-1.00	21.49	0.7	4	1.9161	212.404	A	0.000	212.404	212.404	100.00	0.000	0.000
						B	0.000	212.404		100.00	0.000	0.000
						C	0.000	212.404		100.00	5.791	0.000

Tower Pressure - Service

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	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	152.07	1.114	9	101.086	A	0.000	101.086	101.086	100.00	0.000	0.000
176.00-130.75					B	0.000	101.086		100.00	0.000	0.000
					C	0.000	101.086		100.00	0.000	0.000
L2	107.69	1.009	8	138.047	A	0.000	138.047	138.047	100.00	0.000	0.000
130.75-86.12					B	0.000	138.047		100.00	0.000	0.000
					C	0.000	138.047		100.00	55.202	0.000
L3 86.12-43.00	64.29	0.871	7	168.853	A	0.000	168.853	168.853	100.00	0.000	0.000
					B	0.000	168.853		100.00	0.000	0.000
					C	0.000	168.853		100.00	85.378	0.000
L4 43.00-1.00	21.49	0.7	6	197.439	A	0.000	197.439	197.439	100.00	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	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
					B	0.000	197.439		100.00	0.000	0.000
					C	0.000	197.439		100.00	43.560	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	1.17	3.23	A	1	0.65	28	1	1	101.086	2.04	44.98	C
176.00-130.75			B	1	0.65		1	1	101.086			
			C	1	0.65		1	1	101.086			
L2	2.30	5.98	A	1	0.65	25	1	1	138.047	2.52	56.37	C
130.75-86.12			B	1	0.65		1	1	138.047			
			C	1	0.65		1	1	138.047			
L3	2.57	9.04	A	1	0.65	22	1	1	168.853	2.65	61.39	C
86.12-43.00			B	1	0.65		1	1	168.853			
			C	1	0.65		1	1	168.853			
L4 43.00-1.00	1.74	12.70	A	1	0.65	18	1	1	197.439	2.53	60.17	C
			B	1	0.65		1	1	197.439			
			C	1	0.65		1	1	197.439			
Sum Weight:	7.78	30.94						OTM	795.20 kip-ft	9.73		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	1.17	3.23	A	1	0.65	28	1	1	101.086	2.04	44.98	C
176.00-130.75			B	1	0.65		1	1	101.086			
			C	1	0.65		1	1	101.086			
L2	2.30	5.98	A	1	0.65	25	1	1	138.047	2.52	56.37	C
130.75-86.12			B	1	0.65		1	1	138.047			
			C	1	0.65		1	1	138.047			
L3	2.57	9.04	A	1	0.65	22	1	1	168.853	2.65	61.39	C
86.12-43.00			B	1	0.65		1	1	168.853			
			C	1	0.65		1	1	168.853			
L4 43.00-1.00	1.74	12.70	A	1	0.65	18	1	1	197.439	2.53	60.17	C
			B	1	0.65		1	1	197.439			
			C	1	0.65		1	1	197.439			
Sum Weight:	7.78	30.94						OTM	795.20 kip-ft	9.73		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	1.17	3.23	A	1	0.65	28	1	1	101.086	2.04	44.98	C
176.00-130.75			B	1	0.65		1	1	101.086			
			C	1	0.65		1	1	101.086			
L2	2.30	5.98	A	1	0.65	25	1	1	138.047	6.41	143.61	C
130.75-86.12			B	1	0.65		1	1	138.047			
			C	1	1.2		1	1	138.047			
L3	2.57	9.04	A	1	0.65	22	1	1	168.853	7.23	167.77	C
86.12-43.00			B	1	0.65		1	1	168.853			
			C	1	1.2		1	1	168.853			
L4 43.00-1.00	1.74	12.70	A	1	0.65	18	1	1	197.439	3.04	72.39	C
			B	1	0.65		1	1	197.439			
			C	1	0.782		1	1	197.439			
Sum Weight:	7.78	30.94						OTM	1511.42 kip-ft	18.72		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	1.17	6.97	A	1	1.2	7	1	1	118.659	1.06	23.42	C
176.00-130.75			B	1	1.2		1	1	118.659			
			C	1	1.2		1	1	118.659			
L2	3.60	10.79	A	1	1.2	6	1	1	155.380	2.61	58.49	B
130.75-86.12			B	1	1.2		1	1	155.380			
			C	1	1.2		1	1	155.380			
L3	4.50	14.55	A	1	1.2	5	1	1	185.031	3.00	69.57	B
86.12-43.00			B	1	1.2		1	1	185.031			
			C	1	1.2		1	1	185.031			
L4 43.00-1.00	2.68	18.40	A	1	1.2	4	1	1	212.404	1.87	44.46	B
			B	1	1.2		1	1	212.404			
			C	1	1.2		1	1	212.404			
Sum Weight:	11.95	50.71						OTM	666.71 kip-ft	8.54		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	1.17	6.97	A	1	1.2	7	1	1	118.659	1.06	23.42	C
176.00-130.75			B	1	1.2		1	1	118.659			
			C	1	1.2		1	1	118.659			
L2	3.60	10.79	A	1	1.2	6	1	1	155.380	2.61	58.49	C
130.75-86.12			B	1	1.2		1	1	155.380			
			C	1	1.2		1	1	155.380			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L3	4.50	14.55	A	1	1.2	5	1	1	185.031	3.00	69.57	C
86.12-43.00			B	1	1.2		1	1	185.031			
			C	1	1.2		1	1	185.031			
L4 43.00-1.00	2.68	18.40	A	1	1.2	4	1	1	212.404	1.87	44.46	C
			B	1	1.2		1	1	212.404			
			C	1	1.2		1	1	212.404			
Sum Weight:	11.95	50.71						OTM	666.71 kip-ft	8.54		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	1.17	6.97	A	1	1.2	7	1	1	118.659	1.06	23.42	C
176.00-130.75			B	1	1.2		1	1	118.659			
			C	1	1.2		1	1	118.659			
L2	3.60	10.79	A	1	1.2	6	1	1	155.380	3.43	76.88	C
130.75-86.12			B	1	1.2		1	1	155.380			
			C	1	1.2		1	1	155.380			
L3	4.50	14.55	A	1	1.2	5	1	1	185.031	4.10	95.10	C
86.12-43.00			B	1	1.2		1	1	185.031			
			C	1	1.2		1	1	185.031			
L4 43.00-1.00	2.68	18.40	A	1	1.2	4	1	1	212.404	2.33	55.51	C
			B	1	1.2		1	1	212.404			
			C	1	1.2		1	1	212.404			
Sum Weight:	11.95	50.71						OTM	833.48 kip-ft	10.92		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	1.17	3.23	A	1	0.65	9	1	1	101.086	0.63	13.92	C
176.00-130.75			B	1	0.65		1	1	101.086			
			C	1	0.65		1	1	101.086			
L2	2.30	5.98	A	1	0.65	8	1	1	138.047	0.78	17.45	C
130.75-86.12			B	1	0.65		1	1	138.047			
			C	1	0.65		1	1	138.047			
L3	2.57	9.04	A	1	0.65	7	1	1	168.853	0.82	19.01	C
86.12-43.00			B	1	0.65		1	1	168.853			
			C	1	0.65		1	1	168.853			
L4 43.00-1.00	1.74	12.70	A	1	0.65	6	1	1	197.439	0.78	18.63	C
			B	1	0.65		1	1	197.439			
			C	1	0.65		1	1	197.439			
Sum Weight:	7.78	30.94						OTM	246.19	3.01		

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
									kip-ft			

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	1.17	3.23	A	1	0.65	9	1	1	101.086	0.63	13.92	C
176.00-130.75			B	1	0.65		1	1	101.086			
			C	1	0.65		1	1	101.086			
L2	2.30	5.98	A	1	0.65	8	1	1	138.047	0.78	17.45	C
130.75-86.12			B	1	0.65		1	1	138.047			
			C	1	0.65		1	1	138.047			
L3	2.57	9.04	A	1	0.65	7	1	1	168.853	0.82	19.01	C
86.12-43.00			B	1	0.65		1	1	168.853			
			C	1	0.65		1	1	168.853			
L4 43.00-1.00	1.74	12.70	A	1	0.65	6	1	1	197.439	0.78	18.63	C
			B	1	0.65		1	1	197.439			
			C	1	0.65		1	1	197.439			
Sum Weight:	7.78	30.94						OTM	246.19 kip-ft	3.01		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	1.17	3.23	A	1	0.65	9	1	1	101.086	0.63	13.92	C
176.00-130.75			B	1	0.65		1	1	101.086			
			C	1	0.65		1	1	101.086			
L2	2.30	5.98	A	1	0.65	8	1	1	138.047	1.98	44.46	C
130.75-86.12			B	1	0.65		1	1	138.047			
			C	1	1.2		1	1	138.047			
L3	2.57	9.04	A	1	0.65	7	1	1	168.853	2.24	51.94	C
86.12-43.00			B	1	0.65		1	1	168.853			
			C	1	1.2		1	1	168.853			
L4 43.00-1.00	1.74	12.70	A	1	0.65	6	1	1	197.439	0.94	22.41	C
			B	1	0.65		1	1	197.439			
			C	1	0.782		1	1	197.439			
Sum Weight:	7.78	30.94						OTM	467.93 kip-ft	5.80		

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	30.94					
Bracing Weight	0.00					
Total Member Self-Weight	30.94			4.65	-1.71	
Total Weight	49.54			4.65	-1.71	
Wind 0 deg - No Ice		-0.03	-22.21	-2604.34	0.11	0.74
Wind 30 deg - No Ice		10.98	-19.22	-2253.89	-1292.61	0.99
Wind 60 deg - No Ice		19.05	-11.08	-1298.27	-2239.44	0.97
Wind 90 deg - No Ice		31.00	0.03	6.47	-3302.88	0.69
Wind 120 deg - No Ice		19.08	11.13	1310.72	-2241.25	0.23
Wind 150 deg - No Ice		11.03	19.24	2265.02	-1295.76	-0.30
Wind 180 deg - No Ice		0.03	22.21	2613.65	-3.52	-0.74
Wind 210 deg - No Ice		-10.98	19.22	2263.20	1289.20	-0.99
Wind 240 deg - No Ice		-19.05	11.08	1307.58	2236.02	-0.97
Wind 270 deg - No Ice		-31.00	-0.03	2.84	3299.47	-0.69
Wind 300 deg - No Ice		-19.08	-11.13	-1301.41	2237.84	-0.23
Wind 330 deg - No Ice		-11.03	-19.24	-2255.71	1292.34	0.30
Member Ice	19.77					
Total Weight Ice	99.72			10.83	-4.68	
Wind 0 deg - Ice		-0.01	-9.78	-1120.78	-4.05	0.51
Wind 30 deg - Ice		4.85	-8.46	-968.86	-566.33	0.95
Wind 60 deg - Ice		11.64	-6.75	-687.64	-1208.86	1.14
Wind 90 deg - Ice		15.84	0.01	11.46	-1562.28	1.02
Wind 120 deg - Ice		11.65	6.76	710.39	-1209.49	0.63
Wind 150 deg - Ice		4.87	8.47	991.14	-567.43	0.07
Wind 180 deg - Ice		0.01	9.78	1142.43	-5.31	-0.51
Wind 210 deg - Ice		-4.85	8.46	990.51	556.98	-0.95
Wind 240 deg - Ice		-11.64	6.75	709.30	1199.50	-1.14
Wind 270 deg - Ice		-15.84	-0.01	10.19	1552.93	-1.02
Wind 300 deg - Ice		-11.65	-6.76	-688.74	1200.14	-0.63
Wind 330 deg - Ice		-4.87	-8.47	-969.49	558.07	-0.07
Total Weight	49.54			4.65	-1.71	
Wind 0 deg - Service		-0.01	-6.87	-803.08	-1.14	0.23
Wind 30 deg - Service		3.40	-5.95	-694.59	-401.37	0.30
Wind 60 deg - Service		5.90	-3.43	-398.73	-694.50	0.30
Wind 90 deg - Service		9.60	0.01	5.22	-1023.74	0.21
Wind 120 deg - Service		5.91	3.45	409.01	-695.06	0.07
Wind 150 deg - Service		3.42	5.96	704.46	-402.34	-0.09
Wind 180 deg - Service		0.01	6.87	812.39	-2.27	-0.23
Wind 210 deg - Service		-3.40	5.95	703.89	397.95	-0.30
Wind 240 deg - Service		-5.90	3.43	408.04	691.09	-0.30
Wind 270 deg - Service		-9.60	-0.01	4.09	1020.33	-0.21
Wind 300 deg - Service		-5.91	-3.45	-399.70	691.65	-0.07
Wind 330 deg - Service		-3.42	-5.96	-695.15	398.93	0.09

Load Combinations

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

Comb. No.	Description
6	1.2 Dead+1.6 Wind 60 deg - No Ice
7	0.9 Dead+1.6 Wind 60 deg - No Ice
8	1.2 Dead+1.6 Wind 90 deg - No Ice
9	0.9 Dead+1.6 Wind 90 deg - No Ice
10	1.2 Dead+1.6 Wind 120 deg - No Ice
11	0.9 Dead+1.6 Wind 120 deg - No Ice
12	1.2 Dead+1.6 Wind 150 deg - No Ice
13	0.9 Dead+1.6 Wind 150 deg - No Ice
14	1.2 Dead+1.6 Wind 180 deg - No Ice
15	0.9 Dead+1.6 Wind 180 deg - No Ice
16	1.2 Dead+1.6 Wind 210 deg - No Ice
17	0.9 Dead+1.6 Wind 210 deg - No Ice
18	1.2 Dead+1.6 Wind 240 deg - No Ice
19	0.9 Dead+1.6 Wind 240 deg - No Ice
20	1.2 Dead+1.6 Wind 270 deg - No Ice
21	0.9 Dead+1.6 Wind 270 deg - No Ice
22	1.2 Dead+1.6 Wind 300 deg - No Ice
23	0.9 Dead+1.6 Wind 300 deg - No Ice
24	1.2 Dead+1.6 Wind 330 deg - No Ice
25	0.9 Dead+1.6 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	176 - 130.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-36.83	5.25	-14.88
			Max. Mx	20	-12.95	452.51	-6.74
			Max. My	14	-13.14	3.28	-454.01
			Max. Vy	8	18.05	-448.12	-3.66
			Max. Vx	14	17.98	3.28	-454.01
			Max. Torque	22			7.60
L2	130.75 - 86.12	Pole	Max Tension	1	0.00	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Compression	26	-62.76	-5.49	-14.43
			Max. Mx	8	-24.66	-1560.48	-4.65
			Max. My	14	-25.30	-0.81	-1461.31
			Max. Vy	8	33.43	-1560.48	-4.65
			Max. Vx	14	28.14	-0.81	-1461.31
			Max. Torque	22			6.53
L3	86.12 - 43	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-83.56	-5.73	-15.08
			Max. Mx	8	-38.42	-3183.65	-6.75
			Max. My	14	-39.05	-2.82	-2719.12
			Max. Vy	8	44.11	-3183.65	-6.75
			Max. Vx	14	31.84	-2.82	-2719.12
			Max. Torque	18			2.04
L4	43 - 1	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-112.00	-5.66	-15.00
			Max. Mx	8	-59.50	-5508.54	-9.02
			Max. My	14	-59.52	-5.08	-4373.99
			Max. Vy	8	49.66	-5508.54	-9.02
			Max. Vx	14	35.57	-5.08	-4373.99
			Max. Torque	4			-1.94

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	30	112.00	-15.84	-0.01
	Max. H_x	20	59.54	49.61	0.05
	Max. H_z	3	44.66	0.05	35.53
	Max. M_x	2	4361.78	0.05	35.53
	Max. M_z	8	5508.54	-49.61	-0.05
	Max. Torsion	16	1.79	17.57	-30.75
	Min. Vert	19	44.66	30.48	-17.72
	Min. H_x	8	59.54	-49.61	-0.05
	Min. H_z	15	44.66	-0.05	-35.53
	Min. M_x	14	-4373.99	-0.05	-35.53
	Min. M_z	20	-5504.21	49.61	0.05
	Min. Torsion	4	-1.79	-17.57	30.75

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	49.62	0.00	0.00	4.96	-1.75	-0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	59.54	-0.05	-35.53	-4361.78	0.73	1.34
0.9 Dead+1.6 Wind 0 deg - No Ice	44.66	-0.05	-35.53	-4311.39	1.30	1.30
1.2 Dead+1.6 Wind 30 deg - No Ice	59.54	17.57	-30.75	-3775.16	-2163.56	1.79
0.9 Dead+1.6 Wind 30 deg - No Ice	44.66	17.57	-30.75	-3731.74	-2137.20	1.74

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
1.2 Dead+1.6 Wind 60 deg - No Ice	59.54	30.48	-17.72	-2175.35	-3748.74	1.77
0.9 Dead+1.6 Wind 60 deg - No Ice	44.66	30.48	-17.72	-2150.97	-3703.50	1.71
1.2 Dead+1.6 Wind 90 deg - No Ice	59.54	49.61	0.05	9.02	-5508.54	1.29
0.9 Dead+1.6 Wind 90 deg - No Ice	44.66	49.61	0.05	7.38	-5447.24	1.23
1.2 Dead+1.6 Wind 120 deg - No Ice	59.54	30.52	17.80	2192.61	-3751.64	0.43
0.9 Dead+1.6 Wind 120 deg - No Ice	44.66	30.52	17.80	2164.96	-3706.41	0.41
1.2 Dead+1.6 Wind 150 deg - No Ice	59.54	17.65	30.79	3790.28	-2168.58	-0.52
0.9 Dead+1.6 Wind 150 deg - No Ice	44.66	17.65	30.79	3743.59	-2142.23	-0.52
1.2 Dead+1.6 Wind 180 deg - No Ice	59.54	0.05	35.53	4373.99	-5.08	-1.34
0.9 Dead+1.6 Wind 180 deg - No Ice	44.66	0.05	35.53	4320.32	-4.52	-1.30
1.2 Dead+1.6 Wind 210 deg - No Ice	59.54	-17.57	30.75	3787.38	2159.19	-1.79
0.9 Dead+1.6 Wind 210 deg - No Ice	44.66	-17.57	30.75	3740.68	2133.97	-1.73
1.2 Dead+1.6 Wind 240 deg - No Ice	59.54	-30.48	17.72	2187.59	3744.39	-1.77
0.9 Dead+1.6 Wind 240 deg - No Ice	44.66	-30.48	17.72	2159.93	3700.28	-1.71
1.2 Dead+1.6 Wind 270 deg - No Ice	59.54	-49.61	-0.05	3.20	5504.21	-1.29
0.9 Dead+1.6 Wind 270 deg - No Ice	44.66	-49.61	-0.05	1.56	5444.04	-1.23
1.2 Dead+1.6 Wind 300 deg - No Ice	59.54	-30.52	-17.80	-2180.39	3747.32	-0.44
0.9 Dead+1.6 Wind 300 deg - No Ice	44.66	-30.52	-17.80	-2156.02	3703.21	-0.41
1.2 Dead+1.6 Wind 330 deg - No Ice	59.54	-17.65	-30.79	-3778.08	2164.25	0.52
0.9 Dead+1.6 Wind 330 deg - No Ice	44.66	-17.65	-30.79	-3734.66	2139.02	0.51
1.2 Dead+1.0 Ice+1.0 Temp	112.00	0.00	0.00	15.00	-5.66	-0.01
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	112.00	-0.01	-9.78	-1253.11	-5.10	0.61
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	112.00	4.85	-8.46	-1082.93	-635.34	1.14
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	112.00	11.64	-6.75	-761.48	-1344.58	1.39
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	112.00	15.84	0.01	15.78	-1730.88	1.26
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	112.00	11.65	6.76	792.87	-1345.21	0.76
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	112.00	4.87	8.47	1113.87	-636.43	0.08
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	112.00	0.01	9.78	1283.42	-6.35	-0.62
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	112.00	-4.85	8.46	1113.25	623.89	-1.15
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	112.00	-11.64	6.75	791.79	1333.12	-1.40
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	112.00	-15.84	-0.01	14.52	1719.43	-1.27

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	112.00	-11.65	-6.76	-762.56	1333.75	-0.78
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	112.00	-4.87	-8.47	-1083.55	624.97	-0.09
Dead+Wind 0 deg - Service	49.62	-0.01	-6.87	-834.60	-1.23	0.25
Dead+Wind 30 deg - Service	49.62	3.40	-5.95	-721.83	-417.27	0.34
Dead+Wind 60 deg - Service	49.62	5.90	-3.43	-414.29	-721.99	0.34
Dead+Wind 90 deg - Service	49.62	9.60	0.01	5.62	-1061.17	0.25
Dead+Wind 120 deg - Service	49.62	5.91	3.45	425.37	-722.55	0.09
Dead+Wind 150 deg - Service	49.62	3.42	5.96	732.50	-418.25	-0.10
Dead+Wind 180 deg - Service	49.62	0.01	6.87	844.72	-2.35	-0.25
Dead+Wind 210 deg - Service	49.62	-3.40	5.95	731.94	413.70	-0.34
Dead+Wind 240 deg - Service	49.62	-5.90	3.43	424.40	718.42	-0.34
Dead+Wind 270 deg - Service	49.62	-9.60	-0.01	4.49	1057.60	-0.25
Dead+Wind 300 deg - Service	49.62	-5.91	-3.45	-415.26	718.98	-0.09
Dead+Wind 330 deg - Service	49.62	-3.42	-5.96	-722.39	414.67	0.10

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-49.62	0.00	0.00	49.62	-0.00	0.000%
2	-0.05	-59.54	-35.53	0.05	59.54	35.53	0.000%
3	-0.05	-44.66	-35.53	0.05	44.66	35.53	0.000%
4	17.57	-59.54	-30.75	-17.57	59.54	30.75	0.000%
5	17.57	-44.66	-30.75	-17.57	44.66	30.75	0.000%
6	30.48	-59.54	-17.72	-30.48	59.54	17.72	0.000%
7	30.48	-44.66	-17.72	-30.48	44.66	17.72	0.000%
8	49.61	-59.54	0.05	-49.61	59.54	-0.05	0.000%
9	49.61	-44.66	0.05	-49.61	44.66	-0.05	0.000%
10	30.52	-59.54	17.80	-30.52	59.54	-17.80	0.000%
11	30.52	-44.66	17.80	-30.52	44.66	-17.80	0.000%
12	17.65	-59.54	30.79	-17.65	59.54	-30.79	0.000%
13	17.65	-44.66	30.79	-17.65	44.66	-30.79	0.000%
14	0.05	-59.54	35.53	-0.05	59.54	-35.53	0.000%
15	0.05	-44.66	35.53	-0.05	44.66	-35.53	0.000%
16	-17.57	-59.54	30.75	17.57	59.54	-30.75	0.000%
17	-17.57	-44.66	30.75	17.57	44.66	-30.75	0.000%
18	-30.48	-59.54	17.72	30.48	59.54	-17.72	0.000%
19	-30.48	-44.66	17.72	30.48	44.66	-17.72	0.000%
20	-49.61	-59.54	-0.05	49.61	59.54	0.05	0.000%
21	-49.61	-44.66	-0.05	49.61	44.66	0.05	0.000%
22	-30.52	-59.54	-17.80	30.52	59.54	17.80	0.000%
23	-30.52	-44.66	-17.80	30.52	44.66	17.80	0.000%
24	-17.65	-59.54	-30.79	17.65	59.54	30.79	0.000%
25	-17.65	-44.66	-30.79	17.65	44.66	30.79	0.000%
26	0.00	-112.00	0.00	-0.00	112.00	-0.00	0.000%
27	-0.01	-112.00	-9.78	0.01	112.00	9.78	0.000%
28	4.85	-112.00	-8.46	-4.85	112.00	8.46	0.000%
29	11.64	-112.00	-6.75	-11.64	112.00	6.75	0.000%
30	15.84	-112.00	0.01	-15.84	112.00	-0.01	0.000%
31	11.65	-112.00	6.76	-11.65	112.00	-6.76	0.000%
32	4.87	-112.00	8.47	-4.87	112.00	-8.47	0.000%
33	0.01	-112.00	9.78	-0.01	112.00	-9.78	0.000%
34	-4.85	-112.00	8.46	4.85	112.00	-8.46	0.000%
35	-11.64	-112.00	6.75	11.64	112.00	-6.75	0.000%
36	-15.84	-112.00	-0.01	15.84	112.00	0.01	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
37	-11.65	-112.00	-6.76	11.65	112.00	6.76	0.000%
38	-4.87	-112.00	-8.47	4.87	112.00	8.47	0.000%
39	-0.01	-49.62	-6.87	0.01	49.62	6.87	0.000%
40	3.40	-49.62	-5.95	-3.40	49.62	5.95	0.000%
41	5.90	-49.62	-3.43	-5.90	49.62	3.43	0.000%
42	9.60	-49.62	0.01	-9.60	49.62	-0.01	0.000%
43	5.91	-49.62	3.45	-5.91	49.62	-3.45	0.000%
44	3.42	-49.62	5.96	-3.42	49.62	-5.96	0.000%
45	0.01	-49.62	6.87	-0.01	49.62	-6.87	0.000%
46	-3.40	-49.62	5.95	3.40	49.62	-5.95	0.000%
47	-5.90	-49.62	3.43	5.90	49.62	-3.43	0.000%
48	-9.60	-49.62	-0.01	9.60	49.62	0.01	0.000%
49	-5.91	-49.62	-3.45	5.91	49.62	3.45	0.000%
50	-3.42	-49.62	-5.96	3.42	49.62	5.96	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	5	0.00000001	0.00005968
3	Yes	4	0.00000001	0.00069521
4	Yes	6	0.00000001	0.00008554
5	Yes	5	0.00000001	0.00067989
6	Yes	6	0.00000001	0.00008192
7	Yes	5	0.00000001	0.00065201
8	Yes	5	0.00000001	0.00012027
9	Yes	5	0.00000001	0.00005173
10	Yes	6	0.00000001	0.00008844
11	Yes	5	0.00000001	0.00070225
12	Yes	6	0.00000001	0.00008331
13	Yes	5	0.00000001	0.00066035
14	Yes	5	0.00000001	0.00006116
15	Yes	4	0.00000001	0.00071088
16	Yes	6	0.00000001	0.00008393
17	Yes	5	0.00000001	0.00066656
18	Yes	6	0.00000001	0.00008758
19	Yes	5	0.00000001	0.00069552
20	Yes	5	0.00000001	0.00011999
21	Yes	5	0.00000001	0.00005160
22	Yes	6	0.00000001	0.00008122
23	Yes	5	0.00000001	0.00064644
24	Yes	6	0.00000001	0.00008629
25	Yes	5	0.00000001	0.00068712
26	Yes	4	0.00000001	0.00016293
27	Yes	5	0.00000001	0.00074361
28	Yes	6	0.00000001	0.00015658
29	Yes	6	0.00000001	0.00018192
30	Yes	5	0.00006547	0.00093763
31	Yes	6	0.00000001	0.00020340
32	Yes	6	0.00000001	0.00016319
33	Yes	5	0.00006731	0.00078946
34	Yes	6	0.00000001	0.00016067
35	Yes	6	0.00000001	0.00020252
36	Yes	5	0.00006553	0.00093110
37	Yes	6	0.00000001	0.00018061

38	Yes	6	0.00000001	0.00015379
39	Yes	4	0.00000001	0.00006520
40	Yes	4	0.00000001	0.00026194
41	Yes	4	0.00000001	0.00022802
42	Yes	4	0.00000001	0.00011529
43	Yes	4	0.00000001	0.00030490
44	Yes	4	0.00000001	0.00025258
45	Yes	4	0.00000001	0.00006745
46	Yes	4	0.00000001	0.00025327
47	Yes	4	0.00000001	0.00029153
48	Yes	4	0.00000001	0.00011505
49	Yes	4	0.00000001	0.00022831
50	Yes	4	0.00000001	0.00027530

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	176 - 130.75	26.615	42	1.3069	0.0081
L2	135.25 - 86.12	15.942	42	1.1371	0.0023
L3	91.87 - 43	7.163	42	0.7581	0.0006
L4	50 - 1	2.056	42	0.3822	0.0002

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
176.00	10' Dipole AF	42	26.615	1.3069	0.0081	54795
170.00	Valmont T-Arm (3)	42	24.978	1.2877	0.0071	45662
162.00	MF-900B	42	22.811	1.2607	0.0058	19569
160.00	LNX-6515DS-VTM	42	22.274	1.2539	0.0055	17123
150.00	VHLP2.5-180	42	19.634	1.2154	0.0040	10537
146.00	MF-900B	42	18.605	1.1971	0.0035	9132
131.00	Custom Standoff Mount	42	14.939	1.1083	0.0019	6730
130.50	Custom Standoff Mount	42	14.823	1.1047	0.0019	6731
130.00	10' Dipole AF	42	14.707	1.1011	0.0019	6732
114.00	(2) LPA-70063-6CF-EDIN-X	42	11.229	0.9688	0.0010	6746
100.00	MF-900B	42	8.553	0.8366	0.0007	6569
61.00	GPS	42	3.047	0.4758	0.0003	5659
56.00	GPS	42	2.564	0.4328	0.0003	5552
51.00	GPS	42	2.135	0.3906	0.0002	5507
46.00	GPS	42	1.761	0.3492	0.0002	5913
41.00	GPS	42	1.438	0.3085	0.0002	6651
36.00	GPS	42	1.159	0.2685	0.0001	7601
31.00	GPS	42	0.920	0.2290	0.0001	8868
26.00	GPS	42	0.715	0.1901	0.0001	10642
21.00	GPS	42	0.538	0.1516	0.0001	13302
16.00	GPS	42	0.384	0.1134	0.0000	17736
11.00	GPS	42	0.247	0.0755	0.0000	26605
6.00	GPS	42	0.120	0.0377	0.0000	53209
1.00	GPS	0	0.000	0.0000	0.0000	53209

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	176 - 130.75	138.309	8	6.8024	0.0424
L2	135.25 - 86.12	82.768	8	5.9154	0.0120
L3	91.87 - 43	37.192	8	3.9383	0.0033
L4	50 - 1	10.677	8	1.9854	0.0011

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
176.00	10' Dipole AF	8	138.309	6.8024	0.0424	11295
170.00	Valmont T-Arm (3)	8	129.787	6.7060	0.0372	9413
162.00	MF-900B	8	118.503	6.5695	0.0304	4032
160.00	LNX-6515DS-VTM	8	115.707	6.5334	0.0288	3528
150.00	VHLP2.5-180	8	101.967	6.3282	0.0210	2168
146.00	MF-900B	8	96.613	6.2314	0.0182	1878
131.00	Custom Standoff Mount	8	77.553	5.7641	0.0102	1373
130.50	Custom Standoff Mount	8	76.950	5.7454	0.0100	1372
130.00	10' Dipole AF	8	76.349	5.7264	0.0098	1372
114.00	(2) LPA-70063-6CF-EDIN-X	8	58.290	5.0351	0.0052	1324
100.00	MF-900B	8	44.406	4.3465	0.0038	1278
61.00	GPS	8	15.823	2.4714	0.0017	1093
56.00	GPS	8	13.316	2.2480	0.0014	1072
51.00	GPS	8	11.089	2.0288	0.0012	1062
46.00	GPS	8	9.145	1.8137	0.0010	1139
41.00	GPS	8	7.465	1.6024	0.0008	1281
36.00	GPS	8	6.019	1.3946	0.0007	1464
31.00	GPS	8	4.778	1.1898	0.0005	1707
26.00	GPS	8	3.713	0.9876	0.0004	2049
21.00	GPS	8	2.795	0.7875	0.0003	2561
16.00	GPS	8	1.993	0.5891	0.0002	3414
11.00	GPS	8	1.280	0.3920	0.0002	5121
6.00	GPS	8	0.625	0.1958	0.0001	10241
1.00	GPS	0	0.000	0.0000	0.0000	10241

Base Plate Design Data

Plate Thickness in	Number of Anchor Bolts	Anchor Bolt Size in	Actual Allowable Ratio Bolt Tension K	Actual Allowable Ratio Bolt Compression K	Actual Allowable Ratio Plate Stress ksi	Actual Allowable Ratio Stiffener Stress ksi	Controlling Condition	Ratio
2.0000	18	2.2500	203.36 223.65 0.91	209.97 371.27 0.57	35.569 58.500 0.61	37.082 58.500 0.63	Bolt T	0.91 ✔

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
L1	176 - 130.75 (1)	TP31.8x21x0.25	45.25	0.00	0.0	24.1827	-13.14	1698.25	0.008
L2	130.75 - 86.12 (2)	TP41.82x30.226x0.3125	49.13	0.00	0.0	39.8244	-24.66	2747.89	0.009
L3	86.12 - 43 (3)	TP51.36x39.8381x0.375	48.87	0.00	0.0	58.7205	-38.42	4018.07	0.010
L4	43 - 1 (4)	TP60.5x48.9596x0.4375	49.00	0.00	0.0	83.4043	-59.50	5618.13	0.011

Pole Bending Design Data

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	176 - 130.75 (1)	TP31.8x21x0.25	455.22	1063.91	0.428	0.00	1063.91	0.000
L2	130.75 - 86.12 (2)	TP41.82x30.226x0.3125	1560.48	2268.91	0.688	0.00	2268.91	0.000
L3	86.12 - 43 (3)	TP51.36x39.8381x0.375	3183.66	4077.31	0.781	0.00	4077.31	0.000
L4	43 - 1 (4)	TP60.5x48.9596x0.4375	5508.55	6942.81	0.793	0.00	6942.81	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	176 - 130.75 (1)	TP31.8x21x0.25	18.01	849.12	0.021	1.64	2130.42	0.001
L2	130.75 - 86.12 (2)	TP41.82x30.226x0.3125	33.43	1373.95	0.024	1.52	4543.37	0.000
L3	86.12 - 43 (3)	TP51.36x39.8381x0.375	44.11	2009.04	0.022	1.48	8164.59	0.000
L4	43 - 1 (4)	TP60.5x48.9596x0.4375	49.66	2809.06	0.018	1.29	13902.58	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria

Section No.	Elevation ft	Ratio P_u / ϕP_n	Ratio M_{ux} / ϕM_{nx}	Ratio M_{uy} / ϕM_{ny}	Ratio V_u / ϕV_n	Ratio T_u / ϕT_n	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	176 - 130.75 (1)	0.008	0.428	0.000	0.021	0.001	0.436 ✔	1.000	4.8.2 ✔
L2	130.75 - 86.12 (2)	0.009	0.688	0.000	0.024	0.000	0.697 ✔	1.000	4.8.2 ✔
L3	86.12 - 43 (3)	0.010	0.781	0.000	0.022	0.000	0.791 ✔	1.000	4.8.2 ✔
L4	43 - 1 (4)	0.011	0.793	0.000	0.018	0.000	0.804 ✔	1.000	4.8.2 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	176 - 130.75	Pole	TP31.8x21x0.25	1	-13.14	1698.25	43.6	Pass
L2	130.75 - 86.12	Pole	TP41.82x30.226x0.3125	2	-24.66	2747.89	69.7	Pass
L3	86.12 - 43	Pole	TP51.36x39.8381x0.375	3	-38.42	4018.07	79.1	Pass
L4	43 - 1	Pole	TP60.5x48.9596x0.4375	4	-59.50	5618.13	80.4	Pass
							Summary	
						Pole (L4)	80.4	Pass
						Base Plate	90.9	Pass
						RATING =	**90.9**	**Pass**

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Framingham, MA 01701

Antenna Mount Analysis

Site Name:	*Kensington Ct*
FA #:	*10070926*
Site Number:	*CT5375*
Site Address:	*1657 Willbur Cross Highway* *Kensington, CT 06037* *Hartford County*
Maser Project Number:	*16963024A*

December 9, 2016

Analysis Type	*T-Arm Mount*
Pass/Fail	*Pass*
Mount Utilization	*93.5%*

Frank E. Pazden, P.E.
Connecticut Professional Engineer
PE License # 28188

Objective:

The objective of this report is to determine the capacity of the existing antenna support mount at the subject facility for the final wireless telecommunications configuration, per the applicable codes and standards.

Introduction:

Maser Consulting Connecticut has reviewed the following documents in completing this report:

- RFDS 1369522 provided by Empire Telecom, dated September 2, 2016.
- Construction Drawings prepared by Maser Consulting Connecticut.
- Mount Mapping Report prepared by Tower Engineering Professionals, TEP# 74314.102188 dated, November 21, 2016.
- Previous Structural Analysis prepared by Destek Engineering, Job # 1629028 dated, February 11, 2016.

The existing **AT&T** equipment is supported on an existing antenna support mount constructed of structural steel antenna support pipes supported by HSS tubes and pipes at a centerline of approximately 170'-0" above ground level. This report is based only upon this information, as well as the information obtained in the field.

Discrete and Linear Appurtenances:

The overall mount loading is found in the Loading Summary section of this report.

Codes, Standards and Loading:

Maser Consulting Connecticut utilized the following codes and standards:

- 2016 Connecticut State Building Code, Incorporating The 2012 IBC
- Structural Standards for Antenna Supporting Structures and Antennas ANSI/TIA-222-G
    - Basic Wind Speed – 102 mph, Ice Wind Speed – 50 mph and Ice thickness - 1 in
    - Exposure Category – B
    - Structure Class – II
    - Topographic Category - 1

Analysis Approach & Assumptions:

The analysis approach used in this structural analysis is based on the premise that if the existing antenna mount is structurally adequate to support the existing and proposed equipment per the aforementioned codes and standards, or if the increase in the forces in the structure are deemed to be negligible or acceptable, then the proposed equipment can be installed as intended. Risa-3D, a 3D finite element modeling and analysis program, was used to determine the capacity and usage of the existing antenna support mount.

The following assumptions were utilized in this report:

- Structural Steel Pipes are constructed of A53 Grade B Steel.
- Structural Steel HSS are constructed of A500 Grade B Steel.

- It is assumed that the telecommunication equipment supports, antenna supports, and existing structure have been designed by a registered licensed professional engineer for the existing loads acting on the structure, as required by all applicable codes.
- It is assumed that information provided by the client regarding the structure itself, the antenna models, feed lines, and other relevant information is current and correct.
- It is assumed all other existing appurtenances, antennas, cables, etc. belonging to others have been installed and supported per code and per specifications so as not to damage any existing structural support members, and that any contributing loads from adjacent equipment has been taken into consideration for their design.
- Proposed equipment and locations should not deviate from the proposed locations noted herein and shown on the associated Maser Consulting Connecticut final Construction Drawings.

Calculations:

The calculations are found in Appendix A of this report.

Conclusion:

The existing antenna mount was analyzed for the loading in the applicable codes and standards. The mount has been determined to be structurally **ADEQUATE** to support the proposed and existing antennas, based upon the aforementioned assumptions.

The antenna mount has been determined to be stressed to a maximum of **93.5%** of its structural capacity with the maximum usage occurring at the main horizontal pipe. Therefore, the proposed **AT&T** installation **CAN** be placed as intended.

The conclusions reached by Maser Consulting Connecticut in this evaluation are only applicable for the existing structural members supporting the proposed **AT&T** telecommunications installation described herein. Further, no structural qualifications are made or implied by this document for the existing structure.

We appreciate the opportunity to be of service on this project. If you should have any questions or require any additional information, please do not hesitate to call our office.

Sincerely,
Maser Consulting Connecticut

Frank Pazden, P.E.
Telecommunications Department Manager

Anwesha Bera, E.I.T.
Structural Design Engineer

5. LOADING SUMMARY

Quantity	Manufacterer	Antenna/ Appurtenance	Status	Sector
3	Kathrein	80010121	Existing	Alpha, Beta, & Gamma
3	CCI	HPA-65R-BUU-H6	Existing	Alpha, Beta, & Gamma
1	Raycap	DC6-48-60-0-8F	Existing	Alpha
3	Ericsson	RRUS 11	Existing	Alpha, Beta, & Gamma
3	Ericsson	RRUS 32 B2	Proposed	Alpha, Beta, & Gamma
6	Powerwave	LGP 21401	Existing	Alpha, Beta, & Gamma

The worst case loading occurs in the Alpha Sector

Quantity	Manufacterer	Antenna/ Appurtenance	Status
1	Kathrein	80010121	Existing
1	CCI	HPA-65R-BUU-H6	Existing
1	Raycap	DC6-48-60-0-8F	Existing
1	Ericsson	RRUS 11	Existing
1	Ericsson	RRUS 32 B2	Proposed
2	Powerwave	LGP 21401	Existing

Client:	ATT	Computed By:	AB
Site Name:	Kensington Ct	Date:	12/9/2016
Project No.	16963024A	Verified By:	FEP
Title:	Antenna Mount Analysis	Page:	7

ANALYSIS AND DESIGN

Client:	ATT	Computed By:	AB
Site Name:	Kensington Ct	Date:	12/9/2016
Project No.	16963024A	Verified By:	FEP
Title:	Antenna Mount Analysis	Page:	8

I. DESIGN INPUTS

Calculations for gravity and lateral loading on equipment and support mounts are determined as per the ANSI/TIA-222-G Code, Addendum 2

Wind Load Inputs Parameters

				Reference	*Equation*
Antenna Centerline	z	170	ft		
Normal Wind Speed (3 sec. Gust):	V	102	mph	Ref. 1, Eqn. 16-33	
Normal Wind Speed with Ice (3 sec. gust):	V_i	50.0	mph	(Figure a5-2a, p. 233)	
Service Wind Speed:	V_s	60.0	mph	(Figure a5-2a, p. 233)	
Design Ice Thickness:	t_i	1.00	in	(Figure A1-2a, p. 233)	
Exposure Category:		B		Ref. 3, Section 2.6.5.1	
Structure Class:		II		Ref. 3, Table 2-1	
Gust Effect Factor:	G_h	1.00		Ref. 3, Section 2.6.7	
Wind Directionality Factor:	K_d	0.95		Ref. 3, Table 2-2	
Topographic Category:		1		Ref. 3, Section 2.6.6.2	

Wind Load Coefficients

Importance Factors:

Non-Iced:	I	1		Ref. 3, Table 2-3	
Iced:	I_{ice}	1		(Table 2-3, P. 39)	

Exposure Category Coefficients:

3-s Gust-Speed Power Law Exponent:	α	7.0		Ref. 3, Table 2-4	
Nominal Height of the Atmospheric Boundary Layer:	Z_g	1200	ft	Ref. 3, Table 2-4	
Min. Value for k_z:	Kz_{min}	0.70		Ref. 3, Table 2-4	
Terrain Constant:	K_e	0.90		Ref. 3, Table 2-4	
Velocity Pressure Exposure Coefficient:	K_z	1.150		Ref. 3, Section 2.6.5.2	$=2.01\cdot(z/z_g)^{2/\alpha}$

Topographic Category Coefficients:

Topographic Constant:	K_t	N/A		Ref. 3, Table 2-5	
Height Attenuation Factor:	f	N/A		Ref. 3, Table 2-5	
Height Reduction Factor:	K_h	N/A		Ref. 3, Section 2.6.6.4	$=e^{(f\cdot z/H)}$
Topographic Factor:	K_{zt}	1.00		Ref.3, Section 2.6.6.4	$=[1+(K_e\cdot K_t/K_h)]^2$

Ice Accumulation:

Ice Velocity Pressure Exposure Coefficient:	K_{iz}	1.18			$=(z/33)^{0.10}$
Factored Ice Thickness:	t_{iz}	2.36	in	(Section 2.6.8, p. 16)	$=2.0\cdot t_i\cdot I\cdot K_{iz}\cdot K_{zt}$
Ice Density:	ρ_i	56.00	pcf		

Design Wind Pressures:

Velocity Pressure:	q_z	29.10	psf	Ref. 3, Section 2.6.9.6	$=0.00256\cdot K_z\cdot K_{zt}\cdot K_d\cdot V^2\cdot I$
Velocity Pressure (With Ice):	q_{zi}	6.99	psf	(Section 2.6.9.6, P. 25)	$=.00256\cdot K_z\cdot K_{zt}\cdot K_d\cdot V_i^2\cdot I$
Velocity Pressure (Service):	q_{zs}	10.07	psf	(Section 2.6.9.6, P. 25)	$=.00256\cdot K_z\cdot K_{zt}\cdot K_d\cdot V_i^2\cdot I$

Client:	ATT	Computed By:	AB
Site Name:	Kensington Ct	Date:	12/9/2016
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Title:	Antenna Mount Analysis	Page:	9

II. CALCULATIONS

- ***Wind Load on Appurtenances***

Dimensions and Force Coefficients

Antenna/ Appurtenance	Non-Iced Condition								Iced Condition							
	Mounting Pipe			Equipment					Mounting Pipe			Equipment				
	Length (in)	Diameter (in)	Force Coefficient C_a	Height (in)	Width (in)	Depth (in)	Force Coefficient $C_{a\ Front}$	Force Coefficient $C_{a\ Side}$	Length (in)	Diameter (in)	Force Coefficient C_a	Height (in)	Width (in)	Depth (in)	Force Coefficient $C_{a\ Front}$	Force Coefficient $C_{a\ Side}$
80010121	84.0	2.375	1.200	54.50	10.30	5.90	1.32	1.47	88.7	7.1	0.923	59.21	15.01	10.61	1.26	1.34
HPA-65R-BUU-H6	108.0	2.375	1.200	72.30	14.40	7.30	1.31	1.50	112.7	7.1	0.998	77.01	19.11	12.01	1.27	1.37
DC6-48-60-0-8F	0.0	0.000	0.000	31.25	11.00	11.00	0.71	0.71	0.0	0.0	0.000	35.96	15.71	15.71	0.70	0.70
RRUS 11	0.0	0.000	0.000	19.70	17.00	7.20	1.20	1.21	0.0	0.0	0.000	24.41	21.71	11.91	1.20	1.20
RRUS 32 B2	0.0	0.000	0.000	29.90	13.30	9.50	1.20	1.23	0.0	0.0	0.000	34.61	18.01	14.21	1.20	1.20
LGP 21401	0.0	0.000	0.000	13.80	14.40	3.70	1.20	1.25	0.0	0.0	0.000	18.51	19.11	8.41	1.20	1.20

Antenna/ Appurtenance	# of Brackets	Non-Iced Condition				Iced Condition			
		Wind Force (lbs.)		Controlling Wind Force (lbs.)	Gravity (lbs.)	Wind Force (lbs.)		Controlling Wind Force (lbs.)	Gravity (lbs.)
		F_N	F_T			F_N	F_T		
80010121	2	83.6	72.1	**83.6**	**30.7**	33.4	34.5	**34.5**	**101.0**
HPA-65R-BUU-H6	2	148.3	110.9	**148.3**	**29.0**	52.7	50.2	**52.7**	**170.9**
DC6-48-60-0-8F	1	49.1	49.1	**49.1**	**47.8**	19.2	19.2	**19.2**	**154.5**
RRUS 11	1	81.2	34.7	**81.2**	**65.0**	30.9	16.9	**30.9**	**121.9**
RRUS 32 B2	1	96.4	70.5	**96.4**	**67.9**	36.3	28.7	**36.3**	**155.3**
LGP 21401	1	48.2	12.9	**48.2**	**35.0**	20.6	9.1	**20.6**	**76.5**

**** ALL CALCULATED LOADS ARE PER MOUNTING BRACKET. TO GET THE TOTAL EQUIPMENT LOAD, MULTIPLY THE INDIVIDUAL LOADS BY THE NUMBER OF BRACKETS***

- ***Wind Load on Framing Members***

Member Category	Member Shape	Length (in)	Member Surface	Non-Iced Condition			Iced Condition					
				Exposed Wind Height (in)	Force Coefficient C_a	Wind Load (plf)	Exposed Wind Height (in)	Depth (in)	Length (in)	Force Coefficient C_a	Wind Load (plf)	Ice Weight (plf)
Pipe	Pipe 3.0	156	Round	3.50	1.20	10.18	8.21	8.21	160.71	1.08	5.16	16.86
Pipe	Pipe 2.0	108	Round	2.38	1.20	6.91	7.09	7.09	112.71	1.00	4.12	13.62
Square HSS	HSS 4X4	31.5	Square	4.00	1.43	13.86	8.71	8.71	36.21	1.27	6.47	23.07
Pipe	Pipe 4.0	18	Round	4.50	0.73	8.00	9.21	9.21	22.71	0.70	3.76	19.74

BASIC EQUATIONS

ANSI/TIA-222-G Reference

Importance Factor:

$$I := \begin{cases} 1.0 & \text{if Class = "II"} \\ 1.15 & \text{if Class = "III"} \end{cases} \quad = 1$$

Table 2-3, Pg. 39

Force Coefficient:
(Square)

$$C_{f\_square}(h, w) := \begin{cases} 1.2 & \text{if } \frac{h}{w} \le 2.5 \\ \left[1.2 + \frac{0.2}{4.5} \cdot \left(\frac{h}{w} - 2.5\right)\right] & \text{if } \frac{h}{w} > 2.5 \wedge \frac{h}{w} \le 7 \\ \left[1.4 + \frac{0.6}{18} \cdot \left(\frac{h}{w} - 7\right)\right] & \text{if } \frac{h}{w} > 7 \wedge \frac{h}{w} \le 25 \\ 2.0 & \text{otherwise} \end{cases}$$

Table 2-8, P. 42

Force Coefficient:
(Round)

$$C_{f\_round}(h, w) := \begin{cases} 0.7 & \text{if } \frac{h}{w} \le 2.5 \\ \left[0.7 + \frac{0.1}{4.5} \cdot \left(\frac{h}{w} - 2.5\right)\right] & \text{if } \frac{h}{w} > 2.5 \wedge \frac{h}{w} \le 7 \\ \left[0.8 + \frac{0.4}{18} \cdot \left(\frac{h}{w} - 7\right)\right] & \text{if } \frac{h}{w} > 7 \wedge \frac{h}{w} \le 25 \\ 1.2 & \text{otherwise} \end{cases}$$

Table 2-8, P. 42

Terrain Exposure Constants:

Table 2-4, P. 40

$$\alpha := \begin{cases} 7.0 & \text{if Exp = "B"} \\ 9.5 & \text{if Exp = "C"} \\ 11.5 & \text{if Exp = "D"} \end{cases} \quad Z_g := \begin{cases} 1200\text{ft} & \text{if Exp = "B"} \\ 900\text{ft} & \text{if Exp = "C"} \\ 700\text{ft} & \text{if Exp = "D"} \end{cases} \quad K_{zmin} := \begin{cases} 0.70 & \text{if Exp = "B"} \\ 0.85 & \text{if Exp = "C"} \\ 1.03 & \text{if Exp = "D"} \end{cases}$$

BASIC EQUATIONS

ANSI/TIA-222-G Reference

Velocity Pressure Coefficient:

$$Kz(z) := \left| \begin{array}{l} K_z \leftarrow \max\left[2.01 \cdot \left(\frac{z}{Z_g} \right)^{\frac{2}{\alpha}}, K_{zmin} \right] \\ K_z \leftarrow \min\left(K_z, 2.01 \right) \end{array} \right.$$

$K_z := Kz(z)$ Section 2.6.5, P. 13

$$Kzt(z) := K_{zt} \leftarrow \left| \begin{array}{l} 1.0 \text{ if } Topo = "1" \\ \text{otherwise} \\ \quad K_e \leftarrow \left| \begin{array}{l} 0.90 \text{ if } Exp = "B" \\ 1.00 \text{ if } Exp = "C" \\ 1.10 \text{ if } Exp = "D" \end{array} \right. \\ \quad K_t \leftarrow \left| \begin{array}{l} 0.43 \text{ if } Topo = "2" \\ 0.53 \text{ if } Topo = "3" \\ 0.72 \text{ if } Topo = "4" \end{array} \right. \\ \quad f \leftarrow \left| \begin{array}{l} 1.25 \text{ if } Topo = "2" \\ 2.00 \text{ if } Topo = "3" \\ 1.50 \text{ if } Topo = "4" \end{array} \right. \\ \quad K_h \leftarrow e^{\left(\frac{f \cdot z}{CH} \right)} \\ \quad \left(1 + \frac{K_e \cdot K_t}{K_h} \right)^2 \end{array} \right.$$

Section 2.6.6.4, p. 14

Table 2-4 p. 40

Table 2-5 p. 40

Table 2-5 p. 40

Section 2.6.6.4, P. 14

Section 2.6.6.4, P. 14

$K_{zt} := Kzt(z)$

Velocity Pressure: Section 2.6.9.6, P. 25

$$q_z := 0.00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V^2 \cdot I \cdot psf$$

LOAD EQUATIONS

WIND LOAD

Area (Normal): $AN_{area} = H_{ant} \cdot Want$

Area (Side): $AT_{area} = H_{ant} \cdot Dant$

Force Coefficient (Normal): $C_{fn} = C_{fsquare}(H_{ant}, Want)$

Force Coefficient (Side): $C_{fs} = C_{fsquare}(H_{ant}, Dant)$

Pipe Area (Normal): $AN_p = \max[(L_p - H_{ant}) * Dp\ , 0]$

Pipe Area (Side): $AT_p = L_p \cdot Dp$

Force Coefficient (Normal): $C_{fp} = C_{fround}(Lp, Dp)$

Normal Effective Projected Area: $E_{pan} = (C_{fn} \cdot ANarea) + (Cfp \cdot ANp)$

Side Effective Projected Area: $E_{pat} = (C_{fs} \cdot ATarea) + (Cfp \cdot ATp)$

Effective Projected Area: $EPA = max(E_{pan}, Epat)$

Wind Force: $F_{ant} = q_z \cdot Gh \cdot EPA$

ICE DEAD LOAD

Largest Out-to-Out Dimension: $D_{ant} = \sqrt{{D_{ant}}^2 + {W_{ant}}^2}$

Cross Sectional Area of Ice: $A_{ice\_ant} = \pi \cdot tiz \cdot (Dant + tiz\ )$

Total Ice Dead Load: $DL_{ice\_ant} = \boldsymbol{\rho_i} \cdot (Aice_{\_ant} \cdot Hant\ )$

ICE WIND LOAD

Dimensions: $H_{i_{ant}} = H_{ant} + 2tiz$

$W_{i_{ant}} = W_{ant} + 2tiz$

$D_{i_{ant}} = D_{ant} + 2tiz$

Area (Normal): $AIN_{area} = H_{i\_ant} \cdot W_{i\_ant}$

Area (Side): $AIT_{area} = H_{i\_ant} \cdot D_{i\_ant}$

Force Coefficient (Normal): $Ci_{fn} = C_{fsquare}(H_{i\_ant}, W_{i\_ant})$

Force Coefficient (Side): $Ci_{fs} = C_{fsquare}(H_{i\_ant}, D_{i\_ant})$

Pipe Area (Normal): $AN_p = \max[(L_{ip} - H_{i\_ant}) * D_{ip}\ , 0]$

Pipe Area (Side): $AT_p = L_{ip} \cdot Dip$

Force Coefficient (Normal): $C_{fp} = C_{fround}(L_{ip}, D_{ip})$

Normal Effective Projected Area: $E_{pain} = (Ci_{fn} \cdot ANarea) + (Cfp \cdot ANp)$

Side Effective Projected Area: $E_{pait} = (Ci_{fs} \cdot ATarea) + (Cfp \cdot ATp)$

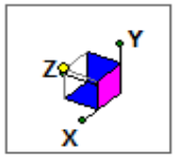
Effective Projected Area: $EPA_i = max(E_{pain}, Epait)$

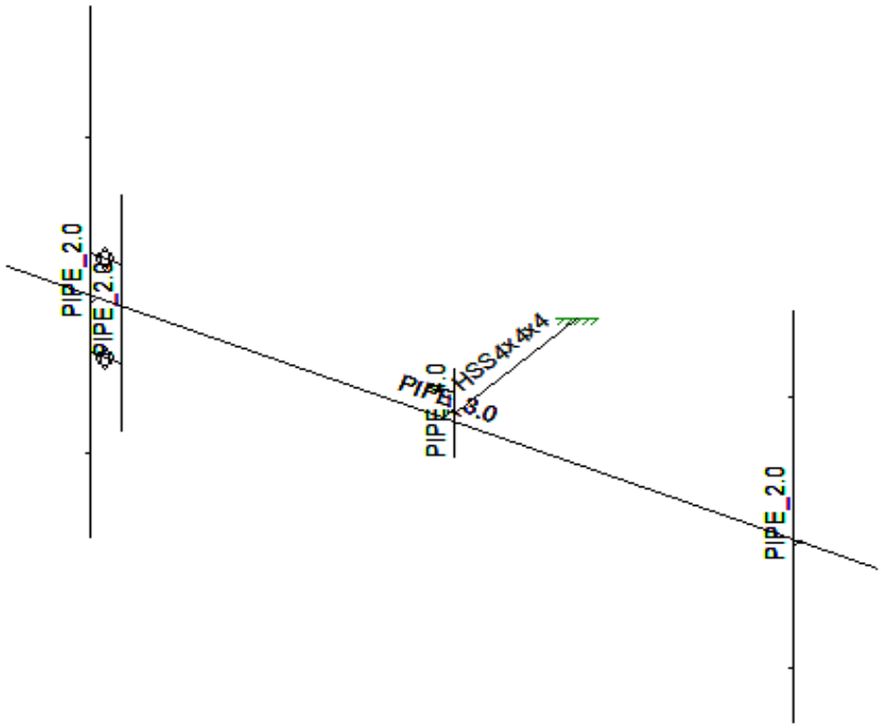
Wind Force: $F_{i\_ant} = q_z \cdot Gh \cdot EPAi$

III. ATTACHMENTS

Client:	ATT	Computed By:	AB
Site Name:	Kensington Ct	Date:	12/9/2016
Project No.	16963024A	Verified By:	FEP
Title:	Antenna Mount Analysis	Page:	14

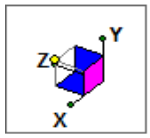
RISA MODEL

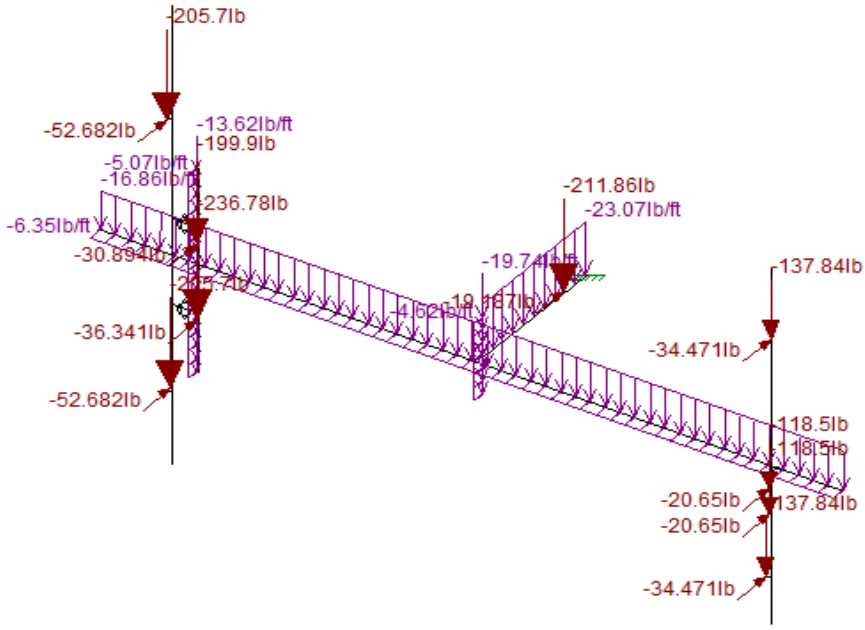




Client:	ATT	Computed By:	AB
Site Name:	Kensington Ct	Date:	12/9/2016
Project No.	16963024A	Verified By:	FEP
Title:	Antenna Mount Analysis	Page:	15

RISA WORST CASE LOADING

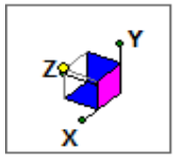


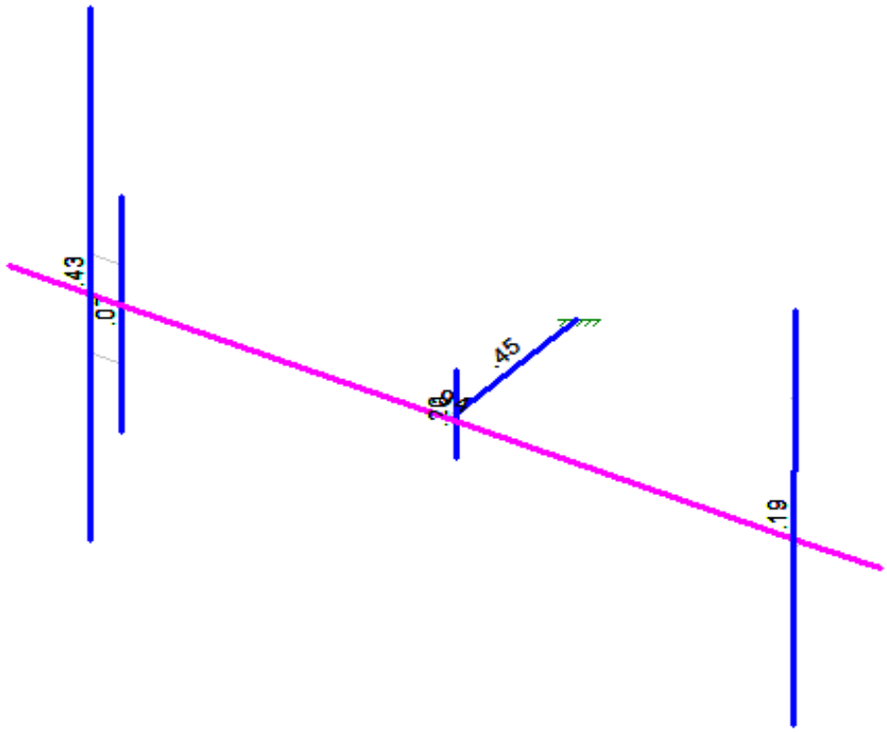


Loads: LC 21, 1.2D+1.0ICE+1.0W7ICE
Envelope Only Solution

Client:	ATT	Computed By:	AB
Site Name:	Kensington Ct	Date:	12/9/2016
Project No.	16963024A	Verified By:	FEP
Title:	Antenna Mount Analysis	Page:	16

RISA CODE CHECK





Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N1	N2			Hss member s...	Beam	SquareTube	A500 Gr. ...	Typical
2	M3	N5	N6			Horizontal mou...	Beam	Pipe	A53 Gr. B	Typical
3	M6	N8	N20			RIGID	None	None	RIGID	Typical
4	M7	N9	N21			RIGID	None	None	RIGID	Typical
5	M10	N12	N16			Antenna Pipe	Beam	Pipe	A53 Gr. B	Typical
6	M11	N13	N17			Antenna Pipe	Beam	Pipe	A53 Gr. B	Typical
7	M17	N29	N37			RIGID	None	None	RIGID	Typical
8	M18	N25	N33			RIGID	None	None	RIGID	Typical
9	M19	N26	N34			RIGID	None	None	RIGID	Typical
10	M20	N30	N38			RIGID	None	None	RIGID	Typical
11	M11A	N26A	N25A			Center Mast	Beam	Pipe	A53 Gr. B	Typical
12	M12	N27A	N28			RIGID	None	None	RIGID	Typical
13	M14	N30A	N31			Antenna Pipe	Beam	Pipe	A53 Gr. B	Typical
14	M15A	N33C	N34B			RIGID	None	None	RIGID	Typical
15	M16	N35	N36			RIGID	None	None	RIGID	Typical

Joint Loads and Enforced Displacements (BLC 1 : Dead)

	Joint Label	L,D,M	Direction	Magnitude[(lb,k-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N26	L	Y	-30.7
2	N38	L	Y	-30.7
3	N33	L	Y	-29
4	N29	L	Y	-29
5	N33B	L	Y	-47.8
6	N33A	L	Y	-65
7	N34A	L	Y	-67.9
8	N40B	L	Y	-35
9	N41A	L	Y	-35

Joint Loads and Enforced Displacements (BLC 2 : Wx)

	Joint Label	L,D,M	Direction	Magnitude[(lb,k-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N26	L	X	83.658
2	N38	L	X	83.658
3	N33	L	X	148.373
4	N29	L	X	148.373
5	N33B	L	X	49.187
6	N33A	L	X	81.219
7	N34A	L	X	96.503
8	N40B	L	X	48.211
9	N41A	L	X	48.211

Joint Loads and Enforced Displacements (BLC 3 : Wz)

	Joint Label	L,D,M	Direction	Magnitude[(lb,k-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N26	L	Z	83.658
2	N38	L	Z	83.658
3	N33	L	Z	148.373
4	N29	L	Z	148.373
5	N33B	L	Z	49.187
6	N33A	L	Z	81.219

Joint Loads and Enforced Displacements (BLC 3 : Wz) (Continued)

	Joint Label	L,D,M	Direction	Magnitude[(lb,k-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
7	N34A	L	Z	96.503
8	N40B	L	Z	48.211
9	N41A	L	Z	48.211

Joint Loads and Enforced Displacements (BLC 4 : Ice Wx)

	Joint Label	L,D,M	Direction	Magnitude[(lb,k-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N26	L	X	34.471
2	N38	L	X	34.471
3	N33	L	X	52.682
4	N29	L	X	52.682
5	N33B	L	X	19.187
6	N33A	L	X	30.894
7	N34A	L	X	36.341
8	N40B	L	X	20.65
9	N41A	L	X	20.65

Joint Loads and Enforced Displacements (BLC 5 : Ice Wz)

	Joint Label	L,D,M	Direction	Magnitude[(lb,k-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N26	L	Z	34.471
2	N38	L	Z	34.471
3	N33	L	Z	52.682
4	N29	L	Z	52.682
5	N33B	L	Z	19.187
6	N33A	L	Z	30.894
7	N34A	L	Z	36.341
8	N40B	L	Z	20.65
9	N41A	L	Z	20.65

Joint Loads and Enforced Displacements (BLC 6 : Ice weight)

	Joint Label	L,D,M	Direction	Magnitude[(lb,k-ft), (in,rad), (lb*s^2/in, lb*s^2*in)]
1	N26	L	Y	-101
2	N38	L	Y	-101
3	N33	L	Y	-170.9
4	N29	L	Y	-170.9
5	N33B	L	Y	-154.5
6	N33A	L	Y	-121.9
7	N34A	L	Y	-155.3
8	N40B	L	Y	-76.5
9	N41A	L	Y	-76.5

Member Distributed Loads (BLC 2 : Wx)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[in,%]	End Location[in,%]
1	M3	PX	12.53	12.53	0	0
2	M14	PX	8.5	8.5	0	0
3	M1	PX	17.06	17.06	0	0
4	M11A	PX	9.85	9.85	0	0

Member Distributed Loads (BLC 3 : Wz)

Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[in,%]	End Location[in,%]

Member Distributed Loads (BLC 3 : Wz) (Continued)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[in,%]	End Location[in,%]
1	M3	PZ	12.53	12.53	0	0
2	M14	PZ	8.5	8.5	0	0
3	M1	PZ	17.06	17.06	0	0
4	M11A	PZ	9.85	9.85	0	0

Member Distributed Loads (BLC 4 : Ice Wx)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[in,%]	End Location[in,%]
1	M3	PX	6.35	6.35	0	0
2	M14	PX	5.07	5.07	0	0
3	M1	PX	7.96	7.96	0	0
4	M11A	PX	4.62	4.62	0	0

Member Distributed Loads (BLC 5 : Ice Wz)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[in,%]	End Location[in,%]
1	M3	PZ	6.35	6.35	0	0
2	M14	PZ	5.07	5.07	0	0
3	M1	PZ	7.96	7.96	0	0
4	M11A	PZ	4.62	4.62	0	0

Member Distributed Loads (BLC 6 : Ice weight)

	Member Label	Direction	Start Magnitude[lb/ft,F]	End Magnitude[lb/ft,F]	Start Location[in,%]	End Location[in,%]
1	M3	Y	-16.86	-16.86	0	0
2	M14	Y	-13.62	-13.62	0	0
3	M1	Y	-23.07	-23.07	0	0
4	M11A	Y	-19.74	-19.74	0	0

Basic Load Cases

	BLC Descr...	Category	X Gr...	Y Gr...	Z Gr...	Joint	Point	Distr...	Area(Member)	Surf...
1	Dead	DL		-1.05		9				
2	Wx	WL				9		4		
3	Wz	WL				9		4		
4	Ice Wx	WL				9		4		
5	Ice Wz	None				9		4		
6	Ice weight	None				9		4		

Load Combinations

	Description	Solve	PD...	SR...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...
1	1.4D	Yes	Y		1	1.4														
2	1.2D+1.6W1	Yes	Y		1	1.2	2	1.6	3											
3	1.2D+1.6W2	Yes	Y		1	1.2	2	1.386	3	.8										
4	1.2D+1.6W3	Yes	Y		1	1.2	2	.8	3	1.386										
5	1.2D+1.6W4	Yes	Y		1	1.2	2		3	1.6										
6	1.2D+1.6W5	Yes	Y		1	1.2	2	-.8	3	1.386										
7	1.2D+1.6W6	Yes	Y		1	1.2	2	-1.3...	3	.8										
8	1.2D+1.6W7	Yes	Y		1	1.2	2	-1.6	3											
9	1.2D+1.6W8	Yes	Y		1	1.2	2	-1.3...	3	-.8										
10	1.2D+1.6W9	Yes	Y		1	1.2	2	-.8	3	-1.3...										

Load Combinations (Continued)

	Description	Solve	PD...	SR...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...
11	1.2D+1.6W10	Yes	Y		1	1.2	2		3	-1.6												
12	1.2D+1.6W11	Yes	Y		1	1.2	2	.8	3	-1.3...												
13	1.2D+1.6W12	Yes	Y		1	1.2	2	1.386	3	-.8												
14	1.2D+1.0 Ice	Yes	Y		1	1.2	6	1														
15	1.2D+1.0ICE+1.0W1ICE	Yes	Y		1	1.2	6	1	4	1	5											
16	1.2D+1.0ICE+1.0W2ICE	Yes	Y		1	1.2	6	1	4	.866	5	.5										
17	1.2D+1.0ICE+1.0W3ICE	Yes	Y		1	1.2	6	1	4	.5	5	.866										
18	1.2D+1.0ICE+1.0W4ICE	Yes	Y		1	1.2	6	1	4		5	1										
19	1.2D+1.0ICE+1.0W5ICE	Yes	Y		1	1.2	6	1	4	-.5	5	.866										
20	1.2D+1.0ICE+1.0W6ICE	Yes	Y		1	1.2	6	1	4	-.866	5	.5										
21	1.2D+1.0ICE+1.0W7ICE	Yes	Y		1	1.2	6	1	4	-1	5											
22	1.2D+1.0ICE+1.0W8ICE	Yes	Y		1	1.2	6	1	4	-.866	5	-.5										
23	1.2D+1.0ICE+1.0W9ICE	Yes	Y		1	1.2	6	1	4	-.5	5	-.866										
24	1.2D+1.0ICE+1.0W10ICE	Yes	Y		1	1.2	6	1	4		5	-1										
25	1.2D+1.0ICE+1.0W11ICE	Yes	Y		1	1.2	6	1	4	.5	5	-.866										
26	1.2D+1.0ICE+1.0W12ICE	Yes	Y		1	1.2	6	1	4	.866	5	-.5										

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N1	max	1598.418	8	2199.354	18	1411.787	11	-.343	11	4.424	6	6.134	15
2		min	-1598.419	2	705.125	7	-1411.808	5	-1.833	24	-4.502	12	1.87	8
3	Totals:	max	1598.418	8	2199.354	18	1411.787	11						
4		min	-1598.419	2	705.125	7	-1411.808	5						

Envelope AISC 14th(360-10): LRFD Steel Code Checks

	Member	Shape	Code Check	Loc[in]	LC	Shear Check	Loc[...	Dir	LC	phi*Pn...	phi*Pnt...	phi*Mn...	phi*Mn...	Cb	Eqn
1	M3	PIPE_3.0	.935	78	21	.095	78		21	52006....	65205	5.749	5.749	1...	H1-1b
2	M1	HSS4x4x4	.445	0	25	.191	0	y	24	13530...	139518	16.181	16.181	1...	H1-1b
3	M10	PIPE_2.0	.432	59.625	11	.102	60.75		2	12143....	32130	1.872	1.872	1...	H1-1b
4	M11A	PIPE_4.0	.198	8.063	24	.248	9		13	92571....	93240	10.631	10.631	1...	H1-1b
5	M11	PIPE_2.0	.194	48.125	8	.040	48.1...		11	17855....	32130	1.872	1.872	1...	H1-1b
6	M14	PIPE_2.0	.071	34	18	.026	34		7	26521....	32130	1.872	1.872	3...	H1-1b

MASER CONSULTING
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at&t

550 Cochituate Road
Framingham, MA 01701

Revision 0

Monopole Feasibility Study

Site Name:	*Kensington Ct*
FA #:	*10070926*
Site Number:	*CT5375*
Site Address:	*1657 Willbur Cross Highway* *Kensington, CT 06037* *Hartford County*
Maser Project Number:	*16963024A*

December 12, 2016

Analysis Type	*Monopole*
Pass/Fail	*Pass*
Mount Utilization	*90.9%*

Frank E. Pazden, P.E.
Connecticut Professional Engineer
PE License # 28188

Objective:

The objective of this report is to determine the capacity of the existing 176' monopole at the subject facility for the final wireless telecommunications configuration, per the applicable codes and standards.

Introduction:

Maser Consulting Connecticut has reviewed the following documents in completing this report:

- RFDS 1369522 provided by Empire Telecom, dated September 2, 2016.
- Construction Drawings prepared by Maser Consulting Connecticut.
- Mount Mapping Report prepared by Tower Engineering Professionals, TEP# 74314.102188 dated, November 21, 2016.
- Previous Structural Analysis prepared by Destek Engineering, Job # 1629028 dated, February 11, 2016.

The existing **AT&T** equipment is supported on an existing 176' monopole. The existing **AT&T** equipment is supported on an existing antenna support mount constructed of structural steel antenna support pipes supported by HSS tubes and pipes at a centerline of approximately 170'-0" above ground level. This report is based only upon this information, as well as the information obtained in the field.

Discrete and Linear Appurtenances:

The overall antenna loading is found in the Appendix A of this report.

Tower Member Information:

See the material Take-Off sheet in appendix A for tower information.

Codes, Standards and Loading:

Maser Consulting Connecticut utilized the following codes and standards:

- 2016 Connecticut State Building Code, Incorporating The 2012 IBC
- Structural Standards for Antenna Supporting Structures and Antennas ANSI/TIA-222-G
    - Basic Wind Speed – 102 mph, Ice Wind Speed – 50 mph and Ice thickness - 1 in
    - Exposure Category – B
    - Structure Class – II
    - Topographic Category - 1

Analysis Approach & Assumptions:

The analysis approach used in this structural analysis is based on the premise that if the existing monopole structure is structurally adequate to support the existing and proposed equipment per the aforementioned codes and standards, or if the increase in the forces in the structure are deemed to be negligible or acceptable, then the proposed equipment can be installed as intended. Tower Numerics, tnx Tower, an analysis and design program, designed specifically for the telecommunications industry and for all applicable codes and standards was used for this structural analysis.

The following assumptions were utilized in this report:

- Structural Steel for the monopole sections are assumed to be A572-65 Grade.
- Structural Anchor Bolts are assumed to be A615-75 grade.
- No physical deterioration has occurred in any of the structural components of the monopole and all the tower members have the same capacity as the day they were erected.
- The existing monopole foundations are assumed to have been constructed per the original design drawings. As such the foundation design reactions are used for comparison to the base reactions of this analysis.
- It is assumed that the telecommunication equipment supports, antenna supports, and existing structure have been designed by a registered licensed professional engineer for the existing loads acting on the structure, as required by all applicable codes, prior to the proposed modifications listed within this report.
- It is assumed that information provided by the client regarding the structure itself, the antenna models, feed lines, and other relevant information is current and correct.
- It is assumed all other existing appurtenances, antennas, cables, etc. belonging to others have been installed and supported per code and per specifications so as not to damage any existing structural support members, and that any contributing loads from adjacent equipment has been taken into consideration for their design.
- Proposed equipment and locations should not deviate from the proposed locations noted herein and shown on the associated Maser Consulting Connecticut final Construction Drawings.

Calculations:

The calculations are found in Appendix A of this report.

Conclusion:

The existing monopole was analyzed for the loading in the applicable codes and standards. The monopole has been determined to be structurally **ADEQUATE** to support the proposed and existing antennas, based upon the aforementioned assumptions.

The monopole has been determined to be stressed to a maximum of **90.9%** of its structural capacity with the maximum usage occurring at the monopole base plate. Therefore, the proposed **AT&T** installation **CAN** be placed as intended in all sectors, without modifications.

Prior to the installation of the proposed equipment, the contractor shall verify that all bolted connections are properly fastened from the original installation. Additionally, the contractor shall inspect all existing hardware and verify that it is in its original condition and free of rust and deterioration. If any deficiencies are noted the contractor shall notify the engineer of the conditions prior to installation of any equipment for additional evaluation.

Maser Consulting Connecticut has reviewed the original tower foundation reactions and has determined that their values were based upon an Allowable Stress Design procedure. As such, the original design base reactions shall be multiplied by 1.35 per Section 15.5.1 of the ANSI/TIA-222-G code for comparison to the base reactions of this analysis. It is assumed that the tower foundations have been constructed to support the original design reactions. Based on the comparison of the original design reactions to the base reactions of this analysis, the existing concrete foundations have been determined to have **ADEQUATE** structural capacity.

Please see the table below for the comparison of the original design base reactions and the base reactions of this analysis.

Base Reactions Summary:

	Maser Consulting, PA (G-Code)	. Original Design Reactions*
Moment (Kip-Ft)	5535	5813.8
Shear (Kips)	50	47.2
Axial (Kips)	59	66.96

**Reactions were provided in the structural analysis by Destek Engineering and have been multiplied by 1.35 per Section 15.5.1 of the ANSI/TIA-222-G Code*

We appreciate the opportunity to be of service on this project. If you should have any questions or require any additional information, please do not hesitate to call our office.

Sincerely,
Maser Consulting Connecticut

Frank Pazden, P.E.
Telecommunications Department Manager

Anwesha Bera, E.I.T.
Structural Design Engineer

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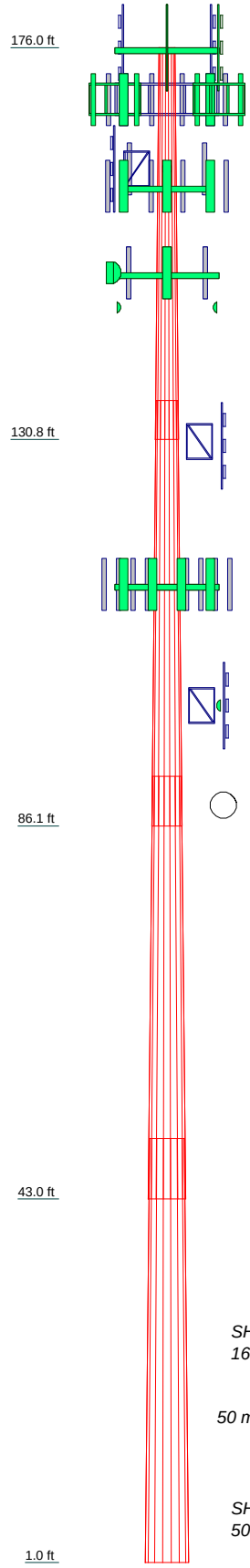
APPENDIX A

Section	1	2	3	4
Length (ft)	45.25	49.13	48.87	49.00
Number of Sides	18	18	18	18
Thickness (in)	0.2500	0.3125	0.3750	0.4375
Socket Length (ft)	4.50	5.75	7.00	
Top Dia (in)	21.0000	30.2260	39.8381	48.9596
Bot Dia (in)	31.8000	41.8200	51.3600	60.5000
Grade	A572-65			
Weight (K)	3.2	6.0	9.0	12.7



ALL REACTIONS ARE FACTORED

AXIAL 112 K

SHEAR 16 K

MOMENT 1731 kip-ft

TORQUE 1 kip-ft
50 mph WIND - 1.0000 in ICE

AXIAL 60 K

SHEAR 50 K

MOMENT 5509 kip-ft

TORQUE 2 kip-ft
REACTIONS - 102 mph WIND

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for Exposure B to the TIA-222-G Standard.
2. Tower designed for a 102 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class II.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. Weld together tower sections have flange connections.
8. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
9. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
10. Welds are fabricated with ER-70S-6 electrodes.
11. TOWER RATING: 90.9%

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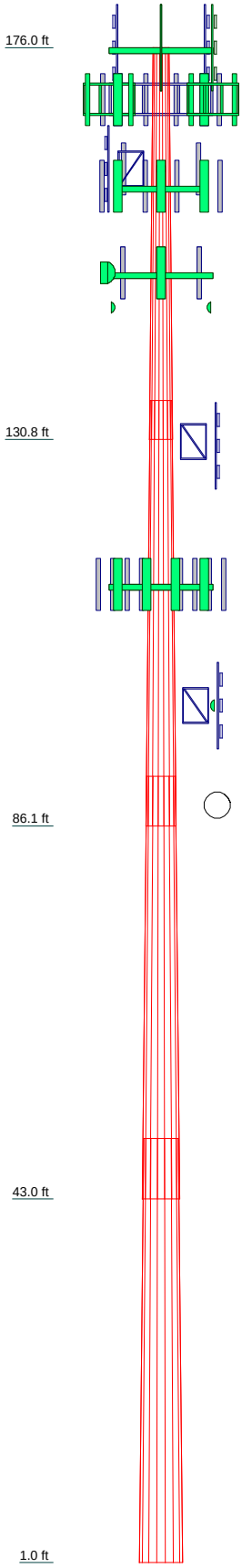
Job: ***KENSINGTON CT-CT5375***			
Project: ***16963024A***			
Client: AT&T	Drawn by:	App'd:	
Code: TIA-222-G	Date: 12/12/16	Scale: NTS	
Path: R:\Projects\2016\16963000A\16963024A\Structural\Tower Analysis\Rev 0\TNX\Monopole.eri		Dwg No. E-1	

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	45.25	18	0.2500	4.50	21.0000	31.8000		3.2
2	49.13	18	0.3125	5.75	30.2260	41.8200		6.0
3	48.87	18	0.3750	7.00	39.8381	51.3600		9.0
4	49.00	18	0.4375		48.9596	60.5000		12.7
							A572-65	30.9



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
10' Dipole AF	176	FD-RRH-4X45-1900 (Sprint)	150
10' Dipole AF	176	FD-RRH-2X50-800 (Sprint)	150
10' Dipole AF	176	FD-RRH-2X50-800 (Sprint)	150
2" Dia 10' Omni	176	FD-RRH-2X50-800 (Sprint)	150
2" Dia 10' Omni	176	840 10054 (Sprint)	150
Valmont 13' Platform w/o Rails	176	840 10054 (Sprint)	150
Valmont T-Arm (3) (ATI)	170	840 10054 (Sprint)	150
800-10121 (ATI)	170	APXV9TM14-C-I20 (sprint)	150
800-10121 (ATI)	170	APXV9TM14-C-I20 (sprint)	150
800-10121 (ATI)	170	APXV9TM14-C-I20 (sprint)	150
HPA-65R-BUU-H6 (ATI)	170	VHLP2.5-180	150
HPA-65R-BUU-H6 (ATI)	170	VHLP2.5-180	150
HPA-65R-BUU-H6 (ATI)	170	APXVSPP18-C-A20 (Sprint)	150
(2) LGP21401 (ATI)	170	MF-900B	146
(2) LGP21401 (ATI)	170	MF-900B	146
(2) LGP21401 (ATI)	170	Custom Standoff Mount	131 - 130
RRUS-11 (ATI)	170	10' Dipole AF	130
RRUS-11 (ATI)	170	TMA	130
RRUS-11 (ATI)	170	MGD3-900TX (Verizon)	114
RRUS 32 (ATI)	170	MGD3-900TX (Verizon)	114
RRUS 32 (ATI)	170	TMA (Verizon)	114
RRUS 32 (ATI)	170	TMA (Verizon)	114
DC6-48-06-18-8F (ATI)	170	TMA (Verizon)	114
10' Dipole AF	162	Valmont 13' Platform w/o Rails (Verizon)	114
Custom Standoff Mount	162		
LNX-6515DS-VTM (T-Mobile)	162	LNX-6514DS-T4M (Verizon)	114
LNX-6515DS-VTM (T-Mobile)	162	BXA-185060 (Verizon)	114
MF-900B	162	LNX-6514DS-T4M (Verizon)	114
(2) Ericsson AIR21 (T-Mobile)	160	(2) LPA-70063-6CF-EDIN-X (Verizon)	114
(2) Ericsson AIR21 (T-Mobile)	160	(2) LPA-70063-6CF-EDIN-X (Verizon)	114
(2) Ericsson AIR21 (T-Mobile)	160	RWA-80013 (Verizon)	114
Rohn T-Arm (3) (T-Mobile)	160	LNX-6514DS-T4M (Verizon)	114
LNX-6515DS-VTM (T-Mobile)	160	(2) RWA-80013 (Verizon)	114
APXVSPP18-C-A20 (Sprint)	150	Custom Standoff Mount	100
APXVSPP18-C-A20 (Sprint)	150	10' Dipole AF	100
TD-RRH8x20-25 (Sprint)	150	TMA	100
TD-RRH8x20-25 (Sprint)	150	MF-900B	100
TD-RRH8x20-25 (Sprint)	150	GPS	61 - 1
Valmont 13' Platform w/o Rails (Sprint)	150	GPS	61 - 1
FD-RRH-4X45-1900 (Sprint)	150	GPS	61 - 1
FD-RRH-4X45-1900 (Sprint)	150		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for Exposure B to the TIA-222-G Standard.
2. Tower designed for a 102 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class II.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. Weld together tower sections have flange connections.
8. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
9. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
10. Welds are fabricated with ER-70S-6 electrodes.

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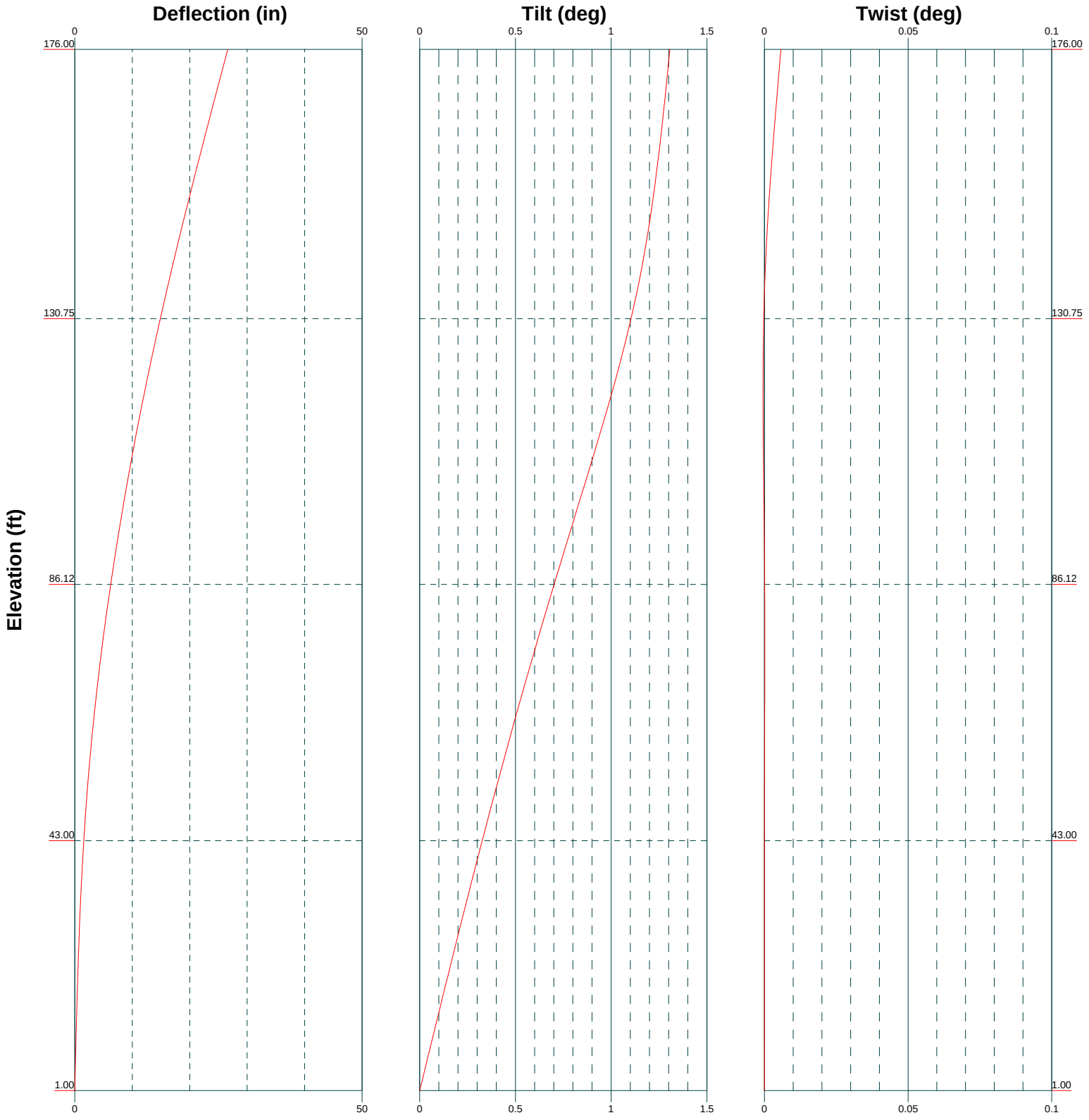
Project: ***16963024A***			
Client: AT&T	Drawn by:	App'd:	
Code: TIA-222-G	Date: 12/12/16	Scale: NTS	
Path: R:\Projects\2016\16963000A\16963024A\Structural\Tower Analysis\Rev 0\TNX\Monopole.eri		Dwg No. E-1	

TIA-222-G - Service - 60 mph

Maximum Values



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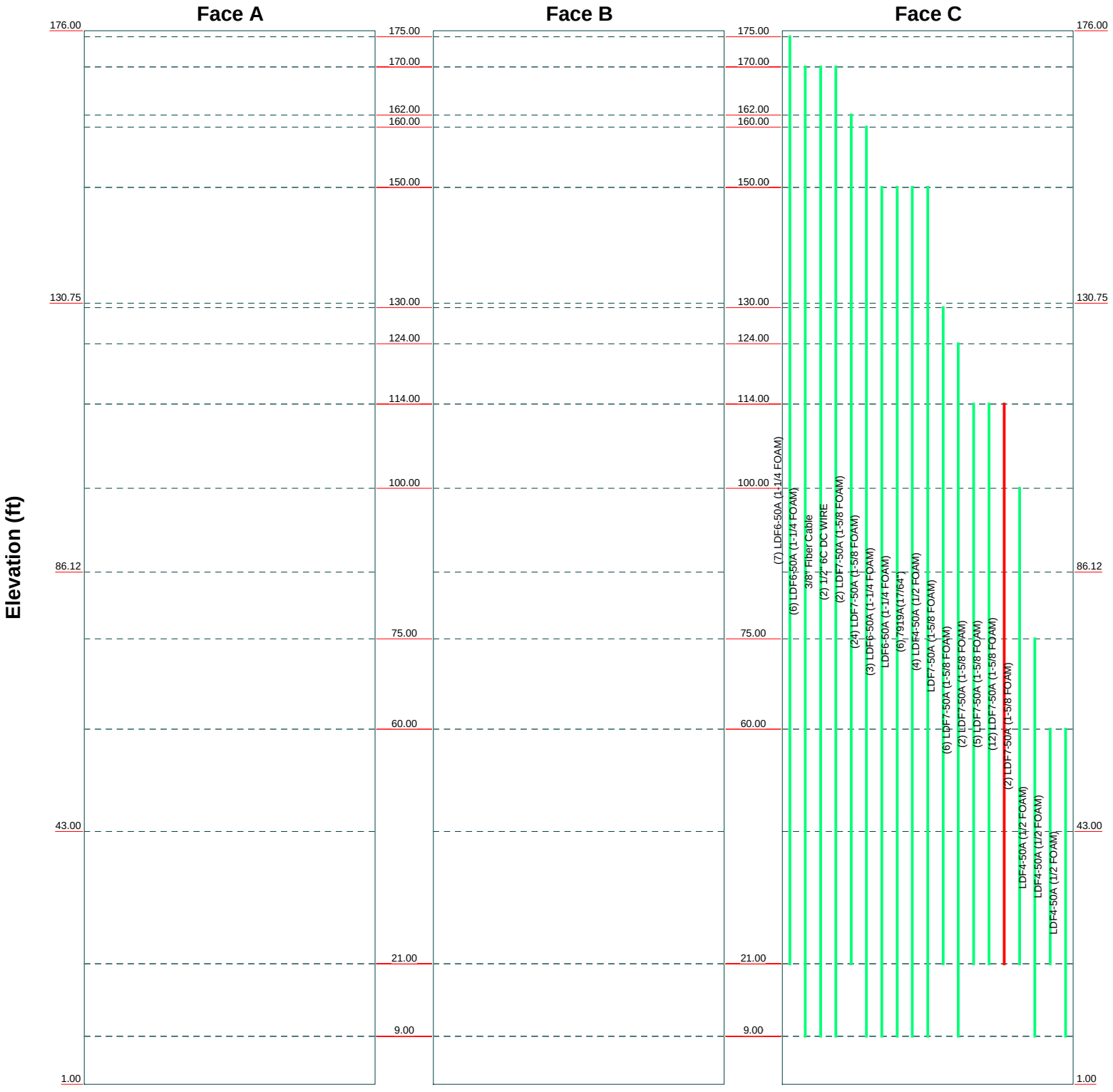
Path: R:\Projects\2016\16963000A\16963024A\Structural\Tower Analysis\Rev 0\TNX\Monopole.eri		Dwg No. E-5	

Feed Line Distribution Chart
1' - 176'

Round | Flat | App In Face | App Out Face | Truss Leg



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Project: ***16963024A***			
Client: AT&T	Drawn by:	App'd:	
Code: TIA-222-G	Date: 12/12/16	Scale: NTS	
Path: R:\Projects\2016\16963000A\16963024A\Structural\Tower Analysis\Rev 0\TNX\Monopole.eri		Dwg No. E-7	

Tower Input Data

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

- Basic wind speed of 102 mph.
- Structure Class II.
- Exposure Category B.
- Topographic Category 1.
- Crest Height 0.00 ft.
- Nominal ice thickness of 1.0000 in.
- Ice thickness is considered to increase with height.
- Ice density of 56 pcf.
- A wind speed of 50 mph is used in combination with ice.
- Temperature drop of 50 °F.
- Deflections calculated using a wind speed of 60 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.
- Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	176.00-130.75	45.25	4.50	18	21.0000	31.8000	0.2500	1.0000	A572-65 (65 ksi)
L2	130.75-86.12	49.13	5.75	18	30.2260	41.8200	0.3125	1.2500	A572-65 (65 ksi)
L3	86.12-43.00	48.87	7.00	18	39.8381	51.3600	0.3750	1.5000	A572-65 (65 ksi)
L4	43.00-1.00	49.00		18	48.9596	60.5000	0.4375	1.7500	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	21.3240	16.4651	895.6507	7.3663	10.6680	83.9568	1792.4800	8.2341	3.2560	13.024
	32.2906	25.0349	3148.3461	11.2003	16.1544	194.8909	6300.8349	12.5198	5.1568	20.627
L2	31.7706	29.6704	3354.2439	10.6193	15.3548	218.4493	6712.9014	14.8380	4.7698	15.263
	42.4651	41.1703	8961.3641	14.7352	21.2446	421.8192	17934.5198	20.5890	6.8103	21.793
L3	41.8292	46.9709	9241.6269	14.0094	20.2377	456.6531	18495.4142	23.4899	6.3515	16.937
	52.1523	60.6849	19929.7987	18.0997	26.0909	763.8607	39885.8215	30.3482	8.3794	22.345
L4	51.3890	67.3790	20042.0464	17.2254	24.8715	805.8240	40110.4646	33.6959	7.8469	17.936
	61.4333	83.4043	38013.0437	21.3222	30.7340	1236.8401	76076.1060	41.7101	9.8780	22.578

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	Double Angle Stitch Bolt Spacing Redundants in
L1 176.00-130.75				1	1	1.01			
L2 130.75-86.12				1	1	1.01			
L3 86.12-43.00				1	1	1.01			
L4 43.00-1.00				1	1	1.01			

Monopole Base Plate Data

Base Plate Data	
Base plate is square	
Base plate is grouted	
Anchor bolt grade	A615-75
Anchor bolt size	2.2500 in
Number of bolts	18
Embedment length	24.0000 in
f'_c	4 ksi
Grout space	2.0000 in
Base plate grade	A572-65
Base plate thickness	2.0000 in
Bolt circle diameter	70.0000 in
Outer diameter	76.0000 in
Inner diameter	60.7500 in
Base plate type	Stiffened Plate
Bolts per stiffener	1

Base Plate Data	
Stiffener thickness	0.5000 in
Stiffener height	12.0000 in

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Sector	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or Diameter in	Perimeter in	Weight plf
LDF7-50A (1-5/8 FOAM)	C	Surface Af (CaAa)	114.00 - 21.00	12	6	0.000 0.000	1.9800	6.2172	0.82

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
LDF6-50A (1-1/4 FOAM)	C	No	Inside Pole	175.00 - 21.00	7	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.66 0.66 0.66
LDF6-50A (1-1/4 FOAM)	C	No	Inside Pole	170.00 - 9.00	6	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.66 0.66 0.66
3/8" Fiber Cable	C	No	Inside Pole	170.00 - 9.00	1	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	1.00 1.00 1.00
1/2" 6C DC WIRE	C	No	Inside Pole	170.00 - 9.00	2	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	1.00 1.00 1.00
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	162.00 - 21.00	2	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.82 0.82 0.82
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	160.00 - 9.00	24	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.82 0.82 0.82
LDF6-50A (1-1/4 FOAM)	C	No	Inside Pole	150.00 - 9.00	3	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.66 0.66 0.66
LDF6-50A (1-1/4 FOAM)	C	No	Inside Pole	150.00 - 9.00	1	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.66 0.66 0.66
7919A(17/64")	C	No	Inside Pole	150.00 - 9.00	6	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.04 0.04 0.04
LDF4-50A (1/2 FOAM)	C	No	Inside Pole	150.00 - 9.00	4	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.15 0.15 0.15
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	130.00 - 21.00	1	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.82 0.82 0.82
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	124.00 - 9.00	6	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.82 0.82 0.82
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	114.00 - 21.00	2	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.82 0.82 0.82
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	114.00 - 21.00	5	No Ice 1/2" Ice	0.00 0.00	0.82 0.82

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
						1" Ice	0.00	0.82
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	100.00 - 21.00	2	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
LDF4-50A (1/2 FOAM)	C	No	Inside Pole	75.00 - 9.00	1	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15
						1" Ice	0.00	0.15
LDF4-50A (1/2 FOAM)	C	No	Inside Pole	60.00 - 21.00	1	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15
						1" Ice	0.00	0.15
LDF4-50A (1/2 FOAM)	C	No	Inside Pole	60.00 - 9.00	1	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15
						1" Ice	0.00	0.15

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	176.00-130.75	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	1.17
L2	130.75-86.12	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	55.202	0.000	2.30
L3	86.12-43.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	85.378	0.000	2.57
L4	43.00-1.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	43.560	0.000	1.74

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	176.00-130.75	A	2.330	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	1.17
L2	130.75-86.12	A	2.251	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	7.811	0.000	3.60
L3	86.12-43.00	A	2.138	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	11.779	0.000	4.50
L4	43.00-1.00	A	1.916	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	5.791	0.000	2.68

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
L1	15	LDF7-50A (1-5/8 FOAM)	130.75 - 114.00	1.0000	1.0000
L2	15	LDF7-50A (1-5/8 FOAM)	86.12 - 114.00	1.0000	1.0000
L3	15	LDF7-50A (1-5/8 FOAM)	43.00 - 86.12	1.0000	1.0000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
10' Dipole AF	A	From Face	5.00	0.0000	176.00	No Ice	2.00	2.00	0.06
			0.00			1/2" Ice	3.02	3.02	0.08
			0.00			1" Ice	4.07	4.07	0.10
10' Dipole AF	B	From Face	5.00	0.0000	176.00	No Ice	2.00	2.00	0.06
			0.00			1/2" Ice	3.02	3.02	0.08
			0.00			1" Ice	4.07	4.07	0.10
10' Dipole AF	B	From Leg	6.00	0.0000	176.00	No Ice	2.00	2.00	0.06
			0.00			1/2" Ice	3.02	3.02	0.08
			0.00			1" Ice	4.07	4.07	0.10
2" Dia 10' Omni	C	From Face	5.00	0.0000	176.00	No Ice	2.00	2.00	0.03
			0.00			1/2" Ice	3.02	3.02	0.05
			0.00			1" Ice	4.07	4.07	0.07
2" Dia 10' Omni	C	From Face	5.00	0.0000	176.00	No Ice	2.00	2.00	0.03
			0.00			1/2" Ice	3.02	3.02	0.05
			0.00			1" Ice	4.07	4.07	0.07
Valmont 13' Platform w/o Rails	C	From Face	0.00	0.0000	176.00	No Ice	35.00	35.00	1.35
			0.00			1/2" Ice	42.00	42.00	2.00
			0.00			1" Ice	49.00	49.00	3.00
Valmont T-Arm (3) (AT&T)	C	From Face	0.00	0.0000	170.00	No Ice	21.00	21.00	1.01
			0.00			1/2" Ice	29.00	29.00	1.24
			0.00			1" Ice	37.00	37.00	1.46
800-10121 (AT&T)	A	From Face	4.00	0.0000	170.00	No Ice	5.16	3.29	0.05
			0.00			1/2" Ice	5.51	3.64	0.08
			0.00			1" Ice	5.87	3.99	0.12
800-10121 (AT&T)	B	From Face	4.00	0.0000	170.00	No Ice	5.16	3.29	0.05
			0.00			1/2" Ice	5.51	3.64	0.08
			0.00			1" Ice	5.87	3.99	0.12
800-10121 (AT&T)	C	From Face	4.00	0.0000	170.00	No Ice	5.16	3.29	0.05
			0.00			1/2" Ice	5.51	3.64	0.08
			0.00			1" Ice	5.87	3.99	0.12
HPA-65R-BUU-H6 (AT&T)	A	From Face	4.00	0.0000	170.00	No Ice	9.49	5.49	0.03
			0.00			1/2" Ice	9.96	5.94	0.09
			0.00			1" Ice	10.43	6.41	0.15
HPA-65R-BUU-H6 (AT&T)	B	From Face	4.00	0.0000	170.00	No Ice	9.49	5.49	0.03
			0.00			1/2" Ice	9.96	5.94	0.09
			0.00			1" Ice	10.43	6.41	0.15
HPA-65R-BUU-H6 (AT&T)	C	From Face	4.00	0.0000	170.00	No Ice	9.49	5.49	0.03
			0.00			1/2" Ice	9.96	5.94	0.09

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Offsets: Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00				1" Ice	10.43	6.41	0.15
(2) LGP21401	A	From Face	4.00	0.0000	170.00		No Ice	1.66	0.44	0.04
(AT&T)			0.00				1/2" Ice	1.82	0.54	0.05
			0.00				1" Ice	1.98	0.65	0.06
(2) LGP21401	B	From Face	4.00	0.0000	170.00		No Ice	1.66	0.44	0.04
(AT&T)			0.00				1/2" Ice	1.82	0.54	0.05
			0.00				1" Ice	1.98	0.65	0.06
(2) LGP21401	C	From Face	4.00	0.0000	170.00		No Ice	1.66	0.44	0.04
(AT&T)			0.00				1/2" Ice	1.82	0.54	0.05
			0.00				1" Ice	1.98	0.65	0.06
RRUS-11	A	From Face	4.00	0.0000	170.00		No Ice	2.52	1.02	0.06
(AT&T)			0.00				1/2" Ice	2.72	1.16	0.07
			0.00				1" Ice	2.92	1.30	0.10
RRUS-11	B	From Face	4.00	0.0000	170.00		No Ice	2.52	1.02	0.06
(AT&T)			0.00				1/2" Ice	2.72	1.16	0.07
			0.00				1" Ice	2.92	1.30	0.10
RRUS-11	C	From Face	4.00	0.0000	170.00		No Ice	2.52	1.02	0.06
(AT&T)			0.00				1/2" Ice	2.72	1.16	0.07
			0.00				1" Ice	2.92	1.30	0.10
RRUS 32	A	From Face	4.00	0.0000	170.00		No Ice	3.31	2.42	0.09
(AT&T)			0.00				1/2" Ice	3.56	2.64	0.12
			0.00				1" Ice	3.81	2.86	0.15
RRUS 32	B	From Face	4.00	0.0000	170.00		No Ice	3.31	2.42	0.09
(AT&T)			0.00				1/2" Ice	3.56	2.64	0.12
			0.00				1" Ice	3.81	2.86	0.15
RRUS 32	C	From Face	4.00	0.0000	170.00		No Ice	3.31	2.42	0.09
(AT&T)			0.00				1/2" Ice	3.56	2.64	0.12
			0.00				1" Ice	3.81	2.86	0.15
DC6-48-06-18-8F	A	From Face	1.00	0.0000	170.00		No Ice	1.20	1.20	0.03
(AT&T)			0.00				1/2" Ice	1.88	1.88	0.05
			0.00				1" Ice	2.09	2.09	0.08
10' Dipole AF	A	From Face	6.00	0.0000	162.00		No Ice	2.00	2.00	0.06
			0.00				1/2" Ice	3.02	3.02	0.08
			0.00				1" Ice	4.07	4.07	0.10
Custom Standoff Mount	A	From Face	3.00	0.0000	162.00		No Ice	8.83	11.42	0.30
			0.00				1/2" Ice	9.41	12.18	0.39
			0.00				1" Ice	9.99	12.93	0.48
LNX-6515DS-VTM	A	From Face	4.00	0.0000	162.00		No Ice	11.39	9.56	0.07
(T-Mobile)			0.00				1/2" Ice	12.01	10.97	0.16
			0.00				1" Ice	12.63	12.24	0.26
LNX-6515DS-VTM	B	From Face	4.00	0.0000	162.00		No Ice	11.39	9.56	0.07
(T-Mobile)			0.00				1/2" Ice	12.01	10.97	0.16
			0.00				1" Ice	12.63	12.24	0.26
LNX-6515DS-VTM	C	From Face	4.00	0.0000	160.00		No Ice	11.39	9.56	0.07
(T-Mobile)			0.00				1/2" Ice	12.01	10.97	0.16
			0.00				1" Ice	12.63	12.24	0.26
(2) Ericsson AIR21	A	From Face	4.00	0.0000	160.00		No Ice	4.31	6.05	0.10
(T-Mobile)			0.00				1/2" Ice	4.66	6.42	0.14
			0.00				1" Ice	5.02	6.80	0.19
(2) Ericsson AIR21	B	From Face	4.00	0.0000	160.00		No Ice	4.31	6.05	0.10
(T-Mobile)			0.00				1/2" Ice	4.66	6.42	0.14
			0.00				1" Ice	5.02	6.80	0.19
(2) Ericsson AIR21	C	From Face	4.00	0.0000	160.00		No Ice	4.31	6.05	0.10
(T-Mobile)			0.00				1/2" Ice	4.66	6.42	0.14
			0.00				1" Ice	5.02	6.80	0.19
Rohn T-Arm (3)	C	From Face	0.00	0.0000	160.00		No Ice	22.00	22.00	1.13
(T-Mobile)			0.00				1/2" Ice	30.00	30.00	1.47

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00				1" Ice	38.00	38.00	1.81
APXVSPP18-C-A20	A	From Face	4.00	0.0000	150.00		No Ice	8.02	5.81	0.06
(Sprint)			0.00				1/2" Ice	8.48	6.27	0.12
			0.00				1" Ice	8.94	6.73	0.17
APXVSPP18-C-A20	B	From Face	4.00	0.0000	150.00		No Ice	8.02	5.81	0.06
(Sprint)			0.00				1/2" Ice	8.48	6.27	0.12
			0.00				1" Ice	8.94	6.73	0.17
APXVSPP18-C-A20	C	From Face	4.00	0.0000	150.00		No Ice	8.02	5.81	0.06
(Sprint)			0.00				1/2" Ice	8.48	6.27	0.12
			0.00				1" Ice	8.94	6.73	0.17
TD-RRH8x20-25	A	From Face	4.00	0.0000	150.00		No Ice	4.05	1.53	0.07
(Sprint)			0.00				1/2" Ice	4.30	1.71	0.10
			0.00				1" Ice	4.56	1.90	0.13
TD-RRH8x20-25	B	From Face	4.00	0.0000	150.00		No Ice	4.05	1.53	0.07
(Sprint)			0.00				1/2" Ice	4.30	1.71	0.10
			0.00				1" Ice	4.56	1.90	0.13
TD-RRH8x20-25	C	From Face	4.00	0.0000	150.00		No Ice	4.05	1.53	0.07
(Sprint)			0.00				1/2" Ice	4.30	1.71	0.10
			0.00				1" Ice	4.56	1.90	0.13
Valmont 13' Platform w/o Rails	C	From Face	0.00	0.0000	150.00		No Ice	35.00	35.00	1.35
			0.00				1/2" Ice	42.00	42.00	2.00
(Sprint)			0.00				1" Ice	49.00	49.00	3.00
FD-RRH-4X45-1900	A	From Face	4.00	0.0000	150.00		No Ice	2.38	2.32	0.06
(Sprint)			0.00				1/2" Ice	2.59	2.52	0.08
			0.00				1" Ice	2.80	2.74	0.11
FD-RRH-4X45-1900	B	From Face	4.00	0.0000	150.00		No Ice	2.38	2.32	0.06
(Sprint)			0.00				1/2" Ice	2.59	2.52	0.08
			0.00				1" Ice	2.80	2.74	0.11
FD-RRH-4X45-1900	C	From Face	4.00	0.0000	150.00		No Ice	2.38	2.32	0.06
(Sprint)			0.00				1/2" Ice	2.59	2.52	0.08
			0.00				1" Ice	2.80	2.74	0.11
FD-RRH-2X50-800	A	From Face	4.00	0.0000	150.00		No Ice	2.13	2.46	0.06
(Sprint)			0.00				1/2" Ice	2.32	2.66	0.09
			0.00				1" Ice	2.51	2.86	0.12
FD-RRH-2X50-800	B	From Face	4.00	0.0000	150.00		No Ice	2.13	2.46	0.06
(Sprint)			0.00				1/2" Ice	2.32	2.66	0.09
			0.00				1" Ice	2.51	2.86	0.12
FD-RRH-2X50-800	C	From Face	4.00	0.0000	150.00		No Ice	2.13	2.46	0.06
(Sprint)			0.00				1/2" Ice	2.32	2.66	0.09
			0.00				1" Ice	2.51	2.86	0.12
840 10054	A	From Face	4.00	0.0000	150.00		No Ice	4.58	1.36	0.03
(Sprint)			0.00				1/2" Ice	4.87	1.62	0.05
			0.00				1" Ice	5.18	1.89	0.08
840 10054	B	From Face	4.00	0.0000	150.00		No Ice	4.58	1.36	0.03
(Sprint)			0.00				1/2" Ice	4.87	1.62	0.05
			0.00				1" Ice	5.18	1.89	0.08
840 10054	C	From Face	4.00	0.0000	150.00		No Ice	4.58	1.36	0.03
(Sprint)			0.00				1/2" Ice	4.87	1.62	0.05
			0.00				1" Ice	5.18	1.89	0.08
10' Dipole AF	B	From Face	6.00	0.0000	130.00		No Ice	2.00	2.00	0.06
			0.00				1/2" Ice	3.02	3.02	0.08
			0.00				1" Ice	4.07	4.07	0.10
TMA	B	From Face	2.00	0.0000	130.00		No Ice	0.31	0.23	0.01
			0.00				1/2" Ice	0.39	0.31	0.02
			0.00				1" Ice	0.48	0.39	0.02
Custom Standoff Mount	B	From Face	3.00	0.0000	131.00 - 130.00		No Ice	8.83	11.42	0.30
			0.00				1/2" Ice	9.41	12.18	0.39

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00				1" Ice	9.99	12.93	0.48
(2) LPA-70063-6CF-EDIN-X (Verizon)	A	From Face	4.00	0.00	0.0000	114.00	No Ice	13.65	12.13	0.01
			0.00				1/2" Ice	14.25	12.73	0.11
			0.00				1" Ice	14.85	13.33	0.22
(2) LPA-70063-6CF-EDIN-X (Verizon)	B	From Face	4.00	0.00	0.0000	114.00	No Ice	13.65	12.13	0.01
			0.00				1/2" Ice	14.25	12.73	0.11
			0.00				1" Ice	14.85	13.33	0.22
(2) RWA-80013 (Verizon)	C	From Face	4.00	0.00	0.0000	114.00	No Ice	4.80	2.84	0.01
			0.00				1/2" Ice	5.12	3.15	0.05
			0.00				1" Ice	5.45	3.47	0.08
RWA-80013 (Verizon)	C	From Face	4.00	0.00	0.0000	114.00	No Ice	4.80	2.84	0.01
			0.00				1/2" Ice	5.12	3.15	0.05
			0.00				1" Ice	5.45	3.47	0.08
LNX-6514DS-T4M (Verizon)	A	From Face	4.00	0.00	0.0000	114.00	No Ice	8.17	5.41	0.04
			0.00				1/2" Ice	8.63	5.86	0.09
			0.00				1" Ice	9.10	6.33	0.15
LNX-6514DS-T4M (Verizon)	B	From Face	4.00	0.00	0.0000	114.00	No Ice	8.17	5.41	0.04
			0.00				1/2" Ice	8.63	5.86	0.09
			0.00				1" Ice	9.10	6.33	0.15
LNX-6514DS-T4M (Verizon)	C	From Face	4.00	0.00	0.0000	114.00	No Ice	8.17	5.41	0.04
			0.00				1/2" Ice	8.63	5.86	0.09
			0.00				1" Ice	9.10	6.33	0.15
BXA-185060 (Verizon)	A	From Face	4.00	0.00	0.0000	114.00	No Ice	1.36	0.80	0.01
			0.00				1/2" Ice	1.53	0.96	0.01
			0.00				1" Ice	1.71	1.13	0.03
MGD3-900TX (Verizon)	B	From Face	4.00	0.00	0.0000	114.00	No Ice	4.78	3.60	0.02
			0.00				1/2" Ice	5.24	4.04	0.05
			0.00				1" Ice	5.70	4.49	0.08
MGD3-900TX (Verizon)	C	From Face	4.00	0.00	0.0000	114.00	No Ice	4.78	3.60	0.02
			0.00				1/2" Ice	5.24	4.04	0.05
			0.00				1" Ice	5.70	4.49	0.08
TMA (Verizon)	A	From Face	4.00	0.00	0.0000	114.00	No Ice	0.31	0.23	0.01
			0.00				1/2" Ice	0.39	0.31	0.02
			0.00				1" Ice	0.48	0.39	0.02
TMA (Verizon)	B	From Face	4.00	0.00	0.0000	114.00	No Ice	0.31	0.23	0.01
			0.00				1/2" Ice	0.39	0.31	0.02
			0.00				1" Ice	0.48	0.39	0.02
TMA (Verizon)	C	From Face	4.00	0.00	0.0000	114.00	No Ice	0.31	0.23	0.01
			0.00				1/2" Ice	0.39	0.31	0.02
			0.00				1" Ice	0.48	0.39	0.02
Valmont 13' Platform w/o Rails (Verizon)	C	From Face	0.00	0.00	0.0000	114.00	No Ice	35.00	35.00	1.35
			0.00				1/2" Ice	42.00	42.00	2.00
			0.00				1" Ice	49.00	49.00	3.00
10' Dipole AF	B	From Face	6.00	0.00	0.0000	100.00	No Ice	2.00	2.00	0.06
			0.00				1/2" Ice	3.02	3.02	0.08
			0.00				1" Ice	4.07	4.07	0.10
TMA	B	From Face	2.00	0.00	0.0000	100.00	No Ice	0.31	0.23	0.01
			0.00				1/2" Ice	0.39	0.31	0.02
			0.00				1" Ice	0.48	0.39	0.02
Custom Standoff Mount	B	From Face	3.00	0.00	0.0000	100.00	No Ice	8.83	11.42	0.30
			0.00				1/2" Ice	9.41	12.18	0.39
			0.00				1" Ice	9.99	12.93	0.48
GPS	A	From Face	2.00	0.00	0.0000	61.00 - 1.00	No Ice	1.00	1.00	0.01
			0.00				1/2" Ice	1.50	1.50	0.01
			0.00				1" Ice	2.00	2.00	0.02
GPS	A	From Face	2.00	0.00	0.0000	61.00 - 1.00	No Ice	1.00	1.00	0.01
			0.00				1/2" Ice	1.50	1.50	0.01

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
			0.00			1" Ice	2.00	2.00	0.02
GPS	B	From Face	2.00	0.0000	61.00 - 1.00	No Ice	1.00	1.00	0.01
			0.00			1/2" Ice	1.50	1.50	0.01
			0.00			1" Ice	2.00	2.00	0.02
APXV9TM14-C-I20	A	From Face	4.00	0.0000	150.00	No Ice	6.34	3.61	0.06
(sprint)			0.00			1/2" Ice	6.72	3.97	0.09
			0.00			1" Ice	7.10	4.33	0.14
APXV9TM14-C-I20	B	From Face	4.00	0.0000	150.00	No Ice	6.34	3.61	0.06
(sprint)			0.00			1/2" Ice	6.72	3.97	0.09
			0.00			1" Ice	7.10	4.33	0.14
APXV9TM14-C-I20	C	From Face	4.00	0.0000	150.00	No Ice	6.34	3.61	0.06
(sprint)			0.00			1/2" Ice	6.72	3.97	0.09
			0.00			1" Ice	7.10	4.33	0.14

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
VHLP2.5-180	C	Paraboloid w/Shroud (HP)	From Leg	5.00	Worst		150.00	2.50	No Ice	4.90	0.07
				0.00					1/2" Ice	5.24	0.10
				0.00					1" Ice	5.58	0.12
VHLP2.5-180	C	Paraboloid w/Shroud (HP)	From Leg	5.00	Worst		150.00	2.50	No Ice	4.90	0.07
				0.00					1/2" Ice	5.24	0.10
				0.00					1" Ice	5.58	0.12
MF-900B	B	Grid	From Leg	5.00	Worst		146.00	1.33	No Ice	2.66	0.01
				0.00					1/2" Ice	1.58	0.02
				0.00					1" Ice	0.00	0.03
MF-900B	C	Grid	From Leg	5.00	Worst		146.00	1.33	No Ice	2.66	0.01
				0.00					1/2" Ice	1.58	0.02
				0.00					1" Ice	0.00	0.03
MF-900B	A	Grid	From Leg	5.00	Worst		162.00	1.33	No Ice	2.66	0.01
				0.00					1/2" Ice	1.58	0.02
				0.00					1" Ice	0.00	0.03
MF-900B	B	Grid	From Leg	5.00	Worst		100.00	1.33	No Ice	2.66	0.01
				0.00					1/2" Ice	1.58	0.02
				0.00					1" Ice	0.00	0.03

Tower Pressures - No Ice

$G_H = 1.100$

Section Elevation ft	z ft	K_Z	q_z psf	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	152.07	1.114	28	101.086	A	0.000	101.086	101.086	100.00	0.000	0.000
176.00-130.75					B	0.000	101.086		100.00	0.000	0.000
					C	0.000	101.086		100.00	0.000	0.000
L2	107.69	1.009	25	138.047	A	0.000	138.047	138.047	100.00	0.000	0.000
130.75-86.12					B	0.000	138.047		100.00	0.000	0.000
					C	0.000	138.047		100.00	55.202	0.000
L3 86.12-43.00	64.29	0.871	22	168.853	A	0.000	168.853	168.853	100.00	0.000	0.000
					B	0.000	168.853		100.00	0.000	0.000
					C	0.000	168.853		100.00	85.378	0.000
L4 43.00-1.00	21.49	0.7	18	197.439	A	0.000	197.439	197.439	100.00	0.000	0.000
					B	0.000	197.439		100.00	0.000	0.000
					C	0.000	197.439		100.00	43.560	0.000

Tower Pressure - With Ice

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	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	152.07	1.114	7	2.3301	118.659	A	0.000	118.659	118.659	100.00	0.000	0.000
176.00-130.75						B	0.000	118.659		100.00	0.000	0.000
						C	0.000	118.659		100.00	0.000	0.000
L2 130.75-86.12	107.69	1.009	6	2.2511	155.380	A	0.000	155.380	155.380	100.00	0.000	0.000
						B	0.000	155.380		100.00	0.000	0.000
						C	0.000	155.380		100.00	7.811	0.000
L3 86.12-43.00	64.29	0.871	5	2.1379	185.031	A	0.000	185.031	185.031	100.00	0.000	0.000
						B	0.000	185.031		100.00	0.000	0.000
						C	0.000	185.031		100.00	11.779	0.000
L4 43.00-1.00	21.49	0.7	4	1.9161	212.404	A	0.000	212.404	212.404	100.00	0.000	0.000
						B	0.000	212.404		100.00	0.000	0.000
						C	0.000	212.404		100.00	5.791	0.000

Tower Pressure - Service

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	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	152.07	1.114	9	101.086	A	0.000	101.086	101.086	100.00	0.000	0.000
176.00-130.75					B	0.000	101.086		100.00	0.000	0.000
					C	0.000	101.086		100.00	0.000	0.000
L2	107.69	1.009	8	138.047	A	0.000	138.047	138.047	100.00	0.000	0.000
130.75-86.12					B	0.000	138.047		100.00	0.000	0.000
					C	0.000	138.047		100.00	55.202	0.000
L3 86.12-43.00	64.29	0.871	7	168.853	A	0.000	168.853	168.853	100.00	0.000	0.000
					B	0.000	168.853		100.00	0.000	0.000
					C	0.000	168.853		100.00	85.378	0.000
L4 43.00-1.00	21.49	0.7	6	197.439	A	0.000	197.439	197.439	100.00	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	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
					B	0.000	197.439		100.00	0.000	0.000
					C	0.000	197.439		100.00	43.560	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	1.17	3.23	A	1	0.65	28	1	1	101.086	2.04	44.98	C
176.00-130.75			B	1	0.65		1	1	101.086			
			C	1	0.65		1	1	101.086			
L2	2.30	5.98	A	1	0.65	25	1	1	138.047	2.52	56.37	C
130.75-86.12			B	1	0.65		1	1	138.047			
			C	1	0.65		1	1	138.047			
L3	2.57	9.04	A	1	0.65	22	1	1	168.853	2.65	61.39	C
86.12-43.00			B	1	0.65		1	1	168.853			
			C	1	0.65		1	1	168.853			
L4 43.00-1.00	1.74	12.70	A	1	0.65	18	1	1	197.439	2.53	60.17	C
			B	1	0.65		1	1	197.439			
			C	1	0.65		1	1	197.439			
Sum Weight:	7.78	30.94						OTM	795.20 kip-ft	9.73		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	1.17	3.23	A	1	0.65	28	1	1	101.086	2.04	44.98	C
176.00-130.75			B	1	0.65		1	1	101.086			
			C	1	0.65		1	1	101.086			
L2	2.30	5.98	A	1	0.65	25	1	1	138.047	2.52	56.37	C
130.75-86.12			B	1	0.65		1	1	138.047			
			C	1	0.65		1	1	138.047			
L3	2.57	9.04	A	1	0.65	22	1	1	168.853	2.65	61.39	C
86.12-43.00			B	1	0.65		1	1	168.853			
			C	1	0.65		1	1	168.853			
L4 43.00-1.00	1.74	12.70	A	1	0.65	18	1	1	197.439	2.53	60.17	C
			B	1	0.65		1	1	197.439			
			C	1	0.65		1	1	197.439			
Sum Weight:	7.78	30.94						OTM	795.20 kip-ft	9.73		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	1.17	3.23	A	1	0.65	28	1	1	101.086	2.04	44.98	C
176.00-130.75			B	1	0.65		1	1	101.086			
			C	1	0.65		1	1	101.086			
L2	2.30	5.98	A	1	0.65	25	1	1	138.047	6.41	143.61	C
130.75-86.12			B	1	0.65		1	1	138.047			
			C	1	1.2		1	1	138.047			
L3	2.57	9.04	A	1	0.65	22	1	1	168.853	7.23	167.77	C
86.12-43.00			B	1	0.65		1	1	168.853			
			C	1	1.2		1	1	168.853			
L4 43.00-1.00	1.74	12.70	A	1	0.65	18	1	1	197.439	3.04	72.39	C
			B	1	0.65		1	1	197.439			
			C	1	0.782		1	1	197.439			
Sum Weight:	7.78	30.94						OTM	1511.42 kip-ft	18.72		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	1.17	6.97	A	1	1.2	7	1	1	118.659	1.06	23.42	C
176.00-130.75			B	1	1.2		1	1	118.659			
			C	1	1.2		1	1	118.659			
L2	3.60	10.79	A	1	1.2	6	1	1	155.380	2.61	58.49	B
130.75-86.12			B	1	1.2		1	1	155.380			
			C	1	1.2		1	1	155.380			
L3	4.50	14.55	A	1	1.2	5	1	1	185.031	3.00	69.57	B
86.12-43.00			B	1	1.2		1	1	185.031			
			C	1	1.2		1	1	185.031			
L4 43.00-1.00	2.68	18.40	A	1	1.2	4	1	1	212.404	1.87	44.46	B
			B	1	1.2		1	1	212.404			
			C	1	1.2		1	1	212.404			
Sum Weight:	11.95	50.71						OTM	666.71 kip-ft	8.54		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1	1.17	6.97	A	1	1.2	7	1	1	118.659	1.06	23.42	C
176.00-130.75			B	1	1.2		1	1	118.659			
			C	1	1.2		1	1	118.659			
L2	3.60	10.79	A	1	1.2	6	1	1	155.380	2.61	58.49	C
130.75-86.12			B	1	1.2		1	1	155.380			
			C	1	1.2		1	1	155.380			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L3	4.50	14.55	A	1	1.2	5	1	1	185.031	3.00	69.57	C
86.12-43.00			B	1	1.2		1	1	185.031			
			C	1	1.2		1	1	185.031			
L4 43.00-1.00	2.68	18.40	A	1	1.2	4	1	1	212.404	1.87	44.46	C
			B	1	1.2		1	1	212.404			
			C	1	1.2		1	1	212.404			
Sum Weight:	11.95	50.71						OTM	666.71 kip-ft	8.54		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	1.17	6.97	A	1	1.2	7	1	1	118.659	1.06	23.42	C
176.00-130.75			B	1	1.2		1	1	118.659			
			C	1	1.2		1	1	118.659			
L2	3.60	10.79	A	1	1.2	6	1	1	155.380	3.43	76.88	C
130.75-86.12			B	1	1.2		1	1	155.380			
			C	1	1.2		1	1	155.380			
L3	4.50	14.55	A	1	1.2	5	1	1	185.031	4.10	95.10	C
86.12-43.00			B	1	1.2		1	1	185.031			
			C	1	1.2		1	1	185.031			
L4 43.00-1.00	2.68	18.40	A	1	1.2	4	1	1	212.404	2.33	55.51	C
			B	1	1.2		1	1	212.404			
			C	1	1.2		1	1	212.404			
Sum Weight:	11.95	50.71						OTM	833.48 kip-ft	10.92		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	1.17	3.23	A	1	0.65	9	1	1	101.086	0.63	13.92	C
176.00-130.75			B	1	0.65		1	1	101.086			
			C	1	0.65		1	1	101.086			
L2	2.30	5.98	A	1	0.65	8	1	1	138.047	0.78	17.45	C
130.75-86.12			B	1	0.65		1	1	138.047			
			C	1	0.65		1	1	138.047			
L3	2.57	9.04	A	1	0.65	7	1	1	168.853	0.82	19.01	C
86.12-43.00			B	1	0.65		1	1	168.853			
			C	1	0.65		1	1	168.853			
L4 43.00-1.00	1.74	12.70	A	1	0.65	6	1	1	197.439	0.78	18.63	C
			B	1	0.65		1	1	197.439			
			C	1	0.65		1	1	197.439			
Sum Weight:	7.78	30.94						OTM	246.19	3.01		

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
									kip-ft			

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	1.17	3.23	A	1	0.65	9	1	1	101.086	0.63	13.92	C
176.00-130.75			B	1	0.65		1	1	101.086			
			C	1	0.65		1	1	101.086			
L2	2.30	5.98	A	1	0.65	8	1	1	138.047	0.78	17.45	C
130.75-86.12			B	1	0.65		1	1	138.047			
			C	1	0.65		1	1	138.047			
L3	2.57	9.04	A	1	0.65	7	1	1	168.853	0.82	19.01	C
86.12-43.00			B	1	0.65		1	1	168.853			
			C	1	0.65		1	1	168.853			
L4 43.00-1.00	1.74	12.70	A	1	0.65	6	1	1	197.439	0.78	18.63	C
			B	1	0.65		1	1	197.439			
			C	1	0.65		1	1	197.439			
Sum Weight:	7.78	30.94						OTM	246.19 kip-ft	3.01		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1	1.17	3.23	A	1	0.65	9	1	1	101.086	0.63	13.92	C
176.00-130.75			B	1	0.65		1	1	101.086			
			C	1	0.65		1	1	101.086			
L2	2.30	5.98	A	1	0.65	8	1	1	138.047	1.98	44.46	C
130.75-86.12			B	1	0.65		1	1	138.047			
			C	1	1.2		1	1	138.047			
L3	2.57	9.04	A	1	0.65	7	1	1	168.853	2.24	51.94	C
86.12-43.00			B	1	0.65		1	1	168.853			
			C	1	1.2		1	1	168.853			
L4 43.00-1.00	1.74	12.70	A	1	0.65	6	1	1	197.439	0.94	22.41	C
			B	1	0.65		1	1	197.439			
			C	1	0.782		1	1	197.439			
Sum Weight:	7.78	30.94						OTM	467.93 kip-ft	5.80		

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	30.94					
Bracing Weight	0.00					
Total Member Self-Weight	30.94			4.65	-1.71	
Total Weight	49.54			4.65	-1.71	
Wind 0 deg - No Ice		-0.03	-22.21	-2604.34	0.11	0.74
Wind 30 deg - No Ice		10.98	-19.22	-2253.89	-1292.61	0.99
Wind 60 deg - No Ice		19.05	-11.08	-1298.27	-2239.44	0.97
Wind 90 deg - No Ice		31.00	0.03	6.47	-3302.88	0.69
Wind 120 deg - No Ice		19.08	11.13	1310.72	-2241.25	0.23
Wind 150 deg - No Ice		11.03	19.24	2265.02	-1295.76	-0.30
Wind 180 deg - No Ice		0.03	22.21	2613.65	-3.52	-0.74
Wind 210 deg - No Ice		-10.98	19.22	2263.20	1289.20	-0.99
Wind 240 deg - No Ice		-19.05	11.08	1307.58	2236.02	-0.97
Wind 270 deg - No Ice		-31.00	-0.03	2.84	3299.47	-0.69
Wind 300 deg - No Ice		-19.08	-11.13	-1301.41	2237.84	-0.23
Wind 330 deg - No Ice		-11.03	-19.24	-2255.71	1292.34	0.30
Member Ice	19.77					
Total Weight Ice	99.72			10.83	-4.68	
Wind 0 deg - Ice		-0.01	-9.78	-1120.78	-4.05	0.51
Wind 30 deg - Ice		4.85	-8.46	-968.86	-566.33	0.95
Wind 60 deg - Ice		11.64	-6.75	-687.64	-1208.86	1.14
Wind 90 deg - Ice		15.84	0.01	11.46	-1562.28	1.02
Wind 120 deg - Ice		11.65	6.76	710.39	-1209.49	0.63
Wind 150 deg - Ice		4.87	8.47	991.14	-567.43	0.07
Wind 180 deg - Ice		0.01	9.78	1142.43	-5.31	-0.51
Wind 210 deg - Ice		-4.85	8.46	990.51	556.98	-0.95
Wind 240 deg - Ice		-11.64	6.75	709.30	1199.50	-1.14
Wind 270 deg - Ice		-15.84	-0.01	10.19	1552.93	-1.02
Wind 300 deg - Ice		-11.65	-6.76	-688.74	1200.14	-0.63
Wind 330 deg - Ice		-4.87	-8.47	-969.49	558.07	-0.07
Total Weight	49.54			4.65	-1.71	
Wind 0 deg - Service		-0.01	-6.87	-803.08	-1.14	0.23
Wind 30 deg - Service		3.40	-5.95	-694.59	-401.37	0.30
Wind 60 deg - Service		5.90	-3.43	-398.73	-694.50	0.30
Wind 90 deg - Service		9.60	0.01	5.22	-1023.74	0.21
Wind 120 deg - Service		5.91	3.45	409.01	-695.06	0.07
Wind 150 deg - Service		3.42	5.96	704.46	-402.34	-0.09
Wind 180 deg - Service		0.01	6.87	812.39	-2.27	-0.23
Wind 210 deg - Service		-3.40	5.95	703.89	397.95	-0.30
Wind 240 deg - Service		-5.90	3.43	408.04	691.09	-0.30
Wind 270 deg - Service		-9.60	-0.01	4.09	1020.33	-0.21
Wind 300 deg - Service		-5.91	-3.45	-399.70	691.65	-0.07
Wind 330 deg - Service		-3.42	-5.96	-695.15	398.93	0.09

Load Combinations

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

Comb. No.	Description
6	1.2 Dead+1.6 Wind 60 deg - No Ice
7	0.9 Dead+1.6 Wind 60 deg - No Ice
8	1.2 Dead+1.6 Wind 90 deg - No Ice
9	0.9 Dead+1.6 Wind 90 deg - No Ice
10	1.2 Dead+1.6 Wind 120 deg - No Ice
11	0.9 Dead+1.6 Wind 120 deg - No Ice
12	1.2 Dead+1.6 Wind 150 deg - No Ice
13	0.9 Dead+1.6 Wind 150 deg - No Ice
14	1.2 Dead+1.6 Wind 180 deg - No Ice
15	0.9 Dead+1.6 Wind 180 deg - No Ice
16	1.2 Dead+1.6 Wind 210 deg - No Ice
17	0.9 Dead+1.6 Wind 210 deg - No Ice
18	1.2 Dead+1.6 Wind 240 deg - No Ice
19	0.9 Dead+1.6 Wind 240 deg - No Ice
20	1.2 Dead+1.6 Wind 270 deg - No Ice
21	0.9 Dead+1.6 Wind 270 deg - No Ice
22	1.2 Dead+1.6 Wind 300 deg - No Ice
23	0.9 Dead+1.6 Wind 300 deg - No Ice
24	1.2 Dead+1.6 Wind 330 deg - No Ice
25	0.9 Dead+1.6 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	176 - 130.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-36.83	5.25	-14.88
			Max. Mx	20	-12.95	452.51	-6.74
			Max. My	14	-13.14	3.28	-454.01
			Max. Vy	8	18.05	-448.12	-3.66
			Max. Vx	14	17.98	3.28	-454.01
			Max. Torque	22			7.60
L2	130.75 - 86.12	Pole	Max Tension	1	0.00	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Compression	26	-62.76	-5.49	-14.43
			Max. Mx	8	-24.66	-1560.48	-4.65
			Max. My	14	-25.30	-0.81	-1461.31
			Max. Vy	8	33.43	-1560.48	-4.65
			Max. Vx	14	28.14	-0.81	-1461.31
			Max. Torque	22			6.53
L3	86.12 - 43	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-83.56	-5.73	-15.08
			Max. Mx	8	-38.42	-3183.65	-6.75
			Max. My	14	-39.05	-2.82	-2719.12
			Max. Vy	8	44.11	-3183.65	-6.75
			Max. Vx	14	31.84	-2.82	-2719.12
			Max. Torque	18			2.04
L4	43 - 1	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-112.00	-5.66	-15.00
			Max. Mx	8	-59.50	-5508.54	-9.02
			Max. My	14	-59.52	-5.08	-4373.99
			Max. Vy	8	49.66	-5508.54	-9.02
			Max. Vx	14	35.57	-5.08	-4373.99
			Max. Torque	4			-1.94

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	30	112.00	-15.84	-0.01
	Max. H_x	20	59.54	49.61	0.05
	Max. H_z	3	44.66	0.05	35.53
	Max. M_x	2	4361.78	0.05	35.53
	Max. M_z	8	5508.54	-49.61	-0.05
	Max. Torsion	16	1.79	17.57	-30.75
	Min. Vert	19	44.66	30.48	-17.72
	Min. H_x	8	59.54	-49.61	-0.05
	Min. H_z	15	44.66	-0.05	-35.53
	Min. M_x	14	-4373.99	-0.05	-35.53
	Min. M_z	20	-5504.21	49.61	0.05
	Min. Torsion	4	-1.79	-17.57	30.75

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	49.62	0.00	0.00	4.96	-1.75	-0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	59.54	-0.05	-35.53	-4361.78	0.73	1.34
0.9 Dead+1.6 Wind 0 deg - No Ice	44.66	-0.05	-35.53	-4311.39	1.30	1.30
1.2 Dead+1.6 Wind 30 deg - No Ice	59.54	17.57	-30.75	-3775.16	-2163.56	1.79
0.9 Dead+1.6 Wind 30 deg - No Ice	44.66	17.57	-30.75	-3731.74	-2137.20	1.74

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
1.2 Dead+1.6 Wind 60 deg - No Ice	59.54	30.48	-17.72	-2175.35	-3748.74	1.77
0.9 Dead+1.6 Wind 60 deg - No Ice	44.66	30.48	-17.72	-2150.97	-3703.50	1.71
1.2 Dead+1.6 Wind 90 deg - No Ice	59.54	49.61	0.05	9.02	-5508.54	1.29
0.9 Dead+1.6 Wind 90 deg - No Ice	44.66	49.61	0.05	7.38	-5447.24	1.23
1.2 Dead+1.6 Wind 120 deg - No Ice	59.54	30.52	17.80	2192.61	-3751.64	0.43
0.9 Dead+1.6 Wind 120 deg - No Ice	44.66	30.52	17.80	2164.96	-3706.41	0.41
1.2 Dead+1.6 Wind 150 deg - No Ice	59.54	17.65	30.79	3790.28	-2168.58	-0.52
0.9 Dead+1.6 Wind 150 deg - No Ice	44.66	17.65	30.79	3743.59	-2142.23	-0.52
1.2 Dead+1.6 Wind 180 deg - No Ice	59.54	0.05	35.53	4373.99	-5.08	-1.34
0.9 Dead+1.6 Wind 180 deg - No Ice	44.66	0.05	35.53	4320.32	-4.52	-1.30
1.2 Dead+1.6 Wind 210 deg - No Ice	59.54	-17.57	30.75	3787.38	2159.19	-1.79
0.9 Dead+1.6 Wind 210 deg - No Ice	44.66	-17.57	30.75	3740.68	2133.97	-1.73
1.2 Dead+1.6 Wind 240 deg - No Ice	59.54	-30.48	17.72	2187.59	3744.39	-1.77
0.9 Dead+1.6 Wind 240 deg - No Ice	44.66	-30.48	17.72	2159.93	3700.28	-1.71
1.2 Dead+1.6 Wind 270 deg - No Ice	59.54	-49.61	-0.05	3.20	5504.21	-1.29
0.9 Dead+1.6 Wind 270 deg - No Ice	44.66	-49.61	-0.05	1.56	5444.04	-1.23
1.2 Dead+1.6 Wind 300 deg - No Ice	59.54	-30.52	-17.80	-2180.39	3747.32	-0.44
0.9 Dead+1.6 Wind 300 deg - No Ice	44.66	-30.52	-17.80	-2156.02	3703.21	-0.41
1.2 Dead+1.6 Wind 330 deg - No Ice	59.54	-17.65	-30.79	-3778.08	2164.25	0.52
0.9 Dead+1.6 Wind 330 deg - No Ice	44.66	-17.65	-30.79	-3734.66	2139.02	0.51
1.2 Dead+1.0 Ice+1.0 Temp	112.00	0.00	0.00	15.00	-5.66	-0.01
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	112.00	-0.01	-9.78	-1253.11	-5.10	0.61
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	112.00	4.85	-8.46	-1082.93	-635.34	1.14
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	112.00	11.64	-6.75	-761.48	-1344.58	1.39
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	112.00	15.84	0.01	15.78	-1730.88	1.26
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	112.00	11.65	6.76	792.87	-1345.21	0.76
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	112.00	4.87	8.47	1113.87	-636.43	0.08
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	112.00	0.01	9.78	1283.42	-6.35	-0.62
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	112.00	-4.85	8.46	1113.25	623.89	-1.15
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	112.00	-11.64	6.75	791.79	1333.12	-1.40
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	112.00	-15.84	-0.01	14.52	1719.43	-1.27

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	112.00	-11.65	-6.76	-762.56	1333.75	-0.78
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	112.00	-4.87	-8.47	-1083.55	624.97	-0.09
Dead+Wind 0 deg - Service	49.62	-0.01	-6.87	-834.60	-1.23	0.25
Dead+Wind 30 deg - Service	49.62	3.40	-5.95	-721.83	-417.27	0.34
Dead+Wind 60 deg - Service	49.62	5.90	-3.43	-414.29	-721.99	0.34
Dead+Wind 90 deg - Service	49.62	9.60	0.01	5.62	-1061.17	0.25
Dead+Wind 120 deg - Service	49.62	5.91	3.45	425.37	-722.55	0.09
Dead+Wind 150 deg - Service	49.62	3.42	5.96	732.50	-418.25	-0.10
Dead+Wind 180 deg - Service	49.62	0.01	6.87	844.72	-2.35	-0.25
Dead+Wind 210 deg - Service	49.62	-3.40	5.95	731.94	413.70	-0.34
Dead+Wind 240 deg - Service	49.62	-5.90	3.43	424.40	718.42	-0.34
Dead+Wind 270 deg - Service	49.62	-9.60	-0.01	4.49	1057.60	-0.25
Dead+Wind 300 deg - Service	49.62	-5.91	-3.45	-415.26	718.98	-0.09
Dead+Wind 330 deg - Service	49.62	-3.42	-5.96	-722.39	414.67	0.10

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-49.62	0.00	0.00	49.62	-0.00	0.000%
2	-0.05	-59.54	-35.53	0.05	59.54	35.53	0.000%
3	-0.05	-44.66	-35.53	0.05	44.66	35.53	0.000%
4	17.57	-59.54	-30.75	-17.57	59.54	30.75	0.000%
5	17.57	-44.66	-30.75	-17.57	44.66	30.75	0.000%
6	30.48	-59.54	-17.72	-30.48	59.54	17.72	0.000%
7	30.48	-44.66	-17.72	-30.48	44.66	17.72	0.000%
8	49.61	-59.54	0.05	-49.61	59.54	-0.05	0.000%
9	49.61	-44.66	0.05	-49.61	44.66	-0.05	0.000%
10	30.52	-59.54	17.80	-30.52	59.54	-17.80	0.000%
11	30.52	-44.66	17.80	-30.52	44.66	-17.80	0.000%
12	17.65	-59.54	30.79	-17.65	59.54	-30.79	0.000%
13	17.65	-44.66	30.79	-17.65	44.66	-30.79	0.000%
14	0.05	-59.54	35.53	-0.05	59.54	-35.53	0.000%
15	0.05	-44.66	35.53	-0.05	44.66	-35.53	0.000%
16	-17.57	-59.54	30.75	17.57	59.54	-30.75	0.000%
17	-17.57	-44.66	30.75	17.57	44.66	-30.75	0.000%
18	-30.48	-59.54	17.72	30.48	59.54	-17.72	0.000%
19	-30.48	-44.66	17.72	30.48	44.66	-17.72	0.000%
20	-49.61	-59.54	-0.05	49.61	59.54	0.05	0.000%
21	-49.61	-44.66	-0.05	49.61	44.66	0.05	0.000%
22	-30.52	-59.54	-17.80	30.52	59.54	17.80	0.000%
23	-30.52	-44.66	-17.80	30.52	44.66	17.80	0.000%
24	-17.65	-59.54	-30.79	17.65	59.54	30.79	0.000%
25	-17.65	-44.66	-30.79	17.65	44.66	30.79	0.000%
26	0.00	-112.00	0.00	-0.00	112.00	-0.00	0.000%
27	-0.01	-112.00	-9.78	0.01	112.00	9.78	0.000%
28	4.85	-112.00	-8.46	-4.85	112.00	8.46	0.000%
29	11.64	-112.00	-6.75	-11.64	112.00	6.75	0.000%
30	15.84	-112.00	0.01	-15.84	112.00	-0.01	0.000%
31	11.65	-112.00	6.76	-11.65	112.00	-6.76	0.000%
32	4.87	-112.00	8.47	-4.87	112.00	-8.47	0.000%
33	0.01	-112.00	9.78	-0.01	112.00	-9.78	0.000%
34	-4.85	-112.00	8.46	4.85	112.00	-8.46	0.000%
35	-11.64	-112.00	6.75	11.64	112.00	-6.75	0.000%
36	-15.84	-112.00	-0.01	15.84	112.00	0.01	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
37	-11.65	-112.00	-6.76	11.65	112.00	6.76	0.000%
38	-4.87	-112.00	-8.47	4.87	112.00	8.47	0.000%
39	-0.01	-49.62	-6.87	0.01	49.62	6.87	0.000%
40	3.40	-49.62	-5.95	-3.40	49.62	5.95	0.000%
41	5.90	-49.62	-3.43	-5.90	49.62	3.43	0.000%
42	9.60	-49.62	0.01	-9.60	49.62	-0.01	0.000%
43	5.91	-49.62	3.45	-5.91	49.62	-3.45	0.000%
44	3.42	-49.62	5.96	-3.42	49.62	-5.96	0.000%
45	0.01	-49.62	6.87	-0.01	49.62	-6.87	0.000%
46	-3.40	-49.62	5.95	3.40	49.62	-5.95	0.000%
47	-5.90	-49.62	3.43	5.90	49.62	-3.43	0.000%
48	-9.60	-49.62	-0.01	9.60	49.62	0.01	0.000%
49	-5.91	-49.62	-3.45	5.91	49.62	3.45	0.000%
50	-3.42	-49.62	-5.96	3.42	49.62	5.96	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	5	0.00000001	0.00005968
3	Yes	4	0.00000001	0.00069521
4	Yes	6	0.00000001	0.00008554
5	Yes	5	0.00000001	0.00067989
6	Yes	6	0.00000001	0.00008192
7	Yes	5	0.00000001	0.00065201
8	Yes	5	0.00000001	0.00012027
9	Yes	5	0.00000001	0.00005173
10	Yes	6	0.00000001	0.00008844
11	Yes	5	0.00000001	0.00070225
12	Yes	6	0.00000001	0.00008331
13	Yes	5	0.00000001	0.00066035
14	Yes	5	0.00000001	0.00006116
15	Yes	4	0.00000001	0.00071088
16	Yes	6	0.00000001	0.00008393
17	Yes	5	0.00000001	0.00066656
18	Yes	6	0.00000001	0.00008758
19	Yes	5	0.00000001	0.00069552
20	Yes	5	0.00000001	0.00011999
21	Yes	5	0.00000001	0.00005160
22	Yes	6	0.00000001	0.00008122
23	Yes	5	0.00000001	0.00064644
24	Yes	6	0.00000001	0.00008629
25	Yes	5	0.00000001	0.00068712
26	Yes	4	0.00000001	0.00016293
27	Yes	5	0.00000001	0.00074361
28	Yes	6	0.00000001	0.00015658
29	Yes	6	0.00000001	0.00018192
30	Yes	5	0.00006547	0.00093763
31	Yes	6	0.00000001	0.00020340
32	Yes	6	0.00000001	0.00016319
33	Yes	5	0.00006731	0.00078946
34	Yes	6	0.00000001	0.00016067
35	Yes	6	0.00000001	0.00020252
36	Yes	5	0.00006553	0.00093110
37	Yes	6	0.00000001	0.00018061

38	Yes	6	0.00000001	0.00015379
39	Yes	4	0.00000001	0.00006520
40	Yes	4	0.00000001	0.00026194
41	Yes	4	0.00000001	0.00022802
42	Yes	4	0.00000001	0.00011529
43	Yes	4	0.00000001	0.00030490
44	Yes	4	0.00000001	0.00025258
45	Yes	4	0.00000001	0.00006745
46	Yes	4	0.00000001	0.00025327
47	Yes	4	0.00000001	0.00029153
48	Yes	4	0.00000001	0.00011505
49	Yes	4	0.00000001	0.00022831
50	Yes	4	0.00000001	0.00027530

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	176 - 130.75	26.615	42	1.3069	0.0081
L2	135.25 - 86.12	15.942	42	1.1371	0.0023
L3	91.87 - 43	7.163	42	0.7581	0.0006
L4	50 - 1	2.056	42	0.3822	0.0002

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
176.00	10' Dipole AF	42	26.615	1.3069	0.0081	54795
170.00	Valmont T-Arm (3)	42	24.978	1.2877	0.0071	45662
162.00	MF-900B	42	22.811	1.2607	0.0058	19569
160.00	LNX-6515DS-VTM	42	22.274	1.2539	0.0055	17123
150.00	VHLP2.5-180	42	19.634	1.2154	0.0040	10537
146.00	MF-900B	42	18.605	1.1971	0.0035	9132
131.00	Custom Standoff Mount	42	14.939	1.1083	0.0019	6730
130.50	Custom Standoff Mount	42	14.823	1.1047	0.0019	6731
130.00	10' Dipole AF	42	14.707	1.1011	0.0019	6732
114.00	(2) LPA-70063-6CF-EDIN-X	42	11.229	0.9688	0.0010	6746
100.00	MF-900B	42	8.553	0.8366	0.0007	6569
61.00	GPS	42	3.047	0.4758	0.0003	5659
56.00	GPS	42	2.564	0.4328	0.0003	5552
51.00	GPS	42	2.135	0.3906	0.0002	5507
46.00	GPS	42	1.761	0.3492	0.0002	5913
41.00	GPS	42	1.438	0.3085	0.0002	6651
36.00	GPS	42	1.159	0.2685	0.0001	7601
31.00	GPS	42	0.920	0.2290	0.0001	8868
26.00	GPS	42	0.715	0.1901	0.0001	10642
21.00	GPS	42	0.538	0.1516	0.0001	13302
16.00	GPS	42	0.384	0.1134	0.0000	17736
11.00	GPS	42	0.247	0.0755	0.0000	26605
6.00	GPS	42	0.120	0.0377	0.0000	53209
1.00	GPS	0	0.000	0.0000	0.0000	53209

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	176 - 130.75	138.309	8	6.8024	0.0424
L2	135.25 - 86.12	82.768	8	5.9154	0.0120
L3	91.87 - 43	37.192	8	3.9383	0.0033
L4	50 - 1	10.677	8	1.9854	0.0011

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
176.00	10' Dipole AF	8	138.309	6.8024	0.0424	11295
170.00	Valmont T-Arm (3)	8	129.787	6.7060	0.0372	9413
162.00	MF-900B	8	118.503	6.5695	0.0304	4032
160.00	LNX-6515DS-VTM	8	115.707	6.5334	0.0288	3528
150.00	VHLP2.5-180	8	101.967	6.3282	0.0210	2168
146.00	MF-900B	8	96.613	6.2314	0.0182	1878
131.00	Custom Standoff Mount	8	77.553	5.7641	0.0102	1373
130.50	Custom Standoff Mount	8	76.950	5.7454	0.0100	1372
130.00	10' Dipole AF	8	76.349	5.7264	0.0098	1372
114.00	(2) LPA-70063-6CF-EDIN-X	8	58.290	5.0351	0.0052	1324
100.00	MF-900B	8	44.406	4.3465	0.0038	1278
61.00	GPS	8	15.823	2.4714	0.0017	1093
56.00	GPS	8	13.316	2.2480	0.0014	1072
51.00	GPS	8	11.089	2.0288	0.0012	1062
46.00	GPS	8	9.145	1.8137	0.0010	1139
41.00	GPS	8	7.465	1.6024	0.0008	1281
36.00	GPS	8	6.019	1.3946	0.0007	1464
31.00	GPS	8	4.778	1.1898	0.0005	1707
26.00	GPS	8	3.713	0.9876	0.0004	2049
21.00	GPS	8	2.795	0.7875	0.0003	2561
16.00	GPS	8	1.993	0.5891	0.0002	3414
11.00	GPS	8	1.280	0.3920	0.0002	5121
6.00	GPS	8	0.625	0.1958	0.0001	10241
1.00	GPS	0	0.000	0.0000	0.0000	10241

Base Plate Design Data

Plate Thickness in	Number of Anchor Bolts	Anchor Bolt Size in	Actual Allowable Ratio Bolt Tension K	Actual Allowable Ratio Bolt Compression K	Actual Allowable Ratio Plate Stress ksi	Actual Allowable Ratio Stiffener Stress ksi	Controlling Condition	Ratio
2.0000	18	2.2500	203.36 223.65 0.91	209.97 371.27 0.57	35.569 58.500 0.61	37.082 58.500 0.63	Bolt T	0.91 ✔

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
L1	176 - 130.75 (1)	TP31.8x21x0.25	45.25	0.00	0.0	24.1827	-13.14	1698.25	0.008
L2	130.75 - 86.12 (2)	TP41.82x30.226x0.3125	49.13	0.00	0.0	39.8244	-24.66	2747.89	0.009
L3	86.12 - 43 (3)	TP51.36x39.8381x0.375	48.87	0.00	0.0	58.7205	-38.42	4018.07	0.010
L4	43 - 1 (4)	TP60.5x48.9596x0.4375	49.00	0.00	0.0	83.4043	-59.50	5618.13	0.011

Pole Bending Design Data

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	176 - 130.75 (1)	TP31.8x21x0.25	455.22	1063.91	0.428	0.00	1063.91	0.000
L2	130.75 - 86.12 (2)	TP41.82x30.226x0.3125	1560.48	2268.91	0.688	0.00	2268.91	0.000
L3	86.12 - 43 (3)	TP51.36x39.8381x0.375	3183.66	4077.31	0.781	0.00	4077.31	0.000
L4	43 - 1 (4)	TP60.5x48.9596x0.4375	5508.55	6942.81	0.793	0.00	6942.81	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	176 - 130.75 (1)	TP31.8x21x0.25	18.01	849.12	0.021	1.64	2130.42	0.001
L2	130.75 - 86.12 (2)	TP41.82x30.226x0.3125	33.43	1373.95	0.024	1.52	4543.37	0.000
L3	86.12 - 43 (3)	TP51.36x39.8381x0.375	44.11	2009.04	0.022	1.48	8164.59	0.000
L4	43 - 1 (4)	TP60.5x48.9596x0.4375	49.66	2809.06	0.018	1.29	13902.58	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria

Section No.	Elevation ft	Ratio P_u / ϕP_n	Ratio M_{ux} / ϕM_{nx}	Ratio M_{uy} / ϕM_{ny}	Ratio V_u / ϕV_n	Ratio T_u / ϕT_n	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	176 - 130.75 (1)	0.008	0.428	0.000	0.021	0.001	0.436 ✔	1.000	4.8.2 ✔
L2	130.75 - 86.12 (2)	0.009	0.688	0.000	0.024	0.000	0.697 ✔	1.000	4.8.2 ✔
L3	86.12 - 43 (3)	0.010	0.781	0.000	0.022	0.000	0.791 ✔	1.000	4.8.2 ✔
L4	43 - 1 (4)	0.011	0.793	0.000	0.018	0.000	0.804 ✔	1.000	4.8.2 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	176 - 130.75	Pole	TP31.8x21x0.25	1	-13.14	1698.25	43.6	Pass
L2	130.75 - 86.12	Pole	TP41.82x30.226x0.3125	2	-24.66	2747.89	69.7	Pass
L3	86.12 - 43	Pole	TP51.36x39.8381x0.375	3	-38.42	4018.07	79.1	Pass
L4	43 - 1	Pole	TP60.5x48.9596x0.4375	4	-59.50	5618.13	80.4	Pass
							Summary	
						Pole (L4)	80.4	Pass
						Base Plate	90.9	Pass
						RATING =	**90.9**	**Pass**