EMPIRE telecom
A QualTek Company

March 16, 2017

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

RE: AT&T Wireless Modifications to Telecommunication Facility –
975 Mix Avenue, Hamden, CT 06514 (aka 905 Mix Ave.)

Dear Ms. Bachman:

Enclosed please find an original and two copies of the following documents:

- Notice of Exempt Modification;
- Drawings of the proposal;
- The narrative portion of two structural Reports (1 failing and 1 passing with remedial measures);
- An RF emissions reports;
- A Parcel Map and owner identification; and
- Notification letters to the municipality, to Planning & Zoning, and the property and tower owner.

Also enclosed is a check in the amount of six hundred twenty five ($625.00) for the filing fee.

Please note that the CSC database, AT&T's database and prior approvals list the site address as 975 Mix Avenue. However, the Hamden GIS database lists this property as 905 Mix Avenue; this GIS address is listed on the enclosed Parcel Map and Owner identification documents. An attempt to obtain GIS information for 975 Mix Avenue yielded no results; a copy of this print-out document is also enclosed. I have accordingly added "aka 905 Mix Ave." to the subject line of the enclosed letters.

I have submitted electronic copies of these documents via email to the CSC today. 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
443-286-4006
jandrews@empiretelecomm.com

Enclosures

EMPIRE telecom
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Jack Andrews
Zoning Manager, Empire Telecom
o/b/o AT&T Wireless
10130 Donleigh Drive
Columbia, MD 21046
443-286-4007
jandrews@empiretelecomm.com

March 16, 2007

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

NOTICE OF EXEMPT MODIFICATION

975 Mix Avenue, Hamden, CT 06514 (aka 905 Mix Ave)

Lat: 41-22-42.78 (41.37855)
Long. 72-55-4.32 (-72.91786667)

Dear Ms. Bachman:

AT&T Wireless currently maintains nine (9) antennas at the 61 foot level of an existing 65 foot monopole "stub" tower located on the rooftop of a four (4) story building at 975 Mix Avenue, in Hamden, CT. The tower is owned by Chestnut Hill North, LLC. The property is owned by Chestnut Hill North, LLC. AT&T Wireless now seeks to add three (3) new Remote Radio Units ("RRU") RRUS-11, add three (3) new RRUS-E2 and add one (1) DC6 surge suppressor, at the base of the monopole, to be mounted on the existing platform. Moreover, the applicant intends to upgrade the equipment by adding a second XMU, two (2) DC cables and one (1) fiber cable to the facility. Finally, AT&T proposes to structurally reinforce the base on the monopole.

The facility was approved by the Connecticut Siting Council in EM-CING-062-160823 on September 12, 2016. Six (6) conditions were enumerated in the Council's decision: 1) any deviation from the modification as specified in the Notice and supporting documentation 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 nonfunctional antenna and associated antenna mounting equipment on this facility owned and operated by New Cingular Wireless PCS, LLC (AT&T) shall be removed within 60 days of the date the antennas ceased to function; 5) the validity of the action shall expire one year from the date of the letter; and 6) 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 Curt B. Leng, the Mayor of Hamden, as well as to Chestnut Hill North, LLC., the tower owner, to Chestnut Hill North, LLC, the property owner and to Dan Kops, the Town Planner, with the Hamden Department of Planning and Zoning.

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
443-286-4007
jandrews@empiretelecomm.com

Enclosures

cc: Honorable Curt B. Leng, Mayor of Hamden
Chestnut Hill North, LLC, Attn: Steve Lopes, as the property owner and the tower owner
Dan Kops, Town Planner, Hamden Department of Planning and Zoning.

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A QualTek Company

March 16, 2017

Dan Kops, Town Planner
Hamden Department of Planning and Zoning
Hamden Government Center
2750 Dixwell Avenue
Hamden, CT 06518

RE: AT&T Wireless Modifications to Telecommunication Facility –
975 Mix Avenue, Hamden, CT 06514 (aka 905 Mix Ave.)

Dear Mr. Kops:

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 nine (9) antennas at the 61 foot level of an existing 65 foot monopole "stub" tower located on the rooftop of a four (4) story building at 975 Mix Avenue, in Hamden, CT. The tower is owned by Chestnut Hill North, LLC. The property is owned by Chestnut Hill North, LLC.

AT&T Wireless now seeks to add three (3) new Remote Radio Units ("RRU") RRUS-11, add three (3) new RRUS-E2, and add one (1) DC6 surge suppressor, at the base of the monopole, to be mounted on the existing platform. Moreover, the applicant intends to upgrade the equipment by adding a second XMU, two (2) DC cables and one (1) fiber cable to the facility. Finally, AT&T proposes to structurally reinforce the base on the monopole.

This letter is intended to serve as the required notice to the Department of Planning and Zoning of 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).

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A QualTek Company

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 443-286-4006 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
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March 16, 2017

Honorable Curt B. Leng
Hamden Government Center
2750 Dixwell Avenue
Hamden, CT 06518

RE: AT&T Wireless Modifications to Telecommunication Facility –
975 Mix Avenue, Hamden, CT 06514 (aka 905 Mix Ave.)

Dear Mayor Leng:

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1150 First Ave
Suite 600
King of Prussia, PA 19406

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Respectfully submitted,

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

Enclosures

cc: Melanie Bachman, Connecticut Siting Council

EMPIRE telecom
A QualTek Company

March 16, 2017

Chestnut Hill North, LLC
1621 State Street
New Haven, CT 06511
Attn: Steve Lopes

RE: AT&T Wireless Modifications to Telecommunication Facility –
975 Mix Avenue, Hamden, CT 06514 (aka 905 Mix Ave.)

Dear Mr. Lopes:

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 nine (9) antennas at the 61 foot level of an existing 65 foot monopole "stub" tower located on the rooftop of a four (4) story building at 975 Mix Avenue, in Hamden, CT. The tower is owned by Chestnut Hill North, LLC. The property is owned by Chestnut Hill North, LLC.

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This letter is intended to serve as the required notice to 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).

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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

TOWN OF HAMDEN, CONNECTICUT
GEOGRAPHIC & PROPERTY INFORMATION NETWORK

2750 DIXWELL AVENUE
HAMDEN, CT 06518
203-287-2500
E-MAIL: GENERAL INFORMATION

» MAIN MENU
GIS HOME

INTERACTIVE MAPPING
HELP

PROPERTY INFO DATA UPDATED
Nightly
CURRENT PARCEL COUNT
16,800 +/-

» SUMMARY PARCEL INFORMATION & MAP DOCUMENTS

Detailed Parcel Information

Parcel No
2628-101-00-0000

Unique ID
100226

Account
100226

Owner
CHESTNUT HILL NORTH LLC

Location
905 MIX AVE

MAILING ADDRESS
1621 STATE STREET
NEW HAVEN CT 06511

Scroll Down For Complete Property Detail

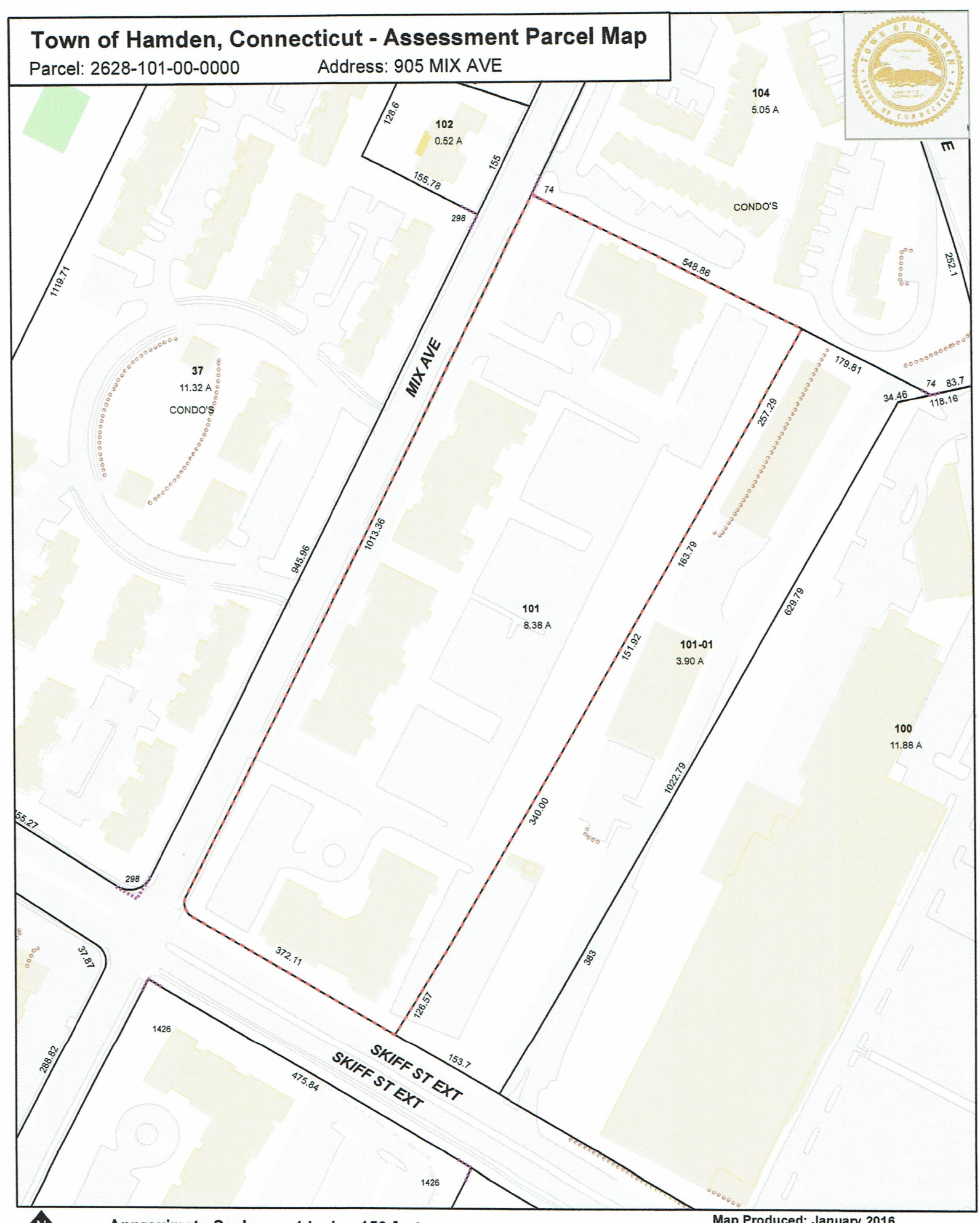
Click on the Google logo to go to Google Maps

Parcel Documents

Create Parcel Map | Property Summary Card

Town of Hamden, Connecticut - Assessment Parcel Map

Parcel: 2628-101-00-0000 Address: 905 MIX AVE



N

Approximate Scale: 1 inch = 150 feet

0 75 150 225 300 Feet

Map Produced: January 2016

Disclaimer: This map is for informational purposes only. All information is subject to verification by any user. The Town of Hamden and its mapping contractors assume no legal responsibility for the information contained herein.

TOWN OF HAMDEN, CONNECTICUT
GEOGRAPHIC & PROPERTY INFORMATION NETWORK

2750 DIXWELL AVENUE
HAMDEN, CT 06518
203-287-2500
E-MAIL: GENERAL INFORMATION

» MAIN MENU

- GIS HOME
- GIS PROPERTY MAP SEARCH
- TOWN WIDE MAP GALLERY
- TOWN GRID MAPS
- INTERACTIVE MAPPING
- HELP

PROPERTY INFO DATA UPDATED

Nightly

CURRENT PARCEL COUNT

16,800 +/-

» PROPERTY MAP DATABASE SEARCH RESULTS

Click on Parcel No. for a list of maps available for this property.

You have typed the Address 975 MIX AVE.

Back | New Search | Town of Hamden

Radio Frequency Emissions Analysis Report

AT&T Existing Facility

Site ID: CT2035

Hamden
975 Mix Avenue
Hamden, CT 6514

February 23, 2017

Centerline Communications Project Number: 950006-037

Site Compliance Summary	
Compliance Status:	**COMPLIANT**
Site total MPE% of FCC general population allowable limit:	**21.50 %**

February 23, 2017

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

Emissions Analysis for Site: **CT2035 – Hamden**

Centerline Communications, LLC ("Centerline") was directed to analyze the proposed AT&T facility located at **975 Mix Avenue, Hamden, 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 population 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 population would always be considered under this category when exposure is not employment related, for example, in the case of a telecommunications facility that exposes persons in a nearby residential area.

Population 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 **975 Mix Avenue, Hamden, 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 facility. For this report the sample point is the top of a 6-foot person standing at the base of the facility.

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
LTE	850 MHz	2	60
LTE	2300 MHz (WCS)	2	60
LTE	1900 MHz (PCS)	2	60
LTE	700 MHz	4	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, 1900 MHz (PCS) and 2300 MHz (WCS) 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 / Model	Antenna Centerline (ft)
A	1	Kathrein 800-10121	61
A	2	Quintel QS66512-2	61
A	3	CCI HPA-65R-BUU-H6	61
B	1	Kathrein 800-10121	61
B	2	Quintel QS66512-2	61
B	3	CCI HPA-65R-BUU-H6	61
C	1	Kathrein 800-10121	61
C	2	Quintel QS66512-2	61
C	3	CCI HPA-65R-BUU-H6	61

Table 2: Antenna Data

All calculations were done with respect to uncontrolled / general population 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	11.45	2	60	837.82	1.76
Antenna A2	Quintel QS66512-2	850 MHz / 2300 MHz (WCS) / 1900 MHz (PCS) / 700 MHz	11.35 / 14.85 / 13.85 / 10.85	8	480	9,674.76	14.96
Antenna A3	CCI HPA-65R-BUU-H6	700 MHz	11.95	2	120	1,880.10	4.78
						Sector A Composite MPE%	**21.50**
Antenna B1	Kathrein 800-10121	850 MHz	11.45	2	60	837.82	1.76
Antenna B2	Quintel QS66512-2	850 MHz / 2300 MHz (WCS) / 1900 MHz (PCS) / 700 MHz	11.35 / 14.85 / 13.85 / 10.85	8	480	9,674.76	14.96
Antenna B3	CCI HPA-65R-BUU-H6	700 MHz	11.95	2	120	1,880.10	4.78
						Sector B Composite MPE%	**21.50**
Antenna C1	Kathrein 800-10121	850 MHz	11.45	2	60	837.82	1.76
Antenna C2	Quintel QS66512-2	850 MHz / 2300 MHz (WCS) / 1900 MHz (PCS) / 700 MHz	11.35 / 14.85 / 13.85 / 10.85	8	480	9,674.76	14.96
Antenna C3	CCI HPA-65R-BUU-H6	700 MHz	11.95	2	120	1,880.10	4.78
						Sector C Composite MPE%	**21.50**

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	**21.50 %**
No Additional Carriers Located at This Facility	NA
Site Total MPE %:	**21.50 %**

Table 4: All Carrier MPE Contributions

AT&T Sector A Total:	21.50 %
AT&T Sector B Total:	21.50 %
AT&T Sector C Total:	21.50 %
Site Total:	21.50 %

Table 5: Site MPE Summary

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. *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 (All Sectors)	# 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	61	9.96	850 MHz	567	1.76%
AT&T 850 MHz LTE	2	818.75	61	19.46	850 MHz	567	3.43%
AT&T 2300 MHz (WCS) LTE	2	1,832.95	61	43.57	2300 MHz (WCS)	1000	4.36%
AT&T 1900 MHz (PCS) LTE	2	1,455.97	61	34.61	1900 MHz (PCS)	1000	3.46%
AT&T 700 MHz LTE	2	729.71	61	17.34	700 MHz	467	3.71%
AT&T 700 MHz LTE	2	940.05	61	22.34	700 MHz	467	4.78%
						Total:	21.50%

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 population 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 population exposure to RF Emissions are shown here:

AT&T Sector	Power Density Value (%)
Sector A:	21.50 %
Sector B:	21.50 %
Sector C:	21.50 %
AT&T Maximum Total (per sector):	21.50 %
Site Total:	21.50 %
Site Compliance Status:	**COMPLIANT**

The anticipated composite MPE value for this site assuming all carriers present is **21.50 %** of the allowable FCC established general population 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: HAMDEN
PROJECT: LTE MULTICARRIER ADD
FA NUMBER: 10035036
SITE NUMBER: CT2035
975 MIX AVENUE
HAMDEN, CT 06514
NEW HAVEN 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

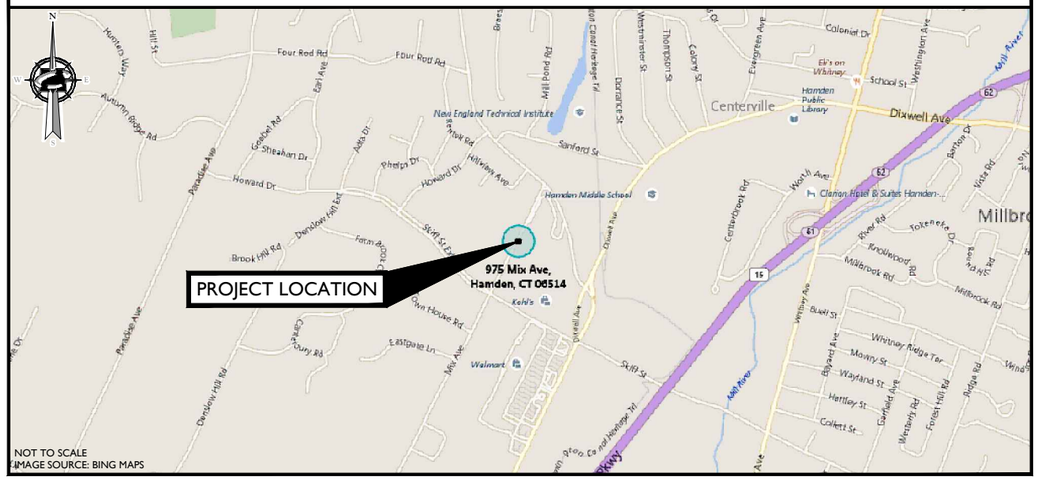
at&t

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

PROPERTY OWNER:

NAME:	TBD
ADDRESS:	975 MIX AVENUE
CITY, STATE, ZIP:	HAMDEN, CT 06514
LATITUDE:	41.37852° N
LONGITUDE:	72.9179161° 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



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 UI-91 S. AT EXIT 17, TAKE RAMP RIGHT FOR CT-15 SOUTH TOWARD E. MAIN ST / W. CROSS PKWY. AT EXIT 62, TAKE RAMP RIGHT FOR WHITNEY AVE TOWARD HAMDEN. BEAR RIGHT ONTO WHITNEY AVE. TURN LEFT ONTO CT-10 / DIXWELL AVE. TURN RIGHT ONTO SKIFF ST. TURN RIGHT ONTO MIX AVE. IN 0.2 MILES ARRIVE AT SITE.

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	PARTIAL ROOF PLAN AND EQUIPMENT PLAN
A-2	ELEVATION VIEW AND ANTENNA SCHEDULE
A-3	ANTENNA LAYOUTS
A-4	DETAILS
A-5	DETAILS
A-6	RF PLUMBING DIAGRAMS
G-1	GROUNDING DETAILS
S-1	STRUCTURAL DETAILS AND NOTES

PROJECT DESCRIPTION/SCOPE OF WORK

THIS PROJECT WILL BE COMPRISED OF:

- ADD (3) NEW RRUS-11
- ADD (3) NEW RRUS-E2
- ADD SECOND XMU
- ADD (1) DC6
- ADD (2) DC CABLES
- ADD (1) FIBER CABLE

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FOR STATE SPECIFIC DIRECT PHONE NUMBERS VISIT:
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SCALE :	JOB NUMBER :
AS SHOWN	16963030A

REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY
0	02/09/17	FOR CONSTRUCTION	GP	FEP
1	01/13/17	ISSUED FOR REVIEW	AF	RA

STATE OF CONNECTICUT
FRANK E. AZDEN
10
LICENSED
PROFESSIONAL ENGINEER

FRANK E. AZDEN
CONNECTICUT PROFESSIONAL ENGINEER - LICENSE NUMBER: PEN.0029

SITE NAME:

HAMDEN
CT2035

975 MIX AVENUE
HAMDEN, CT 06514
NEW HAVEN 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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REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY
0	02/09/17	FOR CONSTRUCTION	GP	FEP
1	01/13/17	ISSUED FOR REVIEW	AF	RA

STATE OF CONNECTICUT — FRANK E. FAZDEN — LICENSED PROFESSIONAL ENGINEER

FRANK E. FAZDEN
CONNECTICUT PROFESSIONAL
ENGINEER - LICENSE NUMBER: PEN.28[illegible]

SITE NAME:

HAMDEN
CT2035

975 MIX AVENUE
HAMDEN, CT 06514
NEW HAVEN COUNTY

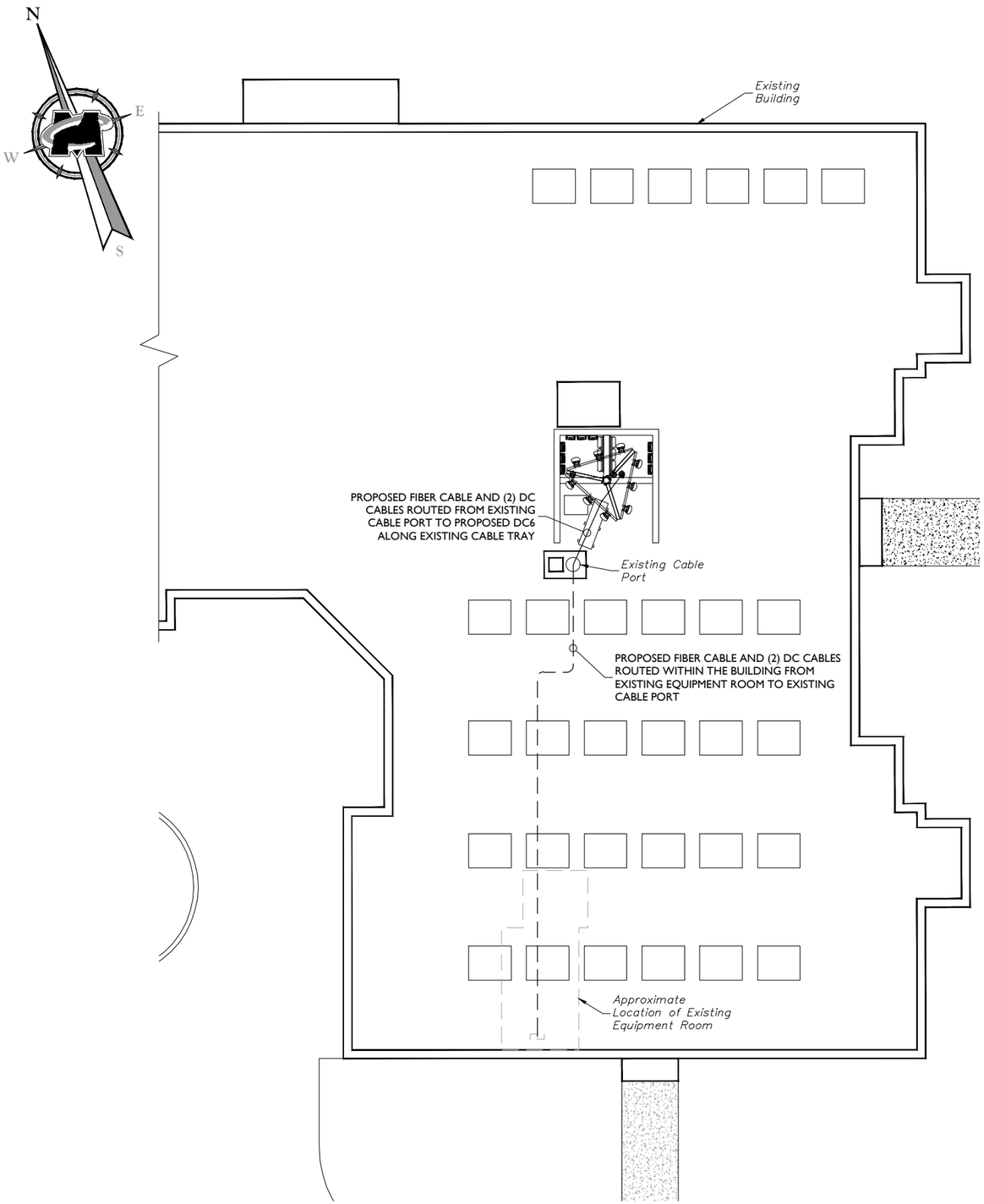
RED BANK OFFICE
331 Newman Springs Road
Suite 203
Red Bank, NJ 07701-5699
Phone: 732.383.1950
Fax: 732.383.1984

SHEET TITLE :

GENERAL NOTES

SHEET NUMBER :

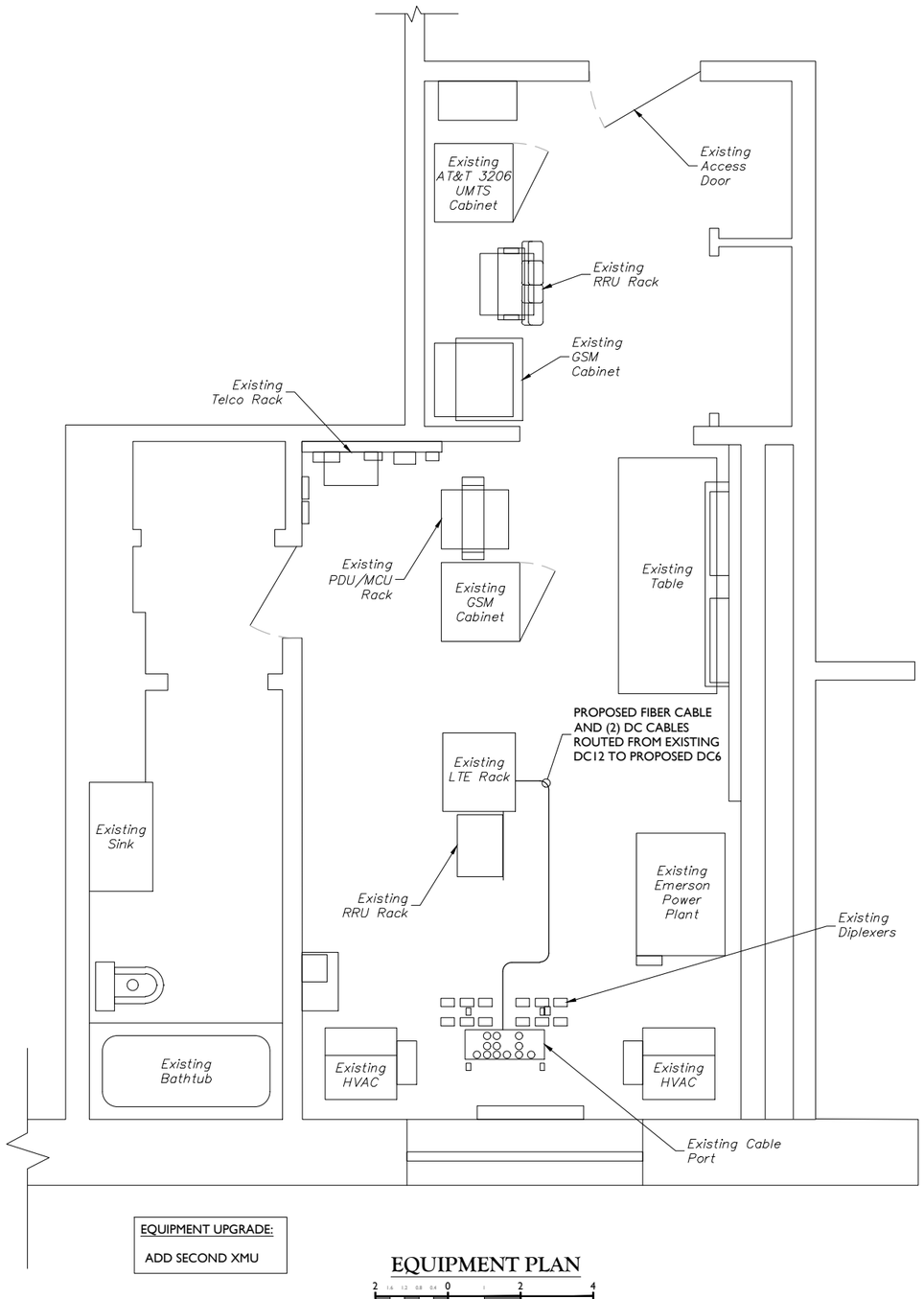
GN-1



PARTIAL ROOF PLAN

10 8 6 4 2 0 5 10 20

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



EQUIPMENT UPGRADE:

ADD SECOND XMU

EQUIPMENT PLAN

2 1.6 1.2 0.8 0.4 0 1 2 4

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

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FRANK E. PAZDEN
LICENSED PROFESSIONAL ENGINEER

FRANK E. PAZDEN
CONNECTICUT PROFESSIONAL ENGINEER - LICENSE NUMBER: PEN.0025[illegible]

SITE NAME:

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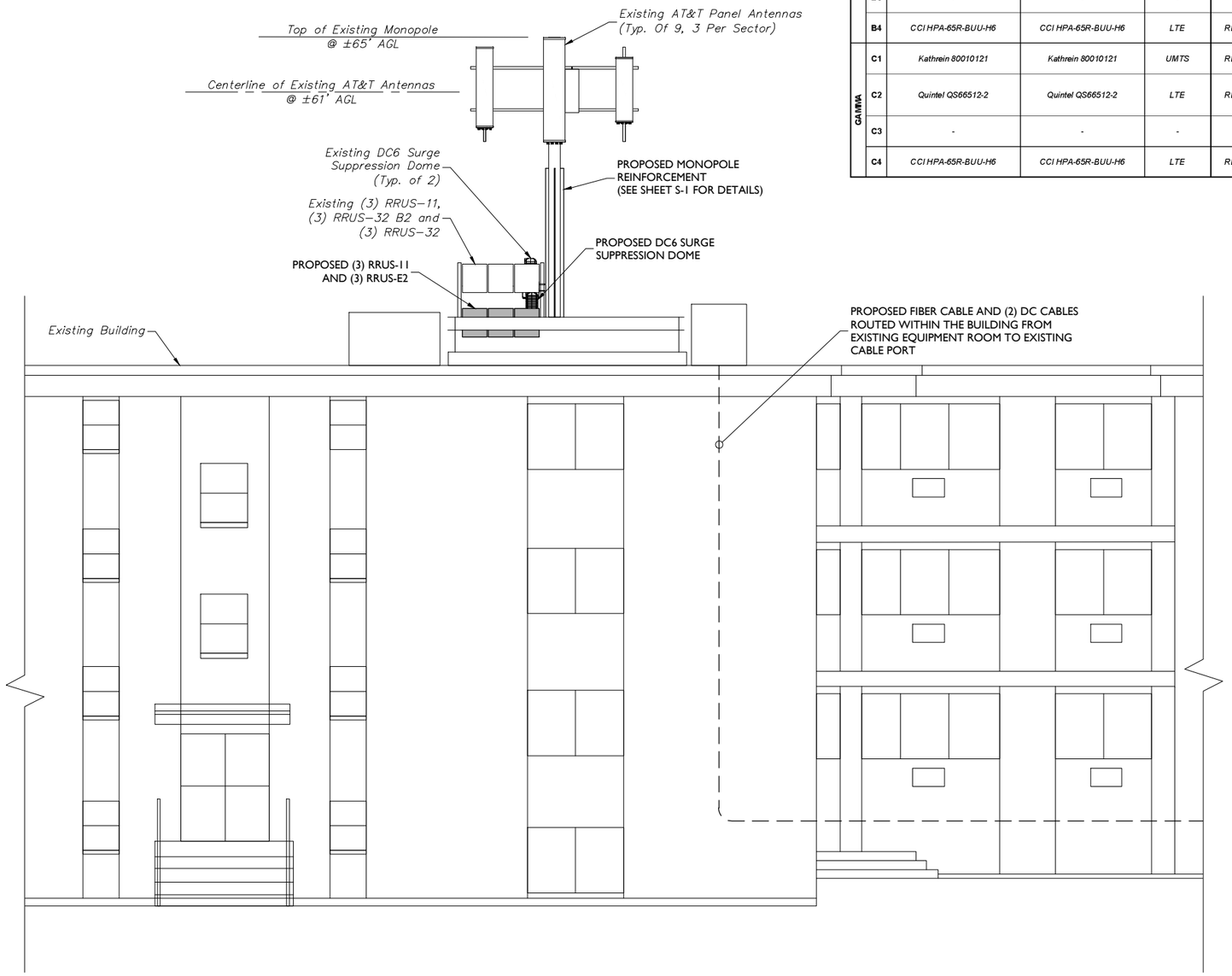
PARTIAL ROOF PLAN
AND EQUIPMENT PLAN

SHEET NUMBER :

A-1



ELEVATION VIEW

10 8 6 4 2 0 5 10 20

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. C.L. ELEV (ft.)	RRUS CONFIGURATION	STATUS
ALPHA	A1	Kathrein 80010121	Kathrein 80010121	UMTS	REMAIN	54.50	10.30	5.90	51.20	143°	61.0'	-	-
	A2	Quintel QS66512-2	Quintel QS66512-2	LTE	REMAIN	72.00	12.00	9.60	111.00	20°	61.0'	**RRUS-E2** **RRUS-11** RRUS-32 B2 RRUS-32	**NEW** **NEW** REMAIN REMAIN
	A3	-	-	-	-	-	-	-	-	-	-	-	-
	A4	CCI HPA-65R-BUU-H6	CCI HPA-65R-BUU-H6	LTE	REMAIN	72.00	14.80	9.00	60.50	20°	61.0'	RRUS-11	REMAIN
BETA	B1	Kathrein 80010121	Kathrein 80010121	UMTS	REMAIN	54.50	10.30	5.90	51.20	263°	61.0'	-	-
	B2	Quintel QS66512-2	Quintel QS66512-2	LTE	REMAIN	72.00	12.00	9.60	111.00	150°	61.0'	**RRUS-E2** **RRUS-11** RRUS-32 B2 RRUS-32	**NEW** **NEW** REMAIN REMAIN
	B3	-	-	-	-	-	-	-	-	-	-	-	-
	B4	CCI HPA-65R-BUU-H6	CCI HPA-65R-BUU-H6	LTE	REMAIN	72.00	14.80	9.00	60.50	150°	61.0'	RRUS-11	REMAIN
GAMMA	C1	Kathrein 80010121	Kathrein 80010121	UMTS	REMAIN	54.50	10.30	5.90	51.20	23°	61.0'	-	-
	C2	Quintel QS66512-2	Quintel QS66512-2	LTE	REMAIN	72.00	12.00	9.60	111.00	260°	61.0'	**RRUS-E2** **RRUS-11** RRUS-32 B2 RRUS-32	**NEW** **NEW** REMAIN REMAIN
	C3	-	-	-	-	-	-	-	-	-	-	-	-
	C4	CCI HPA-65R-BUU-H6	CCI HPA-65R-BUU-H6	LTE	REMAIN	72.00	14.80	9.00	60.50	260°	61.0'	RRUS-11	REMAIN

ANTENNA SCHEDULE

ALL PROPOSED MODIFICATION COMPONENTS SHALL BE INSTALLED PRIOR TO INSTALLATION OF ANY PROPOSED EQUIPMENT OR MODIFICATIONS TO EXISTING EQUIPMENT.

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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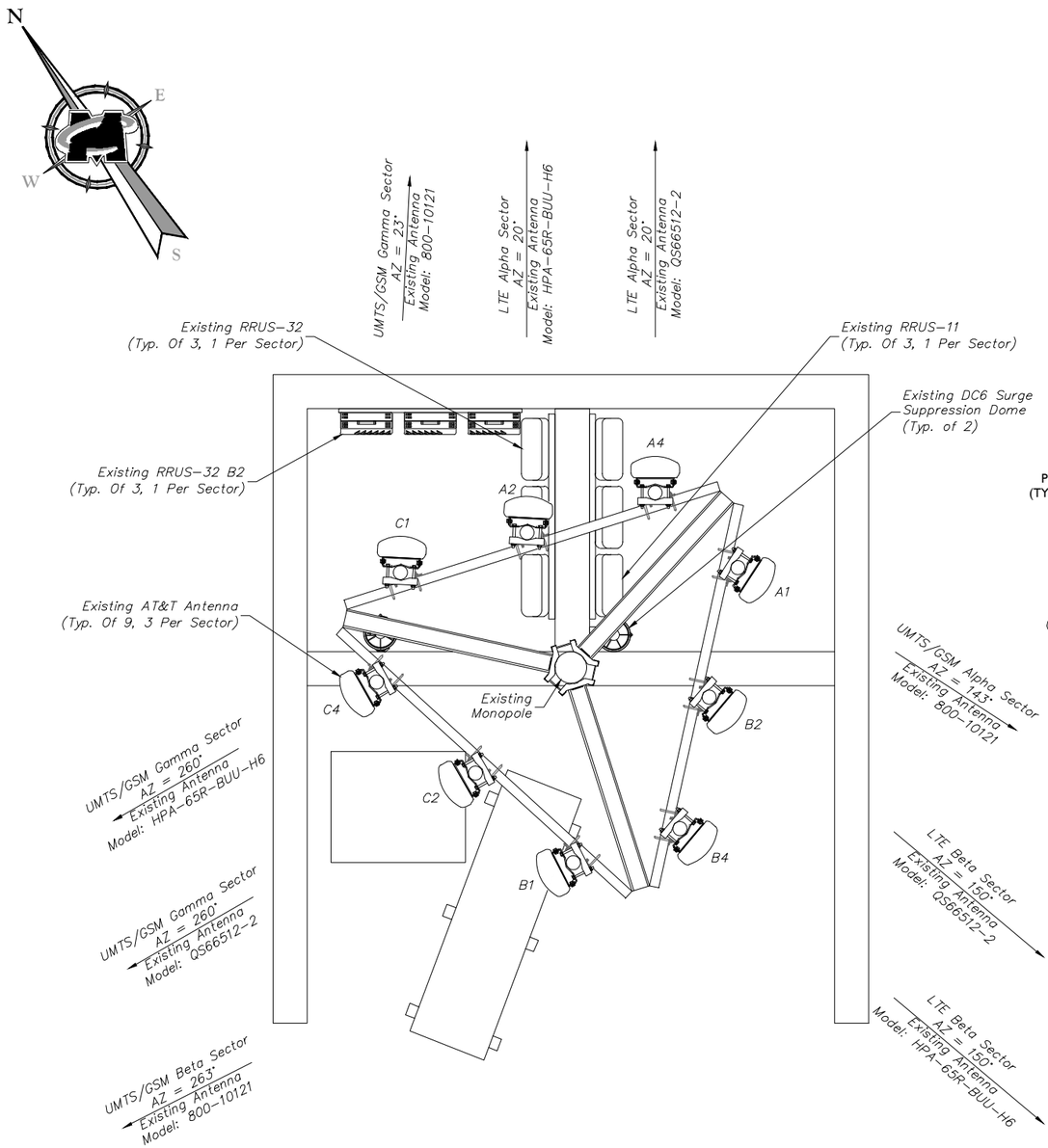
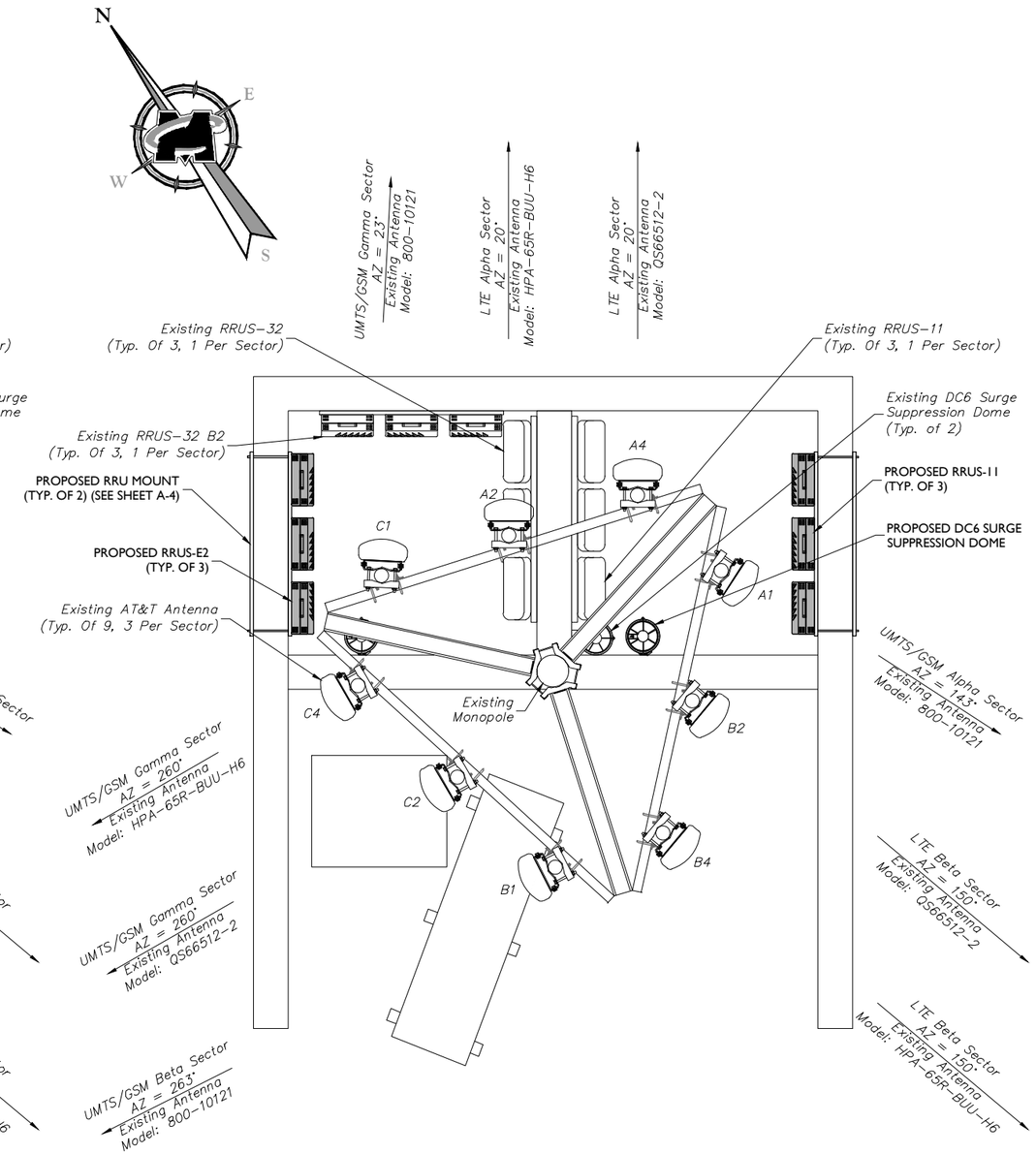
Suite 203
Red Bank, NJ 07701-5699
Phone: 732.383.1950
Fax: 732.383.1984

SHEET TITLE :
ELEVATION VIEW AND ANTENNA SCHEDULE

SHEET NUMBER :
A-2



EXISTING - ANTENNA LAYOUT
NOT TO SCALE



PROPOSED - ANTENNA LAYOUT
NOT TO SCALE

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SCALE : AS SHOWN
JOB NUMBER : 16963030A

REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY
0	02/09/17	FOR CONSTRUCTION	GP	FEP
1	01/13/17	ISSUED FOR REVIEW	AF	RA

STATE OF CONNECTICUT
FRANK E. PAZDEN
10
LICENSED PROFESSIONAL ENGINEER

FRANK E. PAZDEN
CONNECTICUT LICENSED PROFESSIONAL ENGINEER - LICENSE NUMBER: PEN.0025[illegible]

SITE NAME:

HAMDEN
CT2035

975 MIX AVENUE
HAMDEN, CT 06514
NEW HAVEN COUNTY

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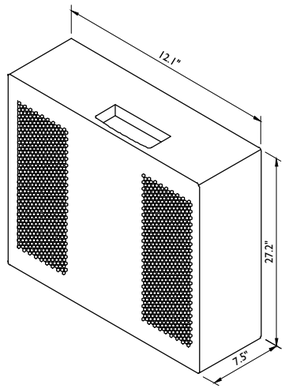
Red Bank, NJ 07701-5699
Phone: 732.383.1950
Fax: 732.383.1984

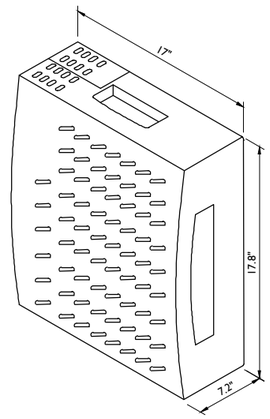
SHEET TITLE :
ANTENNA LAYOUTS

SHEET NUMBER :
A-3



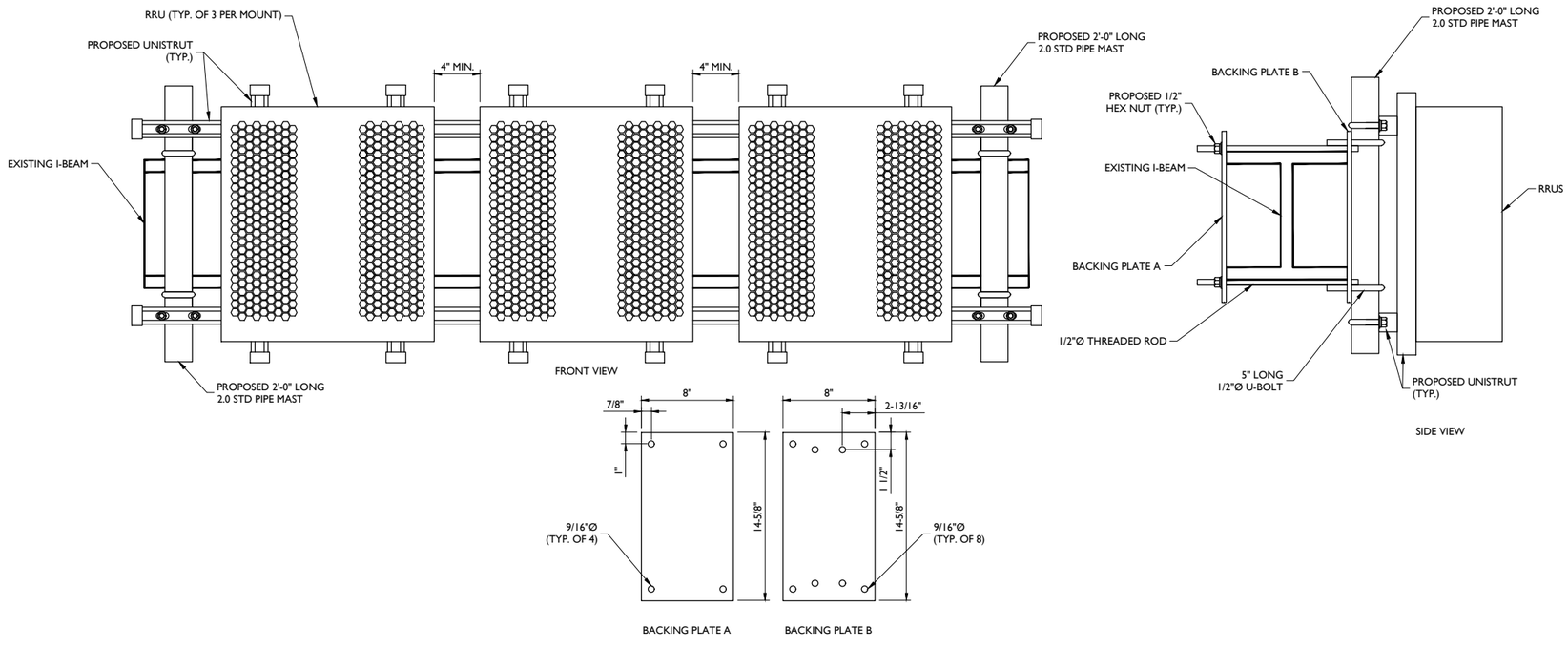
RRUS-32 B2 DIMENSIONS (H X W X D): 20.4" X 18.5" X 7.5" (INCLUDES SUNSHIELD)
WEIGHT: 60 LBS

RRUS-E2 DETAIL
NOT TO SCALE



RRUS–11 DIMENSIONS (H X W X D): 17.8" X 17" X 7.2" (INCLUDES SUNSHIELD)
WEIGHT: 55 LBS

RRUS-11 DETAIL
NOT TO SCALE



RRUS MOUNTING DETAIL

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SCALE : AS SHOWN
JOB NUMBER : 16963030A

REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY
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STATE OF CONNECTICUT — FRANK E. FAZDEN — LICENSED PROFESSIONAL ENGINEER
FRANK E. FAZDEN
CONNECTICUT PROFESSIONAL ENGINEER - LICENSE NUMBER: PEN.28181

SITE NAME:
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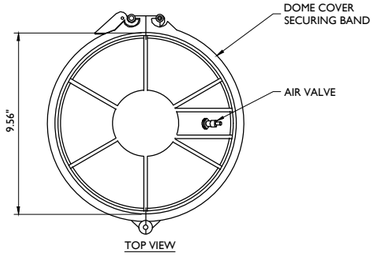
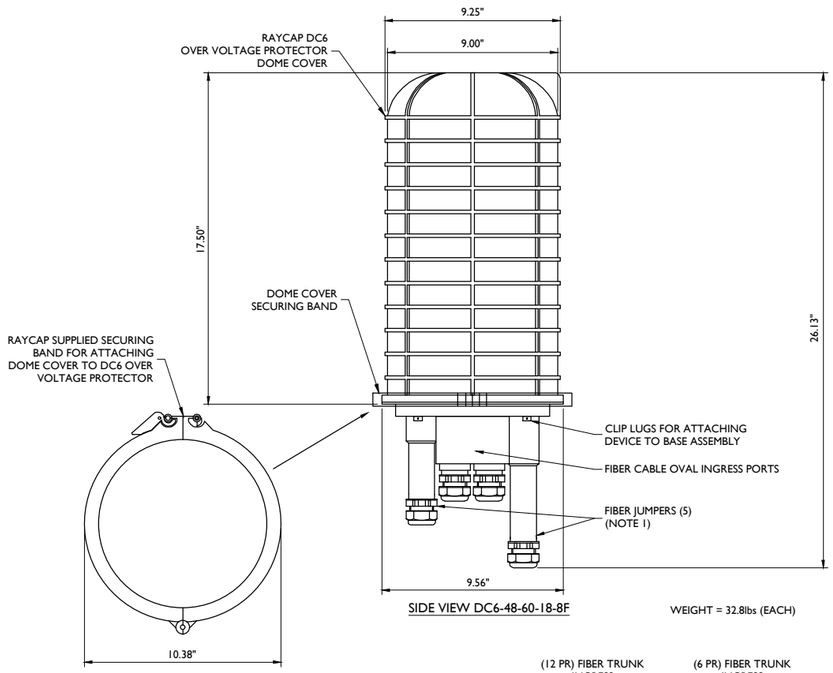
SHEET TITLE : DETAILS
SHEET NUMBER : A-4

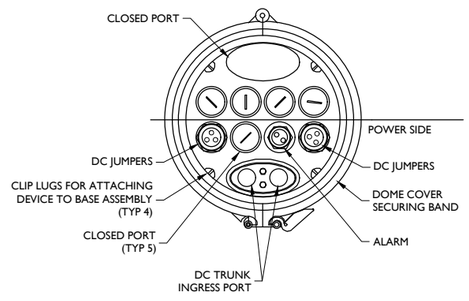


TOP VIEW

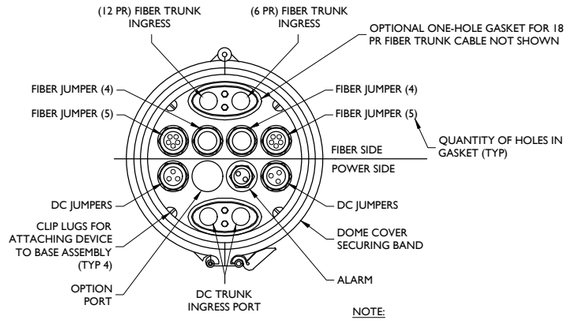


SIDE VIEW DC6-48-60-18-8F

WEIGHT = 32.8lbs (EACH)



BOTTOM VIEW
DC6-48-60-0-8F



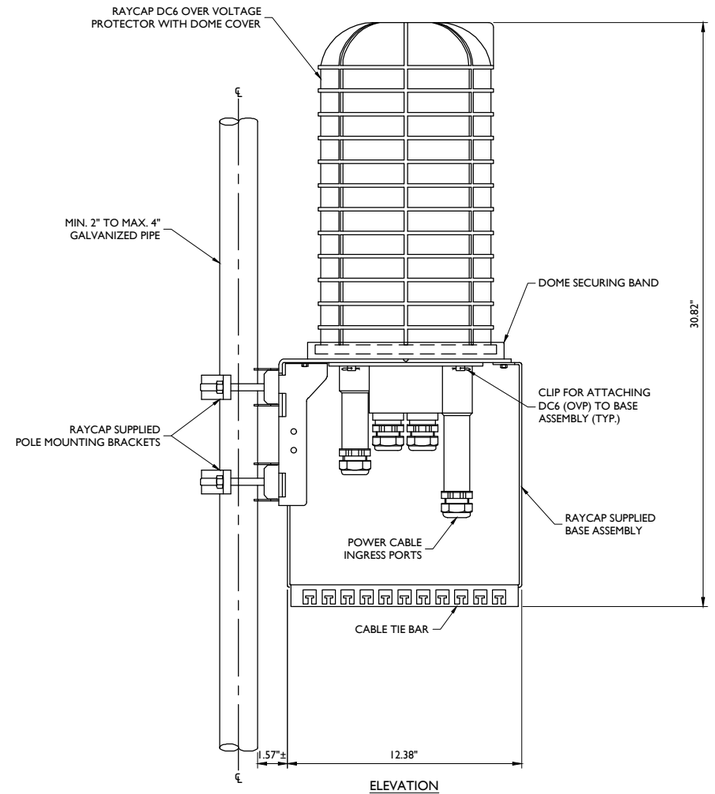
BOTTOM VIEW
DC6-48-60-18-8F

NOTE:

REMOVE CABLE SEALING GLAND AND INSTALL M32x1.5 METRIC-TO-1" NPT ADAPTER (COOPER CROUSE-HINES P/N CAP 740 994 OR EQUIVALENT MFR) WHEN CONNECTING CONDUIT TO OVP.

DC6 SURGE SUPPRESSION DOME DETAIL

NOT TO SCALE



ELEVATION

NOTES:

RAYCAP VIA AT&T SUPPLIES THE DC6 OVER VOLTAGE PROTECTOR AND PIPE MOUNTING BRACKETS. SUBCONTRACTOR SHALL SUPPLY THE PIPE.

RAYCAP DC6-48-60-18-8F & DC6-48-60-0-8F
DC POWER OVER VOLTAGE PROTECTOR (OVP)
POLE MOUNT BASE ASSEMBLY

NOT TO SCALE

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SCALE :	JOB NUMBER :
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STATE OF CONNECTICUT
FRANK E. PAZDEN
LICENSED PROFESSIONAL ENGINEER

FRANK E. PAZDEN
CONNECTICUT LICENSED PROFESSIONAL ENGINEER - LICENSE NUMBER: PEN.28111

SITE NAME:

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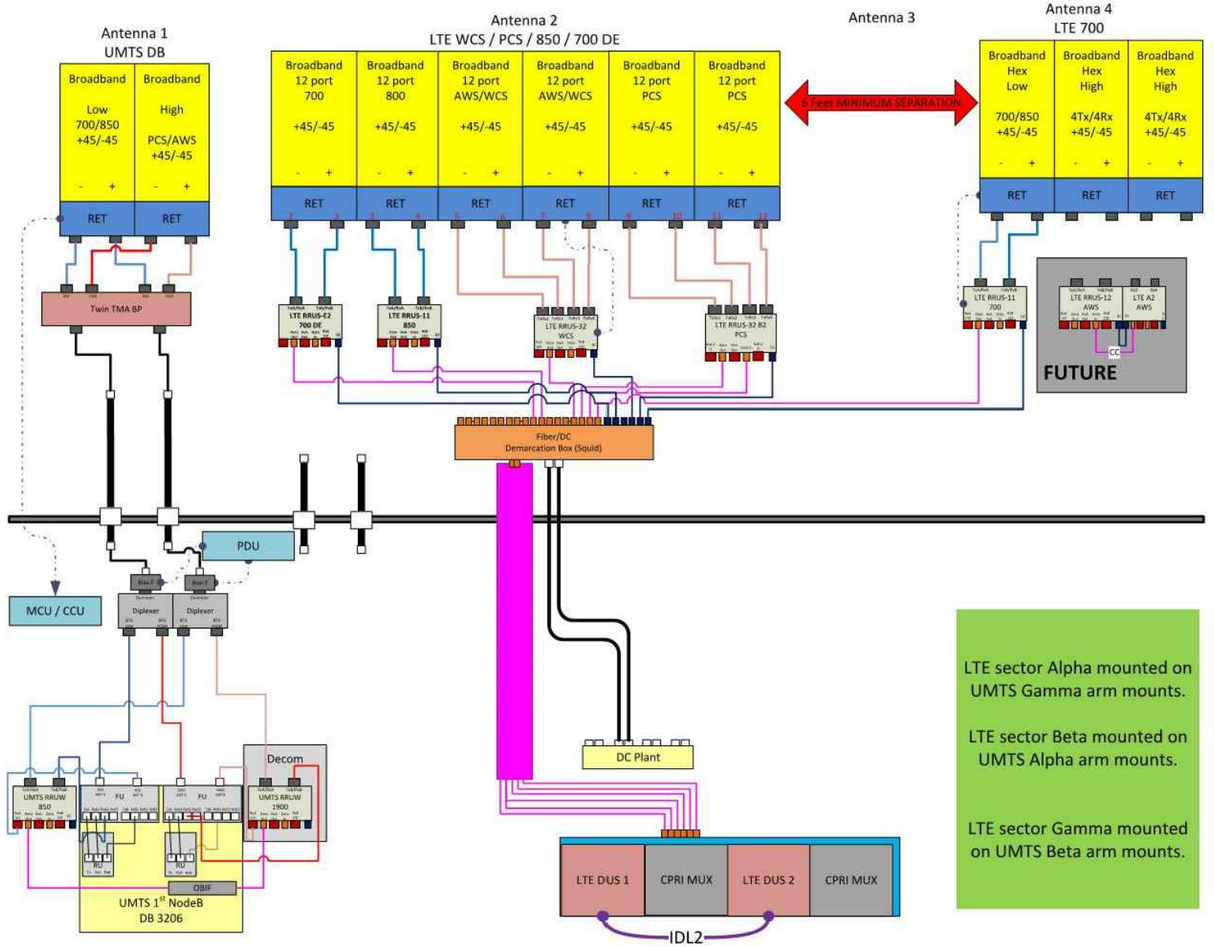
SHEET TITLE :

DETAILS

SHEET NUMBER :

A-5

Diagram - Sector	A	Diagram File Name -	CT2035_A_B_C_BrzRRH Add_4C_5C_Rev1.vsd				
Atoll Site Name -	CTV2035	Location Name -	HAMDEN	Market -	CONNECTICUT	Market Cluster -	NEW ENGLAND
Comments:							



ALL SECTORS

NEW-ENGLAND_CONNECTICUT_CTV2035_2017-LTE-Next-Carrier_LTE_mm093q_PTN_10035036_61166_09-22-2016_Final-Approved_v2.00

RF PLUMBING DIAGRAMS

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FRANK E. AZDEN
CONNECTICUT PROFESSIONAL ENGINEER - LICENSE NUMBER: PEN.22[illegible]
STATE OF CONNECTICUT · LICENSED PROFESSIONAL ENGINEER

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NEW HAVEN COUNTY

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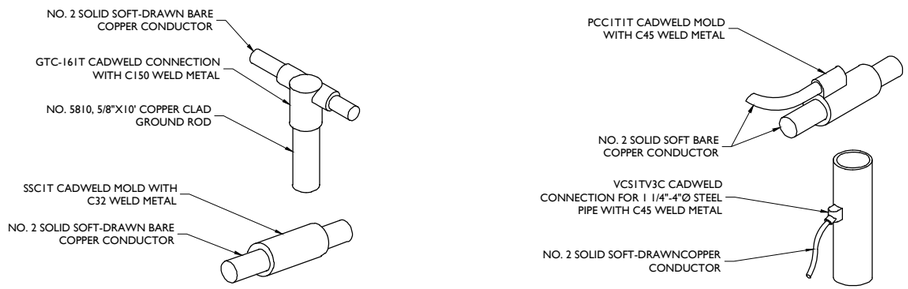
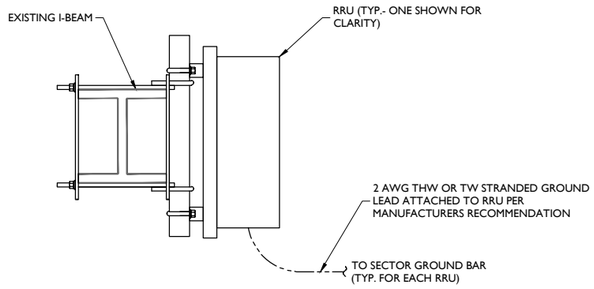
Phone: 732.383.1950
Fax: 732.383.1984

SHEET TITLE :
RF PLUMBING DIAGRAMS

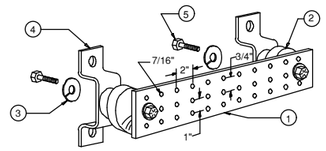
SHEET NUMBER :
A-6



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.

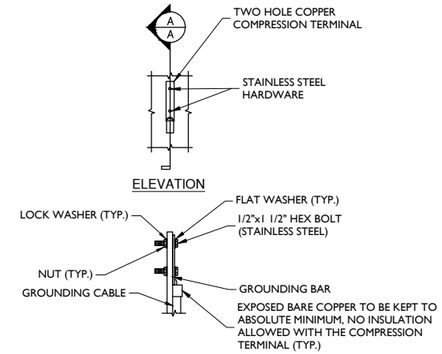
SECTION "P" - SURGE PRODUCERS

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.

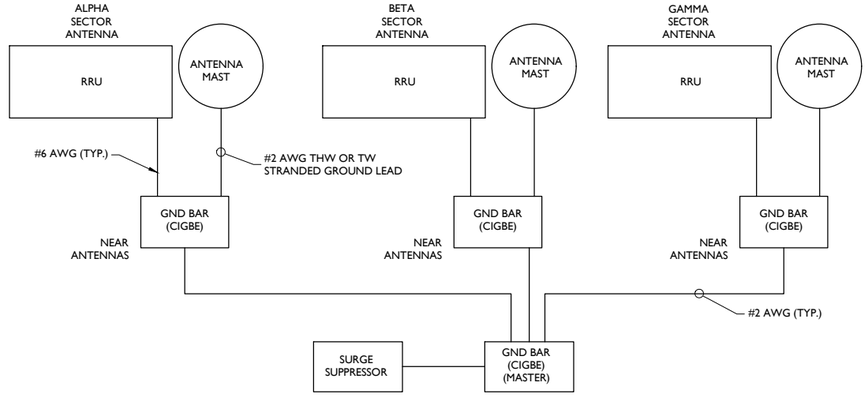
SECTION "A" - SURGE ABSORBERS

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

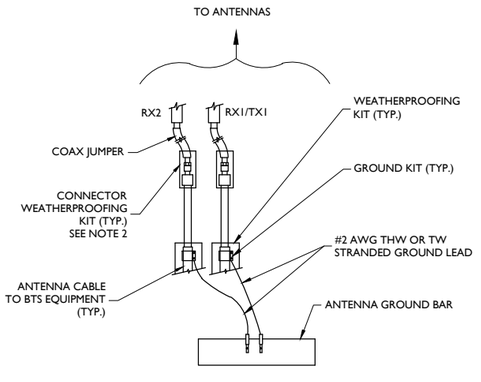
MASTER GROUND BAR
NOT TO SCALE



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. PALLEN — LICENSED PROFESSIONAL ENGINEER

FRANK E. PALLEN
CONNECTICUT PROFESSIONAL ENGINEER - LICENSE NUMBER: PEN.0028

SITE NAME:

HAMDEN
CT2035
975 MIX AVENUE
HAMDEN, CT 06514
NEW HAVEN COUNTY

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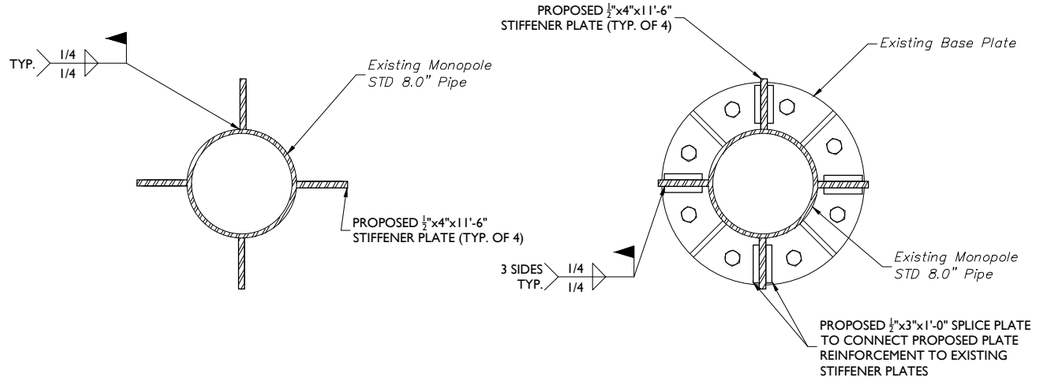
Red Bank, NJ 07701-5699
Phone: 732.383.1950
Fax: 732.383.1984

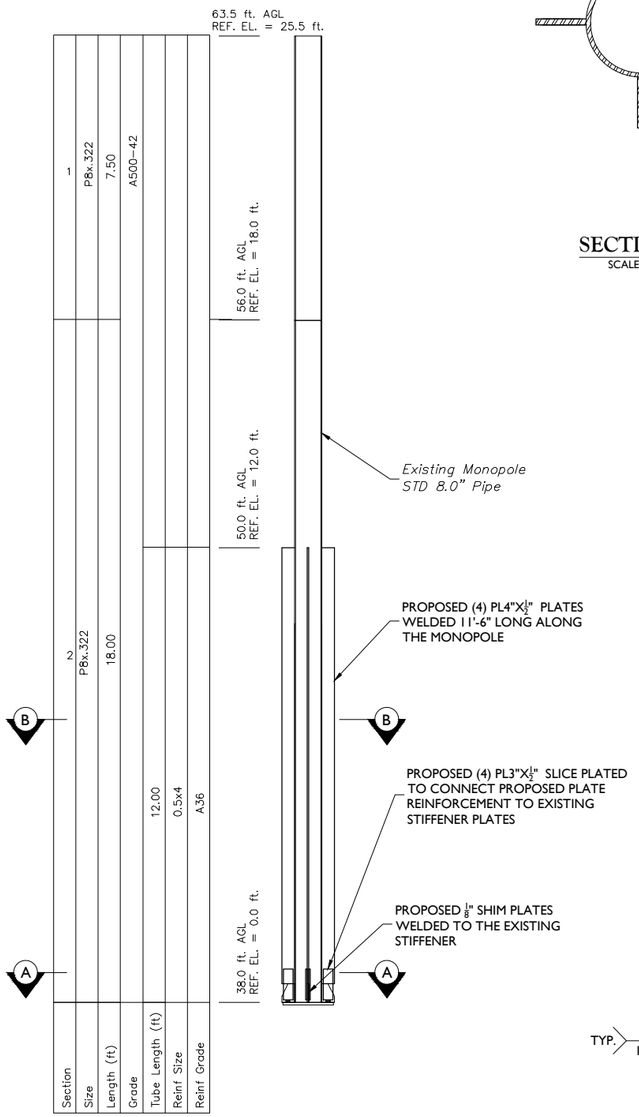
SHEET TITLE : GROUNDING DETAILS

SHEET NUMBER : G-1

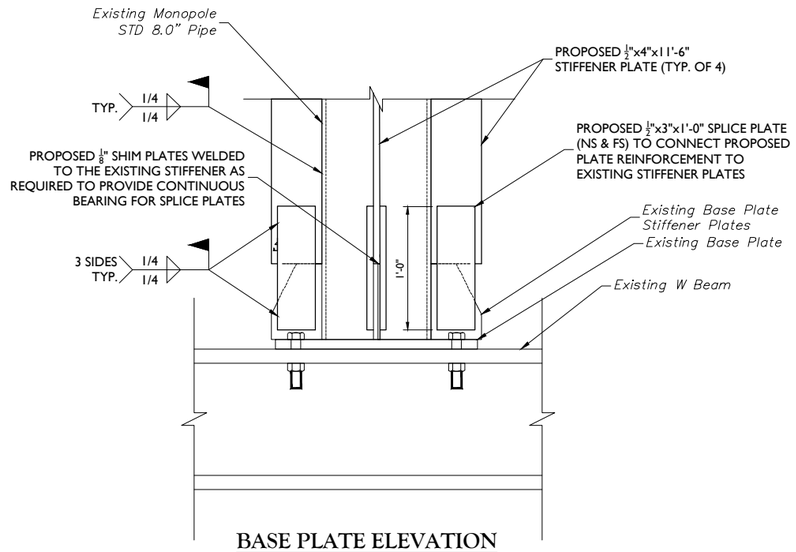


SECTION A-A
SCALE: 2"=1'-0"

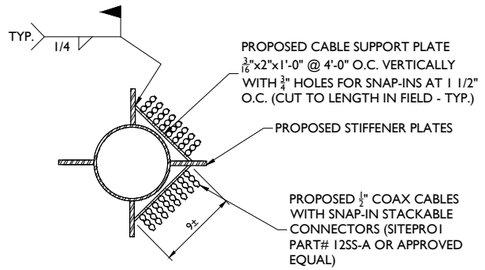
SECTION B-B
SCALE: 2"=1'-0"



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



BASE PLATE ELEVATION
SCALE: 2"=1'-0"



CABLE LAYOUT
NOT TO SCALE

MODIFICATION NOTES:

1. IF THE EXISTING CONDITIONS ARE NOT AS REPRESENTED ON THESE DRAWINGS, MASER CONSULTING SHOULD BE CONTACTED IMMEDIATELY TO RE-RVALUATE THE STRUCTURE BASED ON THE FIELD CONDITIONS AND DIMENSIONS FOUND.
2. IT IS ASSUMED THAT ANY STRUCTURAL MODIFICATION WORK SPECIFIED ON THESE DRAWINGS WILL BE ACCOMPLISHED BY KNOWLEDGEABLE WORKMEN WITH TOWER/ANTENNA MOUNT CONSTRUCTION EXPERIENCE.
3. THIS DRAWING DOES NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTORS SHALL SUPERVISE AND DIRECT THE WORK AND THEY SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES.
4. CONTRACTOR SHALL VERIFY PLACEMENT OF ALL NEW PIECES FOR ADEQUATE FIT, CLEARANCES, AND DESIGN INTENT BEFORE FABRICATION STARTS.
5. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE THE ERECTION PROCEDURE AND SEQUENCE TO INSURE THE STABILITY, SAFETY OF THE STRUCTURE AND MOUNTS (AS APPLICABLE), AND THE ADEQUACY OF TEMPORARY OR INCOMPLETE CONNECTIONS DURING CONSTRUCTION.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INITIATING, MAINTAINING, AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE WORK. THIS INCLUDES WHATEVER PROVISIONS NEED TO BE TAKEN TO PROTECT THE PROPERTY IN THE VICINITY OF THE TOWER DURING CONSTRUCTION.
7. DURING CONSTRUCTION THE CONTRACTOR SHALL COORDINATE WITH THE TOWER/STRUCTURE OWNER AND CORDON OFF AREAS BELOW AND AROUND THE WORK TO PREVENT INJURY TO PERSONS AND/OR PROPERTY. DAMAGES RESULTING FROM THE CONTRACTORS WORK SHALL BE REPAIRED AT THE CONTRACTORS EXPENSE.
8. BACK CHARGES FOR CORRECTIVE WORK OR REPLACEMENT MATERIALS WILL NOT BE ACCEPTED UNLESS EXPRESSLY AUTHORIZED BY MASER CONSULTING BEFORE ANY SUCH COSTS ARE INCURRED.
9. POST CONSTRUCTION INSPECTION TO BE COMPLETED BY OTHERS.
10. ALL FIELD CONNECTIONS, UNLESS NOTED OTHERWISE , SHALL BE BOLTED.
11. CUTTING OR BURNING OF STEEL IN THE FIELD IS STRICTLY PROHIBITED.
12. WHERE STEEL IS IN CONTACT WITH ALUMINUM PROVIDE ADEQUATE BARRIER TO PREVENT OXIDATION OF THE STEEL AND ALUMINUM.
13. ALL BOLT HOLES SHALL BE $\frac{1}{16}$" LARGER THAN BOLT DIAMETER. ALL BOLTS SHALL HAVE ONE FLAT WASHER, ONE LOCK WASHER, AND ONE NUT UNLESS NOTED OTHERWISE.
14. COMPLY WITH ALL APPLICABLE REQUIREMENTS OF THE CURRENT EDITIONS OF THE FOLLOWING STANDARDS AND CODES
    - 14.1. AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC) "SPECIFICATIONS FOR THE DESIGN, FABRICATION, AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS".
    - 14.2. AMERICAN IRON AND STEEL INSTITUTE (AISI) "DESIGN OF COLD FORMED STEEL STRUCTURAL MEMBERS".
    - 14.3. ASTM A563-04 "STANDARD SPECIFICATION FOR CARBON AND ALLOY STEEL NUTS".
    - 14.4. ASTM F436-03 "STANDARD SPECIFICATION FOR HARDENED STEEL WASHERS"
    - 14.5. ASTM A325-04 "STANDARD SPECIFICATION FOR STRUCTURAL BOLTS, STEEL, HEAT TREATED, 120/105 KSI MINIMUM TENSILE STRENGTH".
    - 14.6. ASTM A153/A153M-09 "STANDARD SPECIFICATION FOR ZINC COATING (HOT-DIP) ON IRON AND STEEL HARDWARE".
    - 14.7. ASTM 123/A1123M-09 "STANDARD SPECIFICATION FOR ZINC (HOT-DIP GALVANIZED) COATINGS ON IRON AND STEEL PRODUCTS".
15. ALL STEEL WORK SHALL BE ASTM A572 GRADE 50 FOR W-FLANGE SECTIONS AND A36 FOR ALL OTHER SHAPES AND GALVANIZED UNLESS NOTED OTHERWISE, GALVANIZED COATING THICKNESS TO BE G90.
16. FIELD WELDING SHALL BE PERFORMED BY WELDERS THAT ARE CERTIFIED (AWS "STANDARD QUALIFICATION PROCEDURE") TO PERFORM THE TYPE OF WORK REQUIRED. WELDS SHALL CONFORM TO AMERICAN WELDING SOCIETY (AWS) D1.1 "STRUCTURAL WELDING CODE - STEEL". PROVIDE THE MINIMUM SIZE PER PART 8 IN THE AISC "MANUAL OF STEEL CONSTRUCTION", LRFD 3RD EDITION, WHEN WELD SIZES ARE NOT SHOWN. USE E70XX ELECTRODES FOR ALL WELDING.
17. ALL CONNECTIONS, UNLESS OTHERWISE NOTED, SHALL BE CONSTRUCTED WITH A MINIMUM EDGE DISTANCE OF 1 1/2 INCHES AND BOLT SPACING OF 3 INCHES.
18. UNLESS NOTED OTHERWISE ALL BOLTS SHALL BE INSTALLED WITH HEADS UP OR TOWARD THE OUTSIDE FACE, AND NUTS DOWN OR ON THE SIDE MOST PROTECTED FROM WEATHER.
19. USE PRECAUTIONS & PROCEDURES PER AWS D1.1 WHEN WELDING GALVANIZED MATERIALS. AT COMPLETION OF WELDING, ALL DAMAGE TO GALVANIZED COATING SHALL BE REPAIRED.
20. TOUCH-UP ALL DAMAGE GALVANIZED STEEL WITH COLD ZINC, "GALVANOX", "DRY GALV.", "ZINC-IT" OR APPROVED EQUIVALENT, IN ACCORDANCE WITH MANUFACTURER'S GUIDELINES. TOUCH-UP DAMAGED NON GALVANIZED STEEL WITH SAME PAINT APPLIED IN SHOP OR FIELD.
21. ALL STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE CURRENT EDITION OF AISC "SPECIFICATIONS FOR DESIGN, FABRICATION AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS - LOAD AND RESISTANCE FACTOR DESIGN".
22. MEMBERS SHALL BE LAID PLUMB AND TRUE AS SHOWN ON THE DRAWINGS.
23. COPE ALL FRAMING AT ENDS AS NECESSARY, UNLESS NOTED OTHERWISE.
24. THE GENERAL CONTRACTOR AND THEIR SUB-CONSULTANTS SHALL BE RESPONSIBLE FOR OBTAINING ALL PERMITS AND INSPECTIONS WHICH MAY BE REQUIRED FOR THE WORK.

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Engineers ■ Planners ■ Surveyors
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at&t
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811 Know what's below. Call before you dig.
PROTECT YOURSELF
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 : AS SHOWN
JOB NUMBER : 16963030A

REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY
0	02/09/17	FOR CONSTRUCTION	GP	FEP
1	01/13/17	ISSUED FOR REVIEW	AF	RA

STATE OF CONNECTICUT
FRANK E. PAZDEN
CONNECTICUT PROFESSIONAL ENGINEER - LICENSE NUMBER: PEN.28545
LICENSED PROFESSIONAL ENGINEER

IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF THE RESPONSIBLE LICENSED PROFFESIONAL ENGINEER, TO ALTER THIS DOCUMENT.

SITE NAME:
HAMDEN
CT2035
975 MIX AVENUE
HAMDEN, CT 06514
NEW HAVEN 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 : COMPOUND PLAN AND EQUIPMENT PLAN

SHEET NUMBER : S-1

MASER CONSULTING
— CONNECTICUT—

331 Newman Springs Road, Suite 203
Red Bank, NJ 07701
T: 732.383.1950
www.maserconsulting.com

February 7, 2017

Mr. David Cooper
Empire Telecom
16 Esquire Road
Billerica, MA 01862

Re: **Structural Evaluation**
AT&T: Site CT2035
FA # 10108060
Site Name: Hamden
975 Mix Avenue
Hamden, CT 06514
Maser Consulting Project #: 16963030A

Dear Mr. Cooper,

In accordance with your request, Maser Consulting Connecticut prepared a modification design analysis to the existing monopole on the rooftop at the above referenced address.

Maser Consulting Connecticut has performed limited field observations on December 21th, 2016 to verify the existing visual condition of the structure and locate and quantify the existing wireless appurtenances, from ground level. This structural design is only valid for the appurtenances analyzed in the previous failing Antenna mount analysis and Structural analysis dated January 17, 2017.

The proposed modification design includes:

1) Welding (4) 4"x0.5" stiffener plates from the base plate up 12 ft. perpendicular to the monopole pipe section as shown in the Maser Consulting Structural Drawings.
2) Relocating Feedlines along the length of the monopole per the new layout design shown in the Structural Modification Construction Drawings.

See the Structural modification Construction Drawing prepared by Maser Consulting P.A. for further details.

Maser Consulting Connecticut has determined the modified monopole per the above mentioned proposed design has **ADEQUATE** structural capacity to support the existing and proposed installation. The Monopole and base plate are determined to be stressed to a maximum of **93.9%** of their structural capacity after proposed modifications are installed per Maser Consulting Recommendations. The equipment platform is determined to be stressed to a maximum of **89.0%** of its structural capacity with the maximum stress occurring at the column HSS member.

Therefore, the proposed **AT&T** installation and proposed platform **CAN** be installed as intended, pending a passing structural analysis of the building.

Maser Consulting Connecticut reserves the right to amend this report if additional information about the existing monopole, platform and building structure is provided. No structural qualifications are made or implied by this document for the monopole, platform and building structure. The conclusions reached by Maser Consulting Connecticut in this report are only valid for the discrete and linear appurtenances listed in the previously completed mount analysis referenced above. Any change to the installation will require a revision to this structural analysis.

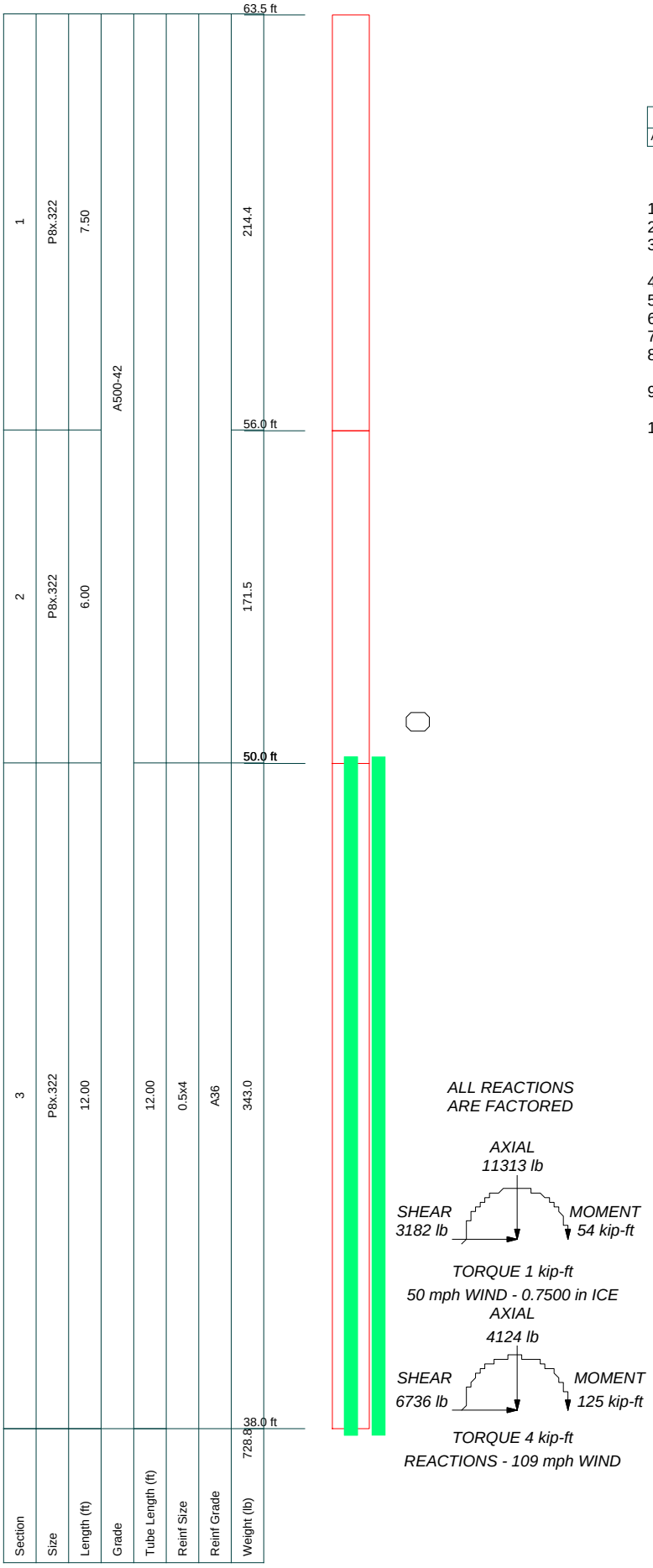
If you have any questions or comments, or require additional information, please do not hesitate to contact me.

Sincerely,
Maser Consulting P.A.

Frank E. Pazden
Geographic Discipline Leader
Connecticut Professional Engineer
PE License # 28188

Gowtham Penumatsa
Structural Design Engineer

APPENDIX A



Section	Size	Length (ft)	Grade	Tube Length (ft)	Reinf Size	Reinf Grade	Weight (lb)
1	P8x.322	7.50	A500-42				214.4
2	P8x.322	6.00					171.5
3	P8x.322	12.00		12.00	0.5x4	A36	343.0
							728.8

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500-42	42 ksi	58 ksi	A36	36 ksi	58 ksi

TOWER DESIGN NOTES

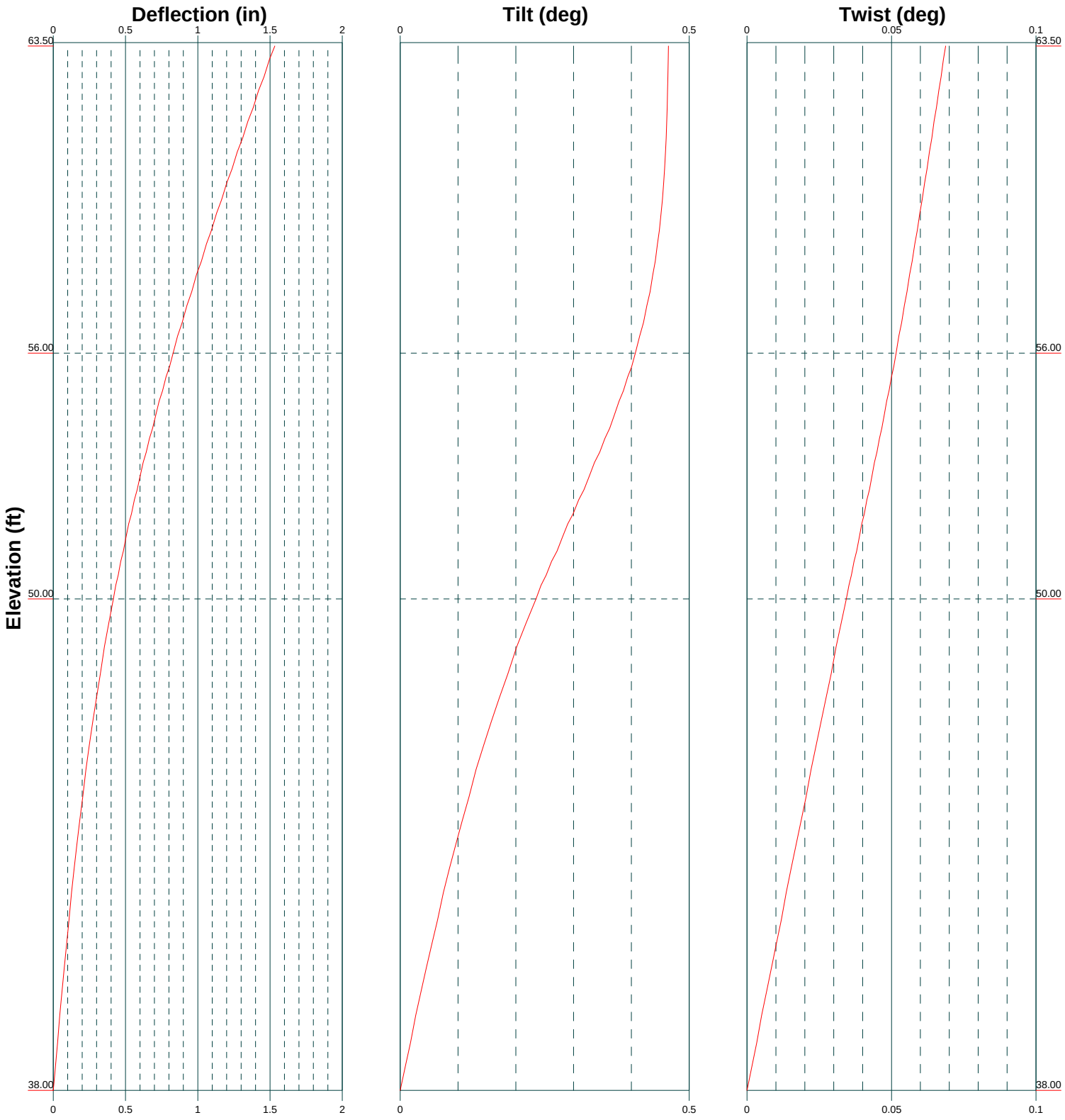
1. Tower designed for Exposure B to the TIA-222-G Standard.
2. Tower designed for a 109 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 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.

Maser Consulting P.A
400 Valley Road
Mt Arlington, NJ
Phone: 973.398.3110
FAX: 973.398.3199

Job: **16963030A**			
Project: **Hamden**			
Client: Empire Telecom	Drawn by: gpenumatsa	App'd:	
Code: TIA-222-G	Date: 02/03/17	Scale: NTS	
Path: C:\Users\gpenumatsa\Desktop\Othe survor jobs\16963030A\Modification Analysis\TNX\Monopole Anlaysis.eri		Dwg No. E-1	

TIA-222-G - Service - 60 mph

Maximum Values



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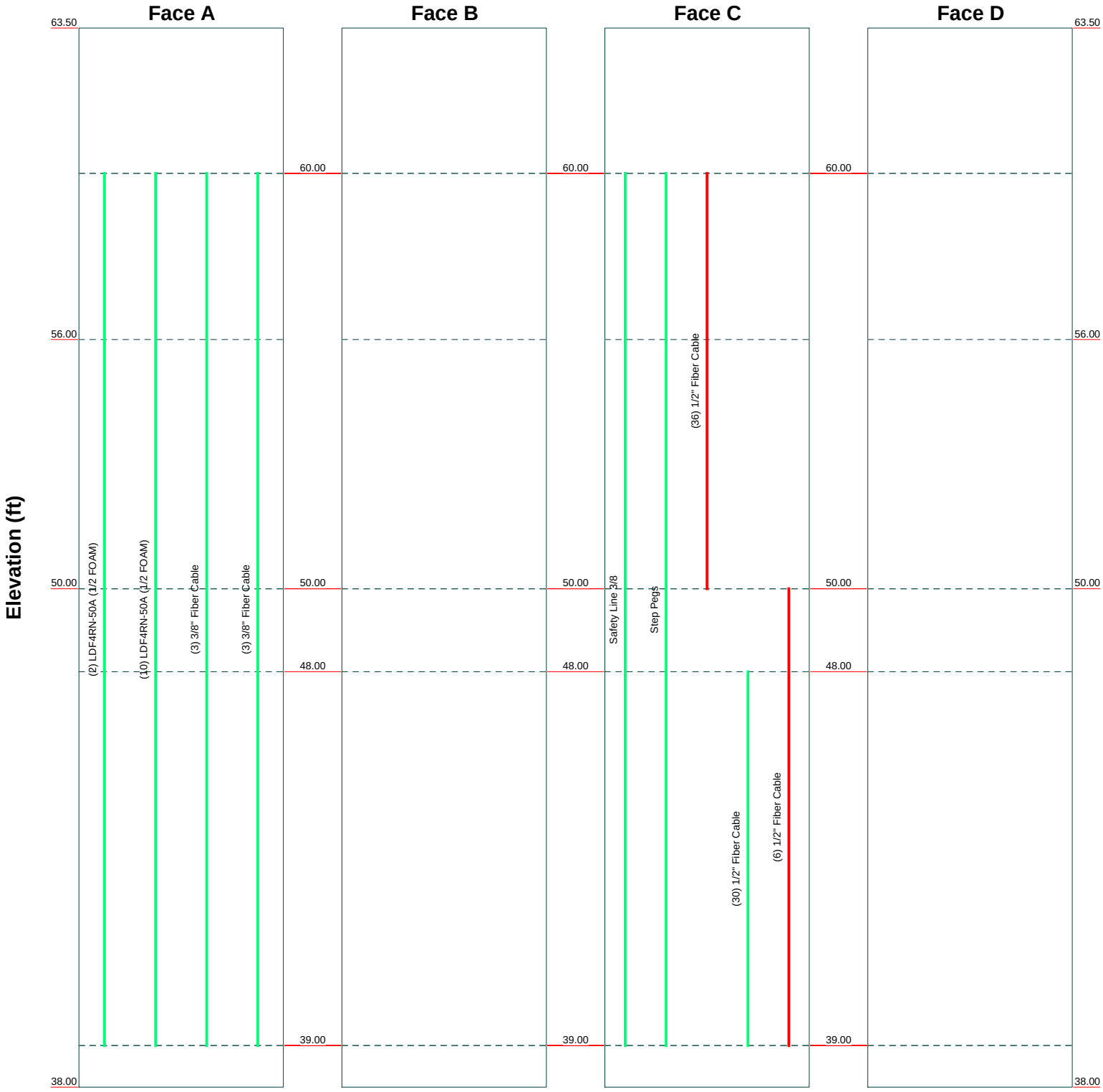
FAX: 973.398.3199

Job: ***16963030A***			
Project: ***Hamden***			
Client: Empire Telecom	Drawn by: gpenumatsa	App'd:	
Code: TIA-222-G	Date: 02/03/17	Scale: NTS	
Path: C:\Users\gpenumatsa\Desktop\Othe survor jobs\16963030A\Modification Analysis\TNX\Monopole Anlaysis.eri		Dwg No. E-5	

Feed Line Distribution Chart
38' - 63'6"

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



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Phone: 973.398.3110
FAX: 973.398.3199

Job: ***16963030A***			
Project: ***Hamden***			
Client: Empire Telecom	Drawn by: gpenumatsa	App'd:	
Code: TIA-222-G	Date: 02/03/17	Scale: NTS	
Path: C:\Users\gpenumatsa\Desktop\Othe survor jobs\16963030A\Modification Analysis\TNX\Monopole Anlaysis.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 109 mph.
Structure Class II.
Exposure Category B.
Topographic Category 1.
Crest Height 0.00 ft.
Nominal ice thickness of 0.7500 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				

Pole Section Geometry

Section	Elevation ft	Section Length ft	Pole Size	Pole Grade	Socket Length ft
L1	63.50-56.00	7.50	P8x.322	A500-42 (42 ksi)	
L2	56.00-50.00	6.00	P8x.322	A500-42 (42 ksi)	
L3	50.00-38.00	12.00	P8x.322	A500-42 (42 ksi)	

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 63.50-56.00				1	1	1			
L2 56.00-50.00				1	1	1			
L3 50.00-38.00				1	1.93	1			

Pole Reinforcing Data

Height Above Base ft	Segment Length ft	No. of Segments	Offset in	Grade	Type	Size	Unbraced Length ft	K	Bolt Hole Dia. in	Bolts per Row	Shear Lag Factor U
0.00	12.00	4	2.0000	A36 (36 ksi)	Flat Bar	0.5x4	0.00	1.00	0.0000	0	1.000

Monopole Base Plate Data

Base Plate Data	
Base plate is square	
Base plate is grouted	
Anchor bolt grade	A490N
Anchor bolt size	0.7500 in
Number of bolts	8
Embedment length	0.0000 in
f'_c	50 ksi
Grout space	0.0000 in
Base plate grade	A36
Base plate thickness	1.7500 in
Bolt circle diameter	12.1700 in
Outer diameter	16.0000 in
Inner diameter	8.6250 in
Base plate type	Stiffened Plate
Bolts per stiffener	1
Stiffener thickness	0.3750 in
Stiffener height	6.0000 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
1/2" Fiber Cable	C	Surface Ar (CaAa)	60.00 - 50.00	36	10	0.000 0.000	0.5000		1.00
1/2" Fiber Cable	C	Surface Ar (CaAa)	50.00 - 39.00	6	4	0.000 0.000	0.5000		1.00

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
LDF4RN-50A (1/2 FOAM)	A	No	CaAa (Out Of Face)	60.00 - 39.00	2	No Ice	0.06	0.15
						1/2" Ice	0.16	0.84
						1" Ice	0.26	2.14
LDF4RN-50A (1/2 FOAM)	A	No	CaAa (Out Of Face)	60.00 - 39.00	10	No Ice	0.06	0.15
						1/2" Ice	0.16	0.84
						1" Ice	0.26	2.14
3/8" Fiber Cable	A	No	CaAa (Out Of Face)	60.00 - 39.00	3	No Ice	0.00	1.00
						1/2" Ice	0.15	1.61
						1" Ice	0.25	2.83
3/8" Fiber Cable	A	No	CaAa (Out Of Face)	60.00 - 39.00	3	No Ice	0.00	1.00
						1/2" Ice	0.15	1.61
						1" Ice	0.25	2.83
Safety Line 3/8	C	No	CaAa (Out Of Face)	60.00 - 39.00	1	No Ice	0.04	0.22
						1/2" Ice	0.14	0.75
						1" Ice	0.24	1.28
Step Pegs	C	No	CaAa (Out Of Face)	60.00 - 39.00	1	No Ice	0.02	1.50
						1/2" Ice	0.05	2.25
						1" Ice	0.08	3.00
1/2" Fiber Cable	C	No	CaAa (Out Of Face)	48.00 - 39.00	30	No Ice	0.00	1.00
						1/2" Ice	0.15	1.61
						1" Ice	0.25	2.83

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 lb
L1	63.50-56.00	A	0.000	0.000	0.000	3.057	31.20
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	2.000	0.230	150.88
		D	0.000	0.000	0.000	0.000	0.00
L2	56.00-50.00	A	0.000	0.000	0.000	4.586	46.80
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	3.000	0.345	226.32
		D	0.000	0.000	0.000	0.000	0.00
L3	50.00-38.00	A	0.000	0.000	0.000	8.407	85.80
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	2.200	1.005	354.92
		D	0.000	0.000	0.000	0.000	0.00

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 lb
L1	63.50-56.00	A	1.592	0.000	0.000	0.000	27.145	357.47
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	4.092	1.885	236.47
		D		0.000	0.000	0.000	0.000	0.00
L2	56.00-50.00	A	1.573	0.000	0.000	0.000	40.308	527.22
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	6.109	2.799	353.26
		D		0.000	0.000	0.000	0.000	0.00
L3	50.00-38.00	A	1.544	0.000	0.000	0.000	72.749	941.41
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	6.995	101.911	1599.10
		D		0.000	0.000	0.000	0.000	0.00

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	63.50-56.00	0.2693	-0.2018	-0.2117	-0.4548
L2	56.00-50.00	0.3524	-0.2641	-0.2287	-0.4944
L3	50.00-38.00	-0.1012	-0.1997	0.1486	0.1063

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
L1	7	1/2" Fiber Cable	56.00 - 60.00	1.0000	1.0000
L2	7	1/2" Fiber Cable	50.00 - 56.00	1.0000	1.0000
L3	9	1/2" Fiber Cable	39.00 - 50.00	1.0000	1.0000

Discrete Tower Loads

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 lb
80010121 9' Mount Pipe (AT&T)	A	From Leg	4.00 -4.00 0.00	0.0000	61.00	No Ice 1/2" Ice 1" Ice	6.22 7.03 7.86	5.43 6.71 8.00	93.85 150.46 214.13
Quintel QS66512-2 w/m pipe (AT&T)	A	From Leg	4.00 0.00	0.0000	61.00	No Ice 1/2" Ice	8.85 9.61	8.94 10.33	143.85 224.75

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 lb
			0.00			1" Ice	10.39	11.73	314.20
HPA-65R-BUU-H6 W/Mt pipe	A	From Leg	4.00	0.0000	61.00	No Ice	10.37	8.59	93.35
			4.00			1/2" Ice	11.15	9.98	180.04
(AT&T)			0.00			1" Ice	11.94	11.39	275.42
80010121 9' Mount Pipe	B	From Leg	4.00	0.0000	61.00	No Ice	6.22	5.43	93.85
(AT&T)			-4.00			1/2" Ice	7.03	6.71	150.46
			0.00			1" Ice	7.86	8.00	214.13
Quintel QS66512-2 w/m pipe	B	From Leg	4.00	0.0000	61.00	No Ice	8.85	8.94	143.85
(AT&T)			0.00			1/2" Ice	9.61	10.33	224.75
			0.00			1" Ice	10.39	11.73	314.20
HPA-65R-BUU-H6 W/Mt pipe	B	From Leg	4.00	0.0000	61.00	No Ice	10.37	8.59	93.35
			4.00			1/2" Ice	11.15	9.98	180.04
(AT&T)			0.00			1" Ice	11.94	11.39	275.42
80010121 9' Mount Pipe	C	From Leg	4.00	0.0000	61.00	No Ice	6.22	5.43	93.85
(AT&T)			-4.00			1/2" Ice	7.03	6.71	150.46
			0.00			1" Ice	7.86	8.00	214.13
Quintel QS66512-2 w/m pipe	C	From Leg	4.00	0.0000	61.00	No Ice	8.85	8.94	143.85
(AT&T)			0.00			1/2" Ice	9.61	10.33	224.75
			0.00			1" Ice	10.39	11.73	314.20
HPA-65R-BUU-H6 W/Mt pipe	C	From Leg	4.00	0.0000	61.00	No Ice	10.37	8.59	93.35
			4.00			1/2" Ice	11.15	9.98	180.04
(AT&T)			0.00			1" Ice	11.94	11.39	275.42
Modified T Frame	A	None		0.0000	59.00	No Ice	9.63	9.63	164.00
(AT&T)						1/2" Ice	12.41	12.41	228.00
						1" Ice	15.20	15.20	292.00
Modified T Frame	B	None		0.0000	59.00	No Ice	9.63	9.63	164.00
(AT&T)						1/2" Ice	12.41	12.41	228.00
						1" Ice	15.20	15.20	292.00
Modified T Frame	C	None		0.0000	59.00	No Ice	9.63	9.63	164.00
(AT&T)						1/2" Ice	12.41	12.41	228.00
						1" Ice	15.20	15.20	292.00

Tower Pressures - No Ice

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1 63.50-56.00	59.75	0.853	25	5.391	A	0.000	5.391	5.391	100.00	0.000	3.057
					B	0.000	5.391		100.00	0.000	0.000
					C	0.000	5.391		100.00	2.000	0.230
					D	0.000	5.391		100.00	0.000	0.000
L2 56.00-50.00	53.00	0.824	24	4.313	A	0.000	4.313	4.313	100.00	0.000	4.586
					B	0.000	4.313		100.00	0.000	0.000
					C	0.000	4.313		100.00	3.000	0.345
					D	0.000	4.313		100.00	0.000	0.000
L3 50.00-38.00	44.00	0.782	23	8.625	A	0.000	16.646	16.646	100.00	0.000	8.407
					B	0.000	16.646		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
					C	0.000	16.646		100.00	2.200	1.005
					D	0.000	16.646		100.00	0.000	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 63.50-56.00	59.75	0.853	5	1.5917	7.380	A	0.000	7.380	7.380	100.00	0.000	27.145
						B	0.000	7.380		100.00	0.000	0.000
						C	0.000	7.380		100.00	4.092	1.885
						D	0.000	7.380		100.00	0.000	0.000
L2 56.00-50.00	53.00	0.824	5	1.5728	5.885	A	0.000	5.885	5.885	100.00	0.000	40.308
						B	0.000	5.885		100.00	0.000	0.000
						C	0.000	5.885		100.00	6.109	2.799
						D	0.000	5.885		100.00	0.000	0.000
L3 50.00-38.00	44.00	0.782	5	1.5438	11.713	A	0.000	22.605	22.605	100.00	0.000	72.749
						B	0.000	22.605		100.00	0.000	0.000
						C	0.000	22.605		100.00	6.995	101.911
						D	0.000	22.605		100.00	0.000	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 63.50-56.00	59.75	0.853	7	5.391	A	0.000	5.391	5.391	100.00	0.000	3.057
					B	0.000	5.391		100.00	0.000	0.000
					C	0.000	5.391		100.00	2.000	0.230
					D	0.000	5.391		100.00	0.000	0.000
L2 56.00-50.00	53.00	0.824	6	4.313	A	0.000	4.313	4.313	100.00	0.000	4.586
					B	0.000	4.313		100.00	0.000	0.000
					C	0.000	4.313		100.00	3.000	0.345
					D	0.000	4.313		100.00	0.000	0.000
L3 50.00-38.00	44.00	0.782	6	8.625	A	0.000	16.646	16.646	100.00	0.000	8.407
					B	0.000	16.646		100.00	0.000	0.000
					C	0.000	16.646		100.00	2.200	1.005
					D	0.000	16.646		100.00	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L1	182.08	214.36	A	1	1.2	25	1	1	5.391	465.13	62.02	D
63.50-56.00			B	1	1.2		1	1	5.391			
			C	1	1.2		1	1	5.391			
			D	1	1.2		1	1	5.391			
L2	273.12	171.49	A	1	1.2	24	1	1	4.313	555.57	92.60	D
56.00-50.00			B	1	1.2		1	1	4.313			
			C	1	1.2		1	1	4.313			
			D	1	1.2		1	1	4.313			
L3	440.72	669.64	A	1	1.2	23	1	1	16.646	825.71	68.81	D
50.00-38.00			B	1	1.2		1	1	16.646			
			C	1	1.2		1	1	16.646			
			D	1	1.2		1	1	16.646			
Sum Weight:	895.92	1055.48						OTM	23.40 kip-ft	1846.42		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L1	182.08	214.36	A	1	1.2	25	1	1	5.391	465.13	62.02	D
63.50-56.00			B	1	1.2		1	1	5.391			
			C	1	1.2		1	1	5.391			
			D	1	1.2		1	1	5.391			
L2	273.12	171.49	A	1	1.2	24	1	1	4.313	555.57	92.60	D
56.00-50.00			B	1	1.2		1	1	4.313			
			C	1	1.2		1	1	4.313			
			D	1	1.2		1	1	4.313			
L3	440.72	669.64	A	1	1.2	23	1	1	16.646	730.07	60.84	D
50.00-38.00			B	1	1.2		1	1	16.646			
			C	1	1.2		1	1	16.646			
			D	1	1.2		1	1	16.646			
Sum Weight:	895.92	1055.48						OTM	22.83 kip-ft	1750.77		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L1	593.93	363.37	A	1	1.2	5	1	1	7.380	527.15	70.29	D
63.50-56.00			B	1	1.2		1	1	7.380			
			C	1	1.2		1	1	7.380			
			D	1	1.2		1	1	7.380			
L2	880.49	289.06	A	1	1.2	5	1	1	5.885	722.74	120.46	D
56.00-50.00			B	1	1.2		1	1	5.885			
			C	1	1.2		1	1	5.885			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
			D	1	1.2		1	1	5.885			
L3	2540.52	1404.49	A	1	1.2	5	1	1	22.605	1154.33	96.19	D
50.00-38.00			B	1	1.2		1	1	22.605			
			C	1	1.2		1	1	22.605			
			D	1	1.2		1	1	22.605			
Sum Weight:	4014.94	2056.92						OTM	29.23 kip-ft	2404.22		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L1	593.93	363.37	A	1	1.2	5	1	1	7.380	524.88	69.98	D
63.50-56.00			B	1	1.2		1	1	7.380			
			C	1	1.2		1	1	7.380			
			D	1	1.2		1	1	7.380			
L2	880.49	289.06	A	1	1.2	5	1	1	5.885	720.07	120.01	D
56.00-50.00			B	1	1.2		1	1	5.885			
			C	1	1.2		1	1	5.885			
			D	1	1.2		1	1	5.885			
L3	2540.52	1404.49	A	1	1.2	5	1	1	22.605	1095.49	91.29	D
50.00-38.00			B	1	1.2		1	1	22.605			
			C	1	1.2		1	1	22.605			
			D	1	1.2		1	1	22.605			
Sum Weight:	4014.94	2056.92						OTM	28.79 kip-ft	2340.44		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L1	182.08	214.36	A	1	1.2	7	1	1	5.391	126.10	16.81	D
63.50-56.00			B	1	1.2		1	1	5.391			
			C	1	1.2		1	1	5.391			
			D	1	1.2		1	1	5.391			
L2	273.12	171.49	A	1	1.2	6	1	1	4.313	150.62	25.10	D
56.00-50.00			B	1	1.2		1	1	4.313			
			C	1	1.2		1	1	4.313			
			D	1	1.2		1	1	4.313			
L3	440.72	669.64	A	1	1.2	6	1	1	16.646	223.86	18.65	D
50.00-38.00			B	1	1.2		1	1	16.646			
			C	1	1.2		1	1	16.646			
			D	1	1.2		1	1	16.646			
Sum Weight:	895.92	1055.48						OTM	6.35 kip-ft	500.58		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L1	182.08	214.36	A	1	1.2	7	1	1	5.391	126.10	16.81	D
63.50-56.00			B	1	1.2		1	1	5.391			
			C	1	1.2		1	1	5.391			
			D	1	1.2		1	1	5.391			
L2	273.12	171.49	A	1	1.2	6	1	1	4.313	150.62	25.10	D
56.00-50.00			B	1	1.2		1	1	4.313			
			C	1	1.2		1	1	4.313			
			D	1	1.2		1	1	4.313			
L3	440.72	669.64	A	1	1.2	6	1	1	16.646	197.93	16.49	D
50.00-38.00			B	1	1.2		1	1	16.646			
			C	1	1.2		1	1	16.646			
			D	1	1.2		1	1	16.646			
Sum Weight:	895.92	1055.48						OTM	6.19 kip-ft	474.65		

Discrete Appurtenance Pressures - No Ice G_H = 1.100

Description	Aiming Azimuth °	Weight lb	$Offset_x$ ft	$Offset_z$ ft	z ft	K_z	q_z psf	C_AA_C Front ft^2	C_AA_C Side ft^2
80010121 9' Mount Pipe	315.0000	93.85	-5.91	-0.25	61.00	0.858	25	6.22	5.43
Quintel QS66512-2 w/m pipe	315.0000	143.85	-3.08	-3.08	61.00	0.858	25	8.85	8.94
HPA-65R-BUU-H6 W/Mt pipe	315.0000	93.35	-0.25	-5.91	61.00	0.858	25	10.37	8.59
80010121 9' Mount Pipe	45.0000	93.85	0.25	-5.91	61.00	0.858	25	6.22	5.43
Quintel QS66512-2 w/m pipe	45.0000	143.85	3.08	-3.08	61.00	0.858	25	8.85	8.94
HPA-65R-BUU-H6 W/Mt pipe	45.0000	93.35	5.91	-0.25	61.00	0.858	25	10.37	8.59
80010121 9' Mount Pipe	135.0000	93.85	5.91	0.25	61.00	0.858	25	6.22	5.43
Quintel QS66512-2 w/m pipe	135.0000	143.85	3.08	3.08	61.00	0.858	25	8.85	8.94
HPA-65R-BUU-H6 W/Mt pipe	135.0000	93.35	0.25	5.91	61.00	0.858	25	10.37	8.59
Modified T Frame	0.0000	164.00	0.00	0.00	59.00	0.850	25	9.63	9.63
Modified T Frame	0.0000	164.00	0.00	0.00	59.00	0.850	25	9.63	9.63
Modified T Frame	0.0000	164.00	0.00	0.00	59.00	0.850	25	9.63	9.63
	Sum Weight:	1485.15							

Discrete Appurtenance Pressures - With Ice G_H = 1.100

Description	Aiming Azimuth °	Weight lb	$Offset_x$ ft	$Offset_z$ ft	z ft	K_z	q_z psf	C_AA_C Front ft^2	C_AA_C Side ft^2	t_z in

Description	Aiming Azimuth °	Weight lb	$Offset_x$ ft	$Offset_z$ ft	z ft	K_z	q_z psf	C_AA_C Front ft^2	C_AA_C Side ft^2	t_z in
80010121 9' Mount Pipe	315.0000	305.10	-5.91	-0.25	61.00	0.858	5	8.63	9.10	1.5950
Quintel QS66512-2 w/m pipe	315.0000	438.50	-3.08	-3.08	61.00	0.858	5	11.18	12.95	1.5950
HPA-65R-BUU-H6 W/Mt pipe	315.0000	407.03	-0.25	-5.91	61.00	0.858	5	12.75	12.61	1.5950
80010121 9' Mount Pipe	45.0000	305.10	0.25	-5.91	61.00	0.858	5	8.63	9.10	1.5950
Quintel QS66512-2 w/m pipe	45.0000	438.50	3.08	-3.08	61.00	0.858	5	11.18	12.95	1.5950
HPA-65R-BUU-H6 W/Mt pipe	45.0000	407.03	5.91	-0.25	61.00	0.858	5	12.75	12.61	1.5950
80010121 9' Mount Pipe	135.0000	305.10	5.91	0.25	61.00	0.858	5	8.63	9.10	1.5950
Quintel QS66512-2 w/m pipe	135.0000	438.50	3.08	3.08	61.00	0.858	5	11.18	12.95	1.5950
HPA-65R-BUU-H6 W/Mt pipe	135.0000	407.03	0.25	5.91	61.00	0.858	5	12.75	12.61	1.5950
Modified T Frame	0.0000	367.49	0.00	0.00	59.00	0.850	5	18.48	18.48	1.5897
Modified T Frame	0.0000	367.49	0.00	0.00	59.00	0.850	5	18.48	18.48	1.5897
Modified T Frame	0.0000	367.49	0.00	0.00	59.00	0.850	5	18.48	18.48	1.5897
	Sum Weight:	4554.32								

Discrete Appurtenance Pressures - Service $G_H = 1.100$

Description	Aiming Azimuth °	Weight lb	$Offset_x$ ft	$Offset_z$ ft	z ft	K_z	q_z psf	C_AA_C Front ft^2	C_AA_C Side ft^2
80010121 9' Mount Pipe	315.0000	93.85	-5.91	-0.25	61.00	0.858	7	6.22	5.43
Quintel QS66512-2 w/m pipe	315.0000	143.85	-3.08	-3.08	61.00	0.858	7	8.85	8.94
HPA-65R-BUU-H6 W/Mt pipe	315.0000	93.35	-0.25	-5.91	61.00	0.858	7	10.37	8.59
80010121 9' Mount Pipe	45.0000	93.85	0.25	-5.91	61.00	0.858	7	6.22	5.43
Quintel QS66512-2 w/m pipe	45.0000	143.85	3.08	-3.08	61.00	0.858	7	8.85	8.94
HPA-65R-BUU-H6 W/Mt pipe	45.0000	93.35	5.91	-0.25	61.00	0.858	7	10.37	8.59
80010121 9' Mount Pipe	135.0000	93.85	5.91	0.25	61.00	0.858	7	6.22	5.43
Quintel QS66512-2 w/m pipe	135.0000	143.85	3.08	3.08	61.00	0.858	7	8.85	8.94
HPA-65R-BUU-H6 W/Mt pipe	135.0000	93.35	0.25	5.91	61.00	0.858	7	10.37	8.59
Modified T Frame	0.0000	164.00	0.00	0.00	59.00	0.850	7	9.63	9.63
Modified T Frame	0.0000	164.00	0.00	0.00	59.00	0.850	7	9.63	9.63
Modified T Frame	0.0000	164.00	0.00	0.00	59.00	0.850	7	9.63	9.63
	Sum Weight:	1485.15							

Force Totals

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	728.81					
Bracing Weight	326.67					

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Total Member Self-Weight	1055.48			-0.99	-1.38	
Total Weight	3436.55			-0.99	-1.38	
Wind 0 deg - No Ice		-27.07	-4210.21	-77.20	-0.76	2.16
Wind 45 deg - No Ice		2890.29	-2890.29	-54.03	-54.43	0.52
Wind 90 deg - No Ice		3623.12	27.07	-0.36	-68.30	-1.38
Wind 135 deg - No Ice		2928.58	2928.58	52.94	-55.31	-2.47
Wind 180 deg - No Ice		27.07	4210.21	75.23	-2.01	-2.16
Wind 225 deg - No Ice		-2890.29	2890.29	52.06	51.66	-0.52
Wind 270 deg - No Ice		-3623.12	-27.07	-1.61	65.53	1.38
Wind 315 deg - No Ice		-2928.58	-2928.58	-54.91	52.54	2.47
Member Ice	1001.44					
Total Weight Ice	10626.18			-3.34	-4.26	
Wind 0 deg - Ice		4.83	-3182.23	-49.83	-4.37	0.96
Wind 45 deg - Ice		2208.49	-2208.49	-35.98	-36.91	0.32
Wind 90 deg - Ice		2325.54	-4.83	-3.45	-36.70	-0.49
Wind 135 deg - Ice		2201.66	2201.66	29.15	-36.75	-1.01
Wind 180 deg - Ice		-4.83	3182.23	43.16	-4.15	-0.96
Wind 225 deg - Ice		-2208.49	2208.49	29.31	28.38	-0.32
Wind 270 deg - Ice		-2325.54	4.83	-3.23	28.18	0.49
Wind 315 deg - Ice		-2201.66	-2201.66	-35.82	28.22	1.01
Total Weight	3436.55			-0.99	-1.38	
Wind 0 deg - Service		-7.34	-1141.43	-21.68	-0.85	0.49
Wind 45 deg - Service		783.59	-783.59	-15.40	-15.40	0.10
Wind 90 deg - Service		982.26	7.34	-0.85	-19.16	-0.35
Wind 135 deg - Service		793.96	793.96	13.60	-15.64	-0.59
Wind 180 deg - Service		7.34	1141.43	19.64	-1.19	-0.49
Wind 225 deg - Service		-783.59	783.59	13.36	13.36	-0.10
Wind 270 deg - Service		-982.26	-7.34	-1.19	17.12	0.35
Wind 315 deg - Service		-793.96	-793.96	-15.64	13.60	0.59

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 45 deg - No Ice
5	0.9 Dead+1.6 Wind 45 deg - No Ice
6	1.2 Dead+1.6 Wind 90 deg - No Ice
7	0.9 Dead+1.6 Wind 90 deg - No Ice
8	1.2 Dead+1.6 Wind 135 deg - No Ice
9	0.9 Dead+1.6 Wind 135 deg - No Ice
10	1.2 Dead+1.6 Wind 180 deg - No Ice
11	0.9 Dead+1.6 Wind 180 deg - No Ice
12	1.2 Dead+1.6 Wind 225 deg - No Ice
13	0.9 Dead+1.6 Wind 225 deg - No Ice
14	1.2 Dead+1.6 Wind 270 deg - No Ice
15	0.9 Dead+1.6 Wind 270 deg - No Ice
16	1.2 Dead+1.6 Wind 315 deg - No Ice
17	0.9 Dead+1.6 Wind 315 deg - No Ice
18	1.2 Dead+1.0 Ice+1.0 Temp
19	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
20	1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp
21	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
22	1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp

Comb. No.	Description
23	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
24	1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp
25	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
26	1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp
27	Dead+Wind 0 deg - Service
28	Dead+Wind 45 deg - Service
29	Dead+Wind 90 deg - Service
30	Dead+Wind 135 deg - Service
31	Dead+Wind 180 deg - Service
32	Dead+Wind 225 deg - Service
33	Dead+Wind 270 deg - Service
34	Dead+Wind 315 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	63.5 - 56	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-5887.89	-4.25	3.63
			Max. Mx	6	-2114.09	-19.68	1.02
			Max. My	2	-2087.53	-1.15	20.79
			Max. Vy	6	4279.53	-19.68	1.02
			Max. Vx	2	-4607.59	-1.15	20.79
			Max. Torque	17			-3.66
L2	56 - 50	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-7146.39	-4.51	3.82
			Max. Mx	6	-2692.67	-46.79	0.84
			Max. My	2	-2662.32	-1.21	51.07
			Max. Vy	6	4687.13	-46.79	0.84
			Max. Vx	2	-5479.99	-1.21	51.07
			Max. Torque	17			-3.94
L3	50 - 38	Pole	Max Tension	20	35990.91	2.44	-2.52
			Max. Compression	1	-1866.69	-0.48	0.31
			Max. Mx	6	-181.14	-57.44	-0.15
			Max. My	2	360.88	-0.05	65.68
			Max. Vy	6	5973.68	-57.44	-0.15
			Max. Vx	2	-6938.55	-0.05	65.68
			Max. Torque	17			-3.92
	38 - 50	Reinforcing	Max Tension	2	54947.48	0.00	-0.79
			Max. Compression	2	-57085.68	0.00	-0.00
			Max. Mx	2	-420.71	-0.01	-0.02
			Max. My	2	54947.48	0.00	-0.79
			Max. Vy	2	-1.84	-0.01	-0.02
			Max. Vx	2	-66.44	0.00	-0.79

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Pole	Max. Vert	1	1866.69	-3.97	3.15
	Max. H_x	14	346.97	5960.79	39.90
	Max. H_z	2	-345.82	57.12	6939.31
	Max. M_x	2	65.68	57.12	6939.31

Location	*Condition*	*Gov. Load Comb.*	*Vertical lb*	*Horizontal, X lb*	*Horizontal, Z lb*
	Max. M_z	6	57.44	-5973.32	-50.69
	Max. Torsion	9	3.92	-4812.38	-4832.31
	Min. Vert	20	-32699.88	-2461.00	2454.10
	Min. H_x	6	192.48	-5973.32	-50.69
	Min. H_z	10	-217.44	-33.72	-6929.12
	Min. M_x	10	-64.93	-33.72	-6929.12
	Min. M_z	14	-56.28	5960.79	39.90
	Min. Torsion	17	-3.92	4831.90	4810.55
Reinf @ Azimuth 90 deg	Max. Vert	6	50947.83	786.32	4.86
	Max. H_x	6	50947.83	786.32	4.86
	Max. H_z	8	41392.37	524.84	471.35
	Min. Vert	15	-47132.93	596.18	15.64
	Min. H_x	25	162.25	-7.13	-0.10
	Min. H_z	4	40694.83	508.85	-461.84
Reinf @ Azimuth 0 deg	Max. Vert	2	57077.18	-6.04	-986.91
	Max. H_x	4	40425.54	457.96	-503.12
	Max. H_z	22	-472.20	-2.58	5.79
	Min. Vert	11	-53425.65	-22.70	-783.94
	Min. H_x	16	41125.51	-466.13	-518.76
	Min. H_z	2	57077.18	-6.04	-986.91
Reinf @ Azimuth 270 deg	Max. Vert	14	48805.41	-730.15	-8.25
	Max. H_x	19	7981.19	11.19	-51.75
	Max. H_z	4	-38469.06	-390.21	433.26
	Min. Vert	6	-48983.00	-638.60	5.24
	Min. H_x	15	48788.18	-730.96	-6.30
	Min. H_z	16	39233.26	-479.75	-442.57
Reinf @ Azimuth 180 deg	Max. Vert	10	55464.62	8.82	940.24
	Max. H_x	8	39504.62	448.52	485.74
	Max. H_z	10	55464.62	8.82	940.24
	Min. Vert	2	-54843.39	-11.86	820.70
	Min. H_x	4	-38199.66	-434.97	385.76
	Min. H_z	21	8490.20	40.58	-9.44

Tower Mast Reaction Summary

Load Combination	*Vertical lb*	*Shear$_x$ lb*	*Shear$_z$ lb*	*Overturning Moment, M_x kip-ft*	*Overturning Moment, M_z kip-ft*	*Torque kip-ft*
Dead Only	3436.55	-0.00	0.00	-1.00	-1.41	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	4123.86	-43.31	-6736.33	-124.56	-0.68	3.43
0.9 Dead+1.6 Wind 0 deg - No Ice	3092.90	-43.31	-6736.33	-123.88	-0.25	3.43
1.2 Dead+1.6 Wind 45 deg - No Ice	4123.86	4624.47	-4624.47	-87.06	-87.54	0.83
0.9 Dead+1.6 Wind 45 deg - No Ice	3092.90	4624.47	-4624.47	-86.50	-86.86	0.83
1.2 Dead+1.6 Wind 90 deg - No Ice	4123.86	5796.99	43.31	-0.19	-110.01	-2.19
0.9 Dead+1.6 Wind 90 deg - No Ice	3092.90	5796.99	43.31	0.11	-109.26	-2.19
1.2 Dead+1.6 Wind 135 deg - No Ice	4123.86	4685.72	4685.72	86.08	-88.97	-3.92

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	lb	lb	lb	kip-ft	kip-ft	kip-ft
0.9 Dead+1.6 Wind 135 deg - No Ice	3092.90	4685.72	4685.72	86.12	-88.28	-3.93
1.2 Dead+1.6 Wind 180 deg - No Ice	4123.86	43.31	6736.33	122.15	-2.69	-3.43
0.9 Dead+1.6 Wind 180 deg - No Ice	3092.90	43.31	6736.33	122.09	-2.26	-3.43
1.2 Dead+1.6 Wind 225 deg - No Ice	4123.86	-4624.47	4624.47	84.65	84.17	-0.83
0.9 Dead+1.6 Wind 225 deg - No Ice	3092.90	-4624.47	4624.47	84.70	84.34	-0.83
1.2 Dead+1.6 Wind 270 deg - No Ice	4123.86	-5796.99	-43.31	-2.21	106.63	2.19
0.9 Dead+1.6 Wind 270 deg - No Ice	3092.90	-5796.99	-43.31	-1.90	106.73	2.20
1.2 Dead+1.6 Wind 315 deg - No Ice	4123.86	-4685.72	-4685.72	-88.48	85.59	3.92
0.9 Dead+1.6 Wind 315 deg - No Ice	3092.90	-4685.72	-4685.72	-87.92	85.76	3.93
1.2 Dead+1.0 Ice+1.0 Temp	11313.49	-0.00	0.00	-3.73	-4.78	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	11313.49	4.83	-3182.22	-51.60	-4.89	0.94
1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp	11313.49	2208.49	-2208.49	-37.34	-38.39	0.32
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	11313.49	2325.54	-4.83	-3.84	-38.18	-0.48
1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp	11313.49	2201.65	2201.65	29.72	-38.22	-0.99
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	11313.49	-4.83	3182.22	44.14	-4.66	-0.94
1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp	11313.49	-2208.49	2208.49	29.88	28.83	-0.32
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	11313.49	-2325.54	4.83	-3.61	28.63	0.48
1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp	11313.49	-2201.65	-2201.65	-37.18	28.67	0.99
Dead+Wind 0 deg - Service	3436.55	-7.34	-1141.43	-21.87	-1.24	0.49
Dead+Wind 45 deg - Service	3436.55	783.59	-783.59	-15.53	-15.93	0.10
Dead+Wind 90 deg - Service	3436.55	982.26	7.34	-0.83	-19.73	-0.35
Dead+Wind 135 deg - Service	3436.55	793.96	793.96	13.76	-16.17	-0.59
Dead+Wind 180 deg - Service	3436.55	7.34	1141.43	19.86	-1.58	-0.49
Dead+Wind 225 deg - Service	3436.55	-783.59	783.59	13.52	13.12	-0.10
Dead+Wind 270 deg - Service	3436.55	-982.26	-7.34	-1.17	16.92	0.35
Dead+Wind 315 deg - Service	3436.55	-793.96	-793.96	-15.77	13.36	0.59

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	lb	lb	lb	lb	lb	lb	
1	0.00	-3436.55	0.00	0.00	3436.55	-0.00	0.000%
2	-43.31	-4123.86	-6736.33	43.31	4123.86	6736.33	0.000%
3	-43.31	-3092.90	-6736.33	43.31	3092.90	6736.33	0.000%
4	4624.47	-4123.86	-4624.47	-4624.47	4123.86	4624.47	0.000%
5	4624.47	-3092.90	-4624.47	-4624.47	3092.90	4624.47	0.000%
6	5796.99	-4123.86	43.31	-5796.99	4123.86	-43.31	0.000%
7	5796.99	-3092.90	43.31	-5796.99	3092.90	-43.31	0.000%
8	4685.72	-4123.86	4685.72	-4685.72	4123.86	-4685.72	0.000%
9	4685.72	-3092.90	4685.72	-4685.72	3092.90	-4685.72	0.000%

Load Comb.	Sum of Applied Forces PX lb	PY lb	PZ lb	Sum of Reactions PX lb	PY lb	PZ lb	% Error
10	43.31	-4123.86	6736.33	-43.31	4123.86	-6736.33	0.000%
11	43.31	-3092.90	6736.33	-43.31	3092.90	-6736.33	0.000%
12	-4624.47	-4123.86	4624.47	4624.47	4123.86	-4624.47	0.000%
13	-4624.47	-3092.90	4624.47	4624.47	3092.90	-4624.47	0.000%
14	-5796.99	-4123.86	-43.31	5796.99	4123.86	43.31	0.000%
15	-5796.99	-3092.90	-43.31	5796.99	3092.90	43.31	0.000%
16	-4685.72	-4123.86	-4685.72	4685.72	4123.86	4685.72	0.000%
17	-4685.72	-3092.90	-4685.72	4685.72	3092.90	4685.72	0.000%
18	0.00	-11313.49	0.00	0.00	11313.49	-0.00	0.000%
19	4.83	-11313.49	-3182.23	-4.83	11313.49	3182.22	0.000%
20	2208.49	-11313.49	-2208.49	-2208.49	11313.49	2208.49	0.000%
21	2325.54	-11313.49	-4.83	-2325.54	11313.49	4.83	0.000%
22	2201.66	-11313.49	2201.66	-2201.65	11313.49	-2201.65	0.000%
23	-4.83	-11313.49	3182.23	4.83	11313.49	-3182.22	0.000%
24	-2208.49	-11313.49	2208.49	2208.49	11313.49	-2208.49	0.000%
25	-2325.54	-11313.49	4.83	2325.54	11313.49	-4.83	0.000%
26	-2201.66	-11313.49	-2201.66	2201.65	11313.49	2201.65	0.000%
27	-7.34	-3436.55	-1141.43	7.34	3436.55	1141.43	0.000%
28	783.59	-3436.55	-783.59	-783.59	3436.55	783.59	0.000%
29	982.26	-3436.55	7.34	-982.26	3436.55	-7.34	0.000%
30	793.96	-3436.55	793.96	-793.96	3436.55	-793.96	0.000%
31	7.34	-3436.55	1141.43	-7.34	3436.55	-1141.43	0.000%
32	-783.59	-3436.55	783.59	783.59	3436.55	-783.59	0.000%
33	-982.26	-3436.55	-7.34	982.26	3436.55	7.34	0.000%
34	-793.96	-3436.55	-793.96	793.96	3436.55	793.96	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	4	0.00000001	0.00027610
3	Yes	4	0.00000001	0.00015578
4	Yes	4	0.00000001	0.00009399
5	Yes	4	0.00000001	0.00005924
6	Yes	4	0.00000001	0.00018024
7	Yes	4	0.00000001	0.00010127
8	Yes	4	0.00000001	0.00038439
9	Yes	4	0.00000001	0.00024845
10	Yes	4	0.00000001	0.00027694
11	Yes	4	0.00000001	0.00015718
12	Yes	4	0.00000001	0.00007078
13	Yes	4	0.00000001	0.00003786
14	Yes	4	0.00000001	0.00017965
15	Yes	4	0.00000001	0.00010103
16	Yes	4	0.00000001	0.00031149
17	Yes	4	0.00000001	0.00016343
18	Yes	4	0.00000001	0.00000615
19	Yes	4	0.00000001	0.00010611
20	Yes	4	0.00000001	0.00004605
21	Yes	4	0.00000001	0.00005247
22	Yes	4	0.00000001	0.00009887
23	Yes	4	0.00000001	0.00007393
24	Yes	4	0.00000001	0.00002273
25	Yes	4	0.00000001	0.00002803
26	Yes	4	0.00000001	0.00009444

27	Yes	4	0.00000001	0.00000001
28	Yes	4	0.00000001	0.00000001
29	Yes	4	0.00000001	0.00000001
30	Yes	4	0.00000001	0.00000001
31	Yes	4	0.00000001	0.00000001
32	Yes	4	0.00000001	0.00000001
33	Yes	4	0.00000001	0.00000001
34	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	63.5 - 56	1.533	28	0.4643	0.0685
L2	56 - 50	0.829	28	0.4051	0.0536
L3	50 - 38	0.416	28	0.2323	0.0358

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
61.00	80010121 9' Mount Pipe	28	1.286	0.4590	0.0642	4126
59.00	Modified T Frame	28	1.095	0.4475	0.0604	4126

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	63.5 - 56	8.048	2	2.3113	0.4453
L2	56 - 50	4.510	2	2.1009	0.3542
L3	50 - 38	2.326	2	1.2614	0.2389

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
61.00	80010121 9' Mount Pipe	2	6.818	2.3172	0.4194	977
59.00	Modified T Frame	2	5.859	2.2835	0.3964	977

Base Plate Design Data

Plate Thickness	Number of Anchor Bolts	Anchor Bolt Size	Actual / Allowable Ratio Bolt Tension	Actual / Allowable Ratio Concrete Stress	Actual / Allowable Ratio Plate Stress	Actual / Allowable Ratio Stiffener Stress	Controlling Condition	Critical Ratio
in		in	lb	ksi	ksi	ksi		
1.7500	8	0.7500	23112.00 37441.40 0.62	8.379 51.000 0.16	28.722 32.400 0.89	7.266 32.400 0.22	Plate	0.89 ✔

Compression Checks

Pole Design Data

Section No.	Elevation	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	lb	lb	
L1	63.5 - 56 (1)	P8x.322	7.50	0.00	0.0	8.3993	-2088.77	317492.00	0.007
L2	56 - 50 (2)	P8x.322	6.00	0.00	0.0	8.3993	-2663.66	317492.00	0.008
L3	50 - 38 (3)	P8x.322	12.00	0.00	0.0	8.3993	-181.14	317492.00	0.001

Pole Bending Design Data

Section No.	Elevation	Size	M_{ux}	ϕM_{nx}	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy}	ϕM_{ny}	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
	ft		kip-ft	kip-ft		kip-ft	kip-ft	
L1	63.5 - 56 (1)	P8x.322	21.18	69.96	0.303	0.00	69.96	0.000
L2	56 - 50 (2)	P8x.322	51.34	69.96	0.734	0.00	69.96	0.000
L3	50 - 38 (3)	P8x.322	57.44	69.96	0.821	0.00	69.96	0.000

Pole Shear Design Data

Section No.	Elevation	Size	Actual V_u	ϕV_n	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u	ϕT_n	Ratio $\frac{T_u}{\phi T_n}$
	ft		lb	lb		kip-ft	kip-ft	
L1	63.5 - 56 (1)	P8x.322	4564.24	158746.00	0.029	0.73	105.90	0.007
L2	56 - 50 (2)	P8x.322	5436.38	158746.00	0.034	0.94	105.90	0.009
L3	50 - 38 (3)	P8x.322	5973.89	158746.00	0.038	2.19	105.90	0.021

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $P_u/\phi P_n$	Ratio $M_{ux}/\phi M_{nx}$	Ratio $M_{uy}/\phi M_{ny}$	Ratio $V_u/\phi V_n$	Ratio $T_u/\phi T_n$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	63.5 - 56 (1)	0.007	0.303	0.000	0.029	0.007	0.311 ✔	1.000	4.8.2 ✔
L2	56 - 50 (2)	0.008	0.734	0.000	0.034	0.009	0.744 ✔	1.000	4.8.2 ✔
L3	50 - 38 (3)	0.001	0.821	0.000	0.038	0.021	0.825 ✔	1.000	4.8.2 ✔

Reinforcing Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $P_u/\phi P_n$
L3	50 - 38	0.5x4	12.00	0.00	0.0 K=1.00	2.0000	-57036.70	64800.00	0.880

Reinforcing Bending Design Data

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $M_{ux}/\phi M_{nx}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $M_{uy}/\phi M_{ny}$
L3	50 - 38	0.5x4	-0.00	0.68	0.001	0.79	5.40	0.146

Reinforcing Interaction Design Data

Section No.	Elevation ft	Size	Ratio $P_u/\phi P_n$	Ratio $M_{ux}/\phi M_{nx}$	Ratio $M_{uy}/\phi M_{ny}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L3	50 - 38	0.5x4	0.880	0.001	0.146	0.913 ✔	1.000	4.8.1 ✔

Tension Checks

Reinforcing Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
L3	50 - 38	0.5x4	12.00	0.00	0.0	2.0000	54947.50	64800.00	0.848

Reinforcing 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 $\frac{M_{uy}}{\phi M_{ny}}$
L3	50 - 38	0.5x4	0.00	0.68	0.000	-0.79	5.40	0.146

Reinforcing Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L3	50 - 38	0.5x4	0.848	0.000	0.146	0.884 ✔	1.000	4.8.1 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
L1	63.5 - 56	Pole	P8x.322	1	-2088.77	317492.00	31.1	Pass
L2	56 - 50	Pole	P8x.322	2	-2663.66	317492.00	74.4	Pass
L3	50 - 38	Pole	P8x.322	3	399.95	317492.00	93.9	Pass
	50 - 38	Reinforcing	0.5x4	5	-57036.70	64800.00	91.3	Pass
							Summary	
						Pole (L3)	93.9	Pass
						Reinforcing (L3)	91.3	Pass
						Base Plate	88.6	Pass
						RATING =	**93.9**	**Pass**

Design Wind Load On Appurtenances:

Inputs:

ANSI/TIA-222-G Reference

Location: **Hamden, CT**

Basic Wind Speed(Nominal): $V := 109$ MPH (Figure A1-1e, p. 232)

Antenna Centerline: $z := 40ft$

Structure Class: $Class := "II"$ (Table 2-1, P. 39)

Exposure Category: $Exp := "B"$ (Section 2.6.5.1, p. 12)

Gust Effect Factor: $G_h := 0.85$ (Section 2.6.9, p. 16)

Wind Directionality Factor: $K_d := 0.95$ (Table 2-2, P. 39)

Topographic Category: $Topo := "1"$ (Section 2.6.6.2, p. 13)

Crest Height: $CH := 0ft$ (Section 2.6.6.4, p. 14)

Importance Factor:

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

(Table 2-3, P. 39)

Force Coefficient:

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

Table 2-8, P. 42

Square Members

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

Table 2-8, P. 42

Round Members

Terrain Exposure Constants:

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

Table 2-4, P. 40

Velocity Pressure Coefficient:

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

Velocity Pressure Coefficient: $K_z := Kz(z) = 0.761$ (Section 2.6.5, P. 13)

Velocity Pressure Coefficient:

$$Kzt(z) := K_{zt} \leftarrow \left| \begin{array}{l} 1.0 \text{ if } Topo = "1" \\ \text{otherwise} \\ \quad K_e \leftarrow \left| \begin{array}{l} 0.90 \text{ if } Exp = "B" \\ 1.00 \text{ if } Exp = "C" \\ 1.10 \text{ if } Exp = "D" \end{array} \right. \quad \text{(Table 2-4 p. 40)} \\ \quad K_t \leftarrow \left| \begin{array}{l} 0.43 \text{ if } Topo = "2" \\ 0.53 \text{ if } Topo = "3" \\ 0.72 \text{ if } Topo = "4" \end{array} \right. \quad \text{(Table 2-5 p. 40)} \\ \quad f \leftarrow \left| \begin{array}{l} 1.25 \text{ if } Topo = "2" \\ 2.00 \text{ if } Topo = "3" \\ 1.50 \text{ if } Topo = "4" \end{array} \right. \quad \text{(Table 2-5 p. 40)} \\ \quad K_h \leftarrow e^{\left(\frac{f \cdot z}{CH} \right)} \quad \text{(Section 2.6.6.4, P. 14)} \\ \quad \left(1 + \frac{K_e \cdot K_t}{K_h} \right)^2 \quad \text{(Section 2.6.6.4, P. 14)} \end{array} \right.$$

(Section 2.6.6.4, p. 14)

$K_{zt} := Kzt(z) = 1$

Velocity Pressure: $q_z := 0.00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V^2 \cdot I \cdot psf = 21.977 \cdot psf$ (Section 2.6.9.6, P. 25)

AT&T Wind Loading (No Ice):

RRUS11

Dimensions: $h_{a1} := 19.7 \cdot in$ $w_{a1} := 17 \cdot in$ $d_{a1} := 7.2 \cdot in$

Weight: $DL_{a1} := 65 lbf$ Assumed 15lbs for mounting

Area (Normal): $A_N := h_{a1} \cdot w_{a1} = 2.326\ ft^2$

Area (Side): $A_T := h_{a1} \cdot d_{a1} = 0.985\ ft^2$

Force Coefficient (Normal): $C_{f\_N} := C_{f\_square}(h_{a1}, w_{a1}) = 1.2$

Force Coefficient (Side): $C_{f\_T} := C_{f\_square}(h_{a1}, d_{a1}) = 1.21$

Front Effective Projected Area: $EPA_N := C_{f\_N} \cdot A_N = 2.791\ ft^2$

Side Effective Projected Area: $EPA_T := C_{f\_T} \cdot A_T = 1.192\ ft^2$

Effective Projected Area: $EPA_a := \max(EPA_N, EPA_T) = 2.791\ ft^2$

Wind Force: $F_{a1} := q_z \cdot G_h \cdot EPA_a = 52.135 \cdot lbf$ (Section 2.6.9.2, P. 20)

RRUS 32

Dimensions: $h_{a2} := 27.1 \cdot in$ $w_{a2} := 12.0 \cdot in$ $d_{a2} := 7.0 \cdot in$

Weight: $DL_{a2} := 65.7 lbf$

Area (Normal): $A_N := h_{a2} \cdot w_{a2} = 2.258\ ft^2$

Area (Side): $A_T := h_{a2} \cdot d_{a2} = 1.317\ ft^2$

Force Coefficient (Normal): $C_{f\_N} := C_{f\_square}(h_{a2}, w_{a2}) = 1.2$

Force Coefficient (Side): $C_{f\_T} := C_{f\_square}(h_{a2}, d_{a2}) = 1.261$

Front Effective Projected Area: $EPA_N := C_{f\_N} \cdot A_N = 2.71\ ft^2$

Side Effective Projected Area: $EPA_T := C_{f\_T} \cdot A_T = 1.661\ ft^2$

Effective Projected Area: $EPA_a := \max(EPA_N, EPA_T) = 2.71\ ft^2$

Wind Force: $F_{a2} := q_z \cdot G_h \cdot EPA_a = 50.625 \cdot lbf$ (Section 2.6.9.2, P. 20)

RRUS 32 B2

Dimensions: $h_{a1} := 29.9 \cdot in$ $w_{a1} := 13.3 \cdot in$ $d_{a1} := 9.5 \cdot in$

Weight: $DL_{a3} := 67.9 lbf$ Assumed 15lbs for mounting

Area (Normal): $A_N := h_{a1} \cdot w_{a1} = 2.762\ ft^2$

Area (Side): $A_T := h_{a1} \cdot d_{a1} = 1.973\ ft^2$

Force Coefficient (Normal): $C_{f\_N} := C_{f\_square}(h_{a1}, w_{a1}) = 1.2$

Force Coefficient (Side): $C_{f\_T} := C_{f\_square}(h_{a1}, d_{a1}) = 1.229$

Front Effective Projected Area: $EPA_N := C_{f\_N} \cdot A_N = 3.314\ ft^2$

Side Effective Projected Area: $EPA_T := C_{f\_T} \cdot A_T = 2.424\ ft^2$

Effective Projected Area: $EPA_a := \max(EPA_N, EPA_T) = 3.314\ ft^2$

Wind Force: $F_{a3} := q_z \cdot G_h \cdot EPA_a = 61.907 \cdot lbf$ (Section 2.6.9.2, P. 20)

RRUS E2

Dimensions: $h_{a2} := 20.4 \cdot in$ $w_{a2} := 18.5 \cdot in$ $d_{a2} := 7.5 \cdot in$

Weight: $DL_{a4} := 75 lbf$

Area (Normal): $A_N := h_{a2} \cdot w_{a2} = 2.621\ ft^2$

Area (Side): $A_T := h_{a2} \cdot d_{a2} = 1.062\ ft^2$

Force Coefficient (Normal): $C_{f\_N} := C_{f\_square}(h_{a2}, w_{a2}) = 1.2$

Force Coefficient (Side): $C_{f\_T} := C_{f\_square}(h_{a2}, d_{a2}) = 1.21$

Front Effective Projected Area: $EPA_N := C_{f\_N} \cdot A_N = 3.145\ ft^2$

Side Effective Projected Area: $EPA_T := C_{f\_T} \cdot A_T = 1.285\ ft^2$

Effective Projected Area: $EPA_a := \max(EPA_N, EPA_T) = 3.145\ ft^2$

Wind Force: $F_{a4} := q_z \cdot G_h \cdot EPA_a = 58.751 \cdot lbf$ (Section 2.6.9.2, P. 20)

Powerwave TMA's TT19-08BP111-001

Dimensions: $h_{a1} := 9.9 \cdot in$ $w_{a1} := 6.7 \cdot in$ $d_{a1} := 5.4 \cdot in$

Weight: $DL_{a5} := 16 lbf$ Assumed 15lbs for mounting

Area (Normal): $A_N := h_{a1} \cdot w_{a1} = 0.461\ ft^2$

Area (Side): $A_T := h_{a1} \cdot d_{a1} = 0.371\ ft^2$

Force Coefficient (Normal): $C_{f\_N} := C_{f\_square}(h_{a1}, w_{a1}) = 1.2$

Force Coefficient (Side): $C_{f\_T} := C_{f\_square}(h_{a1}, d_{a1}) = 1.2$

Front Effective Projected Area: $EPA_N := C_{f\_N} \cdot A_N = 0.553\ ft^2$

Side Effective Projected Area: $EPA_T := C_{f\_T} \cdot A_T = 0.446\ ft^2$

Effective Projected Area: $EPA_a := \max(EPA_N, EPA_T) = 0.553\ ft^2$

Wind Force: $F_{a5} := q_z \cdot G_h \cdot EPA_a = 10.326 \cdot lbf$ (Section 2.6.9.2, P. 20)

DC6 Squid

Dimensions: $h_{a2} := 24 \cdot in$ $w_{a2} := 11 \cdot in$ $d_{a2} := 11 \cdot in$

Weight: $DL_{a6} := 47.8 lbf$

Area (Normal): $A_N := h_{a2} \cdot w_{a2} = 1.833\ ft^2$

Area (Side): $A_T := h_{a2} \cdot d_{a2} = 1.833\ ft^2$

Force Coefficient (Normal): $C_{f\_N} := C_{f\_square}(h_{a2}, w_{a2}) = 1.2$

Force Coefficient (Side): $C_{f\_T} := C_{f\_square}(h_{a2}, d_{a2}) = 1.2$

Front Effective Projected Area: $EPA_N := C_{f\_N} \cdot A_N = 2.2\ ft^2$

Side Effective Projected Area: $EPA_T := C_{f\_T} \cdot A_T = 2.2\ ft^2$

Effective Projected Area: $EPA_a := \max(EPA_N, EPA_T) = 2.2\ ft^2$

Wind Force: $F_{a6} := q_z \cdot G_h \cdot EPA_a = 41.098 \cdot lbf$ (Section 2.6.9.2, P. 20)

Antenna Mount Loading:

4.0" STD Loading:

Height: $h_{m1} := 60in$

Width: $w_{m1} := 4 \cdot in$

Area: $A_a := h_{m1} \cdot w_{m1} = 1.667\ ft^2$

Force Coefficient: $C_f := C_{f\_square}(h_{m1}, w_{m1}) = 1.667$

Wind Load: $f_{m1} := q_z \cdot G_h \cdot C_f \cdot w_{m1} = 10.378 \cdot plf$ (Section 2.6.9.2, P. 20)

W10 Beam Loading:

Height: $h_{m2} := 10in$

Width: $w_{m2} := 12in$

Area: $A_a := h_{m2} \cdot w_{m2} = 0.833\ ft^2$

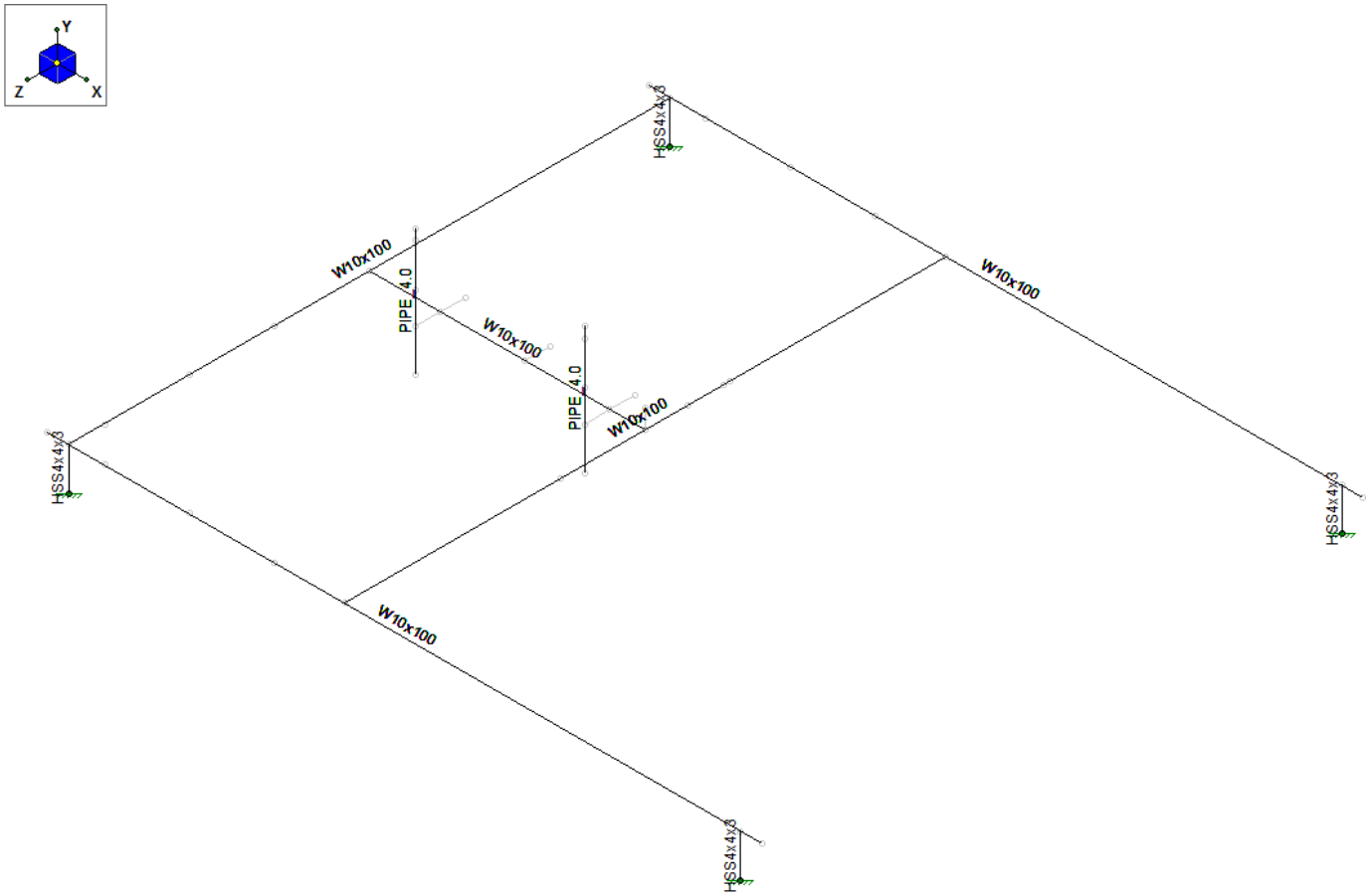
Force Coefficient: $C_f := C_{f\_square}(h_{m2}, w_{m2}) = 1.2$

Wind Load: $f_{m2} := q_z \cdot G_h \cdot C_f \cdot w_{m2} = 22.417 \cdot plf$ (Section 2.6.9.2, P. 20)

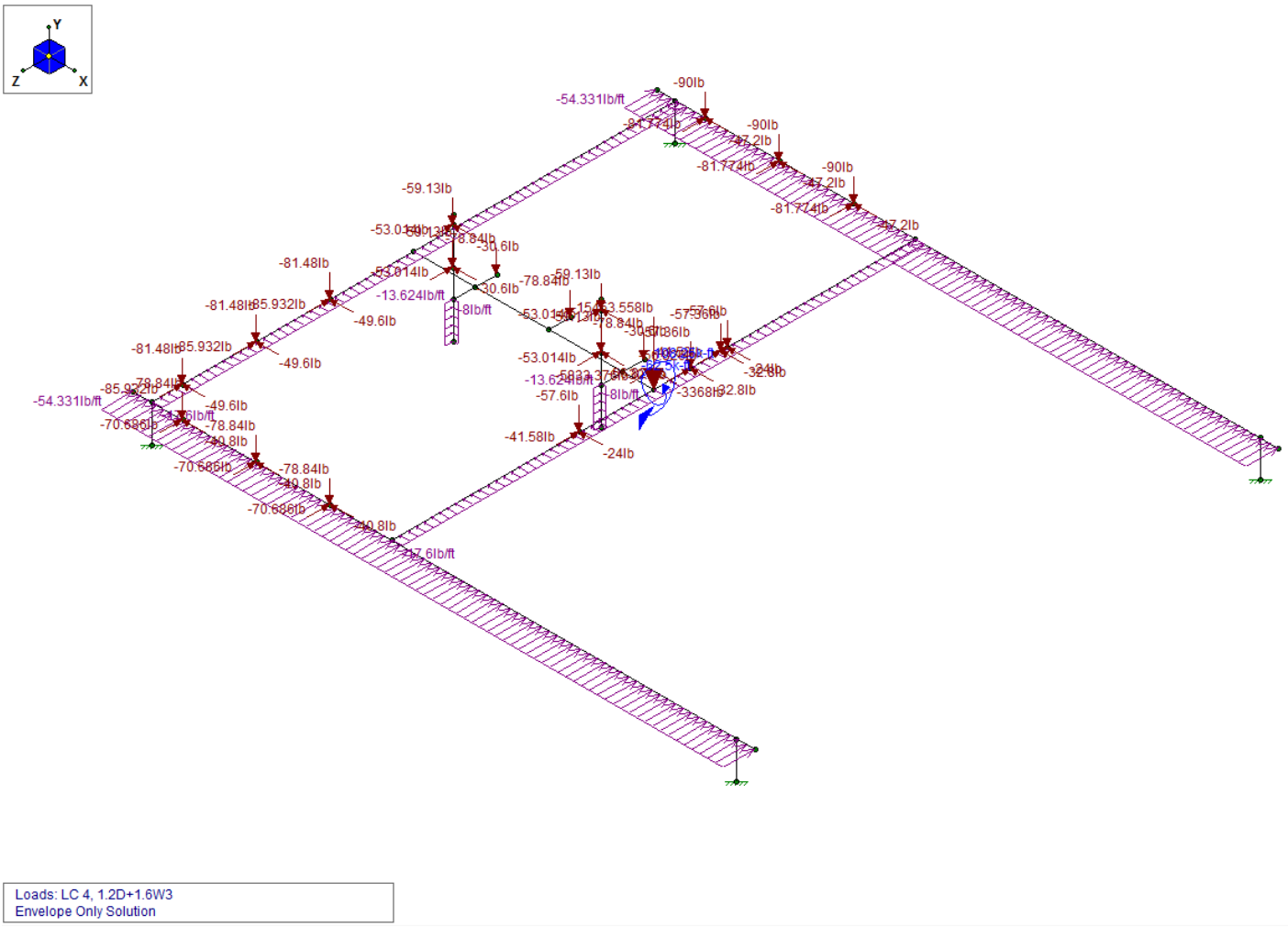
Summary:

	Dead Load (No Ice)	Wind Load (No Ice)
RRUS 11	$DL_{a1} = 65\,lbf$	$F_{a1} = 52\,lbf$
RRUS 32	$DL_{a2} = 66\,lbf$	$F_{a2} = 51\,lbf$
RRUS 32 B2	$DL_{a3} = 68\,lbf$	$F_{a3} = 62\,lbf$
RRUS E2	$DL_{a4} = 75\,lbf$	$F_{a4} = 59\,lbf$
Powerwave TT19 TMA	$DL_{a5} = 16\,lbf$	$F_{a5} = 10\,lbf$
DC6 Squid	$DL_{a6} = 48\,lbf$	$F_{a6} = 41\,lbf$
4.0" Pipe Loading Loading		$f_{m1} = 10 \cdot plf$
W Beam Wind Loading:		$f_{m2} = 22 \cdot plf$

Risa Model:

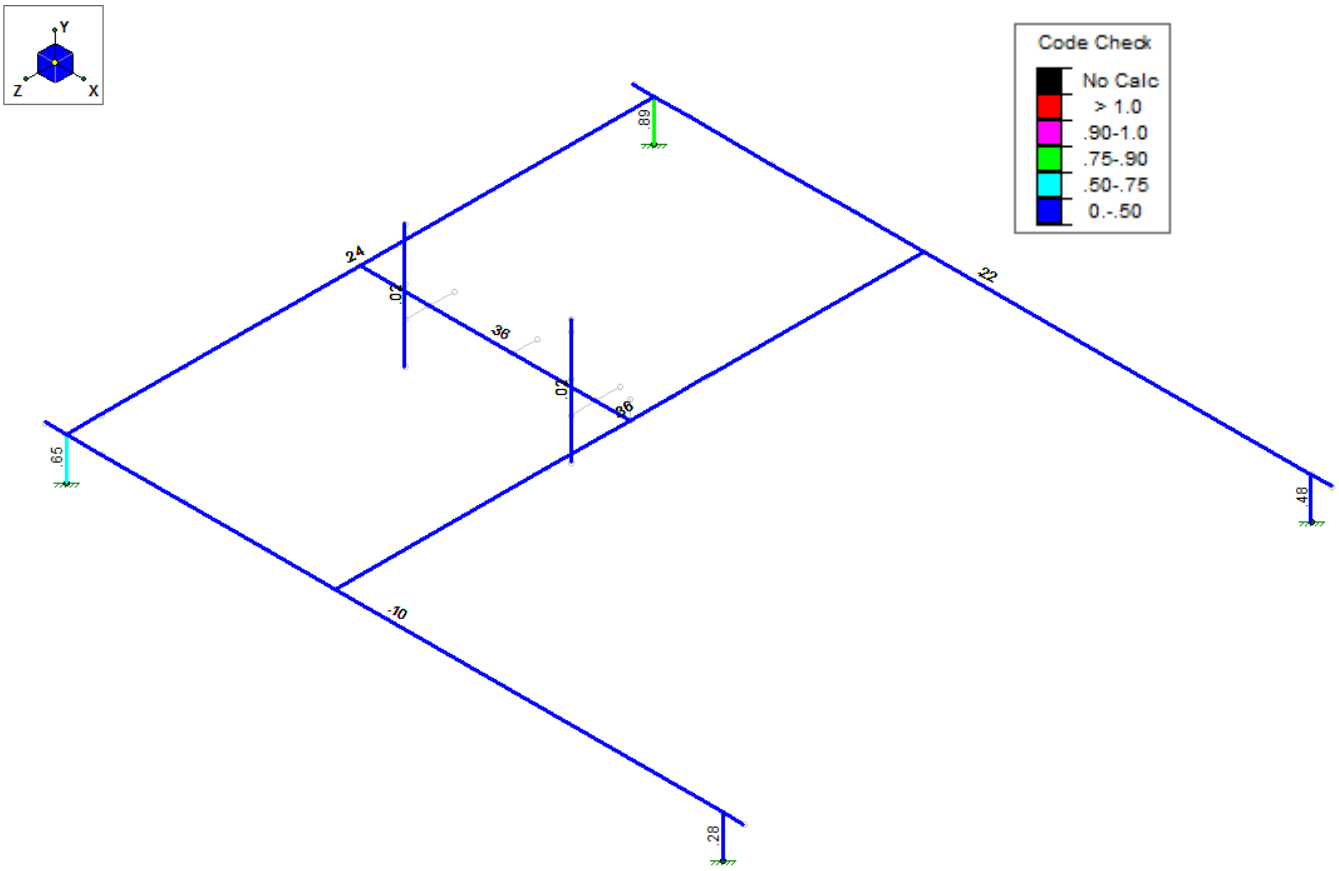

Y
Z
X
HSS4x4x3
W10x100
PIPE_4.0
W10x100
PIPE_4.0
W10x100
W10x100
HSS4x4x3
W10x100
HSS4x4x3
HSS4x4x3

Most Critical Loading:



Loads: LC 4, 1.2D+1.6W3
Envelope Only Solution

Risa 3D Code Check:



Existing Dead Load:

The total load of the Equipment platform, Monopole, Mount and Existing Antennas:

Equipment Platform:	1584lbs
Monopole :	3436lbs
Antenna Mount:	492lbs
Existing Antennas:	668.1lbs
Existing RRH's+TMA+Squid	533.8lbf

$$DL_{Exist} := 1584lbf + 3020lbf + 492lbf + 668lbf + 533.8lbf = 6.298 \times 10^{3}\,lbf$$

Proposed Dead Load:

Total Weight of Proposed RRHS :

$$DL_{Prop} := 3DL_{a2} + 3DL_{a3} + 3DL_{a4} + 1DL_{a6} = 673.6 \cdot lbf$$

$$Ratio := \frac{DL_{Prop}}{DL_{Exist}} \cdot 100 = 10.696$$

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Billerica, MA 01862

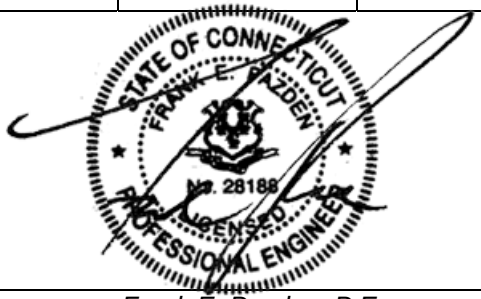
LTE 4C/5C

Structural Analysis & Antenna Mount Analysis

Site Name:	*Hamden*
FA #:	*10035036*
Site Number:	*CTV2035*
Site Address:	*975 Mix Avenue* *Hamden, CT 06514* *New Heaven County*
Maser Project Number:	*16963030A*

January 17, 2017

Monopole	*Monopole*	*Equipment Platform*
Pass/Fail	*Fail*	*Pass*
Utilization	*185.1%*	*72.9*



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 equipment platform supporting the monopole at the subject facility for the final wireless telecommunications configuration, per the applicable codes and standards.

Introduction:

Maser Consulting Connecticut has performed limited field observations on December 21, 2016 to verify the existing condition of the structure and to locate and quantify the existing wireless appurtenances, where possible. This structural analysis is only valid for the appurtenances listed in the report. Additionally, Maser Consulting Connecticut has reviewed the following documents in completing this report:

- RFDS 1404033 provided by Empire Telecom, dated December 12, 2016.
- Rev A., Construction Drawings prepared by Maser Consulting Connecticut for project #16963030A.
- Previous Structural analysis prepared by Destek Engineering, LLC, dated, August 01, 2016.

The existing structure is a 4-Story residential building comprised of reinforced concrete slabs and supported on concrete masonry unit walls. The existing **AT&T** equipment is to be supported on an existing 25'-6" monopole supporting (9) panel antennas at a centerline of 61'-0" above grade level. The proposed equipment is to be mounted on the equipment platform on the rooftop that supports the monopole. The equipment platform is constructed of structural steel wide flange beams supported over concrete masonry unit walls on the rooftop of the building at an elevation of 34'-0" above the grade level. This report is based only upon this information, as well as the information obtained in the field.

Discrete and Linear Appurtenances:

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	REMAIN	54.50	10.30	5.90	51.20	143°	61.0'	-	-
	A2	Quintel QS66512-2	Quintel QS66512-2	LTE	REMAIN	72.00	12.00	9.60	111.00	20°	61.0'	**RRUS-E2** **RRUS-11** RRUS-32 RRUS-32 B2	**NEW** **NEW** REMAIN REMAIN
	A3	-	-	-	-	-	-	-	-	-	-	-	-
	A4	CCI HPA-65R-BUU-H6	CCI HPA-65R-BUU-H6	LTE	REMAIN	72.00	14.80	9.00	60.50	143°	61.0'	**RRUS-11**	**NEW**
BETA	B1	Kathrein 80010121	Kathrein 80010121	UMTS	REMAIN	54.50	10.30	5.90	51.20	263°	61.0'	-	-
	B2	Quintel QS66512-2	Quintel QS66512-2	LTE	REMAIN	72.00	12.00	9.60	111.00	150°	61.0'	**RRUS-E2** **RRUS-11** RRUS-32 RRUS-32 B2	**NEW** **NEW** REMAIN REMAIN
	B3	-	-	-	-	-	-	-	-	-	-	-	-
	B4	CCI HPA-65R-BUU-H6	CCI HPA-65R-BUU-H6	LTE	REMAIN	72.00	14.80	9.00	60.50	150°	61.0'	**RRUS-11**	**NEW**
GAMMA	C1	Kathrein 80010121	Kathrein 80010121	UMTS	REMAIN	54.50	10.30	5.90	51.20	23°	61.0'	-	-
	C2	Quintel QS66512-2	Quintel QS66512-2	LTE	REMAIN	72.00	12.00	9.60	111.00	260°	61.0'	**RRUS-E2** **RRUS-11** RRUS-32 RRUS-32 B2	**NEW** **NEW** REMAIN REMAIN
	C3	-	-	-	-	-	-	-	-	-	-	-	-
	C4	CCI HPA-65R-BUU-H6	CCI HPA-65R-BUU-H6	LTE	REMAIN	72.00	14.80	9.00	60.50	260°	61.0'	**RRUS-11**	**NEW**

All existing and proposed RRU's are located at the base of monopole.
(3) RRUS 11, (3) RRUS 32, (3) RRUS E2 and (1) DC6 shall added to the equipment platform in addition to existing (3) RRUS 32, (3) RRUS 11 (6) TMA's and (1) DC6 Squid

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 for the monopole analysis.
    - Basic Wind Speed – 109 mph (3 Second Gust)
    - 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, equipment platform and the building structure are 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. TNX Tower and Risa-3D, 3D finite element modeling and analysis programs, were used to determine the capacity and usage of the existing monopole and equipment platform respectively.

The following assumptions were utilized in this report:

- Monopole Structural Steel Strength 42ksi (A500 Gr.42) Steel is assumed per the previous structural analysis.
- The base plate is assumed to be constructed of A36 (36 ksi) grade B steel.
- The anchor bolts are assumed to be made up of A325 (92 ksi) grade of steel.
- The equipment platform beams are assumed to be up of A992 (50 ksi) grade of steel
- The foundation of the building is not evaluated as a part of this analysis and this report is conducted assuming the foundation is structurally adequate to carry the existing and proposed equipment described herein.
- The antenna mount and its connections to the monopole are not analyzed as a part of this analysis report.
- It is assumed that the telecommunication equipment supports, antenna supports, existing structure and its foundation 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 monopole was analyzed for the loading in the applicable codes and standards. The Monopole has been determined to be structurally **INADEQUATE** to support the proposed load configuration based upon the aforementioned assumptions. The Monopole has been determined to be stressed to a maximum of **185.1%** of its structural capacity with the maximum usage occurring at the 0'-18' section. The base plate has been determined to be over stressed and determined that it has **INADEQUATE** capacity with maximum usage occurring to be **177.2%**.

The existing dunnage platform with the existing monopole and proposed loading was analyzed for the loading in the applicable codes and standards. The existing dunnage platform has been determined to be structurally **ADEQUATE** to support the proposed and existing antennas, based upon the aforementioned assumptions. The dunnage platform has been determined to be stressed to a maximum of **72.1%** of its structural capacity with the maximum usage occurring at one of the column HSS member.

The building was not analyzed as a part of this report, but in comparison with the existing load condition analyzed, the proposed equipment is shielded for wind load and is a negligible addition of Gravity load. Therefore, the conclusions of the previous structural analysis still govern. Since the monopole and equipment platform are part of the same structural support system, the proposed **AT&T** installation **CANNOT** be placed as intended until the monopole is modified to support the proposed load condition. The designs of the monopole and baseplate modifications are not within the scope of this report and shall be completed under separate cover.

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

Gowtham Penumatsa, E.I.T.
Structural Design Engineer

\\maserconsulting.com\unm\AllOffices\MtLaurel\Projects\2016\16963000A\16963029A\Structural\Mount Analysis\Rev 0\Word\10035108.CT1146.East Hartford CT.Mount Analysis.Rev 0

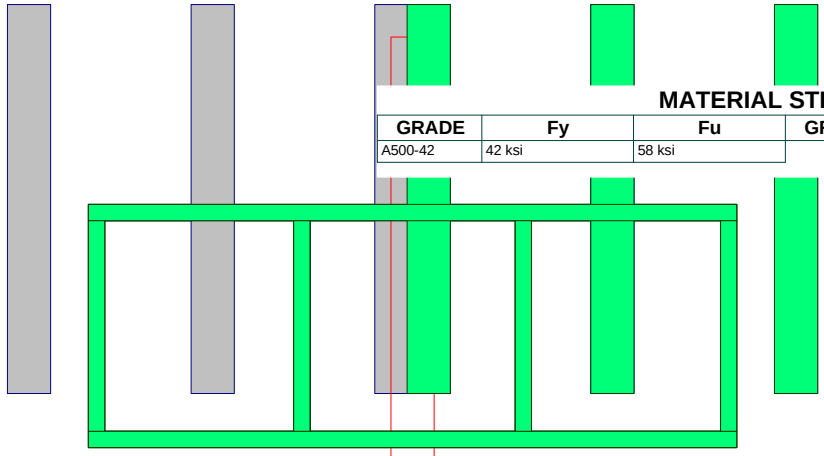
APPENDIX

Section	Size	Length (ft)	Grade	Weight (lb)
1	P8x.322	7.50	A500-42	214.4
2	P8x.322	18.00		514.5
				728.8

63.5 ft

56.0 ft

38.0 ft



MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500-42	42 ksi	58 ksi			

ALL REACTIONS ARE FACTORED

AXIAL 9473 lb

SHEAR 3275 lb *MOMENT 57 kip-ft*

TORQUE 2 kip-ft

50 mph WIND - 0.7500 in ICE

AXIAL 3804 lb

SHEAR 7038 lb *MOMENT 128 kip-ft*

TORQUE 5 kip-ft

REACTIONS - 109 mph WIND

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400 Valley Road
Mt Arlington, NJ
Phone: 973.398.3110
FAX: 973.398.3199

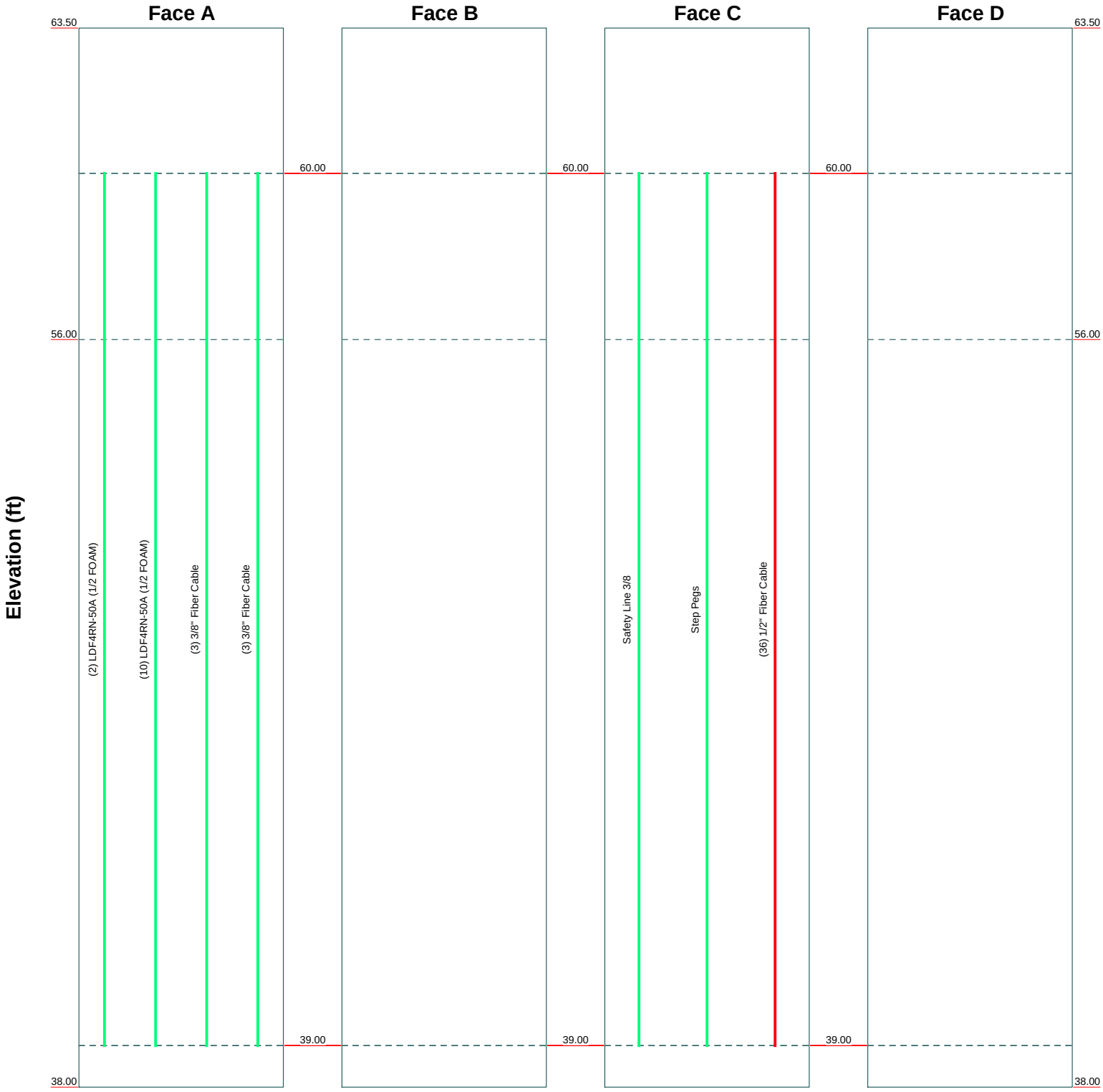
Job: ***16963030A***

Project: ***Hamden***

Client: Empire Telecom	Drawn by: gpenumatsa	App'd:
Code: TIA-222-G	Date: 01/17/17	Scale: NTS
Path: \\maserconsulting.com\unnml\AllOffices\MtLaurel\Projects\2016\16963000A\16963030A\Structural\Rev 0\TNX\Monopole Antanysis.eri		Dwg No. E-1

Feed Line Distribution Chart
38' - 63'6"

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



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Job: ***16963030A***		
Project: ***Hamden***		
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Code: TIA-222-G	Date: 01/17/17	Scale: NTS
Path: \\maserconsulting.com\unm\AllOffices\MtLaurel\Projects\2016\16963000A\16963030A\Structural\Rev 0\TNX\Monopole Antenna.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 109 mph.
Structure Class II.
Exposure Category B.
Topographic Category 1.
Crest Height 0.00 ft.
Nominal ice thickness of 0.7500 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				

Pole Section Geometry

Section	Elevation ft	Section Length ft	Pole Size	Pole Grade	Socket Length ft
L1	63.50-56.00	7.50	P8x.322	A500-42 (42 ksi)	
L2	56.00-38.00	18.00	P8x.322	A500-42 (42 ksi)	

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 63.50-56.00				1	1	1			
L2 56.00-38.00				1	1	1			

Monopole Base Plate Data

Base Plate Data	
Base plate is square	√
Base plate is grouted	
Anchor bolt grade	A490N
Anchor bolt size	1.0000 in
Number of bolts	8
Embedment length	100.0000 in
f'_c	4 ksi
Grout space	3.2500 in
Base plate grade	A36
Base plate thickness	1.5000 in
Bolt circle diameter	12.1700 in
Outer diameter	16.0000 in
Inner diameter	8.6250 in
Base plate type	Plain Plate

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
1/2" Fiber Cable	C	Surface Ar (CaAa)	60.00 - 39.00	36	10	0.000 0.000	0.5000		1.00

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
LDF4RN-50A (1/2 FOAM)	A	No	CaAa (Out Of Face)	60.00 - 39.00	2	No Ice 1/2" Ice 1" Ice	0.06 0.16 0.26	0.15 0.84 2.14
LDF4RN-50A (1/2 FOAM)	A	No	CaAa (Out Of Face)	60.00 - 39.00	10	No Ice 1/2" Ice	0.06 0.16	0.15 0.84

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
						1" Ice	0.26	2.14
3/8" Fiber Cable	A	No	CaAa (Out Of Face)	60.00 - 39.00	3	No Ice	0.00	1.00
						1/2" Ice	0.15	1.61
						1" Ice	0.25	2.83
3/8" Fiber Cable	A	No	CaAa (Out Of Face)	60.00 - 39.00	3	No Ice	0.00	1.00
						1/2" Ice	0.15	1.61
						1" Ice	0.25	2.83
Safety Line 3/8	C	No	CaAa (Out Of Face)	60.00 - 39.00	1	No Ice	0.04	0.22
						1/2" Ice	0.14	0.75
						1" Ice	0.24	1.28
Step Pegs	C	No	CaAa (Out Of Face)	60.00 - 39.00	1	No Ice	0.02	1.50
						1/2" Ice	0.05	2.25
						1" Ice	0.08	3.00

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
L1	63.50-56.00	A	0.000	0.000	0.000	3.057	31.20
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	2.000	0.230	150.88
		D	0.000	0.000	0.000	0.000	0.00
L2	56.00-38.00	A	0.000	0.000	0.000	12.993	132.60
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	8.500	0.977	641.24
		D	0.000	0.000	0.000	0.000	0.00

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 lb
L1	63.50-56.00	A	1.592	0.000	0.000	0.000	27.145	357.47
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	4.092	1.885	236.47
		D		0.000	0.000	0.000	0.000	0.00
L2	56.00-38.00	A	1.554	0.000	0.000	0.000	113.056	1468.61
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	17.229	7.846	996.89
		D		0.000	0.000	0.000	0.000	0.00

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	63.50-56.00	0.5503	-0.2018	-0.0667	-0.4548
L2	56.00-38.00	0.7053	-0.2587	-0.0674	-0.4909

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
L1	7	1/2" Fiber Cable	56.00 - 60.00	1.0000	1.0000
L2	7	1/2" Fiber Cable	39.00 - 56.00	1.0000	1.0000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
80010121 9' Mount Pipe	A	From Leg	4.00	0.0000	61.00	No Ice	6.22	5.43	93.85
(AT&T)			-4.00			1/2" Ice	7.03	6.71	150.46
			0.00			1" Ice	7.86	8.00	214.13
Quintel QS66512-2 w/m pipe	A	From Leg	4.00	0.0000	61.00	No Ice	8.85	8.94	143.85
(AT&T)			0.00			1/2" Ice	9.61	10.33	224.75
			0.00			1" Ice	10.39	11.73	314.20
HPA-65R-BUU-H6 W/Mt	A	From Leg	4.00	0.0000	61.00	No Ice	10.37	8.59	93.35
pipe			4.00			1/2" Ice	11.15	9.98	180.04
(AT&T)			0.00			1" Ice	11.94	11.39	275.42
80010121 9' Mount Pipe	B	From Leg	4.00	0.0000	61.00	No Ice	6.22	5.43	93.85
(AT&T)			-4.00			1/2" Ice	7.03	6.71	150.46
			0.00			1" Ice	7.86	8.00	214.13
Quintel QS66512-2 w/m pipe	B	From Leg	4.00	0.0000	61.00	No Ice	8.85	8.94	143.85
(AT&T)			0.00			1/2" Ice	9.61	10.33	224.75
			0.00			1" Ice	10.39	11.73	314.20
HPA-65R-BUU-H6 W/Mt	B	From Leg	4.00	0.0000	61.00	No Ice	10.37	8.59	93.35
pipe			4.00			1/2" Ice	11.15	9.98	180.04
(AT&T)			0.00			1" Ice	11.94	11.39	275.42
80010121 9' Mount Pipe	C	From Leg	4.00	0.0000	61.00	No Ice	6.22	5.43	93.85
(AT&T)			-4.00			1/2" Ice	7.03	6.71	150.46
			0.00			1" Ice	7.86	8.00	214.13
Quintel QS66512-2 w/m pipe	C	From Leg	4.00	0.0000	61.00	No Ice	8.85	8.94	143.85
(AT&T)			0.00			1/2" Ice	9.61	10.33	224.75
			0.00			1" Ice	10.39	11.73	314.20
HPA-65R-BUU-H6 W/Mt	C	From Leg	4.00	0.0000	61.00	No Ice	10.37	8.59	93.35
pipe			4.00			1/2" Ice	11.15	9.98	180.04
(AT&T)			0.00			1" Ice	11.94	11.39	275.42
Modified T Frame	A	None		0.0000	59.00	No Ice	9.63	9.63	164.00
(AT&T)						1/2" Ice	12.41	12.41	228.00
						1" Ice	15.20	15.20	292.00
Modified T Frame	B	None		0.0000	59.00	No Ice	9.63	9.63	164.00
(AT&T)						1/2" Ice	12.41	12.41	228.00
						1" Ice	15.20	15.20	292.00
Modified T Frame	C	None		0.0000	59.00	No Ice	9.63	9.63	164.00
(AT&T)						1/2" Ice	12.41	12.41	228.00
						1" Ice	15.20	15.20	292.00

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 63.50-56.00	59.75	0.853	25	5.391	A	0.000	5.391	5.391	100.00	0.000	3.057
					B	0.000	5.391		100.00	0.000	0.000
					C	0.000	5.391		100.00	2.000	0.230
					D	0.000	5.391		100.00	0.000	0.000
L2 56.00-38.00	47.00	0.796	23	12.938	A	0.000	12.938	12.938	100.00	0.000	12.993
					B	0.000	12.938		100.00	0.000	0.000
					C	0.000	12.938		100.00	8.500	0.977
					D	0.000	12.938		100.00	0.000	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 63.50-56.00	59.75	0.853	5	1.5917	7.380	A	0.000	7.380	7.380	100.00	0.000	27.145
						B	0.000	7.380		100.00	0.000	0.000
						C	0.000	7.380		100.00	4.092	1.885
						D	0.000	7.380		100.00	0.000	0.000
L2 56.00-38.00	47.00	0.796	5	1.5540	17.599	A	0.000	17.599	17.599	100.00	0.000	113.056
						B	0.000	17.599		100.00	0.000	0.000
						C	0.000	17.599		100.00	17.229	7.846
						D	0.000	17.599		100.00	0.000	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 63.50-56.00	59.75	0.853	7	5.391	A	0.000	5.391	5.391	100.00	0.000	3.057
					B	0.000	5.391		100.00	0.000	0.000
					C	0.000	5.391		100.00	2.000	0.230
					D	0.000	5.391		100.00	0.000	0.000
L2 56.00-38.00	47.00	0.796	6	12.938	A	0.000	12.938	12.938	100.00	0.000	12.993
					B	0.000	12.938		100.00	0.000	0.000
					C	0.000	12.938		100.00	8.500	0.977

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
					D	0.000	12.938		100.00	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1	182.08	214.36	A	1	1.2	25	1	1	5.391	465.13	62.02	D
63.50-56.00			B	1	1.2		1	1	5.391			
			C	1	1.2		1	1	5.391			
			D	1	1.2		1	1	5.391			
L2	773.84	514.46	A	1	1.2	23	1	1	12.938	1542.84	85.71	D
56.00-38.00			B	1	1.2		1	1	12.938			
			C	1	1.2		1	1	12.938			
			D	1	1.2		1	1	12.938			
Sum Weight:	955.92	728.81						OTM	24.00 kip-ft	2007.97		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1	182.08	214.36	A	1	1.2	25	1	1	5.391	465.13	62.02	D
63.50-56.00			B	1	1.2		1	1	5.391			
			C	1	1.2		1	1	5.391			
			D	1	1.2		1	1	5.391			
L2	773.84	514.46	A	1	1.2	23	1	1	12.938	1542.84	85.71	D
56.00-38.00			B	1	1.2		1	1	12.938			
			C	1	1.2		1	1	12.938			
			D	1	1.2		1	1	12.938			
Sum Weight:	955.92	728.81						OTM	24.00 kip-ft	2007.97		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
L1	593.93	363.37	A	1	1.2	5	1	1	7.380	527.15	70.29	D
63.50-56.00			B	1	1.2		1	1	7.380			
			C	1	1.2		1	1	7.380			
			D	1	1.2		1	1	7.380			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L2	2465.50	862.31	A	1	1.2	5	1	1	17.599	1965.41	109.19	D
56.00-38.00			B	1	1.2		1	1	17.599			
			C	1	1.2		1	1	17.599			
			D	1	1.2		1	1	17.599			
Sum Weight:	3059.44	1225.68						OTM	29.15 kip-ft	2492.56		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L1	593.93	363.37	A	1	1.2	5	1	1	7.380	527.15	70.29	D
63.50-56.00			B	1	1.2		1	1	7.380			
			C	1	1.2		1	1	7.380			
			D	1	1.2		1	1	7.380			
L2	2465.50	862.31	A	1	1.2	5	1	1	17.599	1965.41	109.19	D
56.00-38.00			B	1	1.2		1	1	17.599			
			C	1	1.2		1	1	17.599			
			D	1	1.2		1	1	17.599			
Sum Weight:	3059.44	1225.68						OTM	29.15 kip-ft	2492.56		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L1	182.08	214.36	A	1	1.2	7	1	1	5.391	126.10	16.81	D
63.50-56.00			B	1	1.2		1	1	5.391			
			C	1	1.2		1	1	5.391			
			D	1	1.2		1	1	5.391			
L2	773.84	514.46	A	1	1.2	6	1	1	12.938	418.28	23.24	D
56.00-38.00			B	1	1.2		1	1	12.938			
			C	1	1.2		1	1	12.938			
			D	1	1.2		1	1	12.938			
Sum Weight:	955.92	728.81						OTM	6.51 kip-ft	544.38		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F lb	w plf	Ctrl. Face
L1	182.08	214.36	A	1	1.2	7	1	1	5.391	126.10	16.81	D
63.50-56.00			B	1	1.2		1	1	5.391			
			C	1	1.2		1	1	5.391			
			D	1	1.2		1	1	5.391			
L2	773.84	514.46	A	1	1.2	6	1	1	12.938	418.28	23.24	D
56.00-38.00			B	1	1.2		1	1	12.938			
			C	1	1.2		1	1	12.938			
			D	1	1.2		1	1	12.938			
Sum Weight:	955.92	728.81						OTM	6.51 kip-ft	544.38		

Discrete Appurtenance Pressures - No Ice $G_H = 1.100$

Description	Aiming Azimuth °	Weight lb	$Offset_x$ ft	$Offset_z$ ft	z ft	K_z	q_z psf	C_AA_C Front ft^2	C_AA_C Side ft^2
80010121 9' Mount Pipe	315.0000	93.85	-5.91	-0.25	61.00	0.858	25	6.22	5.43
Quintel QS66512-2 w/m pipe	315.0000	143.85	-3.08	-3.08	61.00	0.858	25	8.85	8.94
HPA-65R-BUU-H6 W/Mt pipe	315.0000	93.35	-0.25	-5.91	61.00	0.858	25	10.37	8.59
80010121 9' Mount Pipe	45.0000	93.85	0.25	-5.91	61.00	0.858	25	6.22	5.43
Quintel QS66512-2 w/m pipe	45.0000	143.85	3.08	-3.08	61.00	0.858	25	8.85	8.94
HPA-65R-BUU-H6 W/Mt pipe	45.0000	93.35	5.91	-0.25	61.00	0.858	25	10.37	8.59
80010121 9' Mount Pipe	135.0000	93.85	5.91	0.25	61.00	0.858	25	6.22	5.43
Quintel QS66512-2 w/m pipe	135.0000	143.85	3.08	3.08	61.00	0.858	25	8.85	8.94
HPA-65R-BUU-H6 W/Mt pipe	135.0000	93.35	0.25	5.91	61.00	0.858	25	10.37	8.59
Modified T Frame	0.0000	164.00	0.00	0.00	59.00	0.850	25	9.63	9.63
Modified T Frame	0.0000	164.00	0.00	0.00	59.00	0.850	25	9.63	9.63
Modified T Frame	0.0000	164.00	0.00	0.00	59.00	0.850	25	9.63	9.63
	Sum Weight:	1485.15							

Discrete Appurtenance Pressures - With Ice $G_H = 1.100$

Description	Aiming Azimuth °	Weight lb	$Offset_x$ ft	$Offset_z$ ft	z ft	K_z	q_z psf	C_AA_C Front ft^2	C_AA_C Side ft^2	t_z in
80010121 9' Mount Pipe	315.0000	305.10	-5.91	-0.25	61.00	0.858	5	8.63	9.10	1.5950
Quintel QS66512-2 w/m pipe	315.0000	438.50	-3.08	-3.08	61.00	0.858	5	11.18	12.95	1.5950
HPA-65R-BUU-H6 W/Mt pipe	315.0000	407.03	-0.25	-5.91	61.00	0.858	5	12.75	12.61	1.5950
80010121 9' Mount Pipe	45.0000	305.10	0.25	-5.91	61.00	0.858	5	8.63	9.10	1.5950
Quintel QS66512-2 w/m pipe	45.0000	438.50	3.08	-3.08	61.00	0.858	5	11.18	12.95	1.5950
HPA-65R-BUU-H6 W/Mt pipe	45.0000	407.03	5.91	-0.25	61.00	0.858	5	12.75	12.61	1.5950

Description	Aiming Azimuth °	Weight lb	$Offset_x$ ft	$Offset_z$ ft	z ft	K_z	q_z psf	C_AA_C Front ft^2	C_AA_C Side ft^2	t_z in
80010121 9' Mount Pipe	135.0000	305.10	5.91	0.25	61.00	0.858	5	8.63	9.10	1.5950
Quintel QS66512-2 w/m pipe	135.0000	438.50	3.08	3.08	61.00	0.858	5	11.18	12.95	1.5950
HPA-65R-BUU-H6 W/Mt pipe	135.0000	407.03	0.25	5.91	61.00	0.858	5	12.75	12.61	1.5950
Modified T Frame	0.0000	367.49	0.00	0.00	59.00	0.850	5	18.48	18.48	1.5897
Modified T Frame	0.0000	367.49	0.00	0.00	59.00	0.850	5	18.48	18.48	1.5897
Modified T Frame	0.0000	367.49	0.00	0.00	59.00	0.850	5	18.48	18.48	1.5897
	Sum Weight:	4554.32								

Discrete Appurtenance Pressures - Service $G_H = 1.100$

Description	Aiming Azimuth °	Weight lb	$Offset_x$ ft	$Offset_z$ ft	z ft	K_z	q_z psf	C_AA_C Front ft^2	C_AA_C Side ft^2
80010121 9' Mount Pipe	315.0000	93.85	-5.91	-0.25	61.00	0.858	7	6.22	5.43
Quintel QS66512-2 w/m pipe	315.0000	143.85	-3.08	-3.08	61.00	0.858	7	8.85	8.94
HPA-65R-BUU-H6 W/Mt pipe	315.0000	93.35	-0.25	-5.91	61.00	0.858	7	10.37	8.59
80010121 9' Mount Pipe	45.0000	93.85	0.25	-5.91	61.00	0.858	7	6.22	5.43
Quintel QS66512-2 w/m pipe	45.0000	143.85	3.08	-3.08	61.00	0.858	7	8.85	8.94
HPA-65R-BUU-H6 W/Mt pipe	45.0000	93.35	5.91	-0.25	61.00	0.858	7	10.37	8.59
80010121 9' Mount Pipe	135.0000	93.85	5.91	0.25	61.00	0.858	7	6.22	5.43
Quintel QS66512-2 w/m pipe	135.0000	143.85	3.08	3.08	61.00	0.858	7	8.85	8.94
HPA-65R-BUU-H6 W/Mt pipe	135.0000	93.35	0.25	5.91	61.00	0.858	7	10.37	8.59
Modified T Frame	0.0000	164.00	0.00	0.00	59.00	0.850	7	9.63	9.63
Modified T Frame	0.0000	164.00	0.00	0.00	59.00	0.850	7	9.63	9.63
Modified T Frame	0.0000	164.00	0.00	0.00	59.00	0.850	7	9.63	9.63
	Sum Weight:	1485.15							

Force Totals

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	728.81					
Bracing Weight	0.00					
Total Member Self-Weight	728.81			-1.05	-2.00	
Total Weight	3169.88			-1.05	-2.00	
Wind 0 deg - No Ice		-27.07	-4371.76	-77.86	-1.38	3.04
Wind 45 deg - No Ice		3072.16	-3072.16	-54.93	-55.87	1.17
Wind 90 deg - No Ice		3374.97	27.07	-0.43	-67.28	-1.38
Wind 135 deg - No Ice		3110.44	3110.44	53.70	-56.75	-3.13
Wind 180 deg - No Ice		27.07	4371.76	75.75	-2.62	-3.04
Wind 225 deg - No Ice		-3072.16	3072.16	52.82	51.87	-1.17
Wind 270 deg - No Ice		-3374.97	-27.07	-1.68	63.28	1.38
Wind 315 deg - No Ice		-3110.44	-3110.44	-55.81	52.75	3.13

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Member Ice	496.87					
Total Weight Ice	8839.44			-3.69	-4.89	
Wind 0 deg - Ice		4.83	-3270.57	-50.11	-5.00	1.77
Wind 45 deg - Ice		2316.06	-2316.06	-36.59	-37.79	0.82
Wind 90 deg - Ice		1750.68	-4.83	-3.80	-33.67	-0.62
Wind 135 deg - Ice		2309.22	2309.22	29.05	-37.64	-1.69
Wind 180 deg - Ice		-4.83	3270.57	42.73	-4.78	-1.77
Wind 225 deg - Ice		-2316.06	2316.06	29.21	28.01	-0.82
Wind 270 deg - Ice		-1750.68	4.83	-3.58	23.88	0.62
Wind 315 deg - Ice		-2309.22	-2309.22	-36.44	27.85	1.69
Total Weight	3169.88			-1.05	-2.00	
Wind 0 deg - Service		-7.34	-1185.23	-21.85	-0.85	0.49
Wind 45 deg - Service		832.89	-832.89	-15.63	-15.62	0.10
Wind 90 deg - Service		914.99	7.34	-0.85	-18.72	-0.35
Wind 135 deg - Service		843.27	843.27	13.82	-15.86	-0.59
Wind 180 deg - Service		7.34	1185.23	19.80	-1.19	-0.49
Wind 225 deg - Service		-832.89	832.89	13.58	13.59	-0.10
Wind 270 deg - Service		-914.99	-7.34	-1.19	16.68	0.35
Wind 315 deg - Service		-843.27	-843.27	-15.87	13.82	0.59

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 45 deg - No Ice
5	0.9 Dead+1.6 Wind 45 deg - No Ice
6	1.2 Dead+1.6 Wind 90 deg - No Ice
7	0.9 Dead+1.6 Wind 90 deg - No Ice
8	1.2 Dead+1.6 Wind 135 deg - No Ice
9	0.9 Dead+1.6 Wind 135 deg - No Ice
10	1.2 Dead+1.6 Wind 180 deg - No Ice
11	0.9 Dead+1.6 Wind 180 deg - No Ice
12	1.2 Dead+1.6 Wind 225 deg - No Ice
13	0.9 Dead+1.6 Wind 225 deg - No Ice
14	1.2 Dead+1.6 Wind 270 deg - No Ice
15	0.9 Dead+1.6 Wind 270 deg - No Ice
16	1.2 Dead+1.6 Wind 315 deg - No Ice
17	0.9 Dead+1.6 Wind 315 deg - No Ice
18	1.2 Dead+1.0 Ice+1.0 Temp
19	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
20	1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp
21	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
22	1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp
23	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
24	1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp
25	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
26	1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp
27	Dead+Wind 0 deg - Service
28	Dead+Wind 45 deg - Service
29	Dead+Wind 90 deg - Service
30	Dead+Wind 135 deg - Service
31	Dead+Wind 180 deg - Service
32	Dead+Wind 225 deg - Service

Comb. No.	Description
33	Dead+Wind 270 deg - Service
34	Dead+Wind 315 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	63.5 - 56	Pole	Max Tension	19	0.05	0.01	-0.00
			Max. Compression	18	-5887.73	-4.46	3.69
			Max. Mx	6	-1919.40	-20.14	0.93
			Max. My	2	-1850.66	-1.09	21.20
			Max. Vy	6	4370.58	-20.14	0.93
			Max. Vx	2	-4707.71	-1.09	21.20
			Max. Torque	17			-3.74
L2	56 - 38	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	18	-9473.42	-5.91	4.38
			Max. Mx	6	-3783.85	-109.88	0.28
			Max. My	2	-3773.83	-1.44	127.53
			Max. Vy	6	5414.00	-109.88	0.28
			Max. Vx	2	-7011.08	-1.44	127.53
			Max. Torque	17			-4.92

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Pole	Max. Vert	20	9473.42	-2316.10	2316.09
	Max. H_x	15	2852.90	5399.95	43.31
	Max. H_z	3	2852.90	43.31	6994.82
	Max. M_x	2	127.53	43.31	6994.82
	Max. M_z	6	109.88	-5399.95	-43.31
	Max. Torsion	9	4.91	-4976.71	-4976.71
	Min. Vert	15	2852.90	5399.95	43.31
	Min. H_x	6	3803.86	-5399.95	-43.31
	Min. H_z	11	2852.90	-43.31	-6994.82
	Min. M_x	10	-124.92	-43.31	-6994.82
	Min. M_z	14	-104.94	5399.95	43.31
	Min. Torsion	17	-4.92	4976.71	4976.71

Tower Mast Reaction Summary

Load Combination	Vertical lb	$Shear_x$ lb	$Shear_z$ lb	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	3169.88	0.00	-0.00	-1.09	-2.06	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	3803.86	-43.31	-6994.82	-127.53	-1.43	4.77
0.9 Dead+1.6 Wind 0 deg - No Ice	2852.90	-43.31	-6994.82	-126.28	-0.81	4.79

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	lb	lb	lb	kip-ft	kip-ft	kip-ft
1.2 Dead+1.6 Wind 45 deg - No Ice	3803.86	4915.46	-4915.46	-89.84	-91.00	1.85
0.9 Dead+1.6 Wind 45 deg - No Ice	2852.90	4915.46	-4915.46	-88.87	-89.73	1.85
1.2 Dead+1.6 Wind 90 deg - No Ice	3803.86	5399.95	43.31	-0.28	-109.88	-2.16
0.9 Dead+1.6 Wind 90 deg - No Ice	2852.90	5399.95	43.31	0.05	-108.45	-2.17
1.2 Dead+1.6 Wind 135 deg - No Ice	3803.86	4976.71	4976.71	88.68	-92.44	-4.90
0.9 Dead+1.6 Wind 135 deg - No Ice	2852.90	4976.71	4976.71	88.36	-91.15	-4.91
1.2 Dead+1.6 Wind 180 deg - No Ice	3803.86	43.31	6994.82	124.92	-3.48	-4.78
0.9 Dead+1.6 Wind 180 deg - No Ice	2852.90	43.31	6994.82	124.35	-2.84	-4.79
1.2 Dead+1.6 Wind 225 deg - No Ice	3803.86	-4915.46	4915.46	87.22	86.07	-1.86
0.9 Dead+1.6 Wind 225 deg - No Ice	2852.90	-4915.46	4915.46	86.92	86.06	-1.86
1.2 Dead+1.6 Wind 270 deg - No Ice	3803.86	-5399.95	-43.31	-2.33	104.94	2.17
0.9 Dead+1.6 Wind 270 deg - No Ice	2852.90	-5399.95	-43.31	-1.99	104.77	2.17
1.2 Dead+1.6 Wind 315 deg - No Ice	3803.86	-4976.71	-4976.71	-91.28	87.52	4.90
0.9 Dead+1.6 Wind 315 deg - No Ice	2852.90	-4976.71	-4976.71	-90.29	87.50	4.92
1.2 Dead+1.0 Ice+1.0 Temp	9473.42	0.01	-0.01	-4.38	-5.91	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	9473.42	4.85	-3270.62	-54.21	-6.02	1.73
1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp	9473.42	2316.10	-2316.09	-39.70	-41.22	0.81
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	9473.42	1750.71	-4.84	-4.49	-36.92	-0.59
1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp	9473.42	2309.27	2309.24	30.78	-41.05	-1.63
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	9473.42	-4.82	3270.61	45.46	-5.78	-1.73
1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp	9473.42	-2316.08	2316.09	30.95	29.42	-0.81
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	9473.42	-1750.70	4.82	-4.26	25.11	0.59
1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp	9473.42	-2309.24	-2309.27	-39.52	29.25	1.63
Dead+Wind 0 deg - Service	3169.88	-7.34	-1185.23	-22.42	-1.89	0.48
Dead+Wind 45 deg - Service	3169.88	832.89	-832.89	-16.05	-17.02	0.10
Dead+Wind 90 deg - Service	3169.88	914.99	7.34	-0.92	-20.20	-0.34
Dead+Wind 135 deg - Service	3169.88	843.27	843.27	14.11	-17.26	-0.58
Dead+Wind 180 deg - Service	3169.88	7.34	1185.23	20.23	-2.24	-0.48
Dead+Wind 225 deg - Service	3169.88	-832.89	832.89	13.86	12.90	-0.10
Dead+Wind 270 deg - Service	3169.88	-914.99	-7.34	-1.27	16.08	0.34
Dead+Wind 315 deg - Service	3169.88	-843.27	-843.27	-16.30	13.14	0.58

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	% Error
1	0.00	-3169.88	0.00	-0.00	3169.88	0.00	0.000%
2	-43.31	-3803.86	-6994.82	43.31	3803.86	6994.82	0.000%
3	-43.31	-2852.90	-6994.82	43.31	2852.90	6994.82	0.000%
4	4915.46	-3803.86	-4915.46	-4915.46	3803.86	4915.46	0.000%
5	4915.46	-2852.90	-4915.46	-4915.46	2852.90	4915.46	0.000%
6	5399.95	-3803.86	43.31	-5399.95	3803.86	-43.31	0.000%
7	5399.95	-2852.90	43.31	-5399.95	2852.90	-43.31	0.000%
8	4976.71	-3803.86	4976.71	-4976.71	3803.86	-4976.71	0.000%
9	4976.71	-2852.90	4976.71	-4976.71	2852.90	-4976.71	0.000%
10	43.31	-3803.86	6994.82	-43.31	3803.86	-6994.82	0.000%
11	43.31	-2852.90	6994.82	-43.31	2852.90	-6994.82	0.000%
12	-4915.46	-3803.86	4915.46	4915.46	3803.86	-4915.46	0.000%
13	-4915.46	-2852.90	4915.46	4915.46	2852.90	-4915.46	0.000%
14	-5399.95	-3803.86	-43.31	5399.95	3803.86	43.31	0.000%
15	-5399.95	-2852.90	-43.31	5399.95	2852.90	43.31	0.000%
16	-4976.71	-3803.86	-4976.71	4976.71	3803.86	4976.71	0.000%
17	-4976.71	-2852.90	-4976.71	4976.71	2852.90	4976.71	0.000%
18	0.00	-9473.42	0.00	-0.01	9473.42	0.01	0.000%
19	4.83	-9473.42	-3270.57	-4.85	9473.42	3270.62	0.001%
20	2316.06	-9473.42	-2316.06	-2316.10	9473.42	2316.09	0.001%
21	1750.68	-9473.42	-4.83	-1750.71	9473.42	4.84	0.000%
22	2309.22	-9473.42	2309.22	-2309.27	9473.42	-2309.24	0.000%
23	-4.83	-9473.42	3270.57	4.82	9473.42	-3270.61	0.000%
24	-2316.06	-9473.42	2316.06	2316.08	9473.42	-2316.09	0.000%
25	-1750.68	-9473.42	4.83	1750.70	9473.42	-4.82	0.000%
26	-2309.22	-9473.42	-2309.22	2309.24	9473.42	2309.27	0.000%
27	-7.34	-3169.88	-1185.23	7.34	3169.88	1185.23	0.000%
28	832.89	-3169.88	-832.89	-832.89	3169.88	832.89	0.000%
29	914.99	-3169.88	7.34	-914.99	3169.88	-7.34	0.000%
30	843.27	-3169.88	843.27	-843.27	3169.88	-843.27	0.000%
31	7.34	-3169.88	1185.23	-7.34	3169.88	-1185.23	0.000%
32	-832.89	-3169.88	832.89	832.89	3169.88	-832.89	0.000%
33	-914.99	-3169.88	-7.34	914.99	3169.88	7.34	0.000%
34	-843.27	-3169.88	-843.27	843.27	3169.88	843.27	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	0.00032941
3	Yes	4	0.00000001	0.00648114
4	Yes	4	0.00000001	0.00711644
5	Yes	4	0.00000001	0.00381850
6	Yes	4	0.00000001	0.00629291
7	Yes	4	0.00000001	0.00360125
8	Yes	5	0.00000001	0.00043652
9	Yes	4	0.00000001	0.00890096
10	Yes	5	0.00000001	0.00033808
11	Yes	4	0.00000001	0.00657192
12	Yes	4	0.00000001	0.00644238
13	Yes	4	0.00000001	0.00361221
14	Yes	4	0.00000001	0.00626961
15	Yes	4	0.00000001	0.00364382
16	Yes	5	0.00000001	0.00043349
17	Yes	4	0.00000001	0.00882210

18	Yes	4	0.00000001	0.00033715
19	Yes	4	0.00000001	0.00931628
20	Yes	4	0.00000001	0.00606395
21	Yes	4	0.00000001	0.00332860
22	Yes	4	0.00000001	0.00730632
23	Yes	4	0.00000001	0.00679566
24	Yes	4	0.00000001	0.00280512
25	Yes	4	0.00000001	0.00176849
26	Yes	4	0.00000001	0.00688041
27	Yes	4	0.00000001	0.00051492
28	Yes	4	0.00000001	0.00013469
29	Yes	4	0.00000001	0.00034507
30	Yes	4	0.00000001	0.00056885
31	Yes	4	0.00000001	0.00043773
32	Yes	4	0.00000001	0.00008228
33	Yes	4	0.00000001	0.00025670
34	Yes	4	0.00000001	0.00053331

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	63.5 - 56	3.795	28	1.0202	0.0676
L2	56 - 38	2.219	28	0.9595	0.0531

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
61.00	80010121 9' Mount Pipe	28	3.241	1.0147	0.0631	1815
59.00	Modified T Frame	28	2.812	1.0029	0.0593	1815

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	63.5 - 56	19.987	4	5.2527	0.4846
L2	56 - 38	11.838	4	5.0377	0.3932

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
61.00	80010121 9' Mount Pipe	4	17.131	5.2631	0.4573	372
59.00	Modified T Frame	4	14.916	5.2301	0.4339	372

Base Plate Design Data

Plate Thickness in	Number of Anchor Bolts	Anchor Bolt Size in	Actual / Allowable Ratio Bolt Tension lb	Actual / Allowable Ratio Bolt Compression lb	Actual / Allowable Ratio Plate Stress ksi	Actual / Allowable Ratio Stiffener Stress ksi	Controlling Condition	Ratio
1.5000	8	1.0000	60772.94 66562.49 0.96	61716.32 110493.74 0.61	57.418 32.400 1.77		Plate	1.77 ✘

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
L1	63.5 - 56 (1)	P8x.322	7.50	0.00	0.0	8.3993	-1852.19	317492.00	0.006
L2	56 - 38 (2)	P8x.322 4.8.2 (1.85 CR) - 2	18.00	0.00	0.0	8.3993	-3773.52	317492.00	0.012

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	63.5 - 56 (1)	P8x.322	21.65	69.96	0.310	0.00	69.96	0.000
L2	56 - 38 (2)	P8x.322	128.10	69.96	1.831	0.00	69.96	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u lb	ϕV_n lb	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	63.5 - 56 (1)	P8x.322	4666.54	158746.00	0.029	0.84	105.90	0.008
L2	56 - 38 (2)	P8x.322	7054.45	158746.00	0.044	4.90	105.90	0.046

Section No.	Elevation ft	Size	Actual V_u lb	ϕV_n lb	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$

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
L1	63.5 - 56 (1)	0.006	0.310	0.000	0.029	0.008	0.317 ✓	1.000	4.8.2 ✓
L2	56 - 38 (2)	0.012	1.831	0.000	0.044	0.046	1.851 ✗	1.000	4.8.2 ✗

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
L1	63.5 - 56	Pole	P8x.322	1	-1852.19	317492.00	31.7	Pass
L2	56 - 38	Pole	P8x.322	2	-3773.52	317492.00	185.1	Fail ✗
							Summary	
						Pole (L2)	185.1	Fail ✗
						Base Plate	177.2	Fail ✗
						RATING =	**185.1**	**Fail** ✗

Design Wind Load On Appurtenances:

Inputs:

ANSI/TIA-222-G Reference

Location: **Hamden, CT**

Basic Wind Speed(Nominal): $V := 109$ MPH (Figure A1-1e, p. 232)

Antenna Centerline: $z := 40ft$

Structure Class: $Class := "II"$ (Table 2-1, P. 39)

Exposure Category: $Exp := "B"$ (Section 2.6.5.1, p. 12)

Gust Effect Factor: $G_h := 0.85$ (Section 2.6.9, p. 16)

Wind Directionality Factor: $K_d := 0.95$ (Table 2-2, P. 39)

Topographic Category: $Topo := "1"$ (Section 2.6.6.2, p. 13)

Crest Height: $CH := 0ft$ (Section 2.6.6.4, p. 14)

Importance Factor:

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

(Table 2-3, P. 39)

Force Coefficient:

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

Table 2-8, P. 42

Square Members

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

Table 2-8, P. 42

Round Members

Terrain Exposure Constants:

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

Table 2-4, P. 40

Velocity Pressure Coefficient:

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

Velocity Pressure Coefficient: $K_z := Kz(z) = 0.761$ (Section 2.6.5, P. 13)

Velocity Pressure Coefficient:

$$Kzt(z) := K_{zt} \leftarrow \left| \begin{array}{l} 1.0 \text{ if } Topo = "1" \\ \text{otherwise} \\ \quad K_e \leftarrow \left| \begin{array}{l} 0.90 \text{ if } Exp = "B" \\ 1.00 \text{ if } Exp = "C" \\ 1.10 \text{ if } Exp = "D" \end{array} \right. \quad \text{(Table 2-4 p. 40)} \\ \quad K_t \leftarrow \left| \begin{array}{l} 0.43 \text{ if } Topo = "2" \\ 0.53 \text{ if } Topo = "3" \\ 0.72 \text{ if } Topo = "4" \end{array} \right. \quad \text{(Table 2-5 p. 40)} \\ \quad f \leftarrow \left| \begin{array}{l} 1.25 \text{ if } Topo = "2" \\ 2.00 \text{ if } Topo = "3" \\ 1.50 \text{ if } Topo = "4" \end{array} \right. \quad \text{(Table 2-5 p. 40)} \\ \quad K_h \leftarrow e^{\left(\frac{f \cdot z}{CH} \right)} \quad \text{(Section 2.6.6.4, P. 14)} \\ \quad \left(1 + \frac{K_e \cdot K_t}{K_h} \right)^2 \quad \text{(Section 2.6.6.4, P. 14)} \end{array} \right.$$

(Section 2.6.6.4, p. 14)

$K_{zt} := Kzt(z) = 1$

Velocity Pressure: $q_z := 0.00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V^2 \cdot I \cdot psf = 21.977 \cdot psf$ (Section 2.6.9.6, P. 25)

AT&T Wind Loading (No Ice):

RRUS11

Dimensions: $h_{a1} := 19.7 \cdot in$ $w_{a1} := 17 \cdot in$ $d_{a1} := 7.2 \cdot in$

Weight: $DL_{a1} := 65 lbf$ Assumed 15lbs for mounting

Area (Normal): $A_N := h_{a1} \cdot w_{a1} = 2.326\ ft^2$

Area (Side): $A_T := h_{a1} \cdot d_{a1} = 0.985\ ft^2$

Force Coefficient (Normal): $C_{f\_N} := C_{f\_square}(h_{a1}, w_{a1}) = 1.2$

Force Coefficient (Side): $C_{f\_T} := C_{f\_square}(h_{a1}, d_{a1}) = 1.21$

Front Effective Projected Area: $EPA_N := C_{f\_N} \cdot A_N = 2.791\ ft^2$

Side Effective Projected Area: $EPA_T := C_{f\_T} \cdot A_T = 1.192\ ft^2$

Effective Projected Area: $EPA_a := \max(EPA_N, EPA_T) = 2.791\ ft^2$

Wind Force: $F_{a1} := q_z \cdot G_h \cdot EPA_a = 52.135 \cdot lbf$ (Section 2.6.9.2, P. 20)

RRUS 32

Dimensions: $h_{a2} := 27.1 \cdot in$ $w_{a2} := 12.0 \cdot in$ $d_{a2} := 7.0 \cdot in$

Weight: $DL_{a2} := 65.7 lbf$

Area (Normal): $A_N := h_{a2} \cdot w_{a2} = 2.258\ ft^2$

Area (Side): $A_T := h_{a2} \cdot d_{a2} = 1.317\ ft^2$

Force Coefficient (Normal): $C_{f\_N} := C_{f\_square}(h_{a2}, w_{a2}) = 1.2$

Force Coefficient (Side): $C_{f\_T} := C_{f\_square}(h_{a2}, d_{a2}) = 1.261$

Front Effective Projected Area: $EPA_N := C_{f\_N} \cdot A_N = 2.71\ ft^2$

Side Effective Projected Area: $EPA_T := C_{f\_T} \cdot A_T = 1.661\ ft^2$

Effective Projected Area: $EPA_a := \max(EPA_N, EPA_T) = 2.71\ ft^2$

Wind Force: $F_{a2} := q_z \cdot G_h \cdot EPA_a = 50.625 \cdot lbf$ (Section 2.6.9.2, P. 20)

RRUS 32 B2

Dimensions: $h_{a1} := 29.9 \cdot in$ $w_{a1} := 13.3 \cdot in$ $d_{a1} := 9.5 \cdot in$

Weight: $DL_{a3} := 67.9 lbf$ Assumed 15lbs for mounting

Area (Normal): $A_N := h_{a1} \cdot w_{a1} = 2.762\ ft^2$

Area (Side): $A_T := h_{a1} \cdot d_{a1} = 1.973\ ft^2$

Force Coefficient (Normal): $C_{f\_N} := C_{f\_square}(h_{a1}, w_{a1}) = 1.2$

Force Coefficient (Side): $C_{f\_T} := C_{f\_square}(h_{a1}, d_{a1}) = 1.229$

Front Effective Projected Area: $EPA_N := C_{f\_N} \cdot A_N = 3.314\ ft^2$

Side Effective Projected Area: $EPA_T := C_{f\_T} \cdot A_T = 2.424\ ft^2$

Effective Projected Area: $EPA_a := \max(EPA_N, EPA_T) = 3.314\ ft^2$

Wind Force: $F_{a3} := q_z \cdot G_h \cdot EPA_a = 61.907 \cdot lbf$ (Section 2.6.9.2, P. 20)

RRUS E2

Dimensions: $h_{a2} := 20.4 \cdot in$ $w_{a2} := 18.5 \cdot in$ $d_{a2} := 7.5 \cdot in$

Weight: $DL_{a4} := 75 lbf$

Area (Normal): $A_N := h_{a2} \cdot w_{a2} = 2.621\ ft^2$

Area (Side): $A_T := h_{a2} \cdot d_{a2} = 1.062\ ft^2$

Force Coefficient (Normal): $C_{f\_N} := C_{f\_square}(h_{a2}, w_{a2}) = 1.2$

Force Coefficient (Side): $C_{f\_T} := C_{f\_square}(h_{a2}, d_{a2}) = 1.21$

Front Effective Projected Area: $EPA_N := C_{f\_N} \cdot A_N = 3.145\ ft^2$

Side Effective Projected Area: $EPA_T := C_{f\_T} \cdot A_T = 1.285\ ft^2$

Effective Projected Area: $EPA_a := \max(EPA_N, EPA_T) = 3.145\ ft^2$

Wind Force: $F_{a4} := q_z \cdot G_h \cdot EPA_a = 58.751 \cdot lbf$ (Section 2.6.9.2, P. 20)

Powerwave TMA's TT19-08BP111-001

Dimensions: $h_{a1} := 9.9 \cdot in$ $w_{a1} := 6.7 \cdot in$ $d_{a1} := 5.4 \cdot in$

Weight: $DL_{a5} := 16 lbf$ Assumed 15lbs for mounting

Area (Normal): $A_N := h_{a1} \cdot w_{a1} = 0.461\ ft^2$

Area (Side): $A_T := h_{a1} \cdot d_{a1} = 0.371\ ft^2$

Force Coefficient (Normal): $C_{f\_N} := C_{f\_square}(h_{a1}, w_{a1}) = 1.2$

Force Coefficient (Side): $C_{f\_T} := C_{f\_square}(h_{a1}, d_{a1}) = 1.2$

Front Effective Projected Area: $EPA_N := C_{f\_N} \cdot A_N = 0.553\ ft^2$

Side Effective Projected Area: $EPA_T := C_{f\_T} \cdot A_T = 0.446\ ft^2$

Effective Projected Area: $EPA_a := \max(EPA_N, EPA_T) = 0.553\ ft^2$

Wind Force: $F_{a5} := q_z \cdot G_h \cdot EPA_a = 10.326 \cdot lbf$ (Section 2.6.9.2, P. 20)

DC6 Squid

Dimensions: $h_{a2} := 24 \cdot in$ $w_{a2} := 11 \cdot in$ $d_{a2} := 11 \cdot in$

Weight: $DL_{a6} := 47.8 lbf$

Area (Normal): $A_N := h_{a2} \cdot w_{a2} = 1.833\ ft^2$

Area (Side): $A_T := h_{a2} \cdot d_{a2} = 1.833\ ft^2$

Force Coefficient (Normal): $C_{f\_N} := C_{f\_square}(h_{a2}, w_{a2}) = 1.2$

Force Coefficient (Side): $C_{f\_T} := C_{f\_square}(h_{a2}, d_{a2}) = 1.2$

Front Effective Projected Area: $EPA_N := C_{f\_N} \cdot A_N = 2.2\ ft^2$

Side Effective Projected Area: $EPA_T := C_{f\_T} \cdot A_T = 2.2\ ft^2$

Effective Projected Area: $EPA_a := \max(EPA_N, EPA_T) = 2.2\ ft^2$

Wind Force: $F_{a6} := q_z \cdot G_h \cdot EPA_a = 41.098 \cdot lbf$ (Section 2.6.9.2, P. 20)

Antenna Mount Loading:

4.0" STD Loading:

Height: $h_{m1} := 60in$

Width: $w_{m1} := 4 \cdot in$

Area: $A_a := h_{m1} \cdot w_{m1} = 1.667\ ft^2$

Force Coefficient: $C_f := C_{f\_square}(h_{m1}, w_{m1}) = 1.667$

Wind Load: $f_{m1} := q_z \cdot G_h \cdot C_f \cdot w_{m1} = 10.378 \cdot plf$ (Section 2.6.9.2, P. 20)

W10 Beam Loading:

Height: $h_{m2} := 10in$

Width: $w_{m2} := 12in$

Area: $A_a := h_{m2} \cdot w_{m2} = 0.833\ ft^2$

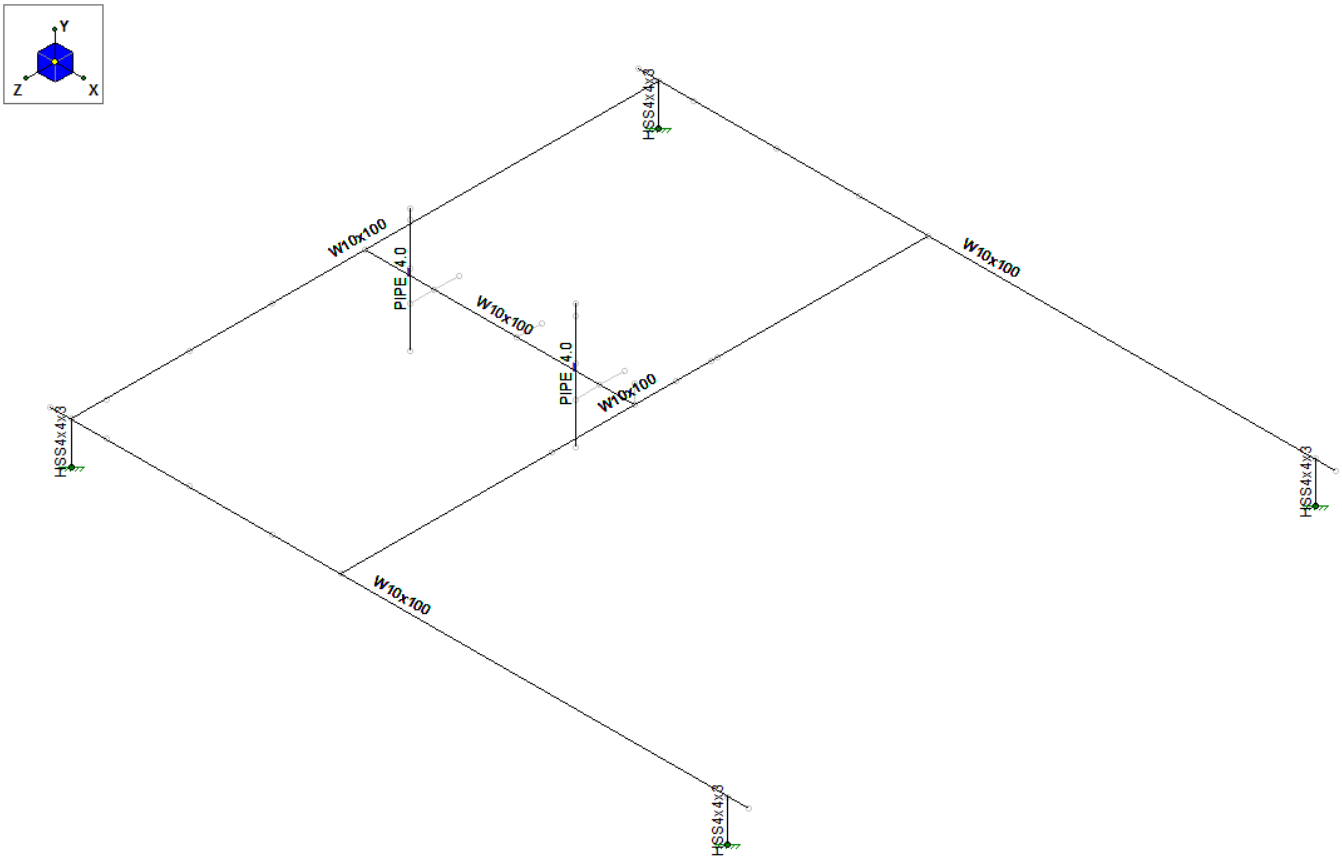
Force Coefficient: $C_f := C_{f\_square}(h_{m2}, w_{m2}) = 1.2$

Wind Load: $f_{m2} := q_z \cdot G_h \cdot C_f \cdot w_{m2} = 22.417 \cdot plf$ (Section 2.6.9.2, P. 20)

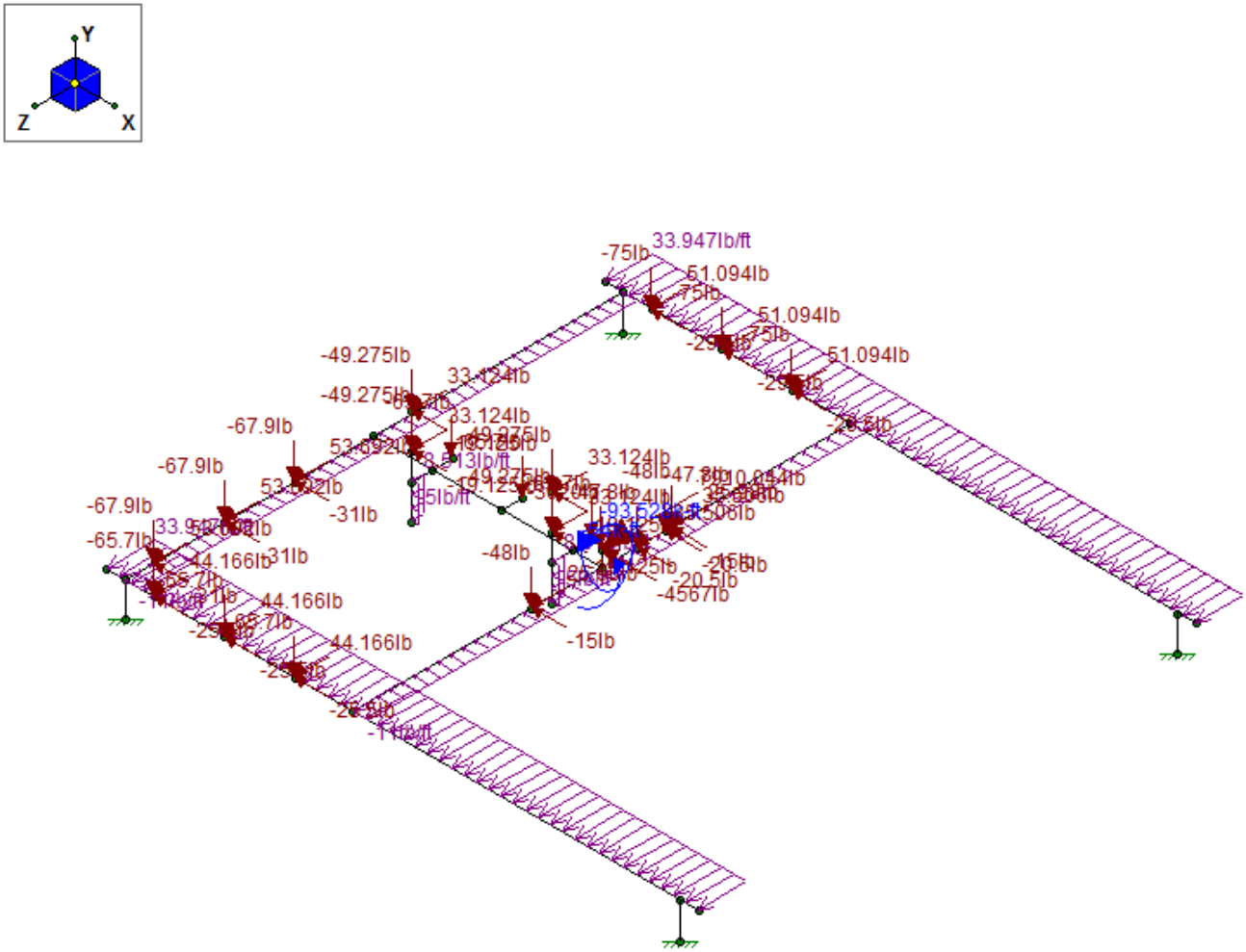
Summary:

	Dead Load (No Ice)	Wind Load (No Ice)
RRUS 11	$DL_{a1} = 65\,lbf$	$F_{a1} = 52\,lbf$
RRUS 32	$DL_{a2} = 66\,lbf$	$F_{a2} = 51\,lbf$
RRUS 32 B2	$DL_{a3} = 68\,lbf$	$F_{a3} = 62\,lbf$
RRUS E2	$DL_{a4} = 75\,lbf$	$F_{a4} = 59\,lbf$
Powerwave TT19 TMA	$DL_{a5} = 16\,lbf$	$F_{a5} = 10\,lbf$
DC6 Squid	$DL_{a6} = 48\,lbf$	$F_{a6} = 41\,lbf$
4.0" Pipe Loading Loading		$f_{m1} = 10 \cdot plf$
W Beam Wind Loading:		$f_{m2} = 22 \cdot plf$

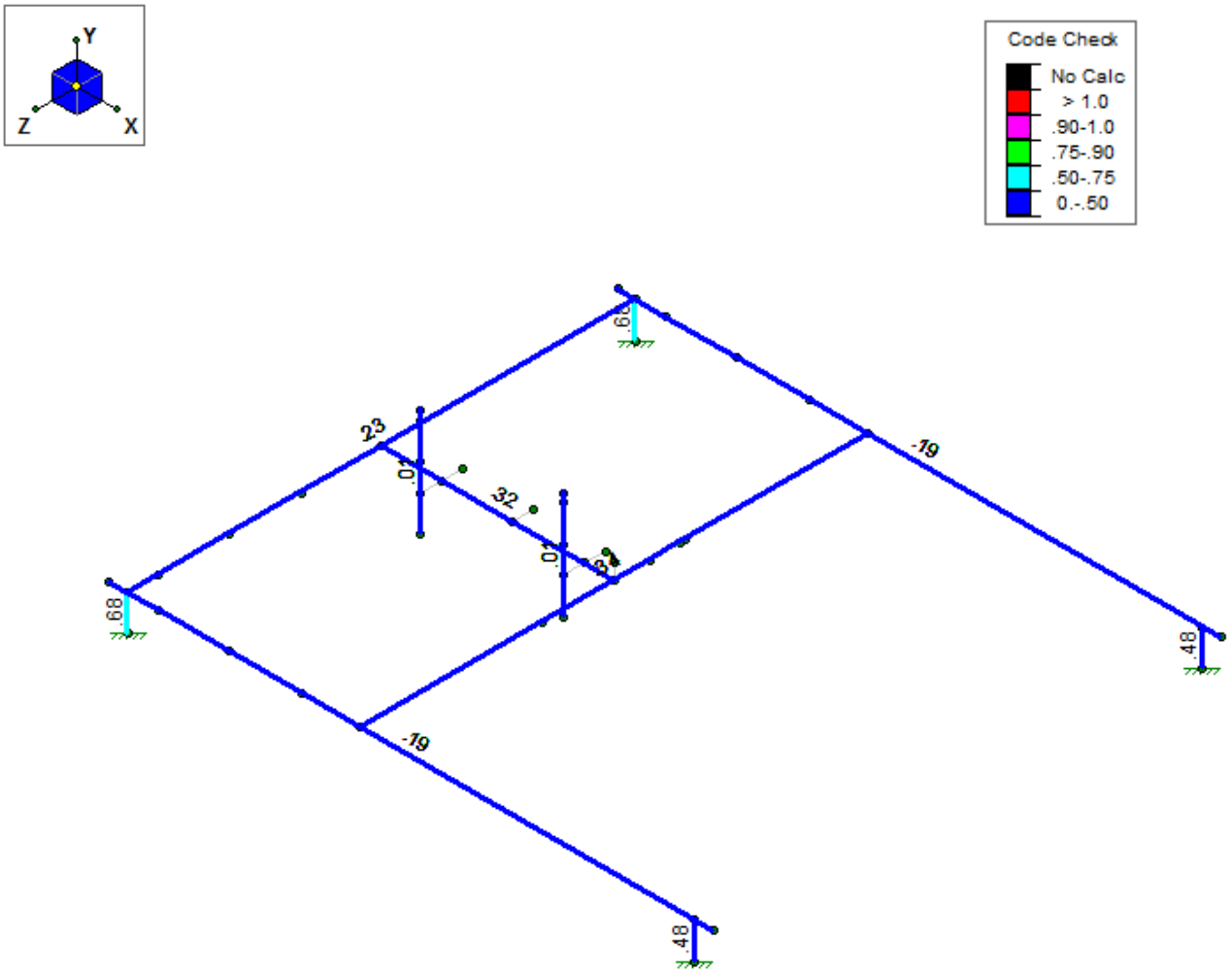
Risa Model:


Y
Z
X
HSS4x4x3
W10x100
PIPE 4.0
W10x100
PIPE 4.0
W10x100
W10x100
HSS4x4x3
HSS4x4x3
W10x100
HSS4x4x3

Most Critical Loading:



Risa 3D Code Check:



Existing Dead Load:

The total load of the Equipment platform, Monopole, Mount and Existing Antennas:

Equipment Platform:	1584lbs
Monopole :	3020lbs
Antenna Mount:	492lbs
Existing Antennas:	668.1lbs
Existing RRH's+TMA+Squid	533.8lbf

$$DL_{Exist} := 1584lbf + 3020lbf + 492lbf + 668lbf + 533.8lbf = 6.298 \times 10^{3}\,lbf$$

Proposed Dead Load:

Total Weight of Proposed RRHS :

$$DL_{Prop} := 3DL_{a2} + 3DL_{a3} + 3DL_{a4} + 1DL_{a6} = 673.6 \cdot lbf$$

$$Ratio := \frac{DL_{Prop}}{DL_{Exist}} \cdot 100 = 10.696$$