05/25/2019

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

Re:	**Notice of Exempt Modification – Antenna Swap**
Property Address:	**83 Windham St Willimantic, CT 06226**
Applicant:	**AT&T Mobility, LLC**

Dear Ms. Bachman:

On behalf of AT&T, please accept this application as notification pursuant to R.C.S.A. §16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. §16-50j-72(b) (2).

AT&T currently maintains a wireless telecommunications facility consisting of nine (9) wireless telecommunication antennas at an antenna center line height of 137-feet on an existing 175 –monopole tower, owned by the City of Willimantic located at 83 Windham St Willimantic, CT 06226. AT&T now intends to:

INSTALL (3) NEW RRUS-E2 WITH SURGE ARRESTORS, AT GRADE ,INSTALL (3) NEW AT&T ANTENNAS, (1) PER SECTOR, (3) NEW AT&T ANTENNAS TO REPLACE (3) EXISTING ANTENNAS, (1) PER SECTOR INSTALL (3) LOW BAND COMBINERS IN POSITION # 3, (1) PER SECTOR, INSTALL (3) LOW BAND COMBINERS, AT GRADE, INSTALL (1) NEW FIBER BOX, AT GRADE, INSTALL (12) NEW TELCO FLEX FOR PROPOSED DC TRUNKS, INSTALL (3) NEW RRUS-32, (1) PER SECTOR, (3) NEW RRUS-4415 B25 TO REPLACE (3) EXISTING RRUS, (1) PER SECTOR INSTALL (3) NEW RRUS-4478 B14, (1) PER SECTOR INSTALL (1) NEW DC-6 SURGE SUPPRESSION DOME, INSTALL (2) 6/C DC POWER CABLES, SWAP DUS WITH 5216 AND ADD 2ND 5216, ADD 2ND XMU AND IDLe, INSTALL (1) FIBER TRUNK and replace base plate stiffeners.

This facility was approved the application dated December 30, 2003 and related plans dated August 13, 2003 for Project # CT-11-506A by the Office of the State Building who issued Building Permit #09-03 for structural/ electrical work to erect telecommunications antennas and associated equipment to an existing 175 foot monopole tower.

Note: Any changes to the approved plans shall be submitted to the office of the State Building Inspector for review.

The following is a list of subsequent decisions by the Connecticut Siting Council:

EM-AT&T-163-170511 – AT&T notice of intent to modify an existing telecommunications facility located at 83 Windham Street, Willimantic, Connecticut. Decision Extension Request and CSC Decision Completion Letter

EM-AT&T-163-160627 - AT&T notice of intent to modify an existing telecommunications facility located at 83 Windham Street, Willimantic (Windham), Connecticut. Decision. Completion Letter

EM-AT&T-163-140730 - AT&T notice of intent to modify an existing telecommunications facility located at 83 Windham Street, Windham, Connecticut. Decision. Extension Request and CSC Decision.

EM-AT&T-163-121001 – AT&T Mobility notice of intent to modify an existing telecommunications facility located at 83 Windham Street, Willimantic, Connecticut.

EM-CING-163-080514 – New Cingular Wireless PCS, LLC notice of intent to modify an existing telecommunications facility located at 183 Windham Center Road, Windham, Connecticut.

Please accept this letter pursuant to Regulation of Connecticut State Agencies §16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-5I0j-72(b) (2). In accordance with R.C.S.A. A copy of this letter is being sent Renee Theroux-Keech, AIA Interim Director of Facilities Management & Planning Eastern Connecticut State University 83 Windham Street, Willimantic, CT 06226
A copy of this letter is also being sent Theresa O'Brien, Director of Fiscal Affairs and Acquisitions to the same address and the Office of the Connecticut State Building Inspector, 165 Capitol Avenue, Room 265
Hartford, CT 06106.

The planned modifications to AT&T's facility fall squarely within those activities explicitly provided for in R.C.S.A. §16-50j-72(b) (2).

1. The proposed modifications will not result in an increase in the height of the existing tower. AT&T's replacement antennas will be installed at the 137-foot level of the 175-Monopole tower.
2. The proposed modifications will not involve any changes to ground-mounted equipment and, therefore, will not require and extension of the site boundary.
3. The proposed modifications will not increase the noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.
4. The operation of the modified facility will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety

standard. A cumulative worst-case RF emissions calculation for AT&T's modified facility is provided in the RF Emissions Compliance Report, included in Tab 2.

5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.
6. The tower and its foundation can support AT&T's proposed modifications. (See Structural Analysis Report included in Tab 3).

For the foregoing reasons, AT&T respectfully submits that the proposed modifications to the above referenced telecommunications facility constitutes an exempt modification under R.C.S.A. §16-50j-72(b) (2).

Sincerely,

David Barbagallo

Enclosures
CC w/enclosures:

Renee Theroux-Keech, AIA Interim Director of Facilities Management & Planning Eastern Connecticut State University
Theresa O'Brien, Director of Fiscal Affairs Eastern Connecticut State University
Office of the Connecticut State Building Inspector,

STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@po.state.ct.us
Web Site: www.state.ct.us/csc/index.htm

September 24, 2003

Stephen J. Humes
LeBoeuf, Lamb, Greene & MacRae
Goodwin Square
225 Asylum Street
Hartford, CT 06103

RE: **TS-T-MOBILE-163-030912** - Omnipoint Communications, Inc., request for an order to approve tower sharing of an existing telecommunications facility located at Eastern Road, Willimantic, Connecticut.

Dear Attorney Humes:

At a public meeting held September 23, 2003, the Connecticut Siting Council (Council) ruled that the shared use of this existing tower site is technically, legally, environmentally, and economically feasible and meets public safety concerns, and therefore, in compliance with General Statutes § 16-50aa, the Council has ordered the shared use of this facility to avoid the unnecessary proliferation of tower structures. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

This decision is under the exclusive jurisdiction of the Council. Any additional change to this facility may require an explicit request to this agency pursuant to General Statutes § 16-50aa or notice pursuant to Regulations of Connecticut State Agencies Section 16-50j-73, as applicable. Such request or notice shall include all relevant information regarding the proposed change with cumulative worst-case modeling of radio frequency exposure at the closest point of uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin 65. Any deviation from this format may result in the Council implementing enforcement proceedings pursuant to General Statutes § 16-50u including, without limitation, imposition of expenses resulting from such failure and of civil penalties in an amount not less than one thousand dollars per day for each day of construction or operation in material violation.

This decision applies only to this request for tower sharing and is not applicable to any other request or construction.

The proposed shared use is to be implemented as specified in your letter dated September 12, 2003.

Thank you for your attention and cooperation.

Very truly yours,

Pamela B. Katz

Pamela B. Katz, P.E.
Chairman

PBK/laf

c: Honorable Michael T. Paulhus, First Selectman, Town of Windham
James E. Finger, Town Planner, Town of Windham
Thomas J. Regan, Esq., Brown Rudnick Berlack Israels
Michele G. Briggs, Southwestern Bell Mobile Systems
Sandy M. Carter, Verizon Wireless

STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@po.state.ct.us
Web Site: www.state.ct.us/csc/index.htm

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Very truly yours,

Pamela B. Katz (signature)

Pamela B. Katz, P.E.
Chairman

PBK/laf

c: Honorable Michael T. Paulhus, First Selectman, Town of Windham
James E. Finger, Town Planner, Town of Windham
Thomas J. Regan, Esq., Brown Rudnick Berlack Israels
Michele G. Briggs, Southwestern Bell Mobile Systems
Sandy M. Carter, Verizon Wireless

775344438076

Delivered
Friday 5/31/2019 at 11:51 am

DELIVERED

Signed for by: Signature on File

GET STATUS UPDATES

OBTAIN PROOF OF DELIVERY

FROM

Smartlink LLC
Dave Barbagallo
265 Lincoln St
KENSINGTON, CT US 06037
860 681-7708

TO

Eastern Connecticut University
Renee Theroux-Keech
Willimantic, CT US 06226
860 490-4662

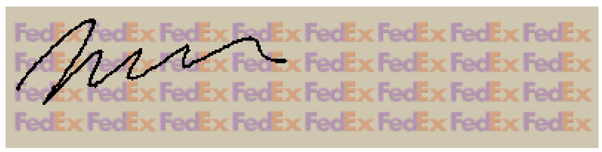
Ask FedEx

Shipment Facts

Delivered
Tuesday 6/04/2019 at 10:18 am

DELIVERED

Signed for by: J.RODRIUGEZ



GET STATUS UPDATES

OBTAIN PROOF OF DELIVERY

FROM

Smartlink LLC
Dave Barbagallo
265 Lincoln St
KENSINGTON, CT US 06037
860 681-7708
Origin Terminal
NEWINGTON, CT

TO

Eastern Connecticut University
Theresa O'Brien
WILLIMANTIC, CT US 06226
860 490-4662
Destination Location
NORWICH, CT

Shipment Facts

TRACKING NUMBER
775344459946

SERVICE
FedEx Express Saver

WEIGHT
1 lbs / 0.45 kgs

DELIVERY ATTEMPTS
1

DELIVERED TO
Shipping/Receiving

TOTAL PIECES
1

TOTAL SHIPMENT WEIGHT
1 lbs / 0.45 kgs

TERMS
Shipper

PACKAGING
FedEx Pak

SPECIAL HANDLING SECTION
Deliver Weekday

STANDARD TRANSIT
?
6/04/2019 by 4:30 pm

SHIP DATE
?
Thu 5/30/2019

ACTUAL DELIVERY
Tue 6/04/2019 10:18 am

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Ex.

DELIVERY ATTEMPTS
1

TOTAL PIECES
1

TERMS
Shipper

PACKAGING
Package

STANDARD TRANSIT
?
5/31/2019

SHIP DATE
?
Thu 5/30/2019

ACTUAL DELIVERY
Fri 5/31/2019 11:51 am

Travel History

Local Scan Time

Expand History

Delivered
Tuesday 6/04/2019 at 9:00 am

DELIVERED

Signed for by: J.JERARD

GET STATUS UPDATES

OBTAIN PROOF OF DELIVERY

FROM

Smartlink LLC
Dave Barbagallo
265 Lincoln St
KENSINGTON, CT US 06037
860 681-7708
Origin Terminal
NEWINGTON, CT

TO

Office of the State Building Inspec
Renee Theroux-Keech
HARTFORD, CT US 06106
860 713-5900
Destination Location
WINDSOR LOCKS, CT

Shipment Facts

TRACKING NUMBER
775344655590

SERVICE
FedEx Express Saver

WEIGHT
1 lbs / 0.45 kgs

DELIVERY ATTEMPTS
1

DELIVERED TO
Shipping/Receiving

TOTAL PIECES
1

TOTAL SHIPMENT WEIGHT
1 lbs / 0.45 kgs

TERMS
Shipper

PACKAGING
FedEx Pak

SPECIAL HANDLING SECTION
Deliver Weekday

STANDARD TRANSIT
?
6/04/2019 by 4:30 pm

SHIP DATE
?
Thu 5/30/2019

ACTUAL DELIVERY
Tue 6/04/2019 9:00 am

SITE NAME: WILLIMANTIC T6
FA NUMBER: 10035388
SITE NUMBER: CTL01051
4C - MRCTB023678
5C - MRCTB023786
6C - MRCTB023972
83 WINDHAM STREET
WILLIMANTIC, CT 06226
WINDHAM COUNTY

PROJECT TEAM

CLIENT REPRESENTATIVE

COMPANY:	SMARTLINK, LLC
ADDRESS:	85 RANGEWAY ROAD, BUILDING 3, SUITE 102
CITY, STATE, ZIP:	NORTH BILLERICA, MA 01862-2105
CONTACT:	TODD OLIVER
PHONE:	(774) 369-3618
E-MAIL:	TODD.OLIVER@SMARTLINKLLC.COM

SITE ACQUISITION

COMPANY:	SMARTLINK, LLC
ADDRESS:	85 RANGEWAY ROAD, BUILDING 3, SUITE 102
CITY, STATE, ZIP:	NORTH BILLERICA, MA 01862-2105
CONTACT:	SHARON.KEEFE
PHONE:	978-930-3918
E-MAIL:	SHARON.KEEFE@SMARTLINKLLC.COM

ENGINEER

COMPANY:	MASER CONSULTING CONNECTICUT
ADDRESS:	31 NEWMAN SPRINGS ROAD, SUITE 203
CITY, STATE, ZIP:	RED BANK, NJ 07701
CONTACT:	PETROS TSOUKALAS
PHONE:	(732) 383-1955 EXT. 4102
E-MAIL:	PTSOUKALAS@MASERCONSULTING.COM

CONSTRUCTION MANAGER

COMPANY:	SMARTLINK, LLC.
ADDRESS:	33 BOSTON POST ROAD WEST, SUITE 210
CITY, STATE, ZIP:	MARLBOROUGH, MA 01752
CONTACT:	MARK DONNELLY
PHONE:	(617) 515-2080
E-MAIL:	MARK.DONNELLY@SMARTLINKLLC.COM

SITE INFORMATION

APPLICANT/LESSEE

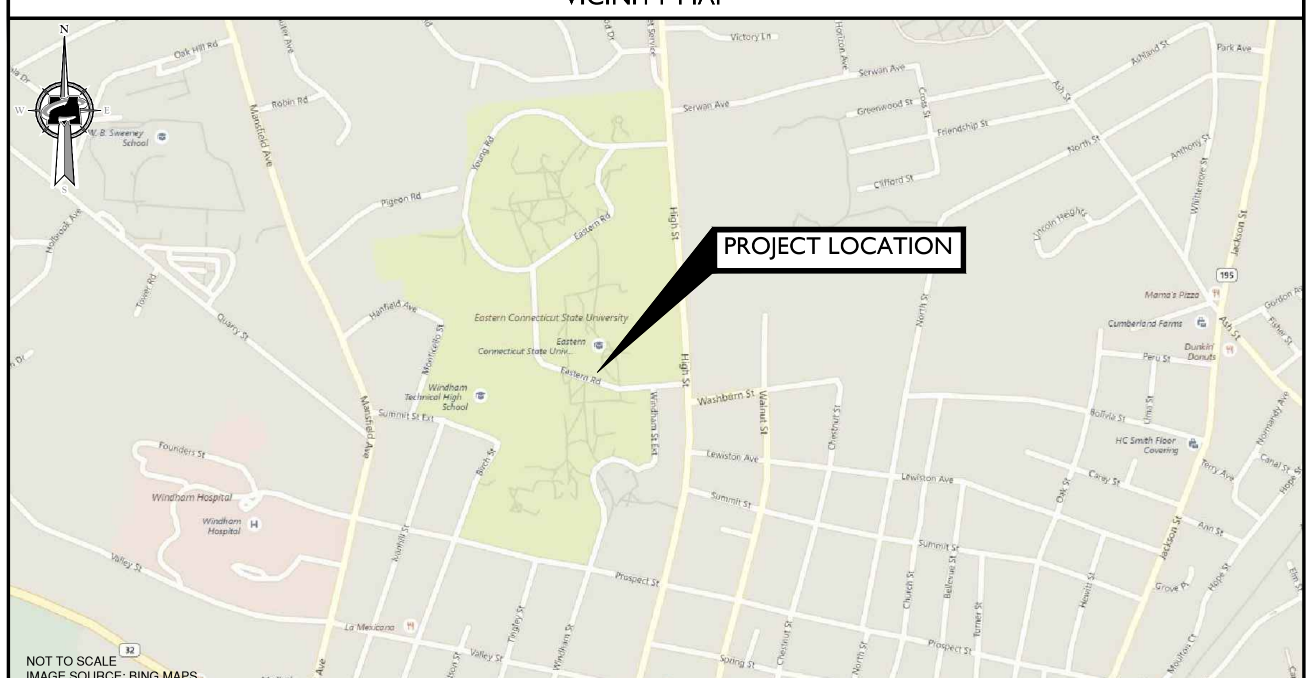
at&t

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

PROPERTY/TOWER OWNER:

NAME:	EASTERN CONNECTICUT UNIVERSITY
ADDRESS:	83 WINDHAM STREET
CITY, STATE, ZIP:	WILLIMANTIC, CT 06226
LATITUDE:	41.72058889° N
LONGITUDE:	72.21818056° W
LAT./LONG. TYPE:	NAD 83
AREA OF CONSTRUCTION:	EXISTING EQUIPMENT SHELTER AND MONOPOLE
ZONING/JURISDICTION:	CITY OF WLLIMANTIC
CURRENT USE/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



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. 2018 CONNECTICUT STATE BUILDING CODE INCORPORATING THE 2015 IBC
2. 2017 NATIONAL ELECTRIC CODE - NFPA 70
3. 2017 NATIONAL FIRE PROTECTION ASSOCIATION 70
4. AMERICAN CONCRETE INSTITUTE 318
5. AMERICAN INSTITUTE OF STEEL CONSTRICTION 360-10.
6. EIA/TIA-222 REVISION H
7. TIA 607 FOR GROUNDING
8. INSTITUTE FOR ELECTRICAL AND ELECTRONICS ENGINEERS 81 IEEE C2 LATEST EDITION
9. TELCORDIA GR-1275
10. ANSI T1.311

GENERAL CONTRACTOR NOTES

DO NOT SCALE DRAWINGS

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

GENERAL NOTES

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

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

PROJECT DESCRIPTION/SCOPE OF WORK

THIS PROJECT WILL BE COMPRISED OF:

- INSTALL (3) NEW RRUS-E2 WITH SURGE ARRESTORS, AT GRADE
- INSTALL (3) NEW AT&T ANTENNAS, (1) PER SECTOR
- (3) NEW AT&T ANTENNAS TO REPLACE (3) EXISTING ANTENNAS, (1) PER SECTOR
- INSTALL (3) LOW BAND COMBINERS IN POSITION # 3, (1) PER SECTOR
- INSTALL (3) LOW BAND COMBINERS, AT GRADE
- INSTALL (1) NEW FIBER BOX, AT GRADE
- INSTALL (12) NEW TELCO FLEX FOR PROPOSED DC TRUNKS
- INSTALL (3) NEW RRUS-32, (1) PER SECTOR
- (3) NEW RRUS-4415 B25 TO REPLACE (3) EXISTING RRUS, (1) PER SECTOR
- INSTALL (3) NEW RRUS-4478 B14, (1) PER SECTOR
- INSTALL (1) NEW DC-6 SURGE SUPPRESSION DOME
- INSTALL (2) 6/C DC POWER CABLES
- SWAP DUS WITH 5216 AND ADD 2ND 5216
- ADD 2ND XMU AND IDLe
- INSTALL (1) FIBER TRUNK

5

PROPOSED PROJECT SCOPE BASED ON RFDS ID #1736989 VERSION 3.00, LAST UPDATED 03/19/18

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— CONNECTICUT —

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Engineers ■ Planners ■ Surveyors
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at&t

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

smartlink
85 RANGEWAY ROAD
BUILDING 3, SUITE 102
NORTH BILLERICA, MA 01862
TEL: (774) 369-3613

SCALE :	JOB NUMBER :
AS SHOWN	18946006A

REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY
.	.	.	.	.
.	.	.	.	.
5	05/03/19	REVISED PER COMMENTS	AJC	RA
4	04/22/19	REVISED PER COMMENTS	AJC	RA
3	3/01/19	REVISED PER COMMENTS	AJC	RA
2	11/01/18	REVISED PER COMMENTS	AJC	RA
1	07/03/18	REVISED PER COMMENTS	AJC	RA
0	04/03/18	ISSUED FOR REVIEW	AJC	RA

STATE OF CONNECTICUT
PETROS TSOUKALAS
32577
LICENSED PROFESSIONAL ENGINEER

PETROS E. TSOUKALAS
CONNECTICUT PROFESSIONAL ENGINEER - LICENSE NUMBER: PEN.32577

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:

WILLIMANTIC T6
FA# 10035388
SITE # CTL01051

83 WINDHAM STREET
WILLIMANTIC, CT 06226
WINDHAM COUNTY

RED BANK OFFICE
331 Newman Springs Road
Suite 203
Red Bank, NJ 07701
Phone: 732.383.1950
Fax: 732.383.1984
email: solutions@maserconsulting.com

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 - SMARTLINK
    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 (F_y = 36 ksi) UNLESS OTHERWISE NOTED. PIPES SHALL BE ASTM A53 TYPE E (F_y = 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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JOB NUMBER : 18946006A

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0	04/03/18	ISSUED FOR REVIEW	AJC	RA

PETROS E. TSOUKALAS
CONNECTICUT PROFESSIONAL ENGINEER - LICENSE NUMBER: PEN.32577

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SITE NAME:

WILLIMANTIC T6
FA# 10035388
SITE # CTL01051

83 WINDHAM STREET
WILLIMANTIC, CT 06226
WINDHAM COUNTY

RED BANK OFFICE
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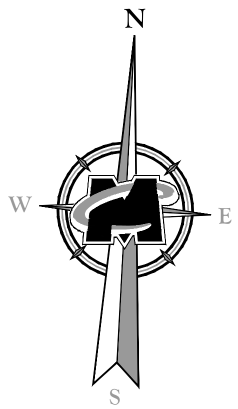
Phone: 732.383.1950
Fax: 732.383.1984
email: solutions@maserconsulting.com

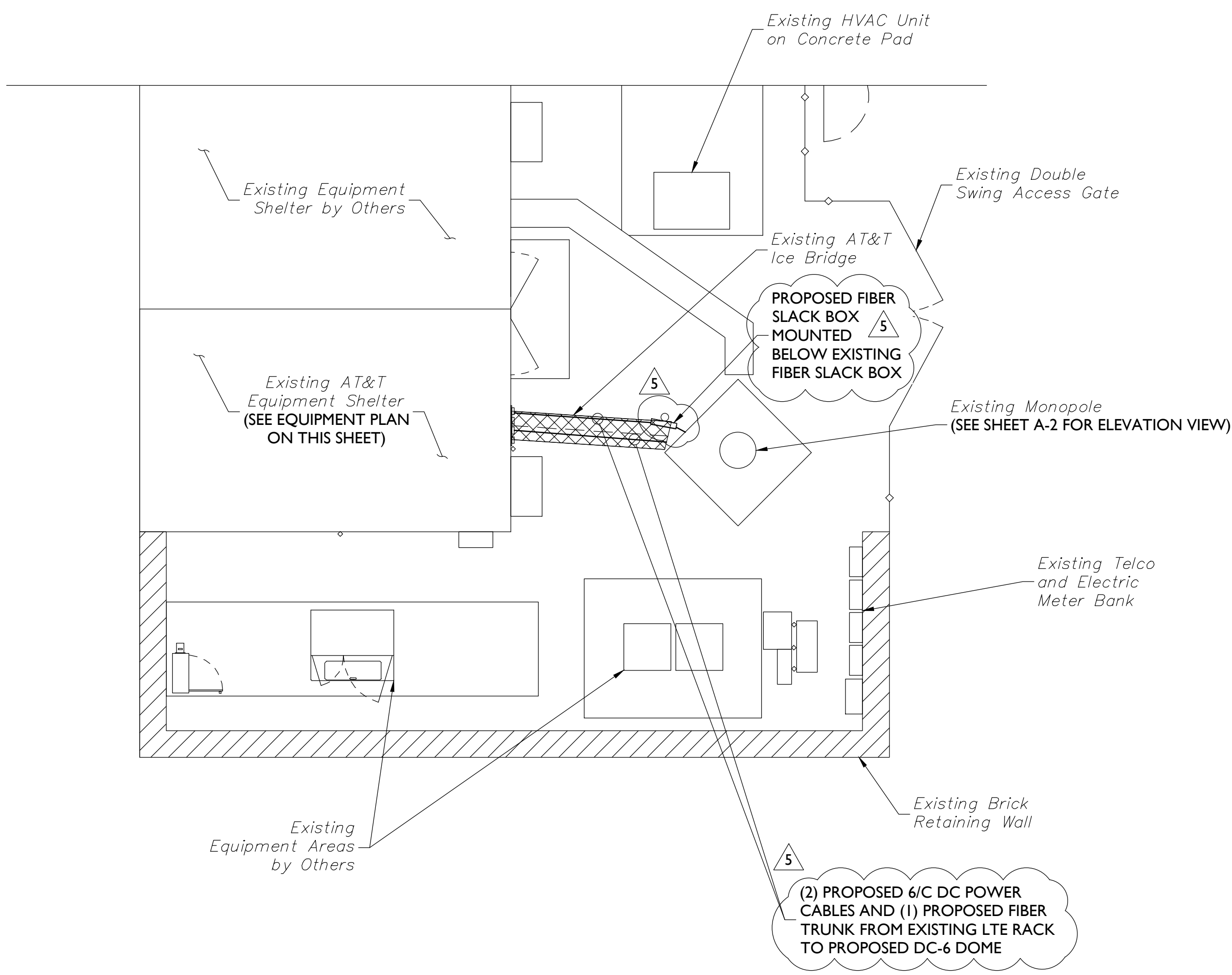
SHEET TITLE : GENERAL NOTES

SHEET NUMBER : GN-1



NOTES:

1. THE CONDUIT ROUTING IS DIAGRAMMATICALLY SHOWN ON THE PLANS AND ARE ONLY APPROXIMATIONS. THE EXACT LOCATION AND ROUTING SHALL BE FIELD VERIFIED.
2. ALL DISCONNECTS AND CONTROLLING DEVICES SHALL BE PROVIDED WITH ENGRAVED LAMICOID NAMEPLATES, INDICATING THE CIRCUITS ORIGINATION AND ALL EQUIPMENT TERMINATIONS.
3. SUBCONTRACTOR SHALL PROVIDE ALL CONDUITS AND CIRCUITS AS REQUIRED FOR A COMPLETED SYSTEM AND SHALL BE IN COMPLIANCE WITH THE MANUFACTURER'S SPECIFICATIONS.
4. ALL NEW CABLING TO BE ROUTED ON EXISTING CABLE RACKS.
5. ALL INSTALLED GROUND LUGS MUST BE INSPECTION HOLE LUGS.
6. INSTALLED GROUND LEADS MUST TERMINATE AT MGB, NOT HALO.
7. NO OVERLAPPING GROUND HARDWARE.



COMPOUND PLAN

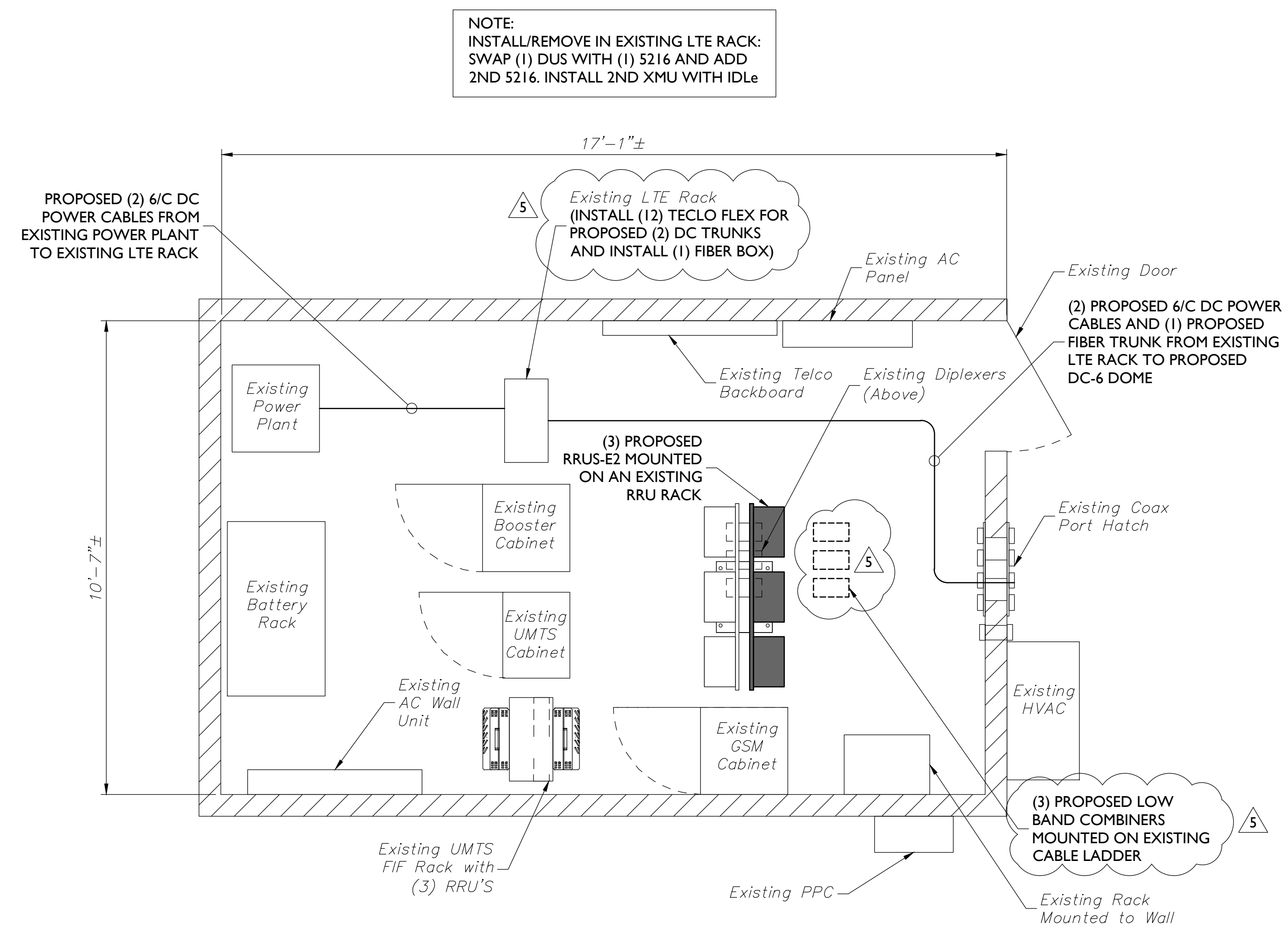
GRAPHIC SCALE

5 0 2.5 5 10

(IN FEET)

SCALE: 1" = 5' FOR 24"X36" DRAWINGS

(DO NOT SCALE 11"X17" DRAWINGS)



EQUIPMENT PLAN

GRAPHIC SCALE

2 0 1 2 4

(IN FEET)

SCALE: 1" = 2' FOR 24"X36" DRAWINGS

(DO NOT SCALE 11"X17" DRAWINGS)

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STATE OF CONNECTICUT
PETROS TSOUKALAS
CONNECTICUT PROFESSIONAL ENGINEER - LICENSE NUMBER: PEN.32577
32577
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SITE # CTL01051

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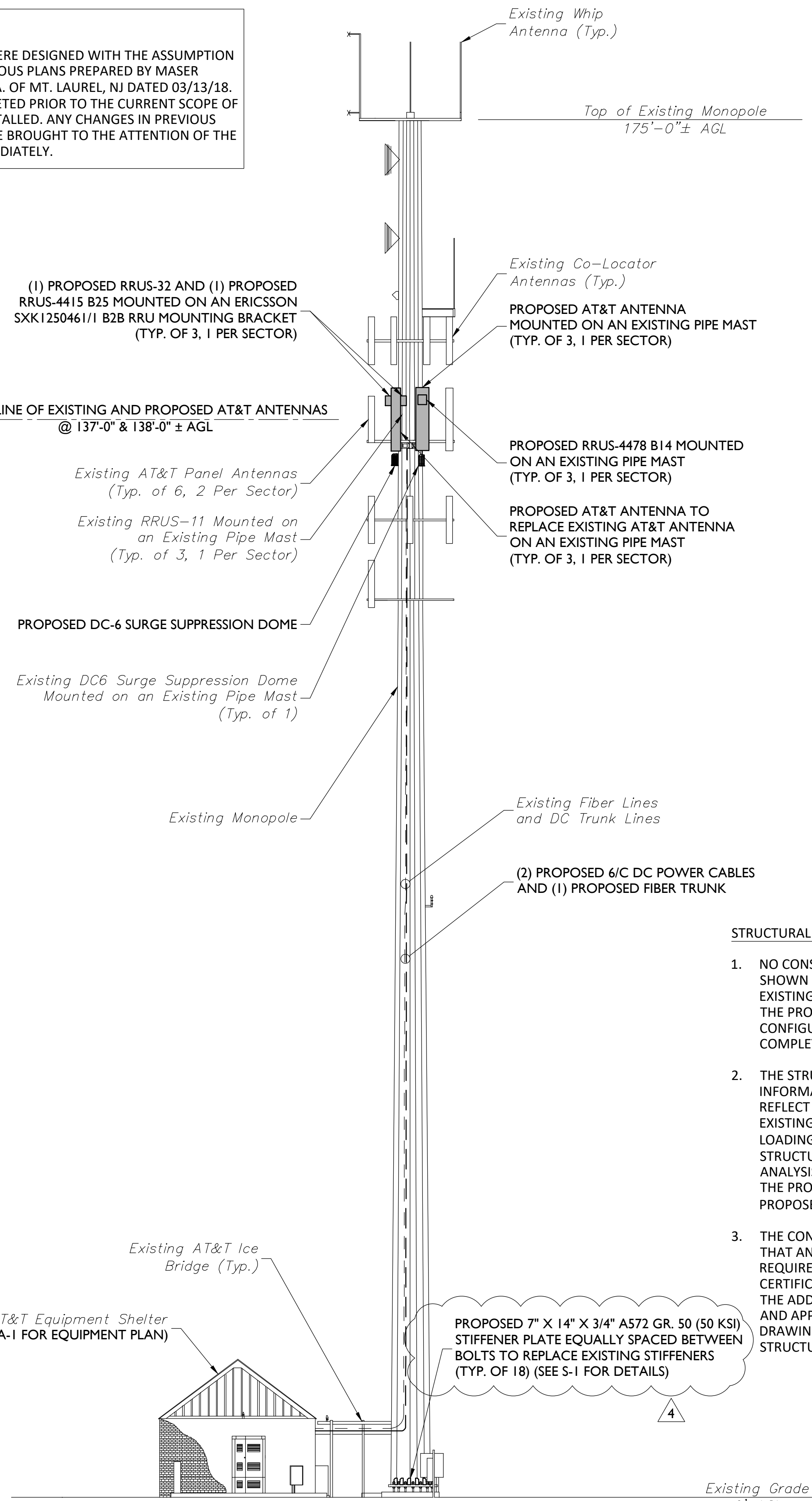
SHEET TITLE :
COMPOUND PLAN AND EQUIPMENT PLAN

SHEET NUMBER :
A-1

NOTE:

THESE PLANS WERE DESIGNED WITH THE ASSUMPTION THAT THE PREVIOUS PLANS PREPARED BY MASER CONSULTING P.A. OF MT. LAUREL, NJ DATED 03/13/18. WILL BE COMPLETED PRIOR TO THE CURRENT SCOPE OF WOK BEING INSTALLED. ANY CHANGES IN PREVIOUS DESIGN SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER IMMEDIATELY.



ELEVATION VIEW

GRAPHIC SCALE

10 0 5 10 20

(IN FEET)

SCALE: 1" = 10' FOR 24"X36" DRAWINGS
(DO NOT SCALE 11"X17" DRAWINGS)

PROPOSED ANTENNA AND RRUS CONFIGURATION

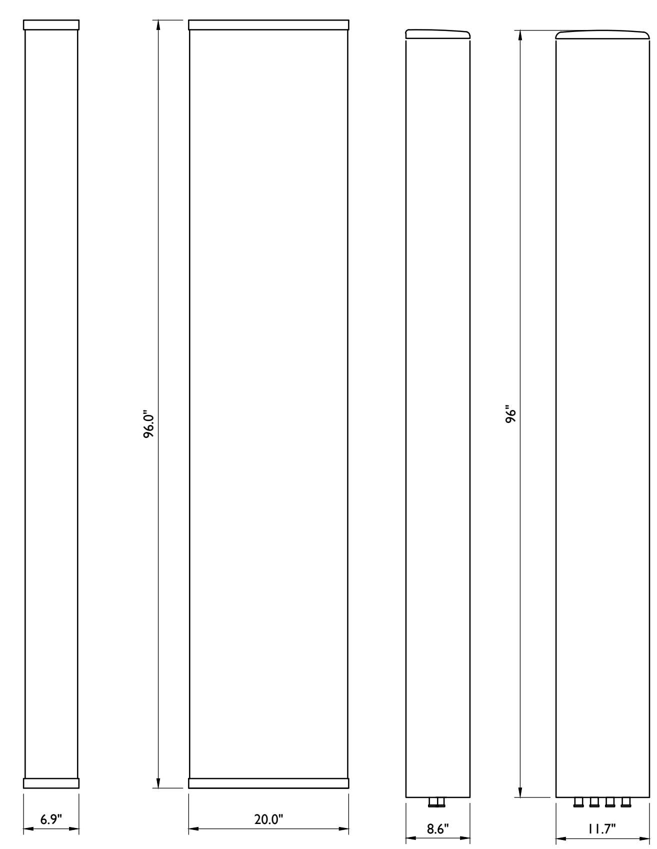
SECTOR		EXISTING ANTENNA	PROPOSED ANTENNA	TECHNOLOGY	ANTENNA STATUS	HEIGHT (in)	WIDTH (in)	DEPTH (in)	WEIGHT (lbs)	ANTENNA AZIMUTH (DEG.)	ANT. CL. ELEV. (ft.)	REMOTE RADIO/TMA CONFIGURATION	STATUS	TRANSMISSION CABLE QUANTITY	TRANSMISSION CABLE TYPE	TRANSMISSION CABLE STATUS
ALPHA	A1	AM-X-CD-17-65-00T-RET	AM-X-CD-17-65-00T-RET	LTE 700 BC	REMAIN	96.00	11.80	5.90	59.50	0°	138'	(1) RRUS 11	REMAIN	1 2	FIBER DC	REMAIN
	A2	VACANT MAST	800-10966	LTE 700 B14 PCS	NEW	96.00	20.00	6.90	114.60	0°		(1) RRUS-4478 B14	NEW	1 2	FIBER DC	NEW
	A3	Powerwave 7770	CCI OPA65R-BU8B	LTE 700DE/850/WCS	NEW	95.90	11.70	8.40	69.00	0°	138'	(1) RRUS-12 (AT GRADE) (1) DB0061F1V51-2 (1) DB0061F1V51-2 (AT GRADE) (1) RRUS 32 (1) RRUS 4415-B25 5 (1) RRUS-E2 (AT GRADE)	REMAIN NEW	2	1-5/8" COAX	REMAIN
	A4	Powerwave 7770	Powerwave 7770	UMTS	REMAIN	55.00	11.00	5.00	35.00	143°	137'	(4) LGP 13519 Diplexer (2) LGP17201 TMA	REMAIN	2	1-5/8" COAX	REMAIN
BETA	B1	AM-X-CD-17-65-00T-RET	AM-X-CD-17-65-00T-RET	LTE 700 BC	REMAIN	96.00	11.80	5.90	59.50	120°	138'	(1) RRUS 11	REMAIN			
	B2	VACANT MAST	800-10966	LTE 700 B14 PCS	NEW	96.00	20.00	6.90	114.60	120°	138'	(1) RRUS-4478 B14	NEW		5	
	B3	Powerwave 7770	CCI OPA65R-BU8B	LTE 700DE/850/WCS	NEW	95.90	11.70	8.40	69.00	120°	138'	(1) RRUS-12 (AT GRADE) (1) DB0061F1V51-2 (1) DB0061F1V51-2 (AT GRADE) (1) RRUS 32 (1) RRUS 4415-B25 5 (1) RRUS-E2 (AT GRADE)	REMAIN NEW	2	1-5/8" COAX	REMAIN
	B4	Powerwave 7770	Powerwave 7770	UMTS	REMAIN	55.00	11.00	5.00	35.00	263°	137'	(4) LGP 13519 Diplexer (2) LGP17201 TMA	REMAIN	2	1-5/8" COAX	REMAIN
GAMMA	C1	AM-X-CD-17-65-00T-RET	AM-X-CD-17-65-00T-RET	LTE 700 BC	REMAIN	96.00	11.80	5.90	59.50	240°	138'	(1) RRUS 11	REMAIN			
	C2	VACANT MAST	800-10966	LTE 700 B14 PCS	NEW	96.00	20.00	6.90	114.60	240°	138'	(1) RRUS-4478 B14	NEW		5	
	C3	Powerwave 7770	CCI OPA65R-BU8B	LTE 700DE/850/WCS	NEW	95.90	11.70	8.40	69.00	240°	138'	(1) RRUS-12 (AT GRADE) (1) DB0061F1V51-2 (1) DB0061F1V51-2 (AT GRADE) (1) RRUS 32 (1) RRUS 4415-B25 5 (1) RRUS-E2 (AT GRADE)	REMAIN NEW	2	1-5/8" COAX	REMAIN
	C4	Powerwave 7770	Powerwave 7770	UMTS	REMAIN	55.00	11.00	5.00	35.00	23°	137'	~~(4) LGP 13519 Diplexer~~ (2) LGP17201 TMA	REMAIN	2	1-5/8" COAX	REMAIN

5

ANTENNA SCHEDULE

STRUCTURAL NOTES:

1. NO CONSTRUCTION OF THE PROPOSED LOADING SHOWN SHALL PROCEED UNTIL ADEQUACY OF THE EXISTING STRUCTURE AND FOUNDATION, INCLUDING THE PROPOSED AT&T ANTENNA MOUNTING CONFIGURATION SHOWN HEREIN, HAS BEEN COMPLETED.
2. THE STRUCTURE ELEVATION IS SHOWN FOR INFORMATIONAL PURPOSES ONLY AND MAY NOT REFLECT AS-BUILT FIELD CONDITIONS FOR ALL EXISTING INVENTORY LOADING/ANTENNAS/APPURTENANCES 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.



WEIGHT = 114.6 LBS

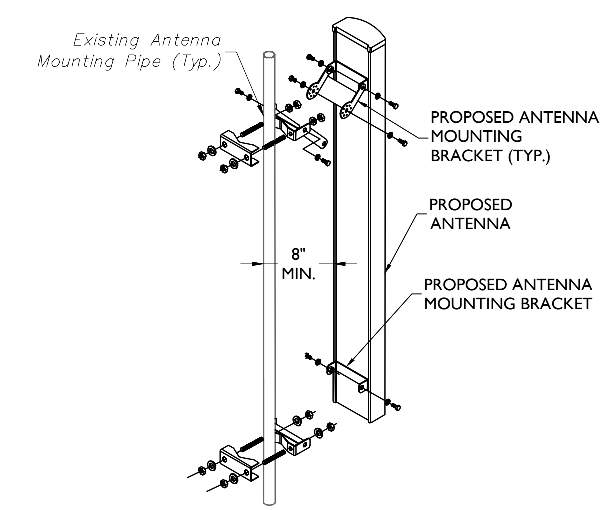
KATHREIN 800-10966

WEIGHT =69 LBS

CCI OPA65R-BU8B

ANTENNA DETAILS

NOT TO SCALE



ANTENNA MOUNTING DETAIL

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STATE OF CONNECTICUT
PETROS TSOUKALAS
32577
LICENSED PROFESSIONAL ENGINEER

PETROS E. TSOUKALAS
CONNECTICUT PROFESSIONAL ENGINEER - LICENSE NUMBER: PEN.32577

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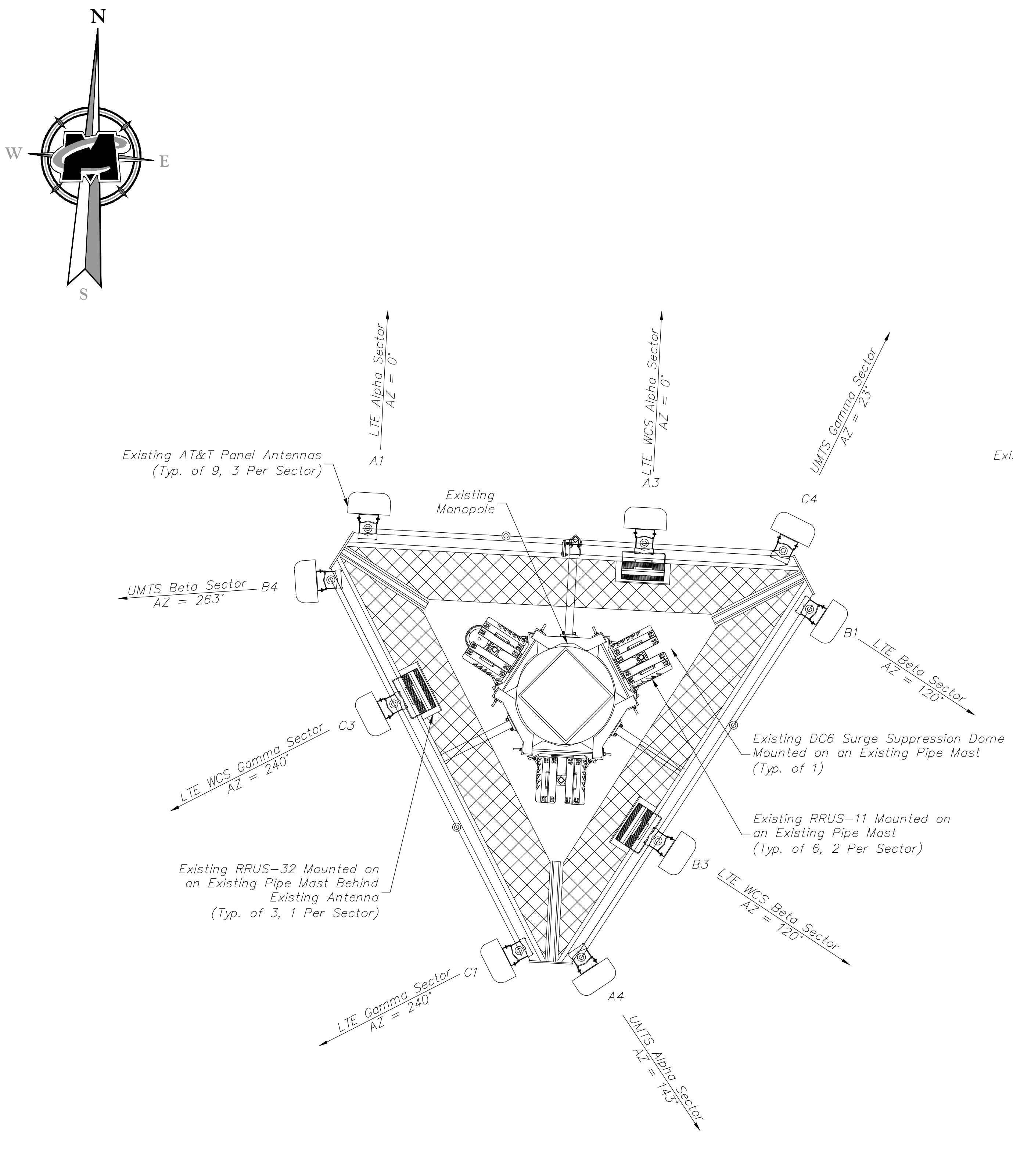
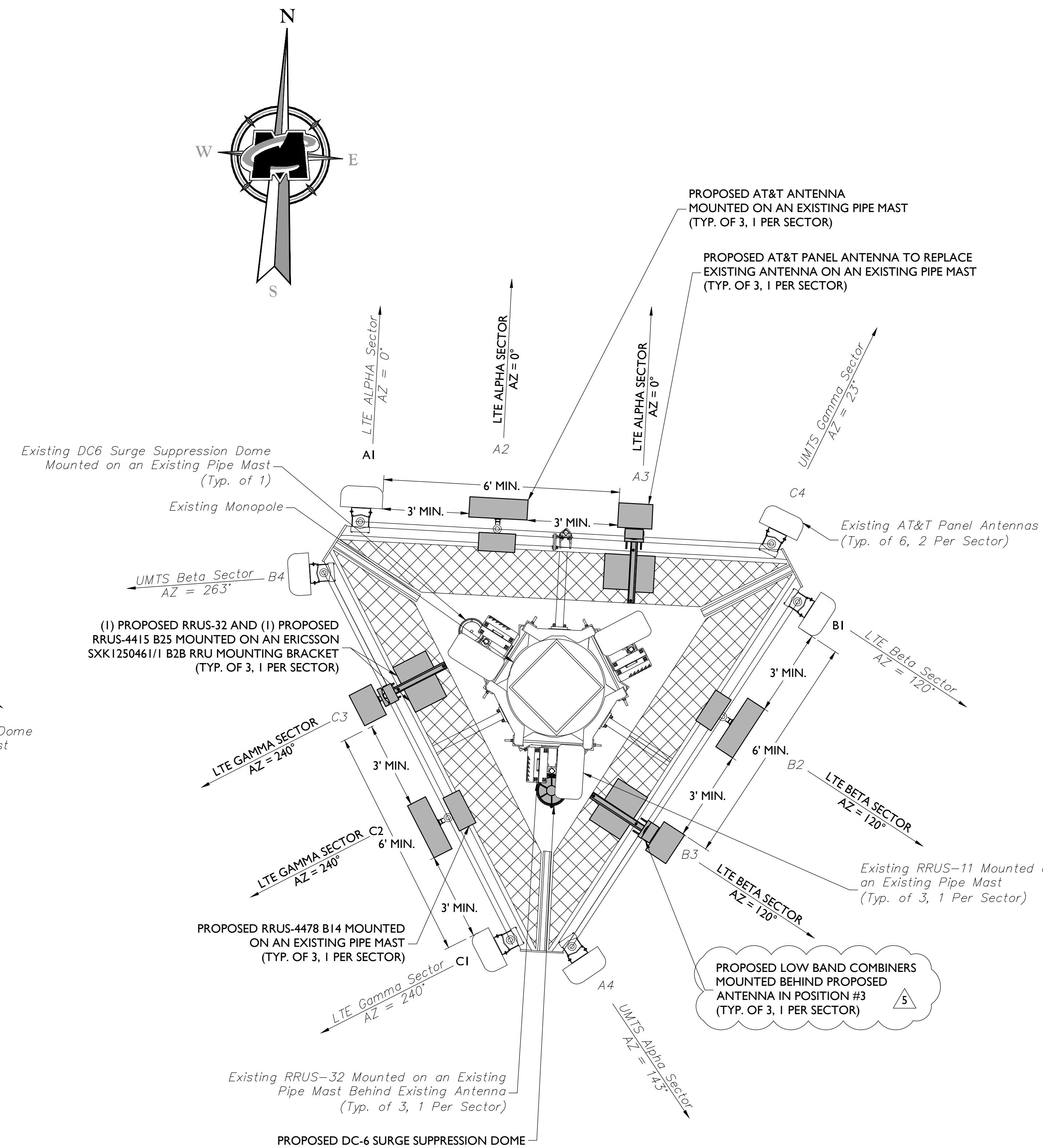
SHEET TITLE :
ELEVATION VIEW, DETAILS AND ANTENNA SCHEDULE

SHEET NUMBER :
A-2



EXISTING - ANTENNA LAYOUT

NOT TO SCALE



PROPOSED - ANTENNA LAYOUT

NOT TO SCALE

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STATE OF CONNECTICUT · PETROS TSOUKALAS · 32577 · LICENSED · PROFESSIONAL ENGINEER

PETROS E. TSOUKALAS
CONNECTICUT PROFESSIONAL ENGINEER - LICENSE NUMBER: PEN.32577

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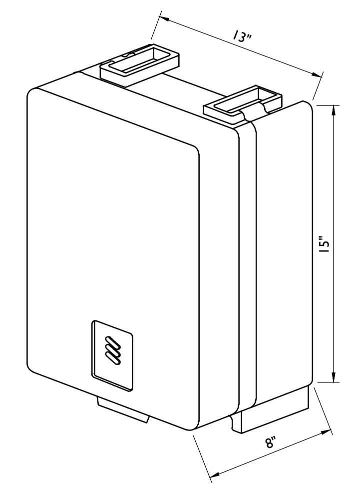
SHEET TITLE : ANTENNA LAYOUTS

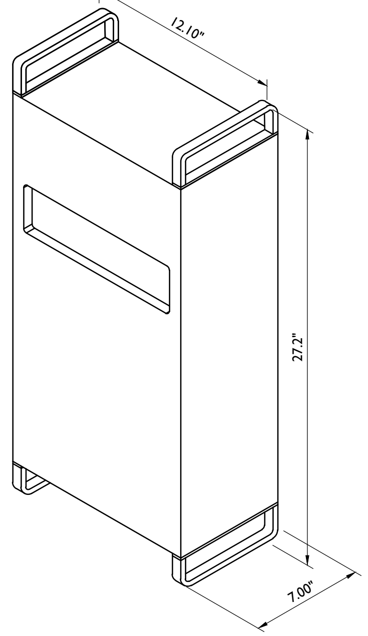
SHEET NUMBER : A-3



DIMENSIONS (H X W X D): 15"H X 13"W X 8"D (INCLUDES SUNSHIELD)
WEIGHT: 60 LBS

RRU-4478-B14 DETAIL

NOT TO SCALE

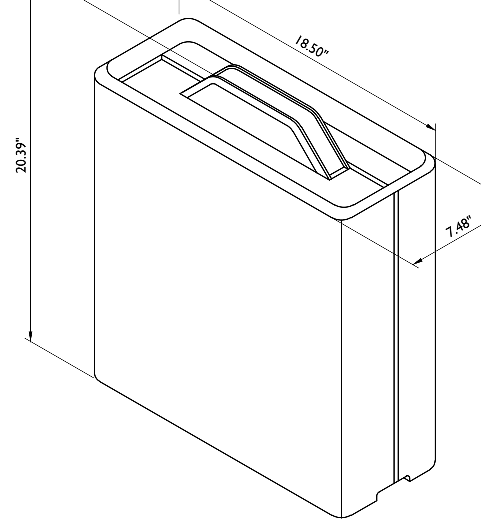


RRUS-4426 B66 DIMENSIONS (H X W X D): 27.2" X 12.1" X 7.0"
(INCLUDES HANDLES, FEET AND SUNSHIELD)

WEIGHT: 53 LBS

4415 B25 DETAIL

NOT TO SCALE

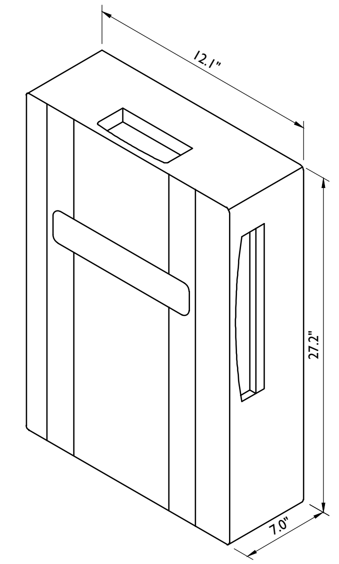


RRUS-32 B66 DIMENSIONS (H X W X D): 20.39" X 18.5" X 7.48"
(INCLUDES HANDLES)

WEIGHT: 53 LBS

RRUS E2 DETAIL

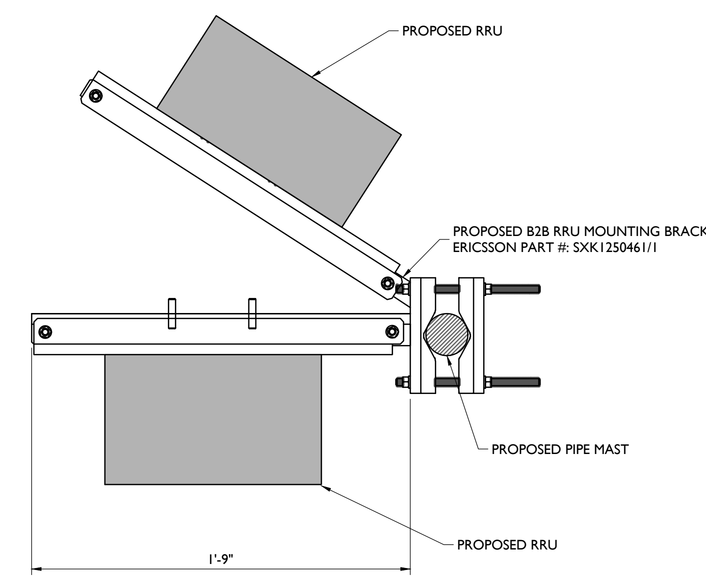
NOT TO SCALE



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

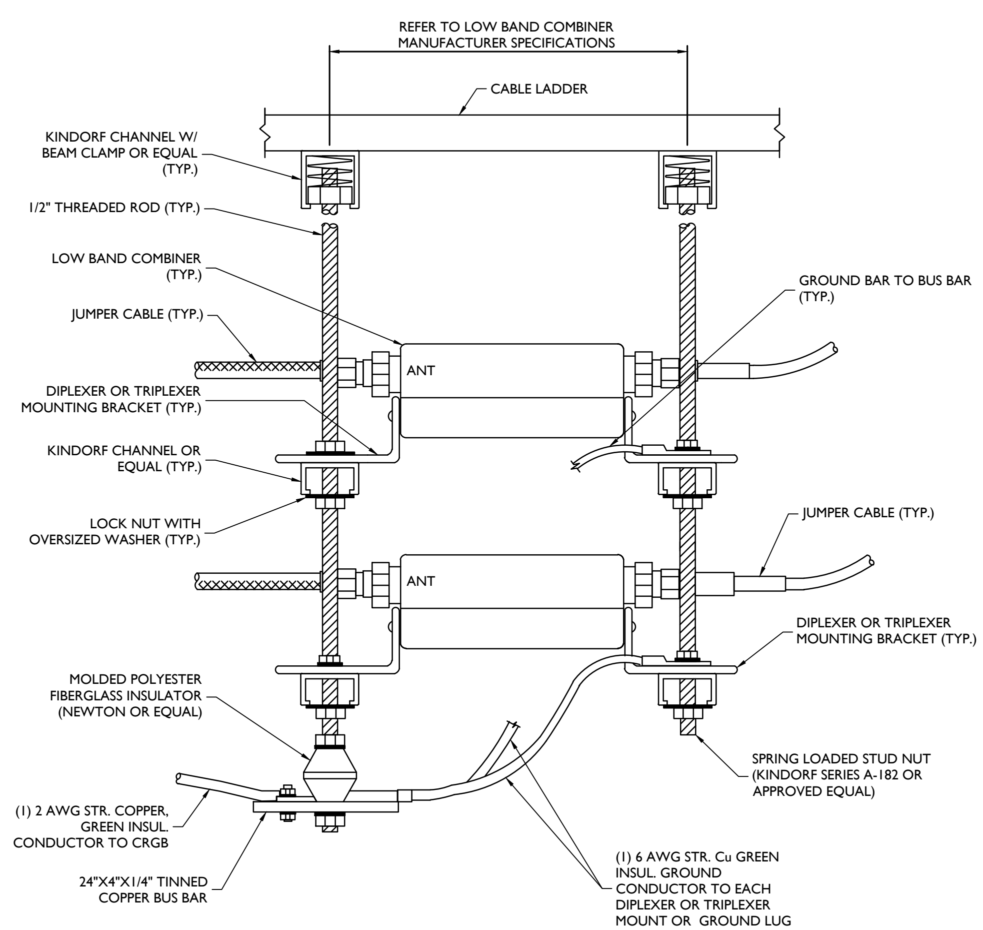
RRUS-32 DETAIL

NOT TO SCALE



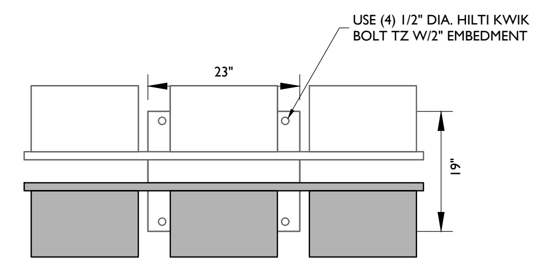
RRU MOUNTING DETAIL

NOT TO SCALE



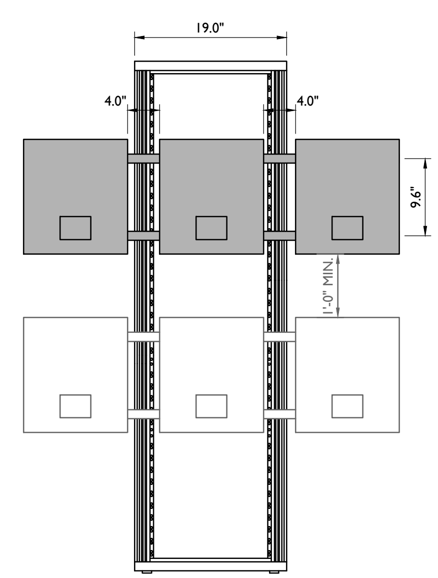
LOW BAND COMBINER MOUNTING DETAIL

5



PLAN VIEW

TO SCALE

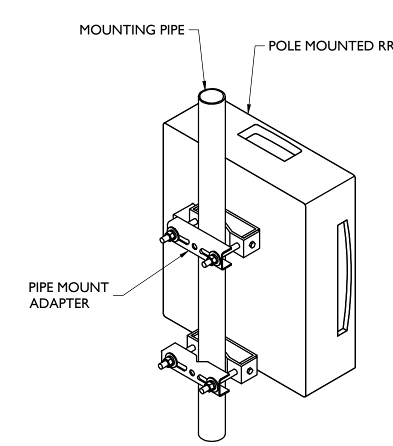


NOTE:

MOUNT RRU'S TO UNISTRUT WITH 3/8"Ø UNISTRUT BOLTING HARDWARE AND SPRING NUTS THROUGH EQUIPMENT MOUNTING HOLES. SUBCONTRACTOR SHALL SUPPLY.

RRU RACK MOUNTED DETAIL

NOT TO SCALE



RRU PIPE MOUNT DETAIL

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SCALE :	JOB NUMBER :
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5	05/03/19	REVISED PER COMMENTS	AJC	RA
4	04/22/19	REVISED PER COMMENTS	AJC	RA
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0	04/03/18	ISSUED FOR REVIEW	AJC	RA

PETROS E. TSOUKALAS
CONNECTICUT PROFESSIONAL
ENGINEER - LICENSE NUMBER: PEN.32577

SITE NAME:

WILLIMANTIC T6
FA# 10035388
SITE # CTL01051

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Fax: 732.383.1984
email: solutions@maserconsulting.com

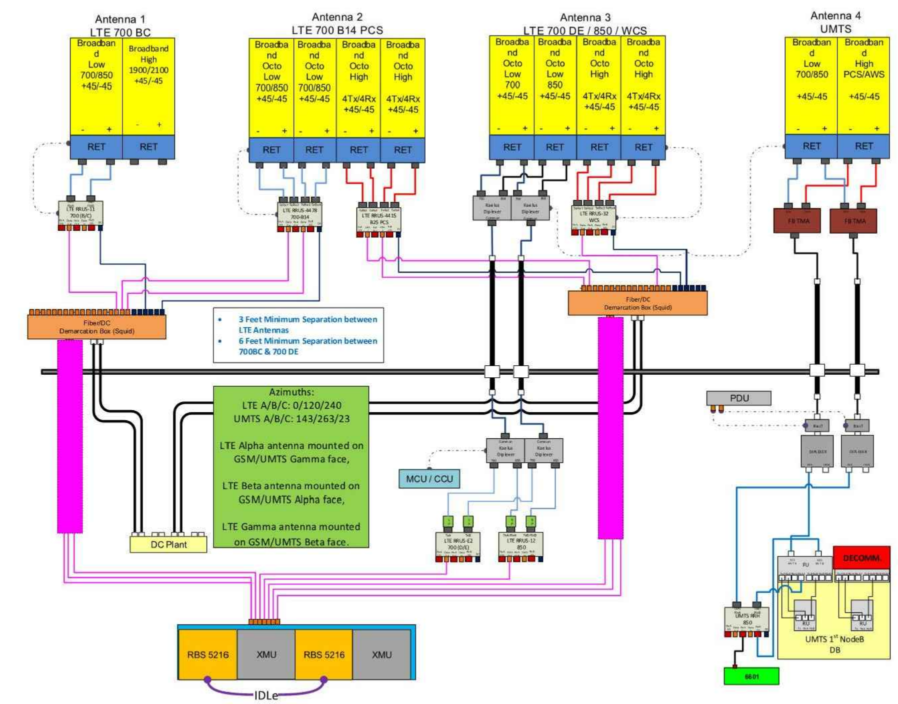
SHEET TITLE :

DETAILS

SHEET NUMBER :

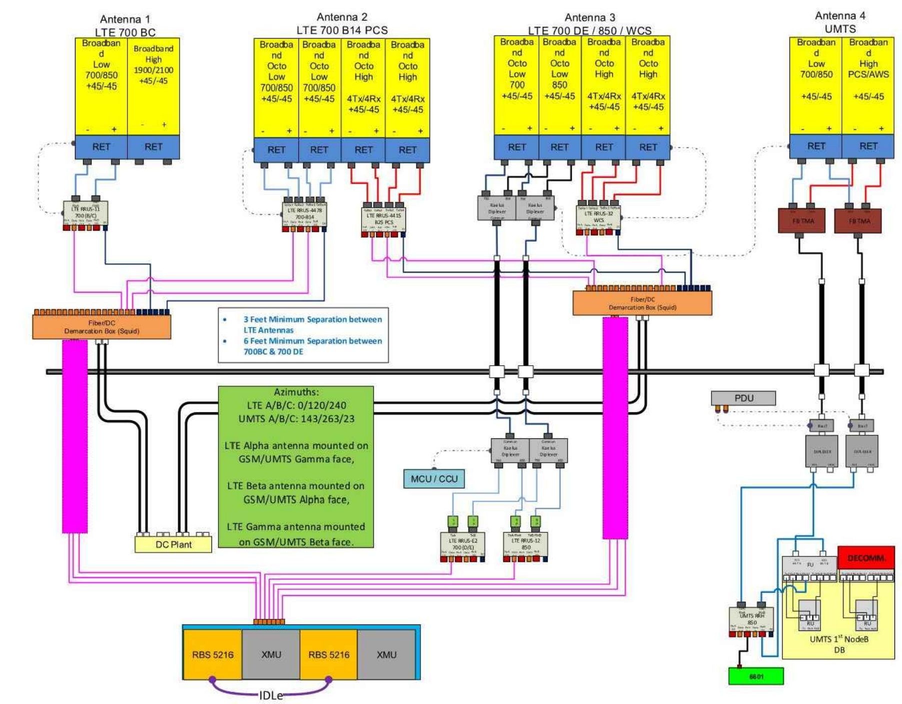
A-4

Diagram - Sector A | Diagram File Name - CT1051_ABC_Rev3.vsd
Atoll Site Name - CTL01051 | Location Name - WILLIMANTIC ECSU | Market - CONNECTICUT | Market Cluster - NEW ENGLAND
Comments: Important Note: For detailed radio to antenna wiring refer to the latest 4T4R Antenna/ radio Port connections Field Notice (RF-HW-2016-265)



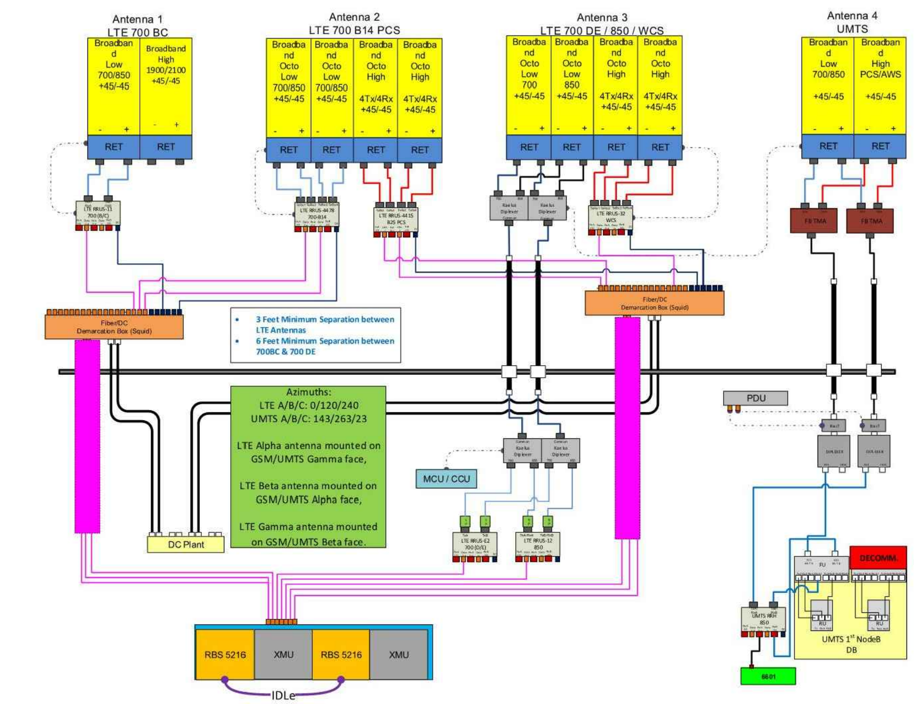
ALPHA SECTOR

Diagram - Sector B | Diagram File Name - CT1051_ABC_Rev3.vsd
Atoll Site Name - CTL01051 | Location Name - WILLIMANTIC ECSU | Market - CONNECTICUT | Market Cluster - NEW ENGLAND
Comments: Important Note: For detailed radio to antenna wiring refer to the latest 4T4R Antenna/ radio Port connections Field Notice (RF-HW-2016-265)



BETA SECTOR

Diagram - Sector C | Diagram File Name - CT1051_ABC_Rev3.vsd
Atoll Site Name - CTL01051 | Location Name - WILLIMANTIC ECSU | Market - CONNECTICUT | Market Cluster - NEW ENGLAND
Comments: Important Note: For detailed radio to antenna wiring refer to the latest 4T4R Antenna/ radio Port connections Field Notice (RF-HW-2016-265)



GAMMA SECTOR

BASED ON RF ENGINEERING DESIGN ENTITLED "NEW-ENGLAND_CONNECTICUT_CTL01051_2018-LTE-Next-Carrier_LTE_mm093q_2051A0B8T4_10035388_71313_04-20-2017_Final-Approved_v3.00", LAST UPDATED 03/19/18.

RF PLUMBING DIAGRAM

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0	04/03/18	ISSUED FOR REVIEW	AJC	RA

PETROS E. TSOUKALAS
CONNECTICUT PROFESSIONAL ENGINEER - LICENSE NUMBER: PEN.32577

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FA# 10035388
SITE # CTL01051

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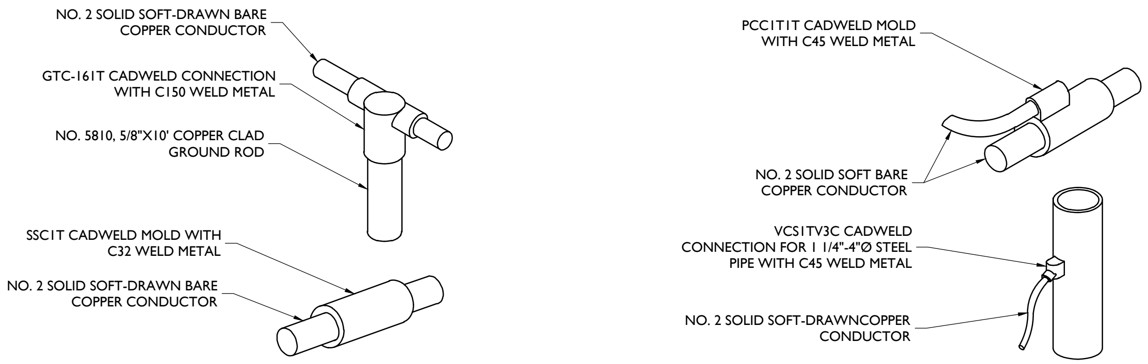
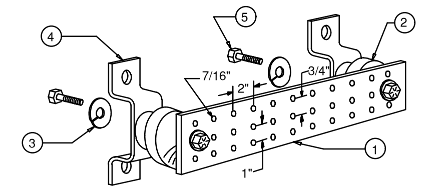
SHEET TITLE : RF PLUMBING DIAGRAM

SHEET NUMBER : A-5



CADWELD DETAILS
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.

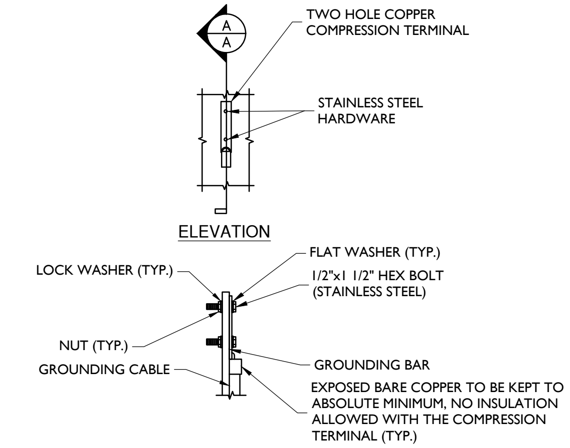
SECTION "P" - SURGE PRODUCERS

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 SUPPLT RETURN BAR (#2)
RECTIFIER FRAMES.

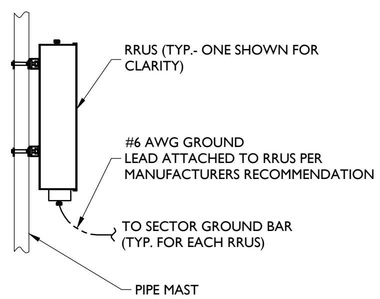
SECTION "A" - SURGE ABSORBERS

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

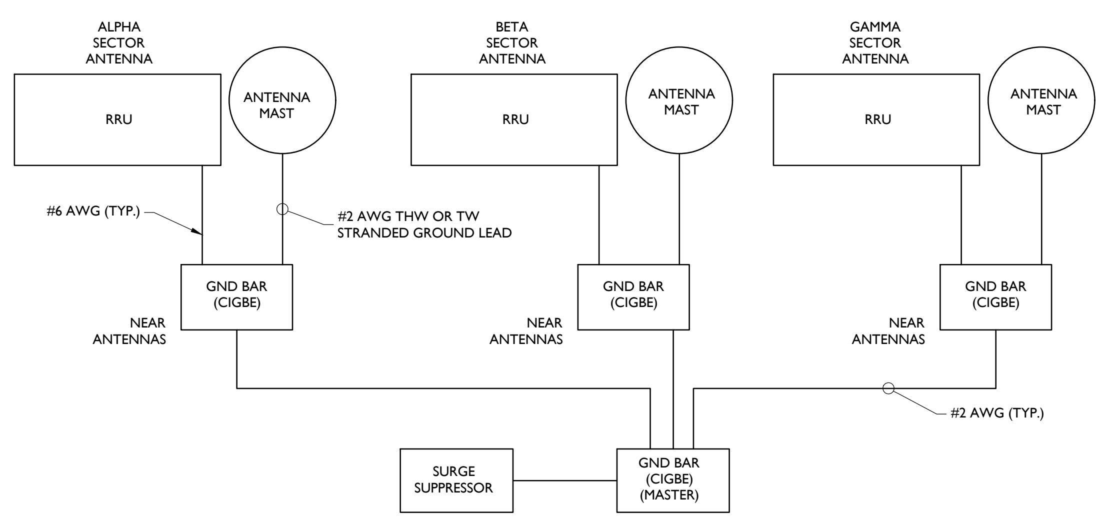
MASTER GROUND BAR
NOT TO SCALE



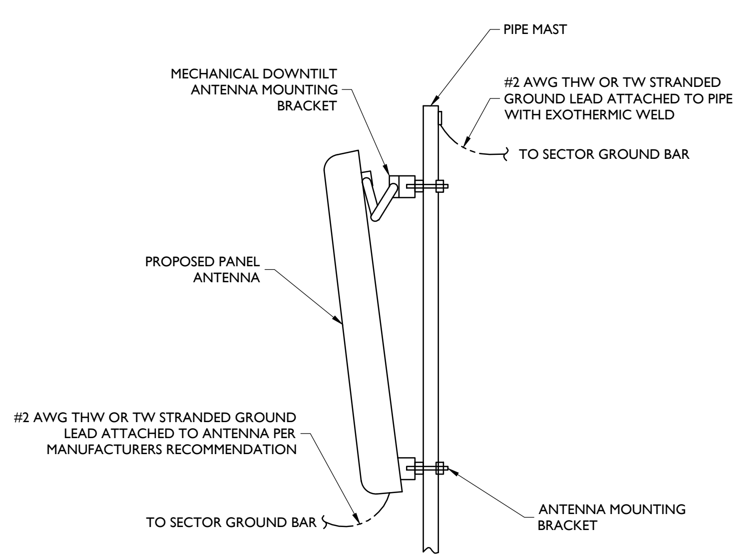
TYPICAL GROUND BAR CONNECTION DETAIL
NOT TO SCALE



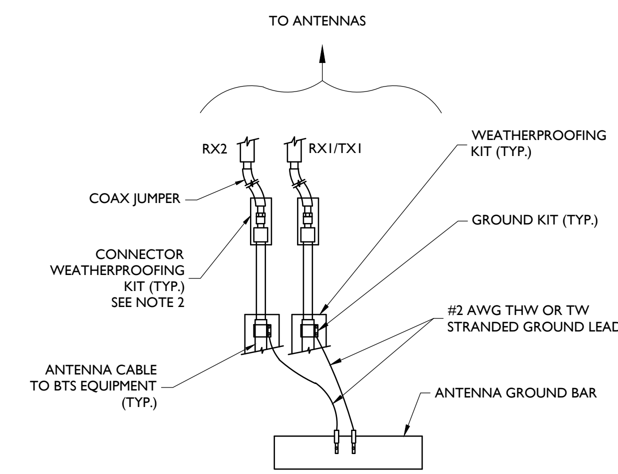
RRU GROUNDING
NOT TO SCALE



SCHEMATIC DIAGRAM GROUNDING SYSTEM
NOT TO SCALE



ANTENNA GROUNDING
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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SCALE :	JOB NUMBER :
AS SHOWN	18946006A

REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY
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0	04/03/18	ISSUED FOR REVIEW	AJC	RA

STATE OF CONNECTICUT PETROS TSOUKALAS 32577 LICENSED PROFESSIONAL ENGINEER

PETROS E. TSOUKALAS
CONNECTICUT PROFESSIONAL ENGINEER - LICENSE NUMBER: PEN.32577

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SITE NAME:

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FA# 10035388
SITE # CTL01051

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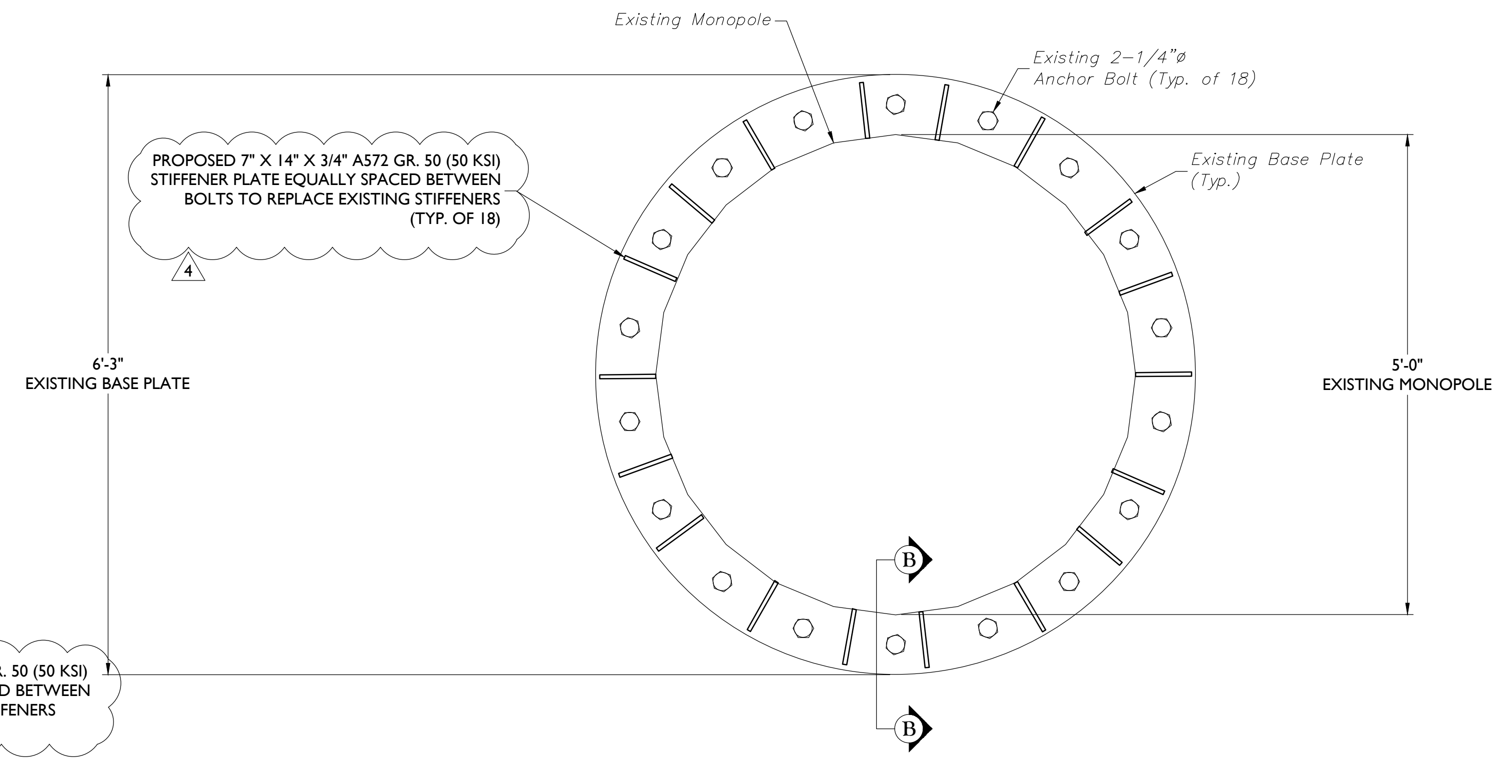
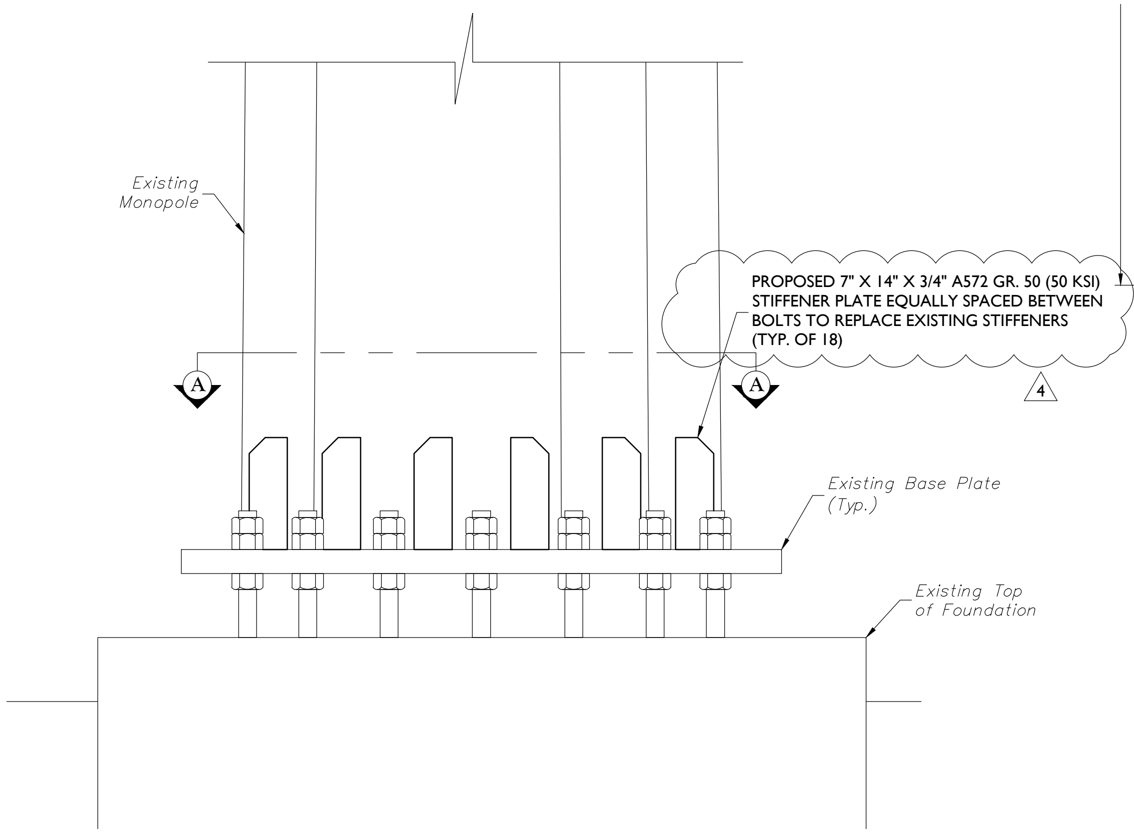
SHEET TITLE :
GROUNDING DETAILS

SHEET NUMBER :
G-1



SECTION A-A

GRAPHIC SCALE
1 0 .5 1 2
(IN FEET)
SCALE: 1" = 1' FOR 24"X36" DRAWINGS
(DO NOT SCALE 11"X17" DRAWINGS)



BASE ELEVATION VIEW

GRAPHIC SCALE
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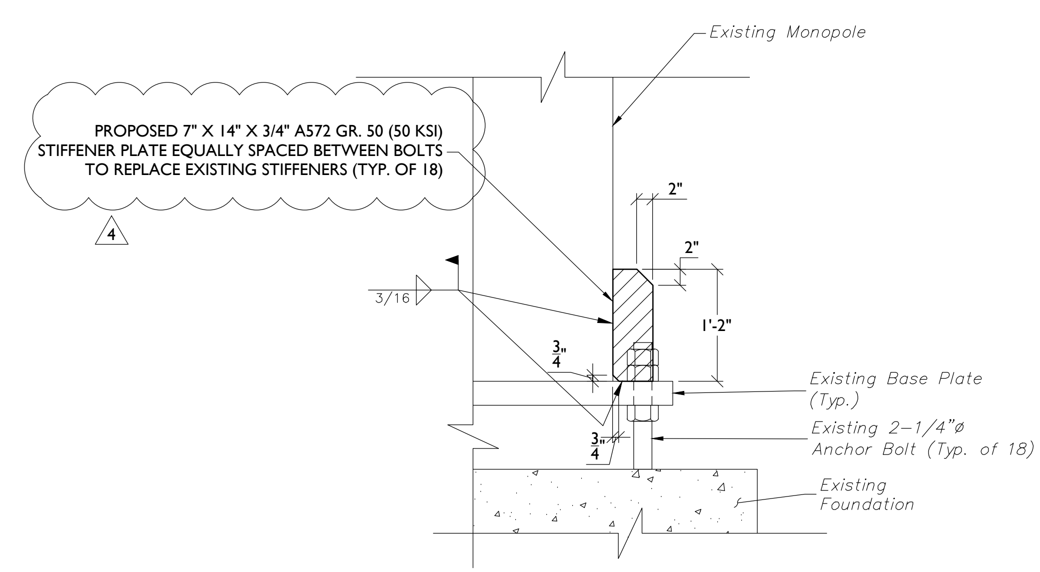
(IN FEET)
SCALE: 1" = 1' FOR 24"X36" DRAWINGS
(DO NOT SCALE 11"X17" DRAWINGS)



SECTION B-B

GRAPHIC SCALE
1 0 .5 1 2
(IN FEET)
SCALE: 1" = 1' FOR 24"X36" DRAWINGS
(DO NOT SCALE 11"X17" DRAWINGS)

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STATE OF CONNECTICUT PETROS TSOUKALAS 32577 LICENSED PROFESSIONAL ENGINEER

PETROS E. TSOUKALAS
CONNECTICUT PROFESSIONAL
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email: solutions@maserconsulting.com

SHEET TITLE :
STRUCTURAL DETAILS

SHEET NUMBER :
S-1

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Monopole Feasibility Study

FOR

CTL01051 – Willimantic ECSU

FA # 10035388
LTE 4C/5C/6C
83 Windham Street
Willimantic, CT 06226
Windham County

Tower Utilization (Without Modification): 154.2%
Tower Utilization (With Modification): 83.2%
Foundation Utilization (Without Modification): 66.9%
Tower Modification Cost Estimate: $7,000-$10,000

November 9, 2018

Prepared For

AT&T
550 Cochituate Road
Framingham, MA 01701

Prepared By

Maser Consulting Connecticut
331 Newman Springs Road, Suite 203
Red Bank, NJ 07701
T: 732.383.1950

STATE OF CONNECTICUT PETROS TSOUKALAS 32557 LICENSED PROFESSIONAL ENGINEER

Petros E. Tsoukalas, P.E.
Geographic Discipline Leader
Connecticut License No. 32557

MC Project No. 18946006A

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

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

• RFDS 1736989 provided by Smartlink, dated March 19, 2018.
• Monopole Structural Analysis prepared by Maser Consulting Connecticut, Project No. 16946011A, dated December 30, 2016.
• Failing Tower Analysis prepared by Maser Consulting Connecticut, Project No. 18946006A, dated May 7, 2018
• Previous Tower Analysis report, prepared by GPD Group, Inc., Project No. 2014723.21.71313.01, dated May 14, 2014.

The proposed **AT&T** equipment is to be supported on the existing antenna support mount constructed of structural steel antenna support pipes supported by tubes at centerlines of approximately 137'-0" and 138'-0" above ground level. This report is based only upon this information.

The tower modifications per the previous referenced SA have not been installed and therefore not included in this analysis.

Discrete and Linear Appurtenances:
Maser Consulting Connecticut understands the existing and proposed **AT&T** loading to be as follows:

Quantity	Manufacturer	Antenna/ Appurtenance	Status	Sector	
3	**CCI**	**OPA65R-BU8B**	**Proposed**	**Alpha, Beta, & Gamma**	
3	POWERWAVE	7770	Existing	Alpha, Beta, & Gamma	
3	KMW	AM-X-CD-17-65-00T-RET	Existing	Alpha, Beta, & Gamma	
3	**KATHREIN**	**80010966**	**Proposed**	**Alpha, Beta, & Gamma**	
2	**Raycap**	**DC6-48-60-18-8F**	**Existing/Proposed**	**Alpha & Beta**	(Attached to the tower)
3	ERICSSON	RRUS 11	Existing	Alpha, Beta, & Gamma	(Attached to the tower)
3	**ERICSSON**	**RRUS 4478 B14**	**Proposed**	**Alpha, Beta, & Gamma**	
3	**ERICSSON**	**RRU 4415 B25**	**Proposed**	**Alpha, Beta, & Gamma**	
3	**ERICSSON**	**RRUS 32**	**Proposed**	**Alpha, Beta, & Gamma**	(Attached to the tower)
3	ERICSSON	RRUS 12	Existing	Alpha, Beta, & Gamma	(At Ground Level)
3	**ERICSSON**	**RRUS E2**	**Proposed**	**Alpha, Beta, & Gamma**	(At Ground Level)
6	POWERWAVE	LGP17201	Existing	Alpha, Beta, & Gamma	
6	**KAELUS**	**DBC0061F1V51-2 (SINGLE)**	**Proposed**	**Alpha, Beta, & Gamma**	

See the Material Take-Off sheet in **Appendix A** for monopole information.

Codes, Standards and Loading:

Maser Consulting Connecticut utilized the following codes and standards:

- 2018 Connecticut State Building Code, Incorporating the 2015 IBC
- Structural Standards for Antenna Supporting Structures and Antennas ANSI/TIA-222-G
    - Ultimate Wind Speed – 130 mph (3 Second Gust)
    - Nominal Wind Speed – 101 mph (3 Second Gust)
    - Exposure Category – B
    - Structural Class – II
    - Topographic Category – 1
    - Ice Wind – 50 mph
    - Ice Thickness – 0.75"
- Specification for Structural Steel Buildings ANSI/AISC 360-10, American Institute of Steel Construction (AISC)

Analysis Approach & Assumptions:

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

The following assumptions were considered during this analysis:

- No physical deterioration has occurred in any of the structural components of the monopole.
- The monopole has the same capacity as the day it was erected.

General Site Design Assumption:

- All engineering services are performed on the basis that the information used is current and correct.
- It is assumed that the telecommunication equipment supports, antenna supports, and existing structure have been designed by a registered licensed professional engineer for the existing loads acting on the structure, as required by all applicable codes, prior to the proposed modifications listed within this report, if any.
- 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 the responsibility of the client to ensure that the information provided to Maser Consulting Connecticut and used in the performance of our engineering services is correct and complete. In the absence of information to the contrary, we assume that the original design, material production, fabrication, and erection of the existing structure was performed in accordance with accepted industry design standards and in accordance with all applicable codes. Further, it is assumed that the existing structure and appurtenances have been properly maintained in accordance with all applicable codes and manufacturer's specifications and no structural defects and/or deterioration to the structural members has occurred.
- 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.

- All services are performed, results obtained, and recommendations made in accordance with generally accepted engineering principles and practices. Maser Consulting Connecticut is not responsible for the conclusion, opinions, and recommendations made by others based on the information we supply.

Site Specific Design Assumptions:

The following design parameters have been utilized in this report:

- *Structural Steel HSS Tubes are constructed of A500 Grade B Steel*
- *Structural Steel Pipes are constructed of A53 Grade B Steel*
- *It is assumed that the tower foundation data and soil parameters per previous Structural Analysis Report by GPD Group, Inc., Project No. 2014723.21.71313.01, dated May 14, 2014 were accurate.*

Note about the Proposed Installation:

- The proposed antennas in position 3 in all sectors shall replace the existing antennas, on the existing antenna pipe masts.
- The proposed antennas in position 2 in all sectors shall be installed on three (3) proposed 9'-0" long 2.5 STD pipe masts, which shall be attached to the main HSS members between positions 1 and 3 with a minimum distance of 3'-0" from position 3 antenna pipe.
- The proposed DC-6 shall be mounted on the existing support secured to the monopole.
- The proposed B14 and B25 RRUS shall be installed behind antennas on the existing and proposed antenna pipes, in positions 2 and 3, respectively.
- The proposed RRUS E2 shall be mounted on the existing RRU Rack at ground level.

Note about the Tower Modification:

- **Remove the existing stiffener plates along the baseplate**
- **Install 10" long ½" thick stiffener plates in between each bolt on the existing base plate**

Please see the final Maser Consulting Connecticut Construction Drawings for more details

Calculations:

The calculations are found in Appendix A of this report.

Conclusion:

Maser Consulting Connecticut has determined that the existing modified monopole is **ADEQUATE** to support the existing and proposed loading per the aforementioned codes and standards. It has been calculated that the maximum stress ratio is in the baseplate. The monopole, its baseplate and foundation are stressed to **76.7%**, **83.2%** and **66.9%** respectively. Therefore, the proposed **AT&T** installation can be installed as intended **once the proposed modifications are installed.**

Maser Consulting Connecticut reserves the right to amend this report if additional information about the existing members is provided. The conclusions reached by Maser Consulting Connecticut in this report are only valid for the appurtenances listed in this report. Any change to the installation will require a revision to this structural analysis.

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

Petros E. Tsoukalas, P.E.
Geographic Discipline Leader

Dejian Xu, P.E.
Project Engineer

\\maserconsulting.com\luj\Projects\2018\18946000A\18946006A\Structural\Tower analysis\Rev 3\Word\10035388.CTL01051.Tower analysis.Rev3.docx

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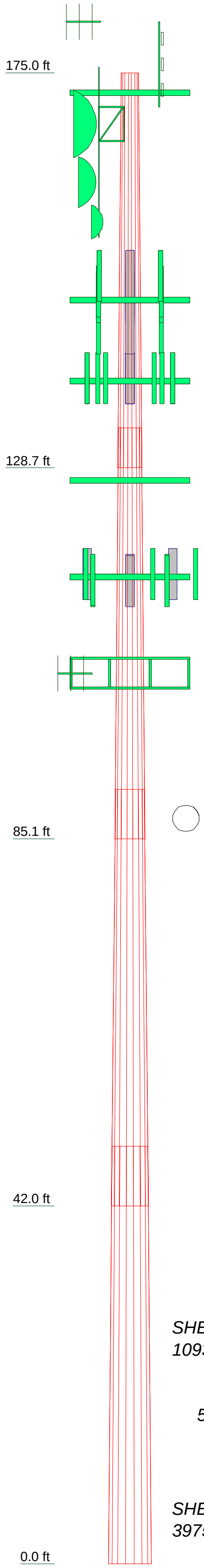
APPENDIX A

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (lb)
1	46.34	18	0.2500	4.68	23.0000	33.3750	A572-65	3495.6
2	48.25	18	0.3125	5.82	31.8272	42.5625		6006.3
3	48.88	18	0.3750	6.94	40.6426	51.4688		9043.5
4	48.97	18	0.4375		49.1817	60.0000		12530.7
								31076.2



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Pirod 6' Side Mount Standoff (1)	185.667	RRUS 32 (ATT)	139.2
Typical Yagi (School)	178	AM-X-CW-18-65-00T-RET (ATT)	139.2
ERI---A-1 Lightning Spur (N/A)	175	OPA65R-BU8B (ATT)	139.2
8'x 1" whip antenna (School)	173.5	OPA65R-BU8B (ATT)	139.2
10" dipole antenna (School)	173	Powerwave 7770 (ATT)	139.2
PiROD 13'/14' Platform w/handrail (School)	173	Powerwave 7770 (ATT)	139.2
		Powerwave 7770 (ATT)	139.2
5'3"x4" Pipe Mount (School)	169	OPA65R-BU8B (ATT)	139.2
8' Mw with Radome (School)	169	Nudd 14' Boom (3) (ATT)	139.2
6' Grid antenna (Sprint)	162.2	RRUS 32 (ATT)	139.2
5'3"x4" Pipe Mount (Sprint)	162	RRU-4478-B14 (ATT)	139.2
4'x16" grid antenna (School)	157.5	RRU-4478-B14 (ATT)	139.2
20'x2" whip antenna (School)	155.667	RRU-4478-B14 (ATT)	139.2
MISC RRH16"X13"X10" (SPRINT)	151.2	80010966 (ATT)	139.2
MISC RRH16"X13"X10" (SPRINT)	151.2	80010966 (ATT)	139.2
MISC RRH16"X13"X10" (SPRINT)	151.2	80010966 (ATT)	139.2
Alcatel-Lucent RRH19004X45 (SPRINT)	151.2	RRUS B25 4415 (ATT)	139.2
		RRUS B25 4415 (ATT)	139.2
Alcatel-Lucent RRH19004X45 (SPRINT)	151.2	RRUS B25 4415 (ATT)	139.2
		(3) ray cap squid DC6 (ATT)	138.33
Alcatel-Lucent RRH19004X45 (SPRINT)	151.2	PiROD 13'/14' Platform w/handrail (n/a)	127.5
RFS Panel (SPRINT)	149.35	PiROD 13'/14' Platform w/handrail (T-Mobile)	116.2
RFS Panel (SPRINT)	149.35		
RFS Panel (SPRINT)	149.35	(2) AIR21B2AB2P (T-Mobile)	116.16
Capstan Panel CT33XC614 (SPRINT)	148.667	(2) AIR21B2AB2P (T-Mobile)	116.16
Capstan Panel CT33XC614 (SPRINT)	148.667	(2) AIR21B2AB2P (T-Mobile)	116.16
Capstan Panel CT33XC614 (SPRINT)	148.667	RRUS 11B2 (T-Mobile)	115.5
PiROD 13'/14' Platform w/handrail (Sprint)	148.667	RRUS 11B2 (T-mobile)	115.5
		RRUS 11B2 (T-Mobile)	115.5
RRU 2'2"X1'6"x7" (SPRINT)	145	LNX-6515D5-A1M (T-MOBILE)	115.33
RRU 2'2"X1'6"x7" (SPRINT)	145	LNX-6515D5-A1M (T-Mobile)	115.33
RRU 2'2"X1'6"x7" (SPRINT)	145	LNX-6515D5-A1M (T-Mobile)	115.33
RRUS-11 (ATT)	140.33	PiROD 13'/14' Platform w/handrail (School)	104.5
RRUS-11 (ATT)	140.33		
RRUS-11 (ATT)	140.33	Typical Yagi (SCHOOL)	104.5
AM-X-CW-18-65-00T-RET (ATT)	139.2	Pirod 6' Side Mount Standoff (1)	78.66
AM-X-CW-18-65-00T-RET (ATT)	139.2	Gps Antenna (SCHOOL)	78.58
RRUS 32 (ATT)	139.2		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for Exposure B to the TIA-222-G Standard.
2. Tower designed for a 101 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. TOWER RATING: 83.2%

ALL REACTIONS ARE FACTORED

AXIAL 104831 lb

SHEAR 10932 lb

MOMENT 1424750 lb-ft

TORQUE 5713 lb-ft

50 mph WIND - 0.7500 in ICE

AXIAL 64290 lb

SHEAR 39757 lb

MOMENT 4981714 lb-ft

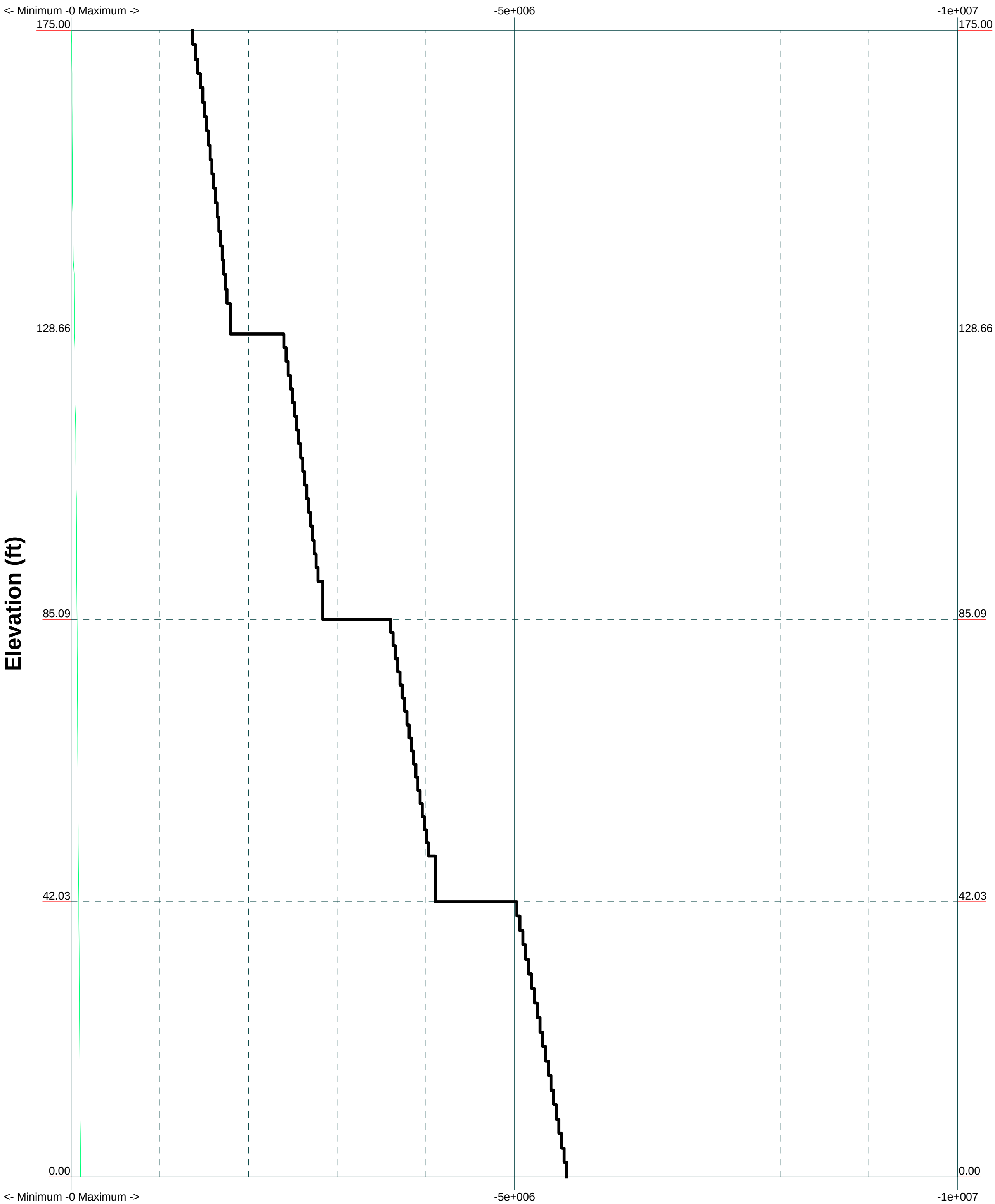
TORQUE 25037 lb-ft

REACTIONS - 101 mph WIND

Maser Consulting, P.A.
MASER Consulting Engineers
2000 Midlantic Drive, Suite 100
Mt. Laurel, NJ 08054
Phone: (856) 797-0412
FAX:

Job: **18946006**		
Project: **CTL01051 Willimantic ECSU**		
Client:	Drawn by: dxu	App'd:
Code: TIA-222-G	Date: 11/09/18	Scale: NTS
Path: \\maserconsulting.com\luj\Projects\2018\18946000A\18946006A\Structural\Tower analysis\Rev 3\tnx Tower\mods.eri		Dwg No. E-1

TIA-222-G - 101 mph/50 mph 0.7500 in Ice Exposure B



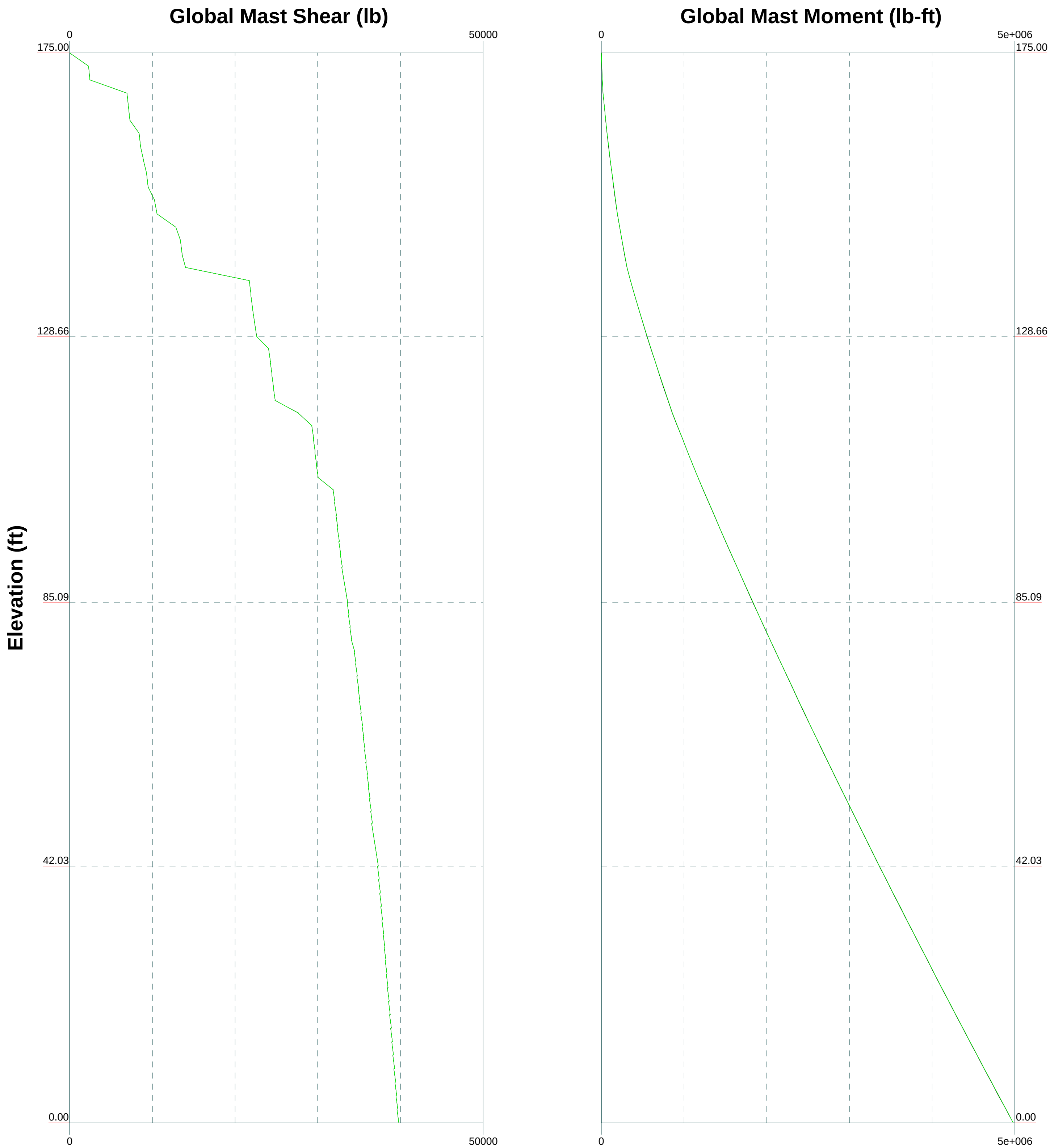
Maser Consulting, P.A. 2000 Midlantic Drive, Suite 100 Mt. Laurel, NJ 08054 Phone: (856) 797-0412 FAX:	Job: ***18946006***		
Consulting Engineers	Project: ***CTL01051 Willimantic ECSU***		
	Client:	Drawn by: dxu	App'd:
	Code: TIA-222-G	Date: 11/09/18	Scale: NTS
	Path: \\maserconsulting.com\lu\Projects\2018\18946000A\18946006A\Structural\Tower analysis\Rev 3\tnx Tower\mods.eri		Dwg No. E-3

TIA-222-G - 101 mph/50 mph 0.7500 in Ice Exposure B

Vx **Vz**

Maximum Values

Mx **Mz**



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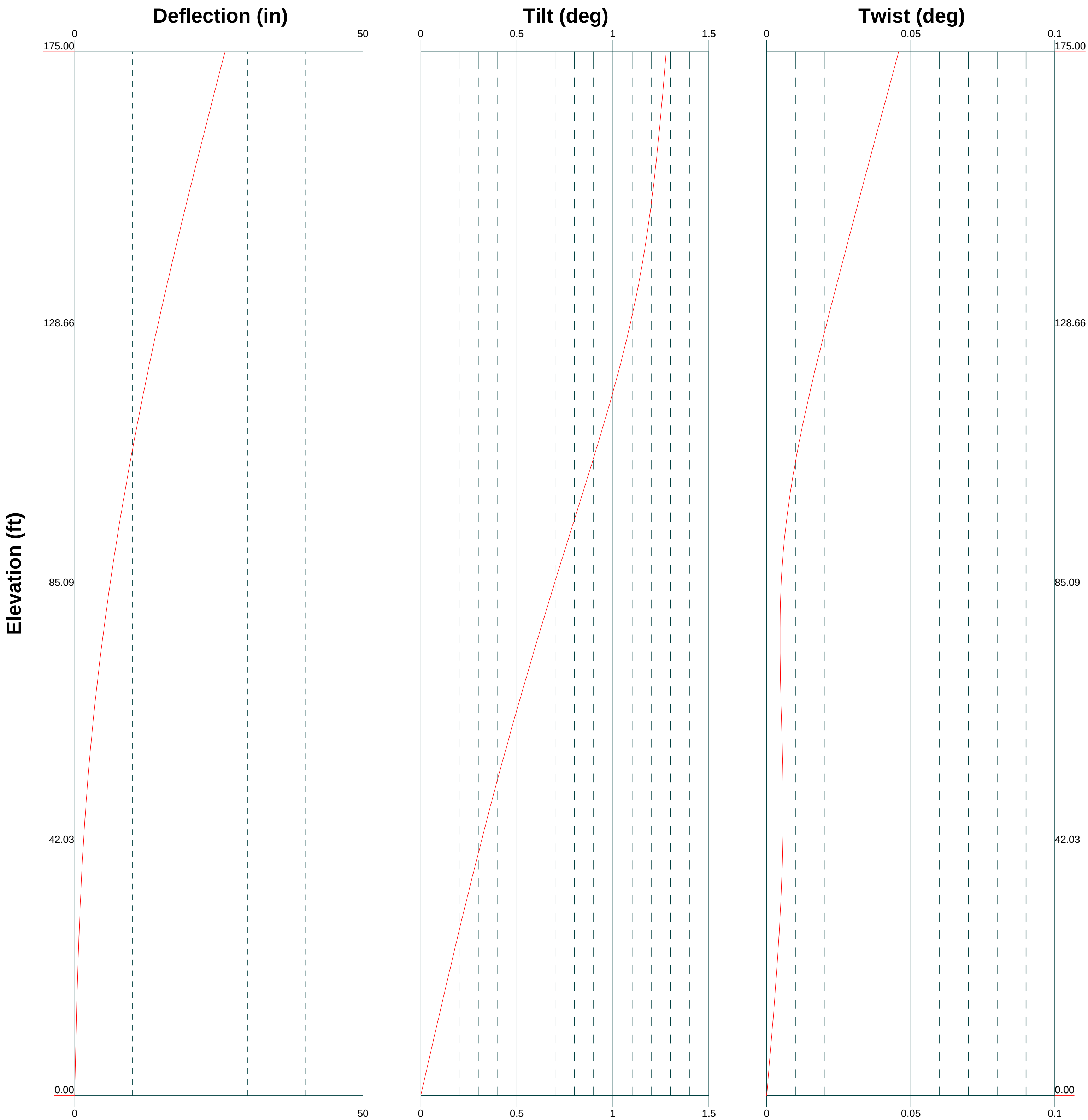
Consulting Engineers

Job: ***18946006***		
Project: ***CTL01051 Willimantic ECSU***		
Client:	Drawn by: dxu	App'd:
Code: TIA-222-G	Date: 11/09/18	Scale: NTS
Path: \\maserconsulting.com\luj\Projects\2018\18946000A\18946006A\Structural\Tower analysis\Rev 3\tnx Tower\mods.eri		Dwg No. E-4

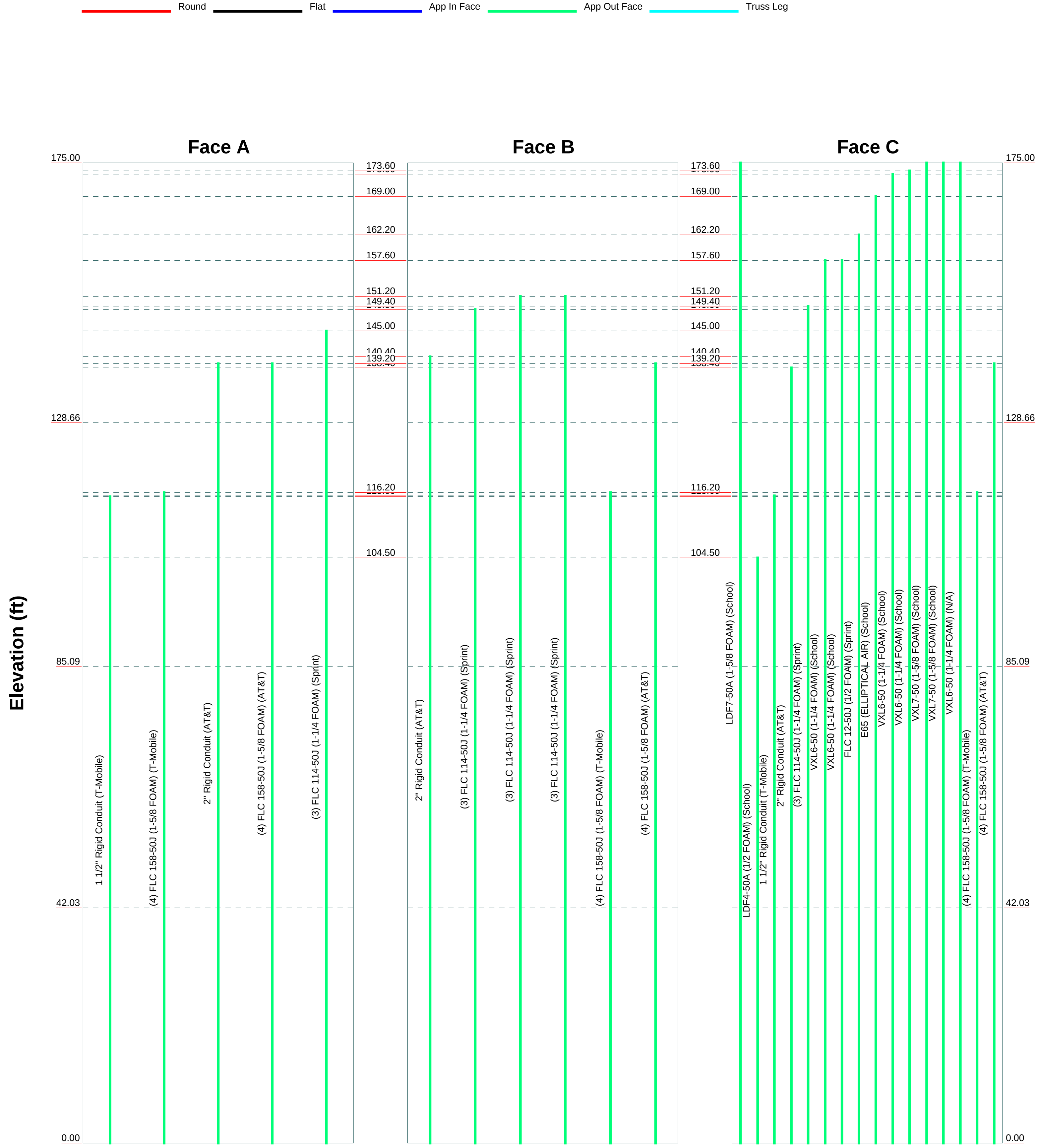
TIA-222-G - Service - 60 mph

Maximum Values

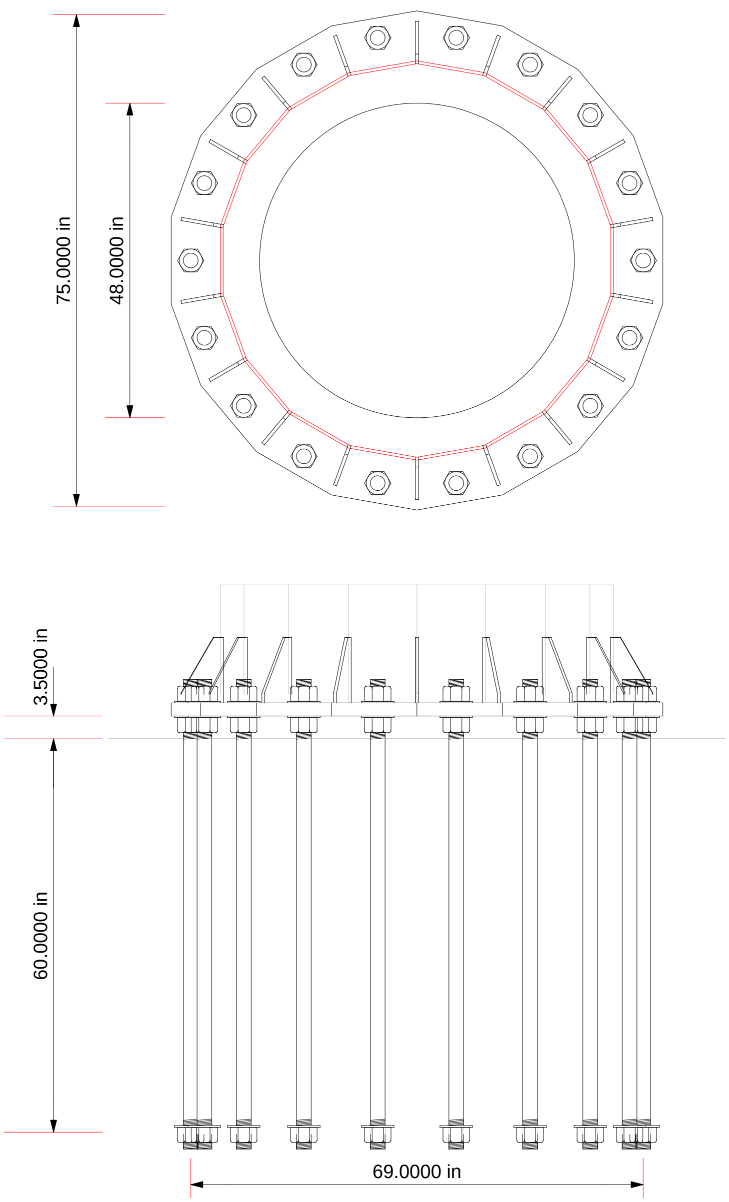


Maser Consulting, P.A. 2000 Midlantic Drive, Suite 100 Mt. Laurel, NJ 08054 Phone: (856) 797-0412 FAX:	Job: **18946006**		
Consulting Engineers	Project: ***CTL01051 Willimantic ECSU***		
	Client:	Drawn by: dxu	App'd:
	Code: TIA-222-G	Date: 11/09/18	Scale: NTS
	Path: \\maserconsulting.com\luj\Projects\2018\18946000A\18946006A\Structural\Tower analysis\Rev 3\tnx Tower\mods.eri		Dwg No. E-5

Feed Line Distribution Chart
0' - 175'



Maser Consulting, P.A. 2000 Midlantic Drive, Suite 100 Mt. Laurel, NJ 08054 Phone: (856) 797-0412 FAX:	Job: ***18946006***		
	Project: ***CTL01051 Willimantic ECSU***		
	Client:	Drawn by: dxu	App'd:
	Code: TIA-222-G	Date: 11/09/18	Scale: NTS
Consulting Engineers	Path: \\maserconsulting.com\lu\Projects\2018\18946000A\18946006A\Structural\Tower analysis\Rev 3\tnx Tower\mods.eri		Dwg No. E-7



FOUNDATION NOTES

1. Plate thickness is 2.0000 in.
2. Plate grade is A572-60.
3. Anchor bolt grade is A615-75.
4. f'c is 3 ksi.

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Consulting Engineers

Job: **18946006**		
Project: **CTL01051 Willimantic ECSU**		
Client:	Drawn by: dxu	App'd:
Code: TIA-222-G	Date: 11/09/18	Scale: NTS
Path: \\maserconsulting.com\luj\Projects\2018\18946000A\18946006A\Structural\Tower analysis\Rev 3\tnx Tower\mods.eri		Dwg No. F-1

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Tower Input Data

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

- Basic wind speed of 101 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.
- A non-linear (P-delta) analysis was used.
- Pressures are calculated at each section.
- Stress ratio used in pole design is 1.
- Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	*Elevation* *ft*	*Section Length* *ft*	*Splice Length* *ft*	*Number of Sides*	*Top Diameter* *in*	*Bottom Diameter* *in*	*Wall Thickness* *in*	*Bend Radius* *in*	*Pole Grade*
L1	175.00-128.66	46.34	4.68	18	23.0000	33.3750	0.2500	1.0000	A572-65 (65 ksi)
L2	128.66-85.09	48.25	5.82	18	31.8272	42.5625	0.3125	1.2500	A572-65 (65 ksi)
L3	85.09-42.03	48.88	6.94	18	40.6426	51.4688	0.3750	1.5000	A572-65

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L4	42.03-0.00	48.97		18	49.1817	60.0000	0.4375	1.7500	(65 ksi) A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	23.3548	18.0521	1180.3983	8.0762	11.6840	101.0269	2362.3498	9.0278	3.6080	14.432
	33.8899	26.2847	3643.7791	11.7594	16.9545	214.9152	7292.3528	13.1448	5.4340	21.736
L2	33.3755	31.2586	3922.2382	11.1877	16.1682	242.5894	7849.6374	15.6323	5.0516	16.165
	43.2191	41.9067	9450.9297	14.9987	21.6217	437.1029	18914.2952	20.9573	6.9410	22.211
L3	42.5785	47.9285	9818.4407	14.2950	20.6464	475.5514	19649.8008	23.9688	6.4931	17.315
	52.2628	60.8144	20057.6594	18.1383	26.1462	767.1362	40141.7111	30.4130	8.3985	22.396
L4	51.4972	67.6874	20318.4713	17.3042	24.9843	813.2496	40663.6782	33.8501	7.8860	18.025
	60.9256	82.7100	37071.5875	21.1447	30.4800	1216.2594	74191.9547	41.3628	9.7900	22.377

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 175.00-128.66				1	1	1			
L2 128.66-85.09				1	1	1			
L3 85.09-42.03				1	1	1			
L4 42.03-0.00				1	1	1			

Monopole Base Plate Data

Base Plate Data

Base plate is square	
Base plate is grouted	
Anchor bolt grade	A615-75
Anchor bolt size	2.2500 in
Number of bolts	18
Embedment length	60.0000 in
f'_c	3 ksi
Grout space	3.5000 in
Base plate grade	A572-60
Base plate thickness	2.0000 in
Bolt circle diameter	69.0000 in
Outer diameter	75.0000 in
Inner diameter	48.0000 in
Base plate type	Stiffened Plate
Bolts per stiffener	1
Stiffener thickness	0.5000 in
Stiffener height	10.0000 in

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
LDF7-50A (1-5/8 FOAM) (School)	C	No	Inside Pole	175.00 - 0.00	1	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
LDF4-50A (1/2 FOAM) (School)	C	No	Inside Pole	104.50 - 0.00	1	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15
						1" Ice	0.00	0.15
1 1/2" Rigid Conduit (T-Mobile)	A	No	Inside Pole	115.40 - 0.00	1	No Ice	0.00	1.00
						1/2" Ice	0.00	1.00
						1" Ice	0.00	1.00
1 1/2" Rigid Conduit (T-Mobile)	C	No	Inside Pole	115.60 - 0.00	1	No Ice	0.00	1.00
						1/2" Ice	0.00	1.00
						1" Ice	0.00	1.00
FLC 158-50J (1-5/8 FOAM) (T-Mobile)	A	No	Inside Pole	116.20 - 0.00	4	No Ice	0.00	0.92
						1/2" Ice	0.00	0.92
						1" Ice	0.00	0.92
2" Rigid Conduit (AT&T)	A	No	Inside Pole	139.20 - 0.00	1	No Ice	0.00	2.80
						1/2" Ice	0.00	2.80
						1" Ice	0.00	2.80
FLC 158-50J (1-5/8 FOAM) (AT&T)	A	No	Inside Pole	139.20 - 0.00	4	No Ice	0.00	0.92
						1/2" Ice	0.00	0.92
						1" Ice	0.00	0.92
2" Rigid Conduit (AT&T)	C	No	Inside Pole	138.40 - 0.00	1	No Ice	0.00	2.80
						1/2" Ice	0.00	2.80
						1" Ice	0.00	2.80
2" Rigid Conduit (AT&T)	B	No	Inside Pole	140.40 - 0.00	1	No Ice	0.00	2.80
						1/2" Ice	0.00	2.80
						1" Ice	0.00	2.80
FLC 114-50J (1-1/4 FOAM) (Sprint)	A	No	Inside Pole	145.00 - 0.00	3	No Ice	0.00	0.70
						1/2" Ice	0.00	0.70
						1" Ice	0.00	0.70
FLC 114-50J (1-1/4 FOAM) (Sprint)	B	No	Inside Pole	148.80 - 0.00	3	No Ice	0.00	0.70
						1/2" Ice	0.00	0.70
						1" Ice	0.00	0.70
FLC 114-50J (1-1/4 FOAM) (Sprint)	C	No	Inside Pole	149.40 - 0.00	3	No Ice	0.00	0.70
						1/2" Ice	0.00	0.70
						1" Ice	0.00	0.70
FLC 114-50J (1-1/4 FOAM) (Sprint)	B	No	Inside Pole	151.20 - 0.00	3	No Ice	0.00	0.70
						1/2" Ice	0.00	0.70
						1" Ice	0.00	0.70
FLC 114-50J (1-1/4 FOAM) (Sprint)	B	No	Inside Pole	151.20 - 0.00	3	No Ice	0.00	0.70
						1/2" Ice	0.00	0.70
						1" Ice	0.00	0.70
VXL6-50 (1-1/4 FOAM) (School)	C	No	Inside Pole	157.60 - 0.00	1	No Ice	0.00	0.50
						1/2" Ice	0.00	0.50
						1" Ice	0.00	0.50
VXL6-50 (1-1/4 FOAM) (School)	C	No	Inside Pole	157.60 - 0.00	1	No Ice	0.00	0.50
						1/2" Ice	0.00	0.50
						1" Ice	0.00	0.50
FLC 12-50J (1/2 FOAM) (Sprint)	C	No	Inside Pole	162.20 - 0.00	1	No Ice	0.00	0.17
						1/2" Ice	0.00	0.17
						1" Ice	0.00	0.17
E65 (ELLIPTICAL AIR) (School)	C	No	Inside Pole	169.00 - 0.00	1	No Ice	0.00	0.67
						1/2" Ice	0.00	0.67
						1" Ice	0.00	0.67
VXL6-50 (1-1/4 FOAM) (School)	C	No	Inside Pole	173.00 - 0.00	1	No Ice	0.00	0.50
						1/2" Ice	0.00	0.50
						1" Ice	0.00	0.50
VXL6-50 (1-1/4 FOAM)	C	No	Inside Pole	173.60 - 0.00	1	No Ice	0.00	0.50

Description	*Face or Leg*	*Allow Shield*	*Component Type*	*Placement* *ft*	*Total Number*		C_AA_A *ft²/ft*	*Weight* *plf*
(School)						1/2" Ice	0.00	0.50
						1" Ice	0.00	0.50
VXL7-50 (1-5/8 FOAM) (School)	C	No	Inside Pole	175.00 - 0.00	1	No Ice	0.00	0.75
						1/2" Ice	0.00	0.75
						1" Ice	0.00	0.75
VXL7-50 (1-5/8 FOAM) (School)	C	No	Inside Pole	175.00 - 0.00	1	No Ice	0.00	0.75
						1/2" Ice	0.00	0.75
						1" Ice	0.00	0.75
VXL6-50 (1-1/4 FOAM) (N/A)	C	No	Inside Pole	175.00 - 0.00	1	No Ice	0.00	0.50
						1/2" Ice	0.00	0.50
						1" Ice	0.00	0.50
FLC 158-50J (1-5/8 FOAM) (T-Mobile)	B	No	Inside Pole	116.20 - 0.00	4	No Ice	0.00	0.92
						1/2" Ice	0.00	0.92
						1" Ice	0.00	0.92
FLC 158-50J (1-5/8 FOAM) (T-Mobile)	C	No	Inside Pole	116.20 - 0.00	4	No Ice	0.00	0.92
						1/2" Ice	0.00	0.92
						1" Ice	0.00	0.92
FLC 158-50J (1-5/8 FOAM) (AT&T)	B	No	Inside Pole	139.20 - 0.00	4	No Ice	0.00	0.92
						1/2" Ice	0.00	0.92
						1" Ice	0.00	0.92
FLC 158-50J (1-5/8 FOAM) (AT&T)	C	No	Inside Pole	139.20 - 0.00	4	No Ice	0.00	0.92
						1/2" Ice	0.00	0.92
						1" Ice	0.00	0.92

Feed Line/Linear Appurtenances Section Areas

Tower Section	*Tower Elevation* *ft*	*Face*	A_R *ft²*	A_F *ft²*	C_AA_A *In Face* *ft²*	C_AA_A *Out Face* *ft²*	*Weight* *lb*
L1	175.00-128.66	A	0.000	0.000	0.000	0.000	102.61
		B	0.000	0.000	0.000	0.000	208.62
		C	0.000	0.000	0.000	0.000	346.60
L2	128.66-85.09	A	0.000	0.000	0.000	0.000	518.63
		B	0.000	0.000	0.000	0.000	671.31
		C	0.000	0.000	0.000	0.000	768.34
L3	85.09-42.03	A	0.000	0.000	0.000	0.000	570.98
		B	0.000	0.000	0.000	0.000	708.77
		C	0.000	0.000	0.000	0.000	821.15
L4	42.03-0.00	A	0.000	0.000	0.000	0.000	557.32
		B	0.000	0.000	0.000	0.000	691.81
		C	0.000	0.000	0.000	0.000	801.51

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	*Tower Elevation* *ft*	*Face or Leg*	*Ice Thickness* *in*	A_R *ft²*	A_F *ft²*	C_AA_A *In Face* *ft²*	C_AA_A *Out Face* *ft²*	*Weight* *lb*
L1	175.00-128.66	A	1.746	0.000	0.000	0.000	0.000	102.61
		B		0.000	0.000	0.000	0.000	208.62
		C		0.000	0.000	0.000	0.000	346.60
L2	128.66-85.09	A	1.686	0.000	0.000	0.000	0.000	518.63
		B		0.000	0.000	0.000	0.000	671.31
		C		0.000	0.000	0.000	0.000	768.34
L3	85.09-42.03	A	1.601	0.000	0.000	0.000	0.000	570.98
		B		0.000	0.000	0.000	0.000	708.77

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*
		C		0.000	0.000	0.000	0.000	821.15
L4	42.03-0.00	A	1.430	0.000	0.000	0.000	0.000	557.32
		B		0.000	0.000	0.000	0.000	691.81
		C		0.000	0.000	0.000	0.000	801.51

Shielding Factor Ka

Tower Section	*Feed Line Record No.*	*Description*	*Feed Line Segment Elev.*	K_a *No Ice*	K_a *Ice*

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*
Gps Antenna (SCHOOL)	A	From Leg	4.00	0.0000	78.58	No Ice	0.05	0.05	2.00
			0.00			1/2" Ice	0.09	0.09	2.94
			0.00			1" Ice	0.14	0.14	4.49
Typical Yagi (SCHOOL)	C	From Leg	3.50	0.0000	104.50	No Ice	3.21	3.21	35.00
			0.00			1/2" Ice	3.21	3.21	40.00
			0.00			1" Ice	3.21	3.21	52.00
LNX-6515D5-A1M (T-MOBILE)	A	From Leg	3.50	0.0000	115.33	No Ice	11.82	9.56	156.22
			0.00			1/2" Ice	12.53	11.02	250.42
			0.00			1" Ice	13.22	12.16	356.64
LNX-6515D5-A1M (T-Mobile)	B	From Leg	3.50	0.0000	115.33	No Ice	11.82	9.56	156.22
			0.00			1/2" Ice	12.53	11.02	250.42
			0.00			1" Ice	13.22	12.16	356.64
LNX-6515D5-A1M (T-Mobile)	C	From Leg	3.50	0.0000	115.33	No Ice	11.82	9.56	156.22
			0.00			1/2" Ice	12.53	11.02	250.42
			0.00			1" Ice	13.22	12.16	356.64
RRUS 11B2 (T-mobile)	A	From Leg	3.50	0.0000	115.50	No Ice	2.89	1.57	52.30
			0.00			1/2" Ice	3.14	1.87	76.17
			0.00			1" Ice	3.42	2.20	103.77
RRUS 11B2 (T-Mobile)	B	From Leg	3.50	0.0000	115.50	No Ice	2.89	1.57	52.30
			0.00			1/2" Ice	3.14	1.87	76.17
			0.00			1" Ice	3.42	2.20	103.77
RRUS 11B2 (T-Mobile)	C	From Leg	3.50	0.0000	115.50	No Ice	2.89	1.57	52.30
			0.00			1/2" Ice	3.14	1.87	76.17
			0.00			1" Ice	3.42	2.20	103.77
(2) AIR21B2AB2P (T-Mobile)	A	From Leg	4.50	0.0000	116.16	No Ice	6.70	5.71	85.55
			0.00			1/2" Ice	7.40	6.83	143.22
			0.00			1" Ice	7.99	7.66	207.64
(2) AIR21B2AB2P (T-Mobile)	B	From Leg	4.50	0.0000	116.16	No Ice	6.70	5.71	85.55
			0.00			1/2" Ice	7.40	6.83	143.22
			0.00			1" Ice	7.99	7.66	207.64
(2) AIR21B2AB2P (T-Mobile)	C	From Leg	4.50	0.0000	116.16	No Ice	6.70	5.71	85.55
			0.00			1/2" Ice	7.40	6.83	143.22
			0.00			1" Ice	7.99	7.66	207.64
OPA65R-BU8B (AT&T)	A	From Leg	4.50	0.0000	139.20	No Ice	11.22	10.56	70.00
			0.00			1/2" Ice	11.84	11.98	160.54

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*
			0.00			1" Ice	12.46	13.26	260.88
OPA65R-BU8B	B	From Leg	4.50	0.0000	139.20	No Ice	11.22	10.56	70.00
(AT&T)			0.00			1/2" Ice	11.84	11.98	160.54
			0.00			1" Ice	12.46	13.26	260.88
OPA65R-BU8B	C	From Leg	4.50	0.0000	139.20	No Ice	11.22	10.56	70.00
(AT&T)			0.00			1/2" Ice	11.84	11.98	160.54
			0.00			1" Ice	12.46	13.26	260.88
Powerwave 7770	A	From Leg	4.50	0.0000	139.20	No Ice	5.51	2.93	27.00
(AT&T)			0.00			1/2" Ice	5.87	3.27	59.63
			0.00			1" Ice	6.23	3.63	97.06
Powerwave 7770	B	From Leg	4.50	0.0000	139.20	No Ice	5.51	2.93	27.00
(AT&T)			0.00			1/2" Ice	5.87	3.27	59.63
			0.00			1" Ice	6.23	3.63	97.06
Powerwave 7770	C	From Leg	4.50	0.0000	139.20	No Ice	5.51	2.93	27.00
(AT&T)			0.00			1/2" Ice	5.87	3.27	59.63
			0.00			1" Ice	6.23	3.63	97.06
(3) ray cap squid DC6	A	From Leg	2.00	0.0000	138.33	No Ice	0.90	0.90	50.00
(AT&T)			0.00			1/2" Ice	1.06	1.06	61.25
			0.00			1" Ice	1.22	1.22	74.49
RRUS-11	A	From Leg	2.00	0.0000	140.33	No Ice	2.52	1.02	55.00
(AT&T)			0.00			1/2" Ice	2.72	1.16	74.32
			0.00			1" Ice	2.92	1.30	96.56
RRUS-11	B	From Leg	2.00	0.0000	140.33	No Ice	2.52	1.02	55.00
(AT&T)			0.00			1/2" Ice	2.72	1.16	74.32
			0.00			1" Ice	2.92	1.30	96.56
RRUS-11	C	From Leg	2.00	0.0000	140.33	No Ice	2.52	1.02	55.00
(AT&T)			0.00			1/2" Ice	2.72	1.16	74.32
			0.00			1" Ice	2.92	1.30	96.56
AM-X-CW-18-65-00T-RET	A	From Leg	3.00	0.0000	139.20	No Ice	11.31	6.80	52.90
(AT&T)			0.00			1/2" Ice	11.93	7.38	114.29
			0.00			1" Ice	12.55	7.98	183.26
AM-X-CW-18-65-00T-RET	B	From Leg	3.00	0.0000	139.20	No Ice	11.31	6.80	52.90
(AT&T)			0.00			1/2" Ice	11.93	7.38	114.29
			0.00			1" Ice	12.55	7.98	183.26
AM-X-CW-18-65-00T-RET	C	From Leg	3.00	0.0000	139.20	No Ice	11.31	6.80	52.90
(AT&T)			0.00			1/2" Ice	11.93	7.38	114.29
			0.00			1" Ice	12.55	7.98	183.26
RRUS 32	A	From Leg	2.00	0.0000	139.20	No Ice	2.72	1.67	52.90
(AT&T)			0.00			1/2" Ice	2.94	1.86	73.90
			0.00			1" Ice	3.17	2.05	98.09
RRUS 32	B	From Leg	2.00	0.0000	139.20	No Ice	2.72	1.67	52.90
(AT&T)			0.00			1/2" Ice	2.94	1.86	73.90
			0.00			1" Ice	3.17	2.05	98.09
RRUS 32	C	From Leg	2.00	0.0000	139.20	No Ice	2.72	1.67	52.90
(AT&T)			0.00			1/2" Ice	2.94	1.86	73.90
			0.00			1" Ice	3.17	2.05	98.09
RRU 2'2"X1'6"x7"	A	From Leg	3.00	0.0000	145.00	No Ice	4.55	1.77	50.00
(SPRINT)			0.00			1/2" Ice	4.84	1.99	76.83
			0.00			1" Ice	5.14	2.21	107.17
RRU 2'2"X1'6"x7"	B	From Leg	3.00	0.0000	145.00	No Ice	4.55	1.77	50.00
(SPRINT)			0.00			1/2" Ice	4.84	1.99	76.83
			0.00			1" Ice	5.14	2.21	107.17
RRU 2'2"X1'6"x7"	C	From Leg	3.00	0.0000	145.00	No Ice	4.55	1.77	50.00
(SPRINT)			0.00			1/2" Ice	4.84	1.99	76.83
			0.00			1" Ice	5.14	2.21	107.17
Capstan Panel CT33XC614	A	From Leg	3.00	0.0000	148.67	No Ice	7.14	4.90	71.29
(SPRINT)			0.00			1/2" Ice	7.69	5.72	126.02

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* (*ft ft ft*)	*Azimuth Adjustment* (*°*)	*Placement* (*ft*)		C_AA_A *Front* (*ft²*)	C_AA_A *Side* (*ft²*)	*Weight* (*lb*)
			0.00			1" Ice	8.22	6.43	187.36
Capstan Panel CT33XC614	B	From Leg	3.00	0.0000	148.67	No Ice	7.14	4.90	71.29
(SPRINT)			0.00			1/2" Ice	7.69	5.72	126.02
			0.00			1" Ice	8.22	6.43	187.36
Capstan Panel CT33XC614	C	From Leg	3.00	0.0000	148.67	No Ice	7.14	4.90	71.29
(SPRINT)			0.00			1/2" Ice	7.69	5.72	126.02
			0.00			1" Ice	8.22	6.43	187.36
RFS Panel	A	From Leg	3.00	0.0000	149.35	No Ice	0.93	0.70	50.00
(SPRINT)			0.00			1/2" Ice	1.07	0.82	57.88
			0.00			1" Ice	1.21	0.95	67.63
RFS Panel	B	From Leg	3.00	0.0000	149.35	No Ice	0.93	0.70	50.00
(SPRINT)			0.00			1/2" Ice	1.07	0.82	57.88
			0.00			1" Ice	1.21	0.95	67.63
RFS Panel	C	From Leg	3.00	0.0000	149.35	No Ice	0.93	0.70	50.00
(SPRINT)			0.00			1/2" Ice	1.07	0.82	57.88
			0.00			1" Ice	1.21	0.95	67.63
MISC RRH16"X13"X10"	A	From Leg	3.00	0.0000	151.20	No Ice	2.02	1.56	40.00
(SPRINT)			0.00			1/2" Ice	2.21	1.73	57.44
			0.00			1" Ice	2.42	1.91	77.59
MISC RRH16"X13"X10"	B	From Leg	3.00	0.0000	151.20	No Ice	2.02	1.56	40.00
(SPRINT)			0.00			1/2" Ice	2.21	1.73	57.44
			0.00			1" Ice	2.42	1.91	77.59
MISC RRH16"X13"X10"	C	From Leg	3.00	0.0000	151.20	No Ice	2.02	1.56	40.00
(SPRINT)			0.00			1/2" Ice	2.21	1.73	57.44
			0.00			1" Ice	2.42	1.91	77.59
Alcatel-Lucent	A	From Leg	3.00	0.0000	151.20	No Ice	3.03	3.03	44.00
RRH19004X45			0.00			1/2" Ice	3.28	3.28	70.54
(SPRINT)			0.00			1" Ice	3.54	3.54	100.52
Alcatel-Lucent	B	From Leg	3.00	0.0000	151.20	No Ice	3.03	3.03	44.00
RRH19004X45			0.00			1/2" Ice	3.28	3.28	70.54
(SPRINT)			0.00			1" Ice	3.54	3.54	100.52
Alcatel-Lucent	C	From Leg	3.00	0.0000	151.20	No Ice	3.03	3.03	44.00
RRH19004X45			0.00			1/2" Ice	3.28	3.28	70.54
(SPRINT)			0.00			1" Ice	3.54	3.54	100.52
20'x2" whip antenna	C	From Leg	3.00	0.0000	155.67	No Ice	4.00	4.00	80.00
(School)			0.00			1/2" Ice	6.03	6.03	110.77
			10.00			1" Ice	8.07	8.07	154.12
10" dipole antenna	B	From Leg	3.00	0.0000	173.00	No Ice	2.00	2.00	70.00
(School)			0.00			1/2" Ice	3.02	3.02	85.50
			3.00			1" Ice	4.07	4.07	107.47
8'x 1" whip antenna	A	From Leg	3.00	0.0000	173.50	No Ice	0.80	0.80	50.00
(School)			0.00			1/2" Ice	1.62	1.62	57.43
			3.00			1" Ice	2.45	2.45	70.01
Typical Yagi	C	From Leg	3.00	0.0000	178.00	No Ice	3.21	3.21	35.00
(School)			0.00			1/2" Ice	3.21	3.21	40.00
			3.00			1" Ice	3.21	3.21	52.00
ERI---A-1 Lightning Spur	A	None		0.0000	175.00	No Ice	2.00	2.00	50.00
(N/A)						1/2" Ice	4.00	4.00	75.00
						1" Ice	6.00	6.00	100.00
Nudd 14' Boom (3)	C	None		0.0000	139.20	No Ice	47.00	47.00	1600.00
(AT&T)						1/2" Ice	67.00	67.00	2050.00
						1" Ice	87.00	87.00	2500.00
PiROD 13'/14' Platform	C	None		0.0000	148.67	No Ice	31.30	31.30	1822.00
w/handrail						1/2" Ice	40.20	40.20	2452.00
(Sprint)						1" Ice	49.10	49.10	3082.00
PiROD 13'/14' Platform	C	None		0.0000	127.50	No Ice	31.30	31.30	1822.00
w/handrail						1/2" Ice	40.20	40.20	2452.00

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert*	*Azimuth Adjustment*	*Placement*		*C_AA_A Front*	*C_AA_A Side*	*Weight*
			ft ft ft	*°*	*ft*		*ft²*	*ft²*	*lb*
(n/a)						1" Ice	49.10	49.10	3082.00
PiROD 13'/14' Platform	C	None		0.0000	116.20	No Ice	31.30	31.30	1822.00
w/handrail						1/2" Ice	40.20	40.20	2452.00
(T-Mobile)						1" Ice	49.10	49.10	3082.00
PiROD 13'/14' Platform	C	None		0.0000	173.00	No Ice	31.30	31.30	1822.00
w/handrail						1/2" Ice	40.20	40.20	2452.00
(School)						1" Ice	49.10	49.10	3082.00
Pirod 6' Side Mount Standoff	C	None		0.0000	78.66	No Ice	4.97	4.97	70.00
(1)						1/2" Ice	6.12	6.12	130.00
						1" Ice	7.27	7.27	190.00
PiROD 13'/14' Platform	C	None		0.0000	104.50	No Ice	31.30	31.30	1822.00
w/handrail						1/2" Ice	40.20	40.20	2452.00
(School)						1" Ice	49.10	49.10	3082.00
Pirod 6' Side Mount Standoff	C	None		0.0000	185.67	No Ice	4.97	4.97	70.00
(1)						1/2" Ice	6.12	6.12	130.00
						1" Ice	7.27	7.27	190.00
5'3"x4" Pipe Mount	C	From Leg	1.50	0.0000	162.00	No Ice	1.60	1.60	57.00
(Sprint)			0.00			1/2" Ice	2.21	2.21	73.81
			0.00			1" Ice	2.54	2.54	94.43
5'3"x4" Pipe Mount	C	From Leg	1.50	0.0000	169.00	No Ice	1.60	1.60	57.00
(School)			0.00			1/2" Ice	2.21	2.21	73.81
			0.00			1" Ice	2.54	2.54	94.43
RRU-4478-B14	A	From Leg	2.00	0.0000	139.20	No Ice	1.63	1.00	60.00
(AT&T)			0.00			1/2" Ice	1.78	1.13	74.78
			0.00			1" Ice	1.95	1.27	92.08
RRU-4478-B14	B	From Leg	2.00	0.0000	139.20	No Ice	1.63	1.00	60.00
(AT&T)			0.00			1/2" Ice	1.78	1.13	74.78
			0.00			1" Ice	1.95	1.27	92.08
RRU-4478-B14	C	From Leg	2.00	0.0000	139.20	No Ice	1.63	1.00	60.00
(AT&T)			0.00			1/2" Ice	1.78	1.13	74.78
			0.00			1" Ice	1.95	1.27	92.08
80010966	A	From Leg	4.50	0.0000	139.20	No Ice	17.36	9.40	158.40
(AT&T)			0.00			1/2" Ice	17.99	10.82	271.68
			0.00			1" Ice	18.63	12.09	395.19
80010966	B	From Leg	4.50	0.0000	139.20	No Ice	17.36	9.40	158.40
(AT&T)			0.00			1/2" Ice	17.99	10.82	271.68
			0.00			1" Ice	18.63	12.09	395.19
80010966	C	From Leg	4.50	0.0000	139.20	No Ice	17.36	9.40	158.40
(AT&T)			0.00			1/2" Ice	17.99	10.82	271.68
			0.00			1" Ice	18.63	12.09	395.19
RRUS B25 4415	A	From Leg	2.00	0.0000	139.20	No Ice	1.86	0.82	47.40
(AT&T)			0.00			1/2" Ice	2.03	0.94	61.55
			0.00			1" Ice	2.20	1.07	78.22
RRUS B25 4415	B	From Leg	2.00	0.0000	139.20	No Ice	1.86	0.82	47.40
(AT&T)			0.00			1/2" Ice	2.03	0.94	61.55
			0.00			1" Ice	2.20	1.07	78.22
RRUS B25 4415	C	From Leg	2.00	0.0000	139.20	No Ice	1.86	0.82	47.40
(AT&T)			0.00			1/2" Ice	2.03	0.94	61.55
			0.00			1" Ice	2.20	1.07	78.22

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight lb
8' Mw with Radome (School)	C	Paraboloid w/o Radome	From Leg	3.50 0.00 0.00	Worst		169.00	8.00	No Ice	50.27	500.00
									1/2" Ice	51.32	763.44
									1" Ice	52.37	1026.89
6' Grid antenna (Sprint)	C	Grid	From Leg	3.50 0.00 0.00	Worst		162.20	6.00	No Ice	28.27	250.00
									1/2" Ice	29.07	399.23
									1" Ice	29.86	548.45
4'x16" grid antenna (School)	C	Grid	From Leg	2.50 0.00 0.00	Worst		157.50	4.00	No Ice	5.31	70.00
									1/2" Ice	5.66	99.05
									1" Ice	6.00	128.11

Force Totals

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x lb-ft	Sum of Overturning Moments, M_z lb-ft	Sum of Torques lb-ft
Leg Weight	31076.18					
Bracing Weight	0.00					
Total Member Self-Weight	31076.18			1730.58	3736.87	
Total Weight	53575.37			1730.58	3736.87	
Wind 0 deg - No Ice		0.00	-24848.41	-2964489.70	3736.87	-13796.84
Wind 30 deg - No Ice		12424.20	-21519.35	-2567091.53	-1479373.27	-8025.45
Wind 60 deg - No Ice		21519.35	-12424.20	-1481379.56	-2565085.24	-103.64
Wind 90 deg - No Ice		24848.41	0.00	1730.58	-2962483.40	7845.94
Wind 120 deg - No Ice		21519.35	12424.20	1484840.72	-2565085.24	13693.20
Wind 150 deg - No Ice		12424.20	21519.35	2570552.70	-1479373.27	15871.39
Wind 180 deg - No Ice		0.00	24848.41	2967950.86	3736.87	13796.84
Wind 210 deg - No Ice		-12424.20	21519.35	2570552.70	1486847.01	8025.45
Wind 240 deg - No Ice		-21519.35	12424.20	1484840.72	2572558.99	103.64
Wind 270 deg - No Ice		-24848.41	0.00	1730.58	2969957.15	-7845.94
Wind 300 deg - No Ice		-21519.35	-12424.20	-1481379.56	2572558.99	-13693.20
Wind 330 deg - No Ice		-12424.20	-21519.35	-2567091.53	1486847.01	-15871.39
Member Ice	14886.25					
Total Weight Ice	92481.20			5300.83	10574.18	
Wind 0 deg - Ice		0.00	-10932.60	-1273490.90	10574.18	-4955.49
Wind 30 deg - Ice		5466.30	-9467.91	-1102165.30	-628821.68	-2879.25
Wind 60 deg - Ice		9467.91	-5466.30	-634095.04	-1096891.94	-31.52
Wind 90 deg - Ice		10932.60	0.00	5300.83	-1268217.55	2824.66
Wind 120 deg - Ice		9467.91	5466.30	644696.70	-1096891.94	4923.97
Wind 150 deg - Ice		5466.30	9467.91	1112766.96	-628821.68	5703.91
Wind 180 deg - Ice		0.00	10932.60	1284092.56	10574.18	4955.49
Wind 210 deg - Ice		-5466.30	9467.91	1112766.96	649970.05	2879.25
Wind 240 deg - Ice		-9467.91	5466.30	644696.70	1118040.31	31.52
Wind 270 deg - Ice		-10932.60	0.00	5300.83	1289365.92	-2824.66
Wind 300 deg - Ice		-9467.91	-5466.30	-634095.04	1118040.31	-4923.97
Wind 330 deg - Ice		-5466.30	-9467.91	-1102165.30	649970.05	-5703.91
Total Weight	53575.37			1730.58	3736.87	
Wind 0 deg - Service		0.00	-7846.10	-934878.73	3736.87	-4356.47
Wind 30 deg - Service		3923.05	-6794.92	-809396.88	-464567.78	-2534.10
Wind 60 deg - Service		6794.92	-3923.05	-466574.08	-807390.59	-32.72
Wind 90 deg - Service		7846.10	0.00	1730.58	-932872.44	2477.42
Wind 120 deg - Service		6794.92	3923.05	470035.24	-807390.59	4323.75
Wind 150 deg - Service		3923.05	6794.92	812858.04	-464567.78	5011.53
Wind 180 deg - Service		0.00	7846.10	938339.90	3736.87	4356.47
Wind 210 deg - Service		-3923.05	6794.92	812858.04	472041.53	2534.10

Load Case	*Vertical Forces* *lb*	*Sum of Forces X* *lb*	*Sum of Forces Z* *lb*	*Sum of Overturning Moments, M_x* *lb-ft*	*Sum of Overturning Moments, M_z* *lb-ft*	*Sum of Torques* *lb-ft*
Wind 240 deg - Service		-6794.92	3923.05	470035.24	814864.34	32.72
Wind 270 deg - Service		-7846.10	0.00	1730.58	940346.19	-2477.42
Wind 300 deg - Service		-6794.92	-3923.05	-466574.08	814864.34	-4323.75
Wind 330 deg - Service		-3923.05	-6794.92	-809396.88	472041.53	-5011.53

Load Combinations

Comb. No.	*Description*
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 60 deg - No Ice
7	0.9 Dead+1.6 Wind 60 deg - No Ice
8	1.2 Dead+1.6 Wind 90 deg - No Ice
9	0.9 Dead+1.6 Wind 90 deg - No Ice
10	1.2 Dead+1.6 Wind 120 deg - No Ice
11	0.9 Dead+1.6 Wind 120 deg - No Ice
12	1.2 Dead+1.6 Wind 150 deg - No Ice
13	0.9 Dead+1.6 Wind 150 deg - No Ice
14	1.2 Dead+1.6 Wind 180 deg - No Ice
15	0.9 Dead+1.6 Wind 180 deg - No Ice
16	1.2 Dead+1.6 Wind 210 deg - No Ice
17	0.9 Dead+1.6 Wind 210 deg - No Ice
18	1.2 Dead+1.6 Wind 240 deg - No Ice
19	0.9 Dead+1.6 Wind 240 deg - No Ice
20	1.2 Dead+1.6 Wind 270 deg - No Ice
21	0.9 Dead+1.6 Wind 270 deg - No Ice
22	1.2 Dead+1.6 Wind 300 deg - No Ice
23	0.9 Dead+1.6 Wind 300 deg - No Ice
24	1.2 Dead+1.6 Wind 330 deg - No Ice
25	0.9 Dead+1.6 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service

Comb. No.	Description
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
L1	175 - 128.66	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-32514.96	11666.05	-5861.60
			Max. Mx	20	-13108.43	449111.16	-1188.50
			Max. My	14	-13111.53	2910.06	-446767.53
			Max. Vy	20	-22112.51	449111.16	-1188.50
			Max. Vx	14	22110.85	2910.06	-446767.53
			Max. Torque	12			-24772.78
L2	128.66 - 85.09	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-62324.50	12886.44	-6494.04
			Max. Mx	20	-29899.13	1642030.69	-1864.78
			Max. My	14	-29901.02	4126.36	-1639540.44
			Max. Vy	20	-32958.94	1642030.69	-1864.78
			Max. Vx	14	32957.43	4126.36	-1639540.44
			Max. Torque	13			-25186.31
L3	85.09 - 42.03	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-79658.06	13445.20	-6724.35
			Max. Mx	20	-43489.80	3105958.90	-2101.38
			Max. My	14	-43490.58	4587.76	-3103414.66
			Max. Vy	20	-36606.32	3105958.90	-2101.38
			Max. Vx	14	36605.64	4587.76	-3103414.66
			Max. Torque	13			-25141.01
L4	42.03 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-104831.35	13480.61	-6741.66
			Max. Mx	20	-64260.86	4981154.26	-2114.78
			Max. My	14	-64260.90	4621.58	-4978605.21
			Max. Vy	20	-39804.56	4981154.26	-2114.78
			Max. Vx	14	39804.92	4621.58	-4978605.21
			Max. Torque	13			-25060.97

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Pole	Max. Vert	26	104831.35	-0.65	0.33
	Max. H_x	21	48217.81	39757.05	-0.01
	Max. H_z	3	48217.82	0.01	39757.30
	Max. M_x	2	4974086.38	0.01	39757.21
	Max. M_z	8	4971418.66	-39756.82	-0.01
	Max. Torsion	25	25036.60	19878.70	34430.91

Location	*Condition*	*Gov. Load Comb.*	*Vertical lb*	*Horizontal, X lb*	*Horizontal, Z lb*
	Min. Vert	21	48217.81	39757.05	-0.01
	Min. H_x	9	48217.81	-39757.05	-0.01
	Min. H_z	15	48217.82	0.01	-39757.30
	Min. M_x	14	-4978605.22	0.01	-39757.21
	Min. M_z	20	-4981154.26	39756.82	-0.01
	Min. Torsion	13	-25036.89	-19878.65	-34430.84

Tower Mast Reaction Summary

Load Combination	*Vertical lb*	*Shear$_x$ lb*	*Shear$_z$ lb*	*Overturning Moment, M_x lb-ft*	*Overturning Moment, M_z lb-ft*	*Torque lb-ft*
Dead Only	53575.37	1.40	-0.67	1730.26	3737.06	-0.12
1.2 Dead+1.6 Wind 0 deg - No Ice	64290.43	-0.01	-39757.21	-4974086.38	4617.73	-21744.41
0.9 Dead+1.6 Wind 0 deg - No Ice	48217.82	-0.01	-39757.30	-4912484.10	3381.97	-21753.22
1.2 Dead+1.6 Wind 30 deg - No Ice	64290.44	19878.68	-34430.88	-4307331.03	-2483440.84	-12630.11
0.9 Dead+1.6 Wind 30 deg - No Ice	48217.82	19878.65	-34430.84	-4254062.94	-2453595.69	-12640.12
1.2 Dead+1.6 Wind 60 deg - No Ice	64290.44	34430.88	-19878.68	-2485927.58	-4304792.60	-130.41
0.9 Dead+1.6 Wind 60 deg - No Ice	48217.82	34430.84	-19878.66	-2455417.58	-4252203.50	-139.26
1.2 Dead+1.6 Wind 90 deg - No Ice	64290.40	39756.82	0.01	2113.11	-4971418.66	12404.54
0.9 Dead+1.6 Wind 90 deg - No Ice	48217.81	39757.05	0.01	1547.21	-4910537.05	12399.18
1.2 Dead+1.6 Wind 120 deg - No Ice	64290.44	34430.88	19878.68	2490225.16	-4304920.81	21614.34
0.9 Dead+1.6 Wind 120 deg - No Ice	48217.83	34430.91	19878.70	2458570.17	-4252308.23	21614.26
1.2 Dead+1.6 Wind 150 deg - No Ice	64290.44	19878.68	34430.88	4311776.00	-2483569.63	25031.30
0.9 Dead+1.6 Wind 150 deg - No Ice	48217.82	19878.65	34430.84	4257316.24	-2453688.76	25036.89
1.2 Dead+1.6 Wind 180 deg - No Ice	64290.43	-0.01	39757.21	4978605.22	4616.72	21741.13
0.9 Dead+1.6 Wind 180 deg - No Ice	48217.82	-0.01	39757.30	4915790.98	3381.42	21750.88
1.2 Dead+1.6 Wind 210 deg - No Ice	64290.44	-19878.68	34430.88	4311993.50	2492927.97	12626.55
0.9 Dead+1.6 Wind 210 deg - No Ice	48217.83	-19878.70	34430.91	4257485.99	2460549.23	12637.57
1.2 Dead+1.6 Wind 240 deg - No Ice	64290.44	-34430.88	19878.68	2490442.07	4314530.99	130.00
0.9 Dead+1.6 Wind 240 deg - No Ice	48217.82	-34430.84	19878.66	2458721.59	4259333.05	138.98
1.2 Dead+1.6 Wind 270 deg - No Ice	64290.40	-39756.82	0.01	2112.00	4981154.26	-12401.29
0.9 Dead+1.6 Wind 270 deg - No Ice	48217.81	-39757.05	0.01	1546.61	4917664.83	-12396.74
1.2 Dead+1.6 Wind 300 deg - No Ice	64290.44	-34430.88	-19878.68	-2486145.90	4314402.87	-21610.68
0.9 Dead+1.6 Wind 300 deg - No Ice	48217.82	-34430.84	-19878.65	-2455575.74	4259240.22	-21611.54

Load Combination	*Vertical* *lb*	*Shear$_x$* *lb*	*Shear$_z$* *lb*	*Overturning Moment, M_x* *lb-ft*	*Overturning Moment, M_z* *lb-ft*	*Torque* *lb-ft*
1.2 Dead+1.6 Wind 330 deg - No Ice	64290.44	-19878.68	-34430.88	-4307548.73	2492800.41	-25031.01
0.9 Dead+1.6 Wind 330 deg - No Ice	48217.83	-19878.70	-34430.91	-4254232.76	2460456.52	-25036.60
1.2 Dead+1.0 Ice+1.0 Temp	104831.35	0.65	-0.33	6741.66	13480.61	-0.94
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	104831.33	0.02	-10931.37	-1402376.24	13717.42	-4954.00
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	104831.33	5465.70	-9466.85	-1213563.49	-690893.34	-2868.01
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	104831.33	9466.86	-5465.69	-697750.24	-1206700.12	-13.57
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	104831.33	10931.38	-0.01	6858.90	-1395504.44	2844.29
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	104831.34	9467.46	5466.03	711554.06	-1206845.58	4939.55
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	104831.33	5465.70	9466.82	1227307.46	-690910.52	5710.80
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	104831.33	0.02	10931.34	1416128.34	13715.69	4951.59
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	104831.34	-5466.02	9467.44	1227466.42	718436.17	2865.56
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	104831.34	-9467.44	5466.03	711579.04	1234329.24	11.68
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	104831.33	-10931.33	-0.01	6857.08	1422997.81	-2845.55
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	104831.33	-9466.81	-5465.69	-697777.97	1234179.27	-4940.77
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	104831.34	-5466.02	-9467.45	-1213721.10	718421.76	-5712.60
Dead+Wind 0 deg - Service	53575.36	0.00	-7845.45	-973545.44	4039.24	-4355.26
Dead+Wind 30 deg - Service	53575.35	3922.27	-6793.56	-842741.53	-483599.46	-2530.26
Dead+Wind 60 deg - Service	53575.35	6793.56	-3922.27	-485765.39	-840574.13	-27.26
Dead+Wind 90 deg - Service	53575.36	7845.46	-0.00	1872.42	-971375.38	2483.01
Dead+Wind 120 deg - Service	53575.35	6793.56	3922.26	489511.77	-840577.77	4327.90
Dead+Wind 150 deg - Service	53575.35	3922.27	6793.55	846491.98	-483603.15	5013.05
Dead+Wind 180 deg - Service	53575.36	0.00	7845.45	977299.13	4039.11	4354.92
Dead+Wind 210 deg - Service	53575.35	-3922.25	6793.54	846497.98	491683.57	2529.91
Dead+Wind 240 deg - Service	53575.36	-6794.35	3922.72	489587.96	848787.26	27.01
Dead+Wind 270 deg - Service	53575.36	-7845.44	-0.00	1872.27	979468.99	-2483.15
Dead+Wind 300 deg - Service	53575.35	-6793.54	-3922.26	-485771.58	848661.70	-4328.02
Dead+Wind 330 deg - Service	53575.36	-3922.72	-6794.36	-842868.16	491750.39	-5013.27

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	-53575.37	0.00	-1.40	53575.37	0.67	0.003%
2	0.00	-64290.44	-39757.45	0.01	64290.43	39757.21	0.000%
3	0.00	-48217.83	-39757.45	0.01	48217.82	39757.30	0.000%
4	19878.73	-64290.44	-34430.96	-19878.68	64290.44	34430.88	0.000%
5	19878.73	-48217.83	-34430.96	-19878.65	48217.82	34430.84	0.000%
6	34430.96	-64290.44	-19878.73	-34430.88	64290.44	19878.68	0.000%
7	34430.96	-48217.83	-19878.73	-34430.84	48217.82	19878.66	0.000%
8	39757.45	-64290.44	0.00	-39756.82	64290.40	-0.01	0.001%
9	39757.45	-48217.83	0.00	-39757.05	48217.81	-0.01	0.001%
10	34430.96	-64290.44	19878.73	-34430.88	64290.44	-19878.68	0.000%
11	34430.96	-48217.83	19878.73	-34430.91	48217.83	-19878.70	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	% Error
12	19878.73	-64290.44	34430.96	-19878.68	64290.44	-34430.88	0.000%
13	19878.73	-48217.83	34430.96	-19878.65	48217.82	-34430.84	0.000%
14	0.00	-64290.44	39757.45	0.01	64290.43	-39757.21	0.000%
15	0.00	-48217.83	39757.45	0.01	48217.82	-39757.30	0.000%
16	-19878.73	-64290.44	34430.96	19878.68	64290.44	-34430.88	0.000%
17	-19878.73	-48217.83	34430.96	19878.70	48217.83	-34430.91	0.000%
18	-34430.96	-64290.44	19878.73	34430.88	64290.44	-19878.68	0.000%
19	-34430.96	-48217.83	19878.73	34430.84	48217.82	-19878.66	0.000%
20	-39757.45	-64290.44	0.00	39756.82	64290.40	-0.01	0.001%
21	-39757.45	-48217.83	0.00	39757.05	48217.81	-0.01	0.001%
22	-34430.96	-64290.44	-19878.73	34430.88	64290.44	19878.68	0.000%
23	-34430.96	-48217.83	-19878.73	34430.84	48217.82	19878.65	0.000%
24	-19878.73	-64290.44	-34430.96	19878.68	64290.44	34430.88	0.000%
25	-19878.73	-48217.83	-34430.96	19878.70	48217.83	34430.91	0.000%
26	0.00	-104831.36	0.00	-0.65	104831.35	0.33	0.001%
27	0.00	-104831.36	-10932.60	-0.02	104831.33	10931.37	0.001%
28	5466.30	-104831.36	-9467.91	-5465.70	104831.33	9466.85	0.001%
29	9467.91	-104831.36	-5466.30	-9466.86	104831.33	5465.69	0.001%
30	10932.60	-104831.36	0.00	-10931.38	104831.33	0.01	0.001%
31	9467.91	-104831.36	5466.30	-9467.46	104831.34	-5466.03	0.001%
32	5466.30	-104831.36	9467.91	-5465.70	104831.33	-9466.82	0.001%
33	0.00	-104831.36	10932.60	-0.02	104831.33	-10931.34	0.001%
34	-5466.30	-104831.36	9467.91	5466.02	104831.34	-9467.44	0.001%
35	-9467.91	-104831.36	5466.30	9467.44	104831.34	-5466.03	0.001%
36	-10932.60	-104831.36	0.00	10931.33	104831.33	0.01	0.001%
37	-9467.91	-104831.36	-5466.30	9466.81	104831.33	5465.69	0.001%
38	-5466.30	-104831.36	-9467.91	5466.02	104831.34	9467.45	0.001%
39	0.00	-53575.37	-7846.10	-0.00	53575.36	7845.45	0.001%
40	3923.05	-53575.37	-6794.92	-3922.27	53575.35	6793.56	0.003%
41	6794.92	-53575.37	-3923.05	-6793.56	53575.35	3922.27	0.003%
42	7846.10	-53575.37	0.00	-7845.46	53575.36	0.00	0.001%
43	6794.92	-53575.37	3923.05	-6793.56	53575.35	-3922.26	0.003%
44	3923.05	-53575.37	6794.92	-3922.27	53575.35	-6793.55	0.003%
45	0.00	-53575.37	7846.10	-0.00	53575.36	-7845.45	0.001%
46	-3923.05	-53575.37	6794.92	3922.25	53575.35	-6793.54	0.003%
47	-6794.92	-53575.37	3923.05	6794.35	53575.36	-3922.72	0.001%
48	-7846.10	-53575.37	0.00	7845.44	53575.36	0.00	0.001%
49	-6794.92	-53575.37	-3923.05	6793.54	53575.35	3922.26	0.003%
50	-3923.05	-53575.37	-6794.92	3922.72	53575.36	6794.36	0.001%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.00000001	0.00001369
2	Yes	17	0.00000001	0.00008691
3	Yes	17	0.00000001	0.00006490
4	Yes	18	0.00000001	0.00007398
5	Yes	17	0.00000001	0.00013212
6	Yes	18	0.00000001	0.00008197
7	Yes	17	0.00000001	0.00014669
8	Yes	16	0.00000001	0.00012056
9	Yes	16	0.00000001	0.00009229
10	Yes	18	0.00000001	0.00010523
11	Yes	18	0.00000001	0.00007485
12	Yes	18	0.00000001	0.00007224

13	Yes	17	0.00000001	0.00012973
14	Yes	17	0.00000001	0.00008704
15	Yes	17	0.00000001	0.00006497
16	Yes	18	0.00000001	0.00009533
17	Yes	18	0.00000001	0.00006729
18	Yes	18	0.00000001	0.00008295
19	Yes	17	0.00000001	0.00014791
20	Yes	16	0.00000001	0.00012094
21	Yes	16	0.00000001	0.00009249
22	Yes	18	0.00000001	0.00007256
23	Yes	17	0.00000001	0.00012979
24	Yes	18	0.00000001	0.00010995
25	Yes	18	0.00000001	0.00007828
26	Yes	11	0.00000001	0.00002468
27	Yes	15	0.00011719	0.00011905
28	Yes	15	0.00011694	0.00013704
29	Yes	15	0.00011691	0.00013969
30	Yes	15	0.00011714	0.00010466
31	Yes	16	0.00000001	0.00007925
32	Yes	15	0.00011703	0.00014687
33	Yes	15	0.00011729	0.00012170
34	Yes	16	0.00000001	0.00007733
35	Yes	16	0.00000001	0.00007174
36	Yes	15	0.00011733	0.00010927
37	Yes	15	0.00011708	0.00014766
38	Yes	16	0.00000001	0.00008382
39	Yes	14	0.00000001	0.00005736
40	Yes	13	0.00014992	0.00005407
41	Yes	13	0.00014991	0.00004547
42	Yes	14	0.00000001	0.00003673
43	Yes	13	0.00014993	0.00014287
44	Yes	13	0.00014997	0.00011039
45	Yes	14	0.00000001	0.00005787
46	Yes	13	0.00015000	0.00010101
47	Yes	14	0.00000001	0.00002165
48	Yes	14	0.00000001	0.00003743
49	Yes	13	0.00014999	0.00009445
50	Yes	14	0.00000001	0.00007570

Base Plate Design Data

Plate Thickness	*Number of Anchor Bolts*	*Anchor Bolt Size*	*Actual / Allowable Ratio Bolt Tension*	*Actual / Allowable Ratio Bolt Compression*	*Actual / Allowable Ratio Plate Stress*	*Actual / Allowable Ratio Stiffener Stress*	*Controlling Condition*	*Ratio*
in		*in*	*lb*	*lb*	*ksi*	*ksi*		
2.0000	18	2.2500	186035.02 223654.40 0.83	193175.11 371266.30 0.52	32.529 54.000 0.60	44.118 54.000 0.82	Bolt T	0.83 ✔

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	175 - 128.66 (1)	TP33.375x23x0.25	46.34	0.00	0.0	25.4533	-13107.80	1757100.00	0.007
L2	128.66 - 85.09 (2)	TP42.5625x31.8272x0.3125	48.25	0.00	0.0	40.6223	-29898.70	2783470.00	0.011
L3	85.09 - 42.03 (3)	TP51.4688x40.6426x0.375	48.88	0.00	0.0	58.9849	-43489.60	4029650.00	0.011
L4	42.03 - 0 (4)	TP60x49.1817x0.4375	48.97	0.00	0.0	82.7100	-64260.90	5588970.00	0.011

Pole Bending Design Data

Section No.	Elevation ft	Size	M_{ux} lb-ft	ϕM_{nx} lb-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} lb-ft	ϕM_{ny} lb-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	175 - 128.66 (1)	TP33.375x23x0.25	449549.17	1159083.33	0.388	0.00	1159083.33	0.000
L2	128.66 - 85.09 (2)	TP42.5625x31.8272x0.3125	1642533.33	2344691.67	0.701	0.00	2344691.67	0.000
L3	85.09 - 42.03 (3)	TP51.4688x40.6426x0.375	3106483.33	4107600.00	0.756	0.00	4107600.00	0.000
L4	42.03 - 0 (4)	TP60x49.1817x0.4375	4981716.67	6848866.67	0.727	0.00	6848866.67	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 lb-ft	ϕT_n lb-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	175 - 128.66 (1)	TP33.375x23x0.25	22115.90	878552.00	0.025	120.97	2321000.00	0.000
L2	128.66 - 85.09 (2)	TP42.5625x31.8272x0.3125	32962.00	1391740.00	0.024	120.54	4695116.67	0.000
L3	85.09 - 42.03 (3)	TP51.4688x40.6426x0.375	36607.50	2014830.00	0.018	130.17	8225250.00	0.000
L4	42.03 - 0 (4)	TP60x49.1817x0.4375	39805.10	2794480.00	0.014	130.00	13714500.00	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	175 - 128.66 (1)	0.007	0.388	0.000	0.025	0.000	0.396 ✔	1.000	4.8.2 ✔
L2	128.66 - 85.09 (2)	0.011	0.701	0.000	0.024	0.000	0.712 ✔	1.000	4.8.2 ✔

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
L3	85.09 - 42.03 (3)	0.011	0.756	0.000	0.018	0.000	0.767 ✔	1.000	4.8.2 ✔
L4	42.03 - 0 (4)	0.011	0.727	0.000	0.014	0.000	0.739 ✔	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	175 - 128.66	Pole	TP33.375x23x0.25	1	-13107.80	1757100.00	39.6	Pass
L2	128.66 - 85.09	Pole	TP42.5625x31.8272x0.3125	2	-29898.70	2783470.00	71.2	Pass
L3	85.09 - 42.03	Pole	TP51.4688x40.6426x0.375	3	-43489.60	4029650.00	76.7	Pass
L4	42.03 - 0	Pole	TP60x49.1817x0.4375	4	-64260.90	5588970.00	73.9	Pass
							Summary	
						Pole (L3)	76.7	Pass
						Base Plate	83.2	Pass
						RATING =	**83.2**	**Pass**

Drilled Pier Foundation Check:

As per tnxTower Output:

$P_{down} := 64.3kip$

$Shear := 39.8kip$

$Moment := 4981.7kip \cdot ft$

Pier Diameter: $B := 8ft$ (per SA report by GPD, dated May 14, 2014)

Pier above grade: $E_{pier} := 1ft$

Soil Layers in total $N_{soil} := 3$

$i := 1 .. N_{soil}$

Soil Layer $N_i :=$	Soil Depth $D_i :=$	Soil Unit Weight $\gamma_{soil_i} :=$	Concrete Unit Weight $\gamma_{concrete_i} :=$	Friction Angle $\phi_i :=$	Cohesive Soil $C_{u_i} :=$	Ultimate Skin Friction Comp. $SK_{down_i} :=$	Ultimate Skin Friction Uplift. $SK_{up_i} :=$
1	5ft	100pcf	150pcf	0deg	0psf	0ksf	0ksf
2	9ft	110pcf	150pcf	38deg	0psf	0.498ksf	0.498ksf
3	13ft	115pcf − 62pcf	150pcf − 62pcf	38deg	0psf	0.996ksf	0.996ksf

Skin Friction Calculation for Cohesive soil

β method - NAVFAC DM 7.2 (1984)

$K_s := 1$ Lateral Earth Pressure Coefficient

$$\sigma1_{v_2} := \gamma_{soil_1} \cdot D_1 + \gamma_{soil_2} \cdot \frac{D_2}{2} \qquad \sigma1_{v_2} = 0.995 \cdot ksf$$

$$SK2 := 0.4 \cdot C_{u_2} + K_s \sigma1_{v_2} \cdot \tan(\phi_2 \cdot 0.7) \qquad SK2 = 0.498 \cdot ksf$$

$$\sigma1_{v_3} := \gamma_{soil_1} \cdot D_1 + \gamma_{soil_2} \cdot D_2 + \gamma_{soil_3} \cdot \frac{D_3}{2} \qquad \sigma1_{v_3} = 1.835 \cdot ksf$$

$$SK3 := 0.4 \cdot C_{u_3} + K_s \sigma1_{v_3} \cdot \tan(\phi_3 \cdot 0.75) \qquad SK3 = 0.996 \cdot ksf$$

(For Concrete Piles)

Down Load Check:

$\phi_b := 0.75$ (Section 9.4.1, TIA-222-G)

$\phi_s := 0.75$ (Section 9.4.1, TIA-222-G)

Ultimate Skin Friction due to Download:

$$SK_{total\_down} := \sum_{i=1}^{N_{soil}} \left[\left(\phi_s \cdot SK_{down} \right)_i \cdot \pi \cdot B \cdot D_i \right] = 328.548 \cdot kip$$

$$P_{dcap} := SK_{total\_down}$$

Down Load Check:

$$Check := \begin{cases} \text{"OK"} & \text{if } P_{dcap} \geq P_{down} \\ \text{"NOT GOOD"} & \text{otherwise} \end{cases} = \text{"OK"}$$

$Check = \text{"OK"}$

Usage:

$$Usage := \frac{P_{down}}{P_{dcap}}$$

$Usage = 19.6 \cdot \%$

Pier Embedment Check:

Check of embedded length of the foundation

Defining variables,

$D_{pier} := B = 8\ ft$ Shaft Diameter

$L_e := 27ft$ Embedded length of the Shaft, L_e

$\phi := 38deg$ Angle of Internal Friction

$$K_p := \tan\left(45deg + \frac{\phi}{2}\right)^2 = 4.204$$

$$\gamma_{soil} := \frac{\sum_{i=1}^{N_{soil}} \left(D_i \cdot \gamma_{soil_i}\right)}{\sum_{i=1}^{N_{soil}} \left(D_i\right)} = 80.704\ pcf$$ Average unit weight of soil

$$V_F := Shear = 39.8\ kip$$

$$M_F := Moment = 4.982 \times 10^3\ kip \cdot ft$$

$H := \frac{Moment}{Shear}$ Equation: C13.6.1.1-2, AASHTO for Broms Methods

Assume Embedment Depth $L_f := 27ft$

Solve for embedment depth $R_0 := root\left[\left(L_f^{\ 3} - \frac{2 \cdot V_F \cdot L_f}{K_p \cdot \gamma_{soil} \cdot D_{pier}} - \frac{2 \cdot M_F}{K_p \cdot \gamma_{soil} \cdot D_{pier}}\right), L_f\right]$ (C13.6.1.1-7)

(required min. embedment) $R_0 = 16.06\ ft$

Check $L_e > R_0$

$$Check_{length} := \begin{cases} \text{"Pass"} & \text{if } L_e > R_0 \\ \text{"Fail"} & \text{if } L_e < R_0 \end{cases}$$

$Check_{length} = \text{"Pass"}$

$$Ratio_{embed} := \frac{R_0}{L_e} = 59.5 \cdot \%$$

Pier Reinforcement Check:

Rebar Size: #11

Rebar Diameter: $d_b := 1.41in$

Rebar Area: $A_b := 1.56 \cdot in^2$

Number of Rebar Required: $n_{rebar} := 27$

Cover thickness: $cc := 3in$

Max. Applied Moment per L-Pile output:

Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile lbs	Max Moment in Pile in-lbs
0.7765	-0.00608	-405145.	6.30E+07

$M_{applied} := 63000000lbf \cdot in = 5.25 \times 10^3 \cdot kip \cdot ft$

Moment Capacity of Pier:

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	64.290	104604.278	0.00300000

$M_{cap.n} := 104604.278kip \cdot in = 8717 \cdot kip \cdot ft$ (per L-Plie Output)

$\phi_{s\_Bending} := 0.9$

$M_{cap} := \phi_{s\_Bending} M_{cap.n} = 7845.3 \cdot kip \cdot ft$

Reinforcement Check:

$$Check := \begin{cases} \text{"OK"} & \text{if } M_{cap} \geq M_{applied} \\ \text{"NOT GOOD"} & \text{otherwise} \end{cases} = \text{"OK"}$$

Check = "OK"

Usage: $Usage := \frac{M_{applied}}{M_{cap}}$ $Usage = 66.9 \cdot \%$

===

LPile for Windows, Version 2016-09.009

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

===

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Files Used for Analysis

Path to file locations:
\\maserconsulting.com\luj\Projects\2018\18946000A\18946006A\Structural\Tower analysis\Rev 3\L-Pile\

Name of input data file:
Pier Check.lp9d

Name of output report file:
Pier Check.lp9o

Name of plot output file:
Pier Check.lp9p

Name of runtime message file:
Pier Check.lp9r

Date and Time of Analysis

Date: November 9, 2018 Time: 16:38:10

Problem Title

Project Name: CTL01051 - Wilimantic ECSU
Job Number: 18946006A
Client: STEALTH CONCEALMENT SOLUTIONS
Engineer: DX
Description:

Program Options and Settings

Computational Options:
- Use unfactored loads in computations (conventional analysis)

Engineering Units Used for Data Input and Computations:
- US Customary System Units (pounds, feet, inches)

Analysis Control Options:
- Maximum number of iterations allowed = 500
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 100.0000 in
- Number of pile increments = 100

Loading Type and Number of Cycles of Loading:
- Static loading specified

- Use of p-y modification factors for p-y curves not selected
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:
- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined = 1
Total length of pile = 28.000 ft

Depth of ground surface below top of pile = 1.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	96.0000
2	28.000	96.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is a round drilled shaft, bored pile, or CIDH pile
Length of section = 28.000000 ft
Shaft Diameter = 96.000000 in
Shear capacity of section = 0.0000 lbs

Ground Slope and Pile Batter Angles

Ground Slope Angle = 0.000 degrees
= 0.000 radians

Pile Batter Angle = 0.000 degrees
= 0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 1.000000 ft
Distance from top of pile to bottom of layer = 6.000000 ft
Effective unit weight at top of layer = 100.000000 pcf
Effective unit weight at bottom of layer = 100.000000 pcf
Friction angle at top of layer = 1.000000 deg.
Friction angle at bottom of layer = 1.000000 deg.
Subgrade k at top of layer = 0.0000 pci
Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 6.000000 ft
Distance from top of pile to bottom of layer = 15.000000 ft
Effective unit weight at top of layer = 110.000000 pcf
Effective unit weight at bottom of layer = 110.000000 pcf
Friction angle at top of layer = 38.000000 deg.
Friction angle at bottom of layer = 38.000000 deg.
Subgrade k at top of layer = 0.0000 pci
Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

Layer 3 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 15.000000 ft
Distance from top of pile to bottom of layer = 28.000000 ft
Effective unit weight at top of layer = 53.000000 pcf
Effective unit weight at bottom of layer = 53.000000 pcf
Friction angle at top of layer = 38.000000 deg.
Friction angle at bottom of layer = 38.000000 deg.
Subgrade k at top of layer = 0.0000 pci
Subgrade k at bottom of layer = 0.0000 pci

NOTE: Default values for subgrade k will be computed for this layer.

(Depth of the lowest soil layer extends 0.000 ft below the pile tip)

Summary of Input Soil Properties

Layer Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Angle of Friction deg.	kpy pci
1	Sand	1.0000	100.0000	1.0000	default
	(Reese, et al.)	6.0000	100.0000	1.0000	default
2	Sand	6.0000	110.0000	38.0000	default
	(Reese, et al.)	15.0000	110.0000	38.0000	default
3	Sand	15.0000	53.0000	38.0000	default
	(Reese, et al.)	28.0000	53.0000	38.0000	default

Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top y vs. Pile Length
1	1	V = 39757. lbs	M = 59780568. in-lbs	64290.	No

V = shear force applied normal to pile axis
M = bending moment applied to pile head
y = lateral deflection normal to pile axis
S = pile slope relative to original pile batter angle
R = rotational stiffness applied to pile head
Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
Thrust force is assumed to be acting axially for all pile batter angles.

Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

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Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions and Properties of Drilled Shaft (Bored Pile):

Length of Section	=	28.000000 ft
Shaft Diameter	=	96.000000 in
Concrete Cover Thickness	=	3.000000 in
Number of Reinforcing Bars	=	27 bars
Yield Stress of Reinforcing Bars	=	60000. psi
Modulus of Elasticity of Reinforcing Bars	=	29000000. psi
Gross Area of Shaft	=	7238. sq. in.
Total Area of Reinforcing Steel	=	42.120000 sq. in.
Area Ratio of Steel Reinforcement	=	0.58 percent
Edge-to-Edge Bar Spacing	=	8.874671 in
Maximum Concrete Aggregate Size	=	0.750000 in
Ratio of Bar Spacing to Aggregate Size	=	11.83
Offset of Center of Rebar Cage from Center of Pile	=	0.0000 in

Axial Structural Capacities:

Nom. Axial Structural Capacity = 0.85 Fc Ac + Fy As = 20877.279 kips
Tensile Load for Cracking of Concrete = -2746.791 kips
Nominal Axial Tensile Capacity = -2527.200 kips

Reinforcing Bar Dimensions and Positions Used in Computations:

Bar Number	Bar Diam. inches	Bar Area sq. in.	X inches	Y inches
1	1.410000	1.560000	44.295000	0.00000
2	1.410000	1.560000	43.101023	10.215130
3	1.410000	1.560000	39.583458	19.879560
4	1.410000	1.560000	33.931939	28.472277
5	1.410000	1.560000	26.451140	35.530047
6	1.410000	1.560000	17.544353	40.672382
7	1.410000	1.560000	7.691746	43.622059
8	1.410000	1.560000	-2.575525	44.220060
9	1.410000	1.560000	-12.703949	42.434145
10	1.410000	1.560000	-22.147500	38.360595
11	1.410000	1.560000	-30.397073	32.219015
12	1.410000	1.560000	-37.007933	24.340500
13	1.410000	1.560000	-41.623685	15.149782
14	1.410000	1.560000	-43.995493	5.142336
15	1.410000	1.560000	-43.995493	-5.142336
16	1.410000	1.560000	-41.623685	-15.149782
17	1.410000	1.560000	-37.007933	-24.340500
18	1.410000	1.560000	-30.397073	-32.219015
19	1.410000	1.560000	-22.147500	-38.360595
20	1.410000	1.560000	-12.703949	-42.434145
21	1.410000	1.560000	-2.575525	-44.220060
22	1.410000	1.560000	7.691746	-43.622059
23	1.410000	1.560000	17.544353	-40.672382
24	1.410000	1.560000	26.451140	-35.530047
25	1.410000	1.560000	33.931939	-28.472277
26	1.410000	1.560000	39.583458	-19.879560
27	1.410000	1.560000	43.101023	-10.215130

NOTE: The positions of the above rebars were computed by LPile

Minimum spacing between any two bars not equal to zero = 8.875 inches between bars 18 and 19.

Ratio of bar spacing to maximum aggregate size = 11.83

Concrete Properties:

Compressive Strength of Concrete = 3000. psi
Modulus of Elasticity of Concrete = 3122019. psi
Modulus of Rupture of Concrete = -410.791918 psi
Compression Strain at Peak Stress = 0.001634
Tensile Strain at Fracture of Concrete = -0.0001160

Maximum Coarse Aggregate Size = 0.750000 in

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	64.290

Definitions of Run Messages and Notes:

C = concrete in section has cracked in tension.
Y = stress in reinforcing steel has reached yield stress.
T = ACI 318 criteria for tension-controlled section met, tensile strain in reinforcement exceeds 0.005 while simultaneously compressive strain in concrete more than 0.003. See ACI 318, Section 10.3.4.
Z = depth of tensile zone in concrete section is less than 10 percent of section depth.

Bending Stiffness (EI) = Computed Bending Moment / Curvature.
Position of neutral axis is measured from edge of compression side of pile.
Compressive stresses and strains are positive in sign.
Tensile stresses and strains are negative in sign.

Axial Thrust Force = 64.290 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Comp Strain in/in	Max Tens Strain in/in	Max Conc Stress ksi	Max Steel Stress ksi	Run Msg
3.12500E-07	5097.	1.63117E+10	55.4678351	0.00001733	-0.00001267	0.0627831	0.4983273	
6.25000E-07	10166.	1.62659E+10	51.7478090	0.00003234	-0.00002766	0.1165362	0.9292290	
9.37500E-07	15205.	1.62192E+10	50.5079074	0.00004735	-0.00004265	0.1697933	1.3601337	
0.00000125	20215.	1.61722E+10	49.8880167	0.00006236	-0.00005764	0.2225542	1.7910406	
0.00000156	25196.	1.61251E+10	49.5161274	0.00007737	-0.00007263	0.2748189	2.2219495	
0.00000188	30146.	1.60780E+10	49.2682387	0.00009238	-0.00008762	0.3265874	2.6528605	
0.00000219	35068.	1.60309E+10	49.0912069	0.0001074	-0.0001026	0.3778597	3.0837734	
0.00000250	35068.	1.40270E+10	24.7884784	0.00006197	-0.0001780	0.2190584	-5.1280353	C
0.00000281	35068.	1.24685E+10	24.3596216	0.00006851	-0.0002015	0.2416105	-5.8040184	C
0.00000313	35068.	1.12216E+10	24.0063135	0.00007502	-0.0002250	0.2639587	-6.4809278	C
0.00000344	35068.	1.02015E+10	23.7184420	0.00008153	-0.0002485	0.2862303	-7.1577178	C
0.00000375	35068.	9351354162.	23.4777140	0.00008804	-0.0002720	0.3084001	-7.8345986	C
0.00000406	35068.	8632019226.	23.2670124	0.00009452	-0.0002955	0.3303803	-8.5123051	C
0.00000438	35068.	8015446424.	23.0873825	0.0001010	-0.0003190	0.3522850	-9.1898883	C
0.00000469	35068.	7481083329.	22.9326132	0.0001075	-0.0003425	0.3741141	-9.8673479	C
0.00000500	35068.	7013515621.	22.7980458	0.0001140	-0.0003660	0.3958676	-10.5446833	C
0.00000531	35068.	6600955879.	22.6801181	0.0001205	-0.0003895	0.4175451	-11.2218943	C
0.00000563	35068.	6234236108.	22.5760593	0.0001270	-0.0004130	0.4391467	-11.8989803	C
0.00000594	35068.	5906118418.	22.4797984	0.0001335	-0.0004365	0.4605943	-12.5766097	C
0.00000625	35068.	5610812497.	22.3931464	0.0001400	-0.0004600	0.4819513	-13.2542422	C
0.00000656	35068.	5343630949.	22.3154324	0.0001464	-0.0004836	0.5032332	-13.9317442	C

0.00000688	35068.	5100738634.	22.2454401	0.0001529	-0.0005071	0.5244398	-14.6091154 C
0.00000719	35068.	4878967389.	22.1821645	0.0001594	-0.0005306	0.5455710	-15.2863551 C
0.00000750	35068.	4675677081.	22.1247681	0.0001659	-0.0005541	0.5666268	-15.9634629 C
0.00000781	35068.	4488649998.	22.0725477	0.0001724	-0.0005776	0.5876068	-16.6404384 C
0.00000813	35068.	4316009613.	22.0249080	0.0001790	-0.0006010	0.6085110	-17.3172810 C
0.00000844	35068.	4156157405.	21.9813421	0.0001855	-0.0006245	0.6293393	-17.9939903 C
0.00000875	35068.	4007723212.	21.9414153	0.0001920	-0.0006480	0.6500915	-18.6705658 C
0.00000906	35068.	3869525860.	21.9047531	0.0001985	-0.0006715	0.6707674	-19.3470071 C
0.00000938	35068.	3740541665.	21.8710308	0.0002050	-0.0006950	0.6913669	-20.0233135 C
0.00000969	35068.	3619879030.	21.8399658	0.0002116	-0.0007184	0.7118900	-20.6994846 C
0.00001000	35068.	3506757811.	21.8113106	0.0002181	-0.0007419	0.7323363	-21.3755199 C
0.00001031	35068.	3400492422.	21.7848478	0.0002247	-0.0007653	0.7527058	-22.0514189 C
0.00001063	35068.	3300477939.	21.7603856	0.0002312	-0.0007888	0.7729983	-22.7271812 C
0.00001094	35068.	3206178570.	21.7377542	0.0002378	-0.0008122	0.7932138	-23.4028061 C
0.00001125	35068.	3117118054.	21.7168026	0.0002443	-0.0008357	0.8133519	-24.0782931 C
0.00001156	35068.	3032871620.	21.6973961	0.0002509	-0.0008591	0.8334127	-24.7536418 C
0.00001188	35068.	2953059209.	21.6794143	0.0002574	-0.0008826	0.8533958	-25.4288520 C
0.00001219	35068.	2877339742.	21.6627490	0.0002640	-0.0009060	0.8733013	-26.1039224 C
0.00001281	35068.	2736981706.	21.6329885	0.0002772	-0.0009528	0.9128785	-27.4536427 C
0.00001344	35387.	2633460184.	21.6074438	0.0002904	-0.0009996	0.9521429	-28.8027992 C
0.00001406	36934.	2626437495.	21.5847750	0.0003035	-0.0010465	0.9910601	-30.1517089 C
0.00001469	38480.	2619907901.	21.5650766	0.0003167	-0.0010933	1.0296495	-31.5001751 C
0.00001531	40024.	2613811294.	21.5483517	0.0003300	-0.0011400	1.0679262	-32.8480350 C
0.00001594	41567.	2608095938.	21.5342614	0.0003432	-0.0011868	1.1058890	-34.1952839 C
0.00001656	43108.	2602718246.	21.5225181	0.0003565	-0.0012335	1.1435366	-35.5419158 C
0.00001719	44647.	2597640596.	21.5128760	0.0003698	-0.0012802	1.1808676	-36.8879260 C
0.00001781	46185.	2592830766.	21.5051242	0.0003831	-0.0013269	1.2178807	-38.2333094 C
0.00001844	47721.	2588260896.	21.4990805	0.0003964	-0.0013736	1.2545744	-39.5780604 C
0.00001906	49256.	2583906768.	21.4945866	0.0004097	-0.0014203	1.2909473	-40.9221738 C
0.00001969	50789.	2579747234.	21.4915046	0.0004231	-0.0014669	1.3269982	-42.2656441 C
0.00002031	52320.	2575763739.	21.4897136	0.0004365	-0.0015135	1.3627254	-43.6084655 C
0.00002094	53850.	2571939935.	21.4891075	0.0004499	-0.0015601	1.3981275	-44.9506325 C
0.00002156	55378.	2568261360.	21.4895923	0.0004634	-0.0016066	1.4332032	-46.2921393 C
0.00002219	56905.	2564715176.	21.4910850	0.0004768	-0.0016532	1.4679509	-47.6329799 C
0.00002281	58429.	2561289940.	21.4935118	0.0004903	-0.0016997	1.5023691	-48.9731485 C
0.00002344	59953.	2557975426.	21.4968068	0.0005038	-0.0017462	1.5364562	-50.3126391 C
0.00002406	61474.	2554762457.	21.5009113	0.0005174	-0.0017926	1.5702108	-51.6514454 C
0.00002469	62994.	2551642782.	21.5057723	0.0005309	-0.0018391	1.6036312	-52.9895612 C
0.00002531	64512.	2548608954.	21.5113427	0.0005445	-0.0018855	1.6367159	-54.3269801 C
0.00002594	66028.	2545654236.	21.5175796	0.0005581	-0.0019319	1.6694633	-55.6636957 C
0.00002656	67542.	2542772518.	21.5244446	0.0005717	-0.0019783	1.7018717	-56.9997015 C
0.00002719	69055.	2539958243.	21.5319027	0.0005854	-0.0020246	1.7339395	-58.3349907 C
0.00002781	70566.	2537206346.	21.5399225	0.0005991	-0.0020709	1.7656650	-59.6695566 C
0.00002844	72075.	2534512199.	21.5484753	0.0006128	-0.0021172	1.7970465	-60.0000000 CY
0.00002906	73583.	2531871563.	21.5575349	0.0006265	-0.0021635	1.8280823	-60.0000000 CY
0.00002969	74956.	2524823688.	21.5538774	0.0006399	-0.0022101	1.8578827	-60.0000000 CY
0.00003031	76125.	2511337778.	21.5310571	0.0006527	-0.0022573	1.8859894	-60.0000000 CY
0.00003094	77173.	2494464771.	21.4978221	0.0006651	-0.0023049	1.9129706	-60.0000000 CY
0.00003156	78130.	2475397705.	21.4576073	0.0006773	-0.0023527	1.9390492	-60.0000000 CY
0.00003219	79010.	2454673678.	21.4118427	0.0006892	-0.0024008	1.9643172	-60.0000000 CY
0.00003281	79827.	2432828717.	21.3621443	0.0007009	-0.0024491	1.9888835	-60.0000000 CY
0.00003344	80603.	2410552709.	21.3106320	0.0007126	-0.0024974	2.0128963	-60.0000000 CY
0.00003406	81306.	2386965755.	21.2542212	0.0007240	-0.0025460	2.0361391	-60.0000000 CY
0.00003469	81997.	2363890746.	21.1991606	0.0007353	-0.0025947	2.0590563	-60.0000000 CY
0.00003531	82642.	2340316847.	21.1417760	0.0007466	-0.0026434	2.0813911	-60.0000000 CY

0.00003594	83230.	2315964874.	21.0810210	0.0007576	-0.0026924	2.1030704	-60.0000000	CY
0.00003656	83813.	2292332191.	21.0223585	0.0007686	-0.0027414	2.1244919	-60.0000000	CY
0.00003719	84381.	2269082170.	20.9645188	0.0007796	-0.0027904	2.1455708	-60.0000000	CY
0.00003969	86333.	2175323492.	20.7236343	0.0008225	-0.0029875	2.2252639	-60.0000000	CY
0.00004219	87954.	2084834017.	20.4736549	0.0008637	-0.0031863	2.2982381	-60.0000000	CY
0.00004469	89361.	1999695619.	20.2288131	0.0009040	-0.0033860	2.3658816	-60.0000000	CY
0.00004719	90604.	1920076640.	19.9969600	0.0009436	-0.0035864	2.4291186	-60.0000000	CY
0.00004969	91651.	1844544233.	19.7710104	0.0009824	-0.0037876	2.4877213	-60.0000000	CY
0.00005219	92617.	1774704888.	19.5536342	0.0010205	-0.0039895	2.5421726	-60.0000000	CY
0.00005469	93458.	1708942297.	19.3387252	0.0010576	-0.0041924	2.5922772	-60.0000000	CY
0.00005719	94196.	1647146039.	19.1338681	0.0010942	-0.0043958	2.6388423	-60.0000000	CY
0.00005969	94928.	1590416765.	18.9484968	0.0011310	-0.0045990	2.6827506	-60.0000000	CY
0.00006219	95542.	1536359438.	18.7665368	0.0011670	-0.0048030	2.7230169	-60.0000000	CY
0.00006469	96088.	1485421644.	18.5833660	0.0012021	-0.0050079	2.7595251	-60.0000000	CY
0.00006719	96627.	1438163438.	18.4122015	0.0012371	-0.0052129	2.7933491	-60.0000000	CY
0.00006969	97132.	1393821518.	18.2513536	0.0012719	-0.0054181	2.8244892	-60.0000000	CY
0.00007219	97553.	1351387373.	18.0926881	0.0013061	-0.0056239	2.8525615	-60.0000000	CY
0.00007469	97949.	1311448087.	17.9435019	0.0013402	-0.0058298	2.8781258	-60.0000000	CY
0.00007719	98341.	1274052250.	17.8058006	0.0013744	-0.0060356	2.9013516	-60.0000000	CY
0.00007969	98721.	1238852707.	17.6702436	0.0014081	-0.0062419	2.9218177	-60.0000000	CY
0.00008219	99073.	1205452959.	17.5371997	0.0014413	-0.0064487	2.9396620	-60.0000000	CY
0.00008469	99347.	1173098846.	17.4020156	0.0014737	-0.0066563	2.9548172	-60.0000000	CY
0.00008719	99616.	1142544122.	17.2757789	0.0015062	-0.0068638	2.9678240	-60.0000000	CY
0.00008969	99881.	1113660024.	17.1580645	0.0015389	-0.0070711	2.9786695	-60.0000000	CY
0.00009219	100144.	1086312248.	17.0482332	0.0015716	-0.0072784	2.9873266	-60.0000000	CY
0.00009469	100404.	1060375896.	16.9456449	0.0016045	-0.0074855	2.9937657	-60.0000000	CY
0.00009719	100660.	1035726162.	16.8495261	0.0016376	-0.0076924	2.9979555	-60.0000000	CY
0.00009969	100872.	1011878066.	16.7484820	0.0016696	-0.0079004	2.9998436	-60.0000000	CY
0.0001022	101055.	988917168.	16.6448450	0.0017009	-0.0081091	2.9962016	-60.0000000	CY
0.0001047	101224.	966914801.	16.5453197	0.0017321	-0.0083179	2.9969343	-60.0000000	CY
0.0001072	101391.	945920185.	16.4516142	0.0017634	-0.0085266	2.9993251	-60.0000000	CY
0.0001097	101556.	925862482.	16.3634153	0.0017949	-0.0087351	2.9993034	-60.0000000	CY
0.0001122	101717.	906671163.	16.2806907	0.0018265	-0.0089435	2.9934816	-60.0000000	CY
0.0001147	101877.	888301769.	16.2025740	0.0018582	-0.0091518	2.9971243	-60.0000000	CY
0.0001172	102035.	870701408.	16.1287861	0.0018901	-0.0093599	2.9993132	-60.0000000	CY
0.0001197	102192.	853820945.	16.0591022	0.0019221	-0.0095679	2.9997372	-60.0000000	CY
0.0001222	102330.	837482344.	15.9907939	0.0019539	-0.0097761	2.9943779	-60.0000000	CY
0.0001247	102450.	821650910.	15.9227068	0.0019854	-0.0099846	2.9949314	-60.0000000	CY
0.0001272	102567.	806422549.	15.8578164	0.0020169	-0.0101931	2.9978243	-60.0000000	CY
0.0001297	102665.	791634019.	15.7872144	0.0020474	-0.0104026	2.9994606	-60.0000000	CY
0.0001322	102760.	777381479.	15.7175793	0.0020777	-0.0106123	3.0000000	-60.0000000	CY
0.0001347	102853.	763642024.	15.6517988	0.0021081	-0.0108219	2.9954317	-60.0000000	CY
0.0001372	102945.	750398157.	15.5889712	0.0021386	-0.0110314	2.9913737	60.0000000	CY
0.0001522	103481.	679958419.	15.2669663	0.0023234	-0.0122866	2.9932632	60.0000000	CY
0.0001672	103906.	621494616.	15.0003914	0.0025079	-0.0135421	2.9999201	60.0000000	CY
0.0001822	104211.	572000868.	14.7539985	0.0026880	-0.0148020	2.9923641	60.0000000	CY
0.0001972	104462.	529761742.	14.5485556	0.0028688	-0.0160612	2.9990061	60.0000000	CY
0.0002122	104663.	493257241.	14.3944512	0.0030543	-0.0173157	2.9871322	60.0000000	CYT
0.0002272	104808.	461328850.	14.2701992	0.0032420	-0.0185680	2.9991623	60.0000000	CYT
0.0002422	104871.	433016772.	14.1635961	0.0034302	-0.0198198	2.9890042	60.0000000	CYT
0.0002572	104920.	407951979.	14.0783204	0.0036208	-0.0210692	2.9860383	60.0000000	CYT
0.0002722	104959.	385614269.	14.0096592	0.0038133	-0.0223167	2.9980774	60.0000000	CYT

Summary of Results for Nominal (Unfactored) Moment Capacity for Section 1

Moment values interpolated at maximum compressive strain = 0.003
or maximum developed moment if pile fails at smaller strains.

Load No.	Axial Thrust kips	Nominal Mom. Cap. in-kip	Max. Comp. Strain
1	64.290	104604.278	0.00300000

Note that the values of moment capacity in the table above are not factored by a strength reduction factor (phi-factor).

In ACI 318, the value of the strength reduction factor depends on whether the transverse reinforcing steel bars are tied hoops (0.65) or spirals (0.70).

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to ACI 318, Section 9.3.2.2 or the value required by the design standard being followed.

The following table presents factored moment capacities and corresponding bending stiffnesses computed for common resistance factor values used for reinforced concrete sections.

Axial Load No.	Resist. Factor for Moment	Nominal Moment Cap in-kips	Ult. (Fac) Ax. Thrust kips	Ult. (Fac) Moment Cap in-kips	Bend. Stiff. at Ult Mom kip-in^2
1	0.65	104604.	41.788500	67993.	2.5419E+09
1	0.70	104604.	45.003000	73223.	2.5325E+09
1	0.75	104604.	48.217500	78453.	2.4678E+09

Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	1.0000	0.00	N.A.	No	0.00	2213.
2	6.0000	5.0000	Yes	No	2213.	1189748.
3	15.0000	14.0000	Yes	No	1191961.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 39757.0 lbs
Applied moment at pile head = 59780568.0 in-lbs
Axial thrust load on pile head = 64290.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Bending Stiffness in-lb^2	Soil Res. p lb/inch	Soil Spr. Es*h lb/inch	Distrib. Lat. Load lb/inch
0.00	0.7765	5.98E+07	39757.	-0.00608	0.00	2.56E+12	0.00	0.00	0.00
0.2800	0.7562	5.99E+07	39757.	-0.00600	0.00	2.56E+12	0.00	0.00	0.00
0.5600	0.7362	6.01E+07	39757.	-0.00592	0.00	2.56E+12	0.00	0.00	0.00
0.8400	0.7164	6.02E+07	39757.	-0.00584	0.00	2.56E+12	0.00	0.00	0.00
1.1200	0.6969	6.03E+07	39756.	-0.00576	0.00	2.56E+12	-0.3706	1.7866	0.00
1.4000	0.6777	6.05E+07	39754.	-0.00568	0.00	2.56E+12	-1.2012	5.9552	0.00
1.6800	0.6588	6.06E+07	39748.	-0.00560	0.00	2.56E+12	-1.9848	10.1238	0.00
1.9600	0.6401	6.07E+07	39740.	-0.00552	0.00	2.56E+12	-2.7226	14.2924	0.00
2.2400	0.6216	6.09E+07	39730.	-0.00544	0.00	2.56E+12	-3.4154	18.4611	0.00
2.5200	0.6035	6.10E+07	39718.	-0.00536	0.00	2.56E+12	-4.0644	22.6297	0.00
2.8000	0.5856	6.11E+07	39703.	-0.00528	0.00	2.56E+12	-4.6704	26.7983	0.00
3.0800	0.5680	6.13E+07	39686.	-0.00520	0.00	2.56E+12	-5.2345	30.9670	0.00
3.3600	0.5506	6.14E+07	39668.	-0.00512	0.00	2.55E+12	-5.7577	35.1356	0.00
3.6400	0.5335	6.15E+07	39648.	-0.00504	0.00	2.55E+12	-6.2411	39.3042	0.00
3.9200	0.5167	6.17E+07	39626.	-0.00496	0.00	2.55E+12	-6.6856	43.4728	0.00
4.2000	0.5002	6.18E+07	39603.	-0.00488	0.00	2.55E+12	-7.0922	47.6415	0.00
4.4800	0.4839	6.19E+07	39578.	-0.00480	0.00	2.55E+12	-7.4621	51.8101	0.00
4.7600	0.4679	6.21E+07	39553.	-0.00472	0.00	2.55E+12	-7.7962	55.9787	0.00
5.0400	0.4522	6.22E+07	39526.	-0.00464	0.00	2.55E+12	-8.0955	60.1473	0.00
5.3200	0.4368	6.23E+07	39498.	-0.00455	0.00	2.55E+12	-8.3610	64.3160	0.00
5.6000	0.4216	6.25E+07	39470.	-0.00447	0.00	2.55E+12	-8.5939	68.4846	0.00
5.8800	0.4068	6.26E+07	39441.	-0.00439	0.00	2.55E+12	-8.7952	72.6532	0.00
6.1600	0.3921	6.27E+07	35058.	-0.00431	0.00	2.55E+12	-2600.	22275.	0.00
6.4400	0.3778	6.28E+07	26077.	-0.00422	0.00	2.55E+12	-2747.	24427.	0.00
6.7200	0.3638	6.29E+07	16606.	-0.00414	0.00	2.55E+12	-2891.	26699.	0.00
7.0000	0.3500	6.30E+07	6658.	-0.00406	0.00	2.55E+12	-3031.	29096.	0.00
7.2800	0.3365	6.30E+07	-3754.	-0.00398	0.00	2.55E+12	-3167.	31623.	0.00
7.5600	0.3233	6.29E+07	-14617.	-0.00389	0.00	2.55E+12	-3299.	34287.	0.00
7.8400	0.3103	6.29E+07	-25915.	-0.00381	0.00	2.55E+12	-3426.	37095.	0.00
8.1200	0.2977	6.28E+07	-37632.	-0.00373	0.00	2.55E+12	-3549.	40054.	0.00
8.4000	0.2853	6.26E+07	-49752.	-0.00364	0.00	2.55E+12	-3666.	43172.	0.00
8.6800	0.2732	6.24E+07	-62257.	-0.00356	0.00	2.55E+12	-3777.	46458.	0.00
8.9600	0.2614	6.22E+07	-75126.	-0.00348	0.00	2.55E+12	-3883.	49919.	0.00
9.2400	0.2498	6.19E+07	-88348.	-0.00340	0.00	2.55E+12	-3987.	53633.	0.00
9.5200	0.2385	6.16E+07	-101912.	-0.00332	0.00	2.55E+12	-4087.	57569.	0.00

9.8000	0.2275	6.12E+07	-115800.	-0.00324	0.00	2.56E+12	-4180.	61730.	0.00
10.0800	0.2168	6.08E+07	-129990.	-0.00316	0.00	2.56E+12	-4267.	66133.	0.00
10.3600	0.2063	6.04E+07	-144461.	-0.00308	0.00	2.56E+12	-4347.	70793.	0.00
10.6400	0.1961	5.99E+07	-159189.	-0.00300	0.00	2.56E+12	-4420.	75730.	0.00
10.9200	0.1862	5.93E+07	-174150.	-0.00292	0.00	2.56E+12	-4486.	80964.	0.00
11.2000	0.1765	5.87E+07	-189287.	-0.00284	0.00	2.56E+12	-4524.	86131.	0.00
11.4800	0.1671	5.80E+07	-204280.	-0.00277	0.00	2.56E+12	-4400.	88495.	0.00
11.7600	0.1579	5.73E+07	-218846.	-0.00269	0.00	2.56E+12	-4270.	90860.	0.00
12.0400	0.1490	5.66E+07	-232964.	-0.00261	0.00	2.57E+12	-4134.	93224.	0.00
12.3200	0.1403	5.58E+07	-246616.	-0.00254	0.00	2.57E+12	-3992.	95589.	0.00
12.6000	0.1319	5.49E+07	-259783.	-0.00247	0.00	2.57E+12	-3846.	97953.	0.00
12.8800	0.1237	5.40E+07	-272451.	-0.00240	0.00	2.57E+12	-3694.	100317.	0.00
13.1600	0.1158	5.31E+07	-284602.	-0.00233	0.00	2.57E+12	-3539.	102682.	0.00
13.4400	0.1081	5.21E+07	-296225.	-0.00226	0.00	2.58E+12	-3379.	105046.	0.00
13.7200	0.1006	5.11E+07	-307306.	-0.00219	0.00	2.58E+12	-3216.	107410.	0.00
14.0000	0.09336	5.00E+07	-317834.	-0.00213	0.00	2.58E+12	-3050.	109775.	0.00
14.2800	0.08633	4.89E+07	-327799.	-0.00206	0.00	2.58E+12	-2881.	112139.	0.00
14.5600	0.07951	4.78E+07	-337192.	-0.00200	0.00	2.59E+12	-2710.	114504.	0.00
14.8400	0.07290	4.67E+07	-346003.	-0.00194	0.00	2.59E+12	-2535.	116868.	0.00
15.1200	0.06649	4.55E+07	-354227.	-0.00188	0.00	2.59E+12	-2359.	119232.	0.00
15.4000	0.06028	4.43E+07	-361855.	-0.00182	0.00	2.60E+12	-2181.	121597.	0.00
15.6800	0.05426	4.31E+07	-368883.	-0.00176	0.00	2.60E+12	-2002.	123961.	0.00
15.9600	0.04843	4.18E+07	-375304.	-0.00171	0.00	2.61E+12	-1821.	126325.	0.00
16.2400	0.04277	4.06E+07	-381115.	-0.00166	0.00	2.61E+12	-1638.	128690.	0.00
16.5200	0.03730	3.93E+07	-386312.	-0.00160	0.00	2.62E+12	-1455.	131054.	0.00
16.8000	0.03199	3.80E+07	-390890.	-0.00155	0.00	2.62E+12	-1270.	133419.	0.00
17.0800	0.02685	3.66E+07	-394847.	-0.00151	0.00	2.63E+12	-1085.	135783.	0.00
17.3600	0.02187	3.53E+07	-398181.	-0.00146	0.00	2.68E+12	-899.0337	138147.	0.00
17.6400	0.01703	3.40E+07	-400888.	-0.00144	0.00	1.60E+13	-712.1692	140512.	0.00
17.9200	0.01222	3.26E+07	-402957.	-0.00143	0.00	1.61E+13	-519.5145	142876.	0.00
18.2000	0.00743	3.13E+07	-404369.	-0.00142	0.00	1.61E+13	-321.0784	145241.	0.00
18.4800	0.00266	2.99E+07	-405105.	-0.00142	0.00	1.61E+13	-116.8665	147605.	0.00
18.7600	-0.00209	2.85E+07	-405145.	-0.00141	0.00	1.61E+13	93.1183	149969.	0.00
19.0400	-0.00681	2.72E+07	-404469.	-0.00140	0.00	1.61E+13	308.8757	152334.	0.00
19.3200	-0.01152	2.58E+07	-403059.	-0.00140	0.00	1.61E+13	530.4080	154698.	0.00
19.6000	-0.01621	2.45E+07	-400895.	-0.00139	0.00	1.61E+13	757.7203	157062.	0.00
19.8800	-0.02088	2.31E+07	-397958.	-0.00139	0.00	1.61E+13	990.8199	159427.	0.00
20.1600	-0.02554	2.18E+07	-394227.	-0.00138	0.00	1.62E+13	1230.	161791.	0.00
20.4400	-0.03018	2.05E+07	-389684.	-0.00138	0.00	1.62E+13	1474.	164156.	0.00
20.7200	-0.03481	1.92E+07	-384309.	-0.00137	0.00	1.62E+13	1725.	166520.	0.00
21.0000	-0.03942	1.79E+07	-378083.	-0.00137	0.00	1.62E+13	1981.	168884.	0.00
21.2800	-0.04402	1.66E+07	-370985.	-0.00137	0.00	1.62E+13	2244.	171249.	0.00
21.5600	-0.04861	1.54E+07	-362996.	-0.00136	0.00	1.62E+13	2512.	173613.	0.00
21.8400	-0.05319	1.42E+07	-354097.	-0.00136	0.00	1.62E+13	2786.	175977.	0.00
22.1200	-0.05776	1.30E+07	-344267.	-0.00136	0.00	1.62E+13	3066.	178342.	0.00
22.4000	-0.06232	1.19E+07	-333486.	-0.00136	0.00	1.62E+13	3351.	180706.	0.00
22.6800	-0.06687	1.08E+07	-321735.	-0.00135	0.00	1.63E+13	3643.	183071.	0.00
22.9600	-0.07141	9719897.	-308994.	-0.00135	0.00	1.63E+13	3941.	185435.	0.00
23.2400	-0.07595	8704217.	-295241.	-0.00135	0.00	1.63E+13	4245.	187799.	0.00
23.5200	-0.08048	7736459.	-280458.	-0.00135	0.00	1.63E+13	4555.	190164.	0.00
23.8000	-0.08500	6820122.	-264623.	-0.00135	0.00	1.63E+13	4871.	192528.	0.00
24.0800	-0.08952	5958774.	-248150.	-0.00134	0.00	1.63E+13	4935.	185214.	0.00
24.3600	-0.09404	5153138.	-231486.	-0.00134	0.00	1.63E+13	4984.	178062.	0.00
24.6400	-0.09855	4403766.	-214668.	-0.00134	0.00	1.63E+13	5027.	171385.	0.00
24.9200	-0.1031	3711147.	-197714.	-0.00134	0.00	1.63E+13	5065.	165124.	0.00

25.2000	-0.1076	3075711.	-180604.	-0.00134	0.00	1.63E+13	5119.	159904.	0.00
25.4800	-0.1121	2498070.	-163302.	-0.00134	0.00	1.63E+13	5179.	155263.	0.00
25.7600	-0.1166	1978898.	-145806.	-0.00134	0.00	1.63E+13	5236.	150894.	0.00
26.0400	-0.1211	1518833.	-128125.	-0.00134	0.00	1.63E+13	5289.	146768.	0.00
26.3200	-0.1256	1118480.	-110268.	-0.00134	0.00	1.63E+13	5340.	142860.	0.00
26.6000	-0.1301	778409.	-92247.	-0.00134	0.00	1.63E+13	5387.	139149.	0.00
26.8800	-0.1346	499158.	-74071.	-0.00134	0.00	1.63E+13	5432.	135615.	0.00
27.1600	-0.1391	281233.	-55748.	-0.00134	0.00	1.63E+13	5474.	132242.	0.00
27.4400	-0.1436	125109.	-37289.	-0.00134	0.00	1.63E+13	5513.	129015.	0.00
27.7200	-0.1481	31228.	-18703.	-0.00134	0.00	1.63E+13	5550.	125921.	0.00
28.0000	-0.1526	0.00	0.00	-0.00134	0.00	1.63E+13	5583.	61475.	0.00

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 0.77652508 inches
Computed slope at pile head = -0.00607856 radians
Maximum bending moment = 62959792. inch-lbs
Maximum shear force = -405145. lbs
Depth of maximum bending moment = 7.28000000 feet below pile head
Depth of maximum shear force = 18.76000000 feet below pile head
Number of iterations = 216
Number of zero deflection points = 1

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type 1	Pile-head Load 1	Load Type 2	Pile-head Load 2	Axial Loading lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear in Pile lbs	Max Moment in Pile in-lbs
1	V, lb	39757.	M, in-lb	5.98E+07	64290.	0.7765	-0.00608	-405145.	6.30E+07

Maximum pile-head deflection = 0.7765250843 inches
Maximum pile-head rotation = -0.0060785553 radians = -0.348276 deg.

Summary of Warning Messages

The following warning was reported 3888 times

**** Warning ****

An unreasonable value was input for friction angle has been specified for a soil layer defined uisng the sand criteria. The input value is either smaller than 20 degrees or higher than 48 degrees. The input data should be checked for correctness.

The analysis ended normally.

Engineers Planners Surveyors Landscape Architects Environmental Scientists

MASER CONSULTING
— CONNECTICUT —

Antenna Mount Analysis

FOR

CT1051 – Willimantic ECSU

FA # 10035388
83 Windham Street
Willimantic, CT 06226
Windham County

Mount Utilization: 58.0%*

***Sufficient upon completion of the changes listed in the 'Recommendations' section of this report.**

March 1, 2019

Prepared For

AT&T
550 Cochituate Road
Framingham, MA 01701

Prepared By

Maser Consulting Connecticut
331 Newman Springs Road, Suite 203
Red Bank, NJ 07701
732.383.1950

Petros E. Tsoukalas, P.E.
Geographic Discipline Leader
Connecticut License No. 32557

MC Project No. 18946006A

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

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

Document Type	Remarks	Source
Previous Mount Analysis	*Maser Consulting Connecticut Project #: 18946006A Dated April 9, 2018*	*Maser Consulting Connecticut*
Radio Frequency Data Sheet (RFDS)	*RFDS ID: 1736989 Dated March 19, 2018*	*Smartlink, LLC*

Codes, Standards and Loading:
Jurisdictional adopted codes and standards:

- 2018 Connecticut State Building Code, Incorporating the 2015 International Building Code

Maser Consulting Connecticut utilized the following codes and standards:

- Structural Standards for Antenna Supporting Structures and Antennas and Small Wind Turbine Support Structures ANSI/TIA-222-H
  - Ultimate Wind Speed – 120 mph (3-Second Gust)
  - Exposure Category – B
  - Risk Category – II
  - Topographic Factor, K_{zt} – 1.0
  - Mean Base Elevation (AMSL) – 354.1’
  - Ice Wind Speed – 50 mph (3-Second Gust)
  - Design Ice Thickness – 1”
  - Maintenance Wind Speed – 30 mph
    - Maintenance Live Load – 250 lbs. at the worst-case location on the mount
    - Maintenance Live Load – 500 lbs. at the worst-case antenna location

The following equipment has been considered for the analysis of the antenna mount(s):

Quantity	Manufacturer	Antenna/ Appurtenance	Status	Sector
3	CCI	OPA65R-BU8B	Proposed	Alpha, Beta, & Gamma
3	POWERWAVE	7770	Existing	Alpha, Beta, & Gamma
3	KMW	AM-X-CD-17-65-00T-RET	Existing	Alpha, Beta, & Gamma
3	**KATHREIN**	**80010966**	**Proposed**	**Alpha, Beta, & Gamma**
2	**Raycap**	**DC6-48-60-18-8F**	**Existing/Proposed**	**Alpha & Beta**
3	ERICSSON	RRUS 11	Existing	Alpha, Beta, & Gamma
3	**ERICSSON**	**RRUS 4478 B14**	**Proposed**	**Alpha, Beta, & Gamma**
3	**ERICSSON**	**RRU 4415 B25**	**Proposed**	**Alpha, Beta, & Gamma**
3	**ERICSSON**	**RRUS 32**	**Proposed**	**Alpha, Beta, & Gamma**
3	ERICSSON	RRUS 12	Existing	Alpha, Beta, & Gamma
3	**ERICSSON**	**RRUS E2**	**Proposed**	**Alpha, Beta, & Gamma**
6	POWERWAVE	LGP 17205	Existing	Alpha, Beta, & Gamma
6	**KAELUS**	**DBC0061F1V51-2 (SINGLE)**	**Proposed**	**Alpha, Beta, & Gamma**

Analysis Approach:

The antenna mount in all sectors has been modeled in RISA-3D (V17), a comprehensive structural analysis program. The program performs design checks of structures under user specified loads. The user specified loads have been calculated separately based on the requirements of the above referenced codes and standards. The program performs an analysis based on the applicable steel code to determine the adequacy of the members and produces the reactions at the connection points of the mounts to the existing structure.

The scope of this assessment does not include analysis of the supporting tower structure. This mounting frame was not analyzed as an anchor attachment point for fall protection. All climbing activities are required to have a fall protection plan completed by a competent engineer.

Assumptions:

General Site Design Assumptions:

1. All engineering services are performed on the basis that the information provided to Maser Consulting Connecticut and used in this analysis is current and correct.
2. The mounting frames were properly fabricated, installed and maintained in good condition, twist free and plumb in accordance with its original design and manufacturer's specifications.
3. The connection from the tower to the mount is in good condition and has been analyzed and found sufficient assuming it will achieve its theoretical strength.
4. Due to site specific analysis parameters, it is assumed that wind forces will control over seismic forces and as such, seismic forces have not been considered in this analysis.
5. It is the responsibility of the client to ensure that the information provided to Maser Consulting Connecticut and used in the performance of our engineering services is correct and complete. In the absence of information to the contrary, we assume that the original design, material production, fabrication, and erection of the existing structure was performed in accordance with accepted industry design standards and in accordance with all applicable codes. Further, it is assumed that the existing structure and appurtenances have been properly maintained in accordance with all applicable codes and manufacturer's specifications and no structural defects and/or deterioration to the structural members has occurred.
6. All member connections are assumed to have been designed to meet or exceed the load carrying capacity of the connected member unless otherwise specified in this report.
7. The existing equipment loading has been applied at locations determined from the supplied documentation and field observations. Should the existing equipment configuration differ from what is utilized in this analysis, the results of this analysis are invalid.
8. All services are performed, results obtained, and recommendations made in accordance with generally accepted engineering principles and practices. Maser Consulting Connecticut is not responsible for the conclusion, opinions, and recommendations made by others based on the information supplied.

Site Specific Assumptions and Design Parameters:

1. Structural Steel Grades have been assumed as follows, if applicable, unless otherwise noted in this analysis:
   - Angle, Plate — ASTM A36 (Gr. 36)
   - HSS (Rectangular) — ASTM 500 (Gr. B-46)
   - Pipe — ASTM A53 (Gr. B-35)
   - Bolts — ASTM A325
2. All proposed equipment locations are to be as depicted in the rendered diagram in Appendix A of this report. Any changes made to the proposed equipment locations will render this report invalid.

Discrepancies between in-field conditions and the assumptions listed above may render this analysis invalid unless explicitly approved by Maser Consulting Connecticut

Calculations:

Selected calculations and analysis output can be found in Appendix A of this report.

Analysis Results and Conclusion:

Component	Utilization %	Pass/Fail
Face Horizontals	26.0	Pass
Standoff Horizontals	58.0	Pass
Antenna Pipe	37.1	Pass
Antenna Pipe 2	38.9	Pass
Support Rail	30.1	Pass
Support Rail Angle	18.2	Pass
Mount Connection	33.8	Pass

Structure Rating – *(Controlling Utilization of all Components)*	**58.0%**

Recommendation:

The existing mounting frame is sufficient for the final loading configuration once the below changes are made:

- Install handrail kit (Site Pro 1 Part #: HRK-12 or EOR approved equivalent) [mount modification sketch and specification sheet attached].

The conclusions reached by Maser Consulting Connecticut in this evaluation are only applicable for the structural members supporting the **AT&T** telecommunications installation described herein. Further, no structural qualifications are made or implied by this document for the existing structure. The mount was checked up to, and including, the bolts that fasten it to the mount collar. However, no structural qualifications are made or implied by this document for the mount collar.

Maser Consulting Connecticut reserves the right to amend this report if additional information regarding the members is provided. The conclusions reached by Maser Consulting Connecticut in this report are only valid for the appurtenances listed in this report. Any change to the installation will require a revision to this structural analysis.

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

Petros E. Tsoukalas, P.E.
Geographic Discipline Leader

Anthony Bassett
Engineer

Disclaimer of Warranties:

The engineering services rendered by Maser Consulting Connecticut in connection with this structural analysis are limited to a computer analysis of the mounting frame structure and theoretical capacity of its main structural members. No allowance has been made for any damaged, bent, missing, loose, or rusted members or connections.

Maser Consulting Connecticut will accept no liability which may arise due to any deficiency in design, material, fabrication, erection, construction, or lack of maintenance. Maser Consulting Connecticut has not performed a site visit of the mounting frame to verify member sizes or equipment loading. Contractor should inspect the condition of the existing structure, mounting frames and connections and notify Maser Consulting Connecticut of any discrepancies or deficiencies before proceeding with installation.

The attached sketch is a schematic representation of the analyzed mounting frames. The contractor shall be responsible for field verifying the existing conditions, proper fit, and clearances in the field. Any mention of structural modifications are reasonable estimates and should not be used as a construction document. Construction documents depicting the required modification are obtainable from Maser Consulting Connecticut, but are beyond the scope of this report.

Miscellaneous items such as antenna mounts, etc., have not been designed or detailed as part of our work. We recommend that material of suitable size and strength be purchased from a reputable manufacturer.

Maser Consulting Connecticut makes no warranties, expressed and/or implied, in connection with this report and disclaims any liability arising from material, fabrication, and erection of the mounting frames. Maser Consulting Connecticut will not be responsible whatsoever for, or on account of, consequential or incidental damages sustained by any person, firm, or organization as a result of any data or conclusions contained in this report.

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APPENDIX A

LOADING SUMMARY

Quantity	Manufacturer	Antenna/ Appurtenance	Status	Sector
3	CCI	OPA65R-BU8B	Proposed	Alpha, Beta, & Gamma
3	POWERWAVE	7770	Existing	Alpha, Beta, & Gamma
3	KMW	AM-X-CD-17-65-00T-RET	Existing	Alpha, Beta, & Gamma
3	**KATHREIN**	**80010966**	**Proposed**	**Alpha, Beta, & Gamma**
2	**Raycap**	**DC6-48-60-18-8F**	**xisting/Propos**	**Alpha & Beta**
3	ERICSSON	RRUS 11	Existing	Alpha, Beta, & Gamma
3	**ERICSSON**	**RRUS 4478 B14**	**Proposed**	**Alpha, Beta, & Gamma**
3	**ERICSSON**	**RRU 4415 B25**	**Proposed**	**Alpha, Beta, & Gamma**
3	**ERICSSON**	**RRUS 32**	**Proposed**	**Alpha, Beta, & Gamma**
3	ERICSSON	RRUS 12	Existing	Alpha, Beta, & Gamma
3	**ERICSSON**	**RRUS E2**	**Proposed**	**Alpha, Beta, & Gamma**
6	POWERWAVE	LGP 17205	Existing	Alpha, Beta, & Gamma
6	**KAELUS**	**DBC0061F1V51-2 (SINGLE)**	**Proposed**	**Alpha, Beta, & Gamma**

I. DESIGN INPUTS

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

Wind Load Inputs Parameters

				Reference	Equation
Antenna Centerline	z	138	ft		
Ultimate Wind Speed	V_u	120	mph		
Normal Wind Speed with Ice (3 sec. Gust):	V_i	50	mph	Figure B9, p. 238	
Maintenace Wind Speed:	V_s	30	mph	Section 2.8.3	
Design Ice Thickness	t_i	1.0	in	Figure B9, p. 238	
Surface Roughness:		B		Section 2.6.5.1.1	
Exposure Category:		B		Section 2.6.5.1.2	
Risk Category:		II		Table 2-1	
Rooftop Wind Speed-Up Factor	K_s	1.0		Section 2.6.7	
Ground Elevation:		354.1	ft		
Ground Elevation Factor:	K_e	0.98726		Table 2-6	
Gust Effect Factor:	G_h	1.00		Section 2.6.9	
Wind Directionality Factor:	K_d	0.95		Table 2-2	
Topographic Category:		1		Section 2.6.6.2	
Shielding Factor	K_a	0.9		Section 16.6	

Wind Load Coefficients

Importance Factors:					
Iced:	I_{ice}	1		Table 2-3	
Exposure Category Coefficients:					
3-s Gust-Speed Power Law Exponent:	α	7.0		Table 2-4	
Nominal Height of the Atmospheric Boundary Layer:	Z_g	1200	ft	Table 2-4	
Min. Value for k_z:	Kz_{min}	0.70		Table 2-4	
Terrain Constant:	K_e	0.90		Table 2-4	
Velocity Pressure Exposure Coefficient:	K_z	1.083		Section 2.6.5.2	$=2.01\cdot(z/z_g)^{2/\alpha'}$
Topographic Category Coefficients:					
Topographic Constant:	K_t	N/A		Table 2-5	
Height Attenuation Factor:	f	N/A		Table 2-5	
Height Reduction Factor:	K_h	N/A		Section 2.6.6.2.1	$=e^{(f\cdot z/H)}$
Topographic Factor:	K_{zt}	1.00		Section 2.6.6.2	$=[1+(K_c\cdot K_t/K_h)]^2$
Ice Accumulation:					
Ice Velocity Pressure Exposure Coefficient:	K_{iz}	1.15			$=(z/33)^{0.10}$
Factored Ice Thickness:	t_{iz}	1.15	in	Section 2.6.10	$=t_i\cdot I\cdot K_{iz}\cdot(K_{zt})^{0.35}$
Ice Density:	ρ_i	56.00	pcf		

Design Wind Pressures:

Velocity Pressure:	q_z	33.72	psf	Section 2.6.11.6	$=0.00256\cdot K_z\cdot K_{zt\cdot Ks\cdot Ke}\cdot K_d\cdot K_a\cdot V^2$
Velocity Pressure (With Ice):	q_{zi}	5.85	psf	Section 2.6.11.6	$=0.00256\cdot K_z\cdot K_{zt\cdot Ks\cdot Ke}\cdot K_d\cdot K_a\cdot V_i^2$
Velocity Pressure (Maintenance):	q_{zm}	2.11	psf	Section 2.6.11.6	$=0.00256\cdot K_z\cdot K_{zt\cdot Ks\cdot Ke}\cdot K_d\cdot K_a\cdot V_m^2$

II. CALCULATIONS

▪ *Wind Load on Appurtenances*

Dimensions and Force Coefficients

Antenna/ Appurtenance	Non-Iced Condition								Iced Condition							
	Mounting Pipe			Equipment					Mounting Pipe			Equipment				
	Length (in)	Diameter (in)	Force Coefficient C_a	Height (in)	Width (in)	Depth (in)	Force Coefficient $C_{a\ Front}$	Force Coefficient $C_{a\ Side}$	Length (in)	Diameter (in)	Force Coefficient C_a	Height (in)	Width (in)	Depth (in)	Force Coefficient $C_{a\ Front}$	Force Coefficient $C_{a\ Side}$
OPA65R-BU8B	108.0	2.375	1.200	95.90	11.70	8.40	1.44	1.55	110.3	4.7	1.168	98.21	14.01	10.71	1.40	1.47
7770	108.0	2.375	1.200	55.00	11.00	5.00	1.31	1.53	110.3	4.7	1.168	57.31	13.31	7.31	1.28	1.43
AM-X-CD-17-65-00T-RET	108.0	2.375	1.200	96.00	11.80	6.00	1.44	1.70	110.3	4.7	1.168	98.31	14.11	8.31	1.40	1.56
80010966	108.0	2.375	1.200	96.00	20.00	6.90	1.30	1.63	110.3	4.7	1.168	98.31	22.31	9.21	1.28	1.52
RRUS 4478 B14	0.0	0.000	0.000	18.10	13.40	8.30	1.20	1.20	0.0	0.0	0.000	20.41	15.71	10.61	1.20	1.20
RRU 4415 B25	0.0	0.000	0.000	15.00	13.20	5.40	1.20	1.21	0.0	0.0	0.000	17.31	15.51	7.71	1.20	1.20
LGP 17205	0.0	0.000	0.000	14.40	13.90	3.70	1.20	1.26	0.0	0.0	0.000	16.71	16.21	6.01	1.20	1.21
DBC0061F1V51-2 (SINGLE)	0.0	0.000	0.000	8.00	6.20	3.20	1.20	1.20	0.0	0.0	0.000	10.31	8.51	5.51	1.20	1.20

Antenna/ Appurtenance	# of Brackets	Non-Iced Condition			Iced Condition			Maintenance Condition	
		Wind Force (lbs.) F_N	Wind Force (lbs.) F_T	Gravity (lbs.)	Wind Force (lbs.) F_N	Wind Force (lbs.) F_T	Gravity (lbs.)	Wind Force (lbs.) F_N	Wind Force (lbs.) F_T
OPA65R-BU8B	2	193.2	181.9	**40.8**	40.5	43.7	**89.7**	12.1	11.4
7770	2	110.5	85.4	**17.5**	25.9	24.4	**44.6**	6.9	5.3
AM-X-CD-17-65-00T-RET	2	194.7	150.6	**37.3**	40.8	38.2	**83.1**	12.2	9.4
80010966	2	296.7	162.4	**62.9**	58.6	40.3	**128.8**	18.5	10.2
RRUS 4478 B14	1	68.1	42.2	**59.4**	15.6	10.6	**40.6**	4.3	2.6
RRU 4415 B25	1	55.6	23.0	**44.0**	13.1	6.5	**31.3**	3.5	1.4
LGP 17205	1	56.2	15.7	**41.0**	13.2	4.9	**30.5**	3.5	1.0
DBC0061F1V51-2 (SINGLE)	1	13.9	7.2	**9.5**	4.3	2.8	**9.8**	0.9	0.4

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

▪ *Wind Load on Framing Members*

Member Category	Member Shape	Length (in)	Member Surface	Non-Iced Condition			Iced Condition						Maintenance Condition
				Exposed Wind Height (in)	Force Coefficient C_a	Wind Load (plf)	Exposed Wind Height (in)	Depth (in)	Length (in)	Force Coefficient C_a	Wind Load (plf)	Ice Weight (plf)	Wind Load (plf)
Pipe	Pipe 2.0	108	Round	2.38	1.20	8.01	4.68	4.68	110.31	1.20	2.74	4.97	0.50
Pipe	Pipe 2.5	108	Round	2.88	1.20	9.69	5.18	5.18	110.31	1.20	3.03	5.68	0.61
Square HSS	HSS 4x4x1/4	168	HSS	4.00	1.25	14.05	6.31	6.31	170.31	1.25	3.85	9.60	0.88
Square HSS	HSS 4x4x1/4	92	HSS	4.00	1.21	13.61	6.31	6.31	94.31	1.21	3.73	9.60	0.85
Pipe	Pipe 2.0	150	Round	2.38	1.20	8.01	4.68	4.68	152.31	1.20	2.74	4.97	0.50
Equal Angle	L2.5x2.5	15	Square	2.50	1.36	9.52	4.81	4.81	17.31	1.36	3.18	6.61	0.60
												Grating	10.73 psf

BASIC EQUATIONS

ANSI/TIA-222-H Reference

Force Coefficient: (Square) — Table 2-9

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

Force Coefficient: (Round) — Table 2-9

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

Terrain Exposure Constants: — Table 2-5

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

BASIC EQUATIONS

ANSI/TIA-222-H Reference

Velocity Pressure Coefficient: — Section 2.6.5.6

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

$$K_z := Kz(z)$$

Table 2-4

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

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

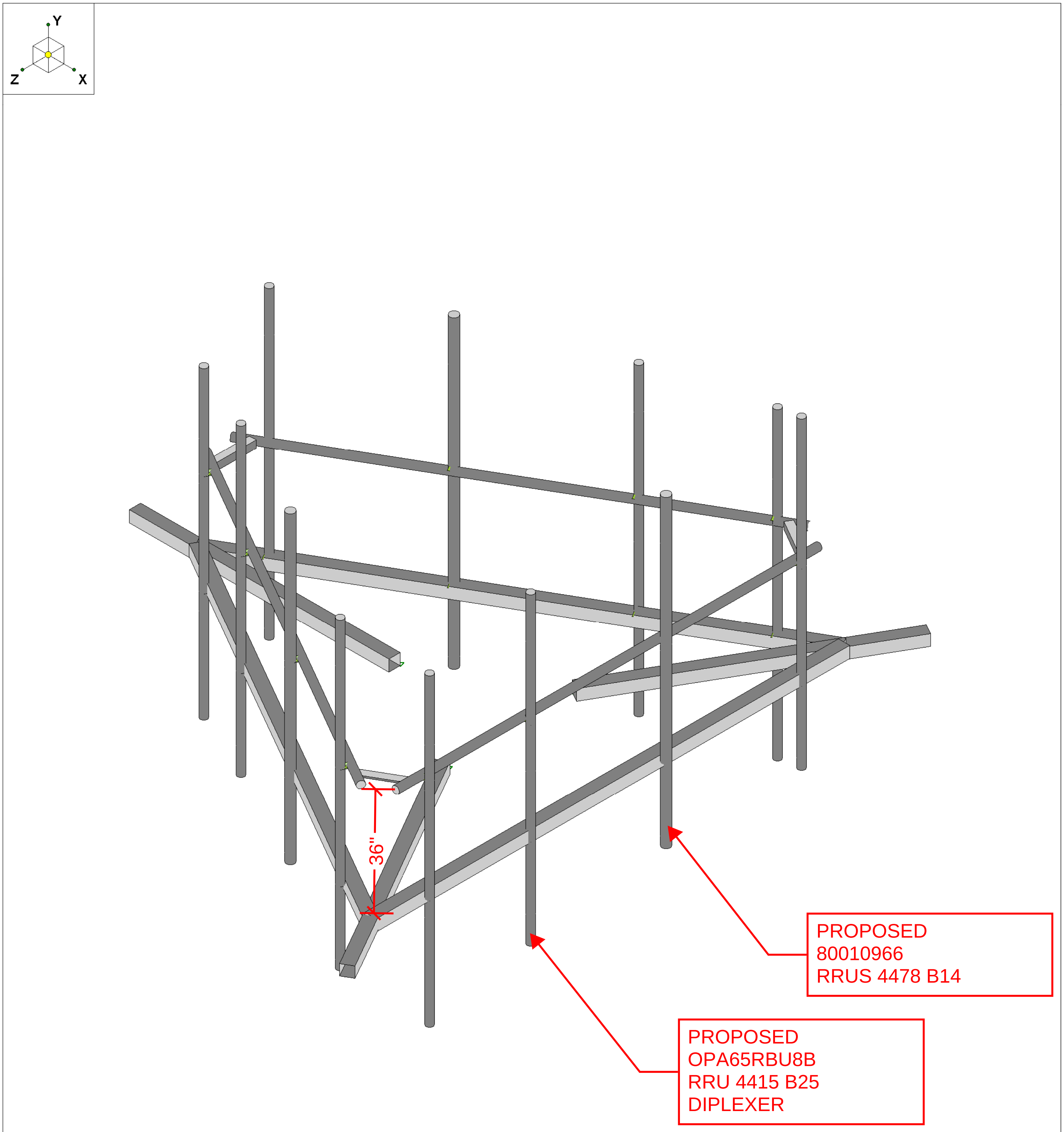
Velocity Pressure: — Section 2.6.9.6

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

LOAD EQUATIONS

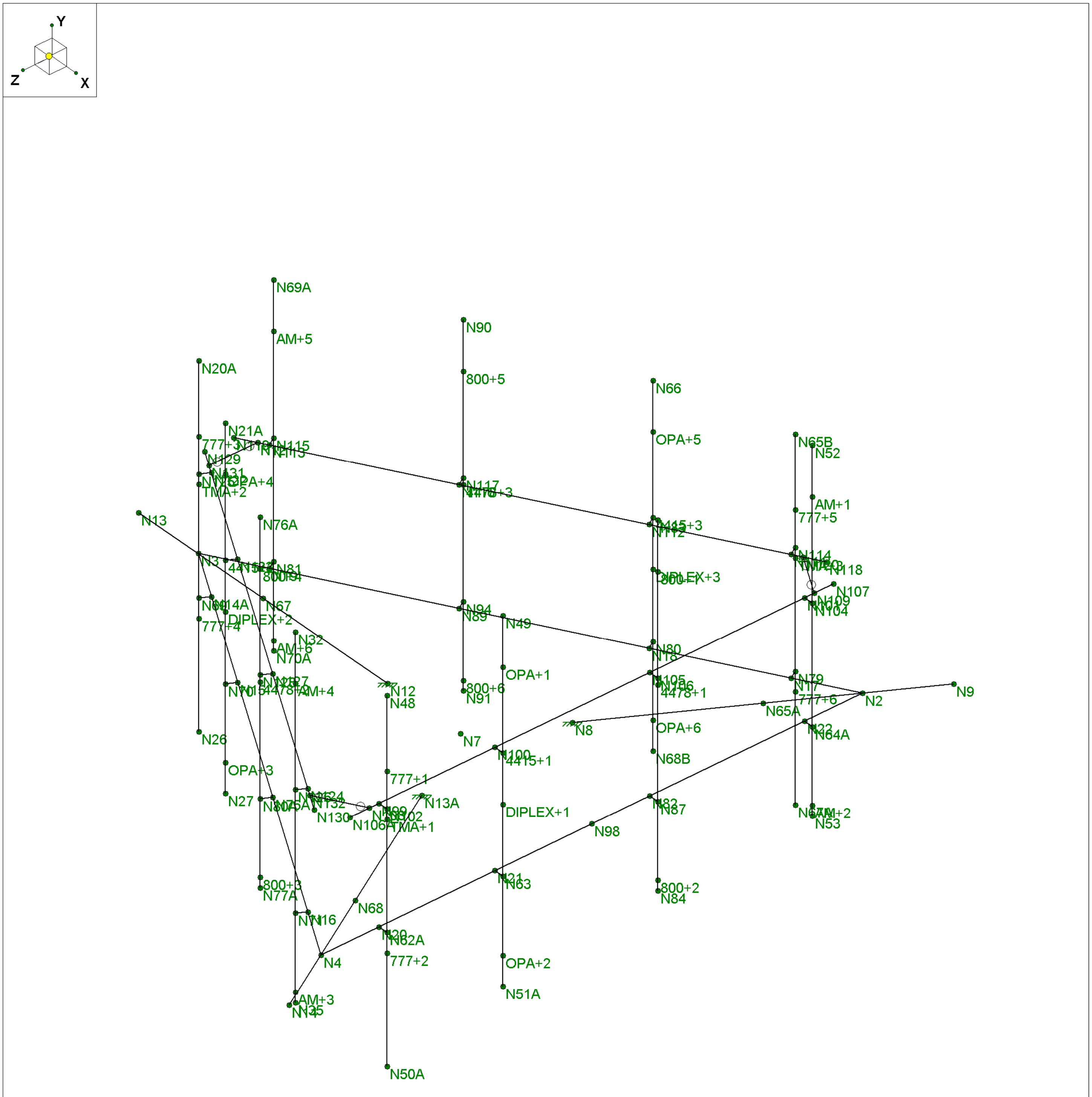
WIND LOAD

Area (Normal):	$AN_{area} = H_{ant} \cdot Want$
Area (Side):	$AT_{area} = H_{ant} \cdot Dant$
Force Coefficient (Normal):	$C_{fn} = C_{fsquare}(H_{ant}, Want)$
Force Coefficient (Side):	$C_{fs} = C_{fsquare}(H_{ant}, Dant)$
Pipe Area (Normal):	$AN_p = \max[(L_p - H_{ant}) * Dp , 0]$
Pipe Area (Side):	$AT_p = L_p \cdot Dp$
Force Coefficient (Normal):	$C_{fp} = C_{fround}(Lp, Dp)$
Normal Effective Projected Area:	$E_{pan} = (C_{fn} \cdot ANarea) + (Cfp \cdot ANp)$
Side Effective Projected Area:	$E_{pat} = (C_{fs} \cdot ATarea) + (Cfp \cdot ATp)$
Effective Projected Area:	$EPA = max(E_{pan}, Epat)$
Wind Force:	$F_{ant} = q_z \cdot Gh \cdot EPA$



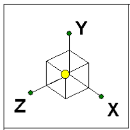
Envelope Only Solution

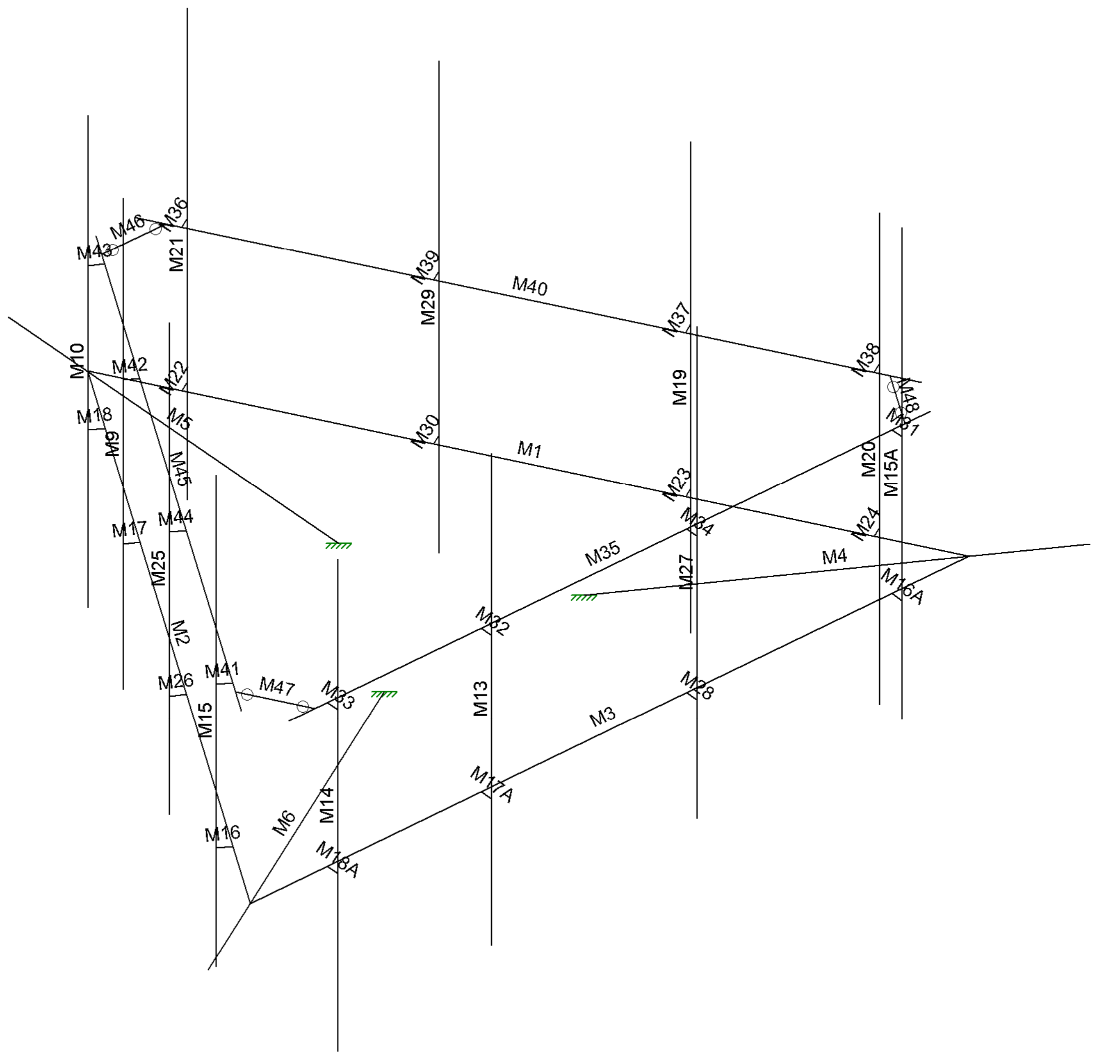
Maser Consulting Connecti...		SK - 1
AB	Mount Analysis	Mar 1, 2019 at 1:51 PM
18946006A	Rendered Model	Williamantic ECSU.r3d



Envelope Only Solution

Maser Consulting Connecti...		SK - 2
AB	Mount Analysis	Mar 1, 2019 at 1:56 PM
18946006A	Joints	Williamantic ECSU.r3d





Envelope Only Solution

Maser Consulting Connecti...		SK - 3
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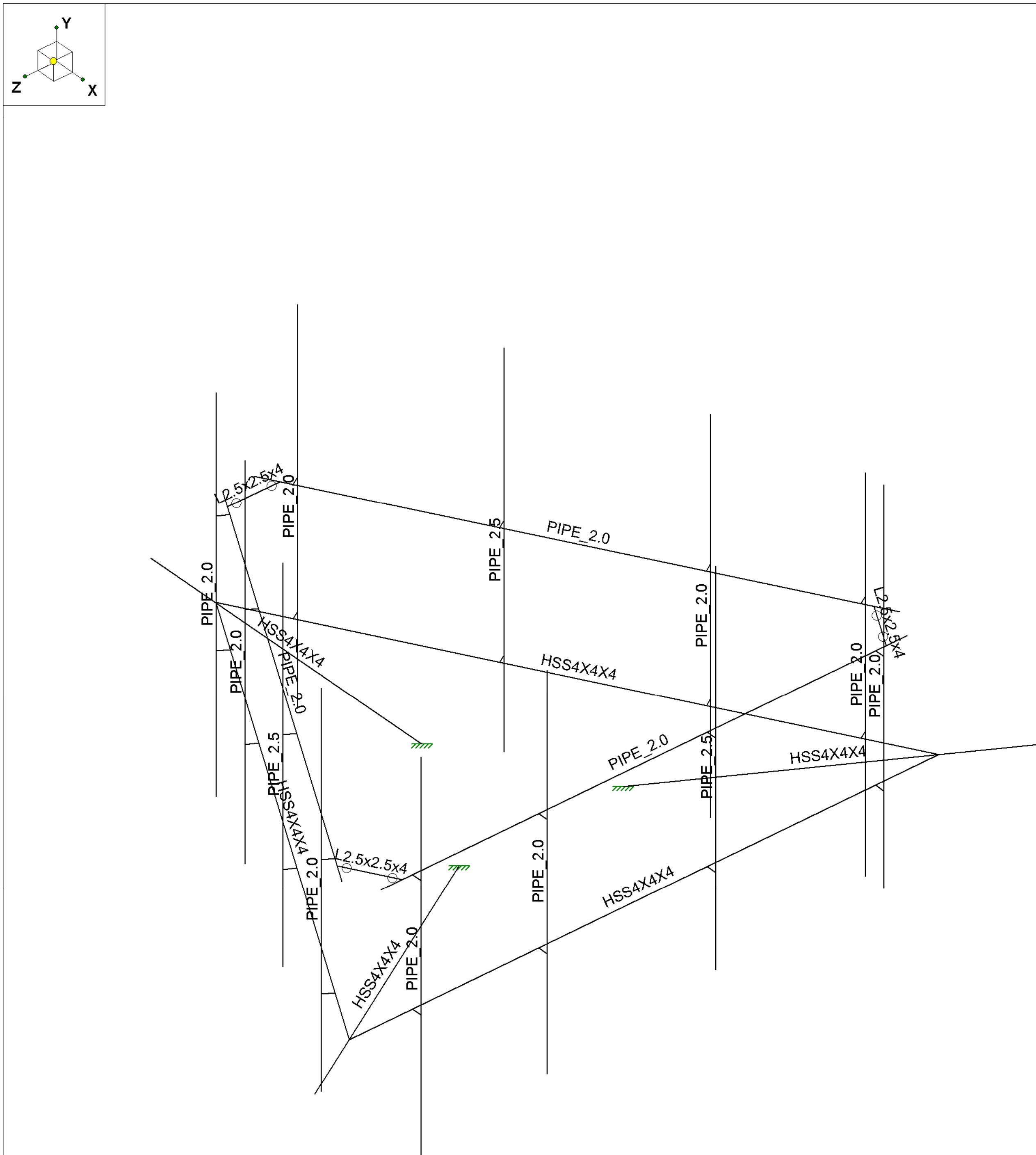

Envelope Only Solution

Maser Consulting Connecti...		SK - 4
AB	Mount Analysis	Mar 1, 2019 at 1:57 PM
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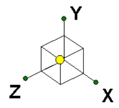
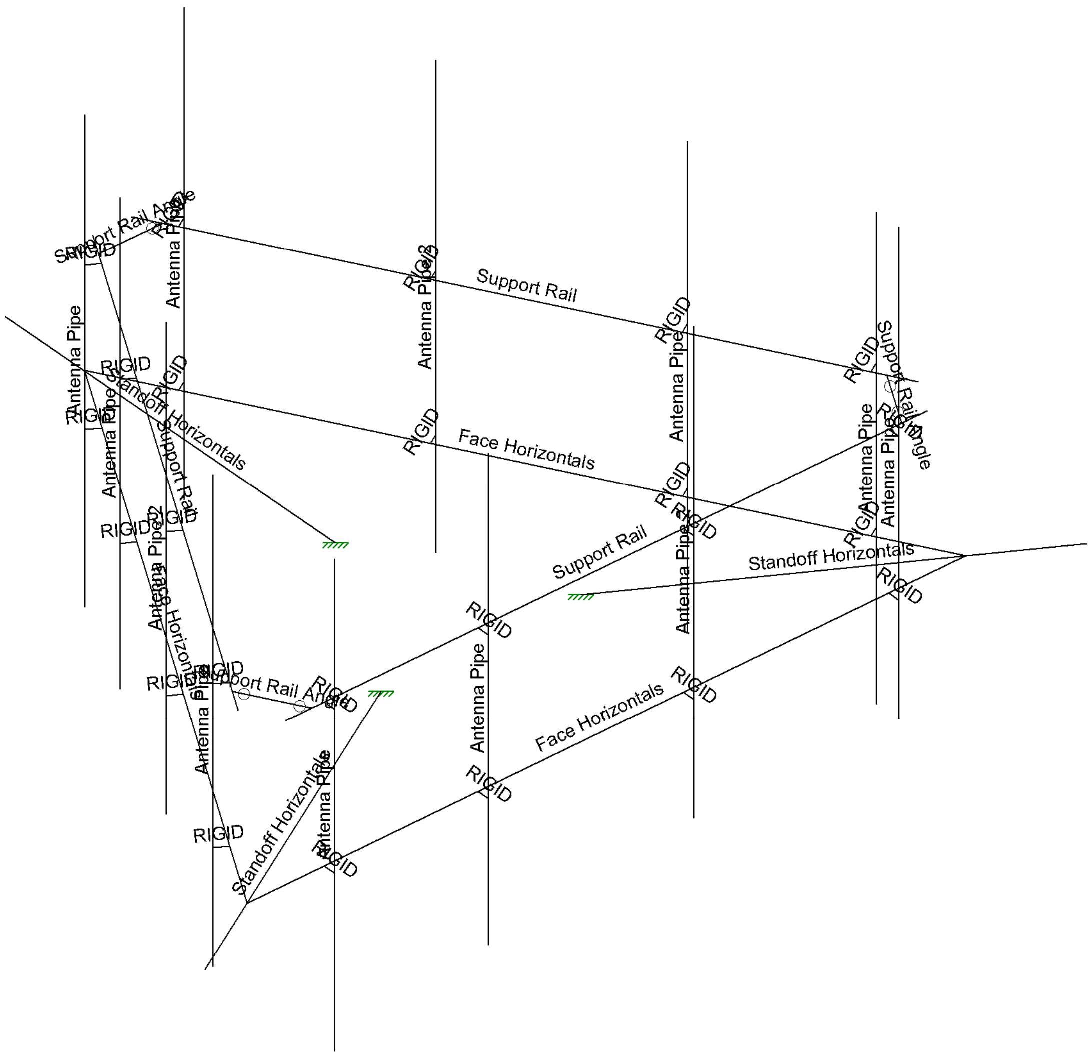
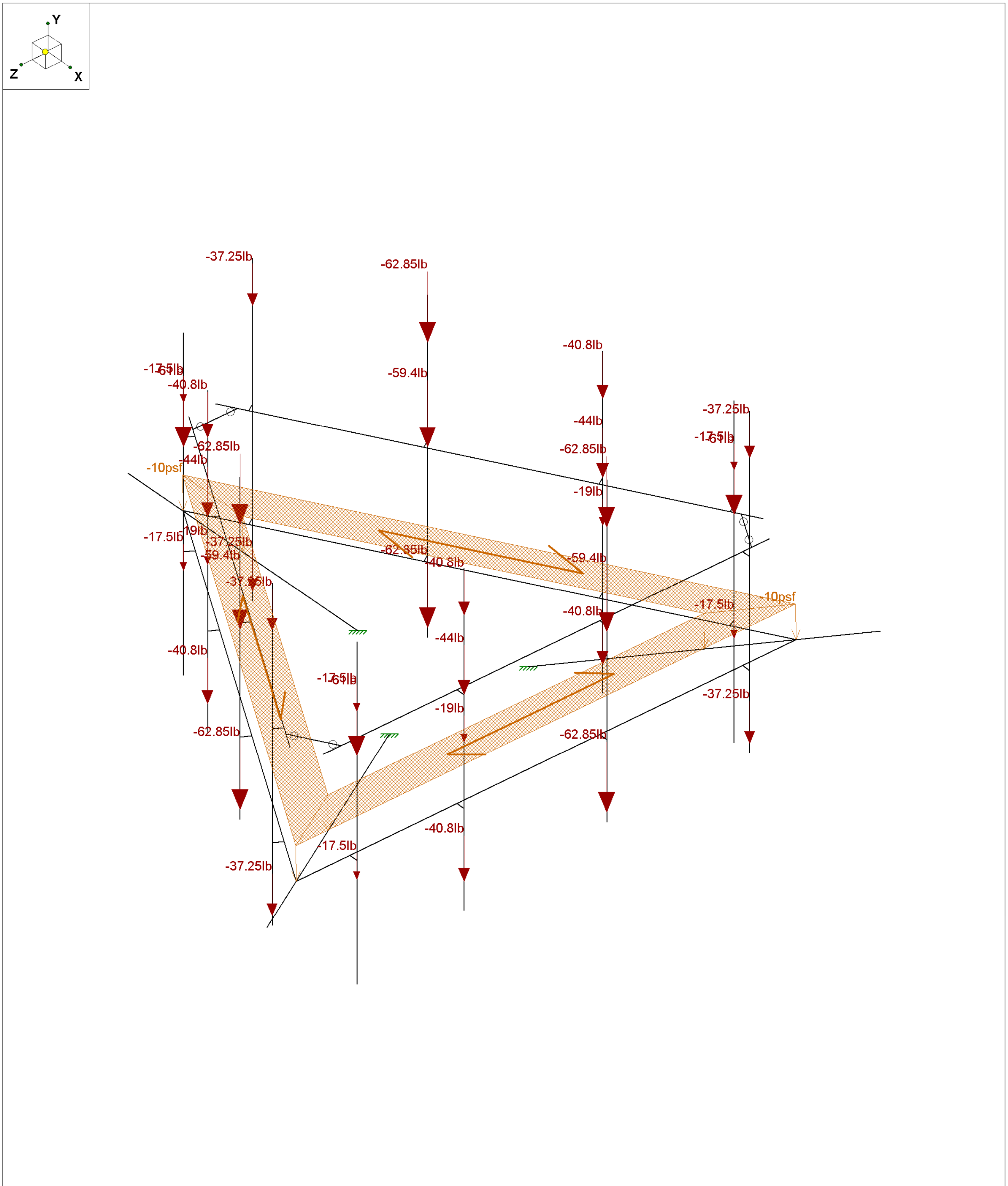




Envelope Only Solution

Maser Consulting Connecti...		SK - 5
AB	Mount Analysis	Mar 1, 2019 at 1:57 PM
18946006A	Section Set	Williamantic ECSU.r3d



Loads: BLC 1, Dead
Envelope Only Solution

Maser Consulting Connecti...		SK - 6
AB	Mount Analysis	Mar 1, 2019 at 1:57 PM
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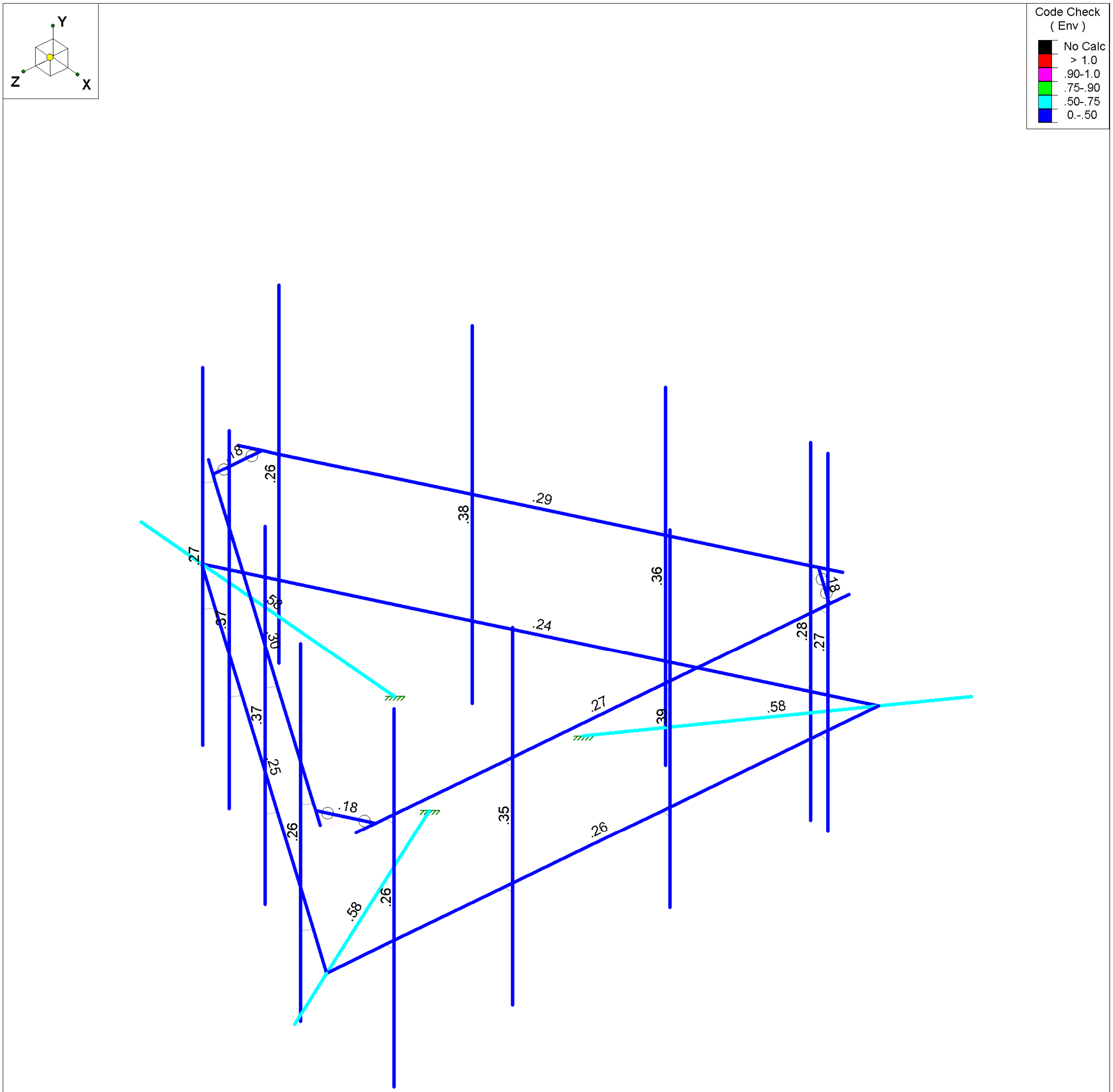

Member Code Checks Displayed (Enveloped)
Envelope Only Solution

Maser Consulting Connecti...		SK - 7
AB	Mount Analysis	Mar 1, 2019 at 1:58 PM
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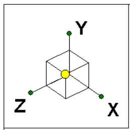
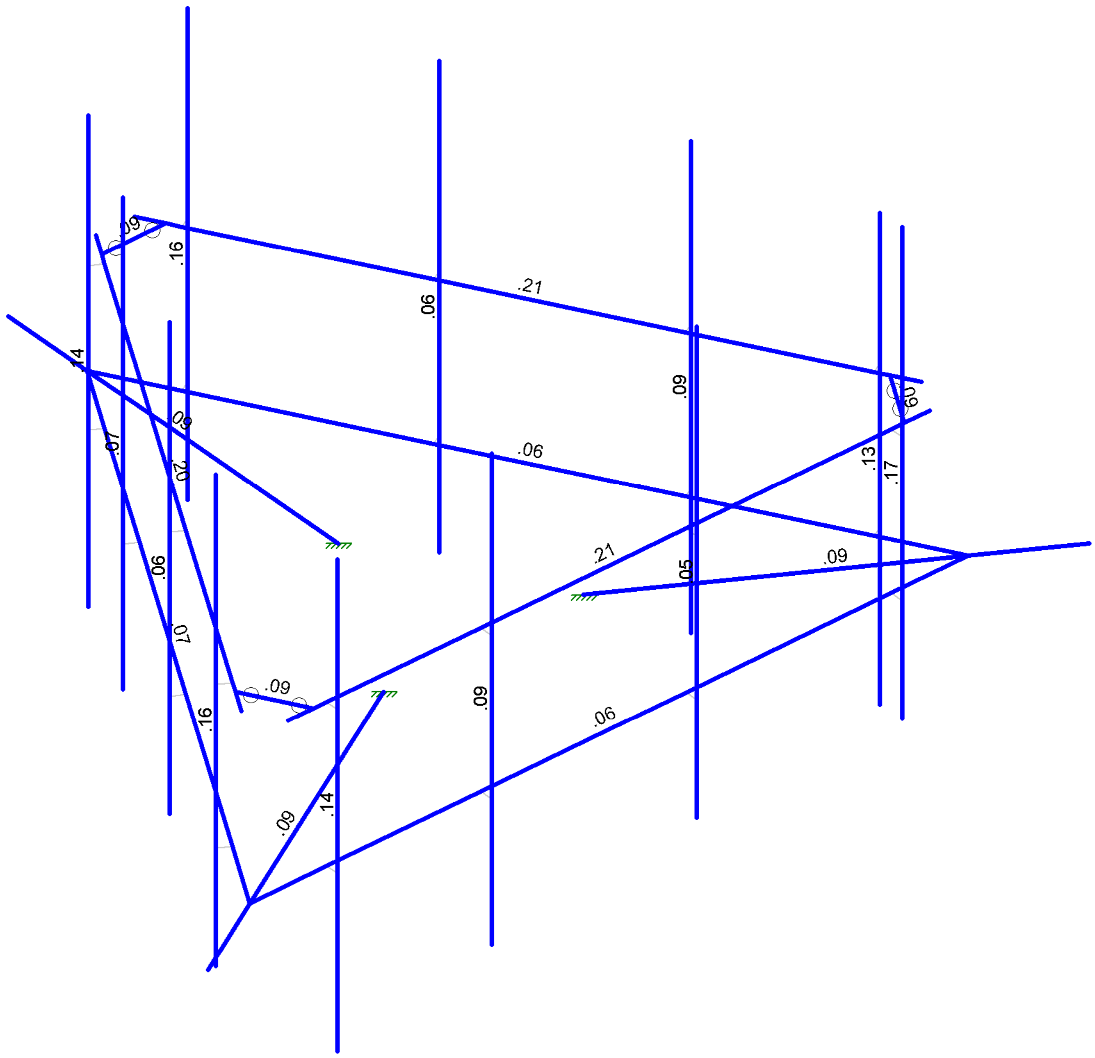




Shear Check (Env)
No Calc
> 1.0
.90-1.0
.75-.90
.50-.75
0.-.50

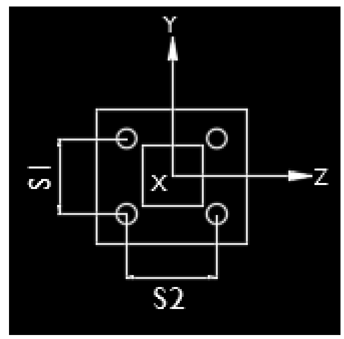
Member Shear Checks Displayed (Enveloped)
Envelope Only Solution

Maser Consulting Connecti...		SK - 8
AB	Mount Analysis	Mar 1, 2019 at 1:58 PM
18946006A	Shear Check	Williamantic ECSU.r3d

Mount to Monopole Ring Mount Kit Connection Check:

Applied Tension:	$Rx := 2835.0 \cdot lbf$	From Risa 3D LRFD Loading
Applied Shear:	$Ry := 2797.3 lbf$	From Risa 3D LRFD Loading
Applied Shear:	$Rz := 682.9 \cdot lbf$	From Risa 3D LRFD Loading
Applied Torque:	$Mx := 683.9 \cdot lbf \cdot ft$	From Risa 3D LRFD Loading
Applied Moment:	$My := 1606.142 lbf \cdot ft$	From Risa 3D LRFD Loading
Applied Moment:	$Mz := 9228.4 \cdot lbf \cdot ft$	From Risa 3D LRFD Loading
Number of Bolts:	$n := 4$	Per Mapping
Bolts Vertical Spacing:	$S_1 := 9in$	Per Mapping
Bolts Horizontal Spacing:	$S_2 := 3in$	Per Mapping

Applied Tension at Bolt: $P_{a.t} := \frac{Rx}{n} + \frac{2My}{n \cdot S_2} + \frac{2Mz}{n \cdot S_1} = 10073.3\ lbf$



Applied Shear at Bolt: $P_{a.v} := \frac{\sqrt{Ry^2 + Rz^2}}{n} + \frac{2Mx}{n\sqrt{S_1^2 + S_2^2}} = 1152.4\ lbf$

Bolt Type Used: **A325N**

Nominal Tensile Stress, Fnt:	$F_{n.t} := 90ksi$	AISC, Table J3-2, P. 16.1-104
Nominal Shear Stress, Fnv:	$F_{n.v} := 54ksi$	AISC, Table J3-2, P. 16.1-104
Nominal Bolt Diameter:	$d_b := \frac{3}{4} in$	Per Mapping
Gross Area of the Bolt:	$A_{b.g} := 0.442 in^2$	AISC, Table 7-18, P. 7-83
Net Area of the Bolt:	$A_{b.n} := 0.334 in^2$	AISC, Table 7-18, P. 7-83
Strength Reduction Factor, ϕ:	$\phi := 0.75$	

Applied Tensile Stress: $F_{a.t} := \frac{P_{a.t}}{A_{b.g}} = 22.8 \cdot ksi$

Applied Shear Stress: $F_{a.v} := \frac{P_{a.v}}{A_{b.g}} = 2.6 \cdot ksi$

Combined Tension And Shear Check

Nominal Tensile Stress, Fnt: $F_{n.t} = 90 \cdot ksi$

Nominal Shear Stress, Fnv: $F_{n.v} = 54 \cdot ksi$

Nominal Tensile Reduced Fntr

$$F_{n.t.r} := 1.3 \cdot F_{n.t} - \frac{F_{n.t}}{\phi \cdot F_{n.v}} \cdot \frac{P_{a.v}}{A_{b.g}} = 111.2 \cdot ksi$$

AISC Eq. J3-3a, P. 16.1-109

$$F_{n.t.r} := \begin{cases} F_{n.t.r} & \text{if } F_{n.t.r} \le F_{n.t} \\ F_{n.t} & \text{otherwise} \end{cases} = 90 \cdot ksi$$

Nominal Shear Reduced Fntv

$$F_{n.v.r} := 1.3 \cdot F_{n.v} - \frac{F_{n.v}}{\phi \cdot F_{n.t}} \cdot \frac{P_{a.t}}{A_{b.g}} = 52 \cdot ksi$$

AISC Eq. J3-3a, P. 16.1-109

$$F_{n.v.r} := \begin{cases} F_{n.v.r} & \text{if } F_{n.v.r} \le F_{n.v} \\ F_{n.v} & \text{otherwise} \end{cases} = 52 \cdot ksi$$

Avalaible Tensile Stress:

$$F_{n.t} := \begin{cases} F_{n.t} & \text{if } \frac{F_{a.t}}{F_{n.t}} \le 30\% \\ F_{n.t.r} & \text{otherwise} \end{cases} = 90 \cdot ksi$$

Bolt Nominal Tensile Strength

$$R_{n.t} := F_{n.t} \cdot A_{b.g} = 39.8 \cdot kip$$

Tension Check

$$Check := \begin{cases} \text{"OK"} & \text{if } \phi \cdot R_{n.t} \ge P_{a.t} \\ \text{"NOT GOOD"} & \text{otherwise} \end{cases}$$

Check = "OK"

Tension Ratio

$$Ratio_t := \frac{P_{a.t}}{\phi \cdot R_{n.t}} \qquad Ratio_t = 33.8 \cdot \%$$

Avalaible Shear Stress:

$$F_{n.v} := \begin{cases} F_{n.v} & \text{if } \frac{F_{a.v}}{F_{n.v}} \le 30\% \\ F_{n.v.r} & \text{otherwise} \end{cases} = 54 \cdot ksi$$

Bolt Nominal Shear Strength

$$R_{n.v} := F_{n.v} \cdot A_{b.g} = 23.9 \cdot kip$$

Shear Check

$$Check := \begin{cases} \text{"OK"} & \text{if } \phi \cdot R_{n.v} \ge P_{a.v} \\ \text{"NOT GOOD"} & \text{otherwise} \end{cases}$$

Check = "OK"

Shear Ratio

$$Ratio_v := \frac{P_{a.v}}{\phi \cdot R_{n.v}} = 6.4 \cdot \%$$

ASCE
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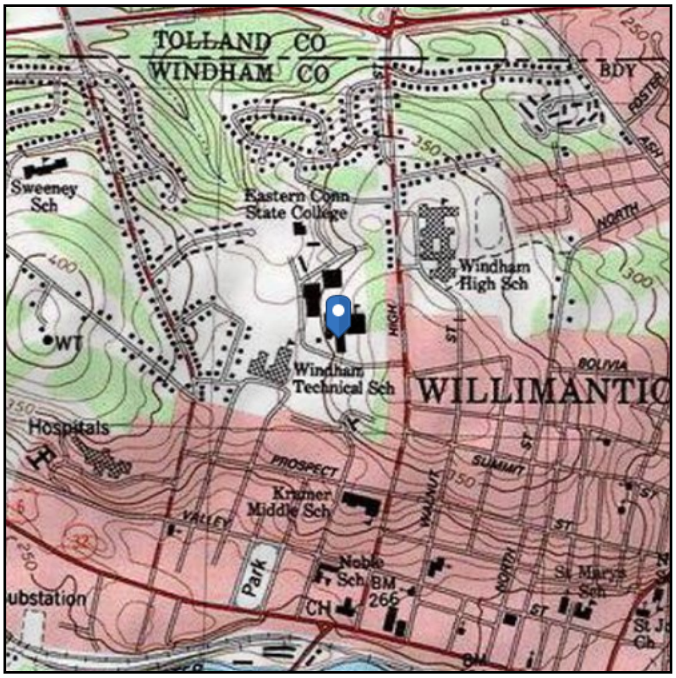
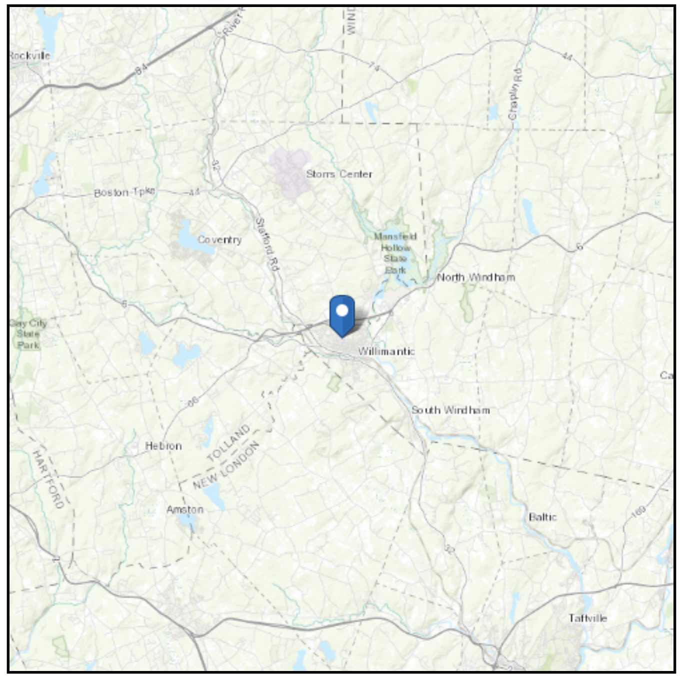
ASCE 7 Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-16
Risk Category: II
Soil Class: D - Default (see Section 11.4.3)

Elevation: 354.08 ft (NAVD 88)
Latitude: 41.720589
Longitude: -72.21818





Wind

Results:

Wind Speed:	120 Vmph
10-year MRI	75 Vmph
25-year MRI	84 Vmph
50-year MRI	93 Vmph
100-year MRI	99 Vmph
Data Source:	ASCE/SEI 7-16, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4
Date Accessed:	Fri Mar 01 2019

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-16 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years).

Site is in a hurricane-prone region as defined in ASCE/SEI 7-16 Section 26.2. Glazed openings need not be protected against wind-borne debris.

Mountainous terrain, gorges, ocean promontories, and special wind regions should be examined for unusual wind conditions.

ASCE AMERICAN SOCIETY OF CIVIL ENGINEERS

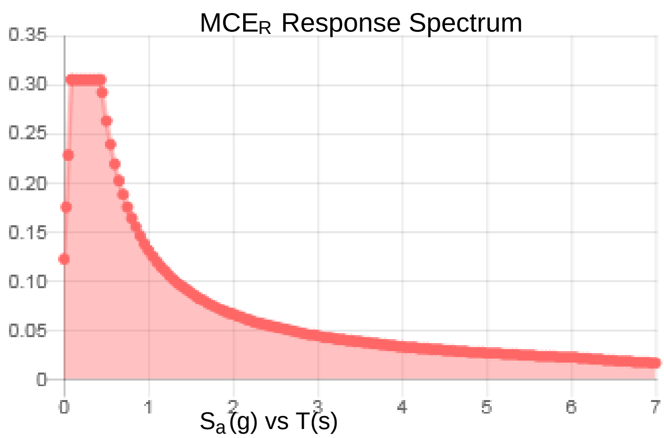
Seismic

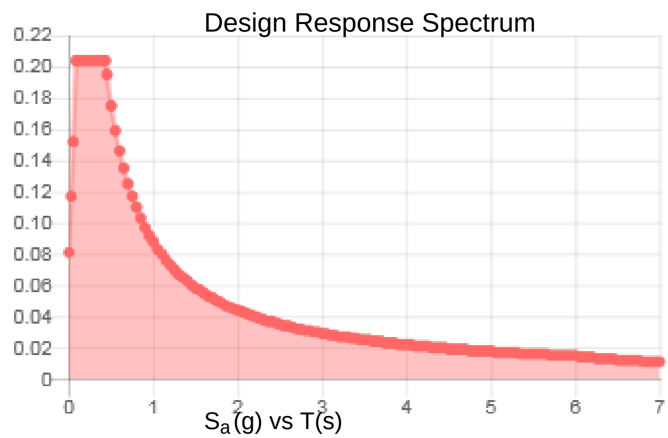
Site Soil Class: D - Default (see Section 11.4.3)

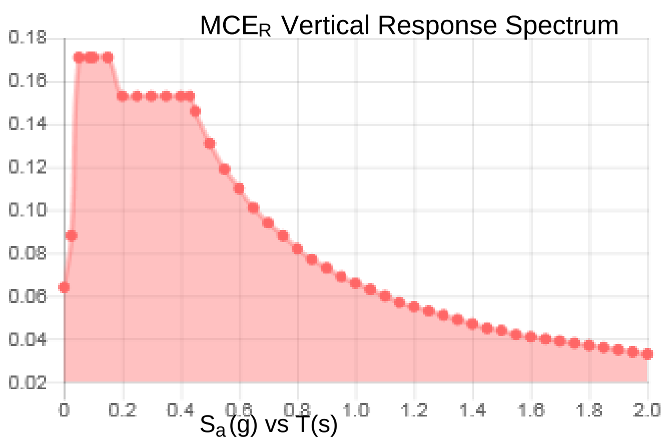
Results:

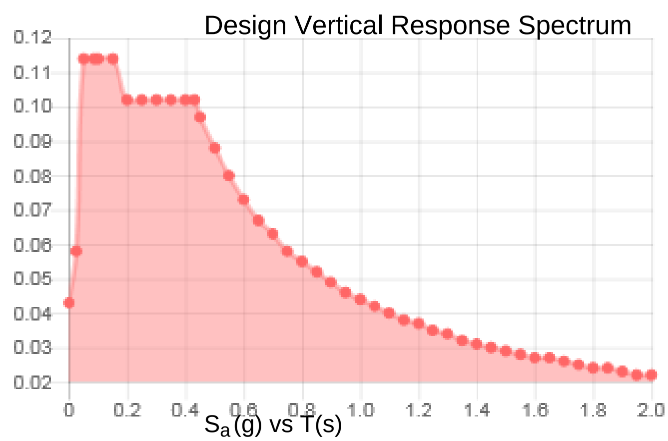
S_S :	0.191	S_{D1} :	0.088
S_1 :	0.055	T_L :	6
F_a :	1.6	PGA :	0.104
F_v :	2.4	PGA_M :	0.165
S_{MS} :	0.305	F_{PGA} :	1.593
S_{M1} :	0.131	I_e :	1
S_{DS} :	0.204	C_v :	0.7

Seismic Design Category B









Data Accessed: Fri Mar 01 2019

Date Source: USGS Seismic Design Maps based on ASCE/SEI 7-16 and ASCE/SEI 7-16 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-16 Ch. 21 are available from USGS.

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

Ice

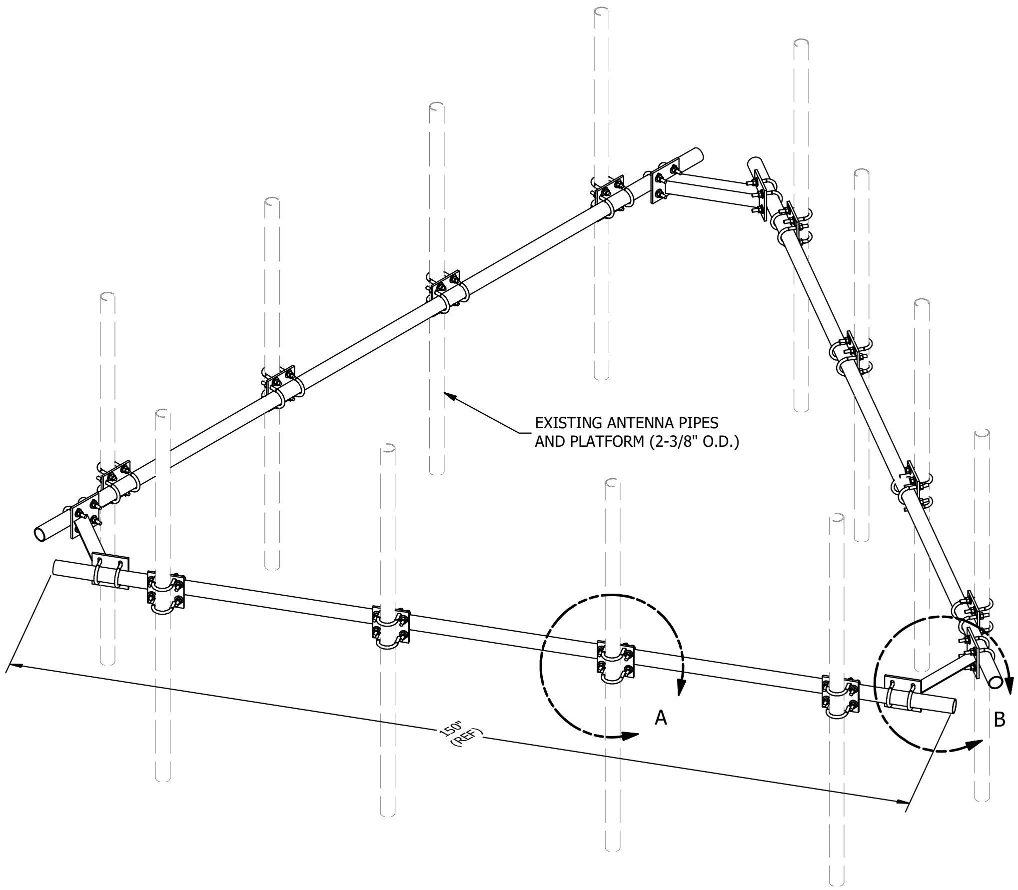
Results:

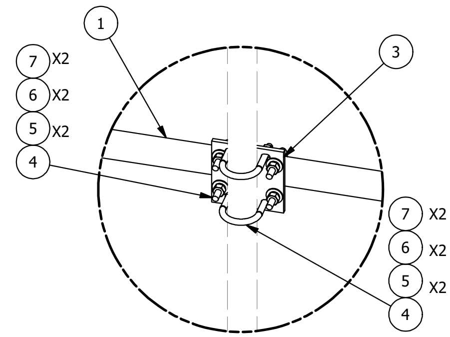
Ice Thickness:	1.00 in.
Concurrent Temperature:	15 F
Gust Speed:	50 mph
Data Source:	Standard ASCE/SEI 7-16, Figs. 10-2 through 10-8
Date Accessed:	Fri Mar 01 2019

Ice thicknesses on structures in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

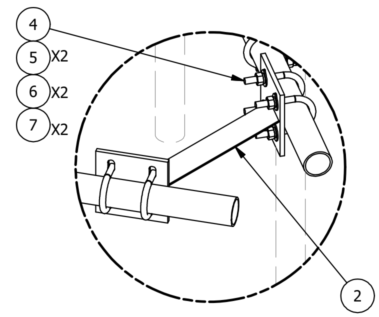
Values provided are equivalent radial ice thicknesses due to freezing rain with concurrent 3-second gust speeds, for a 500-year mean recurrence interval, and temperatures concurrent with ice thicknesses due to freezing rain. Thicknesses for ice accretions caused by other sources shall be obtained from local meteorological studies. Ice thicknesses in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

PARTS LIST						
ITEM	QTY	PART NO.	PART DESCRIPTION	LENGTH	UNIT WT.	NET WT.
1	3	P2150	2-3/8" O.D. X 150" SCH 40 GALVANIZED PIPE	150 in	45.77	137.31
2	3	X-AHCP	ANGLE HANDRAIL CORNER PLATE		12.92	38.76
3	12	SCX1	CROSSOVER PLATE 2-3/8" X 2-3/8"	6 in	3.71	44.50
4	60	X-UB1212	1/2" X 2-1/2" X 4-1/2" X 2" U-BOLT (HDG.)		0.63	37.51
5	120	G12FW	1/2" HDG USS FLATWASHER	3/32 in	0.03	4.09
6	120	G12LW	1/2" HDG LOCKWASHER	1/8 in	0.01	1.67
7	120	G12NUT	1/2" HDG HEAVY 2H HEX NUT		0.07	8.60
					TOTAL WT. #	272.43





DETAIL A



DETAIL B

REV	DESCRIPTION OF REVISIONS	CPD	BY	DATE
A	REPLACED HCP WITH X-AHCP		CEK	7/10/2014

REVISION HISTORY

TOLERANCE NOTES

TOLERANCES ON DIMENSIONS, UNLESS OTHERWISE NOTED ARE:
SAWED, SHEARED AND GAS CUT EDGES *(± 0.030")*
DRILLED AND GAS CUT HOLES *(± 0.030")* - NO CONING OF HOLES
LASER CUT EDGES AND HOLES *(± 0.010")* - NO CONING OF HOLES
BENDS ARE ± 1/2 DEGREE
ALL OTHER MACHINING *(± 0.030")*
ALL OTHER ASSEMBLY *(± 0.060")*

DESCRIPTION
HANDRAIL KIT
FOR 12'-6" FACE

SITE PRO 1
A valmont COMPANY

Engineering Support Team:
1-888-753-7446

Locations:
New York, NY
Atlanta, GA
Los Angeles, CA
Plymouth, IN
Salem, OR
Dallas, TX

CPD NO.		DRAWN BY	ENG. APPROVAL	PART NO.
		KC8 5/30/2012		HRK12
CLASS	SUB	DRAWING USAGE	CHECKED BY	DWG. NO.
81	01	CUSTOMER	BMC 7/13/2014	HRK12

PAGE 1 OF 1

8618 Westwood Center Drive, Suite 315, Vienna, VA 22182
703.276.1100 ● 703.276.1169 fax
info@sitesafe.com ● www.sitesafe.com

Smartlink on behalf of AT&T Mobility, LLC
Site FA – 10035388
Site ID – CT1051 (MRCTB023786-MRCTB023678-MRCTB023972)
USID – 71313
Site Name – WILLIMANTIC T6

83 WINDHAM STREET
WILLIMANTIC, CT 06226

Latitude: N41-43-14.12
Longitude: W72-13-05.45
Structure Type: Monopole

Report generated date: May 15, 2019
Report by: Yasir Alqadhili
Customer Contact: David Barbagallo

AT&T Mobility, LLC will be compliant when the remediation recommended in Section 5.2 or other appropriate remediation is implemented.

Table of Contents

1 General Site Summary

1.1 Report Summary

AT&T Mobility, LLC	Summary
Max Cumulative Simulated RFE Level at antenna level	9,095.7% General Public Limit in front of AT&T Mobility, LLC's Gamma Sector Antenna 11
Max Cumulative Simulated RFE Level on the Ground	<1% General Public Limit
Compliant per FCC Rules and Regulations?	Will Be Compliant
Compliant per AT&T Mobility, LLC's Policy?	No

The following documents were provided by the client and were utilized to create this report:

RFDS: NEW-ENGLAND_CONNECTICUT_CTL01051_2018-LTE-Next-Carrier_LTE_mm093q_2051A0B8T4_10035388_71313_04-20-2017_Final-Approved_v3.00

CD's: 10035388_AE201_CTL01051_190503_REV 5_CD (005)

RF Powers Used: AT&T Mobility, LLC Approved Default Power.

1.2 Fall Arrest Anchor Point Summary

Fall Arrest Anchor & Parapet Info	Parapet Available (Y/N)	Parapet Height (inches)	Fall Arrest Anchor Available (Y/N)
Roof Safety Info	N	N/A	N

1.3 Signage Summary

a. Pre-Site Visit AT&T Signage (Existing Signage)

AT&T Signage Locations	Information 1	Information 2	Notice	Notice 2	Caution	Caution 2	Warning	Warning 2	Barriers
Access Point(s)									
Alpha									
Beta									
Gamma									
Delta									
Epsilon									

Note: No Previous site visit by SiteSafe.

b. Proposed AT&T Signage

AT&T Signage Locations	Information 1	Information 2	Notice	Notice 2	Caution	Caution 2	Warning	Warning 2	Barriers
Access Point(s)						**1**			
Alpha									
Beta									
Gamma									
Delta									
Epsilon									

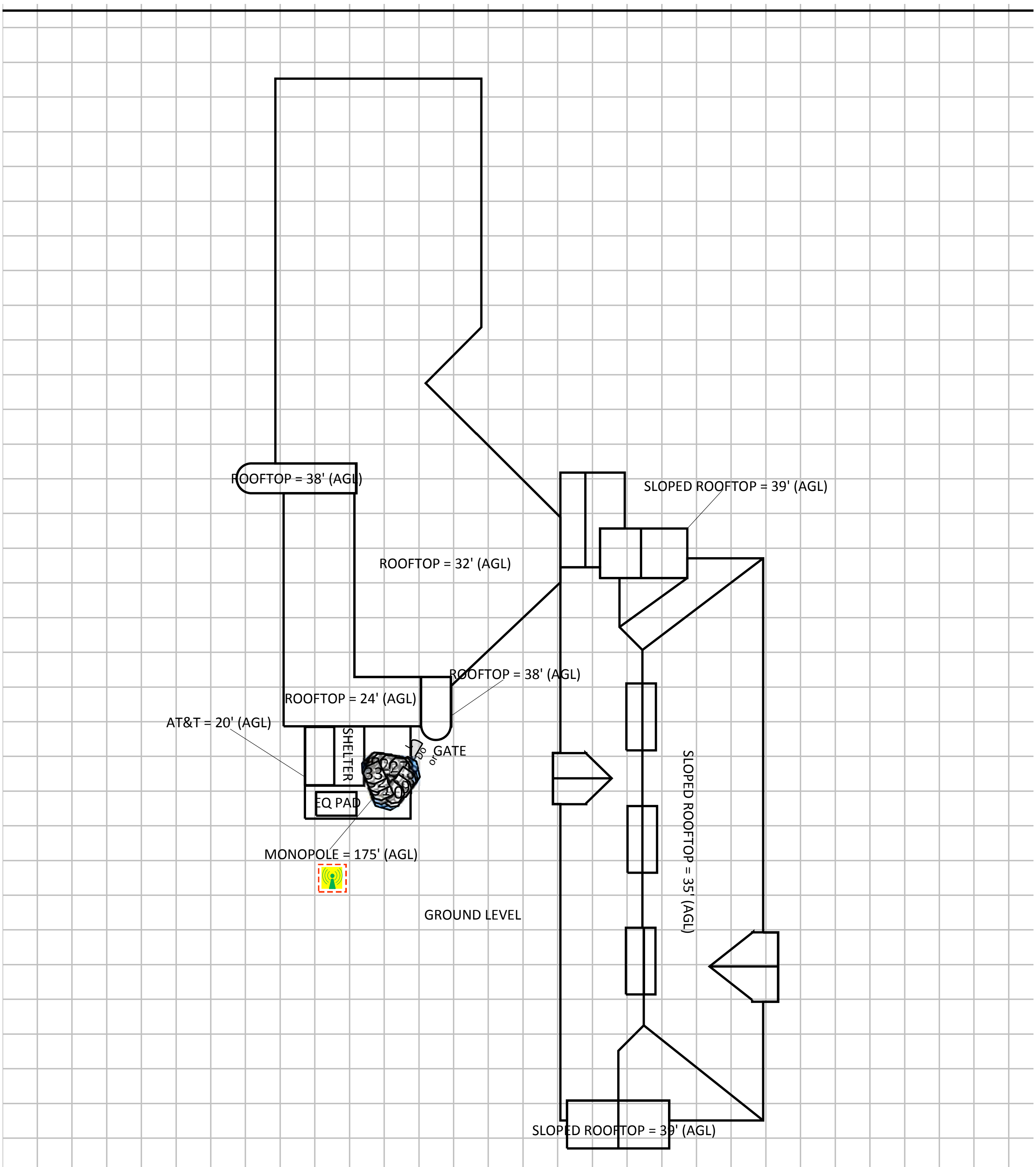
Note: Caution 2B at tower acces.

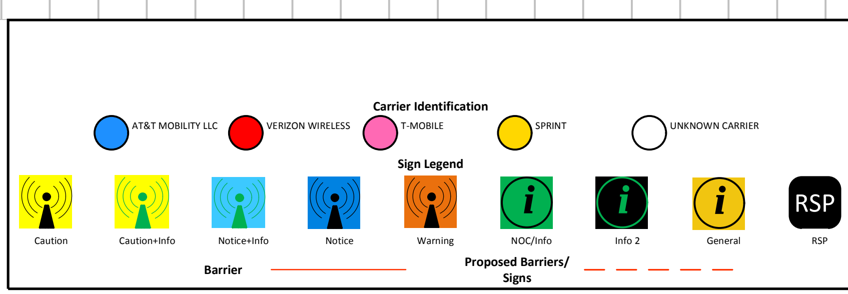
2 Scale Maps of Site

The following diagrams are included:

- Site Scale Map
- RF Exposure Diagram
- AT&T Mobility, LLC Contribution
- Elevation View

Site Scale Map For: WILLIMANTIC T6





(Feet)
0 24.8 49.5

www.sitesafe.com
Site Name:WILLIMANTIC T6
5/15/2019 1:01:27 PM

3 Antenna Inventory

The following antenna inventory was obtained by the customer and was utilized to create the site model diagrams:

Ant ID	Operator	Antenna Make & Model	Type	TX Freq (MHz)	Technology	Az (Deg)	Hor BW (Deg)	Ant Len (ft)	Power	Power Type	Power Unit	Misc Loss	TX Count	Total ERP (Watts)	Ant Gain (dBd)	Z (AGL)	MDT	EDT
1	AT&T MOBILITY LLC	KMW AM-X-CD-17-65-00T	Panel	737	LTE	0	68	8	160	TPO	Watt	0	1	4678.6	14.66	134'	0°	3°
2	AT&T MOBILITY LLC (Proposed)	Kathrein-Scala 800-10966	Panel	1900	LTE	0	66	8	160	TPO	Watt	0	1	6153.5	15.85	134'	0°	3°
2	AT&T MOBILITY LLC (Proposed)	Kathrein-Scala 800-10966	Panel	763	LTE	0	67.9	8	160	TPO	Watt	0	1	3623.4	13.55	134'	0°	3°
3	AT&T MOBILITY LLC (Proposed)	Cci OPA65R-BU8B	Panel	722	LTE	0	64	8	160	TPO	Watt	0	1	3163.2	12.96	134'	0°	3°
3	AT&T MOBILITY LLC (Proposed)	Cci OPA65R-BU8B	Panel	850	LTE	0	67.2	8	160	TPO	Watt	0	1	3020.8	12.76	134'	0°	3°
3	AT&T MOBILITY LLC (Proposed)	Cci OPA65R-BU8B	Panel	2300	LTE	0	56.9	8	100	TPO	Watt	0	1	2666.9	14.26	134'	0°	3°
4	AT&T MOBILITY LLC	Powerwave 7770	Panel	850	UMTS	143	82	4.6	40	TPO	Watt	0	1	566.3	11.51	134.7'	0°	0°
5	AT&T MOBILITY LLC	KMW AM-X-CD-17-65-00T	Panel	737	LTE	120	68	8	160	TPO	Watt	0	1	4678.6	14.66	134'	0°	1°
6	AT&T MOBILITY LLC (Proposed)	Kathrein-Scala 800-10966	Panel	763	LTE	120	67.9	8	160	TPO	Watt	0	1	3623.4	13.55	134'	0°	10°
6	AT&T MOBILITY LLC (Proposed)	Kathrein-Scala 800-10966	Panel	1900	LTE	120	66	8	160	TPO	Watt	0	1	6153.5	15.85	134'	0°	3°
7	AT&T MOBILITY LLC (Proposed)	Cci OPA65R-BU8B	Panel	722	LTE	120	64	8	160	TPO	Watt	0	1	3163.2	12.96	134'	0°	2°
7	AT&T MOBILITY LLC (Proposed)	Cci OPA65R-BU8B	Panel	850	LTE	120	67.2	8	160	TPO	Watt	0	1	3020.8	12.76	134'	0°	2°
7	AT&T MOBILITY LLC (Proposed)	Cci OPA65R-BU8B	Panel	2300	LTE	120	56.9	8	100	TPO	Watt	0	1	2666.9	14.26	134'	0°	2°
8	AT&T MOBILITY LLC	Powerwave 7770	Panel	850	UMTS	263	82	4.6	40	TPO	Watt	0	1	566.3	11.51	134.7'	0°	4°
9	AT&T MOBILITY LLC	KMW AM-X-CD-17-65-00T	Panel	737	LTE	240	68	8	160	TPO	Watt	0	1	4678.6	14.66	134'	0°	1°
10	AT&T MOBILITY LLC (Proposed)	Kathrein-Scala 800-10966	Panel	763	LTE	240	67.9	8	160	TPO	Watt	0	1	3623.4	13.55	134'	0°	2°
10	AT&T MOBILITY LLC (Proposed)	Kathrein-Scala 800-10966	Panel	1900	LTE	240	66	8	160	TPO	Watt	0	1	6153.5	15.85	134'	0°	3°
11	AT&T MOBILITY LLC (Proposed)	Cci OPA65R-BU8B	Panel	722	LTE	240	64	8	160	TPO	Watt	0	1	3163.2	12.96	134'	0°	2°
11	AT&T MOBILITY LLC (Proposed)	Cci OPA65R-BU8B	Panel	850	LTE	240	67.2	8	160	TPO	Watt	0	1	3020.8	12.76	134'	0°	2°
11	AT&T MOBILITY LLC (Proposed)	Cci OPA65R-BU8B	Panel	2300	LTE	240	56.9	8	100	TPO	Watt	0	1	2666.9	14.26	134'	0°	2°
12	AT&T MOBILITY LLC	Powerwave 7770	Panel	850	UMTS	23	82	4.6	40	TPO	Watt	0	1	566.3	11.51	134.7'	0°	0°
13	UNKNOWN CARRIER	Generic	Panel	850		0	65	4.6	60	TPO	Watt	0	0	1135.4	12.77	145.7'	0°	0°
14	UNKNOWN CARRIER	Generic	Panel	1900		0	65	4.6	60	TPO	Watt	0	0	2094.8	15.43	145.7'	0°	0°
15	UNKNOWN CARRIER	Generic	Panel	2100		0	65	4.6	60	TPO	Watt	0	0	2000.6	15.23	145.7'	0°	0°
16	UNKNOWN CARRIER	Generic	Panel	751		0	65	4.6	60	TPO	Watt	0	0	982.1	12.14	145.7'	0°	0°
17	UNKNOWN CARRIER	Generic	Panel	850		120	65	4.6	60	TPO	Watt	0	0	1135.4	12.77	145.7'	0°	0°
18	UNKNOWN CARRIER	Generic	Panel	1900		120	65	4.6	60	TPO	Watt	0	0	2094.8	15.43	145.7'	0°	0°
19	UNKNOWN CARRIER	Generic	Panel	2100		120	65	4.6	60	TPO	Watt	0	0	2000.6	15.23	145.7'	0°	0°
20	UNKNOWN CARRIER	Generic	Panel	751		120	65	4.6	60	TPO	Watt	0	0	982.1	12.14	145.7'	0°	0°
21	UNKNOWN CARRIER	Generic	Panel	850		240	65	4.6	60	TPO	Watt	0	0	1135.4	12.77	145.7'	0°	0°
22	UNKNOWN CARRIER	Generic	Panel	1900		240	65	4.6	60	TPO	Watt	0	0	2094.8	15.43	145.7'	0°	0°
23	UNKNOWN CARRIER	Generic	Panel	2100		240	65	4.6	60	TPO	Watt	0	0	2000.6	15.23	145.7'	0°	0°

Ant ID	Operator	Antenna Make & Model	Type	TX Freq (MHz)	Technology	Az (Deg)	Hor BW (Deg)	Ant Len (ft)	Power	Power Type	Power Unit	Misc Loss	TX Count	Total ERP (Watts)	Ant Gain (dBd)	Z (AGL)	MDT	EDT
24	UNKNOWN CARRIER	Generic	Panel	751		240	65	4.6	60	TPO	Watt	0	0	982.1	12.14	145.7'	0°	0°
25	UNKNOWN CARRIER	Generic	Panel	1900		0	65	4.6	60	TPO	Watt	0	0	2094.8	15.43	125.7'	0°	0°
26	UNKNOWN CARRIER	Generic	Panel	2100		0	65	4.6	60	TPO	Watt	0	0	2000.6	15.23	125.7'	0°	0°
27	UNKNOWN CARRIER	Generic	Panel	1900		0	65	4.6	60	TPO	Watt	0	0	2094.8	15.43	125.7'	0°	0°
28	UNKNOWN CARRIER	Generic	Panel	1900		120	65	4.6	60	TPO	Watt	0	0	2094.8	15.43	125.7'	0°	0°
29	UNKNOWN CARRIER	Generic	Panel	2100		120	65	4.6	60	TPO	Watt	0	0	2000.6	15.23	125.7'	0°	0°
30	UNKNOWN CARRIER	Generic	Panel	1900		120	65	4.6	60	TPO	Watt	0	0	2094.8	15.43	125.7'	0°	0°
31	UNKNOWN CARRIER	Generic	Panel	1900		240	65	4.6	60	TPO	Watt	0	0	2094.8	15.43	125.7'	0°	0°
32	UNKNOWN CARRIER	Generic	Panel	2100		240	65	4.6	60	TPO	Watt	0	0	2000.6	15.23	125.7'	0°	0°
33	UNKNOWN CARRIER	Generic	Panel	1900		240	65	4.6	60	TPO	Watt	0	0	2094.8	15.43	125.7'	0°	0°
34	UNKNOWN CARRIER	Generic	Omni	150		0	360	12.5	100	ERP	Watt	0	0	100	2.87	175.8'	0°	0°

Note: The Z reference indicates the bottom of the antenna height above the main site level unless otherwise indicated. Effective Radiated Power (ERP) is provided by the operator or based on Sitesafe experience. The values used in the modeling may be greater than are currently deployed. For other operators at this site the use of "Generic" as an antenna model or "Unknown" for a wireless operator means the information with regard to operator, their FCC license and/or antenna information was not available nor could it be secured while on site. Other operator's equipment, antenna models and powers used for modeling are based on obtained information or Sitesafe experience.

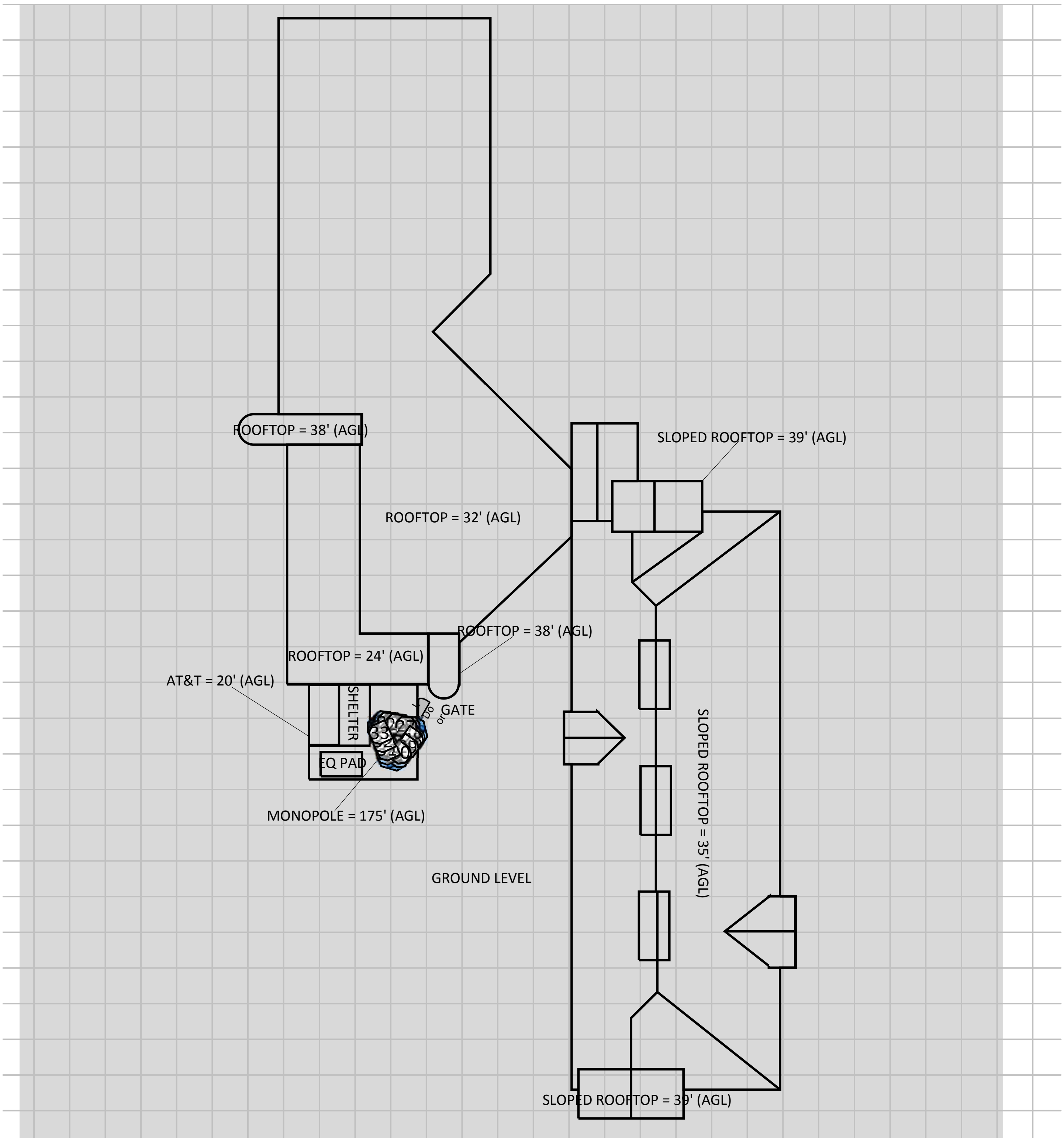
4 Emission Predictions

In the RF Exposure Simulations below all heights are reflected with respect to main site level. In most rooftop cases this is the height of the main rooftop and in other cases this can be ground level. Each different height area, rooftop, or platform level is labeled with its height relative to the main site level. Emissions are calculated appropriately based on the relative height and location of that area to all antennas. The total analyzed elevations in the below RF Exposure Simulations are listed below.

- GROUND LEVEL = 0'
- AT&T = 7'
- BUILDING = 21'
- BUILDING = 32'
- BUILDING = 35'
- BUILDING = 38'

The Antenna Inventory heights are referenced to the same level.

RF Exposure Simulation For: WILLIMANTIC T6
Composite View



% of FCC Public Exposure Limit
Spatial average 0' - 6'

% of FCC Public Exposure Limit

>= 5000	>= 500	>= 100	>= 5	< 5

Carrier Identification

AT&T MOBILITY LLC · VERIZON WIRELESS · T-MOBILE · SPRINT · UNKNOWN CARRIER

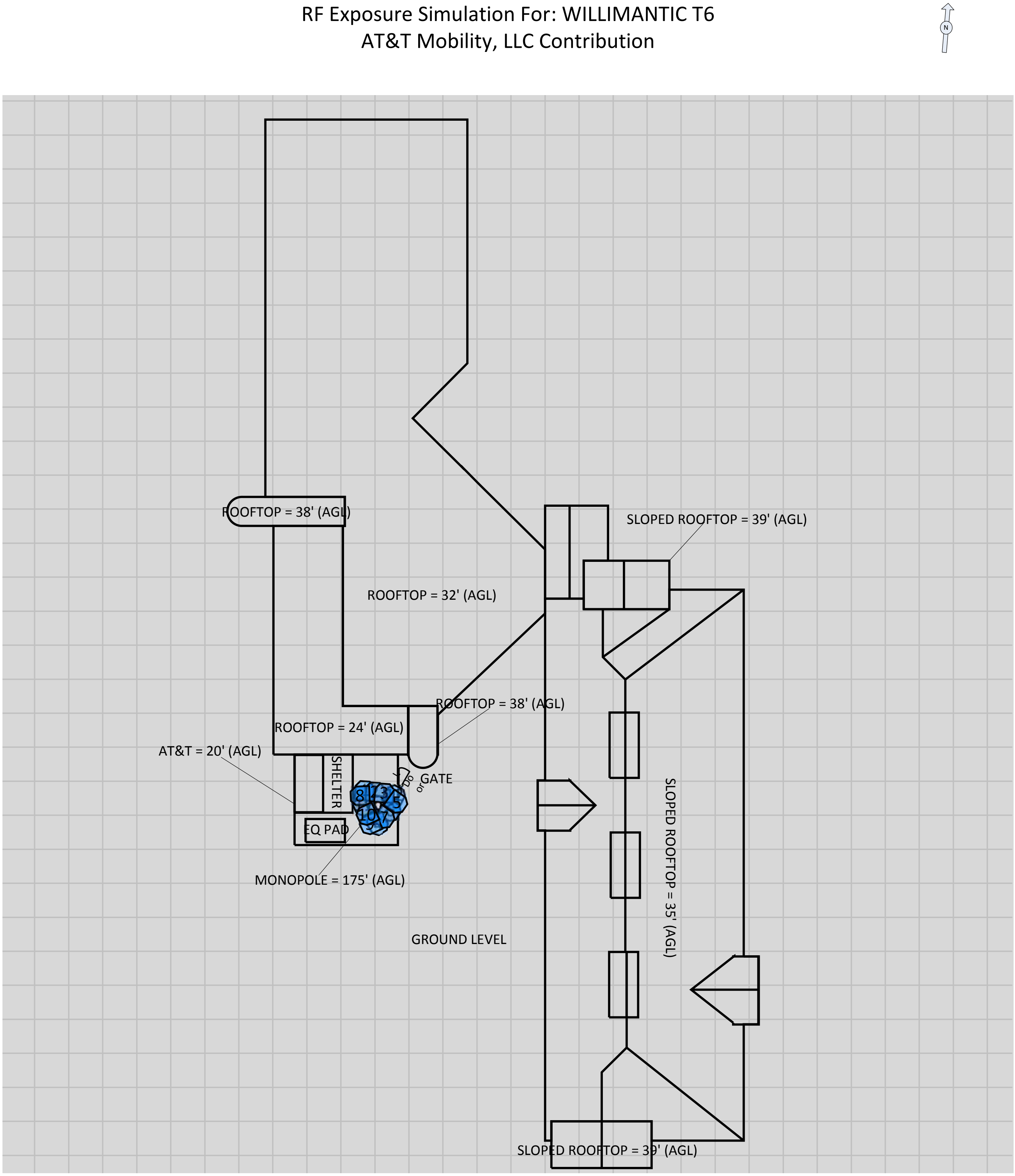
Barrier · **Proposed Barriers/ Signs**

(Feet)
0 26.4 52.8

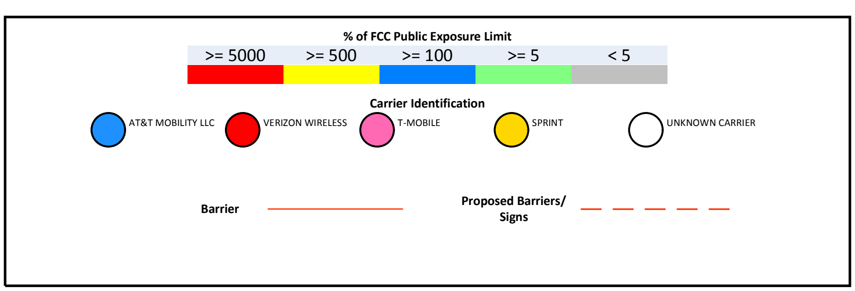
www.sitesafe.com
Site Name:WILLIMANTIC T6
5/15/2019 12:52:24 PM

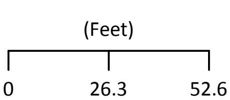
Sitesafe OET-65 Model
Near Field Boundary:
1.5 * Aperture
Reflection Factor: 1
Spatially Averaged

RF Exposure Simulation For: WILLIMANTIC T6
AT&T Mobility, LLC Contribution



% of FCC Public Exposure Limit
Spatial average 0' - 6'

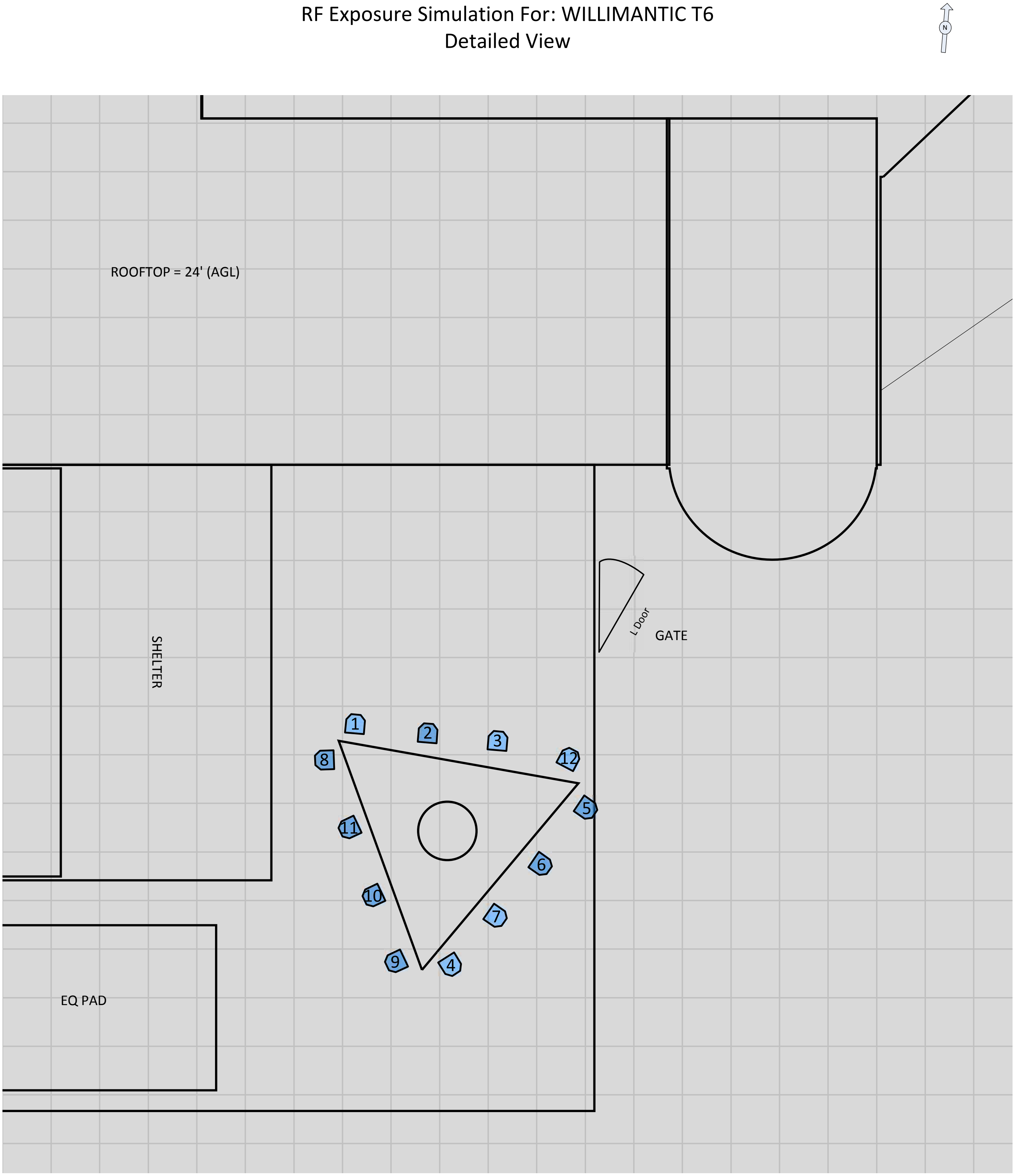




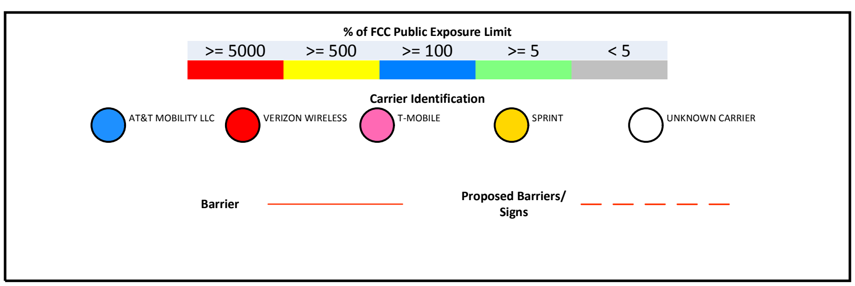
www.sitesafe.com
Site Name:WILLIMANTIC T6
5/15/2019 3:16:20 PM

Sitesafe OET-65 Model
Near Field Boundary:
1.5 * Aperture
Reflection Factor: 1
Spatially Averaged

RF Exposure Simulation For: WILLIMANTIC T6
Detailed View



% of FCC Public Exposure Limit
Spatial average 0' - 6'



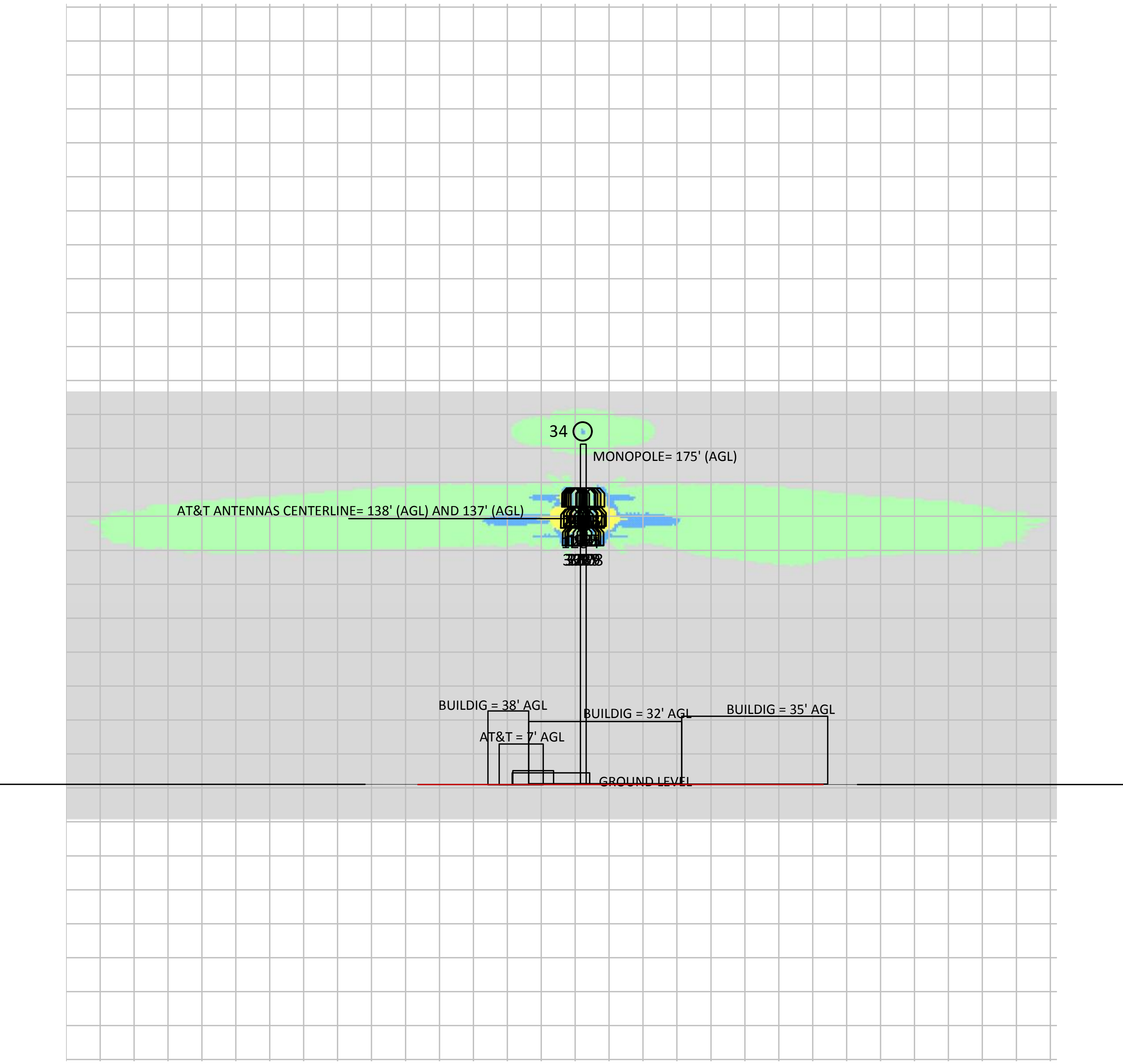
(Feet)

0 3.5 6.9

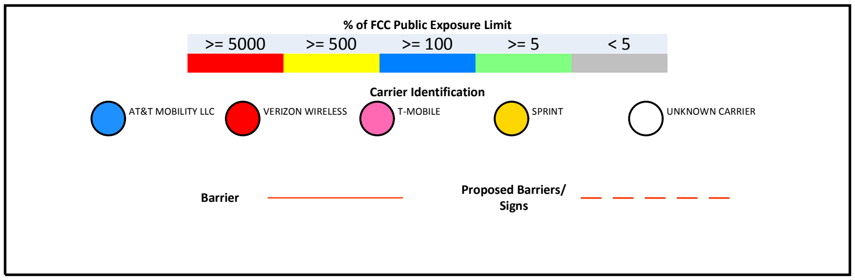
www.sitesafe.com
Site Name:WILLIMANTIC T6
5/15/2019 3:17:16 PM

Sitesafe OET-65 Model
Near Field Boundary:
1.5 * Aperture
Reflection Factor: 1
Spatially Averaged

RF Exposure Simulation For: WILLIMANTIC T6
Elevation View - North



% of FCC Public Exposure Limit
Spatial average 0' - 6'

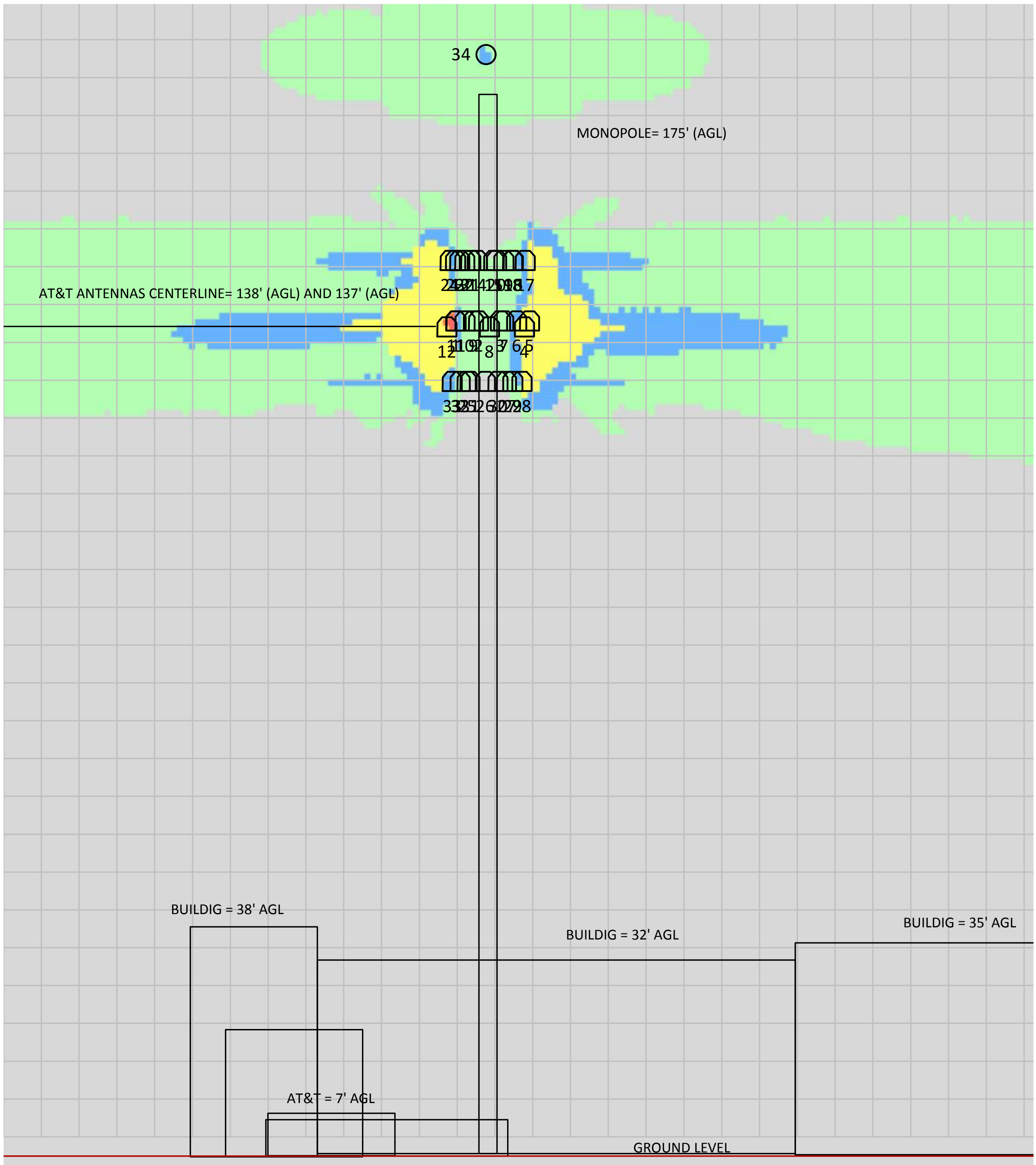


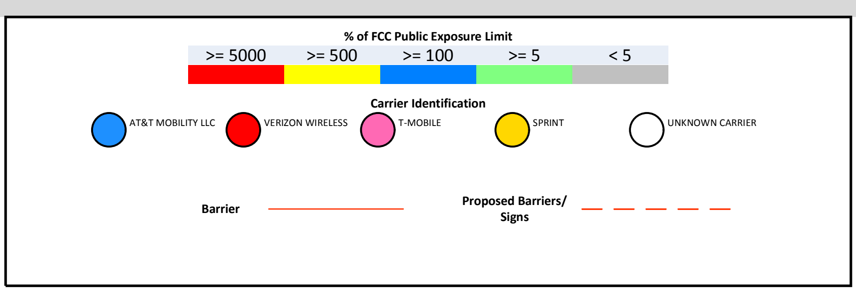
(Feet)
0 34.1 68.1

www.sitesafe.com
Site Name:WILLIMANTIC T6
5/15/2019 1:22:56 PM

Sitesafe OET-65 Model
Near Field Boundary:
1.5 * Aperture
Reflection Factor: 1
Single Level (0)

RF Exposure Simulation For: WILLIMANTIC T6
Detailed View





(Feet)

0 11.4 22.7

www.sitesafe.com
Site Name:WILLIMANTIC T6
5/15/2019 1:27:15 PM

Sitesafe OET-65 Model
Near Field Boundary:
1.5 * Aperture
Reflection Factor: 1
Single Level (0)

5 Site Compliance

5.1 Site Compliance Statement

Upon evaluation of the cumulative RF emission levels from all operators at this site, RF hazard signage and antenna locations, Sitesafe has determined that:

AT&T Mobility, LLC will be compliant when the remediation recommended in Section 5.2 or other appropriate remediation is implemented.

The compliance determination is based on General Public RFE levels derived from theoretical modeling, RF signage placement, proposed antenna inventory and the level of restricted access to the antennas at the site. Any deviation from the AT&T Mobility, LLC's proposed deployment plan could result in the site being rendered non-compliant.

Modeling is used for determining compliance and the percentage of MPE contribution.

5.2 Actions for Site Compliance

Based on FCC regulations, common industry practice, and our understanding of AT&T Mobility, LLC RF Safety Policy requirements, this section provides a statement of recommendations for site compliance. Recommendations have been proposed based on our understanding of existing access restrictions, signage, and an analysis of predicted RFE levels.

AT&T Mobility, LLC will be made compliant if the following changes are implemented:

Monopole Access Location

(1) Yellow Caution 2B sign(s) required at Monopole access ladder.

6 Reviewer Certification

The reviewer whose signature appears below hereby certifies and affirms:

That I am an employee of Site Safe, LLC, in Vienna, Virginia, at which place the staff and I provide RF compliance services to clients in the wireless communications industry; and

That I am thoroughly familiar with the Rules and Regulations of the Federal Communications Commission (FCC) as well as the regulations of the Occupational Safety and Health Administration (OSHA), both in general and specifically as they apply to the FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields; and

That I have thoroughly reviewed this Site Compliance Report and believe it to be true and accurate to the best of my knowledge as assembled by and attested to by Yasir Alqadhili.

May 15, 2019

Appendix A – Statement of Limiting Conditions

Sitesafe has provided computer generated model(s) in this Site Compliance Report to show approximate dimensions of the site, and the model is included to assist the reader of the compliance report to visualize the site area, and to provide supporting documentation for Sitesafe's recommendations.

Sitesafe may note in the Site Compliance Report any adverse physical conditions, such as needed repairs, that Sitesafe became aware of during the normal research involved in creating this report. Sitesafe will not be responsible for any such conditions that do exist or for any engineering or testing that might be required to discover whether such conditions exist. Because Sitesafe is not an expert in the field of mechanical engineering or building maintenance, the Site Compliance Report must not be considered a structural or physical engineering report.

Sitesafe obtained information used in this Site Compliance Report from sources that Sitesafe considers reliable and believes them to be true and correct. Sitesafe does not assume any responsibility for the accuracy of such items that were furnished by other parties. When conflicts in information occur between data collected by Sitesafe provided by a second party and data collected by Sitesafe, the data will be used.

Appendix B – Regulatory Background Information

FCC Rules and Regulations

In 1996, the Federal Communications Commission (FCC) adopted regulations for the evaluating of the effects of RF emissions in 47 CFR § 1.1307 and 1.1310. The guideline from the FCC Office of Engineering and Technology is Bulletin 65 ("OET Bulletin 65"), *Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields*, Edition 97-01, published August 1997. Since 1996 the FCC periodically reviews these rules and regulations as per their congressional mandate.

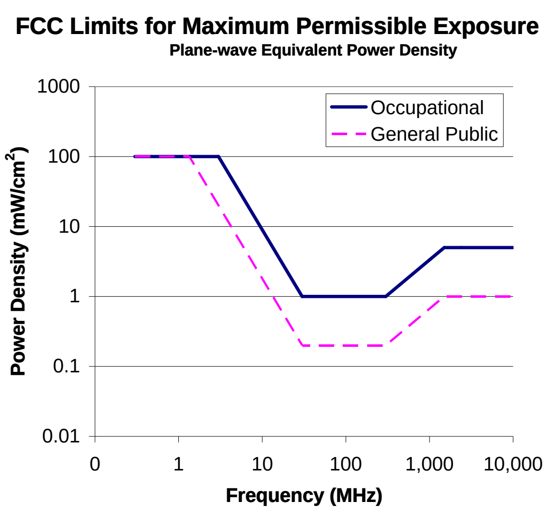
FCC regulations define two separate tiers of exposure limits: Occupational or "Controlled environment" and General Public or "Uncontrolled environment". The General Public limits are generally five times more conservative or restrictive than the Occupational limit. These limits apply to *accessible* areas where workers or the general public may be exposed to Radio Frequency (RF) electromagnetic fields.

Occupational or Controlled limits apply in situations in which persons are exposed as a consequence of their employment and where those persons exposed have been made fully aware of the potential for exposure and can exercise control over their exposure.

An area is considered a Controlled environment when access is limited to these aware personnel. Typical criteria are restricted access (i.e. locked or alarmed doors, barriers, etc.) to the areas where antennas are located coupled with proper RF warning signage. A site with Controlled environments is evaluated with Occupational limits.

All other areas are considered Uncontrolled environments. If a site has no access controls or no RF warning signage it is evaluated with General Public limits.

The theoretical modeling of the RF electromagnetic fields has been performed in accordance with OET Bulletin 65. The Maximum Permissible Exposure (MPE) limits utilized in this analysis are outlined in the following diagram:



Limits for Occupational/Controlled Exposure (MPE)

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

Limits for General Population/Uncontrolled Exposure (MPE)

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

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

OSHA Statement

The General Duty clause of the OSHA Act (Section 5) outlines the occupational safety and health responsibilities of the employer and employee. The General Duty clause in Section 5 states:

(a) Each employer –

(1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;

(2) shall comply with occupational safety and health standards promulgated under this Act.

(b) Each employee shall comply with occupational safety and health standards and all rules, regulations, and orders issued pursuant to this Act which are applicable to his own actions and conduct.

OSHA has defined Radiofrequency and Microwave Radiation safety standards for workers who may enter hazardous RF areas. Regulation Standards 29 CFR § 1910.147 identify a generic Lockout/Tagout procedure aimed to control the unexpected energization or startup of machines when maintenance or service is being performed.

Appendix C – Safety Plan and Procedures

The following items are general safety recommendations that should be administered on a site by site basis as needed by the carrier.

General Maintenance Work: Any maintenance personnel required to work immediately in front of antennas and / or in areas indicated as above 100% of the Occupational MPE limits should coordinate with the wireless operators to disable transmitters during their work activities.

Training and Qualification Verification: All personnel accessing areas indicated as exceeding the General Population MPE limits should have a basic understanding of EME awareness and RF Safety procedures when working around transmitting antennas. Awareness training increases a worker's understanding to potential RF exposure scenarios. Awareness can be achieved in a number of ways (e.g. videos, formal classroom lecture or internet-based courses).

Physical Access Control: Access restrictions to transmitting antennas locations is the primary element in a site safety plan. Examples of access restrictions are as follows:

- Locked door or gate
- Alarmed door
- Locked ladder access
- Restrictive Barrier at antenna (e.g. Chain link with posted RF Sign)

RF Signage: Everyone should obey all posted signs at all times. RF signs play an important role in properly warning a worker prior to entering into a potential RF Exposure area.

Assume all antennas are active: Due to the nature of telecommunications transmissions, an antenna transmits intermittently. Always assume an antenna is transmitting. Never stop in front of an antenna. If you have to pass by an antenna, move through as quickly and safely as possible thereby reducing any exposure to a minimum.

Maintain a 3 foot clearance from all antennas: There is a direct correlation between the strength of an EME field and the distance from the transmitting antenna. The further away from an antenna, the lower the corresponding EME field is.

Site RF Emissions Diagram: Section 4 of this report contains an RF Diagram that outlines various theoretical Maximum Permissible Exposure (MPE) areas at the site. The modeling is a worst-case scenario assuming a duty cycle of 100% for each transmitting antenna at full power. This analysis is based on one of two access control criteria: General Public criteria means the access to the site is uncontrolled and anyone can gain access. Occupational criteria means the access is restricted and only properly trained individuals can gain access to the antenna locations.

Appendix D – RF Emissions

The RF Emissions Simulation(s) in this report display theoretical spatially averaged percentage of the Maximum Permissible Exposure for all systems at the site unless otherwise noted. These diagrams use modeling as prescribed in OET Bulletin 65 and assumptions detailed in Appendix E.

The key at the bottom of each RF Emissions Simulation indicates percentages displayed referenced to FCC General Public Maximum Permissible Exposure (MPE) limits. Color coding on the diagram is as follows:

- Areas indicated as Gray are predicted to be below 5% of the MPE limits. Gray represents areas more than 20 times below the most conservative exposure limit. **Gray areas are accessible to anyone**.
- Green represents areas are predicted to be between 5% and 100% of the MPE limits. **Green areas are accessible to anyone.**
- Blue represents areas predicted to exceed the General Public MPE limits but are less than Occupational limits. **Blue areas should be accessible only to RF trained workers**.
- Yellow represents areas predicted to exceed Occupational MPE limits. **Yellow areas should be accessible only to RF trained workers able to assess current exposure levels.**
- Red represents areas predicted to have exposure more than 10 times the Occupational MPE limits. **Red indicates that the RF levels must be reduced prior to access.** An RF Safety Plan is required which outlines how to reduce the RF energy in these areas prior to access.

If trained occupational personnel require access to areas that are delineated as above 100% of the limit, Sitesafe recommends that they utilize the proper personal protection equipment (RF monitors), coordinate with the carriers to reduce or shutdown power, or make real-time power density measurements with the appropriate power density meter to determine real-time MPE levels. This will allow the personnel to ensure that their work area is within exposure limits.

Appendix E – Assumptions and Definitions

General Model Assumptions

In this site compliance report, it is assumed that all antennas are operating at **full power at all times**. Software modeling was performed for all transmitting antennas located on the site. Sitesafe has further assumed a 100% duty cycle and maximum radiated power.

The modeling is based on recommendations from the FCC's OET-65 bulletin with the following variances per AT&T guidance. Reflection has not been considered in the modeling, i.e. the reflection factor is 1.0. The near / far field boundary has been set to 1.5 times the aperture height of the antenna and modeling beyond that point is the lesser of the near field cylindrical model and the far field model taking into account the gain of the antenna.

The site has been modeled with these assumptions to show the maximum RF energy density. Areas modeled with exposure greater than 100% of the General Public MPE level may not actually occur but are shown as a prediction that could be realized. Sitesafe believes these areas to be safe for entry by occupationally trained personnel utilizing appropriate personal protective equipment (in most cases, a personal monitor).

Use of Generic Antennas

For the purposes of this report, the use of "Generic" as an antenna model, or "Unknown" for an operator means the information about a carrier, their FCC license and/or antenna information was not provided and could not be obtained while on site. In the event of unknown information, Sitesafe will use our industry specific knowledge of equipment, antenna models, and transmit power to model the site. If more specific information can be obtained for the unknown measurement criteria, Sitesafe recommends remodeling of the site utilizing the more complete and accurate data. Information about similar facilities is used when the service is identified and associated with a particular antenna. If no information is available regarding the transmitting service associated with an unidentified antenna, using the antenna manufacturer's published data regarding the antenna's physical characteristics makes more conservative assumptions.

Where the frequency is unknown, Sitesafe uses the closest frequency in the antenna's range that corresponds to the highest Maximum Permissible Exposure (MPE), resulting in a conservative analysis.

Appendix F – Definitions

5% Rule – The rules adopted by the FCC specify that, in general, at multiple transmitter sites actions necessary to bring the area into compliance with the guidelines are the shared responsibility of all licensees whose transmitters produce field strengths or power density levels at the area in question in excess of 5% of the exposure limits. In other words, any wireless operator that contributes 5% or greater of the MPE limit in an area that is identified to be greater than 100% of the MPE limit is responsible for taking corrective actions to bring the site into compliance.

Compliance – The determination of whether a site complies with FCC standards with regards to Human Exposure to Radio Frequency Electromagnetic Fields from transmitting antennas.

Decibel (dB) – A unit for measuring power or strength of a signal.

Duty Cycle – The percent of pulse duration to the pulse period of a periodic pulse train. Also, may be a measure of the temporal transmission characteristic of an intermittently transmitting RF source such as a paging antenna by dividing average transmission duration by the average period for transmission. A duty cycle of 100% corresponds to continuous operation.

Effective (or Equivalent) Isotropic Radiated Power (EIRP) – The product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna.

Effective Radiated Power (ERP) – The product of the power supplied to the antenna and the antenna gain in a given direction relative to a half-wave dipole antenna.

Gain (of an antenna) – The ratio of the maximum power in a given direction to the maximum power in the same direction from an isotropic radiator. Gain is a measure of the relative efficiency of a directional antenna as compared to an omnidirectional antenna.

General Population/Uncontrolled Environment – Defined by the FCC as an area where RF exposure may occur to persons who are **unaware** of the potential for exposure and who have no control over their exposure. General Population is also referenced as General Public.

Generic Antenna – For the purposes of this report, the use of "Generic" as an antenna model means the antenna information was not provided and could not be obtained while on site. In the event of unknown information, Sitesafe will use its industry specific knowledge of antenna models to select a worst-case scenario antenna to model the site.

Isotropic Antenna – An antenna that is completely non-directional. In other words, an antenna that radiates energy equally in all directions.

Maximum Measurement – This measurement represents the single largest measurement recorded when performing a spatial average measurement.

Maximum Permissible Exposure (MPE) – The rms and peak electric and magnetic field strength, their squares, or the plane-wave equivalent power densities associated with these fields to which a person may be exposed without harmful effect and with acceptable safety factor.

Occupational/Controlled Environment – Defined by the FCC as an area where RF exposure may occur to persons who are **aware** of the potential for exposure as a condition of employment or specific activity and can exercise control over their exposure.

OET Bulletin 65 – Technical guideline developed by the FCC's Office of Engineering and Technology to determine the impact of RF exposure on humans. The guideline was published in August 1997.

OSHA (Occupational Safety and Health Administration) – Under the Occupational Safety and Health Act of 1970, employers are responsible for providing a safe and healthy workplace for their employees. OSHA's role is to promote the safety and health of America's working men and women by setting and enforcing standards; providing training, outreach and education; establishing partnerships; and encouraging continual process improvement in workplace safety and health. For more information, visit www.osha.gov.

Radio Frequency Exposure or Electromagnetic Fields – Electromagnetic waves that are propagated from antennas through space.

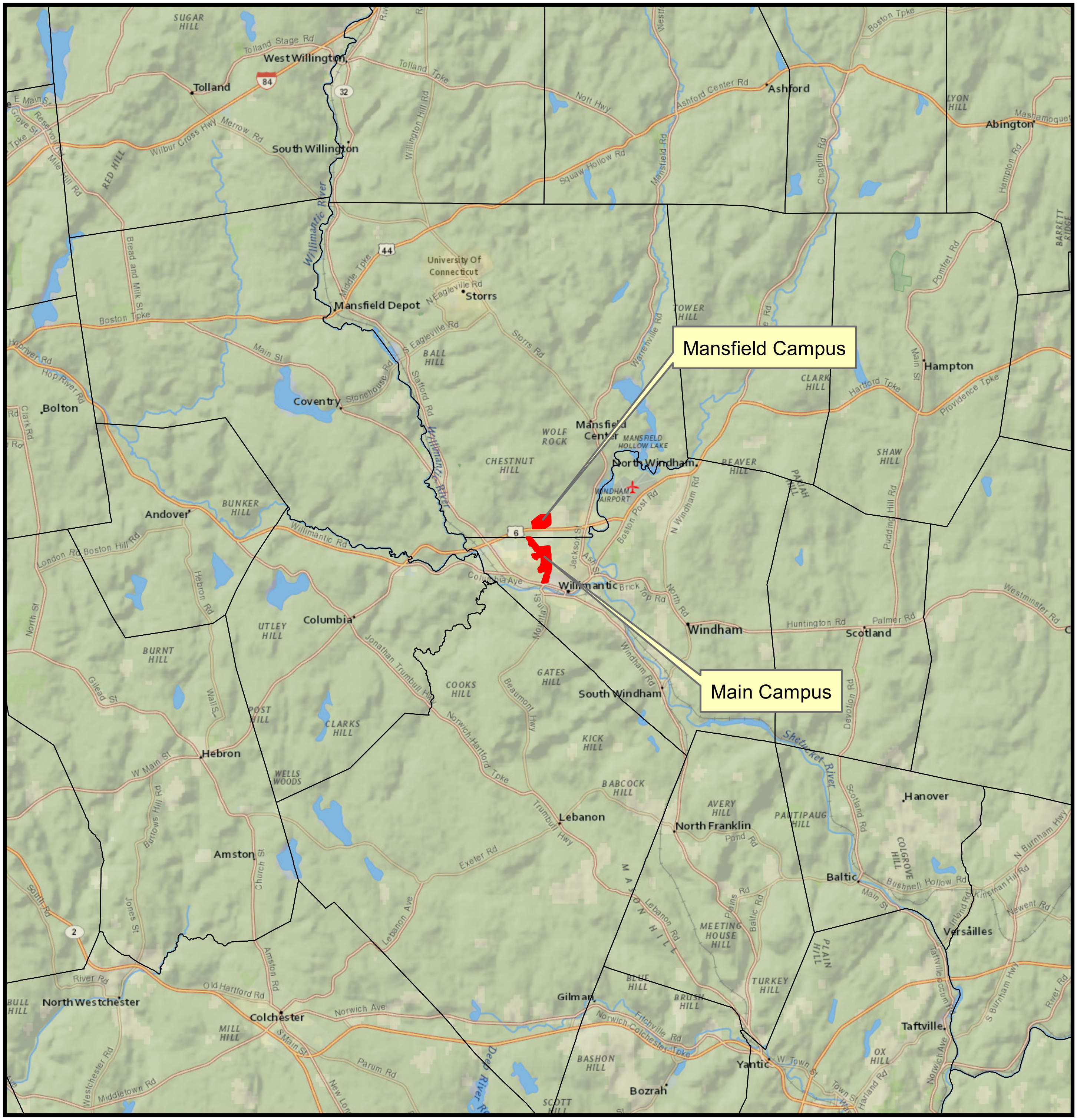
Spatial Average Measurement – A technique used to average a minimum of ten (10) measurements taken in a ten (10) second interval from zero (0) to six (6) feet. This measurement is intended to model the average energy a 6-foot tall human body will absorb while present in an electromagnetic field of energy.

***Transmitter Power Output (TPO)* –** The radio frequency output power of a transmitter's final radio frequency stage as measured at the output terminal while connected to a load.

Appendix G – References

The following references can be followed for further information about RF Health and Safety.

Site Safe, LLC
http://www.sitesafe.com
FCC Radio Frequency Safety
http://www.fcc.gov/encyclopedia/radio-frequency-safety
National Council on Radiation Protection and Measurements (NCRP)
http://www.ncrponline.org
Institute of Electrical and Electronics Engineers, Inc., (IEEE)
http://www.ieee.org
American National Standards Institute (ANSI)
http://www.ansi.org
Environmental Protection Agency (EPA)
http://www.epa.gov/radtown/wireless-tech.html
National Institutes of Health (NIH)
http://www.niehs.nih.gov/health/topics/agents/emf/
Occupational Safety and Health Agency (OSHA)
http://www.osha.gov/SLTC/radiofrequencyradiation/
International Commission on Non-Ionizing Radiation Protection (ICNIRP)
http://www.icnirp.org
World Health Organization (WHO)
http://www.who.int/peh-emf/en/
National Cancer Institute
http://www.cancer.gov/cancertopics/factsheet/Risk/cellphones
American Cancer Society (ACS)
http://www.cancer.org/docroot/PED/content/PED_1_3X_Cellular_Phone_Towers.asp?sitearea=PED
European Commission Scientific Committee on Emerging and Newly Identified Health Risks
http://ec.europa.eu/health/ph_risk/committees/04_scenihr/docs/scenihr_o_022.pdf
Fairfax County, Virginia Public School Survey
http://www.fcps.edu/fts/safety-security/RFEESurvey/
UK Health Protection Agency Advisory Group on Non-Ionizing Radiation
http://www.hpa.org.uk/webw/HPAweb&HPAwebStandard/HPAweb_C/1317133826368
Norwegian Institute of Public Health
http://www.fhi.no/dokumenter/545eea7147.pdf



Legend

ECSU Campus Boundary

N

PROPERTY/PROJECT

Eastern Connecticut State University
2008 Campus Plan Update

Environmental Impact Evaluation

Willimantic and Mansfield, Connecticut
DCS Project No. BI-RW-295

Prepared by:
Department of Construction Services
Environmental Planning & GIS Services
Printed in color. Prepared by: JSB
Date: 2/25/2013

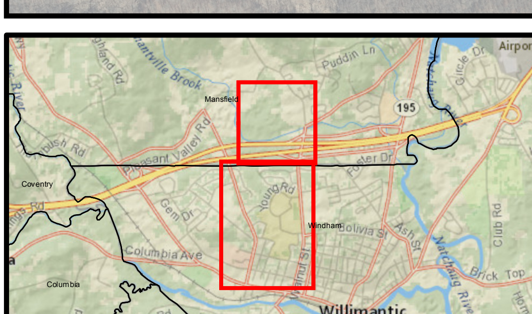
0 0.5 1 2 3 4
Miles

For planning purposes only.
State Plane Coordinate System of 1983, Zone 3526
Lambert Conformal Conic Projection
North American Datum of 1983

Data Sources: National Geographic; DCS

TITLE

Figure 1
General Location



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North American Datum of 1983

Data Sources: 2012 aerial (CLEAR); DESPP (TeleAtlas); DCS

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Eastern Connecticut State University
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Environmental Impact Evaluation

Willimantic and Mansfield, Connecticut
DCS Project No. BI-RW-295

TITLE

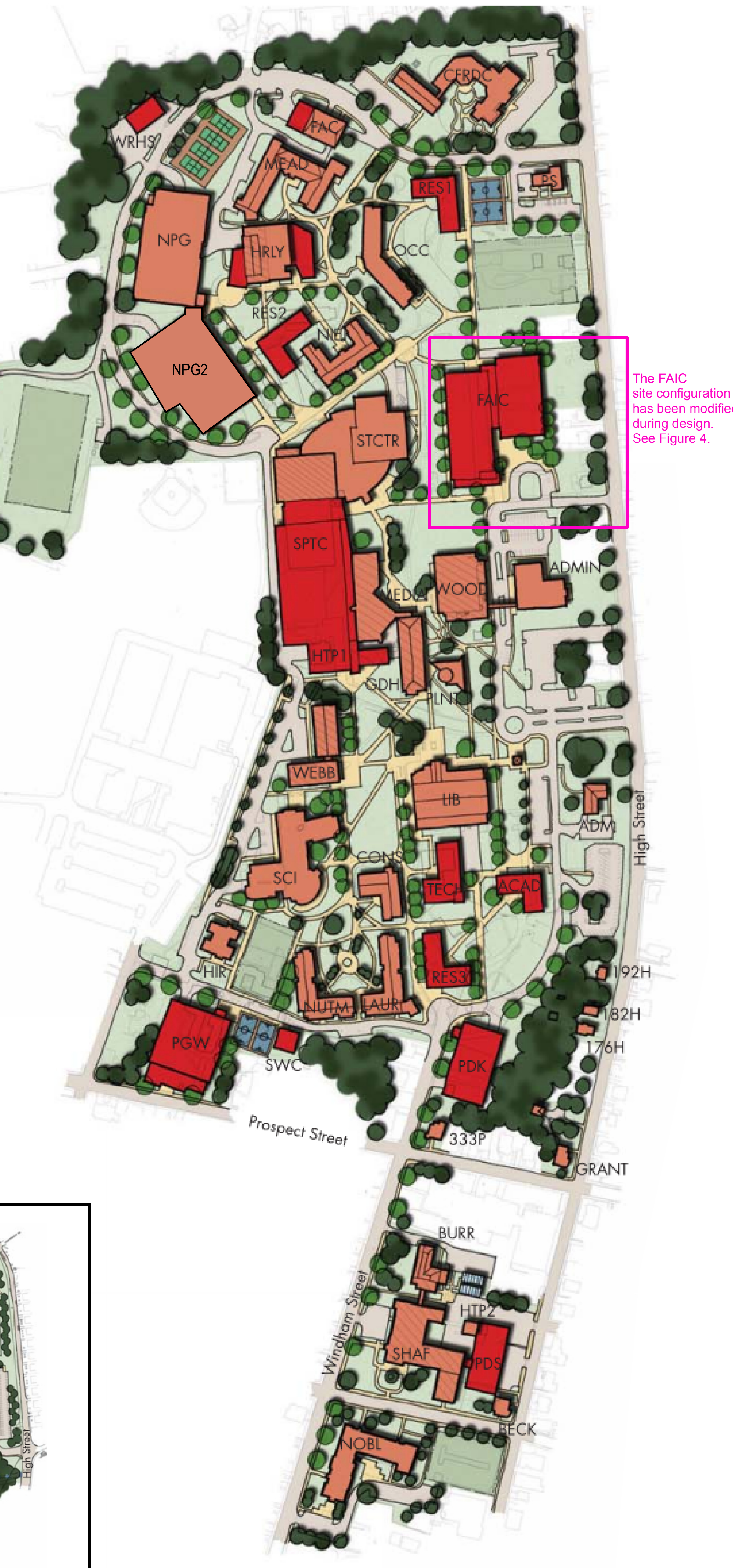
Figure 2
Existing Site Conditions

CAMPUS KEY

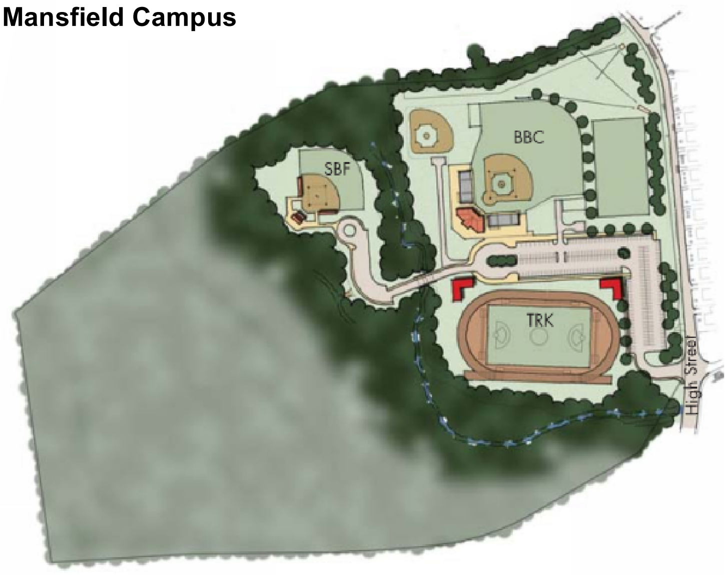
176H	176 High Street
182H	182 High Street
192H	192 High Street
333P	333 Prospect Street
372H	372 High Street
392H	392 High Street
ADMIN	Administration Building
ADM	Admissions Building
BBC	Baseball Field
BECK	Beckert Hall
BURR	Burr Hall
CONS	Constitution Hall
CRH	Crandall Hall
GDH	Goddard Hall
GRANT	Grant House
HTP2	Heating Plant, South
LAUR	Laurel Hall
LIB	J. Eugene Smith Library
MEAD	Mead Hall
MEDIA	Media Building
NIEJ	Niejadlik Hall
NOBL	Noble Hall
NUTM	Nutmeg Hall
OCC	Occum Hall
NPG	North Parking Garage
NPG2	North Parking Garage #2
PS	Police Station
SHAF	Shafer Hall
SCI	Science Building
SBF	Spector Softball Field
STCTR	Student Center
TRK	Track
WEBB	Webb Hall
PLNT	Wickware Planetarium
CFRDC	Child & Family Dev. Resource Center
WOOD	Wood Support Services Center

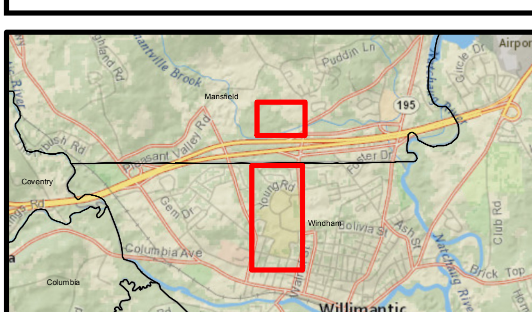
MASTER PLAN PROJECTS

ACAD	New Academic Building
BRNP	Burnap Hall (Demolish)
ESTRN	Eastern Hall (Demolish)
FAC	Facilities Management and Planning (w/ Addition)
FAIC	New Fine Arts Instructional Center
HIR	High Rise Apartments (Demolish)
HLTS	Health Services (Demolish)
HRLY	Hurley Hall/Dining Services (w/ Addition)
HTP1	Heating Plant, North (w/Addition)
KNT	Knight House- Interfaith Center (Demolish)
LoR	Low Rise Apartments (Demolish)
PDK	Knight Parking Deck
PDS	South Parking Deck
PDS	South Parking Deck
RES1	New Residence Hall 1
RES2	New Residence Hall 2
RES3	New Residence Hall 3
SPTC	Sports Center (w/ Addition)
SWC	New Student Wellness Center
TECH	Academic Technology Building
WIN	Winthrop Hall (Demolish)



Mansfield Campus





Legend

- Campus Master Plan Buildings
- Existing Buildings

N

PROPERTY/PROJECT

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Not to scale

For planning purposes only.
State Plane Coordinate System of 1983, Zone 3526
Lambert Conformal Conic Projection
North American Datum of 1983

Data Sources: SMMA (2008)

TITLE

Figure 3
Campus Master Plan