smartlink

January 19, 2018

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

Re:	**Notice of Exempt Modification – Antenna Swap**
Property Address:	**2074 Sparks Street HARTFORD, CT 06106**
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 83-feet on an existing 85 -smokestack, owned by 2074-2100 Park Street LLC 2074 Park St suite 100 Hartford, CT 06106. AT&T now intends to install (3) NEW PANEL ANTENNAS TO REPLACE (3) EXISTING ANTENNAS, (1) PER SECTOR INSTALL (3) NEW RRUS-32, (1) PER SECTOR, INSTALL (3) NEW RRUS-32 B66, (1) PER SECTOR, UPGRADE DUS TO 5216 AND INSTALL (6) LOW BAND COMBINERS, (2) PER SECTOR.

This facility was approved by the city of Hartford on or around January 1998. Historic records confirm that an electrical permit was issued on January 21, 1998. Since there were no conditions that could feasibly be violated by this modification, including total facility height or mounting restrictions, this modification complies with the original local approval.

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

TS-EM-CING-064-120612 - New Cingular Wireless PCS, LLC notice of intent to modify an existing telecommunications facility located at 2074 Park Street, Hartford, Connecticut. EM-CING-064-170417 – New Cingular Wireless PCS, LLC notice of intent to modify an existing telecommunications facility located at 2074 Park Street, Hartford, Connecticut. Decision Completion Letter.

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 to the Honorable Luke Bronin, Mayor of the City of Hartford, 550 Main Street, Hartford, CT 06103 and the Planning and Zoning Department at 250 Constitution Plaza, 4th Floor. A copy is also being sent to John L. Mendonsa 2074-2100 PARK STREET LLC
2074 Park Street Suite 101 Hartford, CT 06106structure and property owner.

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 83-foot level of the 85-foot smokestack.
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:
Honorable Luke Bronin, Mayor of the City of Hartford
Planning and Zoning Department the City of Hartford
2074-2100 Park Street LLC- structure and property owner.

at&t

SITE NAME: HARTFORD PARK ST
FA NUMBER: 10035106
SITE NUMBER: CTL01199
4C - MRCTB025365
3C - MRCTB025356
MULTI-CARRIER - MRCTB019670

2074 PARK STREET
HARTFORD, CT 06106
HARTFORD 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:	TODD OLIVER
PHONE:	(774) 369-3618
E-MAIL:	TODD.OLIVER@SMARTLINKLLC.COM

ENGINEER

COMPANY:	MASER CONSULTING CONNECTICUT
ADDRESS:	331 NEWMAN SPRINGS ROAD
CITY, STATE, ZIP:	RED BANK, NJ 07701-5699
CONTACT:	PETROS TSOUKALAS
PHONE:	(856) 797-0412 x4102
E-MAIL:	PTSOUKALAS@MASERCONSULTING.COM

CONSTRUCTION MANAGER

COMPANY:	SMARTLINK, LLC.
ADDRESS:	85 RANGEWAY ROAD, BUILDING 3, SUITE 102
CITY, STATE, ZIP:	NORTH BILLERICA, MA 01862-2105
CONTACT:	MARK DONNELLY
PHONE:	(617) 515-2080
E-MAIL:	MARK.DONNELLY@SMARTLINKLLC.COM

SITE INFORMATION

APPLICANT/LESSEE

at&t

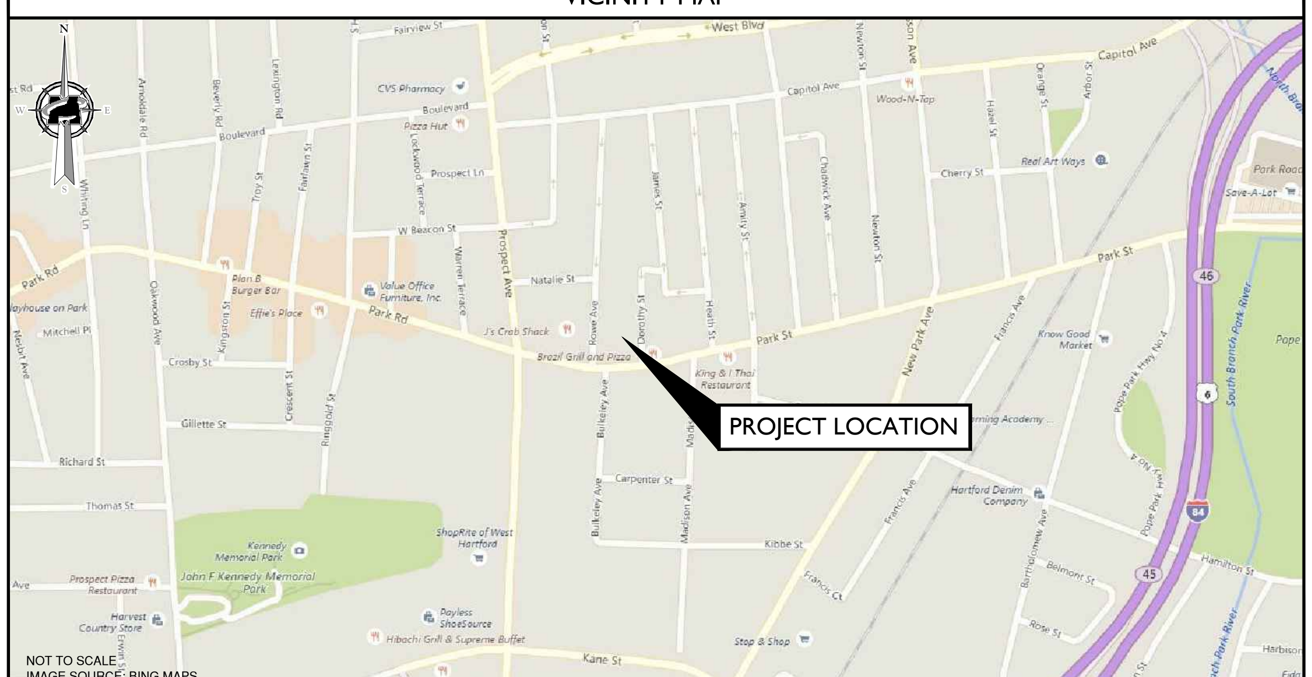
NEW CINGULAR WIRELESS PCS, LLC
550 COCHITUATE ROAD
FRAMINGHAM, MA 01701

TOWER OWNER:

NAME:	TBD
ADDRESS:	
CITY, STATE, ZIP:	

LATITUDE:	41.7567700° N
LONGITUDE:	72.7138881° W
LAT./LONG. TYPE:	NAD 83
AREA OF CONSTRUCTION:	EXISTING EQUIPMENT SHELTER AND SMOKESTACK
ZONING/JURISDICTION:	HARTFORD COUNTY
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



NOT TO SCALE
IMAGE SOURCE: BING MAPS

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. 2016 CONNECTICUT STATE BUILDING CODE, INCORPORATING THE 2012 INTERNATIONAL BUILDING CODE
2. 2014 NEC
3. 2012 NFPA
4. LIGHTNING PROTECTION CODE 2011
5. AMERICAN CONCRETE INSTITUTE 318
6. AMERICAN INSTITUTE OF STEEL CONSTRICTION 360-10
7. EIA/TIA-222 REVISION G
8. TIA-222-G FOR GROUNDING
9. INSTITUTE FOR ELECTRICAL AND ELECTRONICS ENGINEERS 81
10. IEEE C2 LATEST EDITION
11. TELCORDIA GR-1275
12. ANSI T1.311

GENERAL CONTRACTOR NOTES

DO NOT SCALE DRAWINGS

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

GENERAL NOTES

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

PROJECT DESCRIPTION/SCOPE OF WORK

THIS PROJECT WILL BE COMPRISED OF:

- (3) NEW PANEL ANTENNAS TO REPLACE (3) EXISTING ANTENNAS, (1) PER SECTOR
- INSTALL (3) NEW RRUS-32, (1) PER SECTOR
- INSTALL (3) NEW RRUS-32 B66, (1) PER SECTOR
- UPGRADE DUS TO 5216
- INSTALL (6) LOW BAND COMBINERS, (2) PER SECTOR

PROPOSED PROJECT SCOPE BASED ON RFDS ID# 1820379, VERSION 1.0, LAST UPDATED 09/07/17

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

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

SCALE :	JOB NUMBER :
AS SHOWN	17946065A

REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY
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1	12/13/17	ISSUED FOR PERMIT	AJC	PET
0	10/13/17	ISSUED FOR REVIEW	AN	PET

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:

HARTFORD PARK ST
FA# 10035106
SITE # CTL01199

2074 PARK STREET
HARTFORD, CT 06106
HARTFORD 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 (Fy = 36 ksi) UNLESS OTHERWISE NOTED. PIPES SHALL BE ASTM A53 TYPE E (Fy = 36 ksi). ALL STEEL EXPOSED TO WEATHER SHALL BE HOT DIPPED GALVANIZED. TOUCHUP ALL SCRATCHES AND OTHER MARKS IN THE FIELD AFTER STEEL IS ERECTED USING A COMPATIBLE ZINC RICH PAINT.
47. CONSTRUCTION SHALL COMPLY WITH SPECIFICATIONS AND "GENERAL CONSTRUCTION SERVICES FOR CONSTRUCTION OF AT&T MOBILITY SITES."
48. SUBCONTRACTOR SHALL VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS PRIOR TO COMMENCING ANY WORK. ALL DIMENSIONS OF EXISTING CONSTRUCTION SHOWN ON THE DRAWINGS MUST BE VERIFIED. SUBCONTRACTOR SHALL NOTIFY THE CONTRACTOR OF ANY DISCREPANCIES PRIOR TO ORDERING MATERIAL OR PROCEEDING WITH CONSTRUCTION.
49. THE EXISTING CELL SITE IS IN FULL COMMERCIAL OPERATION, ANY CONSTRUCTION WORK BY SUBCONTRACTOR SHALL NOT DISRUPT THE EXISTING NORMAL OPERATION. ANY WORK ON EXISTING EQUIPMENT MUST BE COORDINATED WITH CONTRACTOR. ALSO, WORK SHOULD BE SCHEDULED FOR AN APPROPRIATE MAINTENANCE WINDOW USUALLY IN LOW TRAFFIC PERIODS AFTER MIDNIGHT.
50. SINCE THE CELL SITE IS ACTIVE, ALL SAFETY PRECAUTIONS MUST BE TAKEN WHEN WORKING AROUND HIGH LEVELS OF ELECTROMAGNETIC RADIATION. EQUIPMENT SHOULD BE SHUTDOWN PRIOR TO PERFORMING ANY WORK THAT COULD EXPOSE THE WORKERS TO DANGER. PERSONAL RF EXPOSURE MONITORS ARE ADVISED TO BE WORN ALERT OF DANGEROUS EXPOSURE LEVELS.

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

SCALE :	JOB NUMBER :
AS SHOWN	17946065A

REV	DATE	DESCRIPTION	DRAWN BY	CHECKED BY
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1	12/13/17	ISSUED FOR PERMIT	AJC	PET
0	10/13/17	ISSUED FOR REVIEW	AN	PET

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

PETROS [illegible] TSOUKALAS
CONNECTICUT PROFESSIONAL ENGINEER - LICENSE NUMBER: PEN.32577

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SITE NAME:

HARTFORD PARK ST
FA# 10035106
SITE # CTL01199

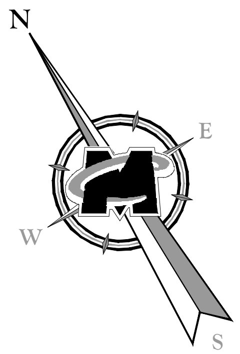
2074 PARK STREET
HARTFORD, CT 06106
HARTFORD COUNTY

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 :
GENERAL NOTES

SHEET NUMBER :
GN-1

8110035106_AE201_171213_CTL01199_Rev 1.dwg\GN-1 By: ACOIA

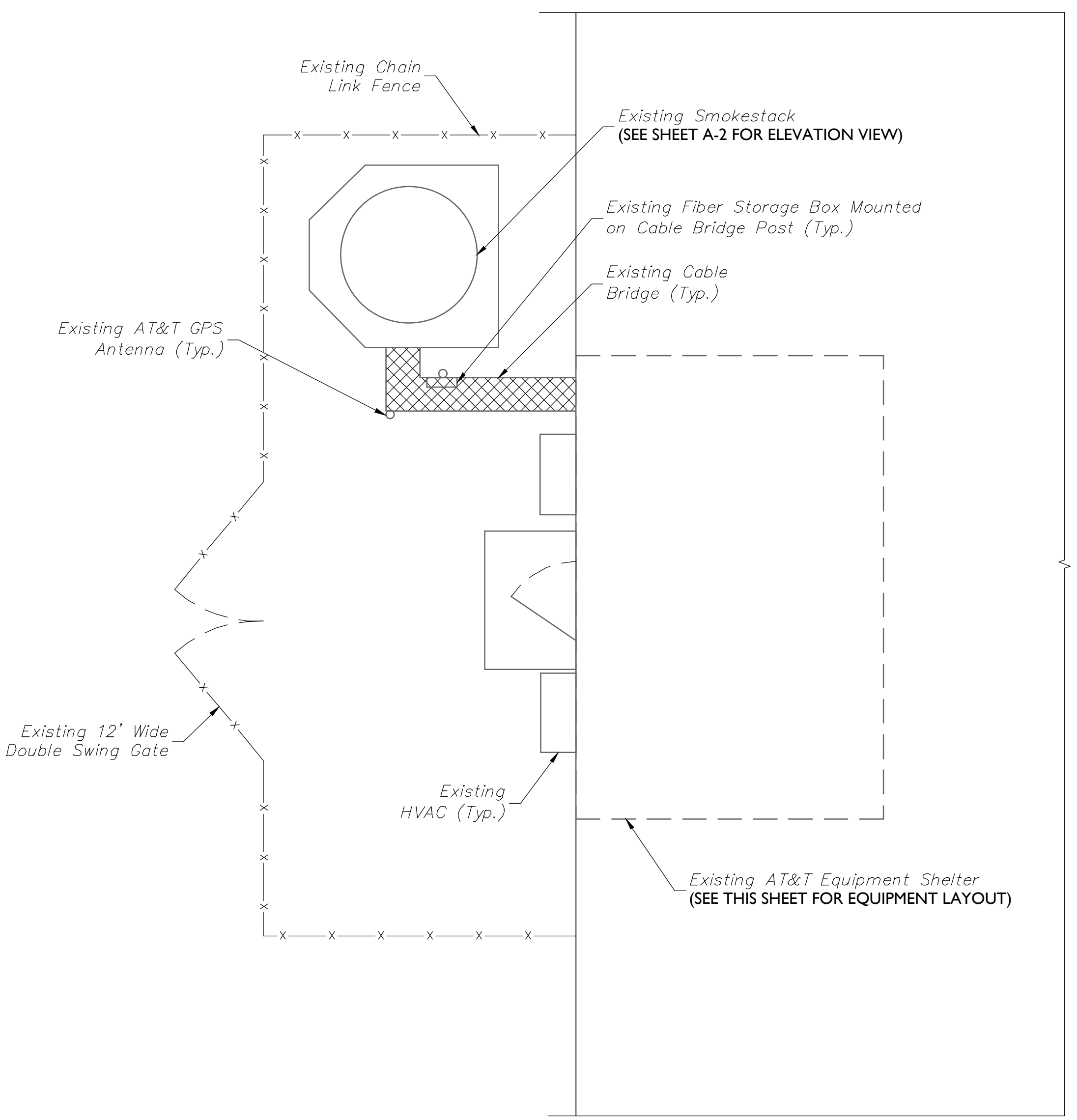


NOTE:

SITE INFORMATION OBTAINED FROM THE FOLLOWING:

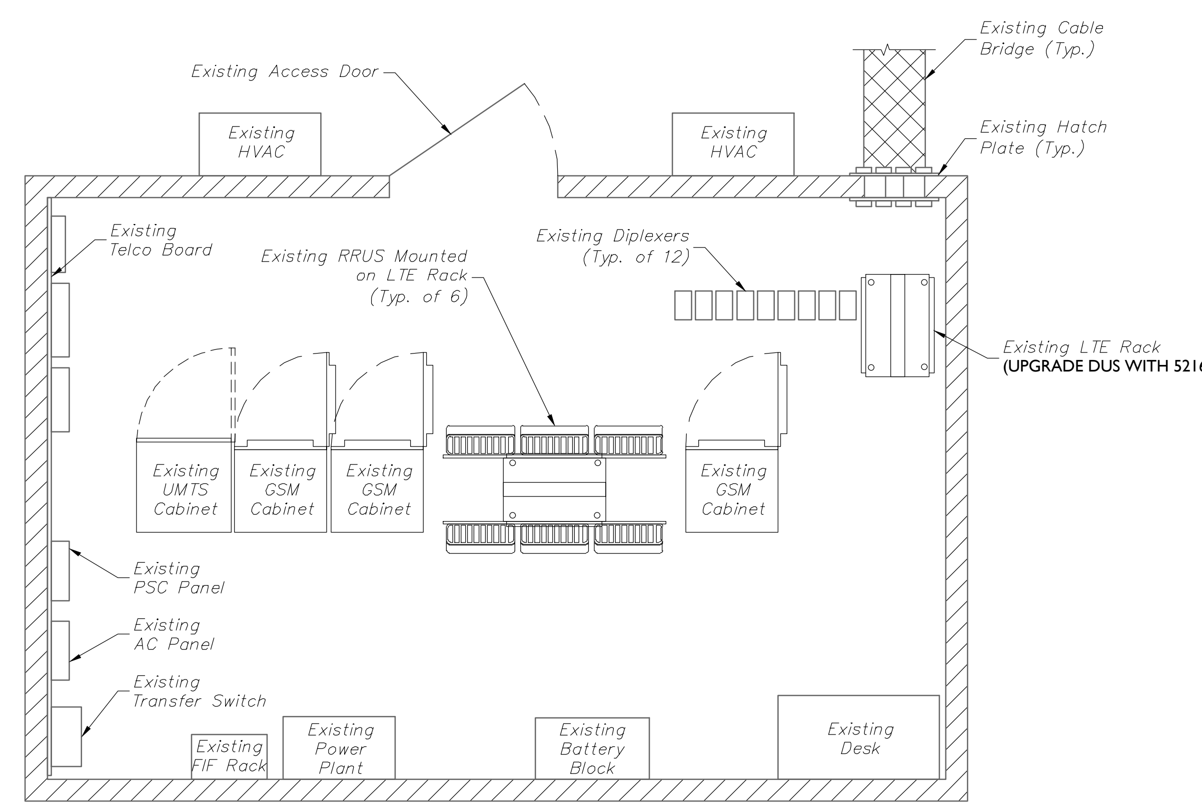
A. PLAN ENTITLED "HARTFORD PARK ST" PREPARED BY PRO TERRA DESIGN GROUP, LLC, LAST REVISED 03/28/2017.

B. LIMITED FIELD OBSERVATION BY MASER CONSULTING P.A. ON 08/21/2017.



COMPOUND LAYOUT

SCALE : 1" = 4'
(DO NOT SCALE 11"X17" DRAWINGS)



EQUIPMENT LAYOUT

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

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SCALE :	JOB NUMBER :
AS SHOWN	17946065A

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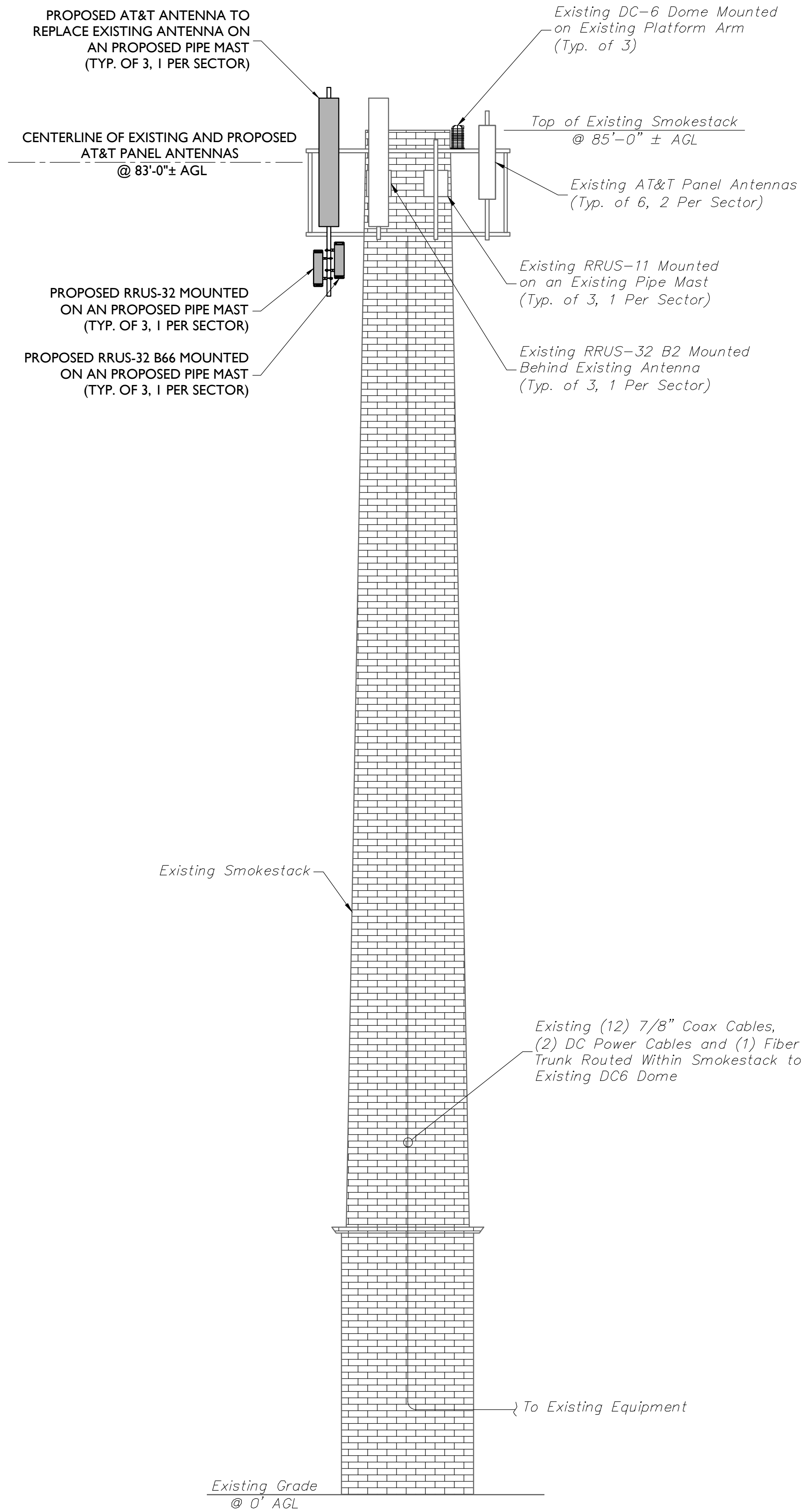
Phone: 732.383.1950
Fax: 732.383.1984
email: solutions@maserconsulting.com

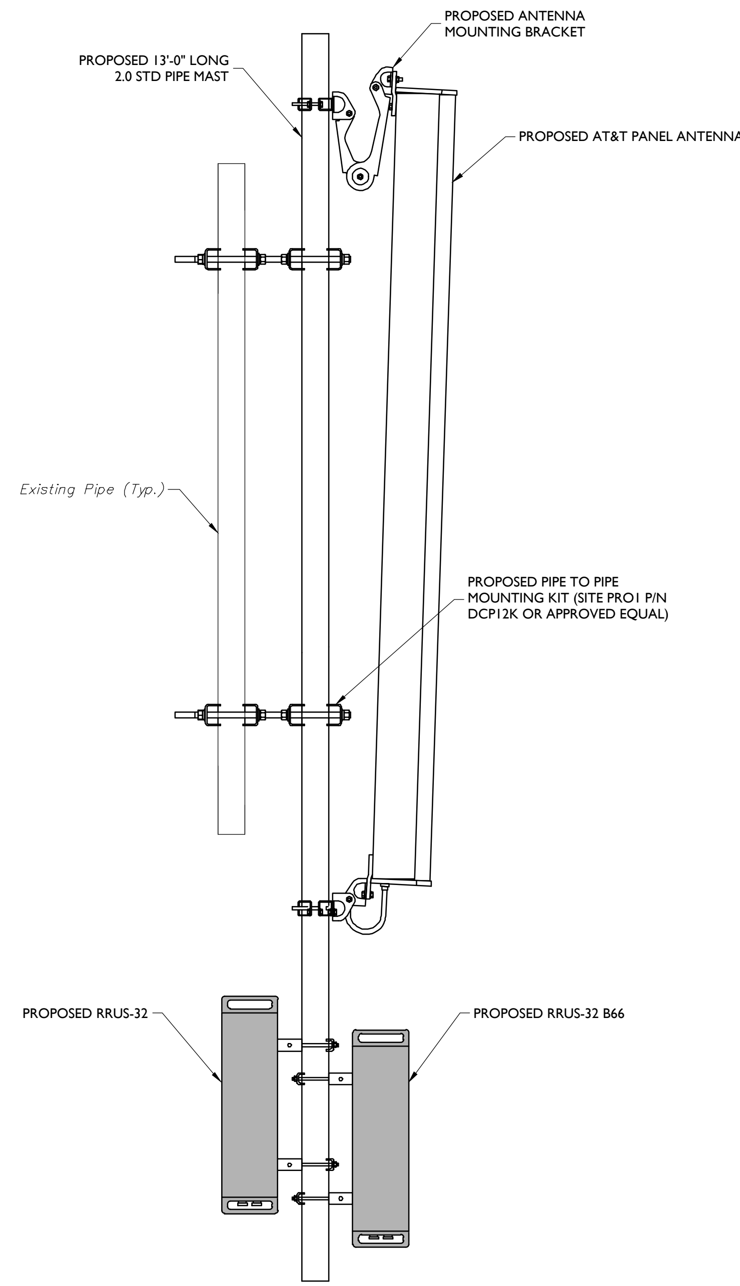
SHEET TITLE :
COMPOUND AND EQUIPMENT LAYOUT

SHEET NUMBER :
A-1



ELEVATION VIEW

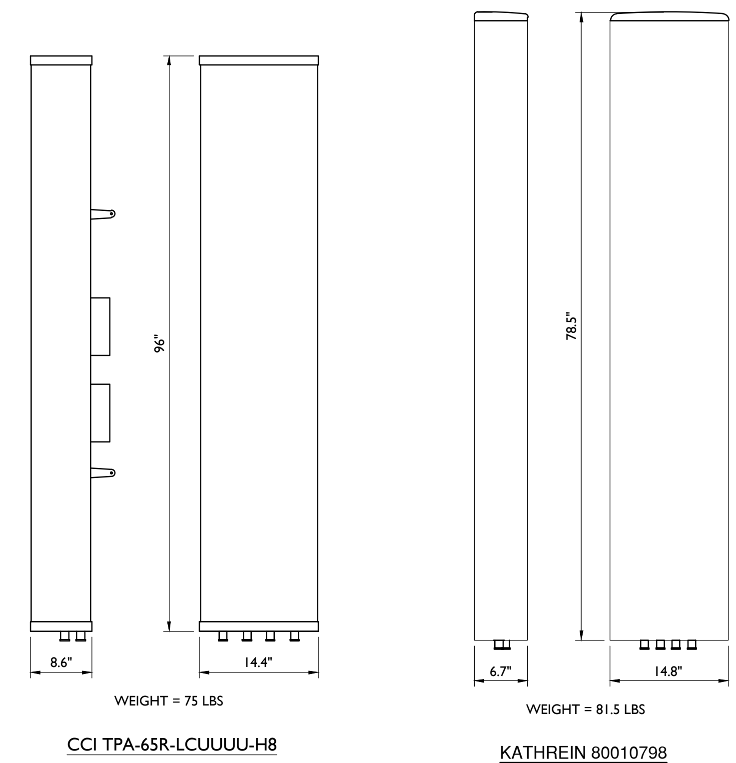
SCALE : 1" = 5'
(DO NOT SCALE 11"X17" DRAWINGS)



ANTENNA MOUNTING DETAIL

NOT TO SCALE

3 FEET MINIMUM SEPARATION BETWEEN LTE ANTENNAS
6 FEET MINIMUM SEPARATION BETWEEN 700BC & 700 DE



ANTENNA DETAILS

NOT TO SCALE

PROPOSED ANTENNA AND RRUS CONFIGURATION													
SECTOR		EXISTING ANTENNA CONFIGURATION	PROPOSED ANTENNA CONFIGURATION	TECHNOLOGY	ANTENNA STATUS	HEIGHT (in)	WIDTH (in)	DEPTH (in)	WEIGHT (lbs)	ANTENNA AZIMUTH	ANT. CL. ELEV (ft.)	RRUS CONFIGURATION	STATUS
ALPHA	A1	Powerwave 7770	Powerwave 7770	UMTS	EXISTING	55.00	11.00	5.00	35.00	23°	83'	-	-
	A3	CCI HPA-65R-BUU-H8	CCI HPA-65R-BUU-H8	LTE	EXISTING	92.40	14.80	7.40	68.00	23°	83'	(1) RRUS-11 (1) RRUS-32 B2	REMAIN REMAIN
	A4	Powerwave 7770	**CCI TPA-65R-LCUUUU-H8**	**LTE**	**NEW**	**96.00**	**14.40**	**8.60**	**75.00**	**23°**	**83'**	**(1) RRUS-32 (1) RRUS-32 B66**	**NEW NEW**
BETA	B1	Powerwave 7770	Powerwave 7770	UMTS	EXISTING	55.00	11.00	5.00	35.00	140°	83'	-	-
	B3	CCI HPA-65R-BUU-H8	CCI HPA-65R-BUU-H8	LTE	EXISTING	92.40	14.80	7.40	68.00	140°	83'	(1) RRUS-11 (1) RRUS-32 B2	REMAIN REMAIN
	B4	Powerwave 7770	**Kathrien 80010798**	**LTE**	**NEW**	**78.50**	**14.80**	**6.70**	**81.50**	**140°**	**83'**	**(1) RRUS-32 (1) RRUS-32 B66**	**NEW NEW**
GAMMA	C1	Powerwave 7770	Powerwave 7770	UMTS	EXISTING	55.00	11.00	5.00	35.00	260°	83'	-	-
	C3	CCI HPA-65R-BUU-H8	CCI HPA-65R-BUU-H8	LTE	EXISTING	92.40	14.80	7.40	68.00	260°	83'	(1) RRUS-11 (1) RRUS-32 B2	REMAIN REMAIN
	C4	Powerwave 7770	**CCI TPA-65R-LCUUUU-H8**	**LTE**	**NEW**	**96.00**	**14.40**	**8.60**	**75.00**	**260°**	**83'**	**(1) RRUS-32 (1) RRUS-32 B66**	**NEW NEW**

ANTENNA SCHEDULE

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

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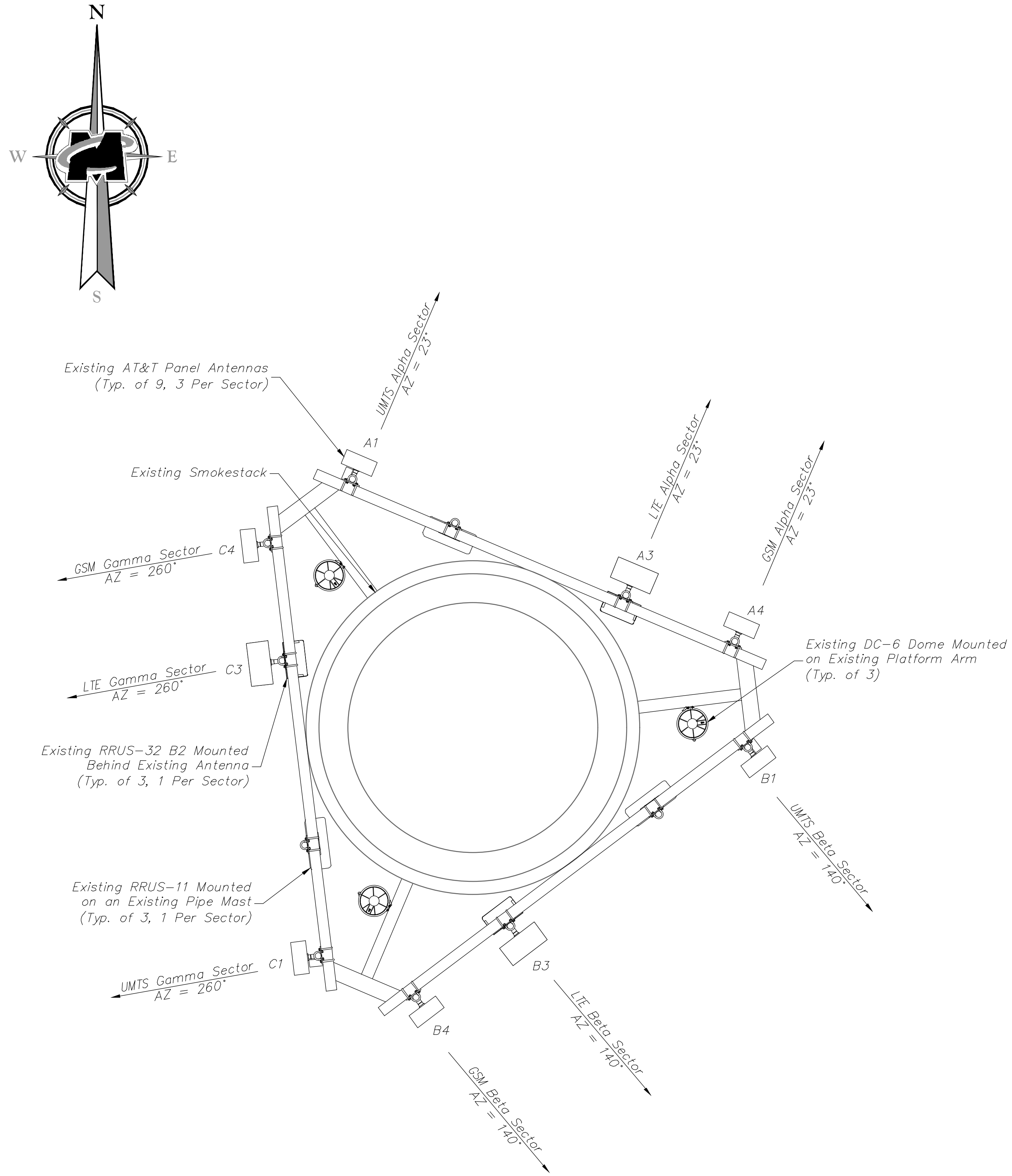
SHEET TITLE :
ELEVATION VIEW, DETAILS AND ANTENNA SCHEDULE

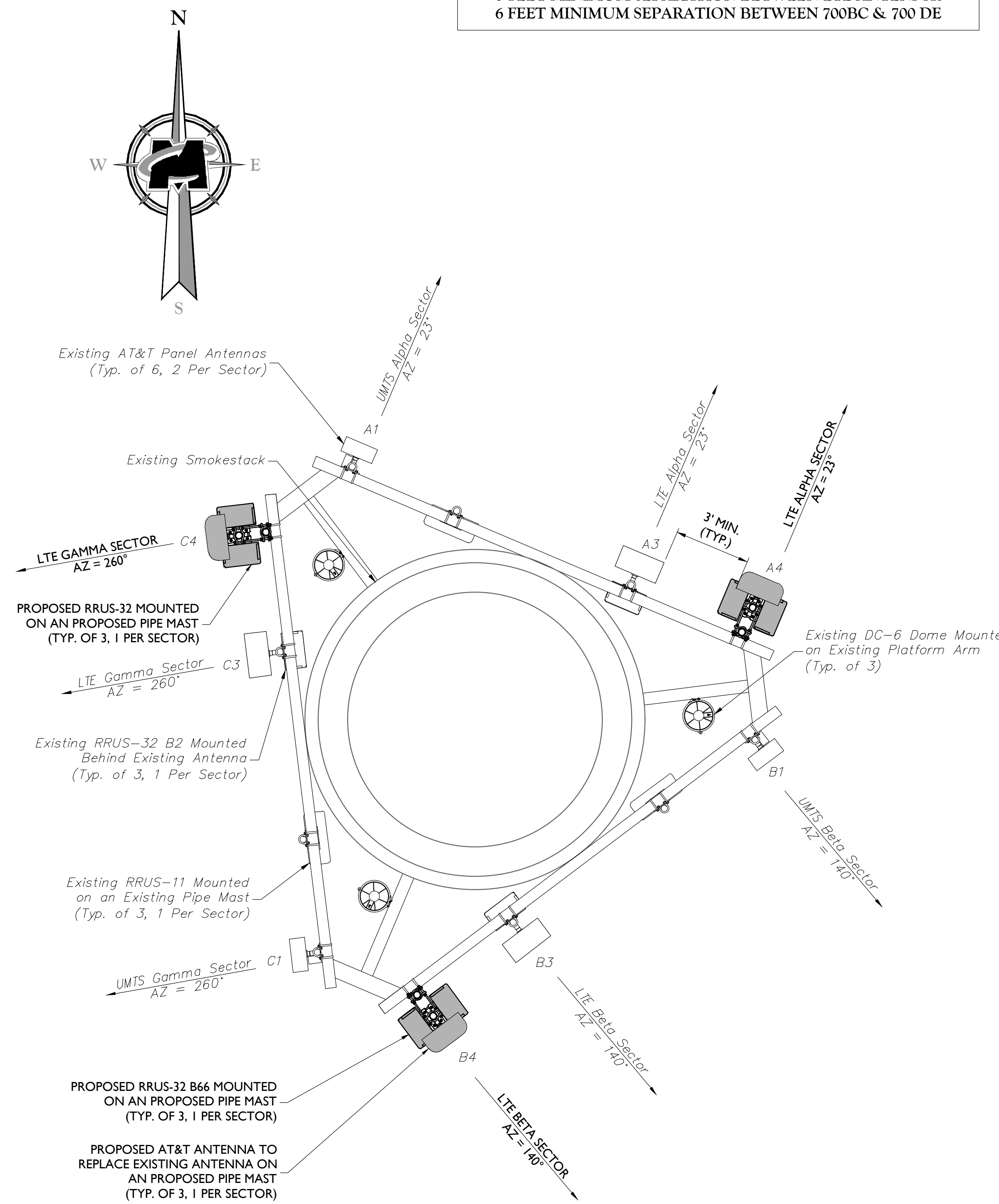
SHEET NUMBER :
A-2

3 FEET MINIMUM SEPARATION BETWEEN LTE ANTENNAS
6 FEET MINIMUM SEPARATION BETWEEN 700BC & 700 DE



EXISTING - ANTENNA LAYOUT

NOT TO SCALE



PROPOSED - ANTENNA LAYOUT

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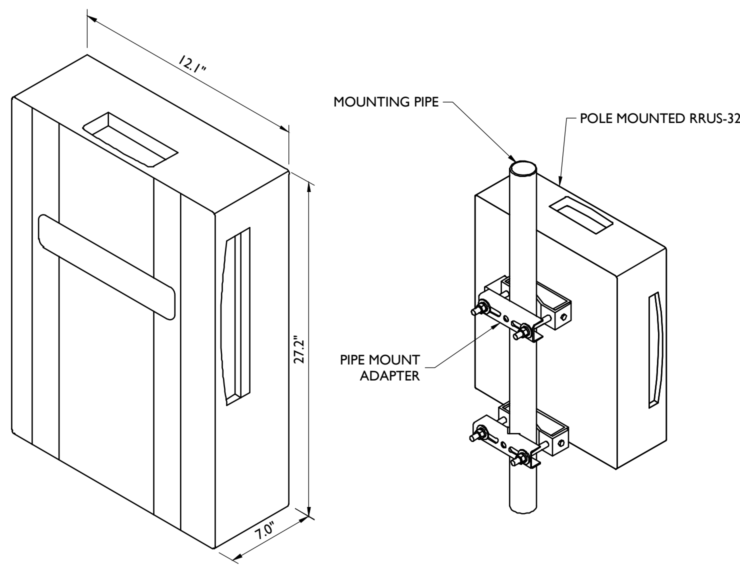
SHEET TITLE :
ANTENNA LAYOUTS

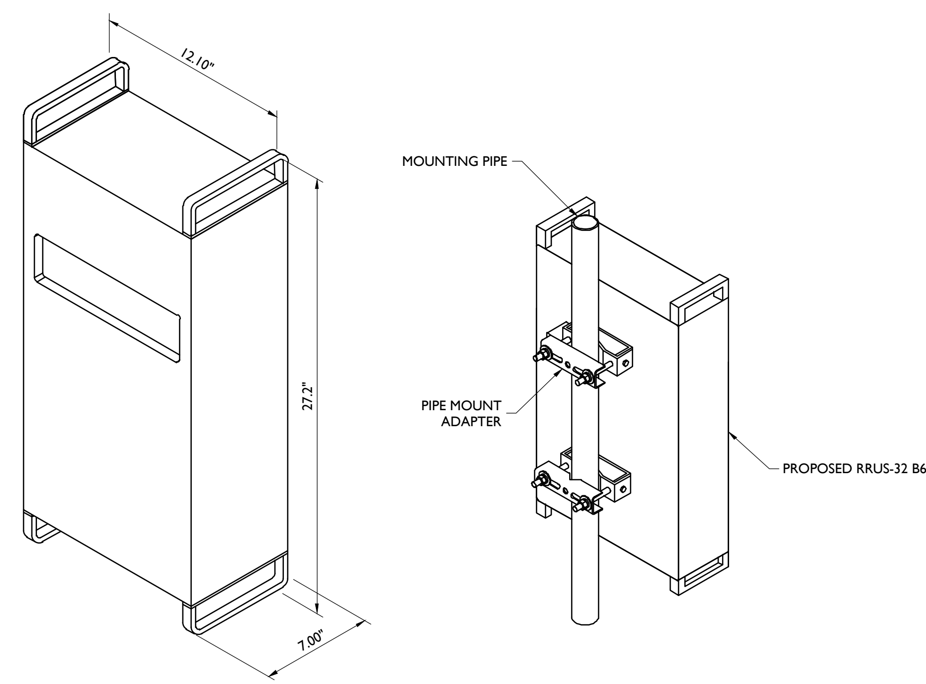
SHEET NUMBER :
A-3



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

RRUS-32 B2 DETAIL

NOT TO SCALE



RRUS-32 B66 DIMENSIONS (H X W X D): 27.2" X 12.1" X 7.0"
(INCLUDES HANDLES, FEET AND SUNSHIELD)
WEIGHT: 53 LBS

RRUS-32 B66 DETAIL

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STATE OF CONNECTICUT
PETROS TSOUKALAS
32577
LICENSED
PROFESSIONAL ENGINEER

PETROS E. TSOUKALAS
CONNECTICUT PROFESSIONAL
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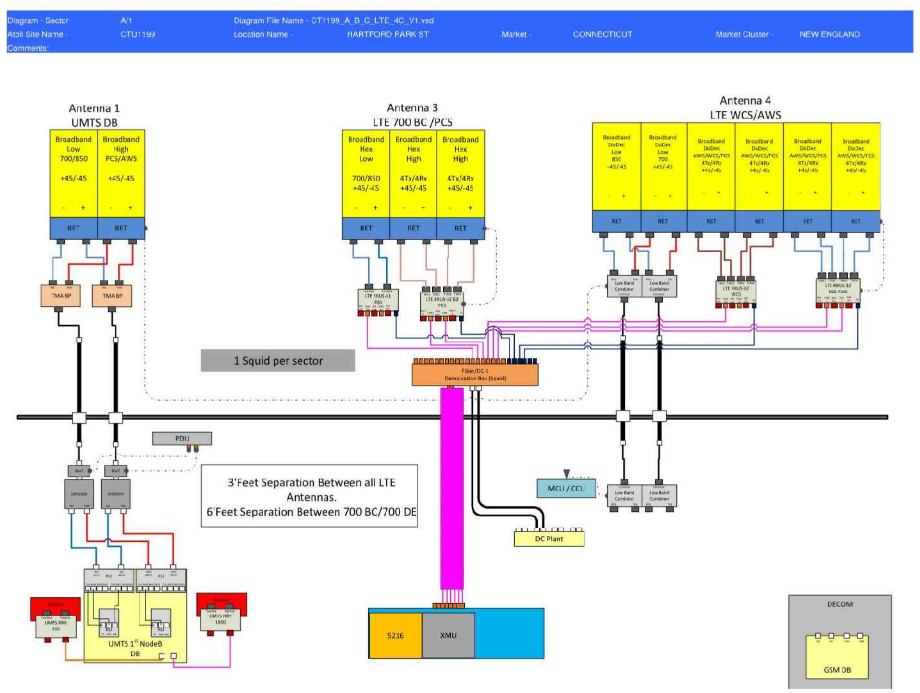
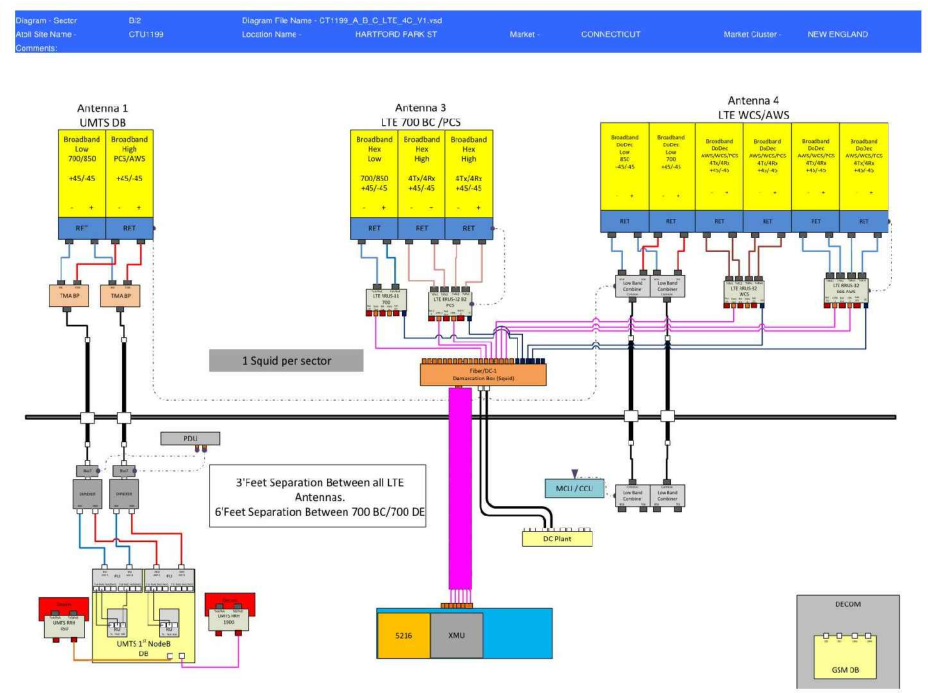
SHEET TITLE :
DETAILS

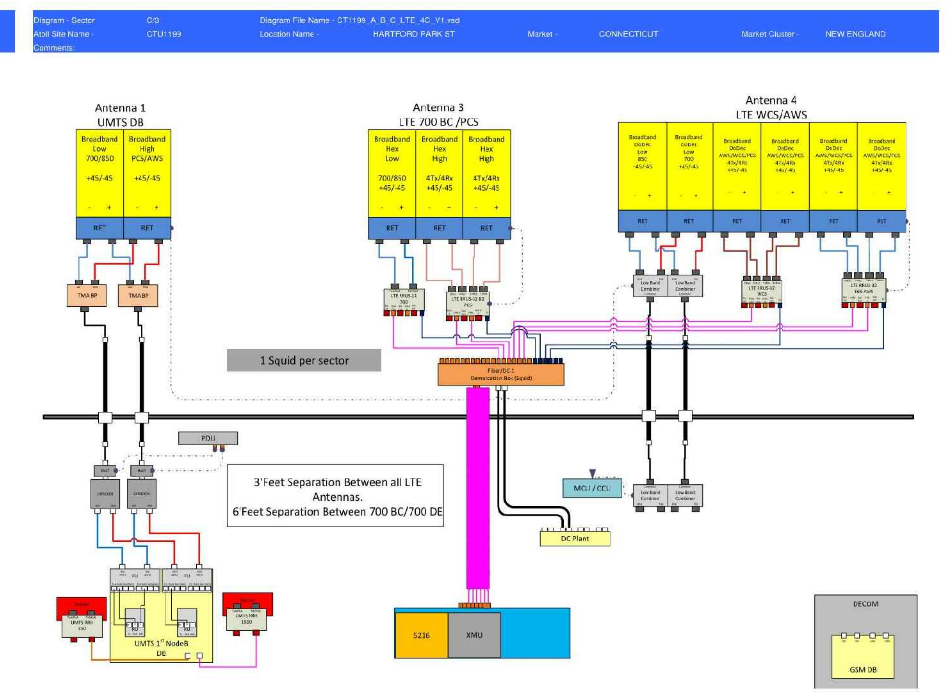
SHEET NUMBER :
A-4



ALPHA SECTOR



BETA SECTOR



GAMMA SECTOR

BASED ON: RF ENGINEERING DESIGN ENTITLED "NEW-ENGLAND_CONNECTICUT_CTU1199_2018-LTE-Next-Carrier_LTE_rx855w_2051A0D6HQ_10035106_59402_06-16-2017_Final-RF-Approval_v1.00", LAST UPDATED 09/07/17

RF PLUMBING DIAGRAMS

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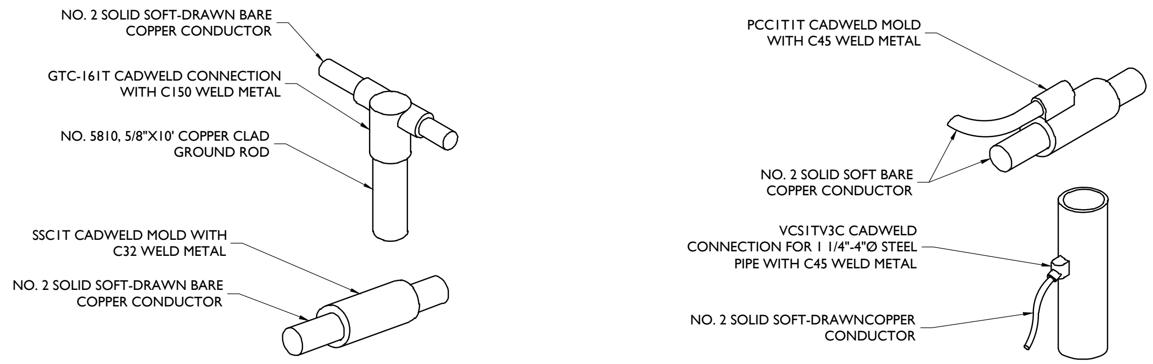
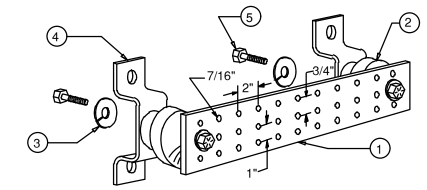
SHEET TITLE :
RF PLUMBING DIAGRAMS

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

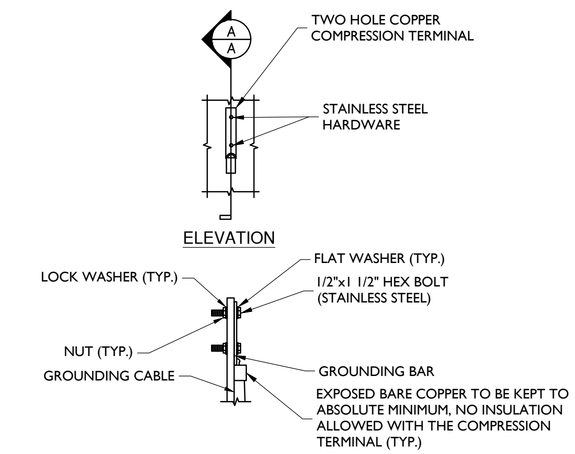
CABLE ENTRY PORTS (HATCH PLATES) (#2)
GENERATOR FRAMEWORK (IF AVAILABLE) (#2)
TELCO GROUND BAR
COMMERCIAL POWER COMMON NEUTRAL/GROUND BOND (#2)
+24V POWER SUPPLY RETURN BAR (#2)
-48V POWER SUPPLY RETURN BAR (#2)
RECTIFIER FRAMES.

SECTION "A" - SURGE ABSORBERS

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

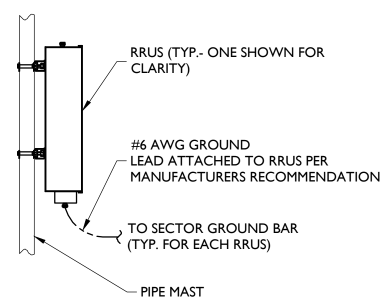
MASTER GROUND BAR

NOT TO SCALE



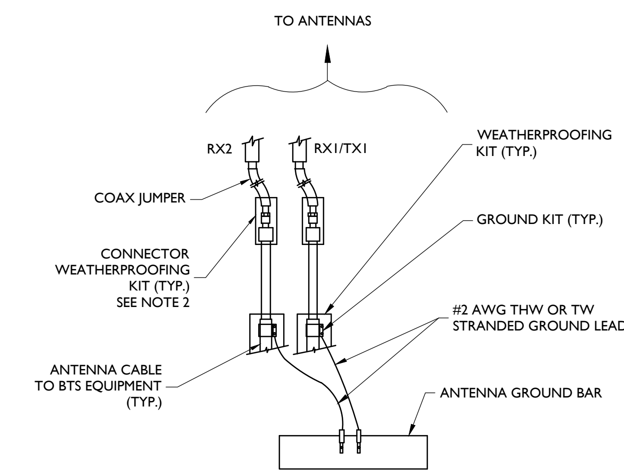
TYPICAL GROUND BAR CONNECTION DETAIL

NOT TO SCALE



RRU GROUNDING

NOT TO SCALE



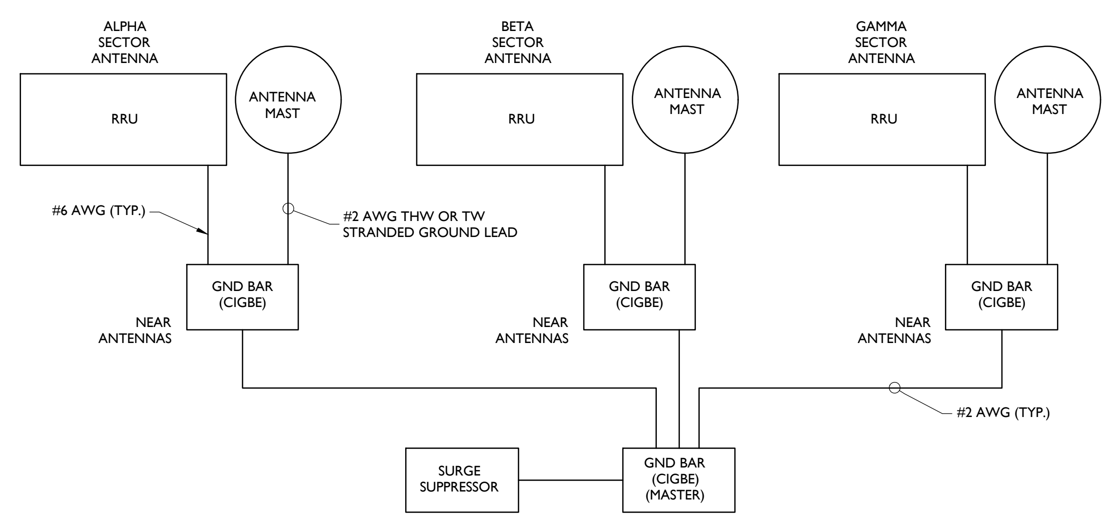
NOTES:

1. DO NOT INSTALL CABLE GROUND KIT AT A BEND AND ALWAYS DIRECT GROUND WIRE DOWN TO ANTENNA GROUND BAR.

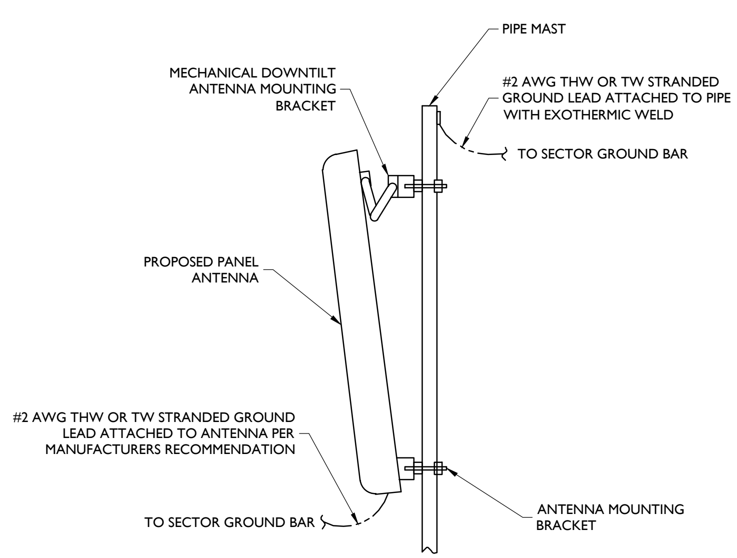
2. WEATHER PROOFING SHALL BE TWO-PART TAPE KIT, COLD SHRINK SHALL NOT BE USED.

TYPICAL GROUND WIRE TO GROUNDING BAR

NOT TO SCALE



SCHEMATIC DIAGRAM GROUNDING SYSTEM



ANTENNA GROUNDING

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SHEET TITLE :
GROUNDING DETAILS

SHEET NUMBER :
G-1

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Smokestack Analysis

FOR

CTL01199 – Hartford Park St

2074 Park Street
Hartford, CT 06106
Hartford County

FA Number – 10035106
LTE 4C – MRCTB025365
LTE 3C – MRCTB025356
Multi-Carrier – MRCTB019670

Smokestack Utilization: 20.4%

January 11, 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

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

MC Project No. 17946065A

Objective:
In accordance with your request, Maser Consulting Connecticut has evaluated the structural impact of the existing and proposed **AT&T** wireless telecommunications equipment, together with the existing loading on the existing smokestack at the above referenced address.

Introduction:
Maser Consulting Connecticut has performed limited field observations on August 21, 2017 to verify the existing condition of the structure and to locate and quantify the existing wireless appurtenances where possible. This structural analysis is only valid for the appurtenances on the site at the time of the field visit. Additionally, Maser Consulting Connecticut has reviewed the following documents in completing this report:

- RFDS 1820379 provided by Smartlink, LLC., Revision 1.00, dated September 7, 2017
- Chimney Design Calculations prepared by International Chimney Corporation, dated March 19, 2017
- Previous Construction Drawings prepared by Hudson Design Group, dated March 21, 2017

The proposed **AT&T** equipment is to be supported on an existing antenna support mount constructed of structural steel antenna support pipes and hollow structural steel tubes at a centerline of approximately 83'-0" above ground level. The antenna mount is attached to the existing 85'-0" tall masonry smokestack. The smokestack is round on the top 67'-0" and octagonal shaped on the bottom 18'-0". This report is based upon this information.

Discrete and Linear Appurtenances:

Maser Consulting Connecticut understands the existing & proposed **AT&T** total loading to be as follows:

Quantity	Manufacturer	Antenna/ Appurtenance	Status	Sector
3	Powerwave	7770	Existing	Alpha, Beta, & Gamma
2	CCI	HPA-65R-BUU-H8	Existing	Alpha & Gamma
1	CCI	HPA-65R-BUU-H6	Existing	Beta
2	CCI	TPA-65R-LCUUUU-H8	Proposed	Alpha & Gamma
1	Kathrein	80010798	Proposed	Beta
3	Raycap	DC6-48-60-0-8C	Existing	Alpha, Beta, & Gamma
6	Powerwave	LGP 21401	Existing	Alpha, Beta, & Gamma
3	Ericsson	RRUS 11	Existing	Alpha, Beta, & Gamma
3	Ericsson	RRUS 32 B2	Existing	Alpha, Beta, & Gamma
3	Ericsson	RRUS 32	Proposed	Alpha, Beta, & Gamma
3	Ericsson	RRUS 32 B66	Proposed	Alpha, Beta, & Gamma

The existing smokestack has been analyzed with the loading of the existing and proposed **AT&T** equipment at centerline of 83'-0". The cables are routed inside the smokestack and thus not included in this analysis.

Codes, Standards and Loading:

Maser Consulting Connecticut utilized the following codes and standards:

- 2016 Connecticut State Building Code, Incorporating the 2012 International Building Code
- Minimum Design Loads for Buildings and Other Structures, ASCE 7-10
  - Ultimate Wind Speed – 125 mph (CT Building Code)
  - Exposure Category – B
  - Structural Class – II
- Building Code Requirements and Specifications for Masonry Structures, ACI 530-11
- Building Code Requirements and Specifications for Structural Concrete, ACI 318-11

Analysis Approach, Assumptions & Design Parameters:

The analysis approach used in this structural analysis is based on the premise that if the existing smokestack is structurally adequate to support the existing and proposed equipment per the aforementioned codes and standards, or if the increase in the forces in the structure is deemed to be negligible or acceptable, then the proposed equipment can be installed as intended.

Based on ASCE 7-10, the load combinations used for mortar check are:

- Compression - 1.0D+0.6W
- Tension - 0.6D+0.6W

<u>The following assumptions and masonry parameters were utilized in this report:</u>

- The allowable compressive strength of the mortar is assumed to be 1500 psi.
- The allowable tensile capacity of mortar is assumed to be 32 psi, σ_{perp} = 32 psi *(Assumed Type S Mortar values per ACI Table 8.2.4.2)*
- The allowable compressive strength of the concrete is assumed to be 3000 psi.
- The allowable Tensile Strength of concrete is assumed to be 0 *(Assumed per section 22.2.2.2 ACI 318-11)*
- Thicknesses and dimeters of the smokestack were taken from the previous reference analysis and are assumed to be accurate.
- The brick density is assumed to be 120 pcf.
- It is assumed that the telecommunication equipment supports, antenna supports, and existing structure have been designed by a registered licensed professional engineer for the existing loads acting on the structure, as required by all applicable codes, prior to the proposed modifications listed within this report.
- It is assumed that information provided by the client regarding the structure itself, the antenna models, feed lines, and other relevant information is current and correct.
- It is assumed all other existing appurtenances, antennas, cables, etc. belonging to others have been installed and supported per code and per specifications so as not to damage any existing structural support members, and that any contributing loads from adjacent equipment has been taken into consideration for their design.
- Proposed equipment and locations should not deviate from the proposed locations noted herein and shown on the associated Maser Consulting Connecticut final Construction Drawings.
- The values calculated on the analysis of the report are based on the masonry being in sound structural condition.

Calculations:
The calculations are found in Appendix A of this report.

Conclusion:
Maser Consulting Connecticut has determined that the existing 85'-0" tall smokestack has **ADEQUATE** structural capacity to support the proposed and existing loading per the aforementioned codes and standards**.** The smokestack was determined to be in compression throughout its height and stressed to **20.4%** of its maximum capacity at 0'-0" AGL. Therefore, the **AT&T** installation can be installed as intended.

The forces exerted on the antenna support mounts were taken into consideration while calculating the applied forces on the smokestack, the **AT&T** antenna mounts have been analyzed under a separate report. Maser Consulting Connecticut has not analyzed the foundation of the smokestack as a part of this structural analysis.

Since most smokestacks were build a few decades ago, Maser Consulting Connecticut recommends that the smokestack be thoroughly inspected for any possible damages, missing mortar, crack propagation, any other damages that may have occurred between the time of this analysis and the time of installation, before proceeding with the intended installation.

Maser Consulting Connecticut reserves the right to amend this report if additional information about the existing smokestack or antenna mounts is provided. The conclusions reached by Maser Consulting Connecticut in this report are only valid for the discrete and linear 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.

Very truly yours,
Maser Consulting Connecticut

Petros E. Tsoukalas, P.E
Geographic Discipline Leader

Lauren Luzier
Engineer

APPENDIX A

Dead Load:

Smokestack: Density of Masonry: $\rho := 120 \cdot pcf$

Masonry Compressive Stress (Type S Mortar): $f_m := 1500 \cdot psi$

Allowable Tensile Stress (Type-S Mortar):

(Table 8.2.4.2 of the ACI 530-14 for Type S Mortar and sound Clay masonry units)

Perpendicular to bed joints: $\sigma_{perp} := 32 \cdot psi$

Parallel to bed joints: $\sigma_{par} := 64 \cdot psi$

Average based on stress distribution around cross-section: $\sigma_a := \frac{(\sigma_{perp} + \sigma_{par})}{2} = 48\,psi$

Section Properties of Smokestack (Per previous SA):

At Top (Point A) (85' AGL):

Diameter at Top: $d_A := 6 \cdot ft$

At Point B:

(80' AGL)

Diameter at Point B: $d_B := 6.21 \cdot ft$

At Point C:

(65' AGL)

Diameter at Point C: $d_C := 7 \cdot ft$

At Point D:

(50' AGL)

Diameter at Point D: $d_D := 7.8ft$

At Point E:

(30' AGL)

Diameter at Point E: $d_E := 8.86 \cdot ft$

At Point F:

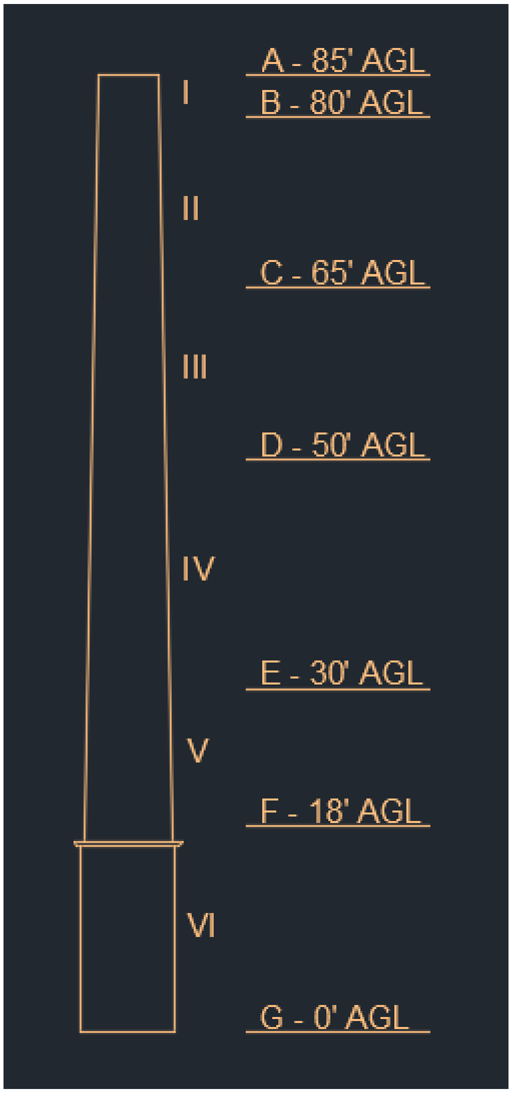
(18' AGL)

Diameter at Point F: $d_F := 9.5 \cdot ft$

At Point G:

(0' AGL)

Diameter at Point G: $d_G := 9.5 \cdot ft$



Weight Of Smokestack:

Section I:

Length of Section I: $L_I := 5ft$

Thickness at center of Section $t_I := 8in$

Top Radius: $r_{top} := \frac{d_A}{2} = 3\ ft$ $\quad r_{top\_in} := \frac{(d_A - 2 \cdot t_I)}{2} = 2.333\ ft$

Bottom Radius: $r_{bot} := \frac{d_B}{2} = 3.105\ ft$ $\quad r_{bot\_in} := \frac{(d_B - 2 \cdot t_I)}{2} = 2.438\ ft$

Outter Volume of Section I: $Vol_{outter\_I} := \frac{\pi}{3} \cdot L_I \cdot \left(r_{top}^2 + r_{bot} \cdot r_{top} + r_{bot}^2\right) = 146.377 \cdot ft^3$

Inner Volume of Section I: $Vol_{inner\_I} := \frac{\pi}{3} \cdot L_I \cdot \left(r_{top\_in}^2 + r_{bot\_in} \cdot r_{top\_in} + r_{bot\_in}^2\right) = 89.427 \cdot ft^3$

Total Volume of Section I: $Vol_I := Vol_{outter\_I} - Vol_{inner\_I} = 56.95 \cdot ft^3$

Weight of Section I: $D_I := Vol_I \cdot \rho = 6.834 \cdot kip$

Section II:

Length of Section II: $L_{II} := 15 \cdot ft$

Thickness at center of Section $t_{II} := 8in$

Top Radius: $r_{top} := \frac{d_B}{2} = 3.105\ ft$ $\quad r_{top\_in} := \frac{(d_B - 2 \cdot t_{II})}{2} = 2.438\ ft$

Bottom Radius: $r_{bot} := \frac{d_C}{2} = 3.5\ ft$ $\quad r_{bot\_in} := \frac{(d_C - 2 \cdot t_{II})}{2} = 2.833\ ft$

Outter Volume of Section II: $Vol_{outter\_II} := \frac{\pi}{3} \cdot L_{II} \cdot \left(r_{top}^2 + r_{bot} \cdot r_{top} + r_{bot}^2\right) = 514.57 \cdot ft^3$

Inner Volume of Section II: $Vol_{inner\_II} := \frac{\pi}{3} \cdot L_{II} \cdot \left(r_{top\_in}^2 + r_{bot\_in} \cdot r_{top\_in} + r_{bot\_in}^2\right) = 328.011 \cdot ft^3$

Total Volume of Section II: $Vol_{II} := Vol_{outter\_II} - Vol_{inner\_II} = 186.558 \cdot ft^3$

Weight of Section II: $D_{II} := Vol_{II} \cdot \rho = 22.387 \cdot kip$

Section III:

Length of Section III: $L_{III} := 15 \cdot ft$

Thickness at center of Section: $t_{III} := 8in$

Top Radius: $r_{top} := \frac{d_C}{2} = 3.5\,ft$ $\quad r_{top\_in} := \frac{(d_C - 2 \cdot t_{III})}{2} = 2.833\,ft$

Bottom Radius: $r_{bot} := \frac{d_D}{2} = 3.9\,ft$ $\quad r_{bot\_in} := \frac{(d_D - 2 \cdot t_{III})}{2} = 3.233\,ft$

Outter Volume of Section III: $Vol_{outter\_III} := \frac{\pi}{3} \cdot L_{III} \cdot \left(r_{top}^2 + r_{bot} \cdot r_{top} + r_{bot}^2\right) = 645.754 \cdot ft^3$

Inner Volume of Section III: $Vol_{inner\_III} := \frac{\pi}{3} \cdot L_{III} \cdot \left(r_{top\_in}^2 + r_{bot\_in} \cdot r_{top\_in} + r_{bot\_in}^2\right) = 434.22 \cdot ft^3$

Total Volume of Section III: $Vol_{III} := Vol_{outter\_III} - Vol_{inner\_III} = 211.534 \cdot ft^3$

Weight of Section III: $D_{III} := Vol_{III} \cdot \rho = 25.384 \cdot kip$

Section IV:

Length of Section IV: $L_{IV} := 20 \cdot ft$

Thickness at center of Section: $t_{IV} := 12in$

Top Radius: $r_{top} := \frac{d_D}{2} = 3.9\,ft$ $\quad r_{top\_in} := \frac{(d_D - 2 \cdot t_{IV})}{2} = 2.9\,ft$

Bottom Radius: $r_{bot} := \frac{d_E}{2} = 4.43\,ft$ $\quad r_{bot\_in} := \frac{(d_E - 2 \cdot t_{IV})}{2} = 3.43\,ft$

Outter Volume of Section IV: $Vol_{outter\_IV} := \frac{\pi}{3} \cdot L_{IV} \cdot \left(r_{top}^2 + r_{bot} \cdot r_{top} + r_{bot}^2\right) = 1091.429 \cdot ft^3$

Inner Volume of Section IV: $Vol_{inner\_IV} := \frac{\pi}{3} \cdot L_{IV} \cdot \left(r_{top\_in}^2 + r_{bot\_in} \cdot r_{top\_in} + r_{bot\_in}^2\right) = 630.872 \cdot ft^3$

Total Volume of Section IV: $Vol_{IV} := Vol_{outter\_IV} - Vol_{inner\_IV} = 460.557 \cdot ft^3$

Weight of Section IV: $D_{IV} := Vol_{IV} \cdot \rho = 55.267 \cdot kip$

Section IV:

Length of Section V: $L_V := 12 \cdot ft$

Thickness at center of Section $t_V := 16in$

Top Radius: $r_{top} := \frac{d_E}{2} = 4.43\,ft$ $\quad r_{top\_in} := \frac{(d_E - 2 \cdot t_V)}{2} = 3.097\,ft$

Bottom Radius: $r_{bot} := \frac{d_F}{2} = 4.75\,ft$ $\quad r_{bot\_in} := \frac{(d_F - 2 \cdot t_V)}{2} = 3.417\,ft$

Outter Volume of Section V: $Vol_{outter\_V} := \frac{\pi}{3} \cdot L_V \cdot \left(r_{top}^2 + r_{bot} \cdot r_{top} + r_{bot}^2\right) = 794.57 \cdot ft^3$

Inner Volume of Section V: $Vol_{inner\_V} := \frac{\pi}{3} \cdot L_V \cdot \left(r_{top\_in}^2 + r_{bot\_in} \cdot r_{top\_in} + r_{bot\_in}^2\right) = 400.154 \cdot ft^3$

Total Volume of Section V: $Vol_V := Vol_{outter\_V} - Vol_{inner\_V} = 394.416 \cdot ft^3$

Weight of Section V: $D_V := Vol_V \cdot \rho = 47.33 \cdot kip$

Section VI:

Length of Section VI: $L_{VI} := 18 \cdot ft$

Thickness of Section IV: $t_{VI} := 16 \cdot in$

Top Radius: $d_{top\_out} := d_F = 9.5\,ft$ $\quad d_{top\_in} := \frac{(d_F - 2 \cdot t_{VI})}{2} = 3.42\,ft$

Bottom Radius: $d_{bot\_out} := d_G = 9.5\,ft$ $\quad d_{bot\_in} := \frac{(d_G - 2 \cdot t_{VI})}{2} = 3.42\,ft$

Octagon Outter Length: $a := 3.6ft$

Octagon Inner Length: $a_i := 2.53ft$

Outter Area: $A_o := 2\left(1 + \sqrt{2}\right) a^2 = 62.58\,ft^2$

Inner Area: $A_i := 2\left(1 + \sqrt{2}\right) \cdot a_i^2 = 30.91\,ft^2$

Outter Volume of Section VI: $Vol_{outter\_VI} := A_o \cdot L_{VI} = 1126.38 \cdot ft^3$

Inner Volume of Section VI: $Vol_{inner\_VI} := A_i \cdot L_{VI} = 556.31 \cdot ft^3$

Total Volume of Section VI: $Vol_{VI} := Vol_{outter\_VI} - Vol_{inner\_VI} = 570.06 \cdot ft^3$

Weight of Section VI: $D_{VI} := Vol_{VI} \cdot \rho = 68.41 \cdot kip$

Existing and Proposed Discrete and Linear Appurtenances:

AT&T Antenna and Mount Loading at 83'-0" AGL CL

Antenna Weight:

Antennas:
(3) 700 Panel Antennas at 50 lbs ea.
(2) HPA-65R-BUU-H8 Panel Antennas at 68lbs ea.
(1) HPA-65R-BUU-H6 Panel Antennas at 58 lbs ea.
(2) TPA-65R-LCUUUU-H8 Panel Antennas at 90 lbs ea.
(3) 80010798 Panel Antennas at 96.6 lbs ea.
(3) DC6 at 33.9 lbs ea.
(6) TMAs at 20lbs ea.
(3) RRUS 11 at 67.9 lbs ea.
(3) RRUS 32 B2 at 67.9 lbs ea.
(3) RRUS 32 at 67.9 lbs ea.
(3) RRUS 32 B66 at 67.9 lbs ea.

$$D_{ant} := (3)\cdot 50\cdot lbf + (2)\cdot 68lbf + (1)\cdot 58lbf + (2)\cdot 90lbf + (3)\cdot 96.6lbf + (3)\cdot 33.9lbf + (6)\cdot 20lbf + (12)\cdot 67.9lbf$$

$$D_{ant} = 1850\,lbf$$

Mount Weight: $D_{mount} := 1467\cdot lbf$ $\quad D_{mount} = 1467\,lbf$ (From RISA 3D)

Total Dead Weight: $D_{83} := D_{ant} + D_{mount}$ $\quad D_{83} = 3317.3\cdot lbf$

Dead Load Summary:

Existing Dead Weight: $D_{ext} := D_{I} + D_{II} + D_{III} + D_{IV} + D_{V} + D_{VI} = 225.609\cdot kip$

Additional Dead Weight: $D_{add} := D_{83} = 3.317\cdot kip$

Dead Weight Ratio: $Ratio := \dfrac{D_{add}}{D_{ext}}$ $\quad Ratio = 1.47\cdot\%$

Site Information:

ASCE 7-10 Reference

Location: **Hartford, CT**

Smokestack Height: $h := 83 \cdot ft$

Smokestack Width: $B := 7 \cdot ft$

Risk Category: Risk_Category := II (Table 1.5-1, P. 2)

Design Wind Load:

Smokestack height: $z := 85$ ft (Figure 26.5-1(A, B or C), p. 247a-249b)

Ultimate Wind Speed: $V := 125$ *mph* (CT State Building Code)

Wind Directionality Factor: $K_d :=$ 0.95 (Section 26.7, p. 246)

Exposure Category: Exp := B (Section 26.8.1, p. 251)

Topographic Category: Topo := No Topo

Height of Hill: $H := 0 \cdot ft$

Distance Upwind of Crest to Half the Height of the Hill: $L_h := 0 \cdot ft$

Distance Upwind or Downwind of Crest to the Site: $x := 0 \cdot ft$

Structure Location: Structure_Location := No Topo *Relative to the Crest*

(Section 26.9, p. 254)

Gust Effect Factor: $G_h := 1.1$

(Table 26.9.1. P. 256)

Terrain Exposure Constants:

$$\alpha := \begin{cases} 7.0 & \text{if } Exp = \text{"B"} \\ 9.5 & \text{if } Exp = \text{"C"} \\ 11.5 & \text{if } Exp = \text{"D"} \end{cases} \qquad Z_g := \begin{cases} 1200 & \text{if } Exp = \text{"B"} \\ 900 & \text{if } Exp = \text{"C"} \\ 700 & \text{if } Exp = \text{"D"} \end{cases}$$

$$K_{zmin} := \begin{cases} 0.70 & \text{if } Exp = \text{"B"} \\ 0.85 & \text{if } Exp = \text{"C"} \\ 1.03 & \text{if } Exp = \text{"D"} \end{cases}$$

Velocity Pressure Coefficient: Table 29.3-1, P. 310

$$Kz(z) := \begin{array}{|l} K_z \leftarrow \max\left[2.01 \cdot \left(\frac{z}{Z_g}\right)^{\frac{2}{\alpha}}, K_{zmin}\right] \text{ if } z \ge 15 \wedge z \le Z_g \\ K_z \leftarrow \max\left[2.01 \cdot \left(\frac{15}{Z_g}\right)^{\frac{2}{\alpha}}, K_{zmin}\right] \text{ if } z < 15 \\ K_z \leftarrow \min(K_z, 2.01) \end{array}$$

Topographic Factor: Table 26.8-1 p. 252)

Height Attenuation Factor

$$\gamma := \begin{cases} 3.0 & \text{if } Topo = \text{"2"} \\ 2.5 & \text{if } Topo = \text{"3"} \\ 4.0 & \text{if } Topo = \text{"4"} \\ 1.0 & \text{otherwise} \end{cases}$$

Horizontal Attenuation Factor

$$\mu := \begin{cases} 1.5 \text{ if } Structure\_Location = \text{"Upwind"} \\ \text{if } Structure\_Location = \text{"Downwind"} \\ \quad \begin{cases} 1.5 & \text{if } Topo = \text{"2"} \\ 4.0\cdot\left(\frac{H}{L_h}\right) & \text{if } Topo = \text{"3"} \\ 1.5\cdot\left(\frac{H}{L_h}\right) & \text{if } Topo = \text{"4"} \end{cases} \\ 1.0 \text{ otherwise} \end{cases}$$

$$Kzt(z) := K_{zt} \leftarrow \begin{cases} 1.0 \text{ if } Topo = \text{"1"} \\ \text{otherwise} \\ \quad K_1 \leftarrow \begin{cases} \text{if } Exp = \text{"B"} \\ \quad \begin{cases} 1.30\cdot\left(\frac{H}{L_h}\right) & \text{if } Topo = \text{"2"} \\ 0.75\cdot\left(\frac{H}{L_h}\right) & \text{if } Topo = \text{"3"} \\ 0.95\cdot\left(\frac{H}{L_h}\right) & \text{if } Topo = \text{"4"} \end{cases} \\ \text{if } Exp = \text{"C"} \\ \quad \begin{cases} 1.45\cdot\left(\frac{H}{L_h}\right) & \text{if } Topo = \text{"2"} \\ 0.85\cdot\left(\frac{H}{L_h}\right) & \text{if } Topo = \text{"3"} \\ 1.05\cdot\left(\frac{H}{L_h}\right) & \text{if } Topo = \text{"4"} \end{cases} \\ \text{if } Exp = \text{"D"} \\ \quad \begin{cases} 1.55\cdot\left(\frac{H}{L_h}\right) & \text{if } Topo = \text{"2"} \\ 0.95\cdot\left(\frac{H}{L_h}\right) & \text{if } Topo = \text{"3"} \\ 1.15\cdot\left(\frac{H}{L_h}\right) & \text{if } Topo = \text{"4"} \end{cases} \end{cases} \\ \quad K_2 \leftarrow 1 - \frac{|x|}{\mu\cdot L_h} \\ \quad K_3 \leftarrow e^{\left(\frac{\gamma\cdot z}{L_h}\right)} \\ \quad \left(1 + K_1\cdot K_2\cdot K_3\right)^2 \end{cases}$$

Velocity Pressure: $q_z := 0.00256\cdot Kz(z)\cdot Kzt(z)\cdot K_d\cdot V^2\cdot psf = 35.849\cdot psf$ (Section 30.3.1, P. 316)

Force Coefficient:

$$C_{f\_square}(h,w) := \begin{cases} 1.3 & \text{if } \frac{h}{w} \le 1.0 \\ \left[1.3 + \frac{0.1}{6.0}\cdot\left(\frac{h}{w} - 1.0\right)\right] & \text{if } \frac{h}{w} > 1.0 \wedge \frac{h}{w} \le 7 \\ \left[1.4 + \frac{0.6}{18}\cdot\left(\frac{h}{w} - 7\right)\right] & \text{if } \frac{h}{w} > 7 \wedge \frac{h}{w} \le 25 \\ 2.0 & \text{otherwise} \end{cases}$$

Figure 29.5-1, P. 312

Square Members
(Wind Normal to Face)

$$C_{f\_round}(h,w) := \begin{cases} 0.7 & \text{if } \frac{h}{w} \le 1.0 \\ \left[0.7 + \frac{0.1}{6.0}\cdot\left(\frac{h}{w} - 1.0\right)\right] & \text{if } \frac{h}{w} > 1.0 \wedge \frac{h}{w} \le 7 \\ \left[0.8 + \frac{0.4}{18}\cdot\left(\frac{h}{w} - 7\right)\right] & \text{if } \frac{h}{w} > 7 \wedge \frac{h}{w} \le 25 \\ 1.2 & \text{otherwise} \end{cases}$$

Figure 29.5-1, P. 312

Round Members
(Wind Normal to Face)

Pressure Coefficient and Gust Factor Product:

$$GC_r(A_f) := \begin{cases} 1.9 & \text{if } A_f \le 0.1\cdot B\cdot h \\ \left[1.9 - \left(\frac{A_f - 0.1\cdot B\cdot h}{B\cdot h}\right)\right] & \text{if } A_f > 0.1\cdot B\cdot h \wedge A_f \le B\cdot h \\ 1.0 & \text{otherwise} \end{cases}$$

Smokestack Loading:

Section I: $z := 83.5$ ft

Velocity Pressure Exposure Coefficient: $Kz(z) = 0.939$ Table 29.3.1

Velocity Pressure: $q_z := 0.00256 \cdot Kz(z) \cdot Kzt(z) \cdot K_d \cdot V^2 \cdot psf = 35.667 \cdot psf$ (Section 27.3.2)

Section I Area: $A_I := \frac{(d_A + d_B)}{2} \cdot L_I = 30.525\, ft^2$

Aspect Ratio: $\lambda := \frac{L_I}{\frac{(d_A + d_B)}{2}} = 0.819$

Force Coefficient:

$$C_{f\_smooth} := \begin{cases} 0.5 & \text{if } \lambda \le 1.0 \\ \left[0.5 + \frac{0.1}{6} \cdot (\lambda - 1)\right] & \text{if } \lambda > 1 \wedge \lambda \le 7 \\ \left[0.6 + \frac{0.1}{18} \cdot (\lambda - 7)\right] & \text{if } \lambda > 7 \wedge \lambda \le 25 \\ 0.7 & \text{otherwise} \end{cases}$$

(Figure 29.5-1)

$C_{f\_smooth} = 0.5$

Wind Load: $F_I := q_z \cdot G_h \cdot C_{f\_smooth} \cdot A_I = 0.599 \cdot kip$ (Figure 29.5-1)

Section II: $z := 72.5$ ft

Velocity Pressure Coefficient: $Kz(z) = 0.901$ Table 29.3.1

Velocity Pressure: $q_z := 0.00256 \cdot Kz(z) \cdot Kzt(z) \cdot K_d \cdot V^2 \cdot psf = 34.256 \cdot psf$ (Section 27.3.26)

Section II Area: $A_{II} := \frac{(d_B + d_C)}{2} \cdot L_{II} = 99.075\, ft^2$

Aspect Ratio: $\lambda := \frac{L_{II}}{\frac{(d_B + d_C)}{2}} = 2.271$

Force Coefficient:

Wind Load: $F_{II} := q_z \cdot G_h \cdot C_{f\_smooth} \cdot A_{II} = 1.867 \cdot kip$ (Figure 29.5-1)

Section III: $z := 57.5$ ft

Velocity Pressure Coefficient: $Kz(z) = 0.844$ — Table 29.3.1

Velocity Pressure: $q_z := 0.00256 \cdot Kz(z) \cdot Kzt(z) \cdot K_d \cdot V^2 \cdot psf = 32.061 \cdot psf$ — (Section 27.3.26)

Section III Area: $A_{III} := \frac{(d_C + d_D)}{2} \cdot L_{III} = 111\ ft^2$

Aspect Ratio: $\lambda := \frac{L_{III}}{\frac{(d_C + d_D)}{2}} = 2.027$

Wind Load: $F_{III} := q_z \cdot G_h \cdot C_{f\_smooth} \cdot A_{III}$ $\quad F_{III} = 1.96 \cdot kip$ — (Section 27.3.26)

Section IV: $z := 40$ ft

Velocity Pressure Coefficient: $Kz(z) = 0.761$

Velocity Pressure: $q_z := 0.00256 \cdot Kz(z) \cdot Kzt(z) \cdot K_d \cdot V^2 \cdot psf = 28.903 \cdot psf$ — (Section 27.3.26)

Section IV Area: $A_{IV} := \frac{(d_D + d_E)}{2} \cdot L_{IV} = 166.6\ ft^2$

Aspect Ratio: $\lambda := \frac{L_{IV}}{\frac{(d_D + d_E)}{2}} = 2.401$

Wind Load: $F_{IV} := q_z \cdot G_h \cdot C_{f\_smooth} \cdot A_{IV} = 2.648 \cdot kip$

(Figure 29.5-1)

Section V: $z := 24$ ft

Velocity Pressure Coefficient: $Kz(z) = 0.7$ — Table 29.3.1

Velocity Pressure: $q_z := 0.00256 \cdot Kz(z) \cdot Kzt(z) \cdot K_d \cdot V^2 \cdot psf = 26.6 \cdot psf$ — (Section 27.3.26)

Section V Area: $A_V := \frac{(d_E + d_F)}{2} \cdot L_V = 110.16\ ft^2$

Aspect Ratio: $\lambda := \frac{L_V}{\frac{(d_E + d_F)}{2}} = 1.307$

Wind Load: $F_V := q_z \cdot G_h \cdot C_{f\_smooth} \cdot A_V = 1.612 \cdot kip$ — (Section 29.5-1, P.308)

Section V: $z := 24$ ft

Velocity Pressure Coefficient: $Kz(z) = 0.7$

Table 29.3.1

Velocity Pressure: $q_z := 0.00256 \cdot Kz(z) \cdot Kzt(z) \cdot K_d \cdot V^2 \cdot psf = 26.6 \cdot psf$

(Section 27.3.26)

Section V Area: $A_V := \frac{(d_F + d_G)}{2} \cdot L_V = 114\ ft^2$

Aspect Ratio: $\lambda := \frac{L_V}{\frac{(d_F + d_G)}{2}} = 1.263$

Wind Load: $F_V := q_z \cdot G_h \cdot C_{f\_smooth} \cdot A_V = 1.668 \cdot kip$

(Figure 29.5-1)

Section VI: $z := 9$ ft

Velocity Pressure Coefficient: $Kz(z) = 0.7$

Table 29.3.1

Velocity Pressure: $q_z := 0.00256 \cdot Kz(z) \cdot Kzt(z) \cdot K_d \cdot V^2 \cdot psf = 26.6 \cdot psf$

(Section 27.3.26)

Section V Area: $A_{VI} := \frac{(d_G + d_F)}{2} \cdot L_{VI} = 171\ ft^2$

Aspect Ratio: $\lambda := \frac{L_{VI}}{d_G} = 1.895$

Wind Load: $F_{VI} := q_z \cdot G_h \cdot C_{f\_smooth} \cdot A_{VI} = 2.502 \cdot kip$

(Section 29.5-1, P.308)

Design Wind Load On Appurtenances:

Ultimate Wind Speed: $V := 125$ *mph* (CT Building Code)

Wind Directionality Factor: $K_d :=$ 0.85 (Section 26.6 and Table 26.6-1, P. 250)

Exposure Category: $Exp :=$ B (Section 26.7, p. 246)

Topographic Category: $Topo :=$ No Topo (Section 26.8.1, p. 251)

Height of Hill: $H := 0 \cdot ft$

Distance Upwind of Crest to Half the Height of the Hill: $L_h := 0 \cdot ft$

Distance Upwind or Downwind of Crest to the Site: $x := 0 \cdot ft$

Structure Location: $Structure\_Location :=$ No Topo *Relative to the Crest*

Gust Effect Factor: $G_h := 0.85$ (Section 26.9, p. 254)

Terrain Exposure Constants: (Table 26.9.1. P. 256)

$$\alpha := \begin{cases} 7.0 & \text{if } Exp = \text{"B"} \\ 9.5 & \text{if } Exp = \text{"C"} \\ 11.5 & \text{if } Exp = \text{"D"} \end{cases} \qquad Z_g := \begin{cases} 1200 & \text{if } Exp = \text{"B"} \\ 900 & \text{if } Exp = \text{"C"} \\ 700 & \text{if } Exp = \text{"D"} \end{cases}$$

$$K_{zmin} := \begin{cases} 0.70 & \text{if } Exp = \text{"B"} \\ 0.85 & \text{if } Exp = \text{"C"} \\ 1.03 & \text{if } Exp = \text{"D"} \end{cases}$$

Velocity Pressure Coefficient: Table 29.3-1, P. 310

$$Kz(z) := \begin{array}{|l} K_z \leftarrow \max\left[2.01 \cdot \left(\frac{z}{Z_g}\right)^{\frac{2}{\alpha}}, K_{zmin}\right] \text{ if } z \ge 15 \wedge z \le Z_g \\ K_z \leftarrow \max\left[2.01 \cdot \left(\frac{15}{Z_g}\right)^{\frac{2}{\alpha}}, K_{zmin}\right] \text{ if } z < 15 \\ K_z \leftarrow \min(K_z, 2.01) \end{array}$$

$Kz(z) = 0.7$

Topographic Factor: Table 26.8-1 p. 252)

Height Attenuation Factor

$$\gamma := \begin{cases} 3.0 & \text{if Topo} = \text{"2"} \\ 2.5 & \text{if Topo} = \text{"3"} \\ 4.0 & \text{if Topo} = \text{"4"} \\ 1.0 & \text{otherwise} \end{cases}$$

$$Kzt(z) := K_{zt} \leftarrow \begin{cases} 1.0 \text{ if Topo} = \text{"1"} \\ \text{otherwise} \\ \quad K_1 \leftarrow \begin{cases} \text{if Exp} = \text{"B"} \\ \quad \begin{cases} 1.30\cdot\left(\frac{H}{L_h}\right) & \text{if Topo} = \text{"2"} \\ 0.75\cdot\left(\frac{H}{L_h}\right) & \text{if Topo} = \text{"3"} \\ 0.95\cdot\left(\frac{H}{L_h}\right) & \text{if Topo} = \text{"4"} \end{cases} \\ \text{if Exp} = \text{"C"} \\ \quad \begin{cases} 1.45\cdot\left(\frac{H}{L_h}\right) & \text{if Topo} = \text{"2"} \\ 0.85\cdot\left(\frac{H}{L_h}\right) & \text{if Topo} = \text{"3"} \\ 1.05\cdot\left(\frac{H}{L_h}\right) & \text{if Topo} = \text{"4"} \end{cases} \\ \text{if Exp} = \text{"D"} \\ \quad \begin{cases} 1.55\cdot\left(\frac{H}{L_h}\right) & \text{if Topo} = \text{"2"} \\ 0.95\cdot\left(\frac{H}{L_h}\right) & \text{if Topo} = \text{"3"} \\ 1.15\cdot\left(\frac{H}{L_h}\right) & \text{if Topo} = \text{"4"} \end{cases} \end{cases} \\ \quad K_2 \leftarrow 1 - \frac{|x|}{\mu\cdot L_h} \\ \quad K_3 \leftarrow e^{\left(\frac{\gamma\cdot z}{L_h}\right)} \\ \quad \left(1 + K_1\cdot K_2\cdot K_3\right)^2 \end{cases}$$

Horizontal Attenuation Factor

$$\mu := \begin{cases} 1.5 \text{ if Structure\_Location} = \text{"Upwind"} \\ \text{if Structure\_Location} = \text{"Downwind"} \\ \quad \begin{cases} 1.5 & \text{if Topo} = \text{"2"} \\ 4.0\cdot\left(\frac{H}{L_h}\right) & \text{if Topo} = \text{"3"} \\ 1.5\cdot\left(\frac{H}{L_h}\right) & \text{if Topo} = \text{"4"} \end{cases} \\ 1.0 \text{ otherwise} \end{cases}$$

Velocity Pressure: $q_z := 0.00256 \cdot Kz(z) \cdot Kzt(z) \cdot K_d \cdot V^2 \cdot psf = 23.8 \cdot psf$ (Section 30.3.1)

Force Coefficient:

$$C_{f\_square}(h,w) := \begin{cases} 1.3 & \text{if } \frac{h}{w} \le 1.0 \\ \left[1.3 + \frac{0.1}{6.0} \cdot \left(\frac{h}{w} - 1.0\right)\right] & \text{if } \frac{h}{w} > 1.0 \wedge \frac{h}{w} \le 7 \\ \left[1.4 + \frac{0.6}{18} \cdot \left(\frac{h}{w} - 7\right)\right] & \text{if } \frac{h}{w} > 7 \wedge \frac{h}{w} \le 25 \\ 2.0 & \text{otherwise} \end{cases}$$

Figure 29.5-1

Square Members
(Wind Normal to Face)

$$C_{f\_round}(h,d) := \begin{cases} \text{if } \frac{d}{ft} \cdot \sqrt{\frac{q_z}{psf}} \le 2.5 \\ \quad \begin{cases} 0.7 & \text{if } \frac{h}{d} \le 1.0 \\ \left[0.7 + \frac{0.1}{6.0} \cdot \left(\frac{h}{d} - 1.0\right)\right] & \text{if } \frac{h}{d} > 1.0 \wedge \frac{h}{d} \le 7 \\ \left[0.8 + \frac{0.4}{18} \cdot \left(\frac{h}{d} - 7\right)\right] & \text{if } \frac{h}{d} > 7 \wedge \frac{h}{d} \le 25 \\ 1.2 & \text{otherwise} \end{cases} \\ \text{if } \frac{d}{ft} \cdot \sqrt{\frac{q_z}{psf}} > 2.5 \\ \quad \begin{cases} 0.5 & \text{if } \frac{h}{d} \le 1.0 \\ \left[0.6 + \frac{0.1}{6.0} \cdot \left(\frac{h}{d} - 1.0\right)\right] & \text{if } \frac{h}{d} > 1.0 \wedge \frac{h}{d} \le 7 \\ \left[0.7 + \frac{0.1}{18} \cdot \left(\frac{h}{d} - 7\right)\right] & \text{if } \frac{h}{d} > 7 \wedge \frac{h}{d} \le 25 \\ 0.7 & \text{otherwise} \end{cases} \end{cases}$$

Figure 29.5-1

Round Members
(Wind Normal to Face)

AT&T Loading at 83'-0" AGL

Antenna Loading: $z := 83$ ft

Velocity Pressure Coefficient: $Kz(z) = 0.937$

Velocity Pressure: $q_z := 0.00256 \cdot Kz(z) \cdot Kzt(z) \cdot K_d \cdot V^2 \cdot psf = 31.858 \cdot psf$ (Section 27.3.26)

7770 Antenna:

Antenna Height: $h := 55 \cdot in$

Antenna Width: $d := 11 \cdot in$

Antenna Area: $A_{ant} := h \cdot d = 4.201\ ft^2$

Force Coefficient: $C_f := C_{f\_square}(h, d) = 1.367$

Wind Load: $F_{ant1} := q_z \cdot G_h \cdot C_f \cdot A_{ant} = 155.486\ lbf$ (Figure 29.5-1)

HPA-65R-BUU-H8:

Antenna Height: $h := 92.8 \cdot in$

Antenna Width: $d := 14.4 \cdot in$

Antenna Area: $A_{ant} := h \cdot d = 9.28\ ft^2$

Force Coefficient: $C_f := C_{f\_square}(h, d) = 1.391$

Wind Load: $F_{ant2} := q_z \cdot G_h \cdot C_f \cdot A_{ant} = 349.486\ lbf$ (Figure 29.5-1)

HPA-65R-BBU-H6:

Antenna Height: $h := 72.3 \cdot in$

Antenna Width: $d := 14.4 \cdot in$

Antenna Area: $A := h \cdot d = 7.23\ ft^2$

Force Coefficient: $C_f := C_{f\_square}(h, d) = 1.367$

Wind Load: $F_{ant3} := q_z \cdot G_h \cdot C_f \cdot A = 267.638\ lbf$

TPA-65R-LCUUUU-H8:

Height: $h := 96 \cdot in$

Width: $d := 14.4 \cdot in$

Area: $A := h \cdot d = 9.6\ ft^2$

Force Coefficient: $C_f := C_{f\_square}(h, d) = 1.394$

Wind Load: $F_{ant4} := q_z \cdot G_h \cdot C_f \cdot A = 362.5\ lbf$ (Figure 29.5-1)

80010798:

Antenna Height: $h := 78.5 \cdot in$

Antenna Width: $d := 14.8 \cdot in$

Antenna Area: $A := h \cdot d = 8.068\, ft^2$

Force Coefficient: $C_f := C_{f\_square}(h, d) = 1.372$

Wind Load: $F_{ant5} := q_z \cdot G_h \cdot C_f \cdot A = 299.692\, lbf$

DC6:

Height: $h := 31.25 \cdot in$

Width: $d := 11 \cdot in$

Area: $A := h \cdot d = 2.387\, ft^2$

Force Coefficient: $C_f := C_{f\_round}(h, d) = 0.631$

Wind Load: $F_{dc} := q_z \cdot G_h \cdot C_f \cdot A = 40.769\, lbf$ (Figure 29.5-1)

TMA's:

Height: $h := 12 \cdot in$

Width: $d := 8 \cdot in$

Area: $A_{tma} := h \cdot d = 0.667\, ft^2$

Force Coefficient: $C_f := C_{f\_square}(h, d) = 1.308$

Wind Load: $F_{tma} := q_z \cdot G_h \cdot C_f \cdot A_{tma} = 23.619\, lbf$

RRUS 11:

Height: $h := 19.7 \cdot in$

Width: $d := 17 \cdot in$

Area: $A := h \cdot d = 2.326\, ft^2$

Force Coefficient: $C_f := C_{f\_square}(h, d) = 1.303$

Wind Load: $F_{rrh1} := q_z \cdot G_h \cdot C_f \cdot A = 82.038\, lbf$ (Figure 29.5-1)

RRUS 32 B2:

Height: $h := 27.2 \cdot in$

Width: $d := 12.1 \cdot in$

Area: $A := h \cdot d = 2.286\, ft^2$

Force Coefficient: $C_f := C_{f\_square}(h, d) = 1.321$

Wind Load: $F_{rrh2} := q_z \cdot G_h \cdot C_f \cdot A = 81.746\, lbf$ (Figure 29.5-1)

RRUS 32:

Height: $h := 29.9 \cdot in - 14.4in$

Width: $d := 13.3 \cdot in$

Area: $A := h \cdot d = 1.432\, ft^2$

Force Coefficient: $C_f := C_{f\_square}(h, d) = 1.303$

Wind Load: $F_{rrh3} := q_z \cdot G_h \cdot C_f \cdot A = 50.503\, lbf$ (Figure 29.5-1)

RRUS 32 B66:

Height: $h := 27.2 \cdot in$

Width: $d := 12.1 \cdot in$

Area: $A := h \cdot d$ $A = 2.286 \cdot ft^2$

Force Coefficient: $C_f := C_{f\_square}(h, d) = 1.321$

Wind Load: $F_{rrh4} := q_z \cdot G_h \cdot C_f \cdot A$ $F_{rrh4} = 82\, lbf$

Mount Loading:

2.0 STD Pipes:

Pipe Length: $h := 8 \cdot ft - 48in$ (Sheilded by Antennas)

Pipe Diameter: $w := 2.375 \cdot in$

Pipe Area: $A_{pipe} := h \cdot w = 0.792\ ft^2$

Force Coefficient: $C_f := C_{f\_round}(h, w) = 1.094$

Wind Load: $F_{pipe} := q_z \cdot G_h \cdot C_f \cdot A_{pipe} = 23.444\ lbf$

Pipe 2:

Pipe Length: $h := 14ft - 96in - 27in$ (Sheilded by Antennas)

Pipe Diameter: $w := 2.375 \cdot in$

Pipe Area: $A_{pipe} := h \cdot w = 0.742\ ft^2$

Force Coefficient: $C_f := C_{f\_round}(h, w) = 1.065$

Wind Load: $F_{pipe2} := q_z \cdot G_h \cdot C_f \cdot A_{pipe} = 21.414\ lbf$

HSS4x4 Long:

Length: $h := 114in - 11in - 14.4in - 14.4in = 6.183\ ft$ (Sheilded by Antennas)

Diameter: $w := 4 \cdot in$

Area: $A := h \cdot w = 2.061\ ft^2$

Force Coefficient: $C_f := C_{f\_square}(h, w) = 1.785$

Wind Load: $F_{hss} := q_z \cdot G_h \cdot C_f \cdot A = 99.627\ lbf$

HSS4x4 Short:

Length: $h := 36in$

Diameter: $w := 4 \cdot in$

Area: $A := h \cdot w = 1\ ft^2$

Force Coefficient: $C_f := C_{f\_square}(h, w) = 1.467$

Wind Load: $F_{hss2} := q_z \cdot G_h \cdot C_f \cdot A = 39.716\ lbf$

Solid Bar:

Length: $h := 42in$

Diameter: $w := 1.625 \cdot in$

Area: $A_{pipe} := h \cdot w = 0.474\,ft^2$

Force Coefficient: $C_f := C_{f\_round}(h, w) = 1.2$

Wind Load: $F_{pipe3} := q_z \cdot G_h \cdot C_f \cdot A_{pipe} = 15.401\,lbf$

Mount Loading:

Wind Load: $F_{Mount} := 18 \cdot F_{pipe} + 3 \cdot F_{pipe2} + 6 \cdot F_{hss} + 6 \cdot F_{hss2} + 6 \cdot F_{pipe3}$ $F_{Mount} = 1415\,lbf$

AT&T Wind Loading:

Total Loading:

$$F_{app\_83} := \left(3 \cdot F_{ant1} + 2 \cdot F_{ant2} + 1 \cdot F_{ant3} + 2 \cdot F_{ant4} + 1 \cdot F_{ant5} + 3 \cdot F_{dc} + 6 \cdot F_{tma} + 3 \cdot F_{rrh1} + 3 \cdot F_{rrh2} + 3F_{rrh3} + 3 \cdot F_{rrh4}\right) \cdot 0.66 + F_{Mount} \cdot 0.66$$

$F_{app\_83} = 3316 \cdot lbf$

(Consider projected loading as 2/3 the full loading)

Wind Forces Summary:

Total Existing Wind Loads: $F_{ext} := F_I + F_{II} + F_{III} + F_{IV} + F_V + F_{VI}$

$F_{ext} = 11.241 \cdot kip$

Total Additional Wind Loads: $F_{app} := F_{app\_83} = 3.316 \cdot kip$

$F_{add} := F_{app} = 3.316 \cdot kip$

Wind Load Ratio: $Ratio := \dfrac{F_{add}}{F_{ext}}$ $Ratio = 29.502 \cdot \%$

Smokestack Check:

Loading Summary:

Stack Weight	Stack Wind	Carrier Weight	Carrier Wind
$D_I = 6.834 \cdot kip$	$F_I = 0.6 \cdot kip$	$D_{83} = 3.32 \cdot kip$	$F_{app\_83} = 3.32 \cdot kip$
$D_{II} = 22.4 \cdot kip$	$F_{II} = 1.87 \cdot kip$		
$D_{III} = 25.4 \cdot kip$	$F_{III} = 1.96 \cdot kip$		
$D_{IV} = 55.3 \cdot kip$	$F_{IV} = 2.65 \cdot kip$		
$D_V = 47.3 \cdot kip$	$F_V = 1.67 \cdot kip$		
$D_{VI} = 68.4 \cdot kip$	$F_{VI} = 2.5 \cdot kip$		

Check for Bending at Point B (80' AGL):

Dead Weight:

Stack Dead Weight: $P_{ext} := D_I = 6.834 \cdot kip$

Additional Dead Weight: $P_{80} := D_{83} = 3.317 \cdot kip$

$P_{add} := P_{80} = 3.317 \cdot kip$

Dead Weight at Point B: $P_B := P_{ext} + P_{add} = 10.151 \cdot kip$

Overturning Moment:

Stack Moment $M_{ext} := F_I \cdot \left(\frac{L_I}{2}\right) = 1.497\, ft \cdot kip$

$M_{80} := F_{app\_83} \cdot (L_I - 2 \cdot ft) = 9.949 \cdot ft \cdot kip$

$M_{add} := M_{80} = 9.949 \cdot ft \cdot kip$

Moment at Point B: $M_B := M_{ext} + M_{add} = 11.446 \cdot ft \cdot kip$

Section Properties:

Area at Point B: $A_B := \frac{\pi \cdot \left[d_B^{\,2} - (d_B - 2 \cdot t_I)^2\right]}{4} = 11.61\, ft^2$

Section Modulus at Point B: $S_B := \frac{\pi \cdot \left[d_B^{\,4} - (d_B - 2 \cdot t_I)^4\right]}{32 \cdot d_B} = 14.57 \cdot ft^3$

Radius of Gyration: $r_B := \frac{\sqrt{d_B^{\,2} + (d_B - 2 \cdot t_I)^2}}{4} = 1.974\, ft$

Check Tension in Mortar: Accoording to ASCE 7-10 The critical load combinations due to wind loads

Compression : 1.0D+0.6W

Tension : 0.6D+0.6W

Compressive Stress: $\sigma_c := \frac{P_B}{A_B} + \frac{0.6 M_B}{S_B} = 9.345\, psi$

Tensile Stress: $\sigma_t := \frac{.6 P_B}{A_B} - \frac{0.6 M_B}{S_B} = 0.37\, psi$

Mortar Check:

$$Mortar := \begin{cases} \text{"OK"} & \text{if } \sigma_t \geq -\sigma_a \\ \text{"No Good"} & \text{otherwise} \end{cases}$$

Interaction Check:

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

Applied Axial Stress:

$$f_a := \frac{P_B}{A_B} = 6.072\,psi$$

Applied Bending Stress:

$$f_b := \frac{M_B}{S_B} = 5.455\,psi$$

Allowable Axial Stress:

$$F_a := \begin{cases} \left[\frac{f_m}{4} \cdot \left(\frac{70 \cdot r_B}{L_I}\right)^2\right] & \text{if } \frac{L_I}{r_B} > 99 \\ \left[\frac{f_m}{4} \cdot \left[1 - \left(\frac{L_I}{140 \cdot r_B}\right)^2\right]\right] \end{cases} = 374.877\,psi$$

Allowable Bending Stress:

$$F_b := \frac{f_m}{3} = 500\,psi$$

Interaction Check:

$$Interaction := \begin{cases} \text{"OK"} & \text{if } f_a < F_a \wedge f_a + f_b < F_b \\ \text{"No Good"} & \text{otherwise} \end{cases}$$

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

$$Interaction := \frac{f_a}{F_a} + \frac{f_b}{F_b}$$

$$Interaction = 0.027$$

Check for Bending at Point C @ 65' AGL:

Dead Weight:

Stack Dead Weight: $P_{ext} := D_I + D_{II} = 29.221 \cdot kip$

Additional Dead Weight:

$P_{65} := D_{83} = 3.317 \cdot kip$

$P_{add} := P_{65} = 3.317 \cdot kip$

Dead Weight at Point C: $P_C := P_{ext} + P_{add} = 32.538 \cdot kip$

Overturning Moment:

Stack Moment $M_{ext} := F_I \cdot \left(L_{II} + \frac{L_I}{2} \right) + F_{II} \cdot \left(\frac{L_{II}}{2} \right) = 24.479 \cdot ft \cdot kip$

$M_{65} := F_{app\_83} \cdot \left(L_I + L_{II} - 2ft \right) = 59.692 \cdot ft \cdot kip$

$M_{add} := M_{65} = 59.692 \cdot ft \cdot kip$

Moment at Point C: $M_C := M_{ext} + M_{add} = 84.171 \cdot ft \cdot kip$

Section Properties:

Area at Point C: $A_C := \frac{\pi \cdot \left[{d_C}^2 - \left(d_C - 2 \cdot t_{II} \right)^2 \right]}{4} = 13.265\,ft^2$

Section Modulus at Point C: $S_C := \frac{\pi \cdot \left[{d_C}^4 - \left(d_C - 2 \cdot t_{II} \right)^4 \right]}{32 \cdot d_C} = 19.212 \cdot ft^3$

Radius of Gyration: $r_C := \frac{\sqrt{{d_C}^2 + \left(d_C - 2 \cdot t_{II} \right)^2}}{4} = 2.252\,ft$

Check Tension in Mortar:

Accoording to ASCE 7-10 The critical load combinations due to wind loads

Compression : 1.0D+0.6W

Tension : 0.6D+0.6W

Compressive Stress:

$$\sigma_c := \frac{P_C}{A_C} + \frac{0.6M_C}{S_C} \qquad \sigma_c = 35.289\,\text{psi}$$

Tensile Stress:

$$\sigma_t := \frac{.6P_C}{A_C} - \frac{0.6M_C}{S_C} \qquad \sigma_t = -8.03\,\text{psi}$$

Mortar Check:

$$\text{Mortar} := \begin{cases} \text{"OK"} & \text{if } \sigma_t \ge -\sigma_a \\ \text{"No Good"} & \text{otherwise} \end{cases}$$

Mortar = "OK"

Interaction Check:

Applied Axial Stress:

$$f_a := \frac{P_C}{A_C} = 17.035\,\text{psi}$$

Applied Bending Stress:

$$f_b := \frac{M_C}{S_C} = 30.424\,\text{psi}$$

Allowable Axial Stress:

$$F_a := \begin{cases} \left[\frac{f_m}{4}\cdot\left(\frac{70\cdot r_C}{L_I + L_{II}}\right)^2\right] & \text{if } \frac{L_I + L_{II}}{r_C} > 99 \\ \left[\frac{f_m}{4}\cdot\left[1 - \left(\frac{L_I + L_{II}}{140\cdot r_C}\right)^2\right]\right] & \end{cases} = 373.49\,\text{psi}$$

Allowable Bending Stress:

$$F_b := \frac{f_m}{3} = 500\,\text{psi}$$

Interaction Check:

$$\text{Interaction} := \begin{cases} \text{"OK"} & \text{if } f_a < F_a \wedge f_a + f_b < F_b \\ \text{"No Good"} & \text{otherwise} \end{cases} \qquad \text{Interaction} = \text{"OK"}$$

$$\text{Interaction} := \frac{f_a}{F_a} + \frac{f_b}{F_b} \qquad \text{Interaction} = 0.106$$

Check for Bending at Point D @ 50' AGL:

Dead Weight:

Stack Dead Weight: $P_{ext} := D_I + D_{II} + D_{III} = 54.605 \cdot kip$

Additional Dead Weight: $D_{app} := D_{83} = 3.317 \cdot kip$

$P_{50} := D_{app} = 3.317 \cdot kip$

$P_{add} := P_{50} = 3.317 \cdot kip$

Dead Weight at Point D: $P_D := P_{ext} + P_{add} = 57.922 \cdot kip$

Overturning Moment:

Stack Moment

$$M_{ext} := \left[F_I \cdot \left(L_{II} + L_{III} + \frac{L_I}{2}\right) + F_{II} \cdot \left(L_{III} + \frac{L_{II}}{2}\right)\right] + F_{III} \cdot \left(\frac{L_{III}}{2}\right) = 76.141 \cdot ft \cdot kip$$

$$M_{83} := F_{app\_83} \cdot \left(L_I + L_{II} + L_{III} - 2ft\right) = 109.435 \cdot ft \cdot kip$$

$$M_{add} := M_{83} = 109.4 \cdot kip \cdot ft$$

Moment at Point D: $M_D := M_{ext} + M_{add} = 185.576 \cdot ft \cdot kip$

Section Properties:

Area at Point D:

$$A_D := \frac{\pi \cdot \left[d_D^{\ 2} - \left(d_D - 2 \cdot t_{III}\right)^2\right]}{4} = 14.94\, ft^2$$

Section Modulus at Point D:

$$S_D := \frac{\pi \cdot \left[d_D^{\ 4} - \left(d_D - 2 \cdot t_{III}\right)^4\right]}{32 \cdot d_D} = 24.579 \cdot ft^3$$

Radius of Gyration at Point D:

$$r_D := \frac{\sqrt{d_D^{\ 2} + \left(d_D - 2 \cdot t_{III}\right)^2}}{4} = 2.533\, ft$$

Check Tension in Mortar:

Accoording to ASCE 7-10 The critical load combinations due to wind loads

Compression : 1.0D+0.6W

Tension : 0.6D+0.6W

Compressive Stress: $\sigma_c := \frac{P_D}{A_D} + \frac{0.6M_D}{S_D}$ $\quad \sigma_c = 58.383\ \text{psi}$

Tensile Stress: $\sigma_t := \frac{.6P_D}{A_D} - \frac{0.6M_D}{S_D}$ $\quad \sigma_t = -15.31\ \text{psi}$ (Negative Value Indicates Tension. Therefore, Stack is in Tension at Point D.)

Mortar Check:

$$\text{Mortar} := \begin{cases} \text{"OK"} & \text{if } \sigma_t \ge -\sigma_a \\ \text{"No Good"} & \text{otherwise} \end{cases} \qquad \text{Mortar} = \text{"OK"}$$

Interaction Check:

Applied Axial Stress: $f_a := \frac{P_D}{A_D} = 26.924\ \text{psi}$

Applied Bending Stress: $f_b := \frac{M_D}{S_D} = 52.433\ \text{psi}$

Allowable Axial Stress:

$$F_a := \begin{cases} \left[\frac{f_m}{4}\cdot\left(\frac{70\cdot r_D}{L_I + L_{II} + L_{III}}\right)^2\right] & \text{if } \frac{L_I + L_{II} + L_{III}}{r_D} > 99 \\ \left[\frac{f_m}{4}\cdot\left[1 - \left(\frac{L_I + L_{II} + L_{III}}{140\cdot r_D}\right)^2\right]\right] & \end{cases} = 371.347\ \text{psi}$$

Allowable Bending Stress: $F_b := \frac{f_m}{3} = 500\ \text{psi}$

Interaction Check:

$$\text{Interaction} := \begin{cases} \text{"OK"} & \text{if } f_a < F_a \wedge f_a + f_b < F_b \\ \text{"No Good"} & \text{otherwise} \end{cases} \qquad \text{Interaction} = \text{"OK"}$$

$$\text{Interaction} := \frac{f_a}{F_a} + \frac{f_b}{F_b} \qquad \text{Interaction} = 0.177$$

Check for Bending at Point E @ 30' AGL:

Dead Weight:

Stack Dead Weight: $P_{ext} := D_I + D_{II} + D_{III} + D_{IV} = 109.872 \cdot kip$

Additional Dead Weight: $D_{app} := D_{83} = 3.317 \cdot kip$

$P_{30} := D_{app} = 3.317 \cdot kip$

$P_{add} := P_{30} = 3.317 \cdot kip$

Dead Weight at Point E: $P_E := P_{ext} + P_{add} = 113.189 \cdot kip$

Overturning Moment:

Stack Moment

$$M_{ext} := \left[F_I \cdot \left(\frac{L_I}{2} + L_{II} + L_{III} + L_{IV}\right) + F_{II} \cdot \left(\frac{L_{II}}{2} + L_{III} + L_{IV}\right)\right] \ldots + F_{III} \cdot \left(\frac{L_{III}}{2} + L_{IV}\right) + F_{IV} \cdot \left(\frac{L_{IV}}{2}\right) = 191.081 \cdot kip \cdot ft$$

$M_{83} := F_{app\_83} \cdot \left(L_I + L_{II} + L_{III} + L_{IV} - 2ft\right) = 175.759 \cdot ft \cdot kip$

$M_{add} := M_{83} = 175.8 \cdot kip \cdot ft$

Moment at the Point E: $M_E := M_{ext} + M_{add} = 366.84 \cdot ft \cdot kip$

Section Properties:

Area at Base: $$A_E := \frac{\pi \cdot \left[d_E^{\,2} - \left(d_E - 2 \cdot t_{IV}\right)^2\right]}{4} = 24.693\,ft^2$$

Section Modulus at Point E: $$S_E := \frac{\pi \cdot \left[d_E^{\,4} - \left(d_E - 2 \cdot t_{IV}\right)^4\right]}{32 \cdot d_E} = 43.742 \cdot ft^3$$

Radius of Gyration at Point E: $$r_E := \frac{\sqrt{d_E^{\,2} + \left(d_E - 2 \cdot t_{IV}\right)^2}}{4} = 2.801\,ft$$

Accoording to ASCE 7-10 The critical load combinations due to wind loads

Compression : 1.0D+0.6W   Tension : 0.6D+0.6W

Check Tension in Mortar:

Compressive Stress: $\sigma_c := \frac{P_E}{A_E} + \frac{0.6M_E}{S_E} = 66.776\,\text{psi}$

Tensile Stress: $\sigma_t := \frac{.6P_E}{A_E} - \frac{0.6M_E}{S_E} = -15.844\,\text{psi}$

(Negative Value Indicates Tension. Therefore, Stack is in Tension at the Bottom.)

Mortar Check:

$$\text{Mortar} := \begin{cases} \text{"OK"} & \text{if } \sigma_t \ge -\sigma_a \\ \text{"No Good"} & \text{otherwise} \end{cases}$$

Mortar = "OK"

Interaction Check:

Applied Axial Stress: $f_a := \frac{P_E}{A_E} = 31.832\,\text{psi}$

Applied Bending Stress: $f_b := \frac{M_E}{S_E} = 58.239\,\text{psi}$

Allowable Axial Stress:

$$F_a := \begin{cases} \left[\frac{f_m}{4}\cdot\left(\frac{70\cdot r_E}{L_I + L_{II} + L_{III} + L_{IV}}\right)^2\right] & \text{if } \frac{L_I + L_{II} + L_{III} + L_{IV}}{r_E} > 99 \\ \left[\frac{f_m}{4}\cdot\left[1 - \left(\frac{L_I + L_{II} + L_{III} + L_{IV}}{140\cdot r_E}\right)^2\right]\right] & \end{cases}$$

$F_a = 367.625\,\text{psi}$

Allowable Bending Stress: $F_b := \frac{f_m}{3} = 500\,\text{psi}$

Interaction Check:

$$\text{Interaction} := \begin{cases} \text{"OK"} & \text{if } f_a < F_a \wedge f_a + f_b < F_b \\ \text{"No Good"} & \text{otherwise} \end{cases}$$

Interaction = "OK"

$$\text{Interaction} := \frac{f_a}{F_a} + \frac{f_b}{F_b}$$

Interaction = 0.203

Check for Bending at Point F @ 18' AGL:

Dead Weight:

Stack Dead Weight: $P_{ext} := D_I + D_{II} + D_{III} + D_{IV} + D_V = 157.202 \cdot kip$

Additional Dead Weight: $D_{app} := D_{83} = 3.317 \cdot kip$

$P_{40} := D_{app} = 3.317 \cdot kip$

$P_{add} := P_{40} = 3.317 \cdot kip$

Dead Weight at Point F: $P_F := P_{ext} + P_{add} = 160.519 \cdot kip$

Overturning Moment:

Stack Moment

$$M_{ext} := F_I \cdot \left(\frac{L_I}{2} + L_{II} + L_{III} + L_{IV} + L_V \right) + F_{II} \cdot \left(\frac{L_{II}}{2} + L_{III} + L_{IV} + L_V \right) + F_{III} \cdot \left(\frac{L_{III}}{2} + L_{IV} + L_V \right) \ldots$$
$$+ F_{IV} \cdot \left(\frac{L_{IV}}{2} + L_V \right) + F_V \cdot \left(\frac{L_V}{2} \right)$$

$M_{ext} = 286 \cdot kip \cdot ft$

$M_{83} := F_{app\_83} \cdot (L_I + L_{II} + L_{III} + L_{IV} + L_V - 2ft) = 215.554 \cdot ft \cdot kip$

$M_{add} := M_{83} = 215.6 \cdot kip \cdot ft$

Moment at the Point E: $M_F := M_{ext} + M_{add} = 501.496 \cdot ft \cdot kip$

Section Properties:

Area at Base: $A_F := \dfrac{\pi \cdot \left[d_F^{\,2} - (d_F - 2 \cdot t_V)^2 \right]}{4} = 34.208\, ft^2$

Section Modulus at Point E: $S_F := \dfrac{\pi \cdot \left[d_F^{\,4} - (d_F - 2 \cdot t_V)^4 \right]}{32 \cdot d_F} = 61.64 \cdot ft^3$

Radius of Gyration at Point E: $r_F := \dfrac{\sqrt{d_F^{\,2} + (d_F - 2 \cdot t_V)^2}}{4} = 2.926\, ft$

Accoording to ASCE 7-10 The critical load combinations due to wind loads

Compression : 1.0D+0.6W   Tension : 0.6D+0.6W

Check Tension in Mortar:

Compressive Stress: $\sigma_c := \frac{P_F}{A_F} + \frac{0.6M_F}{S_F} = 66.485\,\text{psi}$

Tensile Stress: $\sigma_t := \frac{.6P_F}{A_F} - \frac{0.6M_F}{S_F} = -14.348\,\text{psi}$ (Negative Value Indicates Tension. Therefore, Stack is in Tension at the Bottom.)

Mortar Check: $\text{Mortar} := \begin{cases} \text{"OK"} & \text{if } \sigma_t \ge -\sigma_a \\ \text{"No Good"} & \text{otherwise} \end{cases}$ Mortar = "OK"

Interaction Check:

Applied Axial Stress: $f_a := \frac{P_F}{A_F} = 32.586\,\text{psi}$

Applied Bending Stress: $f_b := \frac{M_F}{S_F} = 56.499\,\text{psi}$

Allowable Axial Stress:

$$F_a := \begin{cases} \left[\frac{f_m}{4}\cdot\left(\frac{70\cdot r_F}{L_I + L_{II} + L_{III} + L_{IV} + L_V}\right)^2\right] & \text{if } \frac{L_I + L_{II} + L_{III} + L_{IV} + L_V}{r_F} > 99 \\ \left[\frac{f_m}{4}\cdot\left[1 - \left(\frac{L_I + L_{II} + L_{III} + L_{IV} + L_V}{140\cdot r_F}\right)^2\right]\right] & \end{cases}$$

$F_a = 364.965\,\text{psi}$

Allowable Bending Stress: $F_b := \frac{f_m}{3} = 500\,\text{psi}$

Interaction Check: $\text{Interaction} := \begin{cases} \text{"OK"} & \text{if } f_a < F_a \wedge f_a + f_b < F_b \\ \text{"No Good"} & \text{otherwise} \end{cases}$ Interaction = "OK"

$\text{Interaction} := \frac{f_a}{F_a} + \frac{f_b}{F_b}$ Interaction = 0.202

Check for Bending at Point G @ 0' AGL:

Dead Weight:

Stack Dead Weight: $P_{ext} := D_I + D_{II} + D_{III} + D_{IV} + D_V + D_{VI} = 225.609 \cdot kip$

Additional Dead Weight: $D_{app} := D_{83} = 3.317 \cdot kip$

$P_0 := D_{app} = 3.317 \cdot kip$

$P_{add} := P_0 = 3.317 \cdot kip$

Dead Weight at Point E: $P_G := P_{ext} + P_{add} = 228.927 \cdot kip$

Overturning Moment:

Stack Moment

$$M_{ext} := F_I \cdot \left(\frac{L_I}{2} + L_{II} + L_{III} + L_{IV} + L_V + L_{VI}\right) + F_{II} \cdot \left(\frac{L_{II}}{2} + L_{III} + L_{IV} + L_V + L_{VI}\right) \ldots$$
$$+ F_{III} \cdot \left(\frac{L_{III}}{2} + L_{IV} + L_V + L_{VI}\right) + F_{IV} \cdot \left(\frac{L_{IV}}{2} + L_V + L_{VI}\right) + F_V \cdot \left(\frac{L_V}{2} + L_{VI}\right) + F_{VI} \cdot \left(\frac{L_{VI}}{2}\right)$$

$M_{ext} = 466 \cdot kip \cdot ft$

$M_{83} := F_{app\_83} \cdot \left(L_I + L_{II} + L_{III} + L_{IV} + L_V + L_{VI}\right) = 281.878 \cdot ft \cdot kip$

$M_{add} := M_{83} = 281.9 \cdot kip \cdot ft$

Moment at the Point E: $M_G := M_{ext} + M_{add} = 747.638 \cdot ft \cdot kip$

Section Properties:

Area at Base:
$$A_G := \frac{3 \cdot d_{top\_out}^{\;2} \cdot \tan\left(\frac{\pi}{6}\right) - 3 \cdot d_{top\_in}^{\;2} \cdot \tan\left(\frac{\pi}{6}\right)}{2} = 68.049\,ft^2$$

Moment of Inertia
$$I_x := \frac{5 \cdot d_G^{\,4}}{48\sqrt{3}} - \frac{5\left(d_G - 2t_{VI}\right)^4}{48\sqrt{3}} = 358.72\,ft^4$$
$$I_y := \frac{5 \cdot d_G^{\,4}}{48\sqrt{3}} - \frac{5\left(d_G - 2t_{VI}\right)^4}{48\sqrt{3}} = 358.72\,ft^4$$

Section Modulus at Point G: $S_G := \frac{I_x \cdot 2}{d_G}$ $\quad S_G = 75.52 \cdot ft^3$

Radius of Gyration at Point G: $r_G := \sqrt{\frac{I_x}{A_G}} = 2.296\,ft$ $\quad r_G = 2.296\,ft$

Accoording to ASCE 7-10 The critical load combinations due to wind loads

Compression : 1.0D+0.6W   Tension : 0.6D+0.6W

Check Tension in Mortar:

Compressive Stress: $\sigma_c := \frac{P_G}{A_G} + \frac{0.6M_G}{S_G} = 64.611\ \text{psi}$

Tensile Stress: $\sigma_t := \frac{.6P_G}{A_G} - \frac{0.6M_G}{S_G} = -27.232\ \text{psi}$

Mortar Check: $\text{Mortar} := \begin{cases} \text{"OK"} & \text{if } \sigma_t \geq -\sigma_a \\ \text{"No Good"} & \text{otherwise} \end{cases}$ $\text{Mortar} = \text{"OK"}$

Interaction Check:

Applied Axial Stress: $f_a := \frac{P_G}{A_G} = 23.362\ \text{psi}$

Applied Bending Stress: $f_b := \frac{M_G}{S_G} = 68.749\ \text{psi}$

Allowable Axial Stress:

$$F_a := \begin{cases} \left[\frac{f_m}{4} \cdot \left(\frac{70 \cdot r_G}{L_I + L_{II} + L_{III} + L_{IV} + L_V + L_{VI}}\right)^2\right] & \text{if } \frac{L_I + L_{II} + L_{III} + L_{IV} + L_V + L_{VI}}{r_G} > 9\text{9} \\ \left[\frac{f_m}{4} \cdot \left[1 - \left(\frac{L_I + L_{II} + L_{III} + L_{IV} + L_V + L_{VI}}{140 \cdot r_G}\right)^2\right]\right] \end{cases}$$

$F_a = 348.777\ \text{psi}$

Allowable Bending Stress: $F_b := \frac{f_m}{3}$ $F_b = 500\ \text{psi}$

Interaction Check: $\text{Interaction} := \begin{cases} \text{"OK"} & \text{if } f_a < F_a \wedge f_a + f_b < F_b \\ \text{"No Good"} & \text{otherwise} \end{cases}$ $\text{Interaction} = \text{"OK"}$

$\text{Interaction} := \frac{f_a}{F_a} + \frac{f_b}{F_b}$ $\text{Interaction} = 0.204$

$Vol_{outter\_VI\_1} = \blacksquare \cdot ft^3$

$Vol_{inner\_VI\_1} = \blacksquare \cdot ft^3$

$Vol_{VI\_1} = \blacksquare \cdot ft^3$

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703.276.1100 ● 703.276.1169 fax
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SmartLink, LLC on behalf of AT&T Mobility, LLC
Site FA – 10035106
Site ID – CT1199 (MRCTB025729-MRCTB025707-MRCTB025723)
USID – 59402
Site Name – Hartford Park St
Site Compliance Report

2074 Park St
Hartford, CT 06106

Latitude: N41-45-24.37
Longitude: W72-42-50.00
Structure Type: Rooftop

Report generated date: December 11, 2017
Report by: Kevin Bernstetter II, EI
Customer Contact: David Barbagallo

AT&T Mobility, LLC is compliant based on FCC Rules and Regulations.

Table of Contents

1 General Site Summary

1.1 Report Summary

AT&T Mobility, LLC	Summary
Access to Antennas Locked?	Yes
RF Sign(s) @ access point(s)	(1) Caution 2 @ Smokestack Base (1) Information 1 @ Gate (1) Information 1 @ Equipment
RF Sign(s) @ antennas	None
Barrier(s) @ sectors	None
Max cumulative simulated RFE level on the Ground	<1% General Public Limit at Ground Level
FCC & AT&T Compliant?	Yes

Note: The existing signage was documented at a previous site visit 06/08/2016.

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

RFDS: NEW-ENGLAND_CONNECTICUT_CTU1199_2018-LTE-Next-Carrier_LTE_rx855w_2051A0D...

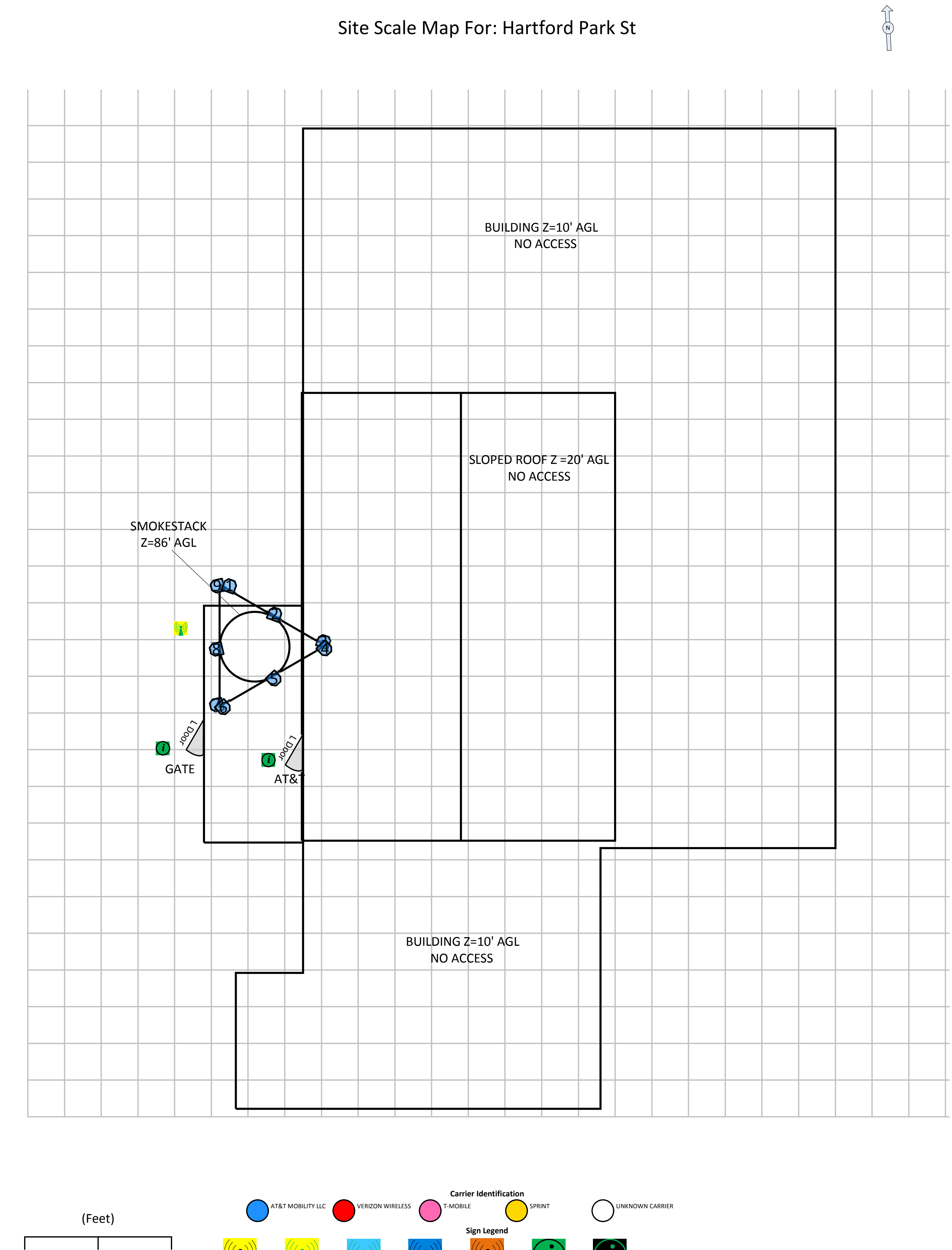
CD's: 10035106_AE201_171013_CTL01199_Rev 0.DBRL

2 Scale Maps of Site

The following diagrams are included:

- Site Scale Map
- RF Exposure Diagram
- Elevation View

Site Scale Map For: Hartford Park St



www.sitesafe.com
Site Name:Hartford Park St
12/11/2017 6:36:43 AM

3 Antenna Inventory

The following antenna inventory on this and the following page, were obtained by the customer and were utilized to create the site model diagrams:

Ant ID	Operator	Antenna Make & Model	Type	TX Freq (MHz)	Az (Deg)	Hor BW (Deg)	Ant Len (ft)	Ant Gain (dBd)	2G GSM Radio(s)	3G UMTS Radio(s)	4G Radio(s)	Total ERP (Watts)	X	Y	Z AGL
1	AT&T MOBILITY LLC	Powerwave 7770	Panel	850	23	82	4.6	11.51	0	1	0	290.4	29.5'	95.7'	80.7'
1	AT&T MOBILITY LLC	Powerwave 7770	Panel	1900	23	86	4.6	13.41	0	1	0	571.5	29.5'	95.7'	80.7'
2	AT&T MOBILITY LLC	CCI Antennas HPA-65R-BUU-H8	Panel	737	23	64.9	7.7	13.26	0	0	1	1475.7	35.6'	91.9'	79.2'
2	AT&T MOBILITY LLC	CCI Antennas HPA-65R-BUU-H8	Panel	1900	23	63.1	7.7	14.76	0	0	1	4842.1	35.6'	91.9'	79.2'
3	AT&T MOBILITY LLC (Proposed)	CCI Antennas TPA-65R-LCUUUU-H8	Panel	2100	23	65.2	8	13.96	0	0	1	5070.3	42.3'	88.1'	79'
3	AT&T MOBILITY LLC (Proposed)	CCI Antennas TPA-65R-LCUUUU-H8	Panel	2300	23	65	8	14.36	0	0	1	1285.3	42.3'	88.1'	79'
4	AT&T MOBILITY LLC	Powerwave 7770	Panel	850	140	82	4.6	11.51	0	1	0	290.4	42.5'	87.1'	80.7'
4	AT&T MOBILITY LLC	Powerwave 7770	Panel	1900	140	86	4.6	13.41	0	1	0	571.5	42.5'	87.1'	80.7'
5	AT&T MOBILITY LLC	CCI Antennas HPA-65R-BUU-H6	Panel	737	140	66.2	6	11.68	0	0	1	1475.7	35.6'	83'	80'
5	AT&T MOBILITY LLC	CCI Antennas HPA-65R-BUU-H6	Panel	1900	140	61.1	6	14.53	0	0	1	4842.1	35.6'	83'	80'
6	AT&T MOBILITY LLC (Proposed)	Kathrein-Scala 800-10798	Panel	2100	140	62	6.5	14.04	0	0	1	5070.3	28.6'	79.1'	79.7'
6	AT&T MOBILITY LLC (Proposed)	Kathrein-Scala 800-10798	Panel	2300	140	64	6.5	13.22	0	0	1	1285.3	28.6'	79.1'	79.7'
7	AT&T MOBILITY LLC	Powerwave 7770	Panel	850	260	82	4.6	11.51	0	1	0	290.4	27.7'	79.5'	80.7'
7	AT&T MOBILITY LLC	Powerwave 7770	Panel	1900	260	86	4.6	13.41	0	1	0	571.5	27.7'	79.5'	80.7'
8	AT&T MOBILITY LLC	CCI Antennas HPA-65R-BUU-H8	Panel	737	260	64.9	7.7	13.26	0	0	1	1475.7	27.7'	87.1'	79.2'
8	AT&T MOBILITY LLC	CCI Antennas HPA-65R-BUU-H8	Panel	1900	260	63.1	7.7	14.76	0	0	1	4842.1	27.7'	87.1'	79.2'
9	AT&T MOBILITY LLC (Proposed)	CCI Antennas TPA-65R-LCUUUU-H8	Panel	2100	260	65.2	8	13.96	0	0	1	5070.3	27.8'	95.7'	79'
9	AT&T MOBILITY LLC (Proposed)	CCI Antennas TPA-65R-LCUUUU-H8	Panel	2300	260	65	8	14.36	0	0	1	1285.3	27.8'	95.7'	79'

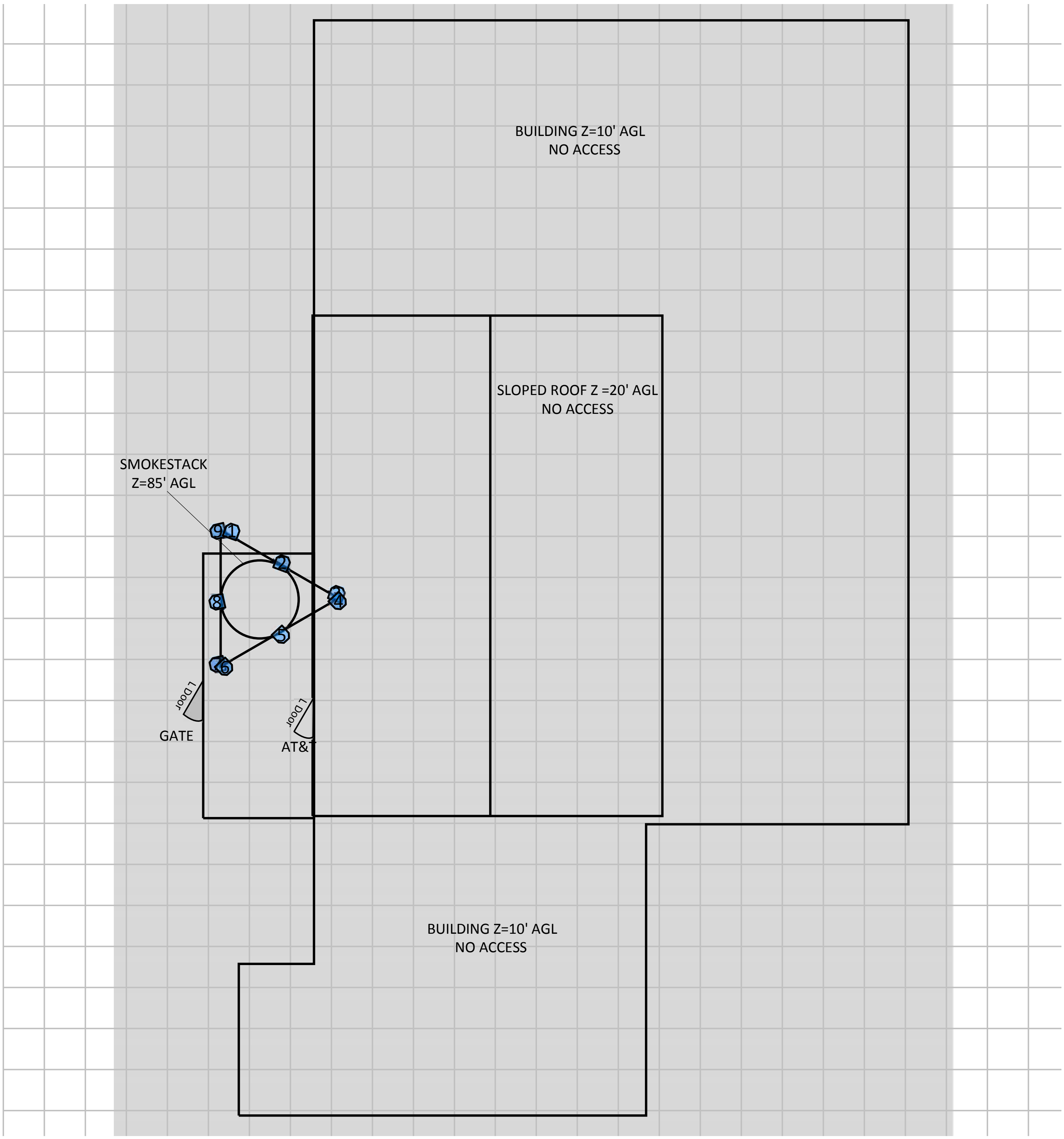
NOTE: X, Y and Z indicate relative position of the bottom of the antenna to the origin location on the site, displayed in the model results diagram. Specifically, the Z reference indicates the bottom of the antenna height above the ground level unless otherwise indicated. The distance to the bottom of the antenna is calculated by subtracting half of the length of the antenna from the antenna centerline. 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.

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 Antenna Inventory heights are referenced to the same level.

RF Exposure Simulation For: Hartford Park St



% 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

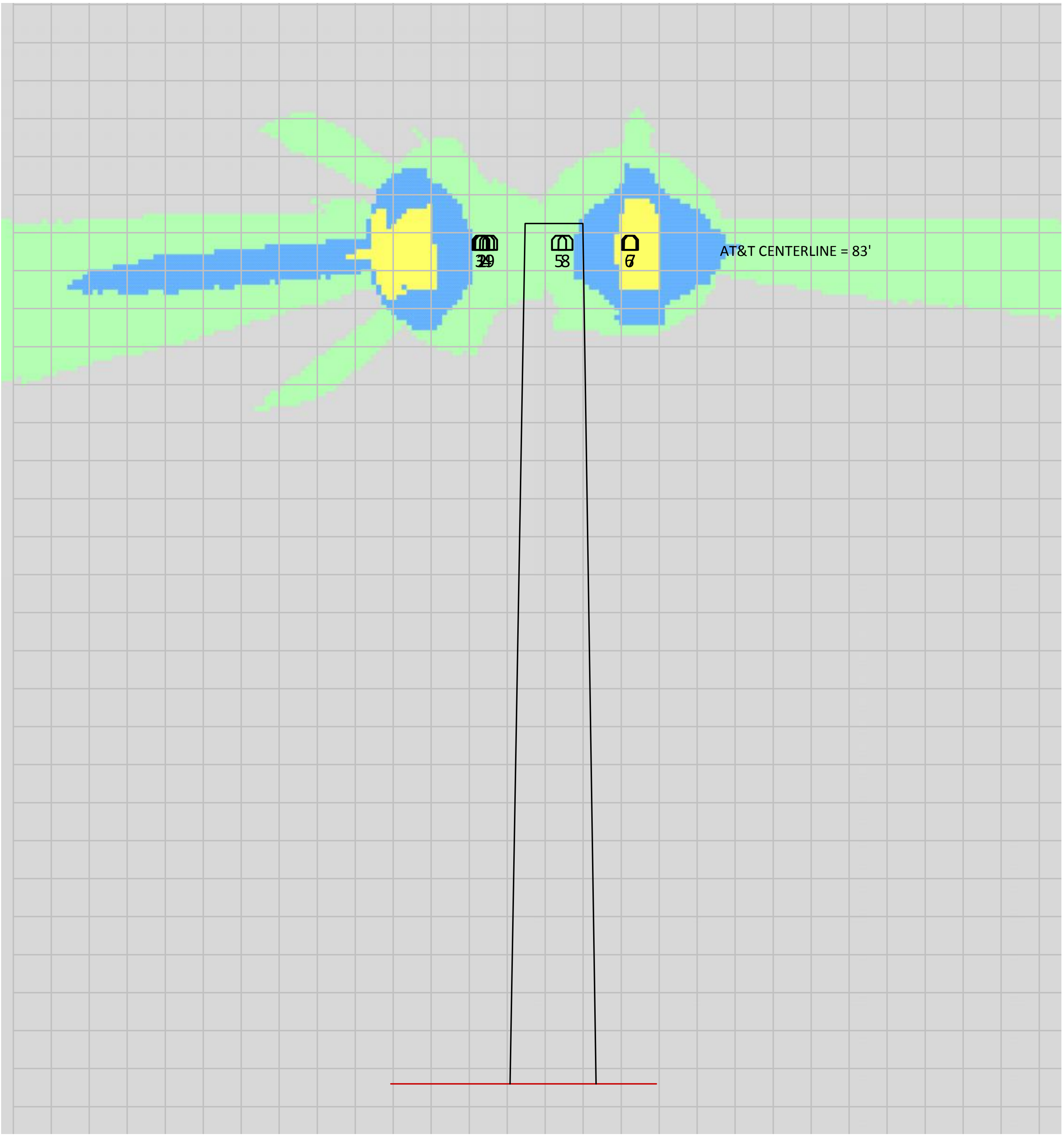
(Feet)
0 9.2 18.3

Barrier **Proposed Barriers**

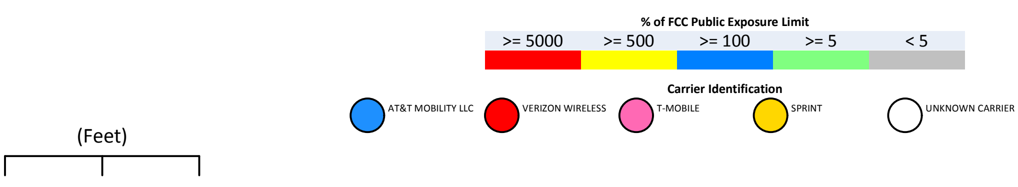
www.sitesafe.com
Site Name:Hartford Park St
12/11/2017 6:39:05 AM

SitesafeTC Version:1.0.0.0 - 0.0.0.266
Sitesafe OET-65 Model
Near Field Boundary: 1.5 * Aperture
Reflection Factor: 1
Spatially Averaged

RF Exposure Simulation For: Hartford Park St
Elevation View



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



www.sitesafe.com
Site Name:Hartford Park St
12/11/2017 6:41:00 AM

SitesafeTC Version:1.0.0.0 - 0.0.0.266
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 is compliant with the FCC rules and regulations, as described in OET Bulletin 65.

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 is compliant with the FCC rules and regulations.

Notes:

- Ensure all existing signage documented in this report still exist at the site.

6 Reviewer Certification

The reviewer whose signature appears below hereby certifies and affirms:

That I am an employee of Sitesafe, Inc., in Arlington, 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 Radiation; 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 Kevin Bernstetter II, EI.

December 11, 2017

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.

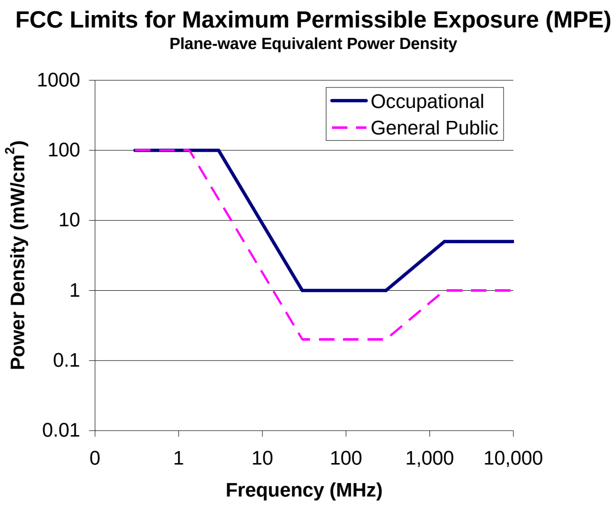
FCC regulations define two separate tiers of exposure limits: Occupational or "Controlled environment" and General Public or "Uncontrolled environment". The General Public limits are generally five times more conservative or restrictive than the Occupational limit. These limits apply to *accessible* 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 Lock Out Tag Out procedure aimed to control the unexpected energization or start up 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 workers 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**.
- 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.

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.

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 taking corrective actions to bring the site into compliance.

Compliance – The determination of whether a site is safe or not with regards to Human Exposure to Radio Frequency Radiation 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) – In a given direction, the relative gain of a transmitting antenna with respect to the maximum directivity of a half wave dipole multiplied by the net power accepted by the antenna from the connecting transmitter.

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

General Population/Uncontrolled Environment – Defined by the FCC, as an area where exposure to RF energy may occur to persons who are **unaware** of the potential for exposure and who have no control of 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 our 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 maximum levels of RF exposure a person may be exposed to without harmful effect and with acceptable safety factor.

Occupational/Controlled Environment – Defined by the FCC, as an area where Radio Frequency Radiation (RFR) 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 Radio Frequency radiation 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 (RF) – The frequencies of electromagnetic waves which are used for radio communications. Approximately 3 kHz to 300 GHz.

Radio Frequency Exposure (RFE) – The amount of RF power density that a person is or might be exposed to.

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 power density an average sized human will be exposed to at a location.

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 F – References

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

Sitesafe, Inc.
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-ionising Radiation
http://www.hpa.org.uk/webw/HPAweb&HPAwebStandard/HPAweb_C/1317133826368
Norwegian Institute of Public Health
http://www.fhi.no/dokumenter/545eea7147.pdf

Unofficial Property Record Card - City of Hartford, CT

General Property Data

Parcel Identification 113-370-033
Property Owner 2074-2100 PARK STREET LLC
Mailing Address 2074 PARK ST SUITE 101
City HARTFORD
Mailing State CT **Zip** 06106-2051
ParcelZoning MS-2

Property Location 2074 PARK ST HARTFORD
Property Use OFF/MANUFAC
Most Recent Sale Date 5/23/2016
Legal Reference 07074-0270
Grantor 2074-2100 PARK STREET LLC,
Sale Price 10
Land Area 1.165 acres

Current Property Assessment

Fiscal Year 2016
Land Value 186,900

Total Value 1,027,530
Building Value 832,650

Building Description

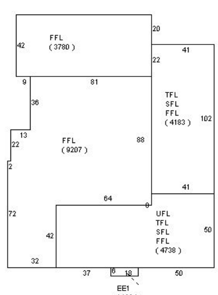
Building Style	MFG/PROCESS	**Foundation Type**	Concrete	**Flooring Type**	COMBINATION
# of Living Units	0	**Frame Type**	Wood Frame	**Basement Floor**	N/A
Year Built	1920	**Roof Structure**	FLAT	**Heating Type**	Unit Heat
Building Grade	Average +	**Roof Cover**	Tar & Gravel	**Heating Fuel**	Gas
Building Condition	Good	**Siding**	Brick	**Air Conditioning**	100%
Finished Area (SF)	44488	**Interior Walls**	AVERAGE	**# of Bsmt Garages**	0
Number Rooms	0	**Number Beds**	0	**# of Full Baths**	0
# of 3/4 Baths	0	**# of 1/2 Baths**	0	**# of Other Fixtures**	0

Legal Description

Narrative Description of Property

This property contains 1.165 acres of land mainly classified as OFF/MANUFAC with a(n) MFG/PROCESS style building, built about 1920 , having Brick exterior and Tar & Gravel roof cover, with 0 unit(s), 0 room(s), 0 bedroom(s), 0 bath(s), 0 half bath(s).

Property Images



Disclaimer: This information is believed to be correct but is subject to change and is not warranteed.

From: TrackingUpdates@fedex.com
To: David Barbagallo
Subject: FedEx Shipment 771260130844 Delivered
Date: Thursday, January 25, 2018 11:18:04 AM

FedEx®

Your package has been delivered

Tracking # 771260130844

Ship date:
Mon, 1/22/2018

Dave Barbagallo
Smartlink LLC
KENSINGTON, CT 06037
US

Delivered

Delivery date:
Thu, 1/25/2018 11:14 am

Luke Bronin
Mayor City of Hartford
550 Main Street, Hartford
Mayor's Office
HARTFORD, CT 06103
US

Shipment Facts

Our records indicate that the following package has been delivered.

Tracking number:	771260130844
Status:	Delivered: 01/25/2018 11:14 AM Signed for By: N.AGOSTO
Signed for by:	N.AGOSTO
Delivery location:	HARTFORD, CT
Delivered to:	Receptionist/Front Desk
Service type:	FedEx Express Saver
Packaging type:	FedEx Pak
Number of pieces:	1
Weight:	1.00 lb.
Special handling/Services:	Deliver Weekday
Standard transit:	1/25/2018 by 4:30 pm

Please do not respond to this message. This email was sent from an unattended mailbox. This report was generated at approximately 10:17 AM CST on 01/25/2018.

All weights are estimated.

To track the latest status of your shipment, click on the tracking number above.

Standard transit is the date and time the package is scheduled to be delivered by, based on the selected service, destination and ship date. Limitations and exceptions may apply. Please see the FedEx Service Guide for terms and conditions of service, including the FedEx Money-Back Guarantee, or contact your FedEx Customer Support representative.

Thank you for your business.

From:	TrackingUpdates@fedex.com
To:	David Barbagallo
Subject:	FedEx Shipment 771260299092 Delivered
Date:	Thursday, January 25, 2018 11:05:28 AM

FedEx®

Your package has been delivered

Tracking # 771260299092

Ship date:
Mon, 1/22/2018

Dave Barbagallo
Smartlink LLC
KENSINGTON, CT 06037
US

Delivered

Delivery date:
Thu, 1/25/2018 10:55 am

Planning and Zoning Department
250 Constitution Plaza
4th Floor
HARTFORD, CT 06103
US

Shipment Facts

Our records indicate that the following package has been delivered.

Tracking number:	771260299092
Status:	Delivered: 01/25/2018 10:55 AM Signed for By: R.AGOSTOA
Signed for by:	R.AGOSTOA
Delivery location:	HARTFORD, CT
Delivered to:	Receptionist/Front Desk
Service type:	FedEx Express Saver
Packaging type:	FedEx Pak
Number of pieces:	1
Weight:	1.00 lb.
Special handling/Services:	Deliver Weekday
Standard transit:	1/25/2018 by 4:30 pm

Please do not respond to this message. This email was sent from an unattended mailbox. This report was generated at approximately 10:03 AM CST on 01/25/2018.

All weights are estimated.

To track the latest status of your shipment, click on the tracking number above.

Standard transit is the date and time the package is scheduled to be delivered by, based on the selected service, destination and ship date. Limitations and exceptions may apply. Please see the FedEx Service Guide for terms and conditions of service, including the FedEx Money-Back Guarantee, or contact your FedEx Customer Support representative.

Thank you for your business.

From: TrackingUpdates@fedex.com
To: David Barbagallo
Subject: FedEx Shipment 771260461495 Delivered
Date: Thursday, January 25, 2018 12:58:34 PM

FedEx®

Your package has been delivered

Tracking # 771260461495

Ship date:
Mon, 1/22/2018

Dave Barbagallo
Smartlink LLC
KENSINGTON, CT 06037
US

Delivered

Delivery date:
Thu, 1/25/2018 12:56 pm

John Mendonsa
2074-2100 PARK STREET LLC
2074 Park St
Suite 101
HARTFORD, CT 06106
US

Shipment Facts

Our records indicate that the following package has been delivered.

Tracking number:	771260461495
Status:	Delivered: 01/25/2018 12:56 PM Signed for By: M.RAMOS
Signed for by:	M.RAMOS
Delivery location:	HARTFORD, CT
Delivered to:	Receptionist/Front Desk
Service type:	FedEx Express Saver
Packaging type:	FedEx Pak
Number of pieces:	1
Weight:	1.00 lb.
Special handling/Services:	Deliver Weekday
Standard transit:	1/25/2018 by 4:30 pm

Please do not respond to this message. This email was sent from an unattended mailbox. This report was generated at approximately 11:58 AM CST on 01/25/2018.

All weights are estimated.

To track the latest status of your shipment, click on the tracking number above.

Standard transit is the date and time the package is scheduled to be delivered by, based on the selected service, destination and ship date. Limitations and exceptions may apply. Please see the FedEx Service Guide for terms and conditions of service, including the FedEx Money-Back Guarantee, or contact your FedEx Customer Support representative.

Thank you for your business.