CROWN CASTLE
Crown Castle
3530 Toringdon Way Suite 300
Charlotte NC 28277
Tel (704) 405-6600

November 13, 2014

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

RE: **T-Mobile-Exempt Modification - Crown Site BU: 829013**
T-Mobile Site ID: CT11178D
Located at: 467 South Quaker Lane, West Hartford, CT 06110

Dear Ms. Bachman:

This letter and exhibits are submitted on behalf of T-Mobile. T-Mobile is making modifications to certain existing sites in its Connecticut system in order to implement their 700MHz technology. Please accept this letter and exhibits as notification, pursuant to § 16-50j-73 of the Regulations of Connecticut State Agencies ("R.C.S.A."), of construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In compliance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Ron Van Winkle, Town Manager for the City of West Hartford, and The Church of St. Mark the Evangelist, Corp., Property Owner.

T-Mobile plans to modify the existing wireless communications facility owned by Crown Castle and located at **467 South Quaker Lane, West Hartford, CT 06110**. Attached are a compound plan and elevation depicting the planned changes (Exhibit-1), and documentation of the structural sufficiency of the structure to accommodate the revised antenna configuration (Exhibit-2). Also included is a power density table report reflecting the modification to T-Mobile's operations at the site (Exhibit-3).

The changes to the facility do not constitute a modification as defined in Connecticut General Statutes ("C.G.S.") § 16-50i(d) because the general physical characteristics of the facility will not be significantly changed. Rather, the planned changes to the facility fall squarely within those activities explicitly provided for in the 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. T-Mobile's replacement antennas will be located at the same elevation on the existing tower.

2. There will be no proposed modifications to the ground and no extension of boundaries.

3. The proposed modifications will not increase noise levels at the facility by six decibels or more.

4. The operation of the replacement antennas will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) adopted safety standard. A cumulative General Power Density table report for T-Mobile's modified facility is included as Exhibit-3.

5. A Structural Modification Report confirming that the tower and foundation can support T-Mobile's proposed modifications is included as Exhibit-2.

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

Sincerely,

Jerry Feathers
Real Estate Specialist

Enclosure

Tab 1: Exhibit-1: Compound plan and elevation depicting the planned changes
Tab 2: Exhibit-2: Structural Modification Report
Tab 3: Exhibit-3: General Power Density Table Report (RF Emissions Analysis Report)

cc: Ron Van Winkle, Town Manager
West Hartford Town Hall
50 South Main Street, Room 310
West Hartford, CT 06107

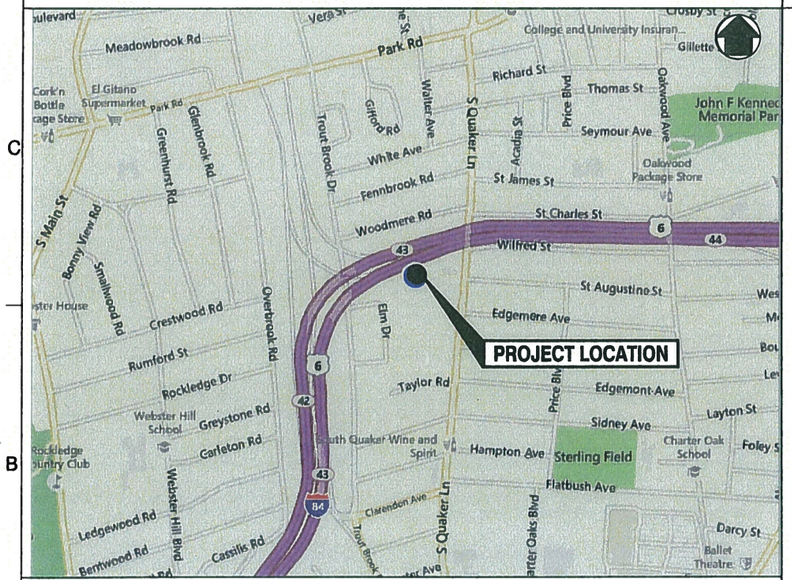
cc: The Church of St. Mark the Evangelist, Corp.
467 South Quaker Lane
West Hartford, CT 06110

T-MOBILE NORTHEAST LLC

T-MOBILE SITE #: CT11178D
CROWN CASTLE BU #: 829013
SITE NAME: WEST HARTFORD/I84
467 SOUTH QUAKER LANE
WEST HARTFORD, CT 06110
HARTFORD COUNTY

SITE CONFIGURATION: 702CU

SITE INFORMATION



KEY MAP
N.T.S.

DIRECTIONS: (FROM PARSIPPANY):

START OUT GOING WEST ON SYLVAN WAY TOWARD CENTURY DR. TURN RIGHT ONTO LITTLETON RD/US-202 N. KEEP LEFT AT THE FORK TO GO ON LITTLETON RD E. MERGE ONTO I-287 N. MERGE ONTO I-87 S/I-287 E/NEW YORK TRWY S TOWARD I-87 S/TAPPAN ZEE BRG/NEW YORK CITY. TAKE THE I-87 S EXIT TOWARD SAW MILL PKWY S/NEW YORK CITY. TAKE THE NY-119/SAW MILL PKWY N EXIT 8A, TOWARD ELMSFORD. MERGE ONTO SAW MILL RIVER PKWY N VIA THE RAMP ON THE LEFT TOWARD KATONAH. MERGE ONTO I-684 N VIA THE EXIT ON THE LEFT. MERGE ONTO I-84 E VIA EXIT 9E TOWARD DANBURY. KEEP RIGHT TO TAKE I-84 E TOWARD HARTFORD. TAKE THE PARK RD EXIT 43, ON THE LEFT TOWARD W HARTFORD CENTER. TURN RIGHT ONTO PARK RD. TURN RIGHT ONTO QUAKER S LN 467 S QUAKER LN IS ON THE RIGHT.

PROJECT INFORMATION

T-MOBILE SITE #:	CT11178D
CROWN CASTLE BU #:	829013
SITE ADDRESS:	467 SOUTH QUAKER LANE WEST HARTFORD, CT 06110 HARTFORD COUNTY
LATITUDE:	N 41° 44' 55.752"
LONGITUDE:	W 72° 43' 52.752"
TOWER OWNER:	CROWN CASTLE 1200 MACARTHUR BLVD., SUITE 200 MAHWAH, NJ 07430
CONTACT:	PETER TISI (201) 236-9228
APPLICANT:	T-MOBILE NORTHEAST, LLC 4 SYLVAN WAY PARSIPPANY, NJ 07054
CONTACT:	PHONE #: (973) 397-4800 FAX #: (973) 292-8893
ENGINEER:	DEWBERRY ENGINEERS INC. 600 PARSIPPANY ROAD, SUITE 301 PARSIPPANY, NJ 07054
CONTACT:	GREG NAWROTZKI (973) 576-9653
SCOPE OF WORK:	REMOVE AND REPLACE (3) EXISTING ANTENNAS, ADD (1) NEW ANTENNA, ADD (3) NEW RRU'S.

SHEET INDEX

SHEET NO.	SHEET DESCRIPTION
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C-2	ANTENNA LAYOUTS & ELEVATIONS
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E-1	GROUNDING NOTES & DETAILS

APPROVALS

T-MOBILE — DATE

OWNER/ LANDLORD — DATE

RF ENGINEER — DATE

ZONING — DATE

CONSTRUCTION — DATE

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WEST HARTFORD/I-84

CT11178D

467 SOUTH QUAKER LANE
WEST HARTFORD, CT 06110
HARTFORD COUNTY

SEAL

JIANG YU
STATE OF CONNECTICUT
No. 23222
PROFESSIONAL ENGINEER
JIANG YU, PE
CONNECTICUT LICENSE NO. 023222

SCALE
AS SHOWN

REV.	DATE	BY	DESCRIPTION
0	09/25/14	HMP	ISSUED AS FINAL
A	09/03/14	HMP	ISSUED FOR REVIEW

REVISIONS

DRAWN BY HMP
CHECKED BY BSH
APPROVED BY GHN
DATE 09/03/14

TITLE

TITLE SHEET

PROJECT NO. 50066258/50066276

T - 1

SHEET NO.

GENERAL NOTES:

1. FOR THE PURPOSE OF CONSTRUCTION DRAWING, THE FOLLOWING DEFINITIONS SHALL APPLY:
   PROJECT MANAGEMENT – CROWN CASTLE
   CONTRACTOR – GENERAL CONTRACTOR (CONSTRUCTION)
   OWNER – T-MOBILE
   OEM – ORIGINAL EQUIPMENT MANUFACTURER
2. PRIOR TO THE SUBMISSION OF BIDS, THE BIDDING CONTRACTOR SHALL VISIT THE CELL SITE TO FAMILIARIZE WITH THE EXISTING CONDITIONS AND TO CONFIRM THAT THE WORK CAN BE ACCOMPLISHED AS SHOWN ON THE CONSTRUCTION DRAWINGS. ANY DISCREPANCY FOUND SHALL BE BROUGHT TO THE ATTENTION OF PROJECT MANAGEMENT.
3. ALL MATERIALS FURNISHED AND INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS, AND ORDINANCES. CONTRACTOR 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.
4. ALL WORK CARRIED OUT SHALL COMPLY WITH ALL APPLICABLE MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS AND LOCAL JURISDICTIONAL CODES, ORDINANCES AND APPLICABLE REGULATIONS.
5. DRAWINGS PROVIDED HERE ARE NOT TO SCALE UNLESS OTHERWISE NOTED AND ARE INTENDED TO SHOW OUTLINE ONLY.
6. UNLESS NOTED OTHERWISE, THE WORK SHALL INCLUDE FURNISHING MATERIALS, EQUIPMENT, APPURTENANCES, AND LABOR NECESSARY TO COMPLETE ALL INSTALLATIONS AS INDICATED ON THE DRAWINGS.
7. THE CONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS UNLESS SPECIFICALLY STATED OTHERWISE.
8. IF THE SPECIFIED EQUIPMENT CANNOT BE INSTALLED AS SHOWN ON THESE DRAWINGS, THE CONTRACTOR SHALL PROPOSE AN ALTERNATIVE INSTALLATION FOR APPROVAL BY PROJECT MANAGEMENT.
9. CONTRACTOR SHALL DETERMINE ACTUAL ROUTING OF CONDUIT, POWER AND T1 CABLES, GROUNDING CABLES AS SHOWN ON THE POWER, GROUNDING AND TELCO PLAN DRAWING. CONTRACTOR SHALL UTILIZE EXISTING TRAYS AND/OR SHALL ADD NEW TRAYS AS NECESSARY. CONTRACTOR SHALL CONFIRM THE ACTUAL ROUTING WITH PROJECT MANAGEMENT.
10. THE CONTRACTOR SHALL PROTECT EXISTING IMPROVEMENTS, PAVEMENTS, CURBS, LANDSCAPING AND STRUCTURES. ANY DAMAGED PART SHALL BE REPAIRED AT CONTRACTOR'S EXPENSE TO THE SATISFACTION OF THE OWNER.
11. CONTRACTOR SHALL LEGALLY AND PROPERLY DISPOSE OF ALL SCRAP MATERIALS SUCH AS COAXIAL CABLES AND OTHER ITEMS REMOVED FROM THE EXISTING FACILITY. ANTENNAS REMOVED SHALL BE RETURNED TO THE OWNER'S DESIGNATED LOCATION.
12. CONTRACTOR SHALL LEAVE PREMISES IN CLEAN CONDITION.
13. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE PROJECT DESCRIBED HEREIN. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES AND FOR COORDINATING ALL PORTIONS OF THE WORK UNDER THE CONTRACT.
14. CONTRACTOR SHALL NOTIFY DEWBERRY 48 HOURS IN ADVANCE OF POURING CONCRETE, OR BACKFILLING TRENCHES, SEALING ROOF AND WALL PENETRATIONS & POST DOWNS, FINISHING NEW WALLS OR FINAL ELECTRICAL CONNECTIONS FOR ENGINEER REVIEW.
15. CONTRACTOR SHALL VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS PRIOR TO COMMENCING ANY WORK. ALL DIMENSIONS OF EXISTING CONSTRUCTION SHOWN ON THE DRAWINGS MUST BE VERIFIED. CONTRACTOR SHALL NOTIFY PROJECT MANAGEMENT OF ANY DISCREPANCIES PRIOR TO ORDERING MATERIAL OR PROCEEDING WITH CONSTRUCTION.
16. THE EXISTING CELL SITE IS IN FULL COMMERCIAL OPERATION. ANY CONSTRUCTION WORK BY CONTRACTOR 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.
17. 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 TO ALERT OF ANY DANGEROUS EXPOSURE LEVELS.

SITE WORK GENERAL NOTES:

1. THE CONTRACTOR SHALL CONTACT UTILITY LOCATING SERVICES PRIOR TO THE START OF CONSTRUCTION.
2. 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 CONTRACTOR. EXTREME CAUTION SHOULD BE USED BY THE CONTRACTOR WHEN EXCAVATING OR DRILLING PIERS AROUND OR NEAR UTILITIES. CONTRACTOR 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.
3. ALL SITE WORK SHALL BE AS INDICATED ON THE DRAWINGS AND PROJECT SPECIFICATIONS.
4. IF NECESSARY, RUBBISH, STUMPS, DEBRIS, STICKS, STONES, TOP SOIL AND OTHER REFUSE SHALL BE REMOVED FROM THE SITE AND DISPOSED OF LEGALLY.
5. 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, SUBJECT TO THE APPROVAL OF CONTRACTOR, OWNER AND/OR LOCAL UTILITIES.
6. CONTRACTOR SHALL MINIMIZE DISTURBANCE TO EXISTING SITE DURING CONSTRUCTION.
7. THE CONTRACTOR SHALL PROVIDE SITE SIGNAGE IN ACCORDANCE WITH THE T-MOBILE SPECIFICATION FOR SITE SIGNAGE.
8. THE SITE SHALL BE GRADED TO CAUSE SURFACE WATER TO FLOW AWAY FROM THE TRANSMISSION EQUIPMENT AND TOWER AREAS.
9. 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.
10. THE SUB GRADE SHALL BE COMPACTED AND BROUGHT TO A SMOOTH UNIFORM GRADE PRIOR TO FINISHED SURFACE APPLICATION, SEE SOIL COMPACTION NOTES.
11. 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.
12. EROSION CONTROL MEASURES, IF REQUIRED DURING CONSTRUCTION, SHALL BE IN CONFORMANCE WITH THE LOCAL JURISDICTION'S GUIDELINES FOR EROSION AND SEDIMENT CONTROL.

CONSTRUCTION NOTES:

1. FIELD VERIFICATION:
   CONTRACTOR SHALL FIELD VERIFY SCOPE OF WORK, T-MOBILE ANTENNA PLATFORM LOCATION AND ANTENNAS TO BE REPLACED.
2. COORDINATION OF WORK:
   CONTRACTOR SHALL COORDINATE RF WORK AND PROCEDURES WITH PROJECT MANAGEMENT.
3. CABLE LADDER RACK:
   CONTRACTOR SHALL FURNISH AND INSTALL CABLE LADDER RACK, CABLE TRAY, AND CONDUIT AS REQUIRED TO SUPPORT CABLES TO THE NEW BTS LOCATION.
4. GROUNDING OF ALL EQUIPMENT AND ANTENNAS IS NOT CONSIDERED PART OF THE SCOPE OF THIS PROJECT AND IS THE RESPONSIBILITY OF THE OWNER AND CONTRACTOR AT THE TIME OF CONSTRUCTION. ALL EQUIPMENT AND ANTENNAS TO BE INSTALLED AND GROUNDED IN ACCORDANCE WITH GOVERNING BUILDING CODE, MANUFACTURER RECOMMENDATIONS AND OWNER SPECIFICATIONS.

ELECTRICAL INSTALLATION NOTES:

1. ALL ELECTRICAL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS, NEC AND ALL APPLICABLE LOCAL CODES.
2. CONTRACTOR SHALL MODIFY EXISTING CABLE TRAY SYSTEM AS REQUIRED TO SUPPORT RF AND TRANSPORT CABLING TO THE NEW BTS EQUIPMENT. CONTRACTOR SHALL SUBMIT MODIFICATIONS TO PROJECT MANAGEMENT FOR APPROVAL.
3. CONDUIT ROUTINGS ARE SCHEMATIC. CONTRACTOR SHALL INSTALL CONDUITS SO THAT ACCESS TO EQUIPMENT IS NOT BLOCKED.
4. WIRING, RACEWAY AND SUPPORT METHODS AND MATERIALS SHALL COMPLY WITH THE REQUIREMENTS OF THE NEC AND TELCORDIA.
5. ALL CIRCUITS SHALL BE SEGREGATED AND MAINTAIN MINIMUM CABLE SEPARATION AS REQUIRED BY THE NEC AND TELCORDIA.
6. CABLES SHALL NOT BE ROUTED THROUGH LADDER-STYLE CABLE TRAY RUNGS.
7. EACH END OF EVERY POWER, POWER PHASE CONDUCTOR (I.E., HOTS), GROUNDING, AND T1 CONDUCTOR AND CABLE SHALL BE LABELED WITH COLOR-CODED INSULATION OR ELECTRICAL TAPE (3M BRAND, 1/2 INCH PLASTIC ELECTRICAL TAPE WITH UV PROTECTION, OR EQUAL). THE IDENTIFICATION METHOD SHALL CONFORM WITH NEC & OSHA, AND MATCH EXISTING INSTALLATION REQUIREMENTS.
8. ALL ELECTRICAL COMPONENTS SHALL BE CLEARLY LABELED WITH ENGRAVED LAMACOID PLASTIC LABELS. ALL EQUIPMENT SHALL BE LABELED WITH THEIR VOLTAGE RATING, PHASE CONFIGURATION, WIRE CONFIGURATION, POWER OR AMPACITY RATING, AND BRANCH CIRCUIT ID NUMBERS (I.E., PANELBOARD AND CIRCUIT ID'S).
9. PANELBOARDS (ID NUMBERS) AND INTERNAL CIRCUIT BREAKERS (CIRCUIT ID NUMBERS) SHALL BE CLEARLY LABELED WITH ENGRAVED LAMACOID PLASTIC LABELS.
10. ALL TIE WRAPS SHALL BE CUT FLUSH WITH APPROVED CUTTING TOOL TO REMOVE SHARP EDGES.
11. POWER, CONTROL, AND EQUIPMENT GROUND WIRING IN TUBING OR CONDUIT SHALL BE SINGLE CONDUCTOR (SIZE 14 AWG OR LARGER), 600V, OIL RESISTANT THHN OR THWN-2, CLASS B STRANDED COPPER CABLE RATED FOR 90 °C (WET AND DRY) OPERATION; LISTED OR LABELED FOR THE LOCATION AND RACEWAY SYSTEM USED, UNLESS OTHERWISE SPECIFIED.
12. POWER PHASE CONDUCTORS (I.E., HOTS) SHALL BE LABELED WITH COLOR-CODED INSULATION OR ELECTRICAL TAPE (3M BRAND, 1/2 INCH PLASTIC ELECTRICAL TAPE WITH UV PROTECTION, OR EQUAL.) PHASE CONDUCTOR COLOR CODES SHALL CONFORM WITH THE NEC & OSHA AND MATCH EXISTING INSTALLATION REQUIREMENTS.
13. SUPPLEMENTAL EQUIPMENT GROUND WIRING LOCATED INDOORS SHALL BE SINGLE CONDUCTOR (SIZE 6 AWG OR LARGER), 600V, OIL RESISTANT THHN OR THWN-2 GREEN INSULATION, CLASS B STRANDED COPPER CABLE RATED FOR 90°C (WET AND DRY) OPERATION; LISTED OR LABELED FOR THE LOCATION AND RACEWAY SYSTEM USED, UNLESS OTHERWISE SPECIFIED.
14. SUPPLEMENTAL EQUIPMENT GROUND WIRING LOCATED OUTDOORS, OR BELOW GRADE, SHALL BE SINGLE CONDUCTOR #2 AWG SOLID TINNED COPPER CABLE, UNLESS OTHERWISE SPECIFIED.
15. POWER AND CONTROL WIRING, NOT IN TUBING OR CONDUIT, SHALL BE MULTI-CONDUCTOR, TYPE TC CABLE (SIZE 14 AWG OR LARGER), 600V, OIL RESISTANT THHN OR THWN-2, CLASS B STRANDED COPPER CABLE RATED FOR 90°C (WET AND DRY) OPERATION; WITH OUTER JACKET; LISTED OR LABELED FOR THE LOCATION USED, UNLESS OTHERWISE SPECIFIED.
16. ALL POWER AND POWER GROUNDING CONNECTIONS SHALL BE CRIMP-STYLE, COMPRESSION WIRE LUGS AND WIRENUTS BY THOMAS AND BETTS (OR EQUAL). LUGS AND WIRENUTS SHALL BE RATED FOR OPERATION AT NO LESS THAN 75°C (90°C IF AVAILABLE).
17. RACEWAY AND CABLE TRAY SHALL BE LISTED OR LABELED FOR ELECTRICAL USE IN ACCORDANCE WITH NEMA, UL, ANSI/IEEE, AND NEC.
18. NEW RACEWAY OR CABLE TRAY WILL MATCH THE EXISTING INSTALLATION WHERE POSSIBLE.
19. ELECTRICAL METALLIC TUBING (EMT) OR RIGID NONMETALLIC CONDUIT (I.E., RIGID PVC SCHEDULE 40, OR RIGID PVC SCHEDULE 80 FOR LOCATIONS SUBJECT TO PHYSICAL DAMAGE) SHALL BE USED FOR EXPOSED INDOOR LOCATIONS.
20. ELECTRICAL METALLIC TUBING (EMT), ELECTRICAL NONMETALLIC TUBING (ENT), OR RIGID NONMETALLIC CONDUIT (RIGID PVC, SCHEDULE 40) SHALL BE USED FOR CONCEALED INDOOR LOCATIONS.
21. GALVANIZED STEEL INTERMEDIATE METALLIC CONDUIT (IMC) SHALL BE USED FOR OUTDOOR LOCATIONS ABOVE GRADE.
22. RIGID NONMETALLIC CONDUIT (I.E., RIGID PVC SCHEDULE 40 OR RIGID PVC SCHEDULE 80) SHALL BE USED UNDERGROUND; DIRECT BURIED, IN AREAS OF OCCASIONAL LIGHT VEHICLE TRAFFIC OR ENCASED IN REINFORCED CONCRETE IN AREAS OF HEAVY VEHICLE TRAFFIC.
23. LIQUID-TIGHT FLEXIBLE METALLIC CONDUIT (LIQUID-TITE FLEX) SHALL BE USED INDOORS AND OUTDOORS, WHERE VIBRATION OCCURS OR FLEXIBILITY IS NEEDED.
24. CONDUIT AND TUBING FITTINGS SHALL BE THREADED OR COMPRESSION-TYPE AND APPROVED FOR THE LOCATION USED. SETSCREW FITTINGS ARE NOT ACCEPTABLE.
25. CABINETS, BOXES, AND WIREWAYS SHALL BE LISTED OR LABELED FOR ELECTRICAL USE IN ACCORDANCE WITH NEMA, UL, ANSI/IEEE, AND NEC.
26. CABINETS, BOXES, AND WIREWAYS TO MATCH THE EXISTING INSTALLATION WHERE POSSIBLE.
27. WIREWAYS SHALL BE EPOXY-COATED (GRAY) AND INCLUDE A HINGED COVER, DESIGNED TO SWING OPEN DOWNWARD; SHALL BE PANDUIT TYPE E (OR EQUAL); AND RATED NEMA 1 (OR BETTER) INDOORS, OR NEMA 3R (OR BETTER) OUTDOORS.
28. EQUIPMENT CABINETS, TERMINAL BOXES, JUNCTION BOXES, AND PULL BOXES SHALL BE GALVANIZED OR EPOXY-COATED SHEET STEEL, SHALL MEET OR EXCEED UL 50, AND RATED NEMA 1 (OR BETTER) INDOORS, OR NEMA 3R (OR BETTER) OUTDOORS.
29. METAL RECEPTACLE, SWITCH, AND DEVICE BOXES SHALL BE GALVANIZED, EPOXY-COATED, OR NON-CORRODING; SHALL MEET OR EXCEED UL 514A AND NEMA OS 1; AND RATED NEMA 1 (OR BETTER) INDOORS, OR WEATHER PROTECTED (WP OR BETTER) OUTDOORS.
30. NONMETALLIC RECEPTACLE, SWITCH, AND DEVICE BOXES SHALL MEET OR EXCEED NEMA OS 2; AND RATED NEMA 1 (OR BETTER) INDOORS, OR WEATHER PROTECTED (WP OR BETTER) OUTDOORS.
31. THE CONTRACTOR SHALL NOTIFY AND OBTAIN NECESSARY AUTHORIZATION FROM PROJECT MANAGEMENT BEFORE COMMENCING WORK ON THE AC POWER DISTRIBUTION PANELS.
32. THE CONTRACTOR SHALL PROVIDE NECESSARY TAGGING ON THE BREAKERS, CABLES AND DISTRIBUTION PANELS IN ACCORDANCE WITH THE APPLICABLE CODES AND STANDARDS TO SAFEGUARD AGAINST LIFE AND PROPERTY.

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WEST HARTFORD/I-84

CT11178D

467 SOUTH QUAKER LANE
WEST HARTFORD, CT 06110
HARTFORD COUNTY

SEAL

STATE OF CONNECTICUT · JIANG YU · No. 23222 · LICENSED PROFESSIONAL ENGINEER

JIANG YU
CONNECTICUT LICENSE NO. 0023222

SCALE

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DRAWN BY HMP
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APPROVED BY GHN
DATE 09/03/14

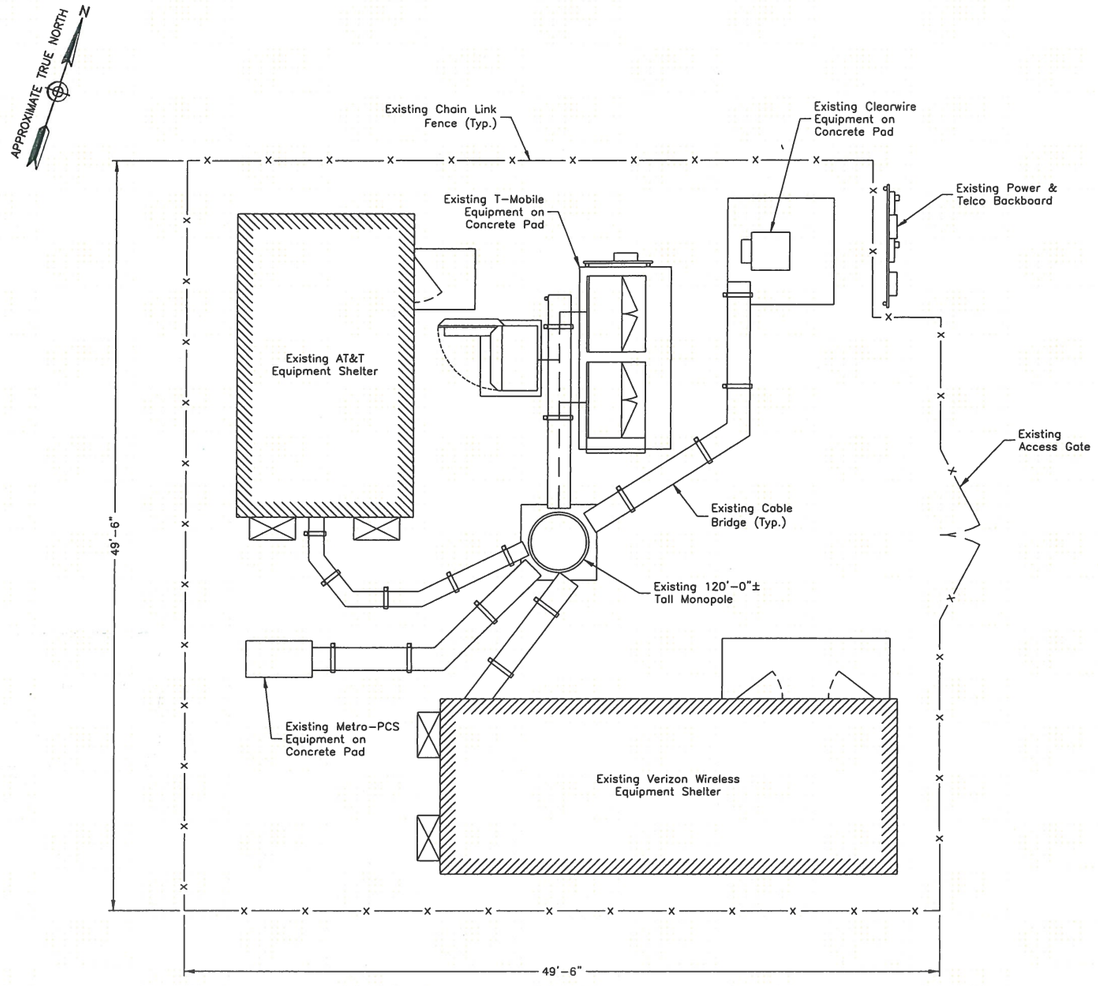
TITLE

GENERAL NOTES

PROJECT NO. 50066258/50066276

G-1

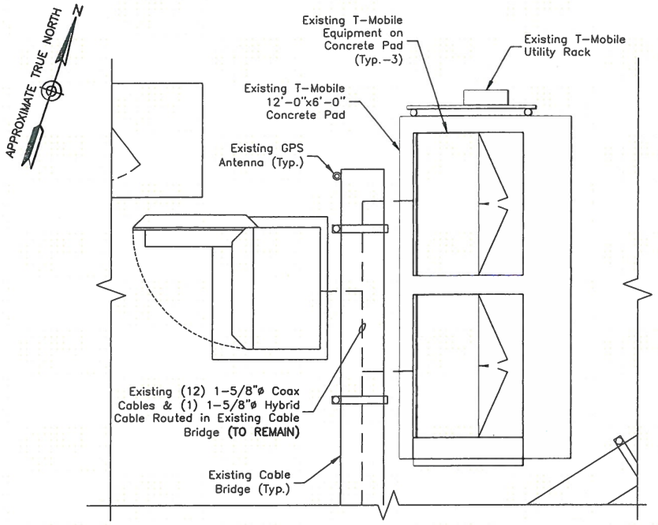
SHEET NO.



COMPOUND PLAN 1

SCALE: 1"=10' FOR 11"x17"
1"=5' FOR 22"x34"

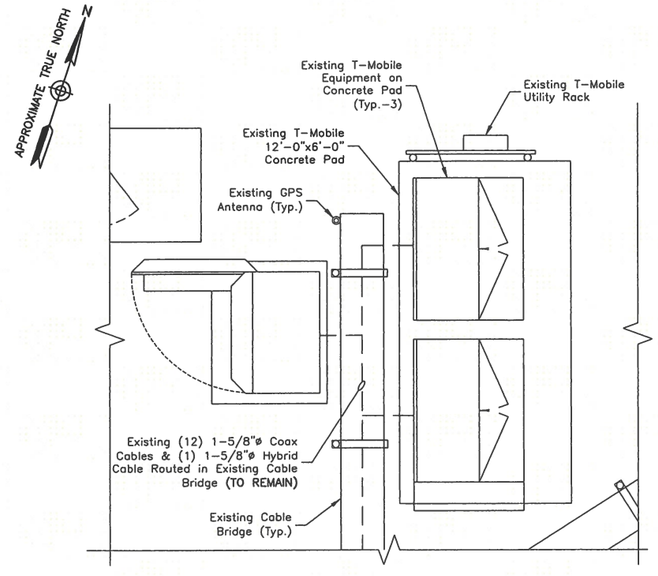
0' 5' 10'



EXISTING EQUIPMENT PLAN 2

SCALE: 3/16"=1' FOR 11"x17"
3/8"=1' FOR 22"x34"

0' 2' 4' 6'



PROPOSED EQUIPMENT PLAN 3

SCALE: 3/16"=1' FOR 11"x17"
3/8"=1' FOR 22"x34"

0' 2' 4' 6'

NOTES:

1. NORTH SHOWN AS APPROXIMATE.
2. NOT ALL INFORMATION IS SHOWN FOR CLARITY.
3. MOUNT ALL ANTENNAS, TMAS, COAX, ETC. IN ACCORDANCE WITH STRUCTURAL ANALYSIS TO BE COMPLETED BY OTHERS.

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COMPOUND PLAN & EQUIPMENT PLANS

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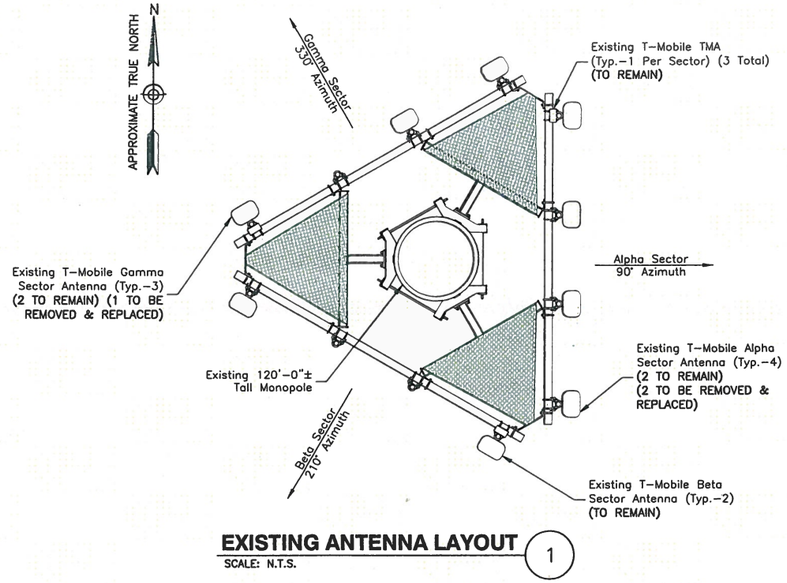
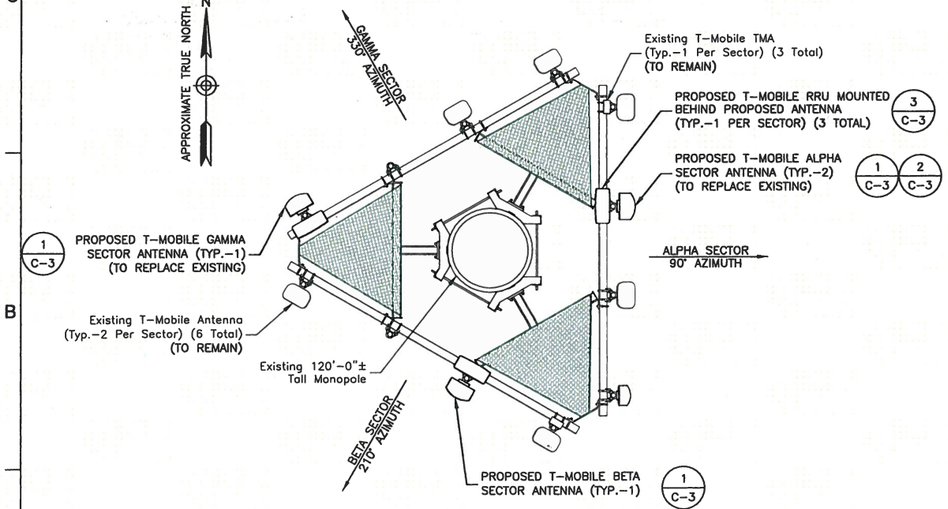
C - 1

SHEET NO.



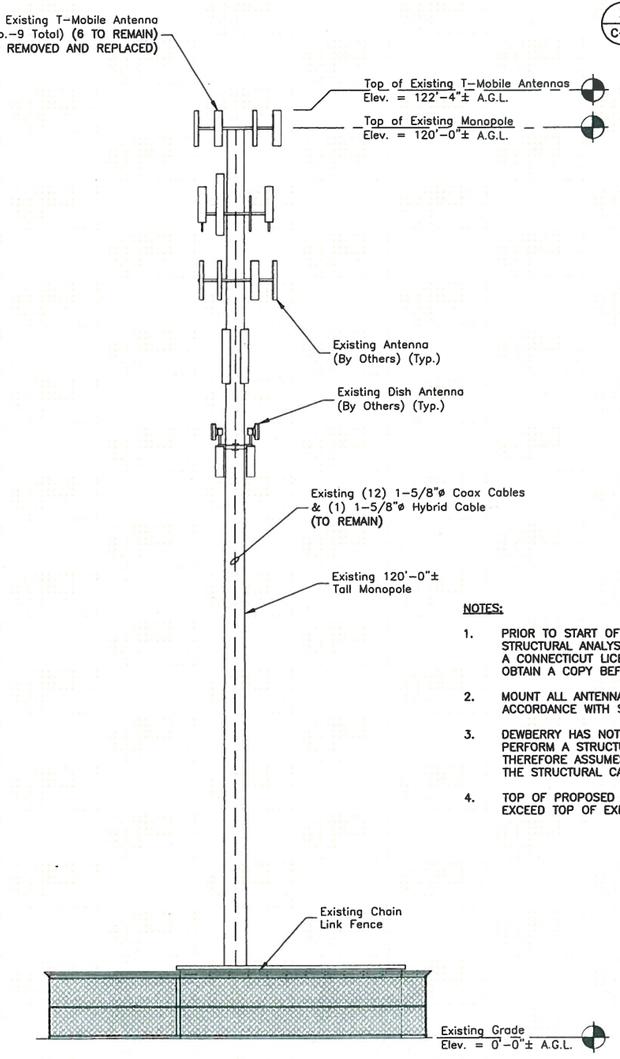
EXISTING ANTENNA LAYOUT 1

SCALE: N.T.S.



PROPOSED ANTENNA LAYOUT 2

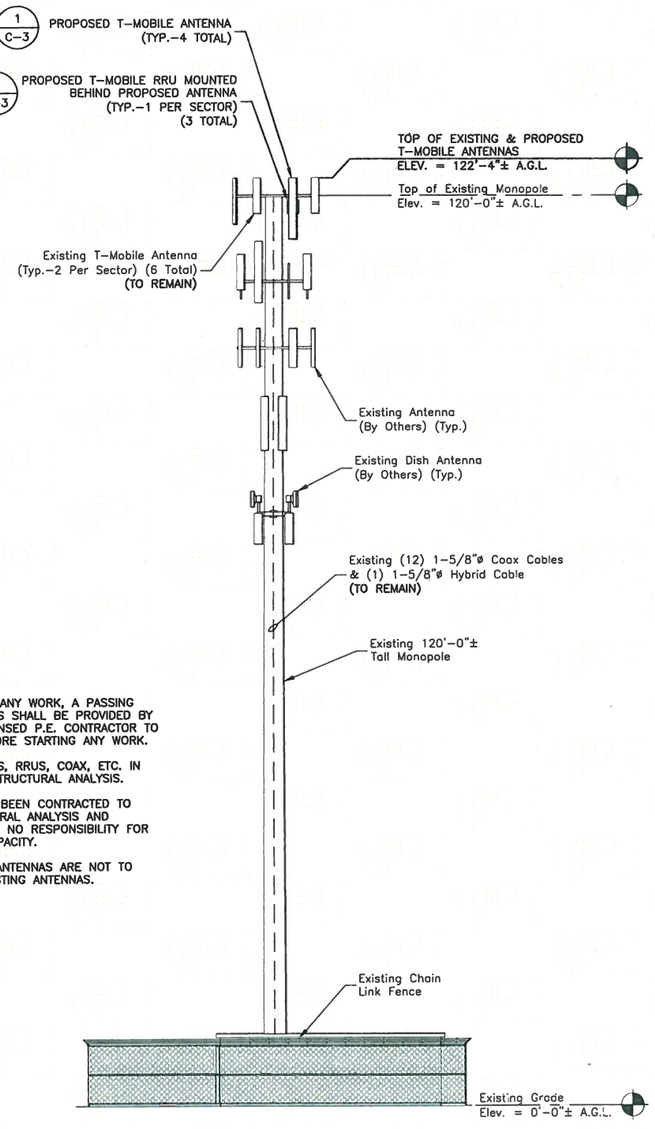
SCALE: N.T.S.



EXISTING ELEVATION 3

SCALE: 1"=20' FOR 11"x17"
1"=10' FOR 22"x34"

0' 10' 20'



PROPOSED ELEVATION 4

SCALE: 1"=20' FOR 11"x17"
1"=10' FOR 22"x34"

0' 10' 20'

NOTES:

1. PRIOR TO START OF ANY WORK, A PASSING STRUCTURAL ANALYSIS SHALL BE PROVIDED BY A CONNECTICUT LICENSED P.E. CONTRACTOR TO OBTAIN A COPY BEFORE STARTING ANY WORK.
2. MOUNT ALL ANTENNAS, RRUS, COAX, ETC. IN ACCORDANCE WITH STRUCTURAL ANALYSIS.
3. DEWBERRY HAS NOT BEEN CONTRACTED TO PERFORM A STRUCTURAL ANALYSIS AND THEREFORE ASSUMES NO RESPONSIBILITY FOR THE STRUCTURAL CAPACITY.
4. TOP OF PROPOSED ANTENNAS ARE NOT TO EXCEED TOP OF EXISTING ANTENNAS.

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CT11178D

467 SOUTH QUAKER LANE
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HARTFORD COUNTY

SEAL

SCALE

AS SHOWN

REV.	DATE	BY	DESCRIPTION
0	09/25/14	HMP	ISSUED AS FINAL
A	09/03/14	HMP	ISSUED FOR REVIEW

REVISIONS

DRAWN BY HMP
CHECKED BY BSH
APPROVED BY GHN
DATE 09/03/14

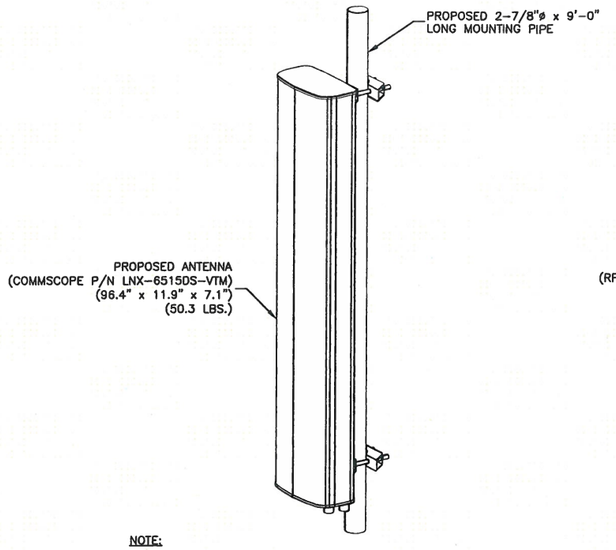
TITLE

ANTENNA LAYOUTS & ELEVATIONS

PROJECT NO. 50066258/50066276

C - 2

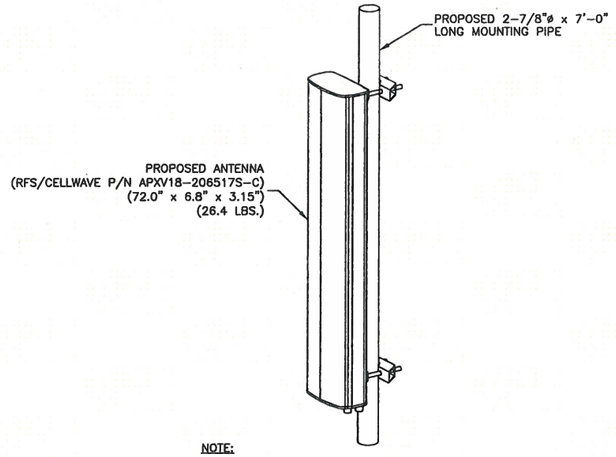
SHEET NO.



NOTE:

1. MOUNT ANTENNAS PER MANUFACTURER'S RECOMMENDATIONS.
2. GROUND ANTENNAS AND MOUNTS PER MANUFACTURER'S RECOMMENDATIONS AND T-MOBILE STANDARDS.
3. CONFIRM REQUIRED ANTENNAS WITH THE LATEST RFDS.

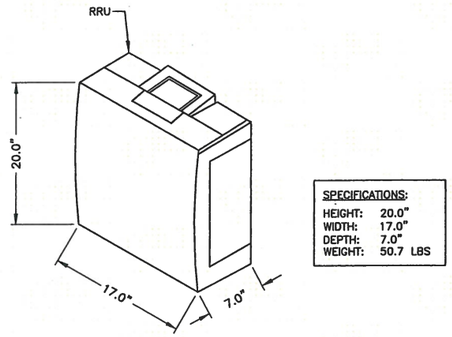
ISOMETRIC ANTENNA DETAIL (1)
SCALE: N.T.S.



NOTE:

1. MOUNT ANTENNAS PER MANUFACTURER'S RECOMMENDATIONS.
2. GROUND ANTENNAS AND MOUNTS PER MANUFACTURER'S RECOMMENDATIONS AND T-MOBILE STANDARDS.
3. CONFIRM REQUIRED ANTENNAS WITH THE LATEST RFDS.

ISOMETRIC ANTENNA DETAIL (2)
SCALE: N.T.S.

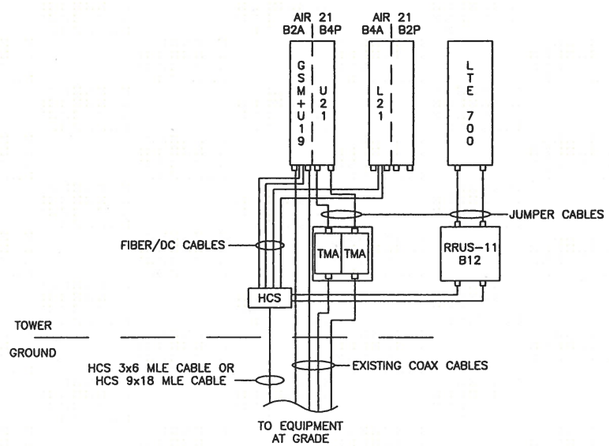


ERICSSON RRUS-11 B12

RRU NOTES:

1. MOUNT EQUIPMENT PER MANUFACTURER'S RECOMMENDATIONS.
2. GROUND EQUIPMENT AND MOUNTS PER MANUFACTURER'S RECOMMENDATIONS AND T-MOBILE STANDARDS.
3. CONFIRM REQUIRED EQUIPMENT WITH THE LATEST RFDS.

RRUS-11 - REMOTE RADIO UNIT (3)
SCALE: N.T.S.



SITE CONFIGURATION 700MHZ (4)
SCALE: N.T.S.

DESIGN CONFIGURATION

	ANTENNAS		COAX		COAX LENGTH
	EXISTING	PROPOSED	EXISTING	PROPOSED	
ALPHA	ERICSSON AIR21 ANTENNA	EXISTING TO REMAIN	(4) 1-5/8"	—	170'
	EXISTING EMS ANTENNA	COMMSCOPE LNX-6515DS-VTM			
	ERICSSON AIR21 ANTENNA	EXISTING TO REMAIN			
	EXISTING EMS ANTENNA	RFS APXV18-206517S-C			
BETA	ERICSSON AIR21 ANTENNA	EXISTING TO REMAIN	(4) 1-5/8"	—	170'
	—	COMMSCOPE LNX-6515DS-VTM			
	ERICSSON AIR21 ANTENNA	EXISTING TO REMAIN			
GAMMA	EXISTING EMS ANTENNA	COMMSCOPE LNX-6515DS-VTM	(4) 1-5/8"	—	170'
	ERICSSON AIR21 ANTENNA	EXISTING TO REMAIN			
	ERICSSON AIR21 ANTENNA	EXISTING TO REMAIN			

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DATE 09/03/14

TITLE

CONSTRUCTION DETAILS

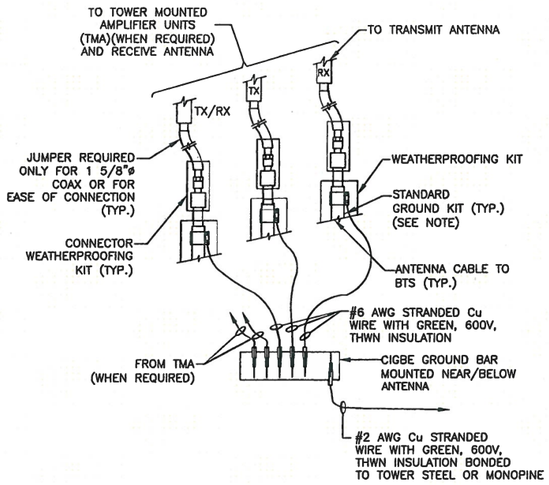
PROJECT NO. 50066258/50066276

C - 3

SHEET NO.

GROUNDING NOTES:

1. THE CONTRACTOR SHALL REVIEW AND INSPECT THE EXISTING FACILITY GROUNDING SYSTEM AND LIGHTNING PROTECTION 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 CONTRACTOR SHALL REPORT ANY VIOLATIONS OR ADVERSE FINDINGS TO THE ENGINEER 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. ALL AVAILABLE GROUNDING ELECTRODES SHALL BE CONNECTED TOGETHER IN ACCORDANCE WITH THE NEC.
3. THE CONTRACTOR SHALL PERFORM IEEE FALL-OF-POTENTIAL RESISTANCE TO EARTH TESTING (PER IEEE 1100 AND 81) FOR GROUND ELECTRODE SYSTEMS. USE OF OTHER METHODS MUST BE PRE-APPROVED BY THE ENGINEER IN WRITING.
4. THE CONTRACTOR SHALL FURNISH AND INSTALL SUPPLEMENTAL GROUND ELECTRODES AS NEEDED TO ACHIEVE A TEST RESULT OF 5 OHMS OR LESS ON TOWER SITES AND 10 OHMS OR LESS ON ROOFTOP SITES. WHEN ADDING ELECTRODES, CONTRACTOR SHALL MAINTAIN A MINIMUM DISTANCE BETWEEN THE ADDED ELECTRODE AND ANY OTHER EXISTING ELECTRODE EQUAL TO THE BURIED LENGTH OF THE ROD. IDEALLY, CONTRACTOR SHALL STRIVE TO KEEP THE SEPARATION DISTANCE EQUAL TO TWICE THE BURIED LENGTH OF THE RODS.
5. THE CONTRACTOR 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.
6. 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 AND UL APPROVED GROUNDING TYPE CONDUIT CLAMPS.
7. 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 TRANSMISSION EQUIPMENT.
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. ALUMINUM CONDUCTOR OR COPPER CLAD STEEL CONDUCTOR SHALL NOT BE USED FOR GROUNDING CONNECTIONS.
10. USE OF 90° BENDS IN THE PROTECTION GROUNDING CONDUCTORS SHALL BE AVOIDED WHEN 45° BENDS CAN BE ADEQUATELY SUPPORTED. IN ALL CASES, BENDS SHALL BE MADE WITH A MINIMUM BEND RADIUS OF 8 INCHES.
11. EACH INTERIOR TRANSMISSION CABINET FRAME/PLINTH SHALL BE DIRECTLY CONNECTED TO THE MASTER GROUND BAR WITH 6 AWG STRANDED, GREEN INSULATED SUPPLEMENTAL EQUIPMENT GROUND WIRE UNLESS NOTED OTHERWISE IN THE DETAILS. EACH OUTDOOR CABINET FRAME/PLINTH SHALL BE DIRECTLY CONNECTED TO THE BURIED GROUND RING WITH 2 AWG SOLID TIN-PLATED COPPER WIRE UNLESS NOTED OTHERWISE IN THE DETAILS.
12. ALL EXTERIOR GROUND CONDUCTORS BETWEEN EQUIPMENT/GROUND BARS AND THE GROUND RING, SHALL BE 2 AWG SOLID TIN-PLATED COPPER UNLESS OTHERWISE INDICATED.
13. EXOTHERMIC WELDS SHALL BE USED FOR ALL GROUNDING CONNECTIONS BELOW GRADE. CONNECTIONS TO ABOVE GRADE UNITS SHALL BE MADE WITH EXOTHERMIC WELDS WHERE PRACTICAL OR WITH 2 HOLE MECHANICAL TYPE BRASS CONNECTORS WITH STAINLESS STEEL HARDWARE, INCLUDING SET SCREWS. HIGH PRESSURE CRIMP CONNECTORS MAY ONLY BE USED WITH WRITTEN PERMISSION FROM T-MOBILE MARKET REPRESENTATIVE.
14. EXOTHERMIC WELDS SHALL BE PERMITTED ON TOWERS ONLY WITH THE EXPRESS APPROVAL OF THE TOWER MANUFACTURER OR THE CONTRACTORS STRUCTURAL ENGINEER.
15. ALL WIRE TO WIRE GROUND CONNECTIONS TO THE INTERIOR GROUND RING SHALL BE FORMED USING HIGH PRESS CRIMPS OR SPLIT BOLT CONNECTORS WHERE INDICATED IN THE DETAILS.
16. ON ROOFTOP SITES WHERE EXOTHERMIC WELDS ARE A FIRE HAZARD COPPER COMPRESSION CAP CONNECTORS MAY BE USED FOR WIRE TO WIRE CONNECTORS. 2 HOLE MECHANICAL TYPE BRASS CONNECTORS WITH STAINLESS STEEL HARDWARE, INCLUDING SET SCREWS SHALL BE USED FOR CONNECTION TO ALL ROOFTOP TRANSMISSION EQUIPMENT AND STRUCTURAL STEEL.
17. COAX BRIDGE BONDING CONDUCTORS SHALL BE EXOTHERMICALLY BONDED OR BOLTED TO THE BRIDGE AND THE TOWER GROUND BAR USING TWO-HOLE MECHANICAL TYPE BRASS CONNECTORS AND STAINLESS STEEL HARDWARE.
18. APPROVED ANTIOXIDANT COATINGS (I.E., CONDUCTIVE GEL OR PASTE) SHALL BE USED ON ALL COMPRESSION AND BOLTED GROUND CONNECTIONS.
19. ALL EXTERIOR GROUND CONNECTIONS SHALL BE COATED WITH A CORROSION RESISTANT MATERIAL.
20. MISCELLANEOUS ELECTRICAL AND NON-ELECTRICAL METAL BOXES, FRAMES AND SUPPORTS SHALL BE BONDED TO THE GROUND RING, IN ACCORDANCE WITH THE NEC.
21. BOND ALL METALLIC OBJECTS WITHIN 6 FT OF THE BURIED GROUND RING WITH 2 AWG SOLID TIN-PLATED COPPER GROUND CONDUCTOR. DURING EXCAVATION FOR NEW GROUND CONDUCTORS, IF EXISTING GROUND CONDUCTORS ARE ENCOUNTERED, BOND EXISTING GROUND CONDUCTORS TO NEW CONDUCTORS.
22. 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 WITH LISTED BONDING FITTINGS.

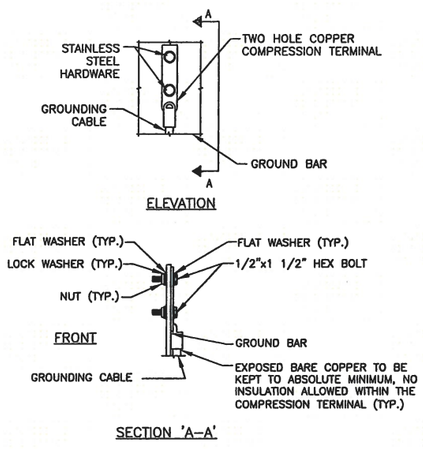


NOTE:

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

CONNECTION OF GROUND WIRES TO GROUNDING BAR (CIGBE) — 1

SCALE: N.T.S.

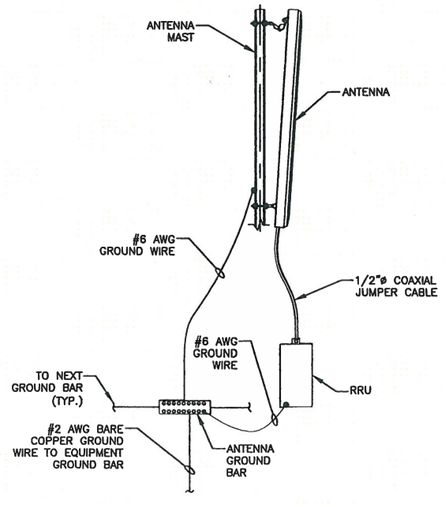


NOTES:

1. DOUBLING UP OR STACKING OF CONNECTIONS IS NOT PERMITTED.
2. OXIDE INHIBITING COMPOUND TO BE USED AT ALL LOCATIONS.

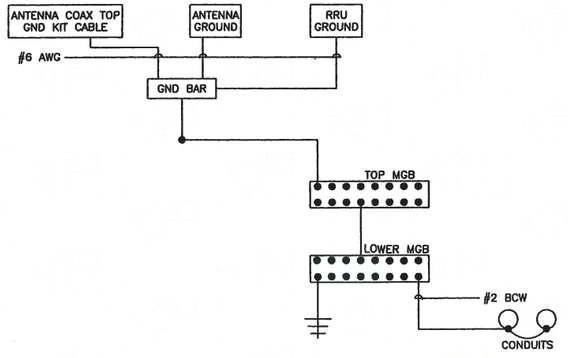
TYPICAL GROUND BAR MECHANICAL CONNECTION DETAIL — 2

SCALE: N.T.S.



TYPICAL ANTENNA GROUNDING DETAIL — 3

SCALE: N.T.S



NOTES:

1. BOND ANTENNA GROUNDING KIT CABLE TO TOP CIGBE
2. BOND ANTENNA GROUNDING KIT CABLE TO BOTTOM CIGBE.
3. SCHEMATIC GROUNDING DIAGRAM IS TYPICAL FOR EACH SECTOR.

SCHEMATIC GROUNDING DIAGRAM — 4

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REVISIONS

DRAWN BY HMP
CHECKED BY BSH
APPROVED BY GHN
DATE 09/03/14

TITLE

GROUNDING NOTES & DETAILS

PROJECT NO. 50066258/50066276

E - 1

SHEET NO.

Date: **October 7, 2014**

Andrew Bazinet
Crown Castle
3 Corporate Park Drive, Suite 101
Clifton Park, NY 12065
(585) 899-3442

Tower Engineering Professionals
326 Tryon Road
Raleigh, NC 27603
(919) 661-6351
crown@tepgroup.net

Subject: Structural Modification Analysis Report

Carrier Designation:	***T-Mobile* Co-Locate**	
	Carrier Site Number:	CT11178D
	Carrier Site Name:	N/A
Crown Castle Designation:	**Crown Castle BU Number:**	829013
	Crown Castle Site Name:	West Hartford/I-84/X43
	Crown Castle JDE Job Number:	302452
	Crown Castle Work Order Number:	939552
	Crown Castle Application Number:	261528 Rev. 3
Engineering Firm Designation:	**TEP Project Number:**	25680.24967
Site Data:	**467 South Quaker Lane (Church of St. Mark)** **West Hartford, Hartford County, CT 06110** **Latitude *41° 44' 55.75"*, Longitude *-72° 43' 52.75"*** **119 Foot - Monopole Tower**	

Dear Andrew Bazinet,

Tower Engineering Professionals is pleased to submit this **"Structural Modification Analysis Report"** to determine the structural integrity of the above mentioned tower. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 712214, in accordance with application 261528, revision 3.

The purpose of the analysis is to determine acceptability of the tower stress level. Based on our analysis we have determined the tower stress level for the structure and foundation, under the following load case, to be:

LC4.7: Existing + Reserved + Proposed Equipment with Proposed Modifications **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

The analysis has been performed in accordance with the TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures and the 2005 Connecticut State Building Code with 2009 amendment (2003 International Building Code) based upon a wind speed of 80 mph fastest mile.

All modifications and equipment proposed in this report shall be installed in accordance with the appurtenances listed in Tables 1 and 2 and the attached drawings for the determined available structural capacity to be effective.

We at *Tower Engineering Professionals* appreciate the opportunity of providing our continuing professional services to you and *Crown Castle*. If you have any questions or need further assistance on this or any other projects please give us a call.

Structural analysis prepared by: Ardalan Arabi, E.I. / JSC

Respectfully submitted by:

Graham M. Andres, P.E.

STATE OF CONNECTICUT
GRAHAM M. ANDRES
29538
LICENSED
PROFESSIONAL ENGINEER
10/7/14

Electronic Copy

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1) INTRODUCTION

This tower is a 119-ft monopole tower designed by Pirod, Inc. in May of 2000. The tower was originally designed for a wind speed of 80 mph per EIA/TIA-222-F for the appurtenances listed in Table 3. The tower has been modified per reinforcement drawings prepared by Natcomm, LLC in November of 2006. TEP visited the site on July of 2014 to perform a Rebar Mapping. All information provided to TEP was assumed to be accurate and complete.

2) ANALYSIS CRITERIA

The analysis has been performed in accordance with the TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures and ASCE 7-05 Minimum Design Loads for Buildings and Other Structures using a fastest mile wind speed of 80 mph with no ice, 37.6 mph with 1.0 inch escalating ice thickness and 50 mph under service loads.

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
120.0	120.0	3	Commscope	LNX-6515DS-VTM w/ Mount Pipe	-	-	-
		3	Ericsson	RRUS 11 B12			
		1	RFS Celwave	APXV18-206517S-C w/ Mount Pipe			

Table 2 - Existing and Reserved Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
120.0	120.0	3	Andrew	ETW190VS12UB	5	1-5/8	1
		6	Ericsson	Air 21 w/ Mount Pipe			
		2	Andrew	VHLP2-11			
		3	Ericsson	Ericsson Air 21 B2A B4P w/ Mount Pipe	13	1-5/8	2
		3	Ericsson	Ericsson Air 21 B4A B2P w/ Mount Pipe			
		3	Ericsson	KRY 112 144/1			
		1	Tower Mounts	Platform Mount [LP 403-1]			
115.0	115.0	1	Andrew	VHLP2-18	3	1/2	2
		1	Tower Mounts	Side Arm Mount [SO 102-3]			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
110.0	110.0	1	Andrew	SBNH-1D6565C w/ Mount Pipe	1 2 12	3/8 7/16 1-5/8	2
		2	KMW Communications	AM-X-CD-16-65-00T-RET w/ Mount Pipe			
		6	Powerwave Technologies	7770.00 w/ Mount Pipe			
		1	Raycap	DC6-48-60-18-8F			
		3	Ericsson	RRUS 11			
		4	Powerwave Technologies	LGP21903			
		3	Ericsson	RRUS-11	-	-	3
		1	Tower Mounts	Platform Mount [LP 1303-1]			
100.0	100.0	3	Alcatel Lucent	RRH2X40-AWS	13	1-5/8	2
		3	Amphenol	BXA-80063-4BF-EDIN-X w/ Mount Pipe			
		2	Andrew	LNX-6514DS-T4M w/ Mount Pipe			
		3	Antel	BXA-171063/8CF w/ Mount Pipe			
		3	Antel	BXA-185063/8CF w/ Mount Pipe			
		1	Antel	BXA-70063-6CF-EDIN-0 w/ Mount Pipe			
		1	RFS Celwave	DB-T1-6Z-8AB-0Z			
		6	RFS Celwave	FD9R6004/2C-3L			
		1	Tower Mounts	Platform Mount [LP 403-1]			
90.0	90.0	3	Kathrein	742 213 w/ Mount Pipe	6	1-5/8	2
80.0	83.0	1	Andrew	VHLP2-23	3 1 1 3	1/4 5/16 1/2 5/8	2
		1	Clearwire	CW Junction Box			
	81.0	3	Argus Technologies	LLPX310R w/ Mount Pipe			
		3	Samsung Telecommunications	Wimax Dap Head			
	80.0	1	Tower Mounts	Side Arm Mount [SO 101-3]			

Notes:
1) Existing equipment; to be removed
2) Existing equipment
3) Reserved equipment

Table 3 - Design Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
120.0	120.0	12	Generic	1'x4' Panels	12	1-5/8
110.0	110.0	12	Generic	1'x4' Panels	12	1-5/8
100.0	100.0	12	Generic	1'x4' Panels	12	1-5/8

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
Supplemental Geotechnical Report	Tower Engineering Professionals	3636697	CCISites
Tower Foundation Drawings	Pirod, Inc.	3636698	CCISites
Tower Manufacturer Drawings	Pirod, Inc.	3525378	CCISites
Post Modification Inspection	Natcomm Consulting Engineers, Inc.	3974228	CCISites
Tower Reinforcement Drawings	Natcomm Consulting Engineers, Inc.	3525386	CCISites
Previous Structural Analysis Report	Vertical Structures, Inc.	5281651	CCISites

3.1) Analysis Method

tnxTower (version 6.1.4.1), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

RISA-3D (version 12.1.0), a commercially available analysis software package, was used to create a three-dimensional model of the tower foundation. Selected output from the analysis is included in Appendix C.

3.2) Assumptions

1) The tower and foundation were built in accordance with the manufacturer's specifications.
2) The tower and foundation have been maintained in accordance with the manufacturer's specification.
3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2, and "Appendix B – Base Level Drawing".
4) When applicable, transmission cables are considered as structural components for calculating wind loads as allowed by the standard.
5) All tower components are in sufficient condition to carry their full design capacity.
6) Serviceability with respect to antenna twist, tilt, roll, or lateral translation, is not checked and is left to the carrier or tower owner to ensure conformance. See Table 7.
7) All antenna mounts and mounting hardware are structurally sufficient to carry the full design capacity requirements of appurtenance wind area and weight as provided by the original manufacturer specifications. It is the carrier's responsibility to ensure compliance to the structural limitations of the existing and/or proposed antenna mounts. TEP did not perform a site visit to verify the size, condition or capacity of the antenna mounts and did not analyze antennas supporting mounts as part of this structural analysis report.

This analysis may be affected if any assumptions are not valid or have been made in error. Tower Engineering Professionals should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_{allow} (K)	% Capacity	Pass / Fail
L1	119.08 - 101.08	Pole	TP26x22.13x0.25	1	-6.885	1036.362	22.2	Pass
L2	101.08 - 66.5	Pole	TP34.063x24.873x0.313	2	-14.509	1691.870	58.1	Pass
L3	66.5 - 32.83	Pole	TP41.75x32.498x0.375	3	-21.460	2488.938	64.4	Pass
L4	32.83 - 0	Pole	TP49.063x39.849x0.375	4	-31.007	3012.660	72.1	Pass
							Summary	
						Pole (L4)	72.1	Pass
						RATING =	**72.1**	**Pass**

Table 6 - Tower Component Stresses vs. Capacity

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	-	70.2	Pass
1	Base Plate	-	60.1	Pass
1	Base Foundation Soil Interaction	-	63.7	Pass
1	Base Foundation Structural	-	81.5	Pass
1	Rock Anchors	-	78.7	Pass

Structure Rating (max from all components) =	**87.9%**

Notes:
1) See additional documentation in "Appendix C - Additional Calculations" for calculations supporting the % capacity listed.

Table 7 - Dish Twist/Sway Results for 50 mph Service Wind Speed

Elevation (ft)	Dish Model	Beam Deflection		
		Deflection (in)	Tilt (deg)	Twist (deg)
115.0	Andrew VHLP2-18	19.310	1.455	0.023
83.0	Andrew VHLP2-23	10.281	1.171	0.009

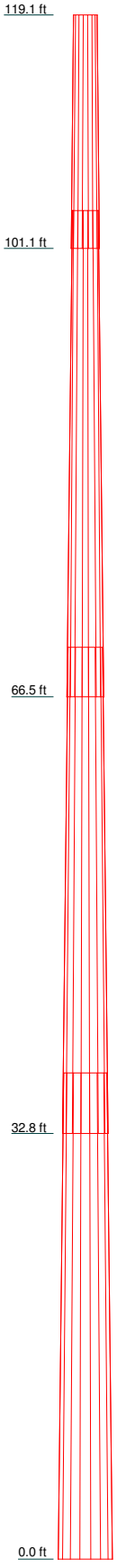
4.1) Recommendations

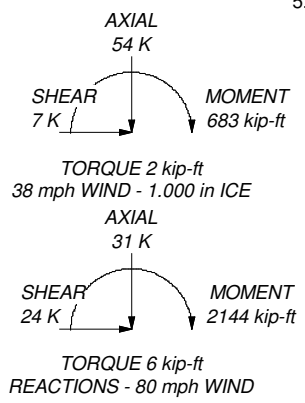
1) If the load differs from that described in Tables 1 and 2 of this report, "Appendix B – Base Level Drawing" or the provisions of this analysis are found to be invalid, another structural analysis should be performed.
2) The modifications depicted in "Appendix D – Structural Design Drawings" shall be installed and, upon completion, inspection. The tower and its foundation have sufficient capacity to carry the existing, reserved and proposed loads once the proposed modifications are installed.

APPENDIX A

TNXTOWER OUTPUT

Section	1	2	3	4
Length (ft)	18.000	37.500	37.500	37.500
Number of Sides	18	18	18	18
Thickness (in)	0.250	0.313	0.375	0.375
Socket Length (ft)	2.917	3.833	4.667	
Top Dia (in)	22.130	24.873	32.498	39.849
Bot Dia (in)	26.000	34.063	41.750	49.063
Grade			A572-65	
Weight (K)	1.2	3.7	5.6	6.7





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
2.4-in x 6-ft Mount Pipe	123	DC6-48-60-18-8F	110
LNX-6515DS-VTM w/ Mount Pipe	120	Platform Mount [LP 1303-1]	110
LNX-6515DS-VTM w/ Mount Pipe	120	RRUS 11	110
LNX-6515DS-VTM w/ Mount Pipe	120	BXA-171063/8CF w/ Mount Pipe	100
APXV18-206517S-C w/ Mount Pipe	120	BXA-171063/8CF w/ Mount Pipe	100
RRUS 11 B12	120	BXA-185063/8CF w/ Mount Pipe	100
RRUS 11 B12	120	BXA-185063/8CF w/ Mount Pipe	100
RRUS 11 B12	120	BXA-185063/8CF w/ Mount Pipe	100
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	120	LNX-6514DS-T4M w/ Mount Pipe	100
		LNX-6514DS-T4M w/ Mount Pipe	100
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	120	BXA-70063-6CF-EDIN-0 w/ Mount Pipe	100
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	120	BXA-80063-4BF-EDIN-X w/ Mount Pipe	100
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	120	BXA-80063-4BF-EDIN-X w/ Mount Pipe	100
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	120	BXA-80063-4BF-EDIN-X w/ Mount Pipe	100
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	120	(2) FD9R6004/2C-3L	100
KRY 112 144/1	120	(2) FD9R6004/2C-3L	100
KRY 112 144/1	120	(2) FD9R6004/2C-3L	100
KRY 112 144/1	120	DB-T1-6Z-8AB-0Z	100
2.4" Dia. x 6' Mount Pipe	120	RRH2X40-AWS	100
2.4" Dia. x 6' Mount Pipe	120	RRH2X40-AWS	100
Platform Mount [LP 403-1]	120	RRH2X40-AWS	100
Side Arm Mount [SO 102-3]	115	Platform Mount [LP 403-1]	100
2.4" Dia. x 6' Mount Pipe	115	BXA-171063/8CF w/ Mount Pipe	100
VHLP2-18	115	2'x3' Ice Shield	97
RRUS 11	110	2'x3' Ice Shield	95
RRUS 11	110	742 213 w/ Mount Pipe	90
(2) 7770.00 w/ Mount Pipe	110	742 213 w/ Mount Pipe	90
(2) 7770.00 w/ Mount Pipe	110	742 213 w/ Mount Pipe	90
(2) 7770.00 w/ Mount Pipe	110	LLPX310R w/ Mount Pipe	80
AM-X-CD-16-65-00T-RET w/ Mount Pipe	110	LLPX310R w/ Mount Pipe	80
SBNH-1D6565C w/ Mount Pipe	110	WIMAX DAP HEAD	80
AM-X-CD-16-65-00T-RET w/ Mount Pipe	110	WIMAX DAP HEAD	80
		WIMAX DAP HEAD	80
(2) LGP21903	110	CW JUNCTION BOX	80
(2) LGP21903	110	2.4" Dia. x 6' Mount Pipe	80
RRUS-11	110	2.4" Dia. x 6' Mount Pipe	80
RRUS-11	110	2.4" Dia. x 6' Mount Pipe	80
RRUS-11	110	Side Arm Mount [SO 101-3]	80
		LLPX310R w/ Mount Pipe	80
		VHLP2-23	80

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Hartford County, Connecticut.
2. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 38 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 72.1%

Tower Engineering Professionals
326 Tryon Road
Raleigh, NC 27603
Phone: (919) 661-6351
FAX: (919) 661-6350

Job: ***West Hartford/I-84/X43 (BU 829013)***			
Project: ***TEP No. 25680.24967***			
Client: Crown Castle	Drawn by: aaarabi	App'd:	
Code: TIA/EIA-222-F	Date: 10/07/14	Scale: NTS	
Path: \\tep-vm-file01\...\West Hartford I-84 X43 CMRP\tnxTower\829013_LC7.eri		Dwg No. E-1	

Tower Input Data

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

Tower is located in Hartford County, Connecticut.
Basic wind speed of 80 mph.
Nominal ice thickness of 1.000 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 38 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	*Elevation* *ft*	*Section Length* *ft*	*Splice Length* *ft*	*Number of Sides*	*Top Diameter* *in*	*Bottom Diameter* *in*	*Wall Thickness* *in*	*Bend Radius* *in*	*Pole Grade*
L1	119.083-101.083	18.000	2.917	18	22.130	26.000	0.250	1.000	A572-65 (65 ksi)
L2	101.083-66.500	37.500	3.833	18	24.873	34.063	0.313	1.250	A572-65 (65 ksi)
L3	66.500-32.833	37.500	4.667	18	32.498	41.750	0.375	1.500	A572-65 (65 ksi)
L4	32.833-0.000	37.500		18	39.849	49.063	0.375	1.500	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	22.471	17.362	1050.090	7.767	11.242	93.407	2101.561	8.683	3.455	13.82
	26.401	20.433	1711.654	9.141	13.208	129.592	3425.561	10.218	4.136	16.544
L2	25.982	24.361	1856.528	8.719	12.635	146.930	3715.500	12.183	3.828	12.248
	34.588	33.476	4817.433	11.981	17.304	278.404	9641.206	16.741	5.445	17.424
L3	33.960	38.235	4984.583	11.404	16.509	301.930	9975.724	19.121	5.060	13.492
	42.394	49.247	10650.982	14.688	21.209	502.192	21315.979	24.628	6.688	17.835
L4	41.628	46.984	9249.061	14.013	20.243	456.899	18510.293	23.496	6.353	16.942
	49.819	57.950	17355.138	17.284	24.924	696.329	34733.112	28.981	7.975	21.267

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 119.083-101.083				1	1	1		
L2 101.083-66.500				1	1	1		
L3 66.500-32.833				1	1	1		
L4 32.833-0.000				1	1	1		

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	Number Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
****										

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
Safety Line 3/8	C	No	CaAa (Out Of Face)	119.000 - 0.000	1	No Ice	0.037	0.220
						1/2" Ice	0.137	0.750
						1" Ice	0.238	1.280
						2" Ice	0.437	2.340
						4" Ice	0.838	4.460
Rung 5/8" SR (12.5"w, 16"s)	C	No	CaAa (Out Of Face)	119.000 - 0.000	1	No Ice	0.049	0.816
						1/2" Ice	0.149	1.420
						1" Ice	0.249	2.634
						2" Ice	0.449	6.895
						4" Ice	0.849	22.749
119								
LDF7-50A(1-5/8")	B	No	Inside Pole	119.083 - 0.000	11	No Ice	0.000	0.820
						1/2" Ice	0.000	0.820
						1" Ice	0.000	0.820
						2" Ice	0.000	0.820

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
						4" Ice	0.000	0.820
LDF7-50A(1-5/8")	B	No	CaAa (Out Of Face)	119.083 - 0.000	1	No Ice	0.198	0.820
						1/2" Ice	0.298	2.335
						1" Ice	0.398	4.461
						2" Ice	0.598	10.545
						4" Ice	0.998	30.044
LDF7-50A(1-5/8")	B	No	CaAa (Out Of Face)	119.083 - 0.000	1	No Ice	0.000	0.820
						1/2" Ice	0.000	2.335
						1" Ice	0.000	4.461
						2" Ice	0.000	10.545
						4" Ice	0.000	30.044
110								
LDF7-50A(1-5/8")	A	No	Inside Pole	110.000 - 0.000	12	No Ice	0.000	0.820
						1/2" Ice	0.000	0.820
						1" Ice	0.000	0.820
						2" Ice	0.000	0.820
						4" Ice	0.000	0.820
WR-VG102ST-BRDA(7/16")	A	No	Inside Pole	110.000 - 0.000	3	No Ice	0.000	0.201
						1/2" Ice	0.000	0.201
						1" Ice	0.000	0.201
						2" Ice	0.000	0.201
						4" Ice	0.000	0.201
WR-VG122ST-BRDA(3/8)	A	No	Inside Pole	110.000 - 0.000	1	No Ice	0.000	0.200
						1/2" Ice	0.000	0.200
						1" Ice	0.000	0.200
						2" Ice	0.000	0.200
						4" Ice	0.000	0.200
3" Flexible Conduit	A	No	Inside Pole	110.000 - 0.000	1	No Ice	0.000	1.040
						1/2" Ice	0.000	1.040
						1" Ice	0.000	1.040
						2" Ice	0.000	1.040
						4" Ice	0.000	1.040
100								
LDF7-50A(1-5/8")	A	No	Inside Pole	100.000 - 0.000	12	No Ice	0.000	0.820
						1/2" Ice	0.000	0.820
						1" Ice	0.000	0.820
						2" Ice	0.000	0.820
						4" Ice	0.000	0.820
LDF7-50A(1-5/8")	A	No	CaAa (Out Of Face)	80.000 - 0.000	1	No Ice	0.000	0.820
						1/2" Ice	0.000	2.335
						1" Ice	0.000	4.461
						2" Ice	0.000	10.545
						4" Ice	0.000	30.044
LDF7-50A(1-5/8")	C	No	CaAa (Out Of Face)	100.000 - 80.000	1	No Ice	0.198	0.820
						1/2" Ice	0.298	2.335
						1" Ice	0.398	4.461
						2" Ice	0.598	10.545
						4" Ice	0.998	30.044
90								
LDF7-50A(1-5/8")	A	No	CaAa (Out Of Face)	90.000 - 0.000	6	No Ice	0.000	0.820
						1/2" Ice	0.000	2.335
						1" Ice	0.000	4.461
						2" Ice	0.000	10.545
						4" Ice	0.000	30.044
80								
FSJ1-50A(1/4")	C	No	Inside Pole	80.000 - 0.000	3	No Ice	0.000	0.045
						1/2" Ice	0.000	0.045
						1" Ice	0.000	0.045
						2" Ice	0.000	0.045
						4" Ice	0.000	0.045
HJ4.5-50(5/8")	C	No	Inside Pole	80.000 - 0.000	3	No Ice	0.000	0.400

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
						1/2" Ice	0.000	0.400
						1" Ice	0.000	0.400
						2" Ice	0.000	0.400
						4" Ice	0.000	0.400
9207(5/16")	C	No	Inside Pole	80.000 - 0.000	1	No Ice	0.000	0.600
						1/2" Ice	0.000	0.600
						1" Ice	0.000	0.600
						2" Ice	0.000	0.600
						4" Ice	0.000	0.600
2" Flexible Conduit	C	No	CaAa (Out Of Face)	80.000 - 0.000	1	No Ice	0.000	0.340
						1/2" Ice	0.000	1.867
						1" Ice	0.000	4.005
						2" Ice	0.000	10.114
						4" Ice	0.000	29.662
2" Flexible Conduit	C	No	CaAa (Out Of Face)	80.000 - 0.000	1	No Ice	0.200	0.340
						1/2" Ice	0.300	1.867
						1" Ice	0.400	4.005
						2" Ice	0.600	10.114
						4" Ice	1.000	29.662
FSJ4-50B(1/2")	C	No	CaAa (Out Of Face)	80.000 - 0.000	4	No Ice	0.000	0.140
						1/2" Ice	0.000	0.763
						1" Ice	0.000	1.997
						2" Ice	0.000	6.298
						4" Ice	0.000	22.229
***								
FSJ4-50B(1/2")	C	No	CaAa (Out Of Face)	80.000 - 0.000	4	No Ice	0.000	0.140
						1/2" Ice	0.000	0.763
						1" Ice	0.000	1.997
						2" Ice	0.000	6.298
						4" Ice	0.000	22.229
FSJ4-50B(1/2")	C	No	CaAa (Out Of Face)	115.000 - 80.000	3	No Ice	0.000	0.140
						1/2" Ice	0.000	0.763
						1" Ice	0.000	1.997
						2" Ice	0.000	6.298
						4" Ice	0.000	22.229
****								

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	119.083-101.083	A	0.000	0.000	0.000	0.000	0.104
		B	0.000	0.000	0.000	3.564	0.192
		C	0.000	0.000	0.000	1.546	0.024
L2	101.083-66.500	A	0.000	0.000	0.000	0.000	0.860
		B	0.000	0.000	0.000	6.847	0.369
		C	0.000	0.000	0.000	9.645	0.112
L3	66.500-32.833	A	0.000	0.000	0.000	0.000	0.918
		B	0.000	0.000	0.000	6.666	0.359
		C	0.000	0.000	0.000	9.639	0.161
L4	32.833-0.000	A	0.000	0.000	0.000	0.000	0.895
		B	0.000	0.000	0.000	6.501	0.350
		C	0.000	0.000	0.000	9.400	0.157

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	119.083-101.083	A	1.155	0.000	0.000	0.000	0.000	0.104
		B		0.000	0.000	0.000	7.723	0.357
		C		0.000	0.000	0.000	9.825	0.196
L2	101.083-66.500	A	1.117	0.000	0.000	0.000	0.000	1.569
		B		0.000	0.000	0.000	14.838	0.686
		C		0.000	0.000	0.000	33.365	0.888
L3	66.500-32.833	A	1.050	0.000	0.000	0.000	0.000	1.944
		B		0.000	0.000	0.000	14.190	0.652
		C		0.000	0.000	0.000	32.210	1.210
L4	32.833-0.000	A	1.000	0.000	0.000	0.000	0.000	1.801
		B		0.000	0.000	0.000	13.394	0.609
		C		0.000	0.000	0.000	30.080	1.064

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	119.083-101.083	0.128	0.187	-0.096	0.462
L2	101.083-66.500	-0.089	0.301	-0.426	0.639
L3	66.500-32.833	-0.099	0.315	-0.464	0.689
L4	32.833-0.000	-0.102	0.322	-0.472	0.710

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
2.4-in x 6-ft Mount Pipe	C	None		0.000	123.000	No Ice	1.440	1.440	0.022
						1/2" Ice	1.933	1.933	0.033
						1" Ice	2.302	2.302	0.048
						2" Ice	3.068	3.068	0.091
						4" Ice	4.711	4.711	0.232
120									
LNX-6515DS-VTM w/ Mount Pipe	A	From Centroid-Face	4.000 7.000 0.000	30.000	120.000	No Ice	11.683	9.842	0.083
						1/2" Ice	12.404	11.366	0.173
						1" Ice	13.135	12.914	0.273
						2" Ice	14.601	15.267	0.506
						4" Ice	17.875	20.139	1.151
LNX-6515DS-VTM w/ Mount Pipe	B	From Centroid-Face	4.000 -3.750 0.000	30.000	120.000	No Ice	11.683	9.842	0.083
						1/2" Ice	12.404	11.366	0.173
						1" Ice	13.135	12.914	0.273
						2" Ice	14.601	15.267	0.506
						4" Ice	17.875	20.139	1.151
LNX-6515DS-VTM w/ Mount Pipe	C	From Centroid-Face	4.000 -3.750 0.000	30.000	120.000	No Ice	11.683	9.842	0.083
						1/2" Ice	12.404	11.366	0.173
						1" Ice	13.135	12.914	0.273
						2" Ice	14.601	15.267	0.506

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						4" Ice	17.875	20.139	1.151
APXV18-206517S-C w/ Mount Pipe	B	From Centroid-Face	4.000 7.000 0.000	30.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.404 5.960 6.481 7.547 9.919	4.700 5.860 6.734 8.515 12.277	0.052 0.097 0.150 0.280 0.679
RRUS 11 B12	A	From Centroid-Face	4.000 7.000 0.000	30.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.306 3.550 3.802 4.334 5.501	1.361 1.540 1.728 2.130 3.038	0.051 0.072 0.095 0.153 0.314
RRUS 11 B12	B	From Centroid-Face	4.000 -3.750 0.000	30.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.306 3.550 3.802 4.334 5.501	1.361 1.540 1.728 2.130 3.038	0.051 0.072 0.095 0.153 0.314
RRUS 11 B12	C	From Centroid-Face	4.000 -3.750 0.000	30.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.306 3.550 3.802 4.334 5.501	1.361 1.540 1.728 2.130 3.038	0.051 0.072 0.095 0.153 0.314
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	A	From Centroid-Face	4.000 -7.000 0.000	30.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.825 7.347 7.863 8.926 11.175	5.642 6.480 7.257 8.864 12.293	0.112 0.169 0.233 0.383 0.807
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	B	From Centroid-Face	4.000 -7.000 0.000	30.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.825 7.347 7.863 8.926 11.175	5.642 6.480 7.257 8.864 12.293	0.112 0.169 0.233 0.383 0.807
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	C	From Centroid-Face	4.000 -7.000 0.000	30.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.825 7.347 7.863 8.926 11.175	5.642 6.480 7.257 8.864 12.293	0.112 0.169 0.233 0.383 0.807
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	A	From Centroid-Face	4.000 3.750 0.000	30.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.825 7.347 7.863 8.926 11.175	5.642 6.480 7.257 8.864 12.293	0.112 0.169 0.233 0.383 0.807
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	B	From Centroid-Face	4.000 3.750 0.000	30.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.825 7.347 7.863 8.926 11.175	5.642 6.480 7.257 8.864 12.293	0.112 0.169 0.233 0.383 0.807
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	C	From Centroid-Face	4.000 7.000 0.000	30.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.825 7.347 7.863 8.926 11.175	5.642 6.480 7.257 8.864 12.293	0.112 0.169 0.233 0.383 0.807
KRY 112 144/1	A	From Centroid-Face	4.000 -7.000 0.000	30.000	120.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.411 0.500 0.597 0.818 1.363	0.189 0.256 0.332 0.510 0.970	0.011 0.014 0.018 0.032 0.081
KRY 112 144/1	B	From	4.000	30.000	120.000	No Ice	0.411	0.189	0.011

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Offsets: Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
		Centroid-Face	-7.000	0.000			1/2" Ice	0.500	0.256	0.014
							1" Ice	0.597	0.332	0.018
							2" Ice	0.818	0.510	0.032
							4" Ice	1.363	0.970	0.081
KRY 112 144/1	C	From Centroid-Face	4.000	-7.000	30.000	120.000	No Ice	0.411	0.189	0.011
				0.000			1/2" Ice	0.500	0.256	0.014
							1" Ice	0.597	0.332	0.018
							2" Ice	0.818	0.510	0.032
							4" Ice	1.363	0.970	0.081
2.4" Dia. x 6' Mount Pipe	B	From Centroid-Face	4.000	0.000	0.000	120.000	No Ice	1.425	1.425	0.022
			0.000	0.000			1/2" Ice	1.931	1.931	0.038
							1" Ice	2.316	2.316	0.056
							2" Ice	3.149	3.149	0.100
							4" Ice	5.058	5.058	0.252
2.4" Dia. x 6' Mount Pipe	C	From Centroid-Face	4.000	0.000	0.000	120.000	No Ice	1.425	1.425	0.022
			0.000	0.000			1/2" Ice	1.931	1.931	0.038
							1" Ice	2.316	2.316	0.056
							2" Ice	3.149	3.149	0.100
							4" Ice	5.058	5.058	0.252
Platform Mount [LP 403-1]	C	None			0.000	120.000	No Ice	18.850	18.850	1.500
							1/2" Ice	24.300	24.300	1.797
							1" Ice	29.750	29.750	2.093
							2" Ice	40.650	40.650	2.686
							4" Ice	62.450	62.450	3.872
****115***										
Side Arm Mount [SO 102-3]	C	None			0.000	115.000	No Ice	3.000	3.000	0.081
							1/2" Ice	3.480	3.480	0.111
							1" Ice	3.960	3.960	0.141
							2" Ice	4.920	4.920	0.201
							4" Ice	6.840	6.840	0.321
2.4" Dia. x 6' Mount Pipe	C	From Leg	0.500	0.000	0.000	115.000	No Ice	1.425	1.425	0.022
			0.000	0.000			1/2" Ice	1.931	1.931	0.038
							1" Ice	2.316	2.316	0.056
							2" Ice	3.149	3.149	0.100
							4" Ice	5.058	5.058	0.252
110										
RRUS 11	A	From Centroid-Face	4.000	6.000	30.000	110.000	No Ice	3.249	1.373	0.048
				0.000			1/2" Ice	3.491	1.551	0.068
							1" Ice	3.741	1.738	0.092
							2" Ice	4.268	2.138	0.150
							4" Ice	5.426	3.042	0.310
RRUS 11	B	From Centroid-Face	4.000	6.000	20.000	110.000	No Ice	3.249	1.373	0.048
				0.000			1/2" Ice	3.491	1.551	0.068
							1" Ice	3.741	1.738	0.092
							2" Ice	4.268	2.138	0.150
							4" Ice	5.426	3.042	0.310
RRUS 11	C	From Centroid-Face	4.000	6.000	30.000	110.000	No Ice	3.249	1.373	0.048
				0.000			1/2" Ice	3.491	1.551	0.068
							1" Ice	3.741	1.738	0.092
							2" Ice	4.268	2.138	0.150
							4" Ice	5.426	3.042	0.310
(2) 7770.00 w/ Mount Pipe	A	From Centroid-Face	4.000	-4.000	30.000	110.000	No Ice	6.119	4.254	0.055
				0.000			1/2" Ice	6.626	5.014	0.103
							1" Ice	7.128	5.711	0.157
							2" Ice	8.164	7.155	0.287
							4" Ice	10.360	10.412	0.665
(2) 7770.00 w/ Mount Pipe	B	From	4.000		20.000	110.000	No Ice	6.119	4.254	0.055

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
		Centroid-Face	-4.000 0.000			1/2" Ice 1" Ice 2" Ice 4" Ice	6.626 7.128 8.164 10.360	5.014 5.711 7.155 10.412	0.103 0.157 0.287 0.665
(2) 7770.00 w/ Mount Pipe	C	From Centroid-Face	4.000 -4.000 0.000	30.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.119 6.626 7.128 8.164 10.360	4.254 5.014 5.711 7.155 10.412	0.055 0.103 0.157 0.287 0.665
AM-X-CD-16-65-00T-RET w/ Mount Pipe	A	From Centroid-Leg	4.000 6.000 0.000	30.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.498 9.149 9.767 11.031 13.679	6.304 7.479 8.368 10.179 14.024	0.074 0.139 0.212 0.385 0.874
SBNH-1D6565C w/ Mount Pipe	B	From Centroid-Leg	4.000 6.000 0.000	20.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	11.695 12.421 13.157 14.630 17.917	9.854 11.383 12.936 15.305 20.189	0.099 0.189 0.289 0.523 1.169
AM-X-CD-16-65-00T-RET w/ Mount Pipe	C	From Centroid-Leg	4.000 6.000 0.000	30.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.498 9.149 9.767 11.031 13.679	6.304 7.479 8.368 10.179 14.024	0.074 0.139 0.212 0.385 0.874
(2) LGP21903	B	From Centroid-Face	4.000 6.000 0.000	20.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.270 0.343 0.425 0.616 1.101	0.184 0.248 0.322 0.494 0.943	0.011 0.013 0.017 0.028 0.072
(2) LGP21903	A	From Centroid-Face	4.000 6.000 0.000	30.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.270 0.343 0.425 0.616 1.101	0.184 0.248 0.322 0.494 0.943	0.011 0.013 0.017 0.028 0.072
RRUS-11	A	From Centroid-Face	4.000 -6.000 0.000	30.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.942 3.172 3.410 3.913 5.023	1.246 1.412 1.587 1.963 2.819	0.055 0.074 0.097 0.151 0.302
RRUS-11	B	From Centroid-Face	4.000 -6.000 0.000	20.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.942 3.172 3.410 3.913 5.023	1.246 1.412 1.587 1.963 2.819	0.055 0.074 0.097 0.151 0.302
RRUS-11	C	From Centroid-Face	4.000 -6.000 0.000	30.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.942 3.172 3.410 3.913 5.023	1.246 1.412 1.587 1.963 2.819	0.055 0.074 0.097 0.151 0.302
DC6-48-60-18-8F	B	From Centroid-Face	4.000 -6.000 0.000	20.000	110.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.266 1.456 1.658 2.093 3.098	1.266 1.456 1.658 2.093 3.098	0.020 0.035 0.053 0.095 0.215
Platform Mount [LP 1303-1]	C	None		0.000	110.000	No Ice 1/2" Ice 1" Ice	56.800 70.800 84.800	56.800 70.800 84.800	2.528 3.385 4.242

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						2" Ice	112.800	112.800	5.956
						4" Ice	168.800	168.800	9.384
100									
BXA-171063/8CF w/ Mount Pipe	A	From Centroid-Face	4.000 -7.000 0.000	0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.140 3.515 3.915 4.804 6.715	3.510 4.130 4.757 6.059 9.095	0.029 0.062 0.100 0.196 0.492
BXA-171063/8CF w/ Mount Pipe	B	From Centroid-Face	4.000 -7.000 0.000	0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.140 3.515 3.915 4.804 6.715	3.510 4.130 4.757 6.059 9.095	0.029 0.062 0.100 0.196 0.492
BXA-171063/8CF w/ Mount Pipe	C	From Centroid-Face	4.000 -7.000 0.000	0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.140 3.515 3.915 4.804 6.715	3.510 4.130 4.757 6.059 9.095	0.029 0.062 0.100 0.196 0.492
BXA-185063/8CF w/ Mount Pipe	A	From Centroid-Face	4.000 3.500 0.000	0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.193 3.564 3.965 4.850 6.761	3.122 3.725 4.346 5.636 8.569	0.039 0.072 0.111 0.205 0.498
BXA-185063/8CF w/ Mount Pipe	B	From Centroid-Face	4.000 3.500 0.000	0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.193 3.564 3.965 4.850 6.761	3.122 3.725 4.346 5.636 8.569	0.039 0.072 0.111 0.205 0.498
BXA-185063/8CF w/ Mount Pipe	C	From Centroid-Face	4.000 3.500 0.000	0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.193 3.564 3.965 4.850 6.761	3.122 3.725 4.346 5.636 8.569	0.039 0.072 0.111 0.205 0.498
LNX-6514DS-T4M w/ Mount Pipe	A	From Centroid-Face	4.000 -3.500 0.000	0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.682 9.312 9.931 11.198 13.852	7.418 8.452 9.345 11.181 15.216	0.079 0.152 0.233 0.420 0.938
LNX-6514DS-T4M w/ Mount Pipe	B	From Centroid-Face	4.000 -3.500 0.000	0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.682 9.312 9.931 11.198 13.852	7.418 8.452 9.345 11.181 15.216	0.079 0.152 0.233 0.420 0.938
BXA-70063-6CF-EDIN-0 w/ Mount Pipe	C	From Centroid-Face	4.000 -3.500 0.000	0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.969 8.609 9.216 10.459 13.066	5.801 6.953 7.819 9.601 13.366	0.042 0.103 0.171 0.335 0.804
BXA-80063-4BF-EDIN-X w/ Mount Pipe	A	From Centroid-Face	4.000 7.000 0.000	0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.089 5.515 5.953 6.859 8.816	3.472 4.045 4.640 5.957 8.886	0.030 0.070 0.116 0.227 0.554
BXA-80063-4BF-EDIN-X w/ Mount Pipe	B	From Centroid-Face	4.000 7.000 0.000	0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice	5.089 5.515 5.953 6.859	3.472 4.045 4.640 5.957	0.030 0.070 0.116 0.227

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						4" Ice	8.816	8.886	0.554
BXA-80063-4BF-EDIN-X w/ Mount Pipe	C	From Centroid-Face	4.000 7.000 0.000	0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.089 5.515 5.953 6.859 8.816	3.472 4.045 4.640 5.957 8.886	0.030 0.070 0.116 0.227 0.554
(2) FD9R6004/2C-3L	A	From Centroid-Face	4.000 0.000 0.000	0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.367 0.451 0.543 0.755 1.281	0.085 0.136 0.196 0.343 0.740	0.003 0.005 0.009 0.020 0.063
(2) FD9R6004/2C-3L	B	From Centroid-Face	4.000 0.000 0.000	0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.367 0.451 0.543 0.755 1.281	0.085 0.136 0.196 0.343 0.740	0.003 0.005 0.009 0.020 0.063
(2) FD9R6004/2C-3L	C	From Centroid-Face	4.000 0.000 0.000	0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.367 0.451 0.543 0.755 1.281	0.085 0.136 0.196 0.343 0.740	0.003 0.005 0.009 0.020 0.063
DB-T1-6Z-8AB-0Z	A	From Centroid-Face	4.000 7.000 0.000	0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.600 5.915 6.240 6.914 8.365	2.333 2.558 2.791 3.284 4.373	0.044 0.080 0.120 0.213 0.455
RRH2X40-AWS	A	From Centroid-Face	4.000 -7.000 0.000	0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.522 2.753 2.993 3.499 4.615	1.589 1.795 2.010 2.465 3.479	0.044 0.061 0.082 0.132 0.275
RRH2X40-AWS	B	From Centroid-Face	4.000 -7.000 0.000	0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.522 2.753 2.993 3.499 4.615	1.589 1.795 2.010 2.465 3.479	0.044 0.061 0.082 0.132 0.275
RRH2X40-AWS	C	From Centroid-Face	4.000 -7.000 0.000	0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.522 2.753 2.993 3.499 4.615	1.589 1.795 2.010 2.465 3.479	0.044 0.061 0.082 0.132 0.275
Platform Mount [LP 403-1]	C	None		0.000	100.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	18.850 24.300 29.750 40.650 62.450	18.850 24.300 29.750 40.650 62.450	1.500 1.797 2.093 2.686 3.872
90									
742 213 w/ Mount Pipe	A	From Leg	0.500 0.000 0.000	30.000	90.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.373 5.950 6.501 7.611 9.933	4.620 6.000 6.982 8.852 12.794	0.049 0.094 0.146 0.277 0.683
742 213 w/ Mount Pipe	B	From Leg	0.500 0.000 0.000	0.000	90.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.373 5.950 6.501 7.611 9.933	4.620 6.000 6.982 8.852 12.794	0.049 0.094 0.146 0.277 0.683

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
742 213 w/ Mount Pipe	C	From Leg	0.500 0.000 0.000	-10.000	90.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.373 5.950 6.501 7.611 9.933	4.620 6.000 6.982 8.852 12.794	0.049 0.094 0.146 0.277 0.683
2'x3' Ice Shield	C	From Leg	0.500 0.000 0.000	-10.000	95.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.720 0.990 1.260 1.800 2.880	1.180 1.610 2.040 2.900 4.620	0.072 0.132 0.192 0.312 0.552
2'x3' Ice Shield	C	From Leg	0.500 0.000 0.000	-10.000	97.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.720 0.990 1.260 1.800 2.880	1.180 1.610 2.040 2.900 4.620	0.072 0.132 0.192 0.312 0.552
*** ***80***									
LLPX310R w/ Mount Pipe	A	From Leg	1.000 -2.000 1.000	30.000	80.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.982 5.376 5.780 6.618 8.437	2.874 3.398 3.937 5.125 7.894	0.044 0.081 0.123 0.227 0.531
LLPX310R w/ Mount Pipe	B	From Leg	1.000 -2.000 1.000	30.000	80.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.982 5.376 5.780 6.618 8.437	2.874 3.398 3.937 5.125 7.894	0.044 0.081 0.123 0.227 0.531
LLPX310R w/ Mount Pipe	C	From Leg	1.000 -2.000 1.000	30.000	80.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.982 5.376 5.780 6.618 8.437	2.874 3.398 3.937 5.125 7.894	0.044 0.081 0.123 0.227 0.531
WIMAX DAP HEAD	A	From Leg	1.000 2.000 1.000	30.000	80.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.804 1.988 2.180 2.589 3.512	0.778 0.918 1.067 1.391 2.143	0.033 0.045 0.058 0.094 0.201
WIMAX DAP HEAD	B	From Leg	1.000 -2.000 1.000	30.000	80.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.804 1.988 2.180 2.589 3.512	0.778 0.918 1.067 1.391 2.143	0.033 0.045 0.058 0.094 0.201
WIMAX DAP HEAD	C	From Leg	1.000 -2.000 1.000	30.000	80.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.804 1.988 2.180 2.589 3.512	0.778 0.918 1.067 1.391 2.143	0.033 0.045 0.058 0.094 0.201
CW JUNCTION BOX	A	From Leg	1.000 2.000 3.000	30.000	80.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.400 1.560 1.728 2.091 2.921	0.700 0.821 0.951 1.236 1.910	0.000 0.010 0.023 0.055 0.153
2.4" Dia. x 6' Mount Pipe	A	From Leg	1.000 2.000 0.000	0.000	80.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.425 1.931 2.316 3.149 5.058	1.425 1.931 2.316 3.149 5.058	0.022 0.038 0.056 0.100 0.252

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
2.4" Dia. x 6' Mount Pipe	B	From Leg	1.000 2.000 0.000	0.000	80.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.425 1.931 2.316 3.149 5.058	1.425 1.931 2.316 3.149 5.058	0.022 0.038 0.056 0.100 0.252
2.4" Dia. x 6' Mount Pipe	C	From Leg	1.000 2.000 0.000	0.000	80.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.425 1.931 2.316 3.149 5.058	1.425 1.931 2.316 3.149 5.058	0.022 0.038 0.056 0.100 0.252
Side Arm Mount [SO 101-3]	C	None		0.000	80.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.500 8.900 10.300 13.100 18.700	7.500 8.900 10.300 13.100 18.700	0.252 0.333 0.414 0.576 0.900

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
115'											
VHLP2-18	C	Paraboloid w/Shroud (HP)	From Leg	1.000 0.000 0.000	0.000		115.000	2.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.140 3.410 3.680 4.210 5.280	0.031 0.049 0.066 0.101 0.171
80'											
VHLP2-23	A	Paraboloid w/Shroud (HP)	From Leg	1.000 0.000 3.000	-30.000		80.000	2.180	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.730 4.020 4.310 4.900 6.060	0.030 0.050 0.070 0.110 0.200
***											

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 60 deg - No Ice
5	Dead+Wind 90 deg - No Ice
6	Dead+Wind 120 deg - No Ice
7	Dead+Wind 150 deg - No Ice
8	Dead+Wind 180 deg - No Ice
9	Dead+Wind 210 deg - No Ice
10	Dead+Wind 240 deg - No Ice

Comb. No.	Description
11	Dead+Wind 270 deg - No Ice
12	Dead+Wind 300 deg - No Ice
13	Dead+Wind 330 deg - No Ice
14	Dead+Ice+Temp
15	Dead+Wind 0 deg+Ice+Temp
16	Dead+Wind 30 deg+Ice+Temp
17	Dead+Wind 60 deg+Ice+Temp
18	Dead+Wind 90 deg+Ice+Temp
19	Dead+Wind 120 deg+Ice+Temp
20	Dead+Wind 150 deg+Ice+Temp
21	Dead+Wind 180 deg+Ice+Temp
22	Dead+Wind 210 deg+Ice+Temp
23	Dead+Wind 240 deg+Ice+Temp
24	Dead+Wind 270 deg+Ice+Temp
25	Dead+Wind 300 deg+Ice+Temp
26	Dead+Wind 330 deg+Ice+Temp
27	Dead+Wind 0 deg - Service
28	Dead+Wind 30 deg - Service
29	Dead+Wind 60 deg - Service
30	Dead+Wind 90 deg - Service
31	Dead+Wind 120 deg - Service
32	Dead+Wind 150 deg - Service
33	Dead+Wind 180 deg - Service
34	Dead+Wind 210 deg - Service
35	Dead+Wind 240 deg - Service
36	Dead+Wind 270 deg - Service
37	Dead+Wind 300 deg - Service
38	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	119.083 - 101.083	Pole	Max Tension	14	0.000	0.000	-0.000
			Max. Compression	14	-14.864	-2.934	2.797
			Max. Mx	5	-6.888	-114.032	1.703
			Max. My	2	-6.897	-1.852	113.057
			Max. Vy	5	10.987	-114.032	1.703
			Max. Vx	2	-10.894	-1.852	113.057
			Max. Torque	7			5.759
L2	101.083 - 66.5	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-29.439	-2.011	4.486
			Max. Mx	5	-14.508	-651.521	2.944
			Max. My	2	-14.516	-3.968	647.736
			Max. Vy	5	18.691	-651.521	2.944
			Max. Vx	8	18.625	1.292	-644.787
			Max. Torque	6			6.624
L3	66.5 - 32.8333	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-40.115	-1.040	5.275
			Max. Mx	5	-21.460	-1305.484	2.125
			Max. My	2	-21.465	-5.290	1298.936
			Max. Vy	5	21.102	-1305.484	2.125
			Max. Vx	8	21.037	1.222	-1296.489
			Max. Torque	6			6.595
L4	32.8333 - 0	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-53.948	0.228	6.199
			Max. Mx	5	-31.007	-2144.332	1.145

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. My	2	-31.007	-6.664	2134.750
			Max. Vy	5	23.639	-2144.332	1.145
			Max. Vx	8	23.578	1.215	-2132.801
			Max. Torque	6			6.516

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	15	53.948	-0.004	7.249
	Max. H_x	11	31.019	23.584	0.010
	Max. H_z	2	31.019	-0.038	23.535
	Max. M_x	2	2134.750	-0.038	23.535
	Max. M_z	5	2144.332	-23.623	-0.033
	Max. Torsion	6	6.440	-20.472	-11.760
	Min. Vert	1	31.019	0.000	0.000
	Min. H_x	5	31.019	-23.623	-0.033
	Min. H_z	8	31.019	-0.002	-23.561
	Min. M_x	8	-2132.801	-0.002	-23.561
	Min. M_z	11	-2138.918	23.584	0.010
	Min. Torsion	12	-6.377	20.428	11.757

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	31.019	0.000	0.000	-1.933	-0.537	0.000
Dead+Wind 0 deg - No Ice	31.019	0.038	-23.535	-2134.750	-6.663	4.723
Dead+Wind 30 deg - No Ice	31.019	11.807	-20.404	-1851.545	-1073.762	1.745
Dead+Wind 60 deg - No Ice	31.019	20.443	-11.792	-1071.674	-1856.335	-1.742
Dead+Wind 90 deg - No Ice	31.019	23.623	0.033	-1.144	-2144.332	-4.732
Dead+Wind 120 deg - No Ice	31.019	20.472	11.760	1061.287	-1858.167	-6.440
Dead+Wind 150 deg - No Ice	31.019	11.795	20.410	1846.912	-1069.309	-6.386
Dead+Wind 180 deg - No Ice	31.019	0.002	23.561	2132.801	1.215	-4.739
Dead+Wind 210 deg - No Ice	31.019	-11.759	20.404	1846.878	1067.830	-1.818
Dead+Wind 240 deg - No Ice	31.019	-20.431	11.751	1063.746	1853.338	1.777
Dead+Wind 270 deg - No Ice	31.019	-23.584	-0.010	-1.191	2138.918	4.738
Dead+Wind 300 deg - No Ice	31.019	-20.428	-11.757	-1065.659	1852.585	6.377
Dead+Wind 330 deg - No Ice	31.019	-11.802	-20.367	-1846.812	1069.625	6.346
Dead+Ice+Temp	53.948	0.000	-0.000	-6.199	0.228	0.001
Dead+Wind 0 deg+Ice+Temp	53.948	0.004	-7.249	-682.618	-0.947	1.282
Dead+Wind 30 deg+Ice+Temp	53.948	3.623	-6.280	-592.433	-338.511	0.517
Dead+Wind 60 deg+Ice+Temp	53.948	6.279	-3.626	-344.908	-586.134	-0.397
Dead+Wind 90 deg+Ice+Temp	53.948	7.258	0.014	-5.595	-677.377	-1.196
Dead+Wind 120 deg+Ice+Temp	53.948	6.292	3.627	331.434	-587.134	-1.671
Dead+Wind 150 deg+Ice+Temp	53.948	3.630	6.288	580.167	-338.159	-1.688
Dead+Wind 180 deg+Ice+Temp	53.948	0.006	7.255	670.560	0.211	-1.284
Dead+Wind 210 deg+Ice+Temp	53.948	-3.610	6.280	579.639	337.655	-0.535
Dead+Wind 240 deg+Ice+Temp	53.948	-6.275	3.615	331.254	586.054	0.407
Dead+Wind 270 deg+Ice+Temp	53.948	-7.247	-0.008	-6.573	676.651	1.199
Dead+Wind 300 deg+Ice+Temp	53.948	-6.280	-3.626	-344.153	586.371	1.656

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead+Wind 330 deg+Ice+Temp	53.948	-3.631	-6.277	-591.665	338.999	1.680
Dead+Wind 0 deg - Service	31.019	0.015	-9.193	-835.586	-2.949	1.854
Dead+Wind 30 deg - Service	31.019	4.612	-7.970	-724.897	-420.026	0.685
Dead+Wind 60 deg - Service	31.019	7.985	-4.606	-420.084	-725.898	-0.684
Dead+Wind 90 deg - Service	31.019	9.228	0.013	-1.665	-838.464	-1.857
Dead+Wind 120 deg - Service	31.019	7.997	4.594	413.590	-726.615	-2.527
Dead+Wind 150 deg - Service	31.019	4.608	7.972	720.657	-418.287	-2.505
Dead+Wind 180 deg - Service	31.019	0.001	9.204	832.399	0.132	-1.859
Dead+Wind 210 deg - Service	31.019	-4.593	7.970	720.647	417.026	-0.713
Dead+Wind 240 deg - Service	31.019	-7.981	4.590	414.557	724.048	0.697
Dead+Wind 270 deg - Service	31.019	-9.213	-0.004	-1.681	835.668	1.859
Dead+Wind 300 deg - Service	31.019	-7.980	-4.593	-417.734	723.749	2.502
Dead+Wind 330 deg - Service	31.019	-4.610	-7.956	-723.047	417.722	2.490

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.000	-31.019	0.000	0.000	31.019	0.000	0.000%
2	0.038	-31.019	-23.535	-0.038	31.019	23.535	0.000%
3	11.807	-31.019	-20.404	-11.807	31.019	20.404	0.000%
4	20.443	-31.019	-11.792	-20.443	31.019	11.792	0.000%
5	23.623	-31.019	0.033	-23.623	31.019	-0.033	0.000%
6	20.472	-31.019	11.760	-20.472	31.019	-11.760	0.000%
7	11.795	-31.019	20.410	-11.795	31.019	-20.410	0.000%
8	0.002	-31.019	23.561	-0.002	31.019	-23.561	0.000%
9	-11.759	-31.019	20.404	11.759	31.019	-20.404	0.000%
10	-20.431	-31.019	11.751	20.431	31.019	-11.751	0.000%
11	-23.584	-31.019	-0.010	23.584	31.019	0.010	0.000%
12	-20.428	-31.019	-11.757	20.428	31.019	11.757	0.000%
13	-11.802	-31.019	-20.367	11.802	31.019	20.367	0.000%
14	0.000	-53.948	0.000	-0.000	53.948	0.000	0.000%
15	0.004	-53.948	-7.249	-0.004	53.948	7.249	0.000%
16	3.623	-53.948	-6.280	-3.623	53.948	6.280	0.000%
17	6.279	-53.948	-3.626	-6.279	53.948	3.626	0.000%
18	7.258	-53.948	0.014	-7.258	53.948	-0.014	0.000%
19	6.292	-53.948	3.627	-6.292	53.948	-3.627	0.000%
20	3.630	-53.948	6.288	-3.630	53.948	-6.288	0.000%
21	0.006	-53.948	7.255	-0.006	53.948	-7.255	0.000%
22	-3.610	-53.948	6.280	3.610	53.948	-6.280	0.000%
23	-6.275	-53.948	3.615	6.275	53.948	-3.615	0.000%
24	-7.247	-53.948	-0.008	7.247	53.948	0.008	0.000%
25	-6.280	-53.948	-3.626	6.280	53.948	3.626	0.000%
26	-3.631	-53.948	-6.277	3.631	53.948	6.277	0.000%
27	0.015	-31.019	-9.193	-0.015	31.019	9.193	0.000%
28	4.612	-31.019	-7.970	-4.612	31.019	7.970	0.000%
29	7.985	-31.019	-4.606	-7.985	31.019	4.606	0.000%
30	9.228	-31.019	0.013	-9.228	31.019	-0.013	0.000%
31	7.997	-31.019	4.594	-7.997	31.019	-4.594	0.000%
32	4.608	-31.019	7.972	-4.608	31.019	-7.972	0.000%
33	0.001	-31.019	9.204	-0.001	31.019	-9.204	0.000%
34	-4.593	-31.019	7.970	4.593	31.019	-7.970	0.000%
35	-7.981	-31.019	4.590	7.981	31.019	-4.590	0.000%
36	-9.213	-31.019	-0.004	9.213	31.019	0.004	0.000%
37	-7.980	-31.019	-4.593	7.980	31.019	4.593	0.000%
38	-4.610	-31.019	-7.956	4.610	31.019	7.956	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	5	0.00000001	0.00010527
3	Yes	5	0.00000001	0.00029118
4	Yes	5	0.00000001	0.00029015
5	Yes	5	0.00000001	0.00010195
6	Yes	5	0.00000001	0.00022777
7	Yes	5	0.00000001	0.00035956
8	Yes	5	0.00000001	0.00010135
9	Yes	5	0.00000001	0.00024612
10	Yes	5	0.00000001	0.00024718
11	Yes	5	0.00000001	0.00010069
12	Yes	5	0.00000001	0.00036116
13	Yes	5	0.00000001	0.00023093
14	Yes	4	0.00000001	0.00003490
15	Yes	5	0.00000001	0.00015628
16	Yes	5	0.00000001	0.00019457
17	Yes	5	0.00000001	0.00019347
18	Yes	5	0.00000001	0.00015413
19	Yes	5	0.00000001	0.00018556
20	Yes	5	0.00000001	0.00020288
21	Yes	5	0.00000001	0.00015130
22	Yes	5	0.00000001	0.00017934
23	Yes	5	0.00000001	0.00017920
24	Yes	5	0.00000001	0.00015232
25	Yes	5	0.00000001	0.00020697
26	Yes	5	0.00000001	0.00018987
27	Yes	4	0.00000001	0.00065810
28	Yes	4	0.00000001	0.00088193
29	Yes	4	0.00000001	0.00087213
30	Yes	4	0.00000001	0.00064612
31	Yes	4	0.00000001	0.00081259
32	Yes	5	0.00000001	0.00004788
33	Yes	4	0.00000001	0.00064240
34	Yes	4	0.00000001	0.00063253
35	Yes	4	0.00000001	0.00063123
36	Yes	4	0.00000001	0.00063953
37	Yes	5	0.00000001	0.00004827
38	Yes	4	0.00000001	0.00082347

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	119.083 - 101.083	20.562	29	1.467	0.025
L2	104 - 66.5	15.998	29	1.406	0.017
L3	70.3333 - 32.8333	7.355	29	0.984	0.007
L4	37.5 - 0	2.110	29	0.517	0.003

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
123.000	2.4-in x 6-ft Mount Pipe	29	20.562	1.467	0.026	20287
120.000	LNX-6515DS-VTM w/ Mount Pipe	29	20.562	1.467	0.026	20287
115.000	VHLP2-18	29	19.310	1.455	0.023	20287
110.000	RRUS 11	29	17.788	1.438	0.020	11167
100.000	BXA-171063/8CF w/ Mount Pipe	29	14.838	1.374	0.015	6221
97.000	2'x3' Ice Shield	29	13.988	1.346	0.014	5887
95.000	2'x3' Ice Shield	29	13.432	1.325	0.013	5685
90.000	742 213 w/ Mount Pipe	29	12.079	1.266	0.011	5235
83.000	VHLP2-23	29	10.281	1.171	0.009	4713
80.000	LLPX310R w/ Mount Pipe	29	9.548	1.128	0.009	4520

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	119.083 - 101.083	52.439	5	3.734	0.065
L2	104 - 66.5	40.825	5	3.584	0.042
L3	70.3333 - 32.8333	18.788	5	2.512	0.017
L4	37.5 - 0	5.394	5	1.321	0.006

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
123.000	2.4-in x 6-ft Mount Pipe	5	52.439	3.734	0.065	8138
120.000	LNX-6515DS-VTM w/ Mount Pipe	5	52.439	3.734	0.065	8138
115.000	VHLP2-18	5	49.253	3.706	0.058	8138
110.000	RRUS 11	5	45.380	3.664	0.051	4479
100.000	BXA-171063/8CF w/ Mount Pipe	5	37.872	3.505	0.038	2486
97.000	2'x3' Ice Shield	5	35.707	3.433	0.034	2348
95.000	2'x3' Ice Shield	5	34.289	3.380	0.032	2264
90.000	742 213 w/ Mount Pipe	5	30.840	3.230	0.028	2079
83.000	VHLP2-23	5	26.256	2.990	0.023	1865
80.000	LLPX310R w/ Mount Pipe	5	24.386	2.880	0.022	1786

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
L1	119.083 - 101.083 (1)	TP26x22.13x0.25	18.000	0.000	0.0	39.000	19.935	-6.885	777.466	0.009
L2	101.083 - 66.5 (2)	TP34.063x24.873x0.313	37.500	0.000	0.0	39.000	32.544	-14.509	1269.220	0.011
L3	66.5 - 32.8333 (3)	TP41.75x32.498x0.375	37.500	0.000	0.0	39.000	47.876	-21.460	1867.170	0.011
L4	32.8333 - 0 (4)	TP49.063x39.849x0.375	37.500	0.000	0.0	39.000	57.950	-31.007	2260.060	0.014

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	119.08 - 101.03 (1)	TP26x22.13x0.25	114.654	11.156	39.000	0.286	0.000	0.000	39.000	0.000
L2	101.08 - 66.5 (2)	TP34.063x24.873x0.313	652.045	29.745	39.000	0.763	0.000	0.000	39.000	0.000
L3	66.5 - 32.83 (3)	TP41.75x32.498x0.375	1305.48	33.015	39.000	0.847	0.000	0.000	39.000	0.000
L4	32.833 - 0 (4)	TP49.063x39.849x0.375	2144.33	36.954	39.000	0.948	0.000	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	119.083 - 101.083 (1)	TP26x22.13x0.25	11.031	0.553	26.000	0.043	0.561	0.027	26.000	0.001
L2	101.083 - 66.5 (2)	TP34.063x24.873x0.313	18.668	0.574	26.000	0.044	1.852	0.041	26.000	0.002
L3	66.5 - 32.8333 (3)	TP41.75x32.498x0.375	21.102	0.441	26.000	0.034	4.820	0.059	26.000	0.002
L4	32.8333 - 0 (4)	TP49.063x39.849x0.375	23.639	0.408	26.000	0.031	4.736	0.040	26.000	0.002

Pole Interaction Design Data

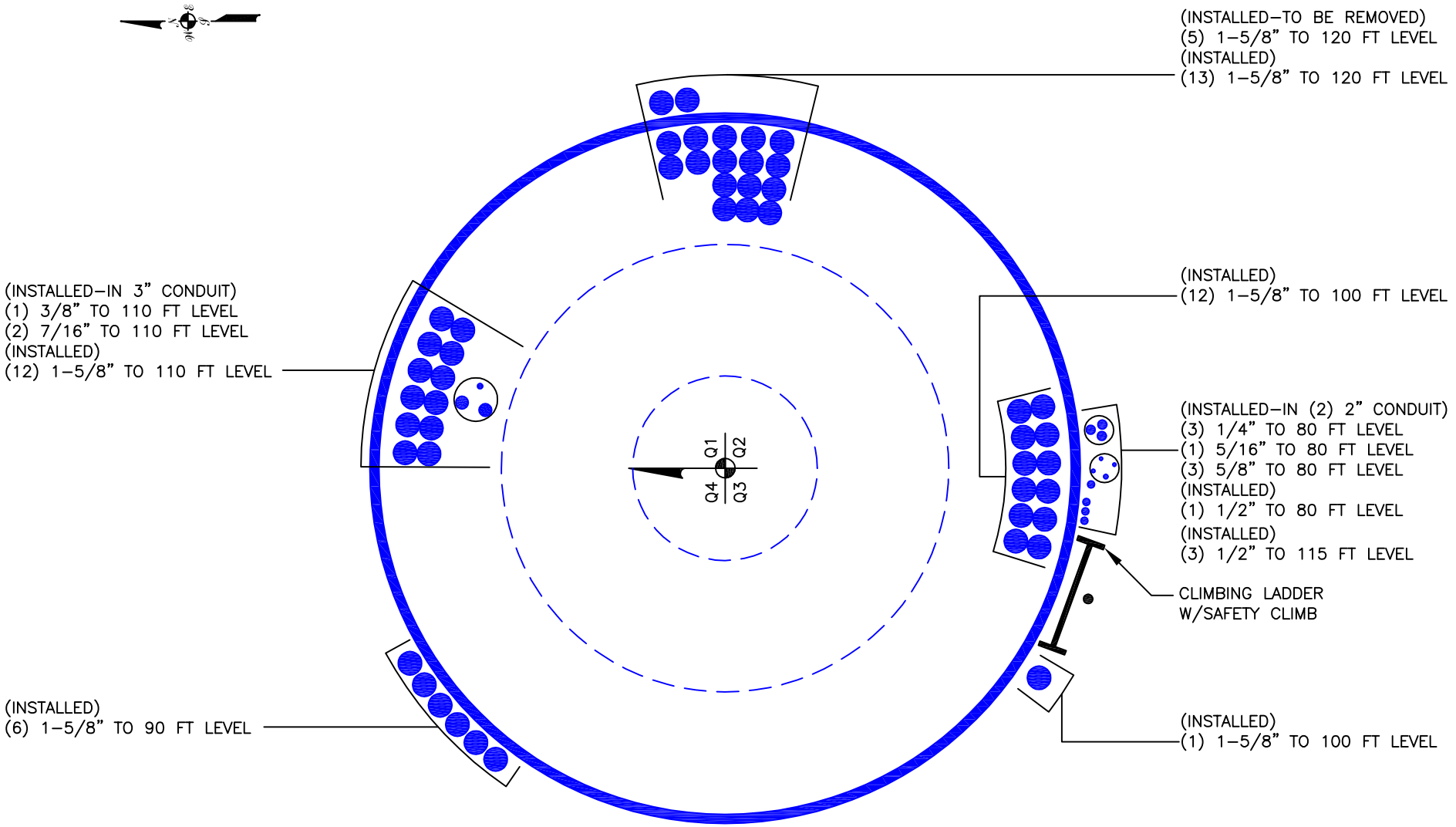
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	119.083 - 101.083 (1)	0.009	0.286	0.000	0.043	0.001	0.295	1.333	H1-3+VT
L2	101.083 - 66.5 (2)	0.011	0.763	0.000	0.044	0.002	0.775	1.333	H1-3+VT
L3	66.5 - 32.8333 (3)	0.011	0.847	0.000	0.034	0.002	0.858	1.333	H1-3+VT
L4	32.8333 - 0 (4)	0.014	0.948	0.000	0.031	0.002	0.962	1.333	H1-3+VT

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	119.08 - 101.08	Pole	TP26x22.13x0.25	1	-6.885	1036.362	22.2	Pass
L2	101.08 - 66.5	Pole	TP34.063x24.873x0.313	2	-14.509	1691.870	58.1	Pass
L3	66.5 - 32.83	Pole	TP41.75x32.498x0.375	3	-21.460	2488.938	64.4	Pass
L4	32.83 - 0	Pole	TP49.063x39.849x0.375	4	-31.007	3012.660	72.1	Pass
							Summary	
						Pole (L4)	72.1	Pass
						RATING =	**72.1**	**Pass**

APPENDIX B

BASE LEVEL DRAWING



BUSINESS UNIT: 829013 TOWER ID: C_BASELEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

Stiffened or Unstiffened, Ungrouted, Circular Base Plate - Any Rod Material

TIA Rev F

Site Data

BU#: *829013*
Site Name: *West Hartford/I-84/X43*
App #: *261528 Rev. 3*
Pole Manufacturer: *Other*

Reactions		
Moment:	2144	ft-kips
Axial:	31	kips
Shear:	24	kips

If No stiffeners, Criteria: AISC ASD <-Only Applcable to Unstiffened Cases

Anchor Rod Data		
Qty:	33	
Diam:	1.25	in
Rod Material:	Other	
Strength (Fu):	150	ksi
Yield (Fy):	105	ksi
Bolt Circle:	54	in

Plate Data		
Diam:	58	in
Thick:	1.5	in
Grade:	50	ksi
Single-Rod B-eff:	4.72	in

Stiffener Data (Welding at both sides)		
Config:	1	*
Weld Type:	Fillet	
Groove Depth:		<-- Disregard
Groove Angle:		<-- Disregard
Fillet H. Weld:	0.5	in
Fillet V. Weld:	0.25	in
Width:	4	in
Height:	12	in
Thick:	0.75	in
Notch:	0.5	in
Grade:	36	ksi
Weld str.:	70	ksi

Pole Data		
Diam:	49.0625	in
Thick:	0.375	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Stress Increase Factor		
ASIF:	1.333	

Anchor Rod Results

		Stiffened
Maximum Rod Tension:	56.8 Kips	Service, ASD
Allowable Tension:	81.0 Kips	Fty*ASIF
Anchor Rod Stress Ratio:	70.2% **Pass**	

Base Plate Results Flexural Check

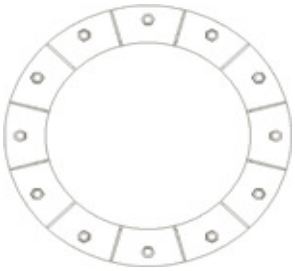
		Stiffened
Base Plate Stress:	30.0 ksi	Service, ASD
Allowable Plate Stress:	50.0 ksi	0.75*Fy*ASIF
Base Plate Stress Ratio:	60.1% **Pass**	Y.L. Length: N/A, Roark

Stiffener Results

Horizontal Weld :	56.8% **Pass**
Vertical Weld:	37.8% **Pass**
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	13.5% **Pass**
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	54.6% **Pass**
Plate Comp. (AISC Bracket):	55.6% **Pass**

Pole Results

Pole Punching Shear Check:	6.8% **Pass**



* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt
** Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes

Monopole on Mat Foundation with Rock Anchors - TIA-222-F

Site Data	
Site Name:	West Hartford/I-84/X43
CCI Number:	829013
TEP Job Number:	25680.24967

ASIF	1.333

Unfactored Reactions from TNX		
Axial	31	k
Shear	24	k
Moment	2144	k-ft

Soil Properties		
Allowable Bearing q_a	8.1	ksf
Mat Subgrade, ks	293	kcf
Wt Soil Above Mat	113	pcf

Mat and Pier Properties		
Mat Width	16.5	ft
Mat Length	16.5	ft
Mat Depth	2.5	ft
Pier Type	Square	
Pier Width/Diam.	6.0	ft
Pier Height	4.5	ft

Rock Anchor Properties		
Diameter	1	in
Net Area	0.85	in^2
Yield Stress	127.7	ksi

Rock Geotechnical Properties		
Wt of Rock	160	pcf
Angle of Rock Cone	30	deg
Steel/Grout Bond[1]	190	psi
Grout/Rock Bond[1]	50	psi
Drilled Shaft Diam.	3.75	in

[1]Allowable Bond Values

Mat Foundation Results

Bearing Stress	6.9	ksf
Allowable Bearing	10.8	ksf
% Capacity	63.7%	**Pass**

Mat and Pier Structural Results

Bending Moment	938.6	kft
Allowable Bending	1151.0	kft
% Capacity	81.5%	**Pass**

Rock Anchor Steel Results

Load Reaction	68.32	k
Allowable Design Load	86.84	k
% Capacity	78.7%	**Pass**

Rock Anchor Pullout Results

Req. Bond Length, ld	9.67	ft
Load Reaction	68.32	k
Allowable Pullout	111.09	k
% Capacity	61.5%	**Pass**

Concrete Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1E...	Density[lb/f...	f'c[ksi]	Lambda	Flex Steel[...	Shear Stee...
1	Conc3000NW	3156	1372	.15	.6	145	3	1	60	60
2	Conc3500NW	3409	1482	.15	.6	145	3.5	1	60	60
3	Conc4000NW	3644	1584	.15	.6	145	4	1	60	60
4	Conc3000LW	2085	907	.15	.6	109.999	3	.75	60	60
5	Conc3500LW	2252	979	.15	.6	109.999	3.5	.75	60	60
6	Conc4000LW	2408	1047	.15	.6	109.999	4	.75	60	60

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(...	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N8	N12			1" WF Rock	Column	None	A722	Typical
2	M2	N7	N11			1" WF Rock	Column	None	A722	Typical
3	M3	N6	N10			1" WF Rock	Column	None	A722	Typical
4	M4	N5	N9			1" WF Rock	Column	None	A722	Typical
5	M5	TL1	N367			CRECT72X72	Column	Rectangular	Conc3000NW	Typical
6	M6	N367	TOWER			6' rigid offset	Column	None	RIGID	Typical

Joint Loads and Enforced Displacements (BLC 1 : Dead)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	TL1	L	Y	-31

Joint Loads and Enforced Displacements (BLC 2 : Wind 0)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	TL1	L	X	24
2	TL1	L	Mz	-2144

Joint Loads and Enforced Displacements (BLC 3 : Wind 90)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	TL1	L	Z	24
2	TL1	L	Mx	2144

Basic Load Cases

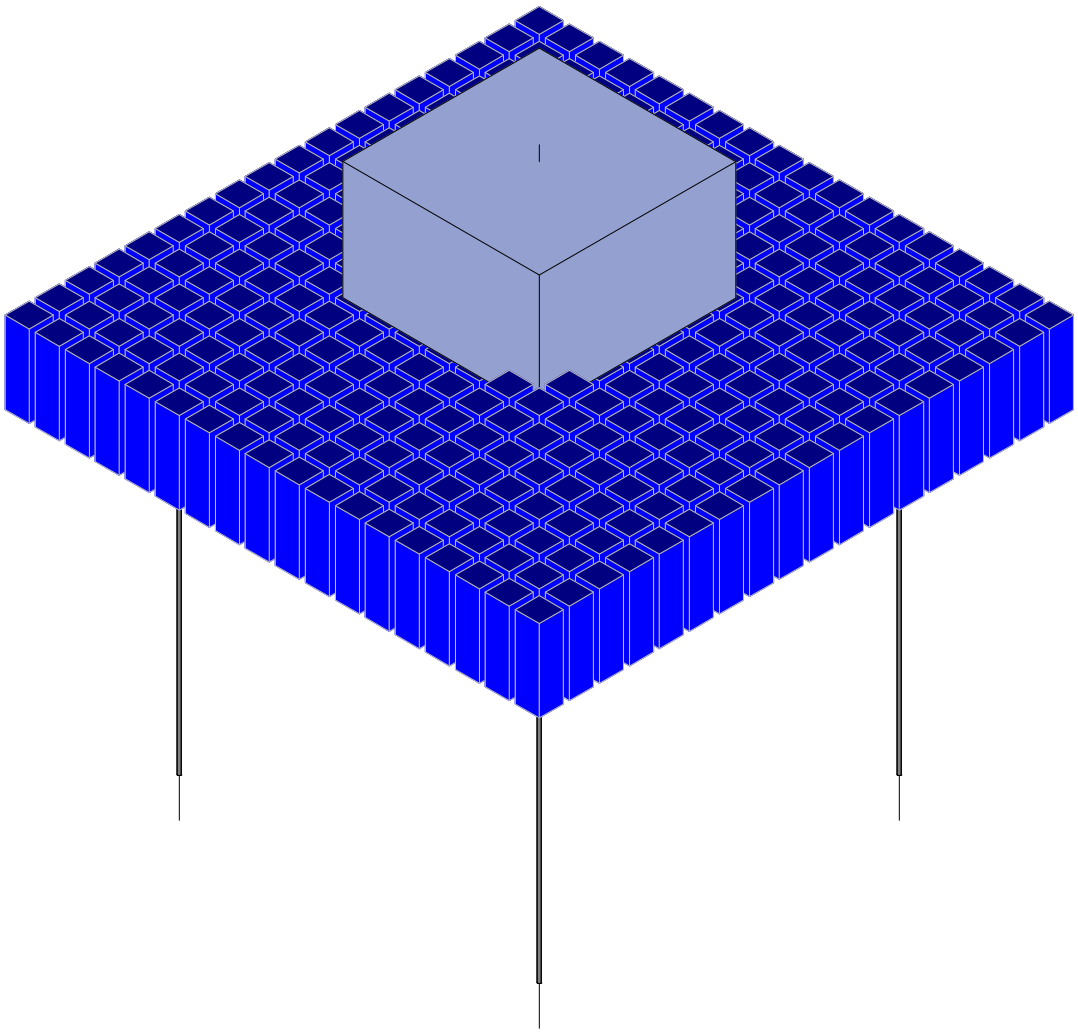
	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(Me...	Surface(P...
1	Dead	None		-1		1				324
2	Wind 0	None				2				
3	Wind 90	None				2				
4	Prestress	None						4		

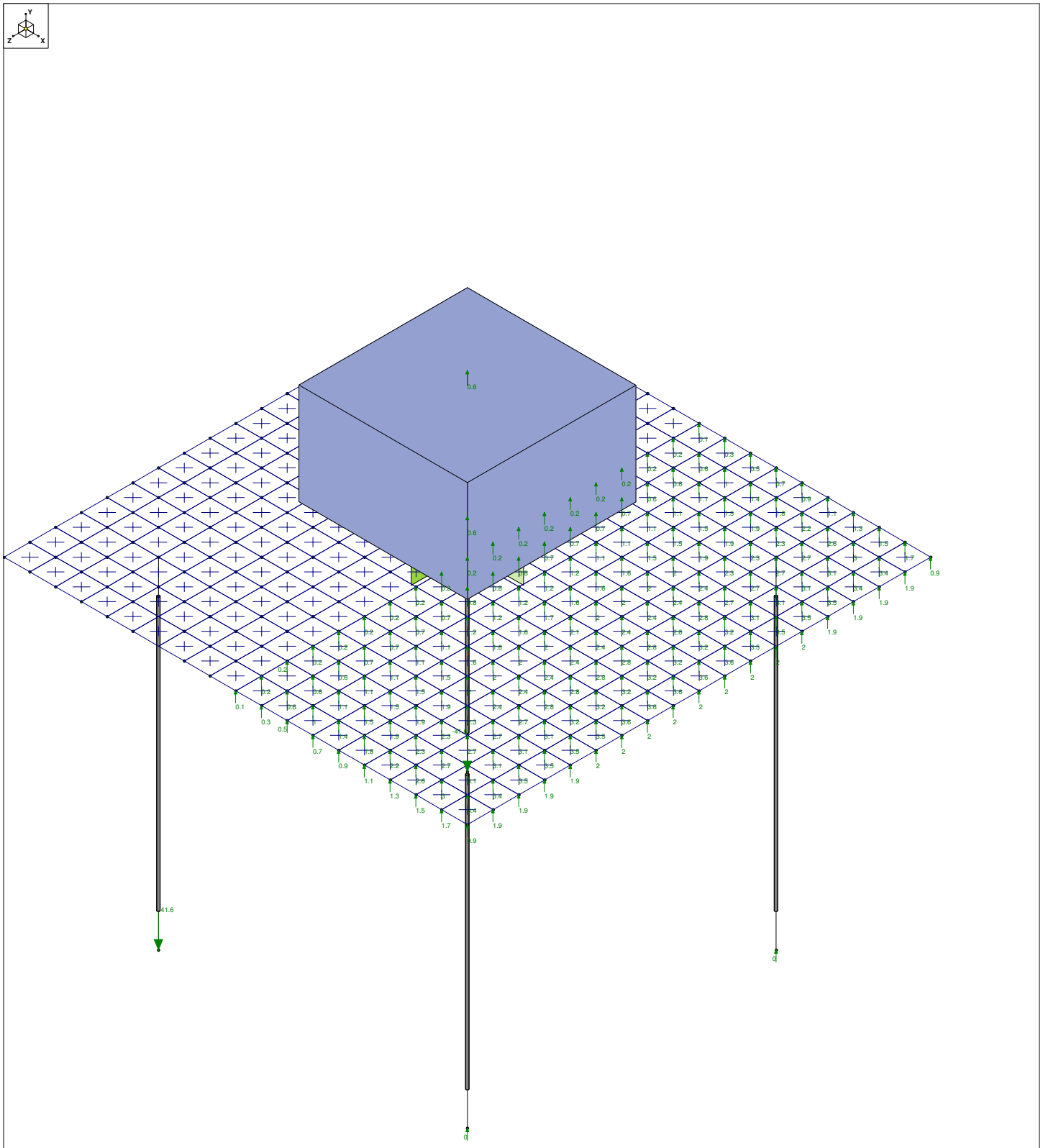
Load Combinations

	Description	Solve	PDelta	SR...	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	D+W0	Yes	Y		1	1	2	1	4	1										
2	D-W0	Yes	Y		1	1	2	-1	4	1										
3	Prestress	Yes	Y				4	1												
4	0.6D+W0	Yes	Y		1	.6	2	1	4	1										
5	0.6D-W0	Yes	Y		1	.6	2	-1	4	1										
6	D+W90	Yes	Y		1	1	3	1	4	1										
7	D-W90	Yes	Y		1	1	3	-1	4	1										
8	0.6D+W90	Yes	Y		1	.6	3	1	4	1										
9	0.6D-W90	Yes	Y		1	.6	3	-1	4	1										
10	D+0.707(W...	Yes	Y		1	1	2	.707	3	.707	4	1								

Load Combinations (Continued)

	Description	Solve	PDelta	SR...	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
11	D+0.707(W...	Yes	Y		1	1	2	.707	3	-.707	4	1								
12	D-0.707(W0...	Yes	Y		1	1	2	-.707	3	.707	4	1								
13	D+0.707(-W...	Yes	Y		1	1	2	-.707	3	-.707	4	1								
14	0.6D+0.707(...	Yes	Y		1	.6	2	.707	3	.707	4	1								
15	0.6D+0.707(...	Yes	Y		1	.6	2	.707	3	-.707	4	1								
16	0.6D-0.707(...	Yes	Y		1	.6	2	-.707	3	.707	4	1								
17	0.6D+0.707(...	Yes	Y		1	.6	2	-.707	3	-.707	4	1								


Y
Z
X


Y
Z
X
0.6
0.2
0.1
0.3
0.5
0.7
0.9
1.1
1.3
1.5
1.7
1.9
2
41.6

		PASS	PASS	West Hartford/I-84/X43 (BU 829013)	
	Results Summary:	LC1	LC2	TEP #:	25680.24967
	Soil Interaction:	N/A	N/A	Analysis: AAA	10/7/2014
Drilled Caisson Tool - Input	Foundation Structural:	81.1%	25.3%	Check: JSC	10/7/2014

Code Revisions: TIA-222-F ACI 318-02

Tower Type: Monopole

	LC1	LC2	
Moment:	2,252.00	714.50	kip-ft
Axial (download):	31.00	54.00	kip
Shear:	24.00	7.00	kip
Axial (uplift):			kip

Shaft Information

Diameter:	6.00	ft
Projection:	0.50	ft
Caisson Length:	4.50	ft
f'c:	3.000	ksi
Max εc:	0.003	in/in

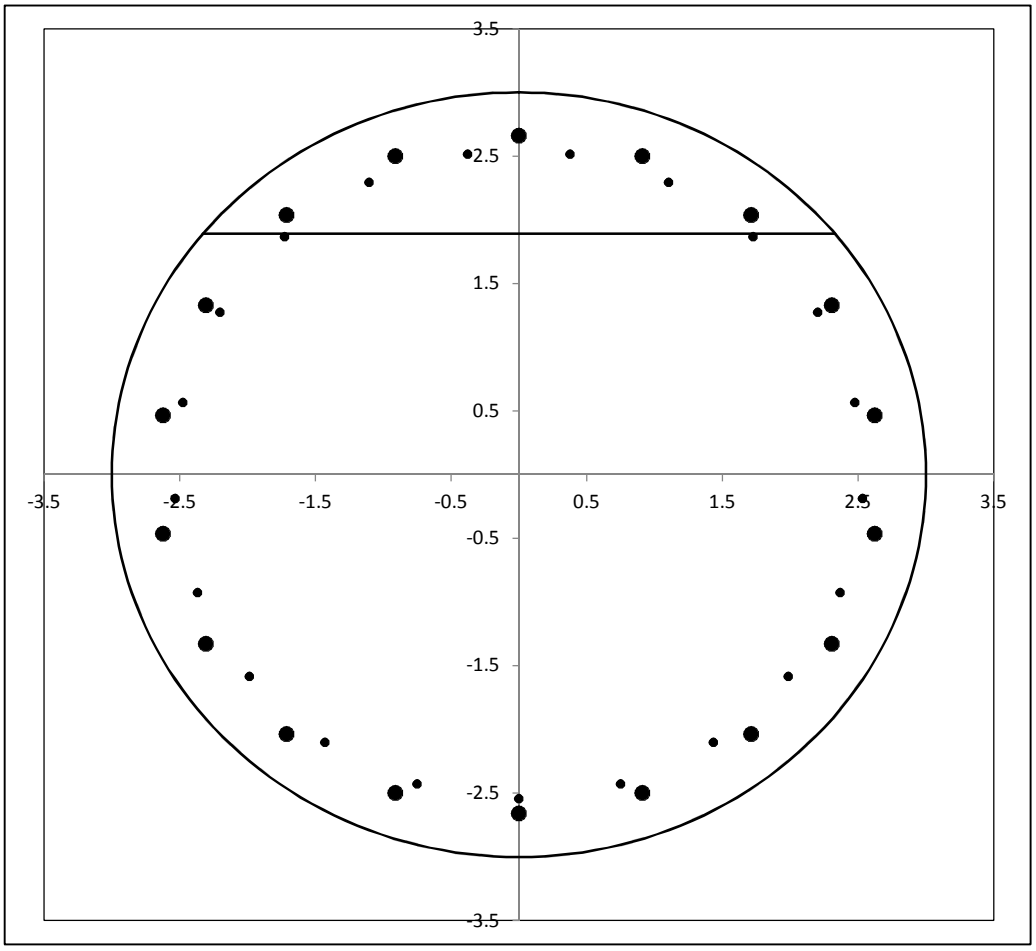
Cage 1 Reinforcement

Tie Bar Size:	4	*(fy = 60.0 ksi)*
Clear Cover to Tie:	3.00	*in (Cage Ø = 63.87in)*
Tie Bar Spacing:	6.00	in
Vertical Bar Size:	9	
Vertical Bar Quantity:	18	*(ρ =0.442%)*
fy:	60.0	ksi
E:	29,000	ksi

Cage 2 Reinforcement

Cage Diameter:	61.00	in
Offset Angle:	0.0	degrees
Vertical Bar Size:	6	
Vertical Bar Qty:	21	*(ρ =0.227%)*
Cage 2 resists compression?	No	
Effective Cage Depth:	4.5	ft
fy:	60	ksi
E:	29,000	ksi

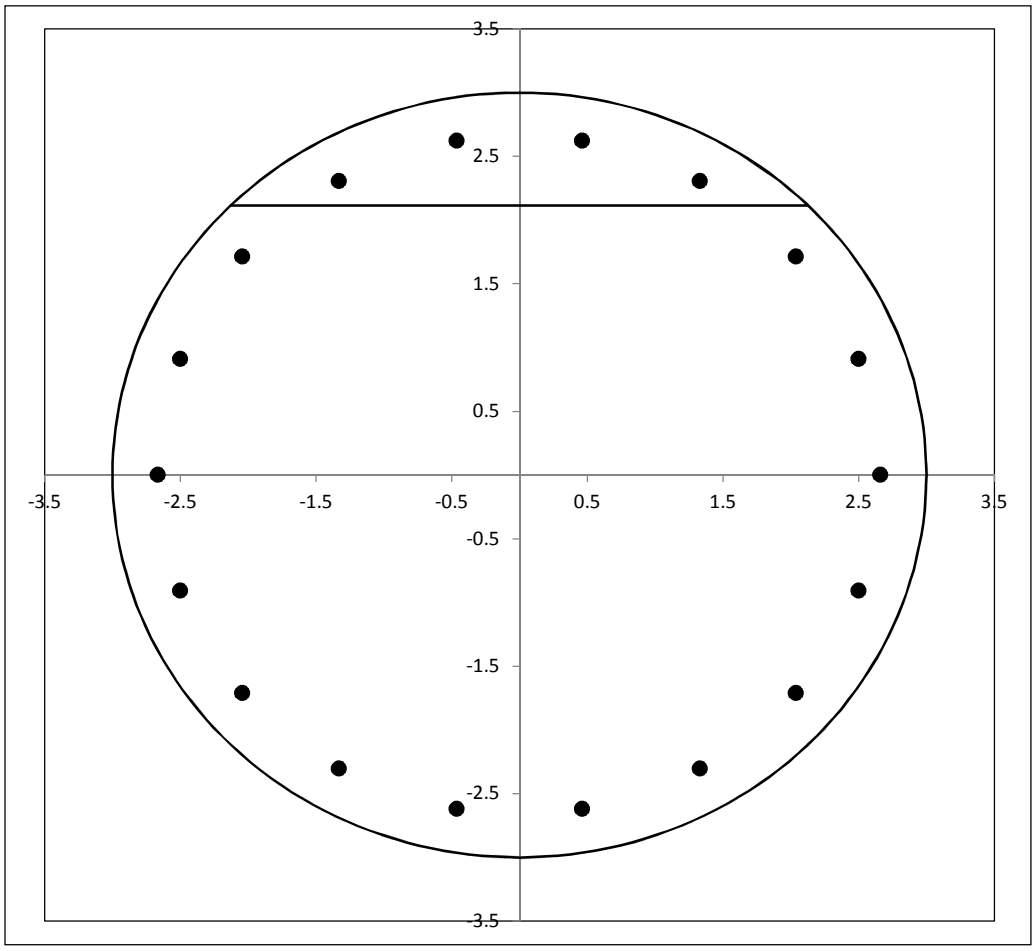
Reinforcement Capacity



		LC1	LC2	
	Vu =	31.2	31.2	kip
	Vc =	447.7	449.0	kip
fy,tie = 60.0	**Vs =**	269.8	269.8	kip
	ϕVn =	538.1	539.1	kip
	Capacity =	**5.8%**	**5.8%**	
		PASS	**PASS**	

	LC1	LC2	
Mu =	2927.6	928.9	kip-ft
ϕMn =	3612.0	3669.9	kip-ft
Capacity =	**81.1%**	**25.3%**	
	PASS	**PASS**	

Reinforcement Capacity, continued



	LC1	LC2	
Mu =	0.0	0.0	kip-ft
ϕMn =	2543.6	2609.0	kip-ft
Capacity =	**0.0%**	**0.0%**	
	PASS	**PASS**	

APPENDIX D

STRUCTURAL DESIGN DRAWINGS

STRUCTURAL DESIGN DRAWINGS

SITE NAME:

WEST HARTFORD/I-84/X43

CROWN CASTLE BU NUMBER:

829013

APPLICATION NUMBER:

261528 REV. 3

SITE ADDRESS:

467 SOUTH QUAKER LANE
WEST HARTFORD, CT 06110
(HARTFORD COUNTY)
N 41° 44' 55.75", W 72° 43' 52.75"

MODIFICATION PROVISIONS

THE MODIFICATIONS DEPICTED ON THESE DRAWINGS ARE BASED ON THE RECOMMENDATIONS OUTLINED IN THE STRUCTURAL MODIFICATION ANALYSIS REPORT COMPLETED BY TOWER ENGINEERING PROFESSIONALS (TEP), JOB#: 25680.24967 DATED OCTOBER 07, 2014 (REV 0). THIS REPORT IS BASED ON A SPECIFIC ANTENNA LOADING AND COAX CONFIGURATION. SEE THE REPORT FOR THE ANTENNA AND COAX LOADING INFORMATION. ANY OTHER ANTENNA OR COAX CONFIGURATION REQUIRES REVIEW BY TEP. SATISFACTORY COMPLETION OF THE MODIFICATIONS INDICATED ON THESE DRAWINGS WILL RESULT IN THE STRUCTURE MEETING THE REQUIREMENTS OF THE SPECIFICATIONS UNDER WHICH THE STRUCTURAL WAS COMPLETED.

CONTRACTOR SHALL FIELD VERIFY ALL: DIMENSIONS, QUANTITIES, PART NUMBERS AND COAX/ANTENNA PLACEMENTS PRIOR TO: BIDDING ORDERING MATERIALS, AND CONSTRUCTION.

INDEX OF SHEETS

NO.	SHEET TITLE	REV
T-1	TITLE SHEET	0
N-1	MI CHECKLIST AND NOTES	0
N-2	PROJECT NOTES I	0
N-3	PROJECT NOTES II	0
S-1	TOWER ELEVATION AND MODIFICATION SCHEDULE	0
S-2	BASE SECTION DETAILS	0
S-3	BASE PLATE STIFFENER DETAILS	0
S-4	FOUNDATION REINFORCEMENT DETAILS	0

PROJECT TEAM

CCI TOWER STRUCTURAL ANALYST:

NAME	CROWN CASTLE
ADDRESS	3 CORPORATE PARK DRIVE, SUITE 101
CITY, STATE, ZIP	CLIFTON PARK, NY 12065
CONTACT	ANDREW BAZINET
PHONE	(585) 899-3442
EMAIL	ANDREW.BAZINET@CROWNCASTLE.COM

CCI MODIFICATION PROJECT MANAGER:

NAME	CROWN CASTLE
CONTACT	JERRY BRUNO
PHONE	(781) 970-0069
EMAIL	JERRY.BRUNO.CONTRACTOR@CROWNCASTLE.COM

ENGINEER OF RECORD (EOR):

NAME	TOWER ENGINEERING PROFESSIONALS, INC.
ADDRESS	326 TRYON ROAD
CITY, STATE, ZIP	RALEIGH, NC 27603
CONTACT	ENGINEERING DEPARTMENT
PHONE	(919) 661-6351
EMAIL	SDD@TEPGROUP.NET

PLANS PREPARED FOR:

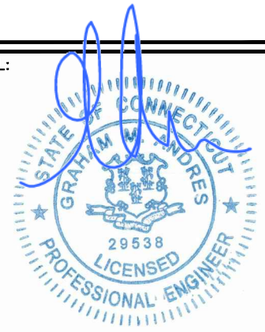
CROWN CASTLE

3 CORPORATE PARK DRIVE, SUITE 101
CLIFTON PARK, NY 12065
OFFICE: (585) 899-3442

PLANS PREPARED BY:

TOWER ENGINEERING PROFESSIONALS
326 TRYON ROAD
RALEIGH, NC 27603-5263
OFFICE: (919) 661-6351
www.tepgroup.net

SEAL:



Electronic Copy

October 07, 2014

REV	DATE	ISSUED FOR:
0	10-07-14	MODIFICATION DRAWINGS

DRAWN BY: EAJ | CHECKED BY: RJR

SHEET TITLE:

TITLE SHEET

SHEET NUMBER: **T-1**

REVISION: **0**

TEP #: 25680.24967

MI CHECKLIST

CONSTRUCTION/INSTALLATION INSPECTIONS AND TESTING REQUIRED (COMPLETED BY EOR)	REPORT ITEM
PRE-CONSTRUCTION	
X	MI CHECKLIST DRAWING
X	EOR APPROVAL
NA	FABRICATION INSPECTION
NA	FABRICATOR CERTIFIED WELD INSPECTION
X	MATERIAL TEST REPORT (MTR)
NA	FABRICATOR NDE INSPECTION
X	NDE REPORT OF MONOPOLE BASE PLATE PER ENG-SOW-10033
X	PACKING SLIPS
ADDITIONAL TESTING AND INSPECTIONS:	
CONSTRUCTION	
X	CONSTRUCTION INSPECTIONS
NA	CONTINUOUS FOUNDATION INSPECTIONS
NA	CONCRETE COMP. STRENGTH AND SLUMP TESTS
NA	GROUT COMP. STRENGTH (ASTM C109)
X	POST INSTALLED REBAR VERIFICATION
NA	BASE PLATE GROUT VERIFICATION
X	CONTRACTOR'S CERTIFIED WELD INSPECTION AND NDE REPORTS
NA	EARTHWORK: LIFT AND DENSITY
X	ON SITE COLD GALVANIZING VERIFICATION
NA	GUY WIRE TENSION REPORT
X	GC AS-BUILT DOCUMENTS
NA	NON-TENSION CONTROLLED BOLT INSPECTION. SEE SHEET N-4 FOR DETAILS.
ADDITIONAL TESTING AND INSPECTIONS:	
POST-CONSTRUCTION	
X	MI INSPECTOR REDLINE OR RECORD DRAWING(S)
NA	POST INSTALLED ANCHOR ROD PULL-OUT TESTING
X	PHOTOGRAPHS
ADDITIONAL TESTING AND INSPECTIONS:	

NOTE: X DENOTES A DOCUMENT NEEDED FOR THE PMI REPORT
NA DENOTES A DOCUMENT THAT IS NOT REQUIRED FOR THE PMI REPORT

MODIFICATION INSPECTION NOTES:

GENERAL

THE MODIFICATION INSPECTION (MI) IS A VISUAL INSPECTION OF TOWER MODIFICATIONS AND A REVIEW OF CONSTRUCTION INSPECTIONS AND OTHER REPORTS TO ENSURE THE INSTALLATION WAS CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS, NAMELY THE MODIFICATION DRAWINGS, AS DESIGNED BY THE ENGINEER OF RECORD (EOR).

THE MI IS TO CONFIRM INSTALLATION CONFIGURATION AND WORKMANSHIP ONLY AND IS NOT A REVIEW OF THE MODIFICATION DESIGN ITSELF, NOR DOES THE MI INSPECTOR TAKE OWNERSHIP OF THE MODIFICATION DESIGN. OWNERSHIP OF THE STRUCTURAL MODIFICATION DESIGN EFFECTIVENESS AND INTEGRITY RESIDES WITH THE EOR AT ALL TIMES.

ALL MI'S SHALL BE CONDUCTED BY A CROWN ENGINEERING VENDOR (AEV) OR ENGINEERING SERVICE VENDOR (AESV) THAT IS APPROVED TO PERFORM ELEVATED WORK FOR CROWN. SEE ENG-BUL-10173 LIST OF APPROVED MI VENDORS.

TO ENSURE THAT THE REQUIREMENTS OF THE MI ARE MET, IT IS VITAL THAT THE GENERAL CONTRACTOR (GC) AND THE MI INSPECTOR BEGIN COMMUNICATING AND COORDINATING AS SOON AS A PO IS RECEIVED. IT IS EXPECTED THAT EACH PARTY WILL BE PROACTIVE IN REACHING OUT TO THE OTHER PARTY. IF CONTACT INFORMATION IS NOT KNOWN, CONTACT YOUR CROWN POINT OF CONTACT (POC).

REFER TO ENG-SOW-10007: MODIFICATION INSPECTION SOW FOR FURTHER DETAILS AND REQUIREMENTS.

MI INSPECTOR

THE MI INSPECTOR IS REQUIRED TO CONTACT THE GC AS SOON AS RECEIVING A PO FOR THE MI TO, AT A MINIMUM:

- REVIEW THE REQUIREMENTS OF THE MI CHECKLIST
- WORK WITH THE GC TO DEVELOP A SCHEDULE TO CONDUCT ON-SITE INSPECTIONS, INCLUDING FOUNDATION INSPECTIONS

THE MI INSPECTOR IS RESPONSIBLE FOR COLLECTING ALL GENERAL CONTRACTOR (GC) INSPECTION AND TEST REPORTS, REVIEWING THE DOCUMENTS FOR ADHERENCE TO THE CONTRACT DOCUMENTS, CONDUCTING THE IN-FIELD INSPECTIONS, AND SUBMITTING THE MI REPORT TO CROWN.

GENERAL CONTRACTOR

THE GC IS REQUIRED TO CONTACT THE MI INSPECTOR AS SOON AS RECEIVING A PO FOR THE MODIFICATION INSTALLATION OR TURNKEY PROJECT TO, AT A MINIMUM:

- REVIEW THE REQUIREMENTS OF THE MI CHECKLIST.
- WORK WITH THE MI INSPECTOR TO DEVELOP A SCHEDULE TO CONDUCT ON-SITE MI INSPECTIONS, INCLUDING FOUNDATION INSPECTIONS.
- BETTER UNDERSTAND ALL INSPECTION AND TESTING REQUIREMENTS.

THE GC SHALL PERFORM AND RECORD THE TEST AND INSPECTION RESULTS IN ACCORDANCE WITH THE REQUIREMENTS OF THE MI CHECKLIST AND ENG-SOW-10007.

RECOMMENDATIONS

THE FOLLOWING RECOMMENDATIONS AND SUGGESTIONS ARE OFFERED TO ENHANCE THE EFFICIENCY AND EFFECTIVENESS OF DELIVERING A MI REPORT:

- IT IS SUGGESTED THAT THE GC PROVIDE A MINIMUM OF 5 BUSINESS DAYS NOTICE, PREFERABLY 10, TO THE MI INSPECTOR AS TO WHEN THE SITE WILL BE READY FOR THE MI TO BE CONDUCTED.
- THE GC AND MI INSPECTOR COORDINATE CLOSELY THROUGHOUT THE ENTIRE PROJECT.
- WHEN POSSIBLE, IT IS PREFERRED TO HAVE THE GC AND MI INSPECTOR ON-SITE SIMULTANEOUSLY FOR ANY GUY WIRE TENSIONING OR RE-TENSIONING OPERATIONS.
- IT MAY BE BENEFICIAL TO INSTALL ALL TOWER MODIFICATIONS PRIOR TO CONDUCTING THE FOUNDATION INSPECTIONS TO ALLOW FOUNDATION AND MI INSPECTION(S) TO COMMENCE WITH ONE SITE VISIT.
- WHEN POSSIBLE, IT IS PREFERRED TO HAVE THE GC AND MI INSPECTOR ON-SITE DURING THE MI TO HAVE ANY DEFICIENCIES CORRECTED DURING THE INITIAL MI. THEREFORE, THE GC MAY CHOOSE TO COORDINATE THE MI CAREFULLY TO ENSURE ALL CONSTRUCTION FACILITIES ARE AT THEIR DISPOSAL WHEN THE MI INSPECTOR IS ON SITE.

CANCELLATION OR DELAYS IN SCHEDULED MI

IF THE GC AND MI INSPECTOR AGREE TO A DATE ON WHICH THE MI WILL BE CONDUCTED, AND EITHER PARTY CANCELS OR DELAYS, CROWN SHALL NOT BE RESPONSIBLE FOR ANY COSTS, FEES, LOSS OF DEPOSITS AND/OR OTHER PENALTIES RELATED TO THE CANCELLATION OR DELAY INCURRED BY EITHER PARTY FOR ANY TIME (E.G. TRAVEL AND LODGING, COSTS OF KEEPING EQUIPMENT ON-SITE, ETC.). IF CROWN CONTRACTS DIRECTLY FOR A THIRD PARTY MI, EXCEPTIONS MAY BE MADE IN THE EVENT THAT THE DELAY/CANCELLATION IS CAUSED BY WEATHER OR OTHER CONDITIONS THAT MAY COMPROMISE THE SAFETY OF THE PARTIES INVOLVED.

CORRECTION OF FAILING MI'S

IF THE MODIFICATION INSTALLATION WOULD FAIL THE MI ("FAILED MI"), THE GC SHALL WORK WITH CROWN TO COORDINATE A REMEDIATION PLAN IN ONE OF TWO WAYS:

- CORRECT FAILING ISSUES TO COMPLY WITH THE SPECIFICATIONS CONTAINED IN THE ORIGINAL CONTRACT DOCUMENTS AND COORDINATE A SUPPLEMENT MI.
- OR, WITH CROWN'S APPROVAL, THE GC MAY WORK WITH THE EOR TO RE-ANALYZE THE MODIFICATION/REINFORCEMENT USING THE AS-BUILT CONDITION.

MI VERIFICATION INSPECTIONS

CROWN RESERVES THE RIGHT TO CONDUCT A MI VERIFICATION INSPECTION TO VERIFY THE ACCURACY AND COMPLETENESS OF PREVIOUSLY COMPLETED MI INSPECTION(S) ON TOWER MODIFICATION PROJECTS.

ALL VERIFICATION INSPECTIONS SHALL BE HELD TO THE SAME SPECIFICATIONS AND REQUIREMENTS IN THE CONTRACT DOCUMENTS AND IN ACCORDANCE WITH ENG-SOW-10007.

VERIFICATION INSPECTION MAY BE CONDUCTED BY AN INDEPENDENT AEV/AESV FIRM AFTER A MODIFICATION PROJECT IS COMPLETED, AS MARKED BY THE DATE OF AN ACCEPTED "PASSING MI" OR "PASS AS NOTED MI" REPORT FOR THE ORIGINAL PROJECT.

REQUIRED PHOTOS

BETWEEN THE GC AND THE MI INSPECTOR THE FOLLOWING PHOTOGRAPHS, AT A MINIMUM, ARE TO BE TAKEN AND INCLUDED IN THE MI REPORT:

- PRE-CONSTRUCTION GENERAL SITE CONDITION
- PHOTOGRAPHS DURING THE REINFORCEMENT MODIFICATION CONSTRUCTION/ERECTION AND INSPECTION:
  - RAW MATERIALS
  - PHOTOS OF ALL CRITICAL DETAILS
  - FOUNDATION MODIFICATIONS
  - WELD PREPARATION
  - BOLT INSTALLATION AND TORQUE
  - FINAL INSTALLED CONDITION
  - SURFACE COATING REPAIR
- POST CONSTRUCTION PHOTOGRAPHS
  - FINAL IN FIELD CONDITION

PHOTOS OF ELEVATED MODIFICATIONS TAKEN FROM THE GROUND SHALL BE CONSIDERED INADEQUATE.

THIS IS NOT A COMPLETE LIST OF REQUIRED PHOTOS, PLEASE REFER TO ENG-SOW-10007.

PLANS PREPARED FOR:

CROWN CASTLE

3 COPORATE PARK DRIVE, SUITE 101
CLIFTON PARK, NY 12065
OFFICE: (585) 899-3442

PROJECT INFORMATION:

WEST HARTFORD/I-84/X43
BU #: 829013
467 SOUTH QUAKER LANE
WEST HARTFORD, CT 06110
(HARTFORD COUNTY)

PLANS PREPARED BY:

TOWER ENGINEERING PROFESSIONALS
326 TRYON ROAD
RALEIGH, NC 27603-5263
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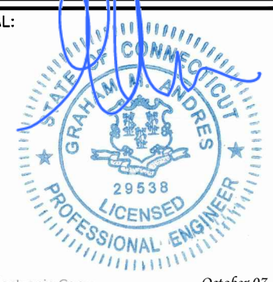
SEAL:



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October 07, 2014

REV	DATE	ISSUED FOR:
0	10-07-14	MODIFICATION DRAWINGS

DRAWN BY: EAJ | CHECKED BY: RJR

SHEET TITLE:

MI CHECKLIST AND NOTES

SHEET NUMBER: **N-1**

REVISION: **0**

TEP #: 25680.24967

GENERAL NOTES:

1. ALL REFERENCES TO THE OWNER IN THESE DOCUMENTS SHALL BE CONSIDERED CROWN CASTLE OR ITS DESIGNATED REPRESENTATIVE.

2. ALL WORK PRESENTED ON THESE DRAWINGS MUST BE COMPLETED BY THE CONTRACTOR UNLESS NOTED OTHERWISE. THE CONTRACTOR MUST HAVE CONSIDERABLE EXPERIENCE IN PERFORMANCE OF WORK SIMILAR TO THAT DESCRIBED HEREIN. BY ACCEPTANCE OF THIS ASSIGNMENT, THE CONTRACTOR IS ATTESTING THAT HE DOES HAVE SUFFICIENT EXPERIENCE AND ABILITY, THAT HE IS KNOWLEDGEABLE OF THE WORK TO BE PERFORMED AND THAT HE IS PROPERLY LICENSED AND PROPERLY REGISTERED TO DO THIS WORK IN THE STATE OF CONNECTICUT.

3. WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE 2005 CONNECTICUT STATE BUILDING CODE.

4. UNLESS SHOWN OR NOTED OTHERWISE ON THE CONTRACT DRAWINGS, OR IN THE SPECIFICATIONS, THE FOLLOWING NOTES SHALL APPLY TO THE MATERIALS LISTED HEREIN, AND TO THE PROCEDURES TO BE USED ON THIS PROJECT.

5. ALL HARDWARE ASSEMBLY MANUFACTURER'S INSTRUCTIONS SHALL BE FOLLOWED EXACTLY AND SHALL SUPERSEDE ANY CONFLICTING NOTES ENCLOSED HEREIN.

6. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE AND SEQUENCE TO ENSURE THE SAFETY OF THE STRUCTURE AND ITS COMPONENT PARTS DURING ERECTION AND/OR FIELD MODIFICATIONS. THIS INCLUDES, BUT IS NOT LIMITED TO, THE ADDITION OF TEMPORARY BRACING, GUYS OR TIE DOWNS THAT MAY BE NECESSARY. SUCH MATERIAL SHALL BE REMOVED AND SHALL REMAIN THE PROPERTY OF THE CONTRACTOR AFTER THE COMPLETION OF THE PROJECT.

7. ALL DIMENSIONS, ELEVATIONS, AND EXISTING CONDITIONS SHOWN ON THE DRAWINGS SHALL BE FIELD VERIFIED BY THE CONTRACTOR PRIOR TO BEGINNING ANY MATERIALS ORDERING, FABRICATION OR CONSTRUCTION WORK ON THIS PROJECT. CONTRACTOR SHALL NOT SCALE CONTRACT DRAWINGS IN LIEU OF FIELD VERIFICATIONS. ANY DISCREPANCIES SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE OWNER AND THE OWNER'S ENGINEER. THE DISCREPANCIES MUST BE RESOLVED BEFORE THE CONTRACTOR IS TO PROCEED WITH THE WORK. THE CONTRACT DOCUMENTS DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE WORK AND SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES. OBSERVATION VISITS TO THE SITE BY THE OWNER AND/OR THE ENGINEER SHALL NOT INCLUDE INSPECTION OF THE PROTECTIVE MEASURES OR THE PROCEDURES.

8. ALL MATERIALS AND EQUIPMENT FURNISHED SHALL BE NEW AND OF GOOD QUALITY, FREE FROM FAULTS AND DEFECTS AND IN CONFORMANCE WITH THE CONTRACT DOCUMENTS. ANY AND ALL SUBSTITUTIONS MUST BE PROPERLY APPROVED AND AUTHORIZED IN WRITING BY THE OWNER AND ENGINEER PRIOR TO INSTALLATION. THE CONTRACTOR SHALL FURNISH SATISFACTORY EVIDENCE AS TO THE KIND AND QUALITY OF THE MATERIALS AND EQUIPMENT BEING SUBSTITUTED.

9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR INITIATING, MAINTAINING, AND SUPERVISING ALL SAFETY PRECAUTIONS AND PROGRAMS IN CONNECTION WITH THE WORK. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT THIS PROJECT AND RELATED WORK COMPLIES WITH ALL APPLICABLE LOCAL, STATE, AND FEDERAL SAFETY CODES AND REGULATIONS GOVERNING THIS WORK.

10. ACCESS TO THE PROPOSED WORK SITE MAY BE RESTRICTED. THE CONTRACTOR SHALL COORDINATE INTENDED CONSTRUCTION ACTIVITY, INCLUDING WORK SCHEDULE AND MATERIALS ACCESS, WITH THE RESIDENT LEASING AGENT FOR APPROVAL.

11. ALL PERMITS THAT MUST BE OBTAINED ARE THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR WILL BE RESPONSIBLE FOR ABIDING BY ALL CONDITIONS AND REQUIREMENTS OF THE PERMITS.

12. IF APPLICABLE, ALL CONCRETE WORK SHALL COMPLY TO LOCAL CODES AND THE ACI 318-02, "BUILDING REQUIREMENTS FOR STRUCTURAL CONCRETE".

13. 24 HOURS PRIOR TO THE BEGINNING OF ANY CONSTRUCTION, THE CONTRACTOR MUST NOTIFY THE APPLICABLE JURISDICTIONAL (STATE, COUNTY OR CITY) ENGINEER.

14. ALL MATERIALS AND WORKMANSHIP SHALL BE WARRANTED FOR ONE YEAR FROM ACCEPTANCE DATE.

15. ALL TOWER DIMENSIONS SHALL BE VERIFIED WITH THE PLANS (LATEST REVISION) PRIOR TO COMMENCING CONSTRUCTION. NOTIFY THE ENGINEER IMMEDIATELY IF ANY DISCREPANCIES ARE DISCOVERED. THE OWNER SHALL HAVE A SET OF APPROVED PLANS AVAILABLE AT THE SITE AT ALL TIMES WHILE WORK IS BEING PERFORMED. A DESIGNATED RESPONSIBLE EMPLOYEE SHALL BE AVAILABLE FOR CONTACT BY GOVERNING AGENCY INSPECTORS.

16. ALL TOWER MODIFICATION WORK SHALL BE IN ACCORDANCE WITH TIA-1019-A STANDARD FOR INSTALLATION, ALTERATION AND MAINTENANCE OF ANTENNA SUPPORTING STRUCTURES AND ANTENNAS.

17. THE CLIMBING FACILITIES, SAFETY CLIMB AND ALL PARTS THEREOF SHALL NOT BE IMPEDED, MODIFIED OR ALTERED WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE TOWER OWNER OR ENGINEER OF RECORD.

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October 07, 2014

REV	DATE	ISSUED FOR:
0	10-07-14	MODIFICATION DRAWINGS

DRAWN BY: EAJ | CHECKED BY: RJR

SHEET TITLE:

PROJECT NOTES I

SHEET NUMBER: **N-2**

REVISION: **0**

TEP #: 25680.24967

STRUCTURAL STEEL NOTES:

1. THE FABRICATION AND ERECTION OF STRUCTURAL STEEL SHALL CONFORM TO THE AISC SPECIFICATION FOR MANUAL OF STEEL CONSTRUCTION, ALLOWABLE STRESS DESIGN (ASD), 9TH EDITION.

2. UNLESS OTHERWISE NOTED, ALL STRUCTURAL ELEMENTS SHALL CONFORM TO THE FOLLOWING REQUIREMENTS:
   STRUCTURAL STEEL:
   - ANGLE: ASTM A36
   - PIPE/TUBE: ASTM A500-50
   - PLATE: ASTM A36 (SELF SUPPORTING AND GUYED TOWERS)
   - PLATE: ASTM A572-65 (MONOPOLE)

   A. ALL BOLTS, ASTM A325 TYPE I GALVANIZED HIGH STRENGTH BOLTS.
   B. ALL U-BOLTS, ASTM A193 GRADE B7
   C. ALL NUTS, ASTM A563 CARBON AND ALLOY STEEL NUTS.
   D. ALL WASHERS, ASTM F436 HARDENED STEEL WASHERS.

3. ALL CONNECTIONS NOT FULLY DETAILED ON THESE PLANS SHALL BE DETAILED BY THE STEEL FABRICATOR IN ACCORDANCE WITH AISC SPECIFICATION FOR MANUAL OF STEEL CONSTRUCTION, ASD, 9TH EDITION.

4. HOLES SHALL NOT BE FLAME CUT THRU STEEL UNLESS APPROVED BY THE ENGINEER.

5. HOT-DIP GALVANIZE ALL ITEMS UNLESS OTHERWISE NOTED, AFTER FABRICATION WHERE PRACTICABLE. GALVANIZING: ASTM A123, ASTM, A153/A153M OR ASTM A653/A653M, G90, AS APPLICABLE. ADDITIONALLY, ALL NEW STEEL SHALL BE PAINTED TO MATCH EXISTING STEEL. CONTRACTOR SHALL OBTAIN WRITTEN PERMISSION TO PROTECT STEEL BY ANY OTHER MEANS.

6. REPAIR DAMAGED SURFACES WITH GALVANIZING REPAIR METHOD AND PAINT CONFORMING TO ASTM A780 OR BY APPLICATION OF STICK OR THICK PASTED MATERIAL SPECIFICALLY DESIGNED FOR REPAIR OF GALVANIZING. CLEAN AREAS TO BE REPAIRED AND REMOVE SLAG FROM WELDS. HEAT SURFACES TO WHICH STICK OR PASTE MATERIAL IS APPLIED, WITH A TORCH TO A TEMPERATURE SUFFICIENT TO MELT THE METALLICS IN STICK OR PASTED; SPREAD MOLTEN MATERIAL UNIFORMLY OVER SURFACES TO BE COATED AND WIPE OFF EXCESS MATERIAL. AFTER REPAIR, STEEL SHALL BE REPAINTED TO MATCH EXISTING FINISH (IF APPLICABLE).

7. A NUT LOCKING DEVICE SHALL BE INSTALLED ON ALL PROPOSED AND/OR REPLACED BOLTS.

8. ALL PROPOSED AND/OR REPLACED BOLTS SHALL BE OF SUFFICIENT LENGTH TO EXCLUDE THE THREADS FROM THE SHEAR PLANE.

9. ALL PROPOSED AND/OR REPLACED BOLTS SHALL BE OF SUFFICIENT LENGTH SUCH THAT THE END OF THE BOLT BE AT LEAST FLUSH WITH THE FACE OF THE NUT. IT IS NOT PERMITTED FOR THE BOLT END TO BE BELOW THE FACE OF THE NUT AFTER TIGHTENING IS COMPLETED.

10. GALVANIZED ASTM A325 BOLTS SHALL NOT BE REUSED.

WELDING NOTES:

1. ALL WELDING SHALL BE IN ACCORDANCE WITH THE AWS D1.1/D1.1M: 2000 "STRUCTURAL WELDING CODE-STEEL".

2. ALL WELDING SHALL BE PERFORMED BY AWS CERTIFIED WELDERS.

3. CONTRACTOR SHALL RETAIN AN AWS CERTIFIED WELD INSPECTOR TO PERFORM VISUAL INSPECTIONS ON FIELD WELDS. A LETTER AND REPORT SHALL BE ISSUED TO THE CONTRACTOR. CONTRACTOR SHALL SUBMIT LETTER AND REPORT TO TOWER ENGINEERING PROFESSIONALS.

4. GRIND THE SURFACE ADJACENT TO THE WELD FOR A DISTANCE OF 2" MINIMUM ALL AROUND. GRIND THE SURFACE OF THE ROD TO BE INSTALLED FOR A DISTANCE OF 2" MINIMUM ALL AROUND THE AREA TO BE WELDED. ENSURE BOTH AREAS ARE 100% FREE OF ALL GALVANIZING. SURFACES TO BE WELDED SHALL BE FREE FROM SCALE, SLAG, RUST, MOISTURE, GREASE OR ANY OTHER FOREIGN MATERIAL THAT WOULD PREVENT PROPER WELDING.

5. DO NOT WELD IF THE TEMPERATURE OF THE STEEL IN THE VICINITY OF THE WELD AREA IS BELOW 0°F. THE MINIMUM PREHEAT AND INTERPASS TEMPERATURE REQUIREMENTS SHALL COMPLY WITH SECTION 3.5.1 AND TABLE 3.2 OF THE AWS D1.1/D1.1M:2000.

6. DO NOT WELD ON WET OR FROST-COVERED SURFACES & PROVIDE ADEQUATE PROTECTION FROM HIGH WINDS.

7. FOR ALL WELDING, USE 70 KSI LOW HYDROGEN ELECTRODES. ELECTRODES SHALL BE APPROPRIATE FOR THE WELDING POSITION REQUIRED TO MAKE THE JOINT.

8. AFTER FINAL INSPECTION, THE AREA OF THE WELDS, THE INSTALLATION AND ALL SURFACES DAMAGED BY WELDING OR GRINDING SHALL RECEIVE A COLD-GALVANIZED COATING. THIS COATING SHALL BE APPLIED BY BRUSH. THE GALVANIZING COMPOUND SHALL CONTAIN A MINIMUM OF 95% ± PURE ZINC. THE FINISHED COATING SHALL BE A MINIMUM THICKNESS OF 3 MILS.

9. FOR MONOPOLE TOWERS FULL PENETRATION WELDS IN THE VICINITY OF THE BASE OF THE TOWER ARE REQUIRED TO BE 100% NDE INSPECTED BY ULTRASONIC TESTING (UT) IN ACCORDANCE WITH AWS D1.1.

10. FOR MONOPOLE TOWERS PARTIAL PENETRATION AND FILLET WELDS IN THE VICINITY OF THE BASE OF THE TOWER ARE REQUIRED TO BE 50% NDE INSPECTED BY MAGNETIC PARTICLE (MT) IN ACCORDANCE WITH AWS D1.1.

BOLT TIGHTENING PROCEDURE:

1. TIGHTEN CONNECTION BOLTS BY AISC – "TURN OF THE NUT" METHOD, USING THE CHART BELOW.

BOLT LENGTHS UP TO AND INCLUDING FOUR DIA.

½"	BOLTS UP TO AND INCLUDING 2.0 INCH LENGTH	+⅓ TURN BEYOND SNUG TIGHT
⅝"	BOLTS UP TO AND INCLUDING 2.5 INCH LENGTH	+⅓ TURN BEYOND SNUG TIGHT
¾"	BOLTS UP TO AND INCLUDING 3.0 INCH LENGTH	+⅓ TURN BEYOND SNUG TIGHT
⅞"	BOLTS UP TO AND INCLUDING 3.5 INCH LENGTH	+⅓ TURN BEYOND SNUG TIGHT
1"	BOLTS UP TO AND INCLUDING 4.0 INCH LENGTH	+⅓ TURN BEYOND SNUG TIGHT

BOLT LENGTHS OVER FOUR DIA. BUT NOT EXCEEDING EIGHT DIA.

½"	BOLTS 2.25 TO 4.0 INCH LENGTH	+½ TURN BEYOND SNUG TIGHT
⅝"	BOLTS 2.75 TO 5.0 INCH LENGTH	+½ TURN BEYOND SNUG TIGHT
¾"	BOLTS 3.25 TO 6.0 INCH LENGTH	+½ TURN BEYOND SNUG TIGHT
⅞"	BOLTS 3.75 TO 7.0 INCH LENGTH	+½ TURN BEYOND SNUG TIGHT
1"	BOLTS 4.25 TO 8.0 INCH LENGTH	+½ TURN BEYOND SNUG TIGHT

2. CONNECTION BOLTS SUBJECT TO DIRECT TENSION SHALL BE INSTALLED AND TIGHTENED AS PER SECTION 8.2.1 OF THE AISC SPECIFICATION FOR STRUCTURAL JOINTS USING A325 OR A490 BOLTS, LOCATED IN THE AISC MANUAL OF STEEL CONSTRUCTION. THE INSTALLATION PROCEDURE IS PARAPHRASED AS FOLLOWS:

3. FASTENERS SHALL BE INSTALLED IN PROPERLY ALIGNED HOLES AND TIGHTENED BY ONE OF THE METHODS DESCRIBED IN SUBSECTION 8.2.1 THROUGH 8.2.4.

8.2.1 TURN-OF-THE-NUT TIGHTENING

BOLTS SHALL BE INSTALLED IN ALL HOLES OF THE CONNECTION AND BROUGHT TO A SNUG TIGHT CONDITION AS DEFINED IN SECTION 8.1, UNTIL ALL THE BOLTS ARE SIMULTANEOUSLY SNUG TIGHT AND THE CONNECTION IS FULLY COMPACTED. FOLLOWING THIS INITIAL OPERATION ALL BOLTS IN THE CONNECTION SHALL BE TIGHTENED FURTHER BY THE APPLICABLE AMOUNT OF ROTATION SPECIFIED ABOVE. DURING THE TIGHTENING OPERATION THERE SHALL BE NO ROTATION OF THE PART NOT TURNED BY THE WRENCH. TIGHTENING SHALL PROGRESS SYSTEMATICALLY FROM THE MOST RIGID PART OF THE JOINT IN A MANNER THAT WILL MINIMIZE RELAXATION OF PREVIOUSLY PRETENSIONED BOLTS.

4. ALL OTHER BOLTED CONNECTIONS SHALL BE BROUGHT TO A SNUG TIGHT CONDITION AS DEFINED IN SECTION 8.1 OF THE SPECIFICATION.

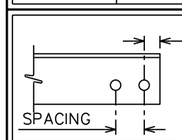
NOMINAL HOLE DIMENSIONS

BOLT DIAMETER	STANDARD HOLE	SHORT SLOT
½	9/16	9/16 X 1 1/16
⅝	1 1/16	1 1/16 X ⅞
¾	1 3/16	1 3/16 X 1
⅞	1 5/16	1 5/16 X 1⅛
1	1 1/16	1 1/16 X 1 5/16

– DIMENSIONS GIVEN IN INCHES

BOLT EDGE AND SPACING

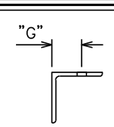
BOLT DIAMETER	MIN. EDGE	SPACING
½	⅞	1½
⅝	1⅛	1⅞
¾	1¼	2¼
⅞	1½	2⅝
1	1¾	3



– DIMENSIONS GIVEN IN INCHES

WORKABLE GAGES

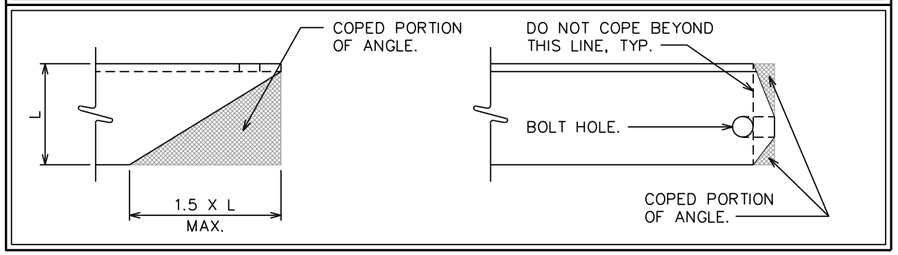
LEG	4	3½	3	2½	2	1¾
G	2½	2	1¾	1⅜	1⅛	1



– WORKABLE GAGES GIVEN IN INCHES

– MATCH EXISTING WHEN APPLICABLE

ALLOWABLE ANGLE COPE



PLANS PREPARED FOR:

CROWN CASTLE

3 COPORATE PARK DRIVE, SUITE 101
CLIFTON PARK, NY 12065
OFFICE: (585) 899-3442

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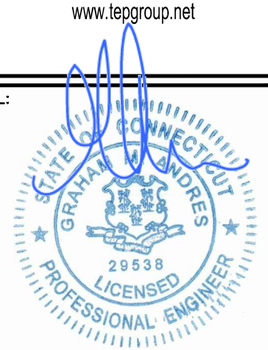

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REV	DATE	ISSUED FOR:
0	10-07-14	MODIFICATION DRAWINGS

DRAWN BY: EAJ | CHECKED BY: RJR

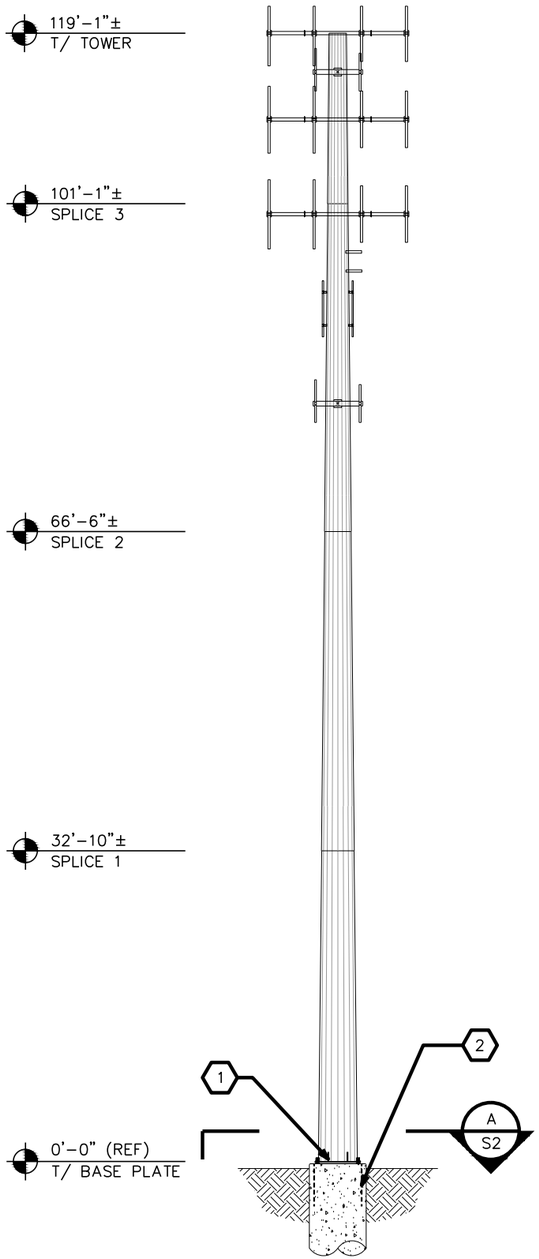
SHEET TITLE:

PROJECT NOTES II

SHEET NUMBER: **N-3**

REVISION: **0**

TEP #: 25680.24967



TOWER ELEVATION

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

POLE SPECIFICATIONS

POLE SHAPE TYPE:	18-SIDED POLYGON
POLE SHAFT GRADE:	ASTM A572-65
BASE PLATE GRADE:	ASTM A572-50
ANCHOR BOLT GRADE:	ASTM A-687

SHAFT SECTION	SECTION LENGTH (FT.)	SHAFT THICKNESS (IN.)	LAP SPLICE (FT.)	OUTER DIAMETER (IN.)	
				TOP	BOTTOM
1	18.00	0.250	2.92	22.130	26.000
2	37.50	0.313	3.83	24.870	36.060
3	37.50	0.375	4.67	32.500	41.750
4	37.50	0.375	-	39.850	49.060

MODIFICATION SCHEDULE

NO.	MODIFICATION DESCRIPTION	ELEVATION (FT.)
1	REINFORCE EXISTING BASE PLATE STIFFENERS. SEE SHEETS S-2 AND S-3 FOR DETAILS.	0
2	INSTALL PROPOSED FOUNDATION REINFORCEMENT. SEE SHEETS S-2 AND S-4 FOR DETAILS.	0
3	CROWN CASTLE WILL CONTRACT WITH A THIRD PARTY VENDOR TO PERFORM THE MODIFICATION INSPECTION. THE CONTRACTOR SHALL COORDINATE THE INSPECTION WITH THE MODIFICATION INSPECTOR AND CROWN CASTLE PROJECT MANAGER. SEE SHEET N-1 FOR DETAILS.	-

NOTES:

1. IT'S THE CONTRACTOR'S SOLE RESPONSIBILITY TO PROVIDE THE MODIFICATION INSPECTOR/ ENGINEER OF RECORD WITH A SEALED CERTIFIED WELD INSPECTION REPORT. THIS REPORT SHALL DOCUMENT THE ENTIRE WELDING PROCESS (PRE/DURING/POST) WITH PROPER PHOTOS. WELDING SHALL CONFORM TO AWS D1.1/D1.1M: 2004 "STRUCTURAL WELDING CODE-STEEL", FOR ADDITIONAL NOTES, SEE WELDING NOTES.
2. ANTENNAS AND OTHER APPURTENANCES MAY NEED TO BE TEMPORARILY REMOVED OR MOVED DURING THE INSTALLATION OF THE MODIFICATIONS SHOWN ABOVE.
3. NDE OF THE CIRCUMFERENTIAL WELD OF THE BASE PLATE TO SHAFT CONNECTION IS REQUIRED. PLEASE SEE ENG-SOW-10033 : TOWER BASE PLATE NDE AND ENG-BUL-10051 : NDE REQUIREMENTS FOR MONOPOLE BASEPLATE TO PREVENT CONNECTION FAILURE. NOTIFY THE EOR AND CROWN ENGINEERING IMMEDIATELY IF ANY CRACKS ARE SUSPECTED OR HAVE BEEN IDENTIFIED. THE NDE SHALL INCLUDE ALL EXISTING MODIFICATIONS THAT HAVE BEEN WELDED TO THE BASE PLATE. FULL PENETRATION WELDING TO THE BASEPLATE REQUIRED AS PART OF THIS ACTIVE REINFORCEMENT DESIGN SHALL BE INCLUDED IN THE NDE SCOPE OF WORK.
4. DUE TO THE MODIFICATIONS REQUIRED, CONTINUOUS INSPECTIONS AND MATERIAL TESTING WILL NEED TO BE PERFORMED.
5. CONTRACTOR SHALL ORDER AND INSTALL A NEW TOWER TAG IF THE EXISTING TOWER TAG IS MOVED OR DAMAGED DUE TO THE INSTALLATION OF THE MODIFICATION SHOWN ABOVE.
6. THE CLIMBING FACILITIES, SAFETY CLIMB AND ALL PARTS THEREOF SHALL NOT BE IMPEDED, MODIFIED OR ALTERED WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE TOWER OWNER OR ENGINEER OF RECORD.

ATTENTION

NO DETAILED INFORMATION REGARDING INTERFERENCES WAS PROVIDED. THEREFORE, CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS AND DIMENSION BEFORE FABRICATING MATERIALS AND PROCEEDING WITH THE WORK. REPORT ANY AND ALL DISCREPANCIES TO TOWER ENGINEERING PROFESSIONALS, INC., AND CROWN CASTLE CONSTRUCTION MANAGER IMMEDIATELY.

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SCALE IN FEET

PLANS PREPARED FOR:

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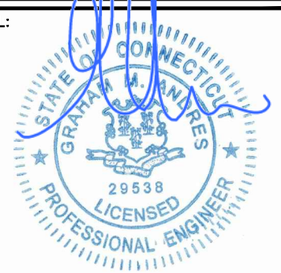

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October 07, 2014

REV	DATE	ISSUED FOR:
0	10-07-14	MODIFICATION DRAWINGS

DRAWN BY: EAJ | CHECKED BY: RJR

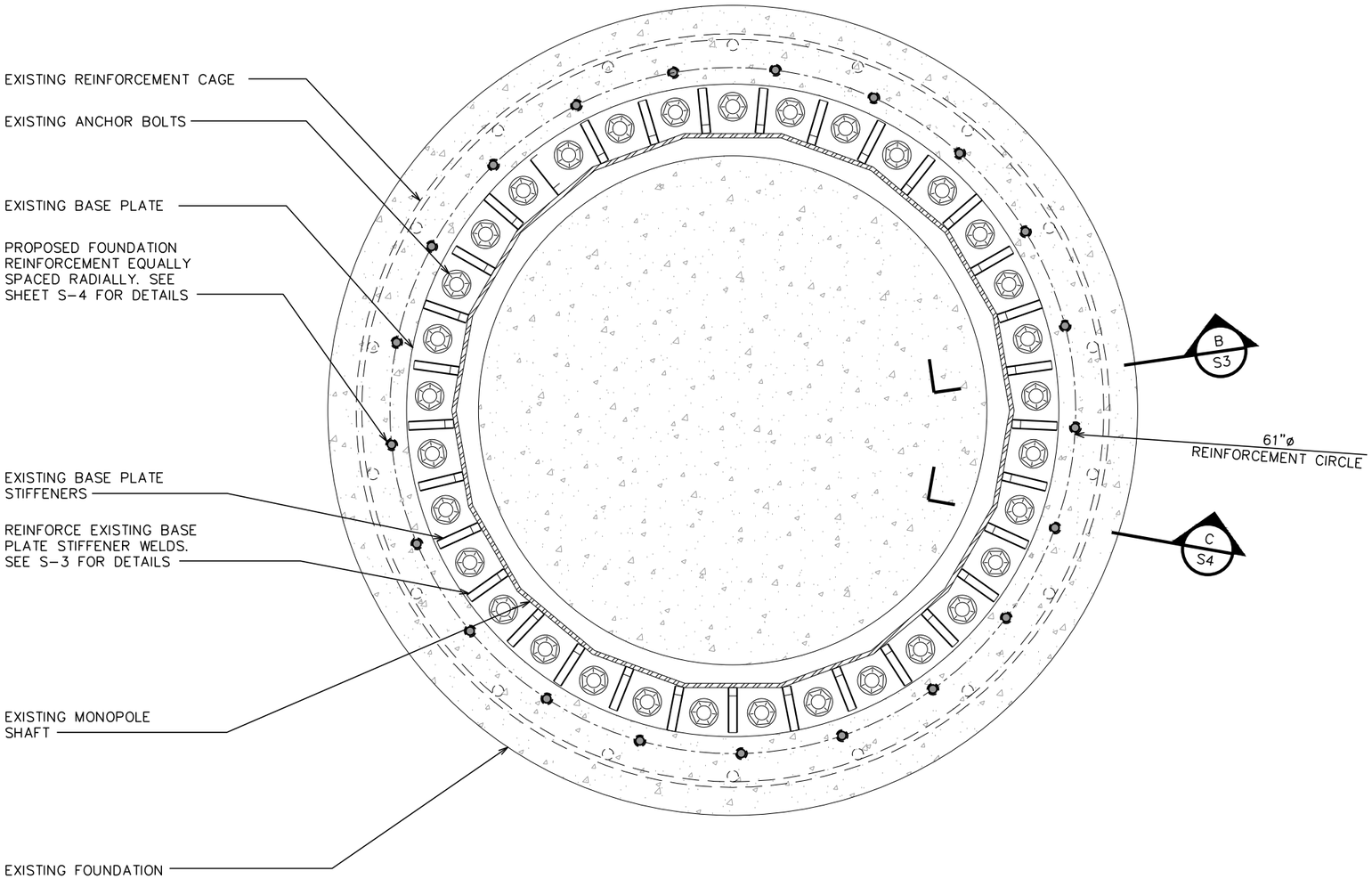
SHEET TITLE:

TOWER ELEVATION AND MODIFICATION SCHEDULE

SHEET NUMBER: **S-1**

REVISION: **0**

TEP #: 25680.24967



SECTION (A)
SCALE: 1" = 1'-0"

0 1 2
SCALE IN FEET

PLANS PREPARED FOR:

CROWN CASTLE

3 COPORATE PARK DRIVE, SUITE 101
CLIFTON PARK, NY 12065
OFFICE: (585) 899-3442

PROJECT INFORMATION:

WEST HARTFORD/I-84/X43
BU #: 829013
467 SOUTH QUAKER LANE
WEST HARTFORD, CT 06110
(HARTFORD COUNTY)

PLANS PREPARED BY:

TOWER ENGINEERING PROFESSIONALS
326 TRYON ROAD
RALEIGH, NC 27603-5263
OFFICE: (919) 661-6351
www.tepgroup.net

SEAL:

Electronic Copy

October 07, 2014

REV	DATE	ISSUED FOR:
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DRAWN BY: EAJ | CHECKED BY: RJR

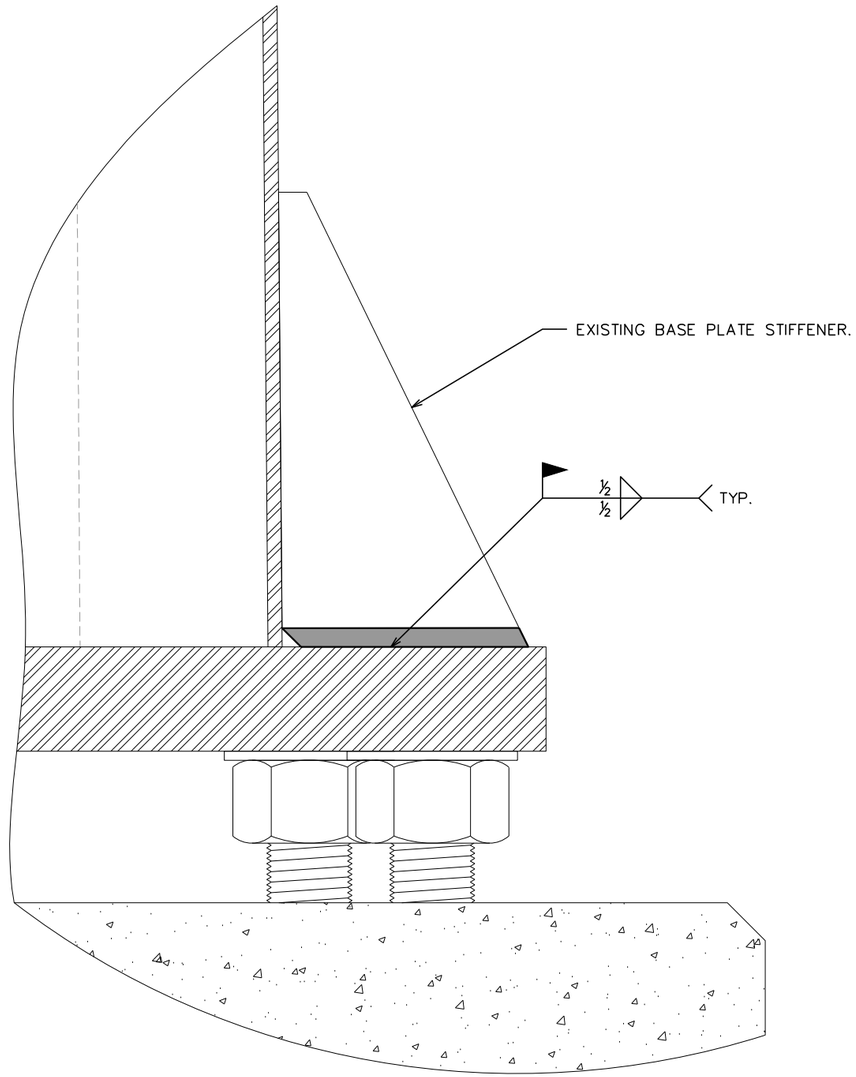
SHEET TITLE:

BASE SECTION DETAILS

SHEET NUMBER: **S-2**

REVISION: **0**

TEP #: 25680.24967



BASE PLATE STIFFENER DETAILS (B)

SCALE: N.T.S.

PLANS PREPARED FOR:

CROWN CASTLE

3 COPORATE PARK DRIVE, SUITE 101
CLIFTON PARK, NY 12065
OFFICE: (585) 899-3442

PROJECT INFORMATION:

WEST HARTFORD/I-84/X43
BU #: 829013
467 SOUTH QUAKER LANE
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PLANS PREPARED BY:

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326 TRYON ROAD
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October 07, 2014

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0	10-07-14	MODIFICATION DRAWINGS

DRAWN BY: EAJ | CHECKED BY: RJR

SHEET TITLE:

BASE PLATE STIFFENER DETAILS

SHEET NUMBER: **S-3**

REVISION: **0**

TEP #: 25680.24967

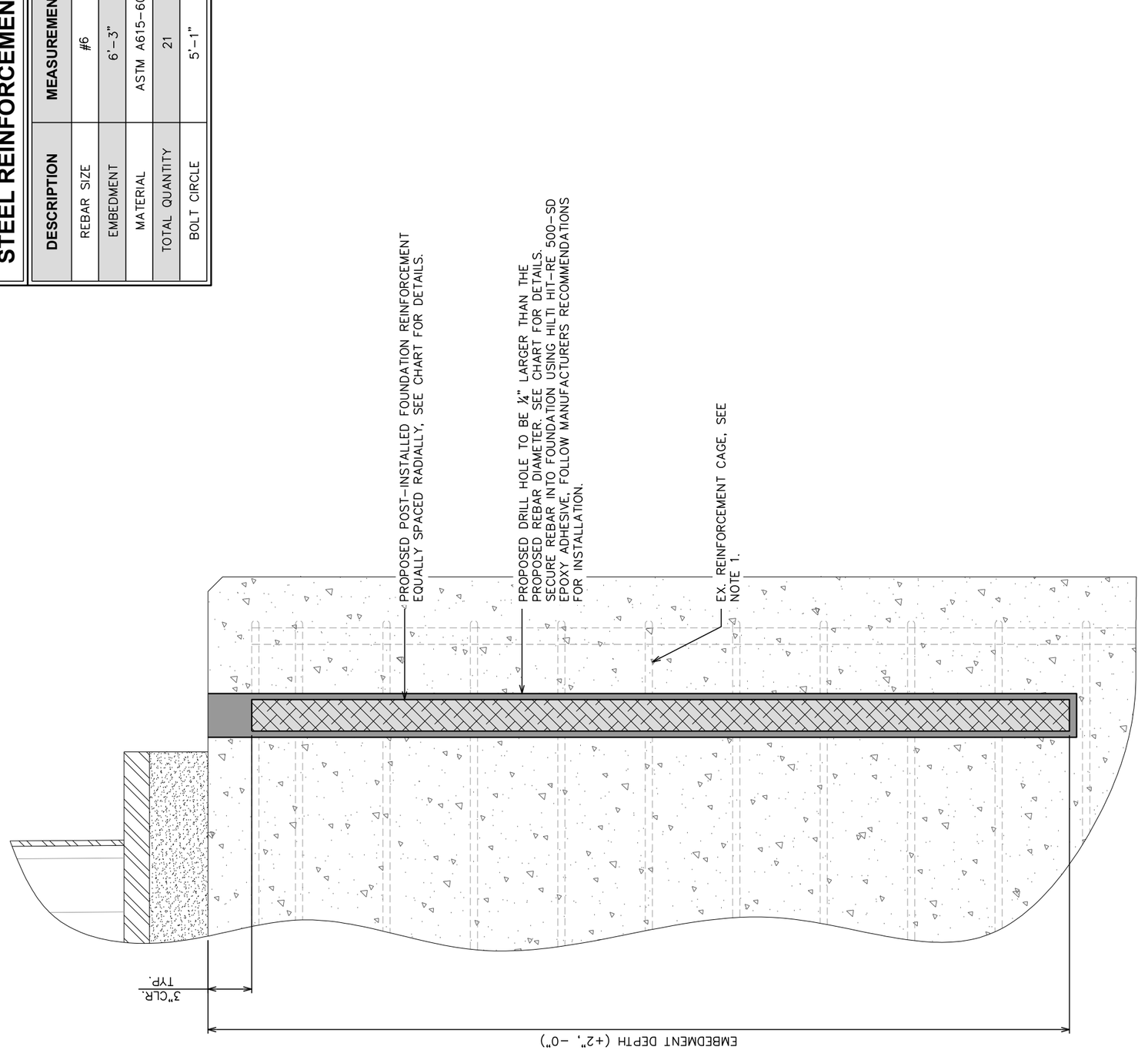
STEEL REINFORCEMENT

DESCRIPTION	MEASUREMENT
REBAR SIZE	#6
EMBEDMENT	6'-3"
MATERIAL	ASTM A615-60
TOTAL QUANTITY	21
BOLT CIRCLE	5'-1"

ATTENTION

1. CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGING THE EXISTING REINFORCING BARS DURING DRILLING OPERATIONS. CONTACT TEP IMMEDIATELY IF THE EXISTING REINFORCING BARS ARE ENCOUNTERED AND INTERFERE WITH THE PROPOSED MODIFICATION. MINOR ADJUSTMENT TO THE PROPOSED LOCATION OF THE NEW ANCHORS MAY BE REQUIRED.

NOTE:
FOR ORDERING HILTI PRODUCTS CONTACT HILTI, INC. AT (800) 879-8000.



FOUNDATION REINFORCEMENT (C)
SCALE: N.T.S.

PLANS PREPARED FOR:

CROWN CASTLE

3 COPORATE PARK DRIVE, SUITE 101
CLIFTON PARK, NY 12065
OFFICE: (585) 899-3442

PROJECT INFORMATION:

WEST HARTFORD/I-84/X43
BU #: 829013
467 SOUTH QUAKER LANE
WEST HARTFORD, CT 06110
(HARTFORD COUNTY)

PLANS PREPARED BY:

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326 TRYON ROAD
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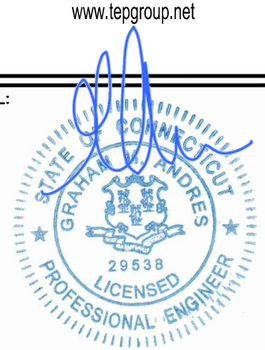
SEAL:



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October 07, 2014

REV	DATE	ISSUED FOR:
0	10-07-14	MODIFICATION DRAWINGS

DRAWN BY: EAJ | CHECKED BY: RJR

SHEET TITLE:

FOUNDATION REINFORCEMENT DETAILS

SHEET NUMBER: **S-4**

REVISION: **0**

TEP #: 25680.24967

EBI Consulting
environmental | engineering | due diligence

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

T-Mobile Existing Facility

Site ID: CT11178D

West Hartford / I-84 / X43
467 South Quaker Lane (Church of St. Mark)
West Hartford, CT 06110

November 13, 2014

EBI Project Number: 62146161

Site Compliance Summary	
Compliance Status:	COMPLIANT
Site total MPE% of FCC general public allowable limit:	77.76 %

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

EBI Consulting
environmental | engineering | due diligence

November 13, 2014

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

Emissions Analysis for Site: **CT11178D – West Hartford / I-84 / X43**

EBI Consulting was directed to analyze the proposed T-Mobile facility located at **467 South Quaker Lane (Church of St. Mark), West Hartford, CT**, for the purpose of determining whether the emissions from the Proposed T-Mobile Antenna Installation located on this property are within specified federal limits.

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

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

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

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ($\mu W/cm^2$). The general population exposure limit for the 700 MHz Band is 467 $\mu W/cm^2$, and the general population exposure limit for the PCS and AWS bands is 1000 $\mu W/cm^2$. Because each carrier

will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

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

Additional details can be found in FCC OET 65.

CALCULATIONS

Calculations were done for the proposed T-Mobile Wireless antenna facility located at **467 South Quaker Lane (Church of St. Mark), West Hartford, CT**, using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. Since T-Mobile is proposing highly focused directional panel antennas, which project most of the emitted energy out toward the horizon, all calculations were performed assuming a lobe representing the maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB, was focused at the base of the tower. For this report the sample point is the top of a 6 foot person standing at the base of the tower.

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

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

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

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

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

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

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

7) The antennas used in this modeling are the **Ericsson AIR21 B4A/B2P** for 1900 MHz (PCS) and 2100 MHz (AWS) channels and the **Commscope LNX-6515DS-VTM** for 700 MHz channels. This is based on feedback from the carrier with regards to anticipated antenna selection. The **Ericsson AIR21 B4A/B2P** has a maximum gain of **15.9 dBd** at its main lobe. The **Commscope LNX-6515DS-VTM** has a maximum gain of **14.6 dBd** at its main lobe. The maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB, was used for all calculations. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.

8) The antenna mounting height centerline of the proposed antennas is **120 feet** above ground level (AGL).

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

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

T-Mobile Site Inventory and Power Data

Sector:	A	Sector:	B	Sector:	C
Antenna #:	**1**	Antenna #:	**1**	Antenna #:	**1**
Make / Model:	Ericsson AIR21 B4A/B2P	Make / Model:	Ericsson AIR21 B4A/B2P	Make / Model:	Ericsson AIR21 B4A/B2P
Gain:	15.9 dBd	Gain:	15.9 dBd	Gain:	15.9 dBd
Height (AGL):	120	Height (AGL):	120	Height (AGL):	120
Frequency Bands	1900 MHz(PCS) / 2100 MHz (AWS)	Frequency Bands	1900 MHz(PCS) / 2100 MHz (AWS)	Frequency Bands	1900 MHz(PCS) / 2100 MHz (AWS)
Channel Count	2	Channel Count	2	# PCS Channels:	2
Total TX Power:	120	Total TX Power:	120	# AWS Channels:	120
ERP (W):	1,906.06	ERP (W):	1,906.06	ERP (W):	1,906.06
Antenna A1 MPE%	1.29	Antenna B1 MPE%	1.29	Antenna C1 MPE%	1.29
Antenna #:	**2**	Antenna #:	**2**	Antenna #:	**2**
Make / Model:	Ericsson AIR21 B4A/B2P	Make / Model:	Ericsson AIR21 B4A/B2P	Make / Model:	Ericsson AIR21 B4A/B2P
Gain:	15.9 dBd	Gain:	15.9 dBd	Gain:	15.9 dBd
Height (AGL):	120	Height (AGL):	120	Height (AGL):	120
Frequency Bands	1900 MHz(PCS) / 2100 MHz (AWS)	Frequency Bands	1900 MHz(PCS) / 2100 MHz (AWS)	Frequency Bands	1900 MHz(PCS) / 2100 MHz (AWS)
Channel Count	4	Channel Count	4	Channel Count	4
Total TX Power:	120	Total TX Power:	120	Total TX Power:	120
ERP (W):	1,906.06	ERP (W):	1,906.06	ERP (W):	1,906.06
Antenna A2 MPE%	1.29	Antenna B2 MPE%	1.29	Antenna C2 MPE%	1.29
Antenna #:	**3**	Antenna #:	**3**	Antenna #:	**3**
Make / Model:	Commscope LNX-6515DS-VTM	Make / Model:	Commscope LNX-6515DS-VTM	Make / Model:	Commscope LNX-6515DS-VTM
Gain:	14.6 dBd	Gain:	14.6 dBd	Gain:	14.6 dBd
Height (AGL):	120	Height (AGL):	120	Height (AGL):	120
Frequency Bands	700 Mhz	Frequency Bands	700 Mhz	Frequency Bands	700 Mhz
Channel Count	1	Channel Count	1	Channel Count	1
Total TX Power:	30	Total TX Power:	30	Total TX Power:	30
ERP (W):	445.37	ERP (W):	445.37	ERP (W):	445.37
Antenna A3 MPE%	0.51	Antenna B3 MPE%	0.51	Antenna C3 MPE%	0.51

Site Composite MPE%	
Carrier	**MPE%**
T-Mobile	**9.29**
AT&T	26.95 %
Clearwire	2.90 %
Verizon Wireless	38.62 %
Site Total MPE %:	**77.76 %**

T-Mobile Sector 1 Total:	3.10 %
T-Mobile Sector 2 Total:	3.10 %
T-Mobile Sector 3 Total:	3.10 %
Site Total:	77.76 %

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Summary

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

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

T-Mobile Sector	Power Density Value (%)
Sector 1:	3.10 %
Sector 2:	3.10 %
Sector 3 :	3.10 %
T-Mobile Total:	9.29 %
Site Total:	77.76 %
Site Compliance Status:	**COMPLIANT**

The anticipated composite MPE value for this site assuming all carriers present is **77.76%** of the allowable FCC established general public limit sampled at the ground level. This is based upon values listed in the Connecticut Siting Council database for existing carrier emissions.

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

Scott Heffernan
RF Engineering Director

EBI Consulting
21 B Street
Burlington, MA 01803

From: (704) 405-6556
Jerry Feathers
Crown Castle
3530 Toringdon Way
Suite 300
Charlotte, NC 28277

Origin ID: MEOA

FedEx Express

J142214092303uv

Ship Date: 14NOV14
ActWgt: 2.0 LB
CAD: 104924201/INET3550

Delivery Address Bar Code

Ref # 1765.6680
Invoice #
PO #
Dept #

SHIP TO: (860) 827-2951 BILL SENDER

Melanie A. Bachman
Connecticut Siting Council
10 Franklin Square

NEW BRITAIN, CT 06051

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XE MPEA

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