Crown Castle
3530 Toringdon Way Suite 300
Charlotte NC 28277

Tel (704) 405-6600

April 2, 2015

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

RE: **T-Mobile-Exempt Modification - Crown Site BU: 806366**
T-Mobile Site ID: CT11251A
Located at: 61-77 North Main Street, Marlborough, CT 06447

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 The Honorable Catherine D. Gaudinski, First Selectman for the Town of Marlborough and Village Properties LLC, Property Owner.

T-Mobile plans to modify the existing wireless communications facility owned by Crown Castle and located at **61-77 North Main Street, Marlborough, CT 06447**. 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: The Honorable Catherine D. Gaudinski, First Selectman
P.O. Box 29
26 North Main Street
Marlborough, CT 06447

cc: Village Properties LLC
Deborah Leonard
486 Maplehurst Drive
Highlands Ranch, CO 80126

T-Mobile®

T-MOBILE NORTHEAST LLC

T-MOBILE SITE #: CT11251A
CROWN CASTLE BU #: 806366
SITE NAME: HRT 107(C) 943204
NORTH MAIN STREET
MARLBOROUGH, CT 06447
HARTFORD COUNTY

VICINITY MAP

FROM PARSIPPANY, NJ:

DEPART SYLVAN WAY AND TAKE I-80 E TO I-95 N TOWARD G WASHINGTON B/NEW YORK. AT EXIT 1C, TAKE RAMP RIGHT FOR I-87 NORTH TOWARD ALBANY. AT EXIT 4, TAKE RAMP RIGHT FOR CENTRAL PARK AVE TOWARD CROSS COUNTY PKWY. TAKE RAMP RIGHT FOR CROSS COUNTY PKWY EAST TOWARD HUTCHINSON PKWY. KEEP STRAIGHT ONTO HUTCHINSON RIVER PKWY. ROAD NAME CHANGES TO CT-15 N/MERRITT PKWY. AT EXIT 68N-E, TAKE RAMP RIGHT FOR I-91 NORTH TOWARD HARTFORD/MIDDLETOWN. AT EXIT 25, TAKE RAMP RIGHT FOR CT-3 NORTH TOWARD GLASTONBURY. TAKE RAMP RIGHT FOR CT-2 EAST TOWARD NORWICH. AT EXIT 12, TAKE RAMP RIGHT FOR WEST ROAD TOWARD BUSINESS ROUTE/MARLBOROUGH. KEEP STRAIGHT ONTO N MAIN ST. TURN RIGHT ONTO HILLSIDE AVE. TURN RIGHT ONTO KEIRSTEAD CIRCLE. SITE WILL BE ON THE RIGHT.

ENGINEER
DEWBERRY ENGINEERS INC.
600 PARSIPPANY ROAD
SUITE 301
PARSIPPANY, NJ 07054

CONTACT: BRYAN HUFF
PHONE #: (973) 576-0147

CONSTRUCTION
CROWN CASTLE
500 WEST CUMMINGS PARK, SUITE 3600
WOBURN, MA 01801

CONTACT: WARREN KELLEHER
PHONE #: (781) 970-0055

CONSULTANT TEAM

SITE NAME:
HRT 107(C) 943204

SITE NUMBER:
CT11251A

TOWER OWNER:
CROWN CASTLE
500 WEST CUMMINGS PARK, SUITE 3600
WOBURN, MA 01801

APPLICANT/DEVELOPER:
T-MOBILE NORTHEAST LLC
4 SYLVAN WAY
PARSIPPANY, NJ 07054

COORDINATES:
LATITUDE: 41°-37'-47.3" N (NAD83)
LONGITUDE: 72°-27'-59.4" W (NAD83)
(PER CROWN CASTLE)

CONFIGURATION
704G

PROJECT SUMMARY

SITE ADDRESS:
NORTH MAIN STREET
MARLBOROUGH, CT 06447
HARTFORD COUNTY

PROJECT DIRECTORY

- REMOVE & REPLACE (3) EXISTING ANTENNAS WITH (3) NEW ANTENNAS.
- INSTALL (3) NEW BIAS TEES.
- INSTALL (6) NEW LINES OF COAX.
- INSTALL (1) NEW BBU CABINET ON A NEW CONCRETE PAD AT GRADE.

SCOPE OF WORK

THIS DOCUMENT WAS DEVELOPED TO REFLECT A SPECIFIC SITE AND ITS SITE CONDITIONS AND IS NOT TO BE USED FOR ANOTHER SITE OR WHEN OTHER CONDITIONS PERTAIN. REUSE OF THIS DOCUMENT IS AT THE SOLE RISK OF THE USER.

A.D.A. COMPLIANCE:
FACILITY IS UNMANNED AND NOT FOR HUMAN HABITATION.

SHT. NO.	DESCRIPTION
T-1	TITLE SHEET
G-1	GENERAL NOTES
C-1	COMPOUND PLAN & EQUIPMENT PLANS
C-2	ANTENNA LAYOUTS & ELEVATIONS
C-3	CONSTRUCTION DETAILS
E-1	GROUNDING NOTES & DETAILS

SHEET INDEX

T-Mobile
T-MOBILE NORTHEAST LLC
4 SYLVAN WAY
PARSIPPANY, NJ 07054

CROWN CASTLE
CROWN CASTLE
500 WEST CUMMINGS PARK, SUITE 3600
WOBURN, MA 01801

CT11251A
HRT 107(C) 943204

CONSTRUCTION DRAWINGS

0	04/01/15	ISSUED AS FINAL
B	03/26/15	REVISED PER COMMENTS
A	03/17/15	ISSUED FOR REVIEW

Dewberry®
Dewberry Engineers Inc.
600 PARSIPPANY ROAD
SUITE 301
PARSIPPANY, NJ 07054
PHONE: 973.739.9400
FAX: 973.739.9710

CONNECTICUT LICENSE # 0012229

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

DRAWN BY:	JC
REVIEWED BY:	BSH
CHECKED BY:	GHN
PROJECT NUMBER:	50066258
JOB NUMBER:	50071480
SITE ADDRESS:	

NORTH MAIN STREET
MARLBOROUGH, CT 06447
HARTFORD COUNTY

SHEET TITLE

TITLE SHEET

SHEET NUMBER

T-1

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.

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.

CONCRETE AND REINFORCING STEEL NOTES:

1. ALL CONCRETE WORK SHALL BE IN ACCORDANCE WITH THE ACI 301, ACI 318, ACI 336, ASTM A184, ASTM A185 AND THE DESIGN AND CONSTRUCTION SPECIFICATION FOR CAST–IN–PLACE CONCRETE.
2. ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI AT 28 DAYS, UNLESS NOTED OTHERWISE. A HIGHER STRENGTH (4000 PSI) MAY BE USED. ALL CONCRETING WORK SHALL BE DONE IN ACCORDANCE WITH ACI 318 CODE REQUIREMENTS.
3. REINFORCING STEEL SHALL CONFORM TO ASTM A 615, GRADE 60, DEFORMED UNLESS NOTED OTHERWISE. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A 185 WELDED STEEL WIRE FABRIC UNLESS NOTED OTHERWISE (UNO). SPLICES SHALL BE CLASS "B" AND ALL HOOKS SHALL BE STANDARD, UNO.
4. THE FOLLOWING MINIMUM CONCRETE COVER SHALL BE PROVIDED FOR REINFORCING STEEL UNLESS SHOWN OTHERWISE ON DRAWINGS:

   CONCRETE CAST AGAINST EARTH.....3 IN.
   CONCRETE EXPOSED TO EARTH OR WEATHER:
   #6 AND LARGER .....2 IN.
   #5 AND SMALLER & WWF.....1 1/2 IN.
   CONCRETE NOT EXPOSED TO EARTH OR WEATHER OR NOT CAST AGAINST THE GROUND:
   SLAB AND WALL .....3/4 IN.
   BEAMS AND COLUMNS.....1 1/2 IN.

5. A CHAMFER 3/4" SHALL BE PROVIDED AT ALL EXPOSED EDGES OF CONCRETE, UNO, IN ACCORDANCE WITH ACI 301 SECTION 4.2.4.
6. INSTALLATION OF CONCRETE EXPANSION/WEDGE ANCHOR, SHALL BE PER MANUFACTURER'S WRITTEN RECOMMENDED PROCEDURE. THE ANCHOR BOLT, DOWEL OR ROD SHALL CONFORM TO MANUFACTURER'S RECOMMENDATION FOR EMBEDMENT DEPTH OR AS SHOWN ON THE DRAWINGS. NO REBAR SHALL BE CUT WITHOUT PRIOR CONTRACTOR APPROVAL WHEN DRILLING HOLES IN CONCRETE. SPECIAL INSPECTIONS, REQUIRED BY GOVERNING CODES, SHALL BE PERFORMED IN ORDER TO MAINTAIN MANUFACTURER'S MAXIMUM ALLOWABLE LOADS. ALL EXPANSION/WEDGE ANCHORS SHALL BE STAINLESS STEEL OR HOT DIPPED GALVANIZED. EXPANSION BOLTS SHALL BE PROVIDED BY RAMSET/REDHEAD OR APPROVED EQUAL.
7. CONCRETE CYLINDER TEST IS NOT REQUIRED FOR SLAB ON GRADE WHEN CONCRETE IS LESS THAN 50 CUBIC YARDS (IBC 1905.6.2.3) IN THAT EVENT THE FOLLOWING RECORDS SHALL BE PROVIDED BY THE CONCRETE SUPPLIER;
   (A) RESULTS OF CONCRETE CYLINDER TESTS PERFORMED AT THE SUPPLIER'S PLANT,
   (B) CERTIFICATION OF MINIMUM COMPRESSIVE STRENGTH FOR THE CONCRETE GRADE SUPPLIED.
   FOR GREATER THAN 50 CUBIC YARDS THE GC SHALL PERFORM THE CONCRETE CYLINDER TEST.
8. AS AN ALTERNATIVE TO ITEM 7, TEST CYLINDERS SHALL BE TAKEN INITIALLY AND THEREAFTER FOR EVERY 50 YARDS OF CONCRETE FROM EACH DIFFERENT BATCH PLANT.
9. EQUIPMENT SHALL NOT BE PLACED ON NEW PADS FOR SEVEN DAYS AFTER PAD IS POURED, UNLESS IT IS VERIFIED BY CYLINDER TESTS THAT COMPRESSIVE STRENGTH HAS BEEN ATTAINED.

STRUCTURAL STEEL NOTES:

1. ALL STEEL WORK SHALL BE PAINTED OR GALVANIZED IN ACCORDANCE WITH THE DRAWINGS UNLESS NOTED OTHERWISE. STRUCTURAL STEEL SHALL BE ASTM–A–36 UNLESS OTHERWISE NOTED ON THE SITE SPECIFIC DRAWINGS. STEEL DESIGN, INSTALLATION AND BOLTING SHALL BE PERFORMED IN ACCORDANCE WITH THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC) "MANUAL OF STEEL CONSTRUCTION".
2. ALL WELDING SHALL BE PERFORMED USING E70XX ELECTRODES AND WELDING SHALL CONFORM TO AISC. WHERE FILLET WELD SIZES ARE NOT SHOWN, PROVIDE THE MINIMUM SIZE PER TABLE J2.4 IN THE AISC "MANUAL OF STEEL CONSTRUCTION". PAINTED SURFACES SHALL BE TOUCHED UP.
3. BOLTED CONNECTIONS SHALL BE ASTM A325 BEARING TYPE (3/4"Ø) CONNECTIONS AND SHALL HAVE MINIMUM OF TWO BOLTS UNLESS NOTED OTHERWISE.
4. NON–STRUCTURAL CONNECTIONS FOR STEEL GRATING MAY USE 5/8" DIA. ASTM A 307 BOLTS UNLESS NOTED OTHERWISE.
5. INSTALLATION OF CONCRETE EXPANSION/WEDGE ANCHOR, SHALL BE PER MANUFACTURER'S WRITTEN RECOMMENDED PROCEDURE. THE ANCHOR BOLT, DOWEL OR ROD SHALL CONFORM TO MANUFACTURER'S RECOMMENDATION FOR EMBEDMENT DEPTH OR AS SHOWN ON THE DRAWINGS. NO REBAR SHALL BE CUT WITHOUT PRIOR CONTRACTOR APPROVAL WHEN DRILLING HOLES IN CONCRETE. SPECIAL INSPECTIONS, REQUIRED BY GOVERNING CODES, SHALL BE PERFORMED IN ORDER TO MAINTAIN MANUFACTURER'S MAXIMUM ALLOWABLE LOADS. ALL EXPANSION/WEDGE ANCHORS SHALL BE STAINLESS STEEL OR HOT DIPPED GALVANIZED. EXPANSION BOLTS SHALL BE PROVIDED BY RAMSET/REDHEAD OR APPROVED EQUAL.
6. CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR ENGINEER REVIEW & APPROVAL ON PROJECTS REQUIRING STRUCTURAL STEEL.
7. ALL STRUCTURAL STEEL WORK SHALL BE DONE IN ACCORDANCE WITH AISC SPECIFICATIONS.

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.

T-Mobile
T–MOBILE NORTHEAST LLC
4 SYLVAN WAY
PARSIPPANY, NJ 07054

CROWN CASTLE

CROWN CASTLE
500 WEST CUMMINGS PARK, SUITE 3600
WOBURN, MA 01801

CT11251A
HRT 107(C) 943204

CONSTRUCTION DRAWINGS

0	04/01/15	ISSUED AS FINAL
B	03/26/15	REVISED PER COMMENTS
A	03/17/15	ISSUED FOR REVIEW

Dewberry
Dewberry Engineers Inc.
600 PARSIPPANY ROAD
SUITE 301
PARSIPPANY, NJ 07054
PHONE: 973.739.9400
FAX: 973.739.9710

STATE OF CONNECTICUT
JIANG YU
No. 0023222
LICENSED PROFESSIONAL ENGINEER
CONNECTICUT LICENSE NO. 0023222

DRAWN BY:	JC
REVIEWED BY:	BSH
CHECKED BY:	GHN
PROJECT NUMBER:	50066258
JOB NUMBER:	50071480
SITE ADDRESS:	

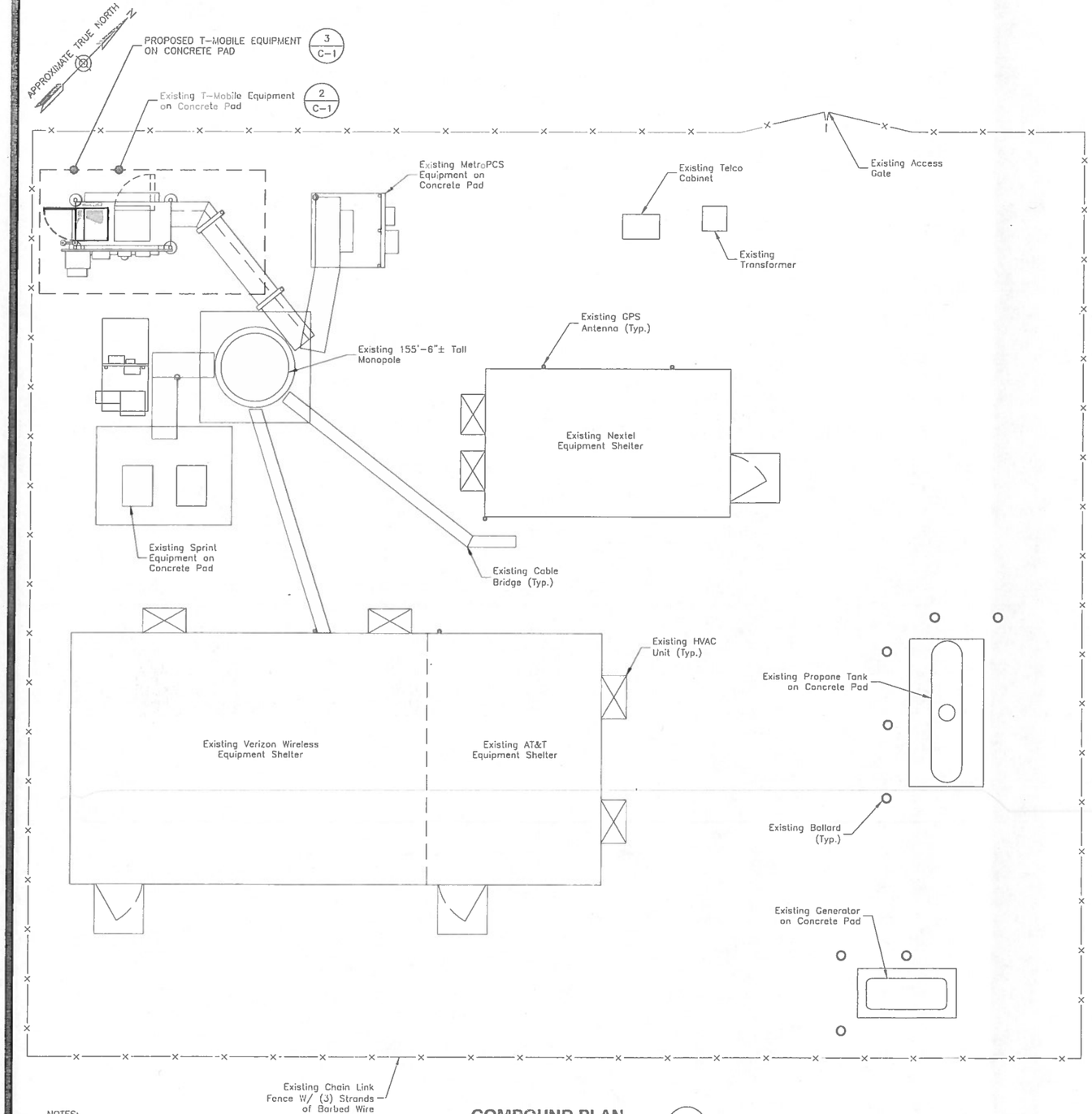
NORTH MAIN STREET
MARLBOROUGH, CT 06447
HARTFORD COUNTY

SHEET TITLE

GENERAL NOTES

SHEET NUMBER

G–1



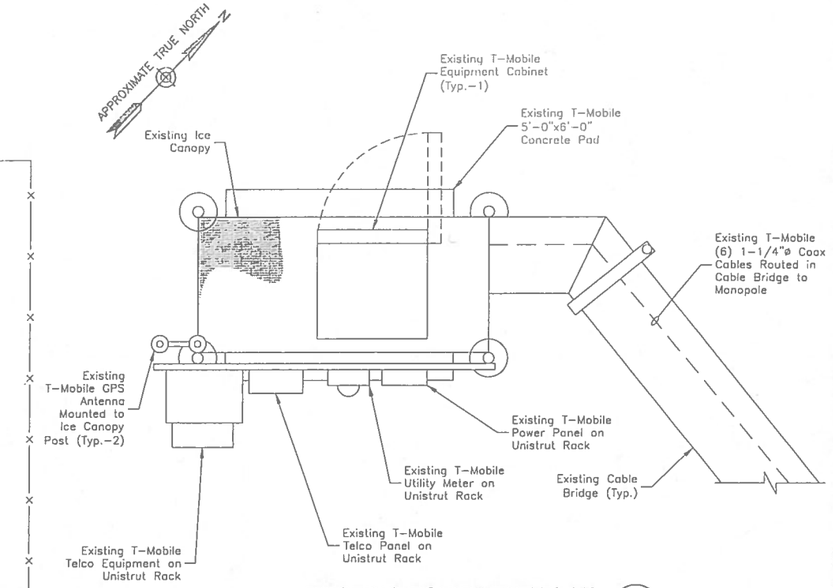
COMPOUND PLAN 1

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

0' 5' 10'

NOTES:

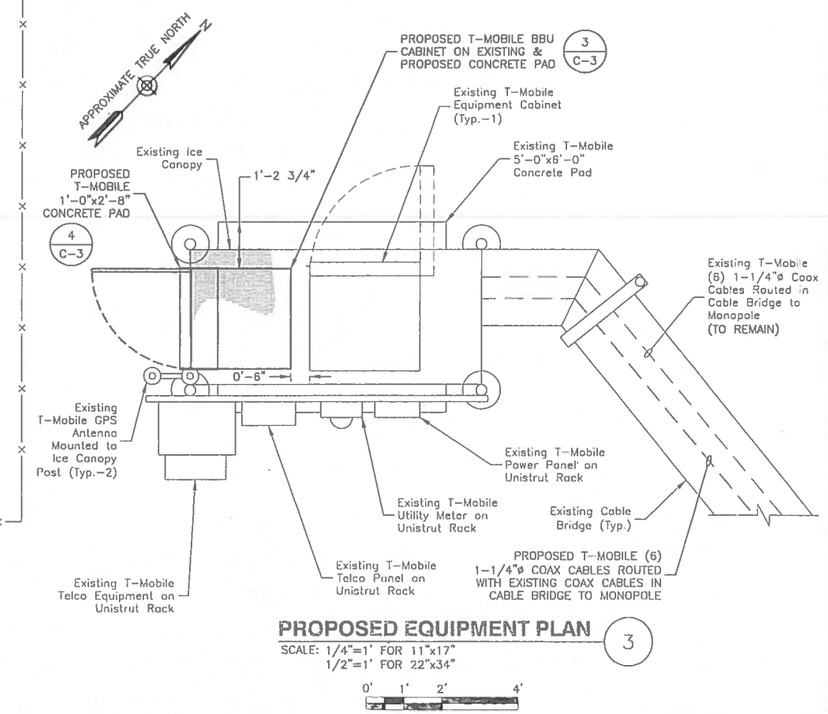
1. NORTH ARROW SHOWN AS APPROXIMATE.
2. NOT ALL INFORMATION IS SHOWN FOR CLARITY.
3. ALL PROPOSED EQUIPMENT, INCLUDING ANTENNAS, BIAS TEES, COAX, ETC., SHALL BE MOUNTED IN ACCORDANCE WITH THE TOWER STRUCTURAL ANALYSIS BY AERO SOLUTIONS, LLC DATED FEBRUARY 24, 2015.



EXISTING EQUIPMENT PLAN 2

SCALE: 1/4"=1' FOR 11"x17"
1/2"=1' FOR 22"x34"

0' 1' 2' 4'



PROPOSED EQUIPMENT PLAN 3

SCALE: 1/4"=1' FOR 11"x17"
1/2"=1' FOR 22"x34"

0' 1' 2' 4'

T-Mobile

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STATE OF CONNECTICUT
JIANG KE
23222
LICENSED PROFESSIONAL ENGINEER
CONNECTICUT LICENSE NO.

DRAWN BY:	JC
REVIEWED BY:	BSH
CHECKED BY:	GHN
PROJECT NUMBER:	50066258
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SITE ADDRESS:	

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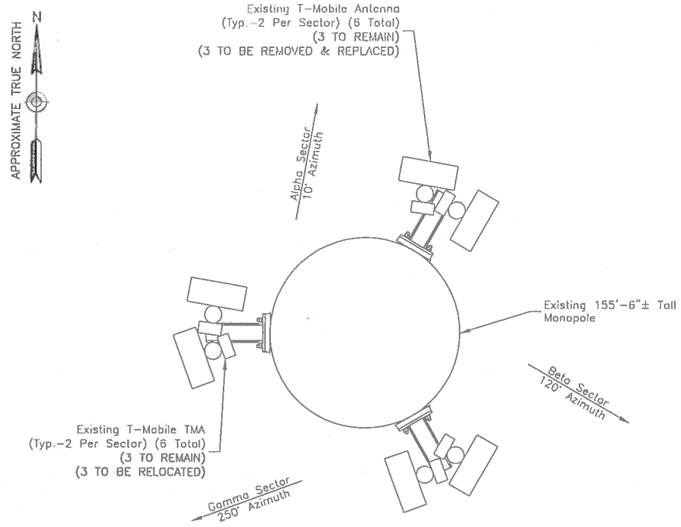
HARTFORD COUNTY

SHEET TITLE

COMPOUND PLAN & EQUIPMENT PLANS

SHEET NUMBER

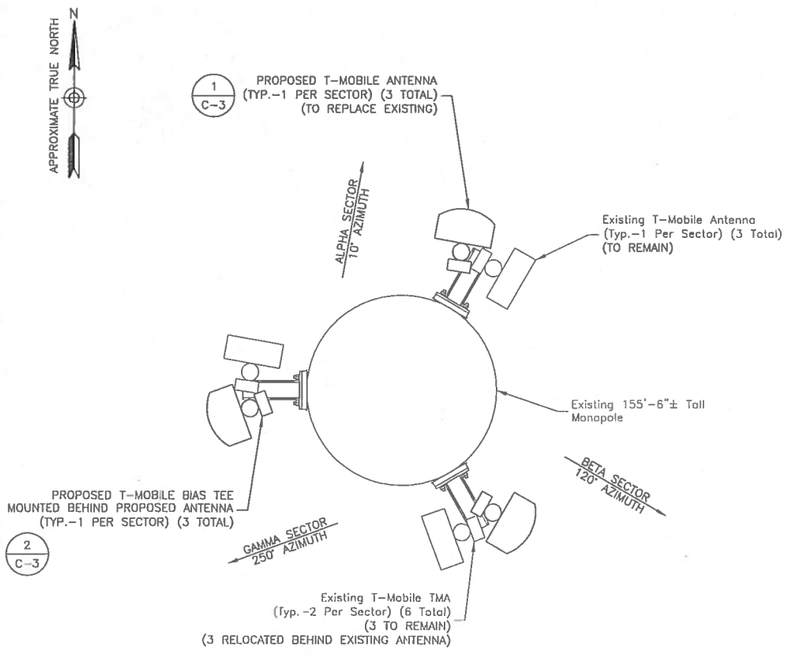
C-1



EXISTING ANTENNA LAYOUT

SCALE: N.T.S.

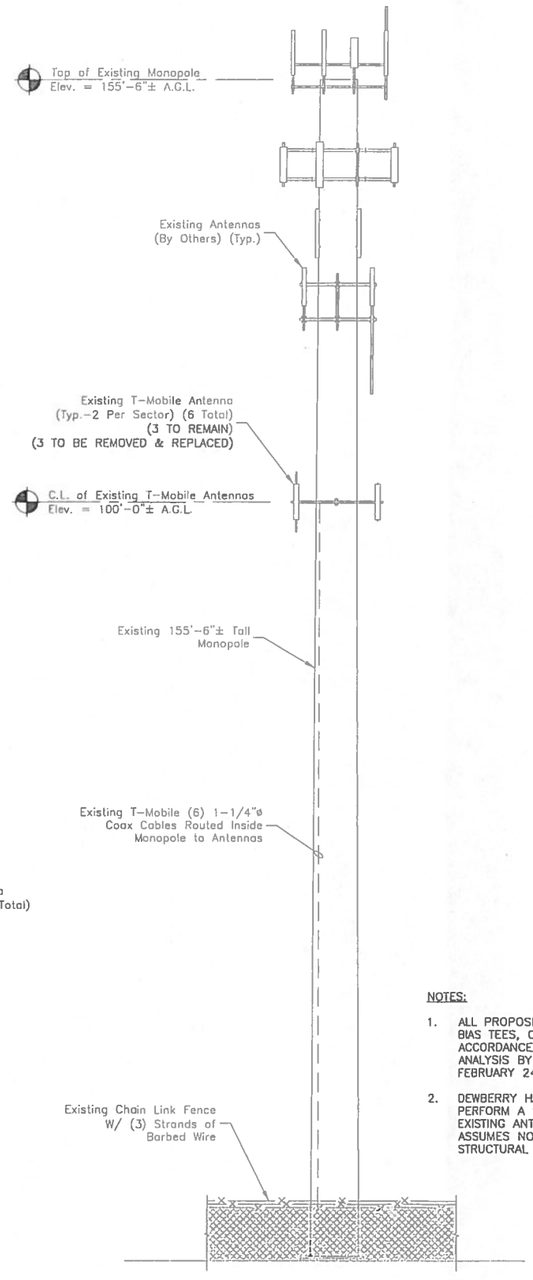
1



PROPOSED ANTENNA LAYOUT

SCALE: N.T.S.

2

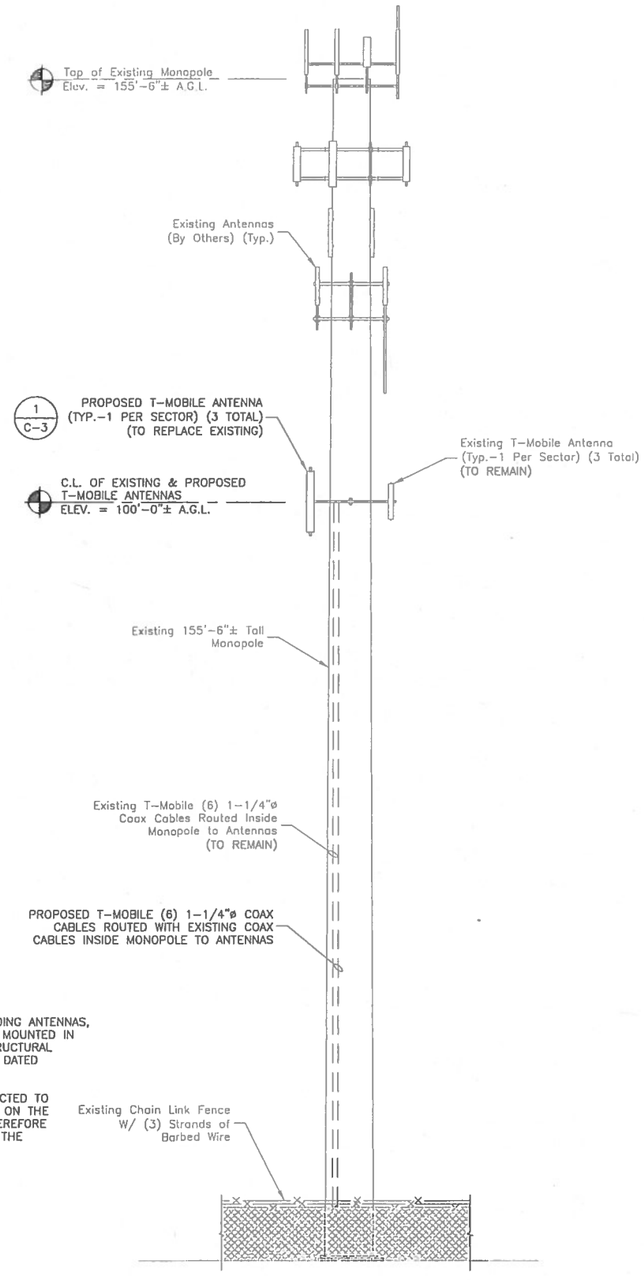


EXISTING ELEVATION

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

0' 10' 20'

3



PROPOSED ELEVATION

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

0' 10' 20'

4

NOTES:

1. ALL PROPOSED EQUIPMENT, INCLUDING ANTENNAS, BIAS TEES, COAX, ETC., SHALL BE MOUNTED IN ACCORDANCE WITH THE TOWER STRUCTURAL ANALYSIS BY AEROSOLUTIONS, LLC DATED FEBRUARY 24, 2015.
2. DEWBERRY HAS NOT BEEN CONTRACTED TO PERFORM A STRUCTURAL ANALYSIS ON THE EXISTING ANTENNA MOUNT AND THEREFORE ASSUMES NO RESPONSIBILITY FOR THE STRUCTURAL CAPACITY.

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DRAWN BY:	JC
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CHECKED BY:	GHN
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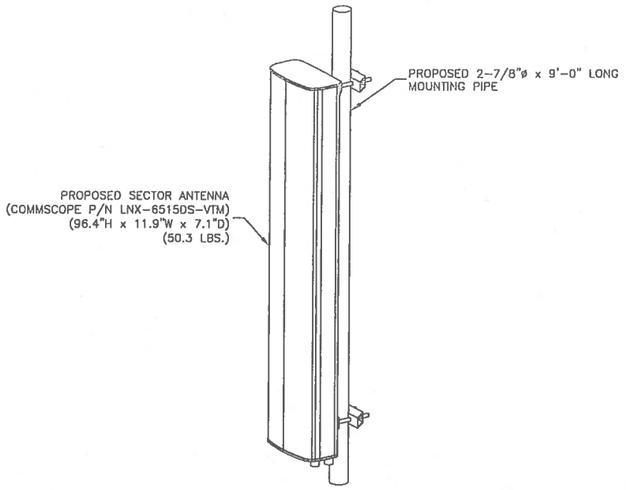
NORTH MAIN STREET
MARLBOROUGH, CT 06447
HARTFORD COUNTY

SHEET TITLE

ANTENNA LAYOUTS & ELEVATIONS

SHEET NUMBER

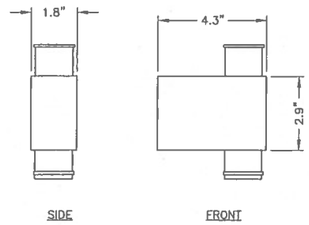
C-2



NOTES:

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.

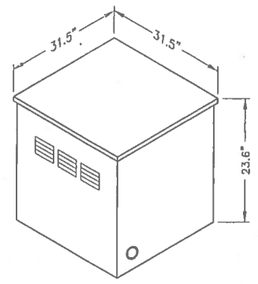


ANDREW AT&T-BOTTOM-24V

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.

BIAS TEE DETAIL 2
SCALE: N.T.S.



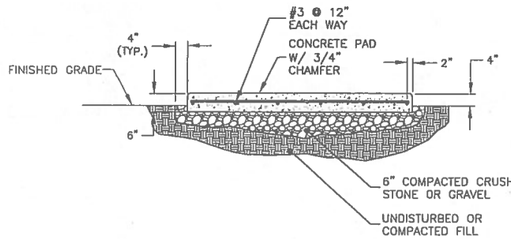
ALCATEL-LUCENT EZBFo BATTERY BACKUP SYSTEM

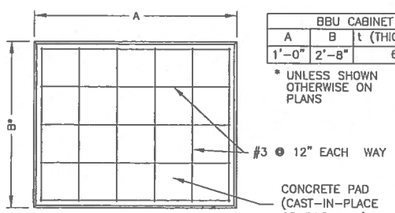
MATERIAL:	ANCHOR:
CONCRETE	3/8"ø HILTI KWIK BOLT 3 W/2-1/2" MIN. EMBED.
STRUCTURAL STEEL	1/2"ø STRUCTURAL BOLTS

NOTE:

1. CONTRACTOR SHALL ANCHOR CABINET IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS.

BBU CABINET DETAIL 3
SCALE: N.T.S.





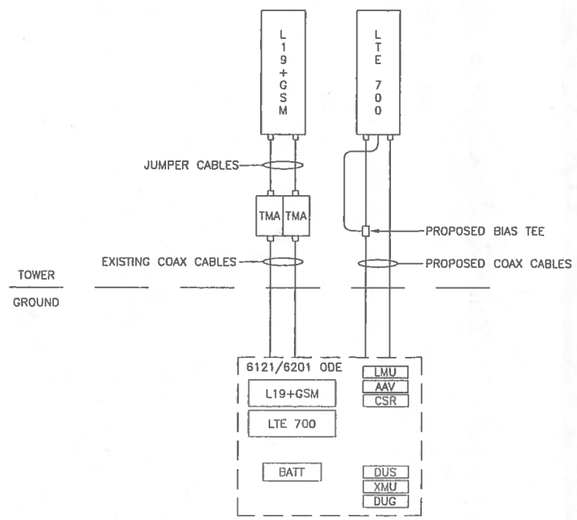
BBU CABINET		
A	B	t (THICKNESS)
1'-0"	2'-8"	6"

* UNLESS SHOWN OTHERWISE ON PLANS

NOTES:

1. USE GALVANIZED HILTI EXPANSION ANCHORS OR, APPROVED EQUAL, FOR EQUIPMENT ANCHORAGE.
2. VERIFY THE SIZE OF THE EMERGENCY GENERATOR WITH THE SUPPLIER.
3. FOR SIZE AND LOCATION OF ANCHORS AND OTHER REQUIREMENT, SEE EQUIPMENT VENDOR DRAWINGS.

OUTDOOR PAD FOR MINOR EQUIPMENT 4
SCALE: N.T.S.



SITE CONFIGURATION 704G 5
SCALE: N.T.S.

DESIGN CONFIGURATION

	ANTENNAS		COAX		COAX LENGTH
	EXISTING	PROPOSED	EXISTING	PROPOSED	
ALPHA	EMS RV90-17-00DP	EXISTING TO REMAIN	(2) 1-1/4"ø	(2) 1-1/4"ø	150'-0"
	EMS RV90-17-00DP	COMMSCOPE LNX-6515DS-VTM			
BETA	EMS RV90-17-00DP	EXISTING TO REMAIN	(2) 1-1/4"ø	(2) 1-1/4"ø	150'-0"
	EMS RV90-17-00DP	COMMSCOPE LNX-6515DS-VTM			
GAMMA	EMS RV90-17-00DP	EXISTING TO REMAIN	(2) 1-1/4"ø	(2) 1-1/4"ø	150'-0"
	EMS RV90-17-00DP	COMMSCOPE LNX-6515DS-VTM			

T-MOBILE NORTHEAST LLC
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PHONE: 973.739.9400
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NORTH MAIN STREET
MARLBOROUGH, CT 06447
HARTFORD COUNTY

SHEET TITLE

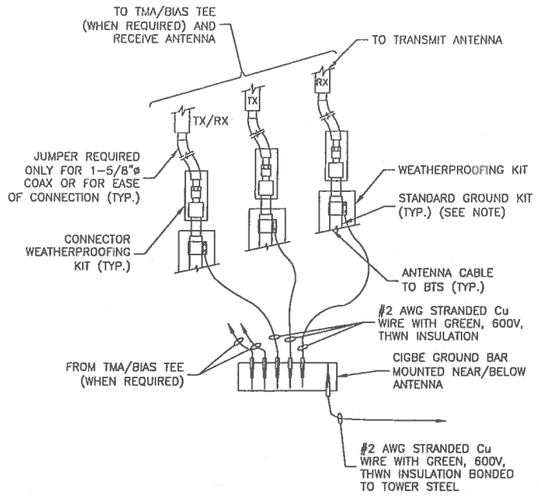
CONSTRUCTION DETAILS

SHEET NUMBER

C-3

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.

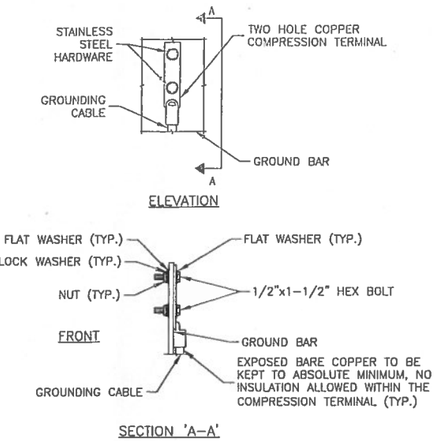


NOTE:

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.

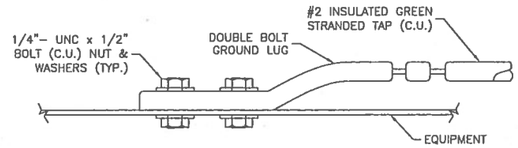


NOTES:

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

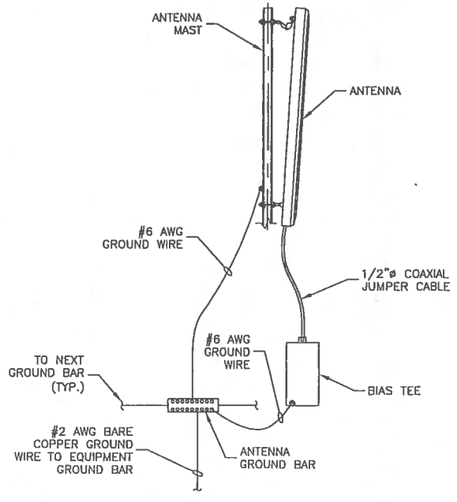
TYPICAL GROUND BAR MECHANICAL CONNECTION DETAIL 2

SCALE: N.T.S.



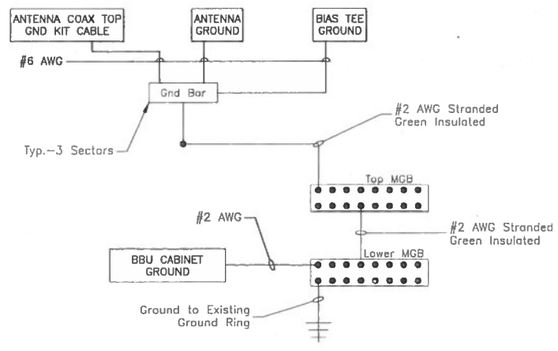
CONNECTION TO EQUIPMENT DETAIL 3

SCALE: N.T.S.



TYPICAL ANTENNA GROUNDING DETAIL 4

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.
4. VERIFY EXISTING GROUND SYSTEM IS INSTALLED PER T-MOBILE STANDARDS.

SCHEMATIC GROUNDING DIAGRAM 5

SCALE: N.T.S.

T-Mobile

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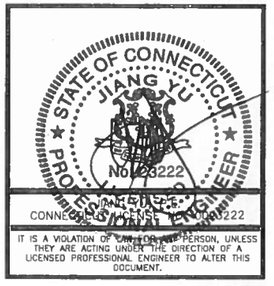

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MARLBOROUGH, CT 06447
HARTFORD COUNTY

SHEET TITLE

GROUNDING NOTES & DETAILS

SHEET NUMBER

E-1

Date: **February 24, 2015**

Darcy Tarr
Crown Castle
3530 Toringdon Way, Suite 300
Charlotte, NC 28277

Aero Solutions, LLC
5500 Flatiron Parkway, Suite 100
Boulder, CO 80301
720-381-2843

Subject: **Structural Analysis Report**

Carrier Designation:	***T-Mobile* Co-Locate**	
	Carrier Site Number:	CT11251A
	Carrier Site Name:	East Hampton-2_1
Crown Castle Designation:	**Crown Castle BU Number:**	806366
	Crown Castle Site Name:	HRT 107(C) 943204
	Crown Castle JDE Job Number:	324080
	Crown Castle Work Order Number:	1013467
	Crown Castle Application Number:	282528 Rev. 1
Engineering Firm Designation:	**Aero Solutions, LLC Project Number:**	003-15-0174
Site Data:	**NORTH MAIN STREET, MARLBOROUGH, Hartford County, CT** **Latitude *41° 37' 47.3"*, Longitude *-72° 27' 59.4"*** **155.5 Foot - Monopole Tower**	

Dear Darcy Tarr,

Aero Solutions, LLC is pleased to submit this **"Structural 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 758928, in accordance with application 282528, revision 1.

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:

LC7: Existing + Reserved + Proposed Equipment **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

This analysis has been performed in accordance with the TIA/EIA-222-F standard and 2005 CT State Building Code with 2009 amendment 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 attached drawings for the determined available structural capacity to be effective.

We at *Aero Solutions, LLC* 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: Benjamin Ude

Respectfully submitted by:

2.26.2015

Shraddha Dharia, P.E.
Structural Engineer
CT PE# PEN0028187
Expires: 1/31/2016

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 155.5 ft Monopole tower designed by FWT INC. in December of 1997. The tower was originally designed for a wind speed of 90 mph per TIA/EIA-222-F.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a fastest mile wind speed of 80 mph with no ice, 37.6 mph with 1.25 inch 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
100.0	100.0	3	commscope	ATBT-BOTTOM-24V	6	1-1/4	
		3	commscope	LNX-6515DS-VTM 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
158.0	162.0	6	rfs celwave	FD9R6004/2C-3L	15	1-5/8	1
	159.0	3	alcatel lucent	RRH2X60-AWS	2	1-5/8	2
		3	alcatel lucent	RRH2X60-PCS			
		6	commscope	HBXX-6517DS-A2M w/ Mount Pipe			
		3	commscope	LNX-6514DS-A1M w/ Mount Pipe			
		2	commscope	LNX-6514DS-AIM w/ Mount Pipe			
		1	commscope	LNX-8513DS-VTM w/ Mount Pipe			
		3	decibel	DB809K-Y			1
		2	rfs celwave	DB-T1-6Z-8AB-0Z			2
	158.0	1	tower mounts	Platform Mount [LP 1001-1]			1
144.0	144.0	6	ericsson	RRUS-11	1 2 12	3/8 3/4 1-1/4	1
		3	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			
		1	tower mounts	Platform Mount [LP 1001-1]			
	142.0	6	powerwave technologies	LGP 17201			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
		6	powerwave technologies	LGP21903			
135.0	135.0	3	kathrein	742 213 w/ Mount Pipe	6	1-1/4	1
126.0	128.0	6	decibel	DB980H90E-M w/ Mount Pipe	6	1-1/4	1
	127.0	1	tower mounts	T-Arm Mount [TA 602-3]			
	125.0	1	tower mounts	T-Arm Mount [TA 602-3]			
	120.0	3	decibel	DB809K-Y			
100.0	100.0	6	andrew	ETM19V2S12UB	6	1-1/4	1
		3	ems wireless	RV90-17-00DP w/ Mount Pipe			
		3	ems wireless	RV90-17-00DP w/ Mount Pipe			3
		1	tower mounts	Side Arm Mount [SO 104-3]			1

Notes:
1) Existing Equipment
2) Reserved Equipment
3) Equipment To Be Removed

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)
157.75	157.75	12	Swedcom	ALP-9212-N		
144.25	144.25	9	Swedcom	ALP-9212-N		
132	132	2	Celwave	PD1142		
		1	Celwave	PD201		
		2	Celwave	PD220		
		9	Decibel	DB980		

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	FDH Engineering, Inc.	2208816	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	FWT, Inc.	823125	CCISITES
4-TOWER MANUFACTURER DRAWINGS	FWT, Inc.	823126	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.

3.2) Assumptions

1) Tower and structures were built in accordance with the manufacturer's specifications.
2) The tower and structures 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 the referenced drawings.
4) When applicable, transmission cables are considered as structural components for calculating wind loads as allowed by TIA/EIA-222-F.

This analysis may be affected if any assumptions are not valid or have been made in error. Aero Solutions, LLC 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	155.5 - 110	Pole	TP64.606x58.6x0.375	1	-20.86	3194.44	17.0	Pass
L2	110 - 72.5	Pole	TP68.805x62.8x0.4375	2	-36.62	4260.83	31.7	Pass
L3	72.5 - 36	Pole	TP72.748x66.8082x0.5	3	-54.67	5424.19	41.8	Pass
L4	36 - 0	Pole	TP76.5x70.56x0.5	4	-78.69	5547.27	62.9	Pass
							Summary	
						Pole (L4)	62.9	Pass
						Rating =	62.9	Pass

Table 6 - Tower Component Stresses vs. Capacity – LC7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	62.3	Pass
1	Base Plate	0	30.9	Pass
1	Base Foundation	0	38.2	Pass
1	Base Foundation Soil Interaction	0	39.1	Pass

Structure Rating (max from all components) =	62.9%

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

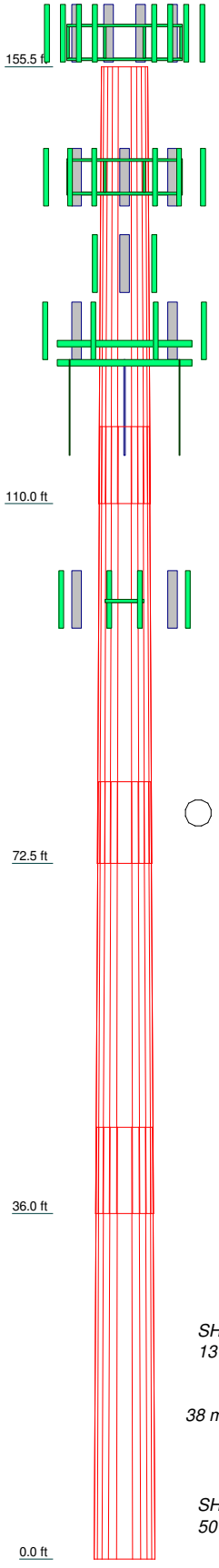
4.1) Recommendations

The tower and its foundation have sufficient capacity to carry the existing, reserved, and proposed loads. No modifications are required at this time.

APPENDIX A

TNXTOWER OUTPUT

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	45.50	12	0.3750	8.00	58.6000	64.6060	A572-65	11.4
2	45.50	12	0.4375	8.50	62.8000	68.8050		14.3
3	45.00	12	0.5000	9.00	66.8082	72.7480		17.1
4	45.00	12	0.5000		70.5600	76.5000		18.0
								60.8



AXIAL
115 K
SHEAR
13 K
MOMENT
1526 kip-ft
TORQUE 1 kip-ft
38 mph WIND - 1.2500 in ICE
AXIAL
79 K
SHEAR
50 K
MOMENT
5285 kip-ft
TORQUE 1 kip-ft
REACTIONS - 80 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
DB809K-Y	158	(2) 7770.00 w/ Mount Pipe	144
(2) FD9R6004/2C-3L	158	(2) LGP 17201	144
(2) HBXX-6517DS-A2M w/ Mount Pipe	158	(2) LGP21903	144
LNX-6514DS-A1M w/ Mount Pipe	158	(2) RRUS-11	144
LNX-8513DS-VTM w/ Mount Pipe	158	AM-X-CD-16-65-00T-RET w/ Mount Pipe	144
RRH2X60-AWS	158		
RRH2X60-PCS	158	Platform Mount [LP 1001-1]	144
(2) DB-T1-6Z-8AB-0Z	158	(2) 6' x 2" Mount Pipe	144
DB809K-Y	158	(2) 6' x 2" Mount Pipe	144
(2) FD9R6004/2C-3L	158	(2) 6' x 2" Mount Pipe	144
(2) HBXX-6517DS-A2M w/ Mount Pipe	158	742 213 w/ Mount Pipe	135
LNX-6514DS-A1M w/ Mount Pipe	158	742 213 w/ Mount Pipe	135
LNX-6514DS-AIM w/ Mount Pipe	158	742 213 w/ Mount Pipe	135
RRH2X60-AWS	158	DB809K-Y	126
RRH2X60-PCS	158	DB809K-Y	126
DB809K-Y	158	DB809K-Y	126
(2) FD9R6004/2C-3L	158	(2) DB980H90E-M w/ Mount Pipe	126
(2) HBXX-6517DS-A2M w/ Mount Pipe	158	(2) DB980H90E-M w/ Mount Pipe	126
LNX-6514DS-A1M w/ Mount Pipe	158	(2) DB980H90E-M w/ Mount Pipe	126
LNX-6514DS-AIM w/ Mount Pipe	158	T-Arm Mount [TA 602-3]	126
RRH2X60-AWS	158	T-Arm Mount [TA 602-3]	126
RRH2X60-PCS	158	6' x 2" Mount Pipe	126
Platform Mount [LP 1001-1]	158	6' x 2" Mount Pipe	126
(2) 6' x 2" Mount Pipe	158	6' x 2" Mount Pipe	126
(2) 6' x 2" Mount Pipe	158	(2) ETM19V2S12UB	100
(2) 6' x 2" Mount Pipe	158	RV90-17-00DP w/ Mount Pipe	100
(2) 7770.00 w/ Mount Pipe	144	ATBT-BOTTOM-24V	100
(2) LGP 17201	144	LNX-6515DS-VTM w/ Mount Pipe	100
(2) LGP21903	144	(2) ETM19V2S12UB	100
(2) RRUS-11	144	RV90-17-00DP w/ Mount Pipe	100
AM-X-CD-16-65-00T-RET w/ Mount Pipe	144	ATBT-BOTTOM-24V	100
		LNX-6515DS-VTM w/ Mount Pipe	100
DC6-48-60-18-8F	144	(2) ETM19V2S12UB	100
(2) 7770.00 w/ Mount Pipe	144	RV90-17-00DP w/ Mount Pipe	100
(2) LGP 17201	144	ATBT-BOTTOM-24V	100
(2) LGP21903	144	LNX-6515DS-VTM w/ Mount Pipe	100
(2) RRUS-11	144	Side Arm Mount [SO 104-3]	100
AM-X-CD-16-65-00T-RET w/ Mount Pipe	144		

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 1.25 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 62.9%

Aero Solutions, LLC
5500 Flatiron Parkway, Suite 100
Boulder, CO 80301
Phone: 720-381-2843
FAX: 720-304-6883

Job: ***BU# 806366 HRT 107-C-943204***			
Project: ***Existing 155.5' Monopole***			
Client: Crown Castle	Drawn by: Benjamin Ude	App'd:	
Code: TIA/EIA-222-F	Date: 02/24/15	Scale: NTS	
Path: P:\004_CCI_SITES\806366 HRT 107-C- 943204\003-15-0174\Engineering\Aero Calculations\Working RISA\806366 HRT 107-C- 943204.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:

4) Tower is located in Hartford County, Connecticut.
5) Basic wind speed of 80 mph.
6) Nominal ice thickness of 1.2500 in.
7) Ice thickness is considered to increase with height.
8) Ice density of 56 pcf.
9) A wind speed of 38 mph is used in combination with ice.
10) Temperature drop of 50 °F.
11) Deflections calculated using a wind speed of 50 mph.
12) A non-linear (P-delta) analysis was used.
13) Pressures are calculated at each section.
14) Stress ratio used in pole design is 1.333.
15) 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	155.50-110.00	45.50	8.00	12	58.6000	64.6060	0.3750	1.5000	A572-65 (65 ksi)
L2	110.00-72.50	45.50	8.50	12	62.8000	68.8050	0.4375	1.7500	A572-65 (65 ksi)
L3	72.50-36.00	45.00	9.00	12	66.8082	72.7480	0.5000	2.0000	A572-65 (65 ksi)
L4	36.00-0.00	45.00		12	70.5600	76.5000	0.5000	2.0000	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

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	60.6672	70.3067	30422.9680	20.8446	30.3548	1002.2457	61645.1813	34.6028	14.6998	39.199
	66.8851	77.5589	40842.0131	22.9947	33.4659	1220.4065	82756.9913	38.1721	16.3094	43.492
L2	66.1084	87.8532	43610.4361	22.3258	32.5304	1340.6056	88366.5670	43.2387	15.6579	35.789
	71.2322	96.3127	57460.4440	24.4756	35.6410	1612.2011	116430.4378	47.4022	17.2672	39.468
L3	70.3265	106.7562	59911.9268	23.7383	34.6066	1731.2263	121397.8066	52.5421	16.5646	33.129
	75.3143	116.3193	77497.7893	25.8648	37.6835	2056.5463	157031.5318	57.2488	18.1565	36.313
L4	74.2790	112.7967	70668.0184	25.0815	36.5501	1933.4563	143192.5643	55.5151	17.5701	35.14
	79.1986	122.3600	90209.5680	27.2080	39.6270	2276.4673	182789.0418	60.2219	19.1620	38.324

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 155.50-110.00				1	1	1		
L2 110.00-72.50				1	1	1		
L3 72.50-36.00				1	1	1		
L4 36.00-0.00				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
561(1-5/8")	C	No	Inside Pole	155.50 - 0.00	12	No Ice	0.00	1.35
						1/2" Ice	0.00	1.35
						1" Ice	0.00	1.35
						2" Ice	0.00	1.35
						4" Ice	0.00	1.35
LDF7-50A(1-5/8")	B	No	Inside Pole	155.50 - 0.00	3	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
						2" Ice	0.00	0.82
						4" Ice	0.00	0.82
HB158-1-08U8-S8J18(1-5/8)	C	No	Inside Pole	155.50 - 0.00	2	No Ice	0.00	1.30
						1/2" Ice	0.00	1.30
						1" Ice	0.00	1.30
						2" Ice	0.00	1.30
						4" Ice	0.00	1.30
***								
UCF114-50JA(1 1/4")	B	No	Inside Pole	144.00 - 0.00	12	No Ice	0.00	0.55
						1/2" Ice	0.00	0.55
						1" Ice	0.00	0.55
						2" Ice	0.00	0.55

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
						4" Ice	0.00	0.55
FB-L98B-002-75000(3/8")	B	No	Inside Pole	144.00 - 0.00	1	No Ice	0.00	0.06
						1/2" Ice	0.00	0.06
						1" Ice	0.00	0.06
						2" Ice	0.00	0.06
						4" Ice	0.00	0.06
WR-VG86ST-BRD(3/4)	B	No	Inside Pole	144.00 - 0.00	2	No Ice	0.00	0.58
						1/2" Ice	0.00	0.58
						1" Ice	0.00	0.58
						2" Ice	0.00	0.58
						4" Ice	0.00	0.58
2" Conduit	B	No	Inside Pole	144.00 - 0.00	1	No Ice	0.00	2.80
						1/2" Ice	0.00	2.80
						1" Ice	0.00	2.80
						2" Ice	0.00	2.80
						4" Ice	0.00	2.80
***								
AVA6-50(1-1/4")	A	No	Inside Pole	135.00 - 0.00	6	No Ice	0.00	0.45
						1/2" Ice	0.00	0.45
						1" Ice	0.00	0.45
						2" Ice	0.00	0.45
						4" Ice	0.00	0.45
***								
LDF6-50A(1-1/4")	C	No	Inside Pole	126.00 - 0.00	6	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
						1" Ice	0.00	0.66
						2" Ice	0.00	0.66
						4" Ice	0.00	0.66
***								
LDF6-50A(1-1/4")	A	No	Inside Pole	100.00 - 0.00	6	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
						1" Ice	0.00	0.66
						2" Ice	0.00	0.66
						4" Ice	0.00	0.66
AVA6-50(1-1/4")	A	No	Inside Pole	100.00 - 0.00	6	No Ice	0.00	0.45
						1/2" Ice	0.00	0.45
						1" Ice	0.00	0.45
						2" Ice	0.00	0.45
						4" Ice	0.00	0.45
***								

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	155.50-110.00	A	0.000	0.000	0.000	0.000	0.07
		B	0.000	0.000	0.000	0.000	0.47
		C	0.000	0.000	0.000	0.000	0.92
L2	110.00-72.50	A	0.000	0.000	0.000	0.000	0.28
		B	0.000	0.000	0.000	0.000	0.49
		C	0.000	0.000	0.000	0.000	0.85
L3	72.50-36.00	A	0.000	0.000	0.000	0.000	0.34
		B	0.000	0.000	0.000	0.000	0.48
		C	0.000	0.000	0.000	0.000	0.83
L4	36.00-0.00	A	0.000	0.000	0.000	0.000	0.34
		B	0.000	0.000	0.000	0.000	0.47
		C	0.000	0.000	0.000	0.000	0.82

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	155.50-110.00	A	1.477	0.000	0.000	0.000	0.000	0.07
		B		0.000	0.000	0.000	0.000	0.47
		C		0.000	0.000	0.000	0.000	0.92
L2	110.00-72.50	A	1.412	0.000	0.000	0.000	0.000	0.28
		B		0.000	0.000	0.000	0.000	0.49
		C		0.000	0.000	0.000	0.000	0.85
L3	72.50-36.00	A	1.328	0.000	0.000	0.000	0.000	0.34
		B		0.000	0.000	0.000	0.000	0.48
		C		0.000	0.000	0.000	0.000	0.83
L4	36.00-0.00	A	1.250	0.000	0.000	0.000	0.000	0.34
		B		0.000	0.000	0.000	0.000	0.47
		C		0.000	0.000	0.000	0.000	0.82

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	155.50-110.00	0.0000	0.0000	0.0000	0.0000
L2	110.00-72.50	0.0000	0.0000	0.0000	0.0000
L3	72.50-36.00	0.0000	0.0000	0.0000	0.0000
L4	36.00-0.00	0.0000	0.0000	0.0000	0.0000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
***									
DB809K-Y	A	From Leg	4.00 0.00 1.00	0.0000	158.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.85 4.03 5.21 7.17 10.06	2.85 4.03 5.21 7.17 10.06	0.03 0.05 0.08 0.16 0.42
(2) FD9R6004/2C-3L	A	From Leg	4.00 0.00 4.00	0.0000	158.00	No Ice 1/2" Ice Ice 1" Ice 2" Ice 4" Ice	0.37 0.45 0.54 0.75 1.28	0.08 0.14 0.20 0.34 0.74	0.00 0.01 0.01 0.02 0.06
(2) HBXX-6517DS-A2M w/ Mount Pipe	A	From Leg	4.00 0.00 1.00	0.0000	158.00	No Ice 1/2" Ice Ice 1" Ice 2" Ice 4" Ice	8.98 9.65 10.29 11.59 14.32	6.96 8.18 9.14 11.02 15.03	0.07 0.14 0.21 0.40 0.91
LNX-6514DS-A1M w/ Mount Pipe	A	From Leg	4.00 0.00 1.00	0.0000	158.00	No Ice 1/2" Ice Ice 1" Ice 2" Ice 4" Ice	8.65 9.31 9.93 11.20 13.87	7.08 8.27 9.18 11.02 15.06	0.06 0.13 0.21 0.39 0.90
LNX-8513DS-VTM w/ Mount Pipe	A	From Leg	4.00 0.00 1.00	0.0000	158.00	No Ice 1/2" Ice Ice 1" Ice	8.65 9.31 9.93 11.20	7.08 8.27 9.18 11.02	0.06 0.13 0.21 0.39

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" Ice 4" Ice	13.87	15.06	0.90
RRH2X60-AWS	A	From Leg	4.00 0.00 1.00	0.0000	158.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.96 4.27 4.60 5.27 6.72	1.82 2.08 2.36 2.96 4.25	0.06 0.08 0.11 0.17 0.35
RRH2X60-PCS	A	From Leg	4.00 0.00 1.00	0.0000	158.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.57 2.79 3.02 3.52 4.61	2.01 2.22 2.43 2.89 3.92	0.06 0.08 0.10 0.16 0.31
(2) DB-T1-6Z-8AB-0Z	A	From Leg	4.00 0.00 1.00	0.0000	158.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.60 5.92 6.24 6.91 8.37	2.33 2.56 2.79 3.28 4.37	0.04 0.08 0.12 0.21 0.45
DB809K-Y	B	From Leg	4.00 0.00 1.00	30.0000	158.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.85 4.03 5.21 7.17 10.06	2.85 4.03 5.21 7.17 10.06	0.03 0.05 0.08 0.16 0.42
(2) FD9R6004/2C-3L	B	From Leg	4.00 0.00 4.00	20.0000	158.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.37 0.45 0.54 0.75 1.28	0.08 0.14 0.20 0.34 0.74	0.00 0.01 0.01 0.02 0.06
(2) HBXX-6517DS-A2M w/ Mount Pipe	B	From Leg	4.00 0.00 1.00	20.0000	158.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.98 9.65 10.29 11.59 14.32	6.96 8.18 9.14 11.02 15.03	0.07 0.14 0.21 0.40 0.91
LNX-6514DS-A1M w/ Mount Pipe	B	From Leg	4.00 0.00 1.00	20.0000	158.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.65 9.31 9.93 11.20 13.87	7.08 8.27 9.18 11.02 15.06	0.06 0.13 0.21 0.39 0.90
LNX-6514DS-AIM w/ Mount Pipe	B	From Leg	4.00 0.00 1.00	20.0000	158.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.65 9.31 9.93 11.20 13.87	7.08 8.27 9.18 11.02 15.06	0.06 0.13 0.21 0.39 0.90
RRH2X60-AWS	B	From Leg	4.00 0.00 1.00	20.0000	158.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.96 4.27 4.60 5.27 6.72	1.82 2.08 2.36 2.96 4.25	0.06 0.08 0.11 0.17 0.35
RRH2X60-PCS	B	From Leg	4.00 0.00 1.00	20.0000	158.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.57 2.79 3.02 3.52 4.61	2.01 2.22 2.43 2.89 3.92	0.06 0.08 0.10 0.16 0.31
DB809K-Y	C	From Leg	4.00 0.00 1.00	30.0000	158.00	No Ice 1/2" Ice	2.85 4.03 5.21	2.85 4.03 5.21	0.03 0.05 0.08

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
						1" Ice	7.17	7.17	0.16
						2" Ice	10.06	10.06	0.42
						4" Ice			
(2) FD9R6004/2C-3L	C	From Leg	4.00	10.0000	158.00	No Ice	0.37	0.08	0.00
			0.00			1/2"	0.45	0.14	0.01
			4.00			Ice	0.54	0.20	0.01
						1" Ice	0.75	0.34	0.02
						2" Ice	1.28	0.74	0.06
						4" Ice			
(2) HBXX-6517DS-A2M w/ Mount Pipe	C	From Leg	4.00	10.0000	158.00	No Ice	8.98	6.96	0.07
			0.00			1/2"	9.65	8.18	0.14
			1.00			Ice	10.29	9.14	0.21
						1" Ice	11.59	11.02	0.40
						2" Ice	14.32	15.03	0.91
						4" Ice			
LNX-6514DS-A1M w/ Mount Pipe	C	From Leg	4.00	10.0000	158.00	No Ice	8.65	7.08	0.06
			0.00			1/2"	9.31	8.27	0.13
			1.00			Ice	9.93	9.18	0.21
						1" Ice	11.20	11.02	0.39
						2" Ice	13.87	15.06	0.90
						4" Ice			
LNX-6514DS-AIM w/ Mount Pipe	C	From Leg	4.00	10.0000	158.00	No Ice	8.65	7.08	0.06
			0.00			1/2"	9.31	8.27	0.13
			1.00			Ice	9.93	9.18	0.21
						1" Ice	11.20	11.02	0.39
						2" Ice	13.87	15.06	0.90
						4" Ice			
RRH2X60-AWS	C	From Leg	4.00	10.0000	158.00	No Ice	3.96	1.82	0.06
			0.00			1/2"	4.27	2.08	0.08
			1.00			Ice	4.60	2.36	0.11
						1" Ice	5.27	2.96	0.17
						2" Ice	6.72	4.25	0.35
						4" Ice			
RRH2X60-PCS	C	From Leg	4.00	10.0000	158.00	No Ice	2.57	2.01	0.06
			0.00			1/2"	2.79	2.22	0.08
			1.00			Ice	3.02	2.43	0.10
						1" Ice	3.52	2.89	0.16
						2" Ice	4.61	3.92	0.31
						4" Ice			
Platform Mount [LP 1001-1]	C	None		0.0000	158.00	No Ice	47.70	47.70	3.02
						1/2"	59.50	59.50	3.62
						Ice	71.30	71.30	4.22
						1" Ice	94.90	94.90	5.43
						2" Ice	142.10	142.10	7.85
						4" Ice			
(2) 6' x 2" Mount Pipe	A	From Leg	4.00	0.0000	158.00	No Ice	1.43	1.43	0.02
			0.00			1/2"	1.92	1.92	0.03
			0.00			Ice	2.29	2.29	0.05
						1" Ice	3.06	3.06	0.09
						2" Ice	4.70	4.70	0.23
						4" Ice			
(2) 6' x 2" Mount Pipe	B	From Leg	4.00	0.0000	158.00	No Ice	1.43	1.43	0.02
			0.00			1/2"	1.92	1.92	0.03
			0.00			Ice	2.29	2.29	0.05
						1" Ice	3.06	3.06	0.09
						2" Ice	4.70	4.70	0.23
						4" Ice			
(2) 6' x 2" Mount Pipe	C	From Leg	4.00	0.0000	158.00	No Ice	1.43	1.43	0.02
			0.00			1/2"	1.92	1.92	0.03
			0.00			Ice	2.29	2.29	0.05
						1" Ice	3.06	3.06	0.09
						2" Ice	4.70	4.70	0.23
						4" Ice			
***									
(2) 7770.00 w/ Mount Pipe	A	From Leg	4.00	6.0000	144.00	No Ice	6.12	4.25	0.06

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
			0.00			1/2"	6.63	5.01	0.10
			0.00			Ice	7.13	5.71	0.16
						1" Ice	8.16	7.16	0.29
						2" Ice	10.36	10.41	0.66
						4" Ice			
(2) LGP 17201	A	From Leg	4.00	6.0000	144.00	No Ice	1.95	0.52	0.03
			0.00			1/2"	2.13	0.64	0.04
			-2.00			Ice	2.33	0.77	0.06
						1" Ice	2.75	1.06	0.09
						2" Ice	3.69	1.73	0.19
						4" Ice			
(2) LGP21903	A	From Leg	4.00	6.0000	144.00	No Ice	0.27	0.18	0.01
			0.00			1/2"	0.34	0.25	0.01
			-2.00			Ice	0.43	0.32	0.02
						1" Ice	0.62	0.49	0.03
						2" Ice	1.10	0.94	0.07
						4" Ice			
(2) RRUS-11	A	From Leg	4.00	6.0000	144.00	No Ice	2.94	1.25	0.06
			0.00			1/2"	3.17	1.41	0.07
			0.00			Ice	3.41	1.59	0.10
						1" Ice	3.91	1.96	0.15
						2" Ice	5.02	2.82	0.30
						4" Ice			
AM-X-CD-16-65-00T-RET w/ Mount Pipe	A	From Leg	4.00	6.0000	144.00	No Ice	8.50	6.30	0.07
			0.00			1/2"	9.15	7.48	0.14
			0.00			Ice	9.77	8.37	0.21
						1" Ice	11.03	10.18	0.38
						2" Ice	13.68	14.02	0.87
						4" Ice			
DC6-48-60-18-8F	A	From Leg	4.00	6.0000	144.00	No Ice	2.57	2.57	0.03
			0.00			1/2"	2.80	2.80	0.06
			0.00			Ice	3.04	3.04	0.08
						1" Ice	3.54	3.54	0.14
						2" Ice	4.66	4.66	0.31
						4" Ice			
(2) 7770.00 w/ Mount Pipe	B	From Leg	4.00	-1.0000	144.00	No Ice	6.12	4.25	0.06
			0.00			1/2"	6.63	5.01	0.10
			0.00			Ice	7.13	5.71	0.16
						1" Ice	8.16	7.16	0.29
						2" Ice	10.36	10.41	0.66
						4" Ice			
(2) LGP 17201	B	From Leg	4.00	-1.0000	144.00	No Ice	1.95	0.52	0.03
			0.00			1/2"	2.13	0.64	0.04
			-2.00			Ice	2.33	0.77	0.06
						1" Ice	2.75	1.06	0.09
						2" Ice	3.69	1.73	0.19
						4" Ice			
(2) LGP21903	B	From Leg	4.00	-1.0000	144.00	No Ice	0.27	0.18	0.01
			0.00			1/2"	0.34	0.25	0.01
			-2.00			Ice	0.43	0.32	0.02
						1" Ice	0.62	0.49	0.03
						2" Ice	1.10	0.94	0.07
						4" Ice			
(2) RRUS-11	B	From Leg	4.00	-1.0000	144.00	No Ice	2.94	1.25	0.06
			0.00			1/2"	3.17	1.41	0.07
			0.00			Ice	3.41	1.59	0.10
						1" Ice	3.91	1.96	0.15
						2" Ice	5.02	2.82	0.30
						4" Ice			
AM-X-CD-16-65-00T-RET w/ Mount Pipe	B	From Leg	4.00	-1.0000	144.00	No Ice	8.50	6.30	0.07
			0.00			1/2"	9.15	7.48	0.14
			0.00			Ice	9.77	8.37	0.21
						1" Ice	11.03	10.18	0.38
						2" Ice	13.68	14.02	0.87
						4" Ice			

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) 7770.00 w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	10.0000	144.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.12 6.63 7.13 8.16 10.36	4.25 5.01 5.71 7.16 10.41	0.06 0.10 0.16 0.29 0.66
(2) LGP 17201	C	From Leg	4.00 0.00 -2.00	10.0000	144.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.95 2.13 2.33 2.75 3.69	0.52 0.64 0.77 1.06 1.73	0.03 0.04 0.06 0.09 0.19
(2) LGP21903	C	From Leg	4.00 0.00 -2.00	10.0000	144.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.27 0.34 0.43 0.62 1.10	0.18 0.25 0.32 0.49 0.94	0.01 0.01 0.02 0.03 0.07
(2) RRUS-11	C	From Leg	4.00 0.00 0.00	10.0000	144.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.94 3.17 3.41 3.91 5.02	1.25 1.41 1.59 1.96 2.82	0.06 0.07 0.10 0.15 0.30
AM-X-CD-16-65-00T-RET w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	10.0000	144.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.50 9.15 9.77 11.03 13.68	6.30 7.48 8.37 10.18 14.02	0.07 0.14 0.21 0.38 0.87
Platform Mount [LP 1001-1]	C	None		0.0000	144.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	47.70 59.50 71.30 94.90 142.10	47.70 59.50 71.30 94.90 142.10	3.02 3.62 4.22 5.43 7.85
(2) 6' x 2" Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	144.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.43 1.92 2.29 3.06 4.70	1.43 1.92 2.29 3.06 4.70	0.02 0.03 0.05 0.09 0.23
(2) 6' x 2" Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	144.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.43 1.92 2.29 3.06 4.70	1.43 1.92 2.29 3.06 4.70	0.02 0.03 0.05 0.09 0.23
(2) 6' x 2" Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	144.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.43 1.92 2.29 3.06 4.70	1.43 1.92 2.29 3.06 4.70	0.02 0.03 0.05 0.09 0.23
***									
742 213 w/ Mount Pipe	A	From Leg	1.00 0.00 0.00	30.0000	135.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.37 5.95 6.50 7.61 9.93	4.62 6.00 6.98 8.85 12.79	0.05 0.09 0.15 0.28 0.68
742 213 w/ Mount Pipe	B	From Leg	1.00 0.00 0.00	30.0000	135.00	No Ice 1/2" Ice 1" Ice	5.37 5.95 6.50 7.61	4.62 6.00 6.98 8.85	0.05 0.09 0.15 0.28

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" Ice	9.93	12.79	0.68
						4" Ice			
742 213 w/ Mount Pipe	C	From Leg	1.00 0.00 0.00	30.0000	135.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.37 5.95 6.50 7.61 9.93	4.62 6.00 6.98 8.85 12.79	0.05 0.09 0.15 0.28 0.68
***									
DB809K-Y	A	From Leg	4.00 0.00 -6.00	0.0000	126.00	No Ice 1/2" Ice Ice 1" Ice 2" Ice 4" Ice	2.85 4.03 5.21 7.17 10.06	2.85 4.03 5.21 7.17 10.06	0.03 0.05 0.08 0.16 0.42
DB809K-Y	B	From Leg	4.00 0.00 -6.00	0.0000	126.00	No Ice 1/2" Ice Ice 1" Ice 2" Ice 4" Ice	2.85 4.03 5.21 7.17 10.06	2.85 4.03 5.21 7.17 10.06	0.03 0.05 0.08 0.16 0.42
DB809K-Y	C	From Leg	4.00 0.00 -6.00	0.0000	126.00	No Ice 1/2" Ice Ice 1" Ice 2" Ice 4" Ice	2.85 4.03 5.21 7.17 10.06	2.85 4.03 5.21 7.17 10.06	0.03 0.05 0.08 0.16 0.42
(2) DB980H90E-M w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.0000	126.00	No Ice 1/2" Ice Ice 1" Ice 2" Ice 4" Ice	4.04 4.50 4.95 5.87 8.05	3.62 4.48 5.22 6.74 10.00	0.03 0.07 0.11 0.22 0.55
(2) DB980H90E-M w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	0.0000	126.00	No Ice 1/2" Ice Ice 1" Ice 2" Ice 4" Ice	4.04 4.50 4.95 5.87 8.05	3.62 4.48 5.22 6.74 10.00	0.03 0.07 0.11 0.22 0.55
(2) DB980H90E-M w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.0000	126.00	No Ice 1/2" Ice Ice 1" Ice 2" Ice 4" Ice	4.04 4.50 4.95 5.87 8.05	3.62 4.48 5.22 6.74 10.00	0.03 0.07 0.11 0.22 0.55
T-Arm Mount [TA 602-3]	C	From Face	0.00 0.00 1.00	0.0000	126.00	No Ice 1/2" Ice Ice 1" Ice 2" Ice 4" Ice	11.59 15.44 19.29 26.99 42.39	11.59 15.44 19.29 26.99 42.39	0.77 0.99 1.21 1.64 2.50
T-Arm Mount [TA 602-3]	C	From Face	0.00 0.00 -1.00	0.0000	126.00	No Ice 1/2" Ice Ice 1" Ice 2" Ice 4" Ice	11.59 15.44 19.29 26.99 42.39	11.59 15.44 19.29 26.99 42.39	0.77 0.99 1.21 1.64 2.50
6' x 2" Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	126.00	No Ice 1/2" Ice Ice 1" Ice 2" Ice 4" Ice	1.43 1.92 2.29 3.06 4.70	1.43 1.92 2.29 3.06 4.70	0.02 0.03 0.05 0.09 0.23
6' x 2" Mount Pipe	B	From Leg	4.00 0.00	0.0000	126.00	No Ice 1/2"	1.43 1.92	1.43 1.92	0.02 0.03

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
			0.00			Ice	2.29	2.29	0.05
						1" Ice	3.06	3.06	0.09
						2" Ice	4.70	4.70	0.23
						4" Ice			
6' x 2" Mount Pipe	C	From Leg	4.00	0.0000	126.00	No Ice	1.43	1.43	0.02
			0.00			1/2"	1.92	1.92	0.03
			0.00			Ice	2.29	2.29	0.05
						1" Ice	3.06	3.06	0.09
						2" Ice	4.70	4.70	0.23
						4" Ice			
***									
(2) ETM19V2S12UB	A	From Leg	2.00	10.0000	100.00	No Ice	0.84	0.22	0.01
			0.00			1/2"	0.96	0.31	0.02
			0.00			Ice	1.09	0.40	0.02
						1" Ice	1.39	0.61	0.04
						2" Ice	2.08	1.14	0.10
						4" Ice			
RV90-17-00DP w/ Mount Pipe	A	From Leg	2.00	10.0000	100.00	No Ice	4.59	3.32	0.04
			0.00			1/2"	5.09	4.09	0.08
			0.00			Ice	5.58	4.78	0.12
						1" Ice	6.59	6.23	0.23
						2" Ice	8.73	9.31	0.56
						4" Ice			
ATBT-BOTTOM-24V	A	From Leg	2.00	10.0000	100.00	No Ice	0.12	0.08	0.00
			0.00			1/2"	0.17	0.12	0.00
			0.00			Ice	0.23	0.17	0.01
						1" Ice	0.38	0.30	0.01
						2" Ice	0.77	0.67	0.04
						4" Ice			
LNX-6515DS-VTM w/ Mount Pipe	A	From Leg	2.00	10.0000	100.00	No Ice	11.68	9.84	0.08
			0.00			1/2"	12.40	11.37	0.17
			0.00			Ice	13.14	12.91	0.27
						1" Ice	14.60	15.27	0.51
						2" Ice	17.87	20.14	1.15
						4" Ice			
(2) ETM19V2S12UB	B	From Leg	2.00	0.0000	100.00	No Ice	0.84	0.22	0.01
			0.00			1/2"	0.96	0.31	0.02
			0.00			Ice	1.09	0.40	0.02
						1" Ice	1.39	0.61	0.04
						2" Ice	2.08	1.14	0.10
						4" Ice			
RV90-17-00DP w/ Mount Pipe	B	From Leg	2.00	0.0000	100.00	No Ice	4.59	3.32	0.04
			0.00			1/2"	5.09	4.09	0.08
			0.00			Ice	5.58	4.78	0.12
						1" Ice	6.59	6.23	0.23
						2" Ice	8.73	9.31	0.56
						4" Ice			
ATBT-BOTTOM-24V	B	From Leg	2.00	0.0000	100.00	No Ice	0.12	0.08	0.00
			0.00			1/2"	0.17	0.12	0.00
			0.00			Ice	0.23	0.17	0.01
						1" Ice	0.38	0.30	0.01
						2" Ice	0.77	0.67	0.04
						4" Ice			
LNX-6515DS-VTM w/ Mount Pipe	B	From Leg	2.00	0.0000	100.00	No Ice	11.68	9.84	0.08
			0.00			1/2"	12.40	11.37	0.17
			0.00			Ice	13.14	12.91	0.27
						1" Ice	14.60	15.27	0.51
						2" Ice	17.87	20.14	1.15
						4" Ice			
(2) ETM19V2S12UB	C	From Leg	2.00	10.0000	100.00	No Ice	0.84	0.22	0.01
			0.00			1/2"	0.96	0.31	0.02
			0.00			Ice	1.09	0.40	0.02
						1" Ice	1.39	0.61	0.04
						2" Ice	2.08	1.14	0.10
						4" Ice			

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
RV90-17-00DP w/ Mount Pipe	C	From Leg	2.00 0.00 0.00	10.0000	100.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.59 5.09 5.58 6.59 8.73	3.32 4.09 4.78 6.23 9.31	0.04 0.08 0.12 0.23 0.56
ATBT-BOTTOM-24V	C	From Leg	2.00 0.00 0.00	10.0000	100.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.12 0.17 0.23 0.38 0.77	0.08 0.12 0.17 0.30 0.67	0.00 0.00 0.01 0.01 0.04
LNX-6515DS-VTM w/ Mount Pipe	C	From Leg	2.00 0.00 0.00	10.0000	100.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	11.68 12.40 13.14 14.60 17.87	9.84 11.37 12.91 15.27 20.14	0.08 0.17 0.27 0.51 1.15
Side Arm Mount [SO 104-3] ***	C	None		0.0000	100.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.30 4.13 4.96 6.62 9.94	3.30 4.13 4.96 6.62 9.94	0.29 0.32 0.35 0.41 0.53

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
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

Comb. No.	Description
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	155.5 - 110	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-39.26	0.00	-4.45
			Max. Mx	5	-20.88	-656.15	-6.52
			Max. My	8	-20.86	-3.19	-674.60
			Max. Vy	11	-25.07	656.15	-0.13
			Max. Vx	8	25.38	-3.19	-674.60
			Max. Torque	12			-1.80
L2	110 - 72.5	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-61.93	0.00	-4.45
			Max. Mx	5	-36.63	-1772.37	-9.26
			Max. My	8	-36.62	-5.90	-1801.24
			Max. Vy	11	-35.08	1772.37	2.54
			Max. Vx	8	35.34	-5.90	-1801.24
			Max. Torque	10			1.21
L3	72.5 - 36	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-85.15	0.00	-4.45
			Max. Mx	11	-54.68	3166.90	4.98
			Max. My	8	-54.67	-8.36	-3204.95
			Max. Vy	11	-42.17	3166.90	4.98
			Max. Vx	8	42.42	-8.36	-3204.95
			Max. Torque	10			1.21
L4	36 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-115.11	0.00	-4.45
			Max. Mx	11	-78.69	5235.99	8.01
			Max. My	8	-78.69	-11.40	-5285.37
			Max. Vy	11	-49.62	5235.99	8.01
			Max. Vx	8	49.87	-11.40	-5285.37
			Max. Torque	10			1.21

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	14	115.11	0.00	-0.00
	Max. H_x	11	78.70	49.60	0.07
	Max. H_z	2	78.70	0.07	49.84
	Max. M_x	2	5278.59	0.07	49.84
	Max. M_z	5	5235.99	-49.60	-0.07
	Max. Torsion	10	1.21	42.92	-24.87
	Min. Vert	8	78.70	-0.07	-49.84
	Min. H_x	5	78.70	-49.60	-0.07
	Min. H_z	8	78.70	-0.07	-49.84
	Min. M_x	8	-5285.37	-0.07	-49.84
	Min. M_z	11	-5235.99	49.60	0.07
	Min. Torsion	4	-1.19	-42.92	24.87

Tower Mast Reaction Summary

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 Only	78.70	0.00	0.00	3.32	0.00	0.00
Dead+Wind 0 deg - No Ice	78.70	-0.07	-49.84	-5278.59	11.40	0.66
Dead+Wind 30 deg - No Ice	78.70	24.74	-43.14	-4565.60	-2608.32	1.06
Dead+Wind 60 deg - No Ice	78.70	42.92	-24.87	-2627.93	-4529.15	1.19
Dead+Wind 90 deg - No Ice	78.70	49.60	0.07	14.80	-5235.99	1.00
Dead+Wind 120 deg - No Ice	78.70	42.99	24.98	2654.47	-4540.55	0.54
Dead+Wind 150 deg - No Ice	78.70	24.86	43.20	4583.78	-2628.07	-0.07
Dead+Wind 180 deg - No Ice	78.70	0.07	49.84	5285.37	-11.40	-0.67
Dead+Wind 210 deg - No Ice	78.70	-24.74	43.14	4572.38	2608.32	-1.09
Dead+Wind 240 deg - No Ice	78.70	-42.92	24.87	2634.72	4529.15	-1.21
Dead+Wind 270 deg - No Ice	78.70	-49.60	-0.07	-8.01	5235.99	-0.99
Dead+Wind 300 deg - No Ice	78.70	-42.99	-24.98	-2647.68	4540.55	-0.51
Dead+Wind 330 deg - No Ice	78.70	-24.86	-43.20	-4577.00	2628.07	0.09
Dead+Ice+Temp	115.11	0.00	0.00	4.45	0.00	0.00
Dead+Wind 0 deg+Ice+Temp	115.11	-0.01	-13.48	-1517.19	1.56	0.08
Dead+Wind 30 deg+Ice+Temp	115.11	6.71	-11.67	-1312.53	-754.63	0.37
Dead+Wind 60 deg+Ice+Temp	115.11	11.62	-6.73	-754.93	-1308.62	0.57
Dead+Wind 90 deg+Ice+Temp	115.11	13.43	0.01	6.18	-1511.97	0.61
Dead+Wind 120 deg+Ice+Temp	115.11	11.63	6.75	766.87	-1310.18	0.49
Dead+Wind 150 deg+Ice+Temp	115.11	6.72	11.68	1323.32	-757.34	0.24
Dead+Wind 180 deg+Ice+Temp	115.11	0.01	13.48	1526.42	-1.56	-0.08
Dead+Wind 210 deg+Ice+Temp	115.11	-6.71	11.67	1321.76	754.63	-0.38
Dead+Wind 240 deg+Ice+Temp	115.11	-11.62	6.73	764.17	1308.62	-0.57
Dead+Wind 270 deg+Ice+Temp	115.11	-13.43	-0.01	3.05	1511.97	-0.61
Dead+Wind 300 deg+Ice+Temp	115.11	-11.63	-6.75	-757.64	1310.18	-0.49
Dead+Wind 330 deg+Ice+Temp	115.11	-6.72	-11.68	-1314.09	757.34	-0.23
Dead+Wind 0 deg - Service	78.70	-0.03	-19.47	-2060.06	4.45	0.26
Dead+Wind 30 deg - Service	78.70	9.66	-16.85	-1781.38	-1018.88	0.42
Dead+Wind 60 deg - Service	78.70	16.76	-9.71	-1024.47	-1769.21	0.47
Dead+Wind 90 deg - Service	78.70	19.37	0.03	7.85	-2045.48	0.39
Dead+Wind 120 deg - Service	78.70	16.79	9.76	1038.98	-1773.66	0.21
Dead+Wind 150 deg - Service	78.70	9.71	16.87	1792.62	-1026.60	-0.03
Dead+Wind 180 deg - Service	78.70	0.03	19.47	2066.85	-4.45	-0.26
Dead+Wind 210 deg - Service	78.70	-9.66	16.85	1788.17	1018.88	-0.42
Dead+Wind 240 deg - Service	78.70	-16.76	9.71	1031.26	1769.21	-0.47
Dead+Wind 270 deg - Service	78.70	-19.37	-0.03	-1.06	2045.48	-0.39
Dead+Wind 300 deg - Service	78.70	-16.79	-9.76	-1032.19	1773.66	-0.20
Dead+Wind 330 deg - Service	78.70	-9.71	-16.87	-1785.84	1026.60	0.03

Solution Summary

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
1	0.00	-78.70	0.00	0.00	78.70	-0.00	0.000%
2	-0.07	-78.70	-49.85	0.07	78.70	49.84	0.004%
3	24.74	-78.70	-43.14	-24.74	78.70	43.14	0.000%
4	42.92	-78.70	-24.87	-42.92	78.70	24.87	0.000%
5	49.60	-78.70	0.07	-49.60	78.70	-0.07	0.004%
6	42.99	-78.70	24.98	-42.99	78.70	-24.98	0.000%
7	24.86	-78.70	43.20	-24.86	78.70	-43.20	0.000%
8	0.07	-78.70	49.85	-0.07	78.70	-49.84	0.004%
9	-24.74	-78.70	43.14	24.74	78.70	-43.14	0.000%
10	-42.92	-78.70	24.87	42.92	78.70	-24.87	0.000%
11	-49.60	-78.70	-0.07	49.60	78.70	0.07	0.004%
12	-42.99	-78.70	-24.98	42.99	78.70	24.98	0.000%
13	-24.86	-78.70	-43.20	24.86	78.70	43.20	0.000%
14	0.00	-115.11	0.00	0.00	115.11	-0.00	0.000%
15	-0.01	-115.11	-13.48	0.01	115.11	13.48	0.000%
16	6.71	-115.11	-11.67	-6.71	115.11	11.67	0.000%
17	11.62	-115.11	-6.73	-11.62	115.11	6.73	0.000%
18	13.43	-115.11	0.01	-13.43	115.11	-0.01	0.000%
19	11.63	-115.11	6.75	-11.63	115.11	-6.75	0.000%
20	6.72	-115.11	11.68	-6.72	115.11	-11.68	0.000%
21	0.01	-115.11	13.48	-0.01	115.11	-13.48	0.000%
22	-6.71	-115.11	11.67	6.71	115.11	-11.67	0.000%
23	-11.62	-115.11	6.73	11.62	115.11	-6.73	0.000%
24	-13.43	-115.11	-0.01	13.43	115.11	0.01	0.000%
25	-11.63	-115.11	-6.75	11.63	115.11	6.75	0.000%
26	-6.72	-115.11	-11.68	6.72	115.11	11.68	0.000%
27	-0.03	-78.70	-19.47	0.03	78.70	19.47	0.002%
28	9.66	-78.70	-16.85	-9.66	78.70	16.85	0.002%
29	16.77	-78.70	-9.71	-16.76	78.70	9.71	0.002%
30	19.37	-78.70	0.03	-19.37	78.70	-0.03	0.002%
31	16.79	-78.70	9.76	-16.79	78.70	-9.76	0.002%
32	9.71	-78.70	16.88	-9.71	78.70	-16.87	0.002%
33	0.03	-78.70	19.47	-0.03	78.70	-19.47	0.002%
34	-9.66	-78.70	16.85	9.66	78.70	-16.85	0.002%
35	-16.77	-78.70	9.71	16.76	78.70	-9.71	0.002%
36	-19.37	-78.70	-0.03	19.37	78.70	0.03	0.002%
37	-16.79	-78.70	-9.76	16.79	78.70	9.76	0.002%
38	-9.71	-78.70	-16.88	9.71	78.70	16.87	0.002%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.00000001	0.00000001
2	Yes	8	0.00000001	0.00010423
3	Yes	10	0.00000001	0.00008492
4	Yes	10	0.00000001	0.00007963
5	Yes	8	0.00000001	0.00011852
6	Yes	10	0.00000001	0.00008464
7	Yes	10	0.00000001	0.00008444
8	Yes	8	0.00000001	0.00011093
9	Yes	10	0.00000001	0.00008045
10	Yes	10	0.00000001	0.00008503
11	Yes	8	0.00000001	0.00011082
12	Yes	10	0.00000001	0.00008236
13	Yes	10	0.00000001	0.00008329
14	Yes	6	0.00000001	0.00000001
15	Yes	10	0.00000001	0.00009475
16	Yes	10	0.00000001	0.00009702
17	Yes	10	0.00000001	0.00009678
18	Yes	10	0.00000001	0.00009451
19	Yes	10	0.00000001	0.00009759
20	Yes	10	0.00000001	0.00009807
21	Yes	10	0.00000001	0.00009570
22	Yes	10	0.00000001	0.00009785

23	Yes	10	0.00000001	0.00009738
24	Yes	10	0.00000001	0.00009450
25	Yes	10	0.00000001	0.00009700
26	Yes	10	0.00000001	0.00009723
27	Yes	8	0.00000001	0.00004557
28	Yes	8	0.00000001	0.00009282
29	Yes	8	0.00000001	0.00007862
30	Yes	8	0.00000001	0.00004611
31	Yes	8	0.00000001	0.00008970
32	Yes	8	0.00000001	0.00008875
33	Yes	8	0.00000001	0.00004602
34	Yes	8	0.00000001	0.00008028
35	Yes	8	0.00000001	0.00009348
36	Yes	8	0.00000001	0.00004585
37	Yes	8	0.00000001	0.00008352
38	Yes	8	0.00000001	0.00008557

Maximum Tower Deflections - Service Wind

Section No.	Elevation	Horz. Deflection	Gov. Load Comb.	Tilt	Twist
	ft	in		°	°
L1	155.5 - 110	10.783	33	0.4986	0.0003
L2	118 - 72.5	6.953	33	0.4650	0.0003
L3	81 - 36	3.640	33	0.3722	0.0002
L4	45 - 0	1.265	33	0.2382	0.0001

Critical Deflections and Radius of Curvature - Service Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
158.00	DB809K-Y	33	10.783	0.4986	0.0003	243179
144.00	(2) 7770.00 w/ Mount Pipe	33	9.584	0.4922	0.0003	105730
135.00	742 213 w/ Mount Pipe	33	8.656	0.4856	0.0003	59312
126.00	DB809K-Y	33	7.744	0.4764	0.0003	41217
100.00	(2) ETM19V2S12UB	33	5.262	0.4268	0.0002	26014

Maximum Tower Deflections - Design Wind

Section No.	Elevation	Horz. Deflection	Gov. Load Comb.	Tilt	Twist
	ft	in		°	°
L1	155.5 - 110	27.552	8	1.2737	0.0007
L2	118 - 72.5	17.768	8	1.1878	0.0007
L3	81 - 36	9.306	8	0.9512	0.0004
L4	45 - 0	3.233	8	0.6089	0.0002

Critical Deflections and Radius of Curvature - Design Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
158.00	DB809K-Y	8	27.552	1.2737	0.0007	95509
144.00	(2) 7770.00 w/ Mount Pipe	8	24.490	1.2573	0.0007	41525
135.00	742 213 w/ Mount Pipe	8	22.119	1.2404	0.0007	23294

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
126.00	DB809K-Y	8	19.789	1.2168	0.0007	16187
100.00	(2) ETM19V2S12UB	8	13.449	1.0905	0.0006	10210

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 $\frac{P}{P_a}$
L1	155.5 - 110 (1)	TP64.606x58.6x0.375	45.50	0.00	0.0	31.415	76.2838	-20.86	2396.43	0.009
L2	110 - 72.5 (2)	TP68.805x62.8x0.4375	45.50	0.00	0.0	33.742	94.7324	-36.62	3196.42	0.011
L3	72.5 - 36 (3)	TP72.748x66.8082x0.5	45.00	0.00	0.0	35.568	114.4070	-54.67	4069.16	0.013
L4	36 - 0 (4)	TP76.5x70.56x0.5	45.00	0.00	0.0	34.010	122.3600	-78.69	4161.49	0.019

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	155.5 - 110 (1)	TP64.606x58.6x0.375	674.61	6.858	31.415	0.218	0.00	0.000	31.415	0.000
L2	110 - 72.5 (2)	TP68.805x62.8x0.4375	1801.24	13.860	33.742	0.411	0.00	0.000	33.742	0.000
L3	72.5 - 36 (3)	TP72.748x66.8082x0.5	3204.97	19.334	35.568	0.544	0.00	0.000	35.568	0.000
L4	36 - 0 (4)	TP76.5x70.56x0.5	5285.38	27.861	34.010	0.819	0.00	0.000	34.010	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	155.5 - 110 (1)	TP64.606x58.6x0.375	25.38	0.333	26.000	0.026	0.76	0.004	26.000	0.000
L2	110 - 72.5 (2)	TP68.805x62.8x0.4375	35.34	0.373	26.000	0.029	0.67	0.002	26.000	0.000
L3	72.5 - 36 (3)	TP72.748x66.8082x0.5	42.42	0.371	26.000	0.029	0.67	0.002	26.000	0.000
L4	36 - 0 (4)	TP76.5x70.56x0.5	49.87	0.408	26.000	0.032	0.67	0.002	26.000	0.000

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	155.5 - 110 (1)	0.009	0.218	0.000	0.026	0.000	0.227	1.333	H1-3+VT ✔

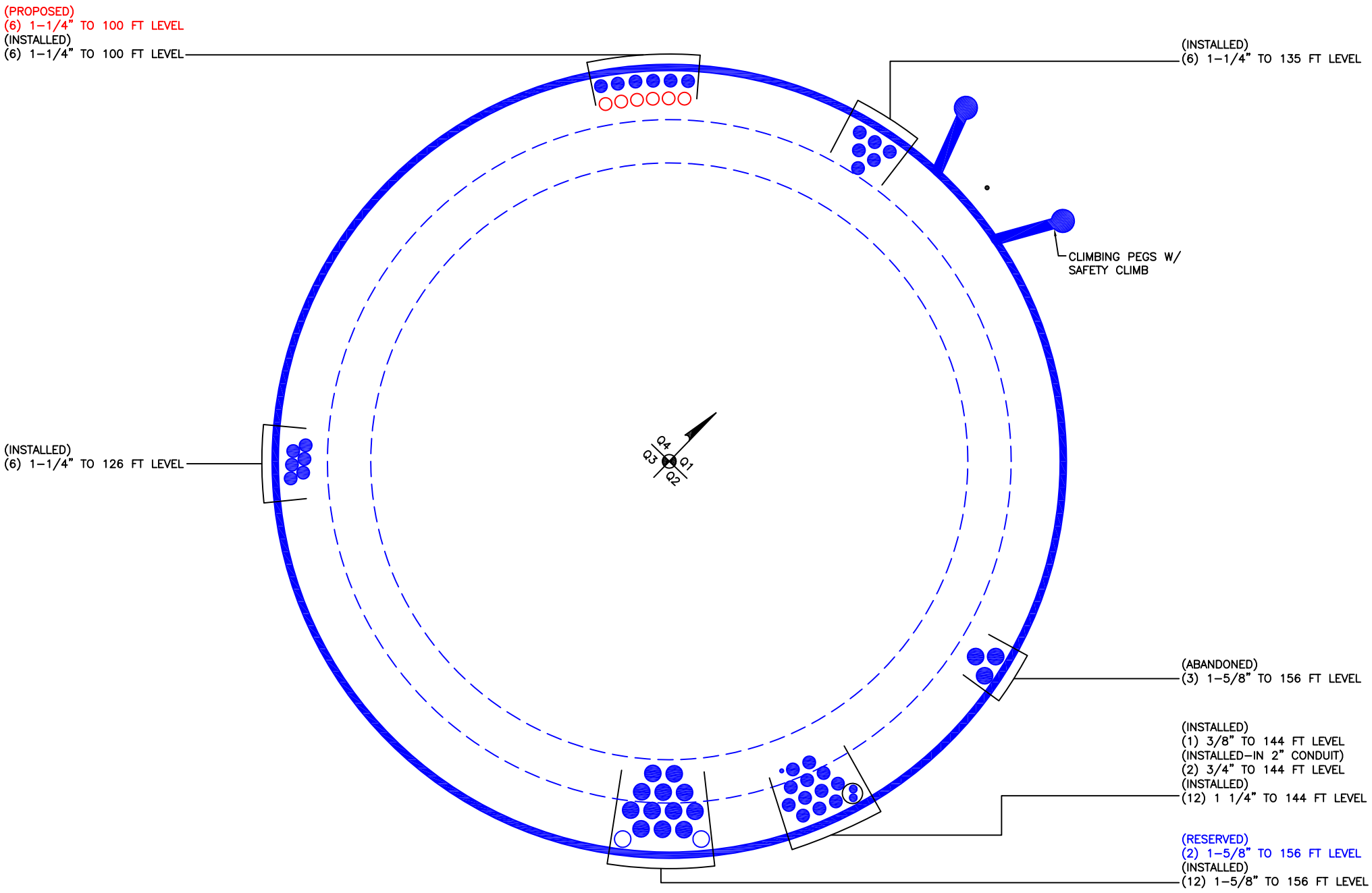
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L2	110 - 72.5 (2)	0.011	0.411	0.000	0.029	0.000	0.422 ✔	1.333	H1-3+VT ✔
L3	72.5 - 36 (3)	0.013	0.544	0.000	0.029	0.000	0.557 ✔	1.333	H1-3+VT ✔
L4	36 - 0 (4)	0.019	0.819	0.000	0.032	0.000	0.838 ✔	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	155.5 - 110	Pole	TP64.606x58.6x0.375	1	-20.86	3194.44	17.0	Pass
L2	110 - 72.5	Pole	TP68.805x62.8x0.4375	2	-36.62	4260.83	31.7	Pass
L3	72.5 - 36	Pole	TP72.748x66.8082x0.5	3	-54.67	5424.19	41.8	Pass
L4	36 - 0	Pole	TP76.5x70.56x0.5	4	-78.69	5547.27	62.9	Pass
							Summary	
						Pole (L4)	62.9	Pass
						RATING =	**62.9**	**Pass**

APPENDIX B

BASE LEVEL DRAWING


(PROPOSED)
(6) 1-1/4" TO 100 FT LEVEL
(INSTALLED)
(6) 1-1/4" TO 100 FT LEVEL
(INSTALLED)
(6) 1-1/4" TO 135 FT LEVEL
CLIMBING PEGS W/
SAFETY CLIMB
(INSTALLED)
(6) 1-1/4" TO 126 FT LEVEL
Q4
Q1
Q3
Q2
(ABANDONED)
(3) 1-5/8" TO 156 FT LEVEL
(INSTALLED)
(1) 3/8" TO 144 FT LEVEL
(INSTALLED-IN 2" CONDUIT)
(2) 3/4" TO 144 FT LEVEL
(INSTALLED)
(12) 1 1/4" TO 144 FT LEVEL
(RESERVED)
(2) 1-5/8" TO 156 FT LEVEL
(INSTALLED)
(12) 1-5/8" TO 156 FT LEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

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

TIA Rev F

Site Data

BU#: *806366*
Site Name: *HRT 107-C- 943204*
App #: *272724*

Pole Manufacturer:	*Other*

Reactions		
Moment:	5285.3862	ft-kips
Axial:	78.6859	kips
Shear:	49.865745	kips

Anchor Rod Data		
Qty:	24	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	84.75	in

Plate Data		
Diam:	91	in
Thick:	3.25	in
Grade:	60	ksi
Single-Rod B-eff:	10.25	in

Stiffener Data (Welding at both sides)		
Config:	0	*
Weld Type:		
Groove Depth:		in **
Groove Angle:		degrees
Fillet H. Weld:		<-- Disregard
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		ksi

Pole Data		
Diam:	76.5	in
Thick:	0.5	in
Grade:	65	ksi
# of Sides:	12	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Stress Increase Factor		
ASIF:	1.333	

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

Anchor Rod Results

Maximum Rod Tension:	121.5 Kips	Rigid
Allowable Tension:	195.0 Kips	Service, ASD
Anchor Rod Stress Ratio:	62.3% **Pass**	Fty*ASIF

Base Plate Results Flexural Check

Base Plate Stress:	18.6 ksi	Rigid
Allowable Plate Stress:	60.0 ksi	Service ASD
Base Plate Stress Ratio:	30.9% **Pass**	0.75*Fy*ASIF
		Y.L. Length: 36.47

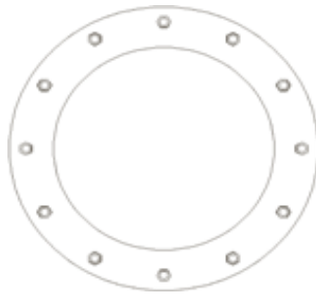
n/a

Stiffener Results

Horizontal Weld :	n/a
Vertical Weld:	n/a
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	n/a
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	n/a
Plate Comp. (AISC Bracket):	n/a

Pole Results

Pole Punching Shear Check: n/a



* 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

(Bearing and Stability Checks) Tool for TIA Rev F or G - Application (MP, SST with unitbase)

Site Data

BU#: *806366*
Site Name: *HRT 107-C- 943204*
App #: *????*

Enter Load Factors Below:		
For P (DL)	1.2	<---- Enter Factor
For P,V, and M (WL)	1.35	<---- Enter Factor

Pad & Pier Data		
Base PL Dist. Above Pier:	0	in
Pier Dist. Above Grade:	6	in
Pad Bearing Depth, D:	7.5	ft
Pad Thickness, T:	4.5	ft
Pad Width=Length, L:	33.25	ft
Pier Cross Section Shape:	Square	<--Pull Down
Enter Pier Side Width:	9	ft
Concrete Density:	150.0	pcf
Pier Cross Section Area:	81.00	ft^2
Pier Height:	3.50	ft
Soil (above pad) Height:	3.00	ft

Soil Parameters		
Unit Weight, γ:	130.0	pcf
Ultimate Bearing Capacity, qn:	21.00	ksf
Strength Reduct. factor, ϕ:	0.75	
Angle of Friction, Φ:	40.0	degrees
Undrained Shear Strength, Cu:	0.00	ksf
Allowable Bearing: ϕ*qn:	15.75	ksf
Passive Pres. Coeff., Kp	4.60	

Forces/Moments due to Wind and Lateral Soil		
Minimum of (φ*Ultimate Pad Passive Force, Vu):	67.3	kips
Pad Force Location Above D:	1.93	ft
ϕ(Passive Pressure Moment):	129.83	ft-kips
Factored O.T. M(WL), "1.6W":	7673.8	ft-kips
Factored OT (MW-Msoil), M1	7543.99	ft-kips

Resistance due to Foundation Gravity		
Soil Wedge Projection grade, a:	2.52	ft
Sum of Soil Wedges Wt:	29.99	kips
Soil Wedges ecc, K1:	14.68	ft
Ftg+Soil above Pad wt:	1188.4	kips
Unfactored (Total ftg-soil Wt):	1218.35	kips
1.2D. **No Soil Wedges**.	1520.45	kips
0.9D. **With Soil Wedges**	1167.33	kips

Resistance due to Cohesion (Vertical)		
ϕ*(1/2*Cu)(Total Vert. Planes)	0.00	kips
Cohesion Force Eccentricity, K2	0.00	ft

Monopole Base Reaction Forces		
TIA Revision:	F	<--Pull Down
Unfactored DL Axial, PD:	78.6859	kips
Unfactored WL Axial, PW:	0	kips
Unfactored WL Shear, V:	49.86575	kips
Unfactored WL Moment, M:	5285.386	ft-kips

Load Factor	Shaft Factored Loads		
1.20	1.2D+1.6W, Pu:	94.42308	kips
0.90	0.9D+1.6W, Pu:	70.81731	kips
1.35	Vu:	67.31876	kips
	Mu:	7135.271	ft-kips

1.2D+1.6W Load Combination, Bearing Results:

(**No Soil Wedges**) [Reaction+Conc+Soil]	1520.45	P1="1.2D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil), M1	7543.99	ft-kips

Orthogonal Direction:

ecc1 = M1/P1 =	4.96	ft
Orthogonal qu=	2.20	ksf
qu/ϕ*qn Ratio=	**13.94%**	**Pass**

Diagonal Direction:

ecc2 = (0.707M1)/P1 =	3.51	ft
Diagonal qu=	2.21	ksf
qu/ϕ*qn Ratio=	**14.03%**	**Pass**

Run <-- Press Upon Completing All Input

Overturning Stability Check

0.9D+1.6W Load Combination, Bearing Results:

(**w/ Soil Wedges**) [Reaction+Conc+Soil]	1167.33	P2="0.9D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil) - 0.9(M of Wedge + M of Cohesion), M2	7147.77	ft-kips

Orthogonal ecc3 = M2/P2 =	6.12	ft
Ortho Non Bearing Length,NBL=	12.25	ft
Orthogonal qu=	1.83	ksf
Diagonal qu=	1.93	ksf

Max Reaction Moment (ft-kips) so that qu=φ*qn = 100% Capacity Rating			
Actual M:	5285.39		
M Orthogonal:	13517.66	**39.10%**	**Pass**
M Diagonal:	13517.66	**39.10%**	**Pass**

Moment Capacity of Drilled Concrete Shaft (Caisson) for TIA Rev F or G

Note: Shaft assumed to have ties, not spiral, transverse reinforcing

Site Data

BU#: *806366*
Site Name: *HRT 107-C- 943204*
App #: *272724*

Enter Load Factors Below:		
For M (WL)	1.3	<---- Enter Factor
For P (DL)	1.3	<---- Enter Factor

Pier Properties

Concrete:

Pier Diameter =	9.0	ft
Concrete Area =	9160.9	in^2

Reinforcement:

Clear Cover to **Tie**=	3.00	in
Horiz. **Tie** Bar Size=	5	
Vert. Cage Diameter =	8.28	ft
Vert. Cage Diameter =	99.34	in
Vertical Bar Size =	11	
Bar Diameter =	1.41	in
Bar Area =	1.56	in^2
Number of Bars =	59	
As Total=	92.04	in^2
A s/ Aconc, Rho:	0.0100	1.00%

ACI 10.5 , ACI 21.10.4, and IBC 1810.
Min As for Flexural, Tension Controlled, Shafts:

(3)*(Sqrt(f'c)/Fy:	0.0032
200 / Fy:	0.0033

Minimum Rho Check:

Actual Req'd Min. Rho:	0.33%	Flexural
Provided Rho:	1.00%	**OK**

Ref. Shaft Max Axial Capacities, ϕ Max(Pn or Tn):		
Max Pu = (φ=0.65) Pn.		
Pn per ACI 318 (10-2)	18905.36	kips
at Mu=(ϕ=0.65)Mn=	14903.09	ft-kips
Max Tu, (φ=0.9) Tn =	4970.16	kips
at Mu=ϕ=(0.90)Mn=	0.00	ft-kips

Maximum Shaft Superimposed Forces

TIA Revision:	F	
Max. Service Shaft M:	5459.916	ft-kips **(* Note)**
Max. Service Shaft P:	78.6859	kips
Max Axial Force Type:	Comp.	

(*) Note: Max Shaft Superimposed Moment does not necessarily equal to the shaft top reaction moment

Load Factor	**Shaft Factored Loads**		
1.30	Mu:	7097.891	ft-kips
1.30	Pu:	102.2917	kips

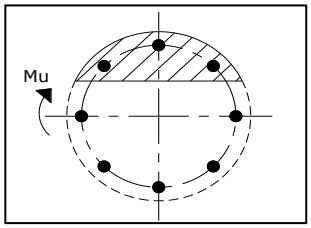
Material Properties

Concrete Comp. strength, f'c =	4000	psi
Reinforcement yield strength, Fy =	60	ksi
Reinforcing Modulus of Elasticity, E =	29000	ksi
Reinforcement yield strain =	0.00207	
Limiting compressive strain =	0.003	
ACI 318 Code		
Select Analysis ACI Code=	2002	
Seismic Properties		
Seismic Design Category =	D	
Seismic Risk =	**High**	

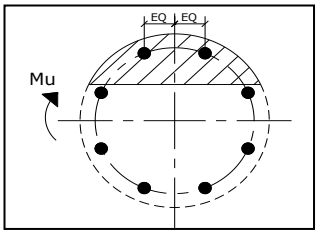
Solve (Run) <-- Press Upon Completing All Input

Results:

Governing Orientation Case: **1**



Case 1



Case 2

Dist. From Edge to Neutral Axis:	**19.35**	in
Extreme Steel Strain, ϵt:	**0.0131**	
ϵt > 0.0050, Tension Controlled		
Reduction Factor,φ:	**0.900**	

Output Note: Negative Pu=Tension

For Axial Compression, φ Pn = Pu:	102.29	kips
Drilled Shaft Moment Capacity, φMn:	**18576.36**	ft-kips
Drilled Shaft Superimposed Mu:	**7097.89**	ft-kips

(Mu/φMn, Drilled Shaft Flexure CSR:	**38.2%**

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March 10, 2015

EBI Project Number: 6215001457

Site Compliance Summary	
Compliance Status:	**COMPLIANT**
Site total MPE% of FCC general public allowable limit:	**58.21 %**

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March 10, 2015

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

Emissions Analysis for Site: **CT11251A – East Hampton-2_1**

EBI Consulting was directed to analyze the proposed T-Mobile facility located at **61-77 North Main Street, Marlborough, 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 **61-77 North Main Street, Marlborough, 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 (PCS Band - 1900 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 (PCS Band - 1900 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 **EMS RR90_17_02DP** for 1900 MHz (PCS) 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 **EMS RR90_17_02DP** has a maximum gain of **14.4 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 **100 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:	EMS RR90_17_02DP	Make / Model:	EMS RR90_17_02DP	Make / Model:	EMS RR90_17_02DP
Gain:	14.4 dBd	Gain:	14.4 dBd	Gain:	14.4 dBd
Height (AGL):	100	Height (AGL):	100	Height (AGL):	100
Frequency Bands	1900 MHz(PCS)	Frequency Bands	1900 MHz(PCS)	Frequency Bands	1900 MHz(PCS)
Channel Count	6	Channel Count	6	# PCS Channels:	6
Total TX Power:	240	Total TX Power:	240	# AWS Channels:	240
ERP (W):	6,610.15	ERP (W):	6,610.15	ERP (W):	6,610.15
Antenna A1 MPE%	2.69	Antenna B1 MPE%	2.69	Antenna C1 MPE%	2.69
Antenna #:	**2**	Antenna #:	**2**	Antenna #:	**2**
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):	100	Height (AGL):	100	Height (AGL):	100
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):	865.21	ERP (W):	865.21	ERP (W):	865.21
Antenna A2 MPE%	0.75	Antenna B2 MPE%	0.75	Antenna C2 MPE%	0.75

Site Composite MPE%	
Carrier	**MPE%**
T-Mobile	**10.33**
AT&T	15.29 %
MetroPCS	3.73 %
Verizon Wireless	14.09 %
Town	6.03 %
Sprint	8.74 %
Site Total MPE %:	**58.21 %**

T-Mobile Sector 1 Total:	3.44 %
T-Mobile Sector 2 Total:	3.44 %
T-Mobile Sector 3 Total:	3.44 %
Site Total:	58.21 %

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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:	3.44 %
Sector 2:	3.44 %
Sector 3 :	3.44 %
T-Mobile Total:	10.33 %
Site Total:	58.21 %
Site Compliance Status:	**COMPLIANT**

The anticipated composite MPE value for this site assuming all carriers present is **58.21%** 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
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Burlington, MA 01803