



Crown Castle
3530 Toringdon Way Suite 300
Charlotte NC 28277

Tel (704) 405-6600

April 8, 2015

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

RE: T-Mobile-Exempt Modification - Crown Site BU: 876380
T-Mobile Site ID: CTNH350A
Located at: Great Hollow Road, Woodbury, CT 06798

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 Mr. William J. Butterly, Jr., First Selectman for the Town of Woodbury and O & G Industries, Inc., Property Owner.

T-Mobile plans to modify the existing wireless communications facility owned by Crown Castle and located at **Great Hollow Road, Woodbury, CT 06798**. 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: Mr. William J. Butterly, Jr., First Selectman
281 Main Street South
Woodbury, CT 06798

cc: O & G Industries, Inc.
112 Wall Street
Torrington, CT 06790



T-MOBILE NORTHEAST LLC

T-MOBILE SITE #: CTNH350A
CROWN CASTLE BU #: 876380
SITE NAME: O&G WOODBURY
GREAT HOLLOW ROAD
WOODBURY, CT 06798
LITCHFIELD COUNTY



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



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

CTNH350A
O&G WOODBURY

CONSTRUCTION DRAWINGS

Table with 2 columns: Revision, Description. Includes entries for 04/07/15 ISSUED AS FINAL and 03/30/15 ISSUED FOR REVIEW.

0 04/07/15 ISSUED AS FINAL
A 03/30/15 ISSUED FOR REVIEW



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



ENGINEER
DEWBERRY ENGINEERS INC.
500 PARSIPPANY ROAD
SUITE 301
PARSIPPANY, NJ 07054
CONTACT: BRYAN HUFF
PHONE #: (973) 576-0147
CONSTRUCTION
CROWN CASTLE
500 WEST CUMMINGS PARK, SUITE 3600
WOBBURN, MA 01801
CONTACT: WARREN KELLEHER
PHONE #: (781) 970-0055

SITE NAME:
O&G WOODBURY
SITE NUMBER:
CTNH350A
TOWER OWNER:
CROWN CASTLE
500 WEST CUMMINGS PARK, SUITE 3600
WOBBURN, MA 01801
APPLICANT/DEVELOPER:
T-MOBILE NORTHEAST LLC
4 SYLVAN WAY
PARSIPPANY, NJ 07054
COORDINATES:
LATITUDE: 41°-31'-19.2" N (NAD83)
LONGITUDE: 73°-13'-15.6" W (NAD83)
(PER CROWN CASTLE)
CONFIGURATION
704G
PROJECT SUMMARY

SITE ADDRESS:
GREAT HOLLOW ROAD
WOODBURY, CT 06798
LITCHFIELD COUNTY
PROJECT DIRECTORY

- REMOVE AND REPLACE (3) EXISTING ANTENNAS WITH (3) NEW ANTENNAS.
REMOVE AND REPLACE (3) EXISTING TMA'S WITH (3) NEW BIAS TEES.
INSTALL (1) NEW BBU CABINET AT GRADE.
INSTALL (3) NEW RRU'S ON A UNISTRUT RACK 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.

Table with 2 columns: SHT. NO., DESCRIPTION. Includes entries for 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.



DRAWN BY: JC
REVIEWED BY: BSH
CHECKED BY: GHN
PROJECT NUMBER: 50066258
JOB NUMBER: 50071492
SITE ADDRESS:

GREAT HOLLOW ROAD
WOODBURY, CT 06798
LITCHFIELD COUNTY

SHEET TITLE

TITLE SHEET

SHEET NUMBER

T-1

FROM PARSIPPANY, NJ:
TAKE I-287 NORTH TOWARD MAHWAH/BOONTON. TAKE RAMP RIGHT FOR I-87 SOUTH/I-287 TOWARD NEW YORK CITY/TAPPAN ZEE BR. KEEP RIGHT TO STAY ON I-87 S/NEW YORK STATE THRUWAY. AT EXIT 8A, TAKE RAMP RIGHT FOR SAW MILL RIVER PKWY NORTH TOWARD KATONAH. TAKE RAMP LEFT FOR I-684 TOWARD BREWSTER. AT EXIT 9E, TAKE RAMP RIGHT FOR I-84 EAST TOWARD DANBURY. KEEP RIGHT TO STAY ON I-84 E/US-6 E. AT EXIT 15, TAKE RAMP RIGHT FOR CT-67 NORTH/US-6 EAST TOWARD WOODBURY/ROXBURY. TURN LEFT ONTO US-6/CT-67. BEAR LEFT ONTO DOLITTLE HILL RD. BEAR LEFT ONTO CT-317/SYCAMORE AVE. TURN LEFT ONTO BEAR HILL RD. TURN LEFT ONTO GREAT HOLLOW RD. SITE WILL BE ON THE RIGHT.

GENERAL NOTES:

- 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
- 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.
- 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.
- ALL WORK CARRIED OUT SHALL COMPLY WITH ALL APPLICABLE MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS AND LOCAL JURISDICTIONAL CODES, ORDINANCES AND APPLICABLE REGULATIONS.
- DRAWINGS PROVIDED HERE ARE NOT TO SCALE UNLESS OTHERWISE NOTED AND ARE INTENDED TO SHOW OUTLINE ONLY.
- UNLESS NOTED OTHERWISE, THE WORK SHALL INCLUDE FURNISHING MATERIALS, EQUIPMENT, APPURTENANCES, AND LABOR NECESSARY TO COMPLETE ALL INSTALLATIONS AS INDICATED ON THE DRAWINGS.
- THE CONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS UNLESS SPECIFICALLY STATED OTHERWISE.
- IF THE SPECIFIED EQUIPMENT CANNOT BE INSTALLED AS SHOWN ON THESE DRAWINGS, THE CONTRACTOR SHALL PROPOSE AN ALTERNATIVE INSTALLATION FOR APPROVAL BY PROJECT MANAGEMENT.
- 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.
- 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.
- 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.
- CONTRACTOR SHALL LEAVE PREMISES IN CLEAN CONDITION.
- 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.
- 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.
- 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.
- 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.
- 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:

- THE CONTRACTOR SHALL CONTACT UTILITY LOCATING SERVICES PRIOR TO THE START OF CONSTRUCTION.
- 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.
- ALL SITE WORK SHALL BE AS INDICATED ON THE DRAWINGS AND PROJECT SPECIFICATIONS.
- IF NECESSARY, RUBBISH, STUMPS, DEBRIS, STICKS, STONES, TOP SOIL AND OTHER REFUSE SHALL BE REMOVED FROM THE SITE AND DISPOSED OF LEGALLY.
- 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.
- CONTRACTOR SHALL MINIMIZE DISTURBANCE TO EXISTING SITE DURING CONSTRUCTION.
- THE CONTRACTOR SHALL PROVIDE SITE SIGNAGE IN ACCORDANCE WITH THE T-MOBILE SPECIFICATION FOR SITE SIGNAGE.
- THE SITE SHALL BE GRADED TO CAUSE SURFACE WATER TO FLOW AWAY FROM THE TRANSMISSION EQUIPMENT AND TOWER AREAS.
- 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.
- THE SUB GRADE SHALL BE COMPACTED AND BROUGHT TO A SMOOTH UNIFORM GRADE PRIOR TO FINISHED SURFACE APPLICATION, SEE SOIL COMPACTION NOTES.
- 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.
- 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:

- ALL ELECTRICAL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS, NEC AND ALL APPLICABLE LOCAL CODES.
- CONTRACTOR SHALL MODIFY EXISTING CABLE TRAY SYSTEM AS REQUIRED TO SUPPORT RF AND TRANSPORT CABLE TO THE NEW BTS EQUIPMENT. CONTRACTOR SHALL SUBMIT MODIFICATIONS TO PROJECT MANAGEMENT FOR APPROVAL.
- CONDUIT ROUTINGS ARE SCHEMATIC. CONTRACTOR SHALL INSTALL CONDUITS SO THAT ACCESS TO EQUIPMENT IS NOT BLOCKED.
- WIRING, RACEWAY AND SUPPORT METHODS AND MATERIALS SHALL COMPLY WITH THE REQUIREMENTS OF THE NEC AND TELCORDIA.
- ALL CIRCUITS SHALL BE SEGREGATED AND MAINTAIN MINIMUM CABLE SEPARATION AS REQUIRED BY THE NEC AND TELCORDIA.
- CABLES SHALL NOT BE ROUTED THROUGH LADDER-STYLE CABLE TRAY RUNGS.
- 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.
- 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).
- PANELBOARDS (ID NUMBERS) AND INTERNAL CIRCUIT BREAKERS (CIRCUIT ID NUMBERS) SHALL BE CLEARLY LABELED WITH ENGRAVED LAMACOID PLASTIC LABELS.
- ALL TIE WRAPS SHALL BE CUT FLUSH WITH APPROVED CUTTING TOOL TO REMOVE SHARP EDGES.
- 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.
- 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.
- SUPPLEMENTAL EQUIPMENT GROUND WIRING LOCATED INDOORS SHALL BE SINGLE CONDUCTOR (SIZE 8 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.
- SUPPLEMENTAL EQUIPMENT GROUND WIRING LOCATED OUTDOORS, OR BELOW GRADE, SHALL BE SINGLE CONDUCTOR #2 AWG SOLID TINNED COPPER CABLE, UNLESS OTHERWISE SPECIFIED.
- 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.
- 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).
- RACEWAY AND CABLE TRAY SHALL BE LISTED OR LABELED FOR ELECTRICAL USE IN ACCORDANCE WITH NEMA, UL, ANSI/IEEE, AND NEC.
- NEW RACEWAY OR CABLE TRAY WILL MATCH THE EXISTING INSTALLATION WHERE POSSIBLE.
- 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.
- ELECTRICAL METALLIC TUBING (EMT), ELECTRICAL NONMETALLIC TUBING (ENT), OR RIGID NONMETALLIC CONDUIT (RIGID PVC, SCHEDULE 40) SHALL BE USED FOR CONCEALED INDOOR LOCATIONS.
- GALVANIZED STEEL INTERMEDIATE METALLIC CONDUIT (IMC) SHALL BE USED FOR OUTDOOR LOCATIONS ABOVE GRADE.
- 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.
- LIQUID-TIGHT FLEXIBLE METALLIC CONDUIT (LIQUID-TITE FLEX) SHALL BE USED INDOORS AND OUTDOORS, WHERE VIBRATION OCCURS OR FLEXIBILITY IS NEEDED.
- CONDUIT AND TUBING FITTINGS SHALL BE THREADED OR COMPRESSION-TYPE AND APPROVED FOR THE LOCATION USED. SETSCREW FITTINGS ARE NOT ACCEPTABLE.
- CABINETS, BOXES, AND WIREWAYS SHALL BE LISTED OR LABELED FOR ELECTRICAL USE IN ACCORDANCE WITH NEMA, UL, ANSI/IEEE, AND NEC.
- CABINETS, BOXES, AND WIREWAYS TO MATCH THE EXISTING INSTALLATION WHERE POSSIBLE.
- 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.
- 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.
- 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.
- 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.
- THE CONTRACTOR SHALL NOTIFY AND OBTAIN NECESSARY AUTHORIZATION FROM PROJECT MANAGEMENT BEFORE COMMENCING WORK ON THE AC POWER DISTRIBUTION PANELS.
- 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:

- 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.
- 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.
- 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.
- 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 LARGER2 IN.
#5 AND SMALLER & WWF.....1 1/2 IN.

CONCRETE NOT EXPOSED TO EARTH OR WEATHER OR NOT CAST AGAINST THE GROUND:
SLAB AND WALL3/4 IN.
BEAMS AND COLUMNS.....1 1/2 IN.
- A CHAMFER 3/4" SHALL BE PROVIDED AT ALL EXPOSED EDGES OF CONCRETE, UNO, IN ACCORDANCE WITH ACI 301 SECTION 4.2.4.
- 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.
- 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.
- 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.
- 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:

- 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".
- 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.
- BOLTED CONNECTIONS SHALL BE ASTM A325 BEARING TYPE (3/4"Ø) CONNECTIONS AND SHALL HAVE MINIMUM OF TWO BOLTS UNLESS NOTED OTHERWISE.
- NON-STRUCTURAL CONNECTIONS FOR STEEL GRATING MAY USE 5/8" DIA. ASTM A 307 BOLTS UNLESS NOTED OTHERWISE.
- 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.
- CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR ENGINEER REVIEW & APPROVAL ON PROJECTS REQUIRING STRUCTURAL STEEL.
- ALL STRUCTURAL STEEL WORK SHALL BE DONE IN ACCORDANCE WITH AISC SPECIFICATIONS.

CONSTRUCTION NOTES:

- FIELD VERIFICATION:
CONTRACTOR SHALL FIELD VERIFY SCOPE OF WORK, T-MOBILE ANTENNA PLATFORM LOCATION AND ANTENNAS TO BE REPLACED.
- COORDINATION OF WORK:
CONTRACTOR SHALL COORDINATE RF WORK AND PROCEDURES WITH PROJECT MANAGEMENT.
- 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.
- 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 NORTHEAST LLC
4 SYLVAN WAY
PARSIPPANY, NJ 07054



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

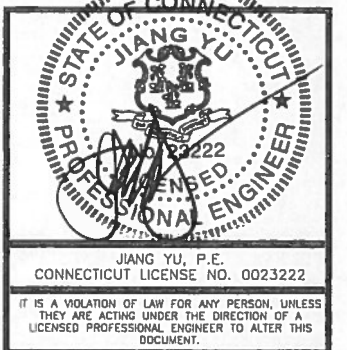
**CTNH350A
O&G WOODBURY**

CONSTRUCTION DRAWINGS

0	04/07/15	ISSUED AS FINAL
A	03/30/15	ISSUED FOR REVIEW



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



DRAWN BY: JC

REVIEWED BY: BSH

CHECKED BY: GHN

PROJECT NUMBER: 50065258

JOB NUMBER: 50071492

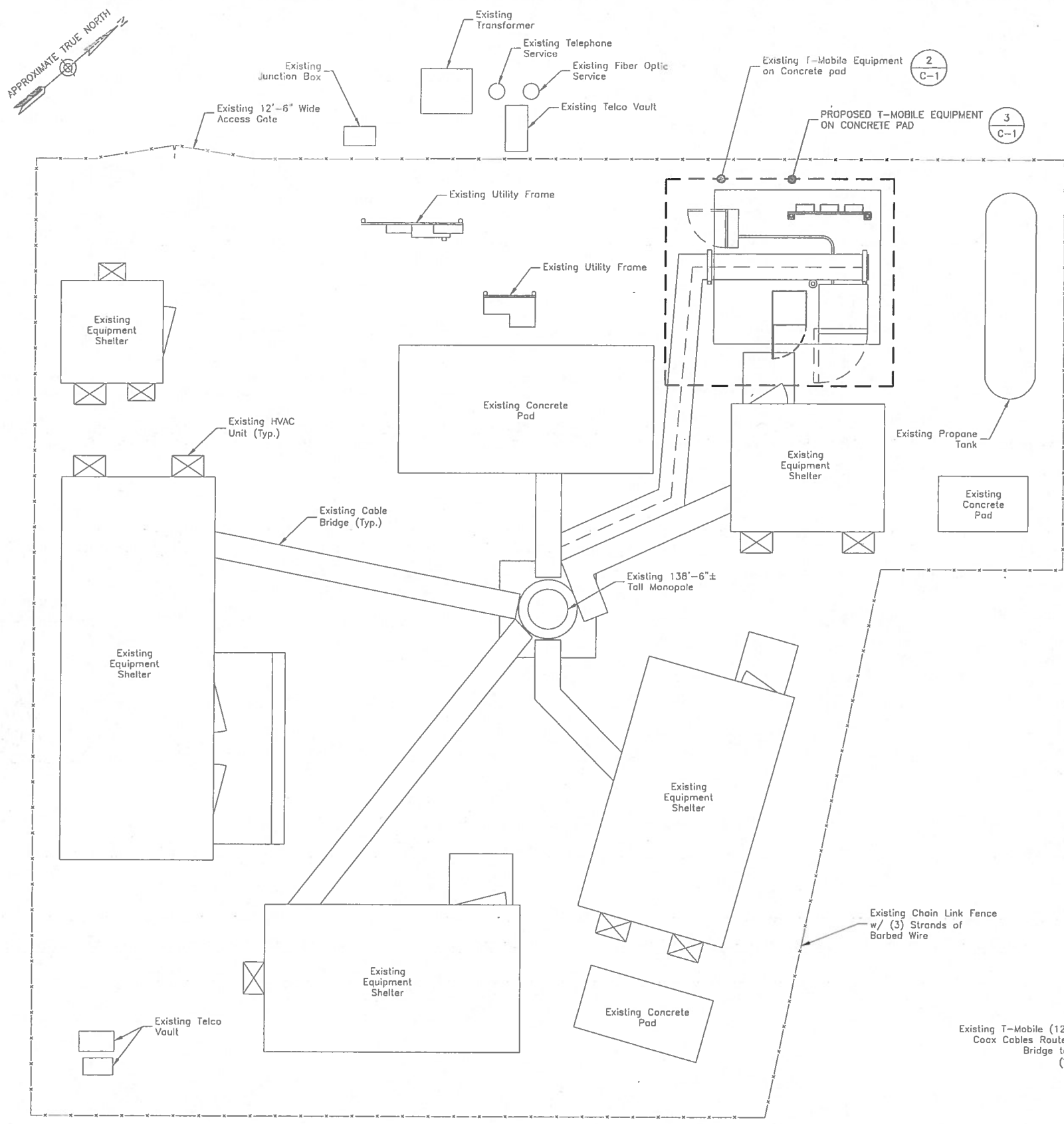
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GREAT HOLLOW ROAD
WOODBURY, CT 06798
LITCHFIELD COUNTY

SHEET TITLE

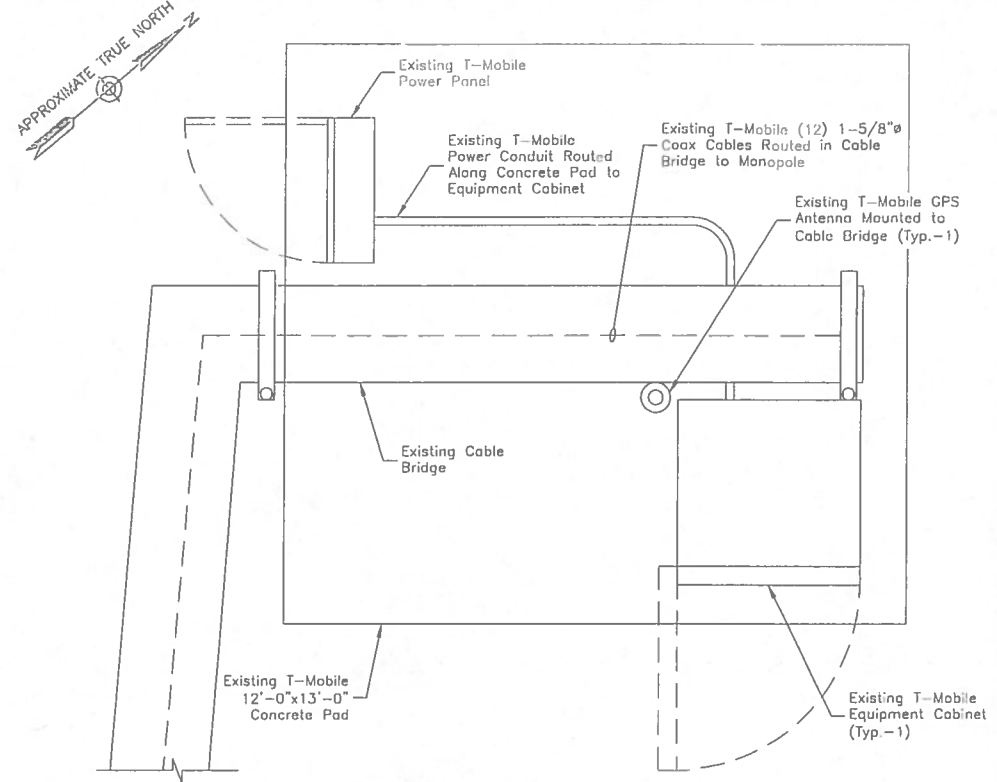
GENERAL NOTES

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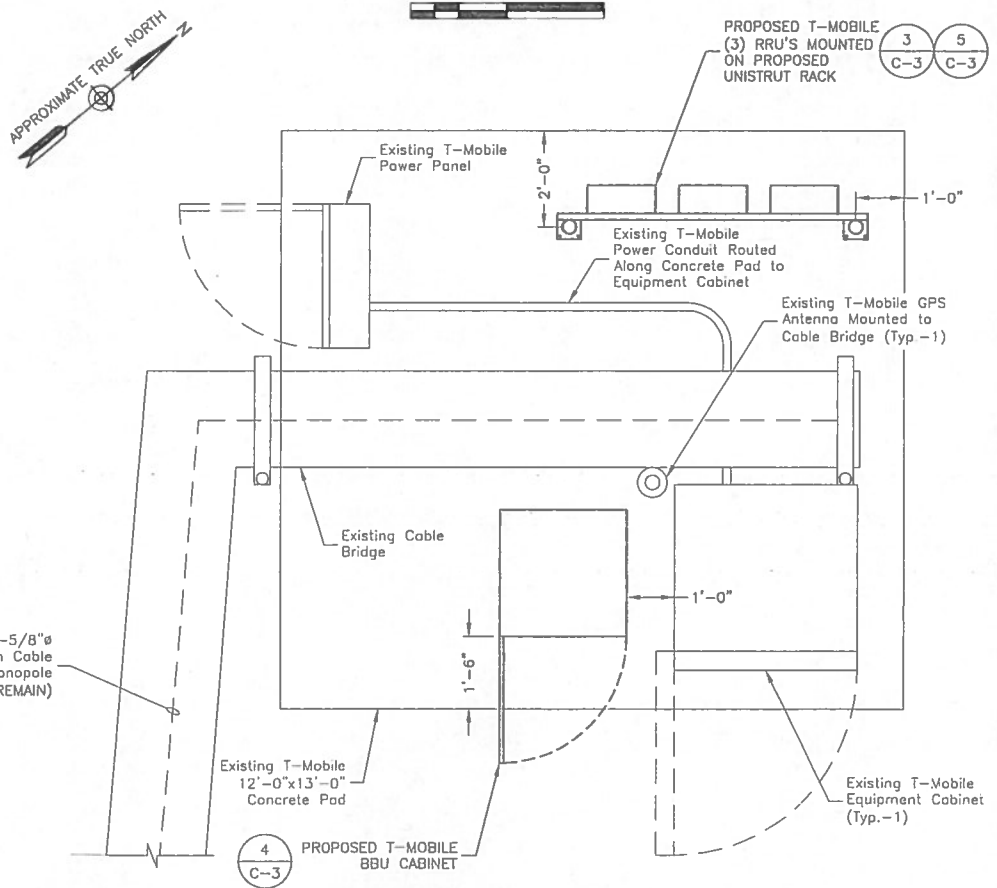


COMPOUND PLAN
 SCALE: 1"=10' FOR 11"x17"
 1"=5' FOR 22"x34"
 0' 5' 10'

- 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 FDH ENGINEERING, INC. DATED MARCH 11, 2015.



EXISTING EQUIPMENT PLAN
 SCALE: 1/4"=1' FOR 11"x17"
 1/2"=1' FOR 22"x34"
 0' 1' 2' 4'



PROPOSED EQUIPMENT PLAN
 SCALE: 1/4"=1' FOR 11"x17"
 1/2"=1' FOR 22"x34"
 0' 1' 2' 4'

T-Mobile

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

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

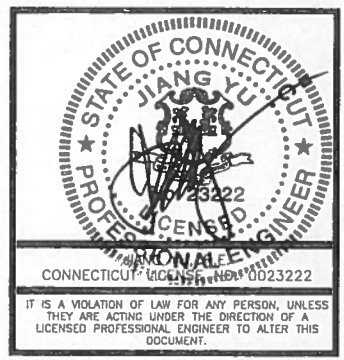
**CTNH350A
 O&G WOODBURY**

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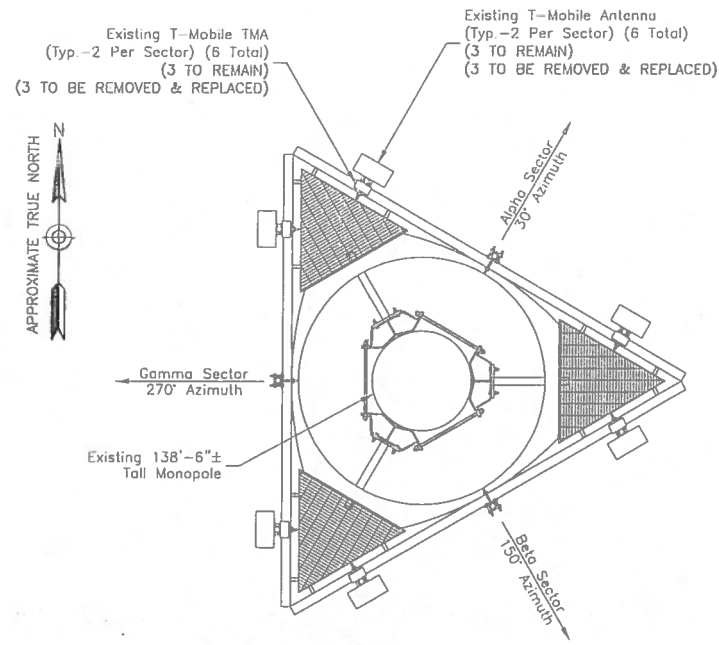
Dewberry Engineers Inc.
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 PARSIPPANY, NJ 07054
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 REVIEWED BY: BSH
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 PROJECT NUMBER: 50066258
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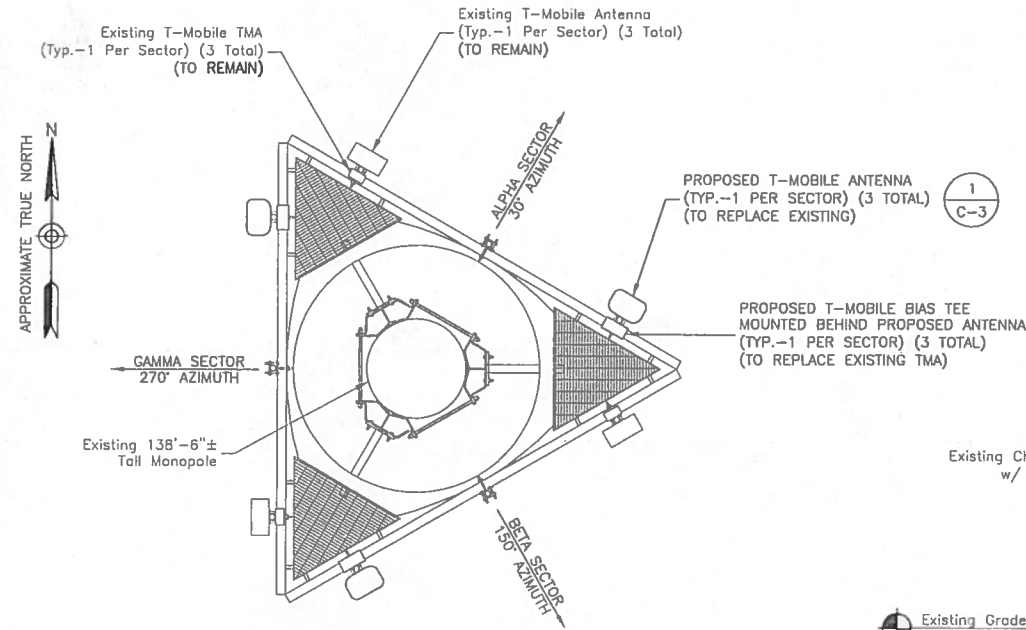
GREAT HOLLOW ROAD
 WOODBURY, CT 06798
 LITCHFIELD COUNTY

SHEET TITLE
**COMPOUND PLAN &
 EQUIPMENT PLANS**
 SHEET NUMBER



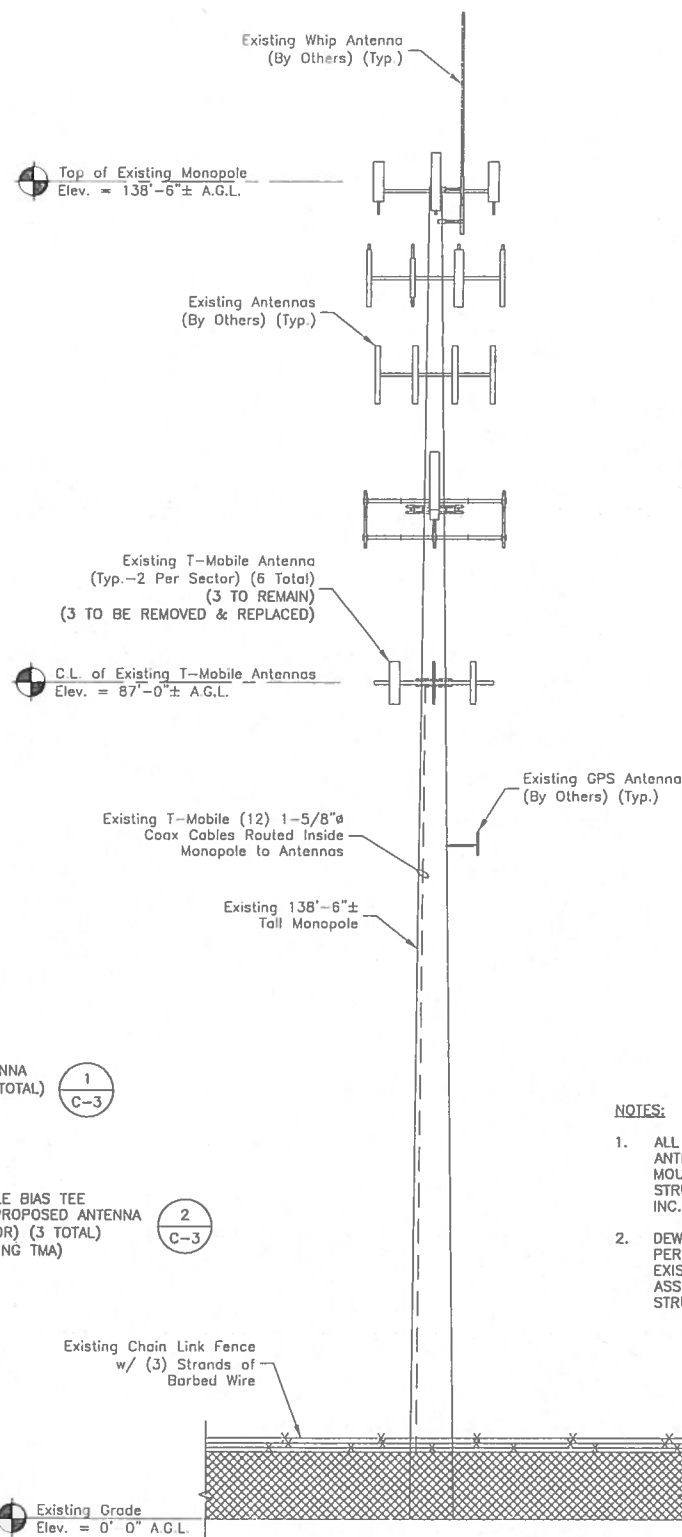
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SCALE: N.T.S.

1



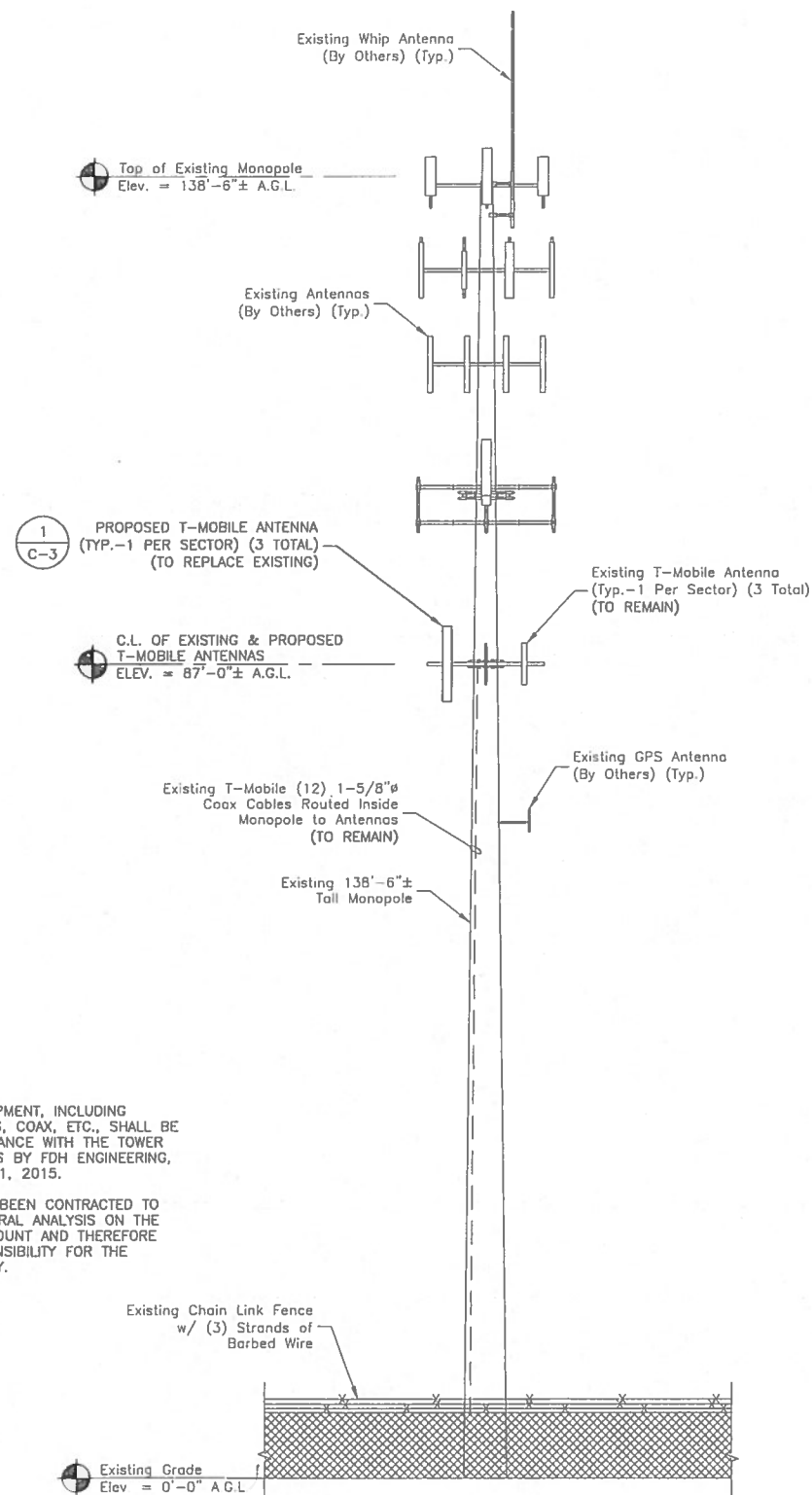
PROPOSED ANTENNA LAYOUT
SCALE: N.T.S.

2



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

3



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

4

NOTES:

1. ALL PROPOSED EQUIPMENT, INCLUDING ANTENNAS, BIAS TEES, COAX, ETC., SHALL BE MOUNTED IN ACCORDANCE WITH THE TOWER STRUCTURAL ANALYSIS BY FDH ENGINEERING, INC. DATED MARCH 11, 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.

T-Mobile

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CTNH350A
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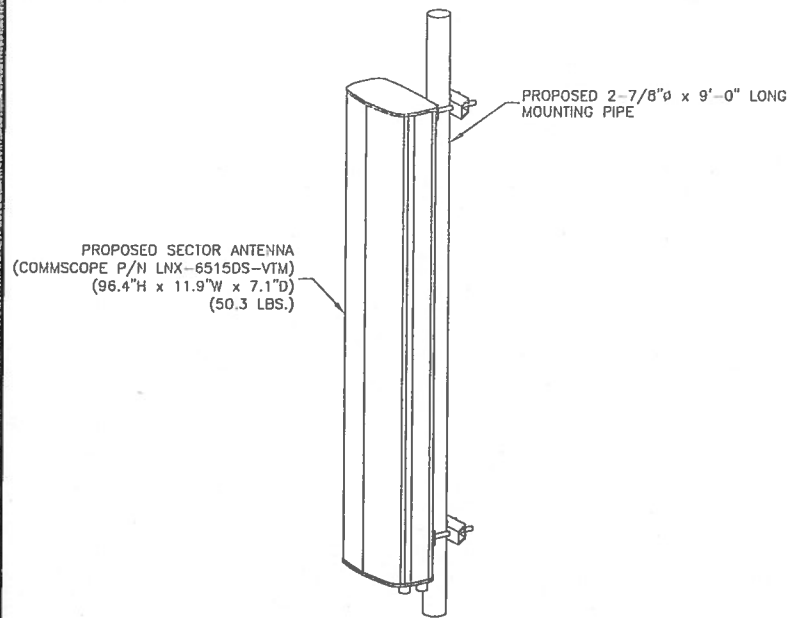
Dewberry Engineers Inc.
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SUITE 301
PARSIPPANY, NJ 07054
PHONE: 973.739.9400
FAX: 973.739.9710



DRAWN BY:	JC
REVIEWED BY:	BSH
CHECKED BY:	GHN
PROJECT NUMBER:	50066258
JOB NUMBER:	50071492
SITE ADDRESS:	

GREAT HOLLOW ROAD
WOODBURY, CT 06798
LITCHFIELD COUNTY

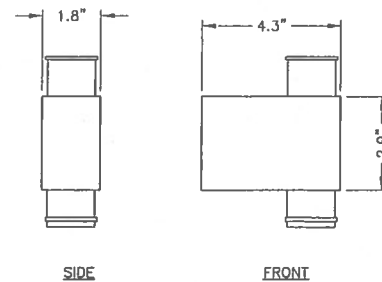
SHEET TITLE	ANTENNA LAYOUTS & ELEVATIONS
SHEET NUMBER	C-2



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.

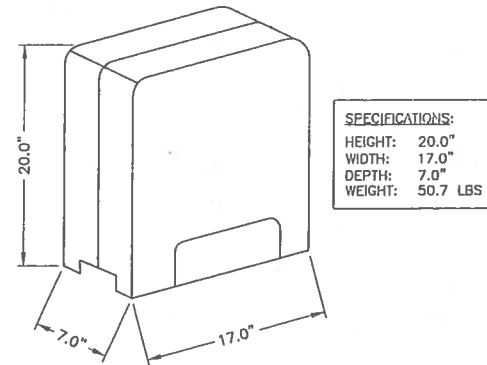
ISOMETRIC ANTENNA DETAIL
SCALE: N.T.S.



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.

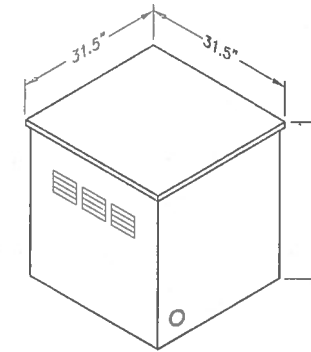
BIAS TEE DETAIL
SCALE: N.T.S.



RRU NOTES:

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

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



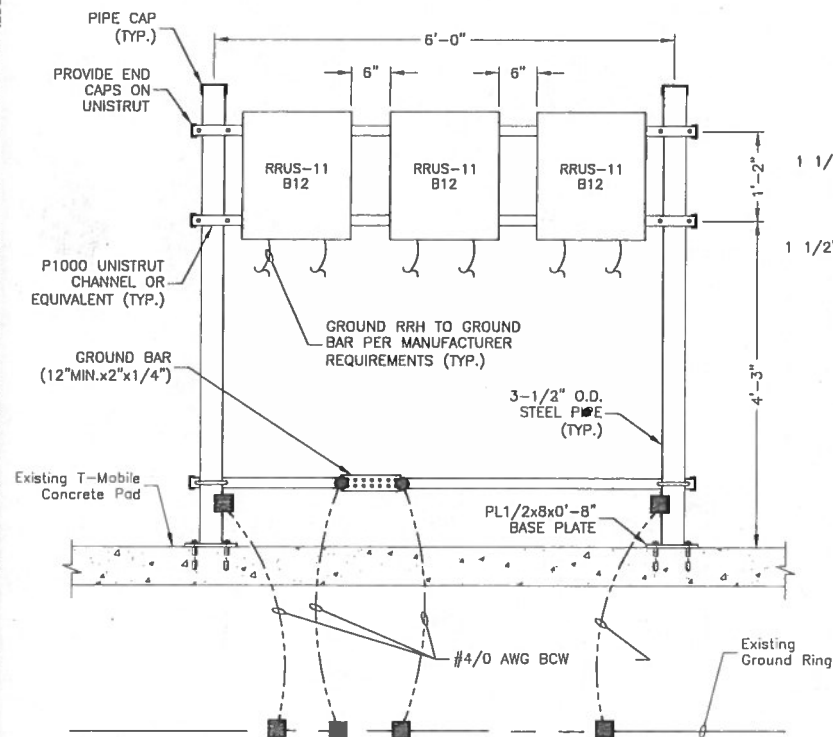
ALCATEL-LUCENT EZBF BATTERY BACKUP SYSTEM

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

NOTE:

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

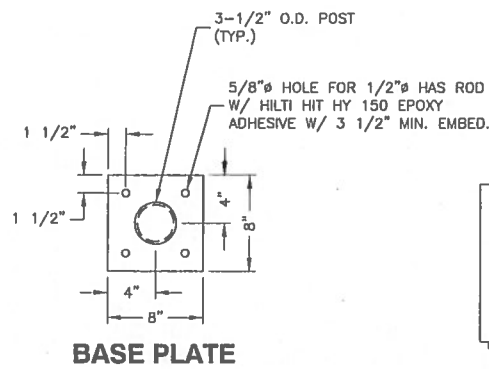
BBU CABINET DETAIL
SCALE: N.T.S.



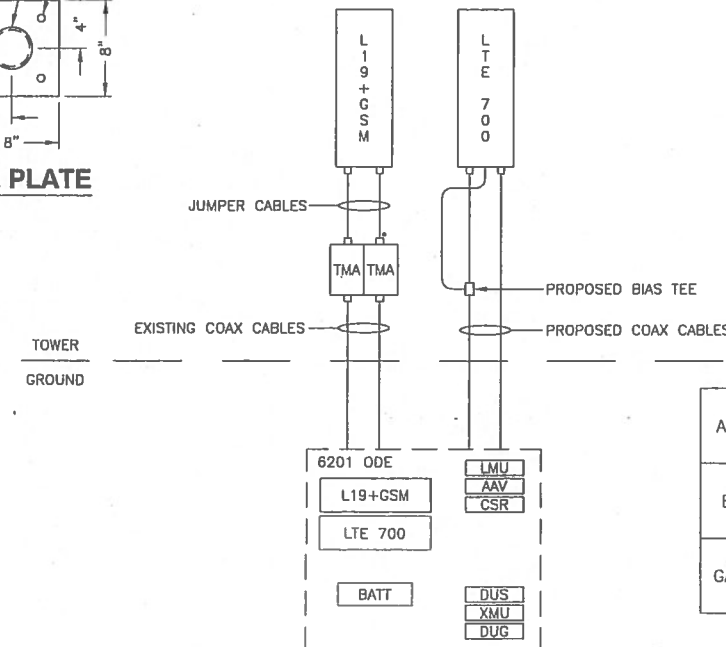
NOTES:

1. CONTRACTOR SHALL SUPPLY AND INSTALL UNISTRUT (OR EQUIVALENT) MOUNTING CHANNELS.
2. CONTRACTOR SHALL SUPPLY (BUT NOT INSTALL) 3/8 inch UNISTRUT BOLTING HARDWARE AND SPRING NUTS, TYPICAL FOUR PER RRU. CONTRACTOR SHALL BAG THE BOLTING HARDWARE AND HANG FROM INSTALLED UNISTRUT FRAME.
3. SPACING MAY VARY BASED ON SELECTED EQUIPMENT. ADJUSTMENTS TO SPACING WILL BE MADE BY RRU INSTALLER.
4. NO PAINTING OF THE RRU OR SOLAR SHIELD IS ALLOWED.

RRU RACK DETAIL
SCALE: N.T.S.



BASE PLATE



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

DESIGN CONFIGURATION					
	ANTENNAS		COAX		COAX LENGTH
	EXISTING	PROPOSED	EXISTING	PROPOSED	
ALPHA	RFS APXV18-209014-C	EXISTING TO REMAIN	(4) 1-5/8"	-	137'-0"
	RFS APX16PV-16PVL-E	COMMSCOPE LNX-6515DS-VTM			
BETA	RFS APXV18-209014-C	EXISTING TO REMAIN	(4) 1-5/8"	-	137'-0"
	RFS APX16PV-16PVL-E	COMMSCOPE LNX-6515DS-VTM			
GAMMA	RFS APXV18-209014-C	EXISTING TO REMAIN	(4) 1-5/8"	-	137'-0"
	RFS APX16PV-16PVL-E	COMMSCOPE LNX-6515DS-VTM			

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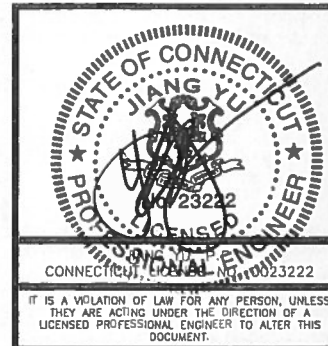
**CTNH350A
O&G WOODBURY**

CONSTRUCTION DRAWINGS

NO.	DATE	DESCRIPTION
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Dewberry

Dewberry Engineers Inc.
600 PARSIPPANY ROAD
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PHONE: 973.739.9400
FAX: 973.739.9710



DRAWN BY: JC

REVIEWED BY: BSH

CHECKED BY: GHN

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JOB NUMBER: 50071492

SITE ADDRESS:

GREAT HOLLOW ROAD
WOODBURY, CT 06798
LITCHFIELD COUNTY

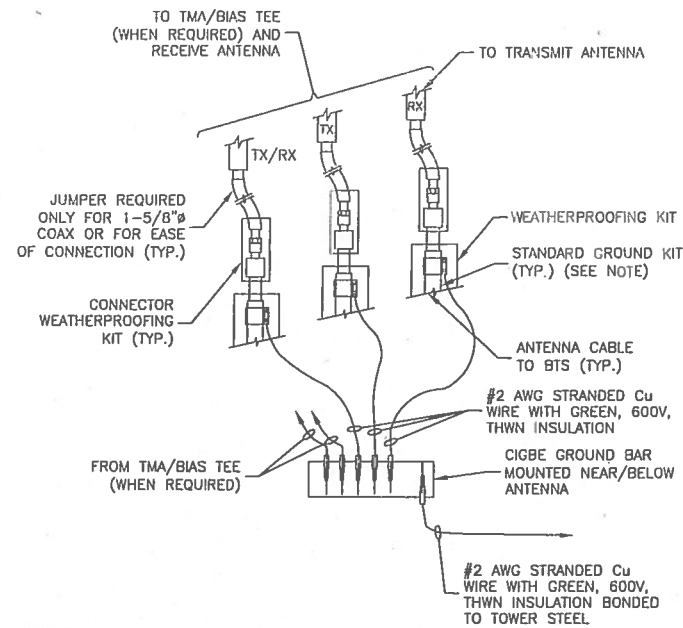
SHEET TITLE

CONSTRUCTION
DETAILS

SHEET NUMBER

GROUNDING NOTES:

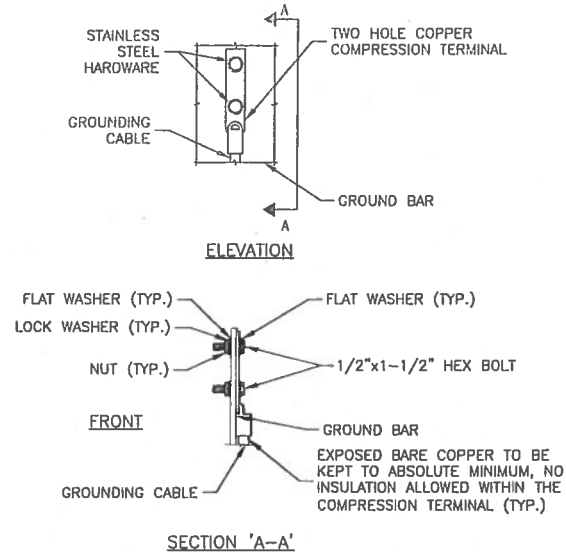
1. THE CONTRACTOR SHALL REVIEW AND INSPECT THE EXISTING FACILITY GROUNDING SYSTEM AND LIGHTNING PROTECTION SYSTEM (AS DESIGNED AND INSTALLED) FOR STRICT COMPLIANCE WITH THE NEC (AS ADOPTED BY THE AHJ), THE SITE-SPECIFIC (UL, LPI, OR NFPA) LIGHTNING PROTECTION CODE, AND GENERAL COMPLIANCE WITH TELCORIA AND TA 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 GESS) 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 GROUNDING 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 CONNECTIONS. 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)

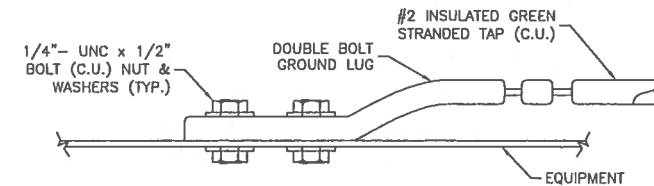
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NOTES:
1. DOUBLING UP OR STACKING OF CONNECTIONS IS NOT PERMITTED.
2. OXIDE INHIBITING COMPOUND TO BE USED AT ALL LOCATIONS.

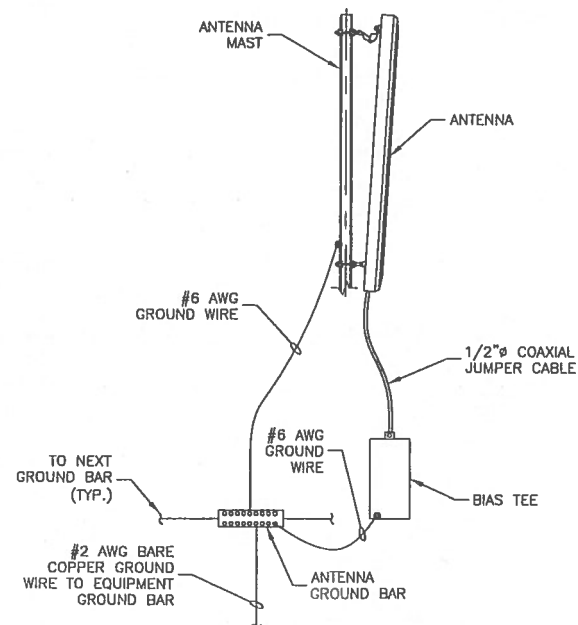
TYPICAL GROUND BAR MECHANICAL CONNECTION DETAIL

SCALE: N.T.S.



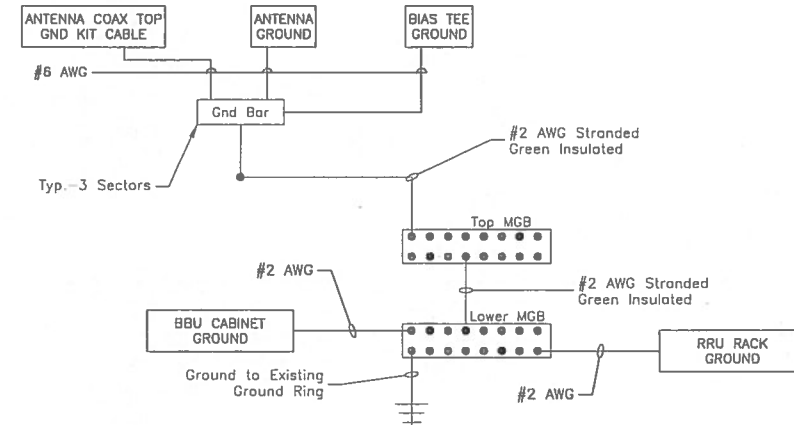
CONNECTION TO EQUIPMENT DETAIL

SCALE: N.T.S.



TYPICAL ANTENNA GROUNDING DETAIL

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

SCALE: N.T.S.

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GREAT HOLLOW ROAD
WOODBURY, CT 06798
LITCHFIELD COUNTY

SHEET TITLE

GROUNDING NOTES & DETAILS

SHEET NUMBER



Date: **March 11, 2015**

Jay Patton
Crown Castle
3530 Toringdon Way Suite 300
Charlotte, NC 28277

FDH Engineering, Inc.
6521 Meridien Drive
Raleigh, NC 27616
(919) 755-1012

Subject: Structural Analysis Report

Carrier Designation: **T-Mobile Co-Locate**
Carrier Site Name: NH350/Global-Woodbury
Carrier Site ID: CTNH350A

Crown Castle Designation: **Crown Castle BU Number:** 876380
Crown Castle Site Name: O&G WOODBURY
Crown Castle JDE Job Number: 324082
Crown Castle Work Order Number: 1022471
Crown Castle Application Number: 282535 Rev. 0

Engineering Firm Designation: **FDH Engineering, Inc. Project Number:** 15BGPW1400

Site Data: **Great Hollow Road, WOODBURY, Litchfield County, CT**
Latitude 41° 31' 19.2", Longitude -73° 13' 15.6"
138.5 Foot - Monopole Tower

Dear Susan Allen,

FDH Engineering, Inc. 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 763992, in accordance with application 282535, revision 0.

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.

The analysis has been performed in accordance with the TIA/EIA-222-F standard and 2005 CT State Building Code based upon a wind speed of 80 mph fastest mile.

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

We at *FDH Engineering, Inc.* 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.

Respectfully submitted by:

Cary J. Webb, PE
Project Engineer

Reviewed by:

Dennis D. Abel PE
Director - Structural Engineering
CT PE License No. 23247



03-11-2015

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1) INTRODUCTION

This tower is a 138.5 ft Monopole tower designed by ENGINEERED ENDEAVORS, INC. in April of 2003. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-F. The tower was originally designed to be 150-ft but was only constructed to a height of 139 ft. The tower has been modified multiple times in the past to accommodate additional loading. The tower was modified per reinforcement drawings prepared by Semaan Engineering Solutions, Inc. in November of 2005. Reinforcement consists of base plate stiffeners. The tower was modified again per reinforcement drawings prepared by GPD Group in December of 2011. Reinforcement consists of additional anchor rods.

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, 28.1 mph with 1 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
87.0	87.0	3	Commscope	LNx-6515DS-VTM w/ Mount Pipe	---	---	---
		3	Biastee	ATBT-Bottom-24V			

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	
139.0	140.0	6	Ericsson	RRUS-11	---	---		
	139.0	1	Crown mounts	Side Arm Mount [SO 102-3]				
138.0	148.0	1	db spectra	DS9A09F36D-N	1 14 2 1	1/2 1-1/4 7/16 3/8	1	
		1	bird technologies group	TTA-429-83H-08179				
	139.0	139.0	6	powerwave technologies				LGP2140X
			6	css				XDUO1416-80 w/ Mount Pipe
			1	kathrein				800 10764 w/ Mount Pipe
			1	kmw communications				AM-X-CD-14-65-00T-RET w/ Mount Pipe
			1	kmw communications				AM-X-CD-16-65-00T-RET w/ Mount Pipe
			1	raycap				DC6-48-60-18-8F
	138.0	138.0	6	powerwave technologies				LGP21401
			6	powerwave technologies				LGP21901
1			crown mounts	Platform Mount [LP 303-1]				
1			crown mounts	Side Arm Mount [SO 309-1]				
137.0	147.0	1	telewave	ANT150F6	1	1/2		
	137.0	1	crown mounts	Pipe Mount [PM 601-1]				

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
129.0	129.0	3	alcatel lucent	RRH2X60-AWS	1	1-5/8	2
		6	andrew	HBXX-6517DS-A2M w/ Mount Pipe			
		3	andrew	LNx-8513DS-A1M w/ Mount Pipe			
		1	rfs celwave	DB-B1-6C-12AB-0Z			
		3	Antel	BXA-70063/6CF2			
119.0	119.0	1	crown mounts	Platform Mount [LP 304-1]	18	1-5/8	1
		1	crown mounts	Platform Mount [LP 304-1]			
105.0	105.0	1	crown mounts	Platform Mount [LP 304-1]	12	1-5/8	4
		12	decibel	DB846G90A-XY w/ Mount Pipe			
104.0	104.0	3	alcatel lucent	1900MHz RRH (65MHz)	--	--	1
		1	crown mounts	Side Arm Mount [SO 102-3]			
104.0	108.0	3	rfs celwave	APXVSP18-C-A20 w/ Mount Pipe	3	1-1/4	1
		9	rfs celwave	ACU-A20-N			
	104.0	3	alcatel lucent	800 EXTERNAL NOTCH FILTER			
		3	alcatel lucent	800MHZ RRH			
		1	crown mounts	Miscellaneous [NA 507-1]			
		1	crown mounts	Platform Mount [LP 712-1]			
87.0	87.0	3	Andrew	ETM19V2S12UB	12	1-5/8	1
		1	crown mounts	Platform Mount [LP 305-1]			
		3	rfs celwave	APXV18-209014-C w/ Mount Pipe			
		3	Andrew	ETM19V2S12UB			
		3	rfs celwave	APXV18-209014-C w/ Mount Pipe			
70.0	71.0	1	lucent	KS24019-L112A	1	1/2	1
	70.0	1	crown mounts	Side Arm Mount [SO 701-1]			

Notes:

- 1) Existing Equipment
- 2) Reserved Equipment
- 3) Existing Equipment to be removed; not considered in this analysis
- 4) Abandoned equipment to be removed; not considered in this analysis

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)
150	150	12	decibel	DB980F90	-	-
140	140	12	decibel	DB980F90	-	-
130	130	12	decibel	DB980F90	-	-
120	120	12	decibel	DB980F90	-	-
109	109	12	decibel	DB980F90	-	-
100	100	12	decibel	DB980F90	-	-

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	Clarence Welti Assoc, Inc.	1531967	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	Engineered Endeavors, Inc.	2122534	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Engineered Endeavors, Inc.	1533002	CCISITES
4-TOWER REINFORCEMENT DESIGN/DRAWINGS/DATA	Semaan Engineering Solutions	2055776	CCISITES
4-TOWER REINFORCEMENT DESIGN/DRAWINGS/DATA	GPD Group	3030835	CCISITES
4-POST-INSTALLATION INSPECTION	GPD Group	3420974	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.
- 5) Tower dimensions for elevation 108.5' to 138.5' was taken from Crown Castle Structural Analysis Report dated March 19, 2013 (Project No. 587330).

This analysis may be affected if any assumptions are not valid or have been made in error. FDH Engineering, Inc. 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	138.5 - 108.5	Pole	TP24.5x17.375x0.1875	1	-6.57	752.20	78.5	Pass
L2	108.5 - 83.75	Pole	TP31.88x24.5x0.25	2	-11.48	1249.44	80.3	Pass
L3	83.75 - 43	Pole	TP43.42x30.0382x0.3125	3	-20.73	2131.32	83.4	Pass
L4	43 - 0	Pole	TP55.5x41.0206x0.3125	4	-33.21	2629.01	95.5	Pass
							Summary	
						Pole (L4)	95.5	Pass
						RATING =	95.5	Pass

Table 6 - Tower Component Stresses vs. Capacity - LC7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Flange Bolts	108.5	44.8	Pass
1	Flange Plate	108.5	31.1	Pass
1	Anchor Rods	0	67.0	Pass
1	Base Plate	0	98.5	Pass
1	Base Foundation	0	76.3	Pass

Structure Rating (max from all components) =	98.5%
---	--------------

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

DESIGNED APPURTENANCE LOADING

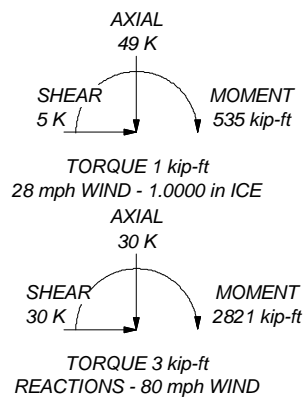
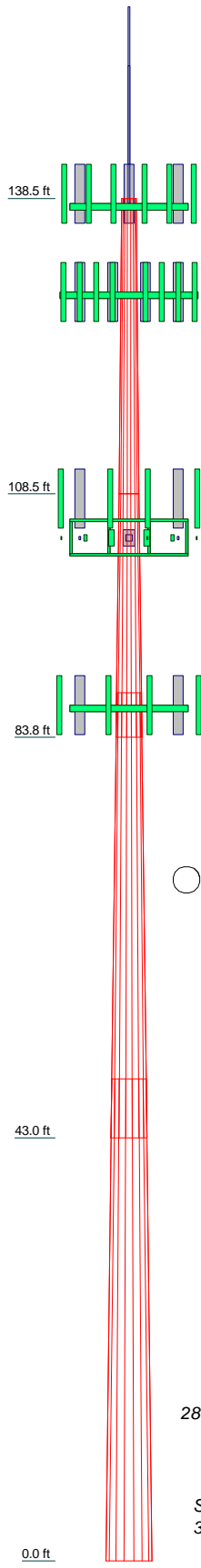
TYPE	ELEVATION	TYPE	ELEVATION
(2) RRUS-11	139	RRH2X60-AWS	129
(2) RRUS-11	139	Platform Mount [LP 304-1]	129
(2) RRUS-11	139	1900MHz RRH (65MHz)	105
Side Arm Mount [SO 102-3]	139	1900MHz RRH (65MHz)	105
(2) LGP21401	138	1900MHz RRH (65MHz)	105
(2) LGP2140X	138	Side Arm Mount [SO 102-3]	105
(2) LGP2140X	138	APXVSPP18-C-A20 w/ Mount Pipe	104
(2) LGP2140X	138	APXVSPP18-C-A20 w/ Mount Pipe	104
(2) LGP21901	138	APXVSPP18-C-A20 w/ Mount Pipe	104
(2) LGP21901	138	(3) ACU-A20-N	104
(2) LGP21901	138	(3) ACU-A20-N	104
(2) XDUO1416-80 w/ Mount Pipe	138	(3) ACU-A20-N	104
(2) XDUO1416-80 w/ Mount Pipe	138	800 EXTERNAL NOTCH FILTER	104
(2) XDUO1416-80 w/ Mount Pipe	138	800 EXTERNAL NOTCH FILTER	104
AM-X-CD-16-65-00T-RET w/ Mount Pipe	138	800 EXTERNAL NOTCH FILTER	104
800 10764 w/ Mount Pipe	138	800MHZ RRH	104
AM-X-CD-14-65-00T-RET w/ Mount Pipe	138	800MHZ RRH	104
DC6-48-60-18-8F	138	Platform Mount [LP 712-1]	104
Platform Mount [LP 303-1]	138	Miscellaneous [NA 507-1]	104
TTA-429-83H-08179	138	ETM19V2S12UB	87
DS9A09F36D-N	138	ETM19V2S12UB	87
(2) LGP21401	138	ETM19V2S12UB	87
(2) LGP21401	138	APXV18-209014-C w/ Mount Pipe	87
ANT150F6	137	APXV18-209014-C w/ Mount Pipe	87
Pipe Mount [PM 601-1]	137	APXV18-209014-C w/ Mount Pipe	87
BXA-70063/6CF-2 W/Mount Pipe	129	Empty Pipe Mount	87
BXA-70063/6CF-2 W/Mount Pipe	129	Empty Pipe Mount	87
BXA-70063/6CF-2 W/Mount Pipe	129	Empty Pipe Mount	87
(2) HBXX-6517DS-A2M w/ Mount Pipe	129	Platform Mount [LP 305-1]	87
(2) HBXX-6517DS-A2M w/ Mount Pipe	129	LNx-6515DS-VTM w/ Mount Pipe	87
(2) HBXX-6517DS-A2M w/ Mount Pipe	129	LNx-6515DS-VTM w/ Mount Pipe	87
LNx-8513DS-A1M w/ Mount Pipe	129	LNx-6515DS-VTM w/ Mount Pipe	87
LNx-8513DS-A1M w/ Mount Pipe	129	ATBT-BOTTOM-24V	87
LNx-8513DS-A1M w/ Mount Pipe	129	ATBT-BOTTOM-24V	87
LNx-8513DS-A1M w/ Mount Pipe	129	ATBT-BOTTOM-24V	87
DB-B1-6C-12AB-0Z	129	KS24019-L112A	70
RRH2X60-AWS	129	Side Arm Mount [SO 701-1]	70
RRH2X60-AWS	129		

MATERIAL STRENGTH


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

TOWER DESIGN NOTES

1. Tower is located in Litchfield 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 28 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.



Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	30.00	18	0.1875	17.3750	24.5000	31.8800	A572-65	1.3
2	24.75	18	0.2500	4.50	24.5000	31.8800	A572-65	1.9
3	45.25	18	0.3125	6.00	30.0382	43.4200	A572-65	5.6
4	49.00	18	0.3125	41.0206	55.5000		A572-65	7.9
								16.6

 FDH Engineering, Inc. 6521 Meridian Drive, Suite 107 Raleigh, North Carolina 27616 Phone: 9197551012 FAX: 9197551031	Job: O&G Woodbury, BU# 876380 Project: 15BGPW1400
	Client: Crown Castle Code: TIA/EIA-222-F Path:
Tower Analysis	App'd: _____ Scale: NTS Dwg No. E-1

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Tower Input Data

There is a pole section.

This tower is designed using the TIA/EIA-222-F standard.

The following design criteria apply:

Tower is located in Litchfield County, Connecticut.

Basic wind speed of 80 mph.

Nominal ice thickness of 1.0000 in.

Ice thickness is considered to increase with height.

Ice density of 56 pcf.

A wind speed of 28 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 50 mph.

A non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

Stress ratio used in pole design is 1.333.

Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

Consider Moments - Legs Consider Moments - Horizontals Consider Moments - Diagonals Use Moment Magnification ✓ Use Code Stress Ratios ✓ Use Code Safety Factors - Guys ✓ Escalate Ice Always Use Max Kz Use Special Wind Profile Include Bolts In Member Capacity Leg Bolts Are At Top Of Section Secondary Horizontal Braces Leg Use Diamond Inner Bracing (4 Sided) Add IBC .6D+W Combination	Distribute Leg Loads As Uniform Assume Legs Pinned ✓ Assume Rigid Index Plate ✓ Use Clear Spans For Wind Area Use Clear Spans For KL/r Retension Guys To Initial Tension ✓ Bypass Mast Stability Checks ✓ Use Azimuth Dish Coefficients ✓ Project Wind Area of Appurt. Autocalc Torque Arm Areas SR Members Have Cut Ends ✓ Sort Capacity Reports By Component Triangulate Diamond Inner Bracing Use TIA-222-G Tension Splice Capacity Exemption	Treat Feedline Bundles As Cylinder Use ASCE 10 X-Brace Ly Rules Calculate Redundant Bracing Forces Ignore Redundant Members in FEA SR Leg Bolts Resist Compression All Leg Panels Have Same Allowable Offset Girt At Foundation ✓ Consider Feedline Torque Include Angle Block Shear Check <div style="text-align: center; background-color: #e0e0e0;">Poles</div> ✓ Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets
--	--	--

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	138.50-108.50	30.00	0.00	18	17.3750	24.5000	0.1875	0.7500	A572-65 (65 ksi)
L2	108.50-83.75	24.75	4.50	18	24.5000	31.8800	0.2500	1.0000	A572-65 (65 ksi)
L3	83.75-43.00	45.25	6.00	18	30.0382	43.4200	0.3125	1.2500	A572-65 (65 ksi)
L4	43.00-0.00	49.00		18	41.0206	55.5000	0.3125	1.2500	A572-65 (65 ksi)

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Tapered Pole Properties

Section	Tip Dia. in	Area in ²	I in ⁴	r in	C in	I/C in ³	J in ⁴	It/Q in ²	w in	w/t
L1	17.6430	10.2287	381.7542	6.1016	8.8265	43.2509	764.0106	5.1153	2.7280	14.549
	24.8780	14.4690	1080.5242	8.6309	12.4460	86.8170	2162.4702	7.2359	3.9820	21.237
L2	24.8780	19.2424	1429.6167	8.6088	12.4460	114.8656	2861.1145	9.6230	3.8720	15.488
	32.3718	25.0984	3172.3563	11.2287	16.1950	195.8844	6348.8868	12.5516	5.1709	20.684
L3	31.8529	29.4842	3291.4698	10.5526	15.2594	215.7012	6587.2706	14.7449	4.7367	15.158
	44.0898	42.7573	10038.1321	15.3032	22.0574	455.0922	20089.4726	21.3827	7.0919	22.694
L4	43.4538	40.3774	8453.5159	14.4514	20.8385	405.6687	16918.1551	20.1925	6.6696	21.343
	56.3562	54.7391	21062.8220	19.5916	28.1940	747.0675	42153.3590	27.3748	9.2180	29.498

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A _f	Adjust. Factor A _r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals
ft	ft ²	in					in	in
L1 138.50-108.50				1	1	1		
L2 108.50-83.75				1	1	1		
L3 83.75-43.00				1	1	1		
L4 43.00-0.00				1	1	1		

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Sector	Component Type	Placement	Total Number	Number Per Row	Start/End Position	Width or Diameter	Perimeter	Weight
			ft				in	in	plf
Safety Line 3/8	C	Surface Ar (CaAa)	138.50 - 0.00	1	1	0.000 0.000	0.3750		0.22
LDF7-50A(1-5/8")	A	Surface Ar (CaAa)	129.00 - 0.00	7	7	0.000 0.250	1.9800		0.82

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement	Total Number		C _A A _A	Weight
				ft			ft ² /ft	plf

LDF6-50A(1-1/4")	A	No	Inside Pole	138.00 - 0.00	6	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.00 0.00 0.00 0.00 0.00	0.66 0.66 0.66 0.66 0.66
LCF114-50J(1-1/4")	A	No	Inside Pole	138.00 - 0.00	6	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.00 0.00 0.00 0.00 0.00	0.70 0.70 0.70 0.70 0.70
FB-L98B-002-75000(A	No	Inside Pole	138.00 - 0.00	1	No Ice	0.00	0.06

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Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_{AA} ft ² /ft	Weight plf
3/8")						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-VG122ST-BRDA(7/16)	A	No	Inside Pole	138.00 - 0.00	2	No Ice	0.00	0.14
						1/2" Ice	0.00	0.14
						1" Ice	0.00	0.14
						2" Ice	0.00	0.14
						4" Ice	0.00	0.14

LDF4-50A(1/2")	A	No	Inside Pole	137.00 - 0.00	1	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15
						1" Ice	0.00	0.15
						2" Ice	0.00	0.15
						4" Ice	0.00	0.15

LDF7-50A(1-5/8")	A	No	Inside Pole	129.00 - 0.00	12	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

HB114-1-0813U4-M5J(1 1/4")	B	No	Inside Pole	104.00 - 0.00	3	No Ice	0.00	1.20
						1/2" Ice	0.00	1.20
						1" Ice	0.00	1.20
						2" Ice	0.00	1.20
						4" Ice	0.00	1.20

LDF7-50A(1-5/8")	B	No	Inside Pole	87.00 - 0.00	12	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

LDF4-50A(1/2")	B	No	Inside Pole	70.00 - 0.00	1	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15
						1" Ice	0.00	0.15
						2" Ice	0.00	0.15
						4" Ice	0.00	0.15

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft ²	A_F ft ²	C_{AA} In Face ft ²	C_{AA} Out Face ft ²	Weight K
L1	138.50-108.50	A	0.000	0.000	28.413	0.000	0.57
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	1.125	0.000	0.01
L2	108.50-83.75	A	0.000	0.000	34.304	0.000	0.60
		B	0.000	0.000	0.000	0.000	0.10
		C	0.000	0.000	0.928	0.000	0.01
L3	83.75-43.00	A	0.000	0.000	56.480	0.000	0.99
		B	0.000	0.000	0.000	0.000	0.55
		C	0.000	0.000	1.528	0.000	0.01
L4	43.00-0.00	A	0.000	0.000	59.598	0.000	1.04
		B	0.000	0.000	0.000	0.000	0.58

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Tower Section	Tower Elevation ft	Face	A _R ft ²	A _F ft ²	C _{AA} In Face ft ²	C _{AA} Out Face ft ²	Weight K
		C	0.000	0.000	1.613	0.000	0.01

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} In Face ft ²	C _{AA} Out Face ft ²	Weight K
L1	138.50-108.50	A	1.171	0.000	0.000	64.213	0.000	0.93
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	8.149	0.000	0.07
L2	108.50-83.75	A	1.136	0.000	0.000	77.070	0.000	1.02
		B		0.000	0.000	0.000	0.000	0.10
		C		0.000	0.000	6.552	0.000	0.06
L3	83.75-43.00	A	1.080	0.000	0.000	126.893	0.000	1.67
		B		0.000	0.000	0.000	0.000	0.55
		C		0.000	0.000	10.788	0.000	0.09
L4	43.00-0.00	A	1.000	0.000	0.000	132.616	0.000	1.73
		B		0.000	0.000	0.000	0.000	0.58
		C		0.000	0.000	10.902	0.000	0.09

Feed Line Center of Pressure

Section	Elevation ft	CP _X in	CP _Z in	CP _X Ice in	CP _Z Ice in
L1	138.50-108.50	-0.7375	-0.7009	-0.9011	-0.7348
L2	108.50-83.75	-0.9797	-0.9442	-1.2117	-1.0520
L3	83.75-43.00	-1.0625	-1.0235	-1.3999	-1.2129
L4	43.00-0.00	-1.1349	-1.0928	-1.5849	-1.3787

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K	
TTA-429-83H-08179	A	From Leg	1.00	0.0000	138.00	No Ice	1.05	1.05	0.02
			0.00			1/2" Ice	1.21	1.21	0.03
			10.00			1" Ice	1.38	1.38	0.04
						2" Ice	1.74	1.74	0.07
						4" Ice	2.57	2.57	0.16
DS9A09F36D-N	A	From Leg	1.00	0.0000	138.00	No Ice	5.76	5.76	0.05
			0.00			1/2" Ice	7.71	7.71	0.09
			10.00			1" Ice	9.68	9.68	0.14
						2" Ice	13.67	13.67	0.29
						4" Ice	20.51	20.51	0.73

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Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} Front	C _{AA} Side	Weight
			Horz Lateral	Vert					

(2) LGP21401	A	From Leg	4.00	0.0000	138.00	No Ice	1.29	0.23	0.01
			0.00			1/2" Ice	1.45	0.31	0.02
			0.00			1" Ice	1.61	0.40	0.03
						2" Ice	1.97	0.61	0.05
						4" Ice	2.79	1.12	0.14
(2) LGP21401	B	From Leg	4.00	0.0000	138.00	No Ice	1.29	0.23	0.01
			0.00			1/2" Ice	1.45	0.31	0.02
			0.00			1" Ice	1.61	0.40	0.03
						2" Ice	1.97	0.61	0.05
						4" Ice	2.79	1.12	0.14
(2) LGP21401	C	From Leg	4.00	0.0000	138.00	No Ice	1.29	0.23	0.01
			0.00			1/2" Ice	1.45	0.31	0.02
			0.00			1" Ice	1.61	0.40	0.03
						2" Ice	1.97	0.61	0.05
						4" Ice	2.79	1.12	0.14
(2) LGP2140X	A	From Leg	4.00	0.0000	138.00	No Ice	1.26	0.38	0.01
			0.00			1/2" Ice	1.42	0.49	0.02
			1.00			1" Ice	1.58	0.62	0.03
						2" Ice	1.94	0.89	0.05
						4" Ice	2.75	1.54	0.13
(2) LGP2140X	B	From Leg	4.00	0.0000	138.00	No Ice	1.26	0.38	0.01
			0.00			1/2" Ice	1.42	0.49	0.02
			1.00			1" Ice	1.58	0.62	0.03
						2" Ice	1.94	0.89	0.05
						4" Ice	2.75	1.54	0.13
(2) LGP2140X	C	From Leg	4.00	0.0000	138.00	No Ice	1.26	0.38	0.01
			0.00			1/2" Ice	1.42	0.49	0.02
			1.00			1" Ice	1.58	0.62	0.03
						2" Ice	1.94	0.89	0.05
						4" Ice	2.75	1.54	0.13
(2) LGP21901	A	From Leg	4.00	0.0000	138.00	No Ice	0.27	0.18	0.01
			0.00			1/2" Ice	0.34	0.25	0.01
			0.00			1" Ice	0.43	0.32	0.01
						2" Ice	0.62	0.49	0.02
						4" Ice	1.10	0.94	0.07
(2) LGP21901	B	From Leg	4.00	0.0000	138.00	No Ice	0.27	0.18	0.01
			0.00			1/2" Ice	0.34	0.25	0.01
			0.00			1" Ice	0.43	0.32	0.01
						2" Ice	0.62	0.49	0.02
						4" Ice	1.10	0.94	0.07
(2) LGP21901	C	From Leg	4.00	0.0000	138.00	No Ice	0.27	0.18	0.01
			0.00			1/2" Ice	0.34	0.25	0.01
			0.00			1" Ice	0.43	0.32	0.01
						2" Ice	0.62	0.49	0.02
						4" Ice	1.10	0.94	0.07
(2) XDUO1416-80 w/ Mount Pipe	A	From Leg	4.00	0.0000	138.00	No Ice	6.73	4.09	0.04
			0.00			1/2" Ice	7.21	4.74	0.09
			1.00			1" Ice	7.69	5.38	0.15
						2" Ice	8.69	6.80	0.28
						4" Ice	10.82	9.91	0.66
(2) XDUO1416-80 w/ Mount Pipe	B	From Leg	4.00	0.0000	138.00	No Ice	6.73	4.09	0.04
			0.00			1/2" Ice	7.21	4.74	0.09
			1.00			1" Ice	7.69	5.38	0.15
						2" Ice	8.69	6.80	0.28
						4" Ice	10.82	9.91	0.66
(2) XDUO1416-80 w/ Mount	C	From Leg	4.00	0.0000	138.00	No Ice	6.73	4.09	0.04

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	Client		Crown Castle				Designed by		Cary Webb

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment °	Placement ft	C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K
			Horz ft	Lateral ft					
Pipe			0.00						0.09
			1.00			1/2" Ice	7.21	4.74	0.15
						1" Ice	7.69	5.38	0.28
						2" Ice	8.69	6.80	0.66
						4" Ice	10.82	9.91	0.07
AM-X-CD-16-65-00T-RET w/ Mount Pipe	A	From Leg	4.00		0.0000	138.00	No Ice	8.50	6.30
			0.00				1/2" Ice	9.15	7.48
			1.00				1" Ice	9.77	8.37
							2" Ice	11.03	10.18
							4" Ice	13.68	14.02
800 10764 w/ Mount Pipe	B	From Leg	4.00		0.0000	138.00	No Ice	6.20	4.29
			0.00				1/2" Ice	6.69	4.99
			1.00				1" Ice	7.18	5.66
							2" Ice	8.19	7.10
							4" Ice	10.33	10.30
AM-X-CD-14-65-00T-RET w/ Mount Pipe	C	From Leg	4.00		0.0000	138.00	No Ice	5.74	4.02
			0.00				1/2" Ice	6.20	4.63
			1.00				1" Ice	6.66	5.28
							2" Ice	7.62	6.68
							4" Ice	9.67	9.74
DC6-48-60-18-8F	B	From Leg	4.00		0.0000	138.00	No Ice	2.57	4.32
			0.00				1/2" Ice	2.80	4.60
			1.00				1" Ice	3.04	4.88
							2" Ice	3.54	5.49
							4" Ice	4.66	6.80
Platform Mount [LP 303-1]	C	None			0.0000	138.00	No Ice	14.66	14.66
							1/2" Ice	18.87	18.87
							1" Ice	23.08	23.08
							2" Ice	31.50	31.50
							4" Ice	48.34	48.34

(2) RRUS-11	A	From Leg	1.00		0.0000	139.00	No Ice	2.94	1.25
			0.00				1/2" Ice	3.17	1.41
			1.00				1" Ice	3.41	1.59
							2" Ice	3.91	1.96
							4" Ice	5.02	2.82
(2) RRUS-11	B	From Leg	1.00		0.0000	139.00	No Ice	2.94	1.25
			0.00				1/2" Ice	3.17	1.41
			1.00				1" Ice	3.41	1.59
							2" Ice	3.91	1.96
							4" Ice	5.02	2.82
(2) RRUS-11	C	From Leg	1.00		0.0000	139.00	No Ice	2.94	1.25
			0.00				1/2" Ice	3.17	1.41
			1.00				1" Ice	3.41	1.59
							2" Ice	3.91	1.96
							4" Ice	5.02	2.82
Side Arm Mount [SO 102-3]	C	None			0.0000	139.00	No Ice	3.00	3.00
							1/2" Ice	3.48	3.48
							1" Ice	3.96	3.96
							2" Ice	4.92	4.92
							4" Ice	6.84	6.84

ANT150F6	A	From Leg	1.00		0.0000	137.00	No Ice	4.80	4.80
			0.00				1/2" Ice	6.83	6.83
			10.00				1" Ice	8.87	8.87
							2" Ice	13.01	13.01
							4" Ice	21.03	21.03
Pipe Mount [PM 601-1]	A	From Leg	0.50		0.0000	137.00	No Ice	3.00	0.90

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Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} Front	C _{AA} Side	Weight	
			Horz	Vert						
			ft	ft	°	ft	ft ²	ft ²	K	
			0.00			1/2" Ice	3.74	1.12	0.08	
			0.00			1" Ice	4.48	1.34	0.09	
						2" Ice	5.96	1.78	0.12	
						4" Ice	8.92	2.66	0.18	

BXA-70063/6CF-2 W/Mount Pipe	A	From Leg	4.00		0.0000	129.00	No Ice	7.75	5.18	0.04
			0.00				1/2" Ice	8.29	6.11	0.10
			0.00				1" Ice	8.85	6.92	0.16
							2" Ice	9.97	8.59	0.31
							4" Ice	12.34	12.13	0.75
BXA-70063/6CF-2 W/Mount Pipe	B	From Leg	4.00		0.0000	129.00	No Ice	7.75	5.18	0.04
			0.00				1/2" Ice	8.29	6.11	0.10
			0.00				1" Ice	8.85	6.92	0.16
							2" Ice	9.97	8.59	0.31
							4" Ice	12.34	12.13	0.75
BXA-70063/6CF-2 W/Mount Pipe	C	From Leg	4.00		0.0000	129.00	No Ice	7.75	5.18	0.04
			0.00				1/2" Ice	8.29	6.11	0.10
			0.00				1" Ice	8.85	6.92	0.16
							2" Ice	9.97	8.59	0.31
							4" Ice	12.34	12.13	0.75
(2) HBXX-6517DS-A2M w/ Mount Pipe	A	From Leg	4.00		0.0000	129.00	No Ice	8.98	6.96	0.07
			0.00				1/2" Ice	9.65	8.18	0.14
			0.00				1" Ice	10.29	9.14	0.21
							2" Ice	11.59	11.02	0.40
							4" Ice	14.32	15.03	0.91
(2) HBXX-6517DS-A2M w/ Mount Pipe	B	From Leg	4.00		0.0000	129.00	No Ice	8.98	6.96	0.07
			0.00				1/2" Ice	9.65	8.18	0.14
			0.00				1" Ice	10.29	9.14	0.21
							2" Ice	11.59	11.02	0.40
							4" Ice	14.32	15.03	0.91
(2) HBXX-6517DS-A2M w/ Mount Pipe	C	From Leg	4.00		0.0000	129.00	No Ice	8.98	6.96	0.07
			0.00				1/2" Ice	9.65	8.18	0.14
			0.00				1" Ice	10.29	9.14	0.21
							2" Ice	11.59	11.02	0.40
							4" Ice	14.32	15.03	0.91
LNx-8513DS-A1M w/ Mount Pipe	A	From Leg	4.00		0.0000	129.00	No Ice	8.65	7.08	0.06
			0.00				1/2" Ice	9.31	8.27	0.13
			0.00				1" Ice	9.93	9.18	0.21
							2" Ice	11.20	11.02	0.39
							4" Ice	13.87	15.06	0.90
LNx-8513DS-A1M w/ Mount Pipe	B	From Leg	4.00		0.0000	129.00	No Ice	8.65	7.08	0.06
			0.00				1/2" Ice	9.31	8.27	0.13
			0.00				1" Ice	9.93	9.18	0.21
							2" Ice	11.20	11.02	0.39
							4" Ice	13.87	15.06	0.90
LNx-8513DS-A1M w/ Mount Pipe	C	From Leg	4.00		0.0000	129.00	No Ice	8.65	7.08	0.06
			0.00				1/2" Ice	9.31	8.27	0.13
			0.00				1" Ice	9.93	9.18	0.21
							2" Ice	11.20	11.02	0.39
							4" Ice	13.87	15.06	0.90
DB-B1-6C-12AB-0Z	A	From Leg	4.00		0.0000	129.00	No Ice	3.92	2.56	0.02
			0.00				1/2" Ice	4.20	2.79	0.05
			0.00				1" Ice	4.48	3.04	0.08
							2" Ice	5.07	3.56	0.16
							4" Ice	6.35	4.70	0.36
RRH2X60-AWS	A	From Leg	4.00		0.0000	129.00	No Ice	2.19	1.43	0.04
			0.00				1/2" Ice	2.40	1.61	0.06

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Description	Face or Leg	Offset Type	Offsets:			Azimuth Adjustment °	Placement ft	C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K
			Horz ft	Lateral ft	Vert ft					
			0.00				1" Ice	2.61	1.80	0.08
							2" Ice	3.07	2.21	0.13
							4" Ice	4.09	3.13	0.26
RRH2X60-AWS	B	From Leg	4.00	0.0000	129.00	No Ice	2.19	1.43	0.04	
			0.00			1/2" Ice	2.40	1.61	0.06	
			0.00			1" Ice	2.61	1.80	0.08	
						2" Ice	3.07	2.21	0.13	
						4" Ice	4.09	3.13	0.26	
RRH2X60-AWS	C	From Leg	4.00	0.0000	129.00	No Ice	2.19	1.43	0.04	
			0.00			1/2" Ice	2.40	1.61	0.06	
			0.00			1" Ice	2.61	1.80	0.08	
						2" Ice	3.07	2.21	0.13	
						4" Ice	4.09	3.13	0.26	
Platform Mount [LP 304-1]	C	None		0.0000	129.00	No Ice	17.46	17.46	1.35	
						1/2" Ice	22.44	22.44	1.62	
						1" Ice	27.42	27.42	1.90	
						2" Ice	37.38	37.38	2.45	
						4" Ice	57.30	57.30	3.55	

1900MHz RRH (65MHz)	A	From Leg	1.00	0.0000	105.00	No Ice	2.70	2.77	0.06	
			0.00			1/2" Ice	2.94	3.01	0.08	
			0.00			1" Ice	3.18	3.26	0.11	
						2" Ice	3.70	3.78	0.18	
						4" Ice	4.85	4.93	0.35	
1900MHz RRH (65MHz)	B	From Leg	1.00	0.0000	105.00	No Ice	2.70	2.77	0.06	
			0.00			1/2" Ice	2.94	3.01	0.08	
			0.00			1" Ice	3.18	3.26	0.11	
						2" Ice	3.70	3.78	0.18	
						4" Ice	4.85	4.93	0.35	
1900MHz RRH (65MHz)	C	From Leg	1.00	0.0000	105.00	No Ice	2.70	2.77	0.06	
			0.00			1/2" Ice	2.94	3.01	0.08	
			0.00			1" Ice	3.18	3.26	0.11	
						2" Ice	3.70	3.78	0.18	
						4" Ice	4.85	4.93	0.35	
Side Arm Mount [SO 102-3]	C	None		0.0000	105.00	No Ice	3.00	3.00	0.08	
						1/2" Ice	3.48	3.48	0.11	
						1" Ice	3.96	3.96	0.14	
						2" Ice	4.92	4.92	0.20	
						4" Ice	6.84	6.84	0.32	

APXVSPP18-C-A20 w/ Mount Pipe	A	From Leg	4.00	0.0000	104.00	No Ice	8.50	6.95	0.08	
			0.00			1/2" Ice	9.15	8.13	0.15	
			4.00			1" Ice	9.77	9.02	0.23	
						2" Ice	11.03	10.84	0.41	
						4" Ice	13.68	14.85	0.91	
APXVSPP18-C-A20 w/ Mount Pipe	B	From Leg	4.00	0.0000	104.00	No Ice	8.50	6.95	0.08	
			0.00			1/2" Ice	9.15	8.13	0.15	
			4.00			1" Ice	9.77	9.02	0.23	
						2" Ice	11.03	10.84	0.41	
						4" Ice	13.68	14.85	0.91	
APXVSPP18-C-A20 w/ Mount Pipe	C	From Leg	4.00	0.0000	104.00	No Ice	8.50	6.95	0.08	
			0.00			1/2" Ice	9.15	8.13	0.15	
			4.00			1" Ice	9.77	9.02	0.23	
						2" Ice	11.03	10.84	0.41	
						4" Ice	13.68	14.85	0.91	
(3) ACU-A20-N	A	From Leg	4.00	0.0000	104.00	No Ice	0.08	0.14	0.00	

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Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment °	Placement ft	C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K	
			Horz ft	Lateral ft						
			0.00			1/2" Ice	0.12	0.19	0.00	
			0.00			1" Ice	0.17	0.25	0.00	
						2" Ice	0.30	0.40	0.01	
						4" Ice	0.67	0.80	0.04	
(3) ACU-A20-N	B	From Leg	4.00		0.0000	104.00	No Ice	0.08	0.14	0.00
			0.00				1/2" Ice	0.12	0.19	0.00
			0.00				1" Ice	0.17	0.25	0.00
							2" Ice	0.30	0.40	0.01
							4" Ice	0.67	0.80	0.04
(3) ACU-A20-N	C	From Leg	4.00		0.0000	104.00	No Ice	0.08	0.14	0.00
			0.00				1/2" Ice	0.12	0.19	0.00
			0.00				1" Ice	0.17	0.25	0.00
							2" Ice	0.30	0.40	0.01
							4" Ice	0.67	0.80	0.04
800 EXTERNAL NOTCH FILTER	A	From Leg	4.00		0.0000	104.00	No Ice	0.77	0.37	0.01
			0.00				1/2" Ice	0.89	0.46	0.02
			0.00				1" Ice	1.02	0.56	0.02
							2" Ice	1.30	0.79	0.04
							4" Ice	1.97	1.34	0.11
800 EXTERNAL NOTCH FILTER	B	From Leg	4.00		0.0000	104.00	No Ice	0.77	0.37	0.01
			0.00				1/2" Ice	0.89	0.46	0.02
			0.00				1" Ice	1.02	0.56	0.02
							2" Ice	1.30	0.79	0.04
							4" Ice	1.97	1.34	0.11
800 EXTERNAL NOTCH FILTER	C	From Leg	4.00		0.0000	104.00	No Ice	0.77	0.37	0.01
			0.00				1/2" Ice	0.89	0.46	0.02
			0.00				1" Ice	1.02	0.56	0.02
							2" Ice	1.30	0.79	0.04
							4" Ice	1.97	1.34	0.11
800MHZ RRH	A	From Leg	1.00		0.0000	104.00	No Ice	2.49	2.07	0.05
			0.00				1/2" Ice	2.71	2.27	0.07
			0.00				1" Ice	2.93	2.48	0.10
							2" Ice	3.41	2.93	0.16
							4" Ice	4.46	3.93	0.32
800MHZ RRH	B	From Leg	1.00		0.0000	104.00	No Ice	2.49	2.07	0.05
			0.00				1/2" Ice	2.71	2.27	0.07
			0.00				1" Ice	2.93	2.48	0.10
							2" Ice	3.41	2.93	0.16
							4" Ice	4.46	3.93	0.32
800MHZ RRH	C	From Leg	1.00		0.0000	104.00	No Ice	2.49	2.07	0.05
			0.00				1/2" Ice	2.71	2.27	0.07
			0.00				1" Ice	2.93	2.48	0.10
							2" Ice	3.41	2.93	0.16
							4" Ice	4.46	3.93	0.32
Platform Mount [LP 712-1]	C	None			0.0000	104.00	No Ice	24.53	24.53	1.34
							1/2" Ice	29.94	29.94	1.65
							1" Ice	35.35	35.35	1.96
							2" Ice	46.17	46.17	2.58
							4" Ice	67.81	67.81	3.82
Miscellaneous [NA 507-1]	C	None			0.0000	104.00	No Ice	4.80	4.80	0.25
							1/2" Ice	6.70	6.70	0.29
							1" Ice	8.60	8.60	0.34
							2" Ice	12.40	12.40	0.44
							4" Ice	20.00	20.00	0.64

ETM19V2S12UB	A	From Leg	4.00		0.0000	87.00	No Ice	0.84	0.22	0.01
			0.00				1/2" Ice	0.96	0.31	0.02

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Description	Face or Leg	Offset Type	Offsets:			Azimuth Adjustment °	Placement ft	C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K
			Horz ft	Lateral ft	Vert ft					
			0.00				1" Ice	1.09	0.40	0.02
							2" Ice	1.39	0.61	0.04
							4" Ice	2.08	1.14	0.10
ETM19V2S12UB	B	From Leg	4.00	0.0000	87.00		No Ice	0.84	0.22	0.01
			0.00				1/2" Ice	0.96	0.31	0.02
			0.00				1" Ice	1.09	0.40	0.02
							2" Ice	1.39	0.61	0.04
							4" Ice	2.08	1.14	0.10
ETM19V2S12UB	C	From Leg	4.00	0.0000	87.00		No Ice	0.84	0.22	0.01
			0.00				1/2" Ice	0.96	0.31	0.02
			0.00				1" Ice	1.09	0.40	0.02
							2" Ice	1.39	0.61	0.04
							4" Ice	2.08	1.14	0.10
APXV18-209014-C w/ Mount Pipe	A	From Leg	4.00	0.0000	87.00		No Ice	3.72	3.31	0.04
			0.00				1/2" Ice	4.13	4.02	0.07
			0.00				1" Ice	4.56	4.68	0.11
							2" Ice	5.51	6.07	0.21
							4" Ice	7.55	9.05	0.52
APXV18-209014-C w/ Mount Pipe	B	From Leg	4.00	0.0000	87.00		No Ice	3.72	3.31	0.04
			0.00				1/2" Ice	4.13	4.02	0.07
			0.00				1" Ice	4.56	4.68	0.11
							2" Ice	5.51	6.07	0.21
							4" Ice	7.55	9.05	0.52
APXV18-209014-C w/ Mount Pipe	C	From Leg	4.00	0.0000	87.00		No Ice	3.72	3.31	0.04
			0.00				1/2" Ice	4.13	4.02	0.07
			0.00				1" Ice	4.56	4.68	0.11
							2" Ice	5.51	6.07	0.21
							4" Ice	7.55	9.05	0.52
Empty Pipe Mount	A	From Leg	4.00	0.0000	87.00		No Ice	1.43	1.43	0.02
			0.00				1/2" Ice	1.50	1.50	0.03
			0.00				1" Ice	1.57	1.57	0.04
							2" Ice	1.71	1.71	0.05
							4" Ice	2.00	2.00	0.07
Empty Pipe Mount	B	From Leg	4.00	0.0000	87.00		No Ice	1.43	1.43	0.02
			0.00				1/2" Ice	1.50	1.50	0.03
			0.00				1" Ice	1.57	1.57	0.04
							2" Ice	1.71	1.71	0.05
							4" Ice	2.00	2.00	0.07
Empty Pipe Mount	C	From Leg	4.00	0.0000	87.00		No Ice	1.43	1.43	0.02
			0.00				1/2" Ice	1.50	1.50	0.03
			0.00				1" Ice	1.57	1.57	0.04
							2" Ice	1.71	1.71	0.05
							4" Ice	2.00	2.00	0.07
Platform Mount [LP 305-1]	C	None		0.0000	87.00		No Ice	18.01	18.01	1.12
							1/2" Ice	23.33	23.33	1.35
							1" Ice	28.65	28.65	1.58
							2" Ice	39.29	39.29	2.05
							4" Ice	60.57	60.57	2.97

KS24019-L112A	A	From Leg	3.00	0.0000	70.00		No Ice	0.16	0.16	0.01
			0.00				1/2" Ice	0.22	0.22	0.01
			1.00				1" Ice	0.30	0.30	0.01
							2" Ice	0.48	0.48	0.02
							4" Ice	0.95	0.95	0.06
Side Arm Mount [SO 701-1]	A	From Leg	0.00	0.0000	70.00		No Ice	0.85	1.67	0.07
			0.00				1/2" Ice	1.14	2.34	0.08
			0.00				1" Ice	1.43	3.01	0.09

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Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} Front	C _{AA} Side	Weight	
			Horz. Lateral ft	Vert ft						°
							2" Ice	2.01	4.35	0.12
							4" Ice	3.17	7.03	0.18

LNX-6515DS-VTM w/ Mount Pipe	A	From Leg	4.00	0.0000	87.00	No Ice	11.68	9.84	0.08	
			0.00			1/2" Ice	12.40	11.37	0.17	
			0.00			1" Ice	13.14	12.91	0.27	
						2" Ice	14.60	15.27	0.51	
						4" Ice	17.87	20.14	1.15	
LNX-6515DS-VTM w/ Mount Pipe	B	From Leg	4.00	0.0000	87.00	No Ice	11.68	9.84	0.08	
			0.00			1/2" Ice	12.40	11.37	0.17	
			0.00			1" Ice	13.14	12.91	0.27	
						2" Ice	14.60	15.27	0.51	
						4" Ice	17.87	20.14	1.15	
LNX-6515DS-VTM w/ Mount Pipe	C	From Leg	4.00	0.0000	87.00	No Ice	11.68	9.84	0.08	
			0.00			1/2" Ice	12.40	11.37	0.17	
			0.00			1" Ice	13.14	12.91	0.27	
						2" Ice	14.60	15.27	0.51	
						4" Ice	17.87	20.14	1.15	
ATBT-BOTTOM-24V	A	From Leg	4.00	0.0000	87.00	No Ice	0.12	0.08	0.00	
			0.00			1/2" Ice	0.17	0.12	0.00	
			0.00			1" Ice	0.23	0.17	0.01	
						2" Ice	0.38	0.30	0.01	
						4" Ice	0.77	0.67	0.04	
ATBT-BOTTOM-24V	B	From Leg	4.00	0.0000	87.00	No Ice	0.12	0.08	0.00	
			0.00			1/2" Ice	0.17	0.12	0.00	
			0.00			1" Ice	0.23	0.17	0.01	
						2" Ice	0.38	0.30	0.01	
						4" Ice	0.77	0.67	0.04	
ATBT-BOTTOM-24V	C	From Leg	4.00	0.0000	87.00	No Ice	0.12	0.08	0.00	
			0.00			1/2" Ice	0.17	0.12	0.00	
			0.00			1" Ice	0.23	0.17	0.01	
						2" Ice	0.38	0.30	0.01	
						4" Ice	0.77	0.67	0.04	

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

<p style="text-align: center;">tnxTower</p> <p style="text-align: center;">FDH Engineering, Inc. 6521 Meridien Drive, Suite 107 Raleigh, North Carolina 27616 Phone: 9197551012 FAX: 9197551031</p>	Job	O&G Woodbury, BU# 876380	Page	12 of 27
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Comb. No.	Description
13	Dead+Wind 330 deg - No Ice
14	Dead+Ice+Temp
15	Dead+Wind 0 deg+Ice+Temp
16	Dead+Wind 30 deg+Ice+Temp
17	Dead+Wind 60 deg+Ice+Temp
18	Dead+Wind 90 deg+Ice+Temp
19	Dead+Wind 120 deg+Ice+Temp
20	Dead+Wind 150 deg+Ice+Temp
21	Dead+Wind 180 deg+Ice+Temp
22	Dead+Wind 210 deg+Ice+Temp
23	Dead+Wind 240 deg+Ice+Temp
24	Dead+Wind 270 deg+Ice+Temp
25	Dead+Wind 300 deg+Ice+Temp
26	Dead+Wind 330 deg+Ice+Temp
27	Dead+Wind 0 deg - Service
28	Dead+Wind 30 deg - Service
29	Dead+Wind 60 deg - Service
30	Dead+Wind 90 deg - Service
31	Dead+Wind 120 deg - Service
32	Dead+Wind 150 deg - Service
33	Dead+Wind 180 deg - Service
34	Dead+Wind 210 deg - Service
35	Dead+Wind 240 deg - Service
36	Dead+Wind 270 deg - Service
37	Dead+Wind 300 deg - Service
38	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	138.5 - 108.5	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-13.62	-0.28	1.65
			Max. Mx	5	-5.41	-286.60	1.31
			Max. My	2	-5.37	-1.01	292.28
			Max. Vy	11	-12.30	286.28	-0.48
			Max. Vx	2	-12.50	-1.01	292.28
			Max. Torque	6			1.64
L2	108.5 - 83.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-21.04	0.15	2.07
			Max. Mx	5	-9.66	-608.21	2.05
			Max. My	2	-9.63	-1.53	618.20
			Max. Vy	11	-17.48	608.10	-0.94
			Max. Vx	2	-17.68	-1.53	618.20
			Max. Torque	11			-1.71
L3	83.75 - 43	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-33.74	1.18	3.20
			Max. Mx	11	-18.17	1477.69	-1.70
			Max. My	2	-18.15	-2.45	1495.28
			Max. Vy	11	-24.41	1477.69	-1.70
			Max. Vx	2	-24.58	-2.45	1495.28
			Max. Torque	11			-2.19
L4	43 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-48.61	2.74	4.55
			Max. Mx	11	-29.65	2795.42	-2.72
			Max. My	2	-29.65	-3.46	2821.38
			Max. Vy	11	-29.38	2795.42	-2.72
			Max. Vx	2	-29.55	-3.46	2821.38

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Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Torque	11			-2.70

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K	
Pole	Max. Vert	15	48.61	-0.00	5.45	
	Max. H _x	11	29.67	29.36	-0.03	
	Max. H _z	2	29.67	-0.03	29.52	
	Max. M _x	2	2821.38	-0.03	29.52	
	Max. M _z	5	2794.19	-29.36	0.03	
	Max. Torsion	5	2.69	-29.36	0.03	
	Min. Vert	1	29.67	0.00	0.00	
	Min. H _x	5	29.67	-29.36	0.03	
	Min. H _z	8	29.67	0.03	-29.52	
	Min. M _x	8	-2818.65	0.03	-29.52	
	Min. M _z	11	-2795.42	29.36	-0.03	
	Min. Torsion	11		-2.70	29.36	-0.03

Tower Mast Reaction Summary

Load Combination	Vertical K	Shear _x K	Shear _z K	Overturning Moment, M _x kip-ft	Overturning Moment, M _z kip-ft	Torque kip-ft
Dead Only	29.67	0.00	0.00	-1.33	0.61	-0.00
Dead+Wind 0 deg - No Ice	29.67	0.03	-29.52	-2821.38	-3.46	-0.48
Dead+Wind 30 deg - No Ice	29.67	14.70	-25.58	-2445.63	-1400.28	-1.76
Dead+Wind 60 deg - No Ice	29.67	25.44	-14.79	-1414.94	-2421.77	-2.57
Dead+Wind 90 deg - No Ice	29.67	29.36	-0.03	-5.44	-2794.19	-2.69
Dead+Wind 120 deg - No Ice	29.67	25.41	14.74	1405.16	-2417.70	-2.09
Dead+Wind 150 deg - No Ice	29.67	14.65	25.55	2438.84	-1393.22	-0.93
Dead+Wind 180 deg - No Ice	29.67	-0.03	29.52	2818.65	4.70	0.48
Dead+Wind 210 deg - No Ice	29.67	-14.70	25.58	2442.89	1401.51	1.76
Dead+Wind 240 deg - No Ice	29.67	-25.44	14.79	1412.21	2422.99	2.58
Dead+Wind 270 deg - No Ice	29.67	-29.36	0.03	2.72	2795.42	2.70
Dead+Wind 300 deg - No Ice	29.67	-25.41	-14.74	-1407.88	2418.95	2.09
Dead+Wind 330 deg - No Ice	29.67	-14.65	-25.55	-2441.57	1394.46	0.93
Dead+Ice+Temp	48.61	-0.00	-0.00	-4.55	2.74	-0.00
Dead+Wind 0 deg+Ice+Temp	48.61	0.00	-5.45	-535.03	2.22	-0.22
Dead+Wind 30 deg+Ice+Temp	48.61	2.72	-4.72	-464.26	-261.06	-0.49
Dead+Wind 60 deg+Ice+Temp	48.61	4.70	-2.73	-270.34	-453.64	-0.63
Dead+Wind 90 deg+Ice+Temp	48.61	5.43	-0.00	-5.22	-523.92	-0.60
Dead+Wind 120 deg+Ice+Temp	48.61	4.70	2.72	260.05	-453.07	-0.41
Dead+Wind 150 deg+Ice+Temp	48.61	2.71	4.72	454.40	-260.07	-0.11
Dead+Wind 180 deg+Ice+Temp	48.61	-0.00	5.45	525.75	3.37	0.22
Dead+Wind 210 deg+Ice+Temp	48.61	-2.72	4.72	454.98	266.65	0.49
Dead+Wind 240 deg+Ice+Temp	48.61	-4.70	2.73	261.05	459.23	0.63
Dead+Wind 270 deg+Ice+Temp	48.61	-5.43	0.00	-4.07	529.50	0.60
Dead+Wind 300 deg+Ice+Temp	48.61	-4.70	-2.72	-269.34	458.65	0.41
Dead+Wind 330 deg+Ice+Temp	48.61	-2.71	-4.72	-463.69	265.65	0.11
Dead+Wind 0 deg - Service	29.67	0.01	-11.53	-1104.33	-0.98	-0.19
Dead+Wind 30 deg - Service	29.67	5.74	-9.99	-957.36	-547.29	-0.69

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Load Combination	Vertical K	Shear _x K	Shear _z K	Overturning Moment, M _x kip-ft	Overturning Moment, M _z kip-ft	Torque kip-ft
Dead+Wind 60 deg - Service	29.67	9.94	-5.78	-554.24	-946.79	-1.01
Dead+Wind 90 deg - Service	29.67	11.47	-0.01	-2.97	-1092.44	-1.06
Dead+Wind 120 deg - Service	29.67	9.93	5.76	548.72	-945.20	-0.83
Dead+Wind 150 deg - Service	29.67	5.72	9.98	953.01	-544.53	-0.37
Dead+Wind 180 deg - Service	29.67	-0.01	11.53	1101.58	2.21	0.19
Dead+Wind 210 deg - Service	29.67	-5.74	9.99	954.61	548.52	0.69
Dead+Wind 240 deg - Service	29.67	-9.94	5.78	551.49	948.02	1.01
Dead+Wind 270 deg - Service	29.67	-11.47	0.01	0.22	1093.67	1.06
Dead+Wind 300 deg - Service	29.67	-9.93	-5.76	-551.47	946.43	0.83
Dead+Wind 330 deg - Service	29.67	-5.72	-9.98	-955.77	545.76	0.37

Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0.00	-29.67	0.00	0.00	29.67	0.00	0.000%
2	0.03	-29.67	-29.52	-0.03	29.67	29.52	0.000%
3	14.70	-29.67	-25.58	-14.70	29.67	25.58	0.000%
4	25.44	-29.67	-14.79	-25.44	29.67	14.79	0.000%
5	29.36	-29.67	-0.03	-29.36	29.67	0.03	0.000%
6	25.41	-29.67	14.74	-25.41	29.67	-14.74	0.000%
7	14.65	-29.67	25.55	-14.65	29.67	-25.55	0.000%
8	-0.03	-29.67	29.52	0.03	29.67	-29.52	0.000%
9	-14.70	-29.67	25.58	14.70	29.67	-25.58	0.000%
10	-25.44	-29.67	14.79	25.44	29.67	-14.79	0.000%
11	-29.36	-29.67	0.03	29.36	29.67	-0.03	0.000%
12	-25.41	-29.67	-14.74	25.41	29.67	14.74	0.000%
13	-14.65	-29.67	-25.55	14.65	29.67	25.55	0.000%
14	0.00	-48.61	0.00	0.00	48.61	0.00	0.000%
15	0.00	-48.61	-5.45	-0.00	48.61	5.45	0.000%
16	2.72	-48.61	-4.72	-2.72	48.61	4.72	0.000%
17	4.70	-48.61	-2.73	-4.70	48.61	2.73	0.000%
18	5.43	-48.61	-0.00	-5.43	48.61	0.00	0.000%
19	4.70	-48.61	2.72	-4.70	48.61	-2.72	0.000%
20	2.71	-48.61	4.72	-2.71	48.61	-4.72	0.000%
21	-0.00	-48.61	5.45	0.00	48.61	-5.45	0.000%
22	-2.72	-48.61	4.72	2.72	48.61	-4.72	0.000%
23	-4.70	-48.61	2.73	4.70	48.61	-2.73	0.000%
24	-5.43	-48.61	0.00	5.43	48.61	-0.00	0.000%
25	-4.70	-48.61	-2.72	4.70	48.61	2.72	0.000%
26	-2.71	-48.61	-4.72	2.71	48.61	4.72	0.000%
27	0.01	-29.67	-11.53	-0.01	29.67	11.53	0.000%
28	5.74	-29.67	-9.99	-5.74	29.67	9.99	0.000%
29	9.94	-29.67	-5.78	-9.94	29.67	5.78	0.000%
30	11.47	-29.67	-0.01	-11.47	29.67	0.01	0.000%
31	9.93	-29.67	5.76	-9.93	29.67	-5.76	0.000%
32	5.72	-29.67	9.98	-5.72	29.67	-9.98	0.000%
33	-0.01	-29.67	11.53	0.01	29.67	-11.53	0.000%
34	-5.74	-29.67	9.99	5.74	29.67	-9.99	0.000%
35	-9.94	-29.67	5.78	9.94	29.67	-5.78	0.000%
36	-11.47	-29.67	0.01	11.47	29.67	-0.01	0.000%
37	-9.93	-29.67	-5.76	9.93	29.67	5.76	0.000%
38	-5.72	-29.67	-9.98	5.72	29.67	9.98	0.000%

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Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00043090
3	Yes	5	0.00000001	0.00077743
4	Yes	5	0.00000001	0.00082055
5	Yes	5	0.00000001	0.00006928
6	Yes	5	0.00000001	0.00075080
7	Yes	5	0.00000001	0.00081068
8	Yes	4	0.00000001	0.00027538
9	Yes	5	0.00000001	0.00080536
10	Yes	5	0.00000001	0.00076057
11	Yes	5	0.00000001	0.00006217
12	Yes	5	0.00000001	0.00082256
13	Yes	5	0.00000001	0.00076424
14	Yes	4	0.00000001	0.00004022
15	Yes	5	0.00000001	0.00020657
16	Yes	5	0.00000001	0.00025035
17	Yes	5	0.00000001	0.00025362
18	Yes	5	0.00000001	0.00020274
19	Yes	5	0.00000001	0.00024143
20	Yes	5	0.00000001	0.00024481
21	Yes	5	0.00000001	0.00020081
22	Yes	5	0.00000001	0.00024762
23	Yes	5	0.00000001	0.00024375
24	Yes	5	0.00000001	0.00020382
25	Yes	5	0.00000001	0.00025389
26	Yes	5	0.00000001	0.00025105
27	Yes	4	0.00000001	0.00012304
28	Yes	5	0.00000001	0.00009973
29	Yes	5	0.00000001	0.00011037
30	Yes	4	0.00000001	0.00049219
31	Yes	5	0.00000001	0.00009340
32	Yes	5	0.00000001	0.00010752
33	Yes	4	0.00000001	0.00011068
34	Yes	5	0.00000001	0.00010603
35	Yes	5	0.00000001	0.00009547
36	Yes	4	0.00000001	0.00047246
37	Yes	5	0.00000001	0.00011096
38	Yes	5	0.00000001	0.00009672

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	138.5 - 108.5	36.223	27	2.5668	0.0144
L2	108.5 - 83.75	21.313	27	2.0283	0.0055
L3	88.25 - 43	13.735	27	1.5385	0.0031
L4	49 - 0	4.092	27	0.7843	0.0012

Critical Deflections and Radius of Curvature - Service Wind

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Elevation	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
139.00	(2) RRUS-11	27	36.223	2.5668	0.0145	11009
138.00	TTA-429-83H-08179	27	35.958	2.5589	0.0143	11009
137.00	ANT150F6	27	35.429	2.5432	0.0140	11009
129.00	BXA-70063/6CF-2 W/Mount Pipe	27	31.221	2.4149	0.0111	5794
105.00	1900MHz RRH (65MHz)	27	19.842	1.9479	0.0049	1977
104.00	APXVSPP18-C-A20 w/ Mount Pipe	27	19.436	1.9241	0.0047	2020
87.00	ETM19V2S12UB	27	13.330	1.5093	0.0030	3073
70.00	KS24019-L112A	27	8.440	1.1535	0.0020	2849

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	138.5 - 108.5	92.297	2	6.5359	0.0362
L2	108.5 - 83.75	54.366	2	5.1722	0.0139
L3	88.25 - 43	35.053	2	3.9257	0.0078
L4	49 - 0	10.449	2	2.0026	0.0030

Critical Deflections and Radius of Curvature - Design Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
139.00	(2) RRUS-11	2	92.297	6.5359	0.0372	4423
138.00	TTA-429-83H-08179	2	91.624	6.5160	0.0368	4423
137.00	ANT150F6	2	90.277	6.4761	0.0358	4423
129.00	BXA-70063/6CF-2 W/Mount Pipe	2	79.577	6.1520	0.0285	2327
105.00	1900MHz RRH (65MHz)	2	50.620	4.9677	0.0124	789
104.00	APXVSPP18-C-A20 w/ Mount Pipe	2	49.585	4.9073	0.0120	806
87.00	ETM19V2S12UB	2	34.021	3.8513	0.0076	1215
70.00	KS24019-L112A	2	21.545	2.9446	0.0050	1122

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L _a ft	Kl/r	F _a ksi	A in ²	Actual P K	Allow. P _a K	Ratio P/P _a
L1	138.5 - 137	TP24.5x17.375x0.1875	30.00	0.00	0.0	39.000	10.4407	-1.91	407.19	0.005
	137 - 135.5					39.000	10.6527	-2.04	415.46	0.005
	135.5 - 134					39.000	10.8648	-2.12	423.73	0.005
	134 - 132.5					39.000	11.0768	-2.19	431.99	0.005
	132.5 - 131					39.000	11.2888	-2.27	440.26	0.005
	131 - 129.5					39.000	11.5008	-2.34	448.53	0.005

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Section No.	Elevation ft	Size	L ft	L _a ft	Kl/r	F _a ksi	A in ²	Actual P K	Allow. P _a K	Ratio P P _a
	129.5 - 128					39.000	11.7128	-4.08	456.80	0.009
	128 - 126.5					39.000	11.9248	-4.17	465.07	0.009
	126.5 - 125					39.000	12.1368	-4.25	473.34	0.009
	125 - 123.5					39.000	12.3488	-4.34	481.61	0.009
	123.5 - 122					39.000	12.5609	-4.44	489.87	0.009
	122 - 120.5					39.000	12.7729	-4.53	498.14	0.009
	120.5 - 119					39.000	12.9849	-4.63	506.41	0.009
	119 - 117.5					39.000	13.1969	-4.73	514.68	0.009
	117.5 - 116					39.000	13.4089	-4.83	522.95	0.009
	116 - 114.5					39.000	13.6209	-4.93	531.22	0.009
	114.5 - 113					39.000	13.8329	-5.04	539.49	0.009
	113 - 111.5					39.000	14.0449	-5.15	547.75	0.009
	111.5 - 110					39.000	14.2570	-5.26	556.02	0.009
	110 - 108.5					39.000	14.4690	-5.37	564.29	0.010
L2	108.5 - 107.434	TP31.88x24.5x0.25	24.75	0.00	0.0	39.000	19.4945	-5.48	760.29	0.007
	107.434 - 106.368					39.000	19.7467	-5.59	770.12	0.007
	106.368 - 105.303					39.000	19.9989	-5.70	779.96	0.007
	105.303 - 104.237					39.000	20.2511	-6.03	789.79	0.008
	104.237 - 103.171					39.000	20.5032	-7.93	799.63	0.010
	103.171 - 102.105					39.000	20.7554	-8.05	809.46	0.010
	102.105 - 101.039					39.000	21.0076	-8.16	819.30	0.010
	101.039 - 99.9737					39.000	21.2598	-8.28	829.13	0.010
	99.9737 - 98.9079					39.000	21.5119	-8.40	838.97	0.010
	98.9079 - 97.8421					39.000	21.7641	-8.52	848.80	0.010
	97.8421 - 96.7763					39.000	22.0163	-8.63	858.63	0.010
	96.7763 - 95.7105					39.000	22.2685	-8.76	868.47	0.010
	95.7105 - 94.6447					39.000	22.5206	-8.88	878.30	0.010
	94.6447 - 93.5789					39.000	22.7728	-9.00	888.14	0.010
	93.5789 - 92.5132					39.000	23.0250	-9.13	897.97	0.010
	92.5132 - 91.4474					39.000	23.2772	-9.25	907.81	0.010
	91.4474 - 90.3816					39.000	23.5293	-9.38	917.64	0.010
	90.3816 - 89.3158					39.000	23.7815	-9.51	927.48	0.010
	89.3158 - 88.25					39.000	24.0337	-9.63	937.31	0.010
	88.25 - 83.75					39.000	25.0984	-5.64	978.84	0.006
L3	88.25 - 83.75	TP43.42x30.0382x0.3125	45.25	0.00	0.0	39.000	30.8041	-6.37	1201.36	0.005
	83.75 - 81.8194					39.000	31.3704	-12.32	1223.45	0.010
	81.8194 - 79.8889					39.000	31.9367	-12.62	1245.53	0.010
	79.8889 - 77.9583					39.000	32.5030	-12.93	1267.62	0.010
	77.9583 - 76.0278					39.000	33.0693	-13.25	1289.70	0.010
	76.0278 -					39.000	33.6356	-13.56	1311.79	0.010

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Section No.	Elevation ft	Size	L ft	L _a ft	Kl/r	F _a ksi	A in ²	Actual P K	Allow. P _a K	Ratio P P _a
	74.0972									
	74.0972 - 72.1667					39.000	34.2019	-13.89	1333.87	0.010
	72.1667 - 70.2361					39.000	34.7681	-14.21	1355.96	0.010
	70.2361 - 68.3056					39.000	35.3344	-14.61	1378.04	0.011
	68.3056 - 66.375					39.000	35.9007	-14.95	1400.13	0.011
	66.375 - 64.4444					39.000	36.4670	-15.29	1422.21	0.011
	64.4444 - 62.5139					39.000	37.0333	-15.63	1444.30	0.011
	62.5139 - 60.5833					39.000	37.5996	-15.98	1466.38	0.011
	60.5833 - 58.6528					39.000	38.1659	-16.33	1488.47	0.011
	58.6528 - 56.7222					39.000	38.7321	-16.69	1510.55	0.011
	56.7222 - 54.7917					39.000	39.2984	-17.05	1532.64	0.011
	54.7917 - 52.8611					39.000	39.8647	-17.41	1554.72	0.011
	52.8611 - 50.9306					39.000	40.4310	-17.78	1576.81	0.011
	50.9306 - 49					39.000	40.9973	-18.15	1598.89	0.011
L4	49 - 43	TP55.5x41.0206x0.3125	49.00	0.00	0.0	39.000	42.7573	-10.18	1667.53	0.006
	43 - 40.7368					39.000	42.1359	-9.93	1643.30	0.006
	40.7368 - 38.4737					39.000	42.7993	-20.56	1669.17	0.012
	38.4737 - 36.2105					39.000	43.4626	-21.02	1695.04	0.012
	36.2105 - 33.9474					39.000	44.1259	-21.49	1720.91	0.012
	33.9474 - 31.6842					39.000	44.7892	-21.96	1746.78	0.013
	31.6842 - 29.4211					39.000	45.4526	-22.44	1772.65	0.013
	29.4211 - 27.1579					39.000	46.1159	-22.92	1798.52	0.013
	27.1579 - 24.8947					38.905	46.7792	-23.40	1819.96	0.013
	24.8947 - 22.6316					38.666	47.4425	-23.89	1834.40	0.013
	22.6316 - 20.3684					38.426	48.1059	-24.39	1848.52	0.013
	20.3684 - 18.1053					38.187	48.7692	-24.89	1862.32	0.013
	18.1053 - 15.8421					37.947	49.4325	-25.40	1875.81	0.014
	15.8421 - 13.5789					37.707	50.0958	-25.91	1888.98	0.014
	13.5789 - 11.3158					37.468	50.7592	-26.43	1901.83	0.014
	11.3158 - 9.05263					37.228	51.4225	-26.95	1914.36	0.014
	9.05263 - 6.78947					36.989	52.0858	-27.48	1926.58	0.014
	6.78947 - 6.78947					36.749	52.7491	-28.01	1938.47	0.014
						36.509	53.4125	-28.55	1950.05	0.015

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Section No.	Elevation ft	Size	L ft	L _a ft	Kl/r	F _a ksi	A in ²	Actual P K	Allow. P _a K	Ratio P P _a
	4.52632									
	4.52632 - 2.26316					36.270	54.0758	-29.10	1961.31	0.015
	2.26316 - 0					36.030	54.7391	-29.65	1972.25	0.015

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M _x kip-ft	Actual f _{bx} ksi	Allow. F _{bx} ksi	Ratio f _{bx} F _{bx}	Actual M _y kip-ft	Actual f _{by} ksi	Allow. F _{by} ksi	Ratio f _{by} F _{by}
L1	138.5 - 137	TP24.5x17.375x0.1875	11.39	3.031	39.000	0.078	0.00	0.000	39.000	0.000
	137 - 135.5		21.04	5.380	39.000	0.138	0.00	0.000	39.000	0.000
	135.5 - 134		28.72	7.059	39.000	0.181	0.00	0.000	39.000	0.000
	134 - 132.5		36.58	8.648	39.000	0.222	0.00	0.000	39.000	0.000
	132.5 - 131		44.63	10.156	39.000	0.260	0.00	0.000	39.000	0.000
	131 - 129.5		52.85	11.586	39.000	0.297	0.00	0.000	39.000	0.000
	129.5 - 128		66.41	14.033	39.000	0.360	0.00	0.000	39.000	0.000
	128 - 126.5		82.58	16.831	39.000	0.432	0.00	0.000	39.000	0.000
	126.5 - 125		98.94	19.464	39.000	0.499	0.00	0.000	39.000	0.000
	125 - 123.5		115.49	21.944	39.000	0.563	0.00	0.000	39.000	0.000
	123.5 - 122		132.24	24.282	39.000	0.623	0.00	0.000	39.000	0.000
	122 - 120.5		149.19	26.489	39.000	0.679	0.00	0.000	39.000	0.000
	120.5 - 119		166.35	28.574	39.000	0.733	0.00	0.000	39.000	0.000
	119 - 117.5		183.71	30.546	39.000	0.783	0.00	0.000	39.000	0.000
	117.5 - 116		201.27	32.412	39.000	0.831	0.00	0.000	39.000	0.000
	116 - 114.5		219.05	34.181	39.000	0.876	0.00	0.000	39.000	0.000
	114.5 - 113		237.03	35.858	39.000	0.919	0.00	0.000	39.000	0.000
113 - 111.5	255.23	37.450	39.000	0.960	0.00	0.000	39.000	0.000		
111.5 - 110	273.65	38.962	39.000	0.999	0.00	0.000	39.000	0.000		
110 - 108.5	292.29	40.400	39.000	1.036	0.00	0.000	39.000	0.000		
L2	108.5 - 107.434	TP31.88x24.5x0.25	305.66	31.108	39.000	0.798	0.00	0.000	39.000	0.000
	107.434 - 106.368		319.16	31.653	39.000	0.812	0.00	0.000	39.000	0.000
	106.368 - 105.303		332.76	32.171	39.000	0.825	0.00	0.000	39.000	0.000
	105.303 - 104.237		346.83	32.697	39.000	0.838	0.00	0.000	39.000	0.000
	104.237 - 103.171		366.86	33.736	39.000	0.865	0.00	0.000	39.000	0.000
	103.171 - 102.105		384.02	34.457	39.000	0.884	0.00	0.000	39.000	0.000
	102.105 - 101.039		401.30	35.144	39.000	0.901	0.00	0.000	39.000	0.000
	101.039 - 99.9737		418.69	35.799	39.000	0.918	0.00	0.000	39.000	0.000
	99.9737 - 98.9079		436.21	36.423	39.000	0.934	0.00	0.000	39.000	0.000
	98.9079 - 97.8421		453.85	37.019	39.000	0.949	0.00	0.000	39.000	0.000
	97.8421 - 96.7763		471.61	37.587	39.000	0.964	0.00	0.000	39.000	0.000
	96.7763 - 95.7105		489.49	38.130	39.000	0.978	0.00	0.000	39.000	0.000
	95.7105 - 94.6447		507.50	38.649	39.000	0.991	0.00	0.000	39.000	0.000

tnxTower

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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 $\frac{f_{by}}{F_{by}}$
	94.6447 - 93.5789		525.63	39.144	39.000	1.004	0.00	0.000	39.000	0.000
	93.5789 - 92.5132		543.88	39.618	39.000	1.016	0.00	0.000	39.000	0.000
	92.5132 - 91.4474		562.27	40.071	39.000	1.027	0.00	0.000	39.000	0.000
	91.4474 - 90.3816		580.78	40.504	39.000	1.039	0.00	0.000	39.000	0.000
	90.3816 - 89.3158		599.43	40.919	39.000	1.049	0.00	0.000	39.000	0.000
	89.3158 - 88.25		618.20	41.316	39.000	1.059	0.00	0.000	39.000	0.000
L3	88.25 - 83.75	TP43.42x30.0382x0.3125	324.55	19.882	39.000	0.510	0.00	0.000	39.000	0.000
	83.75 - 81.8194		382.81	19.502	39.000	0.500	0.00	0.000	39.000	0.000
	81.8194 - 79.8889		747.75	36.724	39.000	0.942	0.00	0.000	39.000	0.000
	79.8889 - 77.9583		788.51	37.358	39.000	0.958	0.00	0.000	39.000	0.000
	77.9583 - 76.0278		829.66	37.944	39.000	0.973	0.00	0.000	39.000	0.000
	76.0278 - 74.0972		871.19	38.484	39.000	0.987	0.00	0.000	39.000	0.000
	74.0972 - 72.1667		913.11	38.983	39.000	1.000	0.00	0.000	39.000	0.000
	72.1667 - 70.2361		955.42	39.444	39.000	1.011	0.00	0.000	39.000	0.000
	70.2361 - 68.3056		998.13	39.869	39.000	1.022	0.00	0.000	39.000	0.000
	68.3056 - 66.375		1041.41	40.270	39.000	1.033	0.00	0.000	39.000	0.000
	66.375 - 64.4444		1084.97	40.636	39.000	1.042	0.00	0.000	39.000	0.000
	64.4444 - 62.5139		1128.94	40.974	39.000	1.051	0.00	0.000	39.000	0.000
	62.5139 - 60.5833		1173.31	41.287	39.000	1.059	0.00	0.000	39.000	0.000
	60.5833 - 58.6528		1218.08	41.575	39.000	1.066	0.00	0.000	39.000	0.000
	58.6528 - 56.7222		1263.25	41.842	39.000	1.073	0.00	0.000	39.000	0.000
	56.7222 - 54.7917		1308.83	42.089	39.000	1.079	0.00	0.000	39.000	0.000
	54.7917 - 52.8611		1354.83	42.316	39.000	1.085	0.00	0.000	39.000	0.000
	52.8611 - 50.9306		1401.23	42.526	39.000	1.090	0.00	0.000	39.000	0.000
	50.9306 - 49		1448.05	42.720	39.000	1.095	0.00	0.000	39.000	0.000
L4	49 - 43	TP55.5x41.0206x0.3125	1495.28	42.899	39.000	1.100	0.00	0.000	39.000	0.000
	43 - 40.7368		841.08	22.178	39.000	0.569	0.00	0.000	39.000	0.000
	40.7368 - 38.4737		803.92	21.830	39.000	0.560	0.00	0.000	39.000	0.000
	38.4737 - 36.2105		1702.57	44.805	39.000	1.149	0.00	0.000	39.000	0.000
	36.2105 - 33.9474		1760.58	44.923	39.000	1.152	0.00	0.000	39.000	0.000
	33.9474 - 31.6842		1819.04	45.026	39.000	1.155	0.00	0.000	39.000	0.000
			1877.97	45.113	39.000	1.157	0.00	0.000	39.000	0.000
			1937.38	45.187	39.000	1.159	0.00	0.000	39.000	0.000

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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 $\frac{f_{vt}}{F_{vt}}$
	106.368									
	106.368 - 105.303		12.82	0.641	26.000	0.049	0.59	0.028	26.000	0.001
	105.303 - 104.237		13.38	0.661	26.000	0.051	0.59	0.027	26.000	0.001
	104.237 - 103.171		16.05	0.783	26.000	0.060	0.58	0.026	26.000	0.001
	103.171 - 102.105		16.16	0.778	26.000	0.060	0.57	0.025	26.000	0.001
	102.105 - 101.039		16.27	0.774	26.000	0.060	0.56	0.024	26.000	0.001
	101.039 - 99.9737		16.38	0.770	26.000	0.059	0.55	0.023	26.000	0.001
	99.9737 - 98.9079		16.49	0.767	26.000	0.059	0.54	0.022	26.000	0.001
	98.9079 - 97.8421		16.61	0.763	26.000	0.059	0.53	0.021	26.000	0.001
	97.8421 - 96.7763		16.72	0.759	26.000	0.058	0.52	0.020	26.000	0.001
	96.7763 - 95.7105		16.84	0.756	26.000	0.058	0.51	0.019	26.000	0.001
	95.7105 - 94.6447		16.95	0.753	26.000	0.058	0.50	0.019	26.000	0.001
	94.6447 - 93.5789		17.07	0.750	26.000	0.058	0.49	0.018	26.000	0.001
	93.5789 - 92.5132		17.19	0.747	26.000	0.057	0.48	0.017	26.000	0.001
	92.5132 - 91.4474		17.31	0.744	26.000	0.057	0.47	0.016	26.000	0.001
	91.4474 - 90.3816		17.43	0.741	26.000	0.057	0.46	0.016	26.000	0.001
	90.3816 - 89.3158		17.56	0.738	26.000	0.057	0.45	0.015	26.000	0.001
	89.3158 - 88.25		17.68	0.736	26.000	0.057	0.44	0.014	26.000	0.001
	88.25 - 83.75		9.96	0.397	26.000	0.031	0.21	0.006	26.000	0.000
L3	88.25 - 83.75	TP43.42x30.0382x0.3125	10.87	0.353	26.000	0.027	0.22	0.006	26.000	0.000
	83.75 - 81.8194		21.02	0.670	26.000	0.052	0.39	0.009	26.000	0.000
	81.8194 - 79.8889		21.22	0.664	26.000	0.051	0.37	0.009	26.000	0.000
	79.8889 - 77.9583		21.42	0.659	26.000	0.051	0.35	0.008	26.000	0.000
	77.9583 - 76.0278		21.62	0.654	26.000	0.050	0.33	0.007	26.000	0.000
	76.0278 - 74.0972		21.82	0.649	26.000	0.050	0.32	0.007	26.000	0.000
	74.0972 - 72.1667		22.02	0.644	26.000	0.050	0.30	0.006	26.000	0.000
	72.1667 - 70.2361		22.23	0.639	26.000	0.049	0.28	0.005	26.000	0.000
	70.2361 - 68.3056		22.47	0.636	26.000	0.049	0.26	0.005	26.000	0.000
	68.3056 - 66.375		22.68	0.632	26.000	0.049	0.24	0.004	26.000	0.000
	66.375 - 64.4444		22.88	0.628	26.000	0.048	0.22	0.004	26.000	0.000
	64.4444 - 62.5139		23.09	0.624	26.000	0.048	0.20	0.003	26.000	0.000
	62.5139 -		23.30	0.620	26.000	0.048	0.18	0.003	26.000	0.000

<p>tnxTower</p> <p>FDH Engineering, Inc. 6521 Meridien Drive, Suite 107 Raleigh, North Carolina 27616 Phone: 9197551012 FAX: 9197551031</p>	Job	O&G Woodbury, BU# 876380	Page	23 of 27
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	Client	Crown Castle	Designed by	Cary Webb

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 $\frac{f_{vt}}{F_{vt}}$
	60.5833									
	60.5833 - 58.6528		23.51	0.616	26.000	0.047	0.16	0.003	26.000	0.000
	58.6528 - 56.7222		23.73	0.613	26.000	0.047	0.14	0.002	26.000	0.000
	56.7222 - 54.7917		23.94	0.609	26.000	0.047	0.12	0.002	26.000	0.000
	54.7917 - 52.8611		24.15	0.606	26.000	0.047	0.10	0.002	26.000	0.000
	52.8611 - 50.9306		24.37	0.603	26.000	0.046	0.08	0.001	26.000	0.000
	50.9306 - 49		24.58	0.600	26.000	0.046	0.06	0.001	26.000	0.000
L4	49 - 43	TP55.5x41.0206x0.3125	13.14	0.307	26.000	0.024	0.04	0.000	26.000	0.000
	49 - 43		12.21	0.290	26.000	0.022	0.00	0.000	26.000	0.000
	43 - 40.7368		25.54	0.597	26.000	0.046	0.04	0.001	26.000	0.000
	40.7368 - 38.4737		25.74	0.592	26.000	0.046	0.07	0.001	26.000	0.000
	38.4737 - 36.2105		25.95	0.588	26.000	0.045	0.09	0.001	26.000	0.000
	36.2105 - 33.9474		26.15	0.584	26.000	0.045	0.11	0.001	26.000	0.000
	33.9474 - 31.6842		26.36	0.580	26.000	0.045	0.13	0.002	26.000	0.000
	31.6842 - 29.4211		26.57	0.576	26.000	0.044	0.16	0.002	26.000	0.000
	29.4211 - 27.1579		26.79	0.573	26.000	0.044	0.18	0.002	26.000	0.000
	27.1579 - 24.8947		27.00	0.569	26.000	0.044	0.20	0.002	26.000	0.000
	24.8947 - 22.6316		27.22	0.566	26.000	0.044	0.23	0.002	26.000	0.000
	22.6316 - 20.3684		27.44	0.563	26.000	0.043	0.25	0.002	26.000	0.000
	20.3684 - 18.1053		27.67	0.560	26.000	0.043	0.27	0.003	26.000	0.000
	18.1053 - 15.8421		27.89	0.557	26.000	0.043	0.30	0.003	26.000	0.000
	15.8421 - 13.5789		28.12	0.554	26.000	0.043	0.32	0.003	26.000	0.000
	13.5789 - 11.3158		28.35	0.551	26.000	0.042	0.35	0.003	26.000	0.000
	11.3158 - 9.05263		28.59	0.549	26.000	0.042	0.38	0.003	26.000	0.000
	9.05263 - 6.78947		28.82	0.546	26.000	0.042	0.40	0.003	26.000	0.000
	6.78947 - 4.52632		29.06	0.544	26.000	0.042	0.43	0.004	26.000	0.000
	4.52632 - 2.26316		29.30	0.542	26.000	0.042	0.46	0.004	26.000	0.000
	2.26316 - 0		29.55	0.540	26.000	0.042	0.48	0.004	26.000	0.000

Pole Interaction Design Data

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Section No.	Elevation ft	Ratio P P_a	Ratio f_{bx} F_{bx}	Ratio f_{by} F_{by}	Ratio f_v F_v	Ratio f_{vt} F_{vt}	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	138.5 - 137	0.005	0.078	0.000	0.034	0.002	0.083	1.333	H1-3+VT ✓
	137 - 135.5	0.005	0.138	0.000	0.037	0.001	0.143	1.333	H1-3+VT ✓
	135.5 - 134	0.005	0.181	0.000	0.037	0.001	0.186	1.333	H1-3+VT ✓
	134 - 132.5	0.005	0.222	0.000	0.037	0.001	0.227	1.333	H1-3+VT ✓
	132.5 - 131	0.005	0.260	0.000	0.037	0.001	0.266	1.333	H1-3+VT ✓
	131 - 129.5	0.005	0.297	0.000	0.037	0.003	0.303	1.333	H1-3+VT ✓
	129.5 - 128	0.009	0.360	0.000	0.070	0.003	0.370	1.333	H1-3+VT ✓
	128 - 126.5	0.009	0.432	0.000	0.070	0.003	0.442	1.333	H1-3+VT ✓
	126.5 - 125	0.009	0.499	0.000	0.070	0.003	0.509	1.333	H1-3+VT ✓
	125 - 123.5	0.009	0.563	0.000	0.069	0.003	0.573	1.333	H1-3+VT ✓
	123.5 - 122	0.009	0.623	0.000	0.069	0.002	0.633	1.333	H1-3+VT ✓
	122 - 120.5	0.009	0.679	0.000	0.068	0.002	0.690	1.333	H1-3+VT ✓
	120.5 - 119	0.009	0.733	0.000	0.068	0.002	0.743	1.333	H1-3+VT ✓
	119 - 117.5	0.009	0.783	0.000	0.068	0.002	0.794	1.333	H1-3+VT ✓
	117.5 - 116	0.009	0.831	0.000	0.068	0.002	0.842	1.333	H1-3+VT ✓
	116 - 114.5	0.009	0.876	0.000	0.067	0.002	0.887	1.333	H1-3+VT ✓
	114.5 - 113	0.009	0.919	0.000	0.067	0.002	0.930	1.333	H1-3+VT ✓
	113 - 111.5	0.009	0.960	0.000	0.067	0.002	0.971	1.333	H1-3+VT ✓
	111.5 - 110	0.009	0.999	0.000	0.067	0.002	1.010	1.333	H1-3+VT ✓
	110 - 108.5	0.010	1.036	0.000	0.066	0.002	1.047	1.333	H1-3+VT ✓
L2	108.5 - 107.434	0.007	0.798	0.000	0.050	0.001	0.806	1.333	H1-3+VT ✓
	107.434 - 106.368	0.007	0.812	0.000	0.050	0.001	0.820	1.333	H1-3+VT ✓
	106.368 - 105.303	0.007	0.825	0.000	0.049	0.001	0.833	1.333	H1-3+VT ✓
	105.303 - 104.237	0.008	0.838	0.000	0.051	0.001	0.847	1.333	H1-3+VT ✓
	104.237 - 103.171	0.010	0.865	0.000	0.060	0.001	0.876	1.333	H1-3+VT ✓
	103.171 - 102.105	0.010	0.884	0.000	0.060	0.001	0.894	1.333	H1-3+VT ✓

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Section No.	Elevation ft	Ratio P	Ratio f_{bx}	Ratio f_{by}	Ratio f_v	Ratio f_{vt}	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
		P_a	F_{bx}	F_{by}	F_v	F_{vt}			
	102.105 - 101.039	0.010	0.901	0.000	0.060	0.001	0.912	1.333	H1-3+VT ✓
	101.039 - 99.9737	0.010	0.918	0.000	0.059	0.001	0.929	1.333	H1-3+VT ✓
	99.9737 - 98.9079	0.010	0.934	0.000	0.059	0.001	0.945	1.333	H1-3+VT ✓
	98.9079 - 97.8421	0.010	0.949	0.000	0.059	0.001	0.960	1.333	H1-3+VT ✓
	97.8421 - 96.7763	0.010	0.964	0.000	0.058	0.001	0.975	1.333	H1-3+VT ✓
	96.7763 - 95.7105	0.010	0.978	0.000	0.058	0.001	0.989	1.333	H1-3+VT ✓
	95.7105 - 94.6447	0.010	0.991	0.000	0.058	0.001	1.002	1.333	H1-3+VT ✓
	94.6447 - 93.5789	0.010	1.004	0.000	0.058	0.001	1.015	1.333	H1-3+VT ✓
	93.5789 - 92.5132	0.010	1.016	0.000	0.057	0.001	1.027	1.333	H1-3+VT ✓
	92.5132 - 91.4474	0.010	1.027	0.000	0.057	0.001	1.038	1.333	H1-3+VT ✓
	91.4474 - 90.3816	0.010	1.039	0.000	0.057	0.001	1.050	1.333	H1-3+VT ✓
	90.3816 - 89.3158	0.010	1.049	0.000	0.057	0.001	1.060	1.333	H1-3+VT ✓
	89.3158 - 88.25	0.010	1.059	0.000	0.057	0.001	1.070	1.333	H1-3+VT ✓
	88.25 - 83.75	0.006	0.510	0.000	0.031	0.000	0.516	1.333	H1-3+VT ✓
L3	88.25 - 83.75	0.005	0.500	0.000	0.027	0.000	0.506	1.333	H1-3+VT ✓
	83.75 - 81.8194	0.010	0.942	0.000	0.052	0.000	0.952	1.333	H1-3+VT ✓
	81.8194 - 79.8889	0.010	0.958	0.000	0.051	0.000	0.969	1.333	H1-3+VT ✓
	79.8889 - 77.9583	0.010	0.973	0.000	0.051	0.000	0.984	1.333	H1-3+VT ✓
	77.9583 - 76.0278	0.010	0.987	0.000	0.050	0.000	0.998	1.333	H1-3+VT ✓
	76.0278 - 74.0972	0.010	1.000	0.000	0.050	0.000	1.011	1.333	H1-3+VT ✓
	74.0972 - 72.1667	0.010	1.011	0.000	0.050	0.000	1.022	1.333	H1-3+VT ✓
	72.1667 - 70.2361	0.010	1.022	0.000	0.049	0.000	1.033	1.333	H1-3+VT ✓
	70.2361 - 68.3056	0.011	1.033	0.000	0.049	0.000	1.044	1.333	H1-3+VT ✓
	68.3056 - 66.375	0.011	1.042	0.000	0.049	0.000	1.053	1.333	H1-3+VT ✓
	66.375 - 64.4444	0.011	1.051	0.000	0.048	0.000	1.062	1.333	H1-3+VT ✓
	64.4444 - 62.5139	0.011	1.059	0.000	0.048	0.000	1.070	1.333	H1-3+VT ✓

tnxTower

FDH Engineering, Inc.
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Section No.	Elevation ft	Ratio P	Ratio f_{bx}	Ratio f_{by}	Ratio f_v	Ratio f_{vt}	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
		P_a	F_{bx}	F_{by}	F_v	F_{vt}			
	62.5139 - 60.5833	0.011	1.066	0.000	0.048	0.000	1.078	1.333	H1-3+VT ✓
	60.5833 - 58.6528	0.011	1.073	0.000	0.047	0.000	1.084	1.333	H1-3+VT ✓
	58.6528 - 56.7222	0.011	1.079	0.000	0.047	0.000	1.091	1.333	H1-3+VT ✓
	56.7222 - 54.7917	0.011	1.085	0.000	0.047	0.000	1.097	1.333	H1-3+VT ✓
	54.7917 - 52.8611	0.011	1.090	0.000	0.047	0.000	1.102	1.333	H1-3+VT ✓
	52.8611 - 50.9306	0.011	1.095	0.000	0.046	0.000	1.107	1.333	H1-3+VT ✓
	50.9306 - 49	0.011	1.100	0.000	0.046	0.000	1.112	1.333	H1-3+VT ✓
	49 - 43	0.006	0.569	0.000	0.024	0.000	0.575	1.333	H1-3+VT ✓
L4	49 - 43	0.006	0.560	0.000	0.022	0.000	0.566	1.333	H1-3+VT ✓
	43 - 40.7368	0.012	1.149	0.000	0.046	0.000	1.162	1.333	H1-3+VT ✓
	40.7368 - 38.4737	0.012	1.152	0.000	0.046	0.000	1.165	1.333	H1-3+VT ✓
	38.4737 - 36.2105	0.012	1.155	0.000	0.045	0.000	1.168	1.333	H1-3+VT ✓
	36.2105 - 33.9474	0.013	1.157	0.000	0.045	0.000	1.170	1.333	H1-3+VT ✓
	33.9474 - 31.6842	0.013	1.159	0.000	0.045	0.000	1.172	1.333	H1-3+VT ✓
	31.6842 - 29.4211	0.013	1.160	0.000	0.044	0.000	1.173	1.333	H1-3+VT ✓
	29.4211 - 27.1579	0.013	1.164	0.000	0.044	0.000	1.178	1.333	H1-3+VT ✓
	27.1579 - 24.8947	0.013	1.173	0.000	0.044	0.000	1.186	1.333	H1-3+VT ✓
	24.8947 - 22.6316	0.013	1.181	0.000	0.044	0.000	1.194	1.333	H1-3+VT ✓
	22.6316 - 20.3684	0.013	1.189	0.000	0.043	0.000	1.203	1.333	H1-3+VT ✓
	20.3684 - 18.1053	0.014	1.197	0.000	0.043	0.000	1.211	1.333	H1-3+VT ✓
	18.1053 - 15.8421	0.014	1.204	0.000	0.043	0.000	1.219	1.333	H1-3+VT ✓
	15.8421 - 13.5789	0.014	1.212	0.000	0.043	0.000	1.227	1.333	H1-3+VT ✓
	13.5789 - 11.3158	0.014	1.220	0.000	0.042	0.000	1.234	1.333	H1-3+VT ✓
	11.3158 - 9.05263	0.014	1.227	0.000	0.042	0.000	1.242	1.333	H1-3+VT ✓
	9.05263 - 6.78947	0.014	1.235	0.000	0.042	0.000	1.250	1.333	H1-3+VT ✓
	6.78947 - 4.52632	0.015	1.243	0.000	0.042	0.000	1.258	1.333	H1-3+VT ✓

tnxTower FDH Engineering, Inc. 6521 Meridien Drive, Suite 107 Raleigh, North Carolina 27616 Phone: 9197551012 FAX: 9197551031	Job O&G Woodbury, BU# 876380	Page 27 of 27
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Section No.	Elevation ft	Ratio P	Ratio f_{bx}	Ratio f_{by}	Ratio f_v	Ratio f_{vt}	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	4.52632 - 2.26316	0.015	1.250	0.000	0.042	0.000	1.266	1.333	H1-3+VT ✓
	2.26316 - 0	0.015	1.258	0.000	0.042	0.000	1.273	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	138.5 - 108.5	Pole	TP24.5x17.375x0.1875	1	-5.37	752.20	78.5	Pass	
L2	108.5 - 83.75	Pole	TP31.88x24.5x0.25	2	-9.63	1249.44	80.3	Pass	
L3	83.75 - 43	Pole	TP43.42x30.0382x0.3125	3	-18.15	2131.32	83.4	Pass	
L4	43 - 0	Pole	TP55.5x41.0206x0.3125	4	-29.65	2629.01	95.5	Pass	
							Summary		
							Pole (L4)	95.5	Pass
							RATING =	95.5	Pass

APPENDIX B
BASE LEVEL DRAWING



(PROPOSED)
(1) 1-5/8" TO 129 FT LEVEL
(INSTALLED)
(18) 1-5/8" TO 129 FT LEVEL

(INSTALLED)
(1) 1/2" TO 137 FT LEVEL

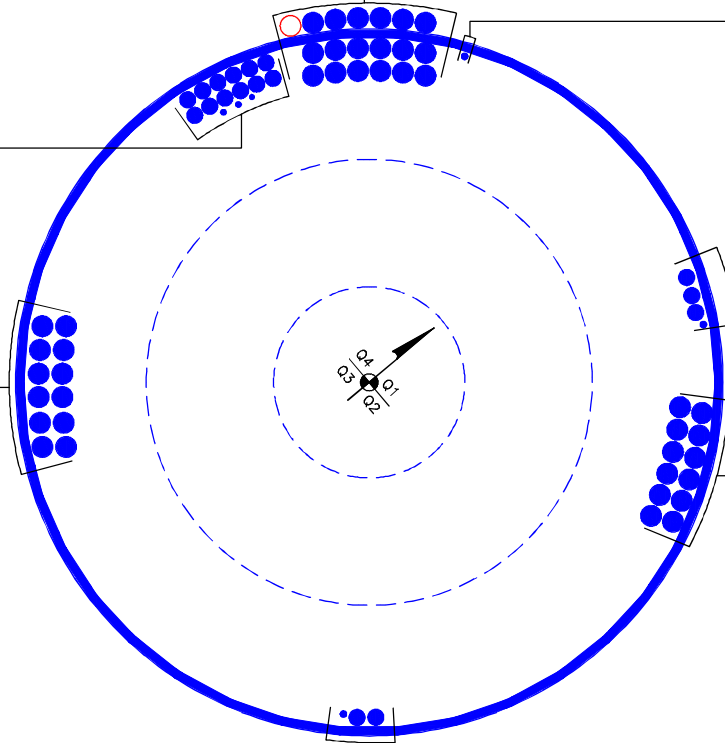
(INSTALLED)
(1) 3/8" TO 138 FT LEVEL
(2) 7/16" TO 138 FT LEVEL
(12) 1-1/4" TO 138 FT LEVEL

(INSTALLED)
(1) 1/2" TO 70 FT LEVEL
(3) 1-1/4" TO 104 FT LEVEL

(ABANDONED TO BE REMOVED)
(12) 1-5/8" TO 119 FT LEVEL

(SLA)
(12) 1-5/8" TO 87 FT LEVEL
(INSTALLED)
(12) 1-5/8" TO 87 FT LEVEL

(INSTALLED)
(1) 1/2" TO 138 FT LEVEL
(2) 1-1/4" TO 138 FT LEVEL



APPENDIX C
ADDITIONAL CALCULATIONS



Anchor Rod Design

Site Name:	O&G Woodbury
Job No. :	876380
Elevation:	0
	Input Cells in Yellow

*Note: Use Anchor Rod Transfer Plate Design Tab in Conjunction

Legend
Input
Output/ Notes

Code (F or G):	F	Pull Down
Anchor Bolts (Yes or No)	Yes	Pull Down
P (from RISA)	30	kips
V (from RISA)	30	kips
M (from RISA)	2821	ft-kips

Existing Rods		
y	32	in
No. Bolts	12	
BC	64	in
I	24453.12	in ⁴
Bolt Grade	A615-75	Pull Down
Thread Form	Non-Upset	-
d (in)	2.25	Pull Down
Ag	3.98	in ²
Ae	3.25	in ²
Fy	75	ksi
Fu	100	ksi

New Rods		
y new	32	in
No. Bolts new	4	
BC new	64	in
I new	8,151	in ⁴
Bolt Grade	A193 B7	Pull Down
Thread Form	Non-Upset	Pull Down
d new (in)	2.25	Pull Down
Ag new	3.98	in ²
Ae new	3.25	in ²
Fy new	105	ksi
Fu new	125	ksi

Req'd Embedment Length for New Rods		
f _c , caisson's concrete strength	4000	psi
f _y , rebar yield strength	60000	psi
d _b , diameter of vertical rebar	1	in
vertical rebar cage BC ø	73	in
vertical rebar top cover distance	3	in
τ, Ultimate Hilti Bond Resistance	1.8	ksi

****Note For New Anchor Rods:****
Williams Bars (Upset)
 A722 (Fy=127.7 ksi, Fu=150 ksi)
 A615-75 (Fy=75 ksi, Fu=100 ksi)

ltot	32604.16	in ⁴
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T	130.359	kips
V	1.875	kips

Tnew	130.359	kips
Vnew	1.875	kips

l _v (vertical rebar dev. Length)	28.460	in
l _{GH} (Hilti dev. length)	76.630	in
G/1.5	3.000	in

Capacity (%)			Pullout Test Value	
Tn/Ω	194.5	kips	OK	67.02
Tn/Ω, new	218.9	kips	OK	59.55
øTn	260	kips		
øTn, new	325	kips		
				218.90 kips

Total Embed. Length of New Bolts	76.63	in
	6.39	ft

Equations:

$$= (M^*y^*Ag)/ltot - P^*(Ag/Atotal)$$

$$Tn/\Omega = 0.33^*Fu^*Ag^{(4/3)}$$

$$= 0.8^*Fu^*Ae \text{ (anchor bolts only)} \quad \phi Tn = 0.75^*Fu^*Ae \text{ (non anchor bolts)}$$

$$I = (No. Bolts/8)^*BC^2^*Ag$$

Notes:

*Ag and Ae are taken from AISC 13th Ed. Manual (pg. 7-83)

*I calc. will only work for symmetric bolt group, otherwise use CAD

Interaction Equation Checks (Rev. G: Section 4.9.9) (works for Rev F also)		
Detail Type (hover for detail)	c	Pull Down
η	0.55	
l _{ar} , for Detail Type d only	2.25	in (top of concrete to bottom of leveling nut)
øRnt	194.5	kips
øRnv	119.4	kips
øRnm	94.922	kip-in
Mu	2.7421875	kip-in
(Pu+Vu/η)/øRnt < 1?	0.688	OK
(Vu/øRnv) ² + ((Pu/øRnt)+(Mu/øRnm)) ²	NA	(only applicable for Detail Type d)

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

TIA Rev F

Site Data

BU#:	876380
Site Name:	O&G Woodbury
App#:	
Pole Manufacturer:	Other

Anchor Rod Data

*Qty:	24	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	64	in

Plate Data

Diam:	70	in
Thick:	1.5	in
Grade:	60	ksi
Single-Rod B-eff:	7.34	in

Stiffener Data (Welding at both sides)

Config:	1	*
Weld Type:	Fillet	
Groove Depth:	0.25	<-- Disregard
Groove Angle:	45	<-- Disregard
Fillet H. Weld:	0.375	in
Fillet V. Weld:	0.25	in
Width:	7	in
Height:	16	in
Thick:	0.5	in
Notch:	0.75	in
Grade:	50	ksi
Weld str.:	70	ksi

Pole Data

Diam:	55.5	in
Thick:	0.3125	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Stress Increase Factor

ASIF:	1.333
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Reactions

*Moment:	4214	ft-kips
Axial:	30	kips
Shear:	30	kips

*Anchor Rod quantity and Moment are modified due to consideration of modifications.

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

Anchor Rod Results

Maximum Rod Tension:	130.4 Kips
Allowable Tension:	195.0 Kips
Anchor Rod Stress Ratio:	66.9% Pass

Stiffened
Service, ASD
Fty*ASIF

Base Plate Results

Base Plate Stress:	57.5 ksi
Allowable Plate Stress:	60.0 ksi
Base Plate Stress Ratio:	95.8% Pass

Flexural Check

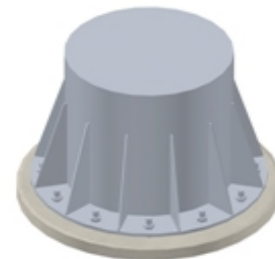
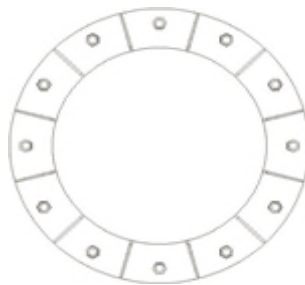
Stiffened
Service, ASD
0.75*Fy*ASIF
Y.L. Length:
N/A, Roark

Stiffener Results

Horizontal Weld :	98.5% Pass
Vertical Weld:	69.2% Pass
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	37.4% Pass
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	82.7% Pass
Plate Comp. (AISC Bracket):	94.5% Pass

Pole Results

Pole Punching Shear Check:	18.0% Pass
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* 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

Stiffened or Unstiffened, Exterior Flange Plate - Any Bolt Material TIA Rev F

Site Data

BU#: 876380
 Site Name: O&G Woodbury
 App #:

Reactions

Moment:	292.29	ft-kips
Axial:	5.48	kips
Shear:	12.6	kips
Elevation:	108.5	feet

Pole Manufacturer: Other

Bolt Data

Qty:	24		
Diameter (in.):	1	Bolt Fu:	120
Bolt Material:	A325	Bolt Fy:	92
N/A:	75	<-- Disregard	Bolt Fty:
N/A:	55	<-- Disregard	44.00
Circle (in.):	28		

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

Flange Bolt Results

Bolt Tension Capacity, B: 46.07 kips
 Max Bolt directly applied T: 20.65 Kips
 Min. PL "tc" for B cap. w/o Pry: 1.340 in
 Min PL "treq" for actual T w/ Pry: 0.695 in
 Min PL "t1" for actual T w/o Pry: 0.897 in
 T allowable w/o Prying: 46.07 kips
 Prying Force, Q: 0.00 kips
 Total Bolt Tension=T+Q: 20.65 kips
 Non-Prying Bolt Stress Ratio, T/B: 44.8% **Pass**

Rigid
Service, ASD
Fty*ASIF

Plate Data

Diam:	31	in
Thick, t:	1.5	in
Grade (Fy):	60	ksi
Strength, Fu:	75	ksi
Single-Rod B-eff:	3.24	in

Exterior Flange Plate Results

Flexural Check
 Compression Side Plate Stress: 18.7 ksi
 Allowable Plate Stress: 60.0 ksi
 Compression Plate Stress Ratio: 31.1% **Pass**
No Prying
 Tension Side Stress Ratio, (treq/t)^2: 21.4% **Pass**

Rigid
Service ASD
0.75*Fy*ASIF
Comp. Y.L. Length:
13.56

Stiffener Data (Welding at Both Sides)

Config:	0	*
Weld Type:	Fillet	
Groove Depth:	0.25	<-- Disregard
Groove Angle:	45	<-- Disregard
Fillet H. Weld:	0.25	in
Fillet V. Weld:	0.25	in
Width:	3	in
Height:	8	in
Thick:	0.5	in
Notch:	0.375	in
Grade:	36	ksi
Weld str.:	70	ksi

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

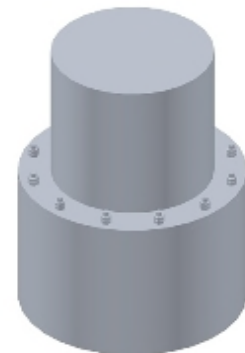
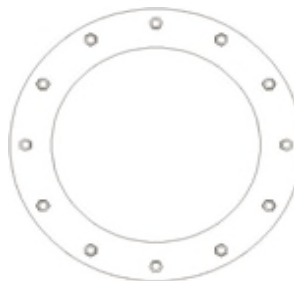
Pole Punching Shear Check: n/a

Pole Data

Diam:	24.5	in
Thick:	0.1875	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Stress Increase Factor

ASIF:	1.333
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* 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#: 876380
Site Name: O&G Woodbury
App #:

Monopole Base Reaction Forces		
TIA Revision:	F	<--Pull Down
Unfactored DL Axial, PD:	30	kips
Unfactored WL Axial, PW:	0	kips
Unfactored WL Shear, V:	30	kips
Unfactored WL Moment, M:	2821	ft-kips

Load Factor	Shaft Factored Loads	
1.20	1.2D+1.6W, Pu:	36 kips
0.90	0.9D+1.6W, Pu:	27 kips
1.35	Vu:	40.5 kips
	Mu:	3808.35 ft-kips

1.2D+1.6W Load Combination, Bearing Results:

(No Soil Wedges) [Reaction+Conc+Soil]	613.35	P1="1.2D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil), M1	4057.43	ft-kips

Orthogonal Direction:

ecc1 = M1/P1 = 6.62 ft
 Orthogonal qu= 2.73 ksf
 qu/φ*qn Ratio= **30.33% Pass**

Diagonal Direction:

ecc2 = (0.707M1)/P1 = 4.68 ft
 Diagonal qu= 3.29 ksf
 qu/φ*qn Ratio= **36.60% Pass**

<-- Press Upon Completing All Input

Overturning Stability Check

0.9D+1.6W Load Combination, Bearing Results:

(w/ Soil Wedges) [Reaction+Conc+Soil]	486.89	P2="0.9D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil) - 0.9(M of Wedge + M of Cohesion), M2	3855.23	ft-kips

Orthogonal ecc3 = M2/P2 = 7.92 ft
 Ortho Non Bearing Length,NBL= **15.84 ft**
 Orthogonal qu= 2.96 ksf
 Diagonal qu= 3.50 ksf

Max Reaction Moment (ft-kips) so that qu=φ*qn = 100% Capacity Rating

Actual M:	2821.00		
M Orthogonal:	3696.60	76.31%	Pass
M Diagonal:	3696.60	76.31%	Pass

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:	12	in
Pad Bearing Depth, D:	6.5	ft
Pad Thickness, T:	3	ft
Pad Width=Length, L:	23	ft
Pier Cross Section Shape:	Square	<--Pull Down
Enter Pier Side Width:	7	ft
Concrete Density:	150.0	pcf
Pier Cross Section Area:	49.00	ft^2
Pier Height:	4.50	ft
Soil (above pad) Height:	3.50	ft

Soil Parameters		
Unit Weight, γ:	125.0	pcf
Ultimate Bearing Capacity, qn:	12.00	ksf
Strength Reduct. factor, φ:	0.75	
Angle of Friction, Φ:	34.0	degrees
Undrained Shear Strength, Cu:	0.00	ksf
Allowable Bearing: φ*qn:	9.00	ksf
Passive Pres. Coeff., Kp	3.54	

Forces/Moments due to Wind and Lateral Soil		
Minimum of (φ*Ultimate Pad Passive Force, Vu):	40.5	kips
Pad Force Location Above D:	1.35	ft
φ(Passive Pressure Moment):	54.68	ft-kips
Factored O.T. M(WL), "1.6W":	4112.1	ft-kips
Factored OT (MW-Msoil), M1	4057.43	ft-kips

Resistance due to Foundation Gravity		
Soil Wedge Projection grade, a:	2.36	ft
Sum of Soil Wedges Wt:	29.86	kips
Soil Wedges ecc, K1:	7.52	ft
Ftg+Soil above Pad wt:	481.1	kips
Unfactored (Total ftg-soil Wt):	510.98	kips
1.2D. No Soil Wedges.	613.35	kips
0.9D. With Soil Wedges	486.89	kips

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

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

T-Mobile Existing Facility

Site ID: CTNH350A

NH350/Global-Woodbury
202 Great Hollow Road
Woodbury, CT 06798

March 23, 2015

EBI Project Number: 6215001736

Site Compliance Summary	
Compliance Status:	COMPLIANT
Site total MPE% of FCC general public allowable limit:	65.69 %

March 23, 2015

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

Emissions Analysis for Site: **CTNH350A – NH350/Global-Woodbury**

EBI Consulting was directed to analyze the proposed T-Mobile facility located at **202 Great Hollow Road, Woodbury, 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 97-01 and ANSI/IEEE Std C95.1. The FCC regulates Maximum Permissible Exposure in units of microwatts per square centimeter ($\mu\text{W}/\text{cm}^2$). The number of $\mu\text{W}/\text{cm}^2$ 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 ($\mu\text{W}/\text{cm}^2$). The general population exposure limit for the 700 MHz Band is $467 \mu\text{W}/\text{cm}^2$, and the general population exposure limit for the PCS and AWS bands is $1000 \mu\text{W}/\text{cm}^2$. 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 **202 Great Hollow Road, Woodbury, CT**, using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. Since T-Mobile is proposing highly focused directional panel antennas, which project most of the emitted energy out toward the horizon, all calculations were performed assuming a lobe representing the maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB, was focused at the base of the tower. For this report the sample point is the top of a 6 foot person standing at the base of the tower.

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

- 1) 2 GSM channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel
- 2) 2 UMTS channels (AWS Band – 2100 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.
- 3) 2 LTE channels (AWS Band – 2100 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 Watts per Channel.
- 4) 1 LTE channel (700 MHz Band) was considered for each sector of the proposed installation. This channel has a transmit power of 30 Watts.
- 5) All radios at the proposed installation were considered to be running at full power and were uncombined in their RF transmissions paths per carrier prescribed configuration. Per FCC OET Bulletin No. 65 - Edition 97-01 recommendations to achieve the maximum anticipated value at each sample point, all power levels emitting from the proposed antenna installation are increased by a factor of 2.56 to account for possible in-phase reflections from the surrounding environment. This is rarely the case, and if so, is never continuous.

- 6) For the following calculations the sample point was the top of a six foot person standing at the base of the tower. The maximum gain of the antenna per the antenna manufactures supplied specifications minus 10 dB was used in this direction. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.
- 7) The antennas used in this modeling are the **RFS APXV18-209014** for 1900 MHz (PCS) and 2100 MHz (AWS) channels and the **Commscope LNX-6515DS-VTM** for 700 MHz channels. This is based on feedback from the carrier with regards to anticipated antenna selection. The **RFS APXV18-209014** 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 **87 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:	RFS APXV18-209014	Make / Model:	RFS APXV18-209014	Make / Model:	RFS APXV18-209014
Gain:	14.4 dBd	Gain:	14.4 dBd	Gain:	14.4 dBd
Height (AGL):	87	Height (AGL):	87	Height (AGL):	87
Frequency Bands	1900 MHz(PCS) / 2100 MHz (AWS)	Frequency Bands	1900 MHz(PCS) / 2100 MHz (AWS)	Frequency Bands	1900 MHz(PCS) / 2100 MHz (AWS)
Channel Count	2	Channel Count	2	# PCS Channels:	2
Total TX Power:	120	Total TX Power:	120	# AWS Channels:	120
ERP (W):	3,305.07	ERP (W):	3,305.07	ERP (W):	3,305.07
Antenna A1 MPE%	1.81	Antenna B1 MPE%	1.81	Antenna C1 MPE%	1.81
Antenna #:	2	Antenna #:	2	Antenna #:	2
Make / Model:	RFS APXV18-209014	Make / Model:	RFS APXV18-209014	Make / Model:	RFS APXV18-209014
Gain:	14.4 dBd	Gain:	14.4 dBd	Gain:	14.4 dBd
Height (AGL):	87	Height (AGL):	87	Height (AGL):	87
Frequency Bands	1900 MHz(PCS) / 2100 MHz (AWS)	Frequency Bands	1900 MHz(PCS) / 2100 MHz (AWS)	Frequency Bands	1900 MHz(PCS) / 2100 MHz (AWS)
Channel Count	4	Channel Count	4	Channel Count	4
Total TX Power:	120	Total TX Power:	120	Total TX Power:	120
ERP (W):	3,305.07	ERP (W):	3,305.07	ERP (W):	3,305.07
Antenna A2 MPE%	1.81	Antenna B2 MPE%	1.81	Antenna C2 MPE%	1.81
Antenna #:	3	Antenna #:	3	Antenna #:	3
Make / Model:	Commscope LNX-6515DS-VTM	Make / Model:	Commscope LNX-6515DS-VTM	Make / Model:	Commscope LNX-6515DS-VTM
Gain:	14.6 dBd	Gain:	14.6 dBd	Gain:	14.6 dBd
Height (AGL):	87	Height (AGL):	87	Height (AGL):	87
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 A3 MPE%	1.02	Antenna B3 MPE%	1.02	Antenna C3 MPE%	1.02

Site Composite MPE%	
Carrier	MPE%
T-Mobile	13.91
Sprint	10.67 %
AT&T	16.64 %
Verizon Wireless	17.93 %
Nextel	5.28 %
CL&P	1.26 %
Site Total MPE %:	65.69 %

T-Mobile Sector 1 Total:	4.64 %
T-Mobile Sector 2 Total:	4.64 %
T-Mobile Sector 3 Total:	4.64 %
Site Total:	65.69 %

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:	4.64 %
Sector 2:	4.64 %
Sector 3 :	4.64 %
T-Mobile Total:	13.91 %
Site Total:	65.69 %
Site Compliance Status:	COMPLIANT

The anticipated composite MPE value for this site assuming all carriers present is **65.69%** 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
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