Transcend Wireless

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February 13, 2018

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

T-Mobile Northeast LLC – CTNL193A
Tower Share Application
720 Quinebaug Road, Thompson, CT 06262
Latitude- 42.02284722
Longitude- -71.94916667

Dear Ms. Bachman,

This letter and attachments are submitted on behalf of T-Mobile Northeast LLC ("T-Mobile"). T-Mobile plans to install antennas and related equipment at the tower site located at 720 Quinebaug Road, Thompson, Connecticut.

T-Mobile will install twelve (12) 600/700/1900/2100 MHz antennas, one (1) microwave dish antenna, twelve (12) RRHs, and eight (8) diplexers at the 105' level of the existing 125' monopole tower. Four (4) hybrid cables and two (2) coax cables will also be installed. T-Mobile's equipment cabinets will be placed on a 5' X 12' concrete pad within the existing ground facility. Included are plans by Centek Engineering, dated February 8, 2018, depicting the planned changes and attached as **Exhibit A**. Also included is a structural analysis prepared by Centek Engineering, dated January 25, 2018, confirming that the existing tower is structurally capable of supporting the proposed equipment with tower modifications and reinforcements. This is attached and detailed in **Exhibit B**.

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies 16-50aa, of T-Mobile's intent to share a telecommunications facility pursuant to R.C.S.A. 16-50j-88. In accordance with R.C.S.A., a copy of this letter is being sent to Ken Beausoleil, First Selectman of the Town of Thompson, as well as the tower and property owner, Quinebaug Volunteer Fire Department. Please see the attached letter from Quinebaug Volunteer Fire Department authorizing the proposed shared use of this facility attached as **Exhibit C**.

The planned modifications of the facility fall squarely within those activities explicitly provided for in R.C.S.A. 16-50j-89.

1. The proposed modification will not result in an increase in the height of the existing structure. The top of the monopole is 125'; T-Mobile's proposed antennas will be located at a center line height of 105'.

2. The proposed modifications will not result in the increase of the site boundary as depicted on the attached site plan.

3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed local and state criteria. T-Mobile's plans include the installation of an emergency back-up generator; noise associated with this installation is exempt from State and local noise standards. The incremental effect of the proposed changes will be negligible.

4. The operation of the proposed antennas will not increase radio frequency emissions at the facility to a level at or above the Federal Communications Commission safety standard. As indicated in the attached power density calculations, the combined site operations will result in a total power density of 12.91%, as evidenced by **Exhibit D**.

Connecticut General Statutes 16-50aa indicates that the Council must approve the shared use of a telecommunications facility provided it finds the shared use is technically, legally, environmentally, and economically feasible and meets public safety concerns. As demonstrated in this letter, T-Mobile respectfully submits that the shared use of this facility satisfies these criteria.

A. Technical Feasibility. The existing monopole has been deemed structurally capable of supporting T-Mobile's proposed loading, with the tower modifications/reinforcements as detailed in the structural analysis. The structural analysis is included as **Exhibit B**.
B. Legal Feasibility. As referenced above, C.G.S. 16-50aa has been authorized to issue orders approving the shared use of an existing tower such as this monopole in Thompson. Under the authority granted to the Council, an order of the Council approving the requested shared use would permit T-Mobile to obtain a building permit for the proposed installation. Further, a Letter of Authorization is included as **Exhibit C**, authorizing T-Mobile to file this application for shared use.
C. Environmental Feasibility. The proposed shared use of this facility would have minimal environmental impact. The installation of T-Mobile equipment at the 105' level of the existing 125' tower would have an insignificant visual impact on the area around the tower. T-Mobile's ground equipment would be installed within the existing facility compound. T-Mobile's shared use would therefore not cause any significant alteration in the physical or environmental characteristics of the existing site. Additionally, as evidenced by **Exhibit D**, the proposed antennas would not increase radio frequency emissions to a level at or above the Federal Communications Commission safety standard.
D. Economic Feasibility. T-Mobile will be entering into an agreement with the owner of this facility to mutually agreeable terms. As previously mentioned, the Letter of Authorization has been provided by the owner to assist T-Mobile with this tower sharing application.
E. Public Safety Concerns. As discussed above, the monopole is structurally capable of supporting T-Mobile's proposed loading. T-Mobile is not aware of any public safety concerns relative to the proposed sharing of the existing monopole. T-Mobile's intentions of providing new and improved wireless service through the shared use of this facility is expected to enhance the safety and welfare of local residents and individuals traveling through Thompson and nearby the facility.

Sincerely,

Kyle Richers

Kyle Richers
Transcend Wireless
10 Industrial Ave., Suite 3
Mahwah, New Jersey
krichers@transcendwireless.com
908-447-4716

CC: Ken Beausoleil- First Selectmen
Quinebaug Volunteer Fire Department

T-Mobile

WIRELESS COMMUNICATIONS FACILITY

QUINEBAUG ROAD

SITE ID: CTNL193

720 QUINEBAUG ROAD

THOMPSON, CT 06262

PROJECT SUMMARY

1. THE PROPOSED SCOPE OF WORK CONSISTS OF THE INSTALLATION OF A PROPOSED UNMANNED TELECOMMUNICATIONS FACILITY INCLUDING THE FOLLOWING:

   A. THE INSTALLATION OF TWELVE (12) NEW T-MOBILE PANEL ANTENNAS, THREE (3) PER SECTOR.

   B. THE INSTALLATION OF TWELVE (12) NEW T-MOBILE REMOTE RADIO UNITS, THREE (3) PER SECTOR.

   C. THE INSTALLATION OF FOUR (4) NEW T-MOBILE FIBER CABLES FROM EQUIPMENT AT GRADE TO ANTENNA SECTORS.

   D. THE INSTALLATION OF A NEW T-MOBILE 60 SF CONCRETE PAD WITH RADIO CABINETS.

PROJECT INFORMATION

SITE NAME:	QUINEBAUG ROAD
SITE ID:	CTNL193
SITE ADDRESS:	720 QUINEBAUG ROAD THOMPSON, CT 06262
APPLICANT:	T-MOBILE NORTHEAST, LLC 35 GRIFFIN ROAD SOUTH BLOOMFIELD, CT 06002
CONTACT PERSON:	DAN REID (PROJECT MANAGER) TRANSCEND WIRELESS, LLC (203) 592-8291
ENGINEER:	CENTEK ENGINEERING, INC. 63-2 NORTH BRANFORD RD. BRANFORD, CT 06405
PROJECT COORDINATES:	LATITUDE: 42°-01'-22.25" N LONGITUDE: 71°-56'-57.17" W GROUND ELEVATION: 368.14'± AMSL COORDINATES AND GROUND ELEVATION BASED ON FAA 2-C SURVEY CERTIFICATION PREPARED BY CENTEK ENGINEERING, INC. DATED DECEMBER 18, 2017

GENERAL NOTES

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE 2012 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2016 CONNECTICUT SUPPLEMENT, INCLUDING THE TIA/EIA-222 REVISION "G" "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND SUPPORTING STRUCTURES." 2016 CONNECTICUT FIRE SAFETY CODE, NATIONAL ELECTRICAL CODE AND LOCAL CODES.
2. CONTRACTOR SHALL REVIEW ALL DRAWINGS AND SPECIFICATIONS IN THE CONTRACT DOCUMENT SET. CONTRACTOR SHALL COORDINATE ALL WORK SHOWN IN THE SET OF DRAWINGS. THE CONTRACTOR SHALL PROVIDE A COMPLETE SET OF DRAWINGS TO ALL SUBCONTRACTORS AND ALL RELATED PARTIES. THE SUBCONTRACTORS SHALL EXAMINE ALL THE DRAWINGS AND SPECIFICATIONS FOR THE INFORMATION THAT AFFECTS THEIR WORK.
3. CONTRACTOR SHALL PROVIDE A COMPLETE BUILD-OUT WITH ALL FINISHES, STRUCTURAL, MECHANICAL, AND ELECTRICAL COMPONENTS AND PROVIDE ALL ITEMS AS SHOWN OR INDICATED ON THE DRAWINGS OR IN THE WRITTEN SPECIFICATIONS.
4. CONTRACTOR SHALL FURNISH ALL MATERIAL, LABOR AND EQUIPMENT TO COMPLETE THE WORK AND FURNISH A COMPLETED JOB ALL IN ACCORDANCE WITH LOCAL AND STATE GOVERNING AUTHORITIES AND OTHER AUTHORITIES HAVING LAWFUL JURISDICTION OVER THE WORK.
5. CONTRACTOR SHALL SECURE AND PAY FOR ALL PERMITS AND ALL INSPECTIONS REQUIRED AND SHALL ALSO PAY FEES REQUIRED FOR THE GENERAL CONSTRUCTION, PLUMBING, ELECTRICAL AND HVAC. PERMITS SHALL BE PAID FOR BY THE RESPECTIVE SUBCONTRACTORS.
6. CONTRACTOR SHALL MAINTAIN A CURRENT SET OF DRAWINGS AND SPECIFICATIONS ON SITE AT ALL TIMES AND INSURE DISTRIBUTION OF NEW DRAWINGS TO SUBCONTRACTORS AND OTHER RELEVANT PARTIES AS SOON AS THEY ARE MADE AVAILABLE. ALL OLD DRAWINGS SHALL BE MARKED VOID AND REMOVED FROM THE CONTRACT AREA. THE CONTRACTOR SHALL FURNISH AN 'AS-BUILT' SET OF DRAWINGS TO OWNER UPON COMPLETION OF PROJECT.
7. LOCATION OF EQUIPMENT, AND WORK SUPPLIED BY OTHERS THAT IS DIAGRAMMATICALLY INDICATED ON THE DRAWINGS SHALL BE DETERMINED BY THE CONTRACTOR. THE CONTRACTOR SHALL DETERMINE LOCATIONS AND DIMENSIONS SUBJECT TO STRUCTURAL CONDITIONS AND WORK OF THE SUBCONTRACTORS.
8. THE CONTRACTOR IS SOLELY RESPONSIBLE TO DETERMINE CONSTRUCTION PROCEDURE AND SEQUENCE, AND TO ENSURE THE SAFETY OF THE EXISTING STRUCTURES AND ITS COMPONENT PARTS DURING CONSTRUCTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, BRACING, UNDERPINNING, ETC. THAT MAY BE NECESSARY.
9. DRAWINGS INDICATE THE MINIMUM STANDARDS, BUT IF ANY WORK SHOULD BE INDICATED TO BE SUBSTANDARD TO ANY ORDINANCES, LAWS, CODES, RULES, OR REGULATIONS BEARING ON THE WORK, THE CONTRACTOR SHALL INCLUDE IN HIS WORK AND SHALL EXECUTE THE WORK CORRECTLY IN ACCORDANCE WITH SUCH ORDINANCES, LAWS, CODES, RULES OR REGULATIONS WITH NO INCREASE IN COSTS.
10. ALL UTILITY WORK SHALL BE IN ACCORDANCE WITH LOCAL UTILITY COMPANY REQUIREMENTS AND SPECIFICATIONS.
11. ALL EQUIPMENT AND PRODUCTS PURCHASED ARE TO BE REVIEWED BY CONTRACTOR AND ALL APPLICABLE SUBCONTRACTORS FOR ANY CONDITION PER MFR.'S RECOMMENDATIONS. CONTRACTOR TO SUPPLY THESE ITEMS AT NO COST TO OWNER OR CONSTRUCTION MANAGER.
12. ANY AND ALL ERRORS, DISCREPANCIES, AND 'MISSED" ITEMS ARE TO BE BROUGHT TO THE ATTENTION OF THE T-MOBILE CONSTRUCTION MANAGER DURING THE BIDDING PROCESS BY THE CONTRACTOR. ALL THESE ITEMS ARE TO BE INCLUDED IN THE BID. NO 'EXTRA' WILL BE ALLOWED FOR MISSED ITEMS.
13. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ON-SITE SAFETY FROM THE TIME THE JOB IS AWARDED UNTIL ALL WORK IS COMPLETE AND ACCEPTED BY THE OWNER.
14. CONTRACTOR TO REVIEW ALL SHOP DRAWINGS AND SUBMIT COPY TO ENGINEER FOR APPROVAL. DRAWINGS MUST BEAR THE CHECKER'S INITIALS BEFORE SUBMITTING TO THE CONSTRUCTION MANAGER FOR REVIEW.
15. THE CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS, ELEVATIONS, ANGLES, AND EXISTING CONDITIONS AT THE SITE, PRIOR TO FABRICATION AND/OR INSTALLATION OF ANY WORK IN THE CONTRACT AREA.
16. COORDINATION, LAYOUT, FURNISHING AND INSTALLATION OF CONDUIT AND ALL APPURTENANCES REQUIRED FOR PROPER INSTALLATION OF ELECTRICAL AND TELECOMMUNICATION SERVICE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
17. ALL DAMAGE CAUSED TO ANY EXISTING STRUCTURE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR WILL BE HELD LIABLE FOR ALL REPAIRS REQUIRED FOR EXISTING STRUCTURES IF DAMAGED DURING CONSTRUCTION ACTIVITIES.
18. THE CONTRACTOR SHALL CONTACT "CALL BEFORE YOU DIG" AT LEAST 48 HOURS PRIOR TO ANY EXCAVATIONS AT 1-800-922-4455. ALL UTILITIES SHALL BE IDENTIFIED AND CLEARLY MARKED. CONTRACTOR SHALL MAINTAIN AND PROTECT MARKED UTILITIES THROUGHOUT PROJECT COMPLETION.
19. CONTRACTOR SHALL COMPLY WITH OWNERS ENVIRONMENTAL ENGINEER ON ALL METHODS AND PROVISIONS FOR ALL EXCAVATION ACTIVITIES INCLUDING SOIL DISPOSAL. ALL BACKFILL MATERIALS TO BE PROVIDED BY THE CONTRACTOR.

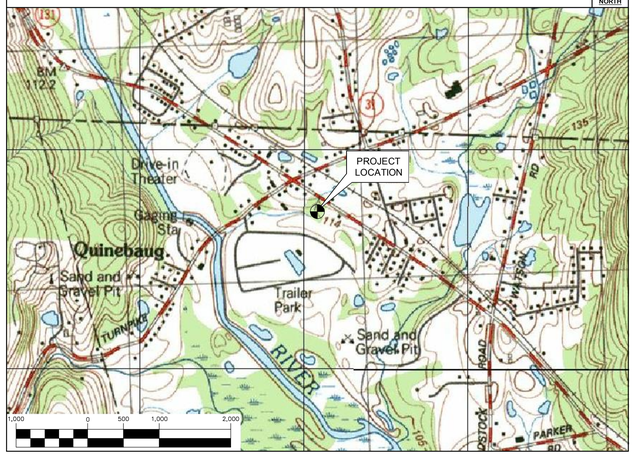
SITE DIRECTIONS

FROM: 35 GRIFFIN ROAD SOUTH, BLOOMFIELD, CT 06002 **TO:** 720 QUINEBAUG ROAD, THOMPSON, CT 06262

1. HEAD NORTH ON GRIFFIN ROAD S. TOWARD HARTMAN RD.	0.30 MI.
2. TAKE THE 2ND RIGHT ONTO DAY HILL RD.	3.64 MI.
3. MERGE ONTO I-91 S TOWARD HARTFORD	3.99 MI.
4. MERGE ONTO I-291 EAST VIA EXIT 35A TOWARD MANCHESTER	6.18 MI.
5. MERGE ONTO I-84 E/WILBUR CROSS HWY N VIA LEFT EXIT TOWARD BOSTON	24.79 MI.
6. TAKE THE CT-190 EXIT, EXIT 73 TOWARD UNION	0.24 MI.
7. TURN RIGHT ONTO BUCKLEY HWY/CT-190	1.90 MI.
8. TURN RIGHT ONTO BIGELOW HOLLOW RD/CT-171/CT-197	2.29 MI.
9. TURN LEFT ONTO LAWSON RD/CT-197 CONTINUE TO FOLLOW CT-197	10.65 MI.
10. TURN RIGHT ONTO QUINEBAUG RD/CT-131	0.12 MI.
11. FINISH AT 720 QUINEBAUG ROAD, THOMPSON, CT	

VICINITY MAP

SCALE: 1" = 1000'



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REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
B	02/08/18	CDZ	DMD	PRELIMINARY CDs - REVISED PER CLIENT COMMENTS
A	01/22/18	CAC	DMD	PRELIMINARY CDs - ISSUED FOR CLIENT REVIEW

PROFESSIONAL ENGINEER SEAL

T-Mobile

Transcend Wireless

CENTEK engineering
Centered on Solutions℠
(203) 488-0580
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63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

T-MOBILE NORTHEAST LLC

WIRELESS COMMUNICATIONS FACILITY

QUINEBAUG ROAD
SITE ID: CTNL193
720 QUINEBAUG ROAD
THOMPSON, CT 06262

DATE: 02/08/18

SCALE: AS NOTED

JOB NO. 17179.00

TITLE SHEET

T-1

Sheet No. 1 of 14

SITE AND FOUNDATION SPECIFICATIONS

DESIGN BASIS:

GOVERNING CODE: 2012 INTERNATIONAL BUILDING (IBC) AS MODIFIED BY THE 2016 CT STATE BUILDING CODE AND AMENDMENTS.

1. DESIGN CRITERIA:

- WIND LOAD: PER TIA 222 G (ANTENNA MOUNTS): 100–110 MPH (3 SECOND GUST)
- RISK CATEGORY: III (BASED ON IBC TABLE 1604.5)
- NOMINAL DESIGN SPEED (OTHER STRUCTURE): 101 MPH (Vasd) (EXPOSURE C/IMPORTANCE FACTOR 1.0 BASED ON ASCE 7–10) PER 2012 INTERNATIONAL BUILDING CODE (IBC) AS MODIFIED BY THE 2016 CONNECTICUT STATE BUILDING CODE.
- SEISMIC LOAD (DOES NOT CONTROL): PER ASCE 7–10 MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES.

GENERAL NOTES

1. IF ANY FIELD CONDITIONS EXIST WHICH PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL PROCEED WITH AFFECTED WORK AFTER CONFLICT IS SATISFACTORILY RESOLVED.
2. DIMENSIONS AND DETAILS SHALL BE CHECKED AGAINST THE PRE MANUFACTURED EQUIPMENT BUILDING SHOP DRAWINGS.
3. THE CONTRACTOR SHALL VERIFY AND COORDINATE THE SIZE AND LOCATION OF ALL OPENINGS, SLEEVES AND ANCHOR BOLTS AS REQUIRED BY ALL TRADES.
4. REFER TO DRAWING T1 FOR ADDITIONAL NOTES AND REQUIREMENTS.

SITE NOTES

1. THE CONTRACTOR SHALL CALL UTILITIES PRIOR TO THE START OF CONSTRUCTION.
2. ACTIVE EXISTING UTILITIES, WHERE ENCOUNTERED IN THE WORK, SHALL BE PROTECTED AT ALL TIMES. THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY, PRIOR TO PROCEEDING, SHOULD ANY UNCOVERED EXISTING UTILITY PRECLUDE COMPLETION OF THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
3. ALL RUBBISH, STUMPS, DEBRIS, STICKS, STONES AND OTHER REFUSE SHALL BE REMOVED OFF SITE AND BE LEGALLY DISPOSED, AT NO ADDITIONAL COST.
4. THE SITE SHALL BE GRADED TO CAUSE SURFACE WATER TO FLOW AWAY FROM THE EQUIPMENT AND TOWER AREAS.
5. 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.
6. THE SUBGRADE SHALL BE COMPACTED AND BROUGHT TO A SMOOTH UNIFORM GRADE PRIOR TO FINISHED SURFACE APPLICATION.
7. THE AREAS OF THE COMPOUND DISTURBED BY THE WORK SHALL BE RETURNED TO THEIR ORIGINAL CONDITION.
8. CONTRACTOR SHALL MINIMIZE DISTURBANCE TO EXISTING SITE DURING CONSTRUCTION. EROSION CONTROL MEASURES, SHALL BE IN CONFORMANCE WITH THE LOCAL GUIDELINES FOR EROSION AND SEDIMENT CONTROL.
9. IF ANY FIELD CONDITIONS EXIST WHICH PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL PROCEED WITH AFFECTED WORK AFTER CONFLICT IS SATISFACTORILY RESOLVED.
10. DIMENSIONS AND DETAILS SHALL BE CHECKED AGAINST THE PRE MANUFACTURED EQUIPMENT BUILDING SHOP DRAWINGS.

EARTHWORK NOTES

1. COMPACTED GRAVEL FILL SHALL BE FURNISHED AND PLACED AS A FOUNDATION FOR STRUCTURES, WHERE SHOWN ON THE CONTRACT DRAWINGS OR DIRECTED BY THE ENGINEER.
2. CRUSHED STONE FILL SHALL BE PLACED IN 12" MAX. LIFTS AND CONSOLIDATED USING A HAND OPERATED VIBRATORY PLATE COMPACTOR WITH A MINIMUM OF 2 PAQSSES OF COMPACTOR PER LIFT.
3. COMPACTED GRAVEL FILL TO BE WELL GRADED BANK RUN GRAVEL MEETING THE FOLLOWING GRADATION REQUIREMENTS:

SIEVE DESIGNATION	% PASSING
1 ½"	100
No. 4	40–70
No. 100	5–20
No. 200	4–8

4. CRUSHED STONE TO BE UNIFORMLY GRADED, CLEAN, HARD PROCESS AGGREGATE MEETING THE FOLLOWING GRADATION REQUIREMENTS:

SIEVE DESIGNATION	% PASSING
1"	100
¾"	90–100
½"	0–15
⅜"	0–5

5. SELECT BACKFILL FOR FOUNDATION WALLS SHALL BE FREE OF ORGANIC MATERIAL, TOPSOIL, DEBRIS AND BOULDERS LARGER THAN 6".
6. GRAVEL AND GRANULAR FILL SHALL BE INSTALLED IN 8" MAX. LIFTS. COMPACTED TO 95% MIN. AT MAX. DRY DENSITY.
7. NON WOVEN GEOTEXTILE FOR SEPARATION PURPOSES SHALL BE MIRAFI 140N, OR ENGINEER APPROVED EQUAL.

FOUNDATION CONSTRUCTION NOTES

1. ALL FOOTINGS SHALL BE PLACED ON SUITABLE, COMPACTED SOIL HAVING ADEQUATE BEARING CAPACITY AND FREE OF ORGANIC CONTENT, CLAY, OR OTHER UNSUITABLE MATERIAL. ADDITIONAL EXCAVATION MAY BE REQUIRED BELOW FOOTING ELEVATIONS INDICATED IF UNSUITABLE MATERIAL IS ENCOUNTERED.
2. SUBGRADE PREPARATION: IF UNSUITABLE SOIL IS ENCOUNTERED, REMOVE ALL UNSUITABLE MATERIALS FROM BELOW PROPOSED STRUCTURE FOUNDATIONS AND COMPACT EXPOSED SOIL SURFACES. PLACE AND COMPACT APPROVED GRAVEL FILL. PLACEMENT OF ALL COMPACTED FILL MUST BE UNDER SUPERVISION OF AN APPROVED TESTING LABORATORY. FILL SHALL BE COMPACTED IN LAYERS NOT TO EXCEED 10" BEFORE COMPACTION. DETERMINE MAXIMUM DRY DENSITY IN ACCORDANCE WITH ASTM D1557–70 AND MAKE ONE (1) FIELD DENSITY TEST IN ACCORDANCE WITH ASTM D2167–66 FOR EACH 50 CUBIC YARDS OF COMPACTED FILL. BUT NOT LESS THAN ONE (1) PER LAYER, TO INSURE COMPACTION TO 95% OF MAX. DRY DENSITY.
3. ALL SOIL SURROUNDING AND UNDER ALL FOOTINGS SHALL BE KEPT REASONABLY DRY AND PROTECTED FROM FREEZING AND FROST ACTION DURING THE COURSE OF CONSTRUCTION.
4. WHERE GROUNDWATER IS ENCOUNTERED, DEWATERING SHALL BE ACCOMPLISHED CONTINUOUSLY AND COMPLETELY DURING FOUNDATION CONSTRUCTION. PROVIDE CRUSHED STONE AS REQUIRED TO STABILIZE FOOTING SUBGRADE.
5. ALL FOOTINGS ARE TO REST ON FIRM SOIL, REGARDLESS OF ELEVATIONS SHOWN ON THE DRAWINGS, BUT IN NO CASE MAY FOOTING ELEVATIONS BE HIGHER THAN INDICATED ON THE FOUNDATION PLAN, UNLESS SPECIFICALLY DIRECTED BY THE ENGINEER.
6. FOUNDATION WATERPROOFING AND DAMPPROOFING SHALL COMPLY WITH BUILDING CODE REQUIREMENTS UNLESS A MORE SUBSTANTIAL SYSTEM IS INDICATED OR SPECIFIED.

CONCRETE CONSTRUCTION NOTES

1. CONCRETE CONSTRUCTION SHALL CONFORM TO THE FOLLOWING STANDARDS:

   ACI 211 – STANDARD PRACTICE FOR SELECTING PROPORTIONS FOR NORMAL AND HEAVYWEIGHT CONCRETE.

   ACI 301 – SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS.

   ACI 302 – GUIDE FOR CONCRETE FLOOR AND SLAB CONSTRUCTION

   ACI 304 – RECOMMENDED PRACTICE FOR MEASURING, MIXING, TRANSPORTING, AND PLACING CONCRETE.

   ACI 306.1 STANDARD SPECIFICATION FOR COLD WEATHER CONCRETING

   ACI 318 – BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE.

2. CONCRETE SHALL DEVELOP COMPRESSIVE STRENGTH IN 28 DAYS AS FOLLOWS:

   SLABS ON GRADE 4,000 PSI
   ALL OTHER CONCRETE 3,000 PSI

   – PORTLAND CEMENT: ASTM C150, TYPE II, (540 LBS/CUBIC YARD)
   – AGGREGATE: ASTM C33, No. 67, TYPICAL
   – WATER: POTABLE WITH MAXIMUM WATER CEMENT RATIO OF .55
   – SLUMP: 3" TO 4"
   – ADMIXTURES: USE AIR ENTRAINING ADGENT CONFORMING TO ASTM C260 WITH 4 TO 6% TOTAL AIR. USE WATER REDUCING AGENT CONFORMING TO ASTM C494, TYPE A, IN ALL CONCRETE. CALCIUM CHLORIDE MAY NOT BE USED TO ACCELERATE THE CONCRETE SETTING TIME.

3. REINFORCING STEEL SHALL BE 60,000 PSI YIELD STRENGTH.
4. WELDED WIRE FABRIC SHALL CONFORM TO ASTM– A–185.
5. ALL DETAILING, FABRICATION, AND ERECTION OF REINFORCING BARS, UNLESS OTHERWISE NOTED, MUST FOLLOW THE LATEST ACI CODE AND LATEST ACI "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES".
6. CONCRETE COVER OVER REINFORCING SHALL CONFORM TO THE FOLLOWING, UNLESS OTHERWISE SHOWN:

   BOTTOM OF FOOTINGS 3 INCHES

   SURFACES NOT EXPOSED TO EARTH OR WEATHER 1–1/2 INCHES

7. NO STEEL WIRE, METAL FORM TIES, OR ANY OTHER METAL SHALL REMAIN WITHIN THE REQUIRED COVER OF ANY CONCRETE SURFACE.
8. ALL REINFORCEMENT SHALL BE CONTINUOUS UNLESS OTHERWISE NOTED. SPLICES SHALL BE WELL STAGGERED. ADDITIONAL BARS AND SPECIAL BENDING DETAILS ARE REQUIRED AT INTERSECTING WALLS AND AT JOINTS. SUCH DETAILS SHALL COMPLY WITH ACI 315 RECOMMENDATIONS UNLESS OTHERWISE SHOWN.
9. NO TACK WELDING OF REINFORCING WILL BE PERMITTED.
10. NO CALCIUM CHLORIDE OR ADMIXTURES CONTAINING MORE THAN 1% CHLORIDE BY WEIGHT OF ADMIXTURE SHALL BE USED IN THE CONCRETE.
11. UNLESS OTHERWISE NOTED, ALL LAP SPLICES SHALL BE 48 BAR DIAMETERS.
12. SLAB ON GRADE FINISHES:

    EXTERIOR SLAB: NON–SLIP BROOM FINISH
    INTERIOR SLAB: STEEL TROWEL FINISH

13. INSPECTION AND TESTING OF CONCRETE WORK SHALL BE PERFORMED BY AN INDEPENDENT TESTING LABORATORY, PAID BY THE OWNER, AND APPROVED BY THE ENGINEER. THE INSPECTOR SHALL OBSERVE CONDITION OF SOILS AND FORMWORK BEFORE FOOTINGS ARE PLACED, SIZE, SPACING AND LOCATION OF REINFORCEMENT, AND PLACEMENT OF CONCRETE.
14. THE TESTING COMPANY SHALL ALSO OBTAIN A MINIMUM OF THREE (3) COMPRESSIVE STRENGTH TEST SPECIMENS FOR EACH CONCRETE MIX DESIGN. ONE SPECIMEN TESTED AT 7 DAYS, ONE AT 28 DAYS, AND ONE HELD IN RESERVE FOR FUTURE TESTING, IF NEEDED.
15. FOUR COPIES OF ALL INSPECTION TEST REPORTS SHALL BE SUBMITTED TO THE ENGINEER WITHIN TEN (10) WORKING DAYS OF THE DATE OF INSPECTION.

STRUCTURAL STEEL

1. ALL STRUCTURAL STEEL IS DESIGNED BY ALLOWABLE STRESS DESIGN (ASD)

   A. STRUCTURAL STEEL (W SHAPES)–––ASTM A992 (FY = 50 KSI)
   B. STRUCTURAL STEEL (OTHER SHAPES)–––ASTM A36 (FY = 36 KSI)
   C. STRUCTURAL HSS (RECTANGULAR SHAPES)–––ASTM A500 GRADE B, (FY = 46 KSI)
   D. STRUCTURAL HSS (ROUND SHAPES)–––ASTM A500 GRADE B, (FY = 42 KSI)
   E. PIPE–––ASTM A53 (FY = 35 KSI)
   F. CONNECTION BOLTS–––ASTM A325–N
   G. U–BOLTS–––ASTM A36
   H. ANCHOR RODS–––ASTM F 1554
   I. WELDING ELECTRODE–––ASTM E 70XX

2. CONTRACTOR TO REVIEW ALL SHOP DRAWINGS AND SUBMIT COPY TO ENGINEER FOR APPROVAL. DRAWINGS MUST BEAR THE CHECKER'S INITIALS BEFORE SUBMITTING TO THE ENGINEER FOR REVIEW. SHOP DRAWINGS SHALL INCLUDE THE FOLLOWING: SECTION PROFILES, SIZES, CONNECTION ATTACHMENTS, REINFORCING, ANCHORAGE, SIZE AND TYPE OF FASTENERS AND ACCESSORIES. INCLUDE ERECTION DRAWINGS, ELEVATIONS AND DETAILS.
3. STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST PROVISIONS OF AISC MANUAL OF STEEL CONSTRUCTION.
4. PROVIDE ALL PLATES, CLIP ANGLES, CLOSURE PIECES, STRAP ANCHORS, MISCELLANEOUS PIECES AND HOLES REQUIRED TO COMPLETE THE STRUCTURE.
5. FIT AND SHOP ASSEMBLE FABRICATIONS IN THE LARGEST PRACTICAL SECTIONS FOR DELIVERY TO SITE.
6. INSTALL FABRICATIONS PLUMB AND LEVEL, ACCURATELY FITTED, AND FREE FROM DISTORTIONS OR DEFECTS.
7. AFTER ERECTION OF STRUCTURES, TOUCHUP ALL WELDS, ABRASIONS AND NON–GALVANIZED SURFACES WITH A 95% ORGANIC ZINC RICH PAINT IN ACCORDANCE WITH ASTM 780.
8. ALL STEEL MATERIAL (EXPOSED TO WEATHER) SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 "ZINC (HOT DIPPED GALVANIZED) COATINGS" ON IRONS AND STEEL PRODUCTS.
9. ALL BOLTS, ANCHORS AND MISCELLANEOUS HARDWARE SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153 "ZINC COATING (HOT–DIP) ON IRON AND STEEL HARDWARE".
10. THE ENGINEER SHALL BE NOTIFIED OF ANY INCORRECTLY FABRICATED, DAMAGED OR OTHERWISE MISFITTING OR NON CONFORMING MATERIALS OR CONDITIONS TO REMEDIAL OR CORRECTIVE ACTION. ANY SUCH ACTION SHALL REQUIRE ENGINEER REVIEW.
11. CONNECTION ANGLES SHALL HAVE A MINIMUM THICKNESS OF 1/4 INCHES.
12. STRUCTURAL CONNECTION BOLTS SHALL CONFORM TO ASTM A325. ALL BOLTS SHALL BE 3/4" DIAMETER MINIMUM AND SHALL HAVE A MINIMUM OF TWO BOLTS, UNLESS OTHERWISE ON THE DRAWINGS.
13. LOCK WASHER ARE NOT PERMITTED FOR A325 STEEL ASSEMBLIES.
14. SHOP CONNECTIONS SHALL BE WELDED OR HIGH STRENGTH BOLTED.
15. MILL BEARING ENDS OF COLUMNS, STIFFENERS, AND OTHER BEARING SURFACES TO TRANSFER LOAD OVER ENTIRE CROSS SECTION.
16. FABRICATE BEAMS WITH MILL CAMBER UP.
17. LEVEL AND PLUMB INDIVIDUAL MEMBERS OF THE STRUCTURE TO AN ACCURACY OF 1:500, BUT NOT TO EXCEED 1/4" IN THE FULL HEIGHT OF THE COLUMN.
18. COMMENCEMENT OF STRUCTURAL STEEL WORK WITHOUT NOTIFYING THE ENGINEER OF ANY DISCREPANCIES WILL BE CONSIDERED ACCEPTANCE OF PRECEDING WORK.
19. INSPECTION AND TESTING OF ALL WELDING AND HIGH STRENGTH BOLTING SHALL BE PERFORMED BY AN INDEPENDENT TESTING LABORATORY.
20. FOUR COPIES OF ALL INSPECTION TEST REPORTS SHALL BE SUBMITTED TO THE ENGINEER WITHIN TEN (10) WORKING DAYS OF THE DATE OF INSPECTION.

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
B	02/08/18	CDZ	DMD	PRELIMINARY CDs – REVISED PER CLIENT COMMENTS
A	01/22/18	CAC	DMD	PRELIMINARY CDs – ISSUED FOR CLIENT REVIEW

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SITE ID: CTNL193
720 QUINEBAUG ROAD
THOMPSON, CT 06262

DATE: 02/08/18
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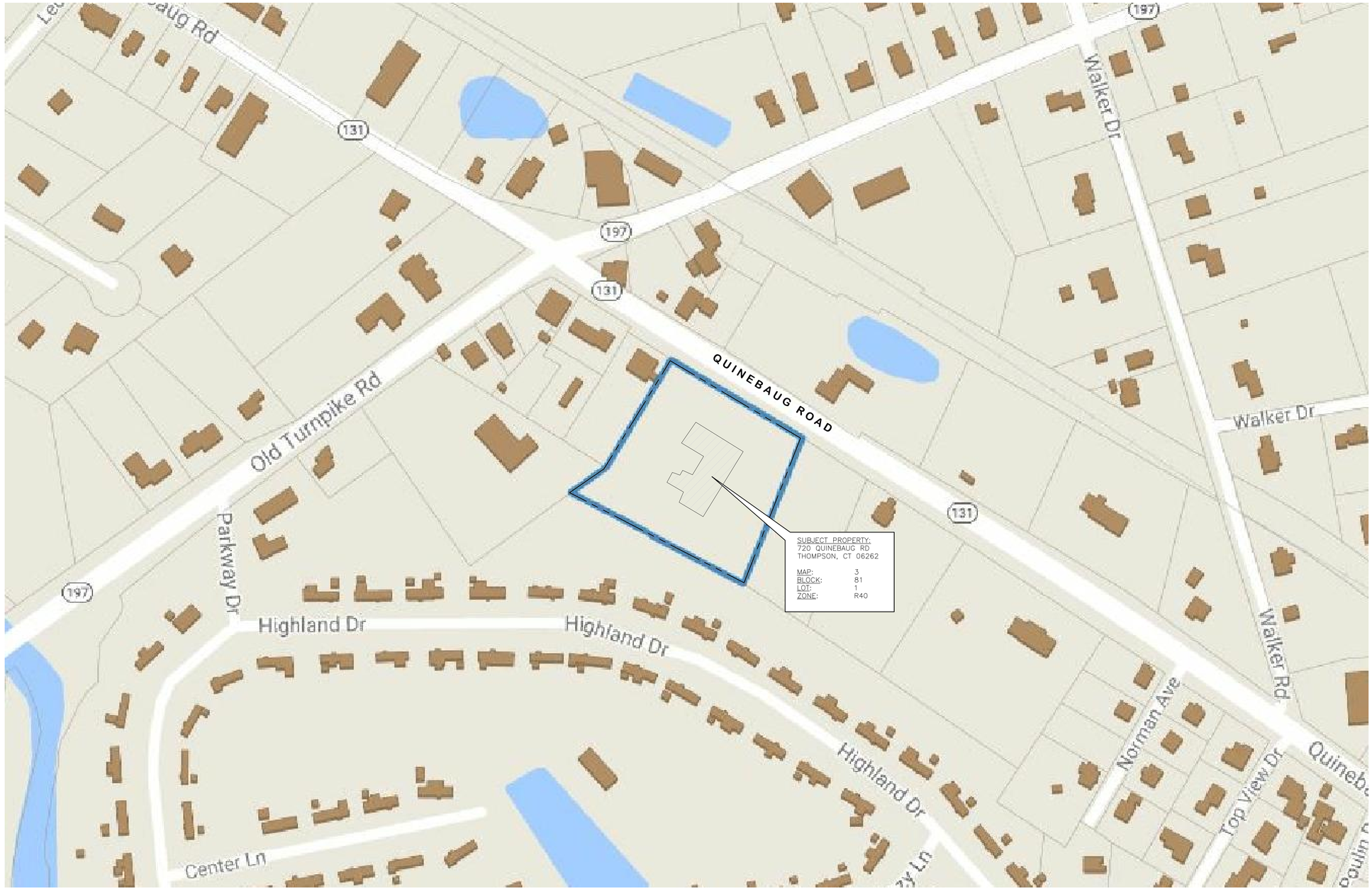
JOB NO. 17179.00

DESIGN BASIS AND STRUCTURAL SPECIFICATIONS

N-1

Sheet No. 2 of 14



1 / C-1 SITE LOCATION PLAN
SCALE: 1" = 100'

APPROX. NORTH

GRAPHIC SCALE
100 0 50 100 200 400
(IN FEET)
1 inch = 100 ft.

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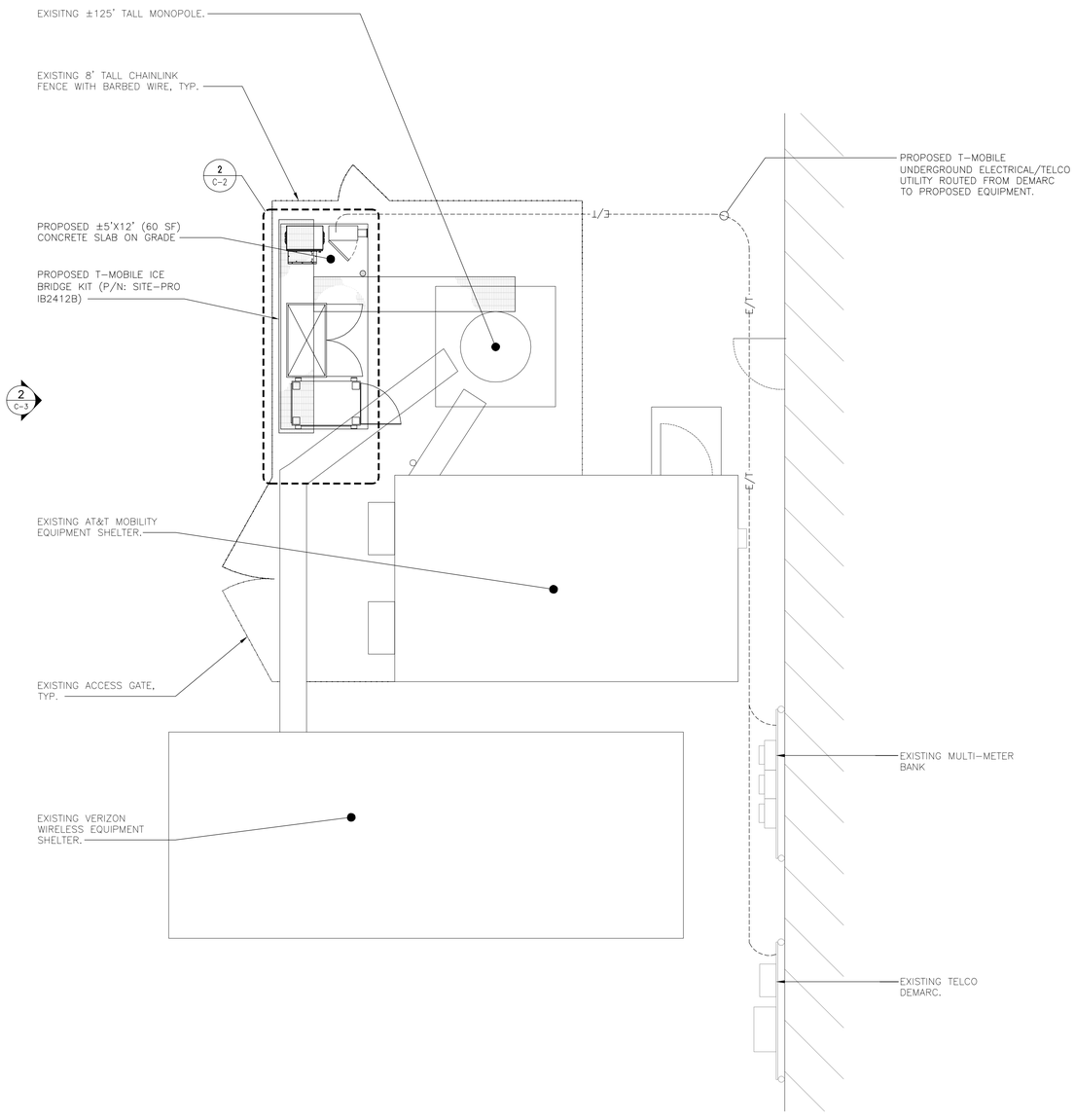
SITE LOCATION PLAN

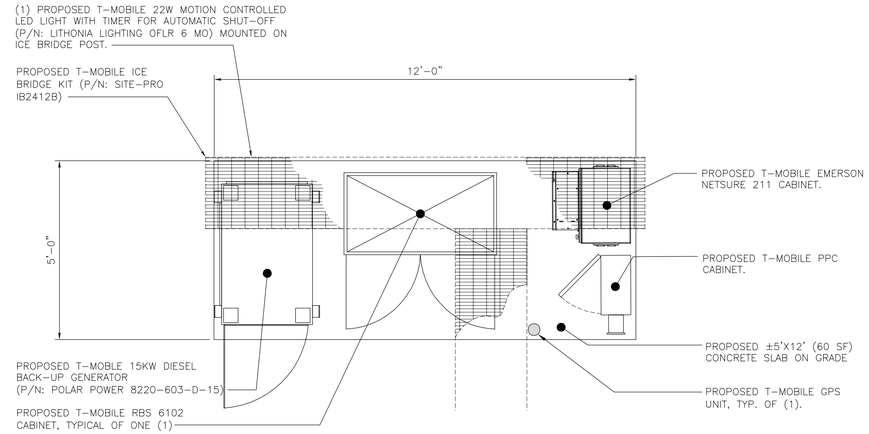
C-1
Sheet No. 3 of 14



1 / C-2 **COMPOUND PLAN**
SCALE: 1" = 30'

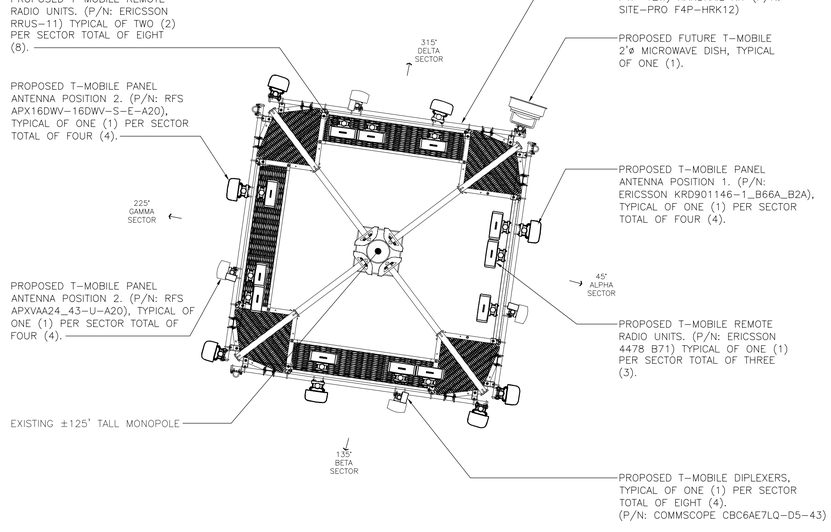
TRUE NORTH

GRAPHIC SCALE
30 0 15 30 60 120
(IN FEET)
1 inch = 30 ft.



3 / C-2 **EQUIPMENT LAYOUT PLAN**
SCALE: 1/2" = 1'

TRUE NORTH



3 / C-2 **ANTENNA MOUNTING CONFIGURATION PLAN**
SCALE: 1/2" = 1'

TRUE NORTH

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
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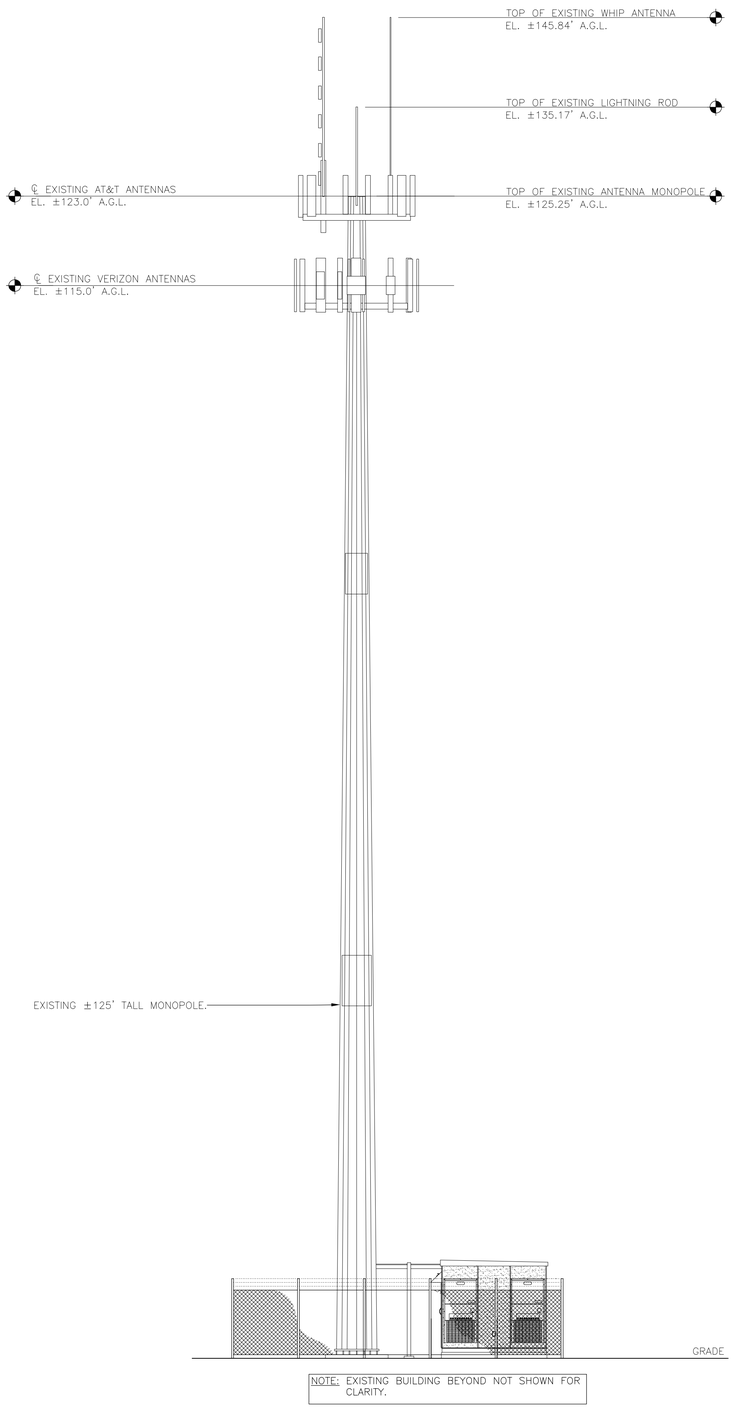
COMPOUND PLAN, EQUIP. LAYOUT AND ANTENNA MOUNTING CONFIG.

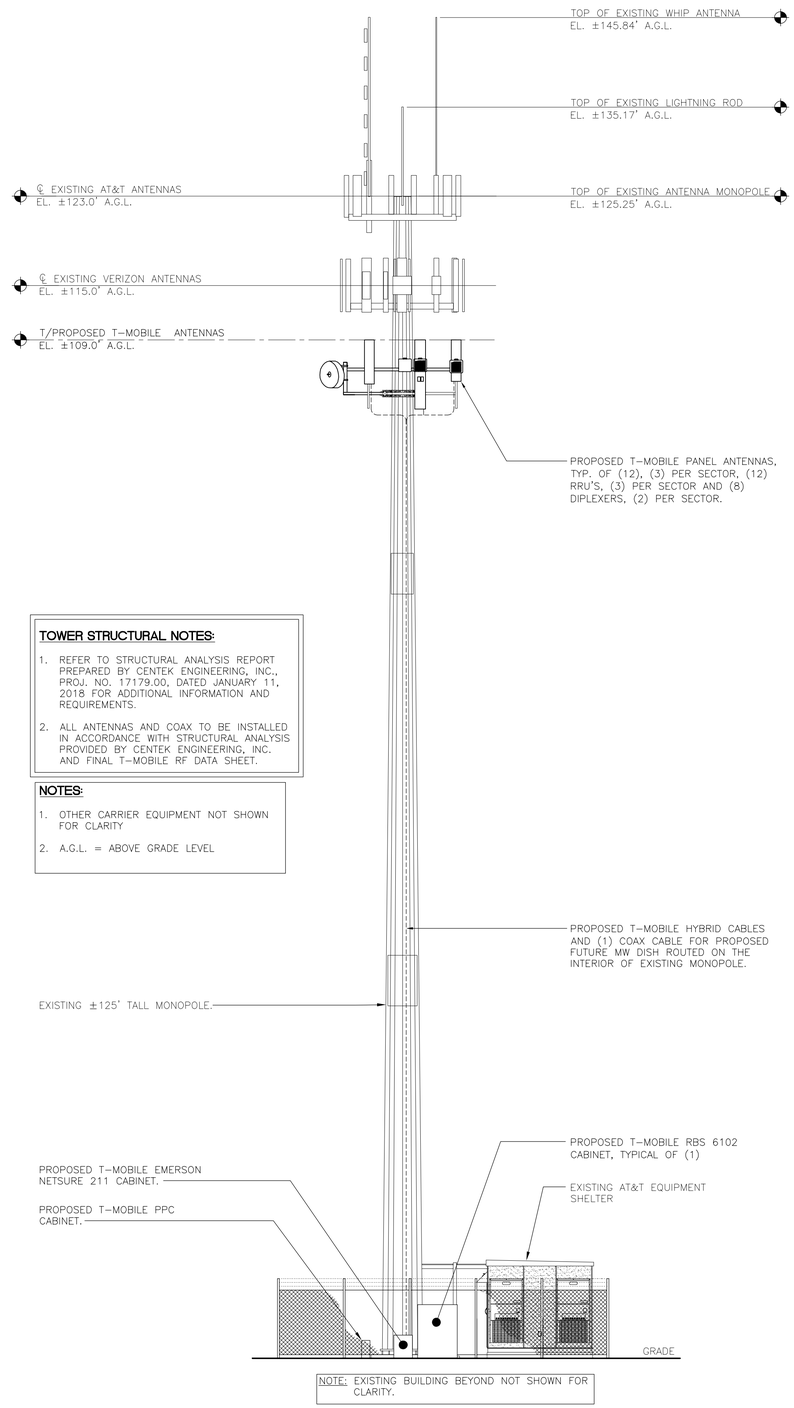
C-2

Sheet No. 4 of 14



NOTE: EXISTING BUILDING BEYOND NOT SHOWN FOR CLARITY.

1 / C-3 **EXISTING ELEVATION**
SCALE: 1/8" = 1'



TOWER STRUCTURAL NOTES:

1. REFER TO STRUCTURAL ANALYSIS REPORT PREPARED BY CENTEK ENGINEERING, INC., PROJ. NO. 17179.00, DATED JANUARY 11, 2018 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
2. ALL ANTENNAS AND COAX TO BE INSTALLED IN ACCORDANCE WITH STRUCTURAL ANALYSIS PROVIDED BY CENTEK ENGINEERING, INC. AND FINAL T-MOBILE RF DATA SHEET.

NOTES:

1. OTHER CARRIER EQUIPMENT NOT SHOWN FOR CLARITY
2. A.G.L. = ABOVE GRADE LEVEL

NOTE: EXISTING BUILDING BEYOND NOT SHOWN FOR CLARITY.

2 / C-3 **PROPOSED ELEVATION**
SCALE: 1/8" = 1'

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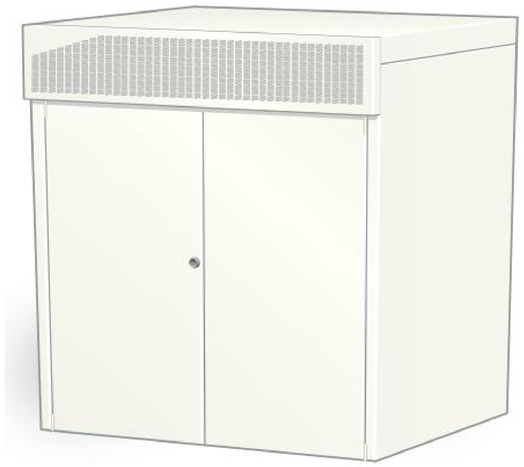
ELEVATIONS

C-3

Sheet No. 5 of 14

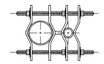


EQUIPMENT CABINET		
EQUIPMENT	DIMENSIONS	WEIGHT
MAKE: ERICSSON MODEL: 6102	57.09"H x 51.18"W x 27.56"D	727.53–LBS

5 C–4 ERICSSON RADIO CABINET DETAIL

SCALE: NTS

BILL OF MATERIALS		
ITEM	DESCRIPTION	QUANTITY
1	2–1/2"ø SCH. 40 x 8'–0" LG. MAX SS OR GALV. PIPE	1
2	UNIVERSAL CLAMP SET.	2

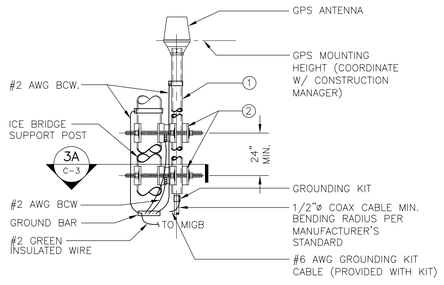


3A C–4 PLAN VIEW

NOT TO SCALE

NOTES:

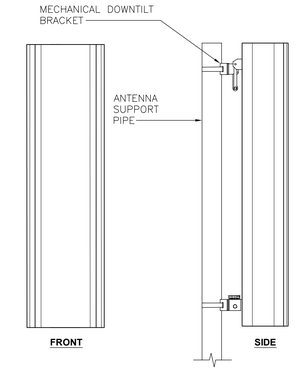
1. THE ELEVATION AND LOCATION OF THE GPS ANTENNA SHALL BE IN ACCORDANCE WITH THE FINAL RF REPORT AND COORDINATED WITH VERIZON WIRELESS CONSTRUCTION MANAGER.
2. THE GPS ANTENNA MOUNT IS DESIGNED TO FASTEN TO A STANDARD 2–1/2" DIAMETER, SCHEDULE 40, GALVANIZED STEEL OR STAINLESS STEEL PIPE. THE PIPE MUST NOT BE THREADED AT THE ANTENNA MOUNT END. THE PIPE SHALL BE CUT TO THE REQUIRED LENGTH (MINIMUM OF 24 INCHES) USING A HAND OR ROTARY PIPE CUTTER TO ASSURE A SMOOTH AND PERPENDICULAR CUT. A HACK SAW SHALL NOT BE USED. THE CUT PIPE END SHALL BE DEBURRED AND SMOOTH IN ORDER TO SEAL AGAINST THE NEOPRENE GASKET ATTACHED TO THE ANTENNA MOUNT.
3. PRIOR TO INSTALLATION CONTRACTOR SHALL TEST GPS LOCATION WITH HAND HELD AND MOVE GPS ANTENNA TO OTHER ICE BRIDGE POSTS AS REQUIRED TO ACHIEVE ADEQUATE SIGNAL. FAILURE TO ACHIEVE ADEQUATE SIGNAL WITH A HAND HELD GPS SHALL BE REPORTED TO CONSTRUCTION MANAGER AND ENGINEER TO DETERMINE ALTERNATE INSTALLATION LOCATION FOR GPS ANTENNA.



GPS ANTENNA MOUNTING BRACKET

3 C–4 GPS GROUNDING/MOUNTING BRACKET DETAILS

NOT TO SCALE



ALPHA/BETA/GAMMA/DELTA ANTENNA		
EQUIPMENT	DIMENSIONS	WEIGHT
MAKE: ERICSSON MODEL: KRD901146–1_B66A_B2A	56.6"H x 12.9"W x 8.7"D	132.2–LBS
MAKE: RFS MODEL: APX16DWV–16DWVS–E–A20	55.9"H x 13.0"W x 3.15"D	40.7–LBS
MAKE: RFS MODEL: APXVAA24_43–U–A20	95.9"H x 24"W x 8.5"D	99–LBS

1 C–4 PROPOSED ANTENNA DETAIL

SCALE: NTS

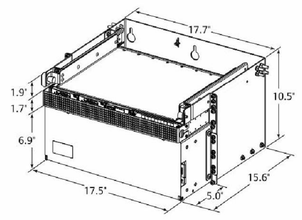
NOTES:
1. INSTALL ANTENNA TO PIPE MAST USING MANUFACTURERS SUPPLIED BRACKETS AND MOUNTING HARDWARE
2. SET MECHANICAL DOWNTILT TO VALUE SPECIFIED IN LATEST RFDS

Electrical	Indoor Solution	Outdoor Solution
System Voltage, Nominal	120 VAC single phase	
Output Voltage	-42 VDC to -58 VDC	
System Capacity	19" 1 RU up to 10 A	19" 1 RU up to 8 A
Rectifier Capacity	0.5 kW @ 120 VAC	0.4 kW @ 120 VAC
DC Distribution	(1) wallmount 10 position GMT type fuse panel with (10) GMT fuses, up to 15 A	
Controller	SCU+ controller	

Physical Characteristics		
Framework Type	Relay rack	NetXtend™ Compact Enclosure
Available Space	1 RU 19" W	Up to 14 RU, 19" W
Dimensions (H x W x D)	DC power system: 1.7" x 19" x 12" Solution: 10.5" x 19" x 15.6"	Enclosure: 24" x 24" x 16" Battery tray: 22" W x 13" D
Mounting	Rack or wall mount	Wall or H-frame, pole mount (wall-mount kit included)
Weight, Equipped	System: 35.5 lb., w/out batteries Four (4) batteries: 36 lb. total	Enclosure: 64 lb., w/out batteries Four (4) batteries: 36 lb. total
Access	Front for batteries, control and distribution, rear for AC	Front

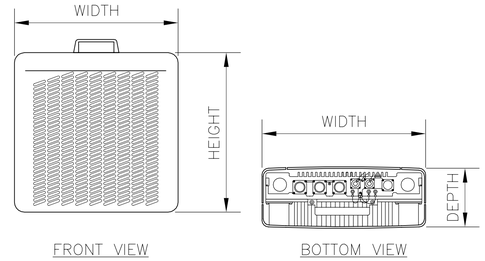
Environmental		
Climate System	Fan-cooled front to rear	Heat Exchanger
Operating Temp.	-40 °C to +75 °C *	-40 °C to +52 °C
Storage Temp.	-40 °C to +75 °C	-40 °C to +75 °C
Relative Humidity	0% to 95% non-condensing	100%
EMI/RFI	Conforms to FCC rules Part 15, Subpart B, Class B and EN55022 Class B, radiated and conducted	
Safety Compliance	cULus 60950 recognized NEBS Level 3 Compliance	cULus 60950 Recognized NEBS Level 3 Compliance Enclosure: cULus Listed GR-487

Indoor Solution



4 C–4 EMERSON NETSURE POWER SYSTEM (582136600SK010)

SCALE: NTS



FRONT VIEW BOTTOM VIEW

RRH (REMOTE RADIO HEAD)		
EQUIPMENT	WEIGHT	CLEARANCES
MAKE: ERICSSON MODEL: RRU 11	50.0 LBS	ABOVE: 12" MIN. BELOW: 12" MIN. FRONT: 36" MIN.
NOTES: 1. CONTRACTOR TO COORDINATE FINAL EQUIPMENT MODEL SELECTION WITH T–MOBILE CONSTRUCTION MANAGER PRIOR TO ORDERING.		

2 C–4 REMOTE RADIO HEAD (RRH) DETAIL

SCALE: NTS

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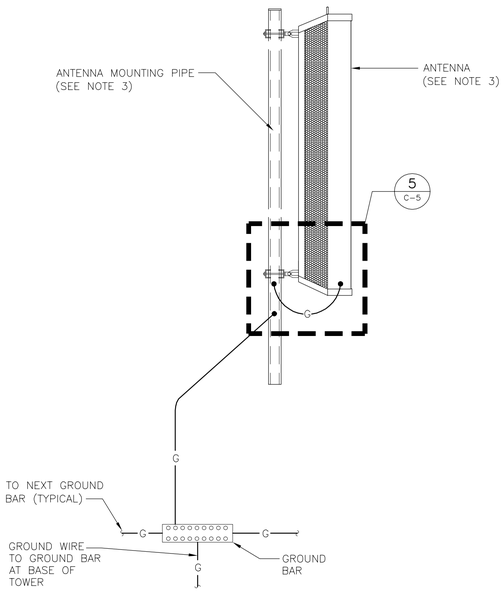
EQUIPMENT DETAILS

C-4

Sheet No. 6 of 14

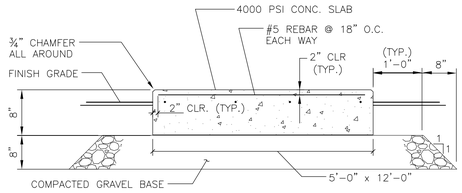


NOTES:

1. BOND COAXIAL CABLE GROUND KITS TO EACH OWNER'S GROUND BAR ALONG ENTIRE COAX RUN FROM ANTENNA TO SHELTER.
2. BOND ALL EQUIPMENT TO GROUND PER NEC AND MANUFACTURERS SPECIFICATIONS.
3. DETAIL IS TYPICAL FOR ALL ANTENNA SECTORS, INCLUDING GPS ANTENNA.

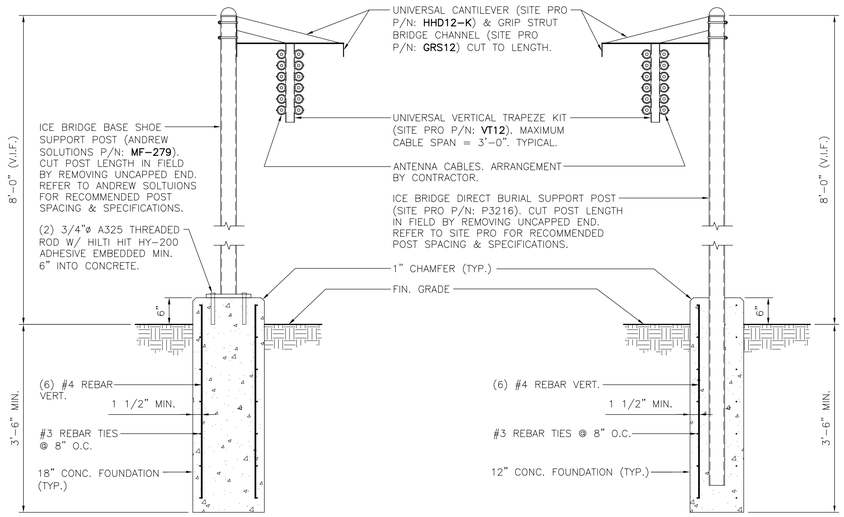
3 C-5 TYPICAL ANTENNA GROUNDING DETAIL

SCALE: NONE



2 C-5 TYPICAL CONCRETE PAD DETAIL

NOT TO SCALE

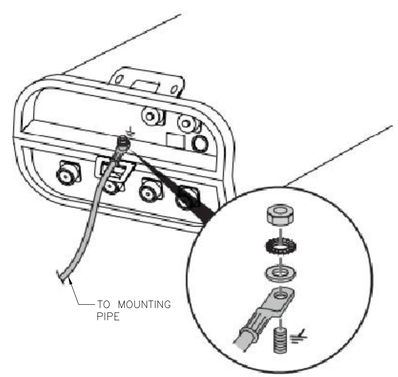


BASE SHOE OPTION

DIRECT BURIAL OPTION

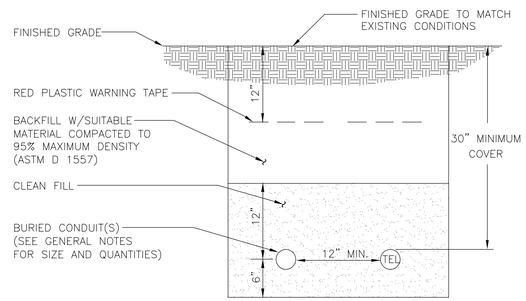
1 C-5 ICE BRIDGE DETAIL

SCALE: 3/4" = 1'



5 C-5 TYPICAL ANTENNA GROUNDING DETAIL

SCALE: NONE



NOTES:

1. THE CLEAN FILL SHALL PASS THROUGH A 3/8" MESH SCREEN AND SHALL NOT CONTAIN SHARP STONES. OTHER BACKFILL SHALL NOT CONTAIN ASHES, CINDERS, SHELLS, FROZEN MATERIAL, LOOSE DEBRIS OR STONES LARGER THAN 2" IN MAXIMUM DIMENSION.
2. WHERE EXISTING UTILITIES ARE LIKELY TO BE ENCOUNTERED, CONTRACTOR SHALL HAND DIG AND PROTECT EXISTING UTILITIES.

4 C-5 TYPICAL ELECTRICAL/TEL TRENCH DETAIL

NOT TO SCALE

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TYPICAL DETAILS

C-5

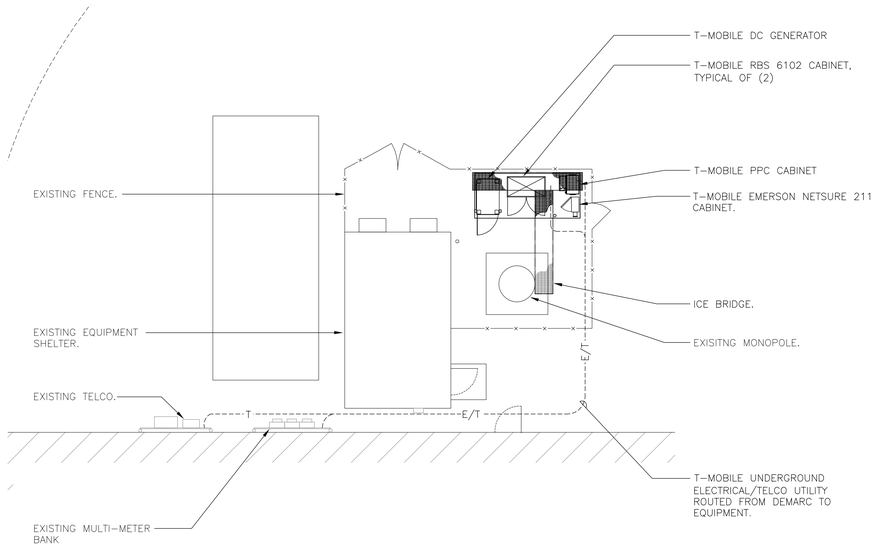
Sheet No. 7 of 14

GENERAL NOTES

1. REFER TO CIVIL DRAWINGS FOR ACTUAL LOCATIONS OF STRUCTURES ON SITE.
2. COORDINATION, LAYOUT AND FURNISHING OF CONDUIT, CABLE AND ALL APPURTENANCES REQUIRED FOR PROPER INSTALLATION OF ELECTRICAL / TELECOMMUNICATIONS SERVICES SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
3. ALL UTILITY WORK SHALL BE IN ACCORDANCE WITH LOCAL UTILITY COMPANY REQUIREMENTS AND SPECIFICATIONS.
4. PROVIDE CADWELD CONNECTION STYLES: THROUGH (CABLE TO CABLE) TYPE "TA"
   (CABLE TO SURFACE) TYPE "LA" OR "VS" (PIPE)
   (CABLE TO ROD) TYPE "CT" OR "NC"
   (CABLE TO CABLE) TYPE "SS"

ELECTRICAL LEGEND

SYMBOL	DESCRIPTION
——— – – ———	GROUND RING
—T———T—	UNDERGROUND COMMUNICATION CONDUIT
—E———E—	UNDERGROUND ELECTRICAL CONDUIT AS INDICATED
	GROUND BAR
——X———X—	PERIMETER CHAIN LINK FENCE
⊗	5/8" DIAMETER x 10'–0" COPPER GROUND ROD OR 24"x24" GROUND PLATE ABOVE MATT FOUNDATION.
⊠	5/8" DIAMETER x 10'–0" COPPER GROUND ROD WITH ACCESS.
■	EXOTHERMIC WELD TYPE "TA"
●	MECHANICAL CONNECTION



1 / E–1 **COMPOUND UTILITY PLAN**
SCALE: 1/8" = 1'–0"

APPROXIMATE NORTH

GRAPHIC SCALE
8 0 4 8 16 32
(IN FEET)
1 inch = 8 ft.

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
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COMPOUND UTILITY PLAN

E-1

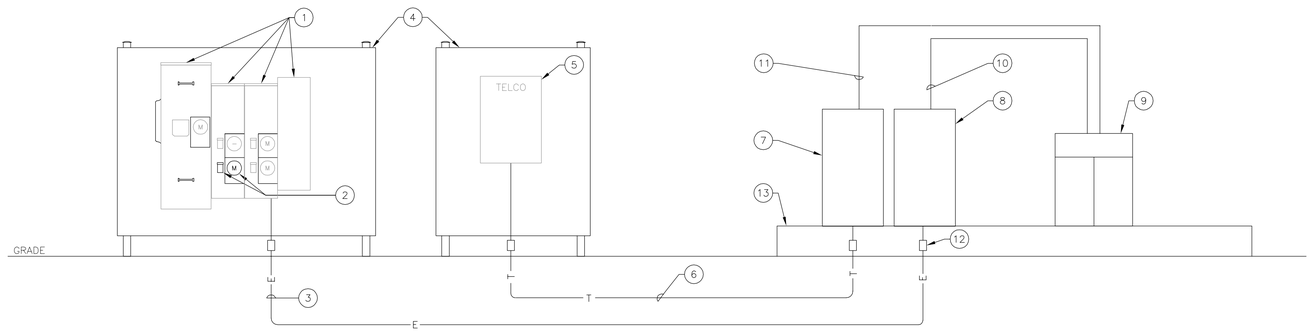
Sheet No. 8 of 14

RISER DIAGRAM NOTES

1. EXISTING MULTIMETER CENTER.
2. NEW 200A UTILITY METER AND 200A/2P CIRCUIT BREAKER IN AVAILABLE POSITION.
3. (3) #3/0 AWG, (1) #6 AWG GROUND, 2" CONDUIT.
4. EXISTING UTILITY BACKROUND.
5. EXISTING TELCO DEMARC.
6. 4" CONDUIT FOR FIBER TELCO SERVICE CONDUCTORS. COORDINATE WITH FIBER TELCO SERVICE PROVIDER FOR REQUIREMENTS.
7. T–MOBILE EMERSON CABINET.
8. T–MOBILE PPC CABINET.
9. T–MOBILE RADIO EQUIPMENT CABINET.
10. POWER CONDUITS AND CONDUCTORS ROUTED TO EQUIPMENT CABINET PER MANUFACTURERS SPECIFICATIONS.
11. TELCO CONDUITS AND CONDUCTORS ROUTED TO EQUIPMENT CABINET PER MANUFACTURERS SPECIFICATIONS.
12. EXPANSION COUPLING (TYP).
13. CONCRETE EQUIPMENT PAD.

GENERAL NOTES:

1. CONDUCTOR SIZES SHALL NOT BE REDUCED OR SUBSTITUTED WITHOUT ENGINEERS APPROVAL.
2. UNLESS OTHERWISE NOTED, ALL CONDUCTORS AND CONDUCTOR TERMINATIONS SHALL BE RATED FOR MINIMUM 75 DEGREE C CONTINUOUS OPERATION.
3. COORDINATE ALL SHUTDOWNS WITH OWNER AND ALL AFFECTED PARTIES. PROVIDE TEMPORARY POWER AS REQUIRED.
4. CONTRACTOR TO COORDINATE ALL CONDUIT ROUTING AND INSTALLATION REQUIREMENTS IN THE FIELD WITH LOCAL UTILITIES, AND WIRELESS CARRIER'S CONSTRUCTION MANAGER PRIOR TO INSTALLATION.
5. RESTORE ALL DISTURBED AREAS TO PRE–CONSTRUCTION CONDITION.
6. ALL WORK SHALL BE IN ACCORDANCE WITH NEC REQUIREMENTS. COORDINATE WITH BUILDING OFFICIAL, BUILDING OWNER, AND CONSTRUCTION MANAGER FOR ANY ADDITIONAL REQUIREMENTS.
7. COORDINATE WITH CONSTRUCTION MANAGER FOR LOCATION, LAYOUT, AND MOUNTING REQUIREMENTS FOR ALL ELECTRICAL EQUIPMENT.
8. ALL CONDUITS SHALL HAVE EXPANSION COUPLINGS WHERE EXTENDING ABOVE GRADE.
9. REFER TO SITE UTILITY PLAN FOR ADDITIONAL INFORMATION.
10. COORDINATE ELECTRICAL SERVICE AND DISTRIBUTION EQUIPMENT INTERRUPTING RATING WITH AVAILABLE FAULT CURRENT FROM UTILITY COMPANY. EQUIPMENT SHALL NOT BE RATED LESS THAN 65 KAIC.
11. ALL TELEPHONE UTILITY WORK MUST BE COORDINATED WITH TELEPHONE UTILITY COMPANY, AND ALL EQUIPMENT MUST BE UTILITY COMPANY APPROVED. CONTRACTOR SHALL PROVIDE ALL ELEMENTS NOT PROVIDED BY UTILITY COMPANY.
12. PROVIDE ALL NEC REQUIRED SIGNAGE AT SERVICE AND DISTRIBUTION EQUIPMENT.



1 / E-2 ELECTRICAL POWER RISER DIAGRAM
NOT TO SCALE

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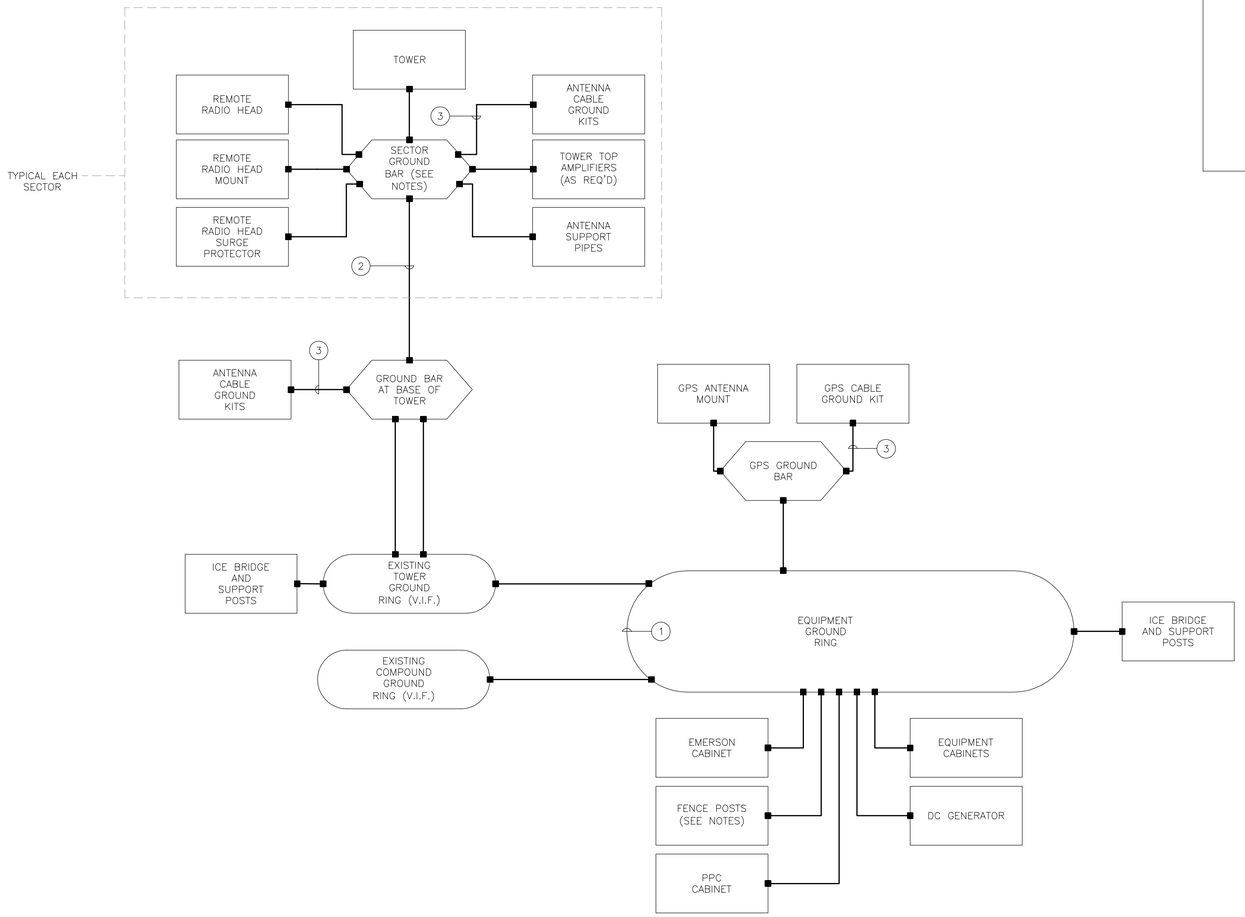
ELECTRICAL RISER DIAGRAM AND NOTES

E-2

Sheet No. 9 of 14



GROUNDING SCHEMATIC NOTES

(1) GROUND RING, #2 AWG BCW

(2) #2/0 GREEN INSULATED

(3) #6 AWG

GENERAL NOTES:

1. ALL SURGE SUPPRESSION EQUIPMENT SHALL BE BONDED TO GROUND PER MANUFACTURER'S SPECIFICATIONS
2. UNLESS OTHERWISE NOTED OR REQUIRED BY CODE, GROUND CONDUCTORS SHOWN SHALL BE #2 AWG (SOLID TINNED BCW – EXTERIOR; STRANDED GREEN INSULATED – INTERIOR).
3. BOND ICE BRIDGE SECTIONS TOGETHER WITH #6 AWG STRANDED GREEN INSULATED JUMPERS.
4. ALL SECTOR GROUND BARS SHALL BE BONDED TOGETHER WITH #2 AWG SOLID TINNED BCW.
5. BOND ALL EQUIPMENT CABINETS AND BATTERY CABINETS TO GROUND PER MANUFACTURER'S SPECIFICATIONS.
6. ALL BONDS TO TOWER SHALL BE MADE IN STRICT ACCORDANCE WITH SPECIFICATIONS OF TOWER MANUFACTURER OR STRUCTURAL ENGINEER.
7. REFER TO GROUNDING PLAN FOR LOCATION OF GROUNDING DEVICES.
8. REFER TO ALL ELECTRICAL AND GROUNDING DETAILS.
9. COORDINATE ALL TOWER MOUNTED EQUIPMENT WITH OWNER.
10. ALL TOWER MOUNTED AMPLIFIERS AND ASSOCIATED EQUIPMENT SHALL BE BONDED TO THE SECTOR GROUND BAR PER MANUFACTURER'S SPECIFICATIONS.
11. ALL FENCE POSTS WITHIN 6' OF EQUIPMENT SHELTER SHALL BE BONDED TO GROUND RING.
12. ALL GROUNDING SHALL BE IN ACCORDANCE WITH NEC AND OWNER'S REQUIREMENTS.
13. COORDINATE WITH TOWER OWNER BEFORE INSTALLING ANY GROUNDING ELEMENTS ON TOWER OR BONDING TO EXISTING TOWER GROUND RING.

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ELECTRICAL SCHEMATIC RISER DIAGRAM

E-3

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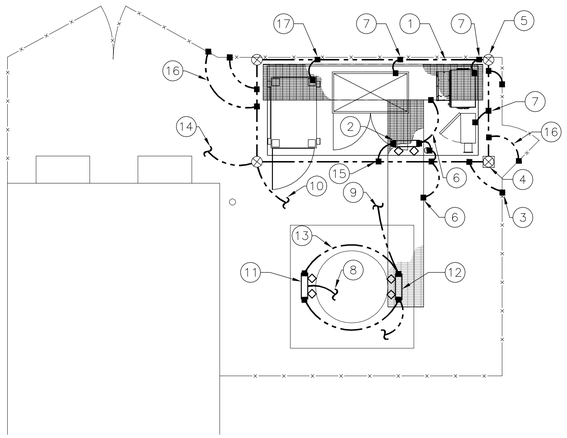
GROUNDING PLAN NOTES

1. #2 SOLID TINNED BCW GROUND RING (2'-0" FROM OUTSIDE EDGE OF EQUIPMENT FOUNDATION) (TYP.).
2. GPS GROUND BAR PER DETAILS.
3. CONNECT FENCE TO GROUNDING RING (TYP. 3 PLACES).
4. GROUNDING ROD WITH ACCESS (TYP.) PER DETAILS.
5. GROUNDING ROD (TYP.) PER DETAILS.
6. ICE BRIDGE POST AND COVER. BOND EACH SECTION AND SUPPORT TO GROUND RING PER DETAILS.
7. BOND EQUIPMENT CABINETS TO GROUND RING PER NEC AND MANUFACTURERS SPECIFICATIONS.
8. TOWER MOUNTED GROUND BAR TO BE BONDED TO TOWER PER TOWER MANUFACTURERS SPECIFICATIONS AND IN ACCORDANCE WITH EIA/TIA REQUIREMENTS. COORDINATE WITH STRUCTURAL ENGINEER AND TOWER MANUFACTURER FOR APPROVED BONDING METHODS.
9. BOND GROUND BAR TO EXISTING TOWER GROUND RING (TYP OF 2). CONTRACTOR TO VERIFY LOCATION IN FIELD.
10. BOND EQUIPMENT GROUND RING TO EXISTING TOWER GROUND RING WITH #2 AWG BCW.
11. UPPER TOWER MOUNTED GROUND BAR PER DETAILS.
12. LOWER TOWER MOUNTED GROUND BAR PER DETAILS.
13. BOND UPPER TOWER MOUNTED GROUND BAR TO LOWER TOWER MOUNTED GROUND BAR (2 GROUND LEADS) PER DETAILS.
14. BOND EQUIPMENT GROUND RING TO EXISTING COMPOUND GROUND RING. (MINIMUM TWO PLACES.)
15. BOND GROUND BAR TO EQUIPMENT GROUND RING PER DETAILS.
16. BOND FENCE GATE TO GROUND RING PER DETAILS.
17. BOND DC GENERATOR TO GROUND PER MANUFACTURERS SPECIFICATIONS.



1 / E-4 ELECTRICAL GROUNDING PLAN

SCALE: 1/4" = 1'-0"

APPROXIMATE NORTH

GRAPHIC SCALE

4 0 2 4 8 24

(IN FEET)

1 inch = 4 ft.

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ELECTRICAL GROUNDING PLAN

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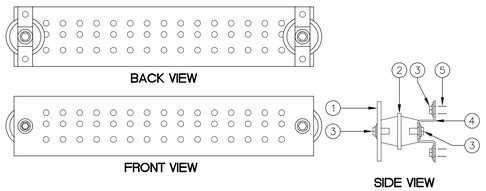
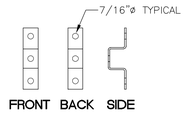


TYPICAL GROUND BAR ASSEMBLY
N.T.S.

TYPICAL GROUND BAR - DIMENSIONS
N.T.S.

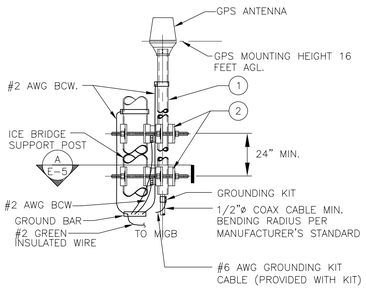
NOTES

1. HIGH CONDUCTIVITY TINNED COPPER BAR 1'-8"Lx4"Wx1/4"D.
2. RED COLORED STANDOFF INSULATOR PLASTIC #1872-1A.
3. STAINLESS STEEL TRUSS SPANNER MACHINE SCREWS, SPLIT LOCKWASHER AND FLAT WASHER.
4. 1"Wx1/8"T STAINLESS STEEL TYPE 304 BRACKET.
5. STAINLESS STEEL TYPE 304 HARDWARE – 3/8"ø EXPANSION BOLT FOR CONCRETE.

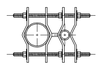


BRACKET FOR GROUND BAR-DIMENSIONS
N.T.S.

1 E-5 MASTER/EQUIPMENT GROUND BAR DETAILS
NOT TO SCALE



GPS ANTENNA MOUNTING BRACKET



A E-5 SECTION
NOT TO SCALE

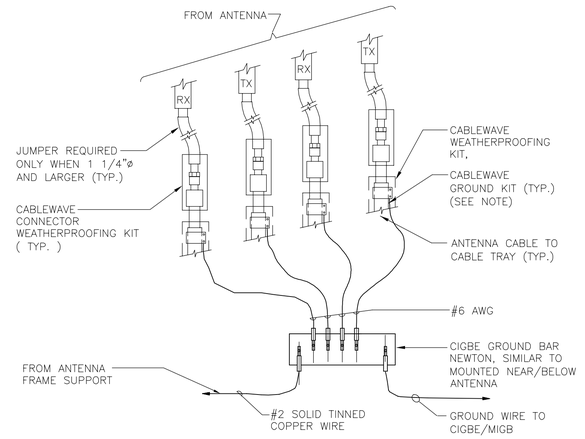
BILL OF MATERIALS

ITEM	DESCRIPTION	QUANTITY
1	2-1/2"ø SCH. 40 x 8'-0" LG. MAX SS OR GALV. PIPE	1
2	UNIVERSAL CLAMP SET.	2

NOTES

1. THE ELEVATION AND LOCATION OF THE GPS ANTENNA SHALL BE IN ACCORDANCE WITH THE FINAL RF REPORT.
2. THE GPS ANTENNA MOUNT IS DESIGNED TO FASTEN TO A STANDARD 2-1/2" DIAMETER, SCHEDULE 40, GALVANIZED STEEL OR STAINLESS STEEL PIPE. THE PIPE MUST NOT BE THREADED AT THE ANTENNA MOUNT END. THE PIPE SHALL BE CUT TO THE REQUIRED LENGTH (MINIMUM OF 24 INCHES) USING A HAND OR ROTARY PIPE CUTTER TO ASSURE A SMOOTH AND PERPENDICULAR CUT. A HACK SAW SHALL NOT BE USED. THE CUT PIPE END SHALL BE DEBURRED AND SMOOTH IN ORDER TO SEAL AGAINST THE NEOPRENE GASKET ATTACHED TO THE ANTENNA MOUNT.

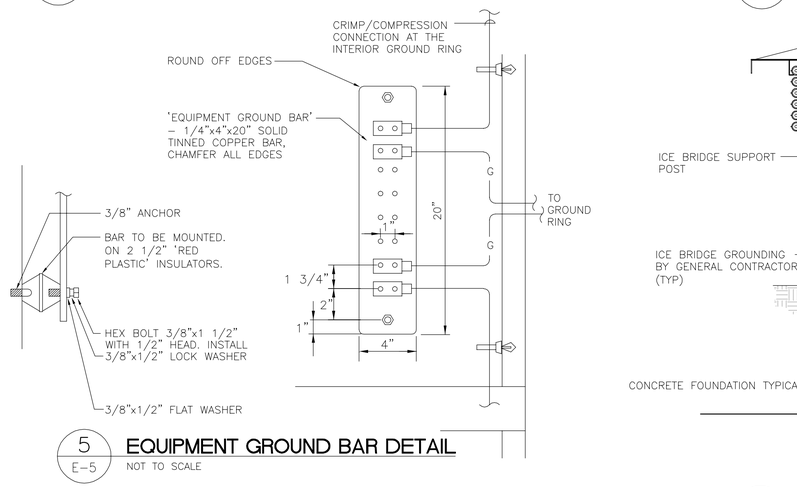
4 E-5 GPS GROUNDING/MOUNTING BRACKET DETAIL
NOT TO SCALE



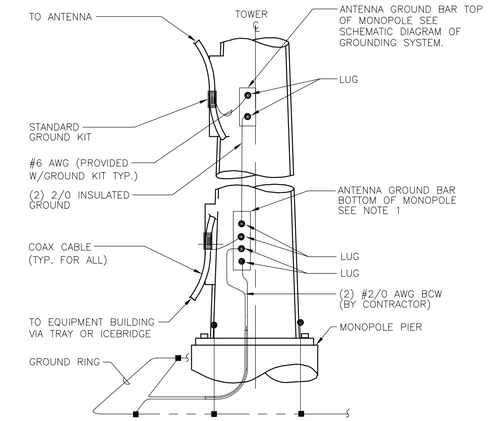
NOTES:

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

2 E-5 CONNECTION OF GROUND WIRES TO GROUND BAR
NOT TO SCALE



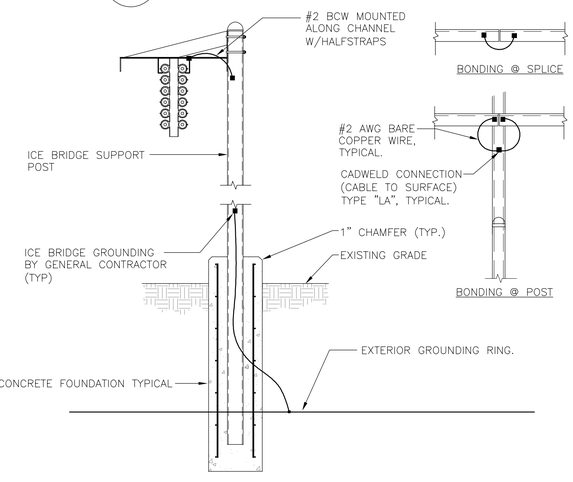
5 E-5 EQUIPMENT GROUND BAR DETAIL
NOT TO SCALE



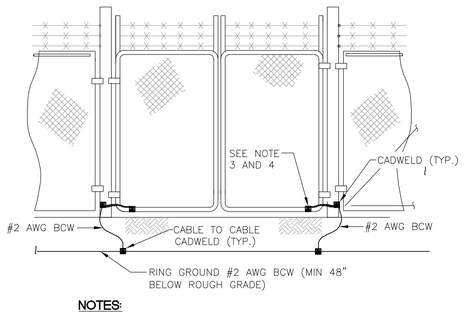
NOTES:

1. NUMBER OF GROUND BARS MAY VARY DEPENDING ON THE TYPE OF TOWER, LOCATION AND CONNECTION ORIENTATION. PROVIDE AS REQUIRED.
2. A SEPARATE GROUND BAR TO BE USED FOR GPS ANTENNA IF REQUIRED.

3 E-5 ANTENNA CABLE GROUNDING
NOT TO SCALE



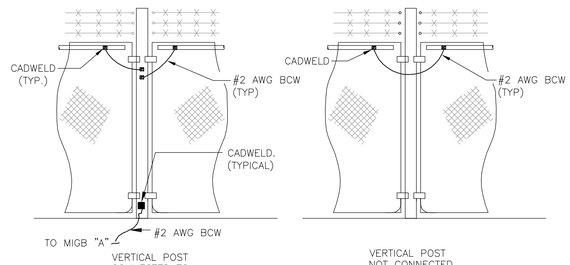
6 E-5 ICE BRIDGE BONDING DETAIL
NOT TO SCALE



NOTES:

1. THE #2 AWG, BCW, FROM THE RING GROUND SHALL BE CADWELDED TO THE POST, ABOVE GRADE.
2. BOND EACH HORIZONTAL POLE/BRACE TO EACH OTHER AND TO EACH VERTICAL POLE BONDED TO THE EXTERIOR GROUND RING.
3. GATE JUMPER SHALL BE #4/0 AWG WELDING CABLE OR FLEXIBLE COPPER BRAID BURNDY TYPE B WITH SLEEVES ON EACH END DESIGNED FOR EXOTHERMIC WELDING.
4. GATE JUMPER SHALL BE INSTALLED SO THAT IT WILL NOT BE SUBJECTED TO DAMAGING STRAIN WHEN GATE IS FULLY OPEN IN EITHER DIRECTION.

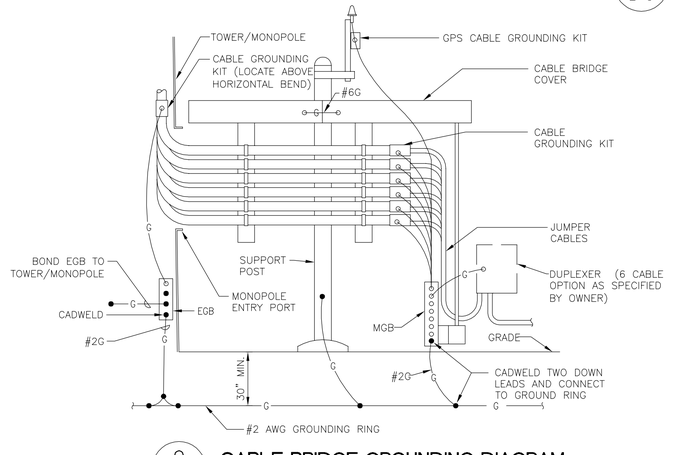
7 E-5 FENCE GATE GROUNDING
NOT TO SCALE



NOTES:

1. VERTICAL POSTS SHALL BE BONDED TO THE RING AT EACH CORNER AND AT EACH GATE POST. AS A MINIMUM ONE VERTICAL POST SHALL BE BONDED TO THE GROUND RING IN EVERY 100 FOOT STRAIGHT RUN OF FENCE.
2. HORIZONTAL POLES SHALL BE BONDED TO EACH OTHER.
3. BOND EACH HORIZONTAL POLE / BRACE TO EACH OTHER AND TO EACH VERTICAL POST THAT IS BONDED TO THE EXTERIOR GROUND RING.

8 E-5 GROUND-STD. DETAIL FENCE GROUNDING
NOT TO SCALE



9 E-5 CABLE BRIDGE GROUNDING DIAGRAM
NOT TO SCALE

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ELECTRICAL DETAILS

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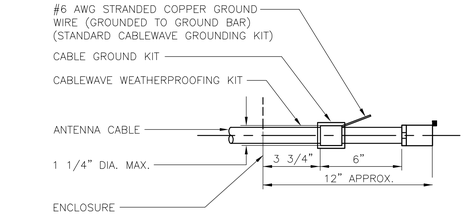
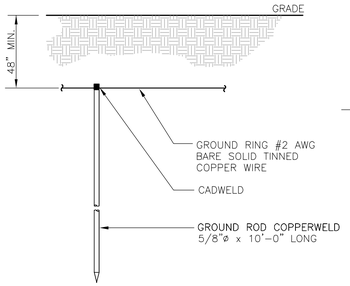


NOTES:

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

1 E-6 ANTENNA CABLE GROUNDING DETAIL

NOT TO SCALE

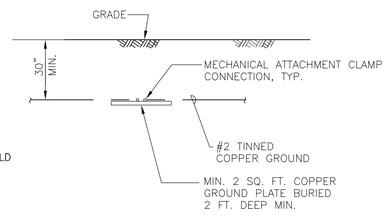


NOTES:

1. USE GROUND PLATE DETAIL IF 10 FT. GROUND ROD DEPTH CANNOT BE ACHIEVED DUE TO LEDGE CONDITION OR IF EXISTING TOWER FOUNDATION IS ENCOUNTERED.

2 E-6 GROUND ROD DETAIL

NOT TO SCALE

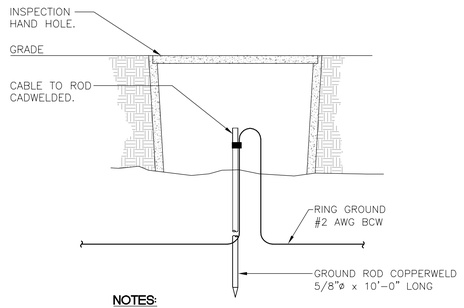


NOTES:

1. GROUND PLATE DETAIL TO BE USED ONLY IF 10 FT. GROUND ROD DEPTH CANNOT BE ACHIEVED DUE TO LEDGE CONDITION OR IF EXISTING TOWER FOUNDATION IS ENCOUNTERED.

2A E-6 GROUND PLATE DETAIL

NOT TO SCALE

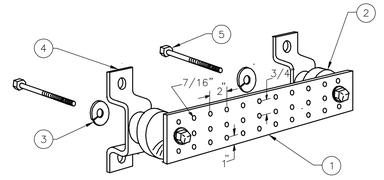


NOTES:

1. INSPECTION HAND HOLE MAY BE CONCRETE OR PVC AND SHALL BE A MINIMUM OF 12" DIA x 18" DEEP.

3 E-6 GROUND ROD WITH ACCESS DETAIL

NOT TO SCALE

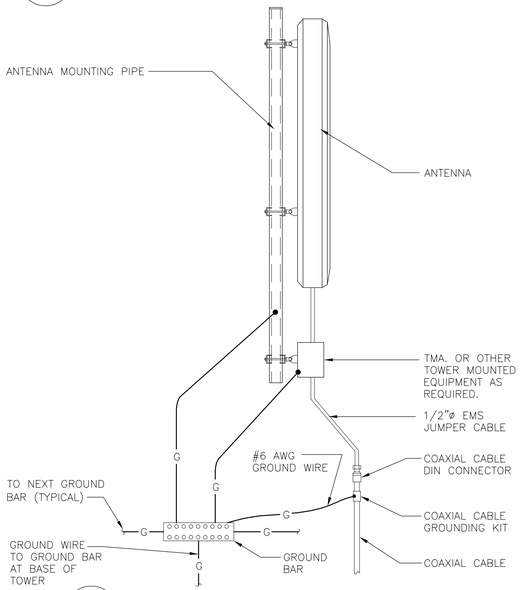


NOTES

1. TINNED COPPER GROUND BAR, 1/4" x 4" x 20", NEWTON INSTRUMENT CO. HOLE CENTERS TO MATCH NEMA DOUBLE LUG CONFIGURATION.
2. INSULATORS, NEWTON INSTRUMENT CAT. NO. 3061-4.
3. 5/8" LOCK WASHERS, NEWTON INSTRUMENT CO. CAT. NO. 3015-8.
4. WALL MOUNTING BRACKET, NEWTON INSTRUMENT CO. CAT NO. A-6056.
5. 5/8-11 x 1" STAINLESS STEEL TRUSS SPANNER MACHINE SCREWS.

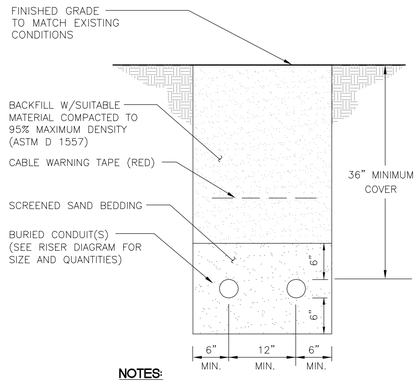
4 E-6 GROUND BAR DETAIL

NOT TO SCALE



5 E-6 TYPICAL ANTENNA GROUNDING DETAIL

NOT TO SCALE

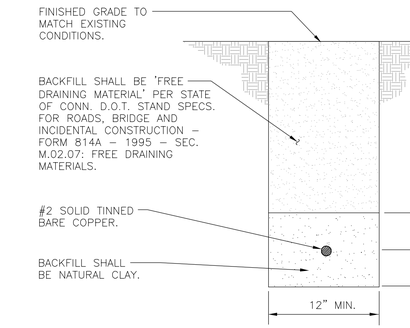


NOTES:

1. THE CLEAN FILL SHALL PASS THROUGH A 3/8" MESH SCREEN AND SHALL NOT CONTAIN SHARP STONES. OTHER BACKFILL SHALL NOT CONTAIN ASHES, CINDERS, SHELLS, FROZEN MATERIAL, LOOSE DEBRIS OR STONES LARGER THAN 2" IN MAXIMUM DIMENSION.
2. WHERE EXISTING UTILITIES ARE LIKELY TO BE ENCOUNTERED, CONTRACTOR SHALL HAND DIG AND PROTECT EXISTING UTILITIES.
3. WHERE SHALLOW BEDROCK IS ENCOUNTERED BETWEEN UTILITY SOURCE AND SERVICE EQUIPMENT, COORDINATE WITH UTILITY COMPANY FOR BURIAL DEPTH REQUIREMENTS.
4. COORDINATE WITH ELECTRICAL ENGINEER WHERE SHALLOW BEDROCK IS ENCOUNTERED BETWEEN SERVICE EQUIPMENT AND EQUIPMENT SHELTER.

6 E-6 TYPICAL ELECTRICAL TRENCH DETAIL

NOT TO SCALE



NOTES:

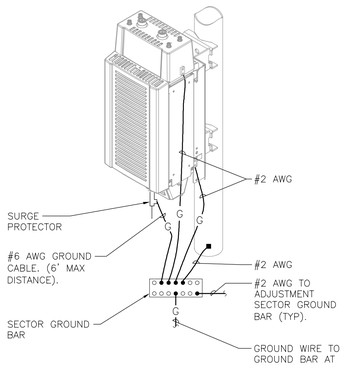
1. ENGINEER SHALL INSPECT PLACEMENT OF EGR CONDUCTOR PRIOR TO BACKFILLING.
2. MAINTAIN MIN. 2'-0" LINEAR CLEARANCE BETWEEN NATURAL CLAY BACKFILL AND THE FOLLOWING: FOUNDATION, UNDERGROUND PIPING/CONDUIT, UNDERGROUND SERVICES. IN THE CLEARANCE AREAS, USE EARTH BACKFILL INSTEAD.
3. EXERCISE HANDLING AND USE PRECAUTION OF BACKFILL MATERIAL PER MFR'S REQUIREMENTS.

7 E-6 EGR TRENCH/BACKFILL DETAIL

NOT TO SCALE

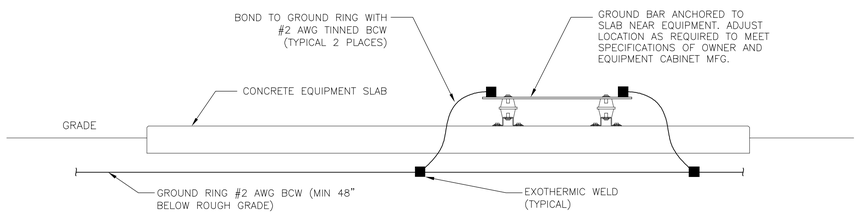
EACH RRH CABINET SHALL BE GROUNDED IN THE FOLLOWING MANNER:

1. AT TOP OF THE CABINET
2. AT RIGHT SIDE OF THE CABINET.



8 E-6 RRH POLE MOUNT GROUNDING

NOT TO SCALE



9 E-6 GROUNDING AND BONDING AT CONCRETE SLAB

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ELECTRICAL DETAILS

E-6

Sheet No. 13 of 14

ELECTRICAL SPECIFICATIONS

SECTION 16010

1.01. SCOPE OF WORK

A. WORK SHALL INCLUDE ALL LABOR, EQUIPMENT AND SERVICES REQUIRED TO COMPLETE (MAKE READY FOR OPERATION) ALL THE ELECTRICAL WORK INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING:

1. INSTALL 200A, 240/120V, 1P, 3 WIRE ELECTRIC SERVICE WITH REVENUE METER AND 200A MAIN CIRCUIT BREAKER FOR OWNER AND ASSOCIATED DISTRIBUTION EQUIPMENT. (AS REQUIRED BY UTILITY CO.)
2. NEW SITE TELEPHONE SERVICE AS SPECIFIED BY TELEPHONE COMPANY.
3. FEEDERS AND BRANCH CIRCUIT WIRING TO PANELS, RECEPTACLES, EQUIPMENT, LIGHTING FIXTURES, ETC. AS INDICATED OR NOTED ON PLANS.
4. CELLULAR SITE ALARMS, ASSOCIATED WIRING AND DEVICES.
5. CELLULAR GROUNDING SYSTEMS, CONSISTING OF ANTENNA GROUNDING, GROUND BARS, ETC.
6. FURNISH AND INSTALL 3/4" PLYWOOD BACKBOARD OF SIZE INDICATED ON DRAWINGS FOR MOUNTING OF POWER/SERVICE EQUIPMENT AND TELEPHONE/ALARM EQUIPMENT. BACKBOARDS SHALL BE PAINTED WITH TWO (2) COATS OF SEMI-GLOSS GRAY FIRE RETARDANT PAINT.
7. FIELD MEASURE EXISTING ELECTRICAL SERVICES TO CONFIRM AVAILABLE EXISTING POWER.
8. COORDINATE ALL WORK SHOWN, ON THESE PLANS WITH LOCAL UTILITY COMPANIES.

B. LOCAL UTILITY COMPANIES SHALL PROVIDE THE FOLLOWING:

1. TELEPHONE CABLES.
2. SHUTDOWN OF SERVICE (COORDINATE WITH OWNER).

C. CONTRACTOR SHALL CONFER WITH LOCAL UTILITY COMPANIES TO ASCERTAIN THE LIMITS OF THEIR WORK AND SHALL INCLUDE IN BID ANY CHARGES OR FEES MADE BY THE UTILITY COMPANIES FOR THEIR PORTION OF THE WORK AND SHALL PROVIDE AND INSTALL ALL ITEMS REQUIRED, BUT NOT PROVIDED BY UTILITY COMPANY.

D. ELECTRICAL CONTRACTOR SHALL COORDINATE ELECTRICAL INSTALLATION WITH ELECTRIC UTILITY CO. PRIOR TO INSTALLATION.

E. CONTRACTOR SHALL COORDINATE WITH TELEPHONE UTILITY COMPANY FOR LOCATION OF TELEPHONE SERVICE AND TO DETERMINE ANY REQUIRED EQUIPMENT TO BE INSTALLED BY CONTRACTOR.

1.02. GENERAL REQUIREMENTS

A. THE ENTIRE ELECTRICAL INSTALLATION SHALL BE MADE IN STRICT ACCORDANCE WITH ALL LOCAL, STATE AND NATIONAL CODES AND REGULATIONS WHICH MAY APPLY AND NOTHING IN THE DRAWINGS OR SPECIFICATIONS SHALL BE INTERPRETED AS AN INFRINGEMENT OF SUCH CODES OR REGULATIONS.

B. THE ELECTRICAL CONTRACTOR IS TO BE RESPONSIBLE FOR THE COMPLETE INSTALLATION AND COORDINATION OF THE ENTIRE ELECTRICAL SERVICE. ALL ACTIVITIES TO BE COORDINATED THROUGH OWNERS REPRESENTATIVE, DESIGN ENGINEER AND OTHER AUTHORITIES HAVING JURISDICTION OF TRADES.

C. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL PERMITS AND PAY ALL FEES THAT MAY BE REQUIRED FOR THE ELECTRICAL WORK AND FOR SCHEDULING OF ALL INSPECTIONS THAT MAY BE REQUIRED BY THE LOCAL AUTHORITY.

D. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION WITH THE BUILDING OWNER FOR NEW AND/OR DEMOLITION WORK INVOLVED.

E. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION WITH LOCAL TELEPHONE COMPANY THAT MAY BE REQUIRED FOR THE INSTALLATION OF TELEPHONE SERVICE TO THE PROPOSED CELLULAR SITE.

F. NO MATERIAL OTHER THAN THAT CONTAINED IN THE "LATEST LIST OF ELECTRICAL FITTINGS" APPROVED BY THE UNDERWRITERS' LABORATORIES, SHALL BE USED IN ANY PART OF THE WORK. ALL MATERIAL FOR WHICH LABEL SERVICE HAS BEEN ESTABLISHED SHALL BEAR THE U.L. LABEL.

G. THE CONTRACTOR SHALL GUARANTEE ALL NEW WORK FOR A PERIOD OF ONE YEAR FROM THE ACCEPTANCE DATE BY THE OWNER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING WARRANTIES FROM ALL EQUIPMENT MANUFACTURERS FOR SUBMISSION TO THE OWNER.

H. DRAWINGS INDICATE GENERAL ARRANGEMENT OF WORK INCLUDED IN CONTRACT. CONTRACTOR SHALL, WITHOUT EXTRA CHARGE, MAKE MODIFICATIONS TO THE LAYOUT OF THE WORK TO PREVENT CONFLICT WITH WORK OF OTHER TRADES AND FOR THE PROPER INSTALLATION OF WORK. CHECK ALL DRAWINGS AND VISIT JOB SITE TO VERIFY SPACE AND TYPE OF EXISTING CONDITIONS IN WHICH WORK WILL BE DONE, PRIOR TO SUBMITTAL OF BID.

I. THE ELECTRICAL CONTRACTOR SHALL SUPPLY THREE (3) COMPLETE SETS OF APPROVED DRAWINGS, ENGINEERING DATA SHEETS, MAINTENANCE AND OPERATING INSTRUCTION MANUALS FOR ALL SYSTEMS AND THEIR RESPECTIVE EQUIPMENT. THESE MANUALS SHALL BE INSERTED IN VINYL COVERED 3-RING BINDERS AND TURNED OVER TO OWNER'S REPRESENTATIVE ONE (1) WEEK PRIOR TO FINAL PUNCH LIST.

J. ALL WORK SHALL BE INSTALLED IN A NEAT AND WORKMAN LIKE MANNER AND WILL BE SUBJECT TO THE APPROVAL OF THE OWNER'S REPRESENTATIVE.

K. ALL EQUIPMENT AND MATERIALS TO BE INSTALLED SHALL BE NEW, UNLESS OTHERWISE NOTED.

L. BEFORE FINAL PAYMENT, THE CONTRACTOR SHALL PROVIDE A COMPLETE SET OF PRINTS (AS-BUILTS), LEGIBLY MARKED IN RED PENCIL TO SHOW ALL CHANGES FROM THE ORIGINAL PLANS.

M. PROVIDE TEMPORARY POWER AND LIGHTING IN WORK AREAS AS REQUIRED.

N. SHOP DRAWINGS:

1. CONTRACTOR SHALL SUBMIT SIX (6) COPIES OF SHOP DRAWINGS ON ALL EQUIPMENT AND MATERIALS PROPOSED FOR USE ON THIS PROJECT, GIVING ALL DETAILS, WHICH INCLUDE DIMENSIONS, CAPACITIES, ETC.
2. CONTRACTOR SHALL SUBMIT SIX (6) COPIES OF ALL TEST REPORTS CALLED FOR IN THE SPECIFICATIONS AND DRAWINGS.

O. ENTIRE ELECTRICAL INSTALLATION SHALL BE IN ACCORDANCE WITH OWNER'S SPECIFICATIONS, AND REQUIREMENTS OF ALL LOCAL AUTHORITIES HAVING JURISDICTION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH APPROPRIATE INDIVIDUALS TO OBTAIN ALL SUCH SPECIFICATIONS AND REQUIREMENTS. NOTHING CONTAINED IN, OR OMITTED FROM, THESE DOCUMENTS SHALL RELIEVE CONTRACTOR FROM THIS OBLIGATION.

SECTION 16111

1.01. CONDUIT

A. MINIMUM CONDUIT SIZE FOR BRANCH CIRCUITS, LOW VOLTAGE CONTROL AND ALARM CIRCUITS SHALL BE 3/4". ALL CONDUIT RUNS LOCATED WITHIN THE OWNER'S EQUIPMENT ROOM SHALL ORIGINATE FROM THE WIREWAY AND RUN VERTICALLY TO ITS DESTINATION. NO BENDS WILL BE ACCEPTED. CONDUITS SHALL BE PROPERLY FASTENED TO THE WALLS AND CEILINGS AS REQUIRED BY THE N.E.C.

CONDUIT MATERIAL SHALL BE AS FOLLOWS:

1. ELECTRIC METALLIC TUBING (EMT) – BRANCH CIRCUITS INSIDE WIRELESS ROOM
2. GALVANIZED RIGID CONDUIT (GRC) – FEEDERS AND CIRCUITS EXPOSED TO EXTERIOR & UNDERGROUND.
3. LIQUID TIGHT FLEXIBLE METAL CONDUIT – FOR SHORT LENGTHS (MAX. 3'-0") WIRING TO VIBRATING EQUIPMENT (HVAC UNITS, MOTORS, ETC.) IN WET LOCATIONS.
4. FLEXIBLE METAL CONDUIT – FOR SHORT LENGTHS (MAX. 3'-0") WIRING TO VIBRATING EQUIPMENT IN DRY LOCATIONS.
5. PVC CONDUIT – WHERE SHOWN ON GROUNDING DETAILS.

SECTION 16114

1.01. CABLE TRAY

A. CABLE TRAY SHALL BE SOLID SIDE BAR, 18" WIDE (NEWTON INSTRUMENT COMPANY, INC.). TRAY SHALL BE INSTALLED AS SHOWN ON CONTRACT DOCUMENTS.

B. CROSSWISE RUNS SHALL BE COORDINATED WITH THE SPECIFIC EQUIPMENT THE TRAY SHALL SERVE.

C. ALL PROTRUDING CABLE TRAY SUPPORT RODS SHALL BE FILED SMOOTH WITH NO SHARP EDGES. ALL SUPPORT RODS SHALL BE CAD-PLATED FOR RUST RESISTANCE AND A MINIMUM 1/2" DIAMETER.

SECTION 16123

1.01. CONDUCTORS

A. ALL CONDUCTORS SHALL BE TYPE THWN (INT. APPLICATION) AND XHHW (EXT. APPLICATION), 75 DEGREE C, 600 VOLT INSULATION, SOFT ANNEALED STRANDED COPPER. #10 AWG AND SMALLER SHALL BE SPLICED USING ACCEPTABLE SOLDERLESS PRESSURE CONNECTORS. #8 AWG AND LARGER SHALL BE SPLICED USING COMPRESSION SPLIT-BOLT TYPE CONNECTORS. #12 AWG SHALL BE THE MINIMUM SIZE CONDUCTOR FOR LINE VOLTAGE BRANCH CIRCUITS. REFER TO PANEL SCHEDULE FOR BRANCH CIRCUIT CONDUCTOR SIZE(S). CONDUCTORS SHALL BE COLOR CODED FOR CONSISTENT PHASE IDENTIFICATION:

	120/208/240V	277/480V
LINE	COLOR	COLOR
A	BLACK	BROWN
B	RED	ORANGE
C	BLUE	YELLOW
N	CONTINUOUS WHITE	GREY
G	CONTINUOUS GREEN	GREEN WITH YELLOW STRIPE

B. MINIMUM BENDING RADIUS FOR CONDUCTORS SHALL BE 12 TIMES THE LARGEST DIAMETER OF BRANCH CIRCUIT CONDUCTOR.

SECTION 16130

1.01. BOXES

A. FURNISH AND INSTALL OUTLET BOXES FOR ALL DEVICES, SWITCHES, RECEPTACLES, ETC.. BOXES TO BE ZINC COATED STEEL.

B. FURNISH AND INSTALL PULL BOXES IN MAIN FEEDERS RUNS WHERE REQUIRED. PULL BOXES SHALL BE GALVANIZED STEEL WITH SCREW REMOVABLE COVERS, SIZE AND QUANTITY AS REQUIRED. PROVIDE WEATHERPROOF CONSTRUCTION IN WET LOCATIONS.

SECTION 16140

1.01. WIRING DEVICES

A. THE FOLLOWING LIST IS PROVIDED TO CONVEY THE QUALITY AND RATING OF WIRING DEVICES WHICH ARE TO BE INSTALLED. A COMPLETE LIST OF ALL DEVICES MUST BE SUBMITTED BEFORE INSTALLATION FOR APPROVAL.

1. 15 MINUTE TIMER SWITCH – INTERMATIC #FF15M (INTERIOR LIGHTS)
2. DUPLEX RECEPTACLE – P&S #2095 (GFCI) SPECIFICATION GRADE
3. SINGLE POLE SWITCH – P&S #CSB20AC2 (20A-120V HARD USE) SPECIFICATION GRADE
4. DUPLEX RECEPTACLE – P&S #5362 (20A-120V HARD USE) SPECIFICATION GRADE

B. PLATES – ALL PLATES USED SHALL BE CORROSION RESISTANT TYPE 304 STAINLESS STEEL. PLATES SHALL BE FROM SAME MANUFACTURER AS SWITCHES AND RECEPTACLES. PROVIDE WEATHERPROOF HOUSING FOR DEVICES LOCATED IN WET LOCATIONS.

C. OTHER MANUFACTURERS OF THE SWITCHES, RECEPTACLES AND PLATES MAY BE SUBMITTED FOR APPROVAL BY THE ENGINEER.

SECTION 16170

1.01. DISCONNECT SWITCHES

A. FUSIBLE AND NON-FUSIBLE, 600V, HEAVY DUTY DISCONNECT SWITCHES SHALL BE AS MANUFACTURED BY SQUARE "D". PROVIDE FUSES AS CALLED FOR ON THE CONTRACT DRAWINGS. AMPERE RATING SHALL BE CONSISTENT WITH LOAD BEING SERVED. DISCONNECT SWITCH COVER SHALL BE MECHANICALLY INTERLOCKED TO PREVENT COVER FROM OPENING WHEN THE SWITCH IS IN THE "ON" POSITION. EXTERIOR APPLICATIONS SHALL BE NEMA 3R CONSTRUCTION WITH PADLOCK FEATURE.

SECTION 16190

1.01. SEISMIC RESTRAINT

A. ALL DEVICES SHALL BE INSTALLED IN ACCORDANCE WITH ZONE 2 SEISMIC REQUIREMENTS.

SECTION 16195

1.01. LABELING AND IDENTIFICATION NOMENCLATURE FOR ELECTRICAL EQUIPMENT

A. CONTRACTOR SHALL FURNISH AND INSTALL NON-METALLIC ENGRAVED BACK-LIT NAMEPLATES ON ALL PANELS AND MAJOR ITEMS OF ELECTRICAL EQUIPMENT.

B. LETTERS TO BE WHITE ON BLACK BACKGROUND WITH LETTERS 1-1/2 INCH HIGH WITH 1/4 INCH MARGIN.

C. IDENTIFICATION NOMENCLATURE SHALL BE IN ACCORDANCE WITH OWNER'S STANDARDS.

D. PROVIDE NAMEPLATE FOR PORTABLE ENGINE/GENERATOR CONNECTION SHOWING VOLTAGE KVA/KW RATING, # PHASE, AND # OF WIRES. PLATE TO BE PLASTIC ENGRAVED, RED WITH WHITE LETTERS.

E. ALL RECEPTACLES, SWITCHES, DISCONNECT SWITCHES, ETC. SHALL BE LABELED WITH THE CORRECT BRANCH CIRCUIT NUMBER SERVED BY MEANS OF PERMANENT PRESSED TYPE BLACK 1/4" TRANSFER LETTERING. (FOR EXAMPLE: "MDP-5", ETC.).

F. PROVIDE A NAMEPLATE AT THE SERVICE EQUIPMENT INDICATING THE TYPE AND LOCATION OF THE ON SITE GENERATOR.

SECTION 16450

1.01. GROUNDING

A. ALL NON-CURRENT CARRYING PARTS OF THE ELECTRICAL AND TELEPHONE CONDUIT SYSTEMS SHALL BE MECHANICALLY AND ELECTRICALLY CONNECTED TO PROVIDE AN INDEPENDENT RETURN PATH TO THE EQUIPMENT GROUNDING SOURCES.

B. GROUNDING SYSTEM WILL BE IN ACCORDANCE WITH THE LATEST ACCEPTABLE EDITION OF THE NATIONAL ELECTRICAL CODE AND REQUIREMENTS PER LOCAL INSPECTOR HAVING JURISDICTION.

C. GROUNDING OF PANELBOARDS:

1. PANELBOARD SHALL BE GROUNDED BY TERMINATING THE PANELBOARD FEEDER'S EQUIPMENT GROUND CONDUCTOR TO THE EQUIPMENT GROUND BAR KIT(S) LUGGED TO THE CABINET. ENSURE THAT THE SURFACE BETWEEN THE KIT AND CABINET ARE BARE METAL TO BARE METAL. PRIME AND PAINT OVER TO PREVENT CORROSION.
2. CONDUIT(S) TERMINATING INTO THE PANELBOARD SHALL HAVE GROUNDING TYPE BUSHINGS. THE BUSHINGS SHALL BE BONDED TOGETHER WITH BARE #10 AWG COPPER CONDUCTOR WHICH IN TURN IS TERMINATED INTO THE PANELBOARD'S EQUIPMENT GROUND BAR KIT(S).

D. EQUIPMENT GROUNDING CONDUCTOR:

1. EACH EQUIPMENT GROUND CONDUCTOR SHALL BE SIZED IN ACCORDANCE WITH THE N.E.C. ARTICLE 250-122.
2. THE MINIMUM SIZE OF EQUIPMENT GROUND CONDUCTOR SHALL BE #12 AWG COPPER.
3. REFER TO PANEL SCHEDULE "BRANCH CIRCUIT" DATA FOR EQUIPMENT GROUND CONDUCTOR SIZE FOR EACH BRANCH CIRCUIT.
4. EACH FEEDER OR BRANCH CIRCUIT SHALL HAVE EQUIPMENT GROUND CONDUCTOR(S) INSTALLED IN THE SAME RACEWAY(S).

E. CELLULAR GROUNDING SYSTEM:

CONTRACTOR SHALL PROVIDE A CELLULAR GROUNDING SYSTEM WITH THE MAXIMUM AC RESISTANCE TO GROUND OF 5 OHM BETWEEN ANY POINT ON THE GROUNDING SYSTEM AS MEASURED BY 3-POINT GROUNDING TEST. (REFER TO SECTION 16960).

PROVIDE THE CELLULAR GROUNDING SYSTEM AS SPECIFIED ON DRAWINGS, INCLUDING, BUT NOT LIMITED TO:

1. GROUND BARS
2. INTERIOR GROUND RING
3. EXTERIOR GROUNDING (WHERE REQUIRED DUE TO MEASURED AC RESISTANCE GREATER THAN SPECIFIED).
4. ANTENNA GROUND CONNECTIONS AND PLATES.

F. CONTRACTOR, AFTER COMPLETION OF THE COMPLETE GROUNDING SYSTEM BUT PRIOR TO CONCEALMENT/BURIAL OF SAME, SHALL NOTIFY OWNER'S WIRELESS PROJECT ENGINEER WHO WILL HAVE A DESIGN ENGINEER VISIT SITE AND MAKE A VISUAL INSPECTION OF THE GROUNDING GRID AND CONNECTIONS OF THE SYSTEM.

G. ALL EQUIPMENT SHALL BE BONDED TO GROUND AS REQUIRED BY N.E.C., MFG. SPECIFICATIONS, AND OWNER'S SPECIFICATIONS.

SECTION 16470

1.01. DISTRIBUTION EQUIPMENT

A. REFER TO CONTRACT DRAWINGS FOR DETAILS AND SCHEDULES.

SECTION 16477

1.01. FUSES

A. FUSES SHALL BE NONRENEWABLE TYPE AS MANUFACTURED BY "BUSSMAN" OR APPROVED EQUAL. FUSES RATED TO 1/10 AMPERE UP TO 600 AMPERES SHALL BE EQUIVALENT TO BUSSMAN TYPE LPN-RK (250V) UL CLASS RK1, LOW PEAK, DUAL ELEMENT, TIME-DELAY FUSES. FUSES SHALL HAVE SEPARATE SHORT CIRCUIT AND OVERLOAD ELEMENTS AND HAVE AN INTERRUPTING RATING OF 200 KAIC. UPON COMPLETION OF WORK, PROVIDE ONE SPARE SET OF FUSES FOR EACH TYPE INSTALLED.

SECTION 16960

1.01. TESTS BY INDEPENDENT ELECTRICAL TESTING FIRM

A. CONTRACTOR SHALL RETAIN THE SERVICES OF A LOCAL INDEPENDENT ELECTRICAL TESTING FIRM (WITH MINIMUM 5 YEARS COMMERCIAL EXPERIENCE IN THE ELECTRICAL TESTING INDUSTRY) AS SPECIFIED BY OWNER TO PERFORM:

TEST 1: THERMAL OVERLOAD AND MAGNETIC TRIP TEST, AND CABLE INSULATION TEST FOR ALL CIRCUIT BREAKERS RATED 100 AMPS OR GREATER.

TEST 2: RESISTANCE TO GROUND TEST ON THE CELLULAR GROUNDING SYSTEM.

THE TESTING FIRM SHALL INCLUDE THE FOLLOWING INFORMATION WITH THE REPORT:

1. TESTING PROCEDURE INCLUDING THE MAKE AND MODEL OF TEST EQUIPMENT.
2. CERTIFICATION OF TESTING EQUIPMENT CALIBRATION WITHIN SIX (6) MONTHS OF DATE OF TESTING. INCLUDE CERTIFICATION LAB ADDRESS AND TELEPHONE NUMBER.
3. GRAPHICAL DESCRIPTION OF TESTING METHOD ACTUALLY IMPLEMENTED.

B. THESE TESTS SHALL BE PERFORMED IN THE PRESENCE AND TO THE SATISFACTION OF OWNER'S CONSTRUCTION REPRESENTATIVE. TESTING DATA SHALL BE INITIALED AND DATED BY THE CONSTRUCTION REPRESENTATIVE AND INCLUDED WITH THE WRITTEN REPORT/ANALYSIS.

C. THE CONTRACTOR SHALL FORWARD SIX (6) COPIES OF THE INDEPENDENT ELECTRICAL TESTING FIRM'S REPORT/ANALYSIS TO ENGINEER A MINIMUM OF TEN (10) WORKING DAYS PRIOR TO THE JOB TURNOVER.

D. CONTRACTOR TO PROVIDE A MINIMUM OF ONE (1) WEEK NOTICE TO OWNER AND ENGINEER FOR ALL TESTS REQUIRING WITNESSING.

SECTION 16961

1.01. TESTS BY CONTRACTOR

A. ALL TESTS AS REQUIRED UPON COMPLETION OF WORK, SHALL BE MADE BY THIS CONTRACTOR. THESE SHALL BE CONTINUITY AND INSULATION TESTS; TEST TO DETERMINE THE QUALITY OF MATERIALS, ETC. AND SHALL BE MADE IN ACCORDANCE WITH N.E.C. RECOMMENDATIONS. ALL FEEDERS AND BRANCH CIRCUIT WIRING (EXCEPT CLASS 2 SIGNAL CIRCUITS) MUST BE TESTED FREE FROM SHORT CIRCUIT AND GROUND FAULT CONDITIONS AT 500V IN A REASONABLY DRY AMBIENT OF APPROXIMATELY 70 DEGREES F.

B. CONTRACTOR SHALL PERFORM LOAD PHASE BALANCING TESTS. CIRCUITS SHALL BE SO CONNECTED TO THE PANELBOARDS SUCH THAT THE NEW LOAD IS DISTRIBUTED AS EQUALLY AS POSSIBLE BETWEEN EACH LOAD AND NEUTRAL. 10% SHALL BE CONSIDERED AS A REASONABLE AND ACCEPTABLE ALLOWANCE. BRANCH CIRCUITS SHALL BE BALANCED ON THEIR OWN PANELBOARDS; FEEDER LOADS SHALL, IN TURN, BE BALANCED ON THE SERVICE EQUIPMENT. REASONABLE LOAD TEST SHALL BE ARRANGED TO VERIFY LOAD BALANCE IF REQUESTED BY THE ENGINEER.

C. ALL TESTS, UPON REQUEST, SHALL BE REPEATED IN THE PRESENCE OF OWNER'S REPRESENTATIVE. ALL TESTS SHALL BE DOCUMENTED AND TURNED OVER TO OWNER. OWNER SHALL HAVE THE AUTHORITY TO STOP ANY OF THE WORK NOT BEING PROPERLY INSTALLED. ALL SUCH DETECTED WORK SHALL BE REPAIRED OR REPLACED AT NO ADDITIONAL EXPENSE TO THE OWNER AND THE TESTS SHALL BE REPEATED.

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
A	01/22/18	TJB	TGK	PRELIMINARY CDs - ISSUED FOR CLIENT REVIEW

PROFESSIONAL ENGINEER SEAL

T-Mobile

Transcend Wireless

CENTEK engineering
Centered on Solutions℠
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T-MOBILE NORTHEAST LLC
WIRELESS COMMUNICATIONS FACILITY
QUINEBAUG ROAD
SITE ID: CTNL193
720 QUINEBAUG ROAD
THOMPSON, CT 06262

DATE: 01/22/18
SCALE: AS NOTED
JOB NO. 17179.00

ELECTRICAL SPECIFICATIONS

E-7

Sheet No. 14 of 14

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

125-ft Existing Valmont Monopole

Proposed T-Mobile
Antenna Installation

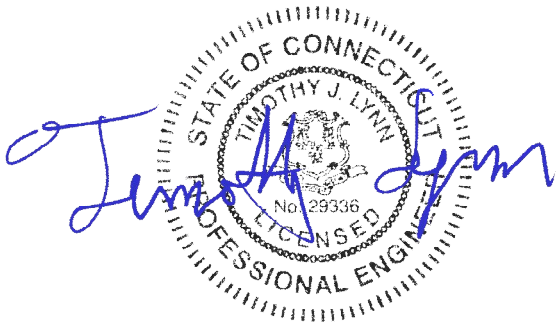
T-Mobile Site Ref: CTNL193A

720 Quinebaug Road
Quinebaug, CT

Centek Project No. 17179.00

~~Date: December 13, 2017~~

Rev 3: January 25, 2018



Prepared for:

T-Mobile USA
35 Griffin Road
Bloomfield, CT 06002

Table of Contents

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna installation proposed by T-Mobile on the existing monopole (tower) located in Quinebaug, CT.

The host tower is a 125-ft tall, three-section, twelve sided, tapered monopole, originally designed and manufactured by Valmont; job no; QU12139, dated December 22, 2005. The tower geometry, structure member sizes and foundation system information were obtained from a previous structural analysis prepared by All-Points Technology project no. CT141102 dated August 16, 2017.

Antenna and appurtenance information were obtained from the aforementioned APT structural report and a T-Mobile RF data sheet.

The tower is made up of three (3) tapered vertical sections consisting of A572-65 pole sections. The vertical tower sections are slip joint connected. The diameter of the pole (flat-flat) is 21.04-in at the top and 47.59-in at the base.

Antenna and Appurtenance Summary

The existing, proposed and future loads considered in this analysis consist of the following:

- TOWN (EXISTING):
  Antennas: One (1) 4-bay dipole antenna, one (1) 20-ft Omni-directional whip antenna and one (1) 8.5-ft Omni-directional whip antenna mounted on the existing AT&T low profile platform with an elevation of 130-ft above grade.
  Coax Cables: Three (3) 7/8" ∅ coax cables running on the inside of the existing tower.
- AT&T (EXISTING):
  Antennas: Six (6) Powerwave 7770.00 panel antennas, one (1) Kathrein 800-10764 panel antenna, one (1) Kathrein 800-10766 panel antenna, one (1) KMW AM-X-CD-17-65-00T panel antenna, six (6) Powerwave LGP21401 TMA's, six (6) Powerwave LGP21901 diplexers, six (6) Ericsson RRUS-11 and one (1) Raycap DC6-48-60-18-8F surge arrestor mounted on an existing low profile platform with a RAD center elevation of 130-ft above grade.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables, one (1) 5/8" ∅ fiber cable and two (2) #8 DC control cables running on the inside of the existing tower.
- VERIZON (EXISTING):
  Antennas: Six (6) Antel LPA-80080-6CF panel antenna, six (6) Andrew JAHH-65B-R3B panel antennas, three (3) Alcatel-Lucent RRH2x60-700 remote radio heads, three (3) Alcatel-Lucent RRH2x60-PCS remote radio heads, three (3) Alcatel-Lucent RRH2x60-AWS remote radio heads and two (2) RFS DB-T1-6Z-8AB-0Z main distribution box mounted on an existing low profile platform with a RAD center elevation of 120-ft above grade.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables and two (2) 1-5/8" ∅ Hybriflex fiber line running on the inside of the existing tower.

- **T-MOBILE (PROPOSED):**
  Misc. Equipment: Four (4) Ericsson AIR32 panel antennas, four (4) RFS APXVAA24_43 panel antennas, four (4) RFS APX16DWV-16DWVS panel antennas, eight (8) Microdata MI-554nn diplexers, eight (8) Ericsson RRUS-11 remote radio heads, four (4) Ericsson 4478 remote radio heads, one (1) 2' microwave dish and one (1) GPS mounted on a SitePro Quad-Platform (p/n F4P-12W) w/ handrail kit (p/n F4P-HRK12) with a top of antenna elevation of 109-ft above grade.
  Coax Cables: Four (4) 1-5/8" ∅ Hybriflex fiber lines and two (2)) 1/2" ∅ coax cables running on the interior of the monopole.

Primary Assumptions Used in the Analysis

- The tower structure's theoretical capacity not including any assessment of the condition of the tower.
- The tower carries the horizontal and vertical loads due to the weight of antennas, ice load and wind.
- Tower is properly installed and maintained.
- Tower is in plumb condition.
- Tower loading for antennas and mounts as listed in this report.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds are fabricated with ER-70S-6 electrodes.
- All members are assumed to be as specified in the original tower design documents or reinforcement drawings.
- All members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
- All member protective coatings are in good condition.
- All tower members were properly designed, detailed, fabricated, installed and have been properly maintained since erection.
- Any deviation from the analyzed antenna loading will require a new analysis for verification of structural adequacy.
- All existing coax cables to be installed as indicated in this report.

Analysis

The existing tower was analyzed using a comprehensive computer program entitled tnxTower. The program analyzes the tower, considering the worst case loading condition. The tower is considered as loaded by concentric forces along the tower, and the model assumes that the tower members are subjected to bending, axial, and shear forces.

The existing tower was analyzed for the controlling basic wind speed (3-second gust) with no ice and the applicable wind and ice combination to determine stresses in members as per guidelines of TIA-222-G-2005 entitled "Structural Standard for Antenna Support Structures and Antennas", the American Institute of Steel Construction (AISC) and the Manual of Steel Construction; Load and Resistance Factor Design (LRFD).

The controlling wind speed is determined by evaluating the local available wind speed data as provided in Appendix N of the CSBC[1] and the wind speed data available in the TIA-222-G-2005 Standard.

Tower Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA-222-G-2005, gravity loads of the tower structure and its components, and the application of 0.75" radial ice on the tower structure and its components.

Basic Wind Speed:	Windham; v = 100-110 mph	*[Annex B of TIA-222-G-2005]*
	Thompson; v = 101 mph	*[Appendix N of the 2016 CT Building Code]*
Load Cases:	Load Case 1; 101 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Appendix N of the 2016 CT Building Code]*
	Load Case 2; 50 mph wind speed w/ 0.75" radial ice plus gravity load – used in calculation of tower stresses.	*[Annex B of TIA-222-G-2005]*

[1] The 2012 International Building Code as amended by the 2016 Connecticut State Building Code (CSBC).

Tower Capacity

Tower stresses were calculated utilizing the structural analysis software tnxTower. Allowable stresses were determined based on Table 5 of the TIA/EIA code with a 1/3 increase per Section 3.1.1.1 of the same code.

- Calculated stresses **with the proposed reinforcements detailed in Section 4 of this report were not found** to be within allowable limits. In Load Case 1, per tnxTower "Section Capacity Table", this tower was found to be at **97.7%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L1)	85.50'-125.00'	86.1%	**PASS**
Pole Shaft (L2)	39.42-85.50'	97.7%	**PASS**
Pole Shaft (L3)	0.00'-39.42'	97.6%	**PASS**

Foundation and Anchors

The existing foundation consists of a 7.0-ft square x 5-ft long reinforced concrete pier on a 20.0-ft square x 3.5-ft thick reinforced concrete pad. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned Valmont design documents; job no; 18435-65, dated August 4, 2005. The base of the tower is connected to the foundation by means of (12) 2.25"∅, ASTM A615-75 anchor bolts embedded approximately 7-ft into the concrete foundation structure.

- The tower base reactions developed from the governing Load Case 1 were used in the verification of the foundation and its anchors:

Location	Vector	Proposed Reactions
Base	Shear	34 kips
	Compression	36 kips
	Moment	3115 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	TIA-222-G Section 9.4 (FS)[1]	Proposed Loading (FS)[1]	Result
Reinforced Concrete Pad and Pier	OTM[2]	1.0	1.38	**PASS**

Note 1: FS denotes Factor of Safety.

- The anchor bolts and base plate were found to be within allowable limits.

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Combined Compression and Bending	73.2%	**PASS**
Base Plate	Bending	74.0%	**PASS**

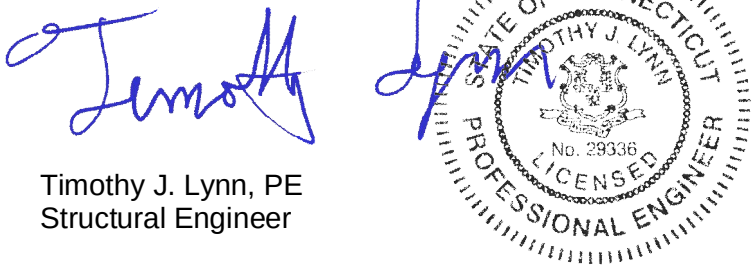
Conclusion

This analysis shows that the subject tower **with the proposed reinforcements detailed in Section 4 of this report is adequate** to support the proposed antenna configuration.

The analysis is based, in part, on the information provided to this office by T-Mobile. If the existing conditions are different than the information in this report, Centek Engineering, Inc. must be contacted for resolution of any potential issues.

Please feel free to call with any questions or comments.

Respectfully Submitted by:



Timothy J. Lynn, PE
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

All engineering services are performed on the basis that the information used is current and correct. This information may consist of, but is not necessarily limited to:

- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of Centek Engineering, Inc. or generated by field inspections or measurements of the structure.
- It is the responsibility of the client to ensure that the information provided to Centek Engineering, Inc. and used in the performance of our engineering services is correct and complete. In the absence of information to the contrary, we assume that all structures were constructed in accordance with the drawings and specifications and are in an un-corroded condition and have not deteriorated. It is therefore assumed that its capacity has not significantly changed from the “as new” condition.
- All services will be performed to the codes specified by the client, and we do not imply to meet any other codes or requirements unless explicitly agreed in writing. If wind and ice loads or other relevant parameters are to be different from the minimum values recommended by the codes, the client shall specify the exact requirement. In the absence of information to the contrary, all work will be performed in accordance with the latest revision of ANSI/ASCE10 & ANSI/EIA-222
- All services performed, results obtained, and recommendations made are in accordance with generally accepted engineering principles and practices. Centek Engineering, Inc. is not responsible for the conclusions, opinions and recommendations made by others based on the information we supply.

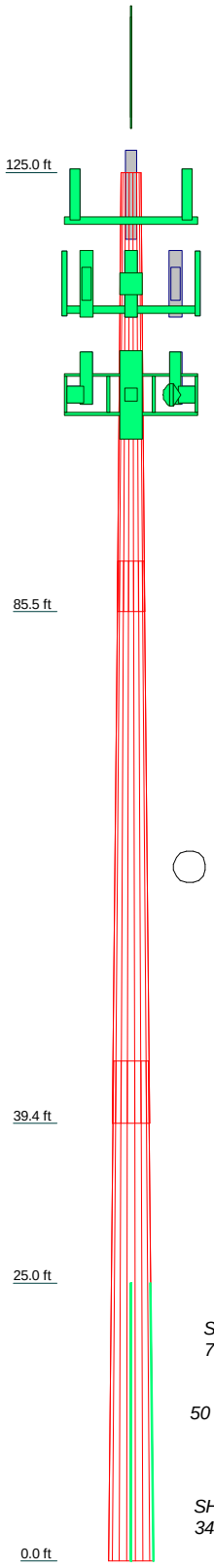
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

tnxTower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, tnxTower, formerly ERITower and RISATower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

tnxTower Features:

- tnxTower can analyze and design 3- and 4-sided guyed towers, 3- and 4-sided self-supporting towers and either round or tapered ground mounted poles with or without guys.
- The program analyzes towers using the TIA-222-G (2005) standard or any of the previous TIA/EIA standards back to RS-222 (1959). Steel design is checked using the AISC ASD 9th Edition or the AISC LRFD specifications.
- Linear and non-linear (P-delta) analyses can be used in determining displacements and forces in the structure. Wind pressures and forces are automatically calculated.
- Extensive graphics plots include material take-off, shear-moment, leg compression, displacement, twist, feed line, guy anchor and stress plots.
- tnxTower contains unique features such as True Cable behavior, hog rod take-up, foundation stiffness and much more.

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Tube Length (ft)	Reinf Size	Reinf Grade	Weight (K)
1	39.500	16	0.188	4.500	21.037	29.725	A572-65				2.0
2	50.580	16	0.281	5.580	28.360	39.486	A572-65				5.2
3	45.000	16	0.313		37.696	47.593	A572-65	25.000	7x1	A572-65	6.5



ALL REACTIONS ARE FACTORED

AXIAL 70 K

SHEAR 7 K

MOMENT 750 kip-ft

TORQUE 4 kip-ft
50 mph WIND - 0.750 in ICE

AXIAL 36 K

SHEAR 34 K

MOMENT 3115 kip-ft

TORQUE 17 kip-ft
REACTIONS - 101 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
4-bay dipole	130	RRH2x60-07-U (Verizon - Existing)	115
20-ft x 3" whip	130	RRH2x60-07-U (Verizon - Existing)	115
8.5-ft x 1.5" whip	130	DB-T1-6Z-8AB-0Z (Verizon - Existing)	115
Lightning Rod 3/4"x8'	130	DB-T1-6Z-8AB-0Z (Verizon - Existing)	115
(2) 7770.00 (ATI - Existing)	123	Valmont 13' Low Profile Platform (Verizon - Existing)	113
(2) 7770.00 (ATI - Existing)	123	AIR32 (T-Mobile - Proposed)	106.5
(2) 7770.00 (ATI - Existing)	123	APX16DWV-16DWVS-E-A20 (T-Mobile - Proposed)	106.5
(2) LGP21401 TMA (ATI - Existing)	123	AIR32 (T-Mobile - Proposed)	106.5
(2) LGP21401 TMA (ATI - Existing)	123	APX16DWV-16DWVS-E-A20 (T-Mobile - Proposed)	106.5
(2) LGP21401 TMA (ATI - Existing)	123	AIR32 (T-Mobile - Proposed)	106.5
(2) LGP21901 Diplexer (ATI - Existing)	123	APX16DWV-16DWVS-E-A20 (T-Mobile - Proposed)	106.5
(2) LGP21901 Diplexer (ATI - Existing)	123	AIR32 (T-Mobile - Proposed)	106.5
(2) LGP21901 Diplexer (ATI - Existing)	123	APX16DWV-16DWVS-E-A20 (T-Mobile - Proposed)	106.5
AM-X-CD-17-65-00T-RET (ATI - Existing)	123	(2) MI-554nn Diplexer (T-Mobile - Proposed)	105
800-10764 (ATI - Existing)	123	(2) MI-554nn Diplexer (T-Mobile - Proposed)	105
800-10766 (ATI - Existing)	123	(2) RRUS-11 (T-Mobile - Proposed)	105
(2) RRUS-11 (ATI - Existing)	123	B14 4478 (T-Mobile - Proposed)	105
(2) RRUS-11 (ATI - Existing)	123	(2) RRUS-11 (T-Mobile - Proposed)	105
(2) RRUS-11 (ATI - Existing)	123	APXVAA24_43 (T-Mobile - Proposed)	105
DC6-48-60-18-8F Surge Arrestor (ATI - Existing)	123	B14 4478 (T-Mobile - Proposed)	105
Andrew 12'-6" Low Profile Platform (ATI - Existing)	121	(2) MI-554nn Diplexer (T-Mobile - Proposed)	105
LPA-80080-6CF (Verizon - Existing)	115	(2) RRUS-11 (T-Mobile - Proposed)	105
JAHH-65B-R3B (Verizon - Existing)	115	B14 4478 (T-Mobile - Proposed)	105
JAHH-65B-R3B (Verizon - Existing)	115	APXVAA24_43 (T-Mobile - Proposed)	105
LPA-80080-6CF (Verizon - Existing)	115	APXVAA24_43 (T-Mobile - Proposed)	105
LPA-80080-6CF (Verizon - Existing)	115	APXVAA24_43 (T-Mobile - Proposed)	105
JAHH-65B-R3B (Verizon - Existing)	115	(2) MI-554nn Diplexer (T-Mobile - Proposed)	105
JAHH-65B-R3B (Verizon - Existing)	115	(2) RRUS-11 (T-Mobile - Proposed)	105
LPA-80080-6CF (Verizon - Existing)	115	B14 4478 (T-Mobile - Proposed)	105
RRH2x60-AWS (Verizon - Existing)	115	GPS (T-Mobile - Proposed)	105
RRH2x60-AWS (Verizon - Existing)	115	F4P-12W Quad Platform w/ Handrail (T-Mobile - Proposed)	105
RRH2x60-AWS (Verizon - Existing)	115	Andrew 2' w/Radome (T-Mobile Proposed)	105
RRH2x60-PCS (Verizon - Existing)	115		
RRH2x60-PCS (Verizon - Existing)	115		
RRH2x60-PCS (Verizon - Existing)	115		
RRH2x60-07-U (Verizon - Existing)	115		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-G Standard.
2. Tower designed for a 101 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class III.
6. Topographic Category 1 with Crest Height of 0.000 ft
7. Weld together tower sections have flange connections.
8. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
9. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
10. Welds are fabricated with ER-70S-6 electrodes.
11. TOWER RATING: 97.7%

Centek Engineering Inc.
63-2 North Branford Rd.
Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Job: **17179.00 - CTNL193A**			
Project: **125ft Valmont Monopole - 720 Quinebaug Rd, Quinebaug, CT**			
Client: T-Mobile	Drawn by: TJL	App'd:	
Code: TIA-222-G	Date: 01/25/18	Scale: NTS	
Path: J:\Jobs\17179\00.WI\04. Structural\Backup Documentation\Rev 0\[Calcs1ER Files\125' Valmont Monopole _ Quinebaug CT.eri		Dwg No. E-1	

Tower Input Data

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

Basic wind speed of 101 mph.
Structure Class III.
Exposure Category C.
Topographic Category 1.
Crest Height 0.000 ft.
Nominal ice thickness of 0.750 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 50 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
Weld together tower sections have flange connections..
Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications..
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-70S-6 electrodes..
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	125.000-85.500	39.500	4.500	16	21.037	29.725	0.188	0.750	A572-65 (65 ksi)
L2	85.500-39.420	50.580	5.580	16	28.360	39.486	0.281	1.125	A572-65 (65 ksi)
L3	39.420-0.000	45.000		16	37.696	47.593	0.313	1.250	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	21.449	12.471	684.847	7.422	10.729	63.832	1380.062	6.166	3.813	20.337
	30.307	17.667	1947.276	10.515	15.160	128.450	3924.036	8.735	5.542	29.558
L2	29.925	25.192	2509.236	9.996	14.464	173.485	5056.464	12.456	5.084	18.076
	40.260	35.174	6829.889	13.957	20.138	339.157	13763.191	17.392	7.298	25.949
L3	39.686	37.267	6579.585	13.309	19.225	342.241	13258.793	18.426	6.880	22.015
	48.526	47.133	13310.880	16.832	24.273	548.393	26823.302	23.305	8.849	28.317

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
L1 125.000-85.500				1	1	1			
L2 85.500-39.420				1	1	1			
L3 39.420-0.000				1	1	1			

Pole Reinforcing Data

Height Above Base ft	Segment Length ft	No. of Segments	Offset in	Grade	Type	Size	Unbraced Length ft	K	Bolt Hole Dia. in	Bolts per Row	Shear Lag Factor U
0.000	25.000	4	0.000	A572-65 (65 ksi)	Flat Bar	7x1	1.000	1.00	0.750	1	1.000

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight klf
7/8	C	No	Inside Pole	130.000 - 3.000	3	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight klf
1 5/8	C	No	Inside Pole	130.000 - 3.000	12	No Ice	0.000	0.001
(AT&T - Existing)						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
1 5/8	C	No	Inside Pole	120.000 - 3.000	12	No Ice	0.000	0.001
(Verizon - Existing)						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
HYBRIFLEX 1-5/8"	C	No	Inside Pole	120.000 - 3.000	2	No Ice	0.000	0.002
(Verizon - Existing)						1/2" Ice	0.000	0.002
						1" Ice	0.000	0.002
DC Trunk	C	No	Inside Pole	130.000 - 3.000	2	No Ice	0.000	0.000
(AT&T - Existing)						1/2" Ice	0.000	0.000
						1" Ice	0.000	0.000
Fiber Trunk	C	No	Inside Pole	130.000 - 3.000	1	No Ice	0.000	0.001
(AT&T - Existing)						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
HYBRIFLEX 1-5/8"	C	No	Inside Pole	110.000 - 3.000	4	No Ice	0.000	0.002
(T-Mobile - Proposed)						1/2" Ice	0.000	0.002
						1" Ice	0.000	0.002
1/2	C	No	Inside Pole	110.000 - 3.000	2	No Ice	0.000	0.000
(T-Mobile - Proposed)						1/2" Ice	0.000	0.000
						1" Ice	0.000	0.000

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	125.000-85.500	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	1.365
		D	0.000	0.000	0.000	0.000	0.000
L2	85.500-39.420	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	1.829
		D	0.000	0.000	0.000	0.000	0.000
L3	39.420-0.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	1.446
		D	0.000	0.000	0.000	0.000	0.000

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	125.000-85.500	A	2.104	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	1.365
		D		0.000	0.000	0.000	0.000	0.000
L2	85.500-39.420	A	1.996	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	1.829
		D		0.000	0.000	0.000	0.000	0.000
L3	39.420-0.000	A	1.781	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
		C		0.000	0.000	0.000	0.000	1.446
		D		0.000	0.000	0.000	0.000	0.000

Shielding Factor Ka

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

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
4-bay dipole	B	From Face	3.500 0.000 10.000	0.000	130.000	No Ice 1/2" Ice 1" Ice	3.150 5.670 8.190	3.150 5.670 8.190	0.032 0.042 0.051
20-ft x 3" whip	C	From Face	3.500 0.000 10.000	0.000	130.000	No Ice 1/2" Ice 1" Ice	0.790 0.910 1.030	0.790 0.910 1.030	0.010 0.015 0.020
8.5-ft x 1.5" whip	D	From Face	3.500 0.000 5.000	0.000	130.000	No Ice 1/2" Ice 1" Ice	1.125 2.004 2.898	1.125 2.004 2.898	0.004 0.014 0.029
Lightning Rod 3/4"x8'	D	From Face	3.500 0.000 4.000	0.000	130.000	No Ice 1/2" Ice 1" Ice	0.600 1.415 2.246	0.600 1.415 2.246	0.014 0.020 0.031
(2) 7770.00 (AT&T - Existing)	B	From Face	3.500 0.000 0.000	0.000	123.000	No Ice 1/2" Ice 1" Ice	5.508 5.867 6.233	2.928 3.273 3.625	0.035 0.068 0.105
(2) 7770.00 (AT&T - Existing)	C	From Face	3.500 0.000 0.000	0.000	123.000	No Ice 1/2" Ice 1" Ice	5.508 5.867 6.233	2.928 3.273 3.625	0.035 0.068 0.105
(2) 7770.00 (AT&T - Existing)	D	From Face	3.500 0.000 0.000	0.000	123.000	No Ice 1/2" Ice 1" Ice	5.508 5.867 6.233	2.928 3.273 3.625	0.035 0.068 0.105
(2) LGP21401 TMA (AT&T - Existing)	B	From Face	3.500 0.000 0.000	0.000	123.000	No Ice 1/2" Ice 1" Ice	0.817 0.937 1.065	0.346 0.440 0.540	0.018 0.023 0.031
(2) LGP21401 TMA (AT&T - Existing)	C	From Face	3.500 0.000 0.000	0.000	123.000	No Ice 1/2" Ice 1" Ice	0.817 0.937 1.065	0.346 0.440 0.540	0.018 0.023 0.031
(2) LGP21401 TMA (AT&T - Existing)	D	From Face	3.500 0.000 0.000	0.000	123.000	No Ice 1/2" Ice 1" Ice	0.817 0.937 1.065	0.346 0.440 0.540	0.018 0.023 0.031
(2) LGP21901 Diplexer (AT&T - Existing)	B	From Face	3.500 0.000 0.000	0.000	123.000	No Ice 1/2" Ice 1" Ice	0.200 0.259 0.326	0.100 0.143 0.193	0.006 0.008 0.011
(2) LGP21901 Diplexer (AT&T - Existing)	C	From Face	3.500 0.000 0.000	0.000	123.000	No Ice 1/2" Ice 1" Ice	0.200 0.259 0.326	0.100 0.143 0.193	0.006 0.008 0.011
(2) LGP21901 Diplexer	D	From Face	3.500	0.000	123.000	No Ice	0.200	0.100	0.006

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(AT&T - Existing)			0.000			1/2" Ice	0.259	0.143	0.008
			0.000			1" Ice	0.326	0.193	0.011
AM-X-CD-17-65-00T-RET	B	From Face	3.500	0.000	123.000	No Ice	11.311	6.800	0.060
(AT&T - Existing)			0.000			1/2" Ice	11.927	7.384	0.121
			0.000			1" Ice	12.550	7.976	0.190
800-10764	C	From Face	3.500	0.000	123.000	No Ice	5.866	3.389	0.041
(AT&T - Existing)			0.000			1/2" Ice	6.230	3.740	0.078
			0.000			1" Ice	6.601	4.099	0.119
800-10766	D	From Face	3.500	0.000	123.000	No Ice	11.311	6.800	0.059
(AT&T - Existing)			0.000			1/2" Ice	11.927	7.384	0.120
			0.000			1" Ice	12.550	7.976	0.189
(2) RRUS-11	B	From Face	3.500	0.000	123.000	No Ice	0.000	1.246	0.050
(AT&T - Existing)			0.000			1/2" Ice	0.000	1.412	0.070
			0.000			1" Ice	0.000	1.587	0.092
(2) RRUS-11	C	From Face	3.500	0.000	123.000	No Ice	0.000	1.246	0.050
(AT&T - Existing)			0.000			1/2" Ice	0.000	1.412	0.070
			0.000			1" Ice	0.000	1.587	0.092
(2) RRUS-11	D	From Face	3.500	0.000	123.000	No Ice	0.000	1.246	0.050
(AT&T - Existing)			0.000			1/2" Ice	0.000	1.412	0.070
			0.000			1" Ice	0.000	1.587	0.092
DC6-48-60-18-8F Surge	B	From Face	3.500	0.000	123.000	No Ice	1.909	1.909	0.020
Arrestor			0.000			1/2" Ice	2.098	2.098	0.039
(AT&T - Existing)			0.000			1" Ice	2.294	2.294	0.062
Andrew 12'-6" Low Profile	D	From Face	2.000	0.000	121.000	No Ice	14.450	14.450	1.300
Platform			0.000			1/2" Ice	19.000	19.000	1.690
(AT&T - Existing)			0.000			1" Ice	23.550	23.550	2.080
LPA-80080-6CF	B	From Face	3.500	0.000	115.000	No Ice	4.326	8.619	0.021
(Verizon - Existing)			6.000			1/2" Ice	4.764	9.075	0.069
			0.000			1" Ice	5.210	9.539	0.123
JAHH-65B-R3B	B	From Face	3.500	0.000	115.000	No Ice	9.113	5.983	0.063
(Verizon - Existing)			4.000			1/2" Ice	9.579	6.442	0.121
			0.000			1" Ice	10.052	6.909	0.185
JAHH-65B-R3B	B	From Face	3.500	0.000	115.000	No Ice	9.113	5.983	0.063
(Verizon - Existing)			0.000			1/2" Ice	9.579	6.442	0.121
			0.000			1" Ice	10.052	6.909	0.185
LPA-80080-6CF	B	From Face	3.500	0.000	115.000	No Ice	4.326	8.619	0.021
(Verizon - Existing)			-6.000			1/2" Ice	4.764	9.075	0.069
			0.000			1" Ice	5.210	9.539	0.123
LPA-80080-6CF	C	From Face	3.500	0.000	115.000	No Ice	4.326	8.619	0.021
(Verizon - Existing)			6.000			1/2" Ice	4.764	9.075	0.069
			0.000			1" Ice	5.210	9.539	0.123
JAHH-65B-R3B	C	From Face	3.500	0.000	115.000	No Ice	9.113	5.983	0.063
(Verizon - Existing)			4.000			1/2" Ice	9.579	6.442	0.121
			0.000			1" Ice	10.052	6.909	0.185
JAHH-65B-R3B	C	From Face	3.500	0.000	115.000	No Ice	9.113	5.983	0.063
(Verizon - Existing)			0.000			1/2" Ice	9.579	6.442	0.121
			0.000			1" Ice	10.052	6.909	0.185
LPA-80080-6CF	C	From Face	3.500	0.000	115.000	No Ice	4.326	8.619	0.021
(Verizon - Existing)			-6.000			1/2" Ice	4.764	9.075	0.069
			0.000			1" Ice	5.210	9.539	0.123
LPA-80080-6CF	D	From Face	3.500	0.000	115.000	No Ice	4.326	8.619	0.021
(Verizon - Existing)			6.000			1/2" Ice	4.764	9.075	0.069
			0.000			1" Ice	5.210	9.539	0.123
JAHH-65B-R3B	D	From Face	3.500	0.000	115.000	No Ice	9.113	5.983	0.063
(Verizon - Existing)			4.000			1/2" Ice	9.579	6.442	0.121
			0.000			1" Ice	10.052	6.909	0.185
JAHH-65B-R3B	D	From Face	3.500	0.000	115.000	No Ice	9.113	5.983	0.063

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Verizon - Existing)			0.000			1/2" Ice	9.579	6.442	0.121
			0.000			1" Ice	10.052	6.909	0.185
LPA-80080-6CF	D	From Face	3.500	0.000	115.000	No Ice	4.326	8.619	0.021
(Verizon - Existing)			-6.000			1/2" Ice	4.764	9.075	0.069
			0.000			1" Ice	5.210	9.539	0.123
RRH2x60-AWS	B	From Face	3.500	0.000	115.000	No Ice	3.357	2.025	0.055
(Verizon - Existing)			4.000			1/2" Ice	3.614	2.258	0.078
			0.000			1" Ice	3.878	2.498	0.105
RRH2x60-AWS	C	From Face	3.500	0.000	115.000	No Ice	3.357	2.025	0.055
(Verizon - Existing)			4.000			1/2" Ice	3.614	2.258	0.078
			0.000			1" Ice	3.878	2.498	0.105
RRH2x60-AWS	D	From Face	3.500	0.000	115.000	No Ice	3.357	2.025	0.055
(Verizon - Existing)			4.000			1/2" Ice	3.614	2.258	0.078
			0.000			1" Ice	3.878	2.498	0.105
RRH2x60-PCS	B	From Face	3.500	0.000	115.000	No Ice	0.000	1.547	0.055
(Verizon - Existing)			-4.000			1/2" Ice	0.000	1.738	0.073
			0.000			1" Ice	0.000	1.939	0.093
RRH2x60-PCS	C	From Face	3.500	0.000	115.000	No Ice	0.000	1.547	0.055
(Verizon - Existing)			-4.000			1/2" Ice	0.000	1.738	0.073
			0.000			1" Ice	0.000	1.939	0.093
RRH2x60-PCS	D	From Face	3.500	0.000	115.000	No Ice	0.000	1.547	0.055
(Verizon - Existing)			-4.000			1/2" Ice	0.000	1.738	0.073
			0.000			1" Ice	0.000	1.939	0.093
RRH2x60-07-U	B	From Face	3.500	0.000	115.000	No Ice	0.000	1.633	0.050
(Verizon - Existing)			0.000			1/2" Ice	0.000	1.826	0.068
			0.000			1" Ice	0.000	2.027	0.089
RRH2x60-07-U	C	From Face	3.500	0.000	115.000	No Ice	0.000	1.633	0.050
(Verizon - Existing)			0.000			1/2" Ice	0.000	1.826	0.068
			0.000			1" Ice	0.000	2.027	0.089
RRH2x60-07-U	D	From Face	3.500	0.000	115.000	No Ice	0.000	1.633	0.050
(Verizon - Existing)			0.000			1/2" Ice	0.000	1.826	0.068
			0.000			1" Ice	0.000	2.027	0.089
DB-T1-6Z-8AB-0Z	D	From Face	3.500	0.000	115.000	No Ice	4.800	2.000	0.044
(Verizon - Existing)			0.000			1/2" Ice	5.070	2.193	0.080
			0.000			1" Ice	5.348	2.393	0.120
DB-T1-6Z-8AB-0Z	C	From Face	3.500	0.000	115.000	No Ice	4.800	2.000	0.044
(Verizon - Existing)			0.000			1/2" Ice	5.070	2.193	0.080
			0.000			1" Ice	5.348	2.393	0.120
Valmont 13' Low Profile	D	From Face	2.000	0.000	113.000	No Ice	15.700	15.700	1.300
Platform			0.000			1/2" Ice	20.100	20.100	1.765
(Verizon - Existing)			0.000			1" Ice	24.500	24.500	2.230
AIR32	A	From Face	3.500	0.000	106.500	No Ice	6.510	4.712	0.133
(T-Mobile - Proposed)			-4.000			1/2" Ice	6.887	5.068	0.179
			0.000			1" Ice	7.271	5.431	0.230
APXVAA24_43	A	From Face	3.500	0.000	105.000	No Ice	20.243	8.733	0.125
(T-Mobile - Proposed)			0.000			1/2" Ice	20.890	9.330	0.237
			0.000			1" Ice	21.544	9.935	0.357
APX16DWV-16DWVS-E-A	A	From Face	3.500	0.000	106.500	No Ice	6.460	2.150	0.041
20			4.000			1/2" Ice	6.833	2.490	0.074
(T-Mobile - Proposed)			0.000			1" Ice	7.214	2.837	0.112
(2) MI-554nn Diplexer	A	From Face	3.500	0.000	105.000	No Ice	0.626	0.302	0.016
(T-Mobile - Proposed)			0.000			1/2" Ice	0.731	0.372	0.023
			0.000			1" Ice	0.843	0.450	0.031
(2) RRUS-11	A	From Face	3.500	0.000	105.000	No Ice	2.566	1.068	0.050
(T-Mobile - Proposed)			0.000			1/2" Ice	2.765	1.211	0.070
			0.000			1" Ice	2.971	1.361	0.092
B14 4478	A	From Face	3.500	0.000	105.000	No Ice	1.627	0.906	0.060

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(T-Mobile - Proposed)			0.000			1/2" Ice	1.786	1.033	0.074
			0.000			1" Ice	1.953	1.168	0.091
AIR32	B	From Face	3.500	0.000	106.500	No Ice	6.510	4.712	0.133
(T-Mobile - Proposed)			-4.000			1/2" Ice	6.887	5.068	0.179
			0.000			1" Ice	7.271	5.431	0.230
APXVAA24_43	B	From Face	3.500	0.000	105.000	No Ice	20.243	8.733	0.125
(T-Mobile - Proposed)			0.000			1/2" Ice	20.890	9.330	0.237
			0.000			1" Ice	21.544	9.935	0.357
APX16DWV-16DWVS-E-A	B	From Face	3.500	0.000	106.500	No Ice	6.460	2.150	0.041
20			4.000			1/2" Ice	6.833	2.490	0.074
(T-Mobile - Proposed)			0.000			1" Ice	7.214	2.837	0.112
(2) MI-554nn Diplexer	B	From Face	3.500	0.000	105.000	No Ice	0.626	0.302	0.016
(T-Mobile - Proposed)			0.000			1/2" Ice	0.731	0.372	0.023
			0.000			1" Ice	0.843	0.450	0.031
(2) RRUS-11	B	From Face	3.500	0.000	105.000	No Ice	2.566	1.068	0.050
(T-Mobile - Proposed)			0.000			1/2" Ice	2.765	1.211	0.070
			0.000			1" Ice	2.971	1.361	0.092
B14 4478	B	From Face	3.500	0.000	105.000	No Ice	1.627	0.906	0.060
(T-Mobile - Proposed)			0.000			1/2" Ice	1.786	1.033	0.074
			0.000			1" Ice	1.953	1.168	0.091
AIR32	C	From Face	3.500	0.000	106.500	No Ice	6.510	4.712	0.133
(T-Mobile - Proposed)			-4.000			1/2" Ice	6.887	5.068	0.179
			0.000			1" Ice	7.271	5.431	0.230
APXVAA24_43	C	From Face	3.500	0.000	105.000	No Ice	20.243	8.733	0.125
(T-Mobile - Proposed)			0.000			1/2" Ice	20.890	9.330	0.237
			0.000			1" Ice	21.544	9.935	0.357
APX16DWV-16DWVS-E-A	C	From Face	3.500	0.000	106.500	No Ice	6.460	2.150	0.041
20			4.000			1/2" Ice	6.833	2.490	0.074
(T-Mobile - Proposed)			0.000			1" Ice	7.214	2.837	0.112
(2) MI-554nn Diplexer	C	From Face	3.500	0.000	105.000	No Ice	0.626	0.302	0.016
(T-Mobile - Proposed)			0.000			1/2" Ice	0.731	0.372	0.023
			0.000			1" Ice	0.843	0.450	0.031
(2) RRUS-11	C	From Face	3.500	0.000	105.000	No Ice	2.566	1.068	0.050
(T-Mobile - Proposed)			0.000			1/2" Ice	2.765	1.211	0.070
			0.000			1" Ice	2.971	1.361	0.092
B14 4478	C	From Face	3.500	0.000	105.000	No Ice	1.627	0.906	0.060
(T-Mobile - Proposed)			0.000			1/2" Ice	1.786	1.033	0.074
			0.000			1" Ice	1.953	1.168	0.091
AIR32	D	From Face	3.500	0.000	106.500	No Ice	6.510	4.712	0.133
(T-Mobile - Proposed)			-4.000			1/2" Ice	6.887	5.068	0.179
			0.000			1" Ice	7.271	5.431	0.230
APXVAA24_43	D	From Face	3.500	0.000	105.000	No Ice	20.243	8.733	0.125
(T-Mobile - Proposed)			0.000			1/2" Ice	20.890	9.330	0.237
			0.000			1" Ice	21.544	9.935	0.357
APX16DWV-16DWVS-E-A	D	From Face	3.500	0.000	106.500	No Ice	6.460	2.150	0.041
20			4.000			1/2" Ice	6.833	2.490	0.074
(T-Mobile - Proposed)			0.000			1" Ice	7.214	2.837	0.112
(2) MI-554nn Diplexer	D	From Face	3.500	0.000	105.000	No Ice	0.626	0.302	0.016
(T-Mobile - Proposed)			0.000			1/2" Ice	0.731	0.372	0.023
			0.000			1" Ice	0.843	0.450	0.031
(2) RRUS-11	D	From Face	3.500	0.000	105.000	No Ice	2.566	1.068	0.050
(T-Mobile - Proposed)			0.000			1/2" Ice	2.765	1.211	0.070
			0.000			1" Ice	2.971	1.361	0.092
B14 4478	D	From Face	3.500	0.000	105.000	No Ice	1.627	0.906	0.060
(T-Mobile - Proposed)			0.000			1/2" Ice	1.786	1.033	0.074
			0.000			1" Ice	1.953	1.168	0.091
GPS	D	From Face	3.500	0.000	105.000	No Ice	1.000	1.000	0.010

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(T-Mobile - Proposed)			0.000			1/2" Ice	1.500	1.500	0.015
			0.000			1" Ice	2.000	2.000	0.020
F4P-12W Quad Platform w/ Handrail	D	From Face	2.000	0.000	105.000	No Ice	35.000	35.000	2.500
			0.000			1/2" Ice	41.000	41.000	3.100
(T-Mobile - Proposed)			0.000			1" Ice	47.000	47.000	3.700

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
Andrew 2' w/Radome	C	Paraboloid w/Radome	From Leg	3.000	Worst		105.000	2.000	No Ice	3.142	0.070
(T-Mobile Proposed)				0.000					1/2" Ice	3.409	0.282
				0.000					1" Ice	3.676	0.494

Tower Pressures - No Ice

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z ksf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1	104.317	1.277	0.036	85.183	A	0.000	85.183	85.183	100.00	0.000	0.000
125.000-85.500					B	0.000	85.183		100.00	0.000	0.000
					C	0.000	85.183		100.00	0.000	0.000
					D	0.000	85.183		100.00	0.000	0.000
L2	61.781	1.144	0.032	134.755	A	0.000	134.755	134.755	100.00	0.000	0.000
85.500-39.420					B	0.000	134.755		100.00	0.000	0.000
					C	0.000	134.755		100.00	0.000	0.000
					D	0.000	134.755		100.00	0.000	0.000
L3	19.742	0.899	0.026	144.887	A	0.000	144.887	144.887	100.00	0.000	0.000
39.420-0.000					B	0.000	144.887		100.00	0.000	0.000
					C	0.000	144.887		100.00	0.000	0.000
					D	0.000	144.887		100.00	0.000	0.000

Tower Pressure - With Ice

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z ksf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1	104.317	1.277	0.008	2.104	99.032	A	0.000	99.032	99.032	100.00	0.000	0.000
125.000-85.500						B	0.000	99.032		100.00	0.000	0.000
						C	0.000	99.032		100.00	0.000	0.000
						D	0.000	99.032		100.00	0.000	0.000
L2	61.781	1.144	0.007	1.996	150.911	A	0.000	150.911	150.911	100.00	0.000	0.000
85.500-39.420						B	0.000	150.911		100.00	0.000	0.000
						C	0.000	150.911		100.00	0.000	0.000
						D	0.000	150.911		100.00	0.000	0.000
L3 39.420-0.000	19.742	0.899	0.006	1.781	158.003	A	0.000	158.003	158.003	100.00	0.000	0.000
						B	0.000	158.003		100.00	0.000	0.000
						C	0.000	158.003		100.00	0.000	0.000
						D	0.000	158.003		100.00	0.000	0.000

Tower Pressure - Service

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z ksf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1	104.317	1.277	0.010	85.183	A	0.000	85.183	85.183	100.00	0.000	0.000
125.000-85.50					B	0.000	85.183		100.00	0.000	0.000
0					C	0.000	85.183		100.00	0.000	0.000
					D	0.000	85.183		100.00	0.000	0.000
L2	61.781	1.144	0.009	134.755	A	0.000	134.755	134.755	100.00	0.000	0.000
85.500-39.420					B	0.000	134.755		100.00	0.000	0.000
					C	0.000	134.755		100.00	0.000	0.000
					D	0.000	134.755		100.00	0.000	0.000
L3	19.742	0.899	0.007	144.887	A	0.000	144.887	144.887	100.00	0.000	0.000
39.420-0.000					B	0.000	144.887		100.00	0.000	0.000
					C	0.000	144.887		100.00	0.000	0.000
					D	0.000	144.887		100.00	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	1.365	2.025	A	1	0.75	0.036	1	1	85.183	2.557	0.065	D
125.000-85.50			B	1	0.75		1	1	85.183			
0			C	1	0.75		1	1	85.183			
			D	1	0.75		1	1	85.183			
L2	1.829	5.195	A	1	0.75	0.032	1	1	134.755	3.611	0.078	D
85.500-39.420			B	1	0.75		1	1	134.755			
			C	1	0.75		1	1	134.755			
			D	1	0.75		1	1	134.755			
L3	1.446	8.844	A	1	0.75	0.026	1	1	144.887	3.106	0.079	D
39.420-0.000			B	1	0.75		1	1	144.887			
			C	1	0.75		1	1	144.887			
			D	1	0.75		1	1	144.887			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
Sum Weight:	4.641	16.064						OTM	551.191 kip-ft	9.275		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	1.365	2.025	A	1	0.75	0.036	1	1	85.183	2.557	0.065	D
125.000-85.50			B	1	0.75		1	1	85.183			
0			C	1	0.75		1	1	85.183			
			D	1	0.75		1	1	85.183			
L2	1.829	5.195	A	1	0.75	0.032	1	1	134.755	3.611	0.078	D
85.500-39.420			B	1	0.75		1	1	134.755			
			C	1	0.75		1	1	134.755			
			D	1	0.75		1	1	134.755			
L3	1.446	8.844	A	1	0.75	0.026	1	1	144.887	3.106	0.079	D
39.420-0.000			B	1	0.75		1	1	144.887			
			C	1	0.75		1	1	144.887			
			D	1	0.75		1	1	144.887			
Sum Weight:	4.641	16.064						OTM	551.191 kip-ft	9.275		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	1.365	4.859	A	1	1.2	0.008	1	1	99.032	1.014	0.026	D
125.000-85.50			B	1	1.2		1	1	99.032			
0			C	1	1.2		1	1	99.032			
			D	1	1.2		1	1	99.032			
L2	1.829	9.351	A	1	1.2	0.007	1	1	150.911	1.379	0.030	D
85.500-39.420			B	1	1.2		1	1	150.911			
			C	1	1.2		1	1	150.911			
			D	1	1.2		1	1	150.911			
L3	1.446	14.693	A	1	1.2	0.006	1	1	158.003	1.155	0.029	D
39.420-0.000			B	1	1.2		1	1	158.003			
			C	1	1.2		1	1	158.003			
			D	1	1.2		1	1	158.003			
Sum Weight:	4.641	28.902						OTM	213.744 kip-ft	3.548		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	1.365	4.859	A	1	1.2	0.008	1	1	99.032	1.014	0.026	D
125.000-85.50			B	1	1.2		1	1	99.032			
0			C	1	1.2		1	1	99.032			
			D	1	1.2		1	1	99.032			
L2	1.829	9.351	A	1	1.2	0.007	1	1	150.911	1.379	0.030	D
85.500-39.420			B	1	1.2		1	1	150.911			
			C	1	1.2		1	1	150.911			
			D	1	1.2		1	1	150.911			
L3	1.446	14.693	A	1	1.2	0.006	1	1	158.003	1.155	0.029	D
39.420-0.000			B	1	1.2		1	1	158.003			
			C	1	1.2		1	1	158.003			
			D	1	1.2		1	1	158.003			
Sum Weight:	4.641	28.902						OTM	213.744 kip-ft	3.548		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	1.365	2.025	A	1	0.75	0.010	1	1	85.183	0.702	0.018	D
125.000-85.50			B	1	0.75		1	1	85.183			
0			C	1	0.75		1	1	85.183			
			D	1	0.75		1	1	85.183			
L2	1.829	5.195	A	1	0.75	0.009	1	1	134.755	0.992	0.022	D
85.500-39.420			B	1	0.75		1	1	134.755			
			C	1	0.75		1	1	134.755			
			D	1	0.75		1	1	134.755			
L3	1.446	8.844	A	1	0.75	0.007	1	1	144.887	0.853	0.022	D
39.420-0.000			B	1	0.75		1	1	144.887			
			C	1	0.75		1	1	144.887			
			D	1	0.75		1	1	144.887			
Sum Weight:	4.641	16.064						OTM	151.342 kip-ft	2.547		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	1.365	2.025	A	1	0.75	0.010	1	1	85.183	0.702	0.018	D
125.000-85.50			B	1	0.75		1	1	85.183			
0			C	1	0.75		1	1	85.183			
			D	1	0.75		1	1	85.183			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L2	1.829	5.195	A	1	0.75	0.009	1	1	134.755	0.992	0.022	D
85.500-39.420			B	1	0.75		1	1	134.755			
			C	1	0.75		1	1	134.755			
			D	1	0.75		1	1	134.755			
L3	1.446	8.844	A	1	0.75	0.007	1	1	144.887	0.853	0.022	D
39.420-0.000			B	1	0.75		1	1	144.887			
			C	1	0.75		1	1	144.887			
			D	1	0.75		1	1	144.887			
Sum Weight:	4.641	16.064						OTM	151.342 kip-ft	2.547		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	13.682					
Bracing Weight	2.382					
Total Member Self-Weight	16.064			15.861	-3.045	
Total Weight	29.815			15.861	-3.045	
Wind 0 deg - No Ice		0.000	-20.951	-1853.396	-3.045	7.626
Wind 30 deg - No Ice		10.372	-18.144	-1602.963	-924.390	10.503
Wind 45 deg - No Ice		14.668	-14.815	-1305.903	-1306.023	10.907
Wind 60 deg - No Ice		17.965	-10.476	-918.768	-1598.861	10.567
Wind 90 deg - No Ice		20.744	0.000	15.861	-1845.734	7.798
Wind 120 deg - No Ice		17.965	10.476	950.489	-1598.861	2.941
Wind 135 deg - No Ice		14.668	14.815	1337.625	-1306.023	0.122
Wind 150 deg - No Ice		10.372	18.144	1634.685	-924.390	-2.705
Wind 180 deg - No Ice		0.000	20.951	1885.118	-3.045	-7.626
Wind 210 deg - No Ice		-10.372	18.144	1634.685	918.299	-10.503
Wind 225 deg - No Ice		-14.668	14.815	1337.625	1299.933	-10.907
Wind 240 deg - No Ice		-17.965	10.476	950.489	1592.771	-10.567
Wind 270 deg - No Ice		-20.744	0.000	15.861	1839.644	-7.798
Wind 300 deg - No Ice		-17.965	-10.476	-918.768	1592.771	-2.941
Wind 315 deg - No Ice		-14.668	-14.815	-1305.903	1299.933	-0.122
Wind 330 deg - No Ice		-10.372	-18.144	-1602.963	918.299	2.705
Member Ice	12.838					
Total Weight Ice	62.620			38.609	-16.193	
Wind 0 deg - Ice		0.000	-7.258	-597.975	-16.193	2.261
Wind 30 deg - Ice		3.616	-6.285	-512.689	-332.693	3.407
Wind 45 deg - Ice		5.113	-5.132	-411.524	-463.791	3.647
Wind 60 deg - Ice		6.262	-3.629	-279.683	-564.387	3.639
Wind 90 deg - Ice		7.231	0.000	38.609	-649.193	2.897
Wind 120 deg - Ice		6.262	3.629	356.901	-564.387	1.378
Wind 135 deg - Ice		5.113	5.132	488.742	-463.791	0.449
Wind 150 deg - Ice		3.616	6.285	589.907	-332.693	-0.510
Wind 180 deg - Ice		0.000	7.258	675.193	-16.193	-2.261
Wind 210 deg - Ice		-3.616	6.285	589.907	300.308	-3.407
Wind 225 deg - Ice		-5.113	5.132	488.742	431.406	-3.647
Wind 240 deg - Ice		-6.262	3.629	356.901	532.002	-3.639
Wind 270 deg - Ice		-7.231	0.000	38.609	616.808	-2.897
Wind 300 deg - Ice		-6.262	-3.629	-279.683	532.002	-1.378
Wind 315 deg - Ice		-5.113	-5.132	-411.524	431.406	-0.449

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 330 deg - Ice		-3.616	-6.285	-512.689	300.308	0.510
Total Weight	29.815			15.861	-3.045	
Wind 0 deg - Service		0.000	-5.753	-497.386	-3.045	2.094
Wind 30 deg - Service		2.848	-4.982	-428.624	-256.021	2.884
Wind 45 deg - Service		4.027	-4.068	-347.059	-360.807	2.995
Wind 60 deg - Service		4.933	-2.876	-240.763	-441.212	2.901
Wind 90 deg - Service		5.696	0.000	15.861	-508.997	2.141
Wind 120 deg - Service		4.933	2.876	272.484	-441.212	0.807
Wind 135 deg - Service		4.027	4.068	378.781	-360.807	0.033
Wind 150 deg - Service		2.848	4.982	460.346	-256.021	-0.743
Wind 180 deg - Service		0.000	5.753	529.108	-3.045	-2.094
Wind 210 deg - Service		-2.848	4.982	460.346	249.931	-2.884
Wind 225 deg - Service		-4.027	4.068	378.781	354.717	-2.995
Wind 240 deg - Service		-4.933	2.876	272.484	435.122	-2.901
Wind 270 deg - Service		-5.696	0.000	15.861	502.907	-2.141
Wind 300 deg - Service		-4.933	-2.876	-240.763	435.122	-0.807
Wind 315 deg - Service		-4.027	-4.068	-347.059	354.717	-0.033
Wind 330 deg - Service		-2.848	-4.982	-428.624	249.931	0.743

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 45 deg - No Ice
7	0.9 Dead+1.6 Wind 45 deg - No Ice
8	1.2 Dead+1.6 Wind 60 deg - No Ice
9	0.9 Dead+1.6 Wind 60 deg - No Ice
10	1.2 Dead+1.6 Wind 90 deg - No Ice
11	0.9 Dead+1.6 Wind 90 deg - No Ice
12	1.2 Dead+1.6 Wind 120 deg - No Ice
13	0.9 Dead+1.6 Wind 120 deg - No Ice
14	1.2 Dead+1.6 Wind 135 deg - No Ice
15	0.9 Dead+1.6 Wind 135 deg - No Ice
16	1.2 Dead+1.6 Wind 150 deg - No Ice
17	0.9 Dead+1.6 Wind 150 deg - No Ice
18	1.2 Dead+1.6 Wind 180 deg - No Ice
19	0.9 Dead+1.6 Wind 180 deg - No Ice
20	1.2 Dead+1.6 Wind 210 deg - No Ice
21	0.9 Dead+1.6 Wind 210 deg - No Ice
22	1.2 Dead+1.6 Wind 225 deg - No Ice
23	0.9 Dead+1.6 Wind 225 deg - No Ice
24	1.2 Dead+1.6 Wind 240 deg - No Ice
25	0.9 Dead+1.6 Wind 240 deg - No Ice
26	1.2 Dead+1.6 Wind 270 deg - No Ice
27	0.9 Dead+1.6 Wind 270 deg - No Ice
28	1.2 Dead+1.6 Wind 300 deg - No Ice
29	0.9 Dead+1.6 Wind 300 deg - No Ice
30	1.2 Dead+1.6 Wind 315 deg - No Ice
31	0.9 Dead+1.6 Wind 315 deg - No Ice
32	1.2 Dead+1.6 Wind 330 deg - No Ice
33	0.9 Dead+1.6 Wind 330 deg - No Ice

Comb. No.	Description
34	1.2 Dead+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
39	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
40	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
41	1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp
42	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
43	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
44	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
45	1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp
46	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
47	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
48	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
49	1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp
50	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
51	Dead+Wind 0 deg - Service
52	Dead+Wind 30 deg - Service
53	Dead+Wind 45 deg - Service
54	Dead+Wind 60 deg - Service
55	Dead+Wind 90 deg - Service
56	Dead+Wind 120 deg - Service
57	Dead+Wind 135 deg - Service
58	Dead+Wind 150 deg - Service
59	Dead+Wind 180 deg - Service
60	Dead+Wind 210 deg - Service
61	Dead+Wind 225 deg - Service
62	Dead+Wind 240 deg - Service
63	Dead+Wind 270 deg - Service
64	Dead+Wind 300 deg - Service
65	Dead+Wind 315 deg - Service
66	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	125 - 85.5	Pole	Max Tension	34	0.000	0.000	0.000
			Max. Compression	34	-36.972	-18.477	-45.825
			Max. Mx	10	-12.349	-506.839	-18.952
			Max. My	18	-12.251	-3.144	-535.617
			Max. Vy	10	23.195	-506.839	-18.952
			Max. Vx	18	23.559	-3.144	-535.617
			Max. Torque	6			-17.357
L2	85.5 - 39.42	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	34	-49.233	-20.050	-49.722
			Max. Mx	10	-21.230	-1667.220	-20.176
			Max. My	18	-21.192	-3.841	-1712.124
			Max. Vy	10	28.361	-1667.220	-20.176
			Max. Vx	18	28.710	-3.841	-1712.124
			Max. Torque	7			-17.310
L3	39.42 - 0	Pole	Max Tension	42	127.510	-162.652	-288.773
			Max. Compression	34	-56.639	-20.322	-50.394
			Max. Mx	10	-26.703	-2257.267	-20.378
			Max. My	18	-26.687	-3.939	-2309.070
			Max. Vy	10	30.564	-2257.267	-20.378
			Max. Vx	18	30.904	-3.939	-2309.070

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
	0 - 25	Reinforcing	Max. Torque	6			-17.288
			Max Tension	18	274.071	-6.301	0.000
			Max. Compression	18	-283.573	0.000	-0.000
			Max. Mx	18	274.071	-6.301	0.000
			Max. My	10	269.649	0.042	-0.147
			Max. Vy	18	-0.259	-6.301	0.000
			Max. Vx	10	-0.012	0.042	-0.147

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	1	18.487	0.006	0.025
	Max. H_x	27	10.147	28.393	0.028
	Max. H_z	3	10.082	0.012	29.658
	Max. M_x	2	1986.707	0.014	29.654
	Max. M_z	10	1968.070	-28.360	0.036
	Max. Torsion	23	17.018	20.089	-20.926
	Min. Vert	42	-119.365	-3.212	-5.778
	Min. H_x	11	10.118	-28.383	0.028
	Min. H_z	19	9.932	0.012	-29.616
	Min. M_x	18	-2010.521	0.014	-29.598
	Min. M_z	26	-1963.509	28.374	0.036
	Min. Torsion	6	-17.281	-20.047	20.981
Reinf @ Azimuth 90 deg	Max. Vert	10	279.042	-0.017	0.017
	Max. H_x	26	-268.094	4.887	-0.019
	Max. H_z	14	198.915	-0.541	1.482
	Min. Vert	26	-268.094	4.887	-0.019
	Min. H_x	39	111.732	-0.782	0.023
	Min. H_z	6	198.884	-0.541	-1.455
Reinf @ Azimuth 0 deg	Max. Vert	2	279.350	-0.000	-0.235
	Max. H_x	6	198.404	1.276	0.367
	Max. H_z	35	104.456	0.007	0.703
	Min. Vert	18	-273.315	-0.006	-4.788
	Min. H_x	30	198.383	-1.275	0.368
	Min. H_z	18	-273.315	-0.006	-4.788
Reinf @ Azimuth 270 deg	Max. Vert	26	278.226	0.024	0.017
	Max. H_x	47	107.493	0.766	0.022
	Max. H_z	22	198.117	0.543	1.473
	Min. Vert	10	-268.890	-4.908	-0.019
	Min. H_x	10	-268.890	-4.908	-0.019
	Min. H_z	30	198.084	0.543	-1.447
Reinf @ Azimuth 180 deg	Max. Vert	18	283.573	-0.000	0.275
	Max. H_x	14	202.616	1.307	-0.349
	Max. H_z	2	-269.196	-0.006	4.682
	Min. Vert	2	-269.196	-0.006	4.682
	Min. H_x	22	202.596	-1.305	-0.349
	Min. H_z	43	114.914	0.007	-0.732

Tower Mast Reaction Summary

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead Only	29.815	0.000	0.000	16.850	-3.238	0.000
1.2 Dead+1.6 Wind 0 deg - No Ice	35.778	-0.000	-33.522	-3074.501	-3.772	11.971
0.9 Dead+1.6 Wind 0 deg - No Ice	26.833	-0.000	-33.522	-3051.497	-2.775	11.978
1.2 Dead+1.6 Wind 30 deg - No Ice	35.778	16.595	-29.031	-2659.971	-1529.124	16.613
0.9 Dead+1.6 Wind 30 deg - No Ice	26.833	16.595	-29.031	-2640.752	-1514.172	16.615
1.2 Dead+1.6 Wind 45 deg - No Ice	35.778	23.469	-23.703	-2168.190	-2160.994	17.271
0.9 Dead+1.6 Wind 45 deg - No Ice	26.833	23.469	-23.703	-2153.475	-2140.257	17.272
1.2 Dead+1.6 Wind 60 deg - No Ice	35.778	28.744	-16.761	-1527.242	-2645.870	16.729
0.9 Dead+1.6 Wind 60 deg - No Ice	26.833	28.744	-16.761	-1518.401	-2620.694	16.729
1.2 Dead+1.6 Wind 90 deg - No Ice	35.778	33.190	-0.000	20.243	-3054.645	12.287
0.9 Dead+1.6 Wind 90 deg - No Ice	26.833	33.190	-0.000	14.899	-3025.731	12.285
1.2 Dead+1.6 Wind 120 deg - No Ice	35.778	28.744	16.761	1567.695	-2645.820	4.554
0.9 Dead+1.6 Wind 120 deg - No Ice	26.833	28.744	16.761	1548.177	-2620.661	4.551
1.2 Dead+1.6 Wind 135 deg - No Ice	35.778	23.469	23.703	2208.610	-2160.935	0.110
0.9 Dead+1.6 Wind 135 deg - No Ice	26.833	23.469	23.703	2183.230	-2140.218	0.105
1.2 Dead+1.6 Wind 150 deg - No Ice	35.778	16.595	29.031	2700.358	-1529.071	-4.315
0.9 Dead+1.6 Wind 150 deg - No Ice	26.833	16.595	29.031	2670.485	-1514.137	-4.323
1.2 Dead+1.6 Wind 180 deg - No Ice	35.778	-0.000	33.522	3114.856	-3.764	-11.950
0.9 Dead+1.6 Wind 180 deg - No Ice	26.833	-0.000	33.522	3081.208	-2.771	-11.962
1.2 Dead+1.6 Wind 210 deg - No Ice	35.778	-16.595	29.031	2700.268	1521.486	-16.390
0.9 Dead+1.6 Wind 210 deg - No Ice	26.833	-16.595	29.031	2670.418	1508.554	-16.402
1.2 Dead+1.6 Wind 225 deg - No Ice	35.778	-23.469	23.703	2208.506	2153.293	-17.023
0.9 Dead+1.6 Wind 225 deg - No Ice	26.833	-23.469	23.703	2183.153	2134.593	-17.033
1.2 Dead+1.6 Wind 240 deg - No Ice	35.778	-28.744	16.761	1567.606	2638.122	-16.519
0.9 Dead+1.6 Wind 240 deg - No Ice	26.833	-28.744	16.761	1548.111	2614.994	-16.526
1.2 Dead+1.6 Wind 270 deg - No Ice	35.778	-33.190	-0.000	20.246	3046.888	-12.291
0.9 Dead+1.6 Wind 270 deg - No Ice	26.833	-33.190	-0.000	14.901	3020.022	-12.288
1.2 Dead+1.6 Wind 300 deg - No Ice	35.778	-28.744	-16.761	-1527.148	2638.165	-4.759
0.9 Dead+1.6 Wind 300 deg - No Ice	26.833	-28.744	-16.761	-1518.332	2615.023	-4.750
1.2 Dead+1.6 Wind 315 deg -	35.778	-23.469	-23.703	-2168.082	2153.342	-0.341

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
No Ice 0.9 Dead+1.6 Wind 315 deg - No Ice	26.833	-23.469	-23.703	-2153.396	2134.626	-0.331
1.2 Dead+1.6 Wind 330 deg - No Ice	35.778	-16.595	-29.031	-2659.877	1521.526	4.123
0.9 Dead+1.6 Wind 330 deg - No Ice	26.833	-16.595	-29.031	-2640.684	1508.581	4.133
1.2 Dead+1.0 Ice+1.0 Temp	69.544	-0.000	-0.000	50.690	-20.441	0.002
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	69.544	-0.000	-7.258	-646.709	-20.404	2.233
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	69.544	3.616	-6.285	-553.292	-367.097	3.375
1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp	69.544	5.113	-5.132	-442.477	-510.702	3.615
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	69.544	6.262	-3.629	-298.059	-620.893	3.608
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	69.544	7.231	-0.000	50.598	-713.784	2.872
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	69.544	6.262	3.629	399.253	-620.880	1.367
1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp	69.544	5.113	5.132	543.669	-510.685	0.449
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	69.544	3.616	6.285	654.482	-367.079	-0.499
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	69.544	-0.000	7.258	747.902	-20.390	-2.226
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	69.544	-3.616	6.285	654.483	326.295	-3.358
1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp	69.544	-5.113	5.132	543.671	469.896	-3.597
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	69.544	-6.262	3.629	399.257	580.084	-3.593
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	69.544	-7.231	-0.000	50.609	672.978	-2.869
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	69.544	-6.262	-3.629	-298.044	580.083	-1.374
1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp	69.544	-5.113	-5.132	-442.463	469.892	-0.457
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	69.544	-3.616	-6.285	-553.281	326.288	0.493
Dead+Wind 0 deg - Service	29.815	0.000	-5.753	-511.982	-3.241	2.091
Dead+Wind 30 deg - Service	29.815	2.848	-4.982	-441.130	-263.898	2.886
Dead+Wind 45 deg - Service	29.815	4.027	-4.068	-357.085	-371.866	2.998
Dead+Wind 60 deg - Service	29.815	4.933	-2.876	-247.555	-454.713	2.905
Dead+Wind 90 deg - Service	29.815	5.696	0.000	16.874	-524.556	2.144
Dead+Wind 120 deg - Service	29.815	4.933	2.876	281.302	-454.711	0.808
Dead+Wind 135 deg - Service	29.815	4.027	4.068	390.831	-371.864	0.034
Dead+Wind 150 deg - Service	29.815	2.848	4.982	474.875	-263.896	-0.742
Dead+Wind 180 deg - Service	29.815	0.000	5.753	545.727	-3.240	-2.090
Dead+Wind 210 deg - Service	29.815	-2.848	4.982	474.873	257.415	-2.879
Dead+Wind 225 deg - Service	29.815	-4.027	4.068	390.829	365.382	-2.990
Dead+Wind 240 deg - Service	29.815	-4.933	2.876	281.300	448.228	-2.899
Dead+Wind 270 deg - Service	29.815	-5.696	0.000	16.874	518.070	-2.144
Dead+Wind 300 deg - Service	29.815	-4.933	-2.876	-247.552	448.227	-0.814
Dead+Wind 315 deg - Service	29.815	-4.027	-4.068	-357.081	365.382	-0.041
Dead+Wind 330 deg - Service	29.815	-2.848	-4.982	-441.126	257.415	0.736

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.000	-29.815	0.000	0.000	29.815	-0.000	0.000%
2	0.000	-35.778	-33.522	0.000	35.778	33.522	0.000%
3	0.000	-26.833	-33.522	0.000	26.833	33.522	0.000%
4	16.595	-35.778	-29.031	-16.595	35.778	29.031	0.000%
5	16.595	-26.833	-29.031	-16.595	26.833	29.031	0.000%
6	23.469	-35.778	-23.703	-23.469	35.778	23.703	0.000%
7	23.469	-26.833	-23.703	-23.469	26.833	23.703	0.000%
8	28.744	-35.778	-16.761	-28.744	35.778	16.761	0.000%
9	28.744	-26.833	-16.761	-28.744	26.833	16.761	0.000%
10	33.190	-35.778	0.000	-33.190	35.778	0.000	0.000%
11	33.190	-26.833	0.000	-33.190	26.833	0.000	0.000%
12	28.744	-35.778	16.761	-28.744	35.778	-16.761	0.000%
13	28.744	-26.833	16.761	-28.744	26.833	-16.761	0.000%
14	23.469	-35.778	23.703	-23.469	35.778	-23.703	0.000%
15	23.469	-26.833	23.703	-23.469	26.833	-23.703	0.000%
16	16.595	-35.778	29.031	-16.595	35.778	-29.031	0.000%
17	16.595	-26.833	29.031	-16.595	26.833	-29.031	0.000%
18	0.000	-35.778	33.522	0.000	35.778	-33.522	0.000%
19	0.000	-26.833	33.522	0.000	26.833	-33.522	0.000%
20	-16.595	-35.778	29.031	16.595	35.778	-29.031	0.000%
21	-16.595	-26.833	29.031	16.595	26.833	-29.031	0.000%
22	-23.469	-35.778	23.703	23.469	35.778	-23.703	0.000%
23	-23.469	-26.833	23.703	23.469	26.833	-23.703	0.000%
24	-28.744	-35.778	16.761	28.744	35.778	-16.761	0.000%
25	-28.744	-26.833	16.761	28.744	26.833	-16.761	0.000%
26	-33.190	-35.778	0.000	33.190	35.778	0.000	0.000%
27	-33.190	-26.833	0.000	33.190	26.833	0.000	0.000%
28	-28.744	-35.778	-16.761	28.744	35.778	16.761	0.000%
29	-28.744	-26.833	-16.761	28.744	26.833	16.761	0.000%
30	-23.469	-35.778	-23.703	23.469	35.778	23.703	0.000%
31	-23.469	-26.833	-23.703	23.469	26.833	23.703	0.000%
32	-16.595	-35.778	-29.031	16.595	35.778	29.031	0.000%
33	-16.595	-26.833	-29.031	16.595	26.833	29.031	0.000%
34	0.000	-69.544	0.000	0.000	69.544	0.000	0.000%
35	0.000	-69.544	-7.258	0.000	69.544	7.258	0.000%
36	3.616	-69.544	-6.285	-3.616	69.544	6.285	0.000%
37	5.113	-69.544	-5.132	-5.113	69.544	5.132	0.000%
38	6.262	-69.544	-3.629	-6.262	69.544	3.629	0.000%
39	7.231	-69.544	0.000	-7.231	69.544	0.000	0.000%
40	6.262	-69.544	3.629	-6.262	69.544	-3.629	0.000%
41	5.113	-69.544	5.132	-5.113	69.544	-5.132	0.000%
42	3.616	-69.544	6.285	-3.616	69.544	-6.285	0.000%
43	0.000	-69.544	7.258	0.000	69.544	-7.258	0.000%
44	-3.616	-69.544	6.285	3.616	69.544	-6.285	0.000%
45	-5.113	-69.544	5.132	5.113	69.544	-5.132	0.000%
46	-6.262	-69.544	3.629	6.262	69.544	-3.629	0.000%
47	-7.231	-69.544	0.000	7.231	69.544	0.000	0.000%
48	-6.262	-69.544	-3.629	6.262	69.544	3.629	0.000%
49	-5.113	-69.544	-5.132	5.113	69.544	5.132	0.000%
50	-3.616	-69.544	-6.285	3.616	69.544	6.285	0.000%
51	0.000	-29.815	-5.753	0.000	29.815	5.753	0.000%
52	2.848	-29.815	-4.982	-2.848	29.815	4.982	0.000%
53	4.027	-29.815	-4.068	-4.027	29.815	4.068	0.000%
54	4.933	-29.815	-2.876	-4.933	29.815	2.876	0.000%
55	5.696	-29.815	0.000	-5.696	29.815	0.000	0.000%
56	4.933	-29.815	2.876	-4.933	29.815	-2.876	0.000%
57	4.027	-29.815	4.068	-4.027	29.815	-4.068	0.000%
58	2.848	-29.815	4.982	-2.848	29.815	-4.982	0.000%
59	0.000	-29.815	5.753	0.000	29.815	-5.753	0.000%
60	-2.848	-29.815	4.982	2.848	29.815	-4.982	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
61	-4.027	-29.815	4.068	4.027	29.815	-4.068	0.000%
62	-4.933	-29.815	2.876	4.933	29.815	-2.876	0.000%
63	-5.696	-29.815	0.000	5.696	29.815	0.000	0.000%
64	-4.933	-29.815	-2.876	4.933	29.815	2.876	0.000%
65	-4.027	-29.815	-4.068	4.027	29.815	4.068	0.000%
66	-2.848	-29.815	-4.982	2.848	29.815	4.982	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00006084
2	Yes	6	0.00000001	0.00004467
3	Yes	5	0.00000001	0.00040527
4	Yes	6	0.00000001	0.00008742
5	Yes	5	0.00000001	0.00080174
6	Yes	6	0.00000001	0.00007544
7	Yes	5	0.00000001	0.00070762
8	Yes	6	0.00000001	0.00005166
9	Yes	5	0.00000001	0.00049546
10	Yes	6	0.00000001	0.00004676
11	Yes	5	0.00000001	0.00042358
12	Yes	6	0.00000001	0.00004829
13	Yes	5	0.00000001	0.00043785
14	Yes	6	0.00000001	0.00004065
15	Yes	5	0.00000001	0.00037230
16	Yes	6	0.00000001	0.00004796
17	Yes	5	0.00000001	0.00043518
18	Yes	6	0.00000001	0.00004367
19	Yes	5	0.00000001	0.00039975
20	Yes	6	0.00000001	0.00004872
21	Yes	5	0.00000001	0.00046989
22	Yes	6	0.00000001	0.00007279
23	Yes	5	0.00000001	0.00068506
24	Yes	6	0.00000001	0.00008664
25	Yes	5	0.00000001	0.00079611
26	Yes	6	0.00000001	0.00004696
27	Yes	5	0.00000001	0.00042469
28	Yes	5	0.00000001	0.00077746
29	Yes	5	0.00000001	0.00028735
30	Yes	6	0.00000001	0.00004069
31	Yes	5	0.00000001	0.00037112
32	Yes	5	0.00000001	0.00078099
33	Yes	5	0.00000001	0.00028573
34	Yes	5	0.00000001	0.00074920
35	Yes	6	0.00000001	0.00043764
36	Yes	6	0.00000001	0.00049190
37	Yes	6	0.00000001	0.00051604
38	Yes	6	0.00000001	0.00053265
39	Yes	6	0.00000001	0.00056813
40	Yes	6	0.00000001	0.00061300
41	Yes	6	0.00000001	0.00062388
42	Yes	6	0.00000001	0.00062289
43	Yes	6	0.00000001	0.00060489
44	Yes	6	0.00000001	0.00059812
45	Yes	6	0.00000001	0.00059019

46	Yes	6	0.00000001	0.00056912
47	Yes	6	0.00000001	0.00049908
48	Yes	6	0.00000001	0.00045652
49	Yes	6	0.00000001	0.00044633
50	Yes	6	0.00000001	0.00043559
51	Yes	5	0.00000001	0.00007753
52	Yes	5	0.00000001	0.00011201
53	Yes	5	0.00000001	0.00011245
54	Yes	5	0.00000001	0.00010512
55	Yes	5	0.00000001	0.00008631
56	Yes	5	0.00000001	0.00005480
57	Yes	5	0.00000001	0.00004438
58	Yes	5	0.00000001	0.00005463
59	Yes	5	0.00000001	0.00008825
60	Yes	5	0.00000001	0.00011209
61	Yes	5	0.00000001	0.00012101
62	Yes	5	0.00000001	0.00012103
63	Yes	5	0.00000001	0.00008408
64	Yes	4	0.00000001	0.00099475
65	Yes	4	0.00000001	0.00090760
66	Yes	4	0.00000001	0.00098012

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	125 - 85.5	17.388	59	1.299	0.036
L2	90 - 39.42	8.568	59	0.998	0.017
L3	45 - 0	1.780	59	0.408	0.005

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
130.000	4-bay dipole	59	17.388	1.299	0.036	28423
123.000	(2) 7770.00	59	16.850	1.285	0.035	28423
121.000	Andrew 12'-6" Low Profile Platform	59	16.312	1.270	0.033	28423
115.000	LPA-80080-6CF	59	14.710	1.225	0.030	14211
113.000	Valmont 13' Low Profile Platform	59	14.182	1.210	0.029	11843
106.500	AIR32	59	12.496	1.157	0.025	7681
105.000	Andrew 2' w/Radome	59	12.116	1.145	0.024	7105

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	125 - 85.5	95.723	18	6.948	0.210
L2	90 - 39.42	48.075	18	5.529	0.096

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L3	45 - 0	10.105	18	2.310	0.028

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
130.000	4-bay dipole	18	95.723	6.948	0.210	5865
123.000	(2) 7770.00	18	92.830	6.884	0.203	5865
121.000	Andrew 12'-6" Low Profile Platform	18	89.940	6.819	0.195	5865
115.000	LPA-80080-6CF	18	81.325	6.620	0.174	2931
113.000	Valmont 13' Low Profile Platform	18	78.482	6.551	0.167	2442
106.500	AIR32	18	69.399	6.311	0.145	1582
105.000	Andrew 2' w/Radome	18	67.345	6.251	0.140	1463

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
L1	125 - 123.158	TP29.725x21.037x0.188	39.500	0.000	0.0	12.713	-0.178	904.725	0.000
	123.158 - 121.316					12.955	-0.970	916.299	0.001
	121.316 - 119.474					13.198	-2.529	927.660	0.003
	119.474 - 117.632					13.440	-2.686	938.809	0.003
	117.632 - 115.789					13.682	-2.844	949.745	0.003
	115.789 - 113.947					13.925	-3.645	960.470	0.004
	113.947 - 112.105					14.167	-5.269	970.982	0.005
	112.105 - 110.263					14.409	-5.440	981.282	0.006
	110.263 - 108.421					14.652	-5.616	991.370	0.006
	108.421 - 106.579					14.894	-5.795	1001.250	0.006
	106.579 - 104.737					15.136	-10.462	1010.910	0.010
	104.737 - 102.895					15.379	-10.662	1020.360	0.010
	102.895 - 101.053					15.621	-10.870	1029.600	0.011
	101.053 - 99.2105					15.863	-11.085	1038.630	0.011
	99.2105 -					16.106	-11.306	1047.440	0.011

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
	97.3684								
	97.3684 - 95.5263					16.348	-11.534	1056.040	0.011
	95.5263 - 93.6842					16.590	-11.767	1064.430	0.011
	93.6842 - 91.8421					16.833	-12.006	1072.610	0.011
	91.8421 - 90					17.075	-12.251	1080.570	0.011
	90 - 85.5					17.667	-5.388	1099.140	0.005
L2	90 - 85.5	TP39.486x28.36x0.281	50.580	0.000	0.0	26.080	-7.852	1908.870	0.004
	85.5 - 83.25					26.524	-13.631	1931.920	0.007
	83.25 - 81					26.968	-14.024	1954.640	0.007
	81 - 78.75					27.412	-14.424	1977.050	0.007
	78.75 - 76.5					27.856	-14.831	1999.140	0.007
	76.5 - 74.25					28.300	-15.245	2020.920	0.008
	74.25 - 72					28.744	-15.665	2042.380	0.008
	72 - 69.75					29.188	-16.092	2063.520	0.008
	69.75 - 67.5					29.632	-16.525	2084.340	0.008
	67.5 - 65.25					30.076	-16.965	2104.850	0.008
	65.25 - 63					30.521	-17.411	2125.040	0.008
	63 - 60.75					30.965	-17.863	2144.920	0.008
	60.75 - 58.5					31.409	-18.321	2164.470	0.008
	58.5 - 56.25					31.853	-18.785	2183.720	0.009
	56.25 - 54					32.297	-19.255	2202.640	0.009
	54 - 51.75					32.741	-19.730	2221.250	0.009
	51.75 - 49.5					33.185	-20.212	2239.540	0.009
	49.5 - 47.25					33.629	-20.699	2257.520	0.009
	47.25 - 45					34.073	-21.192	2275.170	0.009
	45 - 39.42					35.174	-11.130	2317.600	0.005
L3	45 - 39.42	TP47.593x37.696x0.313	45.000	0.000	0.0	38.490	-12.047	2659.650	0.005
	39.42 - 37.3453					38.945	-23.680	2679.560	0.009
	37.3453 - 35.2705					39.400	-24.173	2699.200	0.009
	35.2705 - 33.1958					39.855	-24.671	2718.570	0.009
	33.1958 - 31.1211					40.310	-25.174	2737.670	0.009
	31.1211 - 29.0463					40.765	-25.682	2756.500	0.009
	29.0463 - 26.9716					41.220	-26.194	2775.060	0.009
	26.9716 - 25					41.652	-26.687	2792.450	0.010
	25 - 24.8968					41.674	-9.214	2793.350	0.003
	24.8968 - 22.8221					42.129	-9.676	2811.380	0.003
	22.8221 - 20.7474					42.584	-10.162	2829.130	0.004
	20.7474 - 18.6726					43.039	-10.653	2846.620	0.004
	18.6726 - 16.5979					43.494	-11.148	2863.840	0.004
	16.5979 - 14.5232					43.949	-11.649	2880.780	0.004
	14.5232 - 12.4484					44.404	-12.154	2897.460	0.004
	12.4484 - 10.3737					44.859	-12.664	2913.870	0.004
	10.3737 - 8.29895					45.313	-13.179	2930.010	0.004

Section No.	Elevation	Size	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft		ft	ft		in^2	K	K	
	8.29895 - 6.22421					45.768	-13.699	2945.880	0.005
	6.22421 - 4.14947					46.223	-14.224	2961.480	0.005
	4.14947 - 2.07474					46.678	-14.753	2976.810	0.005
	2.07474 - 0					47.133	-15.287	2991.880	0.005

Pole Bending Design Data

Section No.	Elevation	Size	M_{ux}	ϕM_{nx}	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy}	ϕM_{ny}	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
	ft		kip-ft	kip-ft		kip-ft	kip-ft	
L1	125 - 123.158	TP29.725x21.037x0.188	6.138	393.478	0.016	0.000	393.478	0.000
	123.158 - 121.316		13.763	406.174	0.034	0.000	406.174	0.000
	121.316 - 119.474		26.771	418.968	0.064	0.000	418.968	0.000
	119.474 - 117.632		36.720	431.855	0.085	0.000	431.855	0.000
	117.632 - 115.789		47.027	444.828	0.106	0.000	444.828	0.000
	115.789 - 113.947		63.975	457.884	0.140	0.000	457.884	0.000
	113.947 - 112.105		90.477	471.016	0.192	0.000	471.016	0.000
	112.105 - 110.263		113.634	484.219	0.235	0.000	484.219	0.000
	110.263 - 108.421		137.161	497.488	0.276	0.000	497.488	0.000
	108.421 - 106.579		161.058	510.818	0.315	0.000	510.818	0.000
	106.579 - 104.737		200.242	524.202	0.382	0.000	524.202	0.000
	104.737 - 102.895		240.900	537.637	0.448	0.000	537.637	0.000
	102.895 - 101.053		281.921	551.116	0.512	0.000	551.116	0.000
	101.053 - 99.2105		323.303	564.633	0.573	0.000	564.633	0.000
	99.2105 - 97.3684		365.045	578.185	0.631	0.000	578.185	0.000
	97.3684 - 95.5263		407.148	591.766	0.688	0.000	591.766	0.000
	95.5263 - 93.6842		449.613	605.369	0.743	0.000	605.369	0.000
	93.6842 - 91.8421		492.439	618.991	0.796	0.000	618.991	0.000
	91.8421 - 90		535.626	632.625	0.847	0.000	632.625	0.000
	90 - 85.5		264.824	665.950	0.398	0.000	665.950	0.000
L2	90 - 85.5	TP39.486x28.36x0.281	378.041	1134.450	0.333	0.000	1134.450	0.000
	85.5 - 83.25		697.421	1167.883	0.597	0.000	1167.883	0.000
	83.25 - 81		752.549	1201.583	0.626	0.000	1201.583	0.000
	81 - 78.75		808.248	1235.558	0.654	0.000	1235.558	0.000
	78.75 - 76.5		864.517	1269.783	0.681	0.000	1269.783	0.000
	76.5 - 74.25		921.358	1304.258	0.706	0.000	1304.258	0.000

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
	74.25 - 72		978.775	1338.975	0.731	0.000	1338.975	0.000
	72 - 69.75		1036.750	1373.917	0.755	0.000	1373.917	0.000
	69.75 - 67.5		1095.308	1409.075	0.777	0.000	1409.075	0.000
	67.5 - 65.25		1154.425	1444.442	0.799	0.000	1444.442	0.000
	65.25 - 63		1214.117	1480.008	0.820	0.000	1480.008	0.000
	63 - 60.75		1274.383	1515.758	0.841	0.000	1515.758	0.000
	60.75 - 58.5		1335.208	1551.692	0.860	0.000	1551.692	0.000
	58.5 - 56.25		1396.608	1587.792	0.880	0.000	1587.792	0.000
	56.25 - 54		1458.575	1624.058	0.898	0.000	1624.058	0.000
	54 - 51.75		1521.108	1660.467	0.916	0.000	1660.467	0.000
	51.75 - 49.5		1584.217	1697.025	0.934	0.000	1697.025	0.000
	49.5 - 47.25		1647.892	1733.708	0.951	0.000	1733.708	0.000
	47.25 - 45		1712.125	1770.508	0.967	0.000	1770.508	0.000
	45 - 39.42		909.725	1862.242	0.489	0.000	1862.242	0.000
L3	45 - 39.42	TP47.593x37.696x0.313	964.508	2102.792	0.459	0.000	2102.792	0.000
	39.42 - 37.3453		1935.500	2143.767	0.903	0.000	2143.767	0.000
	37.3453 - 35.2705		1997.208	2184.900	0.914	0.000	2184.900	0.000
	35.2705 - 33.1958		2059.358	2226.183	0.925	0.000	2226.183	0.000
	33.1958 - 31.1211		2121.942	2267.617	0.936	0.000	2267.617	0.000
	31.1211 - 29.0463		2184.958	2309.175	0.946	0.000	2309.175	0.000
	29.0463 - 26.9716		2248.400	2350.867	0.956	0.000	2350.867	0.000
	26.9716 - 25		2309.075	2390.592	0.966	0.000	2390.592	0.000
	25 - 24.8968		1309.967	2392.667	0.547	0.000	2392.667	0.000
	24.8968 - 22.8221		1365.500	2434.592	0.561	0.000	2434.592	0.000
	22.8221 - 20.7474		1421.558	2476.608	0.574	0.000	2476.608	0.000
	20.7474 - 18.6726		1478.150	2518.733	0.587	0.000	2518.733	0.000
	18.6726 - 16.5979		1535.258	2560.942	0.599	0.000	2560.942	0.000
	16.5979 - 14.5232		1592.883	2603.225	0.612	0.000	2603.225	0.000
	14.5232 - 12.4484		1651.025	2645.592	0.624	0.000	2645.592	0.000
	12.4484 - 10.3737		1709.683	2688.017	0.636	0.000	2688.017	0.000
	10.3737 - 8.29895		1768.850	2730.500	0.648	0.000	2730.500	0.000
	8.29895 - 6.22421		1828.517	2773.042	0.659	0.000	2773.042	0.000
	6.22421 - 4.14947		1888.692	2815.617	0.671	0.000	2815.617	0.000
	4.14947 - 2.07474		1949.358	2858.233	0.682	0.000	2858.233	0.000
	2.07474 - 0		2010.525	2900.875	0.693	0.000	2900.875	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	125 - 123.158	TP29.725x21.037x0.188	0.575	452.363	0.001	0.012	793.230	0.000
	123.158 - 121.316		3.950	458.149	0.009	1.674	818.826	0.002
	121.316 - 119.474		5.309	463.830	0.011	3.253	844.617	0.004
	119.474 - 117.632		5.501	469.404	0.012	3.253	870.600	0.004
	117.632 - 115.789		5.695	474.873	0.012	3.253	896.750	0.004
	115.789 - 113.947		11.331	480.235	0.024	11.597	923.075	0.013
	113.947 - 112.105		12.477	485.491	0.026	11.597	949.542	0.012
	112.105 - 110.263		12.676	490.641	0.026	11.596	976.158	0.012
	110.263 - 108.421		12.876	495.685	0.026	11.595	1002.908	0.012
	108.421 - 106.579		13.078	500.623	0.026	11.594	1029.783	0.011
	106.579 - 104.737		21.982	505.454	0.043	12.095	1056.767	0.011
	104.737 - 102.895		22.180	510.180	0.043	12.093	1083.850	0.011
	102.895 - 101.053		22.377	514.799	0.043	12.091	1111.017	0.011
	101.053 - 99.2105		22.574	519.313	0.043	12.088	1138.275	0.011
	99.2105 - 97.3684		22.771	523.720	0.043	12.084	1165.592	0.010
	97.3684 - 95.5263		22.968	528.021	0.043	12.081	1192.967	0.010
	95.5263 - 93.6842		23.165	532.216	0.044	12.077	1220.392	0.010
	93.6842 - 91.8421		23.362	536.305	0.044	12.072	1247.850	0.010
	91.8421 - 90		23.560	540.287	0.044	12.068	1275.342	0.009
	90 - 85.5		10.099	549.570	0.018	4.967	1342.525	0.004
L2	90 - 85.5	TP39.486x28.36x0.281	14.041	954.437	0.015	7.096	2287.000	0.003
	85.5 - 83.25		24.392	965.958	0.025	12.058	2354.392	0.005
	83.25 - 81		24.647	977.321	0.025	12.054	2422.333	0.005
	81 - 78.75		24.902	988.525	0.025	12.049	2490.825	0.005
	78.75 - 76.5		25.157	999.571	0.025	12.044	2559.825	0.005
	76.5 - 74.25		25.412	1010.460	0.025	12.039	2629.325	0.005
	74.25 - 72		25.666	1021.190	0.025	12.034	2699.308	0.004
	72 - 69.75		25.920	1031.760	0.025	12.029	2769.742	0.004
	69.75 - 67.5		26.174	1042.170	0.025	12.024	2840.625	0.004
	67.5 - 65.25		26.429	1052.430	0.025	12.019	2911.917	0.004
	65.25 - 63		26.682	1062.520	0.025	12.014	2983.617	0.004
	63 - 60.75		26.936	1072.460	0.025	12.009	3055.692	0.004
	60.75 - 58.5		27.190	1082.240	0.025	12.004	3128.133	0.004
	58.5 - 56.25		27.444	1091.860	0.025	12.000	3200.917	0.004
	56.25 - 54		27.697	1101.320	0.025	11.995	3274.017	0.004
	54 - 51.75		27.951	1110.620	0.025	11.991	3347.425	0.004
	51.75 - 49.5		28.204	1119.770	0.025	11.987	3421.108	0.004
	49.5 - 47.25		28.457	1128.760	0.025	11.983	3495.058	0.003
	47.25 - 45		28.710	1137.590	0.025	11.979	3569.250	0.003
	45 - 39.42		14.496	1158.800	0.013	5.811	3754.183	0.002
L3	45 - 39.42	TP47.593x37.696x0.313	14.969	1329.820	0.011	6.164	4239.117	0.001
	39.42 - 37.3453		29.669	1339.780	0.022	11.971	4321.725	0.003

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
	37.3453 - 35.2705		29.882	1349.600	0.022	11.968	4404.650	0.003
	35.2705 - 33.1958		30.093	1359.280	0.022	11.966	4487.883	0.003
	33.1958 - 31.1211		30.302	1368.830	0.022	11.963	4571.392	0.003
	31.1211 - 29.0463		30.509	1378.250	0.022	11.961	4655.183	0.003
	29.0463 - 26.9716		30.713	1387.530	0.022	11.958	4739.225	0.003
	26.9716 - 25		30.904	1396.230	0.022	11.956	4819.308	0.002
	25 - 24.8968		26.639	1396.230	0.019	11.951	4823.500	0.002
	24.8968 - 22.8221		26.901	1396.680	0.019	11.950	4908.008	0.002
	22.8221 - 20.7474		27.156	1405.690	0.019	11.950	4992.725	0.002
	20.7474 - 18.6726		27.409	1414.570	0.019	11.949	5077.633	0.002
	18.6726 - 16.5979		27.660	1423.310	0.019	11.948	5162.725	0.002
	16.5979 - 14.5232		27.910	1431.920	0.019	11.948	5247.975	0.002
	14.5232 - 12.4484		28.158	1440.390	0.020	11.947	5333.375	0.002
	12.4484 - 10.3737		28.404	1448.730	0.020	11.947	5418.908	0.002
	10.3737 - 8.29895		28.649	1456.940	0.020	11.947	5504.558	0.002
	8.29895 - 6.22421		28.892	1465.000	0.020	11.946	5590.308	0.002
	6.22421 - 4.14947		29.133	1472.940	0.020	11.946	5676.150	0.002
	4.14947 - 2.07474		29.373	1480.740	0.020	11.946	5762.058	0.002
	2.07474 - 0		29.610	1488.410	0.020	11.946	5848.025	0.002

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	125 - 123.158	0.000	0.016	0.000	0.001	0.000	0.016 ✔	1.000	4.8.2 ✔
	123.158 - 121.316	0.001	0.034	0.000	0.009	0.002	0.035 ✔	1.000	4.8.2 ✔
	121.316 - 119.474	0.003	0.064	0.000	0.011	0.004	0.067 ✔	1.000	4.8.2 ✔
	119.474 - 117.632	0.003	0.085	0.000	0.012	0.004	0.088 ✔	1.000	4.8.2 ✔
	117.632 - 115.789	0.003	0.106	0.000	0.012	0.004	0.109 ✔	1.000	4.8.2 ✔
	115.789 - 113.947	0.004	0.140	0.000	0.024	0.013	0.145 ✔	1.000	4.8.2 ✔

Section No.	Elevation ft	Ratio $P_u/\phi P_n$	Ratio $M_{ux}/\phi M_{nx}$	Ratio $M_{uy}/\phi M_{ny}$	Ratio $V_u/\phi V_n$	Ratio $T_u/\phi T_n$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	113.947 - 112.105	0.005	0.192	0.000	0.026	0.012	0.199 ✔	1.000	4.8.2 ✔
	112.105 - 110.263	0.006	0.235	0.000	0.026	0.012	0.242 ✔	1.000	4.8.2 ✔
	110.263 - 108.421	0.006	0.276	0.000	0.026	0.012	0.283 ✔	1.000	4.8.2 ✔
	108.421 - 106.579	0.006	0.315	0.000	0.026	0.011	0.322 ✔	1.000	4.8.2 ✔
	106.579 - 104.737	0.010	0.382	0.000	0.043	0.011	0.395 ✔	1.000	4.8.2 ✔
	104.737 - 102.895	0.010	0.448	0.000	0.043	0.011	0.462 ✔	1.000	4.8.2 ✔
	102.895 - 101.053	0.011	0.512	0.000	0.043	0.011	0.525 ✔	1.000	4.8.2 ✔
	101.053 - 99.2105	0.011	0.573	0.000	0.043	0.011	0.586 ✔	1.000	4.8.2 ✔
	99.2105 - 97.3684	0.011	0.631	0.000	0.043	0.010	0.645 ✔	1.000	4.8.2 ✔
	97.3684 - 95.5263	0.011	0.688	0.000	0.043	0.010	0.702 ✔	1.000	4.8.2 ✔
	95.5263 - 93.6842	0.011	0.743	0.000	0.044	0.010	0.757 ✔	1.000	4.8.2 ✔
	93.6842 - 91.8421	0.011	0.796	0.000	0.044	0.010	0.810 ✔	1.000	4.8.2 ✔
	91.8421 - 90	0.011	0.847	0.000	0.044	0.009	0.861 ✔	1.000	4.8.2 ✔
	90 - 85.5	0.005	0.398	0.000	0.018	0.004	0.403 ✔	1.000	4.8.2 ✔
L2	90 - 85.5	0.004	0.333	0.000	0.015	0.003	0.338 ✔	1.000	4.8.2 ✔
	85.5 - 83.25	0.007	0.597	0.000	0.025	0.005	0.605 ✔	1.000	4.8.2 ✔
	83.25 - 81	0.007	0.626	0.000	0.025	0.005	0.634 ✔	1.000	4.8.2 ✔
	81 - 78.75	0.007	0.654	0.000	0.025	0.005	0.662 ✔	1.000	4.8.2 ✔
	78.75 - 76.5	0.007	0.681	0.000	0.025	0.005	0.689 ✔	1.000	4.8.2 ✔
	76.5 - 74.25	0.008	0.706	0.000	0.025	0.005	0.715 ✔	1.000	4.8.2 ✔
	74.25 - 72	0.008	0.731	0.000	0.025	0.004	0.740 ✔	1.000	4.8.2 ✔
	72 - 69.75	0.008	0.755	0.000	0.025	0.004	0.763 ✔	1.000	4.8.2 ✔
	69.75 - 67.5	0.008	0.777	0.000	0.025	0.004	0.786 ✔	1.000	4.8.2 ✔
	67.5 - 65.25	0.008	0.799	0.000	0.025	0.004	0.808 ✔	1.000	4.8.2 ✔
	65.25 - 63	0.008	0.820	0.000	0.025	0.004	0.829 ✔	1.000	4.8.2 ✔
	63 - 60.75	0.008	0.841	0.000	0.025	0.004	0.850 ✔	1.000	4.8.2 ✔

Section No.	Elevation ft	Ratio $P_u/\phi P_n$	Ratio $M_{ux}/\phi M_{nx}$	Ratio $M_{uy}/\phi M_{ny}$	Ratio $V_u/\phi V_n$	Ratio $T_u/\phi T_n$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	60.75 - 58.5	0.008	0.860	0.000	0.025	0.004	0.870 ✔	1.000	4.8.2 ✔
	58.5 - 56.25	0.009	0.880	0.000	0.025	0.004	0.889 ✔	1.000	4.8.2 ✔
	56.25 - 54	0.009	0.898	0.000	0.025	0.004	0.908 ✔	1.000	4.8.2 ✔
	54 - 51.75	0.009	0.916	0.000	0.025	0.004	0.926 ✔	1.000	4.8.2 ✔
	51.75 - 49.5	0.009	0.934	0.000	0.025	0.004	0.943 ✔	1.000	4.8.2 ✔
	49.5 - 47.25	0.009	0.951	0.000	0.025	0.003	0.960 ✔	1.000	4.8.2 ✔
	47.25 - 45	0.009	0.967	0.000	0.025	0.003	0.977 ✔	1.000	4.8.2 ✔
	45 - 39.42	0.005	0.489	0.000	0.013	0.002	0.494 ✔	1.000	4.8.2 ✔
L3	45 - 39.42	0.005	0.459	0.000	0.011	0.001	0.463 ✔	1.000	4.8.2 ✔
	39.42 - 37.3453	0.009	0.903	0.000	0.022	0.003	0.912 ✔	1.000	4.8.2 ✔
	37.3453 - 35.2705	0.009	0.914	0.000	0.022	0.003	0.924 ✔	1.000	4.8.2 ✔
	35.2705 - 33.1958	0.009	0.925	0.000	0.022	0.003	0.935 ✔	1.000	4.8.2 ✔
	33.1958 - 31.1211	0.009	0.936	0.000	0.022	0.003	0.946 ✔	1.000	4.8.2 ✔
	31.1211 - 29.0463	0.009	0.946	0.000	0.022	0.003	0.956 ✔	1.000	4.8.2 ✔
	29.0463 - 26.9716	0.009	0.956	0.000	0.022	0.003	0.966 ✔	1.000	4.8.2 ✔
	26.9716 - 25	0.010	0.966	0.000	0.022	0.002	0.976 ✔	1.000	4.8.2 ✔
	25 - 24.8968	0.003	0.547	0.000	0.019	0.002	0.551 ✔	1.000	4.8.2 ✔
	24.8968 - 22.8221	0.003	0.561	0.000	0.019	0.002	0.565 ✔	1.000	4.8.2 ✔
	22.8221 - 20.7474	0.004	0.574	0.000	0.019	0.002	0.578 ✔	1.000	4.8.2 ✔
	20.7474 - 18.6726	0.004	0.587	0.000	0.019	0.002	0.591 ✔	1.000	4.8.2 ✔
	18.6726 - 16.5979	0.004	0.599	0.000	0.019	0.002	0.604 ✔	1.000	4.8.2 ✔
	16.5979 - 14.5232	0.004	0.612	0.000	0.019	0.002	0.616 ✔	1.000	4.8.2 ✔
	14.5232 - 12.4484	0.004	0.624	0.000	0.020	0.002	0.629 ✔	1.000	4.8.2 ✔
	12.4484 - 10.3737	0.004	0.636	0.000	0.020	0.002	0.641 ✔	1.000	4.8.2 ✔
	10.3737 - 8.29895	0.004	0.648	0.000	0.020	0.002	0.653 ✔	1.000	4.8.2 ✔
	8.29895 - 6.22421	0.005	0.659	0.000	0.020	0.002	0.665 ✔	1.000	4.8.2 ✔

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	6.22421 - 4.14947	0.005	0.671	0.000	0.020	0.002	0.676 ✔	1.000	4.8.2 ✔
	4.14947 - 2.07474	0.005	0.682	0.000	0.020	0.002	0.687 ✔	1.000	4.8.2 ✔
	2.07474 - 0	0.005	0.693	0.000	0.020	0.002	0.699 ✔	1.000	4.8.2 ✔

Reinforcing Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
L3	25 - 0	7x1	25.001	1.000	41.6 K=1.00	7.000	-283.216	347.473	0.815

Reinforcing Bending Design Data

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L3	25 - 0	7x1	-6.260	59.719	0.105	0.000	8.531	0.000

Reinforcing Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L3	25 - 0	7x1	0.815	0.105	0.000	0.818 ✔	1.000	4.8.1 ✔

Tension Checks

Reinforcing Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
L3	25 - 0	7x1	25.001	1.000	41.6	6.250	274.071	375.000	0.731

Reinforcing Bending Design Data

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L3	25 - 0	7x1	-6.301	59.719	0.106	0.000	8.531	0.000

Reinforcing Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L3	25 - 0	7x1	0.731	0.106	0.000	0.743 ✔	1.000	4.8.1 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	125 - 85.5	Pole	TP29.725x21.037x0.188	1	-12.251	1080.570	86.1	Pass
L2	85.5 - 39.42	Pole	TP39.486x28.36x0.281	2	-21.192	2275.170	97.7	Pass
L3	39.42 - 0	Pole	TP47.593x37.696x0.313	3	-26.687	2792.450	97.6	Pass
L3	25 - 0	Reinforcing	7x1	7	-283.216	347.473	81.8	Pass
							Summary	
						Pole (L2)	97.7	Pass
						Reinforcing (L3)	81.8	Pass
						RATING =	**97.7**	**Pass**

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Subject:	Anchor Bolt and Baseplate Analysis
Location:	125-FT Valmont Monopole Quinebaug, CT
Rev. 3: 1/25/18	Prepared by: T.J.L. Checked by: C.F.C. Job No. 17179.00

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	$M_u := 3115 \cdot ft \cdot kips$	(Input From RisaTower)
Shear Force =	$Shear := 34 \cdot kips$	(Input From RisaTower)
Axial Force =	$R_u := 36 \cdot kips$	(Input From RisaTower)

Anchor Bolt Data:

ASTMA615 Grade 75

Number of Anchor Bolts =	$N := 12$	(User Input)
Diameter of Bolt Circle =	$D_{BC} := 55.0 \cdot in$	(User Input)
Bolt "Column" Distance =	$l := 3.0 \cdot in$	(User Input)
Bolt Ultimate Strength =	$F_u := 100 \cdot ksi$	(User Input)
Bolt Yield Strength =	$F_y := 75 \cdot ksi$	(User Input)
Bolt Modulus =	$E := 29000 \cdot ksi$	(User Input)
Diameter of Anchor Bolts =	$D := 2.25 \cdot in$	(User Input)
Threads per Inch =	$n := 4.5$	(User Input)
Top of Concrete to Bot Leveling Nut =	$l_{ar} := 2 \cdot in$	(User Input)
Anchor Rod Force Correction Factor =	$n_c = 1.02$	Table 2-1 Addendum 3

Base Plate Data:

Use AST MA572 Grade 60

Plate Yield Strength =	$F_{yf} := 60 \cdot ksi$	(User Input)
Base Plate Thickness =	$t_{TP} := 2.25 \cdot in$	(User Input)
Base Plate Diameter =	$D_{OD} := 61.0 \cdot in$	(User Input)
Outer Pole Diameter =	$D_T := 47.60 \cdot in$	(User Input)
Pole Wall Thickness =	$t_T := 0.3125 \cdot in$	(User Input)
Pole Design Yield Strength =	$F_{yp} := 65 \cdot ksi$	(User Input)
	$\eta := 0.5$	For Ungrouted Base Plate per TIA-222-G Section 4.9.9

Anchor Bolt Analysis:

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 3.976 \cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n} \right)^2 = 3.248 \cdot in^2$

Tensile Root Diameter = $d_{rt} := D - \frac{0.9743 \cdot in}{n} = 2.033 \cdot in$

Plastic Section Modulus = $Z := \frac{d_{rt}^3}{6} = 1.401 \cdot in^3$

Maximum Anchor Rod Force = $P_u := \frac{n_c \cdot \pi \cdot M_u}{N \cdot D_{BC}} + \frac{R_u}{N} = 184.5 \cdot kips$

Maximum Shear Force = $V_u := \frac{Shear}{N} = 2.8 \cdot kips$

Design Tensile Strength = $\Phi R_{nt} := 0.8 \cdot F_u \cdot A_n = 259.815 \cdot k$

Bolt % of Capacity = $\frac{\left(P_u + \frac{V_u}{\eta} \right)}{\Phi R_{nt}} \cdot 100 = 73.2$

Condition1 = $Condition1 := if\left[\frac{\left(P_u + \frac{V_u}{\eta} \right)}{\Phi R_{nt}} \le 1.00, "OK", "Overstressed" \right]$

Condition1 = "OK"

Design Shear Strength = $\Phi R_{nv} := 0.75 \cdot 0.45 \cdot F_u \cdot A_g = 134.193 \cdot k$

Design Flexural Strength = $\Phi R_{nm} := 0.9 \cdot F_y \cdot Z = 94.597 \cdot in \cdot k$

$M_u := \begin{cases} 0 & \text{if } l_{ar} < D \\ 0.65 \cdot l_{ar} \cdot V_u & \text{otherwise} \end{cases} = 0 \cdot in \cdot k$

Bolt % of Capacity = $\left[\left(\frac{V_u}{\Phi R_{nv}} \right)^2 + \left(\frac{P_u}{\Phi R_{nt}} + \frac{M_u}{\Phi R_{nm}} \right)^2 \right] \cdot 100 = 50.5$

Condition2 = $Condition2 := if\left[\left(\frac{V_u}{\Phi R_{nv}} \right)^2 + \left(\frac{P_u}{\Phi R_{nt}} + \frac{M_u}{\Phi R_{nm}} \right)^2 \le 1.00, "OK", "Overstressed" \right]$

Condition2 = "OK"

Base Plate Analysis:

Strength Resistance Factor for Yielding due to Bending = $\phi_b := 0.9$

Strength Resistance Factor for Yielding due to Shear = $\phi_v := 1.0$

Outside Fillet Horizontal Leg Dimension = $w_1 := 0.25 \cdot in$

Effective Pole Outside Diameter = $D_e := D_T + w_1 = 47.85 \cdot in$

Effective Base Plate Outside Diameter = $D_{oe} := \begin{cases} D_{OD} & \text{if } D_{OD} \le \left(D_{BC} + 6 \cdot t_{TP}\right) \\ \left(D_{BC} + 6 \cdot t_{TP}\right) & \text{otherwise} \end{cases} = 61 \cdot in$

Half-Angle Between Radial Lines Extending from Pole Centerline Through Midpoints Between Adjacent Anchor Rods = $\theta_1 := \frac{\pi}{N} = 0.262$

Angle Defining Limiting Effective Base Plate Width Based on Plate Thickness = $\theta_2 := \operatorname{asin}\left(\frac{12 \cdot t_{TP}}{D_{BC}}\right) = 0.513$

Angle Defining Limiting Effective Base Plate Width Based on Distance Between Anchor Rod Bolt Circle and Effective Pole Outside Diameter = $\theta_3 := \operatorname{acos}\left(\frac{D_{BC} + D_e}{2 \cdot D_{BC}}\right) = 0.363$

Governing Angle Defining Effective Base Plate Width Resisting Bending = $\theta := \min\left(\theta_1, \theta_2, \theta_3\right) = 0.262$

Effective Moment Arm of Anchor Rod Force = $x := 0.5 \cdot \left(D_{BC} - D_e\right) = 3.575 \cdot in$

Effective Base Plate Width Resisting Bending from Transverse Bend Line = $B_{et} := D_{BC} \cdot \sin(\theta) = 14.235 \cdot in$

Effective Base Plate Width Resisting Bending from Radial Bend Lines = $B_{er} := \left(D_{oe} - D_e\right) \cdot \sin(\theta) = 3.403 \cdot in$

Total Effective Base Plate Width Resisting Bending = $B_{eff} := B_{et} + B_{er} = 17.639 \cdot in$

Required Base Plate Thickness = $t_{TP.Req} := \sqrt{\frac{4 \cdot P_u \cdot x}{\phi_b \cdot F_{yf} \cdot B_{eff}}} = 1.664 \cdot in$

Plate Bending Stress % of Capacity = $\frac{t_{TP.Req}}{t_{TP}} = 74.0 \cdot \%$

Condition2 = $Condition3 := if\left(\frac{t_{TP.Req}}{t_{TP}} < 1.00, "Ok", "Overstressed"\right)$

Condition3 = "Ok"

Required Base Plate Thickness = $t_{TP.Req} := \frac{\phi_b \cdot t_T \cdot F_{yp}}{\phi_v \cdot 0.6 \cdot F_{yf}} = 0.508 \cdot in$

Plate Bending Stress % of Capacity = $\frac{t_{TP.Req}}{t_{TP}} = 22.6 \cdot \%$

Condition2 = $Condition4 := if\left(\frac{t_{TP.Req}}{t_{TP}} < 1.00, "Ok", "Overstressed"\right)$

Condition4 = "Ok"

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Subject: FOUNDATION ANALYSIS

Location: 125-ft Valmont Monopole
Quinebaug, CT

Rev. 3: 1/25/18

Prepared by: T.J.L Checked by: C.F.C.
Job no. 17179.00

Standard Monopole Foundation:

Input Data:

Tower Data

Overturning Moment =	$OM := 3115 \cdot ft \cdot kips$	(User Input)	
Shear Force =	$Shear := 34 \cdot kip$	(User Input)	
Axial Force =	$Axial := 36 \cdot kip$	(User Input)	
Tower Height =	$H_t := 125 \cdot ft$	(User Input)	

Footing Data:

Overall Depth of Footing =	$D_f := 8 \cdot ft$	(User Input)	
Length of Pier =	$L_p := 5.0 \cdot ft$	(User Input)	
Extension of Pier Above Grade =	$L_{pag} := 0.5 \cdot ft$	(User Input)	
Diameter of Pier =	$d_p := 7.0 \cdot ft$	(User Input)	
Thickness of Footing =	$T_f := 3.5 \cdot ft$	(User Input)	
Width of Footing =	$W_f := 20.0 \cdot ft$	(User Input)	

Anchor Bolt Data:

Length of Anchor Bolts=	$L_{st} := 96 \cdot in$	(User Input)	
Projection of Anchor Bolts Above Pier =	$A_{BP} := 12 \cdot in$	(User Input)	
Anchor Bolt Diameter =	$d_{anchor} := 2.25 \cdot in$	(User Input)	
Base Plate Bolt Circle =	$MP := 55.0 \cdot in$	(User Input)	

Material Properties:

Concrete Compressive Strength =	$f_c := 3000 \cdot psi$	(User Input)	
Steel Reinforcment Yield Strength =	$f_y := 60000 \cdot psi$	(User Input)	
Anchor Bolt Yield Strength =	$f_{ya} := 75000 \cdot psi$	(User Input)	
Internal Friction Angle of Soil =	$\Phi_s := 30 \cdot deg$	(User Input)	
Ultimate Soil Bearing Capacity =	$q_u := 10000 \cdot psf$	(User Input)	
Allowable Soil Bearing Capacity =	$q_a := \frac{q_u}{2} = 5000 \cdot psf$	(User Input)	
Unit Weight of Soil =	$\gamma_{soil} := 100 \cdot pcf$	(User Input)	
Unit Weight of Concrete =	$\gamma_{conc} := 150 \cdot pcf$	(User Input)	
Foundation Bouyancy =	$Bouyancy := 0$	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	$n := 0 \cdot ft$	(User Input)	
Cohesion of Clay Type Soil =	$c := 0 \cdot ksf$	(User Input)	(Use 0 for Sandy Soil)
Seismic Zone Factor =	$Z := 2$	(User Input)	(UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	$\mu := 0.45$	(User Input)	

Pier Reinforcement:

Bar Size =	$BS_{pier} := 9$	(User Input)	
Bar Diameter =	$d_{bpier} := 1.128 \cdot in$	(User Input)	
Number of Bars =	$NB_{pier} := 36$	(User Input)	
Clear Cover of Reinforcement =	$Cvr_{pier} := 3 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Diameter of Tie =	$d_{Tie} := 3 \cdot in$	(User Input)	

Pad Reinforcement:

Bar Size =	$BS_{top} := 6$	(User Input)	(Top of Pad)
Bar Diameter =	$d_{btop} := 0.75 \cdot in$	(User Input)	(Top of Pad)
Number of Bars =	$NB_{top} := 15$	(User Input)	(Top of Pad)
Bar Size =	$BS_{bot} := 7$	(User Input)	(Bottom of Pad)
Bar Diameter =	$d_{bbot} := 0.875 \cdot in$	(User Input)	(Bottom of Pad)
Number of Bars =	$NB_{bot} := 22$	(User Input)	(Bottom of Pad)
Clear Cover of Reinforcement =	$Cvr_{pad} := 3.0 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)

Calculated Factors:

Pier Reinforcement Bar Area = $A_{bpier} := \frac{\pi \cdot d_{bpier}^2}{4} = 0.999 \cdot in^2$

Pad Top Reinforcement Bar Area = $A_{btop} := \frac{\pi \cdot d_{btop}^2}{4} = 0.442 \cdot in^2$

Pad Bottom Reinforcement Bar Area = $A_{bbot} := \frac{\pi \cdot d_{bbot}^2}{4} = 0.601 \cdot in^2$

Coefficient of Lateral Soil Pressure = $K_p := \frac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 3$

Stability of Footing:

Adjusted Concrete Unit Weight = $\gamma_c := if\left(Bouyancy = 1, \gamma_{conc} - 62.4pcf, \gamma_{conc}\right) = 150 \cdot pcf$

Adjusted Soil Unit Weight = $\gamma_s := if\left(Bouyancy = 1, \gamma_{soil} - 62.4pcf, \gamma_{soil}\right) = 100 \cdot pcf$

Passive Pressure = $P_{pn} := K_p \cdot \gamma_s \cdot n + c \cdot 2 \cdot \sqrt{K_p} = 0 \cdot ksf$

$P_{pt} := K_p \cdot \gamma_s \cdot \left(D_f - T_f\right) + c \cdot 2 \cdot \sqrt{K_p} = 1.35 \cdot ksf$

$P_{top} := if\left[n < \left(D_f - T_f\right), P_{pt}, P_{pn}\right] = 1.35 \cdot ksf$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p} = 2.4 \cdot ksf$

$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 1.875 \cdot ksf$

$T_p := if\left[n < \left(D_f - T_f\right), T_f, \left(D_f - n\right)\right] = 3.5$

$A_p := W_f \cdot T_p = 70$

Ultimate Shear = $S_u := P_{ave} \cdot A_p = 131.25 \cdot kip$

Weight of Concrete Pad = $WT_c := \left[\left(W_f^2 \cdot T_f\right) + d_p^2 L_p\right] \cdot \gamma_c = 246.75 \cdot kip$

Weight of Soil Above Footing = $WT_{s1} := \left[\left(W_f^2 - d_p^2\right) \cdot \left(\left|L_p - L_{pag} - n\right|\right)\right] \cdot \gamma_s = 157.95 \cdot kip$

Weight of Soil Wedge at Back Face = $WT_{s2} := \left(\frac{D_f^2 \cdot \tan\left(\Phi_s\right)}{2} \cdot W_f\right) \cdot \gamma_s = 36.95 \cdot kip$

Weight of Soil Wedge at back face Corners = $WT_{s3} := 2 \cdot \left[\left(D_f\right)^3 \cdot \frac{\tan\left(\Phi_s\right)}{3}\right] \cdot \gamma_s = 19.707 \cdot kips$

Total Weight = $WT_{tot} := WT_c + WT_{s1} + Axial = 440.7 \cdot kip$

Resisting Weight = $WT_R := 0.9 \cdot WT_c + 0.75 \cdot WT_{s1} + 0.75 \cdot Axial = 367.538 \cdot kip$

Resisting Moment = $M_r := \left(WT_R\right) \cdot \frac{W_f}{2} + 0.75 \cdot S_u \cdot \frac{T_f}{3} + 0.75 \cdot \left[\left(WT_{s2} + WT_{s3}\right) \cdot \left(W_f + \frac{D_f \cdot \tan\left(\Phi_s\right)}{3}\right)\right] = 4706 \cdot kip \cdot ft$

Overturning Moment = $M_{ot} := OM + Shear \cdot \left(L_p + T_f\right) = 3404 \cdot kip \cdot ft$

Factor of Safety Actual = $FS := \frac{M_r}{M_{ot}} = 1.38$

Factor of Safety Required = $FS_{req} := 1$

$OverTurning\_Moment\_Check := if\left(FS \geq FS_{req}, "Okay", "No\ Good"\right)$

$OverTurning\_Moment\_Check = "Okay"$

Shear Capacity in Pier:

Shear Resistance of Pier = $S_p := \frac{P_{ave} \cdot A_p + \mu \cdot WT_{tot}}{FS_{req}} = 329.565 \cdot kips$

$Shear\_Check := if(S_p > Shear, "Okay", "No Good")$

Shear_Check = "Okay"

Bearing Pressure Caused by Footing:

Area of the Mat = $A_{mat} := W_f^2 = 400$

Section Modulus of Mat = $S := \frac{W_f^3}{6} = 1333.33 \cdot ft^3$

Maximum Pressure in Mat = $P_{max} := \frac{WT_{tot}}{A_{mat}} + \frac{M_{ot}}{S} = 3.655 \cdot ksf$

$Max\_Pressure\_Check := if(P_{max} < .75 \cdot q_u, "Okay", "No Good")$

Max_Pressure_Check = "Okay"

Minimum Pressure in Mat = $P_{min} := \frac{WT_{tot}}{A_{mat}} - \frac{M_{ot}}{S} = -1.451 \cdot ksf$

$Min\_Pressure\_Check := if\left[(P_{min} \geq 0) \cdot (P_{min} < .75 \cdot q_u), "Okay", "No Good"\right]$

Min_Pressure_Check = "No Good"

Distance to Resultant of Pressure Distribution = $X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3} = 4.772$

Distance to Kern = $X_k := \frac{W_f}{6} = 3.333$

Since Resultant Force is Not in Kern, Area to which Pressure is Applied Must be Reduced.

Eccentricity = $e := \frac{\frac{M_{ot}}{1.6}}{WT_{tot}} = 4.828$

Adjusted Soil Pressure = $P_a := \frac{2 \cdot WT_{tot}}{3 \cdot W_f \cdot \left(\frac{W_f}{2} - e\right)} = 2.84 \cdot ksf$

$q_{adj} := if(P_{min} < 0, P_a, P_{max}) = 2.84 \cdot ksf$

$Pressure\_Check := if(q_{adj} < q_a, "Okay", "No Good")$

Pressure_Check = "Okay"

Concrete Bearing Capacity:

Strength Reduction Factor = $\Phi_c := 0.65$ (ACI-2008 9.3.2.2)

Bearing Strength Between Pier and Pad = $P_b := \Phi_c \cdot 0.85 \cdot f_c \cdot \frac{\pi \cdot d_p^2}{4} = 9.185 \times 10^3 \cdot kips$ (ACI-2008 10.14)

$Bearing\_Check := if\left(P_b > Axial, "Okay", "No Good"\right)$

Bearing_Check = "Okay"

Shear Strength of Concrete:

Beam Shear: (Critical section located at a distance d from the face of Pier) (ACI 11.3.1.1)

$\phi_c := 0.85$ (ACI 9.3.2.5)

$d := T_f - Cvr_{pad} - d_{bbot} = 3.177$

$d_1 := \frac{W_f}{2} - \frac{d_p}{2}$

$d_2 := d_1 - d$

$L := \left(\frac{W_f}{2} - e\right) \cdot 3$

$Slope := if\left(L > W_f, \frac{P_{max} - P_{min}}{W_f}, \frac{q_{adj}}{L}\right)$

$V_{req} := \left[\left(q_{adj} - Slope \cdot d_1\right) + \left(\frac{Slope \cdot d_1}{2}\right)\right] \cdot W_f \cdot d_1$

$V_{Avail} := \phi_c \cdot 2 \cdot \sqrt{f_c \cdot psi} \cdot W_f \cdot d$ (ACI-2008 11.2.1.1)

$Beam\_Shear\_Check := if\left(V_{req} < V_{Avail}, "Okay", "No Good"\right)$

Beam_Shear_Check = "Okay"

Punching Shear: (Critical Section Located at a distance of d/2 from the face of pier) (ACI 11.11.1.2)

Critical Perimeter of Punching Shear = $b_o := \left(d_p + d\right) \cdot \pi = 32$

Area Included Inside Perimeter = $A_{bo} := \frac{\pi \cdot \left(d_p + d\right)^2}{4} = 81.3$

Area Outside of Perimeter = $A_{out} := A_{mat} - A_{bo} = 318.7$

Guess Value = $v_u := 1ksf$

(From "Foundation Analysis and design", By Joseph Bowles, Eq. 8-9)

Given $d^2 + d_p \cdot d = \frac{WT_{tot}}{\pi \cdot v_u}$

$v_u := Find(v_u) = 4.3 \cdot ksf$

$V_u := v_u \cdot d \cdot W_f = 275.7 \cdot kips$

Required Shear Strength = $V_{req} := V_u = 275.7 \cdot kips$

Available Shear Strength = $V_{Avail} := \phi_c \cdot 4 \cdot \sqrt{f_c \cdot psi} \cdot b_o \cdot d = 2724 \cdot kip$ (ACI-2008 11.11.2.1)

$Punching\_Shear\_Check := if(V_{req} < V_{Avail}, "Okay", "No Good")$

$Punching\_Shear\_Check = "Okay"$

Steel Reinforcement in Pad:

Required Reinforcement for Bending:

Strength Reduction Factor = $\phi_m := .90$ (ACI-2008 9.3.2.1)

$q_b := q_{adj} - d_1 \cdot Slope = 1.65 \cdot ksf$

Maximum Bending at Face of Pier = $M_n := \frac{1}{\phi_m} \cdot \left[(q_{adj} - q_b) \cdot \frac{d_1^2}{3} + q_b \cdot \frac{d_1^2}{2} \right] \cdot W_f = 1147.1 \cdot kip \cdot ft$

$$\beta := \begin{cases} 0.85 & \text{if } 2500 \cdot psi \le f_c \le 4000 \cdot psi \\ 0.65 & \text{if } f_c > 8000 \cdot psi \\ \left[0.85 - \left[\frac{\left(\frac{f_c}{psi} - 4000 \right)}{1000} \right] \cdot 0.5 \right] & \text{otherwise} \end{cases} = 0.85$$

(ACI-200810.2.7.3)

$R_n := \frac{M_n}{W_f \cdot d^2} = 39.5 \cdot psi$

$\rho := \frac{0.85 \cdot f_c}{f_y} \left(1 - \sqrt{1 - \frac{2 \cdot R_n}{0.85 \cdot f_c}} \right) = 0.0007$

$\rho_{min} := \rho = 0.00066$

Required Reinforcement for Temperature and Shrinkage:

$$\rho_{sh} := \begin{cases} .0018 & \text{if } f_y \geq 60000 \cdot psi \\ .0020 & \text{otherwise} \end{cases}$$ (ACI-2008 7.12.2.1)

Check Bottom Bars:

$$As := \begin{cases} \rho_{min} \cdot W_f \cdot d & \text{if } \rho_{min} > \frac{\rho_{sh}}{2} \\ \rho_{sh} \cdot W_f \cdot \frac{d}{2} & \text{otherwise} \end{cases} = 8.235 \cdot in^2$$

$As_{prov.bot} := A_{bbot} \cdot NB_{bot} = 13.2 \cdot in^2$

$Pad\_Reinforcement\_Bot := if(As_{prov.bot} > As, "Okay", "No Good")$

Pad_Reinforcement_Bot = "Okay"

Check Temp Shrinkage Reinforcement:

$As := \rho_{sh} \cdot (W_f \cdot T_f) = 18.1 \cdot in^2$

$As_{prov.top} := A_{btop} \cdot NB_{top} = 6.6 \cdot in^2$

$As_{prov.tot} := As_{prov.bot} + As_{prov.top} = 19.9 \cdot in^2$

$Pad\_Reinforcement\_Temp := if(As_{prov.tot} > As, "Okay", "No Good")$

Pad_Reinforcement_Temp = "Okay"

Developement Length Pad Reinforcement:

Bar Spacing =

$$B_{sPad} := \frac{W_f - 2 \cdot Cvr_{pad} - NB_{bot} \cdot d_{bbot}}{NB_{bot} - 1} = 10.23 \cdot in$$

Spacing or Cover Dimension =

$$c := if\left(Cvr_{pad} < \frac{B_{sPad}}{2}, Cvr_{pad}, \frac{B_{sPad}}{2}\right) = 3 \cdot in$$

Transverse Reinforcement Index =

$k_{tr} := 0$ (ACI-2008 12.2.3)

$$L_{dbt} := \frac{3 \cdot f_y \alpha_{pad} \cdot \beta_{pad} \cdot \gamma_{pad} \cdot \lambda_{pad}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \frac{c + k_{tr}}{d_{bbot}}} \cdot d_{bbot} = 21 \cdot in$$

Minimum Development Length =

$L_{dbmin} := 12 \cdot in$ (ACI-2008 12.2.1)

$L_{dbtCheck} := if(L_{dbt} \geq L_{dbmin}, "Use L.dbt", "Use L.dbmin")$

Available Length in Pad =

$$L_{Pad} := \frac{W_f}{2} - \frac{d_p}{2} - Cvr_{pad} = 75 \cdot in$$

$Lpad\_Check := if(L_{Pad} > L_{dbt}, "Okay", "No Good")$

Lpad_Check = "Okay"

Steel Reinforcement in Pier:

Area of Pier =

$A_p := d_p^2 = 7056 \cdot in^2$

$A_{smin} := 0.01 \cdot 0.5 \cdot A_p = 35.28 \cdot in^2$ (ACI-2008 10.8.4 & 10.9.1)

$A_{sprov} := NB_{pier} \cdot A_{bpier} = 35.98 \cdot in^2$

$Steel\_Area\_Check := if\left(A_{sprov} > A_{smin}, "Okay", "No Good"\right)$

Steel_Area_Check = "Okay"

NOTE: Anchor Bolts are not accounted for in reinforcement calculation and will provide additional reinforcement to satisfy minimum requirement of steel.

Bar Spacing In Pier =

$B_{sPier} := \frac{d_p \cdot \pi}{NB_{pier}} - d_{bpier} = 6.202 \cdot in$

Diameter of Reinforcement Cage =

$Diam_{cage} := d_p - 2 \cdot Cvr_{pier} = 78 \cdot in$

Maximum Moment in Pier =

$M_p := \left[OM + Shear \cdot \left(L_p + \frac{A_{BP}}{2}\right)\right] = 39624 \cdot in \cdot kips$

Pier Check evaluated from outside program and results are listed below;

$\left(D \;\; N \;\; n \;\; P_u \;\; M_{xu}\right) := \left(d_p \cdot 12 \;\; NB_{pier} \;\; BS_{pier} \;\; \frac{Axial \cdot 1.333}{kips} \;\; \frac{M_p}{in \cdot kips}\right)$

$\left(D \;\; N \;\; n \;\; P_u \;\; M_{xu}\right) = (84 \;\; 36 \;\; 9 \;\; 48 \;\; 39624)$

$\left(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho\right) := (0 \;\; 0 \;\; 0 \;\; 0)$

$\left(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho\right) := \phi P'_n\left(D, N, n, P_u, M_{xu}\right)^T$

$\left(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho\right) = (84.1 \;\; 69454 \;\; -60 \;\; 0)$

$Axial\_Load\_Check := if\left(\phi P_n \geq P_u, "Okay", "No Good"\right)$

Axial_Load_Check = "Okay"

$Bending\_Check := if\left(\phi M_{xn} \geq M_{xu}, "Okay", "No Good"\right)$

Bending_Check = "Okay"

Development Length Pier Reinforcement:

Available Length in Foundation:

$L_{pier} := L_p - Cvr_{pier} = 57 \cdot in$

$L_{pad} := T_f - Cvr_{pad} = 39 \cdot in$

Tension: (ACI-2008 12.2.3)

Spacing or Cover Dimension =

$c := if\left(Cvr_{pier} < \frac{B_{sPier}}{2}, Cvr_{pier}, \frac{B_{sPier}}{2}\right) = 3 \cdot in$

Transverse Reinforcement = $k_{tr} := 0$ (ACI-2008 12.2.3)

$L_{dbt} := \frac{3 \cdot f_y \cdot \alpha_{pier} \cdot \beta_{pier} \cdot \gamma_{pier} \cdot \lambda_{pier}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \left(\frac{c + k_{tr}}{d_{bpier}}\right)} \cdot d_{bpier} = 34.85 \cdot in$

Minimum Development Length = $L_{dh} := \frac{1200 \cdot d_{bpier}}{\sqrt{\frac{f_c}{psi}}} \cdot .7 = 17.299 \cdot in$ (ACI 12.2.1)

Pier reinforcement bars are standard 90 degree hooks and therefore developement in the pad is computed as follows:

$L_{db} := \max\left(L_{dbt}, L_{dbmin}\right)$

$L_{tension\_Check} := if\left(L_{pier} + L_{pad} > L_{dbt}, "Okay", "No Good"\right)$

$L_{tension\_Check} = "Okay"$

Compression: (ACI-2008 12.3.2)

$L_{dbc1} := \frac{.02 \cdot d_{bpier} \cdot f_y}{\sqrt{f_c \cdot psi}} = 24.713 \cdot in$

$L_{dbmin} := 0.0003 \cdot \frac{in^2}{lb} \cdot \left(d_{bpier} \cdot f_y\right) = 20.304 \cdot in$

$L_{dbc} := if\left(L_{dbc1} \geq L_{dbmin}, L_{dbc1}, L_{dbmin}\right) = 24.713 \cdot in$

$L_{compression\_Check} := if\left(L_{pier} + L_{pad} > L_{dbc}, "Okay", "No Good"\right)$

$L_{compression\_Check} = "Okay"$

TOWER REINFORCEMENT DESIGN

CTNL193A

720 QUINEBAUG ROAD

QUINEBAUG, CT 06262

VICINITY MAP

NORTH

PROJECT SUMMARY

SITE ADDRESS:	720 QUINEBAUG ROAD QUINEBAUG, CT 06262
PROJECT COORDINATES:	LAT: 42°–01'–22.30N LON: 71°–56'–57.30W ELEV: ±365' AMSL
SITE REF.:	CTNL193A
T–MOBILE CONTACT:	DAN REID 203.592.8291
ENGINEER OF RECORD:	CENTEK ENGINEERING, INC. 63–2 NORTH BRANFORD ROAD BRANFORD, CT 06405
CENTEK CONTACT:	TIMOTHY J. LYNN, PE 203.433.7507

SHEET INDEX

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REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
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T-MOBILE

PROPOSED TOWER REINFORCEMENT DESIGN

CTNL193A

720 QUINEBAUG ROAD
QUINEBAUG, CT 06262

DATE:	1/11/18
SCALE:	AS SHOWN
JOB NO.	17179.00

TITLE SHEET

SHEET NO.
T-1
Sheet No. 1 of 5

DESIGN BASIS

1. GOVERNING CODE: 2012 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2016 CT STATE SUPPLEMENT.

2. TIA-222-G, "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND ANTENNA SUPPORTING STRUCTURES"

3. DESIGN CRITERIA

   WIND LOAD: (TOWER/FOUNDATION)
   NOMINAL DESIGN WIND SPEED (V) = 101 MPH (2016 CSBC: APPENDIX 'N')

GENERAL NOTES

1. REFER TO STRUCTURAL ANALYSIS AND REINFORCEMENT DESIGN PREPARED BY CENTEK ENGINEERING, INC., FOR VERIZON WIRELESS, REVISION #3, DATED 1/25/18.

2. TOWER GEOMETRY AND STRUCTURE MEMBER SIZES WERE OBTAINED FROM THE A PREVIOUS STRUCTURAL ANALYSIS REPORT PREPARED BY ALL POINTS TECHNOLOGY PROJECT #CT1411102, DATED AUGUST 16, 2017.

3. PROVIDE TEMPORARY ANCHORS, GUYING AND/OR BRACING AS REQUIRED TO SAFELY CONDUCT THE WORK.

4. ALL WORK SHALL BE IN ACCORDANCE WITH TIA/EIA-222 REVISION "G" "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND ANTENNA SUPPORTING STRUCTURES".

5. THE TOWER STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER REINFORCEMENTS ARE COMPLETE. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE AND SEQUENCE AND TO INSURE THE SAFETY OF THE TOWER STRUCTURE AND ITS COMPONENT PARTS DURING ERECTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, TEMPORARY BRACING, GUYS OR TIE-DOWNS, WHICH MIGHT BE NECESSARY.

5. THE CONTRACTOR IS SOLELY RESPONSIBLE TO DETERMINE CONSTRUCTION PROCEDURE AND SEQUENCE, AND TO ENSURE THE SAFETY OF THE EXISTING STRUCTURES AND ITS COMPONENT PARTS DURING CONSTRUCTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, BRACING, UNDERPINNING, ETC. THAT MAY BE NECESSARY. MAINTAIN EXISTING SITE OPERATIONS, COORDINATE WORK WITH TOWER OWNER.

6. DRAWINGS INDICATE THE MINIMUM STANDARDS, BUT IF ANY WORK SHOULD BE INDICATED TO BE SUBSTANDARD TO ANY ORDINANCES, LAWS, CODES, RULES, OR REGULATIONS BEARING ON THE WORK, THE CONTRACTOR SHALL INCLUDE IN HIS SCOPE OF WORK AND SHALL EXECUTE THE WORK CORRECTLY IN ACCORDANCE WITH SUCH ORDINANCES, LAWS, CODES, RULES OR REGULATIONS WITH NO INCREASE IN COSTS.

7. THE CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS, ELEVATIONS, ANGLES, AND EXISTING CONDITIONS AT THE SITE, PRIOR TO FABRICATION AND/OR INSTALLATION OF ANY WORK IN THE CONTRACT AREA.

8. ALL DAMAGE CAUSED TO ANY EXISTING STRUCTURE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR WILL BE HELD LIABLE FOR ALL REPAIRS REQUIRED FOR EXISTING STRUCTURES IF DAMAGED DURING CONSTRUCTION ACTIVITIES.

9. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ON-SITE SAFETY FROM THE TIME THE JOB IS AWARDED UNTIL ALL WORK IS COMPLETE AND ACCEPTED BY THE OWNER.

10. CONTRACTOR SHALL TAKE FIELD MEASUREMENTS NECESSARY TO ASSURE PROPER FIT OF ALL FINISHED WORK.

11. TOWER REINFORCING SHALL BE CONDUCTED BY FIELD CREWS EXPERIENCED IN THE ASSEMBLY AND ERECTION OF RADIO ANTENNAS AND SUPPORT STRUCTURES. ALL SAFETY PROCEDURES, RIGGING AND ERECTION METHODS SHALL BE STANDARD TO THE INDUSTRY AND IN COMPLIANCE WITH OSHA.

12. EXISTING COAXIAL CABLES AND ALL ACCESSORIES SHALL BE RELOCATED AS NECESSARY AND REINSTALLED BY THE CONTRACTOR WITHOUT INTERRUPTION IN SERVICE WHERE THEY ARE IN CONFLICT WITH TOWER REINFORCEMENT.

13. IF ANY FIELD CONDITIONS EXIST WHICH PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL PROCEED WITH AFFECTED WORK AFTER CONFLICT IS SATISFACTORILY RESOLVED.

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0	1/11/18	TJL	CFC	ISSUED FOR CONSTRUCTION

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T-MOBILE
PROPOSED 53' TOWER REINFORCEMENT DESIGN

CTNL193A

720 GUNNESS LUG ROAD
CHESHIRE, CT 06410

DATE:	1/11/18
SCALE:	AS SHOWN
JOB NO.	17179.00

DESIGN BASIS & GENERAL NOTES

SHEET NO.
N-1
Sheet No. 2 of 5

STRUCTURAL STEEL

1. ALL STRUCTURAL STEEL IS DESIGNED BY ALLOWABLE STRESS DESIGN (ASD).

2. MATERIAL SPECIFICATIONS

   A. STRUCTURAL STEEL (W SHAPES)---ASTM A992 (FY = 50 KSI)
   B. STRUCTURAL STEEL (OTHER SHAPES)---ASTM A36 (FY = 36 KSI).
   C. STRUCTURAL STEEL (TOWER REINF. PLATES--- ASTM A572_GR50 (50 KSI)
   D. STRUCTURAL HSS (RECTANGULAR SHAPES)---ASTM A500 GRADE B, (FY = 46 KSI)
   E. STRUCTURAL HSS (ROUND SHAPES)---ASTM A500 GRADE B, (FY = 42 KSI)
   F. PIPE---ASTM A53 GRADE B (FY = 35 KSI)

3. FASTENER SPECIFICATIONS

   A. CONNECTION BOLTS---ASTM A325-N, UNLESS OTHERWISE SCHEDULED.
   B. U-BOLTS---ASTM A307
   C. ANCHOR RODS---ASTM F1554
   D. WELDING ELECTRODES---ASTM E70XX FOR A36 & A572_GR50 STEELS, ASTM E80XX FOR A572_GR65 STEEL.
   E. BLIND BOLTS---AS1252 PROPERTY CLASS 8.8 (FU=120 KSI).

4. CONTRACTOR TO REVIEW ALL SHOP DRAWINGS AND SUBMIT COPY TO ENGINEER FOR APPROVAL. DRAWINGS MUST BEAR THE CHECKER'S INITIALS BEFORE SUBMITTING TO THE ENGINEER FOR REVIEW. SHOP DRAWINGS SHALL INCLUDE THE FOLLOWING: SECTION PROFILES, SIZES, CONNECTION ATTACHMENTS, REINFORCING, ANCHORAGE, SIZE AND TYPE OF FASTENERS AND ACCESSORIES. INCLUDE ERECTION DRAWINGS, ELEVATIONS AND DETAILS.

5. STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST PROVISIONS OF AISC MANUAL OF STEEL CONSTRUCTION.

6. PROVIDE ALL PLATES, CLIP ANGLES, CLOSURE PIECES, STRAP ANCHORS, MISCELLANEOUS PIECES AND HOLES REQUIRED TO COMPLETE THE STRUCTURE.

7. FIT AND SHOP ASSEMBLE FABRICATIONS IN THE LARGEST PRACTICAL SECTIONS FOR DELIVERY TO SITE.

8. INSTALL FABRICATIONS PLUMB AND LEVEL, ACCURATELY FITTED, AND FREE FROM DISTORTIONS OR DEFECTS.

9. AFTER ERECTION OF STRUCTURES, TOUCHUP ALL WELDS, ABRASIONS AND NON-GALVANIZED SURFACES WITH A 95% ORGANIC ZINC RICH PAINT IN ACCORDANCE WITH ASTM 780.

10. ALL STEEL MATERIAL (EXPOSED TO WEATHER) SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 "ZINC (HOT DIPPED GALVANIZED) COATINGS" ON IRONS AND STEEL PRODUCTS.

11. ALL BOLTS, ANCHORS AND MISCELLANEOUS HARDWARE SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153 "ZINC COATING (HOT-DIP) ON IRON AND STEEL HARDWARE".

12. CONTRACTOR SHALL COMPLY WITH AWS CODE FOR PROCEDURES APPEARANCE AND QUALITY OF WELDS, AND WELDING PROCESSES SHALL BE QUALIFIED IN ACCORDANCE WITH AWS "STANDARD QUALIFICATION PROCEDURES". ALL WELDING SHALL BE DONE USING THE SCHEDULED ELECTRODES AND WELDING SHALL CONFORM TO AISC AND D1.1 WHERE FILLET WELD SIZES ARE NOT SHOWN, PROVIDE THE MINIMUM SIZE PER TABLET J2.4 IN THE AISC "MANUAL OF STEEL CONSTRUCTION" 9TH EDITION. AT THE COMPLETION OF WELDING, ALL DAMAGE TO GALVANIZED COATING SHALL BE REPAIRED.

13. THE ENGINEER SHALL BE NOTIFIED OF ANY INCORRECTLY FABRICATED, DAMAGED OR OTHERWISE MISFITTING OR NON CONFORMING MATERIALS OR CONDITIONS TO REMEDIAL OR CORRECTIVE ACTION. ANY SUCH ACTION SHALL REQUIRE ENGINEER REVIEW.

14. CONNECTION ANGLES SHALL HAVE A MINIMUM THICKNESS OF 1/4 INCHES.

15. STRUCTURAL CONNECTION BOLTS SHALL CONFORM TO ASTM A325. ALL BOLTS SHALL BE 3/4" DIAMETER MINIMUM AND SHALL HAVE A MINIMUM OF TWO BOLTS, UNLESS OTHERWISE ON THE DRAWINGS.

16. LOCK WASHER ARE NOT PERMITTED FOR A325 BOLTED STEEL ASSEMBLIES.

17. SHOP CONNECTIONS SHALL BE WELDED OR HIGH STRENGTH BOLTED.

18. MILL BEARING ENDS OF COLUMNS, STIFFENERS, AND OTHER BEARING SURFACES TO TRANSFER LOAD OVER ENTIRE CROSS SECTION.

19. FABRICATE BEAMS WITH MILL CAMBER UP.

20. LEVEL AND PLUMB INDIVIDUAL MEMBERS OF THE STRUCTURE TO AN ACCURACY OF 1:500, BUT NOT TO EXCEED 1/4" IN THE FULL HEIGHT OF THE COLUMN.

21. COMMENCEMENT OF STRUCTURAL STEEL WORK WITHOUT NOTIFYING THE ENGINEER OF ANY DISCREPANCIES WILL BE CONSIDERED ACCEPTANCE OF PRECEDING WORK.

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T-MOBILE

PROPOSED TOWER RE-ENFORCEMENT DESIGN

CTNL193A

721 QUINEBAUG ROAD
COLCHESTER, CT 06415

DATE:	1/11/18
SCALE:	AS SHOWN
JOB NO.	17179.00

STRUCTURAL STEEL NOTES

SHEET NO.
N-2
Sheet No. 3 of 5

MODIFICATION INSPECTION REPORT REQUIREMENTS

PRE-CONSTUCTION		DURING CONSTRUCTION		POST-CONSTRUCTION	
SCHEDULED ITEM	REPORT ITEM	SCHEDULED ITEM	REPORT ITEM	SCHEDULED ITEM	REPORT ITEM
X	EOR MODIFICATION INSPECTION DRAWING	–	FOUNDATIONS	X	MODIFICATION INSPECTOR RECORD REDLINE DRAWING
X	EOR APPROVED SHOP DRAWINGS	–	EARTHWORK: BACKFILL MATERIAL & COMPACTION	–	POST–INSTALLED ANCHOR ROD PULL–OUT TEST
–	EOR APPROVED POST–INSTALLED ANCHOR MPII	–	CONCRETE TESTING	X	PHOTOGRAPHS
–	FABRICATION INSPECTION	X	STEEL INSPECTION		
X	FABRICATOR CERTIFIED WELDER INSPECTION	–	POST INSTALLED ANCHOR ROD VERIFICATION		
X	MATERIAL CERTIFICATIONS	–	BASE PLATE GROUT VERIFICATION		
		X	CONTRACTOR'S CERTIFIED WELD INSPECTION		
		X	ON–SITE COLD GALVANIZING VERIFICATION		
		–	GUY WIRE TENSION REPORT		
		X	CONTRACTOR AS–BUILT REDLINE DRAWINGS		

NOTES:
1. REFER TO MODIFICATION INSPECTION NOTES FOR ADDITIONAL REQUIREMENTS
2. "X" DENOTES DOCUMENT REQUIRED FOR INCLUSION IN MODIFICATION INSPECTION FINAL REPORT.
3. "–" DENOTES DOCUMENT NOT REQUIRED FOR INCLUSION IN MODIFICATION INSPECTION FINAL REPORT.
4. EOR – ENGINEER OF RECORD
4. MPII – "MANUFACTURER'S PRINTED INSTALLATION GUIDELINES"

GENERAL

1. THE MODIFICATION INSPECTION IS A VISUAL INSPECTION OF STRUCTURAL MODIFICATIONS, TO INCLUDE A REVIEW AND COMPILATION OF SPECIFIED SUBMITTALS AND CONSTRUCTION INSPECTIONS, AS AN ASSURANCE OF COMPLIANCE WITH THE CONSTRUCTION DOCUMENTS PREPARED UNDER THE DIRECTION OF THE ENGINEER OF RECORD (EOR).

2. THE MODIFICATION INSPECTION IS TO CONFIRM INSTALLATION CONFIGURATION AND GENERAL WORKMANSHIP AND IS NOT A REVIEW OF THE MODIFICATION DESIGN. OWNERSHIP OF THE MODIFICATION DESIGN EFFECTIVENESS AND INTENT RESIDES WITH THE ENGINEER OF RECORD.

3. TO ENSURE COMPLIANCE WITH THE MODIFICATION INSPECTION REQUIREMENTS THE GENERAL CONTRACTOR (GC) AND THE MODIFICATION INSPECTOR (MI) COMMENCE COMMUNICATION UPON AUTHORIZATION TO PROCEED BY THE CLIENT. EACH PARTY SHALL BE PROACTIVE IN CONTACTING THE OTHER. THE EOR SHALL BE CONTACTED IF SPECIFIC GC/MI CONTACT INFORMATION IS NOT MADE AVAILABLE.

4. THE GC SHALL PROVIDE THE MI WITH A MINIMUM OF 5 BUSINESS DAYS NOTICE OF IMPENDING INSPECTIONS.

5. WHEN POSSIBLE, THE GC AND MI SHALL BE ON SITE DURING THE MODIFICATION INSPECTION TO HAVE ANY NOTED DEFICIENCIES ADDRESSED DURING THE INITIAL MODIFICATION INSPECTION.

MODIFICATION INSPECTOR (MI)

1. THE MI SHALL CONTACT THE GC UPON AUTHORIZATION BY THE CLIENT TO:

   – REVIEW THE MODIFICATION INSPECTION REPORT REQUIREMENTS.
   – WORK WITH THE GC IN DEVELOPMENT OF A SCHEDULE FOR ON–SITE INSPECTIONS.
   – DISCUSS CRITICAL INSPECTIONS AND PROJECT CONCERNS.

2. THE MI IS RESPONSIBLE FOR COLLECTION OF ALL INSPECTION AND TEST REPORTS, REVIEWING REPORTS FOR ADHERENCE TO THE CONTRACT DOCUMENTS, CONDUCTING ON–SITE INSPECTIONS AND COMPILATION & SUBMISSION OF THE MODIFICATION INSPECTION REPORT TO THE CLIENT AND THE EOR.

GENERAL CONTRACTOR (GC)

1. THE GC IS REQUIRED TO CONTACT THE GC UPON AUTHORIZATION TO PROCEED WITH CONSTRUCTION BY THE CLIENT TO:

   – REVIEW THE MODIFICATION INSPECTION REPORT REQUIREMENTS.
   – WORK WITH THE MI IN DEVELOPMENT OF A SCHEDULE FOR ON–SITE INSPECTIONS.
   – DISCUSS CRITICAL INSPECTIONS AND PROJECT CONCERNS.

2. THE GC IS RESPONSIBLE FOR COORDINATING AND SCHEDULING IN ADVANCE ALL REQUIRED INSPECTIONS AND TESTS WITH THE MI.

CORRECTION OF FAILING MODIFICATION INSPECTION

1. SHOULD THE STRUCTURAL MODIFICATION NOT COMPLY WITH THE REQUIREMENTS OF THE CONSTRUCTION DOCUMENTS, THE GC SHALL WORK WITH THE MODIFICATION INSPECTOR IN A VIABLE REMEDIATION PLAN AS FOLLOWS:

   – CORRECT ALL DEFICIENCIES TO COMPLY WITH THE CONTRACT DOCUMENTS AND COORDINATE WITH THE MI FOR A FOLLOW UP INSPECTION.
   – WITH CLIENT AUTHORIZATION, THE GC MAY WORK WITH THE EOR TO REANALYZE THE MODIFICATION USING THE AS–BUILT CONDITION.

REQUIRED PHOTOGRAPHS

1. THE GC AND MI SHALL AT MINIMUM PHOTO DOCUMENT THE FOLLOWING FOR INCLUSION IN THE MODIFICATION INSPECTION REPORT:

   – PRE–CONSTRUCTION: GENERAL CONDITION OF THE SITE.
   – DURING CONSTRUCTION: RAW MATERIALS, CRITICAL DETAILS, WELD PREPARATION, BOLT INSTALLATION & TORQUE, FINAL INSTALLED CONDITION & SURFACE COATING REPAIRS.
   – POST–CONSTRUCTION: FINAL CONDITION OF THE SITE

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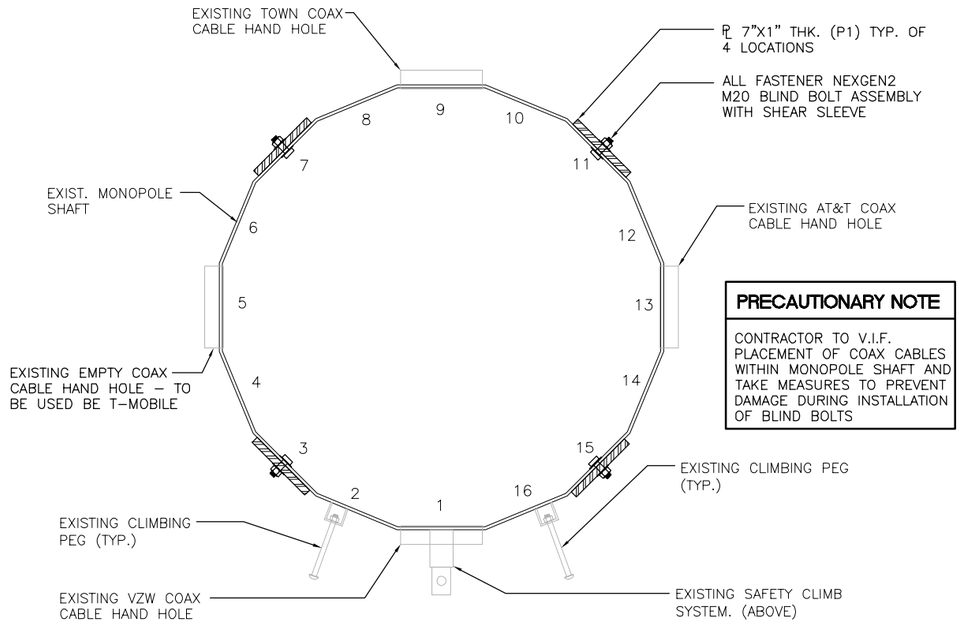
MODIFICATION INSPECTION REQUIREMENTS

SHEET NO.
MI-1
Sheet No. 4 of 5

1 S-1 TOWER ELEVATION

SCALE: 1" = 15'-0"

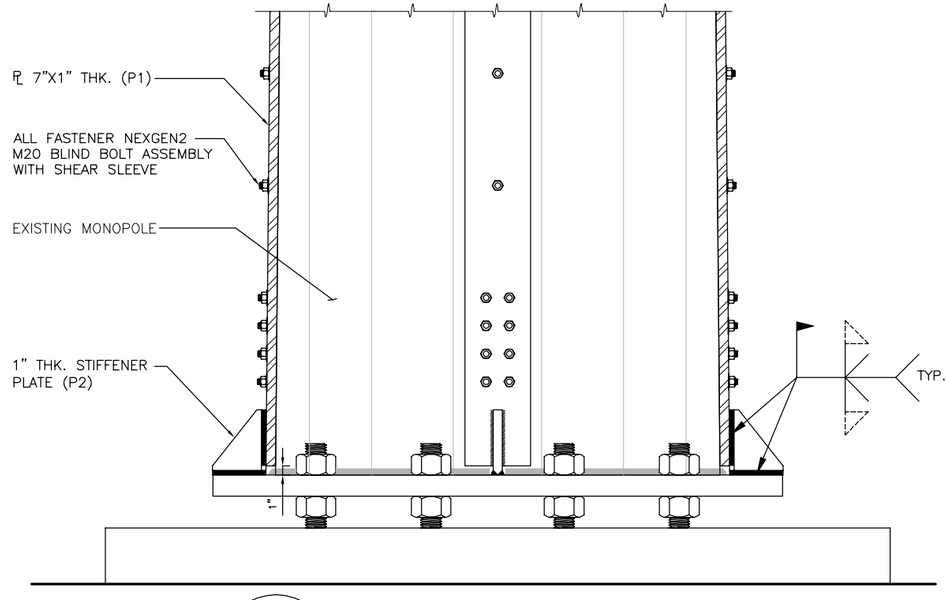


PRECAUTIONARY NOTE

CONTRACTOR TO V.I.F. PLACEMENT OF COAX CABLES WITHIN MONOPOLE SHAFT AND TAKE MEASURES TO PREVENT DAMAGE DURING INSTALLATION OF BLIND BOLTS

2 S-1 REINFORCEMENT PLAN

SCALE: 3/4" = 1'-0"



3 S-1 TOWER/PLATE BASE DETAIL

SCALE: 3/4" = 1'-0"

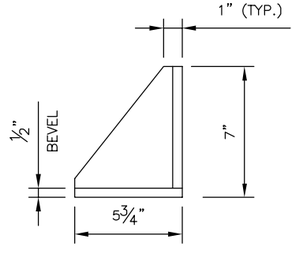


PLATE P2 – 1" THK.
(TYP. OF 4)

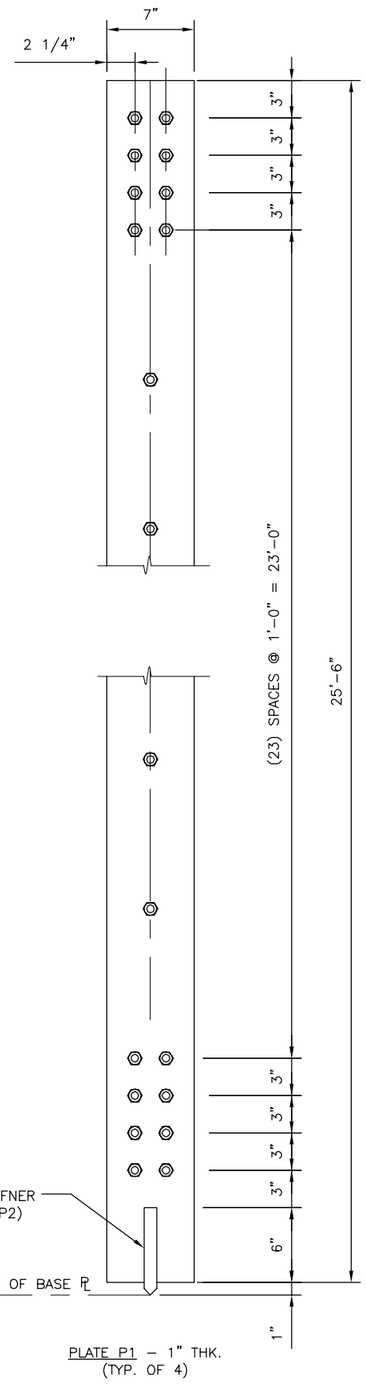


PLATE P1 – 1" THK.
(TYP. OF 4)

4 S-1 PLATE DETAILS

SCALE: NTS

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TOWER REINFORCEMENT DETAILS

SHEET NO.
S-1
Sheet No. 5 of 5

RAN Template:	A&L Template:	Power System Template:
4Sec-6797DB2	4Sec-6797DB2_1xAIR+2QP	Custom

CTNL193A_Coverage Strategy_0.1_draft

Section 1 - Site Information

Site ID: CTNL193A
Status: Draft
Version: 0.1
Project Type: Coverage Strategy
Approved: Not Approved
Approved By: Not Approved
Last Modified: 12/7/2017 2:11:31 PM
Last Modified By: GSM1900MLow1

Site Name: PCTNL192A
Site Class: <undefined>
Site Type: <undefined>
Solution Type:
Plan Year:
Market: CONNECTICUT
Vendor: Ericsson
Landlord: Not Specified

Latitude: 42.02280000
Longitude: -71.94930000
Address: 734 Quinebaug Rd
City, State: Quinebaug, CT
Region: NORTHEAST

RAN Template: 4Sec-6797DB2			AL Template: 4Sec-6797DB2_1xAIR+2QP	
Sector Count: 4	Antenna Count: 12	Coax Line Count: 0	TMA Count: 0	RRU Count: 12

Section 2 - Existing Template Images

----- This section is intentionally blank. -----

Section 3 - Proposed Template Images

----- This section is intentionally blank. -----

Section 4 - Siteplan Images

----- This section is intentionally blank. -----

RAN Template:	A&L Template:	Power System Template:
4Sec-6797DB2	4Sec-6797DB2_1xAIR+2QP	Custom

CTNL193A_Coverage Strategy_0.1_draft

Section 5 - RAN Equipment

Existing RAN Equipment
----- This section is intentionally blank. -----

Proposed RAN Equipment

Template: 4Sec-6797DB2

Enclosure	1	2
Enclosure Type	RBS 6102 MU AC	Ancillary Equipment
Baseband	DUW30 (U2100); BB 5216 (L2100, L1900, L700, L600)	
Hybrid Cable System		Ericsson 6x12 HCS *Select Length & AWG* (x4)
Multiplexer	XMU (L2100, L1900, L700, L600)	

RAN Scope of Work:

RAN Template:	A&L Template:	Power System Template:
4Sec-6797DB2	4Sec-6797DB2_1xAIR+2QP	Custom

CTNL193A_Coverage Strategy_0.1_draft

Section 6 - A&L Equipment

Existing Template: Custom
Proposed Template: 4Sec-6797DB2_1xAIR+2QP

Sector 1 (Proposed) view from behind								
Coverage Type	A - Outdoor Macro							
Antenna	1				2		3	
Antenna Model	Ericsson - AIR32 KRD901146-1_B66A_B2A (Octa)				RFS - APXVAA24_43-U-A20 (Quad)		RFS - APX16DWV-16DWV-S-E-A20 (Quad)	
Azimuth	45				45		45	
M. Tilt	0				0		0	
Height	110				110		110	
Ports	P1	P2	P3	P4	P5	P6	P7	P8
Active Tech.	L2100	L2100	L1900	L1900	L700	L600	U2100	
Dark Tech.								
Restricted Tech.								
Decomm. Tech.								
E. Tilt	2		2		2	2	2	
Cables								
TMAs								
Diplexers / Combiners					Generic 600/700 Diplexer (AtAntenna)	Generic 600/700 Diplexer (AtAntenna)		
Radio					RRUS11 B12 (At Antenna)	Radio 4478 B71 (At Antenna)	RRUS11 B4 (At Antenna)	
Sector Equipment								

Unconnected Equipment:

Scope of Work:

RAN Template:	A&L Template:	Power System Template:
4Sec-6797DB2	4Sec-6797DB2_1xAIR+2QP	Custom

CTNL193A_Coverage Strategy_0.1_draft

Sector 2 (Proposed) view from behind								
Coverage Type	A - Outdoor Macro							
Antenna	1				2		3	
Antenna Model	Ericsson - AIR32 KRD901146-1_B66A_B2A (Octa)				RFS - APXVAA24_43-U-A20 (Quad)		RFS - APX16DWV-16DWV-S-E-A20 (Quad)	
Azimuth	135				135		135	
M. Tilt	0				0		0	
Height	110				110		110	
Ports	P1	P2	P3	P4	P5	P6	P7	P8
Active Tech.	L2100	L2100	L1900	L1900	L700	L600	U2100	
Dark Tech.								
Restricted Tech.								
Decomm. Tech.								
E. Tilt	2		2		2	2	2	
Cables								
TMAs								
Diplexers / Combiners					Generic 600/700 Diplexer (AtAntenna)	Generic 600/700 Diplexer (AtAntenna)		
Radio					RRUS11 B12 (At Antenna)	Radio 4478 B71 (At Antenna)	RRUS11 B4 (At Antenna)	
Sector Equipment								

Unconnected Equipment:

Scope of Work:

RAN Template:	A&L Template:	Power System Template:
4Sec-6797DB2	4Sec-6797DB2_1xAIR+2QP	Custom

CTNL193A_Coverage Strategy_0.1_draft

Sector 3 (Proposed) view from behind								
Coverage Type	A - Outdoor Macro							
Antenna	1				2		3	
Antenna Model	Ericsson - AIR32 KRD901146-1_B66A_B2A (Octa)				RFS - APXVAA24_43-U-A20 (Quad)		RFS - APX16DWV-16DWV-S-E-A20 (Quad)	
Azimuth	225				225		225	
M. Tilt	0				0		0	
Height	110				110		110	
Ports	P1	P2	P3	P4	P5	P6	P7	P8
Active Tech.	L2100	L2100	L1900	L1900	L700	L600	U2100	
Dark Tech.								
Restricted Tech.								
Decomm. Tech.								
E. Tilt	2		2		2	2	2	
Cables								
TMAs								
Diplexers / Combiners					Generic 600/700 Diplexer (AtAntenna)	Generic 600/700 Diplexer (AtAntenna)		
Radio					RRUS11 B12 (At Antenna)	Radio 4478 B71 (At Antenna)	RRUS11 B4 (At Antenna)	
Sector Equipment								

Unconnected Equipment:

Scope of Work:

RAN Template:	A&L Template:	Power System Template:
4Sec-6797DB2	4Sec-6797DB2_1xAIR+2QP	Custom

CTNL193A_Coverage Strategy_0.1_draft

Sector 4 (Proposed) view from behind								
Coverage Type	A - Outdoor Macro							
Antenna	1				2		3	
Antenna Model	Ericsson - AIR32 KRD901146-1_B66A_B2A (Octa)				RFS - APXVAA24_43-U-A20 (Quad)		RFS - APX16DWV-16DWV-S-E-A20 (Quad)	
Azimuth	315				315		315	
M. Tilt	0				0		0	
Height	110				110		110	
Ports	P1	P2	P3	P4	P5	P6	P7	P8
Active Tech.	L2100	L2100	L1900	L1900	L700	L600	U2100	
Dark Tech.								
Restricted Tech.								
Decomm. Tech.								
E. Tilt	2		2		2	2	2	
Cables								
TMAs								
Diplexers / Combiners					Generic 600/700 Diplexer (AtAntenna)	Generic 600/700 Diplexer (AtAntenna)		
Radio					RRUS11 B12 (At Antenna)	Radio 4478 B71 (At Antenna)	RRUS11 B4 (At Antenna)	
Sector Equipment								

Unconnected Equipment:

Scope of Work:

RAN Template:	A&L Template:	Power System Template:
4Sec-6797DB2	4Sec-6797DB2_1xAIR+2QP	Custom

CTNL193A_Coverage Strategy_0.1_draft

Section 7 - Power Systems Equipment

Existing Power Systems Equipment
----- This section is intentionally blank. -----

Proposed Power Systems Equipment

AIR-32 B4A/B2P & B2A/B66AA

ERICSSON ANTENNA INTEGRATED RADIO AIR-32

Radio		
	Single Band (B4a/B2p)	**Dual Band (B2a/B66Aa)**
Band 2 (1850-1910 / 1930-1990 MHz)	Passive frequency band	Active frequency band
Band 4 (1710-1755 / 2110-2155 MHz)	Active frequency band	Subset of Band 66A (AWS 1+3)
Band 66A (1710-1780 / 2110-2180 MHz)	N/A	Active frequency band
PA Output Power	4 x 30W	2 x (4 x 30) W
Downlink EIRP in bore-sight direction for each active band	4 x 62.5 dBmi	4 x 62.5 dBmi
Instantaneous bandwidth	45 MHz (W, L)	B2: 40 MHz (W, L) B2: 20 MHz (G) B66A: 70 MHz (W, L)
Capacity (single standard per unit)	6 GSM 6 WCDMA 2 x 20 MHz LTE	6 GSM (B2 only) 6 WCDMA per Active frequency band 2 x 20 MHz LTE per band
Multi-RAT capability	WCDMA and LTE on both PAs	WCDMA and GSM on both PAs (B2 only) WCDMA and LTE on both PAs (B2 and B4) GSM and LTE (B2 only)

Interfaces		
Optical CPRI	2 x 10 Gbps	2 x 10 Gbps per Active frequency band
DC Power	-48 VDC 3-wire or 2-wire	-48 VDC 3-wire or 2-wire (separate input for both radios)
AC power (Optional)	PSU-AC 08	PSU-AC 08
Passive antenna	4 RF connectors (7/16 female)	N/A
Environmental		
Operating Temperature Range	-40 to +55 °C	-40 to +55 °C
Solar Radiation	≤ 1,120 W/m²	≤ 1,120 W/m²
Relative Humidity	5 to 100%	5 to 100%
Absolute Humidity	0.26 to 40 g/m^3	0.26 to 40 g/m^3
Maximum temperature change	1.0°C/min	1.0°C/min
Antenna		
Electrical Tilt	2º – 12º (B4) 2º – 12º (B2)	2º – 12º (B66A) 2º – 12º (B2)
Bore-sight antenna gain	18 dBi (B4) 17.5 dBi (B2)	18 dBi (B66A) 17.5 dBi (B2)
Nominal beam-width, azimuth	65º (B4) 63º (B2)	65º (B66A) 63º (B2)
Nominal beam-width, elevation	6º (B4) 6º (B2)	6º (B66A) 6º (B2)
Mechanical		
Weight	48 Kg (105.8 lbs)	60 Kg (132.2 lbs)
Dimensions (H x W x D)	1439 x 327 x 220 mm (56.6” x 12.9” x 8.7”)	1439 x 327 x 220 mm (56.6” x 12.9” x 8.7”)
Wind load at 42 m/s (150 km/h) Front / Lateral / Rear	640N / 300N / 660N	640N / 300N / 660N

Product Data Sheet **APX16DWV-16DWVS-E-A20**

Optimizer® Side-by-Side Dual Polarized Antenna, 1710-2200, 65deg, 18.4dBi, 1.4m, VET, 0-10deg RET

Product Description

A combination of two X-Polarized antennas in a single radome, this pair of variable tilt antennas provides exceptional suppression of all upper sidelobes at all downtilt angles. It also features a wide downtilt range. This antenna is optimized for performance across the entire frequency band (1710-2200 MHz). The antenna comes pre-connected with two antenna control units (ACU).

Features/Benefits

- **Variable electrical downtilt - provides enhanced precision in controlling intercell interference. The tilt is infield adjustable 0-10 deg.**
- **High Suppression of all Upper Sidelobes (Typically <-20dB).**
- **Gain tracking – difference between AWS UL (1710-1755 MHz) and DL (2110-2155 MHz) <1dB.**
- **Two X-Polarised panels in a single radome.**
- **Azimuth horizontal beamwidth difference <4deg between AWS UL (1710-1755 MHz) and DL (2110-2155 MHz).**
- **Low profile for low visual impact.**
- **Dual polarization; Broadband design.**
- **Includes (2) AISG 2.0 Compatible ACU-A20-N antenna control units.**

Technical Specifications

Electrical Specifications

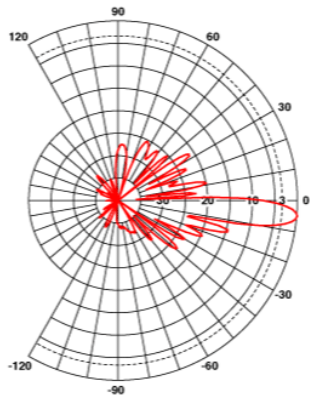
Frequency Range, MHz	1710-2200
Horizontal Beamwidth, deg	65
Vertical Beamwidth, deg	5.9 to 7.7
Electrical Downtilt, deg	0-10
Gain, dBi (dBd)	18.4 (16.3)
1st Upper Sidelobe Suppression, dB	> 18 (typically > 20)
Upper Sidelobe Suppression, dB	> 18 all (typically > 20)
Front-To-Back Ratio, dB	>26 (typically 28)
Polarization	Dual pol +/-45°
VSWR	< 1.5:1
Isolation between Ports, dB	> 30
3rd Order IMP @ 2 x 43 dBm, dBc	> 150 (155 Typical)
Impedance, Ohms	50
Maximum Power Input, W	300
Lightning Protection	Direct Ground
Connector Type	(4) 7-16 Long Neck Female

Mechanical Specifications

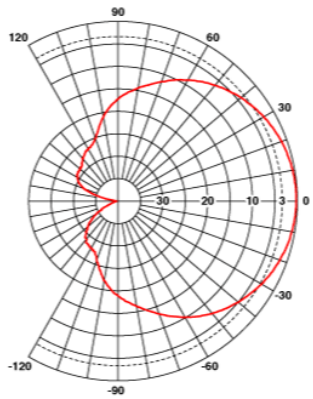
Dimensions - HxWxD, mm (in)	1420 x 331 x 80 (55.9 x 13 x 3.15)
Weight w/o Mtg Hardware, kg (lb)	18.5 (40.7)
Survival Wind Speed, km/h (mph)	200 (125)
Rated Wind Speed, km/h (mph)	160 (100)
Max Wind Loading Area, m² (ft²)	0.47 (5.03)
Front Thrust @ Rated Wind, N (lbf)	756 (170)
Maximum Thrust @ Rated Wind, N (lbf)	756 (170)
Wind Load - Side @ Rated Wind, N (lbf)	231 (52)
Wind Load - Rear @ Rated Wind, N (lbf)	408 (92)
Radome Material	Fiberglass
Radome Color	Light Grey RAL7035
Mounting Hardware Material	Diecasted Aluminum
Shipping Weight, kg (lb)	24.5 (53.9)
Packing Dimensions, HxWxD, mm (in)	1520 x 408 x 198 (59.8 x 16 x 7.8)

Ordering Information

Mounting Hardware	APM40-2 + APM40-E2



Vertical Pattern



Horizontal Pattern

RADIO FREQUENCY SYSTEMS
The Clear Choice®

Dual Slant Polarized Dual Band (4 Port) Antenna, 617-746MHz, 65 deg, 15.6dBi, 2.4m(8ft), VET, RET, 0-11° Tilt Range

FEATURES / BENEFITS

This antenna provides a four port platform for advanced use in 600MHz and 700MHz deployment scenarios in a high quality package design built to withstand harsh environments.

- **24-Inch Width for Easier Zoning**
- **Field Replaceable (Integrated) AISG RET platform for reduced environmental exposure and long lasting quality.**
- **Superior elevation performance across the entire electrical down tilt range.**
- **High Gain performance for optimum site coverage, reduced power and signal integrity.**
- **Excellent Front-to-Back Ratio for less interference from neighboring cells.**
- **Manual Override feature for electrical downtilt adjustment.**
- **Both arrays driven by one RET**

Technical Features

ANTENNA PERFORMANCE - LEFT R1

Frequency Range	MHz	617-698MHz	698-746MHz
Gain	dBi	15.3	15.7
Horizontal Beamwidth	deg	68	65
Vertical Beamwidth	deg	10.6	9.8
Electrical Downtilt Range	deg	0-11	0-11
Upper Side Lobe Suppression Peak to +20	dB	21	21
Upper Side Lobe Suppression 0 to +20	dB	20	21
Front to Back Ratio +/-30 Copolar	dB	27	28
Cross Polar Isolation Between Ports	dB	26	26
Cross Polarization (XPD) @ Boresight	dB	27	27
Cross Polarization (XPD) @ +/-60	dB	10	7
VSWR		1.5:1	1.5:1
3rd Order IMP 2 x 43dBm	dBc		153
Maximum Power Input	Watts	250	250

RADIO FREQUENCY SYSTEMS
The Clear Choice®

Dual Slant Polarized Dual Band (4 Port) Antenna, 617-746MHz, 65 deg, 15.6dBi, 2.4m(8ft), VET, RET, 0-11° Tilt Range

ANTENNA PERFORMANCE - RIGHT R2

Frequency Range	MHz	617-698	698-746
Gain	dBi	15.2	15.5
Horizontal Beamwidth	deg	68	64
Vertical Beamwidth	deg	10.6	9.8
Electrical Downtilt Range	deg	0-11	0-11
Upper Side Lobe Suppression Peak to +20	dB	21	23
Upper Side Lobe Suppression 0 to +20	dB	19	20
Front to Back Ratio +/-30 Copolar	dB	27	28
Cross Polar Isolation Between Ports	dB	26	26
Cross Polar Discrimination (XPD) @ Boresight	dB	24	24
Cross Polar Discrimination (XPD) @ +/- 60	dB	10	7
VSWR		1.5:1	1.5:1
3rd Order IMP 2 x 43dBm	dBc		153
Maximum Power Input	Watts	250	250

ELECTRICAL SPECIFICATIONS

Impedance	Ohm	50.0
Polarization	Deg	±45°

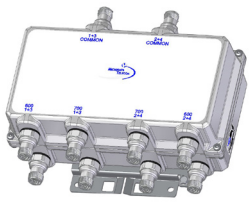
MECHANICAL SPECIFICATIONS

Dimensions - H x W x D	mm (in)	2435 x 609 x 215 (95.9 x 24 x 8.5)
Weight (Antenna Only)	kg (lb)	45 (99)
Weight (Mounting Hardware only)	kg (lb)	11.5 (25.3)
Shipping Weight	kg (lb)	67 (147.4)
Connector type		4 x 4.3-10 Long Neck Female/Bottom + 2 AISG connectors (1 male, 1 female)
Adjustment mechanism		Integrated RET solution AISG compliant (Field Replaceable) + Manual Override + External Tilt Indicator
Mounting Hardware Material		Galvanized steel
Radome Material / Color		Fiber Glass/ Light Grey RAL7035

TESTING AND ENVIRONMENTAL

Temperature Range	°C (°F)	-40 to 60 (-40 to 140)
Lightning protection		Direct Ground
Survival/Rated Wind Velocity	km/h	241 (150)

MI-554nn
Diplexer 600/700



MASS™
Microdata Advanced Site Solutions

With our expertise in site system design we are able to provide a solution for any site sharing or upgrade scenario.

Our focus area is RF-filter based solutions including combiners, multi band TMAs, di-, tri- and quadruplexers.

Our product portfolio supports all frequencies for mobile communication bands ranging from 450 MHz to 6 GHz.

Site and network sharing makes it cost efficient to reach sparsely populated areas where new subscribers can contribute to revenue.

MASS™
Advantage

Increases coverage
more traffic & higher ARPU

Increases capacity
more traffic & higher ARPU

Reduces the cost
of network expansion

Minimizes
site acquisition issues

Specifications

600		
Frequency Band	617 - 688 MHz	
Insertion Loss	<0.3 dB*, <0.55 dB max	
Return Loss	>20 dB	
Rejection 698 - 716 MHz	>20 dB	
Rejection 728 - 746 MHz	>50 dB	
Continuous Average Power	250 W	
Intermodulation, 2x43 dBm TX Carrier	-117 dBm	
700		
Frequency Band	698 - 746 MHz	
Insertion Loss	<0.3 dB*, <0.5 dB max	
Return Loss	>20 dB	
Rejection 663 - 688 MHz	>20 dB	
Rejection 617 - 642 MHz	>50 dB	
Continuous Average Power	250 W	
Intermodulation, 2x43 dBm TX Carrier	-117 dBm	
Environmental		
Operating Temperature Range	-40 to +65°C | -40 to +149°F	
Operation	ETS 300 019-1-4 Class 4.1E	
Storage	ETS 300 019-1-1 Class 1.2	
Ingress Protection	IP67	
Electrical		**With Auto-Sense**
DC By Pass	3 A	2A, drop max 2.4V
AISG pass	Yes	
AISG RL		>12dB
AISG Loss		< 1 dB
Lightning Protection	5 kA 8/20 µs	10 kA 8/20 µs
Input Voltage Power		8-31 V max 0.3 W
Mechanical	4:2 version	8:4 version
Dimensions (WxHxD)	300x160x73 mm 11.81x6.30x2.87 in	300x160x116 mm 11.81x6.30x4.57 in
With Auto-Sense	300x160x73 mm 11.81x6.30x2.87 in	301x161x145 mm 11.85x6.34x5.71 in
Volume	3.5 l	5.6 l
With Auto-Sense	3.5 l	7.0 l
Weight	3.7 kg | 8.16 lb	6.7 kg | 14.77 lb
With Auto-Sense	3.7 kg | 8.16 lb	7.2 kg | 15.87 lb
Connectors	4.3-10 f	
Mounting	Hose clamps or wall mount (Supporter Pole Diameter: 40-140mm)	
Colour	NCS 1502-R	
Bracket	Included	
Versions		
4:2 Diplexer (4 band 2 common)	MI-5543n	
8:4 Diplexer (8 band 4 common)	MI-5544n	
*typical		

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Phone: +46 8 477 77 70, Fax: +46 8 477 77 80
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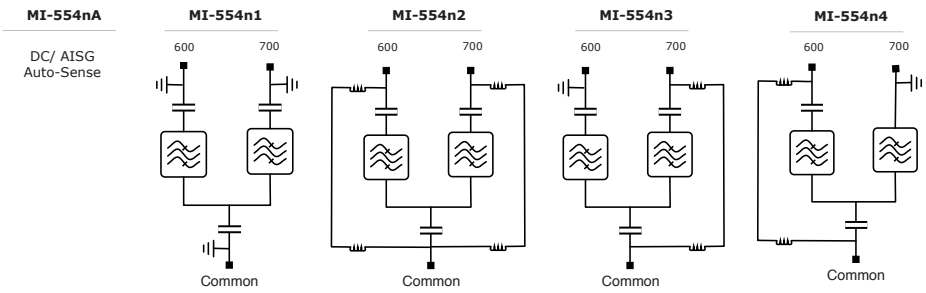
MI-554nn
Diplexer 600/700

Block Diagram

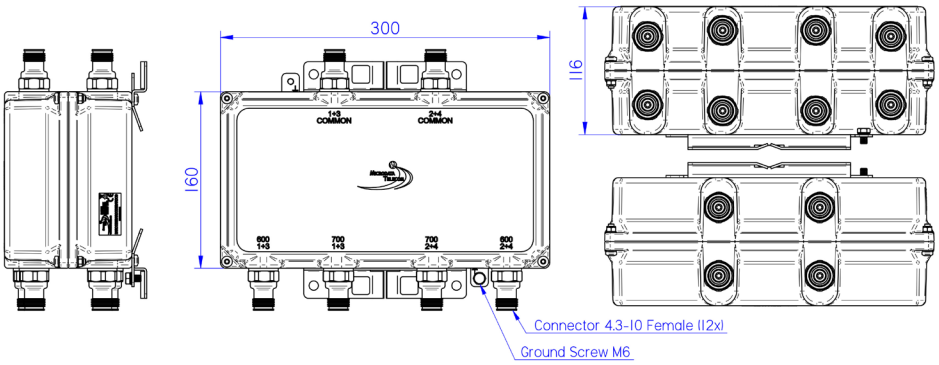


DC/AISG

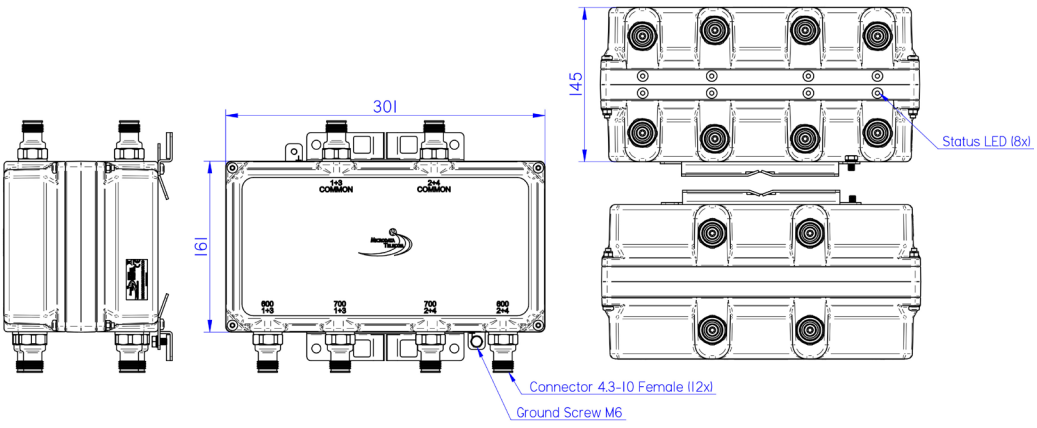
	600	700
MI-554nA	Auto-Sense	
MI-554n1	Block	Block
MI-554n2	Pass	Pass
MI-554n3	Block	Pass
MI-554n4	Pass	Block

Mechanical Drawing

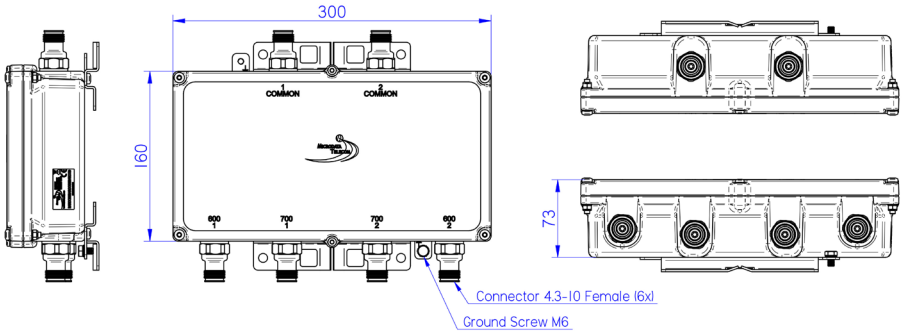
***The picture is showing MI-5544n**



***The picture is showing MI-5544A**



***The picture is showing MI-5543n**



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www.microdatatelecom.com, sales@microdata.se

RRUS 11

Frequency (AT&T)
- ✓ Band 12 (Lower 700 MHz)
- ✓ Band 4 (AWS, 17/2100 MHz) — 2Q2011

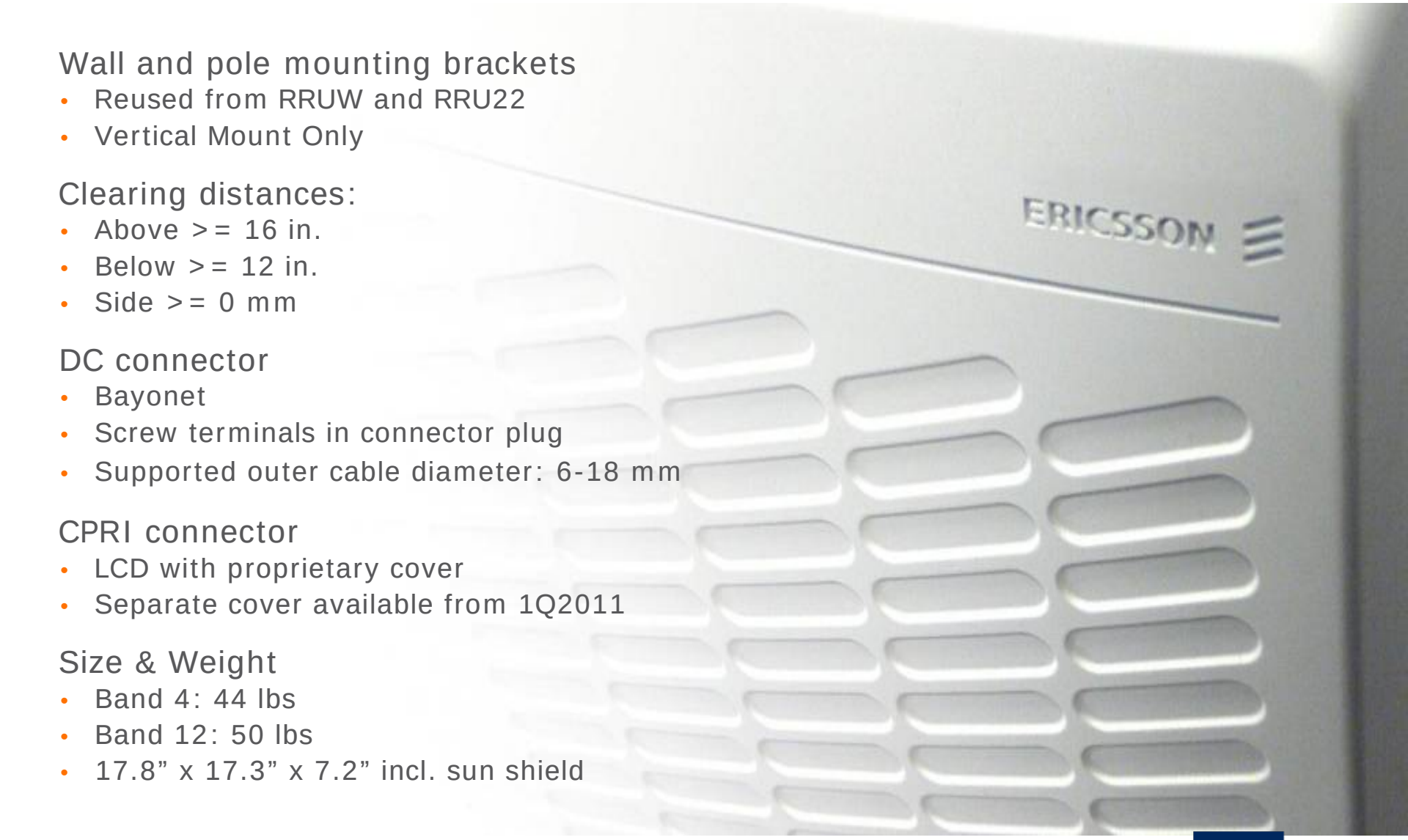
RF Characteristics
- ✓ Output power: 2x30 Watts
- ✓ 2x2 MIMO Capable
- ✓ IBW of 20 MHz
- ✓ Rx Sens.: Better than -105 dBm (5 MHz)

RET/TMA Support
- ✓ AISG 2.0 Compatible
- ✓ Via RET Port and Centre Conductor
- ✓ Cascading
- ✓ 30 VDC Bias

Environmental
- ✓ Self Convection
- ✓ Temperature -40 to 131 F

Power
- ✓ Input voltage: -48 VDC or AC (exemption)
- ✓ Fuse size: 13 – 32 A
  - Recommended: 25 A
- ✓ Power Consumption:
  - Typical 200 Watts
  - Max 310 Watts
  - Excl. RET and TMA load

RRUS 11 Mechanics



Wall and pole mounting brackets
- Reused from RRUW and RRU22
- Vertical Mount Only

Clearing distances:
- Above >= 16 in.
- Below >= 12 in.
- Side >= 0 mm

DC connector
- Bayonet
- Screw terminals in connector plug
- Supported outer cable diameter: 6-18 mm

CPRI connector
- LCD with proprietary cover
- Separate cover available from 1Q2011

Size & Weight
- Band 4: 44 lbs
- Band 12: 50 lbs
- 17.8” x 17.3” x 7.2” incl. sun shield

RADIO 4478

The macro Radio 4478 is a 4T/4R radio supporting low bands with 4x40W output power. As part of the Ericsson Radio System portfolio Radio 4478 has best in class design when it comes to radio performance and power efficiency for wide area 3GPP radio products.

Radio 4478 has by use of its small and smart dimensions support for a wide range of mounting scenarios and provides a pioneering flexibility within its product segment with the One-bolt Installation. With Radio 4478 Ericsson evolves the macro radio part of the portfolio to become even more flexible and making it easier than ever to make small and efficient single and multi-band macro radio installations.

The Radio 4478 should preferably be located near the antenna and can be located up to 40 km from the baseband unit. A fiber optic cable can be used to connect the Radio 4478 to the baseband unit and several radio units can be connected in a cascade or star configuration.

Radio 4478 provides support for AISG TMA and RET towards the antenna system. LTE is supported with up to 6 carriers in MIMO. Four duplex (TX/RX) branches provide in-built support for MIMO, antenna calibration and TX/RX diversity.

Optional installation equipment for wall and pole mount is available. To support AC installations there will be optional Power Supply Units (PSU).

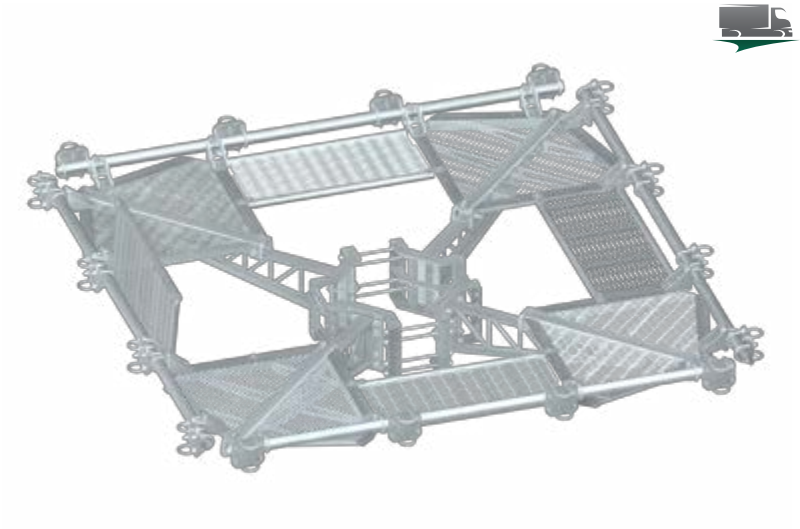
Technical specification for Radio 4478

FREQUENCY BANDS	
Bands:	3GPP FDD low bands (600-900 MHz)
HW CAPACITY	
Carrier capacity LTE:	Up to 6 carriers in MIMO
IBW:	Full band IBW
MIMO:	Yes, 4T4R
Output power:	Up to 4 x 40 W
INTERFACE SPECIFICATIONS	
Antenna ports:	4 x 4.3-10 (f)
External Antenna Line Device:	RET 2.0, using DIN 8 or over the antenna port. AISG TMA & RET support
CPRI:	2 x 2.5/4.9/9.8/10.1 Gbps (exchangeable SFP modules)
Optical indicators:	5
Maintenance button:	1
External alarms:	2 (using DIN 14) or optional fan unit
Field ground:	Dual lug
MECHANICAL SPECIFICATIONS	
Weight:	27 kg
Volume:	24 liter
Mounting:	Rail, wall and pole mount Fans needed when mounted in non-vertical direction
ELECTRICAL SPECIFICATIONS	
Power Supply:	-48 VDC (3-wire)
ENVIRONMENTAL SPECIFICATIONS	
Normal operating temp.:	-40 °C to +55 °C (cold start at -40 °C)
Environment:	Outdoor class with IP65

Telefonaktiebolaget LM Ericsson
SE-164 80 Stockholm, Sweden
www.ericsson.com

28701-FGC 101 3398 Rev A

NEW Fortress™ Quad-Platform Mount



Add Antenna Mounting Pipes separately

- The Fortress™ Quad-Platform is the strongest monopole platform we have ever built; it's robust design eliminates the need for a second ring mount and reinforcement kit.
- The revolutionary new truss design makes the Fortress™ Quad-Platform 3 times stronger than ordinary platform mounts while maintaining a low EPA.
- Innovative hinged grating sections allow easy access to walkway; flush walkway and the lack of sharp edges make this platform safe for climbers.
- Welded design requires minimal hardware; all hardware is 5/8" to further simplify assembly.
- Kits include hardware to mount up to twelve 2-3/8" or 2-7/8" Antenna Mounting Pipes (order separately, p. 208)
- No-grating versions of the Fortress platform are also available, contact us for details

SUPER LD Xtreme Load Design

Part #	Pole Diameter	Pole Circumference	Face Width	Price
F4P-8W	12" - 40"	37.7" - 94.2"	9' - 0"	Call for pricing
F4P-10W	12" - 60"	37.7" - 125.6"	10' - 6"	Call for pricing
F4P-12W	12" - 60"	37.7" - 188.4"	12' - 6"	Call for pricing
F4P-14W	12" - 60"	37.7" - 188.4"	14' - 6"	Call for pricing

Handrail Kits

Part #	Description	Price
F4P-HRK8	Handrail Kit for F4P-8W Platform	Call for pricing
F4P-HRK10	Handrail Kit for F4P-10W Platform	Call for pricing
F4P-HRK12	Handrail Kit for F4P-12W Platform	Call for pricing
F4P-HRK14	Handrail Kit for F4P-14W Platform	Call for pricing

10 INDUSTRIAL AVE,
SUITE 3
MAHWAH NJ 07430

PHONE: 201.684.0055
FAX: 201.684.0066

Transcend Wireless

Letter of Authorization

Site: Monopole Tower at 720 Quinebaug Road, Quinebaug, CT

Owner: Quinebaug Volunteer Fire Department

Lessee: T-Mobile Northeast LLC

Quinebaug Volunteer Fire Department, owner of the tower facility located at the address identified above (the "Tower Facility"), do hereby authorize T-Mobile Northeast LLC, its successors and assigns, and/or its agent, (collectively, the "Lessee") to act as our non-exclusive agent for the sole purpose of filing and consummating any land-use, zoning, or building permit application(s) as may be required by the applicable permitting authorities for Lessee's telecommunications' installations.

We understand that this application may be denied, modified or approved with conditions. The above authorization is limited to the acceptance by Lessee only of conditions related to Lessee's installation and any such conditions of approval or modifications will be Lessee's sole responsibility.

Signature: Steven T. Bodrea

Print Name: STEVEN T. BODREAU

Date: 1/18/18

EBI Consulting
environmental | engineering | due diligence

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

T-Mobile Existing Facility

Site ID: CTNL193A

PCTNL192A
720 Quinebaug Road
Thompson, CT 06262

December 22, 2017

EBI Project Number: 6217005798

Site Compliance Summary	
Compliance Status:	COMPLIANT
Site total MPE% of FCC general population allowable limit:	12.91 %

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

December 22, 2017

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

Emissions Analysis for Site: **CTNL193A – PCTNL192A**

EBI Consulting was directed to analyze the proposed T-Mobile facility located at **720 Quinebaug Road, Thompson, CT**, for the purpose of determining whether the emissions from the Proposed T-Mobile Antenna Installation located on this property are within specified federal limits.

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

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

General population/uncontrolled exposure limits apply to situations in which the general population 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 population would always be considered under this category when exposure is not employment related, for example, in the case of a telecommunications tower that exposes persons in a nearby residential area.

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ($\mu W/cm^2$). The general population exposure limit for the 600 MHz & 700 MHz Bands are approximately 400 $\mu W/cm^2$ and 467 $\mu W/cm^2$ respectively, and the general population exposure limit for the 1900 MHz (PCS) and 2100 MHz (AWS) bands is 1000 $\mu W/cm^2$. Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

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

Additional details can be found in FCC OET 65.

CALCULATIONS

Calculations were done for the proposed T-Mobile Wireless antenna facility located at **720 Quinebaug Road, Thompson, 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 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.

2) 2 LTE channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 Watts per Channel.

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) 1 LTE channel (600 MHz Band) was considered for each sector of the proposed installation. This channel has a transmit power of 30 Watts

6) 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.

7) For the following calculations, the sample point was the top of a 6-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.

8) The antennas used in this modeling are the **Ericsson AIR32 B66A/B2A** & **RFS APX16DWV-16DWVS-E-A20** for 1900 MHz (PCS) and 2100 MHz (AWS) channels and the **RFS APXVAA24-43-U-A20** for 600 MHz & 700 MHz channels. This is based on feedback from the carrier with regards to anticipated antenna selection. The Ericsson **AIR32 B66A/B2A** has a maximum gain of 15.9 dBd at its main lobe at 1900 MHz and 2100 MHz. The **RFS APXVAA24-43-U-A20** has a maximum gain of 13.15 dBd at its main lobe at 600 MHz and a maximum gain of 13.55 dBd at its main lobe at 700 MHz. The **RFS APX16DWV-16DWVS-E-A20** has a maximum gain of 16.3 dBd at its main lobe at 2100 MHz. 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.

9) The antenna mounting height centerline of the proposed antennas is **110 feet** above ground level (AGL).

10) 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.

11) All calculations were done with respect to uncontrolled / general population threshold limits.

T-Mobile Site Inventory and Power Data

Sector:	A	Sector:	B	Sector:	C	Sector:	D
Antenna #:	**1**	Antenna #:	**1**	Antenna #:	**1**	Antenna #:	**1**
Make / Model:	Ericsson AIR32 B66A/B2A	Make / Model:	Ericsson AIR32 B66A/B2A	Make / Model:	Ericsson AIR32 B66A/B2A	Make / Model:	Ericsson AIR32 B66A/B2A
Gain:	15.9 dBd	Gain:	15.9 dBd	Gain:	15.9 dBd	Gain:	15.9 dBd
Height (AGL):	110	Height (AGL):	110	Height (AGL):	110	Height (AGL):	110
Frequency Bands	1900 MHz (PCS) / 2100 MHz (AWS)	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	Channel Count	4
Total TX Power(W):	240	Total TX Power(W):	240	Total TX Power(W):	240	Total TX Power(W):	240
ERP (W):	9,337.08	ERP (W):	9,337.08	ERP (W):	9,337.08	ERP (W):	9,337.08
Antenna A1 MPE%	3.10	Antenna B1 MPE%	3.10	Antenna C1 MPE%	3.10	Antenna D1 MPE%	3.10
Antenna #:	**2**	Antenna #:	**2**	Antenna #:	**2**	Antenna #:	**2**
Make / Model:	RFS APXVAA24-43-U-A20	Make / Model:	RFS APXVAA24-43-U-A20	Make / Model:	RFS APXVAA24-43-U-A20	Make / Model:	RFS APXVAA24-43-U-A20
Gain:	13.15 dBm / 13.55dBd	Gain:	13.15 dBm / 13.55dBd	Gain:	13.15 dBm / 13.55dBd	Gain:	13.15 dBm / 13.55dBd
Height (AGL):	110	Height (AGL):	110	Height (AGL):	110	Height (AGL):	110
Frequency Bands	600 MHz / 700 MHz	Frequency Bands	600 MHz / 700 MHz	Frequency Bands	600 MHz / 700 MHz	Frequency Bands	600 MHz / 700 MHz
Channel Count	4	Channel Count	4	Channel Count	4	Channel Count	4
Total TX Power(W):	120	Total TX Power(W):	120	Total TX Power(W):	120	Total TX Power(W):	120
ERP (W):	2,598.01	ERP (W):	2,598.01	ERP (W):	2,598.01	ERP (W):	2,598.01
Antenna A2 MPE%	2.00	Antenna B2 MPE%	2.00	Antenna C2 MPE%	2.00	Antenna D2 MPE%	2.00
Antenna #:	**3**	Antenna #:	**3**	Antenna #:	**3**	Antenna #:	**3**
Make / Model:	RFS APX16DWV-16DWVS-E-A20	Make / Model:	RFS APX16DWV-16DWVS-E-A20	Make / Model:	RFS APX16DWV-16DWVS-E-A20	Make / Model:	RFS APX16DWV-16DWVS-E-A20
Gain:	16.3 dBd	Gain:	16.3 dBd	Gain:	16.3 dBd	Gain:	16.3 dBd
Height (AGL):	110	Height (AGL):	110	Height (AGL):	110	Height (AGL):	110
Frequency Bands	2100 MHz (AWS)	Frequency Bands	2100 MHz (AWS)	Frequency Bands	2100 MHz (AWS)	Frequency Bands	2100 MHz (AWS)
Channel Count	2	Channel Count	2	Channel Count	2	Channel Count	2
Total TX Power(W):	60	Total TX Power(W):	60	Total TX Power(W):	60	Total TX Power(W):	60
ERP (W):	2,559.48	ERP (W):	2,559.48	ERP (W):	2,559.48	ERP (W):	2,559.48
Antenna A3 MPE%	0.85	Antenna B3 MPE%	0.85	Antenna C3 MPE%	0.85	Antenna D3 MPE%	0.85

Site Composite MPE%	
Carrier	**MPE%**
T-Mobile (Per Sector Max)	**5.95 %**
Quinebaug FD	0.71 %
AT&T	2.31 %
Verizon Wireless	3.94 %
Site Total MPE %:	**12.91 %**

T-Mobile Sector A Total:	5.95 %
T-Mobile Sector B Total:	5.95 %
T-Mobile Sector C Total:	5.95 %
T-Mobile Sector D Total:	5.95 %
Site Total:	12.91 %

T-Mobile Per Sector Maximum Power Values

T-Mobile _Max Values per sector	# Channels	Watts ERP (Per Channel)	Height (feet)	Total Power Density ($\mu W/cm^2$)	Frequency (MHz)	Allowable MPE ($\mu W/cm^2$)	Calculated % MPE
T-Mobile AWS - 2100 MHz LTE	2	2,334.27	110	15.52	AWS - 2100 MHz	1000	1.55%
T-Mobile PCS - 1900 MHz LTE	2	2,334.27	110	15.52	PCS - 1900 MHz	1000	1.55%
T-Mobile 700 MHz LTE	2	679.39	110	4.52	700 MHz	1000	0.97%
T-Mobile 600 MHz LTE	2	619.61	110	4.12	600 MHz	1000	1.03%
T-Mobile AWS - 2100 MHz UMTS	2	1,279.74	110	8.51	AWS - 2100 MHz	467	0.85%
						Total:	**5.95%**

Summary

All calculations performed for this analysis yielded results that were **within** the allowable limits for general population 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 population exposure to RF Emissions are shown here:

T-Mobile Sector	Power Density Value (%)
Sector A:	5.95 %
Sector B:	5.95 %
Sector C:	5.95 %
Sector D:	5.95 %
T-Mobile Per Sector Maximum:	5.95 %
Site Total:	12.91 %
Site Compliance Status:	**COMPLIANT**

The anticipated composite MPE value for this site assuming all carriers present is **12.91%** of the allowable FCC established general population 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.