EMPIRE
telecom

December 21, 2016

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

Regarding:	Notice of Exempt Modification – Swap of 3 Antennas, Swap of (3) TMAs, Addition of (6) TMAs and addition of associated lines
Property Address:	124 Quarry Road, Trumbull, CT (the "Property")
Applicant:	AT&T Mobility ("AT&T" Site: CT5089)

Dear Ms. Bachman:

AT&T currently maintains a wireless telecommunications facility on an existing 150 foot utility tower ("tower") at the above-referenced address, latitude 41.2325, longitude -73.1863889. AT&T's facility consists of three (3) wireless telecommunications antennas at 160 feet. The tower is controlled and owned by Eversource Energy. Assessor's information is attached hereto.

AT&T desires to modify its existing telecommunications facility by swapping three (3) antennas, swapping (3) TMAs, adding (3) TMAs, and adding associated lines. The centerline height of said antennas is and will remain at 160 feet.

Please accept this application as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72 (b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to the First Selectman of the Town of Trumbull, the Building Official of the Town of Trumbull, and the Zoning Enforcement Officer of the Town of Trumbull. A copy of this letter is also being sent to Eversource Energy, the owner of the structure that AT&T is located.

The planned modifications to AT&T's facility fall squarely within those activities explicitly provided for in R.C.S.A. § 16-50j-72(b)(2).

1. The planned modifications will not result in an increase in the height of the existing structure. AT&T's antennas and associated lines will be installed at 160 foot level of the 150 foot utility tower.
2. The proposed modifications will not involve any changes to ground-mounted equipment and, therefore will not require an extension of the site boundary.
3. The proposed modification will not increase the noise level at the facility by six decibel or more, or to levels that exceed state and local criteria.

16 Esquire Road, Billerica, MA 01862 Phone 978-284-3906 Email: ncaplan@empiretelecomm.com

4. The operation of the modified facility will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. An RF emissions calculation is attached.
5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.
6. The tower and its foundation can support AT&T's proposed modifications. (Please see attached Structural analysis completed by Centek Engineering Dated December 13, 2016).

For the foregoing reasons AT&T respectfully requests that the proposed swap of 3 antennas, the swap of (3) TMAs, the addition of (3) TMAs, and addition of associated lines be allowed within the exempt modifications under R.C.S.A. § 16-50j-72(b)(2).

Sincerely,

Nicole Caplan
Site Acquisition Specialist
Empire Telecom

CC: The Honorable Timothy M. Herbst, First Selectman, Town of Trumbull
Robert Dunn, Building Official, Town of Trumbull
Douglas Wenz, Zoning Enforcement Officer, Town of Trumbull
Eversource Energy, c/o Robert Gray

Town of Trumbull

Map Title

Legend

Building Address

Property Lines

Property

ROW

Town

Water Feature

Parcels

Town Boundary

200.0 0 100.00 200.0 Feet

WGS_1984_Web_Mercator_Auxiliary_Sphere
Created by Greater Bridgeport Regional Council

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.
THIS MAP IS NOT TO BE USED FOR NAVIGATION

GBRC Greater Bridgeport Regional Council

WIRELESS COMMUNICATIONS FACILITY
CT5089 - LTE 3C/MULTICARRIER
TRUMBULL SOUTH
CL&P STRUCT. NO.: 844
124 QUARRY ROAD
TRUMBULL, CT 06611

GENERAL NOTES

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE 2003 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2005 CONNECTICUT SUPPLEMENT AND 2009 AMENDMENTS, INCLUDING THE TIA/EIA-222 REVISION "F" "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND SUPPORTING STRUCTURES." 2005 CONNECTICUT FIRE SAFETY CODE AND 2009 AMENDMENTS, NATIONAL ELECTRICAL CODE AND LOCAL CODES.
2. THE COMPOUND, TOWER, PRIMARY GROUND RING, ELECTRICAL SERVICE TO THE METER BANK AND TELEPHONE SERVICE TO THE DEMARCATION POINT ARE PROVIDED BY SITE OWNER. AS BUILT FIELD CONDITIONS REGARDING THESE ITEMS SHALL BE CONFIRMED BY THE CONTRACTOR. SHOULD ANY FIELD CONDITIONS PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL NOT PROCEED WITH ANY AFFECTED WORK.
3. 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.
4. 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.
5. 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.
6. 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.
7. 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.
8. 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.
9. 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 BUILDING'S/PROPERTY'S OPERATIONS, COORDINATE WORK WITH BUILDING/PROPERTY OWNER.
10. 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.
11. ALL UTILITY WORK SHALL BE IN ACCORDANCE WITH LOCAL UTILITY COMPANY REQUIREMENTS AND SPECIFICATIONS.
12. 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.
13. ANY AND ALL ERRORS, DISCREPANCIES, AND 'MISSED" ITEMS ARE TO BE BROUGHT TO THE ATTENTION OF THE AT&T 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.
14. 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.
15. 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.
16. 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.
17. 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.
18. ALL EQUIPMENT AND PRODUCTS PURCHASED ARE TO BE REVIEWED BY CONTRACTOR AND ALL APPLICABLE SUB-CONTRACTORS FOR ANY CONDITION PER THE MANUFACTURER'S RECOMMENDATIONS. CONTRACTOR TO SUPPLY THESE ITEMS AT NO COST TO OWNER OR CONSTRUCTION MANAGER.
19. 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.
20. 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 PRIOR TO ANY EXCAVATION WORK. CONTRACTOR SHALL MAINTAIN AND PROTECT MARKED UTILITIES THROUGHOUT PROJECT COMPLETION.
21. 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: 500 ENTERPRISE DRIVE
ROCKY HILL, CONNECTICUT

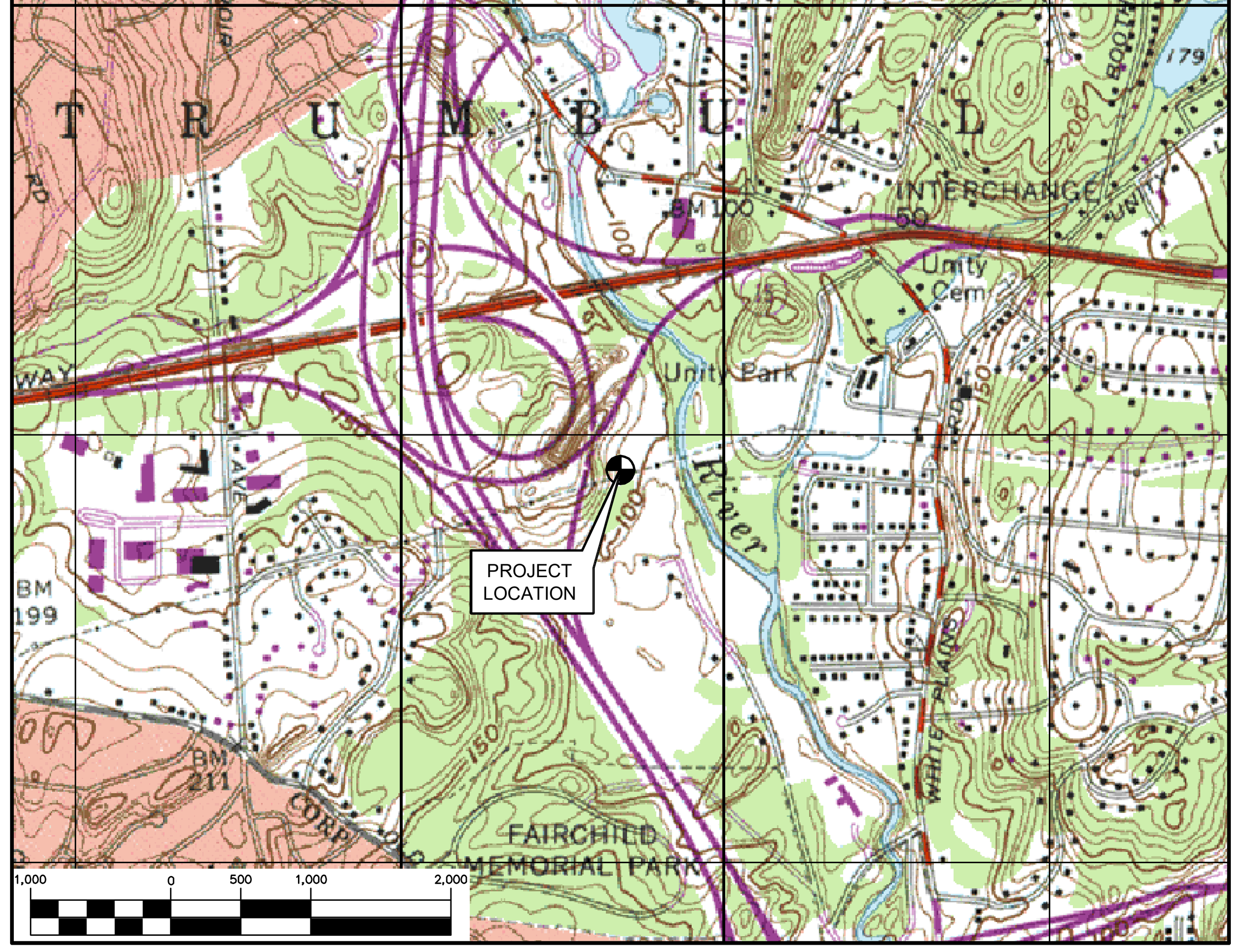
TO: 124 QUARRY ROAD
TRUMBULL, CONNECTICUT

1.	HEAD NORTHEAST ON ENTERPRISE DR TOWARD CAPITAL BLVD	0.31 MI
2.	TURN LEFT ONTO CAPITAL BLVD	0.27 MI
3.	TURN LEFT ONTO WEST ST	0.30 MI
4.	TURN LEFT TO MERGE ONTO I-91 S TOWARD NEW HAVEN	9.59 MI
5.	TAKE EXIT 17 FOR CT-15 S/W CROSS PKWY	30.24 MI
6.	TAKE EXIT 52 TO MERGE ONTO CT-8 S	1.87 MI
7.	TAKE EXIT 7 VIA CT-127	0.26 MI
8.	TURN LEFT ONTO OLD TOWN RD	0.11 MI
9.	TAKE THE FIRST RIGHT ONTO TRUMBULL RD	0.09 MI
10.	STAY STRAIGHT ONTO QUARRY RD. DESTINATION IS AT THE END OF THE ROAD	0.30 MI

VICINITY MAP

SCALE: 1" = 1000'

NORTH



PROJECT SUMMARY

1. THE PROPOSED SCOPE OF WORK CONSISTS OF A MODIFICATION TO THE EXISTING UNMANNED TELECOMMUNICATIONS FACILITY INCLUDING THE FOLLOWING:
   - A. REMOVE AND REPLACE EXISTING LTE ANTENNA FOR PROPOSED LTE (12) PORT ANTENNA, (1) PER SECTOR.
   - B. INSTALL (3) NEW RRUS-32 AND (3) NEW RRUS-32 B2 TO EXISTING SUPPORT FRAME ON CONCRETE SLAB-ON-GRADE.
   - C. INSTALL (3) TMA'S BEHIND PROPOSED LTE ANTENNA

PROJECT INFORMATION

AT&T SITE NUMBER:	CT5089
AT&T SITE NAME:	TRUMBULL SOUTH
SITE ADDRESS:	CL&P STRUCT. NO.: 844 124 QUARRY ROAD TRUMBULL, CT 06611
LESSEE/APPLICANT:	AT&T MOBILITY 500 ENTERPRISE DRIVE, SUITE 3A ROCKY HILL, CT 06067
ENGINEER:	CENTEK ENGINEERING, INC. 63-2 NORTH BRANFORD RD. BRANFORD, CT 06405
PROJECT COORDINATES:	LATITUDE: 41°-13'-56.91" N LONGITUDE: 73°-11'-09.32" W GROUND ELEVATION: ±100' AMSL GROUND ELEVATION AND COORDINATES REFERENCED FROM GOOGLE EARTH.

SHEET INDEX

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REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	12/13/16	HMR	CAG	CONSTRUCTION DOCUMENTS - ISSUED FOR CONSTRUCTION
0	08/30/16	JTD	CAG	CONSTRUCTION DOCUMENTS - ISSUED FOR CLIENT REVIEW

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AT&T MOBILITY
WIRELESS COMMUNICATIONS FACILITY
TRUMBULL SOUTH
CT5089 - LTE 3C/MULTICARRIER
124 QUARRY ROAD
TRUMBULL, CT 06611

DATE: 08/25/16
SCALE: AS NOTED
JOB NO. 16071.34

TITLE SHEET

T-1

Sheet No. 1 of 7

NOTES AND SPECIFICATIONS

DESIGN BASIS:

GOVERNING CODE: 2003 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2005 CT STATE BUILDING CODE AND 2009 AMENDMENTS.

1. DESIGN CRITERIA:
   ANTENNA MAST
   - WIND LOAD: PER EIA/TIA 222 F–96 (ANTENNA MOUNTS): 85 MPH (FASTEST MILE), EQUIVALENT TO 105 MPH (3 SECOND GUST).

   TRANSMISSION TOWER
   - WIND LOAD: PER NESC C2–2012 SECTION 25 RULE 250C (TOWER & FOUNDATION) 110 MPH (3 SECOND GUST)
   - SEISMIC LOAD (DOES NOT CONTROL): PER ASCE 7–02 MINIMUM DESIGN LOADS FOR BUILDING AND OTHER STRUCTURES.

GENERAL NOTES:

1. ALL CONSTRUCTION SHALL BE IN COMPLIANCE WITH THE GOVERNING BUILDING CODE.
2. 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.
3. BEFORE BEGINNING THE WORK, THE CONTRACTOR IS RESPONSIBLE FOR MAKING SUCH INVESTIGATIONS CONCERNING PHYSICAL CONDITIONS (SURFACE AND SUBSURFACE) AT OR CONTIGUOUS TO THE SITE WHICH MAY AFFECT PERFORMANCE AND COST OF THE WORK.
4. DIMENSIONS AND DETAILS SHALL BE CHECKED AGAINST EXISTING FIELD CONDITIONS.
5. THE CONTRACTOR SHALL VERIFY AND COORDINATE THE SIZE AND LOCATION OF ALL OPENINGS, SLEEVES AND ANCHOR BOLTS AS REQUIRED BY ALL TRADES.
6. ALL DIMENSIONS, ELEVATIONS, AND OTHER REFERENCES TO EXISTING STRUCTURES, SURFACE, AND SUBSURFACE CONDITIONS ARE APPROXIMATE. NO GUARANTEE IS MADE FOR THE ACCURACY OR COMPLETENESS OF THE INFORMATION SHOWN. THE CONTRACTOR SHALL VERIFY AND COORDINATE ALL DIMENSIONS, ELEVATIONS, ANGLES WITH EXISTING CONDITIONS AND WITH ARCHITECTURAL AND SITE DRAWINGS BEFORE PROCEEDING WITH ANY WORK.
7. AS THE WORK PROGRESSES, THE CONTRACTOR SHALL NOTIFY THE OWNER OF ANY CONDITIONS WHICH ARE IN CONFLICT OR OTHERWISE NOT CONSISTENT WITH THE CONSTRUCTION DOCUMENTS AND SHALL NOT PROCEED WITH SUCH WORK UNTIL THE CONFLICT IS SATISFACTORILY RESOLVED.
8. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE SAFETY CODES AND REGULATIONS DURING ALL PHASES OF CONSTRUCTION. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR PROVIDING AND MAINTAINING ADEQUATE SHORING, BRACING, AND BARRICADES AS MAY BE REQUIRED FOR THE PROTECTION OF EXISTING PROPERTY, CONSTRUCTION WORKERS, AND FOR PUBLIC SAFETY.
9. 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 NORTHEAST UTILITIES
10. THE STRUCTURE IS DESIGNED TO BE SELF–SUPPORTING AND STABLE AFTER FOUNDATION REMEDIATION WORK IS COMPLETE. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE AND SEQUENCE AND TO ENSURE THE SAFETY OF THE STRUCTURE AND ITS COMPONENT PARTS DURING ERECTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, TEMPORARY BRACING, GUYS OR TIEDOWNS, WHICH MIGHT BE NECESSARY.
11. 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.
12. SHOP DRAWINGS, CONCRETE MIX DESIGNS, TEST REPORTS, AND OTHER SUBMITTALS PERTAINING TO STRUCTURAL WORK SHALL BE FORWARDED TO THE OWNER FOR REVIEW BEFORE FABRICATION AND/OR INSTALLATION IS MADE. SHOP DRAWINGS SHALL INCLUDE ERECTION DRAWINGS AND COMPLETE DETAILS OF CONNECTIONS AS WELL AS MANUFACTURER'S SPECIFICATION DATA WHERE APPROPRIATE. SHOP DRAWINGS SHALL BE CHECKED BY THE CONTRACTOR AND BEAR THE CHECKER'S INITIALS BEFORE BEING SUBMITTED FOR REVIEW.
13. NO DRILLING WELDING OR TAPING ON CL&P OWNED EQUIPMENT.
14. REFER TO DRAWING T1 FOR ADDITIONAL NOTES AND REQUIREMENTS.

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.

PAINT NOTES

PAINTING SCHEDULE:

1. ANTENNA PANELS:
   A. SHERWIN WILLIAMS POLANE–B
   B. COLOR TO BE MATCHED WITH EXISTING TOWER STRUCTURE.
2. COAXIAL CABLES:
   A. ONE COAT OF DTM BONDING PRIMER (2–5 MILS. DRY FINISH)
   B. TWO COATS OF DTM ACRYLIC PRIMER/FINISH (2.5–5 MILS. DRY FINISH)
   C. COLOR TO BE FIELD MATCHED WITH EXISTING STRUCTURE.

EXAMINATION AND PREPARATION:

1. DO NOT APPLY PAINT IN SNOW, RAIN, FOG OR MIST OR WHEN RELATIVE HUMIDITY EXCEEDS 85%. DO NOT APPLY PAINT TO DAMP OR WET SURFACES.
2. VERIFY THAT SUBSTRATE CONDITIONS ARE READY TO RECEIVE WORK. EXAMINE SURFACE SCHEDULED TO BE FINISHED PRIOR TO COMMENCEMENT OF WORK. REPORT ANY CONDITION THAT MAY POTENTIALLY AFFECT PROPER APPLICATION.
3. TEST SHOP APPLIED PRIMER FOR COMPATIBILITY WITH SUBSEQUENT COVER MATERIALS.
4. PERFORM PREPARATION AND CLEANING PROCEDURE IN STRICT ACCORDANCE WITH COATING MANUFACTURER'S INSTRUCTIONS FOR EACH SUBSTRATE CONDITION.
5. CORRECT DEFECTS AND CLEAN SURFACES WHICH AFFECT WORK OF THIS SECTION. REMOVE EXISTING COATINGS THAT EXHIBIT LOOSE SURFACE DEFECTS.
6. IMPERVIOUS SURFACE: REMOVE MILDEW BY SCRUBBING WITH SOLUTION OF TRI–SODIUM PHOSPHATE AND BLEACH. RINSE WITH CLEAN WATER AND ALLOW SURFACE TO DRY.
7. ALUMINUM SURFACE SCHEDULED FOR PAINT FINISH: REMOVE SURFACE CONTAMINATION BY STEAM OR HIGH–PRESSURE WATER. REMOVE OXIDATION WITH ACID ETCH AND SOLVENT WASHING. APPLY ETCHING PRIMER IMMEDIATELY FOLLOWING CLEANING.
8. FERROUS METALS: CLEAN UNGALVANIZED FERROUS METAL SURFACES THAT HAVE NOT BEEN SHOP COATED; REMOVE OIL, GREASE, DIRT, LOOSE MILL SCALE, AND OTHER FOREIGN SUBSTANCES. USE SOLVENT OR MECHANICAL CLEANING METHODS THAT COMPLY WITH THE STEEL STRUCTURES PAINTING COUNCIL'S (SSPC) RECOMMENDATIONS. TOUCH UP BARE AREAS AND SHOP APPLIED PRIME COATS THAT HAVE BEEN DAMAGED. WIRE BRUSH, CLEAN WITH SOLVENTS RECOMMENDED BY PAINT MANUFACTURER, AND TOUCH UP WITH THE SAME PRIMER AS THE SHOP COAT.
9. GALVANIZED SURFACES: CLEAN GALVANIZED SURFACES WITH NON–PETROLEUM–BASED SOLVENTS SO SURFACE IS FREE OF OIL AND SURFACE CONTAMINANTS. REMOVE PRETREATMENT FROM GALVANIZED SHEET METAL FABRICATED FROM COIL STOCK BY MECHANICAL METHODS.
10. ANTENNA PANELS: REMOVE ALL OIL, DUST, GREASE, DIRT, AND OTHER FOREIGN MATERIAL TO ENSURE ADEQUATE ADHESION. PANELS MUST BE WIPED WITH METHYL ETHYL KETONE (MEK).
11. COAXIAL CABLES: REMOVE ALL OIL, DUST, GREASE. DIRT, AND OTHER FOREIGN MATERIAL TO ENSURE ADEQUATE ADHESION.

CLEANING:

1. COLLECT WASTE MATERIAL, WHICH MAY CONSTITUTE A FIRE HAZARD, PLACE IN CLOSED METAL CONTAINERS AND REMOVE DAILY FROM SITE.

APPLICATION:

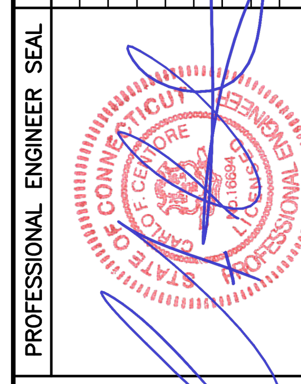
1. APPLY PRODUCTS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
2. DO NOT APPLY FINISHES TO SURFACES THAT ARE NOT DRY.
3. APPLY EACH COAT TO UNIFORM FINISH.
4. APPLY EACH COAT OF PAINT SLIGHTLY DARKER THAN PRECEDING COAT UNLESS OTHERWISE APPROVED.
5. SAND METAL LIGHTLY BETWEEN COATS TO ACHIEVE REQUIRED FINISH.
6. VACUUM CLEAN SURFACES FREE OF LOOSE PARTICLES. USE TACK CLOTH JUST PRIOR TO APPLYING NEXT COAT.
7. ALLOW APPLIED COAT TO DRY BEFORE NEXT COAT IS APPLIED.

COMPLETED WORK:

1. SAMPLES: PREPARE 24" X 24" SAMPLE AREA FOR REVIEW.
2. MATCH APPROVED SAMPLES FOR COLOR, TEXTURE AND COVERAGE. REMOVE REFINISH OR REPAINT WORK NOT IN COMPLIANCE WITH SPECIFIED REQUIREMENTS.

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	12/13/16	HMR	CAG	CONSTRUCTION DOCUMENTS – ISSUED FOR CONSTRUCTION
0	08/30/16	JTD	CAG	CONSTRUCTION DOCUMENTS – ISSUED FOR CLIENT REVIEW

PROFESSIONAL ENGINEER SEAL



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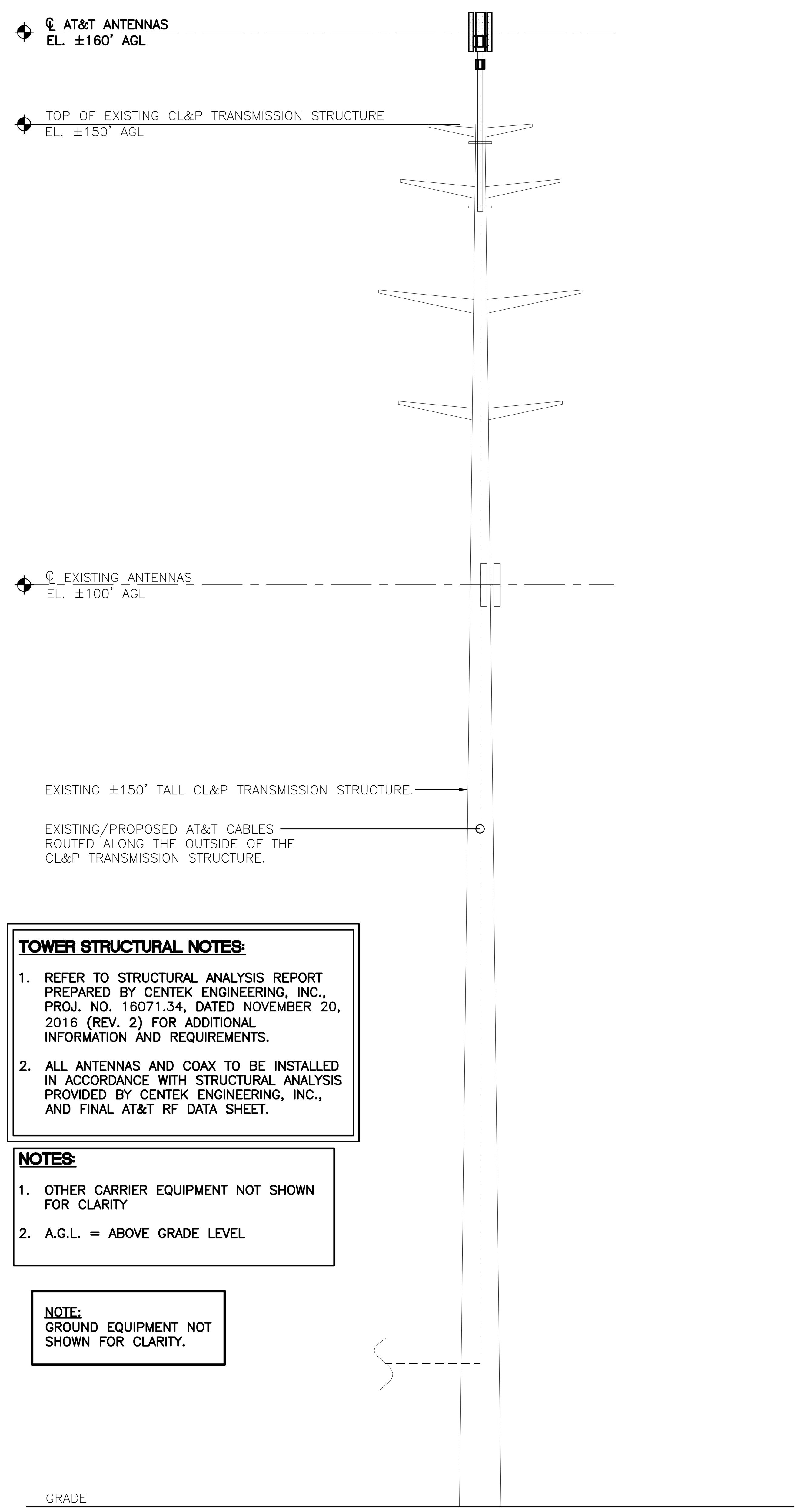
DATE: 08/25/16
SCALE: AS NOTED
JOB NO. 16071.34

NOTES AND SPECIFICATIONS

N–1



TOWER STRUCTURAL NOTES:

1. REFER TO STRUCTURAL ANALYSIS REPORT PREPARED BY CENTEK ENGINEERING, INC., PROJ. NO. 16071.34, DATED NOVEMBER 20, 2016 (REV. 2) 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 AT&T RF DATA SHEET.

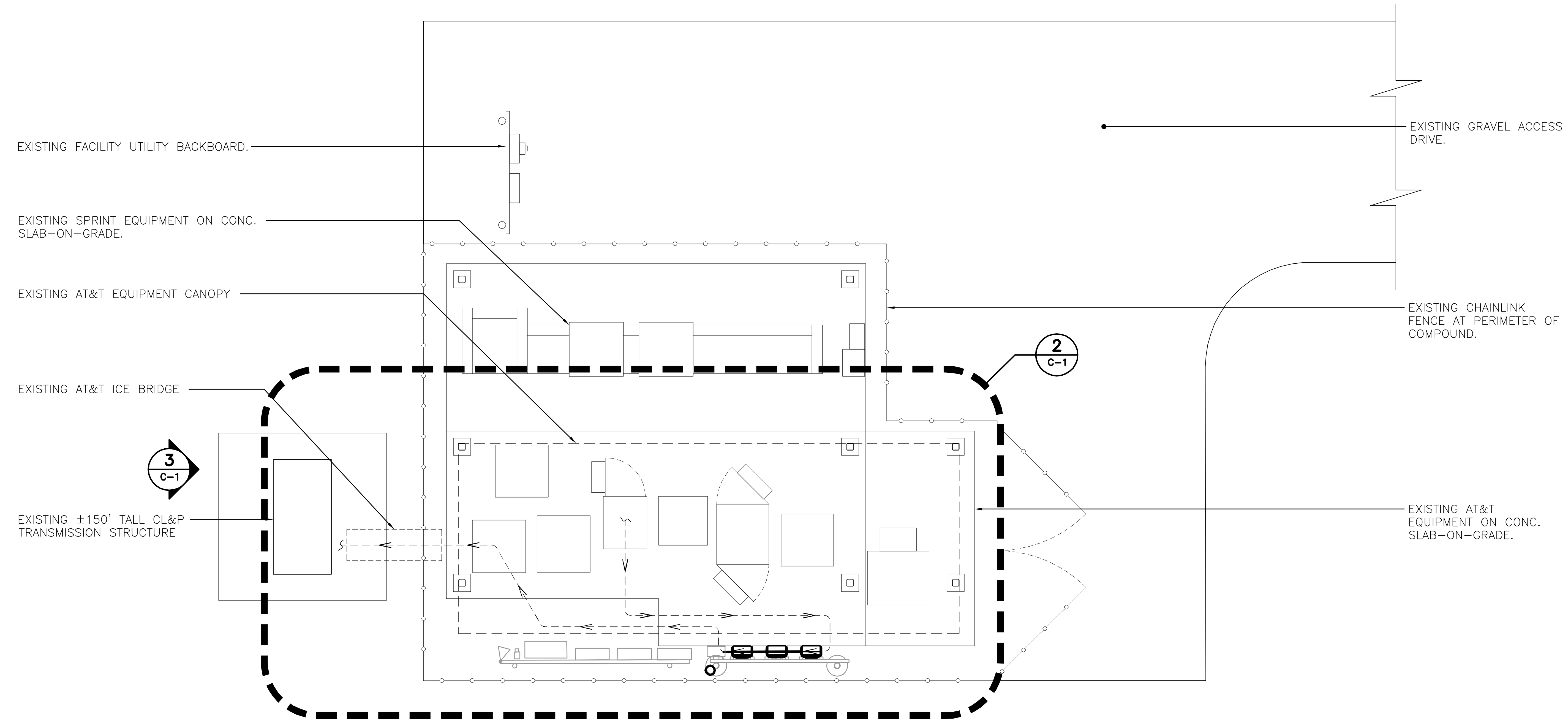
NOTES:

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

NOTE:
GROUND EQUIPMENT NOT SHOWN FOR CLARITY.

3 / C-1 **TOWER ELEVATION**
SCALE: 1" = 10'

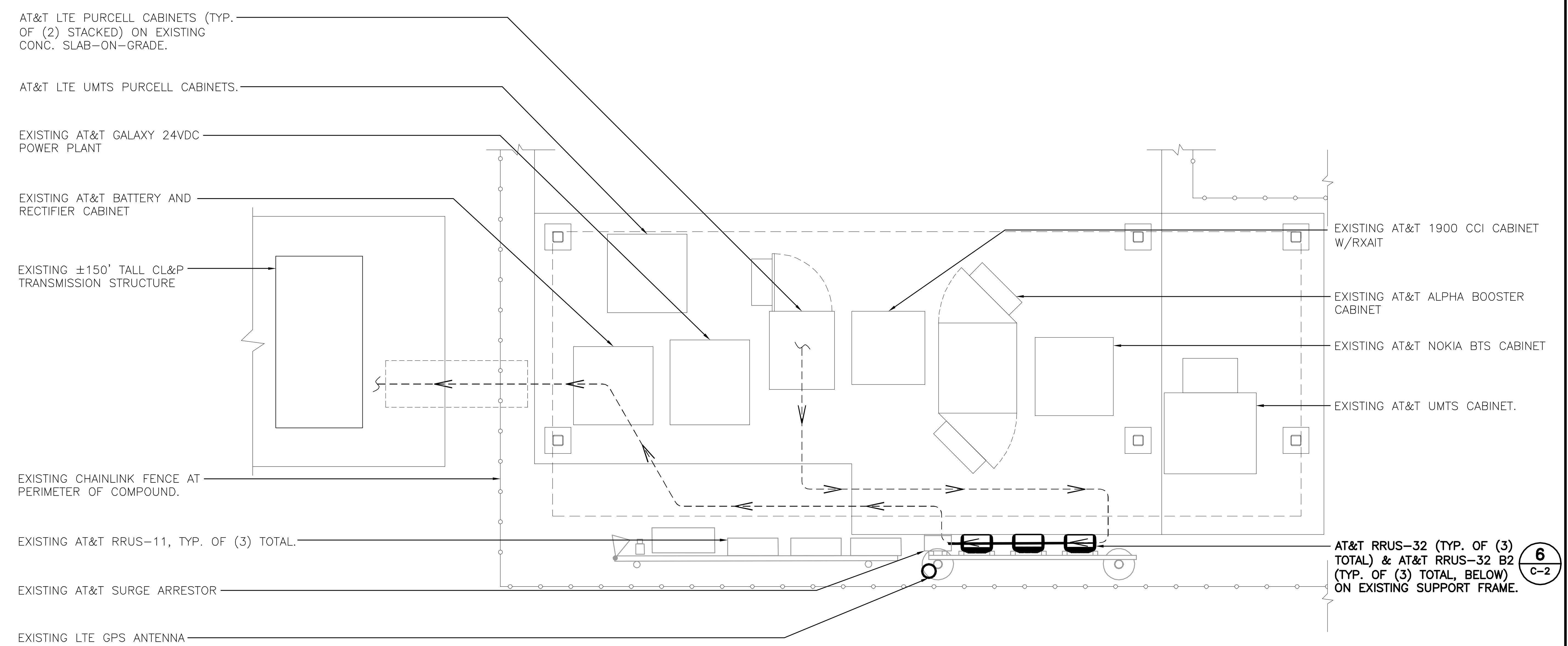
GRAPHIC SCALE: 10, 0, 5, 10, 20, 40 (IN FEET) 1 inch = 10 ft.



1 / C-1 **COMPOUND PLAN**
SCALE: 1/4" = 1'

TRUE NORTH

GRAPHIC SCALE: 4, 0, 2, 4, 8, 16 (IN FEET) 1 inch = 4 ft.



2 / C-1 **EQUIPMENT LAYOUT PLAN**
SCALE: 3/8" = 1'-0"

TRUE NORTH

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
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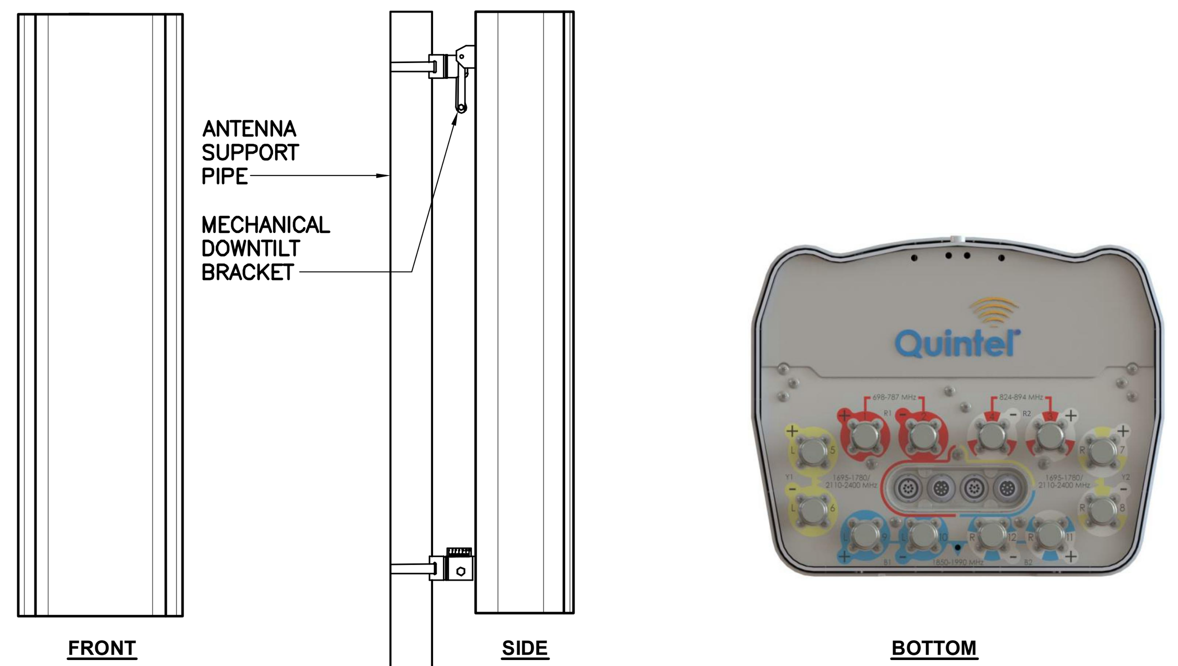
PLANS, ELEVATION AND DETAILS

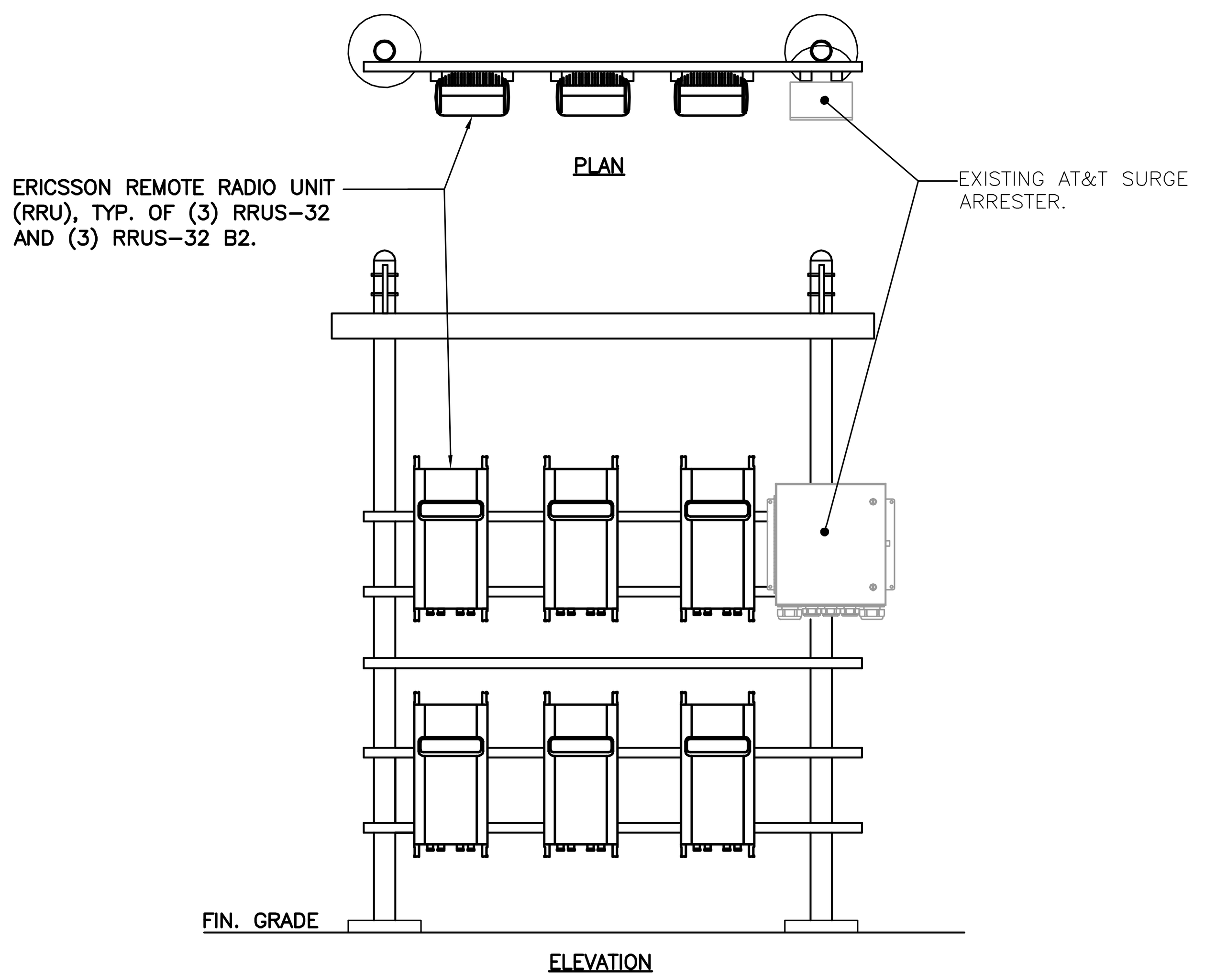
C-1

Sheet No. 3 of 7

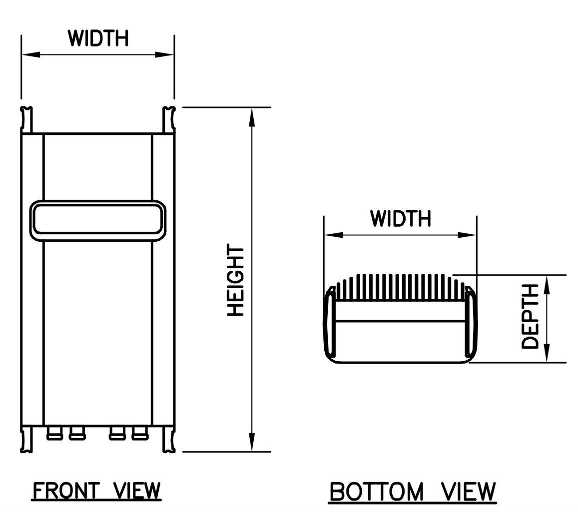


ALPHA/BETA/GAMMA ANTENNA		
EQUIPMENT	DIMENSIONS	WEIGHT
MAKE: QUINTEL MODEL: QS66512-2	72.0"H x 12.0"W x 9.6"D	112.0-LBS

5 (C-2) PROPOSED ANTENNA DETAIL
SCALE: 1/2" = 1'-0"



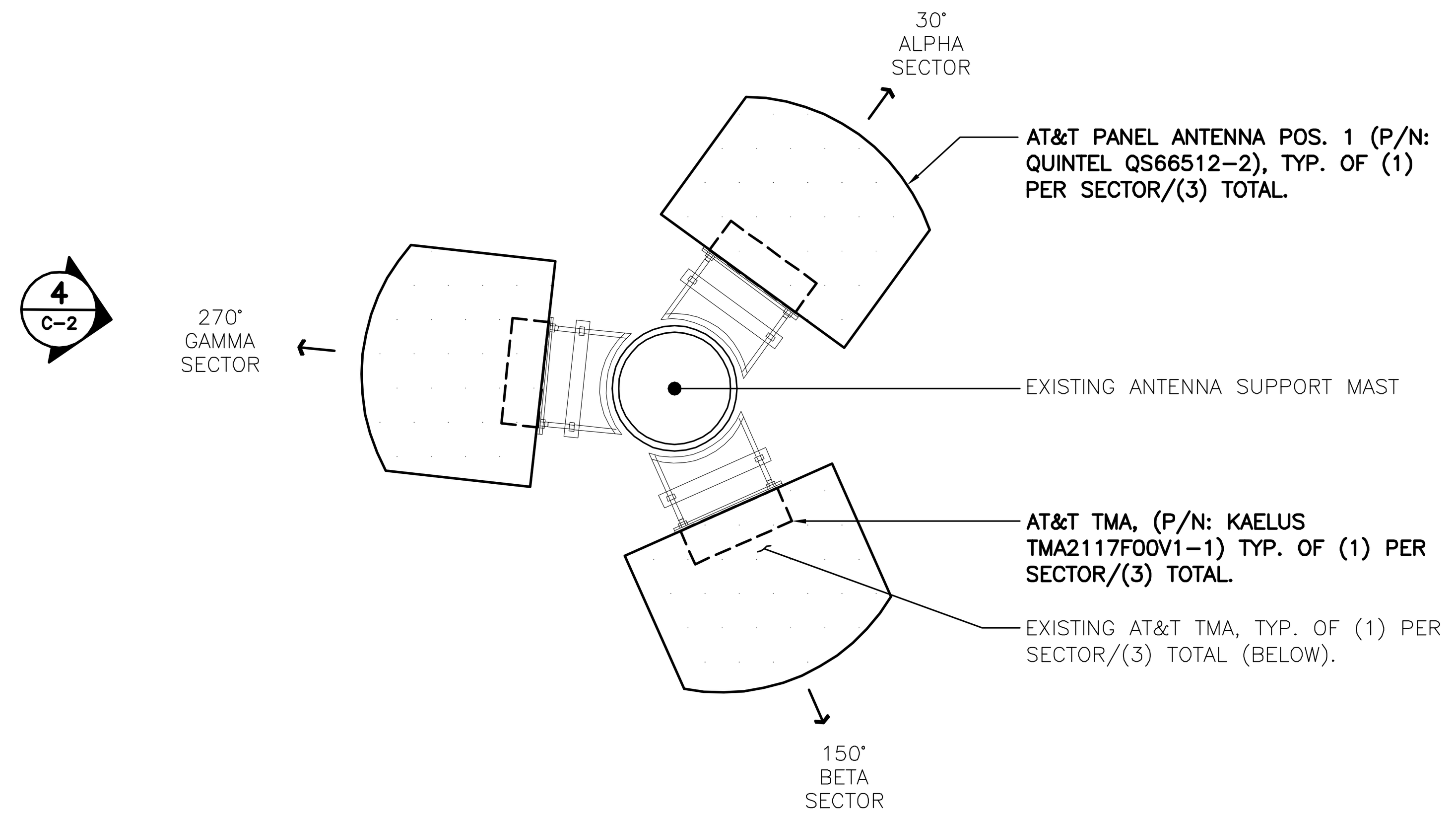
6 (C-2) RRU MOUNTING DETAIL ON SUPPORT FRAME
SCALE: 1" = 1'-0"



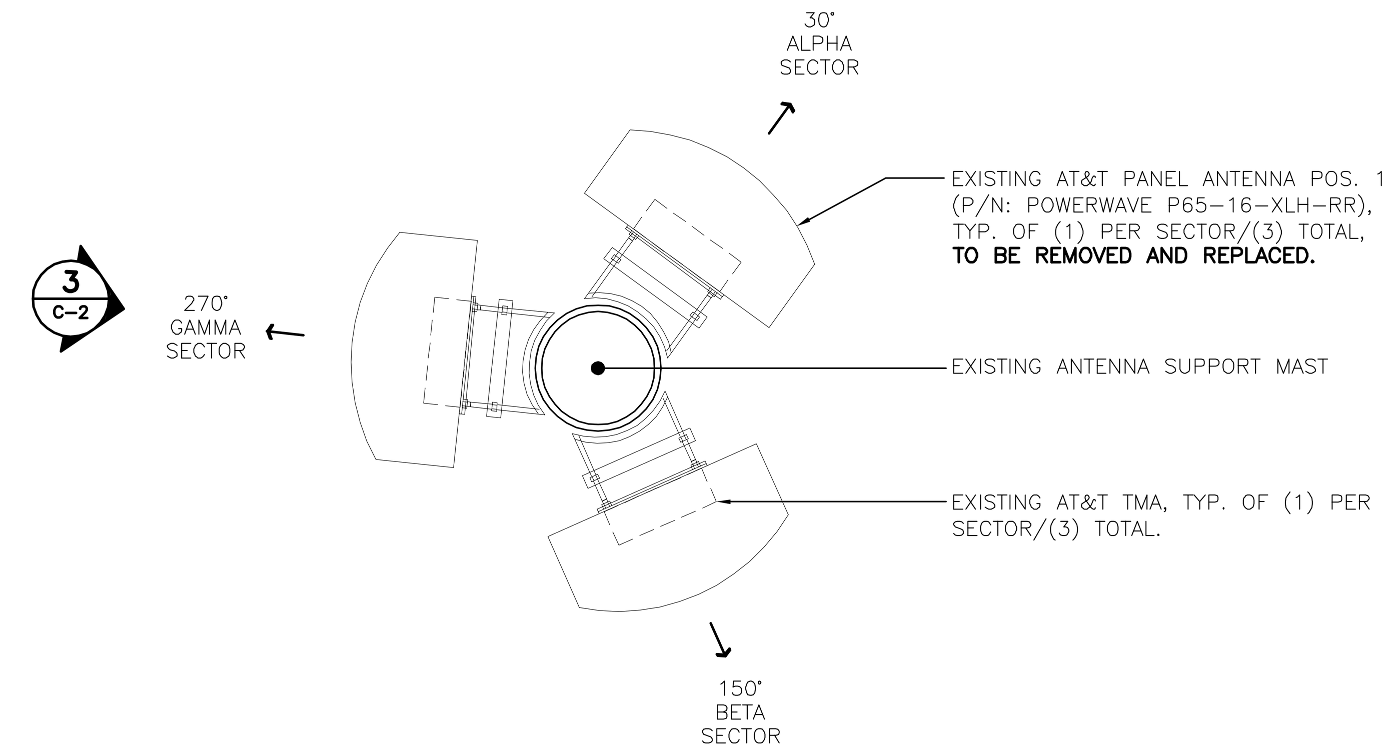
RRU (REMOTE RADIO UNIT)			
EQUIPMENT	DIMENSIONS	WEIGHT	CLEARANCES
MAKE: ERICSSON MODEL: RRUS 32 B2	27.17"H x 12.05"W x 7.01"D	52.91 LBS.	ABOVE: 16" MIN. BELOW: 12" MIN. FRONT: 36" MIN.

NOTES:
1. CONTRACTOR TO COORDINATE FINAL EQUIPMENT MODEL SELECTION WITH AT&T CONSTRUCTION MANAGER PRIOR TO ORDERING.

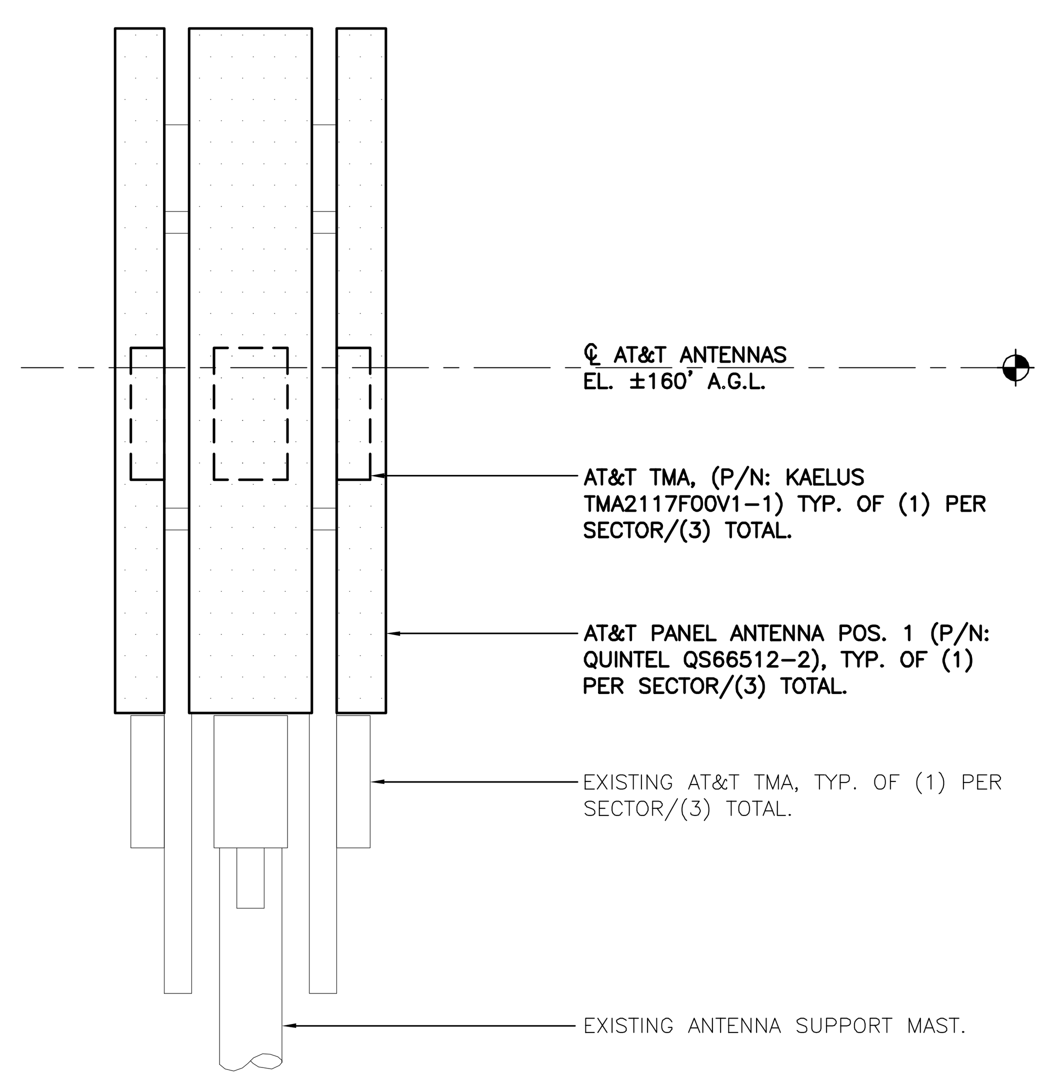
7 (C-2) ERICSSON RRUS 32 B2 DETAIL
SCALE: 1" = 1'-0"



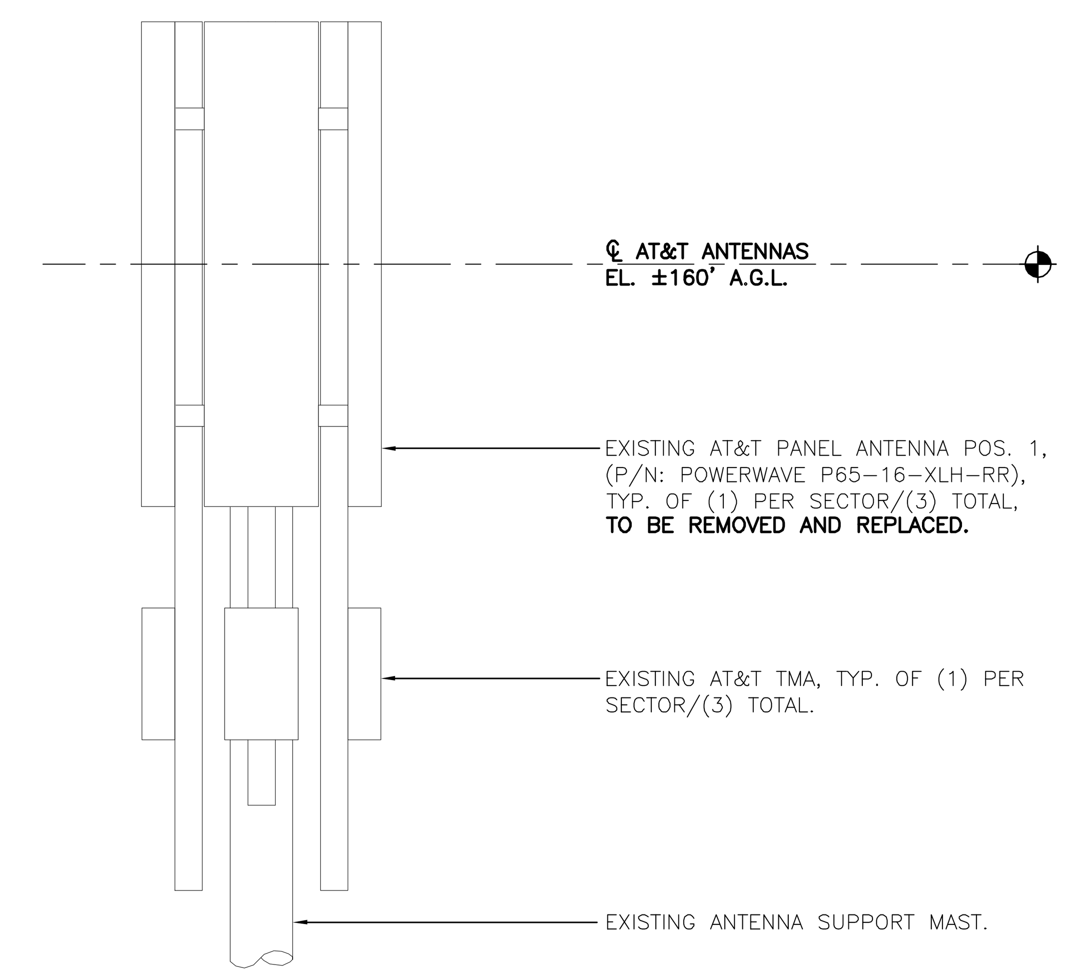
2 (C-2) PROPOSED ANTENNA PLAN
SCALE: 1 1/2" = 1'-0"



1 (C-2) EXISTING ANTENNA PLAN
SCALE: 1 1/2" = 1'-0"



4 (C-2) PROPOSED ANTENNA ELEVATION
SCALE: 3/4" = 1'-0"



3 (C-2) EXISTING ANTENNA ELEVATION
SCALE: 3/4" = 1'-0"

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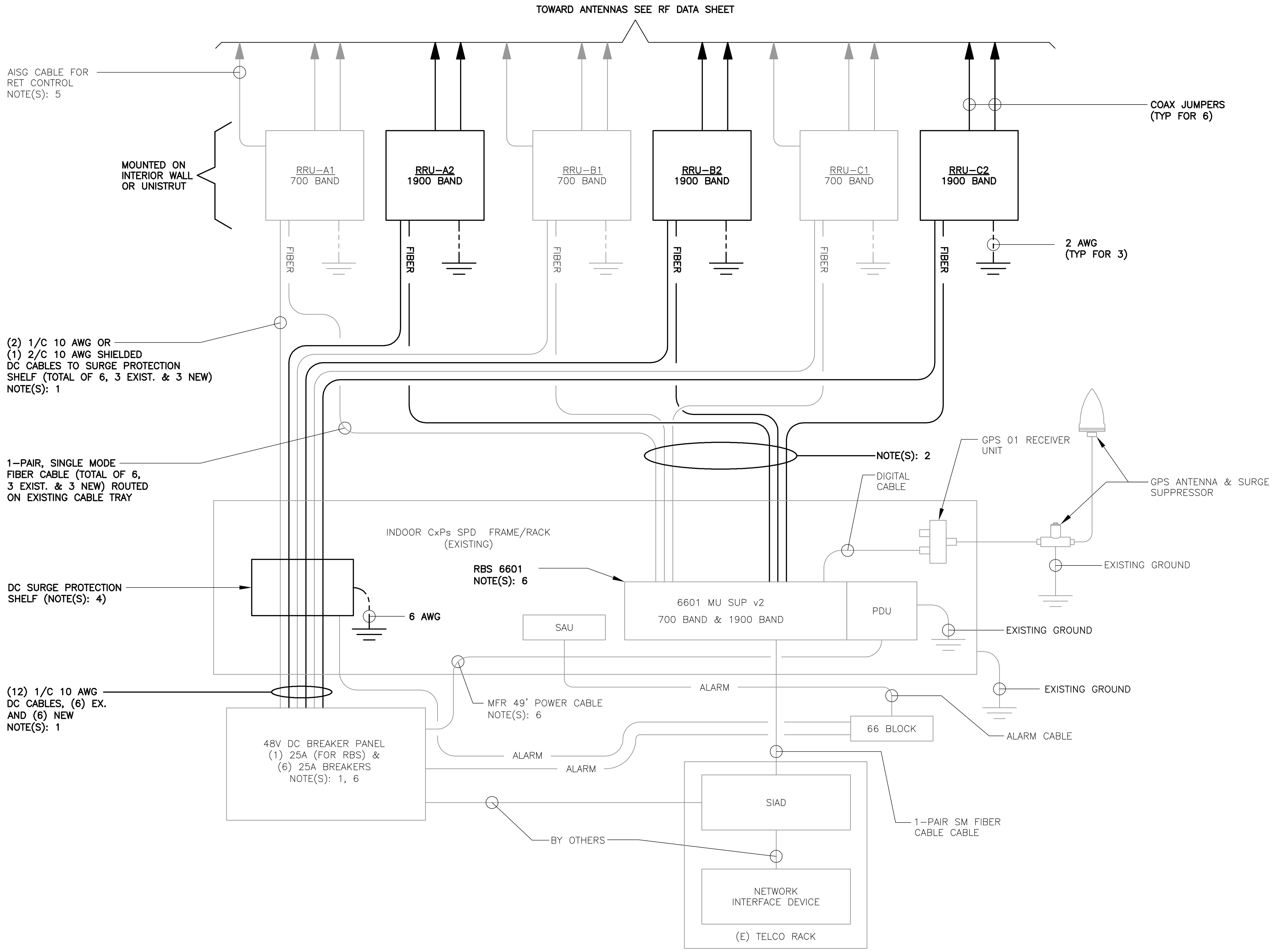
LTE 3C/ MULTICARRIER EQUIPMENT DETAILS

C-2



1 / E-1

LTE SCHEMATIC DIAGRAM

NOT TO SCALE

LTE SCHEMATIC DIAGRAM NOTES:

1. BREAKERS TO BE TAGGED AND LOCKED OUT. A 20A (MIN.) OR 30A (MAX.) BREAKER FOR RRUs MAY BE SUBSTITUTED FOR THE RECOMMENDED 25A BREAKER. SIZE 12 CONDUCTORS MAY BE USED ONLY WITH 20A BREAKERS.
2. LEAVE COILED AND PROTECTED UNTIL TERMINATED.
3. DC AND FIBER CABLE SHALL BE ROUTED WITH THE EXISTING COAX CABLE.
4. DC SURGE PROTECTION SHELF SHALL BE RAYCAP DCx-48-60-RM.
5. FIBER & DC DISTRIBUTION BOX W/DC SURGE PROTECTION SHALL BE RAYCAP DC6-48-60-18-8F.
6. SUPPORT FIBER & DC POWER CABLES WITH SNAP-IN HANGERS SPACED NO GREATER THAN 3 FEET APART ON TOWER. SUPPORT FIBER AND DC POWER CABLES INSIDE MONOPOLE WITH CABLE HOISTING GRIPS AT 250 FT MAXIMUM INTERVALS. DRESS CABLES TO PREVENT CONTACT WITH ENTRANCE AND EXIT OPENINGS.
7. CONDUIT TO BE USED ON A TOWER IF THE RRU IS MORE THAN 10' FROM THE DISTRIBUTION UNITS. MAX CABLE LENGTH IS 16 FEET.
8. SINGLE-CONDUCTOR DC POWER CABLES SHALL BE TELCOFLEX® OR KS24194™, COPPER, UL LISTED RHH NON-HALOGEN, LOW SMOKE WITH BRAIDED COVER, TYPE TC (1/0 AND LARGER). UNLESS OTHERWISE NOTED, STRANDING SHALL BE CLASS B (TYPE III) FOR CABLES SIZES 14, 12 & 10 AWG AND CLASS I (TYPE IV) FOR SIZES 8 AWG AND LARGER. CABLES SHALL BE COLOR CODED RED FOR +24V, BLUE FOR -48V AND GRAY FOR 24V AND 48V RETURN CONDUCTORS. MULTI-CONDUCTOR DC POWER CABLES SHALL BE COPPER, CLASS B STRANDING WITH FLAME RETARDANT PVC JACKET, TYPE TC, UL LISTED FOR 90°C DRY/ 75°C WET INSTALLATION.
9. GROUNDING WIRES SHALL BE COPPER, GREEN THHN/THWN UL LISTED FOR 90°C DRY/75°C WET INSTALLATION. MINIMUM SIZE IS 6 AWG UNLESS NOTED OTHERWISE.
10. FIBER OPTIC CABLES SHALL BE INSTALLED IN FLEXIBLE CONDUIT AS SCOPED BY MARKET.
11. RET CONTROL FROM THE RRU IS AN OPTIONAL METHOD OF CONNECTION. REFER TO RF DATA SHEET FOR APPLICABILITY.
12. RBS 6601 VARIANT 2 REQUIRES A 25A BREAKER AND 10 AWG (MIN.) CONDUCTORS. REPLACE EXISTING 15A OR 20A BREAKERS AND 12 AWG CONDUCTORS WHEN UPGRADING AN EXISTING RBS 6601 VARIANT 1.

ELECTRICAL NOTES

1. PRIOR TO START OF CONSTRUCTION CONTRACTOR SHALL COORDINATE WITH OWNER FOR ALL CONSTRUCTION STANDARDS AND SPECIFICATIONS, AND ALL MANUFACTURER DOCUMENTATION FOR ALL EQUIPMENT TO BE INSTALLED.
2. INSTALL ALL EQUIPMENT IN ACCORDANCE WITH LOCAL BUILDING CODE, NATIONAL ELECTRIC CODE, OWNER AND MANUFACTURER'S SPECIFICATIONS.
3. CONNECT ALL NEW EQUIPMENT TO EXISTING TELCO AS REQUIRED BY MANUFACTURER.
4. MAINTAIN ALL CLEARANCES REQUIRED BY NEC AND EQUIPMENT MANUFACTURER.
5. PRIOR TO INSTALLATION CONTRACTOR SHALL MEASURE EXISTING ELECTRICAL LOAD AND VERIFY EXISTING AVAILABLE CAPACITY FOR PROPOSED INSTALLATION. IF INADEQUATE CAPACITY IS AVAILABLE, CONTRACTOR SHALL COORDINATE WITH LOCAL ELECTRIC UTILITY COMPANY TO UPGRADE EXISTING ELECTRIC SERVICE.
6. CONTRACTOR SHALL INSPECT EXISTING GROUNDING AND LIGHTNING PROTECTION SYSTEM AND ENSURE THAT IT IS IN COMPLIANCE WITH NEC, AND SITE OWNER'S SPECIFICATIONS. THE RESULTS OF THIS INSPECTION SHALL BE PRESENTED TO OWNERS REPRESENTATIVE, AND ANY DEFICIENCIES SHALL BE CORRECTED.
7. ALL TRANSMISSION TOWER SITES CONTAIN AN EXTENSIVE BURIED GROUNDING SYSTEM. ALL GROUNDING WORK MUST BE COORDINATED WITH, AND APPROVED BY, THE TOWER OWNER'S SITE REPRESENTATIVE. ALL OF THE TOWER OWNER'S SPECIFICATIONS MUST BE STRICTLY FOLLOWED.
8. PROVIDE AND INSTALL GROUND KITS FOR ALL NEW COAXIAL CABLES AND BOND TO EXISTING OWNERS GROUNDING SYSTEM PER OWNERS SPECIFICATIONS AND NEC.
9. 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.
10. MINIMUM BENDING RADIUS FOR CONDUCTORS SHALL BE 12 TIMES THE LARGEST DIAMETER OF BRANCH CIRCUIT CONDUCTOR.
11. 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.
12. THE ELECTRICAL CONTRACTOR IS TO BE RESPONSIBLE FOR THE COMPLETE INSTALLATION AND COORDINATION OF THE ENTIRE ELECTRICAL SERVICE. ALL ACTIVITIES TO BE COORDINATED THROUGH OWNER'S REPRESENTATIVE, DESIGN ENGINEER AND OTHER AUTHORITIES HAVING JURISDICTION OF TRADES.
13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL PERMITS AND PAY ALL FEES AS MAY BE REQUIRED FOR THE ELECTRICAL WORK AND FOR SCHEDULING OF ALL INSPECTIONS AS MAY BE REQUIRED BY THE LOCAL AUTHORITY.
14. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION WITH THE SITE AND/OR BUILDING OWNER FOR NEW AND/OR DEMOLITION WORK INVOLVED.
15. 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.
16. 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.
17. 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.
18. GROUNDING SYSTEM WILL BE IN ACCORDANCE WITH THE LATEST ACCEPTABLE EDITION OF THE NATIONAL ELECTRICAL CODE AND REQUIREMENTS PER LOCAL INSPECTOR HAVING JURISDICTION.
19. EACH EQUIPMENT GROUND CONDUCTOR SHALL BE SIZED IN ACCORDANCE WITH THE N.E.C. ARTICLE 250-122. (MIN. #12 AWG).
20. 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).

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: 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. TESTING SHALL BE PERFORMED IN THE PRESENCE AND TO THE SATISFACTION OF OWNERS CONSTRUCTION REPRESENTATIVE. TESTING DATA SHALL BE INITIALED AND DATED BY THE CONSTRUCTION AND INCLUDED WITH THE WRITTEN REPORT/ANALYSIS.

C. THE CONTRACTOR SHALL FORWARD SIX (6) COPIES OF THE INDEPENDENT ELECTRICAL TESTING FIRM 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.

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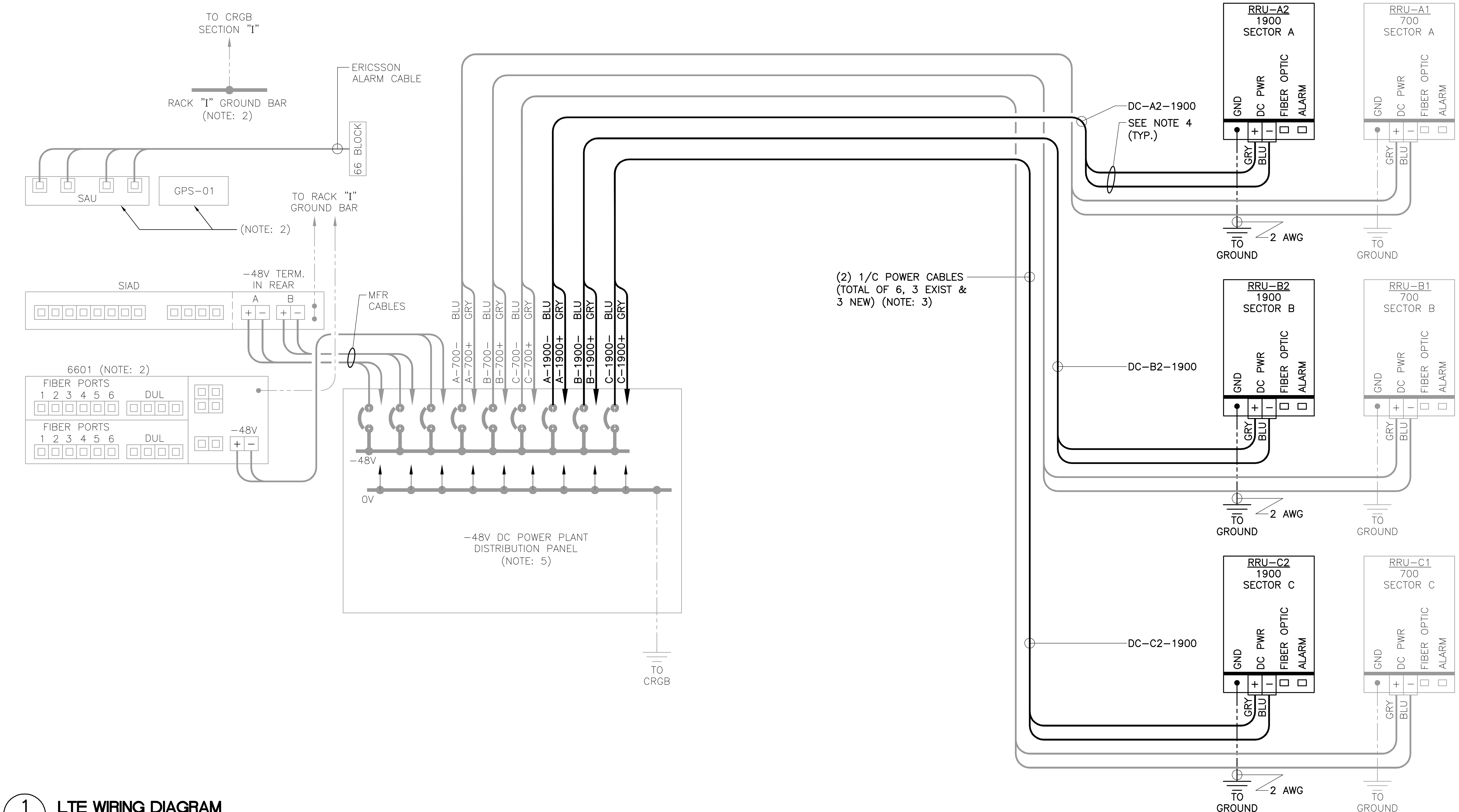
LTE SCHEMATIC DIAGRAM AND NOTES

E-1



1 E-2 **LTE WIRING DIAGRAM**

NOT TO SCALE

LTE WIRING DIAGRAM NOTES:

1. LABEL THE DC POWER CABLES AT BOTH ENDS OF EVERY WIRE AND IN ANY PULL BOX IF USED. LABEL SHALL BE DURABLE, SELF ADHESIVE, WRAPPED LONGITUDINALLY ALONG THE CABLE AND STATE THE SECTOR, FREQUENCY BAND AND POLARITY; I.E. "A-1900+". CABLE AND WIRE LABELS SHOWN ARE REPRESENTATIVE AND MAY BE MODIFIED AS DIRECTED BY AT&T.
2. INSTALL ON BASEBAND EQUIPMENT RACK.
3. THE BARE GROUND WIRE OF EACH MULTI-CONDUCTOR CABLE SHALL BE CONNECTED TO THE "P" GROUND BAR ON THE RACK. WHEN A SHIELDED CABLE IS USED, THE DRAIN WIRE ALSO SHALL BE CONNECTED TO THE "P" GROUND BAR.
4. CABLE GROUND WIRE AND SHIELD DRAIN WIRE TO BE LEFT UN-TERMINATED AT RRU AND DC POWER PLANT.
5. SEE LTE SCHEMATIC DIAGRAM DETAIL 1/E-1 FOR BREAKER RATING.

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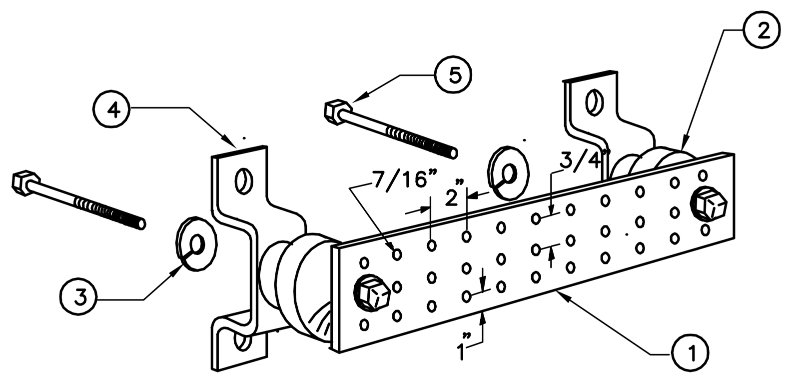
LTE WIRING DIAGRAM

E-2

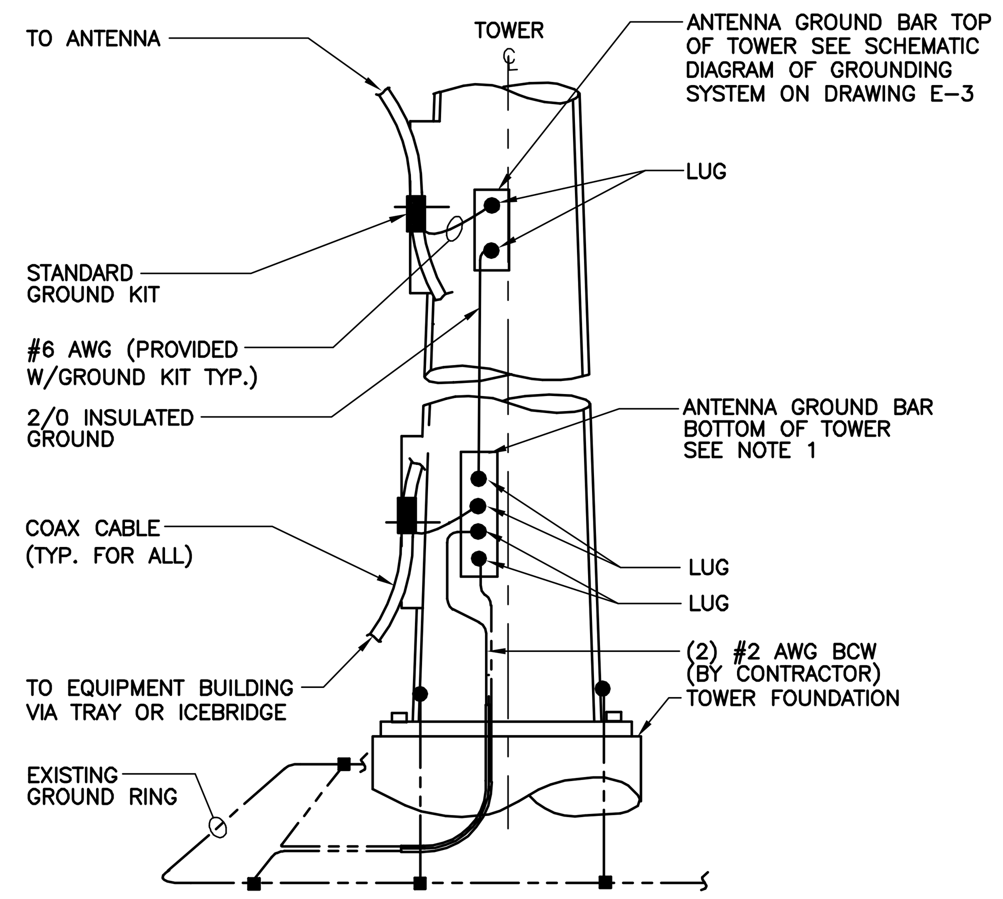
Sheet No. 6 of 7



LEGEND

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

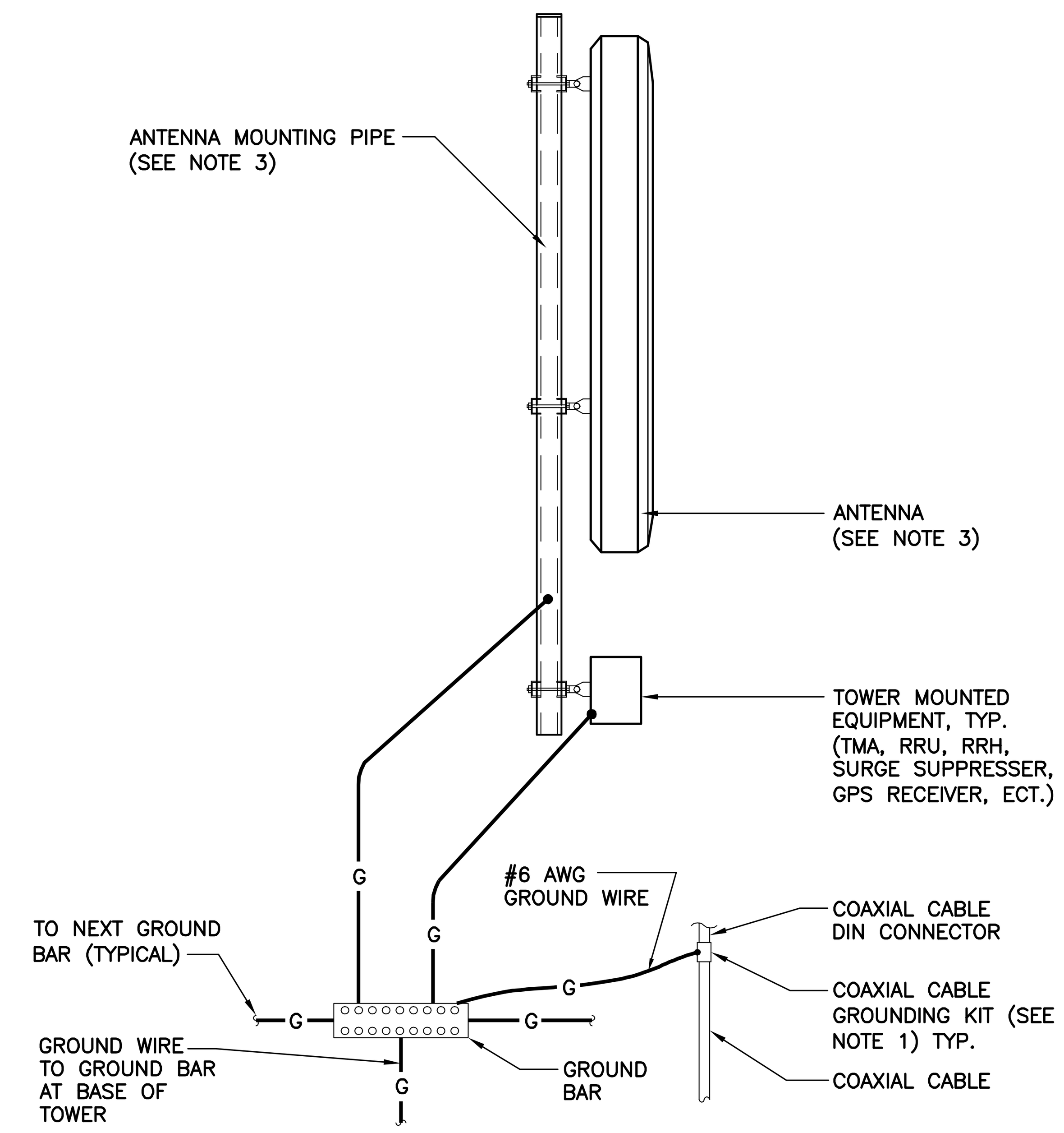
3 / E-3 GROUND BAR DETAIL
NOT TO SCALE



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.

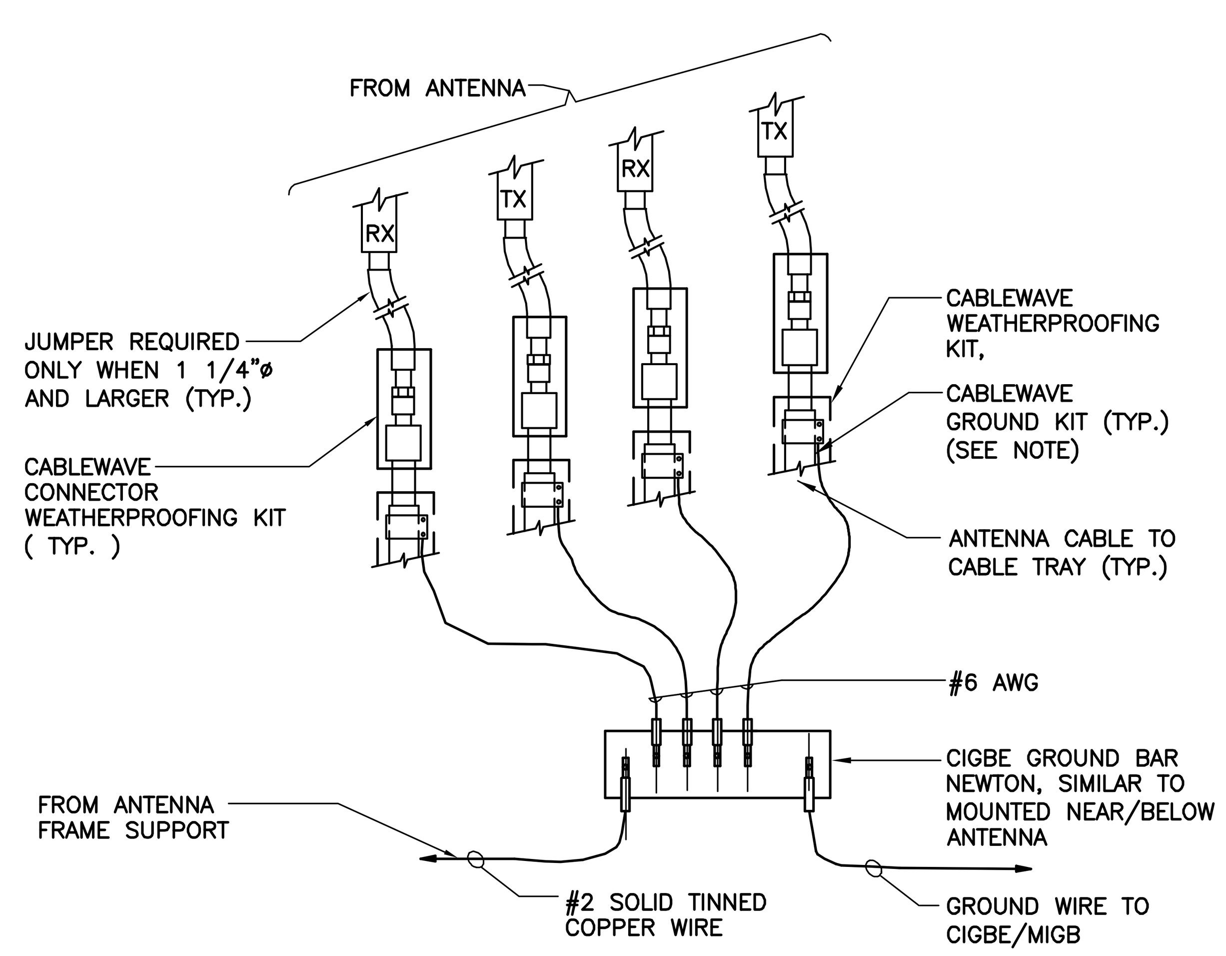
2 / E-3 ANTENNA CABLE GROUNDING - TOWER
NOT TO SCALE



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.

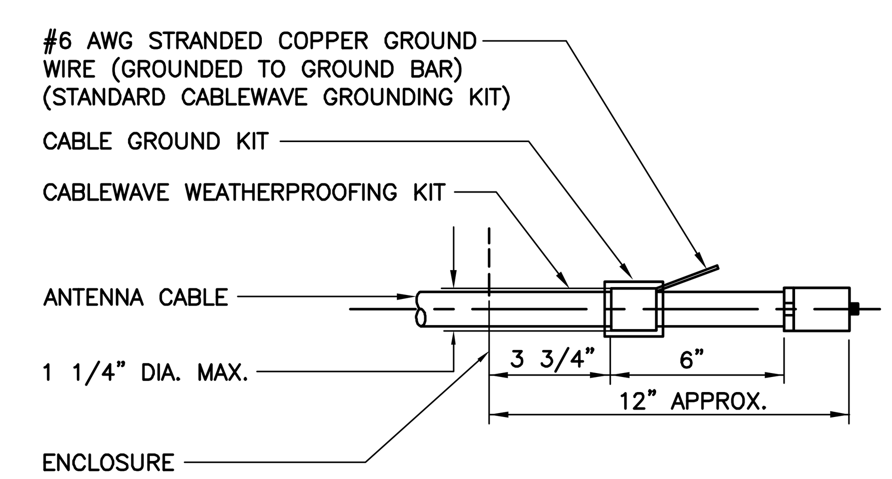
1 / E-3 TYPICAL ANTENNA GROUNDING DETAIL
NOT TO SCALE



NOTE:

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

5 / E-3 CONNECTION OF GROUND WIRES TO GROUND BAR
NOT TO SCALE



NOTE:

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

4 / E-3 ANTENNA CABLE GROUNDING DETAIL
NOT TO SCALE

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TYPICAL ELECTRICAL DETAILS

E-3

Sheet No. 7 of 7

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Structural Analysis of Antenna Mast and Tower

AT&T Site Ref: CT5089

Eversource Structure No. 844

150' Electric Transmission Tower

124 Quarry road
Trumbull, CT

CENTEK Project No. 16071.34

~~Date: August 30, 2016~~

~~Rev 1: October 24, 2016~~

Rev 2: November 21, 2016

STATE OF CONNECTICUT
TIMOTHY J. LYNN
No. 29336
LICENSED
PROFESSIONAL ENGINEER

Prepared for:
AT&T Mobility
500 Enterprise Drive, Suite 3A
Rocky Hill, CT 06067

Table of Contents

Introduction

The purpose of this report is to analyze the existing mast and 150' tower located at 124 Quarry Road in Trumbull, CT for the proposed antenna and equipment upgrade by AT&T.

The existing/proposed loads consist of the following:

- SPRINT (Existing):
  Antennas: Three (3) RFS APXVSPP18-C panel antennas mounted to the existing mast with a RAD center elevation of 100-ft above grade.
  Coax Cables: Eighteen (18) 1-5/8" ∅ coax cables running on the exterior of the existing tower.
- AT&T (Existing to Remain):
  Coax Cables: Six (6) 1-5/8" ∅ coax cables running on the exterior of the existing tower.
  Mast: HSS 6.625"x0.432" x 21-ft long.
- AT&T (Existing to Remove):
  Antennas: Three (3) Powerwave P65-15-XHL-RR panel antennas and three (3) CCI DTMABP7819VG12A TMA's flush mounted on the existing mast with a RAD center elevation of 160-ft above grade.
- **AT&T (Proposed):**
  Antennas: Three (3) Qunitel QS66512-2 panel antennas and six (6) Kaelus TMA2117F00V1-1 TMAs flush mounted on the existing mast with a RAD center elevation of 160-ft above grade.
  Coax Cables: Six (6) 1-5/8" ∅ coax cables running on the exterior of the pole.

Primary assumptions used in the analysis

- Design steel stresses are defined by AISC-LRFD 14th edition for design of the antenna Mast and antenna supporting elements.
- ASCE Manual No. 72, "Design of Steel Transmission Pole Structures Second Edition", defines allowable steel stresses for evaluation of the utility pole.
- All utility pole members are adequately protected to prevent corrosion of steel members.
- All proposed antenna mounts are modeled as listed above.
- Pipe mast will be properly installed and maintained.
- No residual stresses exist due to incorrect pole erection.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds conform to the requirements of AWS D1.1.
- Pipe mast and utility pole will be in plumb condition.
- Utility pole was properly installed and maintained and all members were properly designed, detailed, fabricated, and installed and have been properly maintained since erection.
- Any deviation from the analyzed loading will require a new analysis for verification of structural adequacy.

Analysis

Structural analysis of the existing antenna mast was independently completed using the current version of RISA-3D computer program licensed to CENTEK Engineering, Inc.

The existing mast consisting of a HSS 6.625"x0.432" x 21' long pipe conforming to ASTM A500 Grade B (Fy = 42ksi) connected at two points to the existing pole was analyzed for its ability to resist loads prescribed by the TIA-222-G standard. Section 5 of this report details these gravity and lateral wind loads. NESC prescribed loads were also applied to the mast in order to obtain reactions needed for analyzing the utility pole structure. These loads are developed in Section 7 of this report. Load cases and combinations used in RISA-3D for TIA/EIA loading and for NESC/NU loading are listed in report Sections 6 and 8, respectively.

An envelope solution was first made to determine maximum and minimum forces, stresses, and deflections to confirm the selected section as adequate. Additional analyses were then made to determine the NESC forces to be applied to the pole structure.

The RISA-3D program contains a library of all AISC shapes and corresponding section properties are computed and applied directly within the program. The program's Steel Code Check option was also utilized. The forces calculated in RISA-3D using NESC guidelines were then applied to the pole. Maximum usage for the pole was calculated considering the additional forces from the mast and associated appurtenances.

Design Basis

Our analysis was performed in accordance with TIA-222-G, ASCE Manual No. 72 – "Design of Steel Transmission Pole Structures Second Edition", NESC C2-2007 and Northeast Utilities Design Criteria.

- UTILITY POLE ANALYSIS

  The purpose of this analysis is to determine the adequacy of the existing utility pole to support the proposed antenna loads. The loading and design requirements were analyzed in accordance with the NU Design Criteria Table, NESC C2-2007 ~ Construction Grade B, and ASCE Manual No. 72.

  Load cases considered:

  Load Case 1: NESC Heavy
  Wind Pressure.................................. 4.0 psf
  Radial Ice Thickness........................... 0.5"
  Vertical Overload Capacity Factor............ 1.50
  Wind Overload Capacity Factor................ 2.50
  Wire Tension Overload Capacity Factor...... 1.65

  Load Case 2: NESC Extreme
  Wind Speed..................................... 110 mph [(1)]
  Radial Ice Thickness........................... 0"

  Note 1: NESC C2-2007, Section25, Rule 250C: Extreme Wind Loading, 1.25 x Gust Response Factor (wind speed: 3-second gust)

- MAST ASSEMBLY ANALYSIS

Mast, appurtenances and connections to the utility tower were analyzed and designed in accordance with the NU Design Criteria Table, TIA-222-G and AISC standards.

Load cases considered:

Load Case 1:
Wind Speed………………………………... 97 mph (2016 CSBC Appendix-N)
Radial Ice Thickness……………………….. 0"

Load Case 2:
Wind Pressure.……………………………. 50 mph wind pressure
Radial Ice Thickness……………………….. 0.75"

Results

- MAST ASSEMBLY

The existing mast was determined to be structurally **adequate**.

Member	Stress Ratio (% of capacity)	Result
HSS 6.625"x0.432"	77.5%	**PASS**
3/4" ∅ ASTM A36 Threaded Rod	55.6%	**PASS**

- UTILITY TOWER

This analysis finds that the subject utility structure is adequate to support the existing mast and related appurtenances. The tower stresses meet the requirements set forth by the ASCE Manual No. 10-97, "Design of Latticed Steel Transmission Structures", for the applied NESC Heavy and Hi-Wind load cases. The detailed analysis results are provided in Section 9 of this report. The analysis results are summarized as follows:

A maximum usage of **83.0%** occurs in the utility tower under the **NESC Extreme** loading condition.

TOWER SECTION:

The utility tower was found to be within allowable limits.

Tower Section	Stress Ratio (% of capacity)	Result
Base	83.0%	**PASS**

- FOUNDATION AND ANCHORS

The existing foundation consists of a 8-ft x 8-ft x 8.0-ft long reinforced concrete pier with twelve (12) rock anchors embedded 13-ft into rock. The base of the tower is connected to the foundation by means of twenty-six (26) 2.25"∅, ASTM A615-75 anchor bolts embedded into the concrete foundation structure. Foundation information was obtained from Northeast Utilities drawing 01064-60000.

BASE REACTIONS:

From analysis of CL&P pole based on NESC/NU prescribed loads.

Load Case	Transverse	Axial	Overturning Moment
NESC Heavy Wind x-direction	19.4 kips	99.3 kips	2217.6 ft-kips
NESC Extreme Wind x-direction	41.2 kips	48.3 kips	4154.3 ft-kips
NESC Heavy Wind y-direction	10.6 kips	99.3 kips	787.9 ft-kips
NESC Extreme Wind y-direction	37.2 kips	48.3 kips	2771.9 ft-kips

ANCHOR BOLTS:

The anchor bolts were found to be within allowable limits.

Pole Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Tension	63.8%	**PASS**

BASE PLATE:

The base plate was found to be within allowable limits.

Pole Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Base Plate	Bending	74.2%	**PASS**

FOUNDATION:

The foundation was found to be within allowable limits.

Foundation	Design Limit	Allowable Limit	Proposed Loading	Result
Reinf. Conc. Pier w/ Rock Anchors	OTM (1)	1.0 FS (2)	1.14 FS (2)	**PASS**

Note 1: OTM denote overturning moment.
Note 2: FS denotes Factor of Safety

C o n c l u s i o n

This analysis shows that the subject utility pole **is adequate** to support the proposed AT&T equipment upgrade.

The analysis is based, in part on the information provided to this office by Eversource and AT&T. 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 are performed, results obtained, and recommendations made 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 ~ RISA-3D

RISA-3D Structural Analysis Program is an integrated structural analysis and design software package for buildings, bridges, tower structures, etc.

Modeling Features:

- Comprehensive CAD-like graphic drawing/editing capabilities that let you draw, modify and load elements as well as snap, move, rotate, copy, mirror, scale, split, merge, mesh, delete, apply, etc.
- Versatile drawing grids (orthogonal, radial, skewed)
- Universal snaps and object snaps allow drawing without grids
- Versatile general truss generator
- Powerful graphic select/unselect tools including box, line, polygon, invert, criteria, spreadsheet selection, with locking
- Saved selections to quickly recall desired selections
- Modification tools that modify single items or entire selections
- Real spreadsheets with cut, paste, fill, math, sort, find, etc.
- Dynamic synchronization between spreadsheets and views so you can edit or view any data in the plotted views or in the spreadsheets
- Simultaneous view of multiple spreadsheets
- Constant in-stream error checking and data validation
- Unlimited undo/redo capability
- Generation templates for grids, disks, cylinders, cones, arcs, trusses, tanks, hydrostatic loads, etc.
- Support for all units systems & conversions at any time
- Automatic interaction with RISASection libraries
- Import DXF, RISA-2D, STAAD and ProSteel 3D files
- Export DXF, SDNF and ProSteel 3D files

Analysis Features:

- Static analysis and P-Delta effects
- Multiple simultaneous dynamic and response spectra analysis using Gupta, CQC or SRSS mode combinations
- Automatic inclusion of mass offset (5% or user defined) for dynamic analysis
- Physical member modeling that does not require members to be broken up at intermediate joints
- State of the art 3 or 4 node plate/shell elements
- High-end automatic mesh generation — draw a polygon with any number of sides to create a mesh of well-formed quadrilateral (NOT triangular) elements.
- Accurate analysis of tapered wide flanges - web, top and bottom flanges may all taper independently
- Automatic rigid diaphragm modeling
- Area loads with one-way or two-way distributions
- Multiple simultaneous moving loads with standard AASHTO loads and custom moving loads for bridges, cranes, etc.
- Torsional warping calculations for stiffness, stress and design
- Automatic Top of Member offset modeling
- Member end releases & rigid end offsets
- Joint master-slave assignments
- Joints detachable from diaphragms
- Enforced joint displacements
- 1-Way members, for tension only bracing, slipping, etc.

- 1-Way springs, for modeling soils and other effects
- Euler members that take compression up to their buckling load, then turn off.
- Stress calculations on any arbitrary shape
- Inactive members, plates, and diaphragms allows you to quickly remove parts of structures from consideration
- Story drift calculations provide relative drift and ratio to height
- Automatic self-weight calculations for members and plates
- Automatic subgrade soil spring generator

Graphics Features:

- Unlimited simultaneous model view windows
- Extraordinary "true to scale" rendering, even when drawing
- High-speed redraw algorithm for instant refreshing
- Dynamic scrolling stops right where you want
- Plot & print virtually everything with color coding & labeling
- Rotate, zoom, pan, scroll and snap views
- Saved views to quickly restore frequent or desired views
- Full render or wire-frame animations of deflected model and dynamic mode shapes with frame and speed control
- Animation of moving loads with speed control
- High quality customizable graphics printing

Design Features:

- Designs concrete, hot rolled steel, cold formed steel and wood
- ACI 1999/2002, BS 8110-97, CSA A23.3-94, IS456:2000,EC 2-1992 with consistent bar sizes through adjacent spans
- Exact integration of concrete stress distributions using parabolic or rectangular stress blocks
- Concrete beam detailing (Rectangular, T and L)
- Concrete column interaction diagrams
- Steel Design Codes: AISC ASD 9th, LRFD 2nd & 3rd, HSS Specification, CAN/CSA-S16.1-1994 & 2004, BS 5950-1-2000, IS 800-1984, Euro 3-1993 including local shape databases
- AISI 1999 cold formed steel design
- NDS 1991/1997/2001 wood design, including Structural Composite Lumber, multi-ply, full sawn
- Automatic spectra generation for UBC 1997, IBC 2000/2003
- Generation of load combinations: ASCE, UBC, IBC, BOCA, SBC, ACI
- Unbraced lengths for physical members that recognize connecting elements and full lengths of members
- Automatic approximation of K factors
- Tapered wide flange design with either ASD or LRFD codes
- Optimization of member sizes for all materials and all design codes, controlled by standard or user-defined lists of available sizes and criteria such as maximum depths
- Automatic calculation of custom shape properties
- Steel Shapes: AISC, HSS, CAN, ARBED, British, Euro, Indian, Chilean
- Light Gage Shapes: AISI, SSMA, Dale / Incor, Dietrich, Marino\WARE
- Wood Shapes: Complete NDS species/grade database
- Full seamless integration with RISAFoot (Ver 2 or better) for advanced footing design and detailing
- Plate force summation tool

Results Features:

- Graphic presentation of color-coded results and plotted designs
- Color contours of plate stresses and forces with quadratic smoothing, the contours may also be animated
- Spreadsheet results with sorting and filtering of: reactions, member & joint deflections, beam & plate forces/stresses, optimized sizes, code designs, concrete reinforcing, material takeoffs, frequencies and mode shapes
- Standard and user-defined reports
- Graphic member detail reports with force/stress/deflection diagrams and detailed design calculations and expanded diagrams that display magnitudes at any dialed location
- Saved solutions quickly restore analysis and design results.

GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM ~ PLS-TOWER

PLS-TOWER is a Microsoft Windows program for the analysis and design of steel latticed towers used in electric power lines or communication facilities. Both self-supporting and guyed towers can be modeled. The program performs design checks of structures under user specified loads. For electric power structures it can also calculate maximum allowable wind and weight spans and interaction diagrams between different ratios of allowable wind and weight spans.

Modeling Features:

- Powerful graphics module (stress usages shown in different colors)
- Graphical selection of joints and members allows graphical editing and checking
- Towers can be shown as lines, wire frames or can be rendered as 3-d polygon surfaces
- Can extract geometry and connectivity information from a DXF CAD drawing
- CAD design drawings, title blocks, drawing borders or photos can be tied to structure model
- XML based post processor interface
- Steel Detailing Neutral File (SDNF) export to link with detailing packages
- Can link directly to line design program PLS-CADD
- Automatic generation of structure files for PLS-CADD
- Databases of steel angles, rounds, bolts, guys, etc.
- Automatic generation of joints and members by symmetries and interpolations
- Automated mast generation (quickly builds model for towers that have regular repeating sections) via graphical copy/paste
- Steel angles and rounds modeled either as truss, beam or tension-only elements
- Guys are easily handled (can be modeled as exact cable elements)

Analysis Features:

- Automatic handling of tension-only members
- Automatic distribution of loads in 2-part suspension insulators (v-strings, horizontal vees, etc.)
- Automatic calculation of tower dead, ice, and wind loads as well as drag coefficients according to:
    - ASCE 74-1991
    - NESC 2002
    - NESC 2007
    - IEC 60826:2003
    - EN50341-1:2001 (CENELEC)
    - EN50341-3-9:2001 (UK NNA)
    - EN50341-3-17:2001 (Portugal NNA)
    - ESAA C(b)1-2003 (Australia)
    - TPNZ (New Zealand)
    - REE (Spain)
    - EIA/TIA 222-F
    - ANSI/TIA 222-G
    - CSA S37-01
- Automated microwave antenna loading as per EIA/TIA 222-F and ANSI/TIA 222-G
- Minimization of problems caused by unstable joints and mechanisms
- Automatic bandwidth minimization and ability to solve large problems
- Design checks according to (other standards can be added easily):
    - ASCE Standard 10-90

- AS 3995 (Australian Standard 3995)
- BS 8100 (British Standard 8100)
- EN50341-1 (CENELEC, both empirical and analytical methods are available)
- ECCS 1985
- NGT-ECCS
- PN-90/B-03200
- EIA/TIA 222-F
- ANSI/TIA 222-G
- CSA S37-01
- EDF/RTE Resal
- IS 802 (India Standard 802)

Results Features:

- Design summaries printed for each group of members
- Easy to interpret text, spreadsheet and graphics design summaries
- Automatic determination of allowable wind and weight spans
- Automatic determination of interaction diagrams between allowable wind and weight spans
- Capability to batch run multiple tower configurations and consolidate the results
- Automated optimum angle member size selection and bolt quantity determination

Tool for interactive angle member sizing and bolt quantity determination.

Criteria for Design of PCS Facilities On or Extending Above Metal Electric Transmission Towers & Analysis of Transmission Towers Supporting PCS Masts (1)

Introduction

This criteria is the result from an evaluation of the methods and loadings specified by the separate standards, which are used in designing telecommunications towers and electric transmission towers. That evaluation is detailed elsewhere, but in summary; the methods and loadings are significantly different. This criteria specifies the manner in which the appropriate standard is used to design PCS facilities including masts and brackets (hereafter referred to as “masts”), and to evaluate the electric transmission towers to support PCS masts. The intent is to achieve an equivalent level of safety and security under the extreme design conditions expected in Connecticut and Massachusetts.

ANSI Standard TIA-222 covering the design of telecommunications structures specifies a working strength/allowable stress design approach. This approach applies the loads from extreme weather loading conditions, and designs the structure so that it does not exceed some defined percentage of failure strength (allowable stress).

ANSI Standard C2-2007 (National Electrical Safety Code) covering the design of electric transmission metal structures is based upon an ultimate strength/yield stress design approach. This approach applies a multiplier (overload capacity factor) to the loads possible from extreme weather loading conditions, and designs the structure so that it does not exceed its ultimate strength (yield stress).

Each standard defines the details of how loads are to be calculated differently. Most of the NU effort in “unifying” both codes was to establish what level of strength each approach would provide, and then increasing the appropriate elements of each to achieve a similar level of security under extreme weather loadings.

Two extreme weather conditions are considered. The first is an extreme wind condition (hurricane) based upon a 50-year recurrence (2% annual probability). The second is a winter condition combining wind and ice loadings.

The following sections describe the design criteria for any PCS mast extending above the top of an electric transmission tower, and the analysis criteria for evaluating the loads on the transmission tower from such a mast from the lower portions of such a mast, and loads on the pre-existing electric lower portions of such a mast, and loads on the pre-existing electric transmission tower and the conductors it supports.

Note 1: Prepared from documentation provide from Northeast Utilities.

P C S   M a s t

The PCS facility (mast, external cable/trays, including the initial and any planned future support platforms, antennas, etc. extending the full height above the top level of the electric transmission structure) shall be designed in accordance with the provisions of TIA 222-G:

E L E C T R I C   T R A N S M I S S I O N   T O W E R

The electric transmission tower shall be analyzed using yield stress theory in accordance with the attached table titled “NU Design Criteria”. This specifies uniform loadings (different from the TIA loadings) on the each of the following components of the installed facility:

- PCS mast for its total height above ground level, including the initial and planned future support platforms, antennas, etc. above the top of an electric transmission structure.
- Conductors are related devices and hardware.
- Electric transmission structure. The loads from the PCS facility and from the electric conductors shall be applied to the structure at conductor and PCS mast attachment points, where those load transfer to the tower.

The uniform loadings and factors specified for the above components in the table are based upon the National Electrical Safety Code 2007 Edition Extreme Wind (Rule 250C) and Combined Ice and Wind (Rule 250B-Heavy) Loadings. These provide equivalent loadings compared to TIA and its loads and factors with the exceptions noted above. (Note that the NESC does not require the projected wind surfaces of structures and equipment to be increased by the ice covering.)

In the event that the electric transmission tower is not sufficient to support the additional loadings of the PCS mast, reinforcement will be necessary to upgrade the strength of the overstressed members.

Attachment A

NU Design Criteria

<table>
<tr><th colspan="3"></th><th>Basic Wind Speed</th><th>Pressure</th><th>Height Factor</th><th>Gust Factor</th><th>Load or Stress Factor</th><th>Force Coef - Shape Factor</th></tr>
<tr><th colspan="3"></th><th>V (MPH)</th><th>Q (PSF)</th><th>Kz</th><th>Gh</th><th></th><th></th></tr>
<tr><td rowspan="4">Ice Condition</td><td>TIA/EIA</td><td>Antenna Mount</td><td>TIA</td><td>TIA (.75Wi)</td><td>TIA</td><td>TIA</td><td>TIA, Section 3.1.1.1 disallowed for connection design</td><td>TIA</td></tr>
<tr><td rowspan="3">NESC Heavy</td><td>Tower/Pole Analysis with antennas extending above top of Tower/Pole (Yield Stress)</td><td>------</td><td>4</td><td>1.00</td><td>1.00</td><td>2.50</td><td>1.6 Flat Surfaces
1.3 Round Surfaces</td></tr>
<tr><td>Tower/Pole Analysis with Antennas below top of Tower/Pole (on two faces)</td><td>-----</td><td>4</td><td>1.00</td><td>1.00</td><td>2.50</td><td>1.6 Flat Surfaces
1.3 Round Surfaces</td></tr>
<tr><td>Conductors:</td><td colspan="6">Conductor loads provided by NU</td></tr>
<tr><td rowspan="4">High Wind Condtion</td><td>TIA/EIA</td><td>Antenna Mount</td><td>85</td><td>TIA</td><td>TIA</td><td>TIA</td><td>TIA, Section 3.1.1.1 disallowed for connection design</td><td>TIA</td></tr>
<tr><td rowspan="3">NESC Extreme Wind</td><td>Tower/Pole Analysis with antennas extending above top of Tower/Pole</td><td colspan="5">Use NESC C2-2007, Section 25, Rule 250C: Extreme Wind Loading
1.25 x Gust Response Factor
Height above ground level based on top of Mast/Antenna</td><td>1.6 Flat Surfaces
1.3 Round Surfaces</td></tr>
<tr><td>Tower/Pole Analysis with Antennas below top of Tower/Pole</td><td colspan="5">Use NESC C2-2007, Section 25, Rule 250C: Extreme Wind Loading
Height above ground level based on top of Tower/Pole</td><td>1.6 Flat Surfaces
1.3 Round Surfaces</td></tr>
<tr><td>Conductors:</td><td colspan="6">Conductor loads provided by NU</td></tr>
<tr><td colspan="2" rowspan="4">NESC Extreme Ice with Wind Conditon*</td><td>Tower/Pole Analysis with antennas extending above top of Tower/Pole</td><td colspan="5">Use NESC C2-2007, Section 25, Rule 250D: Extreme Ice with Wind Loading
4PSF Wind Load 1.25 x Gust Response Factor
Height above ground level based on top of Mast/Antenna</td><td>1.6 Flat Surfaces
1.3 Round Surfaces</td></tr>
<tr><td>Tower/Pole Analysis with Antennas below top of Tower/Pole</td><td colspan="5">Use NESC C2-2007, Section 25, Rule 250D: Extreme Ice with Wind Loading
4PSF Wind Load
Height above ground level based on top of Tower/Pole</td><td>1.6 Flat Surfaces
1.3 Round Surfaces</td></tr>
<tr><td>Conductors:</td><td colspan="6">Conductor loads provided by NU</td></tr>
<tr><td colspan="7">* Only for Structures Installed after 2007</td></tr>
</table>

Shape Factor Criteria shall be per TIA Shape Factors.

2) STEP 2 - The electric transmission structure analysis and evaluation shall be performed in accordance with NESC requirements and shall include the mast and antenna loads determined from NESC applied loading conditions (not TIA/EIA Loads) on the structure and mount as specified below, and shall include the wireless communication mast and antenna loads per NESC criteria)

The structure shall be analyzed using yield stress theory in accordance with Attachment A, "NU Design Criteria." This specifies uniform loadings (different from the TIA loadings) on each of the following components of the installed facility:

a) Wireless communication mast for its total height above ground level, including the initial and any planned future equipment (Support Platforms, Antennas, TMA's etc.) above the top of an electric transmission structure.
b) Conductors and related devices and hardware (wire loads will be provided by NU).
c) Electric Transmission Structure
   i) The loads from the wireless communication equipment components based on NESC and NU Criteria in Attachment A, and from the electric conductors shall be applied to the structure at conductor and wireless communication mast attachment points, where those loads transfer to the tower.
   ii) Shape Factor Multiplier:

NESC Structure Shape	Cd
Polyround (for polygonal steel poles)	1.3
Flat	1.6
Open Lattice	3.2

   iii) When Coaxial Cables are mounted along side the pole structure, the shape multiplier shall be:

Mount Type	Cable Cd	Pole Cd
Coaxial Cables on outside periphery (One layer)	1.45	1.45
Coaxial Cables mounted on stand offs	1.6	1.3

d) The uniform loadings and factors specified for the above components in Attachment A, "NU Design Criteria" are based upon the National Electric Safety Code 2007 Edition Extreme Wind (Rule 250C) and Combined Ice and Wind (Rule 250B-Heavy) Loadings. These provide equivalent loadings compared to the TIA and its loads and factors with the exceptions noted above.

   Note: The NESC does not require ice load be included in the supporting structure. (Ice on conductors and shield wire only, and NU will provide these loads).
e) Mast reaction loads shall be evaluated for local effects on the transmission structure members at the attachment points.

TITLE AT&T SITE CT-089, TRUMBULL, CT 12/1/99
STRUCT #844

CONDUCTOR

	AHEAD	BACK
	LAPWING	LAPWING
	1595.000	1595.000
	45/7 ACSR	45/7 ACSR
DIAM =	1.504	1.504
WEIGHT =	1.790	1.790
TENSION (LBS)	AHEAD 11,400	BACK 11,400

LOADCASE	NESC HEAVY
WIND (PSF)	4
ICE (IN)	0.50
OLF ANG	1.65
OLF WIND	2.50
OLF WT	1.50

				NESC HEAVY		
STR	ANGLE	WIND SPAN	WGT SPAN	H	L	V
BACK	0	407	493	849	-18810	2245
AHEAD	0	407	493	849	18810	2245
TOTALS	**0.0**	**814**	**986**	**1699**	**0**	**4490**

TITLE AT&T SITE CT-089, TRUMBULL, CT — 12/1/99

STRUCT # 844

CONDUCTOR

	AHEAD	BACK
	LAPWING	LAPWING
	1595.000	1595.000
	45/7 ACSR	45/7 ACSR
DIAM =	1.504	1.504
WEIGHT =	1.790	1.790
TENSION (LBS)	AHEAD 9,401	BACK 9,401

LOADCASE	HI WIND
WIND (PSF)	20
ICE (IN)	0.00
OLF ANG	1.15
OLF WIND	1.15
OLF WT	1.15

STR	ANGLE	WIND SPAN	WGT SPAN	HI WIND H	HI WIND L	HI WIND V
BACK	0	407	493	1173	-10811	1015
AHEAD	0	407	493	1173	10811	1015
TOTALS	**0.0**	**814**	**986**	**2346**	**0**	**2030**

TITLE AT&T SITE, CT-089, TRUMBULL, CT 12/1/99
STRUCT #844

CONDUCTOR - SHIELD WIRE

	AHEAD	BACK
	3/8 AW	3/8 AW
	0.000	0.000
	7 #8 Al Weld	7 #8 Al Weld
DIAM =	0.385	0.385
WEIGHT =	0.262	0.262
TENSION (LBS)	AHEAD 4,200	BACK 4,200

LOADCASE	NESC HEAVY
WIND (PSF)	4
ICE (IN)	0.50
OLF ANG	1.65
OLF WIND	2.50
OLF WT	1.50

STR	ANGLE	WIND SPAN	WGT SPAN	NESC HEAVY H	L	V
BACK	0	407	493	470	-6930	601
AHEAD	0	407	493	470	6930	601
TOTALS	**0.0**	**814**	**986**	**939**	**0**	**1201**

TITLE AT&T SITE CT-089, TRUMBULL, CT

12/1/99

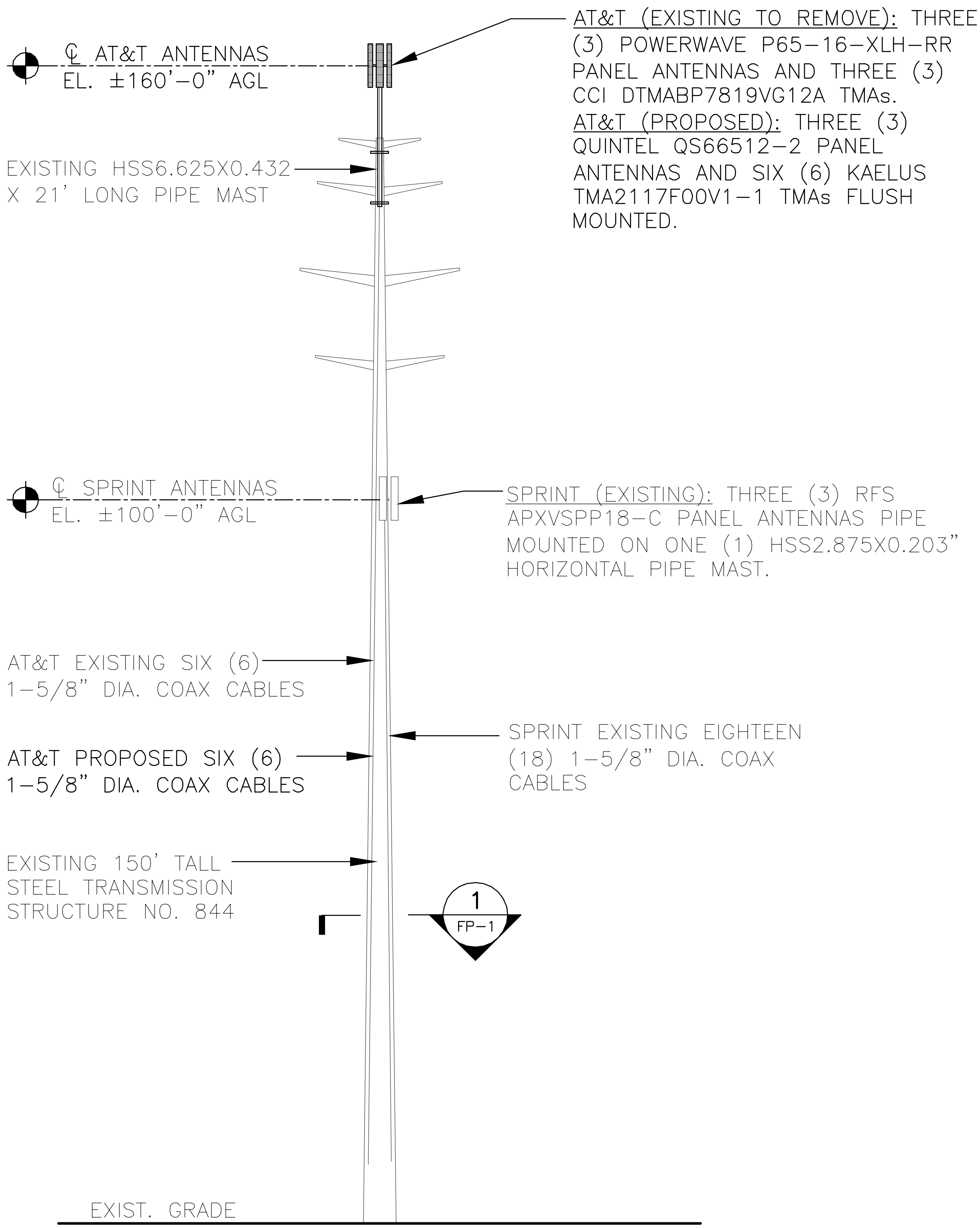
STRUCT # 944

CONDUCTOR

	AHEAD		BACK	
	3/8 AW		3/8 AW	
	0.000		0.000	
	7 #8 Al Weld		7 #8 Al Weld	
DIAM =	0.385		0.385	
WEIGHT =	0.262		0.262	
TENSION (LBS)	AHEAD	2,521	BACK	2,521

LOADCASE	HI WIND
WIND (PSF)	20
ICE (IN)	0.00
OLF ANG	1.15
OLF WIND	1.15
OLF WT	1.15

STR	ANGLE	WIND SPAN	WGT SPAN	HI WIND H	L	V
BACK	0	407	493	300	-2899	148
AHEAD	0	407	493	300	2899	148
TOTALS	**0.0**	**814**	**986**	**601**	**0**	**297**



1
EL-1

TOWER & MAST ELEVATION

SCALE: NOT TO SCALE

REVISIONS		
00	8/30/16	ISSUED FOR REVIEW
01	10/24/16	ISSUED FOR REVIEW

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CT5089
STRUCTURE 844

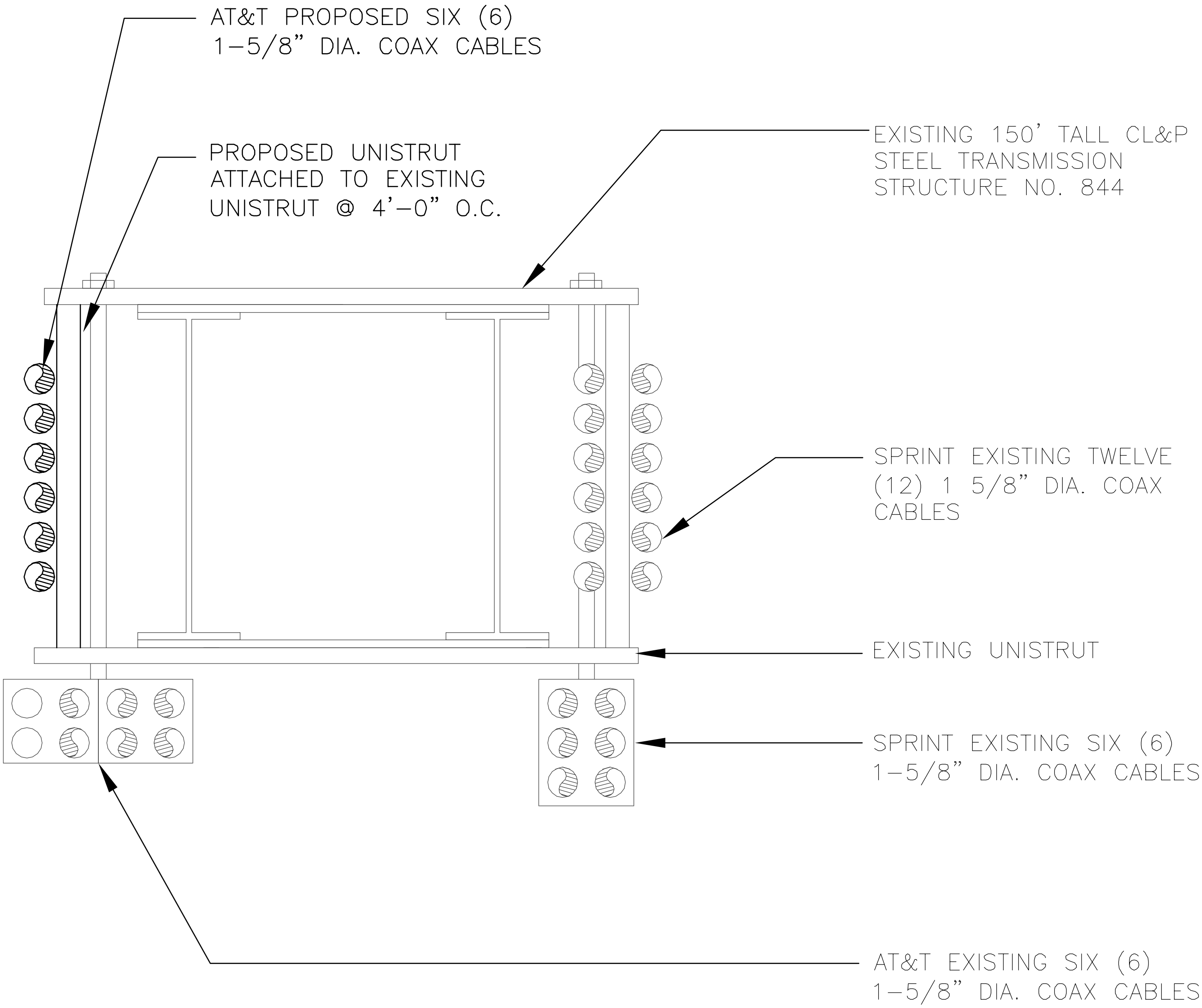
124 QUARRY ROAD
TRUMBULL, CT 06611

PROJECT NO:	16071.34
DRAWN BY:	TJL
CHECKED BY:	CFC
SCALE:	AS NOTED
DATE:	8/30/16

TOWER AND MAST ELEVATION

EL-1

DWG. 1 OF 1



1 / FP–1

FEEDLINE PLAN - TOWER

SCALE: NOT TO SCALE

REVISIONS		
00	8/30/16	ISSUED FOR REVIEW
01	10/24/16	ISSUED FOR REVIEW

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FEEDLINE
PLAN

FP-1

DWG. 2 OF 1

Development of Design Heights, Exposure Coefficients, and Velocity Pressures Per TIA-222-G

Wind Speeds

Basic Wind Speed $V := 97$ mph (User Input - 2016 CSBC Appendix N)

Basic Wind Speed with Ice $V_i := 50$ mph (User Input per Annex B of TIA-222-G)

Input

Structure Type = Structure_Type := Pole (User Input)

Structure Category = $SC := III$ (User Input)

Exposure Category = $Exp := C$ (User Input)

Structure Height = $h := 150$ ft (User Input)

Height to Center of Antennas = $z_{AT\&T} := 160$ ft (User Input)

Radial Ice Thickness = $t_i := 0.75$ in (User Input per Annex B of TIA-222-G)

Radial Ice Density = $Id := 56.00$ pcf (User Input)

Topograpic Factor = $K_{zt} := 1.0$ (User Input)

$K_a := 1.0$ (User Input)

Gust Response Factor = $G_H := 1.35$ (User Input)

Output

Wind Direction Probability Factor = $K_d := \begin{cases} 0.95 & \text{if Structure\_Type = Pole} \\ 0.85 & \text{if Structure\_Type = Lattice} \end{cases} = 0.95$ (Per Table 2-2 of TIA-222-G)

Importance Factors = $I_{Wind} := \begin{cases} 0.87 & \text{if } SC = 1 \\ 1.00 & \text{if } SC = 2 \\ 1.15 & \text{if } SC = 3 \end{cases} = 1.15$ (Per Table 2-3 of TIA-222-G)

$I_{Wind\_w\_Ice} := \begin{cases} 0 & \text{if } SC = 1 \\ 1.00 & \text{if } SC = 2 \\ 1.00 & \text{if } SC = 3 \end{cases} = 1$

$I_{ice} := \begin{cases} 0 & \text{if } SC = 1 \\ 1.00 & \text{if } SC = 2 \\ 1.25 & \text{if } SC = 3 \end{cases} = 1.25$

$$K_{iz} := \left(\frac{z_{AT\&T}}{33}\right)^{0.1} = 1.171$$

$$t_{iz} := 2.0 \cdot t_i \cdot I_{ice} \cdot K_{iz} \cdot K_{zt}^{0.35} = 2.196$$

Velocity Pressure Coefficient = $Kz_{AT\&T} := 2.01\left(\left(\frac{z_{AT\&T}}{zg}\right)\right)^{\frac{2}{\alpha}} = 1.397$

Velocity Pressure w/o Ice = $qz_{AT\&T} := 0.00256 \cdot K_d \cdot Kz_{AT\&T} \cdot K_{zt} \cdot V^2 \cdot I_{Wind} = 36.769$

Velocity Pressure with Ice = $qz_{ice.AT\&T} := 0.00256 \cdot K_d \cdot Kz_{AT\&T} \cdot K_{zt} \cdot V_i^2 \cdot I_{Wind\_w\_Ice} = 8.495$

Development of Wind & Ice Load on Mast

Existing Mast Data: (HSS 6.625"x0.432") (User Input)

Mast Shape = Round (User Input)

Mast Diameter = $D_{mast} := 6.625$ in (User Input)

Mast Length = $L_{mast} := 21$ ft (User Input)

Mast Thickness = $t_{mast} := 0.432$ in (User Input)

Mast Aspect Ratio = $Ar_{mast} := \frac{12L_{mast}}{D_{mast}} = 38.0$

Mast Force Coefficient = $Ca_{mast} = 1.2$

Wind Load (without ice)

Mast Projected Surface Area = $A_{mast} := \frac{D_{mast}}{12} = 0.552$ sf/ft

Total Mast Wind Force = $qz_{AT\&T} \cdot G_H \cdot Ca_{mast} \cdot A_{mast} = 33$ plf **BLC 5**

Wind Load (with ice)

Mast Projected Surface Area w/ Ice = $AICE_{mast} := \frac{(D_{mast} + 2 \cdot t_{iz})}{12} = 0.918$ sf/ft

Total Mast Wind Force w/ Ice = $qz_{ice.AT\&T} \cdot G_H \cdot Ca_{mast} \cdot AICE_{mast} = 13$ plf **BLC 4**

Gravity Loads (without ice)

Weight of the mast = Self Weight **(Computed internally by Risa-3D)** plf **BLC 1**

Gravity Loads (ice only)

Ice Area per Linear Foot = $Ai_{mast} := \frac{\pi}{4}\left[(D_{mast} + t_{iz} \cdot 2)^2 - D_{mast}{}^2\right] = 60.8$ sq in

Weight of Ice on Mast = $W_{ICEmast} := Id \cdot \frac{Ai_{mast}}{144} = 24$ plf **BLC 3**

Development of Wind & Ice Load on Antennas

Proposed Antenna Data:

Antenna Model =	Quintel QS66512-2		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 72$	in	(User Input)
Antenna Width =	$W_{ant} := 12$	in	(User Input)
Antenna Thickness =	$T_{ant} := 9.6$	in	(User Input)
Antenna Weight =	$WT_{ant} := 111$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 3$		(User Input)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 6.0$		
Antenna Force Coefficient =	$Ca_{ant} = 1.36$		

Wind Load (without ice)

Surface Area for One Antenna =	$SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 6$	sf	
Antenna Projected Surface Area =	$A_{ant} := SA_{ant} \cdot N_{ant} = 18$	sf	
Total Antenna Wind Force =	$F_{ant} := qz_{AT\&T} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ant} = 1211$	lbs	**BLC 5**

Wind Load (with ice)

Surface Area for One Antenna w/ Ice =	$SA_{ICEant} := \frac{(L_{ant} + 2 \cdot t_{iz}) \cdot (W_{ant} + 2 \cdot t_{iz})}{144} = 8.7$	sf	
Antenna Projected Surface Area w/ Ice =	$A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 26.1$	sf	
Total Antenna Wind Force w/ Ice =	$Fi_{ant} := qz_{ice.AT\&T} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ICEant} = 406$	lbs	**BLC 4**

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 333$	lbs	**BLC 2**

Gravity Loads (ice only)

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 8294$	cu in	
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 2 \cdot t_{iz})(W_{ant} + 2 \cdot t_{iz}) \cdot (T_{ant} + 2 \cdot t_{iz}) - V_{ant} = 9225$	cu in	
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 299$	lbs	
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 897$	lbs	**BLC 3**

Development of Wind & Ice Load on TMA's

Proposed TMA Data:

TMA Model =	Kaelus TMA2117F00V1-1		
TMA Shape =	Flat		(User Input)
TMA Height =	$L_{TMA} := 8.46$	in	(User Input)
TMA Width =	$W_{TMA} := 11.81$	in	(User Input)
TMA Thickness =	$T_{TMA} := 4.21$	in	(User Input)
TMA Weight =	$WT_{TMA} := 18$	lbs	(User Input)
Number of TMA's =	$N_{TMA} := 6$		(User Input)
TMA Aspect Ratio =	$Ar_{TMA} := \frac{L_{TMA}}{T_{TMA}} = 2$		
TMA Force Coefficient =	$Ca_{TMA} = 1.2$		

Wind Load (without ice)

Surface Area for One TMA =	$SA_{TMA} := \frac{L_{TMA} \cdot W_{TMA}}{144} = 0.7$	sf	
TMA Projected Surface Area =	$A_{TMA} := SA_{TMA} \cdot N_{TMA} = 4.2$	sf	
Total TMA Wind Force =	$F_{TMA} := qz_{AT\&T} \cdot G_H \cdot Ca_{TMA} \cdot K_a \cdot A_{TMA} = 248$	lbs	**BLC 5**

Wind Load (with ice)

Surface Area for One TMA w/ Ice =	$SA_{ICETMA} := \frac{(L_{TMA} + 2 \cdot t_{iz}) \cdot (W_{TMA} + 2 \cdot t_{iz})}{144} = 1.4$	sf	
TMA Projected Surface Area w/ Ice =	$A_{ICETMA} := SA_{ICETMA} \cdot N_{TMA} = 8.7$	sf	
Total TMA Wind Force w/ Ice =	$Fi_{TMA} := qz_{ice.AT\&T} \cdot G_H \cdot Ca_{TMA} \cdot K_a \cdot A_{ICETMA} = 119$	lbs	**BLC 4**

Gravity Load (without ice)

Weight of All TMA's =	$WT_{TMA} \cdot N_{TMA} = 108$	lbs	**BLC 2**

Gravity Load (ice only)

Volume of Each TMA =	$V_{TMA} := L_{TMA} \cdot W_{TMA} \cdot T_{TMA} = 421$	cu in	
Volume of Ice on Each TMA =	$V_{ice} := (L_{TMA} + 2 \cdot t_{iz})(W_{TMA} + 2 \cdot t_{iz})(T_{TMA} + 2 \cdot t_{iz}) - V_{TMA} = 1 \times 10^3$	cu in	
Weight of Ice on Each TMA =	$W_{ICETMA} := \frac{V_{ice}}{1728} \cdot Id = 44$	lbs	
Weight of Ice on All TMA's	$W_{ICETMA} \cdot N_{TMA} = 266$	lbs	**BLC 3**

Development of Wind & Ice Load on Antenna Mounts

Mount Data:

Mount Type:	Pipe Mounts		
Mount Shape =	Round		(User Input)
Pipe Mount Length =	$L_{mnt} := 60$	in	(User Input)
2 inch Pipe Mount Linear Weight =	$W_{mnt} := 3.66$	plf	(User Input)
Pipe Mount Outside Diameter =	$D_{mnt} := 2.375$	in	(User Input)
Number of Mounting Pipes =	$N_{mnt} := 3$		(User Input)
Mount Bracket Weight =	$W_{b.mnt} := 101$	lbs	(User Input)
Mount Aspect Ratio =	$Ar_{mnt} := \frac{L_{mnt}}{D_{mnt}} = 25$		
Mount Force Coefficient =	$Ca_{mnt} := 1.2$		

Wind Load (without ice)

Assumes Mount is Shielded by Antenna

Mount Projected Surface Area = $A_{mnt} := 0.0$ sf

Total Mount Wind Force = $F_{mnt} := qz_{AT\&T} \cdot G_H \cdot Ca_{mnt} \cdot A_{mnt} = 0$ lbs **BLC 5**

Wind Load (with ice)

Assumes Mount is Shielded by Antenna

Mount Projected Surface Area w/ Ice = $A_{ICEmnt} := 0.0$ sf

Total Mount Wind Force = $Fi_{mnt} := qz_{ice.AT\&T} \cdot G_H \cdot Ca_{mnt} \cdot A_{ICEmnt} = 0$ lbs **BLC 4**

Gravity Loads (without ice)

Weight Each Pipe Mount = $WT_{mnt} := W_{mnt} \cdot \frac{L_{mnt}}{12} = 18$ lbs

Weight of All Mounts = $WT_{mnt} \cdot N_{mnt} + W_{b.mnt} = 156$ lbs **BLC 2**

Gravity Loads (ice only)

Volume of Each Pipe = $V_{mnt} := \frac{\pi}{4} \cdot D_{mnt}^2 \cdot L_{mnt} = 266$ cu in

Volume of Ice on Each Pipe = $V_{ice} := \left[\frac{\pi}{4} \cdot \left[\left(D_{mnt} + 2 \cdot t_{iz}\right)^2\right] \cdot \left(L_{mnt} + 2 \cdot t_{iz}\right)\right] - V_{mnt} = 2 \times 10^3$ cu in

Weight of Ice each mount (incl, hardware) = $W_{ICEmnt} := \frac{V_{ice}}{1728} \cdot Id = 66$ lbs

Weight of Ice on All Mounts = $W_{ICEmnt} \cdot N_{mnt} + 30 = 229$ lbs **BLC 3**

Development of Wind & Ice Load on Coax Cables

Coax Cable Data:

Coax Type = HELIAX 1-5/8"

Shape = Round (User Input)

Coax Outside Diameter = $D_{coax} := 1.98$ in (User Input)

Coax Cable Length = $L_{coax} := 12$ ft (User Input)

Weight of Coax per foot = $Wt_{coax} := 1.04$ plf (User Input)

Total Number of Coax = $N_{coax} := 12$ (User Input)

No. of Coax Projecting Outside Face of Mast = $NP_{coax} := 3$ (User Input)

Coax aspect ratio, $Ar_{coax} := \frac{(L_{coax} \cdot 12)}{D_{coax}} = 72.7$

Coax Cable Force Factor Coefficient = $Ca_{coax} = 1.2$

Wind Load (without ice)

Coax projected surface area = $A_{coax} := \frac{(NP_{coax} D_{coax})}{12} = 0.5$ sf/ft

Total Coax Wind Force = $F_{coax} := Ca_{coax} \cdot qz_{AT\&T} \cdot G_H \cdot A_{coax} = 29$ plf **BLC 5**

Wind Load (with ice)

Coax projected surface area w/ Ice = $AICE_{coax} := \frac{(NP_{coax} \cdot D_{coax} + 2 \cdot t_{iz})}{12} = 0.9$ sf/ft

Total Coax Wind Force w/ Ice = $Fi_{coax} := Ca_{coax} \cdot qz_{ice.AT\&T} \cdot G_H \cdot AICE_{coax} = 12$ plf **BLC 4**

Gravity Loads (without ice)

Weight of all cables w/o ice $WT_{coax} := Wt_{coax} \cdot N_{coax} = 12$ plf **BLC 2**

Gravity Loads (ice only)

Ice Area per Linear Foot = $Ai_{coax} := \frac{\pi}{4}\left[(D_{coax} + 2 \cdot t_{iz})^2 - D_{coax}^{\ 2}\right] = 28.8$ sq in

Ice Weight All Coax per foot = $WTi_{coax} := N_{coax} \cdot Id \cdot \frac{Ai_{coax}}{144} = 134$ plf **BLC 3**

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Ph. 203-488-0580 / Fax. 203-488-8587

Subject: **Analysis of TIA/EIA Wind and Ice Loads for Analysis of Mast Only**
Tabulated Load Cases
Location: **Trumbull, CT**

Date: 10/18/16 Prepared by: T.J.L. Checked by: C.F.C. Job No. 16071.34

Load Case	Description
1	Self Weight (Mast)
2	Weight of Appurtenances
3	Weight of Ice Only
4	TIA Wind with Ice
5	TIA Wind

Footnotes:

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Subject: **Analysis of TIA/EIA Wind and Ice Loads for Analysis of Mast Only**
Load Combinations Table

Location: **Trumbull, CT**

Date: 10/18/16 Prepared by: T.J.L. Checked by: C.F.C. Job No. 16071.34

Load Combination	Description	Envelope Soultion	Wind Factor	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	1.2D + 1.6W		1	Y	1	1.2	2	1.2	5	1.6				
2	0.9D + 1.6W		1	Y	1	0.9	2	0.9	5	1.6				
3	1.2D + 1.0Di + 1.0Wi		1	Y	1	1.2	2	1.2	3	1.0	4	1.0		

Footnotes:
BLC = Basic Load Case
D = Dead Load
Di = Dead Load of Ice
W = Wind Load
W = Wind Load w/ Ice

Global

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Increase Nailing Capacity for Wind?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automaticly Iterate Stiffness for Walls?	No
Maximum Iteration Number for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 14th(360-10): LRFD
Adjust Stiffness?	Yes(Iterative)
RISAConnection Code	AISC 14th(360-10): ASD
Cold Formed Steel Code	AISI 1999: ASD
Wood Code	AF&PA NDS-97: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-02
Masonry Code	ACI 530-05: ASD
Aluminum Code	AA ADM1-05: ASD - Building

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	PCA Load Contour
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

Global, Continued

Seismic Code	UBC 1997
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	No
Ct Z	.035
Ct X	.035
T Z (sec)	Not Entered
T X (sec)	Not Entered
R Z	8.5
R X	8.5
Ca	.36
Cv	.54
Nv	1
Occupancy Category	4
Seismic Zone	3
Seismic Detailing Code	ASCE 7-05
Om Z	1
Om X	1
Rho Z	1
Rho X	1

Footing Overturning Safety Factor	1.5
Check Concrete Bearing	No
Footing Concrete Weight (k/ft^3)	0
Footing Concrete f'c (ksi)	3
Footing Concrete Ec (ksi)	4000
Lamda	1
Footing Steel fy (ksi)	60
Minimum Steel	0.0018
Maximum Steel	0.0075
Footing Top Bar	#3
Footing Top Bar Cover (in)	3.5
Footing Bottom Bar	#3
Footing Bottom Bar Cover (in)	3.5
Pedestal Bar	#3
Pedestal Bar Cover (in)	1.5
Pedestal Ties	#3

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1...	Density[k/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	58	1.2
3	A992	29000	11154	.3	.65	.49	50	1.1	58	1.2
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.3	58	1.1
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.2	58	1.1
6	A53 Gr. B	29000	11154	.3	.65	.49	35	1.5	58	1.2

Hot Rolled Steel Design Parameters

	Label	Shape	Lengt...	Lbyy[ft]	Lbzz[ft]	Lcomp t...	Lcomp b...	L-torqu...	Kyy	Kzz	Cb	Function
1	M1	Existing Mast	21.5									Lateral

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design ...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Existing Mast	HSS6.625x0.432	Beam	Pipe	A500 Gr.42	Typical	7.86	38.2	38.2	76.4

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design R...
1	M1	BOTTO...	TOP-M...			Existing Mast	Beam	Pipe	A500 Gr.42	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From ...
1	BOTTOM-MAST	0	0	0	0	
2	BOTTOM-BRACE	0	.5	0	0	
3	TOP-BRACE	0	7.5	0	0	
4	ANTENNA-CL	0	19.5	0	0	
5	TOP-MAST	0	21.5	0	0	

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]	Footing
1	BOTTOM-MAST							
2	BOTTOM-BRACE	Reaction	Reaction	Reaction		Reaction		
3	TOP-BRACE	Reaction	Reaction	Reaction		Reaction		

Member Point Loads

Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
No Data to Print ...			

Joint Loads and Enforced Displacements (BLC 2 : Weight of Appurtenances)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	ANTENNA-CL	L	Y	-.333
2	ANTENNA-CL	L	Y	-.108
3	ANTENNA-CL	L	Y	-.156

Joint Loads and Enforced Displacements (BLC 3 : Weight of Ice Only)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	ANTENNA-CL	L	Y	-.897
2	ANTENNA-CL	L	Y	-.266
3	ANTENNA-CL	L	Y	-.229

Joint Loads and Enforced Displacements (BLC 4 : TIA Wind with Ice)

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

Joint Loads and Enforced Displacements (BLC 4 : TIA Wind with Ice) (Continued)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	ANTENNA-CL	L	X	.406
2	ANTENNA-CL	L	X	.119

Joint Loads and Enforced Displacements (BLC 5 : TIA Wind)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	ANTENNA-CL	L	X	1.211
2	ANTENNA-CL	L	X	.248

Member Distributed Loads (BLC 2 : Weight of Appurtenances)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.012	-.012	0	0

Member Distributed Loads (BLC 3 : Weight of Ice Only)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.024	-.024	0	0
2	M1	Y	-.134	-.134	0	0

Member Distributed Loads (BLC 4 : TIA Wind with Ice)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.013	.013	0	0
2	M1	X	.012	.012	0	0

Member Distributed Loads (BLC 5 : TIA Wind)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.033	.033	0	0
2	M1	X	.029	.029	0	0

Basic Load Cases

	BLC Description	Category	X Gra...	Y Gravity	Z Gra...	Joint	Point	Distrib..	Area(...	Surfa...
1	Self Weight	None		-1						
2	Weight of Appurtenances	None				3		1		
3	Weight of Ice Only	None				3		2		
4	TIA Wind with Ice	None				2		2		
5	TIA Wind	None				2		2		

Load Combinations

	Description	Sol...	PDelta	SR..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact...
1	1.2D + 1.6W	Yes	Y		1	1.2	2	1.2	5	1.6										
2	0.9D + 1.6W	Yes	Y		1	.9	2	.9	5	1.6										
3	1.2D + 1.0Di + 1.0Wi	Yes	Y		1	1.2	2	1.2	3	1	4	1								

Envelope Member Section Forces

	Member	Sec		Axial[k]	LC	y Shear[k]	LC	z Shear[k]	LC	Torqu...	LC	y-y Mo...	LC	z-z Mo...	LC
1	M1	1	max	0	1	0	3	0	1	0	1	0	1	0	1
2			min	0	1	0	2	0	1	0	1	0	1	0	1
3		2	max	-.048	2	-1.343	3	0	1	0	1	0	1	26.12	1
4			min	-.281	3	-5.597	1	0	1	0	1	0	1	6.254	3
5		3	max	4.307	3	3.442	1	0	1	0	1	0	1	26.526	1
6			min	.912	2	.828	3	0	1	0	1	0	1	6.342	3
7		4	max	3.208	3	2.909	1	0	1	0	1	0	1	9.457	1
8			min	.725	2	.694	3	0	1	0	1	0	1	2.253	3
9		5	max	0	1	.002	3	0	1	0	1	0	1	0	1
10			min	0	1	.002	2	0	1	0	1	0	1	0	1

Envelope Member Section Stresses

	Member	Sec		Axial[ksi]	LC	y Shear[...	LC	z Shear[...	LC	y-Top[ksi]	LC	y-Bot[ksi]	LC	z-Top[ksi]	LC	z-Bot[ksi]	LC
1	M1	1	max	0	1	0	3	0	1	0	1	0	1	0	1	0	1
2			min	0	1	0	2	0	1	0	1	0	1	0	1	0	1
3		2	max	-.006	2	-.342	3	0	1	-6.508	3	27.18	1	0	1	0	1
4			min	-.036	3	-1.424	1	0	1	-27.18	1	6.508	3	0	1	0	1
5		3	max	.548	3	.876	1	0	1	-6.599	3	27.603	1	0	1	0	1
6			min	.116	2	.211	3	0	1	-27.603	1	6.599	3	0	1	0	1
7		4	max	.408	3	.74	1	0	1	-2.345	3	9.84	1	0	1	0	1
8			min	.092	2	.176	3	0	1	-9.84	1	2.345	3	0	1	0	1
9		5	max	0	1	0	3	0	1	0	1	0	1	0	1	0	1
10			min	0	1	0	2	0	1	0	1	0	1	0	1	0	1

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	BOTTOM-BR...	max	5.064	1	.818	3	0	1	0	1	0	1	0	1
2		min	1.209	3	.139	2	0	1	0	1	0	1	0	1
3	TOP-BRACE	max	-2.271	3	5.687	3	0	1	0	1	0	1	0	1
4		min	-9.531	1	1.148	2	0	1	0	1	0	1	0	1
5	Totals:	max	-1.063	3	6.505	3	0	1						
6		min	-4.467	1	1.287	2	0	1						

Envelope Joint Displacements

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotatio...	LC	Y Rotatio...	LC	Z Rotation...	LC
1	BOTTOM-MA...	max	.041	1	0	2	0	1	0	1	0	1	6.907e-3	1
2		min	.01	3	0	3	0	1	0	1	0	1	1.653e-3	3
3	BOTTOM-BR...	max	0	3	0	2	0	1	0	1	0	1	6.906e-3	1
4		min	0	1	0	3	0	1	0	1	0	1	1.652e-3	3
5	TOP-BRACE	max	0	1	0	2	0	1	0	1	0	1	-3.445e-3	3
6		min	0	3	0	3	0	1	0	1	0	1	-1.439e-2	1
7	ANTENNA-CL	max	5.502	1	0	2	0	1	0	1	0	1	-1.185e-2	3
8		min	1.317	3	-.002	3	0	1	0	1	0	1	-4.954e-2	1
9	TOP-MAST	max	6.692	1	0	2	0	1	0	1	0	1	-1.185e-2	3
10		min	1.601	3	-.002	3	0	1	0	1	0	1	-4.956e-2	1

Envelope AISC 14th(360-10): LRFD Steel Code Checks

	Member	Shape	Code Check	Loc...	LC	Sh...	Loc[ft]	Dir	LC	phi*Pn...	phi*...	phi*...	phi*...	...	Eqn
1	M1	HSS6.625...	.775	7.615	1	.065	7.391		1	128.111	297...	49.14	49.14	...	H1...

Joint Reactions

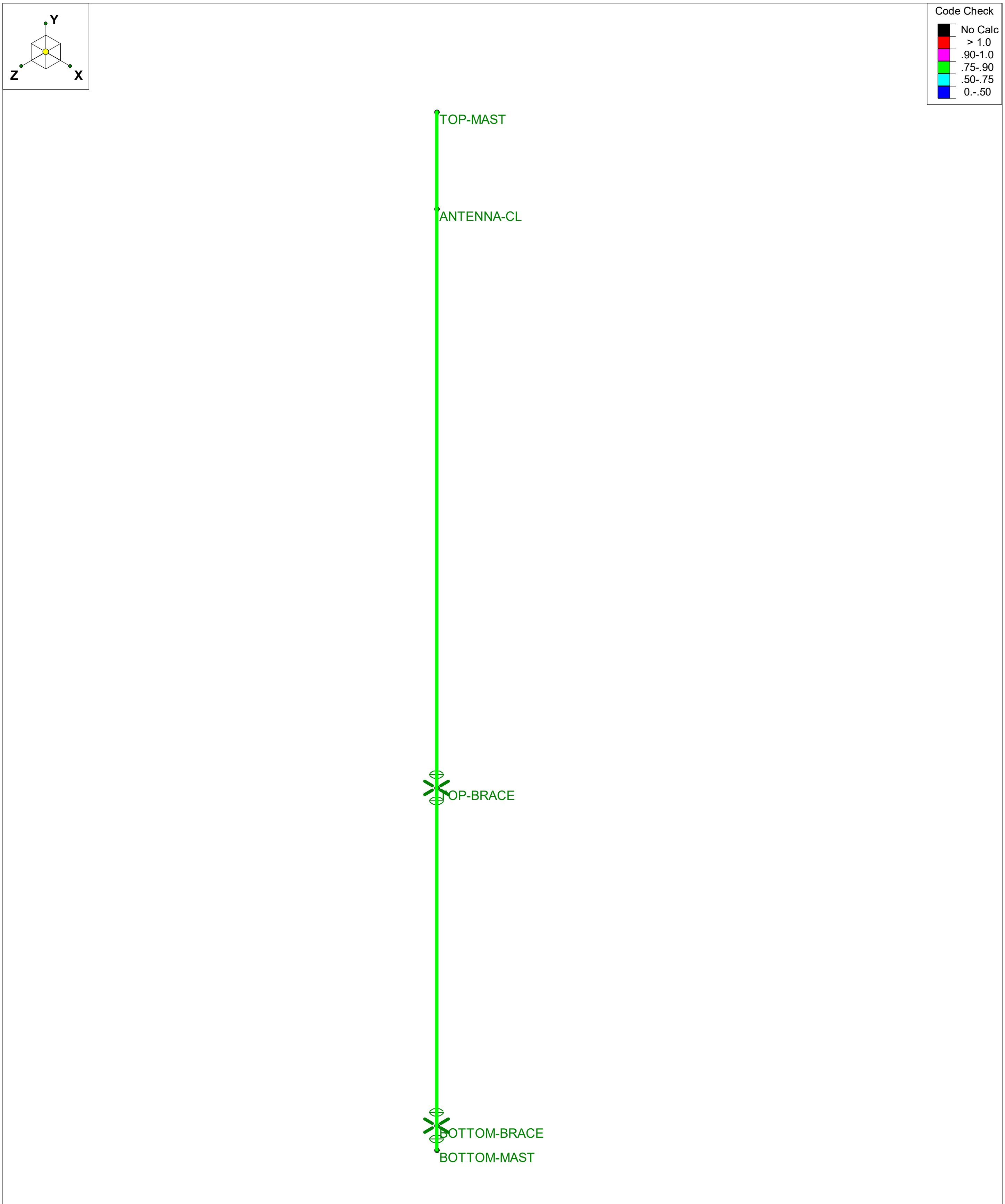
	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	BOTTOM-BRACE	5.064	.186	0	0	0	0
2	1	TOP-BRACE	-9.531	1.53	0	0	0	0
3	1	Totals:	-4.467	1.716	0			
4	1	COG (ft):	X: 0	Y: 14.403	Z: 0			

Joint Reactions

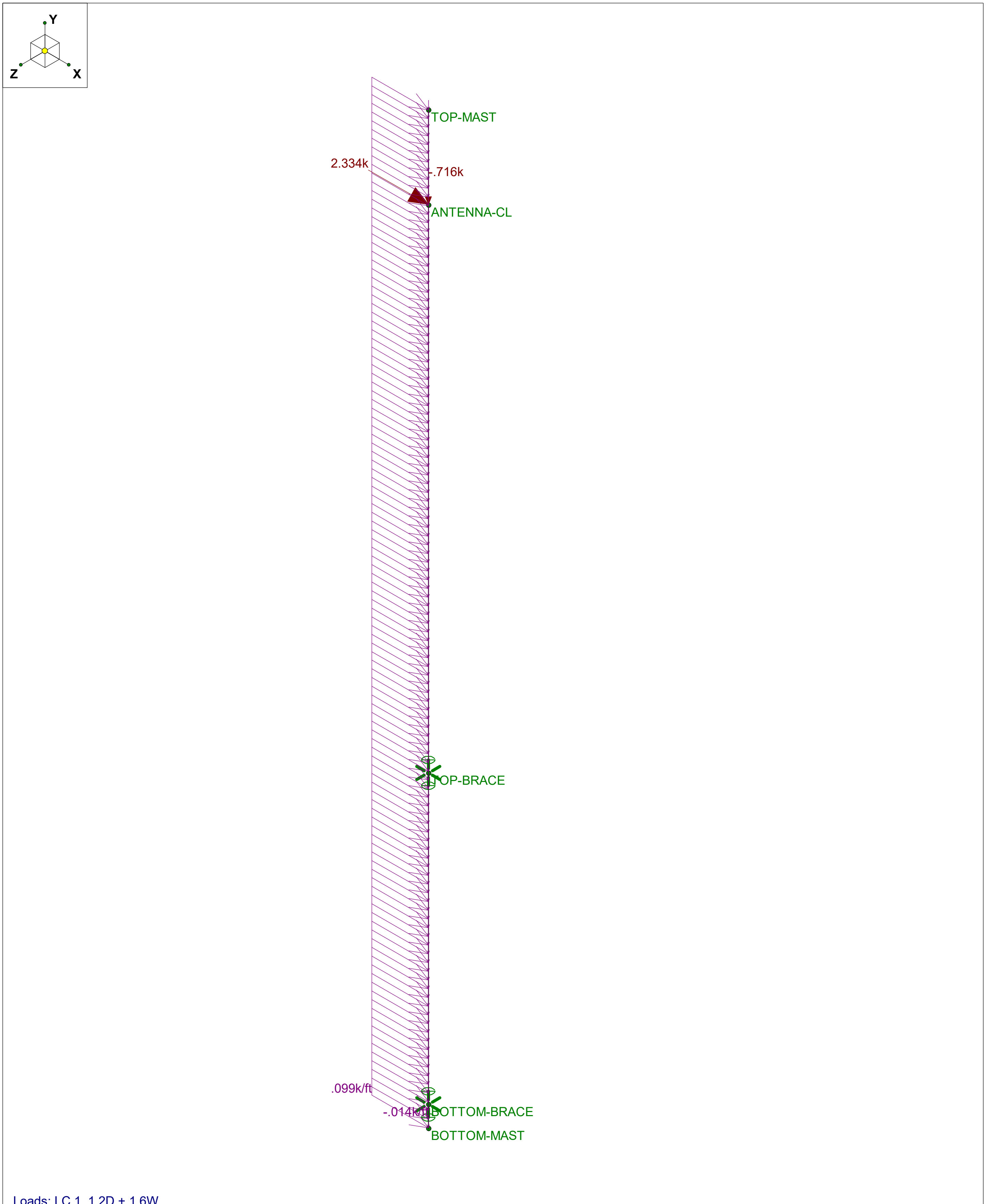
	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	2	BOTTOM-BRACE	5.046	.139	0	0	0	0
2	2	TOP-BRACE	-9.513	1.148	0	0	0	0
3	2	Totals:	-4.467	1.287	0			
4	2	COG (ft):	X: 0	Y: 14.403	Z: 0			

Joint Reactions

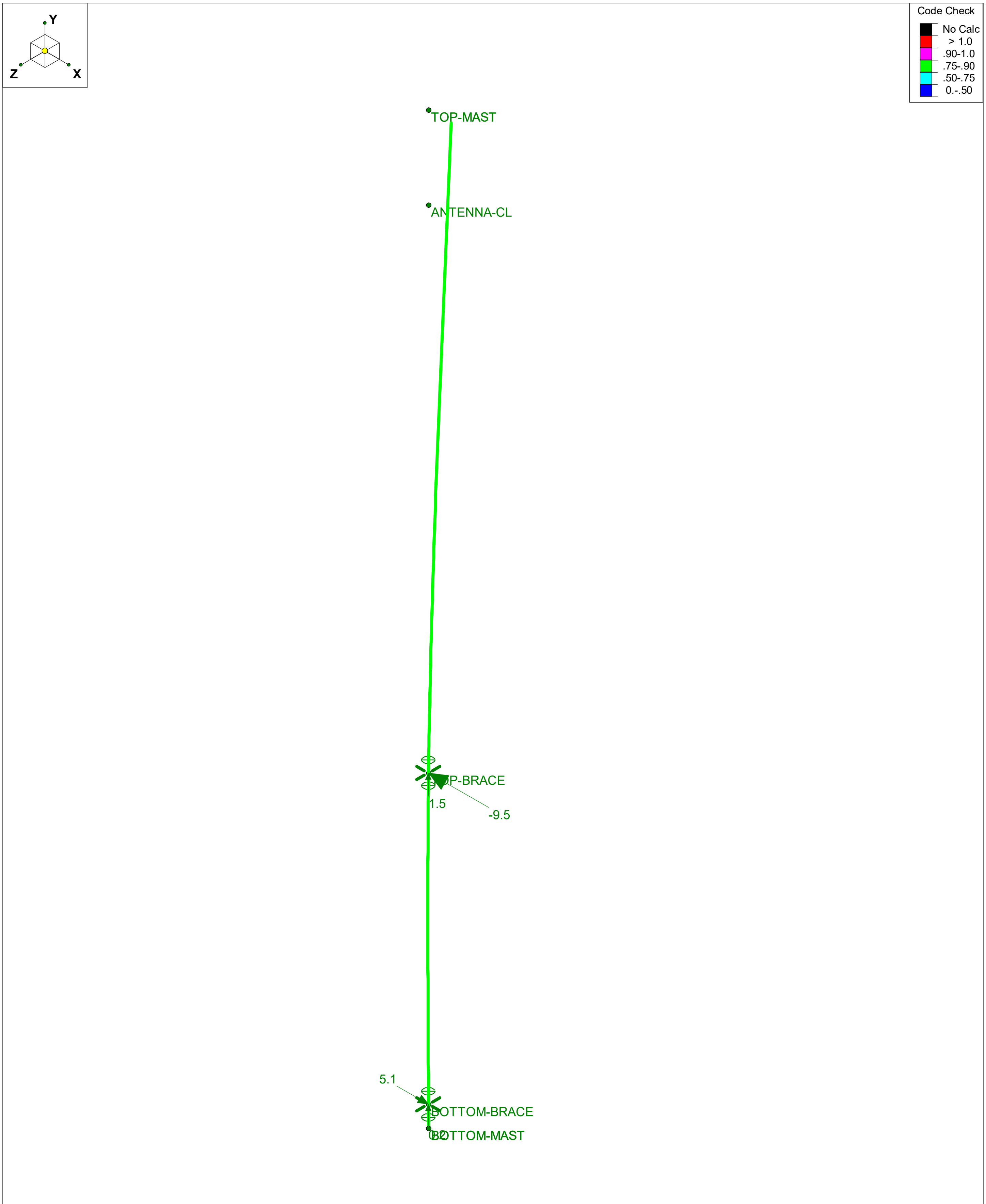
	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	3	BOTTOM-BRACE	1.209	.818	0	0	0	0
2	3	TOP-BRACE	-2.271	5.687	0	0	0	0
3	3	Totals:	-1.063	6.505	0			
4	3	COG (ft):	X: 0	Y: 13.586	Z: 0			



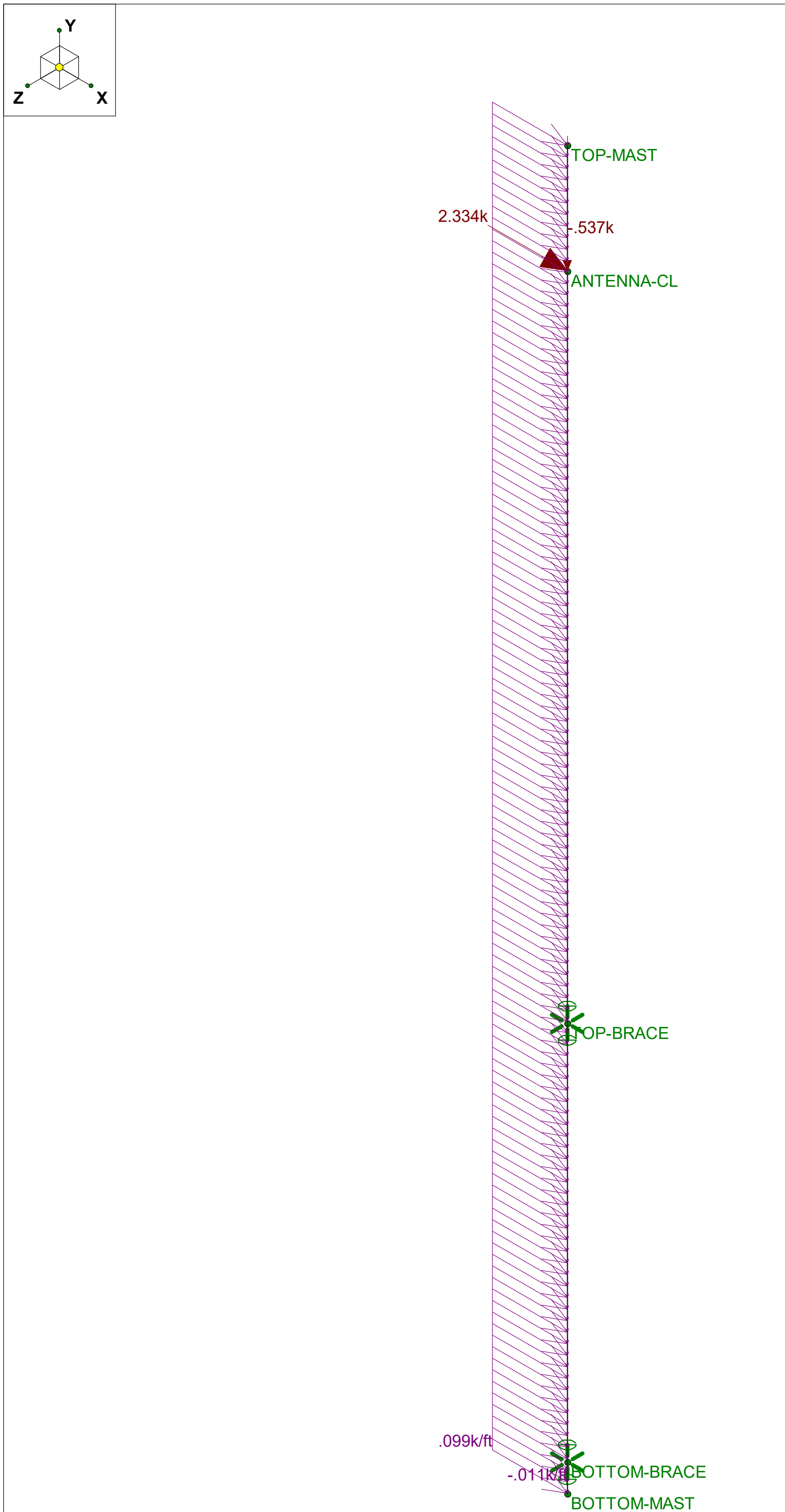
CENTEK Engineering, INC.		
tjl, cfc	Structure # 844 Mast	Nov 21, 2016 at 1:19 PM
16071.34 /AT&T CT5089	Unity Check	TIA.r3d



CENTEK Engineering, INC.		
tjl, cfc	Structure # 844 Mast	Nov 21, 2016 at 1:17 PM
16071.34 /AT&T CT5089	LC #1 Loads	TIA.r3d

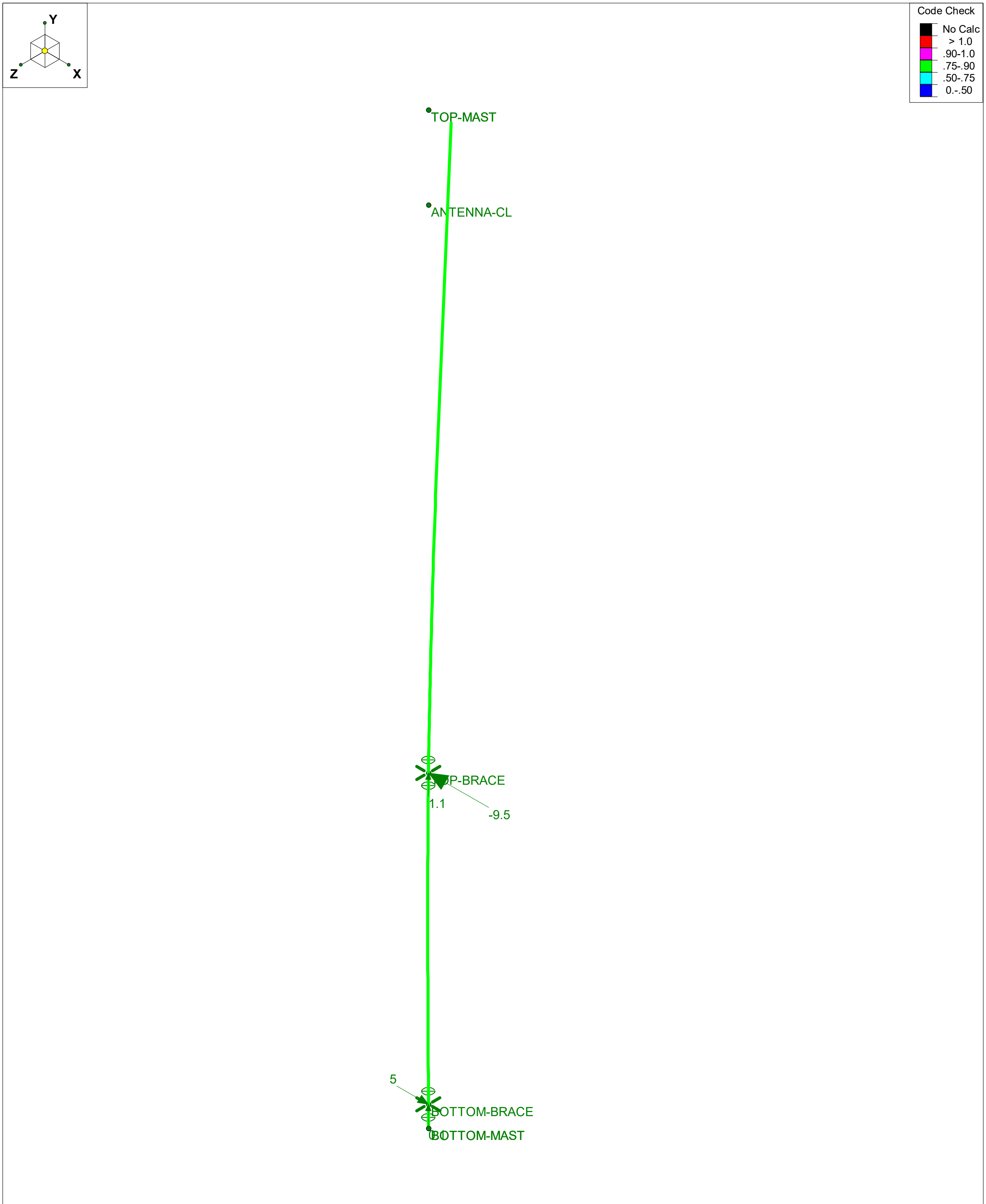


CENTEK Engineering, INC.		
tjl, cfc	Structure # 844 Mast	Nov 21, 2016 at 1:19 PM
16071.34 /AT&T CT5089	LC #1 Reactions and Deflected Shape	TIA.r3d

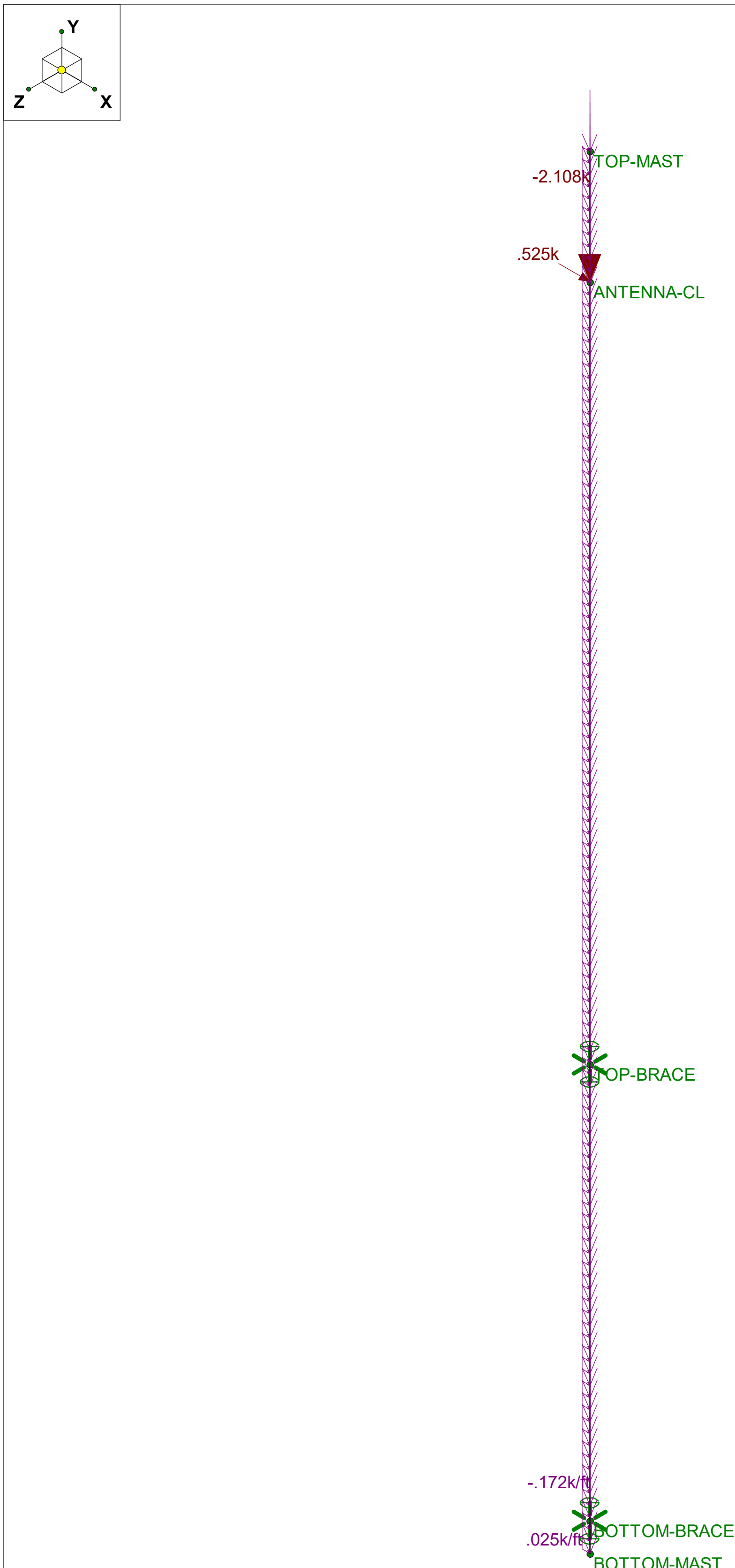


Loads: LC 2, 0.9D + 1.6W

CENTEK Engineering, INC.		
tjl, cfc	Structure # 844 Mast	Nov 21, 2016 at 1:18 PM
16071.34 /AT&T CT5089	LC #2 Loads	TIA.r3d

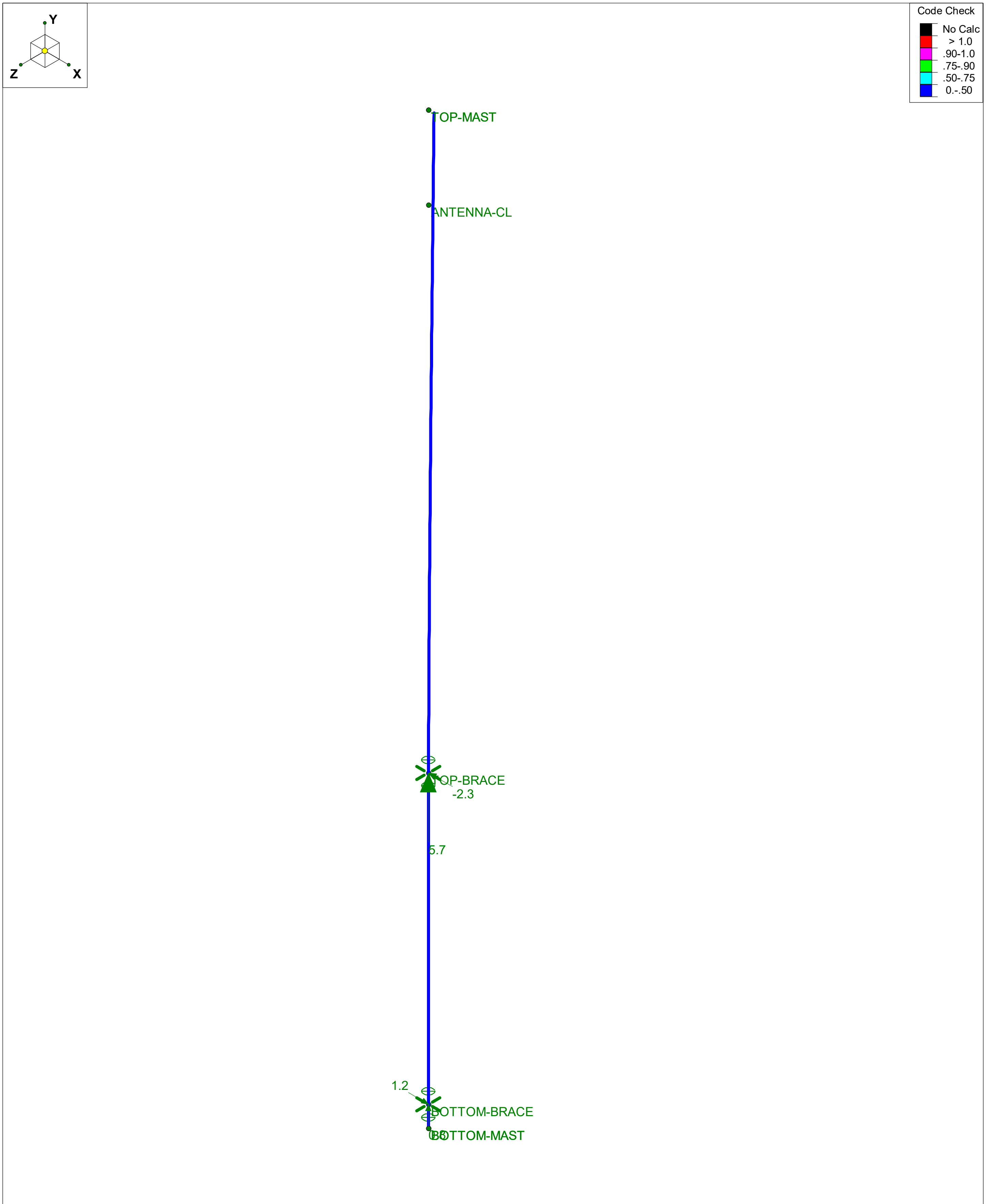


CENTEK Engineering, INC.		
tjl, cfc	Structure # 844 Mast	Nov 21, 2016 at 1:20 PM
16071.34 /AT&T CT5089	LC #2 Reactions and Deflected Shape	TIA.r3d



Loads: LC 3, 1.2D + 1.0Di + 1.0Wi

CENTEK Engineering, INC.		
tjl, cfc	Structure # 844 Mast	Nov 21, 2016 at 1:18 PM
16071.34 /AT&T CT5089	LC #3 Loads	TIA.r3d



CENTEK Engineering, INC.		
tjl, cfc	Structure # 844 Mast	Nov 21, 2016 at 1:20 PM
16071.34 /AT&T CT5089	LC #3 Reactions and Deflected Shape	TIA.r3d

Mast Connection to Tower:

Reactions:

Moment =	$Moment := 0 \cdot kips$	(Input From Risa-3D)
Vertical =	$Vertical := 1.5 \cdot kips$	(Input From Risa-3D)
Horizontal x-dir =	$Horizontal := 9.5 \cdot kips$	(Input From Risa-3D)

Bolt Data:

Bolt Type =	ASTM A36	(User Input)
Bolt Diameter =	$D := 0.75 \cdot in$	(User Input)
Number of Bolts =	$N_b := 2$	(User Input)
Nominal Bolt Area =	$A_b := \frac{1}{4} \cdot \pi \cdot D^2 = 0.442 \cdot in^2$	(User Input)
Bolt Ultimate Strength =	$F_u := 58 \cdot ksi$	(User Input)
Bolt Yield Strength =	$F_y := 36 \cdot ksi$	(User Input)
Resistance Factor =	$\phi := 0.75$	(User Input)
Design Tensile Strength =	$F_{nt} := \phi \cdot 0.75 \cdot F_u \cdot A_b = 14.4 \cdot kips$	(User Input)
Design Shear Strength =	$F_{nv} := \phi \cdot 0.45 \cdot F_u \cdot A_b = 8.6 \cdot kips$	(User Input)

Shear Force = $f_v := \frac{\sqrt{Horizontal^2 + Vertical^2}}{N_b} = 4.8 \cdot kips$

Bolt Shear % of Capacity = $\frac{f_v}{F_{nv}} = 55.61 \cdot \%$

Check Bolt Shear = $Bolt\_Shear := if\left(\frac{f_v}{F_{nv}} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$

Bolt_Shear = "OK"

Tension Force = $f_t := \frac{Horizontal}{N_b} = 4.8 \cdot kips$

Bolt Tenison % of Capacity = $\frac{f_t}{F_{nt}} = 32.96 \cdot \%$

Check Bolt Tension = $Bolt\_Tension := if\left(\frac{f_t}{F_{nt}} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$

Bolt_Tension = "OK"

Basic Components

Heavy Wind Pressure =	$p := 4.00$	psf	(User Input NESC 2007 Figure 250-1 & Table 250-1)
Basic Windspeed =	$V := 110$	mph	(User Input NESC 2007 Figure 250-2(e))
Radial Ice Thickness =	$Ir := 0.50$	in	(User Input)
Radial Ice Density =	$Id := 56.0$	pcf	(User Input)

Factors for Extreme Wind Calculation

Elevation of Top of PCS Mast Above Grade = $TME := 163$ ft (User Input)

Multiplier Gust Response Factor = $m := 1.25$ (User Input - Only for NESC Extreme wind case)

NESC Factor = $kv := 1.43$ (User Input from NESC 2007 Table 250-3 equation)

Importance Factor = $I := 1.0$ (User Input from NESC 2007 Section 250.C.2)

Velocity Pressure Coefficient = $Kz := 2.01 \cdot \left(\frac{TME}{900}\right)^{\frac{2}{9.5}} = 1.403$ (NESC 2007 Table 250-2)

Exposure Factor = $Es := 0.346 \left[\frac{33}{(0.67 \cdot TME)}\right]^{\frac{1}{7}} = 0.292$ (NESC 2007 Table 250-3)

Response Term = $Bs := \frac{1}{\left(1 + 0.375 \cdot \frac{TME}{220}\right)} = 0.783$ (NESC 2007 Table 250-3)

Gust Response Factor = $Grf := \frac{\left[1 + \left(2.7 \cdot Es \cdot Bs^{\frac{1}{2}}\right)\right]}{kv^2} = 0.83$ (NESC 2007 Table 250-3)

Wind Pressure = $qz := 0.00256 \cdot Kz \cdot V^2 \cdot Grf \cdot I = 36$ psf (NESC 2007 Section 250.C.2)

Shape Factors

NUS Design Criteria Issued April 12, 2007

Shape Factor for Round Members =	$Cd_R := 1.3$	(User Input)
Shape Factor for Flat Members =	$Cd_F := 1.6$	(User Input)
Shape Factor for Coax Cables Attached to Outside of Pole =	$Cd_{coax} := 1.45$	(User Input)

Overload Factors

NU Design Criteria Table

Overload Factors for Wind Loads:

NESC Heavy Loading =	**2.5**	(User Input)	Apply in Risa-3D Analysis
NESC Extreme Loading =	**1.0**	(User Input)	Apply in Risa-3D Analysis

Overload Factors for Vertical Loads:

NESC Heavy Loading =	**1.5**	(User Input)	Apply in Risa-3D Analysis
NESC Extreme Loading =	**1.0**	(User Input)	Apply in Risa-3D Analysis

Development of Wind & Ice Load on PCS Mast

Proposed PCS Mast Data: (HSS6.625x0.432)

Mast Shape =	Round		(User Input)
Mast Diameter =	$D_{mast} := 6.625$	in	(User Input)
Mast Length =	$L_{mast} := 21$	ft	(User Input)
Mast Thickness =	$t_{mast} := 0.432$	in	(User Input)

Wind Load (NESC Extreme)

Mast Projected Surface Area =	$A_{mast} := \frac{D_{mast}}{12} = 0.552$	sf/ft	
Total Mast Wind Force (Above NU Structure) =	$qz \cdot Cd_R \cdot A_{mast} \cdot m = 32$	plf	**BLC 5**
Total Mast Wind Force (Below NU Structure) =	$qz \cdot Cd_R \cdot A_{mast} = 26$	plf	**BLC 5**

Wind Load (NESE Heavy)

Mast Projected Surface Area w/ Ice =	$AICE_{mast} := \frac{(D_{mast} + 2 \cdot Ir)}{12} = 0.635$	sf/ft	
Total Mast Wind Force w/ Ice =	$p \cdot Cd_R \cdot AICE_{mast} = 3$	plf	**BLC 4**

Gravity Loads (without ice)

Weight of the mast =	Self Weight **(Computed internally by Risa-3D)**	plf	**BLC 1**

Gravity Loads (ice only)

Ice Area per Linear Foot =	$Ai_{mast} := \frac{\pi}{4}\left[(D_{mast} + Ir \cdot 2)^2 - D_{mast}^2\right] = 11.2$	sq in	
Weight of Ice on Mast =	$W_{ICEmast} := Id \cdot \frac{Ai_{mast}}{144} = 4$	plf	**BLC 3**

Development of Wind & Ice Load on Antennas

Proposed Antenna Data:

Antenna Model =	Qunitel QS66512-2		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 72$	in	(User Input)
Antenna Width =	$W_{ant} := 12$	in	(User Input)
Antenna Thickness =	$T_{ant} := 9.6$	in	(User Input)
Antenna Weight =	$WT_{ant} := 111$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 3$		(User Input)

Wind Load (NESC Extreme)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna = $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 6$ sf

Antenna Projected Surface Area = $A_{ant} := SA_{ant} \cdot N_{ant} = 18$ sf

Total Antenna Wind Force = $F_{ant} := qz \cdot Cd_F \cdot A_{ant} \cdot m = 1298$ lbs **BLC 5**

Wind Load (NESC Heavy)

Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously

Surface Area for One Antenna w/ Ice = $SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 6.6$ sf

Antenna Projected Surface Area w/ Ice = $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 19.8$ sf

Total Antenna Wind Force w/ Ice = $Fi_{ant} := p \cdot Cd_F \cdot A_{ICEant} = 127$ lbs **BLC 4**

Gravity Load (without ice)

Weight of All Antennas = $WT_{ant} \cdot N_{ant} = 333$ lbs **BLC 2**

Gravity Load (ice only)

Volume of Each Antenna = $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 8294$ cu in

Volume of Ice on Each Antenna = $V_{ice} := (L_{ant} + 1)(W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 1765$ cu in

Weight of Ice on Each Antenna = $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 57$ lbs

Weight of Ice on All Antennas = $W_{ICEant} \cdot N_{ant} = 172$ lbs **BLC 3**

Development of Wind & Ice Load on TMA's

Proposed TMA Data:

TMA Model =	Kaelus TMA2117F00V1-1		
TMA Shape =	Flat		(User Input)
TMA Height =	$L_{TMA} := 8.46$	in	(User Input)
TMA Width =	$W_{TMA} := 11.81$	in	(User Input)
TMA Thickness =	$T_{TMA} := 4.21$	in	(User Input)
TMA Weight =	$WT_{TMA} := 18$	lbs	(User Input)
Number of TMA's =	$N_{TMA} := 6$		(User Input)

Wind Load (NESC Extreme)

Surface Area for One TMA = $SA_{TMA} := \frac{L_{TMA} \cdot W_{TMA}}{144} = 0.7$ sf

TMA Projected Surface Area = $A_{TMA} := SA_{TMA} \cdot N_{TMA} = 4.2$ sf

Total TMA Wind Force = $F_{TMA} := qz \cdot Cd_F \cdot A_{TMA} \cdot m = 300$ lbs **BLC 5**

Wind Load (NESC Heavy)

Surface Area for One TMA w/ Ice = $SA_{ICETMA} := \frac{(L_{TMA} + 1) \cdot (W_{TMA} + 1)}{144} = 0.8$ sf

TMA Projected Surface Area w/ Ice = $A_{ICETMA} := SA_{ICETMA} \cdot N_{TMA} = 5$ sf

Total TMA Wind Force w/ Ice = $Fi_{TMA} := p \cdot Cd_F \cdot A_{ICETMA} = 32$ lbs **BLC 4**

Gravity Load (without ice)

Weight of All TMA's = $WT_{TMA} \cdot N_{TMA} = 108$ lbs **BLC 2**

Gravity Load (ice only)

Volume of Each TMA = $V_{TMA} := L_{TMA} \cdot W_{TMA} \cdot T_{TMA} = 421$ cu in

Volume of Ice on Each TMA = $V_{ice} := (L_{TMA} + 1)(W_{TMA} + 1)(T_{TMA} + 1) - V_{TMA} = 211$ cu in

Weight of Ice on Each TMA = $W_{ICETMA} := \frac{V_{ice}}{1728} \cdot Id = 7$ lbs

Weight of Ice on All TMA's $W_{ICETMA} \cdot N_{TMA} = 41$ lbs **BLC 3**

Development of Wind & Ice Load on Antenna Mounts

Proposed Mount Data:

Mount Type:	Site Pro Tri-Sector Chain Mount w/ 3 Pipes		
Mount Shape =	Round		(User Input)
Pipe Mount Length =	$L_{mnt} := 60$	in	(User Input)
2 inch Pipe Mount Linear Weight =	$W_{mnt} := 3.66$	plf	(User Input)
Pipe Mount Outside Diameter =	$D_{mnt} := 2.375$	in	(User Input)
Number of Mounting Pipes =	$N_{mnt} := 3$		(User Input)
Tri Sector Chain Mount Weight =	$W_{tsc.mnt} := 101$	lbs	(User Input)

Wind Load (NESC Extreme)

Assumes Mount is Shielded by Antenna

Mount Projected Surface Area = $A_{mnt} := 0.0$ sf

Total Mount Wind Force = $F_{mnt} := qz \cdot Cd_F \cdot A_{mnt} \cdot m = 0$ lbs **BLC 5**

Wind Load (NESC Heavy)

Assumes Mount is Shielded by Antenna

Mount Projected Surface Area w/ Ice = $A_{ICEmnt} := 0.0$ sf

Total Mount Wind Force = $Fi_{mnt} := p \cdot Cd_F \cdot A_{ICEmnt} = 0$ lbs **BLC 4**

Gravity Loads (without ice) (per TIA/EIA-222-F-1996)

Weight Each Pipe Mount = $WT_{mnt} := W_{mnt} \cdot \frac{L_{mnt}}{12} = 18$ lbs

Weight of All Mounts = $WT_{mnt} \cdot N_{mnt} + W_{tsc.mnt} = 156$ lbs **BLC 2**

Gravity Load (ice only) (per TIA/EIA-222-F-1996)

Volume of Each Pipe = $V_{mnt} := \frac{\pi}{4} \cdot D_{mnt}^{\ 2} \cdot L_{mnt} = 266$ cu in

Volume of Ice on Each Pipe = $V_{ice} := \left[\frac{\pi}{4} \cdot \left[\left(D_{mnt} + 1\right)^2\right] \cdot \left(L_{mnt} + 1\right)\right] - V_{mnt} = 280$ cu in

Weight of Ice each mount (incl, hardware) = $W_{ICEmnt} := \frac{V_{ice}}{1728} \cdot Id = 9$ lbs

Weight of Ice on All Mounts = $W_{ICEmnt} \cdot N_{mnt} + 5 = 32$ lbs **BLC 3**

Development of Wind & Ice Load on Coax Cables

Existing Coax Cable Data:

Coax Type =	HELIAX 1-5/8"		
Shape =	Round		(User Input)
Coax Outside Diameter =	$D_{coax} := 1.98$	in	(User Input)
Coax Cable Length =	$L_{coax} := 21$	ft	(User Input)
Weight of Coax per foot =	$Wt_{coax} := 1.04$	plf	(User Input)
Total Number of Coax =	$N_{coax} := 12$		(User Input)
No. of Coax Projecting Outside Face of PCS Mast =	$NP_{coax} := 3$		(User Input)

Wind Load (NESC Extreme)

Coax projected surface area = $A_{coax} := \frac{(NP_{coax} D_{coax})}{12} = 0.5$ ft

Total Coax Wind Force (Above NU Structure) = $F_{coax} := qz \cdot Cd_{coax} \cdot A_{coax} \cdot m = 32$ plf **BLC 5**

Total Coax Wind Force (Below NU Structure) = $F_{coax} := qz \cdot Cd_{coax} \cdot A_{coax} = 26$ plf **BLC 5**

Wind Load (NESC Heavy)

Coax projected surface area w/ Ice = $AICE_{coax} := \frac{(NP_{coax} \cdot D_{coax} + 2 \cdot Ir)}{12} = 0.6$ ft

Total Coax Wind Force w/ Ice = $Fi_{coax} := p \cdot Cd_{coax} \cdot AICE_{coax} = 3$ plf **BLC 4**

Gravity Loads (without ice)

Weight of all cables w/o ice $WT_{coax} := Wt_{coax} \cdot N_{coax} = 12$ plf **BLC 2**

Gravity Load (ice only)

Ice Area per Linear Foot = $Ai_{coax} := \frac{\pi}{4} \left[(D_{coax} + 2 \cdot Ir)^2 - D_{coax}^{\ 2} \right] = 3.9$ sq in

Ice Weight All Coax per foot = $WTi_{coax} := N_{coax} \cdot Id \cdot \frac{Ai_{coax}}{144} = 18$ plf **BLC 3**

CENTEK engineering, INC.	Subject:	Analysis of NESC Heavy Wind and NESC Extreme Wind
Consulting Engineers		for Obtaining Reactions Applied to Utility Pole
63-2 North Branford Road		Tabulated Load Cases
Branford, CT 06405	Location:	Trumbull, CT
Ph. 203-488-0580 / Fax. 203-488-8587	Date: 8/30/16	Prepared by: T.J.L. Checked by: C.F.C. Job No. 16071.34

Load Case	Description
1	Self Weight (Mast)
2	Weight of Appurtenances
3	Weight of Ice Only
4	NESC Heavy Wind
5	NESC Extreme Wind

Footnotes:

CENTEK engineering, INC.
Consulting Engineers
63-2 North Branford Road
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Subject: **Analysis of NESC Heavy Wind and NESC Extreme Wind for Obtaining Reactions Applied to Utility Pole**
Load Combinations Table
Location: **Trumbull, CT**

Date: 8/30/16 Prepared by: T.J.L. Checked by: C.F.C. Job No. 16071.34

Load Combination	Description	Envelope Soultion	Wind Factor	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	NESC Heavy Wind		1		1	1.5	2	1.5	3	1.5	4	2.5		
2	NESC Extreme Wind		1		1	1	2	1	5	1				

Footnotes:
(1) BLC = Basic Load Case

Global

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Increase Nailing Capacity for Wind?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automaticly Iterate Stiffness for Walls?	No
Maximum Iteration Number for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 9th: ASD
RISAConnection Code	AISC 14th(360-10): ASD
Cold Formed Steel Code	AISI 1999: ASD
Wood Code	AF&PA NDS-97: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-02
Masonry Code	ACI 530-05: ASD
Aluminum Code	AA ADM1-05: ASD - Building

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	PCA Load Contour
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

Global, Continued

Seismic Code	UBC 1997
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	No
Ct Z	.035
Ct X	.035
T Z (sec)	Not Entered
T X (sec)	Not Entered
R Z	8.5
R X	8.5
Ca	.36
Cv	.54
Nv	1
Occupancy Category	4
Seismic Zone	3
Seismic Detailing Code	ASCE 7-05
Om Z	1
Om X	1
Rho Z	1
Rho X	1

Footing Overturning Safety Factor	1.5
Check Concrete Bearing	No
Footing Concrete Weight (k/ft^3)	0
Footing Concrete f'c (ksi)	3
Footing Concrete Ec (ksi)	4000
Lamda	1
Footing Steel fy (ksi)	60
Minimum Steel	0.0018
Maximum Steel	0.0075
Footing Top Bar	#3
Footing Top Bar Cover (in)	3.5
Footing Bottom Bar	#3
Footing Bottom Bar Cover (in)	3.5
Pedestal Bar	#3
Pedestal Bar Cover (in)	1.5
Pedestal Ties	#3

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1...	Density[k/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	58	1.2
3	A992	29000	11154	.3	.65	.49	50	1.1	58	1.2
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.3	58	1.1
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.2	58	1.1
6	A53 Gr. B	29000	11154	.3	.65	.49	35	1.5	58	1.2

Hot Rolled Steel Design Parameters

	Label	Shape	Leng...	Lbyy[ft]	Lbzz[ft]	Lcomp ...	Lcomp ...	Kyy	Kzz	Cm...	Cm...	Cb	y s...	z s...	Functi...
1	M1	Existing Mast	21.5												Lateral

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design ...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Existing Mast	HSS6.625x0.432	Column	Pipe	A500 Gr.42	Typical	7.86	38.2	38.2	76.4

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design R...
1	M1	BOTTO...	TOP-M...			Existing Mast	Column	Pipe	A500 Gr.42	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From D...
1	BOTTOM-MAST	0	0	0	0	
2	BOTTOM-BRACE	0	.5	0	0	
3	TOP-BRACE	0	7.5	0	0	
4	ANTENNA-CL	0	19.5	0	0	
5	TOP-MAST	0	21.5	0	0	

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]	Footing
1	BOTTOM-BRACE	Reaction	Reaction	Reaction		Reaction		
2	TOP-BRACE	Reaction	Reaction	Reaction		Reaction		

Member Point Loads

Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
No Data to Print ...			

Joint Loads and Enforced Displacements (BLC 2 : Weight of Appurtenances)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	ANTENNA-CL	L	Y	-.333
2	ANTENNA-CL	L	Y	-.108
3	ANTENNA-CL	L	Y	-.156

Joint Loads and Enforced Displacements (BLC 3 : Weight of Ice Only)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	ANTENNA-CL	L	Y	-.172
2	ANTENNA-CL	L	Y	-.041
3	ANTENNA-CL	L	Y	-.032

Joint Loads and Enforced Displacements (BLC 4 : NESC Heavy Wind)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	ANTENNA-CL	L	X	.127

Joint Loads and Enforced Displacements (BLC 4 : NESC Heavy Wind) (Continued)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
2	ANTENNA-CL	L	X	.032

Joint Loads and Enforced Displacements (BLC 5 : NESC Extreme Wind)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	ANTENNA-CL	L	X	1.298
2	ANTENNA-CL	L	X	.3

Member Distributed Loads (BLC 2 : Weight of Appurtenances)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.012	-.012	0	0

Member Distributed Loads (BLC 3 : Weight of Ice Only)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.004	-.004	0	0
2	M1	Y	-.018	-.018	0	0

Member Distributed Loads (BLC 4 : NESC Heavy Wind)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.003	.003	0	0
2	M1	X	.003	.003	0	0

Member Distributed Loads (BLC 5 : NESC Extreme Wind)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.026	.026	0	9
2	M1	X	.032	.032	9	21.5
3	M1	X	.026	.026	0	9
4	M1	X	.032	.032	9	21.5

Basic Load Cases

	BLC Description	Category	X Gra...	Y Gravity	Z Gra...	Joint	Point	Distrib...	Area(...	Surfac...
1	Self Weight	None		-1						
2	Weight of Appurtenances	None				3		1		
3	Weight of Ice Only	None				3		2		
4	NESC Heavy Wind	None				2		2		
5	NESC Extreme Wind	None				2		4		

Load Combinations

	Description	Sol...	PDelta	SR...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...	BLC	Fact...
1	NESC Heavy Wind on PC...	Yes			1	1.5	2	1.5	3	1.5	4	2.5								
2	NESC Extreme Wind on P...	Yes			1	1	2	1	5	1										
3	Self Weight				1	1														

Envelope Joint Reactions

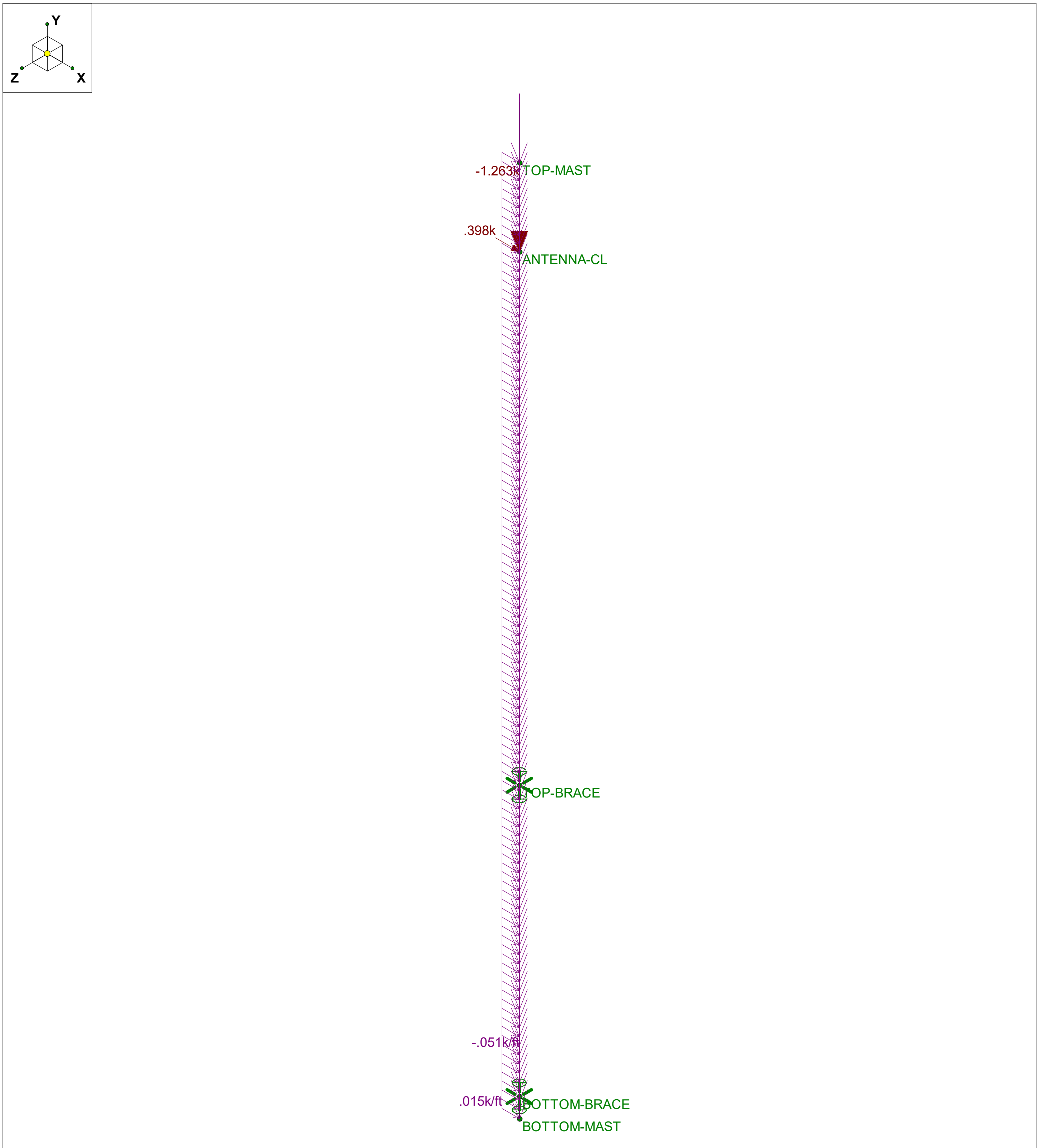
	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	BOTTOM-BR...	max	3.425	2	.364	1	0	1	0	1	0	1	0	1
2		min	.831	1	.155	2	0	1	0	1	0	1	0	1
3	TOP-BRACE	max	-1.551	1	2.858	1	0	1	0	1	0	1	0	1
4		min	-6.291	2	1.275	2	0	1	0	1	0	1	0	1
5	Totals:	max	-.72	1	3.222	1	0	1						
6		min	-2.866	2	1.43	2	0	1						

Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	BOTTOM-BRACE	.831	.364	0	0	0	0
2	1	TOP-BRACE	-1.551	2.858	0	0	0	0
3	1	Totals:	-.72	3.222	0			
4	1	COG (ft):	X: 0	Y: 14.18	Z: 0			

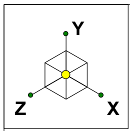
Joint Reactions

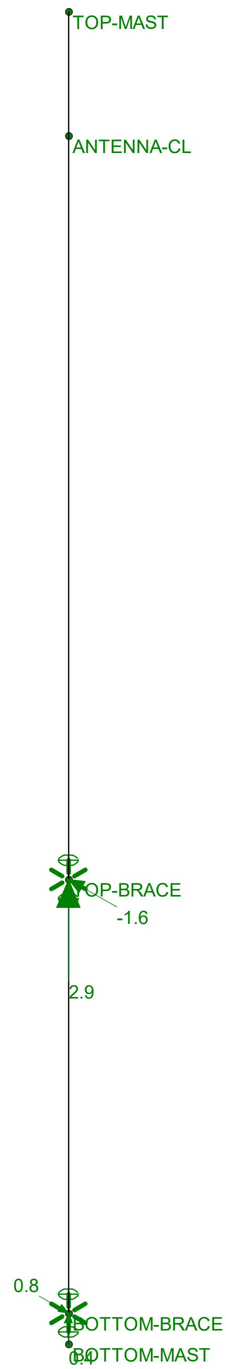
	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	2	BOTTOM-BRACE	3.425	.155	0	0	0	0
2	2	TOP-BRACE	-6.291	1.275	0	0	0	0
3	2	Totals:	-2.866	1.43	0			
4	2	COG (ft):	X: 0	Y: 14.403	Z: 0			



Loads: LC 1, NESC Heavy Wind on PCS Structure

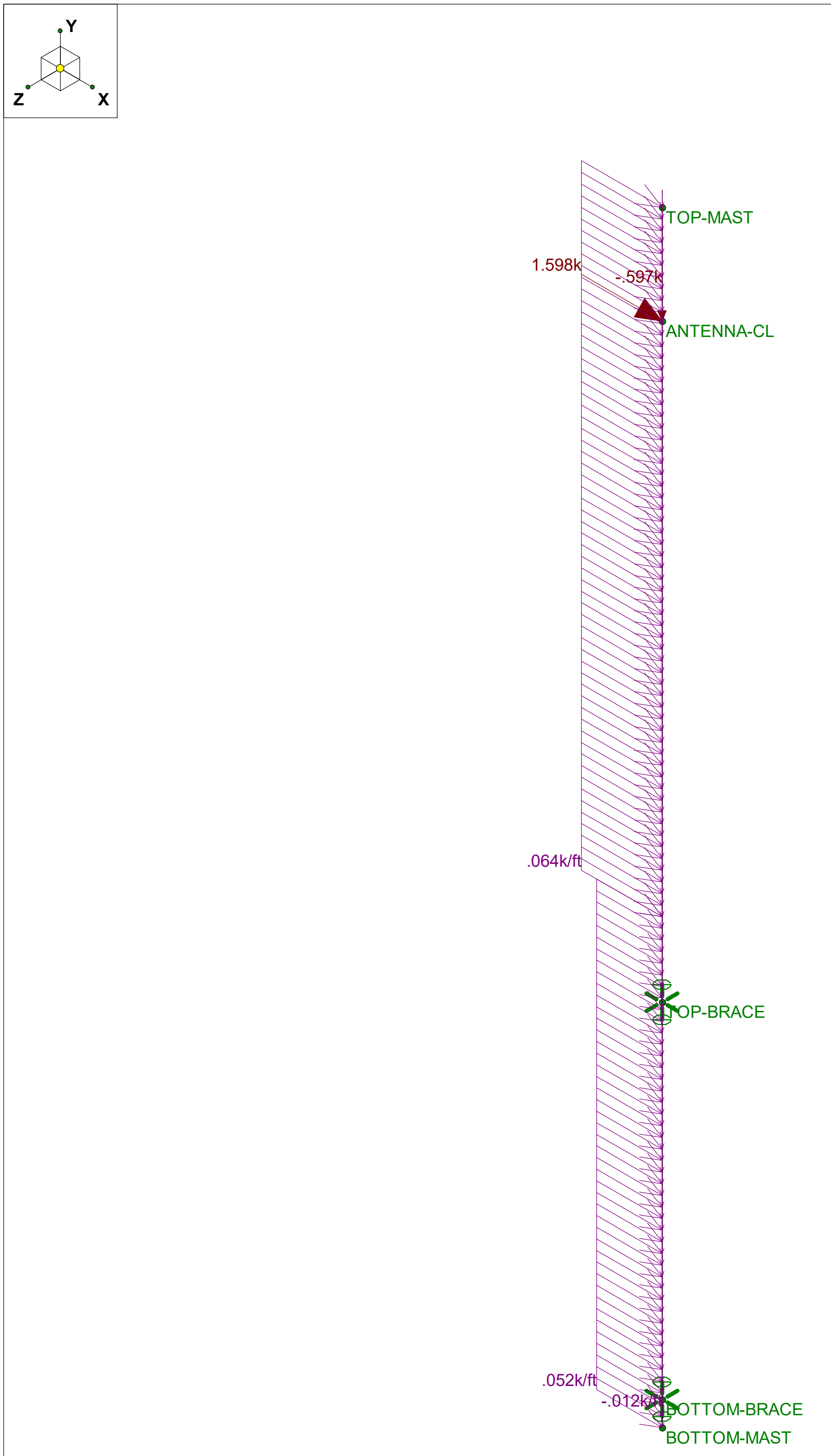
Centek Engineering	Structure # 844 Mast	
tjl, cfc		Aug 30, 2016 at 2:28 PM
16071.34 / AT&T CT5089	LC #1 Loads	NESC.r3d





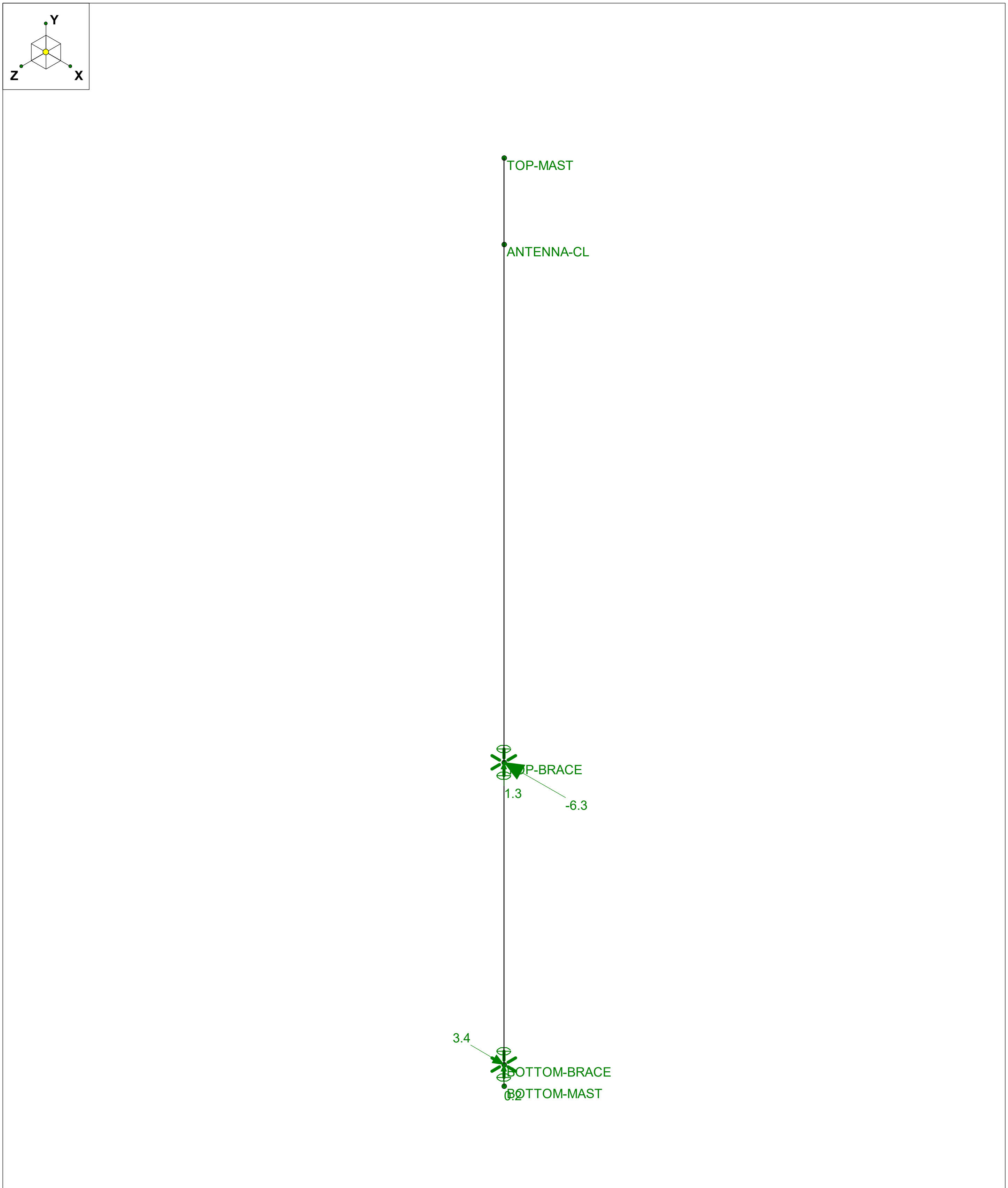
Results for LC 1, NESC Heavy Wind on PCS Structure
Z-moment Reaction Units are k and k-ft

Centek Engineering		
tjl, cfc	Structure # 844 Mast	Aug 30, 2016 at 2:29 PM
16071.34 / AT&T CT5089	LC #1 Reactions	NESC.r3d



Loads: LC 2, NESC Extreme Wind on PCS Structure

Centek Engineering		
tjl, cfc	Structure # 844 Mast	Aug 30, 2016 at 2:28 PM
16071.34 / AT&T CT5089	LC #2 Loads	NESC.r3d



Results for LC 2, NESC Extreme Wind on PCS Structure
Z-moment Reaction Units are k and k-ft

Centek Engineering		
tjl, cfc	Structure # 844 Mast	Aug 30, 2016 at 2:30 PM
16071.34 / AT&T CT5089	LC #2 Reactions	NESC.r3d

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Subject:	Load Analysis of Pole #844
Location:	Trumbull, CT
Rev. 0: 8/30/16	Prepared by: T.J.L Checked by: C.F.C. Job No. 16071.34

Basic Components

Heavy Wind Pressure =	$p := 4.00$	psf	(User Input NESC 2007 Figure 250-1 & Table 250-1)
Basic Windspeed =	$V := 110$	mph	(User Input NESC 2007 Figure 250-2(e))
Radial Ice Thickness =	$Ir := 0.50$	in	(User Input)
Radial Ice Density =	$Id := 56.0$	pcf	(User Input)

Factors for Extreme Wind Calculation

Elevation of Top of PCS Mast Above Grade =	$TME := 163$	ft	(User Input)
Multiplier Gust Response Factor =	$m := 1.25$		(User Input - Only for NESC Extreme wind case)
NESC Factor =	$kv := 1.43$		(User Input from NESC 2007 Table 250-3 equation)
Importance Factor =	$I := 1.0$		(User Input from NESC 2007 Section 250.C.2)

Velocity Pressure Coefficient = $Kz := 2.01 \cdot \left(\frac{TME}{900}\right)^{\frac{2}{9.5}} = 1.403$ (NESC 2007 Table 250-2)

Exposure Factor = $Es := 0.346 \left[\frac{33}{(0.67 \cdot TME)}\right]^{\frac{1}{7}} = 0.292$ (NESC 2007 Table 250-3)

Response Term = $Bs := \frac{1}{\left(1 + 0.375 \cdot \frac{TME}{220}\right)} = 0.783$ (NESC 2007 Table 250-3)

Gust Response Factor = $Grf := \frac{\left[1 + \left(2.7 \cdot Es \cdot Bs^{\frac{1}{2}}\right)\right]}{kv^2} = 0.83$ (NESC 2007 Table 250-3)

Wind Pressure = $qz := 0.00256 \cdot Kz \cdot V^2 \cdot Grf \cdot I = 36$ psf (NESC 2007 Section 250.C.2)

Shape Factors NUS Design Criteria Issued April 12, 2007

Shape Factor for Round Members =	$Cd_R := 1.3$	(User Input)
Shape Factor for Flat Members =	$Cd_F := 1.6$	(User Input)
Shape Factor for Coax Cables Attached to Outside of Pole =	$Cd_{coax} := 1.45$	(User Input)

Overload Factors NU Design Criteria Table

Overload Factors for Wind Loads:

NESC Heavy Loading =	**2.5**	(User Input)	Apply in Risa-3D Analysis
NESC Extreme Loading =	**1.0**	(User Input)	Apply in Risa-3D Analysis

Overload Factors for Vertical Loads:

NESC Heavy Loading =	**1.5**	(User Input)	Apply in Risa-3D Analysis
NESC Extreme Loading =	**1.0**	(User Input)	Apply in Risa-3D Analysis

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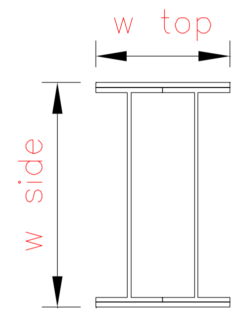
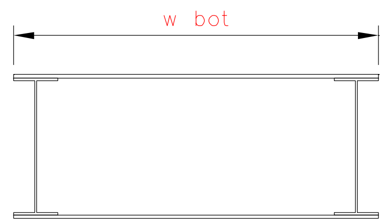
Development of Wind & Ice Load on CL&P Pole

Pole Data:

Shape =	Flat	
Width Side =	$W_{side} := 21.7$	in
Width Top =	$W_{top} := 12$	in
Width Bottom =	$W_{bot} := 54$	in
Length =	$L := 150$	ft
Area Top =	$A_{top} := 30.9$	sq in
Area Bottom =	$A_{bot} := 80.0$	sq in
Weight of Steel =	$W_{steel} := 490$	pcf
Area Top w/ Ice =	$Ai_{top} := 40$	sq in
Area Bottom w/ Ice =	$Ai_{bot} := 112$	sq in





Gravity Loads (without ice)

Weight Pole Top =	$Wt_{top} := \frac{A_{top}}{144} \cdot W_{steel} = 105$	plf	**BLC 2**
Weight Pole Bottom =	$Wt_{bot} := \frac{A_{bot}}{144} \cdot W_{steel} = 272$	plf	**BLC 2**

Gravity Loads (ice only)

Weight of Ice on Pole Top =	$W_{ICE.top} := Id \cdot \frac{Ai_{top}}{144} = 16$	plf	**BLC 3**
Weight of Ice on Pole Bottom =	$W_{ICE.bot} := Id \cdot \frac{Ai_{bot}}{144} = 44$	plf	**BLC 3**

Wind Load (NESC Extreme)

Pole Projected Surface Area Top = $A_{top} := \frac{W_{top}}{12} = 1$ sq ft/ft

Pole Projected Surface Area Bottom = $A_{bot} := \frac{W_{bot}}{12} = 4.5$ sq ft/ft

Pole Projected Surface Area Side = $A_{side} := \frac{W_{side}}{12} = 1.808$ sq ft/ft

Total Pole Wind Force Top = $qz \cdot Cd_F \cdot A_{top} = 58$ plf **BLC 7**

Total Pole Wind Force Bottom = $qz \cdot Cd_F \cdot A_{bot} = 260$ plf **BLC 7**

Total Pole Wind Force Side = $qz \cdot Cd_F \cdot A_{side} = 104$ plf **BLC 5**

Wind Load (NESE Heavy)

Pole Projected Surface Area w/ Ice Top = $AICE_{top} := \frac{(W_{top} + 2 \cdot Ir)}{12} = 1.083$ sq ft/ft

Pole Projected Surface Area w/ Ice Bottom = $AICE_{bot} := \frac{(W_{bot} + 2 \cdot Ir)}{12} = 4.583$ sq ft/ft

Pole Projected Surface Area w/ Ice Side = $AICE_{side} := \frac{(W_{side} + 2 \cdot Ir)}{12} = 1.892$ sq ft/ft

Total Pole Wind Force w/ Ice Top = $p \cdot Cd_F \cdot AICE_{top} = 7$ plf **BLC 6**

Total Pole Wind Force w/ Ice Bottom = $p \cdot Cd_F \cdot AICE_{bot} = 29$ plf **BLC 6**

Total Pole Wind Force w/ Ice Side = $p \cdot Cd_F \cdot AICE_{side} = 12$ plf **BLC 4**

Development of Wind & Ice Load on CL&P Pole Arms

ARM Data:

Shape = Flat

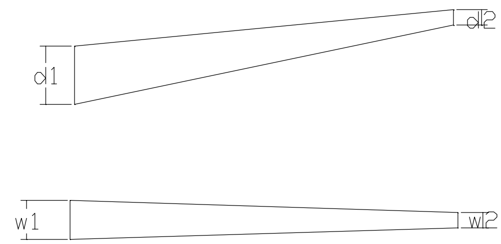
Depth of Arm at Top = $ARM_{d1} := 12$

Depth of Arm at Bottom = $ARM_{d2} := 4$

Width of Arm at Top = $ARM_{W1} := 8$

Width of Arm at Bottom = $ARM_{W2} := 4$

Thickness of Arm Wall = $ARM_t := 0.25$



Gravity Loads (without ice)

Arm Area Top = $A_{armtop} := (ARM_{d1} \cdot ARM_{W1}) - [(ARM_{W1} - 2ARM_t) \cdot (ARM_{d1} - 2ARM_t)]$

Arm Area Bottom = $A_{armbot} := (ARM_{d2} \cdot ARM_{W2}) - [(ARM_{W2} - 2ARM_t) \cdot (ARM_{d2} - 2ARM_t)]$

Weight Arm Top = $Wt_{top} := \frac{A_{armtop}}{144} \cdot W_{steel} = 33$ plf **BLC 2**

Weight Arm Bottom = $Wt_{bot} := \frac{A_{armbot}}{144} \cdot W_{steel} = 13$ plf **BLC 2**

Gravity Loads (ice only)

Arm Area w/ Ice Top = $Ai_{armtop} := (ARM_{d1} + 2 \cdot Ir) \cdot (ARM_{W1} + 2 \cdot Ir) - ARM_{d1} \cdot ARM_{W1} = 21$

Arm Area w/ Ice Bottom = $Ai_{armbot} := (ARM_{d2} + 2 \cdot Ir) \cdot (ARM_{W2} + 2 \cdot Ir) - ARM_{d2} \cdot ARM_{W2} = 9$

Weight of Ice on Arm Top = $W_{ICE.top} := Id \cdot \frac{Ai_{armtop}}{144} = 8$ plf **BLC 3**

Weight of Ice on Arm Bottom = $W_{ICE.bot} := Id \cdot \frac{Ai_{armbot}}{144} = 4$ plf **BLC 3**

Wind Load (NESC Extreme)

Arm Projected Surface Area Top =	$A_{top} := \frac{ARM_{d1}}{12} = 1$	sq ft/ft	
Arm Projected Surface Area Bottom =	$A_{bot} := \frac{ARM_{d2}}{12} = 0.333$	sq ft/ft	
Total Arm Wind Force Top =	$qz \cdot Cd_F \cdot A_{top} = 58$	plf	**BLC 7**
Total Arm Wind Force Bottom =	$qz \cdot Cd_F \cdot A_{bot} = 19$	plf	**BLC 7**

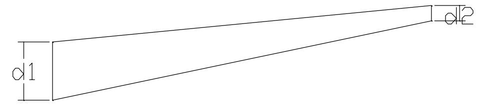
Wind Load (NESE Heavy)

Arm Projected Surface Area w/ Ice Top =	$AICE_{top} := \frac{(ARM_{d1} + 2 \cdot Ir)}{12} = 1.083$	sq ft/ft	
Arm Projected Surface Area w/ Ice Bottom =	$AICE_{bot} := \frac{(ARM_{d2} + 2 \cdot Ir)}{12} = 0.417$	sq ft/ft	
Total Arm Wind Force w/ Ice Top =	$p \cdot Cd_F \cdot AICE_{top} = 7$	plf	**BLC 6**
Total Arm Wind Force w/ Ice Bottom =	$p \cdot Cd_F \cdot AICE_{bot} = 3$	plf	**BLC 6**

Development of Wind & Ice Load on CL&P Pole Arms

ARM Data:

Shape = Flat



Depth of Arm at Top = $ARM_{d1} := 15$

Depth of Arm at Bottom = $ARM_{d2} := 4$

Width of Arm at Top = $ARM_{W1} := 10$

Width of Arm at Bottom = $ARM_{W2} := 4$

Thickness of Arm Wall = $ARM_t := 0.25$

Gravity Loads (without ice)

Arm Area Top = $A_{armtop} := \left(ARM_{d1} \cdot ARM_{W1}\right) - \left[\left(ARM_{W1} - 2ARM_t\right) \cdot \left(ARM_{d1} - 2ARM_t\right)\right]$

Arm Area Bottom = $A_{armbot} := \left(ARM_{d2} \cdot ARM_{W2}\right) - \left[\left(ARM_{W2} - 2ARM_t\right) \cdot \left(ARM_{d2} - 2ARM_t\right)\right]$

Weight Arm Top = $Wt_{top} := \frac{A_{armtop}}{144} \cdot W_{steel} = 42$ plf **BLC 2**

Weight Arm Bottom = $Wt_{bot} := \frac{A_{armbot}}{144} \cdot W_{steel} = 13$ plf **BLC 2**

Gravity Loads (ice only)

Arm Area w/ Ice Top = $Ai_{armtop} := \left(ARM_{d1} + 2 \cdot Ir\right) \cdot \left(ARM_{W1} + 2 \cdot Ir\right) - ARM_{d1} \cdot ARM_{W1} = 26$

Arm Area w/ Ice Bottom = $Ai_{armbot} := \left(ARM_{d2} + 2 \cdot Ir\right) \cdot \left(ARM_{W2} + 2 \cdot Ir\right) - ARM_{d2} \cdot ARM_{W2} = 9$

Weight of Ice on Arm Top = $W_{ICE.top} := Id \cdot \frac{Ai_{armtop}}{144} = 10$ plf **BLC 3**

Weight of Ice on Arm Bottom = $W_{ICE.bot} := Id \cdot \frac{Ai_{armbot}}{144} = 4$ plf **BLC 3**

Wind Load (NESC Extreme)

Arm Projected Surface Area Top =	$A_{top} := \frac{ARM_{d1}}{12} = 1.25$	sq ft/ft	
Arm Projected Surface Area Bottom =	$A_{bot} := \frac{ARM_{d2}}{12} = 0.333$	sq ft/ft	
Total Arm Wind Force Top =	$qz \cdot Cd_F \cdot A_{top} = 72$	plf	**BLC 7**
Total Arm Wind Force Bottom =	$qz \cdot Cd_F \cdot A_{bot} = 19$	plf	**BLC 7**

Wind Load (NESE Heavy)

Arm Projected Surface Area w/ Ice Top =	$AICE_{top} := \frac{(ARM_{d1} + 2 \cdot Ir)}{12} = 1.333$	sq ft/ft	
Arm Projected Surface Area w/ Ice Bottom =	$AICE_{bot} := \frac{(ARM_{d2} + 2 \cdot Ir)}{12} = 0.417$	sq ft/ft	
Total Arm Wind Force w/ Ice Top =	$p \cdot Cd_F \cdot AICE_{top} = 9$	plf	**BLC 6**
Total Arm Wind Force w/ Ice Bottom =	$p \cdot Cd_F \cdot AICE_{bot} = 3$	plf	**BLC 6**

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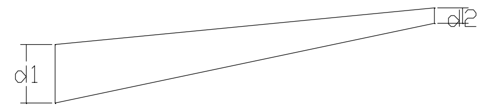
Development of Wind & Ice Load on CL&P Pole Arms

ARM Data:

Shape = Flat

Depth of Arm at Top = $ARM_{d1} := 18$



Depth of Arm at Bottom = $ARM_{d2} := 4$

Width of Arm at Top = $ARM_{W1} := 12$

Width of Arm at Bottom = $ARM_{W2} := 4$

Thickness of Arm Wall = $ARM_t := 0.25$

Gravity Loads (without ice)

Arm Area Top = $A_{armtop} := \left(ARM_{d1} \cdot ARM_{W1}\right) - \left[\left(ARM_{W1} - 2ARM_t\right) \cdot \left(ARM_{d1} - 2ARM_t\right)\right]$

Arm Area Bottom = $A_{armbot} := \left(ARM_{d2} \cdot ARM_{W2}\right) - \left[\left(ARM_{W2} - 2ARM_t\right) \cdot \left(ARM_{d2} - 2ARM_t\right)\right]$

Weight Arm Top = $Wt_{top} := \frac{A_{armtop}}{144} \cdot W_{steel} = 50$ plf **BLC 2**

Weight Arm Bottom = $Wt_{bot} := \frac{A_{armbot}}{144} \cdot W_{steel} = 13$ plf **BLC 2**

Gravity Loads (ice only)

Arm Area w/ Ice Top = $Ai_{armtop} := \left(ARM_{d1} + 2 \cdot Ir\right) \cdot \left(ARM_{W1} + 2 \cdot Ir\right) - ARM_{d1} \cdot ARM_{W1} = 31$

Arm Area w/ Ice Bottom = $Ai_{armbot} := \left(ARM_{d2} + 2 \cdot Ir\right) \cdot \left(ARM_{W2} + 2 \cdot Ir\right) - ARM_{d2} \cdot ARM_{W2} = 9$

Weight of Ice on Arm Top = $W_{ICE.top} := Id \cdot \frac{Ai_{armtop}}{144} = 12$ plf **BLC 3**

Weight of Ice on Arm Bottom = $W_{ICE.bot} := Id \cdot \frac{Ai_{armbot}}{144} = 4$ plf **BLC 3**

Wind Load (NESC Extreme)

Arm Projected Surface Area Top = $A_{top} := \dfrac{ARM_{d1}}{12} = 1.5$ sq ft/ft

Arm Projected Surface Area Bottom = $A_{bot} := \dfrac{ARM_{d2}}{12} = 0.333$ sq ft/ft

Total Arm Wind Force Top = $qz \cdot Cd_F \cdot A_{top} = 87$ plf **BLC 7**

Total Arm Wind Force Bottom = $qz \cdot Cd_F \cdot A_{bot} = 19$ plf **BLC 7**

Wind Load (NESE Heavy)

Arm Projected Surface Area w/ Ice Top = $AICE_{top} := \dfrac{(ARM_{d1} + 2 \cdot Ir)}{12} = 1.583$ sq ft/ft

Arm Projected Surface Area w/ Ice Bottom = $AICE_{bot} := \dfrac{(ARM_{d2} + 2 \cdot Ir)}{12} = 0.417$ sq ft/ft

Total Arm Wind Force w/ Ice Top = $p \cdot Cd_F \cdot AICE_{top} = 10$ plf **BLC 6**

Total Arm Wind Force w/ Ice Bottom = $p \cdot Cd_F \cdot AICE_{bot} = 3$ plf **BLC 6**

Development of Wind & Ice Load on Coax Cables

Coax Cable Data: (0-ft to 100-ft)

Coax Type =	HELIAX 1-5/8"			
Shape =	Round		(User Input)	
Coax Outside Diameter =	$D_{coax} := 1.98$	in	(User Input)	
Coax Cable Length =	$L_{coax} := 100$	ft	(User Input)	
Weight of Coax per foot =	$Wt_{coax} := 1.04$	plf	(User Input)	
Total Number of Coax =	$N_{coax} := 30$		(User Input)	(12 AT&T and 18 Sprint)
No. of Coax Projecting Outside Face of PCS Mast =	$NP_{coax} := 6$		(User Input)	

Wind Load (NESC Extreme)

Coax projected surface area = $A_{coax} := \frac{(NP_{coax} D_{coax})}{12} = 1$ ft

Total Coax Wind Force (Below NU Structure) = $F_{coax} := qz \cdot Cd_{coax} \cdot A_{coax} = 52$ plf **BLC 19 & 21**

Wind Load (NESC Heavy)

Coax projected surface area w/ Ice = $AICE_{coax} := \frac{(NP_{coax} \cdot D_{coax} + 2 \cdot Ir)}{12} = 1.1$ ft

Total Coax Wind Force w/ Ice = $Fi_{coax} := p \cdot Cd_{coax} \cdot AICE_{coax} = 6$ plf **BLC 18 & 20**

Gravity Loads (without ice)

Weight of all cables w/o ice $WT_{coax} := Wt_{coax} \cdot N_{coax} = 31$ plf **BLC 16**

Gravity Load (ice only)

Ice Area per Linear Foot = $Ai_{coax} := \frac{\pi}{4}\left[\left(D_{coax} + 2 \cdot Ir\right)^2 - D_{coax}{}^2\right] = 3.9$ sq in

Ice Weight All Coax per foot = $WTi_{coax} := N_{coax} \cdot Id \cdot \frac{Ai_{coax}}{144} = 45$ plf **BLC 17**

Development of Wind & Ice Load on Coax Cables

Coax Cable Data: (100-ft to 140-ft)

Coax Type = HELIAX 1-5/8"

Shape = Round (User Input)

Coax Outside Diameter = $D_{coax} := 1.98$ in (User Input)

Coax Cable Length = $L_{coax} := 40$ ft (User Input)

Weight of Coax per foot = $Wt_{coax} := 1.04$ plf (User Input)

Total Number of Coax = $N_{coax} := 12$ (User Input) (12 AT&T)

No. of Coax Projecting Outside Face of PCS Mast = $NP_{coax} := 2$ (User Input)

Wind Load (NESC Extreme)

Coax projected surface area = $A_{coax} := \frac{(NP_{coax} D_{coax})}{12} = 0.3$ ft

Total Coax Wind Force (Below NU Structure) = $F_{coax} := qz \cdot Cd_{coax} \cdot A_{coax} = 17$ plf **BLC 19 & 21**

Wind Load (NESC Heavy)

Coax projected surface area w/ Ice = $AICE_{coax} := \frac{(NP_{coax} \cdot D_{coax} + 2 \cdot Ir)}{12} = 0.4$ ft

Total Coax Wind Force w/ Ice = $Fi_{coax} := p \cdot Cd_{coax} \cdot AICE_{coax} = 2$ plf **BLC 18 & 20**

Gravity Loads (without ice)

Weight of all cables w/o ice $WT_{coax} := Wt_{coax} \cdot N_{coax} = 12$ plf **BLC 16**

Gravity Load (ice only)

Ice Area per Linear Foot = $Ai_{coax} := \frac{\pi}{4}\left[(D_{coax} + 2 \cdot Ir)^2 - D_{coax}^{\ 2}\right] = 3.9$ sq in

Ice Weight All Coax per foot = $WTi_{coax} := N_{coax} \cdot Id \cdot \frac{Ai_{coax}}{144} = 18$ plf **BLC 17**

Global

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Increase Nailing Capacity for Wind?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automaticly Iterate Stiffness for Walls?	No
Maximum Iteration Number for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 9th: ASD
RISAConnection Code	AISC 14th(360-10): ASD
Cold Formed Steel Code	AISI 1999: ASD
Wood Code	AF&PA NDS-97: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-02
Masonry Code	ACI 530-05: ASD
Aluminum Code	AA ADM1-05: ASD - Building

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	PCA Load Contour
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

Global, Continued

Seismic Code	UBC 1997
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	No
Ct Z	.035
Ct X	.035
T Z (sec)	Not Entered
T X (sec)	Not Entered
R Z	8.5
R X	8.5
Ca	.36
Cv	.54
Nv	1
Occupancy Category	4
Seismic Zone	3
Seismic Detailing Code	ASCE 7-05
Om Z	1
Om X	1
Rho Z	1
Rho X	1

Footing Overturning Safety Factor	1.5
Check Concrete Bearing	No
Footing Concrete Weight (k/ft^3)	0
Footing Concrete f'c (ksi)	3
Footing Concrete Ec (ksi)	4000
Lamda	1
Footing Steel fy (ksi)	60
Minimum Steel	0.0018
Maximum Steel	0.0075
Footing Top Bar	#3
Footing Top Bar Cover (in)	3.5
Footing Bottom Bar	#3
Footing Bottom Bar Cover (in)	3.5
Pedestal Bar	#3
Pedestal Bar Cover (in)	1.5
Pedestal Ties	#3

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (\1...	Density[k/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	58	1.2
3	A992	29000	11154	.3	.65	.49	50	1.1	58	1.2
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.3	58	1.1
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.2	58	1.1
6	A53 Gr. B	29000	11154	.3	.65	.49	35	1.5	58	1.2

Hot Rolled Steel Design Parameters

	Label	Shape	Leng...	Lbyy[ft]	Lbzz[ft]	Lcomp ...	Lcomp ...	Kyy	Kzz	Cm...	Cm...	Cb	y s...	z s...	Functi...
1	M1	CL&P Pole # 844	150												Lateral
2	M2	arm	9.006												Lateral
3	M3	arm	9.006												Lateral
4	M4	arm	10.854												Lateral
5	M5	arm	10.854												Lateral
6	M6	arm	8.74												Lateral
7	M7	arm	8.74												Lateral
8	M8	arm	5.63												Lateral
9	M9	arm	5.63												Lateral

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design ...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	CL&P Pole # 844	W21x44	Column	Wide Flange	A992	Typical	13	20.7	843	.77
2	arm	W8x28	Beam	Wide Flange	A992	Typical	8.25	21.7	98	.537

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design R...
1	M1	BOTTO...	TOP-PO...			CL&P Pole # 844	Column	Wide Flange	A992	Typical
2	M2	ARM1-L...	ARM1			arm	Beam	Wide Flange	A992	Typical
3	M3	ARM1-R...	ARM1			arm	Beam	Wide Flange	A992	Typical
4	M4	ARM2-L...	ARM2			arm	Beam	Wide Flange	A992	Typical
5	M5	ARM2-R...	ARM2			arm	Beam	Wide Flange	A992	Typical
6	M6	ARM3-L...	ARM3			arm	Beam	Wide Flange	A992	Typical
7	M7	ARM3-R...	ARM3			arm	Beam	Wide Flange	A992	Typical
8	M8	ARM4-R...	ARM4			arm	Beam	Wide Flange	A992	Typical
9	M9	ARM4-L...	ARM4			arm	Beam	Wide Flange	A992	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From D...
1	BOTTOM-POLE	0	0	0	0	
2	POLE-CONNECTION	0	90	0	0	
3	ARM1-LEFT	-8.88	120	0	0	
4	ARM2-LEFT	-10.75	132	0	0	
5	ARM3-LEFT	-8.61	144	0	0	
6	ARM4-LEFT	-5.54	150	0	0	
7	TOP-POLE	0	150	0	0	
8	ARM1-RIGHT	8.88	120	0	0	
9	ARM2-RIGHT	10.75	132	0	0	
10	ARM3-RIGHT	8.61	144	0	0	
11	ARM4-RIGHT	5.54	150	0	0	
12	ARM1	0	118.5	0	0	
13	ARM2	0	130.5	0	0	
14	ARM3	0	142.5	0	0	
15	ARM4	0	149	0	0	
16	BOTTOM-BRACE	0	141	0	0	
17	TOP-BRACE	0	148	0	0	
18	SPRINT-ANTENNAS	0	101	0	0	

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]	Footing
1	BOTTOM-POLE	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction	
2	POLE-CONNECTI...							
3	ARM2-LEFT							
4	ARM1-LEFT							

Member Point Loads

Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
No Data to Print ...			

Joint Loads and Enforced Displacements (BLC 8 : x-direction NESC Heavy Wire Load)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	ARM4-LEFT	L	Y	-1.201
2	ARM4-RIGHT	L	Y	-1.201
3	ARM3-LEFT	L	Y	-4.49
4	ARM3-RIGHT	L	Y	-4.49
5	ARM2-RIGHT	L	Y	-4.49
6	ARM2-LEFT	L	Y	-4.49
7	ARM1-LEFT	L	Y	-4.49
8	ARM1-RIGHT	L	Y	-4.49
9	ARM4-LEFT	L	X	.939
10	ARM4-RIGHT	L	X	.939
11	ARM3-LEFT	L	X	1.699
12	ARM3-RIGHT	L	X	1.699
13	ARM2-LEFT	L	X	1.699
14	ARM2-RIGHT	L	X	1.699
15	ARM1-LEFT	L	X	1.699
16	ARM1-RIGHT	L	X	1.699

Joint Loads and Enforced Displacements (BLC 9 : x-driection NESC Extreme Wire Lo)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	ARM4-LEFT	L	Y	-.297
2	ARM4-RIGHT	L	Y	-.297
3	ARM3-LEFT	L	Y	-2.03
4	ARM3-RIGHT	L	Y	-2.03
5	ARM2-LEFT	L	Y	-2.03
6	ARM2-RIGHT	L	Y	-2.03
7	ARM1-RIGHT	L	Y	-2.03
8	ARM1-LEFT	L	Y	-2.03
9	ARM4-LEFT	L	X	.601
10	ARM4-RIGHT	L	X	.601
11	ARM3-LEFT	L	X	2.346
12	ARM3-RIGHT	L	X	2.346
13	ARM2-RIGHT	L	X	2.346
14	ARM2-LEFT	L	X	2.346
15	ARM1-LEFT	L	X	2.346
16	ARM1-RIGHT	L	X	2.346

Joint Loads and Enforced Displacements (BLC 10 : z-direction NESC Heavy Wire Lo)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	ARM4-LEFT	L	Y	-1.201
2	ARM4-RIGHT	L	Y	-1.201
3	ARM3-LEFT	L	Y	-4.49
4	ARM3-RIGHT	L	Y	-4.49
5	ARM2-LEFT	L	Y	-4.49
6	ARM2-RIGHT	L	Y	-4.49
7	ARM1-LEFT	L	Y	-4.49
8	ARM1-RIGHT	L	Y	-4.49

Joint Loads and Enforced Displacements (BLC 11 : z-direction NESC Extreme Wire Lo)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	ARM4-LEFT	L	Y	-.297
2	ARM4-RIGHT	L	Y	-.297
3	ARM3-LEFT	L	Y	-2.03
4	ARM3-RIGHT	L	Y	-2.03
5	ARM2-LEFT	L	Y	-2.03
6	ARM2-RIGHT	L	Y	-2.03
7	ARM1-LEFT	L	Y	-2.03
8	ARM1-RIGHT	L	Y	-2.03

Joint Loads and Enforced Displacements (BLC 12 : x-direction NESC Heavy Mast Reac)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	TOP-BRACE	L	X	1.551
2	BOTTOM-BRACE	L	X	-.831
3	TOP-BRACE	L	Y	-2.858
4	BOTTOM-BRACE	L	Y	-.364
5	SPRINT-ANTENNAS	L	Y	-.739
6	SPRINT-ANTENNAS	L	X	.41

Joint Loads and Enforced Displacements (BLC 13 : x-direction NESC Extreme Mast Re)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	TOP-BRACE	L	X	6.291
2	BOTTOM-BRACE	L	X	-3.425
3	TOP-BRACE	L	Y	-1.275
4	BOTTOM-BRACE	L	Y	-.155
5	SPRINT-ANTENNAS	L	Y	-.286
6	SPRINT-ANTENNAS	L	X	1.547

Joint Loads and Enforced Displacements (BLC 14 : z-direction NESC Heavy Mast Reac)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	TOP-BRACE	L	Z	1.551
2	BOTTOM-BRACE	L	Z	-.831
3	TOP-BRACE	L	Y	-2.858
4	BOTTOM-BRACE	L	Y	-.364
5	SPRINT-ANTENNAS	L	Y	-.739
6	SPRINT-ANTENNAS	L	Z	.36

Joint Loads and Enforced Displacements (BLC 15 : z-direction NESC Extreme Mast Re)

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

Joint Loads and Enforced Displacements (BLC 15 : z-direction NESC Extreme Mast Re) (Continued)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	TOP-BRACE	L	Z	6.291
2	BOTTOM-BRACE	L	Z	-3.425
3	TOP-BRACE	L	Y	-1.275
4	BOTTOM-BRACE	L	Y	-.155
5	SPRINT-ANTENNAS	L	Y	-.286
6	SPRINT-ANTENNAS	L	Z	1.437

Member Distributed Loads (BLC 2 : Weight Pole and Arms)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.272	-.105	0	0
2	M9	Y	-.013	-.033	0	0
3	M8	Y	-.013	-.033	0	0
4	M6	Y	-.013	-.042	0	0
5	M7	Y	-.013	-.042	0	0
6	M3	Y	-.013	-.042	0	0
7	M2	Y	-.013	-.042	0	0
8	M4	Y	-.013	-.05	0	0
9	M5	Y	-.013	-.05	0	0

Member Distributed Loads (BLC 3 : Weight of Ice Only on Pole and A)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.044	-.016	0	0
2	M9	Y	-.004	-.008	0	0
3	M8	Y	-.004	-.008	0	0
4	M6	Y	-.004	-.01	0	0
5	M7	Y	-.004	-.01	0	0
6	M3	Y	-.004	-.01	0	0
7	M2	Y	-.004	-.01	0	0
8	M4	Y	-.004	-.012	0	0
9	M5	Y	-.004	-.012	0	0

Member Distributed Loads (BLC 4 : x-direction NESC Heavy Wind on P)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.012	.012	0	0

Member Distributed Loads (BLC 5 : x-direction NESC Extreme Wind on)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.104	.104	0	0

Member Distributed Loads (BLC 6 : z-direction NESC Heavy Wind)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.029	.007	0	0
2	M8	Z	.003	.007	0	0
3	M9	Z	.003	.007	0	0
4	M7	Z	.003	.009	0	0
5	M6	Z	.003	.009	0	0
6	M3	Z	.003	.009	0	0
7	M2	Z	.003	.009	0	0

Member Distributed Loads (BLC 6 : z-direction NESC Heavy Wind) (Continued)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
8	M5	Z	.003	.01	0	0
9	M4	Z	.003	.01	0	0

Member Distributed Loads (BLC 7 : z-direction NESC Extreme Wind)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.26	.058	0	0
2	M8	Z	.019	.058	0	0
3	M9	Z	.019	.058	0	0
4	M7	Z	.019	.072	0	0
5	M6	Z	.019	.072	0	0
6	M2	Z	.019	.072	0	0
7	M3	Z	.019	.072	0	0
8	M5	Z	.019	.087	0	0
9	M4	Z	.019	.087	0	0

Member Distributed Loads (BLC 16 : Weight of Coax Cables)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.031	-.031	0	100
2	M1	Y	-.012	-.012	100	140

Member Distributed Loads (BLC 17 : Weight of Ice on Coax Cables)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.045	-.045	0	100
2	M1	Y	-.018	-.018	100	140

Member Distributed Loads (BLC 18 : x-direction NESC Heavy Coax)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.006	.006	0	100
2	M1	X	.002	.002	100	140

Member Distributed Loads (BLC 19 : x-direction NESC Extreme Coax)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.052	.052	0	100
2	M1	X	.017	.017	100	140

Member Distributed Loads (BLC 20 : z-direction NESC Heavy Coax)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.006	.006	0	100
2	M1	Z	.002	.002	100	140

Member Distributed Loads (BLC 21 : z-direction NESC Extreme Coax)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.052	.052	0	100
2	M1	Z	.017	.017	100	140

Basic Load Cases

	BLC Description	Category	X Gra...	Y Gravity	Z Gra...	Joint	Point	Distrib..	Area(...	Surfa...
1	Self Weight (Not Used)	None								
2	Weight Pole and Arms	None						9		
3	Weight of Ice Only on Pole and A	None						9		
4	x-direction NESC Heavy Wind on P	None						1		
5	x-direction NESC Extreme Wind on	None						1		
6	z-direction NESC Heavy Wind	None						9		
7	z-direction NESC Extreme Wind	None						9		
8	x-direction NESC Heavy Wire Load	None				16				
9	x-driection NESC Extreme Wire Lo	None				16				
10	z-direction NESC Heavy Wire Lo	None				8				
11	z-direction NESC Extreme Wire Lo	None				8				
12	x-direction NESC Heavy Mast Reac	None				6				
13	x-direction NESC Extreme Mast Re	None				6				
14	z-direction NESC Heavy Mast Reac	None				6				
15	z-direction NESC Extreme Mast Re	None				6				
16	Weight of Coax Cables	None						2		
17	Weight of Ice on Coax Cables	None						2		
18	x-direction NESC Heavy Coax	None						2		
19	x-direction NESC Extreme Coax	None						2		
20	z-direction NESC Heavy Coax	None						2		
21	z-direction NESC Extreme Coax	None						2		

Load Combinations

	Description	Sol...	PDelta	SR..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact..	BLC	Fact...
1	x-direction NESC Heavy W...	Yes			2	1.5	3	1.5	4	2.5	8	1	12	1	16	1.5	17	1.5	18	2.5
2	x-direction NESC Extreme ...	Yes			2	1	5	1	9	1	13	1	16	1	19	1				
3	z-direction NESC Heavy W...	Yes			2	1.5	3	1.5	6	2.5	10	1	14	1	16	1.5	17	1.5	20	2.5
4	z-direction NESC Extreme ...	Yes			2	1	7	1	11	1	15	1	16	1	21	1				

Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	BOTTOM-PO...	max	0	3	99.278	1	0	1	0	1	0	1	4154.322	2
2		min	-41.171	2	48.264	2	-37.232	4	-2771.893	4	0	1	0	3
3	Totals:	max	0	3	99.278	1	0	1						
4		min	-41.171	2	48.264	2	-37.232	4						

Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	BOTTOM-POLE	-19.402	99.278	0	0	0	2217.595
2	1	Totals:	-19.402	99.278	0			
3	1	COG (ft):	X: 0	Y: 89.369	Z: 0			

Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	2	BOTTOM-POLE	-41.171	48.264	0	0	0	4154.322
2	2	Totals:	-41.171	48.264	0			
3	2	COG (ft):	X: 0	Y: 87.282	Z: 0			

Joint Reactions

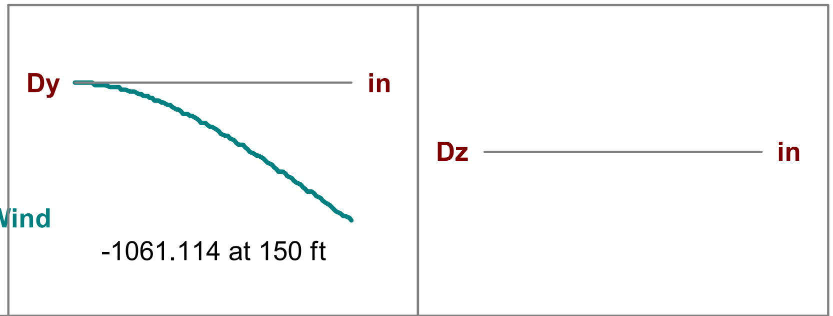
	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	3	BOTTOM-POLE	0	99.278	-10.556	-787.856	0	0
2	3	Totals:	0	99.278	-10.556			
3	3	COG (ft):	X: 0	Y: 89.369	Z: 0			

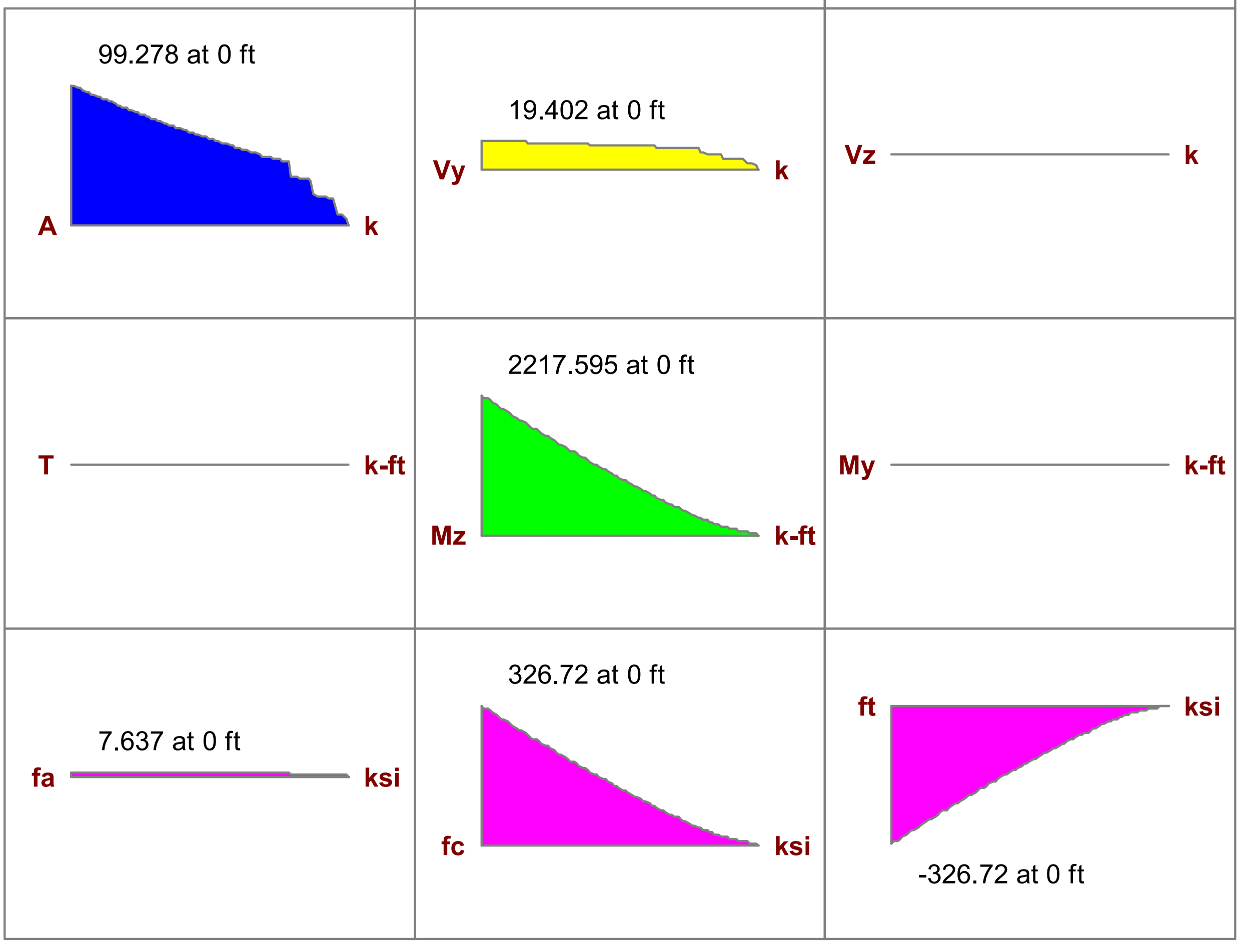
Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	4	BOTTOM-POLE	0	48.264	-37.232	-2771.893	0	0
2	4	Totals:	0	48.264	-37.232			
3	4	COG (ft):	X: 0	Y: 87.282	Z: 0			

Column: ***M1***

Shape: **W21x44**
Material: **A992**
Length: **150 ft**
I Joint: **BOTTOM-POLE**
J Joint: **TOP-POLE**
LC 1: x-direction NESC Heavy Wind
Code Check: **No Calc**
Report Based On 97 Sections





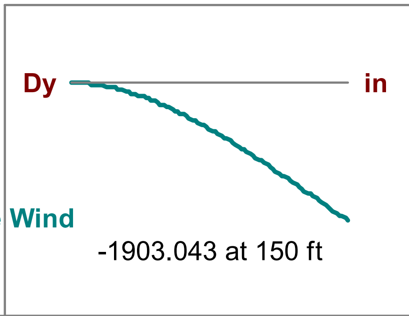
AISC 9th: ASD Code Check

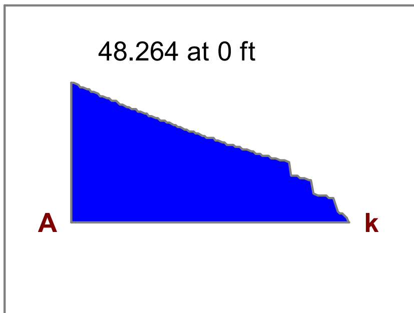
- Compressive stress fa exceeds F'e (Euler buckling) -

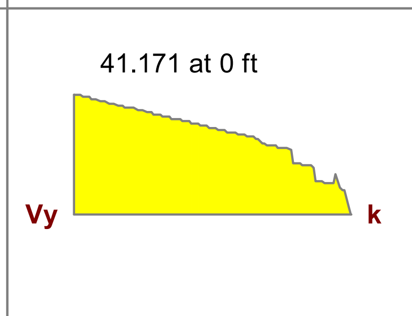
Max Defl Ratio **L/2**

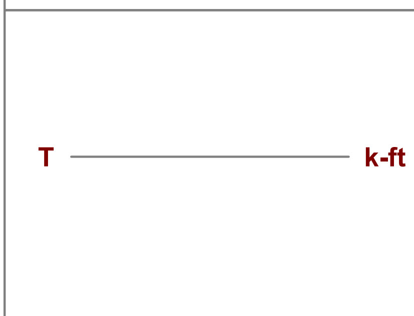
Column: ***M1***

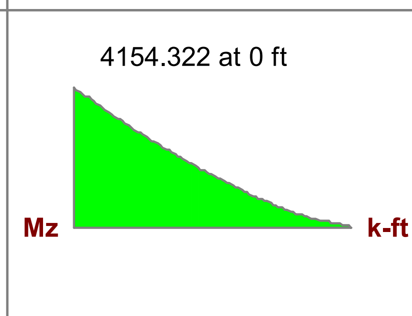
Shape: **W21x44**
Material: **A992**
Length: **150 ft**
I Joint: **BOTTOM-POLE**
J Joint: **TOP-POLE**
LC 2: x-direction NESC Extreme Wind
Code Check: **No Calc**
Report Based On 97 Sections

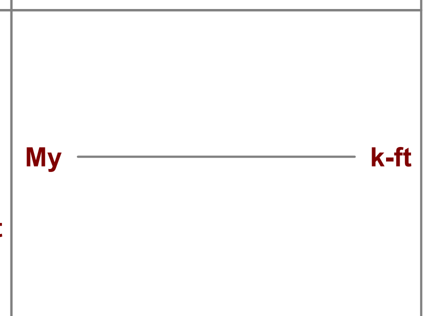


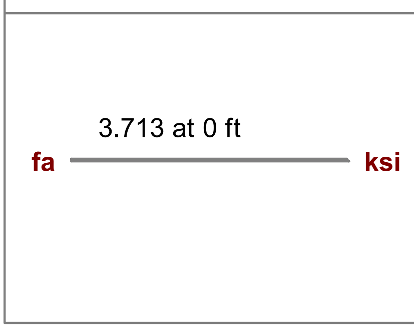


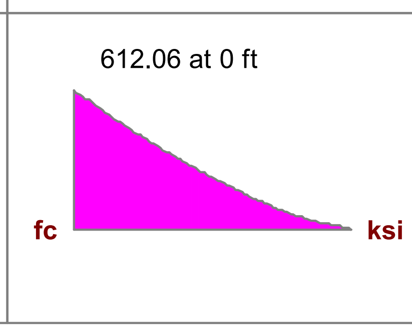


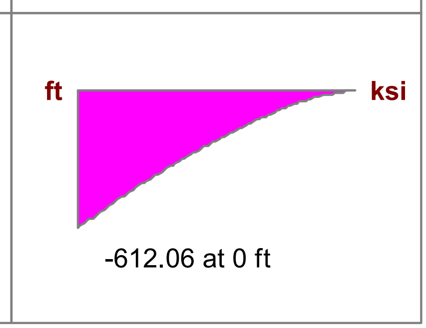












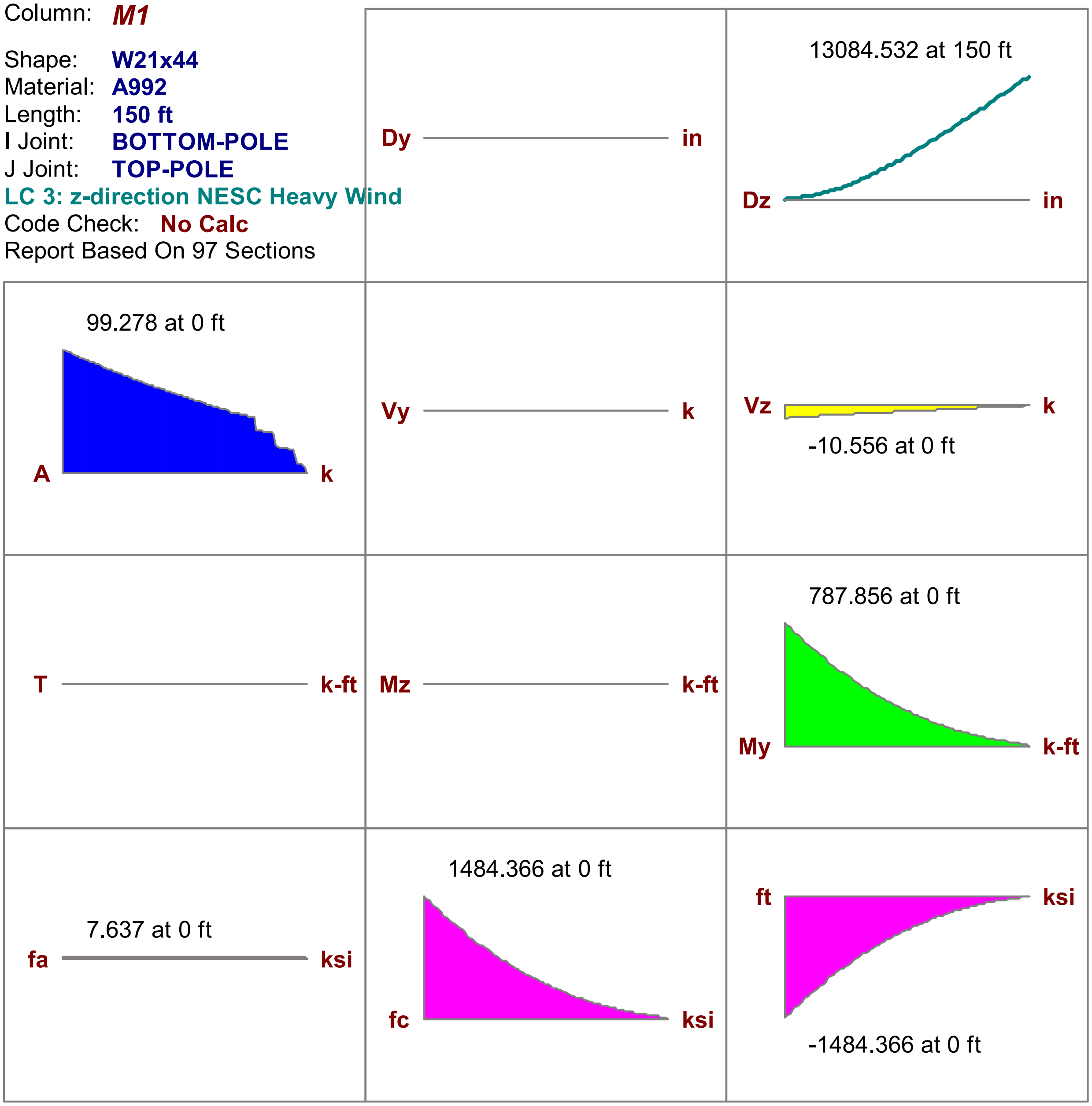
AISC 9th: ASD Code Check

- Compressive stress fa exceeds F'e (Euler buckling) -

Max Defl Ratio **L/1**

Column: ***M1***

Shape: **W21x44**
Material: **A992**
Length: **150 ft**
I Joint: **BOTTOM-POLE**
J Joint: **TOP-POLE**
LC 3: z-direction NESC Heavy Wind
Code Check: **No Calc**
Report Based On 97 Sections



AISC 9th: ASD Code Check

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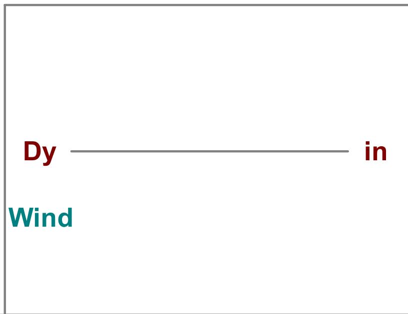
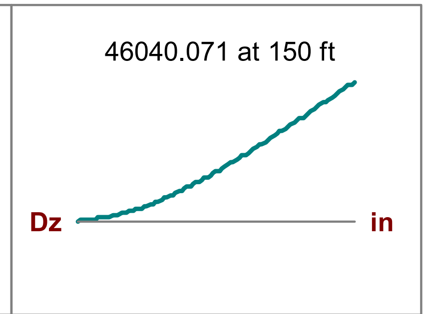
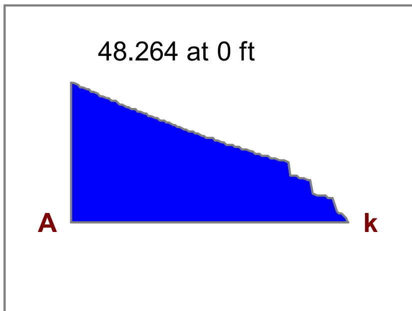
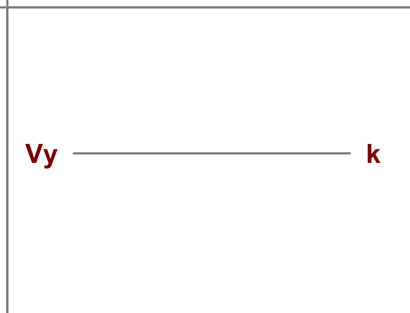
Column: ***M1***

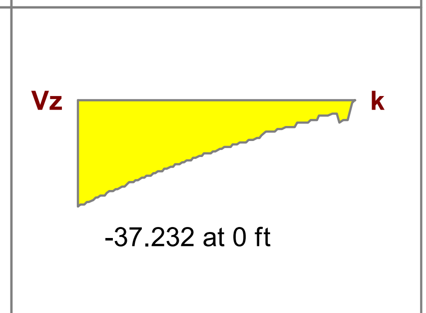
Shape: **W21x44**
Material: **A992**
Length: **150 ft**
I Joint: **BOTTOM-POLE**
J Joint: **TOP-POLE**
LC 4: z-direction NESC Extreme Wind
Code Check: **No Calc**
Report Based On 97 Sections

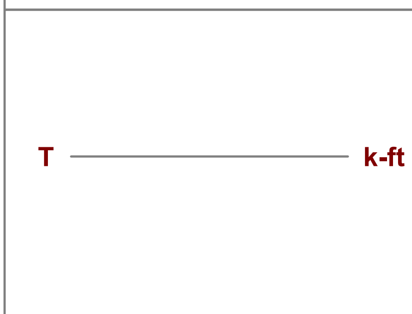


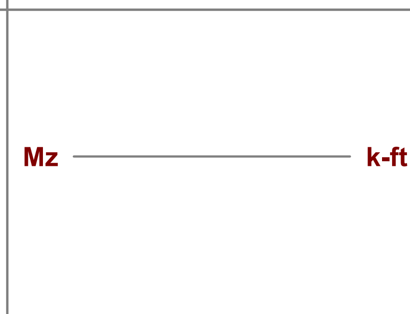


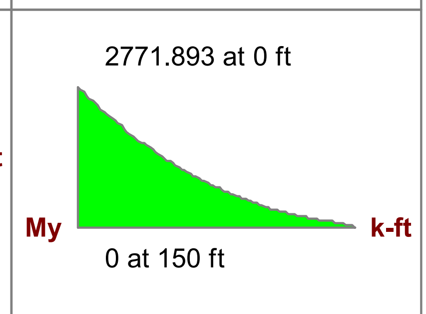


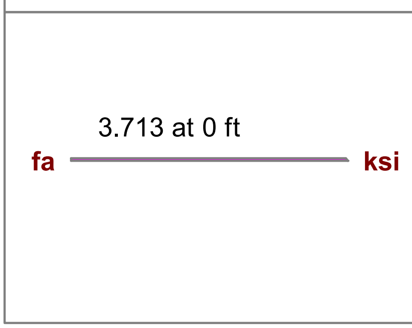


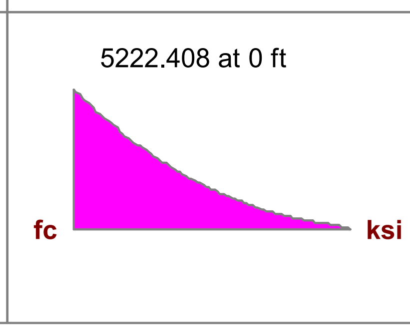


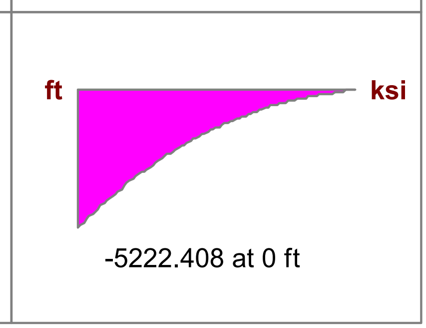












AISC 9th: ASD Code Check

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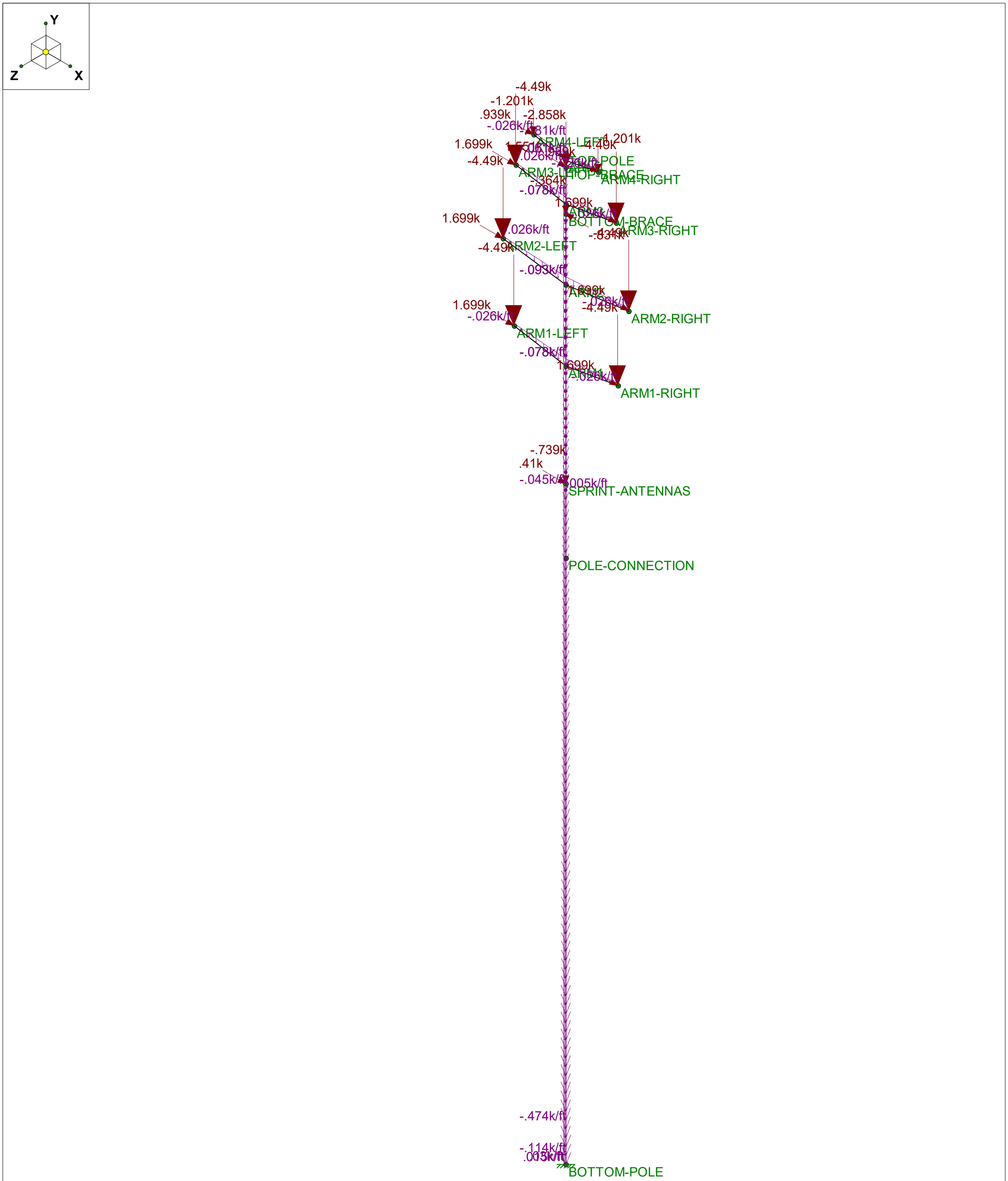
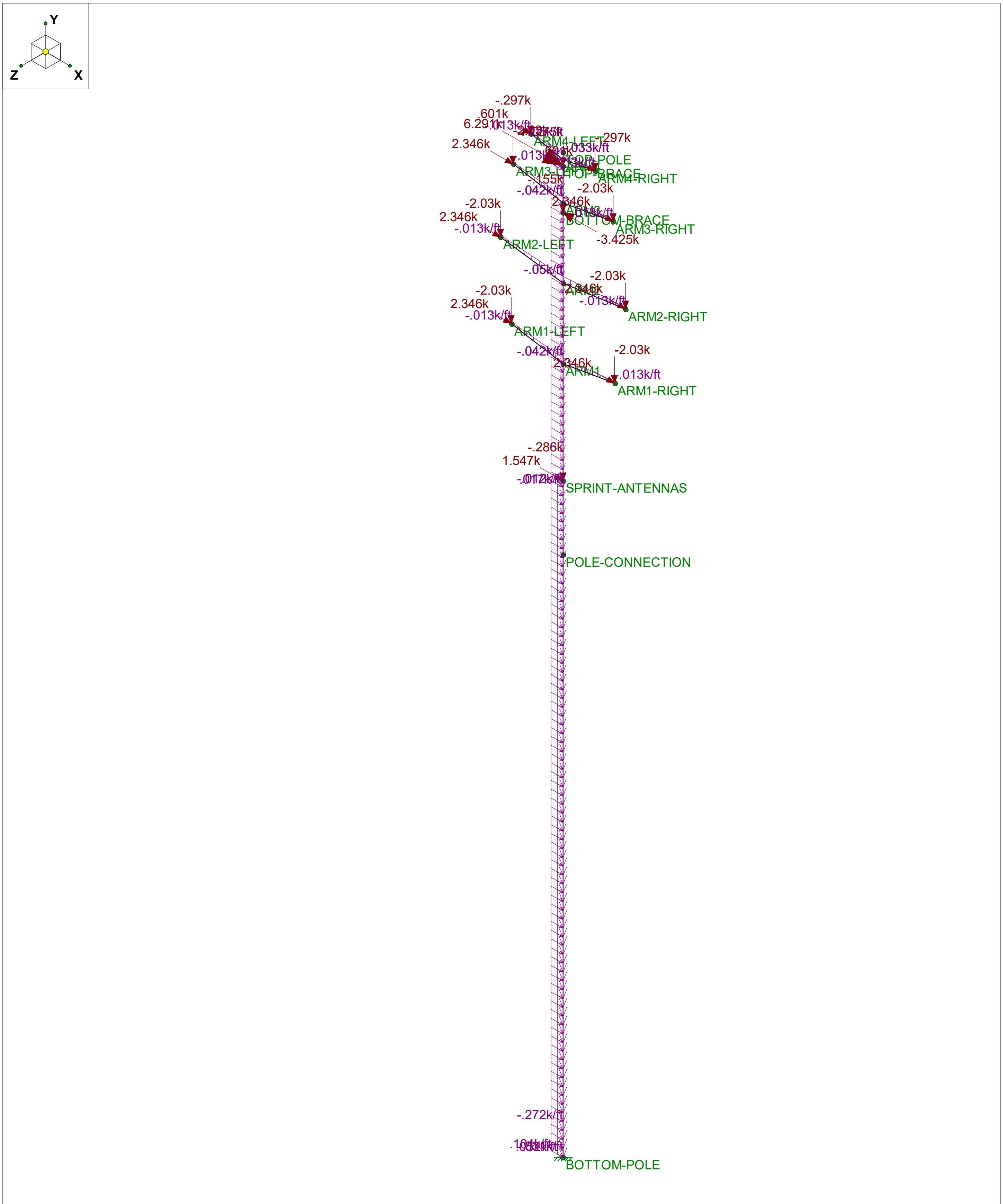
Max Defl Ratio **L/1**



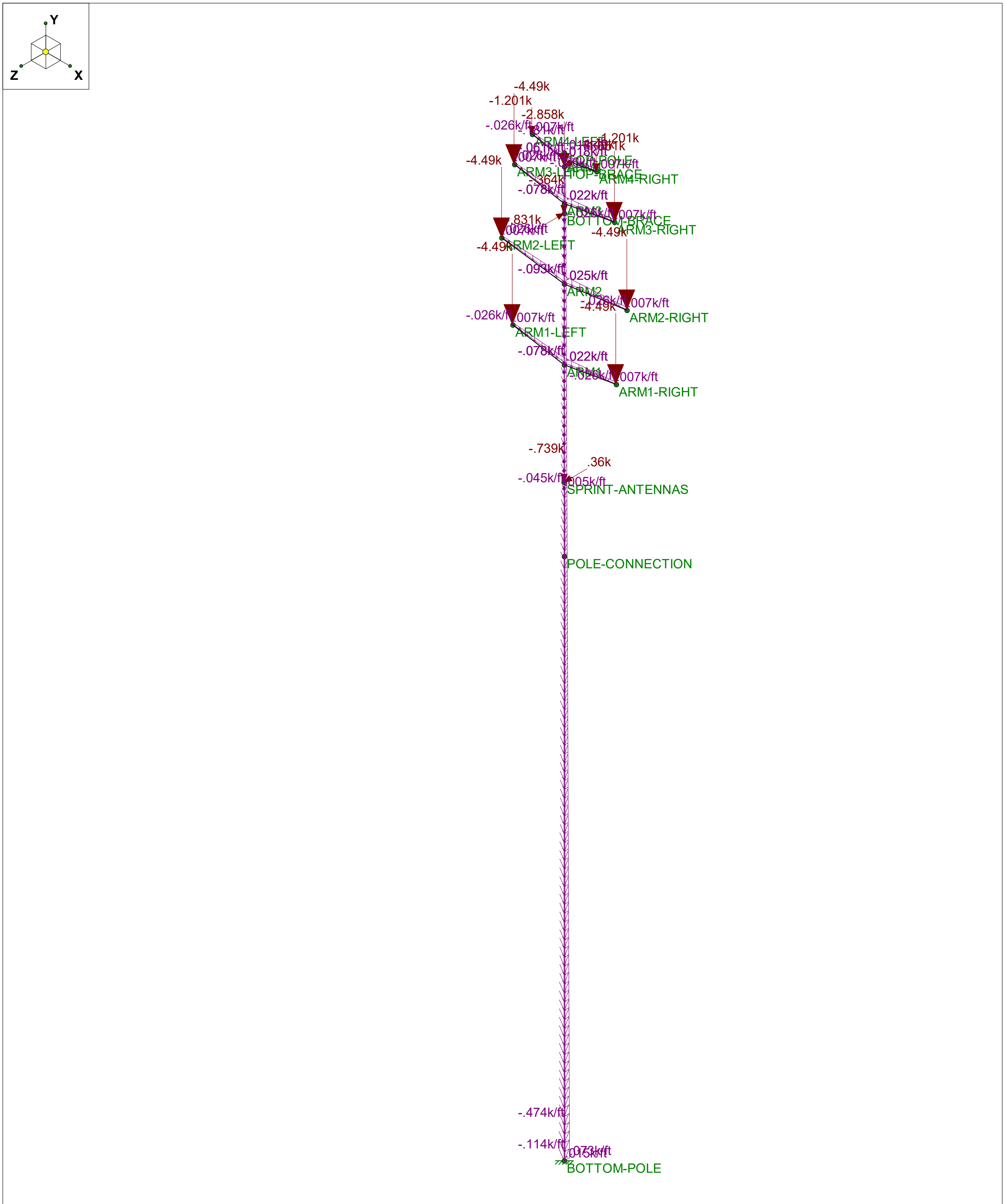
Loads: LC 1, x-direction NESC Heavy Wind

Centek Engineering		
tjl, cfc	Pole # 844	Aug 30, 2016 at 3:03 PM
16071.34 /AT&T CT5089	LC #1 Loads	5089 Pole Analysis Using NESC Loa...



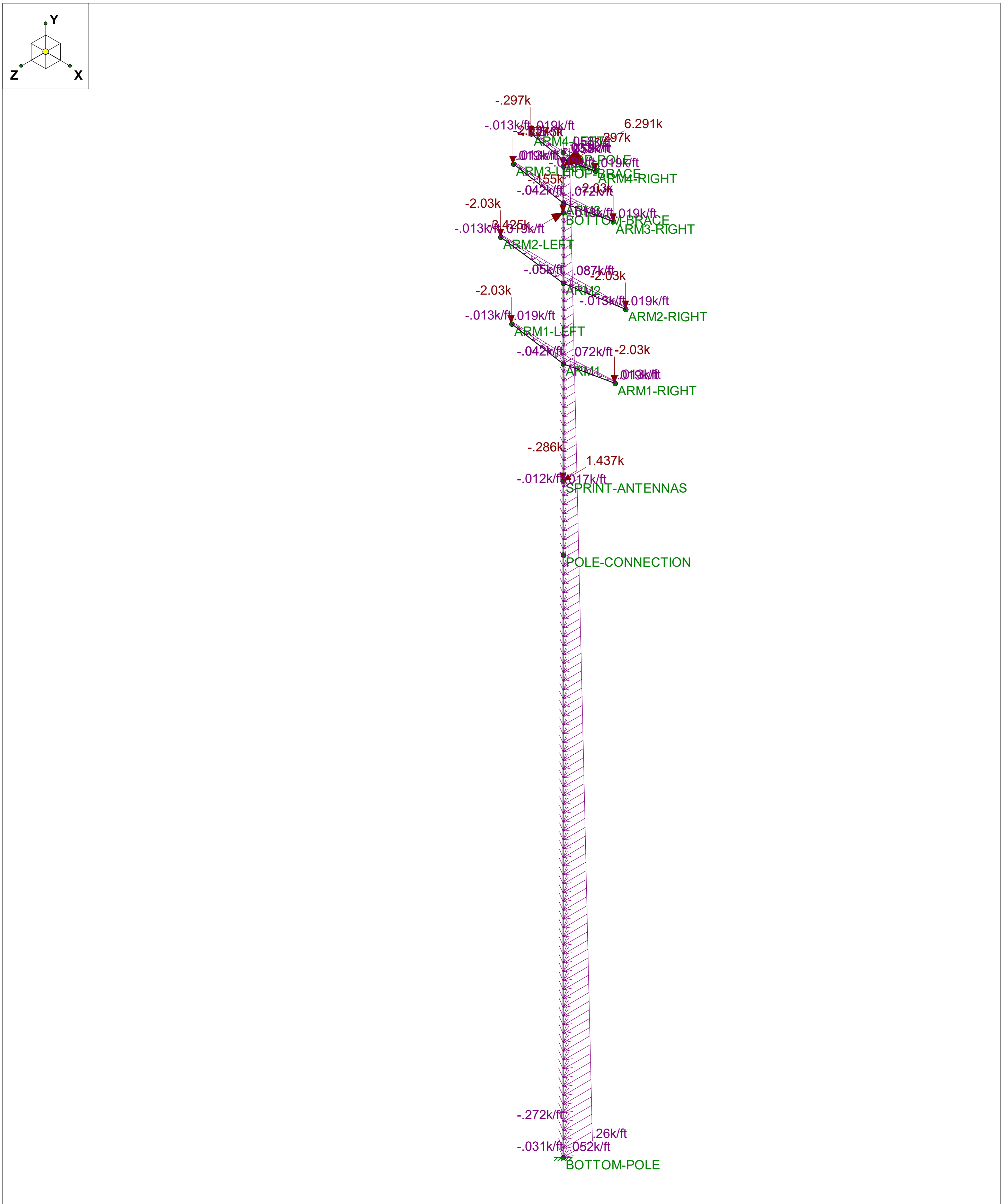
Loads: LC 2, x-direction NESC Extreme Wind

Centek Engineering		
tjl, cfc	Pole # 844	Aug 30, 2016 at 3:03 PM
16071.34 /AT&T CT5089	LC #2 Loads	5089 Pole Analysis Using NESC Loa...



Loads: LC 3, z-direction NESC Heavy Wind

Centek Engineering		
tjl, cfc	Pole # 844	Aug 30, 2016 at 3:04 PM
16071.34 /AT&T CT5089	LC #3 Loads	5089 Pole Analysis Using NESC Loa...



Loads: LC 4, z-direction NESC Extreme Wind

Centek Engineering		
tjl, cfc	Pole # 844	Aug 30, 2016 at 3:04 PM
16071.34 /AT&T CT5089	LC #4 Loads	5089 Pole Analysis Using NESC Loa...

Pole Analysis:

Pole Properties:

Wide Flange Moment of Inertia Iy =	$I_{yy} := 20.7 \cdot in^4$	(User Input)
Wide Flange Moment of Inertia Ix =	$I_{xx} := 843 \cdot in^4$	(User Input)
Wide Flange Area =	$A_{wf} := 13.0 \cdot in^2$	(User Input)
Flange Wdith =	$b_f := 6.5 \cdot in$	(User Input)
Wide Flange Depth =	$d_{wf} := 20.7 \cdot in$	(User Input)
Tower Width Top =	$W_{TTop} := 13 \cdot in$	(User Input)
Tower Width Base =	$W_{TBase} := 54 \cdot in$	(User Input)
Plate Thickness Top =	$Plt_{tTop} := 0.1875 \cdot in$	(User Input)
Plate Thickness Base =	$Plt_{tBase} := 0.5 \cdot in$	(User Input)
Length of Pole =	$L_{pole} := 150 \cdot ft$	(User Input)
Nominal Bending Stress =	$F_b := 60 \cdot ksi$	(User Input)
Modulus of Elasticity =	$E := 29000 \cdot ksi$	(User Input)

Member Forces:

Bending Moment x-direction Top =	$M_{xtop} := 0 \cdot kip \cdot ft$	(User Input from RISA-3D)
Bending Moment x-direction Midspan =	$M_{xmid} := 1505 \cdot kip \cdot ft$	(User Input from RISA-3D)
Bending Moment x-direction Bottom =	$M_{xbot} := 4154 \cdot kip \cdot ft$	(User Input from RISA-3D)
Bending Moment y-direction Top =	$M_{ytop} := 0 \cdot kip \cdot ft$	(User Input from RISA-3D)
Bending Moment y-direction Midspan =	$M_{ymid} := 762 \cdot kip \cdot ft$	(User Input from RISA-3D)
Bending Moment y-direction Bottom =	$M_{ybot} := 2772 kip \cdot ft$	(User Input from RISA-3D)
Axial Force Top =	$P_{top} := 0 \cdot kip$	(User Input from RISA-3D)
Axial Force Bottom =	$P_{bot} := 48 \cdot kip$	(User Input from RISA-3D)

Increment Length =	$lc := 5 \cdot ft$	(User Input)
Number of Increments =	$N := \frac{L_{pole}}{lc}$	(User Input)

$$d_i := \begin{array}{|l} x \leftarrow (lc \cdot i) \\ d \leftarrow (L_{pole} - x) \end{array}$$

Distance Above Ground Level =

$$d_i = \begin{pmatrix} 150 \\ 145 \\ 140 \\ 135 \\ 130 \\ 125 \\ 120 \\ 115 \\ 110 \\ 105 \\ 100 \\ 95 \\ 90 \\ 85 \\ 80 \\ 75 \\ 70 \\ 65 \\ 60 \\ 55 \\ 50 \\ 45 \\ 40 \\ 35 \\ 30 \\ 25 \\ 20 \\ 15 \\ 10 \\ 5 \\ 0 \end{pmatrix} ft$$

Bending Moment x-direction @ 5' Increments =

$$M_{x_i} := \begin{array}{|l} \Delta M_x \leftarrow \frac{(M_{xmid} - M_{xtop})}{0.5 \cdot L_{pole}} \cdot \left(d_i - \frac{L_{pole}}{2}\right) \text{ if } d_i > \frac{L_{pole}}{2} \\ \Delta M_x \leftarrow \frac{(M_{xbot} - M_{xmid})}{0.5 \cdot L_{pole}} \cdot d_i \text{ if } d_i \le \frac{L_{pole}}{2} \\ M_x \leftarrow M_{xmid} - \Delta M_x \text{ if } d_i > \frac{L_{pole}}{2} \\ M_x \leftarrow M_{xbot} - \Delta M_x \text{ if } d_i \le \frac{L_{pole}}{2} \end{array}$$

$$M_{x_i} = \begin{pmatrix} -2 \times 10^{-13} \\ 100 \\ 201 \\ 301 \\ 401 \\ 502 \\ 602 \\ 702 \\ 803 \\ 903 \\ 1003 \\ 1104 \\ 1204 \\ 1304 \\ 1405 \\ 1505 \\ 1682 \\ 1858 \\ 2035 \\ 2211 \\ 2388 \\ 2565 \\ 2741 \\ 2918 \\ 3094 \\ 3271 \\ 3448 \\ 3624 \\ 3801 \\ 3977 \\ 4154 \end{pmatrix} \cdot kip \cdot ft$$

Bending Moment y-direction @ 5' Increments =

$$M_{y_i} := \begin{array}{|l} \Delta M_y \leftarrow \frac{(M_{ymid} - M_{ytop})}{0.5 \cdot L_{pole}} \cdot \left(d_i - \frac{L_{pole}}{2}\right) \text{ if } d_i > \frac{L_{pole}}{2} \\ \Delta M_y \leftarrow \frac{(M_{ybot} - M_{ymid})}{0.5 \cdot L_{pole}} \cdot d_i \text{ if } d_i \le \frac{L_{pole}}{2} \\ M_y \leftarrow M_{ymid} - \Delta M_y \text{ if } d_i > \frac{L_{pole}}{2} \\ M_y \leftarrow M_{ybot} - \Delta M_y \text{ if } d_i \le \frac{L_{pole}}{2} \end{array}$$

$$M_{y_i} = \begin{pmatrix} 0 \\ 51 \\ 102 \\ 152 \\ 203 \\ 254 \\ 305 \\ 356 \\ 406 \\ 457 \\ 508 \\ 559 \\ 610 \\ 660 \\ 711 \\ 762 \\ 896 \\ 1030 \\ 1164 \\ 1298 \\ 1432 \\ 1566 \\ 1700 \\ 1834 \\ 1968 \\ 2102 \\ 2236 \\ 2370 \\ 2504 \\ 2638 \\ 2772 \end{pmatrix} \cdot kip \cdot ft$$

Tower Width =

$$W_{Tx_i} := \begin{vmatrix} \Delta W_{T.x} \leftarrow \frac{(W_{TBase} - W_{TTop})}{L_{pole}} \cdot d_i \\ W_{Tx} \leftarrow W_{TBase} - \Delta W_{T.x} \end{vmatrix}$$

Plate Thickness =

$$Plt_{t_i} := \begin{vmatrix} \Delta Plt_t \leftarrow \frac{(Plt_{tBase} - Plt_{tTop})}{L_{pole}} \cdot d_i \\ Plt_t \leftarrow Plt_{tBase} - \Delta Plt_t \end{vmatrix}$$

Plate Area =

$$Plt_{A_i} := W_{Tx_i} \cdot Plt_{t_i}$$

$$W_{Tx_i} = \begin{pmatrix} 1.083 \\ 1.197 \\ 1.311 \\ 1.425 \\ 1.539 \\ 1.653 \\ 1.767 \\ 1.881 \\ 1.994 \\ 2.108 \\ 2.222 \\ 2.336 \\ 2.45 \\ 2.564 \\ 2.678 \\ 2.792 \\ 2.906 \\ 3.019 \\ 3.133 \\ 3.247 \\ 3.361 \\ 3.475 \\ 3.589 \\ 3.703 \\ 3.817 \\ 3.931 \\ 4.044 \\ 4.158 \\ 4.272 \\ 4.386 \\ 4.5 \end{pmatrix} ft \qquad Plt_{t_i} = \begin{pmatrix} 0.187 \\ 0.198 \\ 0.208 \\ 0.219 \\ 0.229 \\ 0.24 \\ 0.25 \\ 0.26 \\ 0.271 \\ 0.281 \\ 0.292 \\ 0.302 \\ 0.313 \\ 0.323 \\ 0.333 \\ 0.344 \\ 0.354 \\ 0.365 \\ 0.375 \\ 0.385 \\ 0.396 \\ 0.406 \\ 0.417 \\ 0.427 \\ 0.438 \\ 0.448 \\ 0.458 \\ 0.469 \\ 0.479 \\ 0.49 \\ 0.5 \end{pmatrix} \cdot in \qquad Plt_{A_i} = \begin{pmatrix} 2.4 \\ 2.8 \\ 3.3 \\ 3.7 \\ 4.2 \\ 4.8 \\ 5.3 \\ 5.9 \\ 6.5 \\ 7.1 \\ 7.8 \\ 8.5 \\ 9.2 \\ 9.9 \\ 10.7 \\ 11.5 \\ 12.3 \\ 13.2 \\ 14.1 \\ 15 \\ 16 \\ 16.9 \\ 17.9 \\ 19 \\ 20 \\ 21.1 \\ 22.2 \\ 23.4 \\ 24.6 \\ 25.8 \\ 27 \end{pmatrix} \cdot in^2$$

Distance from Wide Flange Centroid to Built-up Section Centroid =

$$d_{x_i} := \frac{W_{Tx_i}}{2} - \frac{b_f}{2}$$

Distance from Plate Centroid to Built-up Section Centroid =

$$d_{y_i} := \frac{Plt_{t_i}}{2} + \frac{d_{wf}}{2}$$

Total Bult-up Section Area =

$$A_{Tot_i} := 2 \cdot (Plt_{A_i} + A_{wf})$$

d_{x_i} (in)	d_{y_i} (in)	A_{Tot_i} (in^2)
3.25	10.44	30.9
3.93	10.45	31.7
4.62	10.45	32.6
5.3	10.46	33.5
5.98	10.46	34.5
6.67	10.47	35.5
7.35	10.47	36.6
8.03	10.48	37.8
8.72	10.49	39
9.4	10.49	40.2
10.08	10.5	41.6
10.77	10.5	42.9
11.45	10.51	44.4
12.13	10.51	45.9
12.82	10.52	47.4
13.5	10.52	49
14.18	10.53	50.7
14.87	10.53	52.4
15.55	10.54	54.2
16.23	10.54	56
16.92	10.55	57.9
17.6	10.55	59.9
18.28	10.56	61.9
18.97	10.56	64
19.65	10.57	66.1
20.33	10.57	68.3
21.02	10.58	70.5
21.7	10.58	72.8
22.38	10.59	75.1
23.07	10.59	77.5
23.75	10.6	80

Built of Section Moment of Inertia Ix =

$$I_{x_i} := 2\left[I_{yy} + A_{wf}\left(d_{x_i}\right)^2 + \frac{1}{12}\cdot Plt_{t_i}\cdot\left(W_{Tx_i}\right)^3\right]$$

$$I_{x_i} = \begin{pmatrix} 385 \\ 541 \\ 731 \\ 954 \\ 1213 \\ 1508 \\ 1843 \\ 2218 \\ 2636 \\ 3098 \\ 3607 \\ 4165 \\ 4774 \\ 5436 \\ 6156 \\ 6934 \\ 7774 \\ 8678 \\ 9651 \\ 10694 \\ 11811 \\ 13005 \\ 14280 \\ 15639 \\ 17086 \\ 18624 \\ 20258 \\ 21992 \\ 23828 \\ 25773 \\ 27829 \end{pmatrix}\cdot in^4$$

Built of Section Moment of Inertia Iy =

$$I_{y_i} := 2\left[I_{xx} + \frac{1}{12}\cdot W_{Tx_i}\cdot\left(Plt_{t_i}\right)^3 + Plt_{A_i}\cdot\left(d_{y_i}\right)^2\right]$$

$$I_{y_i} = \begin{pmatrix} 2218 \\ 2307 \\ 2402 \\ 2504 \\ 2613 \\ 2728 \\ 2849 \\ 2977 \\ 3111 \\ 3252 \\ 3400 \\ 3554 \\ 3714 \\ 3882 \\ 4056 \\ 4236 \\ 4423 \\ 4617 \\ 4818 \\ 5025 \\ 5239 \\ 5460 \\ 5687 \\ 5922 \\ 6163 \\ 6411 \\ 6666 \\ 6928 \\ 7196 \\ 7472 \\ 7755 \end{pmatrix}\cdot in^4$$

Built of Section Modulus Sx = $S_{x_i} := \frac{I_{x_i}}{\frac{W_{Tx_i}}{2}}$

Built of Section Modulus Sy = $S_{y_i} := \frac{I_{y_i}}{Plt_{t_i} + \frac{d_{wf}}{2}}$

$$S_{x_i} = \begin{pmatrix} 59 \\ 75 \\ 93 \\ 112 \\ 131 \\ 152 \\ 174 \\ 197 \\ 220 \\ 245 \\ 271 \\ 297 \\ 325 \\ 353 \\ 383 \\ 414 \\ 446 \\ 479 \\ 513 \\ 549 \\ 586 \\ 624 \\ 663 \\ 704 \\ 746 \\ 790 \\ 835 \\ 881 \\ 930 \\ 979 \\ 1031 \end{pmatrix} \cdot in^3$$

$$S_{y_i} = \begin{pmatrix} 210 \\ 219 \\ 228 \\ 237 \\ 247 \\ 258 \\ 269 \\ 281 \\ 293 \\ 306 \\ 319 \\ 334 \\ 348 \\ 364 \\ 380 \\ 396 \\ 413 \\ 431 \\ 449 \\ 468 \\ 488 \\ 508 \\ 528 \\ 549 \\ 571 \\ 594 \\ 617 \\ 640 \\ 665 \\ 689 \\ 715 \end{pmatrix} \cdot in^3$$

Bending Stress x-direction @ 5' Increments = $fb_{x_i} := \frac{M_{x_i}}{S_{x_i}}$

Bending Stress y-direction @ 5' Increments = $fb_{y_i} := \frac{M_{y_i}}{S_{y_i}}$

$$fb_{x_i} = \begin{pmatrix} -3.5 \times 10^{-14} \\ 16 \\ 25.9 \\ 32.4 \\ 36.7 \\ 39.6 \\ 41.5 \\ 42.9 \\ 43.7 \\ 44.2 \\ 44.5 \\ 44.6 \\ 44.5 \\ 44.3 \\ 44 \\ 43.6 \\ 45.3 \\ 46.5 \\ 47.6 \\ 48.3 \\ 48.9 \\ 49.3 \\ 49.6 \\ 49.7 \\ 49.8 \\ 49.7 \\ 49.6 \\ 49.3 \\ 49.1 \\ 48.7 \\ 48.4 \end{pmatrix} \cdot ksi$$

$$fb_{y_i} = \begin{pmatrix} 0 \\ 2.8 \\ 5.4 \\ 7.7 \\ 9.9 \\ 11.8 \\ 13.6 \\ 15.2 \\ 16.6 \\ 17.9 \\ 19.1 \\ 20.1 \\ 21 \\ 21.8 \\ 22.5 \\ 23.1 \\ 26 \\ 28.7 \\ 31.1 \\ 33.3 \\ 35.2 \\ 37 \\ 38.6 \\ 40.1 \\ 41.3 \\ 42.5 \\ 43.5 \\ 44.4 \\ 45.2 \\ 45.9 \\ 46.5 \end{pmatrix} \cdot ksi$$

Maximum Bending Stress x-direction = $f_{bxmax} := 49.8 \cdot ksi$

Percent Stressed = $\frac{f_{bxmax}}{F_b} = 83 \cdot \%$

Bending_Check_x := if($f_{bxmax} < F_b$, "OK" , "NG")

Bending_Check_x = "OK"

Maximum Bending Stress y-direction = $f_{bymax} := 46.5 \cdot ksi$

Percent Stressed = $\frac{f_{bymax}}{F_b} = 77.5 \cdot \%$

Bending_Check_y := if($f_{bymax} < F_b$, "OK" , "NG")

Bending_Check_y = "OK"

Flange Bolts and Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	$OM := 1065 \cdot ft \cdot kips$	(Input From Risa-3D)
Shear Force =	$Shear := 26.7 \cdot kips$	(Input From Risa-3D)
Axial Force =	$Axial := 24.8 \cdot kips$	(Input From Risa-3D)

Flange Bolt Data:

Use ASTM A490

Number of Flange Bolts =	$N := 24$	(User Input)
Bolt Ultimate Strength =	$F_u := 150 \cdot ksi$	(User Input)
Bolt Yield Strength =	$F_y := 125 \cdot ksi$	(User Input)
Bolt Modulus =	$E := 29000 \cdot ksi$	(User Input)
Diameter of Flange Bolts =	$D := 0.875 \cdot in$	(User Input)
Threads per Inch =	$n := 4.5$	(User Input)

Flange Plate Data:

Use ASTM A36

Plate Yield Strength =	$Fy_{bp} := 36 \cdot ksi$	(User Input)
Flange Plate Thickness =	$t_{bp} := 2.0 \cdot in$	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

$d_1 := 2.0in$ (User Input)

$d_2 := 7.0in$ (User Input)

$d_3 := 12.0in$ (User Input)

$d_4 := 15.5in$ (User Input)

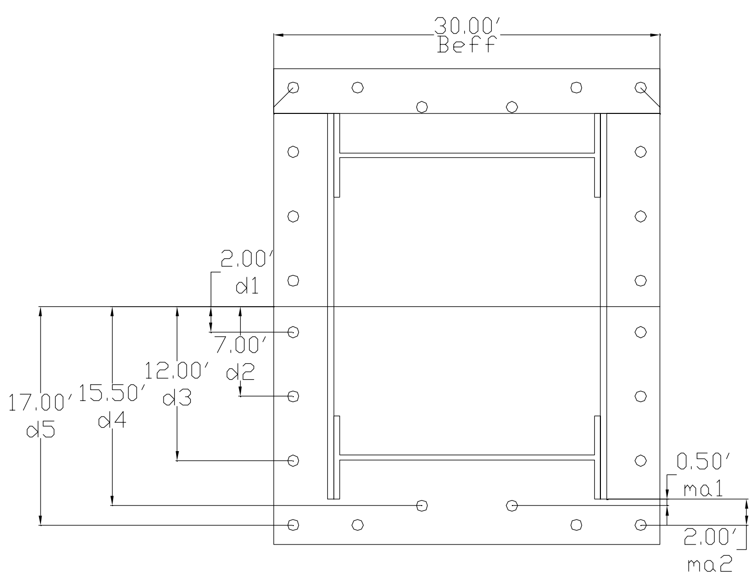
$d_5 := 17.0in$ (User Input)

Critical Distances For Bending in Plate:

$ma_1 := 0.5in$ (User Input)

$ma_2 := 2.0in$ (User Input)

Effective Width of Flange Plate for Bending = $B_{eff} := 30.0in$ (User Input)



FLANGE BOLT AND PLATE GEOMETRY

Flange Bolt Analysis:

Calculated Flange Bolt Properties:

Polar Moment of Inertia = $I_p := \left[(d_1)^2 \cdot 4 + (d_2)^2 \cdot 4 + (d_3)^2 \cdot 4 + (d_4)^2 \cdot 4 + (d_5)^2 \cdot 8\right] = 4.061 \times 10^3 \cdot in^2$

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 0.601 \cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 = 0.341 \cdot in^2$

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 0.658 \cdot in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.165 \cdot in$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^{\ 3}}{32} = 0.028 \cdot in^3$

Check Flange Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{d_5}{I_p} - \frac{Axial}{N} = 52.5 \cdot kips$

Allowable Tensile Force (Gross Area) = $T_{ALL.Gross} := 0.75 \cdot A_g \cdot F_u = 67.6 \cdot kips$

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Gross}} \cdot 100 = 77.6$

Condition1 = $Condition1 := if\left(\frac{T_{Max}}{T_{ALL.Gross}} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$

Condition1 = "OK"

Note Shear stress is negligible

Flange Plate Analysis:

Force from Bolts =

$$C_1 := \frac{OM \cdot d_4}{I_p} + \frac{Axial}{N} = 49.8 \cdot kips$$

$$C_2 := \frac{OM \cdot d_5}{I_p} + \frac{Axial}{N} = 54.5 \cdot kips$$

Applied Bending Stress in Plate =

$$f_{bp} := \frac{6 \cdot \left(2C_1 \cdot ma_1 + 4 \cdot C_2 \cdot ma_2\right)}{B_{eff} \cdot t_{bp}^{\ 2}} = 24.3 \cdot ksi$$

Allowable Bending Stress in Plate =

$$F_{bp} := 0.9 \cdot Fy_{bp} = 32.4 \cdot ksi$$

Plate Bending Stress % of Capacity =

$$\frac{f_{bp}}{F_{bp}} \cdot 100 = 75$$

Condition3 =

$$Condition2 := if\left(\frac{f_{bp}}{F_{bp}} < 1.00, \text{"Ok"}, \text{"Overstressed"}\right)$$

Condition2 = "Ok"

Flange Bolts and Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	$OM := 512 \cdot ft \cdot kips$	(Input From Risa-3D)
Shear Force =	$Shear := 14.5 \cdot kips$	(Input From Risa-3D)
Axial Force =	$Axial := 25 \cdot kips$	(Input From Risa-3D)

Flange Bolt Data:

Use ASTM A490

Number of Flange Bolts =	$N := 24$	(User Input)
Bolt Ultimate Strength =	$F_u := 150 \cdot ksi$	(User Input)
Bolt Yield Strength =	$F_y := 125 \cdot ksi$	(User Input)
Bolt Modulus =	$E := 29000 \cdot ksi$	(User Input)
Diameter of Flange Bolts =	$D := 0.875 \cdot in$	(User Input)
Threads per Inch =	$n := 4.5$	(User Input)

Flange Plate Data:

Use ASTM A36

Plate Yield Strength =	$Fy_{bp} := 36 \cdot ksi$	(User Input)
Flange Plate Thickness =	$t_{bp} := 2.0 \cdot in$	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

$d_1 := 3.5in$ (User Input)

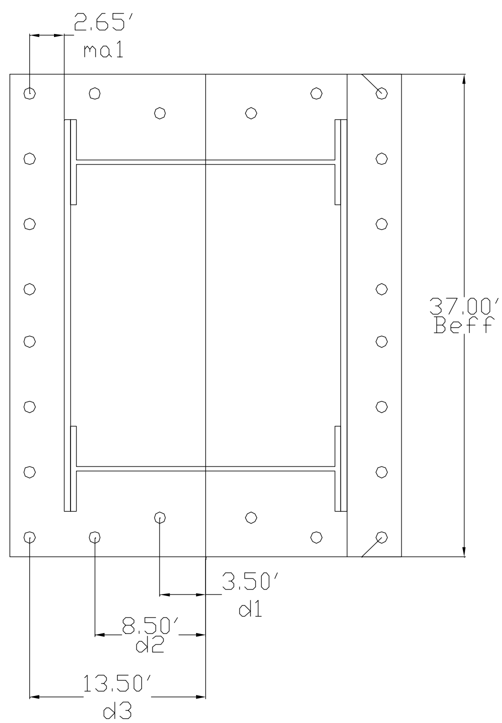
$d_2 := 8.5in$ (User Input)

$d_3 := 13.5in$ (User Input)

Critical Distances For Bending in Plate:

$ma_1 := 2.65in$ (User Input)

Effective Width of Flange Plate for Bending = $B_{eff} := 37.0in$ (User Input)



FLANGE BOLT AND PLATE GEOMETRY

Flange Bolt Analysis:

Calculated Flange Bolt Properties:

Polar Moment of Inertia = $I_p := \left[(d_1)^2 \cdot 4 + (d_2)^2 \cdot 4 + (d_3)^2 \cdot 16\right] = 3.254 \times 10^3 \cdot in^2$

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 0.601 \cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 = 0.341 \cdot in^2$

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 0.658 \cdot in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.165 \cdot in$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^{\,3}}{32} = 0.028 \cdot in^3$

Check Flange Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{d_3}{I_p} - \frac{Axial}{N} = 24.4 \cdot kips$

Allowable Tensile Force (Gross Area) = $T_{ALL.Gross} := \left(.75 A_g \cdot F_u\right) = 67.6 \cdot kips$

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Gross}} \cdot 100 = 36.1$

Condition1 = $Condition1 := if\left(\frac{T_{Max}}{T_{ALL.Gross}} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$

Condition1 = "OK"

Note Shear stress is negligible

Flange Plate Analysis:

Force from Bolts = $C_1 := \frac{OM \cdot d_3}{I_p} + \frac{Axial}{N} = 26.5 \cdot kips$

Applied Bending Stress in Plate = $f_{bp} := \frac{6 \cdot (8C_1 \cdot ma_1)}{B_{eff} \, t_{bp}^{\,2}} = 22.8 \cdot ksi$

Allowable Bending Stress in Plate = $F_{bp} := 0.9 \cdot Fy_{bp} = 32.4 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} \cdot 100 = 70.4$

Condition3 = $Condition2 := if\left(\frac{f_{bp}}{F_{bp}} < 1.00, \text{"Ok"}, \text{"Overstressed"}\right)$

$Condition2 = \text{"Ok"}$

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	$OM := 4154 \cdot ft \cdot kips$	(Input From RisaTower)
Shear Force =	$Shear := 41.2 \cdot kips$	(Input From RisaTower)
Axial Force =	$Axial := 48.3 \cdot kips$	(Input From RisaTower)

Anchor Bolt Data:

Use ASTM A615 Grade 60

Number of Anchor Bolts =	$N := 26$	(User Input)
Bolt "Column" Distance =	$l := 3.0 \cdot in$	(User Input)
Bolt Ultimate Strength =	$F_u := 90 \cdot ksi$	(User Input)
Bolt Yield Strength =	$F_y := 60 \cdot ksi$	(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)

Base Plate Data:

Use ASTM A572 Grade 42

Plate Yield Strength =	$Fy_{bp} := 42 \cdot ksi$	(User Input)
Base Plate Thickness =	$t_{bp} := 3.0 \cdot in$	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

$d_1 := 7.5in$ (User Input)

$d_2 := 15.0in$ (User Input)

$d_3 := 22.5in$ (User Input)

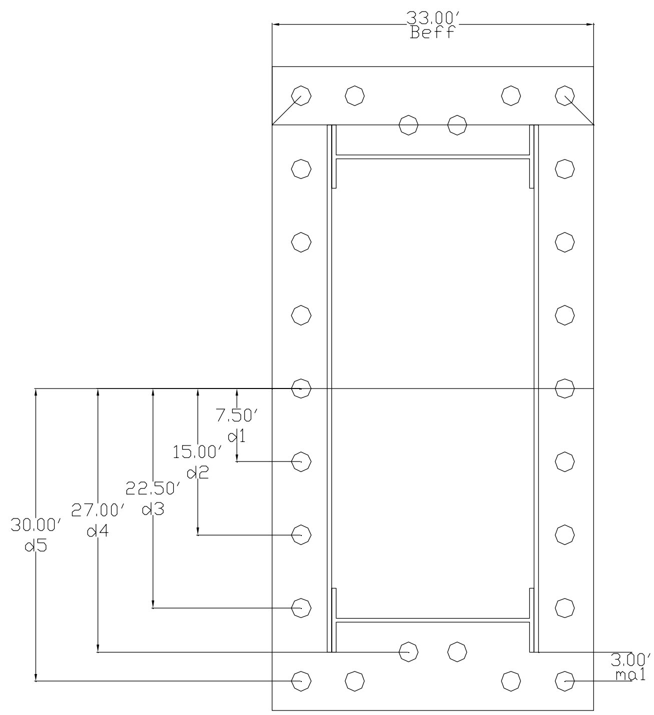
$d_4 := 27.0in$ (User Input)

$d_5 := 30in$ (User Input)

Critical Distances For Bending in Plate:

$ma_1 := 3.0in$ (User Input)

Effective Width of Baseplate for Bending = $B_{eff} := 33.0in$ (User Input)



ANCHOR BOLT AND PLATE GEOMETRY

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Polar Moment of Inertia = $I_p := \left[(d_1)^2 \cdot 4 + (d_2)^2 \cdot 4 + (d_3)^2 \cdot 4 + (d_4)^2 \cdot 4 + (d_5)^2 \cdot 8\right] = 1.327 \times 10^4 \cdot in^2$

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

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

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 2.033 \cdot in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.508 \cdot in$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^{\,3}}{32} = 0.826 \cdot in^3$

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{d_5}{I_p} - \frac{Axial}{N} = 110.9 \cdot kips$

Allowable Tensile Force (Gross Area) = $T_{ALL} := (A_n \cdot F_y) = 194.9 \cdot kips$

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL}} \cdot 100 = 56.9$

Condition1 = $Condition1 := if\left(\frac{T_{Max}}{T_{ALL}} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$

Condition1 = "OK"

Note Shear stress is negligible

Base Plate Analysis:

Force from Bolts = $C_1 := \frac{OM \cdot d_5}{I_p} + \frac{Axial}{N} = 114.6 \cdot kips$

Applied Bending Stress in Plate = $f_{bp} := \frac{6 \cdot (4C_1 \cdot ma_1)}{B_{eff} t_{bp}^{\ 2}} = 27.78 \cdot ksi$

Allowable Bending Stress in Plate = $F_{bp} := Fy_{bp} = 42 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} \cdot 100 = 66.1$

Condition3 = $Condition2 := if\left(\frac{f_{bp}}{F_{bp}} < 1.00, \text{"Ok"}, \text{"Overstressed"}\right)$

$Condition2 = \text{"Ok"}$

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	$OM := 2772 \cdot ft \cdot kips$	(Input From RISA-3D)
Shear Force =	$Shear := 37.2 \cdot kips$	(Input From Risa-3D)
Axial Force =	$Axial := 48.2 \cdot kips$	(Input From Risa-3D)

Anchor Bolt Data:

Use ASTM A615 Grade 60

Number of Anchor Bolts =	$N := 26$	(User Input)
Bolt "Column" Distance =	$l := 3.0 \cdot in$	(User Input)
Bolt Ultimate Strength =	$F_u := 90 \cdot ksi$	(User Input)
Bolt Yield Strength =	$F_y := 60 \cdot ksi$	(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)

Base Plate Data:

Use ASTM A572 Grade 42

Plate Yield Strength =	$Fy_{bp} := 42 \cdot ksi$	(User Input)
Base Plate Thickness =	$t_{bp} := 3.0 \cdot in$	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

$d_1 := 2.5in$ (User Input)

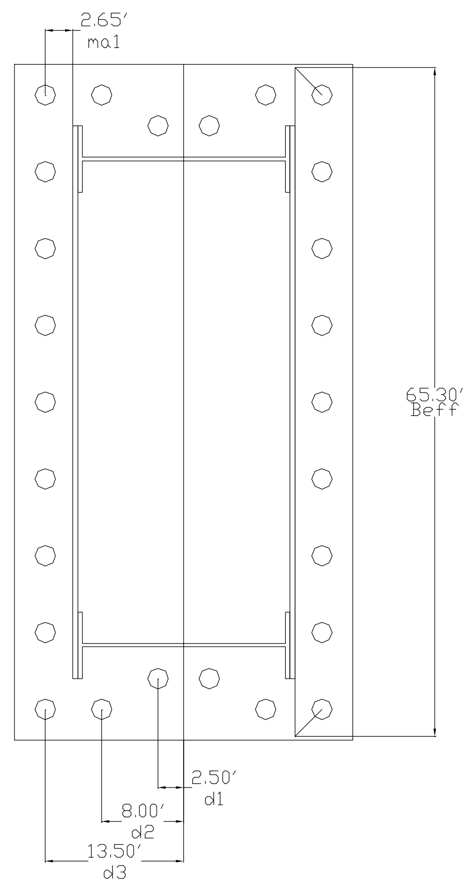
$d_2 := 8.0in$ (User Input)

$d_3 := 13.5in$ (User Input)

Critical Distances For Bending in Plate:

$ma_1 := 2.65in$ (User Input)

Effective Width of Baseplate for Bending = $B_{eff} := 65.3in$ (User Input)



ANCHOR BOLT AND PLATE GEOMETRY

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Polar Moment of Inertia = $I_p := \left[(d_1)^2 \cdot 4 + (d_2)^2 \cdot 4 + (d_3)^2 \cdot 18\right] = 3.562 \times 10^3 \cdot in^2$

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

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

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 2.033 \cdot in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.508 \cdot in$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^3}{32} = 0.826 \cdot in^3$

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{d_3}{I_p} - \frac{Axial}{N} = 124.2 \cdot kips$

Allowable Tensile Force (Gross Area) = $T_{ALL} := (A_n \cdot F_y) = 194.9 \cdot kips$

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL}} \cdot 100 = 63.8$

Condition1 = $Condition1 := if\left(\frac{T_{Max}}{T_{ALL}} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$

Condition1 = "OK"

Note Shear stress is negligible

Base Plate Analysis:

Force from Bolts = $C_1 := \frac{OM \cdot d_3}{I_p} + \frac{Axial}{N} = 127.942 \cdot kips$

Applied Bending Stress in Plate = $f_{bp} := \frac{6 \cdot (9C_1 \cdot ma_1)}{B_{eff} t_{bp}^2} = 31.15 \cdot ksi$

Allowable Bending Stress in Plate = $F_{bp} := Fy_{bp} = 42 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} \cdot 100 = 74.2$

Condition3 = $Condition3 := if\left(\frac{f_{bp}}{F_{bp}} < 1.00, "Ok", "Overstressed"\right)$

Condition3 = "Ok"

Foundation:

Input Data:

Tower Data

Overturning Moment =	$OM := 4154 \cdot 1.1 \cdot ft \cdot kips = 4569 \cdot ft \cdot kips$	(User Input from PLS-Pole)
Shear Force =	$Shear := 41.2 \cdot kip \cdot 1.1 = 45.32 \cdot kips$	(User Input from PLS-Pole)
Axial Force =	$Axial := 48.3 \cdot kip \cdot 1.1 = 53.13 \cdot kips$	(User Input from PLS-Pole)
Tower Height =	$H_t := 150 \cdot ft$	(User Input)

Footing Data:

Depth to Bottom of Footing =	$D_f := 20.5 \cdot ft$	(User Input)
Length of Pier =	$L_p := 8 \cdot ft$	(User Input)
Extension of Pier Above Grade =	$L_{pag} := 0.5 \cdot ft$	(User Input)
Width of Pier =	$W_p := 8 \cdot ft$	(User Input)
Depth of Soil =	$D_{soil} := 8 \cdot ft$	(User Input)
Depth of Rock =	$D_{rock} := 13 \cdot ft$	(User Input)

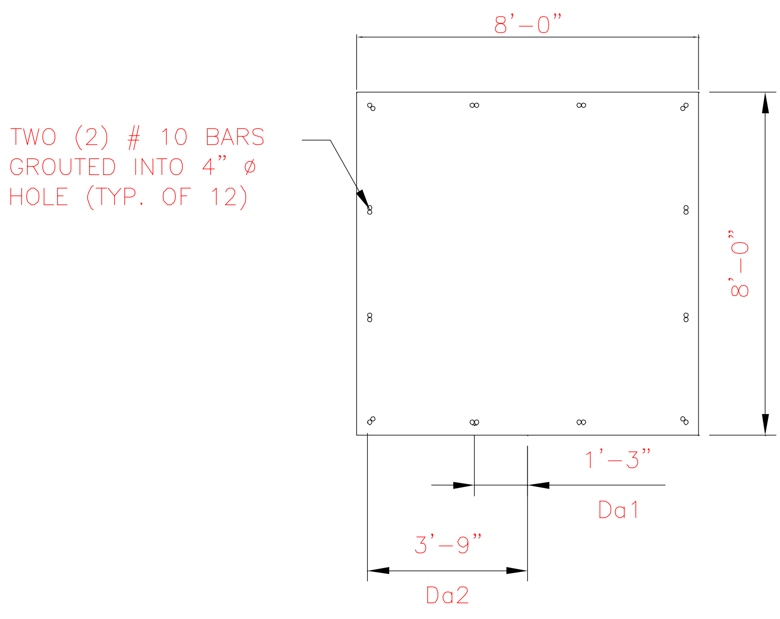
Material Properties:

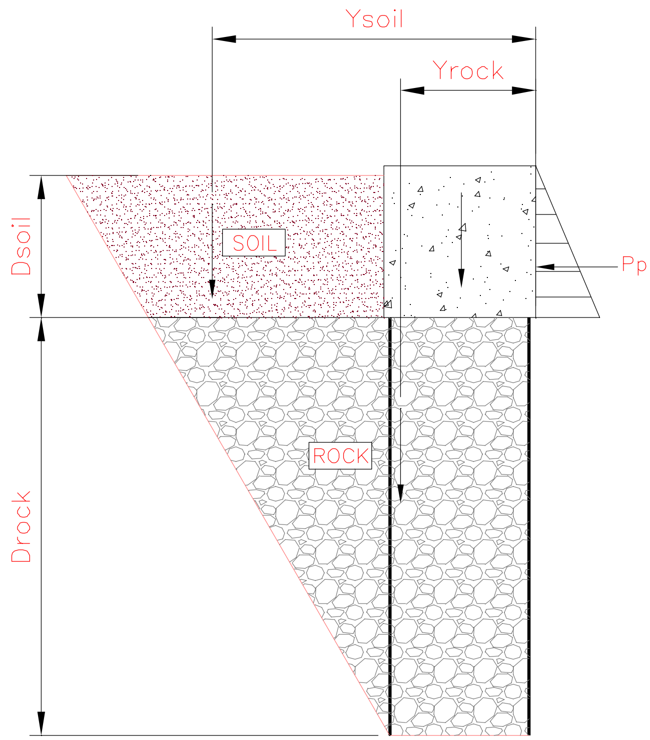
Concrete Compressive Strength =	$f_c := 3500 \cdot psi$	(User Input)	
Steel Reinforcment Yield Strength =	$f_y := 60000 \cdot psi$	(User Input)	
Anchor Bolt Yield Strength =	$f_{ya} := 75000 \cdot psi$	(User Input)	
Internal Friction Angle of Soil =	$\Phi_s := 30 \cdot deg$	(User Input)	
Allowable Soil Bearing Capacity =	$q_s := 4000 \cdot psf$	(User Input)	
Allowable Rock Bearing Capacity =	$q_{rock} := 50000 \cdot psf$	(User Input)	
Unit Weight of Soil =	$\gamma_{soil} := 120 \cdot pcf$	(User Input)	
Unit Weight of Concrete =	$\gamma_{conc} := 150 \cdot pcf$	(User Input)	
Unit Weight of Rock =	$\gamma_{rock} := 160 \cdot pcf$	(User Input)	
Foundation Bouyancy =	$Bouyancy := 0$	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	$n := 1.0 \cdot ft$	(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)	

Rock Anchor Properties:

ASTM A615 Grade 60

Bolt Ultimate Strength =	$F_u := 90 \cdot ksi$	(User Input)	
Bolt Yield Strength =	$F_y := 60 \cdot ksi$	(User Input)	
Anchor Diameter =	$d_{ra} := 2.54 \cdot in$	(User Input)	(2 # 10 Bars)
Hole Diameter =	$d_{Hole} := 4 \cdot in$	(User Input)	
Grout Strength =	$\tau := 120 \cdot psi$	(User Input)	(Assumed Conservative Value)
Distance to Rock Anchor Group 1 =	$D_{a1} := 15 \cdot in$	(User Input)	
Distance to Rock Anchor Group 2 =	$D_{a2} := 45 \cdot in$	(User Input)	
Number of Rock Anchors in Group 1 =	$N_{a1} := 4$	(User Input)	
Number of Rock Anchors in Group 2 =	$N_{a2} := 8$	(User Input)	
Total Number of Rock Anchors =	$N_{atot} := 12$	(User Input)	





Area 1 =	$A1 := \frac{1}{2}\cdot\tan(\Phi_s)\cdot D_{soil}^2 = 18.475\,ft^2$	sf
Area 2 =	$A2 := \tan(\Phi_s)\cdot D_{rock}\cdot D_{soil} = 60.044\,ft^2$	sf
Distance to Centroid 1 =	$Y1 := \tan(\Phi_s)\cdot D_{rock} + \frac{1}{3}\cdot\tan(\Phi_s)\cdot D_{soil} = 9.045\,ft$	ft
Distance to Centroid 2 =	$Y2 := \frac{1}{2}\cdot\tan(\Phi_s)\cdot D_{rock} = 3.753\,ft$	ft
Distance from Toe to Centroid of Soil =	$Y_{soil} := \frac{(A1\cdot Y1 + A2\cdot Y2)}{(A1 + A2)} + W_p = 13\,ft$	ft

Area 1 =	$A1 := \frac{1}{2}\cdot\tan(\Phi_s)\cdot D_{rock}^2 = 48.786\,ft^2$	sf
Area 2 =	$A2 := W_p\cdot D_{rock} = 104\,ft^2$	sf
Distance to Centroid 1 =	$Y1 := W_p + \frac{1}{3}\cdot\tan(\Phi_s)\cdot D_{rock} = 10.502\,ft$	ft
Distance to Centroid 2 =	$Y2 := \frac{W_p}{2} = 4\,ft$	ft
Distance from Toe to Centroid of Rock =	$Y_{rock} := \frac{(A1\cdot Y1 + A2\cdot Y2)}{(A1 + A2)} = 6.08\,ft$	ft

Stability of Footing:

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

Adjusted Soil Unit Weight = $\gamma_s := \text{if}(\text{Bouyancy} = 1, \gamma_{soil} - 62.4\text{pcf}, \gamma_{soil}) = 120 \cdot \text{pcf}$

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

Passive Pressure = $P_{top} := 0 = 0 \cdot \text{ksf}$

$P_{bot} := K_p \cdot \gamma_s \cdot D_{soil} + c \cdot 2 \cdot \sqrt{K_p} = 2.88 \cdot \text{ksf}$

$P_{ave} := \dfrac{P_{top} + P_{bot}}{2} = 1.44 \cdot \text{ksf}$

$A_p := W_p \cdot (L_p - L_{pag}) = 60\,\text{ft}^2$

Ultimate Shear = $S_u := P_{ave} \cdot A_p = 86.4 \cdot \text{kip}$

Weight of Concrete Pad = $WT_c := (W_p^{\ 2} \cdot L_p) \cdot \gamma_c = 76.8 \cdot \text{kip}$

Weight of Soil Wedge at Back Face = $WT_{s1} := \left[W_p \cdot D_{soil} \cdot \tan(\Phi_s) \cdot \left(\dfrac{D_{soil}}{2} + D_{rock}\right)\right] \cdot \gamma_s = 75.379 \cdot \text{kip}$

Weight of Soil Wedge at Back Face Corners = $WT_{s2} := 2 \cdot \left[\dfrac{(D_f^{\ 3} - D_{rock}^{\ 3})}{3} \cdot (\tan(\Phi_s))^2\right] \cdot \gamma_s = 171.15 \cdot \text{kips}$

Total Weight of Soil = $WT_{Stot} := WT_{s1} + WT_{s2} = 246.5 \cdot \text{kips}$

Weight of Rock Between Rock Anchors = $WT_{R1} := (W_p^{\ 2} \cdot D_{rock}) \cdot \gamma_{rock} = 133.12 \cdot \text{kip}$

Weight of Rock Wedge at Back Face = $WT_{R2} := \left(\dfrac{D_{rock}^{\ 2} \cdot \tan(\Phi_s)}{2} \cdot W_p\right) \cdot \gamma_{rock} = 62.446 \cdot \text{kip}$

Weight of Rock at Back Face Corners = $WT_{R3} := 2 \cdot \left[\dfrac{D_{rock}}{3} \cdot (\tan(\Phi_s) \cdot D_{rock})^2\right] \cdot \gamma_{rock} = 78.116 \cdot \text{kips}$

Total Weight of Rock = $WT_{Rtot} := WT_{R1} + WT_{R2} + WT_{R3} = 273.7 \cdot \text{kips}$

Resisting Moment = $M_r := (WT_c + \text{Axial}) \cdot \dfrac{W_p}{2} + S_u \cdot \dfrac{(L_p - L_{pag})}{3} + WT_{Stot} \cdot Y_{soil} + WT_{Rtot} \cdot Y_{rock} = 5603 \cdot \text{kip} \cdot \text{ft}$

Overturning Moment = $M_{ot} := OM + \text{Shear} \cdot L_p = 4932 \cdot \text{kip} \cdot \text{ft}$

Factor of Safety Actual = $FS := \dfrac{M_r}{M_{ot}} = 1.14$

Factor of Safety Required = $FS_{req} := 1.0$

OverTurning_Moment_Check := if$(FS \geq FS_{req}$, "Okay" , "No Good")

OverTurning_Moment_Check = "Okay"

Rock Anchor Check:

Polar Moment of Inertia = $I_p := \left(D_{a1}{}^2 \cdot N_{a1} + D_{a2}{}^2 \cdot N_{a2}\right) = 17100 \cdot in^2$

Maximum Tension Force = $T_{Max} := \frac{OM \cdot D_{a2}}{I_p} - \frac{Axial + WT_c}{N_{atot}} = 133.5 \cdot kips$

Gross Area of Bolt Group = $A_g := \frac{\pi}{4} \cdot d_{ra}{}^2 = 5.067 \cdot in^2$

Allowable Tension = $T_{all} := A_g \cdot F_y = 304 \cdot kips$

$\frac{T_{Max}}{T_{all}} = 43.9 \cdot \%$

$Condition1 := if\left(T_{Max} < T_{all}, \text{"OK"}, \text{"NG"}\right)$

$Condition1 = \text{"OK"}$

Check Bond Strength:

Bond Strength = $Bond\_Strength := d_{Hole} \cdot \pi \cdot D_{rock} \cdot \tau = 235 \cdot kips$

$\frac{T_{Max}}{Bond\_Strength} = 56.7 \cdot \%$

$Condition2 := if\left(T_{Max} < Bond\_Strength, \text{"OK"}, \text{"NG"}\right)$

$Condition2 = \text{"OK"}$

Section 1 - RFDS GENERAL INFORMATION

RFDS NAME:	CTU5089	DATE:	03/22/2016	RF DESIGN ENG:	Omair Mohammed
ISSUE:	Bronze	Approved? (Y/N):	Yes	RF DESIGN PHONE:	860-721-4315
REVISION:	Final	RF MANAGER:	Cameron Syme	RF DESIGN EMAIL:	OM636A@US.ATT.COM
INITIATIVE /PROJECT:	LTE3C WCS with Bronze Standard Configuration. GSM 1900 Decomm - for LTE 1900 CARRIER ADD.				

RF PERF ENG:		RFDS PROGRAM TYPE:	2017 LTE Next Carrier
RF PERF PHONE:		RFDS TECHNOLOGY:	LTE 3C
RF PERF EMAIL:		State:	Final
TRIDENT:		Status:	Approved
GSM FREQUENCY:	1900	RFDS ID:	1113723
UMTS FREQUENCY:	850, 1900	RFDS Version:	1.00
LTE FREQUENCY:	700, 1900, WCS	Created By:	om636a
		Date Created:	3/10/2016 12:24:00 PM
		Date Updated:	6/15/2016 1:40:12 PM
		Updated By:	om636a
I-PLAN JOB # 1:	NER-RCTB-16-01084	IPLAN PRD GRP || SUB GRP #1:	LTE Next Carrier || LTE 3C
I-PLAN JOB # 2:		IPLAN PRD GRP || SUB GRP #2:	
I-PLAN JOB # 3:		IPLAN PRD GRP || SUB GRP #3:	
I-PLAN JOB # 4:		IPLAN PRD GRP || SUB GRP #4:	

Section 2 - LOCATION INFORMATION

USID:	16687	FA LOCATION CODE:	10071285	LOCATION NAME:	TRUMBULL SOUTH
REGION:	NORTHEAST	MARKET CLUSTER:	NEW ENGLAND	MARKET:	CONNECTICUT
ADDRESS:	124 QUARRY ROAD	CITY:	TRUMBULL	STATE:	CT
ZIP CODE:	06611	COUNTY:	FAIRFIELD	MSA / RSA:	
LATITUDE (D-M-S):	41d 13m55.89084s	LONGITUDE (D-M-S):	-73d -11m-12.11604s	LAT (DEC. DEG.):	41.2321919
DIRECTIONS, ACCESS AND EQUIPMENT LOCATION:	DEPART 580 MAIN ST, BOLTON, MA 01740 ON SR-117 [MAIN ST] (EAST) FOR 0.1 MI; TAKE RAMP (RIGHT) ONTO I-495 FOR 12.2 MI; AT EXIT 22, TURN RIGHT ONTO RAMP FOR 0.3 MI; KEEP LEFT TO STAY ON RAMP FOR 0.6 MI; *TOLL ROAD* MERGE ONTO I-90 [MASSACHUSETTS TPKE] FOR 2				

ORACLE PTN # 1:		PACE JOB # 1:	MRCTB018391
ORACLE PTN # 2:		PACE JOB # 2:	
ORACLE PTN # 3:		PACE JOB # 3:	
ORACLE PTN # 4:		PACE JOB # 4:	
SEARCH RING NAME:			
SEARCH RING ID:		CASPR INITIATIVE # 1:	
BTA:		CASPR INITIATIVE # 2:	
LONG (DEC. DEG.):	-73.1866989	CASPR INITIATIVE # 3:	
BORDER CELL WITH CONTOUR COORD:		CASPR INITIATIVE # 4:	
AM STUDY REQ'D (Y/N):	No		
FREQ COORD:			

Section 3 - LICENSE COVERAGE/FILING INFORMATION

CGSA - NO FILING TRIGGERED (Yes/No):	No	CGSA LOSS:		PCS REDUCED - UPS ZIP:	
CGSA - MINOR FILING NEEDED (Yes/No)::	No	CGSA EXT AGMT NEEDED:		PCS POPS REDUCED:	
CGSA - MAJOR FILING NEEDED (Yes/No):	Yes	CGSA SCORECARD UPDATED:			

CGSA CALL SIGNS:	KNKA256,KNKA256,KNKA256

Section 4 - TOWER/REGULATORY INFORMATION

STRUCTURE AT&T OWNED?:	Yes	GROUND ELEVATION (ft):		STRUCTURE TYPE:	UTILITY
ADDITIONAL REGULATORY?:	Yes	HEIGHT OVERALL (ft):	0.00	FCC ASR NUMBER:	NR
SUB-LEASE RIGHTS?:	Yes	STRUCTURE HEIGHT (ft):	0.00		
LIGHTING TYPE:	NOT REQUIRED				

MARKET LOCATION 700 MHz Band:	
MARKET LOCATION 850 MHz Band:	
MARKET LOCATION 1900 MHz Band:	
MARKET LOCATION AWS Band:	
MARKET LOCATION WCS Band:	
MARKET LOCATION Future Band:	

Section 5 - E-911 INFORMATION - existing

	PSAP NAME:	PSAP ID:	E911 PHASE:	MPC SVC PROVIDER:	LMU REQUIRED:	ESRN:	DATE LIVE PH1:	DATE LIVE PH2:
SECTOR A E-911						0		
SECTOR B						0		
SECTOR C						0		
SECTOR D								
SECTOR E								
SECTOR F								
OMNI								

Section 5 - E-911 INFORMATION - final

	PSAP NAME:	PSAP ID:	E911 PHASE:	MPC SVC PROVIDER:	LMU REQUIRED:	ESRN:	DATE LIVE PH1:	DATE LIVE PH2:
SECTOR A E-911						0		
SECTOR B						0		
SECTOR C						0		
SECTOR D								
SECTOR E								
SECTOR F								
OMNI								

Section 6 - RBS GENERAL INFORMATION - existing

	GSM 1ST RBS	UMTS 1ST RBS	UMTS 2ND RBS	UMTS 3RD RBS	LTE 1ST RBS								
RBS ID:	43623	172474	402370	RFDS_15119056	360133								
CTS COMMON ID:	321P5089	CTU5089	CTU4089	CTV4089	CTL05089								
BTA/TID:	321P	321V	321W	321W	321L								
4-DIGIT SITE ID:	5089	5089	04089	4089	5089								
COW OR TOY?:	No	No	No	No	No								
CELL SITE TYPE:													
SITE TYPE:													
BTS LOCATION ID:													
ORIGINATING CO:													
CELLULAR NETWORK:													
OPS DISTRICT:													
RF DISTRICT:													
OPS ZONE:													
RF ZONE:													
BASE STATION TYPE:													
EQUIPMENT NAME:	GSM-TRUMBULL SOUTH	TRUMBULL SOUTH	TRUMBULL SOUTH	TRUMBULL SOUTH	TRUMBULL SOUTH								
DISASTER PRIORITY:													

Section 6 - RBS GENERAL INFORMATION - final

	GSM 1ST RBS	UMTS 1ST RBS	UMTS 2ND RBS	UMTS 3RD RBS	LTE 1ST RBS								
RBS ID:	43623	172474	402370	RFDS_15119049	360133								
CTS COMMON ID:	321P5089	CTU5089	CTU4089	CTV4089	CTL05089								
BTA/TID:	321P	321V	321W	321W	321L								
4-DIGIT SITE ID:	5089	5089	04089	4089	5089								
COW OR TOY?:	No	No	No	No	No								
CELL SITE TYPE:	SECTORIZED	SECTORIZED	SECTORIZED	SECTORIZED	SECTORIZED								
SITE TYPE:	BTS-CONVENTIONAL	MACRO-CONVENTIONAL	MACRO-CONVENTIONAL	MACRO-CONVENTIONAL	MACRO-CONVENTIONAL								
BTS LOCATION ID:	GROUND	INTERNAL	GROUND	GROUND	INTERNAL								
ORIGINATING CO:	CINGULAR	CINGULAR	CINGULAR	CINGULAR	CINGULAR								
CELLULAR NETWORK:	GOLD	GOLD	GOLD	GOLD	GOLD								
OPS DISTRICT:	CT-South	CT-South	CT-South	CT-South	CT-South								
RF DISTRICT:	NPO Triage	NPO Triage	NPO Triage	NPO Triage	NPO Triage								
OPS ZONE:	NE_CT_S_FRFD_CTL_CS	NE_CT_S_FRFD_CTL_CS	NE_CT_S_FRFD_CTL_CS	NE_CT_S_FRFD_CTL_CS	NE_CT_S_FRFD_CTL_CS								
RF ZONE:	Hotseat	Hotseat	Hotseat	Hotseat	Hotseat								
BASE STATION TYPE:	BASE	BASE	OVERLAY	OVERLAY	BASE								
EQUIPMENT NAME:	GSM-TRUMBULL SOUTH	TRUMBULL SOUTH	TRUMBULL SOUTH	TRUMBULL SOUTH	TRUMBULL SOUTH								
DISASTER PRIORITY:	0	2	0	0	3								

Section 7 - RBS SPECIFIC INFORMATION - existing

	GSM 1ST RBS	UMTS 1ST RBS	UMTS 2ND RBS	UMTS 3RD RBS	LTE 1ST RBS							
MSC:												
BSC/RNC/MME POOL ID:	BRPTCTBSC03	BRPTCT04CRBR06	BRPTCT04CRBR06	BRPTCT04CRBR06	FF01							
LAC:	05012	05989	05989	05989								
RAC:												
EQUIPMENT VENDOR:												
EQUIPMENT TYPE:	ULTRASITE											
BASEBAND CONFIGURATION:												
LOCATION:												
CABINET LOCATION:												
MARKET STATE CODE:												
AGPS:	Yes	Yes	Yes	Yes	Yes							
NODE B NUMBER:	0	0	0	0	5089							
PARENT NAME:	BRPTCTBSC03	BRPTCT04CRBR06	BRPTCT04CRBR06	BRPTCT04CRBR06	FF01							

Section 7 - RBS SPECIFIC INFORMATION - final

	GSM 1ST RBS	UMTS 1ST RBS	UMTS 2ND RBS	UMTS 3RD RBS	LTE 1ST RBS							
MSC:												
BSC/RNC/MME POOL ID:	BRPTCTBSC03	BRPTCT04CRBR06	BRPTCT04CRBR06	BRPTCT04CRBR06	FF01							
LAC:	05012	05989	05989	05989								
RAC:												
EQUIPMENT VENDOR:	NOKIA	ERICSSON	ERICSSON	ERICSSON	ERICSSON							
EQUIPMENT TYPE:	ULTRASITE	3206 INDOOR	6601 MAIN UNIT UMTS	6601 MAIN UNIT UMTS	6601 INDOOR MU							
BASEBAND CONFIGURATION:												
LOCATION:												
CABINET LOCATION:												
MARKET STATE CODE:					CT							
AGPS:	Yes	Yes	Yes	Yes	Yes							
NODE B NUMBER:	0	0	0	0	5089							
PARENT NAME:	BRIDGEPORT BSC 03	BRIDGEPORT RNC06 ERICSSON 3820	BRIDGEPORT RNC06 ERICSSON 3820	BRIDGEPORT RNC06 ERICSSON 3820								

Section 8 - RBS INDIVIDUAL INFORMATION - existing

	GSM 1ST 1900	UMTS 1ST 850	UMTS 2ND 850	UMTS 3RD 850	LTE 1ST 700	LTE 1ST 1900	LTE 1ST WCS
RBS ID:	43623	402370	402370	RFDS_15119056	360133	360133	
CELL ID/BCF:	321P5089	CTU4089	CTU4089	CTV4089	CTL05089	CTL05089	
CTS COMMON ID:	321P5089	CTU4089	CTU4089	CTV4089	CTL05089	CTL05089	

Section 8 - RBS INDIVIDUAL INFORMATION - final

	GSM 1ST 1900	UMTS 1ST 850	UMTS 2ND 850	UMTS 3RD 850	LTE 1ST 700	LTE 1ST 1900	LTE 1ST WCS
RBS ID:	43623	402370	402370		360133	360133	360133
CELL ID/BCF:	321P5089	CTU4089	CTU4089		CTL05089	CTL05089	CTL05089
CTS COMMON ID:	321P5089	CTU4089	CTU4089		CTL05089	CTL05089	CTL05089

Section 9 - SOFT SECTOR ID - existing

	GSM 1ST 1900	UMTS 1ST 850	UMTS 2ND 850	UMTS 3RD 850	LTE 1ST 700	LTE 1ST 1900	LTE 1ST WCS																			
USEID (excluding Hard Sector)	16687.1900.25G.1	16687.850.3G.2	16687.850.3G.222	16687.850.3G.333	16687.700.4G.1	16687.1900.4G.1																				
SECTOR A **SOFT SECTOR ID**	321P50891	CTV40891	CTV4089A	CTV4089A	CTL05089_7A_1	CTL05089_9A_1																				
SECTOR B	321P50892	CTV40892	CTV4089B	CTV4089B	CTL05089_7B_1	CTL05089_9B_1																				
SECTOR C	321P50893	CTV40893	CTV4089C	CTV4089C	CTL05089_7C_1	CTL05089_9C_1																				
SECTOR D																										
SECTOR E																										
SECTOR F																										
OMNI																										

Section 9 - SOFT SECTOR ID - final

	GSM 1ST 1900	UMTS 1ST 850	UMTS 2ND 850	UMTS 3RD 850	LTE 1ST 700	LTE 1ST 1900	LTE 1ST WCS																			
USEID (excluding Hard Sector)	16687.1900.25G.1	16687.850.3G.2	16687.850.3G.tmp2		16687.700.4G.1	16687.1900.4G.1	16687.WCS.4G.tmp1																			
SECTOR A **SOFT SECTOR ID**	321P50891	CTV40891	CTV4089A		CTL05089_7A_1	CTL05089_9A_1	CTL05089_3A_1																			
SECTOR B	321P50892	CTV40892	CTV4089B		CTL05089_7B_1	CTL05089_9B_1	CTL05089_3B_1																			
SECTOR C	321P50893	CTV40893	CTV4089C		CTL05089_7C_1	CTL05089_9C_1	CTL05089_3C_1																			
SECTOR D																										
SECTOR E																										
SECTOR F																										
OMNI																										

Section 9 - Cell Number - existing

	GSM 1ST 1900	UMTS 1ST 850	UMTS 2ND 850	UMTS 3RD 850	LTE 1ST 700	LTE 1ST 1900	LTE 1ST WCS																			
USEID (excluding Hard Sector)	16687.1900.25G.1	16687.850.3G.2	16687.850.3G.222	16687.850.3G.333	16687.700.4G.1	16687.1900.4G.1																				
SECTOR A CELL NUMBER					15	8																				
SECTOR B					16	9																				
SECTOR C					17	10																				
SECTOR D																										
SECTOR E																										
SECTOR F																										
OMNI																										

Section 9 - Cell Number - final

	GSM 1ST 1900	UMTS 1ST 850	UMTS 2ND 850	UMTS 3RD 850	LTE 1ST 700	LTE 1ST 1900	LTE 1ST WCS																			
USEID (excluding Hard Sector)	16687.1900.25G.1	16687.850.3G.2	16687.850.3G.tmp2		16687.700.4G.1	16687.1900.4G.1	16687.WCS.4G.tmp1																			
SECTOR A CELL NUMBER					15	8	149																			
SECTOR B					16	9	150																			
SECTOR C					17	10	151																			
SECTOR D																										
SECTOR E																										
SECTOR F																										
OMNI																										

Section 10 - CID/SAC - existing

	GSM 1ST 1900	UMTS 1ST 850	UMTS 2ND 850	UMTS 3RD 850	LTE 1ST 700	LTE 1ST 1900	LTE 1ST WCS																				
SECTOR A CID/SAC	50891	40891	40894	40894																							
SECTOR B	50892	40892	40895	40895																							
SECTOR C	50893	40893	40896	40896																							
SECTOR D																											
SECTOR E																											
SECTOR F																											
OMNI																											

Section 10 - CID/SAC - final

	GSM 1ST 1900	UMTS 1ST 850	UMTS 2ND 850	UMTS 3RD 850	LTE 1ST 700	LTE 1ST 1900	LTE 1ST WCS																				
SECTOR A CID/SAC	50891	40894	40894																								
SECTOR B	50892	40895	40895																								
SECTOR C	50893	40896	40896																								
SECTOR D																											
SECTOR E																											
SECTOR F																											
OMNI																											

Section 11 - CURRENT RADIO COUNTS existing

	GSM 1ST 850	GSM 1ST 1900	GSM 2ND 850	GSM 2ND 1900	UMTS 1ST 850	UMTS 1ST 1900	UMTS 2ND 850	UMTS 2ND 1900	UMTS 3RD 850	UMTS 3RD 1900	UMTS 4TH 850	UMTS 4TH 1900	UMTS 5TH 850	UMTS 5TH 1900	UMTS 6TH 850	UMTS 6TH 1900	LTE 1ST 700	LTE 1ST 850	LTE 1ST 1900	LTE 1ST AWS	LTE 1ST WCS	LTE 1ST FUTURE		
SECTOR A RADIO COUNTS																								
SECTOR B																								
SECTOR C																								
SECTOR D																								
SECTOR E																								
SECTOR F																								
OMNI																								
																	LTE 2ND 700	LTE 2ND 850	LTE 2ND 1900	LTE 2ND AWS	LTE 2ND WCS	LTE 2ND FUTURE		
SECTOR A RADIO COUNTS																								
SECTOR B																								
SECTOR C																								
SECTOR D																								
SECTOR E																								
SECTOR F																								
OMNI																								

Section 12 - CURRENT T1 COUNTS existing

	GSM 1st Cabinet	GSM 2nd Cabinet	UMTS 1st Cabinet	UMTS 2nd Cabinet	UMTS 3rd Cabinet	UMTS 4th Cabinet	UMTS 5th Cabinet	UMTS 6th Cabinet	LTE 1st Cabinet	LTE 2nd Cabinet	LTE 3rd Cabinet	LTE 4th Cabinet
# T1s												
LINK PROFILE												
RF COMBINING												
FIBER or ETHERNET?												
Tx Board Model												
Tx Board QTY												
RAX/ECU Board Model												
RAX/ECU Board QTY												
BBU Board Model												
BBU Board QTY												
RRU - location												
FIBER JUMPER												
DC CABLE												
DC/Fiber Dem. Box												
Bundled Fiber Cable												
Bundled DC Cable												

Section 13 - NEW/PROPOSED RADIO COUNTS

	GSM 1ST 850	GSM 1ST 1900	GSM 2ND 850	GSM 2ND 1900	UMTS 1ST 850	UMTS 1ST 1900	UMTS 2ND 850	UMTS 2ND 1900	UMTS 3RD 850	UMTS 3RD 1900	UMTS 4TH 850	UMTS 4TH 1900	UMTS 5TH 850	UMTS 5TH 1900	UMTS 6TH 850	UMTS 6TH 1900	LTE 1ST 700	LTE 1ST 850	LTE 1ST 1900	LTE 1ST AWS	LTE 1ST WCS	LTE 1ST FUTURE		
SECTOR A RADIO COUNTS																								
SECTOR B																								
SECTOR C																								
SECTOR D																								
SECTOR E																								
SECTOR F																								
OMNI																								
																	LTE 2ND 700	LTE 2ND 850	LTE 2ND 1900	LTE 2ND AWS	LTE 2ND WCS	LTE 2ND FUTURE		
SECTOR A RADIO COUNTS																								
SECTOR B																								
SECTOR C																								
SECTOR D																								
SECTOR E																								
SECTOR F																								
OMNI																								

Section 14 - NEW/PROPOSED T1 COUNTS

	GSM 1st Cabinet	GSM 2nd Cabinet	UMTS 1st Cabinet	UMTS 2nd Cabinet	UMTS 3rd Cabinet	UMTS 4th Cabinet	UMTS 5th Cabinet	UMTS 6th Cabinet	LTE 1st Cabinet	LTE 2nd Cabinet	LTE 3rd Cabinet	LTE 4th Cabinet
# T1s												
LINK PROFILE												
RF COMBINING												
FIBER or ETHERNET?												
Tx Board Model												
Tx Board QTY												
RAX/ECU Board Model												
RAX/ECU Board QTY												
BBU Board Model												
BBU Board QTY												
RRU - location												
FIBER JUMPER												
DC CABLE												
DC/Fiber Dem. Box												
Bundled Fiber Cable												
Bundled DC Cable												

Section 15A - CURRENT SECTOR/CELL INFORMATION - SECTOR A (OR OMNI)

ANTENNA COMMON FIELDS	ANTENNA POSITION 1		ANTENNA POSITION 2		ANTENNA POSITION 3		ANTENNA POSITION 4		ANTENNA POSITION 5		ANTENNA POSITION 6		ANTENNA POSITION 7	
ANTENNA MAKE - MODEL	P65-15-XLH-RR													
ANTENNA VENDOR	Powerwave													
ANTENNA SIZE (H x W x D)	51X12X6													
ANTENNA WEIGHT	41													
AZIMUTH	30													
MAGNETIC DECLINATION														
RADIATION CENTER (feet)	160													
ANTENNA TIP HEIGHT	162													
MECHANICAL DOWNTILT	0													
FEEDER AMOUNT														
VERTICAL SEPARATION from ANTENNA ABOVE (TIP to TIP)														
VERTICAL SEPARATION from ANTENNA BELOW (TIP to TIP)														
HORIZONTAL SEPARATION from CLOSEST ANTENNA to LEFT (CENTERLINE to CENTERLINE)														
HORIZONTAL SEPARATION from CLOSEST ANTENNA to RIGHT (CENTERLINE to CENTERLINE)														
HORIZONTAL SEPARATION from ANOTHER ANTENNA (which antenna # / # of inches)														
Antenna RET Motor (QTY/MODEL)		Built-in												
SURGE ARRESTOR (QTY/MODEL)	4	Andrew APTDC-BDFDM-DB												
DIPLEXER (QTY/MODEL)														
DUPLEXER (QTY/MODEL)														
Antenna RET CONTROL UNIT (QTY/MODEL)	1	Powerwave 7070												
DC BLOCK (QTY/MODEL)														
TMA/LNA (QTY/MODEL)	1	CCI DTMABP7819VG12A Twin PCS w/ 700-850BP (700)												
CURRENT INJECTORS FOR TMA (QTY/MODEL)														
PDU FOR TMAS (QTY/MODEL)														
FILTER (QTY/MODEL)														
SQUID (QTY/MODEL)														
FIBER TRUNK (QTY/MODEL)														
DC TRUNK (QTY/MODEL)														
RRH - 700 band (QTY/MODEL)	1	RRUS-11												
RRH - 850 band (QTY/MODEL)	1	RRUS-12												
RRH - 1900 band (QTY/MODEL)	1	RRUS-11												
RRH - AWS band (QTY/MODEL)														
RRH - WCS band (QTY/MODEL)														
Additional RRH #1 - any band (QTY/MODEL)														
Additional RRH #2 - any band (QTY/MODEL)														
Additional Component1 (QTY/MODEL)														
Additional Component2 (QTY/MODEL)														
Additional Component3 (QTY/MODEL)														
Local Market Note1														
Local Market Note2														
Local Market Note3														

PORT SPECIFIC FIELDS	PORT NUMBER	USEID (CSSng)	USEID (Atoll)	ATOLL TXID	ATOLL CELL ID	TX/RX ?	TECHNOLOGY/FREQUENCY	ANTENNA ATOLL	ANTENNA GAIN	ELECTRICAL AZIMUTH	ELECTRICAL TILT	RRH LOCATION (Top/Bottom/ Integrated/None)	FEEDERS TYPE	FEEDER LENGTH (feet)	RXAIT KIT MODULE?	TRIPLEXER or LLC (QTY)	TRIPLEXER or LLC (MODEL)	SCPA/MCPA MODULE?	HATCHPLATE POWER (Watts)	ERP (Watts)	Antenna RET Name	CABLE NUMBER	CABLE ID (CSSNG)
ANTENNA POSITION 1	**PORT 1**		16687.A.850.3G.1	CTV40891	CTV40891		UMTS 850	P65-15-XLH-RR_840MHz_00DT	14.69	30	0	Bottom	Andrew 1-5/8	185				NO					
	PORT 2		16687.A.700.4G.1	CTL05089_7A_1	CTL05089_7A_1		LTE 700	P65-15-XLH-RR_716MHz_04DT	14	30	4	Bottom	Andrew 1-5/8	185						1475.7065			
	PORT 3					decom	UMTS 1900	P65-15-XLH-RR_1950MHz_02DT	17	30	2	None	Andrew 1-5/8	185	1900 Band	2	1900 LLC	NO					
	PORT 5		16687.A.850.3G.222	CTV40891	CTV40891		UMTS 850	P65-15-XLH-RR_840MHz_00DT	14.69	30	0	Bottom	Andrew 1-5/8	185				NO					
	PORT 6		16687.A.850.3G.333	CTV40891	CTV4089A		UMTS 850	P65-15-XLH-RR_840MHz_00DT	14.69	30	0	Bottom	Andrew 1-5/8	185				NO					

	PORT 7		16687.A.1900.25G.1	321P50891	321P50891		GSM 1900	P65-15-XLH-RR_1950MHz_02DT	17	30	2	None	Andrew 1-5/8	185	1900 Band	2	1900 LLC	NO					
	PORT 8		16687.A.1900.4G.1	CTL05089_9A_1	CTL05089_9A_1		LTE 1900	P65-15-XLH-RR_1950MHz_03DT	17	30	3	Bottom	Andrew 1-5/8	185	1900 Band	2	1900 LLC			2421.029			

Section 15B - CURRENT SECTOR/CELL INFORMATION - SECTOR B

ANTENNA COMMON FIELDS	ANTENNA POSITION 1		ANTENNA POSITION 2		ANTENNA POSITION 3		ANTENNA POSITION 4		ANTENNA POSITION 5		ANTENNA POSITION 6		ANTENNA POSITION 7	
ANTENNA MAKE - MODEL	P65-15-XLH-RR													
ANTENNA VENDOR	Powerwave													
ANTENNA SIZE (H x W x D)	51X12X6													
ANTENNA WEIGHT	41													
AZIMUTH	150													
MAGNETIC DECLINATION														
RADIATION CENTER (feet)	160													
ANTENNA TIP HEIGHT	162													
MECHANICAL DOWNTILT	0													
FEEDER AMOUNT														
VERTICAL SEPARATION from ANTENNA ABOVE (TIP to TIP)														
VERTICAL SEPARATION from ANTENNA BELOW (TIP to TIP)														
HORIZONTAL SEPARATION from CLOSEST ANTENNA to LEFT (CENTERLINE to CENTERLINE)														
HORIZONTAL SEPARATION from CLOSEST ANTENNA to RIGHT (CENTERLINE to CENTERLINE)														
HORIZONTAL SEPARATION from ANOTHER ANTENNA (which antenna # / # of inches)														
Antenna RET Motor (QTY/MODEL)		Built-in												
SURGE ARRESTOR (QTY/MODEL)	4	Andrew APTDC-BDFDM-DB												
DIPLEXER (QTY/MODEL)														
DUPLEXER (QTY/MODEL)														
Antenna RET CONTROL UNIT (QTY/MODEL)														
DC BLOCK (QTY/MODEL)														
TMA/LNA (QTY/MODEL)	1	CCI DTMABP7819VG12A Twin PCS w/ 700-850BP (700)												
CURRENT INJECTORS FOR TMA (QTY/MODEL)														
PDU FOR TMAS (QTY/MODEL)														
FILTER (QTY/MODEL)														
SQUID (QTY/MODEL)														
FIBER TRUNK (QTY/MODEL)														
DC TRUNK (QTY/MODEL)														
RRH - 700 band (QTY/MODEL)	1	RRUS-11												
RRH - 850 band (QTY/MODEL)	1	RRUS-12												
RRH - 1900 band (QTY/MODEL)	1	RRUS-11												
RRH - AWS band (QTY/MODEL)														
RRH - WCS band (QTY/MODEL)														
Additional RRH #1 - any band (QTY/MODEL)														
Additional RRH #2 - any band (QTY/MODEL)														
Additional Component1 (QTY/MODEL)														
Additional Component2 (QTY/MODEL)														
Additional Component3 (QTY/MODEL)														
Local Market Note1														
Local Market Note2														
Local Market Note3														

PORT SPECIFIC FIELDS	PORT NUMBER	USEID (CSSng)	USEID (Atoll)	ATOLL TXID	ATOLL CELL ID	TX/RX ?	TECHNOLOGY/FREQUENCY	ANTENNA ATOLL	ANTENNA GAIN	ELECTRICAL AZIMUTH	ELECTRICAL TILT	RRH LOCATION (Top/Bottom/ Integrated/None)	FEEDERS TYPE	FEEDER LENGTH (feet)	RXAIT KIT MODULE?	TRIPLEXER or LLC (QTY)	TRIPLEXER or LLC (MODEL)	SCPA/MCPA MODULE?	HATCHPLATE POWER (Watts)	ERP (Watts)	Antenna RET Name	CABLE NUMBER	CABLE ID (CSSNG)
ANTENNA POSITION 1	PORT 1		16687.B.850.3G.1	CTV40892	CTV40892		UMTS 850	P65-15-XLH-RR_840MHz_00DT	14.69	150	0	Bottom	Andrew 1-5/8	185				NO					
	PORT 2		16687.B.700.4G.1	CTL05089_7B_1	CTL05089_7B_1		LTE 700	P65-15-XLH-RR_716MHz_10DT	14	150	10	Bottom	Andrew 1-5/8	185						1475.7065			
	PORT 3					decom	UMTS 1900	P65-15-XLH-RR_1950MHz_02DT	17	150	2	None	Andrew 1-5/8	185	1900 Band	2	1900 LLC	NO					
	PORT 5		16687.B.850.3G.222	CTV40892	CTV40892		UMTS 850	P65-15-XLH-RR_840MHz_00DT	14.69	150	0	Bottom	Andrew 1-5/8	185				NO					
	PORT 6		16687.B.850.3G.333	CTV40892	CTV4089B		UMTS 850	P65-15-XLH-RR_840MHz_00DT	14.69	150	0	Bottom	Andrew 1-5/8	185				NO					

	PORT 7		16687.B.1900.25G.1	321P50892	321P50892		GSM 1900	P65-15-XLH-RR_1950MHz_02DT	17	150	2	None	Andrew 1-5/8	185	1900 Band	2	1900 LLC	NO					
	PORT 8		16687.B.1900.4G.1	CTL05089_9B_1	CTL05089_9B_1		LTE 1900	P65-15-XLH-RR_1950MHz_02DT	17	150	2	Bottom	Andrew 1-5/8	185	1900 Band	2	1900 LLC			2421.029			

Section 15C - CURRENT SECTOR/CELL INFORMATION - SECTOR C

ANTENNA COMMON FIELDS	ANTENNA POSITION 1		ANTENNA POSITION 2		ANTENNA POSITION 3		ANTENNA POSITION 4		ANTENNA POSITION 5		ANTENNA POSITION 6		ANTENNA POSITION 7	
ANTENNA MAKE - MODEL	P65-15-XLH-RR													
ANTENNA VENDOR	Powerwave													
ANTENNA SIZE (H x W x D)	51X12X6													
ANTENNA WEIGHT	41													
AZIMUTH	270													
MAGNETIC DECLINATION														
RADIATION CENTER (feet)	160													
ANTENNA TIP HEIGHT	162													
MECHANICAL DOWNTILT	0													
FEEDER AMOUNT														
VERTICAL SEPARATION from ANTENNA ABOVE (TIP to TIP)														
VERTICAL SEPARATION from ANTENNA BELOW (TIP to TIP)														
HORIZONTAL SEPARATION from CLOSEST ANTENNA to LEFT (CENTERLINE to CENTERLINE)														
HORIZONTAL SEPARATION from CLOSEST ANTENNA to RIGHT (CENTERLINE to CENTERLINE)														
HORIZONTAL SEPARATION from ANOTHER ANTENNA (which antenna # / # of inches)														
Antenna RET Motor (QTY/MODEL)		Built-in												
SURGE ARRESTOR (QTY/MODEL)	4	Andrew APTDC-BDFDM-DB												
DIPLEXER (QTY/MODEL)														
DUPLEXER (QTY/MODEL)														
Antenna RET CONTROL UNIT (QTY/MODEL)														
DC BLOCK (QTY/MODEL)														
TMA/LNA (QTY/MODEL)	1	CCI DTMABP7819VG12A Twin PCS w/ 700-850BP (700)												
CURRENT INJECTORS FOR TMA (QTY/MODEL)														
PDU FOR TMAS (QTY/MODEL)														
FILTER (QTY/MODEL)														
SQUID (QTY/MODEL)														
FIBER TRUNK (QTY/MODEL)														
DC TRUNK (QTY/MODEL)														
RRH - 700 band (QTY/MODEL)	1	RRUS-11												
RRH - 850 band (QTY/MODEL)	1	RRUS-12												
RRH - 1900 band (QTY/MODEL)	1	RRUS-11												
RRH - AWS band (QTY/MODEL)														
RRH - WCS band (QTY/MODEL)														
Additional RRH #1 - any band (QTY/MODEL)														
Additional RRH #2 - any band (QTY/MODEL)														
Additional Component1 (QTY/MODEL)														
Additional Component2 (QTY/MODEL)														
Additional Component3 (QTY/MODEL)														
Local Market Note1														
Local Market Note2														
Local Market Note3														

PORT SPECIFIC FIELDS	PORT NUMBER	USEID (CSSng)	USEID (Atoll)	ATOLL TXID	ATOLL CELL ID	TX/RX ?	TECHNOLOGY/FREQUENCY	ANTENNA ATOLL	ANTENNA GAIN	ELECTRICAL AZIMUTH	ELECTRICAL TILT	RRH LOCATION (Top/Bottom/ Integrated/None)	FEEDERS TYPE	FEEDER LENGTH (feet)	RXAIT KIT MODULE?	TRIPLEXER or LLC (QTY)	TRIPLEXER or LLC (MODEL)	SCPA/MCPA MODULE?	HATCHPLATE POWER (Watts)	ERP (Watts)	Antenna RET Name	CABLE NUMBER	CABLE ID (CSSNG)
ANTENNA POSITION 1	PORT 1		16687.C.850.3G.1	CTV40893	CTV40893		UMTS 850	P65-15-XLH-RR_840MHz_00DT	14.69	270	0	Bottom	Andrew 1-5/8	185				NO					
	PORT 2		16687.C.700.4G.1	CTL05089_7C_1	CTL05089_7C_1		LTE 700	P65-15-XLH-RR_716MHz_02DT	14	270	2	Bottom	Andrew 1-5/8	185						1475.7065			
	PORT 3					decom	UMTS 1900	P65-15-XLH-RR_1950MHz_02DT	17	270	2	None	Andrew 1-5/8	185	1900 Band	2	1900 LLC	NO					
	PORT 5		16687.C.850.3G.222	CTV40893	CTV40893		UMTS 850	P65-15-XLH-RR_840MHz_00DT	14.69	270	0	Bottom	Andrew 1-5/8	185				NO					
	PORT 6		16687.C.850.3G.333	CTV40893	CTV4089C		UMTS 850	P65-15-XLH-RR_840MHz_00DT	14.69	270	0	Bottom	Andrew 1-5/8	185				NO					

	PORT 7		16687.C.1900.25G.1	321P50893	321P50893		GSM 1900	P65-15-XLH-RR_1950MHz_02DT	17	270	2	None	Andrew 1-5/8	185	1900 Band	2	1900 LLC	NO					
	PORT 8		16687.C.1900.4G.1	CTL05089_9C_1	CTL05089_9C_1		LTE 1900	P65-15-XLH-RR_1950MHz_03DT	17	270	3	Bottom	Andrew 1-5/8	185	1900 Band	2	1900 LLC			2421.029			

Section 16A - NEW/PROPOSED SECTOR/CELL INFORMATION - SECTOR A (OR OMNI)

ANTENNA COMMON FIELDS	ANTENNA POSITION 1		ANTENNA POSITION 2		ANTENNA POSITION 3		ANTENNA POSITION 4		ANTENNA POSITION 5		ANTENNA POSITION 6		ANTENNA POSITION 7	
Existing Antenna?														
ANTENNA MAKE - MODEL	QS66512-2													
ANTENNA VENDOR	Quintel													
ANTENNA SIZE (H x W x D)	72X12X9.6													
ANTENNA WEIGHT	111													
AZIMUTH	30													
MAGNETIC DECLINATION														
RADIATION CENTER (feet)	160													
ANTENNA TIP HEIGHT	162													
MECHANICAL DOWNTILT	0													
FEEDER AMOUNT	2													
VERTICAL SEPARATION from ANTENNA ABOVE (TIP to TIP)														
VERTICAL SEPARATION from ANTENNA BELOW (TIP to TIP)														
HORIZONTAL SEPARATION from CLOSEST ANTENNA to LEFT (CENTERLINE to CENTERLINE)														
HORIZONTAL SEPARATION from CLOSEST ANTENNA to RIGHT (CENTERLINE to CENTERLINE)														
HORIZONTAL SEPARATION from ANOTHER ANTENNA (which antenna # / # of inches)														
Antenna RET Motor (QTY/MODEL)		Built-in												
SURGE ARRESTOR (QTY/MODEL)	4	Andrew APTDC-BDFDM-DB												
DIPLEXER (QTY/MODEL)	4	CCI Pentaplexer 5PX-0726-O												
DUPLEXER (QTY/MODEL)														
Antenna RET CONTROL UNIT (QTY/MODEL)														
DC BLOCK (QTY/MODEL)														
TMA/LNA (QTY/MODEL)	2	Kaelus TMA2117F00V1-1 (Twin PCS-WCS w/700/850 BP)												
CURRENT INJECTORS FOR TMA (QTY/MODEL)														
PDU FOR TMAS (QTY/MODEL)														
FILTER (QTY/MODEL)														
SQUID (QTY/MODEL)														
FIBER TRUNK (QTY/MODEL)														
DC TRUNK (QTY/MODEL)														
RRH - 700 band (QTY/MODEL)														
RRH - 850 band (QTY/MODEL)														
RRH - 1900 band (QTY/MODEL)														
RRH - AWS band (QTY/MODEL)														
RRH - WCS band (QTY/MODEL)	1	RRUS-32												
Additional RRH #1 - any band (QTY/MODEL)														
Additional RRH #2 - any band (QTY/MODEL)														
Additional Component1 (QTY/MODEL)														
Additional Component2 (QTY/MODEL)														
Additional Component3 (QTY/MODEL)														
Local Market Note1	LTE 3C will be Bronze standard as WCS on this site// Replace existing GSM antenna with 12port antenna//Install RRUS 32 and add 2 coax per sector along with 4 pentaplexers// Install XMU in DUS41 //													
Local Market Note2	Baseband Config- 1 DUS + XMU DUS-1- 7A:7B:7C:X1P1:X1P2:_ XMU-1- PA:_:WA:PB:PC:_:WC:WB:_:_:_:_:_:_:D1E:D1D													
Local Market Note3														

PORT SPECIFIC FIELDS	PORT NUMBER	USEID (CSSng)	USEID (Atoll)	ATOLL TXID	ATOLL CELL ID	TX/RX ?	TECHNOLOGY/FREQUENCY	ANTENNA ATOLL	ANTENNA GAIN	ELECTRICAL AZIMUTH	ELECTRICAL TILT	RRH LOCATION (Top/Bottom/ Integrated/None)	FEEDERS TYPE	FEEDER LENGTH (feet)	RXAIT KIT MODULE?	TRIPLEXER or LLC (QTY)	TRIPLEXER or LLC (MODEL)	SCPA/MCPA MODULE?	HATCHPLATE POWER (Watts)	ERP (Watts)	Antenna RET Name	CABLE NUMBER	CABLE ID (CSSNG)
ANTENNA POSITION 1	PORT 4		16687.A.WCS.4G.1	CTL05089_3A_1	CTL05089_3A_1		LTE WCS	QS66512-2_2350MHz_03DT	16.9	30	3	Bottom	Andrew 1-5/8	185						2421.029			

Section 16B - NEW/PROPOSED SECTOR/CELL INFORMATION - SECTOR B

ANTENNA COMMON FIELDS	ANTENNA POSITION 1		ANTENNA POSITION 2		ANTENNA POSITION 3		ANTENNA POSITION 4		ANTENNA POSITION 5		ANTENNA POSITION 6		ANTENNA POSITION 7	
Existing Antenna?														
ANTENNA MAKE - MODEL	QS66512-2													
ANTENNA VENDOR	Quintel													
ANTENNA SIZE (H x W x D)	72X12X9.6													
ANTENNA WEIGHT	111													
AZIMUTH	150													
MAGNETIC DECLINATION														
RADIATION CENTER (feet)	160													
ANTENNA TIP HEIGHT	162													
MECHANICAL DOWNTILT	0													
FEEDER AMOUNT	2													
VERTICAL SEPARATION from ANTENNA ABOVE (TIP to TIP)														
VERTICAL SEPARATION from ANTENNA BELOW (TIP to TIP)														
HORIZONTAL SEPARATION from CLOSEST ANTENNA to LEFT (CENTERLINE to CENTERLINE)														
HORIZONTAL SEPARATION from CLOSEST ANTENNA to RIGHT (CENTERLINE to CENTERLINE)														
HORIZONTAL SEPARATION from ANOTHER ANTENNA (which antenna # / # of inches)														
Antenna RET Motor (QTY/MODEL)		Built-in												
SURGE ARRESTOR (QTY/MODEL)	4	Andrew APTDC-BDFDM-DB												
DIPLEXER (QTY/MODEL)	4	CCI Pentaplexer 5PX-0726-O												
DUPLEXER (QTY/MODEL)														
Antenna RET CONTROL UNIT (QTY/MODEL)														
DC BLOCK (QTY/MODEL)														
TMA/LNA (QTY/MODEL)	2	Kaelus TMA2117F00V1-1 (Twin PCS-WCS w/700/850 BP)												
CURRENT INJECTORS FOR TMA (QTY/MODEL)														
PDU FOR TMAS (QTY/MODEL)														
FILTER (QTY/MODEL)														
SQUID (QTY/MODEL)														
FIBER TRUNK (QTY/MODEL)														
DC TRUNK (QTY/MODEL)														
RRH - 700 band (QTY/MODEL)														
RRH - 850 band (QTY/MODEL)														
RRH - 1900 band (QTY/MODEL)														
RRH - AWS band (QTY/MODEL)														
RRH - WCS band (QTY/MODEL)	1	RRUS-32												
Additional RRH #1 - any band (QTY/MODEL)														
Additional RRH #2 - any band (QTY/MODEL)														
Additional Component1 (QTY/MODEL)														
Additional Component2 (QTY/MODEL)														
Additional Component3 (QTY/MODEL)														
Local Market Note1	LTE 3C will be Bronze standard as WCS on this site// Replace existing GSM antenna with 12port antenna//Install RRUS 32 and add 2 coax per sector along with 4 pentaplexers// Install XMU in DUS41 //													
Local Market Note2	Baseband Config- 1 DUS + XMU DUS-1- 7A:7B:7C:X1P1:X1P2:_ XMU-1- PA:_:WA:PB:PC:_:WC:WB:_:_:_:_:_:_:D1E:D1D													
Local Market Note3														

PORT SPECIFIC FIELDS	PORT NUMBER	USEID (CSSng)	USEID (Atoll)	ATOLL TXID	ATOLL CELL ID	TX/RX ?	TECHNOLOGY/FREQUENCY	ANTENNA ATOLL	ANTENNA GAIN	ELECTRICAL AZIMUTH	ELECTRICAL TILT	RRH LOCATION (Top/Bottom/Integrated/None)	FEEDERS TYPE	FEEDER LENGTH (feet)	RXAIT KIT MODULE?	TRIPLEXER or LLC (QTY)	TRIPLEXER or LLC (MODEL)	SCPA/MCPA MODULE?	HATCHPLATE POWER (Watts)	ERP (Watts)	Antenna RET Name	CABLE NUMBER	CABLE ID (CSSNG)
ANTENNA POSITION 1	**PORT 4**		16687.B.WCS.4G.1	CTL05089_3B_1	CTL05089_3B_1		LTE WCS	QS66512-2_2350MHz_03DT	16.9	150	3	Bottom	Andrew 1-5/8	185						2421.029			

Section 16C - NEW/PROPOSED SECTOR/CELL INFORMATION - SECTOR C

ANTENNA COMMON FIELDS	ANTENNA POSITION 1		ANTENNA POSITION 2		ANTENNA POSITION 3		ANTENNA POSITION 4		ANTENNA POSITION 5		ANTENNA POSITION 6		ANTENNA POSITION 7	
Existing Antenna?														
ANTENNA MAKE - MODEL	QS66512-2													
ANTENNA VENDOR	Quintel													
ANTENNA SIZE (H x W x D)	72X12X9.6													
ANTENNA WEIGHT	111													
AZIMUTH	270													
MAGNETIC DECLINATION														
RADIATION CENTER (feet)	160													
ANTENNA TIP HEIGHT	162													
MECHANICAL DOWNTILT	0													
FEEDER AMOUNT	2													
VERTICAL SEPARATION from ANTENNA ABOVE (TIP to TIP)														
VERTICAL SEPARATION from ANTENNA BELOW (TIP to TIP)														
HORIZONTAL SEPARATION from CLOSEST ANTENNA to LEFT (CENTERLINE to CENTERLINE)														
HORIZONTAL SEPARATION from CLOSEST ANTENNA to RIGHT (CENTERLINE to CENTERLINE)														
HORIZONTAL SEPARATION from ANOTHER ANTENNA (which antenna # / # of inches)														
Antenna RET Motor (QTY/MODEL)		Built-in												
SURGE ARRESTOR (QTY/MODEL)	4	Andrew APTDC-BDFDM-DB												
DIPLEXER (QTY/MODEL)	4	CCI Pentaplexer 5PX-0726-O												
DUPLEXER (QTY/MODEL)														
Antenna RET CONTROL UNIT (QTY/MODEL)														
DC BLOCK (QTY/MODEL)														
TMA/LNA (QTY/MODEL)	2	Kaelus TMA2117F00V1-1 (Twin PCS-WCS w/700/850 BP)												
CURRENT INJECTORS FOR TMA (QTY/MODEL)														
PDU FOR TMAS (QTY/MODEL)														
FILTER (QTY/MODEL)														
SQUID (QTY/MODEL)														
FIBER TRUNK (QTY/MODEL)														
DC TRUNK (QTY/MODEL)														
RRH - 700 band (QTY/MODEL)														
RRH - 850 band (QTY/MODEL)														
RRH - 1900 band (QTY/MODEL)														
RRH - AWS band (QTY/MODEL)														
RRH - WCS band (QTY/MODEL)	1	RRUS-32												
Additional RRH #1 - any band (QTY/MODEL)														
Additional RRH #2 - any band (QTY/MODEL)														
Additional Component1 (QTY/MODEL)														
Additional Component2 (QTY/MODEL)														
Additional Component3 (QTY/MODEL)														
Local Market Note1	LTE 3C will be Bronze standard as WCS on this site// Replace existing GSM antenna with 12port antenna//Install RRUS 32 and add 2 coax per sector along with 4 pentaplexers// Install XMU in DUS41 //													
Local Market Note2	Baseband Config- 1 DUS + XMU DUS-1- 7A:7B:7C:X1P1:X1P2:_ XMU-1- PA:_:WA:PB:PC:_:WC:WB:_:_:_:_:_:_:D1E:D1D													
Local Market Note3														

PORT SPECIFIC FIELDS	PORT NUMBER	USEID (CSSng)	USEID (Atoll)	ATOLL TXID	ATOLL CELL ID	TX/RX ?	TECHNOLOGY/FREQUENCY	ANTENNA ATOLL	ANTENNA GAIN	ELECTRICAL AZIMUTH	ELECTRICAL TILT	RRH LOCATION (Top/Bottom/Integrated/None)	FEEDERS TYPE	FEEDER LENGTH (feet)	RXAIT KIT MODULE?	TRIPLEXER or LLC (QTY)	TRIPLEXER or LLC (MODEL)	SCPA/MCPA MODULE?	HATCHPLATE POWER (Watts)	ERP (Watts)	Antenna RET Name	CABLE NUMBER	CABLE ID (CSSNG)
ANTENNA POSITION 1	PORT 4		16687.C.WCS.4G.1	CTL05089_3C_1	CTL05089_3C_1		LTE WCS	QS66512-2_2350MHz_03DT	16.9	270	3	Bottom	Andrew 1-5/8	185						2421.029			

Section 17A - FINAL SECTOR/CELL INFORMATION - SECTOR A (OR OMNI)

ANTENNA COMMON FIELDS	ANTENNA POSITION 1		ANTENNA POSITION 2		ANTENNA POSITION 3		ANTENNA POSITION 4		ANTENNA POSITION 5		ANTENNA POSITION 6		ANTENNA POSITION 7	
ANTENNA MAKE - MODEL	QS66512-2													
ANTENNA VENDOR	Quintel													
ANTENNA SIZE (H x W x D)	72X12X9.6													
ANTENNA WEIGHT	111													
AZIMUTH	30													
MAGNETIC DECLINATION														
RADIATION CENTER (feet)	160													
ANTENNA TIP HEIGHT	162													
MECHANICAL DOWNTILT	0													
FEEDER AMOUNT	4													
VERTICAL SEPARATION from ANTENNA ABOVE (TIP to TIP)														
VERTICAL SEPARATION from ANTENNA BELOW (TIP to TIP)														
HORIZONTAL SEPARATION from CLOSEST ANTENNA to LEFT (CENTERLINE to CENTERLINE)														
HORIZONTAL SEPARATION from CLOSEST ANTENNA to RIGHT (CENTERLINE to CENTERLINE)														
HORIZONTAL SEPARATION from ANOTHER ANTENNA (which antenna # / # of inches)														
Antenna RET Motor (QTY/MODEL)		Built-in												
SURGE ARRESTOR (QTY/MODEL)	8	Andrew APTDC-BDFDM-DB												
DIPLEXER (QTY/MODEL)	4	CCI Pentaplexer 5PX-0726-O												
DUPLEXER (QTY/MODEL)														
Antenna RET CONTROL UNIT (QTY/MODEL)		LTE RRH												
DC BLOCK (QTY/MODEL)														
TMA/LNA (QTY/MODEL)	2	Kaelus TMA2117F00V1-1 (Twin PCS-WCS w/700/850 BP)												
CURRENT INJECTORS FOR TMA (QTY/MODEL)														
PDU FOR TMAS (QTY/MODEL)	1	Powerwave 7070												
FILTER (QTY/MODEL)														
SQUID (QTY/MODEL)														
FIBER TRUNK (QTY/MODEL)														
DC TRUNK (QTY/MODEL)														
RRH - 700 band (QTY/MODEL)	1	RRUS-11												
RRH - 850 band (QTY/MODEL)	1	RRUS-12												
RRH - 1900 band (QTY/MODEL)	1	RRUS-11												
RRH - AWS band (QTY/MODEL)														
RRH - WCS band (QTY/MODEL)	1	RRUS-32												
Additional RRH #1 - any band (QTY/MODEL)														
Additional RRH #2 - any band (QTY/MODEL)														
Additional Component1 (QTY/MODEL)														
Additional Component2 (QTY/MODEL)														
Additional Component3 (QTY/MODEL)														
Local Market Note1	LTE 3C will be Bronze standard as WCS on this site// Replace existing GSM antenna with 12port antenna//Install RRUS 32 and add 2 coax per sector along with 4 pentaplexers// Install XMU in DUS41 //													
Local Market Note2														
Local Market Note3	Baseband Config- 1 DUS + XMUDUS-1- 7A:7B:7C:X1P1:X1P2:_XMU-1- PA:_:WA:PB:PC:_:WC:WB:_:_:_:_:_:_:D1E:D1D													

PORT SPECIFIC FIELDS	PORT NUMBER	USEID (CSSng)	USEID (Atoll)	ATOLL TXID	ATOLL CELL ID	TX/RX ?	TECHNOLOGY/FREQUENCY	ANTENNA ATOLL	ANTENNA GAIN	ELECTRICAL AZIMUTH	ELECTRICAL TILT	RRH LOCATION (Top/Bottom/ Integrated/None)	FEEDERS TYPE	FEEDER LENGTH (feet)	RXAIT KIT MODULE?	TRIPLEXER or LLC (QTY)	TRIPLEXER or LLC (MODEL)	SCPA/MCPA MODULE?	HATCHPLATE POWER (Watts)	ERP (Watts)	Antenna RET Name	CABLE NUMBER	CABLE ID (CSSNG)
ANTENNA POSITION 1	PORT 1	16687.A.1900.25G.1,16687.A.850.3G.2	16687.A.850.3G.222	CTV40891	CTV40891		UMTS 850	QS66512-2_849MHz_00DT	13.3	30	0	Bottom	Andrew 1-5/8	185				NO		818.46		1	
	PORT 2	16687.A.850.3G.tmp2	16687.A.850.3G.333	CTV40891	CTV4089A		UMTS 850	QS66512-2_849MHz_00DT	13.3	30	0	Bottom	Andrew 1-5/8	185				NO		818.46		1	
	PORT 3	16687.A.1900.4G.1	16687.A.1900.4G.1	CTL05089_9A_1	CTL05089_9A_1		LTE 1900	QS66512-2_1930MHz_03DT	15.9	30	3	Bottom	Andrew 1-5/8	185						1655.7699		2	
	PORT 4	16687.A.WCS.4G.tmp1	16687.A.WCS.4G.1	CTL05089_3A_1	CTL05089_3A_1		LTE WCS	QS66512-2_2350MHz_03DT	16.9	30	3	Bottom	Andrew 1-5/8	185						1044.7202		2	
	PORT 5	16687.A.700.4G.1	16687.A.700.4G.1	CTL05089_7A_1	CTL05089_7A_1		LTE 700	QS66512-2_719MHz_04DT	12.7	30	4	Bottom	Andrew 1-5/8	185						574.1164		1	

Section 17B - FINAL SECTOR/CELL INFORMATION - SECTOR B

ANTENNA COMMON FIELDS	ANTENNA POSITION 1		ANTENNA POSITION 2		ANTENNA POSITION 3		ANTENNA POSITION 4		ANTENNA POSITION 5		ANTENNA POSITION 6		ANTENNA POSITION 7	
ANTENNA MAKE - MODEL	QS66512-2													
ANTENNA VENDOR	Quintel													
ANTENNA SIZE (H x W x D)	72X12X9.6													
ANTENNA WEIGHT	111													
AZIMUTH	150													
MAGNETIC DECLINATION														
RADIATION CENTER (feet)	160													
ANTENNA TIP HEIGHT	162													
MECHANICAL DOWNTILT	0													
FEEDER AMOUNT	4													
VERTICAL SEPARATION from ANTENNA ABOVE (TIP to TIP)														
VERTICAL SEPARATION from ANTENNA BELOW (TIP to TIP)														
HORIZONTAL SEPARATION from CLOSEST ANTENNA to LEFT (CENTERLINE to CENTERLINE)														
HORIZONTAL SEPARATION from CLOSEST ANTENNA to RIGHT (CENTERLINE to CENTERLINE)														
HORIZONTAL SEPARATION from ANOTHER ANTENNA (which antenna # / # of inches)														
Antenna RET Motor (QTY/MODEL)		Built-in												
SURGE ARRESTOR (QTY/MODEL)	8	Andrew APTDC-BDFDM-DB												
DIPLEXER (QTY/MODEL)	4	CCI Pentaplexer 5PX-0726-O												
DUPLEXER (QTY/MODEL)														
Antenna RET CONTROL UNIT (QTY/MODEL)														
DC BLOCK (QTY/MODEL)														
TMA/LNA (QTY/MODEL)	2	Kaelus TMA2117F00V1-1 (Twin PCS-WCS w/700/850 BP)												
CURRENT INJECTORS FOR TMA (QTY/MODEL)														
PDU FOR TMAS (QTY/MODEL)														
FILTER (QTY/MODEL)														
SQUID (QTY/MODEL)														
FIBER TRUNK (QTY/MODEL)														
DC TRUNK (QTY/MODEL)														
RRH - 700 band (QTY/MODEL)	1	RRUS-11												
RRH - 850 band (QTY/MODEL)	1	RRUS-12												
RRH - 1900 band (QTY/MODEL)	1	RRUS-11												
RRH - AWS band (QTY/MODEL)														
RRH - WCS band (QTY/MODEL)	1	RRUS-32												
Additional RRH #1 - any band (QTY/MODEL)														
Additional RRH #2 - any band (QTY/MODEL)														
Additional Component1 (QTY/MODEL)														
Additional Component2 (QTY/MODEL)														
Additional Component3 (QTY/MODEL)														
Local Market Note1	LTE 3C will be Bronze standard as WCS on this site// Replace existing GSM antenna with 12port antenna//Install RRUS 32 and add 2 coax per sector along with 4 pentaplexers// Install XMU in DUS41 //													
Local Market Note2														
Local Market Note3	Baseband Config- 1 DUS + XMUDUS-1- 7A:7B:7C:X1P1:X1P2:_XMU-1- PA:_:WA:PB:PC:_:WC:WB:_:_:_:_:_:_:D1E:D1D													

PORT SPECIFIC FIELDS	PORT NUMBER	USEID (CSSng)	USEID (Atoll)	ATOLL TXID	ATOLL CELL ID	TX/RX ?	TECHNOLOGY/FREQUENCY	ANTENNA ATOLL	ANTENNA GAIN	ELECTRICAL AZIMUTH	ELECTRICAL TILT	RRH LOCATION (Top/Bottom/ Integrated/None)	FEEDERS TYPE	FEEDER LENGTH (feet)	RXAIT KIT MODULE?	TRIPLEXER or LLC (QTY)	TRIPLEXER or LLC (MODEL)	SCPA/MCPA MODULE?	HATCHPLATE POWER (Watts)	ERP (Watts)	Antenna RET Name	CABLE NUMBER	CABLE ID (CSSNG)
ANTENNA POSITION 1	PORT 1	16687.B.1900.25G.1,16687.B.850.3G.2	16687.B.850.3G.222	CTV40892	CTV40892		UMTS 850	QS66512-2_849MHz_00DT	13.3	150	0	Bottom	Andrew 1-5/8	185				NO		818.46		9	
	PORT 2	16687.B.850.3G.tmp2	16687.B.850.3G.333	CTV40892	CTV4089B		UMTS 850	QS66512-2_849MHz_00DT	13.3	150	0	Bottom	Andrew 1-5/8	185				NO		818.46		9	
	PORT 3	16687.B.1900.4G.1	16687.B.1900.4G.1	CTL05089_9B_1	CTL05089_9B_1		LTE 1900	QS66512-2_1930MHz_02DT	15.8	150	2	Bottom	Andrew 1-5/8	185						1655.7699		10	
	PORT 4	16687.B.WCS.4G.tmp1	16687.B.WCS.4G.1	CTL05089_3B_1	CTL05089_3B_1		LTE WCS	QS66512-2_2350MHz_03DT	16.9	150	3	Bottom	Andrew 1-5/8	185						1044.7202		10	
	PORT 5	16687.B.700.4G.1	16687.B.700.4G.1	CTL05089_7B_1	CTL05089_7B_1		LTE 700	QS66512-2_719MHz_10DT	12.5	150	10	Bottom	Andrew 1-5/8	185						574.1164		9	

Section 17C - FINAL SECTOR/CELL INFORMATION - SECTOR C

ANTENNA COMMON FIELDS	ANTENNA POSITION 1		ANTENNA POSITION 2		ANTENNA POSITION 3		ANTENNA POSITION 4		ANTENNA POSITION 5		ANTENNA POSITION 6		ANTENNA POSITION 7	
ANTENNA MAKE - MODEL	QS66512-2													
ANTENNA VENDOR	Quintel													
ANTENNA SIZE (H x W x D)	72X12X9.6													
ANTENNA WEIGHT	111													
AZIMUTH	270													
MAGNETIC DECLINATION														
RADIATION CENTER (feet)	160													
ANTENNA TIP HEIGHT	162													
MECHANICAL DOWNTILT	0													
FEEDER AMOUNT	4													
VERTICAL SEPARATION from ANTENNA ABOVE (TIP to TIP)														
VERTICAL SEPARATION from ANTENNA BELOW (TIP to TIP)														
HORIZONTAL SEPARATION from CLOSEST ANTENNA to LEFT (CENTERLINE to CENTERLINE)														
HORIZONTAL SEPARATION from CLOSEST ANTENNA to RIGHT (CENTERLINE to CENTERLINE)														
HORIZONTAL SEPARATION from ANOTHER ANTENNA (which antenna # / # of inches)														
Antenna RET Motor (QTY/MODEL)		Built-in												
SURGE ARRESTOR (QTY/MODEL)	8	Andrew APTDC-BDFDM-DB												
DIPLEXER (QTY/MODEL)	4	CCI Pentaplexer 5PX-0726-O												
DUPLEXER (QTY/MODEL)														
Antenna RET CONTROL UNIT (QTY/MODEL)														
DC BLOCK (QTY/MODEL)														
TMA/LNA (QTY/MODEL)	2	Kaelus TMA2117F00V1-1 (Twin PCS-WCS w/700/850 BP)												
CURRENT INJECTORS FOR TMA (QTY/MODEL)														
PDU FOR TMAS (QTY/MODEL)														
FILTER (QTY/MODEL)														
SQUID (QTY/MODEL)														
FIBER TRUNK (QTY/MODEL)														
DC TRUNK (QTY/MODEL)														
RRH - 700 band (QTY/MODEL)	1	RRUS-11												
RRH - 850 band (QTY/MODEL)	1	RRUS-12												
RRH - 1900 band (QTY/MODEL)	1	RRUS-11												
RRH - AWS band (QTY/MODEL)														
RRH - WCS band (QTY/MODEL)	1	RRUS-32												
Additional RRH #1 - any band (QTY/MODEL)														
Additional RRH #2 - any band (QTY/MODEL)														
Additional Component1 (QTY/MODEL)														
Additional Component2 (QTY/MODEL)														
Additional Component3 (QTY/MODEL)														
Local Market Note1	LTE 3C will be Bronze standard as WCS on this site// Replace existing GSM antenna with 12port antenna//Install RRUS 32 and add 2 coax per sector along with 4 pentaplexers// Install XMU in DUS41 //													
Local Market Note2														
Local Market Note3	Baseband Config- 1 DUS + XMUDUS-1- 7A:7B:7C:X1P1:X1P2:_XMU-1- PA:_:WA:PB:PC:_:WC:WB:_:_:_:_:_:_:D1E:D1D													

PORT SPECIFIC FIELDS	PORT NUMBER	USEID (CSSng)	USEID (Atoll)	ATOLL TXID	ATOLL CELL ID	TX/RX ?	TECHNOLOGY/FREQUENCY	ANTENNA ATOLL	ANTENNA GAIN	ELECTRICAL AZIMUTH	ELECTRICAL TILT	RRH LOCATION (Top/Bottom/ Integrated/None)	FEEDERS TYPE	FEEDER LENGTH (feet)	RXAIT KIT MODULE?	TRIPLEXER or LLC (QTY)	TRIPLEXER or LLC (MODEL)	SCPA/MCPA MODULE?	HATCHPLATE POWER (Watts)	ERP (Watts)	Antenna RET Name	CABLE NUMBER	CABLE ID (CSSNG)
ANTENNA POSITION 1	PORT 1	16687.C.1900.25G.1,16687.C.850.3G.2	16687.C.850.3G.222	CTV40893	CTV40893		UMTS 850	QS66512-2_849MHz_00DT	13.3	270	0	Bottom	Andrew 1-5/8	185				NO		818.46		17	
	PORT 2	16687.C.850.3G.tmp2	16687.C.850.3G.333	CTV40893	CTV4089C		UMTS 850	QS66512-2_849MHz_00DT	13.3	270	0	Bottom	Andrew 1-5/8	185				NO		818.46		17	
	PORT 3	16687.C.1900.4G.1	16687.C.1900.4G.1	CTL05089_9C_1	CTL05089_9C_1		LTE 1900	QS66512-2_1930MHz_02DT	15.8	270	3	Bottom	Andrew 1-5/8	185						1655.7699		18	
	PORT 4	16687.C.WCS.4G.tmp1	16687.C.WCS.4G.1	CTL05089_3C_1	CTL05089_3C_1		LTE WCS	QS66512-2_2350MHz_03DT	16.9	270	3	Bottom	Andrew 1-5/8	185						1044.7202		18	
	PORT 5	16687.C.700.4G.1	16687.C.700.4G.1	CTL05089_7C_1	CTL05089_7C_1		LTE 700	QS66512-2_719MHz_02DT	12.7	270	2	Bottom	Andrew 1-5/8	185						574.1164		17	

Diagram - Sector A Diagram File Name - CT5089_ABC_LTE3C_WCS_Rev1.vsd

Atoll Site Name - CTU5089 Location Name - TRUMBULL SOUTH Market - CONNECTICUT Market Cluster - NEW ENGLAND

Comments:

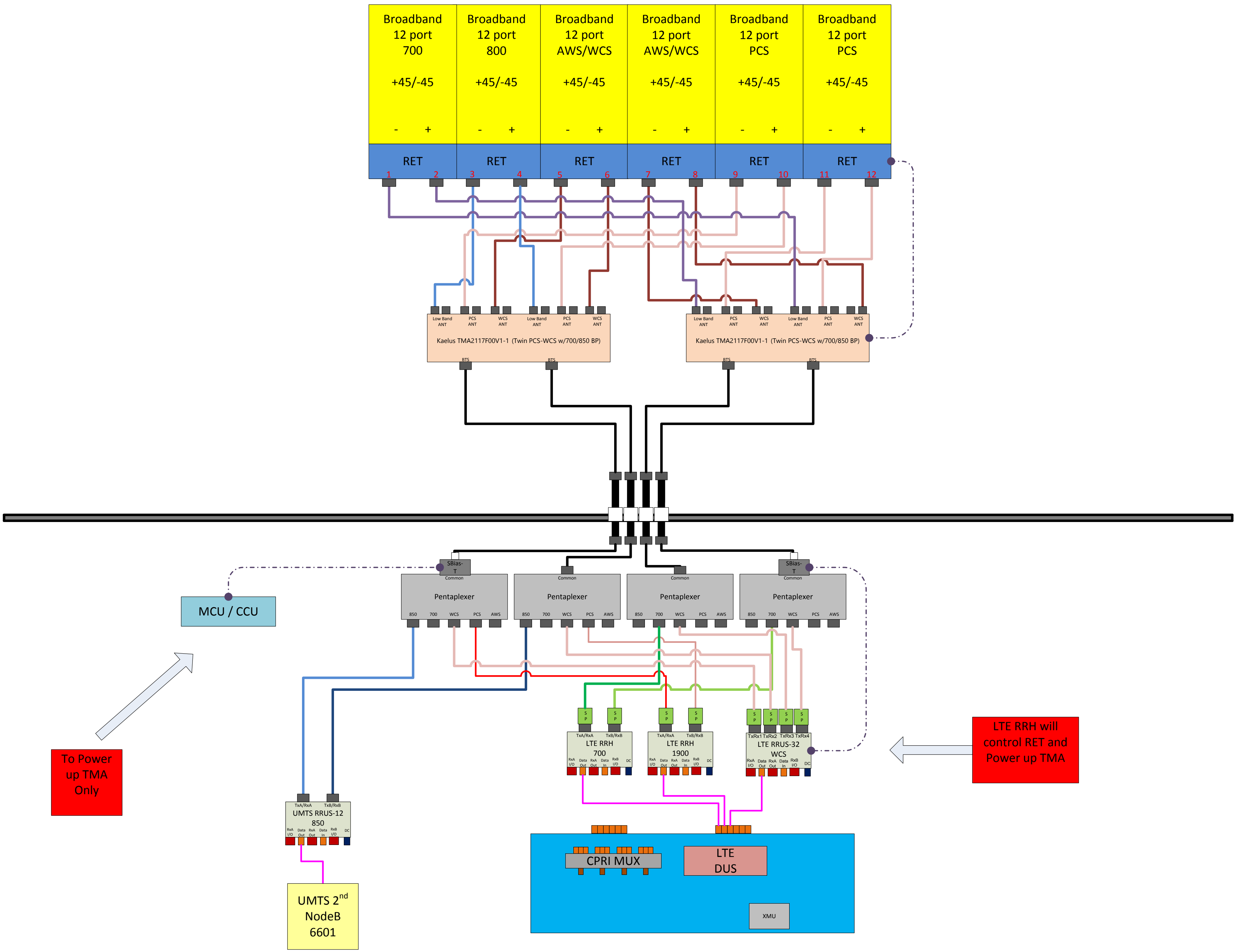


Diagram - Sector B | Diagram File Name - CT5089_ABC_LTE3C_WCS_Rev1.vsd

Atoll Site Name - CTU5089 | Location Name - TRUMBULL SOUTH | Market - CONNECTICUT | Market Cluster - NEW ENGLAND

Comments:

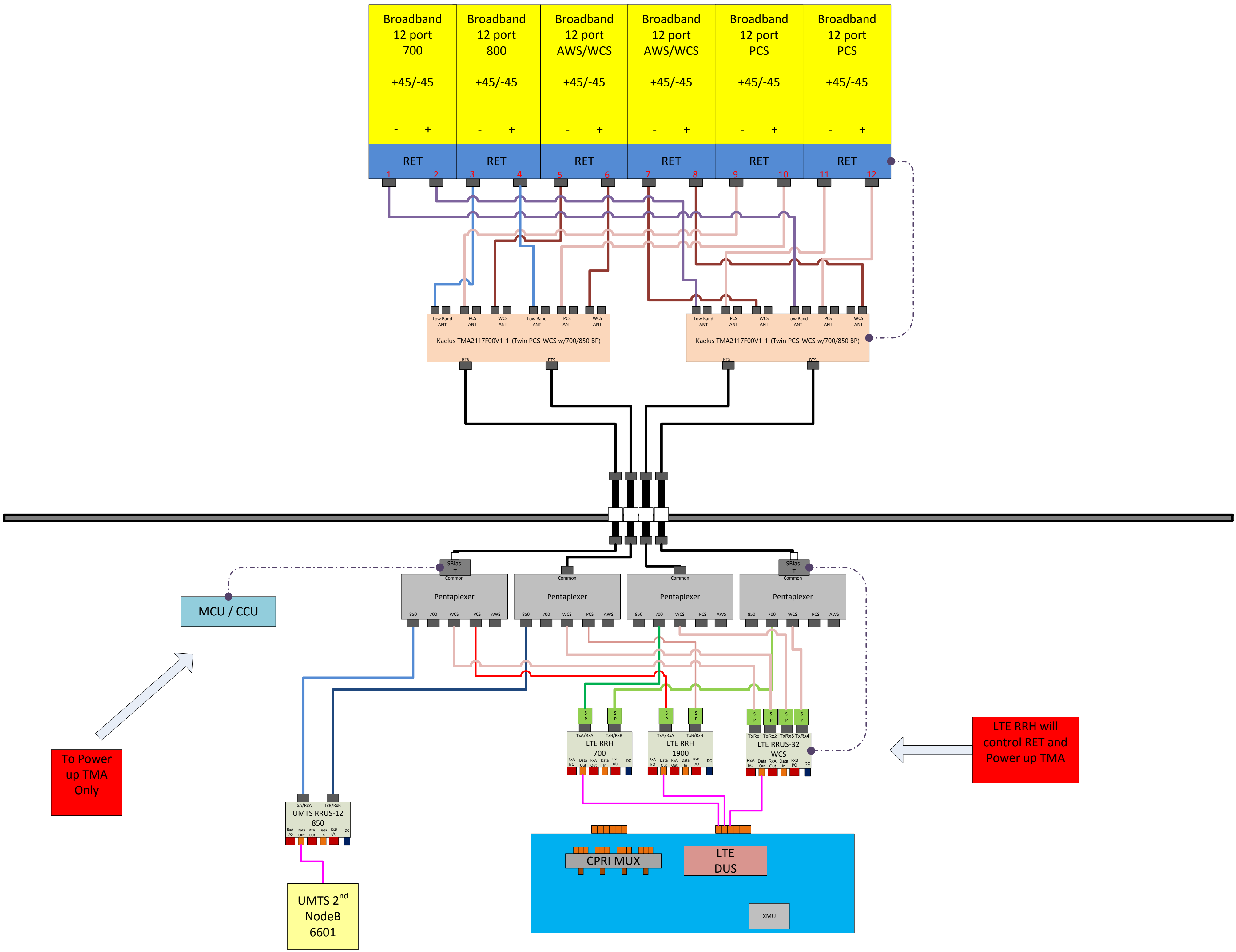
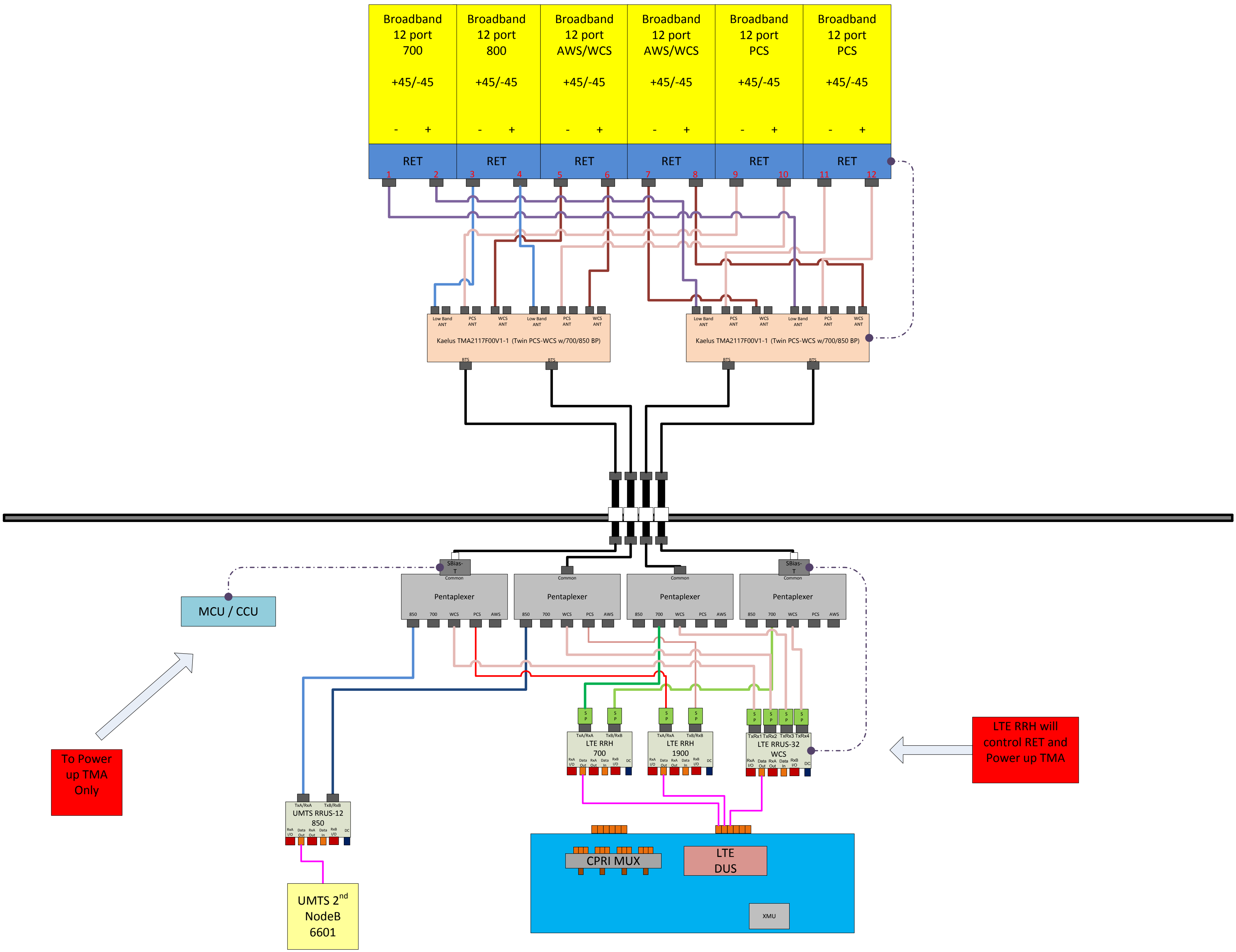


Diagram - Sector C Diagram File Name - CT5089_ABC_LTE3C_WCS_Rev1.vsd

Atoll Site Name - CTU5089 Location Name - TRUMBULL SOUTH Market - CONNECTICUT Market Cluster - NEW ENGLAND

Comments:



NOTES			
Date Time (Central)	Version	ATTUID	Note
3/22/2016 9:15:16 AM	1.00	dr701e	Updated RFDS with PACE number
6/9/2016 12:59:26 PM	1.00	mm093q	Updated Revision from Preliminary to Final. Added WCS in Sec1 LTE Carriers. No changes made which could effect the scope of work.

WORKFLOW SUMMARY						
Date	FROM State / Status	FROM ATTUID	TO State / Status	TO ATTUID	Operation	Comments
03/23/2016	Preliminary / In Progress	om636a	Preliminary / Submitted for Approval	AB014M	Promote	LTE Preliminary RFDS
04/14/2016	Preliminary / Submitted for Approval	AB014M	Preliminary / Approved	BG144B	Promote	
06/09/2016	Preliminary / Approved	BG144B	Final / RF Approval	MM093Q	Promote	Needs Final
06/09/2016	Final / RF Approval	MM093Q	Final / Approved	BG144B	Promote	LTE FINAL RFDS
06/10/2016	Final / Approved	BG144B	Final / Modification Recommended	OM636a	Demote	different Notes in section 16. Please make one which reflects PD
06/15/2016	Final / Modification Recommended	OM636a	Final / Approved	BG144B	Promote	

QS66512-2

6ft 65^{o} XXX MultiServ^{TM} 12-Port Antenna

2x698-806*MHz / 2x824-894MHz / 4x1850-1990MHz / 4x1695-1780+2110-2400MHz

- Provides 12 antenna Ports in a slim-line form factor
- Optimized Azimuth patterns for Min Inter-Sector Interference
- Industry leading Minimal Wind-Load design
- 700, 850, PCS, AWS & WCS bands in one antenna
- AISG & 3GPP compliant internal remote electrical tilt (RET)
- AWS & PCS Cross band PIM >159dBc

The Quintel MultiServ^{TM} Multiband 12 Port Antenna with patented QTilt™ technology uniquely delivers four independent services in a single slim-line antenna. This enables existing antenna network sites to be upgraded constraint free to add new services such as LTE for 700, 850, PCS, AWS and WCS bands with the replacement of one antenna. The QS66512-2 also provides 4x1695-1780+2110-2400MHz & 4x1850-1990MHz ports as two side-by-side (CLA-2X) arrays, each set of 4 ports having independent tilt for connection to 2T4R/4T4R services.

Electrical Characteristics	2x Ports 1&2	2x Ports 3&4	4x Ports 5-8			4 Ports 9-12
Operating Frequency (MHz	**698-806***	**824-894**	**1695-1780 and 2110-2400**			**1850-1990**
	698-806	824-894	1695-1780	2110-2180	2300-2400	1850-1990
Azimuth beamwidth[1]	67^{o}	64^{o}	68^{o}	63^{o}	58^{o}	69^{o}
Elevation beamwidth[1]	12^{o}	10^{o}	6.5^{o}	5.5^{o}	4.5^{o}	5.5^{o}
Gain[1] (dBi)	13.2	13.5	16.2	16.5	17.0	16.0
Polarization	±45^{o}	±45^{o}	±45^{o} ±45^{o}			±45^{o} ±45^{o}
Electrical down-tilt range	2^{o}-10^{o}	2^{o}-10^{o}	2^{o} – 7^{o}			2^{o} – 7^{o}
Upper SLL (20^{o} > mainbeam)[1]	-17dB	-19dB	-18dB	-18B	-18dB	-16dB
Front to Back Ratio(180^{o}±10^{o})[1]	≥27dB	≥29dB	≥28dB	≥28dB	≥28dB	≥27dB
Port to Port isolation[1]	≥28dB	≥30dB	≥30dB	≥30dB	≥30dB	≥30dB
Return loss (VSWR)	14dB(1.5)	14dB(1.5)	14dB(1.5)	14dB(1.5)	14dB (1.5)	14dB(1.5)
X Polar Discrimination (at 0^{o})	>18dB	>16dB	>20dB	>20dB	>18dB	>20dB
Max Power handling (per any port)	500 watts	500 watts	250 watts			250 watts
Total Composite Power (all ports)	1750 watts					
PIM (3rd Order) (2x43dBm)	>153dBc	>153dBc	>153dBc			>153dBc
XBand PIM (3rd Order) (2x43dBm)			>159dBc			

*[1] Typical Performance across frequency and Downtilt. *Products Ordered after Jan 2016 will be 698-806MHz*

Mechanical Characteristics	
Dimensions	L 72"(1828mm) x W 12"(304mm) x D 9.6"(245mm)
Weight (excl mounting brackets)	111lbs (50.3kg)
No. of Connectors	12x 4.3-10.0 DIN Female Long Neck
Max Wind Speed	150mph (67m/s)
Equivalent Flat Plate Area	2.96ft^{2} (0.275m^{2})
Wind Load @160km/h (45m/s)	Front: 587N (132 lbs), Side: 382N (86 lbs)
Operating Temperature	-40°C to +65°C

Fully Integrated RET Characteristics	
AISG Standards	V1.1,V 2.0 and 3GPP
Factory Default	AISG 2.0
Surge immunity	IEC 61000-4-5:2005 4KV(AISG PIN)
Device Type	SRET Type 1
AISG Data rate	9.6 kbps
No of connectors	1in/1out.
Connector type	IEC 60130-9 (Ed 3.0)
MTBF	36,000 Operational moves

All specifications are subject to change without notice. Please contact your Quintel representative for complete information.

TMA2117F00V1-1

PCS / WCS Dual Band Twin TMA, with 700/850 bypass, AISG2.0

Designed to be deployed in co-located PCS & WCS systems with wideband antennas, the Kaelus TMA provides internal diplexing and gain in both bands while allowing 700/850 services to pass through to a separate antenna, thereby saving hardware costs.

PRODUCT FEATURES

- Improved base station sensitivity through gain in PCS and WCS bands
- Hardware and software configuration using AISG "Personality" upload
- High Linearity and low noise performance; Bypass provided for 700/850MHz services
- Fail safe bypass mode with lightning protection

TECHNICAL SPECIFICATIONS

Downlink Path, Band 1	PCS
Passband	1930 - 1990
Insertion Loss	0.5dB typ
Return Loss	18dB min
Max Average input power (W)	160
Max PEP Input Power (W)	2000
Intermodulation, 2 x 43dBm TX carriers (dBc)	-153dBc max
Uplink Path, Band 1	
Passband	1850 - 1910
Gain (dB)	3dB to 13dB in 1dB steps
Gain window	+/- 1dB max
Return Loss (Operating)	18dB min
Return Loss (Bypass)	12dB min
Noise Figure	1.4dB typ
Bypass Loss	2.5dB typ

Supply Current, alarm mode	320 +/- 30mA per port (programmable)

AISG MODE OF OPERATION (AUTO SELECTED ON VALID AISG 2.0 FRAMES)

AISG Version	2
AISG Supply Current	400mA @ 8.5V, 120mA @ 30V typical
AISG Connector	IEC60130-9, 8-pin female
AISG Connector Current rating	< 4A peak, 2A continuous, pin 6
Field firmware upgradable	Yes

ENVIRONMENTAL

Temperature range	-40ºC to +65ºC | -40º to +149ºF
Environmental sealing	IP67
Lightning protection	RF port: +/- 5kA max (8/20us), AISG port: +/- 2kA max (8/20us) IEC61312-1
MTBF	>1,000,000 hours
Compliance	EMC:EN301 489, Ingress ETSI EN 300 019 class 4.1, RoHS

MECHANICAL

Connectors	DIN 4.3-10 (F) x 8 long shank, AISG (F) x 1
Dimensions, H x D x W	216 x 300 x 107mm | 8.46 x 11.81 x 4.21in
Finish	Powder coated, light grey (RAL7035)
Weight	8 kg | 17.6lbs est
Mounting	Pole / wall bracket supplied with two metal clamps for 45-178 mm diameter poles

ELECTRICAL BLOCK DIAGRAM

EBI Consulting
environmental | engineering | due diligence

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

AT&T Existing Facility

Site ID: CT5089

Trumbull South
124 Quarry Road
Trumbull, CT 06611

September 9, 2016

EBI Project Number: 6216003968

Site Compliance Summary	
Compliance Status:	**COMPLIANT**
Site total MPE% of FCC general public allowable limit:	**2.53 %**

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

September 9, 2016

AT&T Mobility – New England
Attn: Cameron Syme, RF Manager
550 Cochituate Road
Suite 550 – 13&14
Framingham, MA 06040

Emissions Analysis for Site: **CT5089 – Trumbull South**

EBI Consulting was directed to analyze the proposed AT&T facility located at **124 Quarry Road, Trumbull, CT**, for the purpose of determining whether the emissions from the Proposed AT&T Antenna Installation located on this property are within specified federal limits.

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

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

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

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ($\mu W/cm^2$). The general population exposure limits for the 700 and 850 MHz Bands are approximately 467 $\mu W/cm^2$ and 567 $\mu W/cm^2$ respectively. The general population exposure limit for the 1900 MHz (PCS), 2100 MHz (AWS) and 2300 MHz (WCS) 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 AT&T Wireless antenna facility located at **124 Quarry Road, Trumbull, CT**, using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. Since AT&T 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 (850 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 (1900 MHz (PCS)) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 Watts per Channel.

3) 2 LTE channels (2300 MHz (WCS)) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 Watts per Channel.

4) 2 LTE channels (700 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 Watts per Channel.

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

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

7) The antennas used in this modeling are the **Quintel QS66512-2** for transmission in the 700 MHz, 850 MHz, 1900 MHz (PCS) and 2300 MHz (WCS) frequency bands. This is based on feedback from the carrier with regards to anticipated antenna selection. Maximum gain values for all antennas are listed in the Inventory and Power Data table below. The maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB, was used for all calculations. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.

8) The antenna mounting height centerlines of the proposed antennas are **160 feet** above ground level (AGL) for **Sector A**, **160 feet** above ground level (AGL) for **Sector B** and **160 feet** above ground level (AGL) for Sector C.

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

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

AT&T Site Inventory and Power Data by Antenna

Sector:	A	Sector:	B	Sector:	C
Antenna #:	**1**	Antenna #:	**1**	Antenna #:	**1**
Make / Model:	Quintel QS66512-2	Make / Model:	Quintel QS66512-2	Make / Model:	Quintel QS66512-2
Gain:	11.35 / 13.85 / 14.85/10.85 dBd	Gain:	11.35 / 13.85 / 14.85 / 10.85 dBd	Gain:	11.35 / 13.85 / 14.85 / 10.85 dBd
Height (AGL):	**160 feet**	Height (AGL):	**160 feet**	Height (AGL):	**160 feet**
Frequency Bands	850 MHz / 1900 MHz (PCS) / 2300 MHz (WCS) / 700 MHz	Frequency Bands	850 MHz / 1900 MHz (PCS) / 2300 MHz (WCS) / 700 MHz	Frequency Bands	850 MHz / 1900 MHz (PCS) / 2300 MHz (WCS) / 700 MHz
Channel Count	8	Channel Count	8	Channel Count	8
Total TX Power(W):	420 Watts	Total TX Power(W):	420 Watts	Total TX Power(W):	420 Watts
ERP (W):	8,856.01	ERP (W):	8,856.01	ERP (W):	8,856.01
Antenna A1 MPE%	**1.69 %**	Antenna B1 MPE%	**1.69 %**	Antenna C1 MPE%	**1.69 %**

Site Composite MPE%	
Carrier	**MPE%**
AT&T – Max per sector	**1.69 %**
Sprint	0.84 %
Site Total MPE %:	**2.53 %**

AT&T Sector A Total:	1.69 %
AT&T Sector B Total:	1.69 %
AT&T Sector C Total:	1.69 %
Site Total:	2.53 %

AT&T Max Values Per Sector:

AT&T _ Frequency Band / Technology	# Channels	Watts ERP (Per Channel)	Height (feet)	Total Power Density ($\mu W/cm^2$)	Frequency (MHz)	Allowable MPE ($\mu W/cm^2$)	Calculated % MPE
AT&T 850 MHz UMTS	2	409.37	160	1.24	850 MHz	567	0.22%
AT&T 1900 MHz (PCS) LTE	2	1,455.97	160	4.41	1900 MHz (PCS)	1000	0.44%
AT&T 2300 MHz (WCS) LTE	2	1,832.95	160	5.56	2300 MHz (WCS)	1000	0.56%
AT&T 700 MHz LTE	2	729.71	160	2.21	700 MHz	467	0.47%
						Total:	1.69%

Summary

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

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

AT&T Sector	Power Density Value (%)
Sector A:	1.69 %
Sector B:	1.69 %
Sector C:	1.69 %
AT&T Maximum Total (per sector):	1.69 %
Site Total:	2.53 %
Site Compliance Status:	**COMPLIANT**

The anticipated composite MPE value for this site assuming all carriers present is **2.53 %** of the allowable FCC established general public limit sampled at the ground level. This is based upon values listed in the Connecticut Siting Council database for existing carrier emissions.

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