August 15, 2014

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

Re:	**Notice of Exempt Modification**
	Proposal to Add Three (3) Remote Radio Heads
Property Address:	**33 Boardman Road, New Milford, CT 06776(the "Property")**
Applicant:	**New Cingular Wireless PCS, LLC ("AT&T")**

Dear Ms. Bachman:

AT&T currently maintains a wireless telecommunications facility on an existing 150-foot Monopine tower location on the Property, owned by Quarry Stone & Gravel, LLC. (the "Tower"). AT&T's facility consists of nine (9) wireless telecommunication antennas at a height of 120-feet.

The Connecticut Siting Council (the "Council) approved AT&T's use of the tower in the following prior decisions; EM-CING-096-121108 & EM-CING-096-051007. In its decision dated November 23, 2012, (the "Decision"), the Council approved AT&T to install six (6) Remote Radio Heads ("RRUs"), but AT&T installed only three (3) RRUs. AT&T now intends to install the remaining RRUs to complete the installation. This exempt modification application is necessary because the Decision is over one year old. Please refer to Tab 1 for further specifications of the RRUs.

Please accept this correspondence 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 Mayor of New Milford, CT. A copy of this letter is also being sent to Quarry Stone & Gravel, LLC.

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 proposed modifications will not result in an increase in the height of the Tower. AT&T's new RRUs will be installed at the 120-foot level of the 150-foot Monopine.

33 Boston Post Road West, Marlborough, Massachusetts 01752
p: 508.954.7702 • adam.braillard@smartlinkllc.com
www.smartlinkllc.com

2. The proposed modifications will not involve any changes to ground-mounted equipment and, therefore, will not require and extension of the site boundary.
3. The proposed modifications will not increase the noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.
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. A RF emissions calculation for AT&T's modified facility was provided in the application which led to the - Decision. See Tab 2 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. (See Structural Analysis Report included in Tab 3).

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

Sincerely,

Adam F. Braillard

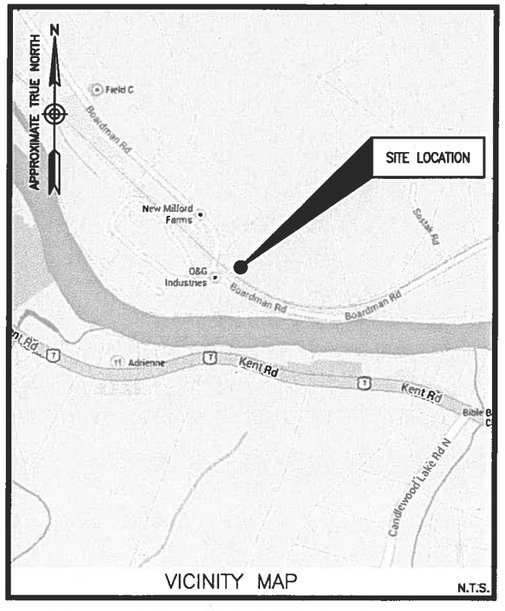
cc:
Quarry Stone & Gravel, LLC
4 Ridgewood Street,
Danbury CT 06810

New Milford Town Hall
10 Main Street,
New Milford, CT 06776

33 Boston Post Road West, Marlborough, Massachusetts 01752
p: 508.954.7702 • adam.braillard@smartlinkllc.com
www.smartlinkllc.com

TAB 1

SITE NAME: NEW MILFORD-BOARDMAN ROAD
SITE NUMBER: CT2001
33 BOARDMAN ROAD,
NEW MILFORD, CT 06776



VICINITY MAP N.T.S.

DIRECTIONS FROM 500 ENTERPRISE DRIVE, ROCKY HILL, CT:

TAKE I-91 S TO I-691 W TO I-84 W. TAKE EXIT 15 FOR US-6 E/CT-67 N. TURN RIGHT ONTO CT-67 N/US-6 E/MAIN ST N. TURN LEFT ONTO CT-67 W/ROXBURY RD. TURN RIGHT ONTO CT-67 W/SOUTHBURY RD. TURN LEFT ONTO CT-317 W/CHURCH ST . CONTINUE ONTO WELLERS BRIDGE RD. TURN LEFT ONTO CT-67 W/BAKER RD. CONTINUE ONTO US-202 W/BRIDGE ST. TURN RIGHT ONTO YOUNGFIELD RD. CONTINUE STRAIGHT ONTO HOUSATONIC AVE. CONTINUE ONTO BOARDMAN RD. TURN RIGHT ONTO COMMERCE RD. SLIGHT LEFT ONTO PANORAMA DR. SITE WILL BE STRAIGHT AHEAD.

SITE COORDINATES:
LATITUDE: N 41° 35' 57.82"
LONGITUDE: W 73° 26' 14.95"
(PER EXISTING FAA 1-A SURVEY)

ELEVATION DATA
GRADE ELEVATION AT TOWER = 566'± A.M.S.L
ELEVATION BASED UPON FIELD SURVEY, NAVD 88

ANTENNA ELEVATION (TO TOP OF ANTENNA)
ALPHA SECTOR: 123'-0"± A.G.L.
BETA SECTOR: 123'-0"± A.G.L.
GAMMA SECTOR: 123'-10"± A.G.L.

SITE INFORMATION

- ADD (1) NEW RRUS-12 PER SECTOR FOR A TOTAL OF (3) NEW RRUS-12'S.

PROJECT DESCRIPTION

SITE NAME:
NEW MILFORD-BOARDMAN ROAD

SITE NUMBER:
CT2001

LOCATION:
33 BOARDMAN ROAD,
NEW MILFORD, CT 06776

APPLICANT/LESSEE:
AT&T MOBILITY
500 ENTERPRISE DRIVE, SUITE 3A
ROCKY HILL, CONNECTICUT 06067

PROJECT INFORMATION

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

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

SHEET NUMBER	DESCRIPTION
T-1	TITLE SHEET
G-1	GENERAL NOTES
C-1	SITE PLAN & EQUIPMENT PLANS
C-2	ANTENNA LAYOUTS & ELEVATIONS
C-3	CONSTRUCTION DETAILS & ANTENNA SCHEDULE
E-1	GROUNDING NOTES & DETAILS

SHEET INDEX

at&t
500 ENTERPRISE DRIVE SUITE 3A
ROCKY HILL, CT 06067

smartlink
1997 ANNAPOLIS EXCHANGE PARKWAY
SUITE 200
ANNAPOLIS, MD 21401

CT2001
NEW MILFORD-BOARDMAN ROAD

CONSTRUCTION DRAWINGS

Q	08/11/14	ISSUED AS REV Q

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

STATE OF CONNECTICUT
JIANG YU
No. 30038
LICENSED PROFESSIONAL ENGINEER

JIANG YU, P.E.
CT LICENSE No. PEN.0023222

DRAWN BY:	FG
REVIEWED BY:	BSH
CHECKED BY:	GHN
PROJECT NUMBER:	50063024
JOB NUMBER:	50063035
SITE ADDRESS:	

33 BOARDMAN ROAD,
NEW MILFORD, CT 06776
LITCHFIELD COUNTY

SHEET TITLE

TITLE SHEET

SHEET NUMBER

T-1

GENERAL NOTES:

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

SITE WORK GENERAL NOTES:

1. THE CONTRACTOR SHALL CONTACT UTILITY LOCATING SERVICES PRIOR TO THE START OF CONSTRUCTION.
2. ALL EXISTING ACTIVE SEWER, WATER, GAS, ELECTRIC, AND OTHER UTILITIES WHERE ENCOUNTERED IN THE WORK, SHALL BE PROTECTED AT ALL TIMES, AND WHERE REQUIRED FOR THE PROPER EXECUTION OF THE WORK, SHALL BE RELOCATED AS DIRECTED BY CONTRACTOR. EXTREME CAUTION SHOULD BE USED BY THE CONTRACTOR WHEN EXCAVATING OR DRILLING PIERS AROUND OR NEAR UTILITIES. CONTRACTOR SHALL PROVIDE SAFETY TRAINING FOR THE WORKING CREW. THIS WILL INCLUDE BUT NOT BE LIMITED TO:
   A) FALL PROTECTION
   B) CONFINED SPACE
   C) ELECTRICAL SAFETY
   D) TRENCHING & EXCAVATION.
3. ALL SITE WORK SHALL BE AS INDICATED ON THE DRAWINGS AND PROJECT SPECIFICATIONS.
4. IF NECESSARY, RUBBISH, STUMPS, DEBRIS, STICKS, STONES, TOP SOIL AND OTHER REFUSE SHALL BE REMOVED FROM THE SITE AND DISPOSED OF LEGALLY.
5. ALL EXISTING INACTIVE SEWER, WATER, GAS, ELECTRIC AND OTHER UTILITIES, WHICH INTERFERE WITH THE EXECUTION OF THE WORK, SHALL BE REMOVED AND/OR CAPPED, PLUGGED OR OTHERWISE DISCONTINUED AT POINTS WHICH WILL NOT INTERFERE WITH THE EXECUTION OF THE WORK, SUBJECT TO THE APPROVAL OF CONTRACTOR, OWNER AND/OR LOCAL UTILITIES.
6. CONTRACTOR SHALL MINIMIZE DISTURBANCE TO EXISTING SITE DURING CONSTRUCTION.
7. THE CONTRACTOR SHALL PROVIDE SITE SIGNAGE IN ACCORDANCE WITH THE AT&T SPECIFICATION FOR SITE SIGNAGE.
8. THE SITE SHALL BE GRADED TO CAUSE SURFACE WATER TO FLOW AWAY FROM THE TRANSMISSION EQUIPMENT AND TOWER AREAS.
9. NO FILL OR EMBANKMENT MATERIAL SHALL BE PLACED ON FROZEN GROUND. FROZEN MATERIALS, SNOW OR ICE SHALL NOT BE PLACED IN ANY FILL OR EMBANKMENT.
10. THE SUB GRADE SHALL BE COMPACTED AND BROUGHT TO A SMOOTH UNIFORM GRADE PRIOR TO FINISHED SURFACE APPLICATION, SEE SOIL COMPACTION NOTES.
11. THE AREAS OF THE OWNER'S PROPERTY DISTURBED BY THE WORK AND NOT COVERED BY THE TOWER, EQUIPMENT OR DRIVEWAY, SHALL BE GRADED TO A UNIFORM SLOPE, AND STABILIZED TO PREVENT EROSION.
12. EROSION CONTROL MEASURES, IF REQUIRED DURING CONSTRUCTION, SHALL BE IN CONFORMANCE WITH THE LOCAL JURISDICTION'S GUIDELINES FOR EROSION AND SEDIMENT CONTROL.

CONCRETE AND REINFORCING STEEL NOTES:

1. ALL CONCRETE WORK SHALL BE IN ACCORDANCE WITH THE ACI 301, ACI 318, ACI 336, ASTM A184, ASTM A185 AND THE DESIGN AND CONSTRUCTION SPECIFICATION FOR CAST-IN-PLACE CONCRETE.
2. ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI AT 28 DAYS, UNLESS NOTED OTHERWISE. A HIGHER STRENGTH (4000 PSI) MAY BE USED. ALL CONCRETING WORK SHALL BE DONE IN ACCORDANCE WITH ACI 318 CODE REQUIREMENTS.
3. REINFORCING STEEL SHALL CONFORM TO ASTM A 615, GRADE 60, DEFORMED UNLESS NOTED OTHERWISE. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A 185 WELDED STEEL WIRE FABRIC UNLESS NOTED OTHERWISE (UNO). SPLICES SHALL BE CLASS "B" AND ALL HOOKS SHALL BE STANDARD, UNO.
4. THE FOLLOWING MINIMUM CONCRETE COVER SHALL BE PROVIDED FOR REINFORCING STEEL UNLESS SHOWN OTHERWISE ON DRAWINGS:
   CONCRETE CAST AGAINST EARTH.....3 IN.
   CONCRETE EXPOSED TO EARTH OR WEATHER:
   #6 AND LARGER .....2 IN.
   #5 AND SMALLER & WWF.....1 1/2 IN.
   CONCRETE NOT EXPOSED TO EARTH OR WEATHER OR NOT CAST AGAINST THE GROUND:
   SLAB AND WALL .....3/4 IN.
   BEAMS AND COLUMNS.....1 1/2 IN.
5. A CHAMFER 3/4" SHALL BE PROVIDED AT ALL EXPOSED EDGES OF CONCRETE, UNO, IN ACCORDANCE WITH ACI 301 SECTION 4.2.4.
6. INSTALLATION OF CONCRETE EXPANSION/WEDGE ANCHOR, SHALL BE PER MANUFACTURER'S WRITTEN RECOMMENDED PROCEDURE. THE ANCHOR BOLT, DOWEL OR ROD SHALL CONFORM TO MANUFACTURER'S RECOMMENDATION FOR EMBEDMENT DEPTH OR AS SHOWN ON THE DRAWINGS. NO REBAR SHALL BE CUT WITHOUT PRIOR CONTRACTOR APPROVAL WHEN DRILLING HOLES IN CONCRETE. SPECIAL INSPECTIONS, REQUIRED BY GOVERNING CODES, SHALL BE PERFORMED IN ORDER TO MAINTAIN MANUFACTURER'S MAXIMUM ALLOWABLE LOADS. ALL EXPANSION/WEDGE ANCHORS SHALL BE STAINLESS STEEL OR HOT DIPPED GALVANIZED. EXPANSION BOLTS SHALL BE PROVIDED BY RAMSET/REDHEAD OR APPROVED EQUAL.
7. CONCRETE CYLINDER TEST IS NOT REQUIRED FOR SLAB ON GRADE WHEN CONCRETE IS LESS THAN 50 CUBIC YARDS (IBC 1905.6.2.3) IN THAT EVENT THE FOLLOWING RECORDS SHALL BE PROVIDED BY THE CONCRETE SUPPLIER;
   (A) RESULTS OF CONCRETE CYLINDER TESTS PERFORMED AT THE SUPPLIER'S PLANT,
   (B) CERTIFICATION OF MINIMUM COMPRESSIVE STRENGTH FOR THE CONCRETE GRADE SUPPLIED.
   FOR GREATER THAN 50 CUBIC YARDS THE GC SHALL PERFORM THE CONCRETE CYLINDER TEST.
8. AS AN ALTERNATIVE TO ITEM 7, TEST CYLINDERS SHALL BE TAKEN INITIALLY AND THEREAFTER FOR EVERY 50 YARDS OF CONCRETE FROM EACH DIFFERENT BATCH PLANT.
9. EQUIPMENT SHALL NOT BE PLACED ON NEW PADS FOR SEVEN DAYS AFTER PAD IS POURED, UNLESS IT IS VERIFIED BY CYLINDER TESTS THAT COMPRESSIVE STRENGTH HAS BEEN ATTAINED.

STRUCTURAL STEEL NOTES:

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

SOIL COMPACTION NOTES FOR SLAB ON GRADE:

1. EXCAVATE AS REQUIRED TO REMOVE VEGETATION & TOPSOIL EXPOSE UNDISTURBED NATURAL SUBGRADE AND PLACE CRUSHED STONE AS REQUIRED.
2. COMPACTION CERTIFICATION: AN INSPECTION AND WRITTEN CERTIFICATION BY A QUALIFIED GEOTECHNICAL TECHNICIAN OR ENGINEER IS ACCEPTABLE.
3. AS AN ALTERNATIVE TO INSPECTION AND WRITTEN CERTIFICATION, THE "UNDISTURBED SOIL" BASE SHALL BE COMPACTED WITH "COMPACTION EQUIPMENT", LISTED BELOW, TO AT LEAST 90% MODIFIED PROCTOR MAXIMUM DENSITY PER ASTM D 1557 METHOD C.
4. COMPACTED SUBBASE SHALL BE UNIFORM & LEVELED. PROVIDE 6" MINIMUM CRUSHED STONE OR GRAVEL COMPACTED IN 3" LIFTS ABOVE COMPACTED SOIL. GRAVEL SHALL BE NATURAL OR CRUSHED WITH 100% PASSING 1" SIEVE.
5. AS AN ALTERNATIVE TO ITEMS 2 AND 3 PROOFROLL THE SUBGRADE SOILS WITH 5 PASSES OF A MEDIUM SIZED VIBRATORY PLATE COMPACTOR (SUCH AS BOMAG BPR 30/38) OR HAND-OPERATED SINGLE DRUM VIBRATORY ROLLER (SUCH AS BOMAG BW 55E). ANY SOFT AREAS THAT ARE ENCOUNTERED SHOULD BE REMOVED AND REPLACED WITH A WELL-GRADED GRANULAR FILL, AND COMPACTED AS STATED ABOVE.

COMPACTION EQUIPMENT:

1. HAND OPERATED DOUBLE DRUM, VIBRATORY ROLLER, VIBRATORY PLATE COMPACTOR OR JUMPING JACK COMPACTOR.

CONSTRUCTION NOTES:

1. FIELD VERIFICATION:
   CONTRACTOR SHALL FIELD VERIFY SCOPE OF WORK, AT&T ANTENNA PLATFORM LOCATION AND ANTENNAS TO BE REPLACED.
2. COORDINATION OF WORK:
   CONTRACTOR SHALL COORDINATE RF WORK AND PROCEDURES WITH PROJECT MANAGEMENT.
3. CABLE LADDER RACK:
   CONTRACTOR SHALL FURNISH AND INSTALL CABLE LADDER RACK, CABLE TRAY, AND CONDUIT AS REQUIRED TO SUPPORT CABLES TO THE NEW BTS LOCATION.

ELECTRICAL INSTALLATION NOTES:

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

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REVIEWED BY:	BSH
CHECKED BY:	GHN
PROJECT NUMBER:	50063024
JOB NUMBER:	50063035
SITE ADDRESS:	

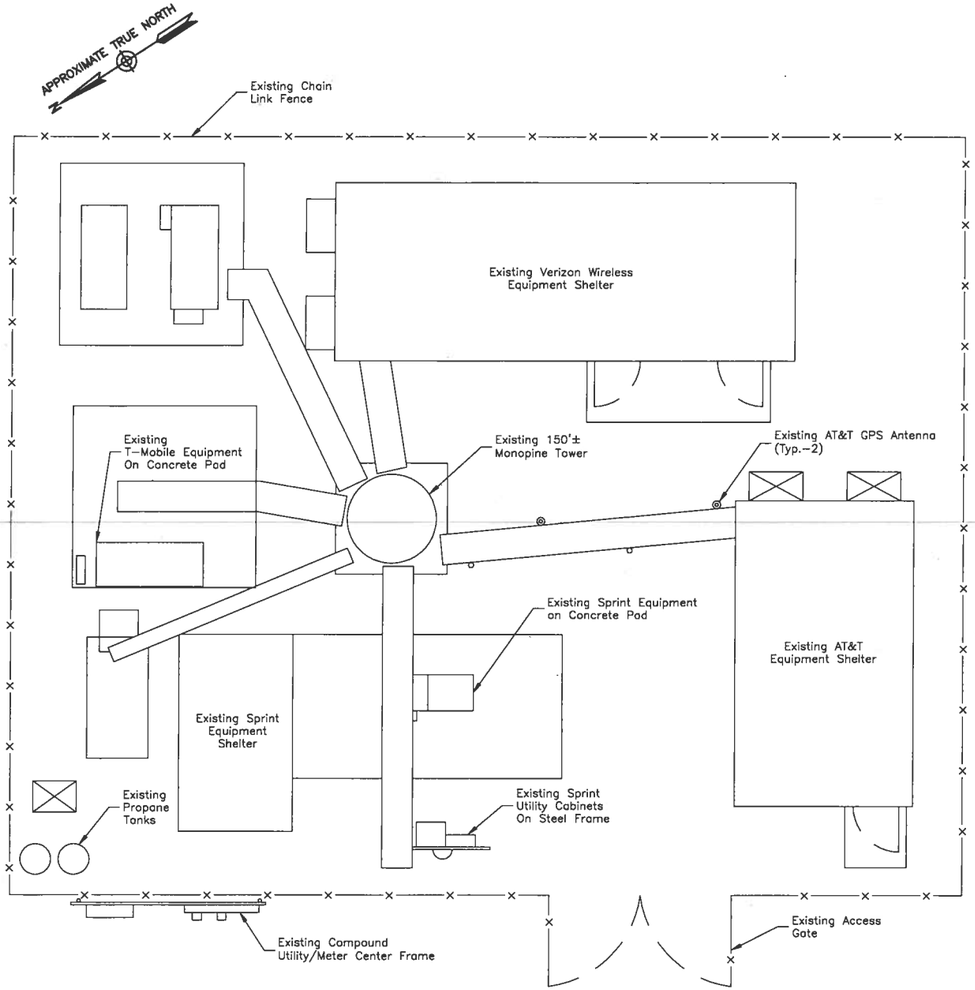
33 BOARDMAN ROAD,
NEW MILFORD, CT 06776
LITCHFIELD COUNTY

SHEET TITLE

GENERAL NOTES

SHEET NUMBER

G-1

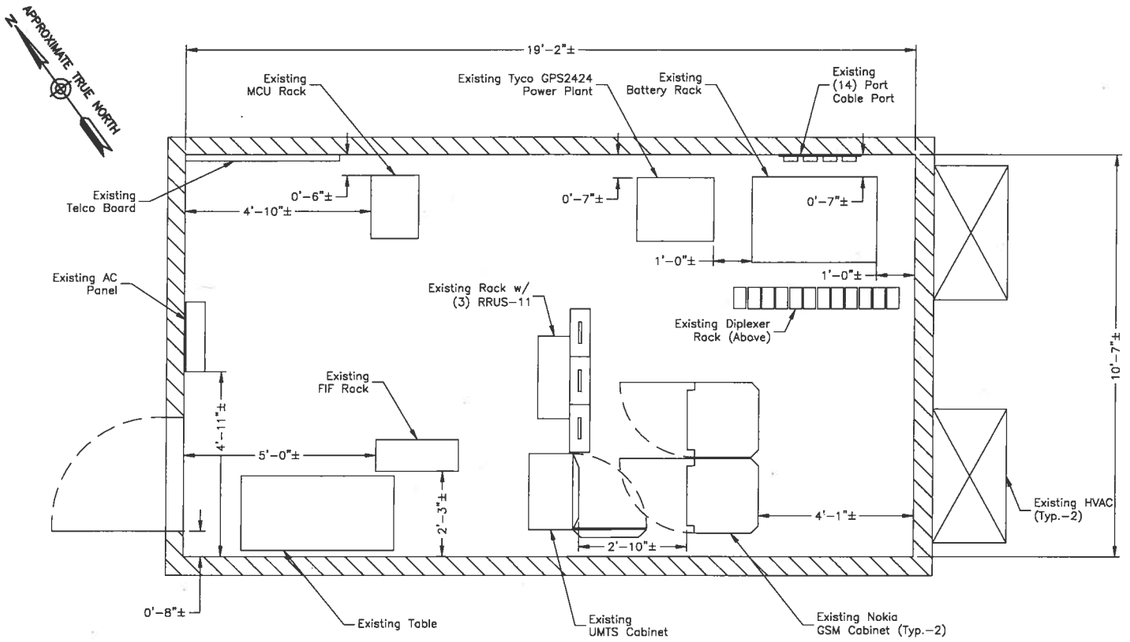


SITE PLAN

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

0' 5' 10'

1

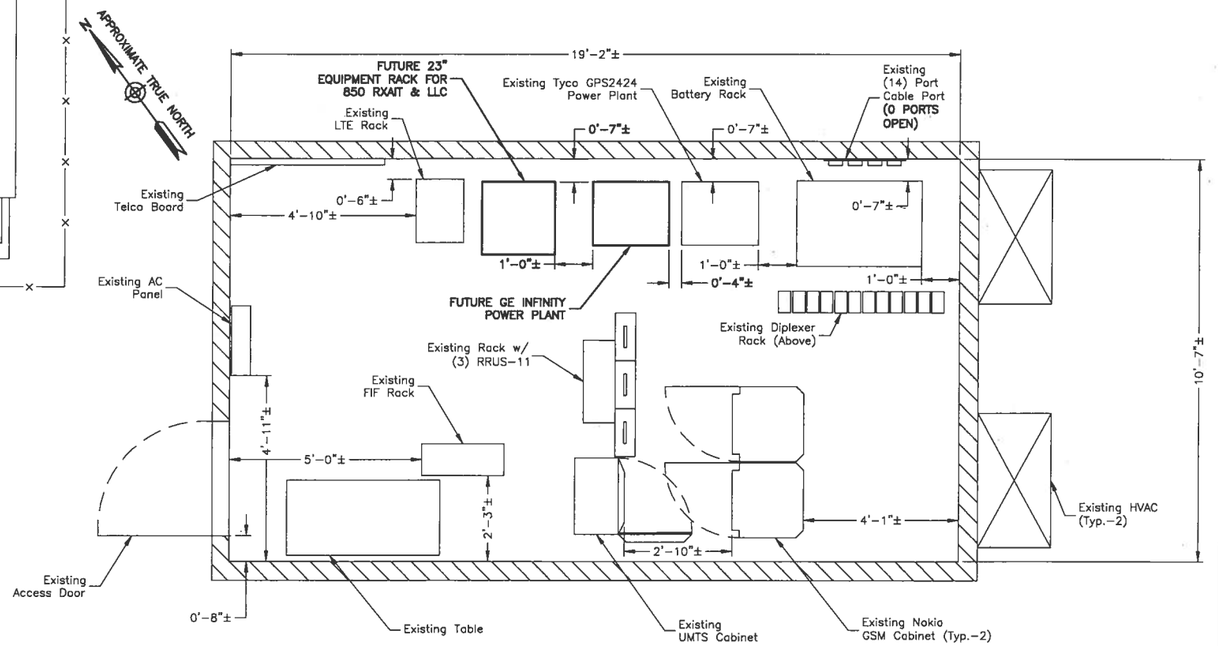


EXISTING EQUIPMENT PLAN

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

0' 1' 2' 4'

2



PROPOSED EQUIPMENT PLAN

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

0' 1' 2' 4'

3

NOTES:

1. NORTH SHOWN AS APPROXIMATE.
2. MOUNT ALL ANTENNAS, COAX, SURGE ARRESTORS, RRUS, ETC. IN ACCORDANCE WITH STRUCTURAL ANALYSIS BY OTHERS.
3. NOT ALL INFORMATION IS SHOWN FOR CLARITY.

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PROJECT NUMBER:	50063024
JOB NUMBER:	50063035
SITE ADDRESS:	

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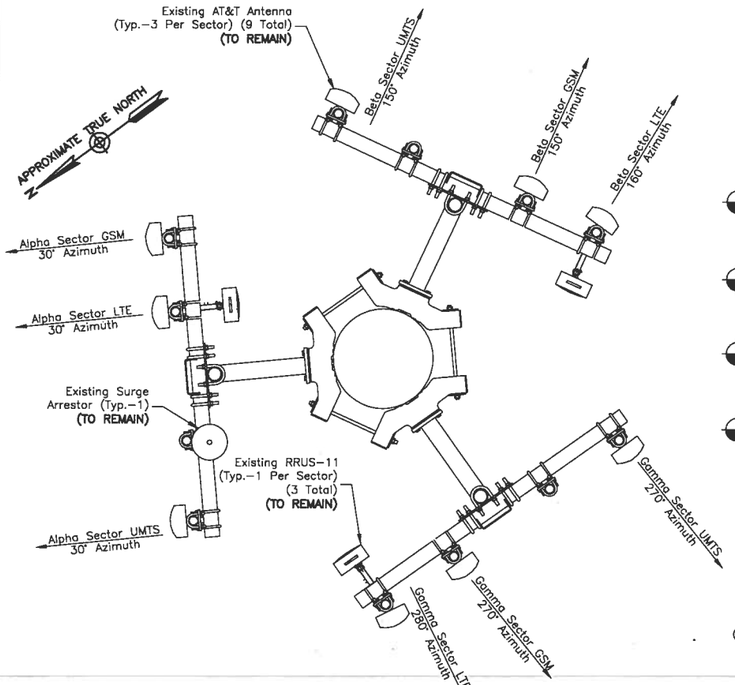
NEW MILFORD, CT 06776
LITCHFIELD COUNTY

SHEET TITLE

SITE PLAN &
EQUIPMENT PLANS

SHEET NUMBER

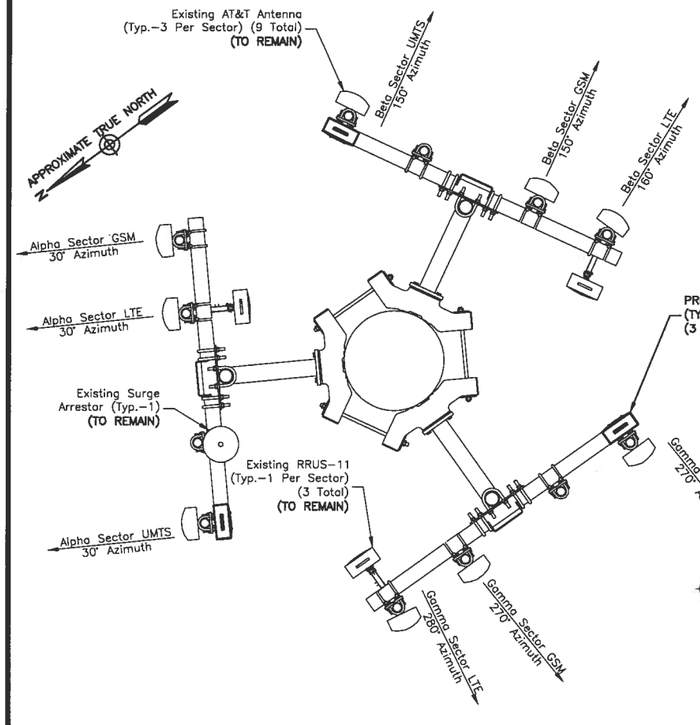
C-1



EXISTING ANTENNA LAYOUT

SCALE: N.T.S.

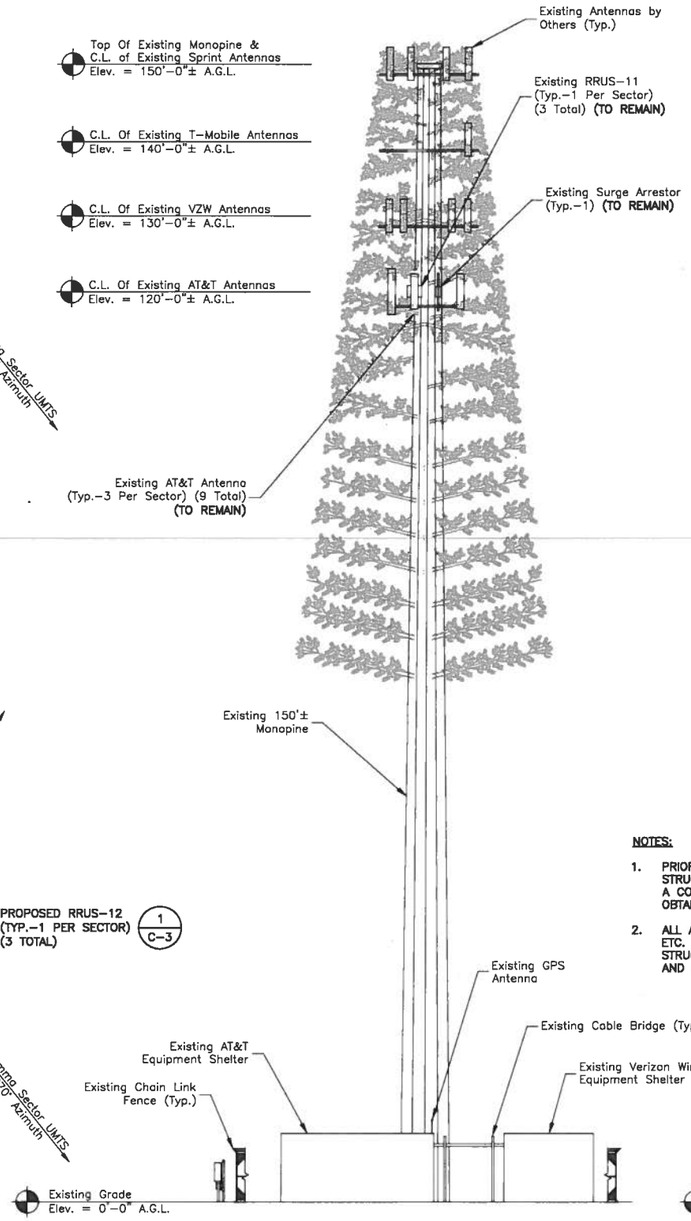
1



PROPOSED ANTENNA LAYOUT

SCALE: N.T.S.

2

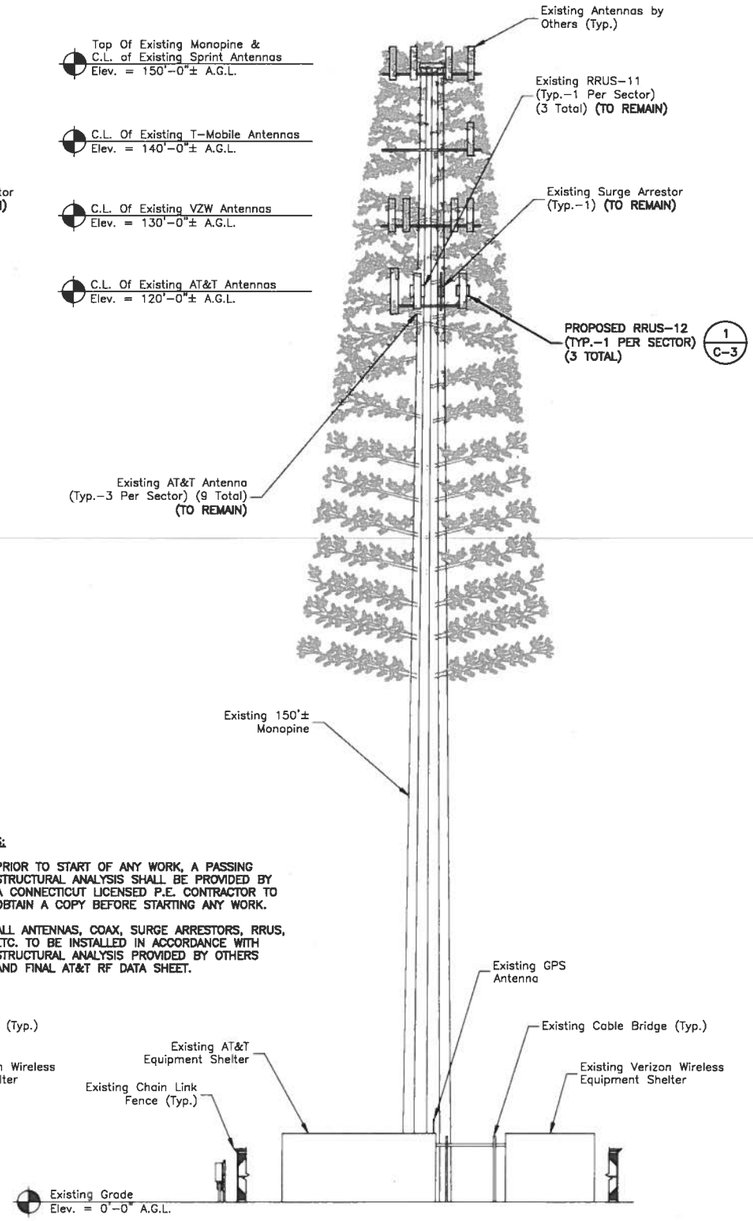


EXISTING SOUTHWEST ELEVATION

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

3

0' 10' 20'



PROPOSED SOUTHWEST ELEVATION

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

4

0' 10' 20'

NOTES:

1. PRIOR TO START OF ANY WORK, A PASSING STRUCTURAL ANALYSIS SHALL BE PROVIDED BY A CONNECTICUT LICENSED P.E. CONTRACTOR TO OBTAIN A COPY BEFORE STARTING ANY WORK.
2. ALL ANTENNAS, COAX, SURGE ARRESTORS, RRUS, ETC. TO BE INSTALLED IN ACCORDANCE WITH STRUCTURAL ANALYSIS PROVIDED BY OTHERS AND FINAL AT&T RF DATA SHEET.

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CHECKED BY:	GHN
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JOB NUMBER:	50083035
SITE ADDRESS:	

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LITCHFIELD COUNTY

SHEET TITLE

ANTENNA LAYOUTS
& ELEVATIONS

SHEET NUMBER

C-2

EXISTING ANTENNA SCHEDULE

SECTOR	MAKE	MODEL#	SIZE (INCHES)
ALPHA:	POWERWAVE	7770	55x11x5
	KMW	AM-X-CD-16-65-00T-RET	72.0x11.8x5.9
	POWERWAVE	7770	55x11x5
BETA:	POWERWAVE	7770	55x11x5
	POWERWAVE	7770	55x11x5
	KMW	AM-X-CD-16-65-00T-RET	72.0x11.8x5.9
GAMMA:	POWERWAVE	7770	55x11x5
	POWERWAVE	7770	55x11x5
	KMW	AM-X-CD-16-65-00T-RET	72.0x11.8x5.9

PROPOSED ANTENNA SCHEDULE

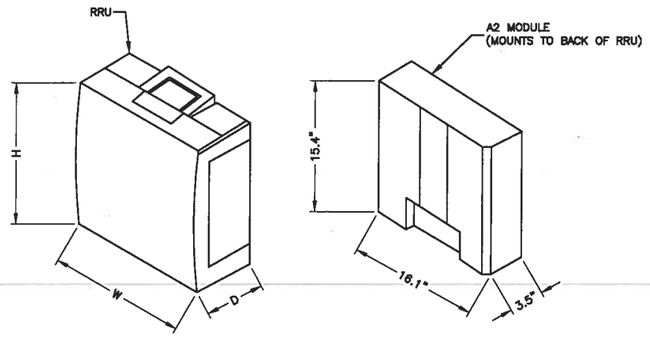
SECTOR	MAKE	MODEL#	SIZE (INCHES)
ALPHA:	POWERWAVE	7770	55x11x5
	KMW	AM-X-CD-16-65-00T-RET	72.0x11.8x5.9
	POWERWAVE	7770	55x11x5
BETA:	POWERWAVE	7770	55x11x5
	POWERWAVE	7770	55x11x5
	KMW	AM-X-CD-16-65-00T-RET	72.0x11.8x5.9
GAMMA:	POWERWAVE	7770	55x11x5
	POWERWAVE	7770	55x11x5
	KMW	AM-X-CD-16-65-00T-RET	72.0x11.8x5.9

EXISTING RRUS SCHEDULE

SECTOR	MAKE	MODEL#	SIZE (INCHES)
ALPHA:	ERICSSON	RRUS-11	19.7x17.0x7.2
BETA:	ERICSSON	RRUS-11	19.7x17.0x7.2
GAMMA:	ERICSSON	RRUS-11	19.7x17.0x7.2

PROPOSED RRUS SCHEDULE

SECTOR	MAKE	MODEL#	SIZE (INCHES)
ALPHA:	ERICSSON	RRUS-11	19.7x17.0x7.2
	ERICSSON	RRUS-12	20.4x18.5x7.5
BETA:	ERICSSON	RRUS-11	19.7x17.0x7.2
	ERICSSON	RRUS-12	20.4x18.5x7.5
GAMMA:	ERICSSON	RRUS-11	19.7x17.0x7.2
	ERICSSON	RRUS-12	20.4x18.5x7.5



RRU MODEL & DIMENSIONS	
ERICSSON MODEL #	DIMENSIONS (HxWxD)
RRUS-11	19.7"x17.0"x7.2"
RRUS-12	20.4"x18.5"x7.5"
RRUS-E2	20.4"x18.5"x7.5"
RRUS-32	29.9"x13.3"x9.5"

NOTES:

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

RRU & A2 MODULE (1)
SCALE: N.T.S.

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LITCHFIELD COUNTY

SHEET TITLE

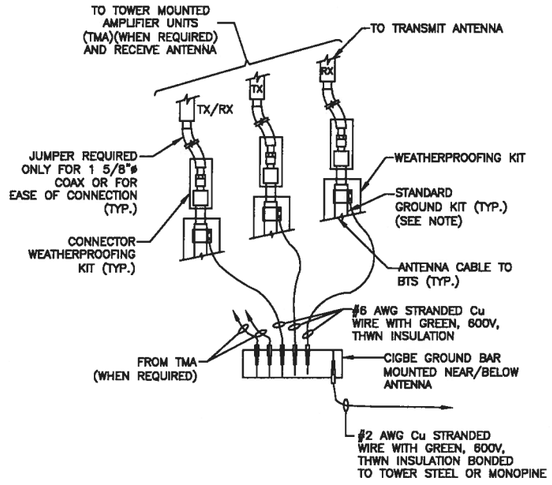
CONSTRUCTION DETAILS
& ANTENNA SCHEDULE

SHEET NUMBER

C-3

GROUNDING NOTES:

1. THE CONTRACTOR SHALL REVIEW AND INSPECT THE EXISTING FACILITY GROUNDING SYSTEM AND LIGHTNING PROTECTION SYSTEM (AS DESIGNED AND INSTALLED) FOR STRICT COMPLIANCE WITH THE NEC (AS ADOPTED BY THE AHJ). THE SITE-SPECIFIC (UL, LPI, OR NFPA) LIGHTING PROTECTION CODE, AND GENERAL COMPLIANCE WITH TELCORDIA AND TIA GROUNDING STANDARDS. THE CONTRACTOR SHALL REPORT ANY VIOLATIONS OR ADVERSE FINDINGS TO THE ENGINEER FOR RESOLUTION.
2. ALL GROUND ELECTRODE SYSTEMS (INCLUDING TELECOMMUNICATION, RADIO, LIGHTNING PROTECTION, AND AC POWER GES'S) SHALL BE BONDED TOGETHER, AT OR BELOW GRADE, BY TWO OR MORE COPPER BONDING CONDUCTORS. ALL AVAILABLE GROUNDING ELECTRODES SHALL BE CONNECTED TOGETHER IN ACCORDANCE WITH THE NEC.
3. THE CONTRACTOR SHALL PERFORM IEEE FALL-OF-POTENTIAL RESISTANCE TO EARTH TESTING (PER IEEE 1100 AND 81) FOR GROUND ELECTRODE SYSTEMS. USE OF OTHER METHODS MUST BE PRE-APPROVED BY THE ENGINEER IN WRITING.
4. THE CONTRACTOR SHALL FURNISH AND INSTALL SUPPLEMENTAL GROUND ELECTRODES AS NEEDED TO ACHIEVE A TEST RESULT OF 5 OHMS OR LESS ON TOWER SITES AND 10 OHMS OR LESS ON ROOFTOP SITES. WHEN ADDING ELECTRODES, CONTRACTOR SHALL MAINTAIN A MINIMUM DISTANCE BETWEEN THE ADDED ELECTRODE AND ANY OTHER EXISTING ELECTRODE EQUAL TO THE BURIED LENGTH OF THE ROD. IDEALLY, CONTRACTOR SHALL STRIVE TO KEEP THE SEPARATION DISTANCE EQUAL TO TWICE THE BURIED LENGTH OF THE RODS.
5. THE CONTRACTOR IS RESPONSIBLE FOR PROPERLY SEQUENCING GROUNDING AND UNDERGROUND CONDUIT INSTALLATION AS TO PREVENT ANY LOSS OF CONTINUITY IN THE GROUNDING SYSTEM OR DAMAGE TO THE CONDUIT.
6. METAL CONDUIT AND TRAY SHALL BE GROUNDED AND MADE ELECTRICALLY CONTINUOUS WITH LISTED BONDING FITTINGS OR BY BONDING ACROSS THE DISCONTINUITY WITH 6 AWG COPPER WIRE AND UL APPROVED GROUNDING TYPE CONDUIT CLAMPS.
7. METAL RACEWAY SHALL NOT BE USED AS THE NEC REQUIRED EQUIPMENT GROUND CONDUCTOR. STRANDED COPPER CONDUCTORS WITH GREEN INSULATION, SIZED IN ACCORDANCE WITH THE NEC, SHALL BE FURNISHED AND INSTALLED WITH THE POWER CIRCUITS TO TRANSMISSION EQUIPMENT.
8. CONNECTIONS TO THE GROUND BUS SHALL NOT BE DOUBLED UP OR STACKED. BACK-TO-BACK CONNECTIONS ON OPPOSITE SIDES OF THE GROUND BUS ARE PERMITTED.
9. ALUMINUM CONDUCTOR OR COPPER CLAD STEEL CONDUCTOR SHALL NOT BE USED FOR GROUNDING CONNECTIONS.
10. USE OF 90° BENDS IN THE PROTECTION GROUNDING CONDUCTORS SHALL BE AVOIDED WHEN 45° BENDS CAN BE ADEQUATELY SUPPORTED. IN ALL CASES, BENDS SHALL BE MADE WITH A MINIMUM BEND RADIUS OF 8 INCHES.
11. EACH INTERIOR TRANSMISSION CABINET FRAME/PLINTH SHALL BE DIRECTLY CONNECTED TO THE MASTER GROUND BAR WITH 6 AWG STRANDED, GREEN INSULATED SUPPLEMENTAL EQUIPMENT GROUND WIRE UNLESS NOTED OTHERWISE IN THE DETAILS. EACH OUTDOOR CABINET FRAME/PLINTH SHALL BE DIRECTLY CONNECTED TO THE BURIED GROUND RING WITH 2 AWG SOLID TIN-PLATED COPPER WIRE UNLESS NOTED OTHERWISE IN THE DETAILS.
12. ALL EXTERIOR GROUND CONDUCTORS BETWEEN EQUIPMENT/GROUND BARS AND THE GROUND RING, SHALL BE 2 AWG SOLID TIN-PLATED COPPER UNLESS OTHERWISE INDICATED.
13. EXOTHERMIC WELDS SHALL BE USED FOR ALL GROUNDING CONNECTIONS BELOW GRADE. CONNECTIONS TO ABOVE GRADE UNITS SHALL BE MADE WITH EXOTHERMIC WELDS WHERE PRACTICAL OR WITH 2 HOLE MECHANICAL TYPE BRASS CONNECTORS WITH STAINLESS STEEL HARDWARE, INCLUDING SET SCREWS. HIGH PRESSURE CRIMP CONNECTORS MAY ONLY BE USED WITH WRITTEN PERMISSION FROM SMARTLINK MARKET REPRESENTATIVE.
14. EXOTHERMIC WELDS SHALL BE PERMITTED ON TOWERS ONLY WITH THE EXPRESS APPROVAL OF THE TOWER MANUFACTURER OR THE CONTRACTORS STRUCTURAL ENGINEER.
15. ALL WIRE TO WIRE GROUND CONNECTIONS TO THE INTERIOR GROUND RING SHALL BE FORMED USING HIGH PRESS CRIMPS OR SPLIT BOLT CONNECTORS WHERE INDICATED IN THE DETAILS.
16. ON ROOFTOP SITES WHERE EXOTHERMIC WELDS ARE A FIRE HAZARD COPPER COMPRESSION CAP CONNECTORS MAY BE USED FOR WIRE TO WIRE CONNECTORS. 2 HOLE MECHANICAL TYPE BRASS CONNECTORS WITH STAINLESS STEEL HARDWARE, INCLUDING SET SCREWS SHALL BE USED FOR CONNECTION TO ALL ROOFTOP TRANSMISSION EQUIPMENT AND STRUCTURAL STEEL.
17. COAX BRIDGE BONDING CONDUCTORS SHALL BE EXOTHERMICALLY BONDED OR BOLTED TO THE BRIDGE AND THE TOWER GROUND BAR USING TWO-HOLE MECHANICAL TYPE BRASS CONNECTORS AND STAINLESS STEEL HARDWARE.
18. APPROVED ANTIOXIDANT COATINGS (I.E., CONDUCTIVE GEL OR PASTE) SHALL BE USED ON ALL COMPRESSION AND BOLTED GROUND CONNECTIONS.
19. ALL EXTERIOR GROUND CONNECTIONS SHALL BE COATED WITH A CORROSION RESISTANT MATERIAL.
20. MISCELLANEOUS ELECTRICAL AND NON-ELECTRICAL METAL BOXES, FRAMES AND SUPPORTS SHALL BE BONDED TO THE GROUND RING, IN ACCORDANCE WITH THE NEC.
21. BOND ALL METALLIC OBJECTS WITHIN 6 FT OF THE BURIED GROUND RING WITH 2 AWG SOLID TIN-PLATED COPPER GROUND CONDUCTOR. DURING EXCAVATION FOR NEW GROUND CONDUCTORS, IF EXISTING GROUND CONDUCTORS ARE ENCOUNTERED, BOND EXISTING GROUND CONDUCTORS TO NEW CONDUCTORS.
22. GROUND CONDUCTORS USED IN THE FACILITY GROUND AND LIGHTNING PROTECTION SYSTEMS SHALL NOT BE ROUTED THROUGH METALLIC OBJECTS THAT FORM A RING AROUND THE CONDUCTOR, SUCH AS METALLIC CONDUITS, METAL SUPPORT CLIPS OR SLEEVES THROUGH WALLS OR FLOORS. WHEN IT IS REQUIRED TO BE HOUSED IN CONDUIT TO MEET CODE REQUIREMENTS OR LOCAL CONDITIONS, NON-METALLIC MATERIAL SUCH AS PVC PLASTIC CONDUIT SHALL BE USED. WHERE USE OF METAL CONDUIT IS UNAVOIDABLE (E.G., NON-METALLIC CONDUIT PROHIBITED BY LOCAL CODE) THE GROUND CONDUCTOR SHALL BE BONDED TO EACH END OF THE METAL CONDUIT WITH LISTED BONDING FITTINGS.

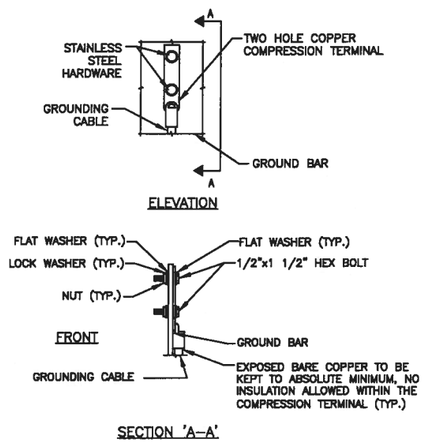


NOTE:

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

CONNECTION OF GROUND WIRES TO GROUNDING BAR (CIGBE) 1

SCALE: N.T.S.

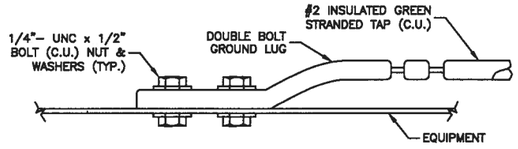


NOTES:

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

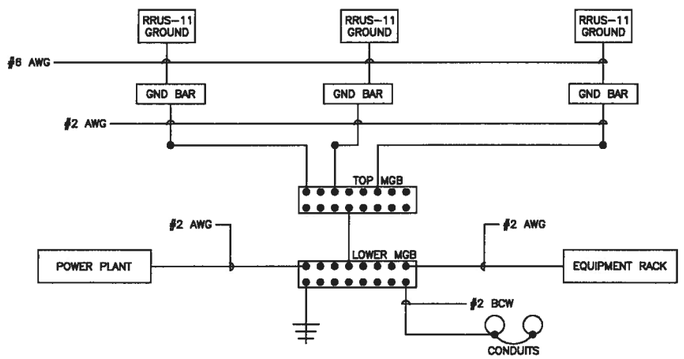
TYPICAL GROUND BAR MECHANICAL CONNECTION DETAIL 2

SCALE: N.T.S.



CONNECTION TO EQUIPMENT DETAIL 3

SCALE: N.T.S.



NOTES:

1. BOND ANTENNA GROUNDING KIT CABLE TO TOP CIGBE
2. BOND ANTENNA GROUNDING KIT CABLE TO BOTTOM CIGBE.
3. SCHEMATIC GROUNDING DIAGRAM IS TYPICAL FOR EACH SECTOR.
4. GROUND ALL EQUIPMENT PER MANUFACTURER RECOMMENDATIONS.

SCHEMATIC GROUNDING DIAGRAM 4

SCALE: N.T.S.

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REVIEWED BY:	BSH
CHECKED BY:	GHN
PROJECT NUMBER:	50063024
JOB NUMBER:	50063035
SITE ADDRESS:	

33 BOARDMAN ROAD,
NEW MILFORD, CT 06776
LITCHFIELD COUNTY

SHEET TITLE

GROUNDING NOTES & DETAILS

SHEET NUMBER

E-1

TAB 2

Power Density Calculations

EM-Sprint-096-121009	New Milford - 33 Boardman Road	Sprint CDMA/	3	778	150	0.0373	1900	1.0000	3.73%	
EM-Sprint-096-121009	New Milford - 33 Boardman Road	Sprint CDMA/	1	438	150	0.0070	850	0.5667	1.24%	
EM-CING-096-121108	**New Milford - 33 Boardman Road**	**AT&T UMTS**	**2**	**565**	**120**	**0.0282**	**880**	**0.5867**	**4.81%**	
EM-CING-096-121108	**New Milford - 33 Boardman Road**	**AT&T UMTS**	**2**	**875**	**120**	**0.0437**	**1900**	**1.0000**	**4.37%**	
EM-CING-096-121108	**New Milford - 33 Boardman Road**	**AT&T GSM**	**1**	**283**	**120**	**0.0071**	**880**	**0.5867**	**1.20%**	
EM-CING-096-121108	**New Milford - 33 Boardman Road**	**AT&T GSM**	**4**	**525**	**120**	**0.0524**	**1900**	**1.0000**	**5.24%**	
EM-CING-096-121108	**New Milford - 33 Boardman Road**	**AT&T LTE**	**1**	**1615**	**120**	**0.0403**	**734**	**0.4893**	**8.24%**	
EM-VER-096-120216B	**New Milford - 33 Boardman Road**	**Verizon PCS**	**11**	**256**	**130**	**0.0599**	**1970**	**1.0000**	**5.99%**	
EM-VER-096-120216B	**New Milford - 33 Boardman Road**	**Verizon cellul**	**9**	**261**	**130**	**0.0500**	**869**	**0.5793**	**8.63%**	
EM-VER-096-120216B	**New Milford - 33 Boardman Road**	**Verizon AWS**	**1**	**670**	**130**	**0.0143**	**2145**	**1.0000**	**1.43%**	
EM-VER-096-120216B	**New Milford - 33 Boardman Road**	**Verizon LTE**	**1**	**852**	**130**	**0.0181**	**698**	**0.4653**	**3.90%**	
EM-T-Mobile-096-06112	**New Milford - 33 Boardman Road**	**T-Mobile**	**8**	**110**	**140**	**0.0161**	**1945**	**1.0000**	**1.61%**	**50.39%**

TAB 3

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

153-ft Existing EEI Monopine

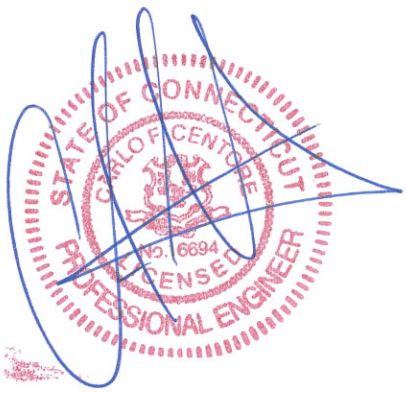
Proposed AT&T Mobility
Antenna Upgrade

AT&T Site Ref: CT2001

86 Boardman Road
New Milford, CT

Centek Project No. 12063.CO44

Date: October 16, 2012



Prepared for:

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

63-2 North Branford Road, Branford, CT 06405 203.488.0580 Fax 203.488.8587 www.CentekEng.com

Table of Contents

Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna upgrade proposed by AT&T Mobility on the existing monopine (tower) located in New Milford, CT.

The host tower is a 153-ft tall, four-section, eighteen sided, tapered monopole, originally designed and manufactured by Engineered Endeavors Inc., job no; 13200, dated March 2, 2005. The tower geometry, structure member sizes and foundation system information were obtained from a previous structural report prepared by Centek job no. 12001.CO1 dated December 19, 2011.

Antenna and appurtenance information were obtained from the a previous structural report prepared by KM Consulting Engineers, Inc. job no. 120834 dated August 22, 2012 and a AT&T scope of work sheet

The tower is made up of four (4) tapered vertical sections consisting of A572-65 pole sections. The vertical tower sections are slip joint connected. The diameter of the pole (flat-flat) is 25.25-in at the top and 61.0-in at the base.

AT&T Mobility proposes the installation of three (3) panel antennas, six (6) Remote Radio Units (RRU's) and one (1) surge arrestor mounted to the existing three (3) 10-ft T-Arms. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

Antenna and Appurtenance Summary

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

- UNKNOWN (EXISTING):
  Antennas: One (1) 10-ft dipole antenna mounted on a 1-ft standoff arm with an elevation of 150-ft above grade.
  Coax Cables: One (1) 7/8" ∅ coax cable running on the inside of the existing tower.
- SPRINT (EXISTING/RESERVED):
  Antennas: Six (6) 72"x6.5"x8" panel antennas, three (3) RFS APXVSPP18-C-A20 panel antennas, three (3) ALU 1900 MHz RRH's and three (3) ALU 800 MHz RRH's mounted on three (3) existing 10-ft T-Arms with a RAD center elevation of 150-ft above grade.
  Coax Cables: Nine (9) 1-5/8" ∅ coax cables and three (3) 1-1/4" ∅ Hybriflex cables running on the inside of the existing tower.
- T-MOBILE (EXISTING):
  Antennas: Three (3) 53"x7"x3" panel antennas and six (6) TMA's mounted on three (3) existing 10-ft T-Arms with a RAD center elevation of 140-ft above grade.
  Coax Cables: Six (6) 1-5/8" ∅ coax cables running on the inside of the existing tower.

- VERIZON (EXISTING):
  Antennas: Six (6) Antel LPA-80080-4CF panel antennas, three (3) Antel BXA-70063-6CF panel antennas, three (3) Antel BXA-171085-8BF panel antennas and six (6) RFS FD9R6004/2C-3L Diplexers mounted on three (3) existing 10-ft T-Arms with a RAD center elevation of 130-ft above grade.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- AT&T (EXISTING TO REMAIN):
  Antennas: Six (6) Powerwave 7770 panel antennas, six (6) Powerwave LGP21401 TMA's and six (6) Powerwave LGP21901 Diplexers mounted on three (3) existing 10-ft T-Arms with a RAD center elevation of 120-ft above grade.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- **AT&T (PROPOSED):**
  Antennas: Two (2) KMW AM-X-CD-16-65-00T-RET panel antennas, one (1) Powerwave P65-17-XLH-RR panel antenna, six (6) Ericsson RRUS-11, one (1) Raycap DC6-48-60-18-8F surge mounted on three (3) existing 10-ft T-Arms with a RAD center elevation of 120-ft above grade.
  Coax Cables: One (1) fiber cable and two (2) dc control cables running within the interior of the existing monopole.

Primary Assumptions Used in the Analysis

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

Analysis

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

The existing tower was analyzed for the controlling basic wind speed (fastest mile) with no ice and a 75% reduction of wind force with ½ inch accumulative ice to determine stresses in members as per guidelines of TIA/EIA-222-F-96 entitled "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures", the American Institute of Steel Construction (AISC) and the Manual of Steel Construction; Allowable Stress Design (ASD).

The controlling wind speed is determined by evaluating the local available wind speed data as provided in Appendix K of the CSBC[1] and the wind speed data available in the TIA/EIA-222-F-96 Standard. The higher of the two wind speeds is utilized in preparation on the tower analysis.

Tower Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA/EIA-222-F, gravity loads of the tower structure and its components, and the application of ½" radial ice on the tower structure and its components.

Basic Wind Speed:	Litchfield; v = 80 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	New Milford; v = 95 mph (3 second gust) equivalent to v = 77.5 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	TIA/EIA-222-F wind speed controls.	
Load Cases:	Load Case 1; 80 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 2; 69 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 69 mph wind speed velocity represents 75% of the wind pressure generated by the 80 mph wind speed.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 3; Seismic – not checked	*[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type*

[1] The 2005 Connecticut State Building Code as amended by the 2009 CT State Supplement. (CSBC)

Tower Capacity

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

- Calculated stresses were found to be within allowable limits. In Load Case 1, per RISATower "Section Capacity Table", this tower was found to be at **92.1%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L4)	1.00'-44.54'	92.1%	**PASS**

Foundation and Anchors

The existing foundation consists of a 7.5-ft square x 3.5-ft long reinforced concrete pier on a 32.0-ft square x 4.0-ft thick reinforced concrete pad. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned structural report prepared by Centek job no. 12001.CO1 dated December 19, 2011. The base of the tower is connected to the foundation by means of (28) 2.25"∅, ASTM A615-75 anchor bolts embedded approximately 7-ft into the concrete foundation structure.

Review of the foundation and anchor design consisted of verification of applied loads obtained from the tower design calculations and code checks of allowable stresses:

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

Location	Vector	Proposed Reactions
Base	Shear	56 kips
	Compression	61 kips
	Moment	6334 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	IBC 2003/2005 CT State Building Code Section 3108.4.2 (FS)(1)	Proposed Loading (FS)(1)	Result
Reinforced Concrete Pad and Pier	OTM(2)	2.0	2.09	**PASS**

Note 1: FS denotes Factor of Safety.
Note 2: OTM denotes Overturning Moment

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Compression	83.1%	**PASS**
Base Plate	Bending	47.9%	**PASS**

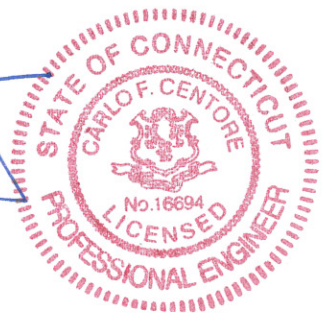
Conclusion

This analysis shows that the subject tower **is adequate** to support the proposed modified antenna configuration.

The analysis is based, in part, on the information provided to this office by Verizon Wireless. 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:



Carlo F. Centore, PE
Principal ~ Structural Engineer

Prepared by:

Timothy J. Lynn, EIT
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

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

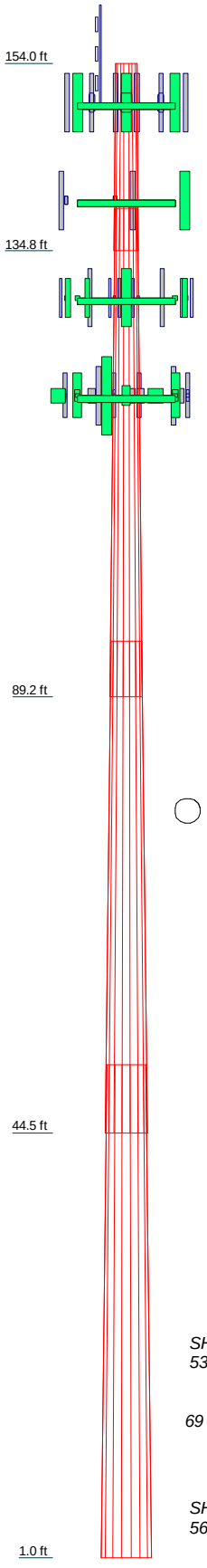
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

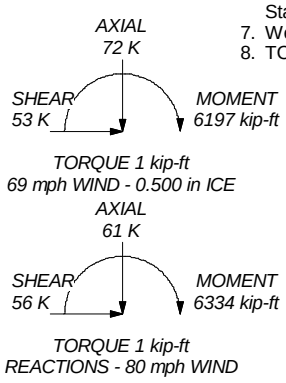
RISATower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, RISATower, formerly ERITower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

RISATower Features:

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

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	19.170	18	0.188	4.330	25.250	30.030		1.1
2	50.000	18	0.313	5.670	28.575	40.910		5.8
3	50.290	18	0.500	6.920	38.886	51.280		12.1
4	50.460	18	0.563		48.575	61.000		16.6
							A572-65	35.6





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
EEI Pine Branches	150	BXA-70063/6CF (Verizon - Existing)	130
10' Dipole	150	LPA-80080-4CF (Verizon - Existing)	130
(2) 72"x6.5"x8" Panel (Sprint - Existing)	150	(2) FD9R6004/2C-3L Diplexer (Verizon - Existing)	130
(2) 72"x6.5"x8" Panel (Sprint - Existing)	150	(2) FD9R6004/2C-3L Diplexer (Verizon - Existing)	130
(2) 72"x6.5"x8" Panel (Sprint - Existing)	150	(2) FD9R6004/2C-3L Diplexer (Verizon - Existing)	130
APXVSPP18-C-A20 (Sprint - Existing)	150	EEI 10' Universal T-Arm (Verizon - Existing)	130
APXVSPP18-C-A20 (Sprint - Existing)	150	EEI 10' Universal T-Arm (Verizon - Existing)	130
APXVSPP18-C-A20 (Sprint - Existing)	150	EEI 10' Universal T-Arm (Verizon - Existing)	130
FD-RRH 2x50 800 (Sprint - Existing)	150	EEI Pine Branches	120
FD-RRH 2x50 800 (Sprint - Existing)	150	(2) 7770.00 (ATI - Existing)	120
FD-RRH 2x50 800 (Sprint - Existing)	150	(2) 7770.00 (ATI - Existing)	120
FD-RRH 4x40 1900 (Sprint - Existing)	150	(2) 7770.00 (ATI - Existing)	120
FD-RRH 4x40 1900 (Sprint - Existing)	150	(2) LGP21401 TMA (ATI - Existing)	120
FD-RRH 4x40 1900 (Sprint - Existing)	150	(2) LGP21401 TMA (ATI - Existing)	120
EEI 10' Universal T-Arm (Sprint - Existing)	150	(2) LGP21401 TMA (ATI - Existing)	120
EEI 10' Universal T-Arm (Sprint - Existing)	150	(2) LGP21901 Diplexer (ATI - Existing)	120
EEI 10' Universal T-Arm (Sprint - Existing)	150	(2) LGP21901 Diplexer (ATI - Existing)	120
EEI Pine Branches	140	(2) LGP21901 Diplexer (ATI - Existing)	120
53"x7"x3" Panel (T-Mobile - Existing)	140	EEI 10' Universal T-Arm (ATI - Existing)	120
53"x7"x3" Panel (T-Mobile - Existing)	140	EEI 10' Universal T-Arm (ATI - Existing)	120
53"x7"x3" Panel (T-Mobile - Existing)	140	EEI 10' Universal T-Arm (ATI - Existing)	120
(2) TMA 10"x8"x3" (T-Mobile - Existing)	140	AM-X-CD-16-65-00T-RET(72") (ATI - Proposed)	120
(2) TMA 10"x8"x3" (T-Mobile - Existing)	140	AM-X-CD-16-65-00T-RET(72") (ATI - Proposed)	120
(2) TMA 10"x8"x3" (T-Mobile - Existing)	140	P65-17-XLH-RR (ATI - Proposed)	120
EEI 10' Universal T-Arm (T-Mobile - Existing)	140	(2) RRUS-11 (ATI - Proposed)	120
EEI 10' Universal T-Arm (T-Mobile - Existing)	140	(2) RRUS-11 (ATI - Proposed)	120
EEI 10' Universal T-Arm (T-Mobile - Existing)	140	(2) RRUS-11 (ATI - Proposed)	120
EEI Pine Branches	130	DC6-48-60-18-8F Surge Arrestor (ATI - Proposed)	120
LPA-80080-4CF (Verizon - Existing)	130	EEI Pine Branches	110
BXA-171085-8BF (Verizon - Existing)	130	EEI Pine Branches	100
BXA-70063/6CF (Verizon - Existing)	130	EEI Pine Branches	90
LPA-80080-4CF (Verizon - Existing)	130	EEI Pine Branches	80
LPA-80080-4CF (Verizon - Existing)	130		
BXA-171085-8BF (Verizon - Existing)	130		
BXA-70063/6CF (Verizon - Existing)	130		
LPA-80080-4CF (Verizon - Existing)	130		
LPA-80080-4CF (Verizon - Existing)	130		
BXA-171085-8BF (Verizon - Existing)	130		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 69 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 50 mph wind.
4. Weld together tower sections have flange connections.
5. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
6. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
7. Welds are fabricated with ER-70S-6 electrodes.
8. TOWER RATING: 92.1%

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

Job: **12063.CO44 - CT2001**		
Project: **153-ft EEI Monopine - 86 Boardman Rd., New Milford, CT**		
Client: AT&T Mobility	Drawn by: TJL	App'd:
Code: TIA/EIA-222-F	Date: 10/16/12	Scale: NTS
Path: J:\Jobs\1206300.WI\CO.44 - CT2001\STRUCTURAL\Calcs\EFI Files\153' EEI Monopine New Milford CT.eri		Dwg No. E-1

Tower Input Data

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

Basic wind speed of 80 mph.
Nominal ice thickness of 0.500 in.
Ice density of 56 pcf.
A wind speed of 69 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
Weld together tower sections have flange connections..
Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications..
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-70S-6 electrodes..
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	154.000-134.830	19.170	4.330	18	25.250	30.030	0.188	0.750	A572-65 (65 ksi)
L2	134.830-89.160	50.000	5.670	18	28.575	40.910	0.313	1.250	A572-65 (65 ksi)
L3	89.160-44.540	50.290	6.920	18	38.886	51.280	0.500	2.000	A572-65 (65 ksi)

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L4	44.540-1.000	50.460		18	48.575	61.000	0.563	2.250	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	25.640	14.915	1183.638	8.897	12.827	92.277	2368.833	7.459	4.114	21.941
	30.493	17.760	1998.257	10.594	15.255	130.988	3999.143	8.882	4.955	26.428
L2	30.101	28.033	2829.053	10.033	14.516	194.888	5661.828	14.019	4.479	14.334
	41.541	40.268	8384.791	14.412	20.782	403.459	16780.616	20.138	6.650	21.281
L3	40.905	60.919	11340.739	13.627	19.754	574.092	22696.401	30.465	5.964	11.928
	52.071	80.588	26253.818	18.027	26.050	1007.815	52542.181	40.302	8.145	16.291
L4	51.054	85.720	24964.271	17.044	24.676	1011.687	49961.392	42.868	7.559	13.438
	61.941	107.904	49795.073	21.455	30.988	1606.915	99655.668	53.962	9.746	17.326

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 154.000-134.830				1	1	1		
L2 134.830-89.160				1	1	1		
L3 89.160-44.540				1	1	1		
L4 44.540-1.000				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight klf
7/8	B	No	Inside Pole	151.000 - 4.000	1	No Ice	0.000	0.001
(Town - Existing)						1/2" Ice	0.000	0.001
1 5/8	B	No	Inside Pole	151.000 - 4.000	9	No Ice	0.000	0.001
(Sprint - Existing)						1/2" Ice	0.000	0.001
1 5/8	B	No	Inside Pole	141.000 - 4.000	6	No Ice	0.000	0.001
(T-Mobile - Existing)						1/2" Ice	0.000	0.001
1 5/8	B	No	Inside Pole	131.000 - 4.000	12	No Ice	0.000	0.001
(Verizon - Existing)						1/2" Ice	0.000	0.001
1 5/8	B	No	Inside Pole	121.000 - 4.000	12	No Ice	0.000	0.001
(AT&T - Existing)						1/2" Ice	0.000	0.001
RG6-Fiber	C	No	Inside Pole	121.000 - 4.000	1	No Ice	0.000	0.001
(AT&T - Proposed)						1/2" Ice	0.000	0.001
#8 AWG Copper WIre	C	No	Inside Pole	121.000 - 4.000	2	No Ice	0.000	0.000
(AT&T - Proposed)						1/2" Ice	0.000	0.000
HYBRIFLEX 1-1/4"	C	No	Inside Pole	151.000 - 4.000	3	No Ice	0.000	0.001

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight klf
(Sprint - Existing)						1/2" Ice	0.000	0.001

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	154.000-134.830	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.199
		C	0.000	0.000	0.000	0.000	0.063
L2	134.830-89.160	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	1.657
		C	0.000	0.000	0.000	0.000	0.213
L3	89.160-44.540	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	1.834
		C	0.000	0.000	0.000	0.000	0.223
L4	44.540-1.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	1.666
		C	0.000	0.000	0.000	0.000	0.203

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	154.000-134.830	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.199
		C		0.000	0.000	0.000	0.000	0.063
L2	134.830-89.160	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	1.657
		C		0.000	0.000	0.000	0.000	0.213
L3	89.160-44.540	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	1.834
		C		0.000	0.000	0.000	0.000	0.223
L4	44.540-1.000	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	1.666
		C		0.000	0.000	0.000	0.000	0.203

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
EEI Pine Branches	C	None		0.000	150.000	No Ice	90.000	90.000	1.500
						1/2" Ice	130.000	130.000	1.900
EEI Pine Branches	C	None		0.000	140.000	No Ice	90.000	90.000	1.500
						1/2" Ice	130.000	130.000	1.900

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
EEI Pine Branches	C	None		0.000	130.000	No Ice	90.000	90.000	1.500
						1/2" Ice	130.000	130.000	1.900
EEI Pine Branches	C	None		0.000	120.000	No Ice	90.000	90.000	1.500
						1/2" Ice	130.000	130.000	1.900
EEI Pine Branches	C	None		0.000	110.000	No Ice	90.000	90.000	1.500
						1/2" Ice	130.000	130.000	1.900
EEI Pine Branches	C	None		0.000	100.000	No Ice	90.000	90.000	1.500
						1/2" Ice	130.000	130.000	1.900
EEI Pine Branches	C	None		0.000	90.000	No Ice	90.000	90.000	1.500
						1/2" Ice	130.000	130.000	1.900
EEI Pine Branches	C	None		0.000	80.000	No Ice	90.000	90.000	1.500
						1/2" Ice	130.000	130.000	1.900
10' Dipole	A	From Face	2.000 0.000 5.000	0.000	150.000	No Ice 1/2" Ice	4.000 6.000	4.000 6.000	0.050 0.072
(2) 72"x6.5"x8" Panel (Sprint - Existing)	A	From Face	3.000 0.000 0.000	0.000	150.000	No Ice 1/2" Ice	5.093 5.547	6.063 6.525	0.015 0.055
(2) 72"x6.5"x8" Panel (Sprint - Existing)	B	From Face	3.000 0.000 0.000	0.000	150.000	No Ice 1/2" Ice	5.093 5.547	6.063 6.525	0.015 0.055
(2) 72"x6.5"x8" Panel (Sprint - Existing)	C	From Face	3.000 0.000 0.000	0.000	150.000	No Ice 1/2" Ice	5.093 5.547	6.063 6.525	0.015 0.055
APXVSPP18-C-A20 (Sprint - Existing)	A	From Face	3.000 0.000 0.000	0.000	150.000	No Ice 1/2" Ice	8.260 8.807	5.283 5.736	0.057 0.107
APXVSPP18-C-A20 (Sprint - Existing)	B	From Face	3.000 0.000 0.000	0.000	150.000	No Ice 1/2" Ice	8.260 8.807	5.283 5.736	0.057 0.107
APXVSPP18-C-A20 (Sprint - Existing)	C	From Face	3.000 0.000 0.000	0.000	150.000	No Ice 1/2" Ice	8.260 8.807	5.283 5.736	0.057 0.107
FD-RRH 2x50 800 (Sprint - Existing)	A	From Face	3.000 0.000 0.000	0.000	150.000	No Ice 1/2" Ice	2.477 2.693	2.058 2.259	0.053 0.074
FD-RRH 2x50 800 (Sprint - Existing)	B	From Face	3.000 0.000 0.000	0.000	150.000	No Ice 1/2" Ice	2.477 2.693	2.058 2.259	0.053 0.074
FD-RRH 2x50 800 (Sprint - Existing)	C	From Face	3.000 0.000 0.000	0.000	150.000	No Ice 1/2" Ice	2.477 2.693	2.058 2.259	0.053 0.074
FD-RRH 4x40 1900 (Sprint - Existing)	A	From Face	3.000 0.000 0.000	0.000	150.000	No Ice 1/2" Ice	2.822 3.062	2.822 3.062	0.044 0.069
FD-RRH 4x40 1900 (Sprint - Existing)	B	From Face	3.000 0.000 0.000	0.000	150.000	No Ice 1/2" Ice	2.822 3.062	2.822 3.062	0.044 0.069
FD-RRH 4x40 1900 (Sprint - Existing)	C	From Face	3.000 0.000 0.000	0.000	150.000	No Ice 1/2" Ice	2.822 3.062	2.822 3.062	0.044 0.069
EEI 10' Universal T-Arm (Sprint - Existing)	A	None		0.000	150.000	No Ice 1/2" Ice	13.340 16.800	13.340 16.800	0.450 0.600
EEI 10' Universal T-Arm (Sprint - Existing)	B	None		0.000	150.000	No Ice 1/2" Ice	13.340 16.800	13.340 16.800	0.450 0.600
EEI 10' Universal T-Arm (Sprint - Existing)	C	None		0.000	150.000	No Ice 1/2" Ice	13.340 16.800	13.340 16.800	0.450 0.600

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* ft ft ft	*Azimuth Adjustment* °	*Placement* ft		C_AA_A *Front* ft^2	C_AA_A *Side* ft^2	*Weight* K
53"x7"x3" Panel (T-Mobile - Existing)	A	From Face	3.000 -6.000 0.000	0.000	140.000	No Ice 1/2" Ice	3.506 3.848	2.003 2.326	0.019 0.039
53"x7"x3" Panel (T-Mobile - Existing)	B	From Face	3.000 -6.000 0.000	0.000	140.000	No Ice 1/2" Ice	3.506 3.848	2.003 2.326	0.019 0.039
53"x7"x3" Panel (T-Mobile - Existing)	C	From Face	3.000 -6.000 0.000	0.000	140.000	No Ice 1/2" Ice	3.506 3.848	2.003 2.326	0.019 0.039
(2) TMA 10"x8"x3" (T-Mobile - Existing)	A	From Face	3.000 0.000 0.000	0.000	140.000	No Ice 1/2" Ice	0.778 0.899	0.292 0.380	0.015 0.020
(2) TMA 10"x8"x3" (T-Mobile - Existing)	A	From Face	3.000 0.000 0.000	0.000	140.000	No Ice 1/2" Ice	0.778 0.899	0.292 0.380	0.015 0.020
(2) TMA 10"x8"x3" (T-Mobile - Existing)	A	From Face	3.000 0.000 0.000	0.000	140.000	No Ice 1/2" Ice	0.778 0.899	0.292 0.380	0.015 0.020
EEI 10' Universal T-Arm (T-Mobile - Existing)	A	None		0.000	140.000	No Ice 1/2" Ice	13.340 16.800	13.340 16.800	0.450 0.600
EEI 10' Universal T-Arm (T-Mobile - Existing)	B	None		0.000	140.000	No Ice 1/2" Ice	13.340 16.800	13.340 16.800	0.450 0.600
EEI 10' Universal T-Arm (T-Mobile - Existing)	C	None		0.000	140.000	No Ice 1/2" Ice	13.340 16.800	13.340 16.800	0.450 0.600
LPA-80080-4CF (Verizon - Existing)	A	From Face	3.000 6.000 0.000	0.000	130.000	No Ice 1/2" Ice	2.619 2.922	6.057 6.453	0.012 0.045
BXA-171085-8BF (Verizon - Existing)	A	From Face	3.000 4.000 0.000	0.000	130.000	No Ice 1/2" Ice	2.941 3.255	2.156 2.458	0.011 0.029
BXA-70063/6CF (Verizon - Existing)	A	From Face	3.000 0.000 0.000	0.000	130.000	No Ice 1/2" Ice	7.731 8.268	4.158 4.595	0.017 0.059
LPA-80080-4CF (Verizon - Existing)	A	From Face	3.000 -6.000 0.000	0.000	130.000	No Ice 1/2" Ice	2.619 2.922	6.057 6.453	0.012 0.045
LPA-80080-4CF (Verizon - Existing)	B	From Face	3.000 6.000 0.000	0.000	130.000	No Ice 1/2" Ice	2.619 2.922	6.057 6.453	0.012 0.045
BXA-171085-8BF (Verizon - Existing)	B	From Face	3.000 4.000 0.000	0.000	130.000	No Ice 1/2" Ice	2.941 3.255	2.156 2.458	0.011 0.029
BXA-70063/6CF (Verizon - Existing)	B	From Face	3.000 0.000 0.000	0.000	130.000	No Ice 1/2" Ice	7.731 8.268	4.158 4.595	0.017 0.059
LPA-80080-4CF (Verizon - Existing)	B	From Face	3.000 -6.000 0.000	0.000	130.000	No Ice 1/2" Ice	2.619 2.922	6.057 6.453	0.012 0.045
LPA-80080-4CF (Verizon - Existing)	C	From Face	3.000 6.000 0.000	0.000	130.000	No Ice 1/2" Ice	2.619 2.922	6.057 6.453	0.012 0.045
BXA-171085-8BF (Verizon - Existing)	C	From Face	3.000 4.000 0.000	0.000	130.000	No Ice 1/2" Ice	2.941 3.255	2.156 2.458	0.011 0.029
BXA-70063/6CF (Verizon - Existing)	C	From Face	3.000 0.000 0.000	0.000	130.000	No Ice 1/2" Ice	7.731 8.268	4.158 4.595	0.017 0.059

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
LPA-80080-4CF	C	From Face	3.000	0.000	130.000	No Ice	2.619	6.057	0.012
(Verizon - Existing)			-6.000			1/2" Ice	2.922	6.453	0.045
			0.000						
(2) FD9R6004/2C-3L	A	From Face	3.000	0.000	130.000	No Ice	0.367	0.085	0.003
Diplexer			0.000			1/2" Ice	0.451	0.136	0.005
(Verizon - Existing)			0.000						
(2) FD9R6004/2C-3L	B	From Face	3.000	0.000	130.000	No Ice	0.367	0.085	0.003
Diplexer			0.000			1/2" Ice	0.451	0.136	0.005
(Verizon - Existing)			0.000						
(2) FD9R6004/2C-3L	C	From Face	3.000	0.000	130.000	No Ice	0.367	0.085	0.003
Diplexer			0.000			1/2" Ice	0.451	0.136	0.005
(Verizon - Existing)			0.000						
EEI 10' Universal T-Arm	A	None		0.000	130.000	No Ice	13.340	13.340	0.450
(Verizon - Existing)						1/2" Ice	16.800	16.800	0.600
EEI 10' Universal T-Arm	B	None		0.000	130.000	No Ice	13.340	13.340	0.450
(Verizon - Existing)						1/2" Ice	16.800	16.800	0.600
EEI 10' Universal T-Arm	C	None		0.000	130.000	No Ice	13.340	13.340	0.450
(Verizon - Existing)						1/2" Ice	16.800	16.800	0.600
(2) 7770.00	A	From Face	3.000	0.000	120.000	No Ice	5.882	2.928	0.035
(AT&T - Existing)			0.000			1/2" Ice	6.314	3.273	0.068
			0.000						
(2) 7770.00	B	From Face	3.000	0.000	120.000	No Ice	5.882	2.928	0.035
(AT&T - Existing)			0.000			1/2" Ice	6.314	3.273	0.068
			0.000						
(2) 7770.00	C	From Face	3.000	0.000	120.000	No Ice	5.882	2.928	0.035
(AT&T - Existing)			0.000			1/2" Ice	6.314	3.273	0.068
			0.000						
(2) LGP21401 TMA	A	From Face	3.000	0.000	120.000	No Ice	0.953	0.367	0.018
(AT&T - Existing)			0.000			1/2" Ice	1.093	0.480	0.023
			0.000						
(2) LGP21401 TMA	B	From Face	3.000	0.000	120.000	No Ice	0.953	0.367	0.018
(AT&T - Existing)			0.000			1/2" Ice	1.093	0.480	0.023
			0.000						
(2) LGP21401 TMA	C	From Face	3.000	0.000	120.000	No Ice	0.953	0.367	0.018
(AT&T - Existing)			0.000			1/2" Ice	1.093	0.480	0.023
			0.000						
(2) LGP21901 Diplexer	A	From Face	3.000	0.000	120.000	No Ice	0.233	0.117	0.006
(AT&T - Existing)			0.000			1/2" Ice	0.302	0.166	0.008
			0.000						
(2) LGP21901 Diplexer	B	From Face	3.000	0.000	120.000	No Ice	0.233	0.117	0.006
(AT&T - Existing)			0.000			1/2" Ice	0.302	0.166	0.008
			0.000						
(2) LGP21901 Diplexer	C	From Face	3.000	0.000	120.000	No Ice	0.233	0.117	0.006
(AT&T - Existing)			0.000			1/2" Ice	0.302	0.166	0.008
			0.000						
EEI 10' Universal T-Arm	A	None		0.000	120.000	No Ice	13.340	13.340	0.450
(AT&T - Existing)						1/2" Ice	16.800	16.800	0.600
EEI 10' Universal T-Arm	B	None		0.000	120.000	No Ice	13.340	13.340	0.450
(AT&T - Existing)						1/2" Ice	16.800	16.800	0.600
EEI 10' Universal T-Arm	C	None		0.000	120.000	No Ice	13.340	13.340	0.450
(AT&T - Existing)						1/2" Ice	16.800	16.800	0.600
AM-X-CD-16-65-00T-RET(7	A	From Face	3.000	0.000	120.000	No Ice	8.260	4.642	0.050
2")			2.000			1/2" Ice	8.807	5.088	0.096
(AT&T - Proposed)			0.000						
AM-X-CD-16-65-00T-RET(7	B	From Face	3.000	0.000	120.000	No Ice	8.260	4.642	0.050
2")			2.000			1/2" Ice	8.807	5.088	0.096
(AT&T - Proposed)			0.000						

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
P65-17-XLH-RR	C	From Face	3.000	0.000	120.000	No Ice	11.467	6.800	0.062
(AT&T - Proposed)			2.000			1/2" Ice	12.083	7.384	0.124
			0.000						
(2) RRUS-11	A	From Face	1.000	0.000	120.000	No Ice	2.994	1.246	0.050
(AT&T - Proposed)			2.000			1/2" Ice	3.226	1.412	0.070
			0.000						
(2) RRUS-11	B	From Face	1.000	0.000	120.000	No Ice	2.994	1.246	0.050
(AT&T - Proposed)			2.000			1/2" Ice	3.226	1.412	0.070
			0.000						
(2) RRUS-11	C	From Face	1.000	0.000	120.000	No Ice	2.994	1.246	0.050
(AT&T - Proposed)			2.000			1/2" Ice	3.226	1.412	0.070
			0.000						
DC6-48-60-18-8F Surge	C	From Face	0.500	0.000	120.000	No Ice	2.228	2.228	0.020
Arrestor			0.000			1/2" Ice	2.447	2.447	0.039
(AT&T - Proposed)			0.000						

Tower Pressures - No Ice

G_H = 1.690

Section Elevation ft	z ft	K_Z	q_z ksf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg % %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1	144.139	1.524	0.025	44.155	A	0.000	44.155	44.155	100.00	0.000	0.000
154.000-134.8					B	0.000	44.155		100.00	0.000	0.000
30					C	0.000	44.155		100.00	0.000	0.000
L2	111.111	1.415	0.023	134.257	A	0.000	134.257	134.257	100.00	0.000	0.000
134.830-89.16					B	0.000	134.257		100.00	0.000	0.000
0					C	0.000	134.257		100.00	0.000	0.000
L3	66.493	1.222	0.020	170.232	A	0.000	170.232	170.232	100.00	0.000	0.000
89.160-44.540					B	0.000	170.232		100.00	0.000	0.000
					C	0.000	170.232		100.00	0.000	0.000
L4	22.093	1	0.016	201.878	A	0.000	201.878	201.878	100.00	0.000	0.000
44.540-1.000					B	0.000	201.878		100.00	0.000	0.000
					C	0.000	201.878		100.00	0.000	0.000

Tower Pressure - With Ice

G_H = 1.690

Section Elevation ft	z ft	K_Z	q_z ksf	t_Z in	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg % %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1	144.139	1.524	0.019	0.500	45.752	A	0.000	45.752	45.752	100.00	0.000	0.000
154.000-134.830						B	0.000	45.752		100.00	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z ksf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
						C	0.000	45.752		100.00	0.000	0.000
L2	111.111	1.415	0.017	0.500	138.063	A	0.000	138.063	138.063	100.00	0.000	0.000
134.830-89.160						B	0.000	138.063		100.00	0.000	0.000
						C	0.000	138.063		100.00	0.000	0.000
L3	66.493	1.222	0.015	0.500	173.950	A	0.000	173.950	173.950	100.00	0.000	0.000
89.160-44.540						B	0.000	173.950		100.00	0.000	0.000
						C	0.000	173.950		100.00	0.000	0.000
L4 44.540-1.000	22.093	1	0.012	0.500	205.506	A	0.000	205.506	205.506	100.00	0.000	0.000
						B	0.000	205.506		100.00	0.000	0.000
						C	0.000	205.506		100.00	0.000	0.000

Tower Pressure - Service

G_H = 1.690

Section Elevation ft	z ft	K_Z	q_z ksf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1	144.139	1.524	0.010	44.155	A	0.000	44.155	44.155	100.00	0.000	0.000
154.000-134.8					B	0.000	44.155		100.00	0.000	0.000
30					C	0.000	44.155		100.00	0.000	0.000
L2	111.111	1.415	0.009	134.257	A	0.000	134.257	134.257	100.00	0.000	0.000
134.830-89.16					B	0.000	134.257		100.00	0.000	0.000
0					C	0.000	134.257		100.00	0.000	0.000
L3	66.493	1.222	0.008	170.232	A	0.000	170.232	170.232	100.00	0.000	0.000
89.160-44.540					B	0.000	170.232		100.00	0.000	0.000
					C	0.000	170.232		100.00	0.000	0.000
L4	22.093	1	0.006	201.878	A	0.000	201.878	201.878	100.00	0.000	0.000
44.540-1.000					B	0.000	201.878		100.00	0.000	0.000
					C	0.000	201.878		100.00	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.262	1.066	A	1	0.65	1	1	1	44.155	1.211	0.063	C
154.000-134.8			B	1	0.65	1	1	1	44.155			
30			C	1	0.65	1	1	1	44.155			
L2	1.870	5.810	A	1	0.65	1	1	1	134.257	3.412	0.075	C
134.830-89.16			B	1	0.65	1	1	1	134.257			
0			C	1	0.65	1	1	1	134.257			
L3	2.057	12.108	A	1	0.65	1	1	1	170.232	3.723	0.083	C
89.160-44.540			B	1	0.65	1	1	1	170.232			
			C	1	0.65	1	1	1	170.232			
L4	1.869	16.623	A	1	0.65	1	1	1	201.878	3.640	0.084	C
44.540-1.000			B	1	0.65	1	1	1	201.878			
			C	1	0.65	1	1	1	201.878			
Sum Weight:	6.057	35.607						OTM	869.635 kip-ft	11.986		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.262	1.066	A	1	0.65	1	1	1	44.155	1.211	0.063	C
154.000-134.8			B	1	0.65	1	1	1	44.155			
30			C	1	0.65	1	1	1	44.155			
L2	1.870	5.810	A	1	0.65	1	1	1	134.257	3.412	0.075	C
134.830-89.16			B	1	0.65	1	1	1	134.257			
0			C	1	0.65	1	1	1	134.257			
L3	2.057	12.108	A	1	0.65	1	1	1	170.232	3.723	0.083	C
89.160-44.540			B	1	0.65	1	1	1	170.232			
			C	1	0.65	1	1	1	170.232			
L4	1.869	16.623	A	1	0.65	1	1	1	201.878	3.640	0.084	C
44.540-1.000			B	1	0.65	1	1	1	201.878			
			C	1	0.65	1	1	1	201.878			
Sum Weight:	6.057	35.607						OTM	869.635 kip-ft	11.986		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.262	1.066	A	1	0.65	1	1	1	44.155	1.211	0.063	C
154.000-134.8			B	1	0.65	1	1	1	44.155			
30			C	1	0.65	1	1	1	44.155			
L2	1.870	5.810	A	1	0.65	1	1	1	134.257	3.412	0.075	C
134.830-89.16			B	1	0.65	1	1	1	134.257			
0			C	1	0.65	1	1	1	134.257			
L3	2.057	12.108	A	1	0.65	1	1	1	170.232	3.723	0.083	C
89.160-44.540			B	1	0.65	1	1	1	170.232			
			C	1	0.65	1	1	1	170.232			
L4	1.869	16.623	A	1	0.65	1	1	1	201.878	3.640	0.084	C
44.540-1.000			B	1	0.65	1	1	1	201.878			
			C	1	0.65	1	1	1	201.878			
Sum Weight:	6.057	35.607						OTM	869.635 kip-ft	11.986		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.262	1.066	A	1	0.65	1	1	1	44.155	1.211	0.063	C
154.000-134.8			B	1	0.65	1	1	1	44.155			
30			C	1	0.65	1	1	1	44.155			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L2	1.870	5.810	A	1	0.65	1	1	1	134.257	3.412	0.075	C
134.830-89.16			B	1	0.65	1	1	1	134.257			
0			C	1	0.65	1	1	1	134.257			
L3	2.057	12.108	A	1	0.65	1	1	1	170.232	3.723	0.083	C
89.160-44.540			B	1	0.65	1	1	1	170.232			
			C	1	0.65	1	1	1	170.232			
L4	1.869	16.623	A	1	0.65	1	1	1	201.878	3.640	0.084	C
44.540-1.000			B	1	0.65	1	1	1	201.878			
			C	1	0.65	1	1	1	201.878			
Sum Weight:	6.057	35.607						OTM	869.635 kip-ft	11.986		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.262	1.399	A	1	0.65	1	1	1	45.752	0.941	0.049	C
154.000-134.8			B	1	0.65	1	1	1	45.752			
30			C	1	0.65	1	1	1	45.752			
L2	1.870	6.819	A	1	0.65	1	1	1	138.063	2.631	0.058	C
134.830-89.16			B	1	0.65	1	1	1	138.063			
0			C	1	0.65	1	1	1	138.063			
L3	2.057	13.382	A	1	0.65	1	1	1	173.950	2.853	0.064	C
89.160-44.540			B	1	0.65	1	1	1	173.950			
			C	1	0.65	1	1	1	173.950			
L4	1.869	18.132	A	1	0.65	1	1	1	205.506	2.779	0.064	C
44.540-1.000			B	1	0.65	1	1	1	205.506			
			C	1	0.65	1	1	1	205.506			
Sum Weight:	6.057	39.731						OTM	669.946 kip-ft	9.205		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.262	1.399	A	1	0.65	1	1	1	45.752	0.941	0.049	C
154.000-134.8			B	1	0.65	1	1	1	45.752			
30			C	1	0.65	1	1	1	45.752			
L2	1.870	6.819	A	1	0.65	1	1	1	138.063	2.631	0.058	C
134.830-89.16			B	1	0.65	1	1	1	138.063			
0			C	1	0.65	1	1	1	138.063			
L3	2.057	13.382	A	1	0.65	1	1	1	173.950	2.853	0.064	C
89.160-44.540			B	1	0.65	1	1	1	173.950			
			C	1	0.65	1	1	1	173.950			
L4	1.869	18.132	A	1	0.65	1	1	1	205.506	2.779	0.064	C
44.540-1.000			B	1	0.65	1	1	1	205.506			
			C	1	0.65	1	1	1	205.506			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
Sum Weight:	6.057	39.731						OTM	669.946 kip-ft	9.205		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.262	1.399	A	1	0.65	1	1	1	45.752	0.941	0.049	C
154.000-134.8			B	1	0.65	1	1	1	45.752			
30			C	1	0.65	1	1	1	45.752			
L2	1.870	6.819	A	1	0.65	1	1	1	138.063	2.631	0.058	C
134.830-89.16			B	1	0.65	1	1	1	138.063			
0			C	1	0.65	1	1	1	138.063			
L3	2.057	13.382	A	1	0.65	1	1	1	173.950	2.853	0.064	C
89.160-44.540			B	1	0.65	1	1	1	173.950			
			C	1	0.65	1	1	1	173.950			
L4	1.869	18.132	A	1	0.65	1	1	1	205.506	2.779	0.064	C
44.540-1.000			B	1	0.65	1	1	1	205.506			
			C	1	0.65	1	1	1	205.506			
Sum Weight:	6.057	39.731						OTM	669.946 kip-ft	9.205		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.262	1.399	A	1	0.65	1	1	1	45.752	0.941	0.049	C
154.000-134.8			B	1	0.65	1	1	1	45.752			
30			C	1	0.65	1	1	1	45.752			
L2	1.870	6.819	A	1	0.65	1	1	1	138.063	2.631	0.058	C
134.830-89.16			B	1	0.65	1	1	1	138.063			
0			C	1	0.65	1	1	1	138.063			
L3	2.057	13.382	A	1	0.65	1	1	1	173.950	2.853	0.064	C
89.160-44.540			B	1	0.65	1	1	1	173.950			
			C	1	0.65	1	1	1	173.950			
L4	1.869	18.132	A	1	0.65	1	1	1	205.506	2.779	0.064	C
44.540-1.000			B	1	0.65	1	1	1	205.506			
			C	1	0.65	1	1	1	205.506			
Sum Weight:	6.057	39.731						OTM	669.946 kip-ft	9.205		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.262	1.066	A	1	0.65	1	1	1	44.155	0.473	0.025	C
154.000-134.8			B	1	0.65	1	1	1	44.155			
30			C	1	0.65	1	1	1	44.155			
L2	1.870	5.810	A	1	0.65	1	1	1	134.257	1.333	0.029	C
134.830-89.16			B	1	0.65	1	1	1	134.257			
0			C	1	0.65	1	1	1	134.257			
L3	2.057	12.108	A	1	0.65	1	1	1	170.232	1.454	0.033	C
89.160-44.540			B	1	0.65	1	1	1	170.232			
			C	1	0.65	1	1	1	170.232			
L4	1.869	16.623	A	1	0.65	1	1	1	201.878	1.422	0.033	C
44.540-1.000			B	1	0.65	1	1	1	201.878			
			C	1	0.65	1	1	1	201.878			
Sum Weight:	6.057	35.607						OTM	339.701 kip-ft	4.682		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.262	1.066	A	1	0.65	1	1	1	44.155	0.473	0.025	C
154.000-134.8			B	1	0.65	1	1	1	44.155			
30			C	1	0.65	1	1	1	44.155			
L2	1.870	5.810	A	1	0.65	1	1	1	134.257	1.333	0.029	C
134.830-89.16			B	1	0.65	1	1	1	134.257			
0			C	1	0.65	1	1	1	134.257			
L3	2.057	12.108	A	1	0.65	1	1	1	170.232	1.454	0.033	C
89.160-44.540			B	1	0.65	1	1	1	170.232			
			C	1	0.65	1	1	1	170.232			
L4	1.869	16.623	A	1	0.65	1	1	1	201.878	1.422	0.033	C
44.540-1.000			B	1	0.65	1	1	1	201.878			
			C	1	0.65	1	1	1	201.878			
Sum Weight:	6.057	35.607						OTM	339.701 kip-ft	4.682		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.262	1.066	A	1	0.65	1	1	1	44.155	0.473	0.025	C
154.000-134.8			B	1	0.65	1	1	1	44.155			
30			C	1	0.65	1	1	1	44.155			
L2	1.870	5.810	A	1	0.65	1	1	1	134.257	1.333	0.029	C
134.830-89.16			B	1	0.65	1	1	1	134.257			
0			C	1	0.65	1	1	1	134.257			
L3	2.057	12.108	A	1	0.65	1	1	1	170.232	1.454	0.033	C
89.160-44.540			B	1	0.65	1	1	1	170.232			
			C	1	0.65	1	1	1	170.232			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L4	1.869	16.623	A	1	0.65	1	1	1	201.878	1.422	0.033	C
44.540-1.000			B	1	0.65	1	1	1	201.878			
			C	1	0.65	1	1	1	201.878			
Sum Weight:	6.057	35.607						OTM	339.701 kip-ft	4.682		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.262	1.066	A	1	0.65	1	1	1	44.155	0.473	0.025	C
154.000-134.8			B	1	0.65	1	1	1	44.155			
30			C	1	0.65	1	1	1	44.155			
L2	1.870	5.810	A	1	0.65	1	1	1	134.257	1.333	0.029	C
134.830-89.16			B	1	0.65	1	1	1	134.257			
0			C	1	0.65	1	1	1	134.257			
L3	2.057	12.108	A	1	0.65	1	1	1	170.232	1.454	0.033	C
89.160-44.540			B	1	0.65	1	1	1	170.232			
			C	1	0.65	1	1	1	170.232			
L4	1.869	16.623	A	1	0.65	1	1	1	201.878	1.422	0.033	C
44.540-1.000			B	1	0.65	1	1	1	201.878			
			C	1	0.65	1	1	1	201.878			
Sum Weight:	6.057	35.607						OTM	339.701 kip-ft	4.682		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	35.607					
Bracing Weight	0.000					
Total Member Self-Weight	35.607			-0.176	0.485	
Total Weight	60.823			-0.176	0.485	
Wind 0 deg - No Ice		-0.053	-55.468	-6166.175	7.831	-0.985
Wind 30 deg - No Ice		27.698	-48.010	-5336.415	-3077.897	-0.789
Wind 45 deg - No Ice		39.198	-39.184	-4355.002	-4356.806	-0.606
Wind 60 deg - No Ice		48.026	-27.688	-3076.814	-5338.774	-0.382
Wind 90 deg - No Ice		55.487	0.053	7.170	-6169.001	0.127
Wind 120 deg - No Ice		48.079	27.780	3089.185	-5346.120	0.603
Wind 135 deg - No Ice		39.272	39.259	4365.038	-4367.195	0.786
Wind 150 deg - No Ice		27.789	48.063	5343.409	-3090.620	0.916
Wind 180 deg - No Ice		0.053	55.468	6165.824	-6.860	0.985
Wind 210 deg - No Ice		-27.698	48.010	5336.064	3078.867	0.789
Wind 225 deg - No Ice		-39.198	39.184	4354.650	4357.777	0.606
Wind 240 deg - No Ice		-48.026	27.688	3076.463	5339.744	0.382
Wind 270 deg - No Ice		-55.487	-0.053	-7.521	6169.972	-0.127
Wind 300 deg - No Ice		-48.079	-27.780	-3089.537	5347.090	-0.603

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 315 deg - No Ice		-39.272	-39.259	-4365.390	4368.165	-0.786
Wind 330 deg - No Ice		-27.789	-48.063	-5343.761	3091.590	-0.916
Member Ice	4.124					
Total Weight Ice	71.510			-0.168	0.685	
Wind 0 deg - Ice		-0.042	-53.195	-5991.554	6.561	-0.976
Wind 30 deg - Ice		26.571	-46.047	-5185.922	-2991.560	-0.850
Wind 45 deg - Ice		37.598	-37.585	-4232.562	-4234.031	-0.697
Wind 60 deg - Ice		46.064	-26.561	-2990.772	-5187.912	-0.496
Wind 90 deg - Ice		53.214	0.042	5.708	-5993.984	-0.009
Wind 120 deg - Ice		46.106	26.634	3000.613	-5193.789	0.481
Wind 135 deg - Ice		37.658	37.644	4240.536	-4242.341	0.684
Wind 150 deg - Ice		26.644	46.089	5191.462	-3001.739	0.841
Wind 180 deg - Ice		0.042	53.195	5991.217	-5.192	0.976
Wind 210 deg - Ice		-26.571	46.047	5185.585	2992.930	0.850
Wind 225 deg - Ice		-37.598	37.585	4232.226	4235.401	0.697
Wind 240 deg - Ice		-46.064	26.561	2990.435	5189.282	0.496
Wind 270 deg - Ice		-53.214	-0.042	-6.045	5995.354	0.009
Wind 300 deg - Ice		-46.106	-26.634	-3000.950	5195.159	-0.481
Wind 315 deg - Ice		-37.658	-37.644	-4240.873	4243.711	-0.684
Wind 330 deg - Ice		-26.644	-46.089	-5191.799	3003.109	-0.841
Total Weight	60.823			-0.176	0.485	
Wind 0 deg - Service		-0.021	-21.667	-2408.769	3.354	-0.385
Wind 30 deg - Service		10.819	-18.754	-2084.644	-1202.008	-0.308
Wind 45 deg - Service		15.312	-15.306	-1701.280	-1701.582	-0.237
Wind 60 deg - Service		18.760	-10.816	-1201.988	-2085.163	-0.149
Wind 90 deg - Service		21.674	0.021	2.694	-2409.471	0.050
Wind 120 deg - Service		18.781	10.851	1206.606	-2088.032	0.235
Wind 135 deg - Service		15.341	15.335	1704.986	-1705.640	0.307
Wind 150 deg - Service		10.855	18.774	2087.162	-1206.978	0.358
Wind 180 deg - Service		0.021	21.667	2408.418	-2.384	0.385
Wind 210 deg - Service		-10.819	18.754	2084.293	1202.978	0.308
Wind 225 deg - Service		-15.312	15.306	1700.928	1702.552	0.237
Wind 240 deg - Service		-18.760	10.816	1201.636	2086.133	0.149
Wind 270 deg - Service		-21.674	-0.021	-3.045	2410.441	-0.050
Wind 300 deg - Service		-18.781	-10.851	-1206.958	2089.003	-0.235
Wind 315 deg - Service		-15.341	-15.335	-1705.338	1706.610	-0.307
Wind 330 deg - Service		-10.855	-18.774	-2087.514	1207.948	-0.358

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 45 deg - No Ice
5	Dead+Wind 60 deg - No Ice
6	Dead+Wind 90 deg - No Ice
7	Dead+Wind 120 deg - No Ice
8	Dead+Wind 135 deg - No Ice
9	Dead+Wind 150 deg - No Ice
10	Dead+Wind 180 deg - No Ice
11	Dead+Wind 210 deg - No Ice
12	Dead+Wind 225 deg - No Ice
13	Dead+Wind 240 deg - No Ice
14	Dead+Wind 270 deg - No Ice

Comb. No.	Description
15	Dead+Wind 300 deg - No Ice
16	Dead+Wind 315 deg - No Ice
17	Dead+Wind 330 deg - No Ice
18	Dead+Ice+Temp
19	Dead+Wind 0 deg+Ice+Temp
20	Dead+Wind 30 deg+Ice+Temp
21	Dead+Wind 45 deg+Ice+Temp
22	Dead+Wind 60 deg+Ice+Temp
23	Dead+Wind 90 deg+Ice+Temp
24	Dead+Wind 120 deg+Ice+Temp
25	Dead+Wind 135 deg+Ice+Temp
26	Dead+Wind 150 deg+Ice+Temp
27	Dead+Wind 180 deg+Ice+Temp
28	Dead+Wind 210 deg+Ice+Temp
29	Dead+Wind 225 deg+Ice+Temp
30	Dead+Wind 240 deg+Ice+Temp
31	Dead+Wind 270 deg+Ice+Temp
32	Dead+Wind 300 deg+Ice+Temp
33	Dead+Wind 315 deg+Ice+Temp
34	Dead+Wind 330 deg+Ice+Temp
35	Dead+Wind 0 deg - Service
36	Dead+Wind 30 deg - Service
37	Dead+Wind 45 deg - Service
38	Dead+Wind 60 deg - Service
39	Dead+Wind 90 deg - Service
40	Dead+Wind 120 deg - Service
41	Dead+Wind 135 deg - Service
42	Dead+Wind 150 deg - Service
43	Dead+Wind 180 deg - Service
44	Dead+Wind 210 deg - Service
45	Dead+Wind 225 deg - Service
46	Dead+Wind 240 deg - Service
47	Dead+Wind 270 deg - Service
48	Dead+Wind 300 deg - Service
49	Dead+Wind 315 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	154 - 134.83	Pole	Max Tension	6	0.000	0.000	-0.000
			Max. Compression	18	-10.048	0.630	0.364
			Max. Mx	14	-6.057	110.746	0.281
			Max. My	2	-6.064	0.456	110.497
			Max. Vy	14	-16.137	110.746	0.281
			Max. Vx	2	-16.076	0.456	110.497
			Max. Torque	28			-0.896
L2	134.83 - 89.16	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-31.132	0.685	0.168
			Max. Mx	14	-21.547	1452.711	2.649
			Max. My	2	-21.550	2.933	1450.657
			Max. Vy	14	-42.561	1452.711	2.649
			Max. Vx	2	-42.541	2.933	1450.657
			Max. Torque	10			-0.980
L3	89.16 - 44.54	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-49.107	0.685	0.168
			Max. Mx	14	-38.450	3597.397	5.025

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. My	2	-38.452	5.340	3594.470
			Max. Vy	14	-52.530	3597.397	5.025
			Max. Vx	2	-52.510	5.340	3594.470
			Max. Torque	10			-0.978
L4	44.54 - 1	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-71.510	0.685	0.168
			Max. Mx	14	-60.783	6327.794	7.742
			Max. My	2	-60.783	8.061	6323.880
			Max. Vy	14	-55.531	6327.794	7.742
			Max. Vx	2	-55.512	8.061	6323.880
			Max. Torque	10			-0.975

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	31	71.510	53.214	0.042
	Max. H_x	14	60.823	55.487	0.053
	Max. H_z	2	60.823	0.053	55.468
	Max. M_x	2	6323.880	0.053	55.468
	Max. M_z	6	6326.781	-55.487	-0.053
	Max. Torsion	2	0.974	0.053	55.468
	Min. Vert	1	60.823	0.000	0.000
	Min. H_x	6	60.823	-55.487	-0.053
	Min. H_z	10	60.823	-0.053	-55.468
	Min. M_x	10	-6323.512	-0.053	-55.468
	Min. M_z	14	-6327.794	55.487	0.053
	Min. Torsion	10	-0.975	-0.053	-55.468

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	60.823	0.000	0.000	-0.176	0.485	0.000
Dead+Wind 0 deg - No Ice	60.823	-0.053	-55.468	-6323.880	8.060	-0.974
Dead+Wind 30 deg - No Ice	60.823	27.698	-48.010	-5472.903	-3156.610	-0.782
Dead+Wind 45 deg - No Ice	60.823	39.198	-39.184	-4466.382	-4468.241	-0.601
Dead+Wind 60 deg - No Ice	60.823	48.026	-27.688	-3155.494	-5475.329	-0.380
Dead+Wind 90 deg - No Ice	60.823	55.487	0.053	7.371	-6326.781	0.124
Dead+Wind 120 deg - No Ice	60.823	48.079	27.780	3168.195	-5482.856	0.595
Dead+Wind 135 deg - No Ice	60.823	39.272	39.259	4476.670	-4478.900	0.777
Dead+Wind 150 deg - No Ice	60.823	27.789	48.063	5480.060	-3169.682	0.906
Dead+Wind 180 deg - No Ice	60.823	0.053	55.468	6323.512	-7.053	0.975
Dead+Wind 210 deg - No Ice	60.823	-27.698	48.010	5472.537	3157.621	0.781
Dead+Wind 225 deg - No Ice	60.823	-39.198	39.184	4466.015	4469.253	0.600
Dead+Wind 240 deg - No Ice	60.823	-48.026	27.688	3155.126	5476.342	0.379
Dead+Wind 270 deg - No Ice	60.823	-55.487	-0.053	-7.742	6327.794	-0.125
Dead+Wind 300 deg - No Ice	60.823	-48.079	-27.780	-3168.567	5483.866	-0.595
Dead+Wind 315 deg - No Ice	60.823	-39.272	-39.259	-4477.042	4479.908	-0.776
Dead+Wind 330 deg - No Ice	60.823	-27.789	-48.063	-5480.431	3170.690	-0.905
Dead+Ice+Temp	71.510	0.000	0.000	-0.168	0.685	0.000

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead+Wind 0 deg+Ice+Temp	71.510	-0.042	-53.195	-6189.078	6.818	-0.965
Dead+Wind 30 deg+Ice+Temp	71.510	26.571	-46.047	-5356.884	-3090.164	-0.843
Dead+Wind 45 deg+Ice+Temp	71.510	37.598	-37.585	-4372.089	-4373.605	-0.692
Dead+Wind 60 deg+Ice+Temp	71.510	46.064	-26.561	-3089.353	-5358.939	-0.495
Dead+Wind 90 deg+Ice+Temp	71.510	53.214	0.042	5.915	-6191.584	-0.013
Dead+Wind 120 deg+Ice+Temp	71.510	46.106	26.634	3099.535	-5365.010	0.471
Dead+Wind 135 deg+Ice+Temp	71.510	37.658	37.644	4380.325	-4382.202	0.674
Dead+Wind 150 deg+Ice+Temp	71.510	26.644	46.089	5362.595	-3100.707	0.830
Dead+Wind 180 deg+Ice+Temp	71.510	0.042	53.195	6188.719	-5.372	0.966
Dead+Wind 210 deg+Ice+Temp	71.510	-26.571	46.047	5356.528	3091.612	0.842
Dead+Wind 225 deg+Ice+Temp	71.510	-37.598	37.585	4371.732	4375.055	0.692
Dead+Wind 240 deg+Ice+Temp	71.510	-46.064	26.561	3088.996	5360.390	0.494
Dead+Wind 270 deg+Ice+Temp	71.510	-53.214	-0.042	-6.275	6193.035	0.013
Dead+Wind 300 deg+Ice+Temp	71.510	-46.106	-26.634	-3099.898	5366.460	-0.471
Dead+Wind 315 deg+Ice+Temp	71.510	-37.658	-37.644	-4380.688	4383.650	-0.673
Dead+Wind 330 deg+Ice+Temp	71.510	-26.644	-46.089	-5362.957	3102.153	-0.829
Dead+Wind 0 deg - Service	60.823	-0.021	-21.667	-2472.840	3.466	-0.384
Dead+Wind 30 deg - Service	60.823	10.819	-18.754	-2140.090	-1233.963	-0.308
Dead+Wind 45 deg - Service	60.823	15.312	-15.306	-1746.529	-1746.830	-0.237
Dead+Wind 60 deg - Service	60.823	18.760	-10.816	-1233.954	-2140.615	-0.150
Dead+Wind 90 deg - Service	60.823	21.674	0.021	2.770	-2473.554	0.049
Dead+Wind 120 deg - Service	60.823	18.781	10.851	1238.700	-2143.569	0.234
Dead+Wind 135 deg - Service	60.823	15.341	15.335	1750.336	-1751.008	0.306
Dead+Wind 150 deg - Service	60.823	10.855	18.774	2142.673	-1239.081	0.357
Dead+Wind 180 deg - Service	60.823	0.021	21.667	2472.470	-2.445	0.384
Dead+Wind 210 deg - Service	60.823	-10.819	18.754	2139.722	1234.985	0.308
Dead+Wind 225 deg - Service	60.823	-15.312	15.306	1746.158	1747.851	0.237
Dead+Wind 240 deg - Service	60.823	-18.760	10.816	1233.583	2141.637	0.149
Dead+Wind 270 deg - Service	60.823	-21.674	-0.021	-3.141	2474.575	-0.049
Dead+Wind 300 deg - Service	60.823	-18.781	-10.851	-1239.072	2144.590	-0.234
Dead+Wind 315 deg - Service	60.823	-15.341	-15.335	-1750.707	1752.029	-0.306
Dead+Wind 330 deg - Service	60.823	-10.855	-18.774	-2143.046	1240.103	-0.357

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.000	-60.823	0.000	0.000	60.823	0.000	0.000%
2	-0.053	-60.823	-55.468	0.053	60.823	55.468	0.000%
3	27.698	-60.823	-48.010	-27.698	60.823	48.010	0.000%
4	39.198	-60.823	-39.184	-39.198	60.823	39.184	0.000%
5	48.026	-60.823	-27.688	-48.026	60.823	27.688	0.000%
6	55.487	-60.823	0.053	-55.487	60.823	-0.053	0.000%
7	48.079	-60.823	27.780	-48.079	60.823	-27.780	0.000%
8	39.272	-60.823	39.259	-39.272	60.823	-39.259	0.000%
9	27.789	-60.823	48.063	-27.789	60.823	-48.063	0.000%
10	0.053	-60.823	55.468	-0.053	60.823	-55.468	0.000%
11	-27.698	-60.823	48.010	27.698	60.823	-48.010	0.000%
12	-39.198	-60.823	39.184	39.198	60.823	-39.184	0.000%
13	-48.026	-60.823	27.688	48.026	60.823	-27.688	0.000%
14	-55.487	-60.823	-0.053	55.487	60.823	0.053	0.000%
15	-48.079	-60.823	-27.780	48.079	60.823	27.780	0.000%
16	-39.272	-60.823	-39.259	39.272	60.823	39.259	0.000%
17	-27.789	-60.823	-48.063	27.789	60.823	48.063	0.000%
18	0.000	-71.510	0.000	0.000	71.510	0.000	0.000%
19	-0.042	-71.510	-53.195	0.042	71.510	53.195	0.000%
20	26.571	-71.510	-46.047	-26.571	71.510	46.047	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
21	37.598	-71.510	-37.585	-37.598	71.510	37.585	0.000%
22	46.064	-71.510	-26.561	-46.064	71.510	26.561	0.000%
23	53.214	-71.510	0.042	-53.214	71.510	-0.042	0.000%
24	46.106	-71.510	26.634	-46.106	71.510	-26.634	0.000%
25	37.658	-71.510	37.644	-37.658	71.510	-37.644	0.000%
26	26.644	-71.510	46.089	-26.644	71.510	-46.089	0.000%
27	0.042	-71.510	53.195	-0.042	71.510	-53.195	0.000%
28	-26.571	-71.510	46.047	26.571	71.510	-46.047	0.000%
29	-37.598	-71.510	37.585	37.598	71.510	-37.585	0.000%
30	-46.064	-71.510	26.561	46.064	71.510	-26.561	0.000%
31	-53.214	-71.510	-0.042	53.214	71.510	0.042	0.000%
32	-46.106	-71.510	-26.634	46.106	71.510	26.634	0.000%
33	-37.658	-71.510	-37.644	37.658	71.510	37.644	0.000%
34	-26.644	-71.510	-46.089	26.644	71.510	46.089	0.000%
35	-0.021	-60.823	-21.667	0.021	60.823	21.667	0.000%
36	10.819	-60.823	-18.754	-10.819	60.823	18.754	0.000%
37	15.312	-60.823	-15.306	-15.312	60.823	15.306	0.000%
38	18.760	-60.823	-10.816	-18.760	60.823	10.816	0.000%
39	21.674	-60.823	0.021	-21.674	60.823	-0.021	0.000%
40	18.781	-60.823	10.851	-18.781	60.823	-10.851	0.000%
41	15.341	-60.823	15.335	-15.341	60.823	-15.335	0.000%
42	10.855	-60.823	18.774	-10.855	60.823	-18.774	0.000%
43	0.021	-60.823	21.667	-0.021	60.823	-21.667	0.000%
44	-10.819	-60.823	18.754	10.819	60.823	-18.754	0.000%
45	-15.312	-60.823	15.306	15.312	60.823	-15.306	0.000%
46	-18.760	-60.823	10.816	18.760	60.823	-10.816	0.000%
47	-21.674	-60.823	-0.021	21.674	60.823	0.021	0.000%
48	-18.781	-60.823	-10.851	18.781	60.823	10.851	0.000%
49	-15.341	-60.823	-15.335	15.341	60.823	15.335	0.000%
50	-10.855	-60.823	-18.774	10.855	60.823	18.774	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00026912
3	Yes	5	0.00000001	0.00025874
4	Yes	5	0.00000001	0.00028494
5	Yes	5	0.00000001	0.00026462
6	Yes	4	0.00000001	0.00006686
7	Yes	5	0.00000001	0.00026520
8	Yes	5	0.00000001	0.00028601
9	Yes	5	0.00000001	0.00026029
10	Yes	4	0.00000001	0.00020889
11	Yes	5	0.00000001	0.00026595
12	Yes	5	0.00000001	0.00028503
13	Yes	5	0.00000001	0.00026022
14	Yes	4	0.00000001	0.00008609
15	Yes	5	0.00000001	0.00026218
16	Yes	5	0.00000001	0.00028626
17	Yes	5	0.00000001	0.00026696
18	Yes	4	0.00000001	0.00000001
19	Yes	5	0.00000001	0.00010517
20	Yes	5	0.00000001	0.00059207
21	Yes	5	0.00000001	0.00066631

22	Yes	5	0.00000001	0.00060320
23	Yes	5	0.00000001	0.00010399
24	Yes	5	0.00000001	0.00060320
25	Yes	5	0.00000001	0.00066854
26	Yes	5	0.00000001	0.00059583
27	Yes	5	0.00000001	0.00010476
28	Yes	5	0.00000001	0.00060552
29	Yes	5	0.00000001	0.00066672
30	Yes	5	0.00000001	0.00059451
31	Yes	5	0.00000001	0.00010409
32	Yes	5	0.00000001	0.00059972
33	Yes	5	0.00000001	0.00066942
34	Yes	5	0.00000001	0.00060698
35	Yes	4	0.00000001	0.00007107
36	Yes	4	0.00000001	0.00095349
37	Yes	5	0.00000001	0.00003721
38	Yes	4	0.00000001	0.00099411
39	Yes	4	0.00000001	0.00003881
40	Yes	4	0.00000001	0.00099642
41	Yes	5	0.00000001	0.00003744
42	Yes	4	0.00000001	0.00096286
43	Yes	4	0.00000001	0.00006607
44	Yes	5	0.00000001	0.00003334
45	Yes	5	0.00000001	0.00003726
46	Yes	4	0.00000001	0.00096409
47	Yes	4	0.00000001	0.00003974
48	Yes	4	0.00000001	0.00097781
49	Yes	5	0.00000001	0.00003759
50	Yes	5	0.00000001	0.00003355

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	154 - 134.83	36.226	48	2.025	0.002
L2	139.16 - 89.16	29.966	48	1.985	0.002
L3	94.83 - 44.54	13.688	48	1.383	0.001
L4	51.46 - 1	3.940	48	0.715	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
150.000	EEI Pine Branches	48	34.526	2.020	0.002	24750
140.000	EEI Pine Branches	48	30.315	1.990	0.002	8996
130.000	EEI Pine Branches	48	26.233	1.912	0.001	6402
120.000	EEI Pine Branches	48	22.340	1.789	0.001	5106
110.000	EEI Pine Branches	48	18.682	1.637	0.001	4247
100.000	EEI Pine Branches	48	15.307	1.470	0.001	3635
90.000	EEI Pine Branches	48	12.261	1.303	0.000	3349
80.000	EEI Pine Branches	48	9.573	1.144	0.000	3281

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	154 - 134.83	92.432	15	5.170	0.006
L2	139.16 - 89.16	76.480	15	5.069	0.004
L3	94.83 - 44.54	34.969	15	3.534	0.001
L4	51.46 - 1	10.072	15	1.829	0.000

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
150.000	EEI Pine Branches	15	88.099	5.157	0.005	9884
140.000	EEI Pine Branches	15	77.369	5.081	0.004	3591
130.000	EEI Pine Branches	15	66.967	4.882	0.003	2548
120.000	EEI Pine Branches	15	57.040	4.570	0.003	2028
110.000	EEI Pine Branches	15	47.710	4.182	0.002	1683
100.000	EEI Pine Branches	15	39.099	3.757	0.002	1437
90.000	EEI Pine Branches	15	31.326	3.331	0.001	1322
80.000	EEI Pine Branches	15	24.464	2.923	0.001	1293

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
L1	154 - 134.83 (1)	TP30.03x25.25x0.188	19.170	0.000	0.0	38.627	17.118	-6.053	661.204	0.009
L2	134.83 - 89.16 (2)	TP40.91x28.575x0.313	50.000	0.000	0.0	39.000	38.880	-21.542	1516.330	0.014
L3	89.16 - 44.54 (3)	TP51.28x38.886x0.5	50.290	0.000	0.0	39.000	77.881	-38.447	3037.370	0.013
L4	44.54 - 1 (4)	TP61x48.575x0.563	50.460	0.000	0.0	39.000	107.904	-60.783	4208.240	0.014

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	154 - 134.83 (1)	TP30.03x25.25x0.188	110.847	10.934	38.627	0.283	0.000	0.000	38.627	0.000
L2	134.83 - 89.16 (2)	TP40.91x28.575x0.313	1454.425	46.414	39.000	1.190	0.000	0.000	39.000	0.000
L3	89.16 - 44.54	TP51.28x38.886x0.5	3600.95	45.924	39.000	1.178	0.000	0.000	39.000	0.000

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L4	(3) 44.54 - 1 (4)	TP61x48.575x0.563	0 6333.517	47.297	39.000	1.213	0.000	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	154 - 134.83 (1)	TP30.03x25.25x0.188	16.169	0.945	26.000	0.073	0.000	0.000	26.000	0.000
L2	134.83 - 89.16 (2)	TP40.91x28.575x0.313	42.603	1.096	26.000	0.084	0.597	0.009	26.000	0.000
L3	89.16 - 44.54 (3)	TP51.28x38.886x0.5	52.572	0.675	26.000	0.052	0.595	0.004	26.000	0.000
L4	44.54 - 1 (4)	TP61x48.575x0.563	55.574	0.515	26.000	0.040	0.776	0.003	26.000	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	154 - 134.83 (1)	0.009	0.283	0.000	0.073	0.000	0.294 ✔	1.333	H1-3+VT ✔
L2	134.83 - 89.16 (2)	0.014	1.190	0.000	0.084	0.000	1.206 ✔	1.333	H1-3+VT ✔
L3	89.16 - 44.54 (3)	0.013	1.178	0.000	0.052	0.000	1.191 ✔	1.333	H1-3+VT ✔
L4	44.54 - 1 (4)	0.014	1.213	0.000	0.040	0.000	1.228 ✔	1.333	H1-3+VT ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	154 - 134.83	Pole	TP30.03x25.25x0.188	1	-6.053	881.385	22.0	Pass
L2	134.83 - 89.16	Pole	TP40.91x28.575x0.313	2	-21.542	2021.268	90.5	Pass
L3	89.16 - 44.54	Pole	TP51.28x38.886x0.5	3	-38.447	4048.814	89.3	Pass
L4	44.54 - 1	Pole	TP61x48.575x0.563	4	-60.783	5609.584	92.1	Pass
							Summary	
						Pole (L4)	92.1	Pass
						RATING =	**92.1**	**Pass**

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Subject:	Anchor Bolt and Baseplate Analysis
Location:	153-ft EEI Monopine New Milford, CT
Rev. 0: 10/16/12	Prepared by: T.J.L. Checked by: C.F.C. Job No. 12063.CO44

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	$OM := 6334 \cdot ft \cdot kips$	(Input From RisaTower)
Shear Force =	$Shear := 56 \cdot kips$	(Input From RisaTower)
Axial Force =	$Axial := 61 \cdot kips$	(Input From RisaTower)

Anchor Bolt Data:

Use ASTM A615 Grade 75

Number of Anchor Bolts =	$N := 28$	(User Input)
Diameter of Bolt Circle =	$D_{bc} := 68.0 \cdot in$	(User Input)
Bolt "Column" Distance =	$l := 3.0 \cdot in$	(User Input)
Bolt Ultimate Strength =	$F_u := 100 \cdot ksi$	(User Input)
Bolt Yield Strength =	$F_y := 75 \cdot ksi$	(User Input)
Bolt Modulus =	$E := 29000 \cdot ksi$	(User Input)
Diameter of Anchor Bolts =	$D := 2.25 \cdot in$	(User Input)
Threads per Inch =	$n := 4.5$	(User Input)

Base Plate Data:

Use ASTM A572 Mod 60

Plate Yield Strength =	$Fy_{bp} := 60 \cdot ksi$	(User Input)
Base Plate Thickness =	$t_{bp} := 3.0 \cdot in$	(User Input)
Base Plate Diameter =	$D_{bp} := 74.0 \cdot in$	(User Input)
Outer Pole Diameter =	$D_{pole} := 61.0 \cdot in$	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

Radius of Bolt Circle =: $R_{bc} := \frac{D_{bc}}{2} = 34 \cdot in$

Distance to Bolts = $i := 1 .. N$

$d_i := \left\| \theta \leftarrow 2 \cdot \pi \cdot \left(\frac{i}{N} \right) \right.$
$\left. d \leftarrow R_{bc} \cdot \sin(\theta) \right.$

$d_1 = 7.57 \cdot in$ $d_7 = 34.00 \cdot in$

$d_2 = 14.75 \cdot in$ $d_8 = 33.15 \cdot in$

$d_3 = 21.20 \cdot in$ $d_9 = 30.63 \cdot in$

$d_4 = 26.58 \cdot in$ $d_{10} = 26.58 \cdot in$

$d_5 = 30.63 \cdot in$ $d_{11} = 21.20 \cdot in$

$d_6 = 33.15 \cdot in$ etc.

Critical Distances For Bending in Plate:

Outer Pole Radius = $R_{pole} := \frac{D_{pole}}{2} = 30.5 \cdot in$

Moment Arms of Bolts about Neutral Axis = $MA_i := if\left(d_i \geq R_{pole}, d_i - R_{pole}, 0in\right)$

$MA_1 = 0.00 \cdot in$ $MA_7 = 3.50 \cdot in$

$MA_2 = 0.00 \cdot in$ $MA_8 = 2.65 \cdot in$

$MA_3 = 0.00 \cdot in$ $MA_9 = 0.13 \cdot in$

$MA_4 = 0.00 \cdot in$ $MA_{10} = 0.00 \cdot in$

$MA_5 = 0.13 \cdot in$ $MA_{11} = 0.00 \cdot in$

$MA_6 = 2.65 \cdot in$ etc

Effective Width of Baseplate for Bending = $B_{eff} := .8 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2} = 33.5 \cdot in$

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Polar Moment of Inertia = $I_p := \sum_i \left(d_i\right)^2 = 1.618 \times 10^4 \cdot in^2$

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 = $T_{Max} := OM \cdot \frac{R_{bc}}{I_p} - \frac{Axial}{N} = 157.5 \cdot kips$

Allowable Tensile Force = $T_{ALL.Gross} := 1.333 \cdot \left(0.33 \cdot A_g \cdot F_u\right) = 174.9 \cdot kips$ (1.333 increase allowed per TIA/EIA)

$T_{ALL.Net} := 1.333 \cdot \left(0.60 \cdot A_n \cdot F_y\right) = 194.812 \cdot kips$ (1.333 increase allowed per TIA/EIA)

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Net}} = 80.8 \cdot \%$ Bolts are "upset bolts". Use net area per AISC

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

Condition1 = "OK"

Check Anchor Bolt Bending Stress:

Maximum Bending Moment = $M_x := \left(\frac{Shear}{N}\right) \cdot l = 0.5 \cdot ft \cdot kips$

Maximum Bending Stress = $f_{bx} := \frac{M_x}{S_x} = 7.3 \cdot ksi$

Allowable Bending Stress = $F_{bx} := 1.333 \cdot 0.6 \cdot F_y = 60 \cdot ksi$ (1.333 increase allowed per TIA/EIA)

Check Combined Stress Requirement:

Per ASCE Manual 72: "If the clearance between the base plate and concrete does not exceed two times the bolt diameter a bending stress analysis of the bolts is NOT normally required.

$$l := \begin{cases} l & \text{if } l > 2 \cdot D_n \\ 0 & \text{otherwise} \end{cases} = 0 \cdot in$$

$$f_{bx} := \begin{cases} f_{bx} & \text{if } l > 2 \cdot D_n \\ 0 & \text{otherwise} \end{cases} = 0 \cdot ksi$$

Check Anchor Bolt Compression/Combined Stress:

Maximum Compressive Force =

$$C_{Max} := OM \cdot \frac{R_{bc}}{l_p} + \frac{Axial}{N} = 161.9 \cdot kips$$

Maximum Compressive Stress =

$$f_a := \frac{C_{Max}}{A_n} = 49.8 \cdot ksi$$

$$K := 0.65$$

$$C_c := \sqrt{\frac{2 \cdot \pi^2 \cdot E}{F_y}} = 87.364$$

$$F_a := \begin{cases} \dfrac{\left[1 - \dfrac{\left(\frac{K \cdot l}{r}\right)^2}{2 \cdot C_c^{\,2}}\right] \cdot F_y}{\dfrac{5}{3} + \dfrac{3 \cdot \left(\frac{K \cdot l}{r}\right)}{8 \cdot C_c} - \dfrac{\left(\frac{K \cdot l}{r}\right)^3}{8 \cdot C_c^{\,3}}} & \text{if } \dfrac{K \cdot l}{r} \le C_c \\ \dfrac{12 \cdot \pi^2 \cdot E}{23 \cdot \left(\frac{K \cdot l}{r}\right)^2} & \text{if } \dfrac{K \cdot l}{r} > C_c \end{cases} = 45 \cdot ksi$$

Allowable Compressive Stress =

$$F_a := 1.333 \cdot F_a = 60 \cdot ksi$$

(1.333 increase allowed per TIA/EIA)

Combined Stress % of Capacity =

$$\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}}\right) = 83.1 \cdot \%$$

Condition 2 =

$$Condition2 := if\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$$

Condition2 = "OK"

Base Plate Analysis:

Force from Bolts = $C_i := \frac{OM \cdot d_i}{I_p} + \frac{Axial}{N}$

$C_1 = 37.7 \cdot kips$ $C_7 = 161.9 \cdot kips$

$C_2 = 71.5 \cdot kips$ $C_8 = 157.9 \cdot kips$

$C_3 = 101.7 \cdot kips$ $C_9 = 146.0 \cdot kips$

$C_4 = 127.0 \cdot kips$ $C_{10} = 127.0 \cdot kips$

$C_5 = 146.0 \cdot kips$ $C_{11} = 101.7 \cdot kips$

$C_6 = 157.9 \cdot kips$ etc.

Maximum Bending Stress in Plate = $f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{\left(B_{eff} \cdot t_{bp}^2\right)} = 28.7 \cdot ksi$

Allowable Bending Stress in Plate = $F_{bp} := 1.33 \cdot 0.75 \cdot Fy_{bp} = 59.9 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} = 47.9 \cdot \%$

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

Condition3 = "Ok"

Standard Monopole Foundation:

Input Data:

Tower Data

Overturning Moment =	$OM := 6334 \cdot ft \cdot kips$	(User Input from RISATower)	
Shear Force =	$Shear := 56 \cdot kip$	(User Input from RISATower)	
Axial Force =	$Axial := 61 \cdot kip$	(User Input from RISATower)	
Tower Height =	$H_t := 153 \cdot ft$	(User Input)	

Footing Data:

Overall Depth of Footing =	$D_f := 6.5 \cdot ft$	(User Input)	
Length of Pier =	$L_p := 3.5 \cdot ft$	(User Input)	
Extension of Pier Above Grade =	$L_{pag} := 1 \cdot ft$	(User Input)	
Diameter of Pier =	$d_p := 7.5 \cdot ft$	(User Input)	
Thickness of Footing =	$T_f := 4 \cdot ft$	(User Input)	
Width of Footing =	$W_f := 32 \cdot ft$	(User Input)	

Anchor Bolt Data:

Length of Anchor Bolts =	$L_{st} := 96 \cdot in$	(User Input)	
Projection of Anchor Bolts Above Pier =	$A_{BP} := 12 \cdot in$	(User Input)	
Anchor Bolt Diameter =	$d_{anchor} := 2.25 \cdot in$	(User Input)	
Base Plate Bolt Circle =	$MP := 68.0 \cdot in$	(User Input)	

Material Properties:

Concrete Compressive Strength =	$f_c := 3000 \cdot psi$	(User Input)	
Steel Reinforcment Yield Strength =	$f_y := 60000 \cdot psi$	(User Input)	
Anchor Bolt Yield Strength =	$f_{ya} := 75000 \cdot psi$	(User Input)	
Internal Friction Angle of Soil =	$\Phi_s := 10 \cdot deg$	(User Input)	
Allowable Soil Bearing Capacity =	$q_s := 6000 \cdot psf$	(User Input)	
Unit Weight of Soil =	$\gamma_{soil} := 100 \cdot pcf$	(User Input)	
Unit Weight of Concrete =	$\gamma_{conc} := 150 \cdot pcf$	(User Input)	
Foundation Bouyancy =	$Bouyancy := 0$	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	$n := 1 \cdot ft$	(User Input)	
Cohesion of Clay Type Soil =	$c := 0 \cdot ksf$	(User Input)	(Use 0 for Sandy Soil)
Seismic Zone Factor =	$Z := 2$	(User Input)	(UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	$\mu := 0.45$	(User Input)	

Pier Reinforcement:

Bar Size =	$BS_{pier} := 11$	(User Input)	
Bar Diameter =	$d_{bpier} := 1.41 \cdot in$	(User Input)	
Number of Bars =	$NB_{pier} := 36$	(User Input)	
Clear Cover of Reinforcement =	$Cvr_{pier} := 3 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Diameter of Tie =	$d_{Tie} := 3 \cdot in$	(User Input)	

Pad Reinforcement:

Bar Size =	$BS_{top} := 11$	(User Input)	(Top of Pad)
Bar Diameter =	$d_{btop} := 1.41 \cdot in$	(User Input)	(Top of Pad)
Number of Bars =	$NB_{top} := 42$	(User Input)	(Top of Pad)
Bar Size =	$BS_{bot} := 11$	(User Input)	(Bottom of Pad)
Bar Diameter =	$d_{bbot} := 1.41 \cdot in$	(User Input)	(Bottom of Pad)
Number of Bars =	$NB_{bot} := 42$	(User Input)	(Bottom of Pad)
Clear Cover of Reinforcement =	$Cvr_{pad} := 3.0 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)

Calculated Factors:

Pier Reinforcement Bar Area =

$$A_{bpier} := \frac{\pi \cdot d_{bpier}^2}{4} = 1.561 \cdot in^2$$

Pad Top Reinforcement Bar Area =

$$A_{btop} := \frac{\pi \cdot d_{btop}^2}{4} = 1.561 \cdot in^2$$

Pad Bottom Reinforcement Bar Area =

$$A_{bbot} := \frac{\pi \cdot d_{bbot}^2}{4} = 1.561 \cdot in^2$$

Coefficient of Lateral Soil Pressure =

$$K_p := \frac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 1.42$$

Load Factor =

$$LF := \begin{cases} 1.333 & \text{if } H_t \le 700 \cdot ft \\ 1.7 & \text{if } H_t \ge 1200 \cdot ft \\ 1.333 + \left(\frac{H_t - 700ft}{1200ft - 700ft} \right) \cdot 0.4 & \text{otherwise} \end{cases} = 1.333$$

Stability of Footing:

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

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

Passive Pressure = $P_{pn} := K_p \cdot \gamma_s \cdot n + c \cdot 2 \cdot \sqrt{K_p} = 0.142 \cdot ksf$

$P_{pt} := K_p \cdot \gamma_s \cdot \left(D_f - T_f\right) + c \cdot 2 \cdot \sqrt{K_p} = 0.355 \cdot ksf$

$P_{top} := if\left[n < \left(D_f - T_f\right), P_{pt}, P_{pn}\right] = 0.355 \cdot ksf$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p} = 0.923 \cdot ksf$

$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 0.639 \cdot ksf$

$T_p := if\left[n < \left(D_f - T_f\right), T_f, \left(D_f - n\right)\right] = 4$

$A_p := W_f \cdot T_p = 128$

Ultimate Shear = $S_u := P_{ave} \cdot A_p = 81.808 \cdot kip$

Weight of Concrete Pad = $WT_c := \left[\left(W_f^2 \cdot T_f\right) + \frac{d_p^2 \cdot \pi}{4} L_p\right] \cdot \gamma_c = 637.594 \cdot kip$

Weight of Soil Above Footing = $WT_{s1} := \left[\left(W_f^2 - \frac{d_p^2 \cdot \pi}{4}\right) \cdot \left(\left|L_p - L_{pag} - n\right|\right)\right] \cdot \gamma_s = 146.97 \cdot kip$

Weight of Soil Wedge at Back Face = $WT_{s2} := \left(\frac{D_f^2 \cdot \tan\left(\Phi_s\right)}{2} \cdot W_f\right) \cdot \gamma_s = 11.92 \cdot kip$

Weight of Soil Wedge at back face Corners = $WT_{s3} := 2 \cdot \left[\left(D_f\right)^3 \cdot \frac{\tan\left(\Phi_s\right)}{3}\right] \cdot \gamma_s = 3.228 \cdot kips$

Total Weight = $WT_{tot} := WT_c + WT_{s1} + Axial = 845.567 \cdot kip$

Resisting Moment = $M_r := \left(WT_{tot}\right) \cdot \frac{W_f}{2} + S_u \cdot \frac{T_f}{3} + \left[\left(WT_{s2} + WT_{s3}\right) \cdot \left(W_f + \frac{D_f \cdot \tan\left(\Phi_s\right)}{3}\right)\right] = 14129 \cdot kip \cdot ft$

Overturning Moment = $M_{ot} := OM + Shear \cdot \left(L_p + T_f\right) = 6754 \cdot kip \cdot ft$

Factor of Safety Actual = $FS := \frac{M_r}{M_{ot}} = 2.09$

Factor of Safety Required = $FS_{req} := 2$

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

$OverTurning\_Moment\_Check = "Okay"$

Shear Capacity in Pier:

Shear Resistance of Pier = $S_p := \frac{P_{ave} \cdot A_p + \mu \cdot WT_{tot}}{FS_{req}} = 231.157 \cdot kips$

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

Shear_Check = "Okay"

Bearing Pressure Caused by Footing:

Area of the Mat = $A_{mat} := W_f^2 = 1.024 \times 10^3$

Section Modulus of Mat = $S := \frac{W_f^3}{6} = 5461.33 \cdot ft^3$

Maximum Pressure in Mat = $P_{max} := \frac{WT_{tot}}{A_{mat}} + \frac{M_{ot}}{S} = 2.062 \cdot ksf$

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

Max_Pressure_Check = "Okay"

Minimum Pressure in Mat = $P_{min} := \frac{WT_{tot}}{A_{mat}} - \frac{M_{ot}}{S} = -0.411 \cdot ksf$

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

Min_Pressure_Check = "No Good"

Distance to Resultant of Pressure Distribution = $X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3} = 8.894$

Distance to Kern = $X_k := \frac{W_f}{6} = 5.333$

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

Eccentricity = $e := \frac{M_{ot}}{WT_{tot}} = 7.988$

Adjusted Soil Pressure = $P_a := \frac{2 \cdot WT_{tot}}{3 \cdot W_f \cdot \left(\frac{W_f}{2} - e\right)} = 2.199 \cdot ksf$

$q_{adj} := if(P_{min} < 0, P_a, P_{max}) = 2.199 \cdot ksf$

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

Pressure_Check = "Okay"

Concrete Bearing Capacity:

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

Bearing Strength Between Pier and Pad = $P_b := \Phi_c \cdot 0.85 \cdot f_c \cdot \frac{\pi \cdot d_p^2}{4} = 1.054 \times 10^4 \cdot kips$ (ACI-2008 10.14)

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

Bearing_Check = "Okay"

Shear Strength of Concrete:

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

$\phi_c := 0.85$ (ACI 9.3.2.5)

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

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

$d_2 := d_1 - d$

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

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

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

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

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

Beam_Shear_Check = "Okay"

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

Critical Perimeter of Punching Shear = $b_o := \left(d_p + d\right) \cdot \pi = 35$

Area Included Inside Perimeter = $A_{bo} := \frac{\pi \cdot \left(d_p + d\right)^2}{4} = 97.3$

Area Outside of Perimeter = $A_{out} := A_{mat} - A_{bo} = 926.7$

Guess Value = $v_u := 1ksf$ (From "Foundation Analysis and design", By Joseph Bowles, Eq. 8-9)

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

$v_u := \text{Find}(v_u) = 6.7 \cdot ksf$

$V_u := v_u \cdot d \cdot W_f = 773.7 \cdot kips$

Required Shear Strength = $V_{req} := LF \cdot V_u = 1 \times 10^3 \cdot kips$

Available Shear Strength = $V_{Avail} := \phi_c \cdot 4 \cdot \sqrt{f_c \cdot psi} \cdot b_o \cdot d = 3406.8 \cdot kip$ (ACI-2008 11.11.2.1)

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

Punching_Shear_Check = "Okay"

Steel Reinforcement in Pad:

Required Reinforcement for Bending:

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

$q_b := q_{adj} - d_1 \cdot Slope = 1.078 \cdot ksf$

Maximum Bending at Face of Pier = $M_n := \frac{1}{\phi_m} \cdot \left[\left(q_{adj} - q_b \right) \cdot \frac{d_1^2}{3} + q_b \cdot \frac{d_1^2}{2} \right] \cdot W_f = 4868.9 \cdot kip \cdot ft$

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

(ACI-200810.2.7.3)

$R_u := \frac{M_n}{\phi_m \cdot W_f \cdot d^2} = 89 \cdot psi$

$\rho := \frac{0.85 \cdot f_c}{f_y} \left(1 - \sqrt{1 - \frac{2 \cdot R_u}{0.85 \cdot f_c}} \right) = 0.0015$

$\rho_{min} := 1.333 \cdot \rho = 0.00201$

Required Reinforcement for Temperature and Shrinkage:

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

Check Bottom Bars:

$$As := \begin{cases} \rho_{min} \cdot W_f \cdot d & \text{if } \rho_{min} > \frac{\rho_{sh}}{2} \\ \rho_{sh} \cdot W_f \cdot \frac{d}{2} & \text{otherwise} \end{cases} = 33.686 \cdot in^2$$

$As_{prov} := A_{bbot} \cdot NB_{bot} = 65.6 \cdot in^2$

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

Pad_Reinforcement_Bot = "Okay"

Check top Bars:

$As := \rho_{sh} \cdot \left(W_f \cdot \frac{d}{2}\right) = 15.1 \cdot in^2$

$As_{prov} := A_{btop} \cdot NB_{top} = 65.6 \cdot in^2$

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

Pad_Reinforcement_Top = "Okay"

Developement Length Pad Reinforcement:

Bar Spacing =

$$B_{sPad} := \frac{W_f - 2 \cdot Cvr_{pad} - NB_{bot} \cdot d_{bbot}}{NB_{bot} - 1} = 7.78 \cdot in$$

Spacing or Cover Dimension =

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

Transverse Reinforcement Index =

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

$$L_{dbt} := \frac{3 \cdot f_y \alpha_{pad} \cdot \beta_{pad} \cdot \gamma_{pad} \cdot \lambda_{pad}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \frac{c + k_{tr}}{d_{bbot}}} \cdot d_{bbot} = 54.4 \cdot in$$

Minimum Development Length =

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

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

Available Length in Pad =

$$L_{Pad} := \frac{W_f}{2} - \frac{d_p}{2} - Cvr_{pad} = 144 \cdot in$$

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

Lpad_Check = "Okay"

Steel Reinforcement in Pier:

Area of Pier = $A_p := \frac{\pi \cdot d_p^2}{4} = 6361.73 \cdot in^2$

$A_{smin} := 0.01 \cdot 0.05 \cdot A_p = 3.18 \cdot in^2$ (ACI-2008 10.8.4 & 10.9.1)

$A_{sprov} := NB_{pier} \cdot A_{bpier} = 56.21 \cdot in^2$

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

Steel_Area_Check = "Okay"

Bar Spacing In Pier = $B_{sPier} := \frac{d_p \cdot \pi}{NB_{pier}} - d_{bpier} = 6.444 \cdot in$

Diameter of Reinforcement Cage = $Diam_{cage} := d_p - 2 \cdot Cvr_{pier} = 84 \cdot in$

Maximum Moment in Pier = $M_p := \left[OM + Shear \cdot \left(L_p + \frac{A_{BP}}{2} \right) \right] \cdot LF = 1 \times 10^5 \cdot in \cdot kips$

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

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

$\left(D \;\; N \;\; n \;\; P_u \;\; M_{xu} \right) = \left(90 \;\; 36 \;\; 11 \;\; 81.3 \;\; 1 \times 10^5 \right)$

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

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

$\left(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho \right) = \left(86.6 \;\; 1.1 \times 10^5 \;\; -60 \;\; 0 \right)$

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

Axial_Load_Check = "Okay"

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

Bending_Check = "Okay"

Development Length Pier Reinforcement:

Available Length in Foundation:

$L_{pier} := L_p - Cvr_{pier} = 39 \cdot in$

$L_{pad} := T_f - Cvr_{pad} = 45 \cdot in$

Tension: (ACI-2008 12.2.3)

Spacing or Cover Dimension =

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

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

$L_{dbt} := \frac{3 \cdot f_y \alpha_{pier} \cdot \beta_{pier} \cdot \gamma_{pier} \cdot \lambda_{pier}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \left(\frac{c + k_{tr}}{d_{bpier}}\right)} \cdot d_{bpier} = 54.45 \cdot in$

Minimum Development Length =

$L_{dh} := \frac{1200 \cdot d_{bpier}}{\sqrt{\frac{f_c}{psi}}} \cdot .7 = 21.624 \cdot in$ (ACI 12.2.1)

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

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

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

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

Compression: (ACI-2008 12.3.2)

$L_{dbc1} := \frac{.02 \cdot d_{bpier} \cdot f_y}{\sqrt{f_c \cdot psi}} = 30.892 \cdot in$

$L_{dbmin} := 0.0003 \cdot \frac{in^2}{lb} \cdot \left(d_{bpier} \cdot f_y\right) = 25.38 \cdot in$

$L_{dbc} := if\left(L_{dbc1} \geq L_{dbmin}, L_{dbc1}, L_{dbmin}\right) = 30.892 \cdot in$

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

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

Tie Size and Spacing in Column:

Minimum Tie Size = $Tie_{min} := if(BS_{pier} \le 10, 3, 4) = 4$

Used #3 Ties

Seismic Factor = $z := if(Z \le 2, 1, 0.5) = 1$ (ACI-2008 21.10.5)

$s_{lim1} := 16 \cdot d_{bpier} \cdot z = 22.56 \cdot in$

$s_{lim2} := \frac{48 \cdot d_{Tie}}{8} \cdot z = 18 \cdot in$

$s_{lim3} := D_f \cdot z = 78 \cdot in$

$s_{lim4} := 18in$

Maximum Spacing = $s_{tie} := \min\left(\begin{pmatrix} s_{lim1} \\ s_{lim2} \\ s_{lim3} \\ s_{lim4} \end{pmatrix}\right) = 18 \cdot in$

Number of Ties Required = $n_{tie} := \frac{L_{pier} - 3 \cdot in}{s_{tie}} + 1 = 3$

Check Anchor Steel Embedment:

Depth Available = $D_{ab} := L_{st} - A_{BP} = 7 \cdot ft$

Length of Anchor Bolt = $L_{anchor} := \frac{(0.11 \cdot f_{ya}) \cdot in}{\sqrt{f_c \cdot psi}} = 12.552 \cdot ft$

$Depth\_Check := if(D_{ab} \ge L_{anchor}, "Okay", "No Good")$

Depth_Check = "No Good"

Note: Anchor plate is provided

AM-X-CD-16-65-00T-RET(6' 65° Dual Broadband Antenna)

Dual Band Electrical DownTilt Antenna

698 ~ 894MHz, X-pol., H65° / V12°

1710 ~ 2170MHz, X-pol., H65° / V6.0°

Electrical Specification

Frequency Range		698~894MHz	1710~2170MHz
Impedance		50Ω	
Polarization		Dual, Slant ±45°	
Gain		15.5dBi / 13.35dBd @ 698-806MHz 16.0dBi / 13.85dBd @ 824-894MHz	17.3dBi / 15.15dBd @ 1710-1755MHz 17.4dBi / 15.25dBd @ 1850-1900MHz 17.1dBi / 14.95dBd @ 2110-2155MHz
Beamwidth	Horizontal	65° @ 698-806MHz 63° @ 824-894MHz	65° @ 1710-1755MHz 67° @ 1850-1900MHz 69° @ 2110-2155MHz
	Vertical	12.3° @ 698-806MHz 11.5° @ 824-894MHz	6.5° @ 1710-1755MHz 6.0° @ 1850-1900MHz 5.7° @ 2110-2155MHz
VSWR		≤1.5:1	
Front-to-Back Ratio		≥27 dB	
Electrical Downtilt Range		2° ~ 16°	0° ~ 10°
Isolation Between Ports		≥30 dB	
Isolation Between Ports of Different Frequency Elements		≥35 dB	
Cross Pole Discrimination		10.0 dB @ ±60° 15.0 dBi @ 0°	
First Upper Side Lobe Suppression		16dB	
Side Lobe Suppression		> 16 dB @ 0-6° Tilt > 18 dB @ 7-12° Tilt (Up to 10° from Boresight)	> 16 dB @ 0-6° Tilt > 18 dB @ 7-10° Tilt (Up to 10° from Boresight)
Passive Intermodulation		≤ -150 dBc @ 2x20w	
Input Maximum CW Power		500 W	300 W
Environmental Compliance		IP65 for Radome IP67 for Connectors	
RET Motor Configuration		Field Replaceable RET Electronic Control Module / RET Motor is internal to antenna & not field replaceable	
Compliant with AISG 1.1 and 2.0		AISG 1.1 and 2.0	

Mechanical Specification

Dimension (W×D×H)	11.8×5.9×72 inches (300×150×1829mm)
Weight (Without clamp)	48.5 lbs (22.0 kg)
Connector	4 x 7/16 DIN(F), Long Neck
Max Wind Speed	150 mph
Wind Load (@150 mph)	1891 N

300

P65-17-XLH-RR

Dual Broadband Antennas

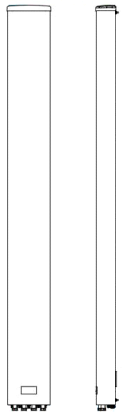
POLARIZATION: Dual linear ±45°
FREQUENCY (MHz): 698-894, 1710-2170
HORIZONTAL BEAM WIDTH (°): 65, 65
GAIN (dBi dBd): 17.2/15.1 17.5/15.4
TILT: 0-7, 0-8
LENGTH: 96”

ELECTRICAL SPECIFICATIONS*

Frequency range (MHz)	698-894			1710-2170		
Frequency band (MHz)	698-806	806-894		1710-1880	1850-1990	1900-2170
Gain (dBi/dBd)	16.4/14.3	17.2/15.1		16.9/14.8	17.2/15.1	17.5/15.4
Polarization	Dual Linear +/- 45			Dual Linear +/- 45		
Nominal Impedance (Ω)	50			50		
VSWR	< 1.5:1			< 1.5:1		
Horizontal beam width, -3 dB (°)	70	63		60	63	60
Vertical beam width, -3 dB (°)	8.4			6.5		
Electrical down tilt (°)	0 to 7			0 to 8		
Side lobe suppression, vertical 1st upper (dB)	> 16			> 16		
Isolation between inputs (dB)	> 30			> 30		
Inter band Isolation (dB)	> 40					
Tracking, horizontal plane ±60° (dB)	< 2			< 2		
Vertical beam squint (°)	< 0.5			< 0.5		
Front to back ratio (dB) 180° ±30° copolar	> 25			> 30		
Front to back ratio (dB) 180° ±30° total power	> 22			> 25		
Cross polar discrimination (XPD) 0° (dB)	> 15			> 15		
Cross polar discrimination (XPD) ±60° (dB)	10			10		
IM3, 2xTx&43dBm (dBc)	<-153			<-153		
Power handling, average per input (W)	500			300		
Power handling, average total (W)	1000			600		

MECHANICAL SPECIFICATIONS*

Connector	4 x 7/16 DIN Female, IP67, 4 x AISG [2 x i-RET 8510.40]
Connector position	Bottom
Dimensions, HxWxD, mm(ft)	2445x312x148(96”x12”x6”)
Mounting	Pre-mounted Tilt Brackets
Weight, with brackets, kg (lbs)	28.2 (62)
Weight, without brackets, kg (lbs)	22.7 (50)
Wind load, frontal/lateral/rear side 42 m/s Cd=1.6 (N)	1006 / 147 / 1273
Maximum operational wind speed, m/s (mph)	45 (100)
Survival wind speed, m/s (mph)	67 (150)
Lightning protection	DC Ground
Operating Temperature	-40°C to +60°C
Radome Material	PVC, IP55
Radome colour	Light Grey
Packing size, HxWxD, mm (ft)	2610 x 427 x 275 (102.8” x 17” x 11”)
Shipping weight, kg (lbs)	37 (81)
RET	iRET AISGv1.1, MET and AISGv2.0 Available
Brackets	7256.00, 7454.00A



*All specifications subject to change without notice. Please contact your Powerwave representative for complete performance data.

ANTENNA PATTERNS*

For detailed patterns visit http://www.powerwave.com/rpa/.

RRUS 11

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

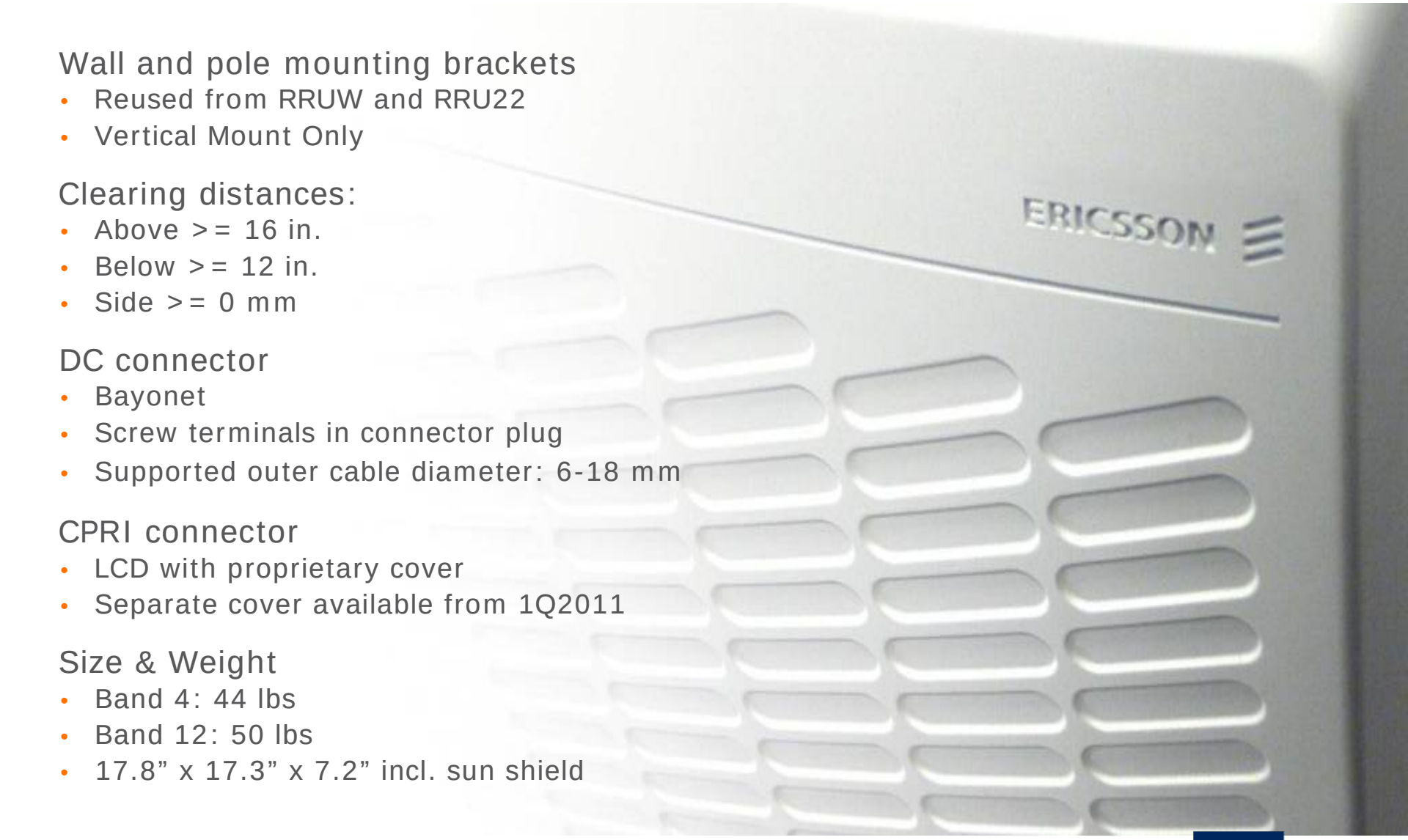
RF Characteristics
- ✓ Output power: 2x30 Watts
- ✓ 2x2 MIMO Capable
- ✓ IBW of 20 MHz
- ✓ Rx Sens.: Better than -105 dBm (5 MHz)

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

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

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

RRUS 11 Mechanics



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

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

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

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

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

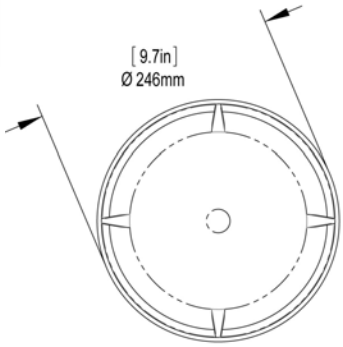
DC6-48-60-18-8F

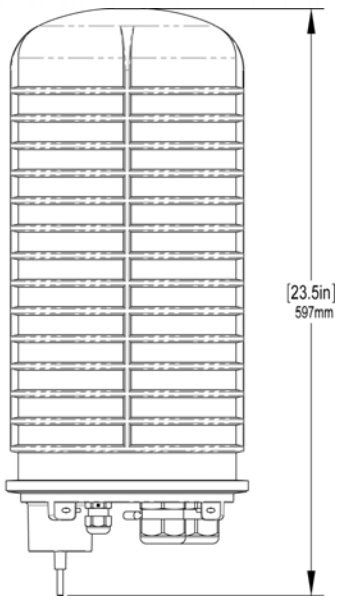
DC Surge Suppression Solution

The DC6-48-60-18 is a dual chambered, DC surge suppression system for use in multi-circuit, Distributed Antenna Systems. The system will protect up to 6 Remote Radio Heads from voltage surges and lightning, and connect up to 18 fiber pairs. The system is enclosed in a NEMA 4 rated, waterproof enclosure.

FEATURES

- Protects up to 6 Remote Radio Heads, each with its own protection circuit.
- Flexible design allows for installation at the top of a tower for Remote Radio Head protection.
- Includes fiber connections for up to 18 pairs of fiber.
- LED indicators on individual circuits provide visual indication of suppressor status.
- Form 'C' relays allow for remote monitoring of the suppressor status.
- Patented Strikesorb technology provides over 60 kA of surge current capacity per circuit.
- Strikesorb suppression modules are fully recognized to UL 1449-3rd Edition Safety Standard, meeting all intermediate and high current fault requirements to facilitate use in OEM applications.
- Raycap recommends that DC protection system be installed within 2 meters or 6 feet of the radio.
- Dome design is lightweight and aerodynamic providing maximum flexibility for installation on top of towers.





Raycap

Phone 208.777.1166 Toll Free 800.890.2569 Fax 208.777.4466 www.raycapsurgeprotection.com

DC6-48-60-18-8F

DC Power Surge Protection

Electrical Specifications	
Model Number	DC6-48-60-18-8F
Nominal Operating Voltage	48 VDC
Nominal Discharge Current (I_n)	20 kA 8/20 µs
Maximum Discharge Current (I_{max}) per NEMA LS-1	60 kA 8/20 µs
Maximum Continuous Operating Voltage (U_c)	75 VDC
Voltage Protection Rating	400 V

Mechanical Specifications	
Suppression Connection Method	Compression lug, #2-#14 AWG Copper, #2-#12 Aluminum
Fiber Connection Method	LC-LC Single mode duplex
Environmental Rating	IP 68, 7m 72hrs
Operating Temperature	-40° C to + 80° C
Storage Temperature	-70° C to + 80° C
Cold Temperature Cycling	IEC 61300-2-22e -30° C to + 60° C 200 hrs @ 5 psi
Resistance to Aggressive Materials	CEI IEC 61073-2 including acids and bases
UV Protection	ISO 4892-2 Method A Xenon-Arc 2160 hrs
Weight	20 lbs without Mounting Bracket

STANDARDS

Strikesorb modules are compliant to the following Surge Protection Device (SPD) Standards:

- ANSI/UL 1449 – 3rd Edition
- IEEE C62.41
- NEMA LS-1, IEC 61643-1:2005 2nd Edition:2005
- IEC 61643-12
- EN 61643-11:2002 (including A11:2007)

GS-07F-0435V

Certified to ISO 9001:2000

TÜV Rheinland of North America

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