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March 13, 2015

VIA ELECTRONIC & OVERNIGHT DELIVERY
Melanie Bachman, Esq.
Executive Director
Connecticut Siting Council
Ten Franklin Square
New Britain, Connecticut 06051

Re: Docket No. 391
Bay Communications II, LLC
Development and Management Plan Revision for
Intervenor New Cingular Wireless PCS, LLC ("AT&T")
232 Shore Road, Old Lyme, Connecticut

Dear Executive Director Bachman:

On behalf of Intervenor New Cingular Wireless PCS LLC ("AT&T"), please accept for review and Council approval this *revised* Development and Management Plan ("D&M Plan") filing for AT&T's facility as approved in Docket No. 391. This D&M revision includes plans for the installation of revised antennas for AT&T.

As you know, on July 11, 2013 the Council transferred the Certificate of Environmental Compatibility and Public Need issued in Docket 391 from T-Mobile Northeast, LLC to Bay Communications II, LLC. On September 8, 2014 the Council granted an extension of time for completion of the facility and installation of at least one fully operational wireless carrier to January 22, 2015. Construction of the tower was completed in the fall and Verizon and T-Mobile subsequently installed facilities of their own on the tower and are both on-air.

Antennas & Other Equipment
Enclosed are fifteen (15) sets of 11" x 17" sized revised construction drawings being filed in accordance with the Decision and Order dated April 28, 2011. Full sized sets will follow under separate cover.

The revised D&M Plan drawings incorporate revised specifications for AT&T's revised installation. As shown in the enclosed drawings, AT&T will install (6) panel antennas as well as (15) remote radio head units (or "RRUs") on T-Arm mounts at a centerline height of 109' AGL on the tower.

Also enclosed is a structural analysis prepared by Centek Engineering last revised January 28, 2015 confirming that the tower facility can structurally accommodate AT&T's facility as proposed well as T-Mobile's and Verizon's existing collocated facilities.

The enclosed cumulative power density report demonstrates compliance with applicable standards for AT&T's planned facility as well as T-Mobile's and Verizon's existing facilities.

Required Notifications
The General Contractor/Supervisor for all construction related matters for AT&T's facility is Bryon Morawski. Mr. Morawski can be reached by telephone at (860) 513-7223.

We respectfully request that this matter be included on the Council's next available agenda for review. Thank you for your consideration of the enclosed.

Very truly yours,

Daniel M. Laub

Enclosures

cc: First Selectwoman Bonnie Reemsnyder, Town of Old Lyme
Michele Briggs, AT&T
Thomas J. Regan, Esq., Brown Rudnick
Julie D. Kohler, Esq., Cohen and Wolf, P.C.
Monte E. Frank, Esq., Cohen and Wolf, P.C.
Kenneth C. Baldwin, Esq., Robinson & Cole, LLP

ATTACHMENT 1

WIRELESS COMMUNICATIONS FACILITY

CT2286
OLD LYME
232 SHORE ROAD
OLD LYME, CT 06371

GENERAL NOTES

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE 2003 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2005 CONNECTICUT SUPPLEMENT AND 2009 AMENDMENTS, INCLUDING THE TIA/EIA-222 REVISION "F" "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND SUPPORTING STRUCTURES." 2005 CONNECTICUT FIRE SAFETY CODE AND 2009 AMENDMENTS, NATIONAL ELECTRICAL CODE AND LOCAL CODES.
2. THE COMPOUND, TOWER, PRIMARY GROUND RING, ELECTRICAL SERVICE TO THE METER BANK AND TELEPHONE SERVICE TO THE DEMARCATION POINT ARE PROVIDED BY SITE OWNER. AS BUILT FIELD CONDITIONS REGARDING THESE ITEMS SHALL BE CONFIRMED BY THE CONTRACTOR. SHOULD ANY FIELD CONDITIONS PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL NOT PROCEED WITH ANY AFFECTED WORK.
3. CONTRACTOR SHALL REVIEW ALL DRAWINGS AND SPECIFICATIONS IN THE CONTRACT DOCUMENT SET. CONTRACTOR SHALL COORDINATE ALL WORK SHOWN IN THE SET OF DRAWINGS. THE CONTRACTOR SHALL PROVIDE A COMPLETE SET OF DRAWINGS TO ALL SUBCONTRACTORS AND ALL RELATED PARTIES. THE SUBCONTRACTORS SHALL EXAMINE ALL THE DRAWINGS AND SPECIFICATIONS FOR THE INFORMATION THAT AFFECTS THEIR WORK.
4. CONTRACTOR SHALL PROVIDE A COMPLETE BUILD-OUT WITH ALL FINISHES, STRUCTURAL, MECHANICAL, AND ELECTRICAL COMPONENTS AND PROVIDE ALL ITEMS AS SHOWN OR INDICATED ON THE DRAWINGS OR IN THE WRITTEN SPECIFICATIONS.
5. CONTRACTOR SHALL FURNISH ALL MATERIAL, LABOR AND EQUIPMENT TO COMPLETE THE WORK AND FURNISH A COMPLETED JOB ALL IN ACCORDANCE WITH LOCAL AND STATE GOVERNING AUTHORITIES AND OTHER AUTHORITIES HAVING LAWFUL JURISDICTION OVER THE WORK.
6. CONTRACTOR SHALL SECURE AND PAY FOR ALL PERMITS AND ALL INSPECTIONS REQUIRED AND SHALL ALSO PAY FEES REQUIRED FOR THE GENERAL CONSTRUCTION, PLUMBING, ELECTRICAL AND HVAC. PERMITS SHALL BE PAID FOR BY THE RESPECTIVE SUBCONTRACTORS.
7. CONTRACTOR SHALL MAINTAIN A CURRENT SET OF DRAWINGS AND SPECIFICATIONS ON SITE AT ALL TIMES AND INSURE DISTRIBUTION OF NEW DRAWINGS TO SUBCONTRACTORS AND OTHER RELEVANT PARTIES AS SOON AS THEY ARE MADE AVAILABLE. ALL OLD DRAWINGS SHALL BE MARKED VOID AND REMOVED FROM THE CONTRACT AREA. THE CONTRACTOR SHALL FURNISH AN "AS-BUILT" SET OF DRAWINGS TO OWNER UPON COMPLETION OF PROJECT.
8. LOCATION OF EQUIPMENT, AND WORK SUPPLIED BY OTHERS THAT IS DIAGRAMMATICALLY INDICATED ON THE DRAWINGS SHALL BE DETERMINED BY THE CONTRACTOR. THE CONTRACTOR SHALL DETERMINE LOCATIONS AND DIMENSIONS SUBJECT TO STRUCTURAL CONDITIONS AND WORK OF THE SUBCONTRACTORS.
9. THE CONTRACTOR IS SOLELY RESPONSIBLE TO DETERMINE CONSTRUCTION PROCEDURE AND SEQUENCE, AND TO ENSURE THE SAFETY OF THE EXISTING STRUCTURES AND ITS COMPONENT PARTS DURING CONSTRUCTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, BRACING, UNDERPINNING, ETC. THAT MAY BE NECESSARY. MAINTAIN EXISTING BUILDING'S/PROPERTY'S OPERATIONS, COORDINATE WORK WITH BUILDING/PROPERTY OWNER.
10. DRAWINGS INDICATE THE MINIMUM STANDARDS, BUT IF ANY WORK SHOULD BE INDICATED TO BE SUBSTANDARD TO ANY ORDINANCES, LAWS, CODES, RULES, OR REGULATIONS BEARING ON THE WORK, THE CONTRACTOR SHALL INCLUDE IN HIS WORK AND SHALL EXECUTE THE WORK CORRECTLY IN ACCORDANCE WITH SUCH ORDINANCES, LAWS, CODES, RULES OR REGULATIONS WITH NO INCREASE IN COSTS.
11. ALL UTILITY WORK SHALL BE IN ACCORDANCE WITH LOCAL UTILITY COMPANY REQUIREMENTS AND SPECIFICATIONS.
12. ALL EQUIPMENT AND PRODUCTS PURCHASED ARE TO BE REVIEWED BY CONTRACTOR AND ALL APPLICABLE SUBCONTRACTORS FOR ANY CONDITION PER MFR.'S RECOMMENDATIONS. CONTRACTOR TO SUPPLY THESE ITEMS AT NO COST TO OWNER OR CONSTRUCTION MANAGER.
13. ANY AND ALL ERRORS, DISCREPANCIES, AND "MISSED" ITEMS ARE TO BE BROUGHT TO THE ATTENTION OF THE AT&T CONSTRUCTION MANAGER DURING THE BIDDING PROCESS BY THE CONTRACTOR. ALL THESE ITEMS ARE TO BE INCLUDED IN THE BID. NO 'EXTRA' WILL BE ALLOWED FOR MISSED ITEMS.
14. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ON-SITE SAFETY FROM THE TIME THE JOB IS AWARDED UNTIL ALL WORK IS COMPLETE AND ACCEPTED BY THE OWNER.
15. CONTRACTOR TO REVIEW ALL SHOP DRAWINGS AND SUBMIT COPY TO ENGINEER FOR APPROVAL. DRAWINGS MUST BEAR THE CHECKER'S INITIALS BEFORE SUBMITTING TO THE CONSTRUCTION MANAGER FOR REVIEW.
16. THE CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS, ELEVATIONS, ANGLES, AND EXISTING CONDITIONS AT THE SITE, PRIOR TO FABRICATION AND/OR INSTALLATION OF ANY WORK IN THE CONTRACT AREA.
17. COORDINATION, LAYOUT, FURNISHING AND INSTALLATION OF CONDUIT AND ALL APPURTENANCES REQUIRED FOR PROPER INSTALLATION OF ELECTRICAL AND TELECOMMUNICATION SERVICE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
18. ALL EQUIPMENT AND PRODUCTS PURCHASED ARE TO BE REVIEWED BY CONTRACTOR AND ALL APPLICABLE SUB-CONTRACTORS FOR ANY CONDITION PER THE MANUFACTURER'S RECOMMENDATIONS. CONTRACTOR TO SUPPLY THESE ITEMS AT NO COST TO OWNER OR CONSTRUCTION MANAGER.
19. ALL DAMAGE CAUSED TO ANY EXISTING STRUCTURE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR WILL BE HELD LIABLE FOR ALL REPAIRS REQUIRED FOR EXISTING STRUCTURES IF DAMAGED DURING CONSTRUCTION ACTIVITIES.
20. THE CONTRACTOR SHALL CONTACT "CALL BEFORE YOU DIG" AT LEAST 48 HOURS PRIOR TO ANY EXCAVATIONS AT 1-800-922-4455. ALL UTILITIES SHALL BE IDENTIFIED AND CLEARLY MARKED PRIOR TO ANY EXCAVATION WORK. CONTRACTOR SHALL MAINTAIN AND PROTECT MARKED UTILITIES THROUGHOUT PROJECT COMPLETION.
21. CONTRACTOR SHALL COMPLY WITH OWNERS ENVIRONMENTAL ENGINEER ON ALL METHODS AND PROVISIONS FOR ALL EXCAVATION ACTIVITIES INCLUDING SOIL DISPOSAL. ALL BACKFILL MATERIALS TO BE PROVIDED BY THE CONTRACTOR.

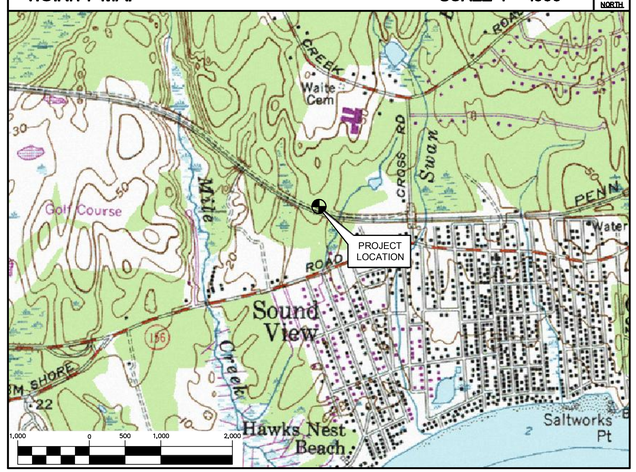
SITE DIRECTIONS

FROM: 500 ENTERPRISE DRIVE, ROCKY HILL, CONNECTICUT **TO:** 232 SHORE ROAD, OLD LYME, CT 06371

1. HEAD NORTHEAST ON ENTERPRISE DRIVE TOWARD CAPITAL BLVD	0.3 MI
2. TURN LEFT ONTO CAPITOL BLVD	0.3 MI
3. TURN LEFT ONTO WEST ST	0.3 MI
4. TURN LEFT TO MERGE ONTO I-91 S TOWARD NEW HAVEN	0.3 MI
5. MERGE ONTO I-91 S	1.1 MI
6. TAKE EXIT 22S ON THE LEFT TO MERGE ONTO CT-9 S TOWARD MIDDLETOWN/OLD SAYBROOK	5.5 MI
7. CONTINUE ONTO CT-17 S/CT-9 S	0.8 MI
8. CONTINUE ONTO CT-9 S	22.9 MI
9. KEEP LEFT AT THE FORK, FOLLOW SIGNS FOR US-1 N/I-95 N/NEW LON/PROVIDENCE AND MERGE ONTO I-95 N/U.S. 1 N	1.2 MI
10. TAKE EXIT 70 TO MERGE ONTO CT-156 E/SHORE RD AND THE DESTINATION WILL BE ON THE LEFT	4.3 MI

VICINITY MAP

SCALE: 1" = 1000'



PROJECT SUMMARY

1. THE PROPOSED SCOPE OF WORK GENERALLY INCLUDES THE INSTALLATION OF A 12'x20' PREFABRICATED WIRELESS EQUIPMENT SHELTER AND A DIESEL FUELED BACKUP POWER GENERATOR ON CONCRETE FOUNDATIONS WITHIN THE WIRELESS COMMUNICATIONS LEASE AREA.
2. A TOTAL OF SIX (6) DIRECTIONAL PANEL ANTENNAS ARE TO BE MOUNTED ON A 110' TALL MONOPOLE TOWER AT A CENTERLINE ELEVATION OF 109' ABOVE THE EXISTING TOWER BASE PLATE.
3. ELECTRIC UTILITY SHALL BE ROUTED UNDERGROUND TO THE AT&T EQUIPMENT SHELTER FROM AN EXISTING UTILITY BACKBOARD LOCATED ADJACENT TO THE FENCED COMPOUND. TELCO UTILITY TO BE ROUTED TO THE PROPOSED EQUIPMENT SHELTER FROM A EXISTING TELCO CABINET LOCATED WITHIN THE EXISTING FENCED COMPOUND.

PROJECT INFORMATION

AT&T SITE NUMBER:	CT2286
AT&T SITE NAME:	OLD LYME
SITE ADDRESS:	232 SHORE ROAD OLD LYME, CT 06371
LESSEE/APPLICANT:	AT&T MOBILITY 500 ENTERPRISE DRIVE, SUITE 3A ROCKY HILL, CT 06067
ENGINEER:	CENTEK ENGINEERING, INC. 63-2 NORTH BRANFORD RD. BRANFORD, CT. 06405
PROJECT COORDINATES:	LATITUDE: 41°-17'-30.18"N LONGITUDE: 72°-17'-13.18"W GROUND ELEVATION: ±30'AMSL (REFERENCED FROM CSC DATABASE)

SHEET INDEX

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REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
6	03/02/15	HMR	DMD	REVISED CONSTRUCTION - AS-BUILT COMPOUND PLAN
5	01/29/15	HMR	DMD	REVISED CONSTRUCTION - UPDATED RFDS
4	03/05/14	HMR	DMD	REVISED CONSTRUCTION
3	12/10/13	HMR	DMD	UPDATED ANTENNA MOUNT
2	11/11/13	HMR	DMD	UPDATED ANTENNA LOADING
1	10/17/13	HMR	DMD	CONSTRUCTION
0	10/04/13	HMR	DMD	CONSTRUCTION - CLIENT REVIEW

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AT&T MOBILITY

WIRELESS COMMUNICATIONS FACILITY

OLD LYME

SITE NUMBER: CTSR2286

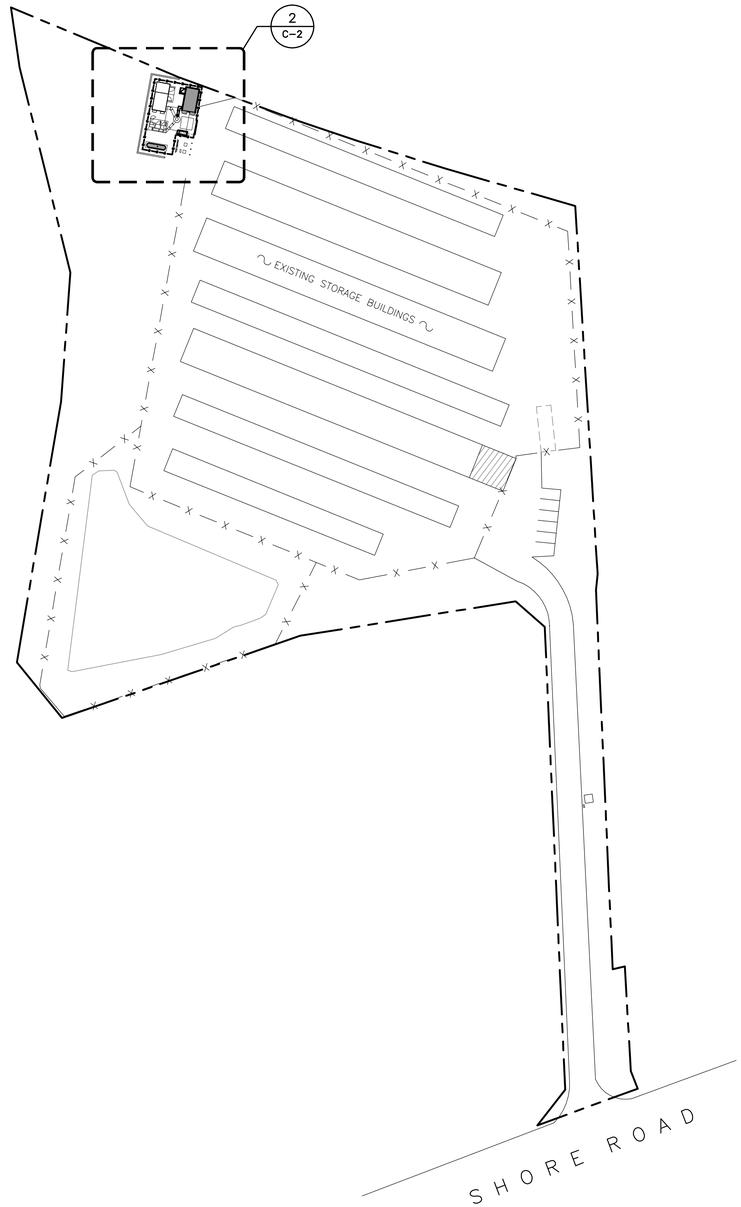
232 SHORE ROAD
OLD LYME, CT 06371

DATE: 10/01/13
SCALE: AS NOTED
JOB NO. 13195.000

TITLE SHEET

T-1

Sheet No. 1 of 13



1 / C-1 **SITE LOCATION PLAN**
SCALE: 1" = 60'

GRAPHIC SCALE
60 0 30 60 120 240
(IN FEET)
1 inch = 60 ft.

APPROXIMATE NORTH

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
6	03/02/15	HMR	DMD	REVISED CONSTRUCTION – AS-BUILT COMPOUND PLAN
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WIRELESS COMMUNICATIONS FACILITY

OLD LYME

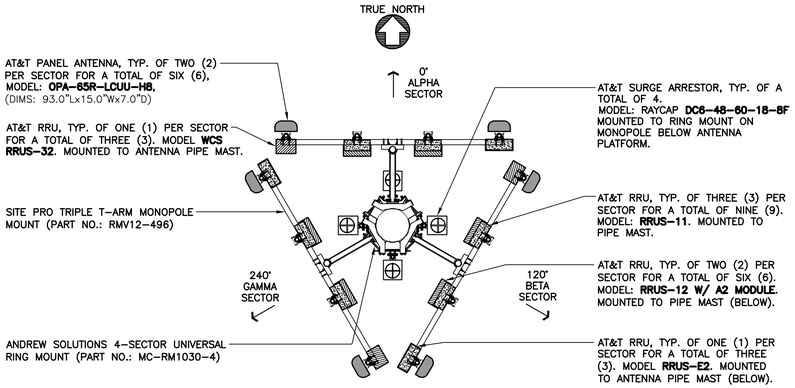
SITE NUMBER: CTSR2286

232 SHORE ROAD
OLD LYME, CT 06371

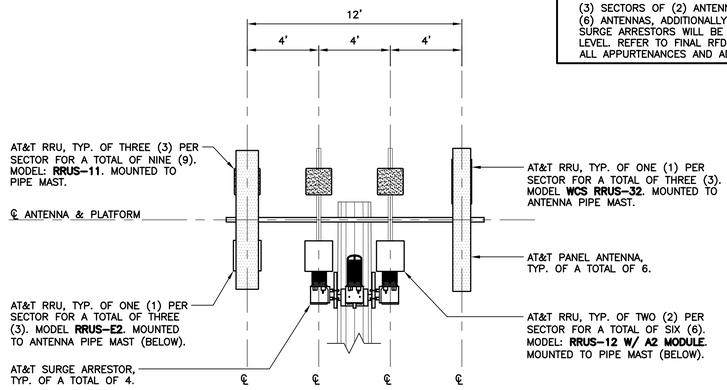
DATE:	10/01/13
SCALE:	AS NOTED
JOB NO.	13195.000

SITE LOCATION PLAN

C-1



PLAN



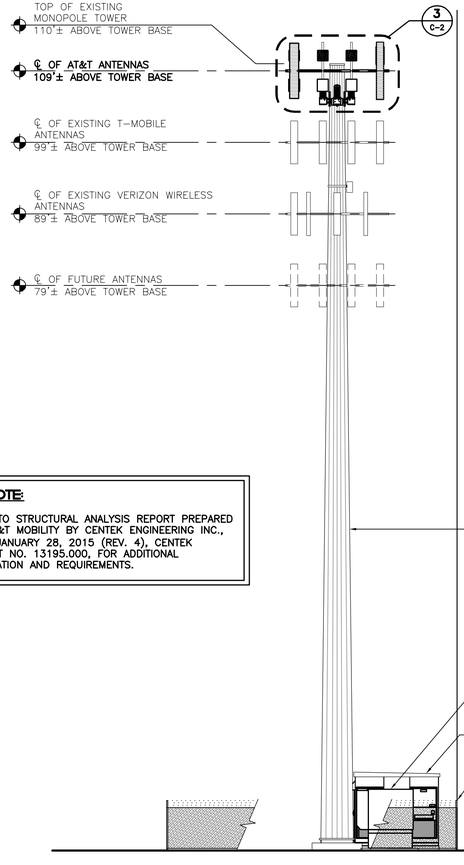
ELEVATION

NOTES:

1. THE AT&T PANEL ANTENNA INSTALLATION TO CONSIST OF (3) SECTORS OF (2) ANTENNAS EACH FOR A TOTAL OF (6) ANTENNAS, ADDITIONALLY, (27) RRHs AND (4) SQUID SURGE ARRESTORS WILL BE INSTALLED AT THE ANTENNA LEVEL. REFER TO FINAL RFDS PROVIDED BY AT&T FOR ALL APPURTENANCES AND ADDITIONAL INFORMATION.

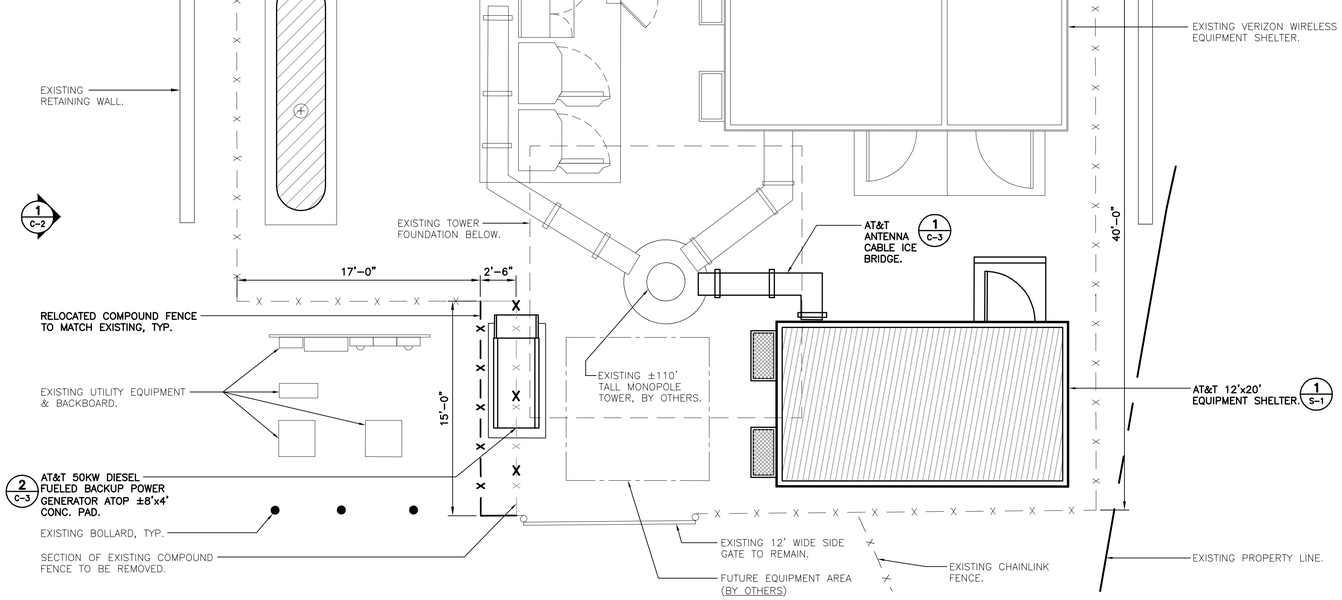
3 / C-2 ANTENNA MOUNTING CONFIGURATION DETAILS

NOT TO SCALE



TOWER NOTE:

1. REFER TO STRUCTURAL ANALYSIS REPORT PREPARED FOR AT&T MOBILITY BY CENTEK ENGINEERING INC., DATED JANUARY 28, 2015 (REV. 4), CENTEK PROJECT NO. 13195.000, FOR ADDITIONAL INFORMATION AND REQUIREMENTS.



2 / C-2 COMPOUND PLAN

SCALE: 1" = 5'

APPROXIMATE NORTH

GRAPHIC SCALE

5 0 2.5 5 10 20

(IN FEET)

1 inch = 5 ft.

1 / C-2 SOUTH ELEVATION

SCALE: 1" = 10'

GRAPHIC SCALE

10 0 5 10 20 40

(IN FEET)

1 inch = 10 ft.

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SCALE: AS NOTED

JOB NO. 13195.000

COMPOUND PLAN ELEVATION AND ANTENNA MOUNTING DETAILS

C-2

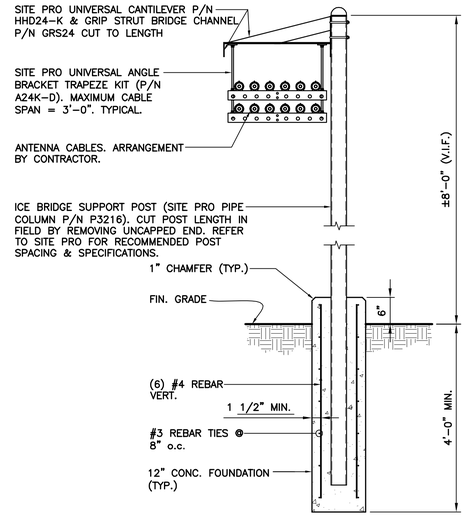
Sheet No. 3 of 13

RF EQUIPMENT TABLE

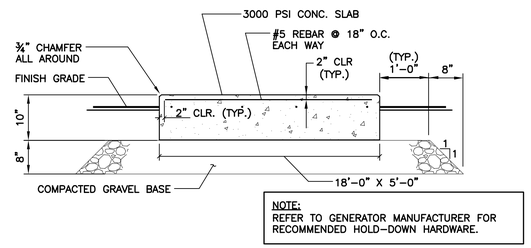
SECTOR	PANEL ANTENNAS					FILTER	FROM REMOTE RADIO UNIT				REMOTE RADIO UNIT		FROM SURGE SUPPRESSOR				SURGE SUPPRESSOR	FROM SHELTER		
	AZIMUTH	QTY.	MAKE & MODEL	RAD CENTER (ATB)	DOWNTILT	QTY.	COAX QTY.	COAX SIZE	COAX LENGTH	RET QTY.	QTY.	MAKE & MODEL	DC QTY.	DC SIZE	FIBER QTY.	DC & FIBER LENGTH	QUANTITY	DC BUNDLE QTY.	FIBER TRUNK QTY.	FIBER & DC LENGTH
ALPHA	0°	2	CCI OPA-65R-LCUU-H8	109.0'	0°M 2°/2°E	0	16	1/2" Ø	15' ±	0	3 2 2 1 1	ERICSSON RRUS-11 ERICSSON RRUS-12 ERICSSON RRUS-A2 ERICSSON RRUS-E2 ERICSSON RRUS-32	7	6MM² PAIR	9	15' ±	4	8	2	120'±
BETA	120°	2	CCI OPA-65R-LCUU-H8	109.0'	0°M 2°/2°E	0	16	1/2" Ø	15' ±	0	3 2 2 1 1	ERICSSON RRUS-11 ERICSSON RRUS-12 ERICSSON RRUS-A2 ERICSSON RRUS-E2 ERICSSON RRUS-32	7	6MM² PAIR	9	15' ±				120'±
GAMMA	240°	2	CCI OPA-65R-LCUU-H8	109.0'	0°M 2°/2°E	0	16	1/2" Ø	15' ±	0	3 2 2 1 1	ERICSSON RRUS-11 ERICSSON RRUS-12 ERICSSON RRUS-A2 ERICSSON RRUS-E2 ERICSSON RRUS-32	7	6MM² PAIR	9	15' ±				120'±

SITE NOTES:

1. THE CONTRACTOR SHALL CALL UTILITIES PRIOR TO THE START OF CONSTRUCTION.
2. ACTIVE EXISTING UTILITIES, WHERE ENCOUNTERED IN THE WORK, SHALL BE PROTECTED AT ALL TIMES. THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY, PRIOR TO PROCEEDING, SHOULD ANY UNCOVERED EXISTING UTILITY PRECLUDE COMPLETION OF THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
3. ALL RUBBISH, STUMPS, DEBRIS, STICKS, STONES AND OTHER REFUSE SHALL BE REMOVED OFF SITE AND BE LEGALLY DISPOSED, AT NO ADDITIONAL COST.
4. THE SITE SHALL BE GRADED TO CAUSE SURFACE WATER TO FLOW AWAY FROM THE EQUIPMENT AND TOWER AREAS.
5. NO FILL OR EMBANKMENT MATERIAL SHALL BE PLACED ON FROZEN GROUND. FROZEN MATERIALS, SNOW OR ICE SHALL NOT BE PLACED IN ANY FILL OR EMBANKMENT.
6. THE SUBGRADE SHALL BE COMPACTED AND BROUGHT TO A SMOOTH UNIFORM GRADE PRIOR TO FINISHED SURFACE APPLICATION.
7. THE AREAS OF THE COMPOUND DISTURBED BY THE WORK SHALL BE RETURNED TO THEIR ORIGINAL CONDITION.
8. CONTRACTOR SHALL MINIMIZE DISTURBANCE TO EXISTING SITE DURING CONSTRUCTION. EROSION CONTROL MEASURES SHALL BE IN CONFORMANCE WITH THE LOCAL GUIDELINES FOR EROSION AND SEDIMENT CONTROL.
9. IF ANY FIELD CONDITIONS EXIST WHICH PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL PROCEED WITH AFFECTED WORK AFTER CONFLICT IS SATISFACTORILY RESOLVED.
10. DIMENSIONS AND DETAILS SHALL BE CHECKED AGAINST THE PRE MANUFACTURED EQUIPMENT BUILDING SHOP DRAWINGS.
11. THE CONTRACTOR SHALL VERIFY AND COORDINATE THE SIZE AND LOCATION OF ALL OPENINGS, SLEEVES AND ANCHOR BOLTS AS REQUIRED BY ALL TRADES.



1 C-3 **ICE BRIDGE DETAIL**
NOT TO SCALE



NOTE:
REFER TO GENERATOR MANUFACTURER FOR RECOMMENDED HOLD-DOWN HARDWARE.

2 C-3 **GENERATOR PAD DETAIL**
NOT TO SCALE

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PROFESSIONAL ENGINEER SEAL

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SAI communications

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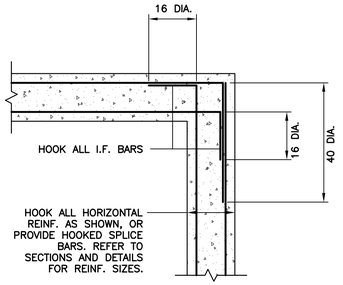
JOB NO.	13195.000

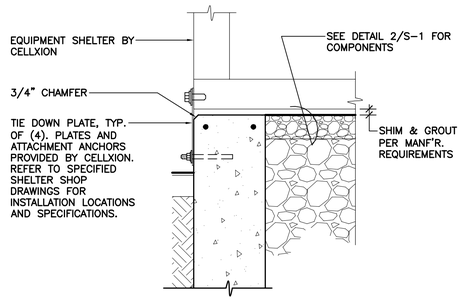
SITE DETAILS, NOTES AND RF EQUIPMENT TABLE

C-3

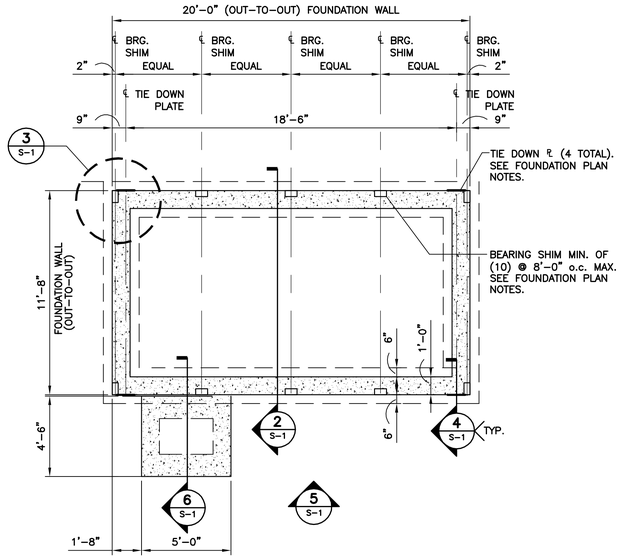
Sheet No. 4 of 13



3 S-1 **PLAN DETAIL**
NOT TO SCALE



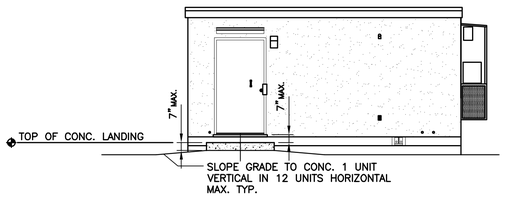
4 S-1 **BUILDING TIE DOWN**
SCALE: 1"=1'-0"



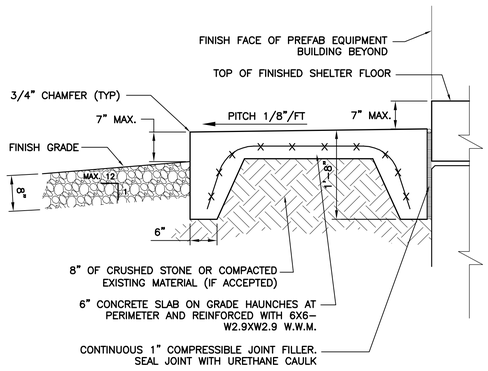
1 S-1 **FOUNDATION PLAN**
SCALE: 1/4"=1'-0"
TRUE NORTH

FOUNDATION PLAN NOTES:

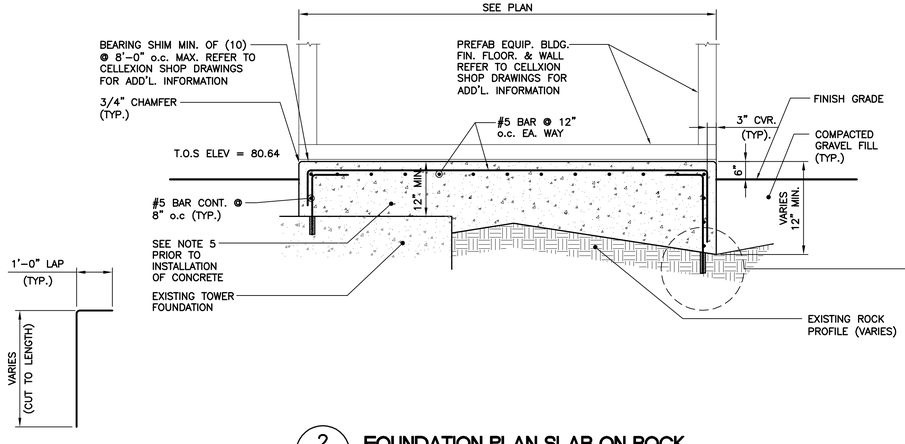
1. B/FTG. ELEVATION AT 3'-6" MINIMUM BELOW FINISHED GRADE, (TYP)
2. BEARING SHIMS, TIE-DOWN PLATES AND ASSOCIATED INSTALLATION ANCHORS PROVIDED BY CELLXION. CONTRACTOR SHALL VERIFY ALL SHIM & TIE-DOWN QUANTITIES AND LOCATIONS WITH CELLXION PRIOR TO PERFORMING FOUNDATION WORK.
3. SLAB/ TOP OF WALL TOLERANCE IS 1/4"±
4. TOP 8" OF FOUNDATION SIDES MUST BE FORMED FLAT TO ACCEPT TIE-DOWN PLATES.
5. REFER TO NOTES ON DWG. S-2 FOR ADDITIONAL REQUIREMENTS.
6. PER NEC REQUIREMENTS, THE REBAR IN FOUNDATION AND FOOTING SHALL BE BONDED TO GROUND RING WITH A #2 AWG SOLID CONDUCTOR USING LISTED AND APPROVED METHODS.
7. PROVIDE PVC SLEEVES FOR UTILITY CONDUIT PASSAGE THROUGH FOUNDATION OR CAST CONDUITS IN PLACE. REFER TO ELECTRICAL DRAWINGS FOR CONDUIT SIZES AND QUANTITIES.



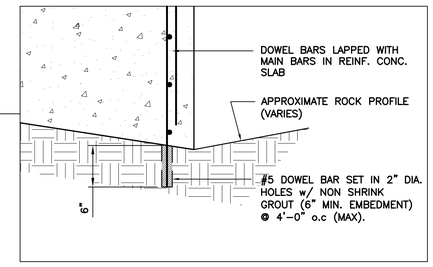
5 S-1 **ENTRY STOOP DETAIL - ELEVATION**
SCALE: 3/16"=1'-0"



6 S-1 **ENTRY STOOP DETAIL - SECTION**
SCALE: 3/16"=1'-0"



2 S-1 **FOUNDATION PLAN SLAB ON ROCK**
SCALE: 1/2"=1'-0"



2A S-1 **PINNED FOUNDATION DETAIL**
SCALE: 1"=1'-0"

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
6	03/02/15	HMR	DMD	REVISED CONSTRUCTION - AS-BUILT COMPOUND PLAN
5	01/29/15	HMR	DMD	REVISED CONSTRUCTION - UPDATED RFDS
4	03/05/14	HMR	DMD	REVISED CONSTRUCTION
3	12/10/13	HMR	DMD	UPDATED ANTENNA MOUNT
2	11/11/13	HMR	DMD	UPDATED ANTENNA LOADING
1	10/17/13	HMR	DMD	CONSTRUCTION
0	10/04/13	HMR	DMD	CONSTRUCTION - CLIENT REVIEW

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232 SHORE ROAD
OLD LYME, CT 06371

DATE:	10/01/13
SCALE:	AS NOTED
JOB NO.	13195.000

FOUNDATION PLAN AND DETAILS

S-1

Sheet No. 5 of 13

SITE AND FOUNDATION SPECIFICATIONS

DESIGN BASIS

GOVERNING CODE: 2003 INTERNATIONAL BUILDING CODE (IBC) AS MODIFIED BY THE 2005 CONNECTICUT STATE BUILDING CODE AND 2009 AMENDMENTS.

1. DESIGN CRITERIA:

   - WIND LOAD (ANTENNA MOUNTS):
     TIA/EIA-222-F-1996
     BASIC WIND SPEED (V) = 85 MPH (FASTEST MILE)

     2009 CT BUILDING CODE AMENDMENT APPENDIX K
     BASIC WIND SPEED (V) = 120 MPH (3-SECOND GUST)
     EQUIVALENT TO (V) = 100 MPH (FASTEST MILE)
     APPENDIX K WIND SPEED CONTROLS

   - BASIC WIND SPEED (OTHER STRUCTURE):
     115 MPH (3 SECOND GUST) (EXPOSURE B/IMPORTANCE FACTOR 1.0 BASED ON ASCE 7-02) PER 2003 INTERNATIONAL BUILDING CODE (IBC) AS MODIFIED BY THE 2005 CONNECTICUT SUPPLEMENT AND 2009 AMENDMENT.

   - SEISMIC LOAD (DOES NOT CONTROL):
     PER ASCE 7-02 MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES.

GENERAL NOTES

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

SITE NOTES

1. THE CONTRACTOR SHALL CALL UTILITIES PRIOR TO THE START OF CONSTRUCTION.
2. ACTIVE EXISTING UTILITIES, WHERE ENCOUNTERED IN THE WORK, SHALL BE PROTECTED AT ALL TIMES. THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY, PRIOR TO PROCEEDING, SHOULD ANY UNCOVERED EXISTING UTILITY PRECLUDE COMPLETION OF THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
3. ALL RUBBISH, STUMPS, DEBRIS, STICKS, STONES AND OTHER REFUSE SHALL BE REMOVED OFF SITE AND BE LEGALLY DISPOSED, AT NO ADDITIONAL COST.
4. THE SITE SHALL BE GRADED TO CAUSE SURFACE WATER TO FLOW AWAY FROM THE EQUIPMENT AND TOWER AREAS.
5. NO FILL OR EMBANKMENT MATERIAL SHALL BE PLACED ON FROZEN GROUND. FROZEN MATERIALS, SNOW OR ICE SHALL NOT BE PLACED IN ANY FILL OR EMBANKMENT.
6. THE SUBGRADE SHALL BE COMPACTED AND BROUGHT TO A SMOOTH UNIFORM GRADE PRIOR TO FINISHED SURFACE APPLICATION.
7. THE AREAS OF THE COMPOUND DISTURBED BY THE WORK SHALL BE RETURNED TO THEIR ORIGINAL CONDITION.
8. CONTRACTOR SHALL MINIMIZE DISTURBANCE TO EXISTING SITE DURING CONSTRUCTION. EROSION CONTROL MEASURES, SHALL BE IN CONFORMANCE WITH THE LOCAL GUIDELINES FOR EROSION AND SEDIMENT CONTROL.
9. IF ANY FIELD CONDITIONS EXIST WHICH PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL PROCEED WITH AFFECTED WORK AFTER CONFLICT IS SATISFACTORILY RESOLVED.
10. DIMENSIONS AND DETAILS SHALL BE CHECKED AGAINST THE PRE MANUFACTURED EQUIPMENT BUILDING SHOP DRAWINGS.

EARTHWORK NOTES

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

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

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

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

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

FOUNDATION CONSTRUCTION NOTES

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

CONCRETE CONSTRUCTION NOTES

1. CONCRETE CONSTRUCTION SHALL CONFORM TO THE FOLLOWING STANDARDS:

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

   ACI 301 – SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS.

   ACI 302 – GUIDE FOR CONCRETE FLOOR AND SLAB CONSTRUCTION

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

   ACI 306.1 STANDARD SPECIFICATION FOR COLD WEATHER CONCRETING

   ACI 318 – BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE.

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

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

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

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

   BOTTOM OF FOOTINGS 3 INCHES

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

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

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

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

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
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OLD LYME

SITE NUMBER: CTSR2286

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OLD LYME, CT 06371

DATE: 10/01/13
SCALE: AS NOTED
JOB NO. 13195.000

STRUCTURAL SPECIFICATIONS

S-2

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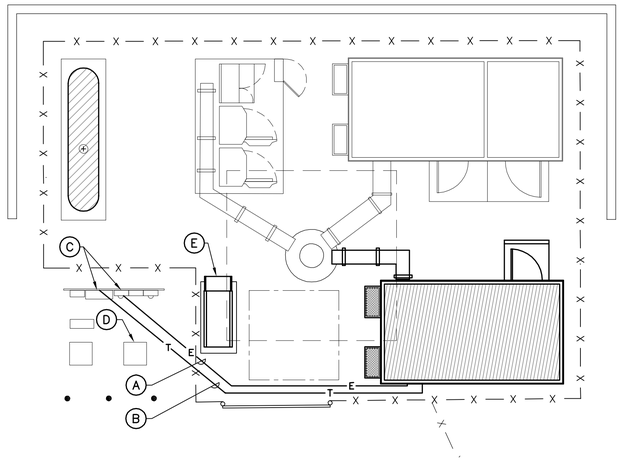
EQUIPMENT SHELTER BY OTHERS. VERIFY ALL SHELTER DIMENSIONS, EQUIPMENT DIMENSIONS, EQUIPMENT LOCATIONS AND UTILITY OPENINGS WITH BUILDING SHOP DRAWINGS PRIOR TO COMMENCEMENT OF WORK.



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

APPROXIMATE NORTH

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

COMPOUND UTILITY PLAN NOTES

(A) CONDUIT AND CONDUCTORS FOR NEW ELECTRICAL SERVICE TO OWNERS EQUIPMENT SHELTER, UNDER FINISHED GRADE. EXTEND CONDUIT AND CONDUCTORS THROUGH EQUIPMENT SHELTER TO MDP/MTS LOCATED WITHIN EQUIPMENT SHELTER. COORDINATE LOCATION WITH SHELTER MANUFACTURER.

(B) CONDUIT AND CONDUCTORS FROM TELCO SERVICE BOX TO EQUIPMENT SHELTER. FINAL CONDUIT ROUTING TO BE DETERMINED IN FIELD BY CONTRACTOR AT TIME OF CONSTRUCTION. EXTEND CONDUIT THROUGH EQUIPMENT SHELTER TO TELCO BOARD. COORDINATE STUB UP IN HOFFMAN BOX LOCATION WITH SHELTER MANUFACTURER.

(C) EXISTING COMPOUND FACILITY ELECTRICAL METER BANK AND TELCO HOFFMAN BOX.

(D) EXISTING TRANSFORMER.

(E) EMERGENCY GENERATOR.

GENERAL NOTES

1. REFER TO CIVIL DRAWINGS FOR ACTUAL LOCATIONS OF STRUCTURES ON SITE.
2. COORDINATION, LAYOUT AND FURNISHING OF CONDUIT, CABLE AND ALL APPURTENANCES REQUIRED FOR PROPER INSTALLATION OF ELECTRICAL / TELECOMMUNICATIONS SERVICES SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
3. THE EXACT BUILDING FOUNDATION SIZE AND BUILDING WALL PENETRATIONS FOR UTILITIES SHALL BE CONFIRMED WITH THE BUILDING SPECIFICATIONS AND PLANS PRIOR TO LAYOUT.
4. ALL UTILITY WORK SHALL BE IN ACCORDANCE WITH LOCAL UTILITY COMPANY REQUIREMENTS AND SPECIFICATIONS.
5. PROVIDE CADWELD CONNECTION STYLES: THROUGH (CABLE TO CABLE) TYPE "TA"
   (CABLE TO SURFACE) TYPE "LA" OR "VS" (PIPE)
   (CABLE TO ROD) TYPE "GT" OR "NC"
   (CABLE TO CABLE) TYPE "SS"
6. EXTEND UTILITY SERVICES TO UTILITY BACKBOARD IN OWNER'S EQUIPMENT SHELTER. COORDINATE WITH SHELTER SHOP DRAWINGS FOR LOCATION. COORDINATE ALL UTILITY SERVICES TO NEW EQUIPMENT SHELTER.

ELECTRICAL LEGEND

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

ELECTRICAL RISER NOTES:

(1) (3) # 3/0 AWG, (1) # 6 AWG GND, MIN 2-1/2" CONDUIT.

(2) 50KW DIESEL FUELED GENERATOR.

(3) 200A, 240V, MAIN CIRCUIT BREAKER AT GENERATOR OUTPUT.

(4) GROUND GENERATOR PER NEC AND MANUFACTURER'S SPECIFICATIONS.

(5) 1" CONDUIT WITH CONTROL AND ALARM CONDUCTORS FROM GENERATOR TO TRANSFER SWITCH AND ALARM PANEL IN SHELTER. INSTALL CONDUCTORS AS REQUIRED BY MANUFACTURER.

(6) REMOTE GENERATOR SHUT OFF SWITCH IN BREAK GLASS ENCLOSURE MOUNTED TO THE EXTERIOR OF THE SHELTER IN LOCATION APPROVED BY LOCAL FIRE MARSHAL. INSTALL ALL REQUIRED SIGNAGE.

(7) 3/4" CONDUIT AND CONDUCTORS REQUIRED FOR PROPER OPERATION OF EMERGENCY GENERATOR SHUT OFF SWITCH.

(8) DEDICATED 20A, 120V, CIRCUIT IN 3/4" CONDUIT FROM OWNER'S ELECTRIC PANEL TO GENERATOR BLOCK HEATER.

(9) DEDICATED 20A, 120V, CIRCUIT IN 3/4" CONDUIT FROM OWNER'S ELECTRIC PANEL TO GENERATOR BATTERY CHARGER AND DUPLEX RECEPTACLE.

(10) DUPLEX GFCI RECEPTACLE IN WEATHERPROOF ENCLOSURE MOUNT IN CONVENIENT LOCATION AT GENERATOR.

(11) GENERATOR BATTERY CHARGER.

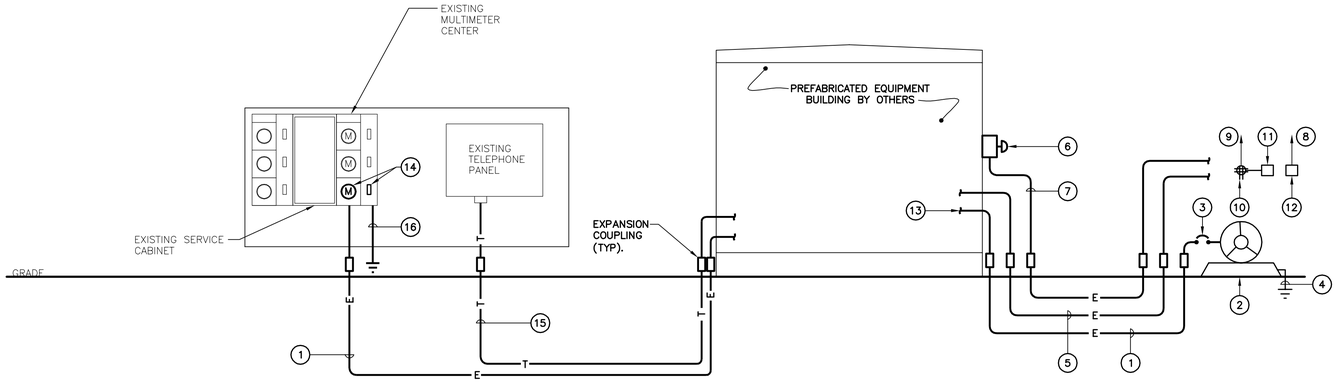
(12) GENERATOR BLOCK HEATER.

(13) EXTEND GENERATOR POWER OUTPUT CONDUCTORS TO EMERGENCY LUGS IN TRANSFER SWITCH.

(14) PROVIDE 120/240AC, 200 AMP., 1ϕ, 3 WIRE REVENUE METER W/200, 1ϕ BREAKER IN SPARE METER AND BREAKER LOCATION. (ALL SERVICE EQUIPMENT MUST BE UTILITY CO. APPROVED).

(15) (1) 4"C, W/ CAT 5E, 25 PAIR, SOLID CABLE RATED FOR T-1 SERVICE TO EXTEND FROM TELCO SERVICE BOX TO EQUIPMENT SHELTER. FINAL CONDUIT ROUTING TO BE DETERMINED IN FIELD BY CONTRACTOR AT TIME OF CONSTRUCTION. EXTEND CONDUIT THROUGH EQUIPMENT SHELTER STUB CONDUIT 1" ABOVE FINISHED SHELTER FLOOR. COORDINATE STUB UP IN HOFFMAN BOX LOCATION WITH SHELTER MANUFACTURER.

(16) SERVICE GROUND PER NEC.



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

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
6	03/02/15	TJB	CKD	REVISED CONSTRUCTION - AS-BUILT COMPOUND PLAN
5	01/29/15	TJB	CKD	REVISED CONSTRUCTION - UPDATED RFDS
4	03/05/14	TJB	CKD	REVISED CONSTRUCTION
3	12/10/13	TJB	CKD	UPDATED ANTENNA MOUNT
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1	10/17/13	TJB	CKD	CONSTRUCTION
0	10/04/13	TJB	CKD	CONSTRUCTION - CLIENT REVIEW

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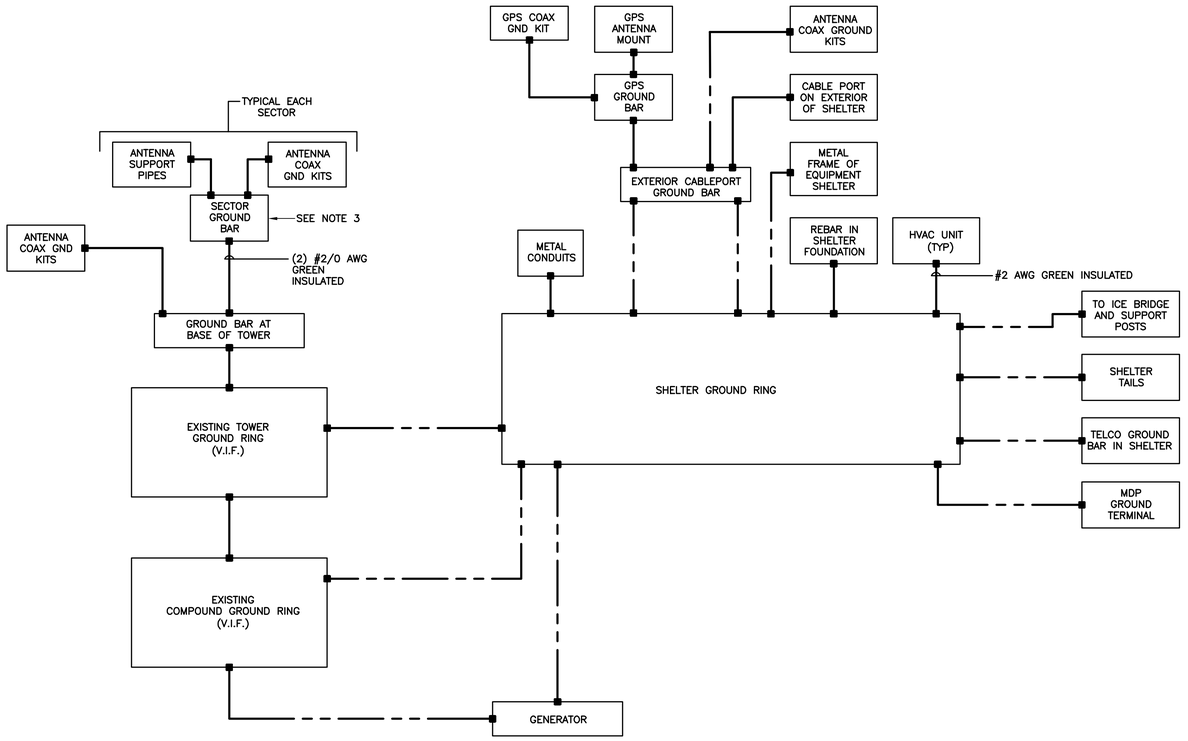
UTILITY PLAN AND RISER DIAGRAM

E-1

Sheet No. 7 of 13



1 / E-2 **SCHEMATIC DIAGRAM-GROUNDING SYSTEM**
NOT TO SCALE

NOTES

1. GROUND CONDUCTORS SHOWN SHALL BE #2 AWG BCW UNLESS OTHERWISE NOTED.
2. GROUND CABLE TRAY SECTIONS TOGETHER WITH #6 STRANDED GREEN INSULATED JUMPERS.
3. ALL SECTOR GROUND BARS SHALL BE BONDED TOGETHER WITH A #2 AWG BCW.
4. ALL EXPOSED METAL OBJECTS IN SHELTER SHALL BE BONDED TO THE HALO GROUND WITHIN THAT ROOM.
5. REFER TO GROUNDING PLAN FOR LOCATION OF GROUNDING DEVICES.
6. REFER TO ALL ELECTRICAL AND GROUNDING DETAILS.

CELLULAR GROUNDING NOTES

OBJECTIVE

PROVIDE A CELLULAR GROUNDING SYSTEM WITH MAXIMUM ALTERNATING CURRENT RESISTANCE OF 5 OHMS BETWEEN ANY POINT ON THE GROUNDING SYSTEM AND REFERENCE GROUND. PROVIDE EXTERIOR GROUNDING SCHEME WITH OWNER'S ENGINEER APPROVAL AS REQUIRED TO ACHIEVE DESIRED MAXIMUM AC RESISTANCE TO GROUND.

TESTING

CONTRACTOR TO PROVIDE AN INDEPENDENT TESTING CONTRACTOR TO DETERMINE THE GROUNDING SYSTEM RESISTANCE BY USE OF THE THREE POINT TEST AND AN AEMC MODEL 4500, OR APPROVED EQUAL. TEST TO BE PERFORMED PRIOR TO CONNECTION OF POWER SUPPLY TO THE CELL SITE AND CONNECTION OF THE GROUNDING SYSTEM TO THE WATER MAIN OR AC SUPPLY AS APPLICABLE.

CONDUCTOR USED FOR CELLULAR GROUNDING SYSTEM

EGR – #2 AWG ANNEALED SOLID TINNED BARE COPPER
IGR – #2 AWG ANNEALED STRANDED (7 STRAND) 'THW' GREEN COLORED INSULATION
INTER-BUS EXTENSION (FROM IGR TO EGR) – SEE DETAILS
EXTERNAL BOND CONNECTIONS TO EGR – #2 ANNEALED SOLID TINNED BARE COPPER
INTERIOR BOND CONNECTIONS TO IGR – #6 ANNEALED STRANDED (7 STRAND) 'THW' GREEN COLORED INSULATION

MINIMUM BENDING RADIUS

IGR #2 : 1'-0" NOMINAL AND 8" MINIMUM
EGR #2 : 2'-0" NOMINAL AND 8" MINIMUM
CELLULAR GROUNDING CONDUCTOR SHALL BE AS STRAIGHT AS POSSIBLE WITH MINIMUM 6" BENDING RADIUS.

FASTENER FOR CELLULAR GROUNDING CONDUCTOR

USE NON-METALLIC FASTENER AND STANDOFF 'CLIC' (AVAIL. FROM NEFCO 203-289-0285) TO SURFACE SUPPORT CONDUCTOR 3" AWAY FROM SURFACES.

SPACING OF FASTENERS: 2'-0" O.C. OUTSIDE BUILDING
3'-0" O.C. INSIDE BUILDING

GROUNDING ELECTRODE

GROUNDING ELECTRODE SHALL BE 5/8" DIA. x 10'-0" l. COPPER CLAD STEEL ROD. ADJUST LOCATION OF GROUNDING ELECTRODE IF SOIL CONDITION IS NOT CONDUCTIVE (GRAVEL, SANDY SOIL, ROCKS). SPACE GROUNDING ELECTRODES 20'-0" APART (SPACING MAY BE REDUCED WHERE REQUIRED TO ACCOMMODATE FIELD CONDITIONS BUT SHALL NOT BE LESS THAN 10'-0"). ELECTRODES SHALL BE DRIVEN ONLY WITH PROPER DRIVER SLEEVE TO PREVENT MUSHROOMING TOP OF ROD. WHEN ROCK BOTTOM IS ENCOUNTERED, THE ELECTRODE SHALL BE DRIVEN AT AN OBLIQUE ANGLE NOT TO EXCEED 45° FROM THE VERTICAL AWAY FROM STRUCTURES. TOP OF GROUNDING ELECTRODE SHALL BE MIN. 3'-6" BELOW FINISH GRADE.

CONNECTIONS ABOVE GRADE (MECHANICAL)

COMPRESSION LUG CONNECTOR – 15 TON COMPRESSION, 2 HOLE, LONG BARREL, ELECTRO TINNED PLATED, HIGH CONDUCTIVITY, COPPER 600V RATED. USE 1/4" ø BOLT, 3/4" SPACING LUGS TO BOND OBJECTS FROM THE IGR. (CONNECTOR SHALL BE BURNDY HYLUG SERIES OR EQUAL.)

EXOTHERMIC WELD LUG CONNECTOR – 2 HOLE, OFFSET, ELECTRO TINNED PLATED, HIGH CONDUCTIVITY, COPPER 600V. USE 1/2"ø BOLT, 1-3/4" SPACING LUGS. CONNECTOR SHALL BE CADWELD CONNECTION STYLE (CABLE TO SURFACE) TYPE LA, LUG SIZE 1/8 x 1. EXOTHERMIC WELD TO LUG AS REQUIRED.

C-TAP COMPRESSION CONNECTOR – HIGH CONDUCTIVITY COPPER FOR MAIN TO BRANCH LINE TAPPING. (CONNECTOR SHALL BE BURNDY HYTAP SERIES OR EQUAL.)

MECHANICAL CONNECTIONS

USE MATCHING MANUFACTURER TOOL AND DIE FOR COMPRESSION CONNECTION.

APPLY ANTI-OXIDANT CONDUCTIVITY ENHANCER COMPOUND ON SURFACES THAT ARE COMPRESSED.

SURFACES INTENDED TO BE CONNECTED WITH MECHANICAL CONNECTORS SHALL BE BARE METAL TO BARE METAL. PRIME AND PAINT OVER BONDED AREA TO PREVENT CORROSION.

WHEN BONDING #2 TO #2

EXTERIOR OF BUILDING – USE EXOTHERMIC WELD CONNECTION
INTERIOR OF BUILDING – USE COMPRESSION CONNECTION ON STRANDED CONDUCTORS ONLY.
– USE EXOTHERMIC WELD CONNECTION ON SOLID CONDUCTOR.

WHEN BONDING #2 TO FENCE POST

USE EXOTHERMIC WELD 'CADWELD TYPE VS' CONNECTION TO FENCE POST STEEL SURFACE. TEST WELD FOR POSSIBLE BURN THRU. PATCH WELDED AREA WITH GALVANIZED COATING AS REQUIRED FOR PROPER WELDED PERMANENT BOND. REFER TO MANUFACTURER'S REQUIREMENTS FOR DETAILS

GROUNDING SYSTEM INTERCONNECTION

BOND THE EGR DOWN CONDUCTORS, AND/OR BURIED GROUND RING TO ANY METALLIC OBJECT OR EXISTING GROUNDING SYSTEM WITHIN 6'.

WHEN BONDING #2 TO TOWER GROUND PLATE

TOWER GROUND PLATE SHALL BE 6" x 8" x 1/4" COPPER AND BE MADE AVAILABLE TO TOWER CONTRACTOR TO BE INSTALLED DURING TOWER CONSTRUCTION. USE EXOTHERMIC WELD 'CADWELD TYPE HS' TO TOWER GROUND PLATE TEST WELD FOR POSSIBLE BURN THRU. COORDINATE THE SIZE OF THE MOUNTING HOLE WITH TOWER CONTRACTOR.

METALLIC CONDUITS

BOND ALL STEEL CONDUITS TO PANELS AT POINT OF CONTACT WITH APPROVED GROUNDING BUSHING.

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4	03/05/14	TJB	CKD	REVISED CONSTRUCTION
3	12/10/13	TJB	CKD	UPDATED ANTENNA MOUNT
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0	10/04/13	TJB	CKD	CONSTRUCTION – CLIENT REVIEW

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GROUNDING SCHEMATIC AND NTOES

E-2

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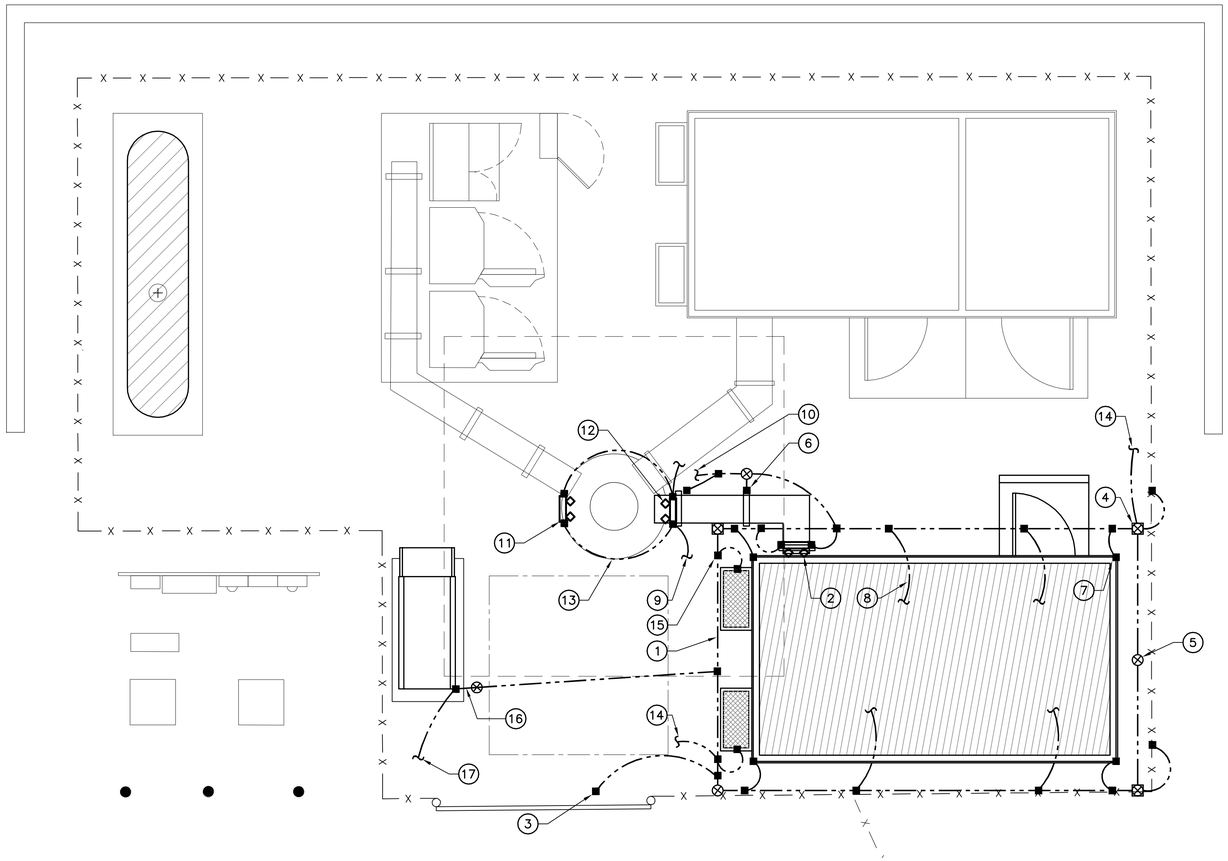
GROUNDING PLAN NOTES

1. #2 SOLID TINNED BCW GROUND RING (2'-0" FROM OUTSIDE EDGE OF EQUIPMENT SHELTER FOUNDATION) (TYP.).
2. WAVEPORT GROUND BAR PER DETAILS.
3. CONNECT FENCE TO GROUNDING RING (TYP. 3 PLACES).
4. GROUNDING ROD WITH ACCESS (TYP.) PER DETAILS.
5. GROUNDING ROD (TYP.) PER DETAILS.
6. ICE BRIDGE POST AND COVER. BOND EACH SECTION AND SUPPORT TO GROUND RING PER DETAILS.
7. CADWELD EQUIPMENT BUILDING TO GROUND RING (TYP. EACH CORNER).
8. EXTEND GROUND RING PIGTAIL THROUGH SHELTER AND BOND TO HALO GROUND DOWNLEAD. (TYP. 6 PLACES)
9. BOND GROUND BAR TO EXISTING TOWER GROUND RING (TYP OF 2). CONTRACTOR TO VERIFY LOCATION IN FIELD.
10. BOND SHELTER GND RING TO EXISTING TOWER GROUND RING WITH #2 AWG BCW.
11. UPPER TOWER MOUNTED GROUND BAR PER DETAILS.
12. LOWER TOWER MOUNTED GROUND BAR PER DETAILS.
13. BOND UPPER TOWER MOUNTED GROUND BAR TO LOWER TOWER MOUNTED GROUND BAR (2 GROUND LEADS) PER DETAILS.
14. BOND SHELTER GROUND RING TO EXISTING COMPOUND GROUND RING. (MINIMUM TWO PLACES.)
15. BOND HVAC UNIT TO GROUND RING (TYPICAL).
16. BOND GENERATOR TO SHELTER GROUND RING PER NEC AND MANUFACTURERS SPECIFICATIONS.
17. BOND GENERATOR TO EXISTING COMPOUND GROUND RING.



1 / E-3 **COMPOUND GROUNDING PLAN**
SCALE: 1/4" = 1'-0"

APPROXIMATE NORTH

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

EQUIPMENT SHELTER BY OTHERS. VERIFY ALL SHELTER DIMENSIONS, EQUIPMENT DIMENSIONS, EQUIPMENT LOCATIONS AND UTILITY OPENINGS WITH BUILDING SHOP DRAWINGS PRIOR TO COMMENCEMENT OF WORK.

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GROUNDING PLAN AND NOTES

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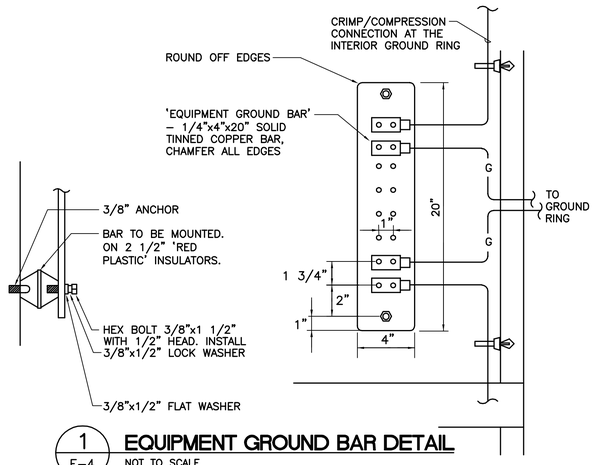
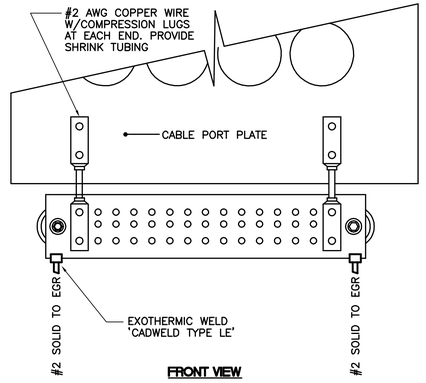
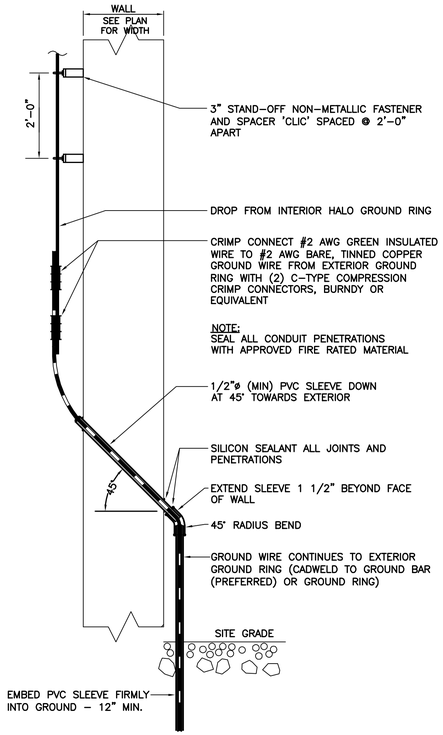


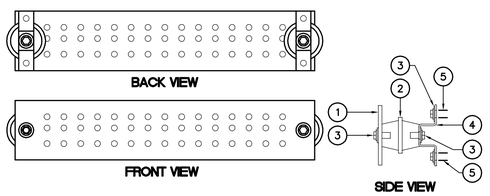
1 E-4 **EQUIPMENT GROUND BAR DETAIL**
NOT TO SCALE



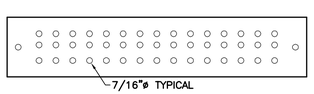
2 E-4 **CABLEPORT GROUND BAR LUG CONNECTION**
NOT TO SCALE



3 E-4 **CELLULAR GROUNDING CONDUCTOR SECURED ON WALL**
N.T.S.



TYPICAL GROUND BAR ASSEMBLY
N.T.S.

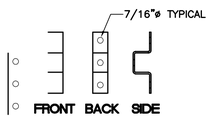


SIDE VIEW

TYPICAL GROUND BAR – DIMENSIONS
N.T.S.

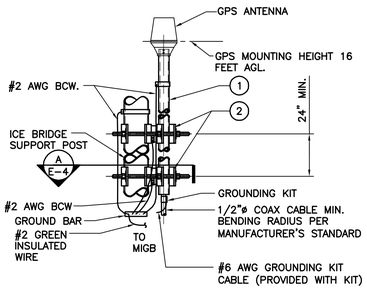
NOTES

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

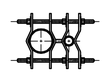


BRACKET FOR GROUND BAR-DIMENSIONS
N.T.S.

4 E-4 **MASTER/EQUIPMENT GROUND BAR DETAILS**
N.T.S.



GPS ANTENNA MOUNTING BRACKET



A E-4 **SECTION**
NOT TO SCALE

BILL OF MATERIALS

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

NOTES

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

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

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1	10/17/13	TJB	CKD	CONSTRUCTION
0	10/04/13	TJB	CKD	CONSTRUCTION – CLIENT REVIEW

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DETAILS

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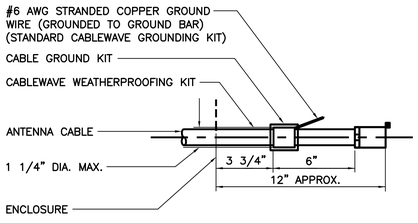
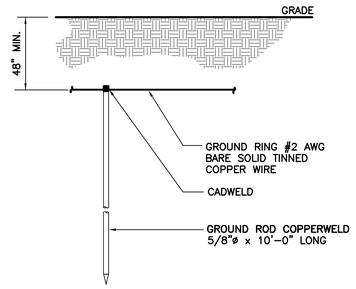


NOTE:

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

1 / E-5 ANTENNA CABLE GROUNDING DETAIL

NOT TO SCALE

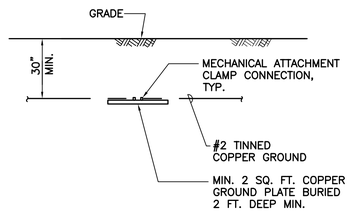


NOTE:

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

2 / E-5 GROUND ROD DETAIL

NOT TO SCALE

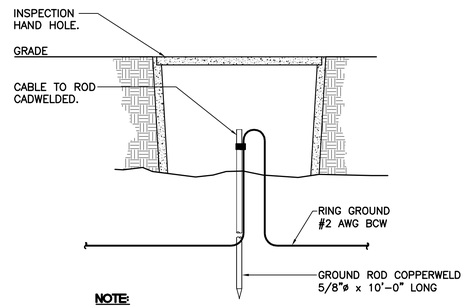


NOTE:

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

2A / E-5 GROUND PLATE DETAIL

NOT TO SCALE

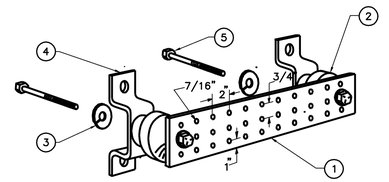


NOTE:

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

3 / E-5 GROUND ROD WITH ACCESS DETAIL

NOT TO SCALE

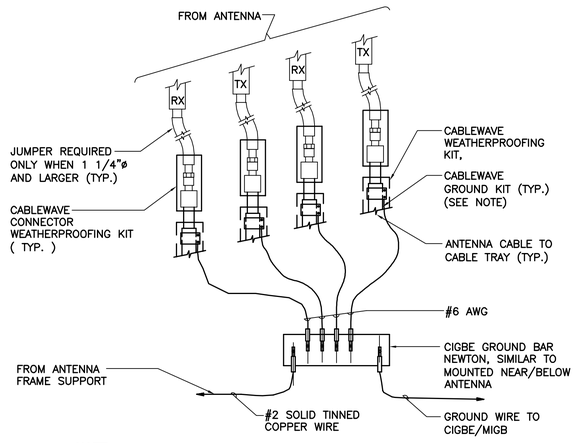


NOTES

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

4 / E-5 GROUND BAR DETAIL

NOT TO SCALE

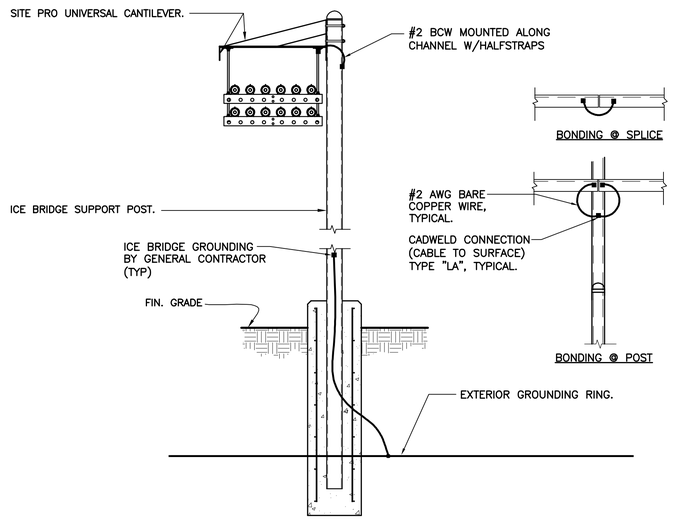


NOTE:

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

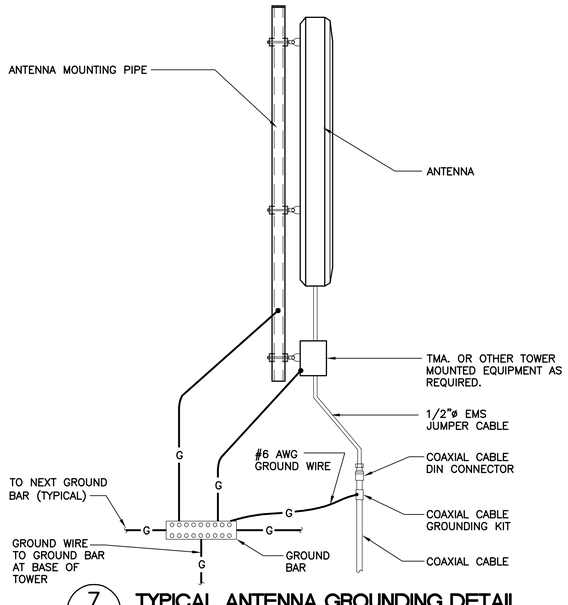
5 / E-5 CONNECTION OF GROUND WIRES TO GROUND BAR

NOT TO SCALE



6 / E-5 ICE BRIDGE BONDING DETAIL

NOT TO SCALE



7 / E-5 TYPICAL ANTENNA GROUNDING DETAIL

NOT TO SCALE

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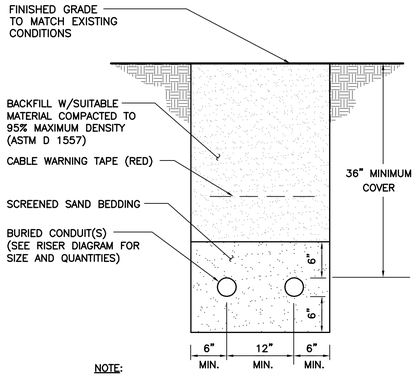
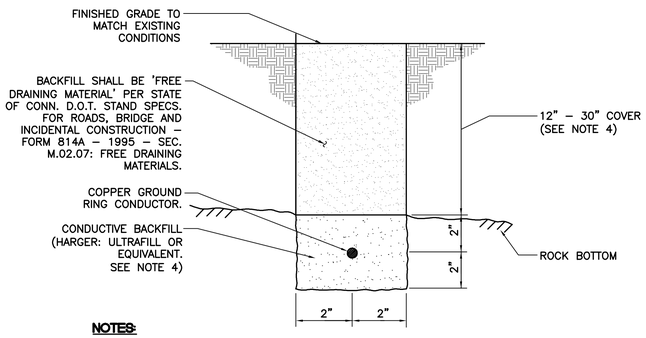


NOTE:

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

1 / E-6 TYPICAL ELECTRICAL TRENCH DETAIL

NOT TO SCALE

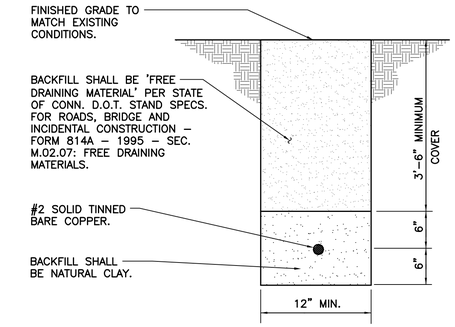


NOTES:

1. ENGINEER SHALL INSPECT PLACEMENT OF EGR CONDUCTOR PRIOR TO BACKFILLING.
2. MAINTAIN MIN. 2'–0" LINEAR CLEARANCE BETWEEN BACKFILL AND THE FOLLOWING: FOUNDATION, UNDERGROUND PIPING/CONDUIT, UNDERGROUND SERVICES. IN THE CLEARANCE AREAS, USE EARTH BACKFILL INSTEAD.
3. EXERCISE HANDLING AND USE PRECAUTION OF BACKFILL MATERIAL PER MFR'S REQUIREMENTS.
4. FOR LOCATIONS WHERE ROCK BOTTOM DEPTH IS LESS THAN 12" CONDUCTIVE CONCRETE SHALL BE USED INSTEAD OF CONDUCTIVE BACKFILL.

2 / E-6 EGR TRENCH/BACKFILL DETAIL (SHALLOW TOPSOIL)

NOT TO SCALE

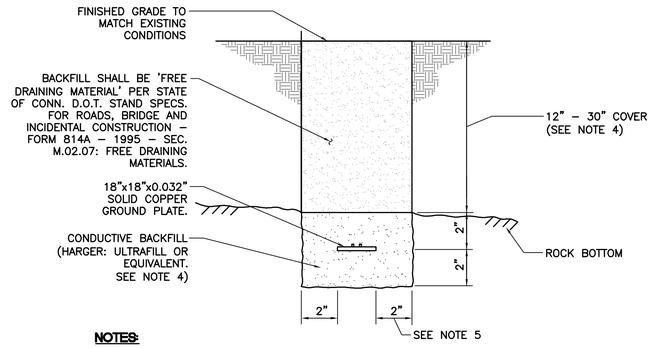


NOTES:

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

3 / E-6 EGR TRENCH/BACKFILL DETAIL

NOT TO SCALE

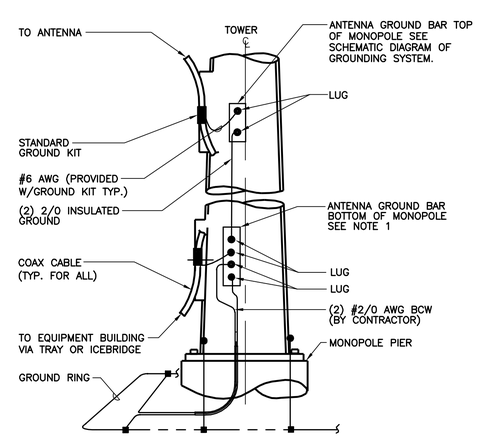


NOTES:

1. ENGINEER SHALL INSPECT PLACEMENT OF EGR CONDUCTOR PRIOR TO BACKFILLING.
2. MAINTAIN MIN. 2'–0" LINEAR CLEARANCE BETWEEN BACKFILL AND THE FOLLOWING: FOUNDATION, UNDERGROUND PIPING/CONDUIT, UNDERGROUND SERVICES. IN THE CLEARANCE AREAS, USE EARTH BACKFILL INSTEAD.
3. EXERCISE HANDLING AND USE PRECAUTION OF BACKFILL MATERIAL PER MFR'S REQUIREMENTS.
4. FOR LOCATIONS WHERE ROCK BOTTOM DEPTH IS LESS THAN 12" CONDUCTIVE CONCRETE SHALL BE USED INSTEAD OF CONDUCTIVE BACKFILL.
5. PROVIDE MIN 2" CLEARANCE ON ALL SIDES OF GROUND PLATE.

4 / E-6 GROUND PLATE TRENCH/BACKFILL DETAIL (SHALLOW TOPSOIL)

NOT TO SCALE



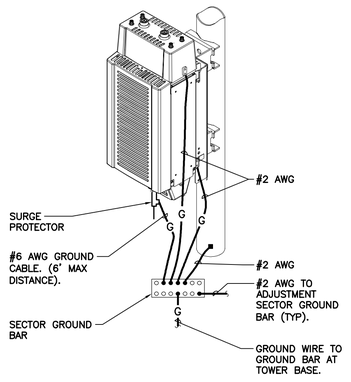
NOTES:

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

5 / E-6 ANTENNA CABLE GROUNDING

NOT TO SCALE

EACH RRH CABINET SHALL BE GROUNDED IN THE FOLLOWING MANNER:
1. AT TOP OF THE CABINET
2. AT RIGHT SIDE OF THE CABINET.



6 / E-6 RRH POLE MOUNT GROUNDING

NOT TO SCALE

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
6	03/02/15	TJB	CKD	REVISED CONSTRUCTION – AS-BUILT COMPOUND PLAN
5	01/29/15	TJB	CKD	REVISED CONSTRUCTION – UPDATED RFDS
4	03/05/14	TJB	CKD	REVISED CONSTRUCTION
3	12/10/13	TJB	CKD	UPDATED ANTENNA MOUNT
2	11/11/13	TJB	CKD	UPDATED ANTENNA LOADING
1	10/17/13	TJB	CKD	CONSTRUCTION
0	10/04/13	TJB	CKD	CONSTRUCTION – CLIENT REVIEW

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OLD LYME

232 SHORE ROAD
OLD LYME, CT 06371

DATE: 10/01/13

SCALE: AS NOTED

JOB NO. 13195.000

DETAILS

E-6

Sheet No. 12 of 13

ELECTRICAL SPECIFICATIONS

SECTION 16010

1.01. SCOPE OF WORK

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

1. INSTALL 200A, 240/120V, 1P, 3 WIRE ELECTRIC SERVICE WITH REVENUE METER AND 200A MAIN CIRCUIT BREAKER FOR OWNER AND ASSOCIATED DISTRIBUTION EQUIPMENT. (AS REQUIRED BY UTILITY CO.)
2. NEW SITE TELEPHONE SERVICE AS SPECIFIED BY TELEPHONE COMPANY.
3. GENERATOR/TRANSFER SWITCH.
4. FEEDERS AND BRANCH CIRCUIT WIRING TO PANELS, RECEPTACLES, EQUIPMENT, LIGHTING FIXTURES, ETC. AS INDICATED OR NOTED ON PLANS.
5. POWER AND TEMPERATURE CONTROL WIRING FOR HVAC EQUIPMENT.
   a. FURNISH AND INSTALL ALL POWER WIRING FOR ALL HEATING, VENTILATING, AIR CONDITIONING, MOTORS AND DEVICES, AND FIRE PROTECTION EQUIPMENT INDICATED ON THE PLANS OR CALLED FOR IN THIS SPECIFICATION, EITHER ELECTRICAL OR MECHANICAL INCLUDING ALL CONTROL WIRING. ALL MAGNETIC STARTERS SHALL BE FURNISHED UNDER DIVISION 15 AND HAVE INSTALLED THEREIN A PROPER OVERLOAD HEATER FOR EACH MOTOR.
   b. ALL WIRING, BOTH POWER AND CONTROL, FOR SUCH ITEMS AS UNIT HEATERS, EXHAUST FANS, ETC., NOT SPECIFICALLY CALLED FOR IN THE TEMPERATURE CONTROL SPECIFICATIONS, SHALL BE WIRED UNDER DIVISION 16.
   c. ALL CONTROLS WHICH ARE TO BE WIRED BY THIS CONTRACTOR SHALL BE DELIVERED TO HIM BY THE CONTRACTOR/VENDOR FURNISHING THEM.
6. CELLULAR SITE ALARMS, ASSOCIATED WIRING AND DEVICES.
7. CELLULAR GROUNDING SYSTEMS, CONSISTING OF ANTENNA GROUNDING, INTERIOR GROUNDING RING, GROUND BARS, ETC.
8. FURNISH AND INSTALL 3/4" PLYWOOD BACKBOARD OF SIZE INDICATED ON DRAWINGS FOR MOUNTING OF POWER/SERVICE EQUIPMENT AND TELEPHONE/ALARM EQUIPMENT. BACKBOARDS SHALL BE PAINTED WITH TWO (2) COATS OF SEMI-GLOSS GRAY FIRE RETARDANT PAINT.
9. FIELD MEASURE EXISTING ELECTRICAL SERVICES TO CONFIRM AVAILABLE EXISTING POWER.
10. COORDINATE ALL WORK SHOWN, ON THESE PLANS WITH LOCAL UTILITY COMPANIES.

B. LOCAL UTILITY COMPANIES SHALL PROVIDING THE FOLLOWING:

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

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

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

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

1.02. GENERAL REQUIREMENTS

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

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

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

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

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

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

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

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

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

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

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

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

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

N. SHOP DRAWINGS:

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

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

SECTION 16111

1.01. CONDUIT

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

CONDUIT MATERIAL SHALL BE AS FOLLOWS:

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

SECTION 16114

1.01. CABLE TRAY

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

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

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

SECTION 16123

1.01. CONDUCTORS

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

120/240V/1PH

LINE	COLOR
A	BLACK
B	RED
N	CONTINUOUS WHITE
G	CONTINUOUS GREEN

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

SECTION 16130

1.01. BOXES

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

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

SECTION 16140

1.01. WIRING DEVICES

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

15 MINUTE TIMER SWITCH – INTERMATIC #FF15M (INTERIOR LIGHTS)

DUPLEX RECEPTACLE – P&S #2091-S (GFCI) SPECIFICATION GRADE

SINGLE POLE SWITCH – P&S #5021-1 (20A-120V HARD USE) SPECIFICATION GRADE

DUPLEX RECEPTACLE – P&S #5342-1 (20A-120V HARD USE) SPECIFICATION GRADE

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

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

SECTION 16170

1.01. DISCONNECT SWITCHES

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

SECTION 16190

1.01. SEISMIC RESTRAINT

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

SECTION 16195

1.01. LABELING AND IDENTIFICATION NOMENCLATURE FOR ELECTRICAL EQUIPMENT

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

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

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

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

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

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

SECTION 16450

1.01. GROUNDING

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

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

C. GROUNDING OF PANELBOARDS:

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

D. EQUIPMENT GROUNDING CONDUCTOR:

1. EACH EQUIPMENT GROUND CONDUCTOR SHALL BE SIZED IN ACCORDANCE WITH THE N.E.C. ARTICLE 250-122.
2. THE MINIMUM SIZE OF EQUIPMENT GROUND CONDUCTOR SHALL BE NO. 12 AWG COPPER.
3. REFER TO PANEL SCHEDULE "BRANCH CIRCUIT" DATA FOR EQUIPMENT GROUND CONDUCTOR SIZE FOR EACH BRANCH CIRCUIT.
4. EACH FEEDER OR BRANCH CIRCUIT SHALL HAVE EQUIPMENT GROUND CONDUCTOR(S) INSTALLED IN THE SAME RACEWAY(S).

E. CELLULAR GROUNDING SYSTEM:

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

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

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

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

G. ALL EQUIPMENT SHALL BE BONDED TO GROUND AS REQUIRED BY NEC, MFG. SPECIFICATIONS AND OWNERS SPECIFICATIONS.

SECTION 16470

1.01. DISTRIBUTION EQUIPMENT

A. REFER TO CONTRACT DRAWINGS FOR DETAILS AND SCHEDULES.

SECTION 16477

1.01. FUSES

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

SECTION 16620

(SUPPLIED BY OWNER, INSTALLED BY CONTRACTOR)

1.01. GENERATOR SET

A. REFER TO CONTRACT DRAWINGS FOR DETAILS AND SCHEDULES.

SECTION 16960

1.01. TESTS BY INDEPENDENT ELECTRICAL TESTING FIRM

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

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

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

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

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

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

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

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

SECTION 16961

1.01. TESTS BY CONTRACTOR

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

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

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

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
6	03/02/15	TJB	CKD	REVISED CONSTRUCTION - AS-BUILT COMPOUND PLAN
5	01/29/15	TJB	CKD	REVISED CONSTRUCTION - UPDATED RFDS
4	03/05/14	TJB	CKD	REVISED CONSTRUCTION
3	12/10/13	TJB	CKD	UPDATED ANTENNA MOUNT
2	11/11/13	TJB	CKD	UPDATED ANTENNA LOADING
1	10/17/13	TJB	CKD	CONSTRUCTION
0	10/04/13	TJB	CKD	CONSTRUCTION - CLIENT REVIEW

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AT&T MOBILITY

WIRELESS COMMUNICATIONS FACILITY

SITE NUMBER: CTSR2286

OLD LYME

232 SHORE ROAD
OLD LYME, CT 06371

DATE: 10/01/13
SCALE: AS NOTED
JOB NO. 13195.000

ELECTRICAL SPECIFICATIONS

E-7

Sheet No. 13 of 13

ATTACHMENT 2

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

110-ft Existing Sabre Monopole

Proposed AT&T Mobility
Antenna Installation

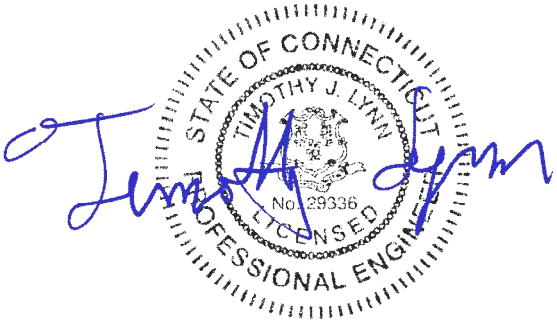
AT&T Site Ref: CT2286

232 Shore Road
Old Lyme, CT

Centek Project No. 13195.000

~~Date: October 14, 2013~~

Rev 4: January 28, 2015



Prepared for:

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

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Introduction

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

The host tower is a 110-ft tall, three-section, eighteen sided, tapered monopole, originally designed and manufactured by Sabre Towers & Poles job no; 41153, dated April 28, 2011. The tower geometry, structure member sizes and foundation information were obtained from the aforementioned design documents.

Antenna and appurtenance information were obtained from the aforementioned design documents, a Verizon RF data sheet and a AT&T RF data sheet.

The tower is made up of three (3) tapered vertical sections consisting of A572-65 pole sections. The vertical tower sections are slip joint connected. The diameter of the pole (flat-flat) is 22.25-in at the top and 52.4-in at the base.

AT&T proposes the installation of six (6) panel antennas, twenty-one (21) remote radio heads and four (4) surge arrestors mounted on 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:

- T-MOBILE (Existing):
  Antennas: Six (6) Ericsson AIR21 panel antennas, three (3) Andrew LNX-6515DS panel antennas, three (3) TMA's and three (3) Ericsson RRUS-11 remote radio units mounted on a 10-ft T-arm array with a RAD center elevation of 99-ft above the existing tower base plate.
  Coax Cables: Six (6) 1-5/8" ∅ coax cables and one (1) 1-5/8" fiber cable running on the inside of the existing tower.
- VERIZON (Existing):
  Antennas: One (1) RFS DB-T1-6Z-8AB-0Z main distribution box mounted to one (1) universal ring mount with a RAD center elevation of 91-ft above grade level.
- VERIZON (Existing):
  Antennas: Six (6) Antel BXA-70063-6CF panel antennas, six (6) BXA-171063-12CF panel antennas, three (3) Alcatel-Lucent RRH2x40-AWS Remote Radio Heads and three (3) Alcatel-Lucent RRH2x40-07-U Remote Radio Heads mounted on a 12-ft T-arm array with a RAD center elevation of 89-ft above the existing tower base plate.
  Coax Cables: Two (2) 1-5/8" ∅ fiber cables running on the inside of the existing tower.

- **AT&T (PROPOSED):**
  Antennas: Six (6) CCI OPA-65R-LCUU-H8 panel antennas, nine (9) Ericsson RRUS-11 remote radio units, six (6) Ericsson RRUS-12 remote radio units, three (3) Ericsson RRUS-E2 remote radio units, three (3) Ericsson RRUS-32 remote radio units and six (6) Ericsson A2 units mounted on a Site Pro Monopole Triple T-arm p/n RMV12-496 with a RAD center elevation of 109-ft above the existing tower base plate.
- **AT&T (Proposed):**
  Antennas: Four (4) Raycap DC6-48-60-18-8F surge arrestors mounted to one (1) universal ring mount with a RAD center elevation of 107-ft above grade level.
  Coax Cables: Two (2) fiber cable, eight (8) dc control cables and three (3) RET cables running inside of the existing tower.

Primary Assumptions Used in the Analysis

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

Analysis

The existing tower was analyzed using a comprehensive computer program entitled tnxTower. The program analyzes the tower, considering the worst case loading condition. The tower is considered as loaded by concentric forces along the tower 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:	New London; v = 85 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Old Lyme; v = 120 mph (3 second gust) equivalent to v = 100 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	Appendix K wind speed controls.	
Load Cases:	Load Case 1; 100 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; 87 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 87 mph wind speed velocity represents 75% of the wind pressure generated by the 100 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 tnxTower. Allowable stresses were determined based on Table 5 of the TIA/EIA code with a 1/3 increase per Section 3.1.1.1 of the same code.

- Calculated stresses were found to be within allowable limits. In Load Case 1, per tnxTower "Section Capacity Table", this tower was found to be at **80.6%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (1)	81.00'-109.00'	80.6%	**PASS**

Foundation and Anchors

The existing foundation consists of a 7.0-ft square x 1.0-ft long reinforced concrete pier on a 19.0-ft square x 3.5-ft thick reinforced concrete pad with four (4) 2-1/2" ∅ x 29.5-ft long A722 150 ksi rock anchors. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned Sabre design documents. The base of the tower is connected to the foundation by means of (24) 2.25"∅, ASTM A615-75 anchor bolts embedded approximately 3-ft 9-in into the concrete foundation structure.

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

Location	Vector	Proposed Reactions
Base	Shear	31 kips
	Compression	23 kips
	Moment	2635 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 w/ Rock Anchors	Uplift	2.0	7.4	**PASS**

Note 1: FS denotes Factor of Safety.

- The flange bolts and plate **with the modification to the flange bolts outlined below** were found to be within allowable limits.

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Flange Bolts	Tension	87.0%	**PASS**
Flange Plate	Bending	32.9%	**PASS**

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Combined Axial and Bending	46.3%	**PASS**
Base Plate	Bending	46.1%	**PASS**

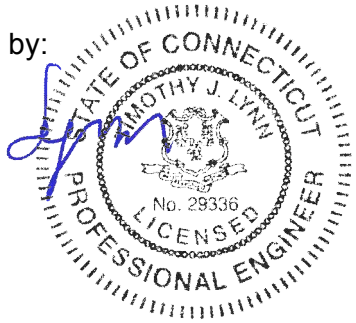
Conclusion

This analysis shows that the subject tower **with the replacement of the twelve (12) 1" diameter A325 flange bolts at 80-ft above tower base with 1" diameter A490 bolts is adequate** to support the proposed modified antenna configuration.

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:



Timothy J. Lynn, PE
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

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

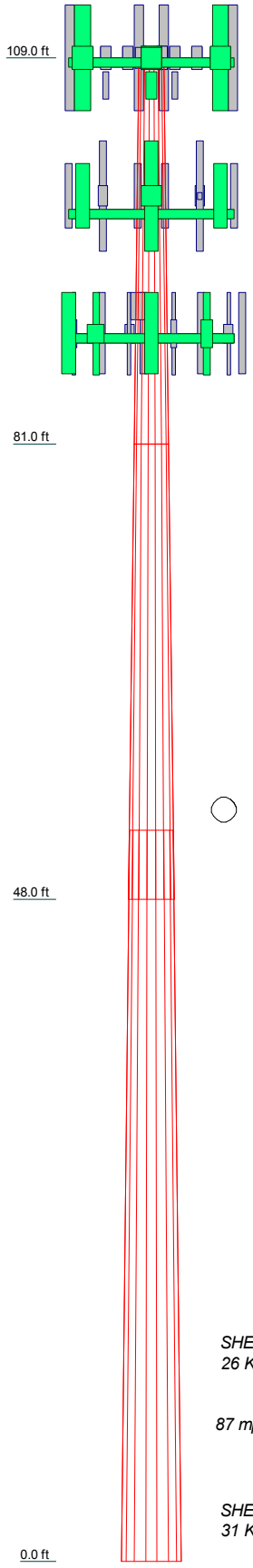
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

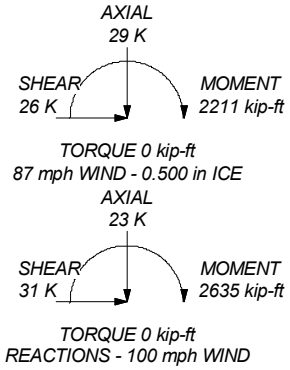
tnxTower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, tnxTower, formerly ERITower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

tnxTower Features:

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

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	28.000	18	0.188		22.250	30.090		1.5
2	33.000	18	0.313	5.000	30.090	39.580	A572-65	3.8
3	53.000	18	0.375		37.517	52.400		9.6
								14.9





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(2) OPA-65R-LCUU-H8 (ATI - Proposed)	109	LNX-6515DS (T-Mobile - Existing)	99
		LNX-6515DS (T-Mobile - Existing)	99
(2) OPA-65R-LCUU-H8 (ATI - Proposed)	109	KRY 112-144-1 TMA (T-Mobile - Existing)	99
(2) OPA-65R-LCUU-H8 (ATI - Proposed)	109	KRY 112-144-1 TMA (T-Mobile - Existing)	99
(3) RRUS-11 (ATI - Proposed)	109	KRY 112-144-1 TMA (T-Mobile - Existing)	99
(2) RRUS-12 (ATI - Proposed)	109		
RRUS-E2 (ATI - Proposed)	109	RRUS-11 (T-Mobile - Existing)	99
RRUS-E2 (ATI - Proposed)	109	RRUS-11 (T-Mobile - Existing)	99
(2) A2 (ATI - Proposed)	109	RRUS-11 (T-Mobile - Existing)	99
(3) RRUS-11 (ATI - Proposed)	109	Valmont T-Arm (3) (T-Mobile - Existing)	98
(2) RRUS-12 (ATI - Proposed)	109	DB-T1-6Z-8AB-0Z (Verizon - Existing)	91
RRUS-E2 (ATI - Proposed)	109	Valmont Uni-Tri Bracket (Verizon - Existing)	91
RRUS-E2 (ATI - Proposed)	109	BXA-70063/6CF (Verizon - Existing)	89
(2) A2 (ATI - Proposed)	109	BXA-171063-12CF (Verizon - Existing)	89
(3) RRUS-11 (ATI - Proposed)	109	BXA-70063/6CF (Verizon - Existing)	89
(2) RRUS-12 (ATI - Proposed)	109	BXA-171063-12CF (Verizon - Existing)	89
RRUS-E2 (ATI - Proposed)	109	BXA-70063/6CF (Verizon - Existing)	89
RRUS-E2 (ATI - Proposed)	109	BXA-171063-12CF (Verizon - Existing)	89
(2) A2 (ATI - Proposed)	109	BXA-70063/6CF (Verizon - Existing)	89
Valmont T-Arm (3) (ATI - Proposed)	109	BXA-171063-12CF (Verizon - Existing)	89
(2) DC6-48-60-18-8F Surge Arrestor (ATI - Proposed)	107	BXA-70063/6CF (Verizon - Existing)	89
DC6-48-60-18-8F Surge Arrestor (ATI - Proposed)	107	BXA-171063-12CF (Verizon - Existing)	89
DC6-48-60-18-8F Surge Arrestor (ATI - Proposed)	107	RRH2x40-07-U (Verizon - Existing)	89
		RRH2x40-07-U (Verizon - Existing)	89
Valmont Uni-Tri Bracket (ATI - Proposed)	107	RRH2x40-07-U (Verizon - Existing)	89
		RRH2x40-AWS (Verizon - Existing)	89
(2) AIR21 (T-Mobile - Existing)	99	RRH2x40-AWS (Verizon - Existing)	89
(2) AIR21 (T-Mobile - Existing)	99	RRH2x40-AWS (Verizon - Existing)	89
(2) AIR21 (T-Mobile - Existing)	99	Valmont T-Arm (3) (Verizon - Existing)	89
LNX-6515DS (T-Mobile - Existing)	99	BXA-70063/6CF (Verizon - Existing)	89
		BXA-171063-12CF (Verizon - Existing)	89

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for a 100 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 87 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: 80.6%

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

Job: ***13195.000 - CT2286***			
Project: ***110-ft Sabre Monopole - 232 Shore Rd., Old Lyme, CT***			
Client: AT&T Mobility	Drawn by: TJL	App'd:	
Code: TIA/EIA-222-F	Date: 01/28/15	Scale: NTS	
Path: J:\Jobs\1319500.WI\04_Structural\Rev (4)\Calcs\ERI Files\110' Monopole_Old Lyme, 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 100 mph.
Nominal ice thickness of 0.500 in.
Ice density of 56 pcf.
A wind speed of 87 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*	*Section Length*	*Splice Length*	*Number of Sides*	*Top Diameter*	*Bottom Diameter*	*Wall Thickness*	*Bend Radius*	*Pole Grade*
	ft	*ft*	*ft*		*in*	*in*	*in*	*in*	
L1	109.000-81.000	28.000	0.000	18	22.250	30.090	0.188	0.750	A572-65 (65 ksi)
L2	81.000-48.000	33.000	5.000	18	30.090	39.580	0.313	1.250	A572-65 (65 ksi)
L3	48.000-0.000	53.000		18	37.517	52.400	0.375	1.500	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	22.593	13.130	807.439	7.832	11.303	71.436	1615.941	6.566	3.586	19.125
	30.554	17.796	2010.334	10.615	15.286	131.517	4023.313	8.900	4.966	26.484
L2	30.554	29.536	3308.713	10.571	15.286	216.458	6621.780	14.771	4.746	15.187
	40.191	38.948	7587.420	13.940	20.107	377.359	15184.825	19.478	6.416	20.531
L3	39.522	44.208	7705.055	13.185	19.059	404.280	15420.249	22.108	5.943	15.848
	53.208	61.923	21174.439	18.469	26.619	795.457	42376.739	30.967	8.562	22.833

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 109.000-81.000				1	1	1		
L2 81.000-48.000				1	1	1		
L3 48.000-0.000				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
Fiber Trunk	C	No	Inside Pole	109.000 - 3.000	2	No Ice	0.000	0.001
(AT&T - Proposed)						1/2" Ice	0.000	0.001
DC Trunk	C	No	Inside Pole	109.000 - 3.000	8	No Ice	0.000	0.000
(AT&T - Proposed)						1/2" Ice	0.000	0.000
HYBRIFLEX 1-5/8"	B	No	Inside Pole	89.000 - 3.000	2	No Ice	0.000	0.002
(Verizon - Existing)						1/2" Ice	0.000	0.002
1 5/8	B	No	Inside Pole	98.000 - 3.000	6	No Ice	0.000	0.001
(T-Mobile - Existing)						1/2" Ice	0.000	0.001
0.3" dia RET	C	No	Inside Pole	109.000 - 3.000	3	No Ice	0.000	0.000
(AT&T - Proposed)						1/2" Ice	0.000	0.000
HYBRIFLEX 1-5/8"	B	No	Inside Pole	98.000 - 3.000	1	No Ice	0.000	0.002
(T-Mobile - Existing)						1/2" Ice	0.000	0.002

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	109.000-81.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.169
		C	0.000	0.000	0.000	0.000	0.081
L2	81.000-48.000	A	0.000	0.000	0.000	0.000	0.000

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
		B	0.000	0.000	0.000	0.000	0.394
		C	0.000	0.000	0.000	0.000	0.095
L3	48.000-0.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.537
		C	0.000	0.000	0.000	0.000	0.130

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	109.000-81.000	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.169
		C		0.000	0.000	0.000	0.000	0.081
L2	81.000-48.000	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.394
		C		0.000	0.000	0.000	0.000	0.095
L3	48.000-0.000	A	0.500	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.537
		C		0.000	0.000	0.000	0.000	0.130

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(2) OPA-65R-LCUU-H8	A	From Face	3.000	0.000	109.000	No Ice	13.295	7.516	0.088
(AT&T - Proposed)			0.000			1/2" Ice	13.994	8.087	0.162
			0.000						
(2) OPA-65R-LCUU-H8	B	From Face	3.000	0.000	109.000	No Ice	13.295	7.516	0.088
(AT&T - Proposed)			0.000			1/2" Ice	13.994	8.087	0.162
			0.000						
(2) OPA-65R-LCUU-H8	C	From Face	3.000	0.000	109.000	No Ice	13.295	7.516	0.088
(AT&T - Proposed)			0.000			1/2" Ice	13.994	8.087	0.162
			0.000						
(3) RRUS-11	A	From Face	0.000	0.000	109.000	No Ice	2.994	1.246	0.050
(AT&T - Proposed)			0.000			1/2" Ice	3.226	1.412	0.070
			0.000						
(2) RRUS-12	A	From Face	0.000	0.000	109.000	No Ice	3.669	1.488	0.058
(AT&T - Proposed)			0.000			1/2" Ice	3.926	1.673	0.081
			0.000						
RRUS-E2	A	From Face	0.000	0.000	109.000	No Ice	3.669	1.488	0.058
(AT&T - Proposed)			0.000			1/2" Ice	3.926	1.673	0.081
			0.000						
RRUS-E2	A	From Face	0.000	0.000	109.000	No Ice	3.669	1.488	0.058
(AT&T - Proposed)			0.000			1/2" Ice	3.926	1.673	0.081
			0.000						
(2) A2	A	From Face	0.000	0.000	109.000	No Ice	2.424	0.542	0.022
(AT&T - Proposed)			0.000			1/2" Ice	2.633	0.675	0.035
			0.000						

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(3) RRUS-11	B	From Face	0.000	0.000	109.000	No Ice	2.994	1.246	0.050
(AT&T - Proposed)			0.000			1/2" Ice	3.226	1.412	0.070
			0.000						
(2) RRUS-12	B	From Face	0.000	0.000	109.000	No Ice	3.669	1.488	0.058
(AT&T - Proposed)			0.000			1/2" Ice	3.926	1.673	0.081
			0.000						
RRUS-E2	B	From Face	0.000	0.000	109.000	No Ice	3.669	1.488	0.058
(AT&T - Proposed)			0.000			1/2" Ice	3.926	1.673	0.081
			0.000						
RRUS-E2	B	From Face	0.000	0.000	109.000	No Ice	3.669	1.488	0.058
(AT&T - Proposed)			0.000			1/2" Ice	3.926	1.673	0.081
			0.000						
(2) A2	B	From Face	0.000	0.000	109.000	No Ice	2.424	0.542	0.022
(AT&T - Proposed)			0.000			1/2" Ice	2.633	0.675	0.035
			0.000						
(3) RRUS-11	C	From Face	0.000	0.000	109.000	No Ice	2.994	1.246	0.050
(AT&T - Proposed)			0.000			1/2" Ice	3.226	1.412	0.070
			0.000						
(2) RRUS-12	C	From Face	0.000	0.000	109.000	No Ice	3.669	1.488	0.058
(AT&T - Proposed)			0.000			1/2" Ice	3.926	1.673	0.081
			0.000						
RRUS-E2	C	From Face	0.000	0.000	109.000	No Ice	3.669	1.488	0.058
(AT&T - Proposed)			0.000			1/2" Ice	3.926	1.673	0.081
			0.000						
RRUS-E2	C	From Face	0.000	0.000	109.000	No Ice	3.669	1.488	0.058
(AT&T - Proposed)			0.000			1/2" Ice	3.926	1.673	0.081
			0.000						
(2) A2	C	From Face	0.000	0.000	109.000	No Ice	2.424	0.542	0.022
(AT&T - Proposed)			0.000			1/2" Ice	2.633	0.675	0.035
			0.000						
Valmont T-Arm (3)	C	None		0.000	109.000	No Ice	21.000	21.000	1.008
(AT&T - Proposed)						1/2" Ice	29.000	29.000	1.236
(2) DC6-48-60-18-8F Surge	A	From Face	0.000	0.000	107.000	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						
DC6-48-60-18-8F Surge	B	From Face	0.000	0.000	107.000	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						
DC6-48-60-18-8F Surge	C	From Face	0.000	0.000	107.000	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						
Valmont Uni-Tri Bracket	C	None		0.000	107.000	No Ice	1.750	1.750	0.290
(AT&T - Proposed)						1/2" Ice	1.940	1.940	0.306
(2) AIR21	A	From Face	3.000	0.000	99.000	No Ice	6.533	4.356	0.083
(T-Mobile - Existing)			0.000			1/2" Ice	6.978	4.775	0.125
			0.000						
(2) AIR21	B	From Face	3.000	0.000	99.000	No Ice	6.533	4.356	0.083
(T-Mobile - Existing)			0.000			1/2" Ice	6.978	4.775	0.125
			0.000						
(2) AIR21	C	From Face	3.000	0.000	99.000	No Ice	6.533	4.356	0.083
(T-Mobile - Existing)			0.000			1/2" Ice	6.978	4.775	0.125
			0.000						
LNX-6515DS	A	From Face	3.000	0.000	99.000	No Ice	11.445	7.696	0.055
(T-Mobile - Existing)			0.000			1/2" Ice	12.064	8.289	0.121
			0.000						
LNX-6515DS	B	From Face	3.000	0.000	99.000	No Ice	11.445	7.696	0.055
(T-Mobile - Existing)			0.000			1/2" Ice	12.064	8.289	0.121

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.000						
LNX-6515DS	C	From Face	3.000	0.000	99.000	No Ice	11.445	7.696	0.055
(T-Mobile - Existing)			0.000			1/2" Ice	12.064	8.289	0.121
			0.000						
KRY 112-144-1 TMA	A	From Face	3.000	0.000	99.000	No Ice	0.409	0.166	0.015
(T-Mobile - Existing)			0.000			1/2" Ice	0.498	0.228	0.018
			0.000						
KRY 112-144-1 TMA	B	From Face	3.000	0.000	99.000	No Ice	0.409	0.166	0.015
(T-Mobile - Existing)			0.000			1/2" Ice	0.498	0.228	0.018
			0.000						
KRY 112-144-1 TMA	C	From Face	3.000	0.000	99.000	No Ice	0.409	0.166	0.015
(T-Mobile - Existing)			0.000			1/2" Ice	0.498	0.228	0.018
			0.000						
RRUS-11	A	From Face	3.000	0.000	99.000	No Ice	2.994	1.246	0.050
(T-Mobile - Existing)			0.000			1/2" Ice	3.226	1.412	0.070
			0.000						
RRUS-11	B	From Face	3.000	0.000	99.000	No Ice	2.994	1.246	0.050
(T-Mobile - Existing)			0.000			1/2" Ice	3.226	1.412	0.070
			0.000						
RRUS-11	C	From Face	3.000	0.000	99.000	No Ice	2.994	1.246	0.050
(T-Mobile - Existing)			0.000			1/2" Ice	3.226	1.412	0.070
			0.000						
Valmont T-Arm (3)	C	None		0.000	98.000	No Ice	21.000	21.000	1.008
(T-Mobile - Existing)						1/2" Ice	29.000	29.000	1.236
BXA-70063/6CF	A	From Face	3.000	0.000	89.000	No Ice	7.731	4.158	0.012
(Verizon - Existing)			6.000			1/2" Ice	8.268	4.595	0.054
			0.000						
BXA-171063-12CF	A	From Face	3.000	0.000	89.000	No Ice	4.791	3.618	0.015
(Verizon - Existing)			4.000			1/2" Ice	5.242	4.058	0.042
			0.000						
BXA-70063/6CF	A	From Face	3.000	0.000	89.000	No Ice	7.731	4.158	0.012
(Verizon - Existing)			0.000			1/2" Ice	8.268	4.595	0.054
			0.000						
BXA-171063-12CF	A	From Face	3.000	0.000	89.000	No Ice	4.791	3.618	0.015
(Verizon - Existing)			-4.000			1/2" Ice	5.242	4.058	0.042
			0.000						
BXA-70063/6CF	B	From Face	3.000	0.000	89.000	No Ice	7.731	4.158	0.012
(Verizon - Existing)			6.000			1/2" Ice	8.268	4.595	0.054
			0.000						
BXA-171063-12CF	B	From Face	3.000	0.000	89.000	No Ice	4.791	3.618	0.015
(Verizon - Existing)			4.000			1/2" Ice	5.242	4.058	0.042
			0.000						
BXA-70063/6CF	B	From Face	3.000	0.000	89.000	No Ice	7.731	4.158	0.012
(Verizon - Existing)			0.000			1/2" Ice	8.268	4.595	0.054
			0.000						
BXA-171063-12CF	B	From Face	3.000	0.000	89.000	No Ice	4.791	3.618	0.015
(Verizon - Existing)			-4.000			1/2" Ice	5.242	4.058	0.042
			0.000						
BXA-70063/6CF	C	From Face	3.000	0.000	89.000	No Ice	7.731	4.158	0.012
(Verizon - Existing)			6.000			1/2" Ice	8.268	4.595	0.054
			0.000						
BXA-171063-12CF	C	From Face	3.000	0.000	89.000	No Ice	4.791	3.618	0.015
(Verizon - Existing)			4.000			1/2" Ice	5.242	4.058	0.042
			0.000						
BXA-70063/6CF	C	From Face	3.000	0.000	89.000	No Ice	7.731	4.158	0.012
(Verizon - Existing)			0.000			1/2" Ice	8.268	4.595	0.054
			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
BXA-171063-12CF	C	From Face	3.000	0.000	89.000	No Ice	4.791	3.618	0.015
(Verizon - Existing)			-4.000			1/2" Ice	5.242	4.058	0.042
			0.000						
RRH2x40-07-U	A	From Face	3.000	0.000	89.000	No Ice	2.246	1.228	0.050
(Verizon - Existing)			4.000			1/2" Ice	2.447	1.385	0.067
			0.000						
RRH2x40-07-U	B	From Face	3.000	0.000	89.000	No Ice	2.246	1.228	0.050
(Verizon - Existing)			4.000			1/2" Ice	2.447	1.385	0.067
			0.000						
RRH2x40-07-U	C	From Face	3.000	0.000	89.000	No Ice	2.246	1.228	0.050
(Verizon - Existing)			4.000			1/2" Ice	2.447	1.385	0.067
			0.000						
RRH2x40-AWS	A	From Face	3.000	0.000	89.000	No Ice	2.522	1.589	0.044
(Verizon - Existing)			-4.000			1/2" Ice	2.753	1.795	0.061
			0.000						
RRH2x40-AWS	B	From Face	3.000	0.000	89.000	No Ice	2.522	1.589	0.044
(Verizon - Existing)			-4.000			1/2" Ice	2.753	1.795	0.061
			0.000						
RRH2x40-AWS	C	From Face	3.000	0.000	89.000	No Ice	2.522	1.589	0.044
(Verizon - Existing)			-4.000			1/2" Ice	2.753	1.795	0.061
			0.000						
Valmont T-Arm (3)	C	None		0.000	89.000	No Ice	21.000	21.000	1.008
(Verizon - Existing)						1/2" Ice	29.000	29.000	1.236
DB-T1-6Z-8AB-0Z	A	From Face	0.000	0.000	91.000	No Ice	5.600	2.333	0.044
(Verizon - Existing)			0.000			1/2" Ice	5.915	2.558	0.080
			0.000						
Valmont Uni-Tri Bracket	C	None		0.000	91.000	No Ice	1.750	1.750	0.290
(Verizon - Existing)						1/2" Ice	1.940	1.940	0.306

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	94.301	1.35	0.035	61.063	A	0.000	61.063	61.063	100.00	0.000	0.000
109.000-81.00					B	0.000	61.063		100.00	0.000	0.000
0					C	0.000	61.063		100.00	0.000	0.000
L2	64.053	1.209	0.031	95.796	A	0.000	95.796	95.796	100.00	0.000	0.000
81.000-48.000					B	0.000	95.796		100.00	0.000	0.000
					C	0.000	95.796		100.00	0.000	0.000
L3	22.952	1	0.026	182.642	A	0.000	182.642	182.642	100.00	0.000	0.000
48.000-0.000					B	0.000	182.642		100.00	0.000	0.000
					C	0.000	182.642		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 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	94.301	1.35	0.026	0.500	63.397	A	0.000	63.397	63.397	100.00	0.000	0.000
109.000-81.000						B	0.000	63.397		100.00	0.000	0.000
						C	0.000	63.397		100.00	0.000	0.000
L2	64.053	1.209	0.023	0.500	98.546	A	0.000	98.546	98.546	100.00	0.000	0.000
81.000-48.000						B	0.000	98.546		100.00	0.000	0.000
						C	0.000	98.546		100.00	0.000	0.000
L3 48.000-0.000	22.952	1	0.019	0.500	186.642	A	0.000	186.642	186.642	100.00	0.000	0.000
						B	0.000	186.642		100.00	0.000	0.000
						C	0.000	186.642		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	94.301	1.35	0.009	61.063	A	0.000	61.063	61.063	100.00	0.000	0.000
109.000-81.00					B	0.000	61.063		100.00	0.000	0.000
0					C	0.000	61.063		100.00	0.000	0.000
L2	64.053	1.209	0.008	95.796	A	0.000	95.796	95.796	100.00	0.000	0.000
81.000-48.000					B	0.000	95.796		100.00	0.000	0.000
					C	0.000	95.796		100.00	0.000	0.000
L3	22.952	1	0.006	182.642	A	0.000	182.642	182.642	100.00	0.000	0.000
48.000-0.000					B	0.000	182.642		100.00	0.000	0.000
					C	0.000	182.642		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	0.250	1.473	A	1	0.65	1	1	1	61.063	2.318	0.083	C
109.000-81.00			B	1	0.65	1	1	1	61.063			
0			C	1	0.65	1	1	1	61.063			
L2	0.489	3.845	A	1	0.65	1	1	1	95.796	3.246	0.098	C
81.000-48.000			B	1	0.65	1	1	1	95.796			
			C	1	0.65	1	1	1	95.796			
L3	0.667	9.570	A	1	0.65	1	1	1	182.642	5.190	0.108	C
48.000-0.000			B	1	0.65	1	1	1	182.642			
			C	1	0.65	1	1	1	182.642			
Sum Weight:	1.406	14.889						OTM	545.628 kip-ft	10.754		

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	0.250	1.473	A	1	0.65	1	1	1	61.063	2.318	0.083	C
109.000-81.00			B	1	0.65	1	1	1	61.063			
0			C	1	0.65	1	1	1	61.063			
L2	0.489	3.845	A	1	0.65	1	1	1	95.796	3.246	0.098	C
81.000-48.000			B	1	0.65	1	1	1	95.796			
			C	1	0.65	1	1	1	95.796			
L3	0.667	9.570	A	1	0.65	1	1	1	182.642	5.190	0.108	C
48.000-0.000			B	1	0.65	1	1	1	182.642			
			C	1	0.65	1	1	1	182.642			
Sum Weight:	1.406	14.889						OTM	545.628 kip-ft	10.754		

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	0.250	1.473	A	1	0.65	1	1	1	61.063	2.318	0.083	C
109.000-81.00			B	1	0.65	1	1	1	61.063			
0			C	1	0.65	1	1	1	61.063			
L2	0.489	3.845	A	1	0.65	1	1	1	95.796	3.246	0.098	C
81.000-48.000			B	1	0.65	1	1	1	95.796			
			C	1	0.65	1	1	1	95.796			
L3	0.667	9.570	A	1	0.65	1	1	1	182.642	5.190	0.108	C
48.000-0.000			B	1	0.65	1	1	1	182.642			
			C	1	0.65	1	1	1	182.642			
Sum Weight:	1.406	14.889						OTM	545.628 kip-ft	10.754		

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	0.250	1.473	A	1	0.65	1	1	1	61.063	2.318	0.083	C
109.000-81.00			B	1	0.65	1	1	1	61.063			
0			C	1	0.65	1	1	1	61.063			
L2	0.489	3.845	A	1	0.65	1	1	1	95.796	3.246	0.098	C
81.000-48.000			B	1	0.65	1	1	1	95.796			
			C	1	0.65	1	1	1	95.796			
L3	0.667	9.570	A	1	0.65	1	1	1	182.642	5.190	0.108	C
48.000-0.000			B	1	0.65	1	1	1	182.642			
			C	1	0.65	1	1	1	182.642			
Sum Weight:	1.406	14.889						OTM	545.628 kip-ft	10.754		

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	0.250	1.934	A	1	0.65	1	1	1	63.397	1.805	0.064	C
109.000-81.00			B	1	0.65	1	1	1	63.397			
0			C	1	0.65	1	1	1	63.397			
L2	0.489	4.565	A	1	0.65	1	1	1	98.546	2.504	0.076	C
81.000-48.000			B	1	0.65	1	1	1	98.546			
			C	1	0.65	1	1	1	98.546			
L3	0.667	10.938	A	1	0.65	1	1	1	186.642	3.978	0.083	C
48.000-0.000			B	1	0.65	1	1	1	186.642			
			C	1	0.65	1	1	1	186.642			
Sum Weight:	1.406	17.437						OTM	421.918 kip-ft	8.287		

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	0.250	1.934	A	1	0.65	1	1	1	63.397	1.805	0.064	C
109.000-81.00			B	1	0.65	1	1	1	63.397			
0			C	1	0.65	1	1	1	63.397			
L2	0.489	4.565	A	1	0.65	1	1	1	98.546	2.504	0.076	C
81.000-48.000			B	1	0.65	1	1	1	98.546			
			C	1	0.65	1	1	1	98.546			
L3	0.667	10.938	A	1	0.65	1	1	1	186.642	3.978	0.083	C
48.000-0.000			B	1	0.65	1	1	1	186.642			
			C	1	0.65	1	1	1	186.642			
Sum Weight:	1.406	17.437						OTM	421.918 kip-ft	8.287		

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	0.250	1.934	A	1	0.65	1	1	1	63.397	1.805	0.064	C
109.000-81.00			B	1	0.65	1	1	1	63.397			
0			C	1	0.65	1	1	1	63.397			
L2	0.489	4.565	A	1	0.65	1	1	1	98.546	2.504	0.076	C
81.000-48.000			B	1	0.65	1	1	1	98.546			
			C	1	0.65	1	1	1	98.546			
L3	0.667	10.938	A	1	0.65	1	1	1	186.642	3.978	0.083	C
48.000-0.000			B	1	0.65	1	1	1	186.642			
			C	1	0.65	1	1	1	186.642			
Sum Weight:	1.406	17.437						OTM	421.918	8.287		

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
									kip-ft			

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	0.250	1.934	A	1	0.65	1	1	1	63.397	1.805	0.064	C
109.000-81.00			B	1	0.65	1	1	1	63.397			
0			C	1	0.65	1	1	1	63.397			
L2	0.489	4.565	A	1	0.65	1	1	1	98.546	2.504	0.076	C
81.000-48.000			B	1	0.65	1	1	1	98.546			
			C	1	0.65	1	1	1	98.546			
L3	0.667	10.938	A	1	0.65	1	1	1	186.642	3.978	0.083	C
48.000-0.000			B	1	0.65	1	1	1	186.642			
			C	1	0.65	1	1	1	186.642			
Sum Weight:	1.406	17.437						OTM	421.918 kip-ft	8.287		

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	0.250	1.473	A	1	0.65	1	1	1	61.063	0.579	0.021	C
109.000-81.00			B	1	0.65	1	1	1	61.063			
0			C	1	0.65	1	1	1	61.063			
L2	0.489	3.845	A	1	0.65	1	1	1	95.796	0.812	0.025	C
81.000-48.000			B	1	0.65	1	1	1	95.796			
			C	1	0.65	1	1	1	95.796			
L3	0.667	9.570	A	1	0.65	1	1	1	182.642	1.297	0.027	C
48.000-0.000			B	1	0.65	1	1	1	182.642			
			C	1	0.65	1	1	1	182.642			
Sum Weight:	1.406	14.889						OTM	136.407 kip-ft	2.688		

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	0.250	1.473	A	1	0.65	1	1	1	61.063	0.579	0.021	C
109.000-81.00			B	1	0.65	1	1	1	61.063			
0			C	1	0.65	1	1	1	61.063			

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	0.489	3.845	A	1	0.65	1	1	1	95.796	0.812	0.025	C
81.000-48.000			B	1	0.65	1	1	1	95.796			
			C	1	0.65	1	1	1	95.796			
L3	0.667	9.570	A	1	0.65	1	1	1	182.642	1.297	0.027	C
48.000-0.000			B	1	0.65	1	1	1	182.642			
			C	1	0.65	1	1	1	182.642			
Sum Weight:	1.406	14.889						OTM	136.407 kip-ft	2.688		

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	0.250	1.473	A	1	0.65	1	1	1	61.063	0.579	0.021	C
109.000-81.00			B	1	0.65	1	1	1	61.063			
0			C	1	0.65	1	1	1	61.063			
L2	0.489	3.845	A	1	0.65	1	1	1	95.796	0.812	0.025	C
81.000-48.000			B	1	0.65	1	1	1	95.796			
			C	1	0.65	1	1	1	95.796			
L3	0.667	9.570	A	1	0.65	1	1	1	182.642	1.297	0.027	C
48.000-0.000			B	1	0.65	1	1	1	182.642			
			C	1	0.65	1	1	1	182.642			
Sum Weight:	1.406	14.889						OTM	136.407 kip-ft	2.688		

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	0.250	1.473	A	1	0.65	1	1	1	61.063	0.579	0.021	C
109.000-81.00			B	1	0.65	1	1	1	61.063			
0			C	1	0.65	1	1	1	61.063			
L2	0.489	3.845	A	1	0.65	1	1	1	95.796	0.812	0.025	C
81.000-48.000			B	1	0.65	1	1	1	95.796			
			C	1	0.65	1	1	1	95.796			
L3	0.667	9.570	A	1	0.65	1	1	1	182.642	1.297	0.027	C
48.000-0.000			B	1	0.65	1	1	1	182.642			
			C	1	0.65	1	1	1	182.642			
Sum Weight:	1.406	14.889						OTM	136.407 kip-ft	2.688		

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	14.889					
Bracing Weight	0.000					
Total Member Self-Weight	14.889			-0.035	0.060	
Total Weight	23.131			-0.035	0.060	
Wind 0 deg - No Ice		-0.082	-31.007	-2585.486	7.501	-0.244
Wind 30 deg - No Ice		15.480	-26.812	-2235.381	-1290.518	-0.282
Wind 45 deg - No Ice		21.935	-21.868	-1822.963	-1828.945	-0.272
Wind 60 deg - No Ice		26.894	-15.433	-1286.316	-2242.728	-0.244
Wind 90 deg - No Ice		31.102	0.082	7.407	-2593.984	-0.141
Wind 120 deg - No Ice		26.976	15.575	1299.136	-2250.169	0.000
Wind 135 deg - No Ice		22.050	21.983	1833.418	-1839.468	0.073
Wind 150 deg - No Ice		15.622	26.894	2242.753	-1303.406	0.141
Wind 180 deg - No Ice		0.082	31.007	2585.417	-7.381	0.244
Wind 210 deg - No Ice		-15.480	26.812	2235.312	1290.638	0.282
Wind 225 deg - No Ice		-21.935	21.868	1822.894	1829.064	0.272
Wind 240 deg - No Ice		-26.894	15.433	1286.247	2242.847	0.244
Wind 270 deg - No Ice		-31.102	-0.082	-7.476	2594.104	0.141
Wind 300 deg - No Ice		-26.976	-15.575	-1299.205	2250.288	0.000
Wind 315 deg - No Ice		-22.050	-21.983	-1833.487	1839.588	-0.073
Wind 330 deg - No Ice		-15.622	-26.894	-2242.822	1303.526	-0.141
Member Ice	2.548					
Total Weight Ice	28.522			-0.064	0.111	
Wind 0 deg - Ice		-0.063	-25.557	-2159.156	5.847	-0.201
Wind 30 deg - Ice		12.760	-22.102	-1867.025	-1077.779	-0.232
Wind 45 deg - Ice		18.078	-18.027	-1522.717	-1527.225	-0.224
Wind 60 deg - Ice		22.165	-12.724	-1074.643	-1872.585	-0.201
Wind 90 deg - Ice		25.630	0.063	5.672	-2165.604	-0.116
Wind 120 deg - Ice		22.228	12.833	1084.449	-1878.321	0.000
Wind 135 deg - Ice		18.168	18.116	1530.700	-1535.337	0.060
Wind 150 deg - Ice		12.869	22.165	1872.632	-1087.714	0.116
Wind 180 deg - Ice		0.063	25.557	2159.028	-5.625	0.201
Wind 210 deg - Ice		-12.760	22.102	1866.896	1078.002	0.232
Wind 225 deg - Ice		-18.078	18.027	1522.589	1527.447	0.224
Wind 240 deg - Ice		-22.165	12.724	1074.514	1872.808	0.201
Wind 270 deg - Ice		-25.630	-0.063	-5.800	2165.827	0.116
Wind 300 deg - Ice		-22.228	-12.833	-1084.578	1878.544	0.000
Wind 315 deg - Ice		-18.168	-18.116	-1530.829	1535.559	-0.060
Wind 330 deg - Ice		-12.869	-22.165	-1872.761	1087.936	-0.116
Total Weight	23.131			-0.035	0.060	
Wind 0 deg - Service		-0.020	-7.752	-646.397	1.920	-0.061
Wind 30 deg - Service		3.870	-6.703	-558.871	-322.585	-0.070
Wind 45 deg - Service		5.484	-5.467	-455.767	-457.191	-0.068
Wind 60 deg - Service		6.724	-3.858	-321.605	-560.637	-0.061
Wind 90 deg - Service		7.775	0.020	1.826	-648.451	-0.035
Wind 120 deg - Service		6.744	3.894	324.758	-562.497	0.000
Wind 135 deg - Service		5.513	5.496	458.328	-459.822	0.018
Wind 150 deg - Service		3.905	6.724	560.662	-325.807	0.035
Wind 180 deg - Service		0.020	7.752	646.328	-1.800	0.061
Wind 210 deg - Service		-3.870	6.703	558.802	322.704	0.070
Wind 225 deg - Service		-5.484	5.467	455.698	457.311	0.068
Wind 240 deg - Service		-6.724	3.858	321.536	560.757	0.061
Wind 270 deg - Service		-7.775	-0.020	-1.895	648.571	0.035
Wind 300 deg - Service		-6.744	-3.894	-324.827	562.617	0.000
Wind 315 deg - Service		-5.513	-5.496	-458.398	459.942	-0.018
Wind 330 deg - Service		-3.905	-6.724	-560.731	325.926	-0.035

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
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

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	109 - 81	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-11.863	0.111	0.064
			Max. Mx	14	-7.255	440.560	0.873
			Max. My	2	-7.265	0.895	439.568
			Max. Vy	14	-23.116	440.560	0.873
			Max. Vx	2	-23.021	0.895	439.568
			Max. Torque	11			-0.281
L2	81 - 48	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-16.071	0.111	0.064
			Max. Mx	14	-11.272	1124.677	3.200
			Max. My	2	-11.278	3.225	1121.006
			Max. Vy	14	-25.797	1124.677	3.200
			Max. Vx	2	-25.701	3.225	1121.006
			Max. Torque	11			-0.281
L3	48 - 0	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	18	-28.522	0.111	0.064
			Max. Mx	14	-23.106	2630.249	7.577
			Max. My	2	-23.106	7.603	2621.527
			Max. Vy	14	-31.120	2630.249	7.577
			Max. Vx	2	-31.026	7.603	2621.527
			Max. Torque	11			-0.280

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	31	28.522	25.630	0.063
	Max. H_x	14	23.131	31.102	0.082
	Max. H_z	2	23.131	0.082	31.007
	Max. M_x	2	2621.527	0.082	31.007
	Max. M_z	6	2630.127	-31.102	-0.082
	Max. Torsion	3	0.280	-15.480	26.812
	Min. Vert	1	23.131	0.000	0.000
	Min. H_x	6	23.131	-31.102	-0.082
	Min. H_z	10	23.131	-0.082	-31.007
	Min. M_x	10	-2621.456	-0.082	-31.007
	Min. M_z	14	-2630.249	31.102	0.082
	Min. Torsion	11	-0.280	15.480	-26.812

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	23.131	0.000	0.000	-0.035	0.060	0.000
Dead+Wind 0 deg - No Ice	23.131	-0.082	-31.007	-2621.527	7.603	-0.243
Dead+Wind 30 deg - No Ice	23.131	15.480	-26.812	-2266.548	-1308.511	-0.280
Dead+Wind 45 deg - No Ice	23.131	21.935	-21.868	-1848.380	-1854.442	-0.270
Dead+Wind 60 deg - No Ice	23.131	26.894	-15.433	-1304.249	-2273.988	-0.242
Dead+Wind 90 deg - No Ice	23.131	31.102	0.082	7.507	-2630.127	-0.139
Dead+Wind 120 deg - No Ice	23.131	26.976	15.575	1317.233	-2281.514	0.000
Dead+Wind 135 deg - No Ice	23.131	22.050	21.983	1858.960	-1865.093	0.072

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 150 deg - No Ice	23.131	15.622	26.894	2274.003	-1321.565	0.139
Dead+Wind 180 deg - No Ice	23.131	0.082	31.007	2621.456	-7.481	0.242
Dead+Wind 210 deg - No Ice	23.131	-15.480	26.812	2266.478	1308.633	0.280
Dead+Wind 225 deg - No Ice	23.131	-21.935	21.868	1848.310	1854.564	0.271
Dead+Wind 240 deg - No Ice	23.131	-26.894	15.433	1304.179	2274.110	0.243
Dead+Wind 270 deg - No Ice	23.131	-31.102	-0.082	-7.577	2630.249	0.141
Dead+Wind 300 deg - No Ice	23.131	-26.976	-15.575	-1317.303	2281.637	0.000
Dead+Wind 315 deg - No Ice	23.131	-22.050	-21.983	-1859.031	1865.215	-0.073
Dead+Wind 330 deg - No Ice	23.131	-15.622	-26.894	-2274.074	1321.686	-0.141
Dead+Ice+Temp	28.522	0.000	0.000	-0.064	0.111	0.000
Dead+Wind 0 deg+Ice+Temp	28.522	-0.063	-25.557	-2200.706	5.957	-0.201
Dead+Wind 30 deg+Ice+Temp	28.522	12.760	-22.102	-1902.958	-1098.520	-0.231
Dead+Wind 45 deg+Ice+Temp	28.522	18.078	-18.027	-1552.024	-1556.613	-0.223
Dead+Wind 60 deg+Ice+Temp	28.522	22.165	-12.724	-1095.327	-1908.616	-0.199
Dead+Wind 90 deg+Ice+Temp	28.522	25.630	0.063	5.776	-2207.264	-0.115
Dead+Wind 120 deg+Ice+Temp	28.522	22.228	12.833	1105.308	-1914.449	0.000
Dead+Wind 135 deg+Ice+Temp	28.522	18.168	18.116	1560.145	-1564.867	0.059
Dead+Wind 150 deg+Ice+Temp	28.522	12.869	22.165	1908.659	-1108.634	0.115
Dead+Wind 180 deg+Ice+Temp	28.522	0.063	25.557	2200.573	-5.727	0.199
Dead+Wind 210 deg+Ice+Temp	28.522	-12.760	22.102	1902.826	1098.750	0.231
Dead+Wind 225 deg+Ice+Temp	28.522	-18.078	18.027	1551.892	1556.843	0.223
Dead+Wind 240 deg+Ice+Temp	28.522	-22.165	12.724	1095.194	1908.846	0.201
Dead+Wind 270 deg+Ice+Temp	28.522	-25.630	-0.063	-5.908	2207.494	0.116
Dead+Wind 300 deg+Ice+Temp	28.522	-22.228	-12.833	-1105.441	1914.680	0.000
Dead+Wind 315 deg+Ice+Temp	28.522	-18.168	-18.116	-1560.278	1565.097	-0.060
Dead+Wind 330 deg+Ice+Temp	28.522	-12.869	-22.165	-1908.792	1108.864	-0.116
Dead+Wind 0 deg - Service	23.131	-0.020	-7.752	-655.869	1.948	-0.061
Dead+Wind 30 deg - Service	23.131	3.870	-6.703	-567.061	-327.311	-0.070
Dead+Wind 45 deg - Service	23.131	5.484	-5.467	-462.446	-463.889	-0.068
Dead+Wind 60 deg - Service	23.131	6.724	-3.858	-326.318	-568.850	-0.061
Dead+Wind 90 deg - Service	23.131	7.775	0.020	1.851	-657.950	-0.035
Dead+Wind 120 deg - Service	23.131	6.744	3.894	329.515	-570.737	0.000
Dead+Wind 135 deg - Service	23.131	5.513	5.496	465.043	-466.557	0.018
Dead+Wind 150 deg - Service	23.131	3.905	6.724	568.876	-330.578	0.035
Dead+Wind 180 deg - Service	23.131	0.020	7.752	655.798	-1.825	0.061
Dead+Wind 210 deg - Service	23.131	-3.870	6.703	566.990	327.434	0.070
Dead+Wind 225 deg - Service	23.131	-5.484	5.467	462.375	464.012	0.068
Dead+Wind 240 deg - Service	23.131	-6.724	3.858	326.247	568.973	0.061
Dead+Wind 270 deg - Service	23.131	-7.775	-0.020	-1.922	658.073	0.035
Dead+Wind 300 deg - Service	23.131	-6.744	-3.894	-329.586	570.860	0.000
Dead+Wind 315 deg - Service	23.131	-5.513	-5.496	-465.114	466.680	-0.018
Dead+Wind 330 deg - Service	23.131	-3.905	-6.724	-568.947	330.701	-0.035

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	-23.131	0.000	0.000	23.131	0.000	0.000%
2	-0.082	-23.131	-31.007	0.082	23.131	31.007	0.000%
3	15.480	-23.131	-26.812	-15.480	23.131	26.812	0.000%
4	21.935	-23.131	-21.868	-21.935	23.131	21.868	0.000%
5	26.894	-23.131	-15.433	-26.894	23.131	15.433	0.000%
6	31.102	-23.131	0.082	-31.102	23.131	-0.082	0.000%
7	26.976	-23.131	15.575	-26.976	23.131	-15.575	0.000%
8	22.050	-23.131	21.983	-22.050	23.131	-21.983	0.000%
9	15.622	-23.131	26.894	-15.622	23.131	-26.894	0.000%
10	0.082	-23.131	31.007	-0.082	23.131	-31.007	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
11	-15.480	-23.131	26.812	15.480	23.131	-26.812	0.000%
12	-21.935	-23.131	21.868	21.935	23.131	-21.868	0.000%
13	-26.894	-23.131	15.433	26.894	23.131	-15.433	0.000%
14	-31.102	-23.131	-0.082	31.102	23.131	0.082	0.000%
15	-26.976	-23.131	-15.575	26.976	23.131	15.575	0.000%
16	-22.050	-23.131	-21.983	22.050	23.131	21.983	0.000%
17	-15.622	-23.131	-26.894	15.622	23.131	26.894	0.000%
18	0.000	-28.522	0.000	0.000	28.522	0.000	0.000%
19	-0.063	-28.522	-25.557	0.063	28.522	25.557	0.000%
20	12.760	-28.522	-22.102	-12.760	28.522	22.102	0.000%
21	18.078	-28.522	-18.027	-18.078	28.522	18.027	0.000%
22	22.165	-28.522	-12.724	-22.165	28.522	12.724	0.000%
23	25.630	-28.522	0.063	-25.630	28.522	-0.063	0.000%
24	22.228	-28.522	12.833	-22.228	28.522	-12.833	0.000%
25	18.168	-28.522	18.116	-18.168	28.522	-18.116	0.000%
26	12.869	-28.522	22.165	-12.869	28.522	-22.165	0.000%
27	0.063	-28.522	25.557	-0.063	28.522	-25.557	0.000%
28	-12.760	-28.522	22.102	12.760	28.522	-22.102	0.000%
29	-18.078	-28.522	18.027	18.078	28.522	-18.027	0.000%
30	-22.165	-28.522	12.724	22.165	28.522	-12.724	0.000%
31	-25.630	-28.522	-0.063	25.630	28.522	0.063	0.000%
32	-22.228	-28.522	-12.833	22.228	28.522	12.833	0.000%
33	-18.168	-28.522	-18.116	18.168	28.522	18.116	0.000%
34	-12.869	-28.522	-22.165	12.869	28.522	22.165	0.000%
35	-0.020	-23.131	-7.752	0.020	23.131	7.752	0.000%
36	3.870	-23.131	-6.703	-3.870	23.131	6.703	0.000%
37	5.484	-23.131	-5.467	-5.484	23.131	5.467	0.000%
38	6.724	-23.131	-3.858	-6.724	23.131	3.858	0.000%
39	7.775	-23.131	0.020	-7.775	23.131	-0.020	0.000%
40	6.744	-23.131	3.894	-6.744	23.131	-3.894	0.000%
41	5.513	-23.131	5.496	-5.513	23.131	-5.496	0.000%
42	3.905	-23.131	6.724	-3.905	23.131	-6.724	0.000%
43	0.020	-23.131	7.752	-0.020	23.131	-7.752	0.000%
44	-3.870	-23.131	6.703	3.870	23.131	-6.703	0.000%
45	-5.484	-23.131	5.467	5.484	23.131	-5.467	0.000%
46	-6.724	-23.131	3.858	6.724	23.131	-3.858	0.000%
47	-7.775	-23.131	-0.020	7.775	23.131	0.020	0.000%
48	-6.744	-23.131	-3.894	6.744	23.131	3.894	0.000%
49	-5.513	-23.131	-5.496	5.513	23.131	5.496	0.000%
50	-3.905	-23.131	-6.724	3.905	23.131	6.724	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	0.00004215
3	Yes	5	0.00000001	0.00002914
4	Yes	5	0.00000001	0.00003194
5	Yes	5	0.00000001	0.00002966
6	Yes	4	0.00000001	0.00001640
7	Yes	5	0.00000001	0.00002964
8	Yes	5	0.00000001	0.00003211
9	Yes	5	0.00000001	0.00002952
10	Yes	4	0.00000001	0.00002028
11	Yes	5	0.00000001	0.00002971

12	Yes	5	0.00000001	0.00003193
13	Yes	5	0.00000001	0.00002917
14	Yes	4	0.00000001	0.00003253
15	Yes	5	0.00000001	0.00002965
16	Yes	5	0.00000001	0.00003211
17	Yes	5	0.00000001	0.00002981
18	Yes	4	0.00000001	0.00000001
19	Yes	5	0.00000001	0.00002448
20	Yes	5	0.00000001	0.00007375
21	Yes	5	0.00000001	0.00008314
22	Yes	5	0.00000001	0.00007440
23	Yes	5	0.00000001	0.00002446
24	Yes	5	0.00000001	0.00007466
25	Yes	5	0.00000001	0.00008366
26	Yes	5	0.00000001	0.00007452
27	Yes	5	0.00000001	0.00002446
28	Yes	5	0.00000001	0.00007450
29	Yes	5	0.00000001	0.00008315
30	Yes	5	0.00000001	0.00007376
31	Yes	5	0.00000001	0.00002447
32	Yes	5	0.00000001	0.00007470
33	Yes	5	0.00000001	0.00008370
34	Yes	5	0.00000001	0.00007493
35	Yes	4	0.00000001	0.00000971
36	Yes	4	0.00000001	0.00007596
37	Yes	4	0.00000001	0.00008967
38	Yes	4	0.00000001	0.00007947
39	Yes	4	0.00000001	0.00000900
40	Yes	4	0.00000001	0.00007894
41	Yes	4	0.00000001	0.00009079
42	Yes	4	0.00000001	0.00007798
43	Yes	4	0.00000001	0.00000936
44	Yes	4	0.00000001	0.00007969
45	Yes	4	0.00000001	0.00008969
46	Yes	4	0.00000001	0.00007627
47	Yes	4	0.00000001	0.00000921
48	Yes	4	0.00000001	0.00007905
49	Yes	4	0.00000001	0.00009091
50	Yes	4	0.00000001	0.00007993

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	109 - 81	12.266	48	1.041	0.001
L2	81 - 48	6.633	48	0.807	0.000
L3	53 - 0	2.787	48	0.495	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
109.000	(2) OPA-65R-LCUU-H8	48	12.266	1.041	0.001	24444
107.000	(2) DC6-48-60-18-8F Surge	48	11.838	1.026	0.001	24444

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
	Arrestor					
99.000	(2) AIR21	48	10.142	0.965	0.000	12222
98.000	Valmont T-Arm (3)	48	9.934	0.957	0.000	11111
91.000	DB-T1-6Z-8AB-0Z	48	8.509	0.899	0.000	6790
89.000	BXA-70063/6CF	48	8.117	0.882	0.000	6111

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	109 - 81	48.956	15	4.158	0.002
L2	81 - 48	26.491	15	3.224	0.001
L3	53 - 0	11.134	15	1.976	0.000

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
109.000	(2) OPA-65R-LCUU-H8	15	48.956	4.158	0.002	6186
107.000	(2) DC6-48-60-18-8F Surge Arrestor	15	47.249	4.098	0.002	6186
99.000	(2) AIR21	15	40.487	3.853	0.002	3092
98.000	Valmont T-Arm (3)	15	39.656	3.821	0.002	2811
91.000	DB-T1-6Z-8AB-0Z	15	33.975	3.592	0.001	1717
89.000	BXA-70063/6CF	15	32.410	3.523	0.001	1545

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	109 - 81 (1)	TP30.09x22.25x0.188	28.000	0.000	0.0	37.947	17.796	-7.250	675.292	0.011
L2	81 - 48 (2)	TP39.58x30.09x0.313	33.000	0.000	0.0	39.000	37.522	-11.269	1463.370	0.008
L3	48 - 0 (3)	TP52.4x37.517x0.375	53.000	0.000	0.0	39.000	61.923	-23.106	2414.990	0.010

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	109 - 81 (1)	TP30.09x22.25x0.188	441.053	40.243	37.947	1.061	0.000	0.000	37.947	0.000
L2	81 - 48 (2)	TP39.58x30.09x0.313	1126.508	38.609	39.000	0.990	0.000	0.000	39.000	0.000
L3	48 - 0 (3)	TP52.4x37.517x0.375	2634.608	39.745	39.000	1.019	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	109 - 81 (1)	TP30.09x22.25x0.188	23.164	1.302	26.000	0.100	0.000	0.000	26.000	0.000
L2	81 - 48 (2)	TP39.58x30.09x0.313	25.845	0.689	26.000	0.053	0.000	0.000	26.000	0.000
L3	48 - 0 (3)	TP52.4x37.517x0.375	31.167	0.503	26.000	0.039	0.000	0.000	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	109 - 81 (1)	0.011	1.061	0.000	0.100	0.000	1.074 ✔	1.333	H1-3+VT ✔
L2	81 - 48 (2)	0.008	0.990	0.000	0.053	0.000	0.998 ✔	1.333	H1-3+VT ✔
L3	48 - 0 (3)	0.010	1.019	0.000	0.039	0.000	1.029 ✔	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	109 - 81	Pole	TP30.09x22.25x0.188	1	-7.250	900.164	80.6	Pass
L2	81 - 48	Pole	TP39.58x30.09x0.313	2	-11.269	1950.672	74.9	Pass
L3	48 - 0	Pole	TP52.4x37.517x0.375	3	-23.106	3219.182	77.2	Pass
							Summary	
						Pole (L1)	80.6	Pass
						RATING =	**80.6**	**Pass**

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Subject:	Flange Bolts and Flangeplate Analysis
Location:	110-ft Sabre Monopole Old Lyme, CT
Rev. 4: 1/28/15	Prepared by: T.J.L. Checked by: C.F.C. Job No. 13195.000

Flange Bolt and Flange Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	OM := 441·ft·kips	(Input From tnxTower)
Shear Force =	Shear := 23.2·kips	(Input From tnxTower)
Axial Force =	Axial := 11.9·kips	(Input From tnxTower)

Flange Bolt Data:

Use ASTM A490

Number of Flange Bolts =	N := 12	(User Input)
Diameter of Bolt Circle =	D_{bc} := 33.625·in	(User Input)
Bolt Ultimate Strength =	F_u := 150·ksi	(User Input)
Bolt Yield Strength =	F_y := 130·ksi	(User Input)
Bolt Modulus =	E := 29000·ksi	(User Input)
Diameter of Flange Bolts =	D := 1.00·in	(User Input)
Threads per Inch =	n := 8	(User Input)

Flange Plate Data:

Use ASTM A572 Mod 60

Plate Yield Strength =	Fy_{bp} := 60·ksi	(User Input)
Flange Plate Thickness =	t_{bp} := 1.25·in	(User Input)
Flange Plate Diameter =	D_{bp} := 37.875·in	(User Input)
Outer Pole Diameter =	D_{pole} := 30.09·in	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

Radius of Bolt Circle =: $R_{bc} := \frac{D_{bc}}{2} = 16.813 \cdot in$

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

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

$d_1 = 8.41 \cdot in$ $d_7 = -8.41 \cdot in$

$d_2 = 14.56 \cdot in$ $d_8 = -14.56 \cdot in$

$d_3 = 16.81 \cdot in$ $d_9 = -16.81 \cdot in$

$d_4 = 14.56 \cdot in$ $d_{10} = -14.56 \cdot in$

$d_5 = 8.41 \cdot in$ $d_{11} = -8.41 \cdot in$

$d_6 = 0.00 \cdot in$ $d_{12} = -0.00 \cdot in$

Critical Distances For Bending in Plate:

Outer Pole Radius = $R_{pole} := \frac{D_{pole}}{2} = 15.045 \cdot in$

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

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

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

$MA_3 = 1.77 \cdot in$ $MA_9 = 0.00 \cdot in$

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

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

$MA_6 = 0.00 \cdot in$ $MA_{12} = 0.00 \cdot in$

Effective Width of Flangeplate for Bending = $B_{eff} := .8 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2} = 18.4 \cdot in$

Flange Bolt Analysis:

Calculated Flange Bolt Properties:

Polar Moment of Inertia = $I_p := \sum_i \left(d_i\right)^2 = 1.696 \times 10^3 \cdot in^2$

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 0.785 \cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 = 0.606 \cdot in^2$

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 0.878 \cdot in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.22 \cdot in$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^3}{32} = 0.066 \cdot in^3$

Check Flange Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{R_{bc}}{I_p} - \frac{Axial}{N} = 51.5 \cdot kips$

Allowable Tensile Force = $T_{ALL.Gross} := 1.333 \cdot \left(0.375 \cdot A_g \cdot F_u\right) = 58.9 \cdot kips$ (1.333 increase allowed per TIA/EIA)

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Gross}} = 87 \cdot \%$

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

Condition1 = "OK"

Flange Plate Analysis:

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

$C_1 = 27.2 \cdot kips$ $C_7 = -25.2 \cdot kips$

$C_2 = 46.4 \cdot kips$ $C_8 = -44.4 \cdot kips$

$C_3 = 53.5 \cdot kips$ $C_9 = -51.5 \cdot kips$

$C_4 = 46.4 \cdot kips$ $C_{10} = -44.4 \cdot kips$

$C_5 = 27.2 \cdot kips$ $C_{11} = -25.2 \cdot kips$

$C_6 = 1.0 \cdot kips$ $C_{12} = 1.0 \cdot kips$

Maximum Bending Stress in Plate =

$$f_{bp} := \sum_i \frac{6 \cdot C_i \cdot MA_i}{\left(B_{eff} \, t_{bp}^{\,2}\right)} = 19.7 \cdot ksi$$

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

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} = 32.9 \cdot \%$

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

Condition2 = "Ok"

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Subject:		Anchor Bolt and Baseplate Analysis
Location:		110-ft Sabre Monopole Old Lyme, CT
Rev. 4: 1/28/15		Prepared by: T.J.L. Checked by: C.F.C. Job No. 13195.000

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	OM := 2635·ft·kips	(Input From tnxTower)
Shear Force =	Shear := 31·kips	(Input From tnxTower)
Axial Force =	Axial := 23·kips	(Input From tnxTower)

Anchor Bolt Data:

Use ASTM A615 Grade 75

Number of Anchor Bolts =	N := 24	(User Input)
Diameter of Bolt Circle =	D_{bc} := 58.75·in	(User Input)
Bolt "Column" Distance =	l := 3.0·in	(User Input)
Bolt Ultimate Strenght =	F_u := 100·ksi	(User Input)
Bolt Yeild Strenght =	F_y := 75·ksi	(User Input)
Bolt Modulus =	E := 29000·ksi	(User Input)
Diameter of Anchor Bolts =	D := 2.25·in	(User Input)
Threads per Inch =	n := 4.5	(User Input)

Base Plate Data:

Use ASTM A572 Mod 50

Plate Yield Strength =	Fy_{bp} := 50·ksi	(User Input)
Base Plate Thickness =	t_{bp} := 2.75·in	(User Input)
Base Plate Diameter =	D_{bp} := 62.75·in	(User Input)
Outer Pole Diameter =	D_{pole} := 52.4·in	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

$d_1 := 29.25in$ (User Input)

$d_2 := 28in$ (User Input)

$d_3 := 25.625in$ (User Input)

$d_4 := 14.375in$ (User Input)

$d_5 := 8.875in$ (User Input)

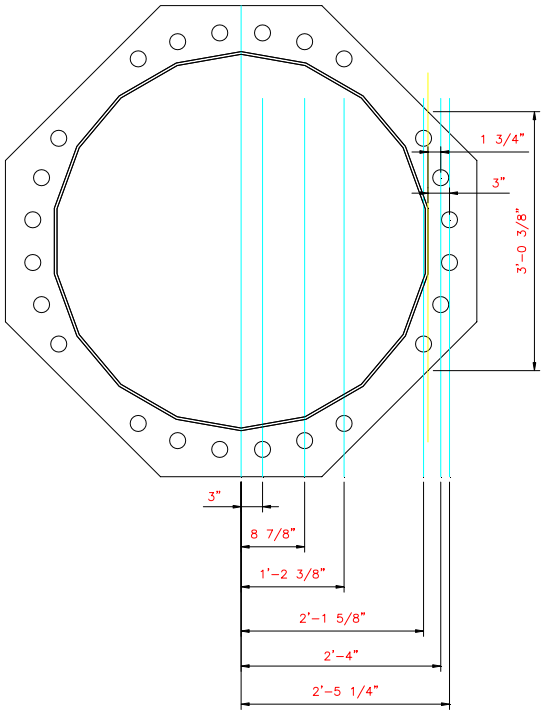
$d_6 := 3in$ (User Input)

Critical Distances For Bending in Plate:

$ma_1 := 3in$ (User Input)

$ma_2 := 1.75in$ (User Input)

Effective Width of Baseplate for Bending = $B_{eff} := 0.8 \cdot 36.375in$ (User Input)



ANCHOR BOLT AND PLATE GEOMETRY

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Polar Moment of Inertia = $I_p := \left[(d_1)^2 \cdot 4 + (d_2)^2 \cdot 4 + (d_3)^2 \cdot 4 + (d_4)^2 \cdot 4 + (d_5)^2 \cdot 4 + (d_6)^2 \cdot 4 \right] = 10362 \cdot in^2$

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

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

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

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

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

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{d_1}{I_p} - \frac{Axial}{N} = 88.3 \cdot kips$

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 = $\frac{T_{Max}}{T_{ALL.Net}} = 45.3 \cdot \%$ 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 = $M_x := \left(\frac{Shear}{N} \right) \cdot l = 0.323 \cdot ft \cdot kips$

Maximum Bending Stress = $f_{bx} := \frac{M_x}{S_x} = 4.7 \cdot ksi$

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 =

$$C_{Max} := OM \cdot \frac{d_1}{l_p} + \frac{Axial}{N} = 90.2 \cdot kips$$

Maximum Compressive Stress =

$$f_a := \frac{C_{Max}}{A_n} = 27.8 \cdot ksi$$

$$K := 0.65$$

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

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

Allowable Compressive Stress =

$$F_a := 1.333 \cdot F_a = 60 \cdot ksi$$ (1.333 increase allowed per TIA/EIA)

Combined Stress % of Capacity =

$$\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}}\right) = 46.3 \cdot \%$$

Condition 2 =

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

Condition2 = "OK"

Base Plate Analysis:

Force from Bolts = $C_1 := OM \cdot \frac{d_1}{I_p} + \frac{Axial}{N} = 90.2 \cdot kips$

$C_2 := OM \cdot \frac{d_2}{I_p} + \frac{Axial}{N} = 86.4 \cdot kips$

Maximum Bending Stress in Plate = $f_{bp} := \frac{6 \cdot \left(2 \cdot C_1 \cdot ma_1 + 2 \cdot C_2 \cdot ma_2\right)}{\left(B_{eff} \cdot t_{bp}^{\ 2}\right)} = 23 \cdot ksi$

Allowable Bending Stress in Plate = $F_{bp} := 1.33 \cdot 0.75 \cdot Fy_{bp} = 49.9 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} = 46.1 \cdot \%$

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

Condition3 = "Ok"

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Subject: FOUNDATION ANALYSIS

Location: 110-ft Sabre Monopole
Old Lyme, CT

Rev. 4: 1/28/15

Prepared by: T.J.L. Checked by: C.F.C.
Job No. 13195.000

Rock Anchor Design:

Input Data:

Max Pier Reactions:

Moment =	Moment := 2635·ft·kips	*user input*	
Shear =	Shear := 31·kips	*user input*	
Compression =	Axial := 23·kips	*user input*	

Structure:

Footing Width =	$W_{ftg} := 19ft$	*user input*	
Footing Length =	$L_{ftg} := 19ft$	*user input*	
Footing Thickness =	$T_{ftg} := 3.5ft$	*user input*	
Pier Length=	$L_{pier} := 7.0ft$	*user input*	
Pier Depth =	$T_{pier} := 1.0ft$	*user input*	
Pier Projection Above Grade =	$P_p := 1.0 \cdot ft$	*user input*	

Depths:

Depth to Bottom of Footing =	$D_{ftg} := 3.5ft$	*user input*	(from grade line)
Depth to Sound (Competent) Rock Per Geo-tech Report =	$D_{rock} := 3.5ft$	*user input*	(from grade line)
Depth to Suitable Earth =	$D_{earth} := 0ft$	*user input*	(from grade line)
Anchor Depth =	$D_{anchor} := 29.5ft$	*user input*	(from grade line)

Subgrade Properties:

Internal Friction Angle =	$\phi := 45deg$	*user input*
Unit Weight of Earth =	$\gamma_{earth} := 125\frac{lb}{ft^3}$	*user input*
Unit Weight of Rock =	$\gamma_{rock} := 165\frac{lb}{ft^3}$	*user input*
Unit Weight of Conc =	$\gamma_{conc} := 150\frac{lb}{ft^3}$	*user input*
Allowable Bearing =	$q_s := 8000 \cdot psf$	*user input*

Rock Anchor Properties:

Number of Anchors (along width) =	$N_{anchor} := 2$	*user input*
Hole Diameter =	$hole_d := 5in$	*user input*
Ultimate Bond Stress Between Rock and Grout =	$\sigma_{bond} := 200 \cdot psi$	*user input*
Allowable Bond Stress Between Rock and Grout =	$\sigma_{allbond} := \sigma_{bond} \cdot 0.5 = 100psi$	*user input*
Grout Allowable Compressive Stress =	$fc_g := 5000 \cdot psi$	*user input*
Anchor Spacing* (along length) =	$S_{anchor} := 14ft$	*user input*
Required Factor of Safety =	$F_S := 2.0$	*user input*
Rock Anchor Ultimate Strength =	$Fu_{anchor} := 150.0ksi$	*user input*
Rock Anchor Yield Strength =	$Fy_{anchor} := 127.7ksi$	*user input*
Rock Anchor Diameter =	$d_{ra} := 2.5in$	*user input*
Rock Anchor Area per Group =	$A_g := 5.19in^2$	*user input*
Rock Anchor Ultimate Tensile Strength =	$P_u := 778kips$	*user input*
Rock Anchor Allowable Tension =	$P_{all} := 0.60 \cdot P_u = 466.8 \cdot kips$	
Rock Anchor Maximum Working Load to Yield =	$T_y := 0.80 \cdot P_u = 622.4 \cdot kips$	
Rock Anchor Shear Capacity =	$Sh := 0.4 \cdot T_y = 248.96 \cdot kips$	
Number of Rock Anchors =	$n_{anchor} := 4$	*user input*

Rock Anchor Tension/Shear Check:

Overturning Moment =	$OM := Moment + Shear \cdot (T_{ftg} + T_{pier}) = 2774.5 \cdot ft \cdot kips$
Weight of Pad =	$W_{pad} := (W_{ftg} \cdot L_{ftg} \cdot T_{ftg}) \cdot \gamma_{conc} = 189.52 \cdot kips$
Weight of Pier =	$W_{pier} := (L_{pier}^2 \cdot T_{pier}) \cdot \gamma_{conc} = 7.4 \cdot kips$
Weight of Soil =	$W_{soil} := [[(W_{ftg} \cdot L_{ftg}) - L_{pier}^2] \cdot D_{earth}] \cdot \gamma_{earth} = 0 \cdot kips$
Total Weight =	$W_{conc} := W_{pad} + W_{pier} = 196.88 \cdot kips$
Total Weight of Foundation =	$W_{tot} := W_{conc} + W_{soil} + Axial = 219.88 \cdot kips$
Resisting Moment =	$M_r := W_{tot} \cdot \left(\frac{W_{ftg}}{2}\right) = 2088.81 ft \cdot kips$
Net Moment Required =	$M_{net} := OM - M_r = 685.69 ft \cdot kips$

Check Perpendicular:

Rock Anchor Distance 1 = $d_1 := 7 \cdot ft$ *user input*

Number of Rock Anchors in Group 1 = $n_1 := 4$ *user input*

Polar Moment of Inertia = $I_{p1} := d_1^2 \cdot n_1 = 196 ft^2$

Tension Force per Anchor Perp = $P_{perp} := \frac{d_1}{I_{p1}} \cdot (M_{net}) = 24.5 \cdot kips$

Check @ 45 Degree Angle:

Rock Anchor Distance 2 = $d_2 := 9.9 \cdot ft$ *user input*

Number of Rock Anchors in Group = $n_2 := 2$ *user input*

Polar Moment of Inertia = $I_{p2} := d_2^2 \cdot n_2 = 196.02 ft^2$

Tension Force per Anchor Diag = $P_{diag} := \frac{d_2}{I_{p2}} \cdot (M_{net}) = 34.6 \cdot kips$

Tension Force per Anchor = $P_{anchor} := \begin{cases} P_{perp} & \text{if } P_{perp} \geq P_{diag} \\ P_{diag} & \text{otherwise} \end{cases} = 34.6 \cdot kips$

Anchor Lock off Load = $Lock_{anchor} := 50 \cdot kips$

Provided Safety Factor = $\frac{P_{anchor}}{Lock_{anchor}} = 0.69$

$Rock\_Anchor := if\left(\frac{P_{anchor}}{Lock_{anchor}} \leq 1.0, "OK", "Overstressed"\right)$

Rock_Anchor = "OK"

Rock Anchor Req'd Development Length in Rock:

Minimum Free Stress Length Provided = $F_{stressprov} := 13ft$ *user input*

Rock Anchor/Grout Bond Length = $L_{bprov} := D_{anchor} - F_{stressprov} = 16.5ft$

Rock/Grout Bond Length Required = $L_{breq} := \frac{Lock_{anchor}}{\pi \cdot hole_d \cdot \sigma_{allbond}} = 2.65ft$

$Bond\_Length\_Check := if\left(\frac{L_{breq}}{L_{bprov}} \le 1.00, "OK", "Increase Length"\right)$

$\frac{L_{breq}}{L_{bprov}} = 0.16$

Bond_Length_Check = "OK"

Resistance Calculations:

Intermediate Dimension:

Total Anchor Width = $W := S_{anchor} = 14ft$

Volumes:

Base Area 1 of Resisting Pyramid = $B_1 := W^2 = 196ft^2$

Base Area 2 of Resisting Pyramid = $B_2 := \left[\tan(\phi) \cdot \left[\left(D_{anchor}\right) \cdot 0.55 - \left(T_{ftg} + T_{pier}\right)\right] \cdot 2 + W\right]^2 = 1402.5ft^2$

Base Area 3 of Resisting Pyramid = $B_3 := \left[\tan(\phi) \cdot \left[\left(D_{anchor}\right) \cdot 0.55 - P_p\right] \cdot 2 + W\right]^2 = 1975.8ft^2$

Volume of Rock = $V_{rock} := \frac{\left[\left[\left(D_{anchor}\right) \cdot 0.55 - \left(T_{ftg} + T_{pier}\right)\right] \cdot \left(B_1 + B_2 + \sqrt{B_1 \cdot B_2}\right)\right]}{3} = 8296.6 \cdot ft^3$

Volume of Concrete = $V_{conc} := \left(W_{ftg} \cdot L_{ftg} \cdot T_{ftg}\right) + \left(L_{pier}^2 \cdot T_{pier}\right) = 1312.5 \cdot ft^3$

$V_{top} := \frac{\left[\left(T_{ftg} + T_{pier} - P_p\right) \cdot \left(B_2 + B_3 + \sqrt{B_2 \cdot B_3}\right)\right]}{3} = 5883.5 \cdot ft^3$

Volume of Earth = $V_{earth} := V_{top} - V_{conc} = 4571 \cdot ft^3$

Resisting Forces:

Resisting Rock Force = $W_{rock} := V_{rock} \cdot \gamma_{rock} = 1368.9 \cdot kips$

Resisting Earth Force = $W_{earth} := V_{earth} \cdot \gamma_{earth} = 571.4 \cdot kips$

Resisting Concrete Force = $W_{conc} = 196.9 \cdot kips$

Total Resisting Force = $W_{total} := W_{rock} + W_{earth} + W_{conc} + Axial = 2160.2 \cdot kips$

Foundation Uplift Check:

Check Perpendicular to Foundation =

Uplift Force = $Uplift_{perp} := \frac{OM}{\left(\frac{W_{ftg}}{2}\right)} = 292.1 \cdot kips$

Factor of Safety = $\frac{W_{total}}{Uplift_{perp}} = 7.40$

$Uplift\_Perp\_Check := if\left(\frac{W_{total}}{Uplift_{perp}} \geq 2.0, "OK", "Overstressed"\right)$

Uplift_Perp_Check = "OK"

Check @ 45 Degree Angle to Foundation =

Uplift Force = $Uplift_{Diag} := \frac{OM}{\frac{\left(\sqrt{2} \cdot L_{ftg}\right)}{2}} = 206.5 \cdot kips$

Factor of Safety = $\frac{W_{total}}{Uplift_{Diag}} = 10.46$

$Uplift\_Diag\_Check := if\left(\frac{W_{total}}{Uplift_{Diag}} \geq 2.0, "OK", "Overstressed"\right)$

Uplift_Diag_Check = "OK"

Rock Bearing Capacity Check:

Bearing Force = $MaxBearing := \left[\frac{\left(Axial + W_{conc}\right) + \left(n_{anchor} Lock_{anchor}\right)}{W_{ftg} \cdot L_{ftg}}\right] + \frac{OM}{\left(\frac{W_{ftg}^{3}}{6}\right)}$

$MaxBearing = 3.59 \cdot ksf$

$\frac{MaxBearing}{q_s} = 0.45$

$Rock\_Bearing\_Check := if\left(\frac{MaxBearing}{q_s} \leq 1.00, "OK", "Overstressed"\right)$

Rock_Bearing_Check = "OK"

Section 1 - RFDS GENERAL INFORMATION

RFDS NAME:	CT1273	DATE:	9/4/2014	RF DESIGN ENG:	Radu Alecsandru	RF PERF ENG:	
ISSUE:	Final	Approved? (Y/N)	Y	RF DESIGN PHONE:	ra9161@att.com	RF PERF PHONE:	
REVISION:	V04	RF MANAGER:	Cameron Syme	RF DESIGN EMAIL:	860-513-7598	RF PERF EMAIL:	
INITIATIVE / PROJECT:	NSB with 2C UMTS & 700 LTE.					TRIDENT:	
						GSM FREQUENCY:	
						UMTS FREQUENCY:	
						LTE FREQUENCY:	
						I-PLAN JOB NUMBER:	

Section 2 - LOCATION INFORMATION

USID:	105914	FA LOCATION CODE:	10133919	LOCATION NAME:	Old Lyme - Shore Rd	ORACLE PROJECT #:	2051001637
REGION:	NE	MARKET CLUSTER:	CT	MARKET:	NER	SEARCH RING NAME:	Old Lyme - Shore Rd
ADDRESS:.	232 Shore Rd	CITY:	Old Lyme	STATE:	CT	SEARCH RING ID:	s2286
ZIP CODE:		COUNTY:		MSA/RSA:		BTA:	
LATITUDE (D-M-S):	41°17'30.25"N	LONGITUDE (D-M-S):	72°17'13.43"W	LAT (DEC. DEG.):		LONG (DEC. DEG.):	
DIRECTIONS, ACCESS AND EQUIPMENT LOCATION:						BORDER CELL WITH CONTOUR COORD:	
						AM STUDY REQ'D (Y/N):	
						FREQ COORD:	

Section 3 - LICENSE COVERAGE/FILING INFORMATION

CGSA - NO FILING TRIGGERED:		CGSA LOSS:		PCS REDUCED - UPS ZIP:	
CGSA - MINOR FILING NEEDED:		CGSA EXT AGMT NEEDED:		PCS POPS REDUCED:	
CGSA - MAJOR FILING NEEDED:		CGSA SCORECARD UPDATED:			

Section 4 - TOWER/REGULATORY INFORMATION

STRUCTURE AT&T OWNED?:		GROUND ELEVATION:		STRUCTURE TYPE:		MARKET LOCATION 850 MHZ CALL SIGN(S):	
ADDTIONAL REGULATORY?:		HEIGHT OVERALL:		FCC ASR NUMBER:		MARKET LOCATION 1900 MHZ CALL SIGN(S):	
SUB-LEASE RIGHTS?:		STRUCTURE HEIGHT:				MARKET LOCATION 700 MHZ CALL SIGN(S):	
LIGHTING TYPE:						MARKET LOCATION AWS MHZ CALL SIGN(S):	

Section 5 - E-911 INFORMATION

	PSAP NAME:	PSAP ID:	E911 PHASE:	MPC SVC PROVIDER:	LMU REQUIRED:	ESRN:	DATE LIVE PH1:	DATE LIVE PH2:
ALPHA								
BETA								
GAMMA								
DELTA								
EPSILON								
PSI								

Section 6 - RBS GENERAL INFORMATION

4-DIGIT SITE ID:	1273	COW OR TOY?:	No	CELLULAR NETWORK:		DISASTER PRIORITY:	
CELL SITE TYPE:	Sectorized	SITE TYPE:		OPS DISTRICT:		OPS ZONE:	
BTS LOCATION ID:		ORIGINATING CO:		RF DISTRICT:		RF ZONE:	

Section 7 - RBS SPECIFIC INFORMATION

	GSM RBSs	UMTS 1ST CARRIER RBSs	UMTS 2ND CARRIER RBSs	UMTS 3RD CARRIER RBSs	UMTS 4TH CARRIER RBSs	LTE RBSs
MSC						
BSC/RNC						
LAC						
RAC						
EQUIPMENT VENDOR		Ericsson	Ericsson			Ericsson
EQUIPMENT TYPE		6601	6601			6601
LOCATION						
CABINET LOCATION						

Section 8 - RBS INDIVIDUAL INFORMATION

	GSM 850 RBS	GSM 1900 RBS	UMTS 850 RBS	UMTS 1900 RBS	UMTS 2ND 850 RBS	UMTS 2ND 1900 RBS	UMTS 3RD 850 RBS	UMTS 3RD 1900 RBS	UMTS 4TH 850 RBS	UMTS 4TH 1900 RBS	LTE 700 RBS	LTE AWS RBS
CELL ID/BCF			CTU1273	CTU1273								
CTS COMMON ID			CTU1273	CTU1273								

Section 9 - SOFT SECTOR ID

	GSM 850 RBS	GSM 1900 RBS	UMTS 850 RBS	UMTS 1900 RBS	UMTS 2ND 850 RBS	UMTS 2ND 1900 RBS	UMTS 3RD 850 RBS	UMTS 3RD 1900 RBS	UMTS 4TH 850 RBS	UMTS 4TH 1900 RBS	LTE 700 RBS	LTE AWS RBS
ALPHA (OR OMNI)			CTV12731	CTU12737								
BETA			CTV12732	CTU12738								
GAMMA			CTV12733	CTU12739								
DELTA												
EPSILON												
PSI												

Section 10 - CID/SAC

	GSM 850 RBS	GSM 1900 RBS	UMTS 850 RBS	UMTS 1900 RBS	UMTS 2ND 850 RBS	UMTS 2ND 1900 RBS	UMTS 3RD 850 RBS	UMTS 3RD 1900 RBS	UMTS 4TH 850 RBS	UMTS 4TH 1900 RBS	LTE 700 RBS	LTE AWS RBS
ALPHA (OR OMNI)			12731	12737								
BETA			12732	12738								
GAMMA			12733	12739								
DELTA												
EPSILON												
PSI												

Section 11 - CURRENT RADIO COUNTS (Existing)

	GSM 850 RBS	GSM 1900 RBS	UMTS 850 RBS	UMTS 1900 RBS	UMTS 2ND 850 RBS	UMTS 2ND 1900 RBS	UMTS 3RD 850 RBS	UMTS 3RD 1900 RBS	UMTS 4TH 850 RBS	UMTS 4TH 1900 RBS	LTE 700 RBS	LTE AWS RBS
ALPHA (OR OMNI)												
BETA												
GAMMA												
DELTA												
EPSILON												
PSI												

Section 12 - CURRENT T1 COUNTS (Existing)

	GSM 1st Cabinet	GSM 2nd Cabinet	UMTS 1st Cabinet	UMTS 2nd Cabinet	LTE 1st Cabinet	LTE 2nd Cabinet
# T1s						
LINK PROFILE						
FIBER or ETHERNET?						
Tx Board Model						
Tx Board QTY						
RAX/ECU Board Model						
RAX/ECU Board QTY						
BBU Board Model						
BBU Board QTY						
RRU - location						

Section 13 - NEW/PROPOSED RADIO COUNTS

	GSM 850 RBS	GSM 1900 RBS	UMTS 850 RBS	UMTS 1900 RBS	UMTS 2ND 850 RBS	UMTS 2ND 1900 RBS	UMTS 3RD 850 RBS	UMTS 3RD 1900 RBS	UMTS 4TH 850 RBS	UMTS 4TH 1900 RBS	LTE 700 RBS	LTE AWS RBS
ALPHA (OR OMNI)			1	1							1	
BETA			1	1							1	
GAMMA			1	1							1	
DELTA												
EPSILON												
PSI												

Section 14 - NEW/PROPOSED T1 COUNTS

	GSM 1st Cabinet	GSM 2nd Cabinet	UMTS 1st Cabinet	UMTS 2nd Cabinet	LTE 1st Cabinet	LTE 2nd Cabinet
# T1s						
LINK PROFILE						
FIBER or ETHERNET?						
Tx Board Model						
Tx Board QTY						
RAX/ECU Board Model						
RAX/ECU Board QTY						
BBU Board Model						
BBU Board QTY						
RRU - location						

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

ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	
TX/RX?										
TECHNOLOGY										
FEEDERS (# /TYPE/LENGTH)										
ANTENNA MAKE - MODEL										
ANTENNA VENDOR										
ANTENNA SIZE H"xW"xD"										
ANTENNA WEIGHT										
ANTENNA GAIN										
AZIMUTH										
RADIATION CENTER										
ANTENNA TIP HEIGHT										
MAGNETIC DECLINATION										
ELECTRICAL TILT (700/850/1900/AWS)										
MECHANICAL DOWNTILT										
SCPA/MCPA?										
MCPA MODULES										
HATCHPLATE POWER (Watts)										
ERP (Watts)										
NARROW BAND LLC (QTY/MODEL)										
HYBRID COMBINER (QTY/MODEL)										
TMA/LNA (TYPE/MODEL)										
CURRENT INJECTORS FOR TMA										
CURRENT INJCTR POWER CABLE										
ANTENNA SHARING KIT?										
BAS Filter										
DIPLEXER (QTY/MODEL)										
DUPLEXER (QTY/MODEL)										
SURGE ARRESTOR (QTY/MODEL)										
DC BLOCK (QTY/MODEL)										
RET EQUIPMENT (QTY/MODEL)										
1900 PDU FOR TMAS										

Section 15B - CURRENT SECTOR/CELL INFORMATION - BETA

ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	
TX/RX?										
TECHNOLOGY										
FEEDERS (# /TYPE/LENGTH)										
ANTENNA MAKE - MODEL										
ANTENNA VENDOR										
ANTENNA SIZE H"xW"xD"										
ANTENNA WEIGHT										
ANTENNA GAIN										
AZIMUTH										
RADIATION CENTER										
ANTENNA TIP HEIGHT										
MAGNETIC DECLINATION										
ELECTRICAL TILT (700/850/1900/AWS)										
MECHANICAL DOWNTILT										
SCPA/MCPA?										
MCPA MODULES										
HATCHPLATE POWER (Watts)										
ERP (Watts)										
NARROW BAND LLC (QTY/MODEL)										
HYBRID COMBINER (QTY/MODEL)										
TMA/LNA (TYPE/MODEL)										
CURRENT INJECTORS FOR TMA										
CURRENT INJCTR POWER CABLE										
ANTENNA SHARING KIT?										
BAS Filter										
DIPLEXER (QTY/MODEL)										
DUPLEXER (QTY/MODEL)										
SURGE ARRESTOR (QTY/MODEL)										
DC BLOCK (QTY/MODEL)										
RET EQUIPMENT (QTY/MODEL)										
1900 PDU FOR TMAS										

Section 15C - CURRENT SECTOR/CELL INFORMATION - GAMMA

ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	
TX/RX?										
TECHNOLOGY										
FEEDERS (# /TYPE/LENGTH)										
ANTENNA MAKE - MODEL										
ANTENNA VENDOR										
ANTENNA SIZE H"xW"xD"										
ANTENNA WEIGHT										
ANTENNA GAIN										
AZIMUTH										
RADIATION CENTER										
ANTENNA TIP HEIGHT										
MAGNETIC DECLINATION										
ELECTRICAL TILT (700/850/1900/AWS)										
MECHANICAL DOWNTILT										
SCPA/MCPA?										
MCPA MODULES										
HATCHPLATE POWER (Watts)										
ERP (Watts)										
NARROW BAND LLC (QTY/MODEL)										
HYBRID COMBINER (QTY/MODEL)										
TMA/LNA (TYPE/MODEL)										
CURRENT INJECTORS FOR TMA										
CURRENT INJCTR POWER CABLE										
ANTENNA SHARING KIT?										
BAS Filter										
DIPLEXER (QTY/MODEL)										
DUPLEXER (QTY/MODEL)										
SURGE ARRESTOR (QTY/MODEL)										
DC BLOCK (QTY/MODEL)										
RET EQUIPMENT (QTY/MODEL)										
1900 PDU FOR TMAS										

Section 15D - CURRENT SECTOR/CELL INFORMATION - DELTA										
ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	
TX/RX?										
TECHNOLOGY										
FEEDERS (# /TYPE/LENGTH)										
ANTENNA MAKE - MODEL										
ANTENNA VENDOR										
ANTENNA SIZE H"xW"xD"										
ANTENNA WEIGHT										
ANTENNA GAIN										
AZIMUTH										
RADIATION CENTER										
ANTENNA TIP HEIGHT										
MAGNETIC DECLINATION										
ELECTRICAL TILT (700/850/1900/AWS)										
MECHANICAL DOWNTILT										
SCPA/MCPA?										
MCPA MODULES										
HATCHPLATE POWER (Watts)										
ERP (Watts)										
NARROW BAND LLC (QTY/MODEL)										
HYBRID COMBINER (QTY/MODEL)										
TMA/LNA (TYPE/MODEL)										
CURRENT INJECTORS FOR TMA										
CURRENT INJCTR POWER CABLE										
ANTENNA SHARING KIT?										
BAS Filter										
DIPLEXER (QTY/MODEL)										
DUPLEXER (QTY/MODEL)										
SURGE ARRESTOR (QTY/MODEL)										
DC BLOCK (QTY/MODEL)										
RET EQUIPMENT (QTY/MODEL)										
1900 PDU FOR TMAS										

Section 15E - CURRENT SECTOR/CELL INFORMATION - EPSILON										
ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	
TX/RX?										
TECHNOLOGY										
FEEDERS (# /TYPE/LENGTH)										
ANTENNA MAKE - MODEL										
ANTENNA VENDOR										
ANTENNA SIZE H"xW"xD"										
ANTENNA WEIGHT										
ANTENNA GAIN										
AZIMUTH										
RADIATION CENTER										
ANTENNA TIP HEIGHT										
MAGNETIC DECLINATION										
ELECTRICAL TILT (700/850/1900/AWS)										
MECHANICAL DOWNTILT										
SCPA/MCPA?										
MCPA MODULES										
HATCHPLATE POWER (Watts)										
ERP (Watts)										
NARROW BAND LLC (QTY/MODEL)										
HYBRID COMBINER (QTY/MODEL)										
TMA/LNA (TYPE/MODEL)										
CURRENT INJECTORS FOR TMA										
CURRENT INJCTR POWER CABLE										
ANTENNA SHARING KIT?										
BAS Filter										
DIPLEXER (QTY/MODEL)										
DUPLEXER (QTY/MODEL)										
SURGE ARRESTOR (QTY/MODEL)										
DC BLOCK (QTY/MODEL)										
RET EQUIPMENT (QTY/MODEL)										
1900 PDU FOR TMAS										

Section 15F - CURRENT SECTOR/CELL INFORMATION - ZETA										
ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)		ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	
TX/RX?										
TECHNOLOGY										
FEEDERS (# /TYPE/LENGTH)										
ANTENNA MAKE - MODEL										
ANTENNA VENDOR										
ANTENNA SIZE H"xW"xD"										
ANTENNA WEIGHT										
ANTENNA GAIN										
AZIMUTH										
RADIATION CENTER										
ANTENNA TIP HEIGHT										
MAGNETIC DECLINATION										
ELECTRICAL TILT (700/850/1900/AWS)										
MECHANICAL DOWNTILT										
SCPA/MCPA?										
MCPA MODULES										
HATCHPLATE POWER (Watts)										
ERP (Watts)										
NARROW BAND LLC (QTY/MODEL)										
HYBRID COMBINER (QTY/MODEL)										
TMA/LNA (TYPE/MODEL)										
CURRENT INJECTORS FOR TMA										
CURRENT INJCTR POWER CABLE										
ANTENNA SHARING KIT?										
BAS Filter										
DIPLEXER (QTY/MODEL)										
DUPLEXER (QTY/MODEL)										
SURGE ARRESTOR (QTY/MODEL)										
DC BLOCK (QTY/MODEL)										
RET EQUIPMENT (QTY/MODEL)										
1900 PDU FOR TMAS										

Section 16A - NEW/PROPOSED SECTOR/CELL INFORMATION - ALPHA (OR OMNI)					
ANTENNA CONFIG (FROM BACK):	**ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)**	**ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)**	**ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)**	**ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)**	**ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)**
TX/RX?	TBD | TBD			TBD | TBD	
TECHNOLOGY	UMTS/LTE-DB			LTE-DB	
FEEDERS (# /TYPE/LENGTH)	2 Optic Fiber w 8 DC lines per site			2 Optic Fiber w 8 DC lines per site	
ANTENNA MAKE - MODEL	OPA-65R-LCUU-H8			OPA-65R-LCUU-H8	
ANTENNA VENDOR	CCI			CCI	
ANTENNA SIZE H"xW"xD"	93 x 15 x 7			93 x 15 x 7	
ANTENNA WEIGHT	95			95	
ANTENNA GAIN	16.3 dBi (high band)			16.3 dBi (high band)	
AZIMUTH	0 °			0 °	
RADIATION CENTER	110			110 '	
ANTENNA TIP HEIGHT	114 '			114 '	
MAGNETIC DECLINATION					
ELECTRICAL TILT (700/850/1900/AWS)	2 ° | 2 °			2 ° | 2 °	
MECHANICAL DOWNTILT	0 °			0 °	
SCPA/MCPA?					
MCPA MODULES					
HATCHPLATE POWER (Watts)					
ERP (Watts)					
NARROW BAND LLC (QTY/MODEL)					
HYBRID COMBINER (QTY/MODEL)					
RRH	850 RRUS11/1900 RRUS12/1900 RRUS-A2/700 RRUS-E2/WCS RRUS32			850 RRUS11/700 RRUS11/1900 RRUS12/1900 RRUS-A2	
CURRENT INJECTORS FOR TMA	n/a			n/a	
CURRENT INJCTR POWER CABLE	n/a			n/a	
ANTENNA SHARING KIT?	n/a			n/a	
BAS Filter	n/a			n/a	
DIPLEXER (QTY/MODEL)	n/a			n/a	
DUPLEXER (QTY/MODEL)	n/a			n/a	
SURGE ARRESTOR (QTY/MODEL)	SQUID x 4 per site			SQUID x 4 per site	
DC BLOCK (QTY/MODEL)	n/a			n/a	
RET EQUIPMENT (QTY/MODEL)	Home Run RET cable			n/a	
1900 PDU FOR TMAS	CCU - Kathrein 860 10006			n/a	

Section 16B - NEW/PROPOSED SECTOR/CELL INFORMATION - BETA					
ANTENNA CONFIG (FROM BACK):	**ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)**	**ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)**	**ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)**	**ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)**	**ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)**
TX/RX?	TBD | TBD			TBD | TBD	
TECHNOLOGY	UMTS/LTE-DB			LTE-DB	
FEEDERS (# /TYPE/LENGTH)	2 Optic Fiber w 8 DC lines per site			2 Optic Fiber w 8 DC lines per site	
ANTENNA MAKE - MODEL	OPA-65R-LCUU-H8			OPA-65R-LCUU-H8	
ANTENNA VENDOR	CCI			CCI	
ANTENNA SIZE H"xW"xD"	93 x 15 x 7			93 x 15 x 7	
ANTENNA WEIGHT	95			95	
ANTENNA GAIN	16.3 dBi (high band)			16.3 dBi (high band)	
AZIMUTH	120 °			120 °	
RADIATION CENTER	110 '			110 '	
ANTENNA TIP HEIGHT	114 '			114 '	
MAGNETIC DECLINATION					
ELECTRICAL TILT (700/850/1900/AWS)	2 ° | 2 °			2 ° | 2 °	
MECHANICAL DOWNTILT	0 °			0 °	
SCPA/MCPA?					
MCPA MODULES					
HATCHPLATE POWER (Watts)					
ERP (Watts)					
NARROW BAND LLC (QTY/MODEL)					
HYBRID COMBINER (QTY/MODEL)					
RRH	850 RRUS11/1900 RRUS12/1900 RRUS-A2/700 RRUS-E2/WCS RRUS32			850 RRUS11/700 RRUS11/1900 RRUS12/1900 RRUS-A2	
CURRENT INJECTORS FOR TMA	n/a			n/a	
CURRENT INJCTR POWER CABLE	n/a			n/a	
ANTENNA SHARING KIT?	n/a			n/a	
BAS Filter	n/a			n/a	
DIPLEXER (QTY/MODEL)	n/a			n/a	
DUPLEXER (QTY/MODEL)	n/a			n/a	
SURGE ARRESTOR (QTY/MODEL)	SQUID x 4 per site			SQUID x 4 per site	
DC BLOCK (QTY/MODEL)	n/a			n/a	
RET EQUIPMENT (QTY/MODEL)	Home Run RET cable			n/a	
1900 PDU FOR TMAS	CCU - Kathrein 860 10006			n/a	

Section 16C - NEW/PROPOSED SECTOR/CELL INFORMATION - GAMMA					
ANTENNA CONFIG (FROM BACK):	**ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)**	**ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)**	**ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)**	**ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)**	**ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)**
TX/RX?	TBD | TBD			TBD | TBD	
TECHNOLOGY	UMTS/LTE-DB			LTE-DB	
FEEDERS (# /TYPE/LENGTH)	2 Optic Fiber w 8 DC lines per site			2 Optic Fiber w 8 DC lines per site	
ANTENNA MAKE - MODEL	OPA-65R-LCUU-H8			OPA-65R-LCUU-H8	
ANTENNA VENDOR	CCI			CCI	
ANTENNA SIZE H"xW"xD"	93 x 15 x 7			93 x 15 x 7	
ANTENNA WEIGHT	95			95	
ANTENNA GAIN	16.3 dBi (high band)			16.3 dBi (high band)	
AZIMUTH	240 °			240 °	
RADIATION CENTER	110 '			110 '	
ANTENNA TIP HEIGHT	114 '			114 '	
MAGNETIC DECLINATION					
ELECTRICAL TILT (700/850/1900/AWS)	2 ° | 2 °			2 ° | 2 °	
MECHANICAL DOWNTILT	0 °			0 °	
SCPA/MCPA?					
MCPA MODULES					
HATCHPLATE POWER (Watts)					
ERP (Watts)					
NARROW BAND LLC (QTY/MODEL)					
HYBRID COMBINER (QTY/MODEL)					
RRH	850 RRUS11/1900 RRUS12/1900 RRUS-A2/700 RRUS-E2/WCS RRUS32			850 RRUS11/700 RRUS11/1900 RRUS12/1900 RRUS-A2	
CURRENT INJECTORS FOR TMA	n/a			n/a	
CURRENT INJCTR POWER CABLE	n/a			n/a	
ANTENNA SHARING KIT?	n/a			n/a	
BAS Filter	n/a			n/a	
DIPLEXER (QTY/MODEL)	n/a			n/a	
DUPLEXER (QTY/MODEL)	n/a			n/a	
SURGE ARRESTOR (QTY/MODEL)	SQUID x 4 per site			SQUID x 4 per site	
DC BLOCK (QTY/MODEL)	n/a			n/a	
RET EQUIPMENT (QTY/MODEL)	Home Run RET cable			n/a	
1900 PDU FOR TMAS	CCU - Kathrein 860 10006			n/a	

65° OctoPort Multi-Band Antenna

Model OPA-65R-LCUU-H8

Octoport Multi-Band Antenna Array

The CCI Octoport Multi-Band Antenna Array is an industry first 8-port antenna with full WCS Band Coverage. With four high band ports covering PCS, AWS and WCS bands, two 700 MHZ ports, and two 850 MHz ports our octoport antenna is ready for 4X4 high band MIMO.

Modern networks demand high performance, consequently CCI has incorporated several new and innovative design techniques to provide an antenna with excellent side-lobe performance, sharp elevation beams, and high front to back ratio.

Multiple networks can now be connected to a single antenna, reducing tower loading and leasing expense, while decreasing deployment time and installation cost.

Full band capability for 700 MHz , Cellular 850 MHz, PCS 1900 MHz, AWS 1710/2155 MHz and WCS 2300 MHz coverage in a single enclosure.

All CCI antennas are manufactured under ISO 9001.

Benefits

- **RET System allows Independent Tilt of each band specific paired port**
- **Reduces tower loading**
- **Frees up space for tower mounted Remote Radio Heads**
- **Single radome with eight ports**
- **All Band design simplifies radio assignments**
- **Sharp elevation beam eases network planning**

Features

- High Band Ports include WCS Band
- Four High Band ports with four Low Band ports in one antenna
- Sharp elevation beam
- Excellent elevation side-lobe performance
- Excellent MIMO performance due to array spacing
- Excellent PIM Performance
- A multi-network solution in one radome

Applications

- 4x4 MIMO on High Band and Dual 2x2 MIMO on 700 & 850 Low Bands
- Adding additional capacity without adding additional antennas
- Adding WCS Band without increasing antenna count

65° OctoPort Multi-Band Antenna

Model OPA-65R-LCUU-H8

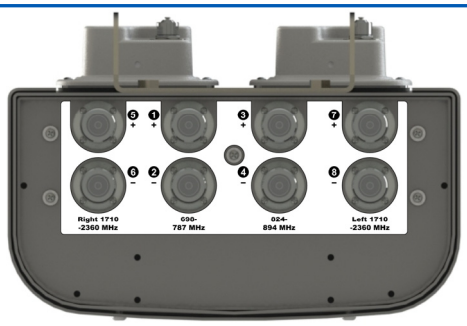
OPA-65R Multi-Band Antenna

Electrical Specifications

Frequency Range	2 X Low Band Ports (L) which cover the range from 698-787 MHz	2 X Low Band Ports (C) which cover the range from 824-894 MHz	4 X High Band Ports (H1 & H2) which cover the full range from 1710-2360 MHz			
			1850-1990 MHz	1710-1755/2110-2170 MHz	2305-2360 MHz	
Gain	14.7 dBi	15.5 dBi	17.0 dBi	16.5 dBi	17.2 dBi	17.1 dBi
Azimuth Beamwidth (-3dB)	65°	61°	62°	67°	64°	61°
Elevation Beamwidth (-3dB)	10.1°	8.5°	5.6°	6.2°	5.0°	4.5°
Electrical Downtilt	2° to 10°	2° to 10°	0° to 8°	0° to 8°	0° to 8°	0° to 8°
Elevation Sidelobes (1st Upper)	< -17 dB	< -17 dB	< -19 dB	< -18 dB	< -18 dB	< -17 dB
Front-to-Back Ratio @180°	> 28 dB	> 28 dB	> 35 dB	> 35 dB	> 35 dB	> 35 dB
Front-to-Back Ratio over ± 20°	> 28 dB	> 27 dB	> 28 dB	> 27 dB	> 27 dB	> 28 dB
Cross-Polar Discrimination (at Peak)	> 24 dB	> 20 dB	> 25 dB	> 25 dB	> 25 dB	> 25 dB
Cross-Polar Discrimination (at ± 60°)	> 16 dB	> 14 dB	> 18 dB	> 18 dB	> 18 dB	> 18 dB
Cross-Polar Port-to-Port Isolation	> 25 dB	> 25 dB	> 25 dB	> 25 dB	> 25 dB	> 25 dB
VSWR	< 1.5:1	< 1.5:1	< 1.5:1	< 1.5:1	< 1.5:1	< 1.5:1
Passive Intermodulation (2x20W)	≤ -150 dBc	≤ -150 dBc	≤ -150 dBc	≤ -150 dBc	≤ -150 dBc	≤ -150 dBc
Input Power	500 Watts CW	500 Watts CW	300 Watts CW	300 Watts CW	300 Watts CW	300 Watts CW
Polarization	Dual Pol 45°	Dual Pol 45°	Dual Pol 45°	Dual Pol 45°	Dual Pol 45°	Dual Pol 45°
Input Impedance	50 Ohms	50 Ohms	50 Ohms	50 Ohms	50 Ohms	50 Ohms
Lightning Protection	DC Ground	DC Ground	DC Ground	DC Ground	DC Ground	DC Ground

Mechanical Specifications

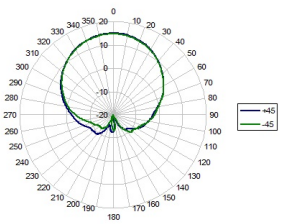
Dimensions (LxWxD)	92.7 x 14.4 x 7.0 inches (2355 x 366 x 179 mm)
Survival Wind Speed	> 150 mph
Front Wind Load	327 lbs (1453 N) @ 100 mph (161 kph)
Side Wind Load	186 lbs (829 N) @ 100 mph (161 kph)
Equivalent Flat Plate Area	12.9 ft^2 (1.2 m^2)
Weight (w/o RET/Mounting)	88 lbs (40 kg)
RET System Weight	7.0 lbs (3.0 kg)
Connector	8; 7-16 DIN female long neck
Mounting Pole	2-5 inches (5-12 cm)



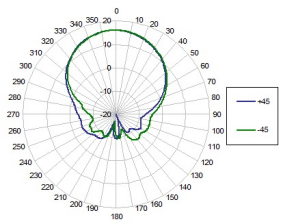
Bottom View

Rear View

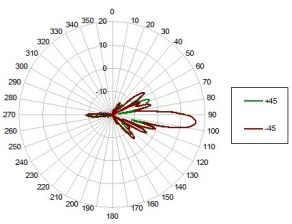
Antenna Patterns*



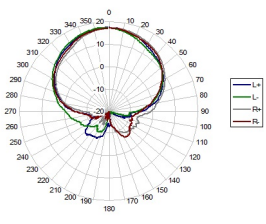
737 MHz Azimuth



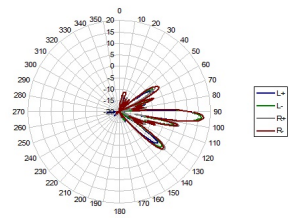
887 MHz Azimuth



Elevation 5°



1920 MHz Azimuth



Elevation 4°

*Typical antenna patterns. For detail information on antenna pattern, please contact us at info@cciproducts.com. All specifications are subject to change without notice.

RRUS 11

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

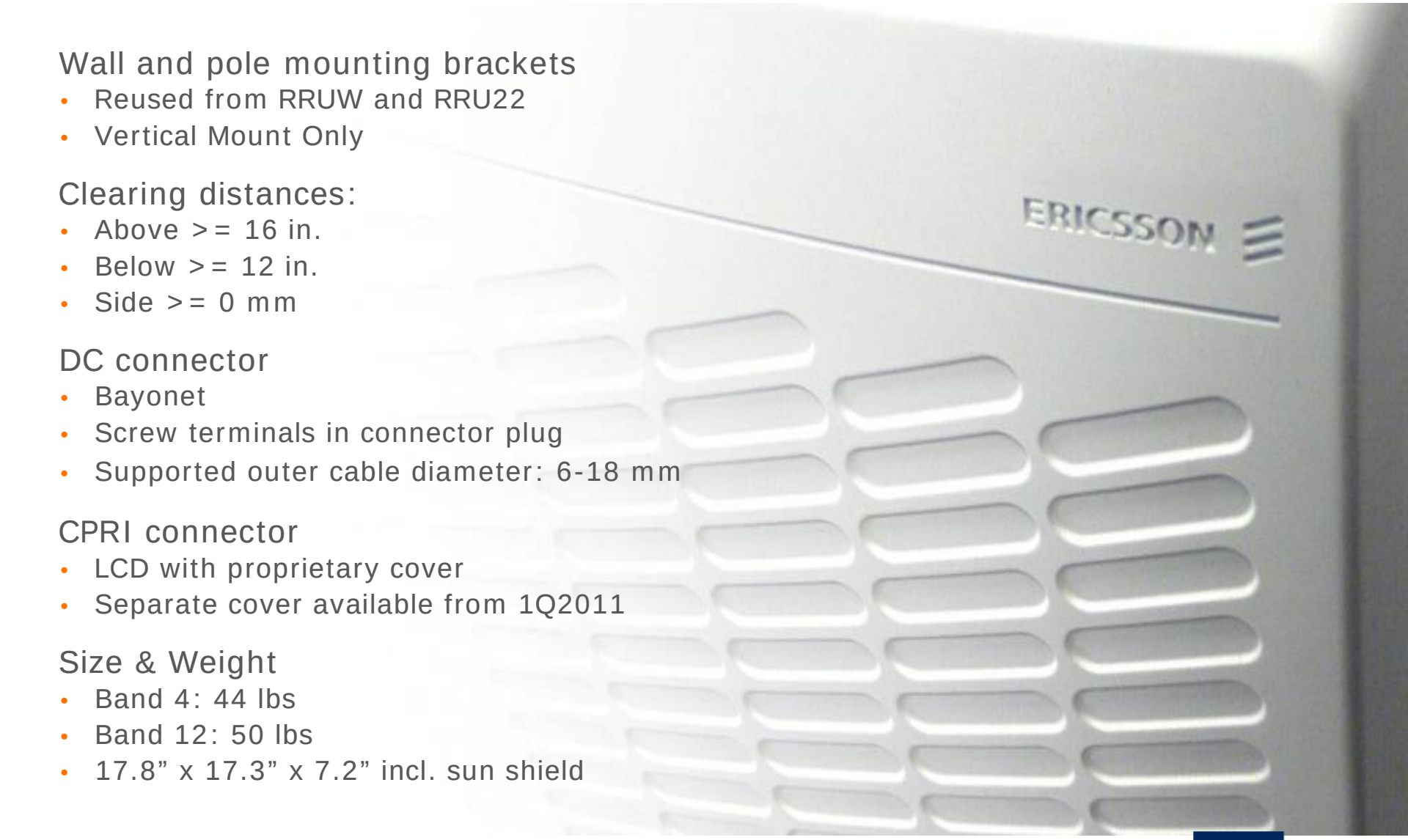
RF Characteristics
- ✓ Output power: 2x30 Watts
- ✓ 2x2 MIMO Capable
- ✓ IBW of 20 MHz
- ✓ Rx Sens.: Better than -105 dBm (5 MHz)

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

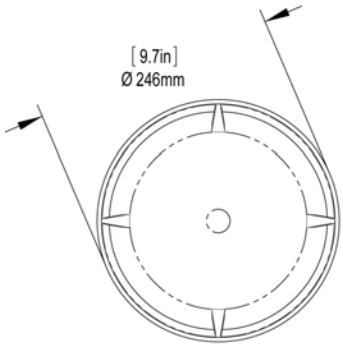
DC6-48-60-18-8F

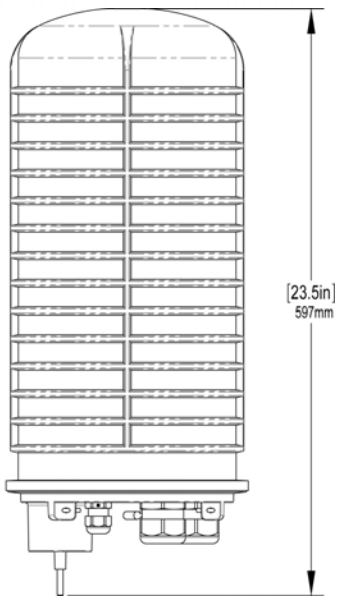
DC Surge Suppression Solution

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

Raycap, Inc. 806 W. Clearwater Loop • Post Falls • Idaho • 83854 • USA
Phone 208.777.1166 • Toll Free 800.890.2569 • Fax 208.777.4466 • www.raycapsurgeprotection.com

Rosenberger
Rosenberger Site Solutions, LLC

AT&T LTE FIBER INSTALLATION MATERIALS

12 PAIR FIBER TRUNK

FTTA fiber trunks are fiber optical cable assemblies connecting base stations and remote radio heads in telecommunication applications. They can be used indoor and outdoor, are UV protected and riser rated. Connectors and fan-out are IP67 protected. This ensures easy handling in an outdoor environment. A pulling sock eases cable hoisting.

Part #	Diameter	Description	QTY
FB-L98B-002-15000 CEQ.32135	10mm	Preconnect Trunk with UL certified cable 12 channels, 24 fibers, single mode LC Duplex to LC Duplex, OD 10.0mm: 15 meter length.	Each
FB-L98B-002-30000 CEQ.32194	10mm	Preconnect Trunk with UL certified cable 12 channels, 24 fibers, single mode LC Duplex to LC Duplex, OD 10.0mm: 30 meter length.	Each
FB-L98B-002-50000 CEQ.32193	10mm	Preconnect Trunk with UL certified cable 12 channels, 24 fibers, single mode LC Duplex to LC Duplex, OD 10.0mm: 50 meter length.	Each
FB-L98B-002-75000 CEQ.32192	10mm	Preconnect Trunk with UL certified cable 12 channels, 24 fibers, single mode LC Duplex to LC Duplex, OD 10.0mm: 75 meter length.	Each
FB-L98B-002-100000 CEQ.32191	10mm	Preconnect Trunk with UL certified cable 12 channels, 24 fibers, single mode LC Duplex to LC Duplex, OD 10.0mm: 100 meter length.	Each
FB-L98B-002-125000 CEQ.32190	10mm	Preconnect Trunk with UL certified cable 12 channels, 24 fibers, single mode LC Duplex to LC Duplex, OD 10.0mm: 125 meter length.	Each

6 CONDUCTOR (3 PAIR) POWER CABLE

600 Volts Power Cable. UL Approved for direct burial or sunlight applications.

Part #	Diameter	Description	QTY
WR-VG86T CEQ.32182	19.2 mm	RSS 8-AWG 6 - Conductor Unshielded 600 Volts Power Cable -# 8 Tinned Copper (three traced red/black pairs) w/ #10 Bare Ground Wire.	Per FT
WR-VG86ST-BRD CEQ.32181	19.7 mm	RSS 8-AWG 6 - Conductor Shielded (Tinned Copper Braid and Aluminum Tape w/ Drain Wire) 600 Volts Power Cable -# 8 Tinned Copper (three traced red/black pairs) w/ #10 Bare Ground Wire.	Per FT

2 CONDUCTOR (SINGLE PAIR) SHIELDED POWER CABLE

600 Volts Power Cable. UL Approved for direct burial or sunlight applications.

Part #	Diameter	Description	QTY
WR-VG122ST-BRDA CEQ.10224	9.8mm	RSS 12-AWG 2 – Flexible Conductor Shielded (Tinned Copper Braid and Aluminum Tape w/ Drain Wire) 600 Volts Power Cable -# 12 AWG 65 Strands Tinned Copper (red and black) w/ #12 Bare Ground Wire.	Per FT
WR-VG102ST-BRDA CEQ.10225	11.6mm	RSS 10-AWG 2 – Flexible Conductor Shielded (Tinned Copper Braid and Aluminum Tape w/ Drain Wire) 600 Volts Power Cable -# 10 AWG 105 Strands Tinned Copper (red and black) w/ #10 Bare Ground Wire.	Per FT
WR-VG82ST-BRDA CEQ.10226	15.4mm	RSS 8-AWG 2 – Flexible Conductor Shielded (Tinned Copper Braid and Aluminum Tape w/ Drain Wire) 600 Volts Power Cable -# 8 AWG 168 Strands Tinned Copper (red and black) w/ #10 Bare Ground Wire.	Per FT

▪P.O. Box 8817 ▪ Lake Charles, LA 70606 ▪ Ph. 337.598.5250 ▪ Fax: 337.598.5290 ▪rlss@rlss.us ▪ www.RLSS.us

Rev. Date: 9/10/2010

Product Specifications

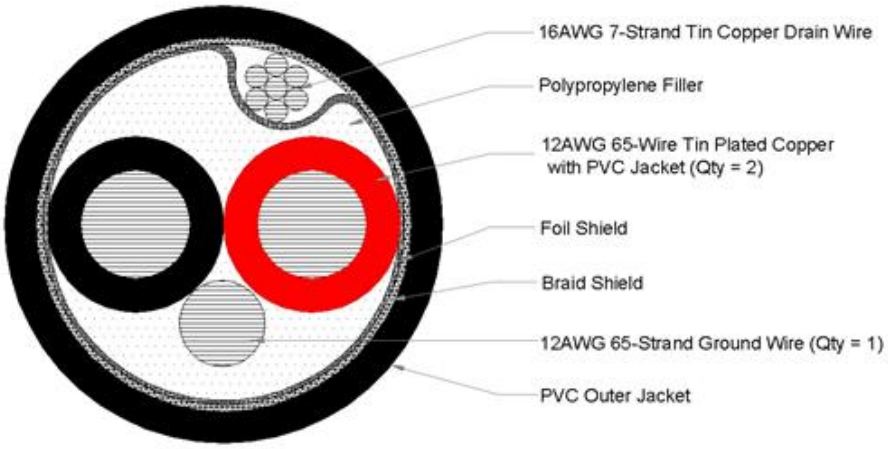
COMMSCOPE®

POWERED BY ANDREW®

PWRT-212-S

Remote Radio Head Power Cable, 2 conductor with shield, 12 AWG (3.31 mm2)

Cross Section Drawing



Construction Materials

Construction Type	Non-armored
Conductor Material	Tinned copper
Dielectric Material	PVC
Drain Wire Material	Tinned copper
Filler Material	Polypropylene
Ground Wire Material	Tinned copper
Insulation Material, singles	PVC
Jacket Material	PVC
Outer Shield (Braid) Coverage	65 %
Outer Shield (Braid) Gauge	36 AWG
Outer Shield (Braid) Material	Tinned copper
Outer Shield (Tape) Material	Aluminum/Poly, non-bonded

Dimensions

Cable Weight	0.16 kg/m | 0.11 lb/ft
Diameter Over Conductor, singles	2.5654 mm per 65 strand 0.1010 in per 65 strand
Diameter Over Dielectric	3.5814 mm | 0.1410 in
Diameter Over Drain Wire	1.5200 mm per 7 strand 0.0598 in per 7 strand
Diameter Over Ground Wire	2.565 mm | 0.101 in
Diameter Over Jacket	10.109 mm | 0.398 in

Product Specifications

PWRT-212-S

Diameter Over Shield (Braid)	7.823 mm | 0.308 in
Jacket Thickness	1.143 mm | 0.045 in

Electrical Specifications

Conductor dc Resistance	1.68 ohms/kft | 5.51 ohms/km
Conductor dc Resistance Note	Maximum value based on a standard condition of 20 °C (68 °F)
Safety Voltage Rating	600 V

Environmental Specifications

Environmental Space	UV resistant for outdoor and/or direct burial installations
Operating Temperature	-40 °C to +90 °C (-40 °F to +194 °F)
Safety Standard	NEC Article 336 (Type TC)

General Specifications

Application	Industrial
Cable Type	Power
Jacket Color	Black
Conductor Gauge, singles	12 AWG
Conductor Type, singles	Stranded
Conductors, quantity	2
Drain Wire Gauge	16 AWG
Ground Wire Gauge	12 AWG
Ground Wire Type	Stranded
Jacket Color, singles	Black | Red

Regulatory Compliance/Certifications

Agency	Classification
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

ATTACHMENT 3

Michael Lawton
SAI Communications
260 Cedar Hill St.
Marlborough, MA 01752
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March 6, 2015

Connecticut Siting Council

Subject: AT&T Wireless, SR2286 – Old Lyme – Shore Road

Dear Connecticut Siting Council:

At the request of AT&T Wireless, SAI Communications has performed a cumulative assessment of the RF Power Density at the proposed site located at 232 Shore Road, Old Lyme, CT.
Calculations were done in compliance with FCC OET Bulletin 65. This report provides an FCC compliance assessment based on a "worst-case" analysis that all transmitters are simultaneously operating at full power and pointing directly at the ground.

FCC OET Bulletin 65 formula:

$$S = \frac{2.56 * 1.64 * ERP}{4 * \pi * R^2}$$

Transmission Mode	Antenna Centerline AGL (ft)	Frequency (MHz)	Number of Channels	Effective Radiated Power per Channel (Watts)	Power Density (mW/cm^2)	Standard Limits (mW/cm^2)	% MPE (Uncontrolled/ General Public)
T-Mobile GSM	97	1945	8	262.14	0.0556	1	5.56%
T-Mobile UMTS	97	2100	2	1,279.56	0.0678	1	6.78%
Verizon PCS	90	1970	3	437.00	0.0582	1	5.82%
Verizon Cellular	90	869	9	390.00	0.1558	0.579333	26.90%
Verizon LTE	90	757	1	794.00	0.0353	0.497333	7.09%
AT&T UMTS	110	850	2	500.00	0.0297	0.5667	5.24%
AT&T UMTS	110	1900	2	500.00	0.0297	1	2.97%
AT&T LTE 700 BC/DE	110	700	2	500.00	0.0297	0.4667	6.37%
AT&T LTE 850	110	850	1	500.00	0.0149	0.5667	2.62%
AT&T LTE 1900	110	1900	2	500.00	0.0297	1	2.97%
AT&T LTE WCS	110	2300	1	500.00	0.0149	1	1.49%
Total							**73.81%**

Conclusion: AT&T's proposed antenna installation is calculated to be within 73.81% of FCC Standard for General Public/Uncontrolled Maximum Permissible Exposure (MPE).

Sincerely,

Michael Lawton
SAI Communications

Revised Per D&M Changes (RFDS ID: 480912, Revision 5)